BM70 - BLEDK3 Application Note

Advanced Info

Revision History

Date	Revision Content	Version
2015/10/22	(Advanced Info)	draft

Content

1. Overview

This document describes the general application information of BM70 module and it's BLEDK3 application. Users can read this document to familiar with the test environment of tools and the related document. Some application examples also illustrated. Some notifications about mass production also listed.

2. EVB and BLEDK3 test environment

2.1. BM70BLES1FC2 EVB

BM70BLES1FC2 EVB(Figure 1) is the default evaluation board with module BM70BLES1FC2 (IS1870SF BLE chip, antenna and shielding case) implemented on the EVB. Test interfaces supported for all application function are connected out. The supported test interface is listed in Table 1. For more detail usage please see "**BM70BLES1FC2_EVB User Guide**" and "**BM70_BM71 Data Sheet**"

Figure 1: BM70BLES1FC2 EVB

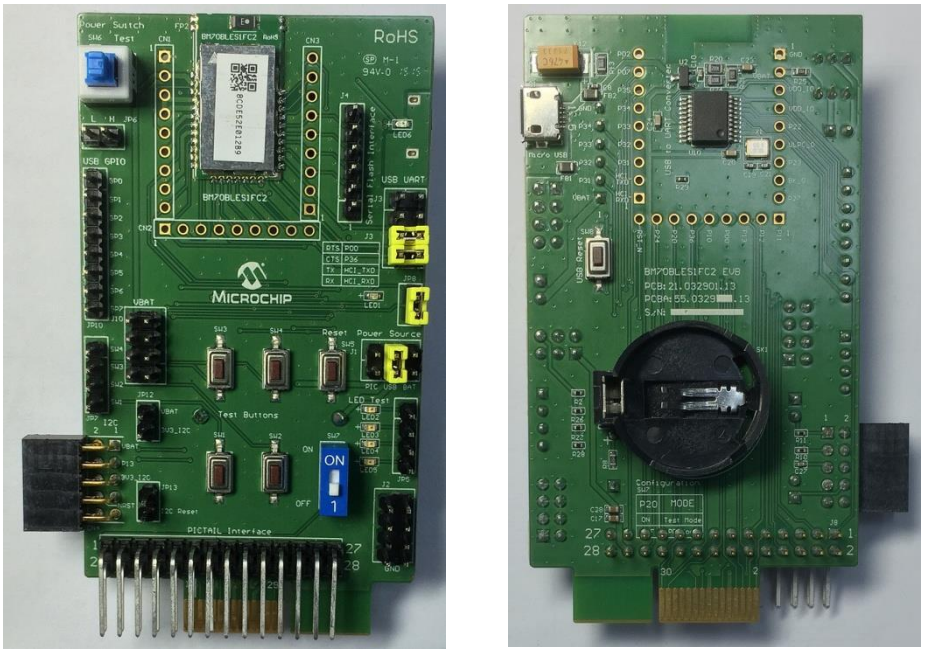


Table-1 Application Interface of BM70BLES1FC2 EVB

1.Power Source Input Select(PICTAIL/USB/BAT)	7. Test buttons(include reset)/LEDs interface
2.UART interface with flow control	8. I2C interface
3.Module test interface	9. DIP switch for mode select
4.USB GPIO test interface	10. USB to UART converter with micro usb connector
5. Power switch test buttons	11. CR2032 button cell battery jack
6. Serial flash interface	12. PICTAIL Interface

2.2. BLEDK3 Tools and Materials

BLEDK3 is one of the IS1870SF BLE application firmware which support the following features:

- BLE UART Transparent
- BLE GATT Based Transceiver
- Beacon

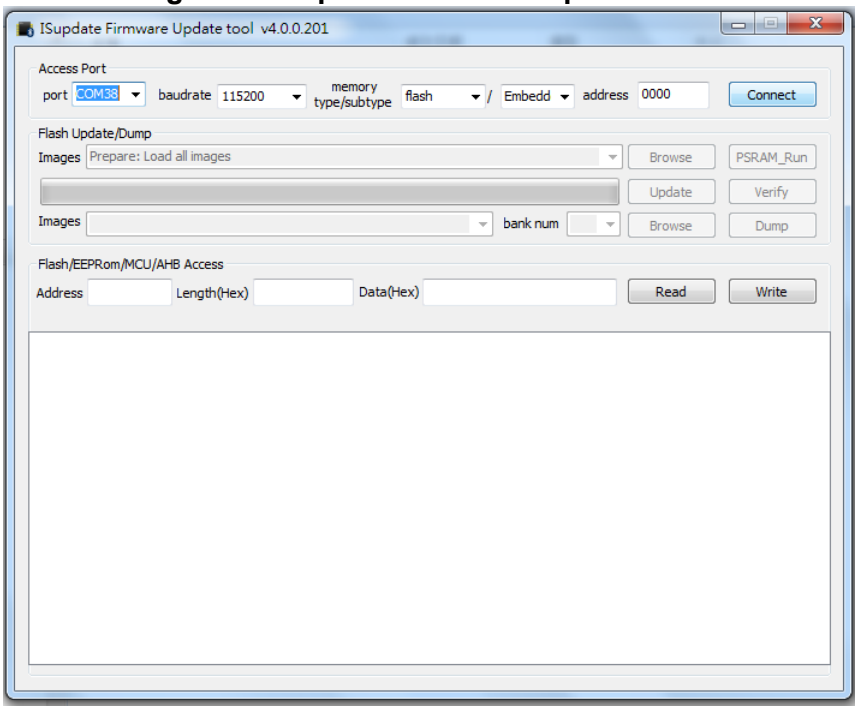
2.2.1 BLEDK3 Release Note

Read first "**BLEDK3 Release Note** ", it describes supported software features for the BLEDK3.

2.2.2 Flash Download Tool

If necessary, new BLEDK3 firmware can be updated with the "**ISupdate Firmware Update Tool**". The download procedure is described in "**BM70BLES1FC2_EVB User Guide**".

Figure 2: ISupdate Firmware Update Tool



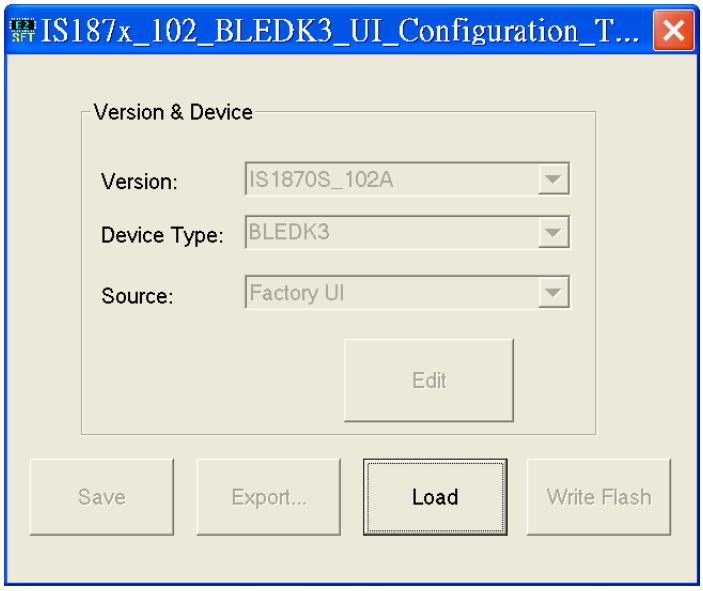
Note: Verify BLEDK3 device features in the "Release Note" Document. If an update to newer firmware version is necessary, then the flash code should be downloaded first, before the UI parameters are loaded. As the flash update process could overwrite the UI parameter configuration.

