



RF Test Report

Applicant : Redpine Signals Inc

Product Type : Single Band 802.11 b/g/n, Bluetooth 5.0, ZigBee Module

Trade Name : Redpine Signals Inc

Model Number : M15SB

Test Specification : Notification No.88 of MIC, 2004, Annex 43
2.4 GHz band wide-band low-power data communication system
(Item 19 of Article 2 Paragraph 1)

Receive Date : Jan. 15, 2019

Test Period : Feb. 19 ~ Feb. 23, 2019

Issue Date : Mar. 29, 2019

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
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Revision History

Rev.	Issue Date	Revisions	Revised By
00	Mar. 29, 2019	Initial Issue	Janet Chao



Verification

Issued Date: Mar. 29, 2019

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Product Type : Single Band 802.11 b/g/n, Bluetooth 5.0, ZigBee Module

Trade Name : Redpine Signals Inc

Model Number : M15SB

EUT Rated Voltage : 1.8 V 0.4 A/ 3.3 V 0.4 A

Test Voltage : DC 5 V

Applicable Standard : Notification No.88 of MIC, 2004, Annex 43
2.4 GHz band wide-band low-power data communication
system (Item 19 of Article 2 Paragraph 1)

Test Result : Complied

Performing Lab. : A Test Lab Techno Corp.
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Taiwan Accreditation Foundation accreditation number: 1330
<http://www.atl-lab.com.tw/e-index.htm>

The above equipment has been tested by A Test Lab Techno Corp., and found compliance with the requirements set forth in the MIC technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved By :

(Manager)

Fly Lu

(Fly Lu)

Reviewed By :

(Testing Engineer)

Eric Ou Yang

(Eric Ou Yang)

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1 General Information

1.1. EUT Description

Applicant	Redpine Signals Inc 2107 N.First Street, Suite 540, San Jose, California, 95131-2019, United States
Manufacturer	Redpine Signals Inc 2107 N.First Street, Suite 540, San Jose, California, 95131-2019, United States
Factory	EMBEDDED IT SOLUTIONS(INDIA) PVT. LTE. Plot No: 5, FABCITY SEZ, Sreenagar, Maheswaram Mandal, R.R. District, Hyderabad-501 359, Telangana, India
Product Type	Single Band 802.11 b/g/n, Bluetooth 5.0, ZigBee Module
Trade Name	Redpine Signals Inc
Model Number	M15SB
Hardware Version	1.0
Software Version	0.9.6.2
Antenna Information	Trade Name: ACON Model Number: AEM6P-100000 Antenna Type: Dipole Antenna Max. Gain: 2 dBi Trade Name: ACON Model Number: AEM6P-100001 Antenna Type: Dipole Antenna Max. Gain: 2 dBi Trade Name: ACON Model Number: AEEEE0-000000 Antenna Type: Multilayer ceramic Antenna Max. Gain: 2.13 dBi Trade Name: ACON Model Number: AEEEE0-000001 Antenna Type: Chip Antenna Max. Gain: 4 dBi Trade Name: ACON Model Number: AEEEE0-000002 Antenna Type: Chip Antenna Max. Gain: 4 dBi Trade Name: ACON Model Number: AEP6P-100006X Antenna Type: PIFA Antenna Max. Gain: 3 dBi Trade Name: ACON Model Number: AEP6P-100008X Antenna Type: PIFA Antenna Max. Gain: 3 dBi



Antenna Information	Trade Name: Redpine Model Number: RSIA15 Antenna Type: PCB Trace Antenna Max. Gain: 0.99 dBi
	Trade Name: Taoglas Model Number: WS.01.B.305151 Antenna Type: Heavy Duty Screw Mount Antenna Max. Gain: Straight: 4.10 dBi
Radio Equipment	2.4 GHz Band Wide-Band Low-Power Data Communication System
Classification of Specified Radio Equipment	Article 2 Clause 1 Item 19
Frequency Band	Bluetooth : 2402 ~ 2480 MHz
Modulation Type	GFSK for 1 Mbps
	$\pi/4$ -DQPSK for 2 Mbps
	8DPSK for 3 Mbps
Type of Emissions	GFSK:F1D
	$\pi/4$ -DQPSK:G1D
	8PSK:G1D
Channel Number	79 Channel
Channel Space	1 MHz
Identification Code	48 Bits
Declared Rated Power	Normal mode: 0.840 mW/MHz (-0.757 dBm/MHz)
	AFH mode: 0.840 mW/MHz (-0.757 dBm/MHz)
Tested Circuit Insertion Loss	10.8 dB
Frequency equal to the transmission rate of the modulation signal	1 MHz
Operate Temp. Range	-40 ~ 85 °C



1.2. Summary of Test Result

Item	Result	Remark
Frequency Error	PASS	-----
Occupied Bandwidth	PASS	-----
Diffusion (spreading) Bandwidth	PASS	-----
Antenna Power (Conducted)	PASS	-----
EIRP Power (density)	PASS	-----
Spreading Rate (Effective Broadening)	PASS	-----
Unwanted Emission Strength	PASS	-----
Secondarily Emitted Radio Wave Strength	PASS	-----
Dwell Time	PASS	-----
Radio Interference Prevention Capability	PASS	-----

The test results of this report relate only to the tested sample(s) identified in this report.

2 Test Methodology

2.1. Mode of Operation

Test Category

2.4 GHz Band Wideband Low-Power Data Communication System

Test Mode
Mode 1: GFSK for 1 Mbps Continuous TX mode
Mode 2: $\pi/4$ -DQPSK for 2 Mbps Continuous TX mode
Mode 3: 8DPSK for 3 Mbps Continuous TX mode
Mode 4: GFSK_AFH for 1 Mbps Continuous TX mode
Mode 5: $\pi/4$ -DQPSK_AFH for 2 Mbps Continuous TX mode
Mode 6: 8DPSK_AFH for 3 Mbps Continuous TX mode

Comprehensive operation test

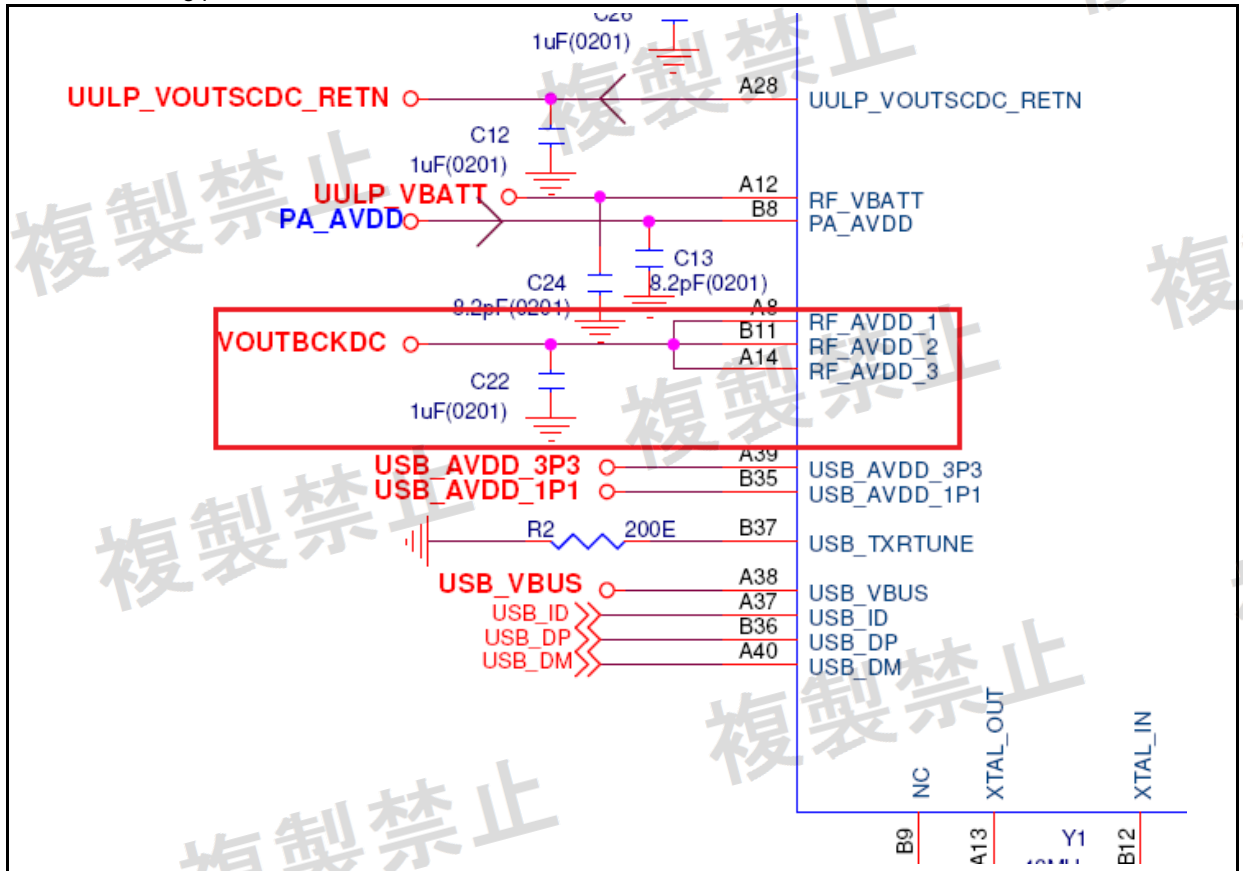
The normal voltage settings are respectively adopted during the test. Because the voltage error are less than 1 %.

