

JAPAN SPECIFIED RADIO TEST REPORT

Client Name : Seeed Technology Co., Ltd.

Address : 9F, G3 Building, TCL International E City,
Zhongshanyuan Road, Nanshan District, Shenzhen,
Guangdong Province, P.R.C

Product Name : RTL8720DN

Date : Apr. 29, 2020



Shenzhen Anbotek Compliance Laboratory Limited



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TEST REPORT

Applicant : Seeed Technology Co., Ltd.

Manufacturer : Seeed Technology Co., Ltd.

EUT : RTL8720DN

Model No. : RTL8720DN

Trade Mark : Seeed Studio

Rating : Input: DC 3.3V, 100mA

**Test Standard(s) : MIC Public Notice 88: 2004, Annex 45
Certification Ordinance, Article 2, Paragraph 1, Item 19-3**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the MIC Notice No.88 Annex45 and Certificate regulation article 12, item 19-3 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt

Apr. 01, 2020

Date of Test

Apr. 01~24, 2020

Prepared By

Dolly mo

(Engineer / Dolly Mo)

Reviewer

Bibo Zhang

(Supervisor / Bibo Zhang)

Approved & Authorized Signer

Tom Chen

(Manager / Tom Chen)

1. GENERAL INFORMATION

1.1. Client Information

Applicant	:	Seed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Manufacturer	:	Seed Technology Co., Ltd.
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Factory	:	Shenzhen Xinxian Technology Co; Limited
Address	:	F5, Building B17, Hengfeng Industrial City, No. 739 Zhoushi Rd, Baoan District, Shenzhen, Guangdong, P.R.C.

1.2. Description of Device (EUT)

Product Name	:	RTL8720DN
Model No.	:	RTL8720DN
Trade Mark	:	Seed Studio
Test Power Supply	:	AC 100V, 50Hz
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Product Description	Operation Frequency:	WiFi 2.4G: 802.11b/ g/ n(HT20) 2412-2462MHz 802.11n(HT40) 2422-2452MHz BLE: 2402-2480MHz WiFi 5.1G: 5180MHz~5240MHz
	Modulation Type:	WiFi 2.4G: 802.11b CCK; 802.11g/n OFDM BLE: GFSK WiFi 5.1G: OFDM with BPSK/QPSK/16QAM/64QAM/256QAM
	Antenna Type:	ANT A: PCB Antenna ANT B: Chip Antenna
	Antenna Gain(Peak):	WiFi 2.4G(ANT A): 4.1 dBi BLE(ANT A): 4.1 dBi WiFi 5.1G(ANT A): 3.6 dBi WiFi 2.4G(ANT B): 1 dBi BLE(ANT B): 1 dBi WiFi 5.1G(ANT B): 4 dBi
	Rated output Power	1.6 mW/MHz
	Hardware version	v1.0
	Software version:	1.0.0.0306_release

Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications

or the User's Manual.

2) This report is for Wifi 5.1G module.

3) Two antennas do not support MIMO.

1.3. Auxiliary Equipment Used During Test

N/A

1.4. Description of Test Modes

The EUT has been tested under operating condition.

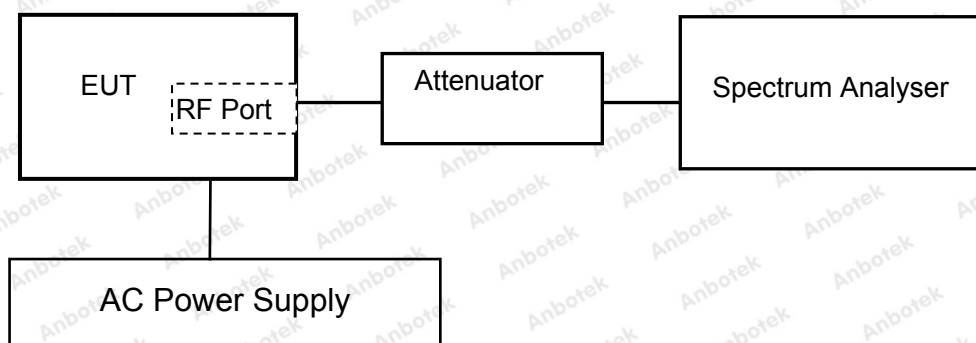
Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

IEEE802.11a: Channel 36(5180MHz), Channel 40(5200MHz) and Channel 48(5240MHz) with MCS0 Worst data rate (worst case) are chosen for the final testing.

1.5. Test Conditions

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-10°C ~ 45°C
Relative Humidity	20% - 75%	N/A
Supply Voltage	AC 100V	AC 90V~AC 110V

1.6. Test Configuration



Duty Cycle and Transmission Cycle Time

These were the transmission time and duty cycle for measurements made with the device configured using a test utility. They are not the burst times that would occur during normal operation.

1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 04, 2019	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI3	101604	Nov. 04, 2019	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 04, 2019	1 Year
4.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 04, 2019	1 Year
5.	Preamplifier	SKET Electronic	BK1G18G30 D	KD17503	Nov. 04, 2019	1 Year
6.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 01, 2019	1 Year
7.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 01, 2019	1 Year
8.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 01, 2019	1 Year
9.	Horn Antenna	A-INFO	LB-180400-K F	J211060628	Nov. 01, 2019	1 Year
10.	Pre-amplifier	SONOMA	310N	186860	Nov. 04, 2019	1 Year
11.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
12.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 04, 2019	1 Year
13.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 04, 2019	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 04, 2019	1 Year
15.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 04, 2019	1 Year
16.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 04, 2019	1 Year
17.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 04, 2019	1 Year
18.	DC Power Supply	LW	TPR-6420D	374470	Nov. 04, 2019	1 Year
19.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80 B	N/A	Nov. 04, 2019	1 Year



1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, September 27, 2019.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A, March 07, 2019.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test

Test Standard	Description of Test	Result
Article 2, Paragraph 1, Item 19-3	Frequency Tolerance	Compliance
	Antenna Power& Output Power Tolerance	Compliance
	Occupied Bandwith	Compliance
	Unwanted Emission Strength/Spurious Area	Compliance
	Adjacent Channel Leakage Power	Compliance
	Outband Leakage Power	Compliance
	Secondary Radiated Emssion Strength	Compliance
	Transmission Burst Length	Compliance
	Carrier Sensing Function	Compliance
	Interference prevention function	Compliance
	EIRP	Compliance

3. FREQUENCY TOLERANCE TEST

3.1. Test Limit

Test Limit

 ± 20 ppm

3.2. Test Equipment

Same as 1.7.

3.3. Test Configuration

Same as 1.6.

3.4. Test Data

PASS

Please refer to the following data.

ANT A:**Low Voltage: AC 90V**

Frequency(MHz)	Reading(MHz)	Tolerance(ppm)	Limit(ppm)
5180.000	5179.9957	-0.830	±20
5200.000	5200.0048	0.923	±20
5240.000	5240.0021	0.401	±20

High Voltage: AC 110V

Frequency(MHz)	Reading(MHz)	Tolerance(ppm)	Limit(ppm)
5180.000	5180.0014	0.270	±20
5200.000	5200.0025	0.481	±20
5240.000	5240.0024	0.458	±20

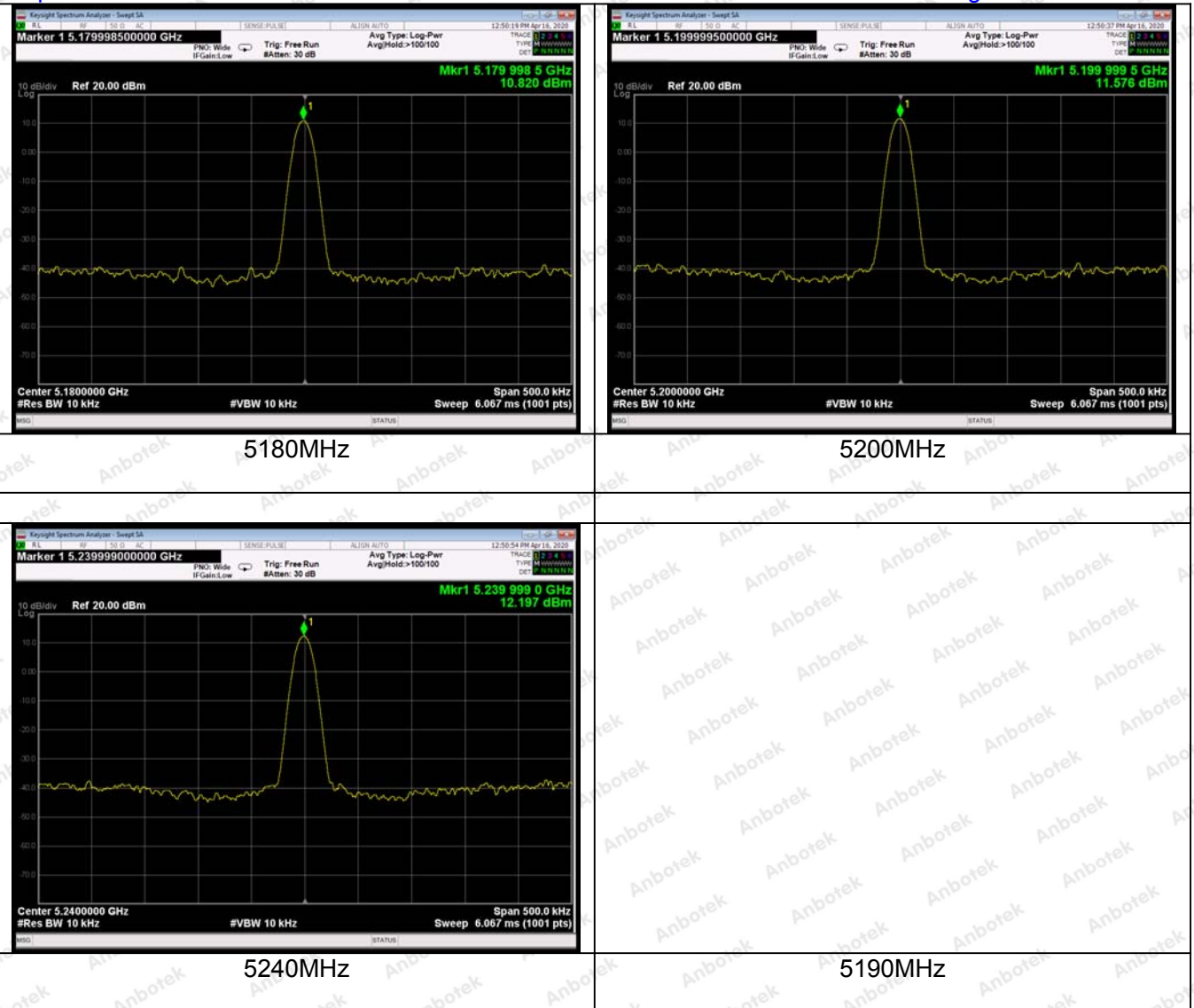
Normal Voltage: AC 100V

Frequency(MHz)	Reading(MHz)	Tolerance(ppm)	Limit(ppm)
5180.000	5179.9985	-0.290	±20
5200.000	5199.9995	-0.096	±20
5240.000	5239.9990	-0.191	±20

Rmark 1: Note - Testing was performed using the peak found in the middle of the modulation envelope with lower res BW.

2: That only normal voltage's plot is reported in the report.





