



ATD600S User Guide

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Version 0.1.1

目录

1	Preface.....	4
1.1	Purpose	4
1.2	Glossary	4
1.3	Reference	4
2	Installation.....	4
2.1	Before installation	4
2.1.1	Unpackaging and accessory checking.....	4
2.1.2	Active device.....	6
2.1.3	Config device	6
2.2	Installation.....	6
3	Function.....	8
3.1	Brief introduction of beacon scanning.....	8
3.1.1	When to scan beacons.....	8
3.1.2	Beacon scanning	8
3.2	Brief introduction of sampling location data	8
3.2.1	When to sample location data	8
3.2.2	Get location data	8
3.3	Data report.....	9
3.3.1	When to report data.....	9
3.4	alarm	9
3.4.1	UAM alarm.....	9
3.4.2	Low Battery alarm	9
3.4.3	Geofence in and/or out alarm	10
3.5	Power management.....	10
3.5.1	Into sleep	10
3.5.2	Wake up.....	10
3.6	button and LED indication.....	10
3.6.1	Device under “normal work” mode.....	10
3.6.2	Device under “set up” mode	11
3.6.3	LED description	11

- 4 LKL, Historical data 11
 - 4.1 LKL 11
 - 4.2 Historical data 11
 - 4.2.1 When to save historical data and report history data..... 11
- 5 How to do a BLE FOTA 12
 - 5.1 Connect with BLE..... 12
 - 5.2 FOTA 18
- 6 Wireless UART 23
 - 6.1 What is wireless UART?..... 23
 - 6.2 How to setup wireless UART? 23
 - 6.3 How to connect a device? 25
- 7 Use BLE to config device..... 29

Version	Date	Author	Comments
0.1.0	3/12/2021	Tina Zhou	Init version, for DVT sample
0.1.1	8/10/2021	JQ Wang	Add some photos

1 Preface

1.1 Purpose

For better support sales team, R&D team make this document to let team know how to install and use ATD600 device.

1.2 Glossary

UAM: Un-authorized Movement

LKL: Last Known Location

NCL: Network Connection Lost

MQTT: Message Queue Telemetry Transport

QoS: Quality of Service

1.3 Reference

For the information of reference manual or document of this document please see Table 1.1.

Name	Version

Table 1.1 Reference Document List

2 Installation

2.1 Before installation

2.1.1 Unpackaging and accessory checking

When you get device, you will see the key information like SN, IMEI, MAC address on the box's label, please check them with label of the back of device, if you find them are not match, then should pop up an issue.



Figure 2.1 label on the box(will update)

● **Accessory**

Here is the component list:

1. ATD600
2. package
3. screw, 2 pcs

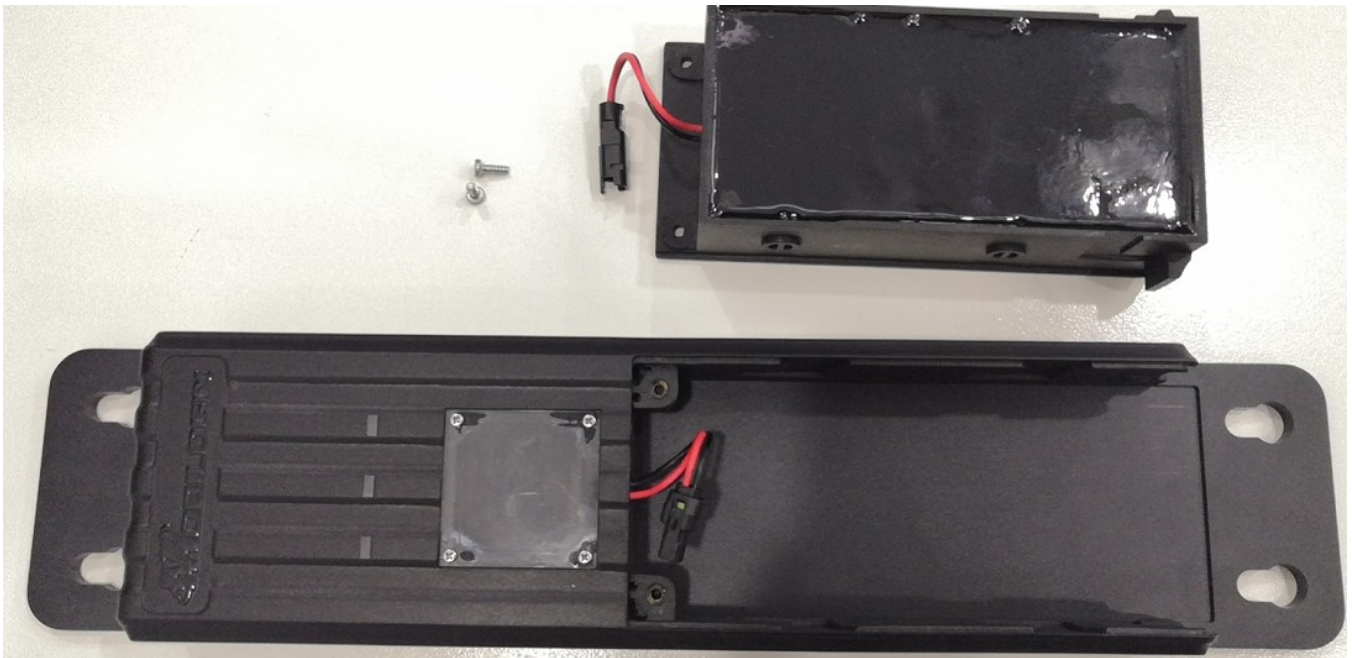


Figure 2.2 Device and cables

2.1.2 Active device

Due to device will go to “Set Up” mode after production, so, before using it, we need active the device, the easy way to do this is pressing the button for more than three seconds, you can see the green led and blue led blink, it means device is activated.



Figure 2.3 Button

2.1.3 Config device

There are 3 ways to config the device, such as wireless UART, APP, and over backend, [chapter 7](#) shows you how to use APP to config the device.

Key items

The APN (username ([apn username](#)), password ([apn psword](#))), server URL (and Port) and cellRAT([Network setting](#)) we need config at first, otherwise, device cannot make connection established.

Notice:

- 1: default APN is: mobilogix1.telefonica.com
- 2: default URL is: mbxiotfusion.mobilogix.com:1883
- 3: default cellRAT is 3, which support both GSM and eMTC RATs.

Here is the RAT selection

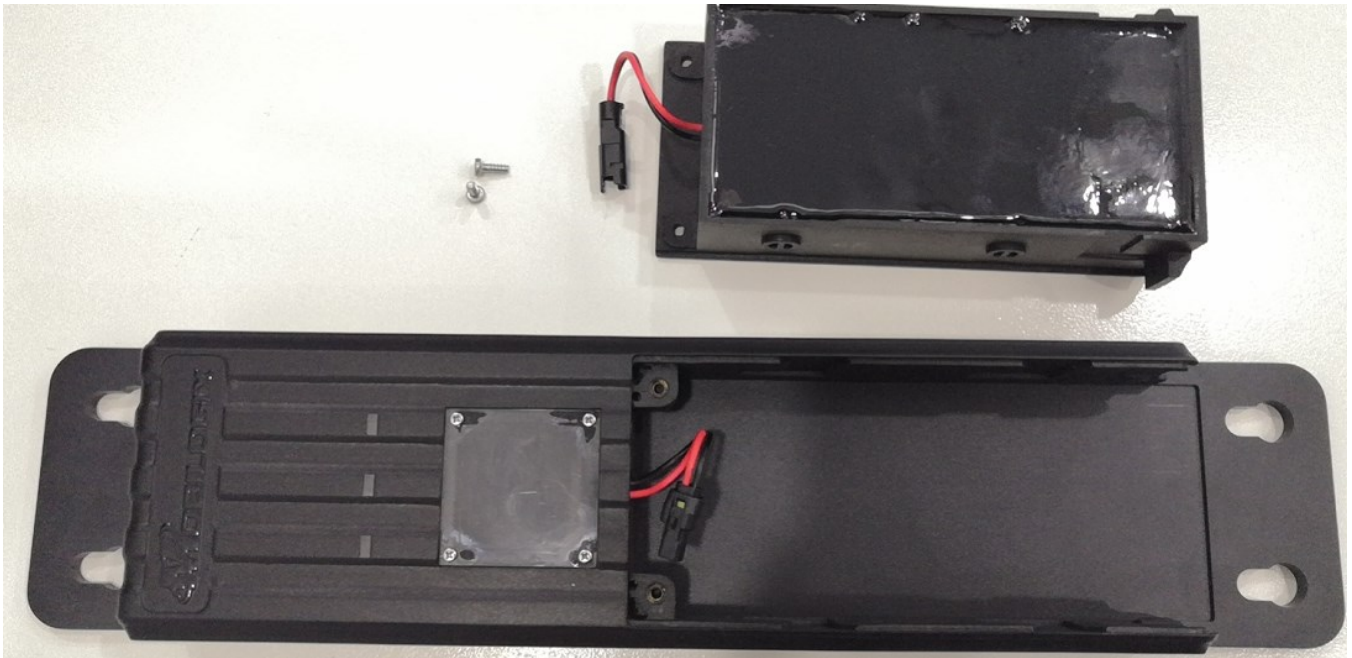
- 0: 2G only
- 1: 2G + NB
- 2: 2G + NB + M1
- 3: 2G + M1
- 4: NB only
- 5: NB + M1
- 6: M1 only

2.2 Installation

Step 1



Step 2



Step 3



Figure 2.8 Example location

3 Function

3.1 Brief introduction of beacon scanning

3.1.1 When to scan beacons

There are two ways to scan beacons.

1. periodically sample (default 4h, [GNSS sample frequency](#))
2. double press button

3.1.2 Beacon scanning

When the sampling period is reached, device begins to scan beacons for 10s (default, [Duration of sleep beacon scan](#)), then stop scanning until next calling. Enable/Disable/Scan Duration/Scan Period are configurable.

