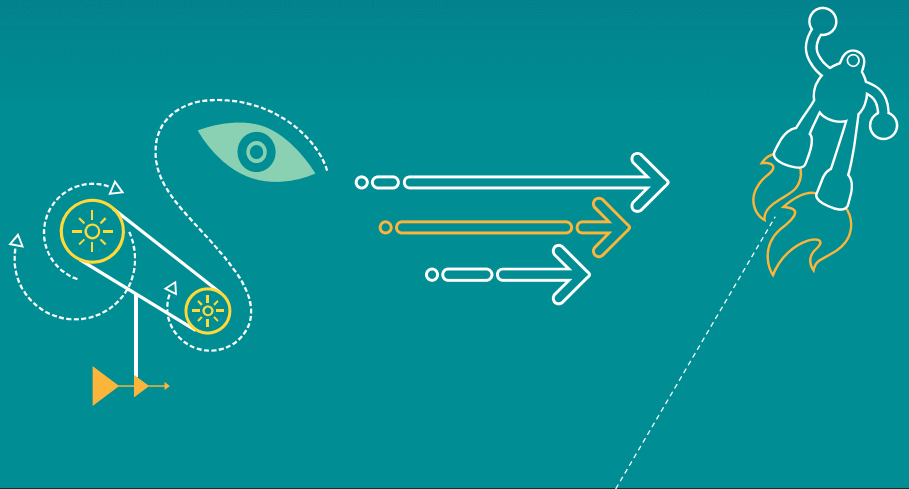
MSM8940/MSM8920 Modem Software Overview

Qualcomm Technologies, Inc.



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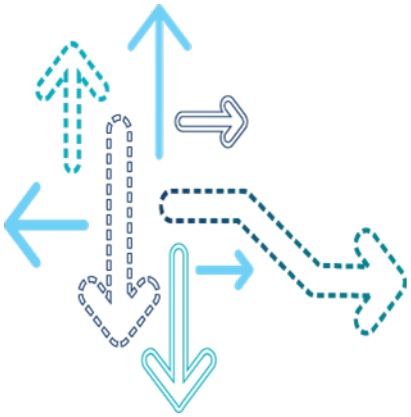
Revision History

Revision	Date	Description
A	May 2016	Initial release
B	June 2016	Updated Modem Capabilities (Features)
C	June 2016	Updated Modem Capabilities (Features), Slides 12, 16, and 18
D	September 2016	Updated Modern Capabilities (Features), Slide 14
E	October 2016	Updated MSM8940 Modem Overview, Slide 7
F	November 2016	Updated for MSM8920 chipset, slides 6 and 7, added slide 8

Contents

Overview



Introduction

- This document provides an overview of the modem subsystem, IP accelerator, modem capabilities, and software features for MPSS.TA.2.3/2.2.
- MSM8940 has modem package TA.2.2 and TA.2.3.
- MSM8920 has modem package is TA.2.3.

MSM8940/MSM8920 Modem Overview

- MSM8940/MSM8920 is based on the MPSS.TA modem with the following changes:
  - MSM8937 to MSM8940, MPSS.JO modem is replaced with MPSS.TA modem, for Cat 6
  - MSM8917 to MSM8920, MPSS.JO modem is replaced with MPSS.TA modem, for Cat 6
  - MSM8940 CS1 – MPSS.TA.2.2 package as base with WTR2965
  - MSM8940/MSM8920 CS2 – MPSS.TA.2.3 package as base with WTR3925 and WTR2965.
- MSM8940/MSM8920 is a Cat 7 (also supports Cat 6) LTE modem with 2x20 Carrier Aggregation (CA) support.
- UL 64-QAM support with Hexagon™ DSP Turbo Fmax at 691 MHz.

