



FCC RADIO TEST REPORT

FCC ID : E2K-DWWPT2101
Equipment : Docking Accessory
Brand Name : DELL
Model Name : K21A
Applicant : DELL Inc.
One Dell Way, Round Rock, TX 78682, USA
Manufacturer : DELL Inc.
One Dell Way, Round Rock, TX 78682, USA
Standard : FCC Part 15 Subpart C §15.209

The product was received on Nov. 03, 2021 and testing was started from Nov. 10, 2021 and completed on Nov. 12, 2021. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)



Table of Contents

History of this test report	3
Summary of Test Result	4
1. General Description	5
1.1 Product Feature of Equipment Under Test	5
1.2 Modification of EUT	5
1.3 Testing Location	5
1.4 Applicable Standards.....	5
2. Test Configuration of Equipment Under Test	6
2.1 Descriptions of Test Mode	6
2.2 Connection Diagram of Test System	6
2.3 Support Unit used in test configuration and system	7
2.4 EUT Operation Test Setup	7
3. Test Results	8
3.1 AC Power Line Conducted Emissions Measurement	8
3.2 20dB and 99% OBW Spectrum Bandwidth Measurement.....	10
3.3 Radiated Emissions Measurement	11
3.4 Antenna Requirements.....	14
4. List of Measuring Equipment	15
5. Uncertainty of Evaluation	16
Appendix A. Test Results of Conducted Emission Test	
Appendix B. Test Results of Conducted Test Items	
Appendix C. Test Results of Radiated Test Items	
C2. Results of Radiated Emissions (9 kHz~30MHz)	
C3. Results of Radiated Emissions (30MHz~1GHz)	
Appendix D. Setup Photographs	



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.207	AC Power Line Conducted Emissions	Pass	Under limit 1.33 dB at 0.303MHz
3.2	15.215(c)	20dB Spectrum Bandwidth	Reporting only	-
	2.1049	99% OBW Spectrum Bandwidth	Reporting only	-
3.3	15.209	Field Strength of Fundamental Emissions	Pass	Under limit 6.90 dB at 37.560MHz
		Radiated Spurious Emissions		
3.4	15.203	Antenna Requirements	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sheng Kuo

Report Producer: Ruby Zou

1. General Description

1.1 Product Feature of Equipment Under Test

WPT

Product Feature	
Antenna Type	WPT: Coil Antenna

Remark: The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory		
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	Sporton Site No.		
	TH03-HY	CO05-HY	03CH07-HY
Test Engineer	Tommy Lee	Tom Lee	Jesse Wang and Stan Hsieh
Temperature (°C)	22~24	23~26	21.3~23.4
Relative Humidity (%)	53~55	45~55	57.9~61.1

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.209
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2. Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

Investigation has been done on all the possible configurations.

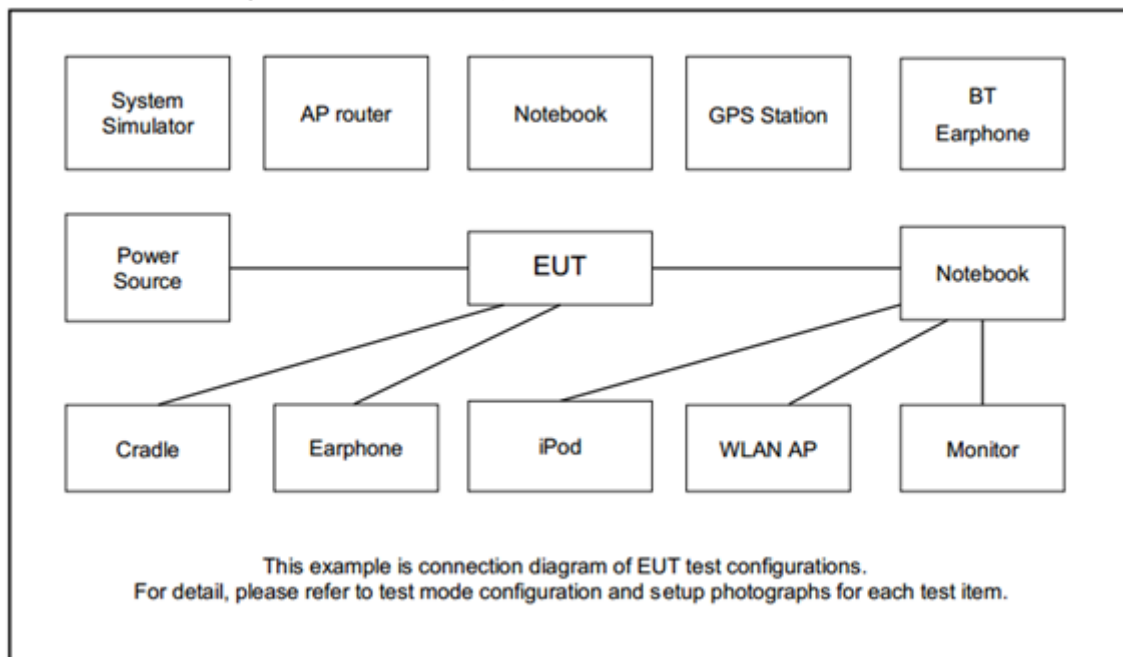
The following table is a list of the test modes shown in this test report.

Test Items	
AC Power Line Conducted Emissions	20dB Spectrum Bandwidth
Field Strength of Fundamental Emissions	
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz

Remark: For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting support unit in portrait or landscape modes and the three coils (Top, Middle, Bottom) of the charging area of the EUT, and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find Top coil mode as worst plane.

Test Cases	
AC Conducted Emission	Mode 1: Wireless Charging with Phone + Middle Coil + Adapter

2.2 Connection Diagram of Test System





2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Phone	Apple	MXD22TA/A	N/A	N/A	N/A

2.4 EUT Operation Test Setup

The EUT is transmitting wireless power to the Phone.



