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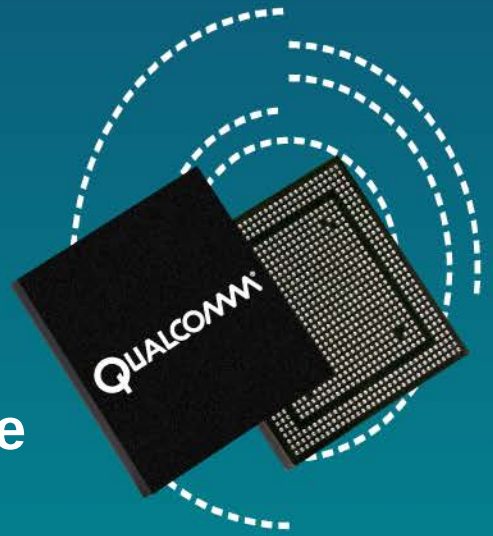

User Equipment Configuration, PICS Mapping, and Recommended Failure Triage Steps

80-N0630-1 K

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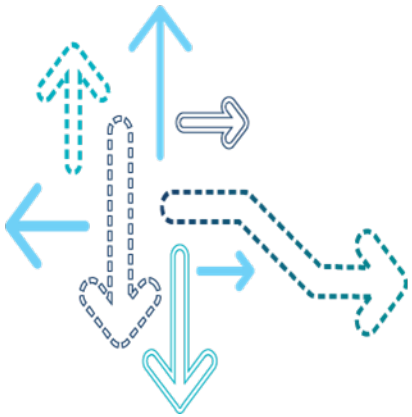
Revision History

Revision	Date	Description
A	Apr 2010	Initial release
B	Feb 2011	Numerous changes were made to this document; it should be read in its entirety
C	Feb 2012	Updated LTE UE configuration
D	Jun 2012	Numerous changes were made to this document; it should be read in its entirety
E	Jun 2012	Updated title on slide 38
F	Jun 2012	Updated Other LTE NV Items Typical Setting and Summary
G	Jan 2013	Updated to describe better configuration-related documentation; added new tools; limited the discussion to commonly used NV/EFS items
H	May 2013	Updated LTE slides for better clarification
J	May 2013	Updated LTE referring to IMS registration
K	May 2014	Updated with additional information about VAMOS dependencies; added information regarding Verizon profile provisioning; updated section regarding binary modem configuration; added information regarding LCR

Contents

Introduction



Objectives

- By the end of this presentation, you will be familiar with:
  - Documentation and tools used to configure the device
  - Various key GERAN, WCDMA, and LTE NV items and EFS files
  - Dependency between NV/EFS settings and PICS/PIXIT settings
  - Typical failures seen in the lab

Introduction

- Two types of items define the configuration of a UE:
  - NV Nonvolatile (NV) items – UE parameters stored permanently in NV RAM
  - Embedded File System (EFS) files
- NV items and EFS files can be one of two states
  - Inactive – Items in Inactive state take a default value defined in the software code
  - Active – Value explicitly written by the user

Introduction (cont.)

- Protocol Implementation Conformance Statement (PICS)
- Protocol Implementation eXtra Information for Testing (PIXIT)
- PICS/PIXIT values in test equipment must match device configuration through NV items or EFS files
- Not all NV items have corresponding PICS/PIXIT values and vice versa

PICS/PIXIT

Device Configuration

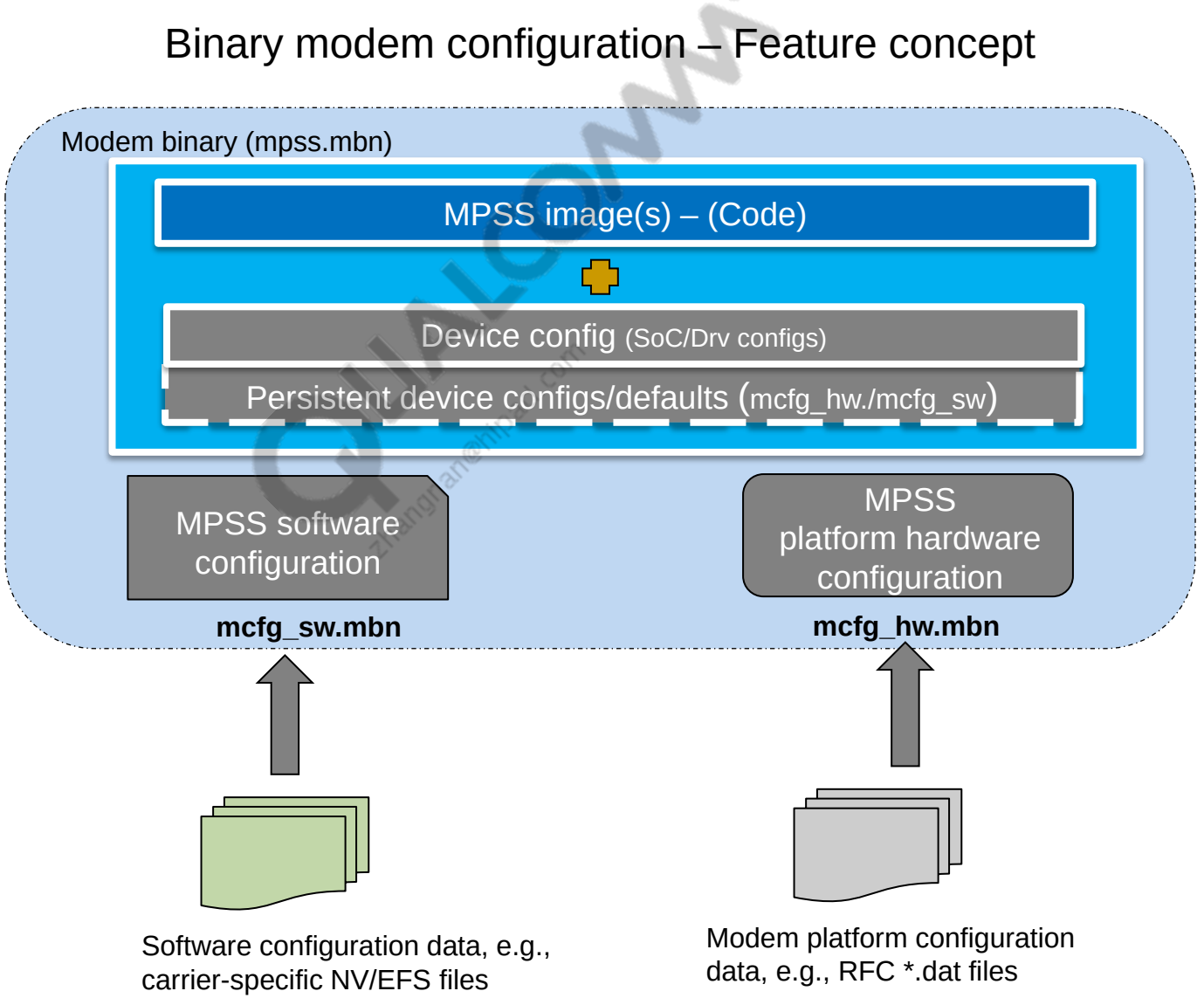
- Configuration refers to PICS, NV items, and Embedded File System (EFS) items.
- Steps for device configuration are:
  1. The OEM must use one of QTI's PICS documents to customize the configuration based on operator and device requirements.
     - Each chipset/baseline has its own PICS document.
     - PICS documents contain an NV Items and EFS table showing the relationship between the device configuration and PICS settings.
  2. The NV/EFS settings determined in the above step are applied to the binary modem configuration, sometimes referred to as the modem software configuration.
     - The binary modem configuration is delivered with each software release.
     - The binary modem configuration contains configuration images readily available for use. There are various configuration options for various operators. These configurations are used during chipset integration and test. See [Q41] for more information.

Configuration Process QMC Uses to Test Lab Conformance

- Identifying the correct configuration using a PICS document – Based on the operator, OS (Android™, Windows Phone, QNX, etc.), device type (data card/smartphone), and LTE mode (FDD/TDD/Dual) to determine columns to use in PICS documents
  - 3G NV table sample

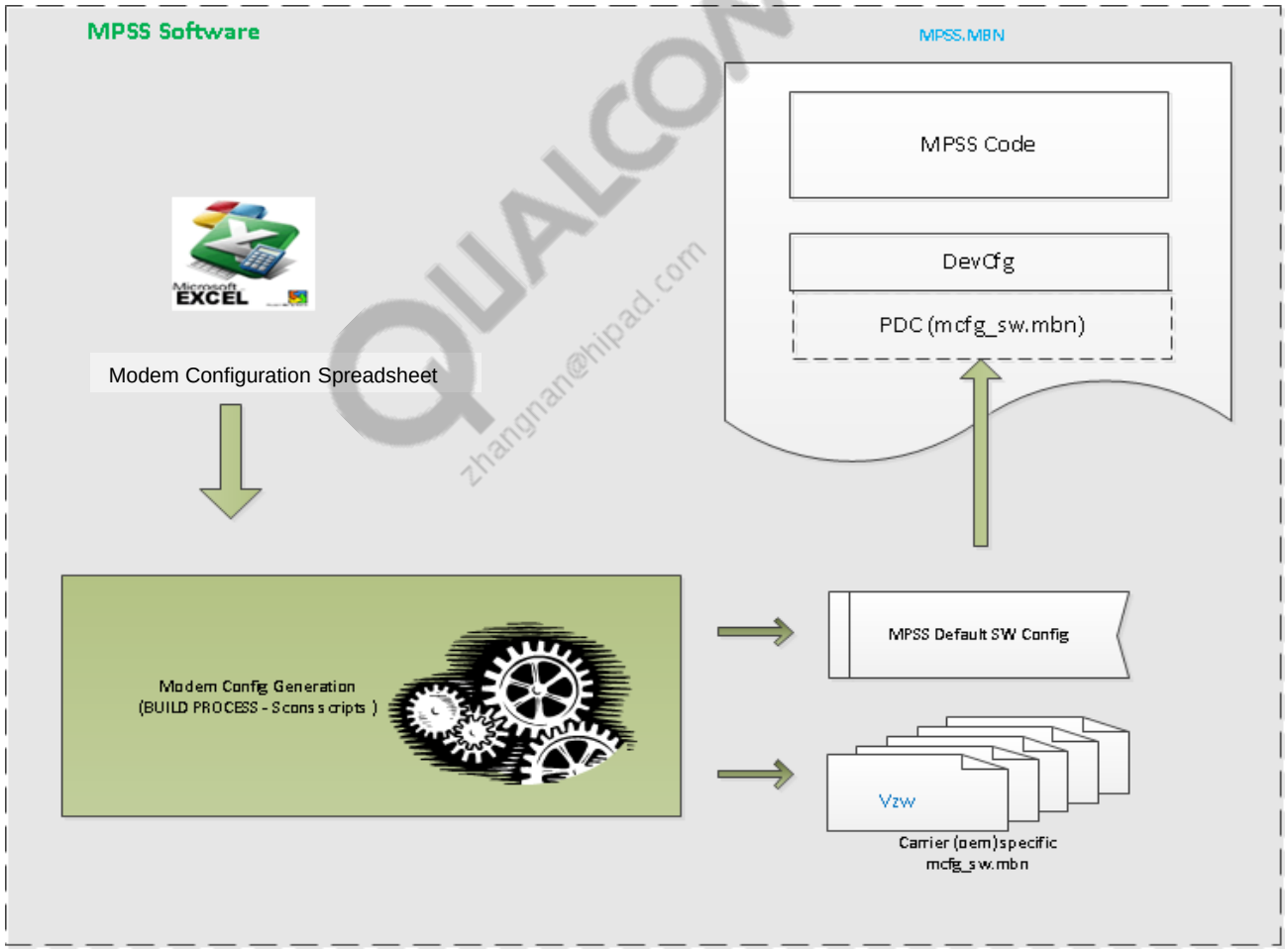
NV item index	NV item	PICS origin	Comments	AT&T LE builds (datacard)	AT&T TN builds (with voice)	AT&T LA builds	AT&T WA/WP builds	VzW/ ROW/ Sprint LE builds (data card)	VzW/ROW/ Sprint TN builds (with voice)	VzW/ ROW/ Sprint LA builds	VzW/ ROW/ Sprint WA/WP builds	CMCC LE builds (datacard)	CMCC TN builds (with voice)	CMCC LA builds	CMCC WA/WP builds
65693	▪ Enhanced CELL_FACH (Rel 7) ▪ Enhanced CELL_PCH (Rel-7) ▪ DRX in CELL_FACH (Enhanced DRX) (Rel-8) ▪ Common EDCH or HS RACH support for MAC-i/is	▪ Table A.18a/29 ▪ Table A.18a/32 ▪ Table A.18a/36 ▪ Table A.18a/34 ▪ Table A.18a/33 ▪ Table A.18a/42 ▪ Table A.18a/43 ▪ Table A.18a/44 ▪ Table A.18a/46	If set to 0x00 – The following features are disabled: ▪ Bit 0 – EFACH (pc_HS_FACH, A18a/29) ▪ Bit 1 – EPCH (pc_HS_PCH, A.18a/32) ▪ Bit 2 – EFACH_DRX (pc_HS_FACH_DRX, A.18a/36) ▪ Bit 3 – Support of common E-DCH or HS-RACH (PC_HS_RACH_EDCH A.18a/34) ▪ Bit 4 – Support for MAC-i/is (pc_MAC_iis, A.18a/33) ▪ Bit 5 – Support for DC-HSUPA ▪ Bit 6 – Support of DBDC (pc_DB_DC_HSDPA_Band1_5 A.18a/42 ▪ pc_DB_DC_HSDPA_Band1_8 A.18a/43 ▪ pc_DB_DC_HSDPA_Band2_4 A.18a/44; pc_DB_DC_HSDPA A.18a/46) Note: If Bit 6 is enabled, NV item 3649 should be set to 0x05 (Rel 9).	0x00	0x00	0x00	0x00	0x05	0x05	0x05	0x05	0x05	0x05	0x05	0x05

Configuration Process QMC Uses to Test Lab Conformance (cont.)



