



CTC Laboratories, Inc.

TEST REPORT

Report No.: CTC2024305802

FCC ID.....: 2BM2I-LC2203

Applicant: Shenzhen Xiaopai Technology Co., Ltd.

Address.....: Unit A 8F 806, skyworth bldg, Gaoxin Ave. 1.S., Nanshan District, Shenzhen,Guangdong Province, China

Manufacturer.....: Shenzhen Xiaopai Technology Co., Ltd.

Address.....: Unit A 8F 806, skyworth bldg, Gaoxin Ave. 1.S., Nanshan District, Shenzhen,Guangdong Province, China

Product Name: Smart Camera

Trade Mark: xpai

Model/Type reference.....: LC2203

Listed Model(s): /

Standard: FCC CFR Title 47 Part 15 Subpart E Section 15.407

Test Report Form No: CTC-TR-063_A1

Master TRF: Dated 2024-09-20

Date of receipt of test sample.....: Dec. 26, 2024

Date of testing.....: Dec. 29, 2024 ~ Jan. 10, 2025

Date of issue.....: Jan. 21, 2025

Result.....: PASS

Compiled by:

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Totti Zhao

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CTC Laboratories, Inc.

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TRF No: CTC-TR-063_A1

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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

[FCC Rules Part 15.407](#): for 802.11a/n/ac/ax, the test procedure follows the FCC KDB 789033 D02 General UNII Test Procedures New Rules V02r01.

[ANSI C63.10-2013](#): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.2. Report Version

Revised No.	Report No.	Date of issue	Description
01	CTC2024305802	Jan. 21, 2025	Original



1.3. Test Description

FCC Part 15 Subpart E (15.407)			
Test Item	Standard Section	Result	Test Engineer
Antenna Requirement	15.203	Pass	Sherlock
Conducted Emission	15.207	Pass	Sherlock
Band Edge Emissions	15.407(b)	Pass	Sherlock
26dB Bandwidth & 99% Bandwidth	15.407(a)	Pass	Sherlock
6dB Bandwidth (only for UNII-3)	15.407(e)	Pass	Sherlock
Peak Output Power	15.407(a)	Pass	Sherlock
Power Spectral Density	15.407(a)	Pass	Sherlock
Transmitter Radiated Spurious Emission	15.407(b) & 15.209	Pass	Sherlock
Frequency Stability	15.407(g)	Pass	Sherlock
Dynamic Frequency Selection (DFS)	15.407(h)	Pass	Sherlock
Automatically Discontinue Transmission	15.407(c)	Pass	Note 3

Note:

1. The measurement uncertainty is not included in the test result.
2. N/A: means this test item is not applicable for this device according to the technology characteristic of device.
3. During no any information transmission, the EUT can automatically discontinue transmission and become standby mode for power saving. the EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.



1.4. Test Facility

Address of the report laboratory

CTC Laboratories, Inc.

Add: Room 101 of Building B, Room 107, 108, 207, 208 of Building A, No. 7, Lanqing 1st Road, Luh Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China

Laboratory accreditation

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

A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 951311, Aug 26, 2017.



1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.

Test Items	Measurement Uncertainty	Notes
Emission Bandwidth	$\pm 0.0196\%$	(1)
Maximum Conduct Output Power	$\pm 0.766\text{dB}$	(1)
Power Spectral Density	$\pm 1.22\text{dB}$	(1)
Band Edge Measurements	$\pm 1.328\text{dB}$	(1)
Unwanted Emissions Measurement	9kHz-1GHz: $\pm 0.746\text{dB}$ 1GHz-26GHz: $\pm 1.328\text{dB}$	(1)
Frequency Stability	$\pm 2.76\%$	(1)
Conducted Emissions 9kHz~30MHz	$\pm 3.08\text{ dB}$	(1)
Radiated Emissions 30~1000MHz	$\pm 4.51\text{ dB}$	(1)
Radiated Emissions 1~18GHz	$\pm 5.84\text{ dB}$	(1)
Radiated Emissions 18~40GHz	$\pm 6.12\text{ dB}$	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



1.6. Environmental Conditions

Normal Condition	Temperature	15 °C to 35 °C
	Relative Humidity	20 % to 75 %
	Air Pressure	101 kPa
	Voltage	The normal test voltage for the equipment shall be the nominal voltage for which the equipment was designed.
Extreme Condition	Temperature	Measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.
	Voltage	Measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.

Normal Condition	T _N =Normal Temperature	25 °C
Extreme Condition	T _L =Lower Temperature	-20 °C
	T _H =Higher Temperature	45 °C



2. GENERAL INFORMATION

2.1. Client Information

Applicant:	Shenzhen Xiaopai Technology Co., Ltd.
Address:	Unit A 8F 806, skyworth bldg, Gaoxin Ave. 1.S., Nanshan District, Shenzhen,Guangdong Province, China
Manufacturer:	Shenzhen Xiaopai Technology Co., Ltd.
Address:	Unit A 8F 806, skyworth bldg, Gaoxin Ave. 1.S., Nanshan District, Shenzhen,Guangdong Province, China
Factory:	henzhen Skyworth Digital Technology Co.,LTD. Baoan Factory
Address:	2-5F,Integration Multi-Storied Building, Skyworth Science and Technology Industrial Park, Tangtou Industrial Zone, Shiyan Street, Baoan District, Shenzhen city, China.

2.2. General Description of EUT

Product Name:	Smart Camera				
Trade Mark:	xpai				
Model/Type reference:	LC2203				
Listed Model(s):	/				
Model Difference:	/				
Sample ID:	CTC241223-008-S018				
Power Supply1:	MODEL:UT-236A-5100 INPUT:100-240V~50/60Hz 0.2A OUTPUT:5.0V=1.0A 5.0W				
Power Supply2:	MODEL:AD-D0930500100US01 INPUT:100-240V~50/60Hz Max 0.2A OUTPUT:5.0V=1.0A				
Hardware Version:	/				
Software Version:	/				
5G Wi-Fi					
Operation Band:	<input type="checkbox"/> U-NII-1	<input type="checkbox"/> U-NII-2A	<input type="checkbox"/> U-NII-2C	<input checked="" type="checkbox"/> U-NII-3	
Operation Frequency:	U-NII-3	5725MHz~5850MHz			
Support Bandwidth:	802.11a	<input checked="" type="checkbox"/> 20MHz			
	802.11n	<input checked="" type="checkbox"/> 20MHz	<input type="checkbox"/> 40MHz		
	802.11ac	<input checked="" type="checkbox"/> 20MHz	<input type="checkbox"/> 40MHz	<input type="checkbox"/> 80MHz	<input type="checkbox"/> 160MHz
Modulation:	802.11a: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)				
Antenna Type:	FPC Antenna				

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Antenna Gain:	3.85dBm
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2.3. Accessory Equipment Information

Equipment Information			
Name	Model	S/N	Manufacturer
Notebook	ThinkPad T460s	/	Lenovo
Serial port board	5800-2CLMH00	/	
Cable Information			
Name	Shielded Type	Ferrite Core	Length
USB Cable	Unshielded	NO	100cm
Test Software Information			
Name	Version	/	/
/	/	/	/



2.4. Operation State

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting.

Operation Frequency List:

Operating Band	20MHz Bandwidth	
	Channel	Frequency (MHz)
U-NII-3	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

Test channel is below:

Operating Band	Test Channel	20MHz Bandwidth	
		Channel	Frequency (MHz)
U-NII-3	CH _L	149	5745
	CH _M	157	5785
	CH _H	165	5825

Data Rated:

Preliminary tests were performed in different data rate, and found which the below bit rate is worst case mode, so only show data which it is a worst case mode.

Test Mode	Data Rate (worst mode)
802.11a	6Mbps
802.11n(HT20)	HT-MCS0



Test Mode:

For RF test items:
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
The EUT was set to connect with the WLAN AP under large package sizes transmission.
For Radiated spurious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.
For DFS test items:
The EUT has been tested under test mode condition. The Applicant provides software to control the EUT for staying in DFS mode for testing.



2.5. Measurement Instruments List

RF Test System - SRD					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 21, 2025
2	Spectrum Analyzer	R&S	FSV40-N	101654	Aug. 06, 2025
3	Spectrum Analyzer	R&S	FSU26	100105	Dec. 12, 2025
4	MXA Signal Analyzer	Keysight	N9020A	MY46471737	Dec. 12, 2025
5	MXA Signal Analyzer	Keysight	N9020A	MY52091402	Aug. 21, 2025
6	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 12, 2025
7	PSG Analog Signal Generator	Agilent	E8257D	MY46521908	Dec. 12, 2025
8	EXG Analog Signal Generator	Keysight	N5173B	MY59100842	Dec. 12, 2025
9	MXG Vector Signal Generator	Keysight	N5182B	MY59100212	Dec. 12, 2025
10	USB Wideband Power Sensor	Keysight	U2021XA	MY55130004	Mar. 21, 2025
11	USB Wideband Power Sensor	Keysight	U2021XA	MY55130006	Mar. 21, 2025
12	Wideband Radio Communication Tester	R&S	CMW500	102257	May 24, 2025
13	Wideband Radio Communication Tester	R&S	CMW500	102414	Dec. 12, 2025
14	RF Control Unit	Tonscend	JS0806-2	/	Aug. 21, 2025
15	High and low temperature test chamber	ESPEC	MT3035	/	Mar. 21, 2025
16	Test Software	Tonscend	JS1120-3	V2.6.88.0346	/
17	Test Software	Tonscend	JS1120-3	V3.3.38	/
18	Test Software	WCS	WCS-WCN	2023.08.04	/

Radiated emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Dec. 24, 2025
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-648	Sep. 25, 2025
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 12, 2025
4	Broadband Amplifier	Schwarzbeck	BBV9743B	259	Dec. 12, 2025
5	Mirowave Broadband Amplifier	Schwarzbeck	BBV9718C	111	Dec. 12, 2025
6	3m chamber 3	YIHENG	EE106	/	Aug. 28, 2026
7	Test Software	FARA	EZ-EMC	FA-03A2	/

Radiated emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Dec. 17, 2025
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-648	Dec. 11, 2025
3	Spectrum Analyzer	R&S	FSU26	100105	Dec. 12, 2025

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4	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 21, 2025
5	Pre-Amplifier	SONOMA	310	186194	Dec. 12, 2025
6	Low Noise Pre-Amplifier	EMCI	EMC051835	980075	Dec. 12, 2025
7	Test Receiver	R&S	ESCI7	100967	Dec. 12, 2025
8	3m chamber 2	Frankonia	EE025	/	Oct. 18, 2027
9	Test Software	FARA	EZ-EMC	FA-03A2	/

Conducted emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101112	Dec. 12, 2025
2	LISN	R&S	ENV216	101113	Dec. 12, 2025
3	EMI Test Receiver	R&S	ESCI	100524	Dec. 12, 2025
4	ISN CAT6	Schwarzbeck	NTFM 8158	CAT6-8158-0046	Dec. 12, 2025
5	ISN CAT5	Schwarzbeck	NTFM 8158	CAT5-8158-0046	Dec. 12, 2025
6	Test Software	R&S	EMC32	6.10.10	/

Note: 1. The Cal. Interval was one year.

2. The Cal. Interval was three years of the antenna.

3. The cable loss has been calculated in test result which connection between each test instruments.

3. TEST ITEM AND RESULTS

3.1. Conducted Emission

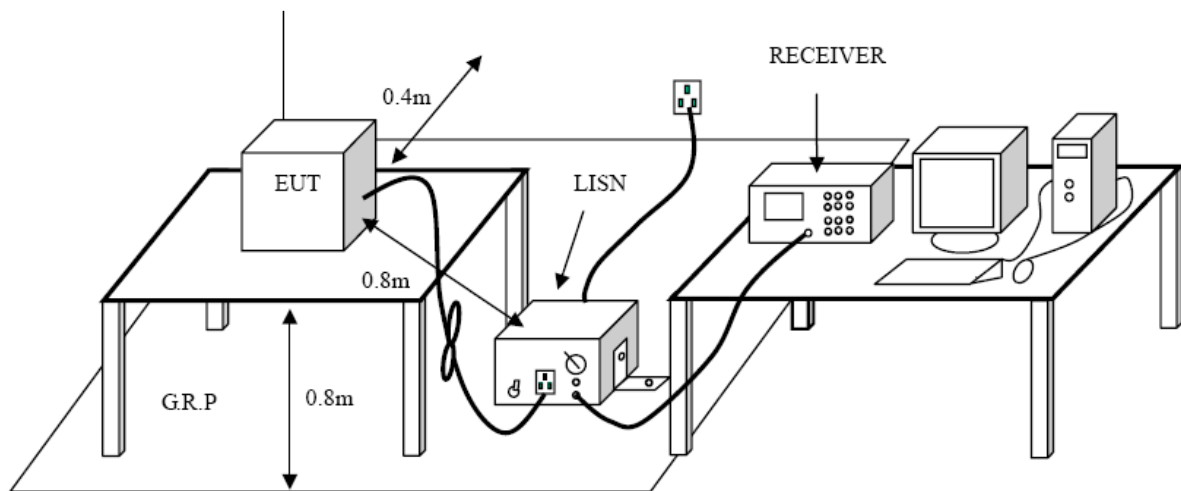
Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.

Test Configuration



Test Procedure

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm / 50 μH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

Test Mode

Please refer to the clause 2.4.

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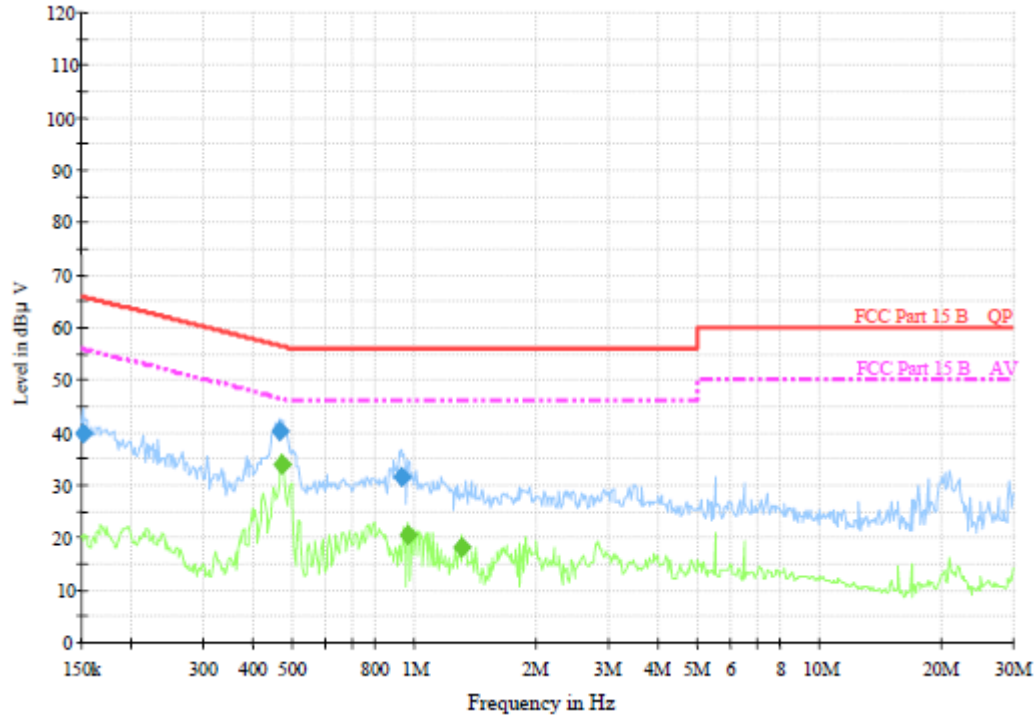
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**Test Result**

Test Voltage:	AC 120V/60Hz
Terminal:	Line
Remark:	Only worse case is reported
MODEL:	UT-236A-5100

**Final Measurement Detector 1**

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.151200	39.7	1000.00	9.000	On	L1	9.5	26.2	65.9	
0.465040	40.3	1000.00	9.000	On	L1	9.5	16.3	56.6	
0.922770	31.7	1000.00	9.000	On	L1	9.5	24.3	56.0	

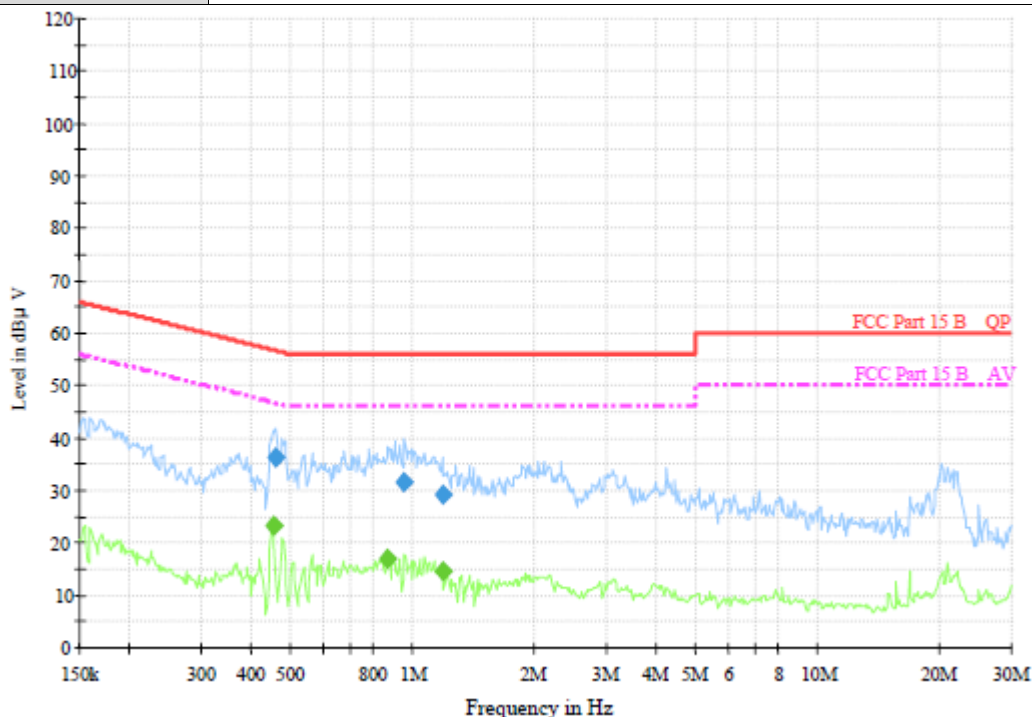
Final Measurement Detector 2

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.468760	33.8	1000.00	9.000	On	L1	9.5	12.7	46.5	
0.960270	20.4	1000.00	9.000	On	L1	9.5	25.6	46.0	
1.310260	18.2	1000.00	9.000	On	L1	9.5	27.8	46.0	

Emission Level = Read Level + Correct Factor



Test Voltage:	AC 120V/60Hz
Terminal:	Neutral
Remark:	Only worse case is reported
MODEL:	UT-236A-5100