2.2.3 UI Tool

Configure the UI parameter by UI tool, then download the UI table to flash in BM70 module.

- UI tool user guide: **"User Guide of BLEDK3 UI Tool"**
- UI table download procedure: " **BM70BLES1FC2_EVB User Guide**"
- UI table for mass production: Save UI table, the ***.hex** file is for mass production.

Figure 3: ISupdate Firmware Update Tool



2.2.4 UART Command Tool

UART command set of BLEDK3 is described in "**BLEDK3 UART command set**" document.

BLEDK3 uart command tool (windows based) operates on either auto pattern or manual pattern.

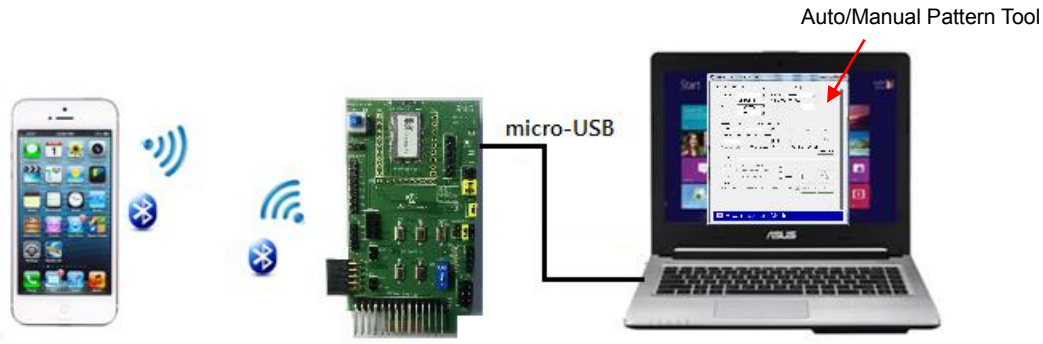
- Auto pattern**, BLEDK3** will be executed base on internal state machine that can be configured by UI tool, it only supports BLE Slave and build-in services.
- Manual pattern, **BLEDK3** will be executed base on MCU command totally, it supports both BLE Master and BLE slave by using UART protocol with MCU. And appended services only can operate in manual pattern.

Supported tools and user menu:

- Auto Pattern: **"BLEDK3 Auto Pattern Test Tool.exe"**, **"User Guide of BLEDK3 Auto Pattern Tool"**
- Manual Pattern: **"BLEDK3 Manual Test Tool.exe"**, **"User Guide of BLEDK3 Manual Pattern Tool"**

Please read the **"BM70BLES1FC2_EVB User Guide"** for set up the test environment.

Figure 4: BLEDK3 test connection between PC and smart phone



In the connection diagram, PC and the tool is acted as a MCU role to communicate with BM70 module by UART command set.

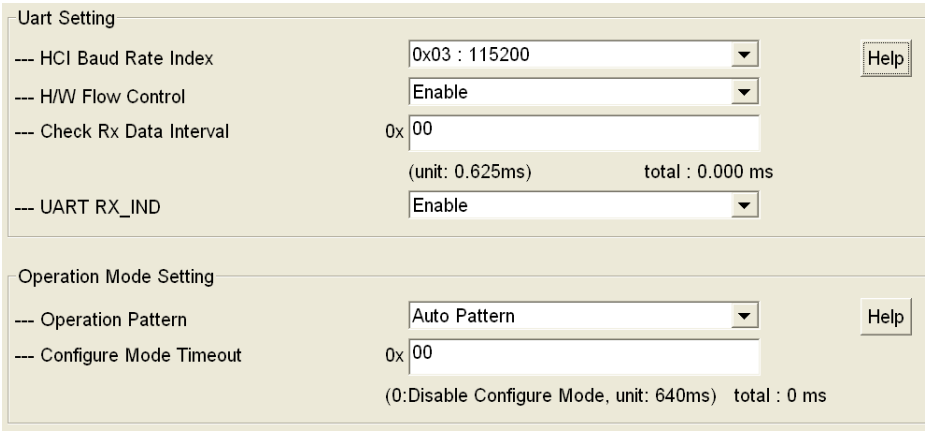
3. Auto/Manual Pattern Tool vs EVB Connection Setup

This chapter demonstrates the EVB GPIO connection when setup the UI and UART command tool. Both auto pattern and manual pattern tool are described.

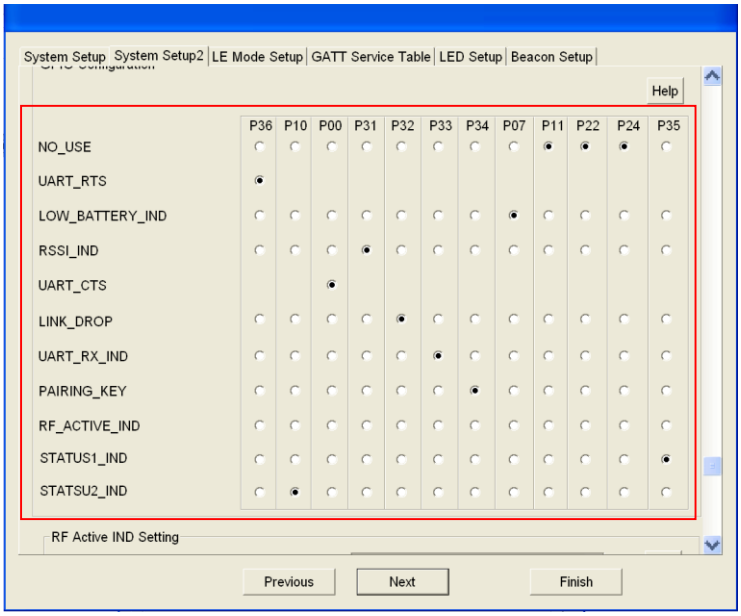
3.1 EVB Connection vs. Auto Pattern Tool and UI Tool Setup

a. Set up UI tool => Flow Control/RX_IND/Auto Pattern/GPIO Configuration. Download the UI table to EVB.

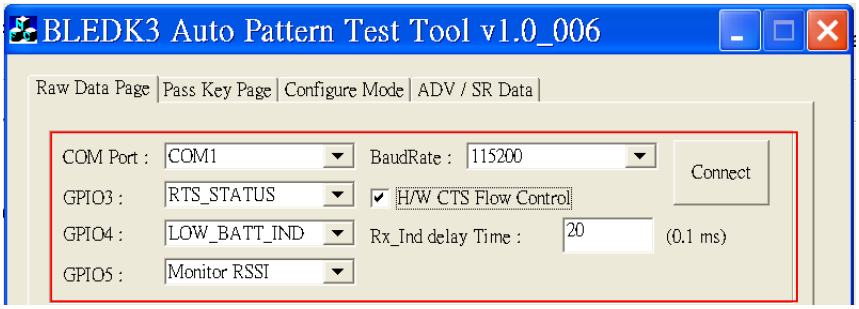
i. UI Tool: in system setup page, enable Flow Control, RX_IND and select auto pattern mode