Configuration Process QMC Uses to Test Lab Conformance (cont.)

- Generating MCFG software image using a macro-enabled spreadsheet



Configuration Process QMC Uses to Test Lab Conformance (cont.)

- Binary modem configuration – Single binary image paired with configuration data/image that can support multiple configurations; allows OEM to configure the modem for various technologies, i.e., C2K, GSM-UMTS, LTE, software features, and carrier-specific customizations
  - Tool location – $BUILD_ROOT\modem_proc\mcfg\mcfg_gen
  - Input – Macro-enabled spreadsheet that allows creation of custom configurations with a button click; this is where PICS customization is applied
  - Output – Generate sources and build modem binary (.mbn) files
  - Reference – See [Q19]
  - To generate the software modem configuration:
    1. Locate and open the modem configuration spreadsheet.
    2. Edit the spreadsheet and save it; this is where PICS customization is applied.
    3. Edit the Summary tab.
    4. Generate source and .mbn files.
    5. Load generated .mbn files onto the target.
  - Limitations – Currently only delivered with PLs above MPSS.DI.1.0

How OEM can Benefit from the QMC-Tested Configuration

- OEM can use the default release configuration as reference to load it on QTI's reference device (MTP/FFA)
- Assume this is the configuration tested by various organizations at QMC, e.g., lab conformance, IOT, field, etc.
- Configuration is version-maintained through the Change Request (CR) process

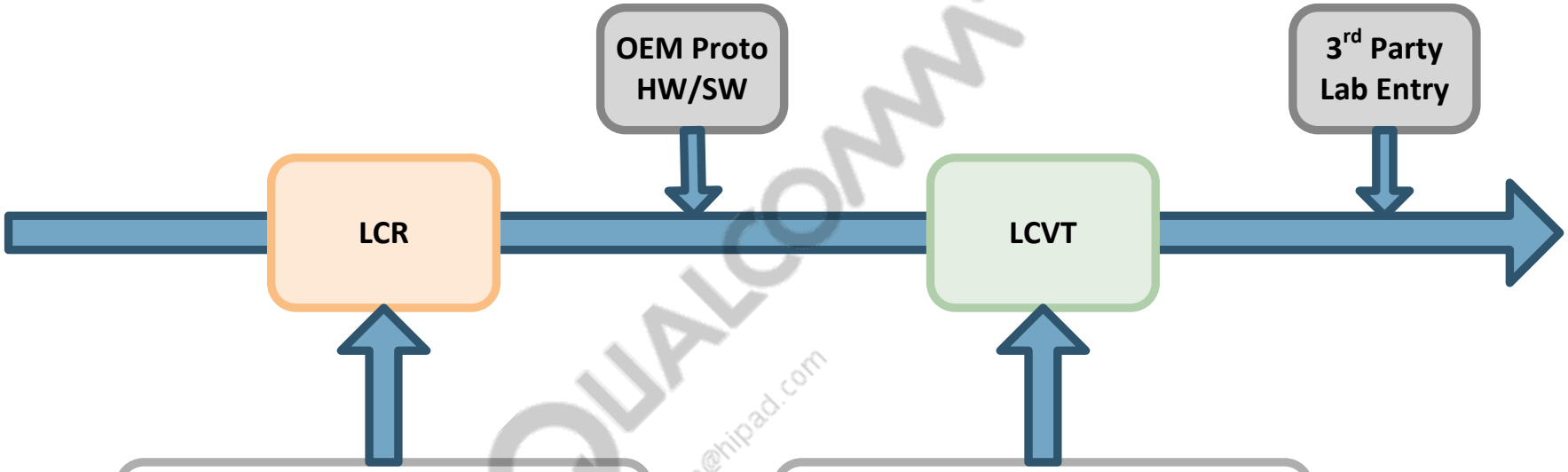
How OEM can Customize Using QTI's Documentation

- OEM can use PICS documents to further customize, if needed.
- PICS documents indicate what needs to be done for each relevant PICS item change.
- Binary Modem Configuration (BMC) is available to OEMs in each released build.
- Apply the custom configuration on top of BMC.

LCR/LCVT Process Overview

- To correctly configure the device, the OEM must undergo a Lab Conformance Review (LCR). An LCR consists of a Configuration Review (NVs, EFS, and PICS) and, as needed, Lab Conformance Verification Testing (LCVT). LCVT is implemented to verify device configuration and basic RF performance in line with GCF, PTCRB, VZW SFN, AT&T PTN, etc.
- During LCR basic information about the device is collected and the configuration is determined. After the configuration is determined, the OEM is provided with specific documentation about how to configure the device and the associated PICS declaration. The OEM is expected to come back with changes or questions. Any change from QTI's recommendations is called the delta list. This list is reviewed by QTI support engineers during the Configuration Review. See [Q42] for more information.

LCR/LCVT Process Overview (cont.)



Lab Conformance Review

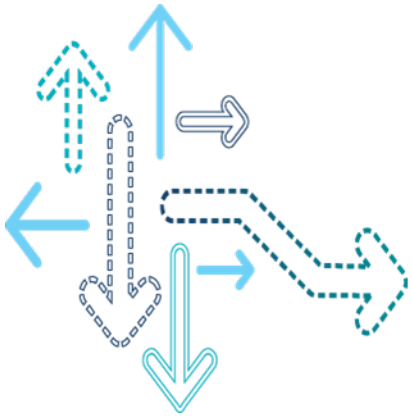
- Review Device Protocol Implementation Conformance Statements (PICS) Declaration
- Review Device NV/EFS Configuration

Lab Conformance Verification Test

- Test key Protocol Test Cases to confirm reviewed configuration
- Test key RF Test Cases to confirm basic device RF performance

- **LCR – Two to four sessions and followup, one to two conference calls/face-to-face meetings**
- **LCVT – Three days per product**

UMTS NV Items



NV_PREF_MODE_I

- Defines the user mode preference; default value of 4 used by AMSS software

Address	Default	Mode preference	Value	PICS
10	4	MODE_PREF_AMPS	0	
		MODE_PREF_DIGITAL	1	
		MODE_PREF_AUTOMATIC	4	pc_UTRAN_GSM=TRUE
		MODE_PREF_EMERGENCY	3	
		MODE_PREF_CDMA	9	
		MODE_PREF_HDR	10	
		MODE_PREF_CDMA_AMPS	11	
		MODE_PREF_GPS	12	
		MODE_PREF_GSM	13	
		MODE_PREF_WCDMA	14	pc_UTRAN_GSM=FALSE
		MODE_PREF_ANY_BUT_HDR	16	
		MODE_PREF_GSM_WCDMA	17	pc_UTRAN_GSM=TRUE
		MODE_PREF_DIGITAL_LESS_HDR	18	
		MODE_PREF_CDMA_HDR	19	

NV_PREF_MODE_I (cont.)

- Extended list of values can be found in [Q2]

Address	Default	Mode preference	Value
10	4	MODE_PREF_LTE_ONLY	30
		MODE_PREF_CDMA_LTE_ONLY	32
		MODE_PREF_ HDR_LTE_ONLY	33
		MODE_PREF_ GSM_LTE_ONLY	34
		MODE_PREF_ WCDMA_LTE_ONLY	35
		MODE_PREF_CDMA_HDR_LTE_ONLY	36
		MODE_PREF_ CDMA_GSM_LTE_ONLY	37
		MODE_PREF_CDMA_WCDMA_LTE_ONLY	38
		MODE_PREF_HDR_GSM_LTE_ONLY	39
		MODE_PREF_HDR_WCDMA_LTE_ONLY	40
		MODE_PREF_CDMA_LTE_WLAN_ONLY	41
		MODE_PREF_HDR_LTE_WLAN_ONLY	42
		MODE_PREF_GSM_LTE_WLAN_ONLY	43
		MODE_PREF_WCDMA_LTE_WLAN_ONLY	44

Band Preference

- Split into three NV items for WCDMA and GSM

Name	Address
NV_BAND_PREF_I	441
NV_BAND_PREF_16_31_I	946
NV_BAND_PREF_32_63_I	2954

- Band preference should match the RF hardware capabilities
- All supported bands are enabled during conformance testing
  - See relevant PICS document for band-specific PICS items dependency

NV Setting for User Band Selection for WCDMA and GSM

Band	Bit position	NV_BAND_PREF_I (441)	NV_BAND_PREF_16_31_I (946)	NV_BAND_PREF_32_63_I (2954)	PICS
GSM 450	16	0x0000	0x0001	0x00000000	
GSM 480	17	0x0000	0x0002	0x00000000	
GSM 750	18	0x0000	0x0004	0x00000000	
GSM 850	19	0x0000	0x0008	0x00000000	TSPC_Type_GSM_850_Band
EGSM 900	08	0x0100	0x0000	0x00000000	TSPC_Type_GSM_E_Band
RGSM 900	20	0x0000	0x0010	0x00000000	
PGSM 900	09	0x0200	0x0000	0x00000000	TSPC_Type_GSM_P_Band
DCS 1800	07	0x0080	0x0000	0x00000000	TSPC_Type_DCS_Band
PCS 1900	21	0x0000	0x0020	0x00000000	TSPC_Type_PCS_Band
WCDMA_I_IMT_2000	22	0x0000	0x0040	0x00000000	Pc_Band1_Support
WCDMA_II_PCS_1900	23	0x0000	0x0080	0x00000000	Pc_Band2_Support
WCDMA_III_1700	24	0x0000	0x0100	0x00000000	Pc_Band3_Support
WCDMA_IV_1700	25	0x0000	0x0200	0x00000000	Pc_Band4_Support
WCDMA_V_850	26	0x0000	0x0400	0x00000000	Pc_Band5_Support
WCDMA_VI_800	27	0x0000	0x0800	0x00000000	Pc_Band6_Support
WCDMA_VII_2600	48	0x0000	0x0000	0x00010000	Pc_Band7_Support
WCDMA_VIII_900	49	0x0000	0x0000	0x00020000	Pc_Band8_Support
WCDMA_IX_1700	50	0x0000	0x0000	0x00040000	Pc_Band9_Support

NV_FORCE_UE_SGSNR_R99_I

- Configures the revision level based on the setting of this NV item with regards to the SGSNR bit

Address	Default	Value	Description
1030	1	0	Forces the UE to behave as Rel 97/Rel 98, irrespective of the SGSNR bit
		1	Forces the UE to behave as Rel 99, irrespective of the SGSNR bit
		2	Causes UE behavior to be dynamic, in accordance with the SGSNR bit: ▪ SGSNR = 0 – SGSN is Rel 98 or earlier ▪ SGSNR = 1 – SGSN is Rel 99 or later

NV_FORCE_UE_MSCR_R99_I

- Configures the revision level based on the setting of this NV item with regards to the MSCR bit

Address	Default	Value	Description
1031	1	0	Forces the UE to behave as Rel 97/Rel 98, irrespective of the MSCR bit
		1	Forces the UE to behave as Rel 99, irrespective of the MSCR bit
		2	Causes the UE's behavior to be dynamic, in accordance with the SGSNR bit: ▪ MSCR = 0 – SGSN is Rel 98 or earlier ▪ MSCR= 1 – SGSN is Rel 99 or later

NV_NAS_COMPLIANCE

- This NV item indicates the NAS specification compliance behavior for Rel 99 and above.

Address	Default	Value	Description
4722	1	0	Forces the UE to be Rel 99 NAS specification-compliant
		1	Forces the UE to be Rel 5 NAS specification-compliant
		2	Forces the UE to be Rel 6 NAS specification-compliant
		3	Forces the UE to be Rel 7 NAS specification-compliant

NV_NAS_COMPLIANCE (cont.)

- The following table shows different combinations of the following NV items for getting the desired UE behavior.