Notice:

1. Beacon scanning is disabled by default.
2. Beacon scanning can be configured by [GNSS sample frequency](#), [Duration of sleep beacon scan](#)). Sample frequent should be more than 4 and report period should be less than or equal to 24h.
3. Data format:

```
{"000383": [{"ts": 1615515383072, "values": {"mac": "5C:85:7E:20:01:F7", "type": "250e", "rssi": -38, "bat": 2915, "t": 22.4, "h": 60.6, "p": 1010.0, "mj": 1001, "mn": 383, "gps": 0, "lat": 0.000000, "long": 0.000000, "mcc": "460", "mnc": "00", "lac": "1D2B", "cellid": "2C5EB3F", "gateway": "A600S20500002H"}]}
```

3.2 Brief introduction of sampling location data

3.2.1 When to sample location data

There are four ways to get location data.

1. periodically sample (default 4h, [GNSS sample frequency](#)).
2. UAM event triggered.
3. Low battery event triggered.
4. double press button

3.2.2 Get location data

On the upon conditions, device begins to sample location data once.

Notice:

1. Get location data is enabled by default.
2. Get location data can be configured by [GNSS sample frequency](#). Sample frequent should be more than 4 and report period should be less than or equal to 24h.
3. Data format:


```
{"ts":1615269209136,"values":{"ET":"LD","SN":"A600S20500029H","IMEI":"864475040056136","IMSI":"460044339301547","IPW":3979,"SS":0,"CS":"LTE Cat NB1","OP":"CHINA MOBILE","LAC":"","CI":"","GFT":0,"LAT":22.576006,"LONG":114.054672,"Heading":240,"Altitude":157.000000,"HDOP":1.230000,"NoS":5,"GFS":1}}
```

3.3 Data report

3.3.1 When to report data

After setting the sampleCount(default 4, [report sample data after sample a certain number of times](#)) and sample frequent(default 4(h), [GNSS sample frequency](#)), every (sampleCount)*(sample frequent) hours will try to report data to cloud.

Notice:

1. sample frequent should be more than 4 and report period should be less than or equal to 24h.
2. Report data can be configured by [report sample data after sample a certain number of times](#), [GNSS sample frequency](#)
3. When you press button for two times, device will report “BP” message, then sample and report beacons data

3.4 alarm

3.4.1 UAM alarm

UAM is a key feature for our device, when shake device, once reach the threshold ([UAM shake Value](#) default is 20, [UAMAlarm shake number](#) default is 5), device will report UAM once and report location data once.

Notice:

1. UAM alarm can be configured by [UAM Alarm En-Disable](#), [UAM shake Value](#), [UAMAlarm shake number](#)
2. UAM alarm is disabled by default.
3. Data format:

```
{"ts":1615278226096,"values":{"ET":"UAM","SN":"A600S20500002H","IMEI":"865284046405886","IMSI":"460046260108483","IPW":3559,"SS":0,"CS":"GSM","OP":"CHINA MOBILE CMCC","LAC":"25F0","CI":"DDF","GFT":0,"LAT":0.000000,"LONG":0.000000,"Heading":0,"Altitude":0.000000,"HDOP":0.000000,"NoS":0,"GFS":0}}
```

3.4.2 Low Battery alarm

If internal power lower than 3300mv, device will report “Low internal battery” to server.

Notice:

1. Low Battery alarm can be configured by [bat alarm endisable](#), [bat alarm value](#)
2. Low Battery alarm is disabled by default.
3. Data format:

```
{"ts":1577836861040,"values":{"ET":"IBL","SN":"A600S20500002H","IMEI":"865284046405886","IMSI":"460046260108483","IPW":3555,"SS":0,"CS":"GSM","OP":"CHINA MOBILE
```

```
CMCC","LAC":"25F0","CI":"DDF","GFT":0,"LAT":0.000000,"LONG":0.000000,"Heading":0,"Altitude":0.000000,"HDOP":0.000000,"NoS":0,"GFS":0}}
```

3.4.3 Geofence in and/or out alarm

This alarm can be divided into “Geofence In” and “Geofence Out” alarm, after setting center point ([geofenceAlarm Point](#)) and radius of geofence cycle and enable it, device will report the alarm after get location data from GPS. Here is an example of Geofence Out.

Notice:

1. Geofence in and/or out alarm can be configured by [geofenceAlarm Point](#), [geofenceAlarm Radius](#) [geofenceAlarm En-disable](#)
2. Geofence in and/or out alarm alarm is disabled by default.
3. Data format:

```
{"ts":1615282576160,"values":{"ET":"GO","SN":"M420S202000086H","IMEI":"865284046405738","IMSI":"460046260108484","IPW":4115,"SS":0,"CS":"GSM","OP":"CHINA MOBILE CMCC","LAC":"25F0","CI":"DDF","GFT":1615282575,"LAT":22.575430,"LONG":114.053322,"Heading":208,"Altitude":321.000000,"HDOP":11.400000,"NoS":4,"GFS":1}}
```

3.5 Power management

3.5.1 Into sleep

When BLE is not connected, on the one of the below circumstances, device will go to sleep, otherwise, device will never fall asleep.

1. sleep time is timeout (timeout value is different in different scenes, when sampling beacons, the value is 60S, when reporting messages, the value is 540S).
2. If GPS is fixed, and there is no message need to be uploaded to the cloud, device will go to sleep in seconds.
3. If GPS is not fixed, and there is no message need to be uploaded to the cloud, device will read GPS for about 30s then enter sleep.

3.5.2 Wake up

Wake up condition:

1. UAM
2. Button press
3. periodically wake up (default 4h, [GNSS sample frequency](#))

3.6 button and LED indication

3.6.1 Device under “normal work” mode

key action	function

quick press one time	Red LED blink once, to tell device is alive and in normal mode.
quick press two times	sampling and report data to cloud, like on demand feature after send report data to cloud blink the red LED based on ACK or NACK (blink 3x for ACK, blink 4x for NACK).
quick press three times	Reboot system.
long press for over 3s	Switch to “set up” modes.

Table 3.1

3.6.2 Device under “set up” mode

key action	function
1 shot press	Red LED blink twice, to tell device is in “set up” mode
long press for 3s	Reboot device to active device, let device into normal work mode, device will register GSM/GNSS and report the beacon data

Table 3.2

3.6.3 LED description

Index	Work mode	Description
Green	Normal mode	1: fast blinking: device is connecting with server. 2: slow blinking: try to register network. 3: solid: connection established.
	Set up mode	off
Blue	Normal mode	1: slow blinking: try to lock GPS. 2: solid: GPS is locked.
	Set up mode	off
Red		Please see table 3.1&3.2

4 LKL, Historical data

4.1 LKL

Some time, GPS may not get locked, if this happened, device would use last time position data instead of current invalid data, the “GPSFIX” flag is the indicator, when it is 1, means current GPS is fixed and data is valid, when it is 2, means GPS not fixed, and the location data is “last time” data, when it is 0, means data is invalid and GPS not fixed.

4.2 Historical data

4.2.1 When to save historical data and report history data

1. If reporting data failed or GSM signal is bad, or if there are too many data full the message queue, the rest data will be saved in case of loss.

- When network OK, and the real-time data is already sent to the server, device will send the history data to server and delete data in memory.

Notice:

- “isHistory” is used in the message to mark it is historical data, for example:

```
{"ts":1577836861040,"values":{"isHistory":1,"ET":"IBL","SN":"A600S20500002H","IMEI":"865284046405886","IMSI":"460046260108483","IPW":3563,"SS":0,"CS":"GSM","OP":"CHINA MOBILE CMCC","LAC":"25F0","CI":"DDF","GFT":0,"LAT":0.000000,"LONG":0.000000,"Heading":0,"Altitude":0.000000,"HDOP":0.000000,"NoS":0,"GFS":0}}
```

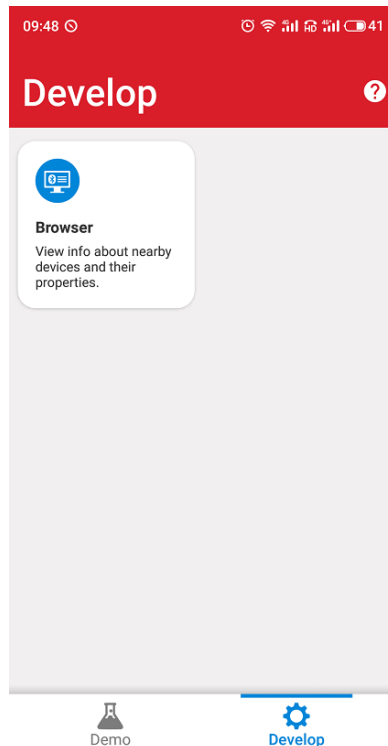
- At most 2000 historical message sets is supported.

