TEST REPORT

Report No.:	BCTC2202327962E
Applicant:	shenzhen chuangzhanxun electronics co., ltd
Product Name:	wireless bridge
Model/Type reference:	CPE220
Tested Date:	2022-02-23 to 2022-03-09
Issued Date:	2022-03-10

Shenzhen BCTC Testing Co., Ltd.

FCC ID: 2A4ZJCPE220

Product Name:	wireless bridge
Trademark:	N/A
Model/Type reference:	CPE220 CPE200, CPE206, CPE320, CPE335, CPE355, CPE365, CPE385, CPE450, CPE520, CPE550, CPE820, CPE920
Prepared For:	shenzhen chuangzhanxun electronics co., ltd
Address:	Room 516-518 Building A3 Zhongyuguan Industry Zhong yu guan Road Longhua District Shenzhen Guangdong China
Manufacturer:	shenzhen chuangzhanxun electronics co., ltd
Address:	Room 516-518 Building A3 Zhongyuguan Industry Zhong yu guan Road Longhua District Shenzhen Guangdong China
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2022-02-23
Sample tested Date:	2022-02-23 to 2022-03-09
Issue Date:	2022-03-10
Report No.:	BCTC2202327962E
Test Standards:	FCC Part15 15.407 ANSI C63.10-2013 KDB 662911 D01 v02r01 KDB 789033 D02 v02r01
Test Results:	PASS
Remark:	This is WIFI-5GHz band radio test report.

Tested by:

Eric Yang/Project Handler

Approved by:

Zero Zhou/Reviewer

Table Of Content

(Note: N/A Means Not Applicable)

1. Version

Report No.	Issue Date	Description	Approved
BCTC2202327962E	2022-03-10	Original	Valid

2. Test Summary

The Product has been tested according to the following specifications:

1	Test Parameter	Clause No.	Results
1	Spurious Radiated Emissions	15.209(a), 15.407 (b)(4) 15.407 (b)(9)	PASS
2	Conducted Emission	15.207	PASS
3	26 dB and 99% Emission Bandwidth	15.407 (a)(12)	PASS
4	Minimum 6 dB bandwidth	15.407(e)	PASS
5	Maximum Conducted Output Power	15.407 (a)(3)	PASS
6	Band Edge	2.1051 15.407(b)(4)	PASS
7	Power Spectral Density	15.407 (a)(3)	PASS
8	Spurious Emissions at Antenna Terminals	2.1051, 15.407(b)	PASS
9	Antenna Requirement	15.203	PASS

3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(9KHz-30MHz)	U=3.7dB
3	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
4	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
5	Conducted Emission (150kHz-30MHz)	U=3.20dB
6	Conducted Adjacent channel power	U=1.38dB
7	Conducted output power uncertainty Above 1G	U=1.576dB
8	Conducted output power uncertainty below 1G	U=1.28dB
9	humidity uncertainty	U=5.3%
10	Temperature uncertainty	U=0.59℃

4. Product Information And Test Setup

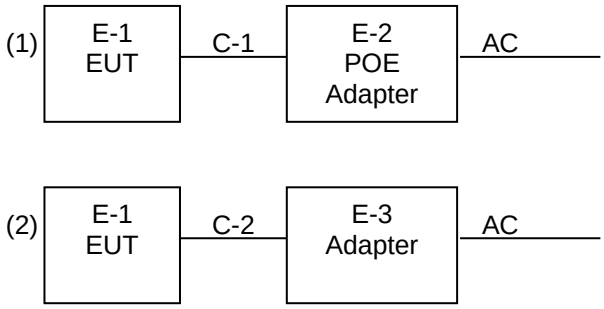
4.1 Product Information

Model/Type reference:	CPE220 CPE200, CPE206, CPE320, CPE335, CPE355, CPE365, CPE385, CPE450, CPE520, CPE550, CPE820, CPE920
Model differences:	All the model are the same circuit and RF module, except model names.
IEEE 802.11 WLAN Mode Supported:	802.11a/n (20MHz channel bandwidth) 802.11n (40MHz channel bandwidth)
Operation Frequency:	5745-5825 MHz for 802.11a/n(HT20); 5755-5795 MHz for 802.11a/n(HT40);
Data Rate:	802.11a: 6,9,12,18,24,36,48,54Mbps; 802.11n(HT20/HT40):MCS0-MCS15;
Type of Modulation:	OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11a/n;
Number Of Channel:	5 channels for 802.11a/n20 in the 5745-5825MHz band ; 2 channels for 802.11 n40 in the 5755-5795MHz band
Antenna installation:	Internal antenna*2 WiFi (5.8GHz): Antenna A : 12 dBi Antenna B : 12 dBi
Ratings:	DC 24V
POE Adapter:	Model: ZD101-2AW-24V Input:100-204V~50/60Hz Output: DC 24V 1.0A

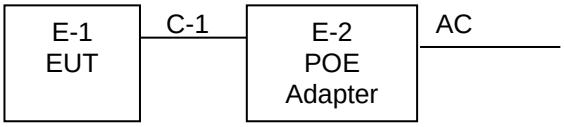
4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.

Conducted Emission/ Radiated Spurious Emission



RF Test



4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
E-2	POE Adapter	N/A	ZD101-2AW-24V	N/A	N/A
E-3	Adapter	N/A	KWT24001	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	N/A	N/A	1M	Ethernet cable unshielded
C-2	N/A	N/A	1M	DC cable unshielded

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

Frequency and Channel list for 802.11a/n (5745-5825MHz):

802.11a/n(20MHz) Carrier Frequency Channel							
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
149	5745	153	5765	157	5785	161	5805
165	5825	-	-	-	-	-	-

802.11n (40MHz) Carrier Frequency Channel							
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
151	5755	159	5795	-	-	-	-

4.5 Test Mode

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	802.11a /n 20 CH149/ CH157/ CH 165
Mode 2	802.11n40 CH 151 / CH 159
Mode 3	Link Mode

Note: The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.

4.6 Table Of Parameters Of Text Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

Test software Version	CMD		
Parameters	DEF	DEF	DEF

4.7 Antenna

Table for Internal antenna

Ant.	Brand	Model Name	Antenna Type	Gain (dBi)	NOTE
A	N/A	N/A	Internal antenna	See 4.1 chapter	N/A
B	N/A	N/A	Internal antenna	See 4.1 chapter	N/A

EUT has two External antennas with Max gain G_{ANT} 12dBi on every antenna, CDD device with two spatial streams, also can operat with one spatial streams according to KDB662911 D01 v02r01,
Directional gain= G_{ANT} + Array Gain, where Array Gain is as follows.

1)For power spectral density(PSD) measurements,
Array Gain=10log(N_{ANT}/N_{SS})dB=10log(2/1)=3.01dB,
So the directional gain for PSD is 15.01dBi

2) For power measurements on IEEE 802.11 devices,
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths $\geq$ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.
So the directional gain for power is 12dBi

5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address:1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.
FCC Test Firm Registration Number: 712850
IC Registered No.: 23583

5.2 Test Instrument Used

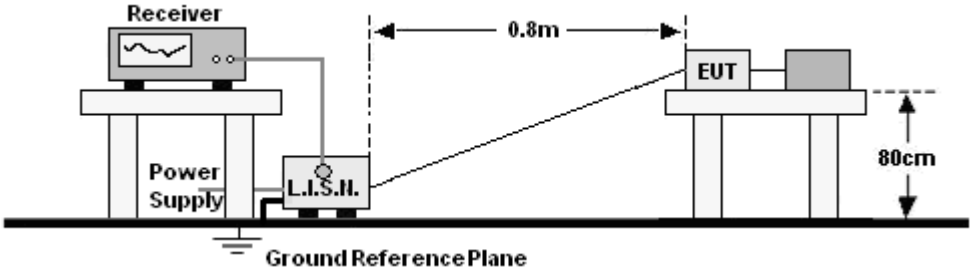
Conducted Emissions Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Receiver	R&S	ESR3	102075	May 28, 2021	May 27, 2022
LISN	R&S	ENV216	101375	May 28, 2021	May 27, 2022
Software	Frad	EZ-EMC	EMC-CON 3A1	\	\
Attenuator	\	10dB C-6GHz	1650	May 28, 2021	May 27, 2022

RF Conducted Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Power Metter	Keysight	E4419	\	May 28, 2021	May 27, 2022
Power Sensor (AV)	Keysight	E9300A	\	May 28, 2021	May 27, 2022
Signal Analyzer 20kHz-26.5GHz	Keysight	N9020A	MY49100060	May 28, 2021	May 27, 2022
Spectrum Analyzer 9kHz-40GHz	R&S	FSP 40	\	May 28, 2021	May 27, 2022

Radiated Emissions Test (966 Chamber)					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
966 chamber	ChengYu	966 Room	966	Jun. 06. 2020	Jun. 05, 2023
Receiver	R&S	ESR3	102075	May 28, 2021	May 27, 2022
Receiver	R&S	ESRP	101154	May 28, 2021	May 27, 2022
Amplifier	SKET	LAPA_01G18G-45dB	\	May 28, 2021	May 27, 2022
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 28, 2021	May 27, 2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	942	Jun. 01, 2021	May 31, 2022
Horn Antenna	Schwarzbeck	BBHA9120D	1541	Jun. 02, 2021	Jun. 01, 2022
Horn Antenn (18GHz-40GHz)	Schwarzbeck	BBHA9170	00822	Jun. 15, 2021	Jun. 14, 2022
Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	May 28, 2021	May 27, 2022
Loop Antenna (9KHz-30MHz)	Schwarzbeck	FMZB1519B	00014	Jun. 02, 2021	Jun. 01, 2022
RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-0008	May 28, 2021	May 27, 2022
RF cables2 (30MHz-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	May 28, 2021	May 27, 2022
RF cables3 (1GHz-40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	May 28, 2021	May 27, 2022
Power Metter	Keysight	E4419	\	May 28, 2021	May 27, 2022
Power Sensor (AV)	Keysight	E9300A	\	May 28, 2021	May 27, 2022
Signal Analyzer 20kHz-26.5GHz	Keysight	N9020A	MY49100060	May 28, 2021	May 27, 2022
Spectrum Analyzer 9kHz-40GHz	R&S	FSP 40	\	May 28, 2021	May 27, 2022
Software	Frad	EZ-EMC	FA-03A2 RE	\	\

6. Conducted Emissions

6.1 Block Diagram Of Test Setup



6.2 Limit

Frequency (MHz)	Limit (dBuV)	
	Quas-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00
Notes: 1. *Decreasing linearly with logarithm of frequency. 2. The lower limit shall apply at the transition frequencies.		

6.3 Test procedure

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

6.4 EUT operating Conditions

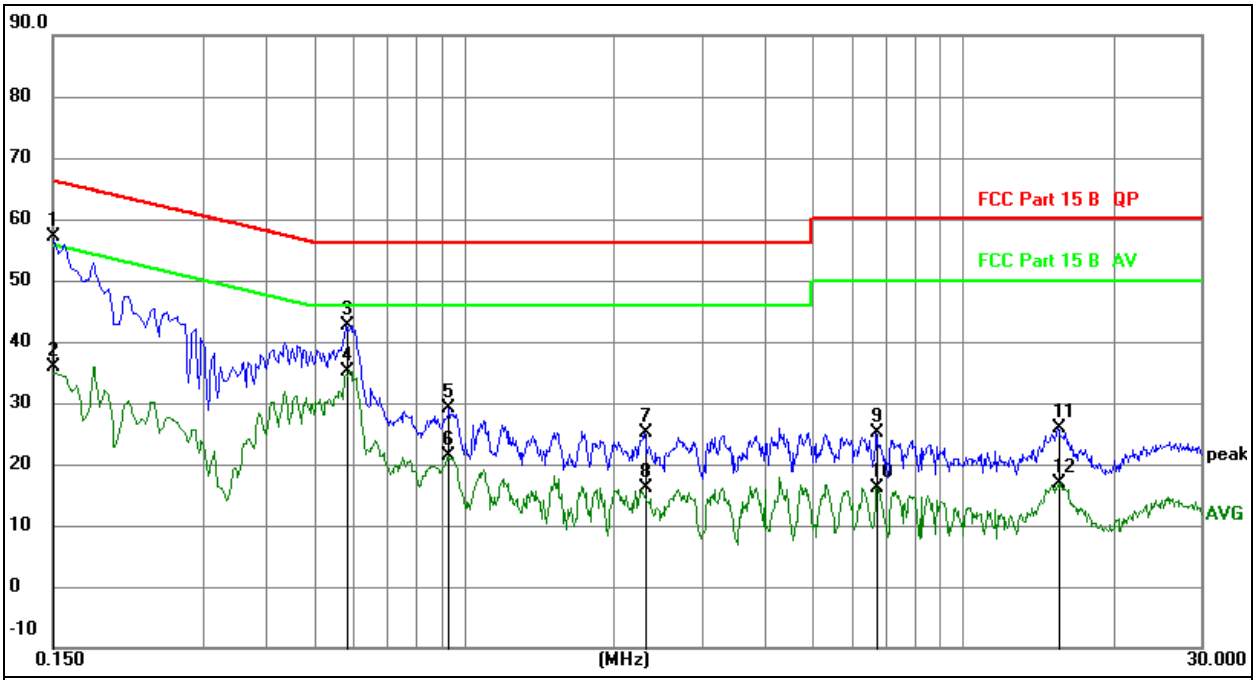
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

Note:

We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

6.5 Test Result

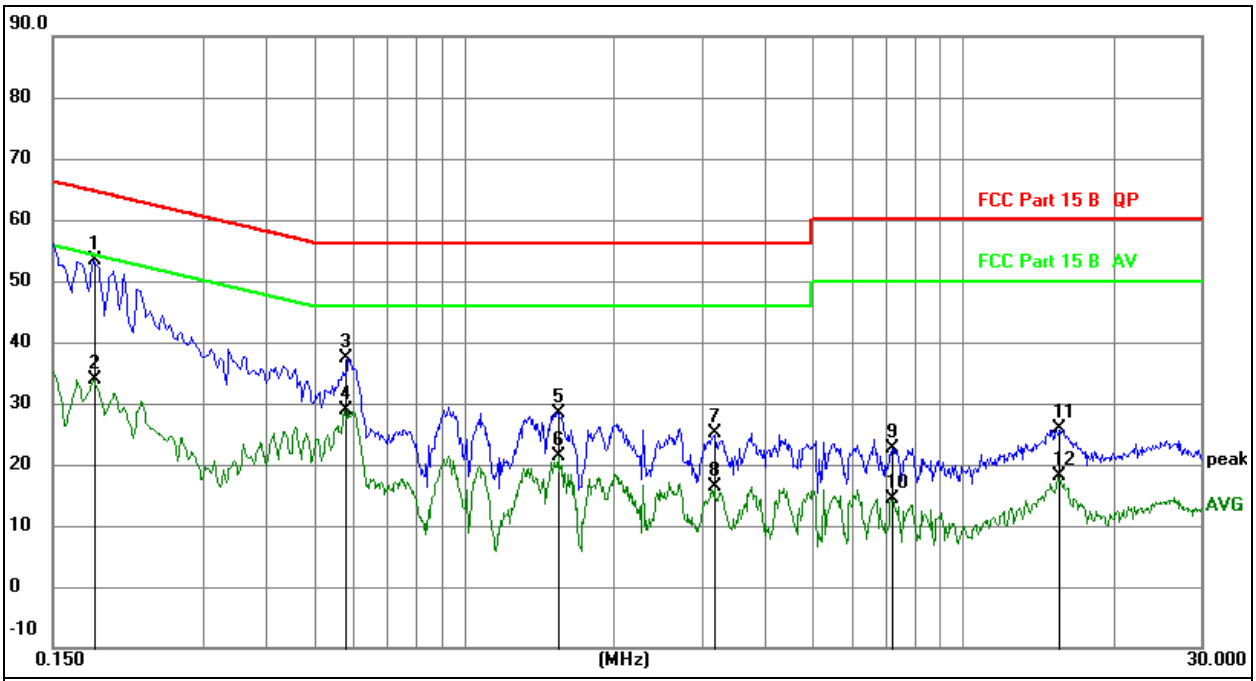
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz(POE Adapter)
Test Mode:	Mode 3	Polarization :	L



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement = Reading Level + Correct Factor
4. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1	*	0.1500	37.48	19.60	57.08	66.00	-8.92	QP
2		0.1500	16.21	19.60	35.81	56.00	-20.19	AVG
3		0.5820	23.03	19.61	42.64	56.00	-13.36	QP
4		0.5820	15.61	19.61	35.22	46.00	-10.78	AVG
5		0.9285	9.41	19.61	29.02	56.00	-26.98	QP
6		0.9285	1.86	19.61	21.47	46.00	-24.53	AVG
7		2.3010	5.41	19.63	25.04	56.00	-30.96	QP
8		2.3010	-3.49	19.63	16.14	46.00	-29.86	AVG
9		6.7065	5.31	19.73	25.04	60.00	-34.96	QP
10		6.7065	-3.53	19.73	16.20	50.00	-33.80	AVG
11		15.4860	6.06	19.77	25.83	60.00	-34.17	QP
12		15.4860	-2.84	19.77	16.93	50.00	-33.07	AVG

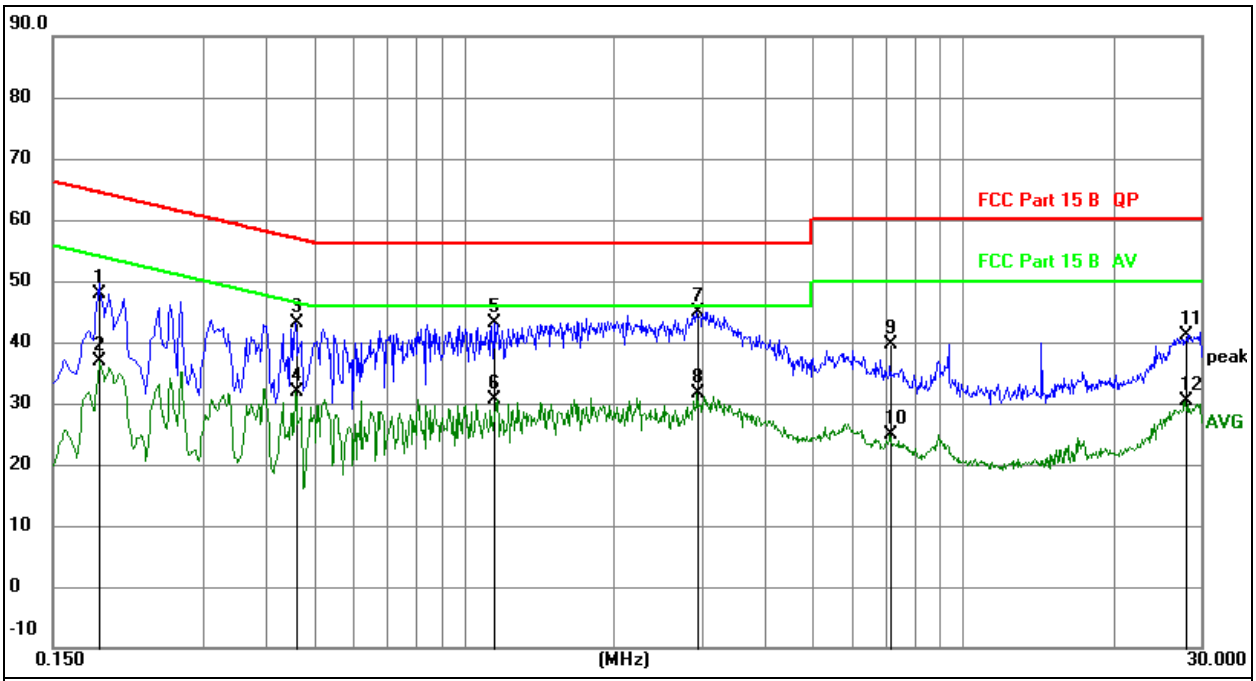
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz(POE Adapter)
Test Mode:	Mode 3	Polarization :	N



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement = Reading Level + Correct Factor
4. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1	*	0.1806	33.73	19.60	53.33	64.46	-11.13	QP
2		0.1806	14.37	19.60	33.97	54.46	-20.49	AVG
3		0.5762	17.82	19.61	37.43	56.00	-18.57	QP
4		0.5762	9.36	19.61	28.97	46.00	-17.03	AVG
5		1.5355	8.87	19.62	28.49	56.00	-27.51	QP
6		1.5355	1.74	19.62	21.36	46.00	-24.64	AVG
7		3.1731	5.43	19.65	25.08	56.00	-30.92	QP
8		3.1731	-3.27	19.65	16.38	46.00	-29.62	AVG
9		7.1754	2.90	19.73	22.63	60.00	-37.37	QP
10		7.1754	-5.33	19.73	14.40	50.00	-35.60	AVG
11		15.4701	6.19	19.77	25.96	60.00	-34.04	QP
12		15.4701	-1.62	19.77	18.15	50.00	-31.85	AVG

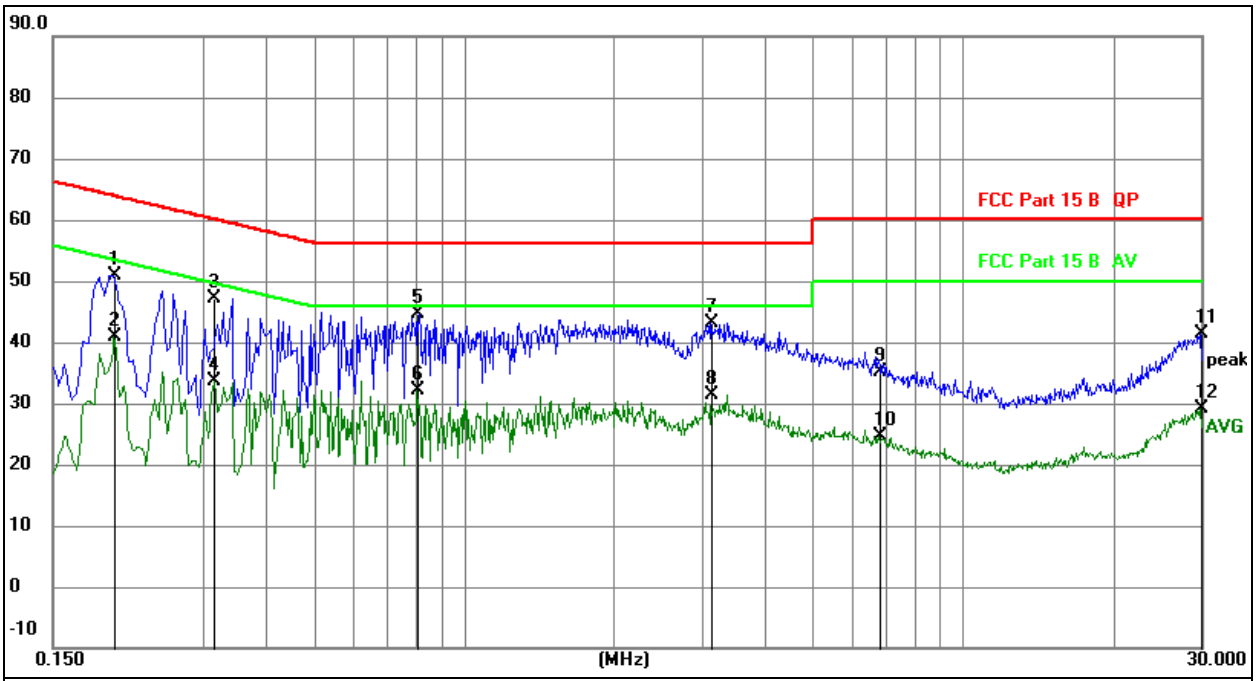
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz (Adapter)
Test Mode:	Mode 3	Polarization :	L



