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Ninja LTE mini PCIe Module

LC4R

User Guide

Version 1.6

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Change List

Revision	Date	Author	Change descriptions
1.0	2015/10/14	Alex Tu	Initial release
1.1	2015/10/14	Alex Tu	Add CDD ON/OFF
1.2	2015/10/21	Alex Tu	Add NAS enable Firmware upgrade
1.3	2015/10/23	Alex Tu	Replace 0,0,0 with null after APNNAME in AT+CGDCONT command
1.4	2015/11/23	Alex Tu	Add more AT commands
1.5	2016/4/1	Alex Tu	Upgrade content update
1.6	2016/6/6	Alex Tu	Add FCC statement



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1 Product Overview

1.1 Introduction

LC4R module uses GCT GDM7243Q chipset which is a wireless LTE FDD/TDD solution. The chipset inside the module owns a dual core CPU. One of CPU (ARM1) is designed to run LTE modem job; the other CPU (ARM0) is designed for router or other application.

In order to get full control, GCT designs three kinds of command sets.

- AT commands : 3GPP standard compatible commands to control network connection
- DM commands : GCT proprietary commands for calibration and NVM configuration
- UCFG commands : GCT proprietary application that manages LTE NVM (Non-Volatile Memory) block used as command based interface at GDM7243 Linux kernel environment.

We will use them for different purposes.

1.2 System Structure

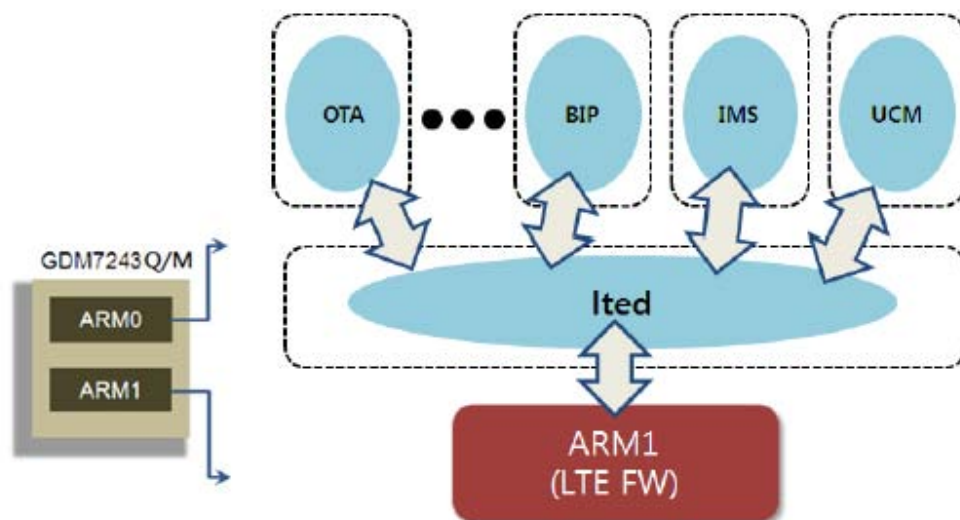
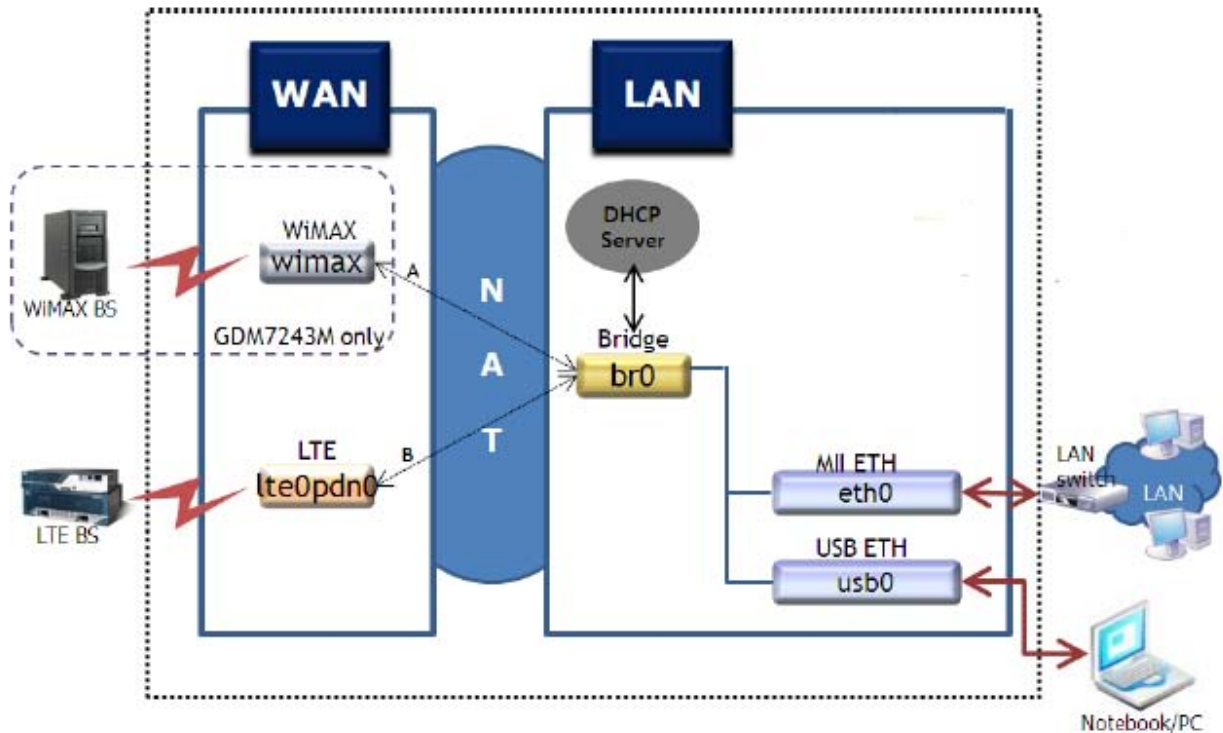


Figure 1: Device Application for CPE

From above diagram, there is an UCM (Unify Connection Manager) application running in ARM0 for connection function. To simply dial process, using it is good suggestion, and AT commands are required. If more specific dial requirement required, DM/UCFG commands are needed.



1.3 Network structure



GDM7243M network block diagram

LC4R chipset, GDM7243Q, doesn't have WiMAX function. MII ETH is not used either due to mini PCIe form factor, so usb0 is the only interface for network communication.

When NAT is enabled, notebook/PC will get IP from DHCP server on br0 interface, it will be like 192.168.0.10. br0 IP is 192.168.0.1. ltepdn0 IP can be retrieved by AT command or DM command Host Interface.

LC4R uses USB 2.0 for data communication. USB interface need to be enabled and usb mode need to be configured for different condition.

- Connect to test board and Windows PC Auto or RNDIS mode
- Connect to Linux OS CDC-EEM or CDC-ECM mode

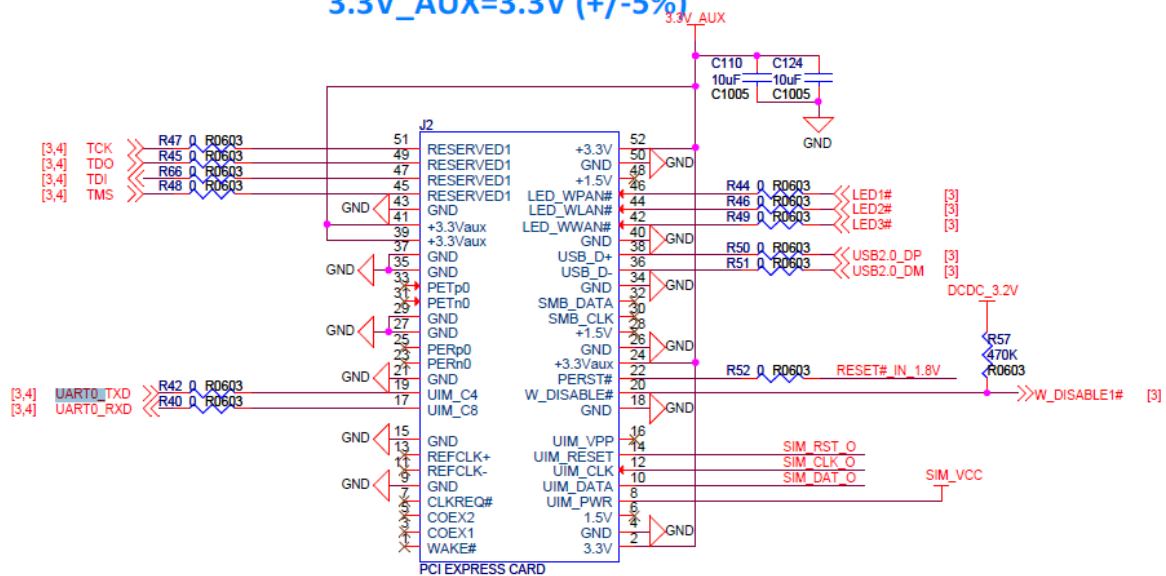
ACM port is a virtual port on USB for AT command access only. We suggested using this interface for AT command because there is no console dump data which mixes with AT command response. **Device can be found at /dev/ttyACM0.**



Modem control and monitor are done by UART which is defined in reserved pin 17 & 19 of mini PCIe interface. UART0_TXD and UART0_RXD voltage is 1.8V. Default baud rate is 921600/n/8/1. If CPE board baud rate cannot support such high bit rate, reducing baud rate is doable from UART at boot loader mode or by pre-configuration.

MiniCard Socket

3.3V_AUX=3.3V (+/-5%)



To update UART port baudrate, go to boot loader (reboot and press enter key during booting), and follow the commands to update new value. Reboot is still required to take new baudrate working.

```
COM36 - PuTTY
Environment size: 2292/131068 bytes
GDM7243> print baudrate
baudrate=921600
GDM7243> set baudrate 115200
## Switch baudrate to 115200 bps and press ENTER ...
GDM7243> saveenv
Erasing Nand...
Erasing at 0x800000 -- 100% complete.
Writing to Nand... done
GDM7243>
```



1.4 Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution:

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and the maximum antenna gain allowed for use with this device is 4 dBi for B25/B41 and 1 dBi for B26.
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: P27LC4R". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User



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The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.



When system boots up, "DM>" prompt will be seen, then DM mode is active. Some of commands will be introduced in the following section.



Command	Response
nv bcfgr <cmd=49> <port=0>	0 OK
Example: nv bcfgr 49 0	

Command	Response
nv bcfgw <cmd=49> <port=0> <band=41 25 26>	OK
Example: nv bcfgw 49 0 41 25 26	

Command	Response
nv bcfgsv <cmd=1>	OK
Example: nv bcfgsv 1	

This command sets cell black list.	
Command	Response
<pre>rrc dm cell block [[<earfcn> <pci>]] rrc dm cell block <'a' or 'd'> [[<earfcn> <start pci> <end pci>]]</pre> 'a' : add a cell to the list 'd' : delete a cell from the list start pci : low PCI of the range end pci : high PCI of the range Notice: total 48 records	
Example: rrc dm cell block a 39650 0 100 rrc dm cell block d 39650 0 100	



2.5 Show PCI Black List

Command	Response
rrc dm cell block ?	
Cell Black List : 2 (use SIB9:0) >> earfcn: 39950, pci: 0 ~ 100 >> earfcn: 38950, pci: 0 ~ 100	



3 UCFG commands

UCFG application needs to be run at Linux kernel. To go to Linux shell, type shell from DM>,



Type “exit” to return DM> mode from Llinux shell mode

3.1 Connection Manager Selection

Command	Response
ucfg set config wan lte vendor <value>	vendor=<value>
<value> :	
0 None	
1 lteautocm	

3.2 PLMN Search Type

Command	Response
ucfg set config wan lte plmn_search_type <value>	vendor=<value>
<value> :	
0 PLMN Search	
1 PLMN Search with band	
2 PLMN Extension Search	

3.3 Set AutoCM Mode

To set lteautocm operation mode. If manual connection is designed, manual mode of lteautocm is used

Command	Response
ucfg set config wan lte autocm manual <value>	vendor=<value>
<value> :	
0 Auto	
1 Manual	



3.4 Set ATCM Mode

To set atcm mode about PDN connect

Command	Response
ucfg set config wan lte atcm use _autocm_req <value>	vendor=<value>
<value> :	
0 By itself	
1 Request to lteautocm	

3.5 USB Ethernet Interface Enable

Command	Response
ucfg set config lan usbeth ENABLE 1	ENABLE=1

3.6 USB Ethernet Interface Disable

Command	Response
ucfg set config lan usbeth ENABLE 0	ENABLE=0

3.7 USB Ethernet Interface Mode

Command	Response
ucfg set config lan usbeth mode <value>	mode=<value>
<value> :	
0 Auto Detect (Default)	
1 RNDIS	
2 CDC-EEM	
3 CDC-ECM	

3.8 List of PLMN Search Type

Command	Response
ucfg set plmn search_list <[type]/[number]/[value]... [type]/[number]/[value]>	mode=0
[type] : the type of PLMN Search	
1 MRU Search	
2 Earfcn Search	
3 Band Search	
4 Sarfcn Range Search	
[number] : the count of each PLMN Search type, Max of number is 5	
While type=1, means The count of MRU Search	
While type=2, means The number of earfcn	
While type=3, means The number of Band	
While type=4, means The number of Earfcn range	
[value] : value of each PLMN Search type	
1 N/A	
2 /earfcn_1/earfcn_2/...../earfcn_[number]	
3 /band_1/band_2..../band_[number]	
4 /start_earfcn_1/end_earfcn1/...../start_earfcn_[number]/end_earfcn_[number]	



4 AT Commands

AT commands can be accessed from UART port and ACM port.