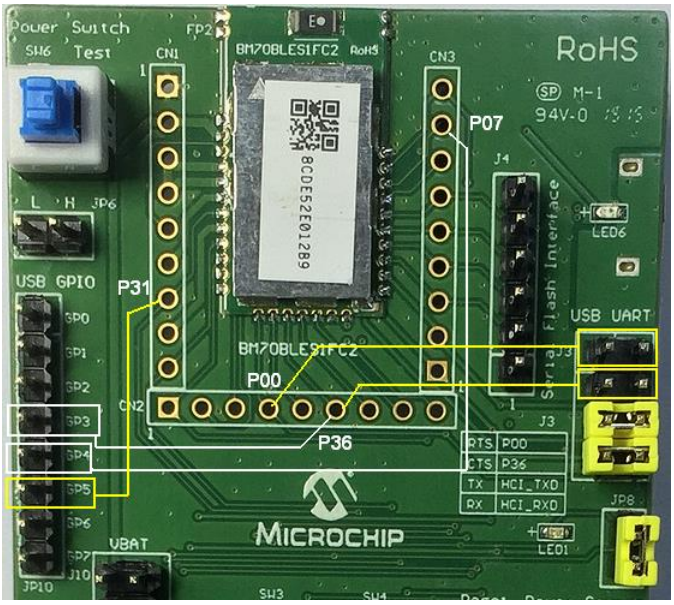
ii. UI Tool: in system setup2 page, configure the GPIO vs function mapping



b. Mapping the USB GPIO setting to functions in Auto Pattern Test Tool



c. Connect the configured module GPIO pin to USB GPIO pin as below.



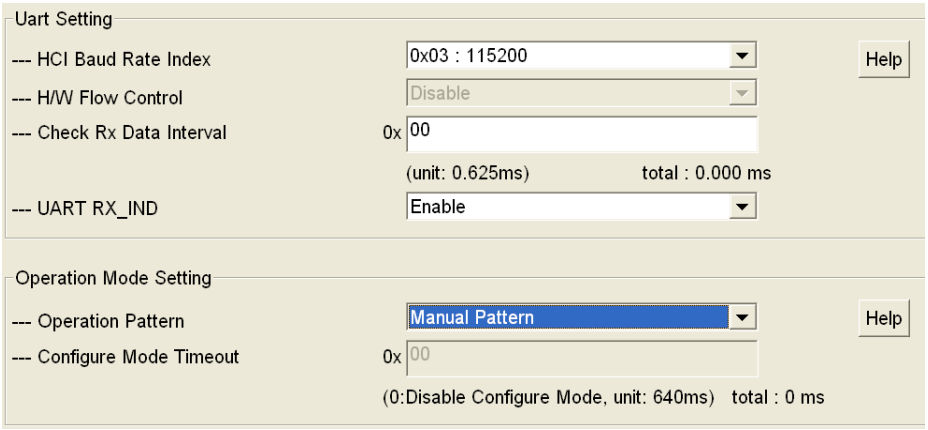
d. In this example, the mapping table between module and USB GPIO is as below:

BM70 GPIO Pin	USB GPIO	BLEDK3 Configured IO Function
P00	RTS	CTS
P07	GP4	LOW_BATTERY_IND
P31	GP5	RSSI_IND
P36	GP3 or CTS	RTS

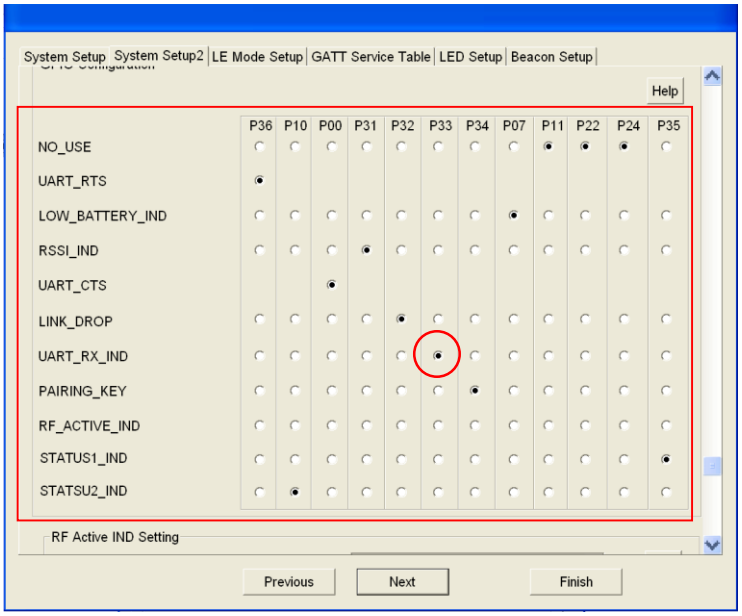
3.2 EVB Connection vs. Manual Pattern Tool and UI Tool Setup

a. Set up UI tool => Flow Control/RX_IND/Manual Pattern/GPIO Configuration. Download the UI table to EVB.

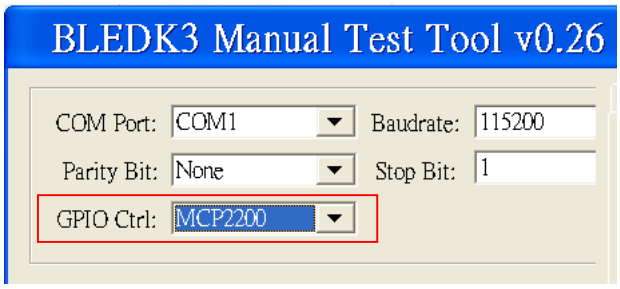
i. UI Tool: in system setup page, enable Flow Control, RX_IND and select Manual pattern mode



ii. UI Tool: in system setup2 page, configure the GPIO vs function mapping. In manual pattern tool, only RX_IND configuration is valid.



b. Manual Pattern Test Tool



c. Connect the P33(configured as RX_IND) to USB GPIO GP0 as below

4. Current Consumption Test Example

This chapter demonstrates how to measure the current consumption of BLEDK3 in BM70BLES1FC2 EVB. The current consumption of standby, connected, connected TX/RX and shutdown mode will be measured.

4.1 Test Condition:

Test EVB: BM70BLES1FC2 EVB

Flash code: BLEDK3 V1.03

UI Tool: IS187x_001_BLEDK3_UI v100.123

Test Phone: iPhone 6+ with iOS 9.02

Test APP: BLEDK3 V1.2

VBAT=3.3V,

UI: LED turn off (JP8 Jumper Off)

4.2 Standby Mode Current

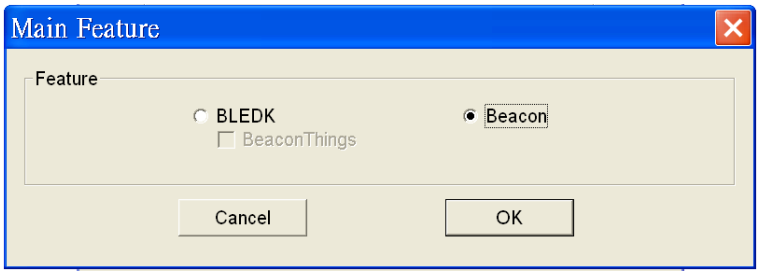
-Test Procedure:

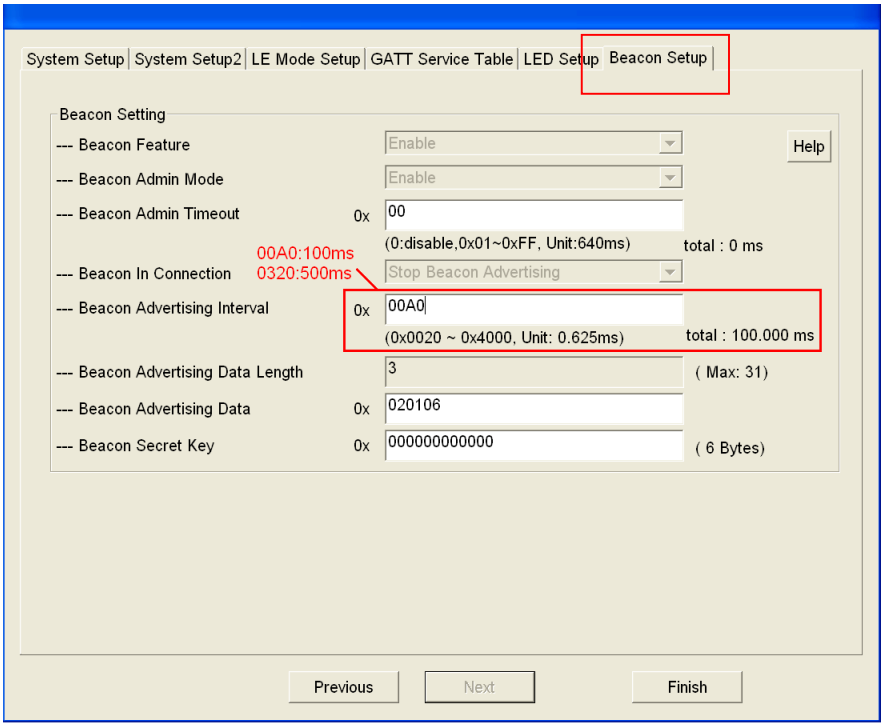
a. Set UI to required test configuration (Beacon Mode) and download UI table to flash.

b. Set EVB in application mode and power on

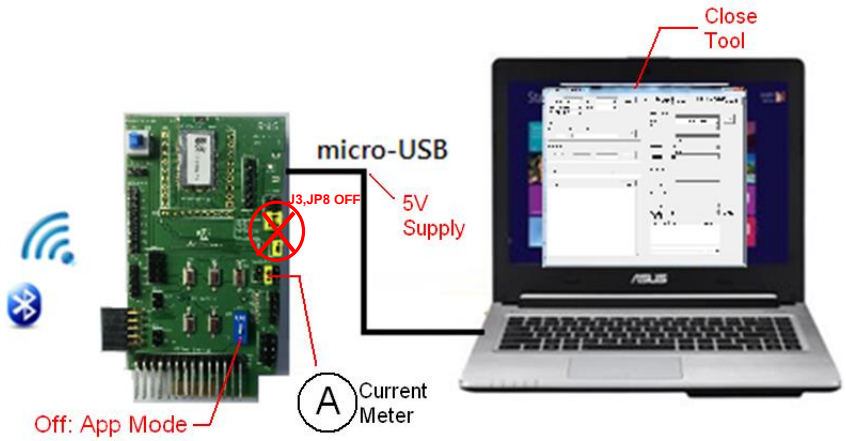
c. Measure the current at J1 jumper

-UI setting: Beacon only, ADV Interval: 100ms or 500ms





- Test Connection:



4.3 Connected Mode Current

-Test Procedure:

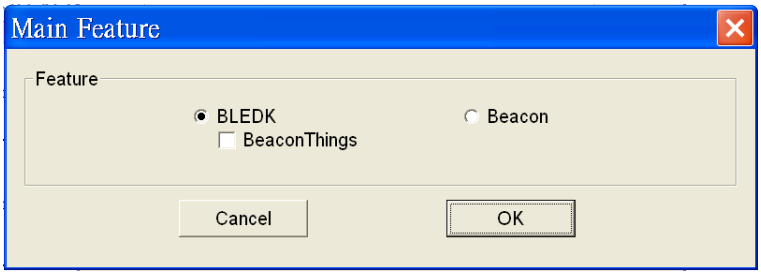
a. Set UI to required test configuration (as below) and download UI table to flash.

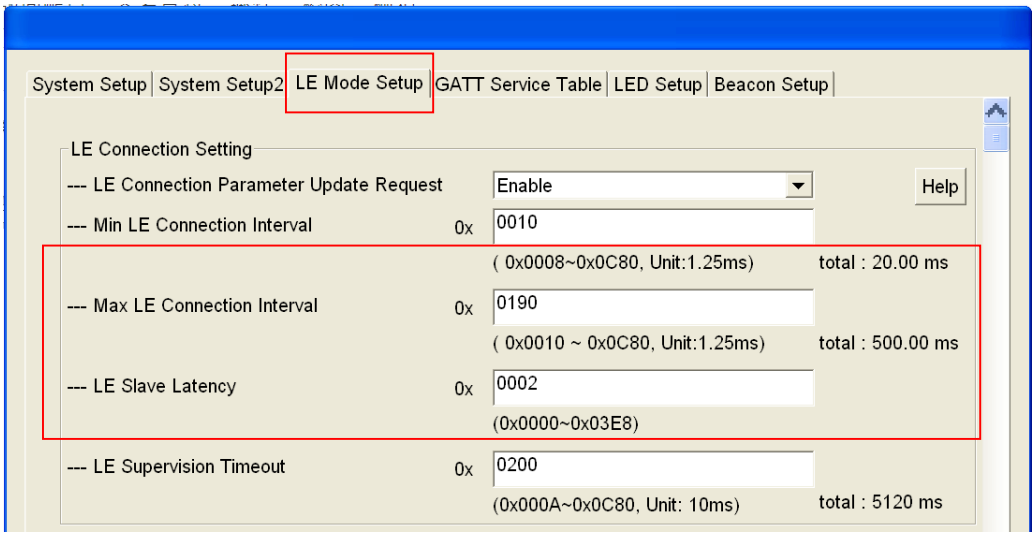
b. Set EVB in application mode and power on

c. Connect to Smart phone BLEDK app and get into connect mode in transparent page