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement = Reading Level + Correct Factor
4. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.1860	28.27	19.61	47.88	64.21	-16.33	QP
2		0.1860	17.19	19.61	36.80	54.21	-17.41	AVG
3		0.4605	23.60	19.62	43.22	56.68	-13.46	QP
4		0.4605	12.20	19.62	31.82	46.68	-14.86	AVG
5		1.1490	23.38	19.63	43.01	56.00	-12.99	QP
6		1.1490	10.92	19.63	30.55	46.00	-15.45	AVG
7	*	2.9355	25.28	19.65	44.93	56.00	-11.07	QP
8		2.9355	11.86	19.65	31.51	46.00	-14.49	AVG
9		7.1430	19.78	19.74	39.52	60.00	-20.48	QP
10		7.1430	5.25	19.74	24.99	50.00	-25.01	AVG
11		27.8835	21.45	19.73	41.18	60.00	-18.82	QP
12		27.8835	10.54	19.73	30.27	50.00	-19.73	AVG

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz(Adapter)
Test Mode:	Mode 3	Polarization :	N



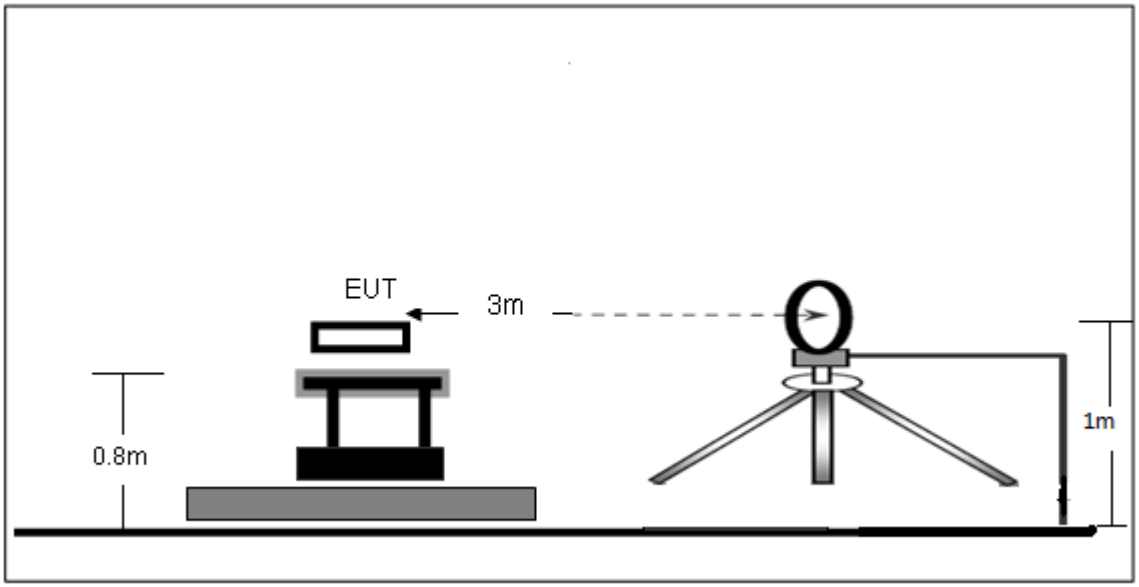
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement = Reading Level + Correct Factor
4. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.1995	31.33	19.61	50.94	63.63	-12.69	QP
2		0.1995	21.25	19.61	40.86	53.63	-12.77	AVG
3		0.3165	27.40	19.61	47.01	59.80	-12.79	QP
4		0.3165	14.03	19.61	33.64	49.80	-16.16	AVG
5	*	0.8070	25.04	19.62	44.66	56.00	-11.34	QP
6		0.8070	12.45	19.62	32.07	46.00	-13.93	AVG
7		3.1380	23.53	19.66	43.19	56.00	-12.81	QP
8		3.1380	11.62	19.66	31.28	46.00	-14.72	AVG
9		6.7920	15.47	19.74	35.21	60.00	-24.79	QP
10		6.7920	4.99	19.74	24.73	50.00	-25.27	AVG
11		29.9850	21.61	19.73	41.34	60.00	-18.66	QP
12		29.9850	9.34	19.73	29.07	50.00	-20.93	AVG

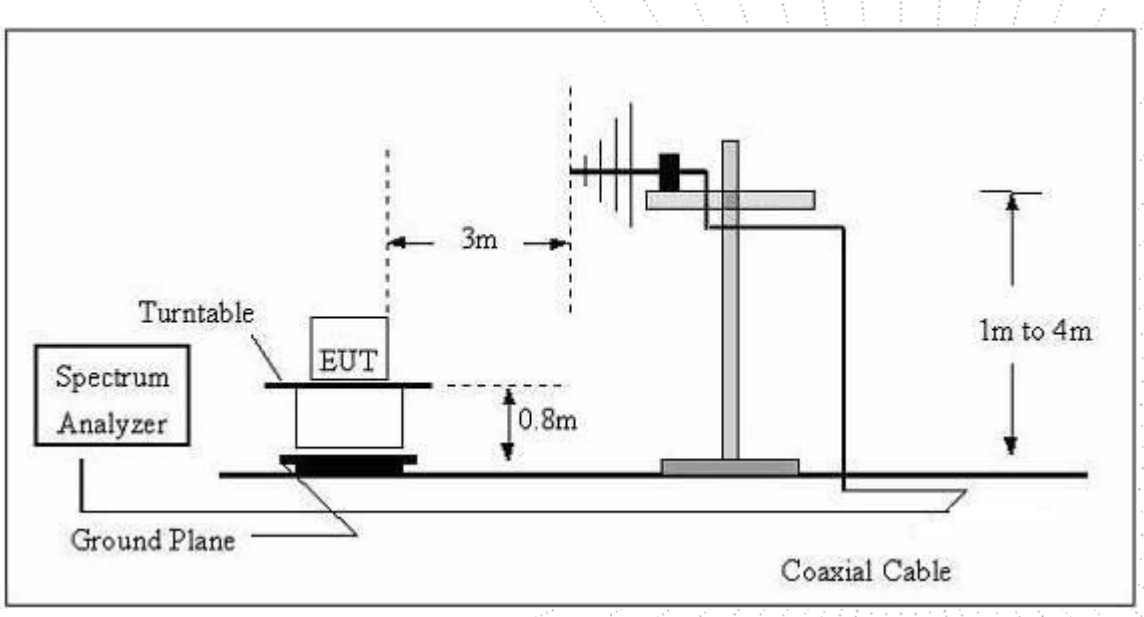
7. Radiated Emissions

7.1 Block Diagram Of Test Setup

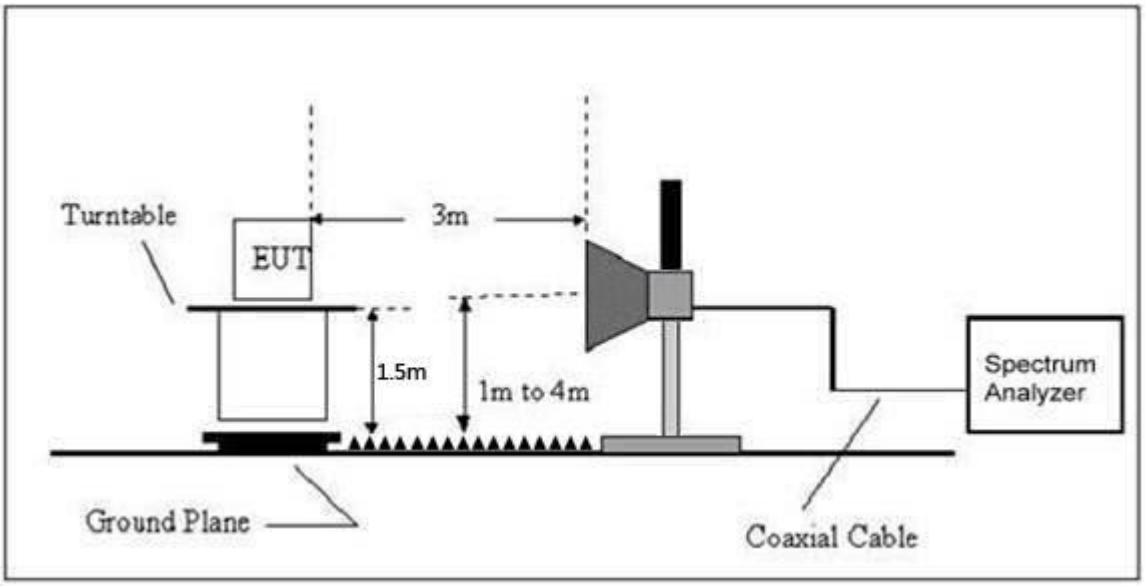
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



7.2 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. 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.

Frequency	Field Strength	Distance	Field Strength Limit at 3m Distance	
(MHz)	uV/m	(m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))}$ + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))}$ + 40
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)}$ + 40
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Limits Of Radiated Emission Measurement (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M)	
	Peak	Average
Above 1000	74	54

Notes:
(1)The limit for radiated test was performed according to FCC PART 15C.
(2)The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).

7.3 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.

7.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

Note:

We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

7.5 Test Result

Below 30MHz

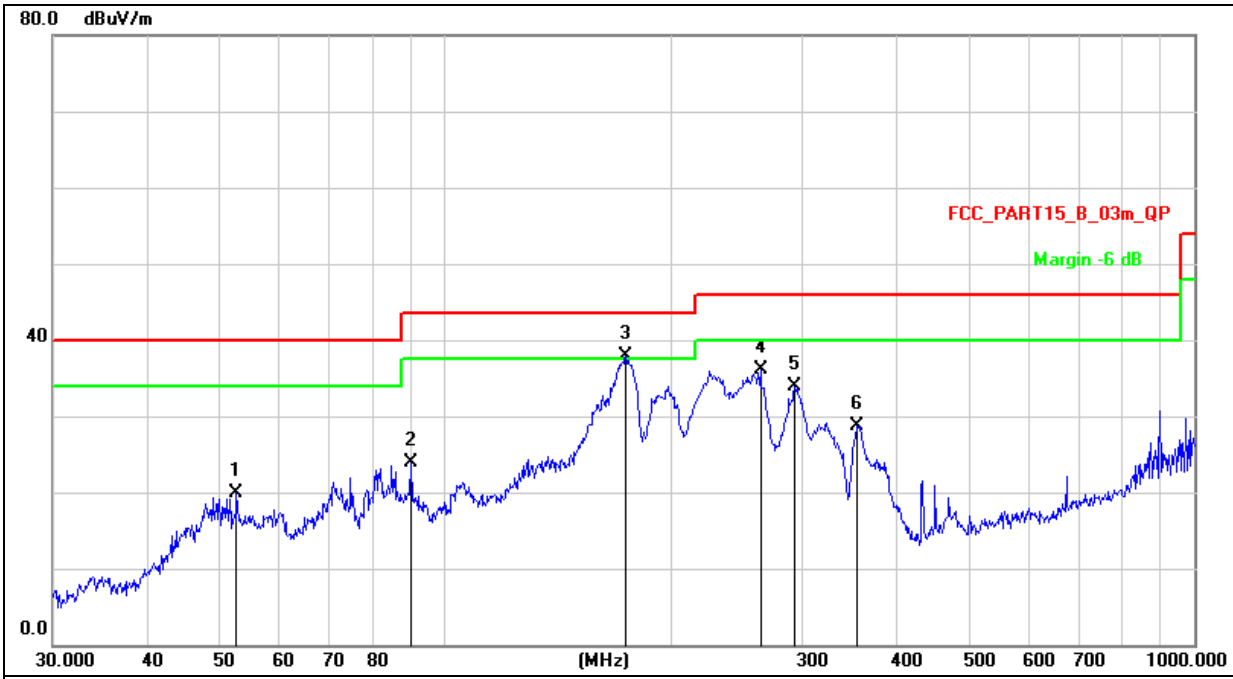
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage ：	AC120V/60Hz(POE Adapter)
Test Mode:	Mode 4	Polarization :	---

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

Note:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

Between 30MHz – 1GHz

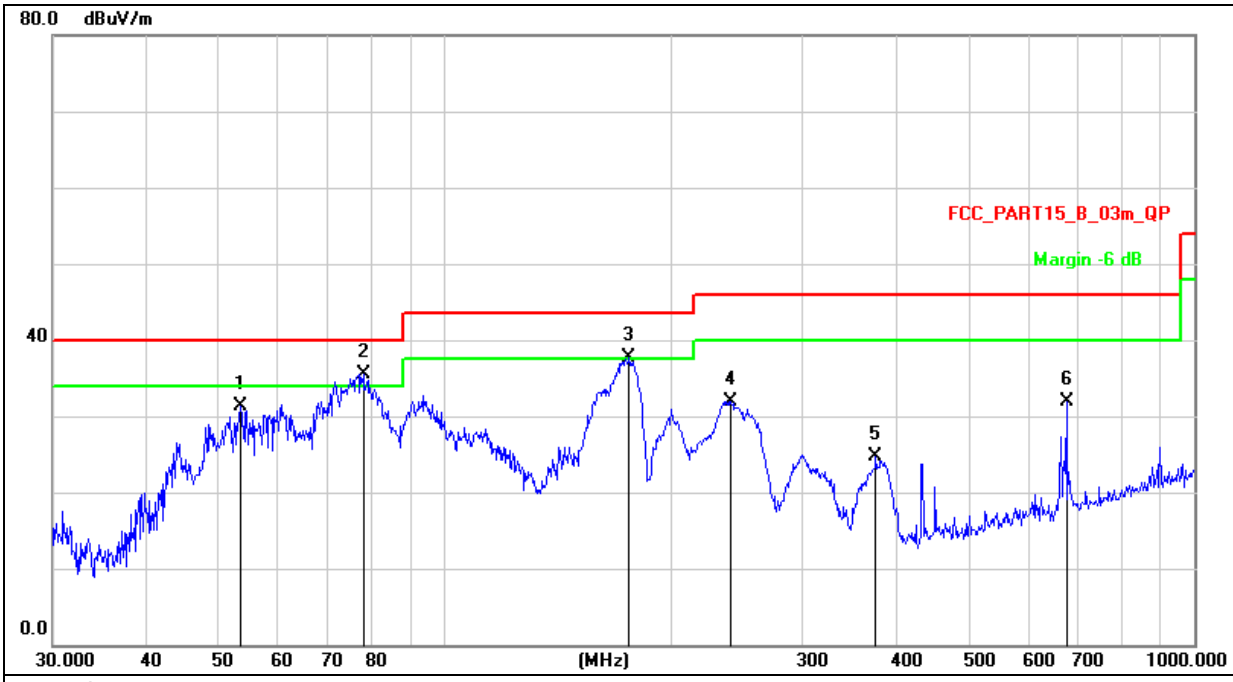
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage ：	AC120V/60Hz(POE Adapter)
Test Mode:	Mode 3	Polarization :	Horizontal



Remark:
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement = Reading Level + Correct Factor
3. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		52.7599	35.12	-15.14	19.98	40.00	-20.02	QP
2		90.2205	42.00	-18.06	23.94	43.50	-19.56	QP
3	*	174.4241	55.78	-17.94	37.84	43.50	-5.66	QP
4		263.8190	50.82	-14.72	36.10	46.00	-9.90	QP
5		293.0842	47.66	-13.81	33.85	46.00	-12.15	QP
6		355.4273	40.84	-12.11	28.73	46.00	-17.27	QP

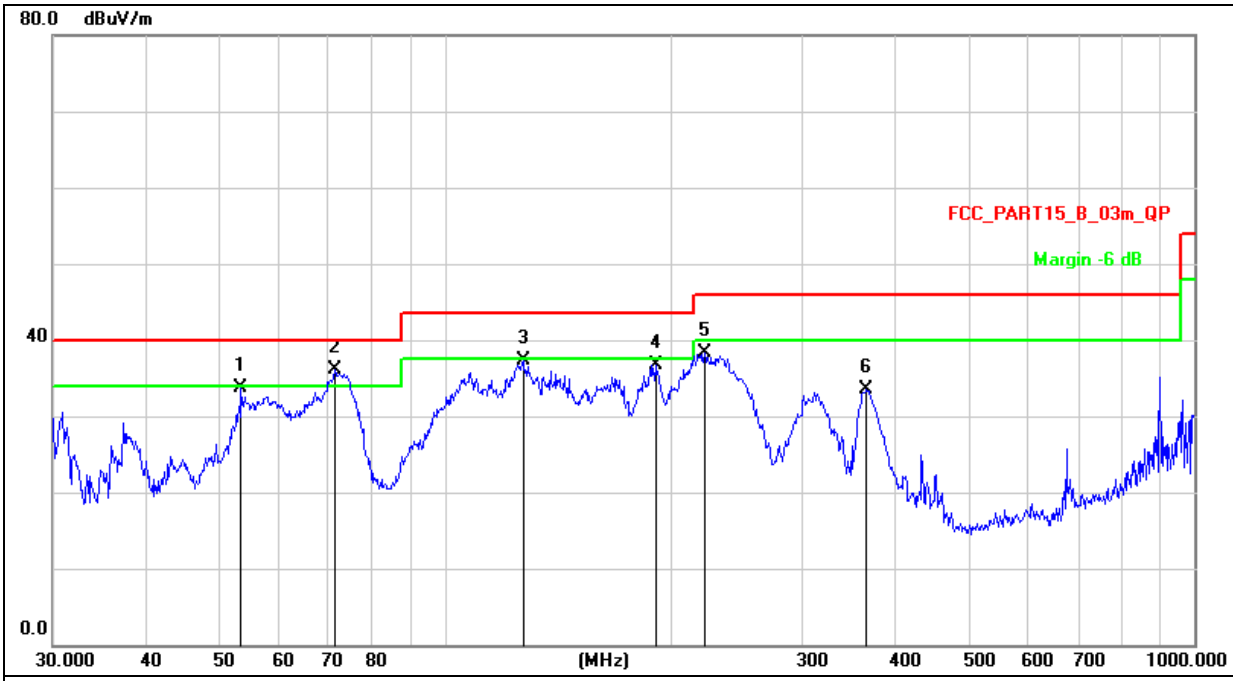
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage ：	AC120V/60Hz(POE Adapter)
Test Mode:	Mode 3	Polarization :	Vertical



Remark:
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement = Reading Level + Correct Factor
3. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		53.5052	46.62	-15.22	31.40	40.00	-8.60	QP
2	*	77.8654	55.40	-19.94	35.46	40.00	-4.54	QP
3	!	176.2686	55.43	-17.82	37.61	43.50	-5.89	QP
4		240.8303	47.33	-15.36	31.97	46.00	-14.03	QP
5		375.9384	36.33	-11.64	24.69	46.00	-21.31	QP
6		675.2078	37.84	-5.97	31.87	46.00	-14.13	QP

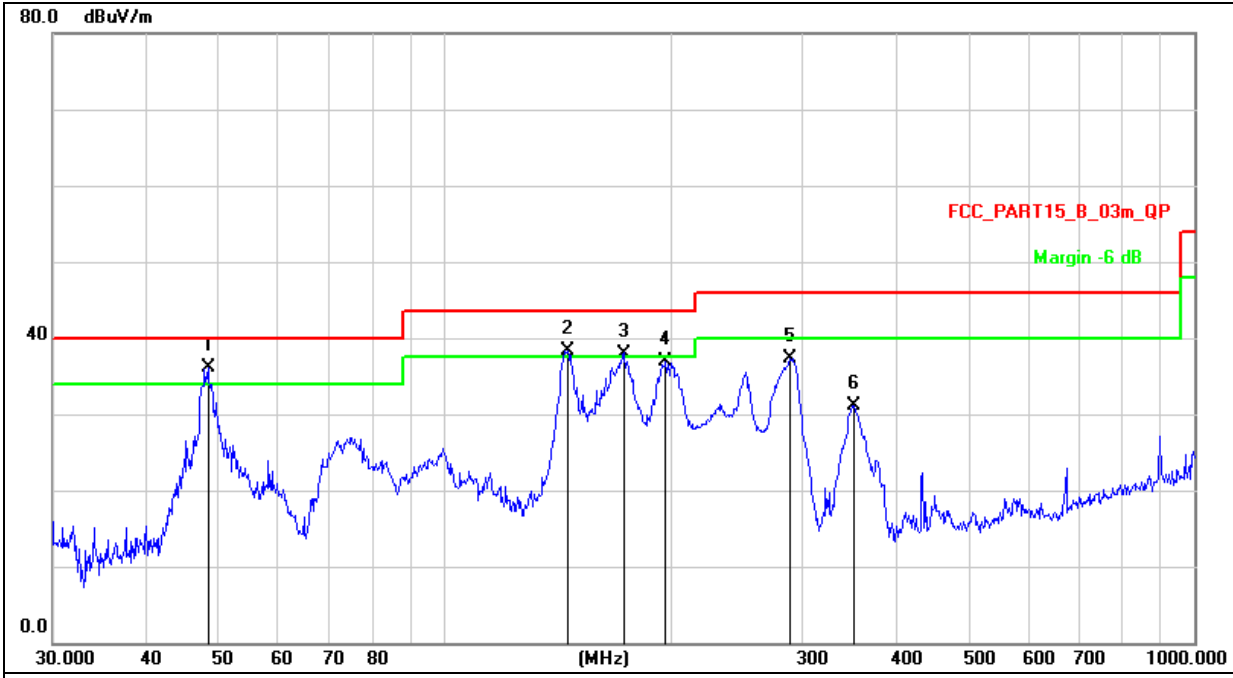
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage ：	AC120V/60Hz(Adapter)
Test Mode:	Mode 3	Polarization :	Horizontal



Remark:
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement = Reading Level + Correct Factor
3. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		53.5052	48.84	-15.22	33.62	40.00	-6.38	QP
2	*	71.3300	54.60	-18.49	36.11	40.00	-3.89	QP
3		127.2176	55.37	-18.03	37.34	43.50	-6.16	QP
4		191.0738	53.66	-16.87	36.79	43.50	-6.71	QP
5		222.1698	54.01	-15.79	38.22	46.00	-7.78	QP
6		365.5391	45.29	-11.88	33.41	46.00	-12.59	QP

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage ：	AC120V/60Hz(Adapter)
Test Mode:	Mode 3	Polarization :	Vertical



Remark:
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement = Reading Level + Correct Factor
3. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	48.3318	50.97	-14.94	36.03	40.00	-3.97	QP
2	!	145.8611	57.56	-19.23	38.33	43.50	-5.17	QP
3	!	173.2051	56.01	-18.01	38.00	43.50	-5.50	QP
4		197.2000	53.35	-16.48	36.87	43.50	-6.63	QP
5		289.0020	51.29	-13.94	37.35	46.00	-8.65	QP
6		351.7078	43.34	-12.19	31.15	46.00	-14.85	QP

Between 1GHz – 40GHz(The worst case is Antenna A.)

