FCC RADIO TEST REPORT
FCC ID: 2BDJ6-MS12SF1

Product: WiFi Module
Trade Mark: MINEWSEMI
Model No.: MS12SF1
Family Model: MS12SF18
Report No.: S23102400705003
Issue Date: Jun 04 , 2024

Prepared for

SHENZHEN MINEWSEMI CO., LTD
3rd Floor,I Building, Gangzhilong Science Park, NO.6, Qinglong Road,Longhua District, Shenzhen

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name ..... : SHENZHEN MINEWSEMI CO., LTD

Address ..... : 3rd Floor,I Building, Gangzhilong Science Park, NO.6, Qinglong Road,Longhua District, Shenzhen

Manufacturer's Name..... : SHENZHEN MINEWSEMI CO., LTD

Address ..... : 3rd Floor,I Building, Gangzhilong Science Park, NO.6, Qinglong Road,Longhua District, Shenzhen

Product description

Product name..... : WiFi Module

Trade Mark..... : MINEWSEMI

Model and/or type reference ..... : MS12SF1

Family Model..... : MS12SF18

Test Sample Number S231024007003

Standards..... : FCC Part15.407

Test procedure ..... ANSI C63.10-2013
KDB 789033 D02 General UNII Test Procedures New Rules v02r01

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test .....

Date (s) of performance of tests ..... Oct. 24, 2023 ~ Mar 31 , 2024

Date of Issue..... Jun 04 , 2024

Test Result..... **Pass**

Prepared By :	Reviewed By :	Approved By :
Mary Hu	Aaron Cheng	Alex Li
(Project Engineer)	(Supervisor)	(Manager)

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Revision History

Report No.	Version	Description	Issued Date
S23102400705003	Rev.01	Initial issue of report	Jun 04 , 2024

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.407) , Subpart E			
Standard Section	Test Item	Judgment	Remark
15.207	AC Power Line Conducted Emissions	PASS	
15.209(a), 15.407 (b)(1) 15.407 (b)(4)	Spurious Radiated Emissions	PASS	
15.407 (a)(1) 15.407 (a)(3)	26 dB and 99% Emission Bandwidth	PASS	
15.407(e)	Minimum 6 dB bandwidth	PASS	
15.407 (a)(1) 15.407 (a)(3)	Maximum Conducted Output Power	PASS	
15.407(b)(1) 15.407(b)(4)	Band Edge	PASS	
15.407 (a)(1) 15.407 (a)(3)	Power Spectral Density	PASS	
15.407(b)	Spurious Emissions at Antenna Terminals	PASS	
15.203	Antenna Requirement	PASS	
15.407(c)	Automatically discontinue transmission	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

(2) This device operates with a duty cycle greater than 99%

(3) The product is a client device, and the data transmission is limited by the AP.
When the information to be sent is missing or the operation fails,
the device will automatically stop sending and directly connect to the AP correctly again.

1.1 FACILITIES AND ACCREDITATIONS

FACILITIES

All measurement facilities used to collect the measurement data are located at
1/F, Building E, Fenda Science Park Sanwei, Xixiang, Bao'an District
Shenzhen, Guangdong, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

CNAS-Lab.	:	The Certificate Registration Number is L5516.
IC-Registration		The Certificate Registration Number is 9270A. CAB identifier:CN0074
FCC- Accredited		Test Firm Registration Number: 463705. Designation Number: CN1184
A2LA-Lab.		The Certificate Registration Number is 4298.01
Name of Firm	:	Shenzhen NTEK Testing Technology Co., Ltd.
Site Location	:	1/F, Building E, Fenda Science Park Sanwei, Xixiang, Bao'an District Shenzhen, Guangdong, China

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	±2.80dB
2	RF power, conducted	±0.16dB
3	Spurious emissions, conducted	±0.21dB
4	Occupied bandwidth	±3.7dB
5	All emissions, radiated(9KHz~30MHz)	±6dB
6	All emissions, radiated(30MHz~1GHz)	±2.64dB
7	All emissions, radiated(1GHz~6GHz)	±2.40dB
8	All emissions, radiated(> 6GHz)	±2.52dB
9	Temperature	±0.5°C
10	Humidity	±2%
11	Radio Frequency	±0.2ppm

1. GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>WiFi Module</td></tr>
<tr><td>Trade Mark</td><td>MINEWSEMI</td></tr>
<tr><td>Model Name</td><td>MS12SF1</td></tr>
<tr><td>Family Model</td><td>MS12SF18</td></tr>
<tr><td>Model Difference</td><td>All models are the same circuit and RF module, except for model names.</td></tr>
<tr><td>FCC ID</td><td>2BDJ6-MS12SF1</td></tr>
<tr><td>Product Description</td><td>
<table>
<tr><td>Mode Supported</td><td>☒802.11a
☒802.11n(HT20)
☒802.11ac(HT20)
☒802.11ax(VHT20)</td></tr>
<tr><td>Data Rate</td><td>802.11a: 6,9,12,18,24,36,48,54Mbps;
802.11n(HT20):MCS0-MCS15;
802.11ac(VHT20): NSS1, MCS0-MCS8
802.11ax (20MHz): MCS0-11, up to 286.8Mbps</td></tr>
<tr><td>Modulation</td><td>OFDM with BPSK/QPSK/16QAM/64QAM</td></tr>
<tr><td>Operating Frequency Range</td><td>☒ U-NII-1: 5150 MHz ~5250MHz
☒ U-NII-3: 5725 MHz ~5850 MHz</td></tr>
<tr><td>Antenna Type</td><td>External rod antenna</td></tr>
<tr><td>Antenna Gain</td><td>WIFI 5.2G:5.78 dBi, WIFI 5.8G:2.24 dBi</td></tr>
</table>
Based on the application, features, or specification exhibited in User's Manual, More details of EUT technical specification, please refer to the User's Manual.
</td></tr>
<tr><td>Adapter</td><td>N/A</td></tr>
<tr><td>Battery</td><td>N/A</td></tr>
<tr><td>Power supply</td><td>DC 3V from DC Supply</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
<tr><td>Hardware version</td><td>N/A</td></tr>
<tr><td>Software version</td><td>N/A</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Frequency and Channel list:

Band	20MHz					
	Channel	Frequency				
U-NII-1	36	5180 MHz				
	40	5200 MHz				
	44	5220 MHz				
	48	5240 MHz				
U-NII-3	149	5745 MHz				
	153	5765 MHz				
	157	5785 MHz				
	161	5805 MHz				
	165	5825 MHz				

1.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Normal Link Mode
Mode 2	802.11a / n 20 /ax20 CH36/ CH40/ CH 48 802.11a / n 20 /ax20 CH149/ CH157/ CH 165

For Radiated Emission	
Final Test Mode	Description
Mode 1	Normal Link Mode
Mode 2	802.11a / n 20 /ax20 CH36/ CH40/ CH 48 802.11a / n 20 /ax20 CH149/ CH157/ CH 165

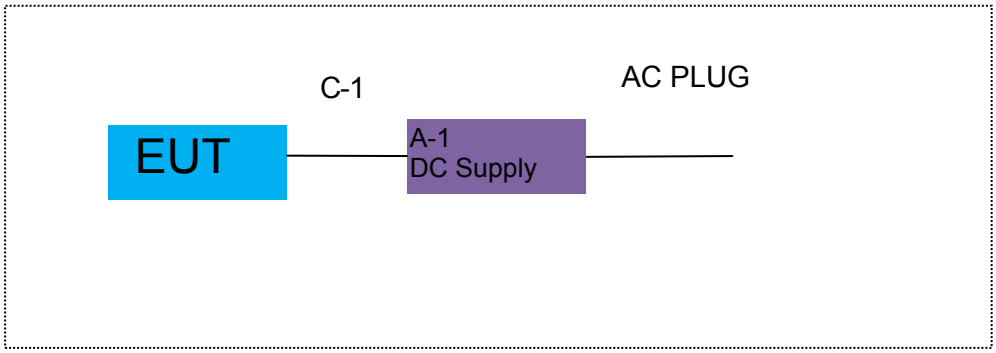
Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

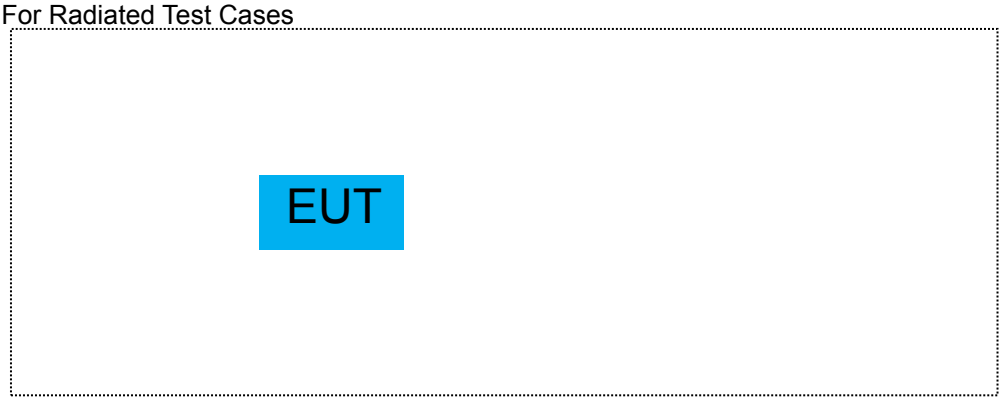
(2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

1.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

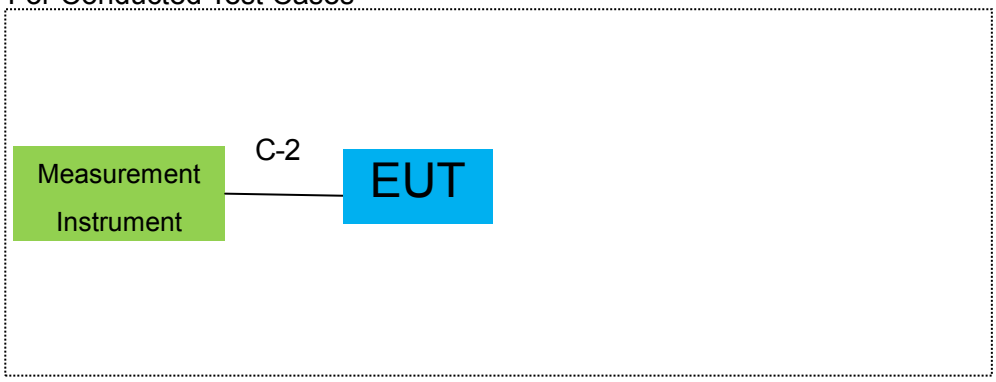
For AC Conducted Emission Mode



For Radiated Test Cases



For Conducted Test Cases



Note: 1. The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

1.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Model/Type No.	Series No.	Note
AE-1	DC Supply	N/A	N/A	Peripherals

Item	Cable Type	Shielded Type	Ferrite Core	Length
C-1	Power Cable	NO	NO	1.0m
C-2	RF Cable	YES	NO	0.1m

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

(3) During the battery power test, the battery is fully charged.

1.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation& Conducted Test equipment

	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4440A	MY41000130	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2023.05.29 2024.03.12	2024.05.28 2025.03.11	1 year
3	Spectrum Analyzer	R&S	FSV40	101417	2023.05.29 2024.03.12	2024.05.28 2025.03.11	1 year
4	Test Receiver	R&S	ESPI7	101318	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
5	Bilog Antenna	TESEQ	CBL6111D	31216	2023.03.16 2024.03.11	2024.03.15 2025.03.10	1 year
6	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2023.05.06	2026.05.05	3 year
7	Horn Antenna	SCHWARZBECK	BBHA 9120 D	2816	2023.01.12	2026.01.11	3 year
8	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	803	2022.11.07	2025.11.06	3 year
9	Amplifier	EMC	EMC051835SE	980246	2023.05.29 2024.03.12	2024.05.28 2025.03.11	1 year
10	Active Loop Antenna	SCHWARZBECK	FMZB 1519 B	055	2023.11.03	2026.11.02	3 year
11	Power Meter	DARE	RPR3006W	15I00041SNO84	2023.05.29 2024.03.12	2024.05.28 2025.03.11	1 year
12	Test Cable (9KHz-30MHz)	N/A	R-01	N/A	2022.06.17	2025.06.16	3 year
13	Test Cable (30MHz-1GHz)	N/A	R-02	N/A	2022.06.17	2025.06.16	3 year
14	High Test Cable(1G-40GHz)	N/A	R-03	N/A	2022.06.17	2025.06.16	3 year
15	Filter	TRILTHIC	2400MHz	29	2023.03.26	2026.03.25	3 year
16	temporary antenna connector (Note)	NTS	R001	N/A	N/A	N/A	N/A

Note:
We will use the temporary antenna connector (soldered on the PCB board) When conducted test
And this temporary antenna connector is listed within the instrument list

AC Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
2	LISN	R&S	ENV216	101313	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
3	LISN	SCHWARZBECK	NNLK 8129	8129245	2023.03.27 2024.03.12	2024.03.26 2025.03.11	1 year
4	50Ω Coaxial Switch	ANRITSU CORP	MP59B	6200983704	2023.05.06	2026.05.05	3 year
5	Test Cable (9KHz-30MHz)	N/A	C01	N/A	2023.05.06	2026.05.05	3 year
6	Test Cable (9KHz-30MHz)	N/A	C02	N/A	2023.05.06	2026.05.05	3 year
7	Test Cable (9KHz-30MHz)	N/A	C03	N/A	2023.05.06	2026.05.05	3 year

Note: Each piece of equipment is scheduled for calibration once a year except the Test Cable& Aux Equipment which is scheduled for calibration every 3 years.

2. EMC EMISSION TEST

2.1 CONDUCTED EMISSION MEASUREMENT

2.1.1 APPLICABLE STANDARD

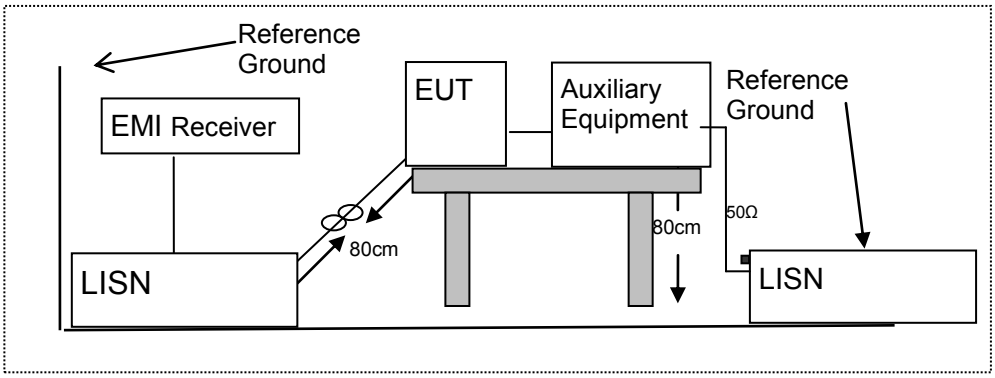
According to FCC Part 15.207(a)

2.1.2 CONFORMANCE LIMIT

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56*	56-46*
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. *Decreases with the logarithm of the frequency
2. The lower limit shall apply at the transition frequencies
3. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

2.1.3 TEST CONFIGURATION



2.1.4 TEST PROCEDURE

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.

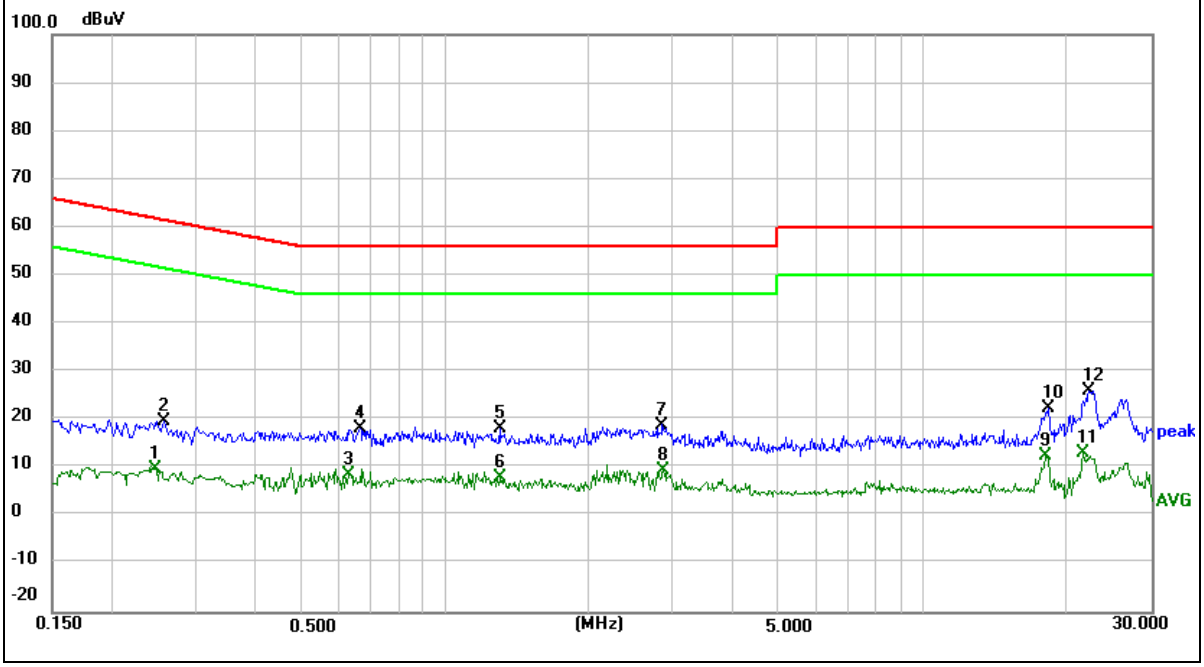
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room.
2. The EUT was placed on a table which is 0.8m above ground plane.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40cm long.
5. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
6. LISN at least 80 cm from nearest part of EUT chassis.
7. The frequency range from 150KHz to 30MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth(IF bandwidth=9KHz) with Maximum Hold Mode
9. For the actual test configuration, please refer to the related Item –EUT Test Photos.

2.1.5 TEST PROCEDURE

EUT :	WiFi Module	Model Name. :	MS12SF1
Temperature :	26 ℃	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 3V from DC Supply AC 120V/60Hz	Test Mode :	Mode 1(5.2G WIFI)

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.2467	-0.42	10.14	9.72	51.87	-42.15	AVG
0.2580	9.70	10.16	19.86	61.50	-41.64	peak
0.6300	-2.32	10.91	8.59	46.00	-37.41	AVG
0.6620	7.26	10.97	18.23	56.00	-37.77	peak
1.3020	6.01	12.26	18.27	56.00	-37.73	peak
1.3020	-4.24	12.26	8.02	46.00	-37.98	AVG
2.8540	9.33	9.67	19.00	56.00	-37.00	peak
2.8580	-0.06	9.67	9.61	46.00	-36.39	AVG
17.9460	2.77	9.71	12.48	50.00	-37.52	AVG
18.3020	12.68	9.71	22.39	60.00	-37.61	peak
21.6660	3.40	9.69	13.09	50.00	-36.91	AVG
22.2220	16.50	9.69	26.19	60.00	-33.81	peak

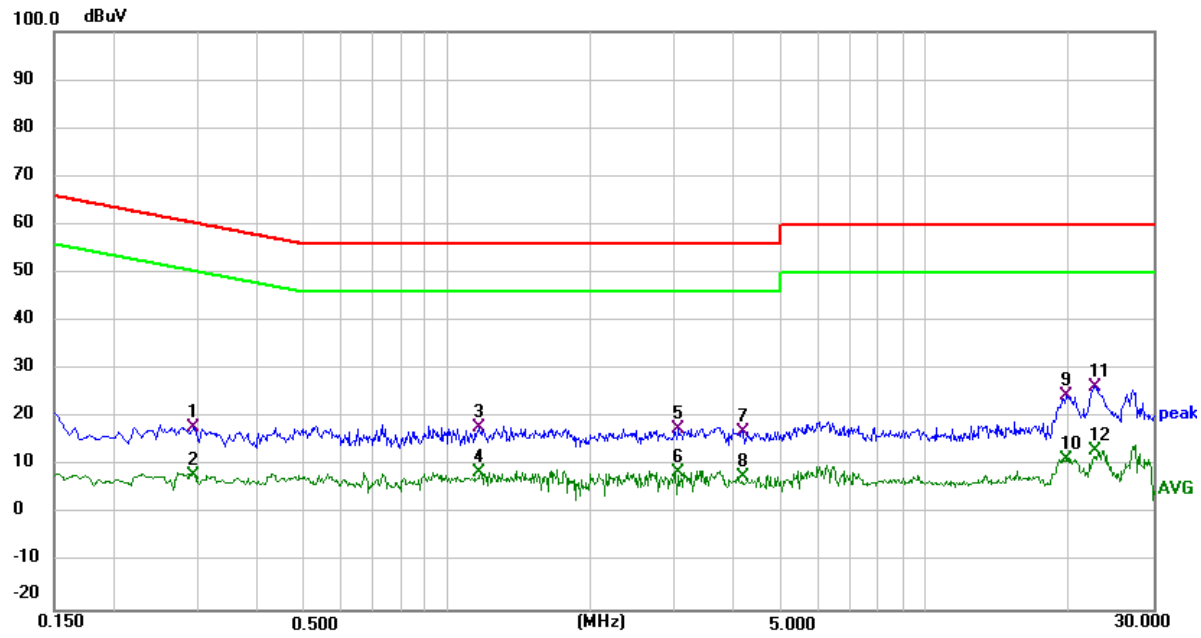
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	WiFi Module	Model Name. ：	MS12SF1
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 3V from DC Supply AC 120V/60Hz	Test Mode：	Mode 1(5.2G WIFI)

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.2940	7.87	10.22	18.09	60.41	-42.32	QP
0.2940	-2.25	10.22	7.97	50.41	-42.44	AVG
1.1700	6.07	12.00	18.07	56.00	-37.93	QP
1.1700	-3.24	12.00	8.76	46.00	-37.24	AVG
3.0540	7.93	9.67	17.60	56.00	-38.40	QP
3.0540	-1.13	9.67	8.54	46.00	-37.46	AVG
4.1420	7.47	9.67	17.14	56.00	-38.86	QP
4.1420	-1.98	9.67	7.69	46.00	-38.31	AVG
19.7979	14.89	9.72	24.61	60.00	-35.39	QP
19.7979	1.77	9.72	11.49	50.00	-38.51	AVG
22.6740	16.82	9.68	26.50	60.00	-33.50	QP
22.6740	3.61	9.68	13.29	50.00	-36.71	AVG

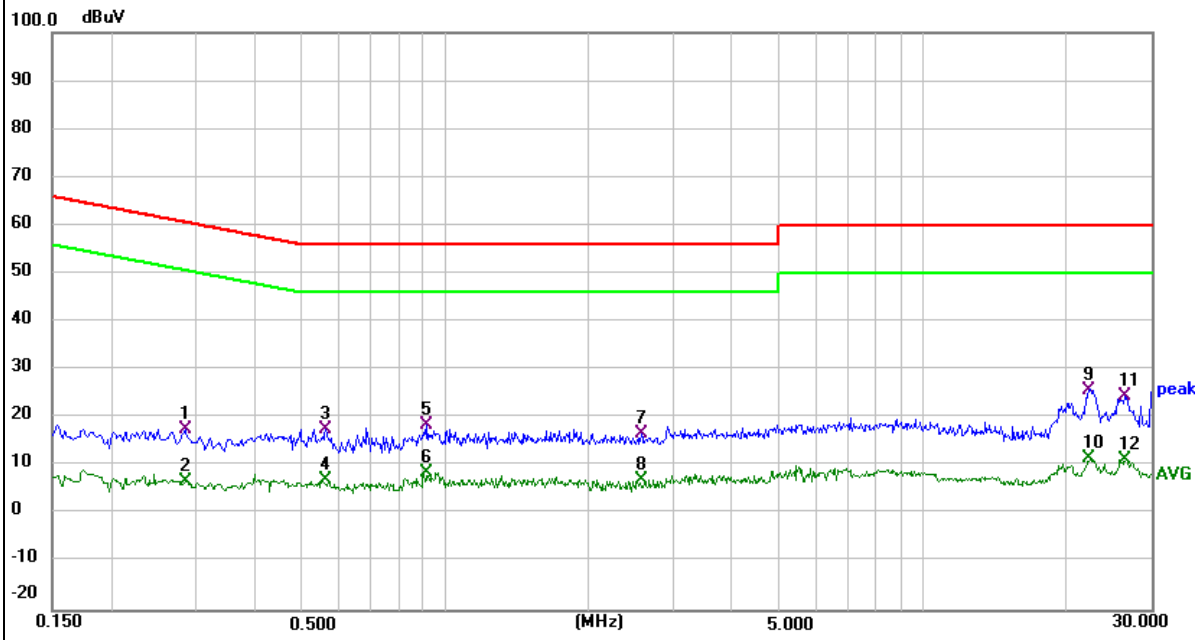
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT :	WiFi Module	Model Name. :	MS12SF1
Temperature :	26 ℃	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 3V from DC Supply AC 120V/60Hz	Test Mode :	Mode 1(5.8G WIFI)

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.2860	7.33	10.22	17.55	60.64	-43.09	QP
0.2862	-3.27	10.22	6.95	50.63	-43.68	AVG
0.5620	6.89	10.77	17.66	56.00	-38.34	QP
0.5620	-3.58	10.77	7.19	46.00	-38.81	AVG
0.9180	6.93	11.50	18.43	56.00	-37.57	QP
0.9180	-2.97	11.50	8.53	46.00	-37.47	AVG
2.5780	7.17	9.67	16.84	56.00	-39.16	QP
2.5780	-2.64	9.67	7.03	46.00	-38.97	AVG
22.3779	16.22	9.68	25.90	60.00	-34.10	QP
22.3779	1.96	9.68	11.64	50.00	-38.36	AVG
26.4500	14.85	9.61	24.46	60.00	-35.54	QP
26.4500	1.87	9.61	11.48	50.00	-38.52	AVG

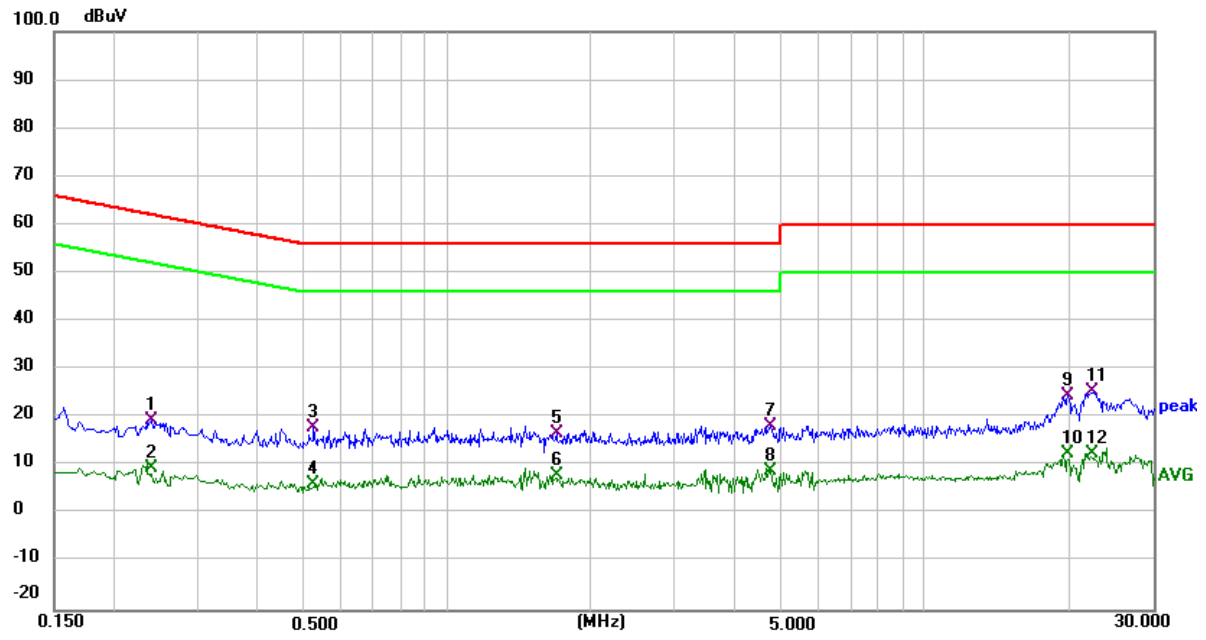
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	WiFi Module	Model Name. ：	MS12SF1
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 3V from DC Supply AC 120V/60Hz	Test Mode：	Mode 1(5.8G WIFI)

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.2403	9.32	10.12	19.44	62.09	-42.65	QP
0.2403	-0.59	10.12	9.53	52.09	-42.56	AVG
0.5260	7.24	10.71	17.95	56.00	-38.05	QP
0.5260	-4.60	10.71	6.11	46.00	-39.89	AVG
1.6980	3.74	13.06	16.80	56.00	-39.20	QP
1.6980	-5.05	13.06	8.01	46.00	-37.99	AVG
4.7540	8.50	9.67	18.17	56.00	-37.83	QP
4.7540	-0.62	9.67	9.05	46.00	-36.95	AVG
19.8940	14.74	9.72	24.46	60.00	-35.54	QP
19.8940	2.79	9.72	12.51	50.00	-37.49	AVG
22.4619	15.92	9.68	25.60	60.00	-34.40	QP
22.4619	2.94	9.68	12.62	50.00	-37.38	AVG

Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



2.2 RADIATED EMISSION MEASUREMENT

2.2.1 APPLICABLE STANDARD

According to FCC Part 15.407(d) and 15.209

2.2.2 CONFORMANCE LIMIT

According to FCC Part 15.407(b)(7): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
According to FCC Part15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009~0.490	2400/F(KHz)	20 log (uV/m)	300
0.490~1.705	24000/F(KHz)	20 log (uV/m)	30
1.705~30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Limits of Radiated Emission Measurement(Above 1000MHz)

Frequency(MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

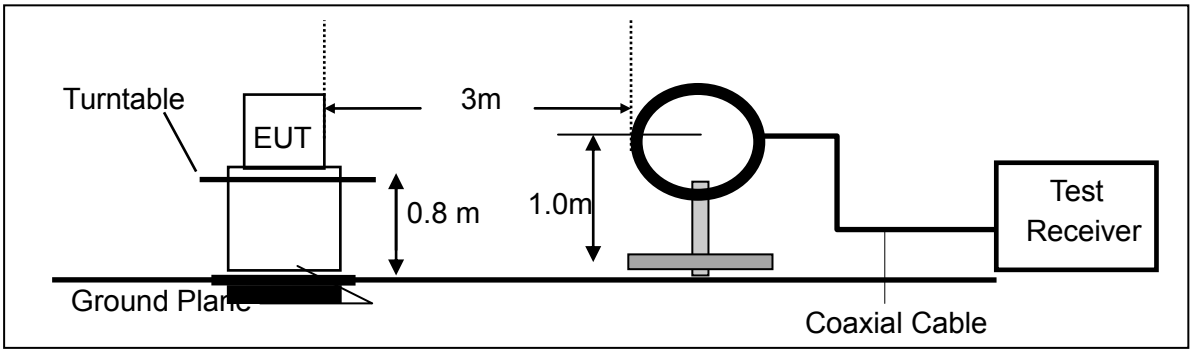
Remark :1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. For Frequency 9kHz~30MHz:
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.
For Frequency above 30MHz:
Distance extrapolation factor =20log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

2.2.3 MEASURING INSTRUMENTS

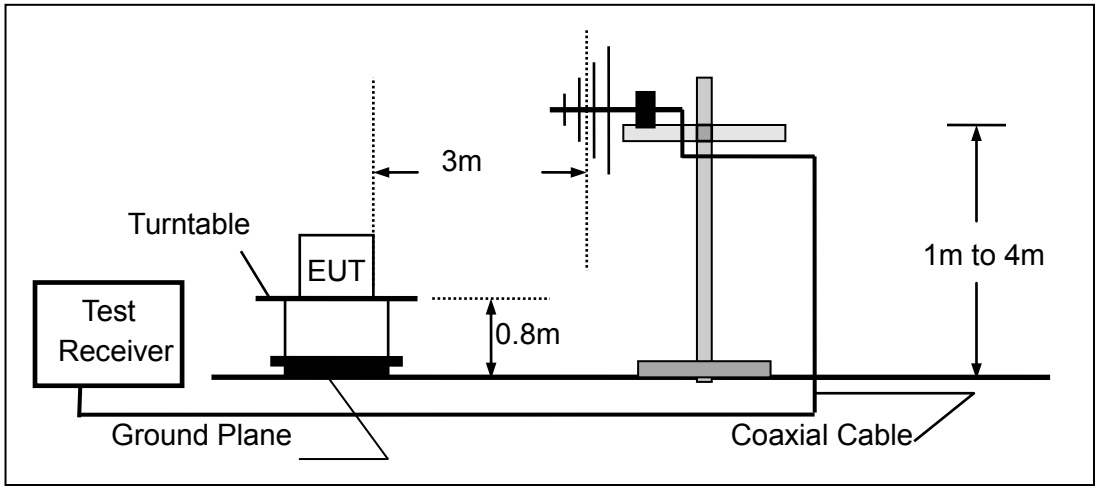
The Measuring equipment is listed in the section 6.3 of this test report.