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμ V)	Comment
0.457680	36.2	1000.00	9.000	On	N	9.4	20.5	56.7	
0.952650	31.7	1000.00	9.000	On	N	9.4	24.3	56.0	
1.181320	29.4	1000.00	9.000	On	N	9.5	26.6	56.0	

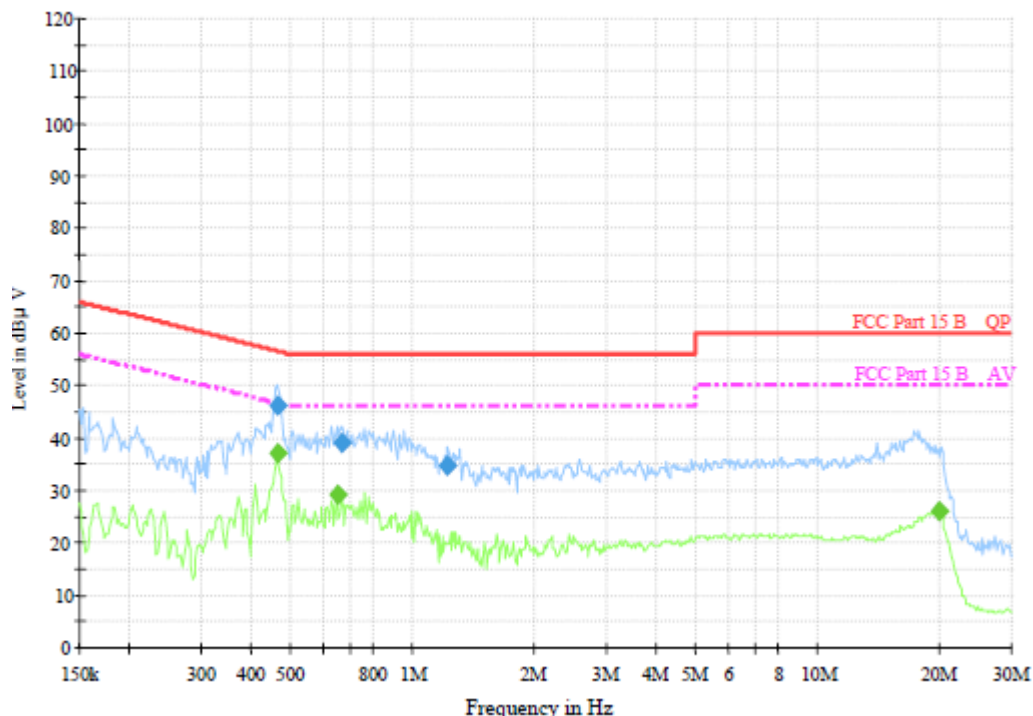
Final Measurement Detector 2

Frequency (MHz)	Average (dBμ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμ V)	Comment
0.450450	23.2	1000.00	9.000	On	N	9.4	23.7	46.9	
0.865780	17.1	1000.00	9.000	On	N	9.4	28.9	46.0	
1.181320	14.8	1000.00	9.000	On	N	9.5	31.2	46.0	

Emission Level = Read Level + Correct Factor



Test Voltage:	AC 120V/60Hz
Terminal:	Line
Remark:	Only worse case is reported
MODEL:	AD-D0930500100US01



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.461350	46.2	1000.00	9.000	On	L1	9.5	10.5	56.7	
0.665600	39.0	1000.00	9.000	On	L1	9.5	17.0	56.0	
1.219580	34.7	1000.00	9.000	On	L1	9.6	21.3	56.0	

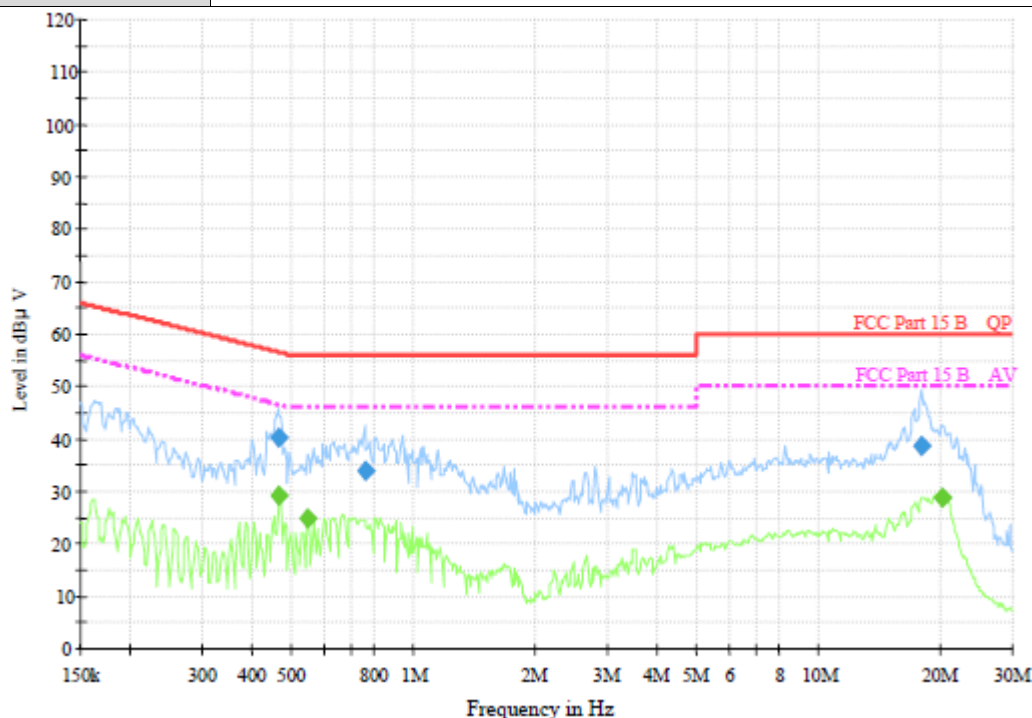
Final Measurement Detector 2

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)	Comment
0.461350	37.3	1000.00	9.000	On	L1	9.5	9.4	46.7	
0.649870	29.4	1000.00	9.000	On	L1	9.5	16.6	46.0	
19.992090	26.1	1000.00	9.000	On	L1	9.7	23.9	50.0	

Emission Level = Read Level + Correct Factor



Test Voltage:	AC 120V/60Hz
Terminal:	Neutral
Remark:	Only worse case is reported
MODEL:	AD-D0930500100US01



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμ V)	Comment
0.461350	40.5	1000.00	9.000	On	N	9.4	16.2	56.7	
0.756100	34.1	1000.00	9.000	On	N	9.4	21.9	56.0	
17.881780	38.7	1000.00	9.000	On	N	9.5	21.3	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBμ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμ V)	Comment
0.465040	29.1	1000.00	9.000	On	N	9.4	17.5	46.6	
0.545380	24.8	1000.00	9.000	On	N	9.4	21.2	46.0	
20.152030	28.9	1000.00	9.000	On	N	9.5	21.1	50.0	

Emission Level = Read Level + Correct Factor



3.2. Radiated Emission

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.209

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F (kHz)	300
0.490~1.705	24000/F (kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Frequency Range (MHz)	dBμV/m (at 3 meters)	
	Peak	Average
Above 1000	74	54

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBμV/m)=20log Emission Level (μV/m).

Limits of unwanted emission out of the restricted bands

FCC CFR Title 47 Part 15 Subpart E Section 15. 407(b)

Frequency (MHz)	EIRP Limits (dBm)	Equivalent Field Strength at 3m (dBμV/m)
5150~5250	-27	68.2
5250~5350	-27	68.2
5470~5725	-27	68.2
5725~5825	-27 (Note 2)	68.2
	10 (Note 2)	105.2
	15.6 (Note 2)	110.8
	27 (Note 2)	122.2

Note:

1. The following formula is used to convert the equipment isotropic radiated power (eirp) to field

strength: $E = \frac{1000000\sqrt{30P}}{3}$ μV/m, where P is the eirp (Watts).

2. According to FCC 16-24, 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 25MHz 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 27dBm/MHz at the band edge.

CTC Laboratories, Inc.

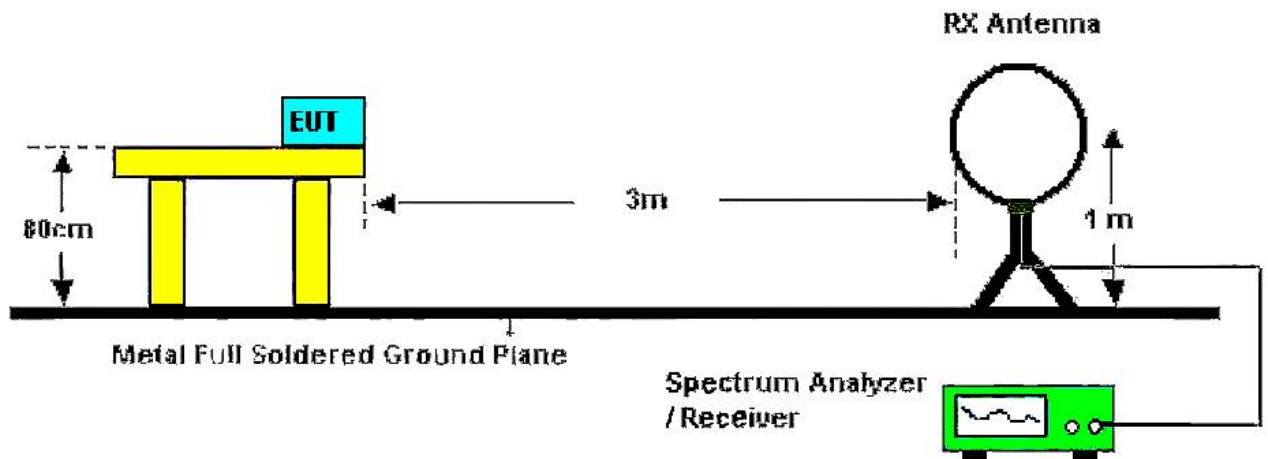
Room 101 Building B, No. 7, Lanqing 1st Road, Luhu Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China
Tel.: (86)755-27521059 Fax: (86)755-27521011 Http://www.sz-ctc.org.cn

TRF No: CTC-TR-063_A1

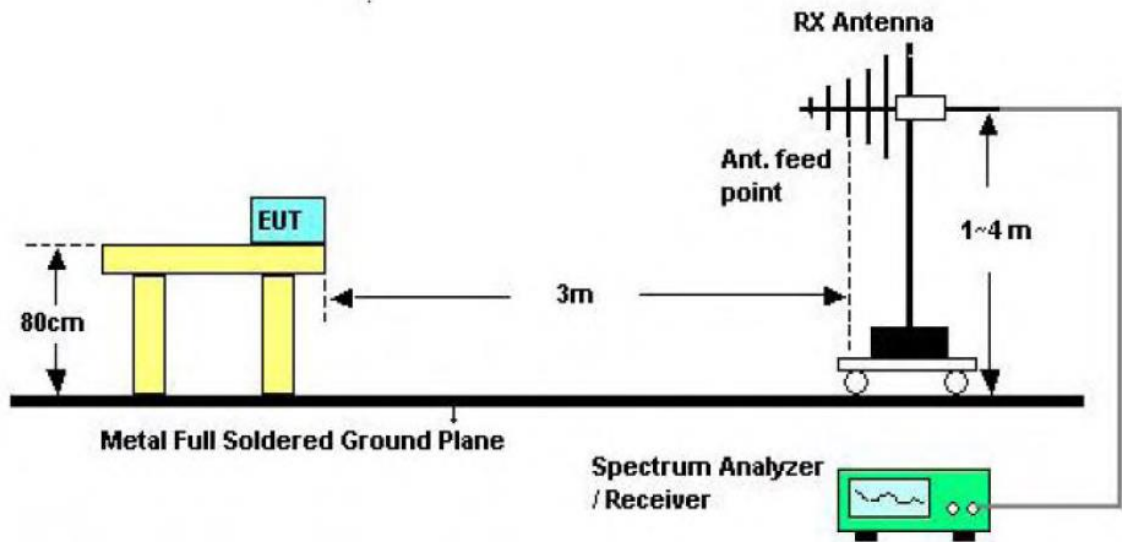
For anti-fake verification, please visit the official website of China Inspection And Testing Society : yz.cnca.cn



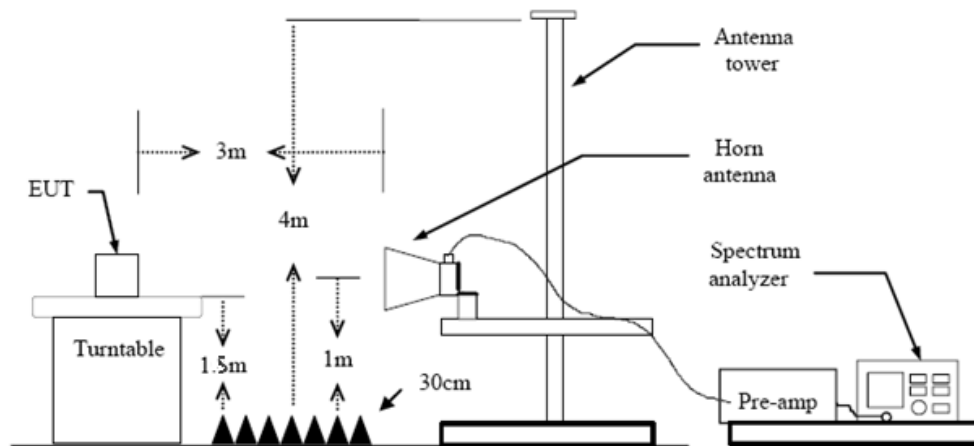
Test Configuration



Below 30MHz Test Setup



30-1000MHz Test Setup



Above 1GHz Test Setup

CTC Laboratories, Inc.

Room 101 Building B, No. 7, Lanqing 1st Road, Luhu Community, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China
Tel.: (86)755-27521059 Fax: (86)755-27521011 Http://www.sz-ctc.org.cn

TRF No: CTC-TR-063_A1

For anti-fake verification, please visit the official website of China Inspection And Testing Society : yz.cnca.cn



Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) 9k – 150kHz:
RBW=300 Hz, VBW=1 kHz, Sweep=auto, Detector function=peak, Trace=max hold
 - (3) 0.15M – 30MHz:
RBW=10 kHz, VBW=30 kHz, Sweep=auto, Detector function=peak, Trace=max hold
 - (4) 30M - 1 GHz:
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max holdIf the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- (5) From 1 GHz to 10th harmonic:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.
Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause Duty Cycle.

Test Mode

Please refer to the clause 2.4.

Test Result

9 kHz~30 MHz

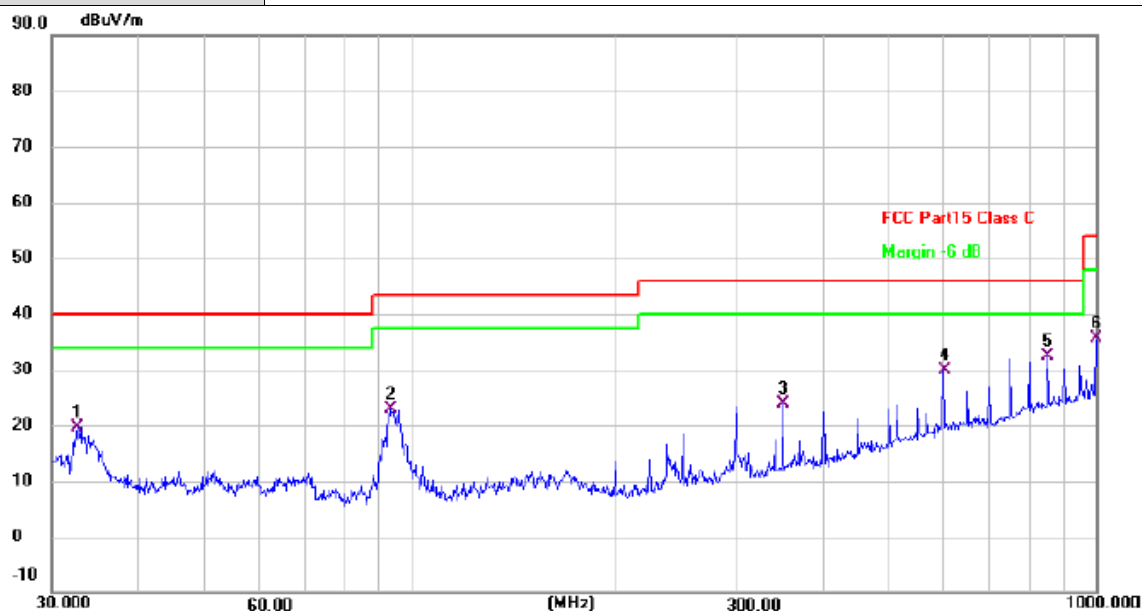
From 9 kHz to 30 MHz: The conclusion is PASS.

- Note: 1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Pre-scan all antenna, only show the test data for worse case antenna on the test report.



30MHz-1GHz

Ant. No.	Ant 1
Ant. Pol.	Horizontal
Test Mode:	TX 802.11a Mode 5745MHz (U-NII-1)
Remark:	Only worse case is reported.



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	32.7257	38.58	-18.92	19.66	40.00	-20.34	QP
2	93.4402	45.13	-22.27	22.86	43.50	-20.64	QP
3	350.2311	40.24	-16.24	24.00	46.00	-22.00	QP
4	600.1625	39.26	-9.40	29.86	46.00	-16.14	QP
5 *	852.2298	37.88	-5.39	32.49	46.00	-13.51	QP
6	1000.0000	38.81	-3.07	35.74	54.00	-18.26	QP

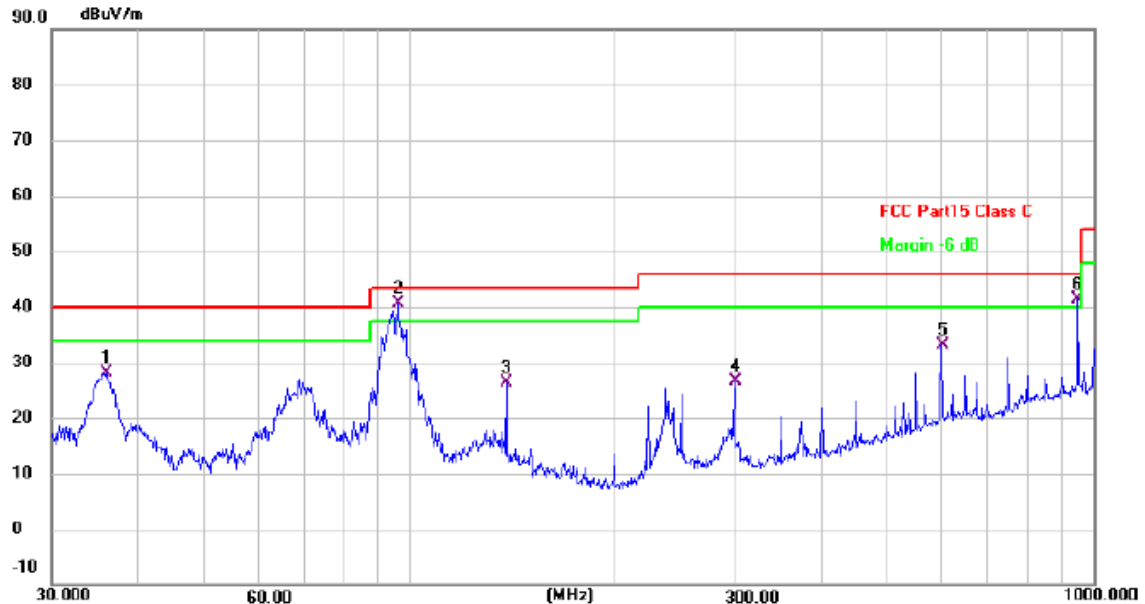
Remarks:

1. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Factor

2. Margin value = Level - Limit value



Ant. No.	Ant 1
Ant. Pol.	Vertical
Test Mode:	TX 802.11a Mode 5745MHz (U-NII-1)
Remark:	Only worse case is reported.