3. Test Results

3.1 AC Power Line Conducted Emissions Measurement

3.1.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	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.

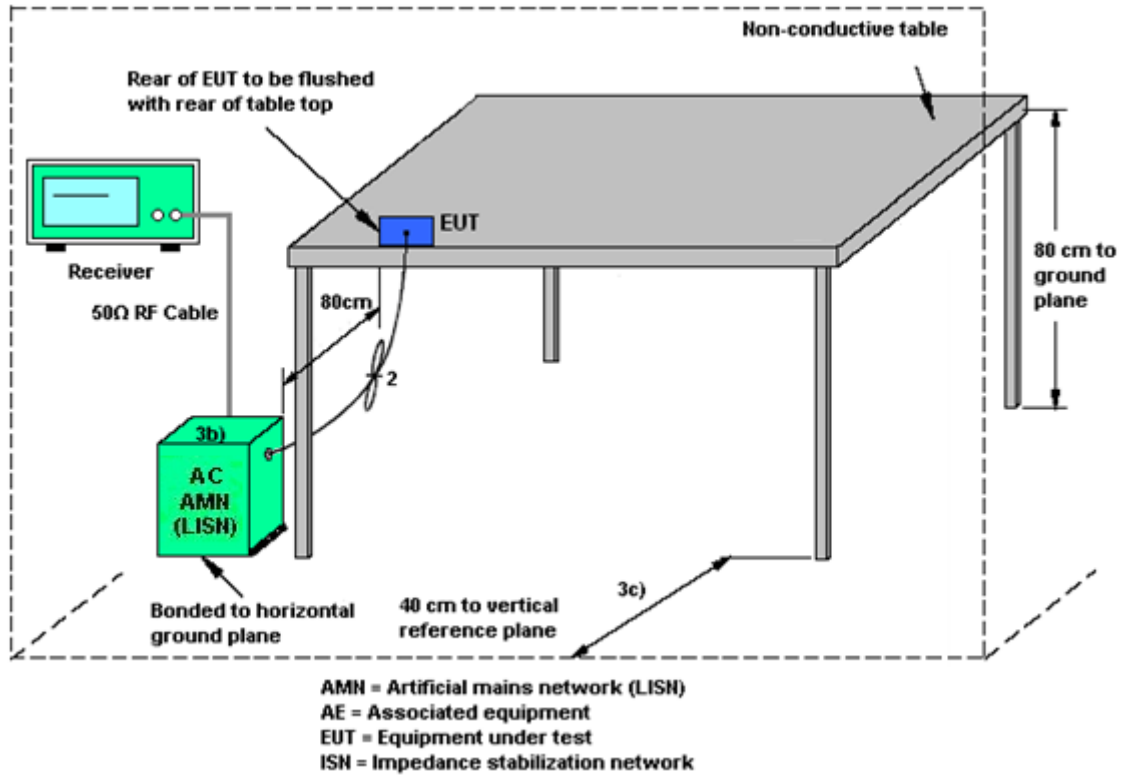
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.1.4 Test setup



3.1.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

3.2 20dB and 99% OBW Spectrum Bandwidth Measurement

3.2.1 Limit

Reporting only

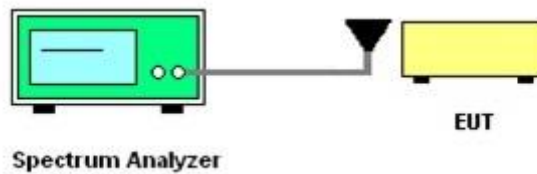
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT in peak Max hold mode.
2. The resolution bandwidth of 300 Hz and the video bandwidth of 300 Hz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.
4. Measured the 99% OBW.

3.2.4 Test Setup



3.2.5 Test Result of Conducted Test Items

Please refer to Appendix B.

3.3 Radiated Emissions Measurement

3.3.1 Limit

The field strength of any emissions which appear band shall not exceed the general radiated emissions limits.

Frequencies (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Measuring Instrument Setting

The following table is the setting of receiver:

Receiver Parameter	Setting
Attenuation	Auto
Frequency Range: 9kHz~150kHz	RBW 200Hz for QP
Frequency Range: 150kHz~30MHz	RBW 9kHz for QP
Frequency Range: 30MHz~1000MHz	RBW 120kHz for Peak

Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

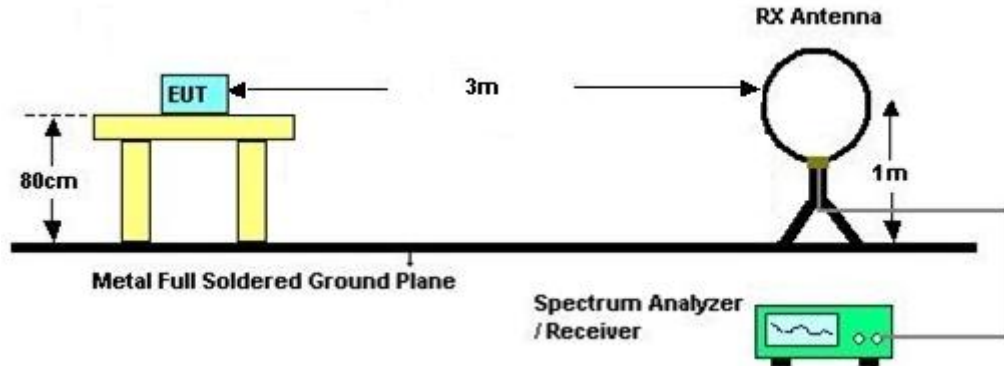


3.3.4 Test Procedures

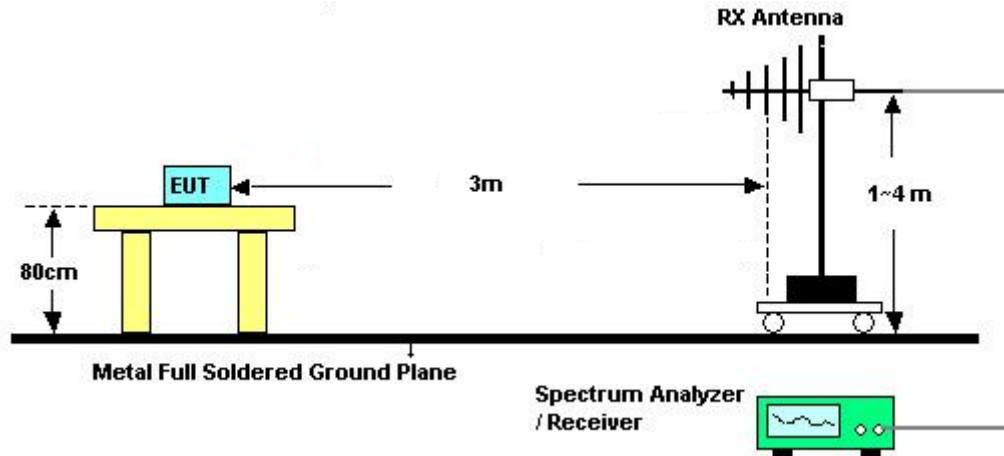
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
7. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver.

3.3.5 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



3.3.6 Test Result of Radiated Emissions Measurement

Please refer to Appendix C.

Remark:

1. There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.
2. According to C63.10 radiated test, the EUT pre-scanned horizontal, vertical, and ground-parallel three polarization's, the worst case is horizontal & vertical polarization, test data of two mode was reported.



3.4 Antenna Requirements

3.4.1 Standard Applicable

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

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 rule.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.



4. List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 10, 2021	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 30, 2020	Nov. 10, 2021	Nov. 29, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 18, 2020	Nov. 10, 2021	Nov. 17, 2021	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 01, 2020	Nov. 10, 2021	Nov. 30, 2021	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Nov. 10, 2021	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-FN	00691	N/A	Jul. 28, 2021	Nov. 10, 2021	Jul. 27, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 31, 2020	Nov. 10, 2021	Dec. 30, 2021	Conduction (CO05-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 28, 2021	Nov. 11, 2021~Nov. 12, 2021	Apr. 27, 2022	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 01, 2020	Nov. 11, 2021~Nov. 12, 2021	Nov. 30, 2021	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jan. 04, 2021	Nov. 11, 2021~Nov. 12, 2021	Jan. 03, 2022	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Oct. 04, 2021	Nov. 11, 2021~Nov. 12, 2021	Oct. 03, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682-4	30MHz to 18GHz	Feb. 24, 2021	Nov. 11, 2021~Nov. 12, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971-4	9kHz to 18GHz	Feb. 24, 2021	Nov. 11, 2021~Nov. 12, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655-4	9kHz to 18GHz	Feb. 24, 2021	Nov. 11, 2021~Nov. 12, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Nov. 11, 2021~Nov. 12, 2021	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Nov. 11, 2021~Nov. 12, 2021	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Nov. 11, 2021~Nov. 12, 2021	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Nov. 11, 2021~Nov. 12, 2021	N/A	Radiation (03CH07-HY)
Software	Audix	E3 6.2009-8-24	N/A	N/A	N/A	Nov. 11, 2021~Nov. 12, 2021	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 09, 2021	Nov. 11, 2021~Nov. 12, 2021	Mar. 08, 2022	Radiation (03CH07-HY)
EMI Test Receiver	Agilent	N9038A(MXE)	MY53290053	20Hz~26.5GHz	May 24, 2021	Nov. 11, 2021~Nov. 12, 2021	May 23, 2022	Radiation (03CH07-HY)
5kVA AC Power Source	TESEQ	NSG 1007	1521A01677	N/A	Jun. 08, 2021	Nov. 12, 2021	Jun. 07, 2022	Conducted (TH03-HY)
Hygrometer	Testo	608-H1	34893241	N/A	Mar. 01, 2021	Nov. 12, 2021	Feb. 28, 2022	Conducted (TH03-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz~40GHz	Jan. 26, 2021	Nov. 12, 2021	Jan. 25, 2022	Conducted (TH03-HY)
Temperature Chamber	ESPEC	SU-241	92003713	-30°C ~95°C	May 21, 2021	Nov. 12, 2021	May 20, 2022	Conducted (TH03-HY)



5. Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.1 dB
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Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.7 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1 dB
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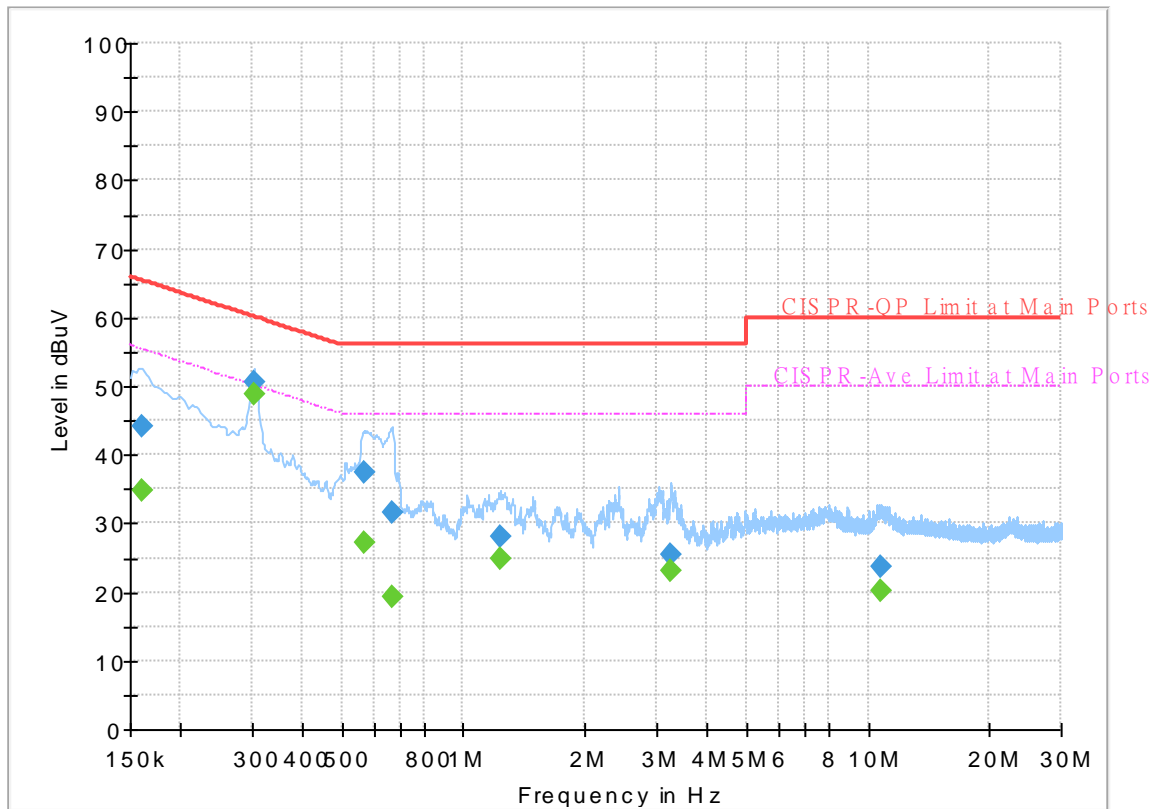


Appendix A. Test Results of Conducted Emission Test

EUT Information

Report NO : 173029
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Line

Full Spectrum



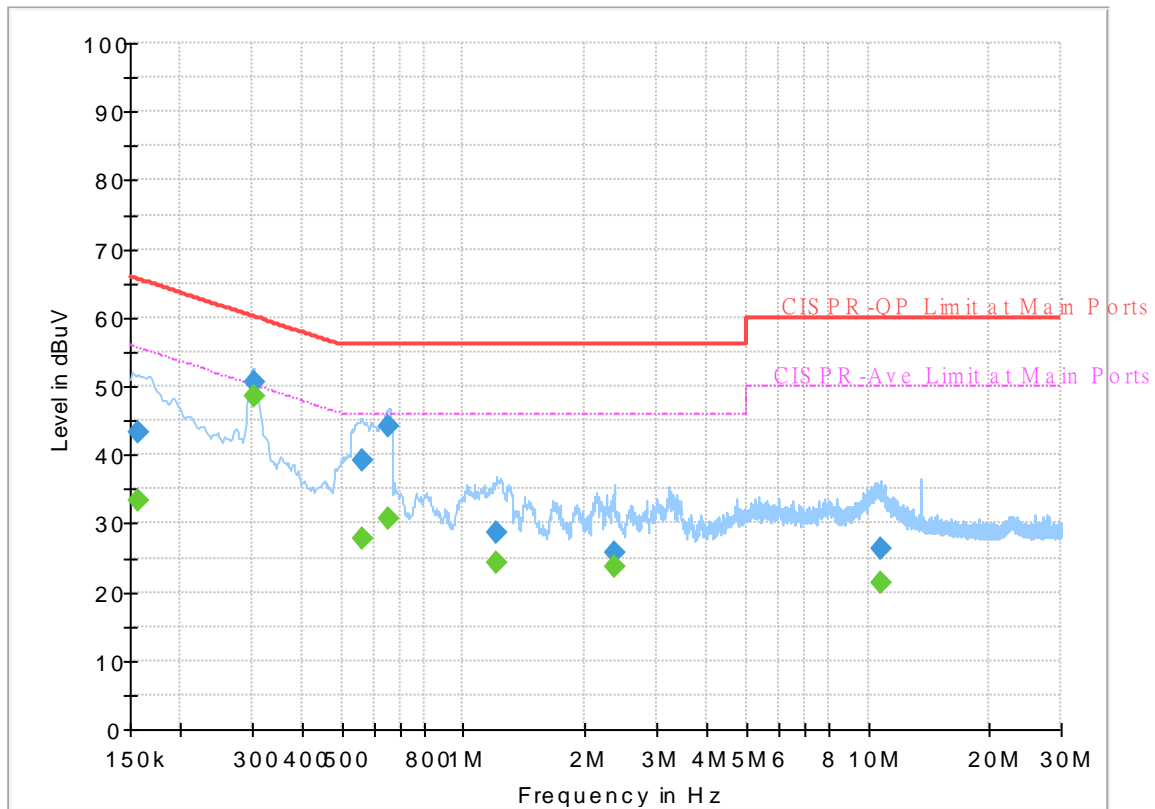
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.161250	---	34.86	55.40	20.54	L1	OFF	19.6
0.161250	44.01	---	65.40	21.39	L1	OFF	19.6
0.303000	---	48.83	50.16	1.33	L1	OFF	19.7
0.303000	50.69	---	60.16	9.47	L1	OFF	19.7
0.566250	---	27.07	46.00	18.93	L1	OFF	19.9
0.566250	37.53	---	56.00	18.47	L1	OFF	19.9
0.665250	---	19.39	46.00	26.61	L1	OFF	19.9
0.665250	31.72	---	56.00	24.28	L1	OFF	19.9
1.232250	---	24.94	46.00	21.06	L1	OFF	20.1
1.232250	28.08	---	56.00	27.92	L1	OFF	20.1
3.248250	---	23.19	46.00	22.81	L1	OFF	19.9
3.248250	25.38	---	56.00	30.62	L1	OFF	19.9
10.794750	---	20.32	50.00	29.68	L1	OFF	19.9
10.794750	23.57	---	60.00	36.43	L1	OFF	19.9

