OPL1000

ULTRA-LOW POWER 2.4GHZ WI-FI + BLUETOOTH SMART SOC

RF Testing Guide

OPULINKS

OPL1000-RF-Testing-Guide | **Version 03**

Date	Version	Contents Updated
2018–07–20	0.1	● Initial Release
2018–07–27	0.2	● Update section 2.3
2019–03–04	0.3	● Add section 2.5

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Scope of Document Applications

This file outline RF testing flow and method on OPL1000.

1.2. Abbreviations

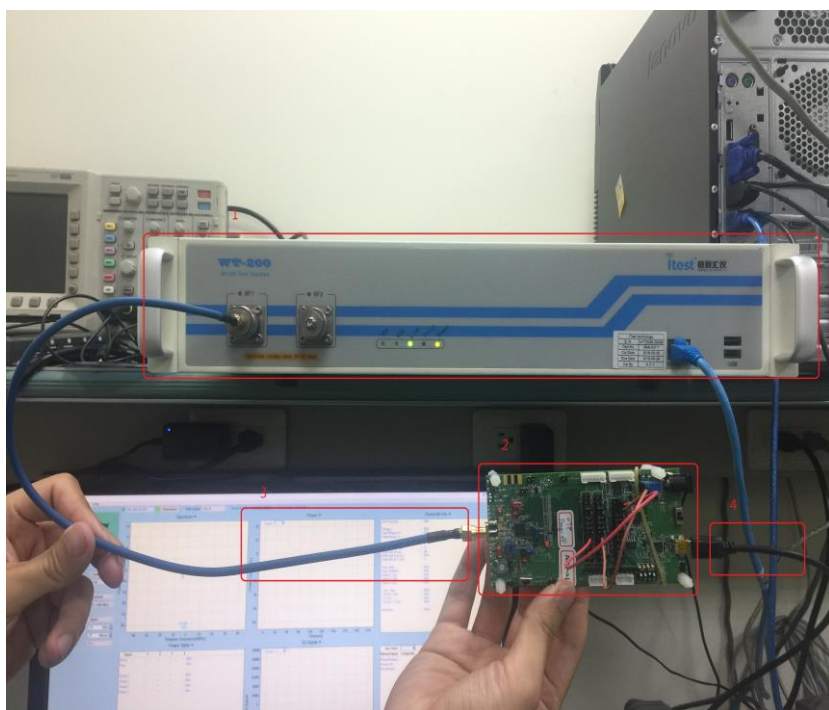| Abbr.	Explanation
BLE	Bluetooth Low Energy
WIFI	Wireless Fidelity
RF	Radio Frequency
RSSI	Radio Signal Strength Indicator
VSA	Vector Signal Analysis
VSG	Vector Signal Generation
DUT	Device Under Test

1.3. References

[1] AT Command and procedure outline, *OPL1000-AT-instruction-set-and-examples.pdf*

2.   METHOD OF OPL1000 RF TESTING

2.1.   Environment Setup

1.   WLAN Meter : This demonstration is set up with WT-200
2.   OPL1000 board : The board being tested
3.   RF cable : Through a wired method to connect WLAN Meter and OPL1000 Board
4.   USB to UART cable : Used to connect with PC to perform operation of UART command

Connect with WLAN Meter: After having activated WLAN Meter, set IP before clicking "Connect".
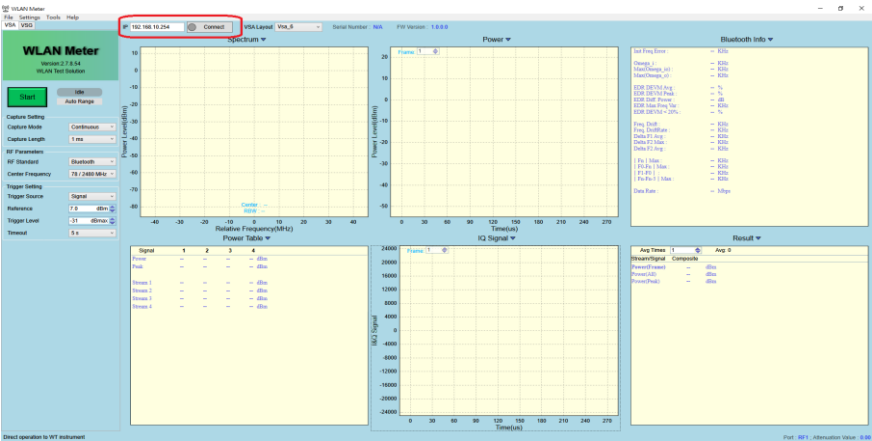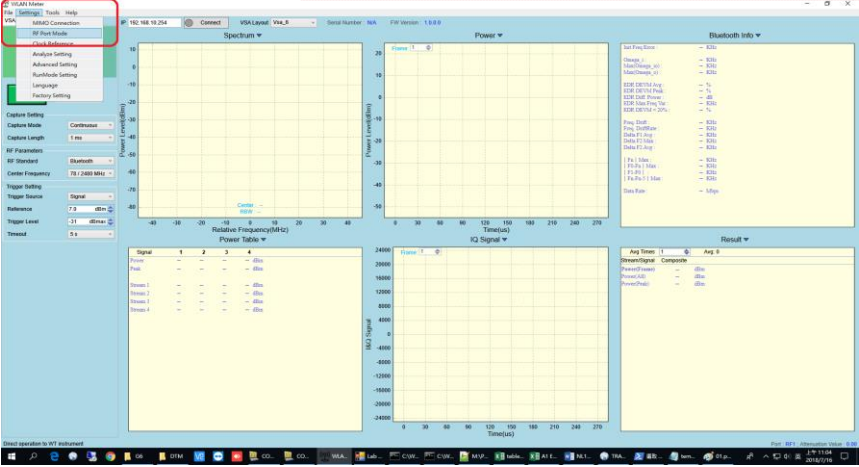

