FCC TEST REPORT

FCC ID: 2AZFE-AAO-MOVIN

On Behalf of

Shenzhen Shadow Crown Technology Co., Ltd.

LED Projector

Model No.: YG600-Movin, YG681, YG621, YG620, YG651

Prepared for	:	Shenzhen Shadow Crown Technology Co., Ltd.
Address	:	A9 East 5th floor, Industrial Building, Longwang Miao, Fuyong street, Baoan district, Shenzhen

Prepared By	:	Shenzhen Alpha Product Testing Co., Ltd.
Address	:	Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

Report Number	:	A2306150-C01-R04
Date of Receipt	:	June 19, 2023
Date of Test	:	June 19, 2023- July 20, 2023
Date of Report	:	July 20, 2023
Version Number	:	V0

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TEST REPORT DECLARATION

Applicant	:	Shenzhen Shadow Crown Technology Co., Ltd.
Address	:	A9 East 5th floor, Industrial Building, Longwang Miao, Fuyong street, Baoan district, Shenzhen
Manufacturer	:	Shenzhen Shadow Crown Technology Co., Ltd.
Address	:	A9 East 5th floor, Industrial Building, Longwang Miao, Fuyong street, Baoan district, Shenzhen
EUT Description	:	LED Projector
	(A) Model No.	: YG600-Movin, YG681, YG621, YG620, YG651
	(B) Trademark	: **/**

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart E

ANSI C63.4:2014, ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart E limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....:	Yannis Wen Project Engineer	
Approved by (name + signature).....:	Reak Yang Project Manager	
Date of issue.....:	July 20, 2023	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	July 20, 2023	Initial released Issue	Yannis Wen

1 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	Section 15.203 Section 7.1.4 RSS-Gen Issue 5	PASS
AC Power Line Conducted Emission	Section 15.207 Section 7.2.4 RSS-GEN(8.8), ANSI C63.10	PASS
Max Transmit Power	Section 15.407(a), RSS-247 5.4(2)	PASS
Power Spectral Density	Section 15.407(a), RSS-247 5.2(2)	PASS
Undesirable Emission	Section 15.407(b), RSS-247 5.5	PASS
Radiated Emission	Section 15.407(b)&15.209 Section 5.5 RSS-Gen(8.9), RSS-247(5.5), ANSI C63.10	PASS
Emission bandwidth and occupied bandwidth	47 CFR Part 15.407(e)	PASS
Band Edge	15.205, RSS-247 Issue 2, ANSI C63.10	PASS
Frequency Stability	15.407(f), RSS-GEN(6.11)	PASS

Remark:

1. Pass: The EUT complies with the essential requirements in the standard.

2. Frequency Stability: The manufacturer stated in the user's manual.

3. The conclusion of this test report is judged by actual test data without considering measurement uncertainty.

1.1 Measurement Uncertainty

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.74dB(Polarize: V)
	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (25GHz to 40GHz)	4.31dB(Polarize: V)
	4.30dB(Polarize: H)
Uncertainty for radio frequency	5.06×10^{-8}GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2 General Information

2.1 General Description of EUT

EUT Name	:	LED Projector
Model No.	:	YG600-Movin, YG681, YG621, YG620, YG651
DIFF.	:	There is no difference except the name of the model. All tests are made with the YG600-Movin model.
Power supply	:	AC 120V/60Hz

Radio Technology	:	5G WIFI
Operation Frequency	:	802.11a/n(HT20): 5180~5240MHz 802.11n(HT40): 5190~5230MHz
Channel separation	:	20MHz for 802.11a/ 802.11n(HT20) 40MHz for 802.11n(HT40)
Modulation technology:	:	IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Type	:	Internal antenna 1, max gain 4.96dBi Internal antenna 2, max gain 4.96dBi The antenna MIMO combining gain is 7.96dBi. (Antenna information is provided by applicant.)

Software version	:	V1.0
Hardware version	:	V1.0
Intend use environment	:	Residential, commercial and light industrial environment

2.2 Test mode

Transmitting mode Keep the EUT in transmitting with modulation.
EUT was test with 99% duty cycle at its maximum power control level.

Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

2.3 Test Facility

Shenzhen Alpha Product Testing Co., Ltd
Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293961

July 25, 2017 Certificated by IC
Registration Number: 12135A

2.4 Description of Support Units

Accessories : /
Manufacturer : /
Model : /
Ratings : /

2.5 Deviation from Standards

None.

2.6 Abnormalities from Standard Conditions

None.

2.7 Other Information Requested by the Customer

None.

2.8 Additional instructions

Software (Used for test) from client

Channel	Power level
Lowest	Default
Middle	Default
Highest	Default

3 Test Instruments list

Equipment	Manufacture	Model No.	Firmware version	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2022.05.17	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2022.08.22	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2022.08.22	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-102082-Wa	2022.08.22	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2022.08.22	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2021.08.30	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2021.08.30	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00059	2021.08.30	2Year
RF Cable	Resenberger	Cable 1	/	RE1	2022.08.22	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2022.08.22	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2022.08.22	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2022.08.22	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2022.08.22	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2022.08.22	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2022.08.23	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	/	00946	2021.08.30	2 Year
Preamplifier	SKET	LNPA_1840-50	/	SK2018101801	2022.08.22	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2022.08.22	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2022.08.22	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2022.08.22	1 Year
Temp. & Humid. Chamber	Teelong	WHTH-1000-40-880	/	TL-20191205-01	2022.07.28	1 Year
Adjustable attenuator	MWRFtest	N/A	/	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	/	N/A	N/A	N/A

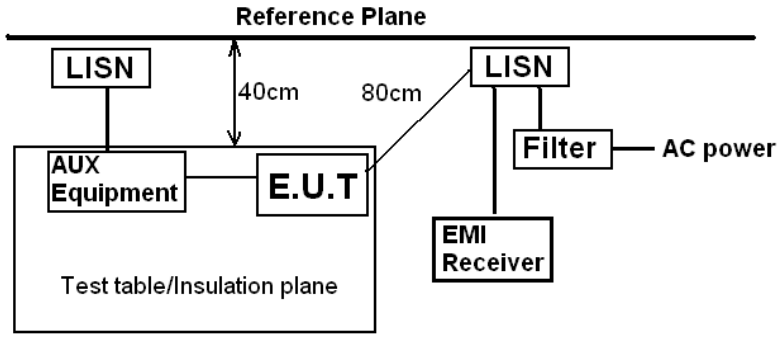
Software Information			
Test Item	Software Name	Manufacturer	Version
RE	EZ-EMC	Farad	Alpha-3A1
CE	EZ-EMC	Farad	Alpha-3A1
RF-CE	MTS 8310	MW	V2.0.0.0

4 Test results and Measurement Data

4.1 Antenna requirement:

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
E.U.T Antenna:	
The antenna is internal antenna. The best case gain of the antenna is 4.96dBi for 5.15~5.25GHz.	

4.2 Conducted Emissions

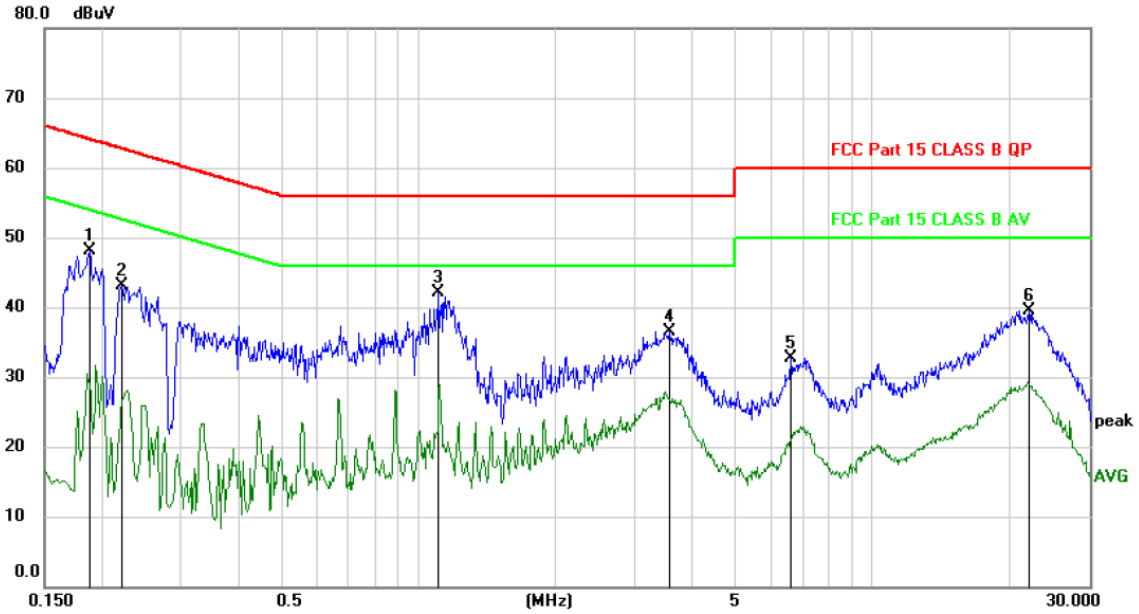
<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>150KHz to 30MHz</td></tr>
<tr><td>Class / Severity:</td><td>Class B</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9KHz, VBW=30KHz</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* Decreases with the logarithm of the frequency.
</td></tr>
<tr><td>Test procedure</td><td>The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</td></tr>
<tr><td>Test setup:</td><td> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 5.10 for details</td></tr>
<tr><td>Test mode:</td><td>Refer to section 5.3 for details</td></tr>
<tr><td>Test results:</td><td>Pass</td></tr>
</table>

Measurement Data

An initial pre-scan was performed on the line and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Line:

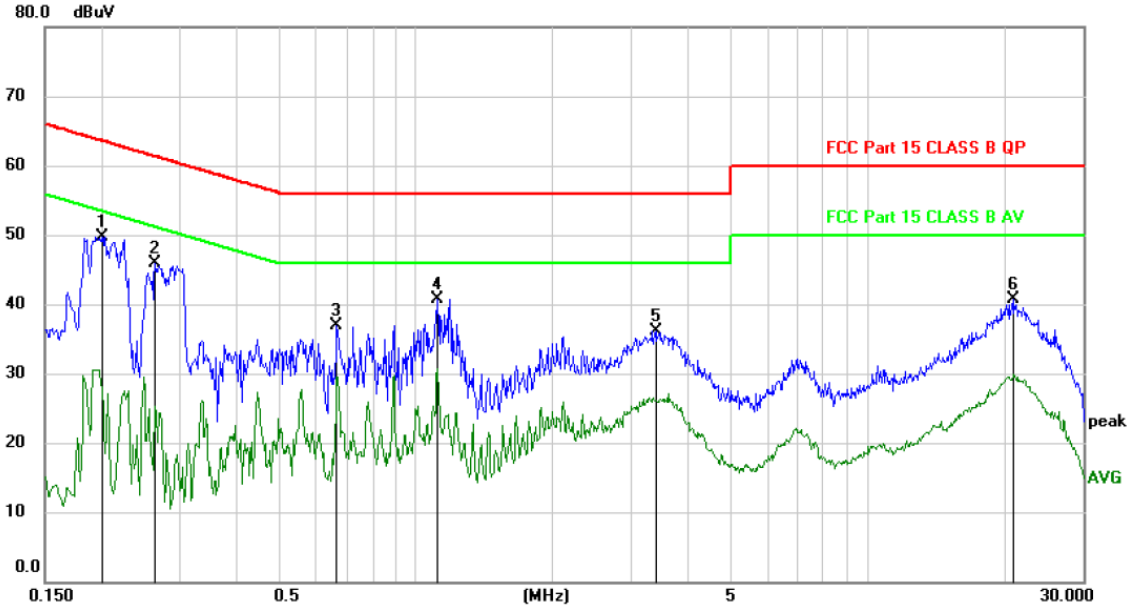


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1890	38.16	9.92	48.08	64.08	-16.00	peak	
2		0.2220	33.16	9.94	43.10	62.74	-19.64	peak	
3	*	1.1100	32.15	9.90	42.05	56.00	-13.95	peak	
4		3.5670	26.63	9.96	36.59	56.00	-19.41	peak	
5		6.6089	22.60	10.10	32.70	60.00	-27.30	peak	
6		22.1700	29.09	10.46	39.55	60.00	-20.45	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Neutral:



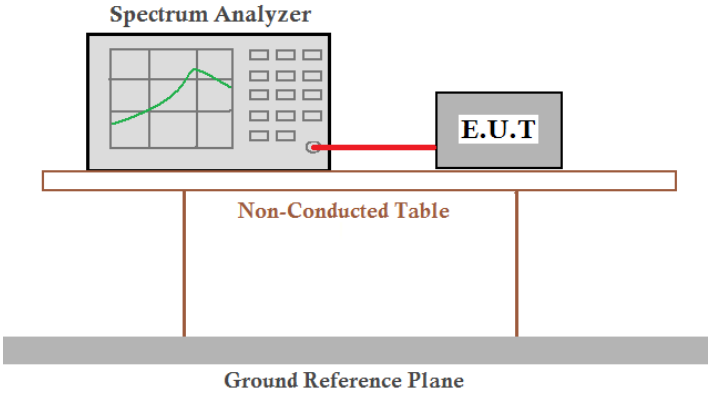
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.2010	39.85	9.92	49.77	63.57	-13.80	peak	
2		0.2640	35.92	9.96	45.88	61.30	-15.42	peak	
3		0.6660	26.99	9.93	36.92	56.00	-19.08	peak	
4		1.1129	30.83	9.90	40.73	56.00	-15.27	peak	
5		3.3929	26.09	9.96	36.05	56.00	-19.95	peak	
6		20.9757	30.23	10.46	40.69	60.00	-19.31	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Note: All modes and channels have been tested and only the A 5180MHz mode with the worst data is listed.

