

TEST REPORT

Applicant: Wyrestorm Technologies ProAV Corporation

Address of Applicant: 27 wood road suite 100, Round Lake, New York 12151, United States

Manufacturer: Wyrestorm Technologies ProAV Corporation

Address of Manufacturer: 27 wood road suite 100, Round Lake, New York 12151, United States

Factory: Shen Zhen Proitav Technology Co.,Ltd

Address of Factory: 301-401, Building 16, Hejing Industrial Park, No.87, Hexiu West Road, Zhancheng Community, Fuhai St., Baoan District, Shenzhen, China

Equipment Under Test (EUT)

Product Name: Video Bar

Model No.: APO-VX20-UC v2(VB20-A00)

Trade Mark: WyreStorm

FCC ID: 2BAXSAPOVX20UCV2

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: April 21, 2026

Date of Test: April 21, 2026-July 10, 2026

Date of report issued: July 14, 2026

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Laboratory Manager

This 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 compiler and approver.

2 Version

Version No.	Date	Description
00	July 14, 2026	Original

Tested By:

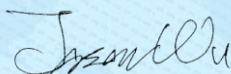


Date:

July 14, 2026

Test Engineer

Prepared By:

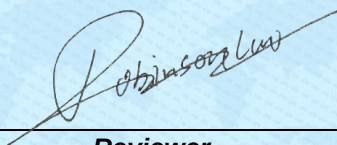


Date:

July 14, 2026

Project Engineer

Check By:



Date:

July 14, 2026

Reviewer

3 Contents

	Page
1 COVER PAGE	1
2 VERSION	2
3 CONTENTS	3
4 TEST SUMMARY	4
5 GENERAL INFORMATION	5
5.1 GENERAL DESCRIPTION OF EUT	5
5.2 TEST MODE	7
5.3 DESCRIPTION OF SUPPORT UNITS	7
5.4 DEVIATION FROM STANDARDS	7
5.5 ABNORMALITIES FROM STANDARD CONDITIONS	7
5.6 TEST FACILITY	7
5.7 TEST LOCATION	7
5.8 ADDITIONAL INSTRUCTIONS	7
6 TEST INSTRUMENTS LIST	8
7 TEST RESULTS AND MEASUREMENT DATA	10
7.1 ANTENNA REQUIREMENT	10
7.2 CONDUCTED EMISSIONS	11
7.3 CONDUCTED OUTPUT POWER	16
7.4 CHANNEL BANDWIDTH	17
7.5 POWER SPECTRAL DENSITY	18
7.6 SPURIOUS EMISSION IN NON-RESTRICTED & RESTRICTED BANDS	19
7.6.1 Conducted Emission Method	19
7.6.2 Radiated Emission Method	20
8 TEST SETUP PHOTO	37
9 EUT CONSTRUCTIONAL DETAILS	37

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Output Power	15.247 (b)(3)	Pass
Channel Bandwidth	15.247 (a)(2)	Pass
Power Spectral Density	15.247 (e)	Pass
Band Edge	15.247(d)	Pass
Spurious Emission	15.205/15.209	Pass

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2020
3. N/A: Not applicable.

Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	Duty cycle	$\pm 0.37\%$
3	Occupied Bandwidth	$\pm 3\%$
4	RF conducted power	$\pm 0.75\text{dB}$
5	RF power density	$\pm 3\text{dB}$
6	Conducted Spurious emissions	$\pm 2.58\text{dB}$
7	AC Power Line Conducted Emission	$\pm 3.44\text{dB}$ (0.15MHz ~ 30MHz)
8	Radiated Spurious emission test	$\pm 3.1\text{dB}$ (9kHz-30MHz)
		$\pm 3.8039\text{dB}$ (30MHz-200MHz)
		$\pm 3.9679\text{dB}$ (200MHz-1GHz)
		$\pm 4.29\text{dB}$ (1GHz-18GHz)
		$\pm 3.30\text{dB}$ (18GHz-40GHz)
9	Temperature test	$\pm 1^\circ\text{C}$
10	Humidity test	$\pm 3\%$
11	Time	$\pm 3\%$

5 General Information

5.1 General Description of EUT

Product Name:	Video Bar
Model No.:	APO-VX20-UC v2(VB20-A00)
Test sample(s) ID:	GTS2026040011-1
Sample(s) Status:	Engineer sample
S/N:	N/A
Operation Frequency:	2402MHz~2480MHz
Channel Numbers:	40
Channel Separation:	2MHz
Modulation Type:	GFSK
Data Rate:	LE 1M PHY: 1Mbps LE 2M PHY: 2Mbps
Antenna Type:	Integral Antenna
Antenna Gain:	2.92dBi(Declared by applicant)
Power Supply:	Adapter 1 Model: FJ-GN212020006000D Input: AC 100-240V, 50/60Hz, 2.5A Max Output: DC 20.0V, 6.0A, 120.0W Adapter 2 Model: DSA-120PFG-193 200600 Input: AC 100-240V, 50/60Hz, 2.0A Output: DC 20.0V, 6.0A, 120.0W

Disclaimer statement:

1. Antenna gain information provided by the customer, and the laboratory is not responsible for its authenticity.
2. The information in this section is provided by the applicant or manufacturer, GTS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402 MHz	11	2422 MHz	21	2442 MHz	31	2462 MHz
2	2404 MHz	12	2424 MHz	22	2444 MHz	32	2464 MHz
3	2406 MHz	13	2426 MHz	23	2446 MHz	33	2466 MHz
4	2408 MHz	14	2428 MHz	24	2448 MHz	34	2468 MHz
5	2410 MHz	15	2430 MHz	25	2450 MHz	35	2470 MHz
6	2412 MHz	16	2432 MHz	26	2452 MHz	36	2472 MHz
7	2414 MHz	17	2434 MHz	27	2454 MHz	37	2474 MHz
8	2416 MHz	18	2436 MHz	28	2456 MHz	38	2476 MHz
9	2418 MHz	19	2438 MHz	29	2458 MHz	39	2478 MHz
10	2420 MHz	20	2440 MHz	30	2460 MHz	40	2480 MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2440MHz
The Highest channel	2480MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
-------------------	---

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations: ● FCC—Registration No.: 381383 Designation Number: CN5029 Global United Technology Services Co., Ltd., Shenzhen 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 files. ● ISED—Registration No.: 9079A CAB identifier: CN0091 The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of ISED for radio equipment testing ● NVLAP (LAB CODE:600179-0) Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).
--

5.7 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

5.8 Additional Instructions

Test Software	Special test software provided by manufacturer
Power level setup	Default

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Apr. 10, 2026	Apr. 09, 2027
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Apr. 10, 2026	Apr. 09, 2027
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	Apr. 11, 2026	Apr. 10, 2027
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	Apr. 11, 2026	Apr. 10, 2027
6	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	Jul. 11, 2025	Jul 10, 2026
7	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov.22, 2025	Nov.21, 2026
8	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	Apr. 10, 2026	Apr. 09, 2027
9	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	Apr. 10, 2026	Apr. 09, 2027
10	Horn Antenna (18GH-40GHz)	Schwarzbeck	BBHA 9170	GTS691	Apr. 11, 2026	Apr. 10, 2027
11	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	Mar. 10, 2026	Mar. 09, 2027
12	Amplifier	/	LNA-1000-30S	GTS650	Apr. 10, 2026	Apr. 09, 2027
13	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS692	Nov. 24, 2025	Nov. 23, 2026
14	Wideband Amplifier	/	WDA-01004000-15P35	GTS602	Apr. 10, 2026	Apr. 09, 2027
15	Thermo meter	JINCHUANG	GSP-8A	GTS643	Apr. 13, 2026	Apr. 12, 2027
16	RE cable 1	GTS	N/A	GTS675	Jul. 11, 2025	Jul. 10, 2026
17	RE cable 2	GTS	N/A	GTS676	Jul. 11, 2025	Jul. 10, 2026
18	RE cable 3	GTS	N/A	GTS677	Jul. 11, 2025	Jul. 10, 2026
19	RE cable 4	GTS	N/A	GTS678	Jul. 11, 2025	Jul. 10, 2026
20	RE cable 5	GTS	N/A	GTS679	Jul. 11, 2025	Jul. 10, 2026
21	RE cable 6	GTS	N/A	GTS680	Jul. 11, 2025	Jul. 10, 2026
22	RE cable 7	GTS	N/A	GTS681	Jul. 11, 2025	Jul. 10, 2026
23	RE cable 8	GTS	N/A	GTS682	Jul. 11, 2025	Jul. 10, 2026
24	EMI Test Software	AUDIX	E3-6.100614a	GTS725	N/A	N/A

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	Jul. 12, 2022	Jul. 11, 2027
2	EMI Test Receiver	R&S	ESCI 7	GTS552	Apr. 11, 2026	Apr. 10, 2027
3	LISN	ROHDE & SCHWARZ	ENV216	GTS226	Apr. 10, 2026	Apr. 09, 2027
4	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
5	Thermo meter	JINCHUANG	GSP-8A	GTS642	Apr. 14, 2026	Apr. 13, 2027
6	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	Apr. 11, 2026	Apr. 10, 2027
7	ISN	SCHWARZBECK	NTFM 8158	GTS565	Apr. 10, 2026	Apr. 09, 2027
8	High voltage probe	SCHWARZBECK	TK9420	GTS537	Apr. 10, 2026	Apr. 09, 2027
9	Antenna end assembly	Weinschel	1870A	GTS560	Apr. 10, 2026	Apr. 09, 2027
10	EMI Test Software	AUDIX	E3-6.100622	GTS726	N/A	N/A
11	Current probe	CYBERTEK	EM5011	GTS698	Jan. 27, 2026	Jan. 26, 2027

