OPL1000

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

RF Testing Guide

OPULINKS

REVISION HISTORY

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

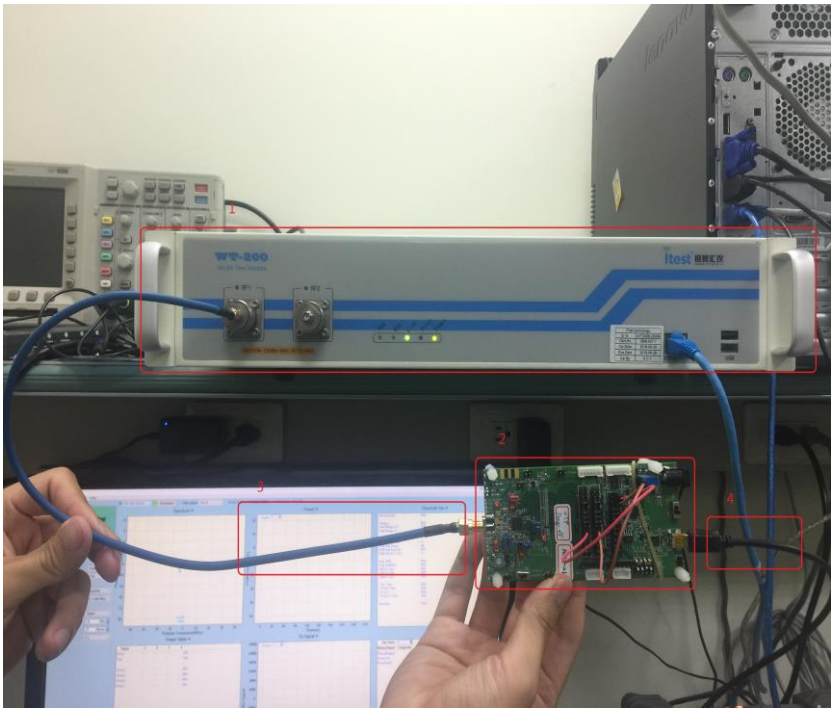
Abbr.	Explanation
BLE	Bluetooth Low Energy
WIFI	Wireless Fidelity
RF	Radio Frequency
RSSI	Radio Signal Strength Indicator
VSA	Vector Signal Analysis
VSG	Vector Signal Generation
DUT	Device Under Test

1.3. References

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

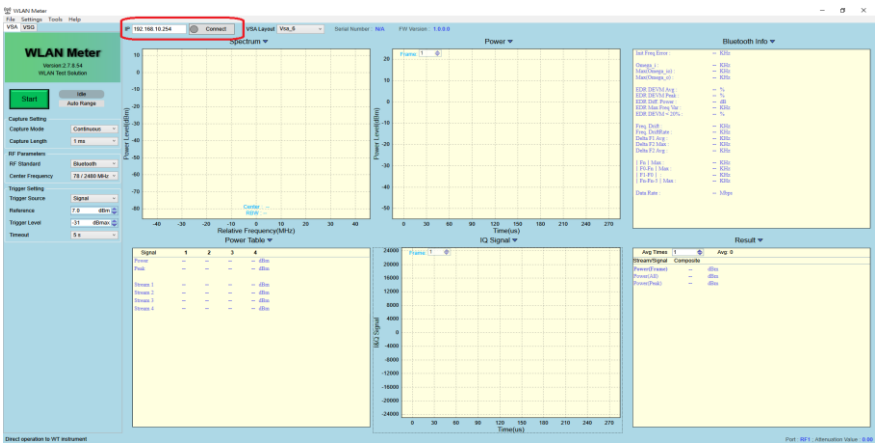
2. METHOD OF OPL1000 RF TESTING

2.1. Environment Setup



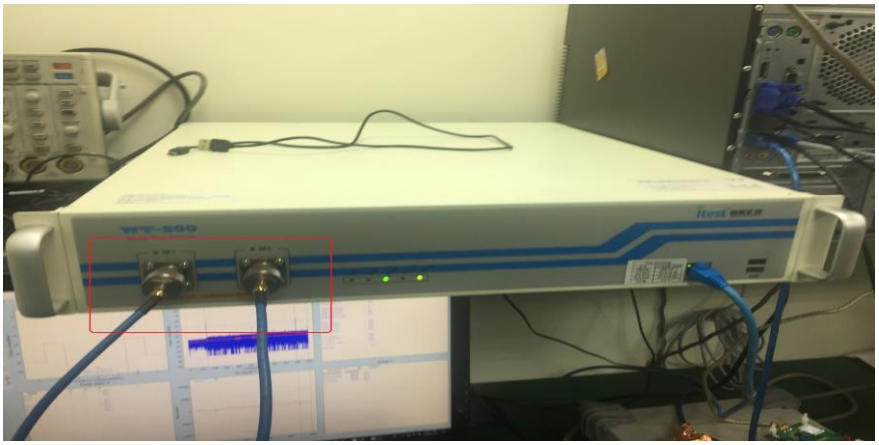
1. WLAN Meter : This demonstration is set up with WT-200
2. OPL1000 board : The board being tested
3. RF cable : Through a wired method to connect WLAN Meter and OPL1000 Board
4. USB to UART cable : Used to connect with PC to perform operation of UART command

