



Certificate #4312.01

TEST REPORT

Product Name: High-Performance Outdoor AX6000 Wi-Fi
6 Access Point

Trade Mark: GRANDSTREAM

Model No.: GWN7664ELR

Report Number: 24031510115EMC-1

Test Standards: FCC 47 CFR Part 15 Subpart B

FCC ID: YZZGWN7664ELR

Test Result: PASS

Date of Issue: June 28, 2024

Prepared for:

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

Prepared by:

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Date: June 28, 2024

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Version

Version No.	Date	Description
V1.0	June 28, 2024	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:	High-Performance Outdoor AX6000 Wi-Fi 6 Access Point
Model No.:	GWN7664ELR
Trade Mark:	GRANDSTREAM
DUT Stage:	Identical Prototype
Rated Voltage:	Powered by POE port
Classification of digital devices:	Class B
Highest Internal Frequency:	5825 MHz
Software Version:	0.3.12.1(Provided by the customer)
Hardware Version:	V1.1 (Provided by the customer)
Sample Received Date:	March 14, 2024
Sample Tested Date:	April 2, 2024 April 12, 2024
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

Others
1x Mounting Bracket, 1x Base Bracket

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
POE	CISCO	MA-INJ-4	QS-6593-01N A02	UnionTrust
POE	H3C	EWPAM1NPOE	9NA0251014	Applicant
Wireless Router	ASUA	RT-AC2200	2019AJ4850	UnionTrust
Notebook	Lenovo	Lenovo B40-80	MP12NEQ6	UnionTrust
Notebook	Lenovo	TP00067A	PN-0FZDEU 16\02	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust
Mobile Phone	MI	MDG1	461cceef7d24	UnionTrust

Support Cable

Cable No.	Description	Connector	Length(Meter)	Supplied by
1	Ethernet Cable	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

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1.4 TEST LOCATION

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1.5 TEST FACILITY

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

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	ANSI C63.4-2014	PASS
Radiated Emission	FCC 47 CFR Part 15.109	ANSI C63.4-2014	PASS



3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
<input checked="" type="checkbox"/>	3m SAC	ETS-LINDGREN	3m	Euroshiedpn-CT 001270-1317	11-Nov-2023	10-Nov-2026
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	27-Oct-2023	26-Oct-2024
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	30-Oct-2023	29-Oct-2024
<input checked="" type="checkbox"/>	6dB Attenuator	Talent	RA6A5-N-18	18103001	30-Oct-2023	29-Oct-2024
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
<input checked="" type="checkbox"/>	Double-Ridged Waveguide Horn Antenna	ETS-LINDGREN	3117-PA	00201541	16-Apr-2023	15-Apr-2024
					01-Apr-2024	31-Mar-2025
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-Lindgren	00118385	00201874	31-Oct-2023	30-Oct-2024
<input checked="" type="checkbox"/>	Double-Ridged Waveguide Horn Antenna	ETS-LINDGREN	3116C-PA	00202652	30-Oct-2023	29-Oct-2024
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-LINDGREN	00118384	00202652	30-Oct-2023	29-Oct-2024
<input checked="" type="checkbox"/>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	101181	27-Oct-2023	26-Oct-2024
<input checked="" type="checkbox"/>	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	27-Oct-2023	26-Oct-2024
<input checked="" type="checkbox"/>	LISN	R&S	ESH2-Z5	860014/024	27-Oct-2023	26-Oct-2024
<input type="checkbox"/>	LISN	ETS-Lindgren	3816/2SH	00201088	27-Oct-2023	26-Oct-2024
<input checked="" type="checkbox"/>	Shielding room	ETS-Lindgren	843	Euroshiedpn-CT 001270-1246	05-Nov-2021	04-Nov-2024
<input checked="" type="checkbox"/>	Test Software	EZ-EMC	EZ-CON	Software Version: EMC-CON 3A1.1		

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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	48	20 to 75
Remark:			
1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test sample

