



Certificate #4312.01

TEST REPORT

Product Name: Multi-WAN Gigabit VPN Router
Trade Mark: GRANDSTREAM
Model No.: GWN7003
Report Number: 2211182630EMC-1
Test Standards: FCC 47 CFR Part 15 Subpart B
ICES-003 Issue 7
FCC ID: YZZGWN7003
Test Result: PASS
Date of Issue: January 4, 2023

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
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January 4, 2023

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Version

Version No.	Date	Description
V1.0	January 4, 2023	Original



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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks, Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Multi-WAN Gigabit VPN Router
Model No.:	GWN7003
Trade Mark:	GRANDSTREAM
DUT Stage:	Identical Prototype
Rated Voltage:	☒ Powered by DC port 12-24V ☒ Powered by POE port
Classification of digital devices:	Class B
Highest Internal Frequency:	1.0 GHz
Sample Received Date:	November 18, 2022
Sample Tested Date:	December 15, 2022 December 20, 2022
Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.	

1.2.2 Description of Accessories

Adapter (1)	
Model No.:	GQ36-240150-AU
Input:	100-240 V~50/60 Hz 1.0 A Max
Output:	24.0 V $\equiv$ 1.5 A
DC Cable:	2.5 Meter, Unshielded without ferrite

Adapter (2)	
Model No.:	GQ24-240100-AU
Input:	100-240 V~50/60 Hz 1.0 A Max
Output:	24.0 V $\equiv$ 1.0 A
DC Cable:	2.5 Meter, Unshielded without ferrite

Adapter (3)	
Model No.:	ADS-25FSG-19 24024EPCU
Input:	100-240 V~50/60 Hz 0.7 A Max
Output:	24.0 V $\equiv$ 1.0 A
DC Cable:	2.5 Meter, Unshielded without ferrite

Adapter (4)	
Model No.:	RA040-2401000US
Input:	100-240 V~50/60 Hz 0.6 A Max
Output:	24.0 V $\equiv$ 1.0 A 24.0W

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DC Cable:	1.2 Meter, Unshielded without ferrite
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Cable	
Connector:	Ethernet Cable
Cable Type:	Unshielded without ferrite
Length:	1.5 Meter

1.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	DELL	Latitude 3400	16238087894	UnionTrust
Mouse	DELL	MS111	CN-011D3V-73826-62N-0LK	UnionTrust
Notebook	DELL	Latitude 3400	14061305558	UnionTrust
Mouse	DELL	MS111	M312090506256	UnionTrust
Network tester	KYLAND	Opal10G-2GX8GE-LV-LV	N/A	UnionTrust
Gigabit port electrical modules	SAMZHE	SZ-QGE	SZ000001237332	UnionTrust
Gigabit port electrical modules	SAMZHE	SZ-QGE	SZ000001237308	UnionTrust
IP Phone	GRANDSTREAM	GRP2650	N/A	Applicant
IP Phone	GRANDSTREAM	GRP2615	N/A	Applicant

Support Cable

Cable No.	Description	Connector	Length(Meter)	Supplied by
1	Ethernet Cable*8	RJ45	1.5 Unshielded without ferrite	UnionTrust
2	Ethernet Cable	RJ45	2.0 Unshielded without ferrite	UnionTrust
3	Ethernet Cable	RJ45	5.0 Unshielded without ferrite	UnionTrust
4	Optic fiber Cable*2	ST	1.0 Unshielded without ferrite	UnionTrust

1.4 TEST LOCATION

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1.5 TEST FACILITY

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

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CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.9 MEASUREMENT UNCERTAINTY

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

No.	Item	Measurement Uncertainty
1	Conducted emission 9kHz-150kHz	±3.2 dB
2	Conducted emission 150kHz-30MHz	±2.7 dB
3	Radiated emission 9kHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart B Test Cases			
Test Item	Test Requirement	Test Method	Result
Conducted Emission	FCC 47 CFR Part 15.107 ICES-003 Issue 7 Section 3.2.1	ANSI C63.4-2014	PASS
Radiated Emission	FCC 47 CFR Part 15.109 ICES-003 Issue 7 Section 3.2.2	ANSI C63.4-2014	PASS



3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	3m SAC	ETS-LINDGREN	3m	Euroshiedpn-CT001270-1317	Jan. 22, 2021	Jan. 21, 2024
☒	Receiver	R&S	ESIB26	100114	Nov. 03, 2022	Nov. 02, 2023
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 11, 2021	Nov. 10, 2023
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 11, 2021	Nov. 10, 2023
☒	Preamplifier	HP	8447F	2805A02960	Nov. 01, 2022	Oct. 31, 2023
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	Apr. 17, 2022	Apr. 16, 2024
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	Nov. 01, 2022	Oct. 31, 2023
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Nov. 01, 2022	Oct. 31, 2023
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 01, 2022	Oct. 31, 2023
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 01, 2022	Oct. 31, 2023
☒	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 01, 2022	Oct. 31, 2023
☒	Test Software	Audix	e3	Software Version: 9.160323		

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NV/NT	+15 to +35	Powered by POE Port or Powered by Adaptor	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test sample

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Conducted Emission	19	56	100.4	S20221118798-ZJA01/2	Lucas Ouyang
Radiated Emission	25.0	55.8	99.6		Andy Lin

4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	Test Mode 1: AC120V/60Hz (Adaptor1) + LAN Port8 & SFP Port10 Loop transmission+ PoE OUT + USB OUT Test Mode 2: AC120V/60Hz (Adaptor1) + SFP Port10 & SFP Port11 Loop transmission+ PoE OUT + USB OUT Test Mode 3: AC120V/60Hz (Adaptor1) + WAN Port9 & LAN Port4/Port8 Loop transmission+ PoE OUT + USB OUT Test Mode 4: AC240V/50Hz (Adaptor1) +Worse from mode 1~3 Test Mode 5: Worse from mode 1~4(Adaptor2) Test Mode 6: Worse from mode 1~4(Adaptor3) Test Mode 7: Worse from mode 1~4(Adaptor4) Test Mode 8: Worse from mode 1~3(POE)
Conducted Emission	Test Mode 1: AC120V/60Hz (Adaptor1) + LAN Port8 & SFP Port10 Loop transmission+ PoE OUT + USB OUT Test Mode 2: AC120V/60Hz (Adaptor1) + SFP Port10 & SFP Port11 Loop transmission+ PoE OUT + USB OUT Test Mode 3: AC120V/60Hz (Adaptor1) + WAN Port9 & LAN Port4/Port8 Loop transmission+ PoE OUT + USB OUT Test Mode 4: AC240V/50Hz (Adaptor1) +Worse from mode 1~3 Test Mode 5: Worse from mode 1~4(Adaptor2) Test Mode 6: Worse from mode 1~4(Adaptor3) Test Mode 7: Worse from mode 1~4(Adaptor4) Test Mode 8: Worse from mode 1~3(POE)
Remark: The above test modes in boldface were the worst cases.	

4.3 TEST SETUP

4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz

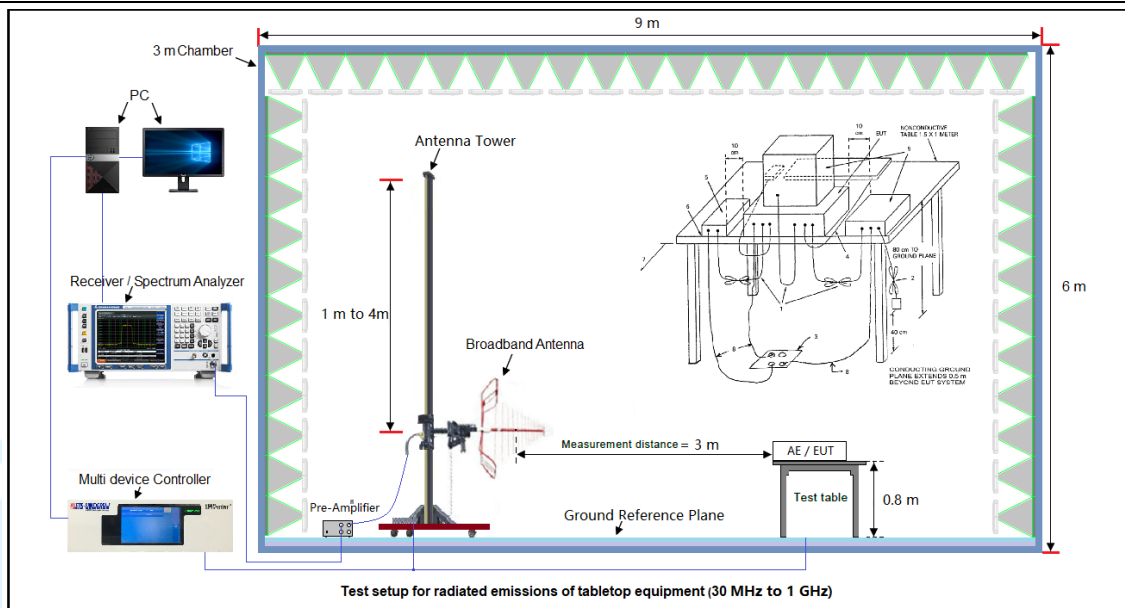
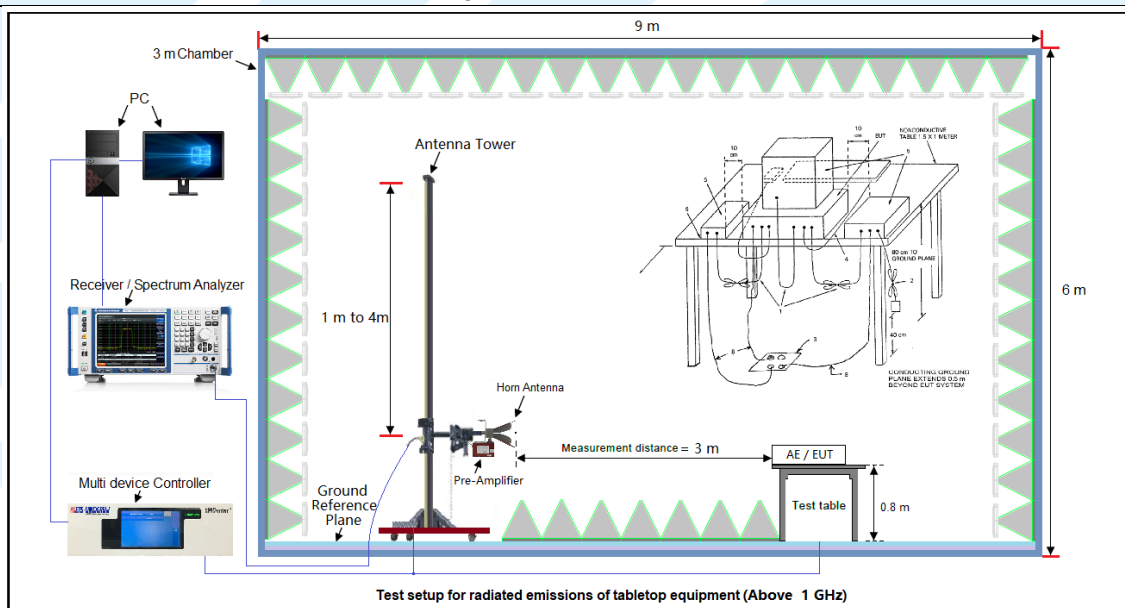
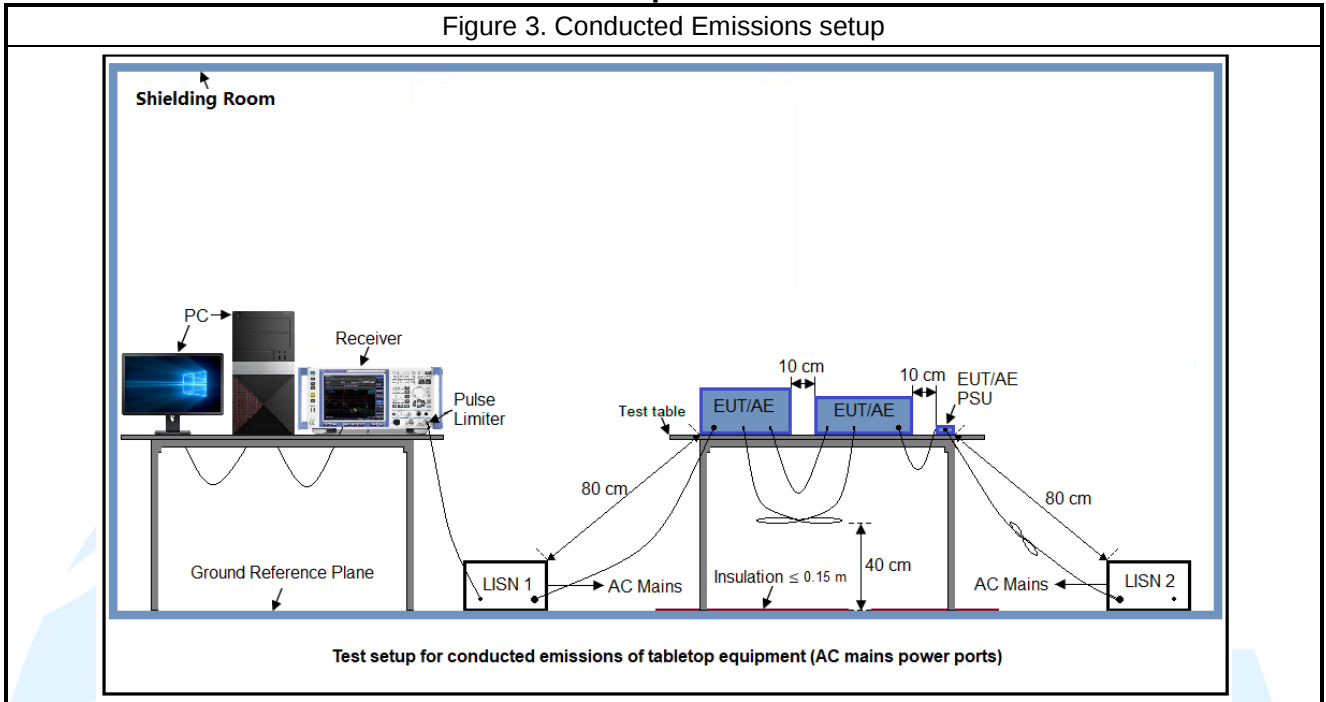


Figure 2. Above 1GHz



4.3.2 For Conducted Emissions test setup

Figure 3. Conducted Emissions setup



4.4 SYSTEM TEST CONFIGURATION

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic (according to KDB 896810 D02 SDoC FAQ v01r01) of the highest fundamental frequency or to 40 GHz, whichever is lower.

5. REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part15 Subpart B	Unintentional Radiators
2	ICES-003 Issue 7	Information Technology Equipment (Including Digital Apparatus)
3	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
4	KDB 174176 D01 Line Conducted FAQ v01r01	AC power-line conducted emission frequency asked questions
5	KDB 896810 D02 SDoC FAQ v01r02	Supplier's Declaration of Conformity frequency asked questions

6. EMC REQUIREMENTS SPECIFICATION

6.1 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.109
ICES-003 Issue 7 Clause 3.2.2

Test Method: ANSI C63.4-2014

Receiver Setup:

Frequency: (f) (MHz)	Detector type	Measurement receiver bandwidth	
		RBW	VBW
$30 \leq f \leq 1\,000$	Quasi Peak	120 kHz	300 kHz
$f \geq 1000$	Peak	1 MHz	3 MHz
	Average	1 MHz	3 MHz

Measured frequency range

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

Limits:

Limits for Class B devices

FCC 47 CFR Part 15 Subpart B

Frequency (MHz)	limits at 3m (dB μ V/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 960	46.0		
960 – 1000	54.0	--	--
Above 1000	--	74.0	54.0

ICES-003 Issue 7

Frequency (MHz)	limits at 3m (dB μ V/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 230	46.0		

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230 – 960	47.0	--	--
960 – 1000	54.0	--	--
Above 1000	--	74.0	54.0

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.3.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:
 - 1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
 - 2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
 - 3) For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.
2. Above 1GHz test procedure as below:
 - 1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
 - 2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
 - 3) For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

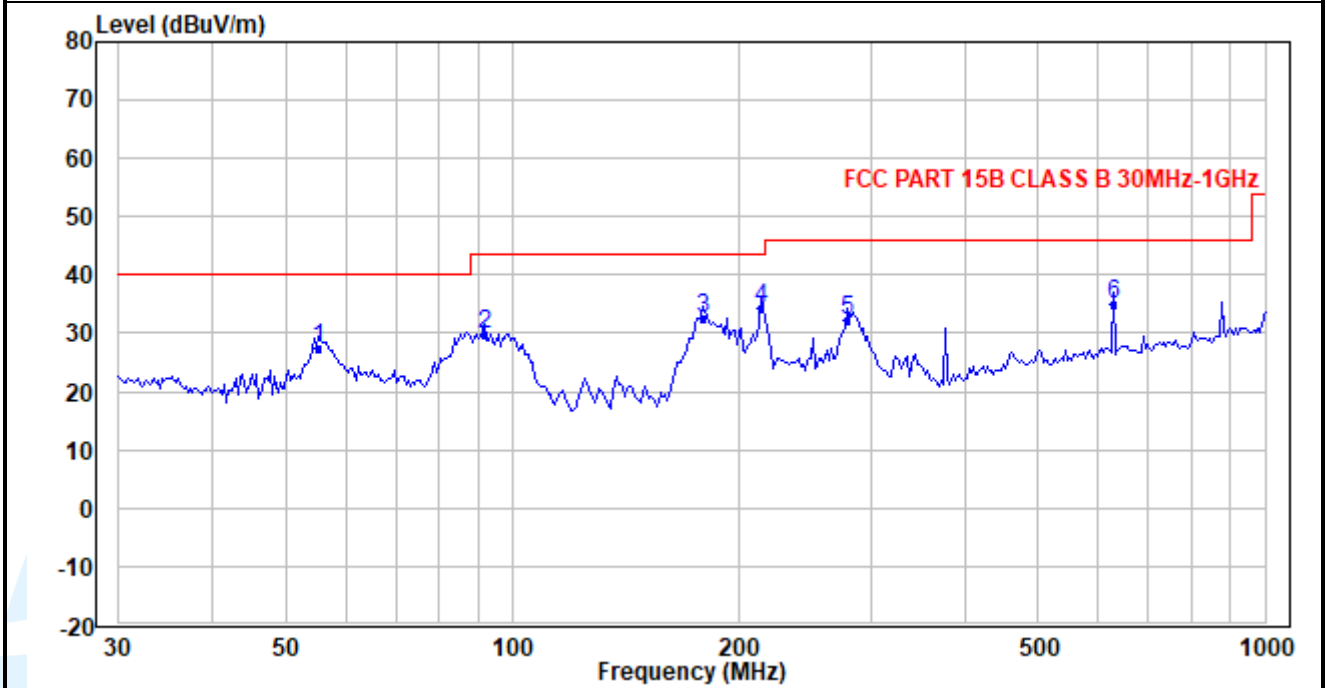
The measurement data as follows:

The measurement data for FCC 47 CFR Part 15 Subpart B as follows:

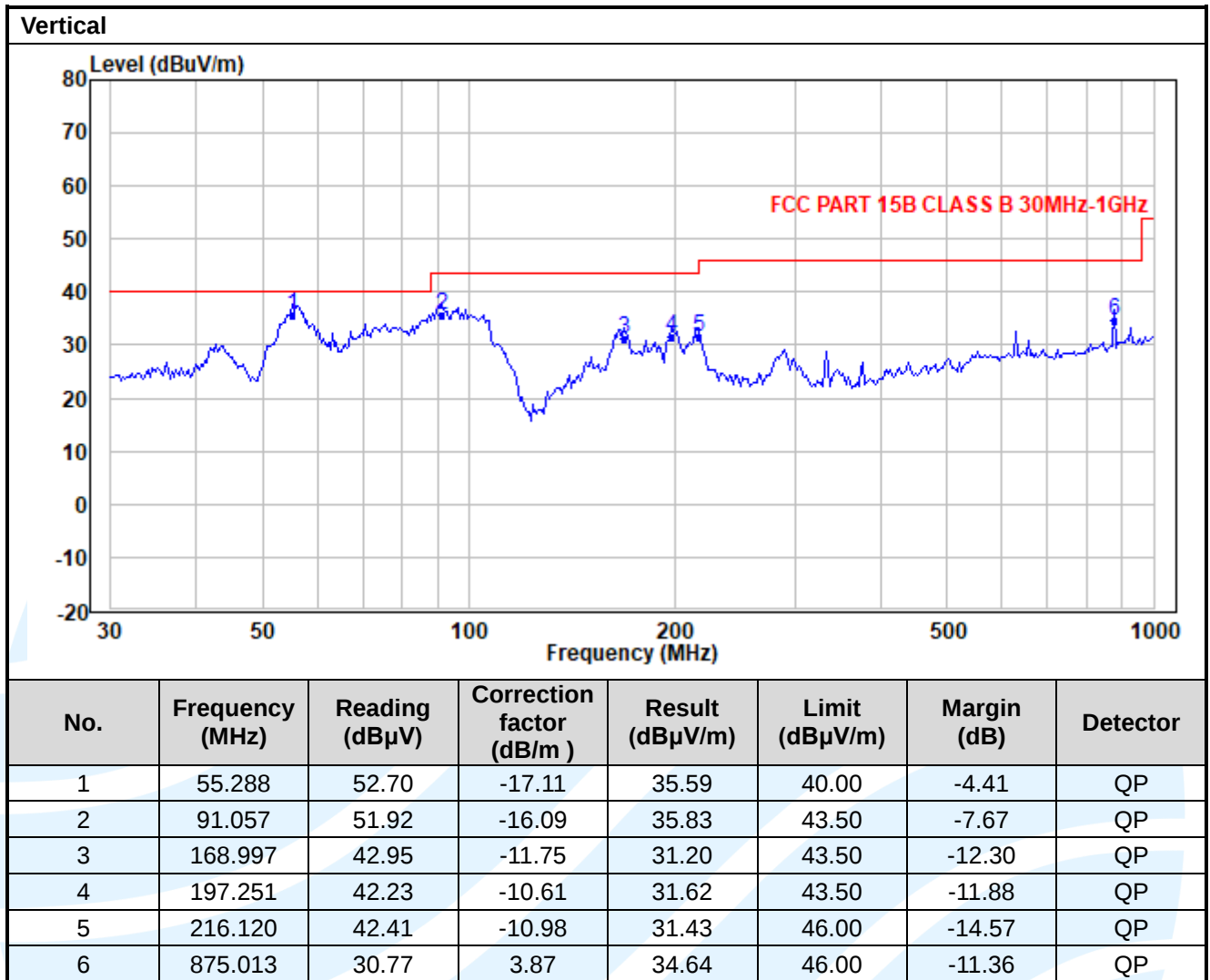
Below 1GHz(Quasi Peak):

Test Mode2

Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	55.288	44.59	-17.11	27.48	40.00	-12.52	QP
2	91.700	45.83	-16.14	29.69	43.50	-13.81	QP
3	178.770	42.45	-9.75	32.70	43.50	-10.80	QP
4	214.606	45.24	-10.92	34.32	43.50	-9.18	QP
5	278.331	39.84	-7.46	32.38	46.00	-13.62	QP
6	628.894	35.24	-0.23	35.01	46.00	-10.99	QP



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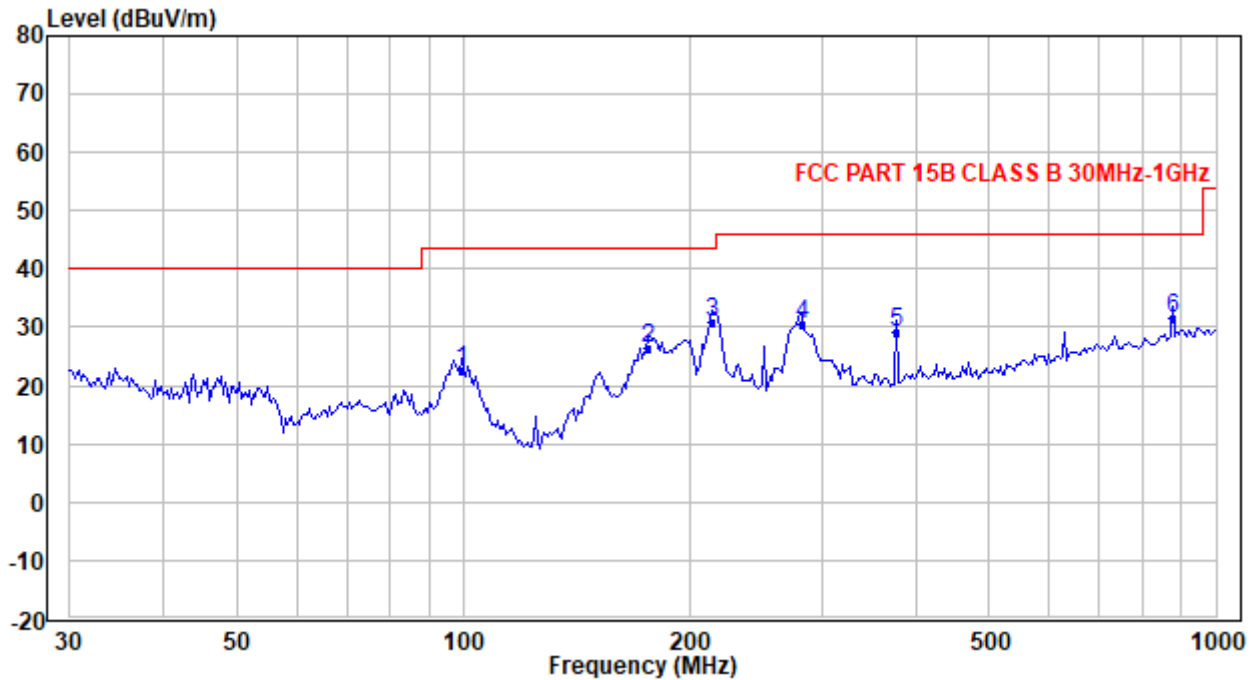
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Below 1GHz(Quasi Peak):
Test Mode5:
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	99.768	38.47	-15.83	22.64	43.50	-20.86	QP
2	176.275	36.73	-10.33	26.40	43.50	-17.10	QP
3	214.606	41.68	-10.92	30.76	43.50	-12.74	QP
4	282.270	37.94	-7.26	30.68	46.00	-15.32	QP
5	376.523	34.37	-5.26	29.11	46.00	-16.89	QP
6	875.013	27.83	3.87	31.70	46.00	-14.30	QP

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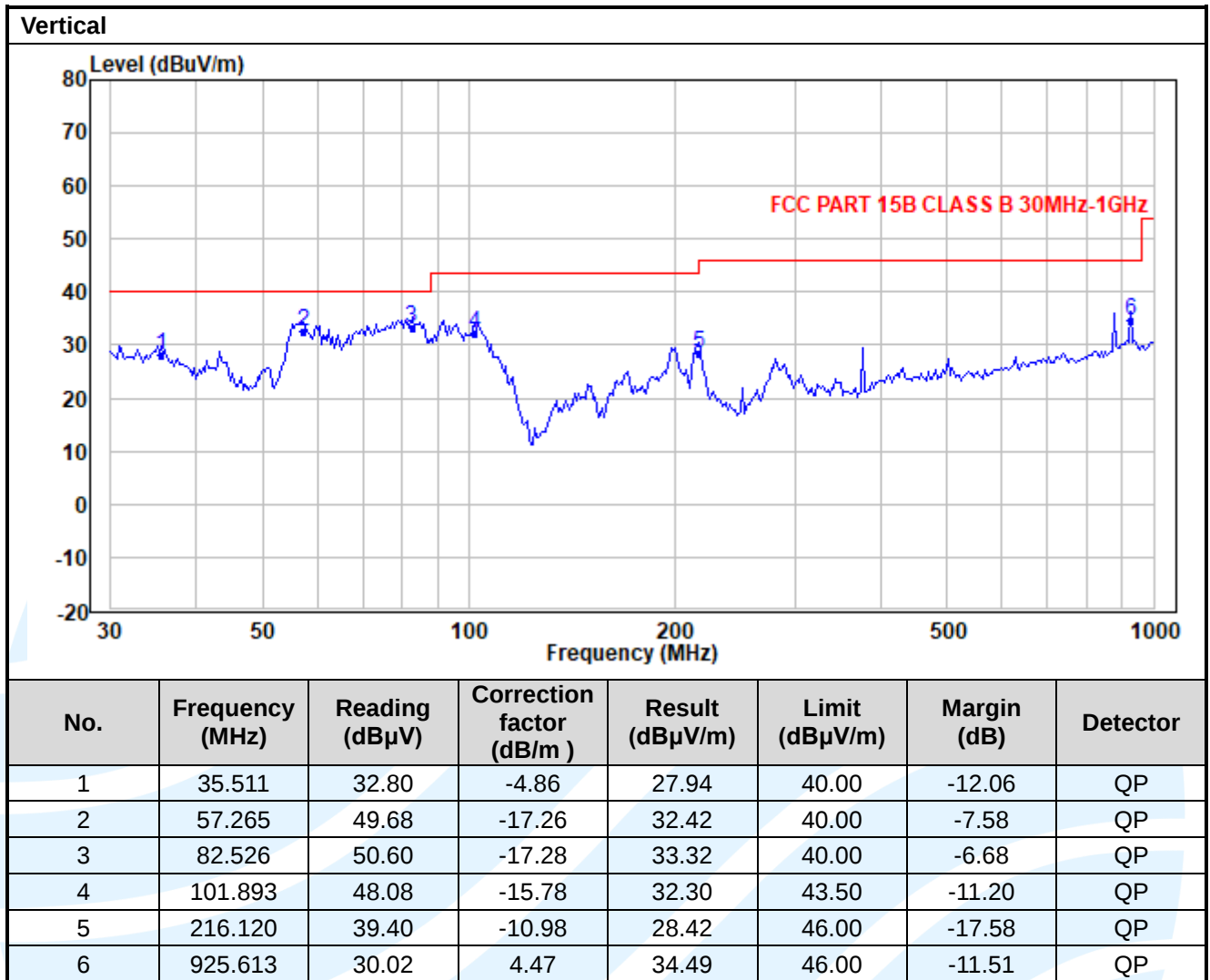
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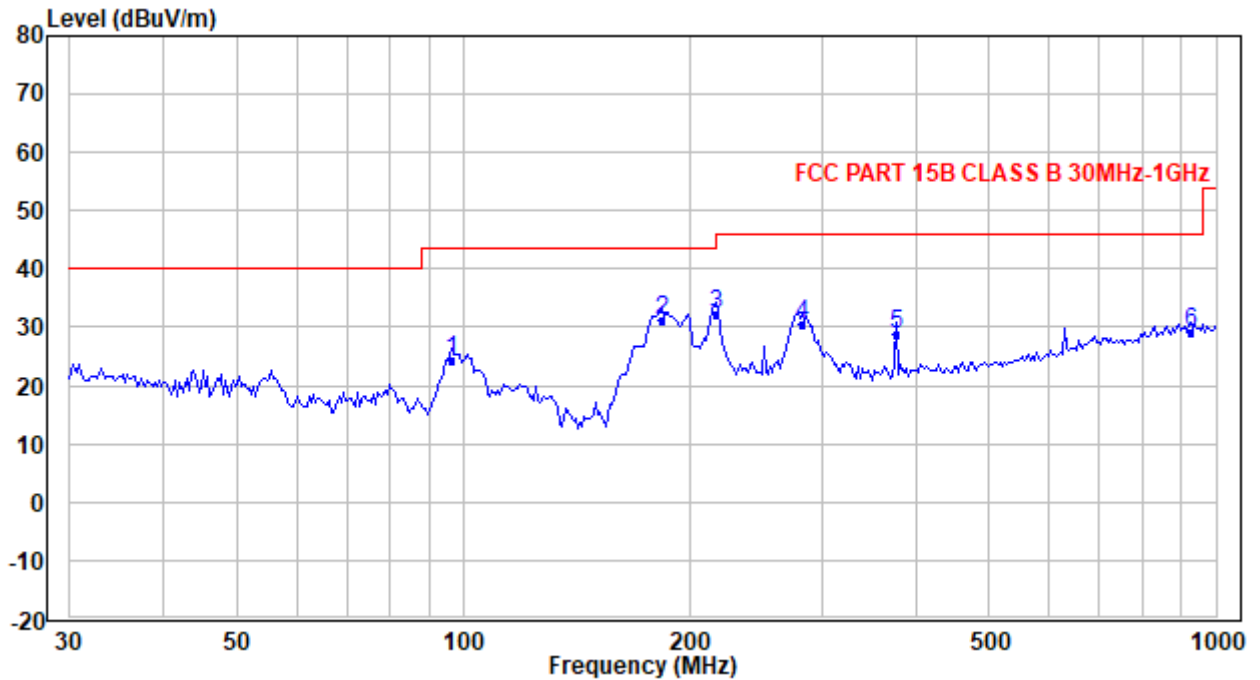
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Below 1GHz(Quasi Peak):
Test Mode6:
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	96.323	40.24	-15.84	24.40	43.50	-19.10	QP
2	183.866	41.61	-10.31	31.30	43.50	-12.20	QP
3	216.120	43.13	-10.98	32.15	46.00	-13.85	QP
4	282.270	37.94	-7.26	30.68	46.00	-15.32	QP
5	376.523	34.13	-5.26	28.87	46.00	-17.13	QP
6	925.613	24.53	4.47	29.00	46.00	-17.00	QP