2.2.4 TEST CONFIGURATION

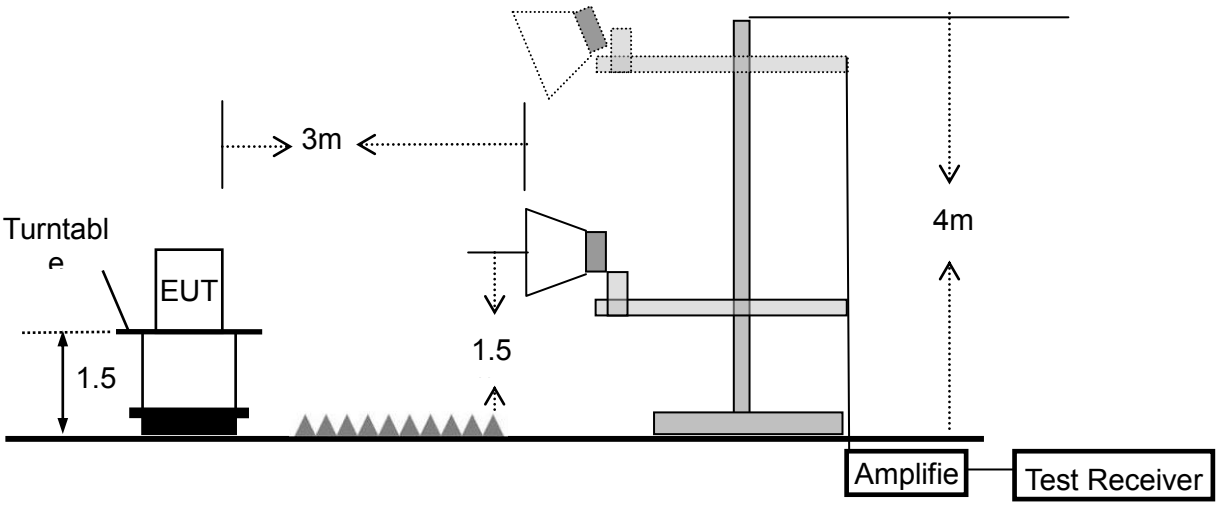
(a) For radiated emissions below 30MHz



(b) For radiated emissions from 30MHz to 1000MHz



(c) For radiated emissions above 1000MHz



2.2.5 TEST PROCEDURE

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.
This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205.
It must be performed with the highest gain of each type of antenna proposed for use with the EUT.
Use the following spectrum analyzer settings:

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Note: for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10*lg(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

2.2.6 TEST RESULTS (9KHZ – 30 MHZ)

EUT :	WiFi Module	Model Name :	MS12SF1
Temperature :	26 ℃	Relative Humidity :	54%
Pressure:	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	N/A
--	--	--	--	N/A

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

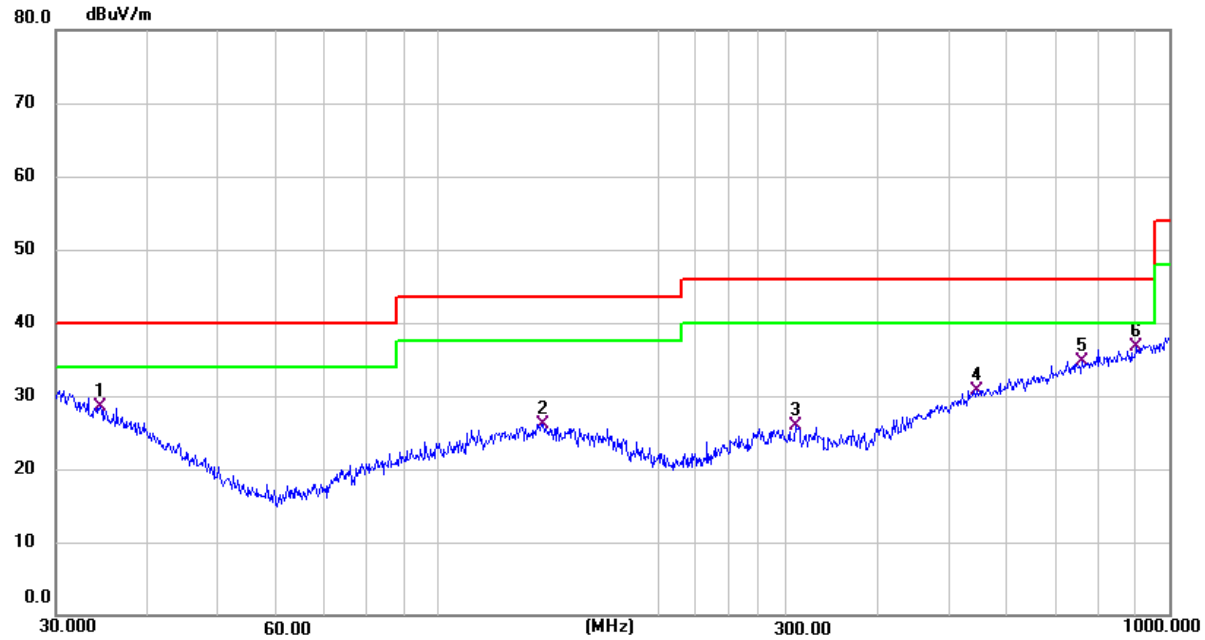
2.2.7 TEST RESULTS (30MHZ – 1GHZ)

EUT :	WiFi Module	Model Name :	MS12SF1
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX(5.2G WIFI)- 802.11a		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
V	34.5172	4.59	23.91	28.50	40.00	-11.50	QP
V	139.3610	7.54	18.58	26.12	43.50	-17.38	QP
V	308.9125	5.77	20.18	25.95	46.00	-20.05	QP
V	545.1825	5.23	25.41	30.64	46.00	-15.36	QP
V	760.7033	5.78	28.88	34.66	46.00	-11.34	QP
V	903.3093	6.04	30.64	36.68	46.00	-9.32	QP

Remark:

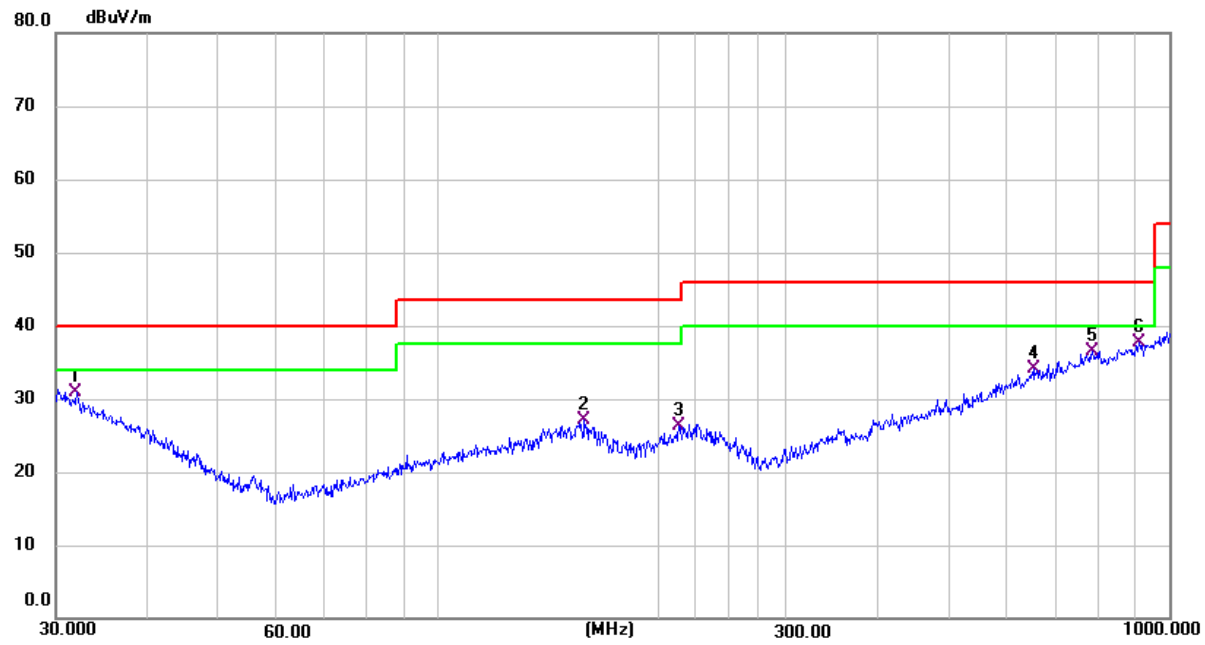
Emission Level= Reading Level+ Factor, Margin= Emission Level - Limit



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
H	32.0667	5.69	25.27	30.96	40.00	-9.04	QP
H	158.6673	9.16	17.99	27.15	43.50	-16.35	QP
H	213.7632	9.75	16.59	26.34	43.50	-17.16	QP
H	654.2318	6.92	27.13	34.05	46.00	-11.95	QP
H	785.0932	7.25	29.24	36.49	46.00	-9.51	QP
H	909.6666	7.04	30.72	37.76	46.00	-8.24	QP

Remark:

Emission Level= ReadingLevel+ Factor, Margin= Emission Level - Limit



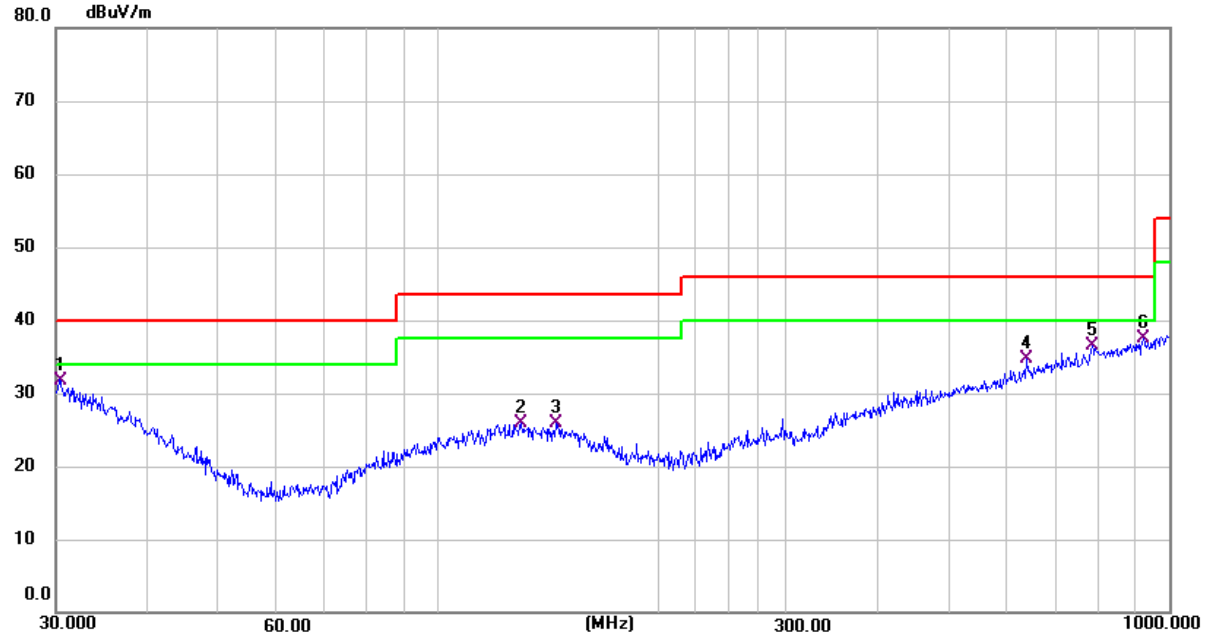
Note: All modes have been tested, just the worst mode has been recorded in the report.

EUT :	WiFi Module	Model Name :	MS12SF1
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX(5.8G WIFI)- 802.11ac20		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
V	30.4237	5.52	26.18	31.70	40.00	-8.30	QP
V	129.9225	7.11	18.75	25.86	43.50	-17.64	QP
V	144.8417	7.34	18.48	25.82	43.50	-17.68	QP
V	638.3686	7.70	26.91	34.61	46.00	-11.39	QP
V	785.0932	7.20	29.24	36.44	46.00	-9.56	QP
V	922.5157	6.62	30.85	37.47	46.00	-8.53	QP

Remark:

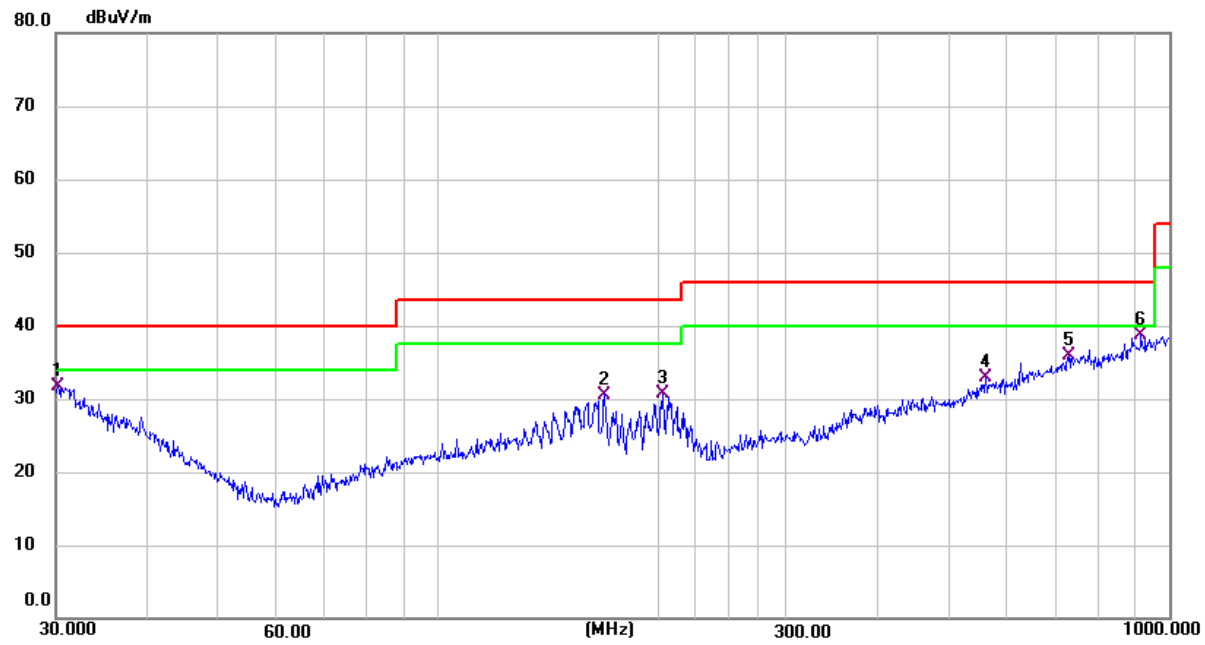
Emission Level= Reading Level+ Factor, Margin= Emission Level - Limit



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
H	30.2110	5.48	26.30	31.78	40.00	-8.22	QP
H	169.0053	13.21	17.39	30.60	43.50	-12.90	QP
H	202.8103	14.49	16.28	30.77	43.50	-12.73	QP
H	560.6928	7.12	25.74	32.86	46.00	-13.14	QP
H	729.3582	7.61	28.33	35.94	46.00	-10.06	QP
H	916.0683	7.90	30.79	38.69	46.00	-7.31	QP

Remark:

Emission Level= ReadingLevel+ Factor, Margin= Emission Level - Limit



Note: All modes have been tested, just the worst mode has been recorded in the report.

2.2.8 TEST RESULTS (1GHz-18GHz)

EUT :	WiFi Module	Model Name. :	MS12SF1
Temperature :	20 ℃	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX(5.2G) - 802.11a		

Polar	Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(H/V)	(MHz)	(dBuV)	(dB)	dB/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel (5180 MHz)-Above 1G									
Vertical	3015	62.10	5.94	35.40	44.00	59.44	68.2	-8.76	Pk
Vertical	10360	59.49	8.46	39.75	44.50	63.20	68.2	-5.00	Pk
Vertical	15540	61.46	10.12	38.80	44.10	66.28	74	-7.72	Pk
Vertical	15540	41.72	10.12	38.80	42.70	47.94	54	-6.06	AV
Horizontal	2981	62.44	5.94	35.18	44.00	59.56	68.2	-8.64	Pk
Horizontal	10360	60.20	8.46	38.71	44.50	62.87	68.2	-5.33	Pk
Horizontal	15540	59.73	10.12	38.38	44.10	64.13	74	-9.87	Pk
Horizontal	15540	38.71	10.12	38.38	44.10	43.11	54	-10.89	AV
middle Channel (5200 MHz)-Above 1G									
Vertical	3561	63.96	6.48	36.35	44.05	62.74	68.2	-5.46	Pk
Vertical	10400	61.31	8.47	37.88	44.51	63.15	68.2	-5.05	Pk
Vertical	15600	59.73	10.12	38.8	44.1	64.55	74	-9.45	Pk
Vertical	15600	41.99	10.12	38.8	42.7	48.21	54	-5.79	AV
Horizontal	3363	62.57	6.48	36.37	44.05	61.37	68.2	-6.83	Pk
Horizontal	10400	59.67	8.47	38.64	44.5	62.28	68.2	-5.92	Pk
Horizontal	15600	59.37	10.12	38.38	44.1	63.77	74	-10.23	Pk
Horizontal	15600	43.25	10.12	38.38	44.1	47.65	54	-6.35	AV
High Channel (5240 MHz)-Above 1G									
Vertical	3926	62.36	7.1	37.24	43.5	63.20	74	-10.80	Pk
Vertical	3926	44.10	7.1	37.24	43.5	44.94	54	-9.06	AV
Vertical	10480	60.96	8.46	37.68	44.5	62.60	68.2	-5.60	Pk
Vertical	15720	57.48	10.12	38.8	44.1	62.30	74	-11.70	Pk
Vertical	15720	34.85	10.12	38.8	42.7	41.07	54	-12.93	AV
Horizontal	3885	65.32	7.1	37.24	43.5	66.16	74	-7.84	Pk
Horizontal	3885	41.09	7.1	37.24	43.5	41.93	54	-12.07	AV
Horizontal	10480	59.09	8.46	38.57	44.5	61.62	68.2	-6.58	Pk
Horizontal	15720	59.97	10.12	38.38	44.1	64.37	74	-9.63	Pk
Horizontal	15720	40.34	10.12	38.38	44.1	44.74	54	-9.26	AV

Note:"802.11a (5.2G)" mode is the worst mode. PK value is lower than the Average value limit, So average didn't record.

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

EUT :	WiFi Module	Model Name. :	MS12SF1
Temperature :	20 ℃	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX (5.8G) -- 802.11ac20		

Polar	Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(H/V)	(MHz)	(dBuV)	(dB)	dB/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel (5745 MHz)-Above 1G									
Vertical	2806.9	62.86	5.94	35.40	44.00	60.20	74.00	-13.80	Pk
Vertical	2806.9	43.81	5.94	35.40	44.00	41.15	54.00	-12.85	AV
Vertical	11490.56	60.17	8.46	39.75	44.50	63.88	74.00	-10.12	Pk
Vertical	11490.56	40.50	8.46	39.75	44.50	44.21	54.00	-9.79	AV
Vertical	17235.32	55.50	10.12	38.80	44.10	60.32	68.20	-7.88	Pk
Horizontal	2911.524	60.74	5.94	35.18	44.00	57.86	68.20	-10.34	Pk
Horizontal	11490.56	60.15	8.46	38.71	44.50	62.82	74.00	-11.18	Pk
Horizontal	11490.56	37.69	8.46	38.71	44.50	40.36	54.00	-13.64	AV
Horizontal	17235.56	56.72	10.12	38.38	44.10	61.12	68.20	-7.08	Pk
middle Channel (5785 MHz)-Above 1G									
Vertical	3763.083	59.34	6.48	36.35	44.05	58.12	74.00	-15.88	Pk
Vertical	3763.083	38.64	6.48	36.35	44.05	37.42	54.00	-16.58	AV
Vertical	11570.56	59.75	8.47	37.88	44.51	61.59	74.00	-12.41	Pk
Vertical	11570.56	40.80	8.47	37.88	44.51	42.64	54.00	-11.36	AV
Vertical	17355.56	55.27	10.12	38.8	44.10	60.09	68.20	-8.11	Pk
Horizontal	3561.585	58.68	6.48	36.37	44.05	57.48	68.20	-10.72	Pk
Horizontal	11570.56	56.08	8.47	38.64	44.50	58.69	74.00	-15.31	Pk
Horizontal	11570.56	40.05	8.47	38.64	44.50	42.66	54.00	-11.34	AV
Horizontal	17355.56	60.13	10.12	38.38	44.10	64.53	74.00	-9.47	Pk
Horizontal	17355.35	40.36	10.12	38.38	44.10	44.76	54.00	-9.24	AV
High Channel (5825 MHz)-Above 1G									
Vertical	3907.168	57.48	7.10	37.24	43.50	58.32	74.00	-15.68	Pk
Vertical	3907.168	40.46	7.10	37.24	43.50	41.30	54.00	-12.70	AV
Vertical	11650.54	57.65	8.46	37.68	44.50	59.29	74.00	-14.71	Pk
Vertical	11650.54	39.63	8.46	37.68	44.50	41.27	54.00	-12.73	AV
Vertical	17475.54	56.47	10.12	38.8	44.10	61.29	68.20	-6.91	Pk
Horizontal	3912.779	57.73	7.10	37.24	43.50	58.57	74.00	-15.43	Pk
Horizontal	3912.779	40.38	7.10	37.24	43.50	41.22	54.00	-12.78	AV
Horizontal	11650.54	58.97	8.46	38.57	44.50	61.50	74.00	-12.50	Pk
Horizontal	11650.54	39.66	8.46	38.57	44.50	42.19	54.00	-11.81	AV
Horizontal	17475.54	55.96	10.12	38.38	44.10	60.36	68.20	-7.84	Pk

Note:"802.11ac20(5.8G)" mode is the worst mode. PK value is lower than the Average value limit, So average didn't record.
The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

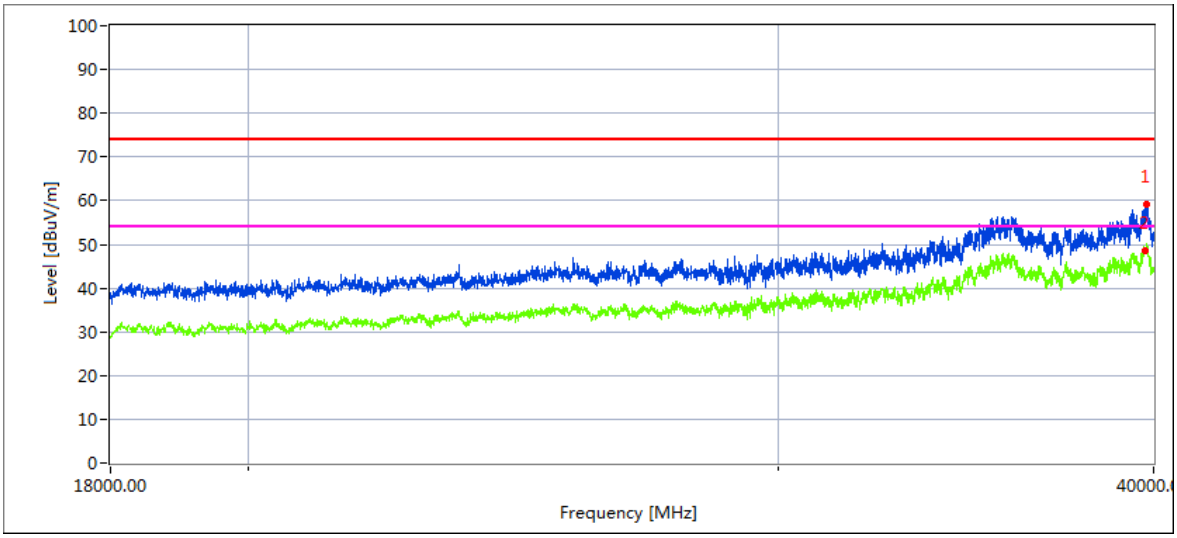
2.2.10 TEST RESULTS (18GHz-40GHz)

EUT :	WiFi Module	Model Name. :	MS12SF1
Temperature :	20 ℃	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX (5.2G)-802.11a ; TX(5.8G)-802.11ac20		

All the modulation modes have been tested, and the worst result was report as below:

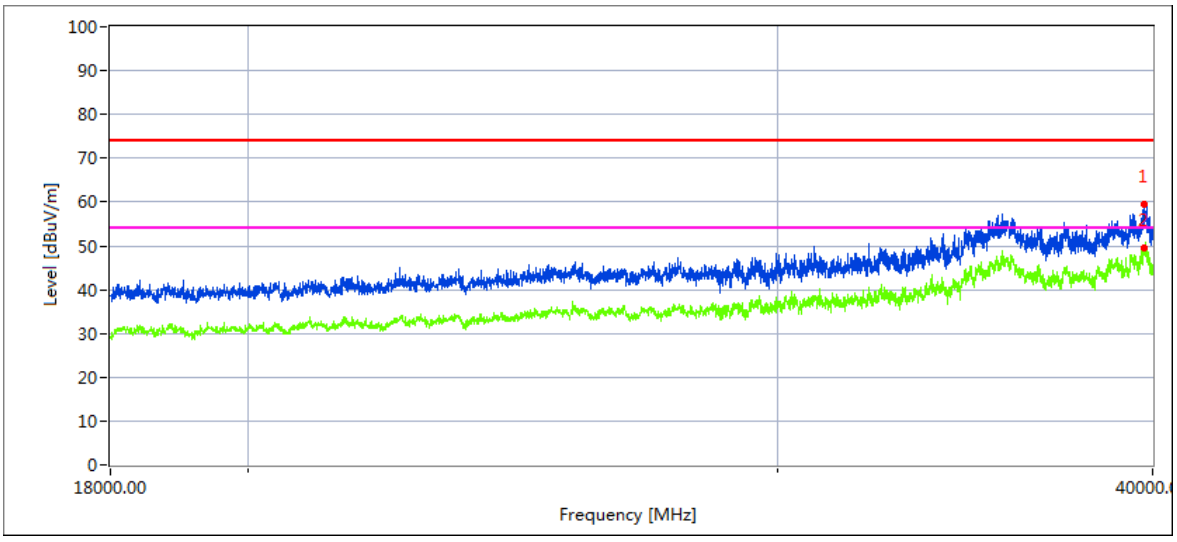
Low Channel (5180 MHz)-Above 1G

Horizontal



Frequency MHz	Meter Reading dBuV	Cable loss dB	Antenna Factor dB/m	Preamp Factor dB	Emission Level dBuV/m	Limits dBuV/m	Margin dB	Detector Type
39800.308	36.32	20.09	44.07	43.48	57	68.2	11.2	Peak

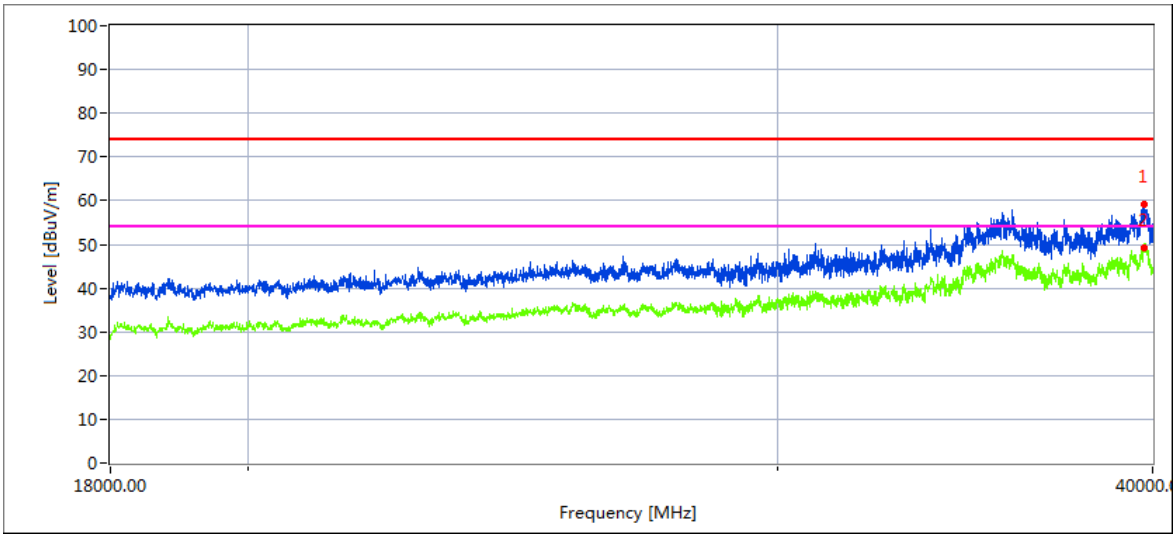
Vertical



Frequency MHz	Meter Reading dBuV	Cable loss dB	Antenna Factor dB/m	Preamp Factor dB	Emission Level dBuV/m	Limits dBuV/m	Margin dB	Detector Type
39732.492	39.57	19.11	42.73	44.61	56.8	68.2	11.4	Peak

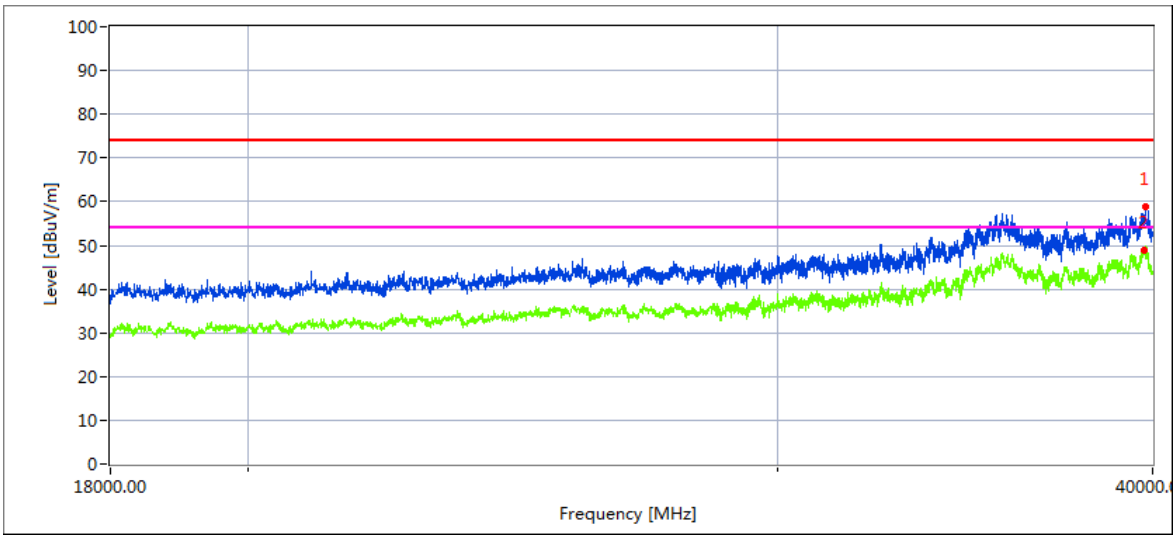
High Channel (5240 MHz)-Above 1G

Horizontal



Frequency MHz	Meter Reading dBuV	Cable loss dB	Antenna Factor dB/m	Preamp Factor dB	Emission Level dBuV/m	Limits dBuV/m	Margin dB	Detector Type
39800.308	35.62	20.09	44.07	43.48	56.3	68.2	11.9	Peak

Vertical

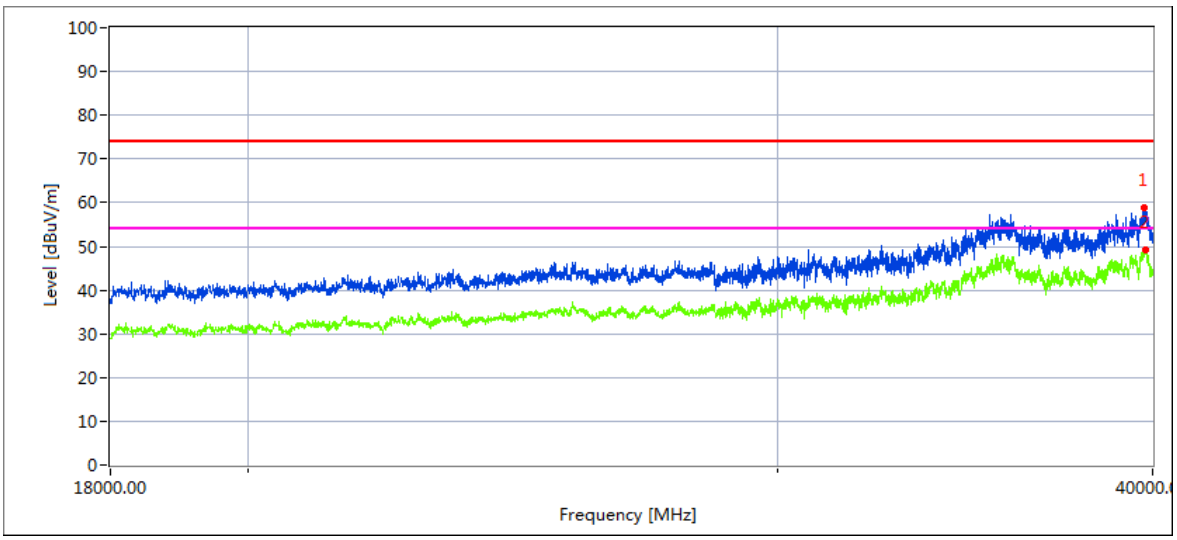


Frequency MHz	Meter Reading dBuV	Cable loss dB	Antenna Factor dB/m	Preamp Factor dB	Emission Level dBuV/m	Limits dBuV/m	Margin dB	Detector Type
39780.472	35.82	20.09	44.07	43.48	56.5	68.2	11.7	Peak

Note:802.11a mode is the worst mode.