Test Mode:	TX(5.8G) - 802.11a

Polar (H/V)	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
Low Channel (5745 MHz)-Above 1G									
V	4679.153	57.23	5.94	35.40	44.00	54.57	74	-19.43	PK
V	4679.153	43.15	5.94	35.40	44.00	40.49	54	-13.51	AV
V	11490.068	57.95	8.46	39.75	44.50	61.66	68.2	-6.54	PK
V	11490.068	43.24	8.46	39.75	44.50	46.95	54	-7.05	AV
V	17235.061	59.00	10.12	38.80	44.10	63.82	68.2	-4.38	PK
V	17235.061	43.88	10.12	38.80	42.70	50.10	54	-3.90	AV
H	4679.107	54.15	5.94	35.18	44.00	51.27	74	-22.73	PK
H	4679.107	43.94	5.94	35.18	44.00	41.06	54	-12.94	AV
H	11490.152	54.74	8.46	38.71	44.50	57.41	68.2	-10.79	PK
H	11490.152	44.55	8.46	38.71	44.50	47.22	54	-6.78	AV
H	17235.107	54.01	10.12	38.38	44.10	58.41	68.2	-9.79	PK
H	17235.107	44.86	10.12	38.38	44.10	49.26	54	-4.74	AV
Middle Channel (5785 MHz)-Above 1G									
V	4592.142	54.03	6.48	36.35	44.05	52.81	74	-21.19	PK
V	4592.142	43.15	6.48	36.35	44.05	41.93	54	-12.07	AV
V	11570.046	58.21	8.47	37.88	44.51	60.05	68.2	-8.15	PK
V	11570.046	43.30	8.47	37.88	44.51	45.14	54	-8.86	AV
V	17355.011	57.64	10.12	38.80	44.10	62.46	68.2	-5.74	PK
V	17355.011	39.37	10.12	38.80	42.70	45.59	54	-8.41	AV
H	4592.054	58.49	6.48	36.37	44.05	57.29	74	-16.71	PK
H	4592.054	43.46	6.48	36.37	44.05	42.26	54	-11.74	AV
H	11570.047	52.58	8.47	38.64	44.50	55.19	68.2	-13.01	PK
H	11570.047	44.32	8.47	38.64	44.50	46.93	54	-7.07	AV
H	17355.126	52.77	10.12	38.38	44.10	57.17	68.2	-11.03	PK
H	17355.126	40.78	10.12	38.38	44.10	45.18	54	-8.82	AV
High Channel (5825 MHz)-Above 1G									
V	6039.105	56.59	7.10	37.24	43.50	57.43	68.2	-10.77	PK
V	6039.105	43.56	7.10	37.24	43.50	44.40	54	-9.60	AV
V	11650.145	60.29	8.46	37.68	44.50	61.93	74	-12.07	PK
V	11650.145	44.00	8.46	37.68	44.50	45.64	54	-8.36	AV
V	17475.095	57.72	10.12	38.80	44.10	62.54	68.2	-5.66	PK
V	17475.095	43.87	10.12	38.80	42.70	50.09	54	-3.91	AV
H	6039.094	55.27	7.10	37.24	43.50	56.11	68.2	-12.09	PK
H	6039.094	43.16	7.10	37.24	43.50	44.00	54	-10.00	AV
H	11650.101	51.52	8.46	38.57	44.50	54.05	74	-19.95	PK
H	11650.101	43.10	8.46	38.57	44.50	45.63	54	-8.37	AV
H	17475.184	53.94	10.12	38.38	44.10	58.34	68.2	-9.86	PK
H	17475.184	43.64	10.12	38.38	44.10	48.04	54	-5.96	AV

Note: PK value is lower than the Average value limit, So average didn't record.
The 26.5-40G 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.

Test Mode:	TX(5.8G) - 802.11n-HT20

Polar (H/V)	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
Low Channel (5745 MHz)-Above 1G									
V	4679.186	60.35	5.94	35.40	44.00	57.69	74	-16.31	PK
V	4679.186	43.68	5.94	35.40	44.00	41.02	54	-12.98	AV
V	11490.105	53.56	8.46	39.75	44.50	57.27	68.2	-10.93	PK
V	11490.105	43.15	8.46	39.75	44.50	46.86	54	-7.14	AV
V	17235.187	60.87	10.12	38.80	44.10	65.69	68.2	-2.51	PK
V	17235.187	43.83	10.12	38.80	42.70	50.05	54	-3.95	AV
H	4679.083	56.69	5.94	35.18	44.00	53.81	74	-20.19	PK
H	4679.083	43.58	5.94	35.18	44.00	40.70	54	-13.30	AV
H	11490.118	51.34	8.46	38.71	44.50	54.01	68.2	-14.19	PK
H	11490.118	43.09	8.46	38.71	44.50	45.76	54	-8.24	AV
H	17235.166	52.96	10.12	38.38	44.10	57.36	68.2	-10.84	PK
H	17235.166	40.26	10.12	38.38	44.10	44.66	54	-9.34	AV
Middle Channel (5785 MHz)-Above 1G									
V	4592.083	60.88	6.48	36.35	44.05	59.66	74	-14.34	PK
V	4592.083	43.25	6.48	36.35	44.05	42.03	54	-11.97	AV
V	11570.143	54.92	8.47	37.88	44.51	56.76	68.2	-11.44	PK
V	11570.143	43.08	8.47	37.88	44.51	44.92	54	-9.08	AV
V	17355.141	59.62	10.12	38.80	44.10	64.44	68.2	-3.76	PK
V	17355.141	44.00	10.12	38.80	42.70	50.22	54	-3.78	AV
H	4592.046	59.52	6.48	36.37	44.05	58.32	74	-15.68	PK
H	4592.046	43.25	6.48	36.37	44.05	42.05	54	-11.95	AV
H	11570.008	54.88	8.47	38.64	44.50	57.49	68.2	-10.71	PK
H	11570.008	44.54	8.47	38.64	44.50	47.15	54	-6.85	AV
H	17355.160	53.13	10.12	38.38	44.10	57.53	68.2	-10.67	PK
H	17355.160	41.98	10.12	38.38	44.10	46.38	54	-7.62	AV
High Channel (5825 MHz)-Above 1G									
V	6039.000	59.15	7.10	37.24	43.50	59.99	68.2	-8.21	PK
V	6039.000	43.42	7.10	37.24	43.50	44.26	54	-9.74	AV
V	11650.008	60.22	8.46	37.68	44.50	61.86	74	-12.14	PK
V	11650.008	43.25	8.46	37.68	44.50	44.89	54	-9.11	AV
V	17475.003	59.30	10.12	38.80	44.10	64.12	68.2	-4.08	PK
V	17475.003	43.57	10.12	38.80	42.70	49.79	54	-4.21	AV
H	6039.196	59.09	7.10	37.24	43.50	59.93	68.2	-8.27	PK
H	6039.196	43.61	7.10	37.24	43.50	44.45	54	-9.55	AV
H	11650.100	54.17	8.46	38.57	44.50	56.70	74	-17.30	PK
H	11650.100	43.71	8.46	38.57	44.50	46.24	54	-7.76	AV
H	17475.136	54.27	10.12	38.38	44.10	58.67	68.2	-9.53	PK
H	17475.136	43.39	10.12	38.38	44.10	47.79	54	-6.21	AV

Note: PK value is lower than the Average value limit, So average didn't record.
The 26.5-40G 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.

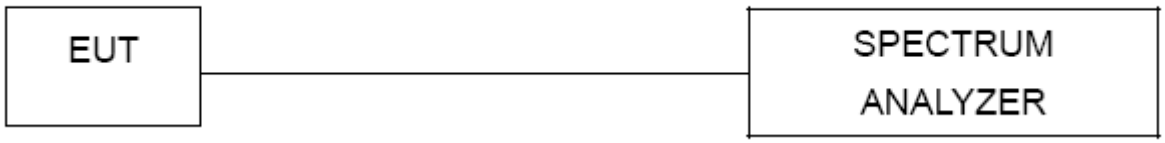
Test Mode:	TX(5.8G) - 802.11n-HT40

Polar (H/V)	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
Low Channel (5755 MHz)-Above 1G									
V	4679.094	59.07	5.94	35.40	44.00	56.41	74	-17.59	PK
V	4679.094	43.83	5.94	35.40	44.00	41.17	54	-12.83	AV
V	11510.023	55.59	8.46	39.75	44.50	59.30	74	-14.70	PK
V	11510.023	43.02	8.46	39.75	44.50	46.73	54	-7.27	AV
V	17265.132	56.24	10.12	38.80	44.10	61.06	68.2	-7.14	PK
V	17265.132	2.00	10.12	38.80	42.70	8.22	54	-45.78	AV
H	4679.110	57.36	5.94	35.18	44.00	54.48	74	-19.52	PK
H	4679.110	43.80	5.94	35.18	44.00	40.92	54	-13.08	AV
H	11510.029	54.36	8.46	38.71	44.50	57.03	74	-16.97	PK
H	11510.029	42.29	8.46	38.71	44.50	44.96	54	-9.04	AV
H	17265.111	54.93	10.12	38.38	44.10	59.33	68.2	-8.87	PK
H	17265.111	42.20	10.12	38.38	44.10	46.60	54	-7.40	AV
High Channel (5795 MHz)-Above 1G									
V	6039.060	59.43	6.48	36.35	44.05	58.21	68.2	-9.99	PK
V	6039.060	43.84	6.48	36.35	44.05	42.62	54	-11.38	AV
V	11590.035	56.53	8.47	37.88	44.51	58.37	74	-15.63	PK
V	11590.035	43.98	8.47	37.88	44.51	45.82	54	-8.18	AV
V	17385.196	55.68	10.12	38.80	44.10	60.50	68.2	-7.70	PK
V	17385.196	41.58	10.12	38.80	42.70	47.80	54	-6.20	AV
H	6039.087	57.60	6.48	36.37	44.05	56.40	68.2	-11.80	PK
H	6039.087	43.81	6.48	36.37	44.05	42.61	54	-11.39	AV
H	11590.093	51.82	8.47	38.64	44.50	54.43	74	-19.57	PK
H	11590.093	42.58	8.47	38.64	44.50	45.19	54	-8.81	AV
H	17385.155	53.97	10.12	38.38	44.10	58.37	68.2	-9.83	PK
H	17385.155	44.12	10.12	38.38	44.10	48.52	54	-5.48	AV

Note: PK value is lower than the Average value limit, So average didn't record.
The 26.5-40G 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.

8. Power Spectral Density Test

8.1 Block Diagram Of Test Setup



8.2 Limit

For the band 5.15-5.25 GHz,
(i)For an outdoor Wifi Repeater 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 Wifi Repeater 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 Wifi Repeaters 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 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.

8.3 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.

8.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

8.5 Test Result

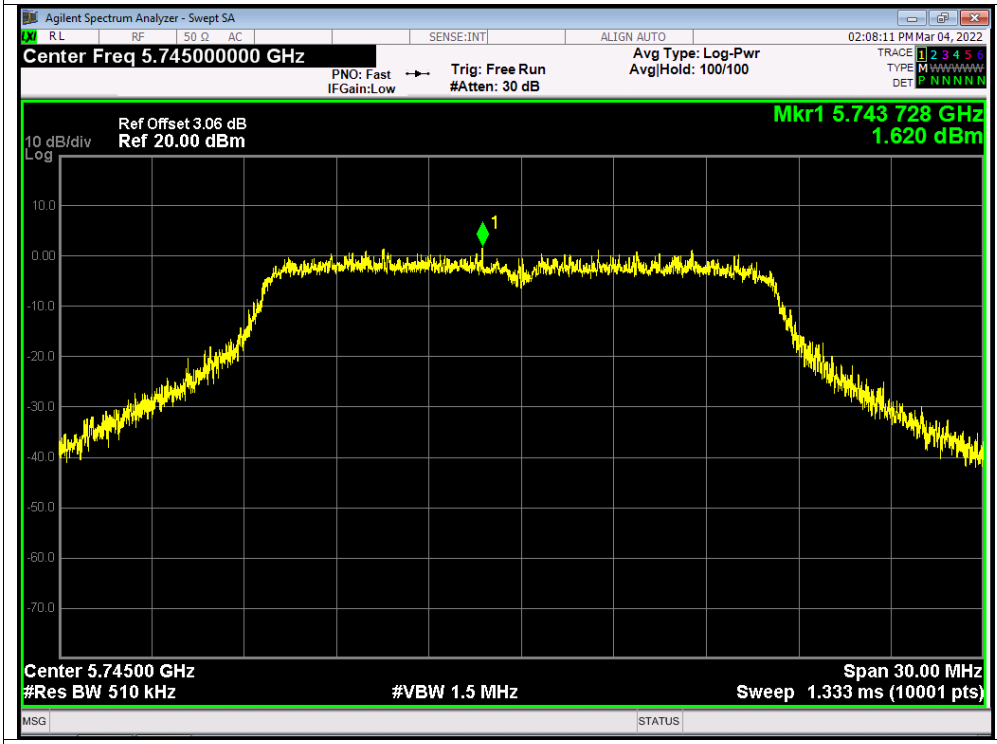
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz
Test Mode:	(5745-5825MHz)		

Condition	Mode	Frequency (MHz)	Conducted PSD (dBm/500KHz)		Total (dBm)	Limit (dBm/500KHz)	Verdict
			Ant A	Ant B			
NVNT	a	5745	1.62	-0.58	/	24	Pass
NVNT	a	5785	0.22	-0.84	/	24	Pass
NVNT	a	5825	-1.95	-0.74	/	24	Pass
NVNT	n20	5745	-1.08	-1.32	1.81	20.99	Pass
NVNT	n20	5785	-2.29	-1.77	0.99	20.99	Pass
NVNT	n20	5825	-4.24	-2.02	0.02	20.99	Pass
NVNT	n40	5755	-4.24	-4.68	-1.44	20.99	Pass
NVNT	n40	5795	-5.05	-4.3	-1.65	20.99	Pass

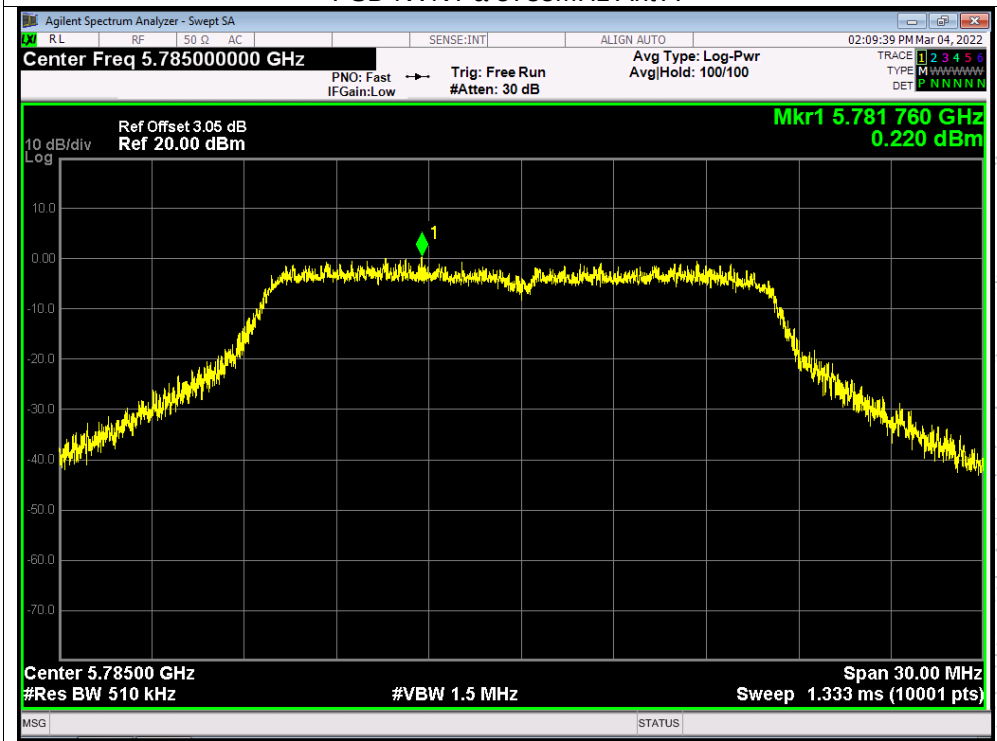
Single antenna:
Antenna gain=12dbi>6, so power limit=30-(12-6.0)=24
MIMO mode:
Directional gain=10log(NANT/NSS) dbi =15.01dbi
15.01dbi>6.0 dbi so limit=30-(15.01-6.0)=20.99

