BG95&BG77&BG600L Series

eDRX Application Note

LPWA Module Series

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About the Document

Revision History

Version	Date	Author	Description
-	2021-12-10	Lane HAO	Creation of the document
1.0	2022-02-25	Lane HAO	First official release

Contents

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1 Introduction

This document introduces the extended Idle Discontinuous Reception (e-I-DRX) feature and explains how to use the e-I-DRX feature of Quectel BG95 series, BG77 and BG600L-M3 modules.

e-I-DRX is also known as eDRX. To simplify the description, eDRX will be used in this application note.

1.1. Applicable Modules

Table 1: Applicable Modules

Module Series	Model	Description
BG95	BG95-M1	Cat M1 only
	BG95-M2	Cat M1/Cat NB2
	BG95-M3	Cat M1/Cat NB2/EGPRS
	BG95-M4	Cat M1/Cat NB2, 450 MHz Supported
	BG95-M5	Cat M1/Cat NB2/EGPRS, Power Class 3
	BG95-M6	Cat M1/Cat NB2, Power Class 3
	BG95-MF	Cat M1/Cat NB2, Wi-Fi Positioning
BG77	BG77	Cat M1/Cat NB2
BG600L-M3	BG600L-M3	Cat M1/Cat NB2/EGPRS

2 Description of eDRX Feature

eDRX is introduced in *3GPP Release 13*. It is an extension of the DRX feature used by IoT devices to reduce power consumption. DRX is a mechanism that puts a device to sleep and then wakes it up after a fixed interval to receive downlink data. The basic principle of eDRX is to extend idle mode DRX cycles to allow the device to remain in a power-saving state for a longer period of time.

Applications that want to use extended idle mode DRX need to consider specific handling of mobile terminating services or data transfers, and in particular they need to consider the delay tolerance of mobile terminated data. A network side application may send mobile terminated data, an SMS, or a device trigger, and needs to be aware that extended idle mode DRX may be in place. A UE should request for extended idle mode DRX only when all expected mobile terminating communication is tolerant to delay. [1)]

The eDRX parameters include paging time window (PTW) and eDRX cycle. UE should set expected extended DRX parameters IE in an **Attach Request** or **Tracking Area Update Request** message to indicate that UE supports the idle eDRX feature. If the network supports eDRX feature, it sends the corresponding eDRX parameter values in the **Attach Accept** or **Tracking Area Update Accept** message to the UE. Regarding eMTC network, it should contain "eDRX-Allowed-r13 true" IE in the system information, otherwise, it should be considered that it does not support eDRX feature.

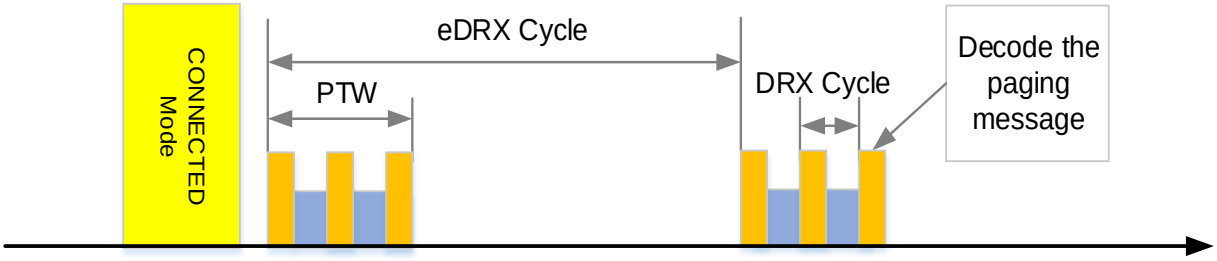


Figure 1: Function Overview

NOTE

1. [1)] Quoted from *3GPP TS 23.682* technical specification. For more information on eDRX mode, see *3GPP TS 23.682, clause 4.5.13 Extended idle mode DRX*.
2. The PTW is not started by receiving RRC release; it starts from the next PO (Paging Occasion). About how to calculate PO, it is mainly determined by UE_ID (IMSI). For more details, see *3GPP TS36.304, clause 7 Paging*.