EUT Information

Report NO : 173029
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.156750	---	33.31	55.63	22.32	N	OFF	19.6
0.156750	43.22	---	65.63	22.41	N	OFF	19.6
0.303000	---	48.67	50.16	1.49	N	OFF	19.6
0.303000	50.55	---	60.16	9.61	N	OFF	19.6
0.564000	---	27.67	46.00	18.33	N	OFF	19.8
0.564000	39.15	---	56.00	16.85	N	OFF	19.8
0.649500	---	30.81	46.00	15.19	N	OFF	19.9
0.649500	44.12	---	56.00	11.88	N	OFF	19.9
1.209750	---	24.38	46.00	21.62	N	OFF	20.1
1.209750	28.70	---	56.00	27.30	N	OFF	20.1
2.357250	---	23.55	46.00	22.45	N	OFF	20.0
2.357250	25.62	---	56.00	30.38	N	OFF	20.0
10.808250	---	21.48	50.00	28.52	N	OFF	19.9
10.808250	26.23	---	60.00	33.77	N	OFF	19.9



Appendix B. Test Results of Conducted Test Items

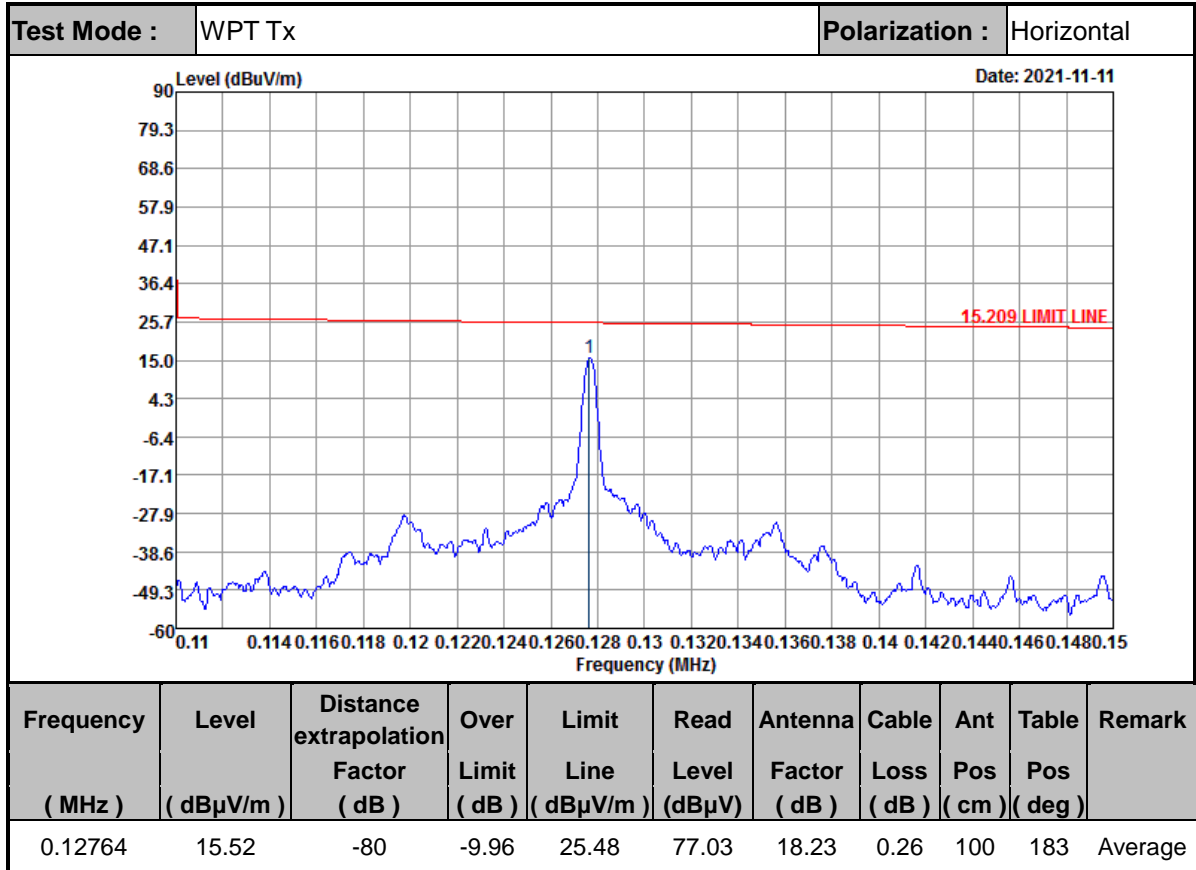
Test mode		WPT Tx	
<p>Date: 12.NOV.2021 11:14:29</p>		<p>Date: 12.NOV.2021 11:08:03</p>	
20dB Bandwidth (kHz)	0.780	99% Occupied BW(kHz)	0.660