2.2. RF Cable Decay Testing and Compensation

RF Cable Connection: Please connect RF cable with these 2 ports, as shown in the diagram below,
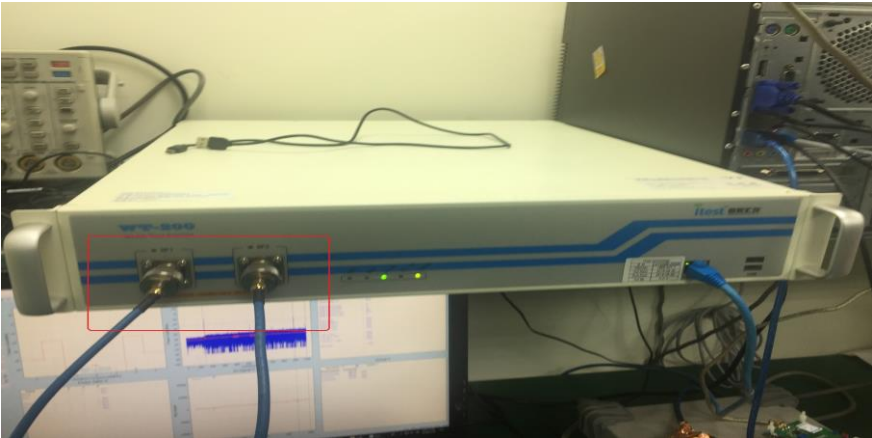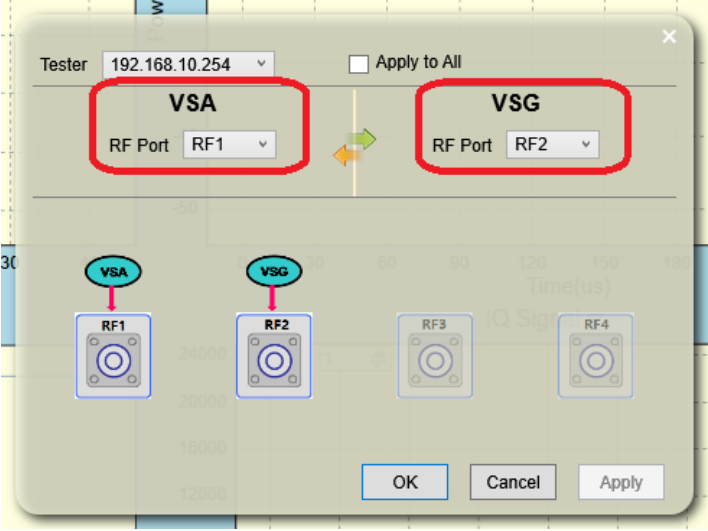
RF Port Setting: After having activated WLAN Meter, please proceed with RF Port set-up
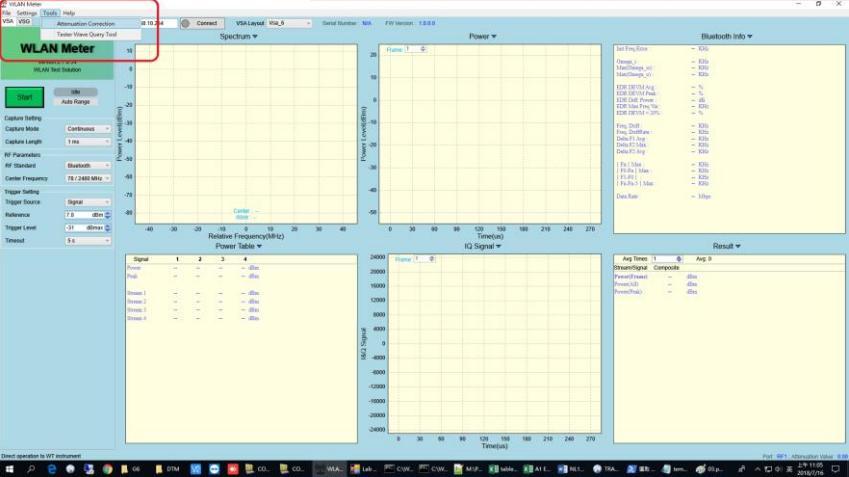
- Step1 : Activate set-up page
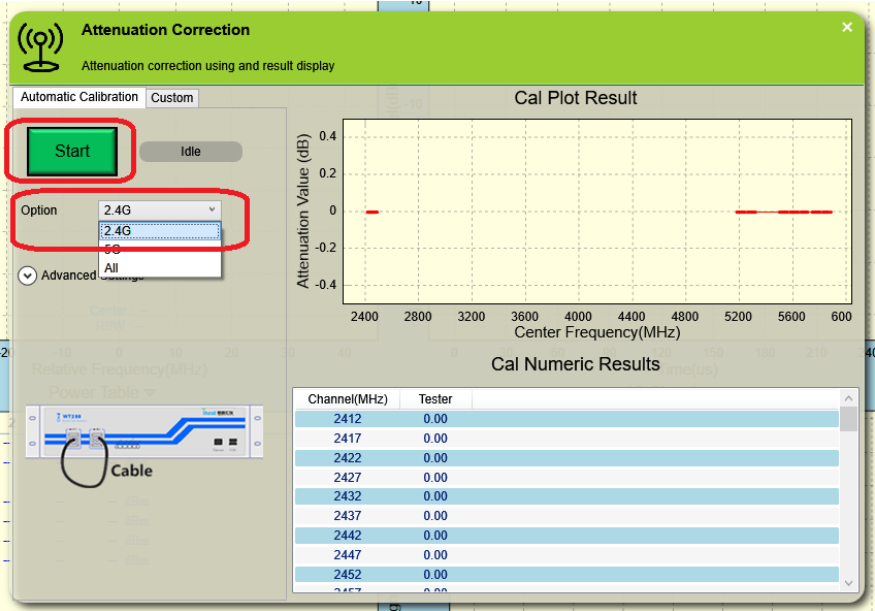
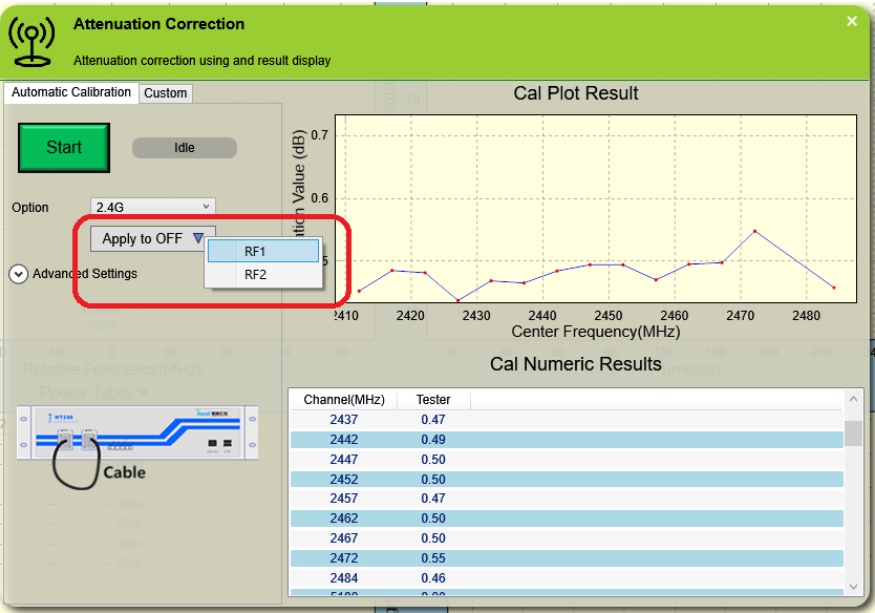- Step 2 : Designate VSA as RF 1, VSG as RF 2.

