WCDMA UGxx QuecCell Application Note

UMTS/HSPA Module Series

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About the Document

History

Revision	Date	Author	Description
1.0	2015-08-20	Jonathan WEN	Initial
1.1	2016-05-05	Sophie ZHU	Deleted the following four parameters: <mcc>,<mnc>,<lac>,<cellid> in 2G "neighbourcell"
1.2	2016-05-06	Ivan ZHANG	Modified the 2G neighbourcell information under 3G condition

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1 Introduction

QuecCell is a feature embedded in Quectel modules which can report the detailed information about the base station, and scan the currently available network. With this feature, MCU can get more information about the wireless network.

This document is applicable to Quectel UGxx modules.

2 QuecCell Overview

QuecCell can be configured by the commands below:

- **AT+QENG:** It provides the information of serving cells, neighbour cells and Packet Switch parameters. After the MCU sends AT+QENG command, the module will report these information. The response information will be different when the module is registered to different networks (GSM or WCDMA).
- **AT+QOPS:** It will scan the currently available network. MCU can specify the radio type and band value or scan the whole band.

The following sections describe how to use these functionalities in detail.

3 AT Commands Description

3.1. AT+QENG Report Cell Information

This command is designed to report the information of serving cells, neighbouring cells and Packet Switch parameters.

AT+QENG Report Cell Information	
Test Command **AT+QENG=?**	Response **+QENG: (list of support <celltype>s)** **OK**
Query serving cells information **AT+QENG="servingcell"**	Response In case of **<rat>**="2G", response **+QENG: "servingcell",<state>,"2G",<mcc>,<mnc>,<lac>,<cellid>,<bsic>,<arfcn>,<band>,<rxlev>,<txp>,<rla>,<drx>,<c1>,<c2>,<gprs>,<tch>,<ts>,<ta>,<maio>,<hsn>,<rxlevsub>,<rxlevfull>,<rxqualsub>,<rxqualfull>,<voicecodec>** **[…]** **OK** In case of **<rat>**="3G", response: **+QENG: "servingcell",<state>,"3G",<mcc>,<mnc>,<lac>,<cellid>,<uarfcn>,<psc>,<rssi>,<rscp>,<ecno>,<srxqual>,<srxlev>,<drx>,<PhysCh>,<SF>,<slot>,<dchrscp>,<dchecno>,<voicecodec>,<ComMod>** **[…]** **OK**
Query neighbour cells information **AT+QENG="neighbourcell"**	Response In case of **<rat>**="2G", response: **[+QENG: "neighbourcell","2G",<mcc>,<mnc>,<lac>,<cellid>,<bsic>, <arfcn>,<rxlev>,<c1>,<c2>,<c31>,<c32>**

	[…]] **[+QENG:** **"neighbourcell","3G",<uarfcn>,<psc>,<rscp>,<ecno>]** **[…]]** **OK** In case of **<rat>**="3G", response: **[+QENG:** **"neighbourcell","3G",<mcc>,<mnc>,<lac>,<cellid>,<uarfcn>,<psc>,<rscp>,<ecno>,<srxqual>,<srxlev>,<set>,<rank>** **[…]]** **[+QENG:** **"neighbourcell","2G",<bsic>,<arfcn>,<last_rssi>,<rxlev>,<rank>,<reserved>,<reserved>]]** **[…]]** **OK**
Query packet switch information **AT+QENG="psinfo"**	Response In case of **<rat>**="2G" ,response **[+QENG:** **"psinfo","2G",<mcc>,<mnc>,<lac>,<cellid>,<bsic>,<rac>,<arfcn>,<c31>,<c32>,<pat>,<nom>,<egprs>,<pbcch>]** **OK** In case of <rat>="3G", response: **[+QENG:** **"psinfo","3G",<mcc>,<mnc>,<lac>,<cellid>,<uarfcn>,<psc>,<rssi>,<rscp>,<ecno>,<srxqual>,<srxlev>,<drx>,<hsdpa>,<hsupa>,<PhysCh>,<SF>,<slot>,<cqi>,<tti>,<hsdpacat>,<hsupacat>,<hsdpacommod>** **[…]]** **OK**
Get cell channel information **AT+QENG="channel"**	Response Only in GSM, get 2G channel information in voice call. **+QENG:** **"channel",<tch>,<ta>,<txpwr>,<maio>,<hsn>,[<arfcn>[,…]]** **OK**
Reference	