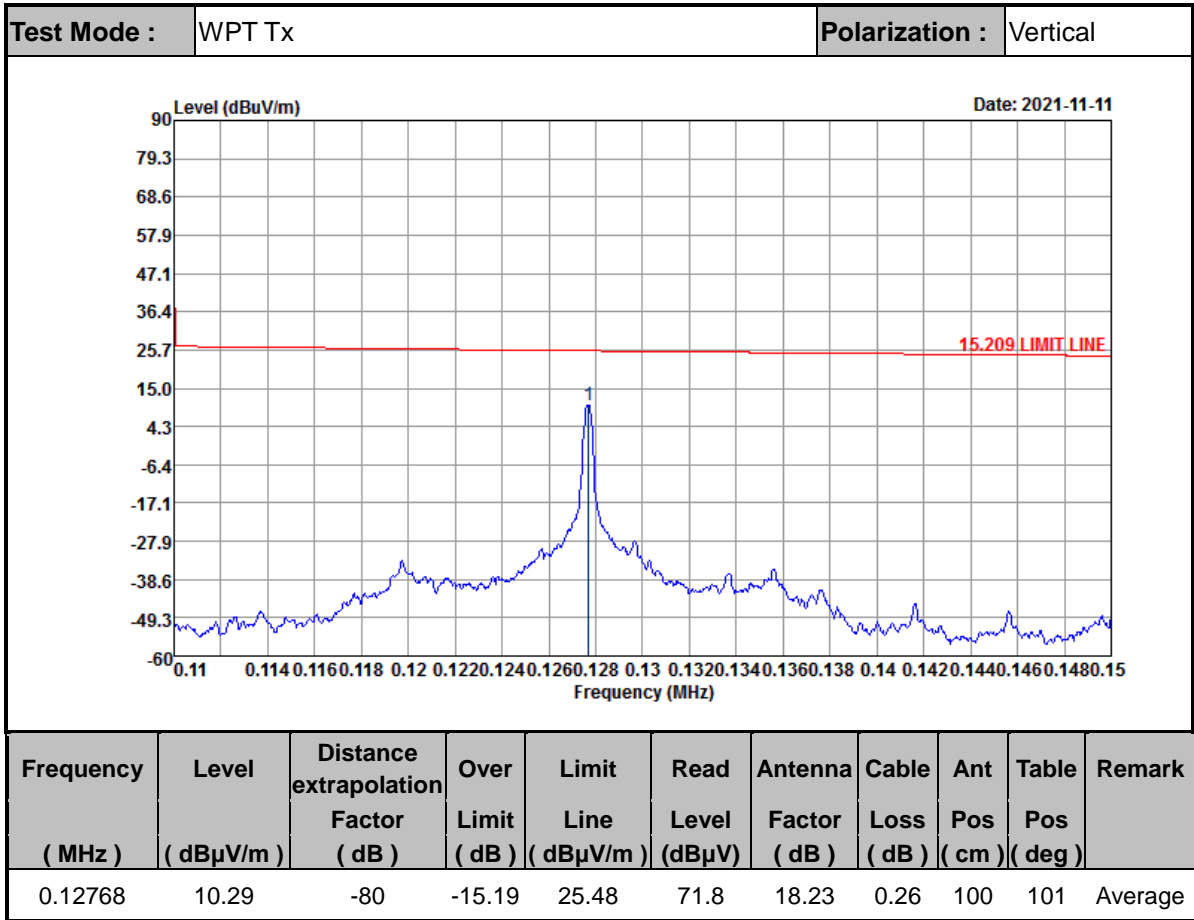
Remark: Because the measured signal is CW adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.