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



2.2. RF Cable Decay Testing and Compensation

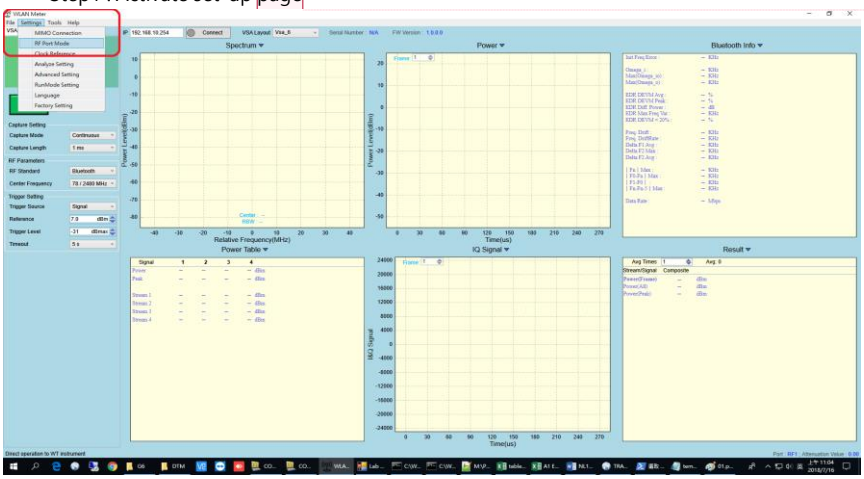
RF Cable Connection: Please connect RF cable with these 2 ports, as shown in the diagram below,



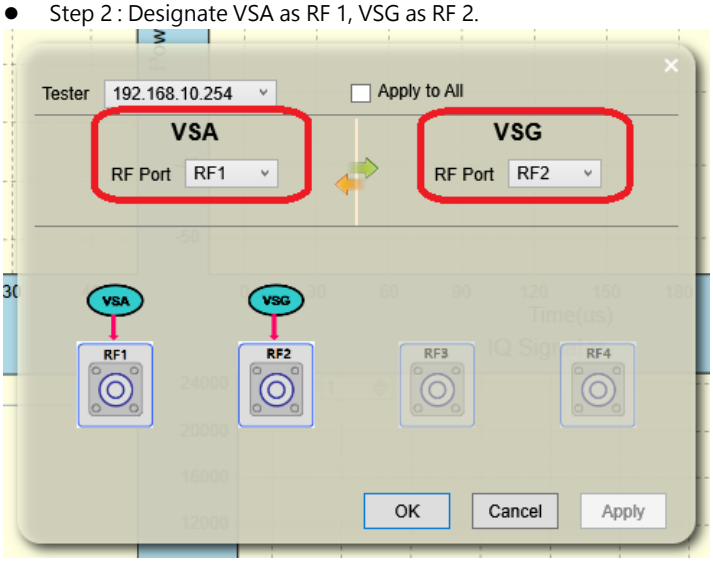
RF Port Setting: After having activated WLAN Meter, please proceed with RF Port set-up

- Step1 : Activate set-up page

批注 [O1]: 為翻譯到

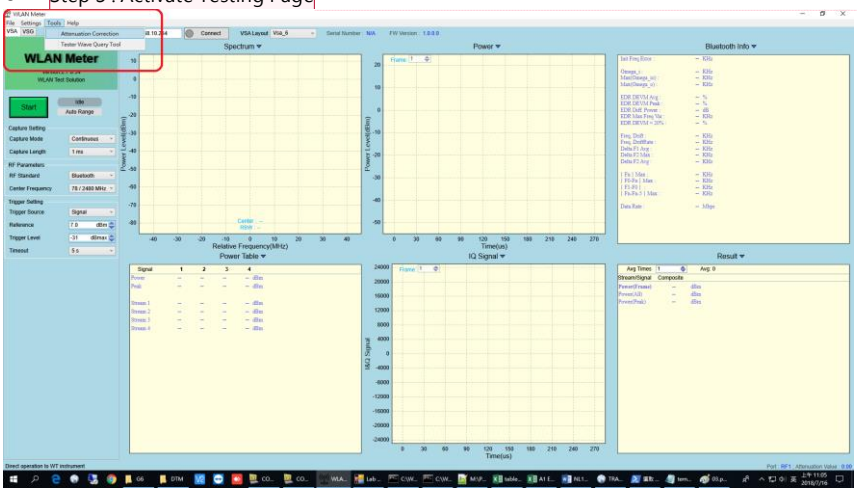


- Step 2 : Designate VSA as RF 1, VSG as RF 2.

