TM500 LTE TDD Single-UE Platform-C Test Mobile

Customer Release Notes

Release K4.1.1

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TM500 LTE Test Mobile Release Note

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CONTENTS

Introduction

1.1 Purpose

This is the release note for TM500 LTE TDD Single UE Release K4.1.1.

This release adds new functionality, including:

- Support for DRX

It also resolves a number of issues. A description of the new functionality can be found in Section 2 and a list of the issues resolved in this release is in Section 4.

Note that this release requires 4 DSP cards. For systems with 3 DSP cards please continue to use K3.x.x releases.

This release is compliant to 3GPP LTE Release 8 March'09 specifications by default. It is possible to switch between Mar'09, Jun'09, Sep'09 or Dec'09 3GPP compliant SW with the commands given in Sections 3.1 and 3.2.2.

This release uses March '10 Rel-9 ASN.1, which is backward compatible with the earlier versions.

1.2 Hardware support

This release supports TM500 LTE TDD. This software requires the TM500 Platform C hardware **with 4 DSP cards**.

This release supports frequency bands 38, 40 and 2.5GHz. The supported bands depend on the RF module fitted.

1.3 Scope

This document describes available functionality plus known limitations.

Note that the release information for the Higher Layers option is now included in this document.

1.4 Supporting Documents

All documentation for this release is contained within the installer, with the exception of the Customer Release Note, which is external.

- TM500 LTE System Overview, 47000/055 Issue 3, 27 October 2010
- TM500 LTE TDD Command Reference Manual, 46882/936 Issue 15, 25 March 2011
- TM500 LTE Measurement Reference Manual, 46882/937 Issue 16, 11 April 2011
- TM500 LTE Test Mobile Application User Guide, 46882/878 Issue 29, 7 April 2011
- TM500 LTE Installation and Configuration Guide, 46882/960 Issue 12

1.5 Version display

It is important that the versions of hardware, firmware and software on the TM500 LTE TDD are correctly matched. Therefore please confirm that the following information is displayed when running the GVER command: If the Versions of the CON, SIG and MOD are different, then please use the firmware update utility to update the firmware of the radio card.

```
GVER
   PPC-0:
    BSP: 2.0/t/R10
    APP: TM500 LTE VERSION:K4.1.1:REV1:PPC:K4.1.1
 DSP-0:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
    PCB: 1
   VHDL: 0x0057
 DSP-1:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-2:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-3:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-4:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
    PCB: 1
   VHDL: 0x0057
 DSP-5:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-6:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-7:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-8:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
    PCB: 1
   VHDL: 0x0057
 DSP-9:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-10:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-11:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-12:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
    PCB: 1
   VHDL: 0x2086
 DSP-13:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-14:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 DSP-15:
    APP: TM500 LTE VERSION:K4.1.1:REV1:DSP:K4.1.1
 Version Label: LTE-SUE-C0309_TDD_L1_K_04_01_01_REV03
 UMBRA-0
    API: 8.0.8  Product: 3
    APP: 1.0.99  Built: Apr 12 2011 12:44:29
    CON: 3.1.2  Build: 289
    SIG: 2.0.44  Build: 44
    MMC: 1.7
    Carrier:  Loc:                   <Hardware Specific>
     PCB:                            <Hardware Specific>
     SN:                             <Hardware Specific>
     BarCode:                        <Hardware Specific>
    MOD: 23.1.0  Build: 44  Type:    <Hardware Specific>
     PCB                             <Hardware Specific>
     SN:                             <Hardware Specific>
     BarCode:                        <Hardware Specific>
```

2 RELEASE INFORMATION

2.1 Added functionality for this release

- Support for DRX
- Issues resolved in Section 4.

2.2 Supported headline functionality

The supported headline functionality for this release is listed below:

- 3GPP March 2009 compliance, with configurable compliance to June ’09, Sept ’09 and Dec’09 via RRC and NAS SETP commands. See section 3.2.2 for details.
- 4x2 MIMO with forced CQI & PMI (Note that this is a licensed feature)
- Release-9 Dual Layer Beamforming (see the section 3.1 for limitations)
- PLMN reselection in automatic mode
- Uplink 64QAM support (up to Cat-4 rates, only)
- Support for NAS, PDPC, RLC, MAC and HARQ test modes.
- Support for 3GPP layers: NAS, RRC, PDCP, RLC (TM/UM/AM), MAC & L1.
- Robust Header Compression (RoHC). (Note that this is a product option)
- UE Categories 2, 3 and 4. (Note that Category 3 and Category 4 are available as product options)
- Support for 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidth.
- RF Frequency Range – 3GPP bands 38, 40 and 2.5GHz (dependent on the RF module fitted)
- Dual Radio Card support. (see notes for restrictions on upgrade)
- Support for inter-frequency handover & measurements on frequencies supported in the same RF module
- Cell Selection, enhanced to select any available cell for a given frequency and to use SIB1 parameters.
- L1 support:
    - P-BCH
    - PDCCH (signalled & scripted operation)
        - Support for DCI formats 0, 1, 1B, 1A, 1C, 2, 2A, 2B, 3 and 3A.
    - PDSCH
        - Transmission modes: Single port 0, transmit diversity, open & closed loop spatial multiplexing.
        - Transport channels: PCH, D-BCH and DL-SCH.
    - PUSCH
        - Transport channels: UL-SCH.
        - Support for PUSCH frequency hopping

        - UCI over PUSCH with no UL-SCH (TBS=0)

    - PUCCH
        - PUCCH formats 1, 1A, 1B, 2, 2A, & 2B.
        - Support for shortened formats (applies to formats 1, 1A & 1B)
    - SRS (wide band, narrow band, hopping)
    - PRACH
    - Closed loop power control
    - CQI support
        - Aperiodic and periodic reports for all supported transmission modes. (Note that it is not possible to disable Aperiodic CQI reports without disabling Periodic CQI reports)
        - Scripted CQI
    - Closed loop HARQ
        - Scripting DL-SCH ACK/NACK.
- Support for all TMA measurement groups except where stated in Section 3. The DLL1L2Control measurement group logs the signalling resource, PDCCH format, and DCI format (where appropriate).
- Support for FFE and PNE
- Support for RACH triggered by SR counter
- **ABOT**, **RBOT** and **RSET**: The commands **ABOT** and **RBOT** reboot the TM500 and permit recovery from a system assert without a power cycle.
  RSET performs a software reset and restores the TM500 to its initial power-on state; see the CRM for further details.
- Supported NAS functionality (NAS mode):
    - NAS Attach procedure
    - NAS Detach procedure (UE and NW initiated)
    - NAS Authentication procedure
    - NAS Security Mode procedure
    - NAS ciphering and integrity (NULL, SNOW 3G and AES supported)
    - Configurable Milenage algorithm via the UsimConfig command.
    - Identity Request
    - Normal and Periodic Tracking Area Update (TAU) in Idle and Connected mode (after handover)
    - Default Bearer setup
    - Dedicated bearer setup and deletion
    - Service Request procedure
    - Multiple PDN support

        - UE requested PDN connectivity procedure
        - UE requested PDN disconnect procedure
- Supported RRC functionality (NAS mode):
    - System Information decode – all scheduled SI messages will be decoded in the protocol log
    - RRC Connection Setup procedure
    - RRC Reconfiguration procedure
    - RRC Security Mode procedure
    - RRC ciphering and integrity (NULL, SNOW 3G and AES supported)
    - RRC Connection Re-establishment
    - Intra-frequency handover
    - Idle Mode paging
    - Connected Mode paging
    - Event-triggered measurement reporting
    - UE Capability procedure (limited support)
    - Cell selection and reselection.
    - Neighbour cell CGI reporting test feature
      (not supported for Inter-Frequency measurements)
      Neighbour cell CGI values are configured manually using an MCI command. Subsequent Measurement Reports requested by the network will contain the preconfigured CGI information. See the Command Reference Manual for details.
- PPPoE data connectivity in NAS and PDCP modes.
- Simulated test USIM functionality supporting test authentication according to 34.108 v8.5.0 section 8.
- TMA 'Protocol View'. This provides both compressed and detailed views of protocol messages in the form of a message sequence chart with RRC and NAS message decoding. It displays information about the current or the last executed test session. A limited buffer of protocol messages is displayed at any one time. This view is selectable from the Logging Controller.
- TMA is supported on the Windows 7 operating system.
- Protocol Configuration Options support (DHCP and DNS)
- Configurable UE Capability reporting
- Neighbour cell CGI reporting test feature (Beta)
- Mutliple PDN support (Beta)
    - UE requested PDN connectivity procedure
    - UE requested PDN disconnect procedure
- Set Active flag in TAU (Beta)
- Set RRC establishment cause (Beta)
- ETWS Support. (Beta)

- Support for Transmission Mode 7 (PDSCH transmission on antenna PORT5).

3 NOTES

3.1 Layer 1 and Layer 2 Operational information

The following operational information is applicable:

IMPORTANT: For optimal decoding performance the input power to the test mobile must be kept below -25dBm.

- Codebook subset restriction feature for Release-9 beamforming not supported in this release.
- UE specific reference signal power measurement in each resource block for Release-9 beamforming not supported in this release.
- The delta power measurement between the cell specific reference signal and UE specific reference signal in each resource block for Release-9 beamforming not supported in this release.
- SPS and TTI bundling are not supported in this release.
- Referring to CRM command PhyConfigPucch: The default TDD ACK/NACK mode is bundling.
- Important: USIM and NAS (capability) changes are not supported by the TMA in this release
- The implementation of MAC CR379 does not support decoding of PDCCH grant for the C-RNTI during the RACH procedure, except at the contention resolution stage. An SR triggered contention based RACH can be initiated. This may have consequences for contention resolution, in this scenario, if CR379 is enabled.
  CR379 controlled by the SETP L2_MAC_ENABLE_CR379_R2_094167. See section 3.2.7.3 for details.
- By default, the minimum receive power level is limited to -120dBm. The PBCH will not be decoded if the receive power is below this threshold. It is possible to override the limit and change the minimum power level to -130dBm using a SETP command. See section 3.2.6.11, RRC_TEST_Q_RX_LEV_MIN_DBM, for details.
- The TM500 implements the behaviour defined in 36.321/5.4.4 regarding initiating a Random Access Procedure if an SR is triggered but PUCCH resource for SR is not configured.
  By default this behaviour is enabled, but a SETP command is provided to disable this if required. This may be required when performing a handover as the SFN of the target cell, required to configure the PUCCH for SR, would not be available until the MIB has been read from the BCH of the target cell. See section 3.2.6.2, L2_MAC_DISABLE_SR_INIT_RACH_IF_SR_NOT_CFG, for details.
- The default BCH transport block size is now 24 bits. Use the `forw l1 SetPBchTbSize` command to override this if the default value is not applicable. This command is configured in a TMA test case via the Set PBCH Transport Block Size test step, which can be found in the Test Step Library under Layers 1&2 Test Features.
- Dual radio cards are supported from K2.4.0 software release and onwards. In order to make use of this feature a replacement back-plate is required and is available from Aeroflex Support.