5 How to do a BLE FOTA

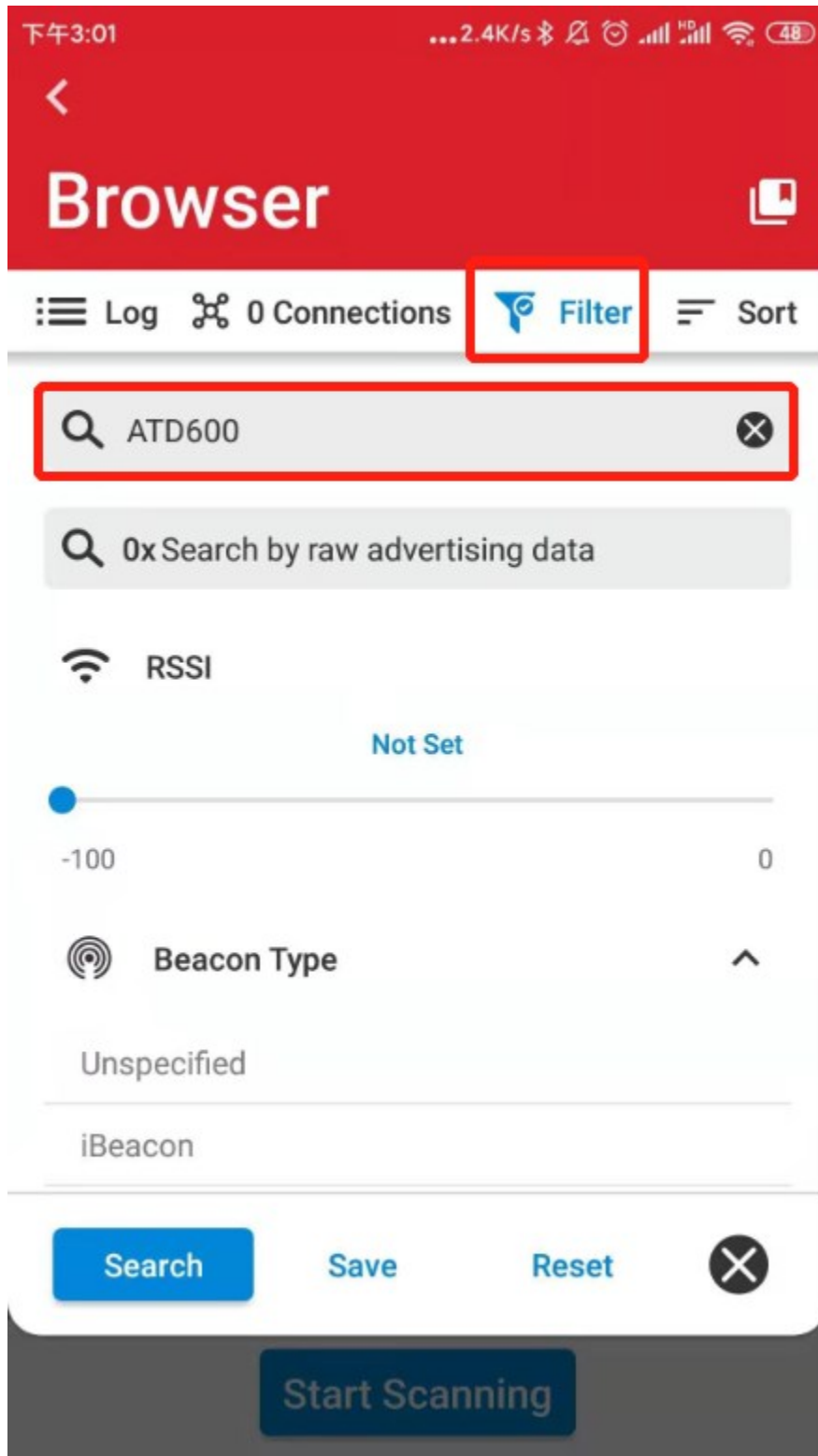
5.1 Connect with BLE



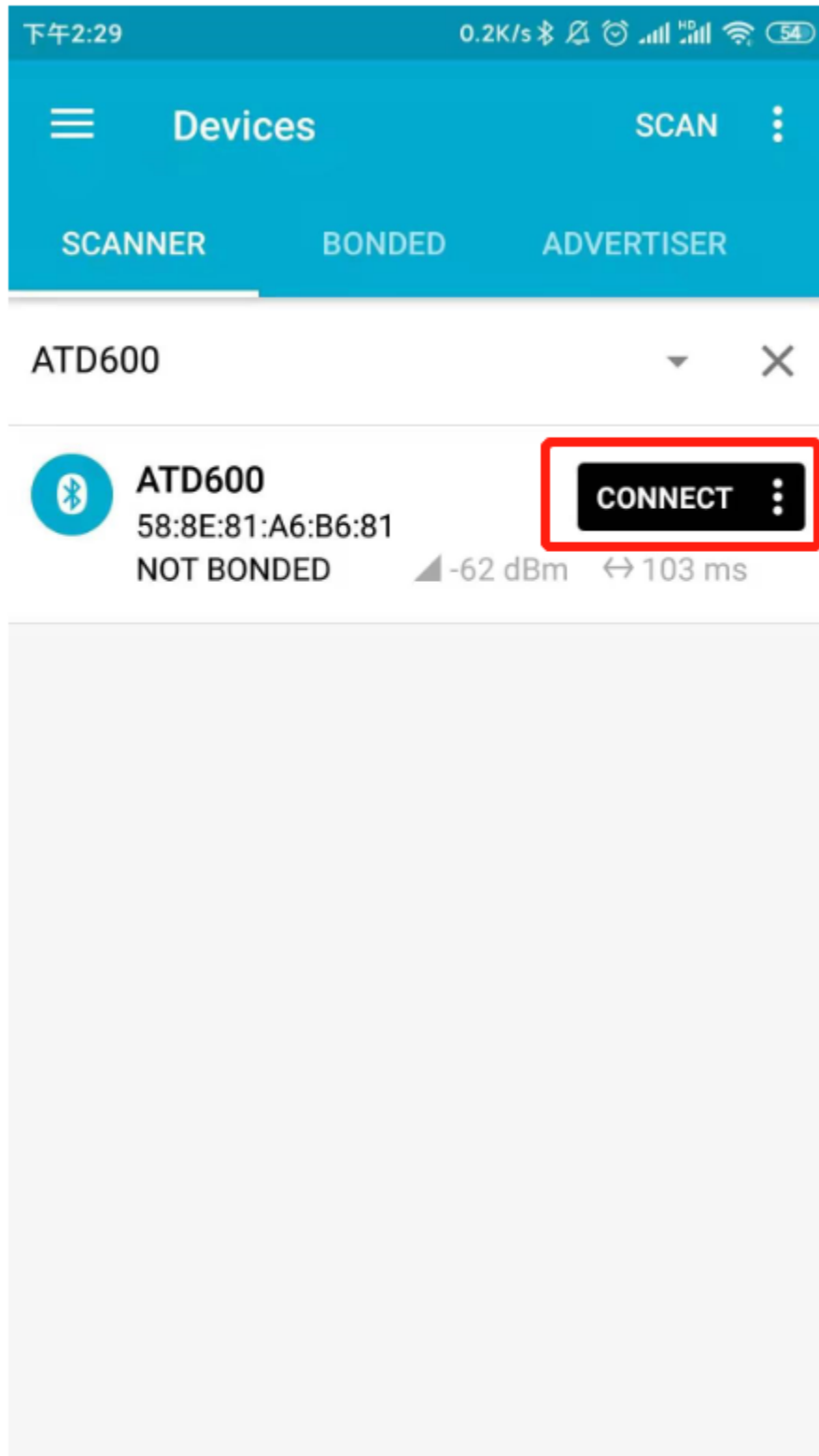
- Due to MBX APP not available, so, we use third party APP. please download “EFR Connect” APP from Google play or Apple store.
- after you open this APP, select “Develop”, show like this:



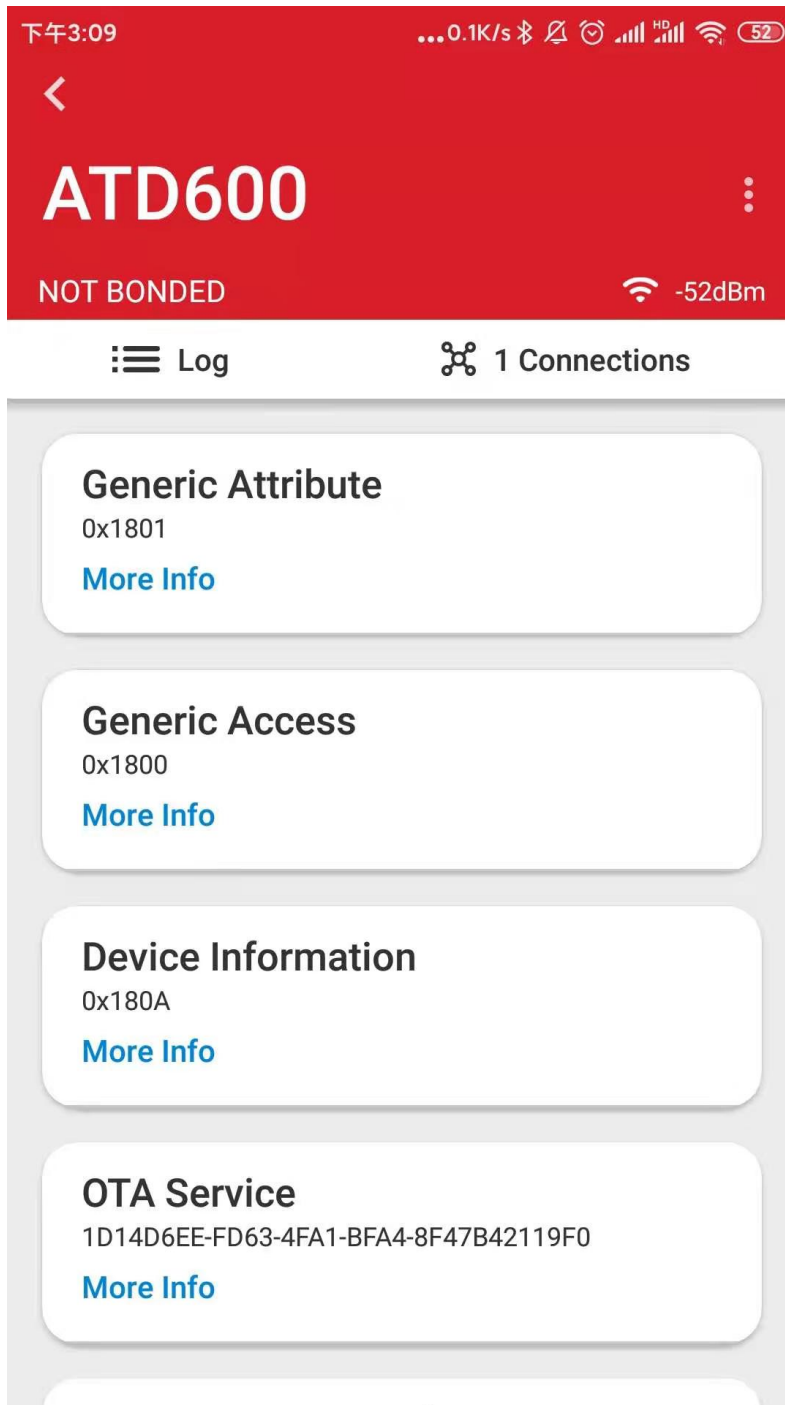
3. then you can search your device, for easier, you can set filter (input ATD600), like this:



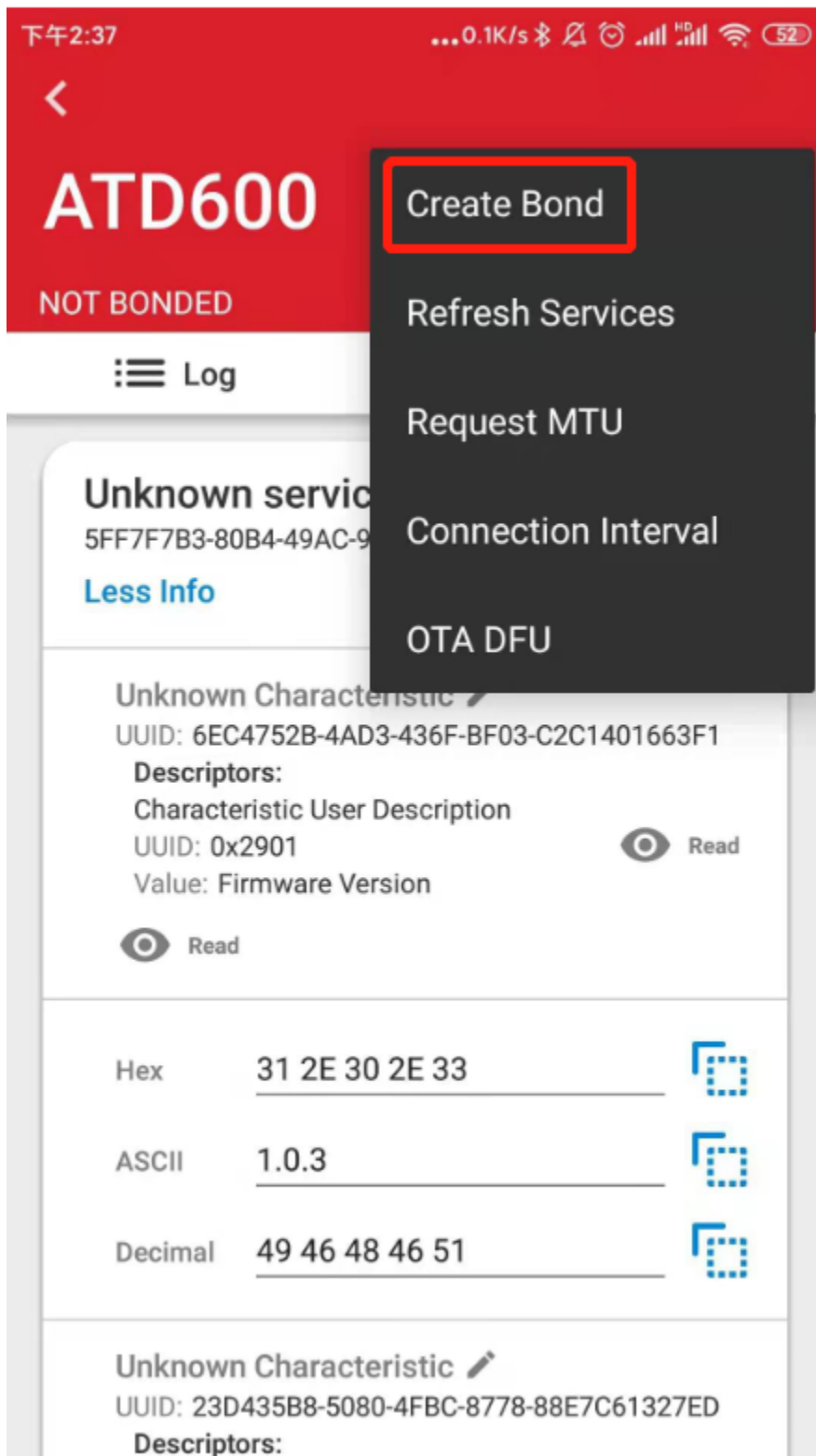
4. select the right device according to the mac address and connect with it.



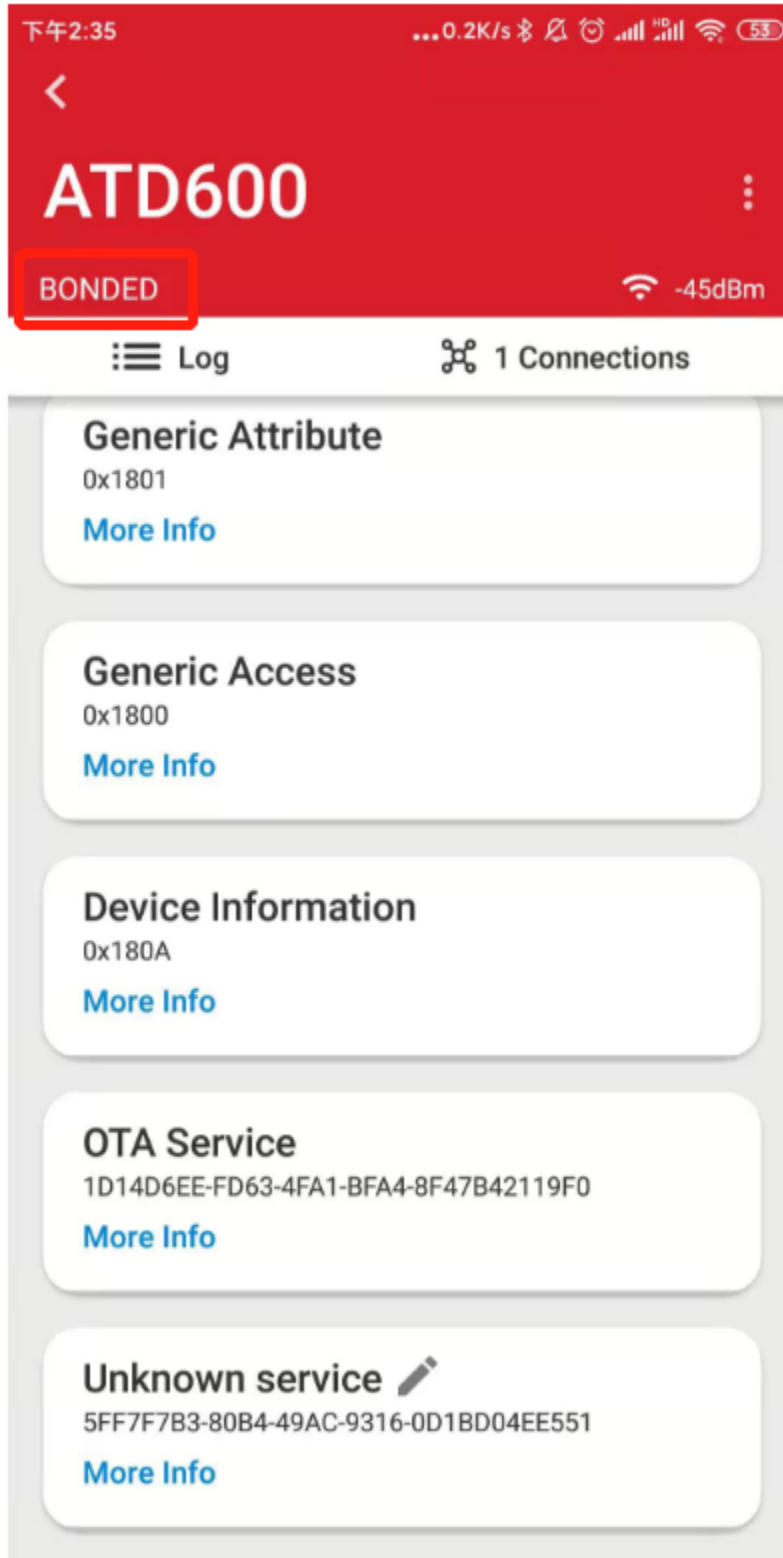
5. after connection, it shows like this:



6. create bond, the passkey is xxxxxx.

