TEST REPORT

Reference No.	:	WTX24X07170578W001
FCC ID	:	2ACGT-MSMB
Applicant	:	GUANGZHOU SHANGKE INFORMATION TECHNOLOGY CO., LTD
Address	:	Room 1205-1212, R&F To-Win Building, No.30 Huaxia Road, Tianhe District, Guangzhou, Guangdong Province,China
Manufacturer	:	The same as Applicant
Address	:	The same as Applicant
Product Name	:	PC Motherboard
Model No.	:	MS-Challenger B760ITX D5 WIFI
Standards	:	FCC Part 15.407
Date of Receipt sample	:	2024-07-19
Date of Test	:	2024-07-19 to 2024-08-30
Date of Issue	:	2024-08-30
Test Report Form No.	:	WTX_Part 15_407W
Test Result	:	**Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

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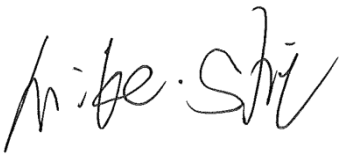
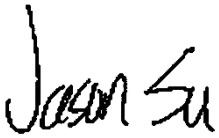
Tested by:



Mike Shi

Approved by:



Jason Su

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Report version

Version No.	Date of issue	Description
Rev.00	2024-08-30	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

General Description of EUT	
Product Name:	PC Motherboard
Trade Name:	/
Model No.:	MS-Challenger B760ITX D5 WIFI
Adding Model(s):	MS-iCraft Z890 VERTEX, MS-iCraft Z890 ARCTIC, MS-iCraft Z890 PACIFIC, MS-Terminator Z890-A WIFI, MS-Terminator Z890M GKD5 WIFI, MS-Terminator Z890M GKD5 ICE, MS-iCraft Z890ITX WIFI, MS-ESPORT Z890M WIFI, MS-Challenger Z890M WIFI, MS-iCraft B860M CROSS, MS-Terminator B860M WIFI, MS-Terminator B860M WIFI6E, MS-Terminator B860M GKD5 WIFI, MS-Terminator B860M GKD5 ICE, MS-ESPORT B860M Sniper WIFI, MS-ESPORT B860M Gank WIFI, MS-ESPORT B860M ACE WIFI, MS-Challenger H810ITX WIFI, MS-Challenger B860BKB WIFI, MS-Terminator B860YTX WIFI, MS-Terminator B860ITX WIFI, MS-ESPORT H810M Gank WIFI, MS-Challenger H810ITX WIFI, MS-Terminator B850M WIFI, MS-Terminator B850ITX WIFI, MS-Challenger B850M WIFI ICE, MS-iCraft Z790 WiFi V2, MS-iCraft Z790ITX WIFI, MS-Terminator Z790-A WIFI6, MS-Terminator Z790M D5 ICE, MS-iCraft B760M CROSS, MS-Terminator B760M D5 WIFI6E, MS-Terminator H770YTX D5 WIFI, MS-Terminator B760M GKD5 ICE, MS-Terminator B760M D5 WIFI, MS-Terminator B760M D4 ICE, MS-Terminator B760M D4 WIFI6E, MS-Terminator B760M D4 WIFI, MS-Terminator B760ITX D4 WIFI V2, MS-Challenger B760M D5 WIFI, MS-B760M GAMING WIFI ACE, MS-B760M GAMING WIFI GANK, MS-Challenger H610ITX 2LAN, MS-H610M 666 WiFi6 D5, MS-H610M 666 WiFi6 ARGB, MS-H610M 666 WiFi6, MS-eSport B650M WIFI6 ICE, MS-eSport B650ITX WIFI ICE, MS-Terminator B650M WIFI6, MS-Challenger B650M WIFI ICE, MS-Challenger B650M WIFI, MS-Challenger A520M-K WIFI, MS-MoDT 12450H ITX WIFI F, MS-MoDT 12650H ITX WIFI F, MS-MoDT 13420H ITX WIFI F, MS-MoDT 13620H ITX WIFI F, ADV-MoDT 12450H ITX WIFI F, ADV-MoDT 12500H ITX WIFI F, ADV-MoDT 12600H ITX WIFI F, ADV-MoDT 12650H ITX WIFI F, ADV-MODT 12700H ITX WIFI F, ADV-MoDT 12800H ITX WIFI F, ADV-MoDT 12900H ITX WIFI F, ADV-MoDT 12900HK ITX WIFI F, ADV-MoDT 13420H ITX WIFI F, ADV-MoDT 13500H ITX WIFI F, ADV-MoDT 13600H ITX WIFI F, ADV-MoDT 13620H ITX WIFI F, ADV-MoDT 13700H ITX WIFI F, ADV-MoDT 13800H ITX WIFI F,

	ADV-MoDT 13900H ITX WIFI F, ADV-MoDT 13900HK ITX WIFI F, ADV-MoDT 13420H ITX D5 F, ADV-MoDT 13500H ITX D5 F, ADV-MoDT 13600H ITX D5 F, ADV-MoDT 13620H ITX D5 F, ADV-MoDT 13700H ITX D5 F, ADV-MoDT 13800H ITX D5 F, ADV-MoDT 13900H ITX D5 F, ADV-MoDT 13900HK ITX D5 F, MS-MoDT ADL-P ITX WIFI F, ADV-MoDT ADL-P ITX WIFI F, ADV-MoDT RPL-P ITX D5, ADV-MoDT RPL-HX MATX D4, ADV-MoDT MTL-H ITX LPD5
Rated Voltage:	DC12V
Battery Capacity:	/
Power Adapter:	/
Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model MS-Challenger B760ITX D5 WIFI, but the circuit and the electronic construction do not change, declared by the manufacturer.	

Technical Characteristics of EUT	
Support Standards:	802.11a, 802.11n-HT20, 802.11n-HT40, 802.11ac-VHT20/40/80, 802.11ax-HE20/40/80
Frequency Range:	5180-5240MHz
Max. RF Output Power:	Antenna 0: 16.09dBm (Conducted) Antenna 1: 16.08dBm (Conducted)
Type of Modulation:	QPSK, 16QAM, 64QAM, 256QAM, 1024QAM
Type of Antenna:	External antenna
Antenna Gain:	4.42dBi
Note The Antenna Gain is provided by the customer and can affect the validity of results.	

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.407: General technical requirements.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
KDB789033 D02 v02r01: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-Nii) Devices Part 15, Subparte.
KDB662911 D01 Multiple Transmitter Output v02r01: Emissions Testing of Transmitters with Multiple Outputs in the Same Band.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB789033 D02 v02r01 The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Table for parameters of Test Software setting

Use “DRTU” and follow the instructions given by the manufacturer, you can start to test. During testing, Chan nel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. Test use the customer default power level, and to measure its highest possibl e emissions level, more detailed description as
follows:
Antenna 0 and Antenna 1

Mode	Test Frequency (MHz)												
	NCB: 20MHz												
	5180	5200	5240	5260	5300	5320	5500	5580	5700	5720	5745	5785	5825
802.11a 6Mbps	17.5	17.5	17.5	/	/	/	/	/	/	/	/	/	/
802.11n-HT20 MCS0	16	16	16	/	/	/	/	/	/	/	/	/	/
802.11ac-VHT20 MCS0	16	16	16	/	/	/	/	/	/	/	/	/	/
802.11ax-HE20 MCS0	16	16	16	/	/	/	/	/	/	/	/	/	/

Mode	NCB: 40MHz									
	5190	5230	5270	5310	5510	5550	5670	5710	5755	5795

802.11n-HT40 MCS0	16	16	/	/	/	/	/	/	/	/
802.11ac-VHT40 MCS0	16	16	/	/	/	/	/	/	/	/
802.11ax-HE40 MCS0	16	16	/	/	/	/	/	/	/	/

Mode	NCB: 80MHz					
	5210	5290	5530	5610	5690	5775
802.11ac-VHT80 MCS0/Nss2	15	15	/	/	/	/
802.11ax-HE80 MCS0/Nss2	15	15	/	/	/	/

1.5 EUT Operating during test

EUT was programmed to be in continuously transmitting mode. During the test, EUT operation to normal function and programs under Android were executed.

1.6 Test Facility

Address of the test laboratory

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C. (518101）

FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) Co., Ltd. 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 mai ntained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A and the CAB identifier is CN0057.

1.7 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11a	5180MHz,5200MHz,5240MHz
TM2	802.11n-HT20	5180MHz,5200MHz,5240MHz
TM3	802.11ac-VHT20	5180MHz,5200MHz,5240MHz
TM4	802.11ax-HE20	5180MHz,5200MHz,5240MHz
TM5	802.11n-HT40	5190MHz,5230MHz
TM6	802.11ac-VHT40	5190MHz,5230MHz
TM7	802.11ax-HE40	5190MHz,5230MHz
TM8	802.11ac-VHT80	5210MHz
TM9	802.11ax-HE80	5210MHz
Note1 : All test modes (different data rate and different modulation) are performed, but only the worst case is recorded in this report; 802.11ac-VHT20, 802.11ac-VHT40 covered by 802.11n-HT20 and 802.11n-HT40. Note 2: The 5GHz WIFI has two antennas and support Multiple Outputs for 802.11n/ac/ax mode for this report; Antenna 0 Gain is 4.42dBi; Antenna 1 Gain is 4.42dBi; According to KDB 662911, for same directional gain: Directional gain = G_{ANT} + 10 log(N_{ANT}) dBi =4.42+10log(2) dBi=7.43dBi		

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	45~55 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
AC Cable	1.5	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Computer	/	/	/
Display	ASUS	VG28U	M9LMTF126416

1.8 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Power Spectral Density	Conducted	±1.8dB
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.9 Test Equipment List and Details

Fixed asset Number	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
WTXE1041A1001	Communication Tester	Rohde & Schwarz	CMW500	148650	2024-02-24	2025-02-23
WTXE1005A1005	Spectrum Analyzer	Agilent	N9020A	US47140102	2024-03-19	2025-03-18
WTXE1084A1001	Spectrum Analyzer	Agilent	N9020A	MY54320548	2024-02-24	2025-02-23
WTXE1004A1-001	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2024-02-27	2025-02-26
☐ Chamber A: Below 1GHz						
WTXE1005A1003	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2024-02-24	2025-02-23
WTXE1001A1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2024-03-19	2025-03-18
WTXE1007A1001	Amplifier	HP	8447F	2805A03475	2024-02-24	2025-02-23
WTXE1010A1007	Loop Antenna	Schwarz beck	FMZB 1516	9773	2024-02-26	2025-02-25
WTXE1010A1006	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2024-02-24	2025-02-23
☐ Chamber A: Above 1GHz						
WTXE1005A1003	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2024-02-24	2025-02-23
WTXE1001A1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2024-03-19	2025-03-18
WTXE1065A1001	Amplifier	C&D	PAP-1G18	2002	2024-02-27	2025-02-26
WTXE1010A1005	Horn Antenna	ETS	3117	00086197	2024-02-26	2025-02-25
WTXE1010A1010	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2024-03-17	2025-03-16
WTXE1003A1001	Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2024-02-29	2025-02-28
☐ Chamber B:Below 1GHz						
WTXE1010A1006	Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2024-03-17	2027-03-16
WTXE1038A1001	Amplifier	Agilent	8447D	2944A10457	2024-02-24	2025-02-23

WTXE1001A 1002	EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2024-02-24	2025-02-23
☒ Chamber C:Below 1GHz						
WTXE1093A 1001	EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2024-02-27	2025-02-26
WTXE1010A 1013-1	Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2024-04-18	2027-04-17
WTXE1007A 1002	Amplifier	HP	8447F	2944A038 69	2024-02-24	2025-02-23
WTXE1010A 1007	Loop Antenna	Schwarz beck	FMZB 1516	9773	2024-02-26	2025-02-25
☒ Chamber C: Above 1GHz						
WTXE1093A 1001	EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2024-02-27	2025-02-26
WTXE1103A 1005	Horn Antenna	POAM	RTF-118A	1820	2023-03-10	2026-03-09
WTXE1103A 1006	Amplifier	Tonscend	TAP01018050	AP22E806 235	2024-02-27	2025-02-26
WTXE1010A 1010	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2024-03-17	2025-03-16
WTXE1003A 1001	Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2024-02-29	2025-02-28
☐ Conducted Room 1#						
WTXE1104A 1029	EMI Test Receiver	Rohde & Schwarz	ESCI	100525	2023-12-12	2024-12-11
WTXE1002A 1001	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2024-02-24	2025-02-23
WTXE1003A 1001	AC LISN	Schwarz beck	NSLK8126	8126-279	2024-02-24	2025-02-23
☒ Conducted Room 2#						
WTXE1001A 1004	EMI Test Receiver	Rohde & Schwarz	ESPI	101259	2024-02-24	2025-02-23
WTXE1003A 1003	LISN	Rohde & Schwarz	ENV 216	100097	2024-02-24	2025-02-23

Software List			
Description	**Manufacturer**	**Model**	**Version**
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission Room 1#)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission Room 2#)*	SKET	EMC-I	V2.0

*Remark: indicates software version used in the compliance certification testing.

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§15.203; §15.405	Antenna Requirement	Compliant
15.407 (c)	Automatically Discontinue Transmission	Compliant
§15.207; §15.407(b)(6)	Conducted Emission	Compliant
§15.407(a)(1),(2)	Power Spectral Density	Compliant
§15.407(e)	Emission Bandwidth and Occupied Bandwidth	Compliant
§15.407(a)(1),(2)	Maximum Conducted Output Power	Compliant
§15.407(b)(1),(2),(3),(4)	Undesirable emission	Compliant
§15.205; §15.407(b)(1),(2),(3)	Radiated Emission	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.407(h)	Dynamic Frequency Selection (DFS)	Compliant

N/A: Not applicable.

3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 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 an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Evaluation Information

This product has two External antennas, fulfill the requirement of this section.

4. Automatically Discontinue Transmission

4.1 Standard Applicable

According to FCC Part 15.407(c), the device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

4.2 Summary of Test Results

While the EUT is not transmitting any information, 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.

5. Power Spectral Density

5.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25GHz.
(iv) For mobile and portable client devices in the 5.15-5.25GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6dBi. In addition, the maximum power spectral density shall not exceed 11dBm 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 6dBi.

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

(3) For the band 5.725-5.85GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30dBm in any 500kHz band. If transmitting antennas of directional gain greater than 6dBi 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 6dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter conducted power. 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.

5.2 Test Procedure

According to 789033 D02 v02r01 General UNII Test Procedures New Rules v02, the following is the measurement procedure.
For devices operating in the bands 5.15-5.25GHz, 5.25-5.35GHz, and 5.47-5.725GHz, the above procedures make use of 1MHz RBW to satisfy directly the 1MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85GHz, the rules specify a measurement bandwidth of 500kHz. Many spectrum analyzers do not have 500kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1MHz, or 500kHz, “provided that the measured power is integrated over the full

reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1MHz, or 500kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500kHz) and integrated over 1 MHz, or 500kHz 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 500kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1MHz) 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 100kHz for the sections 5.c) and 5.d) above, since RBW=100kHZ is available on nearly all spectrum analyzers.

5.3 Summary of Test Results/Plots

Please refer to Appendix C

6. Emission Bandwidth and Occupied Bandwidth

6.1 Standard Applicable

According to 15.407(a) and (e):

(1) For the band 5.15-5.25GHz.
(iv) For mobile and portable client devices in the 5.15-5.25GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6dBi. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6dBi 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 6dBi.

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

(3) For the band 5.725-5.85GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30dBm in any 500kHz band. If transmitting antennas of directional gain greater than 6dBi 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 6dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter conducted power. 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.

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

6.2 Test Procedure

According to 789033 D02 v02r0r section C&D, the following is the measurement procedure.

1. Emission Bandwidth (EBW)
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 26dB 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%.

2. Minimum Emission Bandwidth for the band 5.725-5.85GHz
Section 15.407(e) specifies the minimum 6dB emission bandwidth of at least 500KHz for the band 5.715-5.85GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

D. 99 Percent Occupied Bandwidth
The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to 789033 D02 v02r01 General UNII Test Procedures New Rules v01 define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

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.

6.3 Summary of Test Results/Plots

Please refer to Appendix A

7. Maximum Conducted Output Power

7.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25GHz.
(iv) For mobile and portable client devices in the 5.15-5.25GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6dBi. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6dBi 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 6dBi.

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

(3) For the band 5.725-5.85GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30dBm in any 500kHz band. If transmitting antennas of directional gain greater than 6dBi 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 6dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter conducted power. 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.

7.2 Test Procedure

According to KDB789033 D02 v02r01 section E, the following is the measurement procedure.

(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1MHz.

(iii) Set VBW ≥ 3MHz.

(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 levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

7.3 Summary of Test Results/Plots

Please refer to Appendix B

8. Radiated Spurious Emissions

8.1 Standard Applicable

According to §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 5.15-5.25GHz band: All emissions outside of the 5.15-5.35GHz band shall not exceed an e.i.r.p. of −27dBm/MHz.

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

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

(4) For transmitters operating in the 5.725-5.85GHz band:

(i) All emissions shall be limited to a level of −27dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10dBm/MHz at 25MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6dBm/MHz at 5MHz above or below the band edge, and from 5MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

According to §15.407(b)(6), Unwanted emissions below 1GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

According to §15.407(b)(7), The provisions of §15.205 apply to intentional radiators operating under this section.