4.3 Emission Bandwidth and 99% Occupied Bandwidth

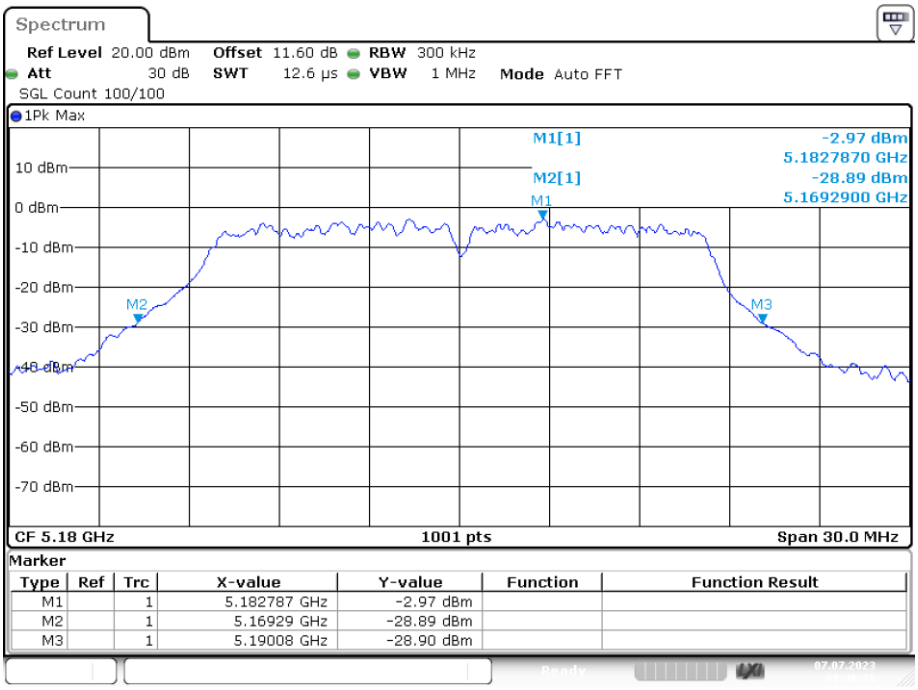
Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01
Limit:	N/A
Test setup:	
Test procedure:	According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data:

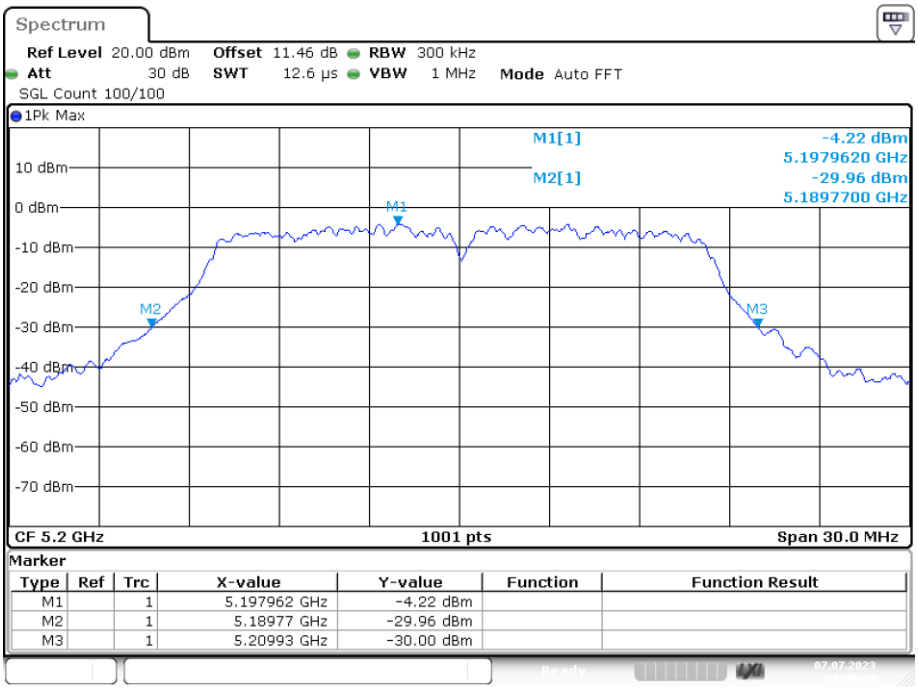
Band 1 (5150-5250 MHz):
-26dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-26 dB Bandwidth (MHz)
NVNT	a	5180	Ant1	20.79
NVNT	a	5200	Ant1	20.16
NVNT	a	5240	Ant1	20.61
NVNT	n20	5180	Ant1	21.03
NVNT	n20	5200	Ant1	20.82
NVNT	n20	5240	Ant1	21.39
NVNT	n40	5190	Ant1	38.28
NVNT	n40	5230	Ant1	37.86

-26dB Bandwidth NVNT a 5180MHz Ant1



-26dB Bandwidth NVNT a 5200MHz Ant1



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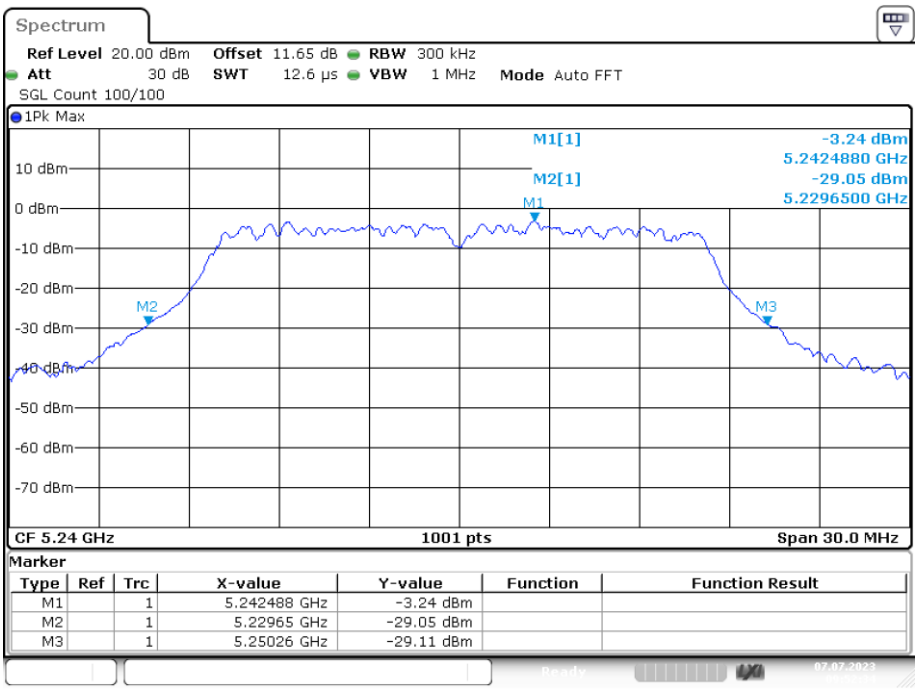
-26dB Bandwidth NVNT a 5240MHz Ant1



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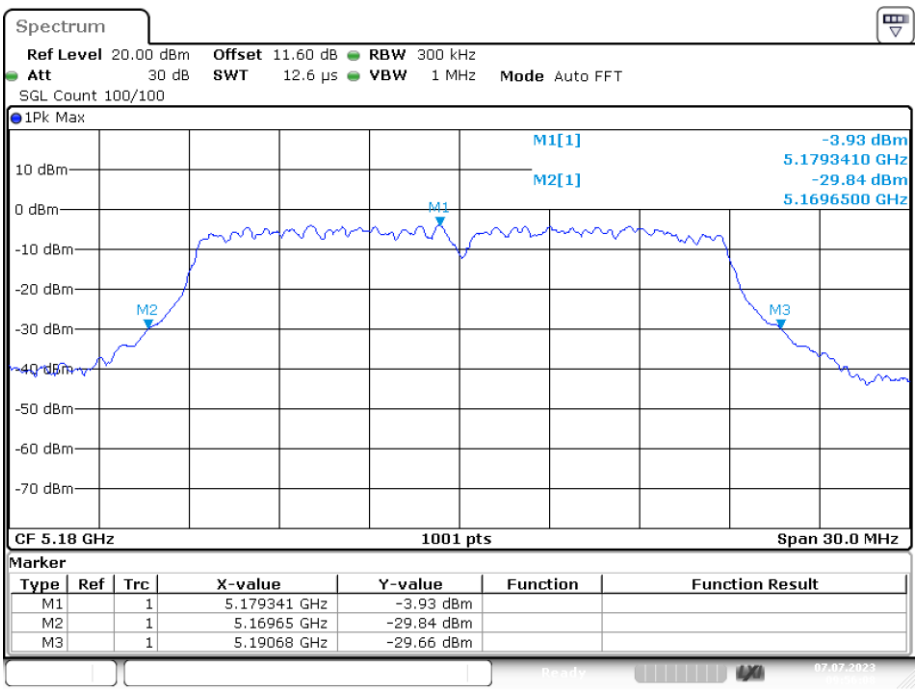
-26dB Bandwidth NVNT n20 5180MHz Ant1



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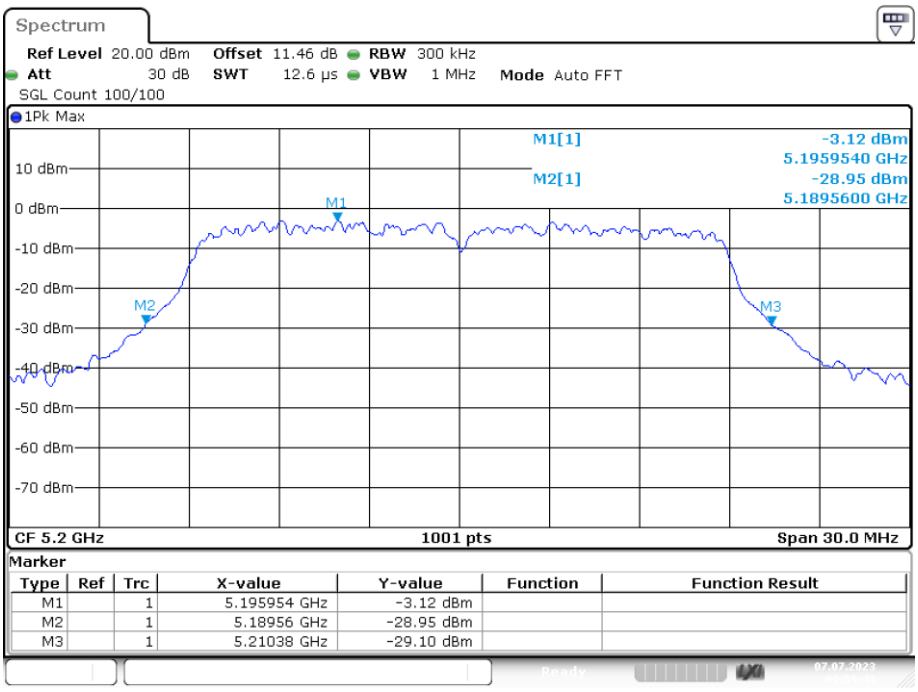
-26dB Bandwidth NVNT n20 5200MHz Ant1



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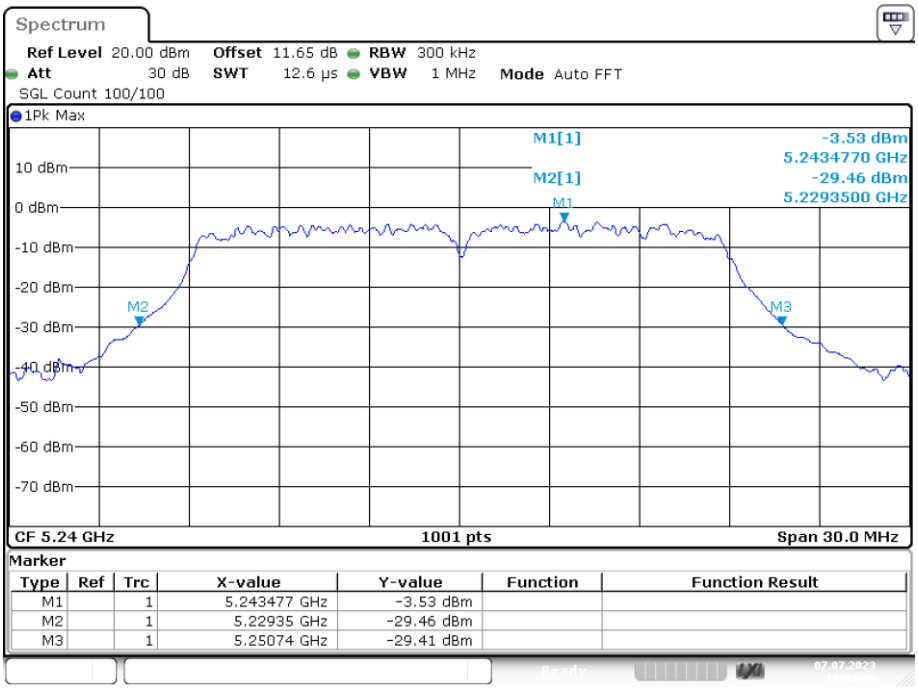
-26dB Bandwidth NVNT n20 5240MHz Ant1



