

# **EG06xK&Ex120K&EM060K Series**

## **SAR Power Back-off Application Note**

**LTE-A Module Series**

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# About the Document

## Revision History

Version	Date	Author	Description
-	2022-09-28	Kevin LI	Creation of the document
1.0	2022-11-22	Kevin LI	First official release

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# 1 Introduction

This document mainly introduces how to implement the power back-off function of Quectel LTE-A EG060K series, EG065K series, EG120K series, EM120K-GL, and EM060K series modules in WCDMA/LTE through AT commands.

## 1.1. Applicable Modules

**Table 1: Applicable Modules**

Module Family	Module
EG06xK	EG060K Series
	EG065K Series
Ex120K	EG120K Series
	EM120K-GL
EM060K	EM060K Series

# 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 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 2: Types of AT Commands**

Command Type	Syntax	Description
Test Command	<b>AT+&lt;cmd&gt;=?</b>	Test the existence of the corresponding command and return information about the type, value, or range of its parameter.
Read Command	<b>AT+&lt;cmd&gt;?</b>	Check the current parameter value of the corresponding command.
Write Command	<b>AT+&lt;cmd&gt;=&lt;p1&gt;[,&lt;p2&gt;[,&lt;p3&gt;[...]]]</b>	Set user-definable parameter value.
Execution Command	<b>AT+&lt;cmd&gt;</b>	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 the use of the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendations or suggestions about how to design a program flow or what status to set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there is a correlation among these examples, or that they should be executed in a given sequence.

## 2.3. Description of Power Back-off AT Commands

### 2.3.1. AT+QSAR Set SAR Power Back-off Level for WCDMA/LTE

This command sets SAR power back-off level for WCDMA/LTE.

AT+QSAR Set SAR Power Back-off Level for WCDMA/LTE	
Test Command <b>AT+QSAR=?</b>	Response <b>+QSAR:</b> (range of supported <level>s),(list of supported <save>s)  <b>OK</b> Or <b>ERROR</b>
Read Command <b>AT+QSAR?</b>	Response <b>+QSAR:</b> <level>  <b>OK</b> Or <b>ERROR</b>
Write Command <b>AT+QSAR=&lt;level&gt;[,&lt;save&gt;]</b>	Response <b>OK</b> Or <b>ERROR</b>
Maximum Response Time	500 ms
Characteristics	The command takes effect immediately. <save> determines whether the configuration will be saved after power back-off.

## Parameter

<b>&lt;level&gt;</b>	Integer type. SAR power back-off level in WCDMA/LTE. Range: 0–8.
0	Disable power back-off function
1–8	SAR power back-off level in WCDMA/LTE. Level1-level8 correspond to device status index number 1-8 (see <b>Chapter 2.3.2</b> )
<b>&lt;save&gt;</b>	Integer type. Whether to save the configuration to NVM.
0	Not save
1	Save

### 2.3.2. AT+QCFG="SAR\_DSI" Set SAR Power Back-off Value for WCDMA/LTE Band

This command sets SAR power back-off value for WCDMA/LTE band.

#### AT+QCFG="SAR\_DSI" Set SAR Power Back-off Value for WCDMA/LTE Band

Write Command <b>AT+QCFG="SAR_DSI",&lt;RAT&gt;[,&lt;band&gt;,&lt;DSI1&gt;,&lt;DSI2&gt;,&lt;DSI3&gt;,&lt;DSI4&gt;,&lt;DSI5&gt;,&lt;DSI6&gt;,&lt;DSI7&gt;,&lt;DSI8&gt;]</b>	Response If the optional parameters are omitted, query the current configuration: <b>+QCFG: "SAR_DSI",&lt;RAT&gt;,&lt;band1&gt;,&lt;DSI1&gt;,&lt;DSI2&gt;,&lt;DSI3&gt;,&lt;DSI4&gt;,&lt;DSI5&gt;,&lt;DSI6&gt;,&lt;DSI7&gt;,&lt;DSI8&gt;</b> ... <b>OK</b>  If the optional parameters are specified, set SAR power back-off value for WCDMA/LTE bands: <b>OK</b> Or <b>ERROR</b>
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration will be saved automatically.

## Parameter

<b>&lt;RAT&gt;</b>	String type. Radio Access Technology. "lte_wcdma" LTE and WCDMA "lte" LTE "wcdma" WCDMA
<b>&lt;band&gt;</b>	Integer type. See <b>&lt;band1&gt;</b> for detailed parameter values.
<b>&lt;band1&gt;</b>	String type. The supported LTE/WCDMA bands corresponding to <b>&lt;band&gt;</b> .