4.1 Request information commands

4.1.1 AT+CGMI Request manufacture identification

This command gets the manufacture identification

Command	Response	Value
+CGMI	<manufacture> +CME ERROR: <err>	GCT
+CGMI=?		

4.1.2 AT+CGMM Request model identification

This command gets the model identification

Command	Response	Value
+CGMM	<model> +CME ERROR: <err>	GDM7243R0
+CGMM=?		

- <model>: The value will be updated to GDM7243Q in next FW release.

4.1.3 AT+CGMR Request revision identification

This command gets the revision identification

Command	Response	Value
+CGMR	<revision> +CME ERROR: <err>	FW_VER: 0.2.65.1
+CGMR=?		

4.1.4 AT+CGSN Request product serial number identification

This command gets the serial number identification

Command	Response	Value
+CGSN	<sn>	IMEI

4.1.5 AT+CSCS Request TE character set

Command	Response	Value
+CSCS=[<chset>]		
+CSCS?	+CSCS:<chset>	
+CSCS=?	+CSCS: (list of supported <chset>s)	



- <chset>: character set as a string type (conversion schemes not listed here can be defined by manufacturers)

"GSM" GSM 7 bit default alphabet (3GPP TS 23.038 [25]); this setting causes easily software flow control (XON/XOFF) problems.

"HEX" Character strings consist only of hexadecimal numbers from 00 to FF; e.g. "032FE6" equals three 8-bit characters with decimal values 3, 47 and 230; no conversions to the original MT character set shall be done.

If MT is using GSM 7 bit default alphabet, its characters shall be padded with 8th bit (zero) before converting them to hexadecimal numbers (i.e. no SMS-style packing of 7-bit alphabet).

"IRA" International reference alphabet (see ITU-T Recommendation T.50 [13]).

"UCS2" 16-bit universal multiple-octet coded character set (see ISO/IEC10646 [32]); UCS2 character strings are converted to hexadecimal numbers from 0000 to FFFF; e.g. "004100620063" equals three 16-bit characters with decimal values 65, 98 and 99.

"UTF-8" Octet (8-bit) lossless encoding of UCS characters (see RFC 3629 [69]); UTF-8 encodes each UCS character as a variable number of octets, where the number of octets depends on the integer value assigned to the UCS character. The input format shall be a stream of octets. It shall not be converted to hexadecimal numbers as in "HEX" or "UCS2". This character set requires an 8-bit TA – TE interface.

4.1.6 AT+CIMI Request international mobile subscriber identity

Command	Response	Value
+CIMI	<IMSI> +CME ERROR: <err>	
+CIMI=?		

- <IMSI>: Iterational Mobile Subscriber Identity (string without double quote)



4.2 Network service related commands

4.2.1 AT+COPS PLMN selection

Forces an attempt to select and register the GSM/UMTS network operator

Command	Possible Response
+COPS=?	+COPS: ([list of supported<stat> ,long alphanumeric <oper> ,short alphanumeric <oper> ,numeric <oper>[,<Act>])s][, (list of supported<mode> s), (list of supported <format> s)] +CME ERROR:<err>
+COPS?	+COPS: <mode>[,<format>,<oper>[,<Act>]]
+COPS=[<mode>[,<format>[,<oper>]]]	

- <stat>: Availability of operator
 - 0 unknown
 - 1 available
 - 2 current
 - 3 forbidden
- <oper>: Shows the operator identity in the format set by <format>
- <mode>: Registration mode
 - 0 automatic (<oper> field is ignored)
 - 1 manual (<oper> field shall be present, and <Act> optionally)
 - 2 deregister from network
 - 3 set only <format> (for read command AT+COPS?), do not attempt registration / de-registration (<oper> field is ignored); this value is not applicable in read command response
 - 4 manual/automatic (<oper> field shall be present); if manual selection fails, automatic mode<mode> =0) is entered
 - 5 manual (use plmn extension list)
- <format>: Format of <oper> reports
 - 0 long format alphanumeric <oper>
 - 1 short format alphanumeric <oper>
 - 2 numeric <oper>

4.2.2 AT+CLCK Facility lock

Command	Response
+CLCK=<fac>,<mode>[,<passwd>[,<class>]]	+CME ERROR: <err> when <mode>=2 and command successful: +CLCK: <status>[,<class1> [<CR><LF>+CLCK: <status>,<class2> [...]]
+CLCK=?	+CLCK: (list of supported <fac>s) +CME ERROR: <err>



-<fac> values reserved by the present document:

"SC" SIM (lock SIM/UICC card) (SIM/UICC asks password in MT power-up and when this lock command issued)

"UP" GCT specific facility code for universal PIN

"P2" SIM PIN2

4.2.1 AT+CPWD Change password

This command gets the revision identification

Command	Response
+CPWD=<fac>,<oldpwd>,<newpwd>	+CME ERROR: <err>
+CPWD=?	+CPWD: list of supported (<fac>,<pwdlength>)s +CME ERROR: <err>

- <fac>:

"P2" SIM PIN2

refer Facility Lock +CLCK for other values

-<oldpwd>, <newpwd>: string type; <oldpwd> shall be the same as password specified for the facility from the MT user interface or with command Change Password +CPWD and <newpwd> is the new password; maximum length of password can be determined with <pwdlength>

-<pwdlength>: integer type maximum length of the password for the facility

4.2.2 AT+CPOL Preferred PLMN list

Command	Possible response(s)
+CPOL=[<index>][,<format>][,<oper>][,<GSM_Act>,<GSM_Compact_Act>,<UTRAN_Act>,<E-UTRAN_Act>]]]	+CME ERROR: <err>
+CPOL?	+CPOL: <index1>,<format>,<oper1>[,<GSM_Act1>,<GSM_Compact_Act1>,<UTRAN_Act1>,<E-UTRAN_Act1>] [<CR><LF>+CPOL: <index2>,<format>,<oper2>[,<GSM_Act2>,<GSM_Compact_Act2>,<UTRAN_Act2>,<E-UTRAN_Act2>] [...]] +CME ERROR: <err>
+CPOL=?	+CPOL: (list of supported <index>s), (list of supported <format>s) +CME ERROR: <err>



This command is used to edit the PLMN selector with Access Technology lists in the SIM card or active application in the UICC (GSM or USIM)

- **[execution command]**
: writes an entry in the SIM/USIM list of preferred PLMNs, previously selected by the command +CPLS.
- **[read command]**
: returns all used entries from the SIM/USIM list of preferred PLMNs, previously selected by the command +CPLS, with the Access Technologies for each PLMN in the list
- **[test command]**
: returns the whole index range supported by the SIM.

strcat((char *) g_szMsg, (char *) pSpec->m_pszString);	strcat((char *) g_szMsg, (char *) pSpec->m_pszString);
strcat((char *) g_szMsg, (char *) pSpec->m_pszString);	strcat((char *) g_szMsg, (char *) pSpec->m_pszString);
strcat((char *) g_szMsg, (char *) pSpec->m_pszString);	strcat((char *) g_szMsg, (char *) pSpec->m_pszString);
strcat((char *) g_szMsg, (char *) pSpec->m_pszString);	strcat((char *) g_szMsg, (char *) pSpec->m_pszString);

- <indexn>: integer type; the order number of operator in the SIM/USIM preferred operator list
- <format>:
 - 0 long format alphanumeric <oper>
 - 1 short format alphanumeric <oper>
 - 2 numeric <oper>
- <opern>: string type; <format> indicates if the format is alphanumeric or numeric (see +COPS)
- <GSM_AcTn>: GSM access technology:
 - 0 access technology not selected
 - 1 access technology selected
- <GSM_Compact_AcTn>: GSM compact access technology:
 - 0 access technology not selected
 - 1 access technology selected
- <UTRAN_AcTn>: UTRAN access technology:
 - 0 access technology not selected
 - 1 access technology selected
- <E-UTRAN_AcTn>: E-UTRAN access technology:
 - 0 access technology not selected
 - 1 access technology selected



4.2.3 AT+CPLS Selection of preferred PLMN list

This command is used to select one PLMN selector with Access Technology list in the SIM card or active application in the UICC(GSM or USIM), that is used by +CPOL command

- **[execution command]**
: selects a list in the SIM/USIM.
- **[read command]**
: returns the selected PLMN selector list from the SIM/USIM
- **[test command]**
: returns the whole index range supported lists by the SIM/USIM.

Command	Response
+CPLS=<list>	+CME ERROR: <err>
+CPLS?	+CPLS: <list> +CME ERROR: <err>
+CPLS=?	+CPLS: (list of supported <list>s) +CME ERROR: <err>

- <list>:
 - 0 User controlled PLMN selector with Access Technology EFPLMNwAcT, if not found in the SIM/UICC then PLMN preferred list EFPLMNsel (this file is only available in SIM card or GSM application selected in UICC)
 - 1 Operator controlled PLMN selector with Access Technology EFOPLMNwAcT
 - 2 HPLMN selector with Access Technology EFHPLMNwAcT

4.3 Mobile Termination control and status commands

4.3.1 AT+CPAS Phone activity status

Command	Response
+CPAS	+CPAS: <pas> +CME ERROR: <err>
+CPAS=?	+CPAS: (list of supported <pas>s) +CME ERROR: <err>

-<pas>: integer type

- 0 ready (MT allows commands from TA/TE)
- 1 unavailable (MT does not allow commands from TA/TE)
- 2 unknown (MT is not guaranteed to respond to instructions)
- 3 ringing (Not Supported : MT is ready for commands from TA/TE, but the ringer is active)
- 4 call in progress (Not Supported : MT is ready for commands from TA/TE, but a call is in progress)



5 asleep (Not Supported : MT is unable to process commands from TA/TE because it is in a low functionality state)

all other values below 128 are reserved by the present document.

4.3.2 AT+CFUN Set phone functionality

Command	Response
+CFUN=[<fun>[,<rst>]]	+CME ERROR: <err>
+CFUN?	+CFUN: <fun> +CME ERROR: <err>
+CFUN=?	+CFUN: (list of supported <fun>s),(list of supported <rst>s) +CME ERROR: <err>

-<fun>: integer type

0 minimum functionality(Air Plane Mode On)

1 full functionality(Air Plane Mode Off)

Note : <fun> store in NV.

-<rst>: integer type

0 do not reset the MT before setting it to <fun> power level

1 reset the MT before setting it to <fun> power level

4.3.3 AT+CPIN Enter PIN

Command	Response
+CPIN=<pin>[,<newpin>]	+CME ERROR: <err>
+CPIN?	+CPIN: <code> +CME ERROR: <err>
+CPIN=?	