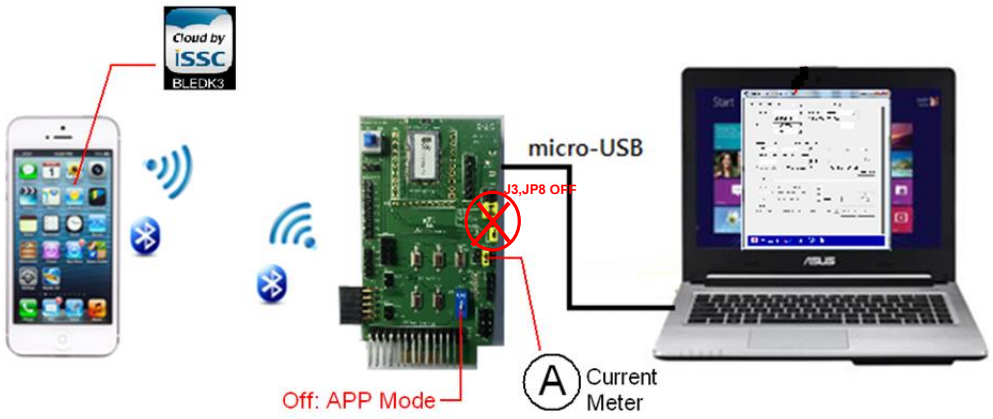
d. Measure the current at J1 jumper

-UI setting: Select BLEDK Mode, set connection interval 500ms, Latency=2

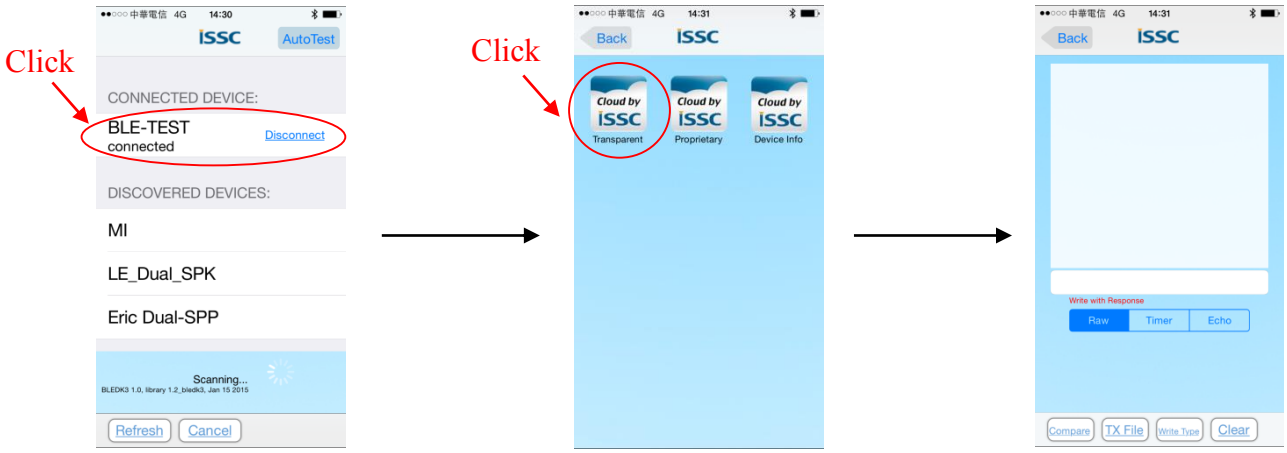




- Test Connection:



- BLEDK3 APP Setup: Make link and click to transparent page to test current in connected mode



4.4 Connected TX Mode Current

-Test Procedure:

a. Set UI to required test configuration (with two Tx data throughput setting as below) and download UI table to flash.

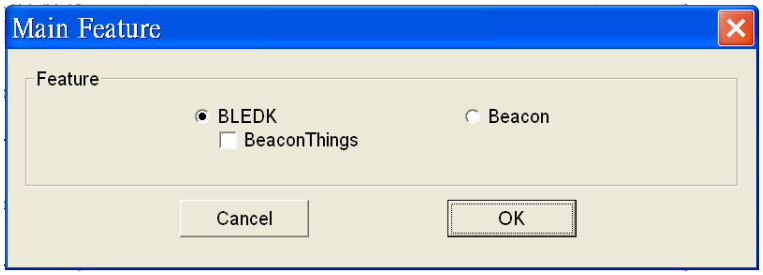
b. Set EVB in application mode and power on

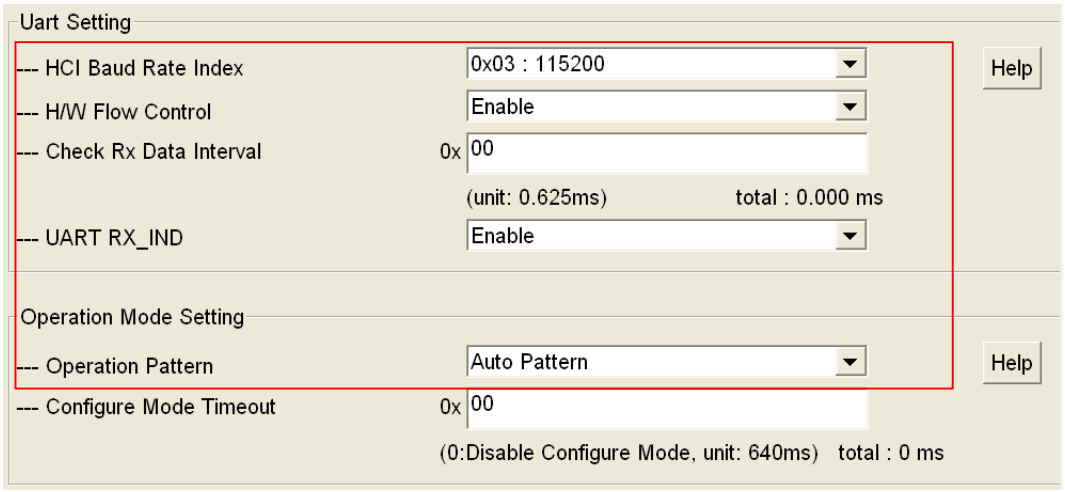
c. Connect to Smart phone BLEDK app and get into connect mode in transparent page, click compare and select 100k.txt to compare received data

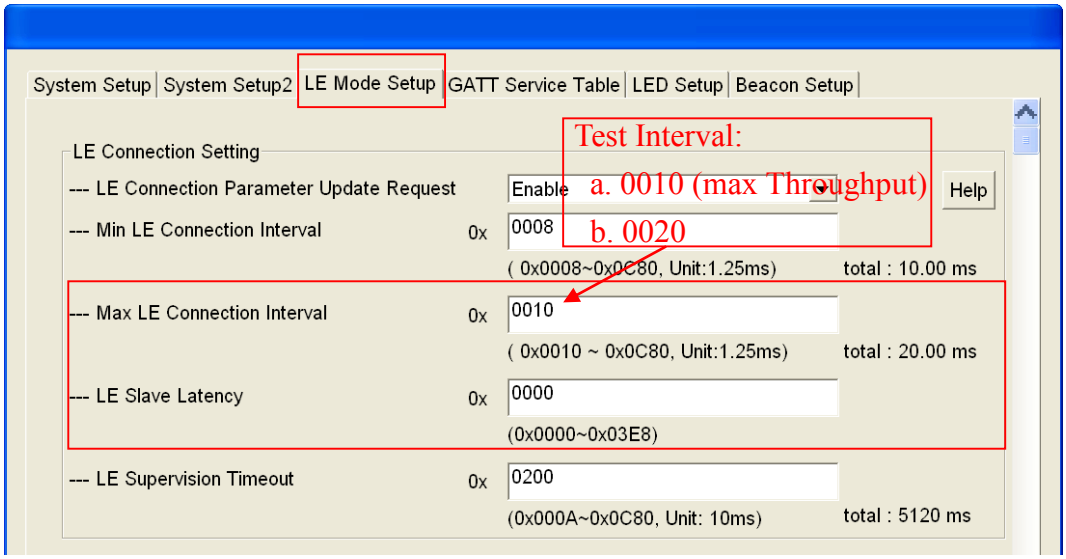
d. Open auto pattern tool, set flow control and make connection. Click Load File and select 100K.txt file. Click Tx start and start TX test.

e. Measure the current at J1 jumper

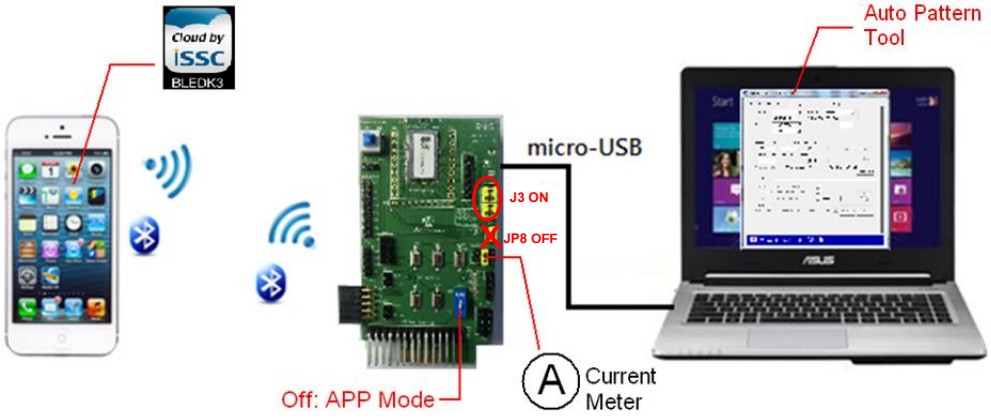
- UI setting: Select BLEDK Mode, Enable Flow Control, RX_IND and set Auto Pattern. Set Max throughput Setting