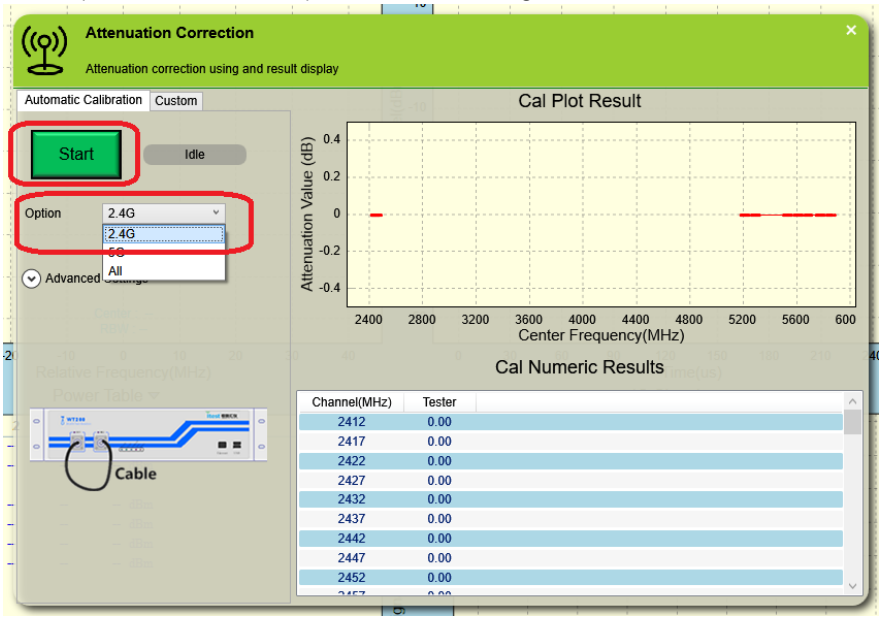


- Step 3 : Activate Testing Page

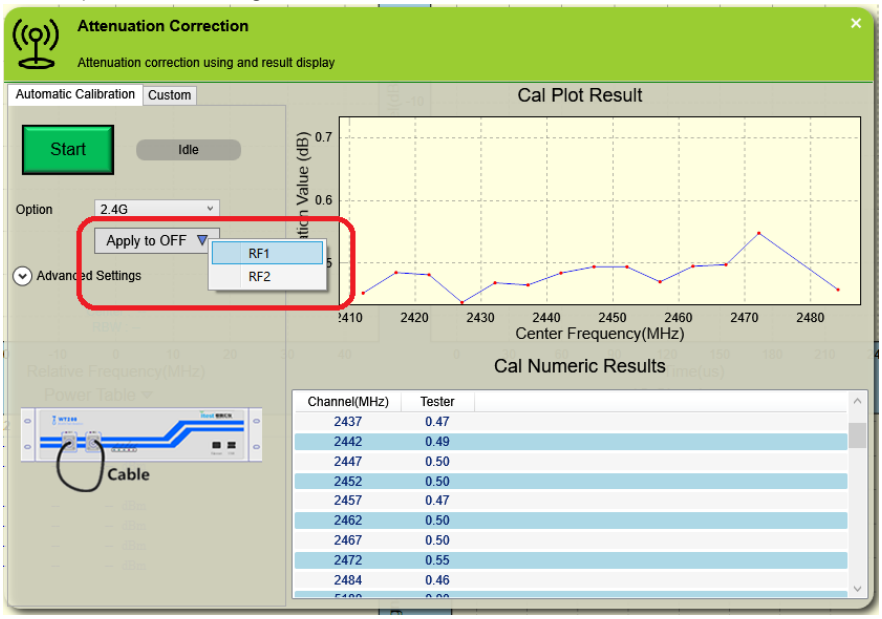
批注 [O2]: 未翻譯到



- 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	

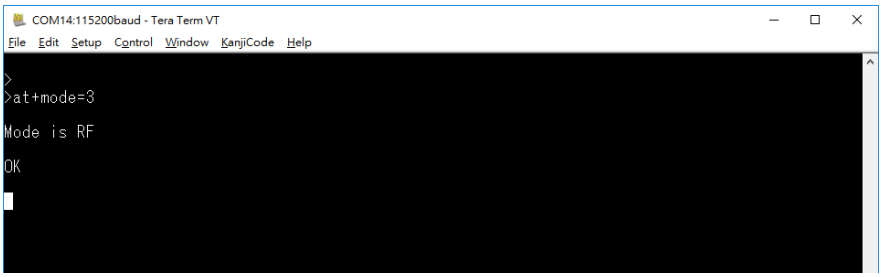
- Read WiFi Rx Data Count

at+counters?	