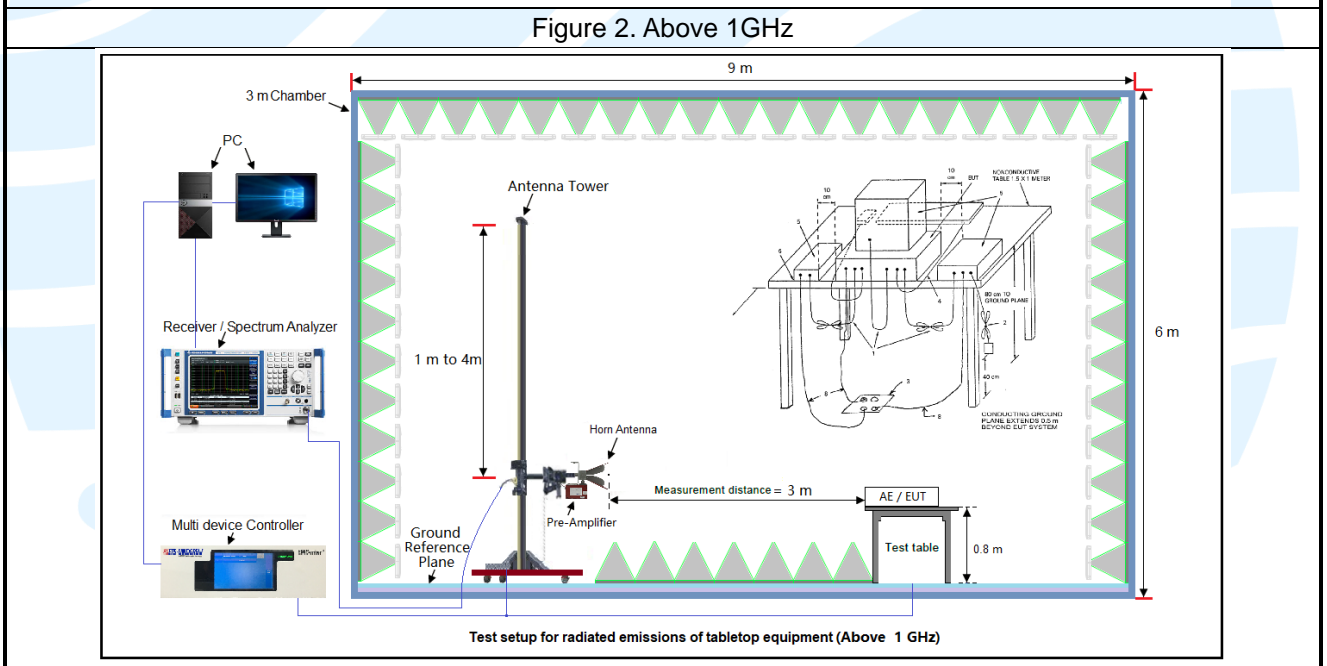
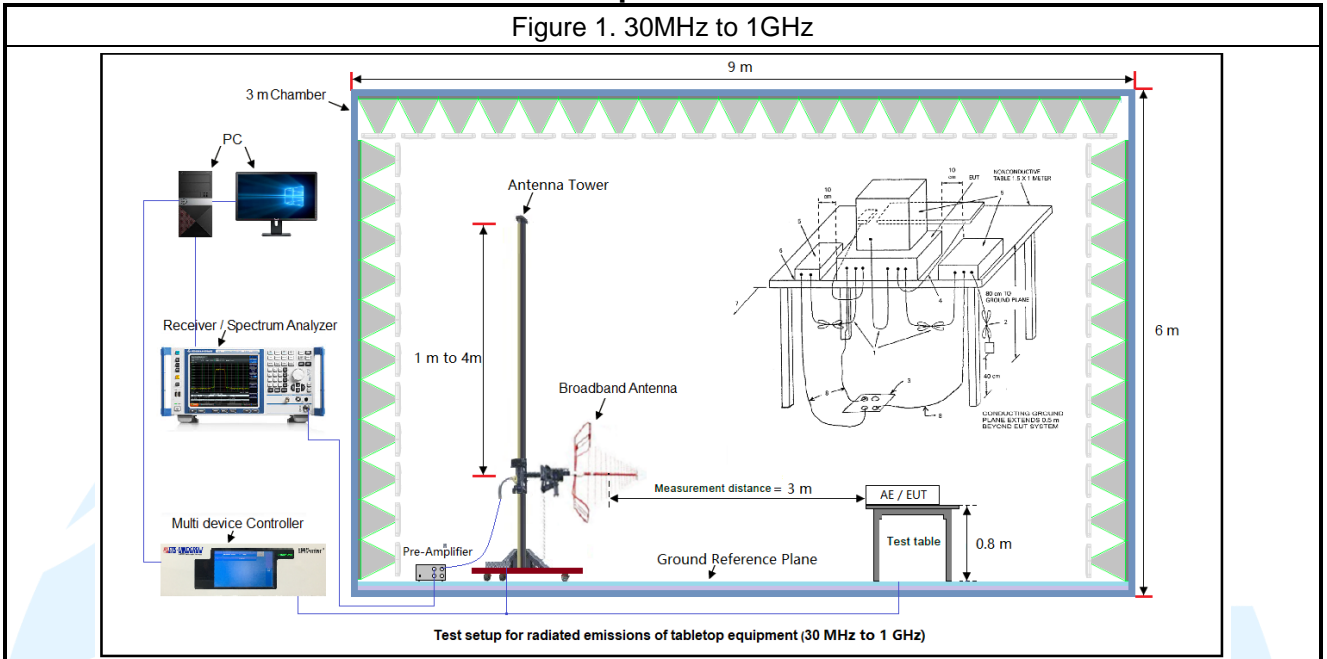
Test Item	Temp. (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Conducted Emission	22.0	55.2	100.5	S202403142878-ZJA01/6	Linson Xie
Radiated Emission	23.9	57.7	100.1		Yana Zeng

