



LTE 3GPP Band 13 Network Access

Device Requirements

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LTE 3GPP Band 13 Network Access

Revision History

Author	Description of Changes
Verizon Wireless	Version 0.9: Initial version
Verizon Wireless	Version 0.95 Updates/Clarifications/Additions to the following sections: 1.1, 1.2, 1.3, 1.7, 2.2.1.3, 2.2.2, 3.1.1, 3.1.2.5, 3.1.3, 3.2.1, 3.2.4, 3.2.5, 3.2.6, 3.2.7, 3.2.8, 3.2.11, 3.2.12, 3.2.13, 4.1.4, 5.2, 6.1.1, 6.1.2, 6.2.1, 6.2.2, 6.2.3, 6.3.1, 7, 8
Verizon Wireless	Version 0.96 Updates/Clarifications/Additions to the following sections: 1.3, 2.2.1.3, 2.2.2.1, 3.1.2.3, 3.1.2.5, 3.1.3.3, 3.2.2, 3.2.3, 3.2.4, 3.2.6, 3.2.7, 3.2.8, 3.2.10, 3.2.12, 4.1.2, 4.1.3, 4.1.4, 5.4, 6.2.1.2, 6.2.3.2, 7, 8
Verizon Wireless	Version 0.97 Updates/Clarifications/Additions to the following sections: 1.3, 2.2.2.1, 3.1.2.5, 3.2.4.4, 3.2.6, 3.2.8, 3.2.9, 3.2.10, 3.2.13, 4.1.2, 4.1.3, 4.1.4, 5.4, 6.1.1, 6.1.2, 6.2, 6.2.1, 6.2.2, 6.2.3, 7, 8
Verizon Wireless	Version 1.00 Updates/Clarifications/Additions to the following sections: 1.2, 1.7, 2.2.1.1, 2.2.2.2, 3.1.2.5, 3.1.3, 3.1.3.3, 3.2.1, 3.2.2, 3.2.4.1, 3.2.4.2.2, 3.2.6, 3.2.10, 3.2.11, 4.1.1, 4.1.3.1, 4.1.3.4.1, 4.1.5.1, 5.4, 6.1.1, 6.2.2.2, 7, 8
Verizon Wireless	Version 2.00 Updates/Clarifications/Additions to the following

	sections: 1.3, 2.2.1.2, 3.1.2.6, 3.2.4.2.1, 3.2.4.4.2, 3.2.6, 3.2.8.1, 3.2.8.2, 3.2.8.4.1, 3.2.10, 3.2.10.2, 3.2.13, 4.1.2.1, 4.1.2.2, 4.1.2.3, 4.1.3.1, 4.1.4, 4.1.8, 4.1.9, 5.4.1, 6.2, 6.2.5, 6.3, 8
Verizon Wireless	Version 3.00 Updates/Clarifications/Additions to the following sections: 1.2, 1.3, 3.1.2.2, 3.2.4.1, 3.2.4.4.2, 3.2.4.4.3, 3.2.4.7, 3.2.5, 3.2.8.5, 3.2.9, 3.2.14, 4.1.2.3, 4.1.2.4.2, 4.1.3, 4.1.3.1, 4.1.3.3.1, 4.1.4.2, 4.1.4.3, 4.1.10, 5.4.1, 6.2.1.2, 6.2.3.2.1, 6.2.3.2.2, 6.2.3.2.3, 7, 8
Verizon Wireless	Version 4.00 Updates/Clarifications/Additions to the following sections: 3.2.4.1, 3.2.4.4.2, 3.2.5, 3.2.5.1, 4.1.3.1, 4.1.4, 4.1.8, 4.1.10, 8
Verizon Wireless	Version 5.00 Updates/Clarifications/Additions to the following sections: 1.2, 3.1.2.6, 3.2.8.5, 4.1.2.1.1, 4.1.3, 4.1.4.1, 4.1.4.2, 4.1.4.2.1, 4.1.4.2.2, 4.1.4.3, 4.1.6.1, 4.1.8, 5.4.1, 6.2.1.2, 6.2.3.2.1, 6.2.3.2.2, 6.3.4.1, 6.3.4.2, 7, 8
Verizon Wireless	Version 6.00 Updates/Clarifications/Additions to the following sections: 3.1.2.7, 3.2.4.3, 3.2.8.6, 3.2.10.3.1, 4.1.3, 4.1.4.1, 4.1.4.2.1, 4.1.4.2.2, 4.1.4.2.3, 4.1.4.3, 4.1.6.1, 4.1.8.1, 4.1.8.2.2, 5.5.1
Verizon Wireless	Version 7.00 Updates/Clarifications/Additions to the following sections: 1.2, 2.2.1.1, 2.2.1.3, 3.1.2.7, 3.2.4.4.2, 3.2.4.7, 3.2.4.8, 3.2.6, 3.2.8.6, 3.2.9, 4.1.4.2.1, 4.1.10, 5.4.1, 6.2.2.5, 6.2.3.2, 8 Updates to Release 9 throughout the document
Verizon Wireless	Version 8.00



	Updates/Clarifications/Additions to the following sections: 1, 3.1.2.5, 3.1.2.7, 3.1.2.7.1, 3.1.2.7.4, 3.1.2.7.5, 3.2.2, 3.2.15, 4.1.4.2.1, 4.1.7, 6.1.3, 6.2.1.2, 6.2.3.2, 6.2.3.2.1, 6.2.3.2.2, 6.2.4.1, 6.2.4.2, 6.3.5, 8
Verizon Wireless	Version 9.00 Updates/Clarifications/Additions to the following sections: 2.1.1, 2.2.2.1, 3.2.1.1, 3.2.4.3, 3.2.4.6, 3.2.4.7, 3.2.6, 3.2.10, 3.2.10.1, 3.2.10.2.1, 3.2.10.3, 3.2.15, 3.2.16, 4.1.2.1.2, 4.1.4.1, 5.4.2, 5.5.1, 6.2.4.2, 8
Verizon Wireless	Version 10.00 Updates/Clarifications/Additions to the following sections: 3.1.2.7.1, 3.1.2.7.2, 3.1.2.7.5, 3.2.4.4.3, 3.2.4.7, 3.2.8.5, 4.1.4.2.1, 5.4.1, 8
Verizon Wireless	Version 11.00 Updates/Clarifications/Additions to the following sections: 3.1.2.7
Verizon Wireless	Version 12.00 Updates/Clarifications/Additions to the following sections: 4.1.4.1, 4.1.4.2.2, 4.1.4.3, 4.1.6.1, 4.1.8.2.1, 4.1.8.2.2
Verizon Wireless	Version 13.00 Updates/Clarifications/Additions to the following sections: 3.1.2.7.5, 3.1.2.7.6, 3.2.1.1, 3.2.1.2, 3.2.1.3, 3.2.8.7, 3.2.9, 3.2.17, 4.1.2.4.1, 4.1.2.4.4, 4.1.11, 6.2.1.2, 6.2.3.2.1, 6.2.3.2.2, 6.2.3.2.3
Verizon Wireless	Version 14.00 Added section 6.4
Verizon Wireless	Version 15.00 Updates/Clarifications/Additions to the following sections: 3.1.2.7, 3.1.3.3, 3.1.3.7, 3.2.4.4.3, 3.2.4.8, 4.1.2.4.2, 4.1.2.4.5, 4.1.3, 4.1.3.3.1, 4.1.3.3.2, 4.1.6, 4.1.12



Verizon Wireless	<p>Version 16.00</p> <p>Updates/Clarifications/Additions to the following sections: 2.2.3, 3.1.2.7, 3.1.3.3, 3.1.3.4, 3.2.4.7.1, 3.2.4.7.2, 4.1.2.4.2, 4.1.2.4.6, 4.1.3.3.1, 4.1.4.1, 4.1.8.1.1, 4.1.13, 5.4.1, 8</p>
Verizon Wireless	<p>Version 17.00</p> <p>Updates/Clarifications/Additions to the following sections: 1.2, 2.1.1, 2.2.1.3, 3.1.3, 3.1.3.3, 3.1.3.8, 3.2.4.7.2, 3.2.4.8, 3.2.9, 3.2.10 Added IMS registration requirements from LTE SMS Requirements, 3.2.10.4.1, 3.2.10.4.4, 3.2.10.4.6, 3.2.10.4.7, 3.2.11, 3.2.18, 4.1.2.4, 4.1.2.4.2, 4.1.2.4.5, 4.1.3.3, 4.1.3.3.1, 4.1.3.3.2, 4.1.5.1, 4.1.10, 4.1.12.1.3, 4.1.14, 4.1.15, 4.1.16, 4.1.17, 4.1.18, 5.4.1, 6.4.1.1, 6.4.1.2, 6.4.2.1, 6.4.2.2, 8</p>
Verizon Wireless	<p>Version 18.00</p> <p>Updates/Clarifications/Additions to the following sections: 1.2, 2.2.1.1, 3.1.3.9, 3.2.10.5.8, 3.2.10.8, 4.1.18.1, 4.1.18.5, 6.2.1.2, 6.2.1.2.1, 6.2.2.2, 6.2.3.2, 6.2.3.2.1, 6.2.3.2.2, 6.2.3.2.3</p>
Verizon Wireless	<p>Version 19.00</p> <p>Updates/Clarifications/Additions to the following sections: 3.1.3.10, 3.2.10.4.3, 3.2.10.4.4, 3.2.10.4.6, 3.2.10.5.1, 3.2.10.5.9, 3.2.10.6, 5.4.1, 6.2.1.2.1</p>
Verizon Wireless	<p>Version 20.00</p> <p>Updates/Clarifications/Additions to the following sections: 3.2.10.4.3, 3.2.10.4.6, 3.2.10.4.7, 3.2.10.5.9, 3.2.10.9</p>
Verizon Wireless	<p>Version 21.00</p> <p>Updates to sections: 3.1.3.10.1 (VZ_REQ_LTEB13NAC_6461) 3.1.3.11.1 (VZ_REQ_LTEB13NAC_6482)</p>



	3.2.10.5.8.1 (VZ_REQ_LTEB13NAC_6439) 4.1.4.3.1 (VZ_REQ_LTEB13NAC_6370) 4.1.6.2.1 (VZ_REQ_LTEB13NAC_6375)
Verizon Wireless	Version 22.00 Updates to sections: 2.2.1.3.1 (VZ_REQ_LTEB13NAC_6270), 2.2.1.3.2 (VZ_REQ_LTEB13NAC_6271), 3.1.3.5.1 (VZ_REQ_LTEB13NAC_6299), 3.1.3.13.1 (VZ_REQ_LTEB13NAC_36250), 3.2.4.2.1 (VZ_REQ_LTEB13NAC_22716), 3.2.4.3.2.1 (VZ_REQ_LTEB13NAC_6311), 3.2.9.1 (VZ_REQ_LTEB13NAC_6334), 3.2.10.5.3.1 (VZ_REQ_LTEB13NAC_6434), 3.2.10.5.6.1 (VZ_REQ_LTEB13NAC_6437), 3.2.10.5.11.1 (VZ_REQ_LTEB13NAC_6442), 3.2.10.5.13.1 (VZ_REQ_LTEB13NAC_35804), 3.2.10.6.1.1 (VZ_REQ_LTEB13NAC_6444), 3.2.10.6.2.1 (VZ_REQ_LTEB13NAC_6452), 3.2.10.6.7.1 (VZ_REQ_LTEB13NAC_6457), 3.2.10.6.10.1 (VZ_REQ_LTEB13NAC_36128), 3.2.10.10.1 (VZ_REQ_LTEB13NAC_33802), 3.2.10.11 (VZ_REQ_LTEB13NAC_36124, VZ_REQ_LTEB13NAC_36125, VZ_REQ_LTEB13NAC_36126), 4.1.7.2 (VZ_REQ_LTEB13NAC_35805), 4.1.19.1 (VZ_REQ_LTEB13NAC_35802), 4.1.20.1 (VZ_REQ_LTEB13NAC_36238), 5.5.1 (VZ_REQ_LTEB13NAC_23654)
Verizon Wireless	Version 23.00 Updates to sections: VZ_REQ_LTEB13NAC_6264, VZ_REQ_LTEB13NAC_6268, VZ_REQ_LTEB13NAC_6269, VZ_REQ_LTEB13NAC_6270, VZ_REQ_LTEB13NAC_6274, VZ_REQ_LTEB13NAC_6275, VZ_REQ_LTEB13NAC_6277, VZ_REQ_LTEB13NAC_6461, VZ_REQ_LTEB13NAC_6482, VZ_REQ_LTEB13NAC_36250, VZ_REQ_LTEB13NAC_6317, VZ_REQ_LTEB13NAC_6433, VZ_REQ_LTEB13NAC_6435, VZ_REQ_LTEB13NAC_6439, VZ_REQ_LTEB13NAC_6442, VZ_REQ_LTEB13NAC_6444, VZ_REQ_LTEB13NAC_33802, VZ_REQ_LTEB13NAC_36124, VZ_REQ_LTEB13NAC_36125, VZ_REQ_LTEB13NAC_36126, VZ_REQ_LTEB13NAC_23543, VZ_REQ_LTEB13NAC_36843, VZ_REQ_LTEB13NAC_36950, VZ_REQ_LTEB13NAC_36951, VZ_REQ_LTEB13NAC_36952, VZ_REQ_LTEB13NAC_36953, VZ_REQ_LTEB13NAC_36954, VZ_REQ_LTEB13NAC_36957, VZ_REQ_LTEB13NAC_36959, VZ_REQ_LTEB13NAC_36960, VZ_REQ_LTEB13NAC_36963, VZ_REQ_LTEB13NAC_36964, VZ_REQ_LTEB13NAC_36965,



	VZ_REQ_LTEB13NAC_36966, VZ_REQ_LTEB13NAC_36967, VZ_REQ_LTEB13NAC_36968, VZ_REQ_LTEB13NAC_36969, VZ_REQ_LTEB13NAC_6370, VZ_REQ_LTEB13NAC_6375, VZ_REQ_LTEB13NAC_23623, VZ_REQ_LTEB13NAC_36995, VZ_REQ_LTEB13NAC_6392, VZ_REQ_LTEB13NAC_6401, VZ_REQ_LTEB13NAC_6402, VZ_REQ_LTEB13NAC_6403, VZ_REQ_LTEB13NAC_6404, VZ_REQ_LTEB13NAC_6405, VZ_REQ_LTEB13NAC_6412, VZ_REQ_LTEB13NAC_6413
Verizon Wireless	<p>Version 24.00</p> <p>Updates to sections: VZ_REQ_LTEB13NAC_6264, VZ_REQ_LTEB13NAC_6268, VZ_REQ_LTEB13NAC_6269, VZ_REQ_LTEB13NAC_6270, VZ_REQ_LTEB13NAC_37889, VZ_REQ_LTEB13NAC_6434, VZ_REQ_LTEB13NAC_6435, VZ_REQ_LTEB13NAC_6437, VZ_REQ_LTEB13NAC_6439, VZ_REQ_LTEB13NAC_6485, VZ_REQ_LTEB13NAC_36948, VZ_REQ_LTEB13NAC_36950, VZ_REQ_LTEB13NAC_36952, VZ_REQ_LTEB13NAC_36957, VZ_REQ_LTEB13NAC_37714, VZ_REQ_LTEB13NAC_37808, VZ_REQ_LTEB13NAC_37809, VZ_REQ_LTEB13NAC_37810, VZ_REQ_LTEB13NAC_37812, VZ_REQ_LTEB13NAC_37813, VZ_REQ_LTEB13NAC_37814, VZ_REQ_LTEB13NAC_36238, VZ_REQ_LTEB13NAC_36995, VZ_REQ_LTEB13NAC_37647, VZ_REQ_LTEB13NAC_37648, VZ_REQ_LTEB13NAC_37649, VZ_REQ_LTEB13NAC_37650, VZ_REQ_LTEB13NAC_36963, VZ_REQ_LTEB13NAC_36964, VZ_REQ_LTEB13NAC_36965, VZ_REQ_LTEB13NAC_36966, VZ_REQ_LTEB13NAC_36969, VZ_REQ_LTEB13NAC_37651, VZ_REQ_LTEB13NAC_37816, VZ_REQ_LTEB13NAC_37817</p> <p>Updated "CTIA Test Plan for Wireless Device Over the Air Performance" references throughout the document.</p>
Verizon Wireless	<p>Version 25.00</p> <p>Updates to sections: VZ_REQ_LTEB13NAC_6274, VZ_REQ_LTEB13NAC_6332, VZ_REQ_LTEB13NAC_6433, VZ_REQ_LTEB13NAC_6435, VZ_REQ_LTEB13NAC_35804, VZ_REQ_LTEB13NAC_6453, VZ_REQ_LTEB13NAC_6459, VZ_REQ_LTEB13NAC_33802, VZ_REQ_LTEB13NAC_37806, VZ_REQ_LTEB13NAC_38376, VZ_REQ_LTEB13NAC_6465, VZ_REQ_LTEB13NAC_6466, VZ_REQ_LTEB13NAC_38228, VZ_REQ_LTEB13NAC_38230, VZ_REQ_LTEB13NAC_38231, VZ_REQ_LTEB13NAC_38232, VZ_REQ_LTEB13NAC_38233, VZ_REQ_LTEB13NAC_38234, VZ_REQ_LTEB13NAC_38235, VZ_REQ_LTEB13NAC_38236, VZ_REQ_LTEB13NAC_38756, VZ_REQ_LTEB13NAC_38757, VZ_REQ_LTEB13NAC_38238,</p>



VZ_REQ_LTEB13NAC_38239, VZ_REQ_LTEB13NAC_38240, VZ_REQ_LTEB13NAC_38241, VZ_REQ_LTEB13NAC_38242, VZ_REQ_LTEB13NAC_38243, VZ_REQ_LTEB13NAC_38244, VZ_REQ_LTEB13NAC_35802, VZ_REQ_LTEB13NAC_36238, VZ_REQ_LTEB13NAC_38507, VZ_REQ_LTEB13NAC_38508, VZ_REQ_LTEB13NAC_6385, VZ_REQ_LTEB13NAC_38378
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1 INTRODUCTION **VZ_REQ_LTEB13NAC_1869**

Verizon Wireless has launched LTE network service in the 3GPP Band 13 frequency band (700 MHz C Block). This publication is part of Verizon Wireless compliance with the FCCs rules for 700 MHz C Block (47 C.F.R. § 27.16), as explained in the FCCs Second Report and Order in WT Docket No. 06-150, "Service Rules for the 698-746, 747-762 and 777-792 MHz Bands" released on August 10, 2007.

In this document, the terms LTE (Long Term Evolution) and E-UTRA (Evolved Universal Terrestrial Radio Access) are considered equivalent.

1.1 APPLICABILITY **VZ_REQ_LTEB13NAC_1870**

These requirements apply to all devices designed to operate on the Verizon Wireless LTE 3GPP Band 13 network. 3GPP Band 13 is per 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*.

For any questions related to this document, please contact Verizon Wireless through the Verizon Wireless Open Development website.

1.2 3GPP RELEASE 9 SPECIFICATIONS **VZ_REQ_LTEB13NAC_1871**

1.2.1 **VZ_REQ_LTEB13NAC_6264**

In this document, the term "3GPP Release 9 Specifications" refers to all 3GPP specifications that have been

updated for Release 9 as of the September 2010 baseline with the exceptions noted below:

- The following CRs and features from later releases shall be included:
 - 3GPP RP-101431, CR#532: Splitting FGI bit 3 (CR to 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*)
 - SIB16 per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*.
 - RRC Connection Reject with Deprioritization per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*.
 - SON support (i.e. radio link failure reporting, handover failure reporting, and RACH information reporting) per the Release 10 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*.
 - Support for EMM Cause Value #42 "Service Network Failure" per the Release 11 version of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.
 - Cell selection with hybrid cells per section 5.2.4.9 of the Release 10 version of 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode*.
 - Timers T3245, T3346, and T3396 per the Release 10 version of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.
 - T3402 value in the ATTACH REJECT message per the Release 10 version of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.
 - Low priority access/delay tolerant UE support and extended access barring per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*.
 - feICIC (and associated features) per 3GPP Release 11.
 - Transmission mode 9 (TM9) downlink CoMP per 3GPP Release 10.
 - Transmission mode 10 (TM10) downlink CoMP per 3GPP Release 11.

The versions for all referenced 3GPP documents shall be as per the September 2010 Release 9 baseline with the exceptions noted above.

For a complete list of 3GPP documents, refer to 3GPP TS 21.201: *Technical Specifications and Technical Reports relating to an Evolved Packet System (EPS) based 3GPP system*.

Please refer to <http://www.3gpp.org> for the latest version of the 3GPP Specifications.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

1.3 VZ_REQ_LTEB13NAC_1872

This section defines acronyms and terms used throughout the document.

Acronym/Term	Definition
3GPP	3 rd Generation Partnership Project, manages GSM, EDGE, UMTS, HSPA, and LTE

	standards
A-MPR	Additional Maximum Power Reduction
APN	Access Point Name
ATSC	Advanced Television Systems Committee
BW	Bandwidth
CAT	Card Application Toolkit
CMAS	Commercial Mobile Alert Service
CR	Change Request
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
EMM	EPS Mobility Management
EPS	Evolved Packet System
ETSI	European Telecommunications Standards Institute
E-UTRA	Evolved Universal Terrestrial Radio Access
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
FCC	Federal Communications Commission
FDD	Frequency-Division Duplex
FQDN	Fully Qualified Domain Name
GCF	Global Certification Forum
IEC	International Electrotechnical Commission
IMEI	International Mobile station Equipment Identity
IMEISV	International Mobile station Equipment Identity and Software Version Number
IMS	IP Multimedia Subsystem
IMSI	International Mobile Subscriber Identity
ISIM	IP Multimedia Services Identity Module
ISO	International Organization for Standardization

LTE	Long Term Evolution
MCC	Mobile Country Code
MIMO	Multiple Input-Multiple Output
MNC	Mobile Network Code
MPR	Maximum Power Reduction
NAI	Network Access Identifier
NAS	Non-Access Stratum
NI	Network Identifier (part of APN)
OI	Operator Identifier (part of APN)
OTADM	Over-the-Air Device Management
PCO	Protocol Configuration Options
P-CSCF	Proxy-Call Session Control Function
PDN	Packet Data Network
PDP	Packet Data Protocol
PLMN	Public Land Mobile Network
PUCCH	Physical Uplink Control Channel
PUSCH	Physical Uplink Shared Channel
QoS	Quality of Service
RAT	Radio Access Technology
RB	Resource Block
REFSENS	Reference Sensitivity
ROHC	Robust Header Compression
RRC	Radio Resource Control
RSS	Received Signal Strength
SMS	Short Message Service
SNR	Serial Number (part of IMEI and IMEISV)

SVN	Software Version Number (part of IMEISV)
TAC	Type Allocation Code (part of IMEI and IMEISV)
TDD	Time-Division Duplex
TIS	Total Isotropic Sensitivity
TRP	Total Radiated Power
TTL	Time-to-Live
UE	User Equipment
UICC	Universal Integrated Circuit Card
USIM	Universal Subscriber Identity Module
VZW	Verizon Wireless

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, Open Development]

1.4 FCC COMPLIANCE [VZ_REQ_LTEB13NAC_1873](#)

1.4.1 [VZ_REQ_LTEB13NAC_6265](#)

Please note that devices submitted to the Verizon Wireless Open Development Initiative for conformance testing must have previously completed U.S. Federal Communications Commission equipment authorization procedures and comply with relevant FCC rules and regulations. It is the responsibility of the developer to comply with relevant FCC requirements.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

1.5 LTE SERVICES [VZ_REQ_LTEB13NAC_1874](#)

Initially, Verizon Wireless will be providing packet data service over the Verizon Wireless LTE 3GPP Band 13 network.

1.6 REQUIREMENTS LANGUAGE [VZ_REQ_LTEB13NAC_1875](#)

This document uses the following verbal forms in conjunction with requirements:

- "Shall" or "Shall not" indicates the requirement is mandatory
- "Should" indicates the requirement is recommended but not mandatory
- "May" indicates the requirement is optional

1.7 DEVICE TESTING ON THE VERIZON WIRELESS LTE 3GPP BAND 13 NETWORK VZ_REQ_LTEB13NAC_1876

1.7.1 VZ_REQ_LTEB13NAC_6266

Prior to any testing on the "live" Verizon Wireless LTE network, the device shall pass the Verizon Wireless LTE Band 13 Safe for Network Test Plan.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2 HARDWARE SPECIFICATIONS VZ_REQ_LTEB13NAC_1877

2.1 MECHANICAL VZ_REQ_LTEB13NAC_1878

2.1.1 UICC SUPPORT - FORM FACTOR VZ_REQ_LTEB13NAC_22654

2.1.1.1 VZ_REQ_LTEB13NAC_6267

The device shall support one of the following UICC form factors:

- 2FF, or Plug-in, UICC, as specified in clause 4.2 of ETSI TS 102 221: *Smart Cards UICC-Terminal Interface; Physical and Logical Characteristics, Release 8*
- 3FF, or Mini, UICC, as specified in clause 4.3 of ETSI TS 102 221: *Smart Cards UICC-Terminal Interface; Physical and Logical Characteristics, Release 8*
- 4FF UICC, as specified in clause 4.0.4 of ETSI TS 102 221: *Smart Cards UICC-Terminal Interface; Physical and Logical Characteristics, Release 11*



Verizon Wireless strongly recommends support of the 4FF UICC, with mechanical provisions in the device for easy insertion and removal of the card.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2 ELECTRICAL VZ_REQ_LTEB13NAC_1879

2.2.1 LTE SUPPORT VZ_REQ_LTEB13NAC_22655

2.2.1.1 LTE SPECIFICATION VZ_REQ_LTEB13NAC_22657

2.2.1.1.1 VZ_REQ_LTEB13NAC_6268

The device shall support Frequency-Division Duplex (FDD) LTE operation as defined in the 3GPP Release 9 Specifications, September 2010 baseline. Time-Division Duplex (TDD) operation is not required for LTE in 3GPP Band 13. The device may support Frequency-Division Duplex (FDD) LTE operation as defined in the 3GPP Release 10 Specifications, June 2011 baseline.

If the device supports 3GPP Release 9 (September 2010 baseline), support for the following CRs to Release 9 and the following features from Release 10 and Release 11 shall be included:

- 3GPP RP-101431, CR#532: Splitting FGI bit 3 (CR to 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*)
- SIB16 per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*.
- RRC Connection Reject with Deprioritization per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*.
- SON support (i.e. radio link failure reporting, handover failure reporting, and RACH information reporting) per the Release 10 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*.
- Support for EMM Cause Value #42 "Service Network Failure" per the Release 11 version of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.
- Cell selection with hybrid cells per section 5.2.4.9 of the Release 10 version of 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode*.
- Timers T3245, T3346, and T3396 per the Release 10 version of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.
- T3402 value in the ATTACH REJECT message per the Release 10 version of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.
- Low priority access/delay tolerant UE support and extended access barring per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control*



(RRC); *Protocol specification*.

- feICIC (and associated features) per 3GPP Release 11.
- Transmission mode 9 (TM9) downlink CoMP per 3GPP Release 10.
- Transmission mode 10 (TM10) downlink CoMP per 3GPP Release 11.

If the device supports 3GPP Release 10 (June 2011 baseline), support for the following features from Release 11 shall be included:

- SIB16 per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*.
- RRC Connection Reject with Deprioritization per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*.
- Support for EMM Cause Value #42 "Service Network Failure" per the Release 11 version of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.
- Low priority access/delay tolerant UE support and extended access barring per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*.
- feICIC (and associated features) per 3GPP Release 11.
- Transmission mode 10 (TM10) downlink CoMP per 3GPP Release 11 (including TM9 downlink CoMP per 3GPP Release 10).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.1.2 LTE DEVICE CATEGORY **VZ_REQ_LTEB13NAC_22658**

2.2.1.2.1 **VZ_REQ_LTEB13NAC_6269**

The device shall be an LTE category 1, 2, 3, 4, 6, or 9 device per 3GPP TS 36.306: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.1.3 RRC UE FEATURE GROUP SUPPORT **VZ_REQ_LTEB13NAC_22659**

2.2.1.3.1 **VZ_REQ_LTEB13NAC_6270**

The device shall support the following feature groups defined in section B.1 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*: 2, 3, 4, 5, 6, 7, 14, 16, 17, 20, 21, and 103.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.1.3.2 VZ_REQ_LTEB13NAC_6271

The device may support the following additional feature groups defined in section B.1 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*: 28 and 29.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.1.3.3 VZ_REQ_LTEB13NAC_6272

When responding to the *UECapabilityEnquiry* RRC message (refer to 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, clause 5.6.3 for additional details), the indicators for all feature groups that are not supported by the device and the indicators for all feature groups with capabilities that have not been tested as a part of 3GPP standard conformance testing or VZW-specific testing shall be set to "0" (i.e. indicating that the UE does not support them). Refer to the *Performance and Required Verizon Wireless Device Compliance Test Plans* sections of this document for additional details on 3GPP standard conformance testing and VZW-specific testing.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.1.4 LTE FREQUENCY BAND VZ_REQ_LTEB13NAC_22660

2.2.1.4.1 VZ_REQ_LTEB13NAC_6273

The device shall support LTE in 3GPP Band 13 using a 10 MHz channel bandwidth as defined in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.2 MIMO SUPPORT VZ_REQ_LTEB13NAC_22661

2.2.2.1 MIMO ANTENNA REQUIREMENTS VZ_REQ_LTEB13NAC_22664

2.2.2.1.1 VZ_REQ_LTEB13NAC_6274

The device shall support one transmitter and two receivers for LTE 3GPP Band 13 operation. The device shall have a primary antenna for transmit and receive functions, and a secondary antenna for MIMO/receive diversity functions. When receiving LTE 3GPP Band 13 signals, the device shall always support dual receiver operation. At no time when receiving LTE 3GPP Band 13 signals shall the device autonomously cease dual receiver operation for any purpose.

NOTE: This requirement applies to all device categories, including category 1 with the following exception:

- A single receive antenna (i.e., no secondary antenna for MIMO/received diversity functions) is permissible with Category 1, 2, or 3 machine-to-machine (non-voice-enabled) devices that operate at very low data rates (no more than 1 MB/day). If operating with a single receive antenna:
 1. The device shall at all times report a rank indicator of 1 to the network.
 2. The device shall meet all 3GPP and Verizon Wireless LTE RF and RRM performance requirements. The receive antenna shall meet the radiated performance requirements for the "primary receiver" as defined in requirement VZ_REQ_LTEB13NAC_6401 of this document.
 3. To ensure that devices with one receive antenna do not significantly increase interference into other users on the network, the device shall be designed for use cases that require a data rate of no more than 1 MB/day. Devices for other use cases should support one transmitter and two receivers for LTE 3GPP Band 13 operation.

NOTE: For devices with a single receive antenna, the device receiver performance will be negatively affected by up to 4 dB. Verizon Wireless cannot guarantee that device field performance with single receive antenna operation will be comparable to device field performance with dual receive antenna operation. Verizon Wireless strongly recommends against single receive antenna operation for mission critical devices. Verizon Wireless will monitor any increased interference to other users devices arising from devices operating with a single receive antenna, and reserves the right to terminate network access for a device that exceeds the data rate specified above while operating with a single receive antenna until the device manufacturer, owner, or user implements corrective action to come back into compliance with these requirements or otherwise to the satisfaction of Verizon Wireless. Additionally, devices designed for other use cases must adhere to the standard for two receive antennas.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.2.1.2 VZ_REQ_LTEB13NAC_6275

The device shall not allow the transmitter output to be switched between the primary and secondary antennas.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]



2.2.2.2 MIMO SUPPORT REQUIREMENTS **VZ_REQ_LTEB13NAC_22665**

2.2.2.2.1 TRANSMIT DIVERSITY (APPLIES TO ALL DEVICE CATEGORIES)

VZ_REQ_LTEB13NAC_22666

2.2.2.2.1.1 **VZ_REQ_LTEB13NAC_6276**

All devices shall support downlink 2x2 and 4x2 transmit diversity as defined in the 3GPP Release 9 Specifications.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.2.2.2 SPATIAL MULTIPLEXING (CATEGORY 2 AND HIGHER DEVICES ONLY)

VZ_REQ_LTEB13NAC_22667

2.2.2.2.2.1 **VZ_REQ_LTEB13NAC_6277**

As defined in the 3GPP Release 9 Specifications, Category 2 and higher devices shall support:

- downlink 2x2 and 4x2 open loop spatial multiplexing
- downlink 2x2 and 4x2 closed loop spatial multiplexing (single layer and 2 layers).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.3 TESTABILITY **VZ_REQ_LTEB13NAC_22662**

2.2.3.1 **VZ_REQ_LTEB13NAC_6278**

External RF connectors shall be provided for all antenna paths including all MIMO antenna paths. The RF connectors shall be easily accessible, e.g. not behind the battery.

The RF connectors shall be placed such that only the antenna and the antenna matching circuit are disconnected. The conducted path through the RF connectors shall include all elements of the transceiver chain (e.g. filters, active components) except the antenna and the antenna matching circuit.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]



2.2.4 UICC SUPPORT **VZ_REQ_LTEB13NAC_22663**

2.2.4.1 ACTIVATION/DE-ACTIVATION OF CONTACTS TO THE UICC

VZ_REQ_LTEB13NAC_22671

2.2.4.1.1 **VZ_REQ_LTEB13NAC_6279**

Electrical and mechanical interface contacts for activation and de-activation of the UICC shall be compliant with ETSI TS 102 221: *Smart Cards UICC-Terminal Interface; Physical and Logical Characteristics* (Release 8). All mandatory procedures, commands and files shall be supported. Support for contacts c4, c6, and c8 as specified in ETSI TS 102 221: *Smart Cards UICC-Terminal Interface; Physical and Logical Characteristics* (Release 8) is optional.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.4.2 POWER SUPPLY **VZ_REQ_LTEB13NAC_22672**

2.2.4.2.1 **VZ_REQ_LTEB13NAC_6280**

The device shall support both Class B and Class C as specified in ETSI TS 102 221: *Smart Cards UICC-Terminal Interface; Physical and Logical Characteristics* (Release 8).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.4.3 DEVICE INTERFACE **VZ_REQ_LTEB13NAC_22673**

2.2.4.3.1 **VZ_REQ_LTEB13NAC_6281**

The device shall be compliant to the interface defined in ETSI TS 102 221: *Smart Cards UICC-Terminal Interface; Physical and Logical Characteristics* (Release 8). As ETSI 102 221 is generic for an IC card implementation, the device shall also be compliant to the 3GPP application as specified in 3GPP 31.101: *UICC-terminal interface; Physical and logical characteristics*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.4.4 ISO/IEC-7816 SPEED **VZ_REQ_LTEB13NAC_22675**

2.2.4.4.1 VZ_REQ_LTEB13NAC_6282

The device shall support all ISO/IEC-7816-2: 1999/ AM1: 2004, *Identification cards - Integrated circuit(s) cards with contacts - Part 2: Dimension and location of the contacts, Amendment 1: Assignment of contacts for C4 and C8* and ISO/IEC-7816-3: *Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 3: Electronic signals and transmission protocols* communication speeds (as defined by the value of TA1 in the Protocols and Parameters Selection) up to and including TA = 97h.