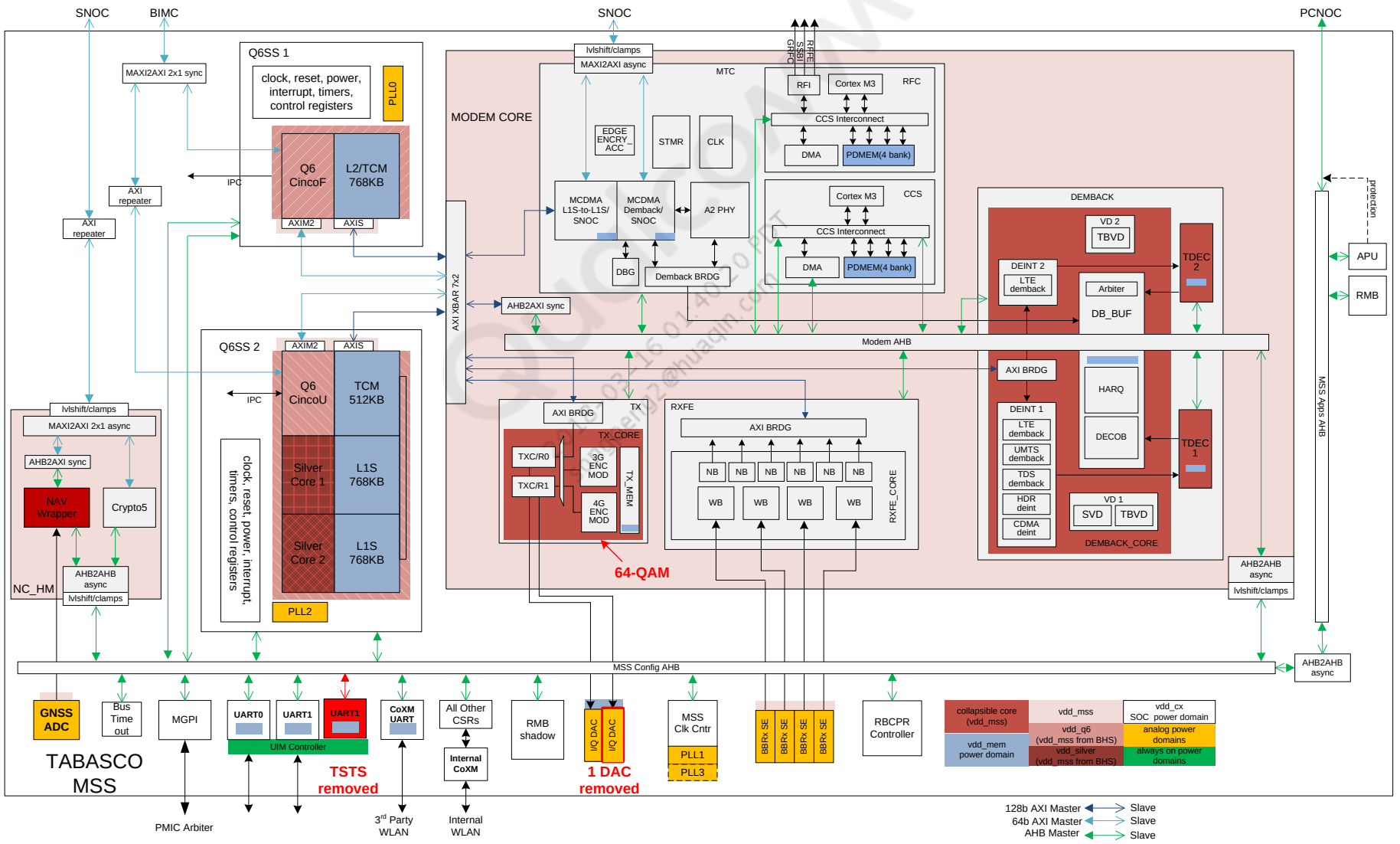
MSM8940/MSM8920 Comparison

Device	Supported airlink technology					μP	Multimedia		
	GSM	WCDMA	TD-SCDMA	LTE	CDMA		Camera	Video decode	Display
MSM8940	to EDGE	to DC-HSPA+	4.2/2.2 Mbps	to Cat 6 2x20 CA	to DOrA	Cortex-A53 64-bit Octa core	21 M	1080p	FHD
MSM8920	to EDGE	to DC-HSPA+	4.2/2.2 Mbps	to Cat 6 2x20 CA	to DOrA	Cortex-A53 64-bit Quad core	16 M	720p	HD

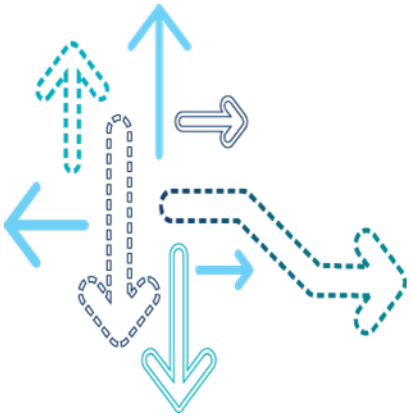
Major Features

Feature	Description	Software /Firmware	RF
1xSCH to G tune-away (MPSS.TA 2.2)	When 1X is in the Traffic state with only the data service option, the mobile station (MS) shall support 1X FCH/SCH to G tune-away with the least amount of interruption to the 1X traffic	1X/G	1X/G
X+W (TA 2.2)	L/W/G+W/G DSDS support	All technologies	All technologies
IMS Features (TA 2.2)	Support of <media> Element in UT/XCAP XML document of call diversion Enhanced Voice Services (EVS) for Carrier Graded IMS-VoWiFi	IMS	No
UL 64 QAM (TA 2.3)	Increased maximum UL throughput. Each symbol now represents 6 bits which was earlier 4 bits for 16 QAM. Maximum throughput will now be thrice that of QPSK and 1.5 times that of 16 QAM.	Few changes in SW and bulk of changes in FW	None