Test Items

1. Initialization

at+mode=3



2. Set up and initiate WiFi Tx Testing

at+channel=7

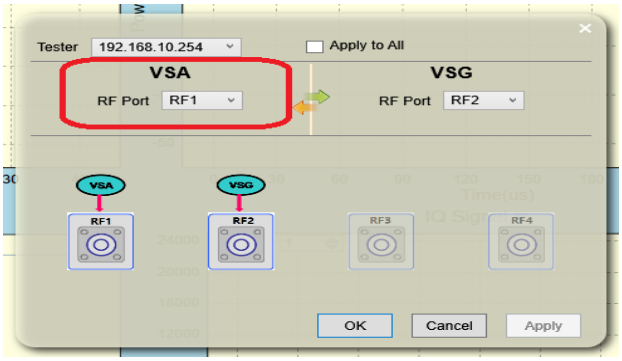
at+go=1,30,40,1,0

at+tx=1

3. WLAN Meter Set-up

- Set up RF Port

VSA as RF 1



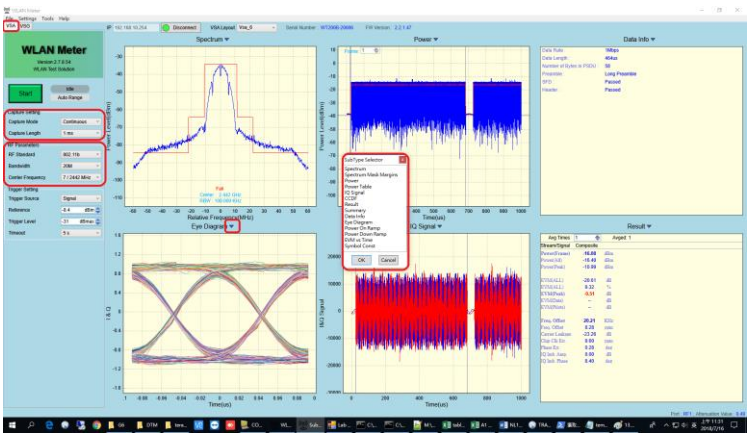
- Set up Related Parameters

Select VSA Page

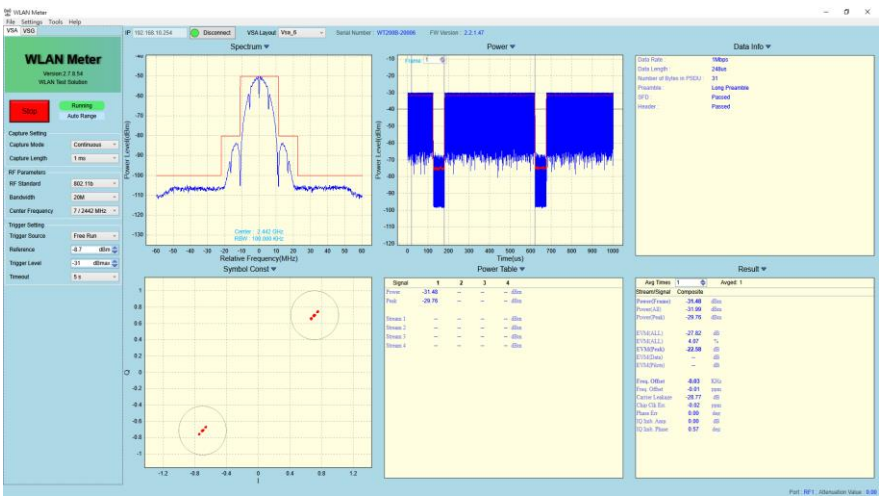
Set up Capture Setting: Continuous mode, with Length of 1ms