**WCDMA:**

<b>&lt;band&gt;</b>	<b>&lt;band1&gt;</b>
1	WCDMA B1
2	WCDMA B2
3	WCDMA B3
4	WCDMA B4
5	WCDMA B5
8	WCDMA B8
9	WCDMA B9
11	WCDMA B11
19	WCDMA B19

**LTE:**

<b>&lt;band&gt;</b>	<b>&lt;band1&gt;</b>
1	LTE B1
2	LTE B2
3	LTE B3
4	LTE B4
5	LTE B5
6	LTE B6
7	LTE B7
8	LTE B8
9	LTE B9
10	LTE B10
11	LTE B11
12	LTE B12
13	LTE B13
14	LTE B14
17	LTE B17
18	LTE B18
19	LTE B19
20	LTE B20
21	LTE B21
23	LTE B23
25	LTE B25
26	LTE B26
27	LTE B27
28	LTE B28
	LTE B28B
30	LTE B30
34	LTE B34
38	LTE B38
	LTE B38K
39	LTE B39
40	LTE B40

---

		LTE B40B
	41	LTE B41
		LTE B41B
		LTE B41C
	42	LTE B42
	43	LTE B43
	46	LTE B46
	47	LTE B47
	48	LTE B48
	66	LTE B66
	71	LTE B71
		LTE B71B
	250	LTE B250
<b>&lt;DSI1&gt;</b>	Integer type. SAR power back-off value corresponding to DSI1 (device status index number 1). The value should be set as a multiple of 10. Range: 60–300. Default value: 230. Unit: 0.1 dBm.	
<b>&lt;DSI2&gt;</b>	Integer type. SAR power back-off value corresponding to DSI2 (device status index number 2). The value should be set as a multiple of 10. Range: 60–300. Default value: 220. Unit: 0.1 dBm.	
<b>&lt;DSI3&gt;</b>	Integer type. SAR power back-off value corresponding to DSI3 (device status index number 3). The value should be set as a multiple of 10. Range: 60–300. Default value: 210. Unit: 0.1 dBm.	
<b>&lt;DSI4&gt;</b>	Integer type. SAR power back-off value corresponding to DSI4 (device status index number 4). The value should be set as a multiple of 10. Range: 60–300. Default value: 200. Unit: 0.1 dBm.	
<b>&lt;DSI5&gt;</b>	Integer type. SAR power back-off value corresponding to DSI5 (device status index number 5). The value should be set as a multiple of 10. Range: 60–300. Default value: 190. Unit: 0.1 dBm.	
<b>&lt;DSI6&gt;</b>	Integer type. SAR power back-off value corresponding to DSI6 (device status index number 6). The value should be set as a multiple of 10. Range: 60–300. Default value: 180. Unit: 0.1 dBm.	
<b>&lt;DSI7&gt;</b>	Integer type. SAR power back-off value corresponding to DSI7 (device status index number 7). The value should be set as a multiple of 10. Range: 60–300. Default value: 170. Unit: 0.1 dBm.	
<b>&lt;DSI8&gt;</b>	Integer type. SAR power back-off value corresponding to DSI8 (device status index number 8). The value should be set as a multiple of 10. Range: 60–300. Default value: 160. Unit: 0.1 dBm.	

**NOTE**

B9, B11 in WCDMA and B6, B9, B10, B11, B21, B23, B27, B46, B47, and B250 in LTE are not applicable to EG060K series, EG065K series, EG120K series, EM120K-GL, and EM060K series modules.

# 3 Examples

```
//Query SAR power back-off value for WCDMA/LTE bands:
```

```
AT+QCFG="SAR_DSI","lte_wcdma"
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B1,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B3,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B5,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B7,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B8,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B20,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B28,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B38,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B40,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",LTE B41,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",WCDMA B1,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",WCDMA B3,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",WCDMA B5,200,110,230,230,230,230,230
```

```
+QCFG: "SAR_DSI","lte_wcdma",WCDMA B8,200,110,230,230,230,230,230
```

```
OK
```

```
//Set SAR power back-off value for LTE B1
```

```
AT+QCFG="SAR_DSI","lte",1,200,110,200,240,230,190,230,230
```

```
OK
```

```
//Set SAR power back-off level to 1
```

```
AT+QSAR=1
```

```
OK
```

# 4 Appendix Reference

**Table 3: Terms and Abbreviations**

Abbreviation	Description
DSI	Device State Index
LTE	Long Term Evolution
NVM	Non-Volatile Memory
RAT	Radio Access Technology
SAR	Specific Absorption Rate
TA	Terminal Adapter
WCDMA	Wideband Code Division Multiple Access