Modem Subsystem Architecture



Modem Capabilities



Features

Feature	MSM8940
LTE	
LTE Cat 7	Yes
eMBMS	Yes
VoLTE	Yes
TM9 (CSI-RS, DM-RS) FDD (& TDD) with up to 4 Tx	Yes
TM9 (CSI-RS, DM-RS) TDD with up to 8 Tx	No
Rel-11 ZUC	Yes
Rel-11 special subframe for TDD	Yes
LTE Rel-10 MDT with location info	Yes
TDD SDL	No
FDD LTE Cat 7 inter-band DL CA 2x20 MHz	Yes
FDD LTE Cat 7 intra-band non-contiguous DL CA 2x20 MHz	Yes
FDD LTE Cat 7 intra-band contiguous DL CA 2x20 MHz	Yes
FDD LTE Cat 7 intra-band non-contiguous CA 2x20 MHz ULCA	No
TDD LTE Cat 7 inter-band DL CA 2x20 MHz	Yes
FDD/TDD UL CA Intraband	Yes

Features (cont.)

Feature	MSM8940
TDD LTE Cat 7 intra-band non-contiguous CA 2x20 MHz	Yes
TDD LTE Cat 7 intra-band non-contiguous CA 2x20 MHz ULCA	No
TDD LTE Cat 7 intra-band contiguous CA 2x20 MHz	Yes
LTE TDD inter-frequency measurement	Yes
IPv6 prefix delegation	Yes
QCF – RLC aggregation	No
QCF – VoIP offload	No
QCF – hotspot offload	No
GERAN	
SAIC for GMSK data (MCS1-4)	Yes
SAIC for 8-PSK data (MCS5-9)	Yes
DTM MSC 11	Yes
EDGE MSC 30-33	Yes
A5/4 voice ciphering	Yes
VAMOS I+II	Yes

Features (cont.)

Feature	MSM8940
UMTS	
HSDPA Cat 24 – 42 Mbps	Yes
HS-FACH/RACH	Yes
CPC (DTX/DRX)	Yes
3-cell Q-ICE (3-2-2 iterations per carrier) with RxD	Yes
WCDMA ASDiv	Yes
Multi-flow HSDPA SF-DC	No
HSUPA Cat 7 11.2 Mbps	No
DC-HSUPA Rel 9 Cat 8 11.2 Mbps	Yes
S(calable)-UMTS	No

Features (cont.)

Feature	MSM8940
CDMA	
DOrA (3.1/1.8 Mbps fwd/rev)	Yes
DOrB Multi-AT page	No
DOrB 1-carrier 4.9 Mbps	No
1X advanced (RC11/RC8 fwd/rev SCH 307 kbps)	Yes
RxD	Yes
ASDiv	Yes
gRICE	Yes
APT/EPT	Yes
TD-SCDMA	
TDS HSUPA Cat-5/6 (2.2 Mbps)	Yes
TDS HSDPA Cat 15 64QM (2.8 Mbps)	Yes
RxD	Yes
APT/EPT	Yes
TD-SCDMA AS Div	Yes

Features (cont.)

Feature	MSM8940
Tune-away	
GPRS tune-away to WCDMA PCH (dual-SIM)	Yes
GPRS tune-away to 1X PCH/QPCH	Yes
EDVO Rev. A with quick tune-away (QTA) to GSM PCH	Yes
GPRS tune-away to TD-SCDMA PCH	Yes
GPRS to GSM burst tune-away (GBTA)	Yes
WCDMA to GSM quick burst tune-away (QBTA)	Yes
WCDMA to GSM with Rx-only tune-away (ROTA)	Yes
GPRS to own GSM PCH burst tune-away	Yes

Features (cont.)

Feature	MSM8940
Multi-tech features	
Single SIM	
SR-LTE (LTE 1X SHDR)	No
SR-LTE (LTE 1X Hybrid mode)	Yes
SV-LTE	No
S-HDR Single Band	No
SV-DO Single Band	No
SG-LTE	No
SG-LTE with 1Tx/2Rx	No
1xSRLTE/VoLTE, LTE Cat.4 2DL CA (2x10 MHz)	Yes
1xSLTE, LTE Cat 6 2DL CA (2x20 MHz)	Yes
TDSSLTE, LTE Cat 6 2DL CA	Yes

Features (cont.)

