EC200U&EG915U Series
FTM Application Note

LTE Standard Module Series

Version: 1.1

Date: 2021-08-20

Status: Released

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About the Document

Revision History

Version	Date	Author	Description
-	2021-04-20	JoJo YAN	Creation of the document
1.0	2021-04-20	JoJo YAN	First Official Release
1.1	2021-08-20	JoJo YAN	Added an applicable module series EG915U.

Contents

Table Index

1 Introduction

The document mainly describes the AT commands which are used to test the transmitting and receiving performances of Quectel LTE Standard EC200U and EG915U series modules in FTM (Factory Test Mode).

NOTE

Rx and Tx tests should be performed according to the bands supported for different modules.

2 Description of AT Commands

2.1. AT Command Introduction

2.1.1. Definitions

- **<CR>** Carriage return character.
- **<LF>** Line feed character.
- **<...>** Parameter name. Angle brackets do not appear on the command line.
- **[...]** Optional parameter of a command or an optional part of TA information response. Square brackets do not appear on the command line. When an optional parameter is not given in a command, the new value equals to its previous value or the default settings, unless otherwise specified.
- **Underline** Default setting of a parameter.

2.1.2. AT Command Syntax

All command lines must start with **AT** or **at** and end with **<CR>**. Information responses and result codes always start and end with a carriage return character and a line feed character: **<CR><LF><response><CR><LF>**. In tables presenting commands and responses throughout this document, only the commands and responses are presented, and **<CR>** and **<LF>** are deliberately omitted.

Table 1: Types of AT Commands

Command Type	Syntax	Description
Test Command	**AT+<cmd>=?**	Test the existence of corresponding Write Command and to return information about the type, value, or range of its parameter.
Read Command	**AT+<cmd>?**	Check the current parameter value of a corresponding Write Command.
Write Command	**AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]**	Set user-definable parameter value.
Execution Command	**AT+<cmd>**	Return a specific information parameter or perform a specific action.

2.2. Declaration of AT Command Examples

The AT command examples in this document are provided to help you learn about how to use the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendation or suggestions about how you should design a program flow or what status you should set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there exists a correlation among these examples and that they should be executed in a given sequence.

2.3. Description of AT Commands

2.3.1. AT+QRFTESTMODE Enter FTM Mode

AT+QRFTESTMODE Enter FTM Mode	
Test Command **AT+QRFTESTMODE=?**	Response **+QRFTESTMODE: (**list of supported **<mode>**s**)** **OK**
Read Command **AT+QRFTESTMODE?**	Response **+QRFTESTMODE: <mode>** **OK**
Write Command **AT+QRFTESTMODE=<mode>**	Response **OK** If there is any error: **ERROR** If the error is related to ME functionality: **+CME ERROR: <err>**
Characteristics	This command takes effect immediately; The configuration will not be saved.

Parameter

<mode>	Integer type. Enter/exit FTM. 0 Exit FTM 1 Enter FTM

2.3.2. AT+QRXFTM Receive in FTM

The Write Command forces module to receive in FTM.

AT+QRXFTM Receive in FTM	
Test Command **AT+QRXFTM=?**	Response **+QRXFTM: <band>,<RX_channel>,<enable>,<RX_power>,(**list of supported **<mode>**s**),<LTE_BW>** **OK**
Write Command In GSM **AT+QRXFTM=<band>,<RX_channel>,<enable>,<RX_power>,<mode>**	Response **+QRXFTM: <RX_RSSI>** **OK** If there is any error: **ERROR** If the error is related to ME functionality: **+CME ERROR: <err>**
Write Command In LTE **AT+QRXFTM=<band>,<RX_channel>,<enable>,<RX_power>,<mode>[,<LTE_BW>]**	Response **+QRXFTM: <RX_RSSI>,-** **OK** If there is any error: **ERROR** If the error is related to ME functionality: **+CME ERROR: <err>**
Characteristics	This command takes effect immediately; The configuration will not be saved.

Parameter

<band> String type. Supported bands in GSM/LTE. The ranges and corresponding channels are shown in the explanation of **<RX_channel>**.