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Wireless Connectivity Test Set	Anritsu	MT8862A	SN6272327180	Aug. 26, 2025	Aug. 25, 2026
2	Bluetooth Test Set	Anritsu	MT8852B	SN6262097212	Aug. 26, 2025	Aug. 25, 2026
3	EXA Signal Analyzer	Keysight	N9010B	MY60241168	Aug. 26, 2025	Aug. 25, 2026
4	Vector Signal Generator	Keysight	N5182B	MY61250192	Apr. 16, 2026	Apr. 15, 2027
5	Analog Signal Generator	Keysight	N5171B	MY61252573	Aug. 26, 2025	Aug. 25, 2026
6	RF Control Unit and Power Test Unit	Tonscend	JS0806-2	SN21F8060437	Apr. 16, 2026	Apr. 15, 2027
7	Power Control Unit	Tonscend	JS0806-4ADC	SN21C8060386	N/A	N/A
8	Wideband Radio Communication Tester	R&S	CWM500	GTS569	Aug. 26, 2025	Aug. 25, 2026
9	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	Apr. 10, 2026	Apr. 09, 2027
10	Thermo meter	JINCHUANG	GSP-8A	GTS641	Apr. 14, 2026	Apr. 13, 2027
11	Test Software	Tonscend	JS1120-3 V3.5.39	N/A	N/A	N/A

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	KUMAO	SF132	GTS647	Jul. 16, 2025	Jul. 15, 2026

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The antenna is integral antenna, reference to the appendix II for details	

7.2 Conducted Emissions

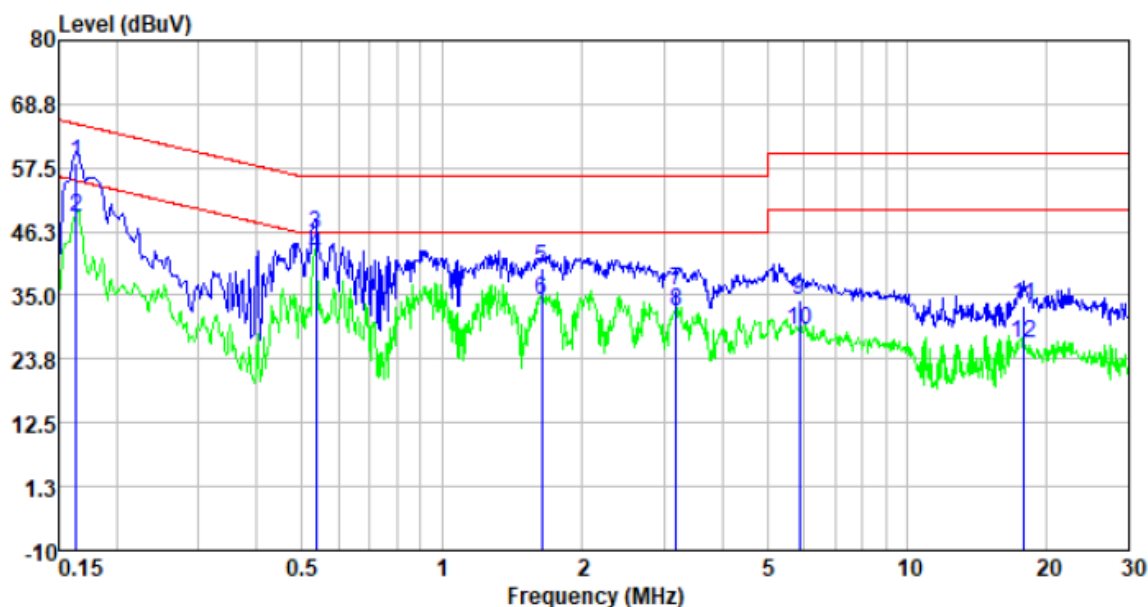
Test Requirement:	FCC Part15 C Section 15.207						
Test Method:	ANSI C63.10:2020						
Test Frequency Range:	150KHz to 30MHz						
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto						
Limit:	Frequency range (MHz)		Limit (dBuV)				
			Quasi-peak		Average		
	0.15-0.5		66 to 56*		56 to 46*		
	0.5-5		56		46		
	5-30		60		50		
* Decreases with the logarithm of the frequency.							
Test setup:	Reference Plane 40cm LISN 40cm AUX Equipment E.U.T 80cm 40cm LISN Filter AC power EMI Receiver Test table/Insulation plane Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m						
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2020 on conducted measurement.						
Test Instruments:	Refer to section 6.0 for details						
Test mode:	Refer to section 5.2 for details						
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar	
Test voltage:	AC 120V, 60Hz						
Test results:	Pass						

Measurement data

Pre-scan all test modes, found worst case at 2440MHz bandwidth, and so only show the test result of it. Both 1MHz and 2MHz bandwidth were tested and passed, only report the worst condition (GFSK_1MHz)

Adapter 1:

Line:

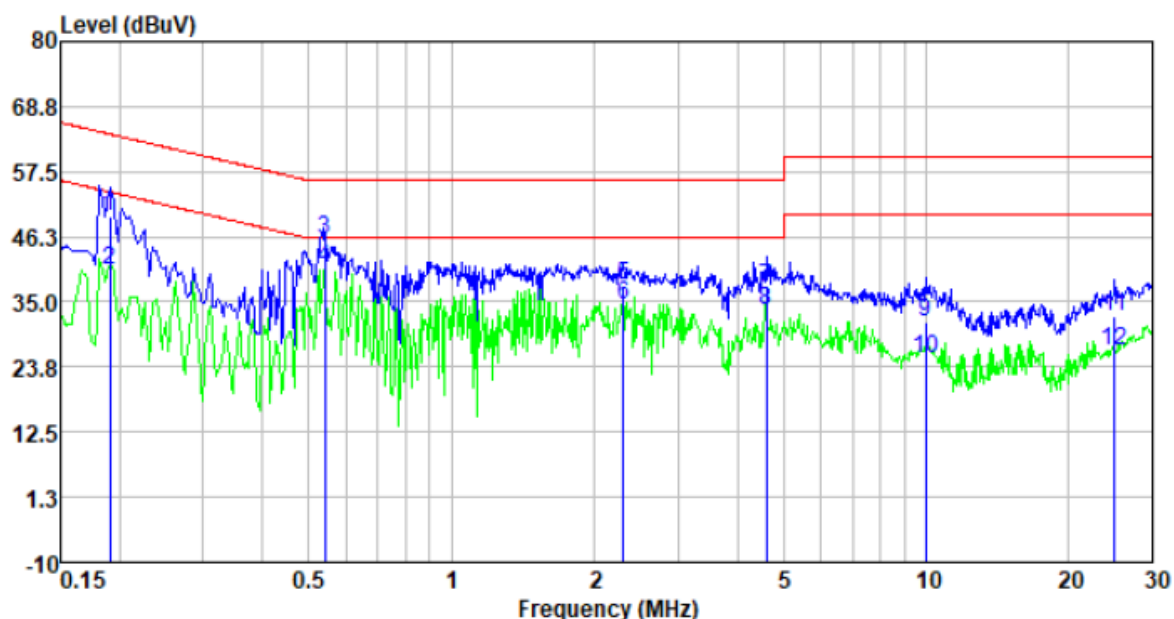


Freq	Reading level	Correct Factor	Final level	Limit level	Over limit	Remark
MHz	dBuV	dB	dBuV	level	dBuV	
0.16	38.92	19.60	58.52	65.30	-6.78	QP
0.16	29.29	19.60	48.89	55.30	-6.41	Average
0.53	26.34	19.60	45.94	56.00	-10.06	QP
0.53	22.61	19.60	42.21	46.00	-3.79	Average
1.64	20.20	19.65	39.85	56.00	-16.15	QP
1.64	14.55	19.65	34.20	46.00	-11.80	Average
3.19	16.23	19.67	35.90	56.00	-20.10	QP
3.19	12.62	19.67	32.29	46.00	-13.71	Average
5.87	14.60	19.70	34.30	60.00	-25.70	QP
5.87	9.09	19.70	28.79	50.00	-21.21	Average
17.85	13.36	19.89	33.25	60.00	-26.75	QP
17.85	6.69	19.89	26.58	50.00	-23.42	Average

Note:Correct Factor (dB)=LISN Factor (dB) + Cable Loss (dB)

Final level (dBuV)=Reading level (dBuV) + Correct Factor (dB)

Neutral:

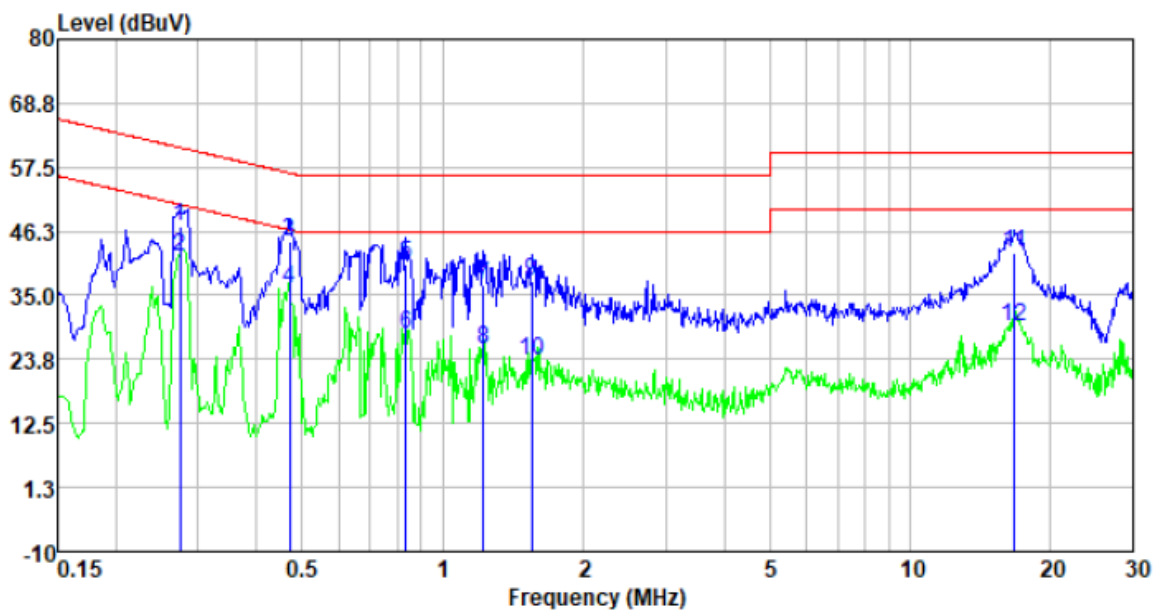


Freq	Reading level	Correct Factor	Final level	Limit level	Over limit	Remark
MHz	dBuV	dB	dBuV	level	dBuV	
0.19	30.23	19.60	49.83	64.02	-14.19	QP
0.19	20.90	19.60	40.50	54.02	-13.52	Average
0.54	26.17	19.60	45.77	56.00	-10.23	QP
0.54	21.25	19.60	40.85	46.00	-5.15	Average
2.30	18.21	19.66	37.87	56.00	-18.13	QP
2.30	14.96	19.66	34.62	46.00	-11.38	Average
4.60	17.67	19.68	37.35	56.00	-18.65	QP
4.60	13.79	19.68	33.47	46.00	-12.53	Average
9.97	11.76	19.72	31.48	60.00	-28.52	QP
9.97	5.46	19.72	25.18	50.00	-24.82	Average
24.92	12.39	20.12	32.51	60.00	-27.49	QP
24.92	6.40	20.12	26.52	50.00	-23.48	Average

Note: Correct Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
Final level (dBuV) = Reading level (dBuV) + Correct Factor (dB)

Adapter 2:

Line:

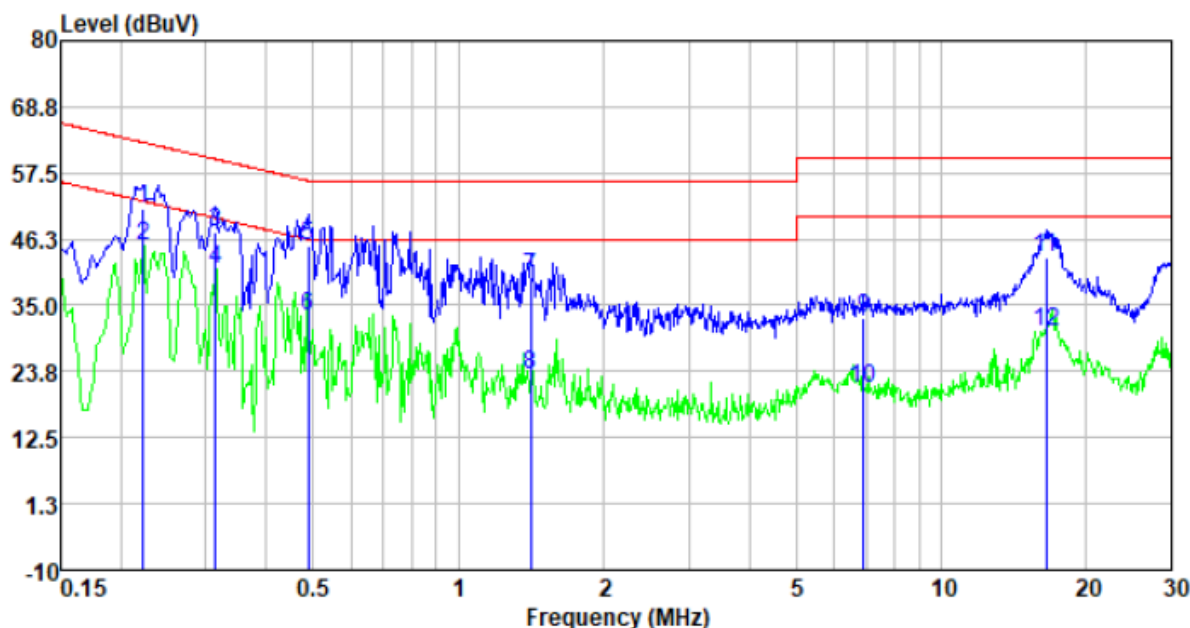


Freq	Reading level	Correct Factor	Final level	Limit level	Over limit	Remark
MHz	dBuV	dB	dBuV	level	dBuV	
0.27	27.36	19.60	46.96	60.98	-14.02	QP
0.27	22.35	19.60	41.95	50.98	-9.03	Average
0.47	24.73	19.60	44.33	56.49	-12.16	QP
0.47	16.71	19.60	36.31	46.49	-10.18	Average
0.83	20.76	19.61	40.37	56.00	-15.63	QP
0.83	8.72	19.61	28.33	46.00	-17.67	Average
1.22	17.28	19.62	36.90	56.00	-19.10	QP
1.22	6.02	19.62	25.64	46.00	-20.36	Average
1.55	17.98	19.65	37.63	56.00	-18.37	QP
1.55	3.79	19.65	23.44	46.00	-22.56	Average
16.75	22.57	19.85	42.42	60.00	-17.58	QP
16.75	9.66	19.85	29.51	50.00	-20.49	Average

Note: Correct Factor (dB) = LISN Factor (dB) + Cable Loss (dB)

Final level (dBuV) = Reading level (dBuV) + Correct Factor (dB)

Neutral:



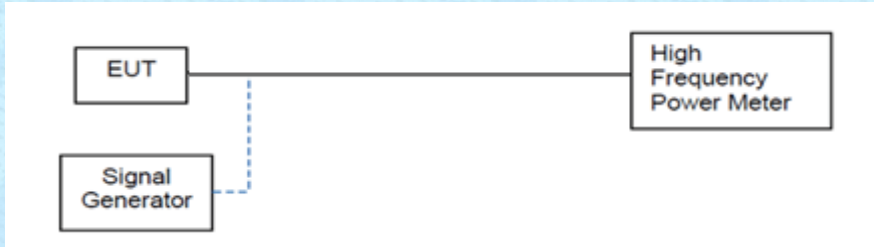
Freq	Reading level	Correct Factor	Final level	Limit level	Over limit	Remark
MHz	dBuV	dB	dBuV	level	dBuV	
0.22	31.74	19.60	51.34	62.74	-11.40	QP
0.22	25.56	19.60	45.16	52.74	-7.58	Average
0.31	27.78	19.60	47.38	59.88	-12.50	QP
0.31	21.61	19.60	41.21	49.88	-8.67	Average
0.49	25.38	19.60	44.98	56.19	-11.21	QP
0.49	13.64	19.60	33.24	46.19	-12.95	Average
1.41	20.15	19.63	39.78	56.00	-16.22	QP
1.41	3.67	19.63	23.30	46.00	-22.70	Average
6.91	12.99	19.70	32.69	60.00	-27.31	QP
6.91	1.22	19.70	20.92	50.00	-29.08	Average
16.49	23.36	19.85	43.21	60.00	-16.79	QP
16.49	10.57	19.85	30.42	50.00	-19.58	Average

Note: Correct Factor (dB)=LISN Factor (dB) + Cable Loss (dB)
Final level (dBuV)=Reading level (dBuV) + Correct Factor (dB)

Notes:

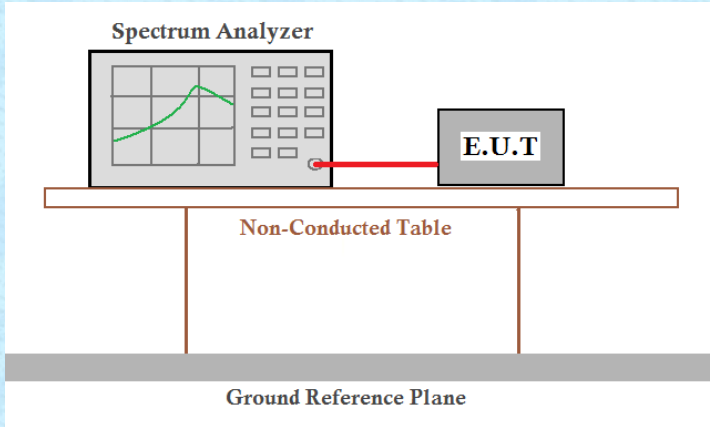
1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission

7.3 Conducted Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2020 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

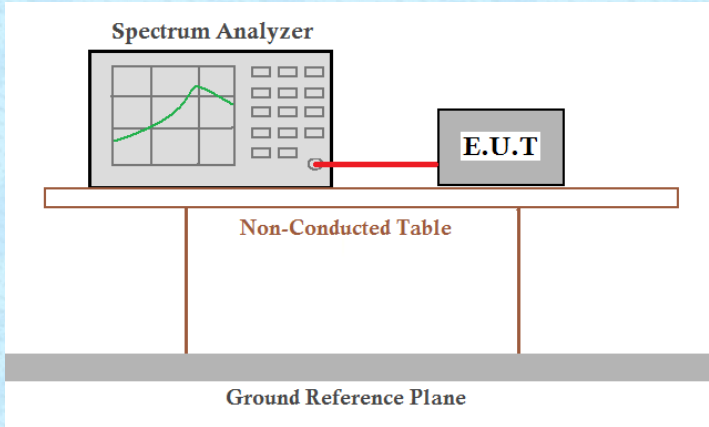
Measurement Data: The detailed test data see Appendix for BLE.

