# EC200U&EG915U Series
# Enhanced Sleep Mode Application Note

**LTE Standard Module Series**

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# About the Document

## Revision History

| Version | Date | Author | Description |
|---|---|---|---|
| - | 2021-04-18 | Marvin NING | Creation of the document |
| 1.0 | 2021-05-31 | Marvin NING | First official release |
| 1.1 | 2021-08-20 | Marvin NING | Added an applicable module series EG915U. |

# Contents

# Table Index

# Figure Index

# 1 Introduction

This document mainly introduces the application note of enhanced sleep mode for Quectel LTE Standard EC200U and EG915U series modules in LTE network. It includes the introduction of related AT command, the data comparison between average current consumption tests in normal sleep mode and enhanced sleep mode in application scenarios as well as precautions.

Enhanced sleep mode refers to the fast sleep after module sending data. The difference between the enhanced sleep mode and the normal sleep mode (controlled by **AT+QSCLK**) is mainly demonstrated in the scenario where data is sent and received at intervals. After the data is sent and received, the enhanced sleep mode can quickly enter the sleep state, thereby reducing the overall average current consumption.

# 2 Related AT Command

## 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 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. Description of AT Command

### 2.2.1. AT+QSCLKEX Enable/Disable Enhanced Sleep Mode

This command enables or disables the enhanced sleep mode.

| AT+QSCLKEX Enable/Disable Enhanced Sleep Mode | |
|---|---|
| Test Command<br>**AT+QSCLKEX=?** | Response<br>**+QSCLKEX: (**list of supported <mode>s**),(**range of supported **<idle_time>**s**),**(**range of supported **<retry_time>**s)**<br><br>**OK** |
| Read Command<br>**AT+QSCLKEX?** | Response<br>**+QSCLKEX: <mode>,<idle_time>,<retry_time>**<br><br>**OK** |
| Write Command<br>**AT+QSCLKEX=<mode>[,<idle_time>[,<retry_time>]]** | Response<br>**OK**<br>Or<br>**ERROR** |
| Maximum Response Time | 300 ms |
| Characteristics | The command takes effect immediately.<br>The configurations will not be saved. |

**Parameter**

| | |
|---|---|
| **<mode>** | Integer type. Enable/disable enhanced sleep mode.<br>0 Disable<br>1 Enable |
| **<idle_time>** | Integer type. Time to enter sleep state after sending data. Range:1–50. Unit: second. |
| **<retry_time>** | Integer type. Time to restore the enhanced sleep mode if an abnormal situation is encountered. Range: 1-600. Unit: minute. This parameter can be set to any value between 1–600 and has no actual function. |

# 3 Tests in Application Scenarios and Precautions

For your reference, this chapter takes EC200U series modules as an example to describe and demonstrate the average current consumption tests in normal sleep mode and enhanced sleep mode in application scenarios. It includes the test steps, data comparison, test examples, test conclusion and precautions.

## 3.1. Test Steps

### 3.1.1. Test Scenarios

Establish a TCP long connection and send 100 bytes data to the server every 60 seconds.

### 3.1.2. Statistical Data

- Test duration
- The average duration to enter low power consumption in normal sleep mode and enhanced sleep mode
- The average current consumption in the process of sending a packet of data to entering low power consumption and waiting for a certain period of time (as described in step 3–4 below).

### 3.1.3. Test Steps

1. Execute **AT+QSCLKEX=1,2,10** to enable enhanced sleep mode.
2. Execute **AT+QIOPEN** (see ***document [2]***) to establish a TCP connection.
3. Execute **AT+QISEND** (see ***document [2]***) to send a packet of data (100 bytes).
4. Pull up DTR to enter in low power mode and wait for 60 seconds (calculate the average current consumption).
5. Pull down DTR to wake up the module
6. Repeat step 3–5 (test duration: 0.5 hour).

## 3.2. Test Data

**Table 2: Average Current Consumption Comparison Between Different Sleep Modes for EC200U Series**

| Operator/Network | Normal Sleep Mode/Enhanced Sleep Mode | Test Duration (H) | Average Duration to Enter Low Power Consumption (S) | Average Current Consumption (mA) |
|---|---|---|---|---|
| Mobile LTE | Normal Sleep Mode | 0.5 | 10.2 | 17.41 |
| | Enhanced Sleep Mode | 0.5 | 2.5 | 6.60 |
| Unicom LTE | Normal Sleep Mode | 0.5 | 20.2 | 31.87 |
| | Enhanced Sleep Mode | 0.5 | 2.1 | 5.84 |
| Telecom LTE | Normal Sleep Mode | 0.5 | 5.8 | 11.24 |
| | Enhanced Sleep Mode | 0.5 | 3.0 | 7.26 |

## 3.3. Test Examples

This chapter mainly demonstrates the average current consumption comparison between normal sleep mode and enhanced sleep mode for EC200U series respectively. The examples are given in comparatively better test scenarios.