Appendix C. Test Results of Radiated Test Items

C1. Test Result of Field Strength of Fundamental Emissions

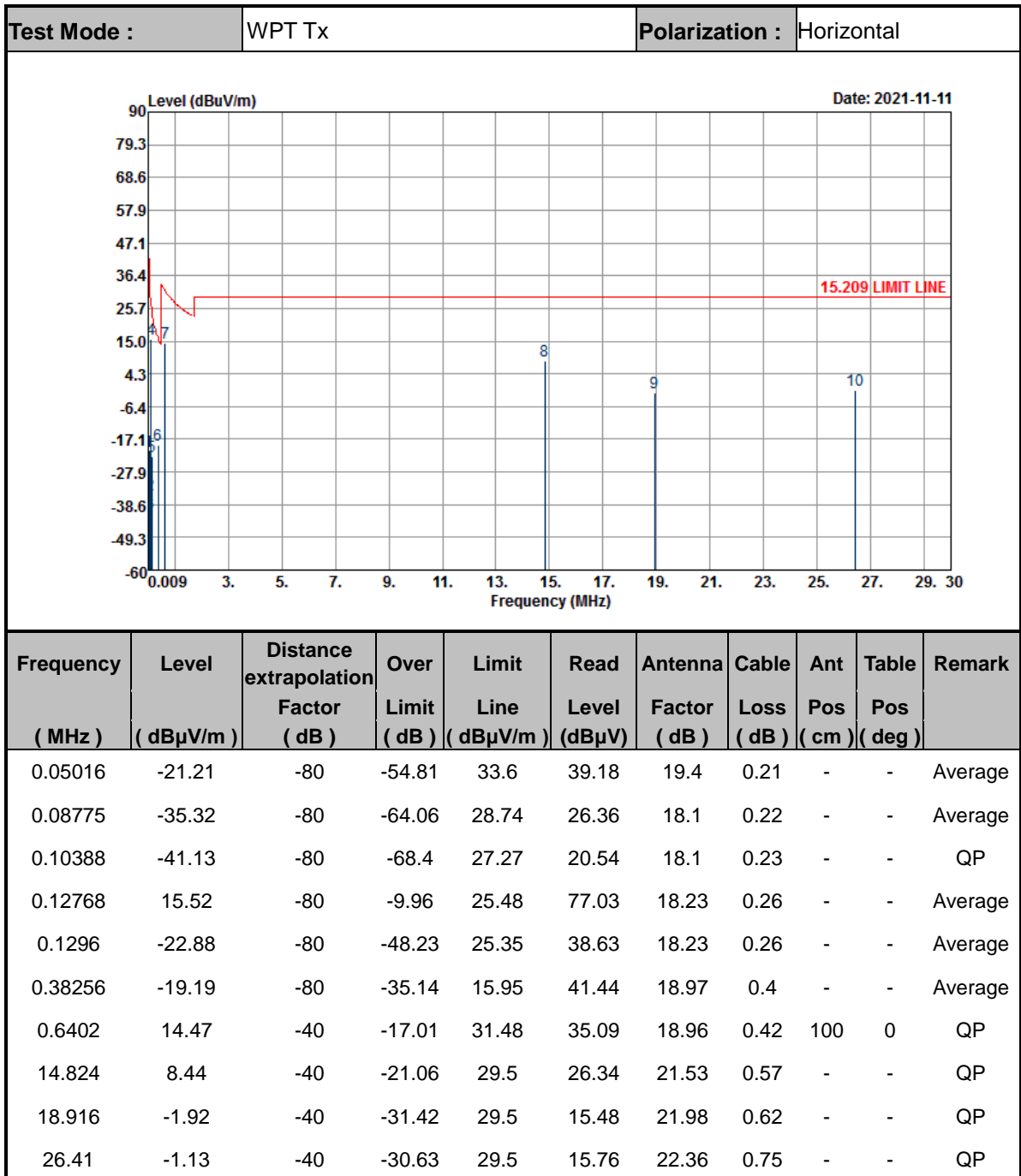


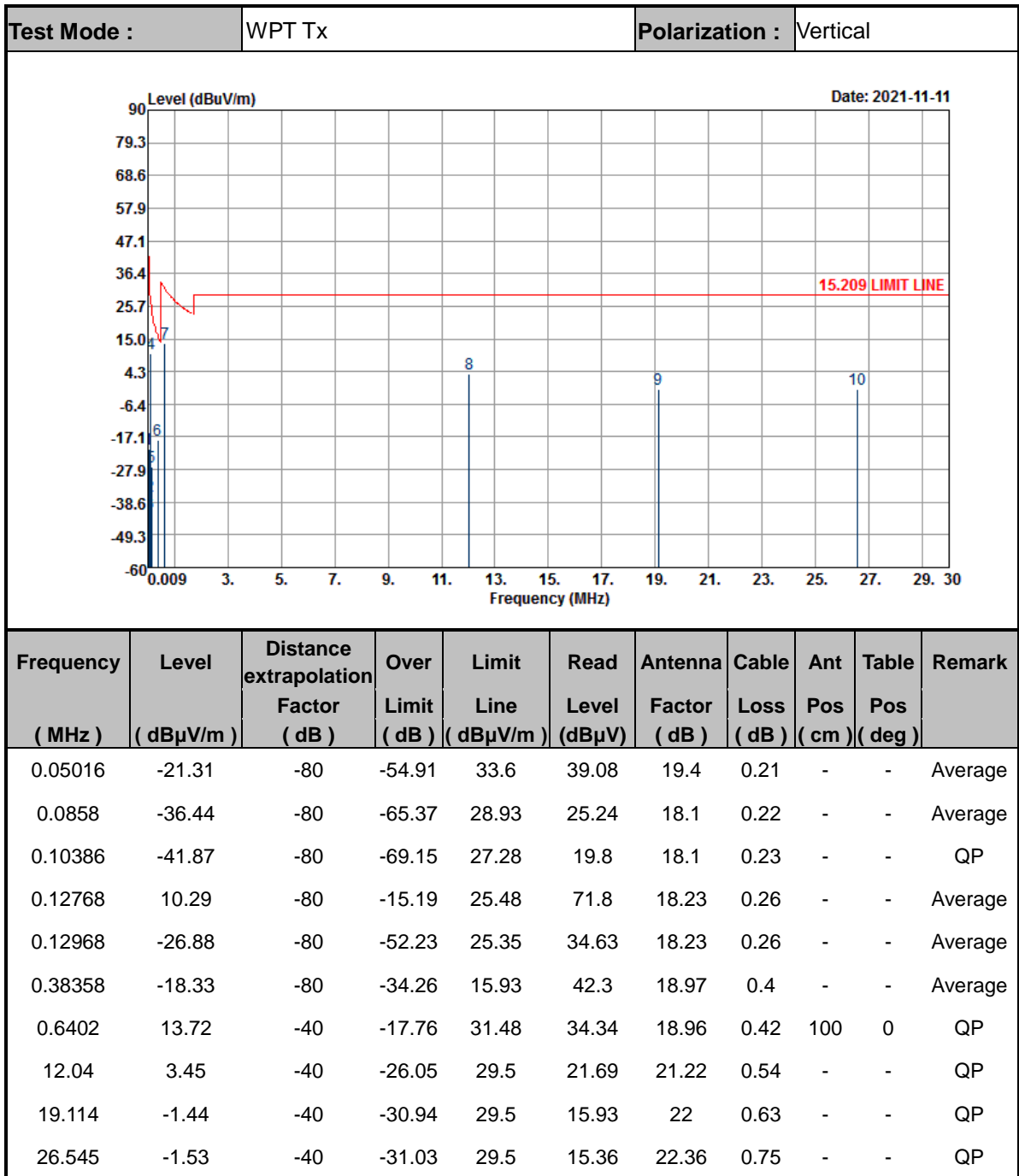


Note:

1. Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
2. Level= Read Level + Antenna Factor + Cable loss + distance extrapolation factor.

C2. Results of Radiated Spurious Emissions (9 kHz~30MHz)