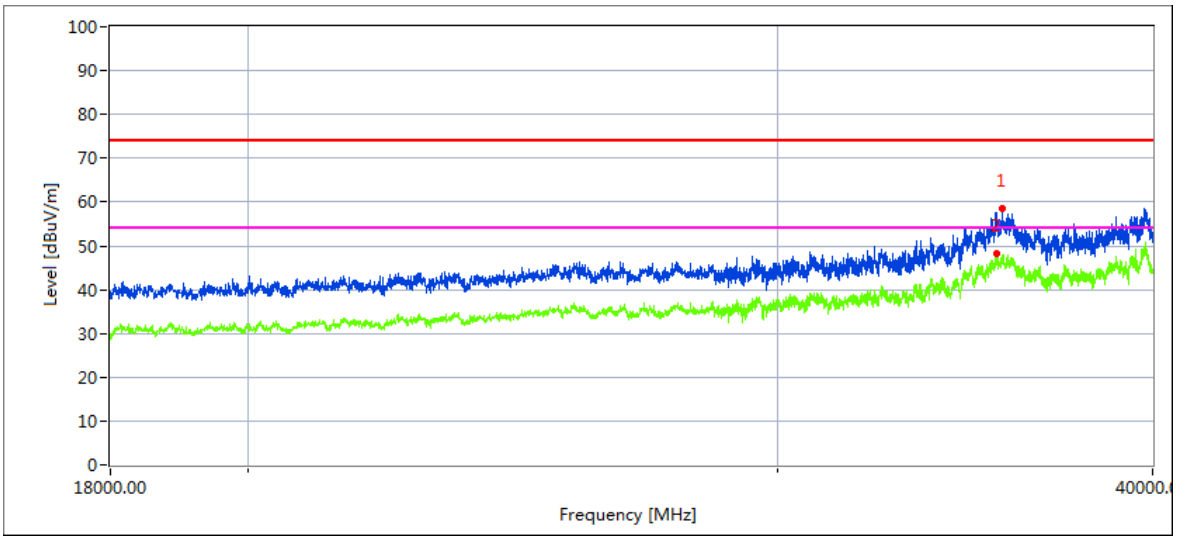
Low Channel (5745 MHz)-Above 1G

Horizontal



Frequency MHz	Meter Reading dBuV	Cable loss dB	Antenna Factor dB/m	Preamp Factor dB	Emission Level dBuV/m	Limits dBuV/m	Margin dB	Detector Type
39759.474	36.03	20.09	44.16	43.48	56.8	68.2	11.4	Peak

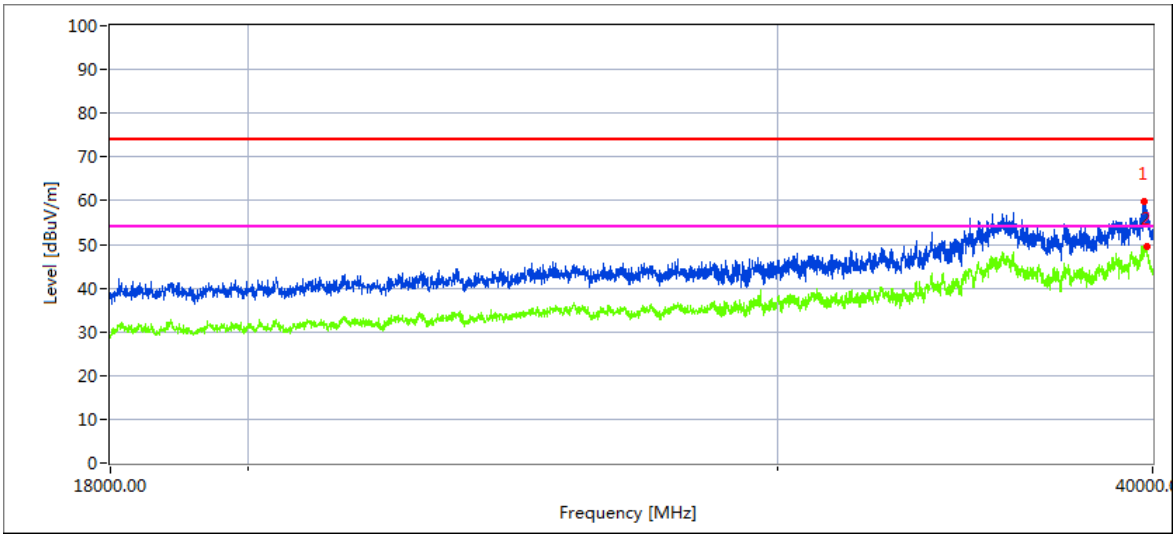
Vertical



Frequency MHz	Meter Reading dBuV	Cable loss dB	Antenna Factor dB/m	Preamp Factor dB	Emission Level dBuV/m	Limits dBuV/m	Margin dB	Detector Type
35480.504	30.54	19.11	42.63	43.48	48.8	68.2	19.4	Peak

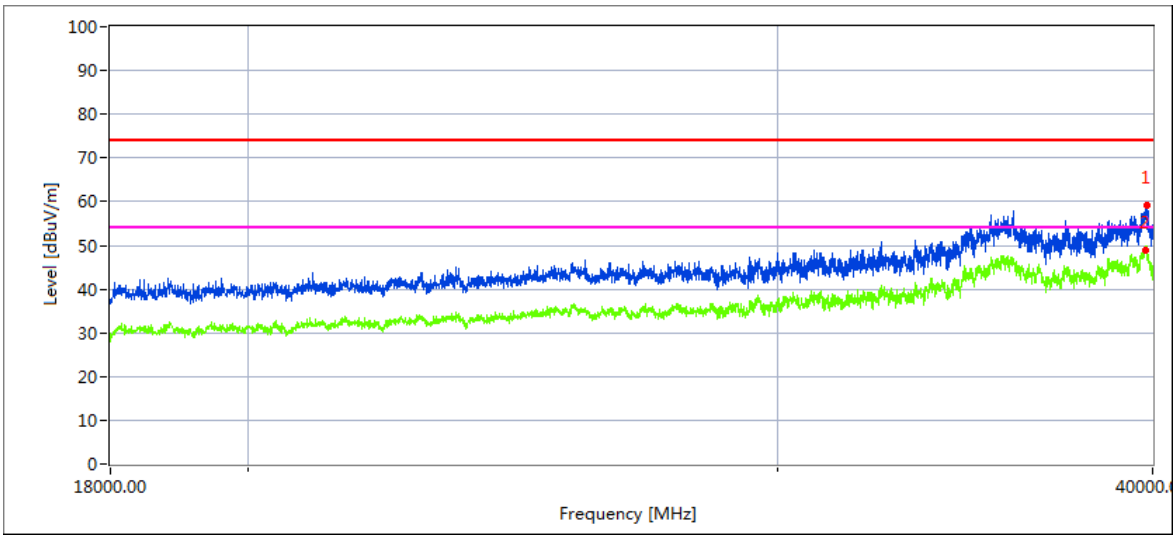
High Channel (5825 MHz)-Above 1G

Horizontal



Frequency MHz	Meter Reading dBuV	Cable loss dB	Antenna Factor dB/m	Preamp Factor dB	Emission Level dBuV/m	Limits dBuV/m	Margin dB	Detector Type
39742.576	33.08	20.06	44.07	43.21	54	68.2	14.2	Peak

Vertical



Frequency MHz	Meter Reading dBuV	Cable loss dB	Antenna Factor dB/m	Preamp Factor dB	Emission Level dBuV/m	Limits dBuV/m	Margin dB	Detector Type
39815.224	34.42	20.1	44.1	43.22	55.4	68.2	12.8	Peak

Note:802.11ac20 mode is the worst mode.

2.2.10 Spurious Emission in Restricted Band 4.5GHz~5.150 GHz& 5.350GHz~5460GHz

EUT :	WiFi Module	Model Name. :	MS12SF1
Temperature :	20 ℃	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX (5.2G)-802.11a		

All the modulation modes have been tested, The report just record the worst data mode.

Frequency	Meter Reading	Cable Loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBμV)	(dB)	dB/m	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type	
5.2G WIFI-802.11a Mode									
4500	63.25	5.2	35.6	44.2	59.85	74	-14.15	Pk	Horizontal
4500	44.82	5.2	35.6	44.2	41.42	54	-12.58	AV	Horizontal
4500	53.04	5.2	35.6	44.2	49.64	74	-24.36	Pk	Horizontal
4500	38.87	5.2	35.6	44.2	35.47	54	-18.53	AV	Horizontal
5150	68.90	5.36	35.66	44.22	65.70	74	-8.30	Pk	Horizontal
5150	51.40	5.36	35.66	44.22	48.20	54	-5.80	AV	Horizontal
5150	68.48	5.36	35.66	44.22	65.28	74	-8.72	Pk	Vertical
5150	50.44	5.36	35.66	44.22	47.24	54	-6.76	AV	Vertical
5350	61.15	5.68	35.68	44.22	58.29	74	-15.71	Pk	Vertical
5350	39.94	5.68	35.68	44.22	37.08	54	-16.92	AV	Vertical
5350	53.42	5.68	35.68	44.22	50.56	74	-23.44	Pk	Horizontal
5350	37.56	5.68	35.68	44.22	34.70	54	-19.30	AV	Horizontal

Note: (1) Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor

(2) “802.11a ” mode is the worst mode. When PK value is lower than the Average value limit, average don't record.

3. POWER SPECTRAL DENSITY TEST

3.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(a)

For the band 5.15-5.25 GHz,

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz

(3)For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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3.2 TEST PROCEDURE

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.I.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

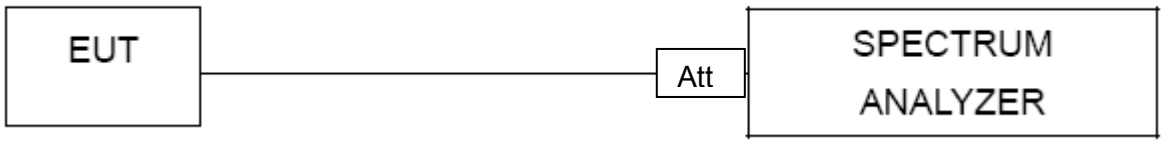
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since RBW=100 KHz is available on nearly all spectrum analyzers.

3.3 DEVIATION FROM STANDARD

No deviation.

3.4 TEST SETUP



3.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

3.6 TEST RESULTS

EUT :	WiFi Module	Model Name :	MS12SF1
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1015 hPa	Test Voltage :	DC 3V
Test Mode :	TX Frequency Band 1 (5150-5250MHz), Band 3 (5745-5825MHz)		

Note: Test data reference attachment.

4. 26DB & 99% EMISSION BANDWIDTH

4.1 APPLIED PROCEDURES / LIMIT

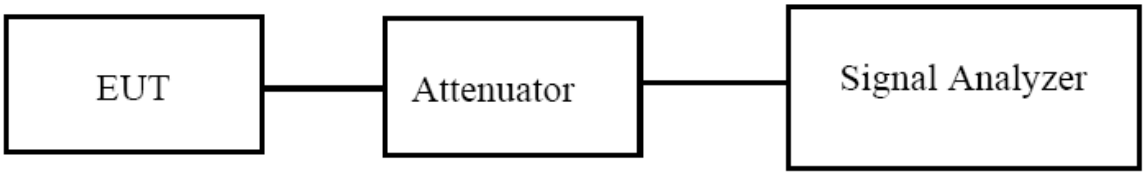
The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

4.2 TEST PROCEDURE

a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 · RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.



4.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.4 TEST RESULTS

EUT :	WiFi Module	Model Name :	MS12SF1
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 3V
Test Mode :	TX Frequency Band 1 (5150-5250MHz), Band 3 (5745-5825MHz)		

Test data reference attachment.

5. MINIMUM 6 DB BANDWIDTH

5.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(e)
(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

5.2 TEST PROCEDURE

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

a) Set RBW = 100 kHz.

b) Set the video bandwidth (VBW) ≥ 3 × RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

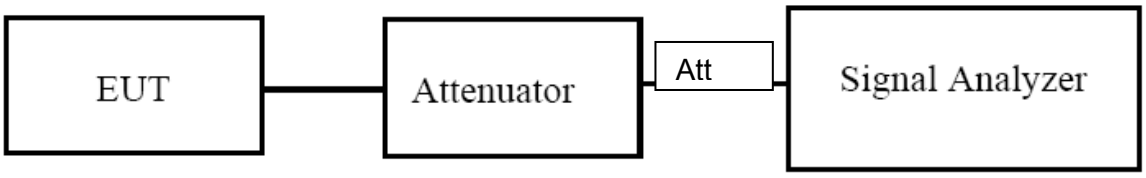
f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

EUT：	WiFi Module	Model Name ：	MS12SF1
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1012 hPa	Test Voltage ：	DC 3V
Test Mode ：	TX (5G) Mode Frequency Band 3 (5725-5850MHz)		

Test data reference attachment.

6. MAXIMUM CONDUCTED OUTPUT POWER

6.1 PPLIED PROCEDURES / LIMIT

According to FCC §15.407

The maximum conduced output power should not exceed:

Frequency Band(MHz)	Limit
5150~5250	250mW
5725~5850	1W

6.2 TEST PROCEDURE

· Method PM is Measurement using an RF average power meter. The procedure for this method is as follows:

a) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:

1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.

2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.

3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

b) If the transmitter does not transmit continuously, measure the duty cycle D of the transmitter output signal as described in 12.2.

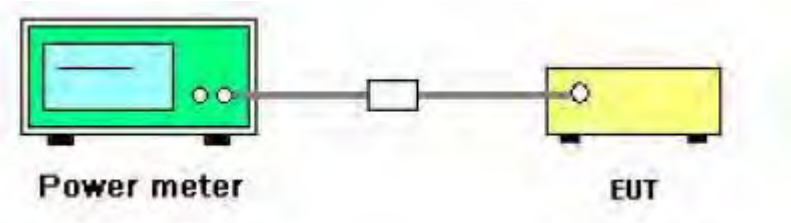
c) Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.

d) Adjust the measurement in dBm by adding [10 log (1 / D)], where D is the duty cycle {e.g., [10 log (1 / 0.25)], if the duty cycle is 25%}.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

6.2 TEST RESULTS

EUT：	WiFi Module	Model Name ：	MS12SF1
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1012 hPa	Test Voltage ：	DC 3V
Test Mode ：	TX Frequency Band 1 (5150-5250MHz), Band 3 (5745-5825MHz)		

Note: Test data reference attachment.

7. OUT OF BAND EMISSIONS

7.1 APPLICABLE STANDARD

According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:
(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

7.2 TEST PROCEDURE

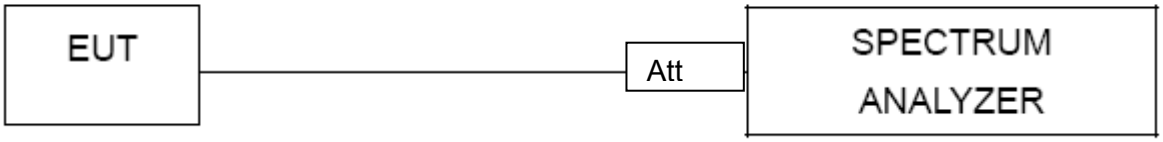
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULTS

EUT：	WiFi Module	Model Name ：	MS12SF1
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1012 hPa	Test Voltage ：	DC 3V

Test data reference attachment.

8. Frequency Stability Measurement

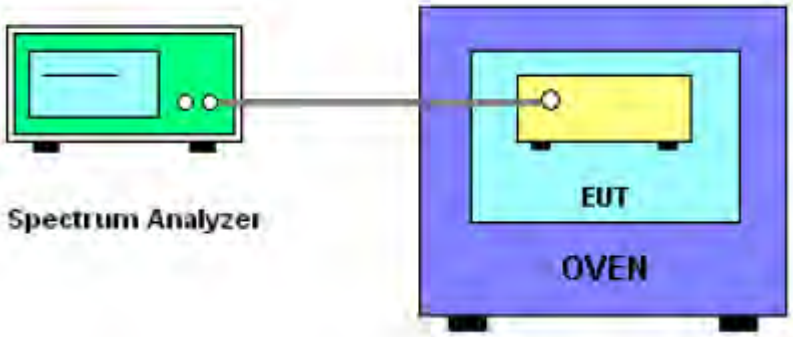
8.1 LIMIT

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

8.2 TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10_6 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is -20°C~70°C.

8.3 TEST SETUP LAYOUT



8.4 EUT OPERATION DURING TEST

1. The EUT was programmed to be in continuously un-modulation transmitting mode.
2. The module has two antennas, and the worst data is Antenna 1, only shown Antenna 1 Plot.

8.5 TEST RESULTS

EUT :	WiFi Module	Model Name. :	MS12SF1
Temperature :	25 ℃	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 3V
Test Mode :	TX Frequency Band I (5150-5250MHz)		

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3	5180.0002	5180	0.0002	0.0333
		V max (V)	3.3	5180.0003	5180	0.0003	0.0521
		V min (V)	2.7	5180.0001	5180	0.0001	0.0109
Limits				Within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3	T (°C)	-20	5180.0005	5180	0.0005	0.0993
		T (°C)	-10	5180.0004	5180	0.0004	0.0742
		T (°C)	0	5180.0002	5180	0.0002	0.0440
		T (°C)	10	5180.0009	5180	0.0009	0.1818
		T (°C)	20	5180.0017	5180	0.0017	0.3368
		T (°C)	30	5180.0011	5180	0.0011	0.2194
		T (°C)	40	5180.0003	5180	0.0003	0.0548
		T (°C)	50	5180.0019	5180	0.0019	0.3661
		T (°C)	60	5180.0016	5180	0.0016	0.3071
		T (°C)	70	5180.0014	5180	0.0014	0.2618
Limits				Within 5150-5250MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3	5200.0014	5200	0.0014	0.2694
		V max (V)	3.3	5200.0014	5200	0.0014	0.2660
		V min (V)	2.7	5200.0020	5200	0.0020	0.3768
Limits				Within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3	T (°C)	-20	5200.0011	5200	0.0011	0.2139
		T (°C)	-10	5200.0016	5200	0.0016	0.3054
		T (°C)	0	5200.0008	5200	0.0008	0.1457
		T (°C)	10	5200.0004	5200	0.0004	0.0713
		T (°C)	20	5200.0005	5200	0.0005	0.1034
		T (°C)	30	5200.0011	5200	0.0011	0.2025
		T (°C)	40	5200.0001	5200	0.0001	0.0146
		T (°C)	50	5200.0004	5200	0.0004	0.0758
		T (°C)	60	5200.0007	5200	0.0007	0.1340
		T (°C)	70	5200.0006	5200	0.0006	0.1080
Limits				Within 5150-5250MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3	5240.0013	5240	0.0013	0.2429
		V max (V)	3.3	5240.0019	5240	0.0019	0.3693
		V min (V)	2.7	5240.0016	5240	0.0016	0.3016
Limits				Within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3	T (°C)	-20	5240.0004	5240	0.0004	0.0834
		T (°C)	-10	5240.0015	5240	0.0015	0.2912
		T (°C)	0	5240.0017	5240	0.0017	0.3314
		T (°C)	10	5240.0012	5240	0.0012	0.2232
		T (°C)	20	5240.0018	5240	0.0018	0.3508
		T (°C)	30	5240.0018	5240	0.0018	0.3434
		T (°C)	40	5240.0020	5240	0.0020	0.3770
		T (°C)	50	5240.0016	5240	0.0016	0.3097
		T (°C)	60	5240.0009	5240	0.0009	0.1662
		T (°C)	70	5240.0020	5240	0.0020	0.3725
Limits				Within 5150-5250MHz			
Result				Complies			

EUT :	WiFi Module	Model Name. :	MS12SF1
Temperature :	25 ℃	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 3V
Test Mode :	TX Frequency(5745-5825MHz)		

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3	5745.0009	5745	0.0009	0.1630
		V max (V)	3.3	5745.0012	5745	0.0012	0.2046
		V min (V)	2.7	5745.0012	5745	0.0012	0.2010
Limits				Within 5745-5850MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3	T (°C)	-20	5745.0007	5745	0.0007	0.1290
		T (°C)	-10	5745.0013	5745	0.0013	0.2221
		T (°C)	0	5745.0003	5745	0.0003	0.0463
		T (°C)	10	5745.0001	5745	0.0001	0.0151
		T (°C)	20	5745.0004	5745	0.0004	0.0720
		T (°C)	30	5745.0005	5745	0.0005	0.0886
		T (°C)	40	5745.0013	5745	0.0013	0.2195
		T (°C)	50	5745.0004	5745	0.0004	0.0737
		T (°C)	60	5745.0005	5745	0.0005	0.0883
		T (°C)	70	5745.0006	5745	0.0006	0.1104
Limits				Within 5745-5850MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3	5785.0007	5785	0.00075	-0.1290
		V max (V)	3.3	5785.0012	5785	0.00116	-0.2002
		V min (V)	2.7	5785.0011	5785	0.00111	-0.1916
Limits				Within 5745-5850MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3	T (°C)	-20	5785.0005	5785	0.0005	0.0866
		T (°C)	-10	5785.0000	5785	0.0000	0.0076
		T (°C)	0	5785.0017	5785	0.0017	0.3018
		T (°C)	10	5785.0013	5785	0.0013	0.2306
		T (°C)	20	5785.0013	5785	0.0013	0.2235
		T (°C)	30	5785.0010	5785	0.0010	0.1768
		T (°C)	40	5785.0007	5785	0.0007	0.1265
		T (°C)	50	5785.0004	5785	0.0004	0.0739
		T (°C)	60	5785.0010	5785	0.0010	0.1734
		T (°C)	70	5785.0007	5785	0.0007	0.1255
Limits				Within 5745-5850MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3	5825.0003	5825	0.0003	0.0476
		V max (V)	3.3	5825.0017	5825	0.0017	0.2852
		V min (V)	2.7	5825.0009	5825	0.0009	0.1565
Limits				Within 5745-5850MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3	T (°C)	-20	5825.0019	5825	0.0019	0.3264
		T (°C)	-10	5825.0017	5825	0.0017	0.2917
		T (°C)	0	5825.0010	5825	0.0010	0.1671
		T (°C)	10	5825.0006	5825	0.0006	0.1032
		T (°C)	20	5825.0012	5825	0.0012	0.2073
		T (°C)	30	5825.0007	5825	0.0007	0.1124
		T (°C)	40	5825.0016	5825	0.0016	0.2757
		T (°C)	50	5825.0018	5825	0.0018	0.3020
		T (°C)	60	5825.0004	5825	0.0004	0.0701
		T (°C)	70	5825.0002	5825	0.0002	0.0410
Limits				Within 5745-5850MHz			
Result				Complies			

9. ANTENNA REQUIREMENT

9.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

9.2 EUT ANTENNA

The EUT antenna is permanent attached External rod antenna (WIFI 5.2G:5.78 dBi, WIFI 5.8G:2.24 dBi). It comply with the standard requirement.