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

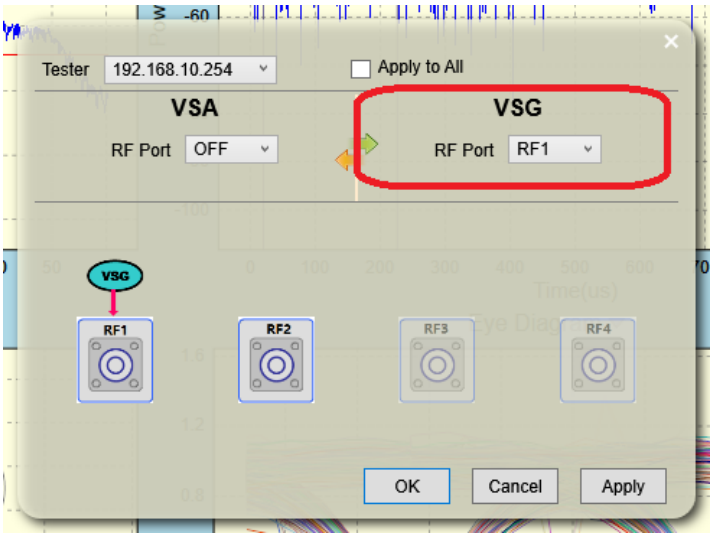
at+rx=1

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

WLAN Meter Set-Up

- Set up RF Port

VSG as RF 1



- Set up Related Parameters

Select VSG Page

Set RF standard : 802.11b

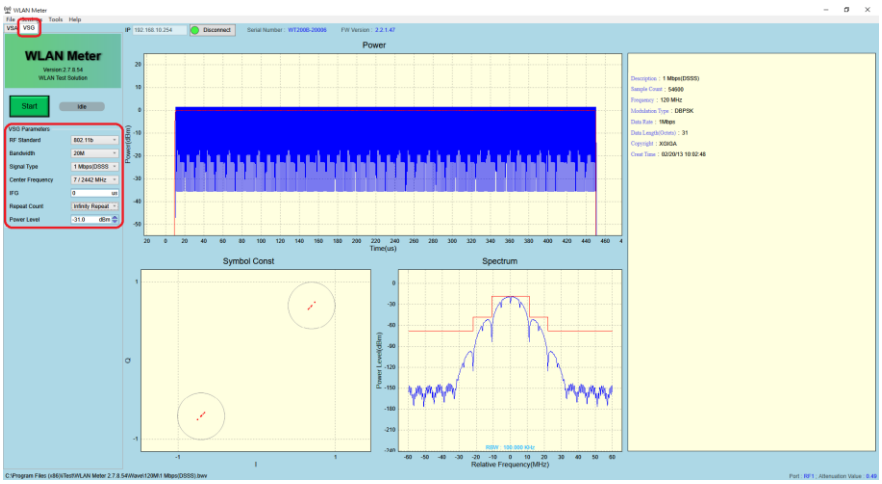
Set Bandwidth : 20M

Set Signal Type : 1 Mbps (DSSS)