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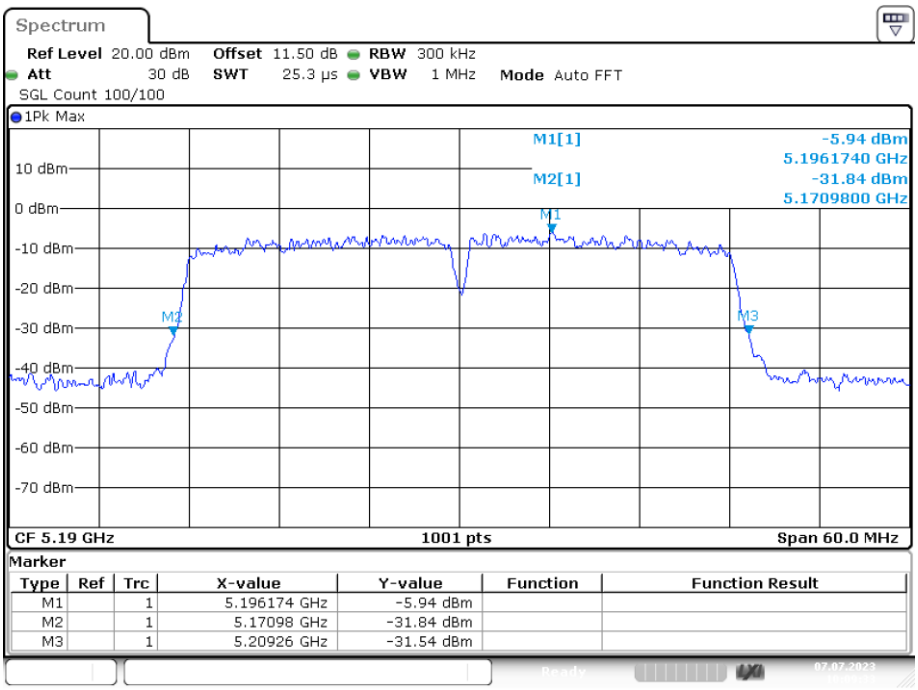
-26dB Bandwidth NVNT n40 5190MHz Ant1



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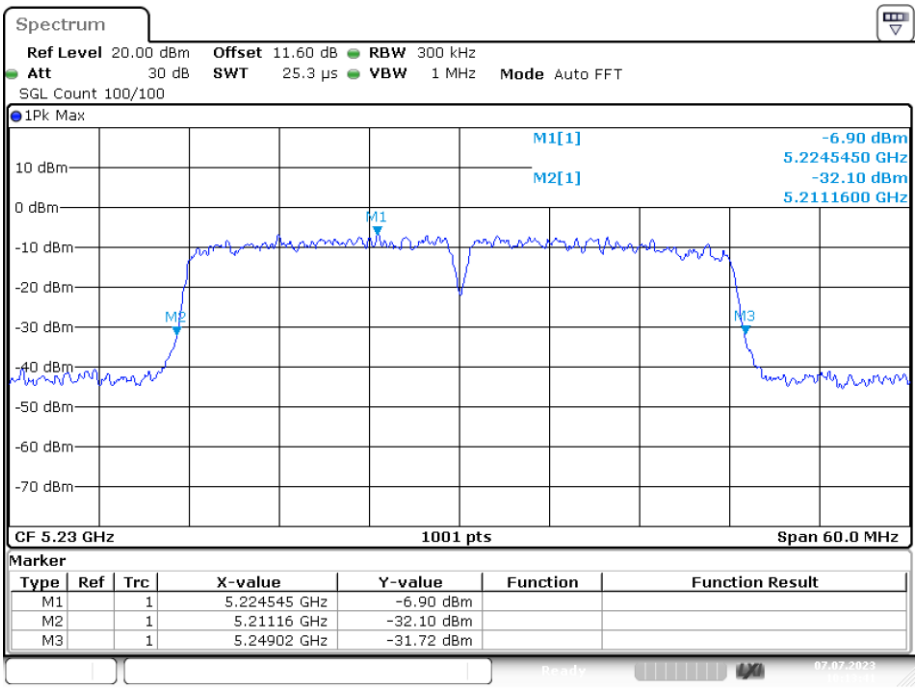
-26dB Bandwidth NVNT n40 5230MHz Ant1



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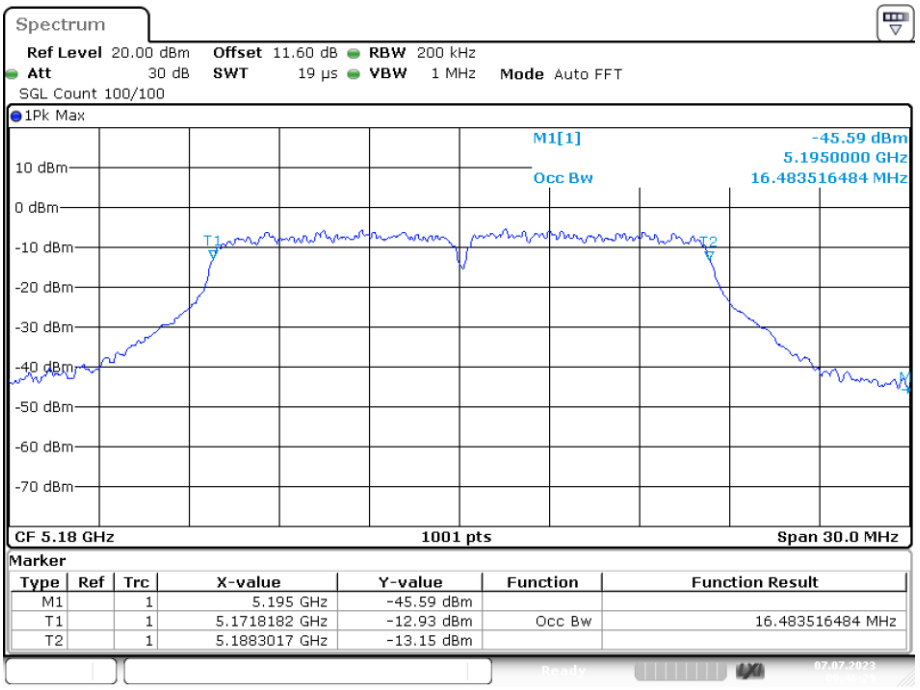
Occupied Channel Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	a	5180	Ant1	16.484
NVNT	a	5200	Ant1	16.454
NVNT	a	5240	Ant1	16.484
NVNT	n20	5180	Ant1	17.622
NVNT	n20	5200	Ant1	17.622
NVNT	n20	5240	Ant1	17.592
NVNT	n40	5190	Ant1	35.724
NVNT	n40	5230	Ant1	35.844

OBW NVNT a 5180MHz Ant1



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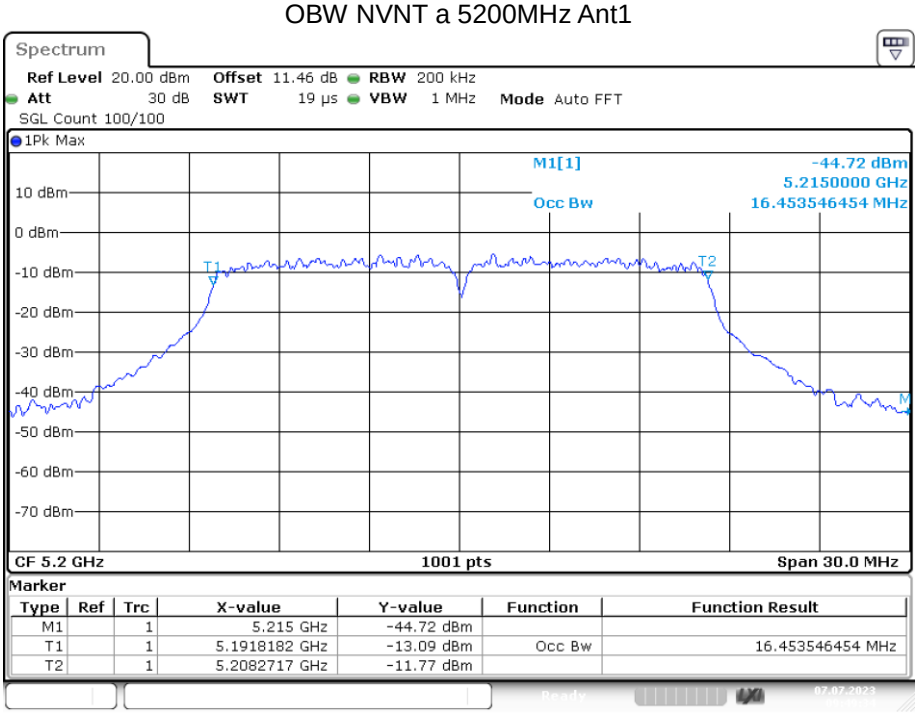
OBW NVNT a 5200MHz Ant1



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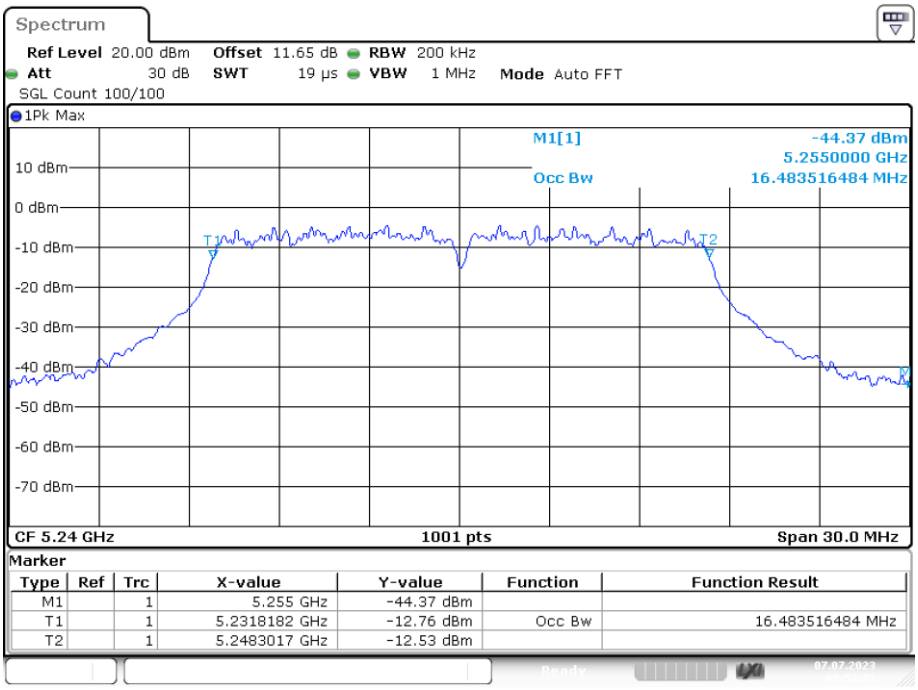
OBW NVNT a 5240MHz Ant1



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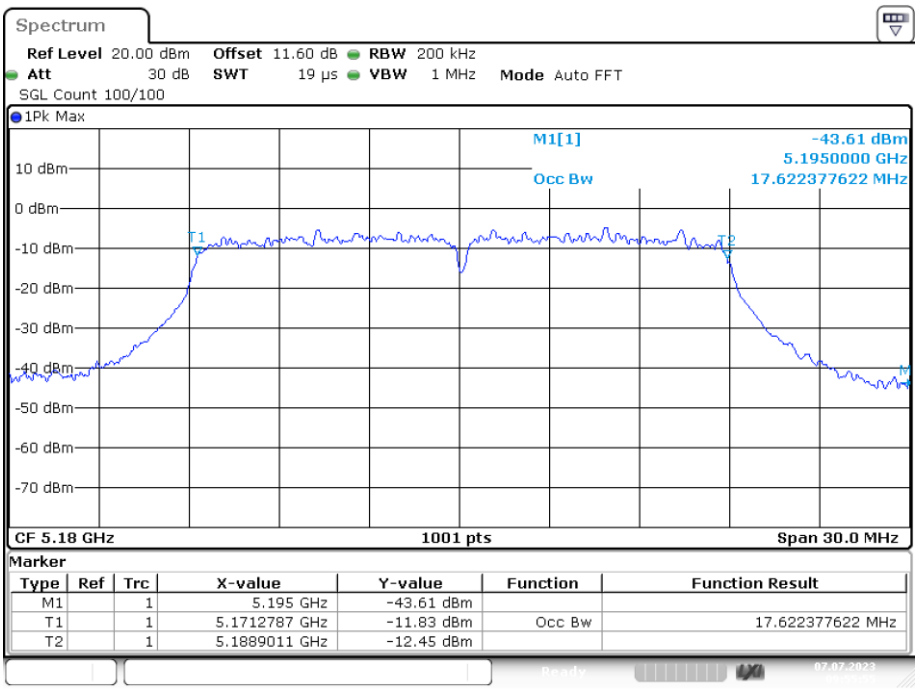
OBW NVNT n20 5180MHz Ant1