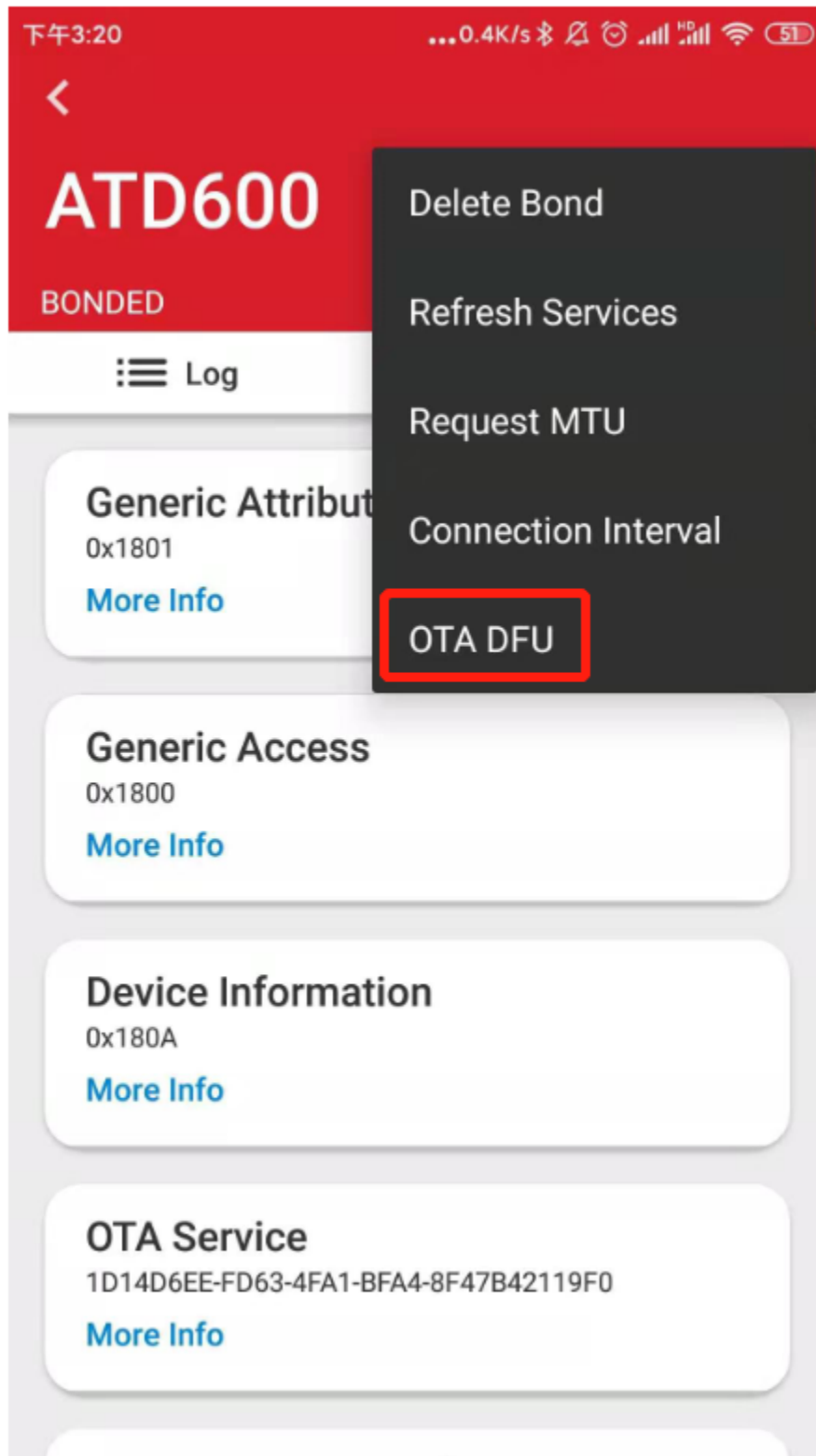


7. after bonding, you can see like this.

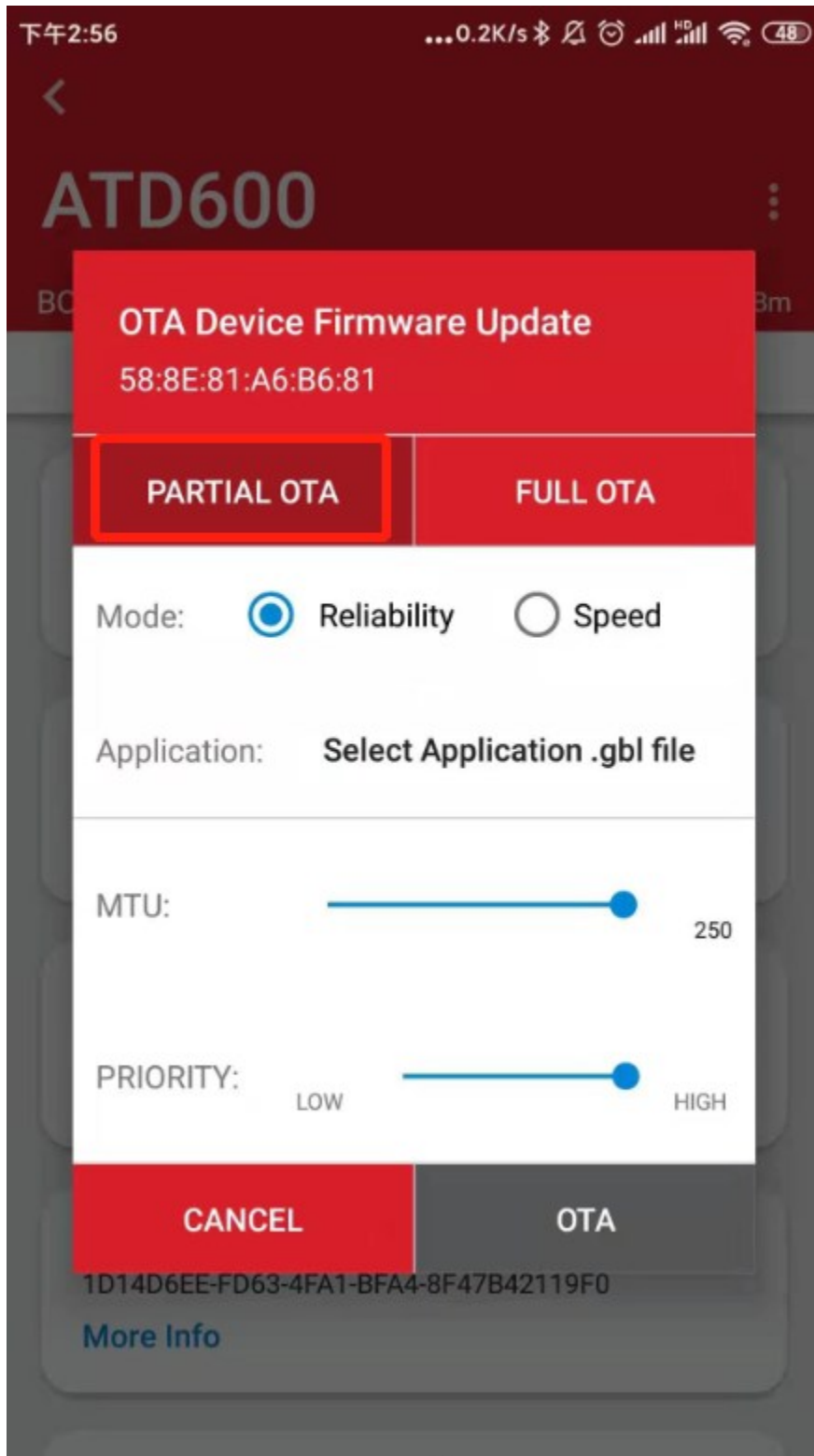


5.2 FOTA

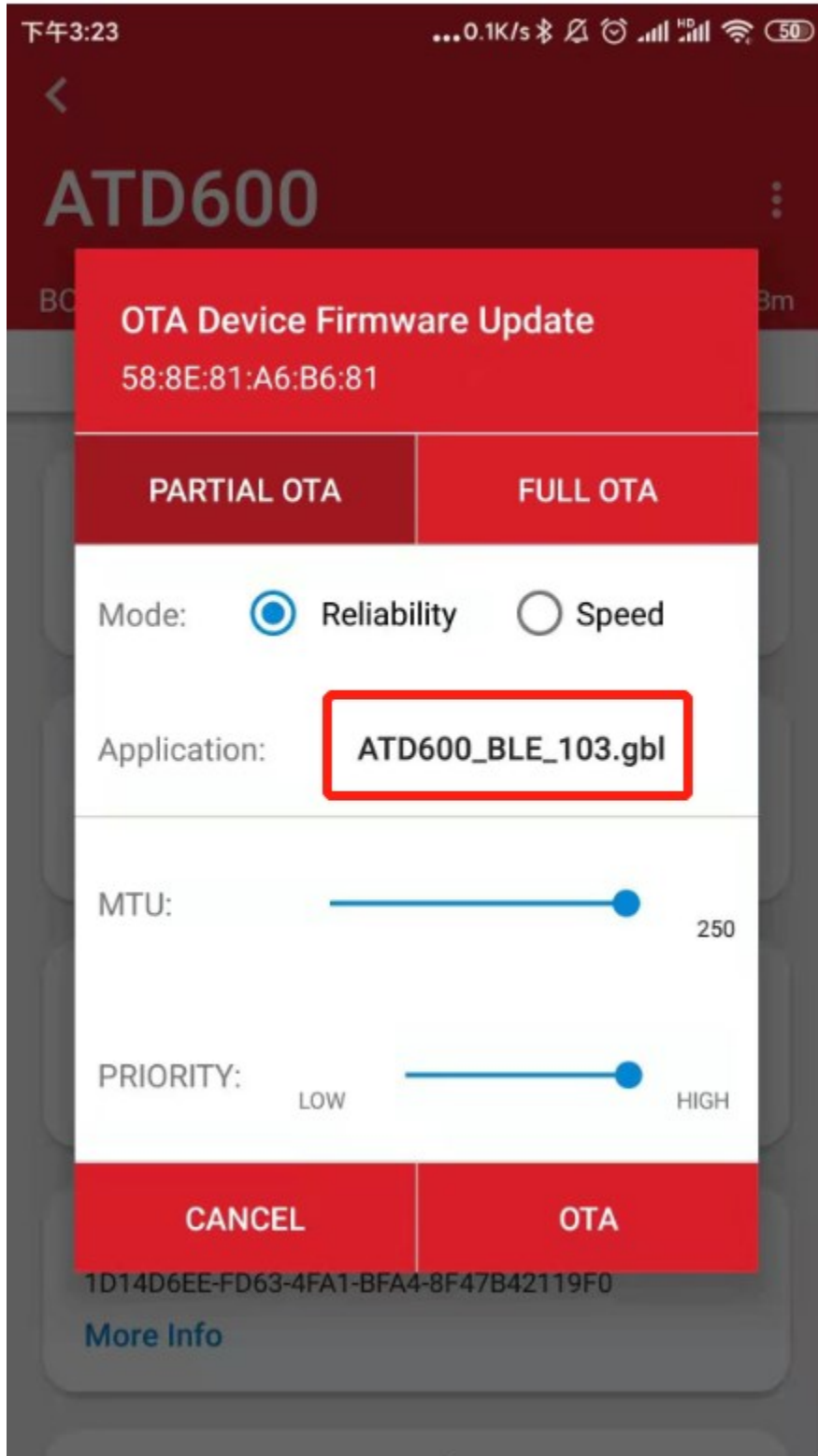
- press the menu show as above, and select “OTA DFU”