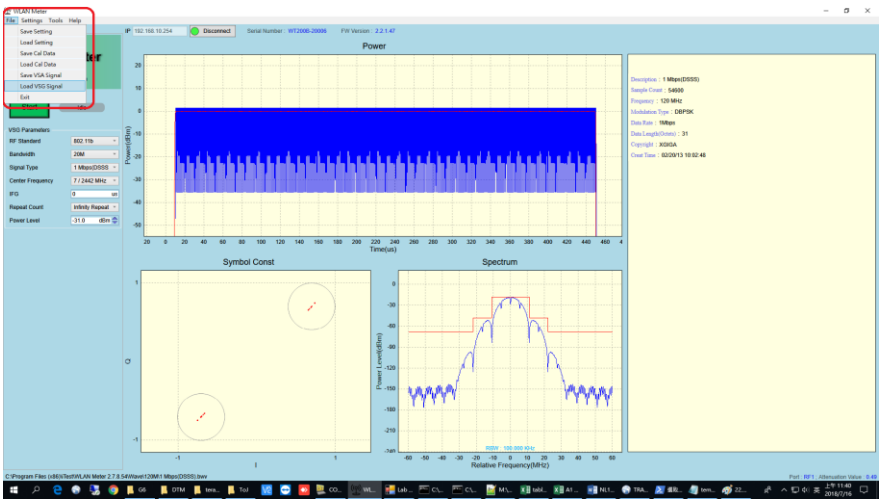
Set Center Frequency : 7 / 2442 MHz

Set IFG : 40 us

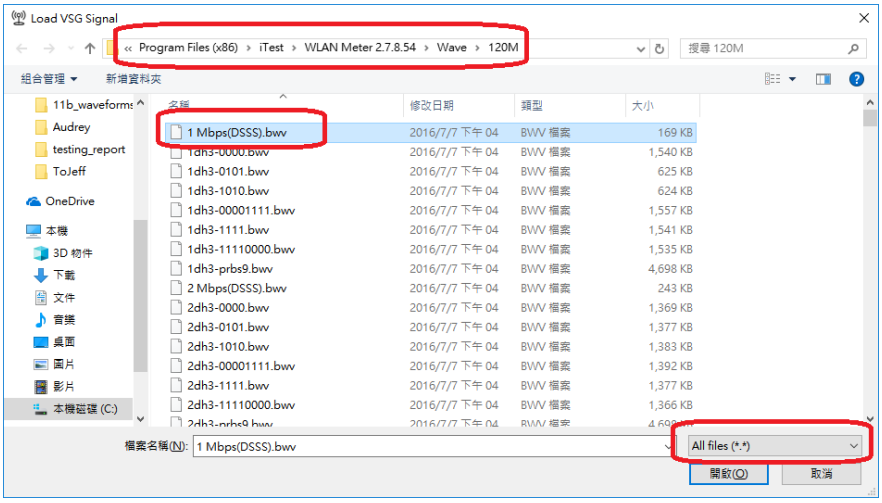
Set Repeat Count : Infinity Repeat



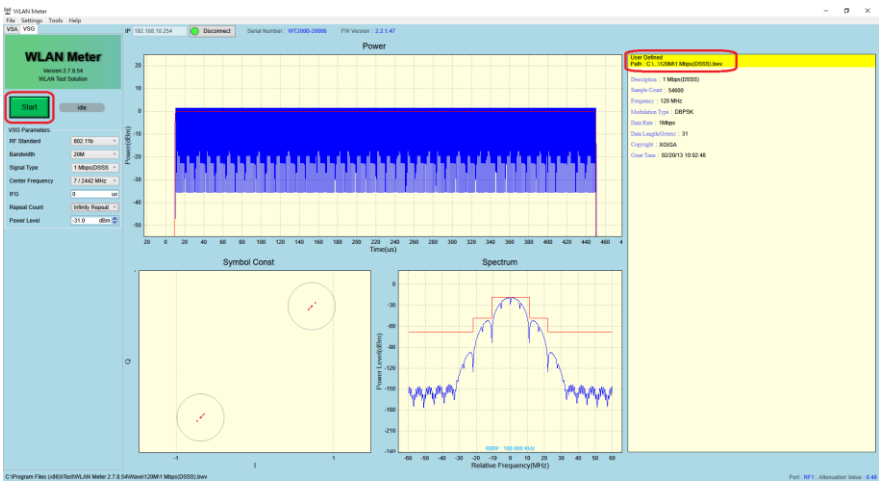
- Loaded VSG Signal



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

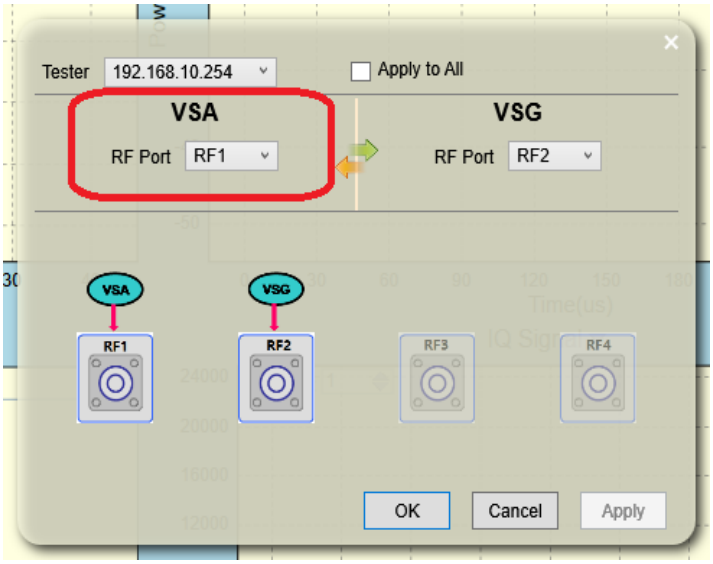
```
>at+dtm=tx,20,30,2
Start DTM Tx
frequency: 20, length: 30, type: 2
OK
```