<RX_channel> Integer type. Supported downlink channels in GSM/LTE. The corresponding downlink channels for different bands in GSM/LTE are as follows:

GSM Bands	Downlink Channel Frequency
"GSM850"	128–251
"GSM900"	0–124, 975–1023
"GSM1800"	512–885

	"GSM1900"	512–810
	LTE Bands	**Downlink Channel Frequency**
	"LTE BAND1"	0–599
	"LTE BAND3"	1200–1949
	"LTE BAND5"	2400–2649
	"LTE BAND7"	2750–3449
	"LTE BAND8"	3450–3799
	"LTE BAND20"	6150–6449
	"LTE BAND28"	9210–9659
	"LTE BAND34"	36200–36349
	"LTE BAND38"	37750–38249
	"LTE BAND39"	38250–38649
	"LTE BAND40"	38650–39649
	"LTE BAND41"	40040–41439/39650–41589[1)]
<enable>	String type. Enable/disable receiving in FTM.	
	"on"	Enable receiving in FTM
	"off"	Disable receiving in FTM
<RX_power>	Integer type. Expected receiving power. Unit: dBm. In LTE, the maximum value is -15 dBm.	
<mode>	Integer type. The transmitting mode. Range: 1–2.	
	1	burst mode (Transmit once)
	2	continues mode (Continue to transmit)
<LTE_BW>	Integer type. Bandwidth. It can only be set in LTE. Range: 0–5. Default value: 3. If omitted, it defaults to 3.	
	0	1.4 MHz
	1	3 MHz
	2	5 MHz
	3	10 MHz
	4	15 MHz
	5	20 MHz
<RX_RSSI>	Integer type. The received signal strength value.	

NOTES

1. If GSM/LTE switching is required in the process of testing, please firstly set **<enable>** to "off" to exit the current network mode. For more details, see ***Chapter 3.1***.
2. For the specific bands supported by different modules, see the specifications of the corresponding modules.
3. [1)] Currently, for the module name with suffix "-CN", the range of **<RX_channel>** corresponding to LTE B41 is from 40040 to 41439; for the module name with suffix "-EU", the range of **<RX_channel>** corresponding to LTE B41 is from 39650 to 41589.
4. LTE diversity is not supported by module, so the Write Command returns "**-**" except **<RX_RSSI>**.
5. During Rx test in LTE, if the CW wave is used, the channel frequency set on the RF instrument needs

to be offset 0.5 MHz from the channel frequency set by this command; if the ARB mode is used, no offset is required.

2.3.3. AT+QRFTEST Transmit in FTM

The Write Command forces module to transmit in FTM.

AT+QRFTEST Transmit in FTM	
Test Command **AT+QRFTEST=?**	Response **+QRXFTM: <band>,<TX_channel>,<enable>,<TX_power>,(**list of supported **<mode>**s**),<LTE_BW>**
Write Command In GSM **AT+QRFTEST=<band>,<TX_channel>,<enable>,<TX_power>,<mode>**	Response **OK** If there is any error: **ERROR** If the error is related to ME functionality: **+CME ERROR: <err>**
Write Command In LTE **AT+QRFTEST=<band>,<TX_channel>,<enable>,<TX_power>,<mode>[,<LTE_BW>]**	Response **OK** If there is any error: **ERROR** If the error is related to ME functionality: **+CME ERROR: <err>**
Characteristics	This command takes effect immediately; The configuration will not be saved.

Parameter

<band> String type. The supported bands in GSM/LTE. The ranges and corresponding channels are shown in the explanation of **<TX_channel>**.

<TX_channel> Integer type. The supported uplink channels in GSM/LTE. The corresponding uplink channels for different bands in GSM/LTE are as follows:

GSM Bands	Uplink Channel Frequency
"GSM850"	128–251
"GSM900"	0–124, 975–1023
"GSM1800"	512–885
"GSM1900"	512–810