Test scenarios:

- Execute **AT+QSCLKEX=1,2,10** to enable enhanced sleep function;
- Insert a China Unicom (U)SIM card and register to LTE Band 3;
- Establish a TCP long connection between the module and the server;
- Test duration: 0.5 hour.

### 3.3.1. EC200U Series Average Current Consumption in Different Sleep Modes

- Normal sleep mode

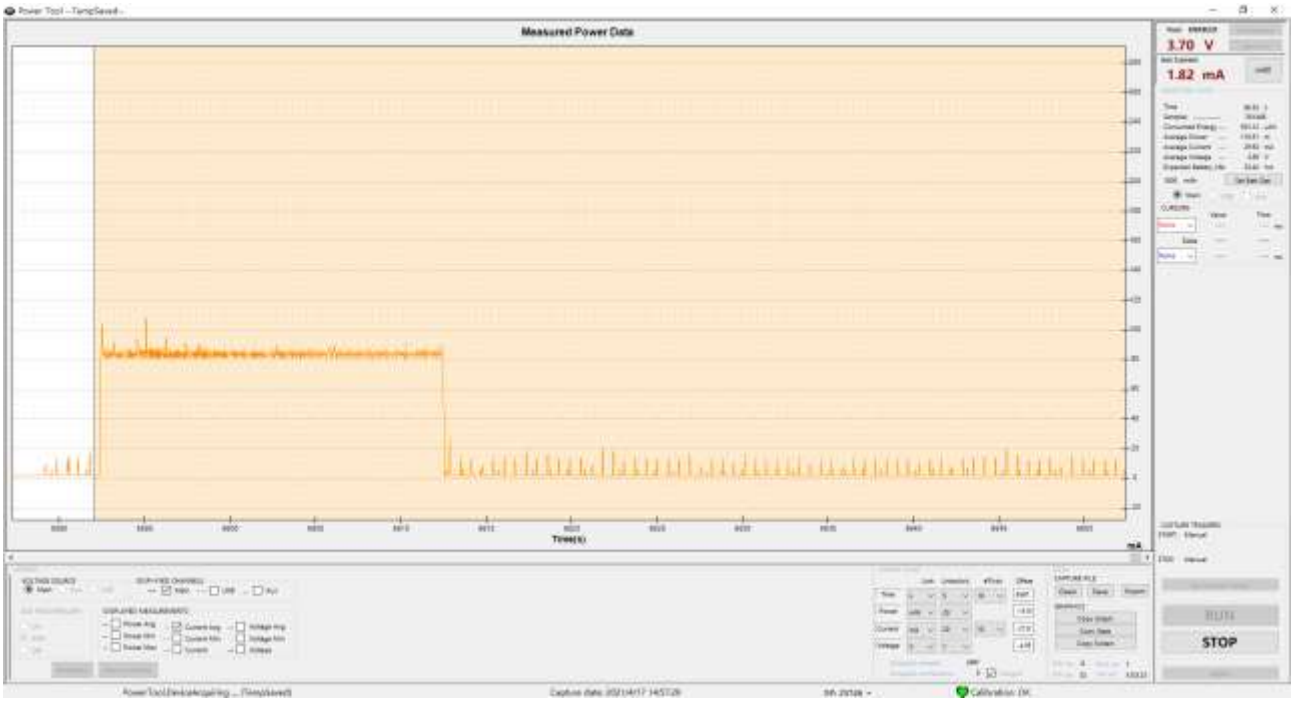


**Figure 1: Average Current Consumption in Normal Sleep Mode for EC200U Series**

As shown in the above figure, after receiving the data, the peak current duration is about 20 seconds, and then module enters sleep state. The average current consumption within 60 seconds is 29.92 mA.