7.4 Channel Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2020 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	>500KHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer, showing a frequency spectrum on its screen, is connected to an E.U.T. (Equipment Under Test) by a red cable. Both the Spectrum Analyzer and the E.U.T. are positioned on a Non-Conducted Table. This table is supported by a Ground Reference Plane, which is represented by a thick grey bar at the bottom of the setup area.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data: The detailed test data see Appendix for BLE.

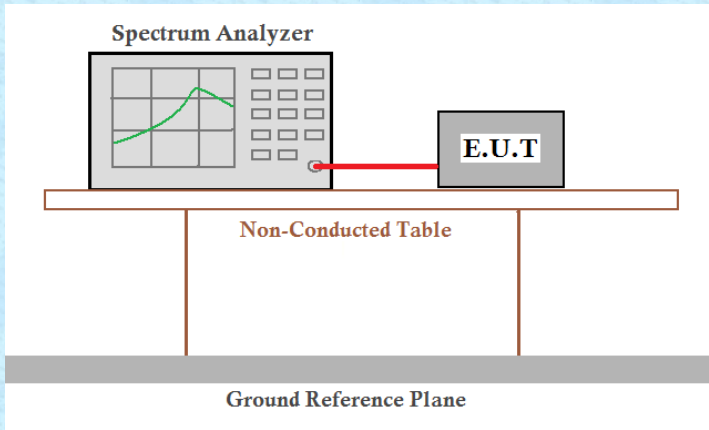
7.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2020 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	8dBm/3kHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer, shown with a green trace on its screen, is connected to an E.U.T. (Equipment Under Test) by a red cable. Both the Spectrum Analyzer and the E.U.T. are positioned on a Non-Conducted Table. This table is supported by a Ground Reference Plane, which is represented by a thick grey bar at the bottom of the setup.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data: The detailed test data see Appendix for BLE.

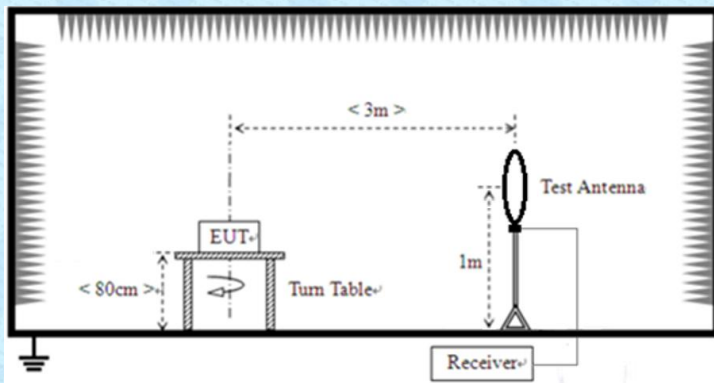
7.6 Spurious Emission in Non-restricted & restricted Bands

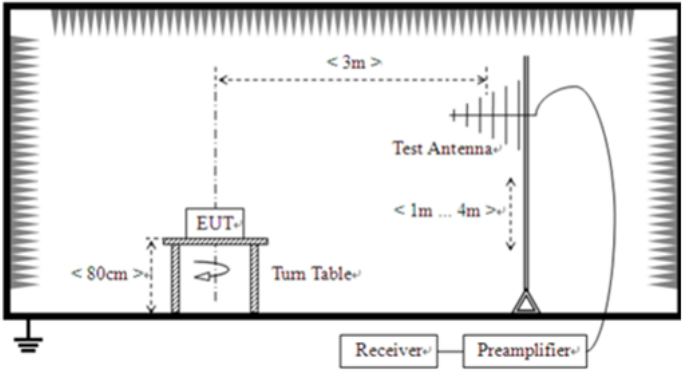
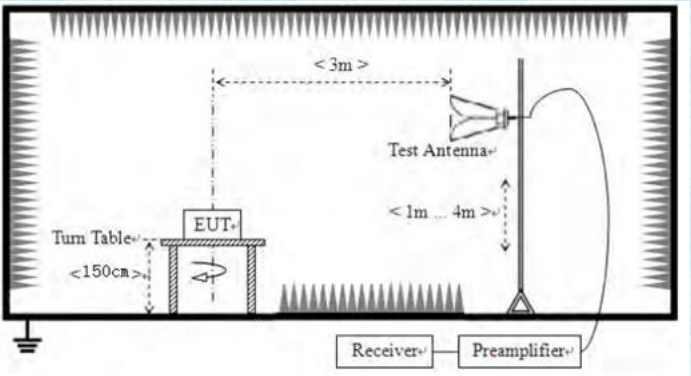
7.6.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2020 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data: The detailed test data see Appendix for BLE.

7.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2020				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Note: For Duty cycle $\geq 98\%$, average detector set as above For Duty cycle $< 98\%$, average detector set as below: $VBW \geq 1 / T$					
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP/PK/AV	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	30m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
		5000	Peak		
Test setup:	For radiated emissions from 9kHz to 30MHz				
					

	For radiated emissions from 30MHz to 1GHz  For radiated emissions above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details

Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data:

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case. Both 1MHz and 2MHz bandwidth were tested and passed, only report the worst condition (GFSK_1MHz)

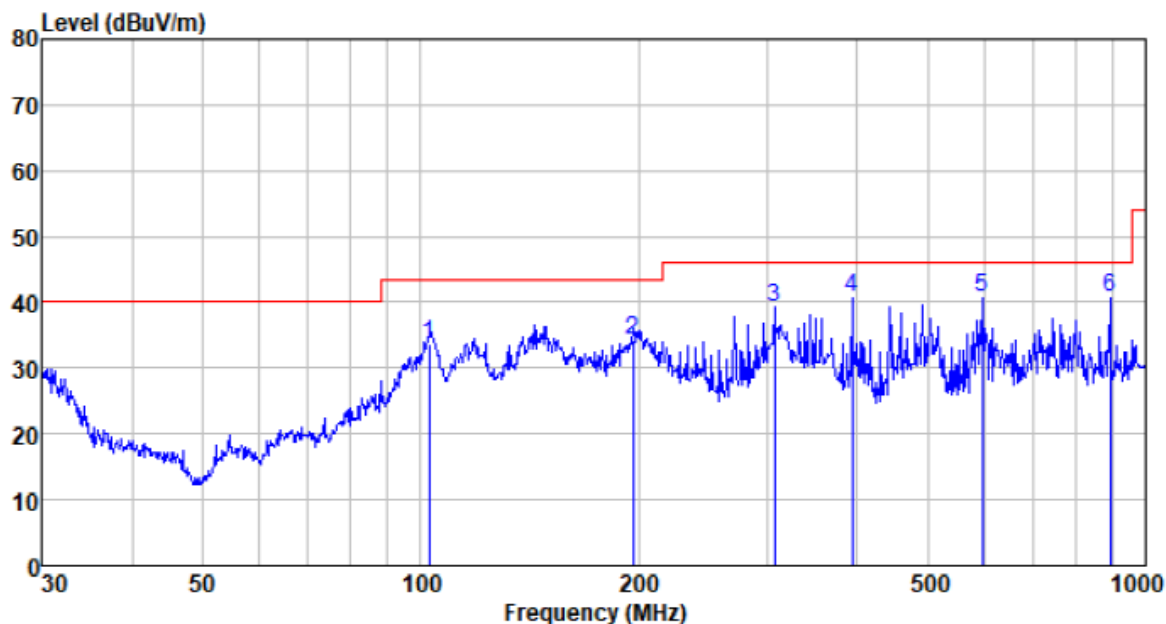
■ 9kHz~30MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

■ Below 1GHz

Pre-scan all test modes, found worst case at 2440MHz bandwidth, and so only show the test result of it.