- Step 3 : Activate Testing Page

- Step 4 : Select 2.4G in "Option", before clicking "Start"

- Step 5 : The result is generated as "RF 1".

2.3. WiFi Testing

Command Index

- Initialization

at+mode= [Mode]	
Mode	3

- Channel setting

at+channel= [Channel]	
Channel	1 ~ 14

- Set WiFi Packet Format

at+go=[bLongPreamble], [Data Length], [Interval], [Data Rate], [Packet Count]	
bLongPreamble	1 for LONG Others for SHORT
Data Length	n bytes
Interval	n us (Packet interval)
Data Rate	1, 2, 5.5, 11 Mbps
Packet Count	0 for infinite Others for given number

- Activate/Terminate WiFi Tx Testing

at+tx=[bEnable]	
bEnable	1 for enable 0 for disable

- Activate/Terminate WiFi Rx Testing

at+rx=[bEnable]	
bEnable	1 for enable 0 for disable

- Clear WiFi Rx Data Count

at+reset_cnts	
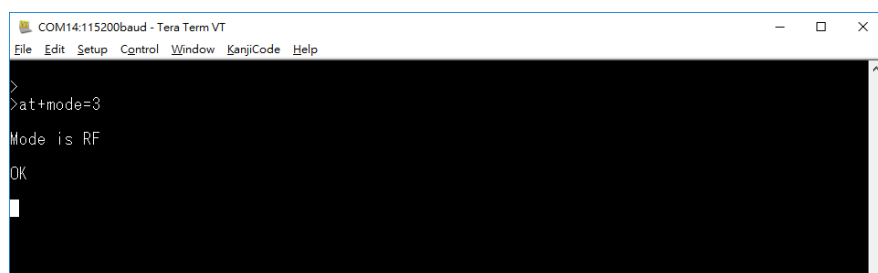
- Read WiFi Rx Data Count

at+counters?	