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	36.0007	46.74	-18.67	28.07	40.00	-11.93	QP
2 *	96.3685	62.71	-22.14	40.57	43.50	-2.93	QP
3	138.7761	45.48	-19.21	26.27	43.50	-17.23	QP
4	298.4774	44.17	-17.54	26.63	46.00	-19.37	QP
5	600.1625	42.64	-9.40	33.24	46.00	-12.76	QP
6 !	950.7592	45.36	-3.94	41.42	46.00	-4.58	QP

Remarks:

1. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Factor

2. Margin value = Level - Limit value



Above 1GHz

Ant. No.	Ant 1						
Ant. Pol.	Horizontal						
Test Mode:	TX 802.11a Mode 5745MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						

Ant. No.	Ant 1						
Ant. Pol.	Vertical						
Test Mode:	TX 802.11a Mode 5745MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						



Ant. No.	Ant 1																														
Ant. Pol.	Horizontal																														
Test Mode:	TX 802.11a Mode 5785MHz (U-NII-3)																														
Remark:	No report for the emission which more than 20 dB below the prescribed limit.																														
<table><tr><th>No.</th><th>Frequency (MHz)</th><th>Reading (dBuV)</th><th>Factor (dB/m)</th><th>Level (dBuV/m)</th><th>Limit (dBuV/m)</th><th>Margin (dB)</th><th>Detector</th></tr><tr><td>1 *</td><td>11569.558</td><td>32.61</td><td>7.28</td><td>39.89</td><td>54.00</td><td>-14.11</td><td>AVG</td></tr><tr><td>2</td><td>11569.683</td><td>44.44</td><td>7.28</td><td>51.72</td><td>74.00</td><td>-22.28</td><td>peak</td></tr></table>								No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	1 *	11569.558	32.61	7.28	39.89	54.00	-14.11	AVG	2	11569.683	44.44	7.28	51.72	74.00	-22.28	peak
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector																								
1 *	11569.558	32.61	7.28	39.89	54.00	-14.11	AVG																								
2	11569.683	44.44	7.28	51.72	74.00	-22.28	peak																								
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value																															

Ant. No.	Ant 1
Ant. Pol.	Vertical
Test Mode:	TX 802.11a Mode 5785MHz (U-NII-3)
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	11569.660	32.52	7.28	39.80	54.00	-14.20	AVG
2	11569.697	45.19	7.28	52.47	74.00	-21.53	peak

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



Ant. No.	Ant 1																														
Ant. Pol.	Horizontal																														
Test Mode:	TX 802.11a Mode 5825MHz (U-NII-3)																														
Remark:	No report for the emission which more than 20 dB below the prescribed limit.																														
<table><tr><th>No.</th><th>Frequency (MHz)</th><th>Reading (dBUV)</th><th>Factor (dB/m)</th><th>Level (dBUV/m)</th><th>Limit (dBUV/m)</th><th>Margin (dB)</th><th>Detector</th></tr><tr><td>1 *</td><td>11649.969</td><td>32.91</td><td>7.24</td><td>40.15</td><td>54.00</td><td>-13.85</td><td>AVG</td></tr><tr><td>2</td><td>11650.098</td><td>45.24</td><td>7.24</td><td>52.48</td><td>74.00</td><td>-21.52</td><td>peak</td></tr></table>								No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	1 *	11649.969	32.91	7.24	40.15	54.00	-13.85	AVG	2	11650.098	45.24	7.24	52.48	74.00	-21.52	peak
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector																								
1 *	11649.969	32.91	7.24	40.15	54.00	-13.85	AVG																								
2	11650.098	45.24	7.24	52.48	74.00	-21.52	peak																								
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value																															

Ant. No.	Ant 1						
Ant. Pol.	Vertical						
Test Mode:	TX 802.11a Mode 5825MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						



Ant. No.	Ant 1						
Ant. Pol.	Horizontal						
Test Mode:	TX 802.11n(HT20) Mode 5745MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						

Ant. No.	Ant 1						
Ant. Pol.	Vertical						
Test Mode:	TX 802.11n(HT20) Mode 5745MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						



Ant. No.	Ant 1						
Ant. Pol.	Horizontal						
Test Mode:	TX 802.11n(HT20) Mode 5785MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						

Ant. No.	Ant 1
Ant. Pol.	Vertical
Test Mode:	TX 802.11n(HT20) Mode 5785MHz (U-NII-3)
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1	11569.862	45.13	7.28	52.41	74.00	-21.59	peak
2 *	11570.154	32.59	7.28	39.87	54.00	-14.13	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



Ant. No.	Ant 1						
Ant. Pol.	Horizontal						
Test Mode:	TX 802.11n(HT20) Mode 5825MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						

Ant. No.	Ant 1						
Ant. Pol.	Vertical						
Test Mode:	TX 802.11n(HT20) Mode 5825MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						



Ant. No.	Ant 1						
Ant. Pol.	Horizontal						
Test Mode:	TX 802.11ac(VHT20) Mode 5745MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						

Ant. No.	Ant 1
Ant. Pol.	Vertical
Test Mode:	TX 802.11ac(VHT20) Mode 5745MHz (U-NII-3)
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1 *	11489.545	33.02	7.33	40.35	54.00	-13.65	AVG
2	11490.230	45.78	7.33	53.11	74.00	-20.89	peak

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



Ant. No.	Ant 1						
Ant. Pol.	Horizontal						
Test Mode:	TX 802.11ac(VHT20) Mode 5785MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						

Ant. No.	Ant 1						
Ant. Pol.	Vertical						
Test Mode:	TX 802.11ac(VHT20) Mode 5785MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						



Ant. No.	Ant 1																														
Ant. Pol.	Horizontal																														
Test Mode:	TX 802.11ac(VHT20) Mode 5825MHz (U-NII-3)																														
Remark:	No report for the emission which more than 20 dB below the prescribed limit.																														
<table><tr><th>No.</th><th>Frequency (MHz)</th><th>Reading (dBUV)</th><th>Factor (dB/m)</th><th>Level (dBUV/m)</th><th>Limit (dBUV/m)</th><th>Margin (dB)</th><th>Detector</th></tr><tr><td>1 *</td><td>11650.042</td><td>32.89</td><td>7.24</td><td>40.13</td><td>54.00</td><td>-13.87</td><td>AVG</td></tr><tr><td>2</td><td>11650.048</td><td>46.12</td><td>7.24</td><td>53.36</td><td>74.00</td><td>-20.64</td><td>peak</td></tr></table>								No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	1 *	11650.042	32.89	7.24	40.13	54.00	-13.87	AVG	2	11650.048	46.12	7.24	53.36	74.00	-20.64	peak
No.	Frequency (MHz)	Reading (dBUV)	Factor (dB/m)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector																								
1 *	11650.042	32.89	7.24	40.13	54.00	-13.87	AVG																								
2	11650.048	46.12	7.24	53.36	74.00	-20.64	peak																								
Remarks: 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value																															

Ant. No.	Ant 1						
Ant. Pol.	Vertical						
Test Mode:	TX 802.11ac(VHT20) Mode 5825MHz (U-NII-3)						
Remark:	No report for the emission which more than 20 dB below the prescribed limit.						

3.3. Band Edge Emissions

Limit

Limits of unwanted emission out of the restricted bands

FCC CFR Title 47 Part 15 Subpart E Section 15. 407(b)

Frequency (MHz)	EIRP Limits (dBm)	Equivalent Field Strength at 3m (dBμV/m)
5150~5250	-27	68.2
5250~5350	-27	68.2
5470~5725	-27	68.2
5725~5825	-27 (Note 2)	68.2
	10 (Note 2)	105.2
	15.6 (Note 2)	110.8
	27 (Note 2)	122.2

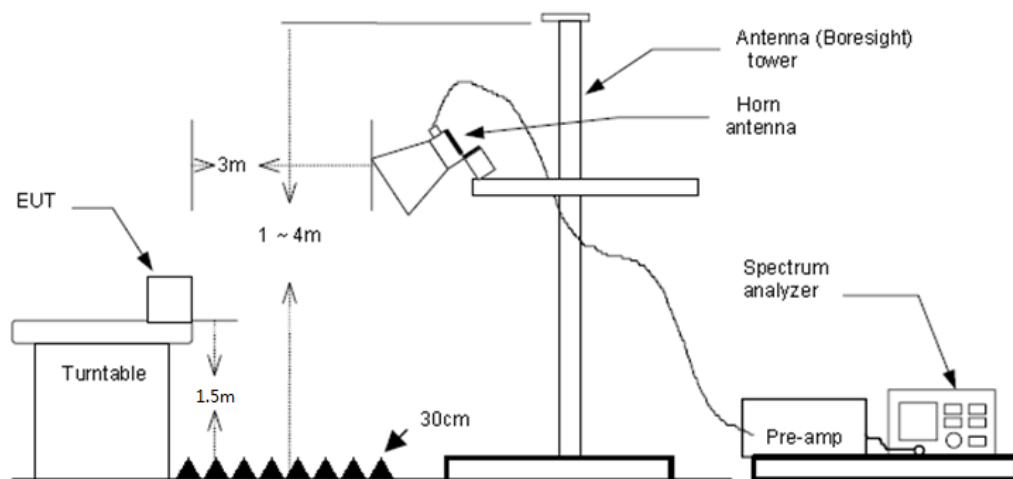
Note:

1. The following formula is used to convert the equipment isotropic radiated power (eirp) to field

strength: $E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m}$, where P is the eirp (Watts).

2. According to FCC 16-24, 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 25MHz 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 27dBm/MHz at the band edge.

Test Configuration





Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause Duty Cycle.

Test Mode

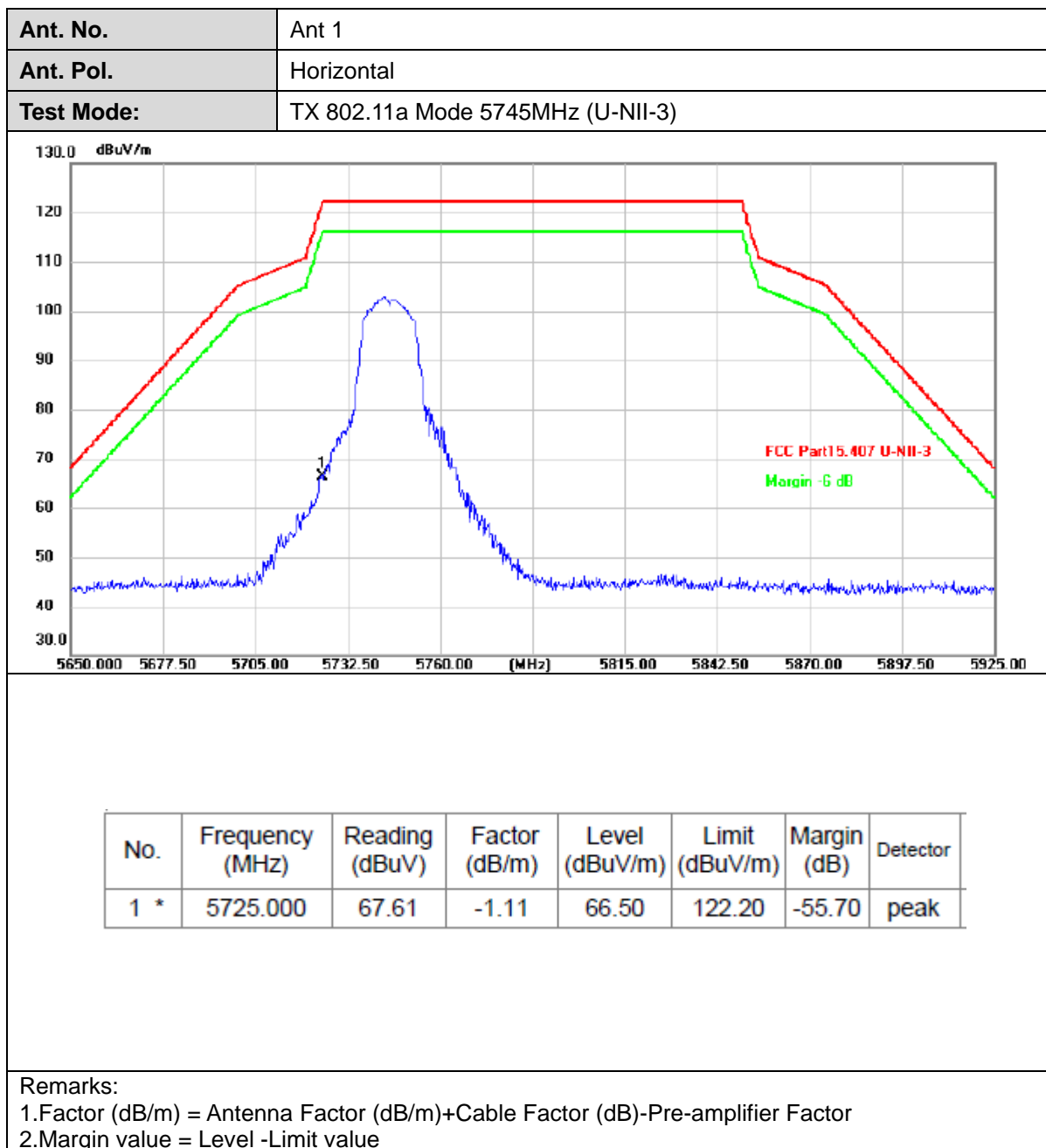
Please refer to the clause 2.4.