  Note that: Multiple radio cards are only supported, if the installed Umbra RF radio card has an MMC version that is V1.7 or later.

The MMC version can be checked using the GVER command.

If the MMC version is before V1.7, the installed radio card must be replaced with one that meets the current released specification, prior to adding a second radio card. This is not an upgrade that can be performed in the field.

- ULSCH TX Ack / Nack logging will not be correct for TDD UL/DL config 6 TTI 8, or config 0 TTI 9
- New test steps are available under the Layers 1&2 Test Features to configure the override tables. These were previously set up in the Configure Downlink SCH, Uplink SCH and RACH test steps. User documentation does not yet reflect this change. The override tables affected are:

  1. Override Buffer Occupancy Table
  2. Override Downlink SCH ACK table
  3. Override Downlink SCH Control table
  4. Override Uplink Power Control table
  5. Override Uplink SCH Control table

- To update the radio firmware in the TM500, please note the following new command: `forw fum updateradio`

  This command can only be issued when in “firmware update node”.

- The **HarqAddUlSchCtrlTableEntry** command can now override the RACH message 2 grant. Note that this requires ‘Forced Event’ mode to be set using the **HarqConfigUlSchCtrlTable** command. These commands are configured in a TMA test case via the Override Uplink SCH Control table test step, which can be found in the Test Step library under Layers 1&2 Test Features.
- If a physical channel parameters relating to the current RACH configuration needs to be re-configured whilst remaining on the same cell, the PDCCH UE-RNTI **must** be re-configured with the TC-RNTI received in the previous RACH preamble response message. If the PDCCH is not re-configured with the TC-RNTI (using the **PhyConfigPdcch** command) then no downlink transport blocks will be decoded and no uplink grant will be decoded and hence no uplink transport blocks will be transmitted, until a subsequent RACH procedure successfully completes. This command is configured in a TMA text case via the Configure Downlink Signalling test step, which can be found in the Test Step library under Layers 1&2 Channel Configuration.
  Note that if the optional UE-RNTI parameter is omitted then the TC-RNTI allocated during the RACH procedure will be retained as the C-RNTI until the PDCCH is reconfigured to provide the C-RNTI or the DL-SCH and UL-SCH are deleted.
- When re-configuring the DL-SCH in MAC or HARQ mode the following commands **must** be re-issued even if they do not contain any parameters that are being changed/re-configured. In HARQ mode these are: **PhyConfigDlSch**, **PhyConfigDlSchCqi** and **HarqConfigDlSch**. In MAC mode these are: **PhyConfigDlSch**, **PhyConfigDlSchCqi** and **MacConfigDlSch**. These commands are configured in a TMA test case via the Configure Downlink SCH test step, which can be found in the Test Step library under Layers 1&2 Channel Configuration.
- When deleting an UL-SCH in all modes, the UL SRS **must** also be explicitly deleted using the **PhyDeleteUlSrs** command, otherwise the UL SRS and both the PUCCH and PDCCH will be left active. The deletion of the UL SRS is **not** automatically performed when deleting the access bearer, radio bearer or transport channel corresponding to the UL-SCH. This command is configured in a TMA test case via the Delete Uplink SRS test step, which can be found in the Test Step library under Layers 1&2 Channel Deletion.

- The SRS cannot be added during handover.
- When configuring a PRACH, commands must also be sent to setup an UL-SCH, PUCCH, PDCCH, & DL-SCH.
- AFC & DL symbol timing tracking are performed using channel estimates from a single channel only (1st transmit antenna to 1st receive antenna).
- When configuring the Fixed Frame Evaluator or Psuedo Noise Evaluator for the BCH, the NumBitsToSkip parameter should be set to 0 and the NumBitsToCheck should be set to 7.
- The timing type in the “Activate” command must be set to “Immediate”.
- The test mobile provides in-sync or out-of-sync indications based on the DL RS SIR.
- The system capability command **PHYGETSYSCAP** is not supported.
- GETSTATS data is delayed by 100ms.
- Fixed frame generator and evaluator configuration must contain at least one byte.
- In general the order of script commands is not important. When an activate command is issued the various layers are configured appropriately. .
- In all TMA measurement groups downlink power measurements are not calibrated.
- The pc may experience a virtual memory limit (2GB) exceedance resulting in possible TMA instability if all the measurement charts are repeatedly created and destroyed multiple times (approx. 1000+). The probability of exceedance could be reduced by selecting a reduced range of charts. This problem appears to be due to a Windows kernel limit (http://support.microsoft.com/default.aspx/kb/949755).
- Please note that all the radio firmware is now contained in a single file (`firmware.pkg`) which must be located in the FW directory under the ftp_root/fw directory.
- The maximum PDCP SDU size is 2047 bytes.
- Blind detection of the number of eNodeB transmit antennas is not supported and hence a non zero value must always be provided for the optional parameter ‘Number of eNB transmit antennas' within the **PhyConfigPbch** command. This command is configured in a TMA test case via the Configure BCH test step, which can be found in the Test Step Library under Layers 1&2 Channel Configuration.
- Use of Forced Event mode with the DL-SCH Control Override table (via the **HarqConfigDlSchCtrlTable** and **HarqAddDlSchCtrlTableEntry** commands) is not supported.
- The DLL1L2Control measurement group logs the signalling resource, PDCCH format, and DCI format (where appropriate)
- Measurement group DLL1L2CONTROL only shows the information from a single PDSCH reception in the event that multiple services were decoded in the same TTI. The RNTI and service type have been added to the group to indicate which PDSCH decode has been logged.
- REINIT is not supported
- The MCI indication on receipt of RACH message 2 has been deprecated. A single indication is now provided on completion of the RACH procedure. Refer to the Command Reference Manual for details.
- A new L1 command SetFlagUseNCCEi is added to select R1-095127 (clause 10.1) or Mar 09 (Default) compliance for the calculation of n(1)PUCCH.Where FORW L1

SetFlagUseNCCEi 1 will enable the specific changes in R1-095127 (clause 10.1). By default it's always FALSE – you can also explicitly set it to FALSE by using FORW L1 SetFlagUseNCCEi 0. Values other than {0,1} will result in an error.

- Beamforming is a licensed option, if the license key for beamforming is not installed then attempting to configure beamforming will result in a command failure

3.1.1 ROHC Operational information

- ROHC is a licensed option. If the license key for ROHC is not installed then attempting to configure ROHC will result in a command failure.
- All RoHC profiles in 36.323 are supported:

Profile Identifier	Usage:	Reference
0x0000	No compression	RFC 4995
0x0001	RTP/UDP/IP	RFC 3095, RFC4815
0x0002	UDP/IP	RFC 3095, RFC4815
0x0003	ESP/IP	RFC 3095, RFC4815
0x0004	IP	RFC 3843, RFC4815
0x0006	TCP/IP	RFC 4996
0x0101	RTP/UDP/IP	RFC 5225
0x0102	UDP/IP	RFC 5225
0x0103	ESP/IP	RFC 5225
0x0104	IP	RFC 5225

- The PDCPCONFIGSYSCAP command has an additional parameter 'Supported ROHC Profiles' enabling the supported profiles to be configured for reporting to the network in a UE Capability message in NAS mode. This command is configured in a PDCP mode TMA test case via the Configure PDCP Capabilities test step, which can be found in the Test Step library under Common System Control.
- The PDCPCONFIGAB command has new choice parameter if 'ROHC Configured' is 1: 'Max CID' and 'ROHC Profiles', This command is used in a PDCP mode TMA test case by the test steps under Channel Configuration in the Test Step library.
- Non IP packets are discarded if routed through an access bearer configured for ROHC.
- PDCP throughput measurements are evaluated before compression/after decompression.

3.2 Higher Layers Operational information

Higher Layer functionality requires the TM500 LTE to be configured in NAS Mode. Using the TMA this is performed by selecting the "NAS Mode" option from the connection dialog.

Alternatively this can be configured using the MCI command "**SCFG NAS_MODE**".

The test features provided by NAS mode are as follows:

- U plane test data is inserted/received as PDCP SDUs at the access bearer interface.
- C plane (SRB) data is terminated at the RRC. NAS commands are encapsulated within RRC PDUs.
- L1 and L2 configuration is performed by the RRC in response to commands from the TM500 NAS or from the eNB RRC and NAS.
- PLMN and Frequency must be specified
- The support and behaviour of Authentication and Security procedures can be configured.

- The following PHY test commands can be used:
  PhyOverrideCqi
  PhyConfigUlTiming

- The following HARQ test commands can be used:
  HarqConfigDlSchOverride
  HarqConfigUlSchForceErrors

- The **PHYCONFIGSYSCAP** command is used to set the number of receive antennas, and the DL and UL categories. Up to category 4 is supported subject to the appropriate license being purchased.
  The default is category 2 and single receive antenna.

- In the **NasConfigBearerResource** the bit rate values should align to the values supported according to 3GPP 24.301 section:9.9.4.3, i.e.:

  1 kbps to 63 kbps in 1 kbps increments.
  64 kbps to 568 kbps in 8 kbps increments.
  576 kbps upwards in 64 kbps increments.
  A value between these increments is rounded up.

- The **NasAptConfigCapability** command enables the expected Security and Authentication procedures to be configured together with the supported ciphering and integrity algorithms.
  Note that the NAS Security options value of 4 (security mode is expected. Authentication procedure is not expected) is not currently supported by the TMA Test Manager.

- The currently supported ciphering algorithms are EEA0 (NULL), EEA1 (SNOW 3G) and EEA2 (AES).

- The currently supported integrity algorithms are EIA1 (SNOW 3G) and EIA2 (AES).

- In addition to the 3GPP defined integrity algorithms EIA0 (Null integrity) is also allowed. If EIA0 is configured then the UE expects this operation to be indicated by the network by using the *Reserved* value in the *Type of integrity protection algorithm* within the NAS Security Algorithms IE (3GPP TS 24.301, 9.9.3.23). If this is configured during the NAS security mode procedure then all subsequent UL and DL NAS PDUs should apply a NAS Security Header where the MAC IE should all be set to all zeros.

- The authentication and security key generation is performed in accordance with Test USIM specification 34.108 section 8. Note that the Authentication Key can now be configured using the **USIMCONFIG** command.

- The **RRCAPT** and **NASAPT** commands must be in the same activation as the **NASCONFIGEMMREGISTER** command.

- Multiple PDN connections (and default EPS bearers) are supported using the **NASCONFIGPDN** and **NASDELETEEPDN** commands.
  The purpose of the UE requested PDN connectivity procedure is for a UE to request the setup of a default EPS bearer to a PDN.