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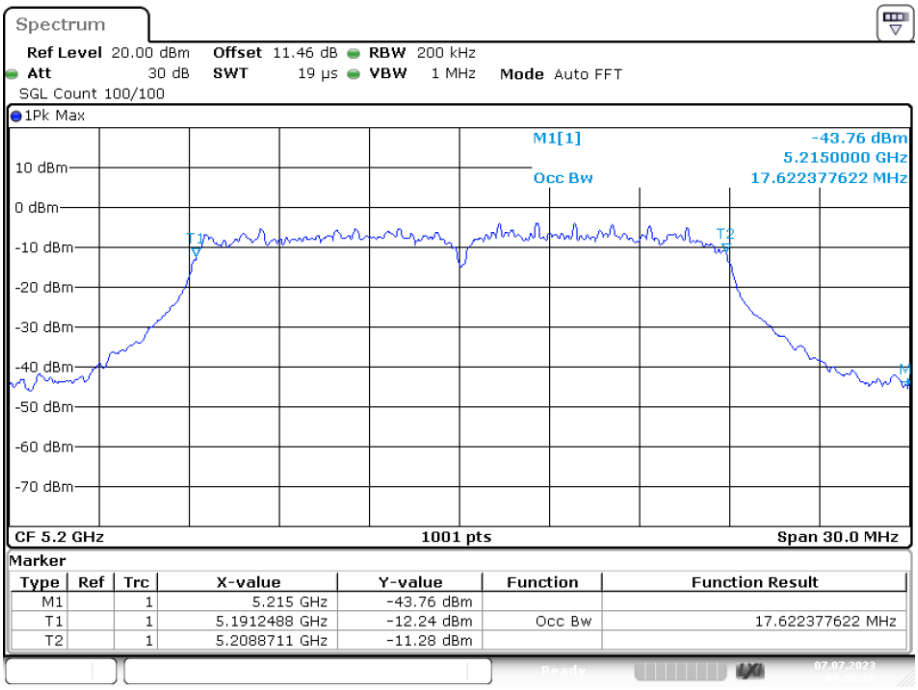

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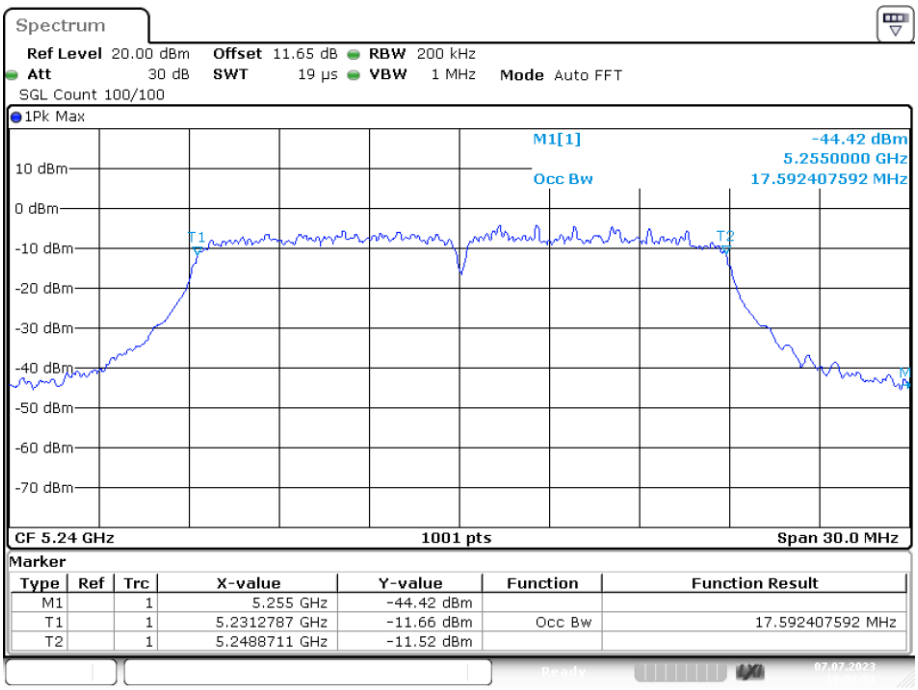

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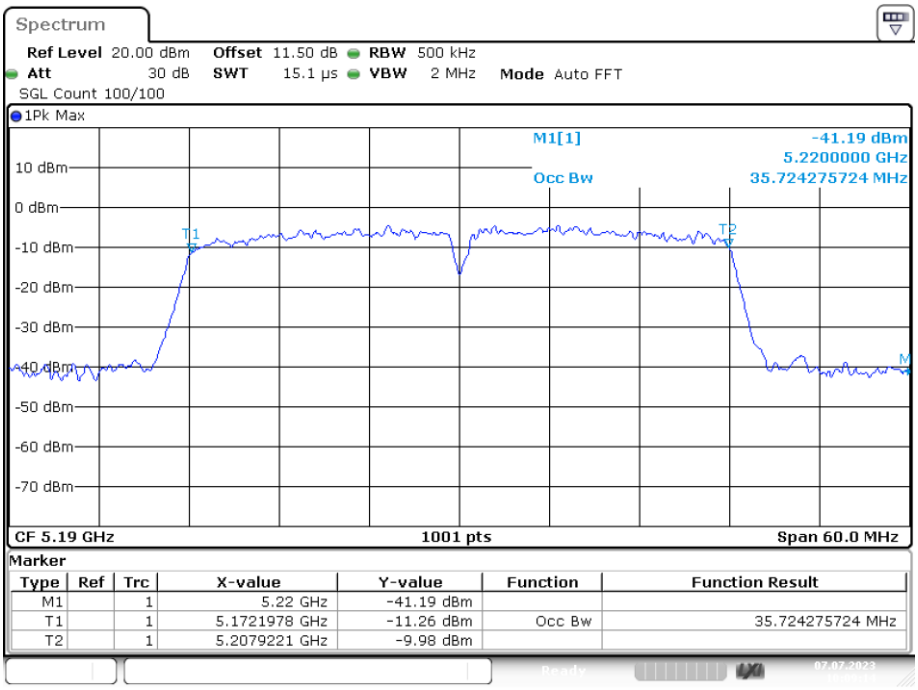
OBW NVNT n40 5190MHz Ant1



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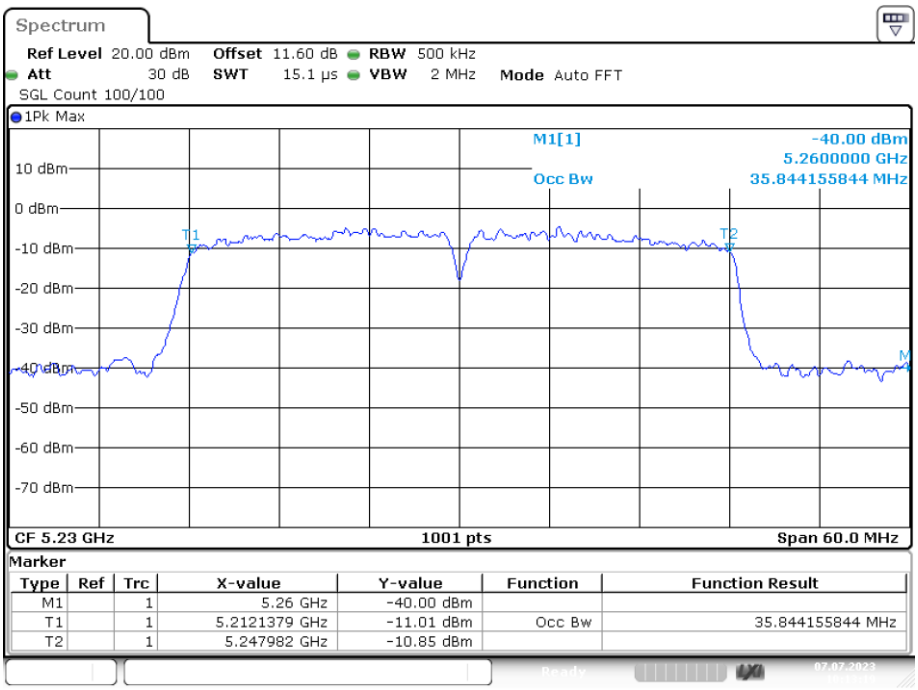
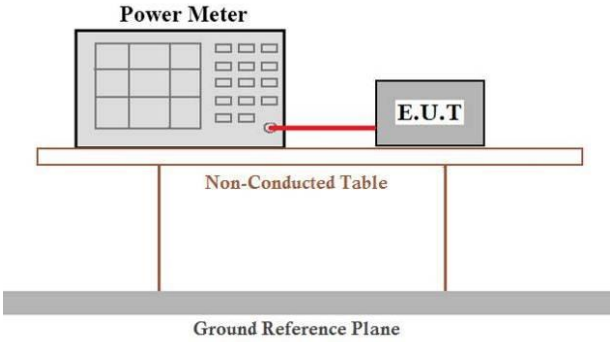


Date: 7.JUL.2023 10:13:19

4.4 Max Transmit Power

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01
Limit:	For the band 5.15-5.25GHz, 5.25-5.35GHz, 5.47-5.725GHz, the maximum conducted output power over the frequency bands of operation shall not exceed 250mW. For the band 5.725-5.85GHz, the maximum conducted output power over the frequency bands of operation shall not exceed 1W.
Test setup:	
Test procedure:	**Measurement using an RF average power meter** (i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied a) The EUT is configured to transmit continuously or to transmit with a constant duty cycle. b) At all times when the EUT is transmitting, it must be transmitting at its maximum power control level. c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five. (ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section B). (iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter. (iv) Adjust the measurement in dBm by adding 10 log(1/x) where x is the duty cycle (e.g., 10log(1/0.25) if the duty cycle is 25 percent).
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

Band 1 (5150-5250 MHz)

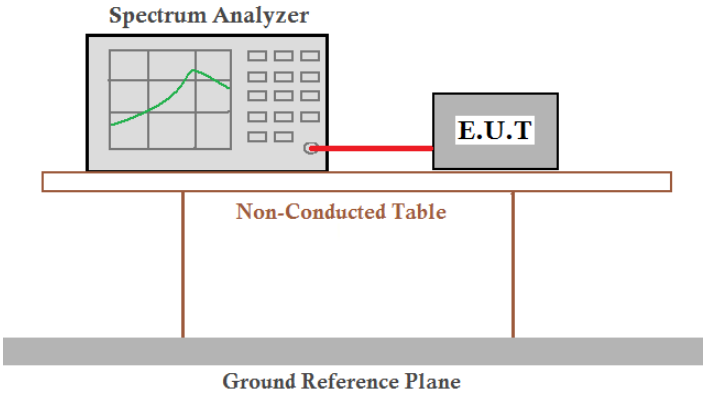
Duty Cycle=100%								
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	Ant1	15.516	0	15.516	24	Pass
NVNT	a	5200	Ant1	14.748	0	14.748	24	Pass
NVNT	a	5240	Ant1	14.989	0	14.989	24	Pass
NVNT	n20	5180	Ant1	15.684	0	15.684	24	Pass
NVNT	n20	5200	Ant1	15.376	0	15.376	24	Pass
NVNT	n20	5240	Ant1	15.032	0	15.032	24	Pass
NVNT	n40	5190	Ant1	15.191	0	15.191	24	Pass
NVNT	n40	5230	Ant1	15.059	0	15.059	24	Pass

Duty Cycle=100%								
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	Ant2	16.291	0	16.291	24	Pass
NVNT	a	5200	Ant2	14.088	0	14.088	24	Pass
NVNT	a	5240	Ant2	14.263	0	14.263	24	Pass
NVNT	n20	5180	Ant2	14.752	0	14.752	24	Pass
NVNT	n20	5200	Ant2	15.731	0	15.731	24	Pass
NVNT	n20	5240	Ant2	15.631	0	15.631	24	Pass
NVNT	n40	5190	Ant2	14.753	0	14.753	24	Pass
NVNT	n40	5230	Ant2	15.690	0	15.690	24	Pass

Duty Cycle=100%								
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	n20	5180	MIMO	18.25	0	18.25	22.04	Pass
NVNT	n20	5200	MIMO	18.57	0	18.57	22.04	Pass
NVNT	n20	5240	MIMO	18.35	0	18.35	22.04	Pass
NVNT	n40	5190	MIMO	17.99	0	17.99	22.04	Pass
NVNT	n40	5230	MIMO	18.40	0	18.40	22.04	Pass

Note: 1. Directional gain=7.96dBi, so the Conducted Power Limit need to reduce 1.96.