ANT B:**Low Voltage: AC 90V**

Frequency(MHz)	Reading(MHz)	Tolerance(ppm)	Limit(ppm)
5180.000	5180.0040	0.772	±20
5200.000	5199.9983	-0.327	±20
5240.000	5240.0036	0.687	±20

High Voltage: AC 110V

Frequency(MHz)	Reading(MHz)	Tolerance(ppm)	Limit(ppm)
5180.000	5179.9978	-0.425	±20
5200.000	5200.0042	0.808	±20
5240.000	5239.9960	-0.763	±20

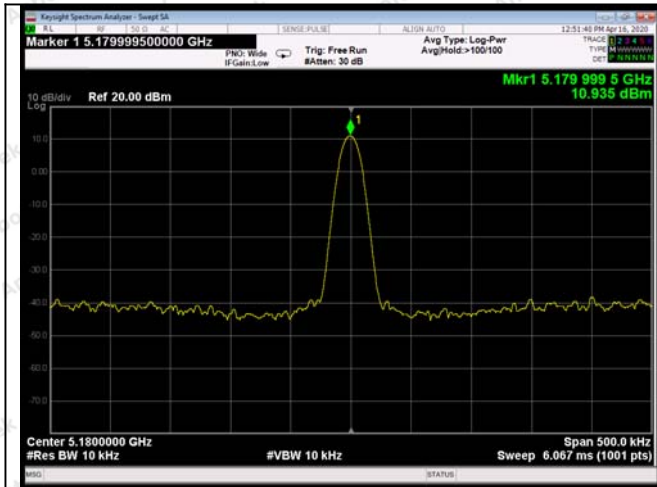
Normal Voltage: AC 100V

Frequency(MHz)	Reading(MHz)	Tolerance(ppm)	Limit(ppm)
5180.000	5179.9995	-0.097	±20
5200.000	5199.9990	-0.192	±20
5240.000	5239.9990	-0.191	±20

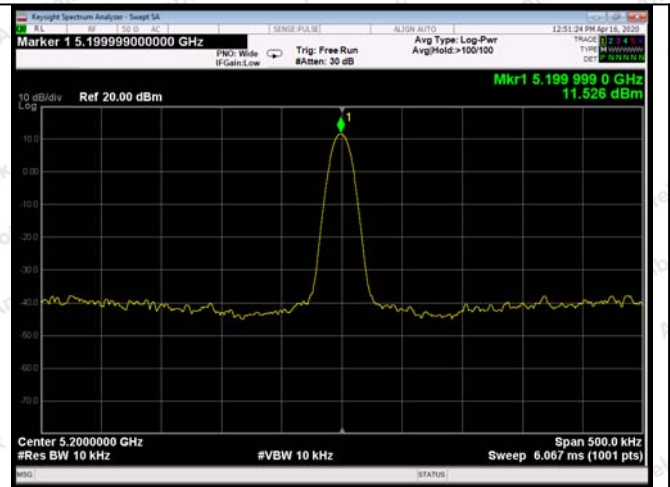
Rmark 1: Note - Testing was performed using the peak found in the middle of the modulation envelope with lower res BW.

2: That only normal voltage's plot is reported in the report.

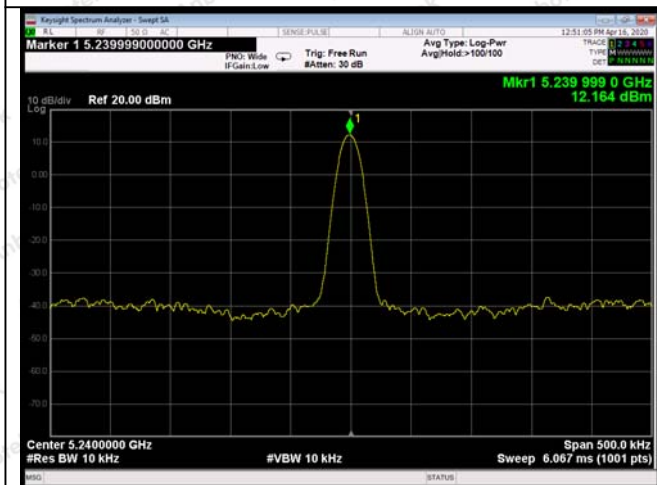




5180MHz



5200MHz



5240MHz



4. OCCUPIED BANDWIDTH (99%) TEST

4.1. Test Equipment

Same as 3.1 Frequency tolerance measurement.

4.2. Test Configuration

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the occupied bandwidth of the center channel at nominal voltage.

The occupied bandwidth was measured with the spectrum analyzer configured according to the table below. The occupied bandwidth was determined from the 99% power bandwidth by determining the highest and lowest frequencies at which 99.5% of the power was captured and then subtracting the two numbers.

The limits are as follows:

Modulation Type	Occupied Band Width
20MHz system for 5.2/5.3GHz (OFDM)	<19 MHz
20MHz system for 5.2/5.3GHz (Other)	<18 MHz
40MHz system for 5.2/5.3GHz (OFDM)	<38 MHz
20MHz system for 5.5/5.6GHz (OFDM)	<19.7 MHz
40MHz system for 5.5/5.6GHz (OFDM)	<38 MHz
80MHz system for 5.21/5.29GHz (OFDM)	<78 MHz

The calculation was done by either the analyzer directly or via the software used to capture the plot.

Instrument Settings and Test Requirements				
Modulation Type	Analyzer Settings			
	Span	RB	VB	Other
OFDM (eg 802.11an)	36-163 MHz	≤540kHz	300kHz	Sample detector, averaging (10 sweeps)2, sweep time auto1)

Note 1: For burst transmissions sweep time set to ensure dwell time in each bandwidth > transmission cycle time (sweep time = transmit cycle time x span/ measurement bandwidth)

Note 2: For burst transmissions trace set for max hold and detector set to positive peak.

4.3. Test Results

ANT A:**Low Voltage: AC 90V****802.11a**

Frequency(MHz)	99% Bandwidth (MHz)	Limit(MHz)
5180.000	16.750	19.0
5200.000	16.739	19.0
5240.000	16.695	19.0

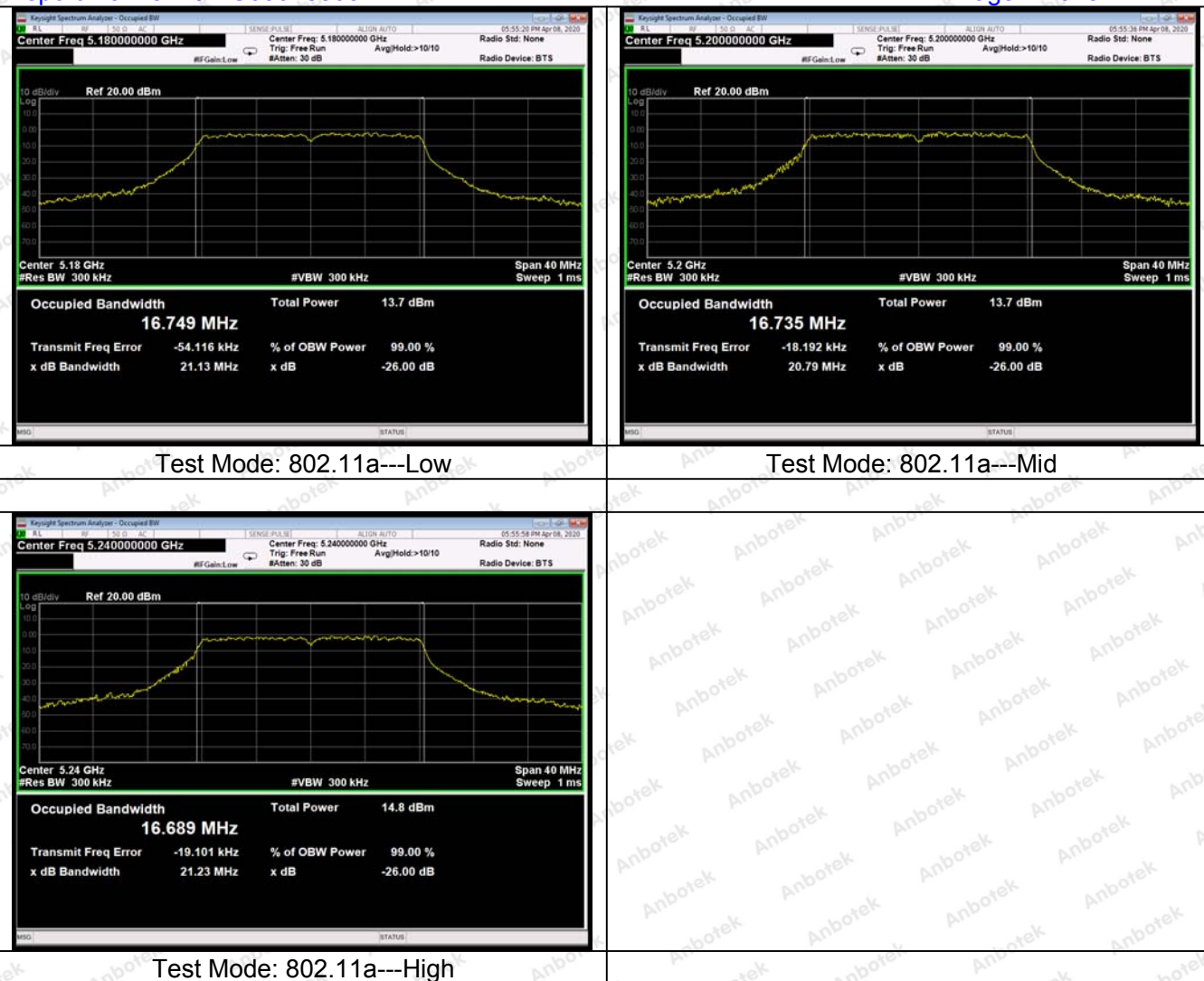
High Voltage: AC 110V**802.11a**

Frequency(MHz)	99% Bandwidth (MHz)	Limit(MHz)
5180.000	16.748	19.0
5200.000	16.740	19.0
5240.000	16.688	19.0

Normal Voltage: AC 100V**802.11a**

Frequency(MHz)	99% Bandwidth (MHz)	Limit(MHz)
5180.000	16.749	19.0
5200.000	16.735	19.0
5240.000	16.689	19.0





Remark: That only normal voltage's plot is reported in the report.



ANT B:**Low Voltage: AC 90V****802.11a**

Frequency(MHz)	99% Bandwidth (MHz)	Limit(MHz)
5180.000	16.680	19.0
5200.000	16.700	19.0
5240.000	16.747	19.0

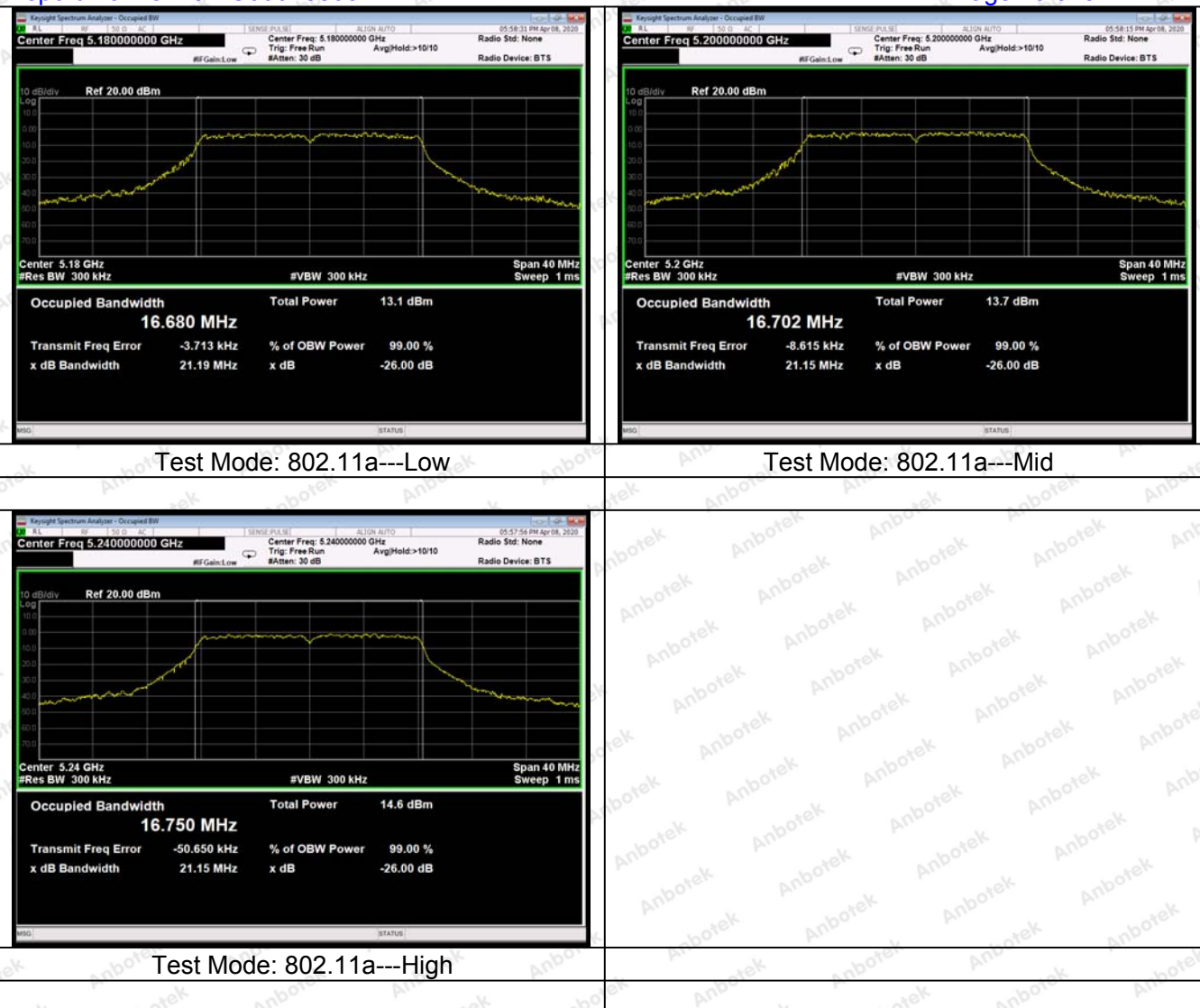
High Voltage: AC 110V**802.11a**

Frequency(MHz)	99% Bandwidth (MHz)	Limit(MHz)
5180.000	16.681	19.0
5200.000	16.706	19.0
5240.000	16.746	19.0

Normal Voltage: AC 100V**802.11a**

Frequency(MHz)	99% Bandwidth (MHz)	Limit(MHz)
5180.000	16.680	19.0
5200.000	16.702	19.0
5240.000	16.750	19.0





Remark: That only normal voltage's plot is reported in the report.