  - The limitation is 8 PDN connections.
  - T3482 is supported.
  - PDN connectivity reject is supported.

  The purpose of the UE requested PDN disconnect procedure is for a UE to request disconnection from one PDN.

  - T3492 is supported but not synchronisation of EPS bearers using TAU.

  - PDN disconnect reject is supported.

- A maximum of 8 data bearers in total are supported.
- The UE Capability procedure is supported but the band information is extracted from the SIB.
  The RrcAptConfigUeCap command may be used to configure measurement related UE capabilities of the featureGroupIndicators IE.
- Connected Mode paging is supported.
- The **USIMCONFIG** command can only be used when the USIM is inactive. In practice this means that the c**ommand can** be used once only after issuing the **SCFG** command.
- The downlink carrier frequency must be configured using the **RRCAPTCONFIGCELLSELECTION** command.
  If the optional cell ID parameter is provided then this forces the use of the designated cell and cell reselection is not performed.
  If the cell ID parameter is not provided then cell selection and reselection is performed in the designated frequency.
- Only automatic registration is supported.
- The last RPLMN is not stored in non-volatile memory. The value is only available after successful registration and until a power down or reset of the TM500 is performed.
- Some NAS MCI indication messages are not in the precise format described in the Command Reference Manual.
- The following restrictions apply to RRC measurement reporting:
  - Only intra-frequency measurements are supported
  - Measurement Gaps not supported
  - Speed Dependant Parameters not supported
- The RRC Connection Re-establishment procedure is used for re-establishment of RRC connection, which involves resumption of SRB1 and re-activation (without changing algorithms) of security. It can only be initiated by a UE in RRC_CONNECTED state if security has been activated earlier and the concerned cell has a valid UE context. This cell may or may not be the serving/source cell.

  SRB2 and DRBs are suspended at the start of re-establishment procedure. They remain suspended even after successful completion of re-establishment procedure. Once re-establishment completes, it is the responsibility of the new eNB to resume SRB2 and DRBs by initiating an RRC Connection Reconfiguration procedure.

  Supported triggers for RRC Connection Re-establishment RRC connection re-establishment can be initiated in the following situations:
  - Radio link failure detection
  - Out-of-sync indication from Physical layer
  - Random access failure indication from MAC
  - Maximum retransmissions reached indication from RLC
  - Handover failure
  - Integrity check failure indication from PDCP
  - RRC connection reconfiguration failure
- Cell selection is supported as specified in 36.304, including support for SIB1 parameters q-RxLevMin, p-Max, cellBarred, and cellReservedForOperatorUse.
  The following limitations apply:

  - Cell selection is only performed in the frequency designated by RrcAptConfigCellSelection.
  - If forced cell id is used in the RrcAptConfigCellSelection command then cell reselection will not be performed.
  - Stored cell selection is not supported.
  - Access class information is not supported. Consequently a cell marked as cellReservedForOperatorUse is considered as barred.

- Cell reselection is supported as specified in 36.304, including support for SIB1 parameters q-RxLevMin, p-Max, cellBarred, and cellReservedForOperatorUse.
  In idle mode the TM500 will continuously look for a better suitable cell than the current serving cell & camp on it.
  Once a cell has been selected and the TM500 is in idle mode, cell reselection evaluation is continuously performed. If Srxlev of serving cell falls below Sintrasearch (if configured) the cell reselection evaluation process is invoked (36.304/5.2.4.2). The neighbour cells are ranked based on cell-ranking criterion (36.304/5.2.4.6). The highest ranked cell, if its Srxlev is better than that of the serving cell, is then checked for suitability. If it is found to be suitable TM500 will camp on it, else it will check the next highest ranked cell.
  If Srxlev of serving cell is no longer greater than 0 and if there are no neighbour candidate cells then any cell selection (36.304/5.2.8) is started.

  The following limitations apply:

  - TreselectionEUTRA is not supported
  - Restriction to spend at least 1 sec on a new selected cell before reselecting another cell is not supported
  - Speed dependent scaling factor is not implemented
  - Cell reselection with CSG cells is not supported
  - Cell reselection is only performed in the frequency designated by RrcAptConfigCellSelection.
  - If forced cell id is used in the RrcAptConfigCellSelection command then cell reselection will not be performed.
  - Access class information is not supported. Consequently a cell marked as cellReservedForOperatorUse is considered as barred.

- Reading SIBs of the destination cell after handover is supported.
- On Demand RRC Measurement Reporting is supported. The purpose of the RrcAptTriggerMeasEvent command is to enable an RRC measurement report to be scripted and sent on demand. The measurement report can relate to any RATs (by default the UE capability as reported to the network supports all RATs).
  Note that a measurement report can only be sent if an appropriate measurement configuration has been received in an RRC reconfiguration message. The RrcAptGetMeasurementConfig command outputs the current measurement configuration to the MCI to enable a valid measurement configuration to be used in the RrcAptTriggerMeasEvent command.
- RRC MCI component indications are provided to display the RRC connection status:
  - RRC Connection Re-establishment Started

- RRC Connection Re-establishment Failure
- RRC Connection Re-establishment Success
- RRC Handover Complete

- RRC MCI component indications are provided to display the RRC cell selection/reselection status.
  The indications may be disabled using SETP RRC_DISABLE_CELL_CHANGE_IND_TO_MCI.

  The provided indications are as follows:
  - RRC Cell Selection
  - RRC Reestablishment Cell Selection
  - RRC Leave Connected Cell Selection
  - RRC Any Cell Selection
  - RRC Cell Reselection

“

- Handling blacklisted cells is supported. If certain cells are marked as blacklisted in measConfig IE of the RrcConnectionReconfiguration message then they will not be considered for evaluation and consequent measurement reporting. This behaviour can be disabled using SETP RRC_IGNORE_BLACKLISTED_CELLS_CONFIG.
- ETWS information is supported. The TM500 will display on the MCI the ETWS (Earthquake and Tsunami Warning System) information in SIB 10 and SIB 11 in response to a paging message with the IE etws-Indication.
  The format of the indication is:

```
I: CMPI RRC ETWS Information:UE Id:n
  SIB 10 information:
    <description of SIB 10 ETWS info>
  SIB 11 information:
     <description of SIB 11 ETWS info>
```

- Authentication SQN and AMF checks are enforced. SETP commands are provided to disable the checking. See NAS_DISABLE_SQN_CHECK (section 3.2.6.21) and NAS_DISABLE_AMF_CHECK (section 3.2.6.22) for details.
- The following Protocol Configuration Options (PCO) are supported:
  - IPv4 address allocation via DHCPv4
  - DNS server address.

  Protocol identifiers are not supported i.e. there is no support for LCH, PAP, CHAP and IPCP.
- On demand TAU is supported using the command NASAPTTRIGGERTAU.
- The Active flag can be set in TAU procedures using the SETP NAS_ENABLE_TAU_ACTIVE_FLAG, section 3.2.6.26.
- On demand Service Request with the ability to set the RRC Establishment Cause is provided by the command NASAPTTRIGGERSERVICEREQUEST.
- The optional IMEISV to be included in Identity Request and Security Mode Complete messages the SETP NAS_ENABLE_TAU_ IMEISV, section 3.2.6.27.

3.2.1 Protocol Logging Restrictions:

- Ensure the 'snapshot view' box is ticked if viewing any data below the RRC. PHY and signaling data can be very high rate and can cause the TMA to become unresponsive, and it may take the TMA a long time to recover after stopping logging.
- TheS32Q16RsrpIndBmpower value in L1_L0L1_CPHY_SCHR_INTRA_MEAS_SET_IND_CELL_INFO is a scaled value and should be divided by 65536 to convert to a value in dBm.

3.2.2 June '09, Sept '09 and Dec '09 Compliance.

This release is compliant to the March '09 3GPP specifications by default. Where non backwards compatible code changes are required support for June '09, Sept '09 and Dec '09 is configurable via the following SETP commands.

- SETP RRC_ENABLE_JUNE_09 (section 3.2.6.15)
- SETP RRC_ENABLE_SEPT_09 (section 3.2.6.16)
- SETP RRC_ENABLE_DEC_09 (section 3.2.6.17)
- SETP NAS_ENABLE_JUNE_09 (section 3.2.6.23)
- SETP NAS_ENABLE_SEPT_09 (section 3.2.6.24)
- SETP NAS_ENABLE_DEC_09 (section 3.2.6.25)

The non-backwards compatible CRs are as follows:

The non-backwards compatible CRs are as follows:

- 36.331 CR 160 Minor corrections to the feature grouping.
  Enable using SETP RRC_ENABLE_JUNE_09 or RRC_ENABLE_SEPT_09.
- 36.331 CR 200 Proposed update of the feature grouping.
  Enable using SETP RRC_ENABLE_SEPT_09.
- 36.331 CR 270 Feature grouping bit for SRVCC handover
  Enable using SETP RRC_ENABLE_DEC_09.
- 24.301 CR 230 New value for ESM timer T3482
  Enable using SETP NAS_ENABLE_JUNE_09 or NAS_ENABLE_SEPT_09.
- 24.301 CR 319 Removal of unnecessary TAU procedure after abnormal bearer allocation failure.
  Enable using SETP NAS_ENABLE_JUNE_09 or NAS_ENABLE_SEPT_09.
- 24.301 CR 246 Correct the UE behaviour of handling ESM message. Not backwards compatible.
  Enable using SETP NAS_ENABLE_SEPT_09 or NAS_ENABLE_SEPT_09_CR_246_397.
- 24.301 CR 397 Security protection of Security mode reject.
  Enable using SETP NAS_ENABLE_SEPT_09 or NAS_ENABLE_SEPT_09_CR_246_397.
- 24.301 CR 426 Correction QCI within EPS quality of service information.
  Enable using SETP NAS_ENABLE_SEPT_09
- 24.301 CR 439 Clarification to UE requested bearer modification procedure.
  Enable using SETP NAS_ENABLE_SEPT_09

- 33.401 CR282 and CR286 Clarification + additional handling of partial/full security context.
  Enable using SETP NAS_ENABLE_SEPT_09
- 33.401 CR504 Mapped QCI Handling in UE.
  Enable using SETP NAS_ENABLE_DEC_09
- 33.401 CR570 Default value for T3412
  Enable using SETP NAS_ENABLE_DEC_09
- 33.401 CR579 Integrity protection of DETACH REQUEST
  Enable using SETP NAS_ENABLE_DEC_09

3.2.3 NAS Mode Data Handling

PPPoE is the default data entity and does not require explicit configuration via DTE commands.

A PPPoE service is created for each default bearer. Dedicated bearers associated with the default bearer share the same PPPoE service.

Alternative data entity types are supported. Refer to section 3.2.3.2 for details.