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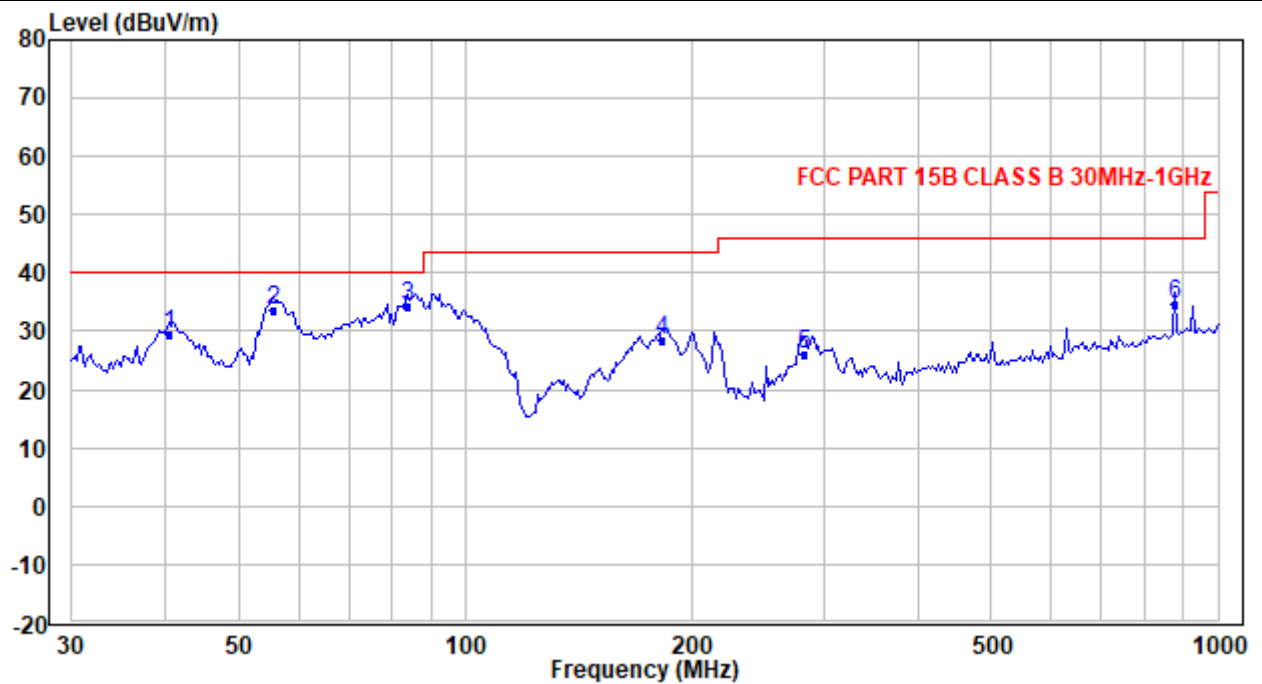
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Vertical



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	40.299	37.50	-8.11	29.39	40.00	-10.61	QP
2	55.678	50.93	-17.19	33.74	40.00	-6.26	QP
3	83.694	51.36	-16.92	34.44	40.00	-5.56	QP
4	182.578	38.63	-10.20	28.43	43.50	-15.07	QP
5	282.270	33.27	-7.26	26.01	46.00	-19.99	QP
6	875.013	30.86	3.87	34.73	46.00	-11.27	QP

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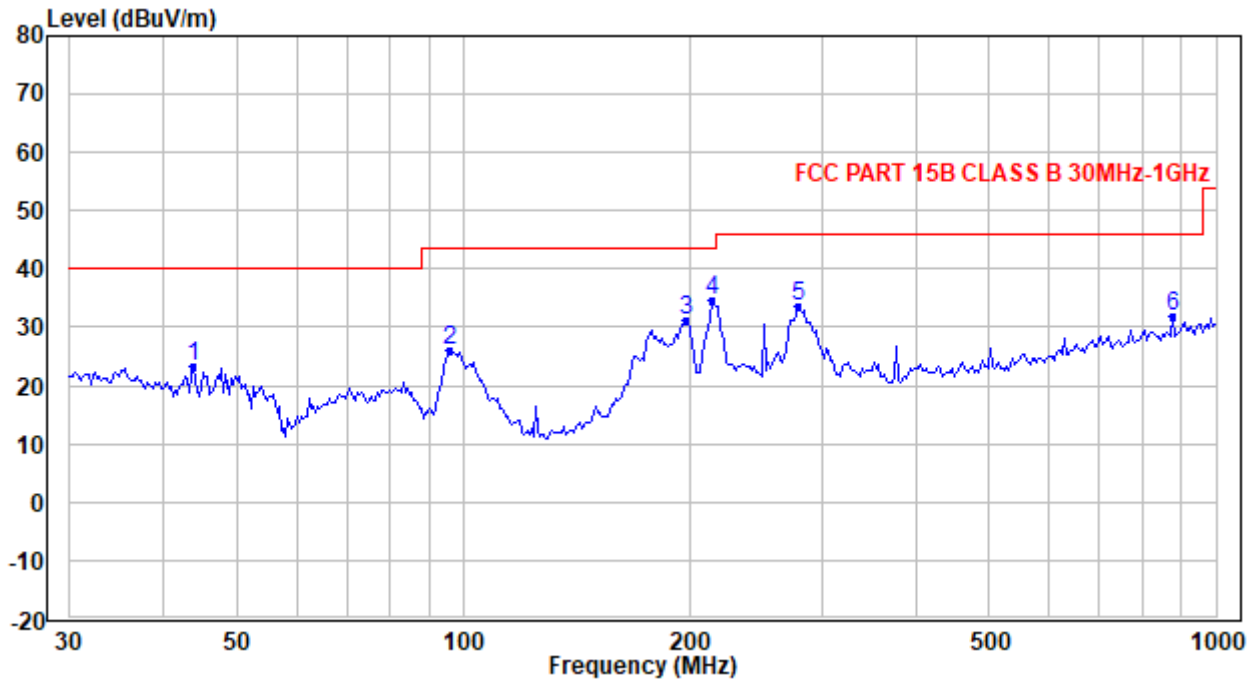
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UTTR-EMC-ICES003-V1.2

Below 1GHz(Quasi Peak):
Test Mode7:
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	43.845	33.61	-10.40	23.21	40.00	-16.79	QP
2	95.649	41.82	-15.80	26.02	43.50	-17.48	QP
3	197.251	41.88	-10.61	31.27	43.50	-12.23	QP
4	214.606	45.41	-10.92	34.49	43.50	-9.01	QP
5	278.331	40.90	-7.46	33.44	46.00	-12.56	QP
6	875.013	27.89	3.87	31.76	46.00	-14.24	QP

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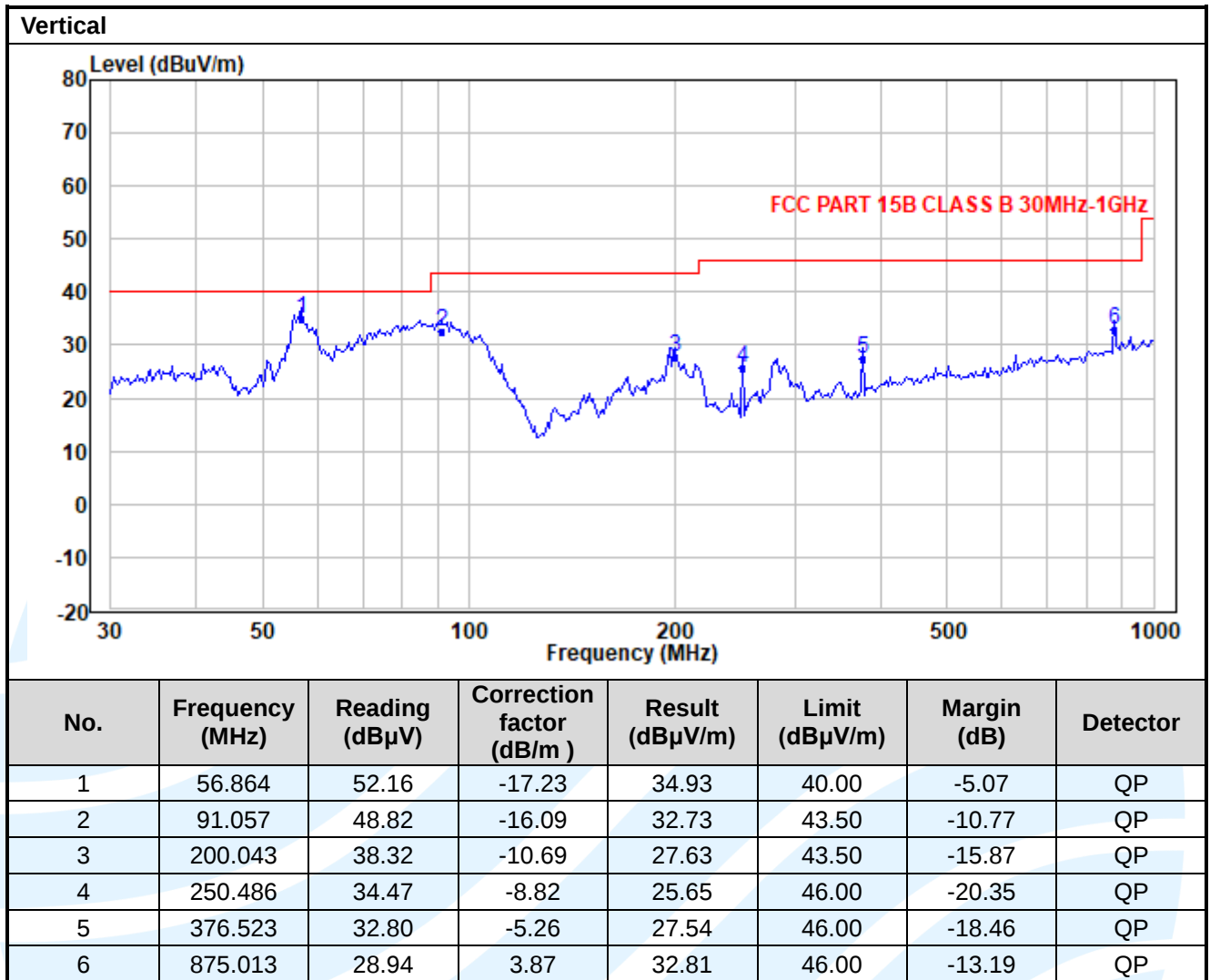
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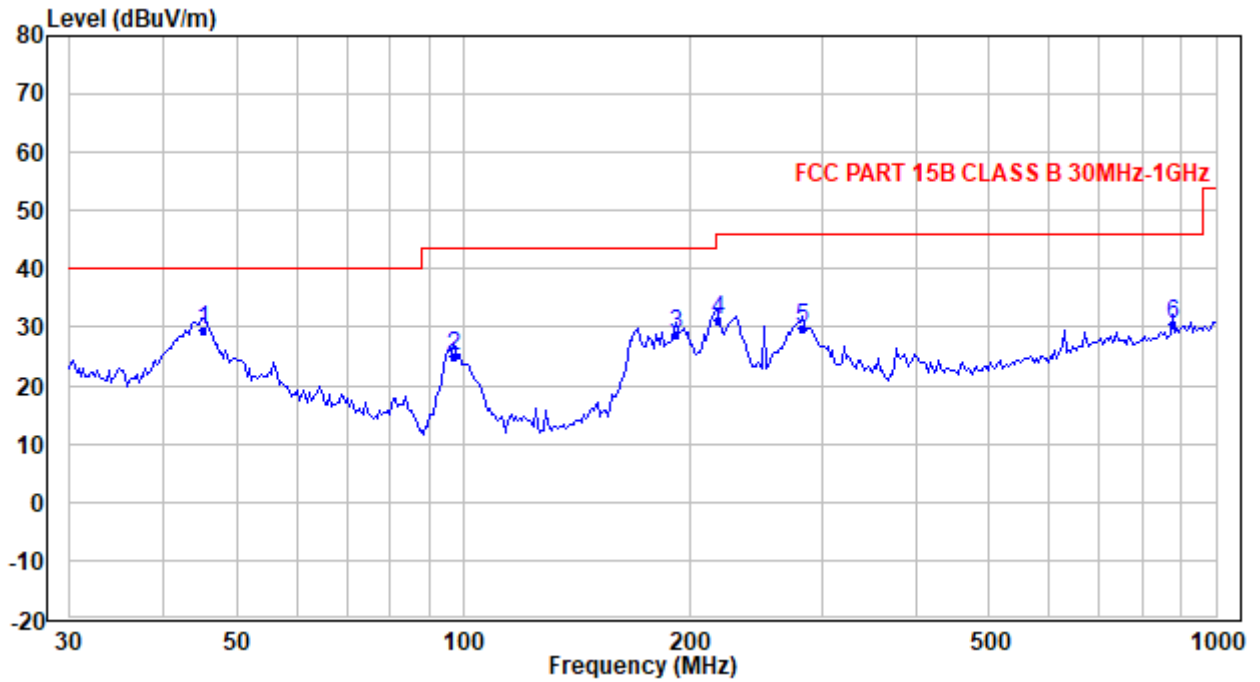
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Below 1GHz(Quasi Peak):
Test Mode8:
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	45.095	40.88	-11.32	29.56	40.00	-10.44	QP
2	97.002	41.02	-15.84	25.18	43.50	-18.32	QP
3	191.784	39.10	-10.28	28.82	43.50	-14.68	QP
4	217.644	42.20	-11.07	31.13	46.00	-14.87	QP
5	282.270	37.00	-7.26	29.74	46.00	-16.26	QP
6	875.013	26.53	3.87	30.40	46.00	-15.60	QP