Constant voltage check

EUT and Module Power tables				
EUT Setup Value (Vdc)		Normal	Hight(+10 %)	Low(-10 %)
		5	5.5	4.5
Module Vdd Power Measurement Value (Vdc)		Normal	Hight(+10 %)	Low(-10 %)
		1.35	1.34	1.35
Voltage error (%)	Result	Ref. level	0.7407	0.0000
	Limit	---	± 1	
Judgment		---	PASS	PASS



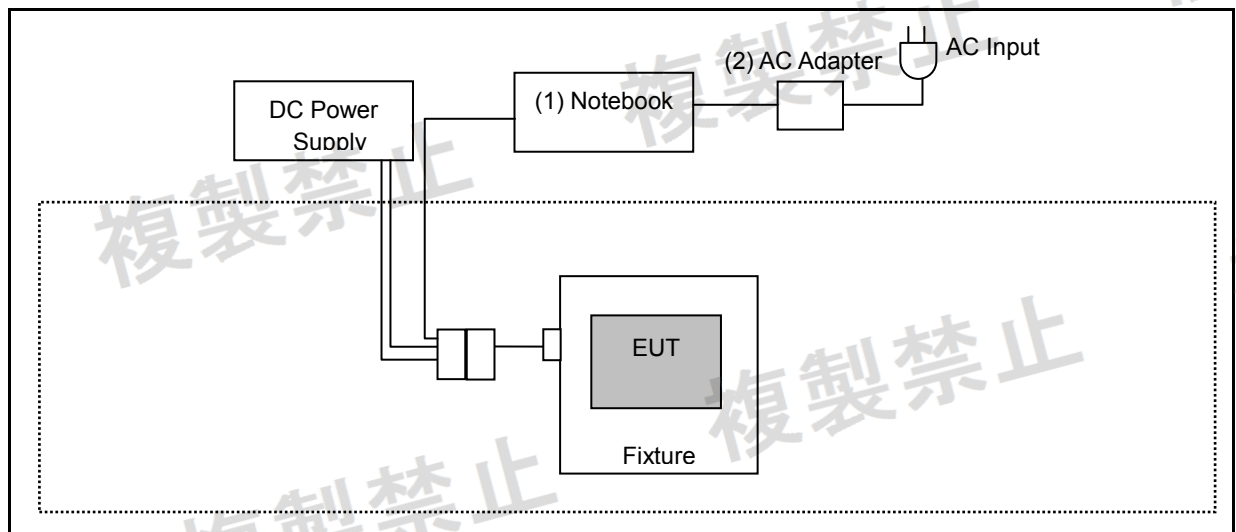
Actual Measuring point



2.2. EUT Test Step

1	Setup the EUT shown on "Configuration of Test System Details."
2	Turn on Bluetooth function.
3	EUT run test program.

2.3. Configuration of Test System Details



Devices Description					
	Product	Manufacturer	Model Number	Serial Number	Power Cord
(1)	Notebook	DELL	LATITUDE E5500	---	---
(2)	AC Adapter	DELL	FA90PE0-00	---	Non-Shielded, 0.8 m

2.4. Test Instruments

Test Period: Feb. 19 ~ Feb. 23, 2019

Describe	Manufacturer	Model Number	Serial Number	Calibration Authority	Cal. Date	Cal. Period
Power Sensor	Agilent	N1921A	MY45241957	ETC	12/13/2018	1 year
Power Meter	Agilent	N1911A	MY45101619	ETC	12/13/2018	1 year
Spectrum Analyzer (20 Hz~26.5 GHz)	Agilent	N9020A	US47520902	ETC	09/25/2018	1 year
Power Supply	GW	GPC-3030D	GEO893367	OLC	12/11/2018	1 year

Note 1: N.C.R. = No Calibration Request.

Note 2: Each calibration by the calibration agency listed on the table corresponds to Item (ii) (c) of Article 24-2 paragraph 4 of the Radio Law.

2.5. Uncertainty of Measured Value

Test Item	Uncertainty
Frequency Error	$\pm 2.21 \times 10^{-7}$
Occupied Bandwidth	$\pm 4.96 \%$
Spread Bandwidth	$\pm 4.96 \%$
Antenna Power Error	$\pm 1.31 \text{ dB}$
Unwanted Emission Strength	$\pm 1.43 \text{ dB}$
Secondarily Emitted Radio Wave Strength	$\pm 1.13 \text{ dB}$
Carrier Sense	$\pm 2.21 \text{ dB}$

2.6. Test Site Environment

Items	Test Item	Required	Actual
Temperature (°C)	Conducted Emission	5-35	26
Humidity (%RH)		45-85	60
Barometric pressure (mbar)		-----	990
Temperature (°C)	Radiated Emission	5-35	26
Humidity (%RH)		45-85	60
Barometric pressure (mbar)		-----	990

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Site Address: No. 140-1, Changan Street, Bade District,
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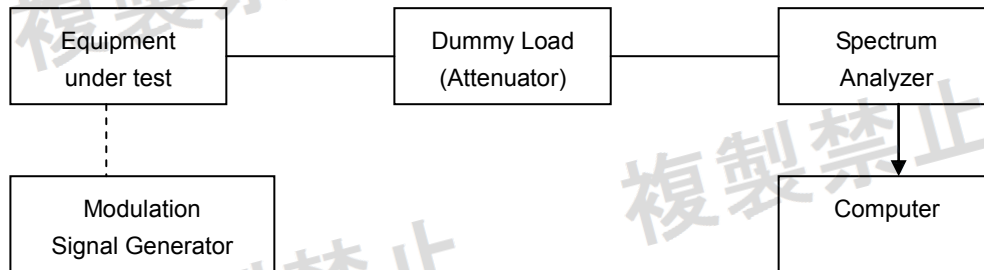
3 Measurement Procedure

3.1. Frequency Error Measurement

■ Limit

Frequency Tolerances ≤ 50 ppm.

■ Test Setup



■ Measuring Equipment Conditions

Spectrum Analyzer Setting

SPAN : 300 kHz

RBW : 1 KH

VBW : 30 kHz

Sweep Time : AUTO (Minimum time to ensure measurement accuracy.)

Data Points : 401 points or more

Sweep Mode : Single Sweep

Detection Mode : Positive Peak

Storage Mode : Normal

Y-axis Scale : 10 dB/Div.

Reference Level : Enough level for maximum dynamic range

■ Conditions of Equipment under Test

- (1) Set the EUT to the test frequency and transmit RF signal.
- (2) The modulation state is "continuous wave without modulation" by stopping spread spectrum in principle. But, if it is not possible, it shall be "continuous burst wave without modulation".

■ Measuring Operation Procedures

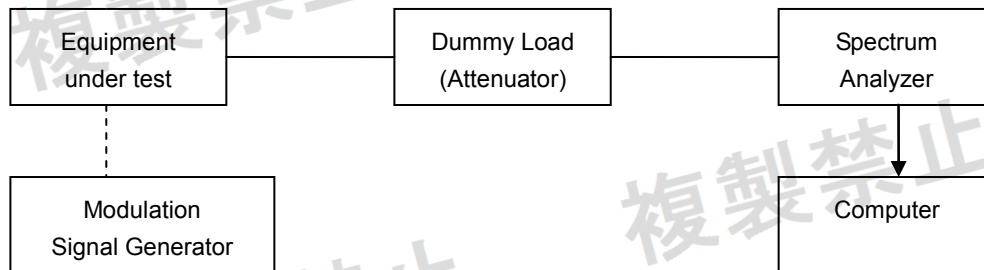
In case of burst waves, the measurement shall be done for enough time(e.g. covering 20 or more of burst waves) in order to obtain the enough measuring accuracy, and the average of the measured values becomes the final value.

3.2. Occupied Bandwidth Measurement

■ Limit

Max. Occupied Bandwidth: 83.5 MHz.

■ Test Setup



■ Measuring Equipment Conditions

Spectrum Analyzer Setting

SPAN : 200 MHz

RBW : 300 kHz

VBW : 300 kHz

Sweep Time : AUTO (Minimum time to ensure measurement accuracy.)

Data Points : 401 points or more

Indication mode : Max hold

Detection Mode : Positive Peak

Storage Mode : Normal

Y-axis Scale : 10 dB/Div.