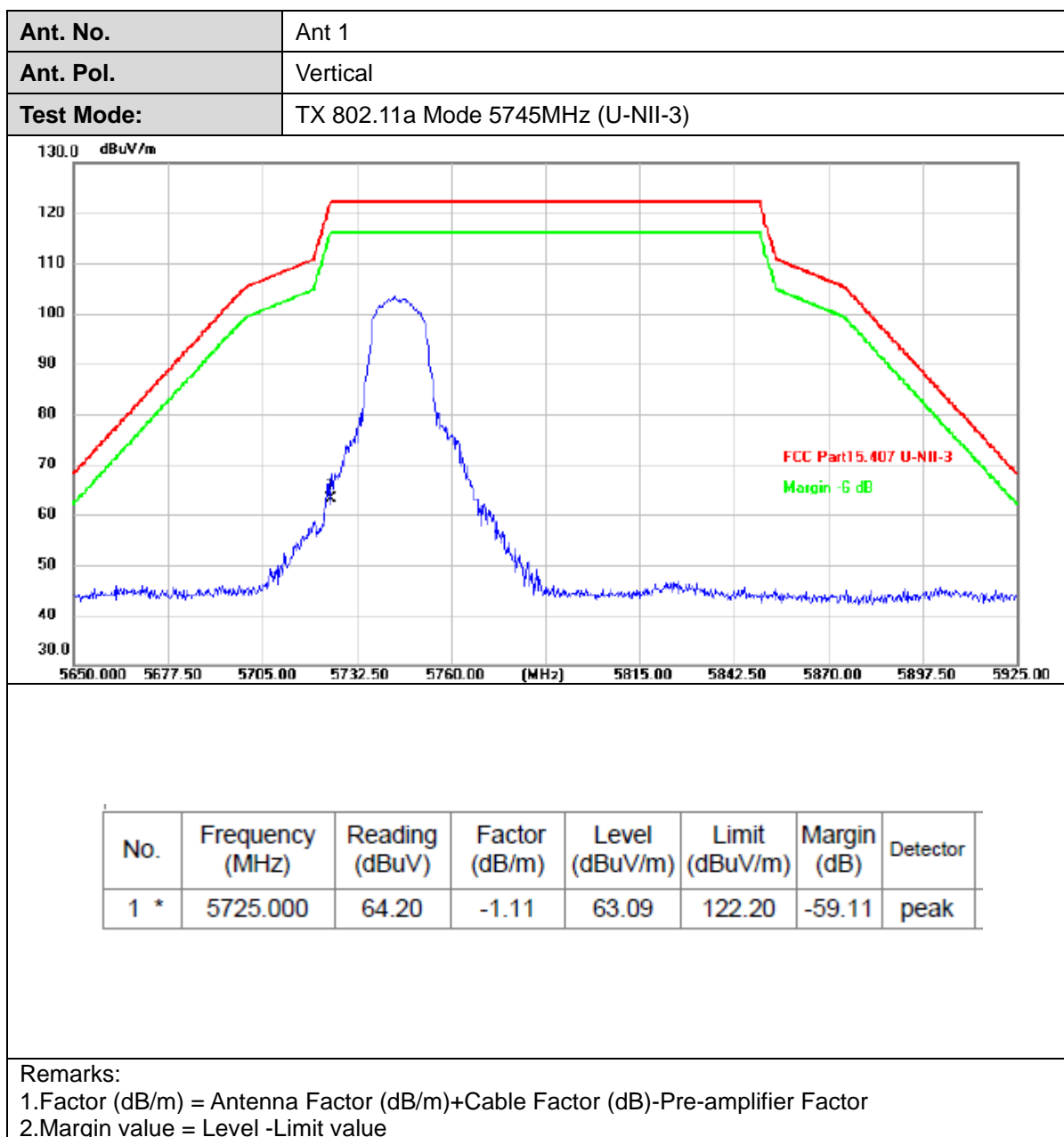


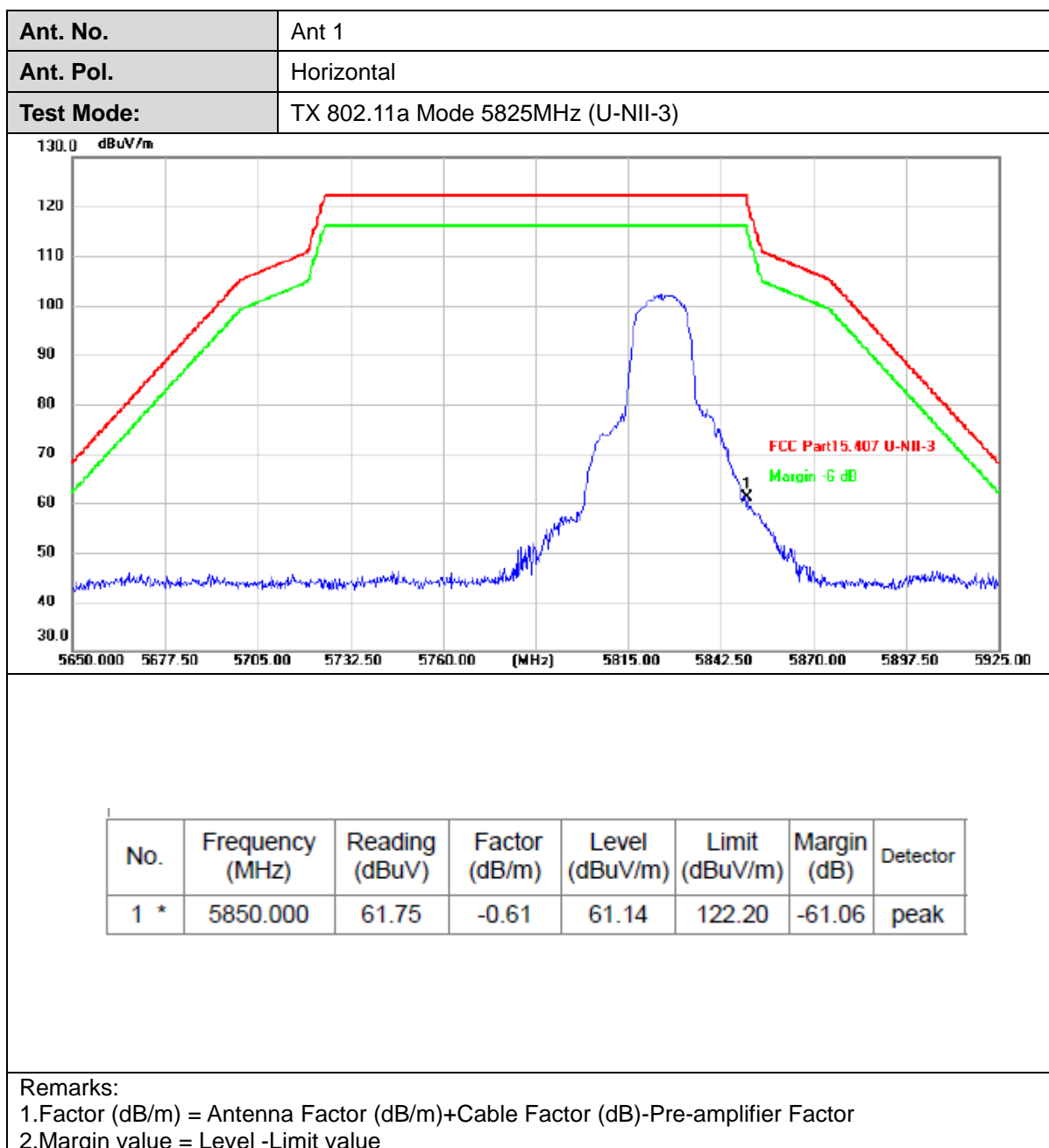
Test Result

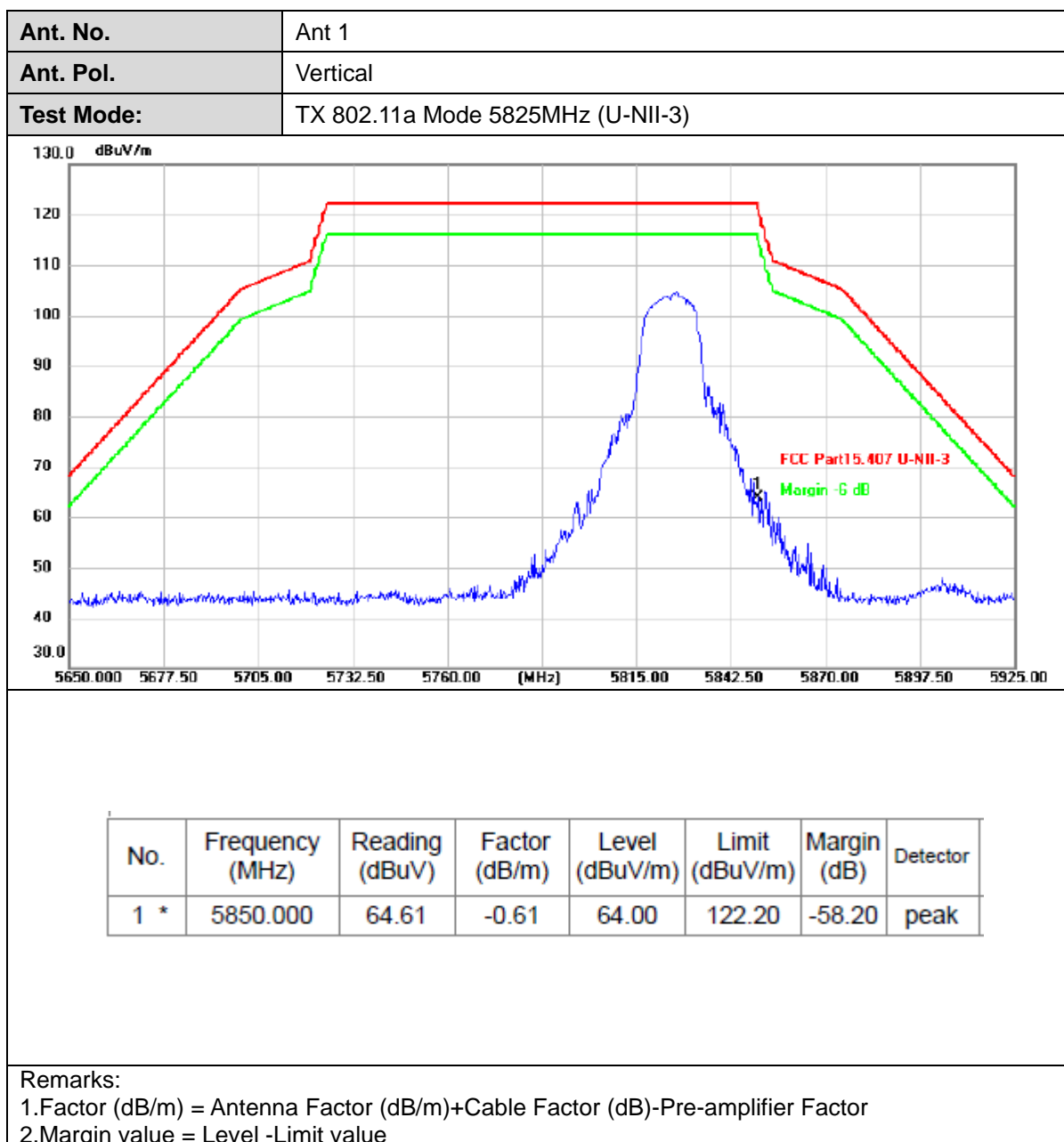
Note: 1. Pre-scan both 4500-5150MHz, 5350-5460MHz were investigated, report only shows the test data for worst case.

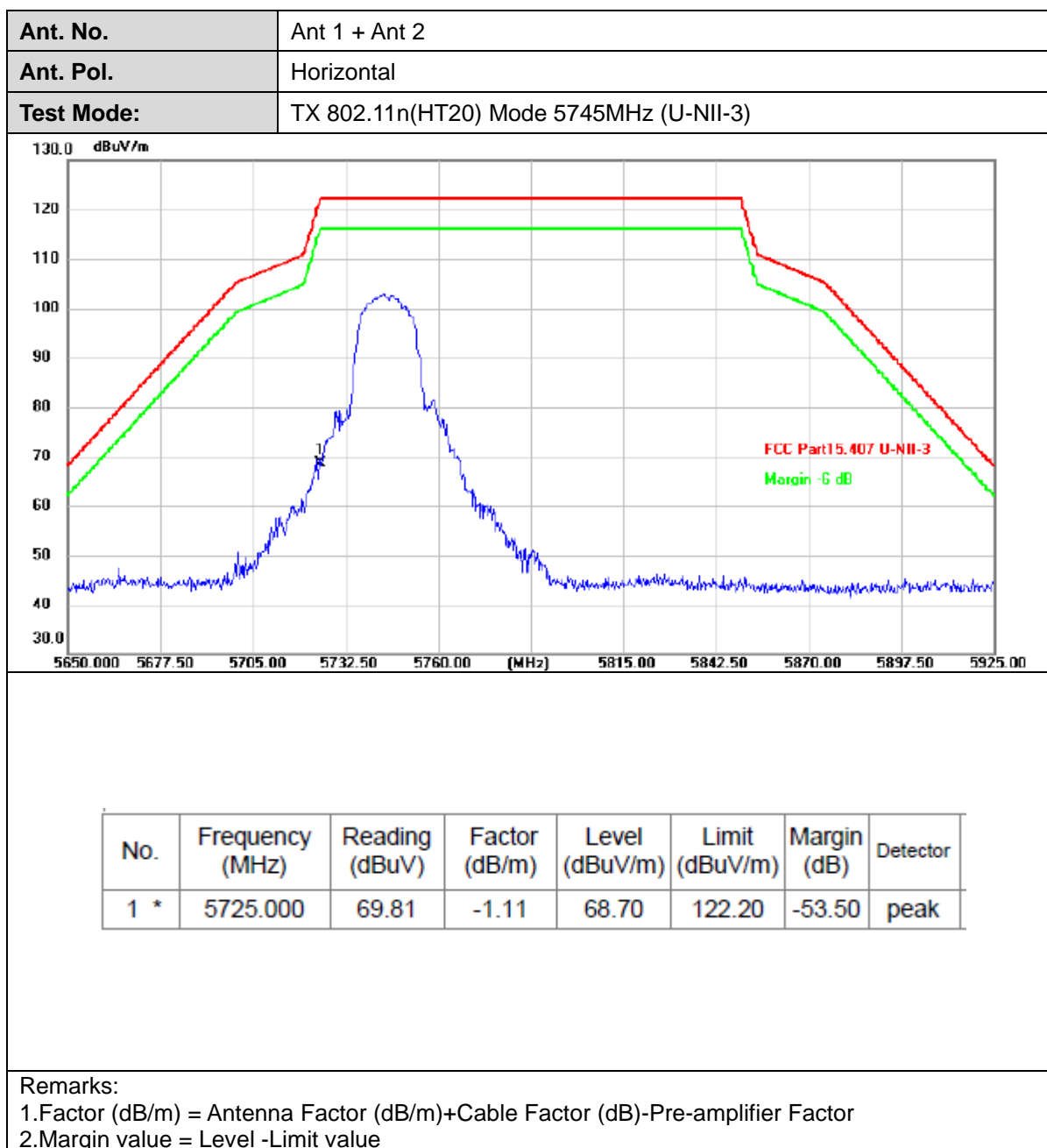
2. Pre-scan all antenna, only show the test data for worse case antenna on the test report.