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If radiated measurements are performed, field strength is then converted to EIRP as follows:

EIRP = ((E*d)^2) / 30

where:

• E is the field strength in V/m;

• d is the measurement distance in meters;

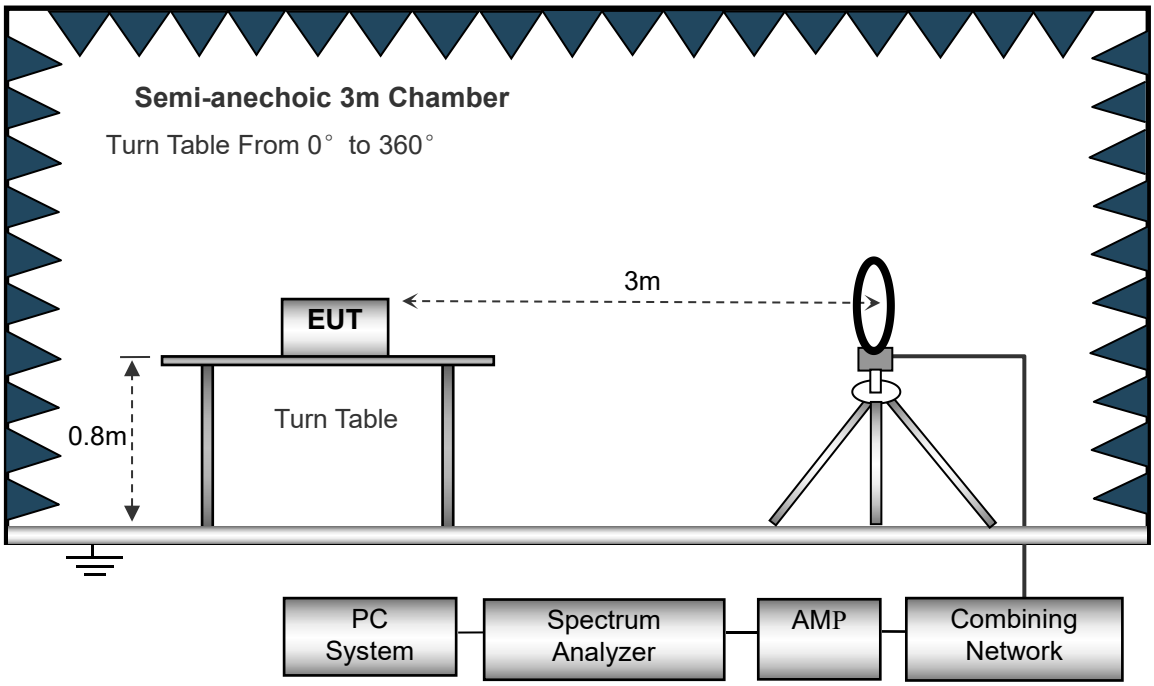
• EIRP is the equivalent isotropically radiated power in watts.

8.2 Test Procedure

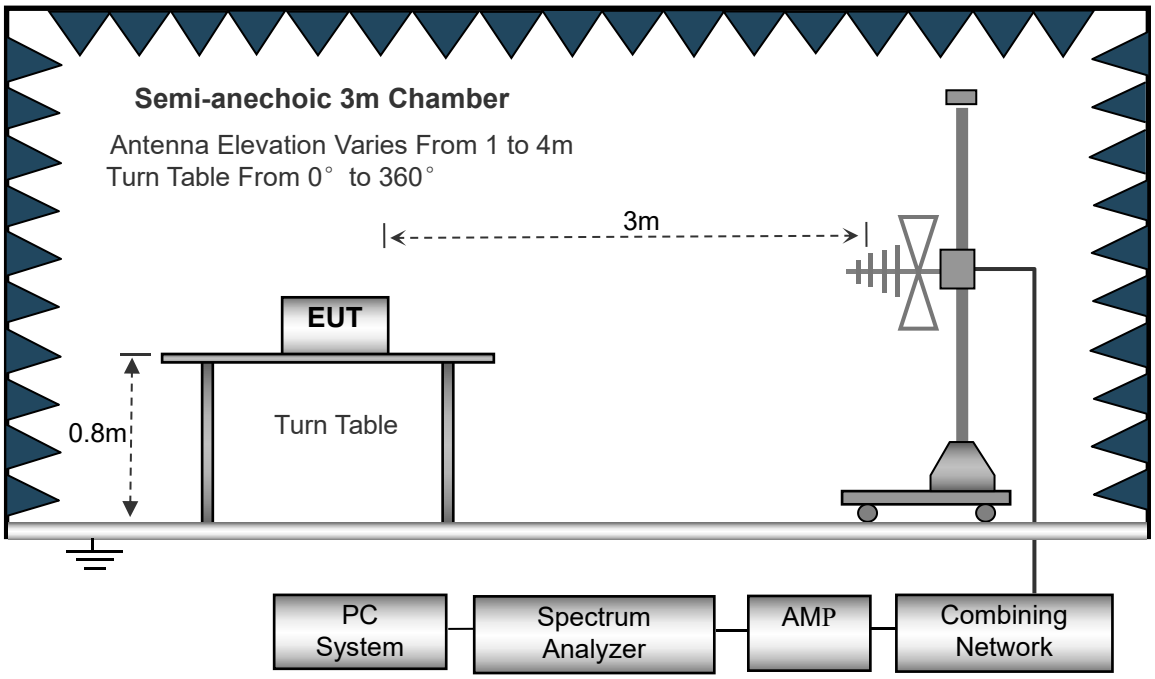
The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.407(b)(6) and FCC Part 15.209 Limit..

The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle. The spacing between the peripherals was 10cm.

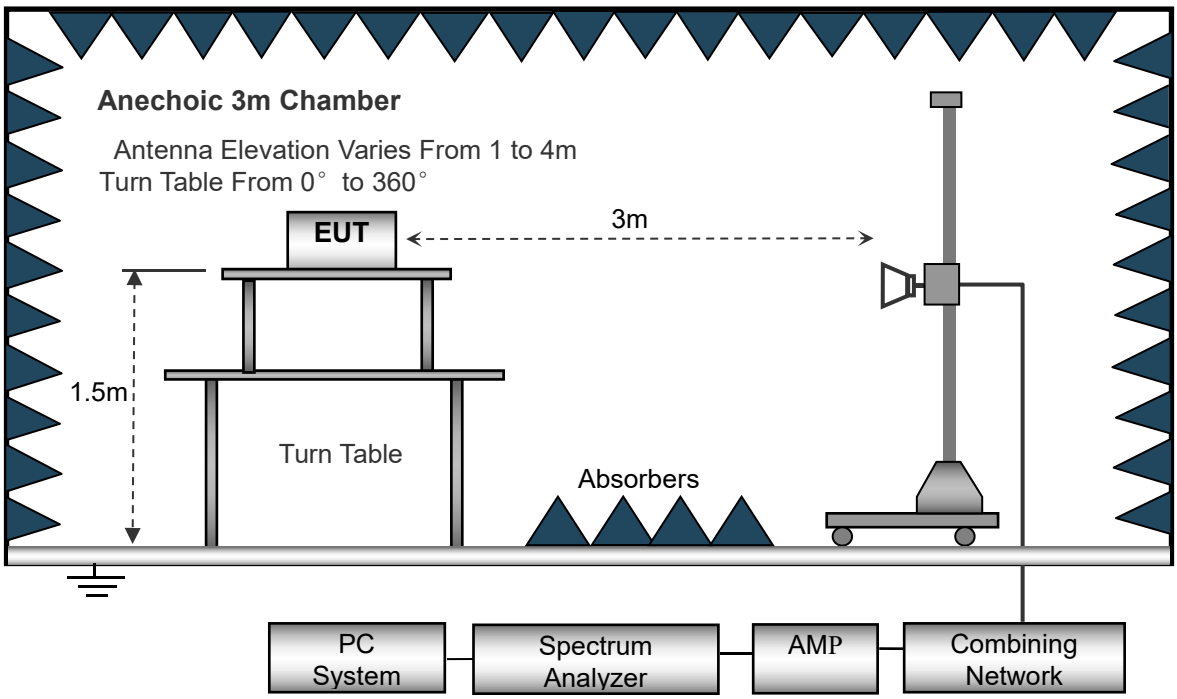
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1GHz.



8.3 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:
RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:
RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

8.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15 Limit

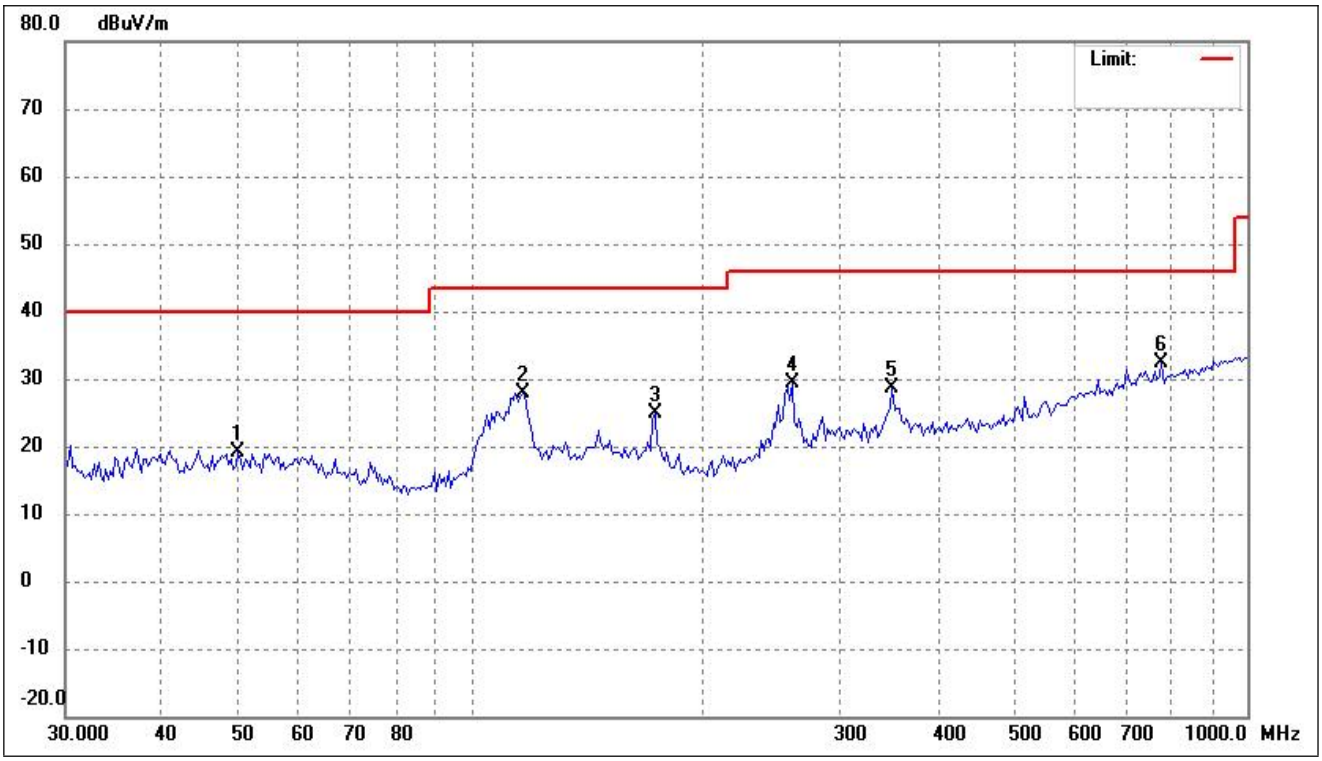
8.5 Summary of Test Results/Plots

Note: *this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

- Spurious Emission From 30MHz to 1GHz

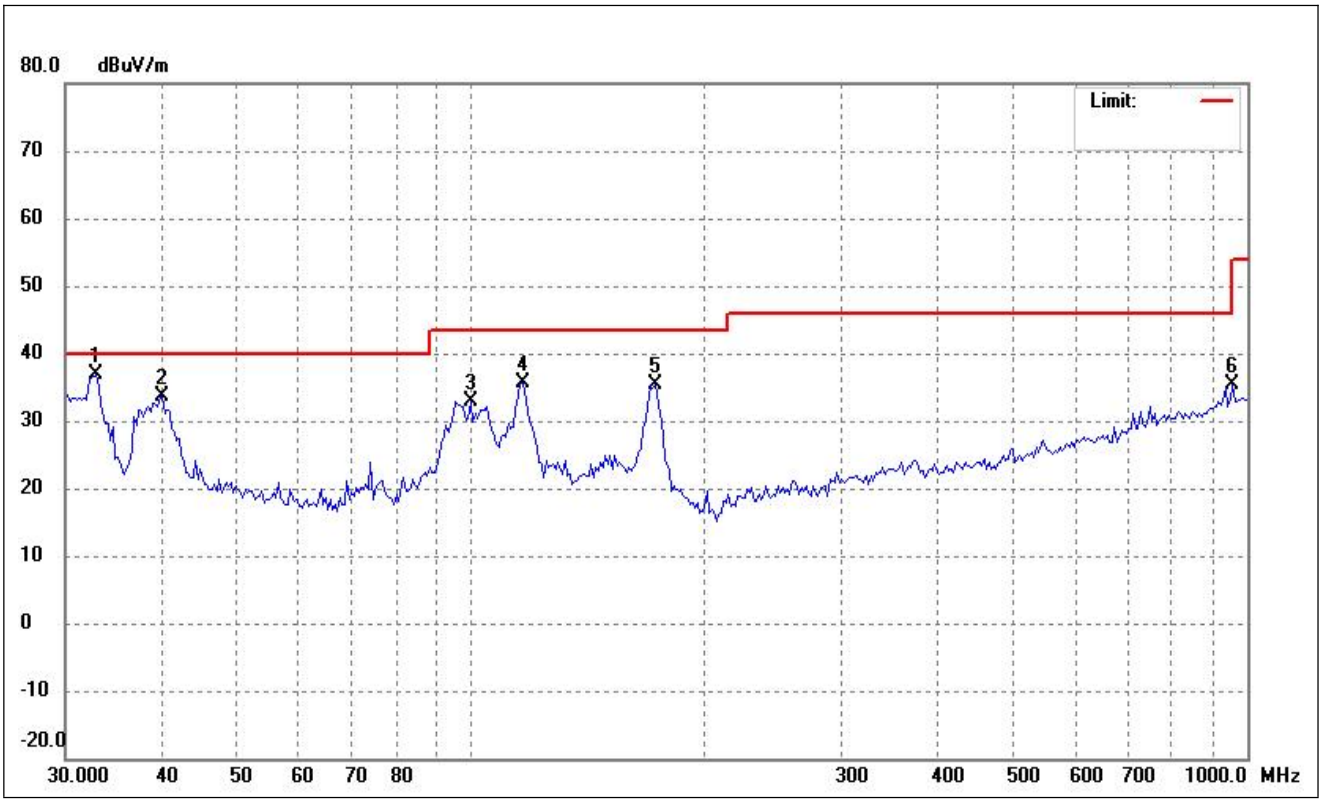
- Antenna 0(Worst case)
- 5150-5250MHz

802.11a			
Test Channel	5180MHz(Worst case)	Polarity:	Horizontal



No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	50.1080	26.65	-7.59	19.06	40.00	-20.94	-	-	peak
2	116.4476	38.26	-10.39	27.87	43.50	-15.63	-	-	peak
3	172.5976	33.63	-8.68	24.95	43.50	-18.55	-	-	peak
4	259.4434	38.66	-9.31	29.35	46.00	-16.65	-	-	peak
5	348.5145	35.82	-7.08	28.74	46.00	-17.26	-	-	peak
6	776.4849	31.71	0.62	32.33	46.00	-13.67	-	-	peak

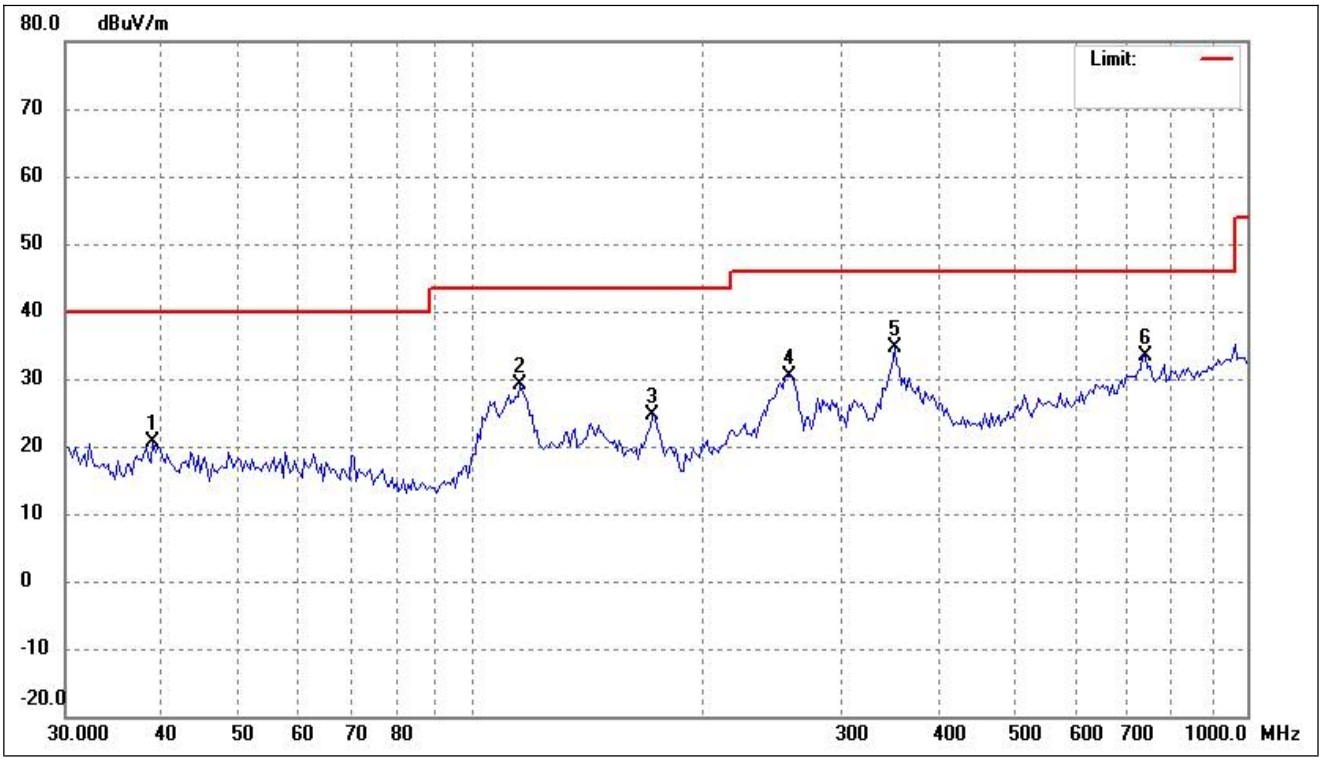
802.11a			
Test Channel	5180MHz(Worst case)	Polarity:	Vertical