If the UICC requests a speed not supported by the device, the device shall use the highest speed supported by the device.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

2.2.4.5 FALLBACK SUPPORT VZ_REQ_LTEB13NAC_22676

2.2.4.5.1 VZ_REQ_LTEB13NAC_6283

The device shall support fallback policy as specified in ISO/IEC-7816-2: 1999/ AM1: 2004, *Identification cards - Integrated circuit(s) cards with contacts - Part 2: Dimension and location of the contacts, Amendment 1: Assignment of contacts for C4 and C8* and ISO/IEC-7816-3: *Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 3: Electronic signals and transmission protocols* for cases where the highest speed is not supported.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3 SOFTWARE SPECIFICATIONS VZ_REQ_LTEB13NAC_1880

3.1 DEVICE BASED VZ_REQ_LTEB13NAC_1881

3.1.1 RRC_CONNECTED TO RRC_IDLE TIMERS (INFORMATIVE)

VZ_REQ_LTEB13NAC_22677

In normal operation, the device transition from the RRC_CONNECTED state to the RRC_IDLE state occurs when the network (i.e. E-UTRAN) sends a *RRConnectionRelease* message to the device (refer to 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2* and 3GPP TS 36.331: *Evolved Universal Terrestrial Radio*

Access (E-UTRA); Radio Resource Control (RRC); Protocol specification for additional details). As a result, in normal operation any timers for triggering the transition from the RRC_CONNECTED state to the RRC_IDLE state will be network based timers as opposed to device based timers (a local RRC connection release is supported in 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification* upon a request from the UE's upper layers).

3.1.2 TESTABILITY **VZ_REQ_LTEB13NAC_22678**

3.1.2.1 LTE TEST APPLICATION PROTOCOL SUITE **VZ_REQ_LTEB13NAC_22681**

3.1.2.1.1 **VZ_REQ_LTEB13NAC_6284**

The device shall support 3GPP TS 36.509: *Evolved Universal Terrestrial Radio Access (E-UTRA); Special conformance testing function for User Equipment (UE)*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.2 LTE TEST MODE SUPPORT **VZ_REQ_LTEB13NAC_22682**

3.1.2.2.1 **VZ_REQ_LTEB13NAC_6285**

The device shall support a test mode in which the device is configured for LTE only operation. In this test mode, the device shall disable any non-LTE radio access technologies supported in the device, and the device shall not perform any interRAT functions while attached to the LTE network. By default, this test mode shall be disabled, i.e. by default the device is configured for normal operation.

This test mode shall be enabled and disabled using a non-volatile memory setting. Upon changing this memory setting, the device shall perform a soft reset. The vendor shall provide a lab application to modify this memory setting during device acceptance testing. The device vendor shall not allow the user to modify this memory setting through the device user interface or the remote access user interface for tethered devices.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.3 LTE DIAGNOSTIC MONITOR CAPABILITY **VZ_REQ_LTEB13NAC_22683**



3.1.2.3.1 **VZ_REQ_LTEB13NAC_6286**

The device should have diagnostic logging capability, which will enable diagnostic tools to log diagnostic packets such as, but not limited to the following:

Diagnostic tool requirement details are in development and will be available in a later release.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.4 FIELD TEST MENU **VZ_REQ_LTEB13NAC_22684**

3.1.2.4.1 **VZ_REQ_LTEB13NAC_6287**

The device should support a field test menu through the diagnostic interface.

Field test menu details are in development and will be available in a later release.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.5 AT COMMAND SUPPORT **VZ_REQ_LTEB13NAC_22685**

To facilitate device testing, the device shall support AT commands per the Verizon Wireless LTE AT Commands for Test Automation Requirements. Compliance to AT command requirements shall be per the Verizon Wireless LTE AT Commands for Test Automation Test Plan.

3.1.2.6 USB DEVICE DRIVER **VZ_REQ_LTEB13NAC_22686**

3.1.2.6.1 **VZ_REQ_LTEB13NAC_6288**

The device vendor shall provide a USB device driver to allow a PC host to communicate with the device over a USB interface. This interface shall allow the device to act as a tethered data device during testing. This interface shall also support communication of the AT command set defined in the *AT Command Support* section of this document. This driver shall be compatible with the following versions of the Microsoft Windows operating system: XP, Vista, 7.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.7 LTE TEST APPLICATION FOR ANTENNA TESTING **VZ_REQ_LTEB13NAC_22687**

3.1.2.7.1 VZ_REQ_LTEB13NAC_6289

To enable radiated receiver performance testing, the device shall support RSS-based TIS measurements as described in section 6.16 of the CTIA Test Plan for Wireless Device Over the Air Performance. The device vendor shall provide a test application to support LTE over-the-air radiated performance testing. This test application shall allow a test platform to:

- Independently enable/disable each receiver path
- Retrieve complex antenna pattern data (i.e. RSSI and phase) for each receiver path

For data-centric devices that are normally plugged into a host laptop (e.g. USB modem), the test application shall be designed to run on the host laptop. The test application shall be compatible with the following versions of the Microsoft Windows operating system: XP, Vista, 7.

For handset form factor devices, the test application shall be preloaded by the vendor on the devices provided to the test lab for over-the-air radiated performance testing.

On launch of this test application, the test application shall support two options for initiating communication with the test platform:

- Option 1 UE initiated: The test application shall open up a UDP port on the test platform based on an IP address and port number for the test platform.
- Option 2 Test platform initiated: The test application shall listen on the IP address and UDP port configured on the test platform and wait for the test platform to initiate communication with the test application.

The test application shall communicate with the test platform using the commands detailed in the subsections below. The test application shall be capable of a minimum polling rate of 100 ms (i.e. minimum time between requests from the test platform). For the commands detailed in the subsections below, the following shall apply:

- "Presence"
 - M= Mandatory
 - O= Optional
- "Format" is the same as for L3 messaging per section 11.2.1.1 of 3GPP TS 24.007: *Mobile radio interface signalling layer 3; General Aspects*
- "Length" is in octets

The test application may also support local data storage. If local storage is supported and enabled:

- The test application shall not attempt to communicate with the test platform.
- The test application shall continuously log complex antenna pattern data (i.e. both magnitude and phase) for both antennas used in the reception of LTE signals and store the data on the device in the format specified in section 6.16.4.1 of the CTIA Test Plan for Wireless Device Over the Air Performance until the application is terminated by the user.
- The device vendor shall provide a PC client to download the stored antenna pattern data into a .csv file on the PC (for downloading, the device shall be tethered to a PC via a USB connection) after test

completion. If local storage is disabled, the test application shall behave normally.

The test application shall have a user interface. Through the user interface, the test application shall allow the user to:

- Configure the IP address and port number for the test platform. This configuration shall be stored across power cycles.
- Configure the test application option for initiating communication with the test platform, i.e. option 1 (UE initiated) or option 2 (test platform initiated). This configuration shall be stored across power cycles.
- Enable/Disable auto-launch for the test application. If auto-launch is enabled, the test application shall automatically launch on device power-up or soft reset. If auto-launch is disabled, user intervention shall be required to launch the test application. This setting shall be stored across power cycles. The default setting shall be "enabled".
- Enable/Disable local data storage if local data storage is supported by the application. This setting shall be stored across power cycles. The default setting shall be "disabled".

The test application shall be installed on a device submitted for device certification testing that is running the commercial software submitted for device certification. The test application shall not be installed on any devices other than those submitted for device certification testing.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.7.2 ANTENNA INFORMATION REQUEST **VZ_REQ_LTEB13NAC_22689**

3.1.2.7.2.1 **VZ_REQ_LTEB13NAC_6290**

This message is only sent in the direction test platform to UE.

Information Element	Presence	Format	Length
Message type	M	V	1
Antenna/Receiver Number	M	V	1

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	0	0	octet 1

where antenna/receiver number is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	A1	A0	octet 1

Upon receipt of an ANTENNA INFORMATION REQUEST message, the UE shall:

1. Perform a new (i.e. the UE shall not cache RSSI results) RSSI measurement on the primary receiver if A0=1 in the antenna/receiver number IE, and report the result to the test platform using the ANTENNA

INFORMATION RESPONSE message. If A0=0, then the UE shall not perform an RSSI measurement on the primary receiver.

2. Perform a new (i.e. the UE shall not cache RSSI results) RSSI measurement on the secondary/MIMO receiver if A1=1 in the antenna/receiver number IE, and report the result to the test platform using the ANTENNA INFORMATION RESPONSE message. If A1=0, then the UE shall not perform an RSSI measurement on the secondary/MIMO receiver.
3. If both receivers are enabled, perform a new (i.e. the UE shall not cache phase results) relative phase measurement between the two receivers, and report the result to the test platform using the ANTENNA INFORMATION RESPONSE message.

The UE shall not send an ANTENNA INFORMATION RESPONSE message while it is performing the RSSI and/or relative phase measurements on either the primary or secondary/MIMO receivers.

If an ANTENNA INFORMATION REQUEST message is sent to the UE for a receiver that is currently disabled, the UE test application shall respond with an ANTENNA ERROR RESPONSE message (as defined in section **ANTENNA ERROR RESPONSE** of this document).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.7.3 ANTENNA INFORMATION RESPONSE VZ_REQ_LTEB13NAC_22690

3.1.2.7.3.1 VZ_REQ_LTEB13NAC_6291

This message is only sent in the direction UE to test platform.

Case 1: Both receivers are enabled (i.e. the UE is reporting RSSI for both receivers and the relative phase between the receivers).

Information Element	Presence	Format	Length
Message type	M	V	1
Date	M	V	4
Time	M	V	4
Reserved	M	V	1
Antenna/Receiver number	M	V	1
(Primary receiver)			
RSSI	M	V	2
(Primary receiver)			
Relative Phase	M	V	2
(between the receivers)			

Antenna/Receiver number (Secondary/MIMO receiver)	M	V	1
RSSI (Secondary/MIMO receiver)	M	V	2

Case 2: Only one receiver is enabled (i.e. the UE is only reporting RSSI for the enabled receiver).

Information Element	Presence	Format	Length
Message type	M	V	1
Date	M	V	4
Time	M	V	4
Reserved	M	V	1
Antenna/Receiver number	M	V	1
RSSI	M	V	2

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	0	1	octet 1

where date is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	Y10	Y9	Y8	octet 1
Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	octet 2
0	0	0	0	M3	M2	M1	M0	octet 3
0	0	0	D4	D3	D2	D1	D0	octet 4

Y10..Y0 is the year and binary coded with Y10 as the most significant bit and Y0 as the least significant bit.
M3..M0 is the month and binary coded with M3 as the most significant bit and M0 as the least significant bit.
D4..D0 is the day and binary coded with D4 as the most significant bit and D0 as the least significant bit.

where time is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	H3	H2	H1	H0	octet 1
0	0	MN5	MN4	MN3	MN2	MN1	MN0	octet 2
S15	S14	S13	S12	S11	S10	S9	S8	octet 3
S7	S6	S5	S4	S3	S2	S1	S0	octet 4

H3..H0 is the hour and binary coded with H3 as the most significant bit and H0 as the least significant bit.
MN5..M0 is the minutes and binary coded with MN5 as the most significant bit and MN0 as the least significant bit.
S15..S0 is the seconds. The seconds value in xx.xxx format shall be multiplied by 1000 and binary coded with S15 as the most significant bit and S0 as the least significant bit.

where reserved is:

8	7	6	5	4	3	2	1	bit no.
---	---	---	---	---	---	---	---	---------



0	0	0	0	0	0	0	0	octet 1
---	---	---	---	---	---	---	---	---------

where antenna/receiver number is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	0	B0	octet 1

B0 = the antenna/receiver number for which results are being reported, i.e.:

- B0=0 for the primary receiver
- B0=1 for the secondary/MIMO receiver

where RSSI is:

8	7	6	5	4	3	2	1	bit no.
0	0	R13	R12	R11	R10	R9	R8	octet 1
R7	R6	R5	R4	R3	R2	R1	R0	octet 2

R13..R0 is the RSSI value measured for the receiver in the preceding antenna/receiver number IE. The RSSI value in -xxx.xx dBm shall be multiplied by -100 and binary coded with R13 as the most significant bit and R0 as the least significant bit. The RSSI value shall be in the range of 0.00 to -120.00 dBm.

where relative phase is:

8	7	6	5	4	3	2	1	bit no.
P15	P14	P13	P12	P11	P10	P9	P8	octet 1
P7	P6	P5	P4	P3	P2	P1	P0	octet 2

P15..P0 is the relative phase value measured between the receivers. The relative phase value in xxx.xx degrees shall be multiplied by 100 and binary coded with P15 as the most significant bit and P0 as the least significant bit. The relative phase value shall be in the range of 0.00 to 360.00 degrees.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.7.4 ANTENNA CONFIGURATION REQUEST VZ_REQ_LTEB13NAC_22691

3.1.2.7.4.1 VZ_REQ_LTEB13NAC_6292

This message is only sent in the direction test platform to UE.

Information Element	Presence	Format	Length
Message type	M	V	1
Antenna/Receiver Enable	M	V	1

where message type is:

8	7	6	5	4	3	2	1	bit no.
---	---	---	---	---	---	---	---	---------

0	0	0	0	0	0	1	0	octet 1
---	---	---	---	---	---	---	---	---------

where antenna/receiver enable is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	E1	E0	octet 1

Upon receipt of an ANTENNA CONFIGURATION REQUEST message, the UE shall enable/disable the antennas/receivers on the device as follows:

E1	E0	UE Behaviour
0	X	Normal dual receiver operation (default UE behaviour)
1	0	Single receiver operation ' enable primary receiver only (disable secondary/MIMO receiver)
1	1	Single receiver operation ' enable secondary/MIMO receiver only (disable primary receiver)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.7.5 ANTENNA ERROR RESPONSE **VZ_REQ_LTEB13NAC_22692**

3.1.2.7.5.1 **VZ_REQ_LTEB13NAC_6293**

This message is only sent in the direction UE to test platform.

Information Element	Presence	Format	Length
Message type	M	V	1
Error	M	V	1

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	1	1	octet 1

where antenna/receiver number is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	0	ERR0	octet 1

E0 = an error occurred while processing an ANTENNA INFORMATION REQUEST or ANTENNA CONFIGURATION REQUEST message, i.e.:

- ERR0=0 for error during processing of ANTENNA INFORMATION REQUEST message
- ERR0=1 for error during processing of ANTENNA CONFIGURATION REQUEST message

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS),

Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.7.6 ANTENNA CONFIGURATION STATUS REQUEST **VZ_REQ_LTEB13NAC_22693**

3.1.2.7.6.1 **VZ_REQ_LTEB13NAC_6294**

This message is only sent in the direction test platform to UE.

Information Element	Presence	Format	Length
Message type	M	V	1

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	1	0	0	octet 1

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.7.7 ANTENNA CONFIGURATION STATUS RESPONSE **VZ_REQ_LTEB13NAC_22695**

3.1.2.7.7.1 **VZ_REQ_LTEB13NAC_6295**

This message is only sent in the direction UE to test platform.

Information Element	Presence	Format	Length
Message type	M	V	1
Antenna/Receiver Status	M	V	1

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	1	0	1	octet 1

where antenna/receiver status is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	ST1	ST0	octet 1

ST1	ST0	UE Behaviour
0	X	Normal dual receiver operation (both receivers enabled)
1	0	Single receiver operation ' primary receiver enabled only (secondary/MIMO receiver disabled)



1	1	Single receiver operation + secondary/MIMO receiver enabled only (primary receiver disabled)
---	---	---

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.2.7.8 RSSI AND RELATIVE PHASE MEASUREMENTS, ACCURACY, AND AVERAGING **VZ_REQ_LTEB13NAC_22696**

3.1.2.7.8.1 **VZ_REQ_LTEB13NAC_6296**

For each receiver, RSSI measurements shall be averaged across at least one subframe but not more than 10 subframes. RSSI shall be as defined in section 5.1.3 of 3GPP TS 36.214: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; Measurements*. The absolute accuracy of RSSI measurements shall be ± 6 dB or better (i.e. consistent with the RSRP absolute accuracy requirement in 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*). The relative accuracy of RSSI measurements shall be ± 1 dB or better.

The relative phase between the receivers shall be measured based on the I-Q values for the reference symbols. The relative phase measurements between the receivers shall be averaged across all the reference symbols in at least one subframe but not more than 10 subframes, i.e. the relative phase shall be measured for each reference symbol and then these relative phase measurements shall be averaged for all the reference symbols in at least one subframe but not more than 10 subframes. The relative accuracy of phase measurements shall be ± 2 degrees or better.

All RSSI and relative phase measurements shall be averaged over the same time interval (i.e. number of subframes, the averaging interval in subframes is the same for both receivers). When both receivers are enabled and an ANTENNA INFORMATION REQUEST message is sent to the device and the device measures RSSI for both receivers and relative phase between the receivers, the RSSI measurements for both receivers and the relative phase measurement between the receivers shall be computed from the same period in time (i.e. t_1 and t_2 are the same for both receivers where t_1 and t_2 are absolute time, the averaging interval in subframes is the same for both receivers).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3 UICC SUPPORT **VZ_REQ_LTEB13NAC_22679**

Device compliance to Verizon Wireless UICC device requirements is validated through the Verizon Wireless LTE Device-UICC (USIM, ISIM) Interaction Test Plan.

3.1.3.1 VZ_REQ_LTEB13NAC_6470

➤ The UICC supports USIM and ISIM profiles. In order to support the USIM and ISIM, the device shall be compliant to the specifications in the subsections below. The device shall use the service table to determine the list of files and functionalities supported on the USIM and ISIM.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.2 VZ_REQ_LTEB13NAC_6471

➤ The device shall select the NAA applications on the UICC by use of the EF_{DIR} file. If an NAA application is listed more than once in EF_{DIR}, only the first application on the list shall be selected.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.3 SUPPORT FOR USIM VZ_REQ_LTEB13NAC_22697

Device compliance to Verizon Wireless UICC device requirements is validated through the Verizon Wireless LTE Device-UICC (USIM, ISIM) Interaction Test Plan.

3.1.3.3.1 VZ_REQ_LTEB13NAC_6297

The device shall support the software to interact with the USIM module on the UICC as described in 3GPP TS 31.102: *Characteristics of the USIM application* and 3GPP TS 31.101: *UICC-terminal interface; Physical and logical characteristics*. The device shall support the security procedures as specified in 3GPP TS 33.401: *3GPP System Architecture Evolution (SAE); Security architecture*. All mandatory procedures, commands, and files shall be supported.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.4 SUPPORT FOR ISIM VZ_REQ_LTEB13NAC_22698

3.1.3.4.1 VZ_REQ_LTEB13NAC_6298

The device shall support the software to interact with the ISIM module on the UICC as described in 3GPP TS 31.103: *Characteristics of the IP Multimedia Services Identity Module (ISIM) application* and 3GPP TS 31.101: *UICC-terminal interface; Physical and logical characteristics*. All mandatory procedures, commands and files



shall be supported.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

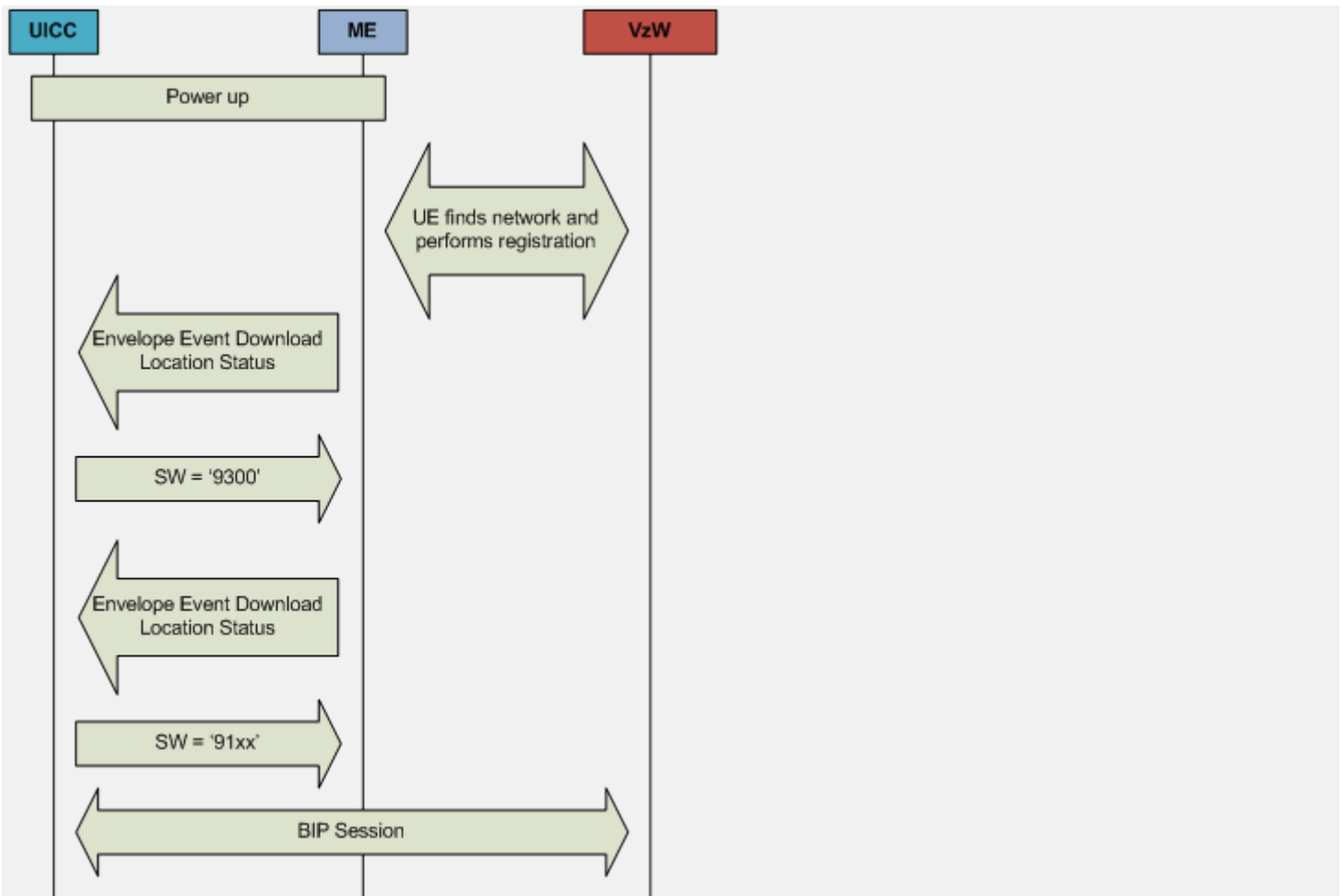
3.1.3.5 SUPPORT FOR APPLICATION TOOLKIT VZ_REQ_LTEB13NAC_22699

3.1.3.5.1 VZ_REQ_LTEB13NAC_6299

The device shall support Card Application Toolkit (CAT) as specified in ETSI TS 102 223: *Smart cards; Card Application Toolkit (CAT), Release 8* and the USIM Application Toolkit (USAT) as described in 3GPP TS 31.111: *Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)*.

The following events, envelope commands, and corresponding procedures shall be supported:

- Envelope SMS-PP Data Download as per 3GPP TS 31.111: *Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)*
 - In the case where the UICC is busy (9300) or provides exceptions, the device shall resend the Envelope SMS-PP to the UICC until a successful response (9000/91xx) from the UICC is received.
- Envelope Timer Expiration
- Envelope Event Download
 - Data available
 - Channel Status
 - Location Status
 - The device shall send the Download Location Status (DLS) Event as per 3GPP TS 31.111: *Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)*.
 - In the case where the UICC is busy (9300) or provides exceptions, the device shall resend the DLS Event to the UICC until a successful response (9000/91xx) from the UICC is received.



- Access Technology Change
 - If more than one access technology is available, only the access technology for the data connection shall be reported.

Data Access Technology	Value
LTE	'08'
Non-LTE	'00', '03', '06', '07'

- In the case where the UICC is busy (9300) or provides exceptions, the device shall resend the Download Access Technology Change Event (DATC) to the UICC until a successful response (9000/91xx) from the UICC is received.

- EVENT PROFILE DOWNLOAD
- STATUS (The device shall send the STATUS command only on logical channel 0.)
- The device shall support the IMS Registration Event as specified in the ETSI TS 131 111: *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS);*

Universal Subscriber Identity Module (USIM) Application Toolkit (USAT), v.10.7.0 section 7.5.21, using Event Download IMS Registration to communicate the IMS registration status and changes in the IMS registration status to the UICC.

The following proactive commands and corresponding procedures shall be supported:

- REFRESH (support for 7 modes) as specified in 3GPP TS 31.111: *Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)* and ETSI TS 102 223: *Smart cards; Card Application Toolkit (CAT), Release 8*
- Send Short Message as specified in 3GPP TS 31.111: *Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)* and ETSI TS 102 223: *Smart cards; Card Application Toolkit (CAT), Release 8*
- OPEN CHANNEL
- CLOSE CHANNEL
- RECEIVE DATA
- SEND DATA
- GET CHANNEL STATUS
- POLL INTERVAL
- TIMER MANAGEMENT
- MORE TIME
- PROVIDE LOCAL INFORMATION (following tags shall be supported)
 - location information
 - terminal identity (IMEI, IMEISV)
 - network measurement results
 - current date, time, and time zone
 - current access technology
 - If more than one access technology is available, only the access technology for the data connection shall be reported.
 - current network search mode

All other events, commands, and procedures defined in ETSI TS 102 223: *Smart cards; Card Application Toolkit (CAT), Release 8* and 3GPP TS 31.111: *Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)* are highly recommended and should be supported.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.6 LOGICAL CHANNELS **VZ_REQ_LTEB13NAC_22700**

3.1.3.6.1 **VZ_REQ_LTEB13NAC_6300**

The device shall support standard and extended logical channels as specified in ETSI TS 102 221: *Smart Cards*

UICC-Terminal Interface; Physical and Logical Characteristics, Release 8.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.7 PLMN SUPPORT VZ_REQ_LTEB13NAC_22701

3.1.3.7.1 VZ_REQ_LTEB13NAC_6301

The device shall support at least 70 entries and the PLMNwAcT, OPLMNwAcT, HPLMNwAcT, LOCIGPRS, PNN, and OPL files related to roaming and PLMN lists as specified in 3GPP 31.102: *Characteristics of the USIM application*. Only Verizon Wireless will update the PLMN lists on the USIM (as needed).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.8 LTE AUTHENTICATION VZ_REQ_LTEB13NAC_22702

3.1.3.8.1 VZ_REQ_LTEB13NAC_6302

The device shall support the authenticate commands and mechanisms to interact with the USIM as specified in 3GPP TS 31.102: *Characteristics of the USIM application*. The EPS security context, procedures, and files shall be supported.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.9 BIP OVER THE CLASS 2 APN VZ_REQ_LTEB13NAC_22703

3.1.3.9.1 VZ_REQ_LTEB13NAC_6424

If the device receives an OPEN CHANNEL command from the UICC with an APN NI equal to "VZWADMIN", then the device shall behave as follows:

- If no PDN connection using the class 2 APN* currently exists, the device shall establish a PDN connection for the class 2 APN* using standard 3GPP messaging. The device shall not release the PDN connection prior to receiving a CLOSE CHANNEL command from the UICC.
- If a PDN connection using the class 2 APN* already exists, the device shall report terminal status as "success" to the UICC and use the existing PDN connection. The device shall not release the PDN connection prior to receiving a CLOSE CHANNEL command from the UICC.



* **NOTE:** The device shall use the class 2 APN NI provisioned on the device regardless of whether the APN NI for the class 2 APN provisioned on the device equals "VZWADMIN".

When the device receives a CLOSE CHANNEL command from the UICC (for the class 2 APN), the device shall behave as follows:

- If the PDN connection for the class 2 APN is being used by other applications, then the device shall not release the PDN connection. The device shall report terminal status "success" to the UICC and leave the PDN connection intact.
- If the PDN connection for the class 2 APN is not being used by any other applications, then the device shall release the PDN connection using standard 3GPP messaging.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.10 DEVICE BEHAVIOR IN RESPONSE TO REFRESH COMMAND

VZ_REQ_LTEB13NAC_22704

3.1.3.10.1 VZ_REQ_LTEB13NAC_6461

Upon receipt of a UICC REFRESH type 0 command, the device shall detach from the LTE network and then re-attach to the LTE network using all updated USIM/ISIM parameters.

If the device has a valid IMS registration when the UICC REFRESH type 0 command is received, the device shall terminate the subscription to the registration events package by sending a Subscribe message with expires=0, followed by an IMS de-registration request message. This shall be done before sending a NAS DETACH REQUEST message. Upon the IMS client generating the initial SIP REGISTER message with expires=0, the device shall start an implementation specific timer with a value of 4 seconds. While this implementation specific timer is running, the device shall respond to all SIP messaging from the network, e.g. if the network challenges the de-registration request with a 401 Unauthorized. Upon expiration of this implementation specific timer, the device shall take no further action with respect to SIP messages from the network and execute the NAS detach procedure. The device shall stop the implementation specific timer and immediately execute the NAS detach procedure if a SIP 200 OK or a SIP 481 or a SIP 501 is received in response to the SIP REGISTER (with expires=0) before the implementation specific timer expires.

NOTE: The implementation specific timer is started when the IMS client generates the initial SIP REGISTER message with expires=0. The implementation specific timer shall run even if the IMS client cannot send the SIP REGISTER message to the modem for transmission because an IMS signaling connection could not be established.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.11 DEVICE BEHAVIOR IF UICC IS NOT PRESENT OR REMOVED

VZ_REQ_LTEB13NAC_22705

3.1.3.11.1 VZ_REQ_LTEB13NAC_6482

If no UICC is present or if the device cannot detect a UICC that is present, the device shall not attempt to access any LTE network.

If the device detects that the UICC has been removed while the device is connected to a LTE network, the device shall detach from the LTE network. If the device has a valid IMS registration when the UICC is removed, the device shall terminate the subscription to the registration events package by sending a Subscribe message with expires=0, followed by an IMS de-registration request message. This shall be done before sending a NAS DETACH REQUEST message. Upon the IMS client generating the initial SIP REGISTER message with expires=0, the device shall start an implementation specific timer with a value of 4 seconds. While this implementation specific timer is running, the device shall respond to all SIP messaging from the network, e.g. if the network challenges the de-registration request with a 401 Unauthorized. Upon expiration of this implementation specific timer, the device shall take no further action with respect to SIP messages from the network and execute the NAS detach procedure. The device shall stop the implementation specific timer and immediately execute the NAS detach procedure if a SIP 200 OK or a SIP 481 or a SIP 501 is received in response to the SIP REGISTER (with expires=0) before the implementation specific timer expires.

Upon detaching from the LTE network, the device shall not attempt to access any LTE network until the UICC is re-inserted in the device or a new UICC is inserted in the device.

NOTE 1: This requirement only applies to non-emergency access to an LTE network. Emergency access to an LTE network shall be allowed regardless of whether a UICC is present or not per 3GPP Release 9 Specifications. The device shall implement emergency access to an LTE network per 3GPP Release 9 Specifications.

NOTE 2: The implementation specific timer is started when the IMS client generates the initial SIP REGISTER message with expires=0. The implementation specific timer shall run even if the IMS client cannot send the SIP REGISTER message to the modem for transmission because an IMS signaling connection could not be established.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.12 APPLET DOWNLOAD TO UICC VZ_REQ_LTEB13NAC_22706

3.1.3.12.1 VZ_REQ_LTEB13NAC_6486

For non-interrupted BIP sessions, the device shall support over the air download to the UICC's Secure Element



of applets at least 100 kilobytes in size in less than two minutes (which is the timing between the OPEN CHANNEL and CLOSE CHANNEL commands).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.13 UICC DNS ADDRESS RETRIEVAL FROM THE NETWORK

VZ_REQ_LTEB13NAC_36248

3.1.3.13.1 VZ_REQ_LTEB13NAC_36250

The device shall support DNS server IP address retrieval from the network as defined in ETSI TS 102 223: *Smart cards; Card Application Toolkit (CAT)* and below:

- The device shall indicate the support of the DNS feature by using bit 1 in Byte 33 of the Terminal Profile.
- When the device receives a DNS resolution request from the UICC (UPD OPEN CHANNEL) with no IP address defined, the device shall establish a session with the PDN for the APN defined in the OPEN CHANNEL command.
- Upon receiving the DNS IP address(es) in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST for the PDN connection, the device shall pass the IP address(es) of the DNS server(s) to the UICC in the Terminal Response.
- The device shall support the notification bit as defined in ETSI TS 102 223: *Smart cards; Card Application Toolkit (CAT)* sections 6.4.28 and 8.6:
 - 6.4.28 : If class "yy" is supported, the UICC may indicate to the terminal that the next CAT command will be an OPEN CHANNEL command using the same setting for the APN, i.e. requesting a channel to the same gateway entity. The device may use this information to keep the channel to the gateway established until the next CAT command.
 - 8.6: CLOSE CHANNEL for packet data service:

bit 1: 0 = no indication;

1 = indication to device that the next CAT command will be OPEN CHANNEL using same APN as channel to be closed.

- If the device receives a CLOSE CHANNEL with bit 1 set to 1, the device shall not close the connection to the PDN unless one of the following occurs:
 - The next UICC command received by the device is not a OPEN CHANNEL using the same APN as the previous command that originally established the PDN connection.
 - The network forced the PDN to be closed due to any reason (i.e. network Idle time out, etc.)
 - The UICC has been idle for more than 30 seconds.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.1.3.14 UICC RE-ACTIVATION [VZ_REQ_LTEB13NAC_37887](#)

3.1.3.14.1 [VZ_REQ_LTEB13NAC_37889](#)

To support UICC re-activation, the device shall support a mechanism via the device user interface or the remote access user interface (for tethered devices) for the user to initiate a power cycle of the device.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2 LTE NETWORK TO/FROM [VZ_REQ_LTEB13NAC_1882](#)

3.2.1 SYSTEM SELECTION/RESELECTION [VZ_REQ_LTEB13NAC_22707](#)

3.2.1.1 [VZ_REQ_LTEB13NAC_6303](#)

If a UICC is inserted in the device, then the device shall support system selection/reselection based on the Verizon Wireless PLMN information stored in the UICC and per 3GPP Release 9 Specifications. For additional details refer to:

- a. 3GPP TS 23.122: *Non-Access Stratum (NAS) functions related to Mobile Station (MS) in idle mode*
- b. 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*
- c. 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode*

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.1.2 MULTIPLE PLMN SUPPORT [VZ_REQ_LTEB13NAC_22708](#)

3.2.1.2.1 [VZ_REQ_LTEB13NAC_6304](#)

The device shall be capable of supporting multiple PLMN's for LTE on 3GPP Band 13. The device shall be capable of decoding up to 6 PLMN ids broadcasted in the System Information Block Type 1.

This includes the use case(s) below. (NOTE: These use case(s) are included for informational purposes only and do not include all possible scenarios associated with this requirement.)

For the use case(s) below, the term UE refers to the combination of the device and the UICC inserted in the device containing the subscriber information.

Use Case #1: One network (A) broadcasting two PLMNs, adjacent to network (B) broadcasting single PLMN where network A broadcasts the PLMN for network A and the PLMN for network B. Networks A and B are in different geographic regions.