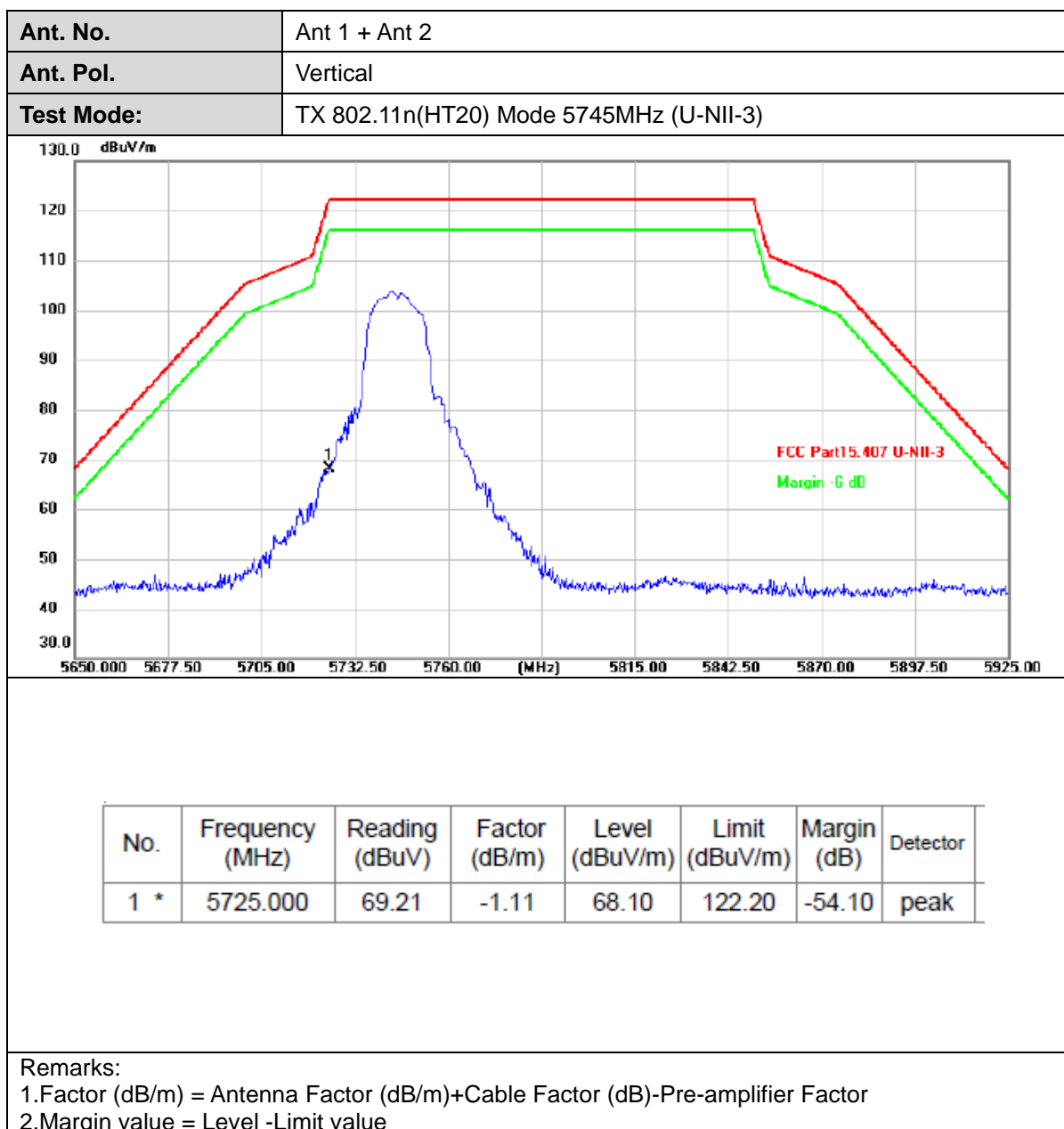


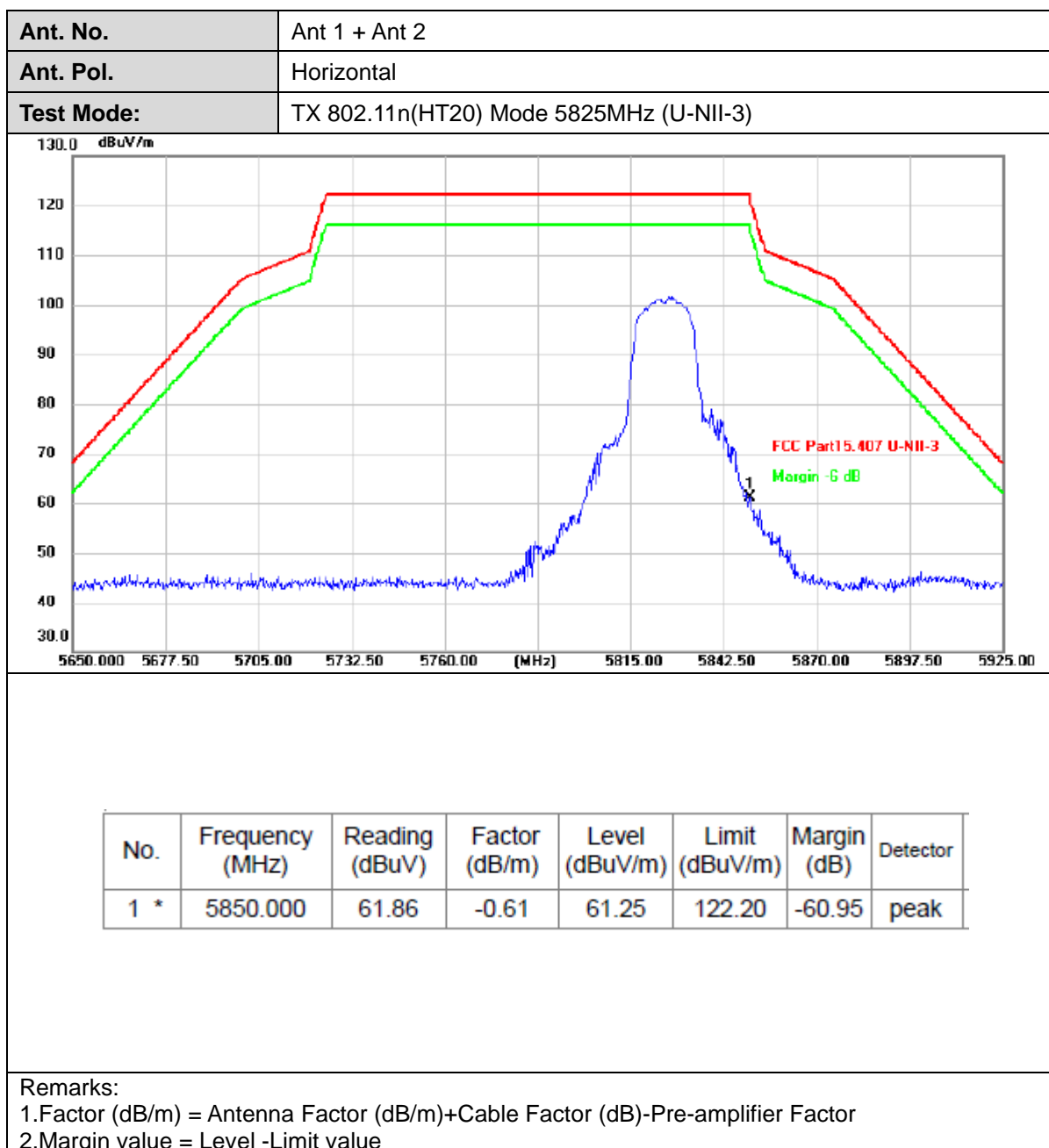


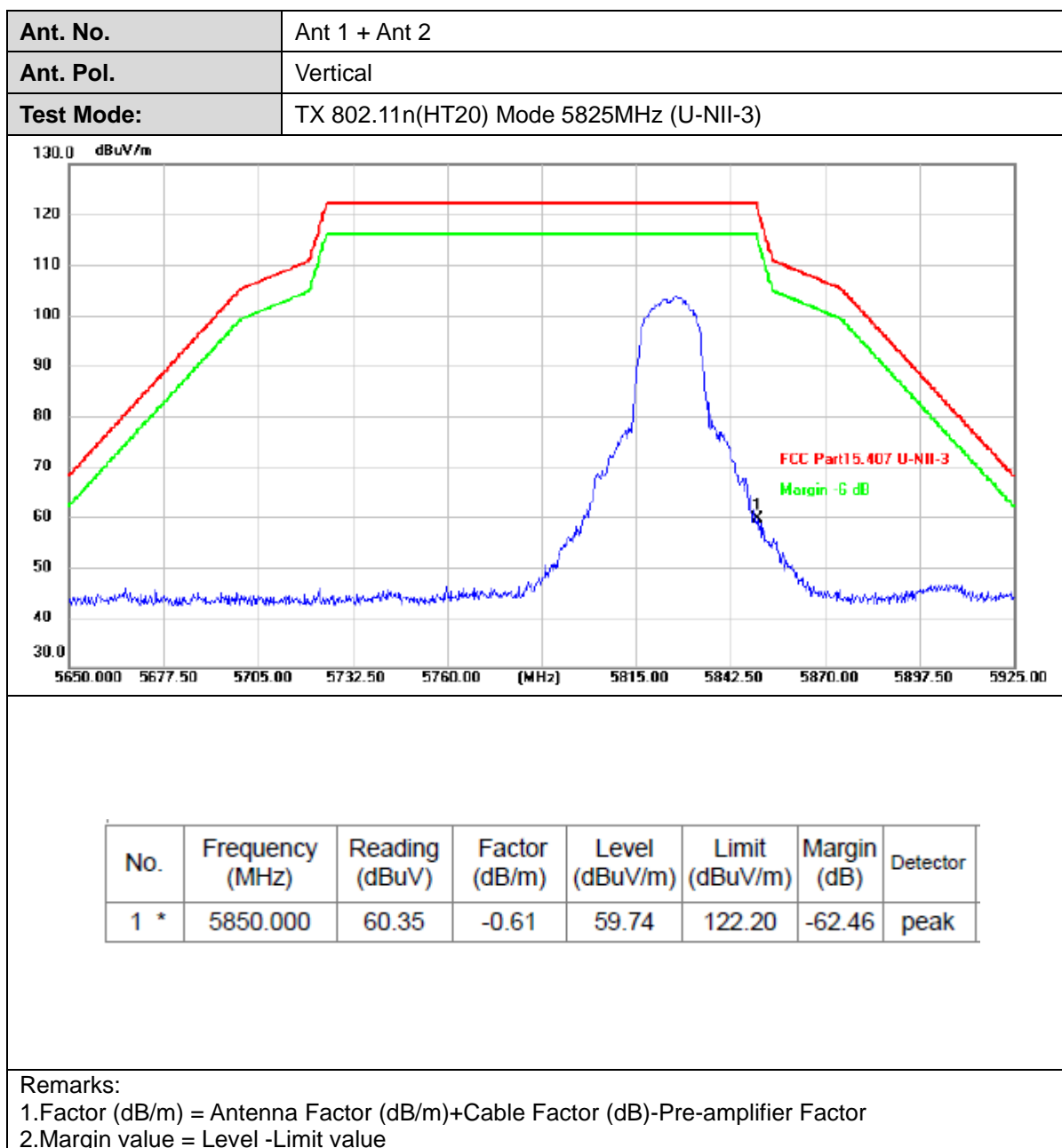


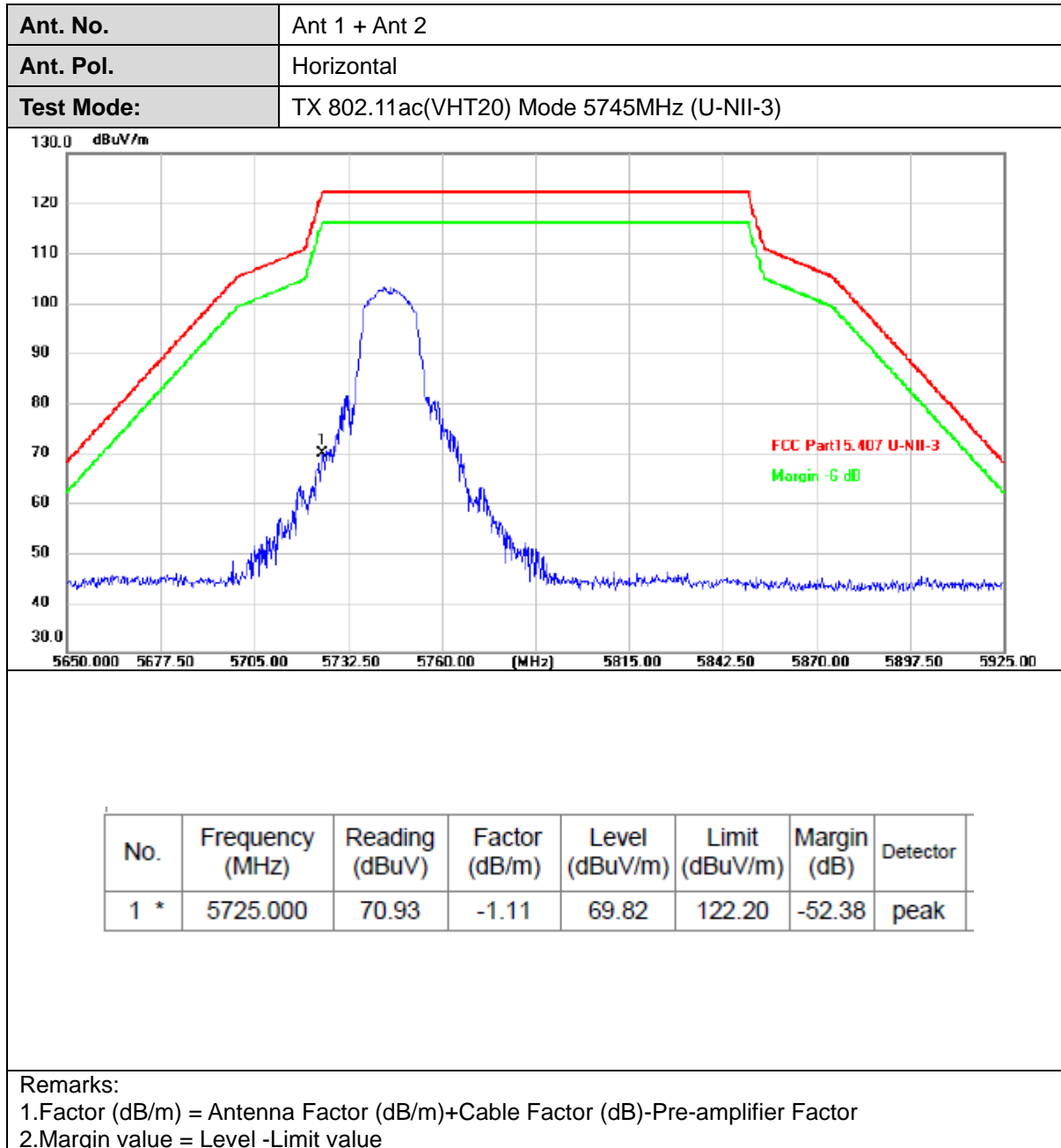


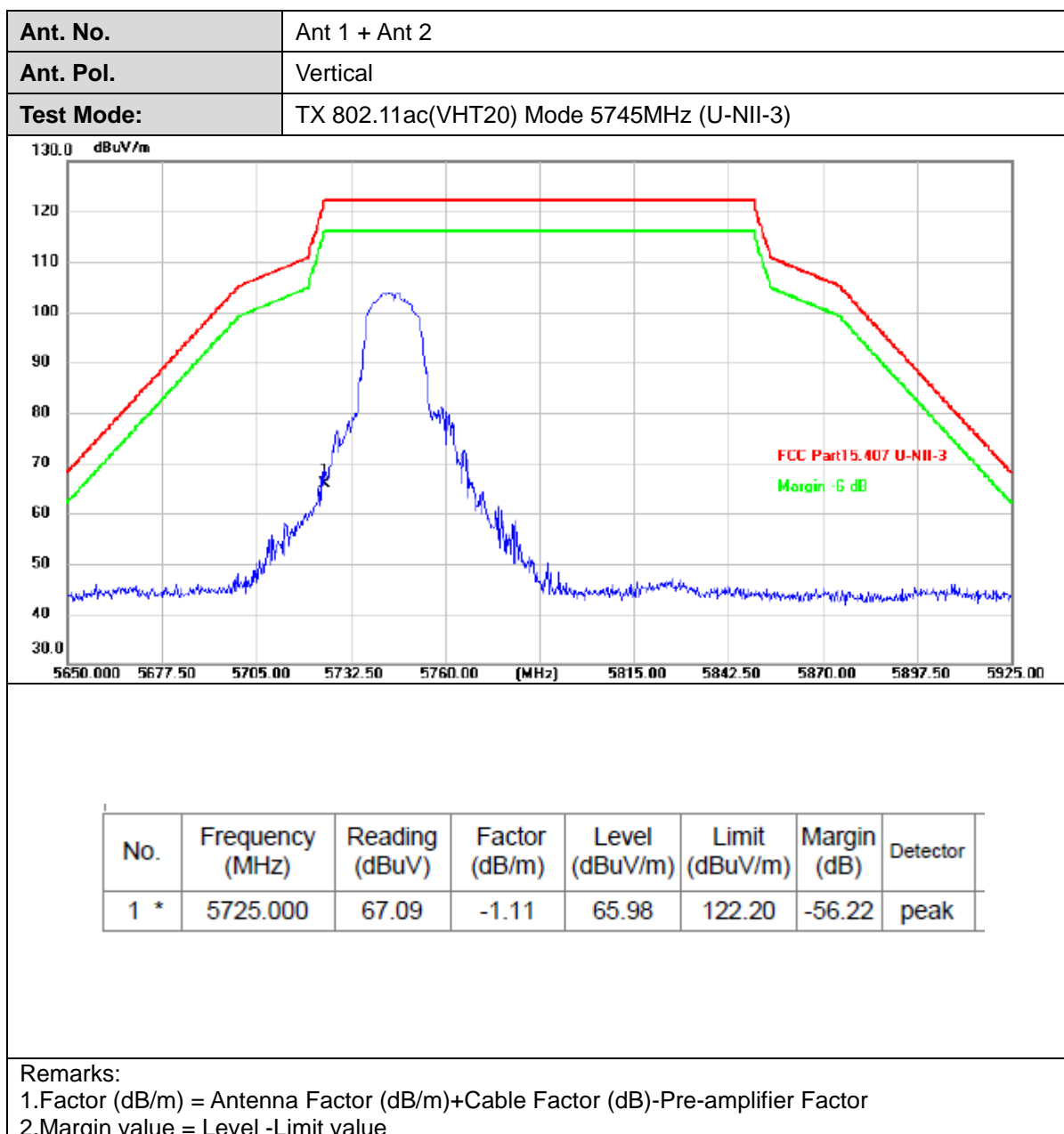






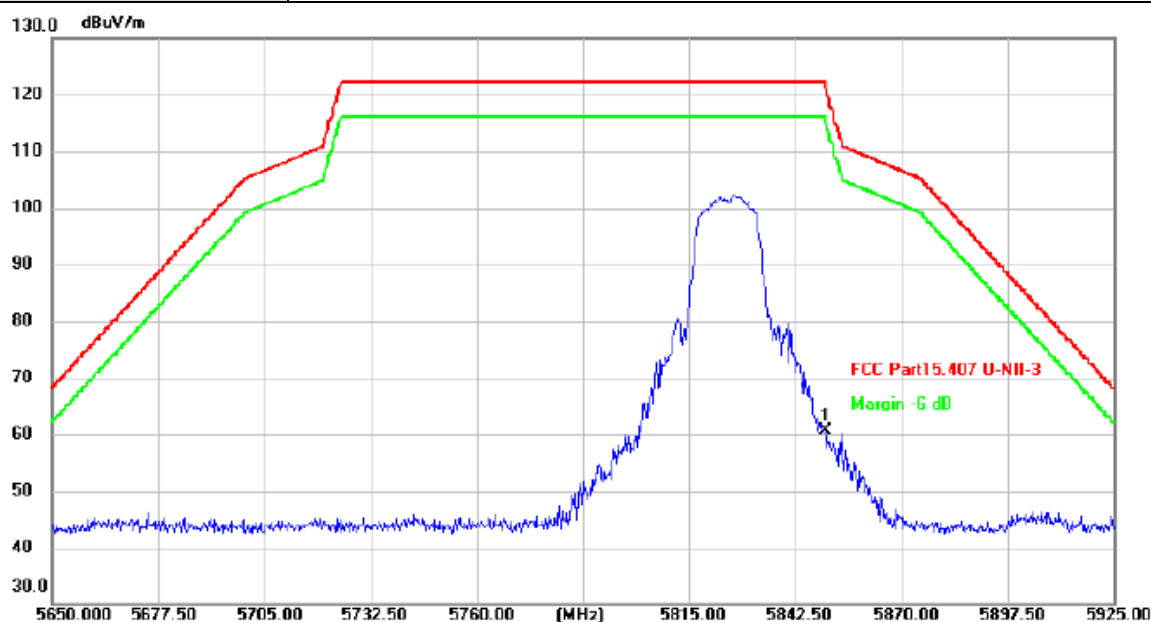








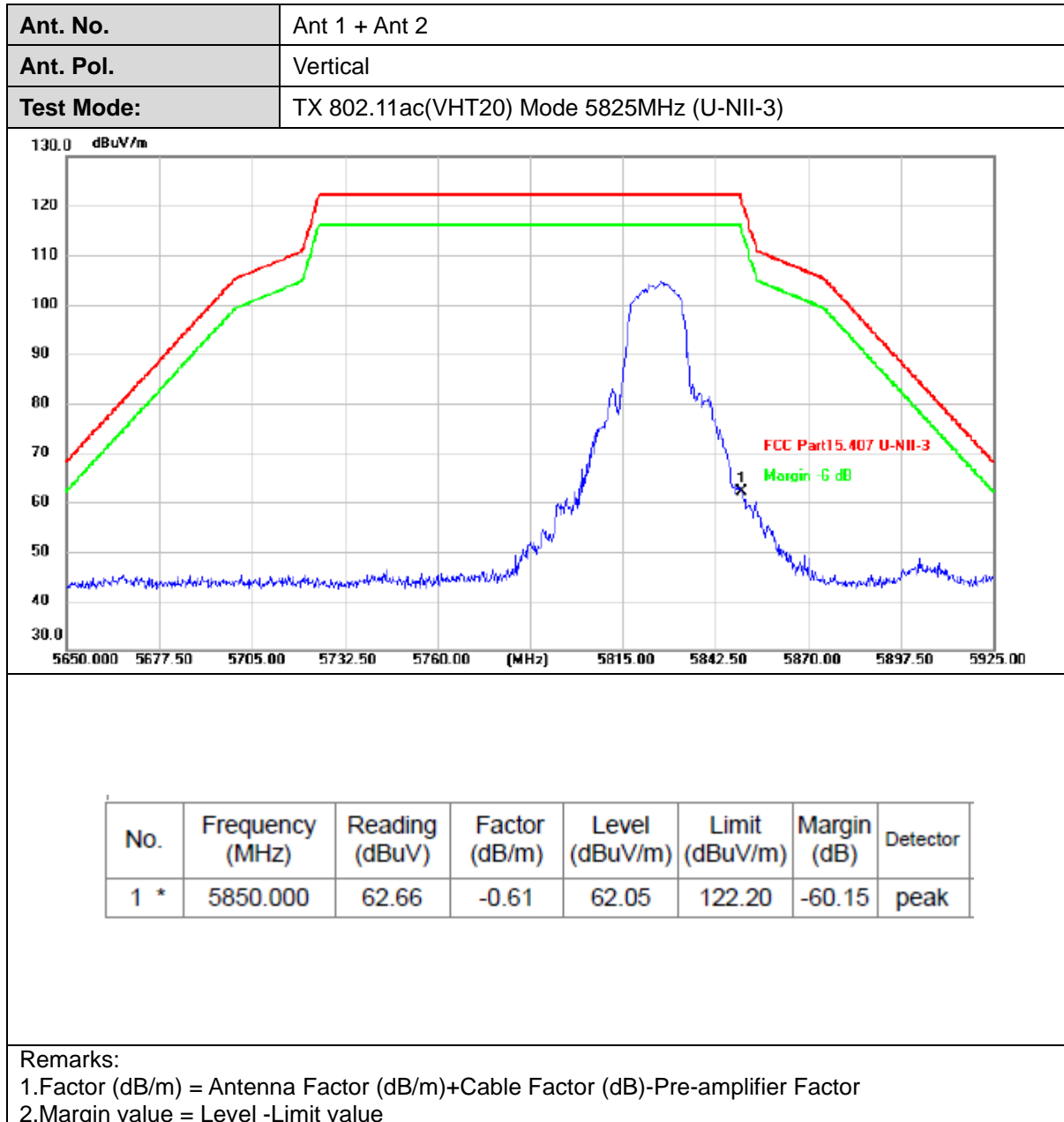
Ant. No.	Ant 1 + Ant 2
Ant. Pol.	Horizontal
Test Mode:	TX 802.11ac(VHT20) Mode 5825MHz (U-NII-3)



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	5850.000	61.29	-0.61	60.68	122.20	-61.52	peak

Remarks:

- Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Level -Limit value





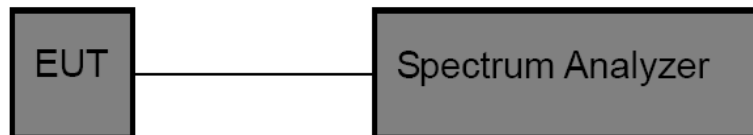
3.4. Bandwidth

Limit

FCC CFR Title 47 Part 15 Subpart E Section 15.407(a) & (e)

Test Item	Limit	Frequency Range (MHz)
26dB Bandwidth& 99% Bandwidth	N/A	5150~5250
		5250~5350
		5500~5700
6 dB Bandwidth	≥500 kHz	5725~5850

Test Configuration



Test Procedure

Please refer to KDB789033 D02 for the measurement methods.

The setting of the spectrum analyzer as below:

26dB Bandwidth Test	
Spectrum Parameters	Setting
Attenuation	Auto
Span	>26 dB Bandwidth
RBW	Approximately 1% of the emission bandwidth
VBW	>RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto



6dB Bandwidth Test	
Spectrum Parameters	Setting
Attenuation	Auto
Span	>6 dB Bandwidth
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto
99% Occupied Bandwidth Test	
Spectrum Parameters	Setting
Attenuation	Auto
RBW	1% to 5% of the OBW
VBW	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold

NOTE: The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.

Test Mode

Please refer to the clause 2.4.