Reference Level : Enough level for maximum dynamic range

■ Conditions of Equipment under Test

Set to testing frequency and modulate using standard encoding test signals.

■ Measuring Operation Procedures

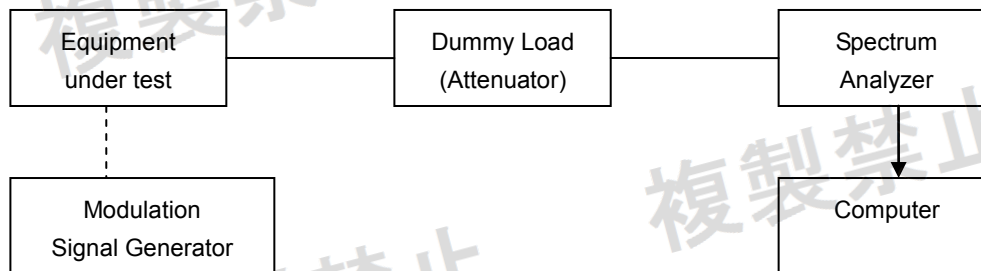
- (1) Configure the setting of the spectrum analyzer to 3.3(1).
- (2) After repeating sweeps until no display changes are found, import the values of all the data points as array variables of the computer.
- (3) Convert the dB value into the antilog of the power dimension (i.e. mW) for all the data.
- (4) Find the total power of the all the data and record as "Total Power" in mW.
- (5) Add power to the minimum frequency data in order and find the value of the limiting data point that is 0.5 % (5 % in the case of spread bandwidth) of the "Total Power". Convert the limiting point into a frequency and record as the "lower limit" frequency.
- (6) Add power to the maximum frequency data in order and find the value of the limiting data point that is 0.5 % (5 % in the case of spread bandwidth) of the "Total Power". Convert the limiting point into a frequency and record as the "upper limit" frequency.

3.3. Diffusion (spreading) Bandwidth Measurement

■ Limit

Minimum Diffusion (spreading) Bandwidth: 500 kHz.

■ Test Setup



■ Measuring Equipment Conditions

Spectrum Analyzer Setting

SPAN : 200 MHz

RBW : 300 kHz

VBW : 300 kHz

Sweep Time : AUTO (Minimum time to ensure measurement accuracy.)

Data Points : 401 points or more

Indication mode : Max hold

Detection Mode : Positive Peak

Storage Mode : Normal

Y-axis Scale : 10 dB/Div.

Reference Level : Enough level for maximum dynamic range

■ Conditions of Equipment under Test

Set the EUT to the test frequency and spread-spectrum test code, and modulate it with the standard coded test signal.

■ Measuring Operation Procedures

- (1) Configure the setting of the spectrum analyzer to 4.3(1).
- (2) After repeating sweeps until no display changes are found, import the values of all the data points as array variables of the computer.
- (3) Convert the dB value into the antilog of the power dimension for all the data.
- (4) Find the total power of the all the data and record as "Total Power".
- (5) Add power to the minimum frequency data in order and find the value of the limiting data point that is 0.5 % (5 % in the case of spread bandwidth) of the "Total Power". Convert the limiting point into a frequency and record as the "lower limit" frequency.
- (6) Add power to the maximum frequency data in order and find the value of the limiting data point that is 0.5 % (5 % in the case of spread bandwidth) of the "Total Power". Convert the limiting point into a frequency and record as the "upper limit" frequency.

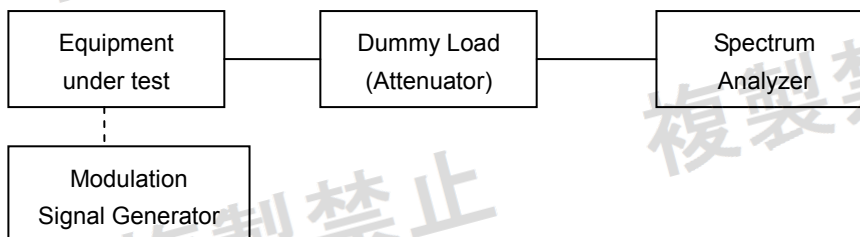
3.4. Antenna Power (Conducted) Measurement

■ Limit

RF Output Power ≤ 3 mW/MHz.

RF Output Power Tolerance $\leq -80\% \sim +20\%$.

■ Test Setup



■ Measuring Equipment Conditions

- (1) Measure the equivalent noise bandwidth (NWB) of the 1 MHz resolution bandwidth in the set-up as stated above; to be used for correction of the output reading.

Correction = [RBW / NWB]

If the spreading bandwidth is less than 1 MHz, and "spreading bandwidth (MHz) / NWB (MHz)" exceeds 1, the RBW must be reduced.

- (2) Set the attenuation of the attenuator to values that provides acceptable input levels to the spectrum analyzer for optimal functioning (middle of the linear part of the mixer).
- (3) The settings of the spectrum analyzer when searching for frequencies that provide maximum antenna power are as follows:

Center frequency: Middle frequencies of the applied frequency bands

Frequency sweep width: 50 MHz

Resolution bandwidth: 1 MHz

Video bandwidth: About 3 times the resolution bandwidth

Y-axis scale: 10 dB/Div.

Sweep time: Minimum amount of time to ensure measurement accuracy

Trigger condition: Free run

Data points: Over 400 points

Sweep mode: Continuous sweep

Detection mode: Positive peak

Indication mode: Maximum hold

- (4) The settings of the spectrum analyzer when measuring antenna power are as follows for the direct spread systems:

Center frequency:	Frequencies providing maximum power density (acquired frequencies during search)
Frequency sweep width:	0 Hz
Resolution bandwidth:	1 MHz
Video bandwidth:	Comparable to resolution bandwidth
Sweep mode:	Continuous sweep

■ Conditions of Equipment under Test

Frequency hopping system or combined systems of direct spread and frequency hopping:

- Connect the high frequency power meter to the output of the attenuator and measure the total power (without bandwidth limitation)
- Divide the total power by the spread bandwidth to find the "average" power per MHz.
- Confirm that frequency distribution of the hopping frequencies is homogeneous according to the supporting data. If frequency distribution of the frequencies is not homogeneous, consider other measurement or correction methods based on the supporting data.
- Set the antenna power as follows:
Continuous waves: value in b.
Burst waves: value in b. and value calculated from the average power within bursts from rates of transmission times

3.5. EIRP Power (density) Measurement

■ Limit

Max. EIRP: 6.91 dBm/MHz

3.6. Spreading Rate (Effective Broadening) Measurement

■ Limit

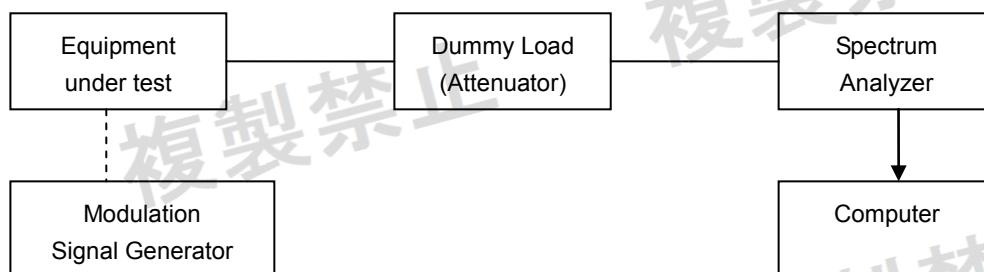
Spreading Rate (Effective Broadening) ≥ 5

3.7. Unwanted Emission Strength Measurement

■ Limit

Frequency (MHz)	Limit (μW/MHz)
Under 2387 MHz	≤ 2.5
2387-2400 MHz	≤ 25
2483.5-2496.5 MHz	≤ 25
2496.5 - 12.5 GHz	≤ 2.5

■ Test Setup



Note 1: The computer is used for calculating the mean value of amplitude levels.

■ Measuring Equipment Conditions

(1) The setting of the spectrum analyzer during spurious searches are as follow:

Sweep Bandwidth:	Starts spurious searches from the smallest possible frequencies to more than 5 times the carrier frequencies..
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Y-axis scale:	10 dB/Div.
Input level:	Maximum dynamic range value
Sweep time:	Minimum amount of time to ensure measurement accuracy.
Sweep mode:	Continuous mode
Data Points:	Over 400 points
Detection mode:	Positive peak
Display mode:	Maximum hold

- (2) The setting of spectrum analyzer while conducting spurious amplitude measurement are as follows:

Center Frequency:	Acquired spurious frequency in (1)
Frequency sweep width:	0 MHz
Resolution bandwidth:	1 MHz
Video bandwidth:	Same as Resolution bandwidth
	Note: take into account that the requirement limits the power in a bandwidth of 1 MHz. If the measurement is carried out with a bandwidth of 100 kHz (for frequencies below 1 GHz), the limit shall be reduced with 10 dB
Y-axis scale:	10 dB/Div
Input level:	Choose input level within the linear range of the SA mixer (so that no additional spurious are generated by the mixer).
Sweep mode:	Minimum amount of time to ensure measurement accuracy.
Data Points:	Over 400 points
Sweep mode:	Single sweep
Detection mode:	Sample (BIN-Width $\leq$ RBW, so that all spurious emissions are captured). [BIN-width is the frequency difference between 2 adjacent sample points on the display.]