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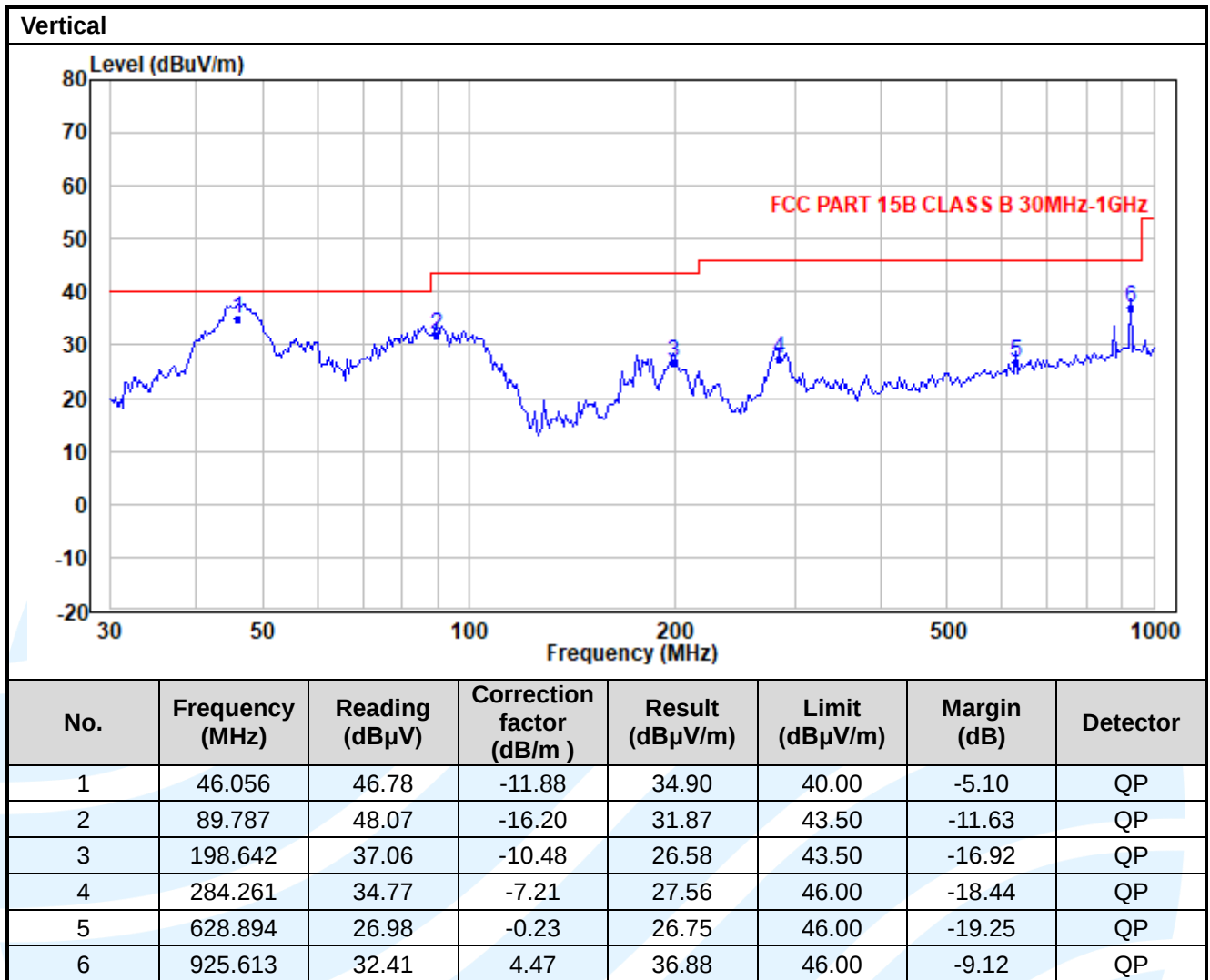
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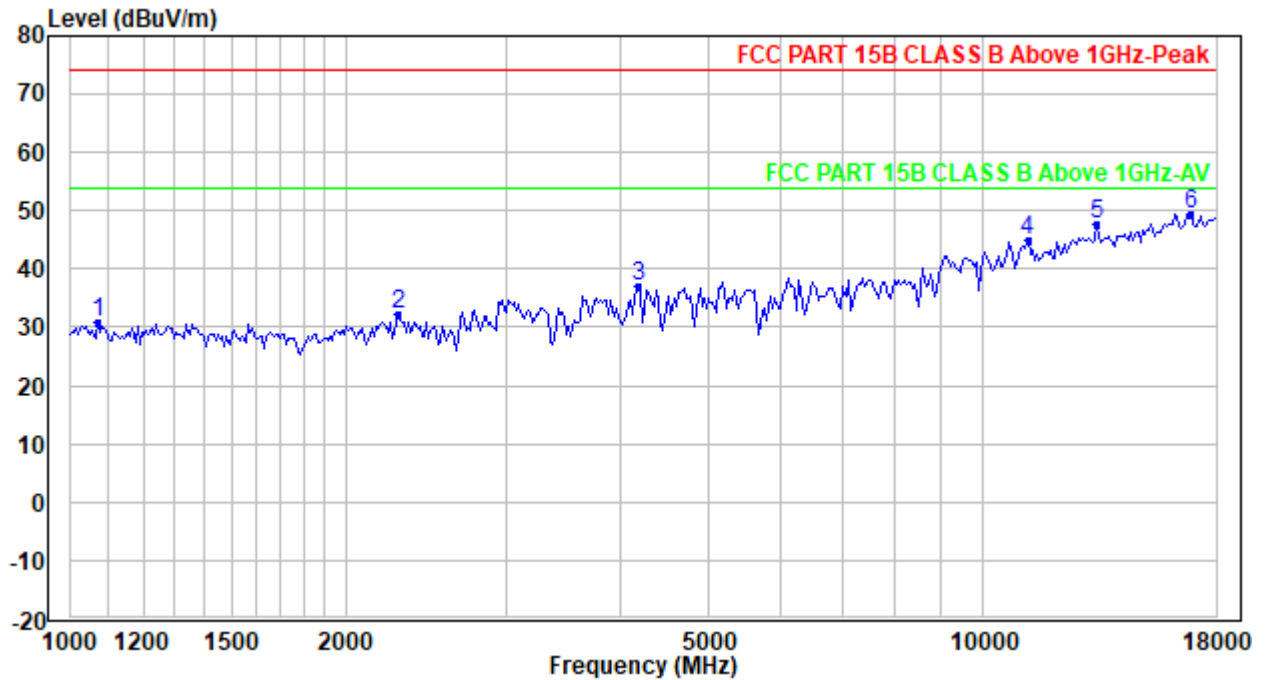
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Above 1GHz(Peak & Average)
Test Mode2:
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	1071.981	44.31	-13.38	30.93	74.00	-43.07	Peak
2	2289.430	41.06	-8.80	32.26	74.00	-41.74	Peak
3	4181.646	39.95	-2.83	37.12	74.00	-36.88	Peak
4	11194.260	37.61	7.29	44.90	74.00	-29.10	Peak
5	13318.720	36.49	11.16	47.65	74.00	-26.35	Peak
6	16888.890	36.69	12.68	49.37	74.00	-24.63	Peak

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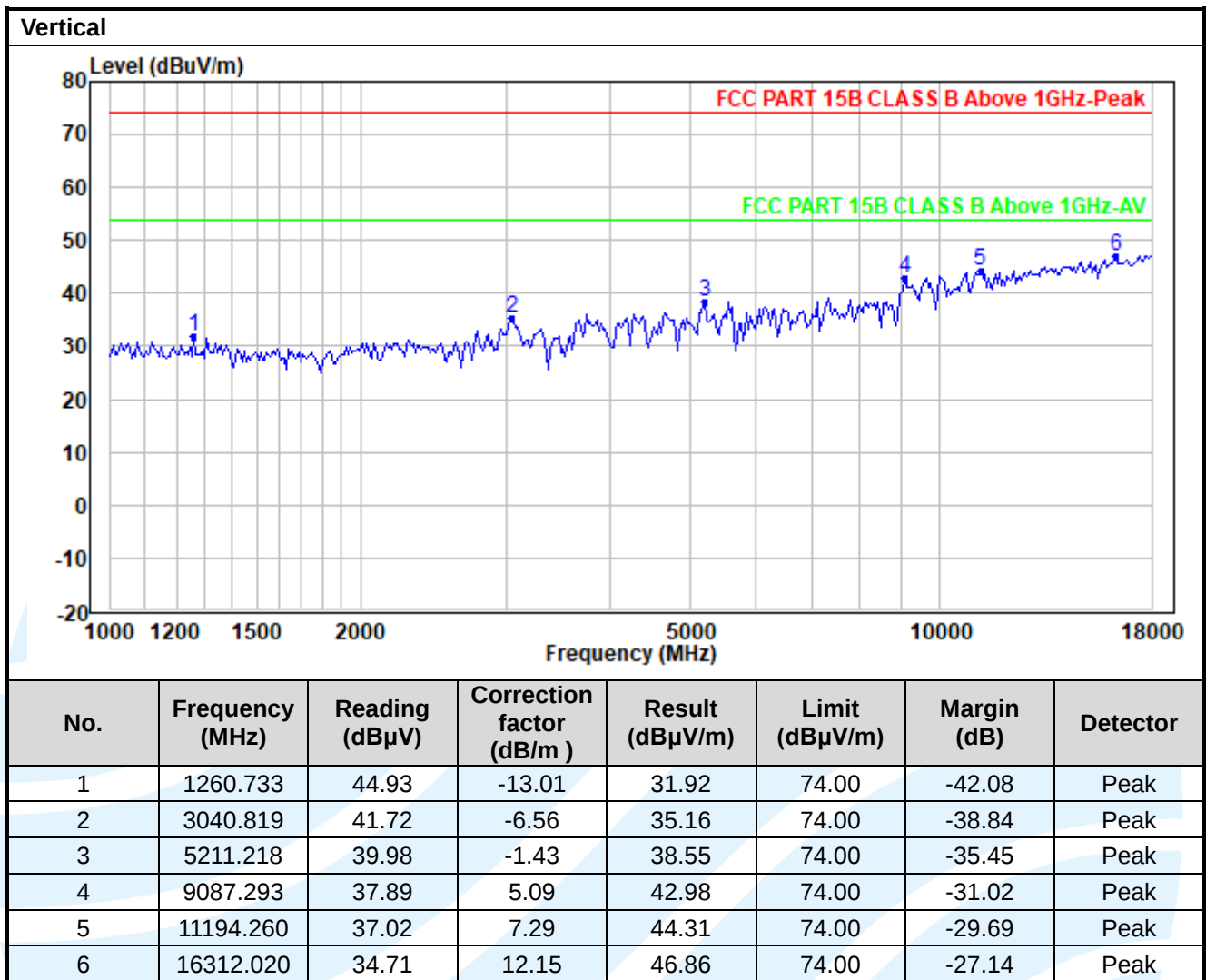
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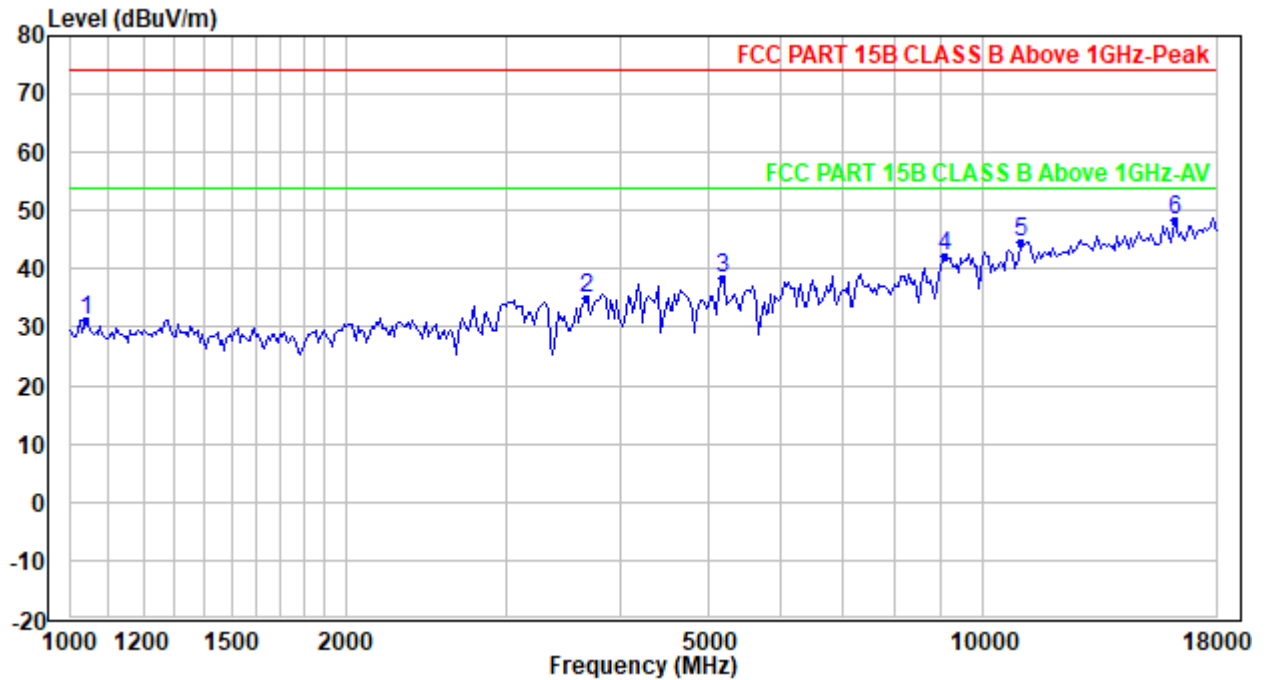
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Above 1GHz(Peak & Average)
Test Mode5:
Horizontal



No.	Frequency (MHz)	Reading (dB μ V)	Correction factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
1	1041.380	44.76	-13.44	31.32	74.00	-42.68	Peak
2	3681.329	39.35	-4.24	35.11	74.00	-38.89	Peak
3	5181.120	40.12	-1.55	38.57	74.00	-35.43	Peak
4	9087.293	37.16	5.09	42.25	74.00	-31.75	Peak
5	11001.420	37.17	7.42	44.59	74.00	-29.41	Peak
6	16217.810	36.27	12.06	48.33	74.00	-25.67	Peak