**Test Result****26dB Bandwidth**

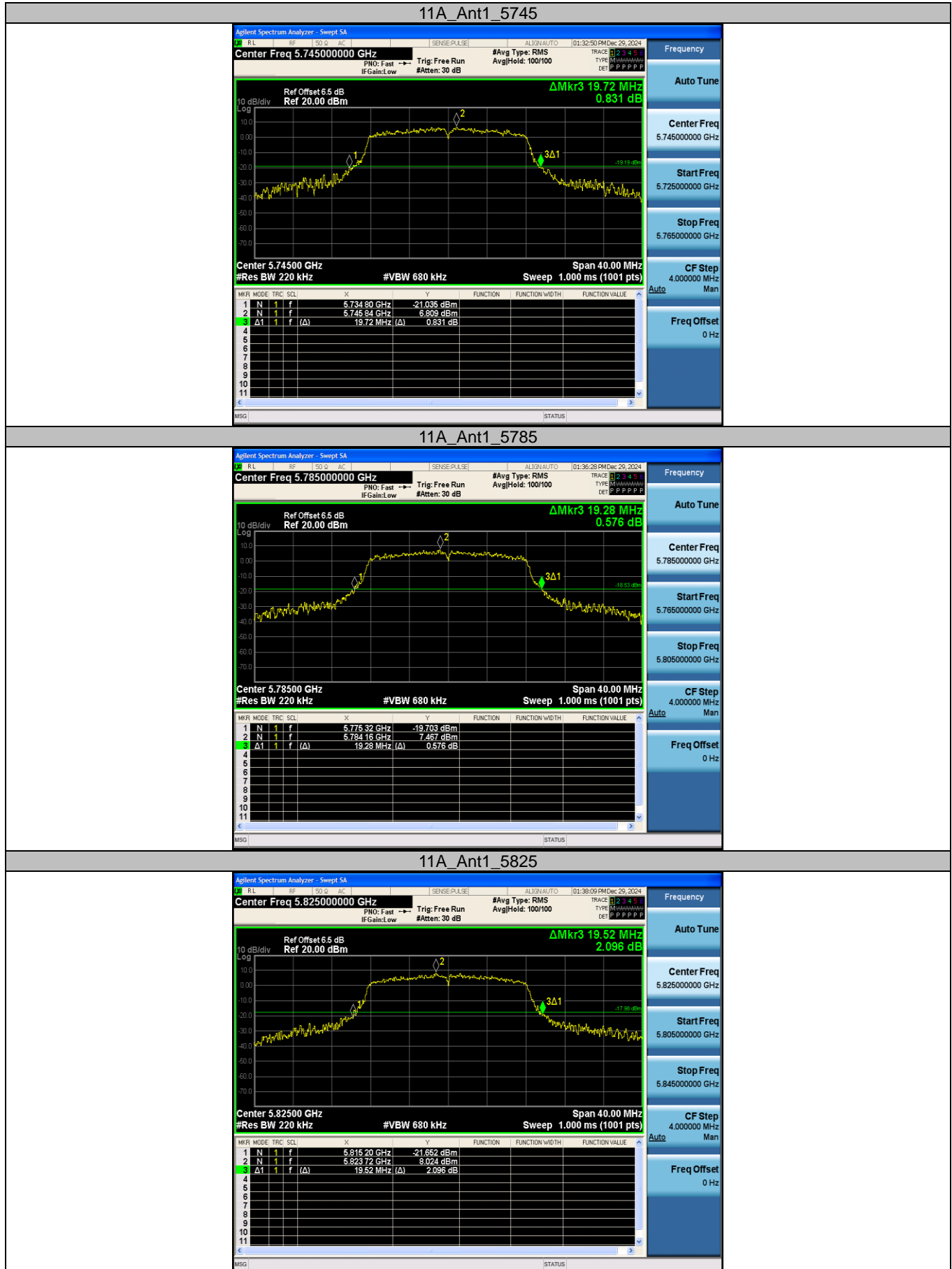
TestMode	Antenna	Freq(MHz)	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	19.720	5734.800	5754.520	---	---
		5785	19.280	5775.320	5794.600	---	---
		5825	19.520	5815.200	5834.720	---	---
11N20SISO	Ant1	5745	20.360	5734.680	5755.040	---	---
		5785	19.920	5775.000	5794.920	---	---
		5825	20.120	5814.920	5835.040	---	---
11AC20SISO	Ant1	5745	19.480	5735.360	5754.840	---	---
		5785	19.800	5774.840	5794.640	---	---
		5825	19.520	5815.040	5834.560	---	---

6dB Bandwidth

TestMode	Antenna	Freq(MHz)	6db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	14.440	5738.080	5752.520	0.5	PASS
		5785	15.120	5777.400	5792.520	0.5	PASS
		5825	11.320	5819.960	5831.280	0.5	PASS
11N20SISO	Ant1	5745	15.440	5737.400	5752.840	0.5	PASS
		5785	15.120	5777.400	5792.520	0.5	PASS
		5825	11.880	5820.560	5832.440	0.5	PASS
11AC20SISO	Ant1	5745	14.040	5737.440	5751.480	0.5	PASS
		5785	15.440	5777.080	5792.520	0.5	PASS
		5825	14.840	5817.640	5832.480	0.5	PASS

99% Occupied Bandwidth

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	16.590	5736.6907	5753.2807	---	---
		5785	16.621	5776.6832	5793.3042	---	---
		5825	16.712	5816.6180	5833.3300	---	---
11N20SISO	Ant1	5745	17.696	5736.1269	5753.8229	---	---
		5785	17.649	5776.1363	5793.7853	---	---
		5825	17.667	5816.1234	5833.7904	---	---
11AC20SISO	Ant1	5745	16.627	5736.6574	5753.2844	---	---
		5785	16.757	5776.5742	5793.3312	---	---
		5825	16.656	5816.6065	5833.2625	---	---

**26dB Bandwidth:**

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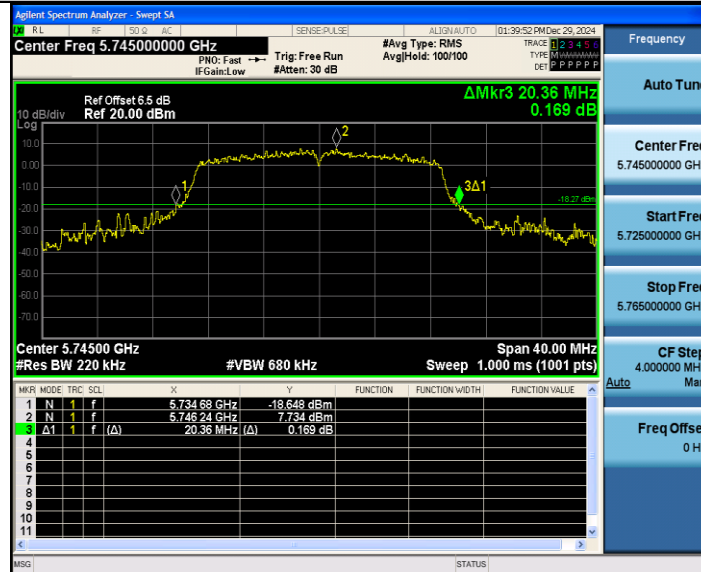
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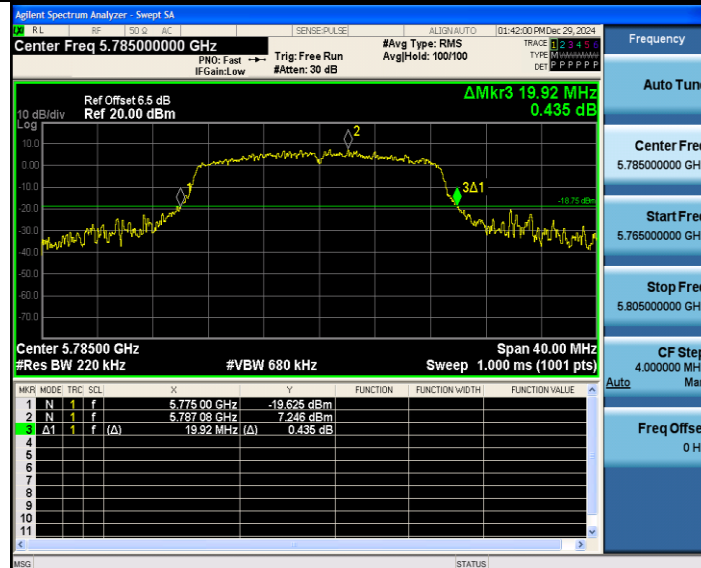
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11N20SISO_Ant1_5745



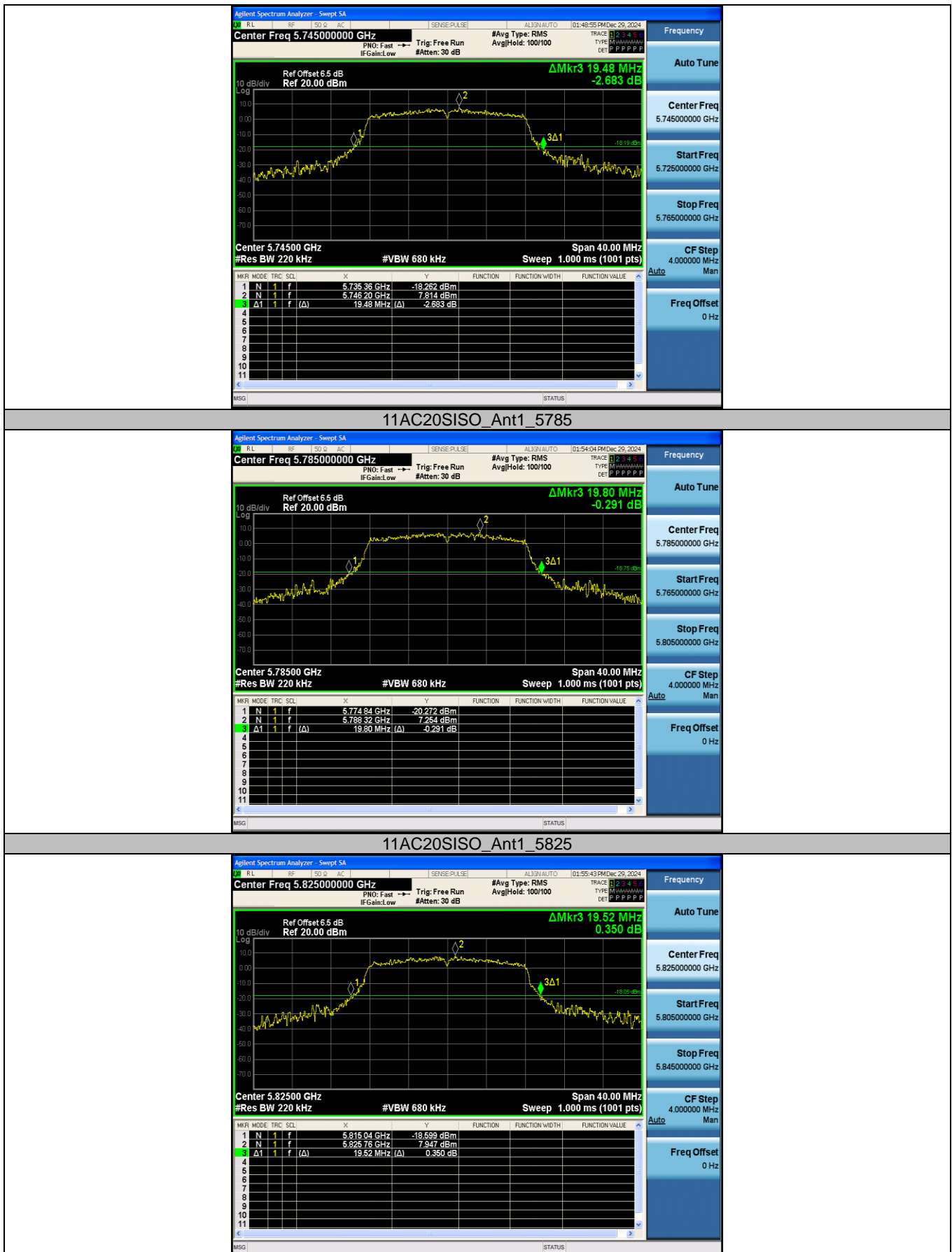
11N20SISO_Ant1_5785



11N20SISO_Ant1_5825



11AC20SISO_Ant1_5745

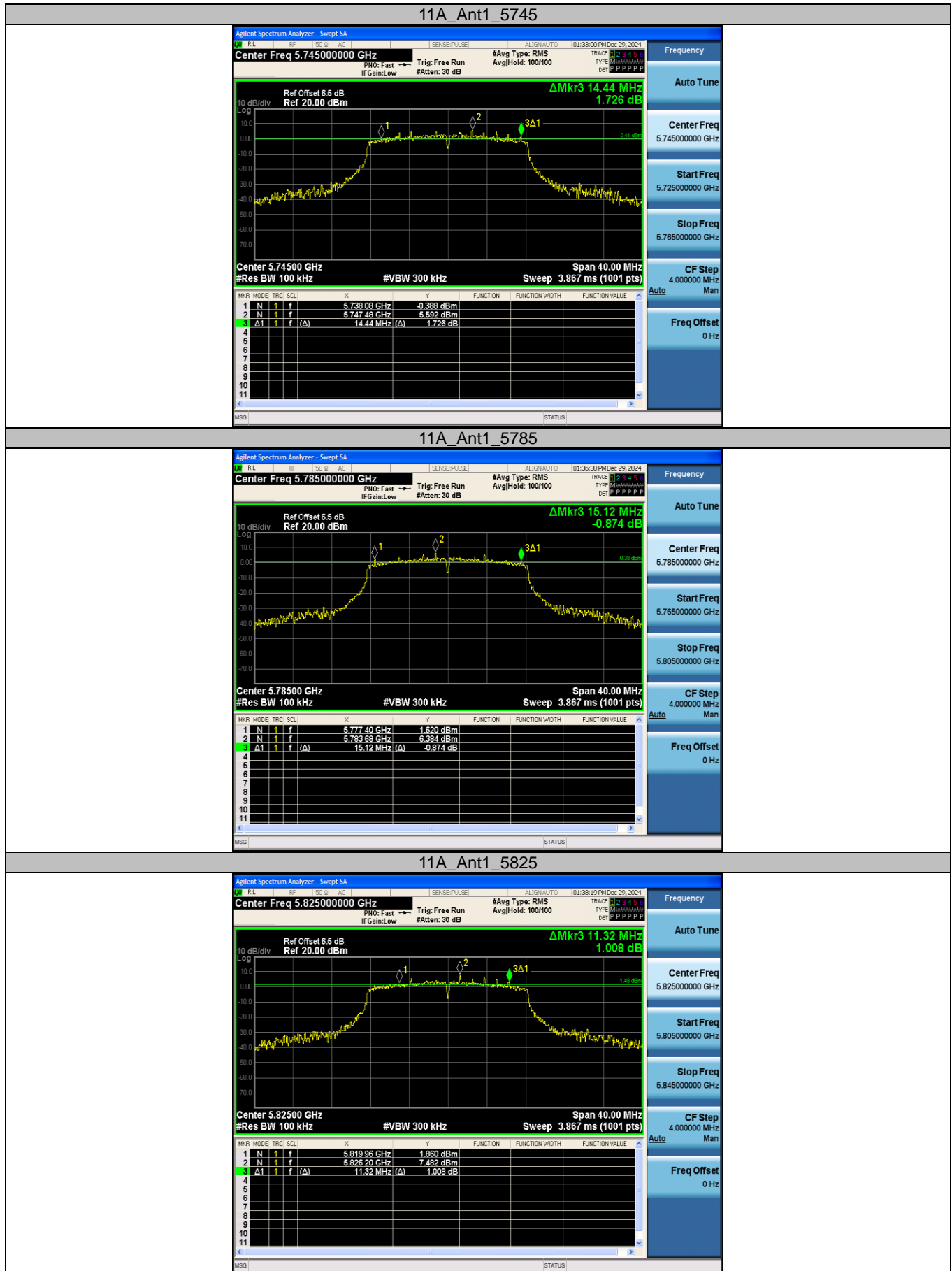


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**6dB Bandwidth:**

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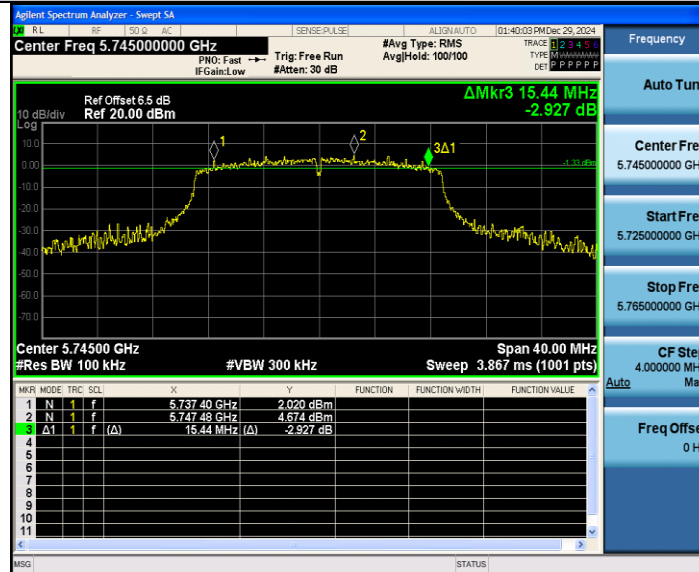
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TRF No: CTC-TR-063_A1

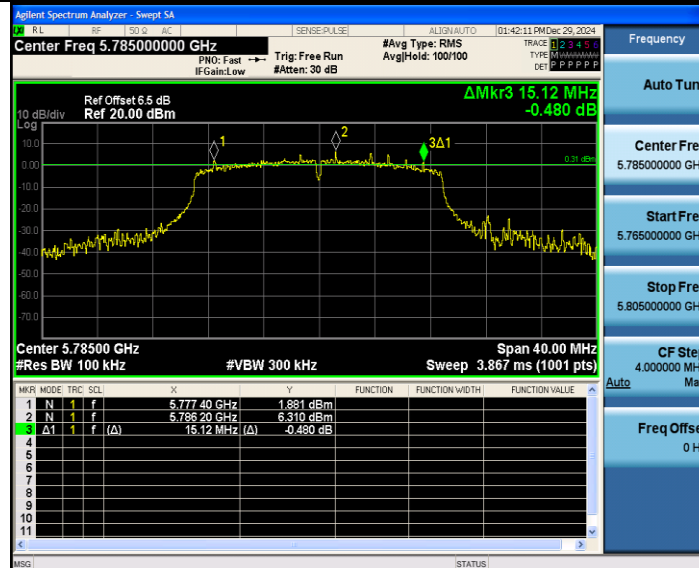
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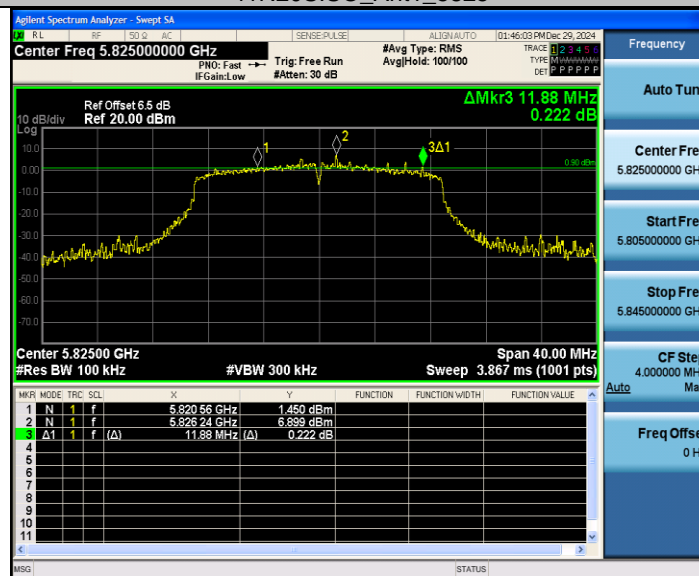
11N20SISO_Ant1_5745