3.2.3.1 PPPoE configuration

The service name is “tm500_lte_<ip_address>_<ue_id>_<pdn_id>”, where:

<ip_address> is the TM500 IP address in standard dot format.

<ue_id> is the numeric identifier for the UE. This is 0 in the single UE product.

<pdn_id> is the PDN Identity provided by the user in the **NASCONFIGEMMREGISTER** command.

For example: “tm500_lte_10.1.0.20_0_0”.

Note that the following PPPoE client connection settings are required:

PPP software compression disabled.

TCP/IP IP header compression disabled.

The PPPoE connection may be set as the default gateway. If not set as the default gateway then a route to each required destination must be manually configured.

Note that the TM500 LTE stack does not currently support automatic DNS server discovery. DNS server addresses must be manually configured or IP address used instead of domain names, e.g.: “212.58.253.68” instead of “www.bbc.com”.

The client cannot connect to the PPPoE service until the underlying EPS bearer has been established.

RASPPPoE, a freeware enhanced PPPoE driver, may be used to support multiple PPPoE connections on a single PC. Note that after installing the PPPoE protocol properties must be changed to increase the number of PPPoE clients allowed (number of WAN ports). Note that RASPPPoE is not supported for Windows Vista.

PPPoE does not work if default route has been set in the VxWorks boot parameters, ensure that the boot parameters do not have an address defined for the “gateway inet”.

Note that it is not possible to use a router between the TM500 and the client PC wishing to connect using PPPoE. PPPoE tunnels over Ethernet and cannot traverse a router.

To achieve high-throughput data testing over PPPoE with no packet loss, the choice of PC and networking hardware, OS and PPPoE client are crucial. We have tested two alternative PC

configurations for best performance and full multi-session (MUE) support, one Windows-based, the other Linux-based:

Linux (to achieve at least 370Mbps @ 1464B):

- Recent PC with >2.5GHz Intel Dual/Quad Core CPU and PCIe.
- A recent, reasonably high-spec Intel or Broadcom PCIe or on-board Gigabit Ethernet NIC.
- Any Linux distribution with Kernel > 2.6.6. Tested: Ubunutu 9.04 Desktop. Note that for maximum data throughput, the Gnome GUI must be idle: any high-speed end data application should run in a non-GUI-windowed SSH/telnet session (or in the background, or on a command shell), with the GUI idle.
- rp-pppoe configured as a Kernel-Mode plugin (this requires a patch to rp-pppoe-3.10, see TN AAS-2009-0708 for further details).

Windows (to achieve at least 360Mbps @ 1464B)

- Recent PC with >2.5GHz Intel Quad Core CPU (preferably Xeon) and PCIe.
- A recent, reasonably high-spec Intel or Broadcom PCIe Gigabit Ethernet NIC with NDIS 6 driver.
- Windows Vista, Windows 7 or Windows Server 2003+ (NB we have only tested with Vista so far).
- cFos Broadband Connect (latest version http://www.cfos.de/download/download_e.htm). Supports up to 64 simultaneous connections.

3.2.3.2 Alternative Data Entity Configuration

To override the default selection of a PPPoE data entity the **DECONFIGEPSBEARER** command may be used to associate a specific data entity with a specific EPS bearer.

The attributes can then be applied to the data entity to produce the required behaviour. The support attribute commands are:

- **DeConfigFfgAttrib** (with **DeAddToFfgBuffer**) and **DeConfigPngAttrib**, used in conjunction with **DeConfigUlDataProfile** to define the UL traffic profile.
- **DeConfigPneAttrib** and **DeConfigFfeAttrib** (with **DeAddToFfeBuffer**).
- **DeConfigUdiAttrib**.

Note that the data entity configuration must be performed prior to performing the **NasConfigEmmRegister** command.

3.2.4 Example Scripts

3.2.4.1 Registration with the network

The following command sequence initiates automatic registration with the network with IMSI 23591000001.

```
# To configure the number of receive antennas and the DL and UL PHY category
FORW MTE PHYCONFIGSYSCAP 1 2 2

# See frequency to 21400 and Cell ID to 0
FORW MTE RRCAPTCONFIGCELLSELECTION 21400 [0]
```

```
# Disable RRC security procedure
FORW MTE RRCAPTCONFIGCAPABILITY [0]

# Set the required PLMN
FORW MTE NASAPTCONFIGPLMNSELECTION 24491

# Enable NAS Authentication, enable NAS security procedure. Set the ciphering
algorithm to NULL
FORW MTE NASAPTCONFIGCAPABILITY [3] [0x80] [0x80]

# Configure the USIM IMSI
FORW MTE USIMCONFIG 1([24491000001 3] [] [] []) [] [0]

# Initiate the NAS Attach with automatic PLMN selection, default bearer reference
of 1 and an IPv4 connection.
FORW MTE NASCONFIGEMMREGISTER 0(1 [0])

FORW MTE ACTIVATE -1
```

If the PLMN to use is not forced, the registration will try the last registered PLMN (if available), and then the home PLMN (23591 – derived from the IMSI).
The RRC is configured to only use cell 0 in frequency 2.14 GHz.

The ACTIVATE indication is only returned on completion, successfully or otherwise, of the registration procedure.
Separate indication messages provide the results of the registration procedure, e.g.:

```
I: CMPI L2 Random Access Complete :UE Id:0 (TC-RNTI: 0xF000, TimingAdv: 0,
PreambleTxCount: 1)
I: CMPI MTE 0  ECM CONNECTION IND: UE Id: 0
I: CMPI MTE 0 EMM REGISTER IND: UE Id: 0
         Selected PLMN: 24491F
         EPS Bearer Id: 5
         Access Point Name: aeroflex.com
         IPv4 Address: 192.168.0.1
```

In the successful case the IP address is the network assigned IP address assigned to the default bearer.

3.2.5 USIM Support

TM500 supports a real USIM when running in NAS mode. The USIM interfaces to TM500 via a smart card reader connected to the PC running TMA. Any smart card reader can be used – for example most modern laptops have a reader built in, although Aeroflex has only verified the Omnikey CardMan 3121.

Aeroflex can supply a USB smart card reader on request – please contact Aeroflex Support for more details. The model provided is the Omnikey CardMan 3121 smart card reader.

The smart card reader Windows driver software must be installed as described in the instructions provided with the device. In particular the PC/SC driver must be installed (OMNIKEY 3x21 PC/SC driver files, selfextracting archive, 32 Bit). This can be downloaded from:
http://www.hidglobal.com/driverDownloads.php?techCat=19&prod_id=188

A PC hosted USIM Relay application, UsimRelayApp.exe, is provided to enable to smart card reader to be used with the TM500. This is an optional package when performing installation of the release.

If the smart card reader is installed correctly a green LED will illuminate when the device is plugged into the PC.

Ensure the USIM card is inserted into the smart card reader and then start the USIM Relay application from the installed directory. The card ID will be shown on the application display.

Set the TM500 IP address as required and then select the “Connect” button. The USIM will now be accessible to the TM500.

3.2.5.1 Operational Notes

- Only the 3G USIM with USIM application is supported.
- PIN1/PIN2 must be disabled on the USIM. Note that the USIM Relay application does not provide a means of doing this but will display a warning message if the PINs have not been disabled. Software provided with the smart card reader, or even a normal 3G mobile phone, can be used to disable the PINs.
- READ and AUTHENTICATE operations are supported.
  The UPDATE operation is not supported to update elementary files (EFs) on USIM.
- NAS Security Context from USIM is not supported.
- PLMN selection is based on IMSI.
- Milenage algorithm is supported.
- The USIM Relay application does not detect USIM insertion/removal. If the USIM is changed the application must be restarted to detect it.
- The UsimConfig command is used to configure use of the smart card reader in the TM500. The first parameter (USIM Type) must be set to '0'. All remaining optional parameters are not required – including the 'Port number'.

3.2.6 SETP Internal Test Commands

SETP commands are used to set the values of parameters that modify the behaviour of the NAS/RRC typically to overcome short-term limitations (missing/mismatched parameters, or unsupported functionality), and are intended to be used primarily by Aeroflex engineering staff. All SETP commands have a single numeric parameter.

The SETP commands required in this release are listed below.

3.2.6.1 L1_CAT5_RATE_MATCHING_IN_CAT4

Enable category 5 rate matching in category 4.

SETP L1_CAT5_RATE_MATCHING_IN_CAT4 N

N = 0 (3GPP compliant behaviour) or 1 (do not RACH if SR not configured on PUCCH), default 0.

3.2.6.2 L2_MAC_DISABLE_SR_INIT_RACH_IF_SR_NOT_CFG

The TM500 implements the behaviour defined in 36.321/5.4.4 regarding initiating a Random Access Procedure if an SR is triggered but PUCCH resource for SR is not configured.

By default this behaviour is enabled, but a SETP command is provided to disable this if required. This may be required when performing a handover as the SFN of the target cell, required to configure the PUCCH for SR, would not be available until the MIB has been read from the BCH of the target cell.

SETP L2_MAC_DISABLE_SR_INIT_RACH_IF_SR_NOT_CFG N

N = 0 (3GPP compliant behaviour) or 1 (do not RACH if SR not configured on PUCCH), default 0

3.2.6.3 L2_PDCP_COMPARE_MACI_FOR_NULL_INTEGRITY

When NULL security is chosen the PDCP will not perform the integrity validation for MAC-I field. This SETP forces the PDCP to explicitly check that the MAC-I field is all zeros.

SETP L2_PDCP_COMPARE_MACI_FOR_NULL_INTEGRITY N

N = 0 (do not check MAC-I field) or 1 (check MAC-I field), default 0

3.2.6.4 L2_MAC_ENABLE_CR379_R2_094167

Controls whether MAC CR379 is applied to the March 09 baseline MAC implementation.

SETP L2_MAC_ENABLE_CR379_R2_094167 N

N = 0 (disable MAC CR379) or 1 (enable MAC CR379), default 0

3.2.6.5 RRC_TEST_PERIODIC_CQI_PRIORITY

This is no longer used.

3.2.6.6 RRC_NUM_DL_ANTENNAS

Used to set the number of eNB transmit antennas for the first selected cell as the PHY layer currently does not automatically determine this during PBCH decoding.

SETP RRC_NUM_DL_ANTENNAS N

N = 1 to 4, default 1.

3.2.6.7 RRC_PUCCH_CLOSE_LOOP_POWER_CONTROL

Used to enable/disable uplink closed loop power control.

SETP RRC_PUCCH_CLOSE_LOOP_POWER_CONTROL N

N = 0 (disable) or 1 (enable), default 1.

3.2.6.8 RRC_OVERRIDE_FREQUENCY_BAND

Used to override the UL frequency band read from SIB1.. Must be issued before registering with the network (i.e.: before initial cell search is performed).