No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	32.8697	46.26	-9.28	36.98	40.00	-3.02	-	-	peak
2	40.0173	41.70	-7.95	33.75	40.00	-6.25	-	-	peak
3	99.7676	44.82	-12.01	32.81	43.50	-10.69	-	-	peak
4	116.4476	45.98	-10.39	35.59	43.50	-7.91	-	-	peak
5	172.5976	43.97	-8.68	35.29	43.50	-8.21	-	-	peak
6	958.7135	32.01	3.34	35.35	46.00	-10.65	-	-	peak

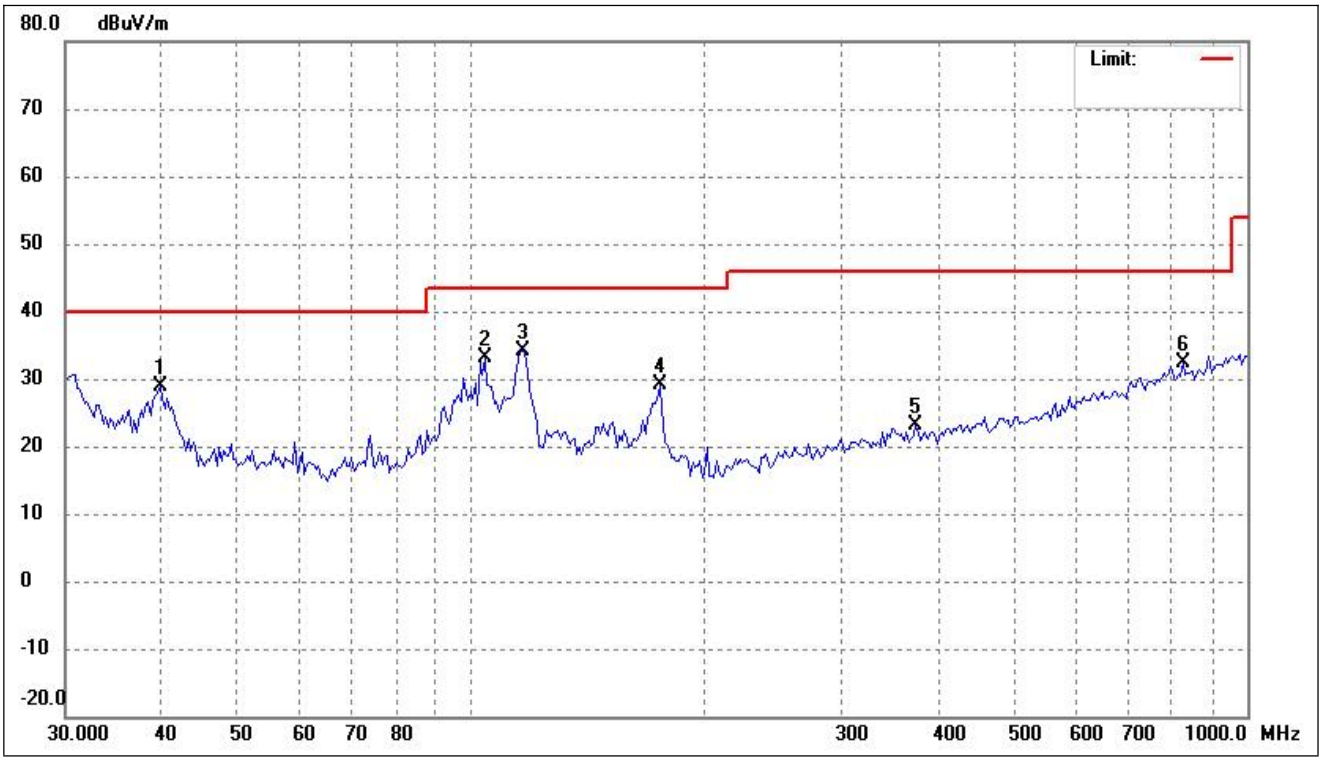
➢ Antenna 0+ Antenna 1

802.11n-HT20			
Test Channel	5180MHz(worst case)	Polarity:	Horizontal



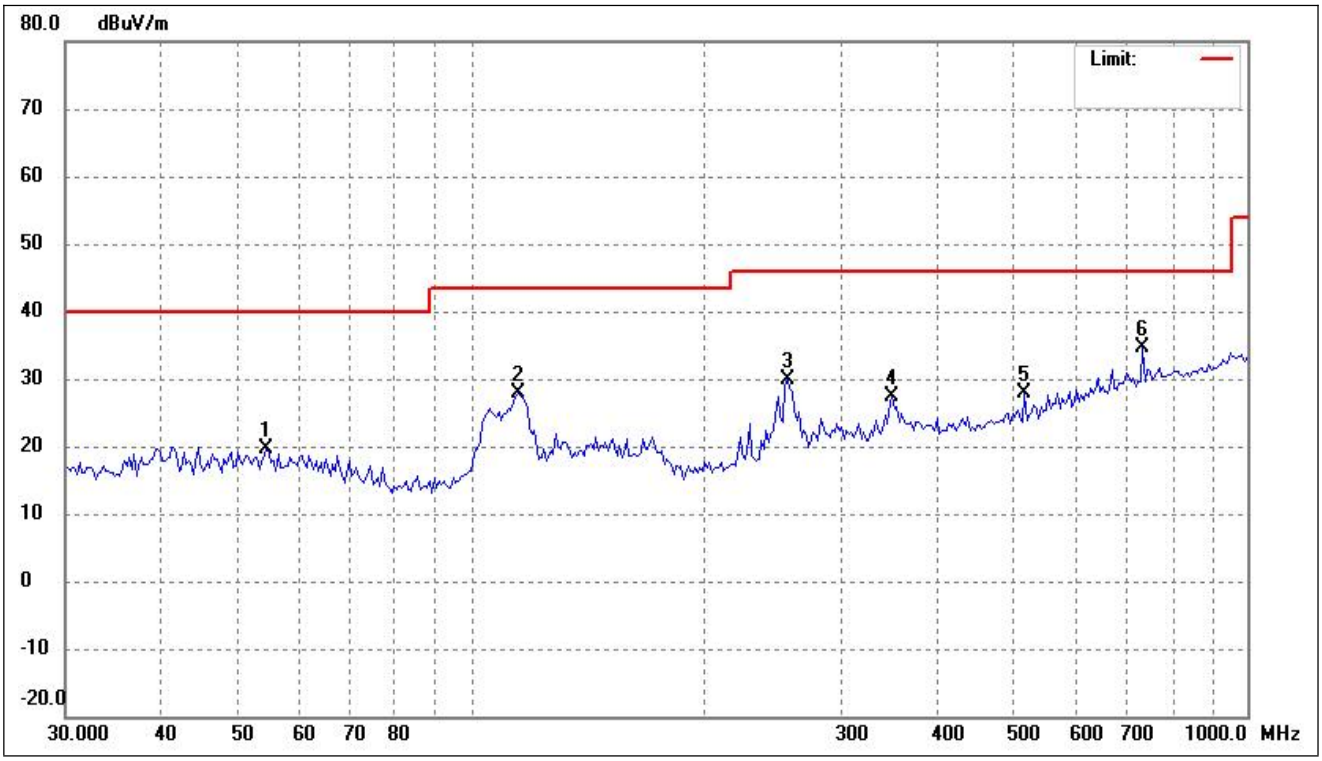
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	38.9081	28.81	-8.19	20.62	40.00	-19.38	-	-	peak
2	115.6322	39.61	-10.47	29.14	43.50	-14.36	-	-	peak
3	171.3890	33.03	-8.51	24.52	43.50	-18.98	-	-	peak
4	257.6266	39.84	-9.38	30.46	46.00	-15.54	-	-	peak
5	350.9722	41.72	-7.05	34.67	46.00	-11.33	-	-	peak
6	739.2136	33.56	-0.09	33.47	46.00	-12.53	-	-	peak

802.11n-HT20			
Test Channel	5180MHz(worst case)	Polarity:	Vertical



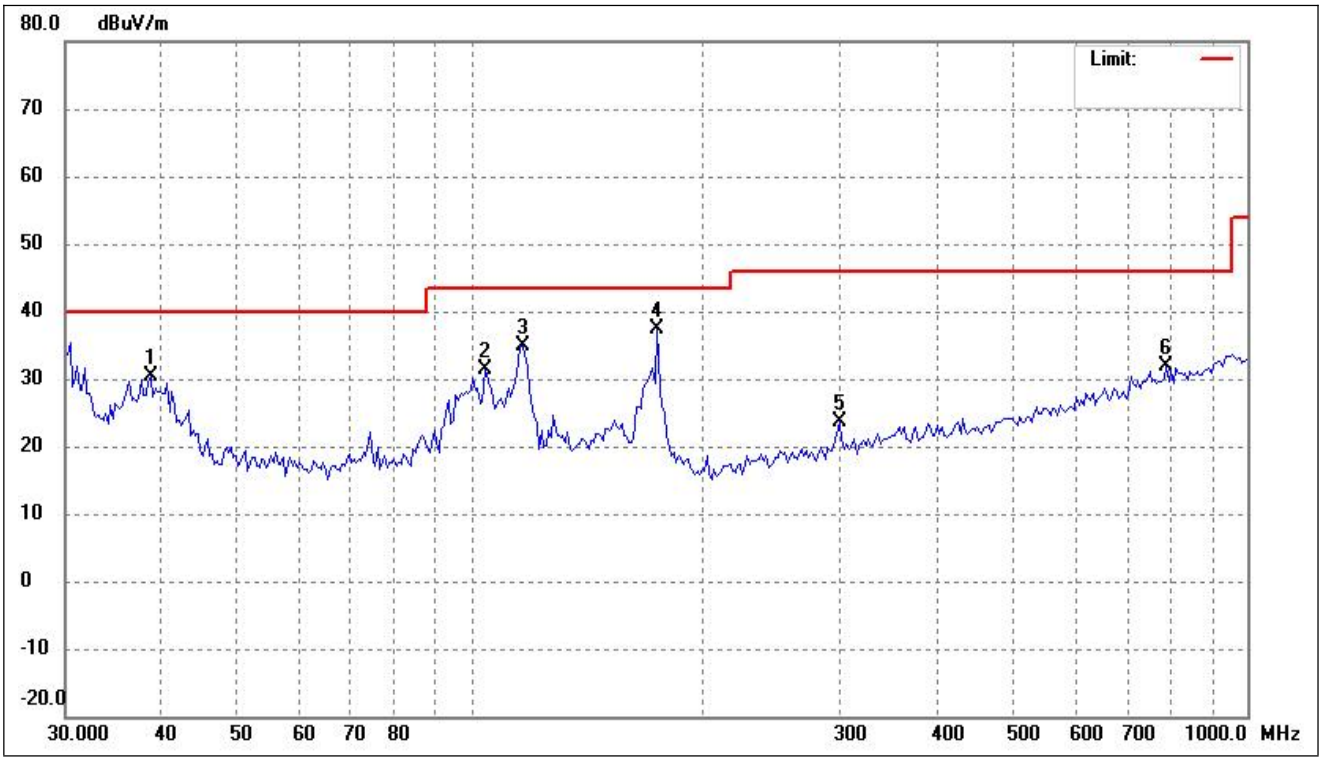
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	39.7371	36.89	-8.01	28.88	40.00	-11.12	-	-	peak
2	104.0640	44.76	-11.62	33.14	43.50	-10.36	-	-	peak
3	116.4476	44.64	-10.39	34.25	43.50	-9.25	-	-	peak
4	175.0404	38.06	-9.03	29.03	43.50	-14.47	-	-	peak
5	373.8862	29.75	-6.62	23.13	46.00	-22.87	-	-	peak
6	827.1795	31.06	1.29	32.35	46.00	-13.65	-	-	peak

802.11ax-HE20			
Test Channel	5180MHz(worst case)	Polarity:	Horizontal



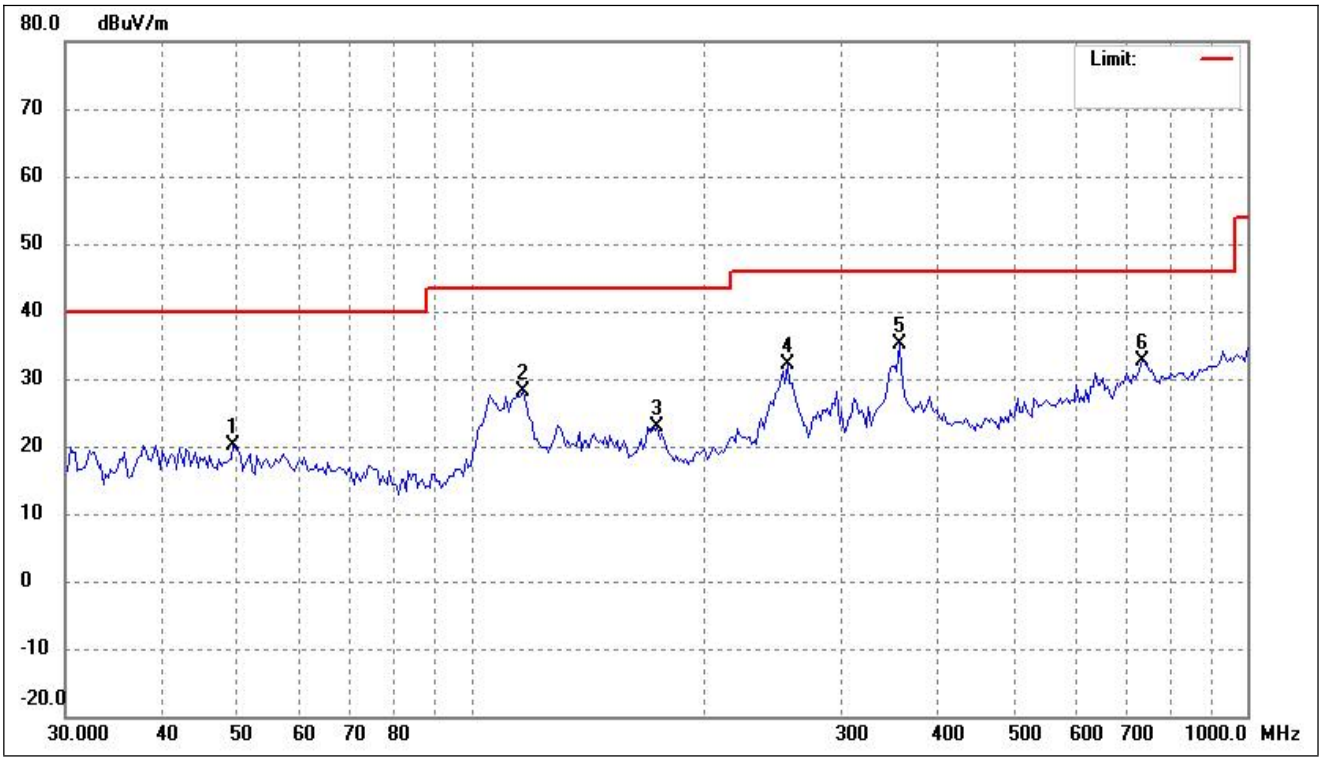
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	54.5167	27.65	-8.07	19.58	40.00	-20.42	-	-	peak
2	114.8224	38.42	-10.56	27.86	43.50	-15.64	-	-	peak
3	255.8226	39.38	-9.47	29.91	46.00	-16.09	-	-	peak
4	348.5145	34.45	-7.08	27.37	46.00	-18.63	-	-	peak
5	516.5651	32.38	-4.48	27.90	46.00	-18.10	-	-	peak
6	734.0373	34.77	-0.23	34.54	46.00	-11.46	-	-	peak

802.11ax-HE20			
Test Channel	5180MHz(worst case)	Polarity:	Vertical



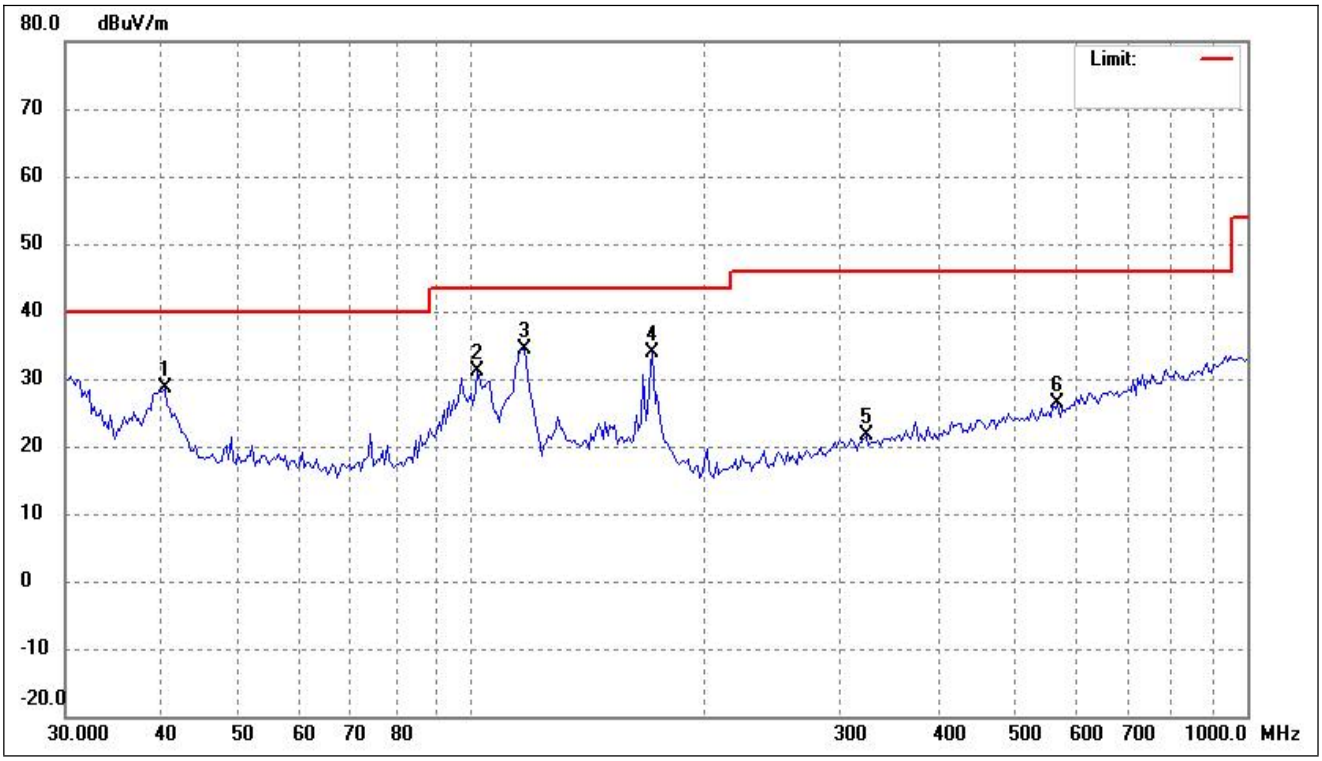
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	38.6357	38.51	-8.25	30.26	40.00	-9.74	-	-	peak
2	104.0640	42.98	-11.62	31.36	43.50	-12.14	-	-	peak
3	116.4476	45.38	-10.39	34.99	43.50	-8.51	-	-	peak
4	173.8147	46.21	-8.85	37.36	43.50	-6.14	-	-	peak
5	298.5932	31.63	-7.90	23.73	46.00	-22.27	-	-	peak
6	787.4749	30.96	0.80	31.76	46.00	-14.24	-	-	peak