5. SPURIOUS AND UNWANTED EMISSIONS

5.1. Test Equipment

Same as 3.1 Frequency tolerance measurement.

5.2. Test Configuration

Any emissions above the limit from the initial peak scan (RB=VB=1MHz, peak detector) are measured by tuning to that signal, setting RB=VB=1MHz, span=0Hz and using a sample detector. The average power over a transmission burst is calculated if the highest signal level still exceeds the limit. If the system uses burst transmissions during testing the threshold for requiring individual measurements becomes limit -3dBrelative to the limit.

For Test from 30MHz to 1000MHz, set RBW=VBW= 100kHz;

For Test from 1000MHz to 26500MHz, set RBW=VBW= 1MHz;

The device transmits in a burst mode, sweep time is calculated for each band tested as shown below. The plots are composite plots of the individual frequency bands.

Frequency (MHz)		Bandwidth (MHz)		Sweep Time (Minimum)
Start	Stop	RB	VB	
30	1000	0.1	0.1	49ms
1000	5140	1	1	207ms
5360	10000	1	1	232ms
10000	26500	1	1	825ms
5340	5360	1	1	1ms
5140	5360	1	1	11ms

The device transmits continuously so the analyzer sweep time is auto-coupled.

5.3. Test Results



ANT A:**Low Voltage: AC 90V****802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-80.892	30~ 1000MHz	≤ -36dBm
	-67.946	1000MHz~ 5135MHz	≤ -26dBm
	-54.952	5365~ 26000MHz	≤ -26dBm
5200.000	-80.787	30~ 1000MHz	≤ -36dBm
	-66.948	1000MHz~ 5135MHz	≤ -26dBm
	-56.634	5365~ 26000MHz	≤ -26dBm
5240.000	-81.842	30~ 1000MHz	≤ -36dBm
	-67.636	1000MHz~ 5135MHz	≤ -26dBm
	-55.125	5365~ 26000MHz	≤ -26dBm

High Voltage: AC 110V**802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-81.094	30~ 1000MHz	≤ -36dBm
	-68.793	1000MHz~ 5135MHz	≤ -26dBm
	-55.157	5365~ 26000MHz	≤ -26dBm
5200.000	-81.213	30~ 1000MHz	≤ -36dBm
	-67.741	1000MHz~ 5135MHz	≤ -26dBm
	-56.013	5365~ 26000MHz	≤ -26dBm
5240.000	-81.812	30~ 1000MHz	≤ -36dBm
	-67.559	1000MHz~ 5135MHz	≤ -26dBm
	-55.950	5365~ 26000MHz	≤ -26dBm

Normal Voltage: AC 100V**802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-80.821	30~ 1000MHz	≤ -36dBm
	-68.462	1000MHz~ 5135MHz	≤ -26dBm
	-54.771	5365~ 26000MHz	≤ -26dBm
5200.000	-81.109	30~ 1000MHz	≤ -36dBm



5240.000	-67.517	1000MHz~ 5135MHz	≤ -26dBm
	-56.526	5365~ 26000MHz	≤ -26dBm
	-82.208	30~ 1000MHz	≤ -36dBm
	-67.351	1000MHz~ 5135MHz	≤ -26dBm
	-55.673	5365~ 26000MHz	≤ -26dBm

ANT B:

Low Voltage: AC 90V

802.11a

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-80.664	30~ 1000MHz	≤ -36dBm
	-67.603	1000MHz~ 5135MHz	≤ -26dBm
	-56.425	5365~ 26000MHz	≤ -26dBm
5200.000	-81.978	30~ 1000MHz	≤ -36dBm
	-68.910	1000MHz~ 5135MHz	≤ -26dBm
	-55.566	5365~ 26000MHz	≤ -26dBm
5240.000	-81.662	30~ 1000MHz	≤ -36dBm
	-68.739	1000MHz~ 5135MHz	≤ -26dBm
	-55.987	5365~ 26000MHz	≤ -26dBm

High Voltage: AC 110V

802.11a

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-80.678	30~ 1000MHz	≤ -36dBm
	-68.222	1000MHz~ 5135MHz	≤ -26dBm
	-56.430	5365~ 26000MHz	≤ -26dBm
5200.000	-81.357	30~ 1000MHz	≤ -36dBm
	-68.698	1000MHz~ 5135MHz	≤ -26dBm
	-55.440	5365~ 26000MHz	≤ -26dBm
5240.000	-81.180	30~ 1000MHz	≤ -36dBm
	-68.628	1000MHz~ 5135MHz	≤ -26dBm
	-56.846	5365~ 26000MHz	≤ -26dBm

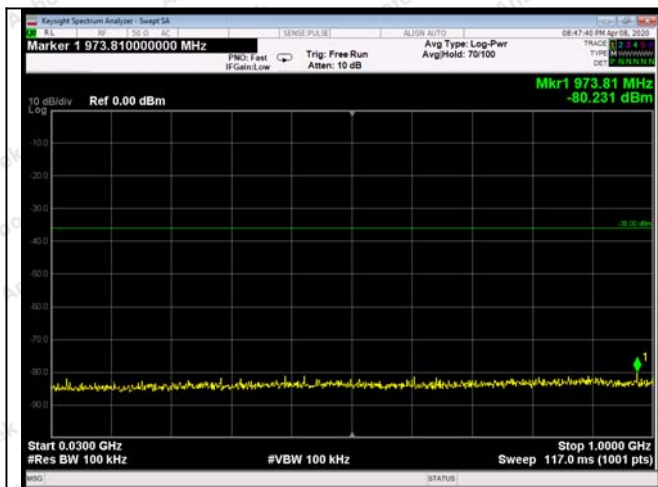
Normal Voltage: AC 100V**802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-81.188	30~ 1000MHz	$\leq -36\text{dBm}$
	-67.839	1000MHz~ 5135MHz	$\leq -26\text{dBm}$
	-56.566	5365~ 26000MHz	$\leq -26\text{dBm}$
5200.000	-81.656	30~ 1000MHz	$\leq -36\text{dBm}$
	-68.925	1000MHz~ 5135MHz	$\leq -26\text{dBm}$
	-55.747	5365~ 26000MHz	$\leq -26\text{dBm}$
5240.000	-81.736	30~ 1000MHz	$\leq -36\text{dBm}$
	-69.028	1000MHz~ 5135MHz	$\leq -26\text{dBm}$
	-56.545	5365~ 26000MHz	$\leq -26\text{dBm}$

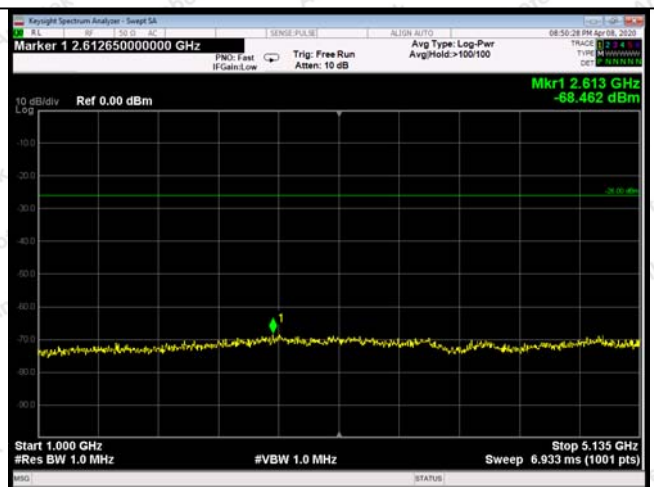
5.4. Test requirements

Test Requirements		
Frequency Range (MHz)	Limit (W52/W53/W56)	
	$\mu\text{W}/\text{MHz}$	dBm/MHz
30 - 5140	2.5	-26.0
5360 - 26500	2.5	-26.0