Value of NV items 1030 and 1031	Value of NV item 4722	UE behavior
0	Not applicable	Pre−Rel 99
1	0	Rel 99
1	1	R5
1	2	R6
1	3	R7
2	0	Pre-Rel 99 if MSCR and SGSNR is 0; Rel 99 if MSCR and SGSNR is 1
2	1	Pre-Rel 99 if MSCR and SGSNR is 0; R5 if MSCR and SGSNR is 1
2	2	Pre-Rel 99 if MSCR and SGSNR is 0; R6 if MSCR and SGSNR is 1
2	3	Pre-Rel 99 if MSCR and SGSNR is 0; R7 if MSCR and SGSNR is 1

NV_MGRF_SUPPORTED_I

- Used to enable/disable the Managed Roaming feature
- Requested from specific operators like Vodafone
- Accept LU only on fifth attempt in certain conditions
- UE to implement optional spec requirement
  - 3GPP 24.008/4.2.1.2 [S2] other cases
    - The state PLMN SEARCH is also entered in the following cases:
      - Optionally, when the mobile station is in the ATTEMPTING TO UPDATE state and is in Automatic Network Selection mode, and location update attempt counter is greater than or equal to 4

Address	Default	Managed Roaming feature	NV item value
5895	0	Enabled	1
		Disabled	0

NV_ENS_ENABLED_I

- Used to enable/disable the Enhanced Network Services (ENS)
- Enabled for AT&T bound devices
- Enabling ENS could conflict with 3GPP specifications; therefore, it should be disabled during 3GPP test cases testing; should be enabled back for AT&T testing and final product

Address	Default	Enhanced network services	NV item value
3461	0	Enabled	1
		Disabled	0

NV_SERVICE_DOMAIN_PREF_I

- Used to set the service domain support for device under test
- See LTE NV Items section for LTE-related PICS dependency

Address	Default	Enhanced network services	NV item value	Associated PICS
850	0	Service domain is CS only	0	▪ pc_CS=TRUE ▪ pc_PS=FALSE
		Service domain is PS only	1	▪ pc_CS=FALSE ▪ pc_PS=TRUE
		Service domain is CS + PS	2	▪ pc_CS=TRUE ▪ pc_PS=TRUE

NV_DISABLE_CM_CALL_TYPE_I

- This NV item is used as a bitmask to disable certain call types.
- See PICS documents; see [Q4] to [Q6] for PICS dependency. There are many PICS items impacted.
- Set to 1 Bit 0 to disable voice call, Bit 1 to disable circuit-switched data, and Bit 9 to disable emergency calls.

Address	Default	Feature support	NV item value	Associated PICS
5280	0	All CS services enabled	0x0	
		Voice call disabled	0x1	
		CSD disabled	0x2	
		Both CSD and voice disabled	0x3	
		Voice, CSD and emergency calls disabled	515	

NV_ACQ_ORDER_PREF_I

- Determines the order in which the systems must be attempted for acquisition when powering up the MS
- This NV item is now only applicable to legacy UMTS only baselines.
- It is used to determine the RAT search order under certain cases, e.g., when FEATURE_DISABLE_RPLMNACT is defined. See [Q15] for other scenarios.

Address	Default	Acquisition order preference	Value	Description
848	0	GW_ACQ_ORDER_PREF_AUTOMATIC	0	Acquisition order to be determined by system selection algorithms without this acquisition order preference
		GW_ACQ_ORDER_PREF_GSM_WCDMA	1	Attempt to acquire GSM systems before WCDMA systems
		GW_ACQ_ORDER_PREF_WCDMA_GSM	2	Attempt to acquire WCDMA systems before GSM system

NV_ENHANCED_HPLMN_SRCH_TBL_I

- This NV item is used to set up specific MCC configuration during higher-priority PLMN search depending on carrier conformance requirements. For additional details, see [Q2].

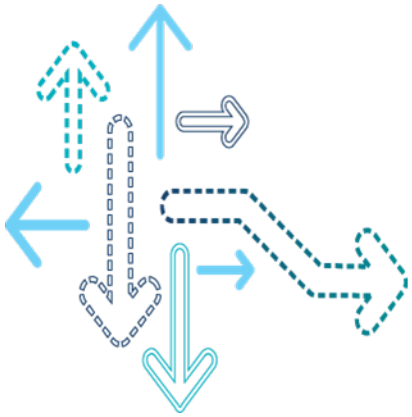
Address	Byte number	Field name	Description
6844	1	Encoding type ▪ 1 – SET type ▪ 2 – ALL MCC Other values are for future use	Describes how the data is encoded ▪ SET type means there are a set of MCCs in records ▪ ALL MCC means no MCC filtering will be done during higher-priority PLMN search
	2	Number of records	How many records there are (applicable for SET TYPE)
	3	Number of MCCs in record	Number of MCC in record – 1
	4	MCC digit 2 | MCC digit 1	MCC1 in record -1, 3 digits MCCs stored in 2 bytes
	5	Not Used | MCC digit 3	
	6	MCC digit 2 | MCC digit 1	MCC2 in record-1, 3 digits MCCs stored in 2 bytes
	7	Not Used | MCC digit 3	—

NV_ENHANCED_HPLMN_SRCH_TBL_I (cont.)

- By default, this NV is inactive so the UE will search only the PLMNs with the same MCC as the current registered VPLMN when the high-priority PLMN search timer expires.

First byte	Second byte	Description
NV is inactive	NV is inactive	UE will only consider the MCC it camped on (default behavior) for non-AT&T SIM card; for AT&T SIM card, UE will populate a default MCC table
1	0	UE will only consider the MCC it camped on (default behavior) for all SIM cards; for AT&T SIM card, UE will *not* populate a default MCC table (multiple MCCs ATT requested)
1	X (anything greater than 0)	UE will consider multiple MCCs
2	X	All MCCs will be searched for; **this setting may cause many 3GPP (GCF/PTCRB) test case failures**
Any other value except 1 or 2, e.g., 0, 3, 4, 5, etc.	X	UE will only consider the MCC it camped on (default behavior) for all SIM cards; for AT&T SIM card, UE will *not* populate a default MCC table

WCDMA NV Items



NV_RRC_INTEGRITY_ENABLED_I

- Used to control the RRC integrity feature
- For most of the testing, this should be set to 1 (Enable)

Address	Default	RRC integrity	NV item value
880	0	Disabled	0
		Enabled	1

NV_RRC_CIPHERING_ENABLED_I

- Used to enable ciphering based on network capability

Address	Default	Ciphering control	NV item value	PiXIT
881	0	Disabled	0	Px_CipheringOnOff=FALSE
		Enabled	1	Px_CipheringOnOff=TRUE

NV_RRC_FAKE_SECURITY_ENABLED_I

- Used to enable UE fake security
- Used mainly for testing purposes, on certain test equipment
- A way by which RRC indicates to NAS that integrity is enabled even without the SMC procedure

Address	Default	Ciphering control	NV item value
882	0	Disabled	0
		Enabled	1

NV_UMTS_AMR_CODEC_PREFERENCE_CONFIG_I

- Used to enable/disable AMR codecs by the UE
- NV Bitmap – XXXXABCD
  - A – Controls WCDMA AMR WB
  - B – Controls GSM HR AMR
  - C – Controls GSM AMR WB
  - D – Controls GSM AMR NB
  - Corresponding bit position enabled and PICS set to TRUE accordingly

Address	Default	AMR control	NV item value	PICS
6850	Default – Depending upon AMSS capability	Enable	1	▪ pc_UMTS_AMR-WB_Speech=TRUE ▪ TSPC_AddInfo_Full_rate_version_3=TRUE ▪ TSPC_AddInfo_Half_rate_version_3=TRUE ▪ TSPC_TCH_WFS=TRUE
		Disable	0	▪ pc_UMTS_AMR-WB_Speech=FALSE ▪ TSPC_AddInfo_Full_rate_version_3=FALSE ▪ TSPC_AddInfo_Half_rate_version_3=FALSE ▪ TSPC_TCH_WFS=FALSE

NV_WCDMA_RRC_VERSION_I

- The UE supports switching between Rel 5, Rel 6, Rel 7, Rel 8, and Rel 99 through NV items in the WCDMA access stratum. This NV item in the WCDMA access stratum is used to change UE's behavior according to the specified 3GPP release version.

Address	Default	NV item value	Behavior
3649	Default – Depending upon AMSS capability	0	Rel 99
		1	Rel 5
		2	Rel 6
		3	Rel 7
		4	Rel 8

NV_HSDPA_CAT_I

- Holds the value of the HSDPA category of the UE
- Default value depends on the specific chipset capability
- See PICS document to ensure that the value set is consistent with the NV item

Address	Default	Example HSDPA category	NV item value	Example PICS
4118	Default – Depending upon AMSS capability	24	24	▪ Pc_HSDPA = TRUE ▪ pc_HSDSCH_UE_Category = 10 ▪ pc_HSDSCH_UE_Category_Extension=14 ▪ pc_HSDSCH_UE_Category_Extension2=24
		14	14	▪ Pc_HSDPA = TRUE ▪ pc_HSDSCH_UE_Category = 10 ▪ pc_HSDSCH_UE_Category_Extension=14 ▪ pc_HSDSCH_UE_Category_Extension2=FALSE
		10	10	▪ Pc_HSDPA = TRUE ▪ pc_HSDSCH_UE_Category = 10 ▪ pc_HSDSCH_UE_Category_Extension=FALSE ▪ pc_HSDSCH_UE_Category_Extension2=FALSE

NV_HSUPA_CAT_I

- Use to select the HSUPA category of the UE
- Depends on the specific chipset

Address	Default	HSUPA category	NV item value	PICS
4210	AMSS-specific	6	6	▪ Pc_HSUPA = TRUE ▪ pc_EDCH_UE_Category = 6
		5	5	▪ Pc_HSUPA = TRUE ▪ pc_EDCH_UE_Category = 5

NV_WCDMA_RX_DIVERSITY_CTRL_I

- This NV item is used to control Receiver Diversity feature.
- This is required to meet performance requirements for Type 1/3/3i receiver type as defined in [S1].

Address	Default	Receiver diversity feature	NV item value	Associated PICS
3851	3	RxD enabled	3	Enhanced performance requirements type 1/3/3i = TRUE
		RxD disabled	0	Enhanced performance requirements type 1/3/3i = FALSE

NV_WCDMA_EQUALIZER_CTRL_I

- This NV item is used to control equalizer functionality.
- This is required to meet performance requirements for Type 2/3/3i receiver type as defined in [S1].
- It is strongly recommended to leave this NV item as inactive. The setting depends on various algorithms used by the software baseline.

Address	Default (example)	Equalizer feature	NV item value	Associated PICS
3852	57 (MDM9x00 modem)	Enabled	57 or 19 (AMSS-specific)	Enhanced performance requirements type 2/3/3i = TRUE
		Disabled	0x06	Enhanced performance requirements type 2/3/3i = FALSE

NV_WCDMA_HSUPA_CM_CTRL_I

- This NV item is used to enable/disable support of Compressed mode feature with HSUPA.

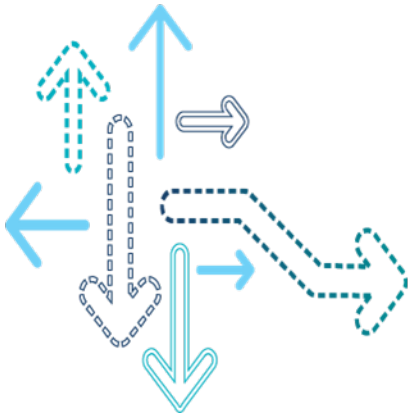
Address	Default	HSUPA/CM feature	NV item value
5090	1	Enabled	1
		Disabled	0

NV_CPU_BASED_FLOW_CONTROL_I

- This NV item is used to enable/disable CPU-based flow control.
- Flow control should be enabled at all times.
- Temporarily disabling helps investigate data throughput issues.