10 TEST RESULT

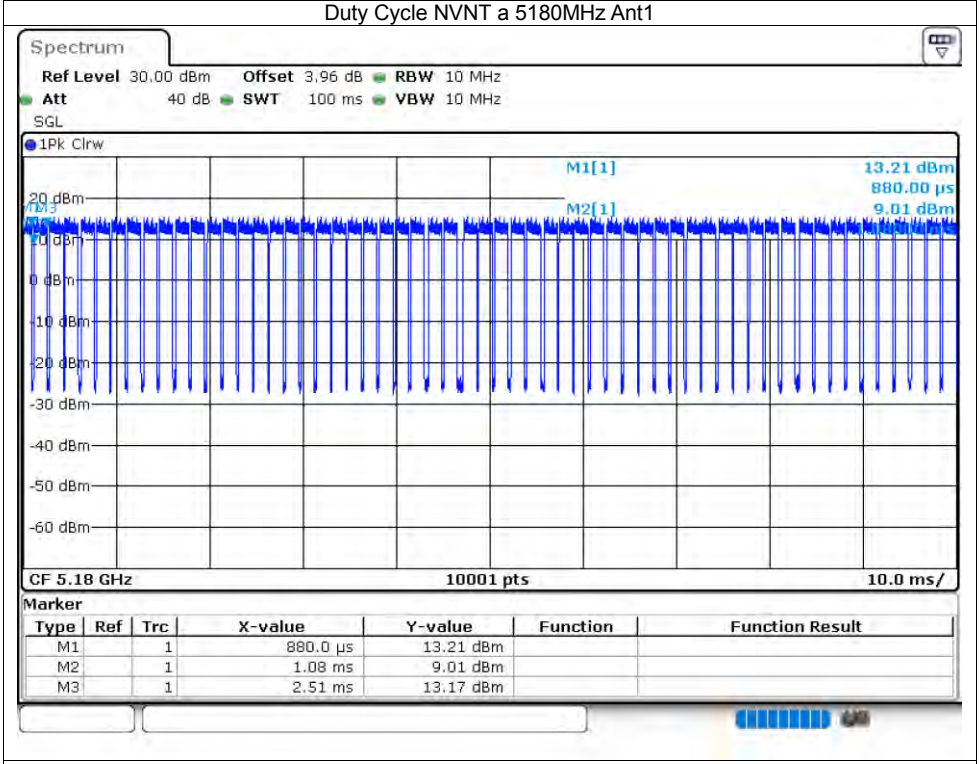
10.1 5.2G

10.1.1 DUTY CYCLE

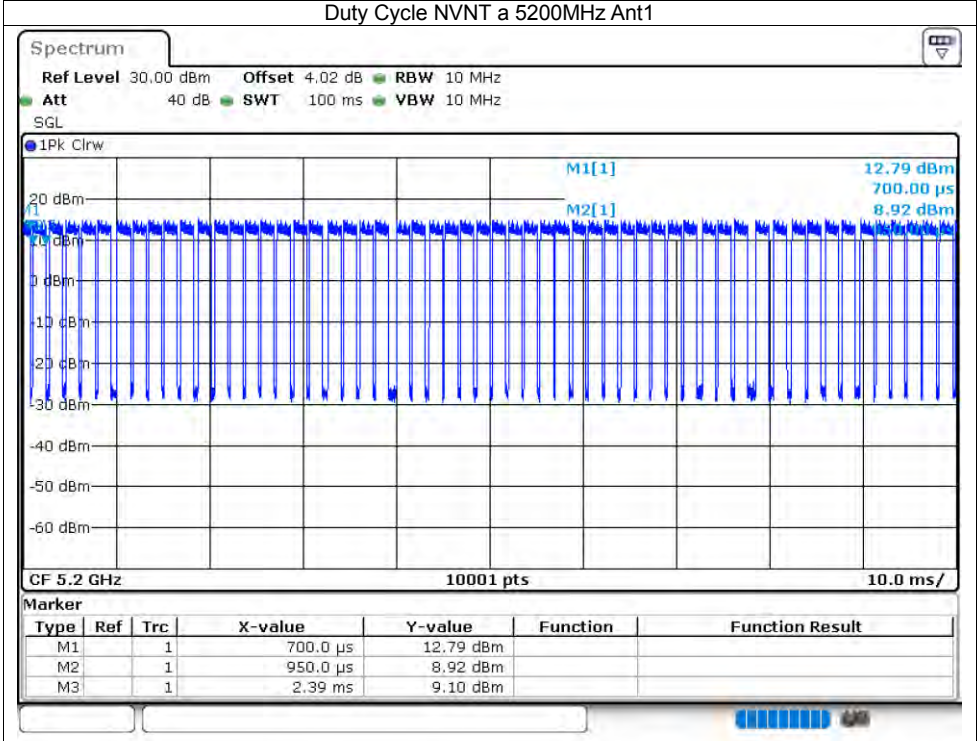
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	a	5180	Ant1	84.53	0.73	0.7
NVNT	a	5200	Ant1	81.6	0.88	0.69
NVNT	a	5240	Ant1	75.76	1.21	0.7
NVNT	n20	5180	Ant1	83.27	0.8	0.75
NVNT	n20	5200	Ant1	82.58	0.83	0.75
NVNT	n20	5240	Ant1	81.36	0.9	0.75
NVNT	ac20	5180	Ant1	79.16	1.01	0.74
NVNT	ac20	5200	Ant1	82.76	0.82	0.74
NVNT	ac20	5240	Ant1	83.59	0.78	0.74
NVNT	ax20	5180	Ant1	82.11	0.86	0.83
NVNT	ax20	5200	Ant1	80.43	0.95	0.83
NVNT	ax20	5240	Ant1	81.24	0.9	0.83

Test Graphs

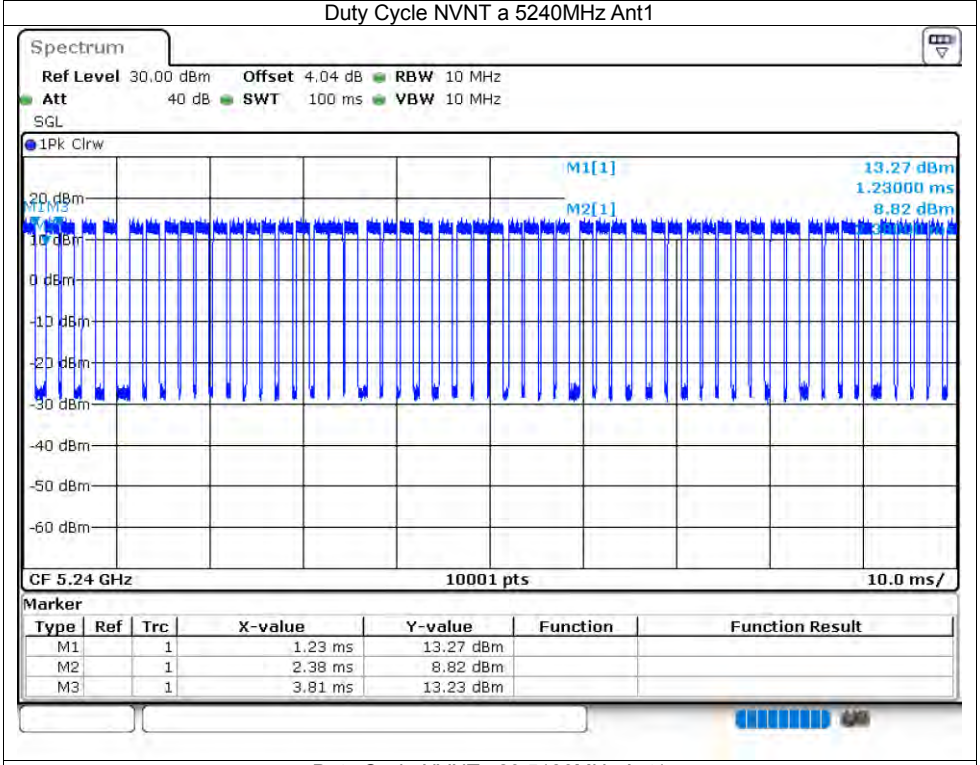
Duty Cycle NVNT a 5180MHz Ant1



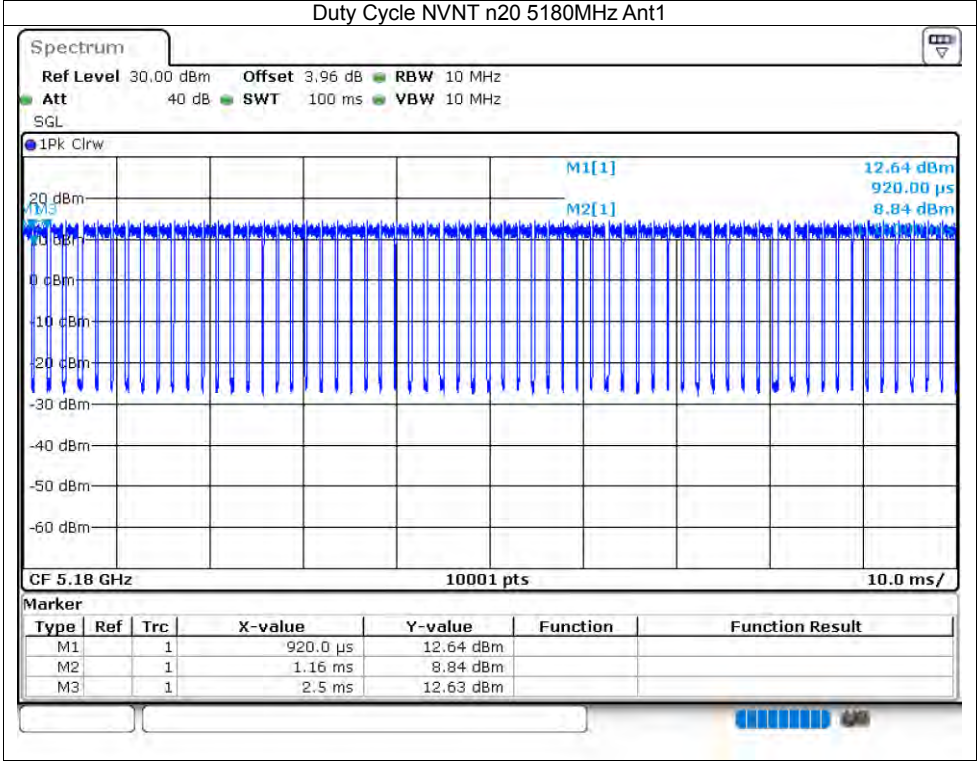
Duty Cycle NVNT a 5200MHz Ant1



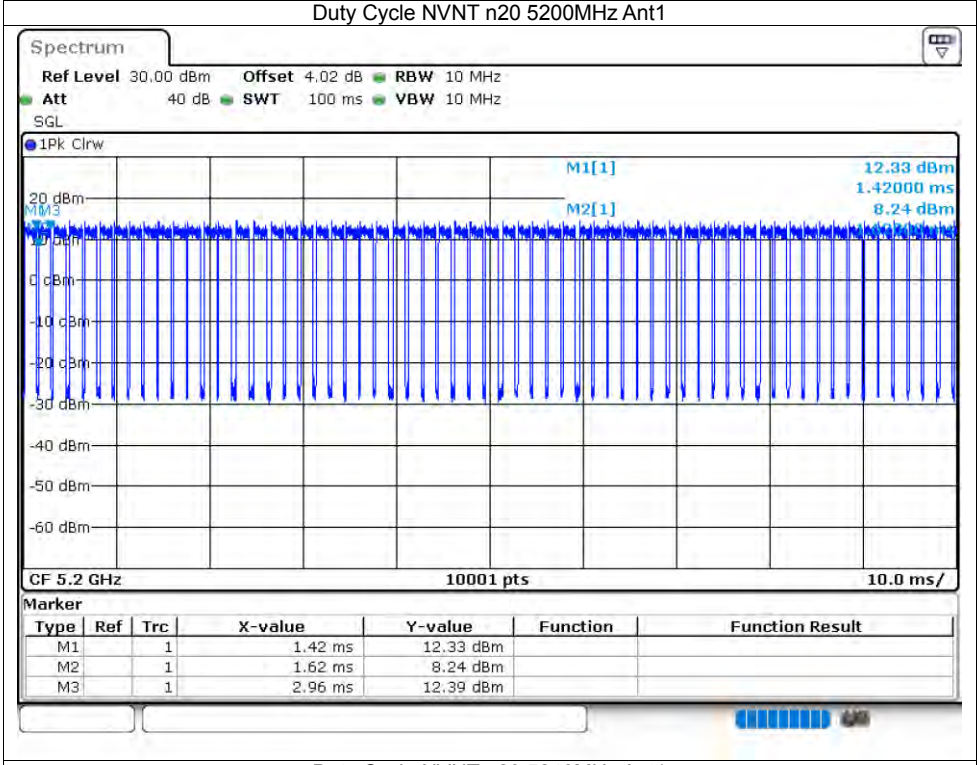
Duty Cycle NVNT a 5240MHz Ant1



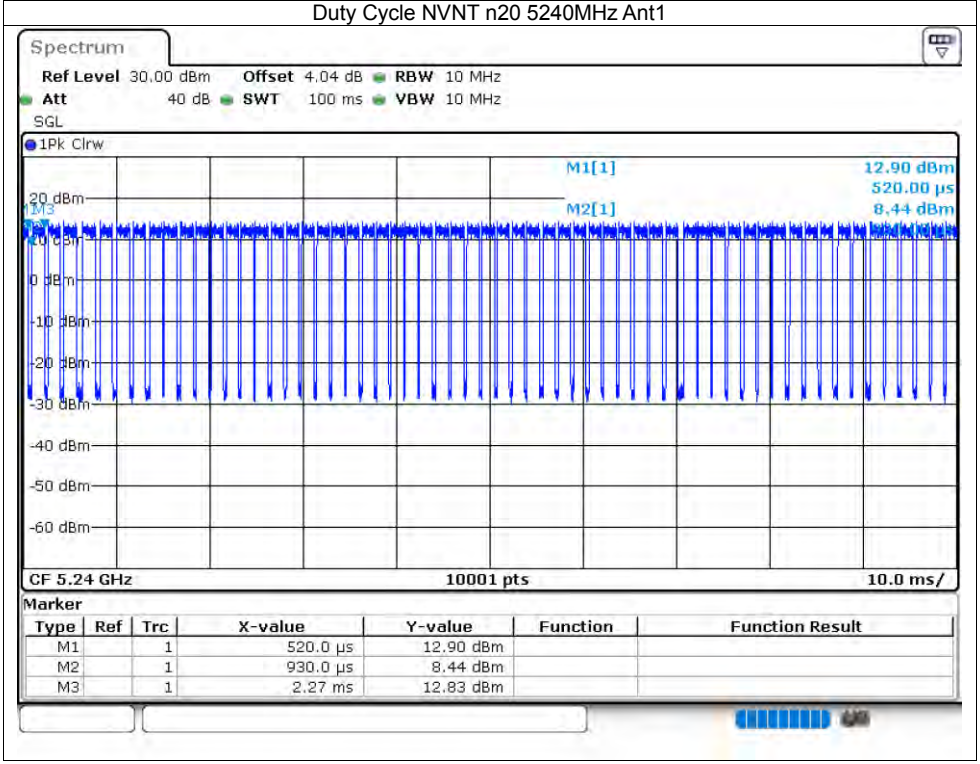
Duty Cycle NVNT n20 5180MHz Ant1



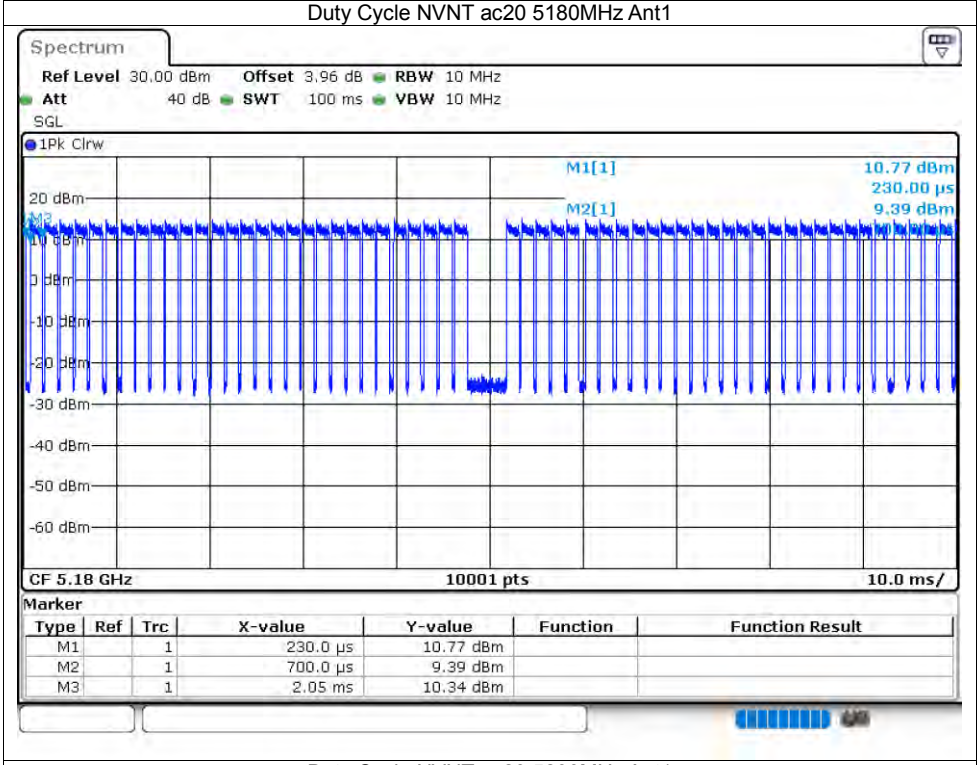
Duty Cycle NVNT n20 5200MHz Ant1



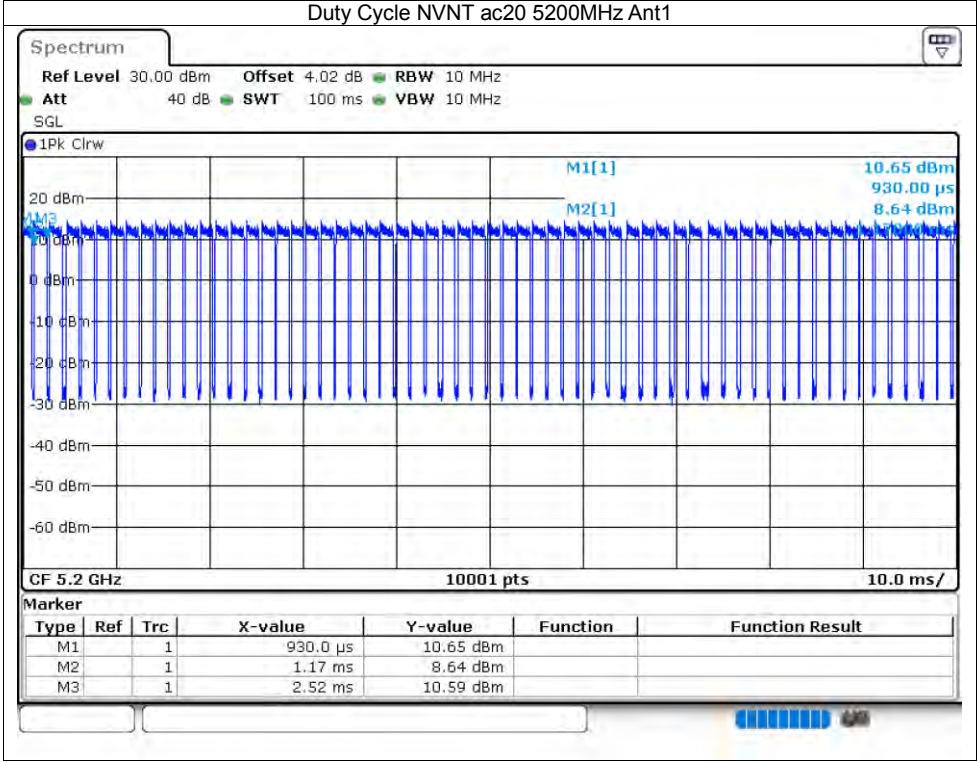
Duty Cycle NVNT n20 5240MHz Ant1



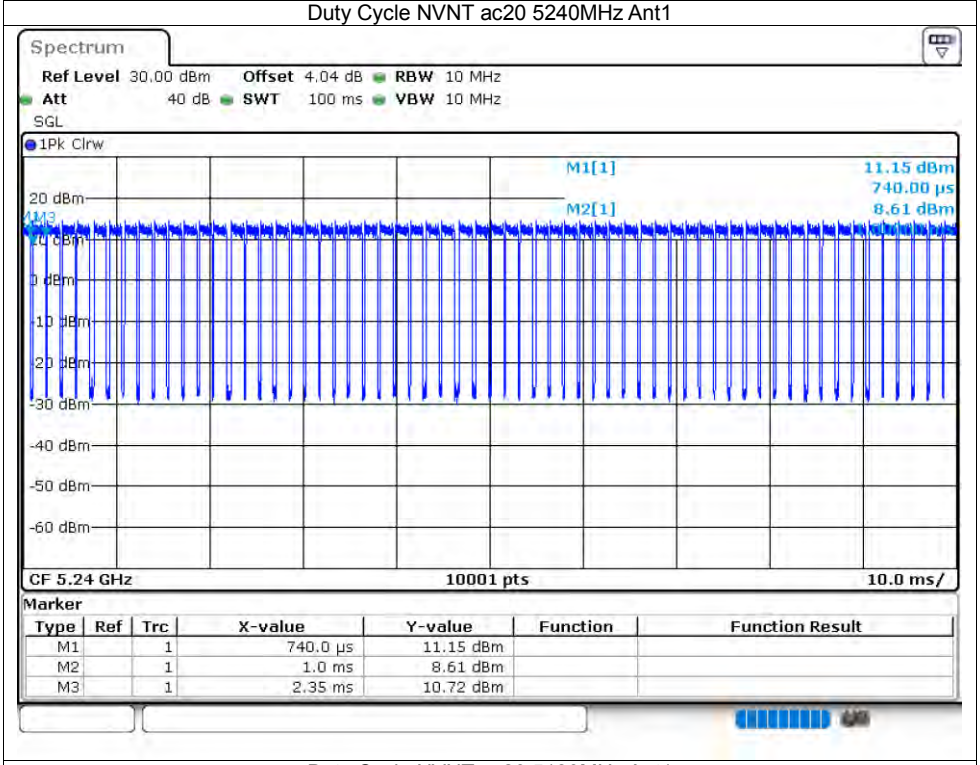
Duty Cycle NVNT ac20 5180MHz Ant1



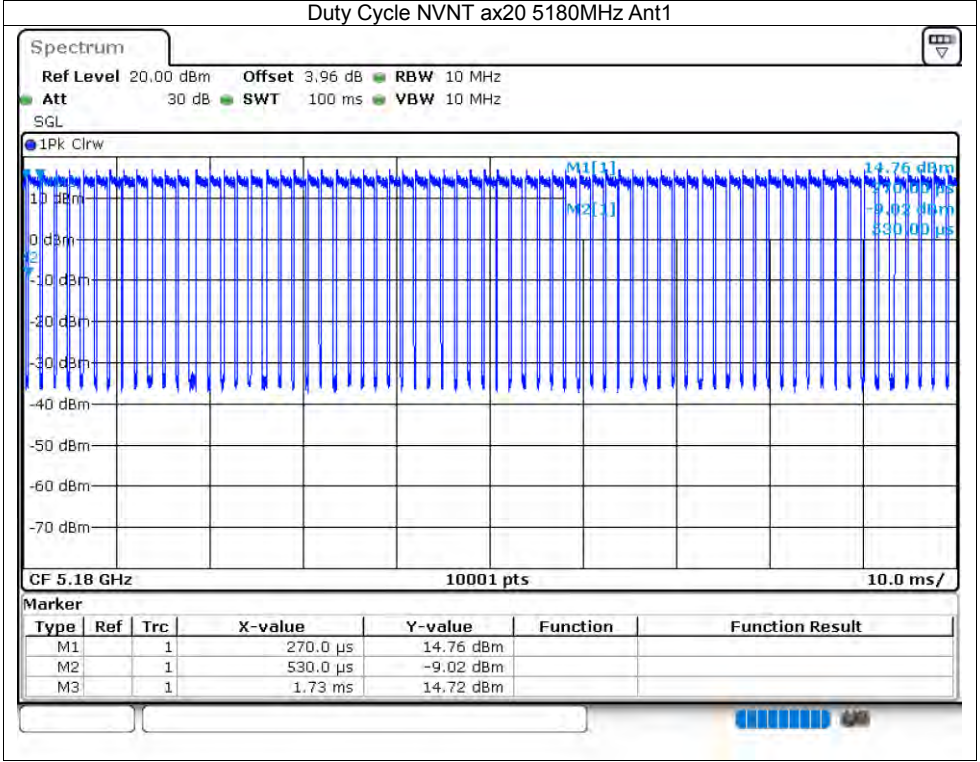
Duty Cycle NVNT ac20 5200MHz Ant1



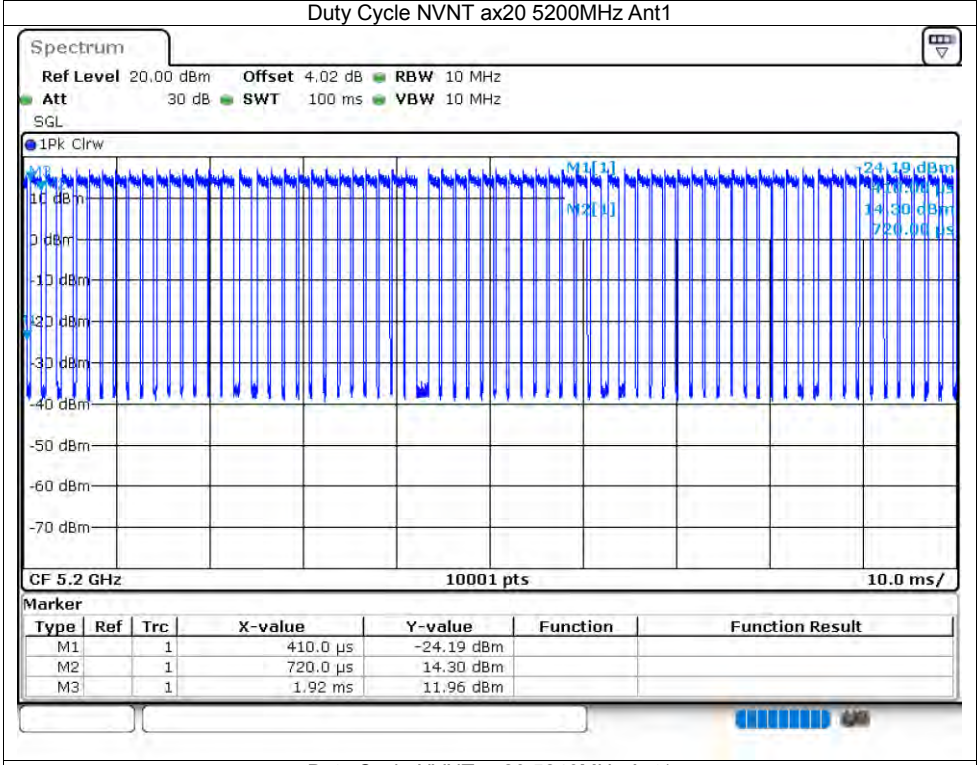
Duty Cycle NVNT ac20 5240MHz Ant1



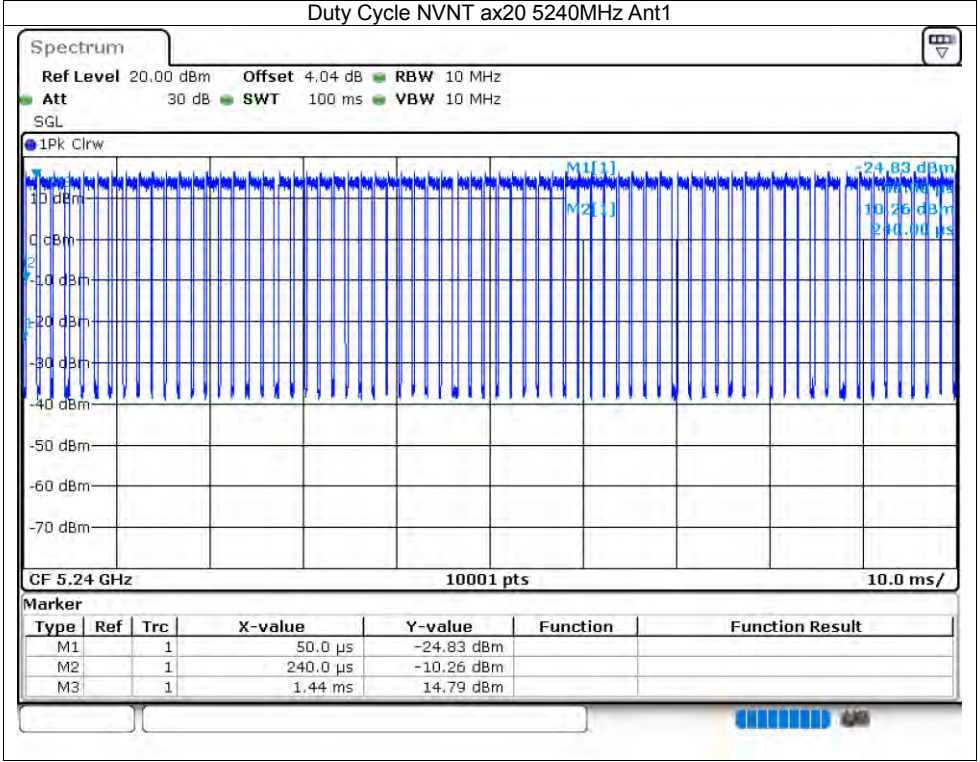
Duty Cycle NVNT ax20 5180MHz Ant1



Duty Cycle NVNT ax20 5200MHz Ant1



Duty Cycle NVNT ax20 5240MHz Ant1



10.1.2 MAXIMUM CONDUCTED OUTPUT POWER

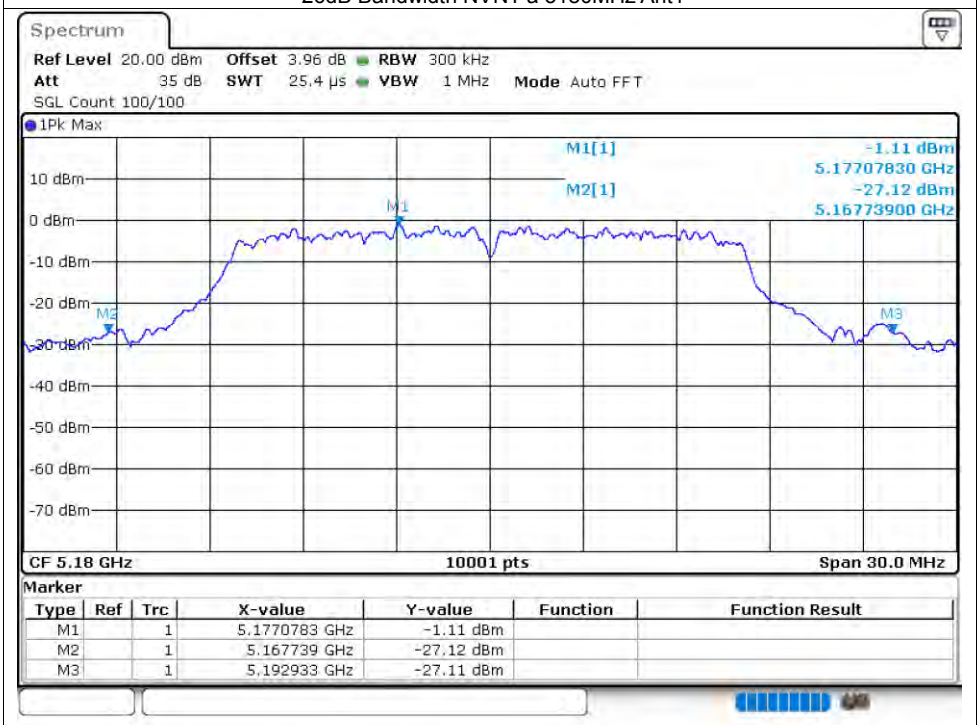
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	Ant1	9.53	0.73	10.26	24	Pass
NVNT	a	5200	Ant1	10.18	0.88	11.06	24	Pass
NVNT	a	5240	Ant1	9.63	1.21	10.84	24	Pass
NVNT	n20	5180	Ant1	8.74	0.8	9.54	24	Pass
NVNT	n20	5200	Ant1	9.2	0.83	10.03	24	Pass
NVNT	n20	5240	Ant1	8.8	0.9	9.7	24	Pass
NVNT	ac20	5180	Ant1	9.53	1.01	10.54	24	Pass
NVNT	ac20	5200	Ant1	9.85	0.82	10.67	24	Pass
NVNT	ac20	5240	Ant1	9.57	0.78	10.35	24	Pass
NVNT	ax20	5180	Ant1	10.71	0.86	11.57	24	Pass
NVNT	ax20	5200	Ant1	11	0.95	11.95	24	Pass
NVNT	ax20	5240	Ant1	10.79	0.9	11.69	24	Pass

10.1.3 -26DB BANDWIDTH

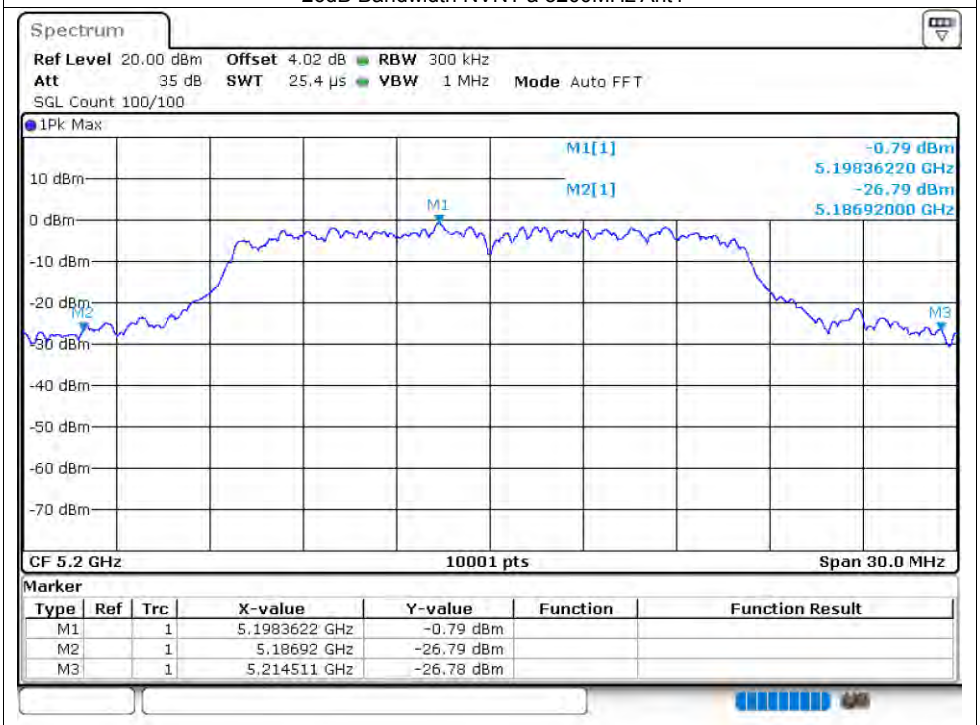
Condition	Mode	Frequency (MHz)	Antenna	-26 dB Bandwidth (MHz)	Verdict
NVNT	a	5180	Ant1	25.194	Pass
NVNT	a	5200	Ant1	27.591	Pass
NVNT	a	5240	Ant1	30	Pass
NVNT	n20	5180	Ant1	19.902	Pass
NVNT	n20	5200	Ant1	26.625	Pass
NVNT	n20	5240	Ant1	24.261	Pass
NVNT	ac20	5180	Ant1	25.869	Pass
NVNT	ac20	5200	Ant1	29.268	Pass
NVNT	ac20	5240	Ant1	29.802	Pass
NVNT	ax20	5180	Ant1	25.113	Pass
NVNT	ax20	5200	Ant1	25.86	Pass
NVNT	ax20	5240	Ant1	22.689	Pass