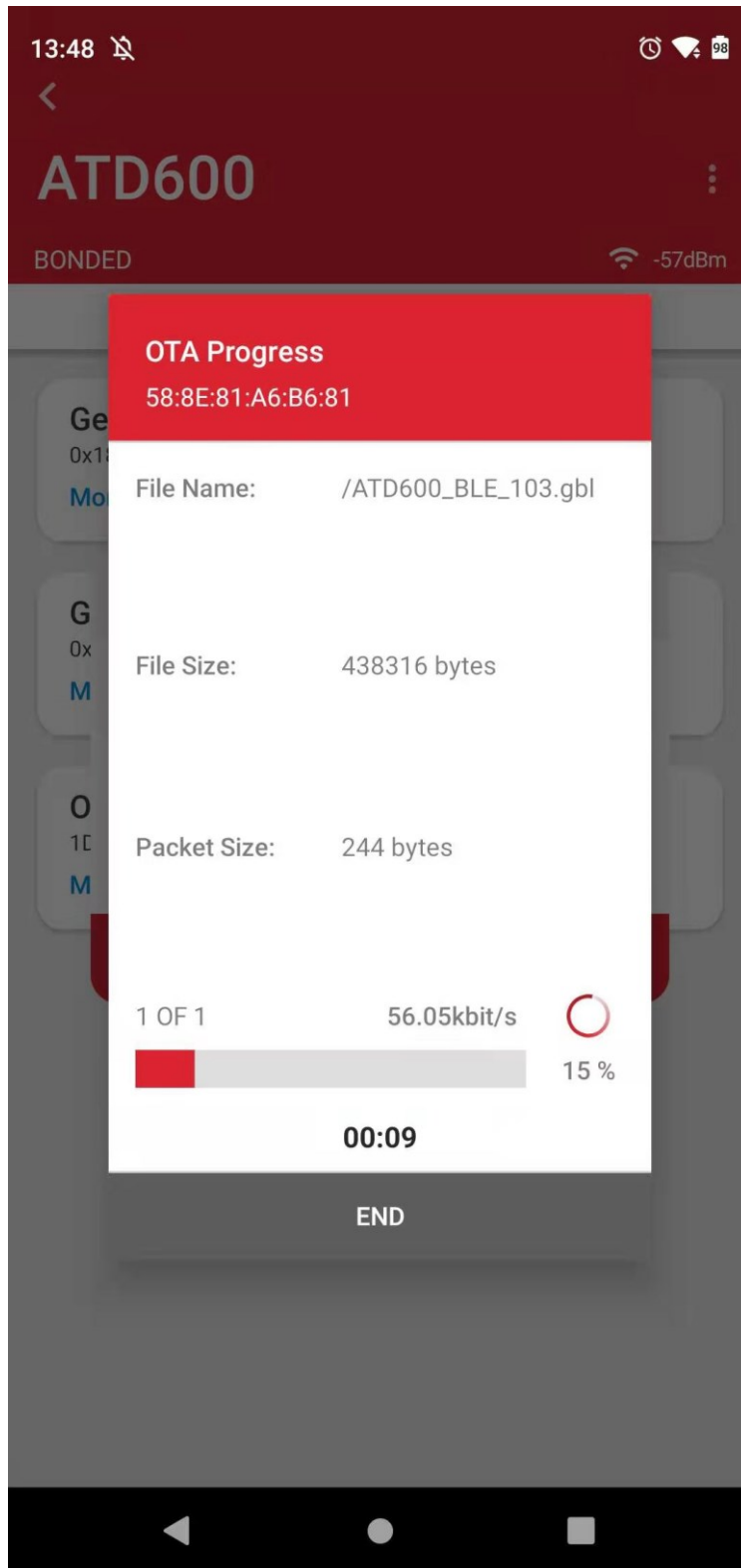
5. then use default setting, make a "PARTIAL OTA"



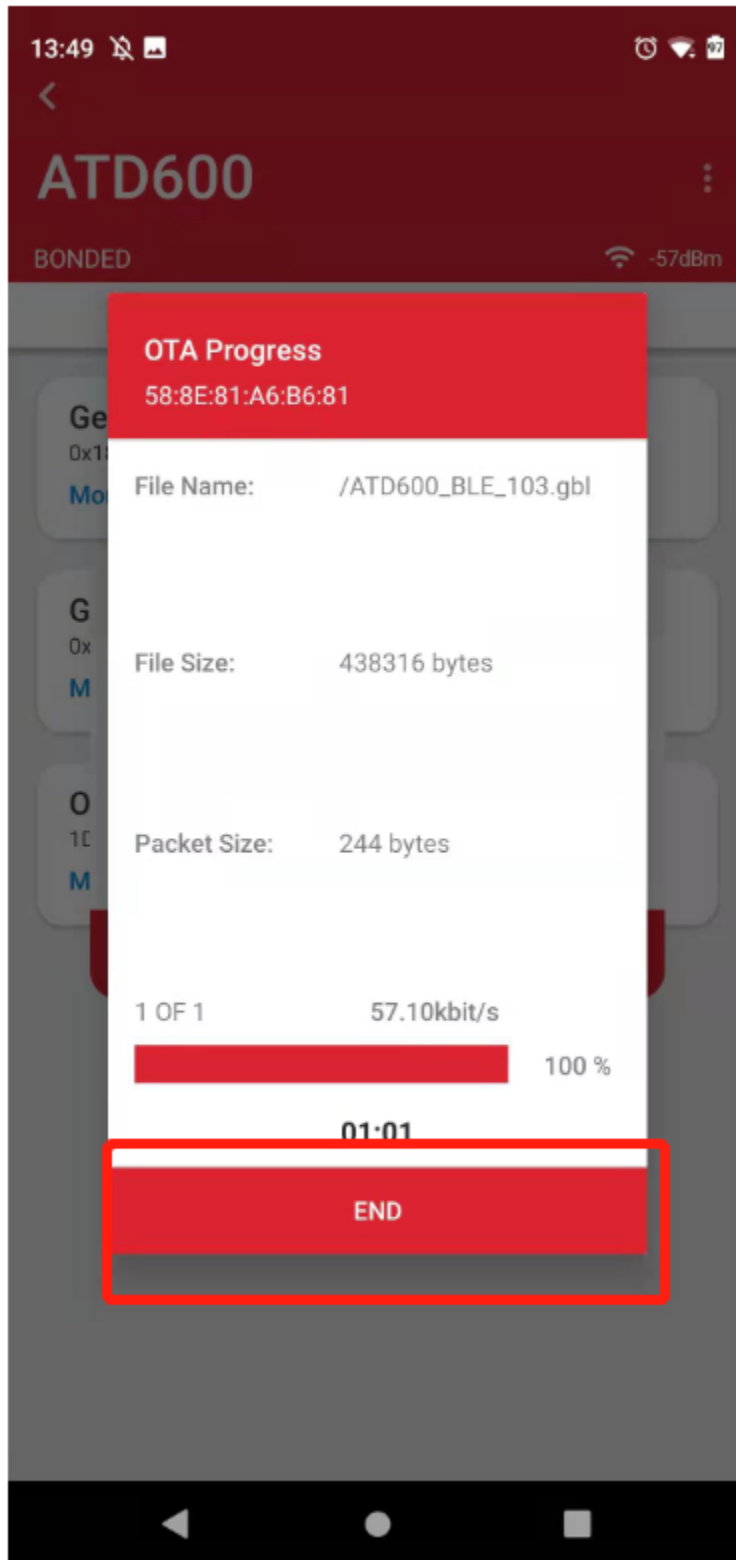
6. select your image file from your phone, press" Application" to add image, like following picture.



7. press OTA to start a FOTA after you load the right Image file.



8. after done, just press "END", like this:



6 Wireless UART

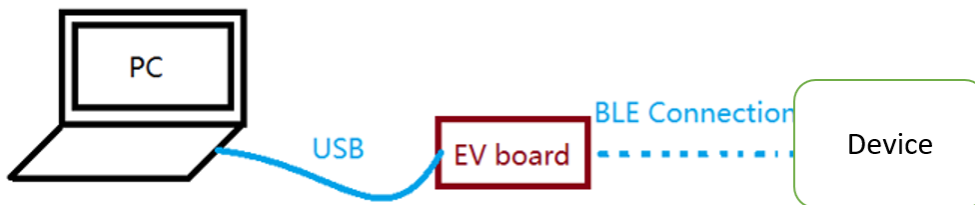
Notice: Wireless UART is only valid before first entering sleep.

6.1 What is wireless UART?

As we know, we can get the device's running log or configure parameters by a serial port connection.

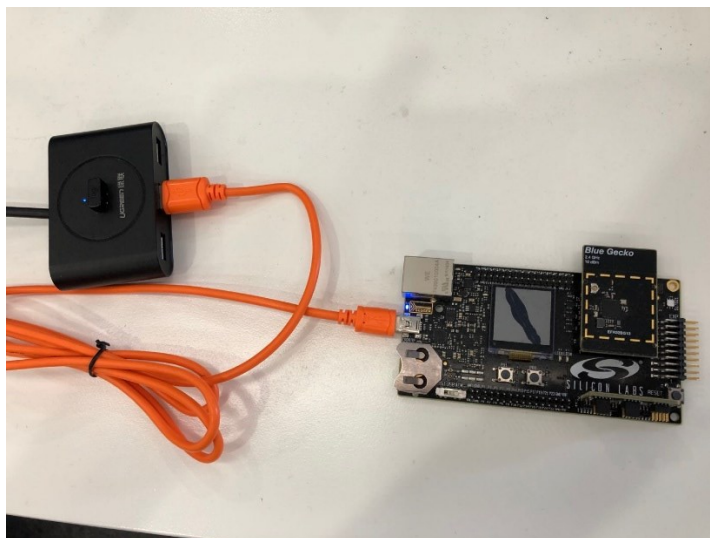


Now, we add an EV board as a wireless bridge between PC and MT4200 to achieve the same functionality. It is convenient for us to read the device's log after the assembly is complete.