-<pin>, <newpin>: string type values

-<code> values reserved by the present document:

READY MT is not pending for any password

SIM PIN MT is waiting SIM PIN to be given

SIM PUK MT is waiting SIM PUK to be given

PH-SIM PIN MT is waiting phone-to-SIM card password to be given



PH-FSIM PUK	MT is waiting phone-to-very first SIM card unblocking password to be given
SIM PIN2	MT is waiting SIM PIN2 to be given (this <code> is recommended to be returned only when the last executed command resulted in PIN2 authentication failure (i.e. +CME ERROR: 17); if PIN2 is not entered right after the failure, it is recommended that MT does not block its operation)
SIM PUK2	MT is waiting SIM PUK2 to be given (this <code> is recommended to be returned only when the last executed command resulted in PUK2 authentication failure (i.e. +CME ERROR: 18); if PUK2 and new PIN2 are not entered right after the failure, it is recommended that MT does not block its operation)
PH-NET PIN	MT is waiting network personalization password to be given
PH-NET PUK	MT is waiting network personalization unblocking password to be given
PH-NETSUB PIN	MT is waiting network subset personalization password to be given
PH-NETSUB PUK	MT is waiting network subset personalization unblocking password to be given
PH-SP PIN	MT is waiting service provider personalization password to be given
PH-SP PUK	MT is waiting service provider personalization unblocking password to be given
PH-CORP PIN	MT is waiting corporate personalization password to be given
PH-CORP PUK	MT is waiting corporate personalization unblocking password to be given

4.3.4 AT+CPUK Unblock PIN2

Command	Response
+CPUK=<fac>,<pin>[,<newpin>]	OK ERROR

- <fac>
 - “SC” SIM
 - “P2” SIM PIN2
 - “UP” Universal PIN

4.3.5 AT+CSQ Signal Quality



Command	Response
+CSQ	+CSQ: <rss>, <ber> +CME ERROR: <err>
+CSQ=?	+CSQ: (list of supported <rss>s) , (list of supported <ber>s)

-<rss>: integer type

0 -113 dBm or less

1 -111 dBm

2...30 -109... -53 dBm

31 -51 dBm or greater

99 not known or not detectable

-<ber>: integer type; channel bit error rate (in percent)

0...7 as RXQUAL values in the table in 3GPP TS 45.008 [20] subclause 8.2.4

99 not known or not detectable

4.3.6 AT+CCLK Clock

Command	Response
+CCLK=<time>	+CME ERROR: <err>
+CCLK?	+CCLK: <time> +CME ERROR: <err>
+CCLK=?	

<time>: string type value; format is "yy/MM/dd,hh:mm:ss±zz", where characters indicate year (two last digits), month, day, hour, minutes, seconds and time zone (indicates the difference, expressed in quarters of an hour, between the local time and GMT; range -96...+96). E.g. 6th of May 1994, 22:10:00 GMT+2 hours equals to "94/05/06,22:10:00+08"

4.3.7 AT+CSIM Generic SIM access

Command	Response
+CSIM=<length>,<command>	+CSIM: <length>,<response> +CME ERROR: <err>
+CSIM=?	

<length>: integer type; length of the characters that are sent to TE in <command> or <response> (two times the actual length of the command or response)



<command>: command passed on by the MT to the SIM in the format as described in 3GPP TS 51.011 [28] (hexadecimal character format; refer +CSCS)

<response>: response to the command passed on by the SIM to the MT in the format as described in 3GPP TS 51.011 [28] (hexadecimal character format; refer +CSCS)

4.3.8 AT+CRSM Restricted SIM access

Command	Response
+CRSM=<command>[,<fileid>[,<P1>,<P2>,<P3>[,<data>[,<pathid>]]]]	+CRSM: <sw1>,<sw2>[,<response>] +CME ERROR: <err>
+CRSM=?	

<command> (command passed on by the MT to the SIM; refer 3GPP TS 51.011 [28]):

176 READ BINARY

178 READ RECORD

192 GET RESPONSE

214 UPDATE BINARY

220 UPDATE RECORD

242 STATUS

203 RETRIEVE DATA

219 SET DATA

all other values are reserved

<fileid>: integer type; this is the identifier of a elementary datafile on SIM. Mandatory for every command except STATUS

<P1>, <P2>, <P3>: integer type; parameters passed on by the MT to the SIM. These parameters are mandatory for every command, except GET RESPONSE and STATUS. The values are described in 3GPP TS 51.011 [28]

<data>: information which shall be written to the SIM (hexadecimal character format; refer +CSCS)

<pathid>: string type; contains the path of an elementary file on the SIM/UICC in hexadecimal format as defined in ETSI TS 102 221 [60] (e.g. "7F205F70" in SIM and UICC case). The <pathid> shall only be used in the mode "select by path from MF" as defined in ETSI TS 102 221 [60].

<sw1>, <sw2>: integer type; information from the SIM about the execution of the actual command. These parameters are delivered to the TE in both cases, on successful or failed execution of the command

<response>: response of a successful completion of the command previously issued (hexadecimal character format; refer +CSCS). STATUS and GET RESPONSE return data, which gives information about the current elementary datafield. This information includes the type of file and its size (refer 3GPP TS 51.011 [28]). After



READ BINARY, READ RECORD or RETRIEVE DATA command the requested data will be returned.
<response> is not returned after a successful UPDATE BINARY, UPDATE RECORD or SET DATA command

4.3.9 AT+CLAC List all available AT commands

Command	Response
+CLAC	<AT Command1> [<CR><LF><AT Command2> [...]] +CME ERROR: <err>
+CLAC=?	

<AT Command>: Defines the AT command including the prefix AT.

4.3.10 AT+CPINC PIN remaining attempt number

This command is used to get the number of valid attempts for PIN1, PIN2, PUK1 and PUK2 identifiers

Command	Response
+CPINC	+CPINC: <pin1>,<pin2>,<puk1>,<puk2> +CME ERROR: <err>
+CPINC?	+CPINC: <pin1>,<pin2>,<puk1>,<puk2> +CME ERROR: <err>
+CPINC=?	OK

<pin1>: Remaining attempts for PIN1/CHV1

0=Blocked

1-3=Remaining attempts

<pin2>: Remaining attempts for PIN2/CHV2

0=Blocked

1-3=Remaining attempts

<puk1>: Remaining attempts for PUK1

0=Blocked

1-10=Remaining attempts

<puk2>: Remaining attempts for PUK2

0=Blocked

1-10=Remaining attempts

Examples :

AT+ CPINC

+ CPINC: 3, 3, 10, 10

OK



4.3.11 AT+CPINR Remaining PIN retries

Command	Response
+CPINR[=<sel_code>]	+CPINR: <code>,<retries>[,<default_retries>] +CME ERROR: <err>
+CPINR=?	OK

<retries>: integer type. Number of remaining retries per PIN.

<default_retries>: integer type. Number of default/initial retries per PIN.

<code>: Type of PIN. All values listed under the description of the AT+CPIN command, <code> parameter, except 'READY'.

AT+CPINR

+CPINR: SIM PIN, 3, 3

+CPINR: SIM PUK, 10, 10

+CPINR: SIM PIN2, 3, 3

+CPINR: SIM PUK2, 10, 10

OK

AT+CPINR="SIM PIN"

+CPINR: SIM PIN, 3, 3

OK

4.4 Commands for packet Domain

4.4.1 AT+CGDCONT Define PDP (Packet Data Protocol) Context

Specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter, <cid>.

- **[set command]**

: specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter, <cid>.

: a special form of the set command, +CGDCONT=<cid> causes the values for context number <cid> to become undefined.

- **[read command]**

: returns the current settings for each defined context.

- **[test command]**

: returns values supported as a compound value.

Command	Response
+CGDCONT=[<cid>,<PDP_type>,<APN>[,<PD P_addr>,<d_comp>,<h_comp>,<IPv4Addr A lloc>,<emergency indication>,<PCSCF_ discovery>,<IM_CN_Signalling_Flag _Ind>]]]]]]]]]]	OK ERROR
+CGDCONT?	+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_ad dr>,<d_comp>,<h_comp>,<IPv4AddrAlloc>,<emerg



	ency indication>[,<PCSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>]]][<CR><LF>+CGDCONT:<cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[,<IPv4AddrAlloc>[,<emergency indication>[,<PCSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>]]][...]]
+CGDCONT=?	+CGDCONT: (range of supported <cid>s),<PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s),(list of supported <IPv4AddrAlloc>s),(list of supported <emergency indication>s),(list of supported <PCSCF_discovery>s),(list of supported <IM_CN_Signalling_Flag_Ind>s) [<CR><LF>+CGDCONT: (range of supported <cid>s),<PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s),(list of supported <IPv4AddrAlloc>s),(list of supported <emergency indication>s),(list of supported <PCSCF_discovery>s),(list of supported <IM_CN_Signalling_Flag_Ind>s) [...]]

- <cid>: numeric; specifies a particular PDP context definition.
- <PDP_type>: string; specifies the type of packet data protocol
X.25 : ITU-T/CCITT X.25 layer 3 (Obsolete)
IP : Internet Protocol
IPV6 : Internet Protocol, version 6
IPV4V6 : Virtual <PDP_type> introduced to handle dual IP stack UE capability.
OSPIH : Internet Hosted Octect Stream Protocol (Obsolete)
PPP : Point to Point Protocol (IETF STD 51)
- <APN>: string; a logical name that is used to select the GGSN or the external packet data network
- <PDP_addr> for EPS, this field is omitted.
- <d_comp>: numeric; controls PDP data compression.
0 - off (default if value is omitted)
1 - on (manufacturer preferred compression)
2 - V.42bis
3 - V.44
Other values are reserved.
- <h_comp>: numeric; controls PDP header compression.
0 - off (default if value is omitted)
1 - on (manufacturer preferred compression)
2 - RFC1144 (applicable for SDCP only)
3 - RFC2507
4 - RFC3095 (applicable for PDCP only)
Other values are reserved.
- <IPv4AddrAlloc>: numeric; controls how the MT/TA requests to get the IPv4 address information
0 - IPv4 Address Allocation through NAS Signaling (default if omitted)
1 - IPv4 Address Allocated through DHCP
- <emergency indication>: a numeric parameter used to indicate whether the PDP context is for emergency bearer services or not.
0 PDP context is not for emergency bearer services
- <P-CSCF_discovery>: a numeric parameter influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [89] annex B and annex L.
0 Preference of P-CSCF address discovery not influenced by +CGDCONT
1 Preference of P-CSCF address discovery through NAS Signalling



2 Preference of P-CSCF address discovery through DHCP

- <IM_CN_Signalling_Flag_Ind>: a numeric parameter used to indicate to the network whether the PDP context is for IM CN subsystem-related signalling only or not.

0 UE indicates that the PDP context is not for IM CN subsystem-related signalling only

4.4.2 AT+CGDSCONT Define Secondary PDP Context

Specifies PDP context parameter values for a Secondary PDP context identified by the (local) context identification parameter, <cid>.

- **[set command]**
 - : specifies PDP context parameter values for a Secondary PDP context identified by the (local) context identification parameter, <cid>.
 - : A special form of the set command, +CGDSCONT= <cid> causes the values for context number <cid> to become undefined
- **[read command]**
 - : returns the current settings for each defined context.
- **[test command]**
 - : returns values supported as a compound value

Command	Response
+CGDSCONT=<cid>,<p_cid> [,<d_comp> [,<h_comp>]]	OK ERROR
+CGDSCONT?	+CGDSCONT: <cid>, <p_cid>, <d_comp>, <h_comp> [<CR><LF>+CGDSCONT: <cid>, <p_cid>, <d_comp>, <h_comp>[...]]
+CGDSCONT=?	+CGDSCONT: (range of supported <cid>s), (list of <cid>s for active primary contexts), (list of supported <d_comp>s), (list of supported <h_comp>s)

- <cid>: numeric; specifies a particular PDP context definition.
- <p_cid>: numeric; specifies a particular PDP context definition which has been specified by use of the +CGDSCONT command
- <d_comp>: numeric; controls PDP data compression (applicable for SNDCPonly).
 - 0 - off (default if value is omitted)
 - 1 - on (manufacturer preferred compression)
 - 2 - V.42bis
 - 3 - V.44
 - Other values are reserved.
- <h_comp>: numeric; controls PDP header compression.
 - 0 - off (default if value is omitted)
 - 1 - on (manufacturer preferred compression)
 - 2 - RFC1144 (applicable for SNDCP only)



3 - RFC2507

4 - RFC3095 (applicable for PDCP only)

Other values are reserved.

4.4.3 AT+CGTFT Traffic Flow Template

Allows TE to specify a Packet Filter for a Traffic Flow Template

- **[set command]**
 - : specifies a Packet Filter that is to be added to the TFT stored in the MT and used for the context identified by the (local) context identification parameter, <cid>.
 - : A special form of the set command, +CGTFT= <cid> causes all of the Packet Filters in the TFT for context number <cid> to become undefined
- **[read command]**
 - : returns the current settings for all Packet Filters for each defined context.
- **[test command]**
 - : returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line

Command	Response
+CGTFT=<cid>, [<packet filter identifier>, <evaluation precedence index> [<source address and subnet mask> [<protocol number (ipv4) / next header (ipv6)> [<destination port range> [<source port range> [<ipsec security parameter index (spi)> [<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask> [<flow label (ipv6)> [<direction>]]]]]]]]]	OK ERROR
+CGTFT?	+CGTFT: <cid>, <packet filter identifier>, <evaluation precedence index>, <source address and subnet mask>, <protocol number (ipv4) / next header (ipv6)>, <destination port range>, <source port range>, <ipsec security parameter index (spi)>, <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>, <flow label (ipv6)>, <direction> [<CR><LF>+CGTFT: <cid>, <packet filter identifier>, <evaluation precedence index>, <source address and subnet mask>, <protocol number (ipv4) / next header (ipv6)>, <destination port range>, <source port range>, <ipsec security parameter index (spi)>, <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>, <flow label (ipv6)>, <direction>[...]]