Adapter 1:
Horizontal:

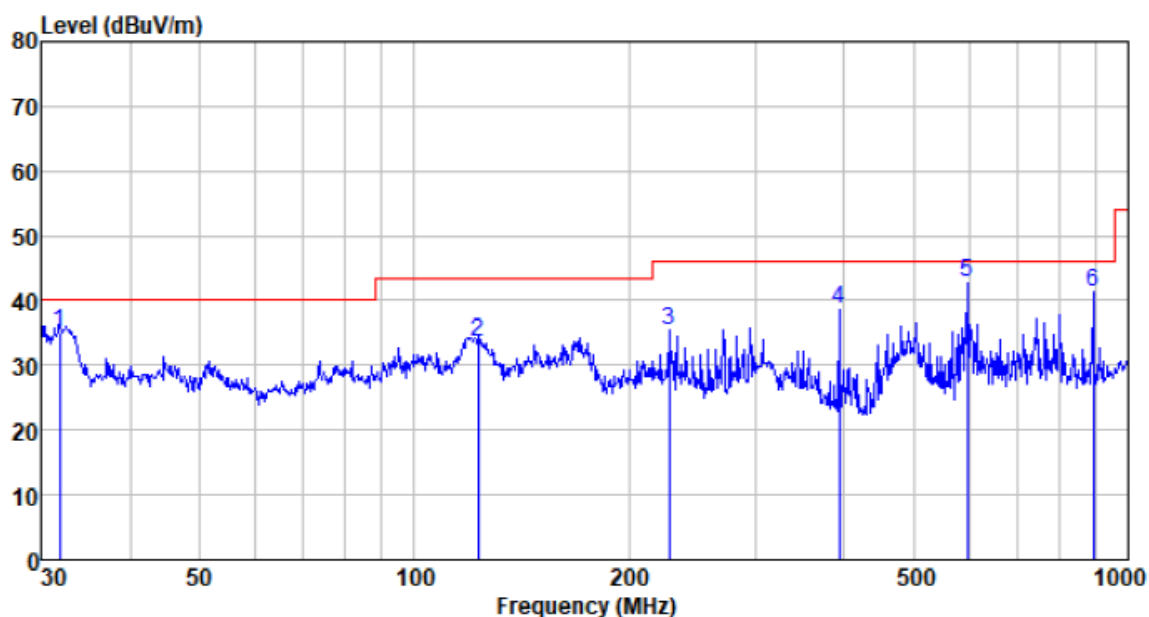


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
102.719	55.31	9.82	1.99	33.59	33.53	43.50	-9.97	QP
196.510	54.17	10.60	2.77	33.41	34.13	43.50	-9.37	QP
307.831	56.45	12.46	3.60	33.18	39.33	46.00	-6.67	QP
393.472	55.10	14.57	4.11	33.04	40.74	46.00	-5.26	QP
595.133	49.56	18.81	5.06	32.64	40.79	46.00	-5.21	QP
893.857	43.07	23.00	6.20	31.65	40.62	46.00	-5.38	QP

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Vertical:

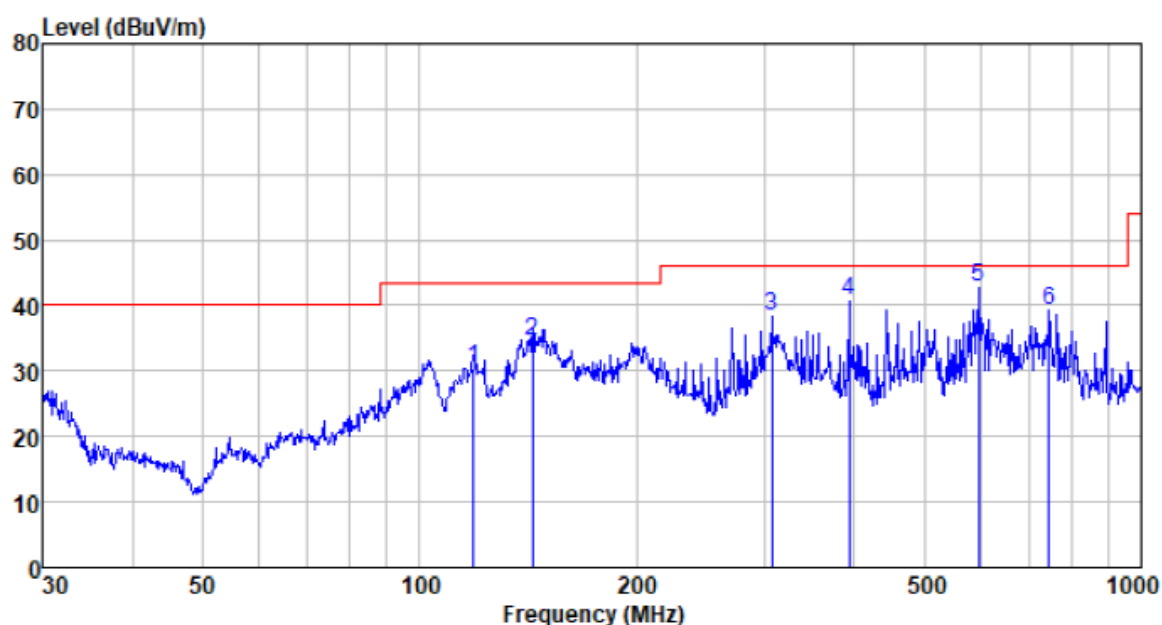


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
31.843	55.04	12.50	1.23	33.59	35.18	40.00	-4.82	QP
122.834	52.25	12.60	2.21	33.54	33.52	43.50	-9.98	QP
227.691	56.32	9.51	3.03	33.34	35.52	46.00	-10.48	QP
393.472	53.14	14.57	4.11	33.04	38.78	46.00	-7.22	QP
595.133	51.60	18.81	5.06	32.64	42.83	46.00	-3.17	QP
893.857	43.73	23.00	6.20	31.65	41.28	46.00	-4.72	QP

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Adapter 2:
Horizontal:

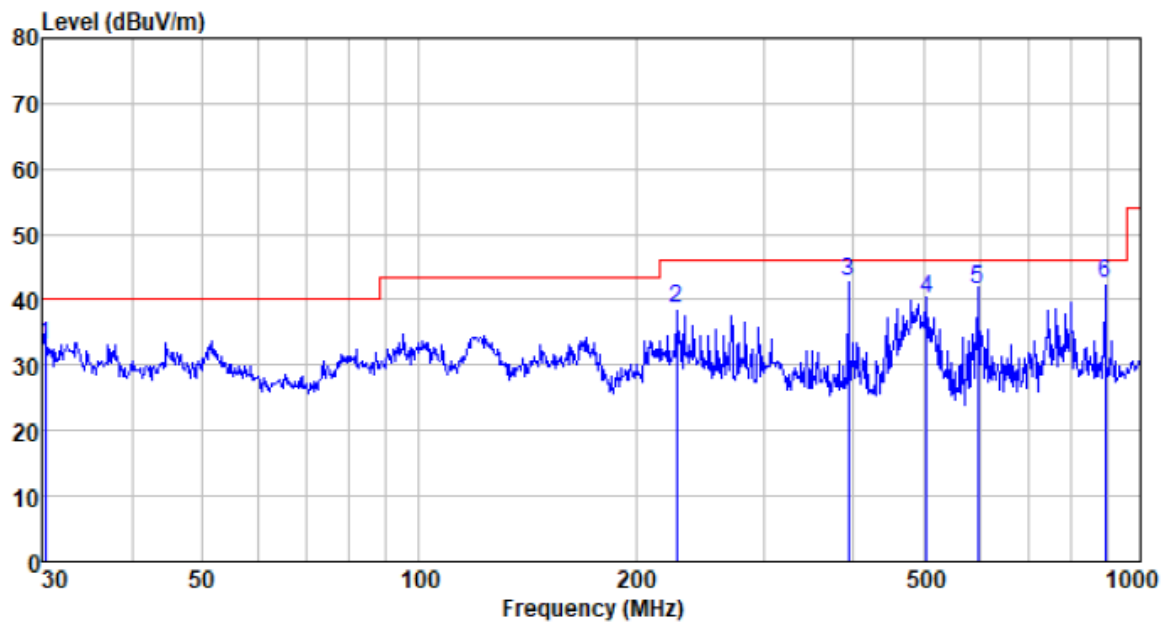


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
118.601	49.43	12.42	2.16	33.55	30.46	43.50	-13.04	QP
143.326	51.44	14.13	2.39	33.50	34.46	43.50	-9.04	QP
307.831	55.45	12.46	3.60	33.18	38.33	46.00	-7.67	QP
393.472	55.10	14.57	4.11	33.04	40.74	46.00	-5.26	QP
595.133	51.61	18.81	5.06	32.64	42.84	46.00	-3.16	QP
744.866	44.63	21.30	5.78	32.31	39.40	46.00	-6.60	QP

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Vertical:



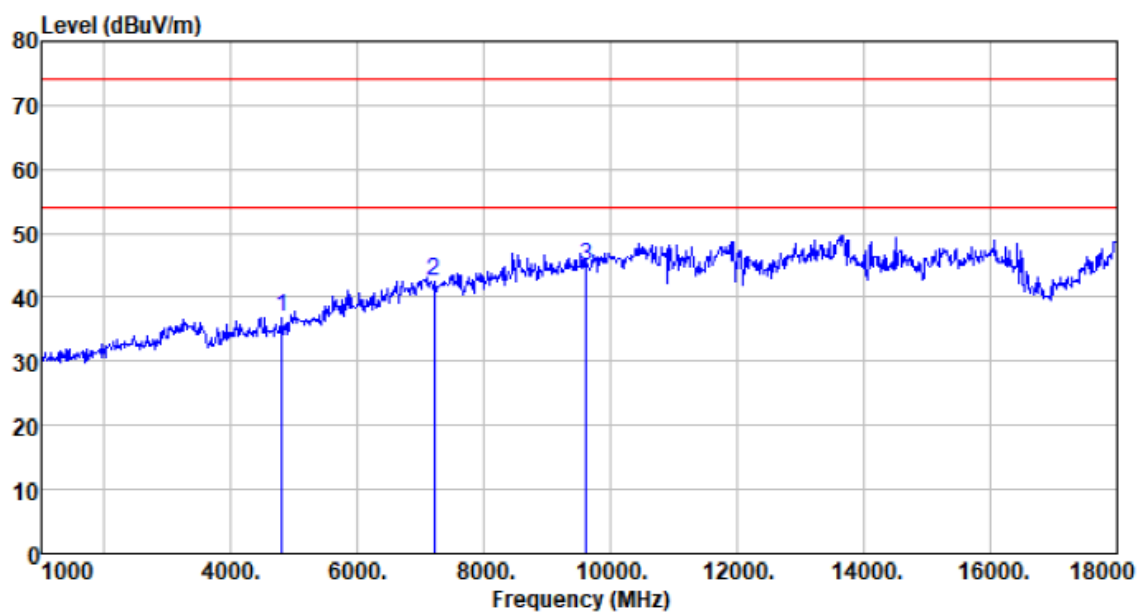
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
30.317	53.13	12.36	1.22	33.60	33.11	40.00	-6.89	QP
227.691	59.40	9.51	3.03	33.34	38.60	46.00	-7.40	QP
393.472	57.06	14.57	4.11	33.04	42.70	46.00	-3.30	QP
504.706	51.49	16.90	4.61	32.89	40.11	46.00	-5.89	QP
595.133	50.43	18.81	5.06	32.64	41.66	46.00	-4.34	QP
893.857	44.87	23.00	6.20	31.65	42.42	46.00	-3.58	QP

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

- Above 1GHz
- Unwanted Emissions in Non-restricted Frequency Bands

Test channel:	Lowest	Polarization:	Horizontal
---------------	--------	---------------	------------

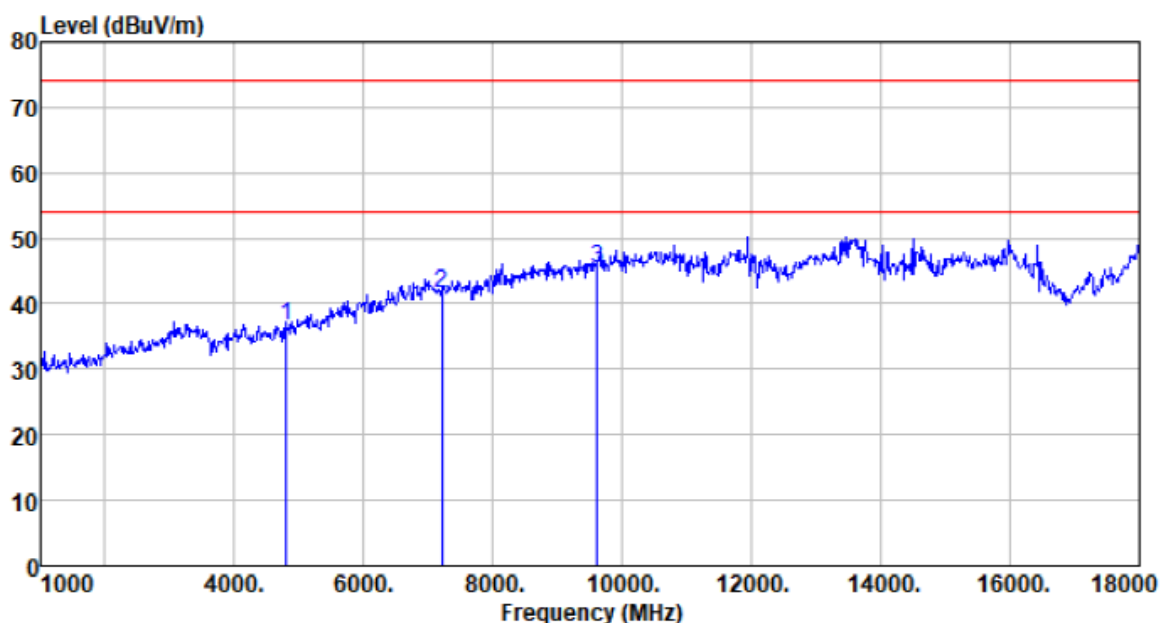


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4804.000	37.19	32.22	5.56	38.02	36.95	74.00	-37.05	Peak
7206.000	36.87	36.41	7.17	37.96	42.49	74.00	-31.51	Peak
9608.000	36.76	38.20	9.07	39.18	44.85	74.00	-29.15	Peak

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Test channel:	Lowest	Polarization:	Vertical
---------------	--------	---------------	----------

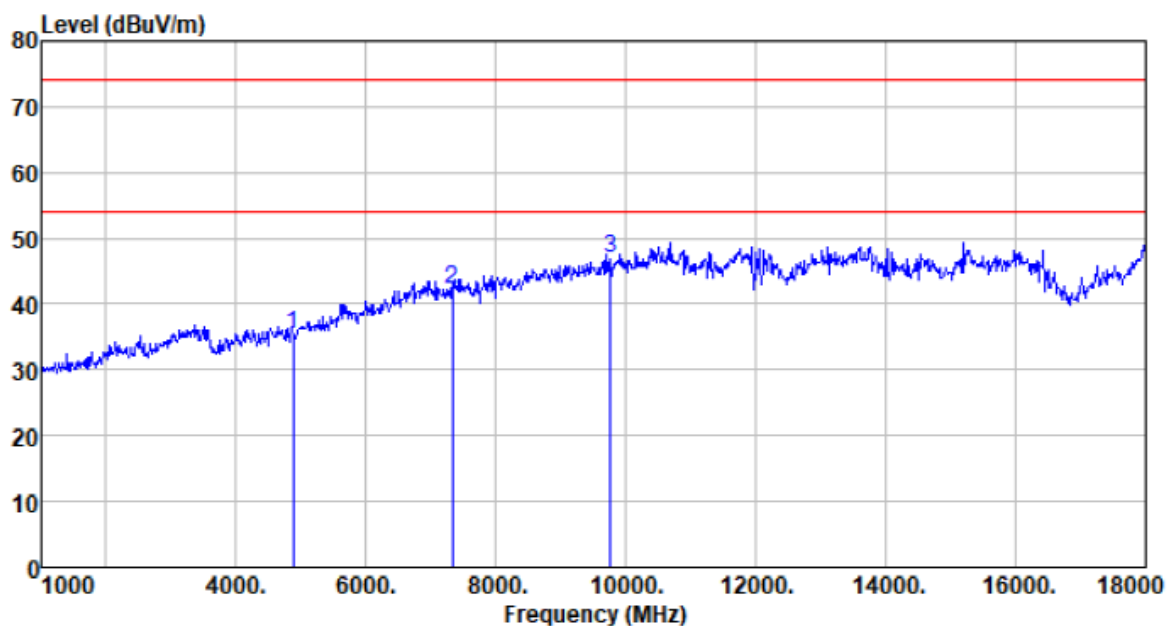


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4804.000	36.76	32.22	5.56	38.02	36.52	74.00	-37.48	Peak
7206.000	36.14	36.41	7.17	37.96	41.76	74.00	-32.24	Peak
9608.000	37.36	38.20	9.07	39.18	45.45	74.00	-28.55	Peak

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Test channel:	Middle	Polarization:	Horizontal
---------------	--------	---------------	------------

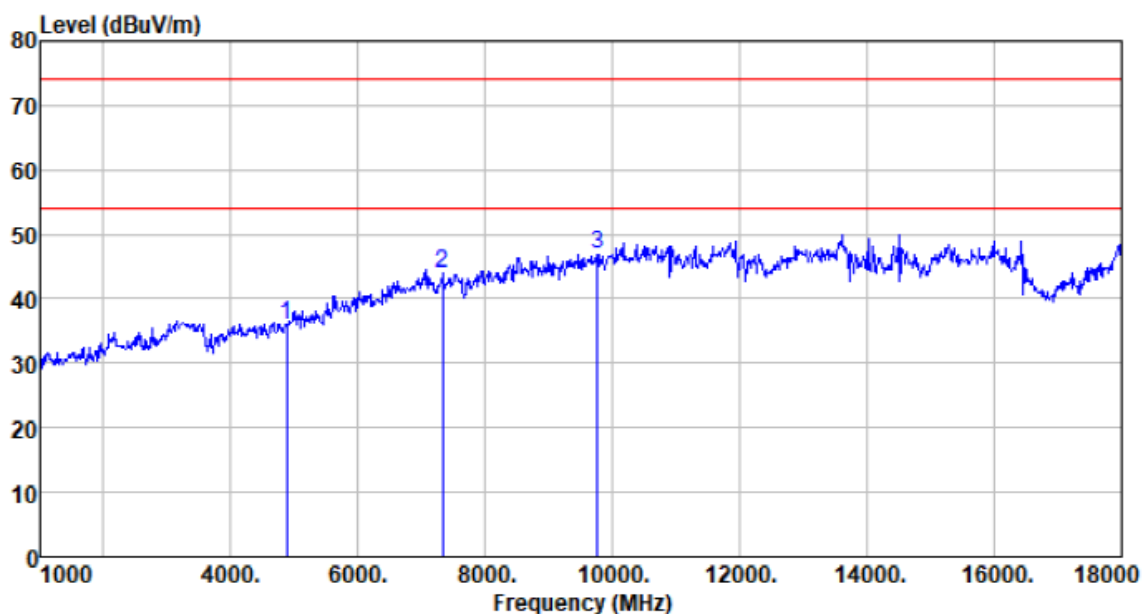


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.000	35.04	32.56	5.66	37.97	35.29	74.00	-38.71	Peak
7320.000	36.35	36.64	7.26	38.06	42.19	74.00	-31.81	Peak
9760.000	38.58	38.30	9.17	39.23	46.82	74.00	-27.18	Peak