	LTE Bands	Uplink Channel Frequency
	"LTE BAND1"	18000–18599
	"LTE BAND3"	19200–19949
	"LTE BAND5"	20400–20649
	"LTE BAND7"	20750–21449
	"LTE BAND8"	21450–21799
	"LTE BAND20"	24150–24449
	"LTE BAND28"	27210–27659
	"LTE BAND34"	36200–36349
	"LTE BAND38"	37750–38249
	"LTE BAND39"	38250–38649
	"LTE BAND40"	38650–39649
	"LTE BAND41"	40040–41439/39650~41589[2)]
<enable>	String type. Enable/disable transmitting in FTM.	
	"on"	Enable transmitting in FTM
	"off"	Disable transmitting in FTM
<TX_power>	Integer type.	
	In GSM, it indicates the power level of PCL. In GSM850/EGSM900, it ranges from 5 to 19; for DCS1800/PCS1900, it ranges from 0 to 15.	
	In LTE, it indicates the excepted transmitting power. Range: 23 to -43. Unit: dBm.	
<mode>	Integer type. The transmitting mode. Range: 1–2.	
	1	burst mode (Transmit once)
	2	continues mode (Continue to transmit)
<LTE_BW>	Integer type. Bandwidth. It can only be set in LTE. Range: 0–5. Default: 3.	
	If omitted, it defaults to 3.	
	0	1.4 MHz
	1	3 MHz
	2	5 MHz
	3	10 MHz
	4	15 MHz
	5	20 MHz

NOTE

1. If GSM/LTE switching is required in the process of testing, please firstly set **<enable>** to "off" to exit the current network mode. For more details, see ***Chapter 3.1***.
2. For the specific bands supported by different modules, see the specifications of the corresponding modules.
3. [2)] Currently, for the module name with suffix "-CN", the range of **<TX_channel>** corresponding to LTE B41 is from 40040 to 41439; for the module name with suffix "-EU", the range of **<TX_channel>** corresponding to LTE B41 is from 39650 to 41589.
4. During Tx test in LTE, if **<mode>** is set to the burst mode, IF power mode should be set on the RF instrument. It is recommended to set **<mode>** to the continues mode.

3 Examples

3.1. Receive in FTM

```
//Test process of GSM&LTE transmitting in FTM.
AT+QRFTESTMODE?                          //Query whether the module is currently in FTM.
+QRFTESTMODE: 0

OK
AT+QRFTESTMODE=1                         //Enter FTM.
OK
AT+QRXFTM="GSM900",62,"on",-90,1         //Test downlink frequency 62 of EGSM900.
+QRXFTM: -91

OK
AT+QRXFTM="GSM900",62,"off",-90,1        //Turn off GSM Rx test.
OK
AT+QRXFTM="LTE BAND1",300,"on",-80,1,3   //Test downlink channel frequency 300 of LTE
                                         B1.
+QRXFTM: -80,-                           //The received signal strength value.

OK
AT+QRXFTM="LTE BAND1",300,"off",-80,1,3  //Turn off LTE Rx test.
OK
AT+QRFTESTMODE=0                         //Turn off Rx test and exit FTM.
OK
```

3.2. Transmit in FTM

```
//Test process of GSM&LTE receiving in FTM.
AT+QRFTESTMODE?                          //Query whether the module is currently in FTM.
+QRFTESTMODE: 0

OK
AT+QRFTESTMODE=1                         //Enter FTM.
```

```
OK
AT+QRFTEST="GSM900",62,"on",5,1                 //Test uplink frequency 62 of EGSM900.
OK
AT+QRFTEST="GSM900",62,"off",5,1                //Turn off GSM Tx test.
OK
AT+QRFTEST="LTE BAND1",18300,"on",23,2,3        //Test uplink channel frequency 18300 of LTE
                                                B1.
OK
AT+QRFTEST="LTE BAND1",18300,"off",23,2,3       //Turn off LTE Tx test.
OK
AT+QRFTESTMODE=0                                //Turn off Tx test and exit FTM.
OK
```

4 Appendix Reference

Table 2: Terms and Abbreviations

Abbreviation	Description
ARB	Adaptive Rate Based
CW	Continuous Wave
FTM	Factory Test Mode
GSM	Global System for Mobile Communications
LTE	Long Term Evolution
RF	Radio Frequency
RSSI	Received Signal Strength Indication
Rx	Receive
Tx	Transmit
WCDMA	Wideband Code Division Multiple Access