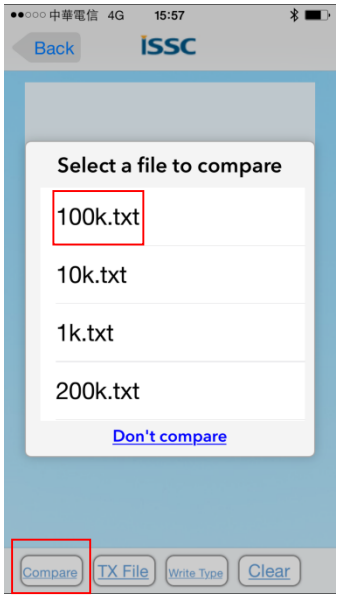




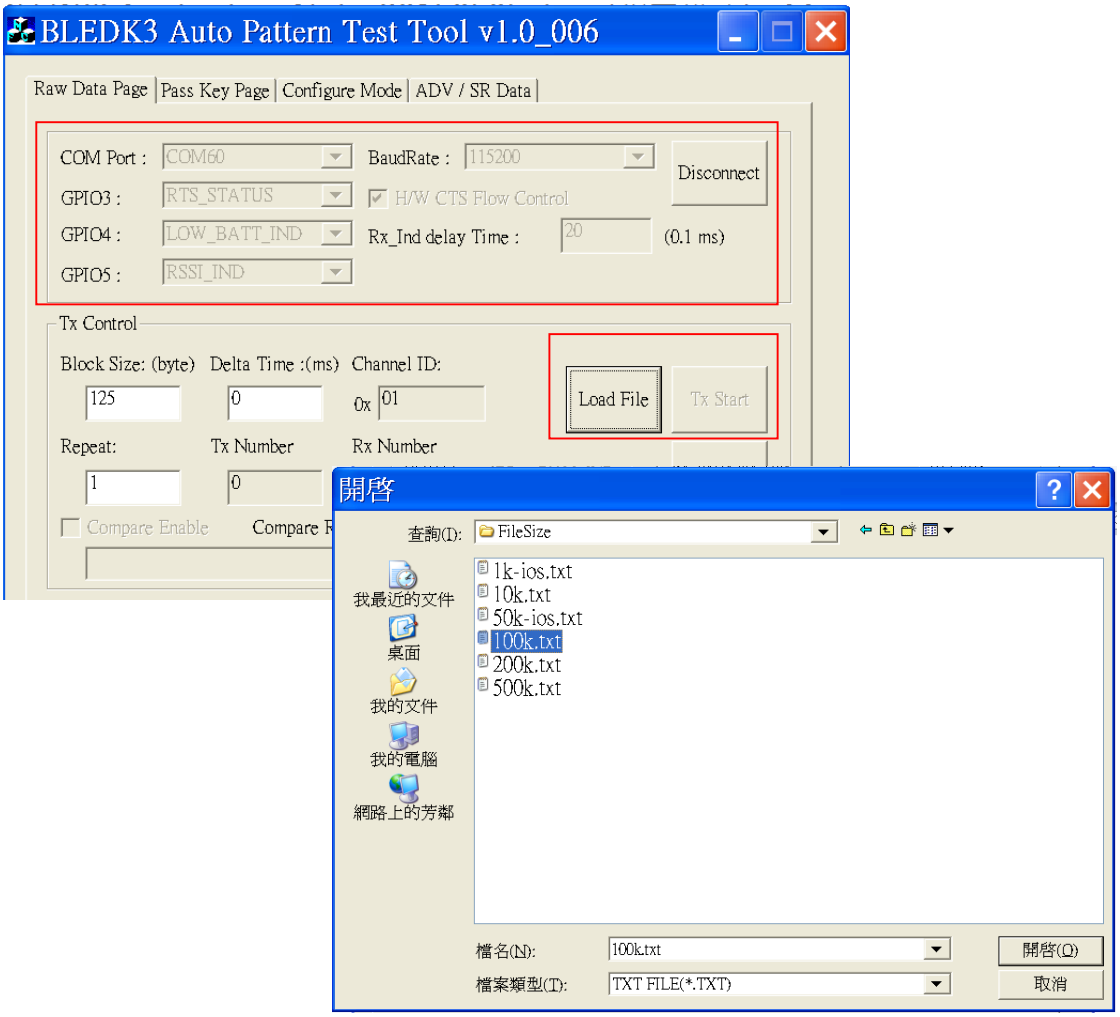
- Test Connection:



- BLEDK3 APP Setup for TX test : refer to 4.3 connected mode test, connect to smart phone BLEDK3 APP and get into transparent mode. Click compare and select 100k.txt for TX test.



- Auto Pattern Test Tool for TX test: Make connect to EVB, Load File and select 100K.txt. Click TX start and measure the TX current.