3 eDRX Related AT Commands

3.1. AT Command Introduction

3.1.1. 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.

3.1.2. 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	**AT+<cmd>=?**	Test the existence of the corresponding command and return information about the type, value, or range of its parameter.
Read Command	**AT+<cmd>?**	Check the current parameter value of the corresponding 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.

3.2. 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.

3.3. Description of AT Commands

3.3.1. AT+CEDRXS eDRX Setting

This command controls the setting of the UE's eDRX (extended DRX) parameters.

AT+CEDRXS eDRX Setting	
Test Command **AT+CEDRXS=?**	Response **+CEDRXS: (**range of supported **<mode>**s**),(**list of supported **<AcT-type>**s**),(**range of supported **<Requested_eDRX_value>**s**)** **OK**
Read Command **AT+CEDRXS?**	Response **+CEDRXS: <AcT-type>[,<Requested_eDRX_value>]** **[+CEDRXS: <AcT-type>[,<Requested_eDRX_value>]** **[...]]** **OK**
Write Command **AT+CEDRXS=<mode>[,<AcT-type>[,<Requested_eDRX_value>]]**	Response **OK** If there is any other error: **ERROR**
Maximum Response Time	300 ms
Characteristics	This command takes effect immediately. The configuration will be saved automatically.
Reference 3GPP TS 27.007	

Parameter

<mode> Integer type. Disable or enable the use of eDRX in the UE.

0	Disable the use of eDRX
1	Enable the use of eDRX
2	Enable the use of eDRX and enable the URC **+CEDRXP: <AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]**
3	Disable the use of eDRX and discard all eDRX parameters or, if available, reset to the default values

<AcT-type> Integer type. The type of access technology.

0	Access technology is not using eDRX. This parameter value is only used in the URC.
4	eMTC
5	NB-IoT

<Requested_eDRX_value> String type. Half a byte in a 4-bit format.

bit				Description
4	3	2	1	E-UTRAN eDRX cycle
0	0	0	0	5.12 seconds
0	0	0	1	10.24 seconds
0	0	1	0	20.48 seconds
0	0	1	1	40.96 seconds
0	1	0	0	61.44 seconds
0	1	0	1	81.92 seconds
0	1	1	0	102.4 seconds
0	1	1	1	122.88 seconds
1	0	0	0	143.36 seconds
1	0	0	1	163.84 seconds
1	0	1	0	327.68 seconds
1	0	1	1	655.36 seconds
1	1	0	0	1310.72 seconds
1	1	0	1	2621.44 seconds
1	1	1	0	5242.88 seconds
1	1	1	1	10485.76 seconds

<NW-provided_eDRX_value> String type. Half a byte in a 4-bit format.

bit				Description
4	3	2	1	E-UTRAN eDRX cycle
0	0	0	0	5.12 seconds
0	0	0	1	10.24 seconds
0	0	1	0	20.48 seconds
0	0	1	1	40.96 seconds
0	1	0	0	61.44 seconds
0	1	0	1	81.92 seconds
0	1	1	0	102.4 seconds
0	1	1	1	122.88 seconds

	1	0	0	0	143.36 seconds
	1	0	0	1	163.84 seconds
	1	0	1	0	327.68 seconds
	1	0	1	1	655,36 seconds
	1	1	0	0	1310.72 seconds
	1	1	0	1	2621.44 seconds
	1	1	1	0	5242.88 seconds
	1	1	1	1	10485.76 seconds
<Paging_time_window>	String type. Half a byte in a 4-bit format.				
	eMTC mode				
	bit				Description
	4	3	2	1	Paging Time Window length
	0	0	0	0	1.28 seconds
	0	0	0	1	2.56 seconds
	0	0	1	0	3.84 seconds
	0	0	1	1	5.12 seconds
	0	1	0	0	6.4 seconds
	0	1	0	1	7.68 seconds
	0	1	1	0	8.96 seconds
	0	1	1	1	10.24 seconds
	1	0	0	0	11.52 seconds
	1	0	0	1	12.8 seconds
	1	0	1	0	14.08 seconds
	1	0	1	1	15.36 seconds
	1	1	0	0	16.64 seconds
	1	1	0	1	17.92 seconds
	1	1	1	0	19.20 seconds
	1	1	1	1	20.48 seconds
	NB-IoT mode				
	bit				Description
	4	3	2	1	Paging Time Window length
	0	0	0	0	2.56 seconds
	0	0	0	1	5.12 seconds
	0	0	1	0	7.68 seconds
	0	0	1	1	10.24 seconds
	0	1	0	0	12.8 seconds
	0	1	0	1	15.36 seconds
	0	1	1	0	17.92 seconds
	0	1	1	1	20.48 seconds
	1	0	0	0	23.04 seconds
	1	0	0	1	25.6 seconds
	1	0	1	0	28.16 seconds
	1	0	1	1	30.72 seconds
	1	1	0	0	33.28 seconds