802.11n-HT40			
Test Channel	5190MHz(worst case)	Polarity:	Horizontal



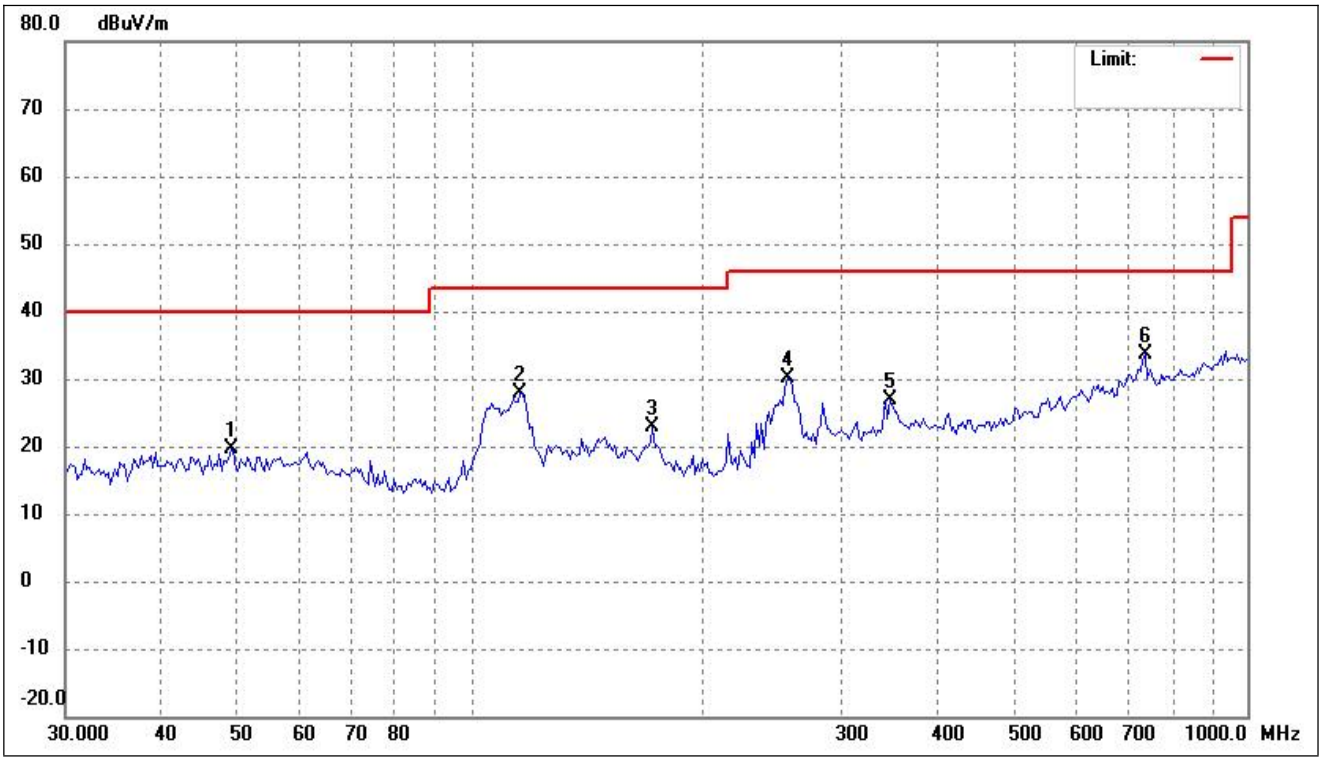
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	49.4087	27.74	-7.63	20.11	40.00	-19.89	-	-	peak
2	116.4476	38.55	-10.39	28.16	43.50	-15.34	-	-	peak
3	173.8147	31.74	-8.85	22.89	43.50	-20.61	-	-	peak
4	255.8226	41.55	-9.47	32.08	46.00	-13.92	-	-	peak
5	355.9397	42.07	-6.95	35.12	46.00	-10.88	-	-	peak
6	734.0373	32.83	-0.23	32.60	46.00	-13.40	-	-	peak

802.11n-HT40			
Test Channel	5190MHz(worst case)	Polarity:	Vertical



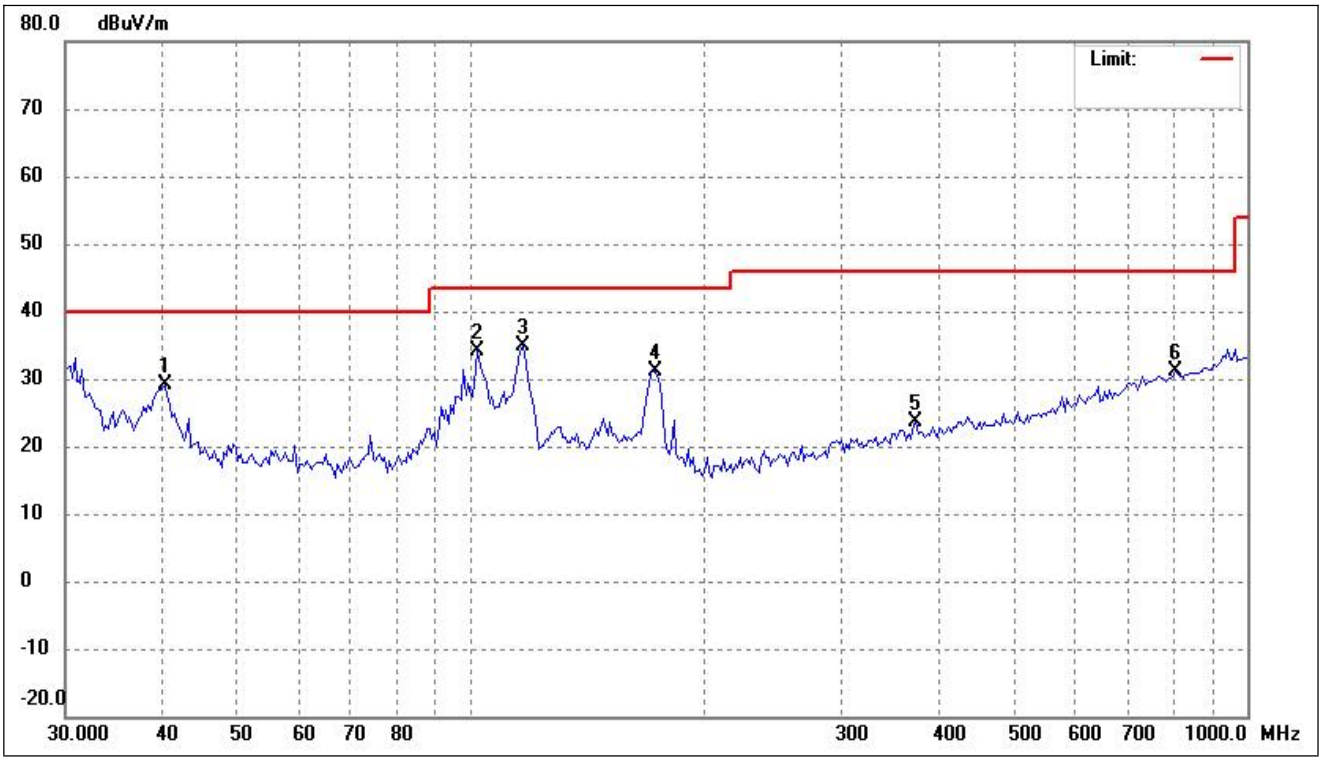
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	40.2995	36.59	-7.96	28.63	40.00	-11.37	-	-	peak
2	101.8932	43.01	-11.82	31.19	43.50	-12.31	-	-	peak
3	117.2688	44.62	-10.30	34.32	43.50	-9.18	-	-	peak
4	171.3890	42.28	-8.51	33.77	43.50	-9.73	-	-	peak
5	322.5896	28.91	-7.38	21.53	46.00	-24.47	-	-	peak
6	569.9688	29.33	-2.98	26.35	46.00	-19.65	-	-	peak

802.11ax-HE40			
Test Channel	5190MHz(worst case)	Polarity:	Horizontal



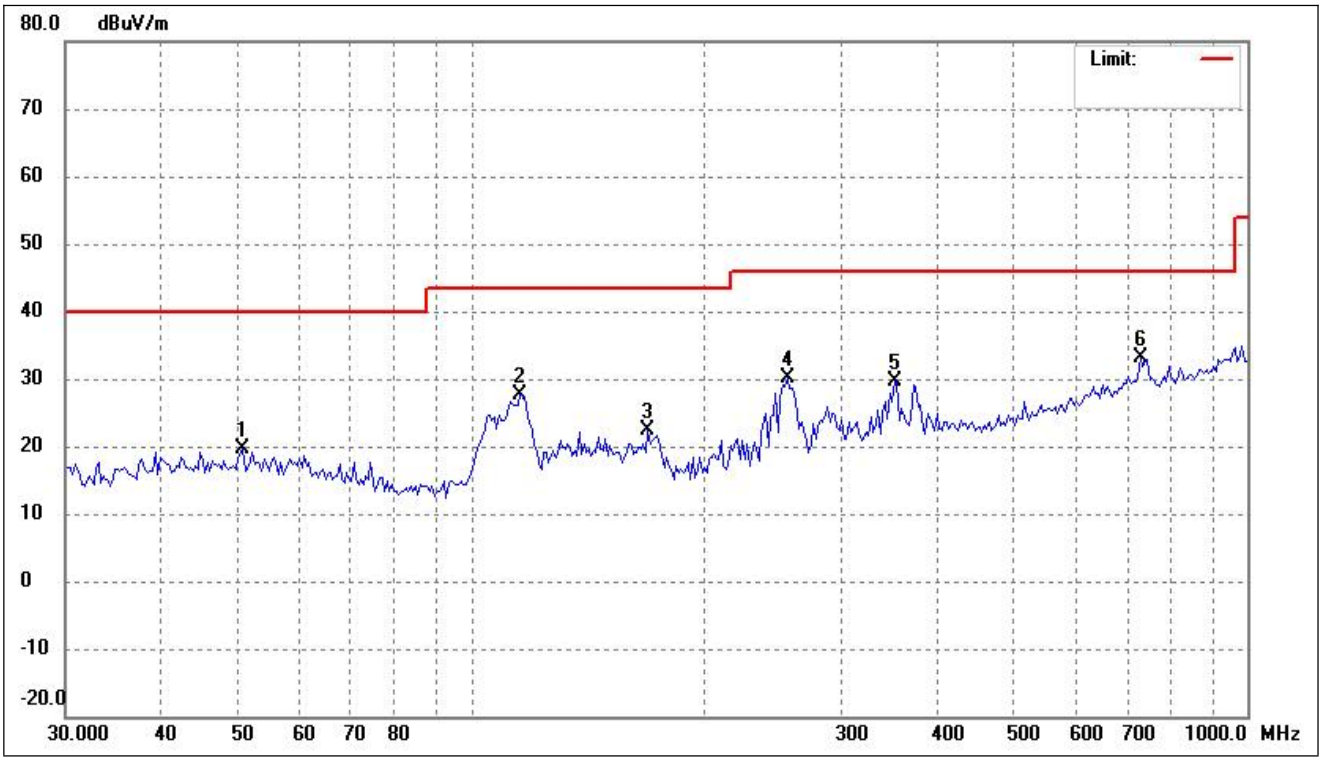
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	49.0627	27.24	-7.65	19.59	40.00	-20.41	-	-	peak
2	115.6322	38.33	-10.47	27.86	43.50	-15.64	-	-	peak
3	171.3890	31.32	-8.51	22.81	43.50	-20.69	-	-	peak
4	255.8226	39.71	-9.47	30.24	46.00	-15.76	-	-	peak
5	346.0740	33.95	-7.10	26.85	46.00	-19.15	-	-	peak
6	739.2136	33.74	-0.09	33.65	46.00	-12.35	-	-	peak

802.11ax-HE40			
Test Channel	5190MHz(worst case)	Polarity:	Vertical



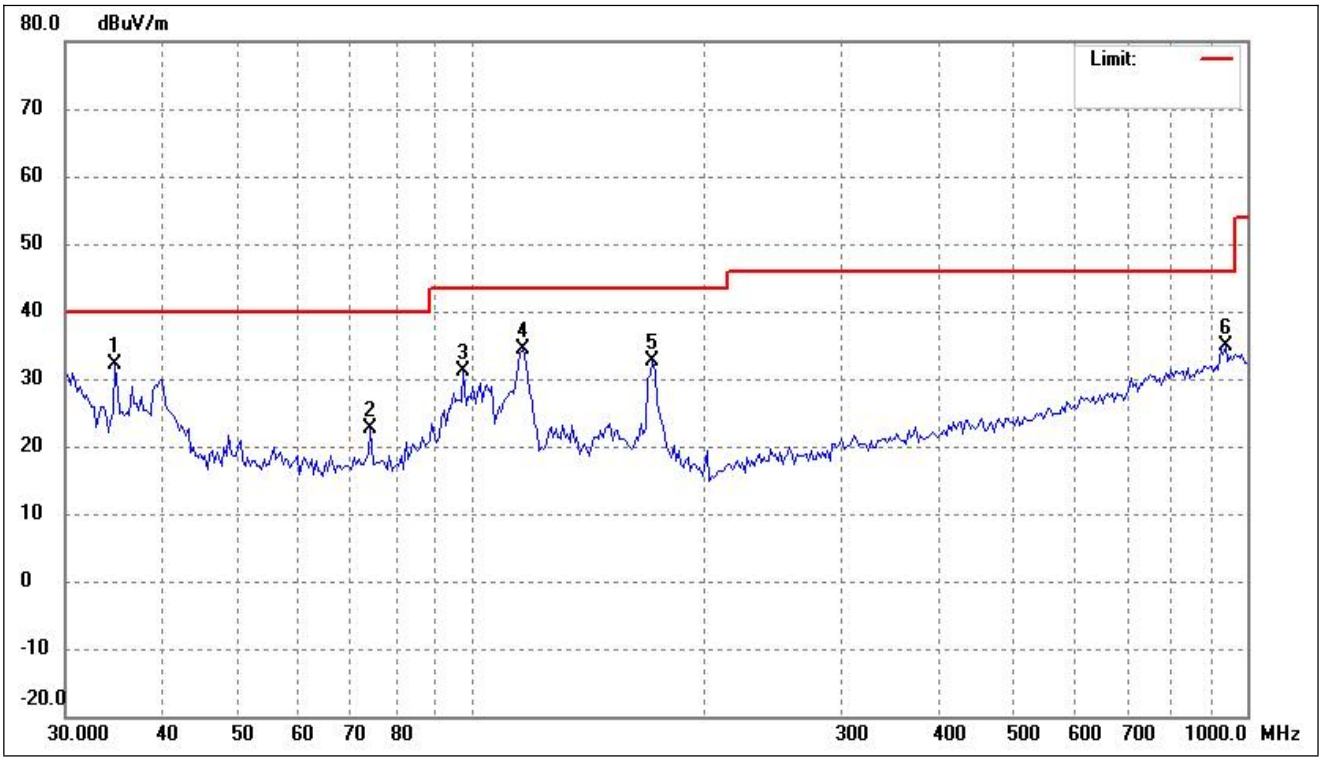
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	40.2995	36.98	-7.96	29.02	40.00	-10.98	-	-	peak
2	101.8932	45.99	-11.82	34.17	43.50	-9.33	-	-	peak
3	116.4476	45.23	-10.39	34.84	43.50	-8.66	-	-	peak
4	171.3890	39.52	-8.51	31.01	43.50	-12.49	-	-	peak
5	373.8862	30.13	-6.62	23.51	46.00	-22.49	-	-	peak
6	809.9238	30.05	1.11	31.16	46.00	-14.84	-	-	peak