Remarks:

$$\text{Final level (dBuV/m)} = \text{Reading level (dBuV)} + \text{Antenna factor (dB/m)} + \text{Cable loss (dB)} - \text{Preamp Factor (dB)}$$

Test channel:	Middle	Polarization:	Vertical
---------------	--------	---------------	----------

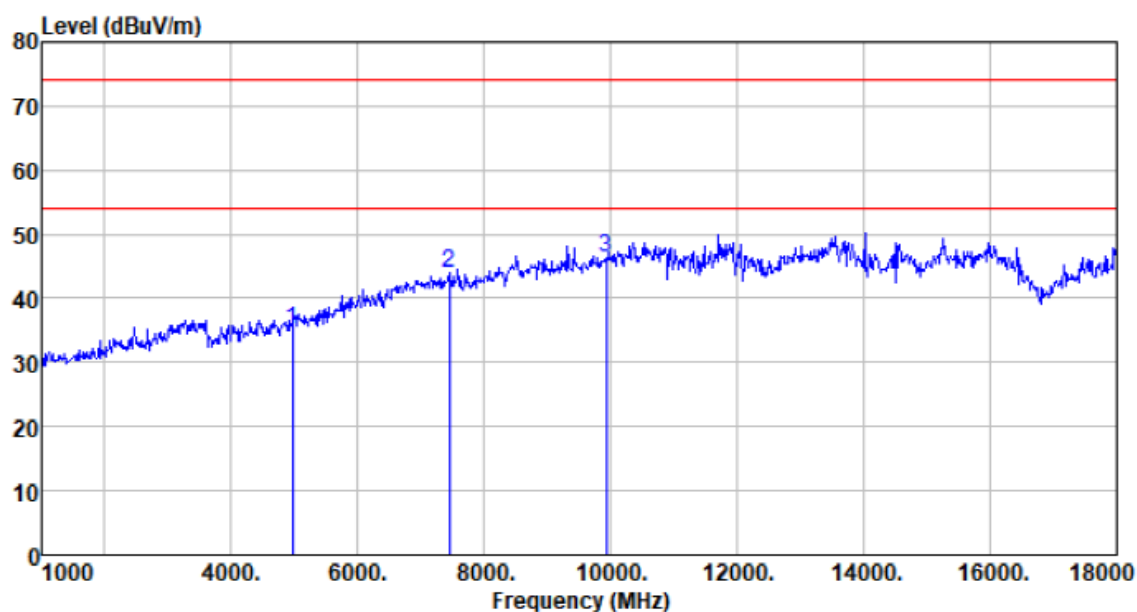


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.000	35.88	32.56	5.66	37.97	36.13	74.00	-37.87	Peak
7320.000	38.28	36.64	7.26	38.06	44.12	74.00	-29.88	Peak
9760.000	38.84	38.30	9.17	39.23	47.08	74.00	-26.92	Peak

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Test channel:	Highest	Polarization:	Horizontal
---------------	---------	---------------	------------

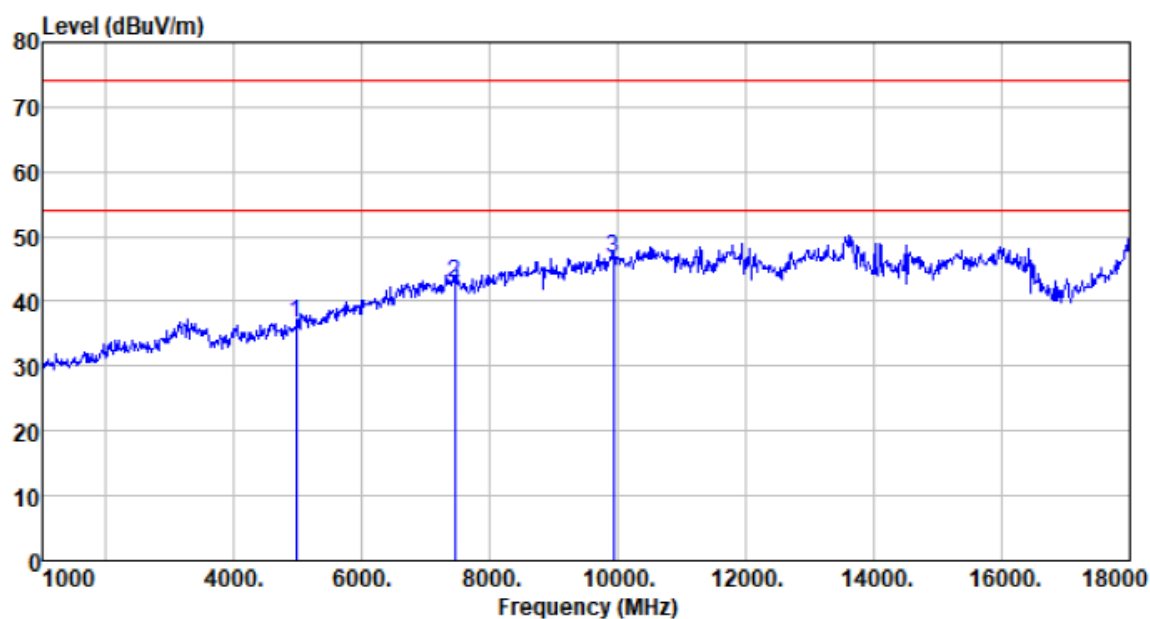


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4960.000	34.44	32.74	5.77	37.92	35.03	74.00	-38.97	Peak
7440.000	37.99	36.68	7.33	38.15	43.85	74.00	-30.15	Peak
9920.000	37.92	38.40	9.24	39.28	46.28	74.00	-27.72	Peak

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Test channel:	Highest	Polarization:	Vertical
---------------	---------	---------------	----------



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4960.000	36.11	32.74	5.77	37.92	36.70	74.00	-37.30	Peak
7440.000	37.02	36.68	7.33	38.15	42.88	74.00	-31.12	Peak
9920.000	38.40	38.40	9.24	39.28	46.76	74.00	-27.24	Peak

Remarks:

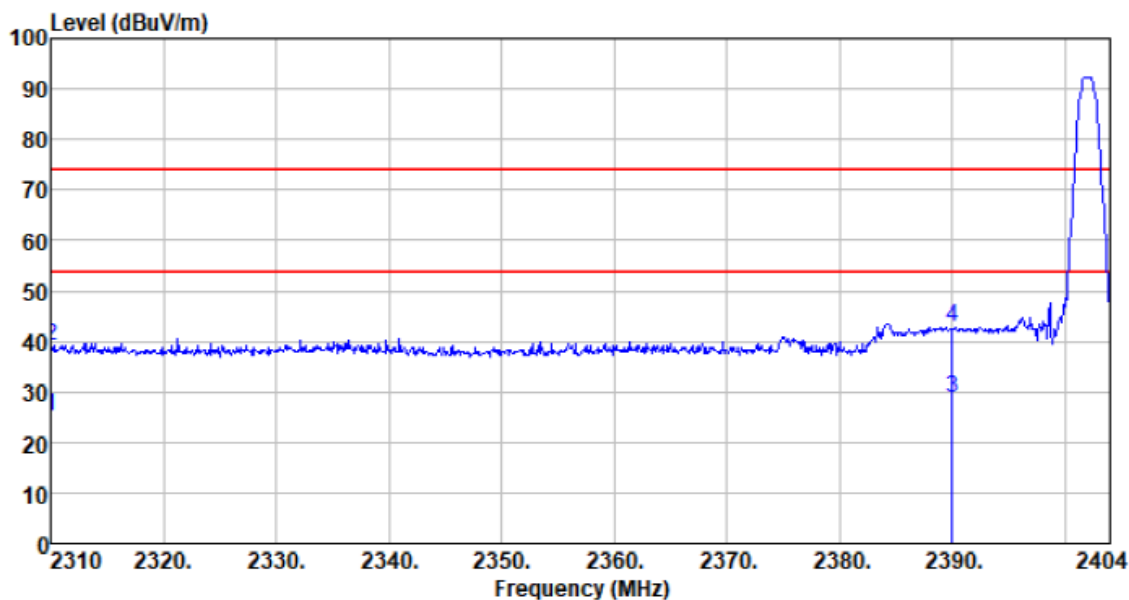
Final level (dBuV/m) = Reading level (dBuV) + Antenna factor (dB/m) + Cable loss (dB) - Preamp Factor (dB)

Notes:

- The emission levels of other frequencies are very lower than the limit and not show in test report.
- For above 18GHz, no emission found.