Test Graphs

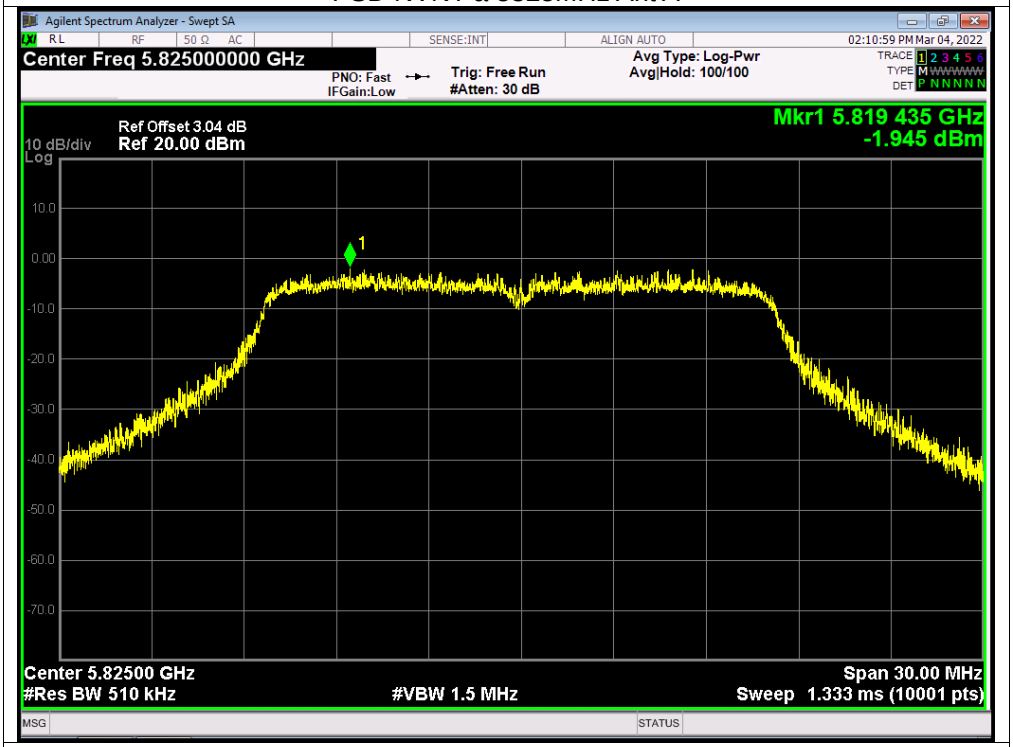
PSD NVNT a 5745MHz Ant A



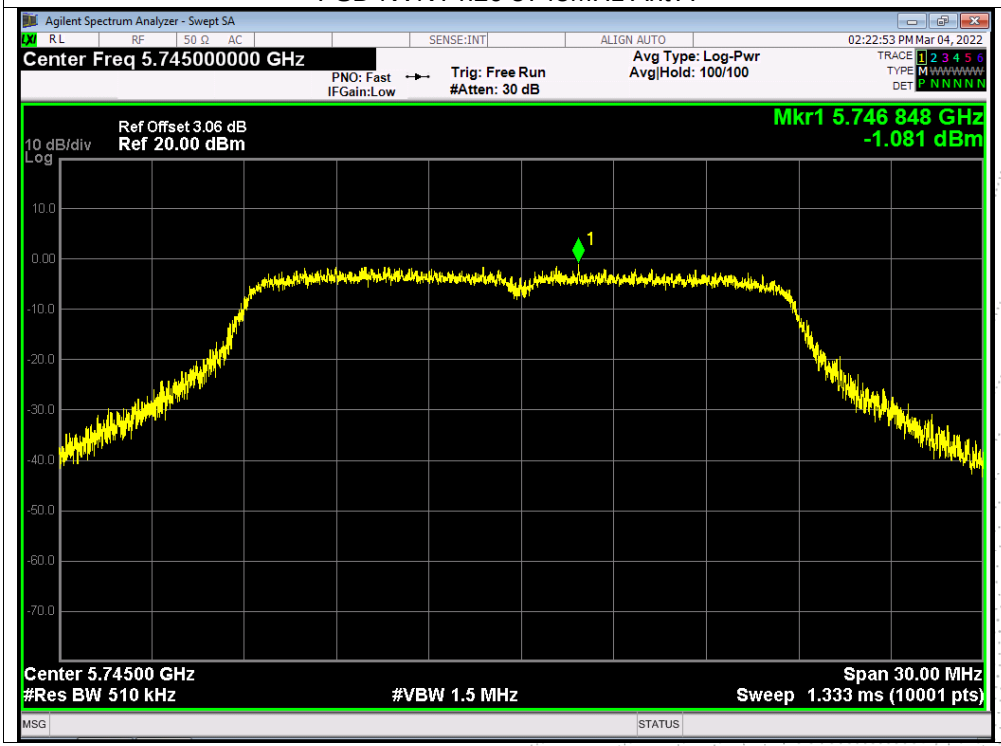
PSD NVNT a 5785MHz Ant A



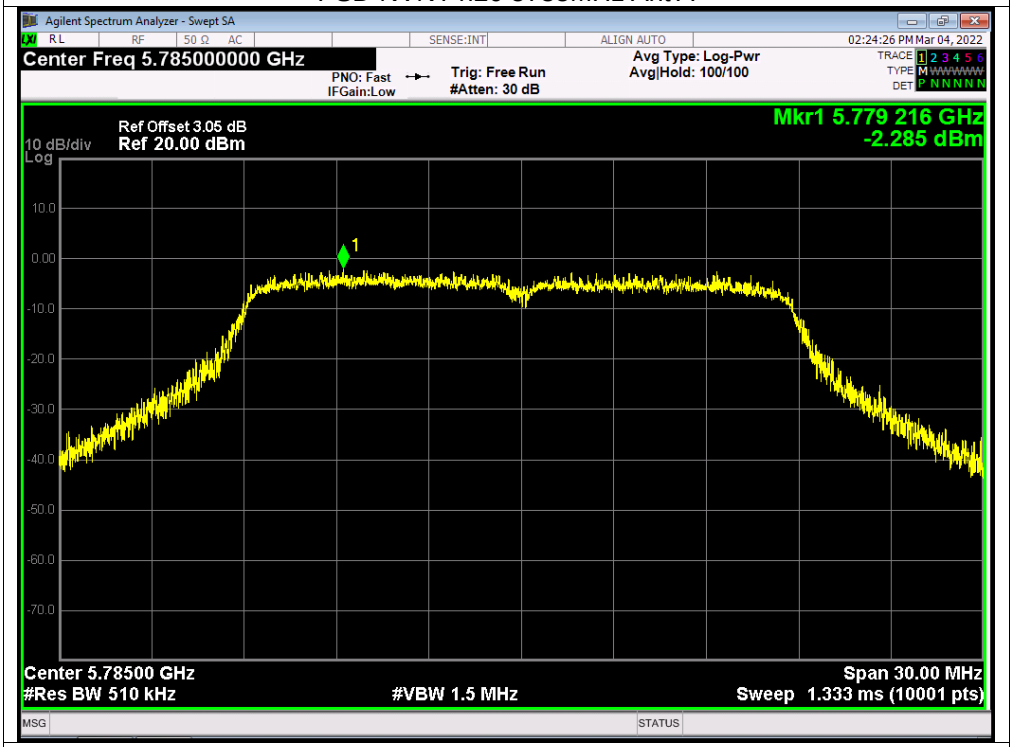
PSD NVNT a 5825MHz Ant A



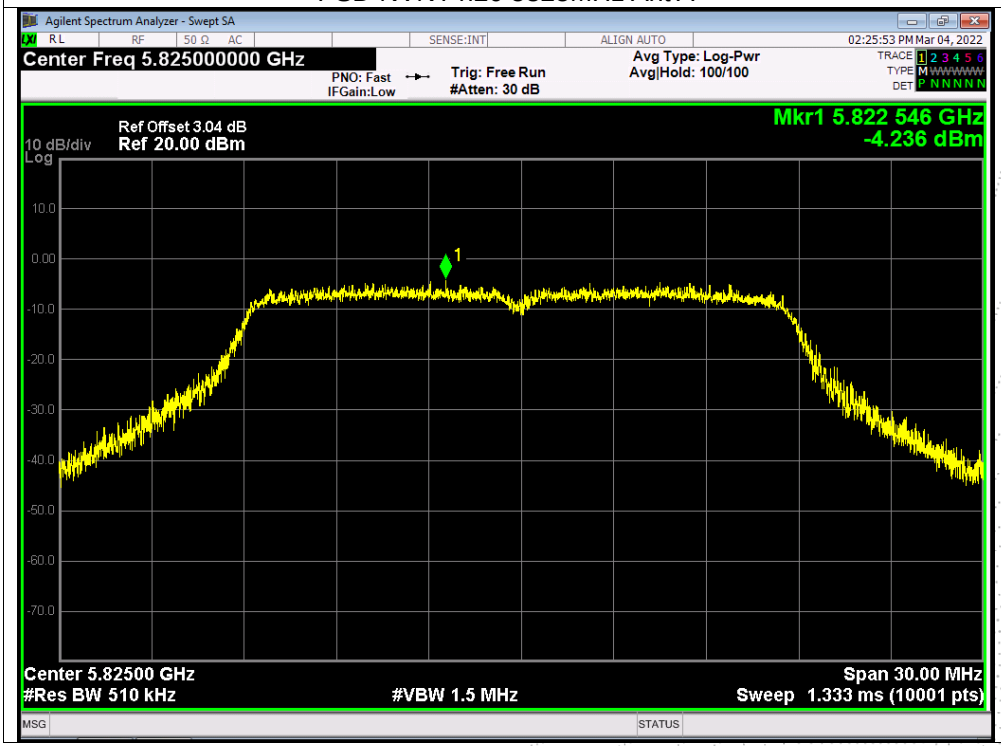
PSD NVNT n20 5745MHz Ant A



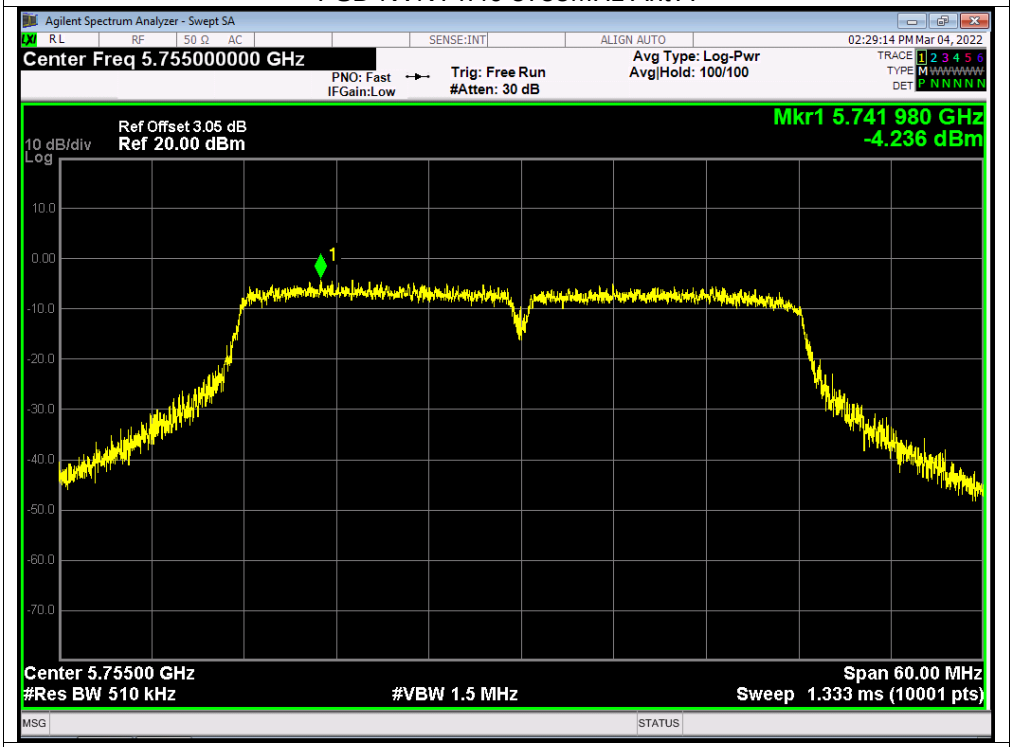
PSD NVNT n20 5785MHz Ant A



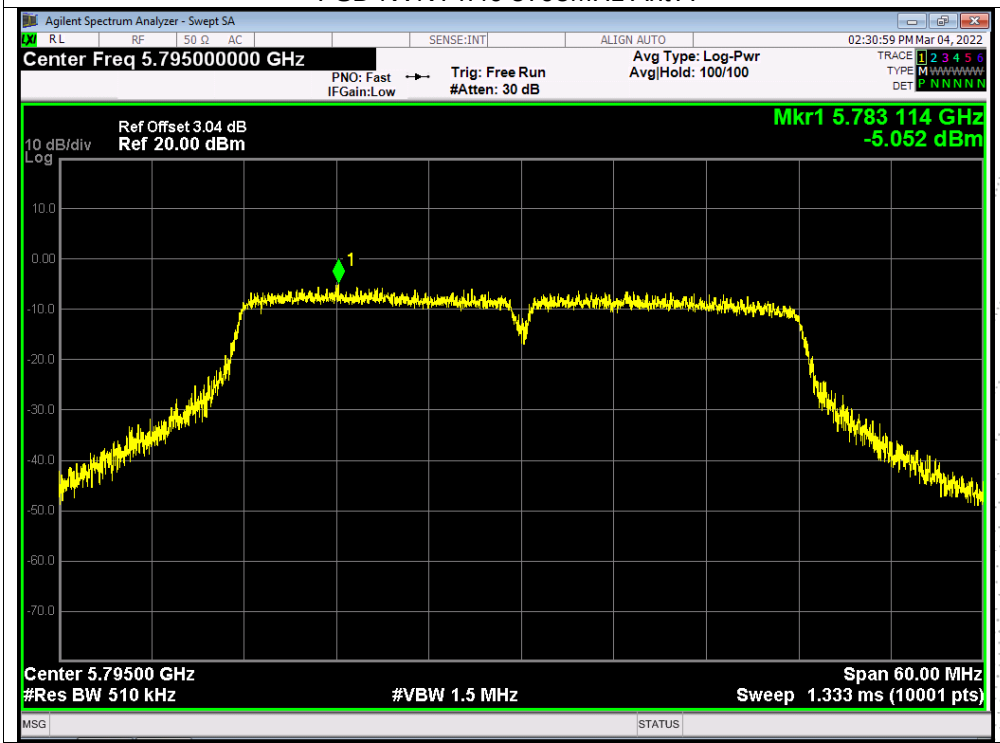
PSD NVNT n20 5825MHz Ant A



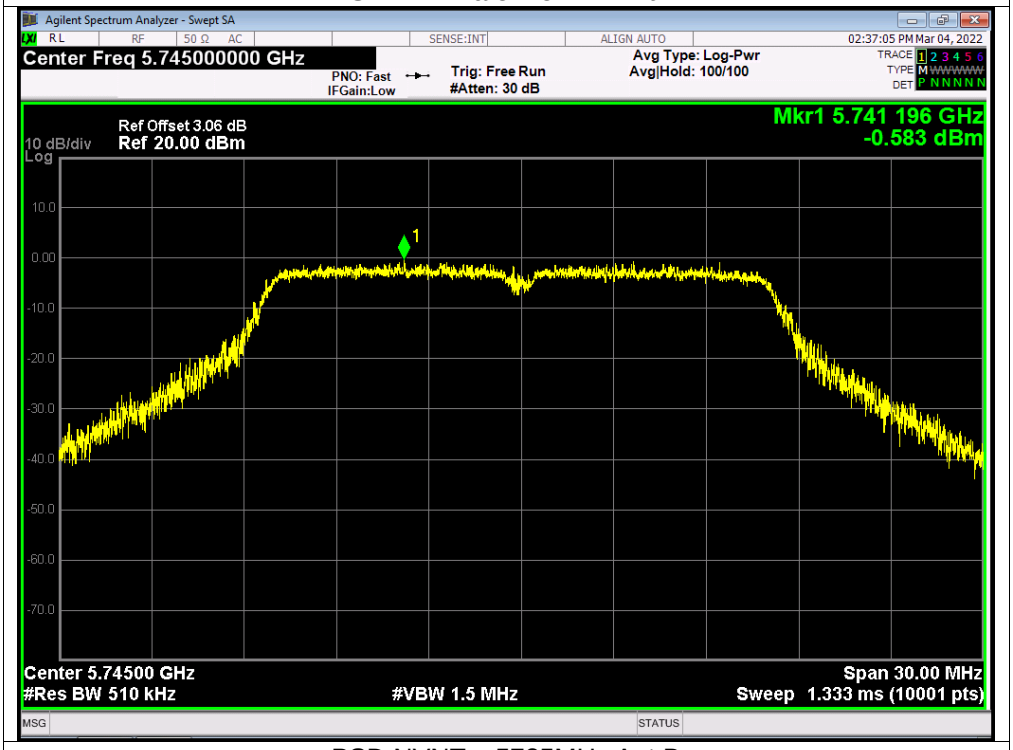
PSD NVNT n40 5755MHz Ant A



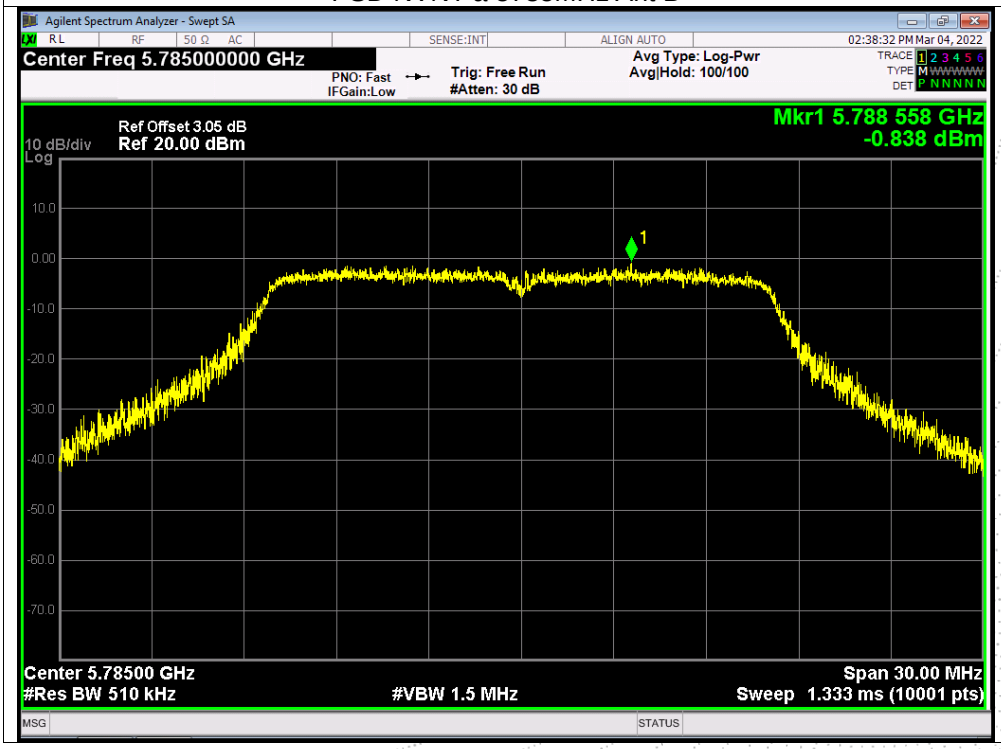
PSD NVNT n40 5795MHz Ant A



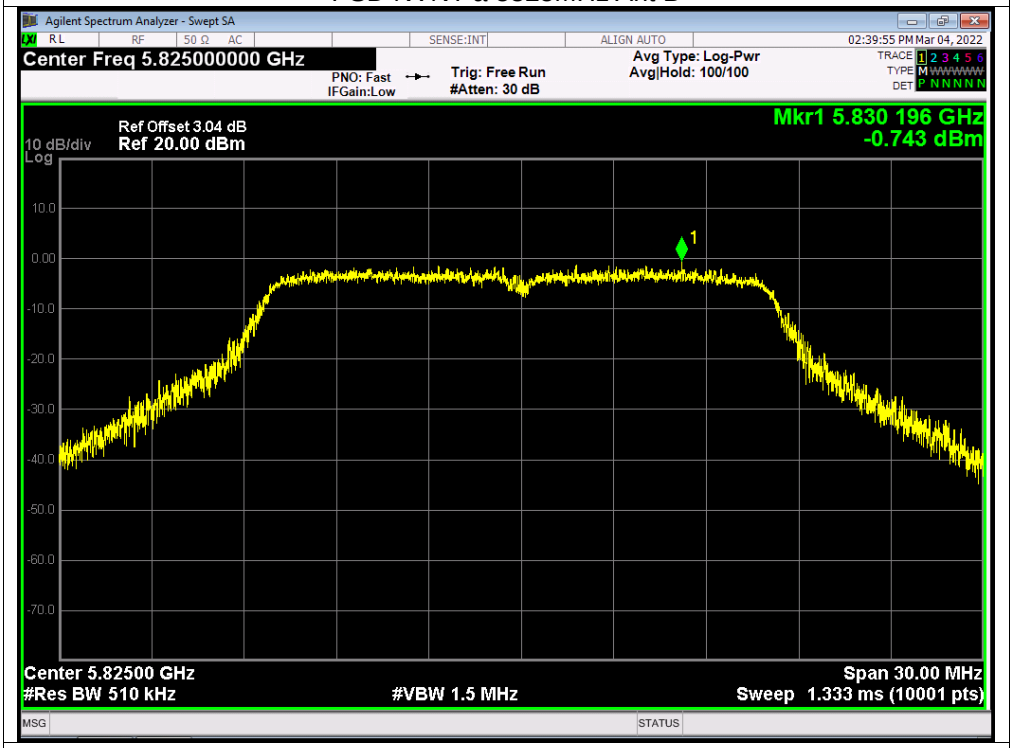
Test Graphs
PSD NVNT a 5745MHz Ant B



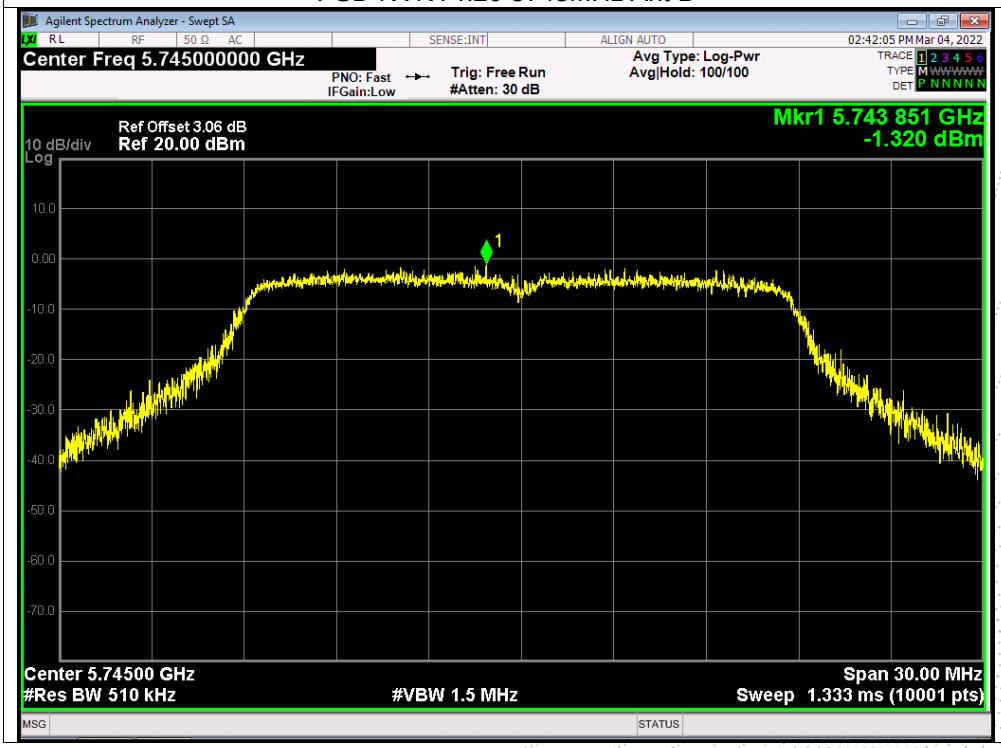
PSD NVNT a 5785MHz Ant B



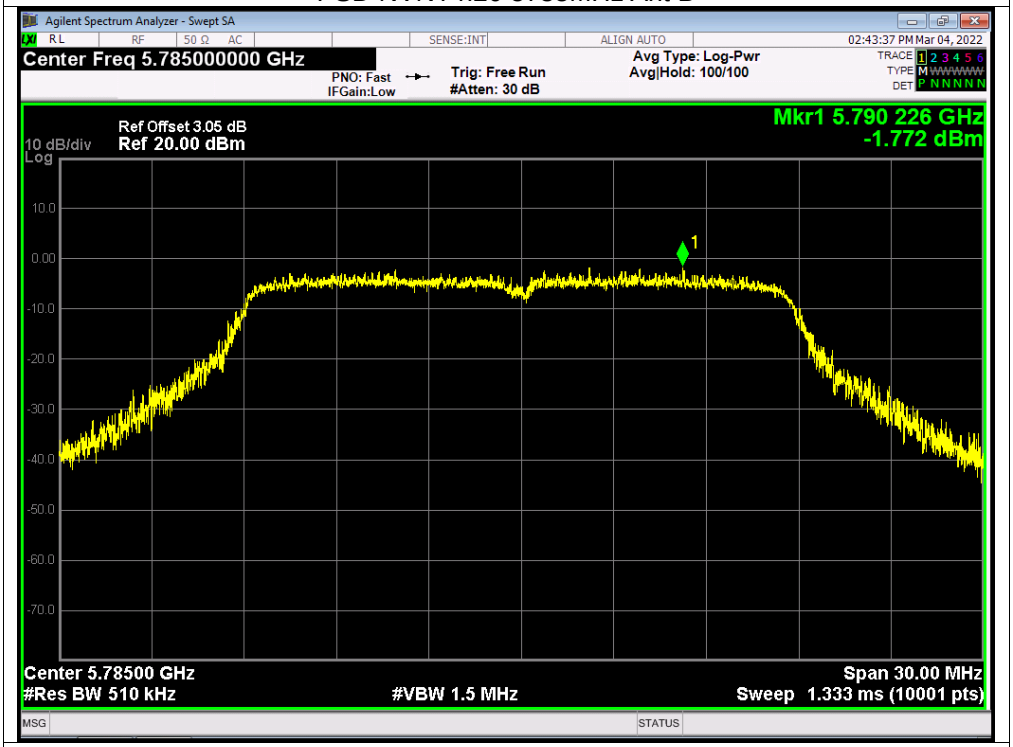
PSD NVNT a 5825MHz Ant B



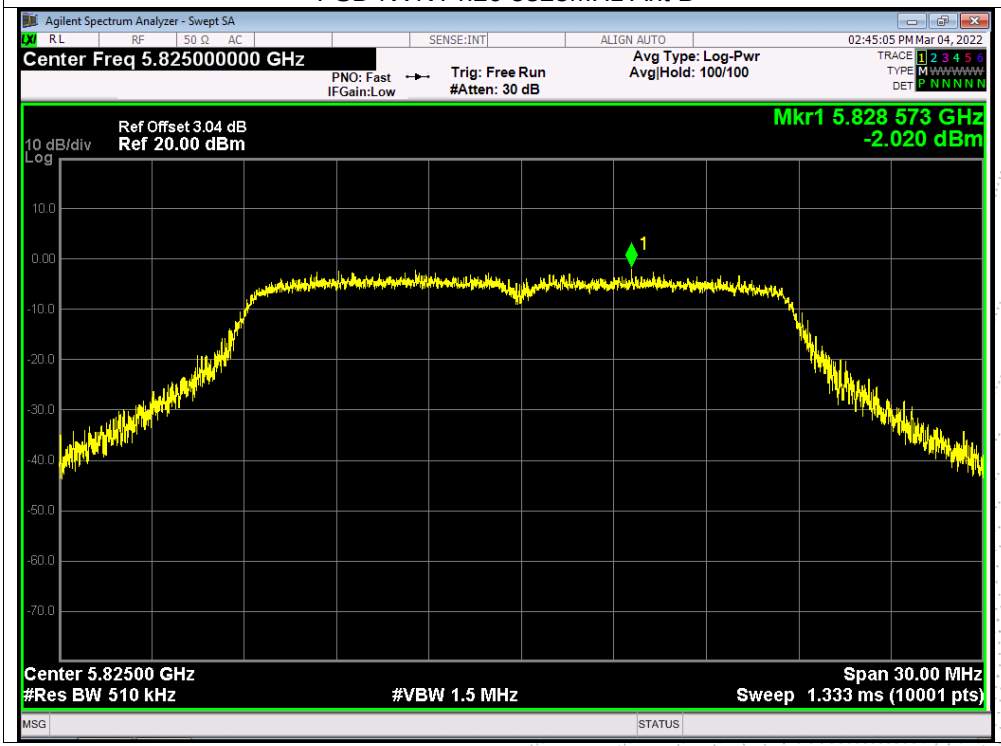
PSD NVNT n20 5745MHz Ant B



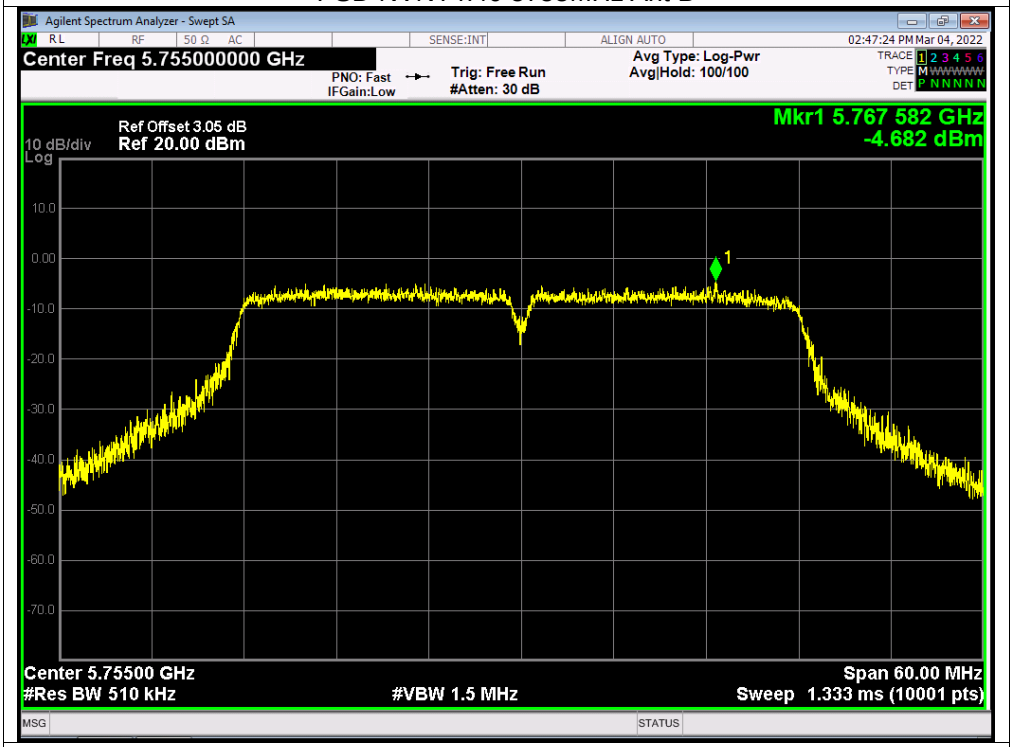
PSD NVNT n20 5785MHz Ant B



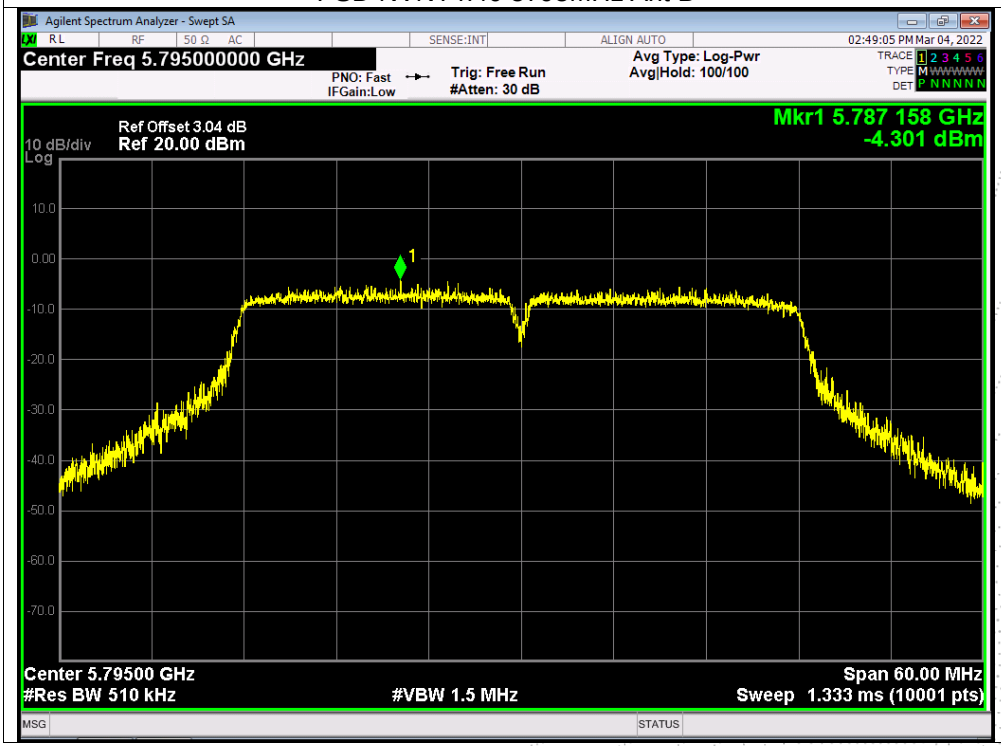
PSD NVNT n20 5825MHz Ant B



PSD NVNT n40 5755MHz Ant B

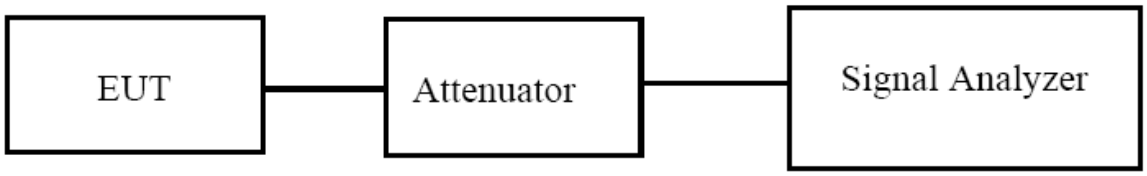


PSD NVNT n40 5795MHz Ant B



9. 6dB & 99% Emission Bandwidth

9.1 Block Diagram Of Test Setup



9.2 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.