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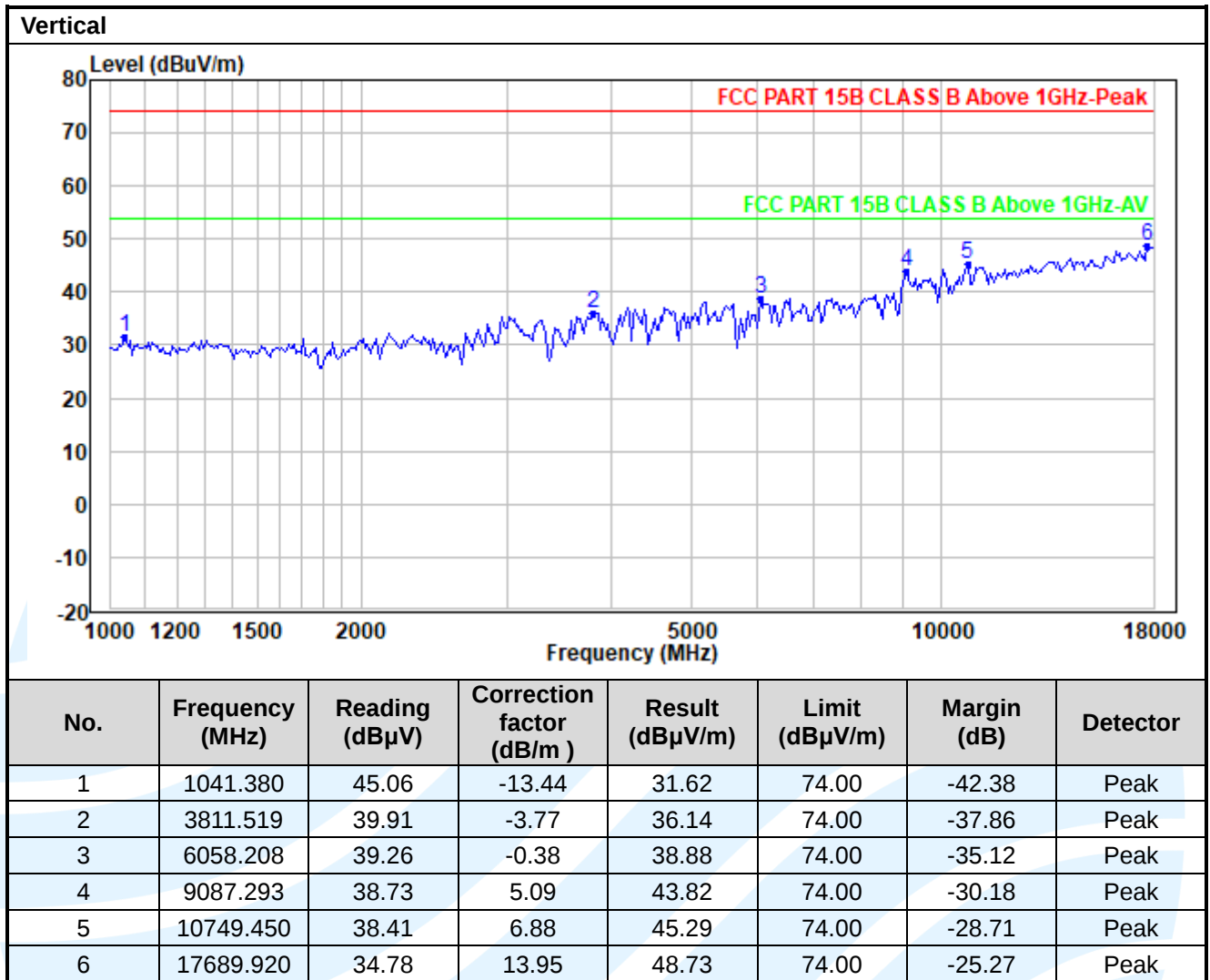
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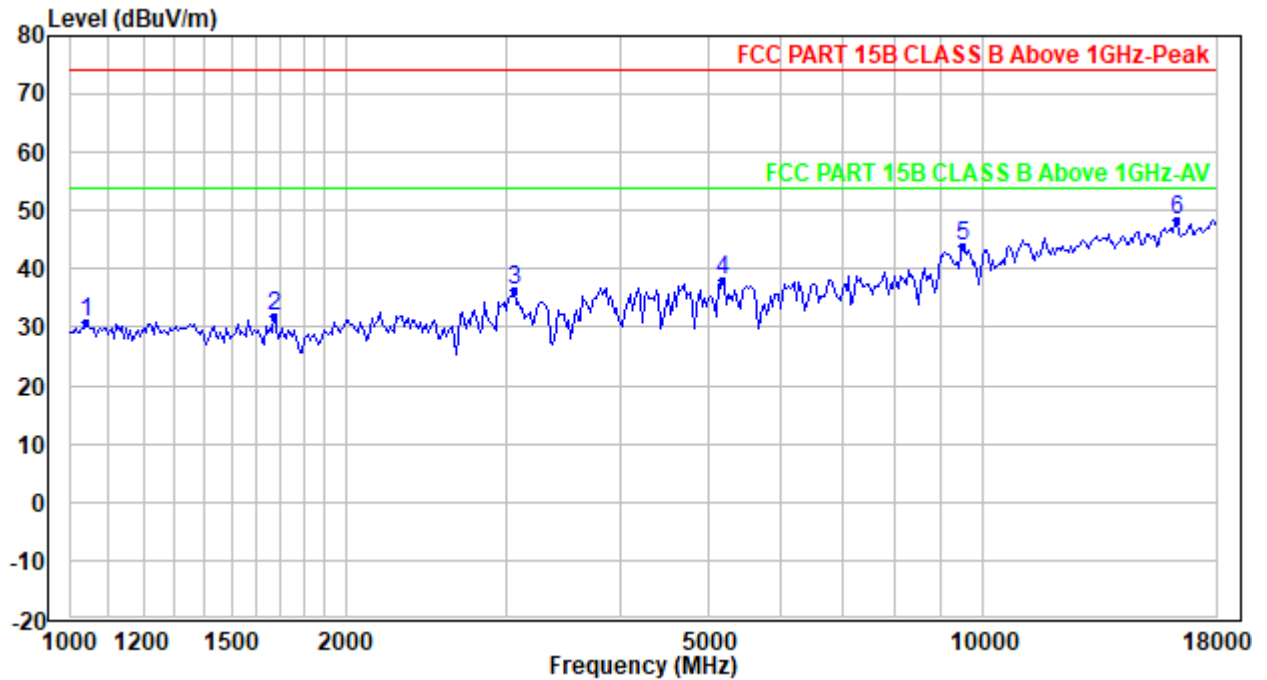
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Above 1GHz(Peak & Average)
Test Mode6:
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	1041.380	44.37	-13.44	30.93	74.00	-43.07	Peak
2	1674.504	43.29	-11.37	31.92	74.00	-42.08	Peak
3	3058.484	42.79	-6.49	36.30	74.00	-37.70	Peak
4	5181.120	39.77	-1.55	38.22	74.00	-35.78	Peak
5	9518.294	38.55	5.37	43.92	74.00	-30.08	Peak
6	16312.020	36.11	12.15	48.26	74.00	-25.74	Peak

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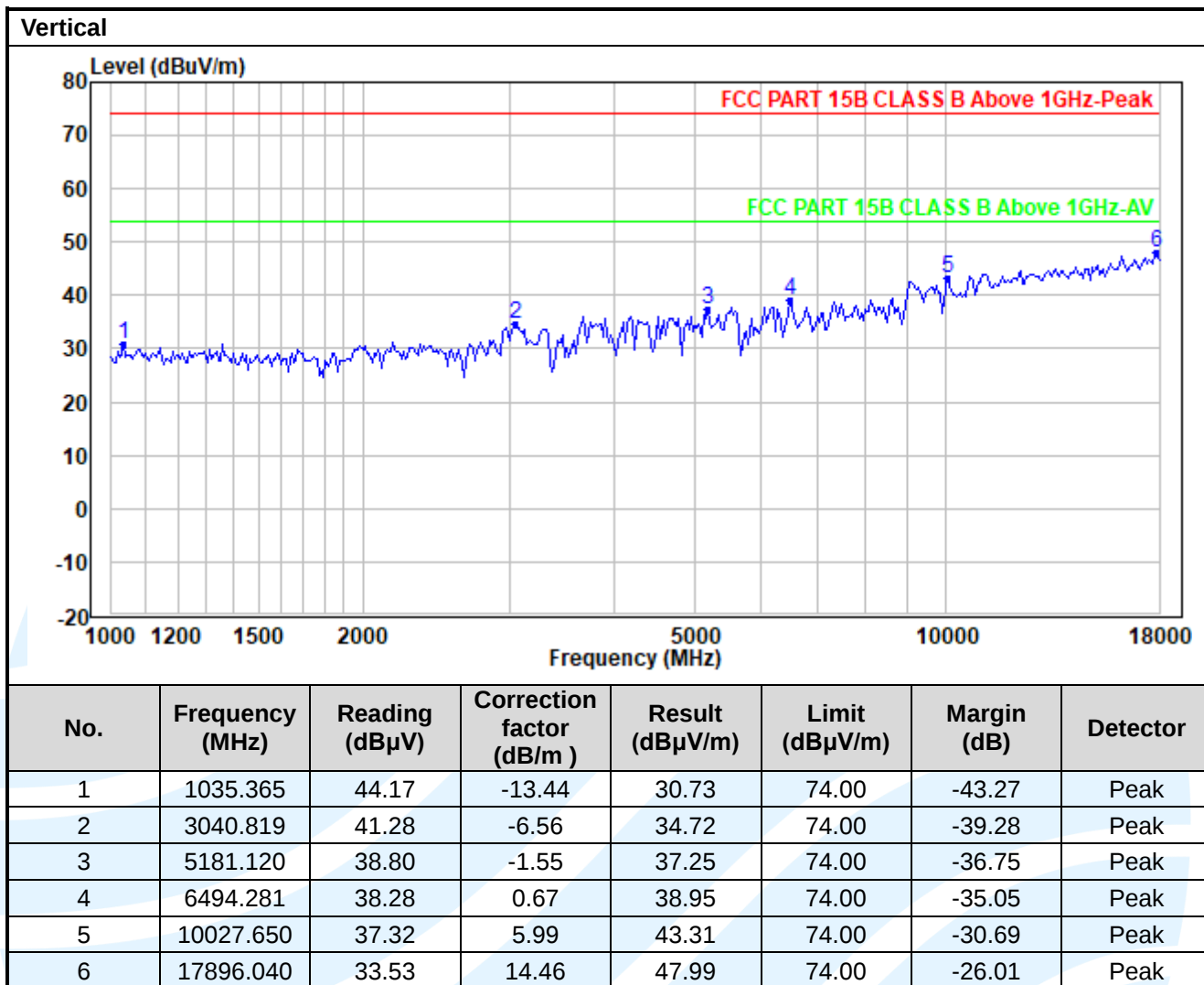
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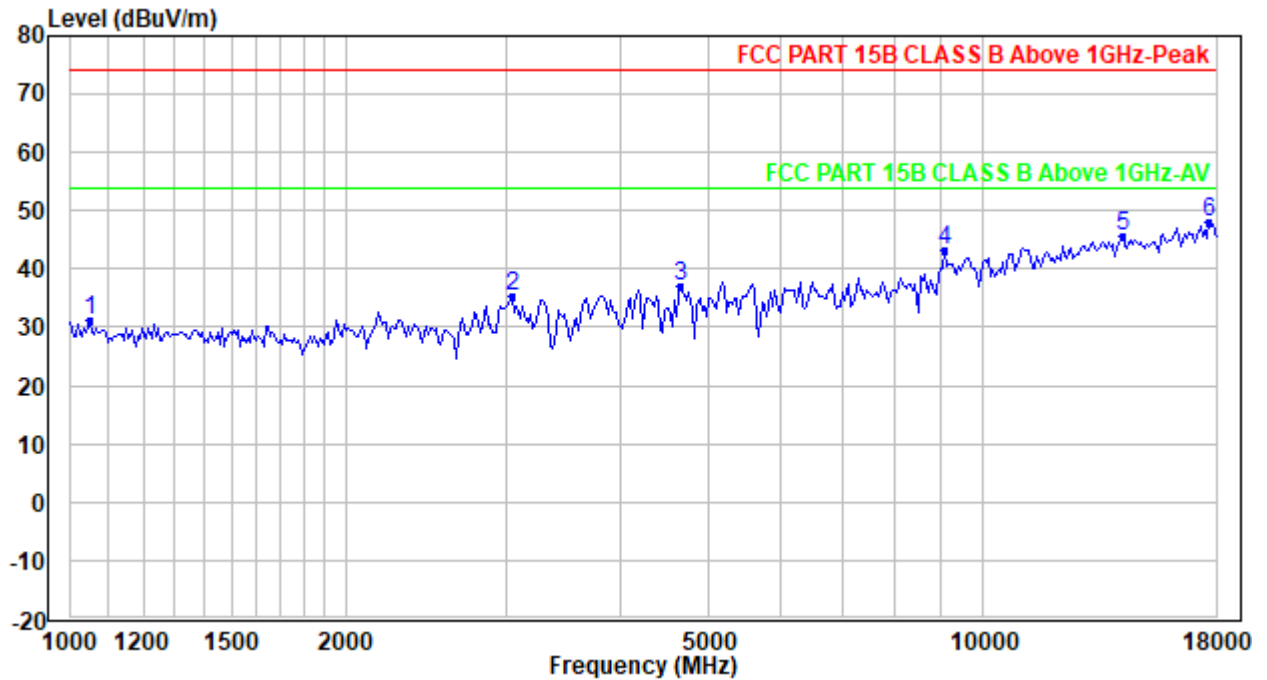
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Above 1GHz(Peak & Average)
Test Mode7:
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	1047.429	44.57	-13.42	31.15	74.00	-42.85	Peak
2	3040.819	42.04	-6.56	35.48	74.00	-38.52	Peak
3	4668.133	39.59	-2.43	37.16	74.00	-36.84	Peak
4	9087.293	38.01	5.09	43.10	74.00	-30.90	Peak
5	14194.950	33.90	11.73	45.63	74.00	-28.37	Peak
6	17689.920	34.18	13.95	48.13	74.00	-25.87	Peak