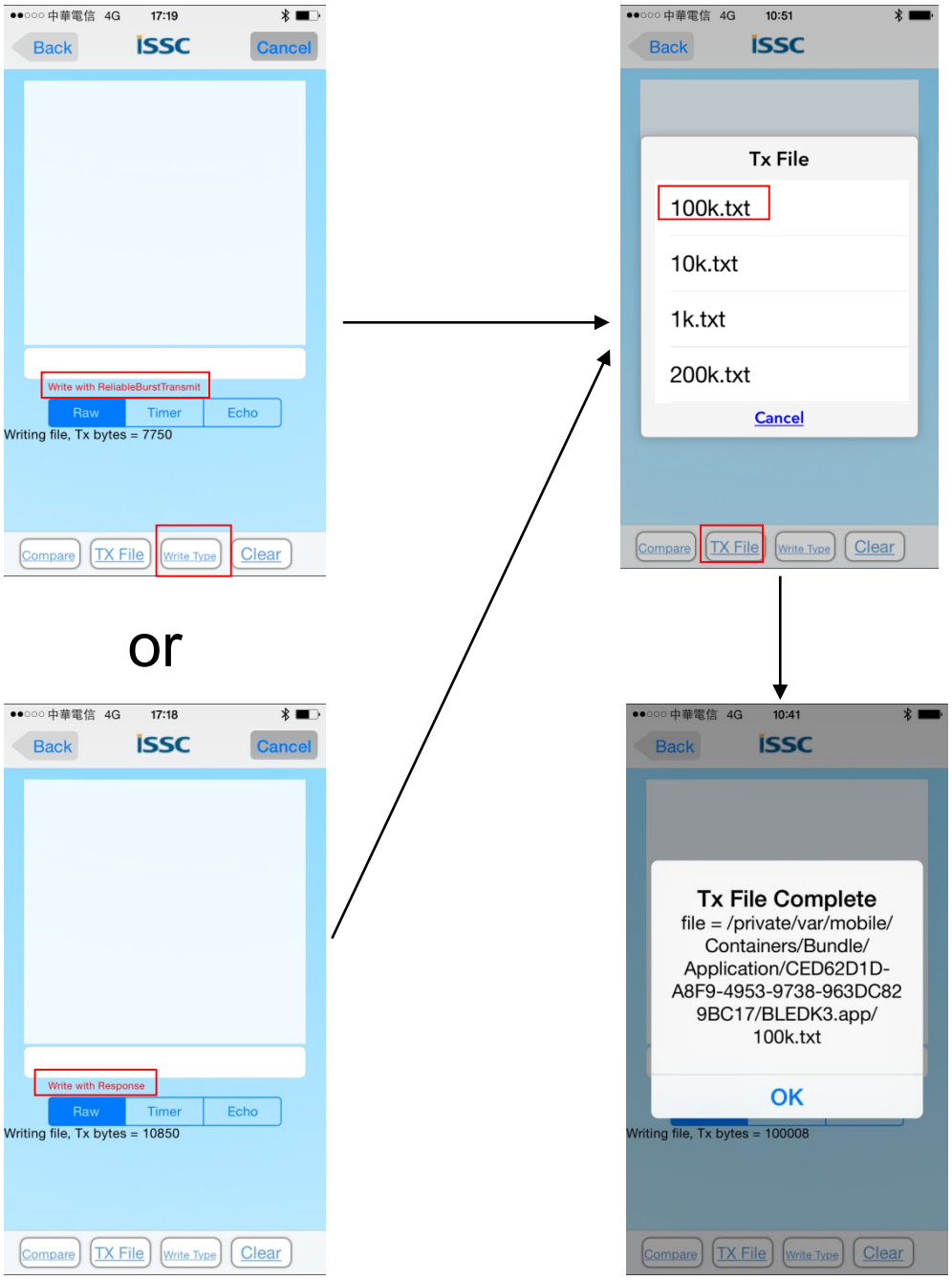


4.5 Connected RX Mode Current

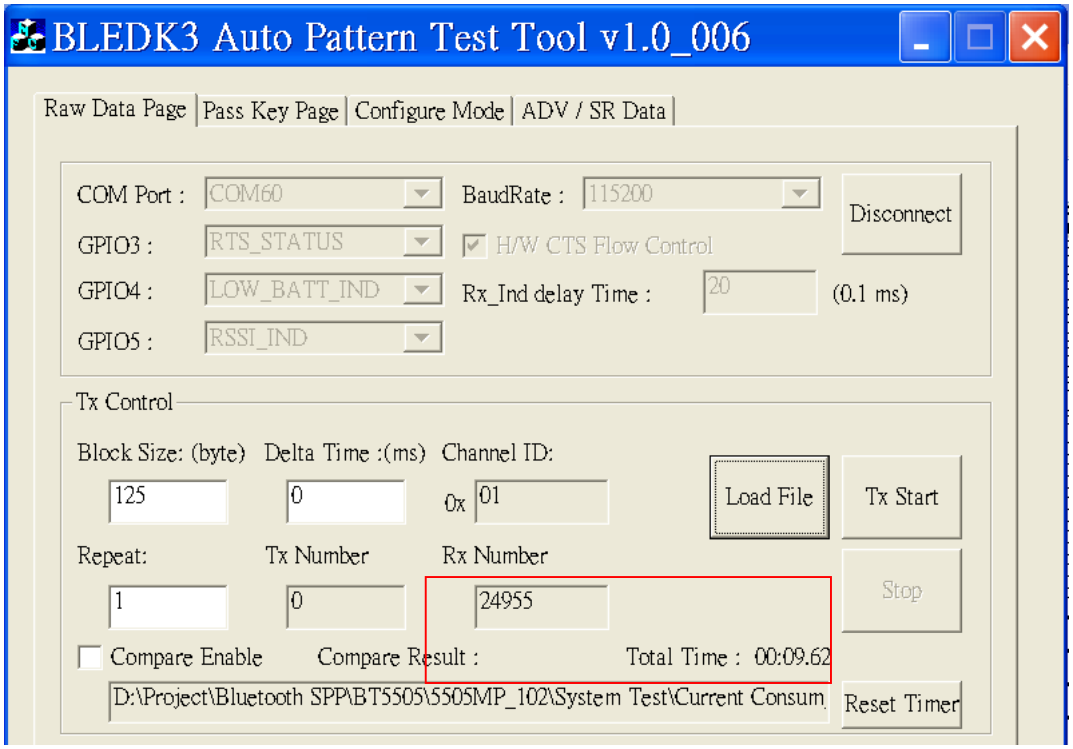
Following the test connection and UI setting as in chapter 4.4 and set the test as follows:

- BLEDK3 APP Setup for RX test : connect to smart phone BLEDK3 APP and get into transparent mode.

Transmit 100K.txt file in “Write with Reliable Burst Transmit” or “Write with Response” mode.



- Auto Pattern Test Tool for TX test: Make connect to EVB. Start TX transmit in BLEDK3 APP of smart phone, the received byte number and transmit time will show on the screen.



4.6 Tested Current Table

Condition		Average Current Consumption	Note
Standby Mode	ADV Interval: 100ms	0.23mA	UI: Set as Beacon
	ADV Interval: 500ms	0.077mA	UI: Set as Beacon
Connected Mode (Transparent Service Enable)	Con Interval: 500ms Slave Latency: 2	0.08mA	*Measured when transparent page is open on BLETK3 APP.
TX data (Transparent Service Enable)	Con Interval: 18.75ms Slave Latency: 0	3.87mA Throughput: 9.863KB/s	Max TX data throughput setting Tested File size: 100K
TX data (Transparent Service Enable)	Con Interval: 40ms Slave Latency: 0	2.77mA Throughput: 4.676KB/s	Tested File size: 100K
RX data (Transparent Service Enable)	Con Interval: 18.75ms Slave Latency: 0	3.06mA Throughput::4.956kB/S (Write with response)	Max TX data throughput setting Tested File size: 100K
		3.9mA Throughput::9.382kB/S (Write with reliable Burst Transmit)	
RX data (Transparent Service Enable)	Con Interval: 40ms Slave Latency: 0	2.14mA Throughput::2.494kB/S (Write with response)	Tested File size: 100K

		3.03mA Throughput::5.056kB/S (Write with reliable Burst Transmit)	
Shutdown Mode		1.44uA	

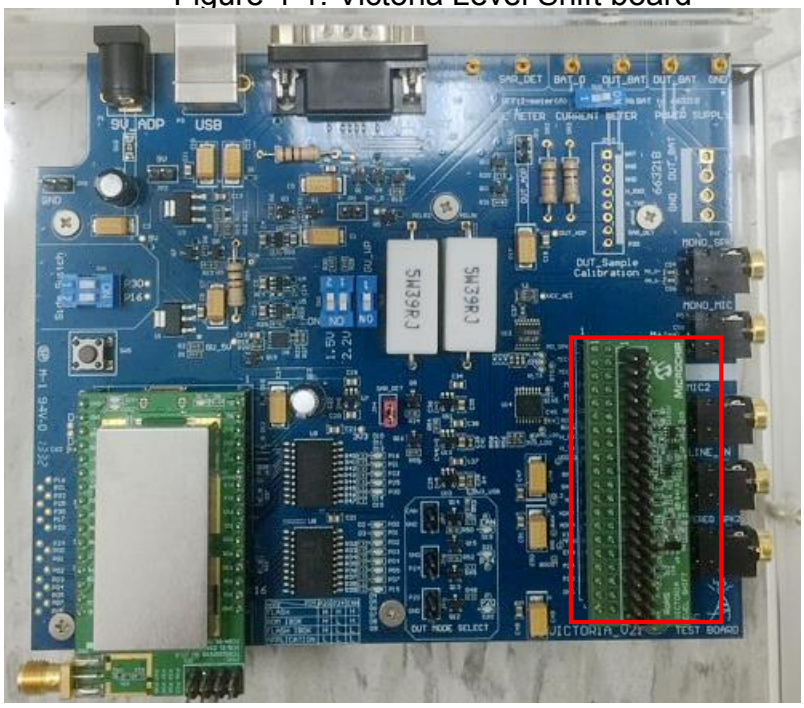
5. MP Test Additional Remark

5.1 MPBT Test environment setting

5.1.1 Victoria Level Shift Board

For MP (Mass Production) test of BM70BLES1FC2 or IS1870SF-102, an adapter board named “Victoria Level Shift” (Shown in figure 4-1) is required to add on the CON1 connector of the Victoria test board. This board provides the function of bypassing the UART TX/RX voltage level to VBAT during voltage calibration.