9.3 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.

6 dB bandwidth
1. Set RBW = 100 kHz, VBW = 300 kHz.
2. Detector = Peak.Trace mode = Max hold.
3. Allow the trace to stabilize.

4. 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.

9.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

9.5 Test Result

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz
Test Mode:	(5745-5825MHz)		

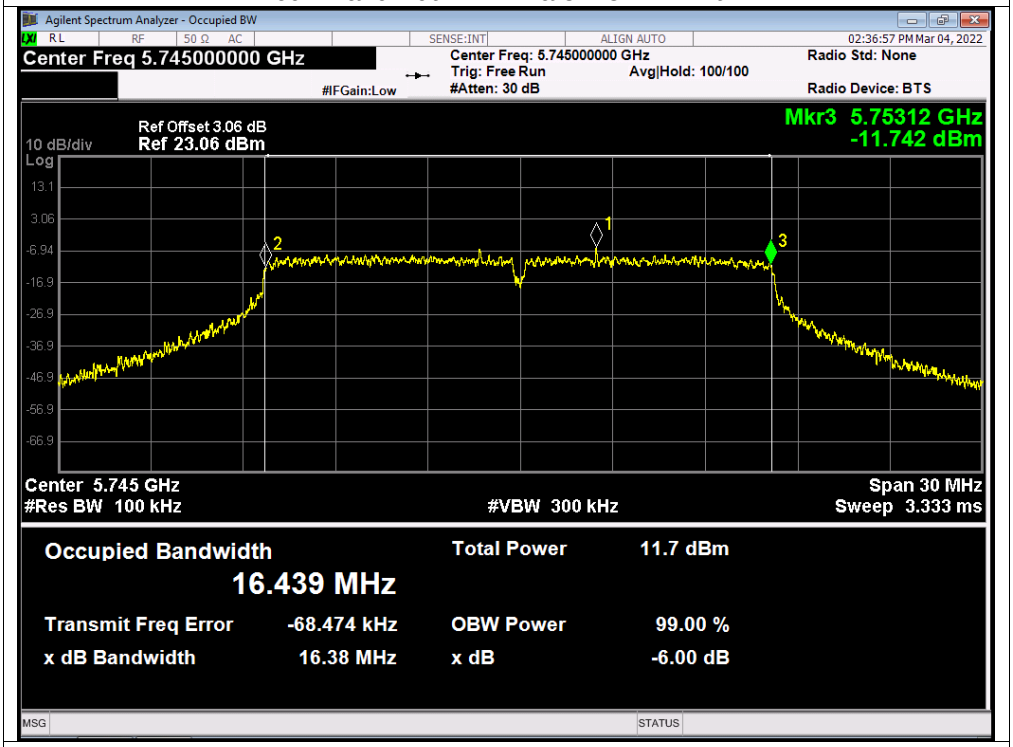
Condition	Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)		Limit -6 dB Bandwidth (MHz)	Verdict
			Ant A	Ant B		
NVNT	a	5745	16.325	16.376	0.5	Pass
NVNT	a	5785	16.389	16.332	0.5	Pass
NVNT	a	5825	16.375	16.332	0.5	Pass
NVNT	n20	5745	17.549	17.267	0.5	Pass
NVNT	n20	5785	16.912	17.543	0.5	Pass
NVNT	n20	5825	17.562	17.033	0.5	Pass
NVNT	n40	5755	35.938	35.929	0.5	Pass
NVNT	n40	5795	36.103	35.924	0.5	Pass

Condition	Mode	Frequency (MHz)	99% OBW (MHz)	
			Ant A	Ant B
NVNT	a	5745	16.498	16.565
NVNT	a	5785	16.501	16.551
NVNT	a	5825	16.505	16.541
NVNT	n20	5745	17.634	17.708
NVNT	n20	5785	17.651	17.691
NVNT	n20	5825	17.681	17.657
NVNT	n40	5755	36.34	36.353
NVNT	n40	5795	36.303	36.353

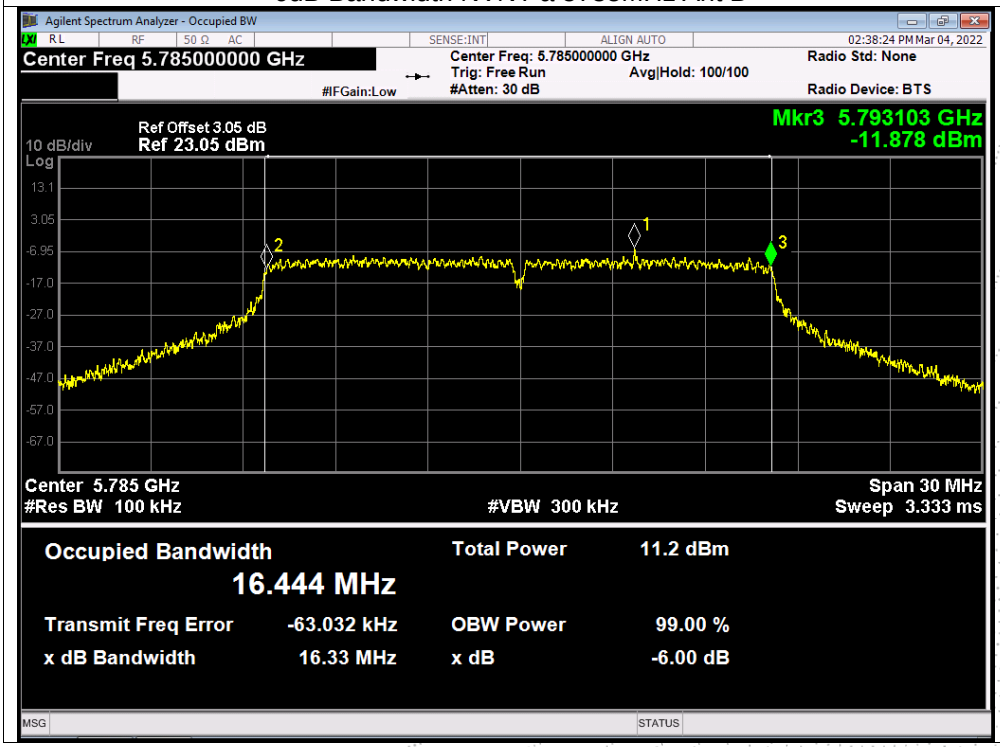
Note: A(B) Represent the value of antenna A and B, The worst data is Antenna B, only shown Antenna B Plot.