Parameters

<celltype>	String format, get different cell information. "servingcell" Get 2G or 3G serving cell information "neighbourcell" Get 2G or 3G neighbour cell information "psinfo" Get 2G or 3G cell information during packet switch connected "ca" Get 2G CA frequency list "ba" Get 2G BA frequency list "channel" Get 2G channel information in voice call
<state>	String format, UE state "SEARCH" UE is searching, but could not (yet) find a 2G or 3G suitable cell "LIMSRV" UE is camping on a cell but not registered to the network "NOCONN" UE is camping on a cell and registered to the network; it's in the idle mode "CONNECT" UE is camping on a cell and registered to the network, and call in progress
<rat>	String format, access technology "2G" GSM "3G" UMTS
<mcc>	Number format. Mobile Country Code (first part of the PLMN code) - Don't get the invalid value
<mnc>	Number format. Mobile Network Code (second part of the PLMN code) - Don't get the invalid value
<lac>	Hexadecimal format. Location Area Code. Parameter determines the two bytes location area code in hexadecimal format (e.g. 00C1 equals 193 in decimal) of the cell that was scanned. Range: 0-65535. - Don't get the invalid value
<cellid>	Hexadecimal format. Cell ID. Parameter determines the 16 bit (GSM) or 28 bit (UMTS). Range: 0-0xFFFFFFF. - Don't get the invalid value
<bsic>	Number format. Base station identification code. Range: 0-63.
<arfcn>	Number format. Parameter determines the ARFCN of the cell that was scanned. Range: 0-1023.
<band>	Number format, indicates the current band is PCS1900 or DCS1800. 0 DCS_1800 1 PCS_1900 - Other band
<rxlev>	Number format. RX level value for base station selection in dB (see 3GPP 25.304). RX level range: 0-63, subtract 111 to dBm value.
<last_rssi>	Reserved always 0.
<txp>	Number format. MS max TX power in CCH.
<rla>	Number format. Min access RX level.
<drx>	Number format. Discontinuous reception cycle length.
<c1>	Number format. Cell selection criterion.

<c2>	Number format. Cell reselection criterion.
<gprs>	Number format. Indicates whether current cell supports GPRS or not. 0 Not support GPRS 1 Support GPRS
<tch>	Number format. If hopping, displays 'h', otherwise displays the current ARFCN in voice call.
<ts>	Number format. Timeslot number
<ta>	Number format. Timing advance for the base station. Range: 0-63
<maio>	Number format. Mobile Allocation Index Offset
<hsn>	Number format. Hopping Sequence Number
<rxqualsub>	Number format. RX quality (sub), range: 0-7
<rxqualfull>	Number format. RX quality (full), range: 0-7
<rxlevsub>	Number format. RX level (sub), range: 0-63
<rxlevfull>	Number format. RX level (full), range: 0-63
<voicecodec>	String format. Channel mode during voice call "HR" Half rate "FR" Full rate "EFR" Enhanced full rate "AMR" Adaptive multi-rate "AMRHR" AMR half rate "AMRFR" AMR full rate "AMRWB" AMR wide band "-" Invalid
<uarfcn>	Number format. Parameter determines the UARFCN of the cell that was scanned.
<psc>	Number format. Parameter determines the primary scrambling code of the cell that was scanned.
<rssi>	Number format. Parameter shows the received signal strength indication.
<rscp>	Number format. Parameter determines the received signal code power level of the cell that was scanned.
<ecno>	Number format. Carrier to noise ratio in dB = measured Ec/Io value in dB.
<srxqual>	Number format. Quality value for base station selection in dB (see 3GPP 25.304).
<srxlev>	Number format. RX level value for base station selection in dB (see 3GPP 25.304).
<PhysCh>	Number format. Parameter shows the current physical channel type. 0 DPCH 1 FDPCH
<SF>	Number format. Spreading Factor, values are 4, 8, 16, 32, 64, 128, 256, 512
<slot>	Number format. Slot Format for DPCH (0-16) (see 3GPP TS 25.211 V7.10.0 Table 11). Slot Format for FDPCH (0-9) (see 3GPP TS 25.211 V7.10.0 Table 16C).
<dchrscp>	Number format. When the state is DCH, parameter determines the received signal code power level of the cell that was scanned.
<dchecno>	Number format. When the state is DCH, carrier to noise ratio in dB = measured Ec/Io value in dB.
<ComMod>	Number format. Compress mode 0 Not support Compress mode