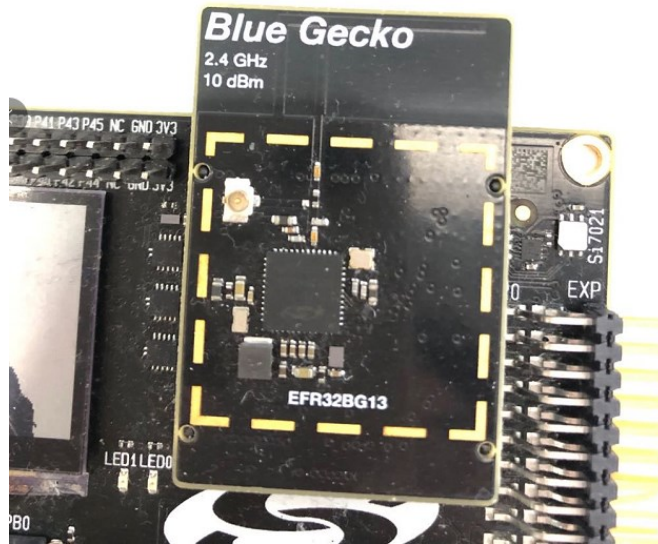


6.2 How to setup wireless UART?

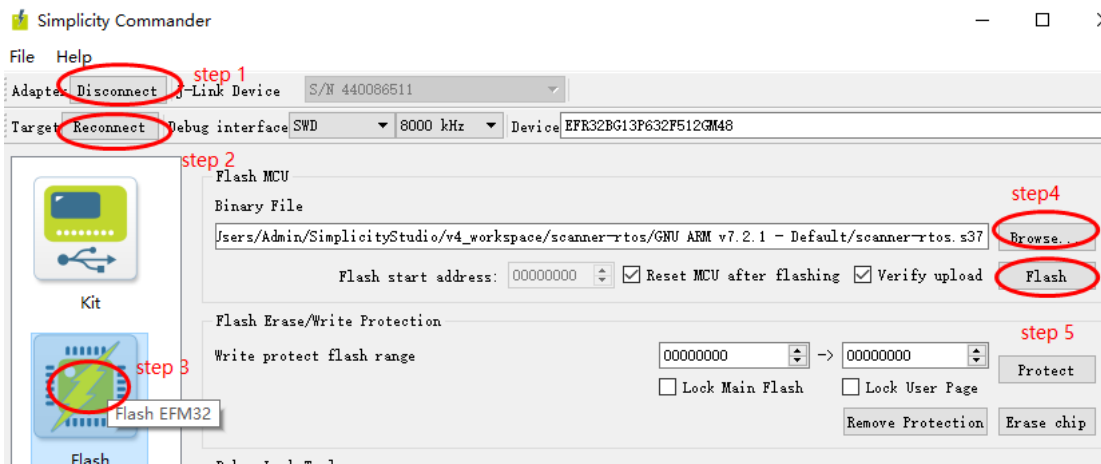
1. Connect EV board to PC through USB.



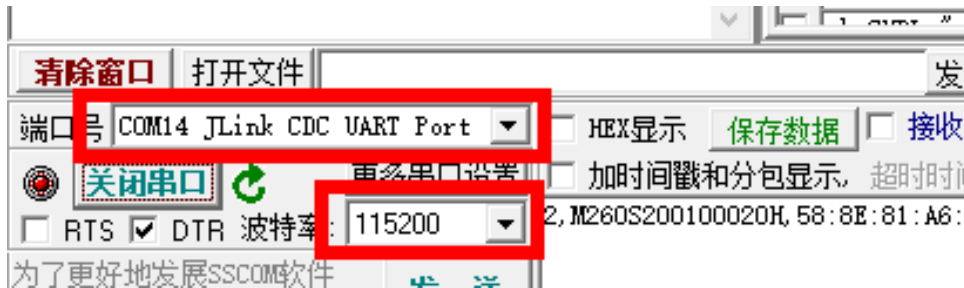
We use EFR32BG13 radio board.



- Radio board need to be program (The firmware is scanner-rtos v001.s37) at first run.

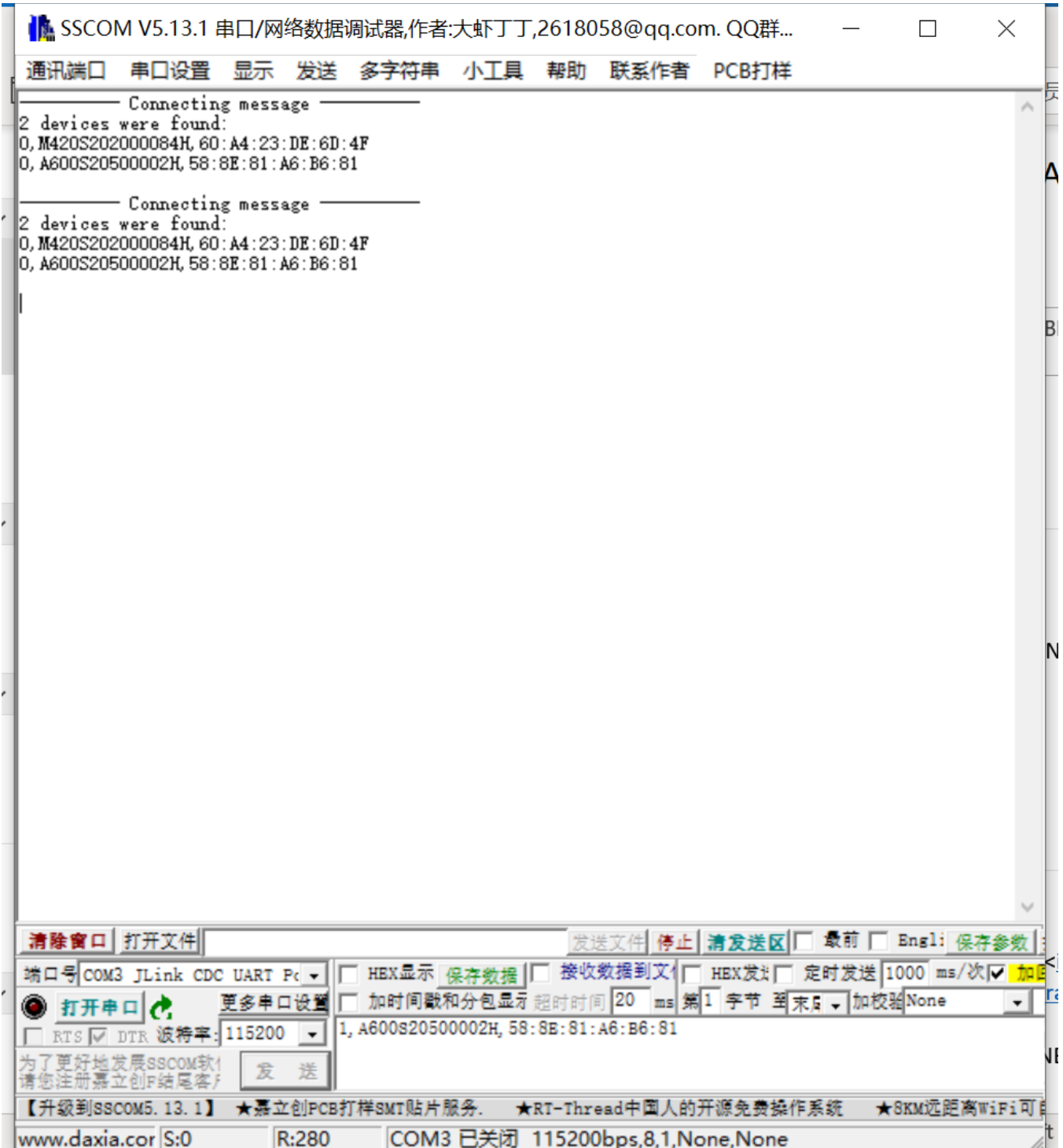


- Open a terminal and open the EV board's COM. The baud rate is 115200.