4.2 TEST MODES

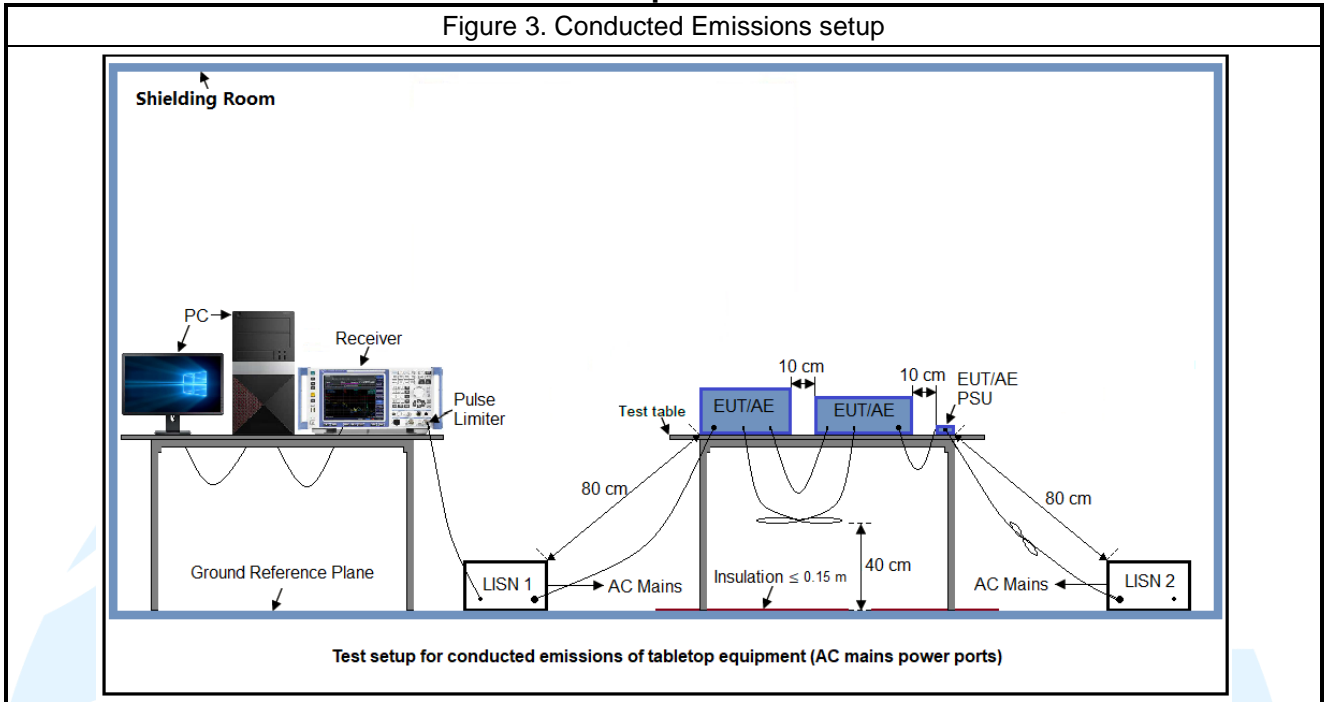
Test Item	EMI Test Modes
Radiated Emission	Test Mode1: Powered by NET/POE port + WIFI Link +RJ45 data transmitting + SFP data transmitting
Conducted Emission	Test Mode1: Powered by NET/POE port + WIFI Link +RJ45 data transmitting + SFP data transmitting

4.3 TEST SETUP

4.3.1 For Radiated Emissions test setup



4.3.2 For Conducted Emissions test 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	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
3	KDB 174176 D01 Line Conducted FAQ v01r01	AC power-line conducted emission frequency asked questions
4	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

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 (dBµV/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

Remark:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBµV/m) = 20 log Emission level (µV/m).
- 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:

- From 30 MHz to 1GHz test procedure as below:

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- 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.