	1 Support Compress mode
<c31>	Number format. GPRS cell selection criterion
<c32>	Number format. GPRS cell reselection criterion
<set>	Number format. 3G neighbour cell set. 1 Active Set 2 Sync Neighbour Set 3 Async Neighbour Set
<rank>	Rank of this cell as neighbour for inter-RAT cell reselection.
<hsdpa>	Number format. Support HSDPA or not. 0 Not support HSDPA 1 Support HSDPA
<hsupa>	Number format. UE HSDPA and HSUPA capability 0 Not support HSUPA 1 Support HSUPA
<egprs>	Number format. Indicates whether current cell supports EGPRS or not. 0 Not support EGPRS 1 Support EGPRS
<pat>	Number format. Priority Access Threshold
<nom>	String format. Network Operation Mode, range: 0-2
<txpwr>	Number format. TX power level for the UE
<pbcch>	Number format. If hopping, displays 'h', otherwise displays the current ARFCN in PS data call.
<cqi>	Number format. Channel quality indicator
<tti>	Number format. Transmission time interval of HSUPA 0 There is no valid value 2 The unit is millisecond 10 The unit is millisecond
<hsdpacat>	Number format. HSDPA category
<hsupacat>	Number format. HSUPA category
<hsdpacommod>	Number format. HSDPA compressed mode

3.2. AT+QOPS Scan Current Available Networks

AT+QOPS is used to scan current available networks.

AT+QOPS Scan Current Available Networks	
Test Command **AT+QOPS=?**	Response **+QOPS:** **(0,1,3,"GSM_900E","GSM_1800","GSM_1900","GSM_850","UMTS_BAND_I","UMTS_BAND_II","UMTS_BAND_V","UMTS_BAND_VI","UMTS_BAND_VIII","UMTS_BAND_XIX"**

	OK
Write Command **AT+QOPS=<scan_type>[,<band_list>]**	Response In case of **<rat_type>**=1, means “2G” **+QOPS: <rat_type>,<arfcn>,<long_plmn_name>,<mcc>,<mnc>,<lac>,<ci>,<bsic>,<rxLev>,<c1>,<cba>,<is_reserved>,<access_service_class>,<is_gprs_support><CRLF><CRLF>** **[....]** In case of **<rat_type>**=2, means "3G" **+QOPS: <rat_type>,<uarfcn>,<long_plmn_name>,<mcc>,<mnc>,<lac>,<ci>,<psc>,<rscp>,<ecno>,<cba>,<is_reserved>,<list of <ac_to_asc >><CRLF><CRLF>** **[....]** **OK**
Reference	