- UE is homed to network B and begins there, i.e. the subscriber/UICC in the UE is homed to network B.
 - When the UE enters network A (two PLMNs), it is required to perform a tracking area update.
 - When the UE returns from network A to network B, it is required to perform a tracking area update.
-
- UE is homed to network A and begins there, i.e. the subscriber/UICC in the UE is homed to network A.
 - When the UE enters network B (single PLMN), it is required to perform a tracking area update.
 - When UE returns to network A, it is required to perform a tracking area update.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.1.3 SERVICE AREA RESOLUTION IN M-PLMN **VZ_REQ_LTEB13NAC_22709**

3.2.1.3.1 **VZ_REQ_LTEB13NAC_6415**

The device shall be capable of determining its serving area based on the UICC configuration as opposed to direction from the network.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.1.4 UICC EFS FOR M-PLMN SUPPORT **VZ_REQ_LTEB13NAC_22710**

3.2.1.4.1 **VZ_REQ_LTEB13NAC_6416**

The device shall support use of the following USIM Elementary Files pursuant to 3GPP TS 31.102:

Characteristics of the USIM application: PLMN Network Name (PNN), Operator PLMN List (OPL), Equivalent Home PLMN (EHPLMN), Operator Controlled PLMN Selector with Access Technology (OPLMNwACT), HPLMN Selector with Access Technology (HPLMNwACT), User Controlled PLMN Selector with Access Technology (PLMNwACT), and Forbidden PLMNs (FPLMN).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.2 LTE-TO-LTE HANDOVERS [VZ_REQ_LTEB13NAC_22711](#)

3.2.2.1 [VZ_REQ_LTEB13NAC_6305](#)

The device shall support LTE-to-LTE handovers per the 3GPP Release 9 Specifications. Refer to 3GPP TS 23.401: *General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access*, 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*, and 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.3 LTE SIGNALING [VZ_REQ_LTEB13NAC_22712](#)

3.2.3.1 [VZ_REQ_LTEB13NAC_6306](#)

The device shall be in conformance with all LTE signaling requirements in the 3GPP Release 9 Specifications. Refer to 3GPP TS 23.122: *Non-Access Stratum (NAS) functions related to Mobile Station (MS) in idle mode*, 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, and 3GPP TS 36.321: *Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4 LTE IPV6/IPV4 AND BEARER SUPPORT [VZ_REQ_LTEB13NAC_22713](#)

3.2.4.1 IPV6/IPV4 SUPPORT [VZ_REQ_LTEB13NAC_22714](#)

3.2.4.1.1 [VZ_REQ_LTEB13NAC_6307](#)

The device shall support both IPv6 and IPv4. IPv6 and IPv4 support shall be per the 3GPP Release 9 Specifications unless indicated otherwise in this document. The device shall be capable of simultaneously supporting at least one unique IPv6 address and a unique IPv4 address for each PDN connection. Refer to 3GPP TS 23.401: *General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access*

Network (E-UTRAN) access and 3GPP TS 24.301: Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.2 PDN SUPPORT **VZ_REQ_LTEB13NAC_22715**

Verizon Wireless PDN implementation details are in development. Additional PDN's and other PDN-related requirements may be included in a future release.

3.2.4.2.1 NETWORK PDN SUPPORT (INFORMATIVE) **VZ_REQ_LTEB13NAC_22716**

The Verizon Wireless LTE network will support multiple PDNs:

- IMS PDN for IMS applications (IPv6 only with support for both default and dedicated bearers, *IPv4 support is reserved for future use*)
- Internet PDN for access to the public internet (IPv4v6 with support for both default and dedicated bearers)
- Administrative PDN for administrative functions such as updates to the UICC/USIM and OTADM (IPv4v6 with support for default bearers only)
- VZW Application PDN for VZW-branded applications (IPv4v6 with support for default bearers only)

3.2.4.2.2 UE PDN SUPPORT **VZ_REQ_LTEB13NAC_22717**

3.2.4.2.2.1 **VZ_REQ_LTEB13NAC_6308**

The device shall connect to the appropriate PDN as follows:

- The device shall connect to the IMS PDN for IMS applications only.
- The device shall connect to the Administrative PDN for UICC/USIM updates and OTADM functions only.
- The device shall connect to the VZW Application PDN for VZW-branded applications only. This PDN applies to handset form factor devices only (i.e. devices that support operation against the head).
- The device shall connect to the Internet PDN for all other applications. When tethered to a laptop, the device shall connect to the Internet PDN for all applications running on the laptop.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]



3.2.4.2.3 UE BEARER AND PDN SUPPORT **VZ_REQ_LTEB13NAC_22718**

3.2.4.2.3.1 **VZ_REQ_LTEB13NAC_6309**

The device shall support a minimum of six simultaneous bearers (default bearers plus dedicated bearers). The device may support up to eight simultaneous bearers (default bearers plus dedicated bearers). The device shall support a minimum of four simultaneous PDN connections.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.3 PDN CONNECTIONS **VZ_REQ_LTEB13NAC_22719**

3.2.4.3.1 PDN TYPE **VZ_REQ_LTEB13NAC_22720**

3.2.4.3.1.1 **VZ_REQ_LTEB13NAC_6310**

In all PDN CONNECTIVITY REQUEST messages, the device shall populate the "PDN Type" information element as IPv4v6 (including the IMS PDN). Refer to the *Scenarios* section of this document for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.3.2 IMS PDN CONNECTION **VZ_REQ_LTEB13NAC_22721**

3.2.4.3.2.1 **VZ_REQ_LTEB13NAC_6311**

As part of the attach procedure to the Verizon Wireless LTE network, the device shall establish a default bearer to the IMS PDN. While attached to the Verizon Wireless LTE network, the device shall maintain a default bearer to the IMS PDN and the associated IP address(es). For the bearers to the IMS PDN, the device shall associate one IPv6 address, one IPv4 address, or both an IPv6 and IPv4 address as directed by the network. The device shall be capable of supporting a dual IP bearer to the IMS PDN connection, i.e. the device shall be capable of simultaneously associating both an IPv6 and an IPv4 address with the bearers to the IMS PDN.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.3.2.2 VZ_REQ_LTEB13NAC_6312

During the initial attach procedure, the PDN CONNECTIVITY REQUEST message in the ESM Container of the ATTACH REQUEST message shall not contain the APN (per section 6.5.1.2 of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*), but shall include the PCO (for requesting DNS IP addresses and P-CSCF IP addresses). The APN shall be included in the ESM INFORMATION RESPONSE message later in the attach procedure.

Refer to the *Scenarios*, *APN Support for LTE*, *DNS*, and *SMS over IMS* sections of this document and 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* for additional details.
Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.3.3 ON-DEMAND PDN CONNECTIONS VZ_REQ_LTEB13NAC_22722

3.2.4.3.3.1 VZ_REQ_LTEB13NAC_6313

The device shall establish a default bearer to the Internet PDN, the Administrative PDN, or the VZW Application PDN if an application requires a bearer to any of these PDN's. If a connection to an on-demand PDN is no longer required (i.e. the application(s) using the on-demand PDN have been closed), the device shall release the default bearer to the PDN by sending a PDN DISCONNECT REQUEST message. For the default bearer to an on-demand PDN, the device shall associate an IPv6 address, an IPv4 address, or both an IPv6 and IPv4 address as directed by the network. The device shall be capable of supporting a dual IP bearer to any on-demand PDN connection, i.e. the device shall be capable of simultaneously associating both an IPv6 and an IPv4 address with the default bearer to any on-demand PDN connection.

NOTE: In a data retry scenario where the device attaches to the LTE network using the internet PDN (or PDN identified by the class 3 APN), the device shall consider the internet PDN (or PDN identified by the class 3 APN) as an "always on" connection as opposed to an "on-demand" PDN connection. If the device successfully attaches to the LTE network using the internet PDN (or PDN identified by the class 3 APN), the device shall consider the IMS PDN to be an "on-demand" PDN for the duration of the attach.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.3.3.2 VZ_REQ_LTEB13NAC_6314

The APN shall be included in the PDN CONNECTIVITY REQUEST message for all on-demand PDN connections established after the initial attach to the IMS PDN.

Refer to the *Scenarios* and the *APN Support for LTE* sections of this document and 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS),



Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.4 IP MOBILITY **VZ_REQ_LTEB13NAC_22723**

3.2.4.4.1 **VZ_REQ_LTEB13NAC_6315**

When establishing default bearers and their associated IP addresses, the device shall use the Attach Procedure to create the first default bearer and the PDN Connectivity Request procedure to request subsequent default bearers. Refer to 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* for additional details.

IP mobility shall be handled by GTP and/or Proxy Mobile IPv6, which are network capabilities (i.e. no device impact). Refer to 3GPP TS 29.274: *3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3* and 3GPP TS 29.275: *Proxy Mobile IPv6 (PMIPv6) based Mobility and Tunnelling protocols; Stage 3* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.5 IP HEADER COMPRESSION **VZ_REQ_LTEB13NAC_22724**

3.2.4.5.1 **VZ_REQ_LTEB13NAC_6316**

The device may support ROHC IP header compression. If the device supports ROHC IP header compression, the device shall support the following ROHC IP header compression profiles defined in section 5.5.1 of 3GPP TS 36.323: *Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification*:

- 0x0000
- 0x0001
- 0x0002

If the device supports ROHC IP header compression, the device may also support the following ROHC IP header compression profiles defined in section 5.5.1 of 3GPP TS 36.323: *Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification*:

- 0x0101
- 0x0102

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.6 BEARER QOS VZ_REQ_LTEB13NAC_22725

3.2.4.6.1 VZ_REQ_LTEB13NAC_6317

The device shall support network initiated quality of service (QoS) for both default and dedicated bearers including the creation of new dedicated bearer(s) using 3GPP standard network initiated bearer context activation procedures defined in 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*. The device shall support changes to the QoS of a default or dedicated bearer using 3GPP standard network initiated bearer context modification procedures defined in 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*. The device shall support the removal of a dedicated bearer using 3GPP standard network initiated bearer context deactivation procedures defined in 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.

If the network establishes dedicated bearers, the device shall route packets to these dedicated bearers based on the traffic flow template information provided by the network in the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST messages or the MODIFY EPS BEARER CONTEXT REQUEST messages (these messages are per 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*).

The device shall support the use of a traffic flow template on any default bearer if the network provides a traffic flow template for a default bearer using 3GPP standard network initiated bearer context modification procedures defined in 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*. If the network assigns a traffic flow template for a default bearer, the device shall route packets on the default bearer per the traffic flow template.

The device shall not initiate QoS establishment or initiate changes to the QoS level for a given bearer. The device shall NOT request a dedicated bearer for any PDN (i.e. all dedicated bearer activation will be initiated by the network).

Refer to 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2*, 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, and 3GPP TS 36.321: *Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.6.2 VZ_REQ_LTEB13NAC_6318

During any conformance or performance testing (e.g. 3GPP standard signaling conformance per 3GPP TS 36.523-1: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio*



Access Network (E-UTRAN); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification), the device shall not attempt to initiate QoS even if the device receives an AT command to initiate QoS.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.6.3 TRAFFIC FLOW TEMPLATE SUPPORT **VZ_REQ_LTEB13NAC_22726**

3.2.4.6.3.1 **VZ_REQ_LTEB13NAC_6428**

The device shall support all traffic flow template requirements as defined in section 15.3 of 3GPP TS 23.060: *General Packet Radio Service (GPRS); Service description; Stage 2* and section 10.5.6.12 of 3GPP TS 24.008: *Mobile radio interface Layer 3 specification; Core network protocols; Stage 3*.

The device shall support a total of 16 packet filters/traffic flows per bearer. These 16 packet filters/traffic flows may be all uplink, all downlink, or any combination of uplink and downlink that adds up to a total of 16.

At a minimum, the device shall support the following protocols in the "Next Header" if the "Next Header" is a packet filter attribute: UDP, TCP, ICMP, ESP, and AH.

The device is only required to support non-zero values for the "TOS/Traffic Class" packet filter attribute.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.6.4 UPLINK TRAFFIC SHAPING **VZ_REQ_LTEB13NAC_22727**

3.2.4.6.4.1 **VZ_REQ_LTEB13NAC_22729**

The device's modem shall not enforce maximum bit rates (MBR's) on any uplink bearer or any uplink APN aggregate maximum bit rates (APN-AMBR's). Enforcement of uplink MBR's and uplink APN-AMBR's will be handled by the network.

The device's modem shall prioritize the routing of uplink packets to their destination bearers based on the priority and prioritized bit rate assigned for each bearer by the network through the RRC *LogicalChannelConfig* information element. For packets destined for the same bearer, the device's modem shall prioritize packets based on their DSCP marking. If the packet has no DSCP marking then a DSCP marking of 0 (i.e. best effort) shall be assumed. Refer to 3GPP TS 23.203: *Policy and charging control architecture*, 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2*, and 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS),



Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.4.7 MTU SIZE **VZ_REQ_LTEB13NAC_22728**

3.2.4.7.1 **VZ_REQ_LTEB13NAC_6319**

For each PDN connection, the MTU size shall be configurable via the Protocol Configuration Options during PDN connection setup, i.e. the device shall request the MTU size as part of the PCO in the PDN CONNECTIVITY REQUEST message. If the network fails to send an MTU size as part of the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the given PDN, the device shall set the MTU size for that PDN to 1428 bytes. The device shall apply the configured MTU size for the given PDN to both IPv4 and IPv6 packets. The device shall be capable of supporting a different MTU size setting for each PDN. The device shall be capable of supporting an MTU size of up to 3000 bytes for each PDN.

The device vendor shall not allow the user to modify the MTU size settings through the device user interface or the remote access user interface for tethered devices.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.5 DNS **VZ_REQ_LTEB13NAC_22730**

3.2.5.1 **VZ_REQ_LTEB13NAC_6320**

The device shall be capable of supporting 2 IPv6 DNS server addresses and 2 IPv4 DNS server addresses for each PDN connection. The device shall be capable of supporting unique DNS server addresses for each PDN connection. DNS server addresses are provided to the device by the network (refer to the *Scenarios* section of this document for additional details) and shall not be hard coded on the device. The device shall not store DNS server addresses across power cycles.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.5.2 CACHING **VZ_REQ_LTEB13NAC_22731**

3.2.5.2.1 **VZ_REQ_LTEB13NAC_6321**

Embedded applications on the device and any other applications that use the DNS resolver software in the device shall not cache DNS results. All caching for such applications shall take place in the DNS resolver software in the device. The applications shall never store IP addresses past the end of a session.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.5.2.2 **VZ_REQ_LTEB13NAC_6322**

The following rules shall apply to the DNS resolver software in the device in the event that the resolver caches the results of a DNS query:

- DNS caches shall be cleared when the device experiences a hard power cycle (i.e. the device is powered off by the user and eventually powered back on, the battery is pulled, etc.) or soft reset (software instigates a power cycle). In other words, any cache of DNS results shall be stored in volatile memory only and shall not be stored in non-volatile memory.
- No DNS result shall be cached by the resolver longer than the Time-To-Live (TTL) field that is returned with the result. For example, if the DNS result indicates a Time-To-Live of 30 minutes, then that result shall not be cached by the device for longer than 30 minutes. If no TTL value is available in a particular response, the embedded application may use the result for the duration of that PDN connection but shall not cache the value after the PDN connection ends.
- In the event that the source software offers an option for setting the maximum cache time (e.g. via a compile-time static variable), the time shall be set to a value of 24 hours. However, if the TTL value is less than the maximum cache time, then the TTL value shall always take precedence over the maximum cache time. For instance, if the maximum cache time is 24 hours and the TTL for a result is 2 hours, then the resolver shall cache the result for 2 hours only. If the maximum cache time is 24 hours and the TTL for a result is 48 hours, then the resolver shall cache the result for 24 hours.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.5.3 DOMAIN NAME MAXIMUM LENGTH **VZ_REQ_LTEB13NAC_22732**

3.2.5.3.1 **VZ_REQ_LTEB13NAC_6323**

As per RFC 1034, the maximum domain name length shall be 255 octets. If an application requests resolution of a domain name longer than 255 octets, the DNS resolver software in the device shall return an error to the application.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.6 DATA RETRY REQUIREMENTS **VZ_REQ_LTEB13NAC_22733**

3.2.6.1 **VZ_REQ_LTEB13NAC_6324**



The device shall comply with all 3GPP Release 9 Specifications (refer to TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS)*; Stage 3 for additional details) and the Verizon Wireless LTE Data Retry Requirements.

Compliance to data retry requirements shall be per the Verizon Wireless LTE Data Retry Test Plan.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.7 IMSI SUPPORT FOR LTE **VZ_REQ_LTEB13NAC_22734**

3.2.7.1 **VZ_REQ_LTEB13NAC_6325**

The device shall retrieve the IMSI stored in the USIM as per 3GPP 31.102: *Characteristics of the Universal Subscriber Identity Module (USIM) application* for operation on the Verizon Wireless 3GPP Band 13 LTE network. The IMSI will be coded as per 3GPP TS 23.003: *Numbering, addressing and identification*. The IMSI will be used as the subscriber identity when interacting with the Verizon Wireless LTE network.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8 APN SUPPORT FOR LTE **VZ_REQ_LTEB13NAC_22741**

3.2.8.1 PDN CONNECTION REQUESTS **VZ_REQ_LTEB13NAC_22742**

3.2.8.1.1 **VZ_REQ_LTEB13NAC_6326**

When requesting a connection to a PDN, the device shall use the APN associated with that PDN based on the APN class as described below.

- The device shall use the Class 1 APN for the IMS PDN.
- The device shall use the Class 2 APN for the Administrative PDN.
- The device shall use the Class 3 APN for the Internet PDN.
- The device shall use the Class 4 APN for the VZW Application PDN.

Refer to the *LTE IPv6/IPv4 and Bearer Support, Scenarios*, and the *Factory LTE Programming* sections of this document and 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS)*; Stage 3 for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS),



Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8.2 APN ENABLE/DISABLE [VZ_REQ_LTEB13NAC_22743](#)

3.2.8.2.1 [VZ_REQ_LTEB13NAC_6327](#)

The device shall support an enable/disable control parameter for each APN.

The device shall only use an APN if the APN is enabled. The device shall not request a PDN connection if the associated APN is disabled or not present (e.g. deleted). If the Class 1 APN (i.e. APN for the IMS PDN) or the Class 2 APN (i.e. APN for the Administrative PDN) is disabled or not present (e.g. deleted), the device shall not attempt to attach to the Verizon Wireless LTE network.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8.3 APN CONTENT [VZ_REQ_LTEB13NAC_22744](#)

3.2.8.3.1 [VZ_REQ_LTEB13NAC_6328](#)

When sending the APN as an information element in a NAS message, the device shall only include the APN Network Identifier (NI). The network will append the APN Operator Identifier (OI) to complete the FQDN of the APN, and the network will perform the DNS resolution.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8.4 UICC APN VERIFICATION [VZ_REQ_LTEB13NAC_22745](#)

3.2.8.4.1 UICC APN VERIFICATION ENABLED [VZ_REQ_LTEB13NAC_22746](#)

3.2.8.4.1.1 [VZ_REQ_LTEB13NAC_6329](#)

If the APN Control List feature is enabled in the UICC (i.e. USIM service table), then the device shall check that the entire APN of any PDP context is listed in EF_{ACL} under USIM before requesting this PDP context activation from the network. If the APN is not present in EF_{ACL}, the device shall not request the corresponding PDP context activation from the network. If the Class 1 APN (i.e. APN for the IMS PDN) is not present in EF_{ACL}, the device shall not attempt to attach to the Verizon Wireless LTE network until the UICC is removed and replaced. If the

device is attached to the Verizon Wireless LTE network and needs to establish a connection to the Administrative PDN and the Class 2 APN (i.e. APN for the Administrative PDN) is not present in EF_{ACL}, the device shall detach from the LTE network using standard 3GPP messaging and shall not attempt to re-attach to the Verizon Wireless LTE network until the UICC is removed and replaced. Refer to 3GPP TS 31.102: *Characteristics of the Universal Subscriber Identity Module (USIM) application*, 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, and the *LTE Network Detachment* section of this document for additional details.

The interpretation of the APN TLV shall be as per 3GPP TS 23.003: *Numbering, addressing and identification*.
Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8.4.2 UICC APN VERIFICATION DISABLED [VZ_REQ_LTEB13NAC_22747](#)

3.2.8.4.2.1 [VZ_REQ_LTEB13NAC_6330](#)

If the APN Control List feature is disabled in the UICC (i.e. the USIM service table), then the device shall use the APN without any verification from the UICC.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8.5 APN STORAGE ON THE DEVICE [VZ_REQ_LTEB13NAC_22748](#)

3.2.8.5.1 [VZ_REQ_LTEB13NAC_6331](#)

APN network identifiers and their associated parameters shall be stored on the device in non-volatile memory. Refer to the *Factory LTE Programming* section of this document for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8.5.2 [VZ_REQ_LTEB13NAC_6332](#)

If the Verizon Wireless UICC is removed from the device, the device shall remember all APN parameter settings used with the Verizon Wireless UICC prior to removal, and the device shall restore all APN parameters to these settings when a Verizon Wireless UICC is re-inserted into the device.

NOTE: The device shall consider the UICC to be a Verizon Wireless UICC if the IMSI begins with either "311480" or "311270".

When the device is operated with a Verizon Wireless UICC, the device shall comply with the following

requirements:

1. The device may provide the capability for the user to update the class 3 APN network identifier through the device user interface or the remote access user interface for tethered devices.
2. The device may provide the capability to update all APN network identifiers through a diagnostic menu (for use during device acceptance/field testing). This diagnostic mode shall not be accessible to the end user, i.e. this diagnostic menu shall only be accessible by the device vendor and/or Verizon Wireless.
3. The device shall not allow the user to update any other existing APN NI's (except the class 3 APN NI) through the device user interface or the remote access user interface for tethered devices. The device shall not allow the user to create a new APN entry in the APN table through the device user interface or the remote access user interface for tethered devices (e.g. the device shall not allow the end user to create an additional class 3 APN entry in the APN table).
4. The device shall provide the capability of updating all APN network identifiers and their associated parameters through OTADM. Refer to the *OTADM* section of this document for additional details. The device shall not allow the user to update the following APN related parameters through the device user interface or the remote access user interface for tethered devices:
 - APN Class
 - APN IP Type
 - APN Bearer
 - APN Enable/Disable
 - APN MAXCONN, MAXCONN_T, WAIT_TIME
5. If an APN network identifier or APN-related parameter is updated after a PDN connection using the APN has been established, the device shall release the PDN connection and then immediately re-establish the PDN connection using the updated APN parameter(s). If any APN network identifier or APN-related parameter is updated for an APN for which the device has no current PDN connection, the device shall use the updated APN parameter(s) in all future PDN connections using the APN. Refer to the *Scenarios* section of this document for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8.6 MULTIPLE PDN CONNECTIONS USING THE SAME APN VZ_REQ_LTEB13NAC_22749

3.2.8.6.1 VZ_REQ_LTEB13NAC_6333

The device shall only support one PDN connection for a given APN. After successful establishment of a PDN connection using a given APN, the device shall not attempt to establish additional PDN connections using the same APN, i.e. the device shall not send another PDN CONNECTIVITY REQUEST message with the same APN.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.8.7 APPLICATION ACCESS TO APN PARAMETERS **VZ_REQ_LTEB13NAC_22750**

3.2.8.7.1 **VZ_REQ_LTEB13NAC_6417**

The device shall not allow any applications to access or modify APN parameters stored on the device with the exception of the device's OTADM application and any lab applications provided the vendor for device certification/acceptance testing.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.9 DEVICE EQUIPMENT IDENTIFIER **VZ_REQ_LTEB13NAC_22751**

3.2.9.1 **VZ_REQ_LTEB13NAC_6334**

The device shall use the IMEI and the IMEISV as the device equipment identifiers when operating in LTE. The IMEI (including the IMEI check digit) shall be stored on the device in secure, non-volatile, read-only memory populated at the time of device manufacture. The device shall not be capable of modifying the IMEI. The device shall not be capable of modifying the Type Allocation Code (TAC) and Serial Number (SNR) components of the IMEI or IMEISV. The device shall not allow the user to modify the SVN component of the IMEISV. The device shall only be capable of updating the Software Version Number (SVN) component of the IMEISV as part of a firmware update to the device. Refer to 3GPP TS 23.003: *Numbering, addressing and identification* and 3GPP TS 22.016: *International Mobile Equipment Identities (IMEI)* for additional details.

The IMEI shall always be read from the device (as opposed to the UICC). When requested by the network, the UICC, or an application on the device, the device shall retrieve the IMEI from the secure, non-volatile, read-only memory whose value was populated at the time of the device manufacture (as opposed to retrieving from any volatile, unsecure memory which may be changed or modified after initial device manufacture).

The value for the SVN component of the IMEISV shall be 00 for the software version on the device at device launch. The SVN component of the IMEISV shall not be incremented as part of any post-launch software update.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.9.2 **VZ_REQ_LTEB13NAC_6335**

When displaying the IMEI to the end user through the device user interface or the remote access user interface for tethered devices, the device shall include the IMEI check digit. Per the 3GPP Release 9 Specifications, the IMEI check digit shall not be included in messaging between the device and the network. Refer to 3GPP TS



23.003: *Numbering, addressing and identification* and 3GPP TS 22.016: *International Mobile Equipment Identities (IMEI)* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10 IMS SUPPORT VZ_REQ_LTEB13NAC_23507

3.2.10.1 VZ_REQ_LTEB13NAC_6336

The device shall support SMS over IMS when operating on the Verizon Wireless LTE network as per the Verizon Wireless LTE SMS Requirements. Compliance to LTE SMS requirements shall be per the Verizon Wireless LTE SMS Test Plan. Compliance to IMS registration and IMS registration retry requirements shall be per the Verizon Wireless LTE IMS Registration and IMS Registration Retry Test Plan.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.2 SMS TRANSPORT LAYER MESSAGE FORMAT VZ_REQ_LTEB13NAC_23508

Refer to the Verizon Wireless LTE SMS requirements.

3.2.10.3 IMS CLIENT VZ_REQ_LTEB13NAC_23509

3.2.10.3.1 VZ_REQ_LTEB13NAC_6337

The IMS client shall be embedded in the device (as opposed to residing on a laptop for tethered devices). In logical terms, the device shall only have one IMS client which communicates with the network.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.3.2 IMS TEST MODE VZ_REQ_LTEB13NAC_23510

3.2.10.3.2.1 VZ_REQ_LTEB13NAC_6338

The device shall support an IMS test mode in which the IMS client is disabled. By default, this test mode shall



be disabled, i.e. the IMS client is enabled.

This test mode shall be enabled and disabled using a non-volatile memory setting. Upon changing this memory setting, the device shall perform a soft reset. The vendor shall provide a lab application to modify this memory setting during device acceptance testing. The device vendor shall not allow the user to modify this memory setting through the device user interface or the remote access user interface for tethered devices.

The IMS test mode shall operate independently of the setting of the *SMS_Over_IP_Networks_Indication* parameter defined in the *SMS over IMS Control* section of the LTE SMS Requirements. Refer to the *LTE Network Attachment* section of this document for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.4 SMS STORAGE **VZ_REQ_LTEB13NAC_23511**

3.2.10.4.1 3GPP FORMATTED SMS TEXT MESSAGES **VZ_REQ_LTEB13NAC_23512**

Refer to the Verizon Wireless LTE SMS Requirements.

3.2.10.4.2 3GPP2 FORMATTED SMS TEXT MESSAGES **VZ_REQ_LTEB13NAC_23513**

Refer to the Verizon Wireless LTE SMS Requirements.

3.2.10.5 IMS REGISTRATION REQUIREMENTS **VZ_REQ_LTEB13NAC_23514**

3.2.10.5.1 PDN AND BEARER SELECTION **VZ_REQ_LTEB13NAC_23515**

3.2.10.5.1.1 **VZ_REQ_LTEB13NAC_6432**

The device shall use the IMS PDN for all messaging and traffic associated with the device's embedded IMS client. No other PDN's shall be used for messaging and traffic associated with the device's embedded IMS client.

The device shall proceed with IMS registration when all of the criteria below are met:

- The device has established a default bearer with the IMS PDN.
- The device has established a globally routable IPv6 address for the IMS PDN.

- The device has received the P-CSCF IP addresses in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN.

The device shall use the IMS PDN default bearer for all SIP signaling unless the network indicates otherwise.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.2 PROXY-CSCF DISCOVERY **VZ_REQ_LTEB13NAC_23516**

3.2.10.5.2.1 **VZ_REQ_LTEB13NAC_6433**

The device shall obtain the IP address(es) of the IMS Proxy-CSCF as one of the Protocol Configuration Option (PCO) parameters that is provided by the network in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN during the LTE attach procedure. The device shall be capable of supporting a minimum of three P-CSCF IP addresses. For requirements on IMS registration and the use of the three P-CSCF IP address values, see section 3.2.10.5 "IMS Registration Errors." The device shall NOT cache P-CSCF IP addresses across IMS PDN contexts - i.e. when a new IMS PDN connection/context is established the device shall use the P-CSCF IP addresses provided in that IMS PDN bearer activation.

The device shall use port 5060 as the default P-CSCF IMS SIP port number, i.e. the destination port number that the device's IMS SIP User Agent Client uses to send SIP messages to the P-CSCF (and the listening port number of the P-CSCF). The device shall also use port 5060 as the default port for the device's IMS SIP User Agent Server's listening port. When opening a new TCP socket for SIP, the device shall randomly select a source port that is above 40000. When opening up a new TCP socket, the device shall not re-use a source port that has been used in any of the previous 32 TCP sockets. The device vendor shall provide a lab application to modify the P-CSCF IMS SIP port setting during device acceptance testing. The device vendor shall not allow the user to modify the P-CSCF IMS SIP port setting through the device user interface or the remote access user interface for tethered devices.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.3 REGISTRATION WITH THE PROXY-CSCF AND S-CSCF

VZ_REQ_LTEB13NAC_23517

3.2.10.5.3.1 **VZ_REQ_LTEB13NAC_6434**

The device shall support the IMS registration functions with the IMS network as described in 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*. Specifically, the device shall support the initial registration functions

described in the section "*Initial Registration*" in 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*.

- The device shall use SIP URIs in the FROM and TO Headers
- The device shall use the pre-provisioned Home Domain Name in the Request URI of the Registration Message.
- The P-Associated-URI will be returned to the device with both a SIP and a tel URI. The device shall use the SIP URI in the P-Preferred Identity and the FROM Headers.
- The device shall attempt IMS registration using the first P-CSCF IP address provided by the network in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN during the LTE attach procedure. The device shall attempt IMS registration using additional P-CSCF IP addresses provided by the network as indicated per section 3.2.10.5 of this document.
- As a part of the IMS registration process, the device shall set the registration expiration timer value to 600,000 seconds as defined in section 5.1.1.2, *Initial Registration*, of 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*. This applies to both the normal scenario where a 200 OK is received in response to the Register, and abnormal scenarios where a SIP error code (such as a SIP 423 Interval Too Brief) is received. The device shall request the registration expiration timer value in either the "Contact" header or the "Expires" header but not both.
- The device shall include the 3GPP SMS feature tag (+g.3gpp.smsip).
- The device shall include the P-Access-Network-Info header in all SIP REGISTER requests per 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*.
- The device shall include the following feature tag in the Contact header of the SIP REGISTER request: "+sip.instance" with a value of the device IMEI in the form "urn:gsma:imei:<device IMEI>", e.g. Contact: +sip.instance= "urn:gsma:imei:<device_IMEI>".

If the device receives a SIP NOTIFY message from the network associated with IMS registration and the SIP NOTIFY message also contains an Instance-ID, then the device shall act as follows:

- If the Instance-ID matches the Instance-ID used in the original IMS REGISTER message for establishing the current IMS registration, then the device shall process the SIP NOTIFY message and take appropriate action.
- If the Instance-ID is different from the Instance-ID used in the original IMS REGISTER message for establishing the current IMS registration, then the device shall disregard the SIP NOTIFY message and take no action.

NOTE: In some cases, the SIP NOTIFY may contain multiple registration instances (each with a unique Instance-ID). The device shall process all registration instances (and their associated Instance-ID's) in the SIP NOTIFY before making a decision how to proceed based on the logic above.

3.2.10.5.4 AUTHENTICATION DURING REGISTRATION **VZ_REQ_LTEB13NAC_23518**

3.2.10.5.4.1 **VZ_REQ_LTEB13NAC_6435**

Until further notice from Verizon Wireless, all devices shall use the Digest AKA_{v2} method as the IMS authentication mechanism. The Digest AKA_{v2} authentication method is per IETF RFC 4169.

Note the following items for Authentication:

- The REGISTER message will be challenged.
- Devices shall always send the "Authorization" header with username parameter even in the initial REGISTER messages.
- De-registrations will be challenged.
- SIP MESSAGE transactions may be challenged by the IMS network.

After a successful IMS registration, the device shall provide an indication of success to the connection manager if the device is tethered to a PC.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.5 URI FORMATTING **VZ_REQ_LTEB13NAC_23519**

3.2.10.5.5.1 **VZ_REQ_LTEB13NAC_6436**

The ISIM will contain multiple records for the IMS Public User Identity under EF_{IMPU}. The first record will always be an IMSI-based SIP URI in the format:
sip:<IMSI>@ims.mnc480.mcc311.3gppnetwork.org (NOTE: Verizon Wireless will add additional MNC-MCC combinations as needed.)

The ISIM will also contain an MSISDN-based SIP URI for the IMS Public User Identity in the format:
sip:+19085554321@vzims.com
where the 10 digit MDN (in E.164 format) is in the user part.

In normal operation, the device shall use the MSISDN-based SIP URI for its IMS Public User Identity. If a tel URI is also desired for the device, it shall not be permanently stored in the device. The tel URI will be downloaded to the device during registration from the IMS network using the P Associated URI Header.

Refer to the *Scenarios* section of the Verizon Wireless LTE SMS Requirements and 3GPP TS 31.103:



Characteristics of the IP Multimedia Services Identity Module (ISIM) application for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.6 SUBSCRIPTION TO THE REG EVENT PACKAGE VZ_REQ_LTEB13NAC_23520

3.2.10.5.6.1 VZ_REQ_LTEB13NAC_6437

After successfully completing any new IMS registration (as opposed to a re-registration), the device shall always request a new subscription to the reg events package. The procedures for this subscription are described in the section "*Subscription to the Registration-State Event Package*" in 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*. The device shall include the following feature tag in the Contact header of the SIP SUBSCRIBE request: "+sip.instance" with a value of the device IMEI in the form "urn:gsma:imei:<device IMEI>", e.g. Contact: +sip.instance= "urn:gsma:imei:<device_IMEI>". **NOTE:** This same "+sip.instance" feature tag shall be included in both the REGISTER message and the SUBSCRIBE (for the reg events package).

Per RFC 3261, the device shall use a "Call-ID" in the SUBSCRIBE message that is different from the "Call-ID" that was established during the registration procedure.

The device shall re-subscribe at the expiration of the subscription timer as described in the section "*Subscription to the Registration-State Event Package*" in 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*. When sending a SUBSCRIBE message to initiate a re-subscribe to the reg events package, the device shall use the same dialog that was established at the initial SUBSCRIBE procedure.

The device shall include the P-Access-Network-Info header in all SIP SUBSCRIBE requests per 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.7 REREGISTRATION VZ_REQ_LTEB13NAC_23521

3.2.10.5.7.1 VZ_REQ_LTEB13NAC_6438

Either the device or the network may initiate a reregistration. The device shall reregister at the expiration of the registration timer as described in the section "*User-initiated Reregistration*" in 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*.