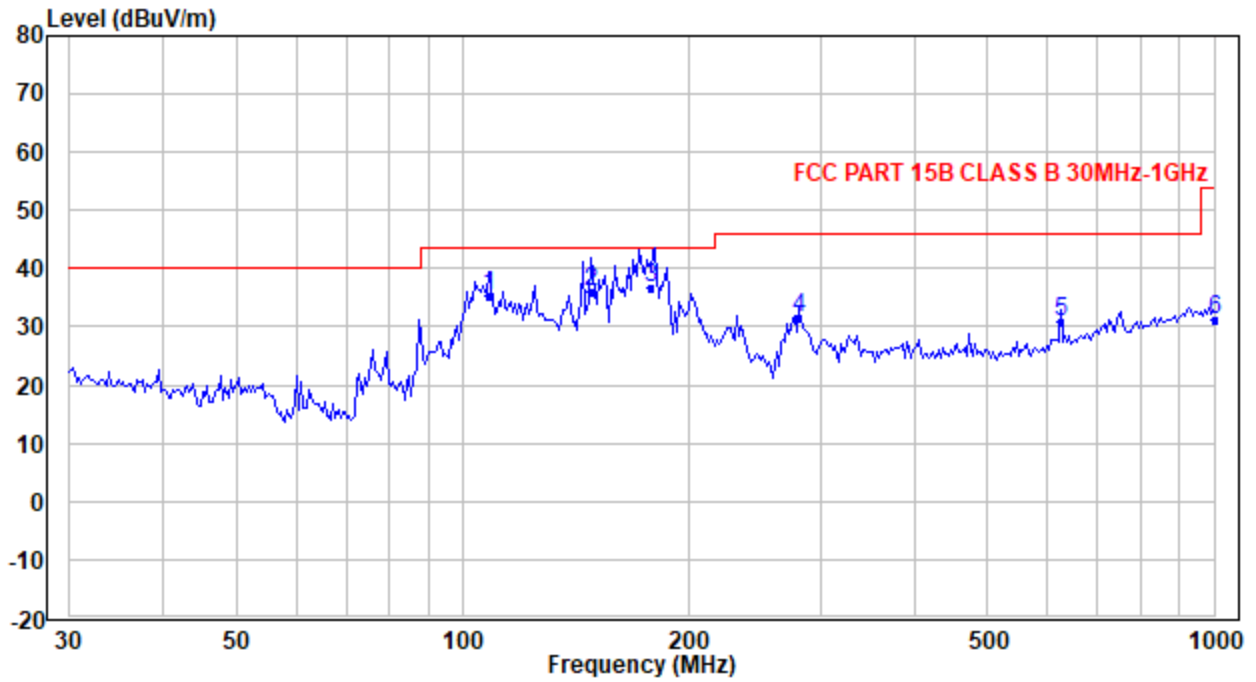
Equipment Used: Refer to section 3 for details.