Parameters

<scan_type>	Number format. Indicates to scan network type 0 Scan 2G available network 1 Scan 3G available network 3 Scan both 2G and 3G available network
<band_list>	String format, specify scan band list. It must be in the list of Test Command’s response. If not specified, it will scan all bands. If **<scan_type>**=1, any UMTS bands should not be in the **<band_list>**, and if **<scan_type>**=2, any GSM bands should not be in the **<band_list>**
<rat>	Number format, access technology 1 GSM 2 UMTS
<long_plmn_name>	String format. PLMN long name
<arfcn>	Number format. Parameter determines the ARFCN of the cell that was scanned. Range: 0-1023.
<mcc>	Number format. Mobile Country Code (first part of the PLMN code).
<mnc>	Number format. Mobile Network Code (second part of the PLMN code).
<lac>	Hexadecimal format. Location Area Code. Parameter determines the two bytes location area code in hexadecimal format (e.g. 00C1 equals 193 in decimal) of the cell that was scanned. Range: 0-65535.
<ci>	Hexadecimal format. Cell ID. Parameter determines the 16 bit (GSM) or 28 bit (UMTS).

	Range: 0-0xFFFFFFF.
<bsic>	Number format. Base station identification code. Range: 0-63.
<rxlev>	Number format. RX level value for base station selection in dB (see 3GPP 25.304). RX level range: 0-63, subtract 111 to dBm value.
<c1>	Number format. Cell selection criterion
<cba>	Number format. Cell bar access
<is_reserved>	Number format. Indicate whether cell is reserved for operator use or not 0 Cell is not reserved for operator use 1 Cell is reserved for operator use
<access_service_class>	Number format. Access service class info.
<is_gprs_support>	Number format. Indicates whether current cell supports GPRS or not. 0 Not support GPRS 1 Support GPRS
<uarfcn>	Number format. Parameter determines the UARFCN of the cell that was scanned.
<psc>	Number format. Parameter determines the primary scrambling code of the cell that was scanned.
<rscp>	Number format. Parameter determines the received signal code power level of the cell that was scanned.
<ecno>	Number format. Carrier to noise ratio in dB = measured Ec/Io value in dB.
<ac_to_asc>	Number format. Access Classes to Access Service Classes

4 Example

4.1. Report Cell Information

```
AT+QENG="servingcell"       //UE is searching, but could not (yet) find a 2G or 3G suitable cell.
+QENG: "servingcell","SEARCH"

OK
AT+QENG="servingcell"       //UE is camping on a 2G cell but not registered to the network.
+QENG:
"servingcell","LIMSRV","2G",460,01,5504,2B55,52,123,0,-67,5,14,64,30,28,0,-,-,-,-,-,-,-,-,-,"-"

OK
AT+QENG="servingcell"       //UE is camping on a 2G cell and registered to the network, in idle mode.
+QENG:
"servingcell","NOCONN","2G",460,01,5504,2B55,52,123,0,-111,5,14,64,0,0,0,-,-,-,-,-,-,-,-,-,"-"

OK
AT+QENG="servingcell"      //UE is camping on a 2G cell and registered to the network, call in progress.
+QENG:
"servingcell","CONNECT","2G",460,00,550A,2BB9,23,94,0,-61,5,14,4,0,0,0,h,1,0,0,33,50,52,0,0,"EF
R"

OK
AT+QENG="neighbourcell"    //Get the UE neighbor cells in 2G mode
+QENG: "neighbourcell","2G",460,00,550A,37A8,50,15,51,37,37,0,0
+QENG: "neighbourcell","2G",460,00,5663,3A40,38,71,45,31,31,0,0
+QENG: "neighbourcell","2G",460,00,550A,2BB7,28,85,46,32,32,0,0
+QENG: "neighbourcell","2G",460,00,550A,11D3,44,77,45,31,31,0,0
+QENG: "neighbourcell","2G",460,00,5665,206F,33,61,42,28,28,0,0
+QENG: "neighbourcell","2G",460,00,550A,1E88,43,63,39,25,25,0,0

OK
AT+QENG="servingcell"       //UE is camping on a 3G cell but not registered to the network.
+QENG:
"servingcell","LIMSRV","3G",460,01,D508,80C389C,10713,387,-125,-102,28,8,12,64,-,-,-,-,-,"-",-
```

```
OK
AT+QENG="servingcell"       //UE is camping on a 3G cell and registered to the network, in idle mode.
+QENG:
"servingcell","NOCONN","3G",460,01,D504,8043799,10713,65,-90,-88,18,18,26,64,-,-,-,-,-,"-",-

OK
AT+QENG="servingcell"       //UE is camping on a 3G cell and registered to the network, call in progress
+QENG:
"servingcell","CONNECT","3G",460,01,D504,8043799,10713,65,-91,-89,16,20,25,0,0,256,9,-88,16,"A
MR",0

OK
AT+QENG="servingcell"       //UE is camping on a 3G cell and call in progress. There is more than one
                              cell in ASET.
+QENG:
"servingcell","CONNECT","3G",460,01,D504,8043799,10713,65,-91,-89,16,20,25,0,0,256,9,-88,16,"A
MR",0
+QENG:
"servingcell","CONNECT","3G",460,01,D508,80C389C,10713,115,-91,-89,21,15,24,0,0,128,8,-91,21,"
AMR",0

OK

AT+QENG="neighbourcell"       //Get the UE neighbor cells in 3G mode
+QENG: "neighbourcell","3G",460,01,D508,80C389C ,10713,387,-96,35,1,18,1,-35
+QENG: "neighbourcell","3G",-,-,-,-, 10713,77,-109,63,-27,5,1,-32768
+QENG: "neighbourcell","3G",460,01,D508,80C389C,10713,115,-101,44,-8,13,1,-32768
+QENG: "neighbourcell","3G",460,01,D509,80D413D,10713,396,-93,29,7,21,1,-29

OK
```