Test Graphs

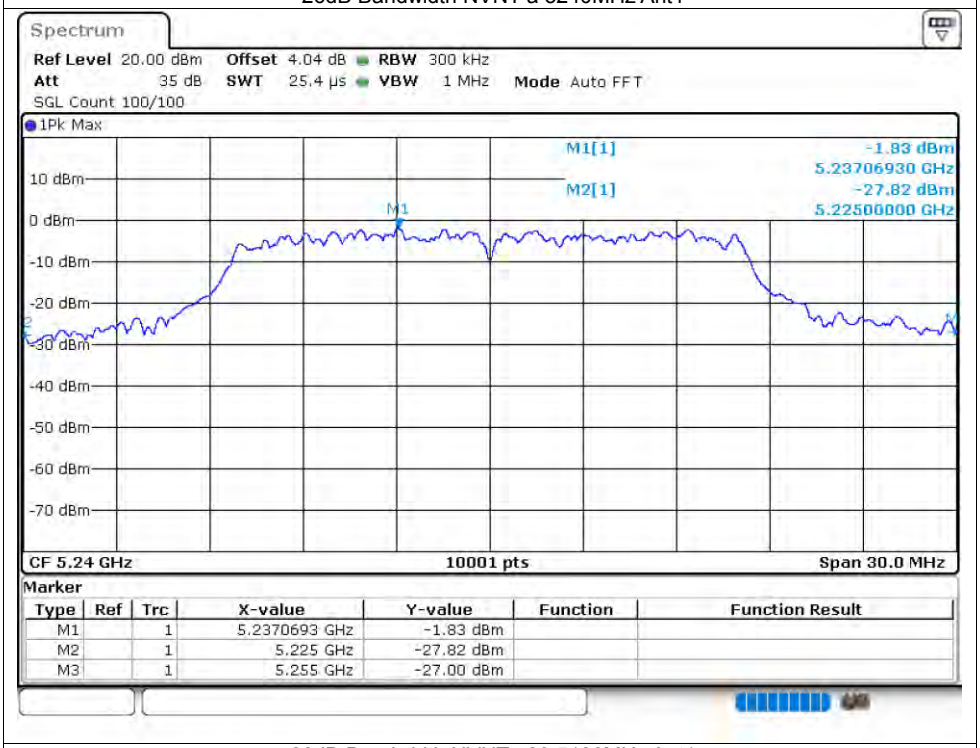
-26dB Bandwidth NVNT a 5180MHz Ant1



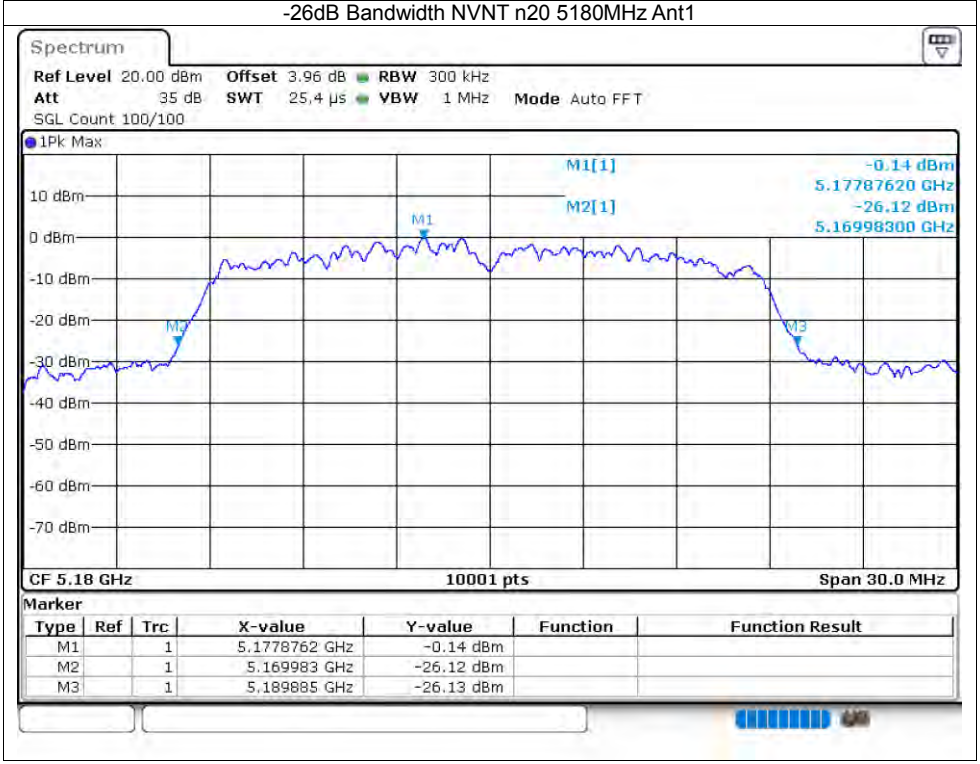
-26dB Bandwidth NVNT a 5200MHz Ant1



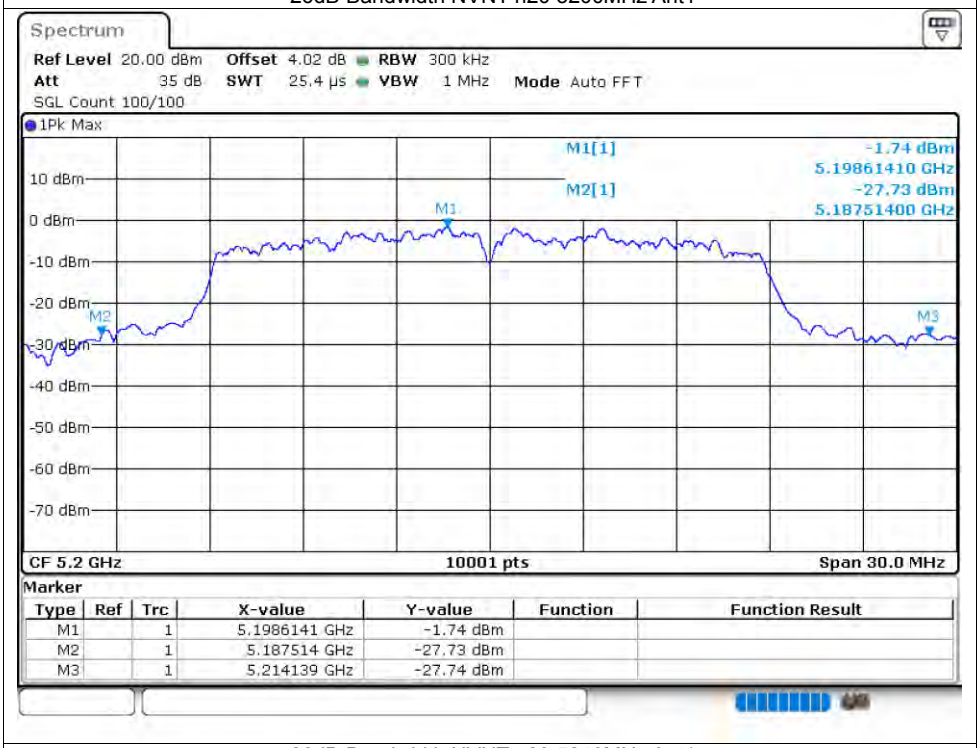
-26dB Bandwidth NVNT a 5240MHz Ant1



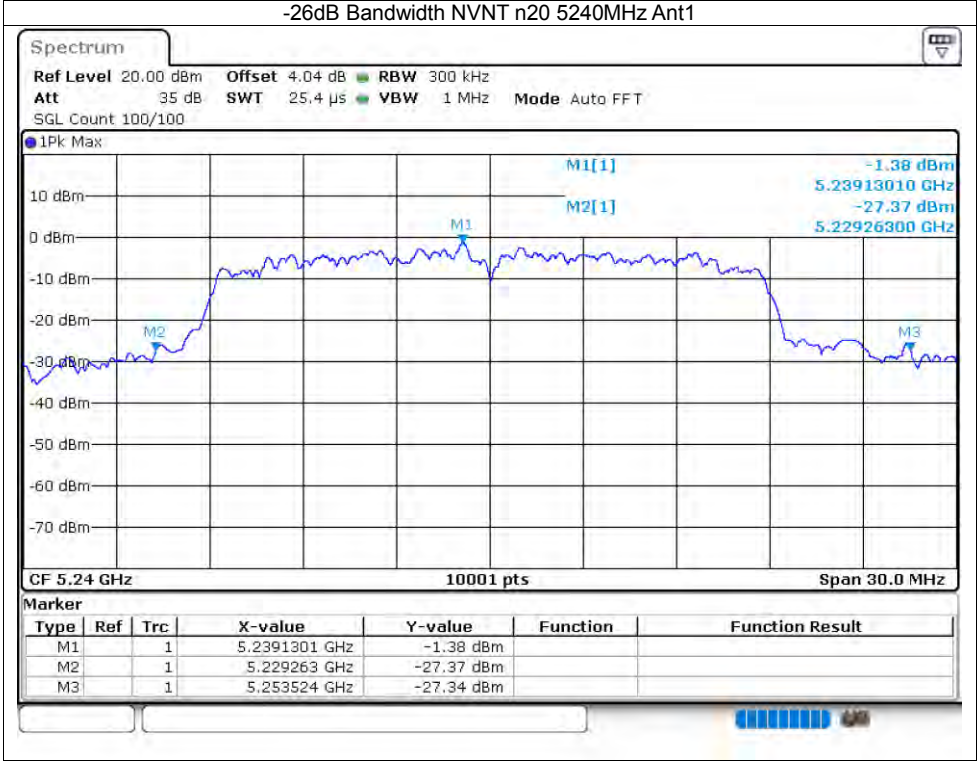
-26dB Bandwidth NVNT n20 5180MHz Ant1



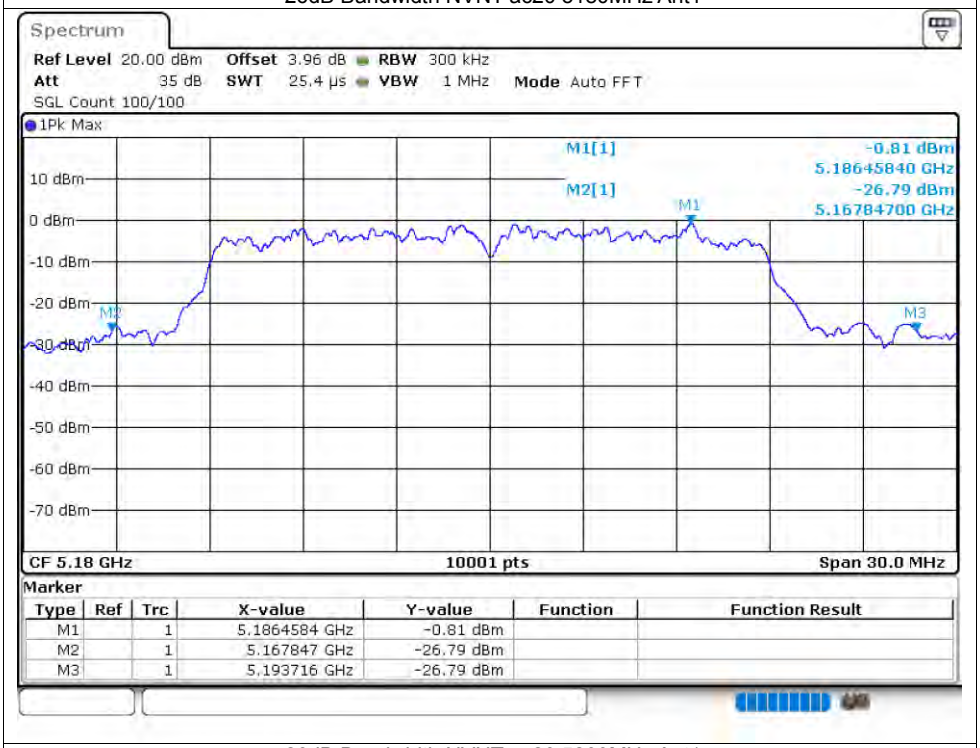
-26dB Bandwidth NVNT n20 5200MHz Ant1



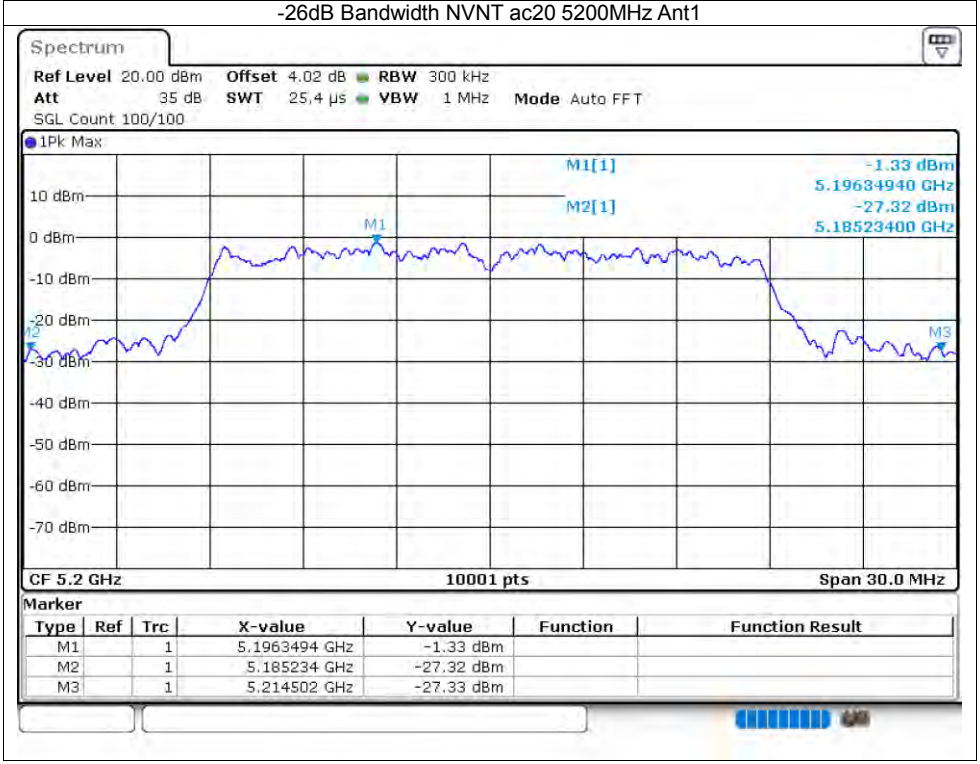
-26dB Bandwidth NVNT n20 5240MHz Ant1



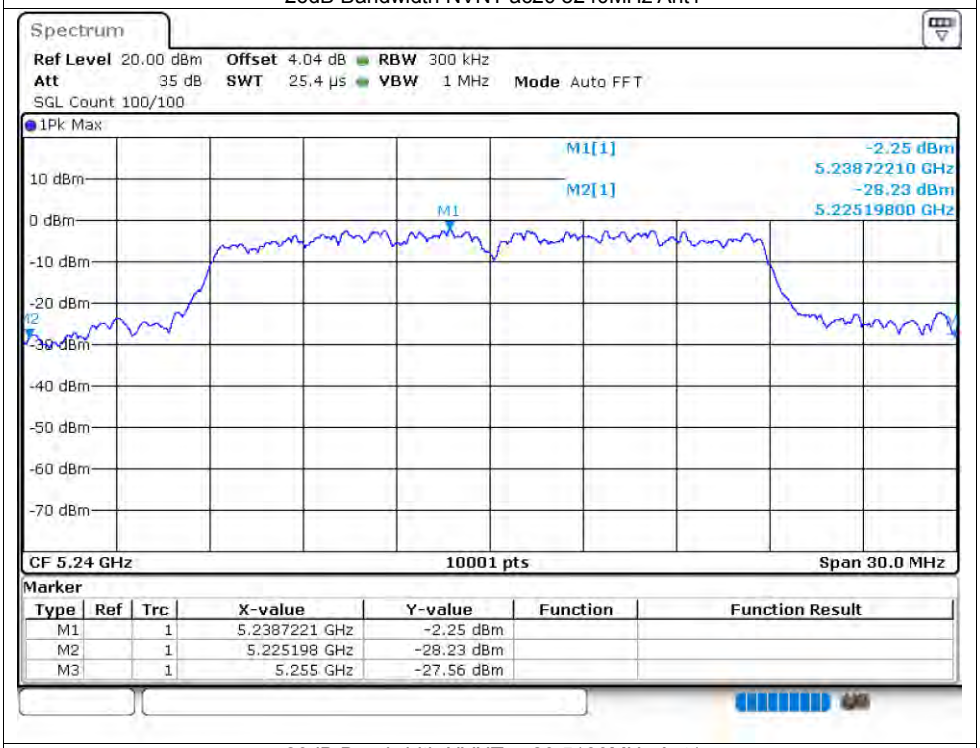
-26dB Bandwidth NVNT ac20 5180MHz Ant1



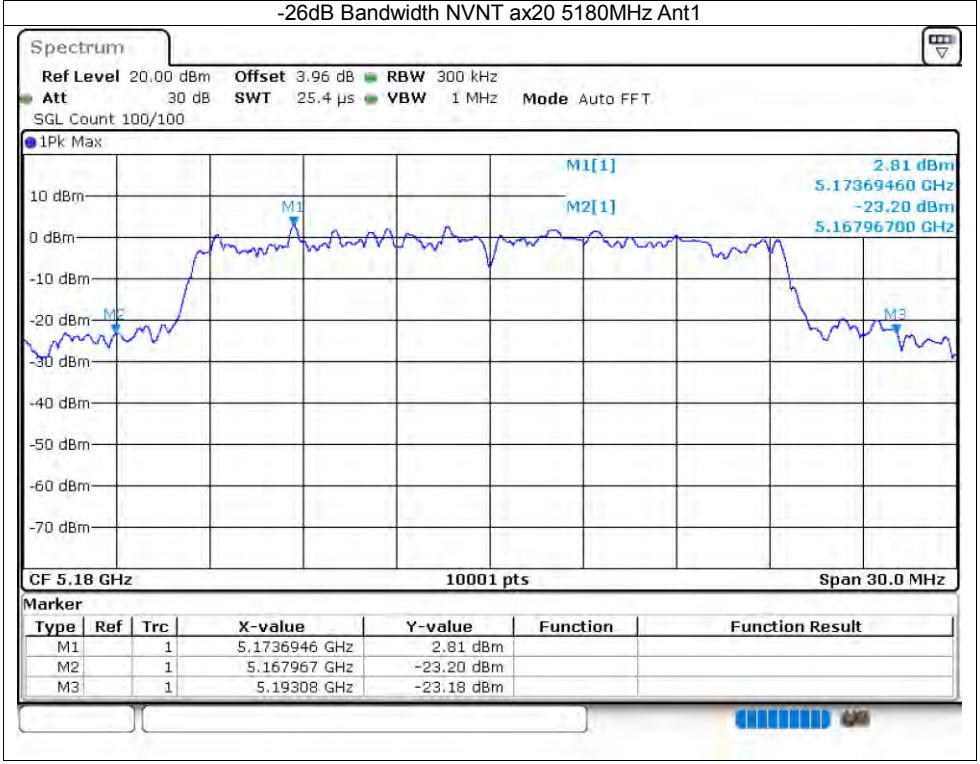
-26dB Bandwidth NVNT ac20 5200MHz Ant1



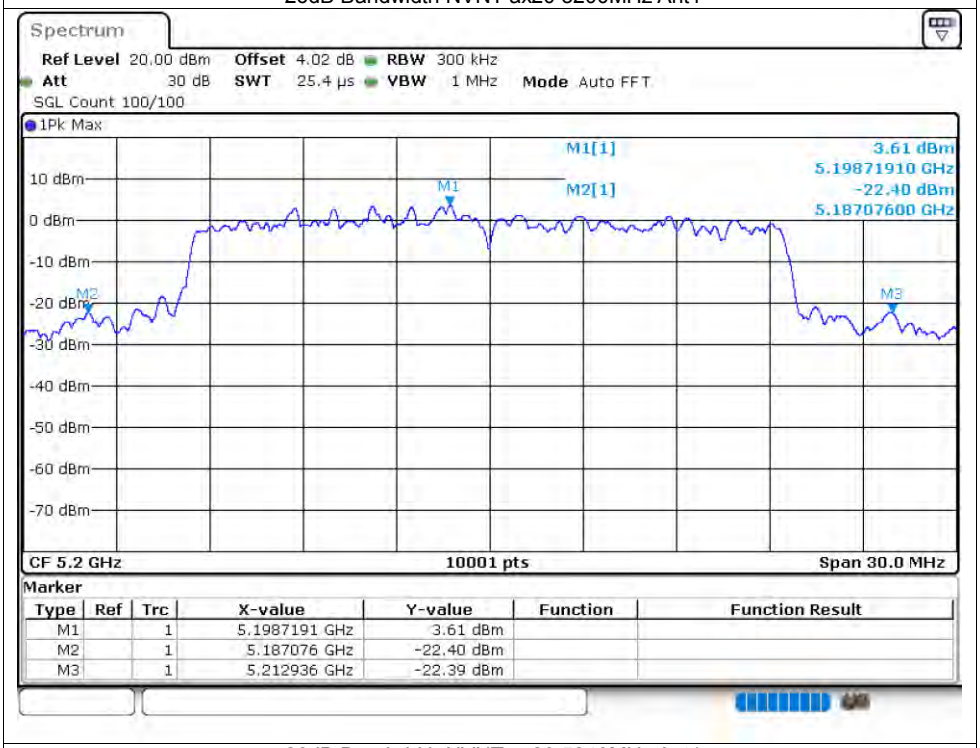
-26dB Bandwidth NVNT ac20 5240MHz Ant1



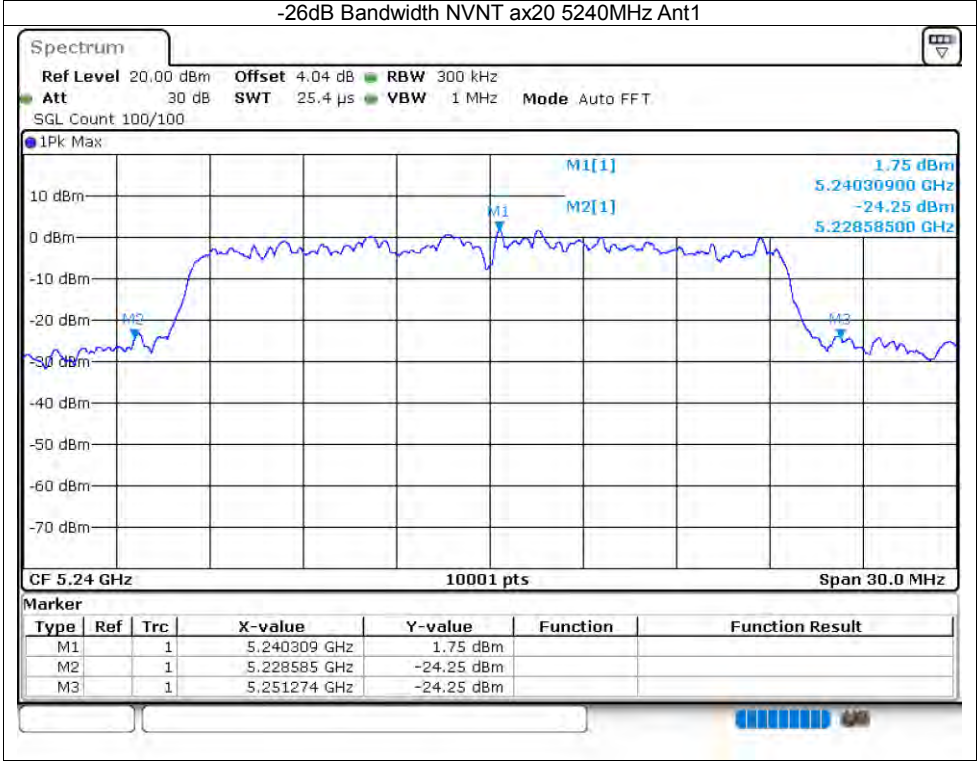
-26dB Bandwidth NVNT ax20 5180MHz Ant1



-26dB Bandwidth NVNT ax20 5200MHz Ant1



-26dB Bandwidth NVNT ax20 5240MHz Ant1

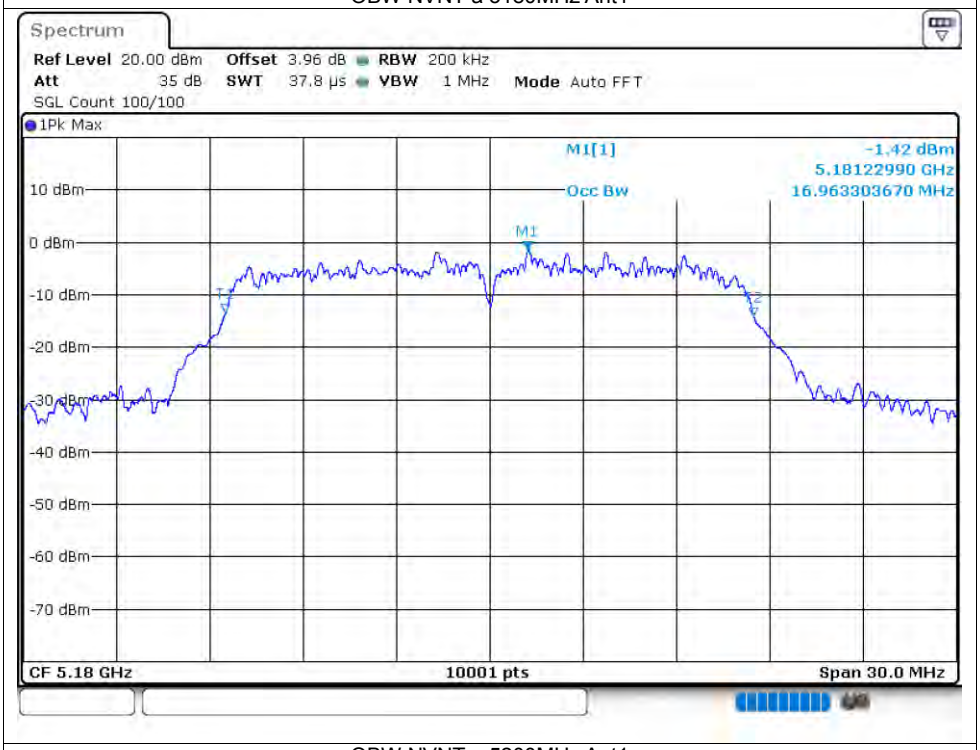


10.1.4 OCCUPIED CHANNEL BANDWIDTH

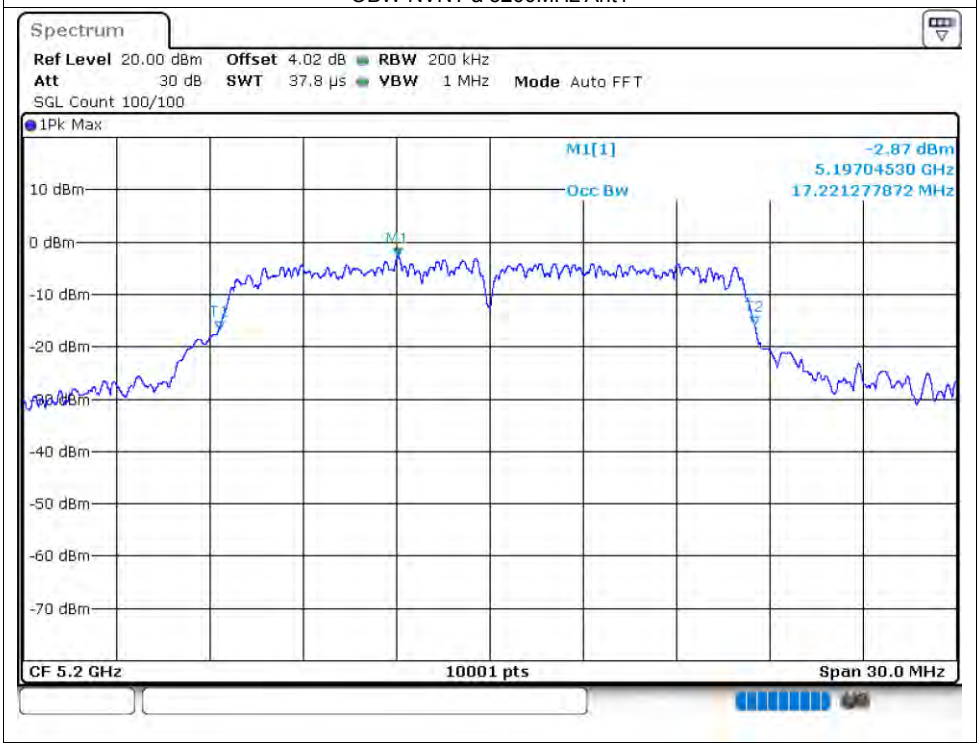
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	a	5180	Ant1	16.963
NVNT	a	5200	Ant1	17.221
NVNT	a	5240	Ant1	17.017
NVNT	n20	5180	Ant1	17.569
NVNT	n20	5200	Ant1	17.647
NVNT	n20	5240	Ant1	17.656
NVNT	ac20	5180	Ant1	17.707
NVNT	ac20	5200	Ant1	17.884
NVNT	ac20	5240	Ant1	18.013
NVNT	ax20	5180	Ant1	18.814
NVNT	ax20	5200	Ant1	18.79
NVNT	ax20	5240	Ant1	18.856