Test Graphs

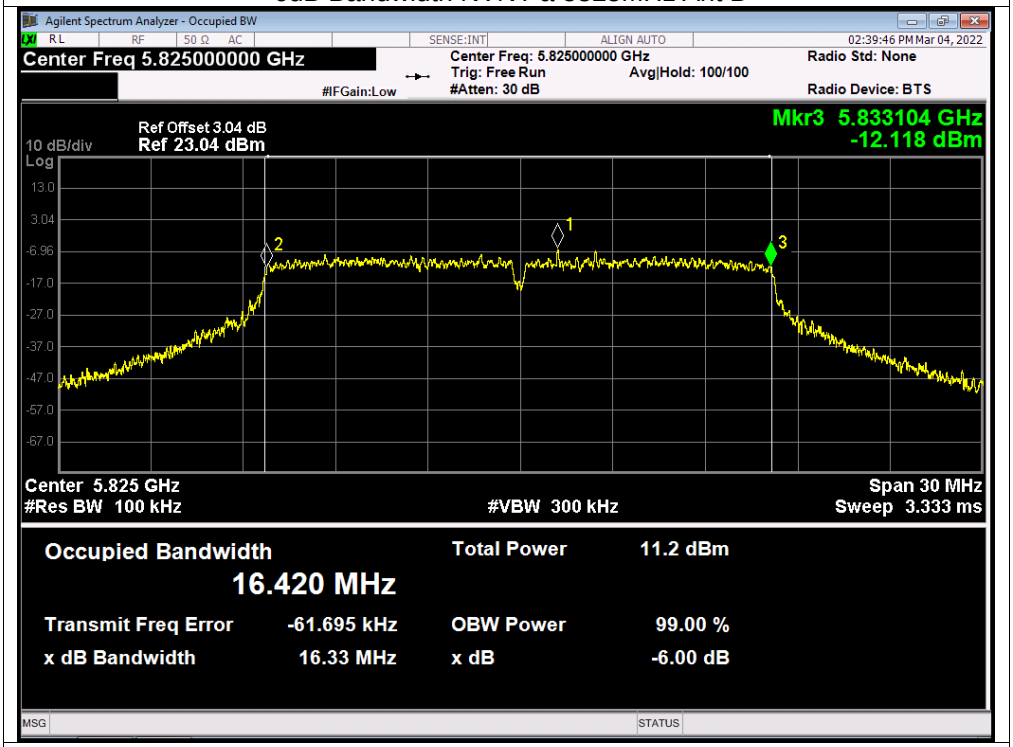
-6dB Bandwidth NVNT a 5745MHz Ant B



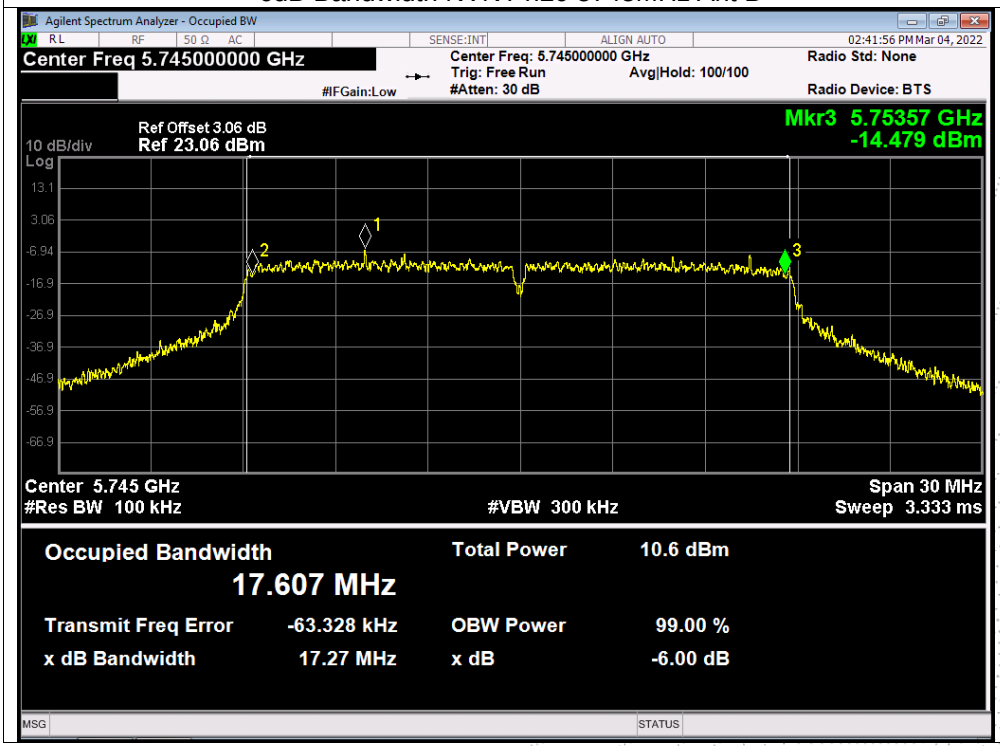
-6dB Bandwidth NVNT a 5785MHz Ant B



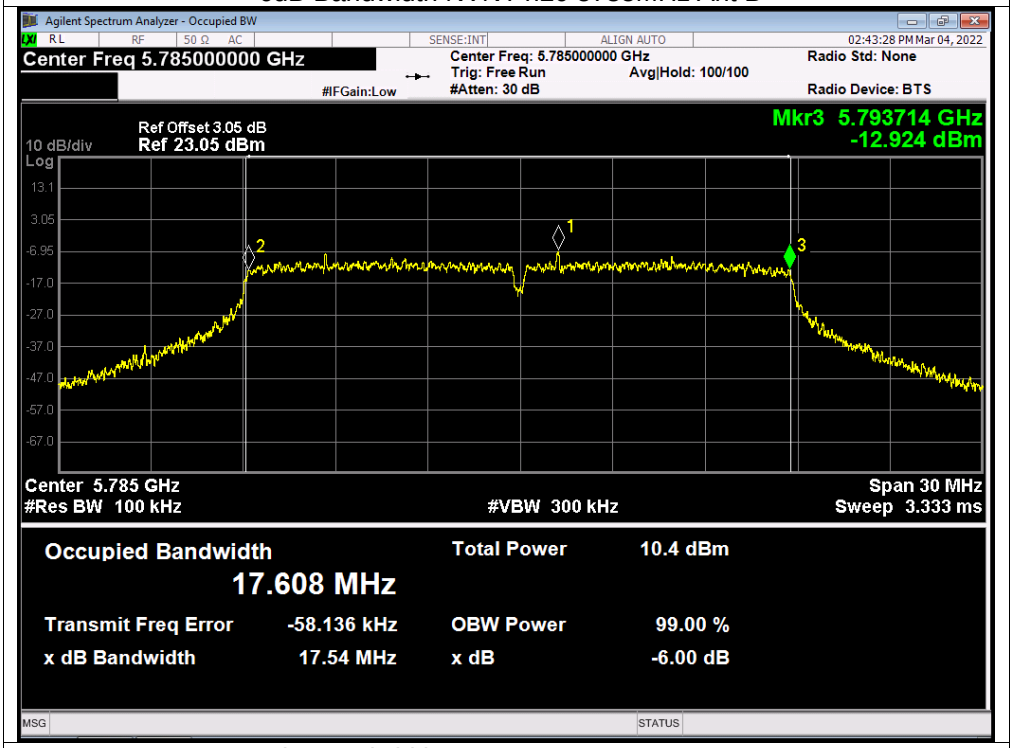
-6dB Bandwidth NVNT a 5825MHz Ant B



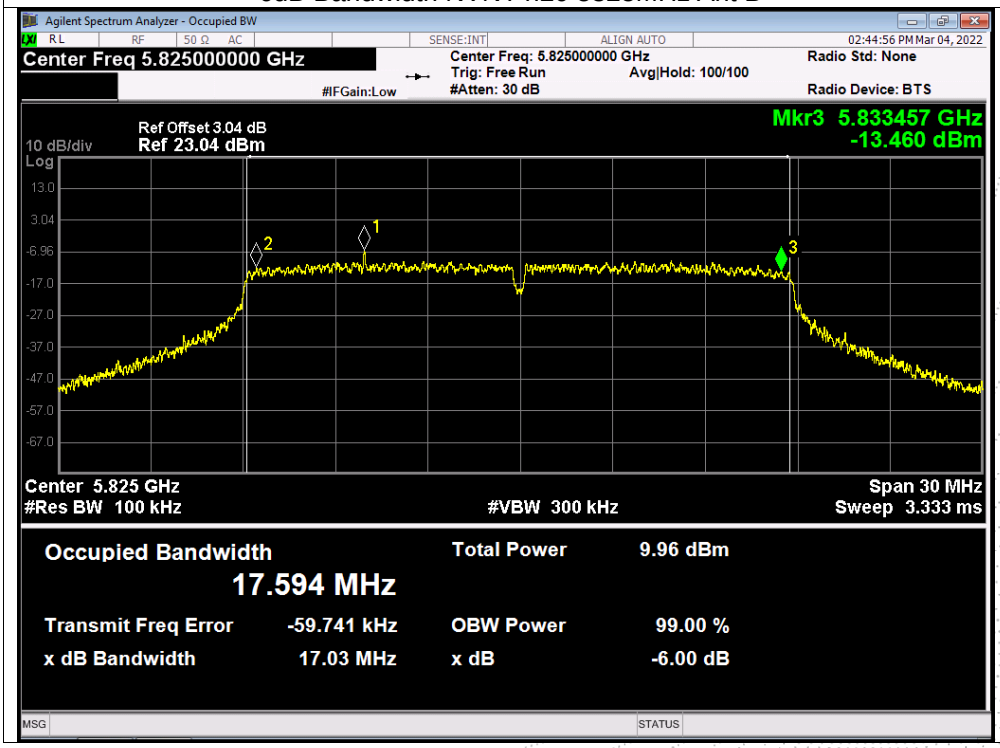
-6dB Bandwidth NVNT n20 5745MHz Ant B



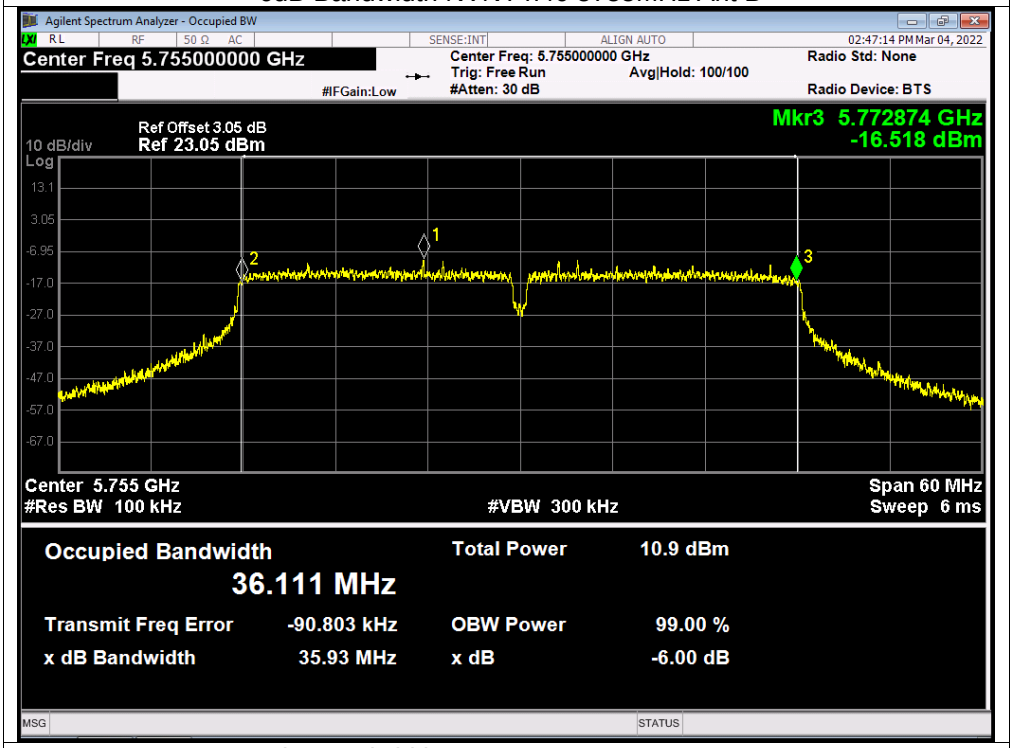
-6dB Bandwidth NVNT n20 5785MHz Ant B



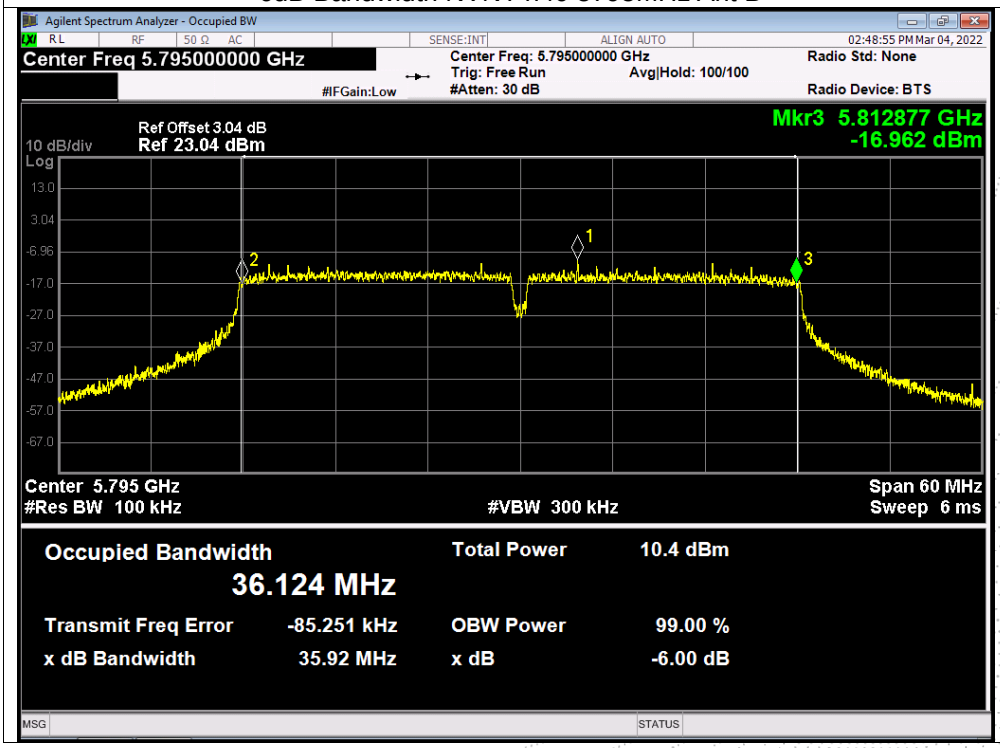
-6dB Bandwidth NVNT n20 5825MHz Ant B



-6dB Bandwidth NVNT n40 5755MHz Ant B

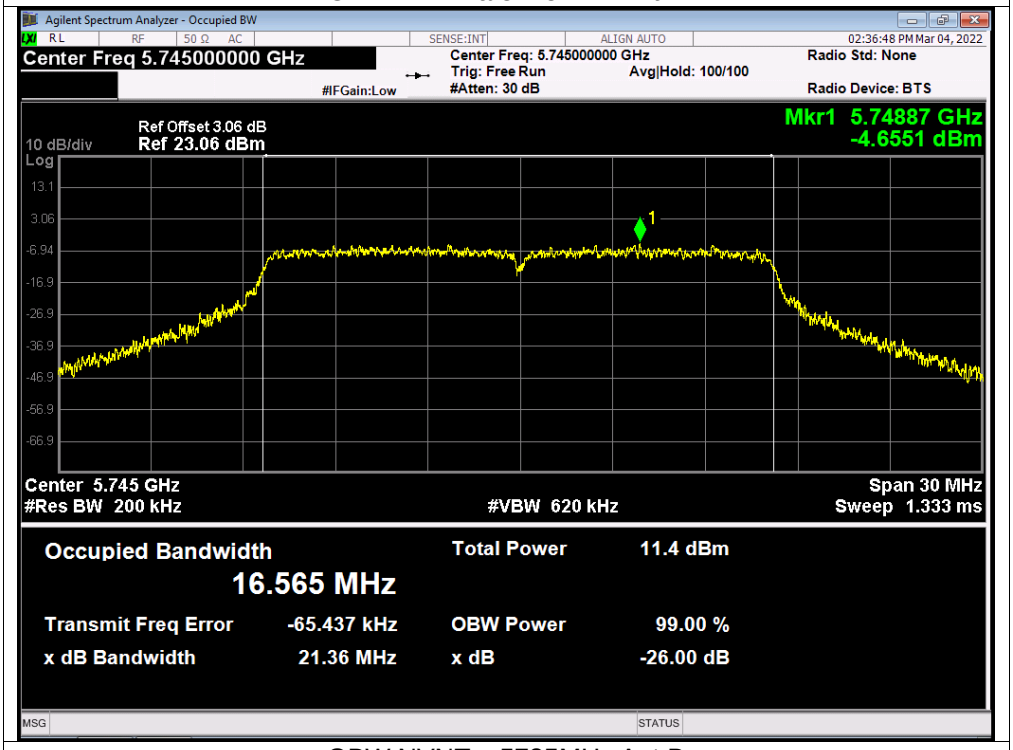


-6dB Bandwidth NVNT n40 5795MHz Ant B

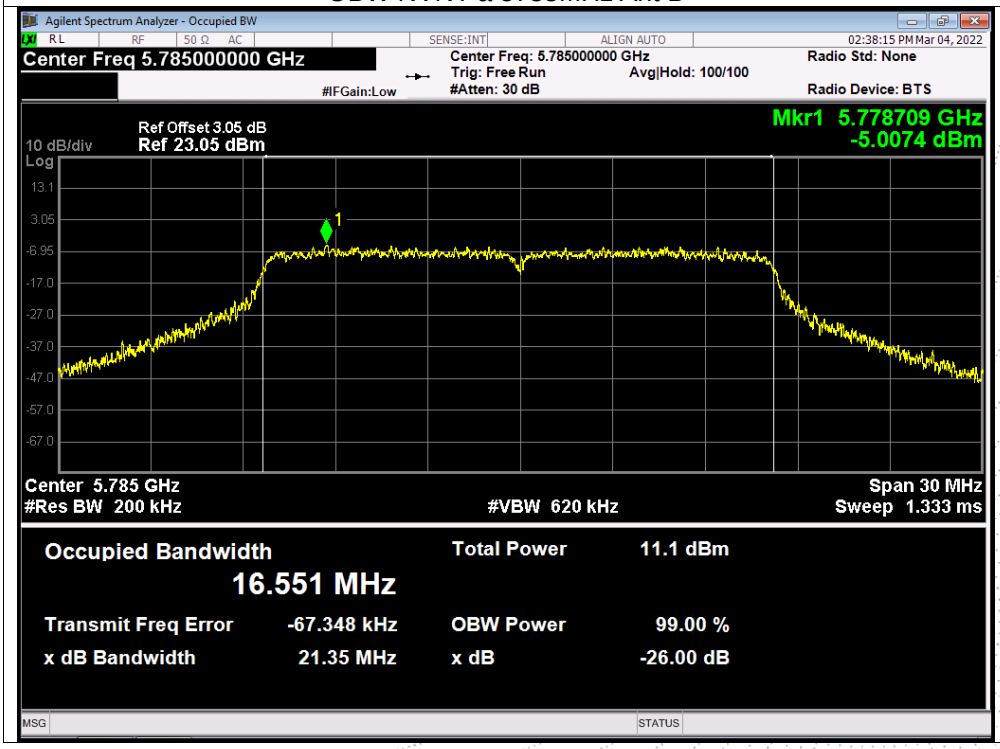


Test Graphs

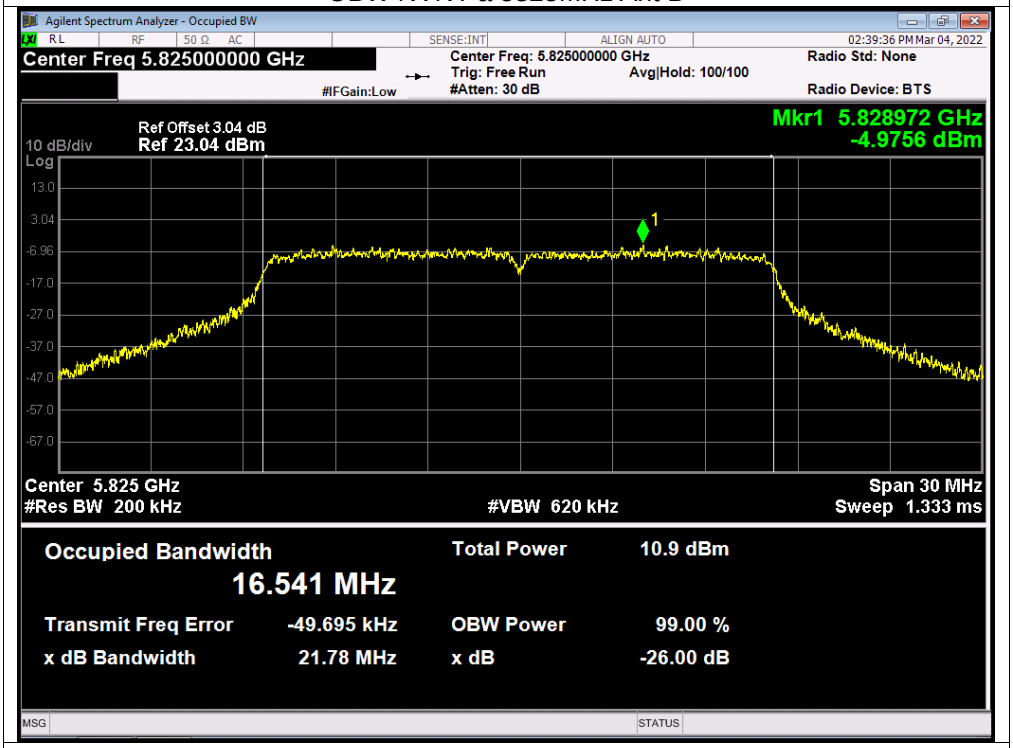
OBW NVNT a 5745MHz Ant B



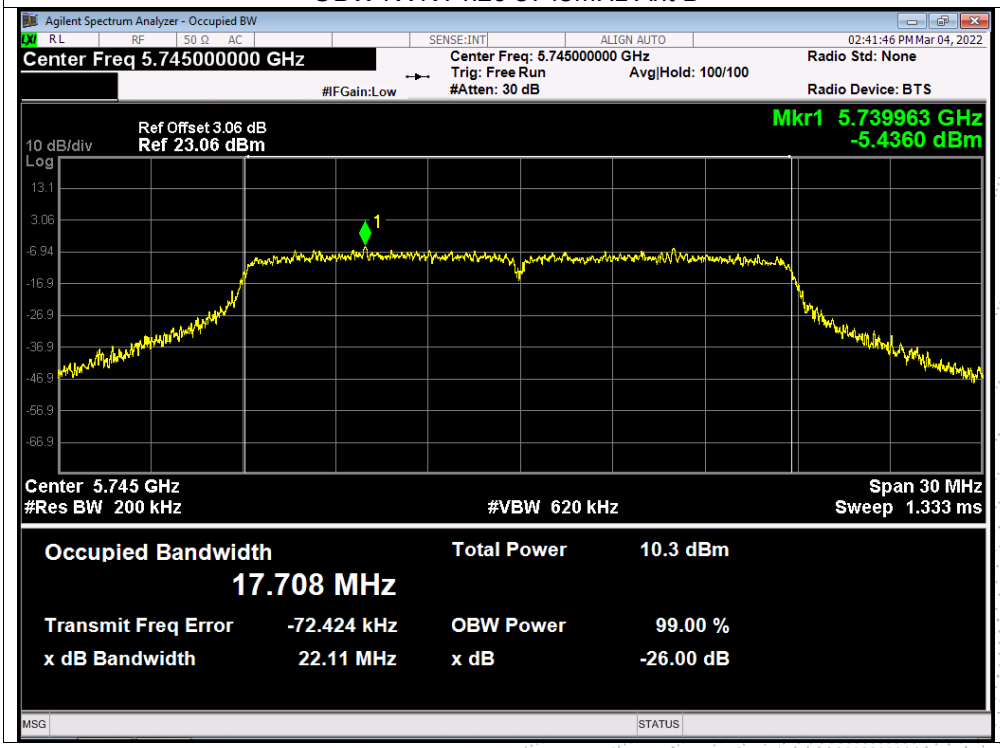
OBW NVNT a 5785MHz Ant B



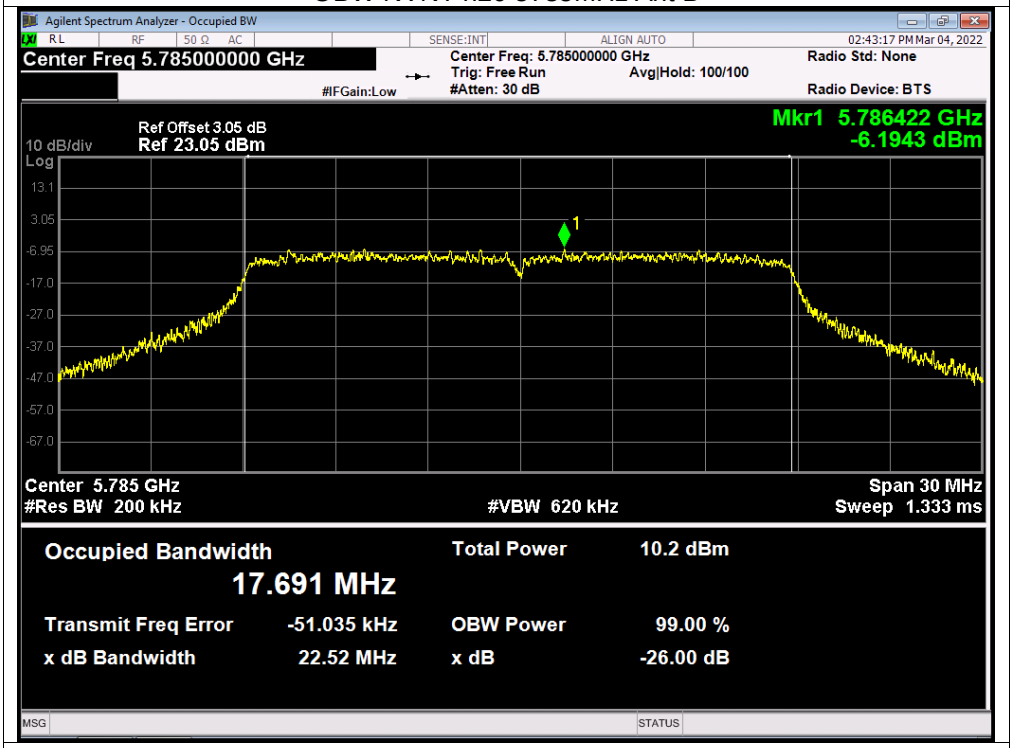
OBW NVNT a 5825MHz Ant B



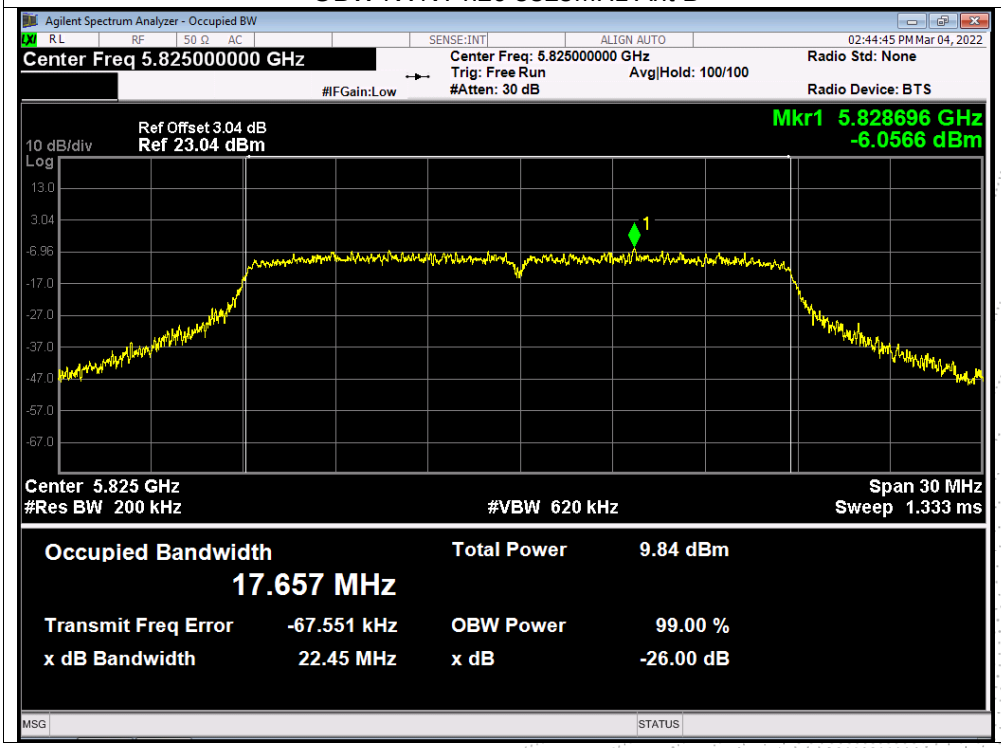
OBW NVNT n20 5745MHz Ant B



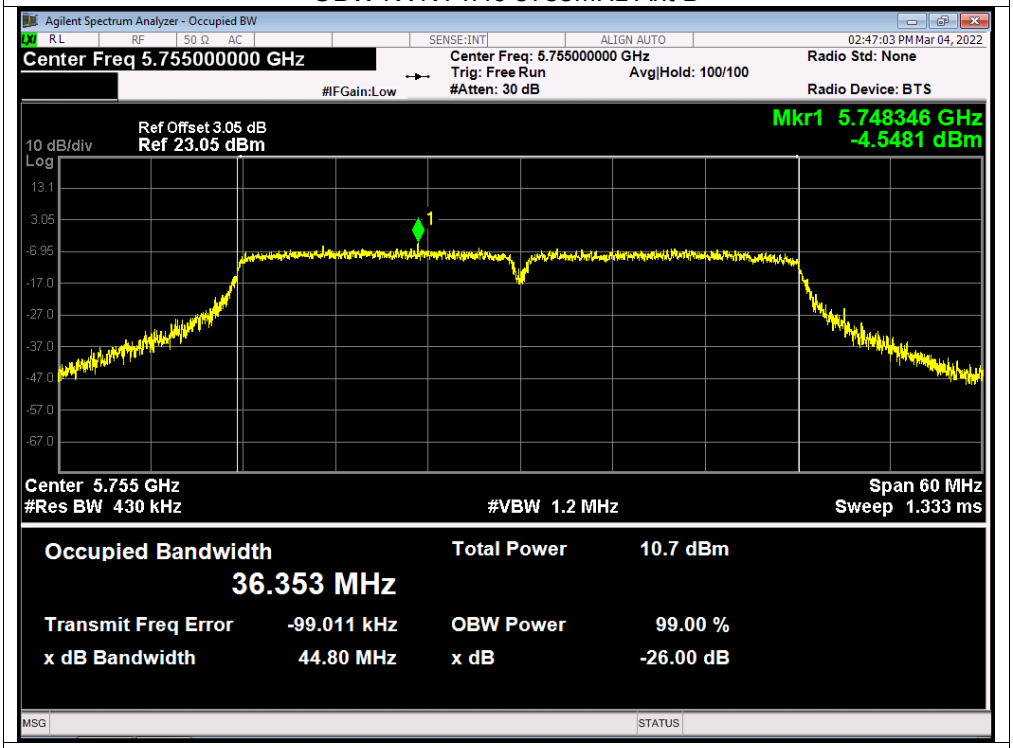
OBW NVNT n20 5785MHz Ant B



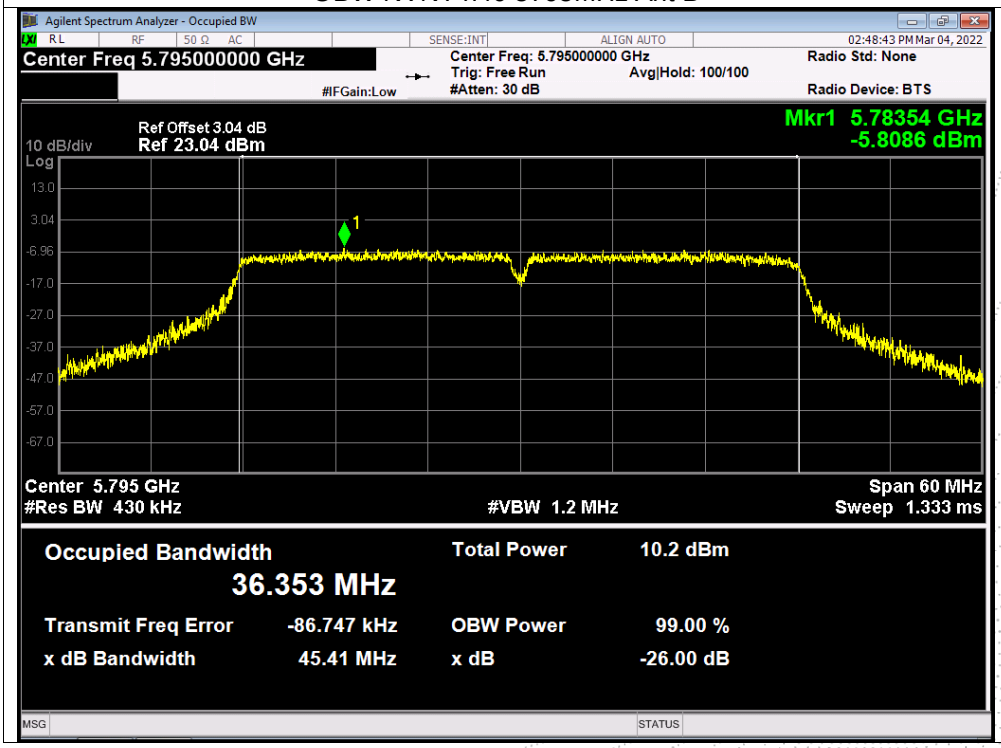
OBW NVNT n20 5825MHz Ant B



OBW NVNT n40 5755MHz Ant B

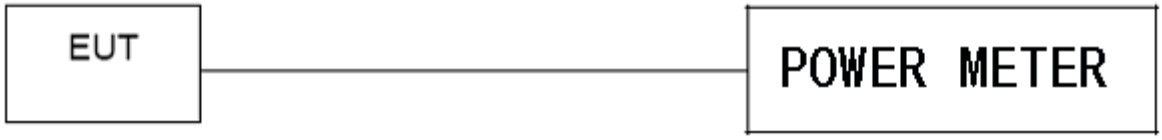


OBW NVNT n40 5795MHz Ant B



10. Maximum Conducted Output Power

10.1 Block Diagram Of Test Setup



10.2 Limit

According to FCC §15.407
The maximum conduced output power should not exceed:

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

10.3 Test procedure

Maximum conducted output power may be measured using a spectrum analyzer/EMI receiver or an RF power meter.