4.5 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01
Limit:	≤11.00dBm/MHz for 5150MHz-5250MHz, 5250-5350MHz and 5470-5725 MHz ≤30.00dBm/500KHz for 5725MHz-5850MHz
Test setup:	
Test procedure:	1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”. 2) Use the peak search function on the instrument to find the peak of the spectrum. 3) Make the following adjustments to the peak value of the spectrum, if applicable: a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum. b) If Method SA-3 Alternative was used and the linear mode was used in step E)2)g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging. 4) The result is the PSD.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

Band 1 (5150 - 5250 MHz)

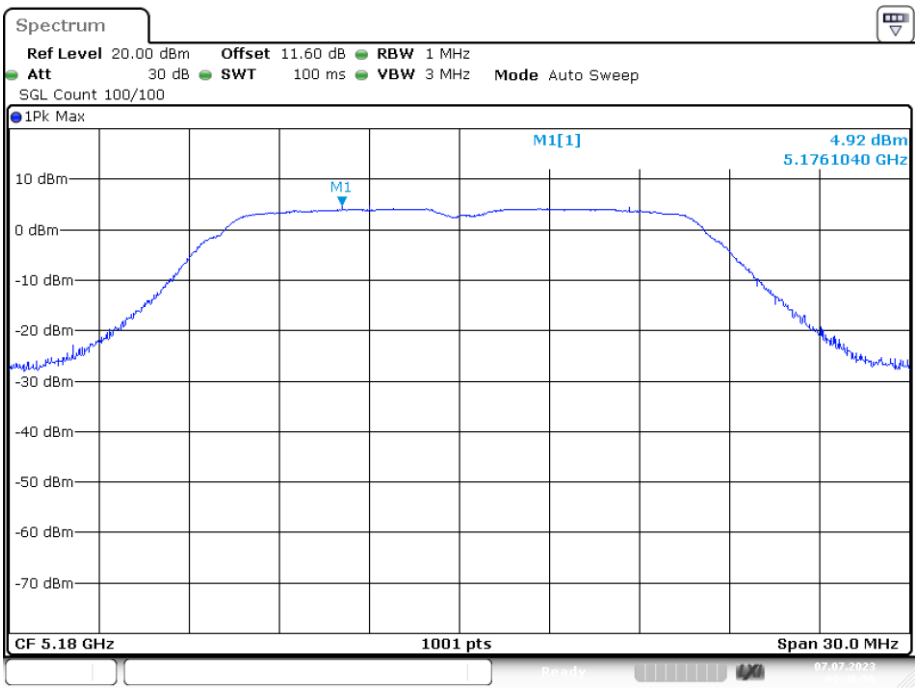
Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	Ant1	4.925	11	Pass
NVNT	a	5200	Ant1	4.12	11	Pass
NVNT	a	5240	Ant1	4.023	11	Pass
NVNT	n20	5180	Ant1	5.111	11	Pass
NVNT	n20	5200	Ant1	4.734	11	Pass
NVNT	n20	5240	Ant1	3.942	11	Pass
NVNT	n40	5190	Ant1	1.888	11	Pass
NVNT	n40	5230	Ant1	1.571	11	Pass

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	a	5180	Ant2	4.702	11	Pass
NVNT	a	5200	Ant2	4.692	11	Pass
NVNT	a	5240	Ant2	4.425	11	Pass
NVNT	n20	5180	Ant2	5.17	11	Pass
NVNT	n20	5200	Ant2	4.597	11	Pass
NVNT	n20	5240	Ant2	4.234	11	Pass
NVNT	n40	5190	Ant2	1.766	11	Pass
NVNT	n40	5230	Ant2	1.602	11	Pass

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	n20	5180	MIMO	8.15	9.04	Pass
NVNT	n20	5200	MIMO	7.68	9.04	Pass
NVNT	n20	5240	MIMO	7.10	9.04	Pass
NVNT	n40	5190	MIMO	4.84	9.04	Pass
NVNT	n40	5230	MIMO	4.60	9.04	Pass

Note: 1. Directional gain=7.96dBi, so the Conducted Power Limit need to reduce 1.96.

PSD NVNT a 5180MHz Ant1



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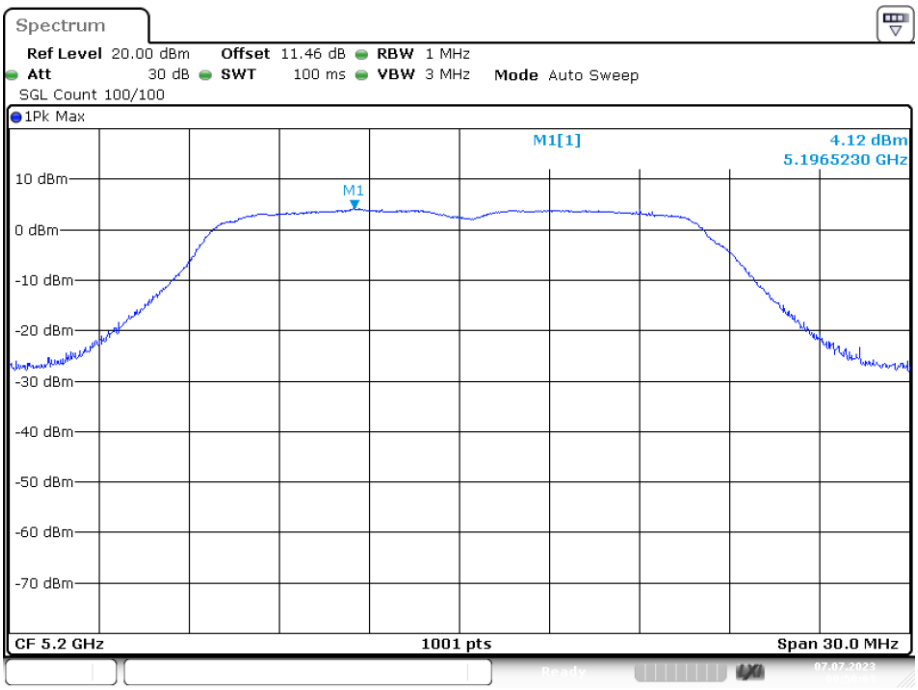
PSD NVNT a 5200MHz Ant1



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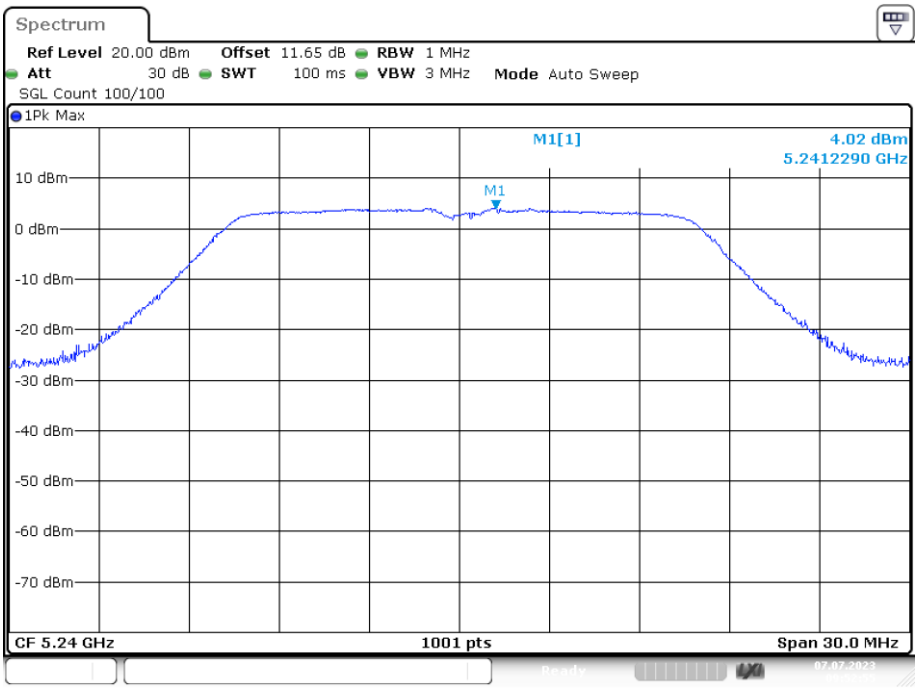
PSD NVNT a 5240MHz Ant1



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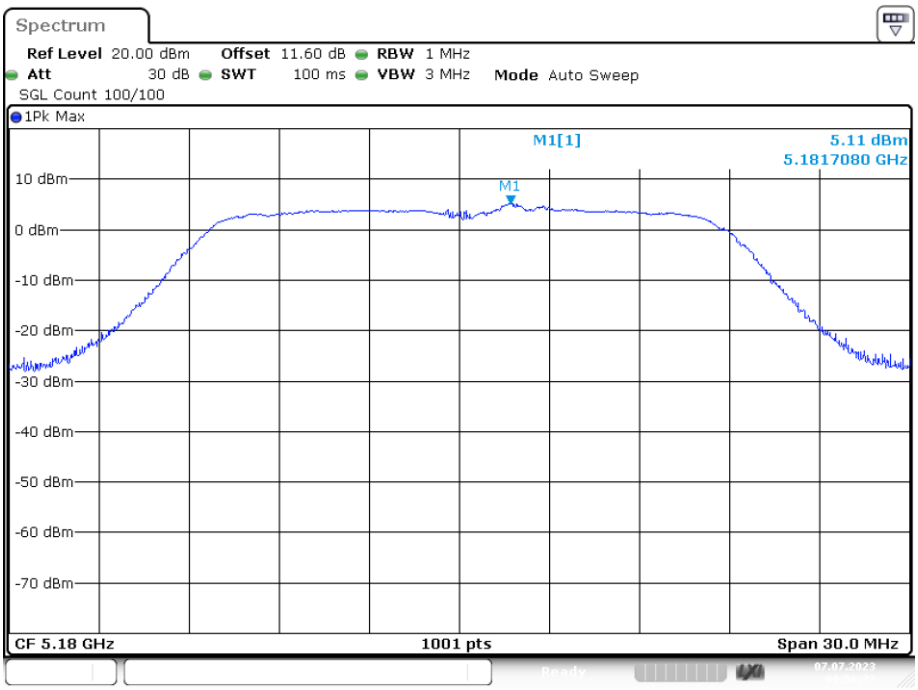
PSD NVNT n20 5180MHz Ant1



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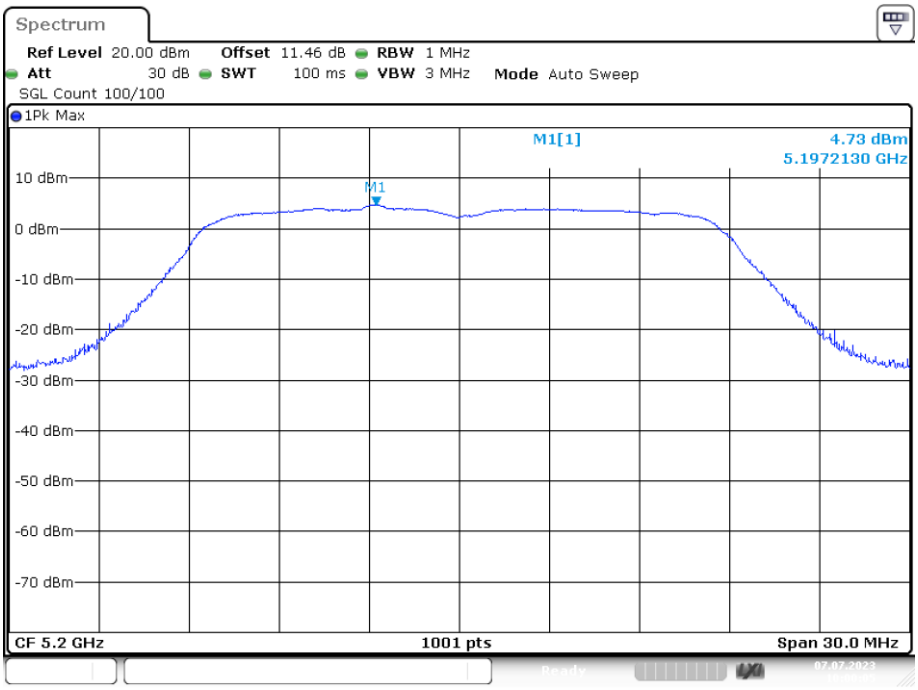
PSD NVNT n20 5200MHz Ant1



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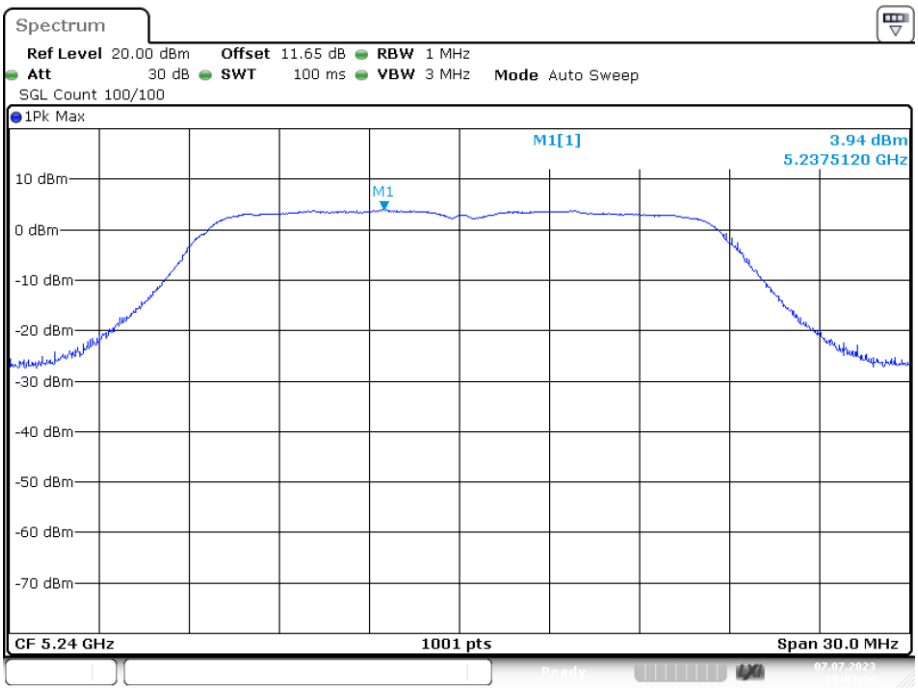
PSD NVNT n20 5240MHz Ant1