Test Graphs

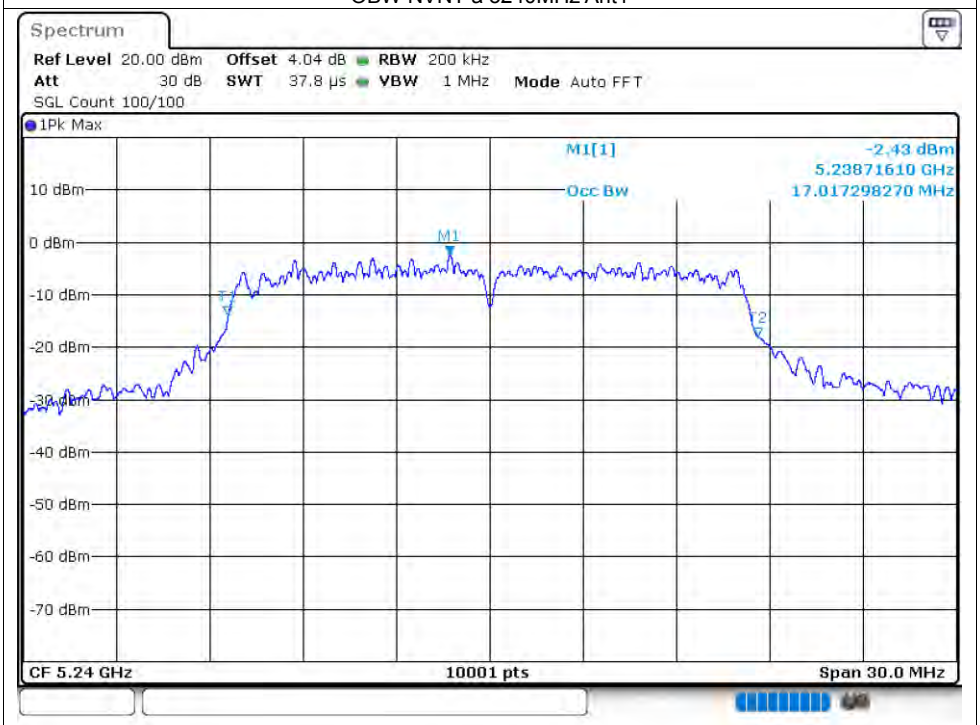
OBW NVNT a 5180MHz Ant1



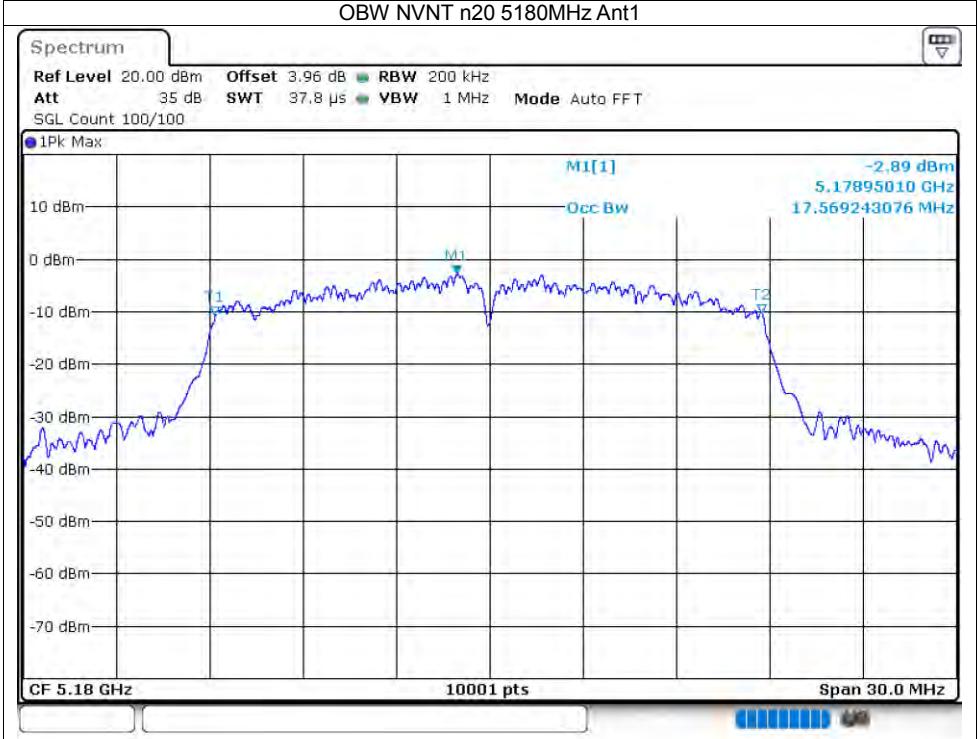
OBW NVNT a 5200MHz Ant1



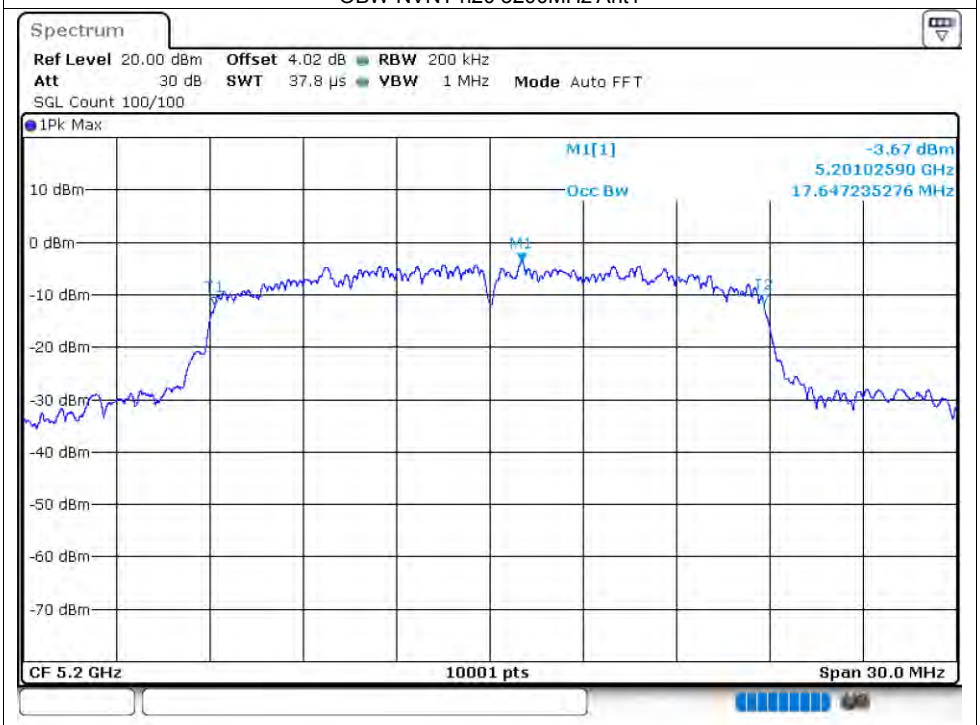
OBW NVNT a 5240MHz Ant1



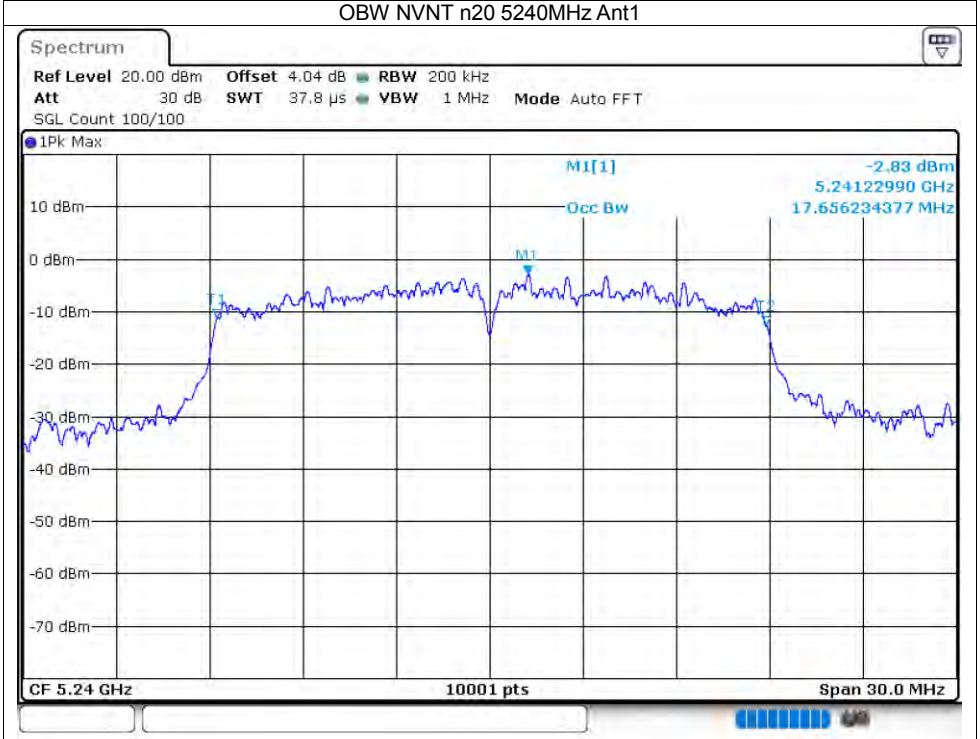
OBW NVNT n20 5180MHz Ant1



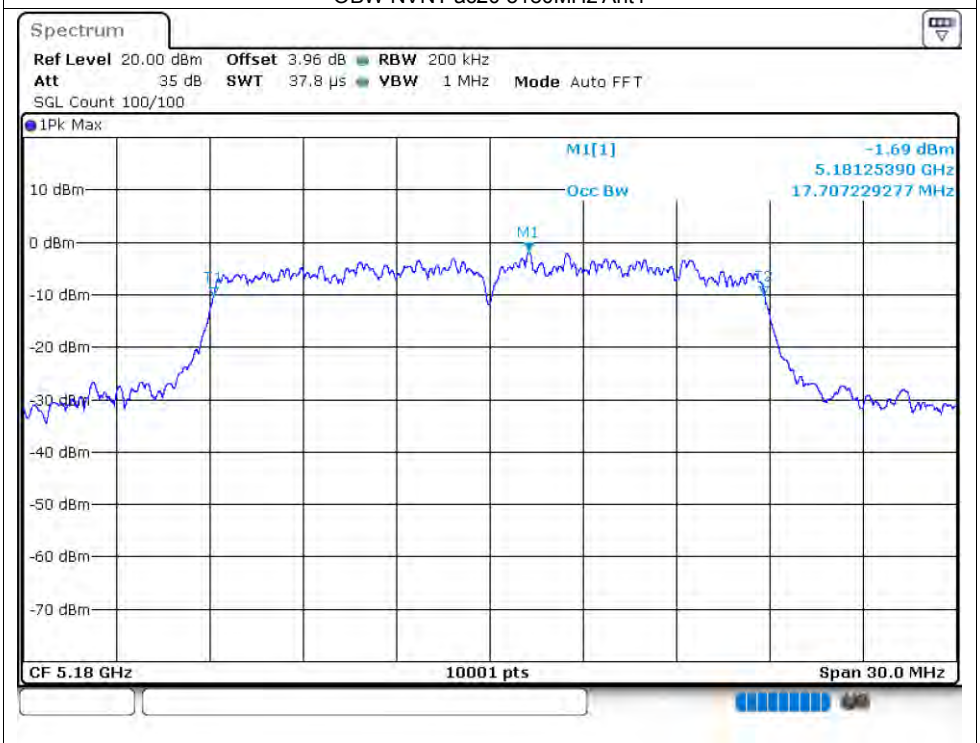
OBW NVNT n20 5200MHz Ant1



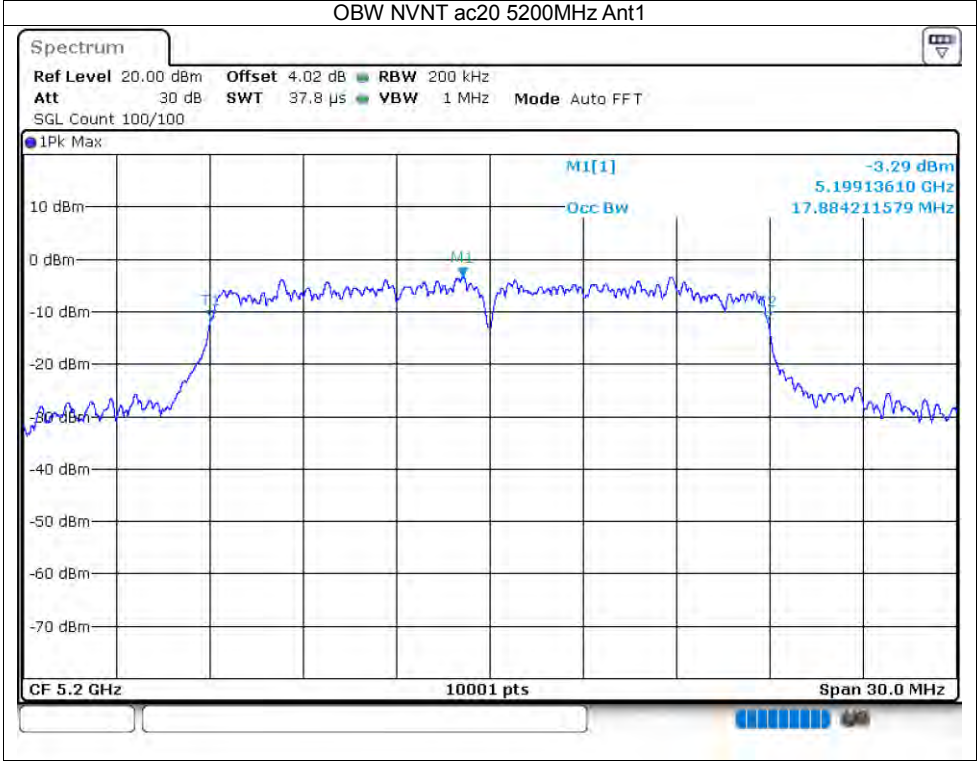
OBW NVNT n20 5240MHz Ant1



OBW NVNT ac20 5180MHz Ant1

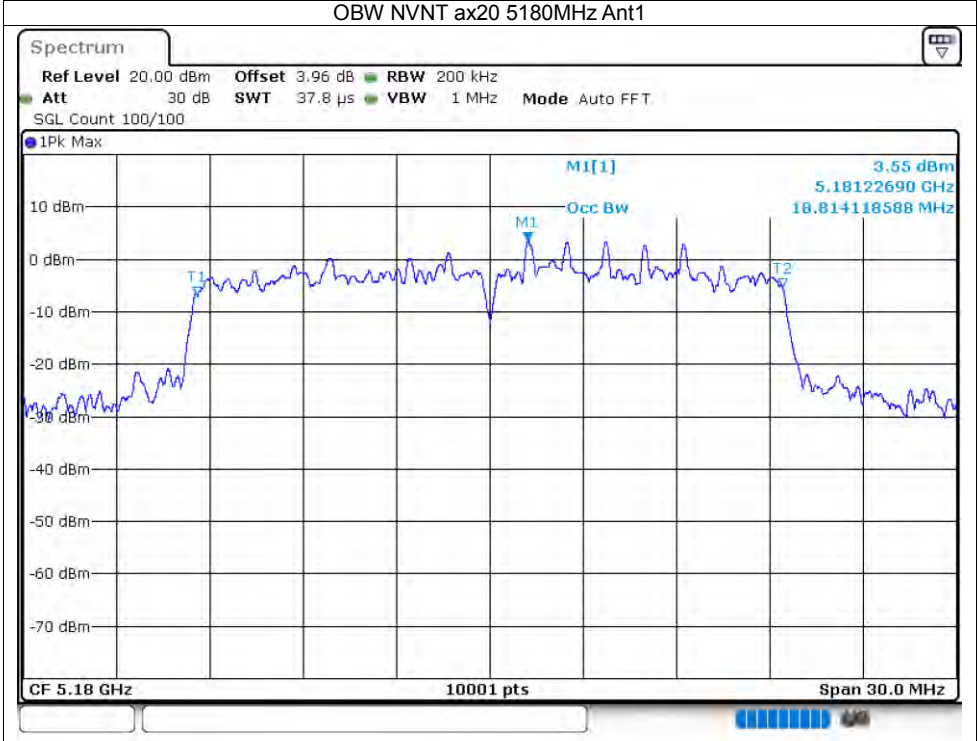


OBW NVNT ac20 5200MHz Ant1

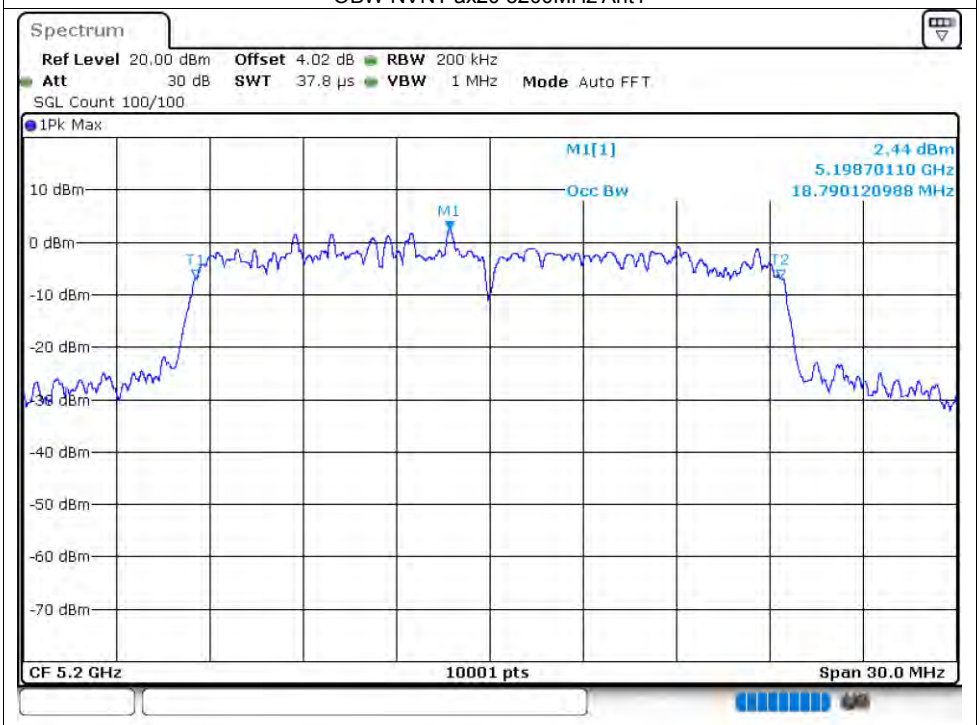


OBW NVNT ac20 5240MHz Ant1

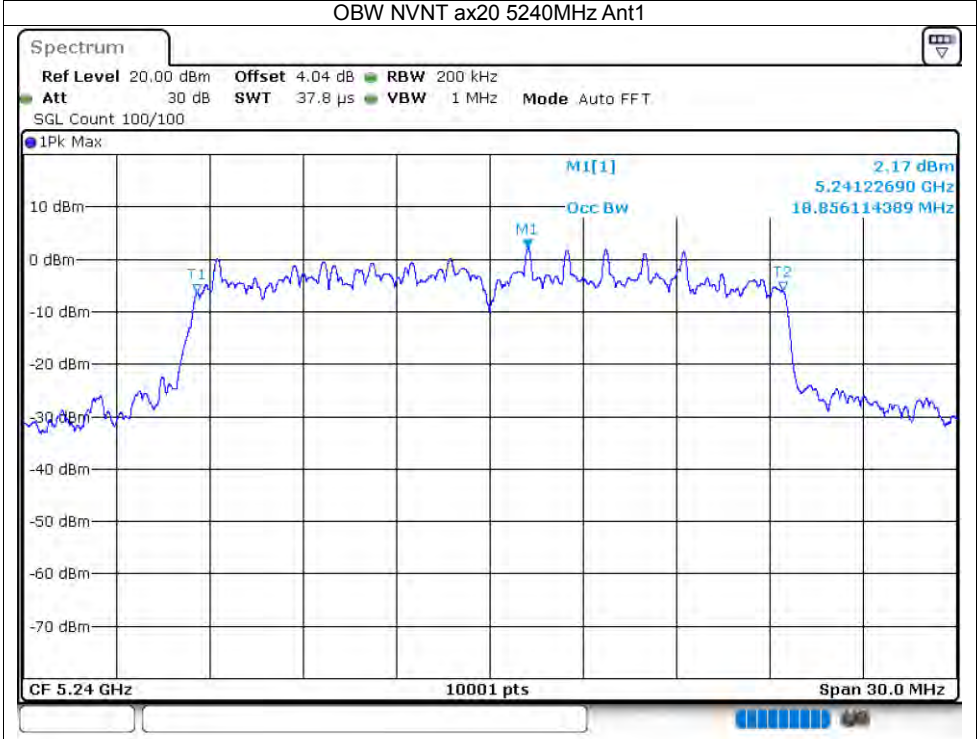
OBW NVNT ax20 5180MHz Ant1



OBW NVNT ax20 5200MHz Ant1



OBW NVNT ax20 5240MHz Ant1

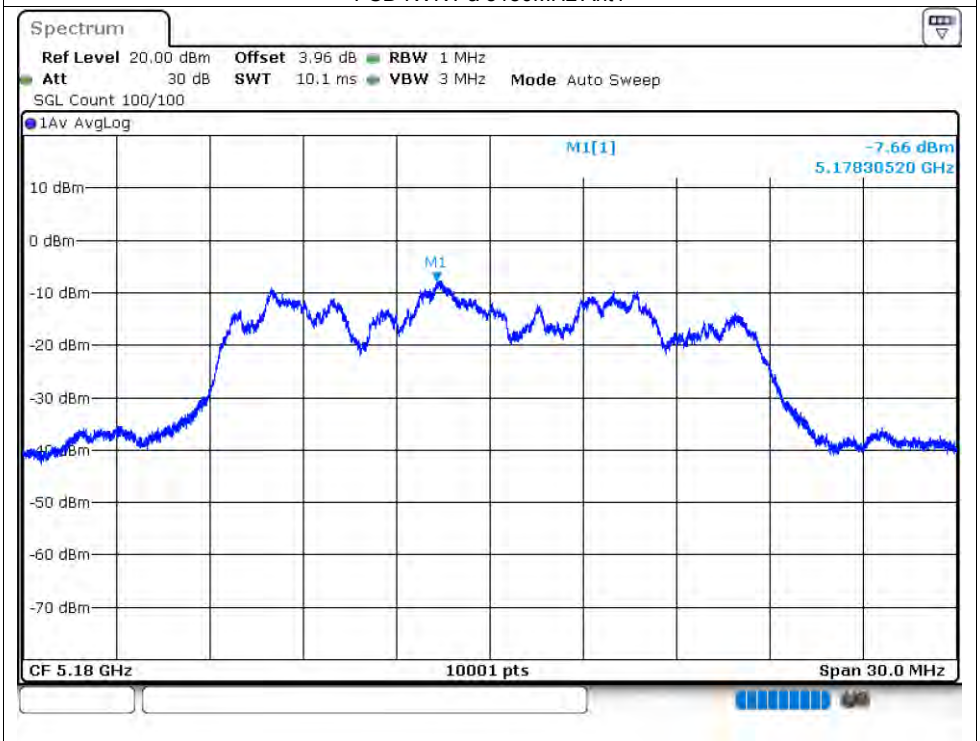


10.1.5 MAXIMUM POWER SPECTRAL DENSITY LEVEL

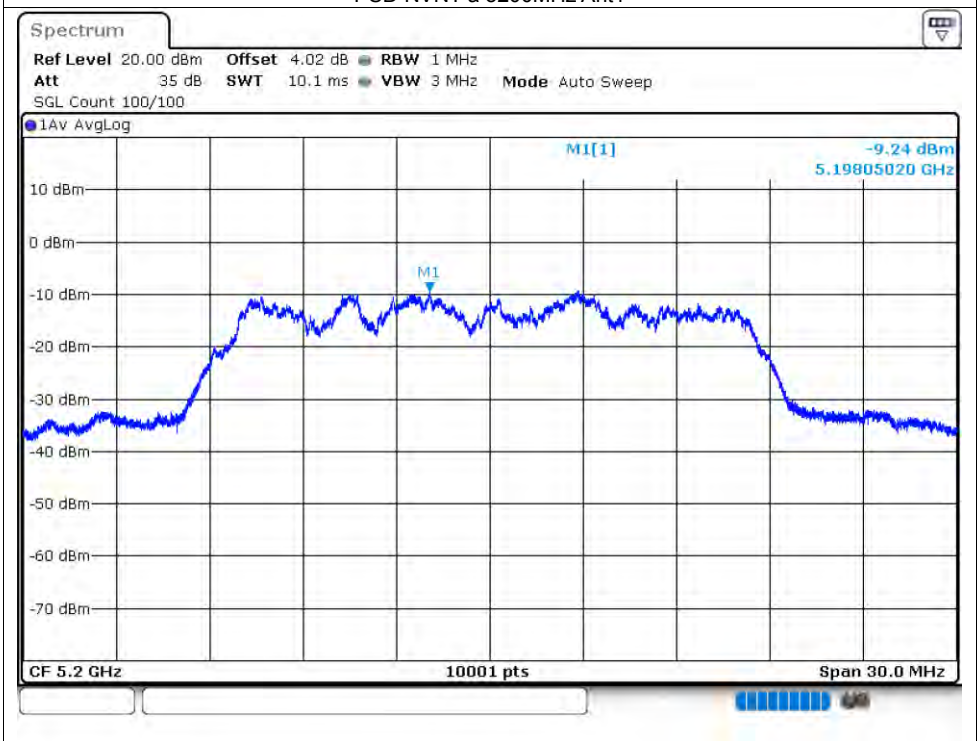
Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm)	Duty Factor (dB)	Total PSD (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	Ant1	-7.66	0.73	-6.93	11	Pass
NVNT	a	5200	Ant1	-9.24	0.88	-8.36	11	Pass
NVNT	a	5240	Ant1	-9.23	1.21	-8.02	11	Pass
NVNT	n20	5180	Ant1	-9.83	0.8	-9.03	11	Pass
NVNT	n20	5200	Ant1	-10.22	0.83	-9.39	11	Pass
NVNT	n20	5240	Ant1	-9.41	0.9	-8.51	11	Pass
NVNT	ac20	5180	Ant1	-8.98	1.01	-7.97	11	Pass
NVNT	ac20	5200	Ant1	-9.88	0.82	-9.06	11	Pass
NVNT	ac20	5240	Ant1	-10.88	0.78	-10.1	11	Pass
NVNT	ax20	5180	Ant1	-11.03	0.86	-10.17	11	Pass
NVNT	ax20	5200	Ant1	-11.29	0.95	-10.34	11	Pass
NVNT	ax20	5240	Ant1	-11.47	0.9	-10.57	11	Pass