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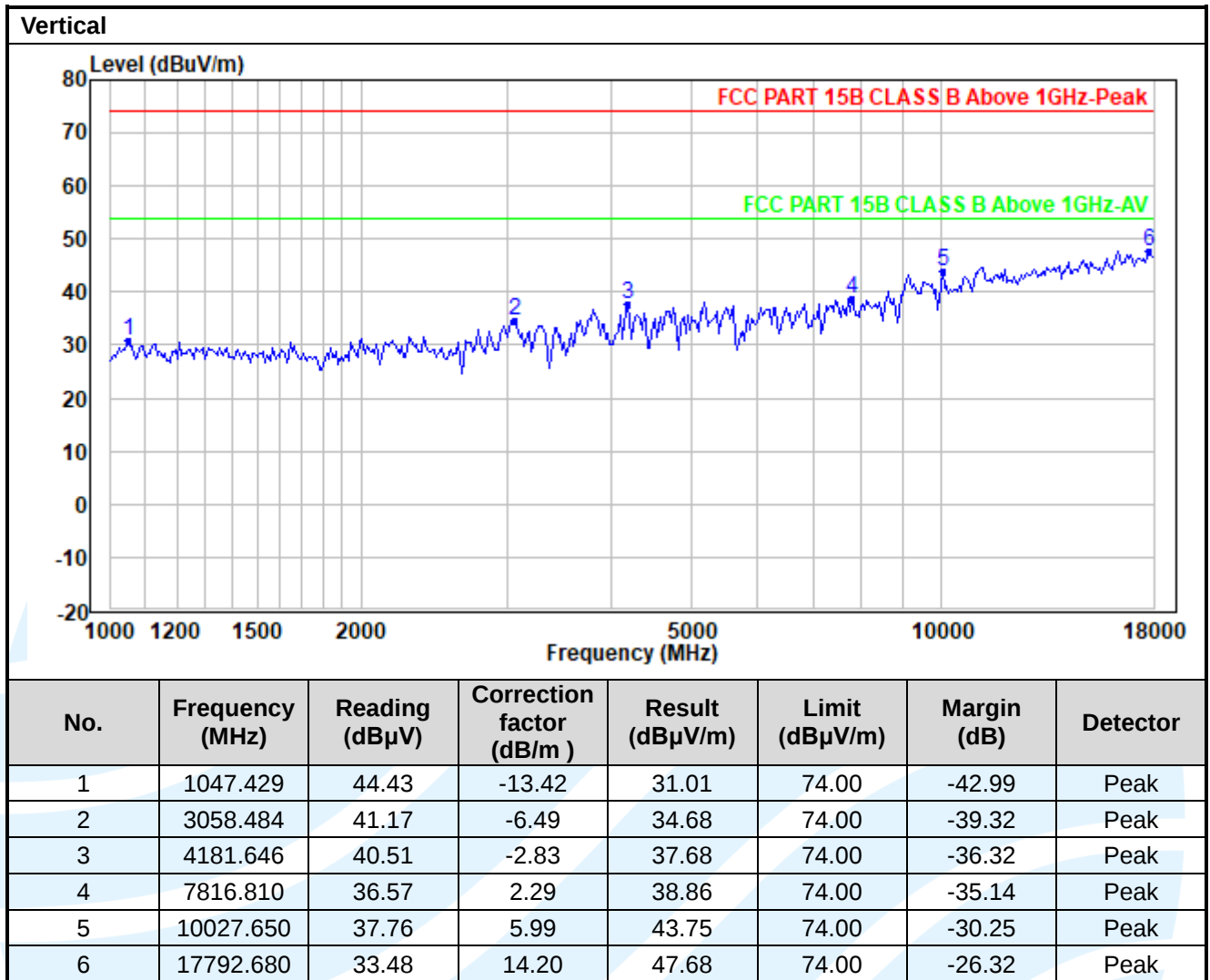
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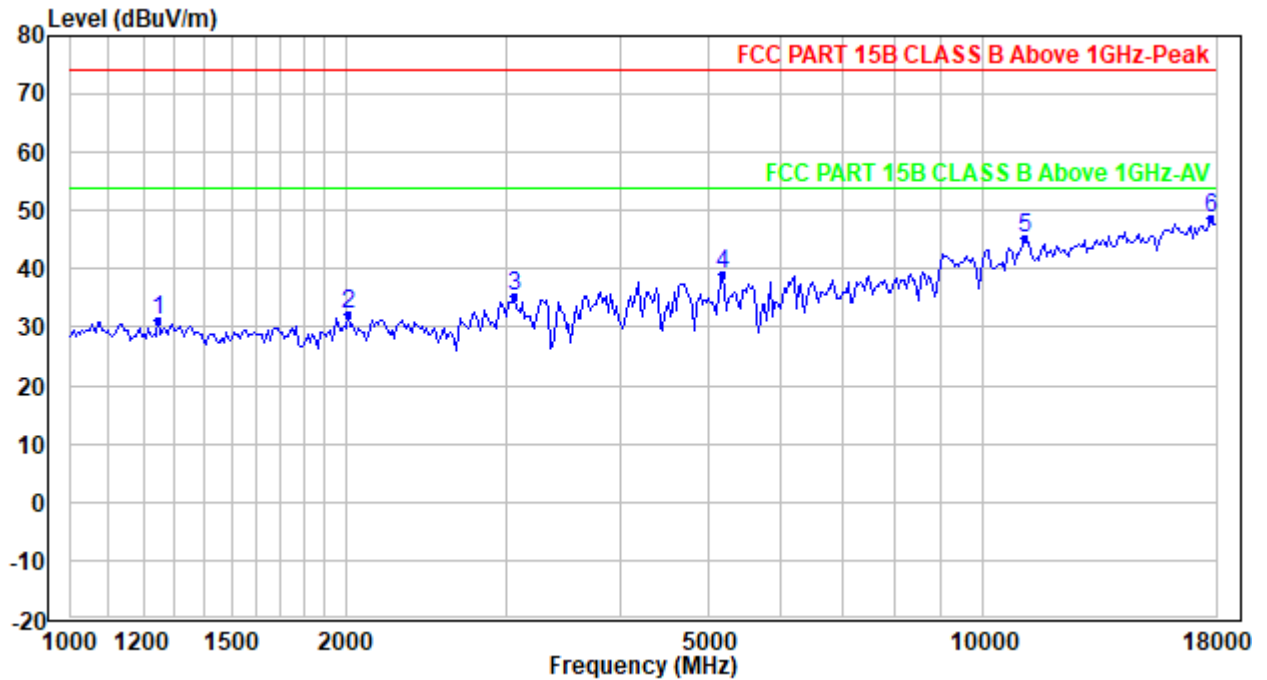
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Above 1GHz(Peak & Average)
Test Mode8:
Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	1246.212	44.22	-13.05	31.17	74.00	-42.83	Peak
2	2015.509	41.67	-9.53	32.14	74.00	-41.86	Peak
3	3058.484	41.75	-6.49	35.26	74.00	-38.74	Peak
4	5181.120	40.64	-1.55	39.09	74.00	-34.91	Peak
5	11129.600	37.80	7.32	45.12	74.00	-28.88	Peak
6	17792.680	34.40	14.20	48.60	74.00	-25.40	Peak

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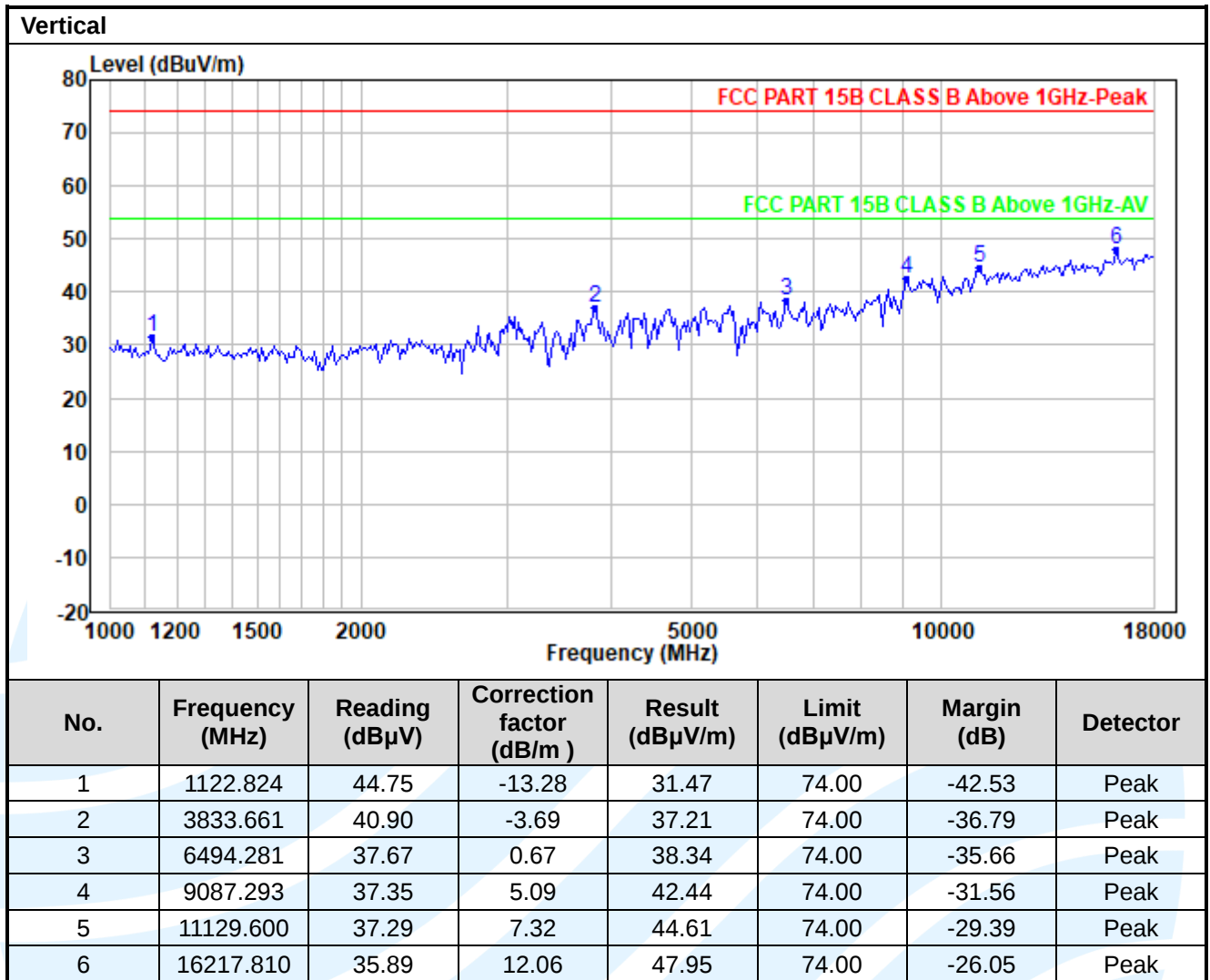
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Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.
5. The limit of ICES-003 in the 230MHz to 960MHz band is higher than that of FCC Part 15B, so the radiation emission test data conform to the limit of ICES-003.

6.2 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.107
ICES-003 Issue 7 Section 3.2.1

Test Method: ANSI C63.4-2014

Limits:

Limits for Class B devices

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.3.2 for details.

Test Procedures:

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

Equipment Used: Refer to section 3 for details.

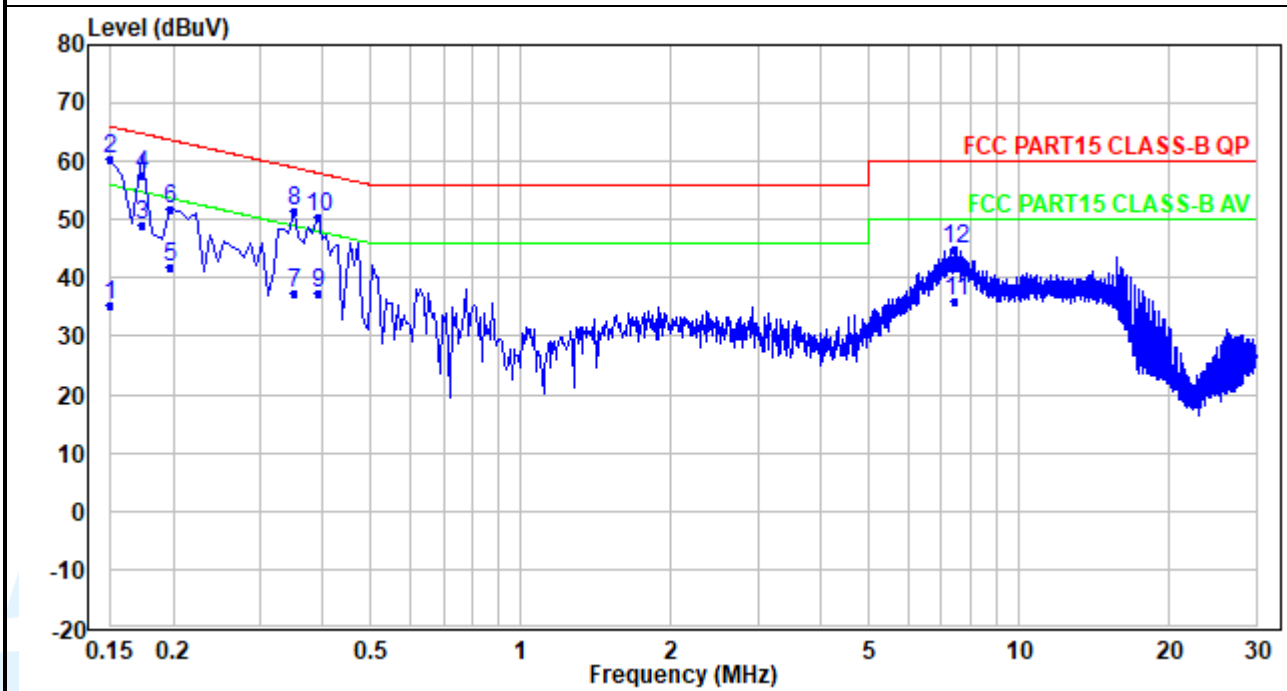
Test Result: Pass

The measurement data as follows:

Quasi Peak and Average:

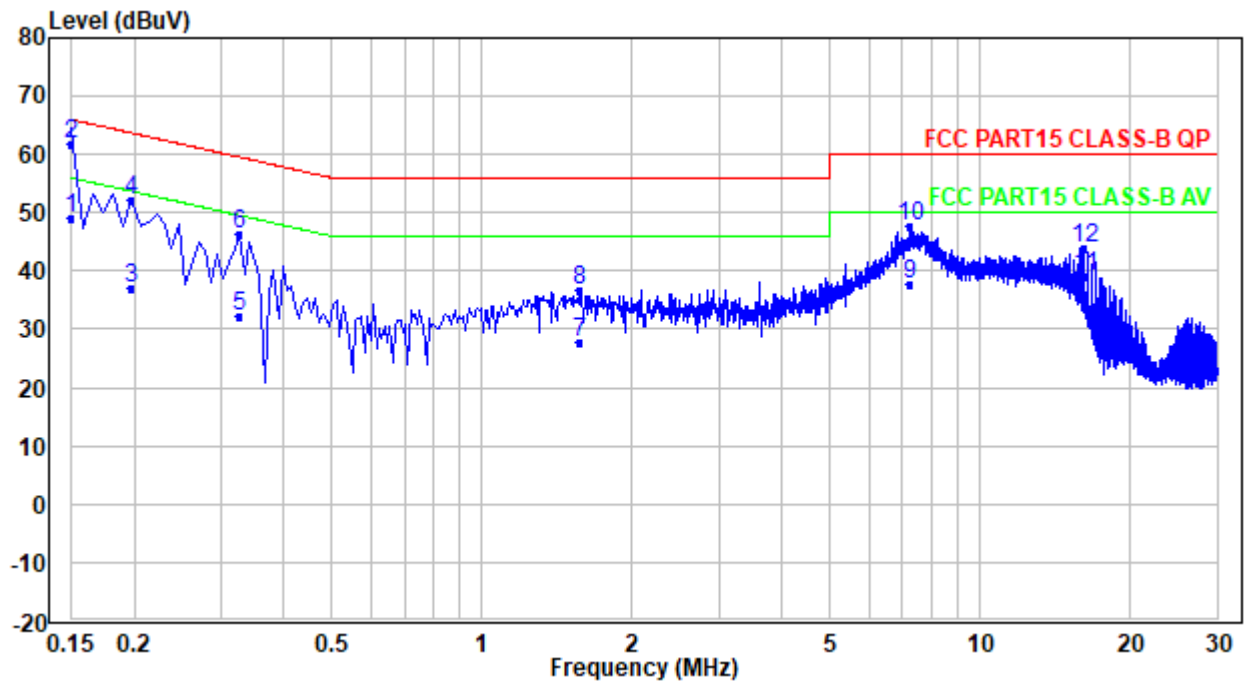
Test Mode1:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.150	25.45	10.03	35.48	56.00	-20.52	Average
2	0.150	50.45	10.03	60.48	66.00	-5.52	QP
3	0.174	39.13	10.03	49.16	54.77	-5.61	Average
4	0.174	47.69	10.03	57.72	64.77	-7.05	QP
5	0.198	31.73	10.02	41.75	53.69	-11.94	Average
6	0.198	41.73	10.02	51.75	63.69	-11.94	QP
7	0.350	27.49	10.03	37.52	48.96	-11.44	Average
8	0.350	41.49	10.03	51.52	58.96	-7.44	QP
9	0.390	27.31	10.04	37.35	48.06	-10.71	Average
10	0.390	40.31	10.04	50.35	58.06	-7.71	QP
11	7.461	25.55	10.45	36.00	50.00	-14.00	Average
12	7.461	34.55	10.45	45.00	60.00	-15.00	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.150	39.09	10.02	49.11	56.00	-6.89	Average
2	0.150	51.69	10.02	61.71	66.00	-4.29	QP
3	0.198	27.11	10.00	37.11	53.69	-16.58	Average
4	0.198	42.11	10.00	52.11	63.69	-11.58	QP
5	0.326	22.35	10.02	32.37	49.55	-17.18	Average
6	0.326	36.35	10.02	46.37	59.55	-13.18	QP
7	1.574	17.71	10.08	27.79	46.00	-18.21	Average
8	1.574	26.71	10.08	36.79	56.00	-19.21	QP
9	7.245	27.41	10.41	37.82	50.00	-12.18	Average
10	7.245	37.41	10.41	47.82	60.00	-12.18	QP
11	16.251	28.04	10.92	38.96	50.00	-11.04	Average
12	16.251	33.04	10.92	43.96	60.00	-16.04	QP