Address	Default	HSUPA/CM feature	NV item value
4261	1	Enabled	1
		Disabled	0

GSM/GPRS NV Items



NV_MULTISLOT_CLASS_I

- Used to select the desired GPRS multislot class of UE
- Choose only one of the available options

Address	Default	MSC	NV item value	PICS
911	12 or 33 (depends on software baseline)	Multislot GPRS class 10	10	TSPC_Type_GPRS_Multislot_Class = 10
		Multislot GPRS class 12	12	TSPC_Type_GPRS_Multislot_Class = 12
		Multislot GPRS class 33	33	TSPC_Type_GPRS_Multislot_Class = 33

NV_EDGE_MULTISLOT_CLASS_I

- Used to select the desired EGPRS multislot class of UE
- Choose only one of the available options

Address	Default	MSC	NV item value	PICS
2509	12 or 33 (depends on software baseline)	Multislot EGPRS class 10	10	TSPC_Type_EGPRS_Multislot_Class = 10
		Multislot EGPRS class 12	12	TSPC_Type_EGPRS_Multislot_Class = 12
		Multislot EGPRS class 33	33	TSPC_Type_EGPRS_Multislot_Class = 33

NV_DTM_MULTISLOT_CLASS_I

- Controls the GPRS/EDGE Dual Transfer Mode (DTM) multislot class of the device
- Choose only one of the available options

Address	Default	DTM class	NV item value	PICS
3629	3 – Multislot class 11	Multislot class 11 (GPRS multislot class should be 12)	3	TSPC_DTM_GPRS_Multislot_Class_11 = TRUE
		Multislot class 9 (GPRS multislot class at 10)	2	TSPC_DTM_GPRS_Multislot_Class_9 = TRUE
		Multislot class 5 (GPRS multislot class at 10)	1	TSPC_DTM_GPRS_Multislot_Class_5 = TRUE

NV_EDGE_8PSK_POWER_ CLASS_I

- When disabled, EDGE is downlink only

Address	Default	DTM class	NV item value	PICS
2510	1	EDGE uplink capability not advertised to the network	0	TSPC_Type_EGPRS_8PSK_uplink = FALSE
		EDGE uplink capability advertised to the network	1	TSPC_Type_EGPRS_8PSK_uplink = TRUE

NV_GSM_A5_ALGORITHMS_SUPPORTED_I

- Used to enable A5 algorithms
- Bit field indicating A5 support with bit 0 representing A5/1, bit 1 representing A5/2, etc.
- For Rel 6 and above A5/3 is mandatory
- Spec has removed A5/2; therefore, A5/2 has to be disabled using this NV item

Address	Default	A5 support	NV item value	PICS
553	1	A5/1	1	TSPC_Feat_A51 = TRUE
		A5/2	2	
		A5/3	4	TSPC_Feat_A53 = TRUE
		A5/4	8	
		A5/5	16	
		A5/6	32	
		A5/7	64	

NV_GPRS_GEA_ALGORITHMS_SUPPORTED_I

- Used to enable GPRS GEA algorithms
- Bit field indicating GEA support with bit 0 representing GEA1, bit 1 representing GEA2, etc.
- Ensure the PICS statement is consistent with the NV item setting; GEA3 is not enabled by default. If GEA3 support is set to TRUE, then set NV4432 to 0x07

Address	Default	A5 support	NV item value	PICS
4432	3	GEA1	1	TSPC_Feat_GEA1 = TRUE
		GEA2	2	TSPC_Feat_GEA2 = TRUE
		GEA3	4	TSPC_Feat_GEA3 = TRUE

NV_DTM_FEATURE_SUPPORT_I

- Controls the Dual Transfer Mode (DTM) support in the UE

Address	Default	DTM support	NV item value	PICS
3628	1	DTM support	1	TSPC_DTM_GPRS = TRUE
			0	TSPC_DTM_GPRS = FALSE

NV_EDTM_FEATURE_SUPPORT_I

- Controls the Enhanced DTM (EDTM) capability advertised to the network
- The device advertises support for “Extended RLC/MAC control message segmentation” if this NV is set to 1

Address	Default	EDTM support	NV item value	PICS
4209	1	EDTM support	1	▪ TSPC_Enhanced_DTM_CS = TRUE ▪ TSPC_Xtd_Ctrl_Message_Segmentation = TRUE
			0	▪ TSPC_Enhanced_DTM_CS=FALSE ▪ TSPC_Xtd_Ctrl_Message_Segmentation = FALSE

NV_EDA_FEATURE_SUPPORT_I

- This NV item is used to define the MSC12/Extended Dynamic Allocation (EDA) feature in the AMSS.
- For MSC10 setting, this is not applicable. TSPC_Extended_Dynamic_ Allocation should be declared as FALSE.

Address	Default	EDA feature support	NV item value	Associated PICS
3630	1	Enabled	1	TSPC_Extended_Dynamic_Allocation = TRUE
		Disabled	0	TSPC_Extended_Dynamic_Allocation = FALSE

NV_DARP_FEATURE_SUPPORT_I

- Controls the SAIC/Downlink Advanced Receiver Performance (DARP) feature support information in the CLASSMARK 3 signaling

Address	Default	DARP feature	NV item value	PICS
4117	0	No DARP support	0	▪ TSPC_DARP_Phase1 = FALSE ▪ TSPC_DARP_Phase2 = FALSE
		DARP is supported	1	▪ TSPC_DARP_Phase1 = TRUE ▪ TSPC_DARP_Phase2 = FALSE

NV_REPEATED_ACCH_I

- Used to enable/disable support of the repeated ACCH feature

Address	Default	R-ACCH support	NV item value	PICS
5107	1 – Both R-FACCH and R-SACCH enabled	No support	0	▪ TSPC_Repeated_FACCH = FALSE ▪ TSPC_Repeated_SACCH = FALSE ▪ TSPC_Repeated_ACCH = FALSE
		Both R-FACCH and R-SACCH supported	1	▪ TSPC_Repeated_FACCH = TRUE ▪ TSPC_Repeated_SACCH = TRUE ▪ TSPC_Repeated_ACCH = TRUE
		R-FACCH alone enabled	2	▪ TSPC_Repeated_FACCH = TRUE ▪ TSPC_Repeated_SACCH = FALSE ▪ TSPC_Repeated_ACCH = TRUE

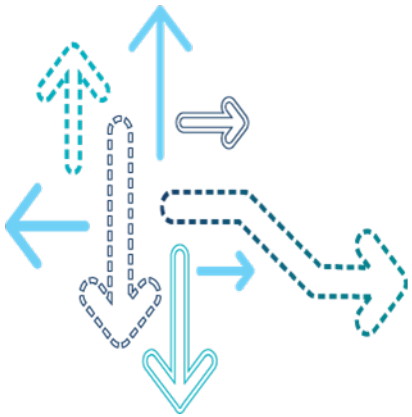
NV_VAMOS_I

- Used to enable/disable support of the VAMOS feature

Address	Default	VAMOS type	NV item value	PICS
67228	0 – Disabled	Disabled	0	▪ Pc_VAMOS_Type1 = FALSE ▪ Pc_VAMOS_Type2 = FALSE
		VAMOS Type 1	1	▪ Pc_VAMOS_Type1 = TRUE ▪ Pc_VAMOS_Type2 = FALSE
		VAMOS Type 2	2	▪ Pc_VAMOS_Type1 = FALSE ▪ Pc_VAMOS_Type2 = TRUE

- To support VAMOS, both DARP and repeated SACCH/FACCH must be supported; otherwise, VAMOS does not work.
- See [Q43].

User Identity Module (UIM) NV Items



UIM NV Items for Lab Conformance Testing

NV item #	NV item name	Description	Typical settings	Reference
65674	Generic SIM application ToolKit (GSTK) feature bitmask	Used to enable certain set of GSTK features, e.g., Bit 2 indicates to the ESTK that the UI client, e.g., Android™, supports icons	▪ VZW phone – 0x47 ▪ None VZW phone – 0xC6 ▪ VZW data card – 0x9 ▪ AT&T data card – 0x8	SF Solution # 18906 See [Q12]
65683	Qualcomm Messaging Interface (QMI) Card Application Toolkit (CAT) MODE	To set raw or decode format of UIM proactive commands ▪ 0x0 – QMI_CAT is disabled ▪ 0x2 – Indications are in RAW format ▪ 0x3 – Indications are in decoded format	▪ Android/Windows Phone 8 – 0x2 ▪ Windows Phone 7/data card – 0x0 ▪ QNX – 0x2	See [Q13]
896	NV_UIM_FIRST_INST_CLASS_I	▪ Card to operate as SIM or USIM card ▪ Sometimes used to test GCF SIM electrical test cases ▪ 0x0 – SIM card ▪ 0x1 – USIM card	0x1	See [Q2]

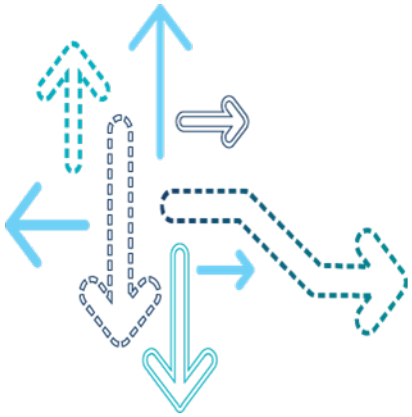
UIM NV Items for Lab Conformance Testing (cont.)

NV item #	NV item name	Description	Typical settings	Reference
4398	NV_UIM_SELECT_ DEFAULT_USIM_APP_I	To select the default provisioning application for multiapplication cards: ▪ 0x1 – Select first AID in EF DIR for multiapp USIM ▪ 0x0 – Wait for UI to select one of AID	▪ Windows Mobile 8 – 0x0 ▪ Others – 0x1	
67287	QMI_CAT custom terminal profile	▪ Customized terminal profile in QMI_CAT ▪ Needed only when OEM wants to customize TP data	QMI_CAT has hardcoded terminal profile	See [Q13]
855	NV_RTRE_CONFIG_I	Determines the Runtime RUIM Enable (RTRE) configuration type; defines whether the values should be read/write from NV or RUIM card	▪ Subscription from card – 0x0 ▪ Subscription from NV – 0x1	See [Q14]
5770	NV_TOOLKIT_CS_PS_ PARALLEL_I	▪ To allow toolkit data call to go through ▪ Set to 0x0 for SAT 27.22.4.27.2.8	▪ 0x0 – Allow ▪ Other value – Do not allow	

Things to Cross-Check

- For adapt testing
  - Mode Pref NV “10” set to 4 (Auto)
  - ENS NV 3461 is set to 1 for all ADAPT testing
  - RAT acquisition order “rat_acq_order” file in EFS under SD folder
- For LTE USIM/USAT testing with CMW500
  - Mode Pref NV “10” set to 4 (Auto)
  - Enable NV_RRC_INTEGRITY_ENABLED_I # 880 = 1
  - Enable NV_RRC_CIPHERING_ENABLED_I # 881 = 1
  - Disable NV_RRC_FAKE_SECURITY_ENABLED_I # 882 = 0
- For SAT/USAT testing with Anritsu (Note: These are workarounds)
  - Mode Pref NV “10” set to 4 (Auto)
  - Enable NV_RRC_INTEGRITY_ENABLED_I # 880 = 0
  - Enable NV_RRC_CIPHERING_ENABLED_I # 881 = 0
  - Disable NV_RRC_FAKE_SECURITY_ENABLED_I # 882 = 1

Short Message (SMS) NV Items



NV_SMS_GW_BEARER_PREF_I

- Used to set the SMS domain preference for MO SMS
  - CS-preferred – Use CS domain except when CS is restricted and PS signaling connection is available.
  - PS preferred – Use PS domain except when PS is restricted and CS signaling connection is available.

Address	Default	SMS domain preference	NV item value	PICS
909	1	CS preferred	0	TSPC_SMS_over_GPRS = TRUE
		PS preferred	1	TSPC_SMS_over_GPRS = TRUE
		CS only	2	TSPC_SMS_over_GPRS = FALSE
		PS only	3	TSPC_SMS_over_GPRS = TRUE

NV_SMS_CFG_ROUTING_I

- NV_SMS_CFG_ROUTING_I (#830) lists out the way SMS messages are routed and stored for different message classes.
- The first six indices of this NV item pp_routes[0 through 5] define the routing process, while the next 6 indices pp_mem_stores[0 through 5] define the storage process for the corresponding route.
- See [Q8] for additional information.

Address	Default
830	▪ Class 0 Routing = 1, Storage = 3→Store and notify, stores in NV for GSM/WCDMA ▪ Class 1 Routing = 1, Storage = 3→Store and notify, stores in NV for GSM/WCDMA ▪ Class 2 Routing = 1, Storage = 2→Store and notify, stores in SIM for GSM/WCDMA ▪ Class 3 Routing = 1, Storage = 3→Store and notify, stores in NV for GSM/WCDMA ▪ Class 4 Routing = 1, Storage = 3→Store and notify, stores in NV for GSM/WCDMA ▪ Class 5 Routing = 1, Storage = 6→Store and notify, stores in NV for CDMA

NV_SMS_GW_CB_CONFIG_I

- This NV item is used to enable/disable reception of Cell Broadcast (CB) messages in GSM and WCDMA mode.