Test Graphs

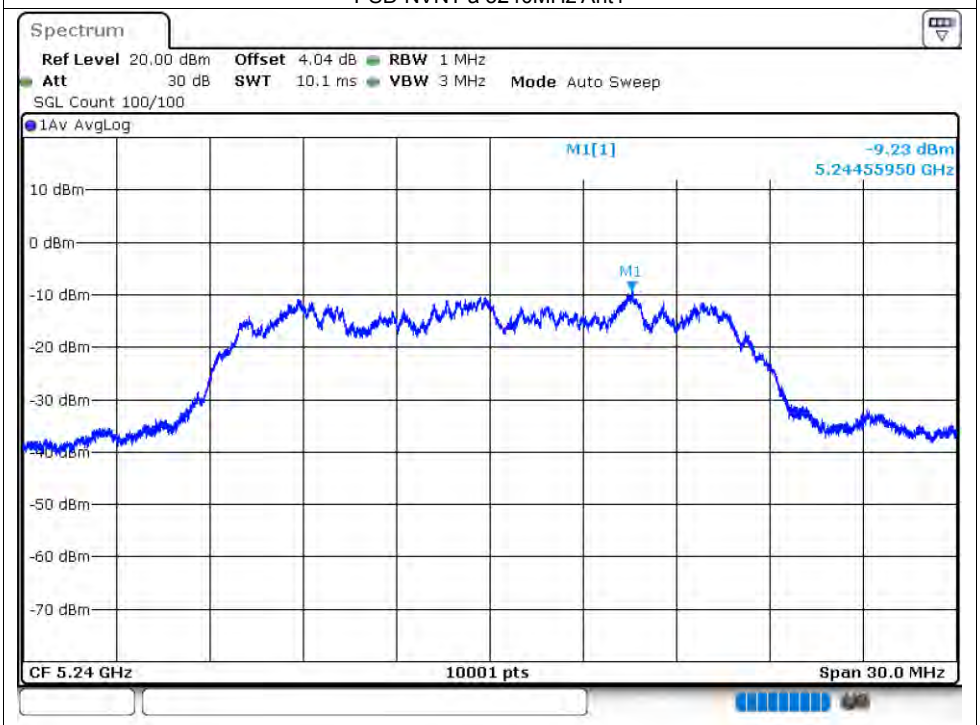
PSD NVNT a 5180MHz Ant1



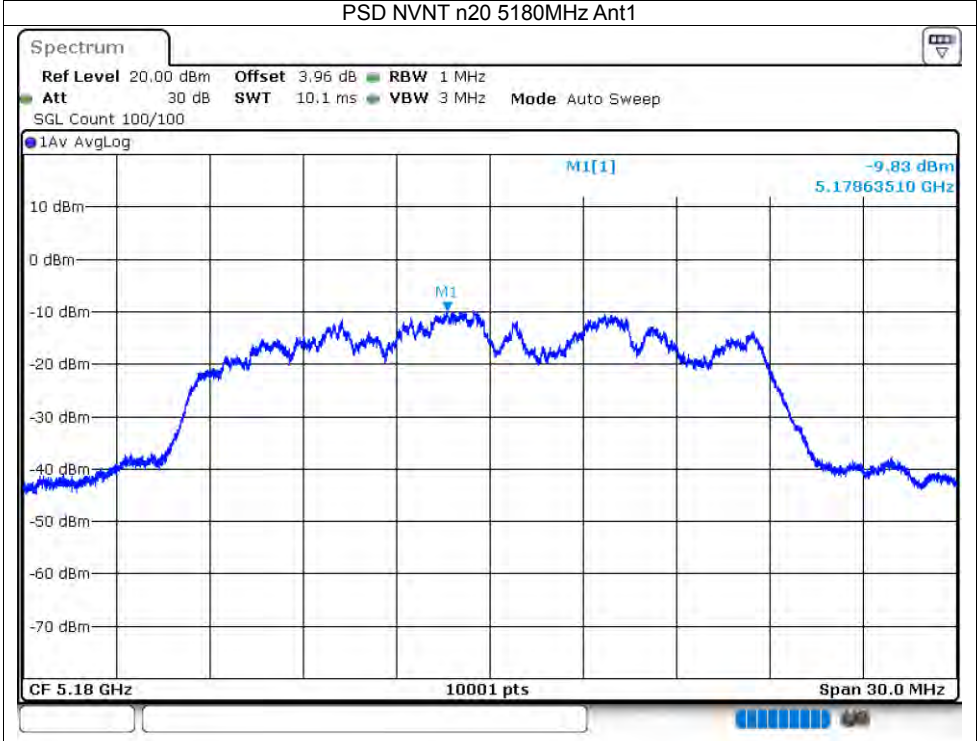
PSD NVNT a 5200MHz Ant1



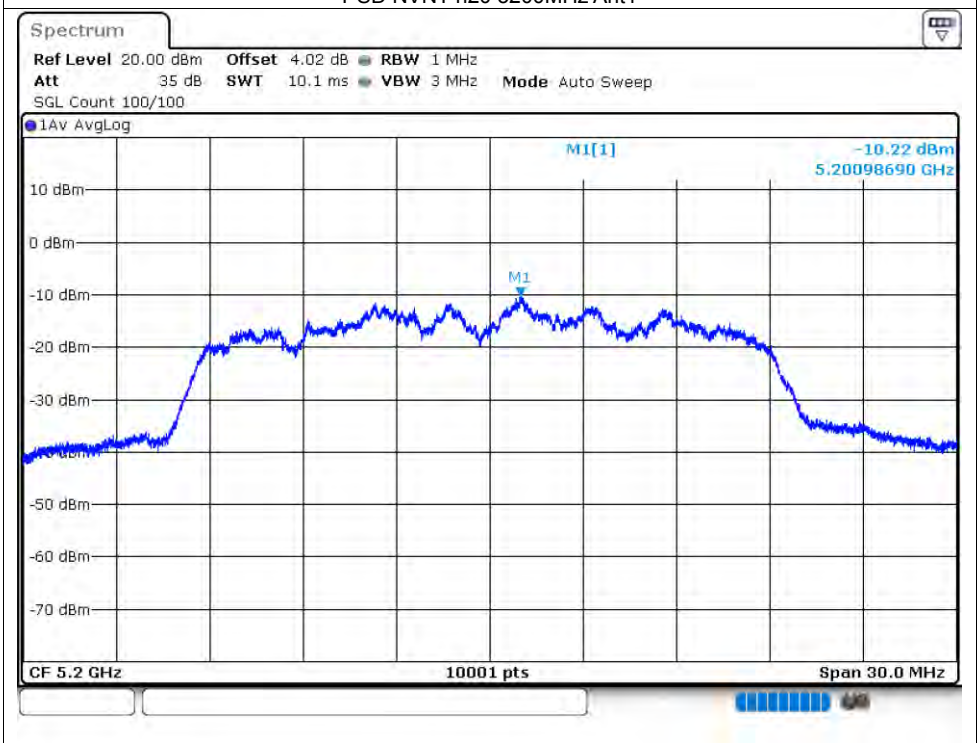
PSD NVNT a 5240MHz Ant1



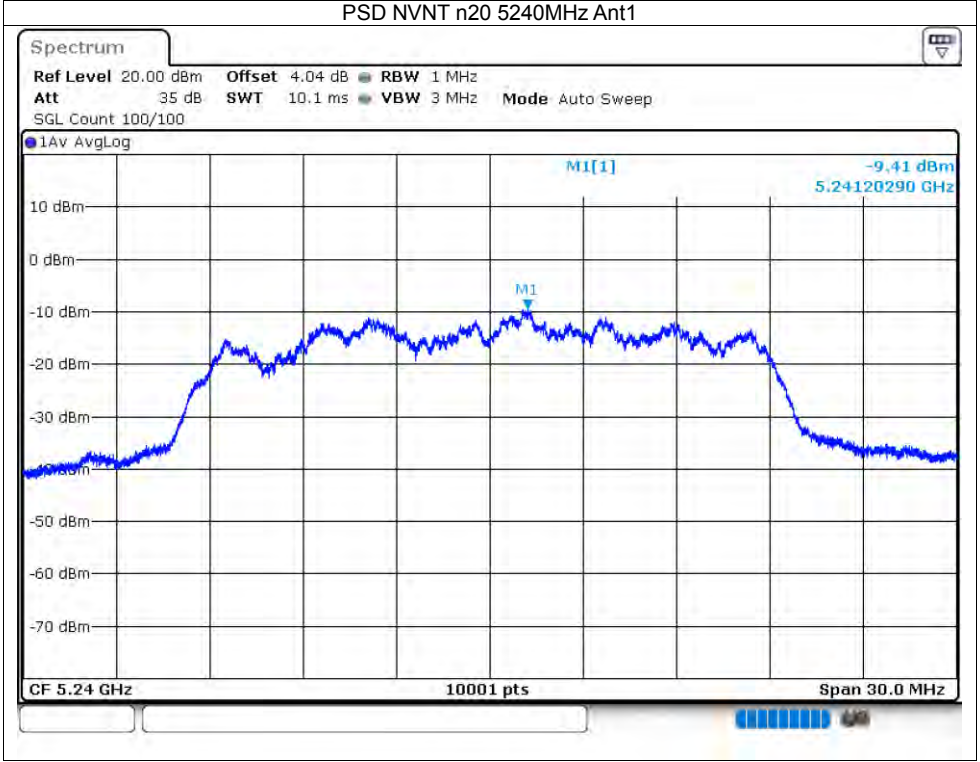
PSD NVNT n20 5180MHz Ant1



PSD NVNT n20 5200MHz Ant1

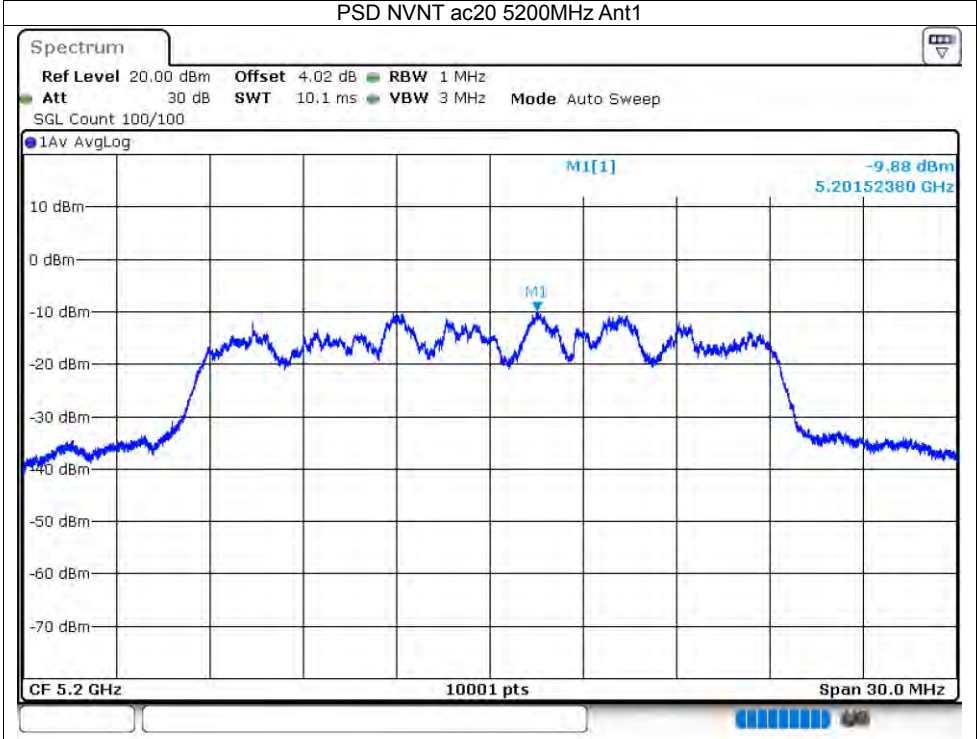


PSD NVNT n20 5240MHz Ant1

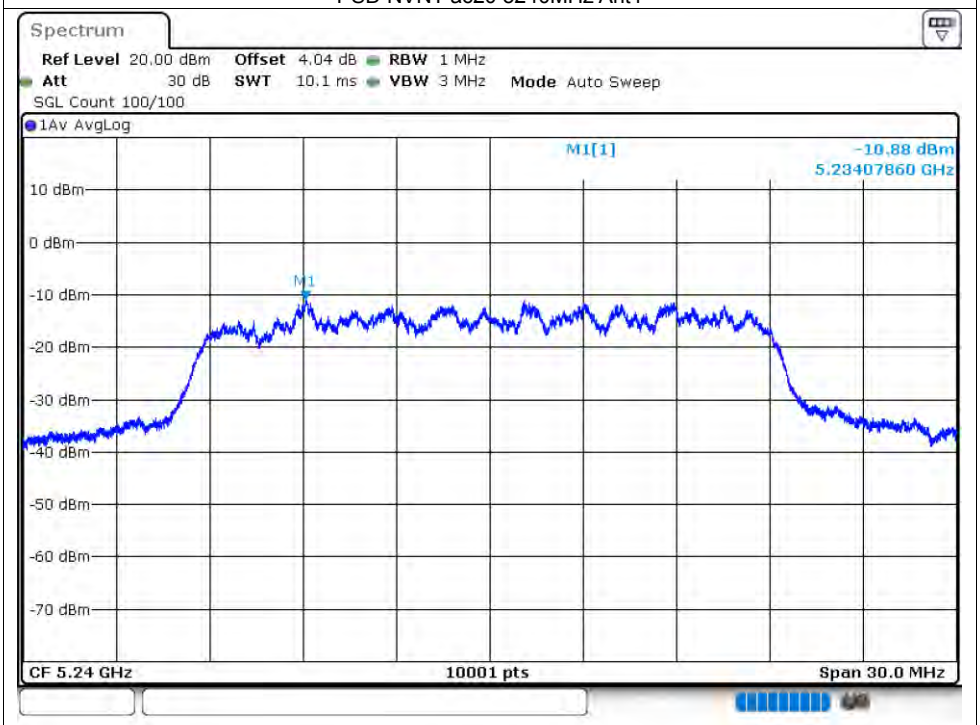


PSD NVNT ac20 5180MHz Ant1

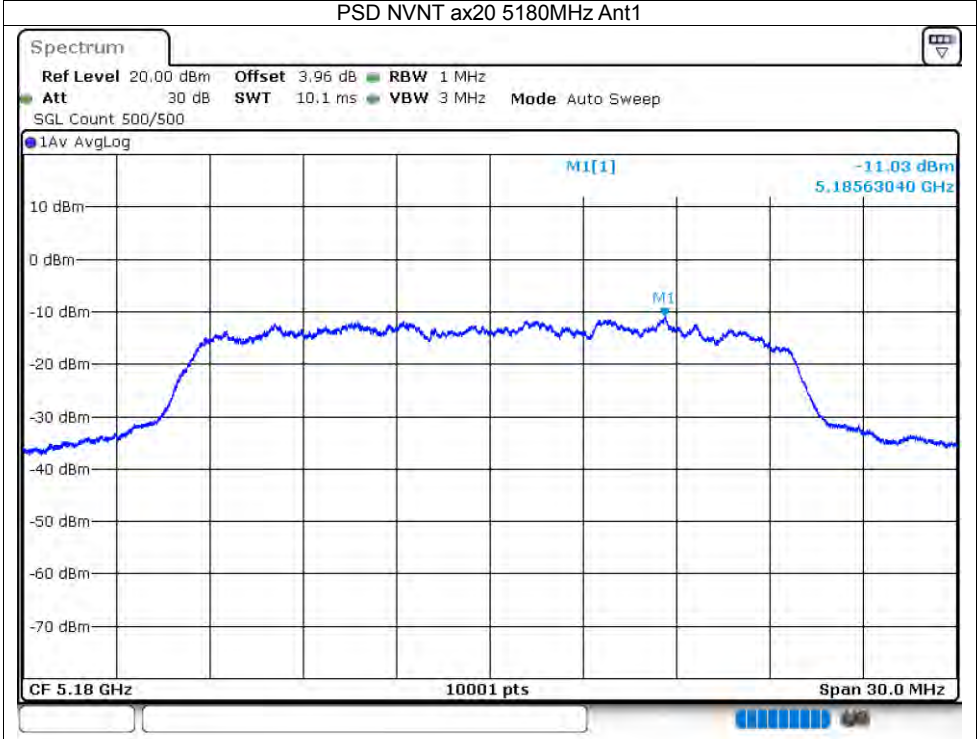
PSD NVNT ac20 5200MHz Ant1



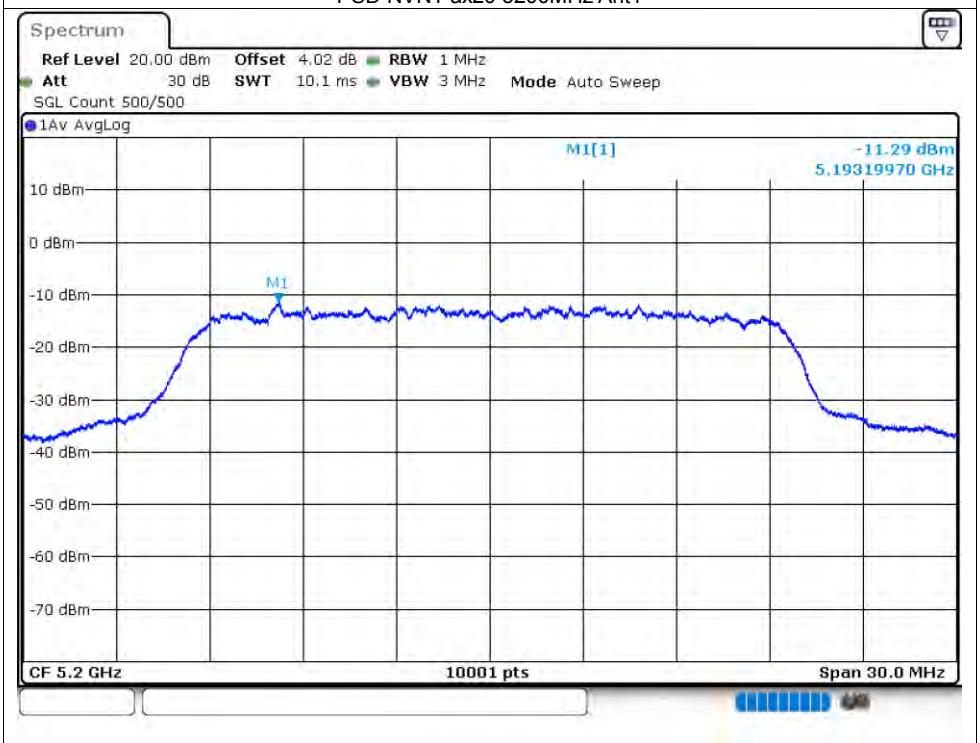
PSD NVNT ac20 5240MHz Ant1



PSD NVNT ax20 5180MHz Ant1



PSD NVNT ax20 5200MHz Ant1



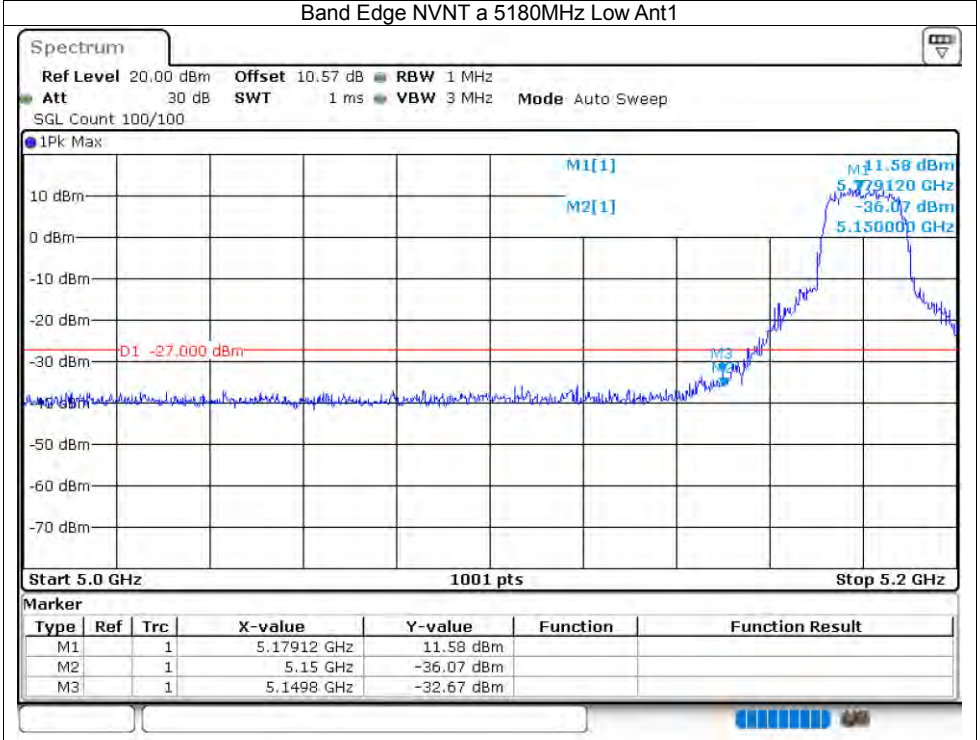
PSD NVNT ax20 5240MHz Ant1

10.1.6 BAND EDGE

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	a	5180	Ant1	-32.66	-27	Pass
NVNT	a	5240	Ant1	-36.87	-27	Pass
NVNT	n20	5180	Ant1	-35.76	-27	Pass
NVNT	n20	5240	Ant1	-35.87	-27	Pass
NVNT	ac20	5180	Ant1	-28.59	-27	Pass
NVNT	ac20	5240	Ant1	-35.75	-27	Pass
NVNT	ax20	5180	Ant1	-29.01	-27	Pass
NVNT	ax20	5240	Ant1	-34.87	-27	Pass

Test Graphs

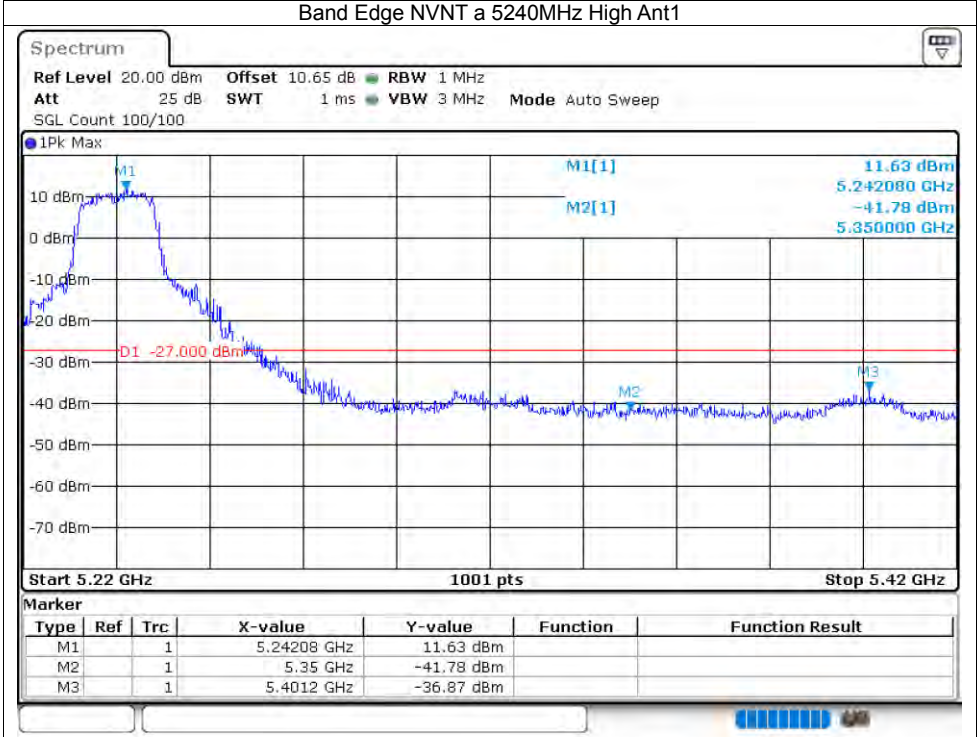
Band Edge NVNT a 5180MHz Low Ant1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.17912 GHz	11.58 dBm		
M2		1	5.15 GHz	-36.07 dBm		
M3		1	5.1498 GHz	-32.67 dBm		

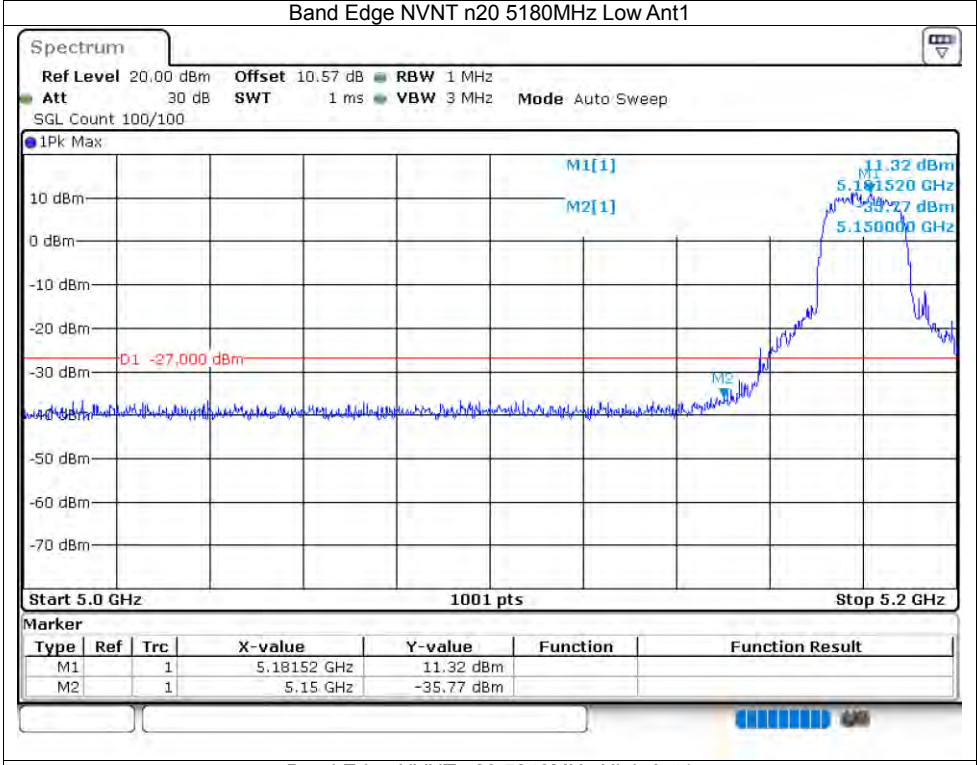
Band Edge NVNT a 5240MHz High Ant1



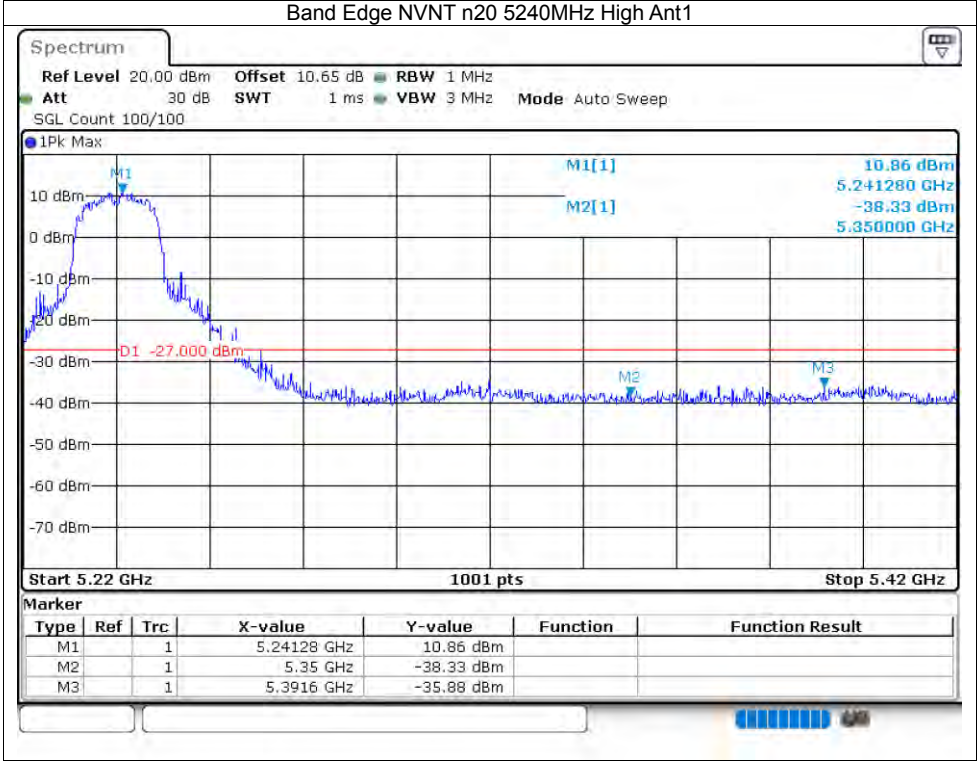
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.24208 GHz	11.63 dBm		
M2		1	5.35 GHz	-41.78 dBm		
M3		1	5.4012 GHz	-36.87 dBm		