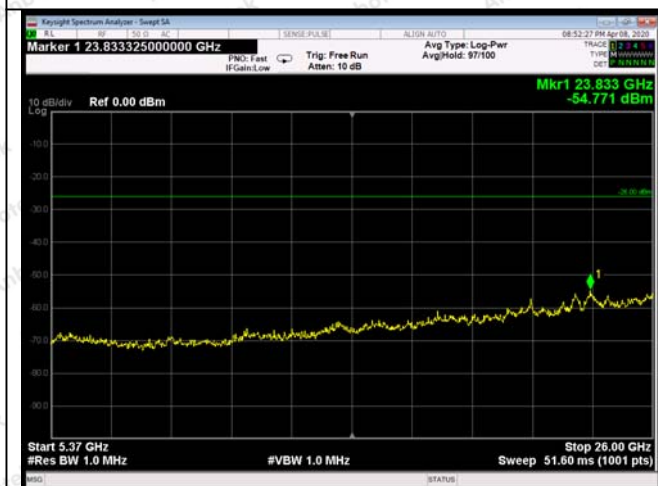
ANT A



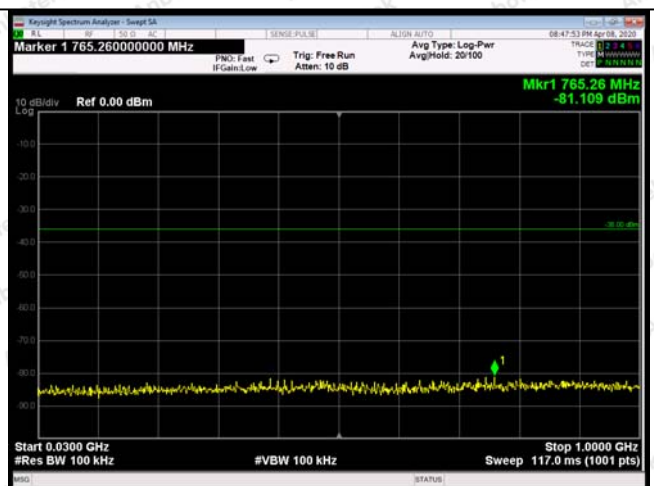
Test Mode: 802.11a---Low



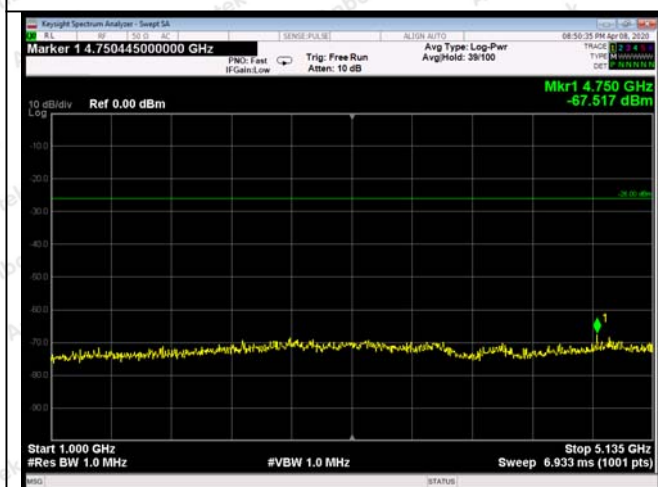
Test Mode: 802.11a---Low



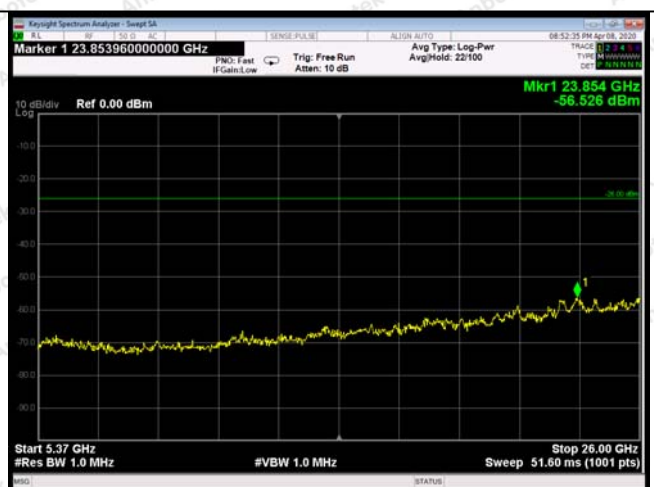
Test Mode: 802.11a---Low



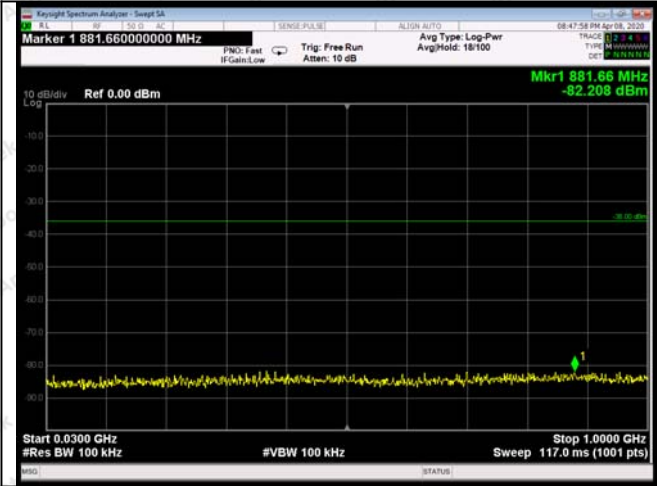
Test Mode: 802.11a---Mid



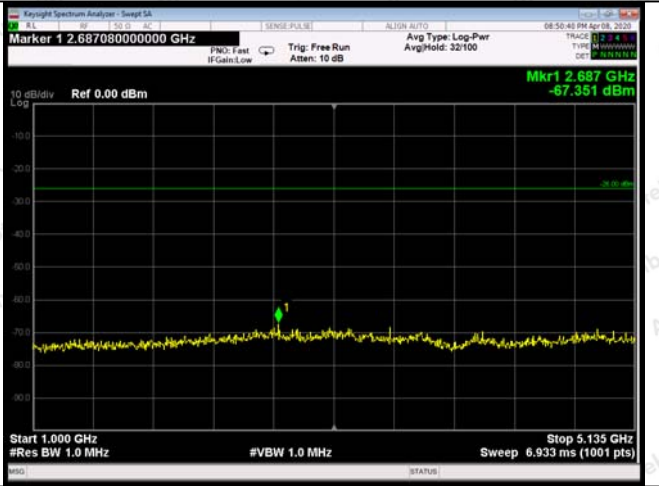
Test Mode: 802.11a---Mid



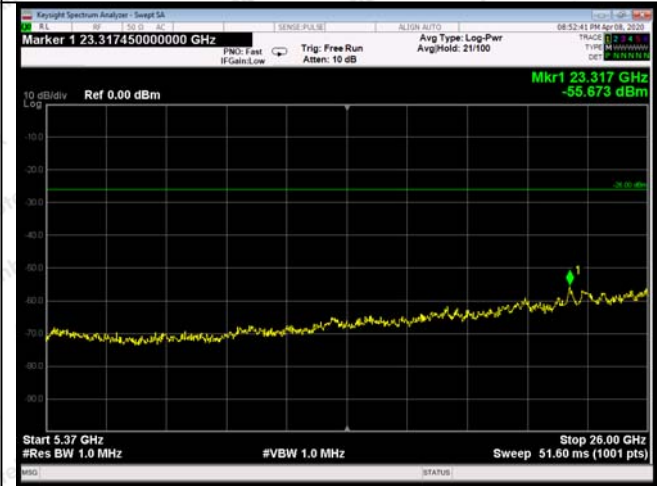
Test Mode: 802.11a---Mid



Test Mode: 802.11a---High



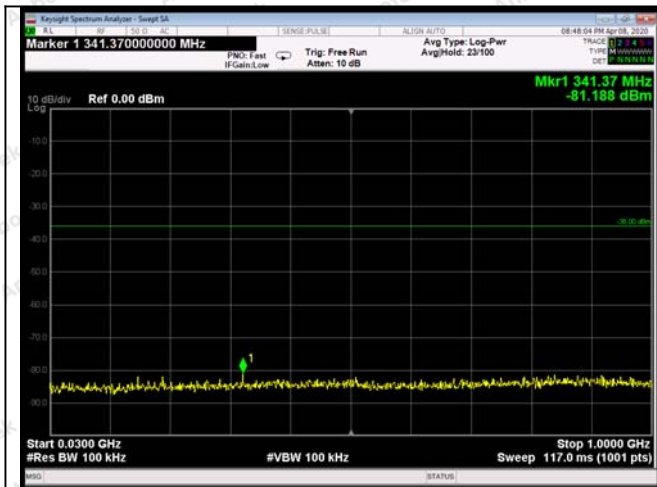
Test Mode: 802.11a---High



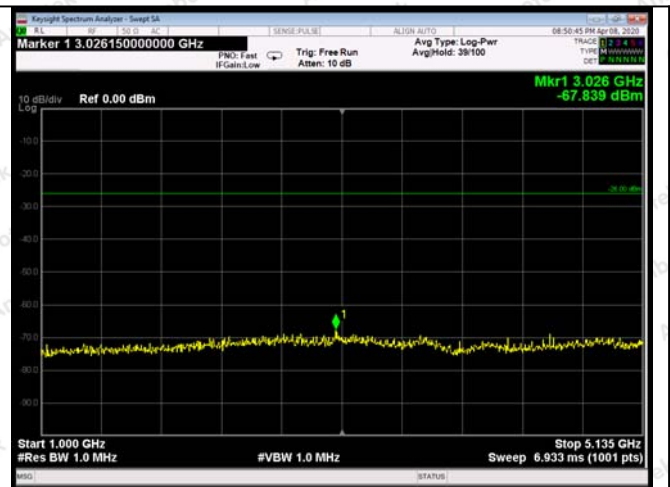
Test Mode: 802.11a---High

Remark: That only normal voltage's plot is reported in the report.

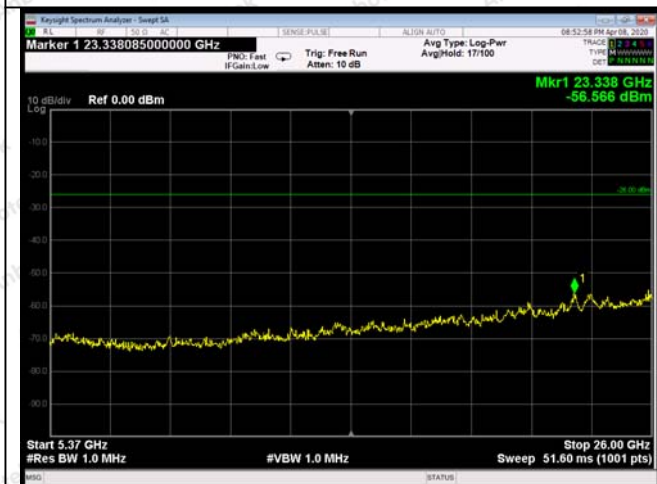
ANT B



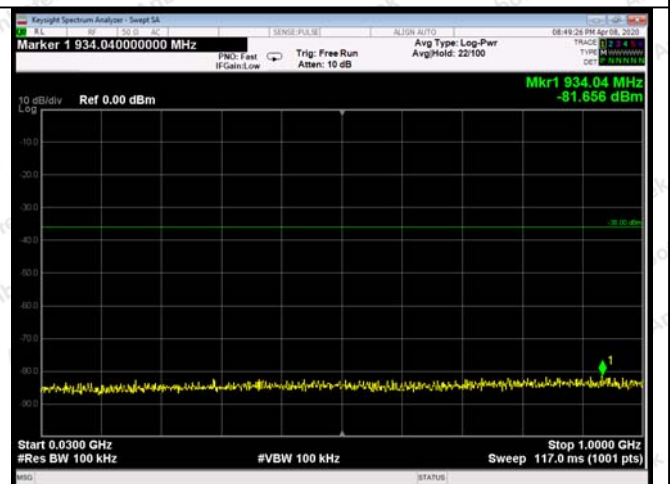
Test Mode: 802.11a---Low



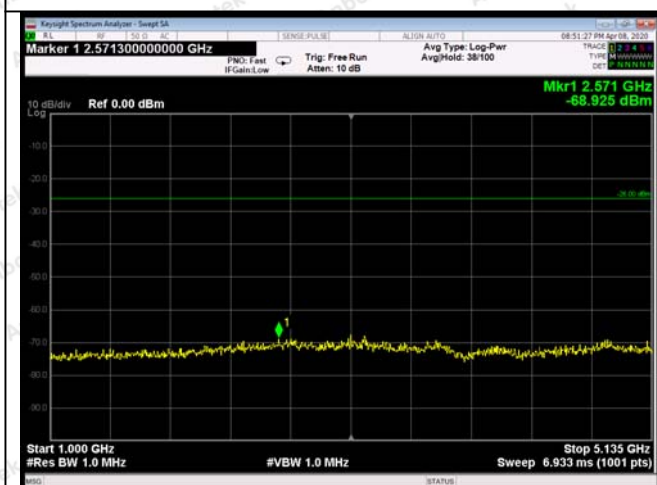
Test Mode: 802.11a---Low



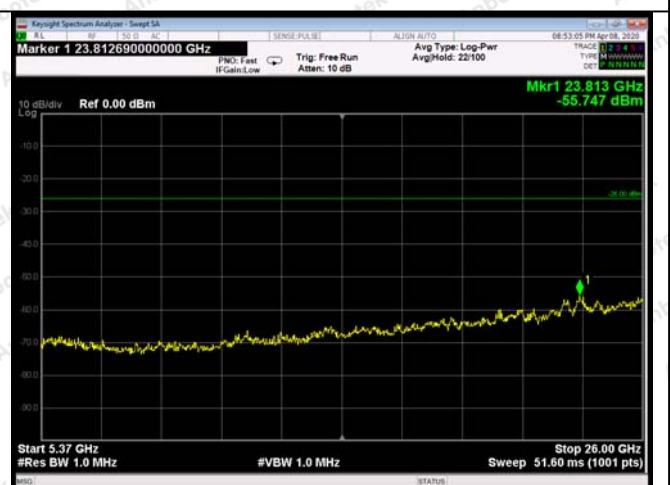
Test Mode: 802.11a---Low



Test Mode: 802.11a---Mid

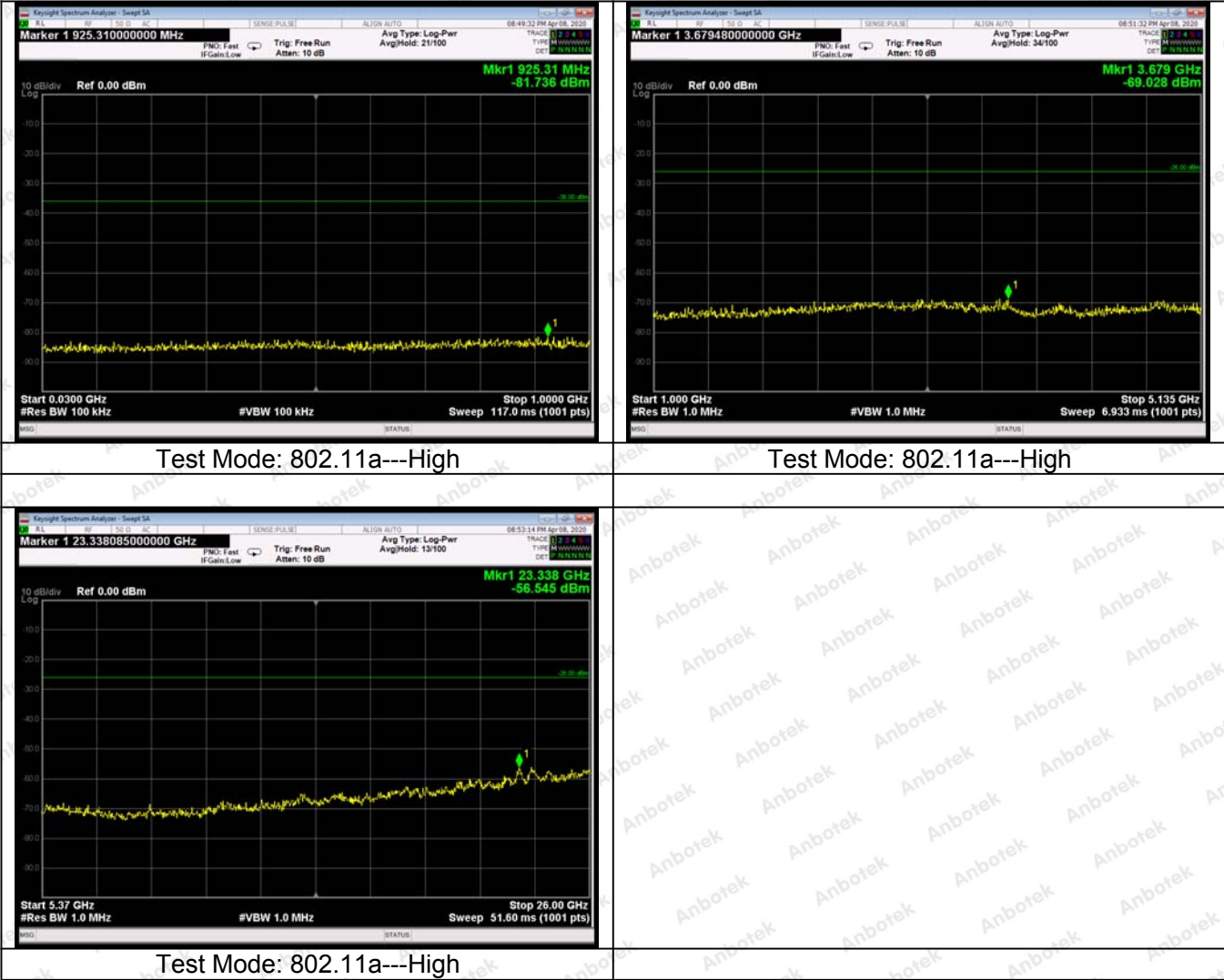


Test Mode: 802.11a---Mid



Test Mode: 802.11a---Mid





Remark: That only normal voltage's plot is reported in the report.