+CGTFT=?	+CGTFT: <PDP_type>, (list of supported <packet filter identifier>s), (list of supported <evaluation precedence index>s), (list of supported <source address and subnet mask>s), (list of supported <protocol number (ipv4) / next header (ipv6)>s), (list of supported <destination port range>s), (list of supported <source port range>s), (list of supported <ipsec security parameter index (spi)>s), (list of supported <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>s), (list of supported <flow label (ipv6)>s), (list of supported <direction>s) [<CR><LF>+CGTFT: <PDP_type>, (list of supported <packet filter identifier>s), (list of supported <evaluation precedence index>s), (list of supported <source address and subnet mask>s), (list of supported <protocol number (ipv4) / next header (ipv6)>s), (list of supported <destination port range>s), (list of supported <source port range>s), (list of supported <ipsec security parameter index (spi)>s), (list of supported <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>s), (list of supported <flow label (ipv6)>s), (list of supported <direction>s)[...]]
----------	---

- <cid>: numeric; specifies a particular PDP context definition.
- <packet filter identifier>: numeric; value range from 1 to 16
- <evaluation precedence index>: numeric; The value range is from 0 to 255.
- <source address and subnet mask>: string; The string is given as dot-separated numeric (0-255) parameters on the form:
"a1.a2.a3.a4.m1.m2.m3.m4" for IPv4 or
"a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16", for IPv6
- <protocol number (ipv4) / next header (ipv6)>: numeric; value range from 0 to 255
- <destination port range>: string ; The string is given as dot-separated numeric (0-65535) parameters on the form "f.t".



- <source port range>:string ; The string is given as dot-separated numeric (0-65535) parameters on the form "f.t".
- <ipsec security parameter index (spi)>: numeric in hexadecimal format; The value range is from 00000000 to FFFFFFFF.
- <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>: string type. The string is given as dot-separated numeric (0-255) parameters on the form "t.m".
- <flow label (ipv6)>: numeric value in hexadecimal format. The value range is from 00000 to FFFFF. Valid for IPv6 only
- <direction>: a numeric parameter which specifies the transmission direction in which the packet filter shall be applied.
 - 0 - Pre-Release 7 TFT filter (see 3GPP TS 24.008 [8], table 10.5.162)
 - 1 – Uplink
 - 2 – Downlink
 - 3 - Birectional (Up & Downlink) (default if omitted)

Example 1) IPv4 Multi-field Classification(TS23.060 #15.3.3.1)

Packet Filter Identifier = 1;

IPv4 Source Address = {172.168.8.0 [255.255.255.0]};

Protocol Number for TCP = 6; and

Destination Port = 5003.

at+cgftf=2,1,0,"172.168.8.0.255.255.255.0",6,"5003",,,,,,3

4.4.4 AT+CGATT PS attach or detach

Attach the MT to, or detach the MT from, the Packet Domain service

- **[execution command]**
 - : attach the MT to, or detach the MT from, the Packet Domain service.
- **[read command]**
 - : returns the current Packet Domain service state.
- **[test command]**
 - : requests information on the supported Packet Domain service states

Command	Response
+CGATT=<state>	OK ERROR
+CGATT?	+CGATT: <state>
+CGATT=?	+CGATT: (list of supported <state>s)

- <state>: indicates the state of PS attachment
 - 0 - detached (normal detach)
 - 1 – attached



4.4.5 AT+CGACT PDP Context Activate or Deactivate

Activate or deactivate the specified PDP context(s).

- **[execution command]**
: activate or deactivate the specified PDP context(s). <cid>: is a numeric parameter which specifies a particular PDP context definition.
- **[read command]**
: returns the current Packet Domain service state.
- **[test command]**
: requests information on the supported PDP context activation states

Command	Response
+CGACT=<state>,<cid>	OK ERROR
+CGACT?	+CGACT: <cid>, <state> [<CR><LF>+CGACT: <cid>, <state>[...]]
+CGACT=?	+CGACT: (list of supported <state>s)

- <state>: indicates the state of PS attachment
0 – deactivated
1 – activated

other values are reserved and will result in an ERROR response to the execution command

- <cid>: numeric; specifies a particular PDP context definition.

4.4.6 AT+CGCMOD PDP Context Modify

Modify the specified PDP context(s) with respect to QoS profiles and TFTs

- **[execution command]**
: modify the specified PDP context (s) with respect to QoS profiles and TFTs.
- **[test command]**
: returns a list of <cid>s associated with active contexts

Command	Response
+CGCMOD=<cid>	OK ERROR
+CGCMOD=?	+CGCMOD: (list of <cid>s associated with active contexts)

- <cid>: numeric; specifies a particular PDP context definition.

4.4.7 AT+CGDATA Enter data rate

+CGDATA

- **[execution command]**
: perform whatever actions are necessary to establish communication between the TE and the network using one or more Packet Domain PDP types



- **[test command]**
: requests information on the supported layer 2 protocols.

Command	Response
+CGDATA=<l2p>,<cid>	OK ERROR
+CGDATA=?	+CGDATA: (list of supported <L2P>s)

- <l2p>: string; indicates the layer 2 protocol to be used between the TE and MT.
Only that value is omitted is supported
- <cid>: numeric; specifies a particular PDP context definition.

4.4.8 AT+CGPADDR Show PDP (IP) address

Specifies PDP address for specified context identification parameter <cid>

- **[execution command]**
: returns a list of PDP addresses for the specified context identifiers.
- **[test command]**
: returns a list of defined <cid>s

Command	Response
+CGPADDR=<l2p>,<cid>	OK ERROR
+CGPADDR=?	+CGPADDR: (list of supported <L2P>s)

- <cid>: numeric; specifies a particular PDP context definition.
- <PDP_addr>: string; identifies the MT in the address space applicable to the PDP.
<PDP_addr> is omitted if none is available.

4.4.9 AT+CGEREP Packet Domain event reporting

event reporting

- **[set command]**
: enables or disables sending of unsolicited result codes, +CGEV: XXX from MT to TE in the case of certain events occurring in the Packet Domain MT or the network
- **[read command]**
: returns the current mode and buffer settings
- **[test command]**
: returns the modes and buffer settings supported by the MT as compound values

Command	Response
+CGEREP=<mode>[,<bfr>]	OK ERROR
+CGEREP?	+CGEREP: <mode>,<bfr>
+CGEREP=?	+CGEREP: (list of supported <mode>s), (list of supported <bfr>s)



- <mode>: numeric;
 - 0 buffer unsolicited result codes in the MT; if MT result code buffer is full, the oldest ones can be discarded. No codes are forwarded to the TE
 - discard unsolicited result codes when MT-TE link is reserved (e.g. in on-line data mode); otherwise forward them directly to the TE
 - buffer unsolicited result codes in the MT when MT-TE link is reserved (e.g. in on-line data mode) and flush them to the TE when MT-TE link becomes available; otherwise forward them directly to the TE
- <bfr>: numeric;
 - MT buffer of unsolicited result codes defined within this command is cleared when
 - <mode> 1 or 2 is entered
 - MT buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1 or 2 is entered (OK response shall be given before flushing the codes)

NOTE: For defined event, refer to subclause 10.1.19 in 3GPP 27.007 spec.

4.4.10 AT+CEREG EPS network registration status

Reports changes in network registration

- **[set command]**
 - : controls the presentation of an unsolicited result code when there is a change in the MT's EPS network registration status.
- **[read command]**
 - : returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT
- **[test command]**
 - : list of supported <n>s

Command	Response
+CEREG=<n>	OK ERROR
+CEREG?	+CEREG: <n>,<stat>[,<lac>,<rac>,<ci>[,<AcT>]] +CME ERROR: <err>
+CEREG=?	+CEREG: (list of supported <n>s)

- <n>: numeric;
 - 0 disable network registration unsolicited result code
 - 1 enable network registration unsolicited result code +CEREG: <stat>
 - 2 enable network registration and location information unsolicited result code +CEREG: <stat>[,<lac>,<rac>,<ci>[,<AcT>]]
- <stat>: numeric; EPS registration status
 - 0 not registered, MT is not currently searching an operator to register to
 - 1 registered, home network
 - 2 not registered, but MT is currently trying to attach or searching an operator to register to
 - 3 registration denied
 - 4 unknown
 - 5 registered, roaming
- <lac>: string; two byte location area code or tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal).
- <rac>: string; one byte routing area code in hexadecimal format (e.g. "1C" equals 28 in decimal). If no routing area code is applicable, "00" (equals 00 in decimal) is provided.
- <ci>: string; four byte GERAN/UTRAN/E-UTRAN cell ID in hexadecimal format.
- <AcT>: numeric; access technology of the registered network



- 0 GSM
- 1 GSM Compact
- 2 UTRAN
- 3 GSM w/EGPRS
- 4 UTRAN w/HSDPA
- 5 UTRAN w/HSUPA
- 6 UTRAN w/HSDPA and HSUPA
- 7 E-UTRAN

4.4.11 AT+CGCONTRDP

PDP Context Read Dynamic Parameters

- **[execution command]**

: returns the relevant information <bearer_id>, <apn>, <ip_addr>, <subnet_mask>, <gw_addr>, <DNS_prim_addr>, <DNS_sec_addr>, <P-CSCF_prim_addr> and <PCSCF_sec_addr> for a non secondary PDP Context established by the network with the primary context identifier <p_cid>
: If the parameter <p_cid> is omitted, the relevant information for all established PDP contexts are returned

- **[test command]**

: returns a list of <p_cid>s associated with active contexts

Command	Response
+CGCONTRDP=[<p_cid>]	+CGCONTRDP: <p_cid>, <bearer_id>, <apn>[, <ip_addr>, <subnet_mask>[, <gw_addr>[, <DNS_prim_addr>, <DNS_sec_addr>[, <PCSCF_prim_addr>[, <P-CSCF_sec_addr>]]]]] [<CR><LF>+CGCONTRDP: <p_cid>, <bearer_id>, <apn>[, <ip_addr>, <subnet_mask>[, <gw_addr>[, <DNS_prim_addr>, <DNS_sec_addr>[, <PCSCF_prim_addr>[, <P-CSCF_sec_addr>]]]]] [...]]
+CGCONTRDP=?	+CGCONTRDP: (list of <p_cid>s associated

- <p_cid>: numeric; specifies a particular non secondary PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands.
- <bearer_id>: numeric; identifies the bearer, EPS Bearer in EPS and NSAPI in UMTS/GPRS.
- <APN>: string; a logical name that was used to select the GGSN or the external packet data network.
- <ip_addr>: string; shows the IP Address of the MT. The string is given as dot-separated numeric (0-255) parameters on the form:
"a1.a2.a3.a4" for IPv4 or
"a1.a2.a3.a4.a5.a6.a7.a8", for IPv6.
If the MT has dual stack capabilities the string shows first the dot separated IPv4 Address followed by the dot separated IPv6 Global Prefix Address. The IPv4 address and the IPv6 address parameters are separated by space:
"a1.a2.a3.a4 a1:a2:a3:a4:a5:a6:a7:a8"
- <subnet_mask>: string; shows the subnet mask for the IP Address of the MT. The string is given as dot-separated numeric (0-255) parameters.
If the MT has dual stack capabilities the string shows the dot separated IPV4 subnet mask followed by the dot separated IPV6 subnet mask. The subnet masks are separated by space.
- <gw_addr>: string; shows the Gateway Address of the MT. The string is given as dot-separated numeric (0-255) parameters
If the MT has dual stack capabilities the parameter shows first the dot separated IPV4 Gateway address followed by the dot separated IPV6 Gateway Address. The gateway addresses are separated by space.