	1	1	0	1	35.84 seconds
	1	1	1	0	38.4 seconds
	1	1	1	1	40.96 seconds

Example

```
AT+CEDRXS=1,4,"0000"                    //Set the requested eDRX cycle to 5.12 seconds.
OK
AT+CEDRXS=0,4                           //Disable eDRX function.
OK
AT+CEDRXS=2,4,"0000"                    //Set the requested eDRX cycle to 5.12 seconds and enable
                                        the URC.
OK

+CEDRXP: 4,"0000","0000","0000"         //Network accepted the eDRX parameters.
```

3.3.2. AT+QPTWEDRXS Paging Time Window Value and eDRX Setting

This command controls the setting of the UE's paging time window (PTW) value and eDRX parameters, whether the UE wants to apply PTW and eDRX or not, as well as the requested PTW and eDRX cycle for each specified type of access technology.

It also controls the presentation of the URC **+QPTWEDRXP: <AcT-type>[,<Requested_paging_time_window>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]]** when **<mode>**=2 and there is a change in the paging time window and eDRX parameters provided by the network.

A special form of the command can be given as **AT+QPTWEDRXS=3**. In this form, PTW and eDRX are disabled and data for all parameters in **AT+QPTWEDRXS** are removed or, if available, set to the default values.

The Read Command returns the current settings for each defined value of **<AcT-type>**.

The Test Command returns the supported **<mode>**s and the value ranges for the access technology and the requested PTW and requested eDRX value as compound values.

AT+QPTWEDRXS Paging Time Window Value and eDRX Setting	
Test Command **AT+QPTWEDRXS=?**	Response **+QPTWEDRXS**: **(**range of supported **<mode>**s**),(**list of supported **<AcT-type>**s**),(**range of supported **<Requested_paging_time_window>**s**),(**range of supported **<Requested_eDRX_value>**s**)** **OK**

Read Command **AT+QPTWEDRXS?**	Response **+QPTWEDRXS: <AcT-type>[,<Requested_paging_time_window>,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]** **[…]** **OK** If there is any error: **+CME ERROR: <err>** If there is any other error: **ERROR**
Write Command **AT+QPTWEDRXS=<mode>[,<AcT-type>[,<Requested_paging_time_window>[,<Requested_eDRX_value>]]]**	Response **OK** If there is any error: **+CME ERROR: <err>** If there is any other error: **ERROR**
Maximum Response Time	300 ms
Characteristics	This command takes effect immediately. The configuration will be saved automatically.

Parameter

<mode>	Integer type. Disable or enable the use of requested PTW and eDRX in the UE. This parameter is applicable to all specified types of access technology, i.e., the most recent setting of **<mode>** will take effect for all specified values of **<AcT>** returned with **AT+QNWINFO**. For more details about the AT command, see ***document [3]***. 0 Disable the use of requested PTW and eDRX feature 1 Enable the use of requested PTW and eDRX feature 2 Enable the use of requested PTW and eDRX, and enable the URC: **+QPTWEDRXP: <AcT-type>[,<Requested_paging_time_window>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]]** 3 Disable the use of eDRX and discard all eDRX parameters or, if available, reset to the default values.
<AcT-type>	Integer type. The type of access technology. This AT command specifies the relationship between the type of access technology and the requested eDRX value.