Test Result: Pass

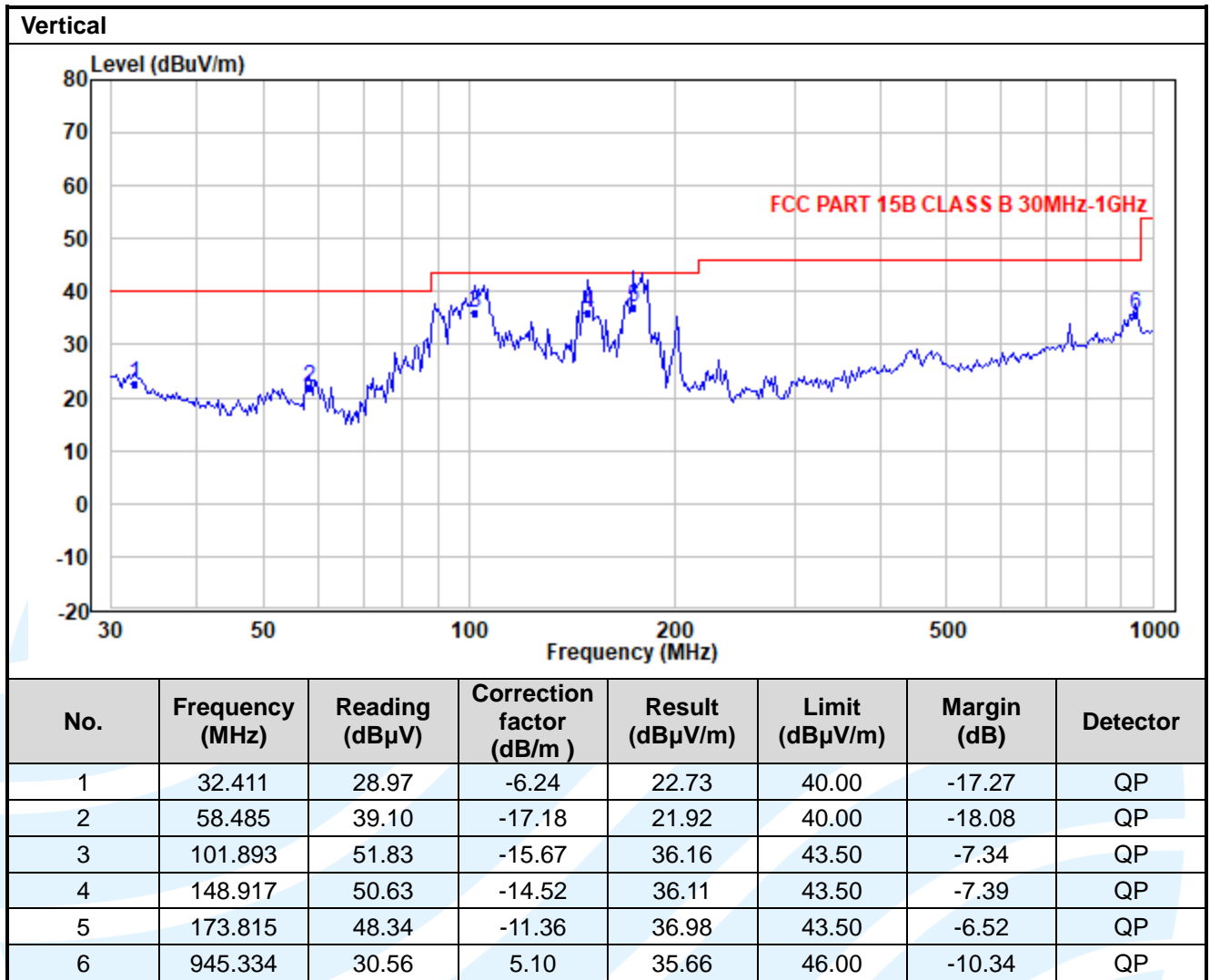
The measurement data as follows:

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

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



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	108.546	50.65	-15.18	35.47	43.50	-8.03	QP
2	148.096	50.70	-14.61	36.09	43.50	-7.41	QP
3	178.217	48.50	-11.75	36.75	43.50	-6.75	QP
4	280.293	41.06	-9.66	31.40	46.00	-14.60	QP
5	624.490	31.08	-0.27	30.81	46.00	-15.19	QP
6	1000.000	25.29	6.01	31.30	54.00	-22.70	QP



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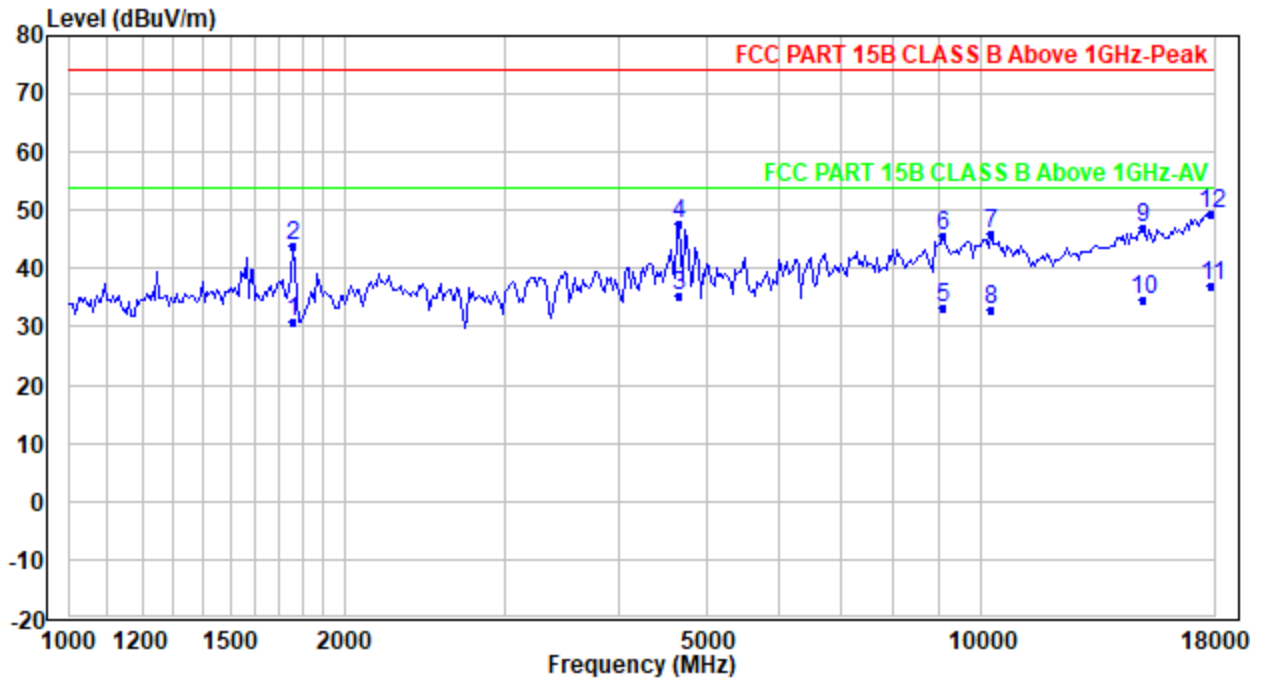
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Above 1GHz(Peak & Average)
 Test Mode 1:
 Horizontal