- <DNS_prim_addr>: string; shows the IP Address of the primary DNS Server. If the MT has dual stack capabilities the parameter shows first the dot separated IPV4 Address, followed by the dot separated IPV6 Address of DNS Server.
- <DNS_sec_addr>: string; shows the IP address of the secondary DNS Server. If the MT has dual stack capabilities the parameter shows first the dot separated IPV4 Address, followed by the dot separated IPV6 Address of DNS Server.
- <P_CSCF_prim_addr>: string; shows the IP Address of the primary P-CSCF Server. If the MT has dual stack capabilities the parameter shows first the dot separated IPV4 Address, followed by the dot separated IPV6 primary Address of P-CSCF Server.
- <P_CSCF_sec_addr>: string; shows the IP Address of the secondary P-CSCF Server. If the MT has dual stack capabilities the parameter shows first the dot separated IPV4 Address, followed by the dot separated IPV6 Address of P-CSCF Server.

4.4.12 AT+CGSCONTRDP Secondary PDP Context Read Dynamic Parameters

- **[execution command]**
 - : returns <p_cid> and <bearer_id> for a given <cid>
- **[test command]**
 - : returns a list of <cid>s associated with active contexts.

Command	Response
+CGSCONTRDP=[<cid>]	+CGSCONTRDP: <cid>, <p_cid>, <bearer_id> [<CR><LF>+CGSCONTRDP: <cid>, <p_cid>, <bearer_id>[...]]
+CGCONTRDP=?	+CGSCONTRDP: (list of <cid>s associated with active contexts)

4.4.13 AT+CGTFTRDP Traffic Flow Template Read Dynamic parameters

- **[execution command]**
 - : returns the relevant information about Traffic Flow Template of <cid> together with the additional network assigned values when established by the network.
 - : If the parameter <cid> is omitted, the Traffic Flow Templates for all established PDP contexts are returned
- **[test command]**
 - : returns a list of <cid>s associated with active contexts

Command	Response
+CGTFTRDP=[<cid>]	+CGTFTRDP: <cid>, <packet filter identifier>, <evaluation precedence index>, <source address and subnet mask>, <protocol number (ipv4) / next header (ipv6)>, <destination port range>, <source port range>, <ipsec security parameter index (spi)>, <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>, <flow label (ipv6)>, <direction>, <NW packet filter Identifier> [<CR><LF>+CGTFTRDP: <cid>, <packet filter identifier>, <evaluation precedence index>,



	<source address and subnet mask>, <protocol number (ipv4) / next header (ipv6)>, <destination port range>, <source port range>, <ipsec security parameter index (spi)>, <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>, <flow label (ipv6)>, <direction>, <NW packet filter Identifier> [...]
+CGTFTTRDP=?	+CGTFTTRDP: (list of <cid>s associated with active contexts)

- <cid>: numeric; specifies a particular PDP context or Traffic Flows definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands.
- <cid>: numeric; specifies a particular PDP context or Traffic Flows definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands.
- <packet filter identifier>: numeric; The value range is from 1 to 16.
- <evaluation precedence index>: numeric; The value range is from 0 to 255.
- <source address and subnet mask>: string; The string is given as dot-separated numeric (0-255) parameters on the form:
"a1.a2.a3.a4.m1.m2.m3.m4" for IPv4 or
"a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16", for IPv6.
- <protocol number (ipv4) / next header (ipv6)>: numeric; value range from 0 to 255.
- <destination port range>: string ; The string is given as dot-separated numeric (0-65535) parameters on the form "f.t".
- <source port range>: string; The string is given as dot-separated numeric (0-65535) parameters on the form "f.t".
- <ipsec security parameter index (spi)>: numeric in hexadecimal format; The value range is from 00000000 to FFFFFFFF.
- <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>: string; The string is given as dot-separated numeric (0-255) parameters on the form "t.m".
- <flow label (ipv6)>: numeric in hexadecimal format; The value range is from 00000 to FFFFF. Valid for IPv6 only.
- <direction>: numeric; specifies the transmission direction in which the Packet Filter shall be applied.
 - Pre Release 7 TFT Filter (see 3GPP TS 24.008 [8], table 10.5.162)
 - Uplink
 - Downlink
 - Bidirectional (Used for Uplink and Downlink)



- <NW packet filter Identifier>: numeric; The value range is from 1 to 16. In EPS the value is assigned by the network when established

4.4.14 AT+CGEQOS Define EPS Quality of Service

- **[set command]**
: allows the TE to specify the EPS Quality of Service parameters <cid>, <QCI>, [<DL_GBR> and <UL_GBR>] and [<DL_MBR> and <UL_MBR>] for a PDP context or Traffic Flows.
: A special form of the set command, +CGEQOS= <cid> causes the values for context number <cid> to become undefined
- **[read command]**
: returns the current settings for each defined QoS
- **[test command]**
: returns the ranges of the supported parameters

Command	Response
+CGEQOS=[<cid> [,<QCI> [,<DL_GBR>, <UL_GBR> [,<DL_MBR>, <UL_MBR>]]]]	+CME ERROR: <err>
+CGEQOS?	+CGEQOS: <cid>, <QCI>, [<DL_GBR>, <UL_GBR>], [<DL_MBR>, <UL_MBR>] [<CR>>LF]+CGEQOS: <cid>, <QCI>, [<DL_GBR>, <UL_GBR>], [<DL_MBR>, <UL_MBR>] [...]
+CGEQOS=?	+CGEQOS: (range of supported <cid>s), (list of supported <QCI>s), (list of supported <DL_GBR>s), (list of supported <UL_GBR>s), (list of supported <DL_MBR>s), (list of supported <UL_MBR>s)

- <cid>: numeric; specifies a particular EPS Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS.
- <QCI>: numeric; specifies a class of EPS QoS. (see 3GPP TS 23.203 [85])
 - QCI is selected by network
 - [1 – 4] value range for guaranteed bit rate Traffic Flows
 - [5 – 9] value range for non-guaranteed bit rate Traffic Flows
- <DL_GBR>: numeric; indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI. (see 3GPP TS 24.301 [83])
- <UL_GBR>: numeric; indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI. (see 3GPP TS 24.301 [83])
- <DL_MBR>: numeric; indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI. (see 3GPP TS 24.301 [83])
- <UL_MBR>: numeric; indicates UL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI. (see 3GPP TS 24.301 [83])



4.4.15 AT+CGEQOSRDP EPS Quality of Service Read Dynamic Parameters

- **[execution command]**
 - : returns the Quality of Service parameters <QCI>, [<DL_GBR>and <UL_GBR>]and [<DL_MBR>and <UL_MBR>]of the established PDP Context associated to the provided context identifier <cid>.
 - : If the parameter <cid>is omitted, the Quality of Service parameters for all established PDP contexts are returned
- **[test command]**
 - : returns a list of <cid>s associated with active contexts.

Command	Response
+CGEQOSRDP=[<cid>]	+CGEQOSRDP: <cid>, <QCI>, [<DL_GBR>,<UL_GBR>], [<DL_MBR>,<UL_MBR>] [<CR>>LF>+CGEQOSRDP: <cid>, <QCI>, [<DL_GBR>,<UL_GBR>], [<DL_MBR>,<UL_MBR>] [...]]
+CGEQOSRDP=?	+CGEQOSRDP: (list of <cid>s associated with active contexts)

- <cid>: numeric; specifies a particular Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS.

- <QCI>: numeric; specifies a class of EPS QoS. (see 3GPP TS 23.203 [85])

- 0 QCI is selected by network
- [1 – 4] value range for guaranteed bit rate Traffic Flows
- [5 – 9] value range for non-guaranteed bit rate Traffic Flows

- <DL_GBR>: numeric; indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI. (see 3GPP TS 24.301 [83])

- <UL_GBR>: numeric; indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI. (see 3GPP TS 24.301 [83])

- <DL_MBR>: numeric; indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI. (see 3GPP TS 24.301 [83])

- <UL_MBR>: numeric; indicates UL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI. (see 3GPP TS 24.301 [83])



4.5 SMS Commands

4.5.1 AT+CSMS

Command	Response
+CSMS=<service>	+CSMS: <mt>,<mo>,<bm> +CMS ERROR: <err>

<mt>, <mo>, <bm>: integer type
0 type not supported
1 type supported

4.5.2 AT+CPMS

Command	Response
+CPMS	AT+CPMS=<mem1>,<mem2>,<mem3> <mem2>,<mem3> are not supported. Ex1) AT+CPMS="ME" <-- (NV) Ex2) AT+CPMS="SM" <-- (USIM)

4.5.3 AT+CMGF

Command	Response
+CMGF=[<mode>]	
+CMGF?	+CMGF: <mode>
+CMGF=?	+CMGF: (list of supported <mode>s)

<mode>: integer type
0 PDU mode
1 text mode

4.5.4 AT+CSCA

Command	Response
+CSCA=<sca>[,<tosca>]	
+CSCA?	+CSCA: <sca>,<tosca>
+CSCA=?	

<sca> : RP SC address Address-Value field in string format;
<tosca> : RP SC address Type-of-Address octet in integer format



4.5.5 AT+CSMP

Command	Response
+CSMP=[<fo>[,<vp>[,<pid>[,<dc>]]]]	<vp>,<pid> are not supported parameters.
+CSMP?	+CSMP: <fo>,<vp>,<pid>,<dc>
+CSMP=?	

<fo> : first octet of SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2) in integer format

Examples

EX 1)

GSM 7 bit default alphabet : 0

AT+CSMP=17,0,0,0

EX 2)

8 bit data: 4

AT+CSMP=0,0,0,4

EX 3)

UCS2 (16bit) : 9

AT+CSMP=17,0,0,9

4.5.6 AT+CMGL

Command	Response
AT+CMGL=<stat>	if text mode (+CMGF=1), command successful and SMS-SUBMITs and/or SMS-DELIVERs:



```

+CMGL: <index>,<stat>,<oa/da>,[<alpha>],[<scts>],[<tooa/toda>,<length>]
<CR><LF><data>[<CR><LF>
+CMGL: <index>,<stat>,<da/oa>,[<alpha>],[<scts>],[<tooa/toda>,<length>]
<CR><LF><data>[...]]
if text mode (+CMGF=1), command successful and SMS-STATUS-REPORTs:
+CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>
[<CR><LF>
+CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>
[...]]
if text mode (+CMGF=1), command successful and SMS-COMMANDs:
+CMGL: <index>,<stat>,<fo>,<ct>[<CR><LF>
+CMGL: <index>,<stat>,<fo>,<ct>[...]]
if text mode (+CMGF=1), command successful and CBM storage:
+CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>
<CR><LF><data>[<CR><LF>
+CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>
<CR><LF><data>[...]]

otherwise:
+CMS ERROR: <err>

```

<stat> : integer type in PDU mode (default 0), or string type in text mode (default "REC UNREAD"); indicates the status of message in memory; defined values:

- 0 "REC UNREAD" received unread message (i.e. new message)
- 1 "REC READ" received read message
- 2 "STO UNSENT" stored unsent message (only applicable to SMS)
- 3 "STO SENT" stored sent message (only applicable to SMS)
- 4 "ALL" all messages (only applicable to +CMGL command)

Examples

EX1)

```

AT+CPMS="ME" <-- (NV)
AT+CMGL=4 <-- (Read All SMS Message in NV)

```

EX2)

```

AT+CPMS="SM" <-- (USIM)
AT+CMGL=4 <-- (Read All SMS Message in USIM)

```



4.5.7 AT+CMGR

Command	Response
AT+CMGR=<index>	if text mode (+CMGF=1), command successful and SMS-DELIVER: +CMGR: <stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dc>,<sca>,<tosca>,<length>]<CR><LF><data> if text mode (+CMGF=1), command successful and SMS-SUBMIT: +CMGR: <stat>,<da>,[<alpha>],[<toda>,<fo>,<pid>,<dc>,<vp>],<sca>,<tosca>,<length>]<CR><LF><data> if text mode (+CMGF=1), command successful and SMS-STATUS-REPORT: +CMGR: <stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> if text mode (+CMGF=1), command successful and SMS-COMMAND: +CMGR: <stat>,<fo>,<ct>[,<pid>,<mn>],[<da>],[<toda>],<length>]<CR><LF><cdata> if text mode (+CMGF=1), command successful and CBM storage: +CMGR: <stat>,<sn>,<mid>,<dc>,<page>,<pages><CR><LF><data> otherwise: +CMS ERROR: <err>

<index> : list after run AT+CMGL=4

4.5.8 AT+CMGS

Command	Response
if text mode (+CMGF=1): +CMGS=<da>[,<toda>]<CR> text is entered<ctrl-Z/ESC>	if text mode (+CMGF=1) and sending successful: +CMGS: <mr>[,<scts>] if sending fails: +CMS ERROR: <err>

Example

AT+CMGS="12345678" <-- Enter
SMS TEST <-- ctrl-Z; When input ctrl+z, SMS message is sent.