4.2. Scan Current Available Nerworks

```
AT+QOPS=3                                   //Scan for all 2G and 3G bands
+QOPS: 2,10688,"CHN-UNICOM",460,1,54536,135025153,380,-102,251,0,0,0,0,0,0,0,0,0

+QOPS: 2,10713,"CHN-UNICOM",460,1,54536,135015153,380,-106,250,0,0,0,0,0,0,0,0,0
[...]

OK

AT+QOPS=0,"GSM_1800","GSM_900"    //Scan for 2G band 1800 and 900
```

```
+QOPS: 1,653,"CHN-UNICOM",460,1,21764,17572,32,29,13,0,0,0,1

+QOPS: 1,648,"CHN-UNICOM",460,1,21764,25651,5,18,3,0,0,0,1

+QOPS: 1,637,"CHN-UNICOM",460,1,21764,17573,52,15,-1,0,0,0,1

+QOPS: 1,646,"CHN-UNICOM",460,1,21764,26611,39,10,-6,0,0,0,1

+QOPS: 1,539,"CHINA MOBILE",460,0,21770,858,26,7,-13,0,0,0,1

+QOPS: 1,642,"CHN-UNICOM",460,1,21764,26253,26,18,3,0,0,0,1

+QOPS: 1,643,"CHN-UNICOM",460,1,21764,17571,44,15,-1,0,0,0,1

OK

AT+QOPS=1,"UMTS_BAND_I"       //Scan for 3G band “UMTS_BAND_I”
+QOPS: 2,10688,"CHN-UNICOM",460,1,54536,135025153,380,-67,251,0,0,0,0,0,0,0,0,0

+QOPS: 2,10713,"CHN-UNICOM",460,1,54536,135015153,380,-71,251,0,0,0,0,0,0,0,0,0

+QOPS: 2,10663,"CHN-UNICOM",460,1,54537,135106399,398,-85,251,0,0,0,0,0,0,0,0,0

OK
```

5 Appendix A Reference

Table 1: Terms and Abbreviations

Abbreviation	Description
BSIC	Base Station Identity Code
RSSI	Received Signal Strength Indication