Test Items

1. Initialization

at+mode=3
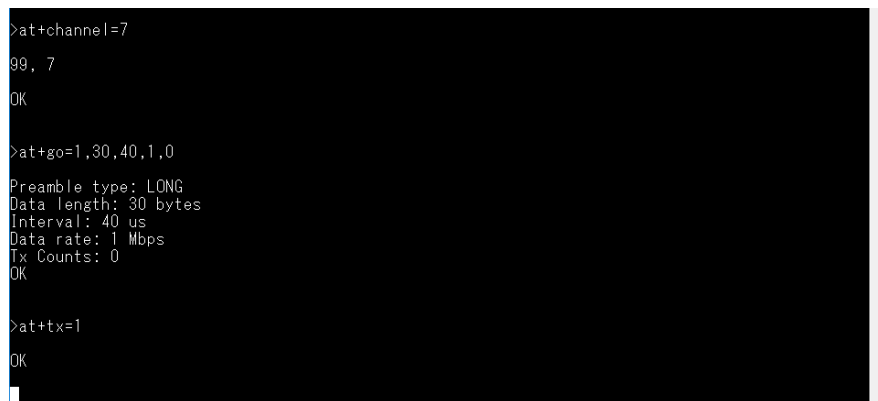
2. Set up and initiate WiFi Tx Testing

at+channel=7

at+go=1,30,40,1,0

at+tx=1

3. WLAN Meter Set-up

● Set up RF Port

VSA as RF 1
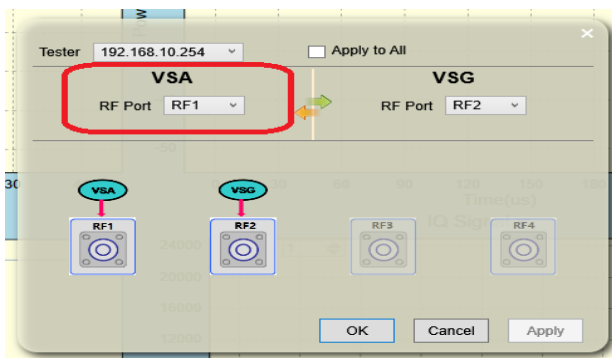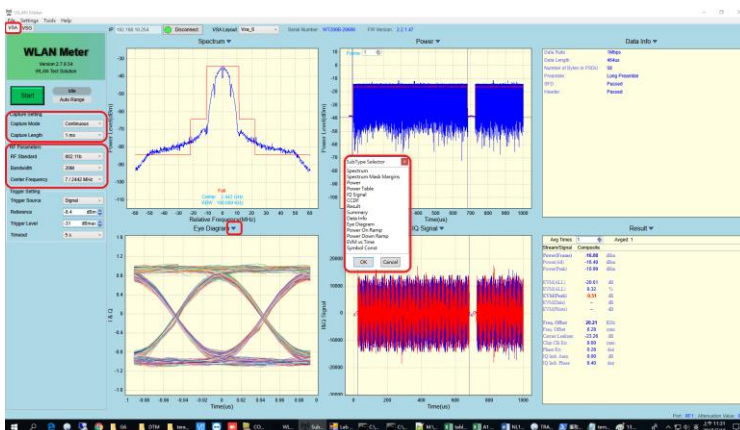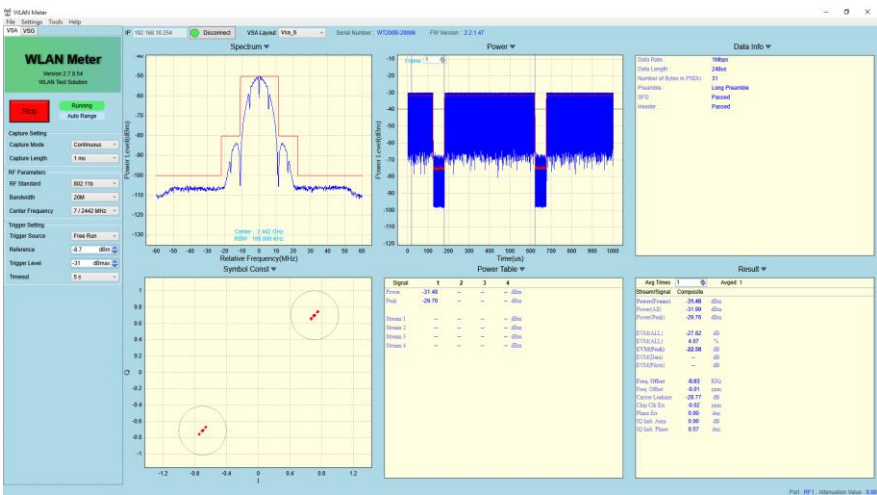

● Set up Related Parameters

Select VSA Page

Set up Capture Setting: Continuous mode, with Length of 1ms

Set up RF parameters : 802.11b、20M, with Center Frequency as 7

Select desired testing result : Spectrum、Power、Symbol Const、Eye Diagram

- As set-up completes, click "Start".