SETP RRC_OVERRIDE_FREQUENCY_BAND N

N = 0 to 40, (0 = do not override, i.e. use freqBandIndicator in SIB1) default 0.

3.2.6.9 RRC_TEST_UL_DELIVERY_INDS_REQUIRED

Used to control whether the RRC expects a confirmation of SRB delivery from the PDCP.

SETP RRC_TEST_UL_DELIVERY_INDS_REQUIRED N

N = 0 (disable) or 1 (enable), default 0.

3.2.6.10 RRC_DISABLE_CELL_RESELECTION

Used to disable Cell Reselection.

SETP RRC_DISABLE_CELL_RESELECTION N

N = 0 (Cell Reselection is enabled) or 1 (Cell Reselection is disabled), default 0.

3.2.6.11 RRC_TEST_Q_RX_LEV_MIN_DBM

By default, the minimum receive power level is limited to -120dBm. The PBCH will not be decoded if the receive power is below this threshold. It is possible to override the limit and change the minimum power level to -130dBm

SETP RRC_TEST_Q_RX_LEV_MIN_DBM N

N = minimum power in dBm

3.2.6.12 RRC_TEST_DISABLE_MAX_SR_TRANSMISSIONS

Allows disabling of MAC initiated RACH for when Scheduling requests are disabled.

SETP RRC_TEST_DISABLE_MAX_SR_TRANSMISSIONS N

N = 0 (Normal operation) or 1 (Disables MAC initiated RACH). Default 0

3.2.6.13 RRC_DISABLE_CELL_CHANGE_IND_TO_MCI

Allow disabling of RRC cell selection/reselection indications.

SETP RRC_DISABLE_CELL_CHANGE_IND_TO_MCI N

N = 0 (Normal operation) or 1 (Disables indications). Default 0

3.2.6.14 RRC_IGNORE_BLACKLISTED_CELLS_CONFIG

Allow disabling of cell blacklisting.

SETP RRC_IGNORE_BLACKLISTED_CELLS_CONFIG N

N = 0 (Normal operation) or 1 (Disable cell blacklisting). Default 0

3.2.6.15RRC_ENABLE_JUNE_09

Enable all June ’09 non-backwards compatible RRC CRs.

SETP RRC_ENABLE_JUNE_09 N

N = 0 (disable) or 1 (enable), default 0.

3.2.6.16RRC_ENABLE_SEPT_09

Enable all Sept ’09 non-backwards compatible RRC CRs. Note that when enabled all June ’09 RRC CRs are automatically enabled.

SETP RRC_ENABLE_SEPT_09 N

N = 0 (disable) or 1 (enable), default 0.

3.2.6.17RRC_ENABLE_DEC_09

Enable all Dec ’09 non-backwards compatible RRC CRs. Note that when enabled all June/Sept ’09 RRC CRs are automatically enabled.

SETP RRC_ENABLE_DEC_09 N

N = 0 (disable) or 1 (enable), default 0.

3.2.6.18RRC_TEST_LOG_PCO_MSG_TO_MCI

Outputs protocol logging information to the MCI as indication messages. Note that this is primarily an internal test command and the indication format is not documented and is subject to change.

SETP RRC_TEST_LOG_PCO_MSG_TO_MCI N

N = 0 (Normal operation) or 1 (Output protocol log information). Default 0

3.2.6.19 NAS_ENABLE_SEPT_09_CR_246_397

Add ESM cause #43 “invalid EPS bearer identity” in the EPS bearer context modification procedure. The exception from normal NAS message handling that SECURITY MODE REJECT is sent without integrity protection, is deleted.

SETP NAS_ENABLE_SEPT_09_CR_246_397 N

N = 0 (disable) or 1 (enable), default 0.

3.2.6.20 NAS_ENABLE_SEPT_09_CR_1411 (DEPRECATED)

This command is now DEPRECATED. See section 3.2.6.15

~~Change the location of the AMF separation bit from bit 1 in octet 10 to bit 8 in octet 9.~~

~~SETP NAS_ENABLE_SEPT_09_CR_1411 N~~

~~N = 0 (disable) or 1 (enable), default 0.~~

3.2.6.21 NAS_DISABLE_SQN_CHECK

Authentication SQN checks are enforced and following SETP can be used to disable these checks:

SETP NAS_DISABLE_SQN_CHECK N

N = 0 (enable) or 1 (disable), default 0.

3.2.6.22 NAS_DISABLE_AMF_CHECK

Authentication AMF checks are enforced and following SETP can be used to disable these checks:

SETP NAS_DISABLE_AMF_CHECK N

N = 0 (enable) or 1 (disable), default 0.

Due to these default checks the SETP command “NAS_ENABLE_SEPT_09_CR_1411” is now deprecated.

3.2.6.23 NAS_ENABLE_JUNE_09

Enable all June ’09 non-backwards compatible NAS CRs.

SETP NAS_ENABLE_JUNE_09 N

N = 0 (disable) or 1 (enable), default 0.

3.2.6.24 NAS_ENABLE_SEPT_09

Enable all Sept ’09 non-backwards compatible NAS CRs. Note that when enabled all June ’09 NAS CRs are automatically enabled.

SETP NAS_ENABLE_SEPT_09 N

N = 0 (disable) or 1 (enable), default 0.

3.2.6.25NAS_ENABLE_DEC_09

Enable all Dec ’09 non-backwards compatible NAS CRs. Note that when enabled all June/Sept ’09 NAS CRs are automatically enabled.

SETP NAS_ENABLE_DEC_09 N

N = 0 (disable) or 1 (enable), default 0.

3.2.6.26 NAS_ENABLE_TAU_ACTIVE_FLAG

Causes the Active flag to be set when performing subsequent TAU procedures.

SETP NAS_ENABLE_TAU_ACTIVE_FLAG N

N = 0 (inactive) or 1 (active), default 0.

3.2.6.27 NAS_ENABLE_TAU_ IMEISV

Causes the optional IMEISV to be included in Identity Request and Security Mode Complete messages.

SETP NAS_ENABLE_TAU_ IMEISV N

N = 0 (inactive) or 1 (active), default 0.

3.2.6.28NAS_ENABLE_REVERT_TO_PRE_V290_INDICATIONS

Reverts the NAS indications to the format used prior to V29.9.0 and C3.15.5.

Must be used in conjunction with REVERT_TO_PRE_V290_INDICATIONS.

SETP NAS_ENABLE_REVERT_TO_PRE_V290_INDICATIONS N

N = 0 (inactive) or 1 (active), default 0.

3.2.6.29 REVERT_TO_PRE_V290_INDICATIONS

Reverts the NAS indications to the format used prior to V2.9.0 and C3.15.5.

Must be used in conjunction with NAS_ENABLE_REVERT_TO_PRE_V290_INDICATIONS.

SETP REVERT_TO_PRE_V290_INDICATIONS N

N = 0 (inactive) or 1 (active), default 0.

3.2.7 ENABLE_OLD_NAS_INDICATIONS

Outputs NAS indication messages in the format used prior to V2.8.0.

SETP ENABLE_OLD_NAS_INDICATIONS N

N = 0 (disable) or 1 (enable), default 0.

3.2.8 NAS_DISABLE_REPLAY_PROTECTION

Disable NAS replay protection.

SETP NAS_DISABLE_REPLAY_PROTECTION N

N = 0 (enable) or 1 (disable), default 0.

3.2.9 NAS_ENABLE_COMBINED_TAU_ACCEPT_WITH_RECONFIGURATION

Allow the TAU Accept message to be within an RRC Reconfiguration message during TAU with active flag set..

SETP NAS_ENABLE_COMBINED_TAU_ACCEPT_WITH_RECONFIGURATION N

N = 0 (inactive) or 1 (active), default 0.

3.2.10 NAS_TEST_IGNORE_RXD_PTI

Ignore the Protocol Transaction Identifier.

Ignore the Protocol Transaction Identifier.

SETP NAS_TEST_IGNORE_RXD_PTI N

N = 0 (inactive) or 1 (active), default 0.

3.3 Circuit Switched Fallback (CSFB) Support

The TM500 provides test commands to enable simulation of the CS Fallback (CSFB) to 1xRTT (CDMA2000) procedure. Note that no support is provided for encoding/decoding of CDMA2000 messages.

In this release, disconnection from LTE using the RRC Connection Release procedure with *RedirectedCarrierInfo* is supported. CS Fallback via the Mobility from EUTRAN procedure will be supported in a later release.

The sequence of operations to simulate CSFB is as follows:

CDMA2000 pre-registration is done as follows:

- Perform NAS Attach using NasConfigEmmRegister.
- Trigger CSFB Parameter request using RrcAptTriggerCsfbParamReqCdma2000 (see section 3.5.2.1.2). This is optional.
- If the eNB sends a CSFB Parameter Response it is logged in TMA protocol log but no MCI indication is provided by default. To see this (and all other protocol log) information on the MCI the test SETP command RRC_TEST_LOG_PCO_MSG_TO_MCI may be used.
- Simulate CDMA2000 registration using RrcAptCdma2000DataTransfer (see section 3.5.2.1.3) The CDMA2000 registration response is sent to the MCI in the indication message Dedicated Info for CDMA2000, as well as being output to the TMA protocol log.

Note that the RrcAptCdma2000DataTransfer message contents is used to transfer CDMA2000 protocol message as an octet string via the LTE RRC IE DedicatedInfoCdma2000. The data must be provided as an ASCII HEX string. TM500 does not provide tools to encode or decode CDMA2000 messages.

The CS Fallback procedure is triggered as follows:

- For MT CS Fallback a CDMA2000-1RTT paging message is sent via dlInformationTransfer and is output to the MCI in the indication message Dedicated Info for CDMA2000 (see section3.5.2.1.7). Note that the TM500 does not decode or act on this message.
- For both MO and MT procedures, initiate the CS fallback using the command NasAptTriggerExtServiceRequest (see section 3.5.2.1.5). If the UE is in Idle state it will initiate connection before sending the message.
- After receiving rrcConnectionRelease with redirectedCarrierInfo cdma2000-1xRTT, the TM500 disconnects from the cell and stop performing measurements.

The following indications show CS Fallback to another RAT:

I: CMPI MTE 0 ECM DISCONNECTION IND:UE Id:0

NAS: Registered - NO SERVICE

I: CMPI MTE 0 EMM PLMN LOSS IND:UE Id:0

Resumption of LTE services is triggered as follows:

- To resume the TM500 on EUTRAN, issue the command RrcAptReturnToEutran (see section 3.5.2.1.4) to cause the TM500 to start the cell selection in accordance with the previous RrcAptConfigCellSelectioncommand.
- To force TM500 to initiate TAU after returning to EUTRAN, issue the command NasAptTriggerTau.

3.4 High Speed Data Logging

The TM500 LTE supports High Speed Data Logging (HSDL) of the UL-SCH encode chain and the DL-SCH decode chain. Section 3.4.5 includes additional information on HSDL deployment.