■ Conditions of Equipment under Test

Set the testing frequency and testing spread codes and modulate using standard encoding test signals. Choose a frequency / channel according to specified range (Low, Middle and High).

Note: If the spurious limit is specified with the EIRP value, the effective (maximum) antenna gain shall be taken into account.

■ Measuring Operation Procedures

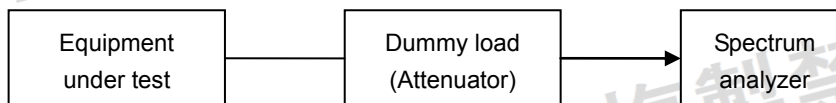
- (1) Configure the settings of the spectrum analyzer to 8.3(1) and search for spurious frequencies by sweeping. Do not conduct the measurements in 8.3(2) if the amplitude value of the acquired spurious frequencies meets the standard value.
- (2) If the acquired spurious amplitude value exceeds the standard value, narrow the sweep Bandwidth, in the order of 100 MHz, 10 MHz, and 1 MHz, to increase the frequency accuracy of the spectrum analyzer and accurately find the spurious frequency. Configure the spectrum analyzer to the settings in 8.3(2), find the average of the spurious amplitude values (in the case of burst waves, the average values are within the respective burst and set this as the measured value. Averaging can be done by summing up the power (display must give the linear power in uW) according to 8.3(2) and dividing by the amount of points. Correction on the equivalent noise bandwidth shall be necessary (if not realized automatically).

3.8. Secondly Emitted Radio Wave Strength Measurement

■ Limit

Frequency (MHz)	Limit (nW)
Under 1 GHz	≤ 4
1 - 12.5 GHz	≤ 20

■ Test Setup



■ Measuring Equipment Conditions

- Set the attenuation of the attenuator to under 20 dB because the subject for measurement is of low level.
- Set the spectrum analyzer as follow:

Frequency sweep width:	See 7.5 Measuring Operation Procedures
Resolution bandwidth:	A value determined by the specified dynamic range and the sweep time. (e.g. 30 kHz for 8 GHz sweep width and 30 second sweep time.).
Video bandwidth:	Approximately the same bandwidth as resolution bandwidth.
Y-axis scale:	10 dB/Div
Input level:	0 dB, if possible.
Sweep mode:	Single sweep
Detection mode:	Positive peak

■ Conditions of Equipment under Test

Set the EUT to receiver the test frequency with forced continuous receiving control.

■ Measuring Operation Procedures

Sweep the spectrum analyzer from a low frequency to a frequency of 3 times if the carrier or over (e.g. 10 MHz to about 8 GHz) and measure the collateral radio emissions.

3.9. Dwell Time Measurement

■ Limit

- (1) Observe the frequency retention time during the observation time T (in seconds) equal to: $T = \text{spreading rate} \times 0.4s$.
- (2) Select a discrete frequency for monitoring (L, M and H).
- (3) Sum-up the different lengths of the bursts for the selected frequency during the observation time. By definition the sum is equal to the dwell time.
- (4) Repeat the measurement for each different mode and for both the maximum amount of hopping channels and the minimum.

The dwell time shall be less then 0.4 seconds in any situation. For category UV equipment (Model-aircraft) the limit for a single transmission burst is 0.05 seconds.

3.10. Radio Interference Prevention Capability Measurement

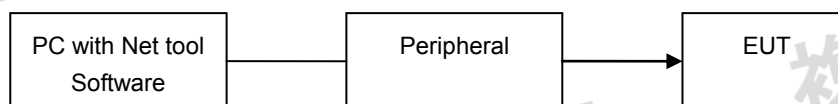
■ Limit

Identification code ≥ 48 bits

■ Measuring Id Code Software

MAC IP List: MAC Scan

■ Test Setup



■ Measuring Operation Procedures

1. In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes form EUT. b. Check the transmitted identification codes with the demodulator.
2. In the case of receiving the identification code: a. Transmit the predetermined identification codes form the counterpart. b . Check if communication is normal. c. Transmit the signals other than predetermined ID codes form the counterpart. d. check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

3.11. Construction Protection Confirmation Method

■ Limit

The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily.



4 Test Results

4.1. Frequency Error Measurement

Test Mode	Mode 1					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Reading Frequency	MHz	2401.9802	2440.9766	2479.9682	-----	-----
Frequency Tolerance	ppm	-8.24	-9.59	-12.82	PASS	-----
Limit	ppm	≤ 50				

Test Mode	Mode 2					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Reading Frequency	MHz	2401.9685	2440.9685	2479.9688	-----	-----
Frequency Tolerance	ppm	-13.11	-12.90	-12.58	PASS	-----
Limit	ppm	≤ 50				

Test Mode	Mode 3					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Reading Frequency	MHz	2401.9730	2440.9685	2479.9679	-----	-----
Frequency Tolerance	ppm	-11.24	-12.90	-12.94	PASS	-----
Limit	ppm	≤ 50				

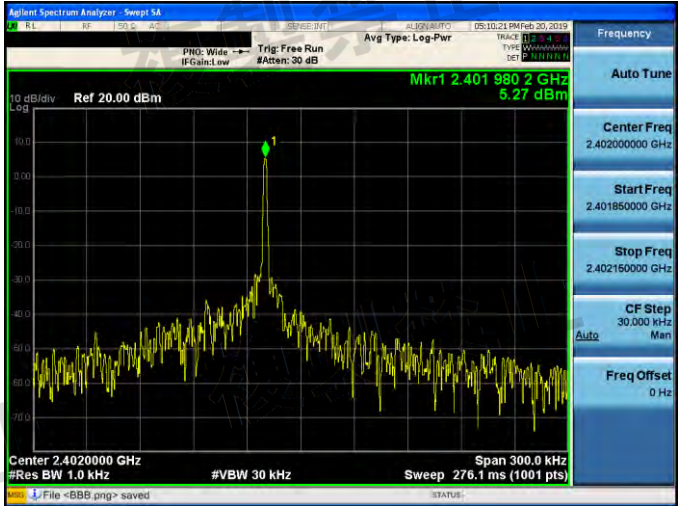
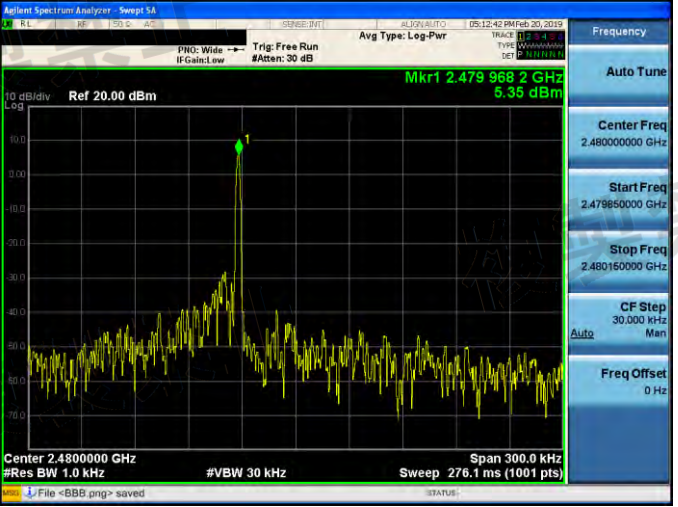


Test Mode	Mode 4					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Reading Frequency	MHz	2401.9760	2440.9718	2479.9703	----	----
Frequency Tolerance	ppm	-9.99	-11.55	-11.98	PASS	----
Limit	ppm	≤ 50				

Test Mode	Mode 5					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Reading Frequency	MHz	2401.9691	2440.9691	2479.9700	----	----
Frequency Tolerance	ppm	-12.86	-12.66	-12.10	PASS	----
Limit	ppm	≤ 50				

Test Mode	Mode 6					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Reading Frequency	MHz	2401.9724	2440.9697	2479.9691	----	----
Frequency Tolerance	ppm	-11.49	-12.41	-12.46	PASS	----
Limit	ppm	≤ 50				