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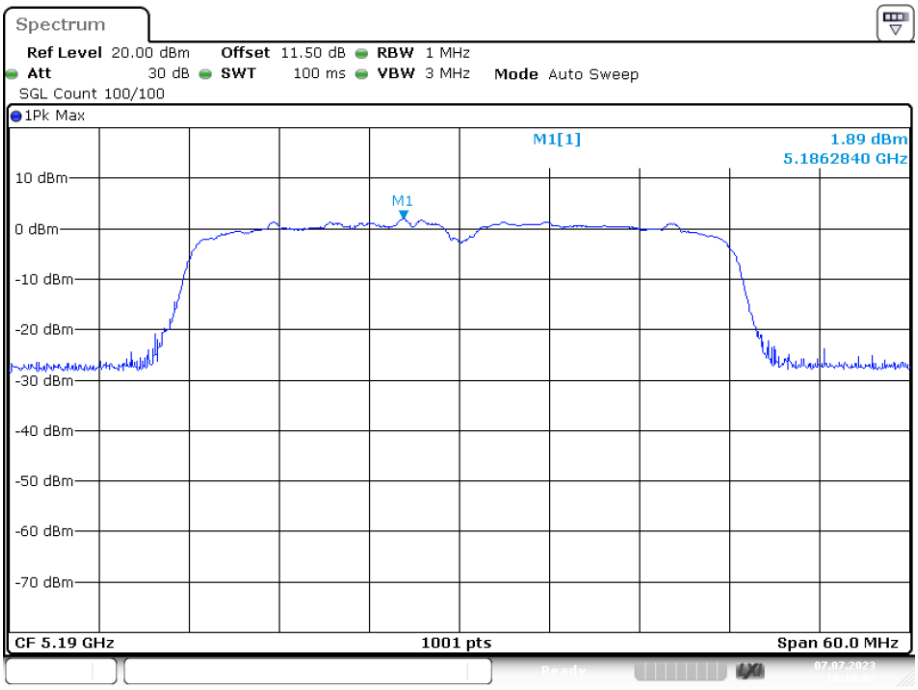
PSD NVNT n40 5190MHz Ant1



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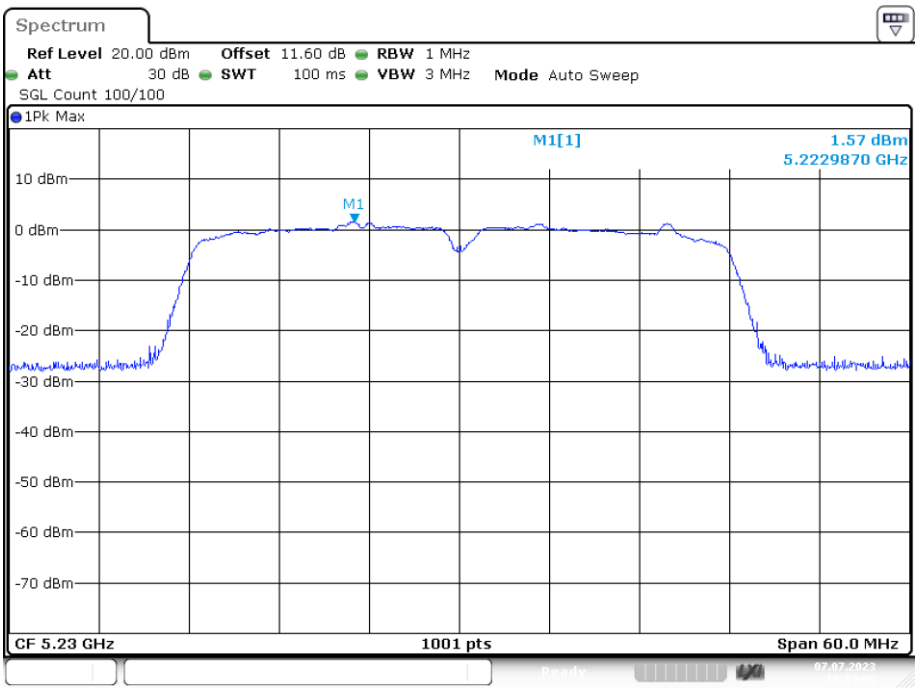
PSD NVNT n40 5230MHz Ant1



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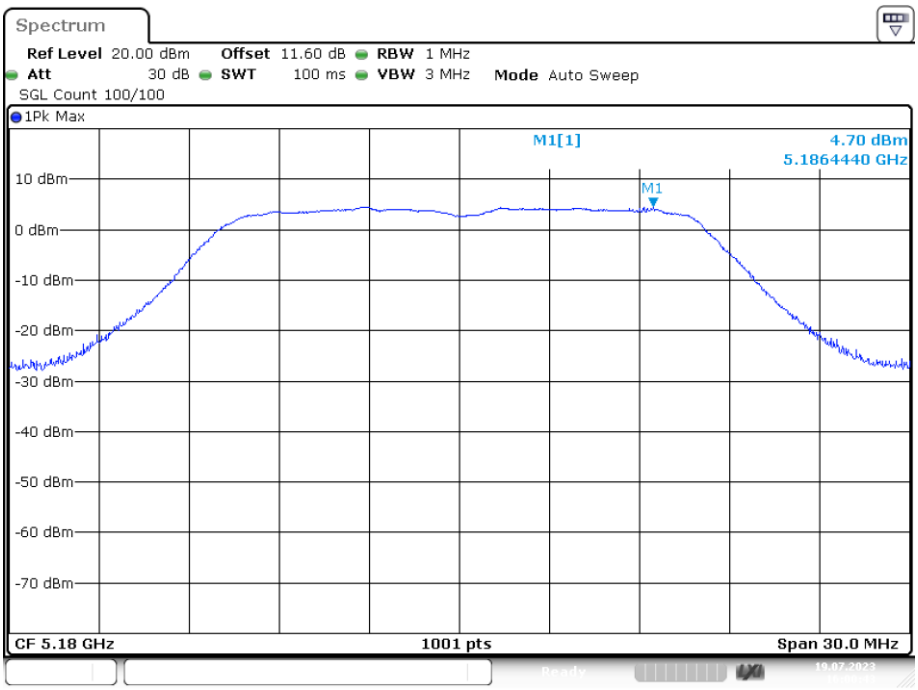
PSD NVNT a 5180MHz Ant2



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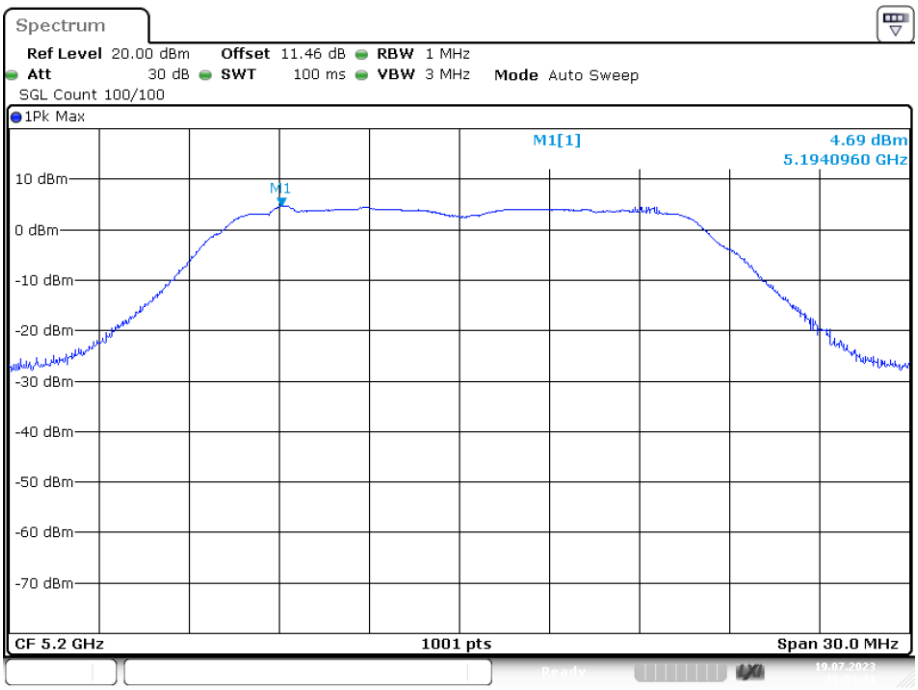
PSD NVNT a 5200MHz Ant2



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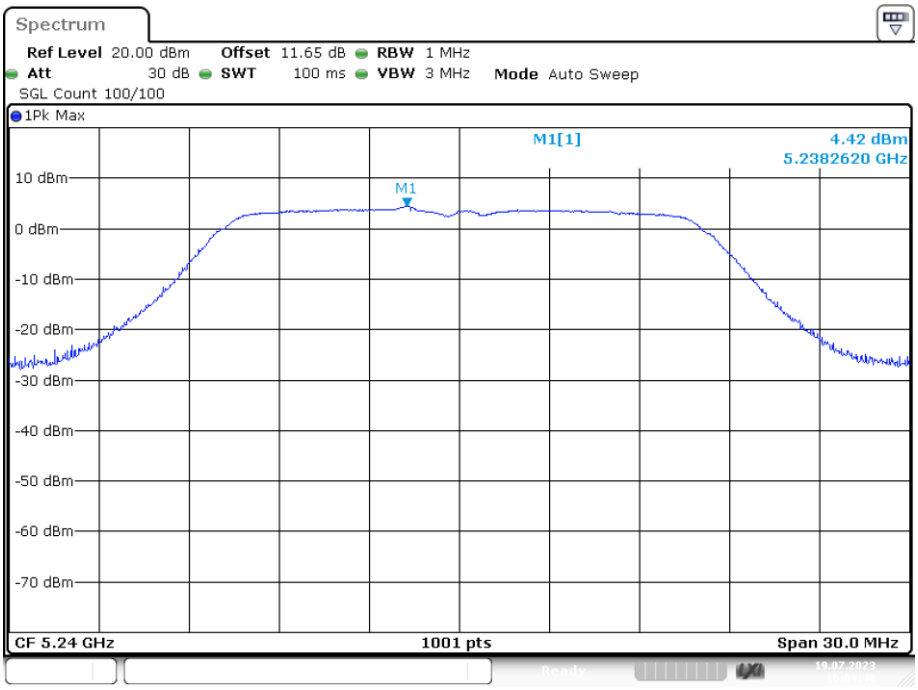

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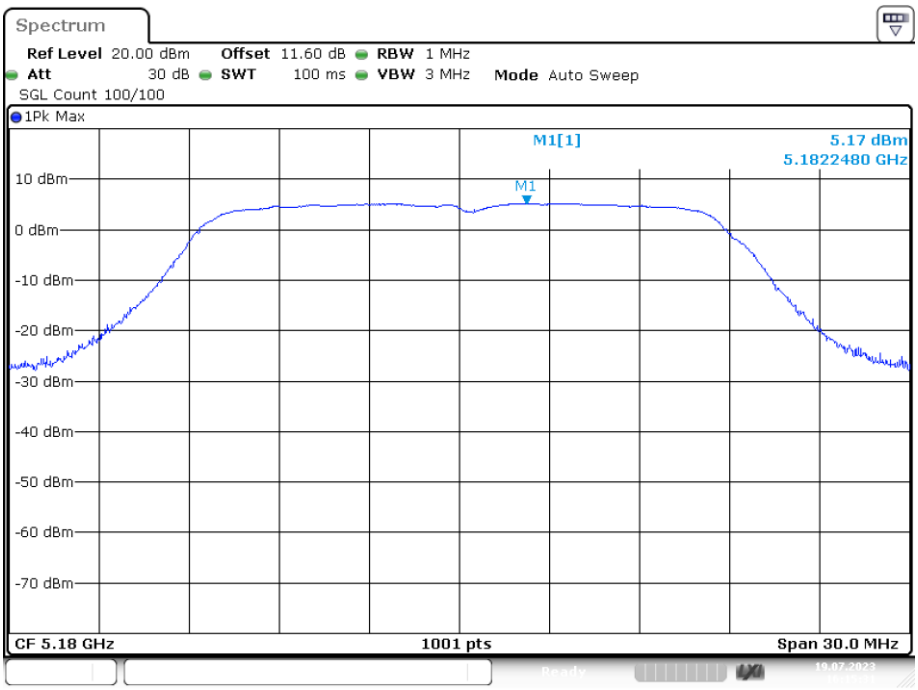
PSD NVNT n20 5180MHz Ant2