HSDL of the PDSCH is only currently supported for SISO operation.

HSDL operation consists of the following steps:

- Disable HSDL (see paragraph 3.4.2).
- Start “loganalyse” data capture application (see paragraph 3.4.3).
- Select which test points to log (see paragraph 3.4.1).
- Trigger logging of data of a limited number of subframes (see paragraph 3.4.2).

These steps are combined in a TMA script supplied with this release. The user must edit the TM500 LTE IP address in this script (see paragraph 3.4.3).

The user is required to edit this script to change which test points are logged, and how many subframes are logged, from the default values.

The data capture application outputs logged data to multiple files in the "C:\TM500_LTE_HSDL" directory. Note the command prompt, which launches this application, should be closed using the return key to ensure all the data is output to the logged file.

3.4.1 Selection of HSDL Test Points

This section details which test points are provided by the HSDL.

3.4.1.1 DL-SCH Test Points

The following figure shows the DL-SCH HSDL test points:

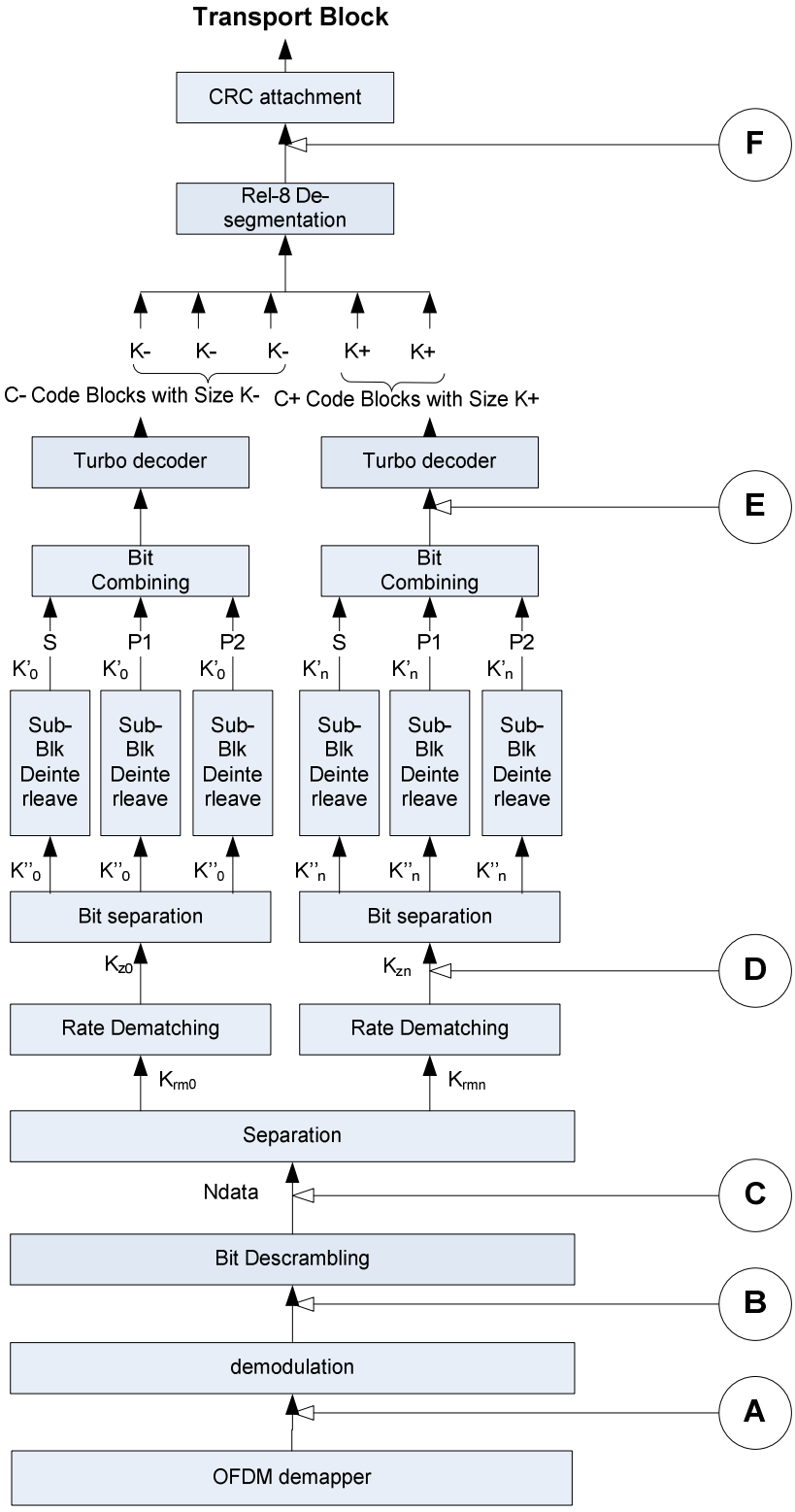

Figure 1: HSDL DL-SCH Test Points

The following table shows the format of the DL-SCH HSDL test points:

HSDL test point	HSDL logging point name	Description	Format
A	LOG_HSDL_DL_NORM_SYMBOL	Normalise modulation symbol for a Turbo code block.	16-bit signed
B	LOG_HSDL_DL_DE_MAP_OP	De-Mapper output i.e. Log Likelihood Ratio (LLR)	8-bit signed
C	LOG_HSDL_DL_DE_RATEMATCH_IP	De-Rate match input	8-bit signed
D	LOG_HSDL_DL_DE_INTERLEAVE_IP	De-Interleaver input	8-bit signed
E	LOG_HSDL_DL_TURBO_DECODE_IP	Turbo decoder input	8-bit signed
F	LOG_HSDL_DL_TR_BLK_CRC	Code block plus CRC	bit packed (MSB 1st)

Table 1: HSDL DL-SCH Logging points

The following table gives the commands required to select which DL-SCH HSDL test points are logged:

DL Test Points Selected	TMA command

All	`lcfg dsp 0  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x000007E0 0x00039D00`
	`lcfg dsp 2  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x000007E0 0x00039D00`
	`lcfg dsp 4  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x000007E0 0x00039D00`
	`lcfg dsp 6  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x000007E0 0x00039D00`

A only	`lcfg dsp 0  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000500`
	`lcfg dsp 2  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000500`
	`lcfg dsp 4  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000500`
	`lcfg dsp 6  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000500`

B only	`lcfg dsp 0  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00001800`
	`lcfg dsp 2  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00001800`
	`lcfg dsp 4  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00001800`
	`lcfg dsp 6  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00001800`

C only	`lcfg dsp 0  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0x00020000`
	`lcfg dsp 2  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0x00020000`
	`lcfg dsp 4  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0x00020000`
	`lcfg dsp 6  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0x00020000`

D only	`lcfg dsp 0  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00018000` `lcfg dsp 2  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0`

	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00018000 lcfg dsp 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00018000 lcfg dsp 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00018000
E only	lcfg dsp 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x000000C0 0 lcfg dsp 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x000000C0 0 lcfg dsp 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x000000C0 0 lcfg dsp 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x000000C0 0
F only	lcfg dsp 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000300 0 lcfg dsp 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000300 0 lcfg dsp 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000300 0 lcfg dsp 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000300 0

Table 2: Commands to select HSDL DL-SCH logging points

3.4.1.2 UL-SCH Test Points

The following figure shows the UL-SCH HSDL test points:

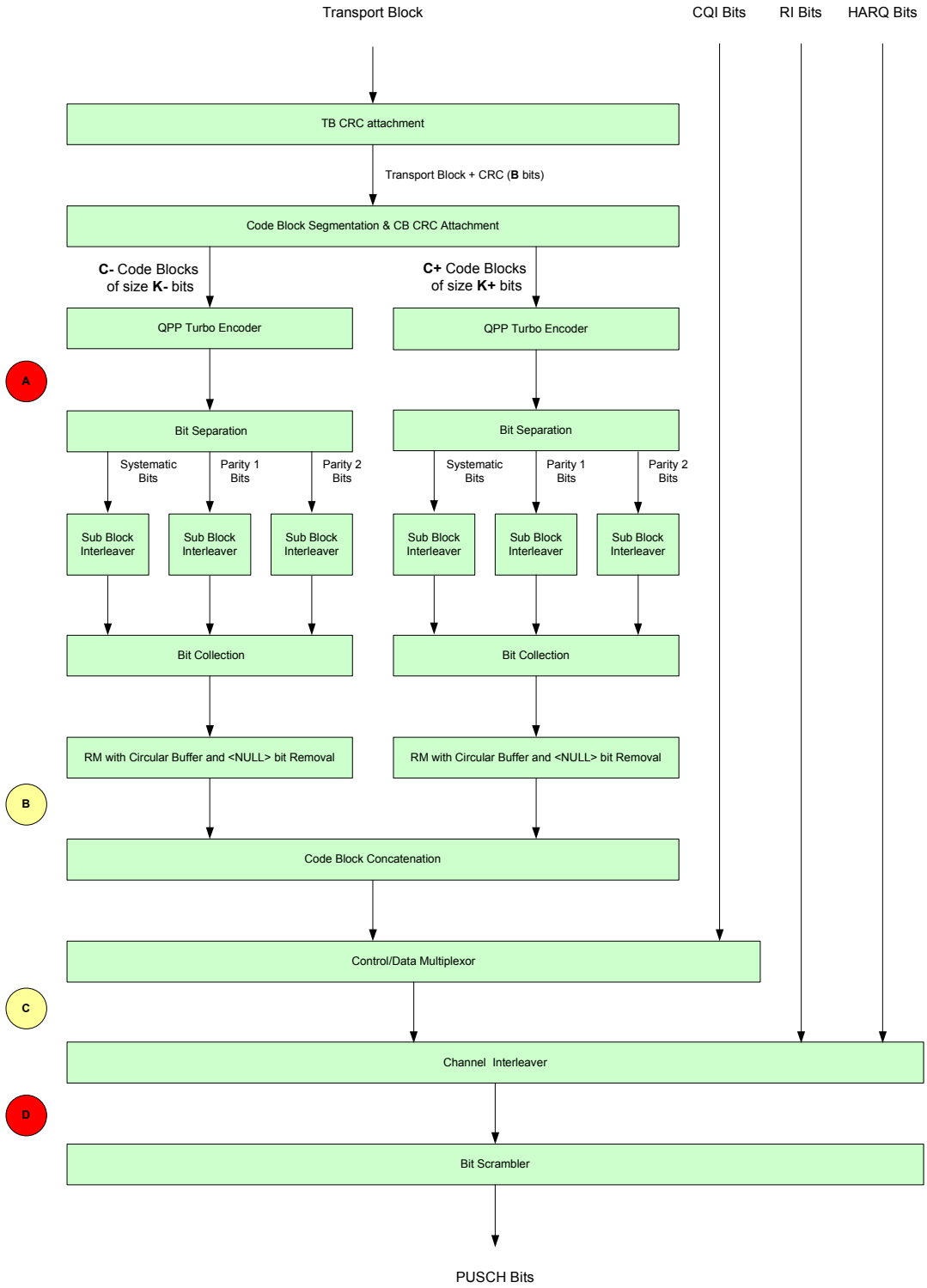

Figure 2: HSDL UL-SCH Test Points

The following table shows the format of the UL-SCH HSDL test points:

HSDL test point	HSDL logging point name	Description	Format
A	LOG_HSDL_UL_TURBO_ENCODE_OP	Turbo encoder output	Two Bit packed (LSB 1st) , first word is length in bit pairs.
B	LOG_HSDL_UL_RATE_MATCH_OP	Rate match output	Bit packed (LSB 1st) , first word is length in bits.
C	LOG_HSDL_UL_BRP_MUX_OP	Multiplexor output	Bit packed (LSB 1st) , first word is length in bits.
D	LOG_HSDL_UL_INTERLEAVE_OP	Channel Interleaver output	Two Bit packed (LSB 1st), first word is length in bit pairs.