When sending a REGISTER message to initiate a re-registration, the device shall use the same "Call-ID" that was established at the initial registration.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.8 DEREGISTRATION VZ_REQ_LTEB13NAC_23522

3.2.10.5.8.1 VZ_REQ_LTEB13NAC_6439

Either the device or the network may request deregistration with the IMS network. The procedures are described in the sections "User-initiated Deregistration" and "Network-initiated Deregistration" in 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*.

The device shall initiate deregistration if it has a current registration and the device is going to either initiate a detach from the LTE network (including device power down detach) or initiate a disconnection of the IMS PDN connection. To deregister, the device shall 1) terminate the subscription to the registration events package by sending a Subscribe message with expires= 0, followed by 2) sending an IMS de-registration request which shall consist of a REGISTER message with the value Expires= 0 in the header. This shall be done before sending a NAS DETACH REQUEST message or a NAS PDN DISCONNECT REQUEST message for the IMS PDN. Upon the IMS client generating the initial SIP REGISTER message with expires=0, the device shall start an implementation specific timer with a value of 4 seconds. While this implementation specific timer is running, the device shall respond to all SIP messaging from the network, e.g. if the network challenges the de-registration request with a 401 Unauthorized. Upon expiration of this implementation specific timer, the device shall take no further action with respect to SIP messages from the network and execute the NAS detach procedure or NAS PDN disconnect procedure. The device shall stop the implementation specific timer and immediately execute the NAS detach procedure or NAS PDN disconnect procedure if a SIP 200 OK or a SIP 481 or a SIP 501 is received in response to the SIP REGISTER (with expires=0) before the implementation specific timer expires.

NOTE: The implementation specific timer is started when the IMS client generates the initial SIP REGISTER message with expires=0. The implementation specific timer shall run even if the IMS client cannot send the SIP REGISTER message to the modem for transmission because an IMS signaling connection could not be established.

The device shall enter the de-registered state if the network sends a SIP NOTIFY message with one or more registration elements that have the state attribute set to "terminated" and the event attribute set to either "rejected" or "deactivated". In this case, the device shall wait 60 seconds and then attempt an initial IMS registration.

If the device receives a SIP NOTIFY message from the network indicating a network-initiated IMS de-

registration and the SIP NOTIFY message also contains an Instance-ID, then the device shall act as follows:

- If the Instance-ID matches the Instance-ID used in the original IMS REGISTER message for establishing the current IMS registration, then the device shall process the request as a normal de-registration following the steps described in the preceding paragraph above.
- If the Instance-ID is different from the Instance-ID used in the original IMS REGISTER message for establishing the current IMS registration, then the device shall disregard the SIP NOTIFY message and take no action.

NOTE: In some cases, the SIP NOTIFY may contain multiple registration instances (each with a unique Instance-ID). The device shall process all registration instances (and their associated Instance-ID's) in the SIP NOTIFY before making a decision how to proceed based on the logic above.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.9 DEVICE IDENTITY AND RELATED PARAMETERS VZ_REQ_LTEB13NAC_23523

3.2.10.5.9.1 VZ_REQ_LTEB13NAC_6440

The device shall store the following parameters:

- IMSI NAI (Network Access Identifier): The device shall use the IMSI-based Network Access Identifier format that is specified in 3GPP TS 23.003: *Numbering, addressing and identification*. Thus the IMSI NAI shall be encoded using the format "6<IMSI>@nai.epc.mnc<MNC>.mcc<MCC>.3gppnetwork.org"

The device shall retrieve the following parameters from the ISIM/USIM:

- IMS Private User Identity: The IMS Private User Identity is a network identity with the format <IMSI>@vzims.com. This parameter is stored in the ISIM on the UICC.
- IMS Public User Identity: In normal SMS operation, the IMS Public User Identity shall be a MSISDN-based SIP URI with the format sip:+19085554321@vzims.com. The ten digit MDN (i.e. 9085554321) is in the user part. This parameter is stored in the ISIM on the UICC. The ISIM also contains an IMSI-based SIP URI of the format sip:<IMSI>@ims.mnc480.mcc311.3gppnetwork.org (NOTE: Verizon Wireless will add additional MNC-MCC combinations as needed.). The first record under EF_{IMPU} will always be the IMSI-based SIP URI.
- Home Network Domain name: the home network domain name of the P-CSCF. This parameter has a default value of vzims.com.
- IMSI: The IMSI consists of 3 digits MCC, 2 or 3 digits MNC, and from 1 to 9 digits MSID that is formatted according to ITU-T E.212. The IMSI has a maximum length of 15 digits. This parameter is stored in the USIM on the UICC.
- IMS AKA: The IMS AKA password is stored in the ISIM on the UICC.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS),



Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.10 SMS OVER IMS CONTROL VZ_REQ_LTEB13NAC_23524

3.2.10.5.10.1 VZ_REQ_LTEB13NAC_6441

The device shall support a configurable parameter that controls the operation of the SMS over IMS functions. The configurable parameter is defined as `SMS_Over_IP_Networks_Indication` and it is a Boolean parameter having a value of 1 or 0 (refer to 3GPP TS 24.167: *3GPP IMS Management Object (MO); Stage 3* for additional details). This configurable parameter shall not be accessible to the end user.

- When the `SMS_Over_IP_Networks_Indication` parameter is set to a value of 1, the device shall support SMS over IMS and shall attempt IMS registration as defined by the requirements in this section. The value of 1 shall be the default value and this value is used for normal operation in the LTE network.
- When the `SMS_Over_IP_Networks_Indication` parameter is set to a value of 0, the device shall not use the SMS over IMS feature to originate SMS messages, but the device shall attach to the LTE network and attempt IMS registration as defined by the requirements in this section. If IMS registration is successful, the device shall be able to receive and process MT SMS messages delivered over IMS, but shall not originate MO SMS messages over IMS.

Note that the `SMS_Over_IP_Networks_Indication` parameter is a parameter that operates independently of the IMS test mode parameter that is defined in this document.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.11 SIP TIMERS FOR IMS VZ_REQ_LTEB13NAC_23525

3.2.10.5.11.1 VZ_REQ_LTEB13NAC_6442

The device shall support the following SIP timers for IMS:

- The value of the SIP T1 timer shall be controlled by the configuration parameter `T1Timer_ims`. This timer shall have a default value of 3 seconds.
- The value of the SIP Timer F (SIP timeout timer) shall be controlled by the configuration parameter `TFtimer_ims`. This timer shall have a default value of 30 seconds. Note that the Timer F value shall not be calculated from the formula in the SIP standard.
- The value of the SIP T2 timer shall be controlled by the configuration parameter `T2timer_ims`. This timer shall have a default value of 16 seconds.
- The parameters `T1timer_ims`, `TFtimer_ims`, and `T2timer_ims` shall be updatable parameters by the OTADM process as defined in the Verizon Wireless LTE OTADM Requirements. The device vendor shall provide a lab application to modify the values of `T1timer_ims`, `TFtimer_ims`, and `T2timer_ims`

during device acceptance testing.

- The values of the other SIP timers shall be as documented in section 7.7 of 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP)*; Stage 3.

The device vendor shall not allow the user to modify any SIP timer settings through the device user interface or the remote access user interface for tethered devices.

If SIP timer(s) T1, T2, and/or TimerF are updated via OTADM, the device shall use the new timer value(s) upon completion of the OTADM session (i.e. the new timer values shall take effect at the next SIP transaction).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.12 MSISDN AND MSISDN-BASED SIP URI VALIDITY VZ_REQ_LTEB13NAC_23526

3.2.10.5.12.1 VZ_REQ_LTEB13NAC_6443

Before any IMS registration attempt, the device shall determine if the MSISDN under EF_{MSISDN} in the USIM and the MSISDN-based SIP URI for the IMS Public User Identity under EF_{IMPU} in the ISIM are valid using the procedure below:

- If all bytes of the dialing number/SSC string under EF_{MSISDN} in the USIM are set to hexadecimal "FF" values, then the MSISDN shall be declared invalid. Otherwise, the MSISDN shall be declared valid. (NOTE: The dialing number/SSC string under EF_{MSISDN} in the USIM is preceded by the TON/NPI byte which may or may not be set to a hexadecimal value of "FF" for an un-provisioned USIM. Only the 10 bytes allocated to the dialing number/SSC string shall be used to determine the validity of the MSISDN.)

If the MSISDN is valid and the MSISDN-based SIP URI for the IMS Public User Identity under EF_{IMPU} in the ISIM contains the dialing number/SSC string read from the USIM EF_{MSISDN}, then the MSISDN-based SIP URI for the IMS Public User Identity under EF_{IMPU} shall be declared valid. Otherwise the MSISDN-based SIP URI for the IMS Public User Identity shall be declared invalid.

If the MSISDN-based SIP URI for the IMS Public User Identity is provisioned in the ISIM and is valid, then the device shall IMS register using the MSISDN-based SIP URI as its IMS Public User Identity. Upon successful IMS registration using the MSISDN-based SIP URI as the device's IMS Public User Identity, the device shall be capable of all SMS services detailed in the Verizon Wireless LTE SMS Requirements.

If the MSISDN-based SIP URI for the IMS Public User Identity is invalid, then the device shall IMS register using the IMSI-based SIP URI as its IMS Public User Identity. The device shall use the first record in the ISIM under EF_{IMPU} as the IMSI-based SIP URI for the IMS Public User Identity. Upon successful IMS registration using the IMSI-based SIP URI as the device's IMS Public User Identity, the device shall operate in a limited access SMS mode where the device only originates/terminates administrative SMS messages. An example of



SMS messages supported in this limited access SMS mode are the administrative SMS messages for the OTADM application or the SIM OTA application. An example of SMS messages that are not supported in this mode would be application directed SMS messages for an end user application. When operating in this limited access SMS mode, the device shall be capable of receiving SMS messages addressed to the device's MDN or addressed to the device's IMSI.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.5.13 UDP VS. TCP FOR SIP SIGNALING VZ_REQ_LTEB13NAC_35803

3.2.10.5.13.1 VZ_REQ_LTEB13NAC_35804

The device shall use UDP for all SIP requests where the request is less than the MTU size for the IMS PDN minus 200 bytes. If the SIP request is within 200 bytes of the MTU size for the IMS PDN, then the device shall use TCP for the SIP request. Refer to RFC 3261 and 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP)*; Stage 3 for additional details.

NOTE: When creating a TCP socket, the device shall use port 5060 as the default P-CSCF IMS SIP port number, i.e. the destination port number that the device's IMS SIP User Agent Client uses to send SIP messages to the P-CSCF (and the listening port number of the P-CSCF). When opening a new TCP socket for SIP, the device shall randomly select a source port that is above 40000. When opening up a new TCP socket, the device shall not re-use a source port that has been used in any of the previous 32 TCP sockets.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6 IMS REGISTRATION ERRORS VZ_REQ_LTEB13NAC_23527

3.2.10.6.1 IMS REGISTRATION/RE-REGISTRATION RETRY ALGORITHM

VZ_REQ_LTEB13NAC_23528

3.2.10.6.1.1 VZ_REQ_LTEB13NAC_6444

The device shall implement an IMS registration/re-registration retry algorithm based on the Failure Type as described in the table below.

Failure Type	Retry Behavior
No response from network and the SIP timeout timer (i.e. SIP Timer F) expires	Follow algorithm below.

Network rejects the IMS registration/re-registration with the following SIP error codes: 400, 402, 421, 484	Refer to the special requirement for these error codes.
Network rejects the IMS registration/re-registration with the following SIP error codes: 403, 404	Refer to the special requirement for this error code.
Network rejects the IMS registration/re-registration with the following SIP error codes: 401 423	Part of normal registration call flow, refer to 3GPP TS 24.229. The device shall use the same P-CSCF for all retries.
Network rejects the IMS registration/re-registration with the following SIP error codes: 480 (if Retry-After header is absent) 482 486 (if Retry-After header is absent) 491 494 500 (if Retry-After header is absent) 503 (if Retry-After header is absent) 504 600 (if Retry-After header is absent)	Follow algorithm below.
Network rejects the IMS registration/re-registration with the following SIP error codes: 480 (if Retry-After header is present) 486 (if Retry-After header is present) 500 (if Retry-After header is present) 503 (if Retry-After header is present) 600 (if Retry-After header is present)	Follow the algorithm below with the following exception: The throttling timer value shall be set to the duration specified in the Retry-After header.
Network rejects the IMS re-registration or de-registration with the following SIP error codes: 481 501 (de-registration only)	Refer to the special requirements.

Definition of general IMS registration and re-registration algorithm is provided below (note that as defined in the above table, some scenarios with specific SIP error codes have special requirements and these are defined in the subsequent sections):

1. The first time an IMS registration or re-registration attempt fails, the IMS application shall increment a

"throttling counter" to 1 and start a "throttling timer". The length of the timer shall be 30 seconds. The IMS application shall not make another registration or re-registration attempt while the throttling timer is running.

2. Upon the expiration of the throttling timer, the IMS application shall make another IMS registration or re-registration attempt. A re-registration attempt shall use the same P-CSCF while a registration attempt shall use the next P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (if the IMS application used the last P-CSCF IP address provided by the network in the previous attempt, then the IMS application shall use the first P-CSCF IP address provided by the network for this attempt). If the IMS registration or re-registration is successful, the throttling counter shall be cleared. If the IMS registration or re-registration attempt fails, the IMS application shall increment the throttling counter to 2 and start the throttling timer. The length of the timer shall be 30 seconds. The IMS application shall not make another registration or re-registration attempt while the throttling timer is running.

3. Upon the expiration of the throttling timer, the IMS application shall make another IMS registration attempt using the next P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (if the IMS application used the last P-CSCF IP address provided by the network in the previous attempt, then the IMS application shall use the first P-CSCF IP address provided by the network for this attempt). If the previous attempt was a re-registration attempt, the IMS application shall make a new IMS registration request in this step and all subsequent steps of the algorithm. If the IMS registration is successful, the throttling counter shall be cleared. If the IMS registration attempt fails, the IMS application shall increment the throttling counter to 3 and start the throttling timer. This time, the length of the timer shall be one minute plus a random value; the random value shall have an upper bound of 15 seconds. The IMS application shall not make another registration attempt while the throttling timer is running.

4. Upon the expiration of the throttling timer, the IMS application shall make another IMS registration attempt using the next P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (if the IMS application used the last P-CSCF IP address provided by the network in the previous attempt, then the IMS application shall use the first P-CSCF IP address provided by the network for this attempt). If the IMS registration is successful, the throttling counter shall be cleared. If the IMS registration attempt fails, the IMS application shall increment the throttling counter to 4 and start the throttling timer. This time, the length of the timer shall be two minutes. The IMS application shall not make another registration attempt while the throttling timer is running.

5. Upon the expiration of the throttling timer, the IMS application shall make another IMS registration attempt using the next P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (if the IMS application used the last P-CSCF IP address provided by the network in the previous attempt, then the IMS application shall use the first P-CSCF IP address provided by the network for this attempt). If the IMS registration is successful, the throttling counter shall be cleared. If the IMS registration attempt fails, the IMS application shall increment the throttling counter to 5 and start the throttling timer. This time, the length of the timer shall be eight minutes. The IMS application shall not make another registration attempt while the throttling timer is running.

6. Upon the expiration of the throttling timer, the IMS application shall make another IMS registration attempt using the next P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS

BEARER CONTEXT REQUEST message for the IMS PDN (if the IMS application used the last P-CSCF IP address provided by the network in the previous attempt, then the IMS application shall use the first P-CSCF IP address provided by the network for this attempt). If the IMS registration is successful, the throttling counter shall be cleared. If the IMS registration attempt fails, the IMS application shall increment the throttling counter to 6 and start the throttling timer. This time, the length of the timer shall be fifteen minutes. The IMS application shall not make another registration attempt while the throttling timer is running. All subsequent IMS registration failures on this system that occur while the throttling counter is set to a value of 6 or greater shall result in a fifteen minute throttling timer. i.e. from this point on, there shall not be more than one attempt at an IMS registration on this system per fifteen minutes. For each subsequent attempt, the IMS application shall use the next P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (if the IMS application used the last P-CSCF IP address provided by the network in the previous attempt, then the IMS application shall use the first P-CSCF IP address provided by the network for this attempt).

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3.2.10.6.2 NETWORK REJECTS THE IMS REGISTRATION/RE-REGISTRATION WITH A 'SIP 400', 'SIP 402', 'SIP 421', OR 'SIP 484' MESSAGE VZ_REQ_LTEB13NAC_23529

3.2.10.6.2.1 VZ_REQ_LTEB13NAC_6452

If the network rejects the IMS registration/re-registration attempt with either of the following cause codes:

- SIP 400
- SIP 402
- SIP 421
- SIP 484

the device shall follow the algorithm defined in section ***IMS Registration/Re-Registration Retry Algorithm*** of this document. If the device encounters another rejection of an IMS registration/re-registration attempt before the throttling counter is reset where the IMS registration/re-registration is rejected by the network with either of the following cause codes:

- SIP 400
- SIP 402
- SIP 421
- SIP 484

then the device shall not attempt to IMS register/re-register with the Verizon Wireless LTE network until the device is power cycled or the UICC containing the ISIM is removed/replaced.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6.3 NETWORK REJECTS THE IMS REGISTRATION/RE-REGISTRATION WITH A 'SIP 403' OR 'SIP 404' MESSAGE VZ_REQ_LTEB13NAC_23530

3.2.10.6.3.1 VZ_REQ_LTEB13NAC_6453

If the network rejects an IMS registration/re-registration attempt using the MSISDN-based SIP URI for the IMS Public User Identity with either of the following cause codes:

- SIP 403
- SIP 404

the device shall immediately reattempt the registration on the same P-CSCF using the IMSI-based SIP URI for the IMS Public User Identity. If an IMS registration using the IMSI-based SIP URI for the IMS Public User Identity is successful, the device shall operate in limited access SMS mode as described in this document.

If the network rejects an IMS registration/re-registration attempt using the IMSI-based SIP URI for the IMS Public User Identity with either of the following cause codes:

- SIP 403
- SIP 404

the device shall wait 30 seconds and then reattempt the registration using the next P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (if the previous attempt was a re-registration attempt, the device shall send a new IMS registration request in this and all subsequent retry attempts). Typically the network will provide the IP address values of three P-CSCF servers in the PCO field. If the device has attempted to IMS register/re-register using all of the P-CSCF IP addresses provided by the network and in all attempts the network has rejected the IMS registration/re-registration attempt (using the IMSI-based SIP URI for the IMS Public User Identity) with either of the following cause codes:

- SIP 403
- SIP 404

then the device shall not attempt to IMS register with the Verizon Wireless LTE network until the device is power cycled or the UICC containing the ISIM is removed/replaced.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6.4 IMS REGISTRATION TIMER EXPIRES WHILE THROTTLING VZ_REQ_LTEB13NAC_23531

3.2.10.6.4.1 VZ_REQ_LTEB13NAC_6454

If the device is attempting to re-register and the registration timer expires while the throttling timer is running,

the device shall perform a new registration attempt at the next retry. The throttling counter shall not be reset.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6.5 IMS REGISTRATION/RE-REGISTRATION THROTTLING ACROSS SYSTEM TRANSITIONS [VZ_REQ_LTEB13NAC_23532](#)

3.2.10.6.5.1 [VZ_REQ_LTEB13NAC_6455](#)

The device shall maintain only one set of IMS registration/re-registration throttling parameters (e.g. timers and counters). This set of throttling parameters shall apply to all systems. The device shall not reset these throttling parameters as the result of a system transition.

For example: consider the case in which the current system is system "A" and the IMS registration/re-registration throttling counter is set to a value of 6 and a fifteen minute throttling timer is running. The device transitions to system "B". The IMS registration/re-registration throttling counter will still be 6 and the 15 minute throttling timer will still be running. The device does not retry IMS registration/re-registration until the throttling timer expires.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6.6 RESET OF THROTTLING COUNTERS AND TIMERS ON POWER CYCLE AND ON USIM/ISIM REPLACEMENT/REFRESH [VZ_REQ_LTEB13NAC_23533](#)

3.2.10.6.6.1 [VZ_REQ_LTEB13NAC_6456](#)

The device shall reset all IMS registration throttling counters and throttling timers on power cycle or USIM/ISIM replacement/refresh.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6.7 SIP 501 OR SIP 481 IN RESPONSE TO A DEREGISTRATION REQUEST [VZ_REQ_LTEB13NAC_23534](#)

3.2.10.6.7.1 [VZ_REQ_LTEB13NAC_6457](#)

If the device receives a SIP 501 or SIP 481 error code in response to a deregistration request, the device shall ignore the error and consider the deregistration request to have been accepted by the network.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6.8 IMS SIGNALING AND LOWER LAYER FAILURES VZ_REQ_LTEB13NAC_23535

3.2.10.6.8.1 VZ_REQ_LTEB13NAC_6480

An IMS registration procedure shall not be started if an IMS signaling connection cannot be established due to lower layer failure(s). An IMS registration procedure shall not be considered a failure if an IMS signaling connection/lower layer failure occurs before the procedure completes. The IMS registration retry throttling counter shall not be incremented and the IMS registration throttling shall not be started. An IMS signaling connection/lower layer failure includes any of the following:

- Any data retry event that prevents connection to the IMS PDN or the P-CSCF.
- Any RRC/radio connection failure

Refer to the Verizon Wireless LTE Data Retry Requirements for additional details.

If the device has successfully IMS registered, any IMS non-registration procedure shall be executed regardless of the IMS signaling connection/lower layer status of the device. For example, if a data retry event prevents connection to the LTE network a SIP SUBSCRIBE shall be allowed to time out.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6.9 SIP 503 WITH 'OUTAGE TEXT' VZ_REQ_LTEB13NAC_23536

3.2.10.6.9.1 VZ_REQ_LTEB13NAC_6485

If the network rejects an IMS registration/re-registration attempt with SIP 503 and includes the following text in the Reason-Phrase (on the Status-Line):

- 503 Service Unavailable: IMS Core Outage

the device shall follow the IMS registration retry logic in section 3.2.10.5.1 of this document.

If the device is using IMS for SMS over IMS only and the network rejects any SUBSCRIBE or MESSAGE SIP request from the device with SIP 503 and includes the following text in the Reason-Phrase (on the Status-Line):

- 503 Service Unavailable: IMS Core Outage

the device shall locally terminate all active SIP dialogs and requests, enter IMS non-registered state, and attempt a new IMS registration. All IMS registration and registration retry requirements in this document shall apply.

NOTE: The device shall NOT treat the reason-phrase in this scenario as case sensitive.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.6.10 SIP 481 IN RESPONSE TO A RE-REGISTRATION REQUEST

VZ_REQ_LTEB13NAC_36127

3.2.10.6.10.1 VZ_REQ_LTEB13NAC_36128

If the network rejects an IMS re-registration request with a SIP 481 cause code, the device shall locally terminate the current IMS registration (including all active SIP dialogs and SIP requests), enter IMS non-registered state, and initiate a new IMS registration request.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.7 IMS REGISTRATION ON SYSTEM TRANSITIONS VZ_REQ_LTEB13NAC_23537

3.2.10.7.1 VZ_REQ_LTEB13NAC_6458

If the device has successfully IMS registered and either a) transitions to another system and successfully performs a tracking area update or "handover" attach (i.e. the "Request Type" information element in the PDN CONNECTIVITY REQUEST message sent as part of the attach procedure is set to "**Handover**"), or b) transitions to "no service" and back to any system and successfully performs a tracking area update or "handover" attach (i.e. the "Request Type" information element in the PDN CONNECTIVITY REQUEST message sent as part of the attach procedure is set to "**Handover**"), the device shall maintain the IMS registration as follows.

The device shall retain the previous IMS registration context including the P-CSCF IP address until either 1) the registration timer for this context expires, or 2) the device sends a de-registration request for this context, or 3) the device successfully re-registers, or 4) the device successfully performs a new registration.

If the following criteria are all met, then the device shall not send a new registration as the result of a system transition (including a transition to another RAT within the same PLMN), i.e. the device shall use the previous established IMS registration context and route all IMS communications using the original P-CSCF:

- IP address continuity is maintained.
- The IMS registration timer has not expired.
- The original P-CSCF IP address is one of the P-CSCF IP addresses provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

If one or more of the criteria above is not met, then the device shall send a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

If the device is using IMS for SMS over IMS only and all the criteria above are all met and the re-registration is not due, then the device shall not send a re-registration request as the result of a system transition, i.e. the device shall use the previous established IMS registration context and route all IMS communications using the original P-CSCF. If the device is using IMS for SMS over IMS only and all the criteria above are all met and the re-registration is due, then the device shall send a re-registration request to the using the original P-CSCF.

For all system transitions where the device successfully performs an "initial" attach (i.e. the "Request Type" information element in the PDN CONNECTIVITY REQUEST message (sent as part of the attach procedure) is set to **"Initial Request"**), the device shall send a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

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3.2.10.7.2 VZ_REQ_LTEB13NAC_6459

Example 1:

- The UE is turned on.
- The UE successfully performs an "initial" attach to system A.
- The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 2:

- UE transitions from system A to system B, and successfully performs either a tracking area update with system B or a "handover" attach to system B.
- All the criteria below are met and the re-registration is not due. The UE does not perform a re-registration and uses the previous established IMS registration context and routes all IMS communications using the original P-CSCF.
 - IP address continuity is maintained.
 - The IMS registration timer has not expired.
 - The device is using IMS for SMS over IMS only.
 - The original P-CSCF IP address is one of the P-CSCF IP addresses provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 2a:

- UE transitions from system A to system B, and successfully performs a "handover" attach to system B.
- The original P-CSCF IP address is one of the P-CSCF IP addresses provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation), but IP address continuity is NOT maintained.
- The UE performs a new registration using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 2b:

- UE transitions from system A to system B, and successfully performs a "handover" attach to system B.
- The original P-CSCF IP address is NOT one of the P-CSCF IP addresses provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).
- The UE performs a new registration using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 3:

- UE transitions from system A to system B, and successfully performs either a tracking area update with system B or a "handover" attach to system B.
- All the criteria below are met and the re-registration is due. The UE sends a re-registration request using the original P-CSCF.
 - IP address continuity is maintained.
 - The IMS registration timer has not expired.
 - The device is using IMS for SMS over IMS only.
 - The original P-CSCF IP address is one of the P-CSCF IP addresses provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 4:

- UE transitions from system A to no service and back to system A.
- The UE successfully performs a tracking area update with system A.
- All the criteria below are met and the re-registration is not due. The UE does not perform a re-registration and uses the previous established IMS registration context and routes all IMS communications using the original P-CSCF.
 - IP address continuity is maintained.
 - The IMS registration timer has not expired.
 - The device is using IMS for SMS over IMS only.

Example 5:

- UE transitions from system A to system B, and a "handover" attach to system B is rejected with EMM

#19 piggybacked with ESM #54 (in the PDN connection reject).

- The UE then successfully performs an "initial" attach to system B.
- The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 6:

- Network detaches the UE from system A.
- The UE then successfully performs an "initial" attach to system A.
- The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 7:

- The UE initiates a detach from system A (per Verizon Wireless requirements, prior to sending the NAS DEATCH REQUEST message, the UE terminates the subscription to the registration events package by sending a Subscribe message with expires= 0, followed by an IMS de-registration request message).
- The UE then successfully performs an "initial" attach to system A.
- The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

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3.2.10.8 IMS REGISTRATION DUE TO NEW IMS PDN BEARER ACTIVATION

VZ_REQ_LTEB13NAC_23538

3.2.10.8.1 VZ_REQ_LTEB13NAC_6460

If while attached to the network the device is required to send a new PDN connection request to re-establish the IMS PDN connection (e.g. network initiates disconnect of the IMS PDN), upon successful re-establishment of the IMS PDN connection, the device shall send a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 8:

- Network disconnects the IMS PDN.
- The UE then successfully performs a PDN connection request to re-establish the IMS PDN connection.
- The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network

in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 9:

- The UE initiates a disconnection of the IMS PDN (per Verizon Wireless requirements, prior to sending the NAS PDN DISCONNECT REQUEST message, the UE terminates the subscription to the registration events package by sending a Subscribe message with expires= 0, followed by an IMS de-registration request message).
- The UE then successfully performs a PDN connection request to re-establish the IMS PDN connection.
- The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.9 IMS REGISTRATION AFTER UICC REFRESH OR UICC INSERTION

VZ_REQ_LTEB13NAC_23539

3.2.10.9.1 VZ_REQ_LTEB13NAC_6483

If the device detached from an LTE network and then successfully re-attached to an LTE network as the result of receiving a UICC REFRESH type 0 command, the device shall send a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

If no UICC was present in the device or the device detached from an LTE network as the result of removal of the UICC, upon successful attach to an LTE network after insertion of a UICC the device shall send a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 10:

- The UICC issues a REFRESH type 0 command to the device triggering a detach from system A (per Verizon Wireless requirements, prior to sending the NAS DEATCH REQUEST message, the UE terminates the subscription to the registration events package by sending a Subscribe message with expires= 0, followed by an IMS de-registration request message).
- The UE then successfully performs an "initial" attach to system A using all updated USIM parameters.
- The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation) using all updated USIM/ISIM parameters.

Example 11:

- No UICC is present in the device on power up.
- UICC is inserted into the device.
- UE is power cycled.
- The UE then successfully performs an "initial" attach to system A.
- The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 12:

- UICC is removed from the device triggering a detach from system A (per Verizon Wireless requirements, prior to sending the NAS DETACH REQUEST message, the UE terminates the subscription to the registration events package by sending a Subscribe message with expires= 0, followed by an IMS de-registration request message).
- UICC is inserted into the device.
- The UE then successfully performs an "initial" attach to system A.

The UE sends a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

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3.2.10.10 P-CSCF RESTORATION PROCEDURES **VZ_REQ_LTEB13NAC_33801**

3.2.10.10.1 **VZ_REQ_LTEB13NAC_33802**

If the device receives a MODIFY EPS BEARER CONTEXT REQUEST message for the IMS PDN default bearer and the PCO of the MODIFY EPS BEARER CONTEXT REQUEST message contains a new list of P-CSCF IP addresses where either or both of the following is true:

- The new list contains one or more P-CSCF IP address entries that are different from the current list of P-CSCF IP addresses.
- The new list contains one or more of the P-CSCF IP address entries in the current list of P-CSCF IP addresses, but the order of the P-CSCF IP addresses has changed.

The device shall replace the current list of P-CSCF IP addresses with the new list of P-CSCF IP addresses. IMS registration retry procedures shall use the new list of P-CSCF IP addresses in the order provided by the network.

If the device is IMS registered and the current P-CSCF IP address is NOT an entry in the new P-CSCF IP address list, the device shall locally terminate the current IMS registration, enter IMS non-registered state, and immediately send a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the MODIFY EPS BEARER REQUEST message. If the IMS registration request fails, the device shall follow the IMS registration retry requirements in this document using the new P-CSCF IP address list.

If the device is IMS registered and the current P-CSCF IP address is an entry in the new P-CSCF IP address list, the device shall immediately send an IMS re-registration request to the current P-CSCF. If the re-registration request fails, the device shall follow the IMS registration retry requirements in this document using the new P-CSCF IP address list.

NOTE 1: If the device receives a MODIFY EPS BEARER CONTEXT REQUEST message for the IMS PDN default bearer and the PCO of the MODIFY EPS BEARER CONTEXT REQUEST message indicates the P-CSCF IPv6 address container is present but the container is either empty or contains an invalid IP address (e.g. all 0's), the device shall disregard the P-CSCF IPv6 address container entirely and maintain the current IMS registration and the current set of P-CSCF IPv6 addresses. The device shall make no change in IMS registration status.

NOTE 2: If the device transitions from one system to another system and receives an ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN and the current P-CSCF IP address is NOT an entry in the new P-CSCF IP address list, then the VZ_REQ_LTEB13NAC_6458 shall take precedence and the device shall initiate a new IMS registration request using the first P-CSCF IP address provided by the network in the PCO field of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN (in the new IMS PDN bearer activation).

Example 13:

- The device receives P-CSCF IP addresses A, B, and C (in this order) in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN.
- The device successfully IMS registers with P-CSCF A.
- The device receives a MODIFY EPS BEARER CONTEXT REQUEST message for the IMS PDN default bearer and the PCO contains P-CSCF IP addresses A, B, and C (in that order).
- The device immediately attempts an IMS re-registration with P-CSCF A.

Example 14:

- The device receives P-CSCF IP addresses A, C, and B (in this order) in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN.
- The device successfully IMS registers with P-CSCF A.
- The device receives a MODIFY EPS BEARER CONTEXT REQUEST message for the IMS PDN default bearer and the PCO contains P-CSCF IP addresses A, B, and C (in that order).
- The device immediately attempts an IMS re-registration with P-CSCF A.
- Both re-registration attempts to P-CSCF A fail.
- The device attempts a new initial IMS registration with P-CSCF B at the next registration retry attempt

(i.e. the device uses the new order for IMS registration retry).

Example 15:

- The device receives P-CSCF IP addresses A, C, and B (in this order) in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN.
- The device successfully IMS registers with P-CSCF A.
- The device receives a MODIFY EPS BEARER CONTEXT REQUEST message for the IMS PDN default bearer and the PCO contains P-CSCF IP addresses E, F, and A (in that order).
- The device immediately attempts an IMS re-registration with P-CSCF A.
- Both re-registration attempts to P-CSCF A fail.
- The device attempts a new initial IMS registration with P-CSCF E at the next registration retry attempt (i.e. the device uses the new list and order for IMS registration retry).

Example 16:

- The device receives P-CSCF IP addresses A, C, and B (in this order) in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN.
- The device successfully IMS registers with P-CSCF A.
- The device receives a MODIFY EPS BEARER CONTEXT REQUEST message for the IMS PDN default bearer and the PCO contains P-CSCF IP addresses D, E, and F (in that order).
- The device immediately attempts a new initial IMS registration with P-CSCF D (i.e. the device uses the new list and order for IMS registration retry).

Example 17:

- The device receives P-CSCF IP addresses A, C, and B (in this order) in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the IMS PDN.
- The device successfully IMS registers with P-CSCF A.
- The device receives a MODIFY EPS BEARER CONTEXT REQUEST message for the IMS PDN default bearer and the PCO contains P-CSCF IP addresses D, E, and F (in that order).
- The device immediately attempts a new initial IMS registration with P-CSCF D and this registration attempt fails.
- The device attempts a new initial IMS registration with P-CSCF E at the next registration retry attempt (i.e. the device uses the new list and order for IMS registration retry).

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.11 SUBSCRIPTION TO THE REG EVENTS PACKAGE FAILURES

VZ_REQ_LTEB13NAC_36123

3.2.10.11.1 RETRY ALGORITHM FOR THE SUBSCRIPTION TO THE REG EVENTS PACKAGE VZ_REQ_LTEB13NAC_36971

3.2.10.11.1.1 VZ_REQ_LTEB13NAC_36124

The device shall implement a retry algorithm for the subscription to the reg events package based on the Failure Type as described in the table below.

NOTE: This retry behavior ONLY applies to SUBSCRIBE requests for the reg events package.