Test Graphs

Mode 1 2402 MHz	
2441 MHz	
2480 MHz	



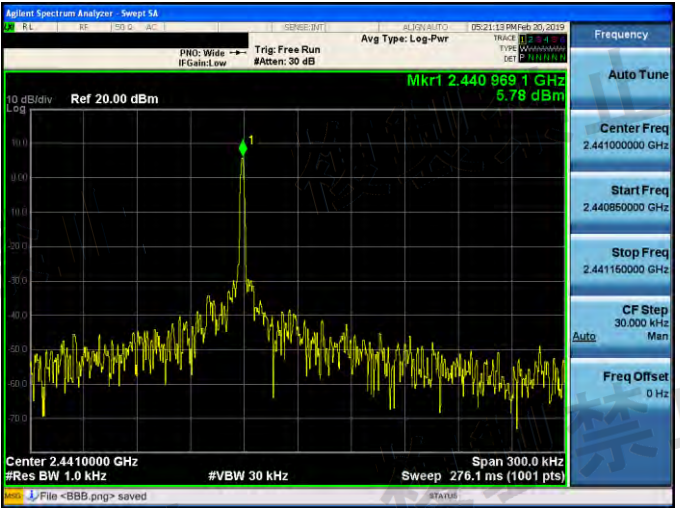
Mode 2	
2402 MHz	
2441 MHz	
2480 MHz	



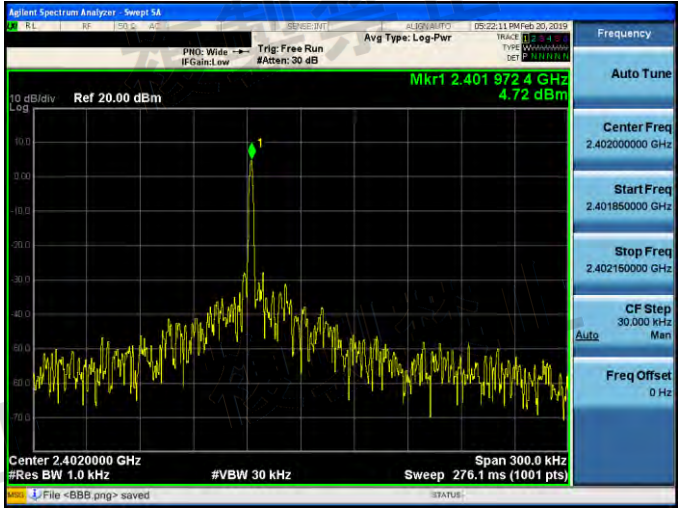
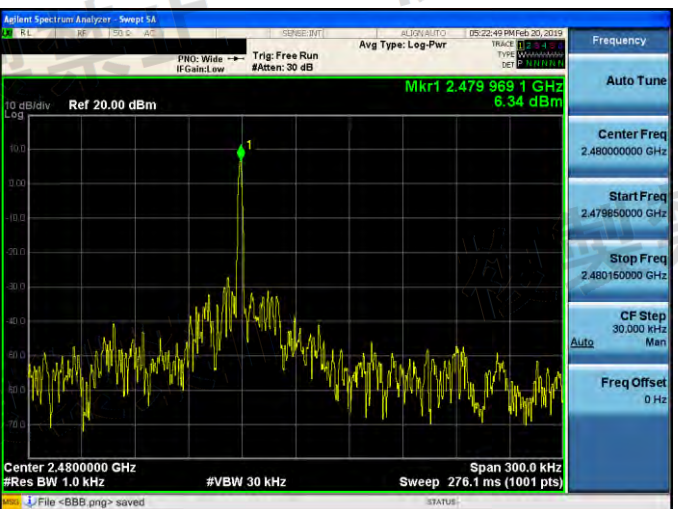
Mode 3	
2402 MHz	
2441 MHz	
2480 MHz	



Mode 4	
2402 MHz	
2441 MHz	
2480 MHz	

Mode 5	
2402 MHz	
2441 MHz	
2480 MHz	



Mode 6	
2402 MHz	
2441 MHz	
2480 MHz	



4.1. Occupied Bandwidth Measurement

Test Mode	Mode 1					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Occupied Bandwidth	MHz	78.1570			PASS	-----
Limit	MHz	≤ 83.5				

Test Mode	Mode 2					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Occupied Bandwidth	MHz	78.2750			PASS	-----
Limit	MHz	≤ 83.5				

Test Mode	Mode 3					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Occupied Bandwidth	MHz	78.2950			PASS	-----
Limit	MHz	≤ 83.5				



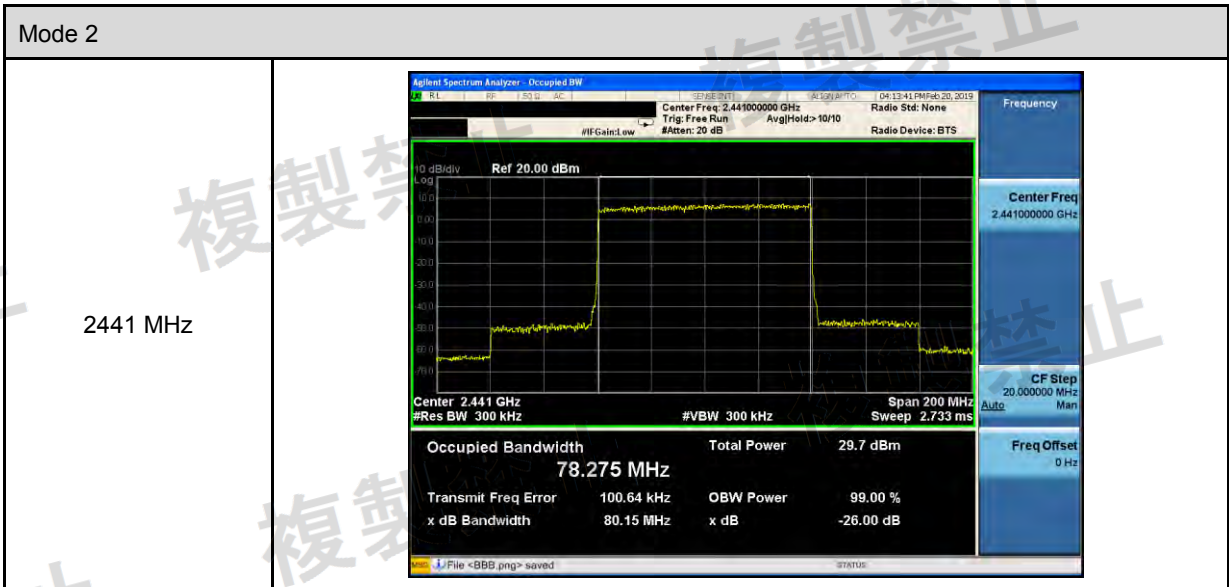
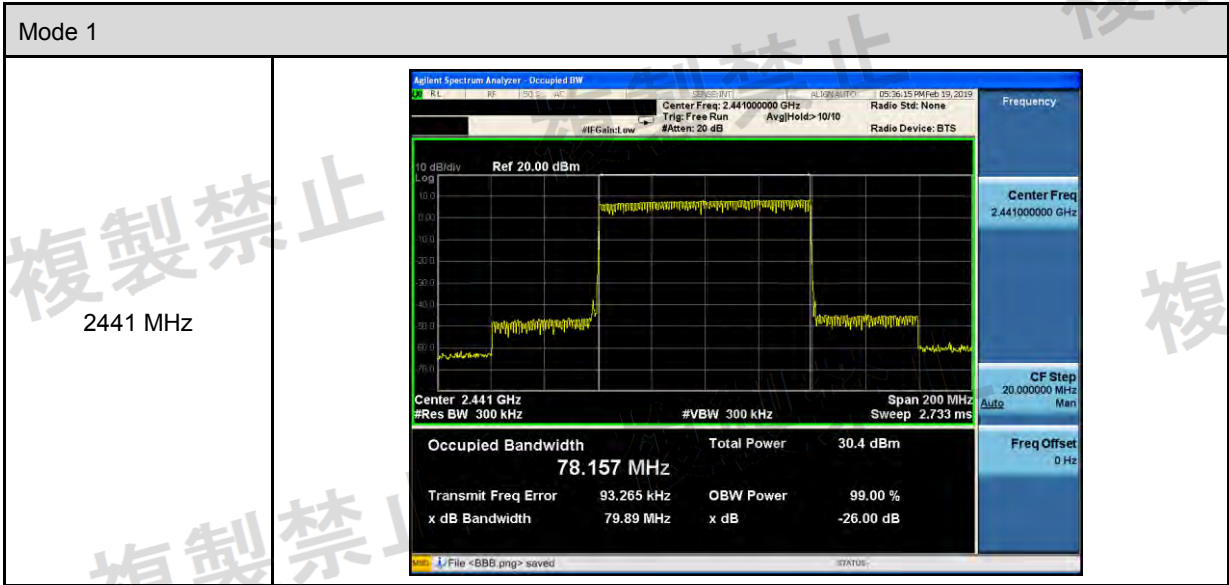
Test Mode	Mode 4					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Occupied Bandwidth	MHz	78.1250			PASS	----
Limit	MHz	≤ 83.5				

Test Mode	Mode 5					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Occupied Bandwidth	MHz	78.3370			PASS	----
Limit	MHz	≤ 83.5				

Test Mode	Mode 6					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Occupied Bandwidth	MHz	78.3820			PASS	----
Limit	MHz	≤ 83.5				