802.11ac-VHT80			
Test Channel	5210MHz(worst case)	Polarity:	Horizontal



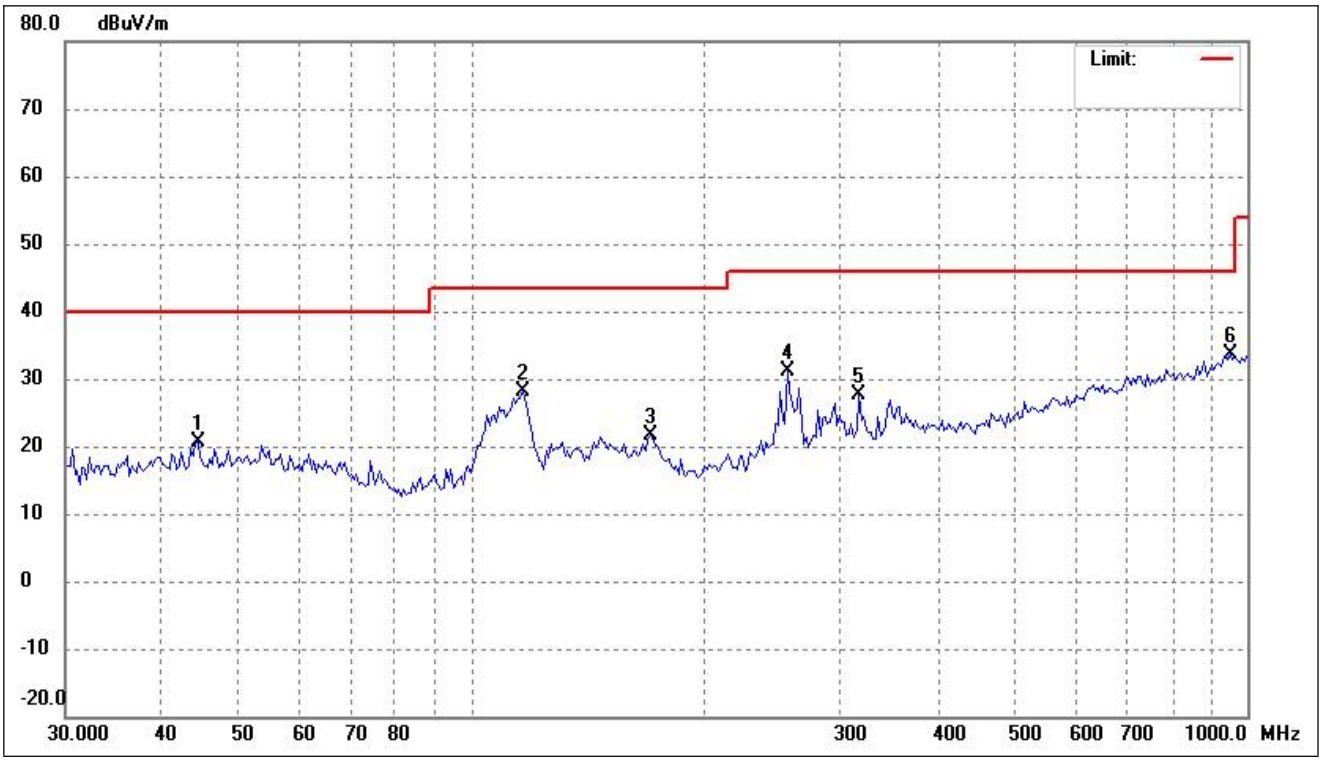
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	50.8172	27.40	-7.67	19.73	40.00	-20.27	-	-	peak
2	115.6322	38.05	-10.47	27.58	43.50	-15.92	-	-	peak
3	168.9970	30.76	-8.29	22.47	43.50	-21.03	-	-	peak
4	255.8226	39.57	-9.47	30.10	46.00	-15.90	-	-	peak
5	350.9722	36.66	-7.05	29.61	46.00	-16.39	-	-	peak
6	728.8971	33.46	-0.36	33.10	46.00	-12.90	-	-	peak

802.11ac-VHT80			
Test Channel	5210MHz(worst case)	Polarity:	Vertical



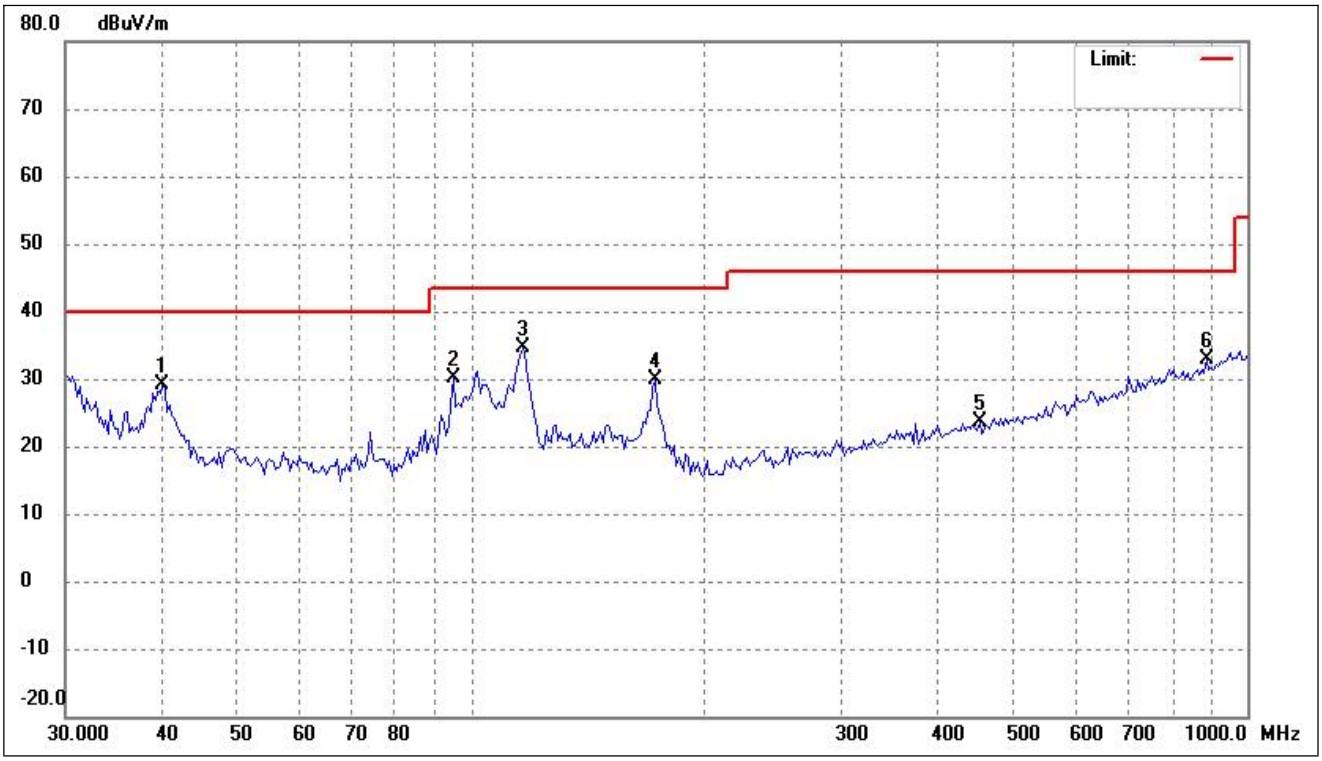
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	34.7705	41.29	-9.05	32.24	40.00	-7.76	-	-	peak
2	74.2696	33.79	-11.18	22.61	40.00	-17.39	-	-	peak
3	97.6864	43.21	-12.14	31.07	43.50	-12.43	-	-	peak
4	116.4476	44.87	-10.39	34.48	43.50	-9.02	-	-	peak
5	171.3890	41.22	-8.51	32.71	43.50	-10.79	-	-	peak
6	938.7139	31.91	3.03	34.94	46.00	-11.06	-	-	peak

802.11ax-HE80			
Test Channel	5210MHz(worst case)	Polarity:	Horizontal



No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	44.4657	28.49	-7.96	20.53	40.00	-19.47	-	-	peak
2	116.4476	38.57	-10.39	28.18	43.50	-15.32	-	-	peak
3	170.1888	29.87	-8.34	21.53	43.50	-21.97	-	-	peak
4	255.8226	40.66	-9.47	31.19	46.00	-14.81	-	-	peak
5	315.8601	35.14	-7.52	27.62	46.00	-18.38	-	-	peak
6	952.0001	30.40	3.31	33.71	46.00	-12.29	-	-	peak

802.11ax-HE80			
Test Channel	5210MHz(worst case)	Polarity:	Vertical



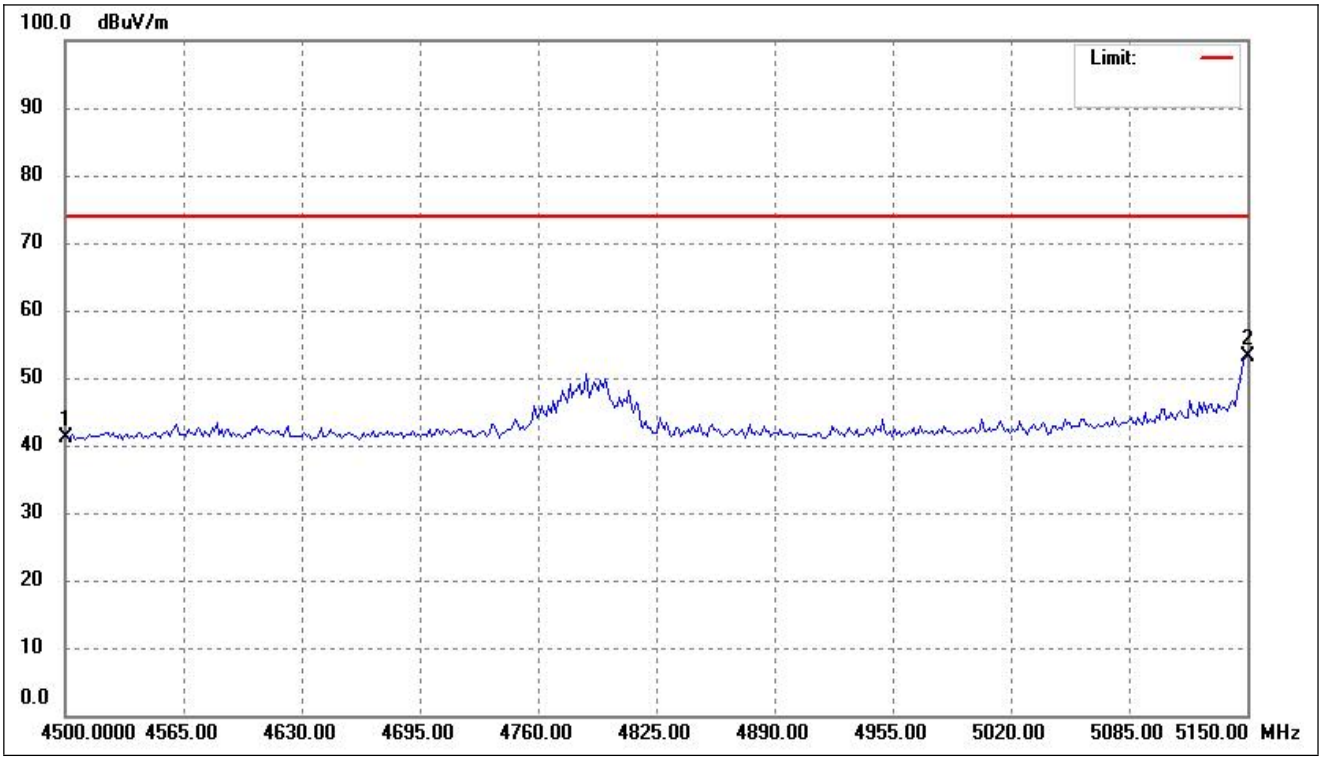
No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	40.0173	37.18	-7.95	29.23	40.00	-10.77	-	-	peak
2	94.9788	42.42	-12.30	30.12	43.50	-13.38	-	-	peak
3	116.4476	44.98	-10.39	34.59	43.50	-8.91	-	-	peak
4	172.5976	38.65	-8.68	29.97	43.50	-13.53	-	-	peak
5	452.0013	28.78	-5.17	23.61	46.00	-22.39	-	-	peak
6	887.3978	30.95	1.95	32.90	46.00	-13.10	-	-	peak

Remark: '-'Means' the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

- Spurious Emission above 1GHz

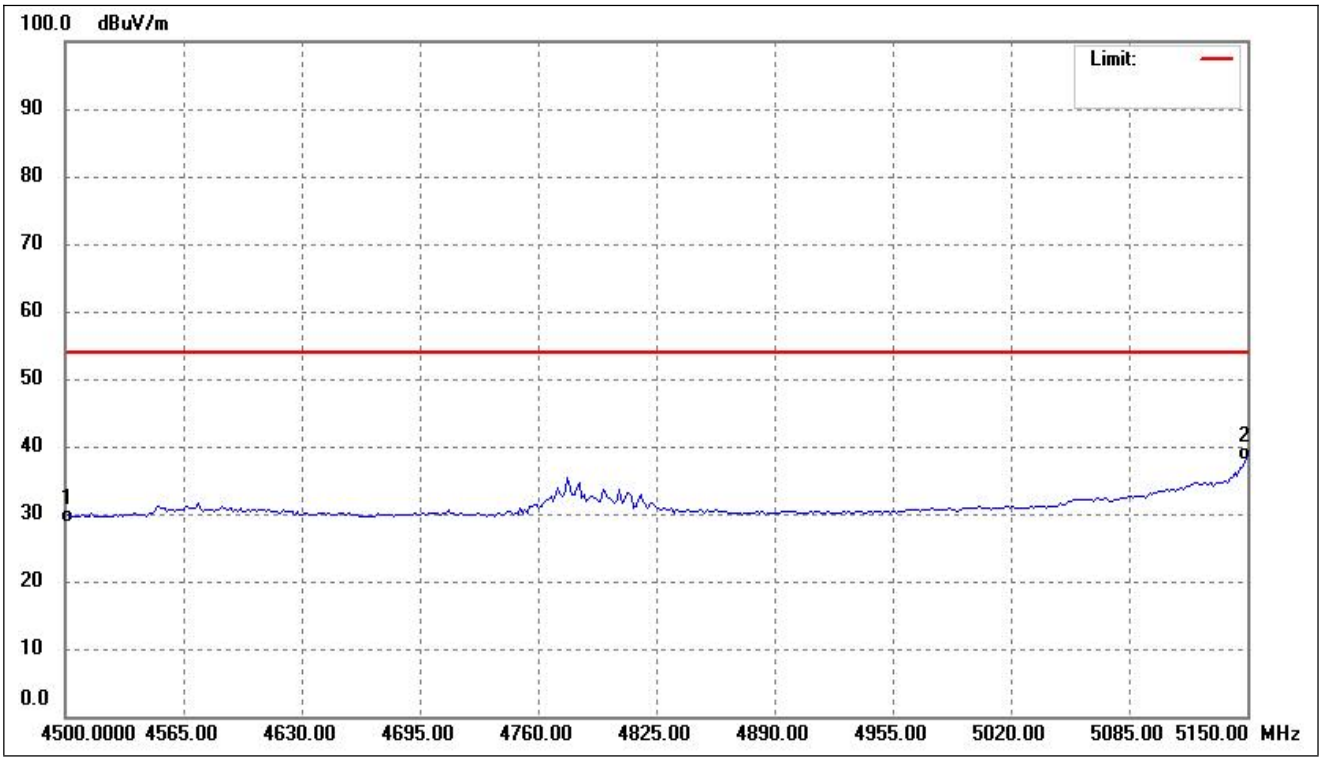
- Antenna 0(worst case)

802.11a- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



No.	Frequency	Reading	Corr.	Result	Limit	Margin	Deg.	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	4500.000	54.90	-13.87	41.03	74.00	-32.97	-	-	peak
2	5150.000	65.74	-12.53	53.21	74.00	-20.79	-	-	peak

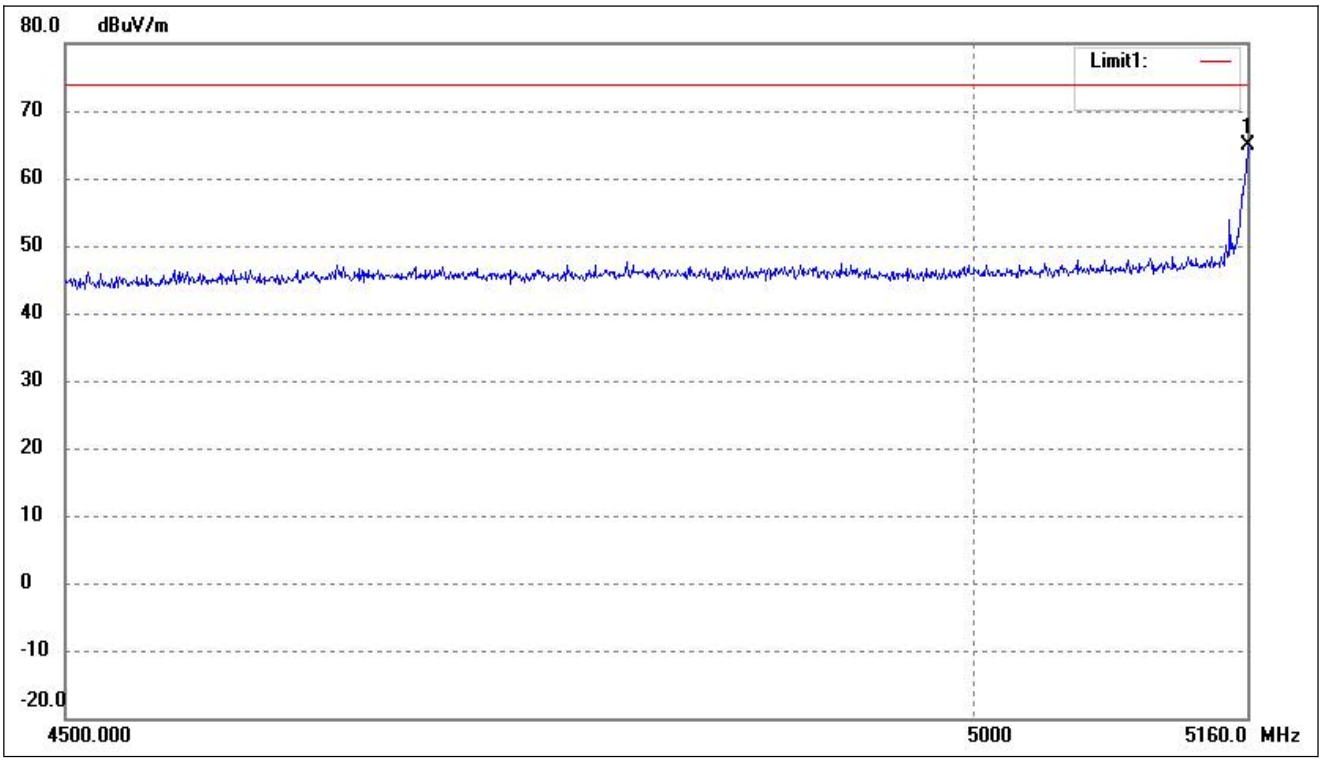
802.11a- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	4500.000	43.52	-13.87	29.65	54.00	-24.35	-	-	AVG
2	5150.000	51.51	-12.53	38.98	54.00	-15.02	-	-	AVG