4.5.9 AT+CMSS

Command	Response
+CMSS=<index>[,<da>[,<toda>]]	if text mode (+CMGF=1) and sending successful: +CMSS: <mr>[,<scts>] if sending fails: +CMS ERROR: <err>

4.5.10 AT+CMGW

Command	Response
if text mode (+CMGF=1): +CMGW[=<oa/da>[,<toa/toda>[,<stat>]]]<CR>	+CMGW: <index> +CMS ERROR: <err>
text is entered <ctrl-Z/ESC>	

<index> : integer type; value in the range of location numbers supported by the associated memory

4.5.11 AT+CMGD

Command	Response
+CMGD=<index> [,<delflag>]	+CMS ERROR: <err>
+CMGD=?	+CMGD : (list of supported <index>s)[,(list of supported <delflag>s)]

<delflag>: integer type, indicating multiple message deletion request as follows:

- 0 Delete the message specified in <index>
- 1 Delete all read messages from preferred message storage, leaving unread messages and stored mobile originated messages (whether sent or not) untouched
- 2 Delete all read messages from preferred message storage and sent mobile originated messages, leaving unread messages and unsent mobile originated messages untouched
- 3 Delete all read messages from preferred message storage, sent and unsent mobile originated messages leaving unread messages untouched.
- 4 Delete all messages from preferred message storage including unread messages.

Examples

EX1)

AT+CPMS="ME" <-- (NV)

AT+CMGD=0,4 <-- (All SMS Message Delete in NV)

EX2)

AT+CPMS="SM" <-- (USIM)

AT+CMGD=0,4 <-- (All SMS Message Delete in USIM)



4.5.12 AT+CMGC

Command	Response
if text mode (+CMGF=1): +CMGC=<fo>,<ct>[,<pid>[,<mn>[,<da>[,<toda>]]]] <CR> text is entered<ctrl-Z/ESC>	if text mode (+CMGF=1) and sending successful: +CMGC: <mr>[,<scts>] if sending fails: +CMS ERROR: <err>



5.1 CDD

1. Run the command in shell mode, **mount -o remount,rw /**
2. Edit script file, **vi etc/sysconfig/script/lte_init_script.sh**
3. Update mode, **chmod +x /etc/sysconfig/script/lte_init_script.sh**

4. write "**lu t cdd 1 4**", save file, and **reboot**

5.1.2 CDD OFF (1 Tx)

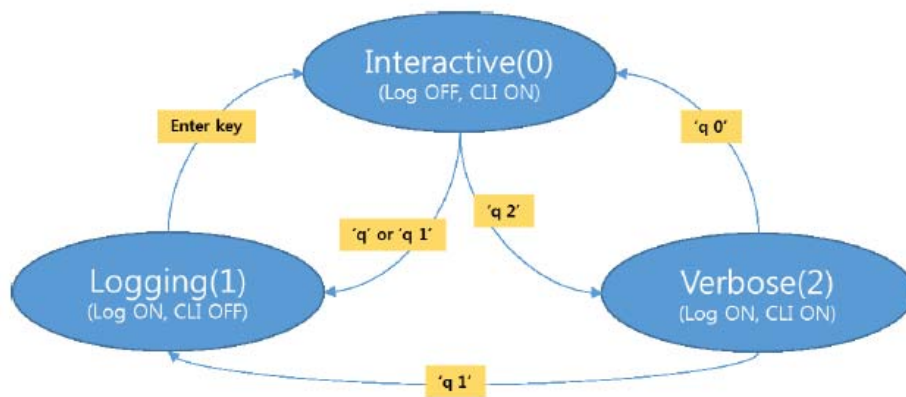
Update `etc/sysconfig/script/lte_init_script.sh` with "`l1u t cdd 0 4`" and save file, **reboot**.



5.2 Q Log Message

There are three text-DM modes when q log command uses, DM>q 0/1/2.

- Interactive mode (q 0) Logging is disabled but command line interface is enabled.
- Logging mode (q 1) Logging is enabled but command line interface is disabled.
- Verbose mode (q 2) Both logging and CLI are enabled.



To enable NAS protocol dump, type DM>**dbg nas* -1** before q log command.

5.2.1 PERF: CPU Usage Profile

PERF : C($P_1/P_2/P_3/P_4$) I(P_5) M(H: P_6 P: $P_7/P_8/P_9/P_{10}$)

P_1 : CPU usage of idle process

P_2 : CPU usage for interrupt handling

P_3 : CPU usage of tasks

P_4 : CPU usage of unknown jobs

P_5 : Number of invocations of interrupt handler during last monitoring interval

P_6 : Usage rate of heap memory

$P_7 \sim P_{10}$: Usage of each FMP

Example: PERF : C(88.4/0.9/7.4/3.3) I(4101) M(H:10.0/2MB P:0.4/0.5/0.1/0.1/2MB)



5.2.2 FRAME: LTE Radio Frame Information

[If FDD] FRAME: P_1 $P_2(P_3)$ Pos= P_4 STI= P_5

[If TDD] FRAME: P_1 $P_2(P_6:P_7, P_3)$ Pos= P_4 STI= P_5

P_1 : PHY layer state (INACT or IDLE or CONNECTED)

P_2 : Duplex mode (TDD or FDD)

P_3 : CP mode (N=normal CP, E=extended CP)

P_4 : Position of radio frame boundary in 61.44MHz clock unit

P_5 : Current STI (= SFN*10 + Subframe)

P_6 : UL/DL configuration index (only for TDD)

P_7 : Special subframe configuration index (only for TDD)

Example: FRAME: CONNECTED CAT5 TDD(2:7,N) Pos=(38245,38247,38247,38247) STI=836

5.2.3 RF: RF Metric

[If 2 Rx] RF : EARFCN(P_1, P_2) AFC($P_3, P_4:P_5:P_6, P_7, P_8, P_9$) AGC($P_{10}, P_{11}:P_{12}:P_{13}, P_{14}:P_{15}:P_{16}$)

[If 4 Rx] RF : EARFCN(P_1, P_2) AFC($P_3, P_4:P_5:P_6, P_7, P_8, P_9$)

AGC($P_{10}, P_{11}:P_{12}:P_{13}, P_{14}:P_{15}:P_{16}, P_{17}:P_{18}:P_{19}, P_{20}:P_{21}:P_{22}$)

P_1 : DL EARFCN

P_2 : UL EARFCN

P_3 : AFC mode (P=PSS, C=CP, R=CRS, S=SW)

P_4 : Average frequency offset

P_5 : Minimum frequency offset

P_6 : Maximum frequency offset

P_7 : Current loop filter value (frequency offset)

P_8 : VCTCXO mode (S=SW-based, H=HW-based)



P_9 : VCTCXO control value

P_{10} : AGC mode (F=fixed, C=coarse, N=normal, S=SW)

P_{11} : Latest AGC index (Rx0)

P_{12} : Minimum AGC index (Rx0)

P_{13} : Maximum AGC index (Rx0)

P_{14} : Latest AGC index (Rx1)

P_{15} : Minimum AGC index (Rx1)

P_{16} : Maximum AGC index (Rx1)

P_{17} : Average AGC index (Rx2)

P_{18} : Minimum AGC index (Rx2)

P_{19} : Maximum AGC index (Rx2)

P_{20} : Average AGC index (Rx3)

P_{21} : Minimum AGC index (Rx3)

P_{22} : Maximum AGC index (Rx3)

Example: RF : E(39850,39850) B41 F25160 AFC(R,0:-182:34,-160,H,0x409)
AGC(N,0x53:50:55,0x5f:5a:61,0x60:5d:61,0x6b:66:6d) ACI=0

5.2.4 CHAN: Channel Information

[If 2 Rx] CHAN : P_1 MHz # AP_2 TMP_3 PCI= P_4 DS($P_5, P_6, P_7, P_8, P_9/P_{10}, P_{11}$) ACE(P_{12}) FIB(P_{13}, P_{14})
CS(P_{15}, P_{16})

[If 4 Rx] CHAN : P_1 MHz # AP_2 TMP_3 PCI= P_4 DS($P_5, P_6, P_7, P_8, P_9/P_{10}, P_{11}$) ACE(P_{12}) FIB($P_{13}, P_{14}, P_{17}, P_{18}$)
CS($P_{15}, P_{16}, P_{19}, P_{20}$)

P_1 : System bandwidth (unit: MHz)

P_2 : Number of eNB Tx antenna ports

P_3 : TM mode

P_4 : Physical cell ID

P_5 : Current delay spread estimation result (S=static, L=low, M=mid, H=high)



P_6 : Number of static delay spread

P_7 : Number of low delay spread

P_8 : Number of mid delay spread

P_9 : Number of high delay spread

P_{10} : Minimum value of delay spread metric

P_{11} : Maximum value of delay spread metric

P_{12} : Channel mode ('I' = Interpolation "A" = Average)

$P_{13} \sim P_{20}$: Control info of Rx timing (Rx0 ~ Rx3)

Example: CHAN : 20MHz #A2 TM2 PCI=501 DS(S,96,0,0,0/0.3,0.3) ACE(I) FIB(-1:0:0:-1) CS(17:17:17:16)

5.2.5 MEAS: Measurement Result of a Serving Cell

MEAS : CINR(P_1, P_2) RSRP(P_3, P_4) RSSI(P_5, P_6) RSRQ(P_7, P_8)

[If 4 Rx] CINR(P_9, P_{10}) RSRP(P_{11}, P_{12}) RSSI(P_{13}, P_{14}) RSRQ(P_{15}, P_{16})

P_1 : Rx0 CINR (SINR)

P_9 : Rx2 CINR(SINR)

P_2 : Rx1 CINR (SINR)

P_{10} : Rx3 CINR(SINR)

P_3 : Rx0 RSRP

P_{11} : Rx2 RSRP

P_4 : Rx1 RSRP

P_{12} : Rx3 RSRP

P_5 : Rx0 RSSI

P_{13} : Rx2 RSSI

P_6 : Rx1 RSSI

P_{14} : Rx3 RSSI

P_7 : Rx0 RSRQ

P_{15} : Rx2 RSRQ

P_8 : Rx1 RSRQ

P_{16} : Rx3 RSRQ

Example: MEAS : CINR(32.1,33.6) RSRP(-75.2,-81.3) RSSI(-49.3,-55.5) RSRQ(-5.9,-5.8)
CINR(33.9,32.2) RSRP(-80.2,-87.3) RSSI(-54.3,-61.5) RSRQ(-5.9,-5.8)



5.2.6 NMEAS: Measurement Result of a Neighbor Cell

NMEAS: $\{P_1, P_2, P_3, P_4\} \dots$

P_1 : EARFCN

P_2 : Cell ID

P_3 : RSRP

P_4 : RSRQ

Example: NMEAS: {39850,501,-75.0,-6.0}

5.2.7 L1D: PHY DL statistics

L1D : DCI0= P_1 DCI= $\{P_2(P_3/P_4), \dots\} \{P_5(P_6/P_7), \dots\}$ BLER= $(P_8/P_9, P_{10}/P_{11})$ Dup(P_{12}, P_{13}) HI(P_{14}/P_{15})

P_1 : Number of DCI-0 received

P_2 : DCI format in codeword0 (CW0)

P_7 : Total number of DCI type P6

P_3 : Number of CRC errors for DCI type P2

P_8 : Number of TB errors in TB1 (or CW0)

P_4 : Total number of DCI type P2

P_9 : Total number of TBs in TB1 (or CW0)

P_5 : DCI format in codeword1 (CW1)

P_{10} : Number of TB errors in TB2 (or CW1)

P_6 : Number of CRC errors for DCI type P5

P_{11} : Total number of TBs in TB2 (or CW1)

P_{12} : Number of duplicated TB transmissions in CW0. Duplicated TB means retransmitted HARQ TB even if HARQ ACK is transmitted.

P_{13} : Number of duplicated TB transmissions in CW1.