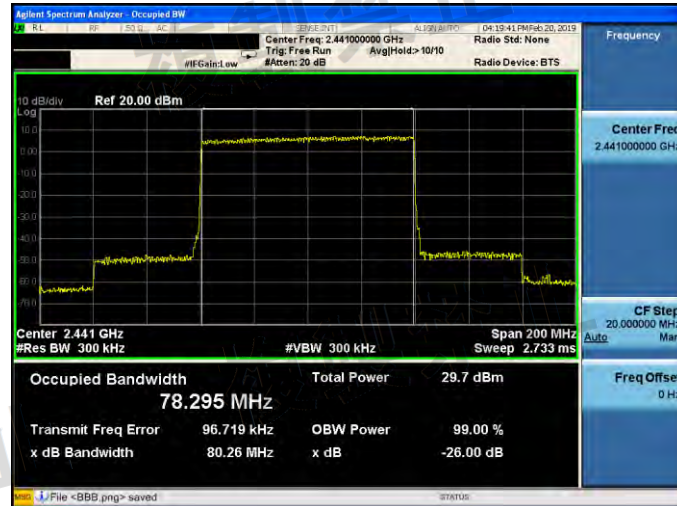
■ Test Graphs





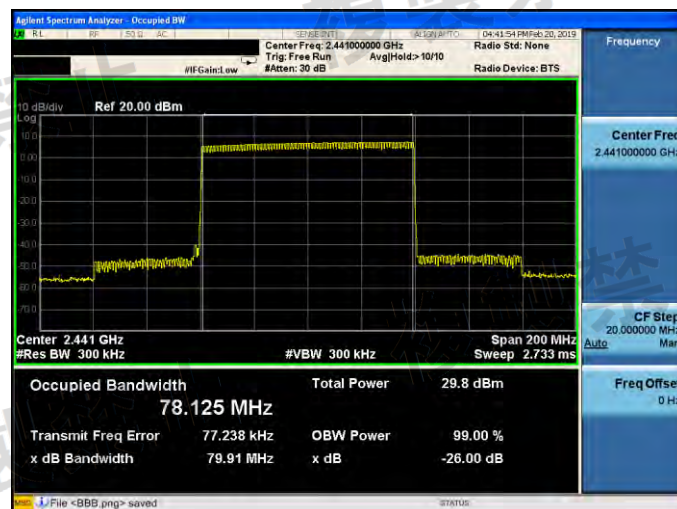
Mode 3

2441 MHz



Mode 4

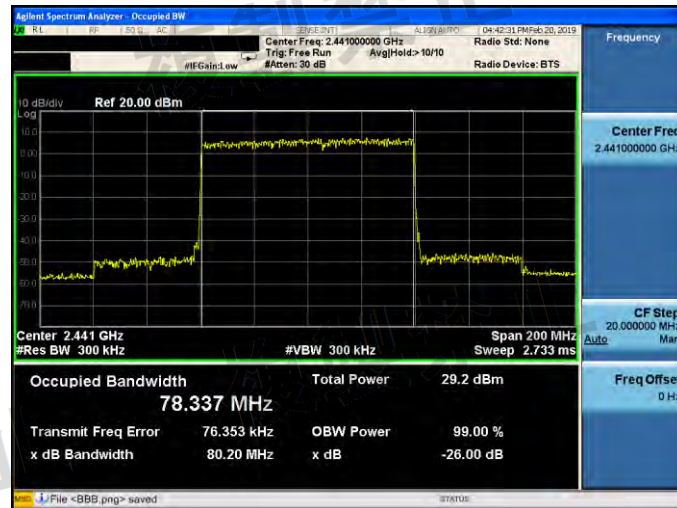
2441 MHz





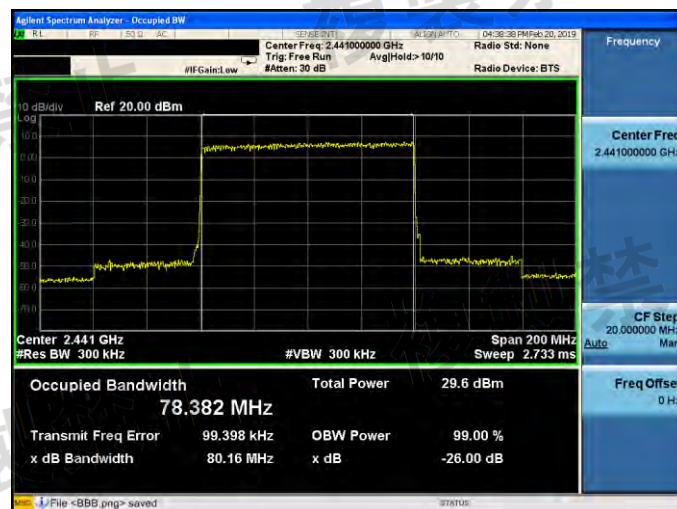
Mode 5

2441 MHz



Mode 6

2441 MHz





4.2. Diffusion (spreading) Bandwidth Measurement

Test Mode	Mode 1					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Spread Bandwidth	MHz	70.3310			PASS	-----
Limit	MHz	≥ 0.5				

Test Mode	Mode 2					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Spread Bandwidth	MHz	70.3680			PASS	-----
Limit	MHz	≥ 0.5				

Test Mode	Mode 3					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Spread Bandwidth	MHz	70.5450			PASS	-----
Limit	MHz	≥ 0.5				



Test Mode	Mode 4					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Spread Bandwidth	MHz	70.2250			PASS	-----
Limit	MHz	≥ 0.5				

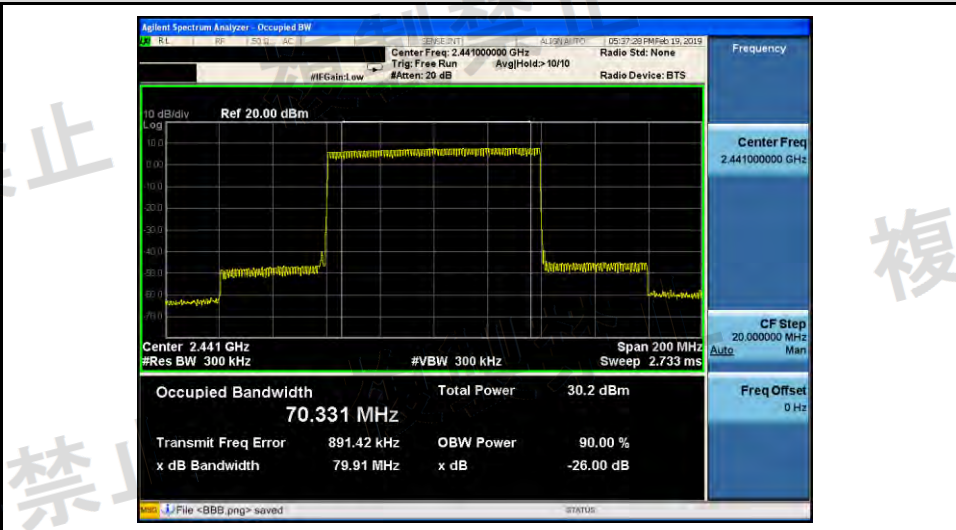
Test Mode	Mode 5					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Spread Bandwidth	MHz	70.4100			PASS	-----
Limit	MHz	≥ 0.5				

Test Mode	Mode 6					
Test Voltage	5 Vdc	Normal Voltage				
Measurement Frequency	MHz	2402	2441	2480	Result	Notes
Channel Number	Ch.	0	39	78		
Spread Bandwidth	MHz	70.4920			PASS	-----
Limit	MHz	≥ 0.5				