Failure Type	Retry Behavior
No response from network to the SUBSCRIBE and the SIP timeout timer (i.e. SIP Timer F) expires NOTE: This does NOT apply to the re-SUBSCRIBE case.	Follow algorithm below.
Network rejects the SUBSCRIBE request (for the reg events package) with the following SIP error codes: 400, 403, 404, 420 NOTE: This does NOT apply to the re-SUBSCRIBE case.	Refer to the special requirement for these error codes.
Network rejects the SUBSCRIBE request (for the reg events package) with the following SIP error codes: 482 487 500 (if Retry-After header is absent) NOTE: This does NOT apply to the re-SUBSCRIBE case.	Follow algorithm below.
Network rejects the SUBSCRIBE request (for the reg events package) with the following SIP error codes: 500 (if Retry-After header is present) NOTE: This does NOT apply to the re-SUBSCRIBE case.	Follow the algorithm below with the following exception: The throttling timer value shall be set to the duration specified in the Retry-After header.
re-SUBSCRIBE failure	Refer to the special requirement.

Definition of the general retry algorithm for the subscription to the reg events package is provided below (note that as defined in the above table, some scenarios with specific SIP error codes have special requirements and these are defined in the subsequent sections):

1. The first time a SUBSCRIBE attempt for the reg events package fails, the IMS application shall increment a "throttling counter" to 1 and start a "throttling timer". The length of the timer shall be 30 seconds. The IMS application shall not make another SUBSCRIBE attempt for the reg events package while the throttling timer is running. There is no impact to the IMS registration status.
2. Upon the expiration of the throttling timer, the IMS application shall make another SUBSCRIBE attempt for the reg events package. If the SUBSCRIBE attempt for the reg events package is successful, the throttling counter shall be cleared. If the SUBSCRIBE attempt for the reg events package fails, the IMS application shall increment the throttling counter to 2 and start the throttling timer. The length of the timer shall be 30 seconds. The IMS application shall not make another SUBSCRIBE attempt for the reg events package while the throttling timer is running. There is no impact to the IMS registration status.
3. Upon the expiration of the throttling timer, the IMS application shall make another SUBSCRIBE attempt for the reg events package. If the SUBSCRIBE attempt for the reg events package is successful, the throttling counter shall be cleared. If the SUBSCRIBE attempt for the reg events package fails, the IMS application shall increment the throttling counter to 3 and start the throttling timer. This time, the length of the timer shall be one minute plus a random value; the random value shall have an upper bound of 15 seconds. The IMS application shall not make another SUBSCRIBE attempt for the reg events package while the throttling timer is running. There is no impact to the IMS registration status.
4. Upon the expiration of the throttling timer, the IMS application shall make another SUBSCRIBE attempt for the reg events package. If the SUBSCRIBE attempt for the reg events package is successful, the throttling counter shall be cleared. If the SUBSCRIBE attempt for the reg events package fails, the IMS application shall increment the throttling counter to 4 and start the throttling timer. This time, the length of the timer shall be two minutes. The IMS application shall not make another SUBSCRIBE attempt for the reg events package while the throttling timer is running. There is no impact to the IMS registration status.
5. Upon the expiration of the throttling timer, the IMS application shall make another SUBSCRIBE attempt for the reg events package. If the SUBSCRIBE attempt for the reg events package is successful, the throttling counter shall be cleared. If the SUBSCRIBE attempt for the reg events package fails, the IMS application shall increment the throttling counter to 5 and start the throttling timer. This time, the length of the timer shall be eight minutes. The IMS application shall not make another SUBSCRIBE attempt for the reg events package while the throttling timer is running. There is no impact to the IMS registration status.
6. Upon the expiration of the throttling timer, the IMS application shall make another SUBSCRIBE attempt for the reg events package. If the SUBSCRIBE attempt for the reg events package is successful, the throttling counter shall be cleared. If the SUBSCRIBE attempt for the reg events package fails, the IMS application shall increment the throttling counter to 6 and start the throttling timer. This time, the length of the timer shall be fifteen minutes. The IMS application shall not make another SUBSCRIBE attempt for the reg events package while the throttling timer is running. All subsequent SUBSCRIBE failures for the reg events package on this system that occur while the throttling counter is set to a value of 6 or greater shall result in a fifteen minute

throttling timer. i.e. from this point on, there shall not be more than one attempt of a SUBSCRIBE for the reg events package on this system per fifteen minutes. There is no impact to the IMS registration status.

The device shall only reset the throttling counter and throttling timer for the algorithm above after one of the following events has occurred:

The device has successfully subscribed to the reg events package.

The device has established a new IMS registration (as opposed to an IMS re-registration).

Power cycle.

USIM/ISIM replacement/refresh.

The device shall maintain only one set of IMS subscription to the reg events package throttling parameters (e.g. timers and counters). This set of throttling parameters shall apply to all systems. The device shall not reset these throttling parameters as the result of a system transition.

For example: consider the case in which the current system is system "A" and the IMS subscription to the reg events package throttling counter is set to a value of 6 and a fifteen minute throttling timer is running. The device transitions to system "B". The IMS subscription to the reg events package throttling counter will still be 6 and the 15 minute throttling timer will still be running. The device does not retry the subscription to the reg events package until the throttling timer expires.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.11.2 NETWORK REJECTS THE SUBSCRIBE REQUEST WITH A SIP 400, 403, 404, OR 420 CAUSE CODE VZ_REQ_LTEB13NAC_36972

3.2.10.11.2.1 VZ_REQ_LTEB13NAC_36125

If the network rejects the SUBSCRIBE attempt for the reg events package with either of the following cause codes:

- SIP 400
- SIP 403
- SIP 404
- SIP 420

the device shall follow the algorithm defined in section *Retry Algorithm for the Subscription to the Reg Events Package* of this document. If the device encounters another rejection of a SUBSCRIBE attempt for the reg events package before the throttling counter is reset where the SUBSCRIBE attempt for the reg events package is rejected by the network with either of the following cause codes:

- SIP 400



- SIP 403
- SIP 404
- SIP 420

then the device shall not make any further SUBSCRIBE attempts for the reg events package until one of the following events has occurred:

The device has established a new IMS registration (as opposed to an IMS re-registration).

Power cycle.

USIM/ISIM replacement/refresh.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.10.11.3 NETWORK REJECTS A re-SUBSCRIBE REQUEST **VZ_REQ_LTEB13NAC_36973**

3.2.10.11.3.1 **VZ_REQ_LTEB13NAC_36126**

If the network rejects a re-SUBSCRIBE attempt for the reg events package with a SIP 481 cause code, the device shall locally terminate the current subscription to the reg events package and initiate a new subscription request for the reg events package.

If the network rejects a re-SUBSCRIBE attempt for the reg events package with any cause code other than SIP 481, the device shall maintain the current subscription to the reg events package until it expires (i.e. the device shall not send any further re-SUBSCRIBE attempts). Upon expiration of the current subscription to the reg events package, the device shall initiate a new subscription request for the reg events package.

If the network ignores a re-SUBSCRIBE attempt for the reg events package (and TimerF expires), the device shall wait 30 seconds and then send a second re-SUBSCRIBE attempt for the reg events package. If the second re-SUBSCRIBE attempt for the reg events package is ignored by the network (and TimerF expires), the device shall maintain the current subscription to the reg events package until it expires (i.e. the device shall not send any further re-SUBSCRIBE attempts). Upon expiration of the current subscription to the reg events package, the device shall initiate a new subscription request for the reg events package.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.11 SYSTEM TIME AND LOCAL TIME **VZ_REQ_LTEB13NAC_23540**

3.2.11.1 VZ_REQ_LTEB13NAC_6339

For system time and local time, the device shall support:

- SIB16 per the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*, including all optional informational elements in SIB16.
- The EMM information procedure and all optional informational elements within the EMM INFORMATION message.

The device shall update the local time based on the contents of SIB16 if SIB16 is broadcast by the LTE network and SIB16 contains all the optional IE's needed to compute local time (i.e. **dayLightSavingIndicator** and **localTimeOffset**). If SIB16 is not broadcast by the network or optional SIB16 IE's needed to compute local time are not present, the device shall update local time based on the contents of the EMM INFORMATION message. Refer to 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)* and 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.12 CIPHERING AND INTEGRITY PROTECTION VZ_REQ_LTEB13NAC_23541

3.2.12.1 VZ_REQ_LTEB13NAC_6340

The device shall support ciphering of RRC signaling, NAS signaling, and user plane data. The device shall also support integrity protection of the RRC signaling and the NAS signaling messages. The device shall support both the SNOW 3G based algorithm and the AES based algorithm for ciphering and integrity protection. Refer to 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, 3GPP TS 33.401: *3GPP System Architecture Evolution (SAE); Security architecture*, 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, and 3GPP TS 36.323: *Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.13 OTADM VZ_REQ_LTEB13NAC_23542

The device shall support over-the-air device management (OTADM) as specified in the Verizon Wireless LTE OTADM Device Requirements. Compliance to LTE OTADM requirements shall be per the Verizon Wireless LTE OTADM Test Plan.

3.2.14 UE MODE OF OPERATION VZ_REQ_LTEB13NAC_23543

VOID

3.2.15 PRIMARY AND SECONDARY SYNCHRONIZATION SIGNAL RECEPTION

VZ_REQ_LTEB13NAC_23544

3.2.15.1 VZ_REQ_LTEB13NAC_6342

The device shall be capable of receiving and decoding the primary and secondary synchronization signals when transmitted by the eNB on antenna port 0, antenna port 1, or both antenna ports 0 and 1. Specifically, the device shall be capable of receiving and decoding the primary and secondary synchronization signals for all three of the eNB transmission scenarios described below:

- The eNB transmits the primary and secondary synchronization signals on antenna port 0 only.
- The eNB transmits the primary and secondary synchronization signals on antenna port 1 only.
- The eNB transmits the primary and secondary synchronization signals on both antenna port 0 and antenna port 1 with precoding.

Primary and secondary synchronization signals are per 3GPP TS 36.211: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.16 CMAS SUPPORT VZ_REQ_LTEB13NAC_23545

3.2.16.1 INDICATION OF CMAS NOTIFICATION VZ_REQ_LTEB13NAC_23548

3.2.16.1.1 VZ_REQ_LTEB13NAC_6343

The device shall be able to receive CMAS messages over LTE per the procedures defined in 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*. Devices in RRC_IDLE and RRC_CONNECTED state shall find out about the presence of one or more CMAS notifications from the *Paging* message (refer to the specification "Reception of the Paging message by the UE" in section 5.3.2.3 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)*). If the device receives a *Paging* message including the *cmas-Indication*, the device shall start receiving the CMAS

notifications according to the *schedulingInfoList* contained in the *SystemInformationBlockType1* (SIB1).

Device shall perform System Information Acquisition procedures as defined in section 5.2.2.4 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)* to acquire the *SystemInformationBlockType12* (SIB12), that contains CMAS notifications, when present.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.16.2 WARNING MESSAGE PROCESSING **VZ_REQ_LTEB13NAC_23549**

3.2.16.2.1 **VZ_REQ_LTEB13NAC_6344**

Following reception of the *SystemInformationBlockType12* (SIB12), the device shall perform the procedures per the specification "Actions upon reception of *SystemInformationBlockType12*" defined in section 5.2.2.19 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)* to process the Warning message information received and forward it to the upper layers. Segmentation can be applied for the delivery of a CMAS notification. The device shall assemble all the segments of the message before forwarding it to the upper layers. Segments of the same message shall contain the same *messageIdentifier*, *serialNumber* and *warningMessageSegmentNumber*).

The device shall discard warning message segments and the associated values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* (SIB12) if the complete warning message has not been assembled within a period of [3] hours.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.16.3 SYSTEMINFORMATIONBLOCKTYPE12 INFORMATION ELEMENT

VZ_REQ_LTEB13NAC_23550

3.2.16.3.1 **VZ_REQ_LTEB13NAC_6345**

The information element *SystemInformationBlockType12* (SIB12) contains a CMAS notification with following fields:

- *messageIdentifier* identifying source and type of CMAS notification (refer to the section 9.4.1.2.2 of 3GPP TS 23.041: *Technical realization of Cell Broadcast Service (CBS)*)
- *serialNumber* identifying variations of a CMAS notification (refer to the section 9.4.1.2.1 of 3GPP TS 23.041: *Technical realization of Cell Broadcast Service (CBS)*)
- *warningMessageSegmentType* indicating whether the current segment is the last segment or not
- *warningMessageSegmentNumber* indicating segment number of the CMAS message contained in the SIB12 (0-63, first segment will have segment number of zero, etc)
- *warningMessageSegment* that carries a segment of the *Warning Message Contents* information element

defined in 3GPP TS 36.413: *Evolved Universal Terrestrial Radio Access Network (E-UTRAN); SI Application Protocol (SIAP)*

- *dataCodingScheme* identifying alphabet/encoding/language of a CMAS notification. Refer to the 3GPP TS 23.041: *Technical realization of Cell Broadcast Service (CBS)* for information element definition and 3GPP TS 23.038: *Alphabets and language-specific information* for encoding details.

In addition, the *Segment1* field shall be present in the first segment of SIB12 only.

Refer to the section 6.3.1 ("System Information Blocks") of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.16.4 DEVICE BEHAVIOR VZ_REQ_LTEB13NAC_23551

3.2.16.4.1 VZ_REQ_LTEB13NAC_6346

Refer to the ATIS-TIA-J-STD-100 Joint ATIS/TIA CMAS Mobile Device Behavior Specification for a common set of requirements for mobile device behavior when a CMAS alert message is received and processed.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.17 SCHEDULING REQUESTS OVER PRACH VZ_REQ_LTEB13NAC_23546

3.2.17.1 VZ_REQ_LTEB13NAC_6418

The device shall be capable of supporting scheduling requests over the PRACH as per 3GPP TS 36.321: *Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.18 LTE FEMTOCELL SUPPORT VZ_REQ_LTEB13NAC_23547

3.2.18.1 VZ_REQ_LTEB13NAC_6472

The device shall be capable of supporting open, closed, and hybrid mode femtocells. Refer to 3GPP TS 22.220: *Service requirements for Home Node B (HNB) and Home eNode B (HeNB)*, 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN)*;

Overall description; Stage 2, 3GPP TS 36.331: Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC), and 3GPP TS 36.133: Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.19 MAC PADDING VZ_REQ_LTEB13NAC_36842

3.2.19.1 VZ_REQ_LTEB13NAC_36843

When applying MAC padding (as defined in 3GPP TS 36.321: *Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification*), the device shall use pseudo-random data in the form of a PN31 sequence for the contents of the MAC padding bits.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.20 LTE feICIC (Further Enhanced Inter-Cell Interference Cancellation)

VZ_REQ_LTEB13NAC_36948

NOTE: Although Verizon only requires feICIC performance of 9dB cell identification bias on the target cell that is being interfered, eICIC Almost Blank Subframe defined in Release 10 is part of feICIC and shall be supported.

Applicable scenarios:

- Heterogeneous network that has both small/pico cells and macro cells deployed
 - feICIC is used to extend the small cell range (referred to as Cell Range Extension) such that a small cell within a macro cell can share the load of the macro cell
 - ABS subframes are used such that the small cells experience less interference from neighbor macro cells PDSCH and other non-essential content
 - CRS IC, SS IC and PBCH IC further extend the small cell range by interference cancellation on common channels
- Macro homogeneous network & Heterogeneous network
 - CRS IC is used in macro network in non-ABS scenario
 - Improve PDCCH and PDSCH performance in non-colliding CRS case (user throughput)
 - Improve RSRP accuracy and channel estimation in colliding CRS case (improved CRS SINR and as a result better performance on PBCH and PSS/SSS)

3.2.20.1 LTE eICIC Support **VZ_REQ_LTEB13NAC_36949**

3.2.20.1.1 Time-Domain Resource Partitioning **VZ_REQ_LTEB13NAC_36955**

3.2.20.1.1.1 **VZ_REQ_LTEB13NAC_36950**

The device shall support all three kinds of measurement resource restriction patterns that may be configured for the UE as specified in section 16.1.5.1 of 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.20.1.1.2 **VZ_REQ_LTEB13NAC_36951**

The device shall support RRC Feature Group Indicator (FGI) index 115 for eICIC per Annex C, Table C.1-1 of the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.20.1.1.3 **VZ_REQ_LTEB13NAC_36952**

The device shall support and apply the measurement subframe pattern of the serving and neighbor cells for RRM (Radio Resource Management)/RLM (Radio Link Monitoring)/CSI (Channel State Indication) measurements when resource restriction in time domain is signaled for inter-cell interference cancellation per sections 5.3.5.6, 5.3.7.2, 5.3.10.0, 5.3.10.8, 5.3.11.3, 5.5.2.5, 5.5.3.1, 6.3.2, 6.3.5, 6.3.6 of the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.20.1.1.4 **VZ_REQ_LTEB13NAC_36953**

The device shall support the RLM (Radio Link Monitoring) procedure with restricted measurement per sections 4.2.1 of the release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.20.1.1.5 VZ_REQ_LTEB13NAC_36954

The device shall support RSRQ measurement with restricted resource measurement per sections 5.1.3 of the release 11 version of 3GPP TS 36.214: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer; Measurements*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.20.2 LTE feICIC Support VZ_REQ_LTEB13NAC_36956

3.2.20.2.1 VZ_REQ_LTEB13NAC_36957

The device shall support (including reporting its capability in *crs-InterfHandl-r11* and *ss-CCH-InterfHandl-r11* defined in section 4.3.4.15 and 4.3.4.20 of the release 11 version of 3GPP TS 36.306: *Evolved Universal Terrestrial Radio Access (E-UTRA); UE Radio Access Capabilities*) and apply neighbor CRS assistance information for CRS interference cancellation per sections, 6.3.2, 6.3.6 of the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.20.2.2 Synchronization and Common Channel Interference Management

VZ_REQ_LTEB13NAC_36958

3.2.20.2.2.1 VZ_REQ_LTEB13NAC_36959

The device shall support *SystemInformationBlockType1* (SIB1) acquisition in dedicated RRC signaling in range extended cells per section 5.2.2.7, 5.3.5.3 of the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.20.2.2.2 VZ_REQ_LTEB13NAC_36960

The device shall support (including reporting its capability) for synchronization and common channel interference cancellation per section 6.3.6 of the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.



Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.21 FREQUENCY HOPPING VZ_REQ_LTEB13NAC_37713

3.2.21.1 VZ_REQ_LTEB13NAC_37714

Per the 3GPP standard, the device shall support predefined, inter-TTI frequency hopping for PUSCH with $N_{sb}=1$. Refer to 3GPP TS 36.211: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.22 LTE CoMP (Coordinated Multi-Point) VZ_REQ_LTEB13NAC_37806

NOTE: Although specifications of DL CoMP are introduced in 3GPP Release 11, Release 10 specifications of Transmission Mode 9 provide some fundamental building blocks for DL CoMP. Verizon requires devices shall support both Release 10 Transmission Mode 9 and Release 11 Transmission mode 10 per the functional requirements in this section, and meet the respective performance requirements in VZ_REQ_LTEB13NAC_37816 and VZ_REQ_LTEB13NAC_37817.

3.2.22.1 Transmission Mode 9 (TM9) VZ_REQ_LTEB13NAC_37807

3.2.22.1.1 VZ_REQ_LTEB13NAC_37808

The device shall support transmission mode 9 per the 3GPP Release 10 Specifications.

When configured in transmission mode 9, the device shall support UE-specific reference signals and associated PDSCH with up to 4 transmission layers, per sections 6.10.3, 6.3, 6.4 of the Release 10 version of 3GPP TS 36.211: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation*.

When configured in transmission mode 9, the device shall support DCI format 2C, per section 5.3.3.1.5C of the Release 10 version of 3GPP TS 36.212: *Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding*.

When configured in transmission mode 9, the device shall support PDSCH transmission in MBSFN subframes, per section 7.1 of the Release 10 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-*



UTRA); Physical Layer Procedures.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.22.1.2 VZ_REQ_LTEB13NAC_37809

When configured in transmission mode 9, the device shall support CSI (Channel State Information) reference signals with up to 4 CSI-RS antenna ports, per section 6.10.5 of the Release 10 version of 3GPP TS 36.211: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation*. The device shall support one non-zero-power CSI-RS configuration per serving cell.

When configured in transmission mode 9, the device shall support CSI-RS based CSI measurements and reporting, per section 7.2 of the Release 10 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.22.1.3 VZ_REQ_LTEB13NAC_37810

The device shall support PDSCH transmission mode 9 with up to 4 CSI-RS antenna ports. The device shall set Feature Group Indicator (FGI) index 103 to 1 in field *featureGroupIndRel10* of *UECapabilityInformation* message, per Annex C, Table C.1-1, of the Release 10 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

The device shall support

- setting of *tm9-v1020* for field *transmissionMode-r10* of *AntennaInfoDedicated-r10* information element,
- *CSI-RS-Config-r10* information element with *antennaPortsCount-r10* set in the range of {*an1*, *an2*, *an4*},

as included in *PhysicalConfigDedicated* and/or *PhysicalConfigDedicatedSCell-r10* information element, and support the physical channel configuration and reconfiguration procedures, per sections 6.3.2, 5.3.3.4, 5.3.5.3, 5.3.5.4, 5.3.5.6, 5.3.7.5, 5.3.10.3b, 5.3.10.6, 5.4.3.5 of the Release 10 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.22.2 Transmission Mode 10 (TM10) VZ_REQ_LTEB13NAC_37811

3.2.22.2.1 VZ_REQ_LTEB13NAC_37812

The device shall support transmission mode 10 per the 3GPP Release 11 Specifications.

When configured in transmission mode 10, the device shall support UE-specific reference signals and associated PDSCH with up to 4 transmission layers, per sections 6.10.3, 6.3, 6.4 of the Release 11 version of 3GPP TS 36.211: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation*.

When configured in transmission mode 10, the device shall support DCI format 2D, per section 5.3.3.1.5D of the Release 11 version of 3GPP TS 36.212: *Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding*.

When configured in transmission mode 10, the device shall support PDSCH transmission in MBSFN subframes, per section 7.1 of the Release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

When configured in transmission mode 10, the device shall support Type A and Type B quasi co-location types, per section 7.1.10 of the Release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

When configured in transmission mode 10, the device shall support 4 parameter sets per serving cell associated with 'PDSCH RE Mapping and Quasi-Co-Location indicator' field in DCI format 2D to determine PDSCH RE mapping and PDSCH antenna port quasi co-location, per section 7.1.9 of the Release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.22.2.2 VZ_REQ_LTEB13NAC_37813

When configured in transmission mode 10, the device shall support CSI reference signals with up to 4 CSI-RS antenna ports, per section 6.10.5 of the Release 11 version of 3GPP TS 36.211: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation*. The device shall support 3 non-zero power CSI-RS configurations and 4 zero-power CSI-RS configurations per serving cell.

When configured in transmission mode 10 and configured with multiple CSI processes, the device shall support 2-bit CSI request field in UL grants, per section 5.3.3.1 of the Release 11 version of 3GPP TS 36.212: *Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding*.

When configured in transmission mode 10, the device shall support 4 CSI processes per serving cell, and the measurements and reporting for each CSI process, per section 7.2 of the Release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*, and sections 5.2.2.6 and 5.2.3.3 of the Release 11 version of 3GPP TS 36.212: *Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding*. The device shall support RI-reference CSI process.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.22.2.3 VZ_REQ_LTEB13NAC_37814

The device shall indicate *supportedCSI-Proc-r11* per band per band combination in *UE-EUTRA-Capability* information element, per section 4.3.5.5 of the Release 11 version of 3GPP TS 36.306: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities*, and sections 6.3.6, 5.6.3.3 of the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

The device shall support

- setting of *tm10-v1130* for field *transmissionMode-r10* in *AntennaInfoDedicated-r10* information element,
- *PDSCH-ConfigDedicated-v1130* information element,
- *CSI-RS-ConfigNZP-r11* information element with *antennaPortsCount-r11* set in the range of {*an1*, *an2*, *an4*}, and *CSI-RS-ConfigZP-r11* information element,
- *CQI-ReportConfig-v1130* information element,

as included in *PhysicalConfigDedicated* and/or *PhysicalConfigDedicatedSCell-r10* information element, and support the physical channel configuration and reconfiguration procedures, per sections 6.3.2, 5.3.3.4, 5.3.5.3, 5.3.5.4, 5.3.5.6, 5.3.7.5, 5.3.10.3b, 5.3.10.6, 5.4.3.5 of the Release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.23 ePDCCH VZ_REQ_LTEB13NAC_38375

3.2.23.1 VZ_REQ_LTEB13NAC_38376

The device shall support receiving enhanced physical downlink control channel (EPDCCH) and associated demodulation reference signals, per sections 6.8A, 6.2.4A, 6.10.3A of the release 11 version of 3GPP TS 36.211: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation*.

When configured with EPDCCH monitoring, the device shall monitor PDCCH and EPDCCH per the procedure in sections 9.1.1, 9.1.4 of the release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*. The device shall support number of EPDCCH-PRB-sets in the range of {1, 2}, with number of PRB-pairs in the range of {2, 4, 8} for each EPDCCH-PRB-set. The device shall support both localized and distributed transmission type, as independently configured for each EPDCCH-PRB-set. The device shall support ECCE aggregation level in the range of {1, 2, 4, 8, 16, 32}, and monitor the EPDCCH candidates as specified in aforementioned standard sections.

When configured with EPDCCH monitoring, the device shall derive the PDSCH starting position and EPDCCH starting position per sections 7.1.6.4, 9.1.4.1 of the release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

When configured in PDSCH transmission mode 10, and if configured to monitor EPDCCH, the device shall use the parameter set indicated by the higher layer parameter *re-MappingQCL-ConfigId-r11* to determine the EPDCCH RE mapping and EPDCCH antenna port quasi co-location for each EPDCCH-PRB-set, per sections 9.1.4.3, 9.1.4.2 of the release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

When configured in PDSCH transmission mode 9 or 10, and if configured to monitor EPDCCH, the device shall monitor EPDCCH in the MBSFN subframes except those indicated by higher layers to decode PMCH, per section 9.1.4 of the release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

The device shall support HARQ-ACK resource offset (ARO) field in DCI format 1/1A/1B/1D/2/2A/2B/2C/2D when the DCI is carried by EPDCCH, per section 5.3.3.1 of the release 11 version of 3GPP TS 36.212: *Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding*. When a PDSCH transmission is assigned by EPDCCH, the device shall derive the PUCCH resource offset for HARQ-ACK per section 10.1.2 of the release 11 version of 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

The device shall indicate the support of EPDCCH via *ePDCCH-r11* field in *UE-EUTRA-Capability* information element, per section 4.3.4.18 of the release 11 version of 3GPP TS 36.306: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities*, and section 6.3.6 of the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

The device shall support *EPDCCH-Config-r11* information element, as included in *PhysicalConfigDedicated* and/or *PhysicalConfigDedicatedSCell-r10* information element, and support the physical channel configuration and reconfiguration procedures, per sections 6.3.2, 5.3.3.4, 5.3.5.3, 5.3.5.4, 5.3.5.6, 5.3.7.5, 5.3.10.3b of the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.24 SON SUPPORT VZ_REQ_LTEB13NAC_23614

3.2.24.1 RADIO LINK AND HANDOVER FAILURE REPORTING VZ_REQ_LTEB13NAC_23615

3.2.24.1.1 VZ_REQ_LTEB13NAC_6465

The device shall provide radio link and handover failure information to the network per the 3GPP release 10 specifications. The device shall store radio link and handover failure information in the *VarRLF-Report* per sections 5.3.5.6 and 5.3.11.3 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*. The device shall signal the availability of this failure information to the network by providing the *rlf-InfoAvailable* IE in the *RRCConnectionReestablishmentComplete*, *RRCConnectionSetupComplete*, and *RRCConnectionReconfigurationComplete* messages as specified in sections 5.3.7.5, 5.3.3.4, and 5.3.5.4, respectively, 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, Release 10. The device shall provide the *rlf-Report* in a *UEInformationResponse* message when requested by the network, per section 5.6.5.3 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, Release 10. The device may discard the stored failure information within 48 hours or upon power cycle or network detach as specified in section 5.3.11.3 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, Release 10.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.24.2 RACH INFORMATION REPORTING VZ_REQ_LTEB13NAC_23616

3.2.24.2.1 VZ_REQ_LTEB13NAC_6466

The device shall provide RACH information to the network per the 3GPP Release 10 specifications. The device shall store RACH information in a *rach-Report* which provides the number of preambles sent for the last successfully completed random access procedure and whether contention was detected for at least one of the transmitted preambles during the procedure. The device shall provide the *rach-Report* in a *UEInformationResponse* message when requested by the network, per section 5.6.5.3 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, Release 10.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

3.2.24.3 MINIMIZATION OF DRIVE TEST VZ_REQ_LTEB13NAC_38228

All requirements in this section apply to intra-LTE MDT.



3.2.24.3.1 Release 10 MDT Support **VZ_REQ_LTEB13NAC_38229**

3.2.24.3.1.1 **VZ_REQ_LTEB13NAC_38230**

The device shall support ALL LTE MDT requirements (stage 2, mandatory and optional) that apply to device as defined in the release 10 version of 3GPP TS 37.320: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Test; Overall description; Stage 2*.

- The ability of the UE to include location information as part of UE radio measurement reporting in RRC connected state, including RACH report
- Configuration of a logging area
- The ability of the UE to log radio measurements during the UEs RRC idle state

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.1.2 **VZ_REQ_LTEB13NAC_38231**

The device shall support UE capability for MDT as defined in section 4.3.13 in the release 10 version of 3GPP TS 36.306: *Evolved Universal Terrestrial Radio Access (E-UTRA); UE Radio Access Capabilities* and section 6.3.6 of the release 10 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*:

- UE-BasedNetwPerfMeasParameters-r10
 - loggedMeasurementsIdle-r10
 - standaloneGNSS-Location-r10

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.1.3 **VZ_REQ_LTEB13NAC_38232**

The device shall set *LocationInfo* in measurement report (immediate reporting) if *includeLocationInfo* is configured in the corresponding *reportConfig* for the *measId* as stated in section 5.5.5, 6.2.2 in the release 10 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

When interpreting "*detailed location information that has not been reported is available*", the battery power usage for obtaining the most recent location information shall not exceed 10% of available battery power.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB



Modem] - Scope: [Branded]

3.2.24.3.1.4 VZ_REQ_LTEB13NAC_38233

When storing failure information in *VarRLF-Report*, the device shall set *LocationInfo* as defined in sections 5.3.5.6 (HO failure), 5.3.11.3 (RLF), 5.6.8.2 (RRC idle MDT logging initiation) in the release 10 version of 3GPP TS 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

When interpreting "*detailed location information is available*", the battery power usage for obtaining the most recent location information shall not exceed 10% of available battery power.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.1.5 VZ_REQ_LTEB13NAC_38234

The device shall indicate availability (*logMeasAvailable*) and report of logged measurements collected in RRC Idle state for RPLMN (registered PLMN) as defined in sections 4.2.1 (architecture), 5.3.3.4 (*RRCConnectionSetupComplete*), 5.3.5.4, 5.4.2.3 (*RRCConnectionReconfigurationComplete* for connection setup and HO), 5.3.7.5 (*RRCConnectionReestablishmentComplete*), 5.6.5.3 (*UEInformationResponse*, RACH report) and 6.2.1, 6.2.2 (message format) in the release 10 version of 3GPP TS 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.1.6 VZ_REQ_LTEB13NAC_38235

The device shall support logged measurements configuration and maintenance/release of the logged measurements (*R10 VarLogMeasConfig-r10* and *VarLogMeasReport-r10*) as defined in section 5.6.6, 6.2.2 in the release 10 version of 3GPP TS 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

When reporting logged measurement, the device shall use variables (as a result of logged measurement configuration) defined in section 7.1 and timers as defined in section 7.3 in the release 10 version of 3GPP TS 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

The device shall support measurement logging in RRC idle state (per configuration defined in section 5.6.6 of TS 36.331) as defined in section 8 of the release 10 version of 3GPP TS 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) Procedures in Idle Mode*.

The device shall support measurement logging in RRC idle state as defined in section 4.3 of the release 10 version of 3GPP TS 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for*



Support of Radio Resource Management.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.1.7 VZ_REQ_LTEB13NAC_38236

The device shall apply R10 restriction on limiting *includeLocationInfo* in measurement report (immediate MDT) to event A2 and periodical report as defined in section 6.3.5 of release 10 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.1.8 VZ_REQ_LTEB13NAC_38756

The device shall support location configuration parameters in *locationInf-r10* when reporting location in MDT measurements as defined in section 5.5.5, 6.3.4, 6.3.5 and 6.3.6 in the release 10 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*:

- *ellipsoid-Point-r10*
- *ellipsoidPointWithAltitude-r10*

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.1.9 VZ_REQ_LTEB13NAC_38757

The device shall support measurement logging in RRC idle state (per configuration defined in section 5.6.6 of TS 36.331) as defined in section 8 of the release 10 version of 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) Procedures in Idle Mode*.