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

Meter Set-Up

- Set up RF Port

VSA as RF 1



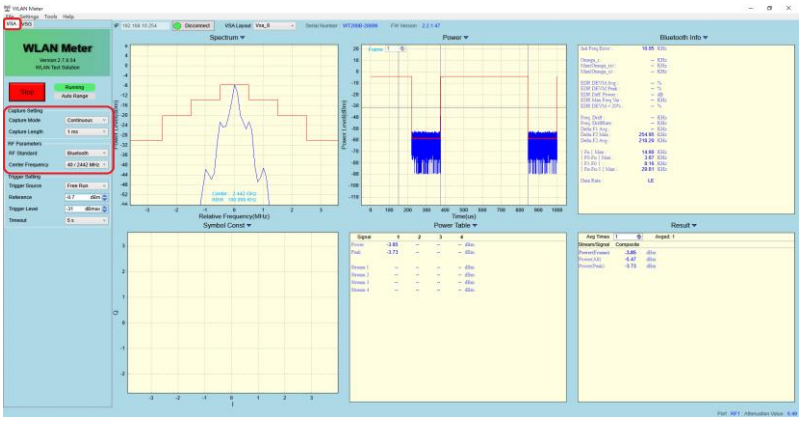
- Set up Related Parameters

Select VSA Page

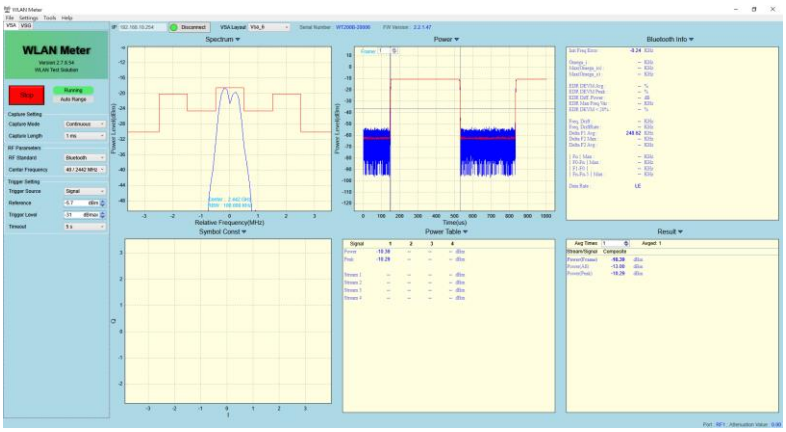
Set Capture Settings: Continuous mode, with Length as 1ms.

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

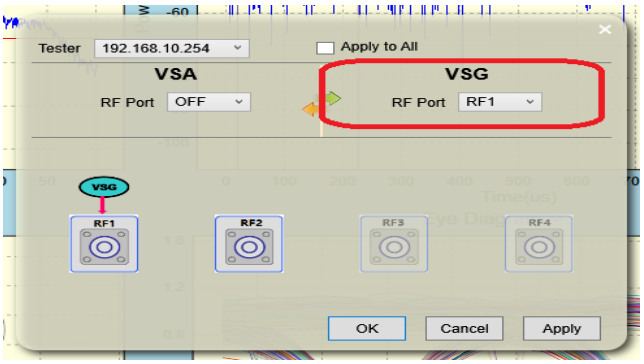
```
>at+dtm=rx,20
Start DTM Rx
frequency: 20
OK
```