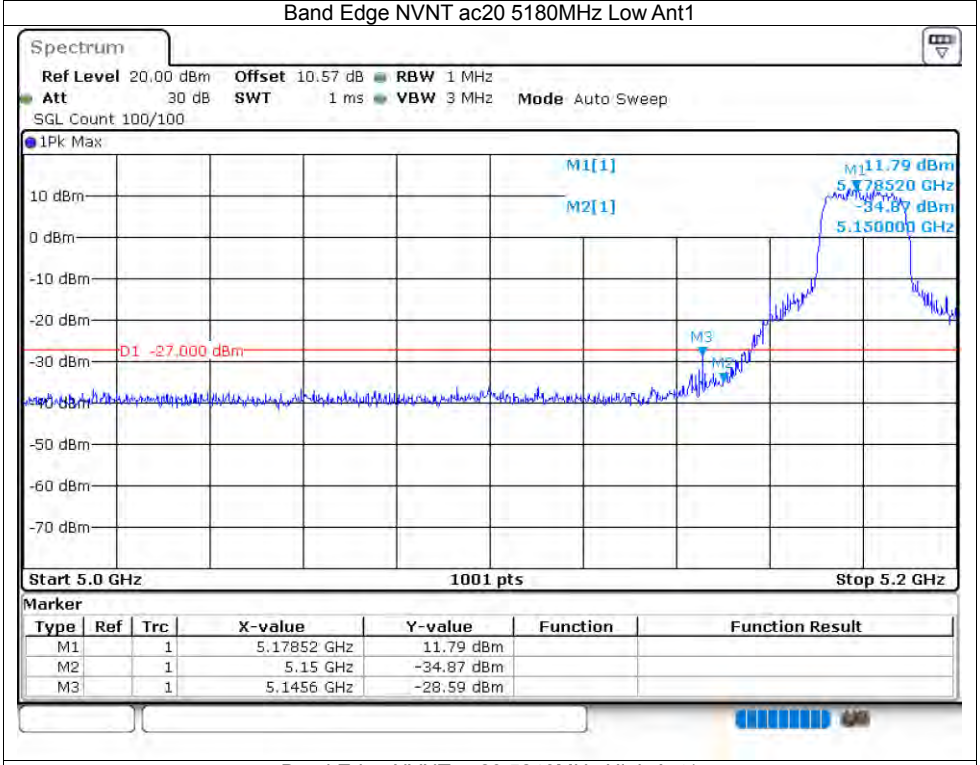
Band Edge NVNT n20 5180MHz Low Ant1



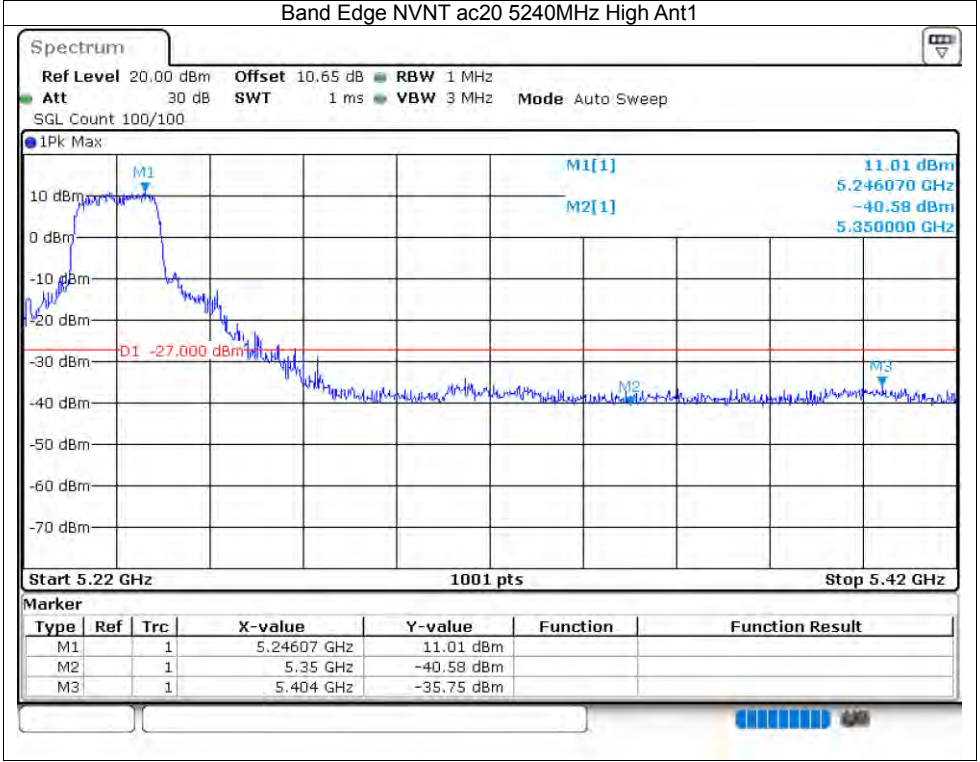
Band Edge NVNT n20 5240MHz High Ant1



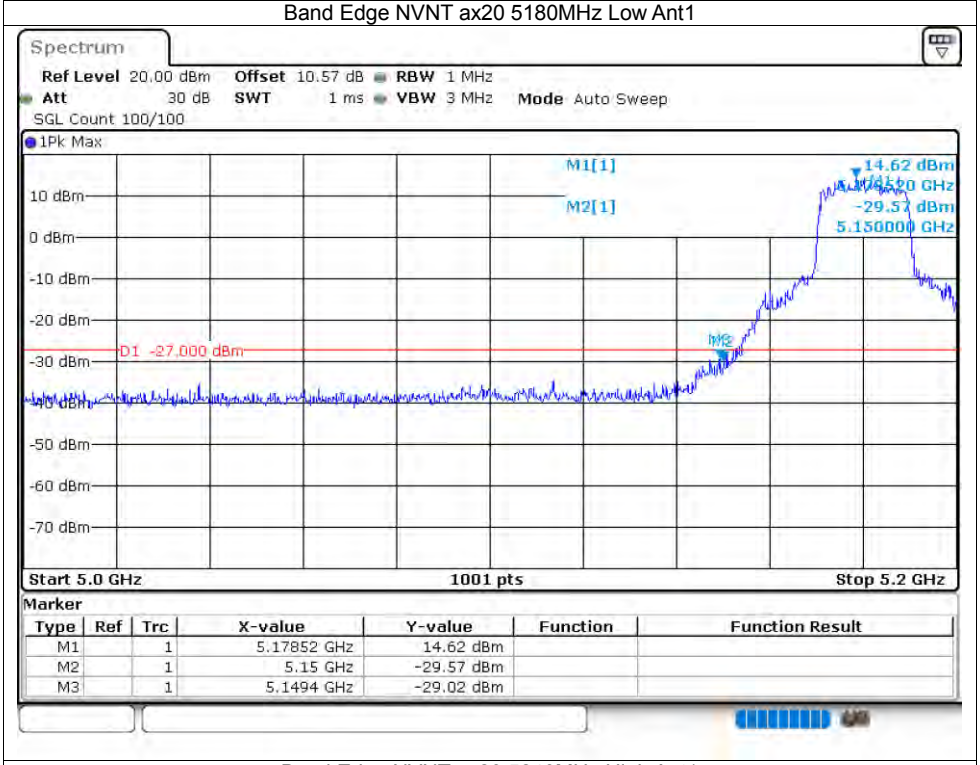
Band Edge NVNT ac20 5180MHz Low Ant1



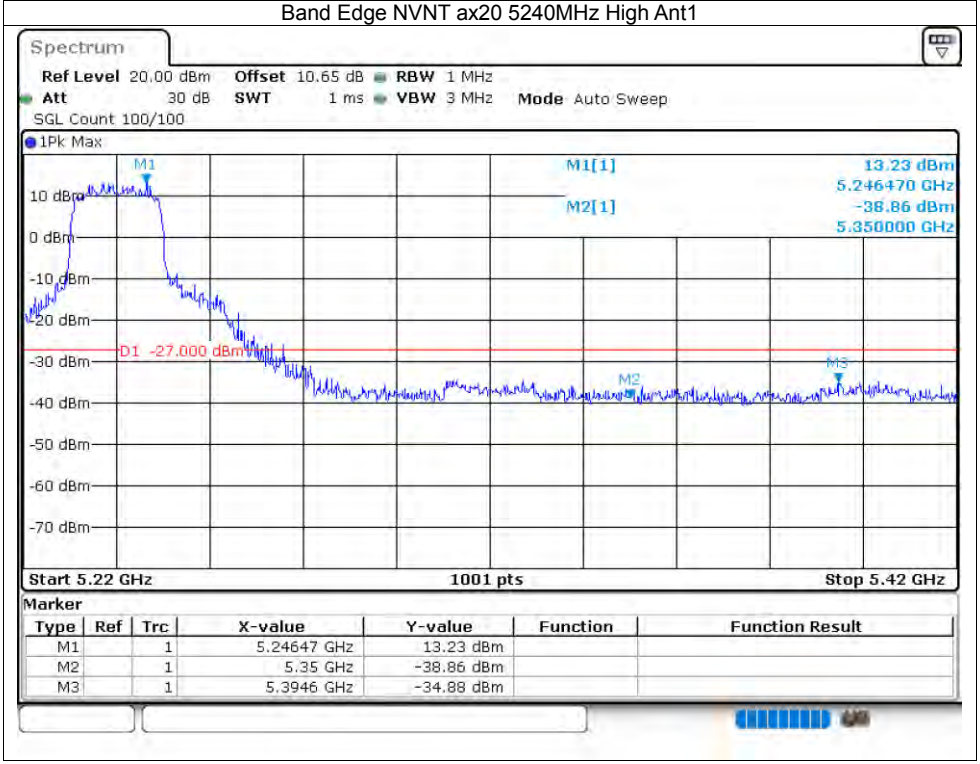
Band Edge NVNT ac20 5240MHz High Ant1



Band Edge NVNT ax20 5180MHz Low Ant1



Band Edge NVNT ax20 5240MHz High Ant1

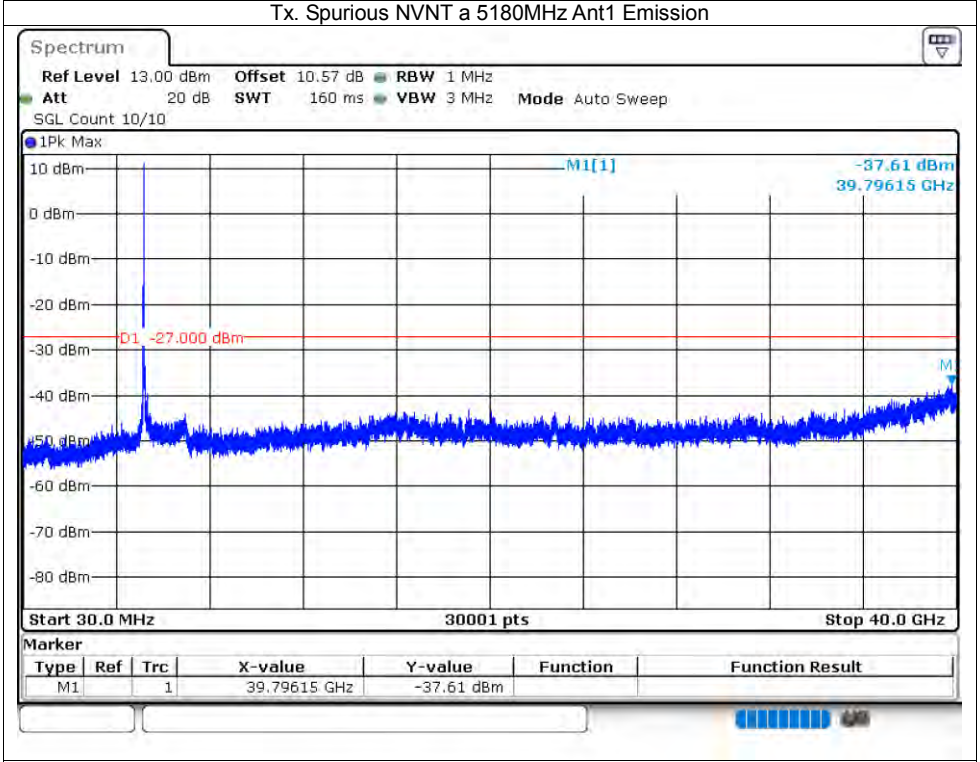


10.1.7 CONDUCTED RF SPURIOUS EMISSION

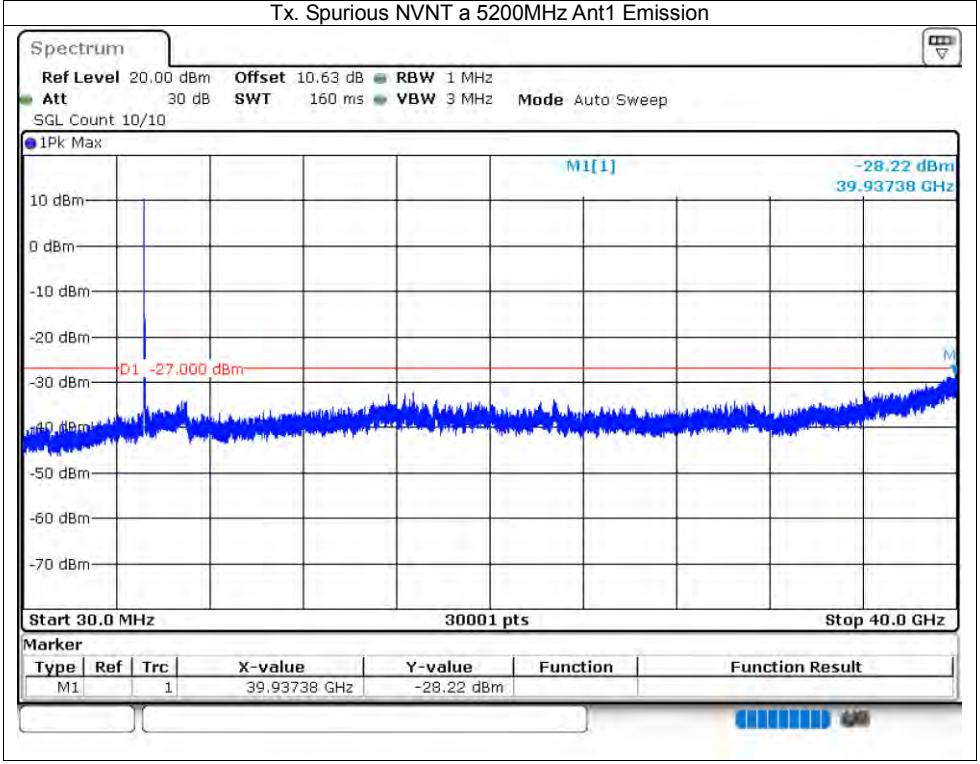
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	a	5180	Ant1	-37.6	-27	Pass
NVNT	a	5200	Ant1	-28.22	-27	Pass
NVNT	a	5240	Ant1	-28.31	-27	Pass
NVNT	n20	5180	Ant1	-28.22	-27	Pass
NVNT	n20	5200	Ant1	-27.64	-27	Pass
NVNT	n20	5240	Ant1	-27.39	-27	Pass
NVNT	ac20	5180	Ant1	-28.17	-27	Pass
NVNT	ac20	5200	Ant1	-27.61	-27	Pass
NVNT	ac20	5240	Ant1	-28.14	-27	Pass
NVNT	ax20	5180	Ant1	-27.9	-27	Pass
NVNT	ax20	5200	Ant1	-27.79	-27	Pass
NVNT	ax20	5240	Ant1	-27.68	-27	Pass

Test Graphs

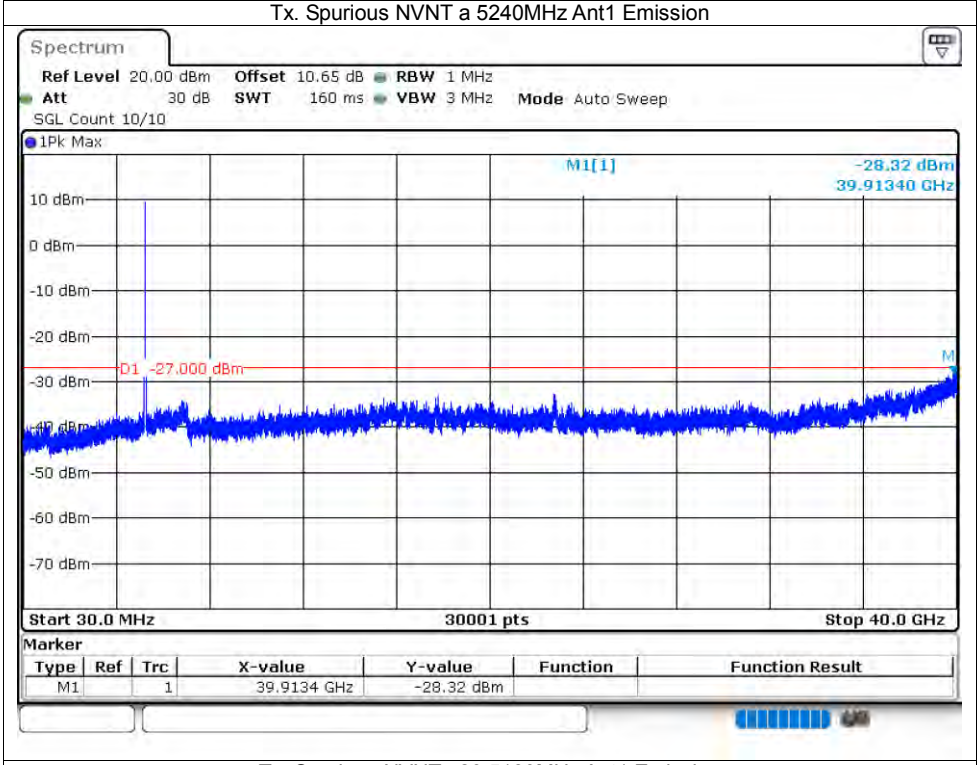
Tx. Spurious NVNT a 5180MHz Ant1 Emission



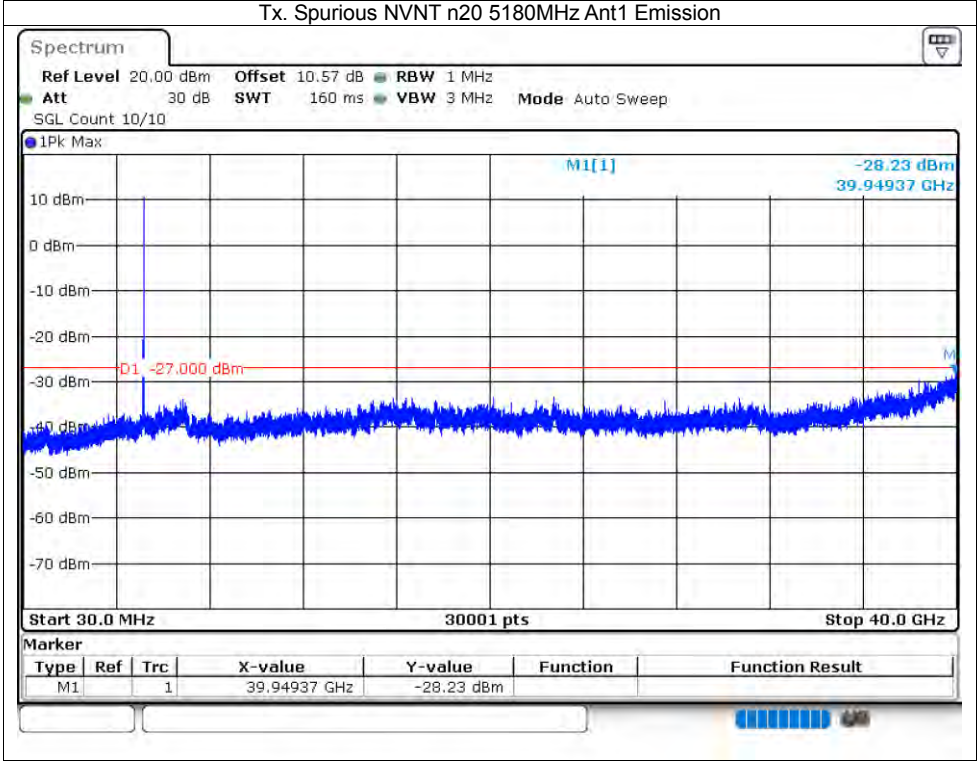
Tx. Spurious NVNT a 5200MHz Ant1 Emission



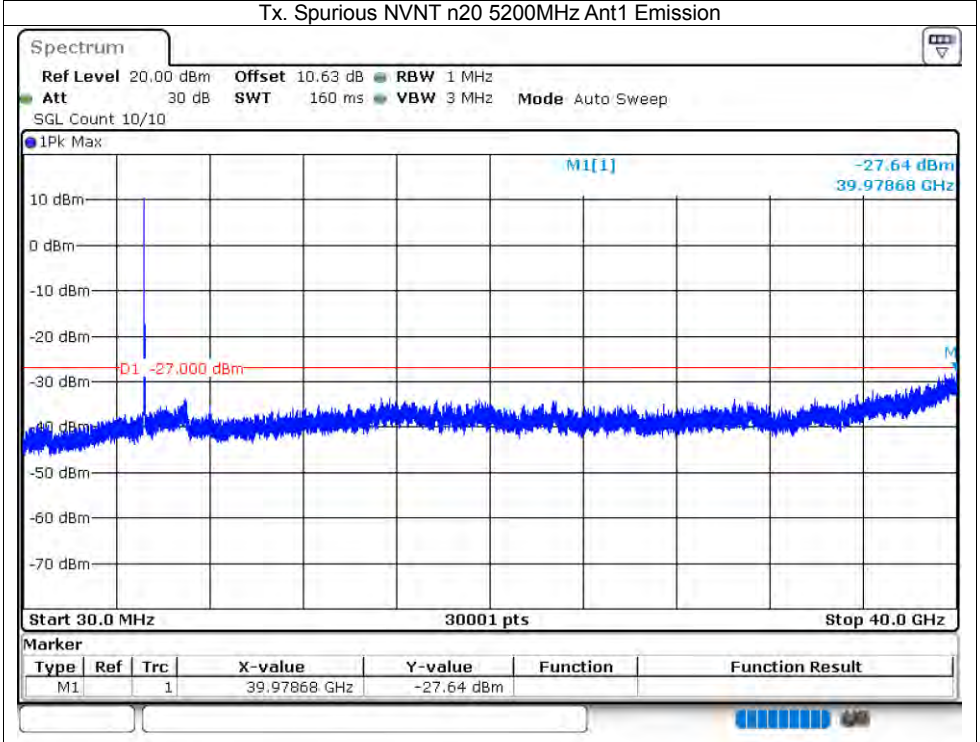
Tx. Spurious NVNT a 5240MHz Ant1 Emission



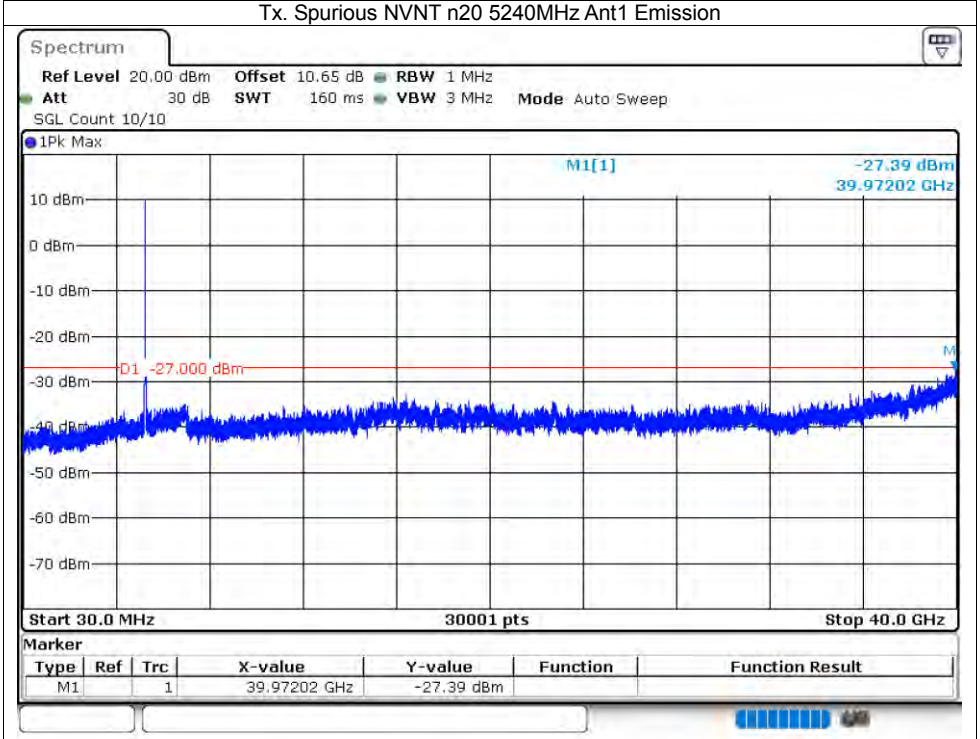
Tx. Spurious NVNT n20 5180MHz Ant1 Emission



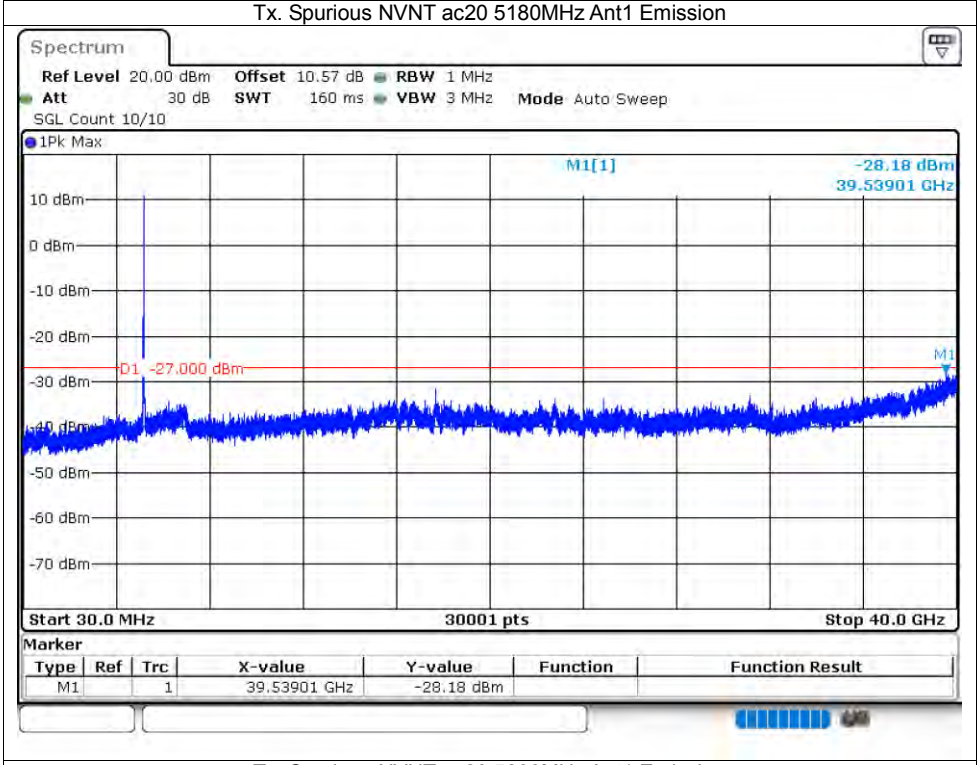
Tx. Spurious NVNT n20 5200MHz Ant1 Emission



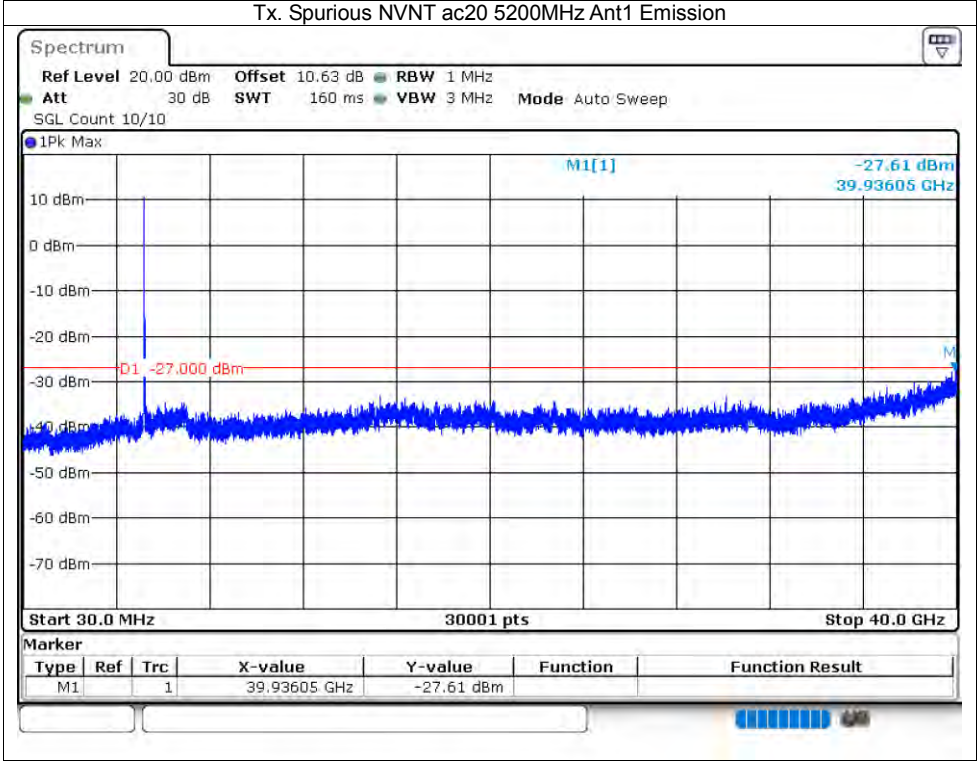
Tx. Spurious NVNT n20 5240MHz Ant1 Emission



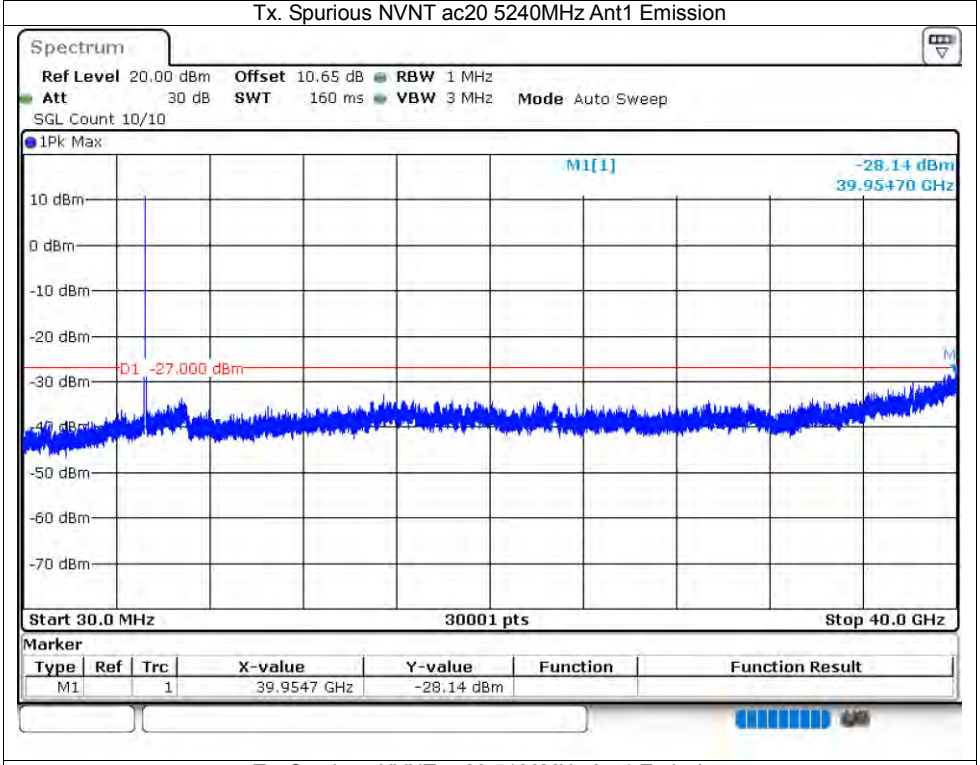
Tx. Spurious NVNT ac20 5180MHz Ant1 Emission



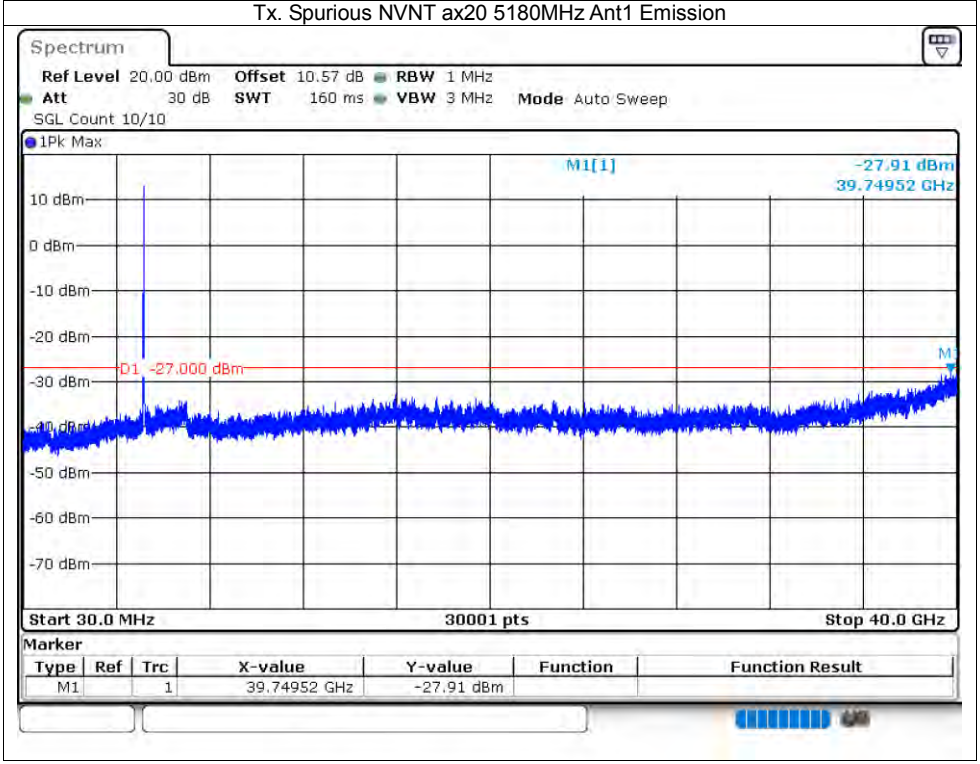
Tx. Spurious NVNT ac20 5200MHz Ant1 Emission



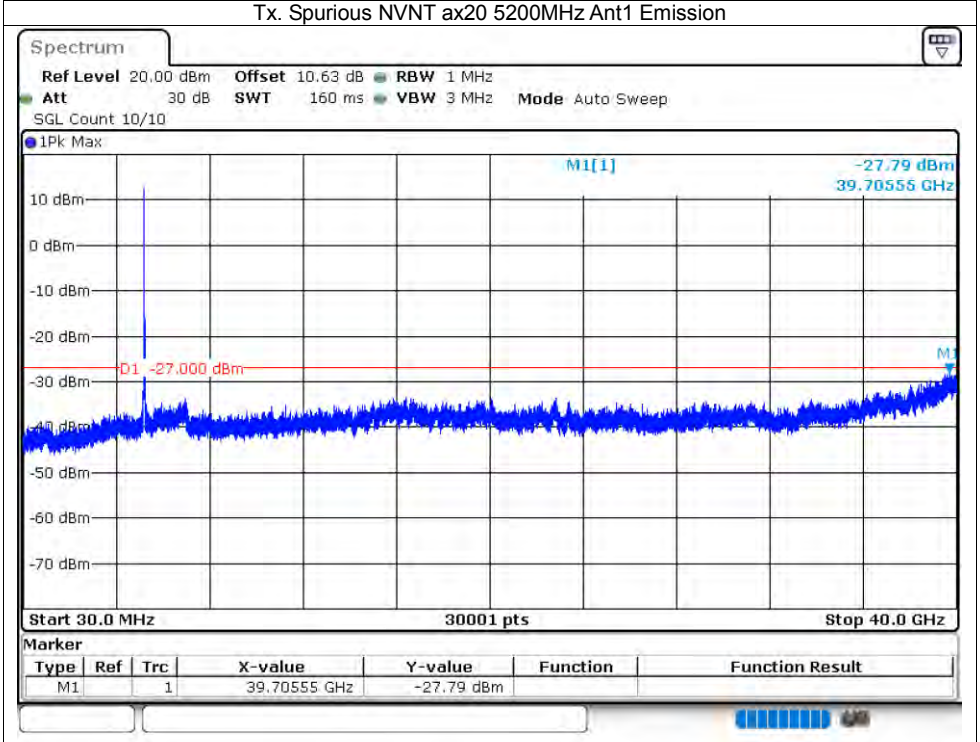
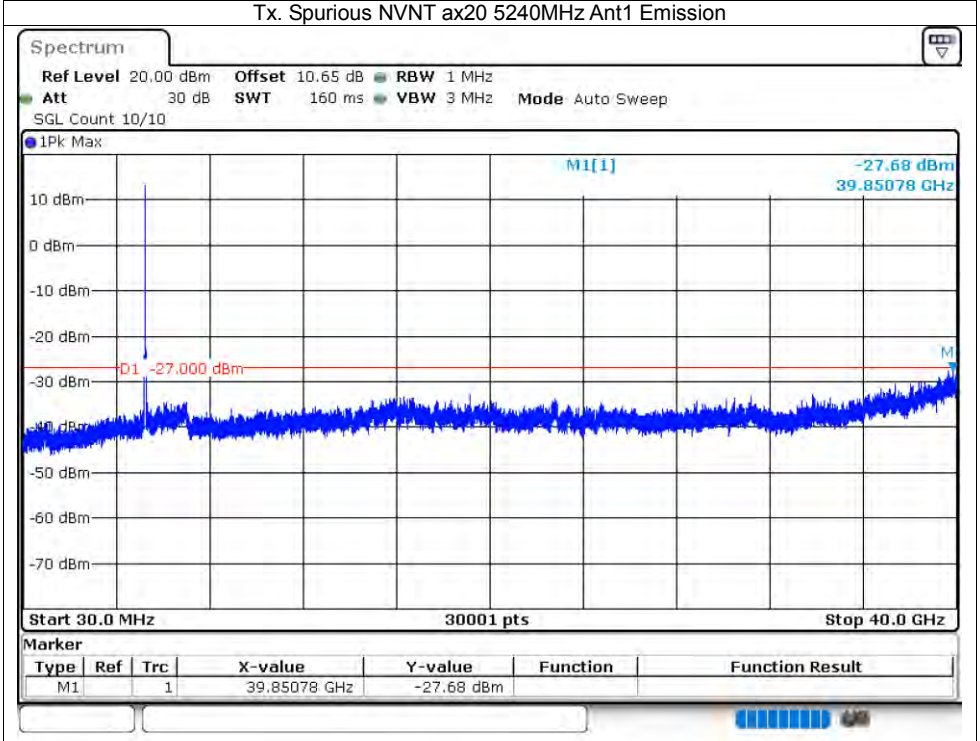
Tx. Spurious NVNT ac20 5240MHz Ant1 Emission



Tx. Spurious NVNT ax20 5180MHz Ant1 Emission



Tx. Spurious NVNT ax20 5200MHz Ant1 Emission



Tx. Spurious NVNT ax20 5240MHz Ant1 Emission