Table 3: HSDL UL-SCH Test Points

The following table gives the commands required to select which UL-SCH HSDL test points are logged:

UL Test Points Selected	TMA command
All	`lcfg dsp 8  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00001380 0 0`
A only	`lcfg dsp 8  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000080 0 0`
B only	`lcfg dsp 8  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000100 0 0`
C only	`lcfg dsp 8  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00001000 0 0`
D only	`lcfg dsp 8  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000200 0 0`

Table 4: Commands to select HSDL UL-SCH logging points

3.4.1.3 Selection of Higher Layer HSDL Test Points

The following table shows the format of the Higher Layer HSDL test points:

HSDL test point	HSDL logging point name	Description	Format
HL1	LOG_HSDL_L1_BCH_PHY	BCH transport blocks	Big endian 32 bit hex
HL2	LOG_HSDL_L1_DLSCH_PHY	DL-SCH transport blocks	Big endian 32 bit hex
HL3	LOG_HSDL_MAC_DL_DTCH_DCCH_SDU	DL MAC SDU data	Big endian 32 bit hex
HL4	LOG_HSDL_RLC_DL_SDU	DL RLC SDU data	Big endian 32 bit hex
HL5	LOG_HSDL_RLC_UL_SDU	UL RLC SDU data	Big endian

			32 bit hex
HL6	LOG_HSDL_LRLC_UL_SDU	UL RLC timer discarded SDUs	Little endian 32 bit hex
HL7	LOG_HSDL_LMAC_UL_DTCH_DCCH_SDU	UL MAC SDU data	Little endian 32 bit words
HL8	LOG_HSDL_UL_BRP_TB_OP	See UL-SCH test point A	-

Table 5: HSDL HL logging points

The following table gives the commands required to select which Higher Layer test points are logged:

UL Test Points Selected	TMA command
All (except HL1)	lcfg hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000060 0 0x00000040 0 0x00000040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 lcfg dsp 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0 0x00000020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 lcfg dsp 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00002000 0 0
PHY SDUs (HL2&8)	lcfg hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 lcfg dsp 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00002000 0 0
MAC SDUs (HL3&7)	lcfg hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 lcfg dsp 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RLC SDUs (HL4,5&6)	lcfg hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 lcfg hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 lcfg dsp 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DL only	lcfg hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0 0x00000040 0 0x00000020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
UL only	lcfg hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 lcfg dsp 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000020 0 0x00000020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Table 6: Commands to select HSDL HL logging points

3.4.1.4 HSDL data formats

HSDL data is generally logged as 32-bit hexadecimal numbers e.g. 0xFF81FF83. The logged data can represent several formats as follows:

- **16-bit signed format**

This is a signed 16-bit number, where the bit 0 to bit 15 of the 32-bit logged data represents the first logged data and bit 16 to bit 31 represents the second logged data as shown in figure 2.

For example 0xFF81FF83 represents the first logged data value of -125 and the second logged value of -127. Note for IQ data pairs, I is the 1st value (-125) & Q the 2nd (-125).

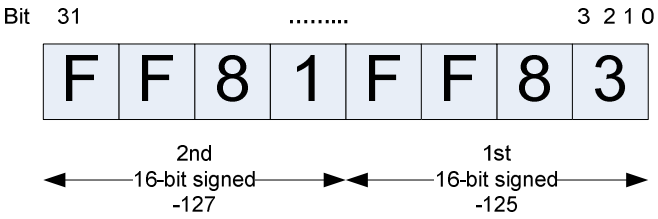

Figure 4: 16-bit signed format

- **8-bit signed format**

  This is a signed 8-bit number, where the bit 0 to bit 7 of the 32-bit logged data represents the first logged data, bit 8 to bit 15 represents the second logged data, bit 16 to bit 23 represents the third logged data and bit 24 to bit 32 represents the fourth logged data as shown in figure 3.

  For example 0x3133D2D4 represents the first logged data value of -44, the second logged data value of -46, the third logged data value of 51 and the fourth logged data value of 49.

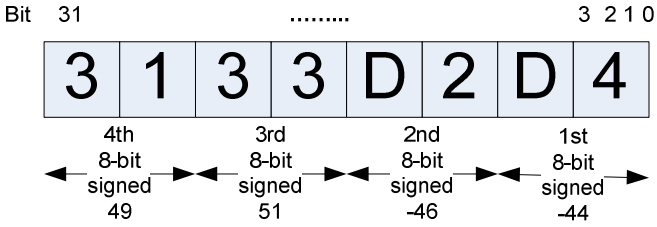

Figure 5: 8-bit signed format

- **Bit packed format**

  For the DL-SCH, TrBk data is logged such that the MSB is the first bit to be received.

  For the UL-SCH, data is logged such that the LSB is the first bit to be transmitted.

3.4.2 Triggering of HSDL

Due to the high data rates, the ethernet link cannot sustain continuous HSDL, therefore discontinuities may occur in the logged data; these are indicated by FLOW CONTROL ON and OFF messages that are inserted in the captured data.

In order to avoid this problem, short bursts of HSDL should be triggered using the following command:

```
FORW L1 SETHSDLSEQUENCE 1 0 <subframe> <mark> <space> <iterations>
```

`<subframe>`	is the subframe number (i.e. 0-9) of the first subframe to log
`<mark>`	is the number of subframes to log
`<space>`	is the number of subframes not to log

`<iterations>` is the number of times to repeat the sequence. A value of -1 will iterate forever, until the command below is used to turn HSDL permanently on or off

Note: `<mark> and <space>` must each be ≤ 80

Note also that sending this command again is not permitted if a previous HSDL sequence is still running. If it is required to change to a new sequence, the command below must first be used to disable the currently running sequence (if any). Set the new HDSL sequence and then re-enable the HSDL logging using the **SETHSDLSTATE** command.

The following command may be used to enable or disable continuous HSDL:

```
FORW L1 SETHSDLSTATE <enable>
```

`<enable>` Set to 0 to turn off all HSDL or set to 1 to enabled output of any configured HSDL

Example:
Disable HSDL logging
FORW L1 SETHSDLSTATE 0

Set desired logging points
```
lcfg dsp 0  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0x00000500
```

Enable sequence
FORW L1 SETHSDLSEQUENCE 1 0 0 1 5 -1

Enable HSDL logging
FORW L1 SETHSDLSTATE 1

3.4.3 Data Capture

The “loganalyse” data capture application is launched from a TMA script using the following commands for the UL and DL, respectively:

shell ("c:\TM500_LTE_HSDL\loganalyse_filedump_ul" a.b.c.d <log filename_prefix>) 0

shell ("c:\TM500_LTE_HSDL\loganalyse_filedump_dl" a.b.c.d <log_filename_prefix>) 0

shell ("c:\TM500_LTE_HSDL\loganalyse_filedump_hsdl_sdus.bat" a.b.c.d <log_filename_prefix>)) 0

where a.b.c.d is the TM500 LTE IP address (same as TMA configuration) and <log_filename_prefix> is the name prefix for the filename containing the captured data.

E.g. shell (“c:\TM500_LTE_HSDL\loganalyse_filedump_dl” 10.1.4.32 c:\TM500_LTE_HSDL\log_dl) 0

DL-SCH HSDL data is captured in two separate files (for a given code word), each file containing the data from a particular code block. The data is tagged with SFN and subframe number to enable the user to re-construct data from a given subframe.

UL-SCH HSDL data is captured into one file containing all selected UL test points.

Higher Layer HSDL SDU data is captured in two separate files: one containing the DL and UL RLC and one containing the UL L1 SDUs.

The logged data is output to the "C:\TM500_LTE_HSDL" directory and written to multiple text files, e.g. log_dl_1.txt, log_dl_2.txt. Note the command prompt, which launches the loganalyse application, should be closed using the return key to ensure all the data is output to the logged file. Please also note that the following files have to be placed manually in the c:\TM500_LTE_HSDL directory: loganalyse.exe, loganalyse.dll, loganalyse_filedump_dl.bat, loganalyse_filedump_ul.bat (see 3.4.5.)

3.4.4 HSDL Limitations

While an HSDL sequence is running, you should not change any services.

UL-SCH HSDL is only supported for data rates up to 10Mbps,

It is recommended that if the user is only logging UL data, then the DL test points are not selected to be logged, and vice versa. This should be done to minimise the amount of data logged, and the likelihood of discontinuities in the data due to flow control.

3.4.5 HSDL Operation

The High Speed Data Logging functionality (HSDL) is deployed as follows:

The installer includes a subdirectory “HSDL”. This contains the Loganalyse executables, batch files, and a sample script for running the HSDL from the TMA as a raw script.

Copy the entire directory to the C: drive to form the directory "C:\TM500_LTE_HSDL".

The directory will contain the following files:

- `loganalyse_filedump_ul.bat`
- `loganalyse_filedump_dl.bat`
- `loganalyse_filedump_hsdl_sdus.bat`
- `hsdl_to_file.txt`
- `hsdl_sdu_logging.txt`
- `Loganalyse.exe`
- `Loganalyse.dll`

This directory is referenced by the above batch and script files. The files can be moved to another directory, but these files would need to be modified to refer to the new location.

The script file `hsdl_to_file.txt` must be modified to configure and match the TM500 setup:

Shell ("c:\TM500_LTE_HSDL\loganalyse_filedump_dl" **10.1.4.232** c:\TM500_LTE_HSDL\log_dl) 0
Shell ("c:\TM500_LTE_HSDL\loganalyse_filedump_ul" **10.1.4.232** c:\TM500_LTE_HSDL\log_ul) 0

The script file `hsdl_sdu_logging.txt` must similarly be modified to match the TM500.