The device shall support measurement logging in RRC idle state as defined in section 4.3 of the release 10 version of 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for Support of Radio Resource Management*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.2 Release 11 MDT Support VZ_REQ_LTEB13NAC_38237

3.2.24.3.2.1 VZ_REQ_LTEB13NAC_38238

The device shall support ALL LTE MDT requirements (stage 2) that apply to device as defined in the release 11 version of 3GPP TS 37.320: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Test; Overall description; Stage 2*, including the following:

- Details on requested location for UE standalone GNSS
- Details on using network-assisted and/or network-based location methods (A-GNSS, mobile-assisted GNSS, E-CID, OTDOA, CID, etc.) is TBD
- A list of PLMNs where MDT is allowed
- Additional configuration of a logging area
- Mandatory accessibility measurements
- Enhancement in location report (added uncertainty, additional shapes)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.2.2 VZ_REQ_LTEB13NAC_38239

The device shall support storing/maintaining, indication of Connection Establishment Failure availability status and reporting accessibility measurements as defined in section 5.3.3.4 (*RRConnectionSetupComplete*), 5.3.3.6 (T300 expires, storing), 5.3.5.4, 5.4.2.3 (*RRConnectionReconfigurationComplete* connection setup or HO), 5.3.7.5 (*RRConnectionReestablishmentComplete*), 5.6.5.3 (*UEInformationResponse*, *connEstFailReport*) and 6.2.1, 6.2.2 (message format) in the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*

- *connEstFailInfoAvailable-r11*
- Set proper fields in *ConnEstFailReport-r11* including:
 - *failedCellId* (5.3.3.6, T300 expire)
 - *maxTxPowerReached* (5.3.3.6, T300 expire)
 - *locationInfo*
 - *measResultFailedCell* (5.3.3.6, T300 expire)
 - *measResultNeighCells*
 - *numberOfPreamblesSent*
 - *contentionDetected*
 - *timeSinceFailure-r11*
 - *measResultListEUTRA*

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.2.3 VZ_REQ_LTEB13NAC_38240

The device shall support R11 *VarLogMeasConfig-r11* and *VarLogMeasReport-r11* including configuration of *plmn-IdentityList*, *areaConfiguration* and verification of RPLMN in *plmn-IdentityList*, of TAC in *areaConfiguration* for various MDT reports as defined in section 5.3.3.4, 5.3.3.6, 5.3.5.4, 5.3.5.6 (T304 expiry, HO failure), 5.3.7.5, 5.3.11.3, 5.4.2.3, 5.6.5.3, 5.6.6.3, 5.6.8.2, 6.2.1, 6.2.2, 6.3.4 (*PLMN-IdentityList3-r11*) in the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*:

- *plmn-IdentityList-r11*
- *areaConfiguration-v1130*

The device shall support update for *plmn-IdentityList* in section 8 of the release 11 version of 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) Procedures in Idle Mode*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.2.4 VZ_REQ_LTEB13NAC_38241

The device shall support additional location parameters in addition to *locationInf-r10* (uncertainty and additional shape) when reporting location in MDT measurements as defined in section 5.5.5, 6.3.4, 6.3.5 (*includeLocationInfo-r11*) and 6.3.6 in the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*:

- *ellipsoidPointWithUncertaintyCircle-r11*
- *ellipsoidPointWithUncertaintyEllipse-r11*
- *ellipsoidPointWithAltitudeAndUncertaintyEllipsoid-r11*
- *ellipsoidArc-r11*
- *polygon-r11*

The device shall support enhanced location for various MDT reports (obtainLocationConfig and maintenance) as defined in section 5.3.7.2, 5.3.10.9 and 6.3.6 in the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.2.5 VZ_REQ_LTEB13NAC_38242

The device shall support following addition fields in *UEInformationResponse* for RLF report as defined in section 5.3.3.6, 5.3.11.3, 5.6.5.3, 6.2.1 in the release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*:

- Set *rlf-Cause* to the trigger of RLF as defined by 3GPP (total of three reasons: T310 expiry, random

access problem and max RLC retransmissions) as well as one other UE-proprietary declaration of RLF (use the spare values) in RLF report (rlf-Cause-r11) (5.3.11.3)

- Set *timeSinceFailure* (5.3.11.3)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.2.6 VZ_REQ_LTEB13NAC_38243

The device shall remove R10 restriction on limiting includeLocationInfo in measurement report (immediate MDT) to event A2 and shall apply includeLocationInfo to all measurement report triggers as defined in section 6.3.5 in release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

3.2.24.3.2.7 VZ_REQ_LTEB13NAC_38244

The device shall indicate its support of ue-Rx-TxTimeDiffMeasurements-r11 for using E-CID positioning for MDT as defined in section 6.3.6 in release 11 version of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) Protocol Specification*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

4 SCENARIOS VZ_REQ_LTEB13NAC_1883

4.1 NETWORK & DEVICE MESSAGE TRANSMISSION & RETRIEVAL

VZ_REQ_LTEB13NAC_1884

4.1.1 LTE SYSTEM SELECTION VZ_REQ_LTEB13NAC_23554

4.1.1.1 VZ_REQ_LTEB13NAC_6347

The device shall support system selection per 3GPP Release 9 Specifications. Refer to section *SYSTEM*



SELECTION/RESELECTION for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2 LTE NETWORK ATTACHMENT VZ_REQ_LTEB13NAC_23555

4.1.2.1 VZ_REQ_LTEB13NAC_6348

The device shall attach to the LTE network using the Attach Procedure described in 3GPP TS 23.401: *General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access* and 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.2 PDN CONNECTION FOR NETWORK ATTACHMENT VZ_REQ_LTEB13NAC_23556

4.1.2.2.1 NORMAL OPERATION VZ_REQ_LTEB13NAC_23557

4.1.2.2.1.1 VZ_REQ_LTEB13NAC_6349

In normal operation, the device shall attach to the LTE network by connecting to the IMS PDN. In normal operation, the device shall not attach to the LTE network by connecting to any PDN other than the IMS PDN.

NOTE: In normal operation, the device shall attach to the LTE network by connecting to the IMS PDN regardless of the setting of the `SMS_Over_IP_Networks_Indication` parameter setting. Refer to the LTE SMS Device Requirements for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.2.2 IMS TEST MODE OPERATION VZ_REQ_LTEB13NAC_23558

4.1.2.2.2.1 VZ_REQ_LTEB13NAC_6350

The device shall support an IMS test mode in which the IMS client is disabled. The device shall initiate a soft reset when it is toggled between the IMS test mode and normal operating mode. When operating in this test



mode, the device shall attach to the LTE network by connecting to the Internet PDN immediately upon detection of the LTE network. This test mode will be used to support RF and signaling conformance testing.

Per the table below, the IMS test mode shall operate independently of the setting of the *SMS_Over_IP_Networks_Indication* parameter defined in the *SMS over IMS Control* section of the LTE SMS Device Requirements.

IMS Test Mode Control Parameter	SMS_Over_IP_Networks_Indication Parameter Setting	Device Operation Mode
Disable	Enable	Normal operation, Device attaches via the IMS PDN, Normal SMS over IMS operation
Disable	Disable	Normal operation, Device attaches via the IMS PDN and performs IMS registration, SMS origination over IMS shall be disabled, but device shall be capable of receiving MT SMS messages over IMS
Enable	Enable	IMS test mode operation, Device attaches via the Internet PDN, SMS over IMS is disabled (device shall not perform IMS registration),
Enable	Disable	IMS test mode operation, Device attaches via the Internet PDN, SMS over IMS is disabled (device shall not perform IMS registration)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.3 IMS PDN DEDICATED BEARER SETUP **VZ_REQ_LTEB13NAC_23559**

4.1.2.3.1 **VZ_REQ_LTEB13NAC_6351**

On network attach (in normal operation), the network may initiate the setup of a dedicated bearer to the IMS PDN.

Should the dedicated bearer setup fail or should the dedicated bearer be released for any reason, the network will attempt to reestablish the dedicated bearer. The device shall not request a dedicated bearer to the IMS PDN at any time.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.4 IP ADDRESS ASSIGNMENT **VZ_REQ_LTEB13NAC_23560**

4.1.2.4.1 NORMAL OPERATION **VZ_REQ_LTEB13NAC_23561**

4.1.2.4.1.1 **VZ_REQ_LTEB13NAC_6352**

On network attach to the IMS PDN (i.e. normal operation), the device shall associate an IPv6 address, an IPv4 address, or both an IPv6 and IPv4 address with the default bearer to the IMS PDN as directed by the network in the "PDN Address" information element of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message. The device shall be capable of supporting a dual IP bearer to the IMS PDN connection, i.e. the device shall be capable of simultaneously associating both an IPv6 and an IPv4 address with the bearers to the IMS PDN. The device shall be capable of supporting an IPv6 address and an IPv4 address for the IMS PDN connection that are unique to any IP addresses assigned to on-demand PDN connections. Verizon Wireless currently plans to use IPv6 addressing for the IMS PDN. *IPv4 addressing for the IMS PDN is reserved for future use.*

Refer to the *IPv6 Address Assignment* section of this document for additional details on IPv6 address assignment.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.4.2 IMS TEST MODE OPERATION **VZ_REQ_LTEB13NAC_23562**

4.1.2.4.2.1 VZ_REQ_LTEB13NAC_6353

On network attach to the Internet PDN during IMS test mode operation, the device shall associate an IPv6 address, an IPv4 address, or both an IPv6 and IPv4 address with the default bearer to the Internet PDN as directed by the network in the "PDN Address" information element of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message. The device shall be capable of supporting a dual IP bearer to the Internet PDN connection, i.e. the device shall be capable of simultaneously associating both an IPv6 and an IPv4 address with the bearers to the Internet PDN connection. The device shall be capable of supporting an IPv6 address and an IPv4 address for the Internet PDN connection that are unique to any IP addresses assigned to other PDN connections.

Refer to the *IPv6 Address Assignment* section of this document for additional details on IPv6 address assignment.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.5 NAS MESSAGING DURING LTE NETWORK ATTACHMENT

VZ_REQ_LTEB13NAC_23563

4.1.2.5.1 VZ_REQ_LTEB13NAC_6354

Refer to the 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* and the sections below for additional details on the NAS messaging during LTE network attachment.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.5.2 ATTACH REQUEST MESSAGE VZ_REQ_LTEB13NAC_23564

4.1.2.5.2.1 VZ_REQ_LTEB13NAC_6355

During the attach procedure, the device shall set the following information elements in the ATTACH REQUEST message as described below:

The device should set the "EPS Attach Type" to *EPS Attach*. The device may use *Combined EPS/IMSI Attach*. However, if the device uses *Combined EPS/IMSI Attach*, the Verizon Wireless network will send an ATTACH ACCEPT message with an EMM cause value of 18 (CS domain not available) to indicate that non-EPS services are not available on the Verizon Wireless LTE network. The device shall comply with all Verizon Wireless LTE data retry requirements as per the Verizon Wireless LTE Data Retry Requirements regardless of the "EPS Attach Type".

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.5.3 PDN CONNECTIVITY REQUEST MESSAGE VZ_REQ_LTEB13NAC_23565

4.1.2.5.3.1 VZ_REQ_LTEB13NAC_6356

During the attach procedure, the device shall set the following information elements in the PDN CONNECTIVITY REQUEST message as described below:

- The device shall set the "Request Type" to *Initial Request*.
- The device shall set the "PDN Type" to the value in the "APN IP Type" field of the APN table in section 5.4.1 of this document (Currently, this value is *IPv4v6* for all PDN's).
- The device shall set the "ESM Information Transfer Flag" to indicate that ciphering of ESM information is requested.
- The device shall not include the APN (per section 6.5.1.2 of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*).
- If the IMS PDN is used for network attach (i.e. normal operation), the device shall include the "Protocol Configuration Options", including requests for the IPv6 DNS IP addresses, IPv4 DNS IP addresses, IPv4 MTU size, and the IPv6 P-CSCF IP addresses.
- If the internet PDN (or PDN identified by the class 3 APN) is used for network attach (i.e. IMS test mode operation or data retry scenario), the device shall include the "Protocol Configuration Options", including requests for the IPv6 DNS IP addresses, the IPv4 DNS IP addresses, and the IPv4 MTU size. The device SHALL NOT request a P-CSCF IP address in the PCO field of a PDN CONNECTIVITY REQUEST message for the internet PDN (or PDN identified by the class 3 APN).
- The device shall also request the operator reserved PCO container FF00H. The device shall always set the MCC to "311" and the MNC to "480" for the operator reserved PCO container FF00H.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.5.4 ESM INFORMATION RESPONSE MESSAGE VZ_REQ_LTEB13NAC_23566

4.1.2.5.4.1 VZ_REQ_LTEB13NAC_6357

The device shall include the APN in the ESM INFORMATION RESPONSE message in the network attach procedure.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.5.5 ATTACH ACCEPT MESSAGE VZ_REQ_LTEB13NAC_23567



4.1.2.5.5.1 VZ_REQ_LTEB13NAC_6358

The device shall be capable of receiving the following optional information elements in the ATTACH ACCEPT message during the network attach procedure:

- "GUTI"
- "EMM Cause". If an EMM cause value of 18 (CS domain not available) is returned in an ATTACH ACCEPT message in response to an ATTACH REQUEST with the "EPS Attach Type" set to *Combined EPS/IMSI Attach*, the device shall operate in normal PS mode 2 (refer to 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS)*; *Stage 3* for additional details)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.5.6 ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST MESSAGE

VZ_REQ_LTEB13NAC_23568

4.1.2.5.6.1 VZ_REQ_LTEB13NAC_6359

The device shall be capable of receiving the following optional information elements in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message during network attach:

- "APN-AMBR"
- "Protocol Configuration Options", will include DNS and P-CSCF IP addresses and the IPv4 MTU size (if the network does not provide the MTU size, the device shall set the MTU size to 1428). If the network provides the operator reserved PCO container FF00H, the device shall make the contents of the FF00H container available to higher layers. If the network does not provide the operator reserved PCO container FF00H, the device shall not consider this to be an error and shall report to higher layers that the operator reserved PCO container FF00H is not available.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.2.5.7 PIGGYBACKING SUPPORT VZ_REQ_LTEB13NAC_23569

VOID

4.1.3 ON -DEMAND PDN CONNECTION ESTABLISHMENT VZ_REQ_LTEB13NAC_23570

4.1.3.1 VZ_REQ_LTEB13NAC_6360

After initial network attachment to the IMS PDN (i.e. normal operation), the device shall establish a default bearer to the Internet PDN, the Administrative PDN, or the VZW Application PDN if an application(s) running on the device or a tethered laptop requires a bearer to any of these PDN's. Refer to the *LTE IPv6/IPv4 and Bearer Support* section of this document for additional details.

NOTE: In a data retry scenario where the device attaches to the LTE network using the internet PDN (or PDN identified by the class 3 APN), the device shall consider the internet PDN (or PDN identified by the class 3 APN) as an "always on" connection as opposed to an "on-demand" PDN connection. In such a data retry scenario, the PDN CONNECTIVITY REQUEST message for the internet PDN (or PDN identified by the class 3 APN) shall comply with section 4.1.2.4 of this document. If the device successfully attaches to the LTE network using the internet PDN (or PDN identified by the class 3 APN), the device shall consider the IMS PDN to be an "on-demand" PDN for the duration of the attach, and the PDN CONNECTIVITY REQUEST for the IMS PDN shall comply with section 4.1.3.3 of this document.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.3.2 VZ_REQ_LTEB13NAC_6361

After initial network attachment to the Internet PDN during IMS test mode operation, the device shall establish a default bearer to the Administrative PDN or the VZW Application PDN if an application(s) running on the device or a tethered laptop requires a bearer to any of these PDN's. Refer to the *LTE IPv6/IPv4 and Bearer Support* and *LTE Network Attachment* sections of this document for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.3.3 DEFAULT BEARERS AND IP ADDRESSES FOR ON-DEMAND PDN CONNECTIONS VZ_REQ_LTEB13NAC_23571

4.1.3.3.1 VZ_REQ_LTEB13NAC_6362

For the default bearers to on-demand PDN's, the device shall associate at least one IPv6 address, an IPv4 address, or both an IPv6 and IPv4 address as directed by the network in the "PDN Address" information element of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message. The device shall be capable of supporting a dual IP bearer to any on-demand PDN connection, i.e. the device shall be capable of simultaneously associating both an IPv6 and an IPv4 address with the default bearer to any on-demand PDN connection. The device shall be capable of supporting a unique IPv6 address and a unique IPv4 address for each PDN connection.

Refer to the *IPv6 Address Assignment* section of this document for additional details on IPv6 address assignment.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS),

Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.3.4 DEDICATED BEARERS FOR ON-DEMAND PDN CONNECTIONS

VZ_REQ_LTEB13NAC_23572

4.1.3.4.1 VZ_REQ_LTEB13NAC_6363

The device shall not request a dedicated bearer to any on-demand PDN.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.3.5 NAS MESSAGING DURING ON DEMAND PDN CONNECTION ESTABLISHMENT

VZ_REQ_LTEB13NAC_23573

4.1.3.5.1 VZ_REQ_LTEB13NAC_6364

Refer to the 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* and the sections below for additional details on the NAS messaging during on demand PDN connection establishment.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.3.5.2 PDN CONNECTIVITY REQUEST MESSAGE

VZ_REQ_LTEB13NAC_23574

4.1.3.5.2.1 VZ_REQ_LTEB13NAC_6365

The device shall set the following information elements in the PDN CONNECTIVITY REQUEST message as described below:

- The device shall set the "Request Type" to *Initial Request*.
- The device shall set the "PDN Type" to the value in the "APN IP Type" field of the APN table in section 5.4.1 of this document (Currently, this value is *IPv4v6* for all PDN's).
- The device shall omit the "ESM Information Transfer Flag".
- The device shall include the APN.
- The device shall include the "Protocol Configuration Options", including requests for the IPv6 DNS IP addresses, the IPv4 DNS IP addresses, and the IPv4 MTU size. If the PDN CONNECTIVITY REQUEST is for the IMS PDN (e.g. IMS test mode operation or data retry scenario), the device shall include requests for the IPv6 P-CSCF IP addresses. The device SHALL NOT request a P-CSCF IP address in the PCO field of a PDN CONNECTIVITY REQUEST for any PDN other than the IMS PDN.

- The device shall also request the operator reserved PCO container FF00H. The device shall always set the MCC to "311" and the MNC to "480" for the operator reserved PCO container FF00H.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.3.5.3 ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST MESSAGE

VZ_REQ_LTEB13NAC_23575

4.1.3.5.3.1 VZ_REQ_LTEB13NAC_6366

The device shall be capable of receiving the following optional information elements in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message:

- "APN-AMBR"
- "Protocol Configuration Options", will include DNS IP addresses and the IPv4 MTU size (if the network does not provide the MTU size, the device shall set the MTU size to 1428). If the network provides the operator reserved PCO container FF00H, the device shall make the contents of the FF00H container available to higher layers. If the network does not provide the operator reserved PCO container FF00H, the device shall not consider this to be an error and shall report to higher layers that the operator reserved PCO container FF00H is not available.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.4 PDN DISCONNECTION VZ_REQ_LTEB13NAC_23576

4.1.4.1 NETWORK INITIATED PDN DISCONNECTION VZ_REQ_LTEB13NAC_23577

4.1.4.1.1 VZ_REQ_LTEB13NAC_6367

The network will initiate disconnection of a PDN connection if the network inactivity timer for that PDN connection has expired, usually by sending a DEACTIVATE EPS BEARER CONTEXT REQUEST message if the device is connected to two or more PDN's or by sending a DETACH REQUEST if the device is connected to only one PDN.

If the network disconnects the connection to the IMS PDN and the device is still attached to the LTE network (through a different PDN connection), the device shall attempt to re-establish the IMS PDN connection by sending a PDN CONNECTIVITY REQUEST message. If that PDN CONNECTIVITY REQUEST message is rejected by the network using a PDN CONNECTIVITY REJECT message or the network does not respond to

the PDN CONNECTIVITY REQUEST message, the device shall follow Verizon Wireless data retry procedures for PDN connection requests as defined in the Verizon Wireless LTE Data Retry Requirements.

If the network disconnects the connection to the IMS PDN using a network initiated DETACH REQUEST message and the network indicates that a re-attach is required per the "Detach Type" information element in the DETACH REQUEST message, the device shall acknowledge the detach procedure and then attempt to re-attach to the LTE network and the IMS PDN by sending an ATTACH REQUEST message. Device behavior shall be per 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, the Verizon Wireless LTE Data Retry Requirements, and this document.

If the network disconnects the connection to the IMS PDN using a network initiated DETACH REQUEST message and the network indicates that a re-attach is not required per the "Detach Type" information element in the DETACH REQUEST message, the device shall acknowledge the detach procedure and take appropriate action based on the EMM cause code in the DETACH REQUEST message. Device behavior shall be per 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, the Verizon Wireless LTE Data Retry Requirements, and this document.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.4.2 UE INITIATED PDN DISCONNECTION **VZ_REQ_LTEB13NAC_23578**

4.1.4.2.1 UE INITIATED PDN DISCONNECTION - APN INACTIVITY TIMERS FOR PDN CONNECTIONS **VZ_REQ_LTEB13NAC_23579**

VOID

4.1.4.2.2 UE INITIATED PDN DISCONNECTION ? UPDATE TO APN RELATED PARAMETERS **VZ_REQ_LTEB13NAC_23580**

4.1.4.2.2.1 **VZ_REQ_LTEB13NAC_6368**

If an APN network identifier or APN-related parameter (refer to the *Factory Programming* section of this document for additional details) is updated after a PDN connection using the APN has been established, the device shall release the PDN connection and then immediately re-establish the PDN connection using the updated APN parameter(s).

The device shall release the PDN connection by:

- sending a PDN DISCONNECT REQUEST message if the device is connected to two or more PDN's.

- sending a DETACH REQUEST if the device is connected to only one PDN connection.

If the device disconnects the connection to the IMS PDN and the device is still attached to the LTE network (through a different PDN connection), the device shall attempt to re-establish the IMS PDN connection by sending a PDN CONNECTIVITY REQUEST message. If that PDN CONNECTIVITY REQUEST message is rejected by the network using a PDN CONNECTIVITY REJECT message or the network does not respond to the PDN CONNECTIVITY REQUEST message, the device shall follow Verizon Wireless data retry procedures for PDN connection requests as defined in the Verizon Wireless LTE Data Retry Requirements.

If the device disconnects an on-demand PDN connection and the device is still attached to the LTE network (through a different PDN connection), the device shall attempt to re-establish the PDN connection by sending a PDN CONNECTIVITY REQUEST message and using the updated APN parameter(s). Device behavior shall be per 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, the Verizon Wireless LTE Data Retry Requirements, and this document.

If the device disconnects the connection using a UE-initiated DETACH REQUEST message, the device shall complete the detach procedure and then attempt to re-attach to the LTE network and the IMS PDN by sending an ATTACH REQUEST message. All updated APN parameter(s) shall be used in the attach procedure and any subsequent PDN connection establishment procedures. Device behavior shall be per 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, the Verizon Wireless LTE Data Retry Requirements, and this document.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.4.2.3 UE INITIATED PDN DISCONNECTION ? ALL OTHER CASES

VZ_REQ_LTEB13NAC_23581

4.1.4.2.3.1 VZ_REQ_LTEB13NAC_6369

If the device is required to initiate a PDN disconnection for any reason other than in response to the expiration of an APN inactivity timer or in response to an update to an APN-related parameter, the device shall follow the requirements below.

Per 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, the device shall release the PDN connection by:

- sending a PDN DISCONNECT REQUEST message if the device is connected to two or more PDN's.
- sending a DETACH REQUEST if the device is connected to only one PDN connection.

Device behavior shall be per 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, the Verizon Wireless LTE Data Retry Requirements, and this document.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.4.3 IMS DE-REGISTRATION DURING UE INITIATED IMS PDN DISCONNECTION

VZ_REQ_LTEB13NAC_23582

4.1.4.3.1 VZ_REQ_LTEB13NAC_6370

If the device has a valid IMS registration, the device shall terminate the subscription to the registration events package by sending a Subscribe message with expires= 0, followed by an IMS de-registration request message. This shall be done before sending a NAS PDN DISCONNECT REQUEST or DETACH REQUEST message. Upon the IMS client generating the initial SIP REGISTER message with expires=0, the device shall start an implementation specific timer with a value of 4 seconds. While this implementation specific timer is running, the device shall respond to all SIP messaging from the network, e.g. if the network challenges the de-registration request with a 401 Unauthorized. Upon expiration of this implementation specific timer, the device shall take no further action with respect to SIP messages from the network and execute the NAS detach procedure or NAS PDN disconnect procedure. The device shall stop the implementation specific timer and immediately execute the NAS detach procedure or NAS PDN disconnect procedure if a SIP 200 OK or a SIP 481 or a SIP 501 is received in response to the SIP REGISTER (with expires=0) before the implementation specific timer expires.

NOTE: The implementation specific timer is started when the IMS client generates the initial SIP REGISTER message with expires=0. The implementation specific timer shall run even if the IMS client cannot send the SIP REGISTER message to the modem for transmission because an IMS signaling connection could not be established.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.5 TRACKING AREA UPDATES VZ_REQ_LTEB13NAC_23583

4.1.5.1 VZ_REQ_LTEB13NAC_6371

Tracking area update procedures are per 3GPP TS 23.401: *General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access* and 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.5.2 NAS MESSAGING DURING TRACKING AREA UPDATES

VZ_REQ_LTEB13NAC_23584



4.1.5.2.1 VZ_REQ_LTEB13NAC_6372

Refer to the 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* and the sections below for additional details on the NAS messaging during tracking area updates.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.5.2.2 TRACKING AREA UPDATE ACCEPT MESSAGE VZ_REQ_LTEB13NAC_23585

4.1.5.2.2.1 VZ_REQ_LTEB13NAC_6373

The device shall be capable of receiving the following optional information elements in the TRACKING AREA UPDATE ACCEPT message:

- "T3412 Value", included if the MME configuration changes
- "GUTI", mandatory if the MME changes
- "TAI List", included in all cases

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.6 LTE NETWORK DETACHMENT VZ_REQ_LTEB13NAC_23586

4.1.6.1 VZ_REQ_LTEB13NAC_6374

Upon device power down, device soft reset, power down of the LTE radio/modem (e.g. when entering airplane mode), or user initiated disconnect of the wireless connection, the device shall initiate the Detach Procedure. Refer to 3GPP TS 23.401: *General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access* and to 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.6.2 IMS DE-REGISTRATION DURING UE INITIATED NETWORK DETACH VZ_REQ_LTEB13NAC_23587

4.1.6.2.1 VZ_REQ_LTEB13NAC_6375

If the device has a valid IMS registration, the device shall terminate the subscription to the registration events

package by sending a Subscribe message with expires= 0, followed by an IMS de-registration request message. This shall be done before sending a NAS DETACH REQUEST message. Upon the IMS client generating the initial SIP REGISTER message with expires=0, the device shall start an implementation specific timer with a value of 4 seconds. While this implementation specific timer is running, the device shall respond to all SIP messaging from the network, e.g. if the network challenges the de-registration request with a 401 Unauthorized. Upon expiration of this implementation specific timer, the device shall take no further action with respect to SIP messages from the network and execute the NAS detach procedure. The device shall stop the implementation specific timer and immediately execute the NAS detach procedure if a SIP 200 OK or a SIP 481 or a SIP 501 is received in response to the SIP REGISTER (with expires=0) before the implementation specific timer expires.

NOTE: The implementation specific timer is started when the IMS client generates the initial SIP REGISTER message with expires=0. The implementation specific timer shall run even if the IMS client cannot send the SIP REGISTER message to the modem for transmission because an IMS signaling connection could not be established.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.7 SYSTEM LOSS VZ_REQ_LTEB13NAC_23588

4.1.7.1 VZ_REQ_LTEB13NAC_6376

If radio link failure occurs (specifically an out-of-sync detection as defined in 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures*), the device shall follow all procedures defined in the 3GPP Release 9 Specifications. Refer to 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification* and 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.7.2 VZ_REQ_LTEB13NAC_35805

If the device needs to send a TRACKING AREA UPDATE REQUEST message after LTE connection re-establishment following LTE radio-link failure (RLF)/system loss and the device has uplink data pending, the device shall set bit 4 of the "EPS Update Type" information element in the TRACKING AREA UPDATE REQUEST message to "1 Bearer establishment requested". Refer to 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.8 IPV6 ADDRESS ASSIGNMENT VZ_REQ_LTEB13NAC_23589

4.1.8.1 LINK-LOCAL ADDRESS AND GLOBALLY ROUTABLE IPV6 ADDRESS FORMATION **VZ_REQ_LTEB13NAC_23590**

4.1.8.1.1 **VZ_REQ_LTEB13NAC_6377**

For IPv6 address assignment, the device shall use IPv6 Stateless Address Autoconfiguration. The device shall not initiate DHCP signaling for the purposes of securing an IPv6 address. The device shall use the Interface ID value received from the network in the "PDN Address" information element of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for its Interface ID when forming its link-local address; the device shall not alter the value for the Interface ID or use a different value when forming its link-local address.

The device shall use the values MAX_RTR_SOLICITATION_DELAY (1 second), MAX_RTR_SOLICITATIONS (3), and RTR_SOLICITATION_INTERVAL (4 seconds) from RFC 4861 as the default values for governing the sending of *Router Solicitation* messages. The device shall form its globally routable IPv6 address by combining the prefix received in the *Router Advertisement* message with the device's Interface ID. When forming a globally routable IPv6 address, the device shall either use the Interface ID provided by the network in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message or choose an Interface ID in accordance with 3GPP TS 29.061: *Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)*. The device shall only form one globally routable IPv6 address when connected to the IMS PDN, and the device shall use that IPv6 address for the duration of the IMS PDN connection. The device should only form one globally routable IPv6 address per PDN connection when connecting to PDNs other than the IMS PDN.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.8.1.2 **VZ_REQ_LTEB13NAC_6378**

The device shall use either the "Valid Lifetime" value or the "Router Lifetime" value received in the *Router Advertisement* message (refer to RFC 4861, section 4.6.2), whichever is shortest, to determine the valid lifetime of its IPv6 address per RFC 4862. The device shall use the "Preferred Lifetime" to determine when the IPv6 address is preferred or deprecated per RFC 4862. If the network sends an unsolicited *Router Advertisement* message, the device shall refresh its valid lifetime by using the values of "Valid Lifetime", and "Router Lifetime" from the new message and its preferred lifetime by using the "Preferred Lifetime". The device may refresh its IPv6 address by soliciting a new *Router Advertisement* message from the network. If the device needs to solicit a new *Router Advertisement* message, it shall use one of following two methods to determine the appropriate timing. Method 1: the device shall wait until at least 75% of the minimum of "Preferred Lifetime", "Valid Lifetime", or "Router Lifetime" has expired and then send a *Router Solicitation* message per RFC 4861 and RFC 4862. Method #2: the device shall wait until either "Preferred Lifetime" has expired or 75% of the valid lifetime (determined by taking the minimum of the "Valid Lifetime" and the "Router Lifetime") has expired before sending the *Router Solicitation* message.



Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.8.1.3 IPV6 ADDRESS ASSIGNMENT FOR LAN-SIDE DEVICES

VZ_REQ_LTEB13NAC_23591

4.1.8.1.3.1 VZ_REQ_LTEB13NAC_6429

If the device supports a LAN and serves as a gateway for the LAN-side devices, the device shall assign globally routable IPv6 addresses to the LAN-side devices as follows:

- All traffic from the LAN-side devices shall be routed on the internet PDN (i.e. Class 3 APN).
- The device shall use the IPv6 prefix provided in the *Router Advertisement* for the Internet PDN for all LAN-side devices.
- To complete the globally routable IPv6 address for a given LAN-side device, the gateway device shall combine the IPv6 prefix provided in the *Router Advertisement* for the Internet PDN with a unique Interface ID created in accordance with 3GPP TS 29.061: *Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)*. The gateway device's WAN-side IPv6 address and all LAN-side IPv6 address shall be unique, i.e. the device shall not use any Interface ID more than once.
- The gateway device shall only assign one globally routable IPv6 address to each LAN-side device.

Refer to RFC 6434 and RFC 6204bis for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.8.2 ROUTER ADVERTISEMENT FAILURES VZ_REQ_LTEB13NAC_23592

4.1.8.2.1 ROUTER ADVERTISEMENT FAILURE DURING INITIAL IPV6 ADDRESS FORMATION VZ_REQ_LTEB13NAC_23594

Refer to the Verizon Wireless Data Retry Requirements.

4.1.8.2.2 ROUTER ADVERTISEMENT FAILURE DURING IPV6 ADDRESS REFRESH VZ_REQ_LTEB13NAC_23595

Refer to the Verizon Wireless Data Retry Requirements.



4.1.8.3 NEIGHBOR SOLICITATION MESSAGES **VZ_REQ_LTEB13NAC_23593**

4.1.8.3.1 **VZ_REQ_LTEB13NAC_6379**

The device shall not send a *Neighbor Solicitation* message for any reason.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.9 DHCP IP ADDRESS ASSIGNMENT/MODIFICATION **VZ_REQ_LTEB13NAC_23602**

4.1.9.1 **VZ_REQ_LTEB13NAC_6380**

The device shall not use DHCP for assignment or modification of IP addresses.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.10 DNS ADDRESS REQUESTS **VZ_REQ_LTEB13NAC_23603**

4.1.10.1 **VZ_REQ_LTEB13NAC_6381**

The device shall request DNS server addresses for a PDN connection using the "Protocol Configuration Options" information element in the PDN CONNECTIVITY REQUEST message. For any PDN connection request, the device shall always request an IPv6 DNS server address and an IPv4 DNS server address from the network. The device shall be capable of accepting 2 IPv6 DNS server addresses, 2 IPv4 DNS server addresses, or both 2 IPv6 DNS server addresses and 2 IPv4 DNS server addresses for each PDN connection as directed by the network. The device shall be capable of supporting unique DNS server addresses for each PDN connection.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.10.2 **VZ_REQ_LTEB13NAC_6382**

When performing DNS resolution on behalf of an application that connects via a specific PDN connection, the device shall utilize the DNS server that was assigned when the device set up the connection to that PDN. For example, if the device has connections to PDN A (with DNS servers A1 and A2) and PDN B (with DNS servers



B1 and B2) and an application that connects through PDN B needs a DNS resolution, the device shall request the resolution from B1 or B2, not from A1 or A2.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.10.3 VZ_REQ_LTEB13NAC_6462

When performing a DNS resolution on behalf of an application that connects via a specific PDN connection, the device shall issue DNS queries in the following order:

1. Query to the first IPv6 DNS server address provided in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the given PDN.
2. Query to the first IPv4 DNS server address provided in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the given PDN.
3. Query to the second IPv6 DNS server address provided in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the given PDN (if a second IPv6 DNS server address is provided by the network).
4. Query to the second IPv4 DNS server address provided in the PCO of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the given PDN (if a second IPv4 DNS server address is provided by the network).

If the first DNS server in the list above does not respond to a query or returns a DNS server error, the device shall issue the request to the next server in the list and so on.

The device shall wait a minimum of 2 seconds before determining a DNS query has timed out.

After a first pass through the DNS server list without a response, the device should apply an incremental backoff to the timeout value for subsequent retries.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.11 IMS TRAFFIC VZ_REQ_LTEB13NAC_23604

4.1.11.1 VZ_REQ_LTEB13NAC_6419

The device shall use the IMS PDN for all IMS traffic destined for the Verizon Wireless IMS network. The device SHALL NOT route any IMS traffic destined for the Verizon Wireless IMS network over any on-demand PDN.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.12 NETWORK INITIATED BEARER MODIFICATION AND DEACTIVATION PROCEDURES VZ_REQ_LTEB13NAC_23605

4.1.12.1 VZ_REQ_LTEB13NAC_6425

The device shall support network initiated bearer modification and deactivation procedures as defined in 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.12.2 NAS MESSAGING FOR NETWORK INITIATED BEARER ACTIVATION, NETWORK INITIATED BEARER MODIFICATION, AND BEARER DEACTIVATION PROCEDURES VZ_REQ_LTEB13NAC_23606

4.1.12.2.1 MODIFY EPS BEARER CONTEXT REQUEST MESSAGE

VZ_REQ_LTEB13NAC_23607

4.1.12.2.1.1 VZ_REQ_LTEB13NAC_6426

The device shall be capable of receiving the following optional information elements in the MODIFY EPS BEARER CONTEXT REQUEST message:

- "New EPS QoS"
- "TFT". The device shall be capable of receiving and applying a TFT for a default bearer or a dedicated bearer.
- "APN-AMBR"
- "Protocol Configuration Options". If the network provides the operator reserved PCO container FF00H, the device shall make the contents of the FF00H container available to higher layers.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.12.2.2 DEACTIVATE EPS BEARER CONTEXT REQUEST MESSAGE

VZ_REQ_LTEB13NAC_23608

4.1.12.2.2.1 VZ_REQ_LTEB13NAC_6427

The device shall be capable of receiving the following optional information elements in the DEACTIVATE EPS



BEARER CONTEXT REQUEST message:

- "Protocol Configuration Options". If the network provides the operator reserved PCO container FF00H, the device shall make the contents of the FF00H container available to higher layers.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.12.2.3 ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST MESSAGE

VZ_REQ_LTEB13NAC_23609

4.1.12.2.3.1 VZ_REQ_LTEB13NAC_6463

The network may activate a dedicated bearer for any PDN. If the network activates a dedicated bearer for a given PDN, the device shall be capable of receiving and processing the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message per 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.13 NAS MESSAGE PIGGYBACKING SUPPORT VZ_REQ_LTEB13NAC_23610

4.1.13.1 PDN BEARER ACTIVATION DURING ATTACH VZ_REQ_LTEB13NAC_23611

4.1.13.1.1 VZ_REQ_LTEB13NAC_6430

The device shall be capable of receiving the ATTACH ACCEPT message, the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the attach PDN, and up to two ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST messages for the attach PDN within the same *RRConnectionReconfiguration* message.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.13.2 PDN BEARER ACTIVATION AFTER ATTACH VZ_REQ_LTEB13NAC_23612

4.1.13.2.1 VZ_REQ_LTEB13NAC_6431



Upon sending a PDN CONNECTIVITY REQUEST message to the network for a given PDN (after attach), the device shall be capable of receiving the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message for the given PDN and up to two ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST messages for the given PDN within the same *RRCCConnectionReconfiguration* message.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.14 GUTI REALLOCATION COMMAND VZ_REQ_LTEB13NAC_23613

4.1.14.1 VZ_REQ_LTEB13NAC_6464

The device shall support the GUTI reallocation procedure per section 5.4.1 of 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*. The device shall be capable of receiving the following optional information elements in the GUTI REALLOCATION COMMAND:

- "TAI List"

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.15 SON SUPPORT VZ_REQ_LTEB13NAC_39045

VOID

4.1.16 NON-CONTENTION BASED RANDOM ACCESS VZ_REQ_LTEB13NAC_23617

4.1.16.1 VZ_REQ_LTEB13NAC_6467

When receiving an *RRCCConnectionReconfiguration* message with the handover command, the device shall support the *RACH-ConfigDedicated* field in the *MobilityControlInfo* IE if present.