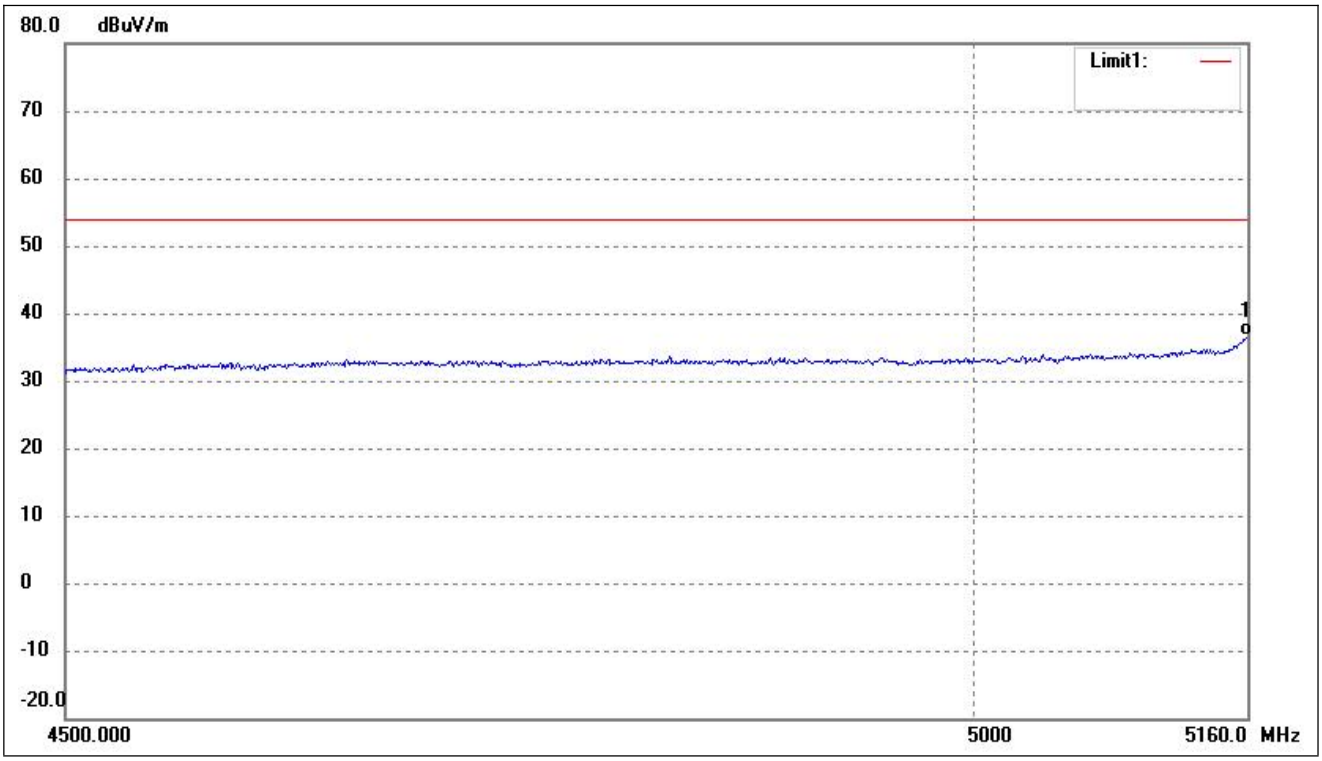
➢ Antenna 0 & Antenna 1

802.11n-HT20- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



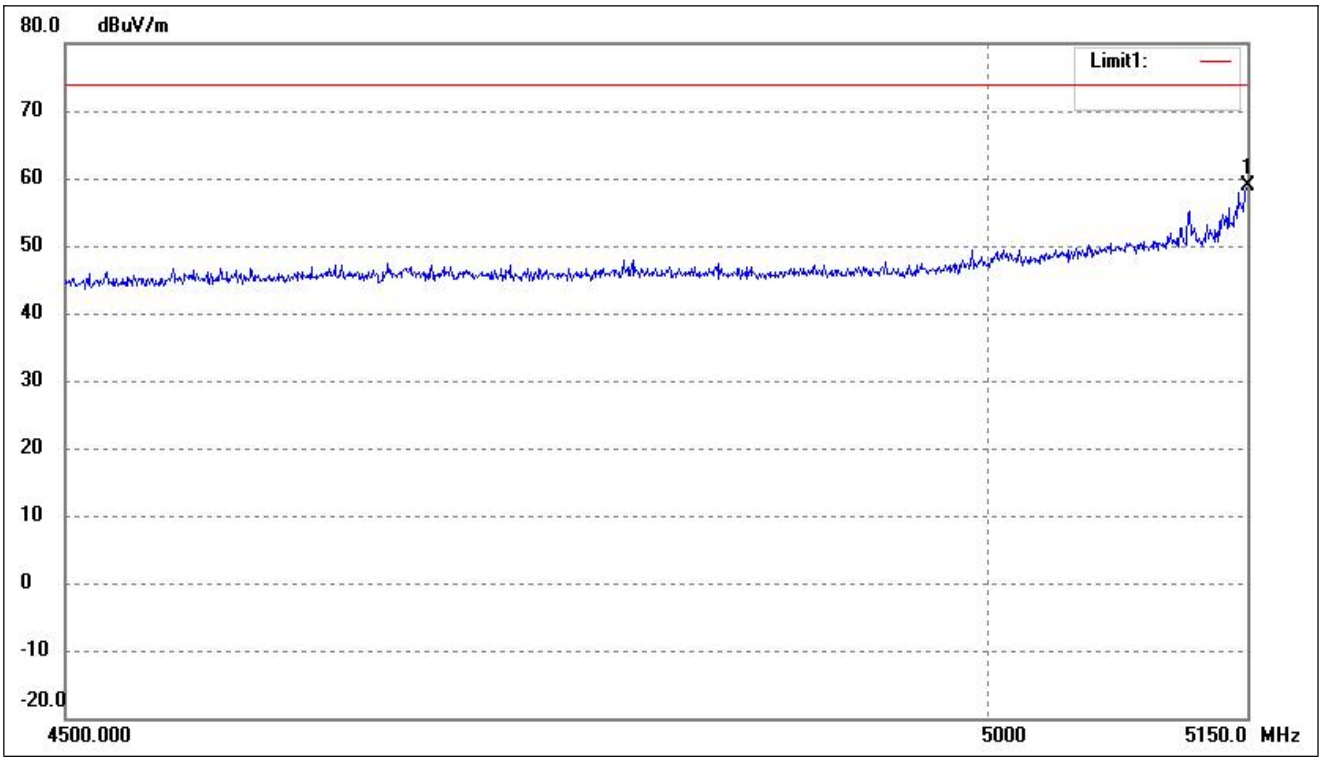
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5160.000	69.76	-4.76	65.00	74.00	-9.00	-	-	peak

802.11n-HT20- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



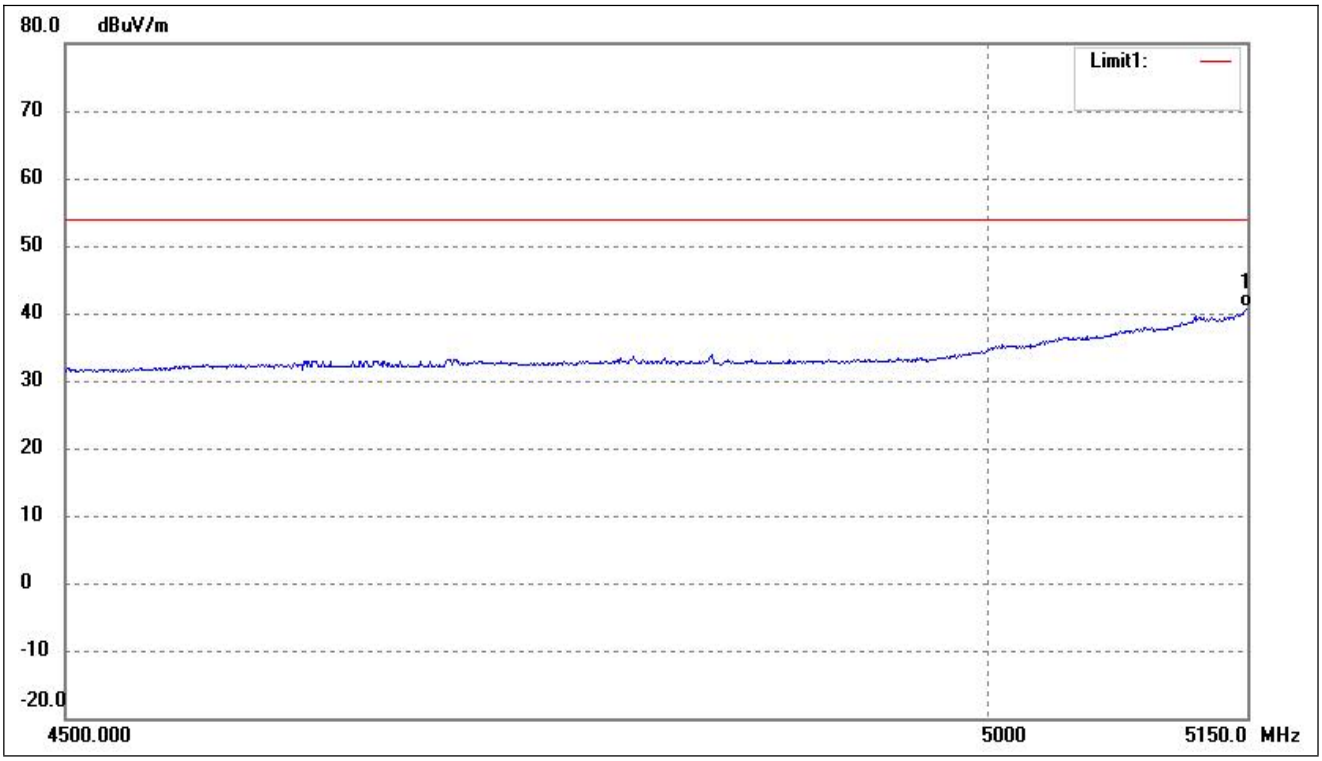
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5160.000	41.41	-4.76	36.65	54.00	-17.35	-	-	AVG

802.11ax-HE20- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



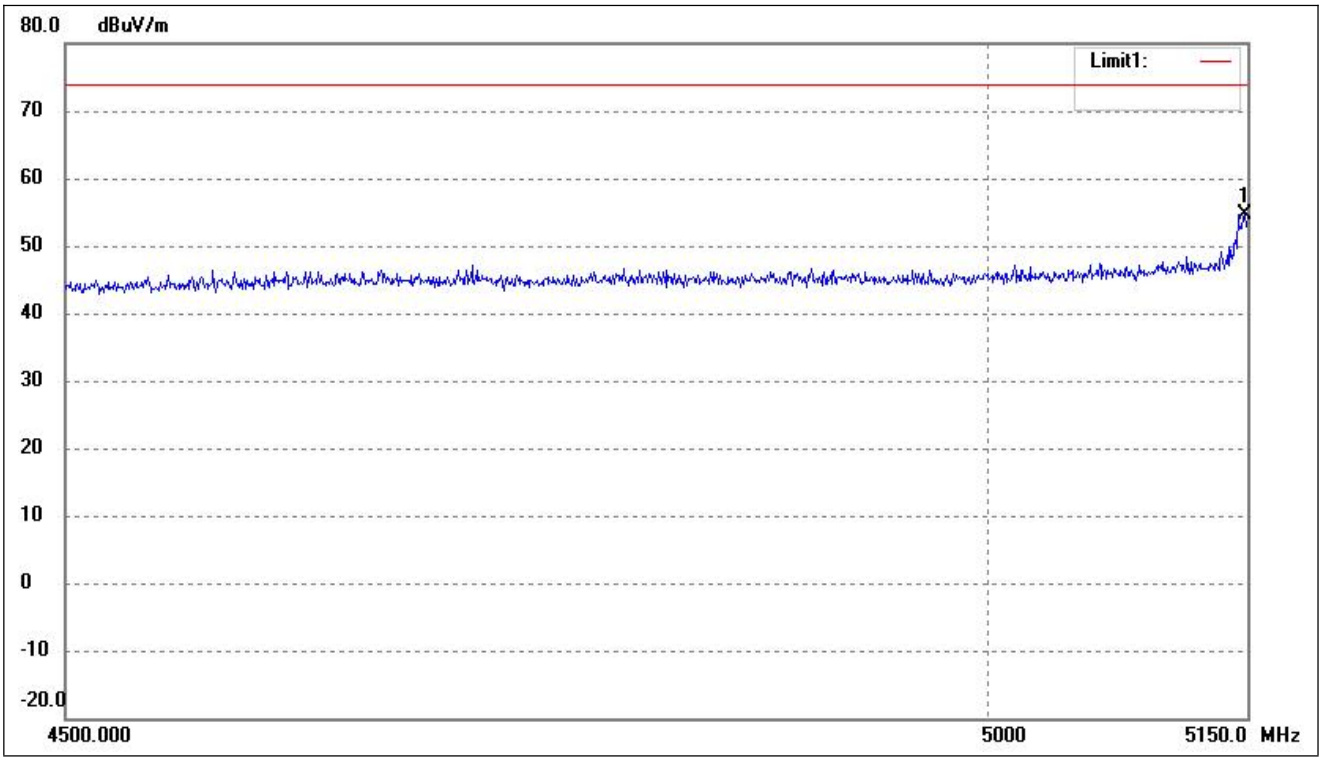
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5150.000	63.69	-4.77	58.92	74.00	-15.08	-	-	peak

802.11ax-HE20- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



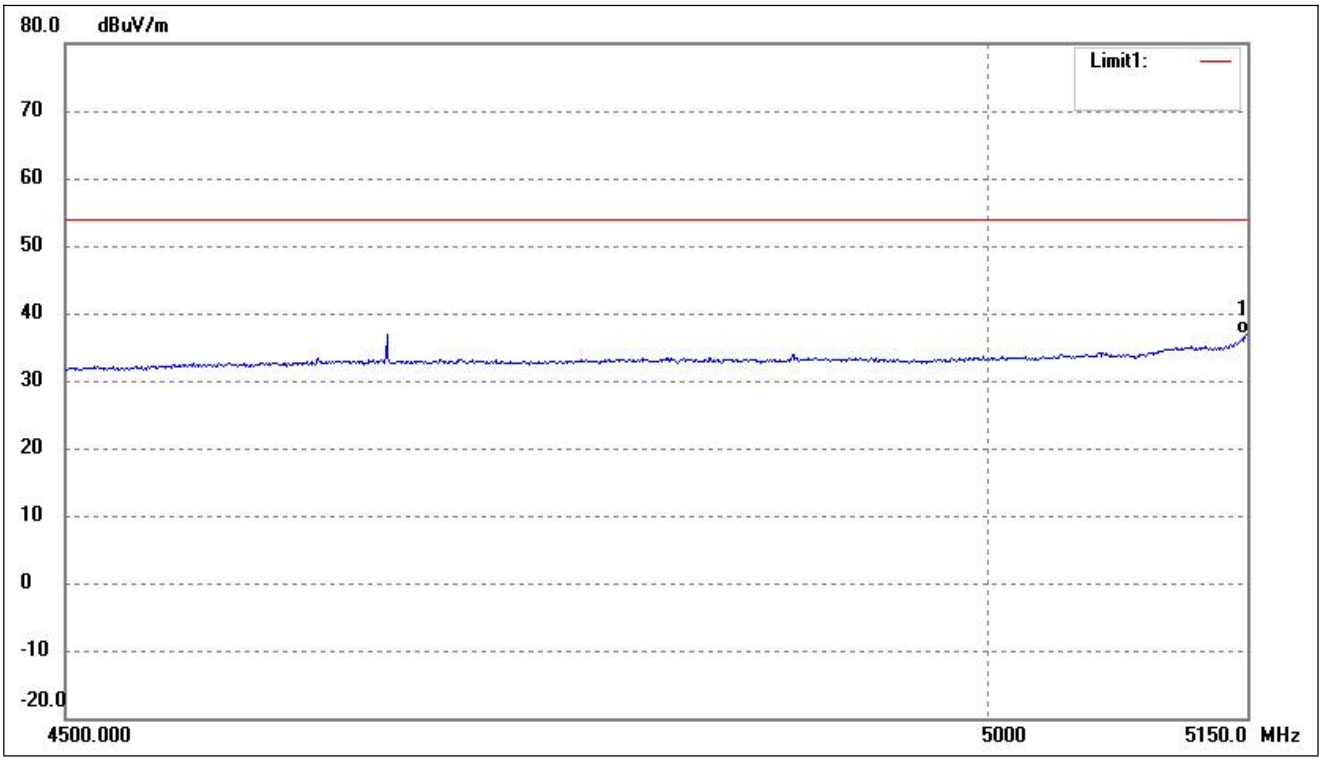
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5150.000	45.59	-4.77	40.82	54.00	-13.18	-	-	AVG