- Enhanced sleep mode

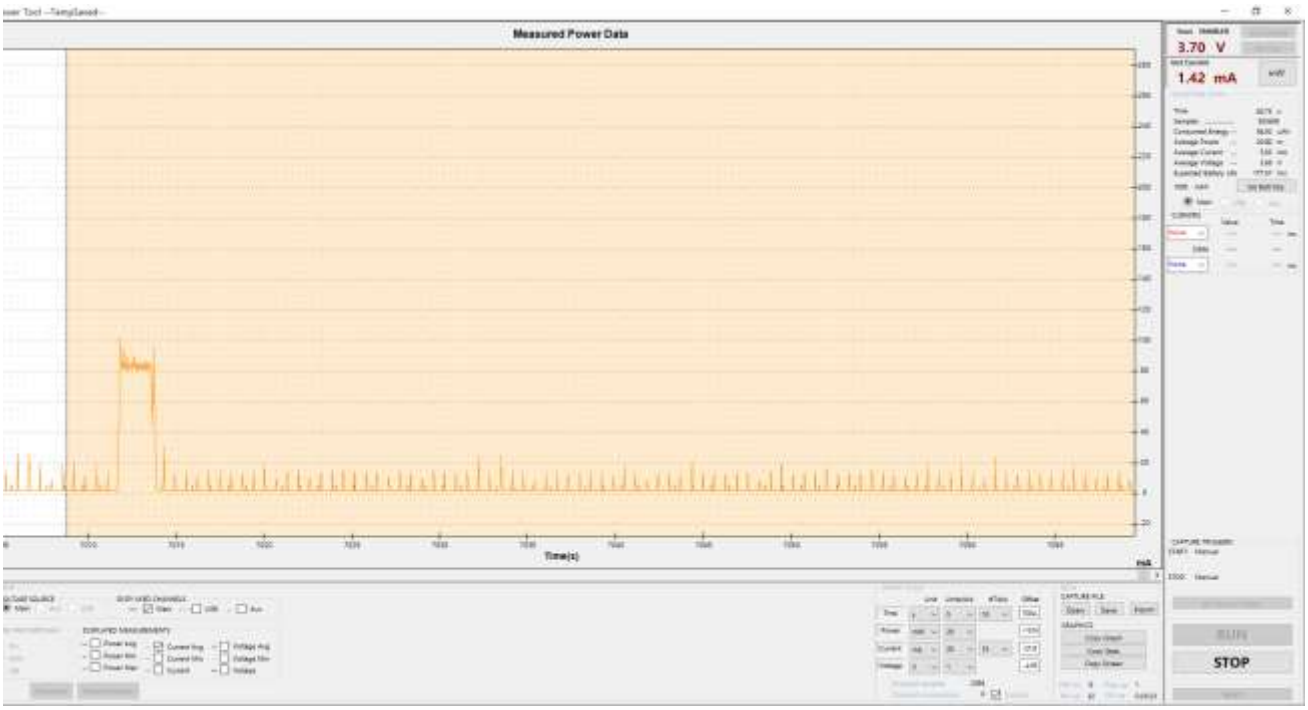


**Figure 2: Average Current Consumption in Enhanced Sleep Mode for EC200U Series**

As shown in the above figure, after receiving the data, the peak current duration is about 2 seconds, and then module enters sleep state. The average current consumption within 60 seconds is 29.92 mA.

From the comparison of ***Figure 1*** and ***Figure 2***, the module can quickly enter in sleep state after receiving and sending data in enhanced sleep mode, thereby reducing the average current consumption.

### 3.3.2. Average Current Consumption Comparison Between Different Sleep Modes

**Table 3: Average Current Consumption Comparison Between Different Sleep Modes**

| Operator/Network | Module | Normal Sleep Mode/ Enhanced Sleep Mode | Test Duration (H) | Average Current Consumption (mA) |
|---|---|---|---|---|
| Unicom LTE | EC200U Series | Normal sleep mode | 0.5 | 31.867 |
| | | Enhanced sleep mode | 0.5 | 5.844 |

## 3.4. Test Conclusion

By comparing the data before and after the enhanced sleep mode is enabled, power consumption reduction is more obvious in enhanced sleep mode.

## 3.5. Precautions

After the enhanced sleep mode is enabled, additional signaling burden will be imposed on the base station when the user initiates data interaction, so there may be a situation where the terminal cannot go online due to the network side punishment. However, the base station currently has no specific restrictions on these additional signaling interactions.

# 4 Appendix References

**Table 4: Related Documents**

| Document Name |
|---|
| [1] Quectel_EC200U&EG915U_Series_AT_Commands_Manual |
| [2] Quectel_EC200U&EG915U_Series_TCP(IP)_Application_Note |

**Table 5: Terms and Abbreviations**

| Abbreviation | Description |
|---|---|
| DTR | Data Terminal Ready |
| IP | Internet Protocol |
| LTE | Long Term Evolution |
| TA | Terminal Adapter |
| TCP | Transmission Control Protocol |