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	1753.924	41.57	-10.56	31.01	54.00	-22.99	Average
2	1753.924	54.38	-10.56	43.82	74.00	-30.18	Peak
3	4668.133	36.46	-1.03	35.43	54.00	-18.57	Average
4	4668.133	48.78	-1.03	47.75	74.00	-26.25	Peak
5	9087.293	27.56	5.78	33.34	54.00	-20.66	Average
6	9087.293	39.87	5.78	45.65	74.00	-28.35	Peak
7	10262.700	39.59	6.28	45.87	74.00	-28.13	Peak
8	10262.700	26.73	6.28	33.01	54.00	-20.99	Average
9	15041.450	35.68	11.46	47.14	74.00	-26.86	Peak
10	15041.450	23.20	11.46	34.66	54.00	-19.34	Average
11	17896.040	21.44	15.75	37.19	54.00	-16.81	Average
12	17896.040	33.75	15.75	49.50	74.00	-24.50	Peak

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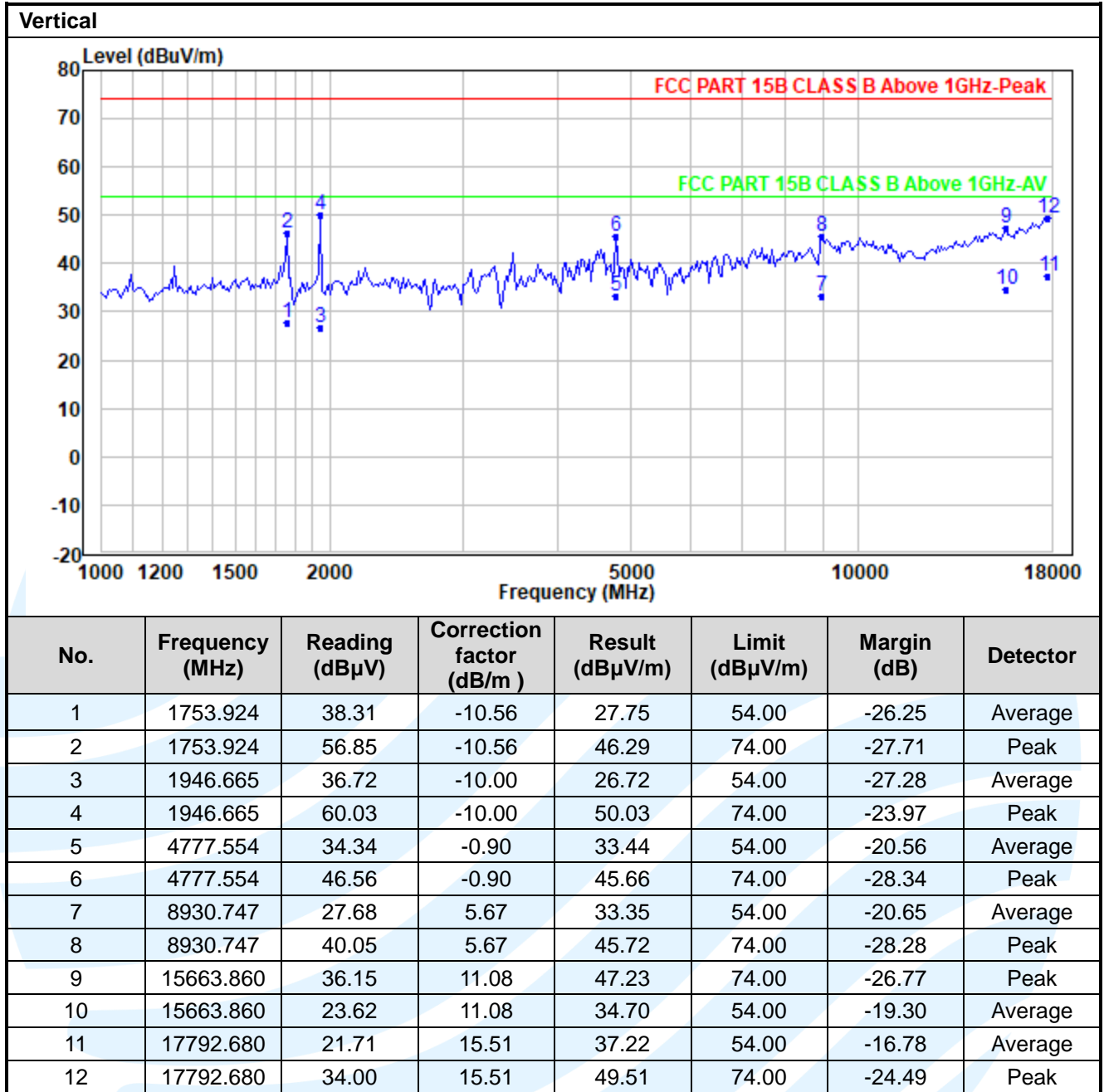
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Remark:

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. For Radiated Emission above 18GHz, there was not any unwanted emission detected.

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6.2 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.107

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.

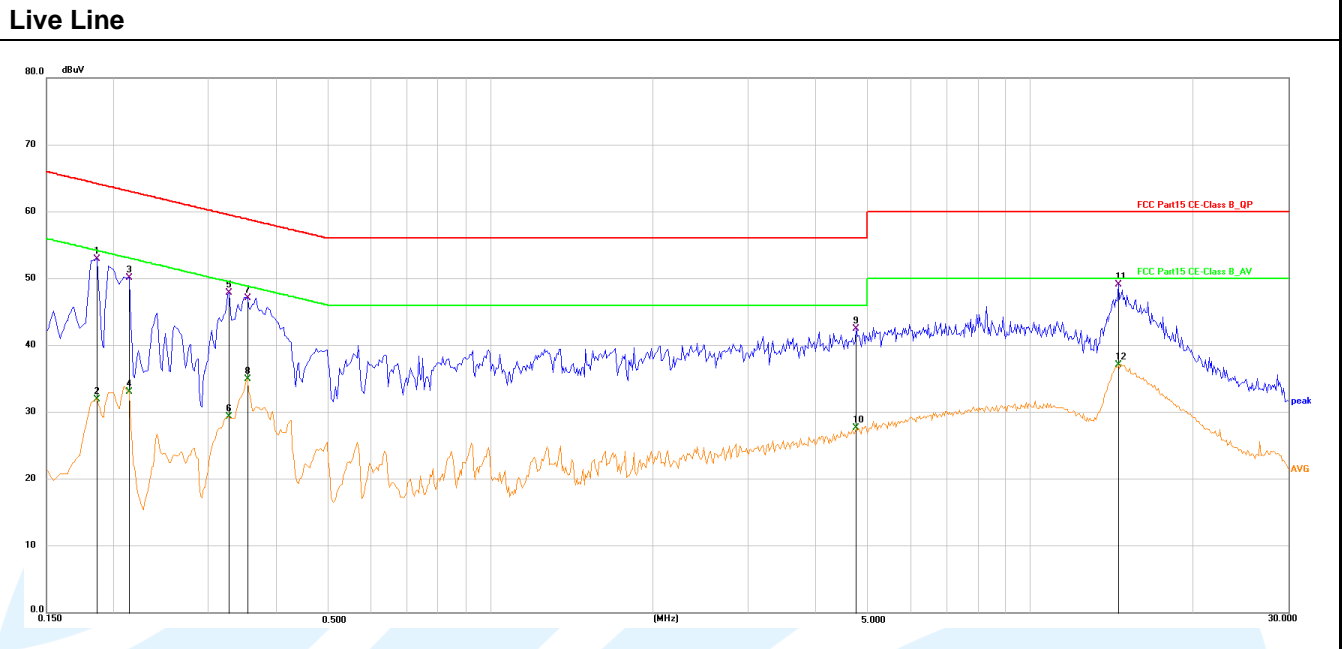
Test Procedures:

- 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 Mode 1:



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.1860	42.76	10.17	52.93	64.21	-11.28	QP
2	0.1860	21.74	10.17	31.91	54.21	-22.30	AVG
3	0.2130	39.93	10.17	50.10	63.09	-12.99	QP
4	0.2130	22.90	10.17	33.07	53.09	-20.02	AVG
5	0.3255	37.68	10.19	47.87	59.57	-11.70	QP
6	0.3255	19.10	10.19	29.29	49.57	-20.28	AVG
7	0.3524	36.92	10.16	47.08	58.91	-11.83	QP
8	0.3524	24.75	10.16	34.91	48.91	-14.00	AVG
9	4.7490	32.18	10.24	42.42	56.00	-13.58	QP
10	4.7490	17.38	10.24	27.62	46.00	-18.38	AVG
11	14.5815	38.58	10.51	49.09	60.00	-10.91	QP
12	14.5815	26.55	10.51	37.06	50.00	-12.94	AVG

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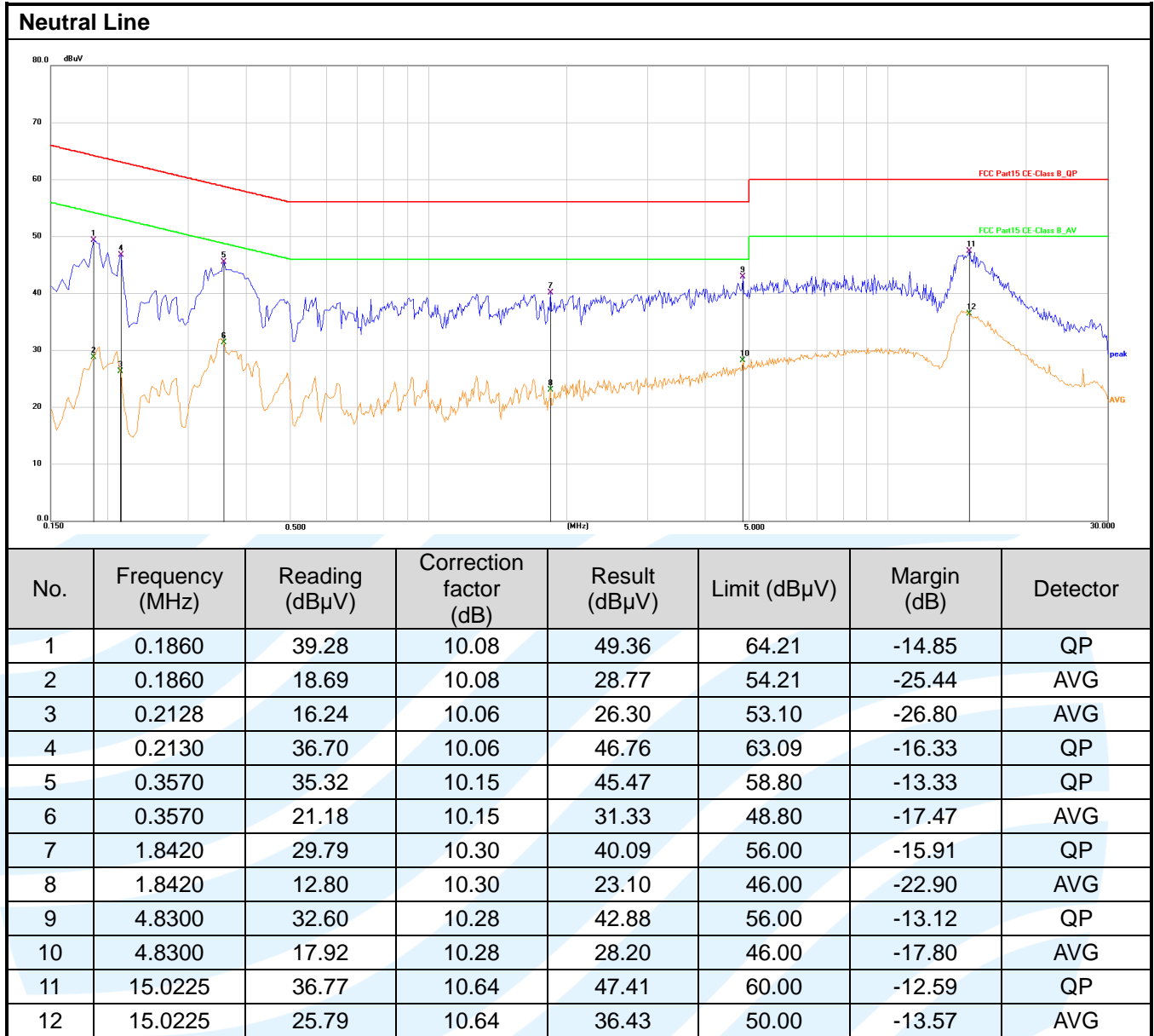
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Remark:

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.

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 *****

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.