Refer to 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification* for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.17 ACCESS BARRING AND ACCESS CLASSES VZ_REQ_LTEB13NAC_23618



4.1.17.1 VZ_REQ_LTEB13NAC_6468

The device shall support SIB2 and access barring per 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, including all optional IE's in SIB2.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.17.2 VZ_REQ_LTEB13NAC_6469

Per 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, if the access class in the USIM of the device is in the range of 11-15, the device shall specify "highPriorityAccess" as the *establishmentCause* in all *RRCConnectionRequest* messages.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.18 LTE FEMTOCELL INTERACTIONS VZ_REQ_LTEB13NAC_23619

4.1.18.1 LTE FEMTOCELL CELL SELECTION/RE-SELECTION VZ_REQ_LTEB13NAC_23620

4.1.18.1.1 VZ_REQ_LTEB13NAC_6473

The device shall support cell selection and re-selection with CSG cells per sections 5.2.4.1, 5.2.4.4, 5.2.4.6, 5.2.4.8, and 5.3.1 of 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode*.

The device shall support manual CSG selection as specified in section 5.5.1 of 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode* and section 5.5.4 of 3GPP TS 22.220: *Service requirements for Home Node B (HNB) and Home eNode B (HeNB)*. The device shall be capable of displaying available CSG cells to the end user through the device user interface or the remote access user interface (for devices operating in a tethered mode).

When a CSG ID which is not included in the device's Allowed CSG List is manually selected by the user, a NAS tracking area update procedure via the selected CSG cell shall be triggered immediately by the device to enable the network to perform CSG access control.

The device shall support section 5.2.4.9 of the Release 10 version of 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.18.2 CSG LIST SUPPORT VZ_REQ_LTEB13NAC_23621

4.1.18.2.1 VZ_REQ_LTEB13NAC_6474

The device shall support CSG lists as specified in section 5.3.2 of 3GPP TS 22.220: *Service requirements for Home Node B (HNB) and Home eNode B (HeNB)*. This support shall include, but not be limited to, the following:

- The device shall store CSG lists on the USIM as specified in 3GPP TS 31.102: *Characteristics of the Universal Subscriber Identity Module (USIM) application*.
- The device shall maintain two CSG lists:
 - Allowed CSG List
 - Operator CSG List
- The device shall allow the end user to add new CSG's to the Allowed CSG List through the manual CSG selection process.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.18.3 MOBILITY BETWEEN CSG AND HYBRID CELLS VZ_REQ_LTEB13NAC_23622

4.1.18.3.1 VZ_REQ_LTEB13NAC_6475

The device shall support mobility to and from CSG and hybrid cells as specified in section 10.5 of 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.18.4 RRC AND RRM SUPPORT FOR FEMTOCELLS AND CSG CELLS

VZ_REQ_LTEB13NAC_23623

4.1.18.4.1 SIB1 AND SIB9 SUPPORT VZ_REQ_LTEB13NAC_23624

4.1.18.4.1.1 VZ_REQ_LTEB13NAC_6476

The device shall supporting and processing the following information elements in

SystemInformationBlockType1 (SIB1) per 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*:

- "cellIdentity", i.e. E-CGI.
- "csg-Indication"
- "csg-Identity"

The device shall supporting and processing the following information elements in SystemInformationBlockType9 (SIB9) per 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*:

- "hnb-Name", i.e. the home eNB name.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.18.4.2 PROXIMITY INDICATION **VZ_REQ_LTEB13NAC_23625**

4.1.18.4.2.1 **VZ_REQ_LTEB13NAC_6477**

The device shall send a ProximityIndication message to the network whenever it detects or leaves the presence of CSG or hybrid cells if configured by the network to do so per section 5.3.14 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification* and section 10.5.1.2 of 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.18.4.3 AUTONOMOUS GAPS **VZ_REQ_LTEB13NAC_23626**

4.1.18.4.3.1 **VZ_REQ_LTEB13NAC_6478**

When directed to do so by the network, the device shall acquire system information and measurement information of targeted cells using autonomous gaps per section 5.5.3.1 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification* and per 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.18.4.4 MEASUREMENT REPORTING VZ_REQ_LTEB13NAC_23627

4.1.18.4.4.1 VZ_REQ_LTEB13NAC_6479

When directed by the network to do so during handover procedures, the device shall provide the following information in a measurement report for a target HeNB per section 10.5.1.2 of 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2* and section 5.5.5 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*:

- *cellGlobalID* (e-CGI)
- *trackingAreaCode*
- *csgIdentity*
- *csgMemberStatus*

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.18.5 FEMTOCELL CONNECTIVITY INDICATOR VZ_REQ_LTEB13NAC_23629

4.1.18.5.1 VZ_REQ_LTEB13NAC_6484

When a device is attached to the Verizon Wireless LTE network via an eNB whose ID (20 most significant bits of ECI) is within the range 1,024,000 to 1,048,575, the device shall provide an indicator (visual or audible) that the device is currently accessing the Verizon Wireless LTE network via a femtocell.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.19 MEASUREMENT REPORTING VZ_REQ_LTEB13NAC_35801

4.1.19.1 VZ_REQ_LTEB13NAC_35802

When reporting measurement results (as per 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*), the device shall include the following optional fields in the *MeasResults* information element:

- *plmn-IdentityList*

When the measurement report trigger is met (per definition in section 5.5.4 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*), the UE

shall use the order of the frequency/band order in the measObjectToAddModList presented in measConfig IE to scan and report the candidate frequencies/bands.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.20 RRC CONNECTION STATE MISMATCH BETWEEN THE UE AND NETWORK

VZ_REQ_LTEB13NAC_36237

4.1.20.1 VZ_REQ_LTEB13NAC_36238

If the device is in RRC_CONNECTED state and receives a paging message from the network, the device shall assume an RRC connection state mismatch has occurred between the device and the network, and the device shall take the following corrective action:

- After RRC connection is established, the device shall wait a configurable delay. During that delay, any paging message towards the UE shall be ignored. After the delay expires, UE shall start to process paging message towards the UE. If paged, the UE shall transition to RRC_IDLE state and initiate a new RRC connection request to respond to the page from the network.
- This delay shall be configurable from 0 to 10 seconds in 1 second increments on the device via a non-volatile memory setting. The default setting for the delay shall be 5 seconds. The vendor shall provide a lab application to modify this delay setting during device acceptance testing. The device vendor shall not allow the user to modify this delay setting through the device user interface or the remote access user interface for tethered devices.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.21 LOW PRIORITY ACCESS & DELAY TOLERANT UE FEATURE SUPPORT

VZ_REQ_LTEB13NAC_36994

4.1.21.1 VZ_REQ_LTEB13NAC_36995

The device shall support the handling of NAS signalling low priority indication as per Section 4.2A of 3GPP TS 24.301: *Non-Access Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*. The device shall only use low priority indication if indicated to do so based on the contents of the NAS configuration management object, EFNASCONFIG, in the UICC as specified in 3GPP TS 24.368: *Non-Access Stratum (NAS) configuration Management Object (MO)*.

If the device is configured for low priority access per SDM as described above, the device shall support the handling of the *extendedWaitTime* parameter in the *RRConnectionReject* and *RRConnectionRelease* messages as defined in 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*. The device shall only use low priority indication if indicated to do so based on the contents of the NAS configuration management object, *EFNASCONFIG*, in the UICC as specified in 3GPP TS 24.368: *Non-Access Stratum (NAS) configuration Management Object (MO)*.

If the device is configured for low priority access per SDM as described above, the device shall support SIB14 and Extended Access Barring as defined in 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*. The device shall only use Extended Access Barring if indicated to do so based on the contents of the NAS configuration management object, *EFNASCONFIG*, in the UICC as specified in 3GPP TS 24.368: *Non-Access Stratum (NAS) configuration Management Object (MO)*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.22 LTE DOWNLINK MONITORING VZ_REQ_LTEB13NAC_38506

4.1.22.1 VZ_REQ_LTEB13NAC_38507

For all downlink supervision failures that are NOT defined in 3GPP (section 5.3.11 of 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*) during RRC-CONNECTED mode (before or after HO, including MIB/SIB read failure), the device shall consider the cell (the EARFCN/PCI where the device failed downlink supervision) for connectivity/selection/reselection purpose no later than a configurable delay after the failure (for example, continue RRC connection without any interruption fulfills this requirement). This delay shall be configurable from 0 to 10 seconds in 1 second increments on the device via a non-volatile memory setting. The default setting for the delay shall be 5 seconds. The vendor shall provide a lab application to modify this delay setting during device acceptance testing. The device vendor shall not allow the user to modify this delay setting through the device user interface or the remote access user interface for tethered devices.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

4.1.22.2 VZ_REQ_LTEB13NAC_38508

In RRC-CONNECTED mode, any non-essential system information detection failure (non-essential system information are any system information other than *MasterInformationBlock*, *SystemInformationBlockType1*, and *SystemInformationBlockType2*) shall NOT trigger downlink supervision failure and shall not cause any interruption of an existing RRC connection.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB



Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

5 PROVISIONING VZ_REQ_LTEB13NAC_1885

5.1 LTE CREDENTIAL STORAGE VZ_REQ_LTEB13NAC_1886

5.1.1 VZ_REQ_LTEB13NAC_6383

LTE credentials to enable network access shall be stored on the UICC. The device shall retrieve the LTE credentials that are stored in the USIM as defined in 3GPP 31.102: *Characteristics of the Universal Subscriber Identity Module (USIM) application*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

5.2 PROVISIONING SEQUENCE VZ_REQ_LTEB13NAC_1887

5.2.1 VZ_REQ_LTEB13NAC_6384

The device shall support provisioning/updates to the UICC/USIM using the Envelope SMS-PP Data Download as per 3GPP TS 31.111: *Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)* and the Bearer Independent Protocol-related class E commands as specified in ETSI TS 102 223: *Smart cards; Card Application Toolkit (CAT), Release 8*.

Additional requirements related to certification are in development and will be included in a future release.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

5.3 SPECIFIC LTE PROGRAMMING PARAMETERS VZ_REQ_LTEB13NAC_1888

Verizon Wireless implementation details are in development. Additional details will be included in a future release.

5.4 FACTORY LTE PROGRAMMING VZ_REQ_LTEB13NAC_1889

5.4.1 APN'S VZ_REQ_LTEB13NAC_23652

5.4.1.1 VZ_REQ_LTEB13NAC_6385

When the device is operated with a Verizon Wireless UICC, the device shall comply with the requirements in this section. APNs for the IMS PDN, the Administrative PDN, the Internet PDN, and the VZW Application PDN shall be stored on the device in non-volatile memory and factory provisioned with the

- APN Class
- APN Network Identifier
- APN IP Type
- APN Bearer
- APN Enable/Disable
- APN MAXCONN, MAXCONN_T, WAIT_TIME

detailed in the table below:

APN Class	APN NI	APN IP Type**	APN Bearer	APN Enable/Disable	APN MAX_CONN ⁺ and MAX_CONN_T ⁺	APN WAIT_TIME ⁺	Description
1	VZWIMS	IPv4v6	LTE	Enabled	MAX_CONN: 20 MAX_CONN_T: 300	0	Verizon Wireless IMS PDN
2	VZWADMIN	IPv4v6	LTE	Enabled	MAX_CONN: 20 MAX_CONN_T: 300	0	Verizon Wireless Administrative PDN
3	VZWINTERNET	IPv4v6	LTE	Enabled	MAX_CONN: 20 MAX_CONN_T: 300	0	Verizon Wireless Internet PDN
4	VZWAPP	IPv4v6	LTE	Enabled*	MAX_CONN: 20	0	Verizon Wireless Application PDN

					MAX_CONN_T: 300		
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* Per the *UE PDN Support* section of this document, the Verizon Wireless Application PDN applies to handset form factor devices only (i.e. devices that support operation against the head). All other devices (i.e. devices that do not support operation against the head) shall set the APN Enable/Disable for the Verizon Wireless Application PDN to "Disable".

** Per the *Scenarios* section of this document, the device shall set the "PDN Type" to *IPv4v6* for all PDN CONNECTIVITY REQUEST messages regardless of the Type listed in the table above. For the IMS PDN, the network will most likely only provide an IPv6 address.

+ MAX_CONN, MAX_CONN_T, and WAIT_TIME are per the Verizon Wireless LTE Data Retry Requirements.

The device shall provide the capability of updating all APN parameters in the table above through OTADM. Refer to the *OTADM* section of this document for additional details. The device shall not allow the user to update the following APN related parameters through the device user interface or the remote access user interface for tethered devices:

- APN Class
- APN IP Type
- APN Bearer
- APN Enable/Disable
- APN MAXCONN, MAXCONN_T, WAIT_TIME

If any APN parameter in the table above is updated after a PDN connection using the APN has been established, the device shall release the PDN connection and then immediately re-establish the PDN connection using the updated APN parameter(s). If any APN parameter in the table above is updated for an APN for which the device has no current PDN connection, the device shall use the updated APN parameter(s) in all future PDN connections using the APN. Refer to the *Scenarios* section of this document for additional details.

The device shall maintain the contents of the APN table during a device software update, i.e. the contents of the APN table after the software update shall be the same as before the software update.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

5.4.2 SMS FORMAT PARAMETER **VZ_REQ_LTEB13NAC_23653**

5.4.2.1 **VZ_REQ_LTEB13NAC_6386**

The device shall store the `smsformat` parameter described in the table below in non-volatile memory. This



parameter shall be factory provisioned with the parameter set to "3gpp2". Refer to the Verizon Wireless LTE SMS Requirements for additional details.

Parameter	Value	Description
smsformat	3gpp2	The device shall use 3GPP2 SMS format per 3GPP2 C.S0015-A v1.0 "Short Message Service (SMS) for Wideband Spread Spectrum Systems" for SMS over IMS (i.e. SMS messages sent from the device using SMS over IMS)
	3gpp	The device shall use 3GPP SMS format per 3GPP TS 23.204: <i>Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP) access; Stage 2</i> for SMS over IMS (i.e. SMS messages sent from the device using SMS over IMS)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

5.5 USER LTE PROGRAMMING VZ_REQ_LTEB13NAC_1890

5.5.1 SMSWRITEUICC PARAMETER VZ_REQ_LTEB13NAC_23654

VOID

6 PERFORMANCE VZ_REQ_LTEB13NAC_1891

6.1 LTE UE MINIMUM PERFORMANCE REQUIREMENTS VZ_REQ_LTEB13NAC_1892

- Test environments for 3GPP standard RF and signaling conformance shall be per 3GPP TS 36.508: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing.*

6.1.1 LTE RF AND RRM CONFORMANCE REQUIREMENTS VZ_REQ_LTEB13NAC_23655

6.1.1.1 VZ_REQ_LTEB13NAC_6388

The device shall meet all RF and RRM conformance requirements for 3GPP Release 9, including all RF and RRM requirements and conformance test cases defined in:

- 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*
- 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*
- 3GPP TS 36.521-1: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: conformance testing*
- 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing*

with the following exceptions:

- The value used in RF conformance testing (per 3GPP TS 36.521-1: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: conformance testing*) for REFSSENS for a 10 MHz channel in 3GPP Band 13 shall be -97 dBm with an uplink RB allocation of 15 RB starting at RB 0. Refer to the *Receiver Sensitivity ‘QPSK Modulation* section of this document for additional details.
- The tolerance for the UE power class 3 in Table 6.2.2-1 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception* for 3GPP Band 13 shall be +2/-1 dB. Refer to the *Maximum Conducted Output Power* section of this document for additional details.
- For 3GPP Band 13 operation, Table 6.2.5-1 in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception* shall be replaced with the table in the *Configured Output Power* section of this document.

NOTE: 3GPP Band 13 is not included under Note 2 in Table 6.2.2-1 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*. As a result, the 1.5 dB relaxation in the transmitter requirements below for uplink allocations within 4 MHz of a band edge are not applicable to LTE 3GPP Band 13 devices:

- UE maximum output power (section 6.2.2 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*)
- Configured transmitted power (section 6.2.5 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*)
- Power control (section 6.3.5 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS),



Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.1.2 LTE SIGNALING CONFORMANCE [VZ_REQ_LTEB13NAC_23656](#)

6.1.2.1 [VZ_REQ_LTEB13NAC_6389](#)

The device shall meet all signaling requirements for 3GPP Release 9, including all signaling requirements and conformance test cases defined in:

- 3GPP TS 36.523-1: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification*
- The Verizon Wireless LTE Supplementary Signaling Conformance Test Plan

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.1.3 GCF CERTIFICATION [VZ_REQ_LTEB13NAC_23657](#)

6.1.3.1 [VZ_REQ_LTEB13NAC_6390](#)

The device shall be GCF certified for LTE operation in Band 13. Refer to the Verizon Wireless LTE 3GPP Band 13 Device Conformance Test Process for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2 VERIZON WIRELESS-SPECIFIC LTE 3GPP BAND 13 RF PERFORMANCE REQUIREMENTS [VZ_REQ_LTEB13NAC_1893](#)

Verizon Wireless-specific RF performance requirements for 3GPP Band 13 build on the RF minimum performance requirements in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*. Compliance to all Verizon Wireless-specific LTE 3GPP Band 13 RF performance requirements shall be per the Verizon Wireless LTE 3GPP Band 13 Supplementary RF Conformance Test Plan unless indicated otherwise.

6.2.1 MAXIMUM TRANSMITTER OUTPUT POWER AND CONFIGURED OUTPUT POWER [VZ_REQ_LTEB13NAC_23658](#)

6.2.1.1 MAXIMUM CONDUCTED OUTPUT POWER VZ_REQ_LTEB13NAC_23659

6.2.1.1.1 VZ_REQ_LTEB13NAC_6391

The device shall be a UE Power Class 3 device with the following exception: the device conducted output power shall be +22 dBm minimum for all resource block (RB) allocations in a 10 MHz channel where the allowable Maximum Power Reduction (MPR) and Additional Maximum Power Reduction (A-MPR) are both 0 dB (for cases where MPR and A-MPR is applicable, the output power may be reduced by the corresponding values of MPR and A-MPR).

Maximum Power Reduction (MPR) may be applied based on RB allocation size and modulation type per 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.1.2 MAXIMUM RADIATED OUTPUT POWER VZ_REQ_LTEB13NAC_23660

6.2.1.2.1 VZ_REQ_LTEB13NAC_6392

The Total Radiated Power (TRP) shall meet the requirements in the table below for all RB allocations in a 10 MHz channel where the allowable MPR and A-MPR are both 0 dB (for cases where MPR and A-MPR is applicable, the values in the table may be reduced by the corresponding values of MPR and A-MPR).

These requirements apply for all valid mechanical use modes of the device, all antenna types, and for both the antenna extended or retracted in the case of devices with retractable antennas. Valid mechanical modes comprise all the mechanical use modes for the device that an end user would be expected to encounter in the course of normal operation of the device. Radiated output power testing shall be per the Verizon Wireless LTE Over the Air Radiated Performance Test Plan.

For any mode in which the device supports voice operation against the head, the device shall meet the requirements in the table below for all valid mechanical modes of the device for the following:

- Free space (FS)
- Head with right hand phantom, i.e. beside head and hand right side (BHHR)
- Head with left hand phantom, i.e. beside head and hand left side (BHHL)
- Right hand only phantom, i.e. hand right (HR)
- Left hand only phantom, i.e. hand left (HL)

NOTE: If the device supports voice operation against the head in a given mechanical mode but the device does not fit in the CTIA standard hand phantom, then the device shall meet the requirements in the table below for all valid mechanical modes of the device for the following:

- Free space (FS)
- Head phantom only, i.e. beside head (BH) including beside head left side (BHL) and beside head right side (BHR)

In the case of devices that support operation against the head in at least one mode, for any mode in which the device does not support voice operation against the head but does support data operation, the device shall meet the requirements in the table below for all valid mechanical modes of the device for the following:

- Free space (FS)
- Right hand only phantom, i.e. hand right (HR)
- Left hand only phantom, i.e. hand left (HL)

For data-centric devices that do not support voice operation against the head, the device shall meet the requirements in the table below for all valid mechanical modes of the device for the following:

- Free space (FS)

The conducted output power of devices submitted for Verizon Wireless over-the-air performance testing shall not exceed the conducted output power of devices submitted for FCC SAR testing. If the conducted output power of devices submitted for Verizon Wireless over-the-air performance testing exceed the conducted output power of devices submitted for FCC SAR testing, Verizon Wireless will adjust the TRP results downward accordingly to determine compliance to Verizon Wireless TRP requirements.

Device Held Up to Head (Yes/No)	Antenna Type	Device Mode	3GPP Band 13 (dBm, Minimum)			
			FS	BH (BHL and BHR)	BHHR/BHHL	HR/HL
Yes ⁽¹⁾	Embedded	LTE	+18	+13	+8	+13
	Stub Or Retractable	LTE	+19	+16	+11	+16
No ⁽²⁾	All	LTE	+18	N/A	N/A	N/A

(1) "Yes" applies if the device supports a mode of operation against the head.

(2) "No" would be applicable to data centric devices that are not held up to the head, e.g. data cards, USB

dongles, embedded laptop modules, etc.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.1.2.2 RADIATED OUTPUT POWER REDUCTION FOR TABLETS

VZ_REQ_LTEB13NAC_23661

6.2.1.2.2.1 VZ_REQ_LTEB13NAC_6481

Tablet devices may reduce radiated output power to meet FCC SAR requirements. If radiated output reduction is implemented in a tablet device, the tablet device shall meet the following requirements:

- The tablet device shall implement a proximity sensor such that radiated output power reduction is only applied when the tablet device is in close proximity to a human body. The tablet device shall not apply radiated output power reduction when the tablet device is not in close proximity to a human body (e.g. lying on a table).
- The tablet device shall be designed such that the radiated output power reduction needed to meet FCC SAR requirements for LTE operation in 3GPP Band 13 shall not exceed 7 dB.
- The device vendor shall provide a lab application to apply the radiated output power reduction setting during device acceptance testing. The device vendor shall not allow the user to modify the radiated output power setting through the device user interface or the remote access user interface for tethered devices.
- TRP shall be measured and reported with and without the radiated output power reduction applied.

Applicable to: [Modem, Tablet] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.1.3 CONFIGURED OUTPUT POWER VZ_REQ_LTEB13NAC_23662

6.2.1.3.1 VZ_REQ_LTEB13NAC_6393

The device shall meet the requirements in section 6.2.5 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception* with the following exception. For 3GPP Band 13 operation, Table 6.2.5-1 in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception* shall be replaced with the table below:

P _C MAX (dBm)	Tolerance T(P _C MAX) (dB)
21 ≤ P _C MAX ≤ 23	+2.0/-1.0
0 ≤ P _C MAX < 21	+/- 2.0
-40 ≤ P _C MAX < 0	+/- 7.0



Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.2 TRANSMITTER EMISSIONS AND TRANSMIT SIGNAL QUALITY

VZ_REQ_LTEB13NAC_23663

6.2.2.1 NS_06 EMISSIONS VZ_REQ_LTEB13NAC_23664

6.2.2.1.1 VZ_REQ_LTEB13NAC_6394

When attached to the Verizon Wireless LTE network using 3GPP Band 13, the device shall at all times meet the additional spectrum emissions requirements associated with a network signaled value of "NS_06" per 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*. The NS_06 emissions mask insures compliance with FCC Part 27 requirements.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.2.2 NS_07 EMISSIONS VZ_REQ_LTEB13NAC_23665

6.2.2.2.1 VZ_REQ_LTEB13NAC_6395

When signaled by the network, the device shall meet the additional spectrum and spurious emissions requirements associated with a network signaled value of "NS_07" per 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*.

Additional Maximum Power Reduction (A-MPR) may be applied to meet the additional spurious emissions requirement per section 6.2.4 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception* with the following exception: For 3GPP Band 13 operation, Table 6.2.4-2 in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception* shall be replaced with the table below:

Parameters	Region A	Region B		Region C
RB_start ¹	0 - 12	13 18	19 42	43 49
L_CRB ² [RBs]	>= 16	>= 25	<= 30	<= 7
A-MPR [dB]	<= 4	<= 3	0	0
Note				

1. RB_start indicates the lowest RB index of transmitted resource blocks
2. L_CRB is the length of a contiguous resource block allocation
3. For intra-subframe frequency hopping between two regions, notes 1 and 2 apply on a per slot basis.
4. For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe.

If NS_07 is deployed in a cell, Verizon Wireless will also allow the network option to implement PUCCH (Physical Uplink Control Channel) over-provisioning in that cell. As a result, the device shall support PUCCH over-provisioning. In the NS_07 with PUCCH over-dimensioning scenario, the RBs used for transmitting the PUCCH would be within Region B (refer to the NS_07 A-MPR table in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception* for a description of the regions). Unused or "blanked" PUCCH RBs in Regions A and C would be re-allocated for PUSCH (Physical Uplink Shared Channel) transmission. *Verizon Wireless deployment details are in development. Additional details will be included in a future release.*

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.2.3 SPURIOUS EMISSIONS FOR UE CO-EXISTENCE WITH OTHER 3GPP FREQUENCY BANDS [VZ_REQ_LTEB13NAC_23666](#)

6.2.2.3.1 [VZ_REQ_LTEB13NAC_6396](#)

The device shall meet the requirements in the table below for emissions into other 3GPP frequency bands. These emission requirements shall apply to UE transmitter emissions into the downlink bands of 3GPP Bands 2, 4, 5, 10, 12, 14, and 17 (3GPP band definition is per 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*).

Uplink RB Allocation Size	UE Transmit Power	Emission Requirement
≤ 15 RB	\leq Maximum UE output power	≤ -60 dBm/MHz
> 15 RB and ≤ 50 RB	$\leq +10$ dBm	≤ -60 dBm/MHz
> 15 RB and ≤ 50 RB	$> +10$ dBm	≤ -50 dBm/MHz

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.2.4 UE TRANSMITTER LO AND IMAGE SUPPRESSION [VZ_REQ_LTEB13NAC_23667](#)

6.2.2.4.1 **VZ_REQ_LTEB13NAC_6397**

The device shall meet the requirements in the table below for transmitter LO and image suppression.

UE Transmitter Output Power	Limit	
	LO	Image
Output power > 0 dBm	-28 dBc	-30 dB
-30 dBm <= Output power <= 0 dBm	-20 dBc	-25 dB
-40 dBm <= Output power < -30 dBm	-10 dBc	-25 dB

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.2.5 SPURIOUS EMISSIONS FOR UE CO-EXISTENCE WITH GPS

VZ_REQ_LTEB13NAC_23668

6.2.2.5.1 **VZ_REQ_LTEB13NAC_6398**

The device shall meet the requirements in the table below for transmitter emissions into the GPS frequency band for all uplink RB allocations and output power levels.

Frequency	Emission Requirement
1559.00 MHz -1574.42 MHz	<= -60 dBm/MHz
1574.42 MHz -1576.42 MHz	<= -80 dBm/MHz
1576.42 MHz -1610.00 MHz	<= -60 dBm/MHz

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.3 RECEIVER SENSITIVITY ? QPSK MODULATION **VZ_REQ_LTEB13NAC_23669**

6.2.3.1 CONDUCTED SENSITIVITY **VZ_REQ_LTEB13NAC_23670**

6.2.3.1.1 **VZ_REQ_LTEB13NAC_6399**

The device conducted reference sensitivity (with QPSK modulation) shall meet the requirements in the table below for a 10 MHz channel bandwidth:

Maximum Sensitivity	Uplink RB Allocation Size	Minimum UE Transmit Power
-97 dBm, Dual Receiver -94 dBm, Single Receiver	≤ 12 RB	+22 dBm (QPSK)
-97 dBm, Dual Receiver -94 dBm, Single Receiver	> 12 RB and ≤ 15 RB	+21 dBm (QPSK)
-97 dBm, Dual Receiver -94 dBm, Single Receiver	> 15 RB and ≤ 50 RB	+0 dBm (QPSK)

Single receiver testing is per the Verizon Wireless LTE 3GPP Band 13 Supplementary RF Conformance Test Plan.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.3.2 RADIATED SENSITIVITY **VZ_REQ_LTEB13NAC_23671**

6.2.3.2.1 **VZ_REQ_LTEB13NAC_6400**

- To enable radiated receiver performance testing, the device shall support RSS-based TIS measurements as described in section 6.8.2 of the CTIA Test Plan for Wireless Device Over the Air Performance. Refer to section *LTE Test Application for Antenna Testing* of this document for additional details.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.3.2.2 PRIMARY RECEIVER **VZ_REQ_LTEB13NAC_23672**

6.2.3.2.2.1 **VZ_REQ_LTEB13NAC_6401**

The radiated sensitivity of the primary receiver (with QPSK modulation) shall meet the Total Isotropic

Sensitivity (TIS) requirements in the table below for a 10 MHz channel bandwidth (and the uplink RB allocations and associated transmit powers defined in section *Conductor Sensitivity*). TIS measurements are to be based on a single receiver. As a result:

- The device shall support single receiver testing.
- The device shall be tested with the secondary MIMO receiver disabled.

These requirements apply for all valid mechanical use modes of the device, all antenna types, and for both the antenna extended or retracted in the case of devices with retractable antennas. Valid mechanical modes comprise all the mechanical use modes for the device that an end user would be expected to encounter in the course of normal operation of the device. Radiated sensitivity testing shall be per the Verizon Wireless LTE Over the Air Radiated Performance Test Plan.

For any mode in which the device supports voice operation against the head, the device shall meet the requirements in the tables below for all valid mechanical modes of the device for the following:

- Free space (FS)
- Head with right hand phantom, i.e. beside head and hand right side (BHHR)
- Head with left hand phantom, i.e. beside head and hand left side (BHHL)
- Right hand only phantom, i.e. hand right (HR)
- Left hand only phantom, i.e. hand left (HL)

NOTE: If the device supports voice operation against the head in a given mechanical mode but the device does not fit in the CTIA standard hand phantom, then the device shall meet the requirements in the tables below for all valid mechanical modes of the device for the following:

- Free space (FS)
- Head phantom only, i.e. beside head (BH) including beside head left side (BHL) and beside head right side (BHR)

In the case of devices that support operation against the head in at least one mode, for any mode in which the device does not support voice operation against the head but does support data operation, the device shall meet the requirements in the tables below for all valid mechanical modes of the device for the following:

- Free space (FS)
- Right hand only phantom, i.e. hand right (HR)
- Left hand only phantom, i.e. hand left (HL)

For data-centric devices that do not support voice operation against the head, the device shall meet the requirements in the tables below for all valid mechanical modes of the device for the following:

- Free space (FS)

Primary receiver TIS requirement for 10 MHz channel bandwidth.

Device Held Up to Head (Yes/No)	Antenna Type	Device Mode	3GPP Band 13 (dBm, Maximum)			
			FS	BH (BHL and BHR)	BHHR/BHHL	HR/HL
Yes ⁽¹⁾	Embedded	LTE	-91	-86	-80	-86
	Stub Or Retractable	LTE	-91	-88	-82	-88
No ⁽²⁾	All	LTE	-91	N/A	N/A	N/A

(1) "Yes" applies if the device supports a mode of operation against the head.

(2) "No" would be applicable to data centric devices that are not held up to the head, e.g. data cards, USB dongles, embedded laptop modules, etc.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.3.2.3 SECONDARY MIMO RECEIVER VZ_REQ_LTEB13NAC_23673

6.2.3.2.3.1 VZ_REQ_LTEB13NAC_6402

The radiated sensitivity of the secondary MIMO receiver (with QPSK modulation) shall meet the Total Isotropic Sensitivity (TIS) requirements in the tables below for a 10 MHz channel bandwidth (and the uplink RB allocations and associated transmit powers defined in section *Conducted Sensitivity*). TIS measurements are to be based on a single receiver. As a result:

- The device shall support single receiver testing.
- The device shall be tested with the primary receiver disabled.

These requirements apply for all valid mechanical use modes of the device, all antenna types, and for both the antenna extended or retracted in the case of devices with retractable antennas. Valid mechanical modes comprise all the mechanical use modes for the device that an end user would be expected to encounter in the course of normal operation of the device. Radiated sensitivity testing shall be per the Verizon Wireless LTE Over the Air Radiated Performance Test Plan.

For any mode in which the device supports voice operation against the head, the device shall meet the requirements in the tables below for all valid mechanical modes of the device for the following:



- Free space (FS)
- Head with right hand phantom, i.e. beside head and hand right side (BHHR)
- Head with left hand phantom, i.e. beside head and hand left side (BHHL)
- Right hand only phantom, i.e. hand right (HR)
- Left hand only phantom, i.e. hand left (HL)

NOTE: If the device supports voice operation against the head in a given mechanical mode but the device does not fit in the CTIA standard hand phantom, then the device shall meet the requirements in the tables below for all valid mechanical modes of the device for the following:

- Free space (FS)
- Head phantom only, i.e. beside head (BH) including beside head left side (BHL) and beside head right side (BHR)

In the case of devices that support operation against the head in at least one mode, for any mode in which the device does not support voice operation against the head but does support data operation, the device shall meet the requirements in the tables below for all valid mechanical modes of the device for the following:

- Free space (FS)
- Right hand only phantom, i.e. hand right (HR)
- Left hand only phantom, i.e. hand left (HL)

For data-centric devices that do not support voice operation against the head, the device shall meet the requirements in the tables below for all valid mechanical modes of the device for the following:

- Free space (FS)

Secondary/MIMO receiver TIS requirement for 10 MHz channel bandwidth.

Device Held Up to Head (Yes/No)	Antenna Type	Device Mode	3GPP Band 13 (dBm, Maximum)			
			FS	BH (BHL and BHR)	BHHR/BHHL	HR/HL
Yes ⁽¹⁾	Embedded	LTE	-88	-83	-77	-83
	Stub Or Retractable	LTE	-88	-85	-79	-85
No ⁽²⁾	All	LTE	-88	N/A	N/A	N/A

Device Held Up to Head (Yes/No)	Antenna Type	Device Mode	Difference between Primary Receiver TIS and Secondary Receiver TIS (dB, Maximum)			
			FS	BH (BHL and BHR)	BHHR/BHHL	HR/HL
Yes ⁽¹⁾	All	LTE	6	6	6	6
No ⁽²⁾	All	LTE	3	N/A	N/A	N/A

(1) "Yes" applies if the device supports a mode of operation against the head.