6. OUTBAND LEAKAGE POWER

6.1. Test Equipment

Same as 3.1 Frequency tolerance measurement.

6.2. Test Configuration

Measurement Summary - Highest emissions in each operating mode

Measurements made at the data rate that produced the highest output power spectral density (refer to antenna power measurements). All plots show the emissions outside of the band to below the average limits when measured with a peak detector.

Preliminary Measurements:

Instrument Settings: RB=VB=1MHz, Positive peak detector and maximum hold for a minimum of 10 sweeps, but until the spectrum displayed becomes stable and no new signals are observed. **An offset equal to the**

antenna gain is applied to the test data so that the displayed level is the eirp of the signal. An additional correction factor for devices that operate on multiple chains equal to $10\log(n)$, where n is the number of transmit chains, is applied to the test data for modes that support MIMO.

Any emissions above the limit from the initial peak scan (RB=VB=1MHz, peak detector) are measured by tuning to that signal, setting RB=VB=1MHz, span=0Hz and using a sample detector. The average power over a transmission burst is calculated if the highest signal level still exceeds the limit. If the system uses burst transmissions during testing the threshold for requiring individual measurements becomes limit -3dB relative to the limit.

6.3. Test Results

Pass.

Please refer to the following pages.



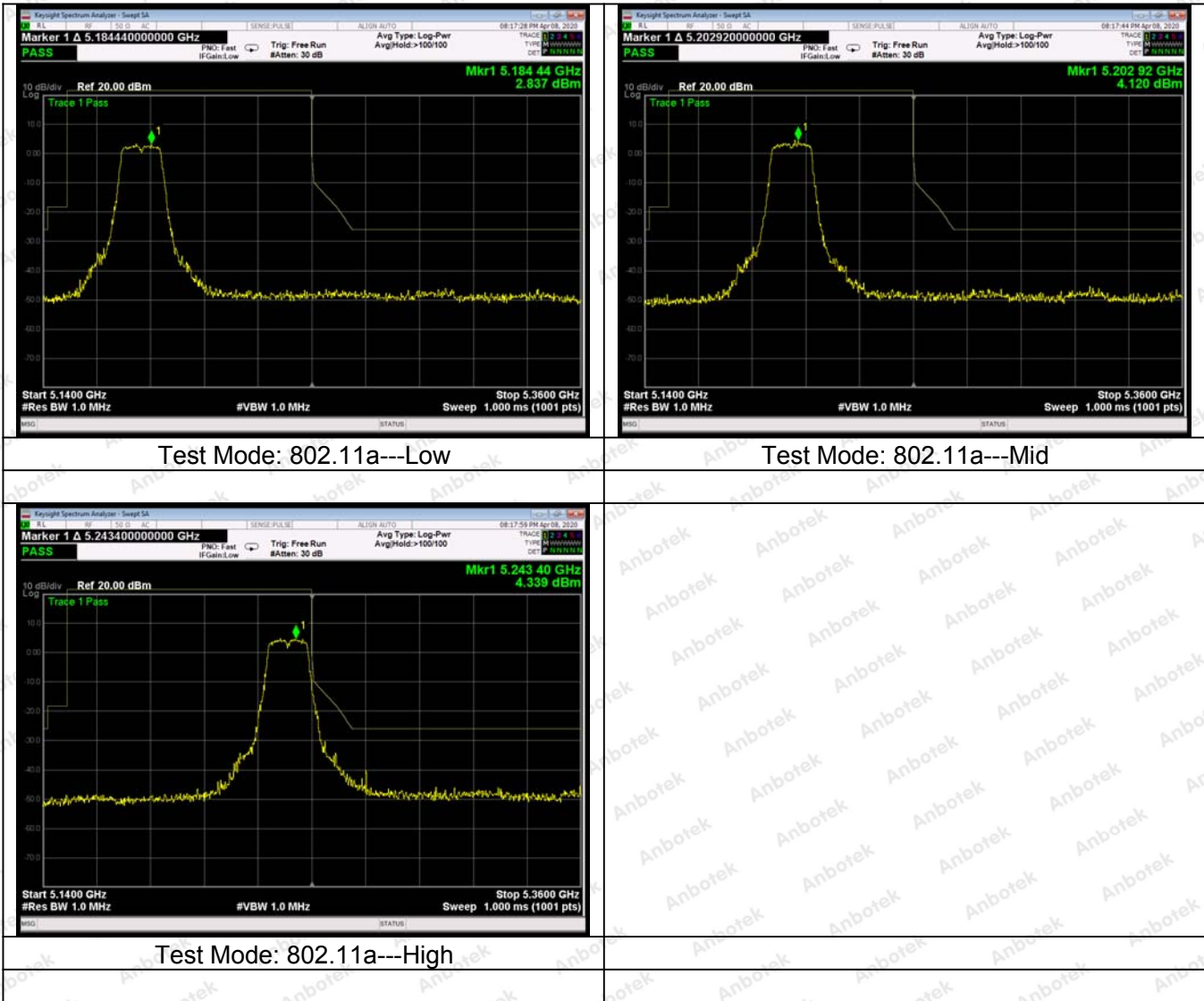
Test Requirements (W52 Band, 5180 - 5240MHz)		
Frequency Range (MHz)	Limit	
	mW/MHz	dBm/MHz
5135-5142	0.0025	-26.0
5142-5150	0.0150	-18.2
5150 - 5250	--	--
5250 - 5251	$10^{1-(f-9)}$	0 to -10
5251 - 5260	$10^{-1-(8/90)(f-11)}$	-10 to -18
5260 - 5266.7	$10^{-1.8-(6/50)(f-20)}$	-18 to -26
5266.7 - 5360	0.0025	-26.0

Test Requirements (W52 Band, 5190 - 5230MHz)		
Frequency Range (MHz)	Limit	
	mW/MHz	dBm/MHz
5100-5141.6	0.0025	-26.0
5141.6-5150	0.0150	-18.2
5150 - 5250	--	--
5250 - 5251	$10^{-(f-20)+\log(1/2)}$	-3 to -13
5251 - 5270	$10^{-(8/190)(f-21)-1+\log(1/2)}$	-13 to -21
5270 - 5278.4	$10^{-(3/50)(f-40)-1.8+\log(1/2)}$	-21 to -26
5278.4 - 5400	0.0025	-26.0

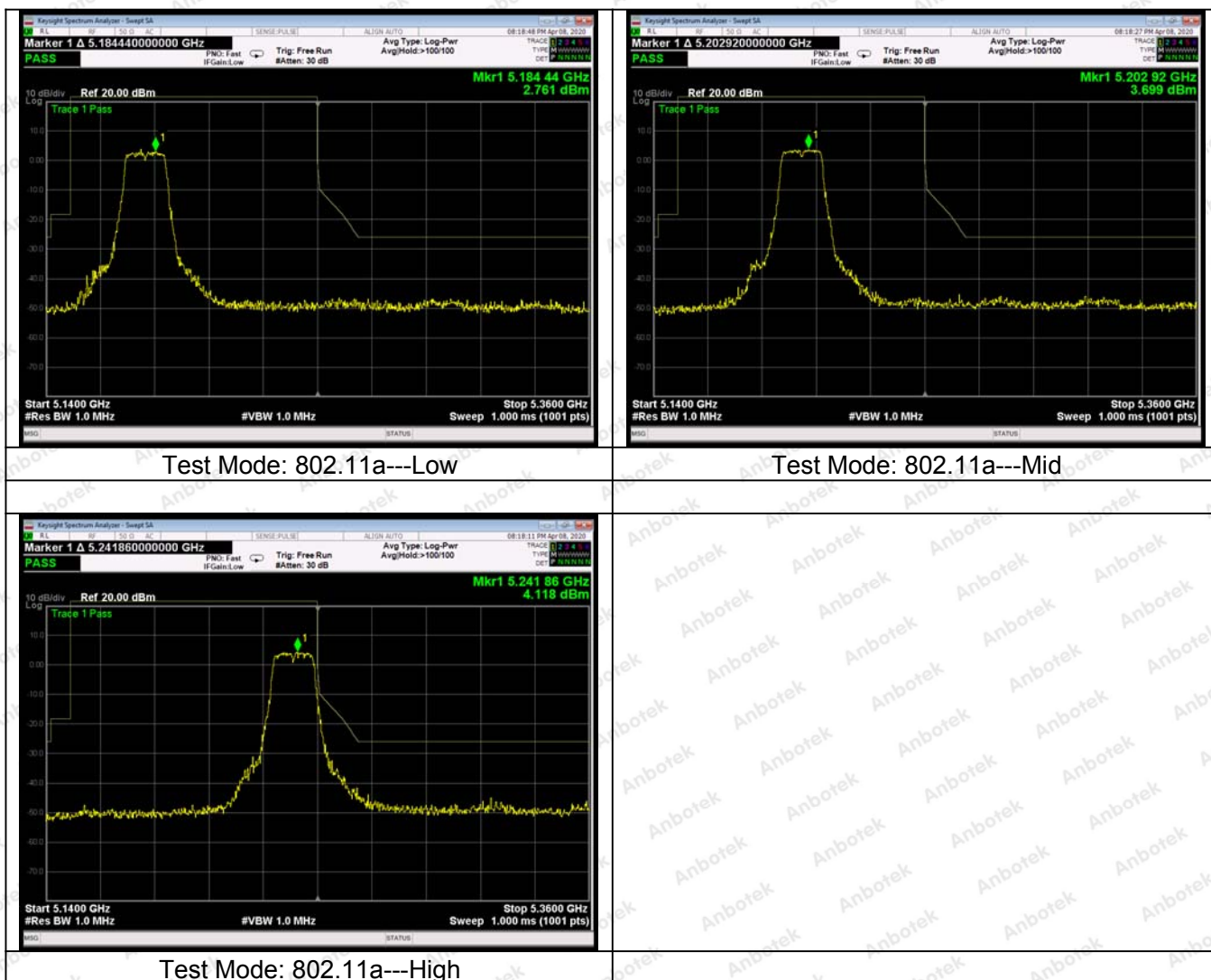
Test Requirements (W52 Band, 5210MHz)		
Frequency Range (MHz)	Limit	
	mW/MHz	dBm/MHz
5020 - 5123.2	0.0025	-26.0
5123.2 - 5150	0.0150	-18.2
5150 - 5250	--	--
5250 - 5251	$10^{-(f-40)+\log(1/4)}$	-6 to -16
5251 - 5290	$10^{-(8/390)(f-41)-1+\log(1/4)}$	-16 to -24
5290 - 5296.7	$10^{-(3/100)(f-80)-1.8+\log(1/4)}$	-24 to -26
5296.7 - 5480	0.0025	-26.0

The limits in the table above are an eirp limit. The f in the limit formulae is the deviation in MHz from 5240MHz (20MHz system) 5230MHz (40MHz system) 5210MHz (80MHz system) for the W52 band

ANT A:



ANT B:



Remark: The test results already include the antenna gain.



7. ANTENNA POWER TEST

7.1. Test Equipment

Same as 3.1 Frequency tolerance measurement.