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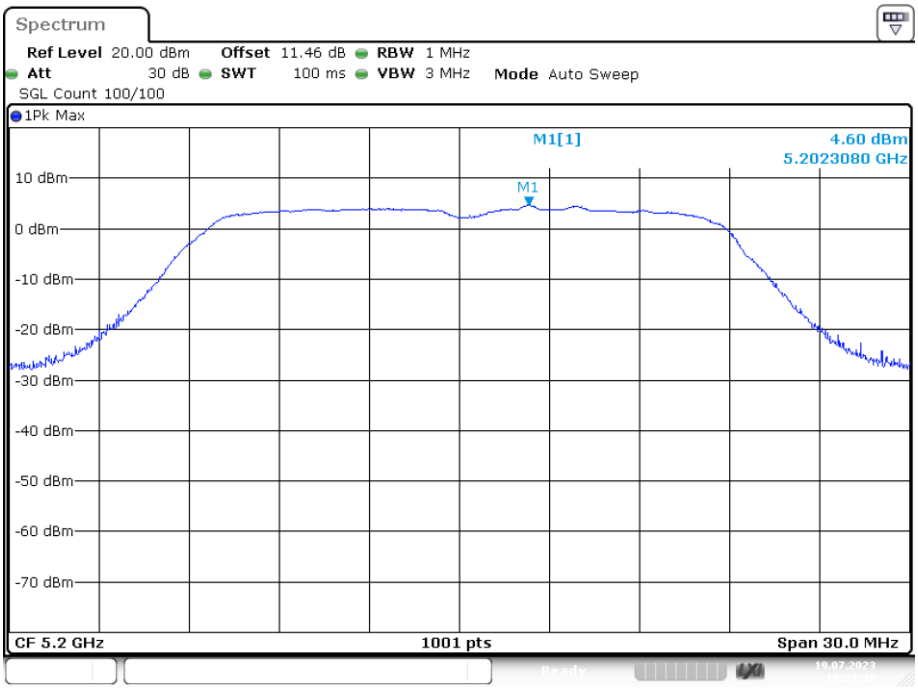
PSD NVNT n20 5200MHz Ant2



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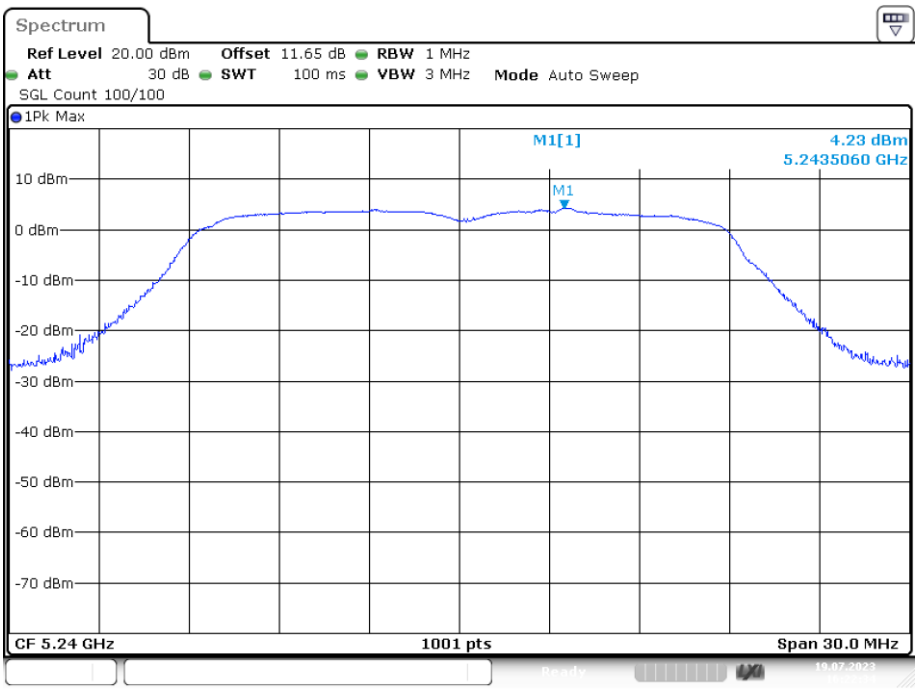
PSD NVNT n20 5240MHz Ant2



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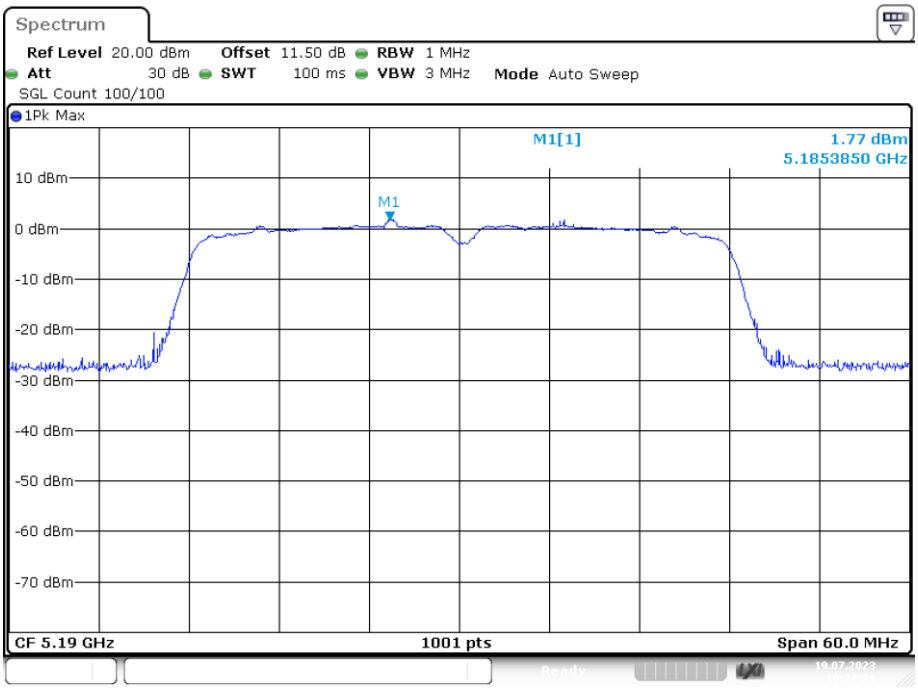
PSD NVNT n40 5190MHz Ant2



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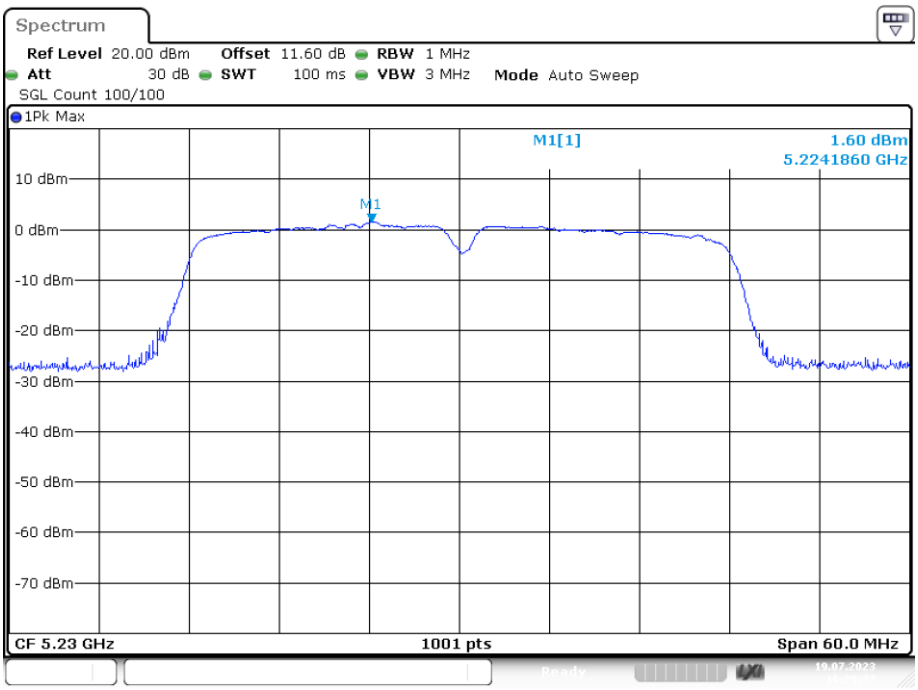
PSD NVNT n40 5230MHz Ant2



Date: 19.JUL.2023 16:29:37

4.6 Band Edge

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 E Section 15.407 and 15.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>AV</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>68.2</td><td>Peak Value</td></tr>
</table>
Undesirable emission 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 EIRP 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 EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
(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 EIRP of −27 dBm/MHz.
</td></tr>
<tr><td>Test Procedure:</td><td>
a. The EUT was placed on the top of a rotating table 1.5 m above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
</td></tr>
<tr><td>Test setup:</td><td>Above 1GHz</td></tr>
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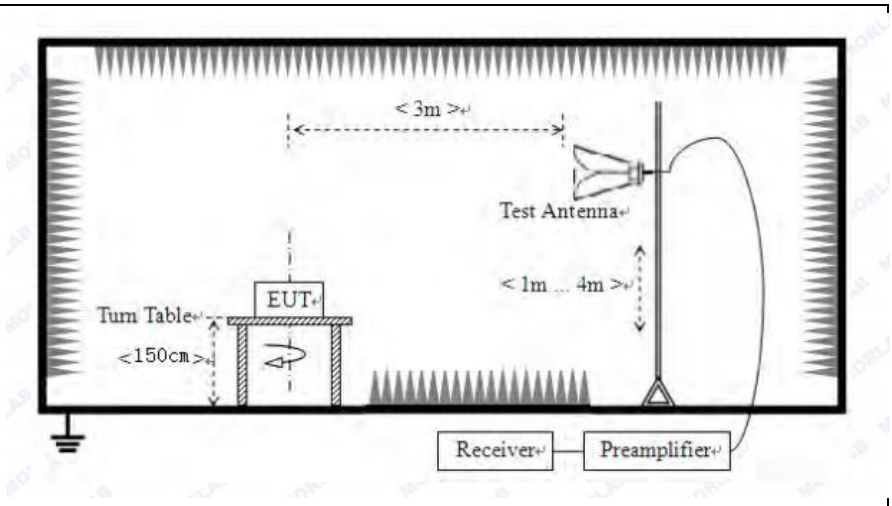
	
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Remark:

According to KDB 789033 D02 v02r01 section G) 1) (d), for For measurements above 1000 MHz @ 3m distance, the limit of field strength is computed as follows:

E[dBuV/m] = EIRP[dBm] + 95.2,

For example, if EIRP = -27dBm

E[dBuV/m] = -27 + 95.2 = 68.2dBuV/m.

Measurement Data:

Band1

Mode:		802.11a		Frequency:		5180MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5150.00	34.94	17.18	52.12	68.20	-16.08	PK
V	5150.00	33.24	17.18	50.42	68.20	-17.78	PK
Mode:		802.11a		Frequency:		5180MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5150.00	25.66	17.18	42.84	54.00	-11.16	AV
V	5150.00	26.82	17.18	44.00	54.00	-10.00	AV
Mode:		802.11a		Frequency:		5240MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5350.00	36.08	17.18	53.26	68.20	-14.94	PK
V	5350.00	33.36	17.18	50.54	68.20	-17.66	PK
Mode:		802.11a		Frequency:		5240MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5350.00	27.28	17.18	44.46	54.00	-9.54	AV
V	5350.00	27.22	17.18	44.40	54.00	-9.60	AV

Mode:		802.11n(HT20)		Frequency:		5180MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5150.00	34.00	17.18	51.18	68.20	-17.02	PK
V	5150.00	32.81	17.18	49.99	68.20	-18.21	PK

Mode:		802.11n(HT20)		Frequency:		5180MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5150.00	24.78	17.18	41.96	54.00	-12.04	AV
V	5150.00	27.07	17.18	44.25	54.00	-9.75	AV

Mode:		802.11n(HT20)		Frequency:		5240MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5350.00	34.97	17.18	52.15	68.20	-16.05	PK
V	5350.00	32.93	17.18	50.11	68.20	-18.09	PK

Mode:		802.11n(HT20)		Frequency:		5240MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5350.00	26.82	17.18	44.00	54.00	-10.00	AV
V	5350.00	25.54	17.18	42.72	54.00	-11.28	AV

Mode:		802.11n(HT40)		Frequency:		5190MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5150.00	34.36	17.18	51.54	68.20	-16.66	PK
V	5150.00	34.51	17.18	51.69	68.20	-16.51	PK
Mode:		802.11n(HT40)		Frequency:		5190MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5150.00	24.44	17.18	41.62	54.00	-12.38	AV
V	5150.00	26.19	17.18	43.37	54.00	-10.63	AV
Mode:		802.11n(HT40)		Frequency:		5230MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5350.00	34.80	17.18	51.98	68.20	-16.22	PK
V	5350.00	33.60	17.18	50.78	68.20	-17.42	PK
Mode:		802.11n(HT40)		Frequency:		5230MHz	
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV)	Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	Detector
H	5350.00	24.87	17.18	42.05	54.00	-11.95	AV
V	5350.00	24.11	17.18	41.29	54.00	-12.71	AV

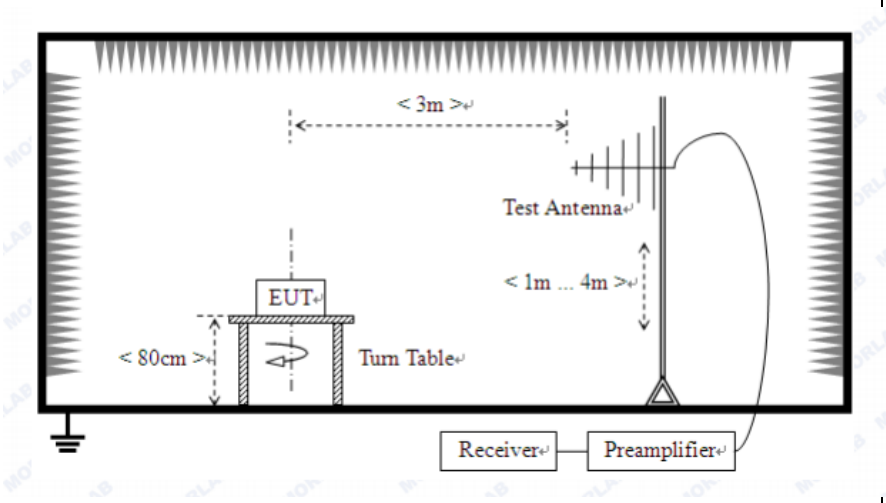
Note: 1. Except for mode a, other modes test the MIMO status.
2. Mode a represents the worst data of antenna 1.