(2) "No" would be applicable to data centric devices that are not held up to the head, e.g. data cards, USB dongles, embedded laptop modules, etc

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.3.2.4 MIMO ANTENNA ENVELOPE CORRELATION COEFFICIENT

VZ_REQ_LTEB13NAC_23674

6.2.3.2.4.1 VZ_REQ_LTEB13NAC_6403

The MIMO antenna envelope correlation coefficient for the device shall be less than or equal to 0.5. This requirement applies for all valid mechanical use modes of the device, all antenna types, and for both the antennas extended or retracted in the case of devices with retractable antennas. Valid mechanical modes comprise all the mechanical use modes for the device that an end user would be expected to encounter in the course of normal operation of the device. Antenna correlation coefficient testing shall be per the Verizon Wireless LTE Over the Air Radiated Performance Test Plan.

For any mode in which the device supports voice operation against the head, the device shall meet the MIMO antenna envelope correlation coefficient requirement above for all valid mechanical modes of the device for the following:

- Free space (FS)
- Head with right hand phantom, i.e. beside head and hand right side (BHHR)
- Head with left hand phantom, i.e. beside head and hand left side (BHHL)
- Right hand only phantom, i.e. hand right (HR)
- Left hand only phantom, i.e. hand left (HL)

NOTE: If the device supports voice operation against the head in a given mechanical mode but the device does not fit in the CTIA standard hand phantom, then the device shall meet the MIMO antenna envelope correlation

coefficient requirement above for all valid mechanical modes of the device for the following:

- Free space (FS)
- Head phantom only, i.e. beside head (BH) including beside head left side (BHL) and beside head right side (BHR)

In the case of devices that support operation against the head in at least one mode, for any mode in which the device does not support voice operation against the head but does support data operation, then the device shall meet the MIMO antenna envelope correlation coefficient requirement above for all valid mechanical modes of the device for the following:

- Free space (FS)
- Right hand only phantom, i.e. hand right (HR)
- Left hand only phantom, i.e. hand left (HL)

For data-centric devices that do not support voice operation against the head, the device shall meet the MIMO antenna envelope correlation coefficient requirement above for all valid mechanical modes of the device for the following:

- Free space (FS)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.4 RECEIVER OUT-OF-BAND INTERFERERS **VZ_REQ_LTEB13NAC_23675**

6.2.4.1 BLOCKING **VZ_REQ_LTEB13NAC_23676**

6.2.4.1.1 **VZ_REQ_LTEB13NAC_6404**

The device receiver shall be capable of rejecting the inband and out-of-band signals in the table below:

Signal Type	Center Frequency	Channel BW	Signal Level
ATSC	689 MHz	6 MHz	-15 dBm
ATSC	695 MHz	6 MHz	-15 dBm
LTE	719 MHz	5 MHz	-44 dBm
LTE	723 MHz	10 MHz	-44 dBm
LTE	731.5 MHz	5 MHz	-44 dBm
LTE	735 MHz	10 MHz	-44 dBm

LTE	741 MHz	10 MHz	-44 dBm
LTE	743.5 MHz	5 MHz	-44 dBm
LTE	760.5 MHz	5 MHz	-44 dBm
LTE	763 MHz	10 MHz	-44 dBm
CW tone	769-775 MHz	N/A	-30 dBm

For additional details on ATSC signals, refer to A/53: *ATSC Digital Television Standard, Parts 1-6, 2007*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.4.2 INTERMODULATION **VZ_REQ_LTEB13NAC_23677**

6.2.4.2.1 **VZ_REQ_LTEB13NAC_6405**

The device receiver shall be capable of rejecting intermodulation distortion from the following pairs of out-of-band signals:

Pair #	Interferer #1 (type, center frequency, channel BW, level)	Interferer #2 (type, center frequency, channel BW, level)
1	ATSC, 689 MHz, 6 MHz, -15 dBm	LTE, 719.5 MHz, 5 MHz, -44 dBm
2	ATSC, 695 MHz, 6 MHz, -15 dBm	LTE, 723 MHz, 10 MHz, -44 dBm
3	LTE, 738.5 MHz, 5 MHz, -44 dBm	LTE, 743.5 MHz, 5 MHz, -44 dBm
4	LTE, 719.5 MHz, 5 MHz, -44 dBm	LTE, 735 MHz, 10 MHz, -44 dBm
5	LTE, 719.5 MHz, 5 MHz, -44 dBm	LTE, 739 MHz, 10 MHz, -44 dBm
6	LTE, 723 MHz, 10 MHz, -44 dBm	LTE, 735 MHz, 10 MHz, -44 dBm
7	LTE, 723 MHz, 10 MHz, -44 dBm	LTE, 739 MHz, 10 MHz, -44 dBm
8	LTE, 731.5 MHz, 5 MHz, -44 dBm	LTE, 741 MHz, 10 MHz, -44 dBm
9	LTE, 735 MHz, 10 MHz, -44 dBm	LTE, 743.5 MHz, 5 MHz, -44 dBm
10	LTE, 760.5 MHz, 5 MHz, -44 dBm	LTE, 765.5 MHz, 5 MHz, -44 dBm
11	LTE, 763 MHz, 10 MHz, -44 dBm	CW tone, 775 MHz, -30 dBm
12	LTE, 760.5 MHz, 5 MHz, -44 dBm	CW tone, 770 MHz, -30 dBm
13	LTE, 765.5 MHz, 5 MHz, -44 dBm	CW tone, 775 MHz, -30 dBm
14	LTE, 701.5 MHz, 5 MHz, -25 dBm	LTE, 723 MHz, 10 MHz, -44 dBm
15	LTE, 712.5 MHz, 5 MHz, -25 dBm	LTE, 734 MHz, 10 MHz, -44 dBm

For additional details on ATSC signals, refer to A/53: *ATSC Digital Television Standard, Parts 1-6, 2007*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.5 RF PERFORMANCE OVER TEMPERATURE AND VOLTAGE

VZ_REQ_LTEB13NAC_23678

6.2.5.1 AMBIENT TEMPERATURE VZ_REQ_LTEB13NAC_23679

6.2.5.1.1 VZ_REQ_LTEB13NAC_6406

Verizon Wireless-specific RF performance requirements for 3GPP Band 13 apply across the temperature ranges for both the normal and extreme conditions defined in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.5.1.2 VZ_REQ_LTEB13NAC_6407

The device vendor may design the device to operate over an extreme temperature range that extends from -30° to $+60^{\circ}$ C. For devices designed to operate over an extreme temperature range of -30° to $+60^{\circ}$ C, 3GPP UE minimum performance requirements per the *LTE UE Minimum Performance Requirements* section of this document and Verizon Wireless-specific RF performance requirements for 3GPP Band 13 apply across the temperature ranges for both the normal and extreme conditions defined in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception* with the following exceptions:

- The extreme temperature range (refer to section E.2.1 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*) shall be -30° to $+60^{\circ}$ C.
- At ambient temperatures greater than $+55^{\circ}$ C, the following RF requirements may be relaxed:
 - The conducted output power in the *Maximum Conducted Output Power* section of this document may be relaxed by 2 dB, i.e. the device may apply an additional A-MPR of 2 dB for all uplink RB allocations.
 - The maximum radiated output power (i.e. TRP) in the *Maximum Radiated Output Power* section of this document may be relaxed by 2 dB.
 - The dual receiver and single receiver sensitivity requirements in the *Conducted Sensitivity* section of this document may be relaxed by 2 dB.
 - The radiated sensitivity requirement (i.e. TIS) for the primary receiver in the *Radiated Sensitivity*

section of this document may be relaxed by 2 dB.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.2.5.2 POWER SUPPLY/BATTERY VOLTAGE [VZ_REQ_LTEB13NAC_23680](#)

6.2.5.2.1 [VZ_REQ_LTEB13NAC_6408](#)

The device manufacturer shall provide the range of operating power supply/battery voltages for the device. The device shall comply with the voltage requirements in 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*, and 3GPP TS 36.508: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing*. Verizon Wireless-specific RF performance requirements for 3GPP Band 13 apply across the operating voltage of the device.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.3 LTE DATA CALL PERFORMANCE [VZ_REQ_LTEB13NAC_1894](#)

The requirements in this section assume an optimal network environment, i.e.:

- One UE per cell
- eNodeB, Serving Gateway, and PDN Gateway are co-located

6.3.1 NETWORK ATTACHMENT TIME [VZ_REQ_LTEB13NAC_23681](#)

6.3.1.1 [VZ_REQ_LTEB13NAC_6409](#)

The average LTE network attachment time shall be less than 120 ms where the network attach time is defined as the control plane latency from the *RRCConnectionSetupComplete* message from the UE with the "ATTACH REQUEST" NAS message until both the "ATTACH COMPLETE" and the "ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT" NAS messages are received by the MME. Compliance to this requirement shall be per the Verizon Wireless LTE 3GPP Band 13 Data Throughput Test Plan.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]



6.3.2 TRANSITION FROM RRC_IDLE TO RRC_CONNECTED VZ_REQ_LTEB13NAC_23682

6.3.2.1 VZ_REQ_LTEB13NAC_6410

The average control plane latency for the transition from the RRC_IDLE state (i.e. EMM-REGISTERED and EMM-IDLE) to the RRC_CONNECTED state (i.e. EMM-REGISTERED and EMM-CONNECTED) shall be less than 100ms for a UE that is registered on the LTE network. The control plane latency is defined as the time from the *RRConnectionSetupComplete* message from the UE with the "SERVICE REQUEST" NAS message until the MME receives the "INITIAL CONTEXT SETUP RESPONSE" NAS message. Compliance to this requirement shall be per the Verizon Wireless LTE 3GPP Band 13 Data Throughput Test Plan.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.3.3 ROUND TRIP DELAY VZ_REQ_LTEB13NAC_23683

6.3.3.1 VZ_REQ_LTEB13NAC_6411

The average user plane round trip delay as measured using 32 byte pings shall be less than 25 ms when the device is in the RRC_CONNECTED state and pings a server connected directly to the PDN Gateway. Compliance to this requirement shall be per the Verizon Wireless LTE 3GPP Band 13 Data Throughput Test Plan.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.3.4 DATA THROUGHPUT PERFORMANCE VZ_REQ_LTEB13NAC_23684

Compliance to the LTE data throughput performance requirements shall be per the Verizon Wireless LTE 3GPP Band 13 Data Throughput Test Plan.

6.3.4.1 DOWNLINK DATA THROUGHPUT VZ_REQ_LTEB13NAC_23685

6.3.4.1.1 VZ_REQ_LTEB13NAC_6412

The device shall be capable of meeting the downlink data throughput requirements in the table below:

UE Category	Peak Physical Layer Throughput*	Average Throughput Range at the
-------------	---------------------------------	---------------------------------



	(Mbps)	TCP/UDP Layer** (Mbps)
1	10	0.050 to ≥ 8.2
2	50	0.050 to ≥ 41.0
≥ 3	73	0.050 to ≥ 51.6

* In a channel without impairments and with sufficient SNR, the device shall be capable of supporting the peak downlink data throughput rate at the physical layer for its given UE Category operating in a 10 MHz channel with the maximum possible transport block size and two layer spatial multiplexing per 3GPP TS 36.306: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities* and 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

** The device shall be capable of operating across this entire range of throughput values for a 10 MHz channel, and dependent on channel conditions (i.e. modulation and coding, signal strength, AWGN, multipath, fading).
Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.3.4.2 UPLINK DATA THROUGHPUT VZ_REQ_LTEB13NAC_23686

6.3.4.2.1 VZ_REQ_LTEB13NAC_6413

The device shall be capable of meeting the uplink data throughput requirements in the table below:

UE Category	Peak Physical Layer Throughput* (Mbps)	Average Throughput Range at the TCP/UDP Layer** (Mbps)
1	5	0.050 to ≥ 3.8
2	25	0.050 to ≥ 19.0
≥ 3	28	0.050 to ≥ 19.0

* In a channel without impairments and with sufficient SNR, the device shall be capable of supporting the peak uplink data throughput rate at the physical layer for its given UE Category operating in a 10 MHz channel with the maximum possible transport block size as per 3GPP TS 36.306: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities* and 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*.

** The device shall be capable of operating across this entire range of throughput values for a 10 MHz channel, and dependent on channel conditions (i.e. modulation and coding, signal strength, AWGN, multipath, fading).
Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]



6.3.5 LTE-TO-LTE HANDOVER PERFORMANCE VZ_REQ_LTEB13NAC_23687

6.3.5.1 VZ_REQ_LTEB13NAC_6414

LTE-to-LTE handover performance shall be per 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management* and 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.4 VERIZON WIRELESS-SPECIFIC LTE 3GPP BAND 13 RRM PERFORMANCE REQUIREMENTS VZ_REQ_LTEB13NAC_1895

Verizon Wireless-specific RRM performance requirements for 3GPP Band 13 build on the RRM minimum performance requirements in 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*. Compliance to all Verizon Wireless-specific LTE 3GPP Band 13 RRM performance requirements shall be per the Verizon Wireless LTE 3GPP Band 13 Supplementary RRM Conformance Test Plan unless indicated otherwise.

6.4.1 RSRP ACCURACY VZ_REQ_LTEB13NAC_23688

6.4.1.1 RSRP ABSOLUTE ACCURACY VZ_REQ_LTEB13NAC_23690

6.4.1.1.1 VZ_REQ_LTEB13NAC_6420

The device shall meet the requirements in the table below for the absolute accuracy of RSRP measurements in RRC_CONNECTED mode (with and without connected mode DRX) and with L3 filtering enabled.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	Io
Intra-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	±4	±6	-121dBm/15kHz & -50dBm/ BW _{Channel}
Inter-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	±4	±6	-121dBm/15kHz & -50dBm/ BW _{Channel}



Note 1. I_{o} is assumed to have constant EPRE across the bandwidth.

The device shall meet the accuracy requirements in the table below for the mean of the absolute RSRP values in RRC_IDLE mode with a default idle mode DRX setting of 1.28 seconds.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	I_{o}
Intra-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 4	± 6	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 4	± 6	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. I_{o} is assumed to have constant EPRE across the bandwidth.

The device shall meet the accuracy requirements in the table below for the standard deviation of the absolute RSRP values in RRC_IDLE mode with a default idle mode DRX setting of 1.28 seconds.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	I_{o}
Intra-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	$\pm \text{FFS}$	$\pm \text{FFS}$	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	$\pm \text{FFS}$	$\pm \text{FFS}$	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. I_{o} is assumed to have constant EPRE across the bandwidth.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.4.1.1.2 VZ_REQ_LTEB13NAC_37647

With feICIC, the device shall meet the requirements in the table below for the absolute accuracy of RSRP measurements in RRC_CONNECTED mode (with and without connected mode DRX) and with L3 filtering enabled.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	I_{o}
Intra-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -9.46$ dB	dBm	± 4	± 6	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. I_o is assumed to have constant EPRE across the bandwidth.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

6.4.1.2 RSRP RELATIVE ACCURACY VZ_REQ_LTEB13NAC_23691

6.4.1.2.1 VZ_REQ_LTEB13NAC_6421

The device shall meet the requirements in the table below for the relative accuracy of RSRP measurements in RRC_CONNECTED mode (with and without connected mode DRX) and with L3 filtering enabled.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	I_o
Intra-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 2	± 3	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 4	± 6	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. I_o is assumed to have constant EPRE across the bandwidth.

Note 2. The parameter \hat{E}_s/lot is the minimum \hat{E}_s/lot of the pair of cells.to which the requirement applies.

The device shall meet the accuracy requirements in the table below for the mean of the relative RSRP values in RRC_IDLE mode with a default idle mode DRX setting of 1.28 seconds.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	I_o
Intra-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 2	± 3	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 4	± 6	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. I_o is assumed to have constant EPRE across the bandwidth.

Note 2. The parameter \hat{E}_s/lot is the minimum \hat{E}_s/lot of the pair of cells.to which the requirement applies.

The device shall meet the accuracy requirements in the table below for the standard deviation of the relative RSRP values in RRC_IDLE mode with a default idle mode DRX setting of 1.28 seconds.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
				I_o

			-30° to +60°C	
Intra-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	$\pm\text{FFS}$	$\pm\text{FFS}$	-121dBm/15kHz & -50dBm/ $\text{BW}_{\text{Channel}}$
Inter-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	$\pm\text{FFS}$	$\pm\text{FFS}$	-121dBm/15kHz & -50dBm/ $\text{BW}_{\text{Channel}}$
Note 1. I_0 is assumed to have constant EPRE across the bandwidth.				
Note 2. The parameter \hat{E}_s/lot is the minimum \hat{E}_s/lot of the pair of cells.to which the requirement applies.				

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.4.1.2.2 **VZ_REQ_LTEB13NAC_37648**

With feICIC, the device shall meet the requirements in the table below for the relative accuracy of RSRP measurements in RRC_CONNECTED mode (with and without connected mode DRX) and with L3 filtering enabled.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	I_0
Intra-Frequency RSRP for $\hat{E}_s/\text{lot} \geq -9.46$ dB	dBm	± 2	± 3	-121dBm/15kHz & -50dBm/ $\text{BW}_{\text{Channel}}$
Note 1. I_0 is assumed to have constant EPRE across the bandwidth.				

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

6.4.2 RSRQ ACCURACY **VZ_REQ_LTEB13NAC_23689**

6.4.2.1 RSRQ ABSOLUTE ACCURACY **VZ_REQ_LTEB13NAC_23692**

6.4.2.1.1 **VZ_REQ_LTEB13NAC_6422**

The device shall meet the requirements in the table below for the absolute accuracy of RSRQ measurements in RRC_CONNECTED mode (with and without connected mode DRX) and with L3 filtering enabled.



Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	Io
Intra-Frequency RSRQ when RSRP $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 2.5	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRQ when RSRP $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 2.5	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. Io is assumed to have constant EPRE across the bandwidth.

The device shall meet the accuracy requirements in the table below for the mean of the absolute RSRQ values in RRC_IDLE mode with a default idle mode DRX setting of 1.28 seconds.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	Io
Intra-Frequency RSRQ when RSRP $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 2.5	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRQ when RSRP $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 2.5	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. Io is assumed to have constant EPRE across the bandwidth.

The device shall meet the accuracy requirements in the table below for the standard deviation of the absolute RSRQ values in RRC_IDLE mode with a default idle mode DRX setting of 1.28 seconds.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	Io
Intra-Frequency RSRQ when RSRP $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	$\pm \text{FFS}$	$\pm \text{FFS}$	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRQ when RSRP $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	$\pm \text{FFS}$	$\pm \text{FFS}$	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. Io is assumed to have constant EPRE across the bandwidth.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.4.2.1.2 VZ_REQ_LTEB13NAC_37649

With feICIC, the device shall meet the requirements in the table below for the absolute accuracy of RSRQ measurements in RRC_CONNECTED mode (with and without connected mode DRX) and with L3 filtering enabled.

Parameter	Unit	Accuracy [dB]	Conditions ¹
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		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	lo
Intra-Frequency RSRQ for $\hat{E}_s/\text{lot} \geq -9.46$ dB	dBm	± 2.5	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. lo is assumed to have constant EPRE across the bandwidth.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

6.4.2.2 RSRQ RELATIVE ACCURACY [VZ_REQ_LTEB13NAC_23693](#)

6.4.2.2.1 [VZ_REQ_LTEB13NAC_6423](#)

The device shall meet the requirements in the table below for the relative accuracy of RSRQ measurements in RRC_CONNECTED mode (with and without connected mode DRX) and with L3 filtering enabled.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	lo
Intra-Frequency RSRQ when $\text{RSRP } \hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 3	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRQ when $\text{RSRP } \hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 3	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. lo is assumed to have constant EPRE across the bandwidth.

Note 2. The parameter \hat{E}_s/lot is the minimum \hat{E}_s/lot of the pair of cells.to which the requirement applies.

The device shall meet the accuracy requirements in the table below for the mean of the relative RSRQ values in RRC_IDLE mode with a default idle mode DRX setting of 1.28 seconds.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	lo
Intra-Frequency RSRQ when $\text{RSRP } \hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 3	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}
Inter-Frequency RSRQ when $\text{RSRP } \hat{E}_s/\text{lot} \geq -6$ dB	dBm	± 3	± 4	-121dBm/15kHz & -50dBm/ BW_{Channel}

Note 1. lo is assumed to have constant EPRE across the bandwidth.

Note 2. The parameter \hat{E}_s/lot is the minimum \hat{E}_s/lot of the pair of cells.to which the requirement applies.

The device shall meet the accuracy requirements in the table below for the standard deviation of the relative RSRQ values in RRC_IDLE mode with a default idle mode DRX setting of 1.28 seconds.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	lo
Intra-Frequency RSRQ when RSRP $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	±FFS	±FFS	-121dBm/15kHz & -50dBm/ BW _{Channel}
Inter-Frequency RSRQ when RSRP $\hat{E}_s/\text{lot} \geq -6$ dB	dBm	±FFS	±FFS	-121dBm/15kHz & -50dBm/ BW _{Channel}
Note 1. lo is assumed to have constant EPRE across the bandwidth.				
Note 2. The parameter \hat{E}_s/lot is the minimum \hat{E}_s/lot of the pair of cells.to which the requirement applies.				

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Femtocell, Jet Pack, Modem, Module, Netbook/Laptop, Router, Set-Top Box (VMS), Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.4.2.2.2 VZ_REQ_LTEB13NAC_37650

With feICIC, the device shall meet the requirements in the table below for the relative accuracy of RSRQ measurements in RRC_CONNECTED mode (with and without connected mode DRX) and with L3 filtering enabled.

Parameter	Unit	Accuracy [dB]		Conditions ¹
		0° to +40°C	-10° to +55°C	Band 13
			-30° to +60°C	lo
Intra-Frequency RSRQ for $\hat{E}_s/\text{lot} \geq -9.46$ dB	dBm	±3	±4	-121dBm/15kHz & -50dBm/ BW _{Channel}
Note 1. lo is assumed to have constant EPRE across the bandwidth.				

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded]

6.5 feICIC Performance VZ_REQ_LTEB13NAC_36962

6.5.1 VZ_REQ_LTEB13NAC_36963



The device shall support and meet the E-UTRAN FDD UE inter-frequency measurements requirements (including cell detection/identification criteria) as specified in section 8.1.2.8.1, 8.1.2.8.3, Annex A.8.1.7, A.8.1.8, B.2.8, B.2.9 of 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.5.2 VZ_REQ_LTEB13NAC_36964

The device shall support and meet the E-UTRAN FDD UE Rx-Tx Time Difference Measurements requirements (including cell detection criteria) as specified in section 8.1.2.9.1, 8.1.2.9.3, 9.1.9.3, 9.1.9.4, A.9.7.3, A.9.7.5 of 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.5.3 VZ_REQ_LTEB13NAC_36965

The device shall support and meet RLM (Radio Link Monitoring) for MBSFN ABS and non-MBSFN ABS requirements handling CRS assistance information as specified in section 7.6.1, 7.6.2, Annex A.7.3.9, A.7.3.11, A.7.3.13, A.7.3.15, A.7.3.17, A.7.3.19, A.7.3.21 of 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.5.4 VZ_REQ_LTEB13NAC_36966

The device shall support and meet **the more stringent requirement** between either the RSRP and RSRQ measurement accuracy requirements in this document or the RSRP and RSRQ measurement accuracy requirements as specified in section 9.1.2.3, 9.1.2.4, 9.1.2.5, 9.1.2.6, 9.1.5.2, 9.1.5.3, Annex A.9.1.8, A.9.1.10, A.9.1.14, A.9.2.7, A.9.2.9, A.9.2.13, A.9.2.15, B.3.9, B.3.10, B.3.11, B.3.12 of 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management* as follows:

- RSRP and RSRQ accuracy values shall use values defined in section 6.4 of this document
- \hat{E}_s/I_{ot} threshold shall use values specified in section 9.1.2.3, 9.1.2.4, 9.1.2.5, 9.1.2.6, 9.1.5.3, Annex A.9.1.14, A.9.2.15, B.3.11, B.3.12 of 3GPP TS 36.133

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.5.5 VZ_REQ_LTEB13NAC_36967

The device shall support and meet PDSCH, PDCCH/PCFICH and PHICH demodulation requirements for transmit diversity, open-loop spatial multiplexing, close-loop spatial multiplexing, as specified in section "8.2.1.2.3, 8.2.1.2.3A", "8.2.1.3.3, 8.2.1.3.4", 8.2.1.4.1C, "8.4.1.2.3, 8.4.1.2.4", "8.5.1.2.3, 8.5.1.2.4", A.3.1.1, A.3.5, C3.3 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA) and User Equipment(UE) Radio Transmission and Reception*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.5.6 VZ_REQ_LTEB13NAC_36968

The device shall support and meet the PBCH demodulation requirements for transmit diversity, open-loop spatial multiplexing, close-loop spatial multiplexing, as specified in section 8.6.1.2.3 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA) and User Equipment(UE) Radio Transmission and Reception*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.5.7 VZ_REQ_LTEB13NAC_36969

The device shall support and meet the CSI, CQI and RI reporting requirements, as specified in section 9.2.1.3, 9.2.1.5, 9.3.1.1.3, 9.5.3.1, 9.5.4.1 of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA) and User Equipment(UE) Radio Transmission and Reception*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.5.8 VZ_REQ_LTEB13NAC_37651

The device shall support CRS IC capability when there is zero ABS subframe configured to achieve the following benefits in a macro-macro cell configuration:

- With colliding CRS
 - Channel estimation improvement (energy, phase)
 - Improves PDSCH decoding as well (UE throughput)
 - Better RSRP accuracy (benefit from averaging channel estimation over energy) than **the more stringent requirement** between either the RSRP and RSRQ measurement accuracy requirements in this document or the RSRP and RSRQ measurement accuracy requirements as specified in section 9.1.2.5, 9.1.2.6, 9.1.5.3, Annex A.9.1.14, A.9.2.15, B.3.11, B.3.12 of 3GPP TS 36.133
- With non-colliding CRS
 - Improved PDCCH and PDSCH decoding results (removing CRS tones from noise estimate for



better UE throughput)

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.6 LTE CoMP (Coordinated Multi-Point) RF and RRM Performance

VZ_REQ_LTEB13NAC_37815

6.6.1 VZ_REQ_LTEB13NAC_37816

The device shall support and meet PDSCH demodulation performance requirements with UE-specific reference signals for single-layer and dual-layer spatial multiplexing, as specified in sections 8.3.1.1, 8.3.1.1A, 8.3.1.1B, 8.3.1.2 of the Release 11 version of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment(UE) Radio Transmission and Reception*.

The device shall support and meet CSI (CQI, PMI, and RI) reporting performance requirements, as specified in sections 9.2.3.1, 9.3.1.2.1, 9.3.2.2.1, 9.3.5.2.1, 9.4.1.3.1, 9.4.2.3.1, 9.5.2.1 of the Release 11 version of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment(UE) Radio Transmission and Reception*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.6.2 VZ_REQ_LTEB13NAC_37817

The device shall support and meet PDSCH demodulation performance requirements with UE-specific reference signals for DCI format 2D and non Quasi Co-located Antenna Ports, as specified in sections 8.3.1.3 of the Release 11 version of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment(UE) Radio Transmission and Reception*.

The device shall support and meet CSI (CQI and RI) reporting performance requirements, as specified in sections 9.2.4.1, 9.3.6.1, 9.5.5.1 of the Release 11 version of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment(UE) Radio Transmission and Reception*.

Applicable to: [4G Basic Phone, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

6.7 ePDCCH Performance VZ_REQ_LTEB13NAC_38377

6.7.1 VZ_REQ_LTEB13NAC_38378

The device shall support and meet EPDCCH demodulation performance requirements for both distributed and localized transmission type, as specified in sections 8.8.1.1, 8.8.2.1, 8.8.3.1 of the release 11 version of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment(UE) Radio Transmission and Reception*.

The device shall meet sustained downlink data rate performance requirements with EPDCCH scheduling, as specified in section 8.7.3 of the release 11 version of 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment(UE) Radio Transmission and Reception*.

Applicable to: [4G Basic Phone, Connected Device, Feature Phone, Jet Pack, Modem, Module, Netbook/Laptop, Router, Smart Phone, Tablet, USB Modem] - Scope: [Branded, LRA (LTE in Rural America), Open Access, Open Development, Wholesale]

7 REQUIRED VERIZON WIRELESS DEVICE COMPLIANCE TEST PLANS VZ_REQ_LTEB13NAC_1896

Refer to the Verizon Wireless LTE 3GPP Band 13 Device Conformance Test Process.

8 REFERENCES VZ_REQ_LTEB13NAC_1897

<Industry Standards References>

Change requests may cause modification to the specifications listed below. Please refer to www.3gpp.org for the latest version of the 3GPP specifications. Verizon Wireless LTE 3GPP Band 13 specifications are available at opennetwork.verizonwireless.com.

1. 3GPP TS 21.201: *Technical Specifications and Technical Reports relating to an Evolved Packet System (EPS) based 3GPP system*, Release 9
2. 3GPP TR 21.900: *Technical Specification Group working methods*, Release 9
3. 3GPP TS 22.016: *International Mobile Equipment Identities (IMEI)*, Release 9
4. 3GPP TS 22.220: *Service requirements for Home Node B (HNB) and Home eNode B (HeNB)*, Release 9
5. 3GPP TS 23.003: *Numbering, addressing and identification*, Release 9
6. 3GPP TS 23.038: *Alphabets and language-specific information*, Release 9
7. 3GPP TS 23.040: *Technical realization of Short Message Service (SMS)*, Release 9
8. 3GPP TS 23.041: *Technical realization of Cell Broadcast Service (CBS)*, Release 9
9. 3GPP TS 23.060: *General Packet Radio Service (GPRS); Service description; Stage 2*, Release 9
10. 3GPP TS 23.122: *Non-Access Stratum (NAS) functions related to Mobile Station (MS) in idle mode*, Release 9
11. 3GPP TS 23.203: *Policy and charging control architecture*, Release 9
12. 3GPP TS 23.204: *Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP)*

access; Stage 2, Release 9

13. 3GPP TS 23.401: *General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access*, Release 9
14. 3GPP TS 24.007: *Mobile radio interface signalling layer 3; General Aspects*, Release 9
15. 3GPP TS 24.008: *Mobile radio interface Layer 3 specification; Core network protocols; Stage 3*, Release 9
16. 3GPP TS 24.167: *3GPP IMS Management Object (MO); Stage 3*, Release 9
17. 3GPP TS 24.229: *Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*, Release 9
18. 3GPP TS 24.301: *Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3*, Release 9
19. 3GPP TS 29.061: *Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)*, Release 9
20. 3GPP TS 29.274: *3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3*, Release 9
21. 3GPP TS 29.275: *Proxy Mobile IPv6 (PMIPv6) based Mobility and Tunnelling protocols; Stage 3*, Release 9
22. 3GPP TS 31.101: *UICC-terminal interface; Physical and logical characteristics*, Release 9
23. 3GPP TS 31.102: *Characteristics of the Universal Subscriber Identity Module (USIM) application*, Release 9
24. 3GPP TS 31.103: *Characteristics of the IP Multimedia Services Identity Module (ISIM) application*, Release 9
25. 3GPP TS 31.111: *Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)*, Release 9
26. 3GPP TS 33.203: *3G security; Access security for IP-based services*, Release 9
27. 3GPP TS 33.401: *3GPP System Architecture Evolution (SAE); Security architecture*, Release 9
28. 3GPP TS 36.101: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception*, Release 9
29. 3GPP TS 36.133: *Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management*, Release 9
30. 3GPP TS 36.211: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation*, Release 9
31. 3GPP TS 36.212: *Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding*, Release 9
32. 3GPP TS 36.213: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures*, Release 9
33. 3GPP TS 36.214: *Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; Measurements*, Release 9
34. 3GPP TS 36.300: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2*, Release 9
35. 3GPP TS 36.304: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode*, Release 9
36. 3GPP TS 36.306: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities*, Release 9
37. 3GPP TS 36.321: *Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification*, Release 9

38. 3GPP TS 36.323: *Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification*, Release 9
39. 3GPP TS 36.331: *Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification*, Release 9
40. 3GPP TS 36.413: *Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)*, Release 9
41. 3GPP TS 36.508: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing*, Release 9
42. 3GPP TS 36.509: *Evolved Universal Terrestrial Radio Access (E-UTRA); Special conformance testing function for User Equipment (UE)*, Release 9
43. 3GPP TS 36.521-1: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: conformance testing*, Release 9
44. 3GPP TS 36.521-2: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 2: Implementation Conformance Statement (ICS)*, Release 9
45. 3GPP TS 36.521-3: *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management conformance testing*, Release 9
46. 3GPP TS 36.523-1: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification*, Release 9
47. 3GPP TS 36.523-2: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 2: ICS*, Release 9
48. 3GPP TS 36.523-3: *Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 3: Test suites*, Release 9
49. 3GPP RP-101431, CR#532: *Splitting FGI bit 3 (CR to 3GPP TS 36.331: Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification)*
50. 3GPP2 C.S0015-A v1.0 *"Short Message Service (SMS) for Wideband Spread Spectrum Systems"*
51. ETSI TS 102 221: *Smart Cards UICC-Terminal Interface; Physical and Logical Characteristics*, Release 8
52. ETSI TS 102 223: *Smart cards; Card Application Toolkit (CAT)*, Release 8
53. ISO/IEC-7816-2: 1999/ AM1: 2004, *Identification cards - Integrated circuit(s) cards with contacts - Part 2: Dimension and location of the contacts, Amendment 1: Assignment of contacts for C4 and C8*
54. ISO/IEC-7816-3: *Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 3: Electronic signals and transmission protocols*
55. A/53: *ATSC Digital Television Standard, Parts 1-6, 2007*, Advanced Television Systems Committee.
56. CTIA Test Plan for Wireless Device Over the Air Performance
57. IETF, RFC 3261 SIP: Session Initiation Protocol
58. IETF, RFC 4861 Neighbor Discovery for IP Version 6 (IPv6)
59. IETF, RFC 4862 IPv6 Stateless Address Autoconfiguration
60. IETF, RFC 6434 IPv6 Node Requirements
61. IETF, RFC 6204bis Basic Requirements for IPv6 Customer Edge Routers
62. ATIS-TIA-J-STD-100 Joint ATIS/TIA CMAS Mobile Device Behavior Specification

<Verizon Specific Documentation References>

63. "Verizon Wireless LTE 3GPP Band 13 Supplementary RF Conformance Test Plan"
64. "Verizon Wireless LTE Supplementary Signaling Conformance Test Plan"
65. "Verizon Wireless LTE Over the Air Radiated Performance Test Plan"
66. "Verizon Wireless LTE Data Retry Test Plan"
67. "Verizon Wireless LTE 3GPP Band 13 Safe for Network Test Plan"
68. "Verizon Wireless LTE Device-UICC (USIM, ISIM) Interaction Test Plan"
69. "Verizon Wireless LTE Data Retry Requirements"
70. "Verizon Wireless LTE OTADM Device Requirements"
71. "Verizon Wireless LTE SMS Requirements"
72. "Verizon Wireless LTE SMS Test Plan"
73. "Verizon Wireless LTE AT Commands for Test Automation Requirements"
74. "Verizon Wireless LTE AT Commands for Test Automation Test Plan"
75. "Verizon Wireless LTE OTADM Test Plan"
76. "Verizon Wireless LTE 3GPP Band 13 Device Conformance Test Procedures"
77. "Verizon Wireless LTE 3GPP Band 13 Data Throughput Test Plan"
78. "Verizon Wireless LTE 3GPP Band 13 Supplementary RRM Conformance Test Plan"

<Other Applicable References>

79. N/A