7.2. Test Configuration

Step 1:

Determine the frequency of the signal with the highest power spectral density

Instrument Settings: RB=1MHz, VB=3MHz, Span > Occupied bandwidth, peak detector, max hold, sampling points > 400.

Once the display has settled (no more peaks added) the marker is paced at the peak of the signal.

The spectrum analyzer center frequency is adjusted to the marker frequency (Mkr -> CF feature), the span is then set to zero span.

Step 2:

Measure the output power

Instrument Settings: RB=VB=1MHz, continuous sweep, trace clear-write

The output power is the power measured by the average power meter connected to the IF output of the analyzer, corrected for the IF path loss, the value of the external attenuator (if used) and the duty cycle of the transmission sequence if the product is not transmitting continuously.

The limits are as follows:

1) RF Output Power:

Conditions	Limits
5.2/5.3GHz for OBW less than 19MHz	< 10mW/MHz
5.2/5.3GHz for OBW over 19MHz to 38MHz	< 5mW/MHz
5.6GHz for OBW less than 19.7MHz	< 10mW/MHz
5.6GHz for OBW over 19.7MHz to 38MHz	< 5mW/MHz
5.2/5.3GHz for OBW over 38MHz to 78MHz	< 2.5mW/MHz

2) Tolerance:

-80% ~ +20% for 5.2/5.3GHz

-50% ~ +50% for 5.6GHz

7.3. Test Results

Pass.

Please refer to the following pages.

ANT A:

Low Voltage: AC 90V

Frequency (MHz)	conducted antenna power density (mW/MHz)		Rated Conducted power density (mW/MHz)	Antenna Power Error (-80%, +20%)	EIRP=Power+ antenna gain (dBm/MHz)
802.11a					
	dBm	mW/MHz			Antenna gain=3.6dBi
5180.000	0.706	1.177	1.6	-26.44%	4.306
5200.000	1.074	1.281	1.6	-19.94%	4.674
5240.000	1.550	1.429	1.6	-10.69%	5.150

High Voltage: AC 110V

Frequency (MHz)	conducted antenna power density (mW/MHz)		Rated Conducted power density (mW/MHz)	Antenna Power Error (-80%, +20%)	EIRP=Power+ antenna gain (dBm/MHz)
802.11a					
	dBm	mW/MHz			Antenna gain=3.6dBi
5180.000	0.703	1.176	1.6	-26.50%	4.303
5200.000	1.070	1.279	1.6	-20.06%	4.670
5240.000	1.552	1.430	1.6	-10.63%	5.152

Normal Voltage: AC 100V

Frequency (MHz)	conducted antenna power density (mW/MHz)		Rated Conducted power density (mW/MHz)	Antenna Power Error (-80%, +20%)	EIRP=Power+ antenna gain (dBm/MHz)
802.11a					
	dBm	mW/MHz			Antenna gain=3.6dBi
5180.000	0.702	1.175	1.6	-26.56%	4.302
5200.000	1.071	1.280	1.6	-20.00%	4.671
5240.000	1.547	1.428	1.6	-10.75%	5.147

ANT B:

Low Voltage: AC 90V

Frequency (MHz)	conducted antenna power density (mW/MHz)		Rated Conducted power density (mW/MHz)	Antenna Power Error (-80%, +20%)	EIRP=Power+ antenna gain (dBm/MHz)
802.11a					
	dBm	mW/MHz			Antenna gain=4dBi
5180.000	0.426	1.103	1.6	-31.06%	4.426
5200.000	1.076	1.281	1.6	-19.94%	5.076
5240.000	1.269	1.339	1.6	-16.31%	5.269

High Voltage: AC 110V

Frequency (MHz)	conducted antenna power density (mW/MHz)		Rated Conducted power density (mW/MHz)	Antenna Power Error (-80%, +20%)	EIRP=Power+ antenna gain (dBm/MHz)
802.11a					
	dBm	mW/MHz			Antenna gain=4dBi
5180.000	0.430	1.104	1.6	-31.00%	4.430
5200.000	1.074	1.281	1.6	-19.94%	5.074
5240.000	1.264	1.338	1.6	-16.38%	5.264

Normal Voltage: AC 100V

Frequency (MHz)	conducted antenna power density (mW/MHz)		Rated Conducted power density (mW/MHz)	Antenna Power Error (-80%, +20%)	EIRP=Power+ antenna gain (dBm/MHz)
802.11a					
	dBm	mW/MHz			Antenna gain=4dBi
5180.000	0.426	1.103	1.6	-31.06%	4.426
5200.000	1.075	1.281	1.6	-19.94%	5.075
5240.000	1.263	1.338	1.6	-16.38%	5.263

8. ADJACENT CHANNEL LEAKAGE POWER

8.1. Test Equipment

Same as 3.1 Frequency tolerance measurement.

8.2. Test Configuration

The power in a $\pm 9.5\text{MHz}$ band centered on the operating frequency is measured and used as a reference value. The powers in the $\pm 9.5\text{MHz}$ band on the adjacent channels ($\pm 20\text{MHz}$ from the operating channel) and alternate channels ($\pm 40\text{MHz}$ from the operating channel) are also measured. The Channel Leakage ratio (CLR) shall be at least 25dB for the adjacent channels and at least 40dB for the alternate channels.

The limits are as follows:

$\pm 9.5\text{MHz}$ bandwidth at 20MHz detuning: -25dB

$\pm 9.5\text{MHz}$ bandwidth at 40MHz detuning: -40dB

$\pm 19\text{MHz}$ bandwidth at 40MHz detuning: -25dB

$\pm 19\text{MHz}$ bandwidth at 80MHz detuning: -40dB

$\pm 39\text{MHz}$ bandwidth at 80MHz detuning: -25dB

8.3. Test Results

Pass.

Please refer to the following pages.



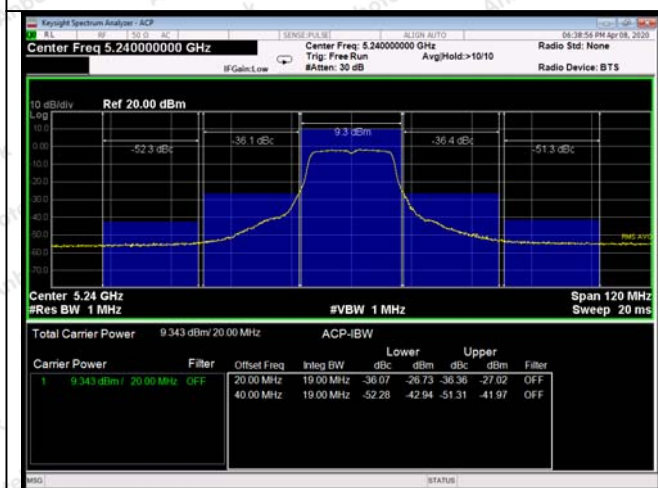
ANT A:



Test Mode: 802.11a---Low



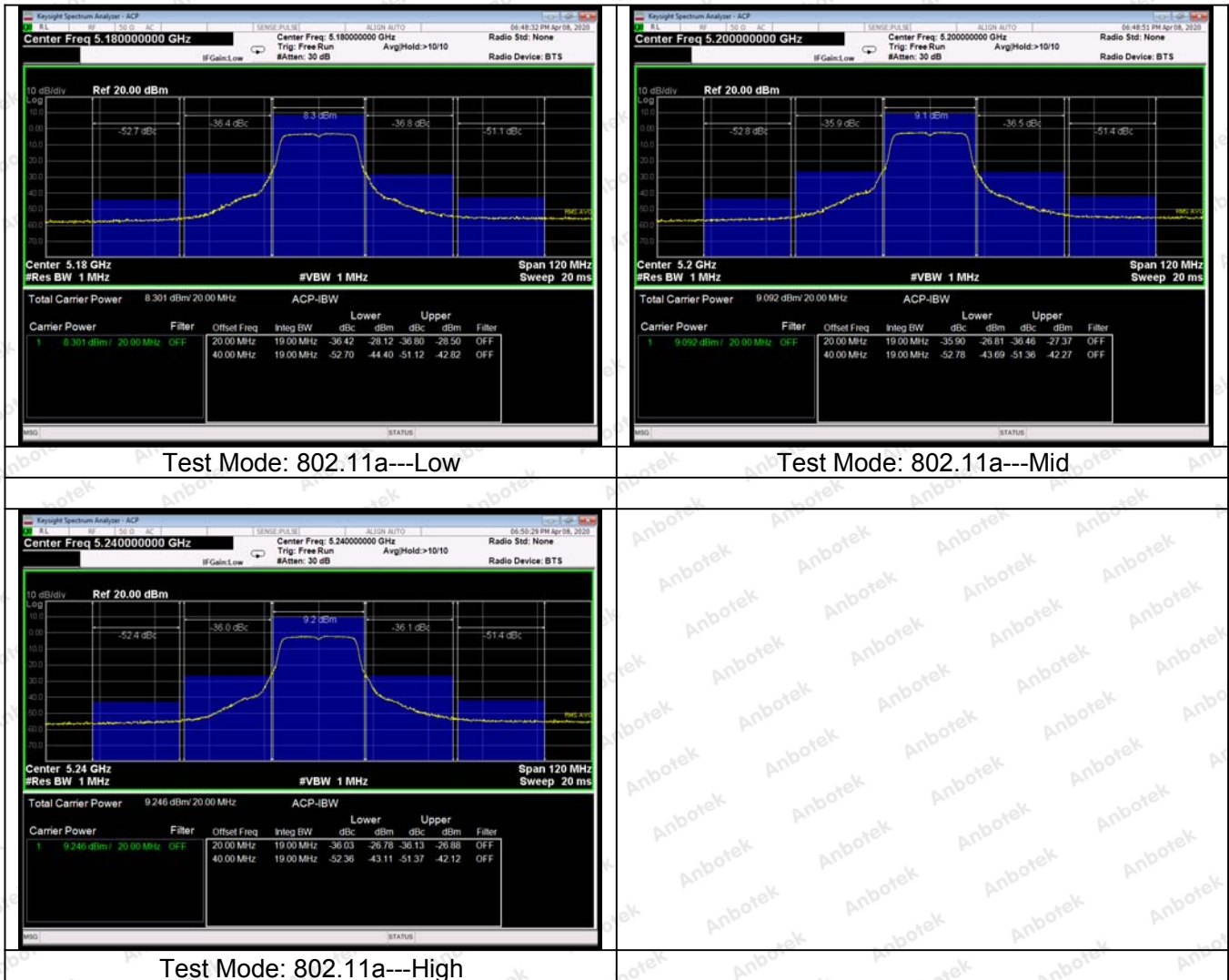
Test Mode: 802.11a---Mid



Test Mode: 802.11a---High



ANT B:



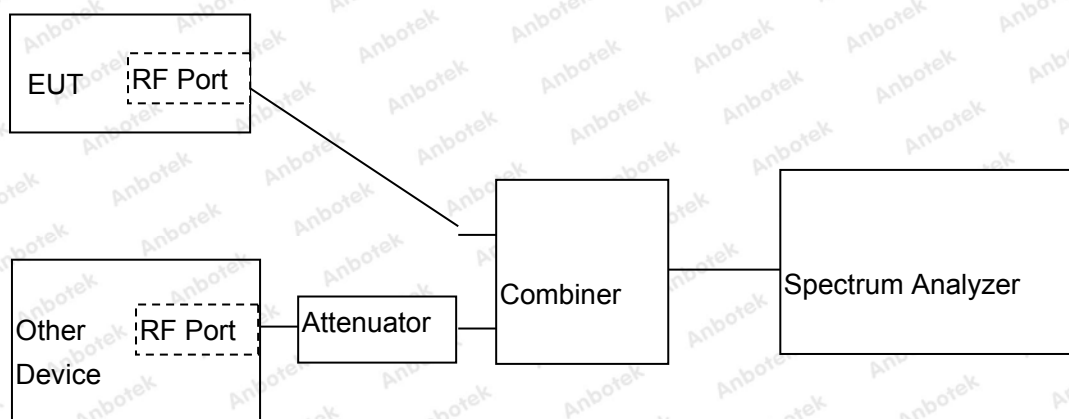
9. BURST TRANSMISSION DURATION

9.1. Test Equipment

Same as 3.1 Frequency tolerance measurement.

9.2. Test Configuration

The device was configured to transmit maximum length packets at the fastest and slowest data rate



9.3. Test Results

ANT A:

Test Mode	Channel	Measured burst length (mS)	Limit (mS)	Result
802.11a (20)	36	1.070	≤4	Pass





ANT B:

Test Mode	Channel	Measured burst length (mS)	Limit (mS)	Result
802.11a (20)	36	1.030	≤4	Pass





10. SECONDARY RADIATED EMISSIONS

10.1. Test Equipment

Same as 3.1 Frequency tolerance measurement.