1. Device Configuration
If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

a) The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)
Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.1 However, the EBW must be used to determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).

a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

• The EUT transmits continuously (or with a duty cycle ≥ 98 percent).

• Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration T of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the

transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than ± 2 percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep): (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.

(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum

10.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

10.5 Test Result

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz
Test Mode:	5745-5825MHz		

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)		Total(dBm)	Limit (dBm)	Verdict
			Ant A	Ant B			
NVNT	a	5745	6.56	6.07	/	24	Pass
NVNT	a	5785	5.49	5.68	/	24	Pass
NVNT	a	5825	3.99	5.47	/	24	Pass
NVNT	n20	5745	5.51	4.96	8.25	24	Pass
NVNT	n20	5785	4.2	4.8	7.52	24	Pass
NVNT	n20	5825	2.26	4.25	6.38	24	Pass
NVNT	n40	5755	5.1	4.97	8.05	24	Pass
NVNT	n40	5795	3.95	4.53	7.26	24	Pass
Antenna gain=12dbi>6, so power limit=30-(12-6.0)=24							

11. Out Of Band Emissions

11.1 Block Diagram Of Test Setup

11.2 Limit

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) 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.

11.3 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.

11.4 EUT operating Conditions

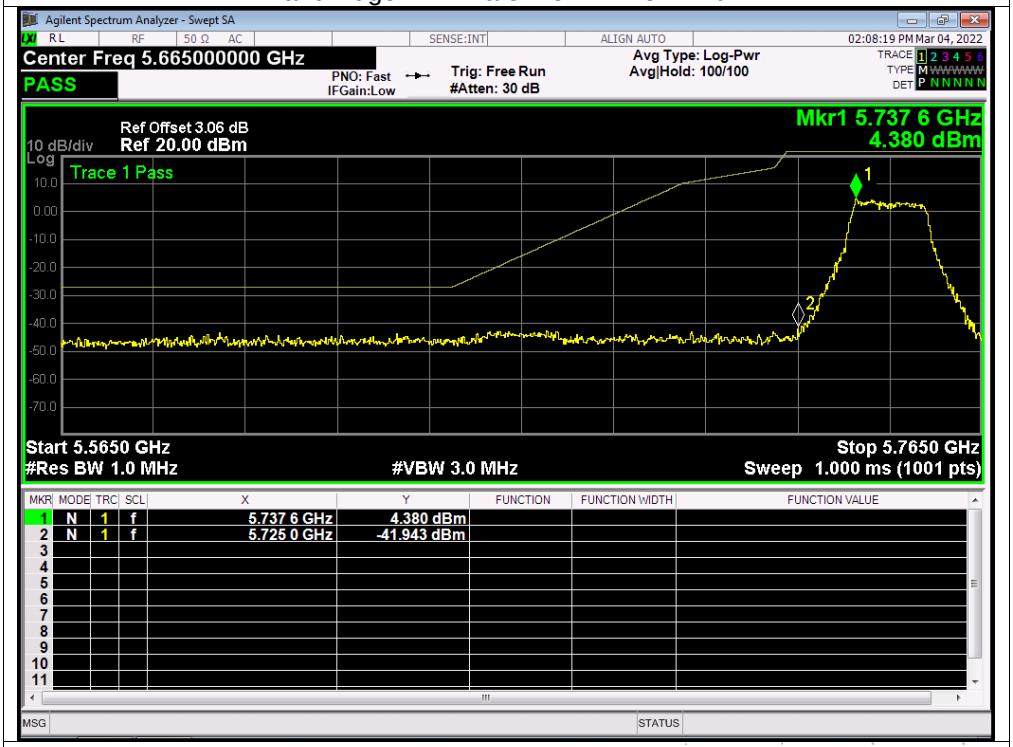
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data

11.5 Test Result

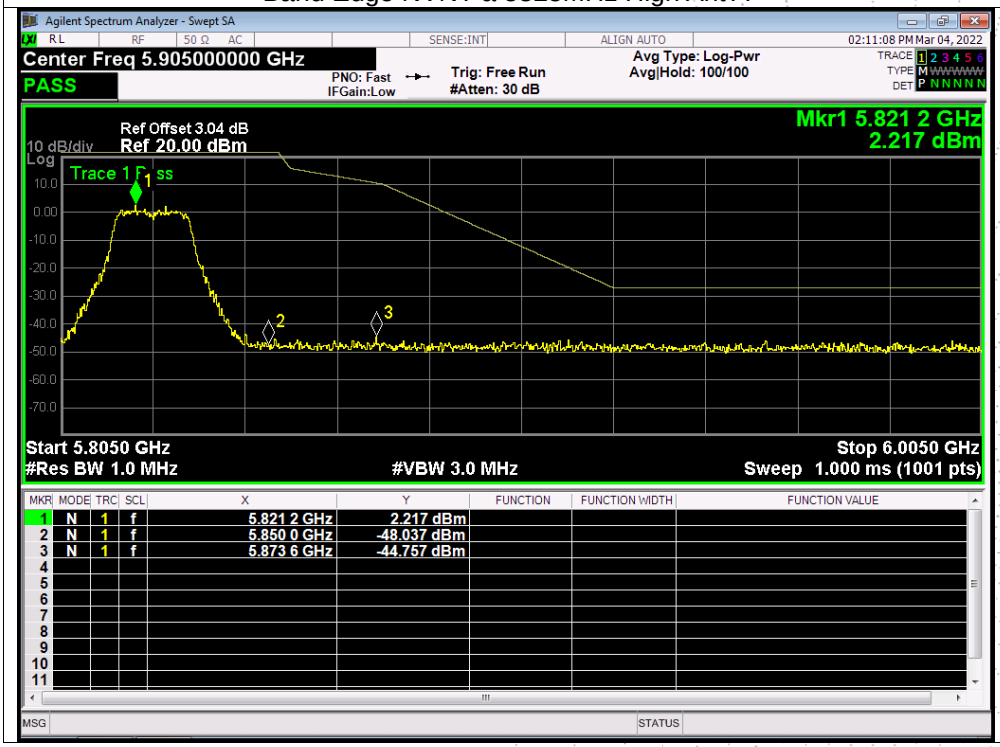
Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

Test Graphs

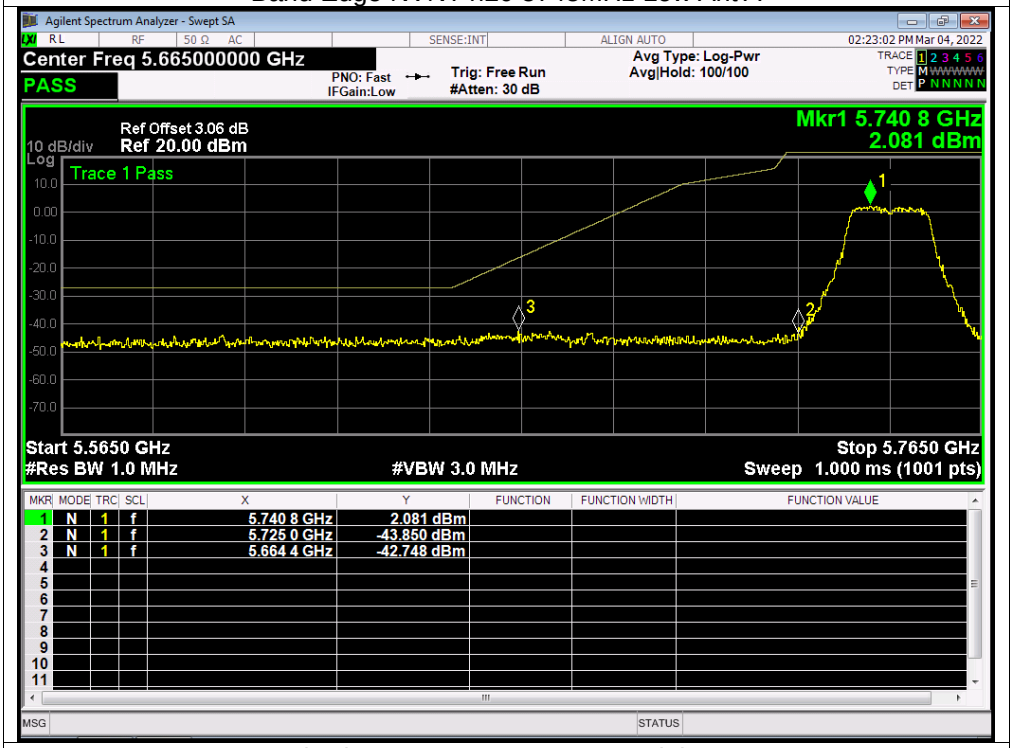
Band Edge NVNT a 5745MHz Low Ant A



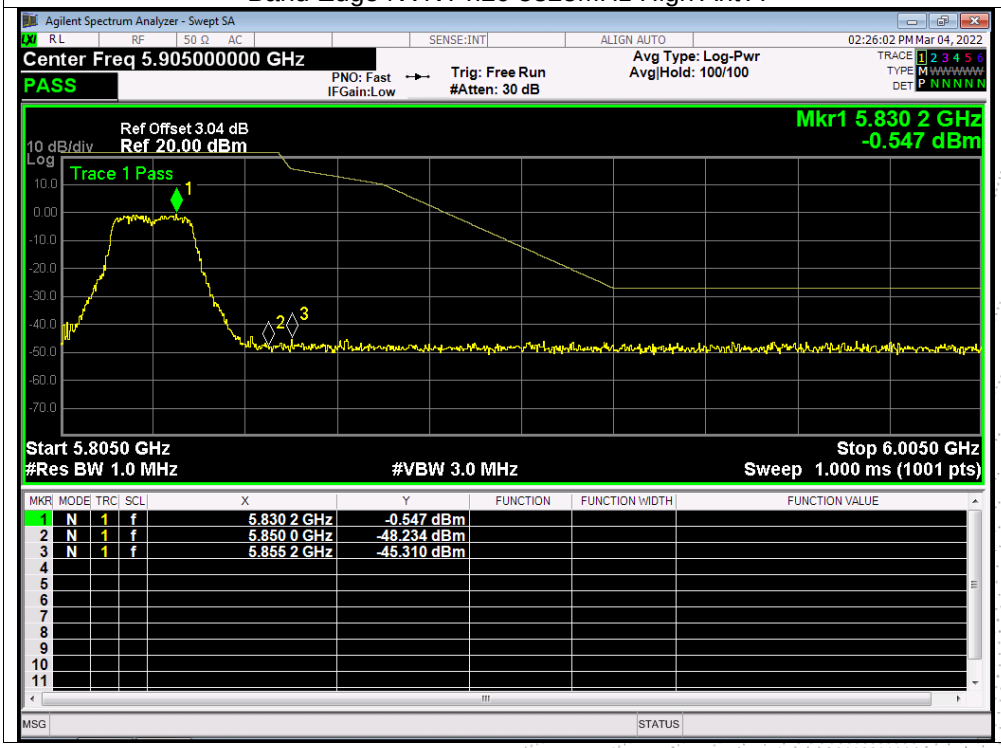
Band Edge NVNT a 5825MHz High Ant A



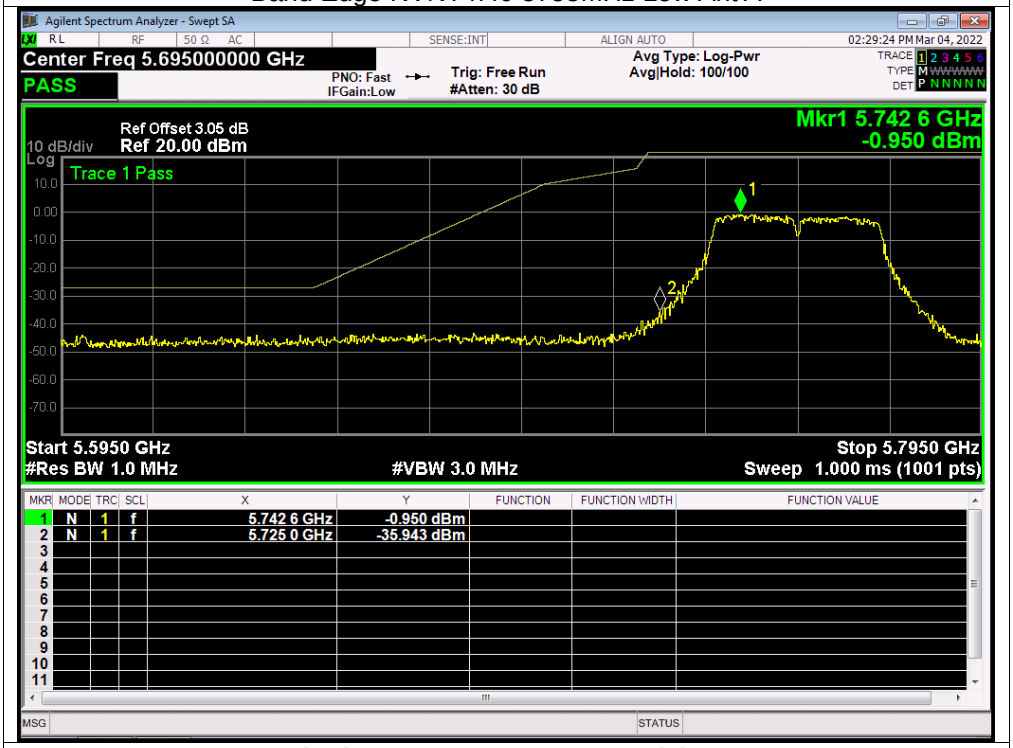
Band Edge NVNT n20 5745MHz Low Ant A



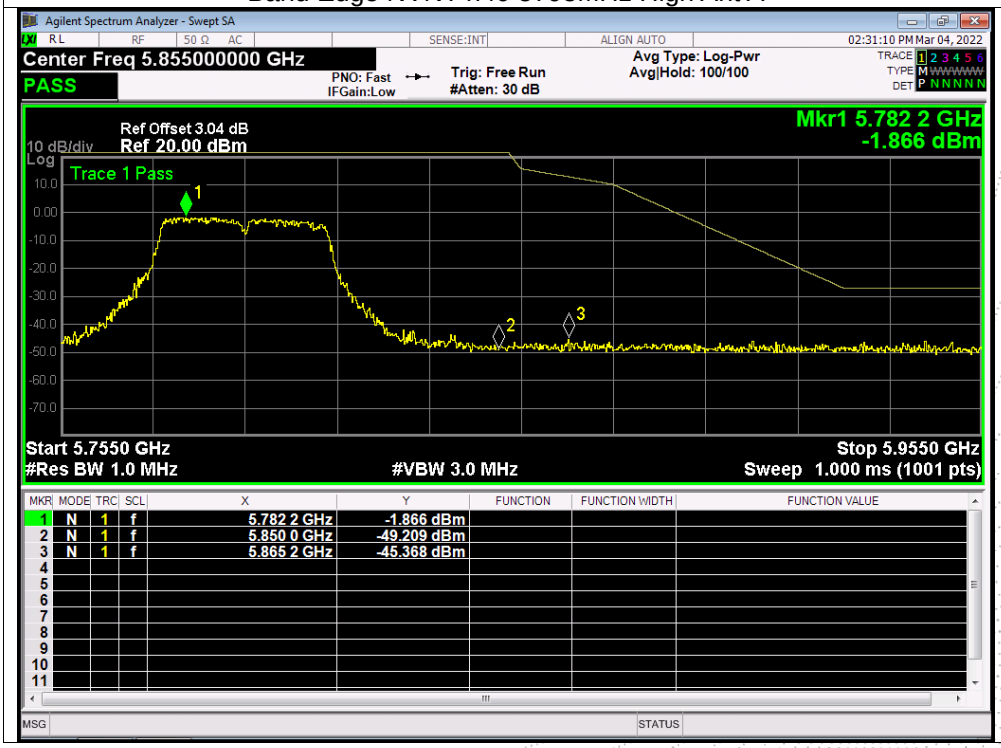
Band Edge NVNT n20 5825MHz High Ant A



Band Edge NVNT n40 5755MHz Low Ant A

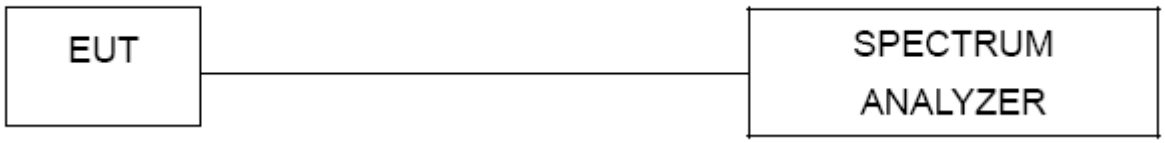


Band Edge NVNT n40 5795MHz High Ant A



12. Spurious RF Conducted Emissions

12.1 Block Diagram Of Test Setup



12.2 Limit

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 5.725-5.85 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.

12.3 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.

12.4 Test Result

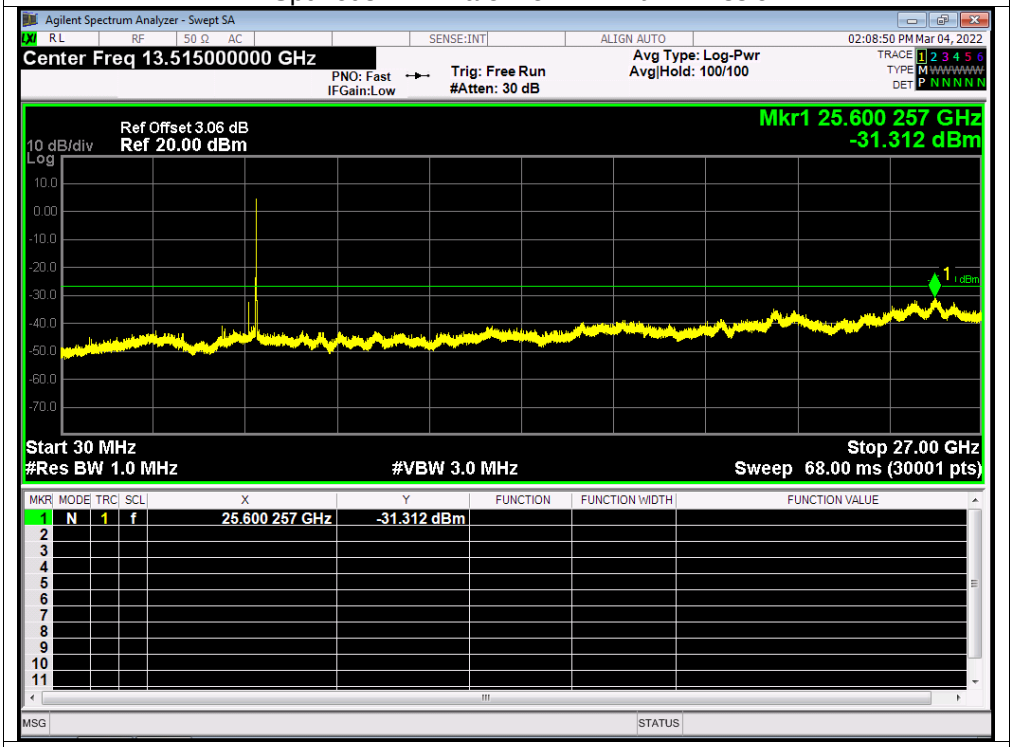
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

About: 26.5GHz-40GHz, The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

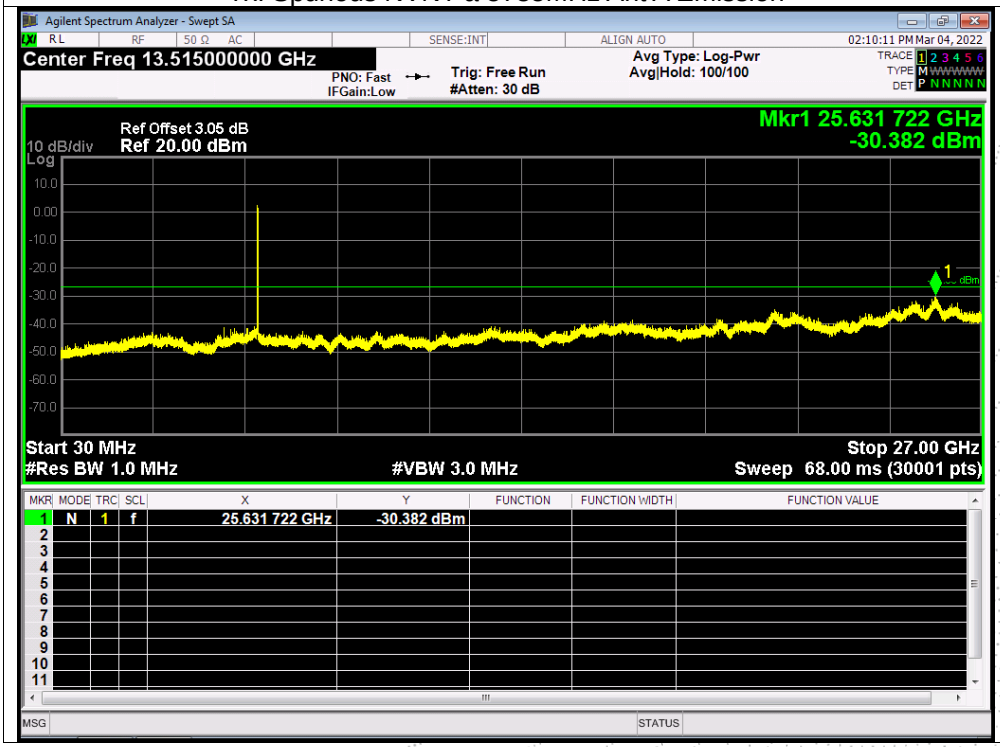
Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