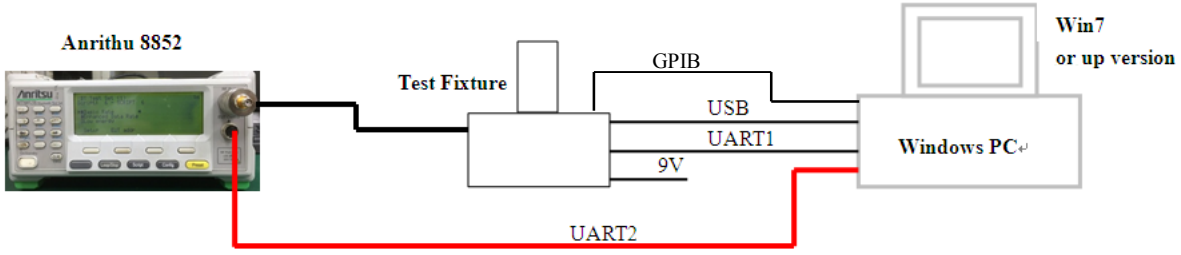
Figure 4-1: Victoria Level Shift board



5.1.2 Test Connection

For Bluetooth BLE RF tester on Anrithu 8852, an UART cable needs to be connected from Anrithu 8852 and PC. Also make sure first the tester has provide the BLE test option. Detail user guide please check the release package of MP tool.

Figure 4-2: Bluetooth BLE test connection with Anrithu 8852.



5.1.3 Test Configuration

In MP tool MPBT configuration page, the UART COM port of device and RF meter page should be set correctly as shown in figure 4.3 and 4.4.

Figure 4.3: Device COM Port Setting

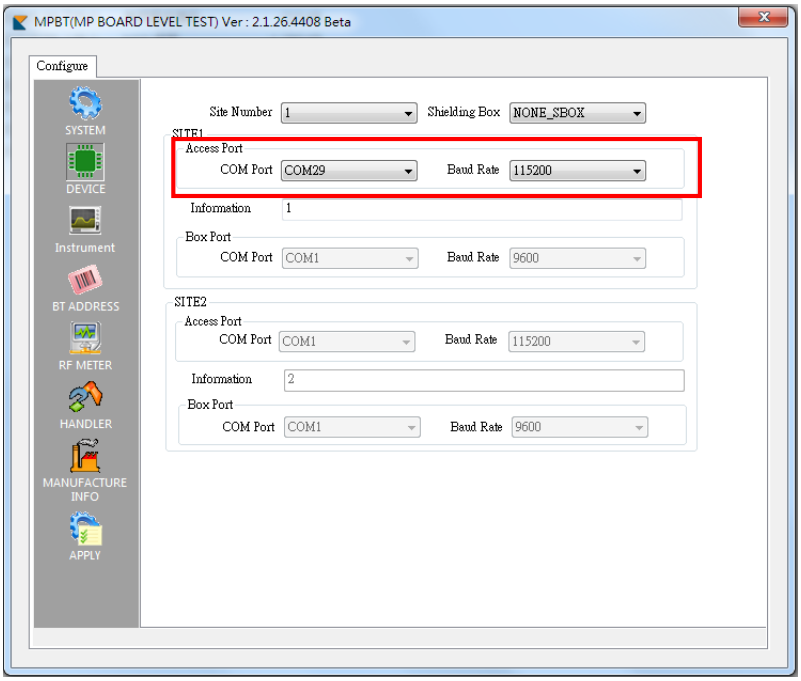
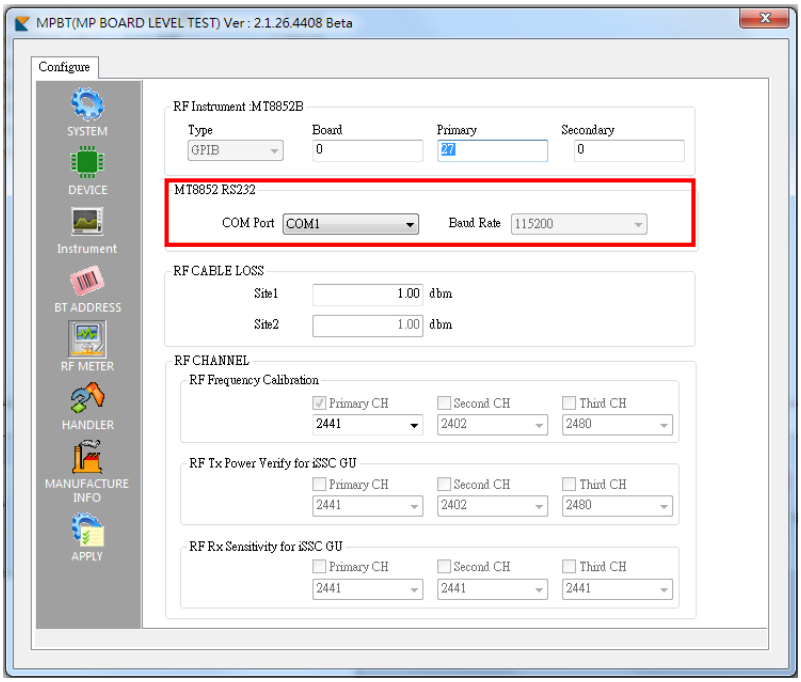


Figure 4.4: MT8852 COM Port Setting



Appendix-1: Document and Tool List

Tool:

Tool Name	Description
isupdate	Flash download tool
IS187x_102_BLEDK3_UI	UI configured parameter download tool for IS187xSF BLE chip
BLEDK3 Auto Pattern Test Tool	BLEDK3 Auto Pattern Test Tool
BLEDK3 Manual Test Tool	BLEDK3 Manual Pattern Test Tool
MP Tool	IS187xSF MP test tool include MPSE,MPBT,MPMF and ISRT
BLEDK3 APP	BLEDK3 test APP for iOS/Android

Document:

File Name (*.pdf)	Description
BLEDK3 Release Note	Describe supported software features for the BLEDK3
BLEDK3 Command Set	Describe how MCU communicates with BLEDK3 and the behavior of BLEDK3
User Guide of BLEDK3 UI Tool	User guide of the UI configuration tool
User Guide of BLEDK3 Auto Pattern Tool	BLEDK3 auto pattern test tool is designed to be installed in Microsoft Windows based PC to act as an MCU emulator to transmit and receive data through USB interface during Bluetooth LE profiles communications with a cellular phone
User Guide of BLEDK3 Manual Pattern Tool	BLEDK3 manual pattern test tool is designed to be installed in Microsoft Windows based PC to act as an MCU emulator to transmit and receive commands and events through USB interface during Bluetooth LE profiles communications with a cellular phone.
User Guide of MP Tool	BLEDK3 MP tool user guide