4. Terminate WiFi Tx Testing

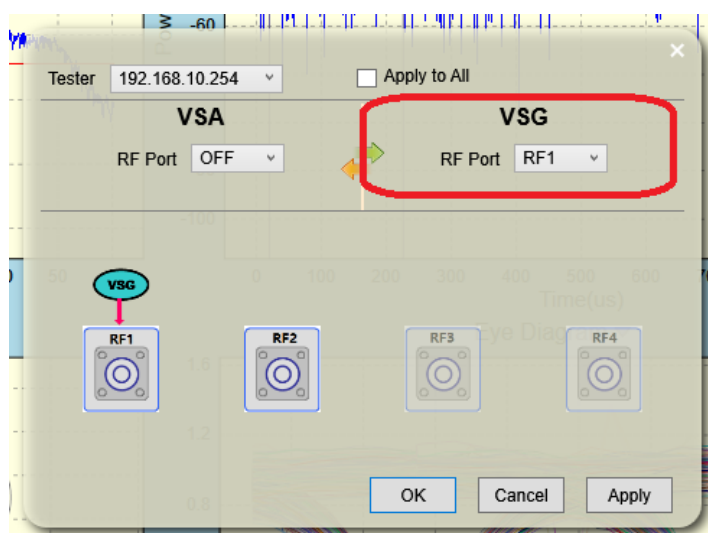at+tx=0

```
>at+tx=0
OK
```

5. Initiate WiFi RX Testing

at+rx=1

```
>at+rx=1
OK
```

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WLAN Meter Set-Up

● Set up RF Port

VSG as RF 1

● Set up Related Parameters
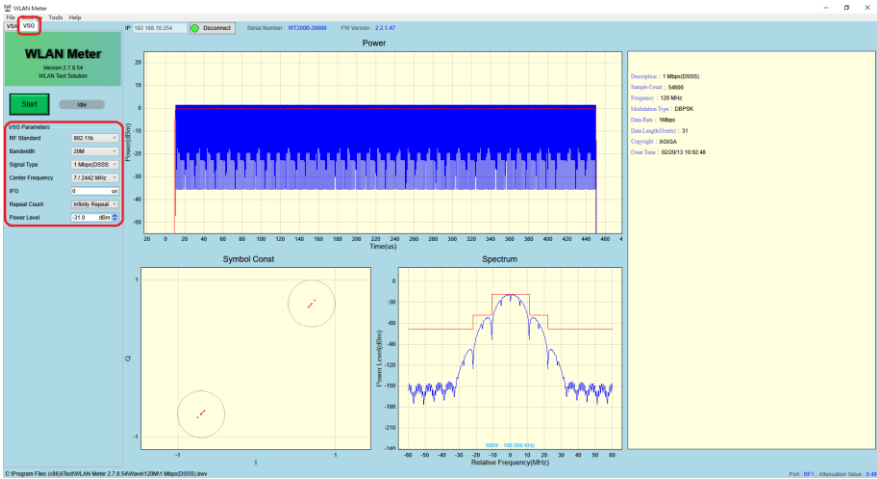
Select VSG Page