Test Graphs

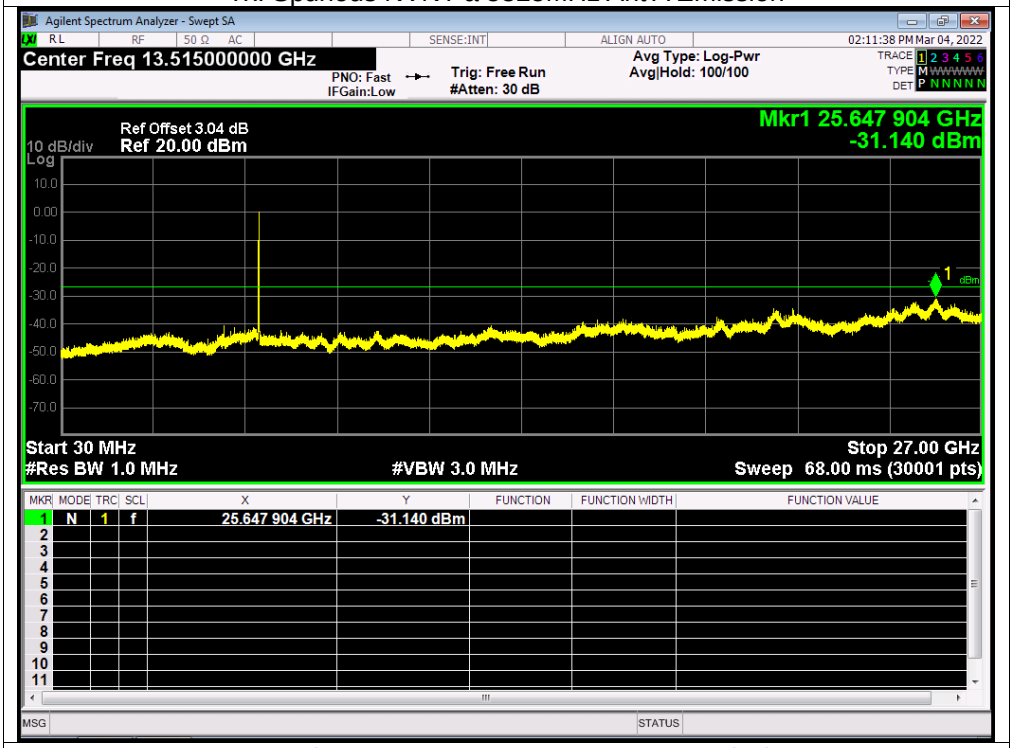
Tx. Spurious NVNT a 5745MHz Ant A Emission



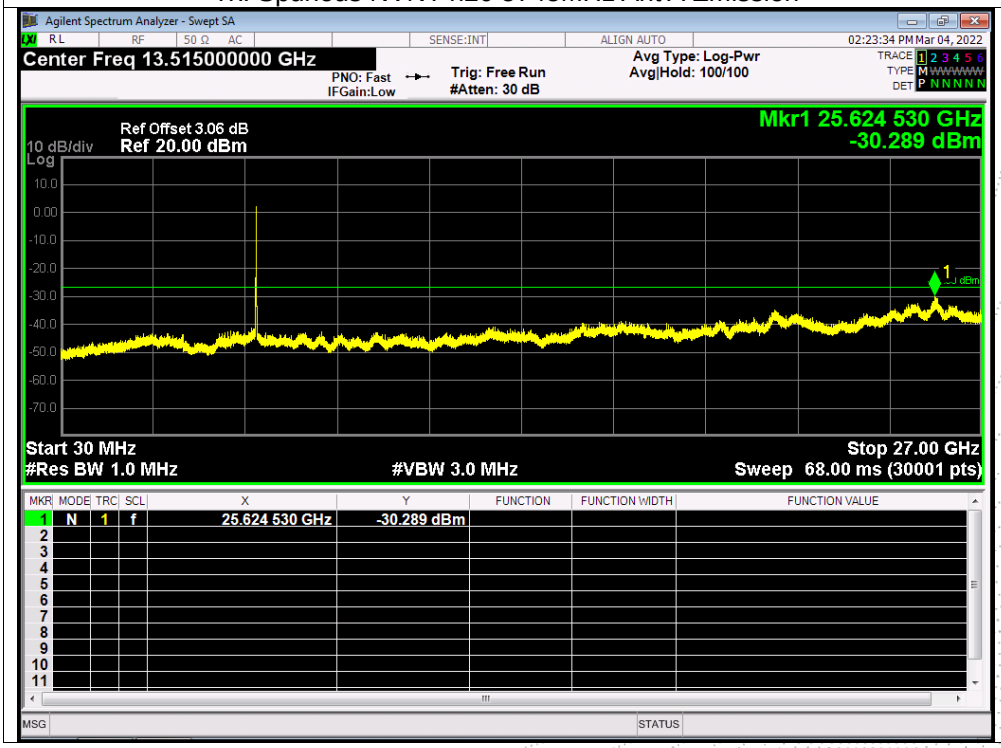
Tx. Spurious NVNT a 5785MHz Ant A Emission



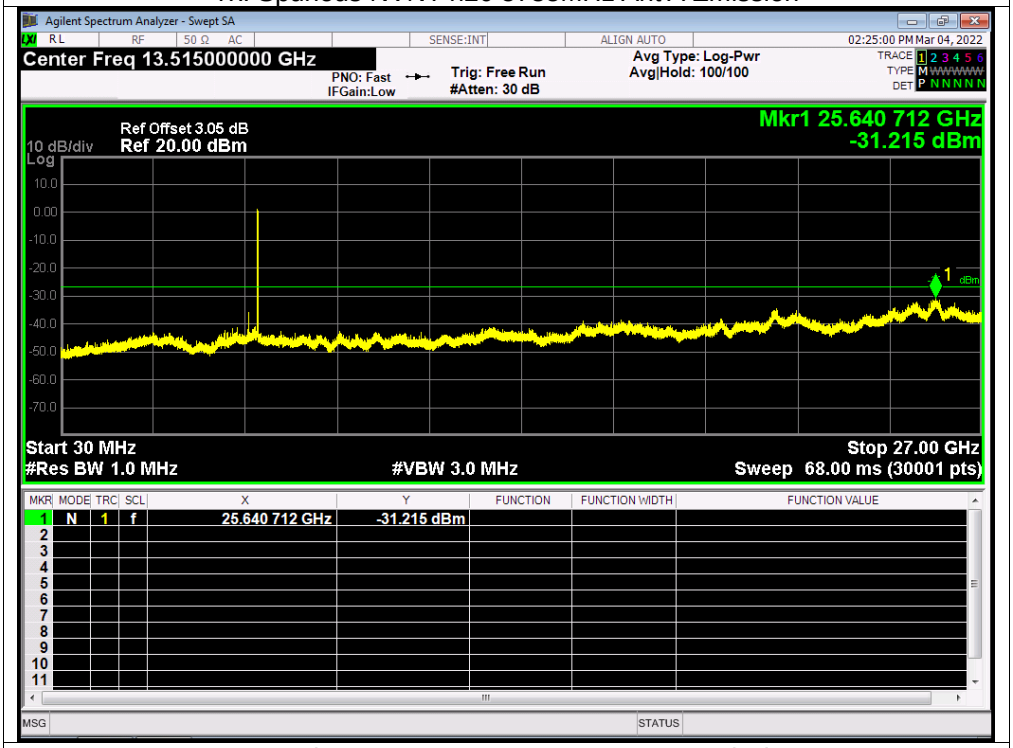
Tx. Spurious NVNT a 5825MHz Ant A Emission



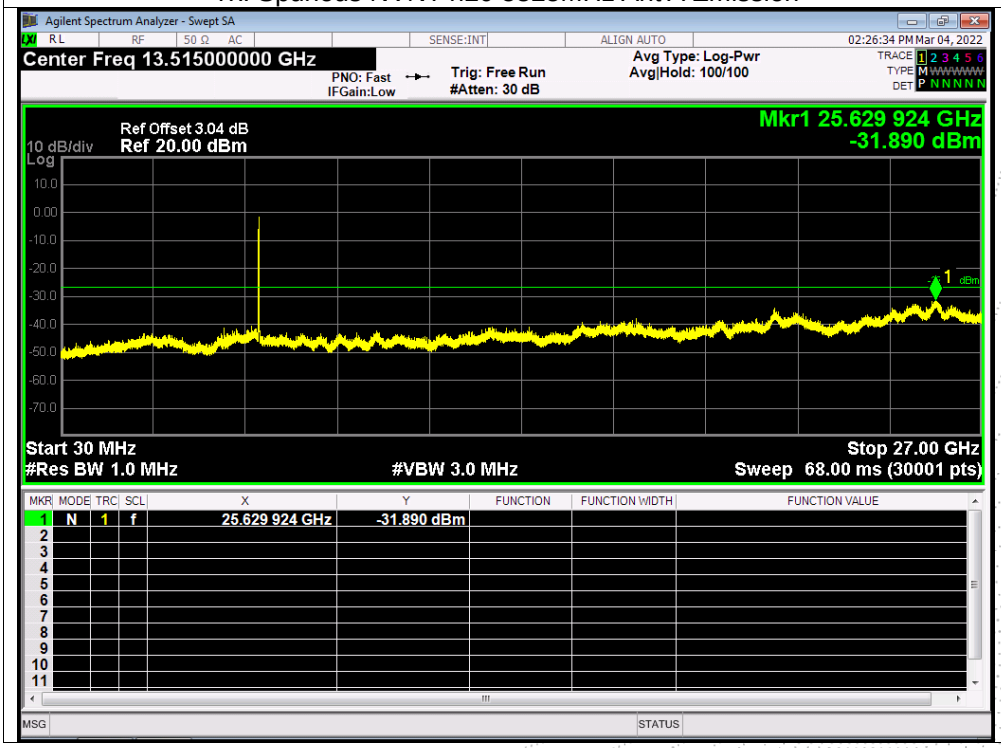
Tx. Spurious NVNT n20 5745MHz Ant A Emission



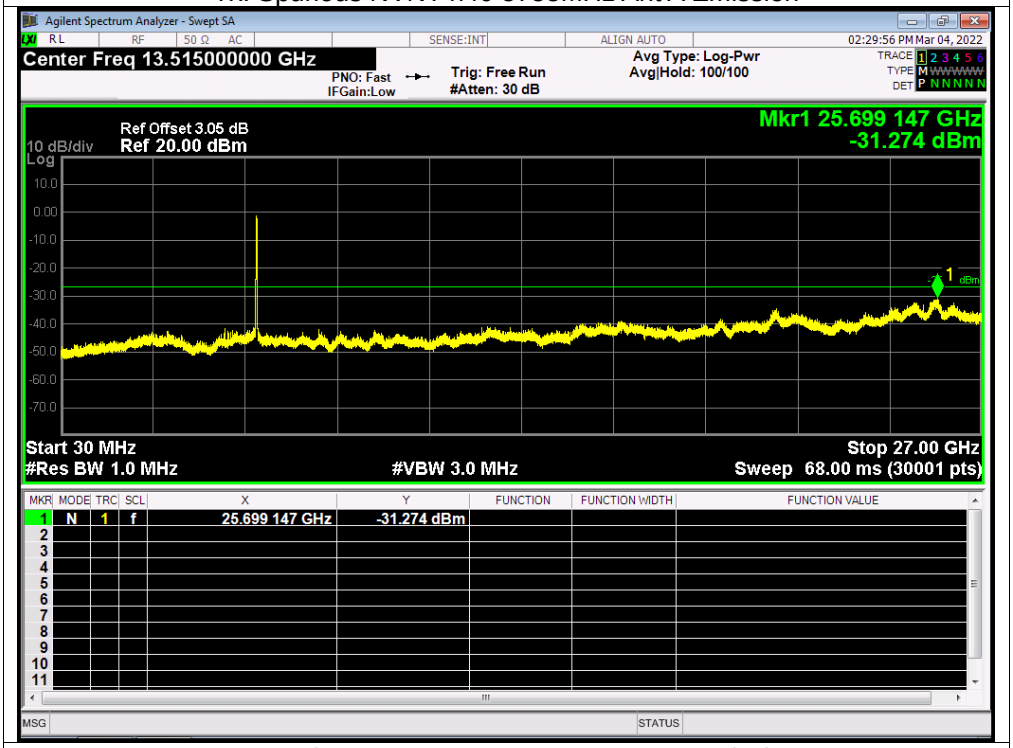
Tx. Spurious NVNT n20 5785MHz Ant A Emission



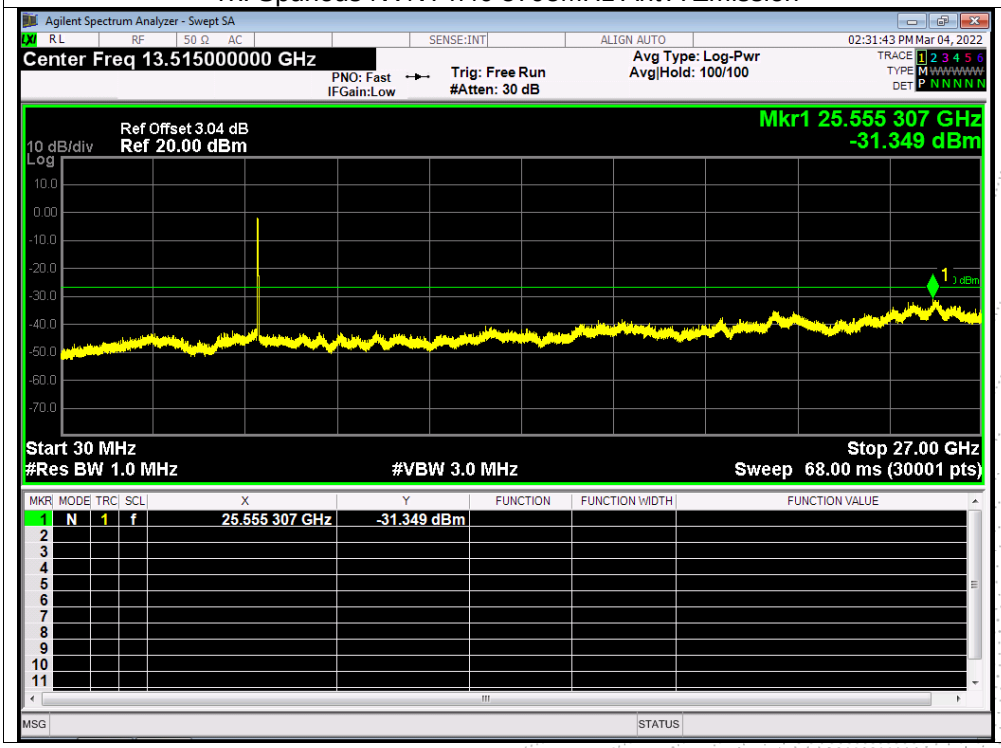
Tx. Spurious NVNT n20 5825MHz Ant A Emission



Tx. Spurious NVNT n40 5755MHz Ant A Emission



Tx. Spurious NVNT n40 5795MHz Ant A Emission



13. Frequency Stability Measurement

13.1 Block Diagram Of Test Setup

13.2 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.
The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

13.3 Test procedure

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 × 106 ppm and he 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.

13.4 Test Result

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage:	AC120V/60Hz
Test Mode:	TX (5.8G) Mode Frequency U-NII-3 (5745-5825MHz)		

Voltage vs. Frequency Stabilit

TEST CONDITIONS				Reference Frequency:5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	120.00	5745.00798	5745	0.00798	1.3885
		V max (V)	138.00	5745.00665	5745	0.00665	1.1570
		V min (V)	102.00	5745.00931	5745	0.00931	1.6206
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency:5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	-20	5745.01289	5745	0.01289	2.2429
		T (°C)	-10	5745.00631	5745	0.00631	1.0987
		T (°C)	0	5745.00081	5745	0.00081	0.1417
		T (°C)	10	5745.00965	5745	0.00965	1.6799
		T (°C)	20	5745.01311	5745	0.01311	2.2814
		T (°C)	30	5745.00479	5745	0.00479	0.8339
		T (°C)	40	5745.00042	5745	0.00042	0.0726
		T (°C)	50	5745.00179	5745	0.00179	0.3115
		T (°C)	60	5745.00072	5745	0.00072	0.1247
		T (°C)	70	5745.00417	5745	0.00417	0.7252
Limits				5725-5850 MHz			
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)	120.00	5785.00615	5785	0.00615	1.0634
		V max (V)	138.00	5785.00994	5785	0.00994	1.7174
		V min (V)	102.00	5785.01310	5785	0.01310	2.2645
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency:5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	-20	5785.01036	5785	0.01036	1.7907
		T (°C)	-10	5785.00270	5785	0.00270	0.4662
		T (°C)	0	5785.00577	5785	0.00577	0.9975
		T (°C)	10	5785.00676	5785	0.00676	1.1682
		T (°C)	20	5785.01285	5785	0.01285	2.2208
		T (°C)	30	5785.01182	5785	0.01182	2.0433
		T (°C)	40	5785.00924	5785	0.00924	1.5977
		T (°C)	50	5785.01226	5785	0.01226	2.1200
		T (°C)	60	5785.01184	5785	0.01184	2.0466
		T (°C)	70	5785.00418	5785	0.00418	0.7225
Limits				5725-5850 MHz			
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)	120.00	5825.00166	5825	0.00166	0.2854
		V max (V)	138.00	5825.00750	5825	0.00750	1.2883
		V min (V)	102.00	5825.00975	5825	0.00975	1.6744
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency:5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	120	T (°C)	-20	5825.00049	5825	0.00049	0.0834
		T (°C)	-10	5825.01328	5825	0.01328	2.2806
		T (°C)	0	5825.01271	5825	0.01271	2.1811
		T (°C)	10	5825.01235	5825	0.01235	2.1202
		T (°C)	20	5825.00686	5825	0.00686	1.1778
		T (°C)	30	5825.00684	5825	0.00684	1.1737
		T (°C)	40	5825.00928	5825	0.00928	1.5929
		T (°C)	50	5825.00425	5825	0.00425	0.7305
		T (°C)	60	5825.00250	5825	0.00250	0.4297
		T (°C)	70	5825.01085	5825	0.01085	1.8621
Limits				5725-5850 MHz			
Result				Complies			

14. Antenna Requirement

14.1 Limit

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.

14.2 Test Antenna

The EUT antenna is Internal antenna. It comply with the standard requirement.

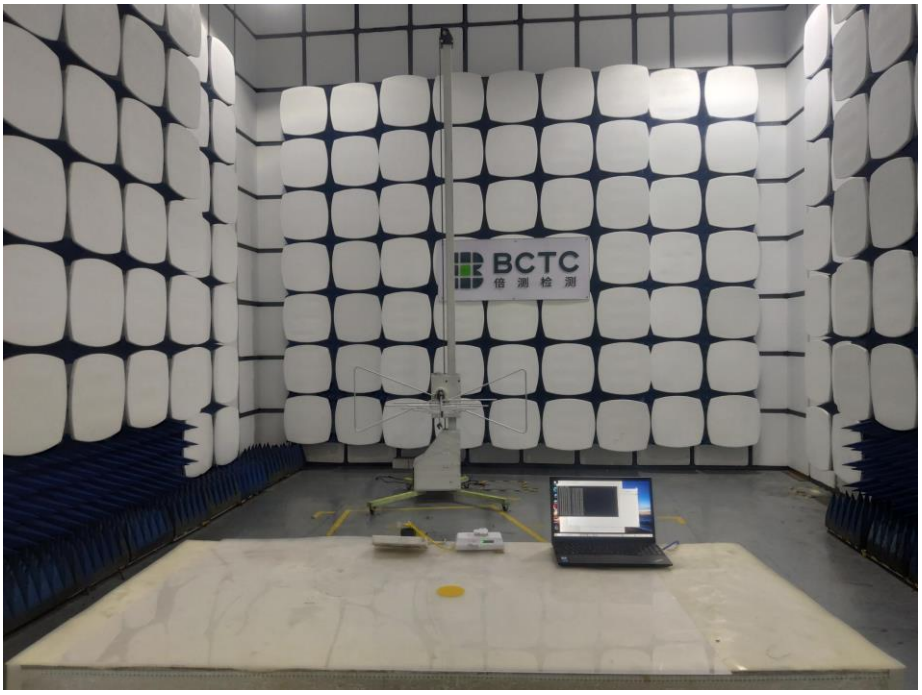
15. EUT Photographs

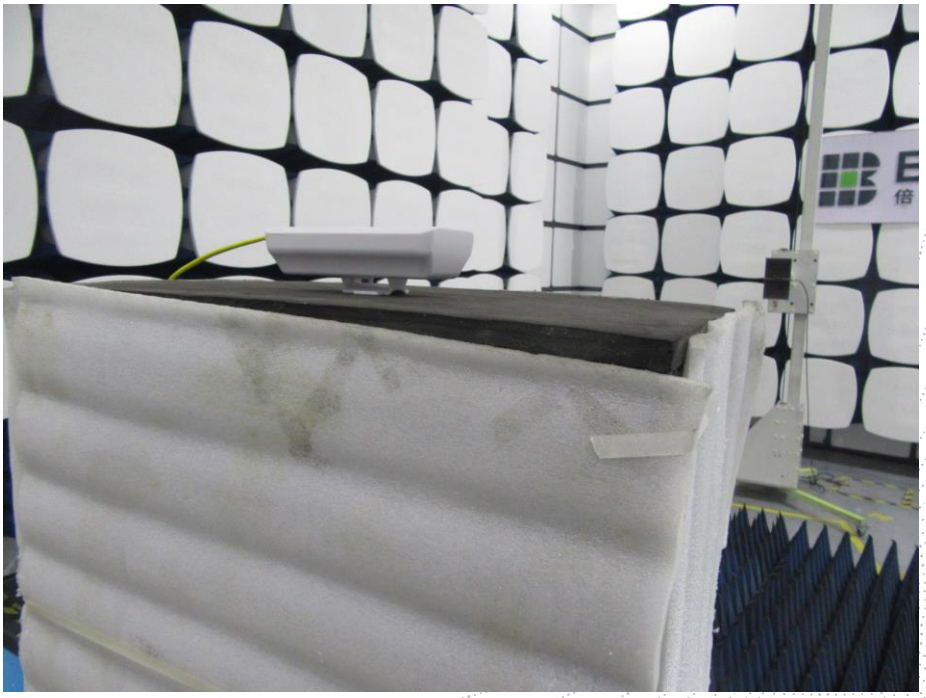
Appendix-Photographs Of EUT Constructional Details

16. EUT Test Setup Photographs

Conducted emissions

Radiated Measurement Photos





STATEMENT

1.The equipment lists are traceable to the national reference standards.

2.The test report can not be partially copied unless prior written approval is issued from our lab.

3.The test report is invalid without stamp of laboratory.

4.The test report is invalid without signature of person(s) testing and authorizing.

5.The test process and test result is only related to the Unit Under Test.

6.The quality system of our laboratory is in accordance with ISO/IEC17025.

7.If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:
1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL：400-788-9558

P.C.: 518103

FAX：0755-33229357

Website：http://www.chnbctc.com

E-Mail：bctc@bctc-lab.com.cn

※※※※※ **END** ※※※※※