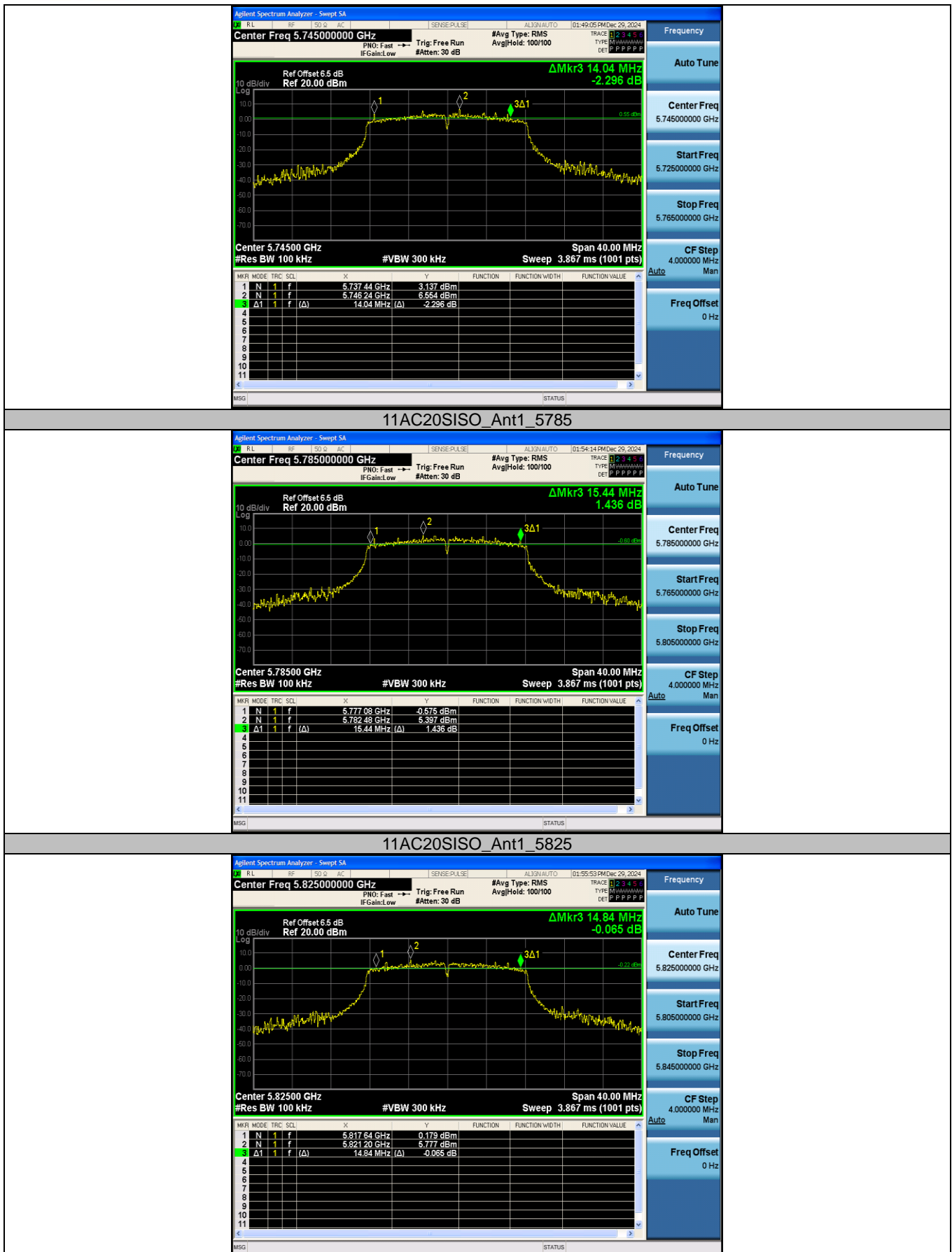
11N20SISO_Ant1_5785



11N20SISO_Ant1_5825



11AC20SISO_Ant1_5745

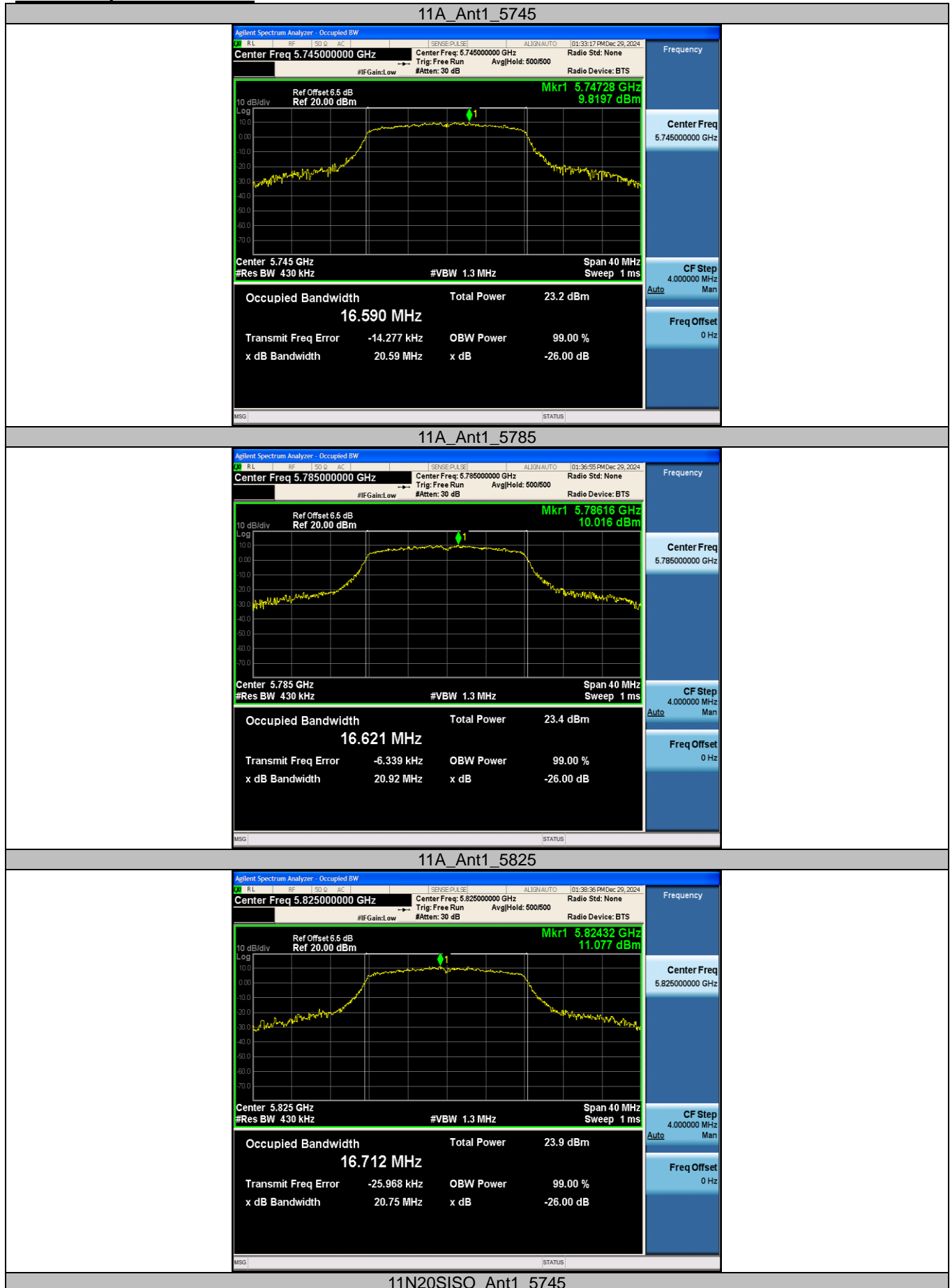


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**99% Occupied Bandwidth**

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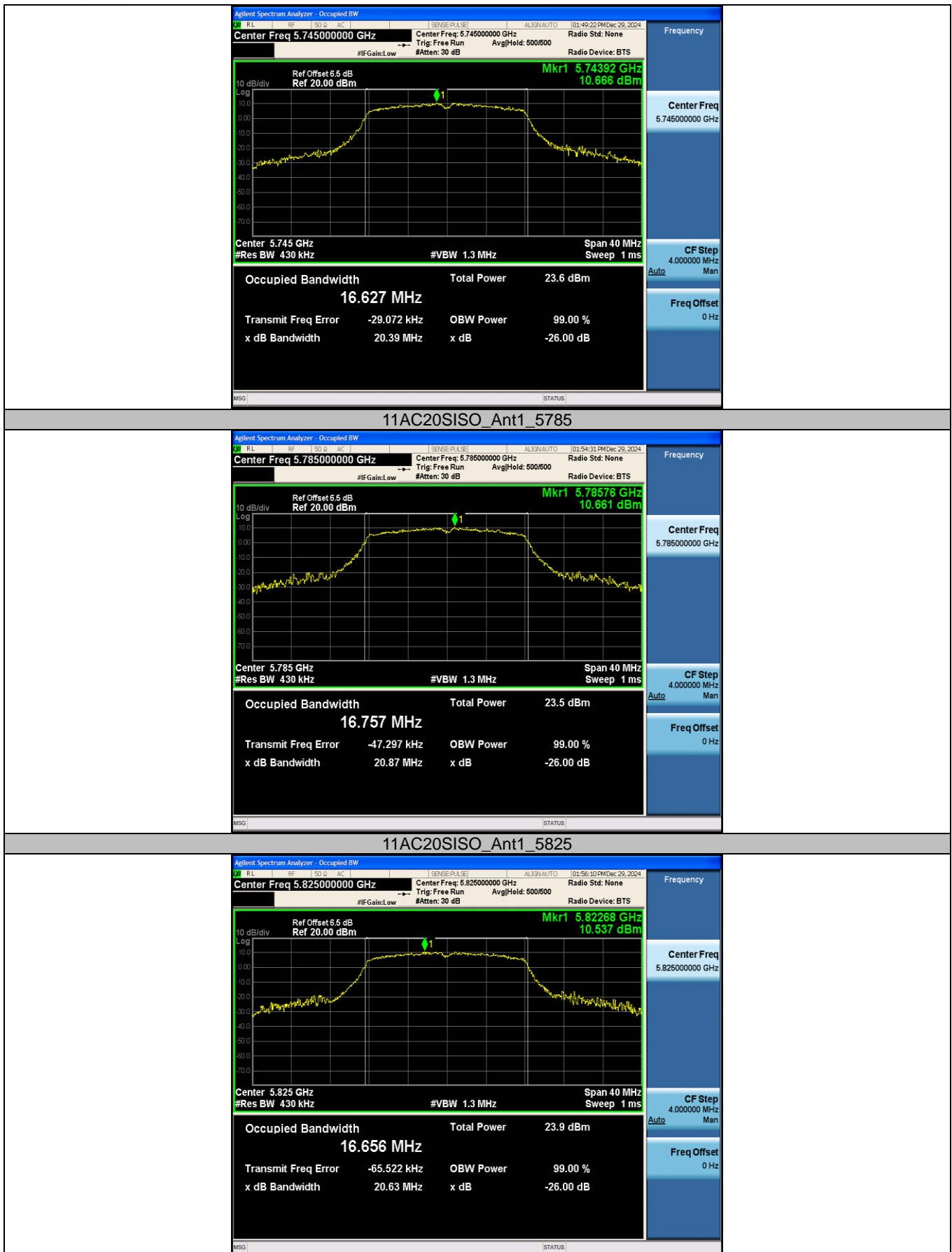


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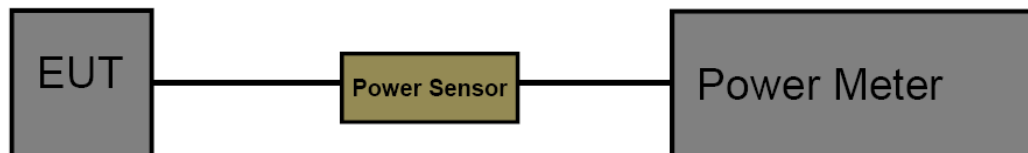
3.5. Peak Output Power

Limit

FCC CFR Title 47 Part 15 Subpart E Section 15.407(a)

Test Item	Limit	Frequency Range (MHz)
Conducted Output Power	Fixed: 1 Watt (30dBm) Mobile and Portable: 250mW (24dBm)	5150~5250
	250mW (24dBm)	5250~5350
	250mW (24dBm)	5500~5700
	1 Watt (30dBm)	5725~5850

Test Configuration



Test Procedure

The measurement is according to section 3 of KDB 789033 D02 General UNII Test Procedures New Rules V02r01.

Test Mode

Please refer to the clause 2.4.

**Test Result**

Test Mode	Antenna	Freq(MHz)	Channel Power [dBm]	Duty Cycle [%]	DC Factor [dBm]	Result [dBm]	Limit [dBm]	Verdict
11A	Ant1	5745	16.04	91.96	0.36	16.40	≤30.00	PASS
		5785	16.27	90.00	0.46	16.73	≤30.00	PASS
		5825	16.71	91.96	0.36	17.07	≤30.00	PASS
11N20SISO	Ant1	5745	16.60	85.71	0.67	17.27	≤30.00	PASS
		5785	16.12	90.09	0.45	16.57	≤30.00	PASS
		5825	16.13	88.84	0.51	16.64	≤30.00	PASS
11AC20SISO	Ant1	5745	16.21	81.50	0.89	17.10	≤30.00	PASS
		5785	16.10	82.07	0.86	16.96	≤30.00	PASS
		5825	16.30	84.43	0.74	17.04	≤30.00	PASS

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3.6. Power Spectral Density

Limit

FCC CFR Title 47 Part 15 Subpart E Section 15.407(a)

For the 5.15~5.25GHz band:

- Outdoor AP
The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
If $G_{Tx} > 6\text{dBi}$, then $\text{PSD} = 17 - (G_{Tx} - 6)$.
- Indoor AP
The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
If $G_{Tx} > 6\text{dBi}$, then $\text{PSD} = 17 - (G_{Tx} - 6)$.
- Point-to-point AP
The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz.
If $G_{Tx} > 23\text{dBi}$, then $\text{PSD} = 17 - (G_{Tx} - 23)$.
- Client devices
The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
If $G_{Tx} > 6\text{dBi}$, then $\text{PSD} = 11 - (G_{Tx} - 6)$.

For the 5.25~5.35GHz band:

The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
If $G_{Tx} > 6\text{dBi}$, then $\text{PSD} = 11 - (G_{Tx} - 6)$.

For the 5.47~5.725GHz band:

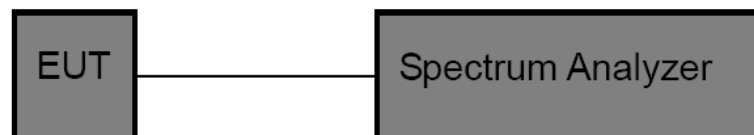
The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz.
If $G_{Tx} > 6\text{dBi}$, then $\text{PSD} = 11 - (G_{Tx} - 6)$.

For the 5.725~5.85GHz band:

- Point-to-multipoint systems (P2M)
The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz.
If $G_{Tx} > 6\text{dBi}$, then $\text{PSD} = 30 - (G_{Tx} - 6)$.
- Point-to-point systems (P2P)
The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz.

Note: G_{Tx} : EUT Antenna gain.

Test Configuration



Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement is according to KDB 789033 D02 General UNII Test Procedures New Rules V02r01.

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Set analyzer center frequency to transmitting frequency.
- (3) Set the span to encompass the entire emissions bandwidth (EBW) (alternatively, the entire 99% OBW) of the signal.

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- (4) RBW=1MHz for devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz
RBW=500kHz for devices operating in the band 5.725-5.85 GHz.
- (5) Set the VBW to: ≥ 3 RBW
- (6) Detector: AVG
- (7) Trace: Max Hold and View
- (7) Sweep time: auto
- (8) Trace average at least 100 traces in power averaging.
- (9) User the peak marker function to determine the maximum amplitude level within the RBW. Apply correction to the result if different RBW is used.

NOTE: The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.

Test Mode

Please refer to the clause 2.4.

**Test Result**

Note : 1.The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.

2.The Duty Cycle Factor and RBW Factor is compensated in the graph.