0	Access technology is not using eDRX. This parameter value is only used in the URC.
4	eMTC
5	NB-IoT

<Requested_paging_time_window> String type. Half a byte in a 4-bit format.

eMTC mode

bit				Description
4	3	2	1	Paging Time Window length
0	0	0	0	1.28 seconds
0	0	0	1	2.56 seconds
0	0	1	0	3.84 seconds
0	0	1	1	5.12 seconds
0	1	0	0	6.4 seconds
0	1	0	1	7.68 seconds
0	1	1	0	8.96 seconds
0	1	1	1	10.24 seconds
1	0	0	0	11.52 seconds
1	0	0	1	12.8 seconds
1	0	1	0	14.08 seconds
1	0	1	1	15.36 seconds
1	1	0	0	16.64 seconds
1	1	0	1	17.92 seconds
1	1	1	0	19.20 seconds
1	1	1	1	20.48 seconds

NB-IoT mode

bit				Description
4	3	2	1	Paging Time Window length
0	0	0	0	2.56 seconds
0	0	0	1	5.12 seconds
0	0	1	0	7.68 seconds
0	0	1	1	10.24 seconds
0	1	0	0	12.8 seconds
0	1	0	1	15.36 seconds
0	1	1	0	17.92 seconds
0	1	1	1	20.48 seconds
1	0	0	0	23.04 seconds
1	0	0	1	25.6 seconds
1	0	1	0	28.16 seconds
1	0	1	1	30.72 seconds
1	1	0	0	33.28 seconds
1	1	0	1	35.84 seconds
1	1	1	0	38.4 seconds
1	1	1	1	40.96 seconds

<Requested_eDRX_value> String type. Half a byte in a 4-bit format.

	bit				Description
	4	3	2	1	E-UTRAN eDRX cycle
	0	0	0	0	5.12 seconds
	0	0	0	1	10.24 seconds
	0	0	1	0	20.48 seconds
	0	0	1	1	40.96 seconds
	0	1	0	0	61.44 seconds
	0	1	0	1	81.92 seconds
	0	1	1	0	102.4 seconds
	0	1	1	1	122.88 seconds
	1	0	0	0	143.36 seconds
	1	0	0	1	163.84 seconds
	1	0	1	0	327.68 seconds
	1	0	1	1	655.36 seconds
	1	1	0	0	1310.72 seconds
	1	1	0	1	2621.44 seconds
	1	1	1	0	5242.88 seconds
	1	1	1	1	10485.76 seconds
<NW-provided_eDRX_value>	String type. Half a byte in a 4-bit format.				
	bit				Description
	4	3	2	1	E-UTRAN eDRX cycle
	0	0	0	0	5.12 seconds
	0	0	0	1	10.24 seconds
	0	0	1	0	20.48 seconds
	0	0	1	1	40.96 seconds
	0	1	0	0	61.44 seconds
	0	1	0	1	81.92 seconds
	0	1	1	0	102.4 seconds
	0	1	1	1	122.88 seconds
	1	0	0	0	143.36 seconds
	1	0	0	1	163.84 seconds
	1	0	1	0	327.68 seconds
	1	0	1	1	655.36 seconds
	1	1	0	0	1310.72 seconds
	1	1	0	1	2621.44 seconds
	1	1	1	0	5242.88 seconds
	1	1	1	1	10485.76 seconds
<Paging_time_window>	String type. Half a byte in a 4-bit format.				
	eMTC mode				
	bit				Description
	4	3	2	1	Paging Time Window length
	0	0	0	0	1.28 seconds
	0	0	0	1	2.56 seconds
	0	0	1	0	3.84 seconds

		0	0	1	1	5.12 seconds
		0	1	0	0	6.4 seconds
		0	1	0	1	7.68 seconds
		0	1	1	0	8.96 seconds
		0	1	1	1	10.24 seconds
		1	0	0	0	11.52 seconds
		1	0	0	1	12.8 seconds
		1	0	1	0	14.08 seconds
		1	0	1	1	15.36 seconds
		1	1	0	0	16.64 seconds
		1	1	0	1	17.92 seconds
		1	1	1	0	19.20 seconds
		1	1	1	1	20.48 seconds
		NB-IoT mode				
		bit				Description
		4	3	2	1	Paging Time Window length
		0	0	0	0	2.56 seconds
		0	0	0	1	5.12 seconds
		0	0	1	0	7.68 seconds
		0	0	1	1	10.24 seconds
		0	1	0	0	12.8 seconds
		0	1	0	1	15.36 seconds
		0	1	1	0	17.92 seconds
		0	1	1	1	20.48 seconds
		1	0	0	0	23.04 seconds
		1	0	0	1	25.6 seconds
		1	0	1	0	28.16 seconds
		1	0	1	1	30.72 seconds
		1	1	0	0	33.28 seconds
		1	1	0	1	35.84 seconds
		1	1	1	0	38.4 seconds
		1	1	1	1	40.96 seconds
<err>	Error codes. For more details, see ***Chapter 5***.					