The parameters in bold must match the IP address of the TM500 LTE.

In the remainder of the file comment/uncomment lines to select the required logging points, and also to define the logging duration at the foot of the file.

Add the script file as a raw script to a Test Suite in the TMA Test Manager.

When services are configured, run the script file via the TMA. Multiple instances of the Loganalyse application will be started in command windows. When the required data has been collected, close down each window by selecting and pressing return.

The logged data will be located in the following files:

```
PHY data:
Log_dl_1.txt, log_dl_2.txt, Log_ul_1.txt, log_ul_2.txt.
HL SDU data:
log_sdus_1.txt, log_sdus_2.txt
```

3.5 Documentation Notes

3.5.1 Command Reference Manual Changes

3.5.1.1 New Commands/Indications

3.5.2 Command Reference Manual Changes

3.5.2.1 New Commands/Indications

3.5.2.1.1 RrcAptOverrideBandSupport

Override/Add the EUTRA Band Information to be used by TM500 RRC

Scope

Applicable to NAS_MODE. Activation time is controlled by the Activate command.

Description

The command is used to override and/or extend the band Information for a specified EUTRA band to support custom bands, the partial emulation of bands which fall within other bands and the remapping of bands when using a frequency converter. In all cases the new/modified band must be supported by the underlying radio card module configuration.

The bands listed in this command will be reported as supported in Supported Eutra Band List in UE EUTRA Capabilities along with the other bands supported by the TM500 radio card.

If the command is sent with the band but no additional parameters the TM500 will use the band frequency ranges defined by 3GPP 36.101.

If the band is not defined in 36.101 and the optional parameters are not included then the command is rejected with error “RRC: Override Band is not defined in RrcAptOverrideBandSupport Command".

If the optional parameters are provided then the End Frequencies and End EARFCNs will be calculated as follows:

DL Frequency End (in 100 KHZ) = DL Frequency start + DL Frequency bandwidth

If DL Frequency bandwidth is not 0:

DL EARFCN End = DL EARFCN start + (DL Frequency bandwidth - 1)

If DL Frequency bandwidth is 0:

DL EARFCN End = DL EARFCN start

UL Frequency End (in 100 KHZ) = UL Frequency start + UL Frequency bandwidth

If UL Frequency bandwidth is not 0:

UL EARFCN End = UL EARFCN start + (UL Frequency bandwidth - 1)

If UL Frequency bandwidth is 0:

UL EARFCN End = UL EARFCN start

If the configured frequencies (or calculated default frequencies on basis of 3GPP 36.101 for 3GPP defined Bands for which frequencies are not configured in the command) are outside the range supported by the installed hardware then the command is rejected with MCI Indication error "RRC RrcAptOverrideBandSupport Command Error: Configured Frequencies are not Supported". This error will be indicated during Registration (i.e. after issue of “nasconfigemmregister” command).

The command must be activated before initiating the registration.

Examples:

To define a new custom band as Band 50, with EARFCN values from 50000- 50299 (30MHz bandwidth), the command would be as follows:

RrcAptOverrideBandSupport 1 { 50 [1 25450 50000 300 25450 50000 300] }

To remap Band 1 to Band 5 when using an external frequency converter (performing a downward translation of 1096 MHz in the UL and 1241 NHz in the DL) the command would be as follows:

RrcAptOverrideBandSupport 1 { 5 [1 2110 2400 250 1920 20400 250] }

Band 5 would be reported as being supported and would be accepted as a valid band in the SIB. The Band 5 EARFCN would then be mapped to a frequency that when frequency converted would correspond to the correct Band 5 frequency.

Syntax

```
FORW MTE RRCAPTOVERRIDEBANDSUPPORT <PARAMETERS>
```

Request parameters

Parameter name	Type	Min	Max	Default
Number of Bands	Int	1	64	
	The number of bands to add or modify.			
{	Int	1	64	
> Band	Will be added to supported bands in SupportedBandListEUTRA in UE Capability IE and TM500 will accept a cell with a SIB1 message containing this band.			
[	Enum	0	1	As per 3GPP defined band
>> FDD/TDD	0 = FDD 1 = TDD			
>> DL Frequency Start	Int	7000	30000	As per 3GPP defined band
	DL start frequency * 100KHz			
>> DL EARFCN Start	Int	0	65535	As per 3GPP defined band
>> DL Frequency Bandwidth	Int	0	2000	As per 3GPP defined band
	DL bandwidth * 100KHz			
>> UL Frequency Start	Int	7000	30000	As per 3GPP defined band
	UL start frequency * 100KHz			
>> UL EARFCN Start	Int	0	65535	As per 3GPP defined band

Parameter name	Type	Min	Max	Default
>> UL Frequency Bandwidth] }	Int	0	2000	As per 3GPP defined band
	UL bandwidth * 100KHz			

Confirm parameters

Parameter name	Comment
RETURN_CODE	Number to indicate success/failure of request.
RETURN_TEXT	Text to indicate success/failure of request.

3.5.2.1.2 RrcAptTriggerCsfbParamReqCdma2000

Trigger transmission of the CSFBParametersRequestCDMA2000 message to eNB.

Scope

Applicable to NAS_MODE. Activation time is controlled by the Activate command.

Description

This command is used for simulation of Circuit Switched Fallback (CSFB). See section 3.3 for details.

This test command is used to transmit the CSFBParametersRequestCDMA2000 message.

Note that CSFBParametersResponseCDMA2000 message from the eNB is only logged in the TMA protocol log and the TM500 does not take any other action.

Syntax

```
forw mte RRCAPTTRIGGERCSFBPARAMREQCDMA2000
```

Request parameters

None

Confirm parameters

Parameter name	Comment
RETURN_CODE	Number to indicate success/failure of request.
RETURN_TEXT	Text to indicate success/failure of request.

3.5.2.1.3 RrcAptCdma2000DataTransfer

Trigger transmission of the RrcAptCdma2000DataTransfer message to eNB.

Scope

Applicable to NAS_MODE. Activation time is controlled by the Activate command.

Description

This command is used for simulation of Circuit Switched Fallback (CSFB). See section 3.3 for details.

This test command is used to tunnel CDMA2000 information through EUTRAN using ULInformationTransfer message when RRC is in connected state. If RRC is in idle, this command returns failure. Note that CDMA2000 DlInformationTransfer is logged in the TMA protocol log and a Dedicated Info for CDMA2000 (section 3.5.2.1.7) indication is also sent.

Example 1: CDMA2000-1xRTT UL Information Transfer

forw mte RRCAPTCDMA2000DATATRANSFER 0 0123456789abcdef

forw mte activate -1

Example 2: CDMA2000-HRPD UL Information Transfer

forw mte RRCAPTCDMA2000DATATRANSFER 1 0123456789abcdef

forw mte Activate -1

Syntax

```
forw mte RRCAPTCDMA2000DATATRANSFER <PARAMETERS>
```

Request parameters

Parameter name	Type	Min	Max	Default
CDMA2000-Type	Enum	0	1	
	0 = CDMA2000-1xRTT 1 = CDMA2000-HRPD			
DedicatedInfoCdma2000	String	1	1023	
	CDMA2000-1xRTT or CDMA2000-HRPD dedicated info in HEX string (Max 1023 digits)			

Confirm parameters

Parameter name	Comment
RETURN_CODE	Number to indicate success/failure of request.
RETURN_TEXT	Text to indicate success/failure of request.

3.5.2.1.4 RrcAptReturnToEutran

End CS Fallback session and re-connect to EUTRAN

Scope

Applicable to NAS_MODE. Activation time is controlled by the Activate command.

Description

This command is used for simulation of Circuit Switched Fallback (CSFB). See section 3.3 for details.

This command is used to end the CS Fallback session and re-connect to EUTRAN. TM500 uses stored cell selection according to earlier issued RrcAptConfigCellSelection command for cell selection after return to EUTRAN from CS Fallback. However, if the Tracking Area code of the cell after CS Fallback is same as the cell before CS Fallback, the TAU procedure will not be initiated by TM500 automatically. To force TAU after return from CS Fallback, use the NasAptTriggerTau command

Syntax

```
forw mte RRCAPTRETURNTOEUTRAN
```

Request parameters

None

Confirm parameters

Parameter name	Comment
RETURN_CODE	Number to indicate success/failure of request.
RETURN_TEXT	Text to indicate success/failure of request.

3.5.2.1.5 NasAptTriggerExtServiceRequest

Initiates Extended Service Request

Scope

Activation time is controlled by the Activate command.

Description

This command is used for simulation of Circuit Switched Fallback (CSFB). See section 3.3 for details.

This command initiates Extended Service Request.

Syntax

```
FORW MTE NASAPTTRIGGEREXTSERVICEREQUEST  <PARAMETERS>
```

Request parameters

Parameter name	Type	Min	Max	Default
Service Type	Enum	0	2	
	Value of the 'Service Type' field to set to in Extended Service Request message 0 = MO 1 = MT 2 = Emergency Call			
[CSFB Response]	Enum	0	1	
	Value of the 'CSFB Response' field to set in the Extended Service Request message 0 = Rejected 1 = Accepted If omitted the 'CSFB Response' field is not included in the Extended Service Request message			

Confirm parameters

Parameter name	Comment
RETURN_CODE	Number to indicate success/failure of request.
RETURN_TEXT	Text to indicate success/failure of request.

3.5.2.1.6 UsimConfig

Support added for NETPARS configuration for simulated USIM. This is an optional parameter block allowing configuration of cell and frequency information to be used for cell selection.

3.5.2.1.7 Dedicated Info for CDMA2000

Used to indicate that a DL information transfer with dedicated CDMA2000 information has been received.

Scope

This indication message may be generated in NAS_MODE.

Description

Used to indicate that a DL information transfer with dedicated CDMA2000 information has been received during the simulation of CS fallback.

Syntax

```
I: CMPI RRC dedicatedInfoCDMA2000 <PARAMETERS>
```

Indication parameters

The following indication parameter strings are concatenated together.

Parameter name	Text
UE Id	String indicating the UE Id: "UE Id:*n* " where *n* is the Id number of the UE as a decimal value.
CDMA2000-Type	The CMA2000 type: "1xRTT" or "HRPD"
Info	String providing the

Example

```
I: CMPI RRC dedicatedInfoCDMA2000:UE Id:0
  CDMA2000-Type:1XRTT
  Info:0123456789ABEDEF00
```

3.5.2.2 Modified Commands/Indications

None

3.5.2.3 Measurement Reference Manual

None

3.5.3 Document Errata

3.5.3.1 Command Reference Manual

DERR and DSTR commands are not supported.

3.5.3.2 Measurement Reference Manual

None

4 ISSUES RESOLVED IN THIS RELEASE

Id	Title
ubi00066913	ASN.1 encoder issue