TestMode	Antenna	Freq(MHz)	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5745	3.58	≤30.00	PASS
		5785	4.06	≤30.00	PASS
		5825	4.55	≤30.00	PASS
11N20SISO	Ant1	5745	4.52	≤30.00	PASS
		5785	3.26	≤30.00	PASS
		5825	3.62	≤30.00	PASS
11AC20SISO	Ant1	5745	5.04	≤30.00	PASS
		5785	4.15	≤30.00	PASS
		5825	4.54	≤30.00	PASS



Test plot as follows:



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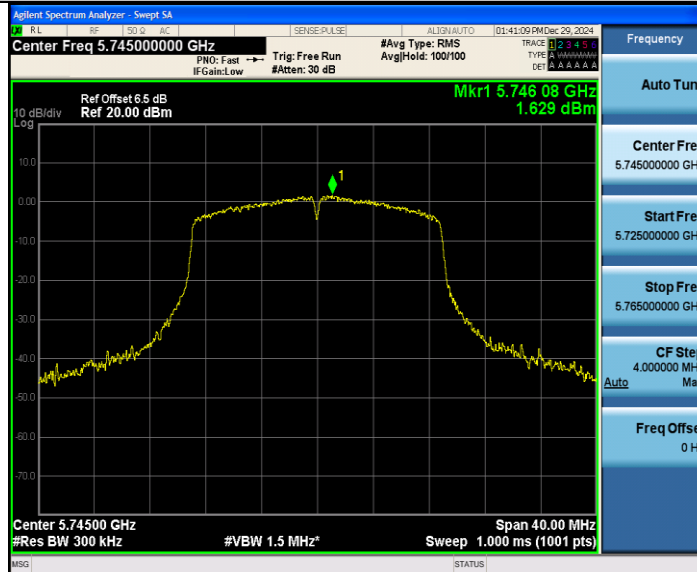
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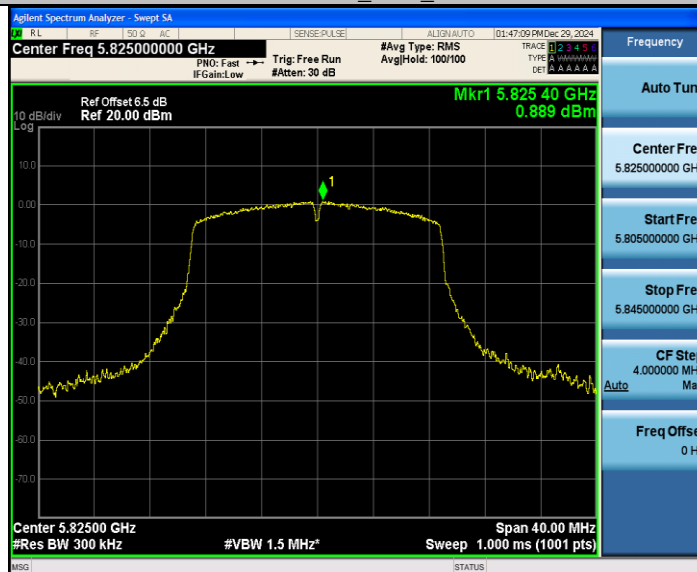
11N20SISO_Ant1_5745



11N20SISO_Ant1_5785



11N20SISO_Ant1_5825



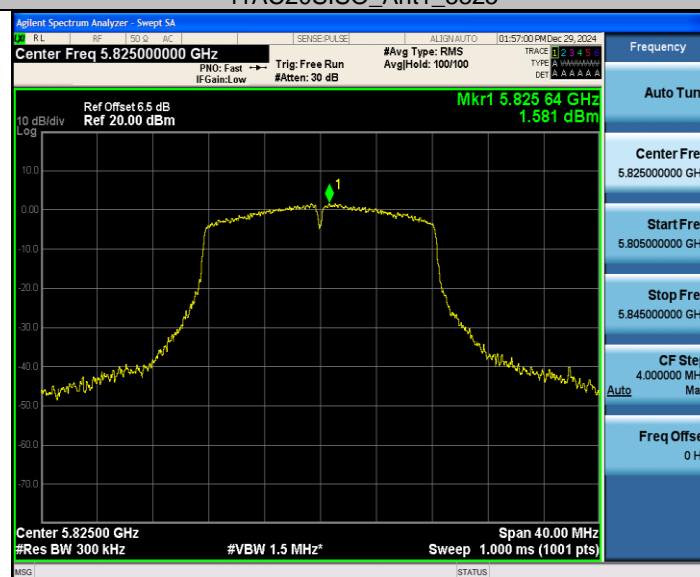
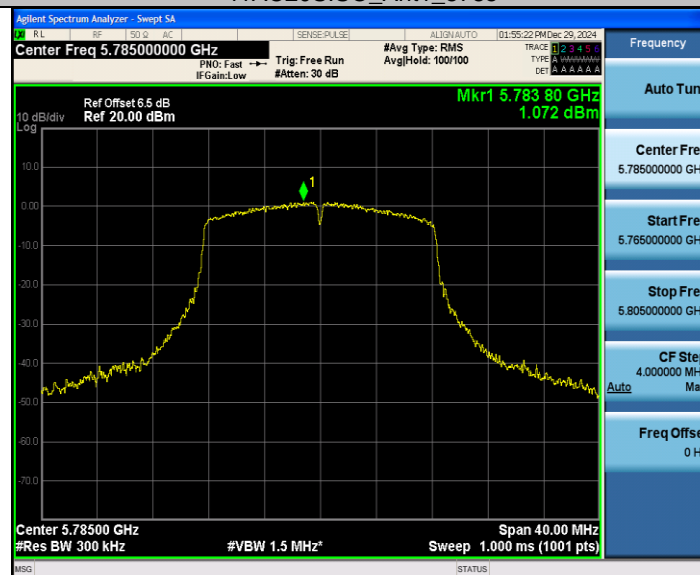
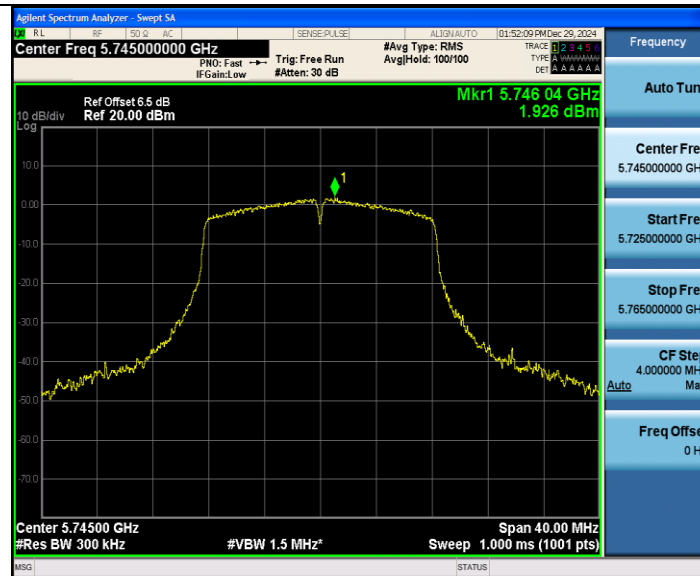
11AC20SISO_Ant1_5745

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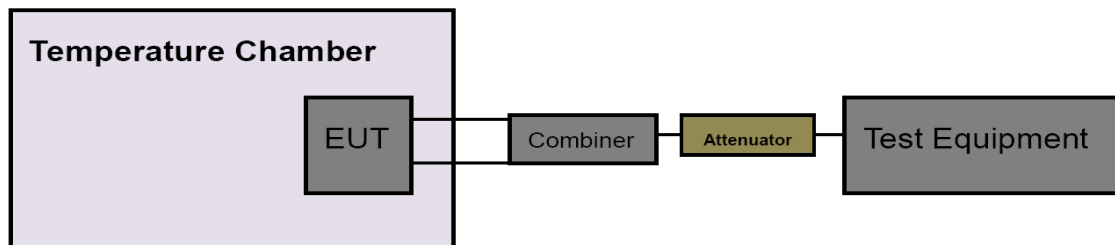
3.7. Frequency Stability

Limit

FCC CFR Title 47 Part 15 Subpart E Section 15.407(g)

Test Item	Limit	Frequency Range (MHz)
Frequency Stability	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)	5150~5250
		5250~5350
		5500~5700
		5725~5850

Test Configuration



Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above.

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Set analyzer center frequency to transmitting frequency.
- (3) Set the span to encompass the entire emissions bandwidth (EBW) of the signal.
- (4) Set the RBW to: 8MHz, VBW=8MHz with peak detector and max hold settings.
- (5) The test extreme voltage is to change the primary supply voltage from 11.4V to 12.6V percent of the nominal value.
- (6) Extreme temperature is -20°C~45°C

NOTE: The EUT was set to continuously transmitting in continuously un-modulation transmitting mode.

Test Mode

Please refer to the clause 2.4.

**Test Result**

Voltage								
TestMode	Antenna	Freq(MHz)	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
11A	Ant1	5745	NV	NT	-47500.00	-8.268059	20	PASS
			LV	NT	-47500.00	-8.268059	20	PASS
			HV	NT	-47500.00	-8.268059	20	PASS
		5785	NV	NT	-47000.00	-8.124460	20	PASS
			LV	NT	-47000.00	-8.124460	20	PASS
			HV	NT	-47000.00	-8.124460	20	PASS
		5825	NV	NT	-47500.00	-8.154506	20	PASS
			LV	NT	-47500.00	-8.154506	20	PASS
			HV	NT	-47500.00	-8.154506	20	PASS
11N20SISO	Ant1	5745	NV	NT	-46500.00	-8.093995	20	PASS
			LV	NT	-47000.00	-8.181027	20	PASS
			HV	NT	-46500.00	-8.093995	20	PASS
		5785	NV	NT	-46500.00	-8.038029	20	PASS
			LV	NT	-46500.00	-8.038029	20	PASS
			HV	NT	-46500.00	-8.038029	20	PASS
		5825	NV	NT	-47000.00	-8.068670	20	PASS
			LV	NT	-47000.00	-8.068670	20	PASS
			HV	NT	-47000.00	-8.068670	20	PASS
11AC20SISO	Ant1	5745	NV	NT	-46500.00	-8.093995	20	PASS
			LV	NT	-46500.00	-8.093995	20	PASS
			HV	NT	-46500.00	-8.093995	20	PASS
		5785	NV	NT	-46500.00	-8.038029	20	PASS
			LV	NT	-46500.00	-8.038029	20	PASS
			HV	NT	-46500.00	-8.038029	20	PASS
		5825	NV	NT	-47000.00	-8.068670	20	PASS
			LV	NT	-47000.00	-8.068670	20	PASS
			HV	NT	-47000.00	-8.068670	20	PASS

Temperature								
TestMode	Antenna	Freq(MHz)	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
			NV	-20	-47000.00	-8.181027	20	PASS
			NV	-10	-47500.00	-8.268059	20	PASS
			NV	0	-47000.00	-8.181027	20	PASS
			NV	10	-47000.00	-8.181027	20	PASS
			NV	20	-47000.00	-8.181027	20	PASS
			NV	30	-47000.00	-8.181027	20	PASS
			NV	40	-47000.00	-8.181027	20	PASS
		5785	NV	50	-47000.00	-8.181027	20	PASS
			NV	-20	-47000.00	-8.124460	20	PASS
			NV	-10	-47000.00	-8.124460	20	PASS
			NV	0	-47000.00	-8.124460	20	PASS
			NV	10	-47000.00	-8.124460	20	PASS
			NV	20	-47000.00	-8.124460	20	PASS
			NV	30	-47000.00	-8.124460	20	PASS
			NV	40	-47000.00	-8.124460	20	PASS
			NV	50	-47000.00	-8.124460	20	PASS
		5825	NV	-20	-47500.00	-8.154506	20	PASS
			NV	-10	-47500.00	-8.154506	20	PASS
			NV	0	-47500.00	-8.154506	20	PASS
			NV	10	-47500.00	-8.154506	20	PASS
			NV	20	-47500.00	-8.154506	20	PASS
			NV	30	-47500.00	-8.154506	20	PASS
			NV	40	-47500.00	-8.154506	20	PASS
			NV	50	-47500.00	-8.154506	20	PASS
11N20SISO	Ant1	5745	NV	-20	-46500.00	-8.093995	20	PASS
			NV	-10	-46500.00	-8.093995	20	PASS
			NV	0	-46500.00	-8.093995	20	PASS
			NV	10	-46500.00	-8.093995	20	PASS

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			NV	20	-46500.00	-8.093995	20	PASS
			NV	30	-46500.00	-8.093995	20	PASS
			NV	40	-46500.00	-8.093995	20	PASS
			NV	50	-46500.00	-8.093995	20	PASS
		5785	NV	-20	-46500.00	-8.038029	20	PASS
			NV	-10	-46500.00	-8.038029	20	PASS
			NV	0	-47000.00	-8.124460	20	PASS
			NV	10	-46500.00	-8.038029	20	PASS
			NV	20	-46500.00	-8.038029	20	PASS
			NV	30	-46500.00	-8.038029	20	PASS
			NV	40	-46500.00	-8.038029	20	PASS
			NV	50	-46500.00	-8.038029	20	PASS
		5825	NV	-20	-47000.00	-8.068670	20	PASS
			NV	-10	-47000.00	-8.068670	20	PASS
			NV	0	-47000.00	-8.068670	20	PASS
			NV	10	-47000.00	-8.068670	20	PASS
			NV	20	-47000.00	-8.068670	20	PASS
			NV	30	-47000.00	-8.068670	20	PASS
			NV	40	-47000.00	-8.068670	20	PASS
			NV	50	-47000.00	-8.068670	20	PASS
11AC20SIS O	Ant1	5745	NV	-20	-46500.00	-8.093995	20	PASS
			NV	-10	-46500.00	-8.093995	20	PASS
			NV	0	-46500.00	-8.093995	20	PASS
			NV	10	-46500.00	-8.093995	20	PASS
			NV	20	-46000.00	-8.006963	20	PASS
			NV	30	-46500.00	-8.093995	20	PASS
			NV	40	-46500.00	-8.093995	20	PASS
			NV	50	-46500.00	-8.093995	20	PASS
		5785	NV	-20	-46500.00	-8.038029	20	PASS
			NV	-10	-46500.00	-8.038029	20	PASS
			NV	0	-46500.00	-8.038029	20	PASS
			NV	10	-46500.00	-8.038029	20	PASS
			NV	20	-46500.00	-8.038029	20	PASS
			NV	30	-46500.00	-8.038029	20	PASS
			NV	40	-46500.00	-8.038029	20	PASS
		5825	NV	-20	-47000.00	-8.068670	20	PASS
			NV	-10	-47000.00	-8.068670	20	PASS
			NV	0	-47000.00	-8.068670	20	PASS
			NV	10	-47000.00	-8.068670	20	PASS
			NV	20	-47000.00	-8.068670	20	PASS
			NV	30	-47000.00	-8.068670	20	PASS
			NV	40	-47000.00	-8.068670	20	PASS
			NV	50	-47000.00	-8.068670	20	PASS



3.8. Antenna Requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 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. The use of a permanently attached antenna or of 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.

Test Result

The directional gain of the antenna is less than 6dBi, Please refer to the EUT internal photographs antenna photo.



3.9. Dynamic Frequency Selection

Requirement

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required

Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.

**Limit****1. DFS Detection Thresholds**

Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP \geq 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm

Note 1: This is the level at the input of the receiver assuming a 0dBi receive antenna.
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.
Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

2. DFS Response Requirements

Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.
Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.
Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.



Table 5 Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	$\text{Roundup} \left\{ \left(\frac{1}{360} \right) \cdot \left(\frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

For example if in Short Pulse Radar Type 1 Test B a PRI of 3066 μsec is selected, the number of pulses

$$\left\{ \left(\frac{1}{360} \right) \cdot \left(\frac{19 \cdot 10^6}{3066} \right) \right\}$$

would be Round up $\left\{ \left(\frac{1}{360} \right) \cdot \left(\frac{19 \cdot 10^6}{3066} \right) \right\} = \text{Round up } \{17.2\} = 18$.

Table 5a - Pulse Repetition Intervals Values for Test A

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658

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Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

Table 6 – Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type waveforms, then each additional waveform must also be unique and not repeated from the previous waveforms.

Table 7 – Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each wave form. The hopping sequence is different for each wave form and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250–5724MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

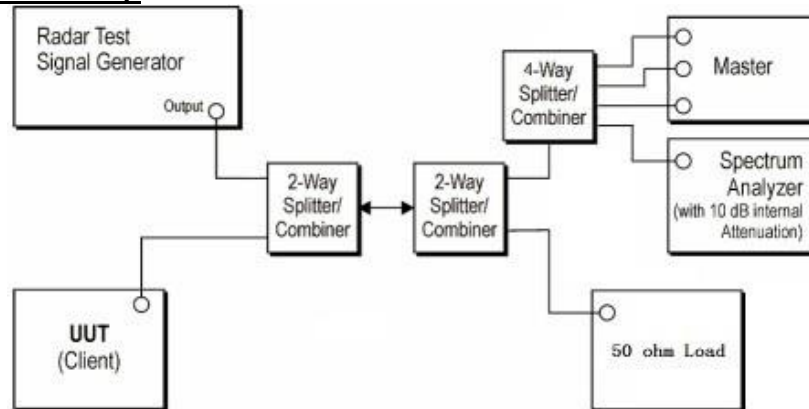


Calibration of Radar Waveform

Radar Waveform Calibration Procedure

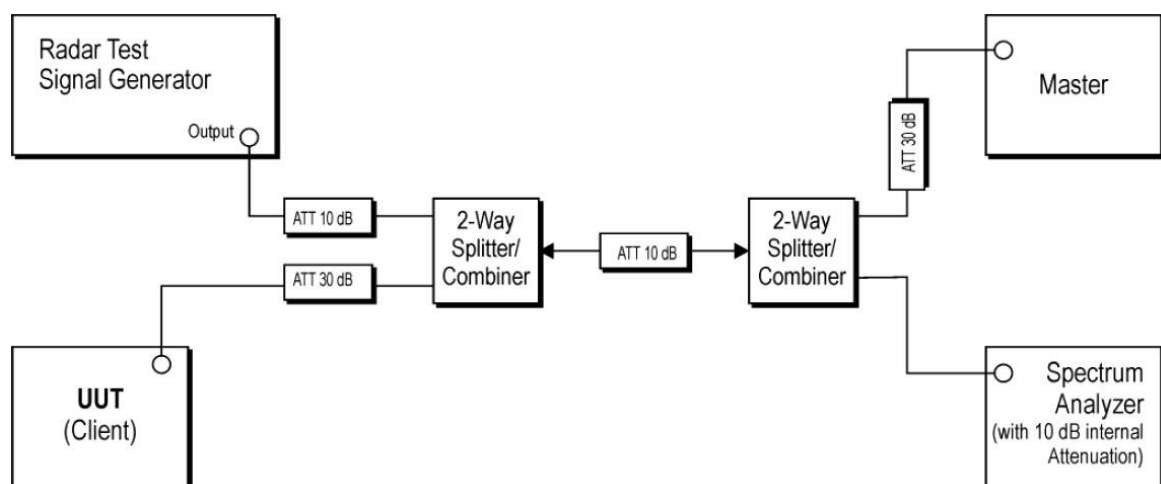
- 1) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master
- 2) The interference Radar Detection Threshold Level is $-62\text{dBm} + 0\text{dBi} + 1\text{dB} = -61\text{dBm}$ that had been taken into account the output power range and antenna gain.
- 3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB .
- 4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was $-62\text{dBm} + 0\text{dBi} + 1\text{dB} = -61\text{dBm}$. Capture the spectrum analyzer plots on short pulse radar waveform.

Conducted Calibration Setup



Test Configuration

Setup for Client with injection at the Master





Test Procedure

1. The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.
2. The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device
3. A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.
4. EUT will associate with the master at channel. The file "iperf.exe" specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Media Player Classic Ver. 6.4.8.6 in order to properly load the network for the entire period of the test.
5. When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.
6. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type
7. Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: $Dwell (0.3ms) = S (12000ms) / B (4000)$; where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: $C (ms) = N \times Dwell (0.3ms)$; where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.
8. Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

Test Mode

Please refer to the clause 2.4.

Test Result

☐ Passed ☒ Not Applicable

The product in this report belongs to Client Without Radar Detection.

*****THE END OF REPORT*****

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