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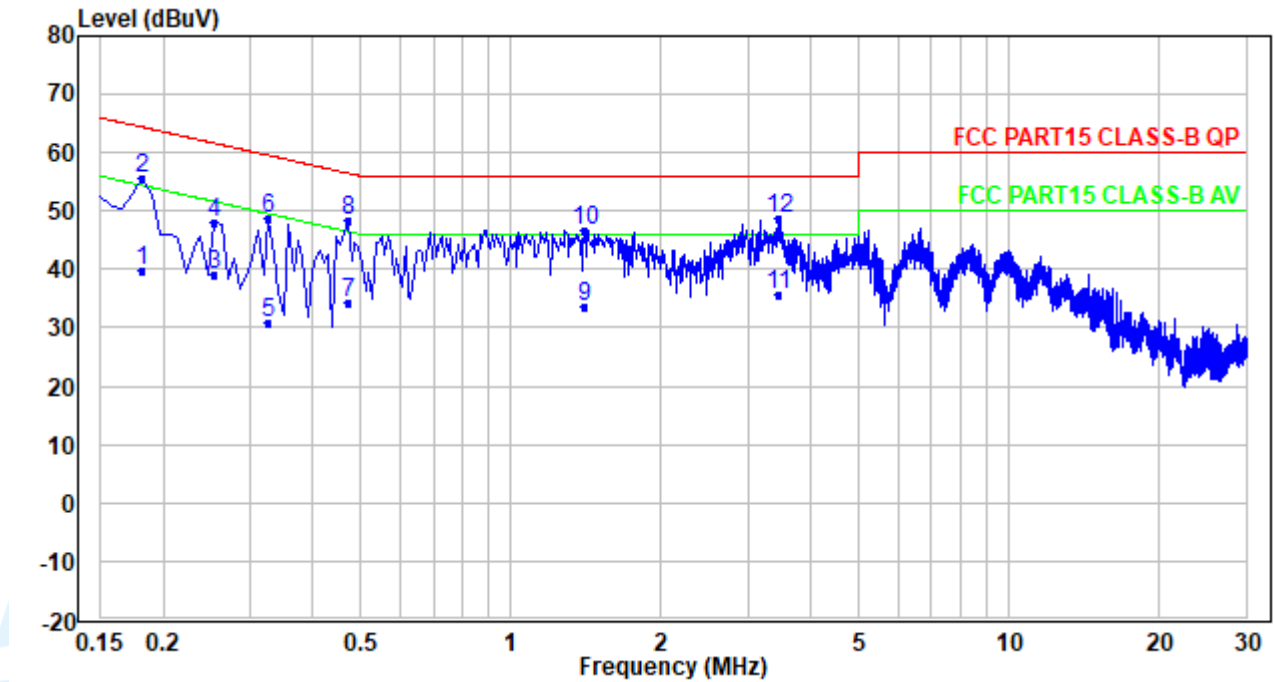
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Quasi Peak and Average:
Test Mode5:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.182	29.70	10.02	39.72	54.39	-14.67	Average
2	0.182	45.70	10.02	55.72	64.39	-8.67	QP
3	0.254	29.16	10.03	39.19	51.63	-12.44	Average
4	0.254	38.16	10.03	48.19	61.63	-13.44	QP
5	0.326	20.84	10.03	30.87	49.55	-18.68	Average
6	0.326	38.84	10.03	48.87	59.55	-10.68	QP
7	0.470	24.36	10.04	34.40	46.52	-12.12	Average
8	0.470	38.36	10.04	48.40	56.52	-8.12	QP
9	1.406	23.64	10.09	33.73	46.00	-12.27	Average
10	1.406	36.64	10.09	46.73	56.00	-9.27	QP
11	3.437	25.44	10.23	35.67	46.00	-10.33	Average
12	3.437	38.44	10.23	48.67	56.00	-7.33	QP

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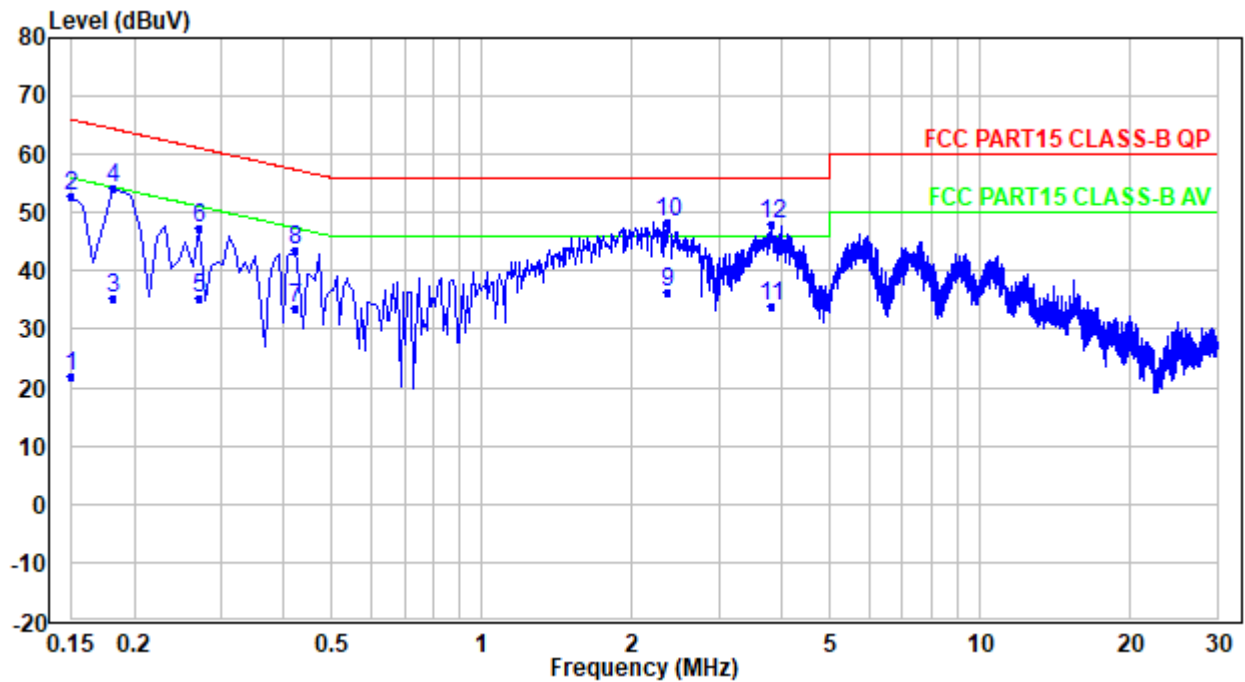
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Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.150	11.83	10.02	21.85	56.00	-34.15	Average
2	0.150	42.83	10.02	52.85	66.00	-13.15	QP
3	0.182	25.28	10.00	35.28	54.39	-19.11	Average
4	0.182	44.28	10.00	54.28	64.39	-10.11	QP
5	0.270	25.38	10.01	35.39	51.12	-15.73	Average
6	0.270	37.38	10.01	47.39	61.12	-13.73	QP
7	0.422	23.63	10.02	33.65	47.41	-13.76	Average
8	0.422	33.63	10.02	43.65	57.41	-13.76	QP
9	2.366	26.26	10.13	36.39	46.00	-9.61	Average
10	2.366	38.26	10.13	48.39	56.00	-7.61	QP
11	3.805	23.87	10.25	34.12	46.00	-11.88	Average
12	3.805	37.87	10.25	48.12	56.00	-7.88	QP

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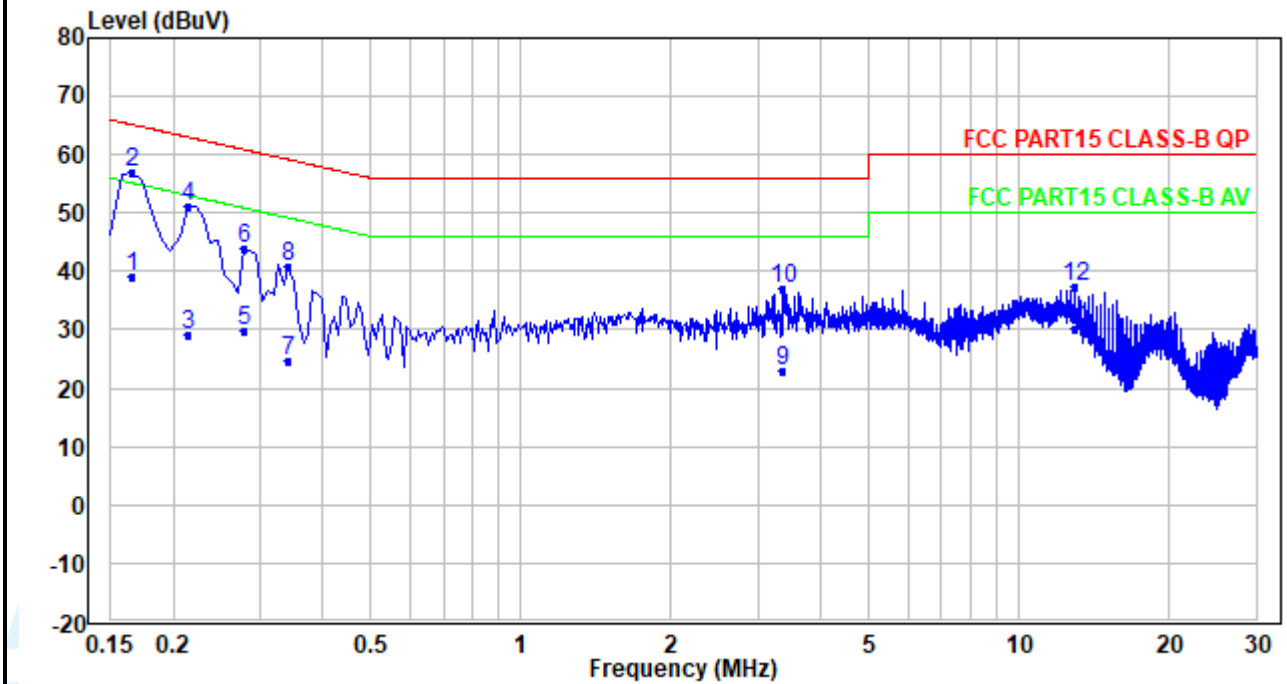
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Quasi Peak and Average:
Test Mode6:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.166	29.10	10.03	39.13	55.16	-16.03	Average
2	0.166	47.10	10.03	57.13	65.16	-8.03	QP
3	0.214	19.07	10.02	29.09	53.05	-23.96	Average
4	0.214	41.07	10.02	51.09	63.05	-11.96	QP
5	0.278	19.95	10.03	29.98	50.88	-20.90	Average
6	0.278	33.95	10.03	43.98	60.88	-16.90	QP
7	0.342	14.80	10.03	24.83	49.16	-24.33	Average
8	0.342	30.80	10.03	40.83	59.16	-18.33	QP
9	3.349	12.72	10.22	22.94	46.00	-23.06	Average
10	3.349	26.72	10.22	36.94	56.00	-19.06	QP
11	13.003	19.56	10.71	30.27	50.00	-19.73	Average
12	13.003	26.56	10.71	37.27	60.00	-22.73	QP

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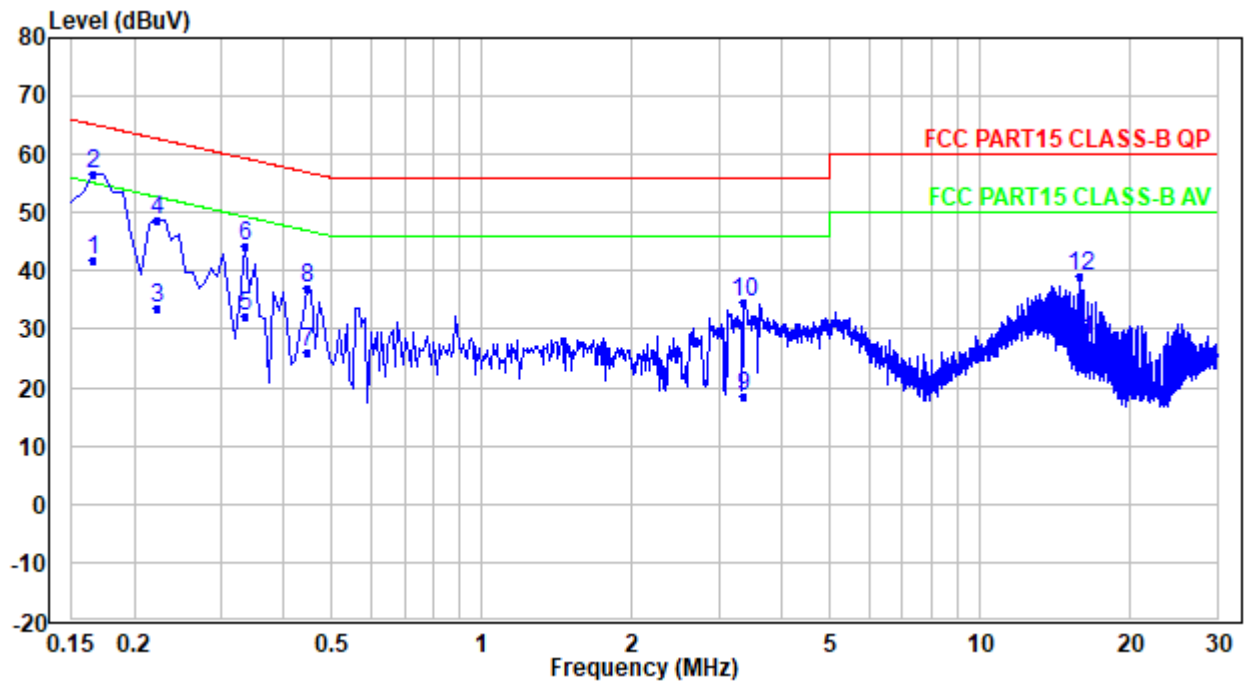
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Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.166	31.76	10.02	41.78	55.16	-13.38	Average
2	0.166	46.76	10.02	56.78	65.16	-8.38	QP
3	0.222	23.77	10.00	33.77	52.74	-18.97	Average
4	0.222	38.77	10.00	48.77	62.74	-13.97	QP
5	0.334	22.13	10.02	32.15	49.35	-17.20	Average
6	0.334	34.13	10.02	44.15	59.35	-15.20	QP
7	0.446	15.93	10.02	25.95	46.95	-21.00	Average
8	0.446	26.93	10.02	36.95	56.95	-20.00	QP
9	3.349	8.39	10.20	18.59	46.00	-27.41	Average
10	3.349	24.39	10.20	34.59	56.00	-21.41	QP
11	15.971	17.07	10.90	27.97	50.00	-22.03	Average
12	15.971	28.07	10.90	38.97	60.00	-21.03	QP