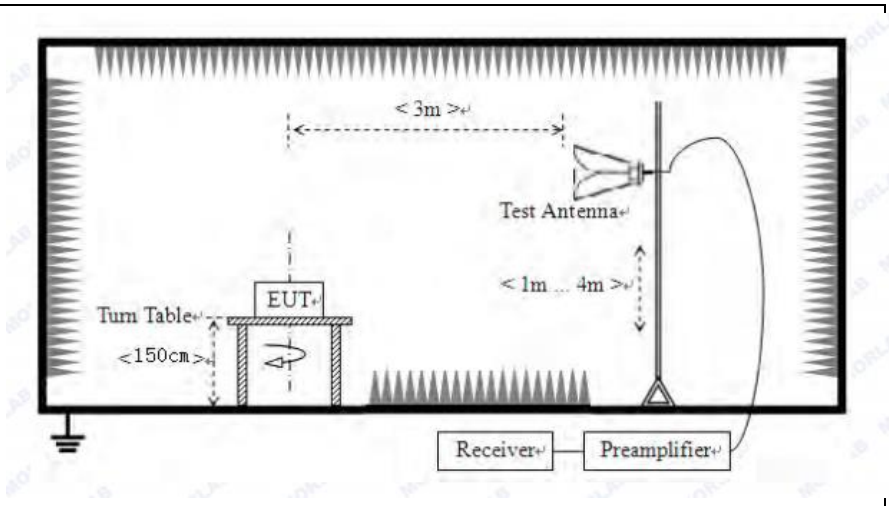
4.7 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 40GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>AV</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>74.0</td><td>Peak Value</td></tr>
<tr><td>54.0</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Test Procedure:</td><td>
Substitution method was performed to determine the actual ERP emission levels of the EUT.
The following test procedure as below:

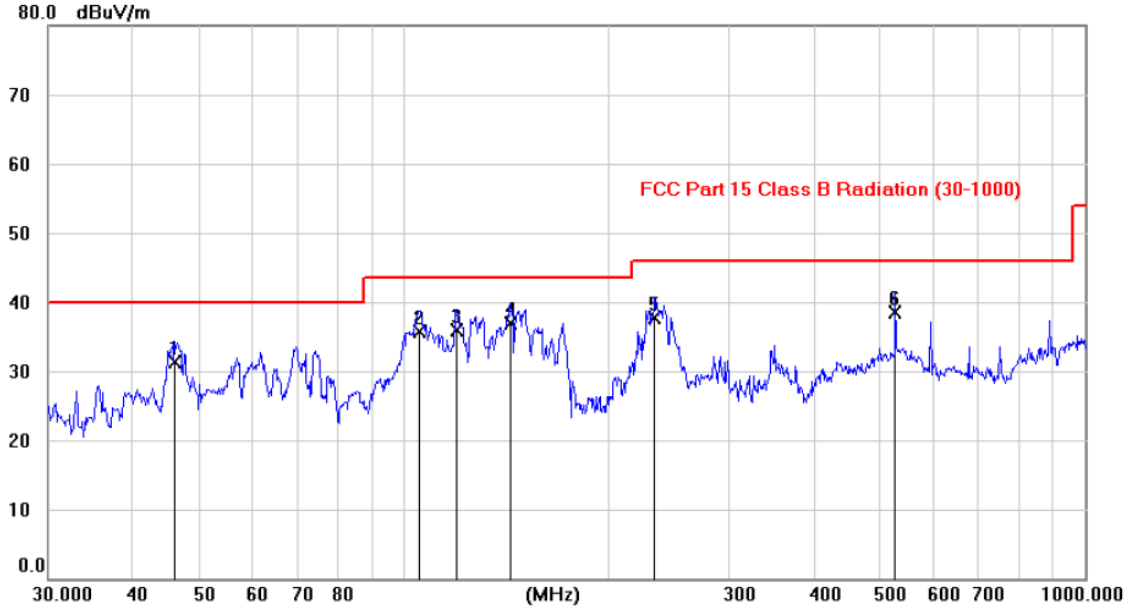
1>.Below 1GHz test procedure:
1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

2>.Above 1GHz test procedure:
1. On the test site as test setup graph above,the EUT shall be placed at the 1.5m support on the turntable and in the position closest to normal use as declared by the provider.
2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter.The output of the test antenna shall be connected to the measuring receiver.
3. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
</td></tr>
</table>

	4. The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver. 5. Repeat step 4 for test frequency with the test antenna polarized horizontally. 6. Remove the transmitter and replace it with a substitution antenna 7. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output. 8. Repeat step 7 with both antennas horizontally polarized for each test frequency. 9. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula: EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi) where: Pg is the generator output power into the substitution antenna.
Test setup:	Below 1GHz  Above 1GHz

	
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

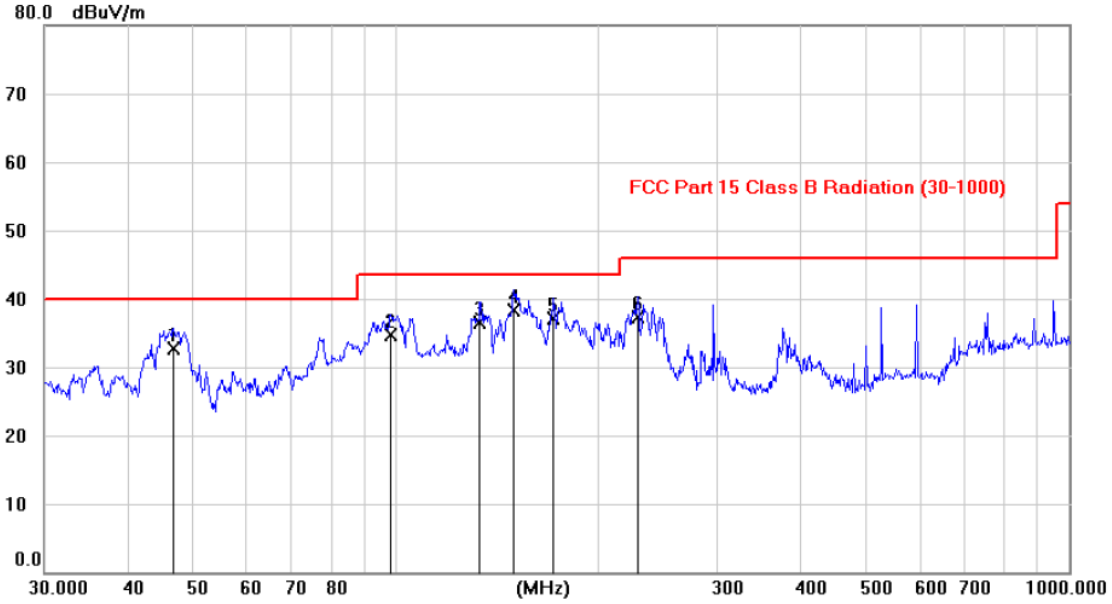
Measurement Data:
Below 1GHz
Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		46.1726	17.15	14.10	31.25	40.00	-8.75	QP			
2		105.6290	24.35	11.40	35.75	43.50	-7.75	QP			
3		119.4638	22.92	12.97	35.89	43.50	-7.61	QP			
4	*	143.4934	22.29	14.57	36.86	43.50	-6.64	QP			
5		234.0860	25.22	12.41	37.63	46.00	-8.37	QP			
6		526.7042	19.82	18.77	38.59	46.00	-7.41	QP			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		46.6771	18.61	14.09	32.70	40.00	-7.30	QP			
2		98.3024	24.02	10.73	34.75	43.50	-8.75	QP			
3		133.5406	22.64	13.84	36.48	43.50	-7.02	QP			
4	*	149.6605	23.17	15.04	38.21	43.50	-5.29	QP			
5		171.6732	23.31	13.85	37.16	43.50	-6.34	QP			
6		228.7572	25.12	12.24	37.36	46.00	-8.64	QP			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Remark: All modes have been tested, and only worst data of a mode, Channel 5180MHz was listed in this report.

Above 1GHz:

802.11a(HT20) 5180MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.86	67.68	11.25	14.62	32.65	60.90	74	-13.10	Vertical
15540.33	63.40	11.93	17.66	34.46	58.53	74	-15.47	Vertical
10360.79	64.49	9.4	14.62	32.65	55.86	74	-18.14	Horizontal
15540.07	68.51	8.5	17.66	34.46	60.21	74	-13.79	Horizontal

802.11a(HT20) 5200MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.33	67.30	11.25	14.62	32.65	60.52	74	-13.48	Vertical
15540.27	63.61	11.93	17.66	34.46	58.74	74	-15.26	Vertical
10360.31	64.71	9.4	14.62	32.65	56.08	74	-17.92	Horizontal
15540.24	68.34	8.5	17.66	34.46	60.04	74	-13.96	Horizontal

802.11a(HT20) 5240MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.76	67.05	11.25	14.62	32.65	60.27	74	-13.73	Vertical
15540.97	63.42	11.93	17.66	34.46	58.55	74	-15.45	Vertical
10360.81	64.48	9.4	14.62	32.65	55.85	74	-18.15	Horizontal
15540.56	67.98	8.5	17.66	34.46	59.68	74	-14.32	Horizontal

802.11n(HT20) 5180MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.52	67.56	11.25	14.62	32.65	60.78	74	-13.22	Vertical
15540.05	63.04	11.93	17.66	34.46	58.17	74	-15.83	Vertical
10360.88	64.98	9.4	14.62	32.65	56.35	74	-17.65	Horizontal
15540.11	68.29	8.5	17.66	34.46	59.99	74	-14.01	Horizontal

802.11n(HT20) 5200MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.92	67.27	11.25	14.62	32.65	60.49	74	-13.51	Vertical
15540.80	63.72	11.93	17.66	34.46	58.85	74	-15.15	Vertical
10360.60	64.62	9.4	14.62	32.65	55.99	74	-18.01	Horizontal
15540.34	67.71	8.5	17.66	34.46	59.41	74	-14.59	Horizontal

802.11n(HT20) 5240MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.20	67.54	11.25	14.62	32.65	60.76	74	-13.24	Vertical
15540.87	63.35	11.93	17.66	34.46	58.48	74	-15.52	Vertical
10360.38	64.34	9.4	14.62	32.65	55.71	74	-18.29	Horizontal
15540.64	68.19	8.5	17.66	34.46	59.89	74	-14.11	Horizontal

802.11n(HT40) 5190MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.85	67.87	11.25	14.62	32.65	61.09	74	-12.91	Vertical
15540.65	63.49	11.93	17.66	34.46	58.62	74	-15.38	Vertical
10360.02	64.73	9.4	14.62	32.65	56.10	74	-17.90	Horizontal
15540.37	68.04	8.5	17.66	34.46	59.74	74	-14.26	Horizontal

802.11n(HT40) 5230MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.97	67.07	11.25	14.62	32.65	60.29	74	-13.71	Vertical
15540.70	63.19	11.93	17.66	34.46	58.32	74	-15.68	Vertical
10360.61	64.36	9.4	14.62	32.65	55.73	74	-18.27	Horizontal
15540.75	67.97	8.5	17.66	34.46	59.67	74	-14.33	Horizontal

Note:

1. Level = Read Level + Antenna Factor+ Cable loss- Preamp Factor.

2. The test trace is same as the ambient noise (the test frequency range: 18GHz~40GHz), therefore no data appear in the report.

3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

4. Except for mode a, other modes test the MIMO status.

5. Mode a represents the worst data of antenna 1

4.8 Frequency stability

Test limit	Manufacturers 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.
Test results:	Pass

Measurement Data:

Mode	Voltage (V)	FHL (5180MHz)	Deviation (KHz)	FHH (5240MHz)	Deviation (KHz)
Band 1 (5150-5250 MHz)	DC 6.29V	5179.987	13	5239.991	9
	DC 7.40V	5179.988	12	5239.987	13
	DC 8.51V	5179.990	10	5239.991	9

Mode	Temperature (℃)	FHL (5180MHz)	Deviation (KHz)	FHH (5240MHz)	Deviation (KHz)
Band 1 (5150-5250 MHz)	-20℃	5179.989	11	5239.991	9
	-10℃	5179.986	14	5239.987	13
	-5℃	5179.988	12	5239.988	12
	0℃	5179.988	12	5239.987	13
	+10℃	5179.989	11	5239.989	11
	+20℃	5179.989	11	5239.989	11
	+30℃	5179.988	12	5239.986	14
	+40℃	5179.987	13	5239.989	11
	+50℃	5179.990	10	5239.988	12

--------END OF REPORT-------