■ Test Graphs

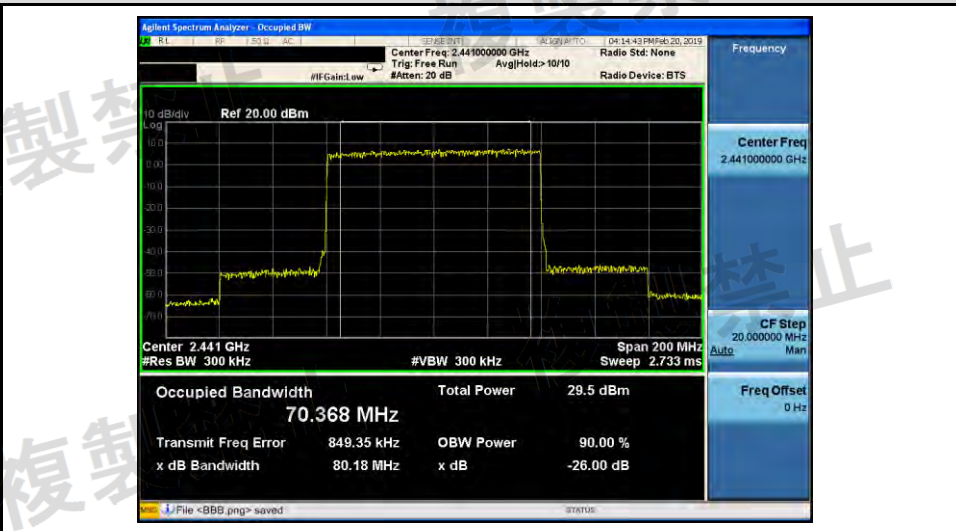
Mode 1

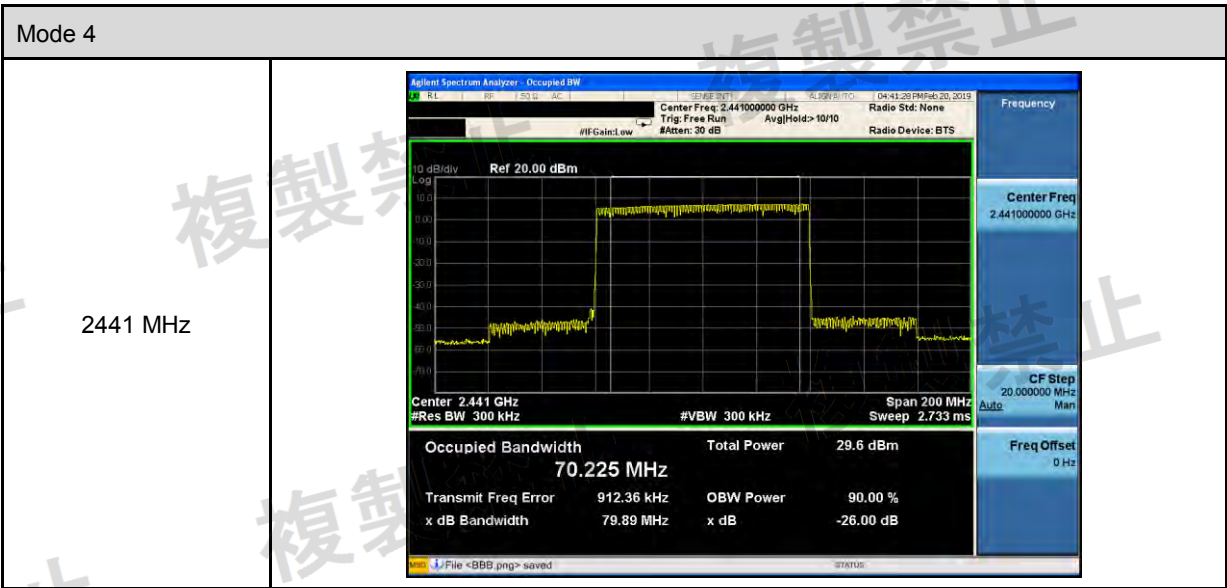
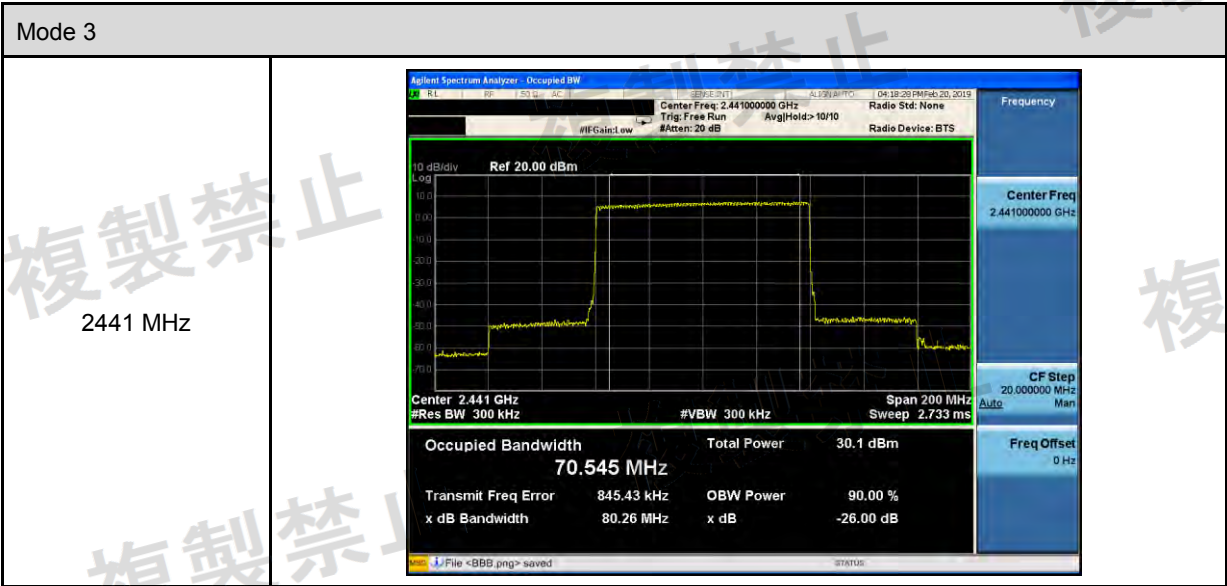
2441 MHz

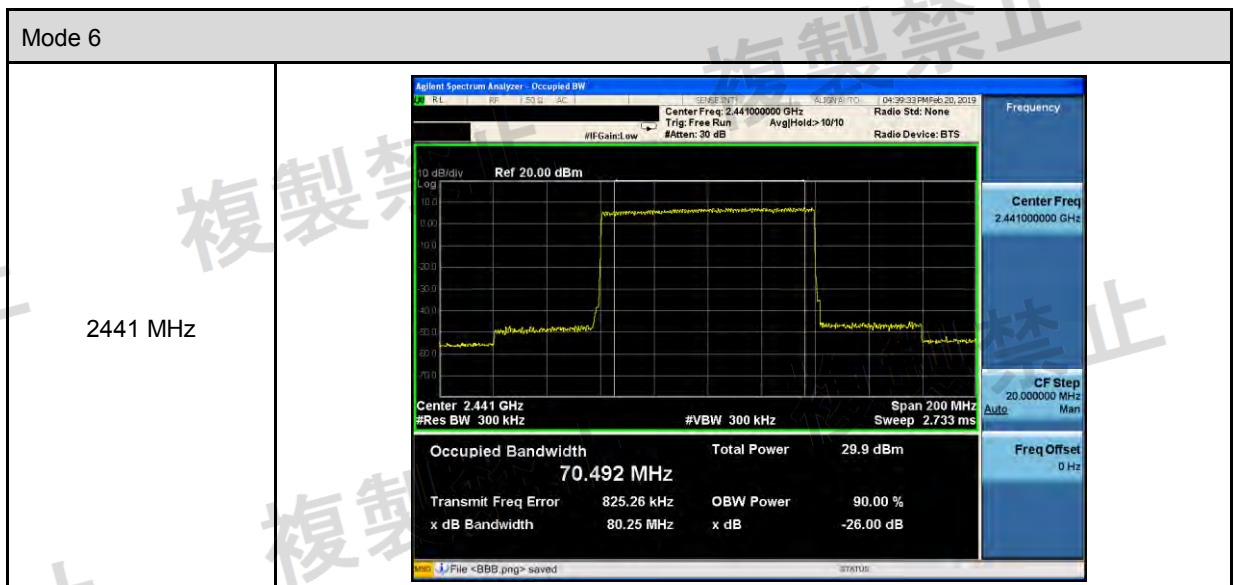
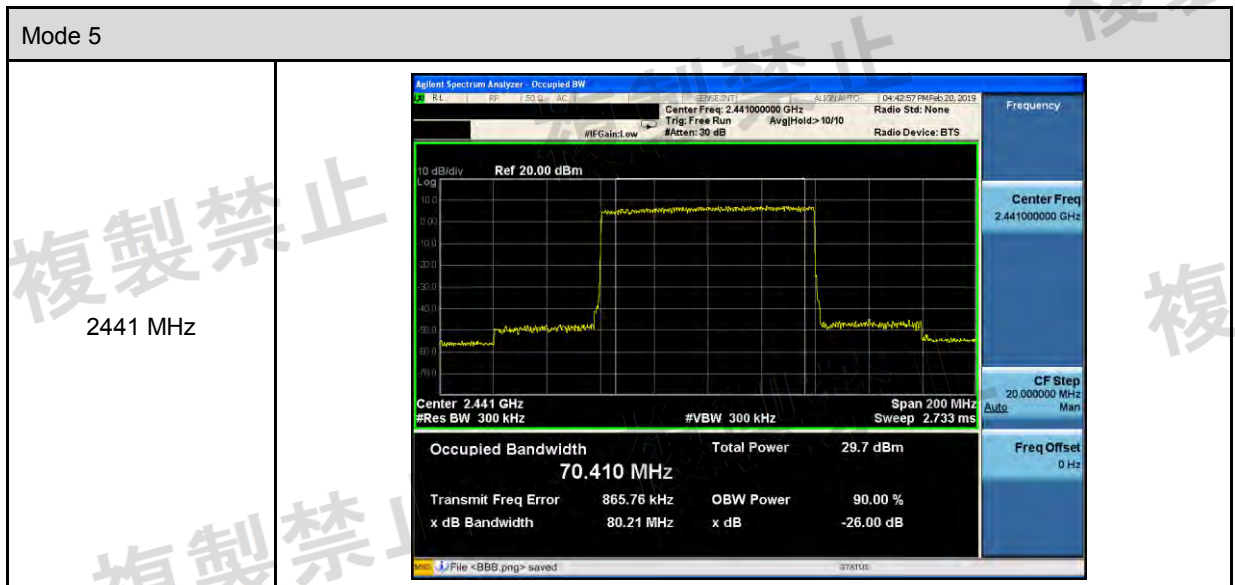