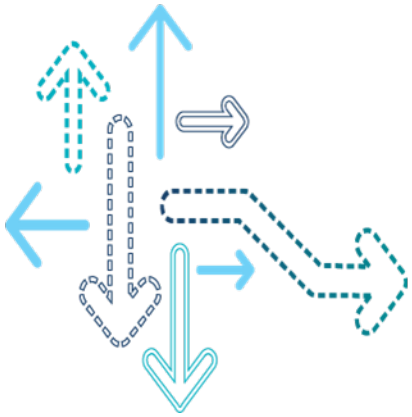
Address	Default	Feature support	NV item value	Associated PICS
1016	0	Enabled	1	▪ TSPC_Feat_SMS_CB_DRX = TRUE ▪ TSPC_Ext_SMcell_BC = TRUE ▪ TSPC_Serv_TS23 = TRUE ▪ pc_SMS_CellBroadcast = TRUE ▪ pc_SMS_CellBroadcast_DRX = TRUE
		Disabled	0	▪ TSPC_Feat_SMS_CB_DRX = FALSE ▪ TSPC_Ext_SMcell_BC = FALSE ▪ TSPC_Serv_TS23 = FALSE ▪ pc_SMS_CellBroadcast = FALSE ▪ pc_SMS_CellBroadcast_DRX = FALSE

NV_SMS_GW_CB_USER_PREF_I

- This NV item is used to enable/disable language filters for receiving broadcast messages. To receive broadcast messages of all languages, this NV should be set to 2.

Address	Default	Feature support	NV item value	Associated PICS
1017	0	Broadcast messages are disabled	0	
		Language Filtering is enabled	1	
		Ignore language filtering	2	

LTE NV Items



NV_LTE_BC_CONFIG_I

- NV 6828
- Setting for user band selection for LTE; this NV item is a bitmap with Band n corresponding to (n-1)th bit position; example provided below

LTE band	Bit position	NV_LTE_BC_ CONFIG_I(6828)	PICS	Associated PICS
eFDD Band I	0	1	pc_eFDD_Band1_Supp	pc_eBand***N***_Supp (where ***N*** is the band number; set TRUE all supported bands)
eFDD Band 2	1	2	pc_eFDD_Band2_Supp	
eFDD Band 3	2	4	pc_eFDD_Band3_Supp	
eFDD Band 4	3	8	pc_eFDD_Band4_Supp	
eFDD Band 5	4	16	pc_eFDD_Band5_Supp	
eFDD Band 6	5	32	pc_eFDD_Band6_Supp	
eFDD Band 7	6	64	pc_eFDD_Band7_Supp	
eFDD Band 8	7	128	pc_eFDD_Band8_Supp	
eFDD Band 9	8	256	pc_eFDD_Band9_Supp	
eFDD Band 10	9	512	pc_eFDD_Band10_Supp	
eFDD Band 11	10	1024	pc_eFDD_Band11_Supp	
eFDD Band 12	11	2048	pc_eFDD_Band12_Supp	
eFDD Band 13	12	4096	pc_eFDD_Band13_Supp	
eFDD Band 14	13	8192	pc_eFDD_Band14_Supp	

NV_IPV6_ENABLED_I

- This NV item is used to enable/disable IPv6 support
- Enabled for Verizon; enabled for AT&T for VoLTE-capable devices

Address	Default	Feature support	NV item value	Associated PICS
1896	1	Enabled	1	pc_ipv6=TRUE
		Disabled	0	pc_ipv6=FALSE

- If this NV remains as a default, the switch from IPv4 to IPv4v6 can be performed with the AT command at+cgdcont.

NV_SMS_ONLY

- If set to 1, device's LTE CS capability is SMS only.
- All data cards that support data only and SMS services should be configured to "SMS only."
- NV 65776 is effective only if voice call support is disabled through NV item 5280

Address	Default	Feature support	NV item value	Associated PICS
65776	0	CS on LTE is SMS only	1	▪ pc _CS_SMS_only = TRUE ▪ pc_SMS_SGs = TRUE ▪ pc_SMS_SGs_MT = TRUE ▪ pc_SMS_SGs_MO = TRUE
		CS on LTE is not SMS only	0	▪ pc _CS_SMS_only = FALSE ▪ pc_SMS_SGs = TRUE ▪ pc_SMS_SGs_MT = TRUE ▪ pc_SMS_SGs_MO = TRUE

NV_UE_USAGE_SETTING

- This NV item is used to set the usage of the device as voice centric or data centric.
- NV item 65777 is not used if NV item 65776 is set to SMS only.

Address	Default	Feature support	NV item value	Associated PICS
65777	0	Voice-centric	0	▪ If 850 = 2 (CS+PS) ▪ pc_CS_PS_data_centric = False ▪ pc_CS_PS_voice_centric = True ▪ If 850 = 1 (PS only) ▪ pc_PS_data_centric = False ▪ pc_PS_voice_centric = True
		Data-centric	1	▪ If 850 = 2 (CS+PS) ▪ pc_CS_PS_data_centric = True ▪ pc_CS_PS_voice_centric = False ▪ If 850 = 1 (PS only) ▪ pc_PS_data_centric = True ▪ pc_PS_voice_centric = False

Notes:

- CS/PS mode 1 of operation – The UE is CSFB-capable and configured to use CSFB, and non-EPS services are preferred. The UE registers to both EPS and non-EPS services.
- CS/PS mode 2 of operation – The UE is CSFB-capable and configured to use CSFB, and EPS services are preferred. The UE registers to both EPS and non-EPS services.

NV_LTE_DISABLE_DURATION

- This NV item is used to configure the duration for disabling LTE mode (voice-centric case or NV65777 = 0).
- Behavior for legacy baselines is different; see [Q2].

Address	Default	Feature support	NV item value	Associated PICS
65778	720s	Read T3402 timer and set the duration to T3402 value; if read fail duration, set to 720 sec	0	
		Duration set to 720 sec	Between 0 and 720 sec	
		Duration set to same as NV setting	>720 sec	

- The following voice-centric device disables LTE for the duration mentioned in NV 65778:
  - Registered in LTE with LTE CS capability as CSFB not preferred
  - Registered in LTE with LTE CS capability as SMS only
  - Registered in LTE only for EPS services
- It is important to set this NV to 0 for AT&T devices to allow correct LTE DAM operation.

LTE NAS Temp Forbidden PLMN Feature

- Only set for Verizon devices
- Once UE starts timer T3402 with limited service on a PLMN (during Attach Failure, TAU failure scenarios), UE is not allowed to do any registration on the same PLMN again for T3402
- Since T3402 timer can be stopped in some scenarios (LTE↔3GPP2 RAT change, service acquired on GW, etc.), NV 65591 is created to fulfill this requirement
- With this NV enabled, UE maintains a temp forbidden PLMN list
- Serving PLMN is added to the list upon T3402 with limited service for certain amount of time.
- No registration is allowed on the PLMN while the PLMN is in the list.

Address	Default	Feature support	NV item value	Associated PICS
65591		Enabled	0xFFFFFFFF	
		Disabled	Other	

NV_FEATURE_3GPP_CSFB_SKIP_OPT_WCDMA_SIBS

- With this feature, only the MIB, SIB1, SIB3, SIB5, and SIB7 are required to camp and proceed with CSFB call on UTRAN.
- For CSFB→UTRAN, the call setup delay increases due to additional signaling on both the LTE and UTRAN side. A substantial part of the call setup delay is due to reading system information on the UTRAN prior to access. In order to meet strict operator Key Performance Indicator (KPI) requirements for call setup delay, the optimization was implemented specifically for CSFB redirection to UTRAN.
- This is enabled only for AT&T devices.

Address	Default	Feature support	NV item value	Associated PICS
65885	0	Enabled	1	
		Disabled	0	

WCDMA→LTE Measurement

- Used to disable EUTRA Compressed mode measurement in WCDMA

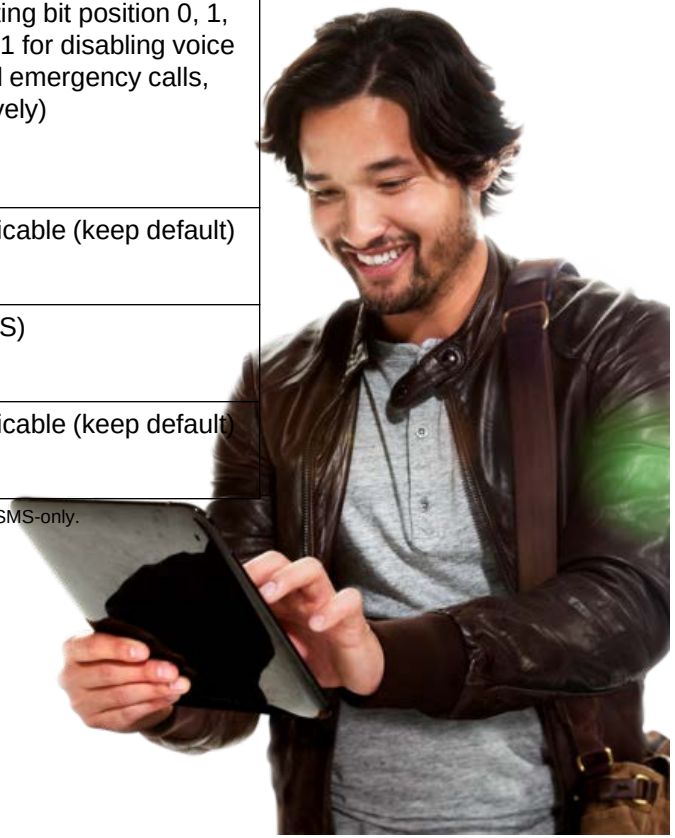
Address	Default	Feature support	NV item value	Associated PICS
67256	1	Disable WCDMA→LTE EUTRA	0	▪ pc_UTRA_CompressedModeRequired=FALSE ▪ pc_UTRA_FeatrGrp_2=FALSE ▪ (Support of EUTRAN measurements and reporting in connected mode)
		Enable WCDMA→LTE EUTRA Compressed mode	1	▪ pc_UTRA_CompressedModeRequired=TRUE ▪ pc_UTRA_FeatrGrp_2=TRUE

LTE NV Items Typical Setting and Summary

- Recommended NV settings for data cards/netbooks/tablets

NV item	Supported values	VzW/Sprint data centric	AT&T voice centric
NV_SMS_ONLY, 65776	0, 1	Not applicable (keep default)	1 (SMS-only enabled)
NV_DISABLE_CM_ CALL_TYPE_I, 5280	See [Q2]	515 (setting bit position 0, 1, and 9 to one for disabling voice, CSD and emergency calls respectively)	515 (setting bit position 0, 1, and 9 to 1 for disabling voice calls and emergency calls, respectively)
NV_UE_USAGE_ SETTING, 65777	0, 1	1 (data-centric)	Not applicable (keep default)
NV_SERVICE_DOMAIN_PR EF_I, 850	0,1,2	2 (CS+PS)	2 (CS+PS)
NV_LTE_DISABLE_ DURATION, 65778	0, between 0 and 720 sec, >720 sec	Not applicable (keep default)	Not applicable (keep default)

Note: NV 65776 is effective only if voice call support is disabled through NV item 5280. NV 65777 is not used if NV 65776 is set to SMS-only.



LTE NV Items Typical Setting and Summary (cont.)

- Recommended NV settings for smartphones

NV item	Supported values	VzW/Sprint data-centric (SVLTE)	AT&T voice-centric
NV_SMS_ONLY, 65776	0, 1	Not applicable (keep default)	Not applicable (keep default)
NV_DISABLE_CM_CALL_TYPE_I, 5280	See [Q2]	2 (setting bit 1 only disables CSD)	2 (setting bit 1 only disables CSD)
NV_UE_USAGE_SETTING, 65777	0, 1	1 (data-centric)	0 (voice-centric)
NV_SERVICE_DOMAIN_PREF_I, 850	0, 1, 2	2 (CS+PS)	2 (CS+PS)
NV_LTE_DISABLE_DURATION, 65778	0, between 0 and 720 sec, >720 sec	Not applicable (keep default)	0

EFS Files

File type	Filename	Location in EFS	Comments/Applicability
PDN throttling timer	pdn_throttling_config.txt	/nv/item_files/modem/data/epc	▪ Governs timing between failed connection attempts to the internet PDN ▪ Verizon and AT&T
Profile list	profile_list	/nv/item_files/modem/data/3gpp/lteps/	▪ This specifies the minimum set of the APN list, which must be enabled in the profile to attach to the LTE RAT. If for some reason one of the APNs from this list is disabled, the UE will not trigger an attach request. ▪ The current values are 1 and 2. ▪ Verizon only
Attach profile	Attach_profile	/nv/item_files/modem/data/3gpp/lteps/	▪ This specifies the profile number the UE will use on initial attach. ▪ The current value is 1. ▪ Verizon only
Default profile	socks_call_prof_num and rmnet_call_prof_num	/pdp_profiles/consl_profiles/	▪ This specifies which profile number will be used by default if the application does not specify one. ▪ The current value is 3 (Internet APN). ▪ Verizon only

EFS Files (cont.)

- For more information, see [Q7] or [Q9].