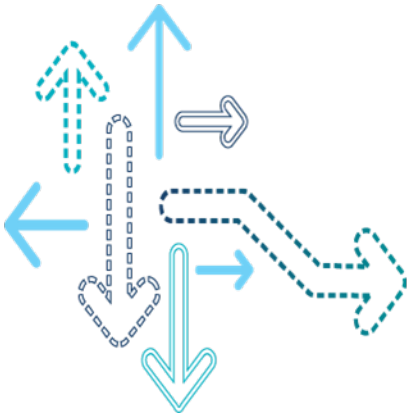
Feature	MSM8940
Dual SIM Dual Standby (DSDS)	
DSDS L/W/G + G, CSFB to W/G	Yes
DSDS L/DO/1X + G, 1xSRLTE	Yes
DSDS L/T/G + G, CSFB to T/G	Yes
DSDS eMBMS + G	Yes
DSDS W+G with Rel-7 HS-FACH	Yes
DSDS W+G with Rel-7 CPC DTX/DRX	Yes
DSDS W+G with HSPA RxD and tune-away to GSM PCH	Yes
DSDS C+G with EVDO RxD and tune-away to 1X and GSM PCH	Yes
DSDS X + W/G	Yes

Features (cont.)

- Technology specific data rates

Air interface	Standard reference	Peak data rates
CDMA2000	▪ 3GPP2 IS-2000 Release C, E, F ▪ 1x Advanced	DL – 307.2 Kbps UL – 307.2 Kbps
1xEV-DO	3GPP2 1xEV-DO Release A	DL – 3.1 Mbps UL – 1.8 Mbps
GERAN	▪ EDGE Multi Slot Class 33	DL – 296 Kbps
WCDMA	▪ 3GPP Release 9 ▪ CAT 24 DC-HSDPA & CAT 8 DC-HSUPA	DL – 42 Mbps UL – 11 Mbps
TD-SCDMA	▪ CCSA Release 3 ▪ Category 24	DL – 4.2 Mbps UL – 2.2 Mbps
LTE FDD	▪ 3GPP Release 8 – Category 7 ▪ 20 MHz inter/intra band carrier aggregation	DL – 300 Mbps UL – 100 Mbps
LTE TDD	▪ 3GPP Release 8 – Category 7 ▪ Configuration 2 (Non CA)	DL – 130 Mbps UL – 35 Mbps

Software Features



Software Features

- Following is a brief summary of the salient modem software features introduced in MSM8940. See the *References* slide for complete document details on the features. The DCNs for reference documents are mentioned in parenthesis.
  - UIM
    - Reusability of an already activated PDP context for open channel instead of creating new PDP context (80-NV694-1)
    - For ISIM authentication, Generic Bootstrapping Architecture support has been brought into modem (80-NV882-1)
    - Avoid interleaving of streaming APDUs (on default channel), MMGSDI transforms the command to high-level APDU and sends to UIMDRV (80-NK374-1)
    - Support for contactless card's envelope and proactive command in GSTK module (80-NF166-1)
    - Support for switching of profiles to facilitate eCall (80-NU320-1)
    - Extending SIMLOCK engine to suit multiple requirements from operators (80-NM328-7)
    - Support for USB UICC in UIMDRV layer to ensure the commands are routed to the AP layer via QMI UIM remote services (80-NN611-1)
    - Support for Dialing 120 should only be treated as a ECC number in CT Network (FR 29353/ 80-P3052-1)
    - Support for DSDS with centralized generic bootstrapping architecture (GBA) (FR 27975/ 80-NV882-1)
  - NAS
    - Location aware PLMN system selection – MCC Based (80-NU917-1)
    - SoftBank mobile operator requirement to disable data services for international roaming (80-NV786-1)
    - When T3346 timer is started due to Service Reject with #22 on UMTS/LTE, a notification of start, stop and expiration needs to be sent to the Apps processor (80-NV785-1)
    - Support of Manual PLMN selection in connected mode for Multi-SIM targets (80-NL239-34)
    - Enable duplication detection during LTE to GSM/WCDMA handover and vice versa for PLMN wide CMAS/ETWS broadcast messages (80-NV823-1)

Software Features (cont.)