3.3.3. AT+CEDRXRDP Read Dynamic Parameters

The Execution Command returns **+CEDRXRDP: <AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]** if eDRX is used for the cell that the MS is currently registered to.

AT+CEDRXRDP Read Dynamic Parameters	
Test Command **AT+CEDRXRDP=?**	Response **OK**

Execution Command **AT+CEDRXRDP**	Response **+CEDRXRDP: <AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]** **OK**
Maximum Response Time	300 ms
Characteristics	/
Reference 3GPP TS 27.007	

Parameter

<AcT_type> Integer type. The type of access technology.

0	Access technology is not using eDRX
4	eMTC
5	NB-IoT

<requested_eDRX_value> String type. Half a byte in a 4-bit format.

bit				Description
4	3	2	1	E-UTRAN eDRX cycle
0	0	0	0	5.12 seconds
0	0	0	1	10.24 seconds
0	0	1	0	20.48 seconds
0	0	1	1	40.96 seconds
0	1	0	0	61.44 seconds
0	1	0	1	81.92 seconds
0	1	1	0	102.4 seconds
0	1	1	1	122.88 seconds
1	0	0	0	143.36 seconds
1	0	0	1	163.84 seconds
1	0	1	0	327.68 seconds
1	0	1	1	655,36 seconds
1	1	0	0	1310.72 seconds
1	1	0	1	2621.44 seconds
1	1	1	0	5242.88 seconds
1	1	1	1	10485.76 seconds

<NW_provided_eDRX_value> String type. Half a byte in a 4-bit format.

bit				Description
4	3	2	1	E-UTRAN eDRX cycle
0	0	0	0	5.12 seconds
0	0	0	1	10.24 seconds
0	0	1	0	20.48 seconds
0	0	1	1	40.96 seconds
0	1	0	0	61.44 seconds

	0	1	0	1	81.92 seconds
	0	1	1	0	102.4 seconds
	0	1	1	1	122.88 seconds
	1	0	0	0	143.36 seconds
	1	0	0	1	163.84 seconds
	1	0	1	0	327.68 seconds
	1	0	1	1	655,36 seconds
	1	1	0	0	1310.72 seconds
	1	1	0	1	2621.44 seconds
	1	1	1	0	5242.88 seconds
	1	1	1	1	10485.76 seconds
<Paging_time_window>	String type. Half a byte in a 4-bit format.				
	eMTC mode				
	bit				Description
	4	3	2	1	Paging Time Window length
	0	0	0	0	1.28 seconds
	0	0	0	1	2.56 seconds
	0	0	1	0	3.84 seconds
	0	0	1	1	5.12 seconds
	0	1	0	0	6.4 seconds
	0	1	0	1	7.68 seconds
	0	1	1	0	8.96 seconds
	0	1	1	1	10.24 seconds
	1	0	0	0	11.52 seconds
	1	0	0	1	12.8 seconds
	1	0	1	0	14.08 seconds
	1	0	1	1	15.36 seconds
	1	1	0	0	16.64 seconds
	1	1	0	1	17.92 seconds
	1	1	1	0	19.20 seconds
	1	1	1	1	20.48 seconds
	NB-IoT mode				
	bit				Description
	4	3	2	1	Paging Time Window length
	0	0	0	0	2.56 seconds
	0	0	0	1	5.12 seconds
	0	0	1	0	7.68 seconds
	0	0	1	1	10.24 seconds
	0	1	0	0	12.8 seconds
	0	1	0	1	15.36 seconds
	0	1	1	0	17.92 seconds
	0	1	1	1	20.48 seconds
	1	0	0	0	23.04 seconds
	1	0	0	1	25.6 seconds