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

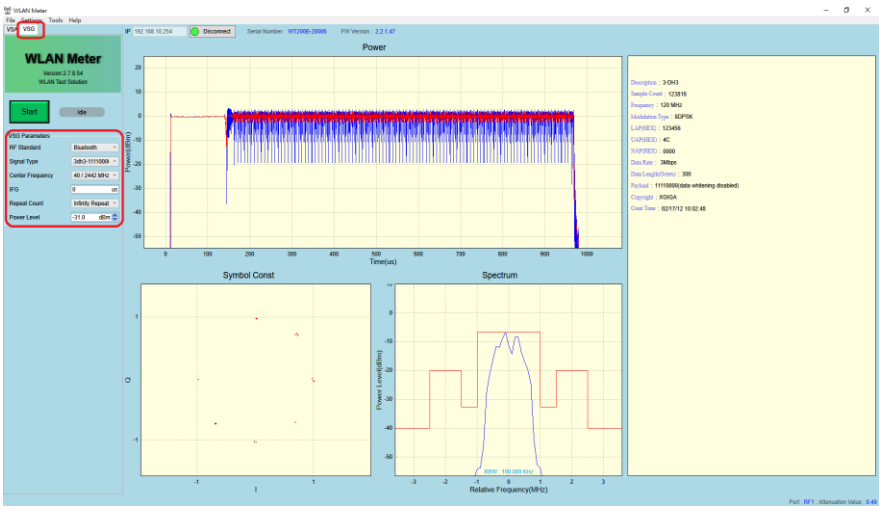
Select VSG Page

Set RF standard : Bluetooth

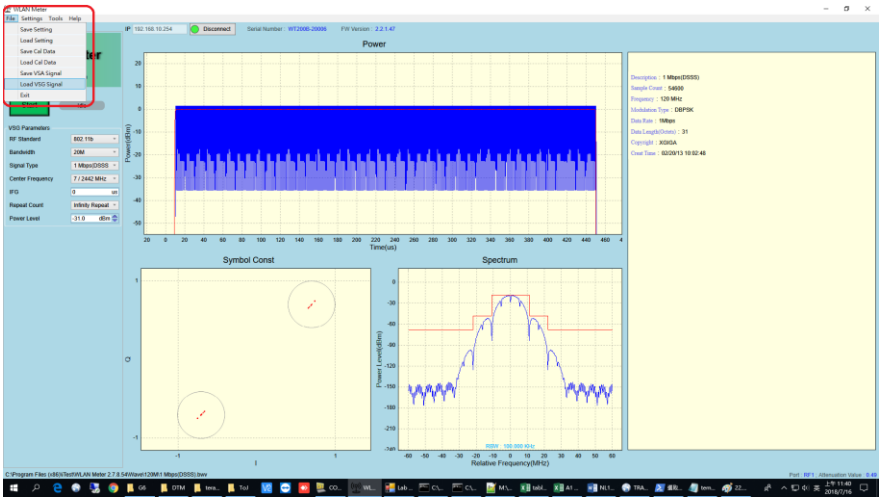
Set Center Frequency : 40 / 2442 MHz

Set IFG : 40 us

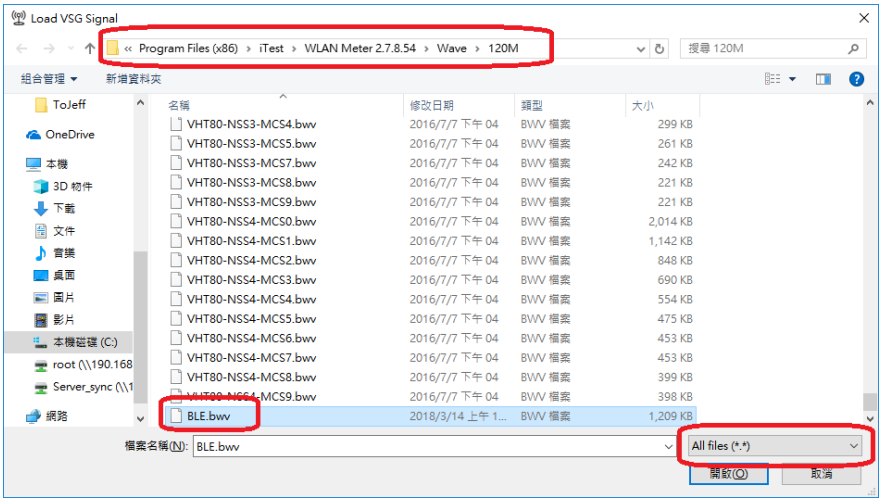
Set Repeat Count : Infinity Repeat



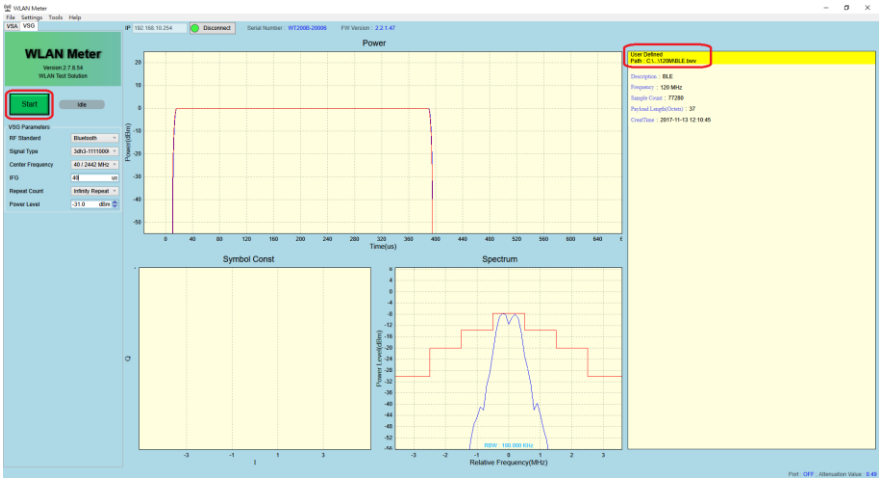
- Loaded VSG Signal



Select file, “BLE.bwv”.



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



4. Terminate BLE Rx Testing

at+dtm=end

```
>at+dtm=end
RX CNT:  28613
CRC OK:  28613
CRC FAIL:        0
packet count: 28613
OK
```

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

CONTACT

sales@Opulinks.com