P_{14} : Number of NACKs in PHICH (HARQ NACK from eNB)

P_{15} : Total number of HARQ feedback in PHICH (HARQ feedback from eNB)

(1) L1D option (mask: 0x1)

DCI(P_1, P_2, P_3) MIB(P_4/P_5) CFI(P_6, P_7, P_8, P_9) H-Fail(P_{10}, P_{11}) Dup= P_{12}

P_1 : Total number of valid DCIs (c.f. $P_1=P_2+P_3$)

P_2 : Number of 'DEM configured' cases (just for debugging purpose)

P_3 : Number of 'DEM not configured' cases (just for debugging purpose)

P_4 : Number of MIB decoding errors



- P_5 : Total number of MIB decoding
- P_6 : CFI1 count
- P_7 : CFI2 count
- P_8 : CFI1 count
- P_9 : CFI2 count
- P_{10} : HARQ allocation failure count for TB1
- P_{11} : HARQ allocation failure count for TB2
- P_{12} : Total size of duplicated TB

(2) L1D option (mask: 0x2)

$$D\text{-Result} = \{P_1, P_2, P_3\} \{P_4, P_5, P_6\}$$

- P_1 : Number of CRC errors due to 'no decoding' in CW0 (timing violation)
- P_2 : Number of CRC errors due to 'decoding not complete' in CW0 (timing violation)
- P_3 : Number of CRC errors in CW0
- P_4 : Number of CRC errors due to 'no decoding' in CW1
- P_5 : Number of CRC errors due to 'decoding not complete' in CW1
- P_6 : Number of CRC errors in CW1

(3) L1D option (mask: 0x4)

$$BLER(RV) = \{P_1/P_2, P_3/P_4, P_5/P_6, P_7/P_8\}$$

- P_1 : CRC error count in RV0
- P_2 : Total TB count in RV0
- P_3 : CRC error count in RV1
- P_4 : Total TB count in RV1
- P_5 : CRC error count in RV2
- P_6 : Total TB count in RV2
- P_7 : CRC error count in RV3
- P_8 : Total TB count in RV3

(4) L1D option (mask: 0x8)

$$BLER(TTI) = \{P_1(P_2/P_3, P_4/P_5), \dots\}$$

- P_1 : Subframe index
- P_2 : Error count in CW0
- P_3 : Total count in CW0
- P_4 : Error count in CW1
- P_5 : Total count in CW1



(5) L1D option (mask: 0x10)

$BLER(PID) = \{P_1(P_2/P_3, P_4/P_5, P_6/P_7, P_8/P_9), \dots\}$

P_1 : HARQ process ID

P_2 : Number of errors among first HARQ transmissions

P_3 : Total number of first HARQ transmissions

P_4 : Number of errors among first HARQ re-transmissions

P_5 : Total number of first HARQ re-transmissions

P_6 : Number of errors among second HARQ re-transmissions

P_7 : Total number of second HARQ re-transmissions

P_8 : Number of errors among third HARQ re-transmissions

P_9 : Total number of third HARQ re-transmissions

(6) L1D option (mask: 0x20)

$PHICH(TTI) = \{P_1(P_2/P_3), \dots\}$

P_1 : Subframe index

P_2 : NACK count

P_3 : NACK + ACK count

(7) L1D option (mask: 0x40)

[If 7243Q] Layer-Map = $\{1C1L=P_1, 1C2L=P_2, 2C2L=P_3, 2C3L=P_4, 2C4L=P_5\}$

P_1 : Number of '1CW 1Layer' assigned

P_2 : Number of '1CW 2Layer' assigned

P_3 : Number of '2CW 2Layer' assigned

P_4 : Number of '2CW 3Layer' assigned

P_5 : Number of '2CW 4Layer' assigned

Example: L1D : DCI0=3 DCI={1A(0/3)} BLER(0/3,0/0) Dup(0,0) HI(0/4) CFI(796:3:1:0) TB(0,0) TP=1K
Layer-Map={1C1L=3,1C2L=0,2C2L=0,2C3L=0,2C4L=0}



5.2.8 L1U: PHY UL Statistics

L1U : PUSCH(P_1)= $\{P_2(P_3), \dots\}$ ACK= $(P_4/P_5, P_6/P_7)$ DTX(P_8, P_9) PWR($P_{10}:P_{11}:P_{12}:P_{13}$)

P_1 : Total number of PUSCH's assigned

P_2 : Subframe index

P_3 : Number of PUSCH's assigned at subframe index P_2

P_4 : Number of HARQ NACK's transmitted (CW0)

P_5 : Total number of HARQ feedbacks (ACK + NACK) transmitted (CW0)

P_6 : Number of HARQ NACK's transmitted (CW1)

P_7 : Total number of HARQ feedbacks (ACK + NACK) transmitted (CW1)

P_8 : DTX count (CW0)

P_9 : DTX count (CW1)

P_{10} : Average Tx-power for PUCCH

P_{11} : Average Tx-power for PUSCH

P_{12} : Average Tx-power for PRACH

P_{13} : Average Tx-power for SRS

(1) L1U option (mask: 0x1)

HARQ= $\{P_1(P_2, P_3, P_4, P_5), \dots\}$

P_1 : UL HARQ PID

P_2 : UL HARQ TB count on RV0

P_3 : UL HARQ TB count on RV1

P_4 : UL HARQ TB count on RV2

P_5 : UL HARQ TB count on RV3

(2) L1U option (mask: 0x2)

ReTx= $\{P_1(P_2), \dots\}$

P_1 : 0=Initial transmission, 1=Retransmission

P_2 : Tx count

(3) L1U option (mask: 0x4)

ACK = $\{P_1(P_2), \dots\}\{P_3(P_4), \dots\}$

P_1 : Subframe index (CW0)

P_2 : Number of ACKs transmitted at subframe index P_1 (CW0)

P_3 : Subframe index (CW1)

P_4 : Number of ACKs transmitted at subframe index P_3 (CW1)



(4) L1U option (mask: 0x8)

$NACK=\{P_1(P_2),...\}\{P_3(P_4),...\}$

P_1 : Subframe index (CW0)

P_2 : Number of NACKs transmitted at subframe index P_1 (CW0)

P_3 : Subframe index (CW1)

P_4 : Number of NACKs transmitted at subframe index P_3 (CW1)

(5) L1U option (mask: 0x10)

$DTX=\{P_1(P_2),...\}\{P_3(P_4),...\}$

P_1 : Subframe index (CW0)

P_2 : Number of DTXs at subframe index P_1 (CW0)

P_3 : Subframe index (CW1)

P_4 : Number of DTXs at subframe index P_3 (CW1)

(6) L1U option (mask: 0x20)

$TxPWR: P_1=P_2(P_3,P_4),...$

P_1 : PUCCH/PUSCH/PRACH/SRS

P_2 : Average Tx power

P_3 : Minimum Tx power

P_4 : Maximum Tx power

Example: L1U : PUSCH(4)={2(0/3),7(0/1)} PRACH=1 ACK(0/3,0/0) DTX(9,12) PWR(-54.0,-23.3,-48.0,-,-28.1)

5.2.9 MCS: DL/UL MCS statistics

$MCS : DL=\{P_1(P_2/P_3),...\} UL=\{P_4(P_5/P_6),...\}$

P_1 : DL MCS index

P_2 : Error count

P_3 : Total count

P_4 : UL MCS index

P_5 : Error count

P_6 : Total count

Example: MCS : DL={0(0/2),5(0/1)} UL={8(0/4)} PMCH={}



5.2.10 CSI: Channel State Information

[If 2 Rx] CSI : CR= P_1 LP= P_2 I(P_3/P_4) AP $P_5(P_6/P_7)$ PP $P_8(P_9/P_{10})$ RI(P_{11}, P_{12}) PMI={ $P_{13}(P_{14}) \dots$ }
CQI={ $P_{15}(P_{16}) \dots$ }{ $P_{17}(P_{18}) \dots$ }

[If 4 Rx] CSI : CR= P_1 LP= P_2 I(P_3/P_4) AP $P_5(P_6/P_7)$ PP $P_8(P_9/P_{10})$ RI($P_{11}, P_{12}, P_{19}, P_{20}$) PMI={ $P_{13}(P_{14}) \dots$ }
CQI={ $P_{15}(P_{16}) \dots$ }{ $P_{17}(P_{18}) \dots$ }

P_1 : Number of CQI request

P_2 : ACSI latest PMI count

P_3 : Number of CSI report by CSI interrupt

P_4 : Number of setting CSI register by DCI interrupt

P_5 : ACSI report mode ('12' or '20' or '22' or '30' or '31' or '-')

P_6 : Number of ACSI report from Tx interrupt

P_7 : Number of setting ACSI register by DCI interrupt

P_8 : PCSI report mode ('10' or '11' or '20' or '21' or '-')

P_9 : Number of PCSI report from Tx interrupt

P_{10} : Number of setting PCSI register by DCI interrupt

P_{11} : Number of RI Rank1 reported during last monitoring interval

P_{12} : Number of RI Rank2 reported during last monitoring interval

P_{13} : WB PMI value

P_{14} : Number of P_{12} reported during last monitoring interval

P_{15} : WB CQI value on CW0

P_{16} : Number of P_{14} reported during last monitoring interval

P_{17} : WB CQI value on CW1

P_{18} : Number of P_{16} reported during last monitoring interval

P_{19} : Number of RI Rank3 reported during last monitoring interval

P_{20} : Number of RI Rank4 reported during last monitoring interval

Example: CSI : RM(0,10,0,0) A30(0/0/0) P10(10/10/10) RI(0,0,0,0) PMI={}
CQI={15(10)}{}



5.2.11 TP: Throughput Statistics

TP : $P_1(P_2:P_3) \dots$

P_1 : PHY/MAC/RLC/PDCP/IPC

P_2 : DL throughput

P_3 : UL throughput

Example: TP : PHY(1K:1K) MAC(1K:1K) RLC(84:79) PDCP(75:73) DIM() IPC(0:0)

5.2.12 MAC

MAC : TrCH= $\{P_1(P_2), \dots\}$ LCID=D $\{P_3(P_4), \dots\}$, U $\{P_5(P_6), \dots\}$ Pad= P_7

P_1 : P=PCH, B=BCH, DS=DL-SCH, US=UL-SCH, RA=RACH

P_2 : Number of data on transport channel P_1

P_3 : DL LCID

P_4 : Number of DL LCID P_3

P_5 : UL LCID

P_6 : Number of UL LCID P_5

P_7 : Number padding PDUs on DL

Example: MAC : [S] PDU=D{4},U{3}, CE=D{CR1,PAD(0/3)},U{PHR2,BSR(0/3/1),SR(0/2),PAD(0/3)}, I{0,0,0}
 [S:0] PDU=D{1},U{2}
 [S:1] PDU=D{2},U{3}
 [R] RA{0/1}, CE{0,1}, CR{0,0,0}

5.2.13 RLC

RLC : PDU=D $\{P_1P_2, \dots\}$, U $\{P_1P_2, \dots\}$ HDR=D $\{P_5P_6, \dots\}$, U $\{P_5P_6, \dots\}$
 FI=D $\{P_9/P_{10}, P_{11}, P_{12}\}$, U $\{P_9/P_{10}, P_{11}, P_{12}\}$

P_1 : T=TM PDU, U=UM PDU, A=AM data PDU, C=AM control PDU

P_2 : Number of RCL PDUs whose type is P_1

P_5 : L=no LI field, R=R flag included, P=P flag included

P_6 : Number of RCL PDUs whose header attribute is P_5

P_9 : Number of RLC PDUs whose FI is equal to 0b00

P_{10} : Number of RLC PDUs whose FI is equal to 0b01

P_{11} : Number of RLC PDUs whose FI is equal to 0b10

P_{12} : Number of RLC PDUs whose FI is equal to 0b11

Example: RLC : [0] PDU=D{T1},U{T1}
 [1] PDU=D{A1,C1},U{A0/2,C1}, I{0,0,1,0}, STATE=D{1,1},U{2,2}

**5.2.14 DP: Data-path statistics**

DP : TB(P_1, P_2) RLC=D{DC P_3 , AF P_4 , UF P_5 } IPC=D{F P_6 , MP P_7 , TP P_8 }, U{AP P_9 , MP P_{10} , TP P_{11} }

- P_1 : Number of TB allocation failures on CW0
- P_2 : Number of TB allocation failures on CW1
- P_3 : Number of cases that DL RLC SDU is discarded
- P_4 : Number of cases that DL RLC AM buffer is full
- P_5 : Number of cases that DL RLC UM buffer is full
- P_6 : Number of cases that DL IPC buffer is full
- P_7 : Maximum DL IP packet aggregation
- P_8 : Number of DL IP packets
- P_9 : Number of cases that UL IPC buffer is full
- P_{10} : Maximum UL IP packet aggregation
- P_{11} : Number of UL IP packets

Example: DP : RLC=D0{DC0,AF0,UF0} IPC=D{F0,M0,T0},U{A0,M0,T0}

5.2.15 CIP: Cipher Integrity Statistics

CIP : S= P_1 DL(P_2, P_3) UL(P_4, P_5) DI(P_6, P_7, P_8) DO(P_9, P_{10}, P_{11}) UI(P_{12}, P_{13}, P_{14}) UO(P_{15}, P_{16}, P_{17}) B(P_{18})