	1	0	1	0	28.16 seconds
	1	0	1	1	30.72 seconds
	1	1	0	0	33.28 seconds
	1	1	0	1	35.84 seconds
	1	1	1	0	38.4 seconds
	1	1	1	1	40.96 seconds

Example

```
AT+CEDRXS=1,4,"0000"                    //Set the requested eDRX cycle to 5.12 seconds.
OK
AT+CEDRXRDP
+CEDRXRDP: 4,"0000","0000","0000"       //Network accepted the eDRX parameters.

OK
AT+CEDRXS=0,4                           //Disable eDRX feature.
OK
AT+CEDRXRDP
+CEDRXRDP: 0                            //Access technology is not using eDRX.

OK
```

4 FAQ

This chapter contains some typical issues and provides corresponding answer.

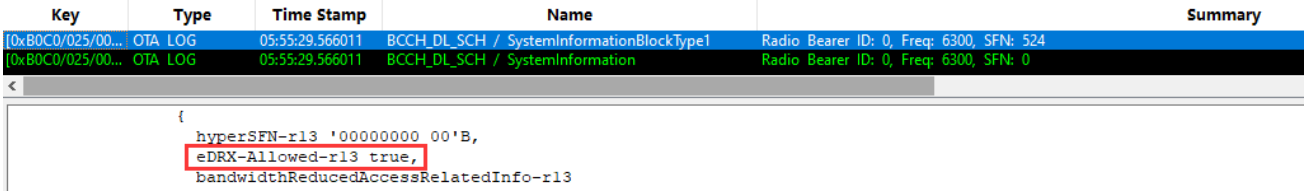
1. **Q:** Can the module use eDRX without enabling PSM?
   A: The eDRX can be enabled without enabling the PSM.

2. **Q:** How to check the eDRX value used by the module?
   A: Execute **AT+CEDRXRDP** to query the eDRX value used by the module.

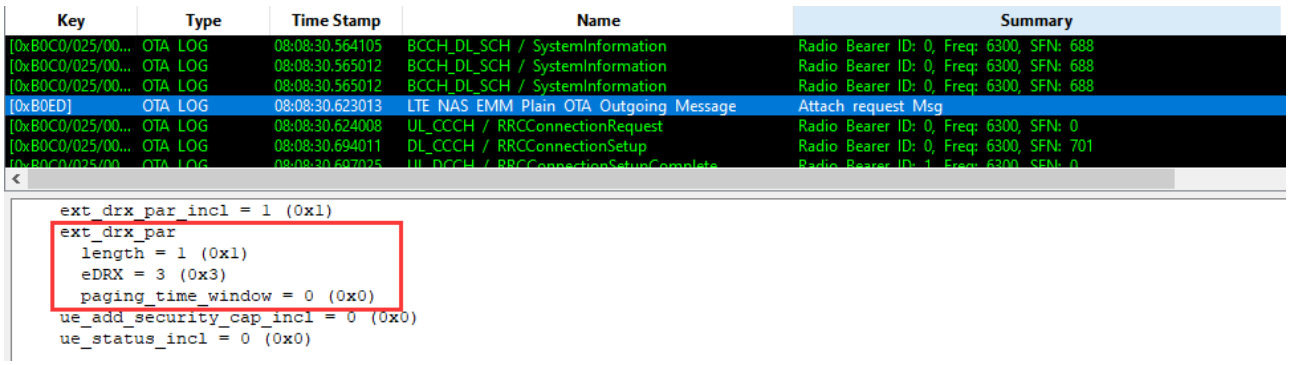
3. **Q:** Does the PTW start from the moment it receives RRC release message?
   A: No. It starts from next PO (Paging Occasion), after the module registers the network. Every PO can be calculated by the module.

4. **Q:** Does the eDRX cause downlink data delay?
   A: Yes. Enabling the eDRX feature will make the module go into sleep mode and then wake up after a fixed interval to receive downlink data. Network does not send downlink data during eDRX idle status.