File type	Filename	Location in EFS	Comments
eHRPD profiles	▪ Profile_000.txt ▪ Profile_103.txt ▪ Profile_104.txt ▪ Profile_106.txt ▪ Profile_107.txt	/application_specific_ profiles	▪ Used by eHPRD to correctly set up PDP contexts ▪ Verizon only
RAT acquisition order	Rat_acq_order	/sd	Determines the RAT priority list for PLMN selection
Band supported table	Bst_tbl	/sd	Allows Bands to be scanned by MCC
Disabling Carrier Aggregation	ca_disable	/nv/item_files/modem/lte/common/	Allows to disable Carrier Aggregation capability. Setting this to 1 disables carrier aggregation
Feature Group Indicator file for Rel 8	fgi	/nv/item_files/modem/lte/rrc/cap/	Used to forcefully disable any of the feature groups (1-32) already supported by the SW. **Update the PICS items Pc_FeatrGrp_1 ... Pc_Featr_grp_32 accordingly**
Feature Group Indicator file for Rel 9	fgi_rel9	/nv/item_files/modem/lte/rrc/cap/	Used to forcefully disable any of the feature groups (33-64) already supported by the SW. **Pc_FeatrGrp_33 ... Pc_Featr_grp_64 accordingly**
Feature Group Indicator file for Rel 10	fgi_r10	/nv/item_files/modem/lte/rrc/cap/	Used to forcefully disable any of the feature groups (101-132) already supported by the SW. **Pc_FeatrGrp_101 ... Pc_Featr_grp_132 accordingly**

PICS Items and Summary

- For GCF testing, these are the typical PICS items that need to match UE configuration.

PICS item	Typical value	Associated NV	Comments
pc_Attach	▪ TRUE for PS only ▪ FALSE for CS+PS	▪ If NV 850 = 1, PS only ▪ If NV 850 = 2, CS+PS	
pc_Combined_Attach	▪ FALSE for PS only ▪ TRUE for CS+PS	▪ If NV 850 = 1, PS only ▪ If NV 850 = 2, CS+PS	
pc_ue_Category_M	Where M = 1, 2, 3, 4, or 5 Typically, pc_ue_Category_3 = TRUE		
pc_eBandN_Supp	TRUE for all bands that apply		Note that N is the band number; in PICS settings you will see it as: pc_eBand1_Supp, pc_eBand2_Supp, etc.
pc_CS_PS_data_centric	▪ True for data-centric device ▪ False for voice-centric device	65777 = 1 and NV850 = 2	Example, for VZW SVLTE device
pc_CS_PS_voice_centric	▪ True for voice-centric device ▪ False for data-centric device	65777 = 0 and NV850 = 2	For AT&T smartphone/ handset
pc_PS_data_centric	▪ True for data-centric device ▪ False for voice-centric device	65777 = 1 and NV850 = 1	For most data cards that do not support SMS over SGs
pc_PS_voice_centric	▪ True for voice-centric device ▪ False for data-centric device	65777 = 0 and NV850 = 1	For VoLTE-capable devices

PICS Items and Summary (cont.)

- For GCF testing, these are typical PICS items that need to match UE configuration.

PICS item	Typical value	Associated NV	Comments
pc_ipv4	TRUE		
pc_ipv6	▪ False for non-VoLTE AT&T ▪ True for Verizon UE or VoLTE AT&T UE	▪ NV 1896 = 0 ▪ NV 1896 = 1	If this NV is left as a default, a switch from IPv4 to IPv4v6 can be performed with the AT command at+cgdcont.

PICS Items and Summary (cont.)

- NV 10 and RAT ACQ Order EFS file should contain the respective RATs.

PICS item	Typical value	Associated NV	Comment
pc_1xRTT	FALSE	These are impacted by the setting of the following: ▪ NV 10 – Pref_mode ▪ NV 855 – RTRE configuration ▪ NV 441, 946, and 2954: CDMA, GSM, and WCDMA Band support configuration ▪ NV 3446 – TRM setting ▪ UICC being used has CSIM application	Though a device may support C2K, UE does not report as part of UE capability
pc_HRPD	FALSE		▪ This should be FALSE unless test UICC contains CSIM subscription ▪ If CSIM is present in UICC, then UE will report that HRPD is supported, thus this would need to be set to TRUE
pc_eFDD	TRUE		TRUE if UE supports FDD LTE
pc_eTDD	FALSE		FALSE if UE does not support TDD LTE
Pc_GERAN	TRUE		▪ TRUE if UE supports GERAN ▪ This should be FALSE unless test UICC contains CSIM subscription
pc_UTRA	TRUE		▪ TRUE if UE supports UTRAN ▪ This must match value of pc_FDD ▪ This should be FALSE unless test UICC contains CSIM subscription
pc_FDD	TRUE		▪ TRUE if UE supports UTRAN-FDD ▪ This must match value of pc_UTRA ▪ This should be FALSE unless test UICC contains CSIM subscription
pc_TDD_LCR	FALSE		FALSE if UE does not support UTRA_TDD

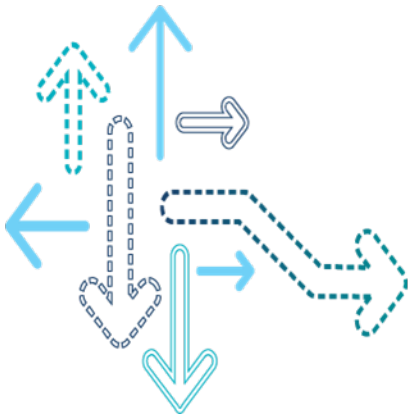
PIXIT Items and Summary

- For GCF testing, these are typical PIXIT items that need to be changed to match UE configuration.

PICS item	Typical value	Comment
px_AttachTypeTested	“EPS_ATTACH_ONLY” for PS only “COMBINED_ATTACH” for CS+PS	Must match pc_ATTACH or pc_COMBINED_ATTACH
px_IMEI_Def	Needs to set to the IMEI of the UE	This is needed for test 9.1.4.2
px_IMSI_Def	Value as in the test UICC used	A mismatch here may impact tests that require PAGING the UE
px_ePrimaryBandChannelBandwidth	n50	n50 = 10 MHz
px_ePrimaryFrequencyBand*	13	Band 13
px_eSecondaryBandChannelBandwidth	n25	n25 = 5 MHz
px_eSecondaryFrequencyBand*	4	Band 4
px_RATComb_Tested	“EUTRA_UTRA” if supports UE also supports UTRA	EUTRA_only if LTE only or if device is LTE and C2K
px_MS_ClsmkESIND	1	UE supports early sending of ClassMark information

*Depending on the test equipment used, this may be automatically set once a band is selected.

Prepping UEs for Lab Testing and Tests Used for Checking UE Configuration



Items to Change from UE Default Carrier Configuration to Support GCF Tests

- In general, IMS is disabled
  - Set NV item 67218 (IMS enabled flag) = 0
- If testing an AT&T-bound device in PTCRB
  - Set NV item 3461 (ENS-enabled flag) = 0
  - Set NV item 69676 (aggression management) = 0

Items to Change from UE Default Carrier Configuration to Support GCF Tests (cont.)

- If a CMCC product is tested, see a sample of things that must be considered for submitting devices to CMCC for lab testing.
- Device reprogramming begins from the default CMCC configuration, e.g., the commercial configuration.
- EFS files specified below (carrier_policy.xml and/or tdscdma_op_plmn_list) are modified specifically for lab testing only. See Salesforce Solution 00028386 for more information.

Product type	UEs to be submitted for testing	Tests to be done on each UE sample	Configuration differences for CMCC lab testing
SGLTE-capable product [handset]	1. UE1 configured to be in SGLTE mode	1) UE1 (as SGLTE mode) a. For TDD-LTE EPS-only TC b. For SGLTE product no need to test TDD-LTE combined attach test cases c. For SGLTE product no need to test about FDD Data Centric TCs (e.g., 9.2.1.2.4 FDD) d. For SGLTE devices, no need to test FDD-LTE TCs	GCF "carrier_policy.xml": PRESENT GCF "tdscdma_op_plmn_list": PRESENT Diff_fdd_tdd_fgi_enable: NOT PRESENT
	2. UE2 configured to be in CSFB mode (combined-attach)(Dual-Mode)	2) UE2 as CSFB mode (Voice Centric)(dual-mode) a. For FDD-LTE combine attach b. For TDD-LTE IRAT to TD-SCDMA c. For TDD-LTE and FDD-LTE IRAT to GSM d. For FDD-LTE <> TDD-LTE Inter-Band testing	GCF "carrier_policy.xml": NOT PRESENT GCF "tdscdma_op_plmn_list": PRESENT Diff_fdd_tdd_fgi_enable: PRESENT
	3. UE3 configured to be in CSFB mode (FDD-LTE/WCDMA IRAT)	3) UE3 as CSFB mode a. For FDD-LTE IRAT to WCDMA	GCF "carrier_policy.xml": NOT PRESENT GCF "tdscdma_op_plmn_list": NOT PRESENT Diff_fdd_tdd_fgi_enable: NOT PRESENT

Tests to Run as Sanity for GCF Configuration (cont.)

- It is recommended that 36.523-1 test cases 9.1.4.2 and 8.5.4.1 are run.
- When test 9.1.4.2 is run, if PIXIT item px_IMEI_Def and/or px_IMEISV_Def are written incorrectly, the test case fails.
- When test 8.5.4.1 is run, it is important to look at the UE Capability Information message from the UE log.

```
================================

Further decode UE EUTRA capability PDU:

================================

value UE-EUTRA-Capability ::=
{
  accessStratumRelease rel8,
  ue-Category 3,
  pdcp-Parameters
```

From this part of the message, the following PICS must be set:

`pc_ue_Category_3` = TRUE

The other pc_ue_Category_***M*** must be set to FALSE.

- For UEs that support categories higher than 5, multiple UE category PICS items must be enabled.

Category supported by UE	PICS items to be enabled
6	▪ pc_UE_Category_4 = True ▪ pc_UE_Category_6 = True
7	▪ pc_UE_Category_4 = True ▪ pc_UE_Category_7 = True
8	▪ pc_UE_Category_5 = True ▪ pc_UE_Category_8 = True

Tests to Run as Sanity for GCF Configuration (cont.)

- To see what Robust Header Compression (RoHC) profiles are supported by the device, look into this part of the message:

```
supportedROHC-Profiles
   {
     profile0x0001 TRUE,
     profile0x0002 TRUE,
     profile0x0003 FALSE,
     profile0x0004 FALSE,
     profile0x0006 FALSE,
     profile0x0101 FALSE,
     profile0x0102 FALSE,
     profile0x0103 FALSE,
     profile0x0104 FALSE
```

From this part of the message, the following PICS must be set:

pc_ROHC_profile0x0001 = TRUE
pc_ROHC_profile0x0002 = TRUE
pc_ROHC_profile0x0003 = FALSE
pc_ROHC_profile0x0004 = FALSE
pc_ROHC_profile0x0006 = FALSE
pc_ROHC_profile0x0101 = FALSE
pc_ROHC_profile0x0102 = FALSE
pc_ROHC_profile0x0103 = FALSE
pc_ROHC_profile0x0104 = FALSE

Tests to Run as Sanity for GCF Configuration (cont.)

- To see what bands are supported by the device, look into this part of the message:

```
rf-Parameters
  {
    supportedBandListEUTRA
    {
      {
        bandEUTRA 1,
        halfDuplex FALSE
      },
      {
        bandEUTRA 3,
        halfDuplex FALSE
      },
      {
        bandEUTRA 7,
        halfDuplex FALSE
      },
      {
        bandEUTRA 8,
        halfDuplex FALSE
      },
      {
        bandEUTRA 20,
        halfDuplex FALSE
      }
```

From this part of the message, the following PICS must be set:

pc_eBand1_Supp = TRUE
pc_eBand3_Supp = TRUE
pc_eBand7_Supp = TRUE
pc_eBand8_Supp = TRUE
pc_eBand20_Supp = TRUE

The other pc_eBand***N***_Supp must be set to FALSE

Tests to Run as Sanity for GCF Configuration (cont.)

- To see what other RATs are supported by the device, look into this part of the message:

```
interRAT-Parameters
    utraFDD
      supportedBandListUTRA-FDD
      {
        bandI,
        bandII,
      },
    geran
    {
      supportedBandListGERAN
      {
        gsm850,
        gsm1900
      },
      interRAT-PS-HO-ToGERAN FALSE
    },
    cdma2000-HRPD
    {
      supportedBandListHRPD
      {
        bc0,
        bc1
      },
      tx-ConfigHRPD single,
      rx-ConfigHRPD single
    },
    cdma2000-1xRTT
    {
      supportedBandList1XRTT
      {
        bc0,
        bc1
      },
      tx-Config1XRTT single,
      rx-Config1XRTT single
    }
```

From this message, the following PICS must be set:

pc_GERAN = TRUE
pc_UTRA = TRUE
pc_FDD = TRUE
pc_1xRTT = TRUE
pc_HRPD = TRUE

Tests to Run as Sanity for GCF Configuration (cont.)