- P_1 : Security mode
- P_2 : DL packet count of ciphering (or integrity)
- P_3 : Maximum DL packet aggregation of ciphering (or integrity)
- P_4 : UL packet count of ciphering (or integrity)
- P_5 : Maximum UL packet aggregation of ciphering (or integrity)
- P_6 : Current read index of DL input buffer
- P_7 : Current write index of DL input buffer
- P_8 : Current done index of DL input buffer
- P_9 : Current read index of DL output buffer
- P_{10} : Current write index of DL output buffer
- P_{11} : Current done index of DL output buffer
- P_{12} : Current read index of UL input buffer
- P_{13} : Current write index of UL input buffer
- P_{14} : Current done index of UL input buffer
- P_{15} : Current read index of UL output buffer
- P_{16} : Current write index of UL output buffer
- P_{17} : Current done index of UL output buffer
- P_{18} : Number of subframe count that did not start because HW was busy

Example: CIP : S=0 DL(0,0) UL(0,0) DI(0,0,0) DO(0,0,0) UI(0,0,0) UO(0,0,0) B(0)



5.3 NAS Protocol Binary Decode

5.3.1 Install decoder

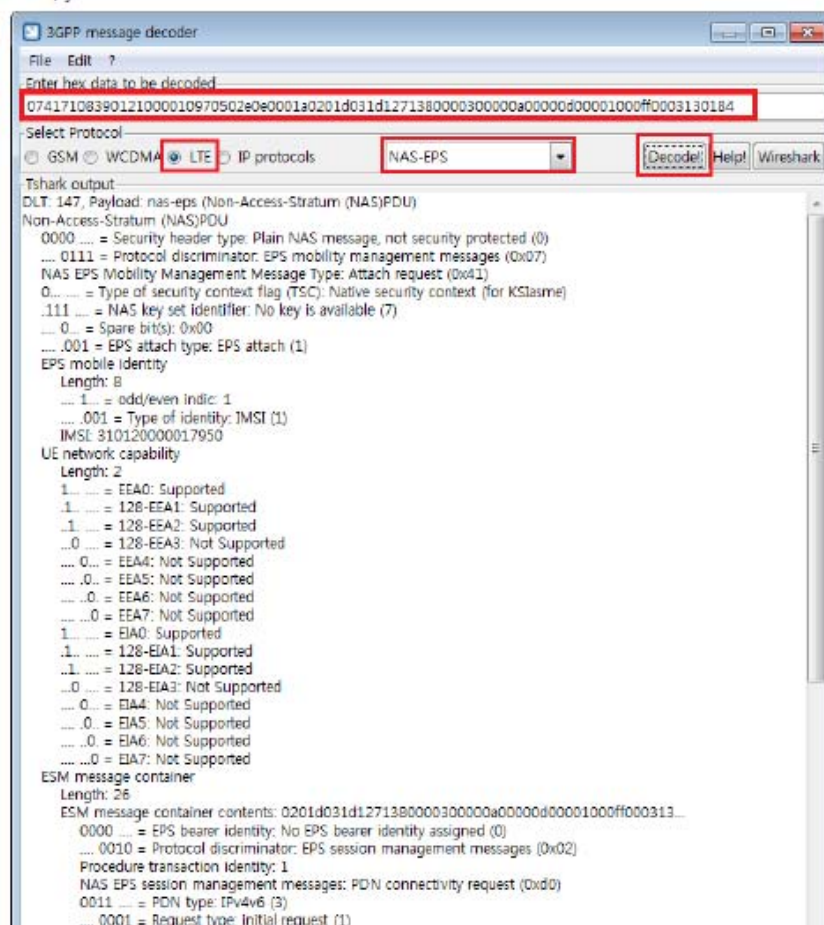
Install 3GPP message decoder

5.3.2 Copy NAS Data

Copy NAS protocol binary string

```
[NAS_EMM] EMM_Add_ToWaitForCnfList-mui:[1],NASMsgLen:[43],count:[0],NASMsg:[07][41][71].  
[NAS_OTA]: NAS MESSAGE  
{  
  TYPE: EMM_ATTACH_REQUEST  
  LENGTH(BYTE): 43  
  PDU(HEX):  
  07417108390121000010970502e0e0001a0201d031d1271380000300000a00000d00001000ff0003130184  
}  
[NAS_EMM] EMM_Timer[EMM_T3411] cancel.  
[NAS_EMM] EMM_Timer[EMM_T3402] cancel.
```

5.3.3 Paste to Decoder





6 Network Connection Examples

6.1 Auto connection (Three bands)

Step	command	Description
1	DM> nv bcfgw 49 0 41 25 26	Write band number into scan list
2	DM> nv bcfgsv 1	Write NVRAM back to flash
3	DM>shell	Enter shell mode
4	#ucfg set config wan lte vendor 1	Connection manager, lteautocm
5	#ucfg set config wan lte autocm manual 0	Lteautocm chooses Auto mode
6	#ucfg set config wan lte atcm use _autocm_req 1	Request to lteautocm
7	#ucfg set config wan lte apntable apn3 ENABLE 1	Enable APN3
8	#ucfg set config wan lte apntable apn3 apn_name <new_APN>	Update correct APN, default is internet
9	#reboot	

6.2 Auto connection (One band, B41 for example)

Step	command	Description
1	DM> nv bcfgw 49 0 41	Write band number 41
2	DM> nv bcfgsv 1	Write NVRAM back to flash
3	DM>shell	Enter shell mode
4	#ucfg set config wan lte vendor 1	Connection manager, lteautocm
5	#ucfg set config wan lte autocm manual 0	Lteautocm chooses Auto mode
6	#ucfg set config wan lte atcm use _autocm_req 1	Request to lteautocm
7	#ucfg set config wan lte apntable apn3 ENABLE 1	Enable APN3
8	#ucfg set config wan lte apntable apn3 apn_name <new_APN>	Update correct APN, default is internet
9	#reboot	

6.3 Manual Connection (Three bands)

Step 1 is to configure required information

Step	command	Description
1	DM> nv bcfgw 49 0 41 25 26	Write band number into scan list
2	DM> nv bcfgsv 1	Write NVRAM back to flash
3	DM>shell	Enter shell mode
4	#ucfg set config wan lte vendor 0	Connection manager, None
5	#ucfg set config wan lte atcm use _autocm_req 0	By itself
6	#ucfg set config wan lte plmn_search_type 2	Search with extension mode
7	#ucfg set plmn_search_list 3/3/41/25/26	Assign scan band to scan list
8	#reboot	



Step 2 is using AT commands to enable modem dial up action

Step	command	Description
1	DM>AT+CGDCONT=1,"IPV4V6","APNNAME","",,,	APNNAME need to change to your network internet APN name, like "internet"
2	DM>AT%GPDNTYPE=1,3	Choose APN 3 for internet
3	DM>AT+COPS=5	Choose search extension mode
4	DM>AT+CGACT=1,1	Attached to network

6.4 Manual Connection (One band only)

Step 1 is to configure required information

Step	command	Description
1	DM> nv bcfgw 49 0 41	Write band number B41 into scan list
2	DM> nv bcfgsv 1	Write NVRAM back to flash
3	DM>shell	Enter shell mode
4	#ucfg set config wan lte vendor 0	Connection manager, None
5	#ucfg set config wan lte atcm use_autocm_req 0	By itself
6	#ucfg set config wan lte plmn_search_type 2	Search with extension mode
7	#ucfg set plmn search_list 3/1/41	Assign scan band to scan list
8	#reboot	

Step 2 is using AT commands to enable modem dial up action

Step	command	Description
1	DM>AT+CGDCONT=1,"IPV4V6","APNNAME","",,,	APNNAME need to change to your network internet APN name, like "internet"
2	DM>AT%GPDNTYPE=1,3	Choose APN 3 for internet
3	DM>AT+COPS=5	Choose search extension mode
4	DM>AT+CGACT=1,1	Attached to network

6.5 Disconnect

Step	command	Description
1	DM>AT+CGACT=0,1	Deactivate "1" PDP context

6.6 Get IP Address

Step	command	Description
1	AT+CGCONTRDP=3?	Cid=3
Response: AT+CGCONTRDP: 3,6,"internet.lguplus.co.kr","10.118.177.89","10.0.0.166","211.40.215.140","117.111.29.4","",",",0 OK Note: ipaddr:10.118.177.89, gateway:10.0.0.166, dns1:211.40.215.140, dns2:117.111.29.4		



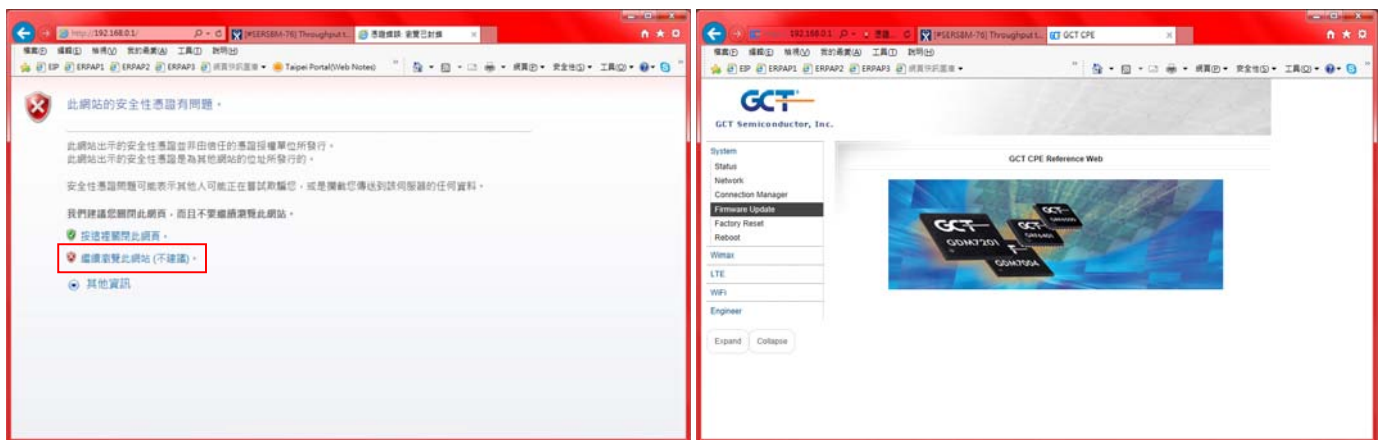
7 FW Upgrade

7.1 Using JIG board or CPE board

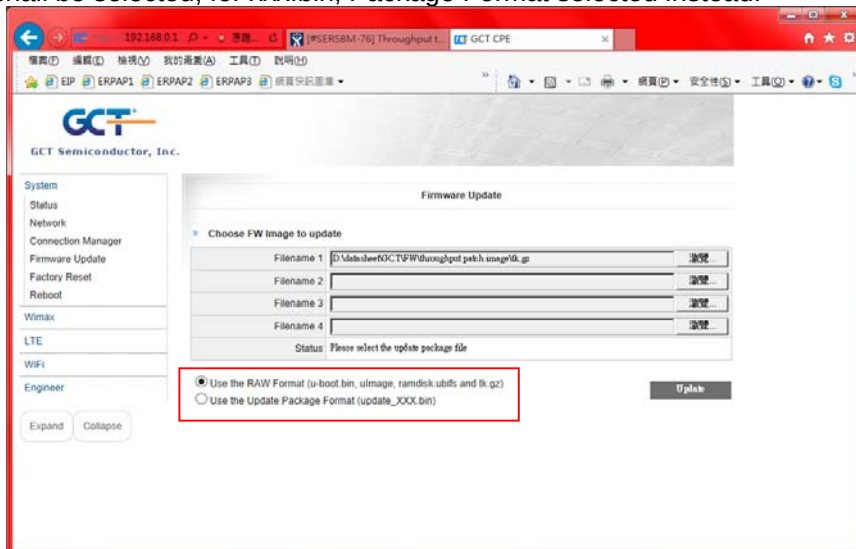
If JIP board is used, GCT LTE window driver and ACM driver are required to install first. When connected PC get IP, 192.168.0.10, from JIG board USB port, GDM7243Q module GUI can be accessed by <http://192.168.0.1>. Click continuous the web site link to go to main page.



If using CPE board, access GCT module by <http://192.168.0.1>



Select **Firmware update** from **System** Link and Select file from filename 1, click **update** button. For xxx.gz file, RAW Format shall be selected; for xxx.bin, Package Format selected instead.



LTE version can be seen from LTE→Status page.