Set RF standard : 802.11b

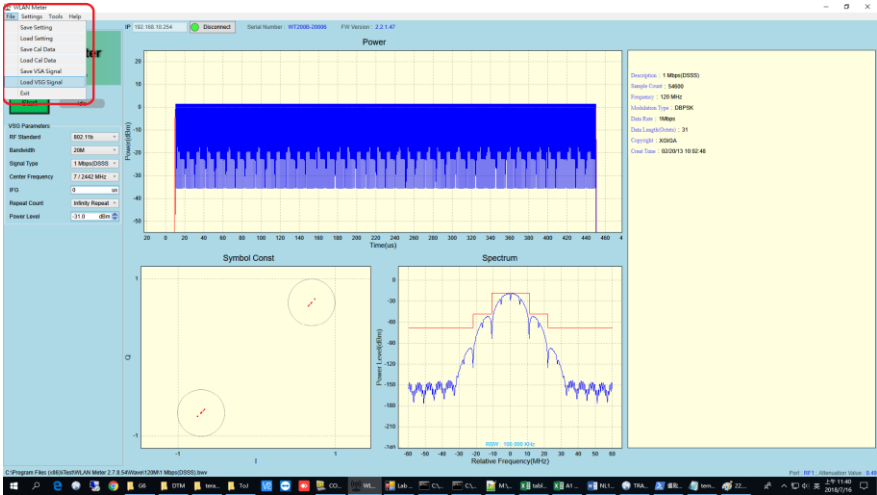Set Bandwidth : 20M

Set Signal Type : 1 Mbps (DSSS)
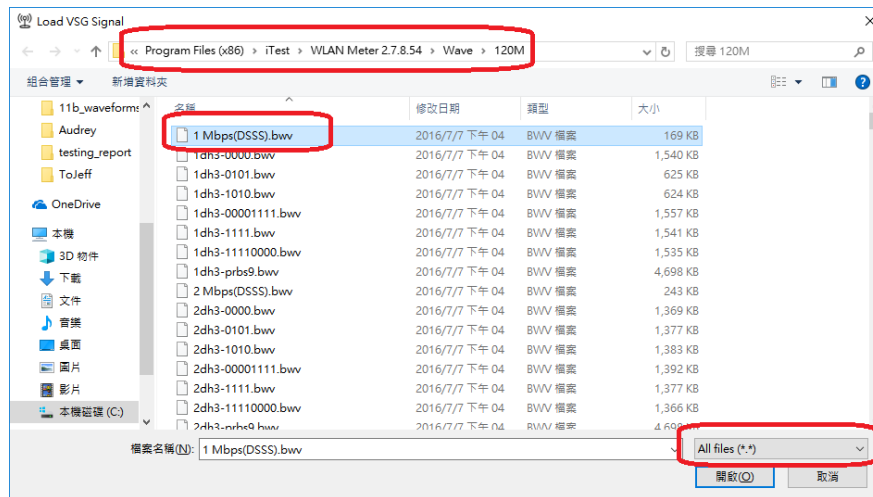
Set Center Frequency : 7 / 2442 MHz
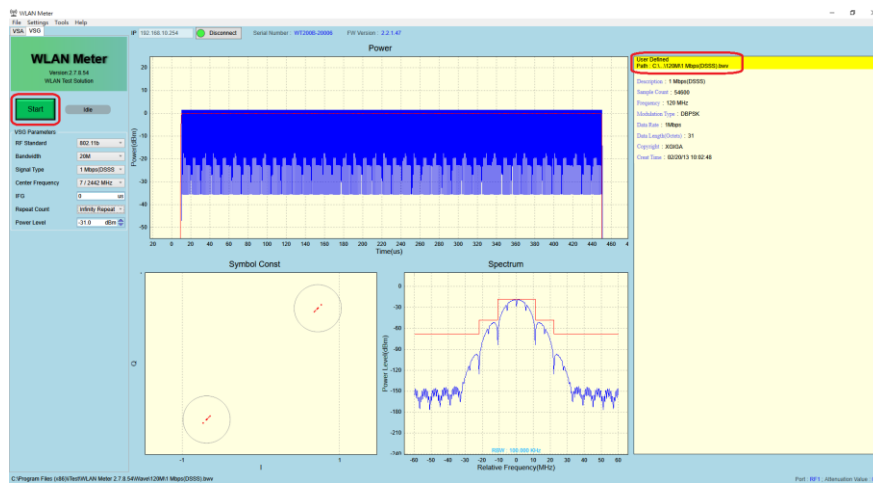
Set IFG : 40 us

Set Repeat Count : Infinity Repeat

- Loaded VSG Signal

Select file, "1 Mbps(DSSS).bwv".

- Confirm uploaded result, before clicking "Start".

6. Clear WiFi Rx Data Count

at+reset_cnts

```
>
>at+reset_cnts
OK
```

7. Read WiFi Rx Data Count

at+counters?

```
>at+counters?

ok: 70558, err: 3836, rssi: -38
OK
```

OK: The number of correct packets received in the testing period.

err: The number of incorrect packets received in the testing period.

rssi: RSSI Value (Signal Strength)

8. Terminate WiFi Rx Testing

at+rx=0

```
>at+rx=0
OK
```

Note: TX and RX cannot be tested at the same time, as one needs to be completed before processing with the other function.

2.4. BLE Testing

Command Index

● Set-Up and initiate BLE Tx Testing

at+dtm= tx [Channel] [Data Length] [Packet Type]	
Channel	0 ~ 39
Data Length	n bytes
Packet Type	0 : PRBS9 1 : Pattern 11110000 2 : Pattern 10101010 3 : PRBS15 4 : Pattern 11111111 5 : Pattern 00000000

● Set-Up and initiate BLE Rx Testing

at+dtm= rx [Channel]	
Channel	0 ~ 39

● Terminate BLE Testing

at+dtm= end	

Test Items:

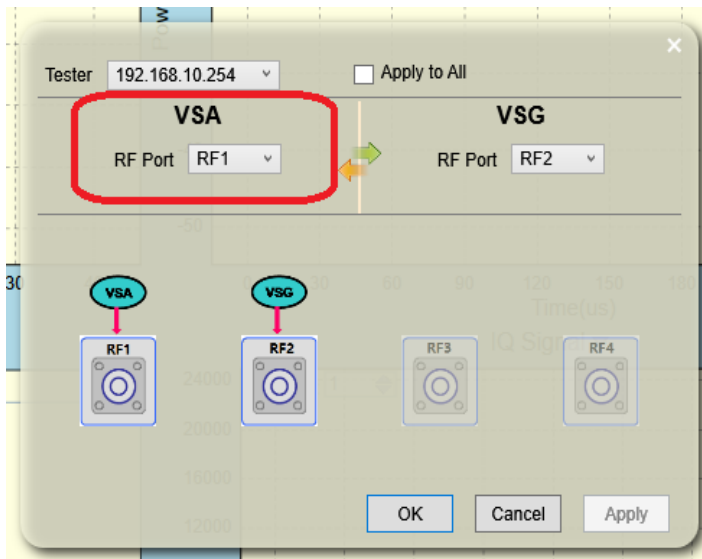1.   Set-Up and initiate BLE Tx Testing

at+dtm=tx,20,30,2

```
>at+dtm=tx,20,30,2
Start DTM Tx
frequency: 20, length: 30, type: 2
OK
```

Note : As Channel = 20, it is equivalent to 2442 MHz.