10.2. Test Configuration

Same as 3.1 Frequency tolerance measurement.

Preliminary Measurements:

Instrument Settings: RB and VB as detailed below, positive peak detector and maximum hold for a minimum of 10 sweeps, but until the spectrum displayed becomes stable and no new signals are observed.

Sweep Settings

Frequency (MHz)		Bandwidth (MHz)		Sweep Time
Start	Stop	RB	VB	
30	1000	0.1	0.1	AUTO ms
1000	26500	1.0	1.0	AUTO ms

10.3. Test Results

Pass.

Please refer to the following pages.



ANT A:**Low Voltage: AC 90V****802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-81.429	30~ 1000MHz	≤ -54dBm
	-55.355	1000~ 26500MHz	≤ -47dBm
5200.000	-81.243	30~ 1000MHz	≤ -54dBm
	-55.688	1000~ 26500MHz	≤ -47dBm
5240.000	-81.495	30~ 1000MHz	≤ -54dBm
	-56.113	1000~ 26500MHz	≤ -47dBm

High Voltage: AC 110V**802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-80.900	30~ 1000MHz	≤ -54dBm
	-55.529	1000~ 26500MHz	≤ -47dBm
5200.000	-81.277	30~ 1000MHz	≤ -54dBm
	-55.365	1000~ 26500MHz	≤ -47dBm
5240.000	-81.427	30~ 1000MHz	≤ -54dBm
	-56.316	1000~ 26500MHz	≤ -47dBm

Normal Voltage: AC 110V**802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-81.233	30~ 1000MHz	≤ -54dBm
	-55.386	1000~ 26500MHz	≤ -47dBm
5200.000	-81.097	30~ 1000MHz	≤ -54dBm
	-55.724	1000~ 26500MHz	≤ -47dBm
5240.000	-81.537	30~ 1000MHz	≤ -54dBm
	-56.610	1000~ 26500MHz	≤ -47dBm

ANT B:**Low Voltage: AC 90V****802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-80.748	30~ 1000MHz	≤ -54dBm
	-56.130	1000~ 26500MHz	≤ -47dBm
5200.000	-81.187	30~ 1000MHz	≤ -54dBm
	-55.905	1000~ 26500MHz	≤ -47dBm
5240.000	-81.516	30~ 1000MHz	≤ -54dBm
	-56.951	1000~ 26500MHz	≤ -47dBm

High Voltage: AC110V**802.11a**

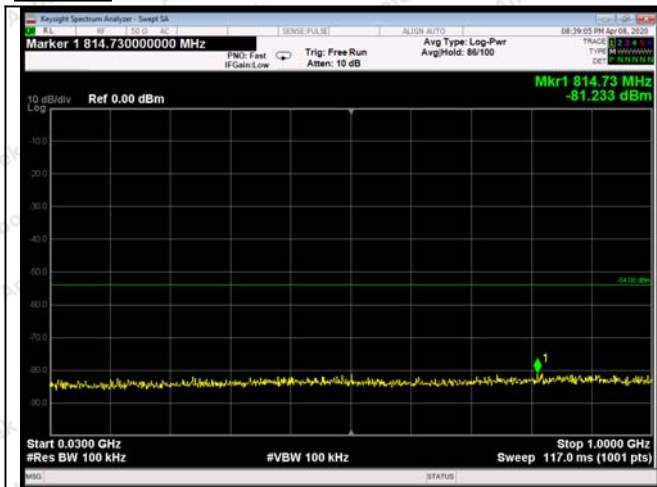
Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-80.898	30~ 1000MHz	≤ -54dBm
	-56.548	1000~ 26500MHz	≤ -47dBm
5200.000	-81.662	30~ 1000MHz	≤ -54dBm
	-55.499	1000~ 26500MHz	≤ -47dBm
5240.000	-81.250	30~ 1000MHz	≤ -54dBm
	-56.405	1000~ 26500MHz	≤ -47dBm

Normal Voltage: AC 100V**802.11a**

Frequency(MHz)	Reading(dBm)	Scanning Bandwidth	Limit
5180.000	-81.143	30~ 1000MHz	≤ -54dBm
	-56.646	1000~ 26500MHz	≤ -47dBm
5200.000	-81.459	30~ 1000MHz	≤ -54dBm
	-56.085	1000~ 26500MHz	≤ -47dBm
5240.000	-81.265	30~ 1000MHz	≤ -54dBm
	-56.893	1000~ 26500MHz	≤ -47dBm



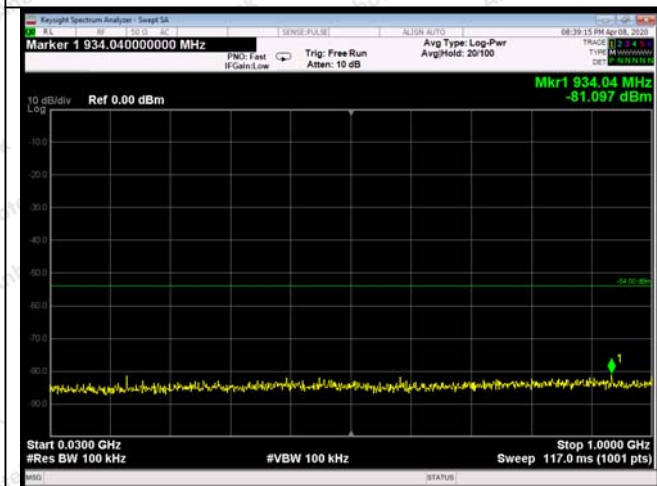
ANT A



Test Mode: 802.11a---Low



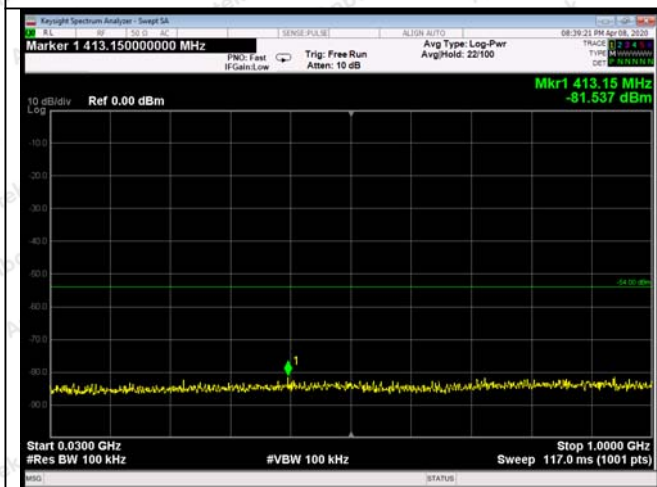
Test Mode: 802.11a---Low



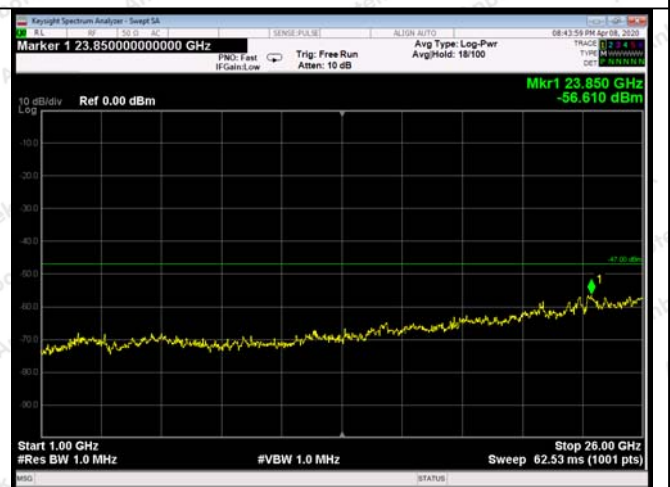
Test Mode: 802.11a---Mid



Test Mode: 802.11a---Mid



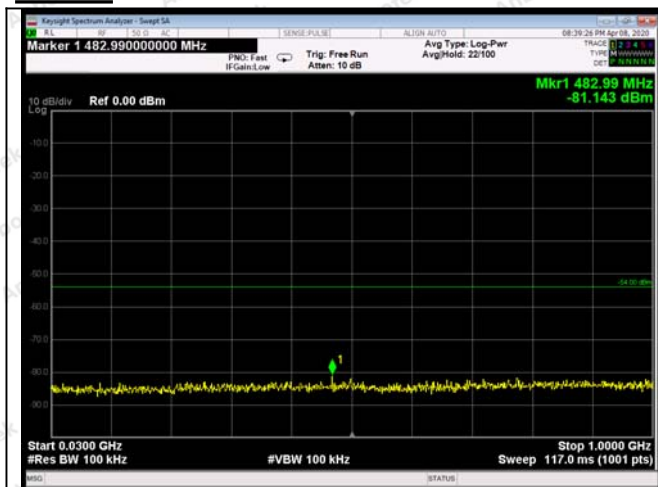
Test Mode: 802.11a---High



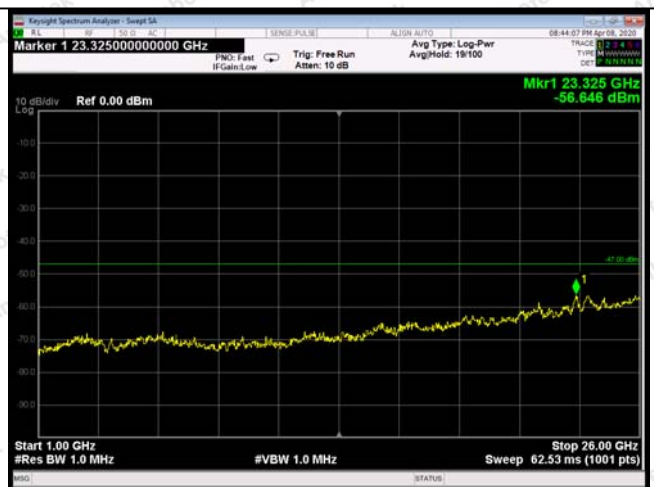
Test Mode: 802.11a---High

Remark: That only normal voltage's plot is reported in the report.