- To see what feature groups are supported by the device, look into this part of the message:

- The feature group indicators field represents what feature groups are supported.
- 1 − TRUE, 0 − FALSE
- The MSB represents FG 1, the next bit to the right represents FG2, etc.
- For the example above, FGs 1, 9, 11, 30, 31 and 32 are *not* supported by the UE and must be set to FALSE in the PICS file. The remaining are TRUE.
- PICS item is “pc_FeatrGrp_X” where “X” is from 1 to 32.

Tests to Run as Sanity for GCF Configuration (cont.)

- Additional Rel 9 FGIs:


```
featureGroupIndRel9Add-r9 '11110000 00000000 00000000 00000000'B
```

- 1 − TRUE, 0 − FALSE
- The MSB represents FG 33, the next bit to the right represents FG 34, etc.
- For the example above, FGs 33 through 36 are supported by the UE and must be set to TRUE in the PICS file. The remaining are FALSE
- PICS item is “pc_FeatrGrp_Y” where “Y” is from 33 to 64.

Tests to Run as Sanity for GCF Configuration (cont.)

- Mode-specific FGIs
  - These are applicable when UE is a Dual-mode UE, which means it can support LTE-FDD and LTE-TDD at the same time
  - The UE will also report Common FGI, as well as FDD-specific and TDD-specific FGIs
  - The FDD-specific PICS item is "**pc_FeatrGrp_n_F**"
  - The TDD-specific PICS item is "**pc_FeatrGrp_n_T**"
  - "n" is the FGI number from 1-64
  - The Common FGIs is an AND of the FDD-specific and TDD-specific FGIs

```
Common Feature group
featureGroupIndicators '01111110 01001101 11011000 10000010'B,
featureGroupIndRel9Add-r9 '00000000 00000000 00000000 00000000'B,

fdd-Add-UE-EUTRA-Capabilities-r9
{
 featureGroupIndicators-r9 '01111111 01001111 11111110 10011010'B,
 featureGroupIndRel9Add-r9 '11000000 00000000 00000000 00000000'B
},
tdd-Add-UE-EUTRA-Capabilities-r9
{
 featureGroupIndicators-r9 '01111110 01001101 11011000 10000010'B,
 featureGroupIndRel9Add-r9 '00000000 00000000 00000000 00000000'B
```

FG 1

FG 33

FG_F 1

FG_F 33

FG_T 1

FG_T 33

Inter-RAT and Feature Group Indicator reporting

- There are a few NVs that impact how certain Inter-RAT support and FGIs are reported by the UE. These are:
  - NV 10 – Mode Preference
  - NV 855 – RTRE configuration
  - NV 441, 946 and 2954 – CDMA, GSM and WCDMA band support configuration
  - NV 3446 – TRM setting
  - UICC being used has CSIM application
- The software takes these settings and determines what Inter-RAT and FGIs to report
  - The basic FGIs impacted are 8, 12, 19, 22, 23, 24, 26.
  - The Add Rel 9 FGIs impacted are 33, 34,35, 36.

Inter-RAT and Feature Group Indicator reporting (cont.)

- Some of the following examples show how the Inter-RAT parameters and FGIs are reported by the UE depending on settings.

Configuration sample	NV 10	NV 3446	NV 441, 946	NV 855	UICC used in testing	Inter-RAT	Basic FGIs	Add Rel 9 FGIs
Configuration sample 1 (VZW SVLTE)	4 - automatic	2,0 or 66,2 (SVLTE-enabled)	CDMA, GSM and WCDMA bands are enabled	0	has CSIM	▪ pc_1xRTT = FALSE ▪ pc_HRPD = TRUE ▪ pc_UTRA = FALSE ▪ pc_FDD = FALSE ▪ pc_GERAN = FALSE	▪ pc_FeatrGrp 8 = FALSE ▪ pc_FeatrGrp 12 = TRUE ▪ pc_FeatrGrp 19 = TRUE ▪ pc_FeatrGrp 22 = FALSE ▪ pc_FeatrGrp 23 = FALSE ▪ pc_FeatrGrp 24 = FALSE ▪ pc_FeatrGrp 26 = TRUE	▪ pc_FeatrGrp 33 = FALSE ▪ pc_FeatrGrp 34 = FALSE ▪ pc_FeatrGrp 35 = FALSE ▪ pc_FeatrGrp 36 = TRUE
Configuration sample 2 (VZW SVLTE)	4 - automatic	2,0 or 66,2 (SVLTE-enabled)	CDMA, GSM and WCDMA bands are enabled	0	has NO CSIM	▪ pc_1xRTT = FALSE ▪ pc_HRPD = FALSE ▪ pc_UTRA = TRUE ▪ pc_FDD = TRUE ▪ pc_GERAN = TRUE	▪ pc_FeatrGrp 8 = TRUE ▪ pc_FeatrGrp 12 = FALSE ▪ pc_FeatrGrp 19 = TRUE ▪ pc_FeatrGrp 22 = TRUE ▪ pc_FeatrGrp 23 = TRUE ▪ pc_FeatrGrp 24 = FALSE ▪ pc_FeatrGrp 26 = FALSE	▪ pc_FeatrGrp 33 = TRUE ▪ pc_FeatrGrp 34 = TRUE ▪ pc_FeatrGrp 35 = FALSE ▪ pc_FeatrGrp 36 = FALSE
Configuration sample 3 (VZW non-SVLTE or RoW that supports 3gpp2)	4 - automatic	98,0 (SVLTE-disabled)	CDMA, GSM and WCDMA bands are enabled	0	has CSIM	▪ pc_1xRTT = TRUE ▪ pc_HRPD = TRUE ▪ pc_UTRA = TRUE ▪ pc_FDD = TRUE ▪ pc_GERAN = TRUE	▪ pc_FeatrGrp 8 = TRUE ▪ pc_FeatrGrp 12 = TRUE ▪ pc_FeatrGrp 19 = TRUE ▪ pc_FeatrGrp 22 = TRUE ▪ pc_FeatrGrp 23 = TRUE ▪ pc_FeatrGrp 24 = TRUE ▪ pc_FeatrGrp 26 = TRUE	▪ pc_FeatrGrp 33 = TRUE ▪ pc_FeatrGrp 34 = TRUE ▪ pc_FeatrGrp 35 = TRUE ▪ pc_FeatrGrp 36 = TRUE
Configuration sample 4 (VZW non-SVLTE or RoW that supports 3gpp2)	30 - LTE only	98,0 (SVLTE-disabled)	CDMA, GSM and WCDMA bands are enabled	0	has CSIM	▪ pc_1xRTT = FALSE ▪ pc_HRPD = FALSE ▪ pc_UTRA = FALSE ▪ pc_FDD = FALSE ▪ pc_GERAN = FALSE	▪ pc_FeatrGrp 8 = FALSE ▪ pc_FeatrGrp 12 = FALSE ▪ pc_FeatrGrp 19 = FALSE ▪ pc_FeatrGrp 22 = FALSE ▪ pc_FeatrGrp 23 = FALSE ▪ pc_FeatrGrp 24 = FALSE ▪ pc_FeatrGrp 26 = FALSE	▪ pc_FeatrGrp 33 = FALSE ▪ pc_FeatrGrp 34 = FALSE ▪ pc_FeatrGrp 35 = FALSE ▪ pc_FeatrGrp 36 = FALSE

Tests to Run as Sanity for GCF Configuration

- It is recommended to run 51.010 test 26.6.11.3 for 2G PICS verification.
- It is recommended to run 34.123-1 test 8.1.5.7 for 3G PICS verification.

Provisioning UE for Specific Carriers

- As mentioned earlier, the UE should be set to the corresponding carrier by default.
- Aside from reverting the changes made to run GCF/PTCRB testing, there should not be a need to make any more changes to the UE.
- To revert the UE to its original AT&T configuration:
  - Set NV item 3461 (ENS enabled flag) = 1
  - Set NV item 69676 (Aggression management) = 1

AT Commands to Configure Verizon Devices

- For Verizon UE, it does not hurt to double-check its configuration using AT commands
- For setting PDP profiles:
  - AT+CGDCONT=<profile #>,<IP stack>,<APN>

    Where:
    - “profile #” is the PDP profile number to be configured (1, 2, 3, or 4)
    - “IP stack” is the type of IP stack that is supported by the UE (IP or IPv4v6)
    - “APN” is the Access Point Name (vzwims or vzwinternet)
- To set for Verizon, use:
  - AT+CGDCONT=1, “IPv4v6”, “vzwims”
  - AT+CGDCONT=2, “IPv4v6”, “vzwadmin”
  - AT+CGDCONT=3, “IPv4v6”, “vzwinternet”
  - AT+CGDCONT=4, “IPv4v6”, “vzwapp”

AT Commands to Configure Verizon Devices (cont.)

- For enabling or disabling PDP profiles:
  - AT$QCPDPCFGE=<profile #>,<enable/disable flag>,<inactivity timer>,<APN class>,<apn_bearer>,< MAX_CONN>,<MAX_CONN_T>,< WAIT_TIME>,<emergency call support>,<operator-specific PCO>,<MCC>,<MNC>

    Where:

    1. profile # – Number of the profile to be configured (1, 2, 3, etc.)
    2. enable/disable flag − 0 = Enable, 1 = Disable
    3. inactivity timer − Time in seconds in which the UE disconnects from PDN if no activity occurs for that duration; 0 = Infinity
    4. APN class − Designator for classification of APN; values are 1 = class 1 APN, 2 = class 2 APN, etc.
    5. apn_bearer – Allows selection of a particular RAT for this PDP context (1 for G, 2 for W, 4 for L, 8 for T, 255 for ANY)
    6. MAX_CONN – Specifies the maximum number of PDN connections in a time block that the UE is allowed to perform with the network; time block size is MAX_CONN_T sec
    7. MAX_CONN_T – Specifies time duration in seconds during which the UE counts PDN connections already made
    8. WAIT_TIME – Specifies the minimum time interval between the new PDN connection request and the last successful UE-initiated PDN disconnection
    9. Emergency call support – Flag that shows if emergency calls are supported on this PDN profile
    10. Operator-specific PCO – Allows operator-specific PCO to be defined; in this case, 65280 or 0xFF00
    11. MCC – Mobile Country Code information for PCO 0xFF00
    12. MNC – Mobile Network Code information for PCO 0xFF00
- Example for enabling PDP profiles 1
  - AT$QCPDPCFGE=1,0,0,1,255,1023,300,0,0,65280,311,480

AT Commands to Configure Verizon Devices (cont.)

- For enabling or disabling IMS P-CSCF IPv6 PCO in ATTACH request
  - AT$QCPDPIMSCFGE=<profile #>,<enable/disable flag>,0,0

    Where:
    - "profile #" is the number of the profile to be configured (1, 2, 3, or 4)
    - "enable/disable flag" − 1 to enable; 0 = to disable
- For setting enabling PDP profile 1 to request for IPv6 P-CSCF:
  - AT$QCPDPIMSCFGE=1,1,0,0
- P-CSCF is the entry point to the IMS domain and serves as the outbound proxy server for the UE; the UE attaches to the P-CSCF prior to performing IMS registrations and initiating SIP sessions
- When UE requests the P-CSCF IPv6 Protocol Configuration Option (PCO) (in Attach Request), it means that the UE is requesting IP Address of the P-CSCF server so that it can initiate a SIP session as part of P-CSCF discovery

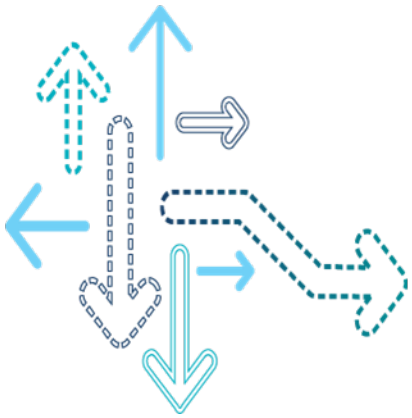
Checking if the Provisioning of Verizon is Correct

- The best way to check if the provisioning of the UE is correct for Verizon test cases, is to execute a few Verizon-specific test cases.
- Test VZW Supplementary Signaling Conformance test case 2.8 – Checks:
  - Attach to VZWIMS PDN is correct, checks that:
    - pdn_type = 3 (0x3) (Ipv4v6)
    - esm_info_trans_flag = 1 (0x1)
    - container_id = 1 (0x1) (P-CSCF Address Request)
    - container_id = 0xFF00 reporting MCC=311 and MNC = 480
    - container_id = 0x10 reporting IPv4 MTU link (for Rel 10 UEs only)
  - Connection to Verizon Internet PDN is successful
  - Connection to Verizon Admin PDN is successful
  - IMS registration is successful
- Test VZW Data Retry test 6.13 – Checks that APN switching works
- Test VZW Data Retry test 6.9 (code 8) – Checks that infinite throttling works
- Test VZW Data Retry test 6.7 (code 26) – Checks that PDN throttling works

Checking If AT&T Provisioning is Correct

- The best way to check if UE provisioning is correct for AT&T test cases is to execute a few AT&T-specific test cases.
  - Test LTE-BTR-1-1806 – Checks that LTE DAM provisioning is correct
  - Test LTE-BTR-1-0802 – Checks that CSG provisioning is correct
  - Test LTE-BTR-1-4075 – Checks that CMAS provisioning is correct

Suggestions for Triaging Lab Issues



GCF/PTCRB Test Failures Encountered Due to Incorrect Provisioning

- Device sends unexpected PDN connectivity request
  - Check to see if “Data Enabled” (for Android) or “Data Connection” (for Windows Mobile) setting is ON; this should be turned OFF
    - This is OK for most devices except AT&T. AT&T specifies in their test plan that Data Enabled must be enabled. To get the same effect, delete all APNs via the UI.
- Device failing to camp/acquire the LTE RF signal
  - Incorrect band being set on test equipment
  - Band tested is not supported or not enabled on UE
    - Check PICS or NV 6828

GCF/PTCRB Test Failures Encountered Due to Incorrect Provisioning (cont.)