Meter Set-Up
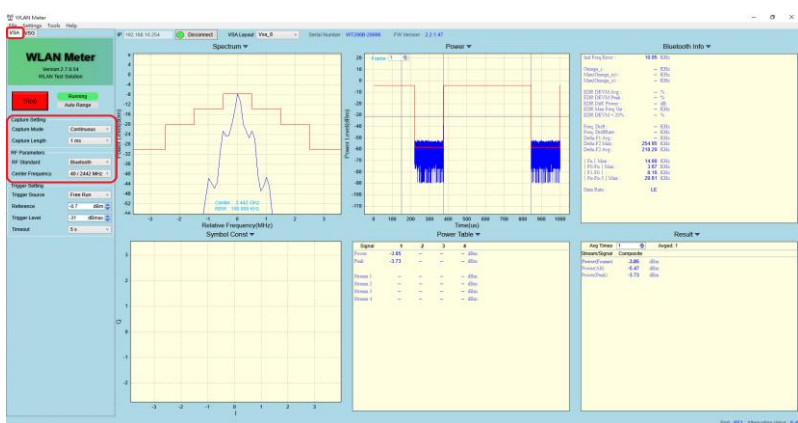
●   Set up RF Port

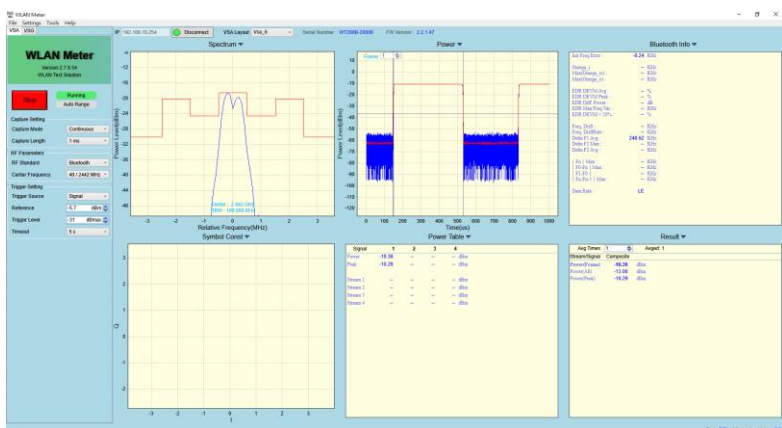VSA as RF 1

- Set up Related Parameters

Select VSA Page

Set Capture Settings: Continuous mode, with Length as 1ms.

Set RF parameters: Bluetooth, with Center Frequency as 40/2442 MHz.

Select desired testing result: Spectrum、Power、Symbol Const、Power Table

- As set-up completes, click "Start".

2. Terminate BLE Tx Testing

at+dtm=end

```
>at+dtm=end
RX CNT:  0
CRC OK:  0
CRC FAIL:       0
packet count: 0
OK
```

3. Set-up and initiate BLE Rx Testing
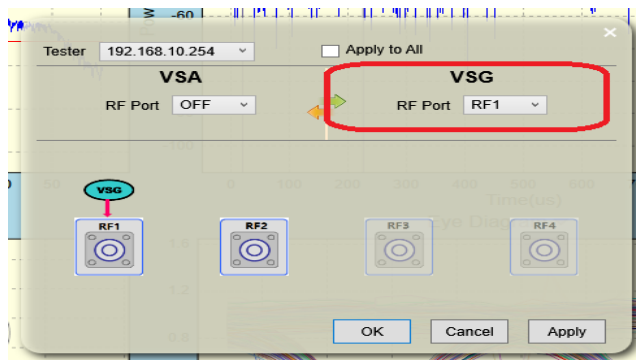
at+dtm=rx,20

```
>at+dtm=rx,20
Start DTM Rx
frequency: 20
OK
```

Note : As Channel = 20, it is equivalent to 2442 MHz.

Meter Set-Up

● Set up RF Port

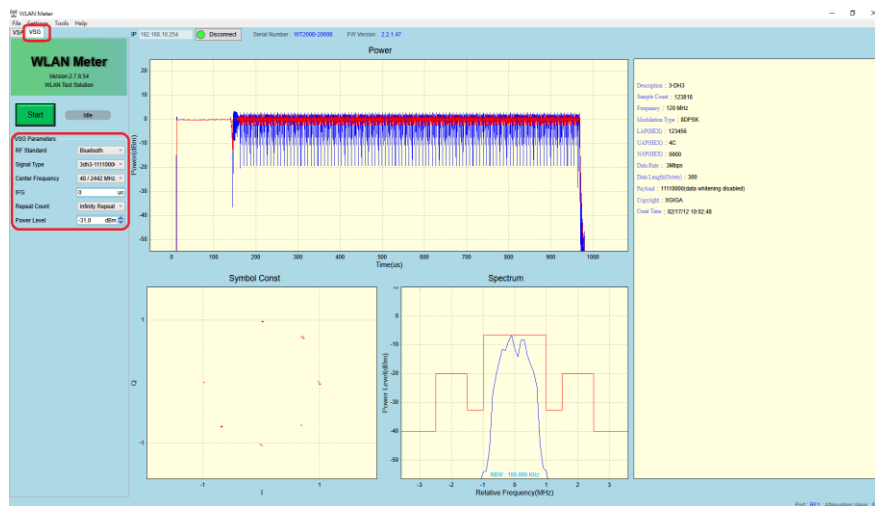VSG as RF 1

- Set up Related Parameters
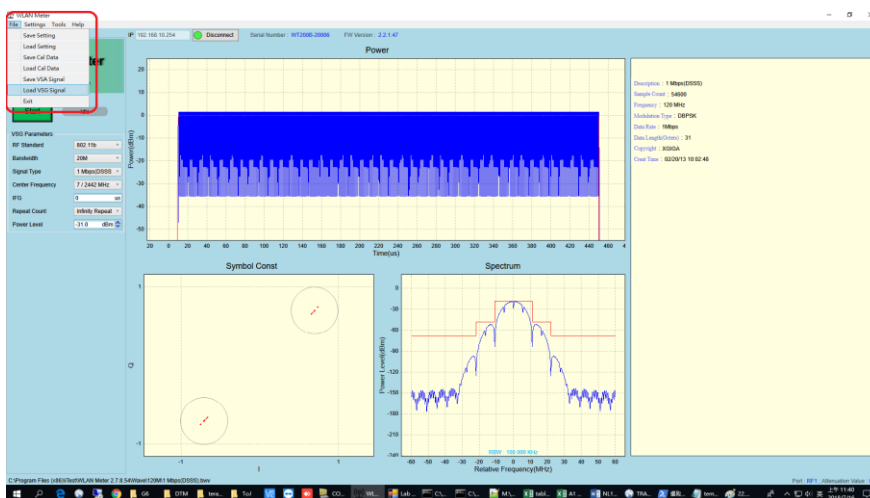
Select VSG Page