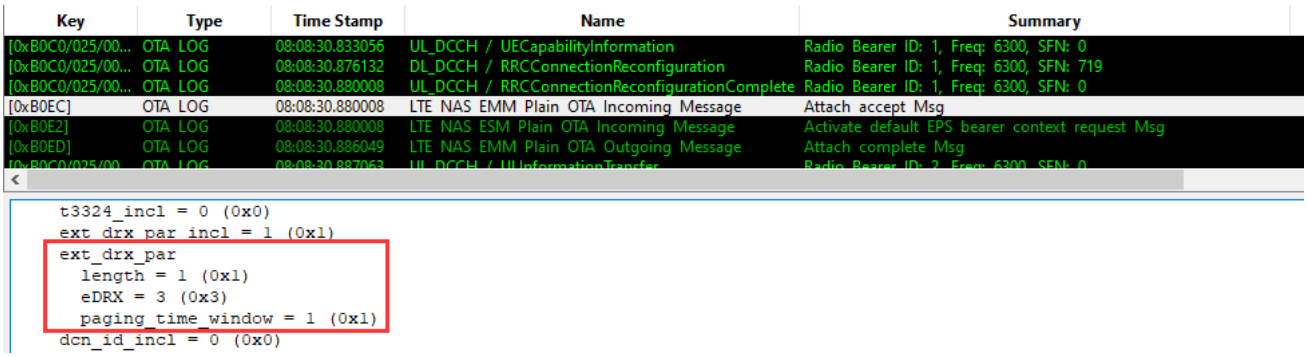
5. **Q:** Why can't the module use eDRX even though the module requested eDRX values and the network assigned eDRX values?
   A: Regarding eMTC network, "eDRX-Allowed-r13 true" IE should be included in the system information, otherwise, it should be considered that it does not support eDRX feature.



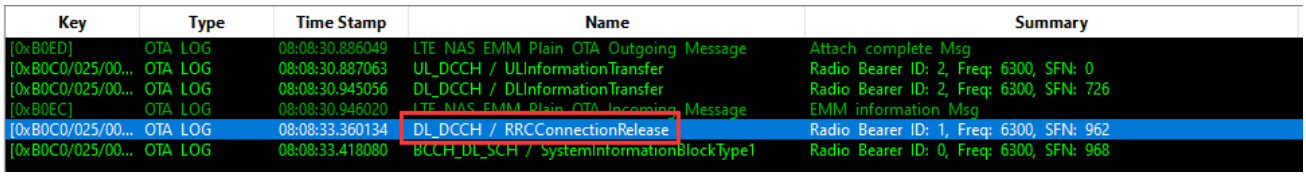
6. **Q:** How to check the eDRX status in the QXDM log?
   A: 1) UE sets eDRX parameters (PTW: 1.28 s; eDRX cycle: 40.96 s) in **Attach Request Msg**.



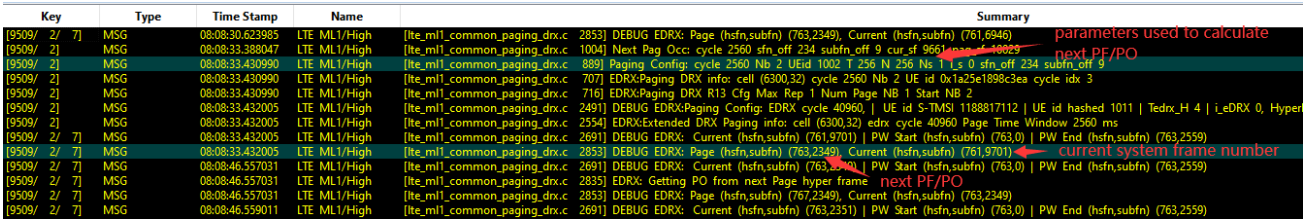
2) Network assigns the eDRX parameter (PTW: 2.56 s; eDRX cycle: 40.96 s) in **Attach Accept Msg**.