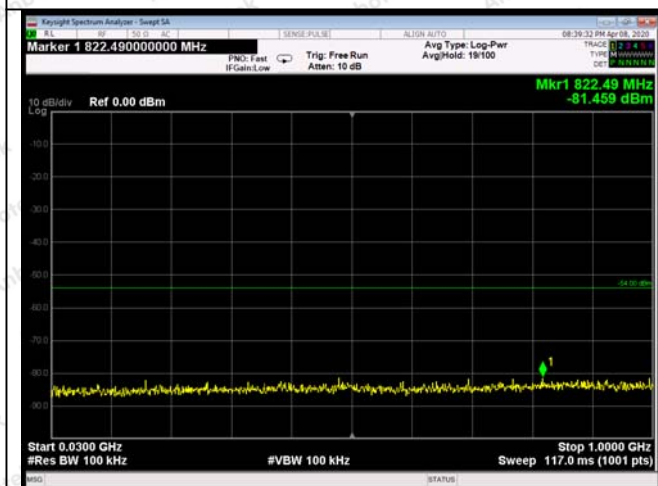
ANT B



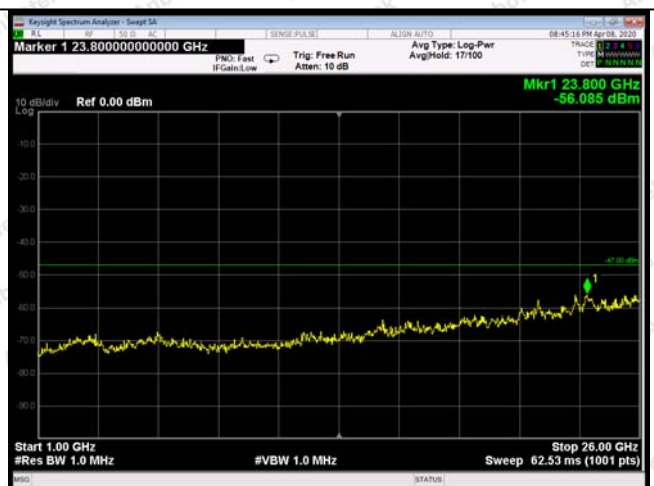
Test Mode: 802.11a---Low



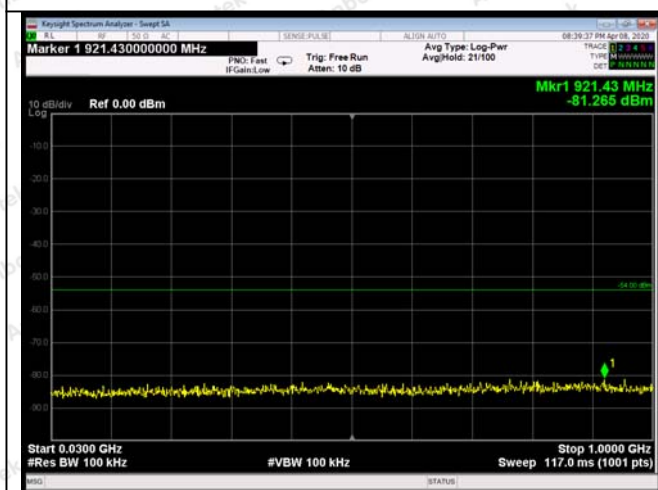
Test Mode: 802.11a---Low



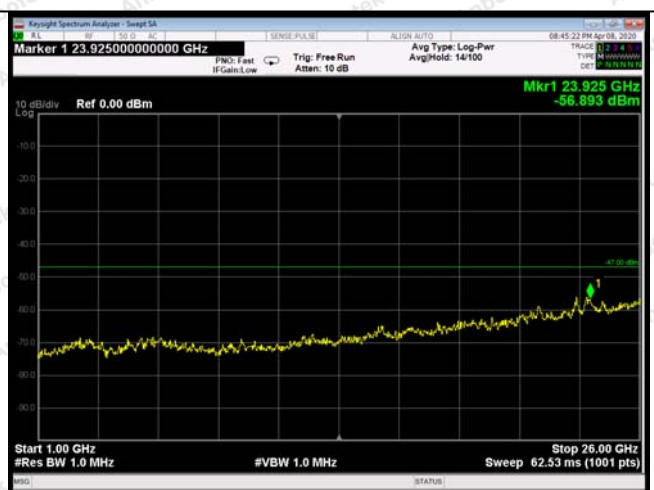
Test Mode: 802.11a---Mid



Test Mode: 802.11a---Mid



Test Mode: 802.11a---High



Test Mode: 802.11a---High

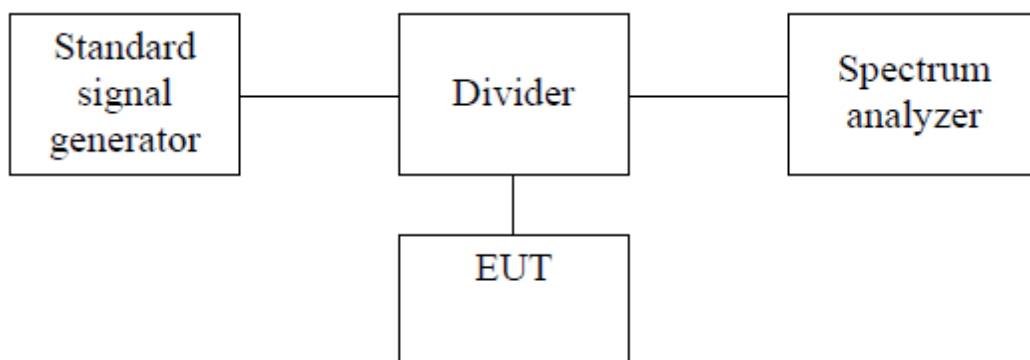
Remark: That only normal voltage's plot is reported in the report.

11. CARRIER SENSE

11.1. Test Equipment

Same as 1.7 Frequency tolerance measurement.

11.2. Test Setup



11.3. Test Configuration

1. Set the standard signal generator as follows.

Carrier frequency	Center frequency of received frequency band
Modulation	Non-modulation
Output level	declared level of applicant at the antenna input part of the EUT.

2. Set the spectrum analyzer as follows.

Frequency:	Center frequency of received frequency band
Span	50MHz
RBW	1MHz
VBW	1MHz
Triggered	Free run
Detector mode	Positive peak

11.4. Test Measurement procedure

1. Confirm that EUT can transmit.
2. Set EUT into Rx Mode.
3. Signal Generator ON
4. Confirm that EUT don't transmit.
5. Start transmission after performing a carrier sense. However, when transmission and reception are controlled from other radio equipment, and when the radioequipment which performed transmission resumes transmission within 4 millisecond after a career sense, it can omit performing a career sense.

11.5. Test Data

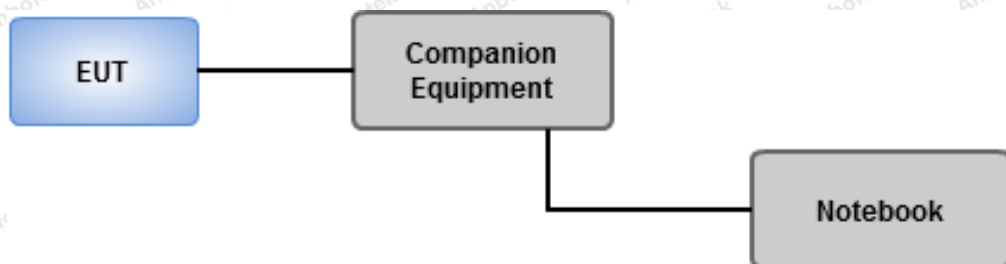
Describe as acceptance (Test pass)

12. INTERFERENCE PREVENTION FUNCTION

12.1. Test Limit

Test Limit	The identification code shall be 48 bits long
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12.2. Test Setup



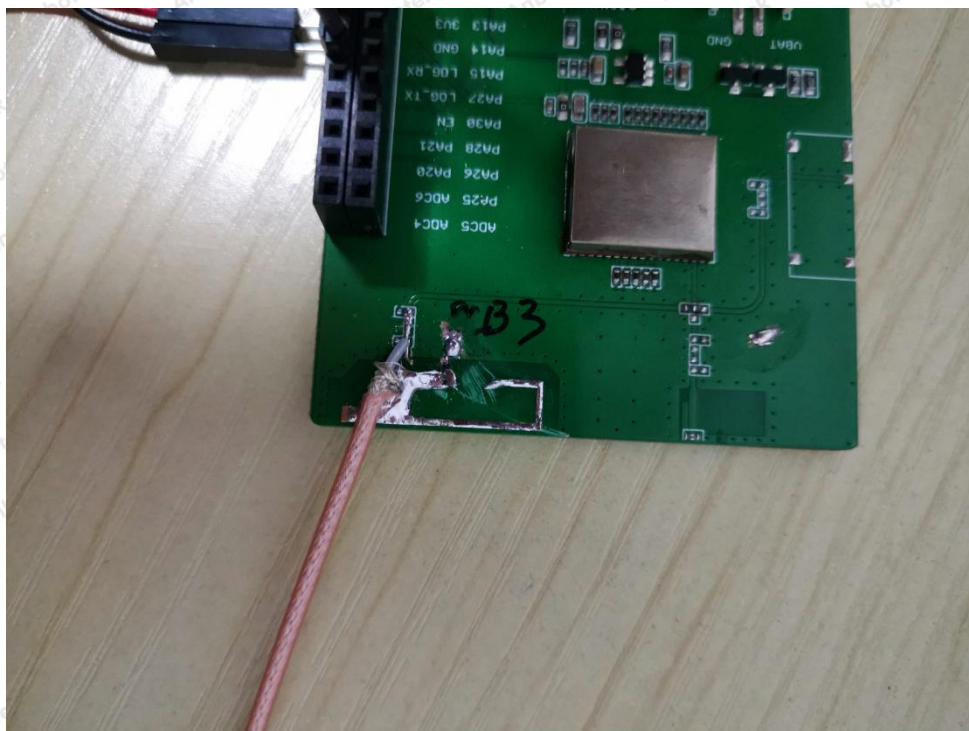
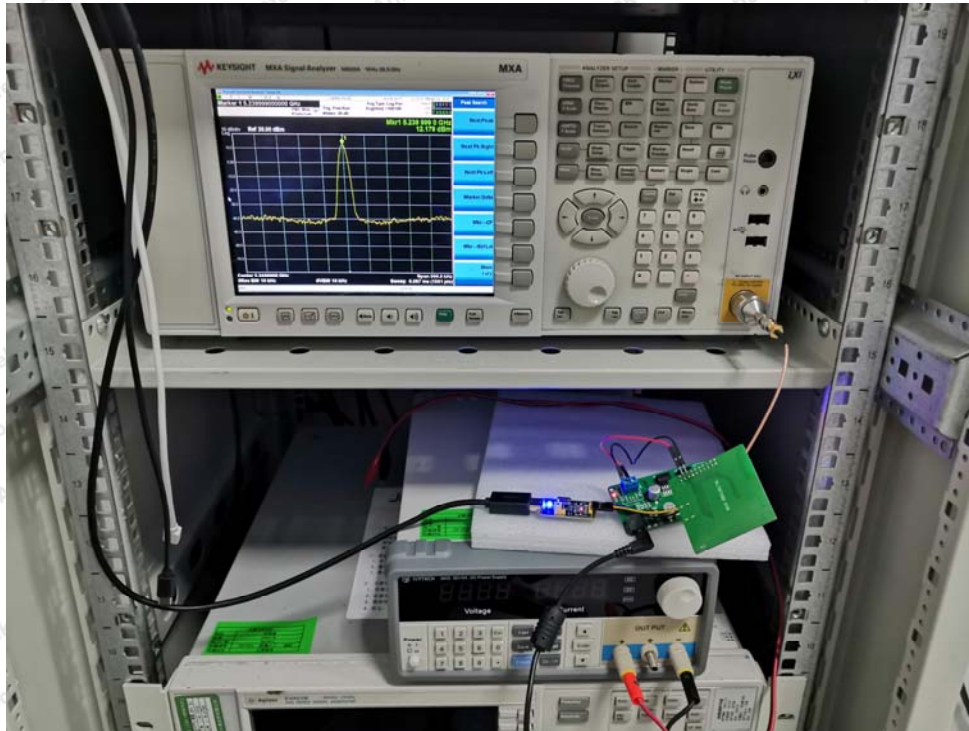
12.3. Test Configuration

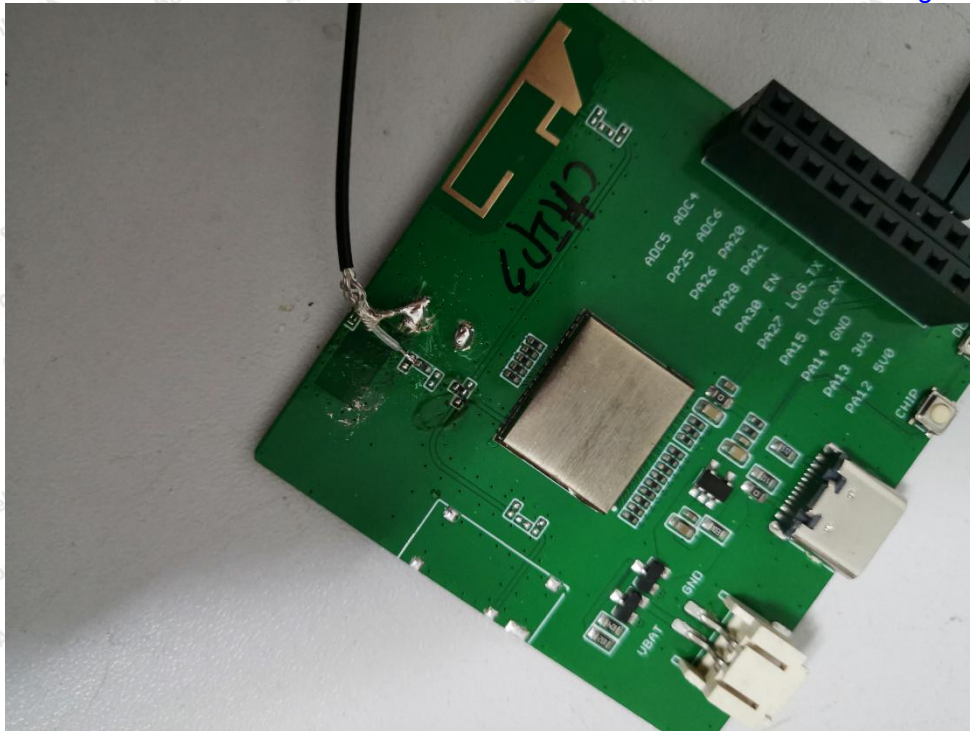
1. Set EUT under operating mode and link up with companion equipment
2. Check communication status between EUT and companion equipment is normal
3. Record the max. reading.
4. Confirm the MAC address of EUT

12.4. Test Data

Test Mode	ID Code	Test Results
5.1G WiFi	42-EB-52-BC-32-A3	Pass

APPENDIX I -- TEST SETUP PHOTOGRAPH





APPENDIX II -- PHOTOGRAPH

Reference to the test report 18220WC00028801.

----- End of Report -----