Set RF standard : Bluetooth

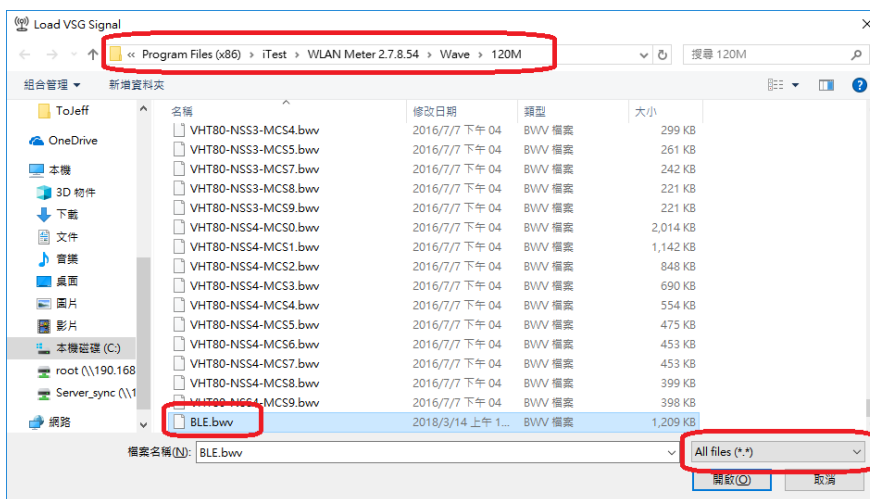Set Center Frequency : 40 / 2442 MHz
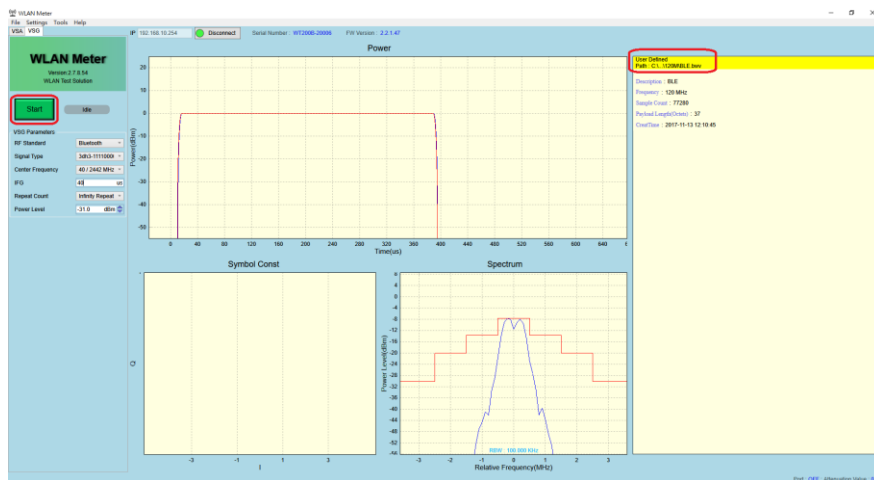
Set IFG : 40 us

Set Repeat Count : Infinity Repeat

- Loaded VSG Signal

Select file, "BLE.bwv".

- Confirm uploaded result, before clicking "Start". Confirm loaded resulted and clicking start

4. Terminate BLE Rx Testing

at+dtm=end

RX CNT : Total number of packets received

CRC OK : The number of correct CRC packets received in the meantime

CRC FAIL : The number of incorrect CRC packets received in the meantime

RSSI : RSSI Value (Signal Strength)

2.5. Announcements

1. For other channels to test, the DUT command is as follows:
   Ex:
   a. Tx power Test for WiFi CH1, 5.5Mbps
   at+channel=1
   at+go=1,30,40,5.5,0
   at+tx=1

   b. Tx power Test for WiFi CH13, 11Mbps
   at+channel=13
   at+go=1,30,40,11,0
   at+tx=1

   c. Rx PER Test for WiFi CH1
   at+channel=1
   at+rx=1
   at+reset_cnts
   at+counters?

   d. Rx PER Test for WiFi CH13
   at+channel=13
   at+rx=1
   at+reset_cnts
   at+counters?

   e. Tx power Test for BLE CH0, payload=PRBS9
   at+dtm=tx,0,30,0
   at+dtm=end

   f. Tx power Test for BLE CH39, payload=0xFF
   at+dtm=tx,39,30,4
   at+dtm=end

g.   Rx PER Test for BLE CH0
at+dtm=rx, 0
at+dtm=end

h.   Rx PER Test for BLE CH39
at+dtm=rx, 39
at+dtm=end

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CONTACT

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