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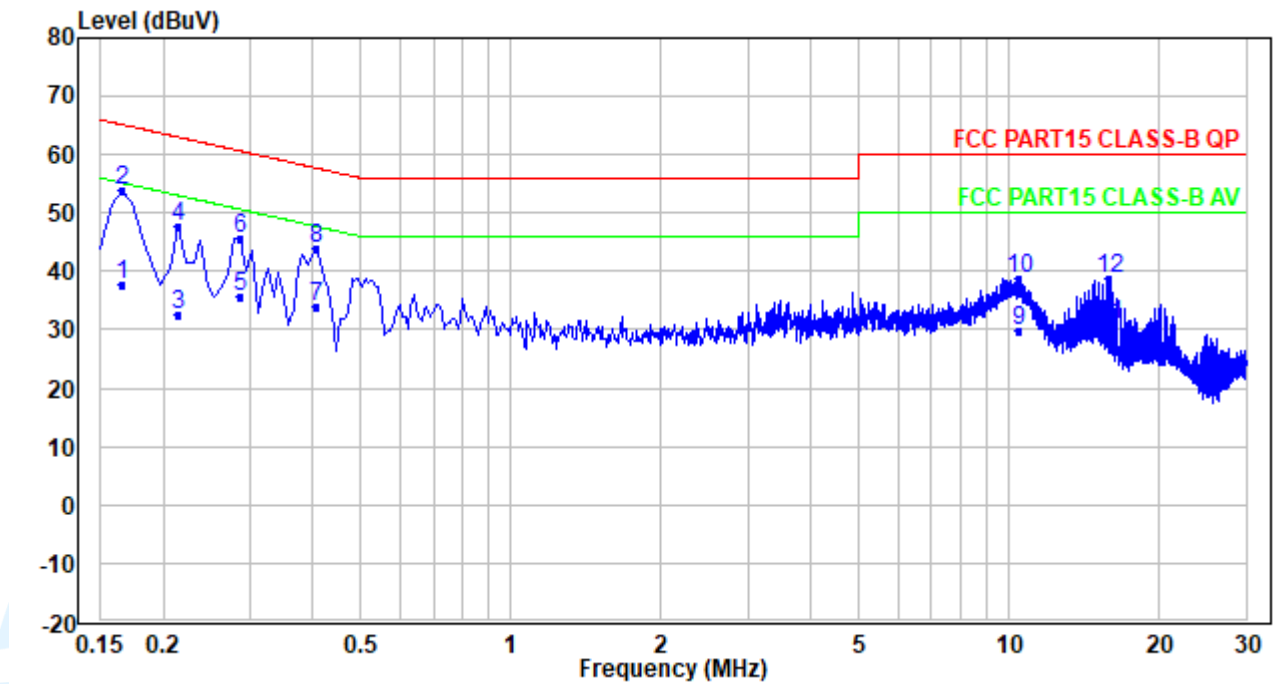
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Quasi Peak and Average:
Test Mode7:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.166	27.87	10.03	37.90	55.16	-17.26	Average
2	0.166	43.87	10.03	53.90	65.16	-11.26	QP
3	0.214	22.71	10.02	32.73	53.05	-20.32	Average
4	0.214	37.71	10.02	47.73	63.05	-15.32	QP
5	0.286	25.72	10.03	35.75	50.64	-14.89	Average
6	0.286	35.72	10.03	45.75	60.64	-14.89	QP
7	0.406	23.77	10.04	33.81	47.73	-13.92	Average
8	0.406	33.77	10.04	43.81	57.73	-13.92	QP
9	10.524	19.26	10.57	29.83	50.00	-20.17	Average
10	10.524	28.26	10.57	38.83	60.00	-21.17	QP
11	15.971	19.78	10.91	30.69	50.00	-19.31	Average
12	15.971	27.78	10.91	38.69	60.00	-21.31	QP

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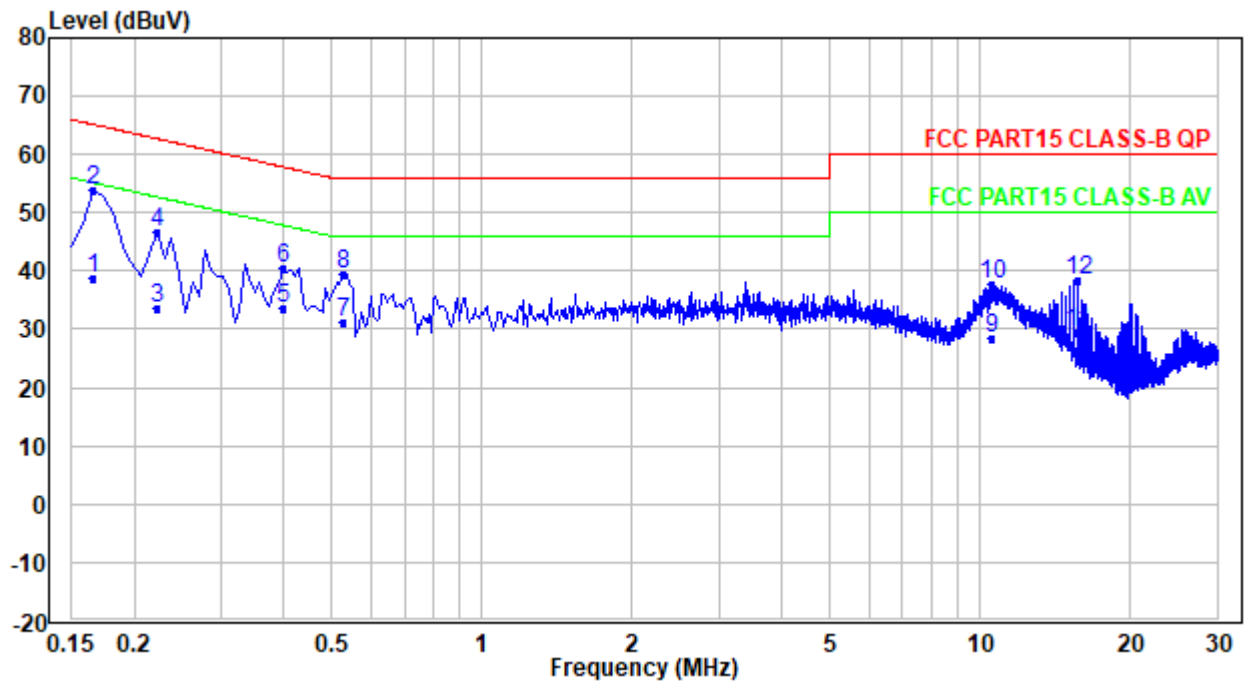
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Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.166	28.85	10.02	38.87	55.16	-16.29	Average
2	0.166	43.85	10.02	53.87	65.16	-11.29	QP
3	0.222	23.67	10.00	33.67	52.74	-19.07	Average
4	0.222	36.67	10.00	46.67	62.74	-16.07	QP
5	0.398	23.55	10.02	33.57	47.90	-14.33	Average
6	0.398	30.55	10.02	40.57	57.90	-17.33	QP
7	0.526	21.34	10.03	31.37	46.00	-14.63	Average
8	0.526	29.34	10.03	39.37	56.00	-16.63	QP
9	10.588	18.09	10.53	28.62	50.00	-21.38	Average
10	10.588	27.09	10.53	37.62	60.00	-22.38	QP
11	15.715	18.65	10.88	29.53	50.00	-20.47	Average
12	15.715	27.65	10.88	38.53	60.00	-21.47	QP

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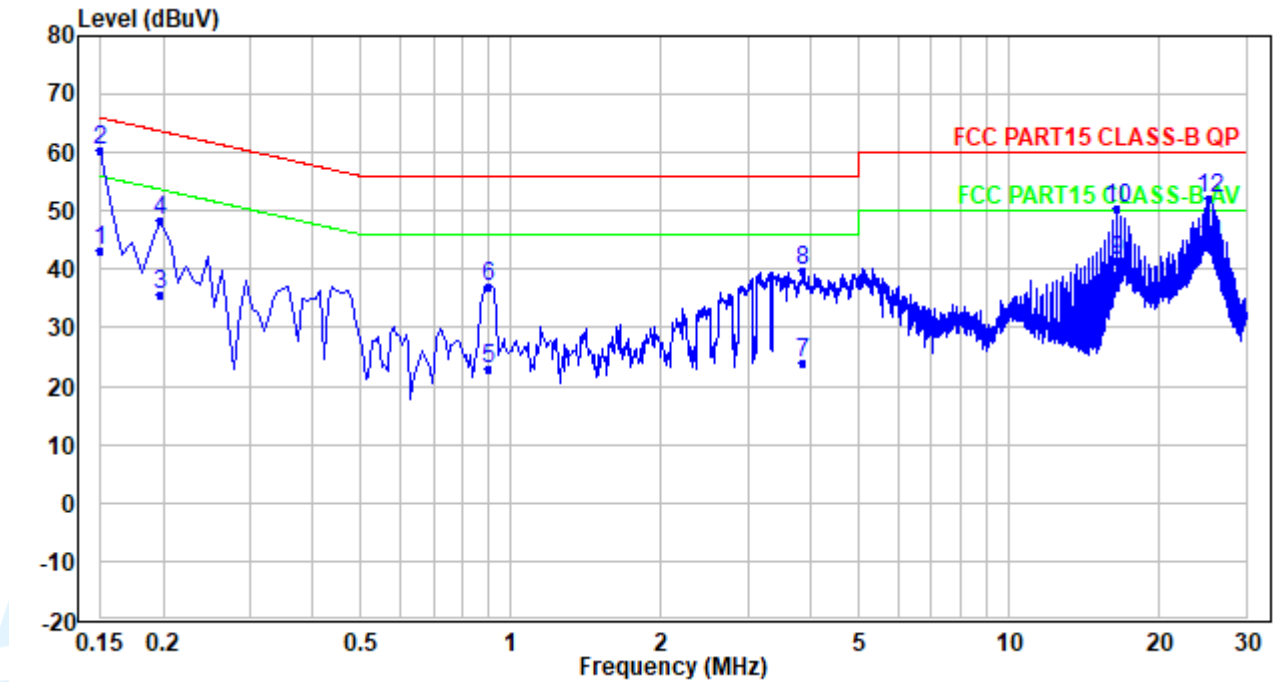
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Quasi Peak and Average:
Test Mode8:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.150	33.32	10.03	43.35	56.00	-12.65	Average
2	0.150	50.32	10.03	60.35	66.00	-5.65	QP
3	0.198	25.49	10.02	35.51	53.69	-18.18	Average
4	0.198	38.49	10.02	48.51	63.69	-15.18	QP
5	0.902	13.04	10.06	23.10	46.00	-22.90	Average
6	0.902	27.04	10.06	37.10	56.00	-18.90	QP
7	3.853	13.63	10.26	23.89	46.00	-22.11	Average
8	3.853	29.63	10.26	39.89	56.00	-16.11	QP
9	16.523	30.52	10.97	41.49	50.00	-8.51	Average
10	16.523	39.52	10.97	50.49	60.00	-9.51	QP
11	25.353	32.60	11.43	44.03	50.00	-5.97	Average
12	25.353	40.60	11.43	52.03	60.00	-7.97	QP

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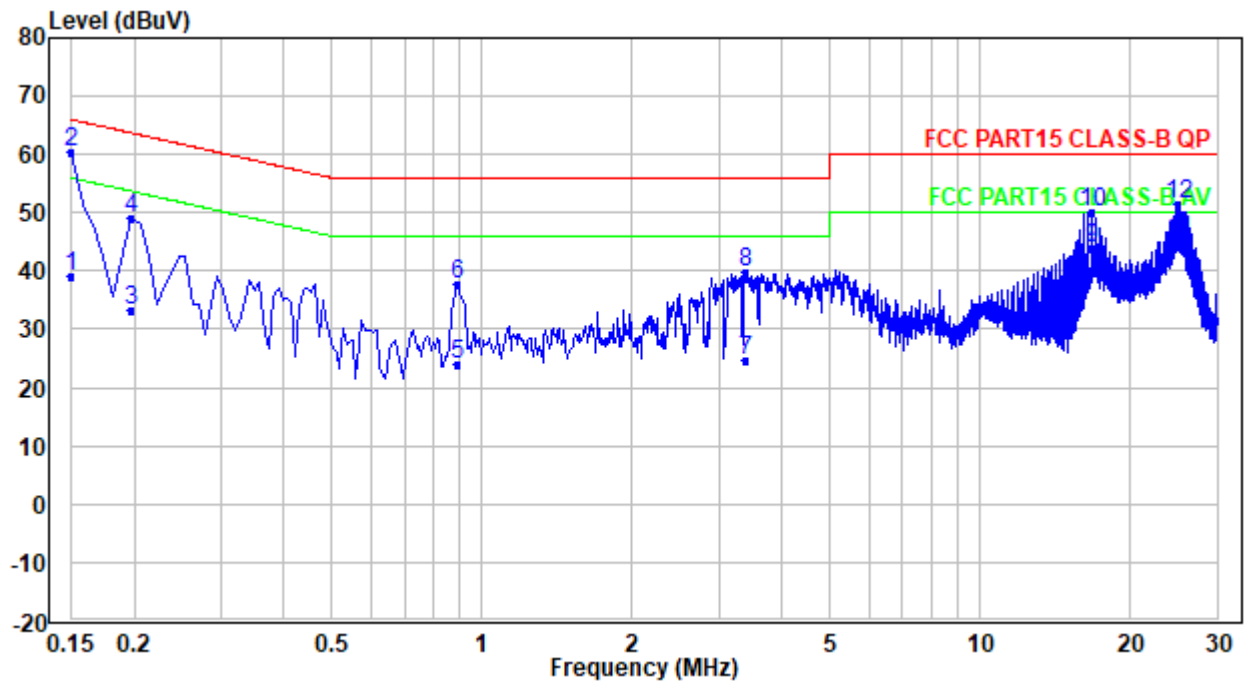
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Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.150	29.23	10.02	39.25	56.00	-16.75	Average
2	0.150	50.23	10.02	60.25	66.00	-5.75	QP
3	0.198	23.13	10.00	33.13	53.69	-20.56	Average
4	0.198	39.13	10.00	49.13	63.69	-14.56	QP
5	0.894	13.79	10.05	23.84	46.00	-22.16	Average
6	0.894	27.79	10.05	37.84	56.00	-18.16	QP
7	3.397	14.49	10.22	24.71	46.00	-21.29	Average
8	3.397	29.49	10.22	39.71	56.00	-16.29	QP
9	16.819	32.98	10.96	43.94	50.00	-6.06	Average
10	16.819	38.98	10.96	49.94	60.00	-10.06	QP
11	25.089	34.00	11.37	45.37	50.00	-4.63	Average
12	25.089	40.00	11.37	51.37	60.00	-8.63	QP

Remark:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

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APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

***** End of Report *****

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