■ Unwanted Emissions in Restricted Frequency Bands

Test channel:	Lowest	Polarization:	Horizontal
---------------	--------	---------------	------------

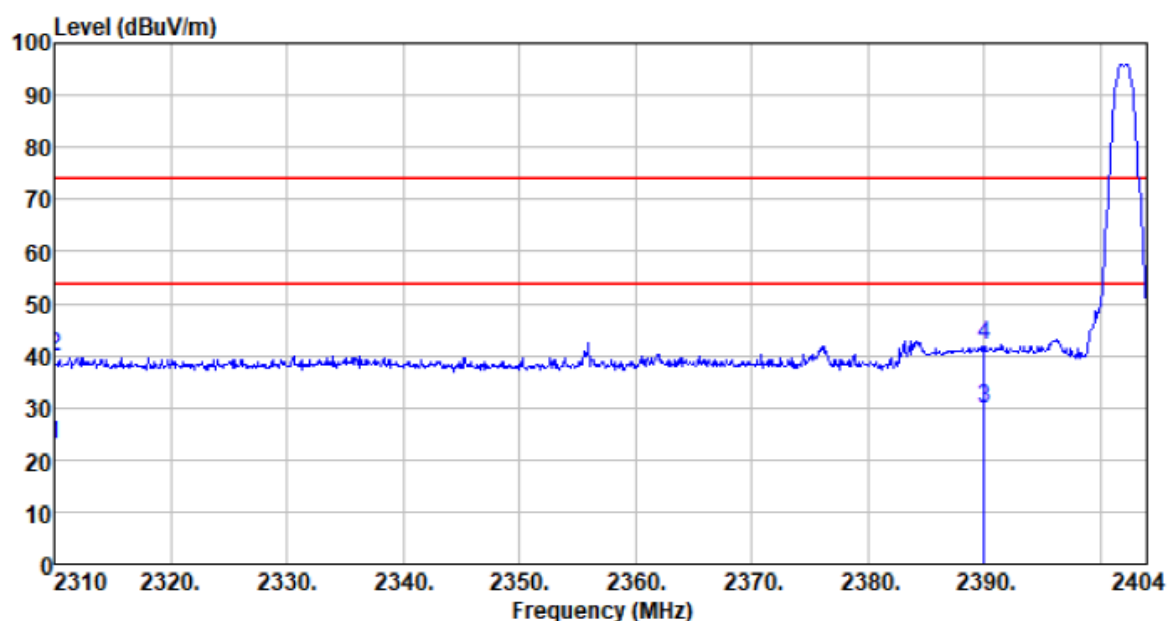


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	32.50	27.48	4.09	38.86	25.21	54.00	-28.79	Average
2310.000	46.31	27.48	4.09	38.86	39.02	74.00	-34.98	Peak
2390.000	36.26	27.32	4.11	38.88	28.81	54.00	-25.19	Average
2390.000	50.19	27.32	4.11	38.88	42.74	74.00	-31.26	Peak

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Test channel:	Lowest	Polarization:	Vertical
---------------	--------	---------------	----------

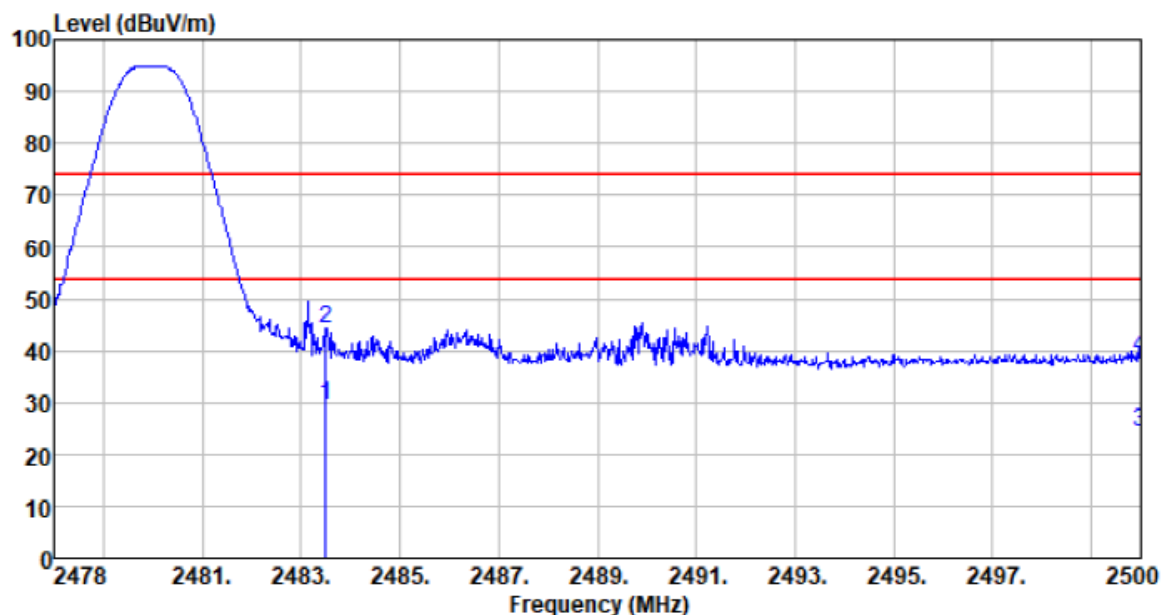


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	30.30	27.48	4.09	38.86	23.01	54.00	-30.99	Average
2310.000	47.17	27.48	4.09	38.86	39.88	74.00	-34.12	Peak
2390.000	37.44	27.32	4.11	38.88	29.99	54.00	-24.01	Average
2390.000	49.37	27.32	4.11	38.88	41.92	74.00	-32.08	Peak

Remarks:

Final level (dBuV/m) = Reading level (dBuV) + Antenna factor (dB/m) + Cable loss (dB) - Preamp Factor (dB)

Test channel:	Highest	Polarization:	Horizontal
---------------	---------	---------------	------------

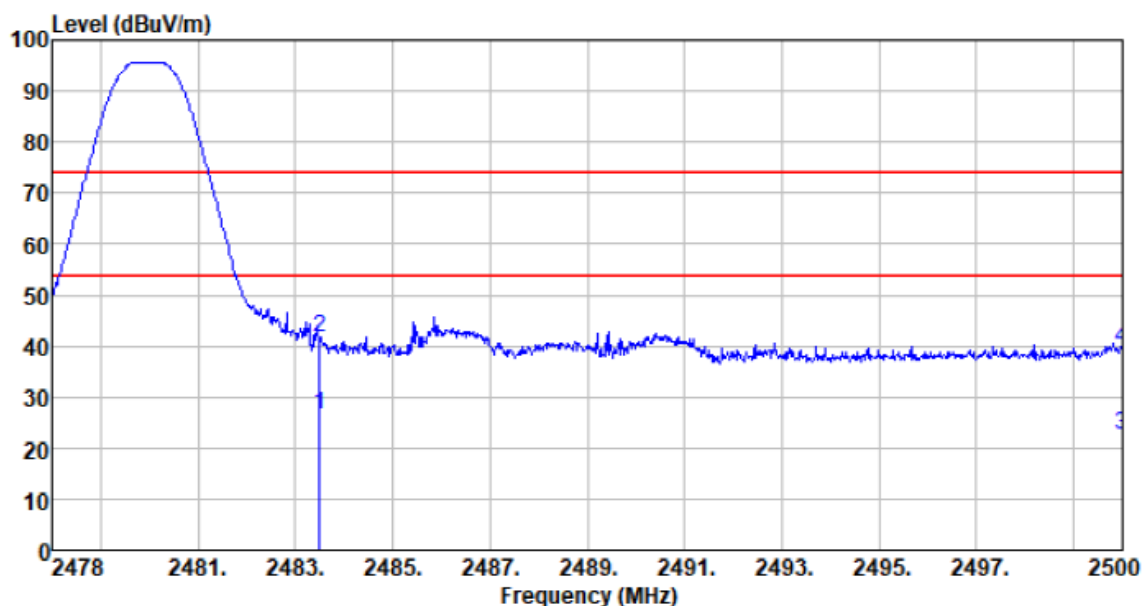


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2483.500	36.85	27.53	4.13	38.90	29.61	54.00	-24.39	Average
2483.500	51.62	27.53	4.13	38.90	44.38	74.00	-29.62	Peak
2500.000	31.58	27.60	4.14	38.90	24.42	54.00	-29.58	Average
2500.000	45.74	27.60	4.14	38.90	38.58	74.00	-35.42	Peak

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Test channel:	Highest	Polarization:	Vertical
---------------	---------	---------------	----------



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	Final level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2483.500	33.64	27.53	4.13	38.90	26.40	54.00	-27.60	Average
2483.500	48.78	27.53	4.13	38.90	41.54	74.00	-32.46	Peak
2500.000	29.58	27.60	4.14	38.90	22.42	54.00	-31.58	Average
2500.000	46.54	27.60	4.14	38.90	39.38	74.00	-34.62	Peak

Remarks:

Final level(dBuV/m) = Reading level(dBuV) + Antenna factor(dB/m) + Cable loss(dB) - Preamp Factor(dB)

Notes:

2. The emission levels of other frequencies are very lower than the limit and not show in test report.

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----