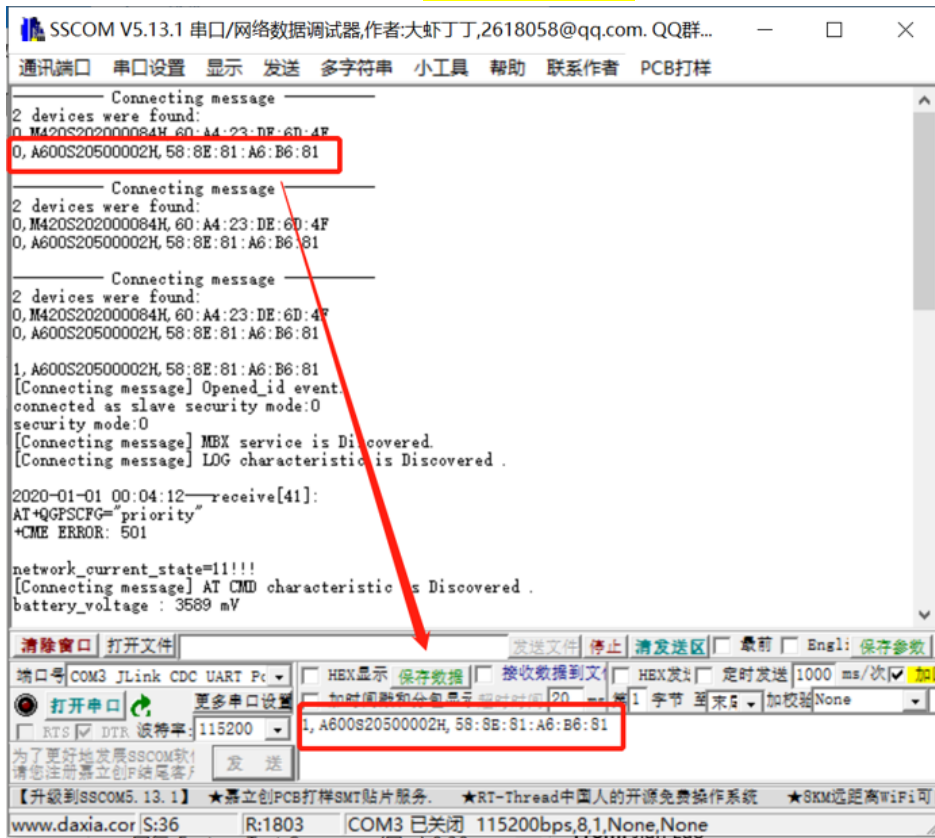


6.3 How to connect a device?

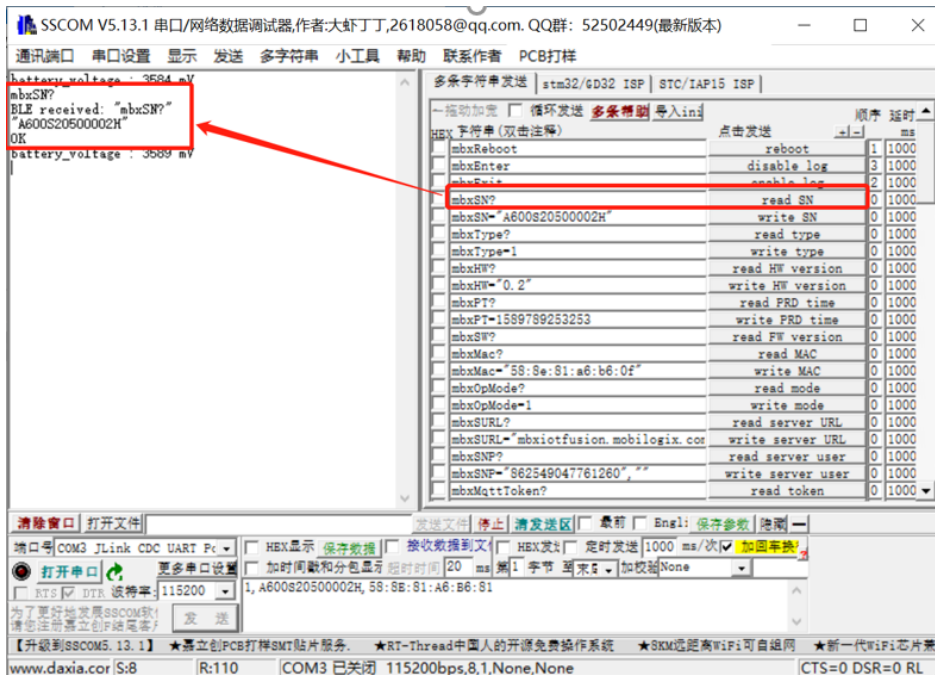
1. First, EV board will print device list. The format is **0,SN,mac address**



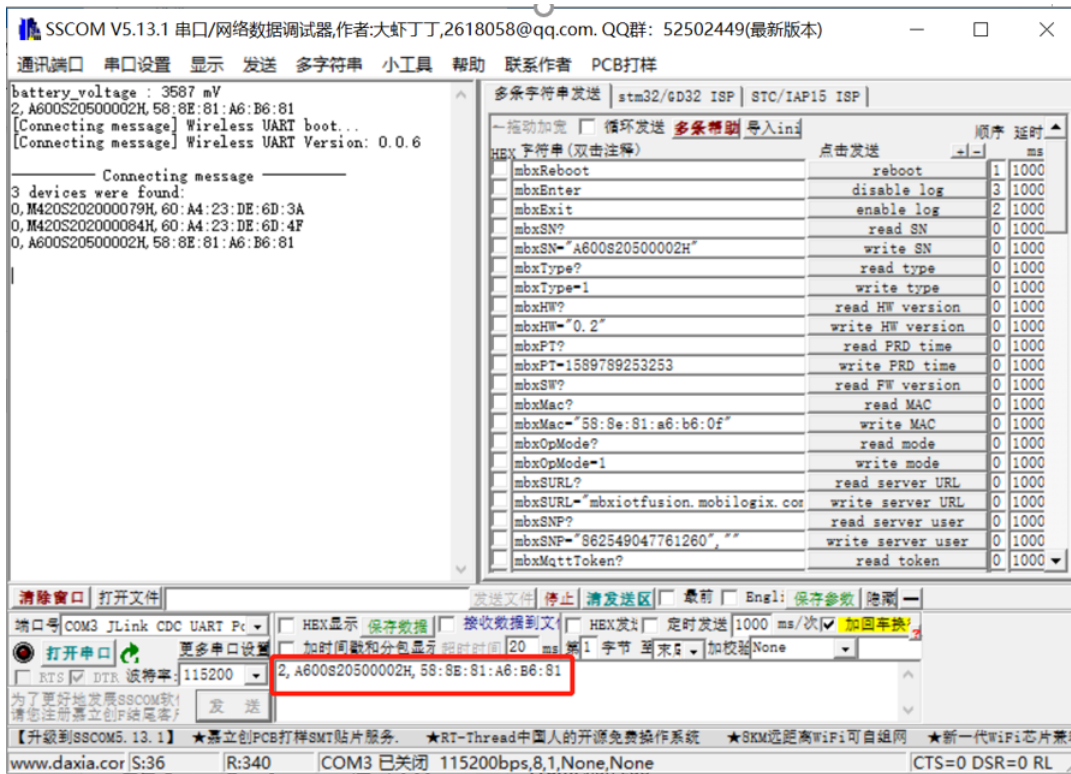
2. Connect to your device by sending 1,SN,mac address



3. Send AT command to read or write parameter.



4. Disconnect by sending 2, SN, mac address or 2,0



5. Attach simple command table at here:

Command	Description
mbxReboot	reboot device
mbxEnter	disable running log (work in normal mode)
mbxExit	enable running log (work in normal mode)
mbxSN?	read SN
mbxHW?	read hardware version
mbxSW?	read firmware version
mbxMac?	read MAC address
mbxSURL?	read server(MQTT) URL
mbxSURL="mbxiotfusion.mobilogix.com"1883	write server(MQTT) URL

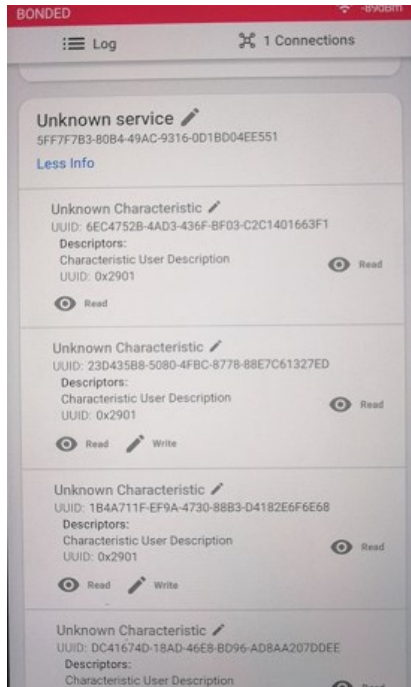
mbxSNP?	read server name and password
mbxSNP="862549047761260", ""	write server name and password
mbxMqttToken?	read MQTT token
mbxMqttToken="efccc44eaf36200e44b3"	write MQTT token
mbxFURL?	read FOTA URL
mbxFURL="http://mbxfota.mobilogix.com", 80	write FOTA URL
mbxAPN?	read APN
mbxAPN="mobilogix1.telefonica.com"	write APN
mbxAPNNP?	read APN name and password
mbxAPNNP="mobilogix""88889999"	write APN name and password
mbxPDP?	read PDP
mbxPDP=1	write PDP
mbxGF?	read geofence state
mbxGF=1	enable/disable geofence
mbxGFR?	read geofence radius
mbxGFR=500	write geofence radius
mbxGFCP?	read geofence center point
mbxGFCP=114.054428,22.574591	write geofence center point
mbxUAM?	read UAM state
mbxUAM=1	enable/disable UAM
mbxUAMV?	read UAM threshold
mbxUAMV=5,20	write UAM threshold
mbxBattery?	read battery voltage
mbxAT=1,AT+GSM	read IMEI from modem

mbxAT=1,AT+CCID	read ICCID form modem
mbxEnScanBcn?	read beacon scanning state
mbxEnScanBcn=	enable/disable beacon scanning
mbxScanBcn?	read beacon scanning time (unit:s)
mbxScanBcn=600,10	write beacon scanning time (unit:s) (here 600 is fixed and 10 is the scanning time)
sampleConfig?	get sample configuration
sampleConfig= frequece, report frequency	set sample frequece/report frequency
mbxCellRAT?	Read network setting
mbxCellRAT=	Write network setting

Table 6.1: AT Command Table

7 Use BLE to config device

1. Connect with BLE, detail information please refer to [5.1](#).
2. Then select Unknow service, you can see like this:



3. then please click review every item by click “Read” and “Write”, and also please review following configuration table:

Here is the command table:

user description	Default	Read	Write	Comment
Firmware Version	1.0.0	TRUE	Fault	
PDP value	1	TRUE	TRUE	rang is 1~16
apn psword		TRUE	TRUE	Max length is 25 bytes
apn username		TRUE	TRUE	Max length is 25 bytes
bat alarm value	3300 mV	TRUE	TRUE	
bat alarm endisable	01	TRUE	TRUE	0/1
mode switch	01	TRUE	TRUE	OPERATION_MODE_SETUP = 0x0, can exit this mode by connecting external power OPERATION_MODE_NORMAL = 0x1, OPERATION_MODE_MANUFACTURE = 0x2, Only ready for Setup mode and Normal mode
ATD600 sn		TRUE	FALSE	16 bytes
reboot		FALSE	TRUE	0/1
reset Factory		FALSE	TRUE	0/1
GNSS sample frequency	4	TRUE	TRUE	4-24
report sample data after sample a certain number of times	4	TRUE	TRUE	1-6
geofenceAlarm Radius	F4 01			
geofenceAlarm Point	114.054428;22.574590	TRUE	TRUE	
geofenceAlarm En-disable	00	TRUE	TRUE	0/1
UAM Alarm En-Disable	01	TRUE	TRUE	0/1

UAM shake Value	20	TRUE	TRUE	
UAMAlarm shake number	5	TRUE	TRUE	
fota Url	http://mbxfota.mobilogix.com	TRUE	TRUE	Max length is 51 bytes
fota Port	80	TRUE	TRUE	Max length is 4 bytes
device Apn	mobilogix1.telefonica.com	TRUE	TRUE	Max length is 56 bytes
server Port	1883	TRUE	TRUE	Max length is 4 bytes
server url	mbxiotfusion.mobilogix.com	TRUE	TRUE	Max length is 51 bytes
Network setting	03	TRUE	TRUE	0: 2G only 1: 2G + NB 2: 2G + NB + M1 3: 2G + M1 4: NB only 5: NB + M1 6: M1 only
Beacon scanning on/off	01	TRUE	TRUE	0/1
beacon scan duration	10	TRUE	TRUE	

Table 7.1 BLE command table

8. FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least **20 cm** from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and consider removing the no-collocation statement.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution!

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

9. Canada Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- 1) L'appareil ne doit pas produire de brouillage;
- 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 2.5 de RSS 102 et la conformité à l'exposition de RSS-102 rf, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de rf.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of **20** centimeters between the radiator and your body.

Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.