802.11n-HT40- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



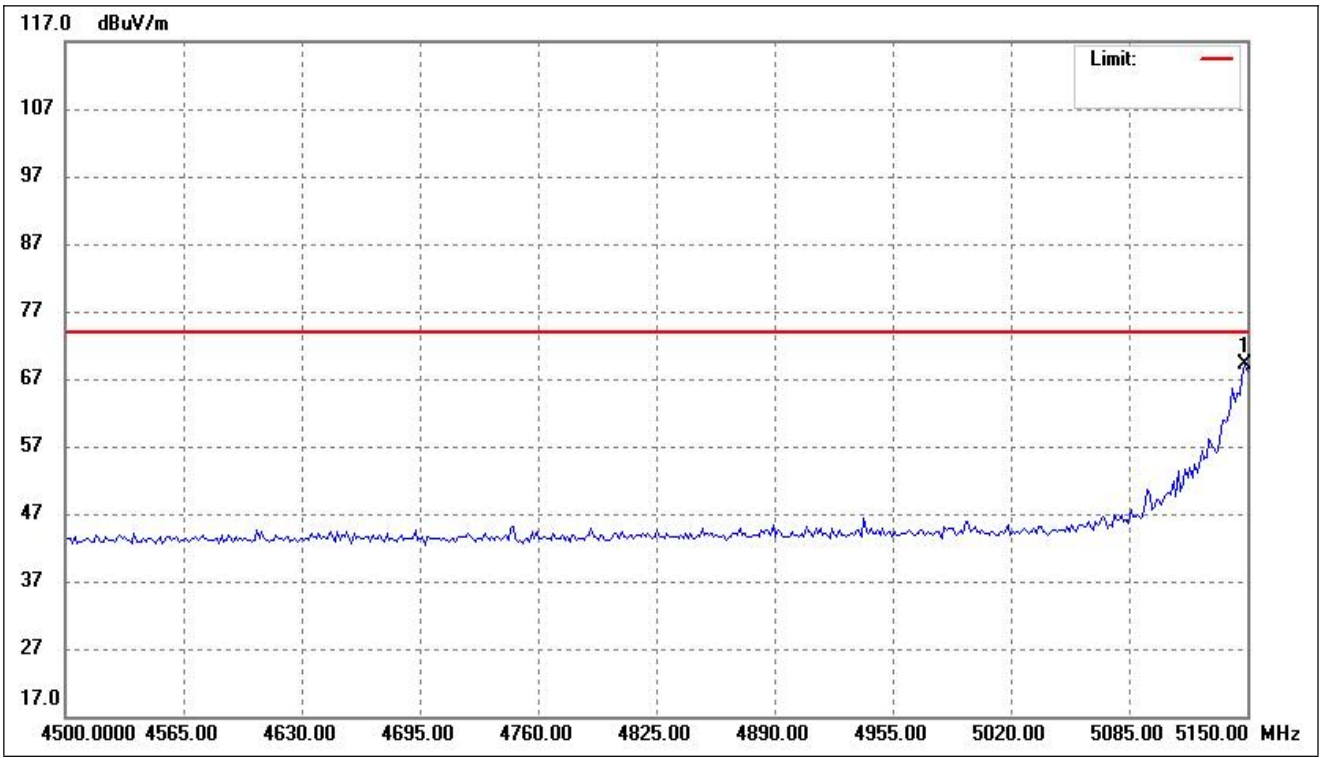
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5148.610	59.44	-4.77	54.67	74.00	-19.33	-	-	peak

802.11n-HT40- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



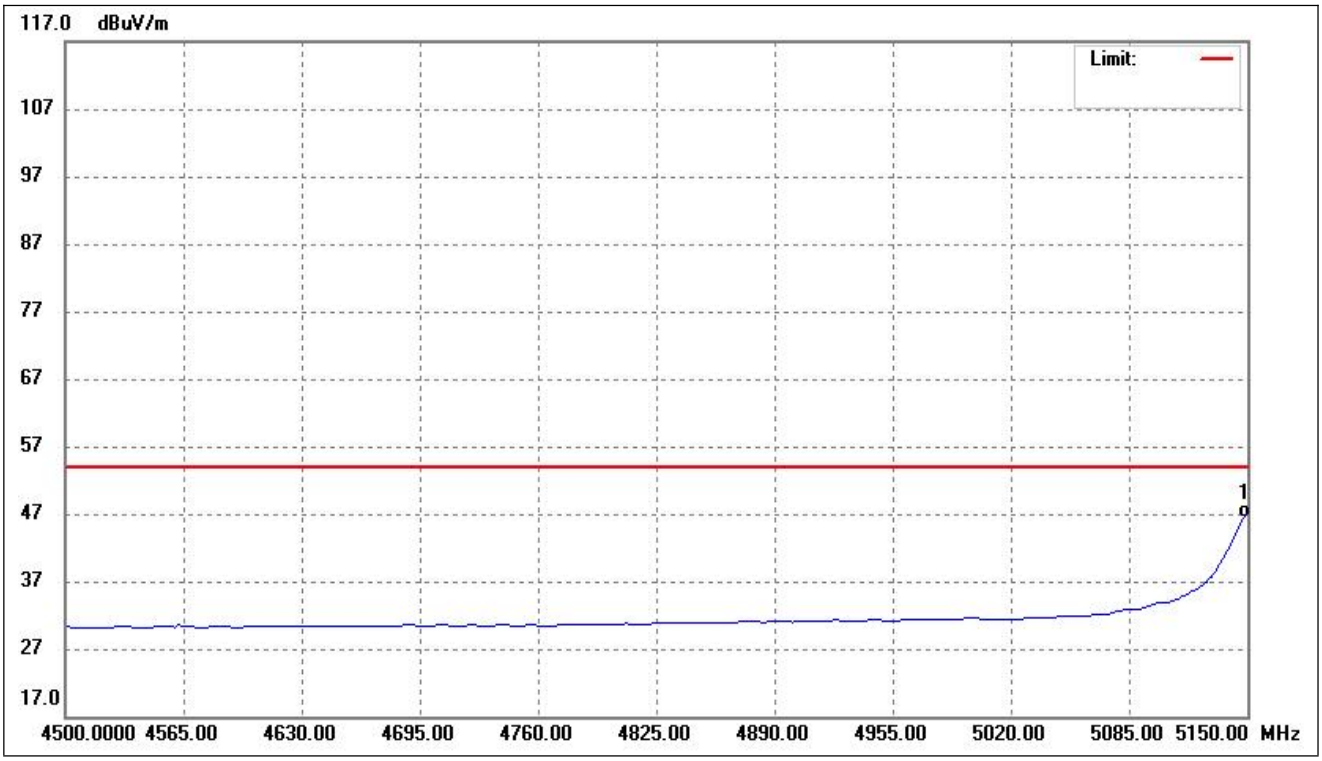
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5150.000	41.63	-4.77	36.86	54.00	-17.14	-	-	AVG

802.11ax-HE40- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



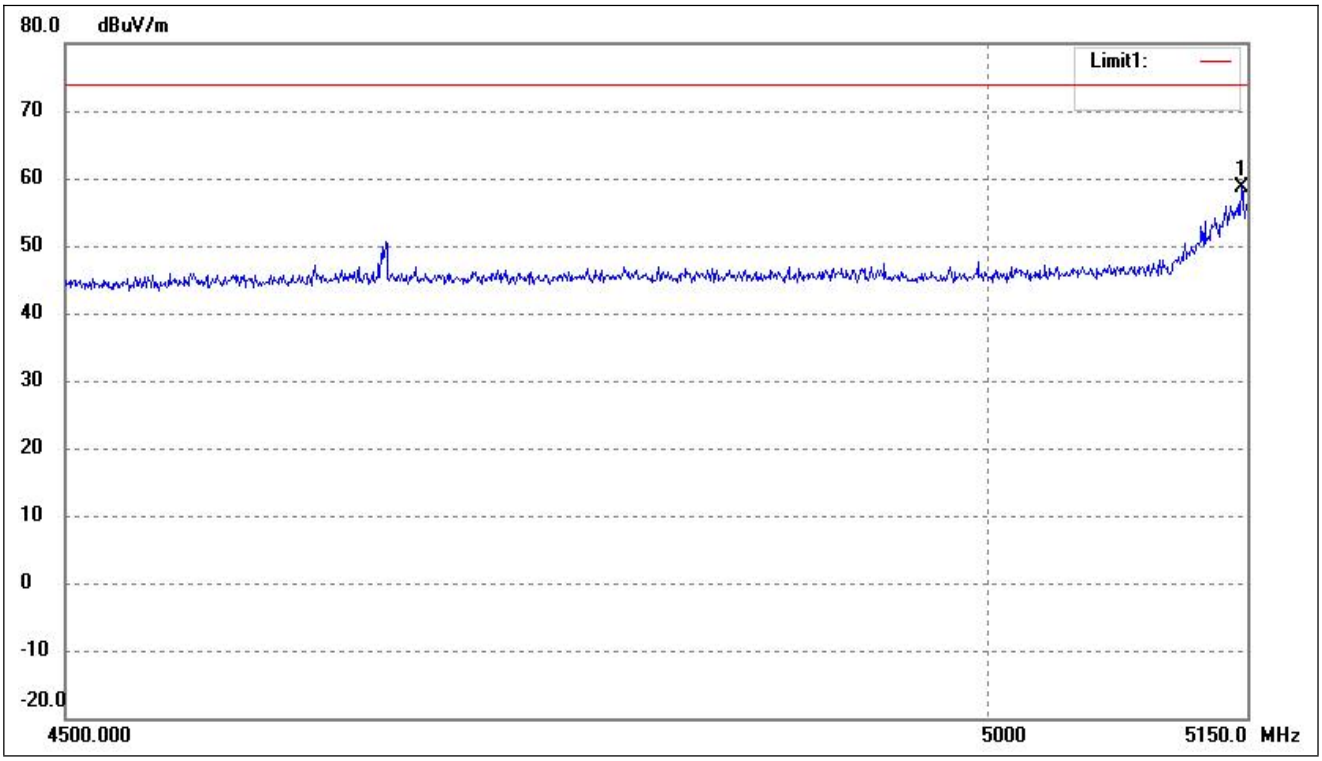
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5148.697	80.87	-11.66	69.21	74.00	-4.79	-	-	peak

802.11ax-HE40- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



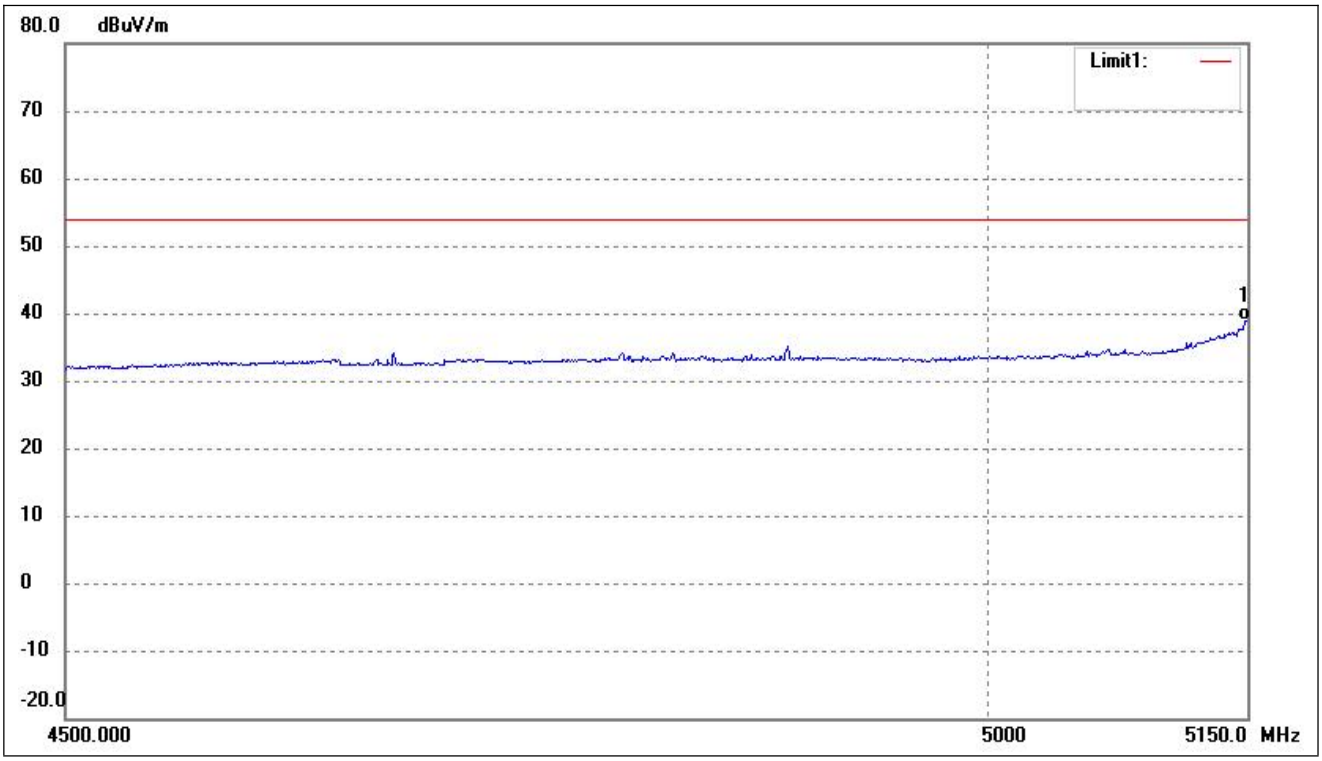
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5150.000	59.06	-11.65	47.41	54.00	-6.59	-	-	AVG

802.11ac-VHT80- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



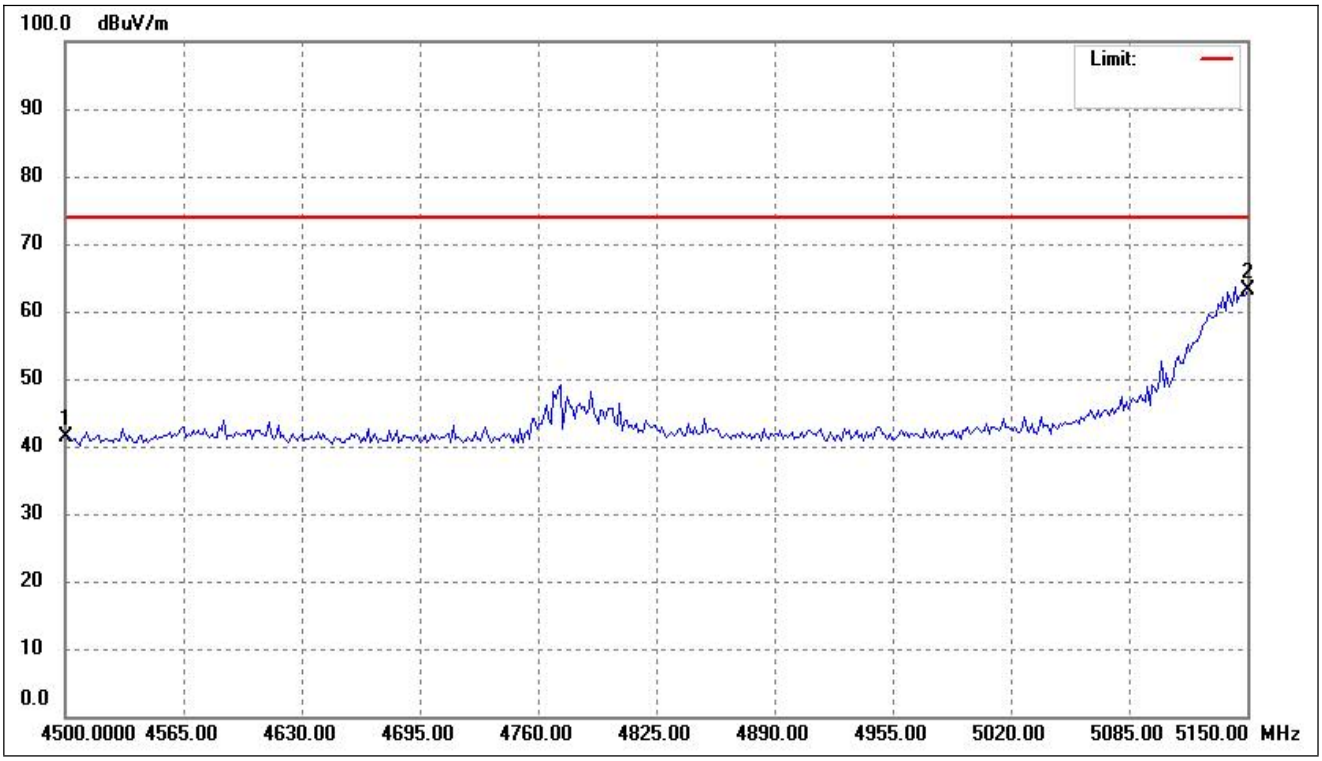
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5146.527	63.51	-4.78	58.73	74.00	-15.27	-	-	peak

802.11ac-VHT80- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



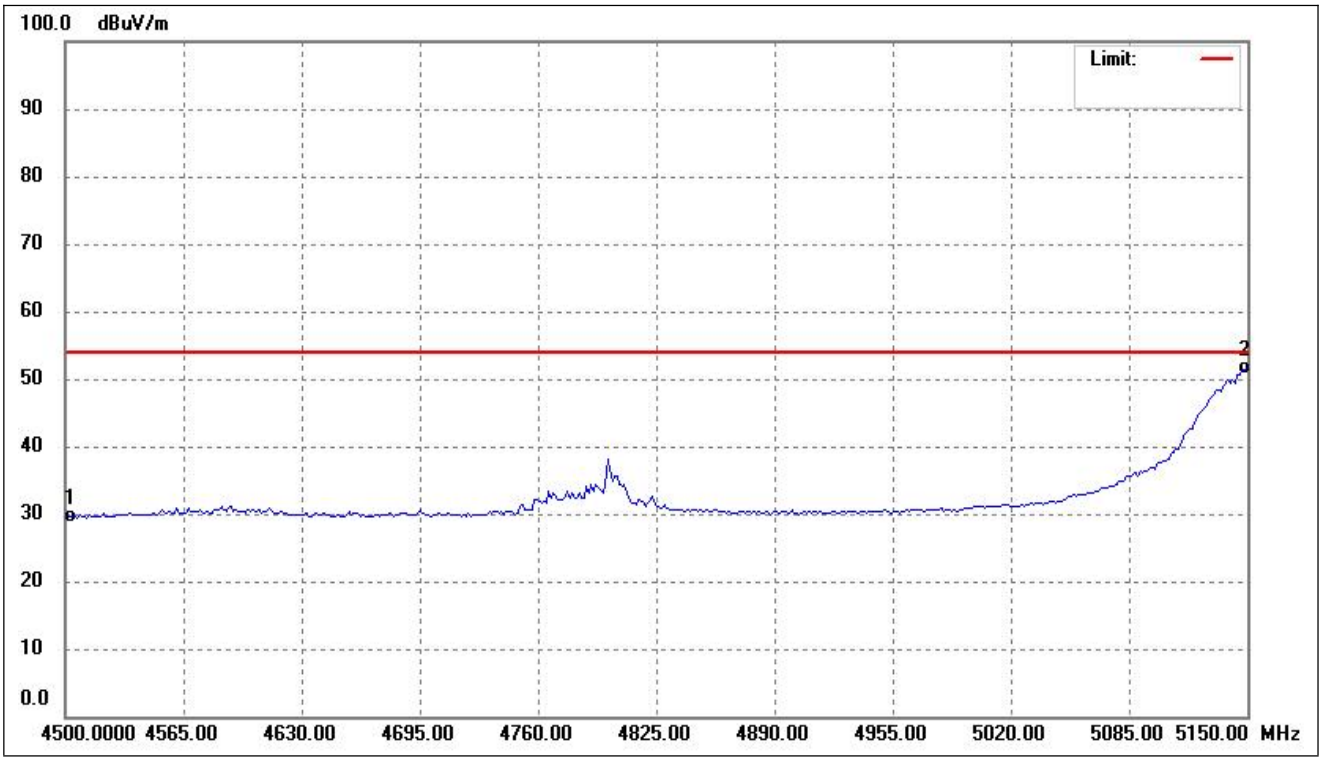
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	5148.610	43.64	-4.77	38.87	54.00	-15.13	-	-	AVG

802.11ax-HE80- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	4500.000	55.23	-13.87	41.36	74.00	-32.64	-	-	peak
2	5150.000	75.60	-12.53	63.07	74.00	-10.93	-	-	peak

802.11ax-HE80- Restricted Bandedge			
Test Channel	band 5.15-5.25GHz	Polarity:	Horizontal(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	4500.000	43.42	-13.87	29.55	54.00	-24.45	-	-	AVG
2	5150.000	64.13	-12.53	51.60	54.00	-2.40	-	-	AVG

Note: The Restricted Bandedge was tested in Horizontal /Vertical and the worst case position data was reported.