Mode 2

2441 MHz







4.3. Antenna Power (Conducted) Measurement

Test Mode		Mode 1				
Test Voltage		5 Vdc	Normal Voltage			
Measurement Frequency		MHz	2402	2441	2480	Result
Channel Number		Ch.	0	39	78	
RF Output Power		mW/MHz	0.530	0.700	0.740	PASS
RF Output Power Tolerance		%	-29.330	-6.667	-1.330	PASS
Real Total Output Power		dBm	15.730	16.950	17.160	-----
Limit	RF Output Power	mW/MHz	≤ 3			
	RF Output Power Tolerance	%	$-80 \leq x \leq +20$			

Test Mode		Mode 2				
Test Voltage		5 Vdc	Normal Voltage			
Measurement Frequency		MHz	2402	2441	2480	Result
Channel Number		Ch.	0	39	78	
RF Output Power		mW/MHz	0.510	0.740	0.760	PASS
RF Output Power Tolerance		%	-33.770	-3.900	-1.300	PASS
Real Total Output Power		dBm	15.580	17.180	17.300	-----
Limit	RF Output Power	mW/MHz	≤ 3			
	RF Output Power Tolerance	%	$-80 \leq x \leq +20$			

Test Mode		Mode 3				
Test Voltage		5 Vdc	Normal Voltage			
Measurement Frequency		MHz	2402	2441	2480	Result
Channel Number		Ch.	0	39	78	
RF Output Power		mW/MHz	0.530	0.790	0.830	PASS
RF Output Power Tolerance		%	-36.900	-5.950	-1.190	PASS
Real Total Output Power		dBm	15.730	17.460	17.660	-----
Limit	RF Output Power	mW/MHz	≤ 3			
	RF Output Power Tolerance	%	$-80 \leq x \leq +20$			

Note : RF Output Power(dBm/MHz)=Channel Power+Cable loss+Duty Cycle Factor



Test Mode		Mode 4					
Test Voltage		5 Vdc	Normal Voltage				
Measurement Frequency		MHz	2402	2441	2480	Result	Notes
Channel Number		Ch.	0	39	78		
RF Output Power		mW/MHz	0.520	0.770	0.830	PASS	----
RF Output Power Tolerance		%	-38.100	-8.330	-1.190	PASS	----
Real Total Output Power		dBm	15.660	17.340	17.630	----	----
Limit	RF Output Power	mW/MHz	≤ 3				
	RF Output Power Tolerance	%	$-80 \leq x \leq +20$				

Test Mode		Mode 5					
Test Voltage		5 Vdc	Normal Voltage				
Measurement Frequency		MHz	2402	2441	2480	Result	Notes
Channel Number		Ch.	0	39	78		
RF Output Power		mW/MHz	0.500	0.740	0.760	PASS	----
RF Output Power Tolerance		%	-35.060	-3.900	-1.300	PASS	----
Real Total Output Power		dBm	15.500	17.160	17.290	----	----
Limit	RF Output Power	mW/MHz	≤ 3				
	RF Output Power Tolerance	%	$-80 \leq x \leq +20$				

Test Mode		Mode 6					
Test Voltage		5 Vdc	Normal Voltage				
Measurement Frequency		MHz	2402	2441	2480	Result	Notes
Channel Number		Ch.	0	39	78		
RF Output Power		mW/MHz	0.520	0.740	0.770	PASS	----
RF Output Power Tolerance		%	-33.330	-5.130	-1.280	PASS	----
Real Total Output Power		dBm	15.610	17.190	17.330	----	----
Limit	RF Output Power	mW/MHz	≤ 3				
	RF Output Power Tolerance	%	$-80 \leq x \leq +20$				

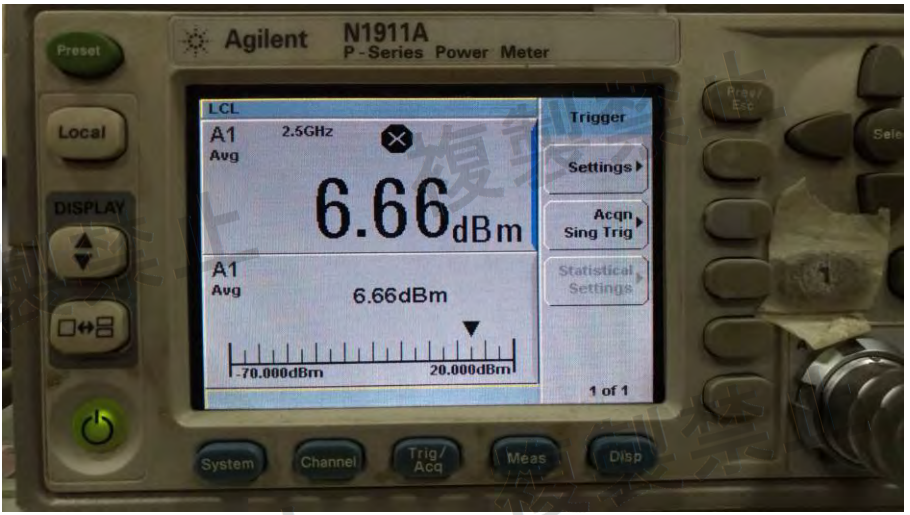
Note : RF Output Power(dBm/MHz)=Channel Power+Cable loss+Duty Cycle Factor

Antenna Power

Test Graphs

Mode 1	
2402 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2402 MHz. The main display shows 4.93 dBm. The secondary display shows 4.93 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg settings.
2441 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2441 MHz. The main display shows 6.15 dBm. The secondary display shows 6.15 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg settings.
2480 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2480 MHz. The main display shows 6.36 dBm. The secondary display shows 6.36 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg settings.

Mode 2	
2402 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2402 MHz. The main display shows 4.78 dBm. The secondary display shows 4.78 dBm. The frequency is 2.5 GHz. The scale ranges from -70.000 dBm to 20.000 dBm. The display is labeled '1 of 1'.
2441 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2441 MHz. The main display shows 6.38 dBm. The secondary display shows 6.38 dBm. The frequency is 2.5 GHz. The scale ranges from -70.000 dBm to 20.000 dBm. The display is labeled '1 of 1'.
2480 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2480 MHz. The main display shows 6.50 dBm. The secondary display shows 6.50 dBm. The frequency is 2.5 GHz. The scale ranges from -70.000 dBm to 20.000 dBm. The display is labeled '1 of 1'.

Mode 3	
2402 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2402 MHz. The main display shows 4.93 dBm. The secondary display shows 4.93 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg. The right side of the display shows Trigger, Settings, Acqn, Sing Trig, and Statistical Settings. The bottom of the display shows 1 of 1.
2441 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2441 MHz. The main display shows 6.66 dBm. The secondary display shows 6.66 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg. The right side of the display shows Trigger, Settings, Acqn, Sing Trig, and Statistical Settings. The bottom of the display shows 1 of 1.
2480 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2480 MHz. The main display shows 6.86 dBm. The secondary display shows 6.86 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg. The right side of the display shows Trigger, Settings, Acqn, Sing Trig, and Statistical Settings. The bottom of the display shows 1 of 1.

Mode 4	
2402 MHz	
2441 MHz	
2480 MHz	

Mode 5	
2402 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2402 MHz. The main display shows 4.70 dBm. The secondary display shows 4.70 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg settings.
2441 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2441 MHz. The main display shows 6.36 dBm. The secondary display shows 6.36 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg settings.
2480 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2480 MHz. The main display shows 6.49 dBm. The secondary display shows 6.49 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, and Avg settings.

Mode 6	
2402 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2402 MHz. The main display shows 4.81 dBm. The secondary display shows 4.81 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, Avg, 2.5GHz, and 1 of 1.
2441 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2441 MHz. The main display shows 6.39 dBm. The secondary display shows 6.39 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, Avg, 2.5GHz, and 1 of 1.
2480 MHz	 The image shows the Agilent N1911A P-Series Power Meter display at 2480 MHz. The main display shows 6.53 dBm. The secondary display shows 6.53 dBm. The scale ranges from -70.000 dBm to 20.000 dBm. The display also shows LCL, A1, Avg, 2.5GHz, and 1 of 1.