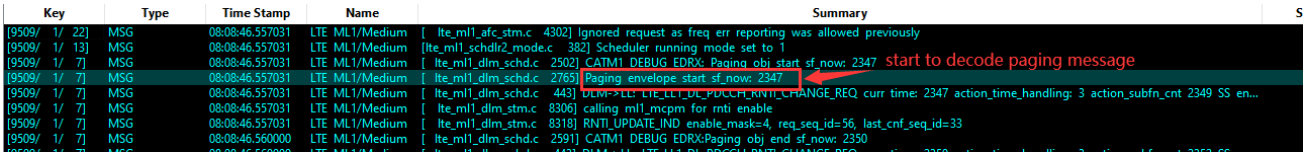
3) UE received the **RRCConnectionRelease** message.



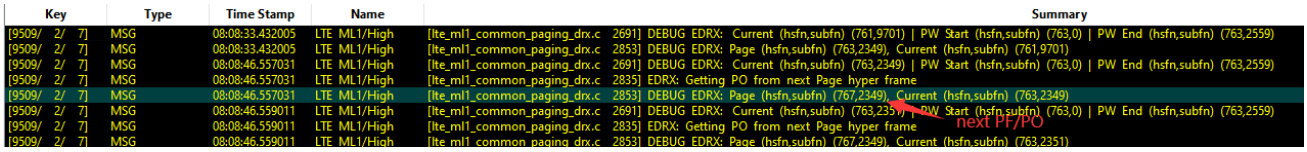
4) UE calculates the next PF/PO, then enters sleep mode and wakes up before the next PTW arrives.



5) UE wakes up to decode paging message when PF/PO arrives.



6) If no paging message is received, UE waits for the next PF/PO.



5 Summary of Error Codes

Final result code **+CME ERROR: <err>** indicates an error related to mobile equipment or network. The operation of **+CME ERROR: <err>** final result code is similar to the regular **ERROR** result code: if **+CME ERROR: <err>** is the result code for any of the commands in a command line, none of the following commands in the same command line is executed (neither **ERROR** nor **OK** result code shall be returned as a result of a completed command line execution). The format of **<err>** can be either numeric or verbose. This is set with **AT+CMEE**.

The following table lists most general and GRPS related **ERROR** codes. For some GSM protocol failure causes described in GSM specifications, the corresponding **ERROR** codes are not included.

Table 3: Summary of CME ERROR Codes

Numeric <err> Value	Verbose <err> Value
0	phone failure
1	no connection to phone
2	phone-adaptor link reserved
3	operation not allowed
4	operation not supported
5	PH-SIM PIN required
6	PH-FSIM PIN required
7	PH-FSIM PUK required
10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
14	SIM busy

15	SIM wrong
16	incorrect password
17	SIM PIN2 required
18	SIM PUK2 required
20	memory full
21	invalid index
22	not found
23	memory failure
24	text string too long
25	invalid characters in text string
26	dial string too long
27	invalid characters in dial string
30	no network service
31	network timeout
32	network not allowed - emergency calls only
40	network personalization PIN required
41	network personalization PUK required
42	network subset personalization PIN required
43	network subset personalization PUK required
44	service provider personalization PIN required
45	service provider personalization PUK required
46	corporate personalization PIN required
47	corporate personalization PUK required

6 Appendix References

Table 4: Related Documents

Document Name	
[1]	3GPP TS 23.682 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Architecture enhancements to facilitate communications with packet data networks and applications
[2]	3GPP TS36.304 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode
[3]	Quectel_BG95&BG77&BG600L_Series_AT_Commands_Manual

Table 5: Terms and Abbreviations

Abbreviation	Description
3GPP	3rd Generation Partnership Project
DRX	Discontinuous Reception
eDRX	Extended Discontinuous Reception
EGPRS	Enhanced General Packet Radio Service
eMTC	Enhanced Machine-Type Communication
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
IE	Item Element
IMSI	International Mobile Subscriber Identity
IoT	Internet of Things

MS	Mobile Station
NB-IoT	Narrowband Internet of Things
PIN	Personal Identification Number
PO	Paging Occasion
PF	Paging Frame
PSM	Power Saving Mode
PTW	Paging Time Window
PUK	PIN Unlock Key
RRC	Radio Resource Control
SMS	Short Message Service
UE	User Equipment
URC	Unsolicited Result Code
(U)SIM	Universal Subscriber Identity Module
Wi-Fi	Wireless Fidelity