Remark: '-'Means' the test Degree and Height is not recorded by the test software and only show the worst case in the test report.

- For the frequency band 5.15-5.25GHz(802.11a)
- Antenna 0
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5180MHz)							
10360	54.21	7.11	61.32	74	-12.68	H	PK
10360	37.36	7.11	44.47	54	-9.53	H	AV
10360	56.22	7.11	63.33	74	-10.67	V	PK
10360	37.75	7.11	44.86	54	-9.14	V	AV
Middle Channel (5200MHz)							
10400	55.84	7.22	63.06	74	-10.94	H	PK
10400	36.65	7.22	43.87	54	-10.13	H	AV
10400	55.25	7.22	62.47	74	-11.53	V	PK
10400	37.13	7.22	44.35	54	-9.65	V	AV
High Channel (5240MHz)							
10480	56.61	7.69	64.30	74	-9.70	H	PK
10480	38.12	7.69	45.81	54	-8.19	H	AV
10480	56.97	7.69	64.66	74	-9.34	V	PK
10480	38.90	7.69	46.59	54	-7.41	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-38.68	-27
Highest	Above 5350	-40.12	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz, (802.11a)
- Antenna 1
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5180MHz)							
10360	56.43	7.11	63.54	74	-10.46	H	PK
10360	40.04	7.11	47.15	54	-6.85	H	AV
10360	56.81	7.11	63.92	74	-10.08	V	PK
10360	40.36	7.11	47.47	54	-6.53	V	AV
Middle Channel (5200MHz)							
10400	54.18	7.22	61.40	74	-12.60	H	PK
10400	37.54	7.22	44.76	54	-9.24	H	AV
10400	56.53	7.22	63.75	74	-10.25	V	PK
10400	38.94	7.22	46.16	54	-7.84	V	AV
High Channel (5240MHz)							
10480	55.36	7.69	63.05	74	-10.95	H	PK
10480	40.22	7.69	47.91	54	-6.09	H	AV
10480	56.18	7.69	63.87	74	-10.13	V	PK
10480	38.16	7.69	45.85	54	-8.15	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-42.87	-27
Highest	Above 5350	-39.31	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz (802.11n HT20)
- Antenna 0&Antenna 1
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5180MHz)							
10360	55.33	7.11	62.44	74	-11.56	H	PK
10360	40.02	7.11	47.13	54	-6.87	H	AV
10360	54.80	7.11	61.91	74	-12.09	V	PK
10360	36.87	7.11	43.98	54	-10.02	V	AV
Middle Channel (5200MHz)							
10400	55.75	7.22	62.97	74	-11.03	H	PK
10400	40.24	7.22	47.46	54	-6.54	H	AV
10400	56.17	7.22	63.39	74	-10.61	V	PK
10400	39.07	7.22	46.29	54	-7.71	V	AV
High Channel (5240MHz)							
10480	56.90	7.69	64.59	74	-9.41	H	PK
10480	37.95	7.69	45.64	54	-8.36	H	AV
10480	54.32	7.69	62.01	74	-11.99	V	PK
10480	38.01	7.69	45.70	54	-8.30	V	AV

- Out of Band edge 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-42.27	-27
Highest	Above 5350	-40.41	-27
Note: the data just list the worst cases			

Note: this EUT was tested in the low, high channel and the worst case position data was reported.

- For the frequency band 5.15-5.25GHz (802.11ax HE20)
- Antenna 0&Antenna 1
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5180MHz)							
10360	57.22	7.11	64.33	74	-9.67	H	PK
10360	39.20	7.11	46.31	54	-7.69	H	AV
10360	56.23	7.11	63.34	74	-10.66	V	PK
10360	37.76	7.11	44.87	54	-9.13	V	AV
Middle Channel (5200MHz)							
10400	54.52	7.22	61.74	74	-12.26	H	PK
10400	40.00	7.22	47.22	54	-6.78	H	AV
10400	56.89	7.22	64.11	74	-9.89	V	PK
10400	37.19	7.22	44.41	54	-9.59	V	AV
High Channel (5240MHz)							
10480	57.28	7.69	64.97	74	-9.03	H	PK
10480	37.88	7.69	45.57	54	-8.43	H	AV
10480	54.67	7.69	62.36	74	-11.64	V	PK
10480	38.59	7.69	46.28	54	-7.72	V	AV

- Out of Band edge 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-36.28	-27
Highest	Above 5350	-39.45	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz (802.11n HT40)
- Antenna 0&Antenna 1
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5190MHz)							
10380	57.40	7.89	65.29	74	-8.71	H	PK
10380	39.45	7.89	47.34	54	-6.66	H	AV
10380	54.57	7.89	62.46	74	-11.54	V	PK
10380	36.70	7.89	44.59	54	-9.41	V	AV
High Channel (5230MHz)							
10460	54.67	7.97	62.64	74	-11.36	H	PK
10460	36.77	7.97	44.74	54	-9.26	H	AV
10460	56.52	7.97	64.49	74	-9.51	V	PK
10460	40.03	7.97	48.00	54	-6.00	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-38.25	-27
Highest	Above 5350	-40.36	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz (802.11ax HE40)
- Antenna 0&Antenna 1
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel (5190MHz)							
10380	55.08	7.89	62.97	74	-11.03	H	PK
10380	36.51	7.89	44.40	54	-9.60	H	AV
10380	57.23	7.89	65.12	74	-8.88	V	PK
10380	37.49	7.89	45.38	54	-8.62	V	AV
High Channel (5230MHz)							
10460	55.54	7.97	63.51	74	-10.49	H	PK
10460	40.38	7.97	48.35	54	-5.65	H	AV
10460	56.49	7.97	64.46	74	-9.54	V	PK
10460	40.07	7.97	48.04	54	-5.96	V	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-41.28	-27
Highest	Above 5350	-40.32	-27
Note: the data just list the worst cases			

- Out of Band edge for 5725-5850MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5715	-41.36	-27
	5715 to 5725	-38.69	-17
Highest	5850 to 5860	-36.14	-17
	Above 5860	-41.28	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHz(802.11ac-VHT80)
- Antenna 0&Antenna 1
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
5210MHz							
10420	55.55	7.53	63.08	74	-10.92	H	PK
10420	39.21	7.53	46.74	54	-7.26	H	AV
10420	54.60	7.53	62.13	74	-11.87	H	PK
10420	39.41	7.53	46.94	54	-7.06	H	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-39.39	-27
Highest	Above 5350	-40.25	-27
Note: the data just list the worst cases			

- For the frequency band 5.15-5.25GHzz (802.11ax HE80)
- Antenna 0&Antenna 1
- Harmonics And Spurious Emissions

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
5210MHz							
10420	56.60	7.53	64.13	74	-9.87	H	PK
10420	38.62	7.53	46.15	54	-7.85	H	AV
10420	56.64	7.53	64.17	74	-9.83	H	PK
10420	36.50	7.53	44.03	54	-9.97	H	AV

- Out of Band edge for 5150-5250MHz

Test CH.	Test Segment	Result	Limit
	MHz	dBm/MHz	dBm/MHz
Lowest	Below 5150	-41.58	-27
Highest	Above 5350	-39.31	-27
Note: the data just list the worst cases			

Note: Testing is carried out with frequency rang 9kHz to 40GHz, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

9. Frequency Stability

9.1 Standard Applicable

According to §15.407(g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

9.2 Test Procedure

According to §2.1055, the following test procedure was performed.
The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.
The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode.

9.3 Summary of Test Results/Plots

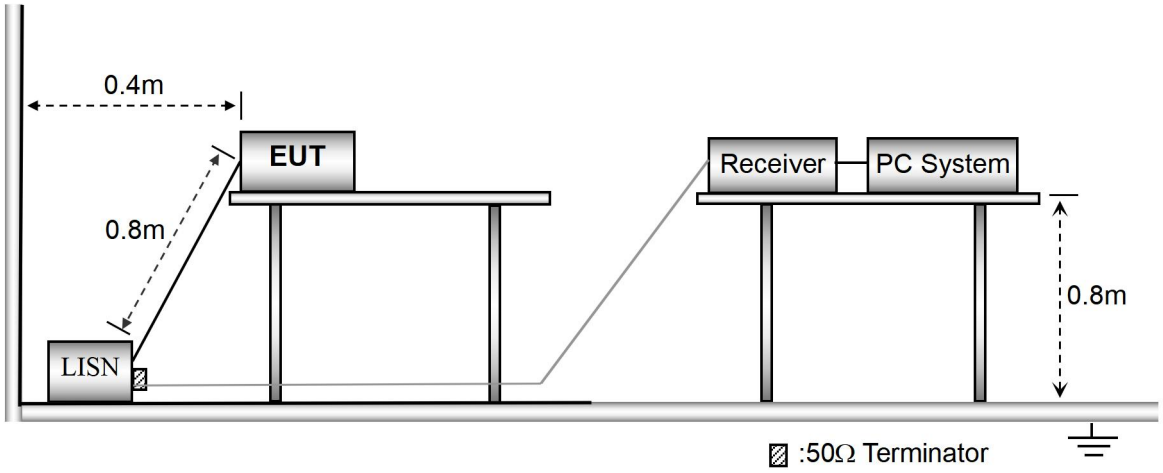
Please refer to Appendix D

10 Conducted Emissions

10.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle. The spacing between the peripherals was 10cm.

10.2 Basic Test Setup Block Diagram



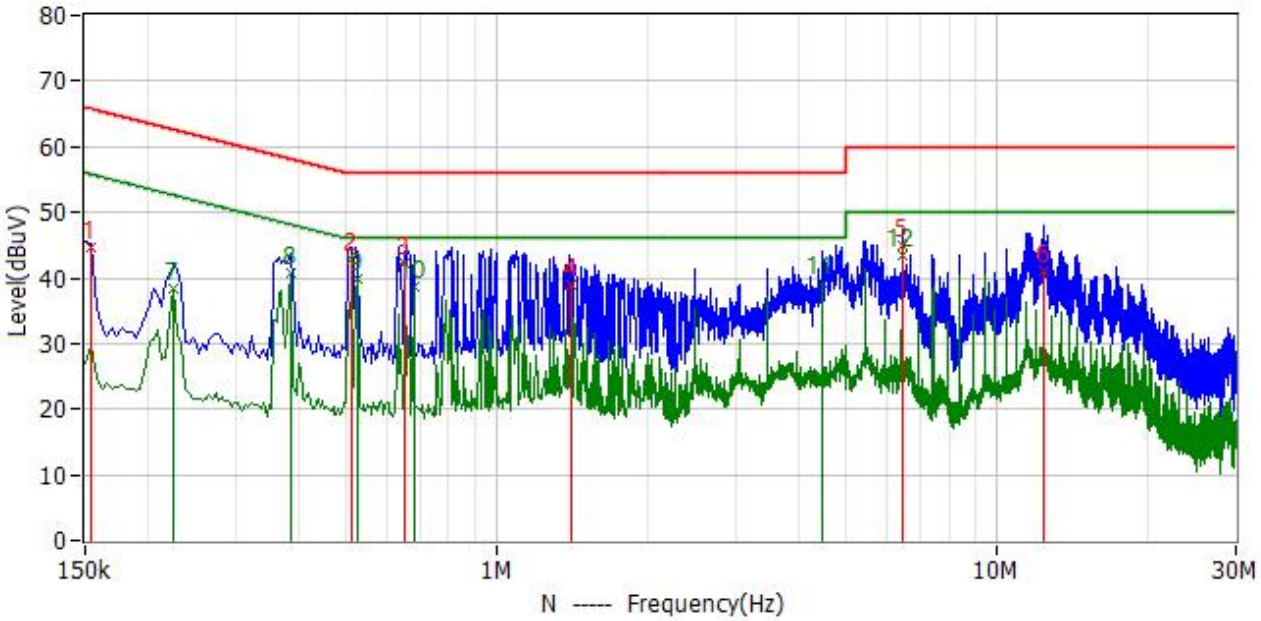
10.3 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency..... 150kHz
Stop Frequency..... 30MHz
Sweep Speed.....Auto
IF Bandwidth..... 10kHz
Quasi-Peak Adapter Bandwidth.....9kHz
Quasi-Peak Adapter Mode.....Normal

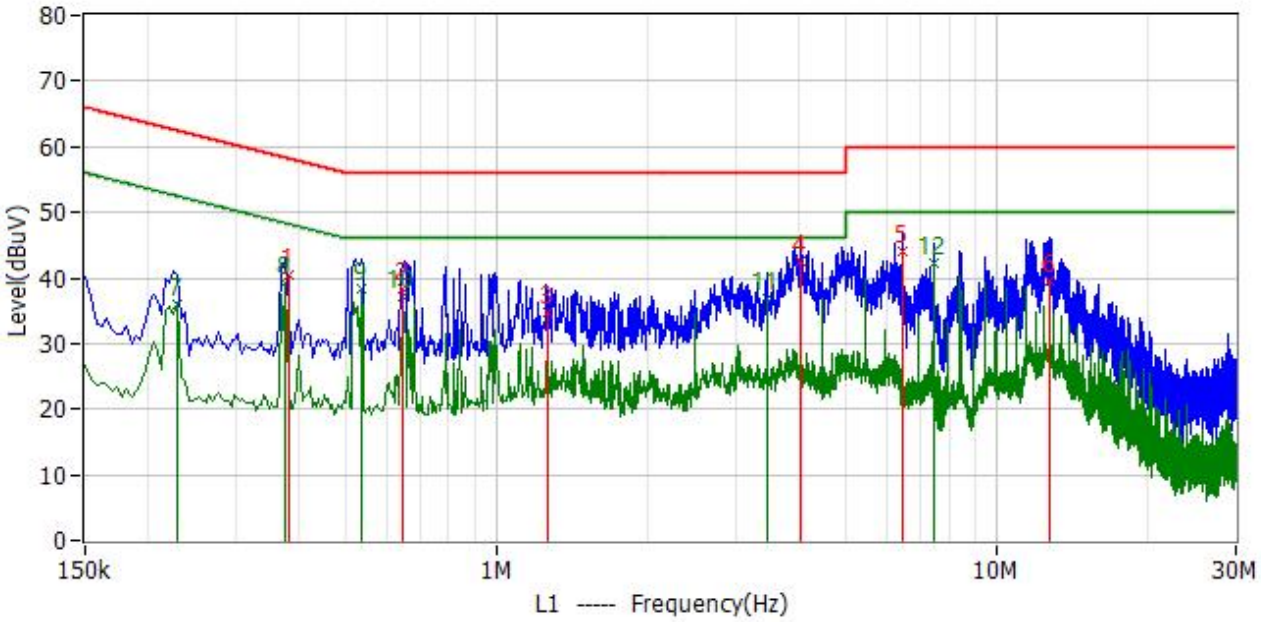
10.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral



No.	Frequency	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Delta dB	Detector
1	154.000kHz	34.8	9.7	44.5	65.8	-21.3	QP
2	514.000kHz	33.0	9.7	42.7	56.0	-13.3	QP
3	654.000kHz	32.5	9.7	42.2	56.0	-13.8	QP
4	1.402MHz	29.5	9.6	39.1	56.0	-16.9	QP
5	6.446MHz	35.1	9.7	44.8	60.0	-15.2	QP
6	12.386MHz	31.1	9.8	40.9	60.0	-19.1	QP
7*	226.000kHz	28.7	9.6	38.3	52.6	-14.3	AV
8*	386.000kHz	31.0	9.6	40.6	48.1	-7.5	AV
9*	526.000kHz	30.1	9.7	39.8	46.0	-6.2	AV
10*	682.000kHz	28.9	9.7	38.6	46.0	-7.4	AV
11*	4.462MHz	29.7	9.6	39.3	46.0	-6.7	AV
12*	6.446MHz	33.6	9.7	43.3	50.0	-6.7	AV

Test Mode	Communication	AC120V 60Hz	Polarity:	Line



No.	Frequency	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Delta dB	Detector
1	382.000kHz	30.8	9.6	40.4	58.2	-17.8	QP
2	646.000kHz	28.7	9.7	38.4	56.0	-17.6	QP
3	1.262MHz	25.2	9.6	34.8	56.0	-21.2	QP
4	4.034MHz	32.8	9.6	42.4	56.0	-13.6	QP
5	6.454MHz	34.2	9.7	43.9	60.0	-16.1	QP
6	12.694MHz	29.8	9.8	39.6	60.0	-20.4	QP
7*	230.000kHz	26.5	9.6	36.1	52.4	-16.3	AV
8*	378.000kHz	29.8	9.6	39.4	48.3	-9.0	AV
9*	534.000kHz	28.8	9.7	38.5	46.0	-7.5	AV
10*	650.000kHz	27.6	9.7	37.3	46.0	-8.7	AV
11*	3.474MHz	27.2	9.6	36.8	46.0	-9.2	AV
12*	7.446MHz	32.5	9.7	42.2	50.0	-7.8	AV

APPENDIX PHOTOGRAPHS

Please refer to “ANNEX”

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