- LTE AS
  - ULCA overview (80-NV396-22)
  - Even though there are no measurement gaps, the UE can perform inter-freq RF tuning procedures for Position Reference Signals occasions if gapless operations can occur (80-NN057-1)
  - Updating LTE RRC with an updated/modified EFS file data without requiring a UE reboot (80-NM328-115)
  - A new EFS file has been introduced which can be used to enable specific carrier Aggregation band combinations as needed (80-NU834-1)
- Data Services
  - ePDG enhancements such as PLMN-based ePDG discovery, multiple FQDNs in ePDG certificate, retries secondary and tertiary ePDG following ePDG failure and No handover in roaming LTE network (80-NV610-22)
  - Support for dual IP stack for DUN calls over single SIO port in LTE/UMTS RATs (80-NV610-22)
  - Optimization for handup from 1X to LTE (80-NV610-22)
  - Default PDN for LTE/VoLTE roaming requirement from KDDI (80-NR635-1)
  - New throttling requirement from Telcel carrier for cause 33 or 29 (80-NV716-1)
- HLOS/QMI/RIL
  - New QMI messages have been added in MPSS.TA to support read/write BSR timer, get/set RPM (Radio Policy Manager) parameters, get/set SSAC timer, raise/drop Transceiver Resource Manager (TRM) priority, start/expiry of T3346 timer, and so on. Additional TLVs are being added for a few existing QMI messages (80-NV955-1).
  - New QMI messages have been added for LTE throughput estimation, set/get APN information, get/notify data setting, enabling eMBMS in DSDS, etc. Additional TLVs are being added for some existing QMI messages.

Software Features (cont.)

- IMS
  - VoLTE conference calling (80-NV888-1)
  - Media Transfer Protocol (MTP) for Voice over Wi-Fi (VoWiFi)
- 1xCDMA/EV-DO
  - A framework to enable the voice encryption feature with customer-defined encryption algorithm and service option (80-NU870-1)
- GERAN
  - DR-DSDS GERAN overview (80-P0345-1)
  - UE to monitor (Own) PCH during a data call in NMO2 configuration (80-NR964-21)
- WCDMA
  - Support for aborting WCDMA/TD-SCDMA → GSM CCO (Cell Change Order) procedure (80-P0141-1)

References

Title	Number
Qualcomm Technologies, Inc.	
Bearer Independent Protocol Requirements for Sharing an Existing PDN Connection (China Telecom)	80-NV694-1
Generic Bootstrapping Architecture in UIM	80-NV882-1
MMGSDI Overview	80-NK374-1
GSTK-Based Log Analysis Overview	80-NF166-1
ERA-GLONASS: Support for Multiple Profiles in a SIM	80-NU320-1
SIM Lock Engine Based on HCK Overview	80-NM328-7
USB UICC Overview	80-NN611-1
Treat Dialing 120 Only as ECC Number in CT Network	80-P3052-1
Generic Bootstrapping Architecture in UIM	80-NV882-1
Enhanced System Selection for International Roaming	80-NU917-1
International Roaming for Data Services Overview	80-NV786-1
Notification of Timer T3346 Start, Stop, and Expiry to the Apps Processor	80-NV785-1
Manual PLMN Selection in Connected Mode	80-NL239-34
CMAS Duplication Detection Across RATs Overview	80-NV823-1

References (cont.)

Title	Number
Qualcomm Technologies, Inc.	
LTE Cat 10 / UL Carrier Aggregation Overview	80-NV396-22
OTDOA Inter-frequency RSTD Measurements Overview	80-NN057-1
Updating LTE RRC with EFS File Data Without a Need to Power Cycle	80-NM328-115
EFS to Control CA-Supported Band Combinations	80-NU834-1
MSM8952 Modem Data Services Overview	80-NV610-22
KDDI PDN Requirements for DI.3.0	80-NR635-1
Telcel Clear Code Requirements Overview	80-NV716-1
ATEL, RIL, and QMI Feature Requests in TA.1.0	80-NV955-1
VoWiFi Configuration Feature	80-NV888-1
Encryption Feature Development Guide	80-NU870-1
Dual Rx-Dual SIM Dual Standby Overview	80-P0345-1
Own PCH Read in Data Call Feature Description	80-NR964-21
WCDMA/TD-SCDMA to GSM CCO Abort Feature	80-P0141-1

References (cont.)

Acronym or term	Definition
ADCs	Analog-to-Digital Conversions
BRIC	Reusable Bus and Interconnect Components
CA	Carrier Aggregation
DACs	Digital-to-Analog Conversions
DSDA	Dual SIM Dual Active
DSDS	Dual SIM Dual Standby
HARQ	Hybrid Automatic Repeat Request
IPA	IP Accelerator
MCDMA	Multi Channel Direct Memory Access
MPLL	Modem Phased Lock Loop
MTC	Modem Top Controller
PLL	Phased Lock Loop
UIM	User Identity Module

Questions?

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