- Device does not send ATTACH request
  - No SIM card
  - Broken SIM card
  - PLMN in FPLMN list – Can use AT command to clear the FPLMN list
    - at+crsm=214,28539,0,0,12,"FFFFFFFFFFFFFFFFFFFFFFFF"
- Device does not send ATTACH successfully
  - Wrong SIM card
    - Example – Using Verizon SIM instead of test equipment-provided SIM or vice versa
  - Badly provisioned SIM card
  - PICS and PIXIT mismatch vs NV settings
    - Dual-stack IP vs IPv4 only
    - Combined-attach vs EPS only
    - Security and/or integrity not enabled correctly
- UE failed test 9.1.4.2
  - PIXIT does not have the correct IMEI and/or IMEISV parameter

Some GCF/PTCRB Test Failures Encountered Due to Incorrect Provisioning

- UE failed test 8.5.4.1
  - Typical LTE PICS discrepancies
    - FGIs reported by UE are not matching PICS
      - If UE is a single-mode device, corresponding mode-specific FGIs must match the common FGIs:
        - For FDD only devices, all **pc_FeatrGrp_n_F** must match **pc_FeatrGrp_n**
        - For TDD-only devices, all **pc_FeatrGrp_n_T** must match **pc_FeatrGrp_n**
      - Check if FGI files are in EFS. These files may be disabling certain FGs incorrectly.
    - eBands reported by UE not matching PICS
    - Other RATs like pc_GERAN, pc_UTRA and pc_FDD, pc_1xRTT, or pc_HRPD not defined in PICS, though device supports it
    - pc_SwitchONOFF is FALSE
    - If UE reports fgi 28 = TRUE, Pc_TTI_Bundling might be set to FALSE, this must be TRUE also
    - If UE reports fgi 29 = TRUE, Pc_Semi_Persistence_Scheduling might be set to FALSE, this must be TRUE also
    - Device mode may have incorrect pref_mode set
      - Example – If the device is set to LTE only, but normally support GERAN and UTRA, the UE will not report GERAN or UTRA in the UE capability information
    - RoHC profiles not matching
    - UE category mismatch
      - A little more complicated for UEs that support Cat 6; set pc_UE_category_4 and pc_UE_category_6 = True

Verizon Test Setup Failures Encountered Due to Incorrect Provisioning

- UE fails to attach to VZWIMS PDN
  - Profile 1 could be provisioned incorrectly
    - USE at+cgdcont=1, “ipv4v6”, “vzwims”
  - EFS file “attach_profile” incorrect
  - May be profile 1 (IMS) and/or profile 2 (ADMIN) are disabled
    - USE at$qcpdpcfge=1,0,0,0 and at$qcpdpcfge=2,0,0,0 to enable the profiles
- UE fails to send PCO for P-CSCF IPv6
  - Use at$qcpdpimscfge=1,1,0,0 to enable the PCO in attach request
- UE fails to set “esm_info_trans_flag = 1” in attach request
  - APN is not specified in Profile 1
  - Use at+cgdcont=1, “ipv4v6”, “vzwims” to associate an APN to Profile 1
- UE fails to send operator-specific PCO 0xFF00 in PDN connectivity request
  - Must be programmed using QMITestPro
- UE fails to send operator-specific PCO IPv4 Link MTU in PDN connectivity request
  - Supported on UEs that are Rel 10 and above; if UE supports Rel 10, check NV 70328 = REL_10_THROTTLING
- IMS parameters may impact UE from sending RRC connection within test script limits
  - For all 6.x Data Retry test cases, in NV 67264 the IMS parameter regManagerPDPFailureSchedule must be changed from 10 to 1. This is for testing purposes only, such that the IMS retry timer does not falsely cause Data Retry test cases to fail.

Verizon Test Setup Failures Encountered Due to Incorrect Provisioning (cont.)

- UE fails to perform IMS registration
  - “qpconfig” file is not in EFS – The file must be added to EFS
  - Test_mode is enabled – The qpconfig file must be updated to disable test mode
    - <app_field id="SMS_CONFIG_IMS_TEST_MODE" type="int32" value="0" />
  - IMS NV not programmed properly (see [Q18])
- UE fails to perform appropriate data throttling
  - “pdn_throttling_config.txt” file is not in EFS – The file must be added to EFS
  - If running successive throttling tests, the UE must be power cycled in between tests to reset the throttling timer
- Device does not send ATTACH request
  - Maybe Prior Data Retry test case that has EMM code 11 or 14 was run
    - Need to clear FPLMN list – Can use AT command to clear the FPLMN list
    - at+crsm=214,28539,0,0,12,"FFFFFFFFFFFFFFFFFFFFFFFF"
  - Need to do full power-cycle for test cases in which EMM cause is 3, 6, 7, or 8 so that UE reads the UICC again; mode LPM/online or Airplane mode is not enough to read UICC again

Triage Recommendations

- Is the test case applicable for the product?
  - Use the relevant applicability statement from [S1] to [S6], etc.
  - For example, many PS-only test cases are not applicable for a device configured as CS+PS.
- Is the test case validated on the test equipment being used?
  - Use GCF and PTCRB website to check.
  - Use ATT 10776 to check.

Triage Recommendations (cont.)

- Is there a known issue with the test case?
  - The following Knowledge-Based (KB) articles have very useful information to let you know waivers, known issues, tricks and tips for various test cases.
  - The list is updated regularly with high priority.
  - It is strongly recommended to check this list before filing cases.
  - Check our test results document for the baseline.
  - Do basic log analysis with the help of debugging skills acquired in this training.

Test area	KB number
3G/4G GCF and PTCRB	00026035
VZW protocol	00027985
ATT/T-MOB	00024649
2G GCF and PTCRB	00026316
CMCC Lab testing information	00028386

Training Materials

- Additional training is provided in [Q18] to [Q36].

References

Ref.	Document	
Qualcomm Technologies		
Q1	*Application Note: Software Glossary for Customers*	CL93-V3077-1
Q2	*Application Note: UMTS/LTE NV Items*	80-VF299-1
Q3	*For Future Use (FFU)*	
Q4	*MSM8960 (LA1.5, LA1.51, QX1.2, WP1.5), MDM9615 (LE1.0, TN1.7, TN 1.75, TN1.8), MSM8930 (LA1.0, LA1.01, WP1.0), APQ8064 LA1.0+MDM9615 TN1.7, and APQ8064 WA1.1+MDM9615 TN1.7 GSM/GPRS/EGPRS Protocol Implementation Conformance Statement (PICS)*	80-NA874-1
Q5	*MSM8960 (LA1.5, LA1.51, QX1.2, WP1.5), MDM9615™ (LE1.0, TN1.7, TN 1.75, TN1.8), MSM8930 (LA1.0, LA1.01, WP1.0), APQ8064 LA1.0+MDM9615 TN1.7, and AP8064 WA1.1+MDM9615 TN1.7 3G Protocol Implementation Conformance Statement (PICS)*	80-NA875-1
Q6	*MSM8960 (LA1.5, LA1.51, QX1.2, WP1.5), MDM9615 (LE1.0, TN1.7, TN 1.75, TN1.8), MSM8930 (LA1.0, LA1.01, WP1.0), APQ8064 LA1.0+MDM9615 TN1.7, and APQ8064 WA1.1+MDM9615 TN1.7 LTE Protocol Implementation Conformance Statement (PICS)*	80-NA877-1
Q7	*Application Note: Verizon Wireless-Specific Configuration Details for the MDM9600/MDM9200and MSM7630+MDM9x00 Solution*	80-N3280-1
Q8	*Application Note: SMS Message Routing and Storage*	80-VN812-1
Q9	*Application Note: Verizon Wireless-Specific Configuration Details for MSM8960 SV Operation*	80-N8205-1
Q10	*Application Note: NV Items Configuration Mandated by AT&T*	80-N4812-1
Q11	*Application Note: Sprint Wireless-Specific UE Configuration Details*	80-N9187-1
Q12	*Generic Subscriber Identity Module Application Toolkit API Interface Specification*	80-V5421-1
Q13	*QMI Card Application Toolkit (QMI_CAT), Major Version 2, Minor Version 12, Specification*	80-VB816-11
Q14	*Call Manager And System Determination Nonvolatile Memory Items*	80-VJ742-1
Q15	*Application Note: PLMN/RAT Selection - UMTS*	80-N9533-1
Q16	*Application Note: Verizon Wireless-Specific Configuration Details for MDM9x15*	80-N5576-54

References (cont.)

Ref.	Document	
Qualcomm Technologies		
Q18	*Unified IMS Configuration*	80-NE411-1
Q19	*Presentation: RF Selected NV and Calibration/Factory Test*	80-NB276-1
Q20	*Qualcomm Development Acceleration Resource Toolkit (QDART) Customer Training*	80-VJ091-1
Q21	*Presentation: MSM8960/MSM8x30/MDM9x15 WTR Factory Calibration Software Update*	80-N9324-3
Q22	*Presentation: GSM Cell Selection, Cell Reselection, and Location Update Procedures*	80-N0612-1
Q23	*Presentation: GSM Dedicated Mode Procedures*	80-N0614-1
Q24	*Presentation: GPRS/EGPRS PS Call Setup and Data Transfer*	80-N0613-1
Q25	*Presentation: UMTS Cell Selection and Registration Overview*	80-N0608-1
Q26	*Presentation: WCDMA and Inter-RAT Cell Reselection Overview*	80-N0607-1
Q27	*Presentation: WCDMA Circuit-Switched and Packet-Switched Call Setup and Release*	80-N0611-1
Q28	*Presentation: Compressed Mode and Inter-RAT Handover*	80-VG976-1
Q29	*Presentation: HSDPA Call Setup and Release*	80-N0609-1
Q30	*Presentation: HSUPA Call Setup and Data Throughput Analysis*	80-N0654-1
Q31	*Presentation: LTE Cell Selection, Registration, TAU Overview*	80-N9811-1
Q32	*Presentation: LTE Connected Mode and Data Transfer*	80-N9812-1
Q33	*Presentation: LTE Cell Reselection and Redirection Overview*	80-N9810-1
Q34	*Presentation: LTE Data Throughput*	80-N9825-1
Q35	*Presentation: LTE-AS - QXDM Professional Screens for LTE Log Analysis*	80-NB453-2
Q36	*Presentation: LTE AS - Carrier Aggregation Overview*	80-NB749-1
Q37	*Presentation: Modem Software Configuration Overview*	80-N5576-96
Q38	*Table For Modem Software Pl Mappings And List Of Lab Conformance Documents*	80-NF025-1

References (cont.)

Ref.	Document	
Qualcomm Technologies		
Q39	*Presentation: LTE AS - Typical Field Scenarios/Checklists*	80-NE962-1
Q40	*Presentation: LTE-AS - QXDM Professional Screens for LTE Log Analysis*	80-NB453-2
Q41	*Presentation: Modem Binary Configuration Overview*	80-NN646-1
Q42	*Design Review Process LCR/LCVT Customer Engineering*	80-NH297-1
Q43	*Presentation: VAMOS Overview*	80-NH874-1
Standards		
S1	*User Equipment (UE) Conformance Specification; Part 2: Implementation Conformance Statement (ICSP) Proforma Specification*	3GPP TS 34.123-2
S2	*Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) Conformance Specification; Part 2: Implementation Conformance Statement (ICS) Proforma Specification*	3GPP TS 36.523-2
S3	*Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) Conformance Specification; Radio Transmission and Reception; Part 2: Implementation Conformance Statement (ICS)*	3GPP TS 36.521-2
S4	*Mobile Station (MS) Conformance Specification; Part 2: Protocol Implementation Conformance Statement (PICS) Proforma Specification*	3GPP TS 51.010-2
S5	*Mobile Station (MS) Conformance Specification; Part 4: Subscriber Identity Module (SIM) Application Toolkit Conformance Test Specification*	3GPP TS 51.010-4
S6	*Electromagnetic Compatibility (EMC) Requirements for Mobile Terminals and Ancillary Equipment*	3GPP TS 34.124

Questions?

https://support.cdmatech.com