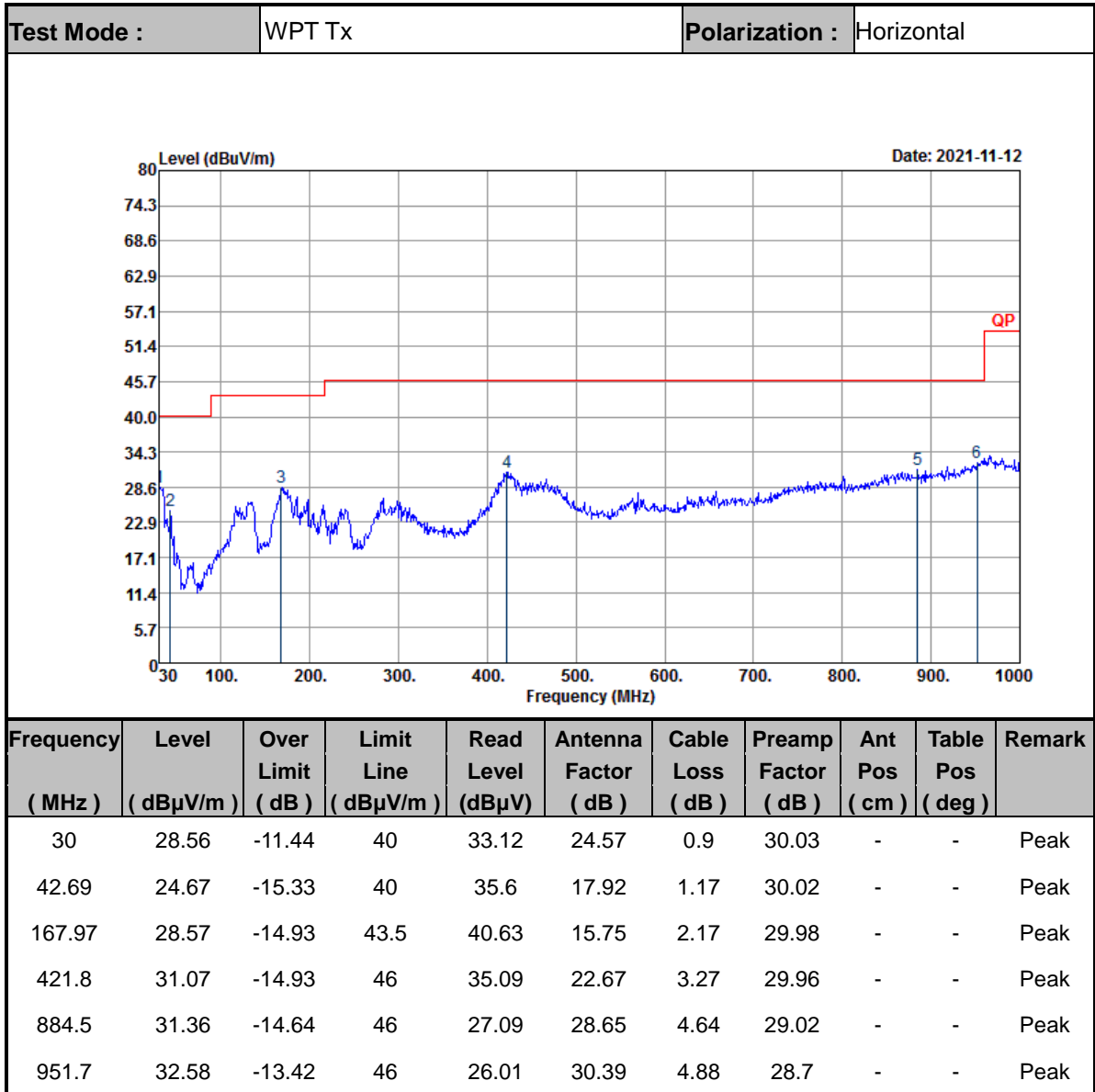




Note:

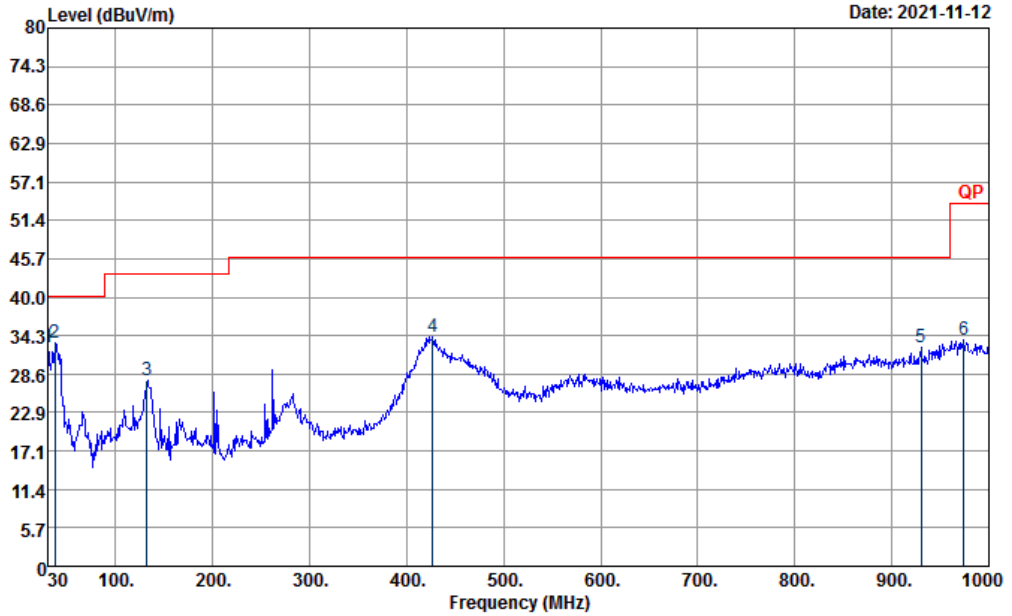
1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
3. Level= Read Level + Antenna Factor + Cable loss + distance extrapolation factor.
4. Frequency 0.12768 MHz is fundamental emissions signals.

C3. Results of Radiated Spurious Emissions (30MHz~1GHz)





Test Mode :	WPT Tx	Polarization :	Vertical
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Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30	32.51	-7.49	40	37.07	24.57	0.9	30.03	-	-	Peak
37.56	33.1	-6.9	40	41.27	20.73	1.12	30.02	-	-	Peak
132.06	27.74	-15.76	43.5	38.22	17.55	1.95	29.98	-	-	Peak
426.7	34.12	-11.88	46	38	22.78	3.29	29.95	-	-	Peak
930	32.56	-13.44	46	27.37	29.19	4.79	28.79	-	-	Peak
974.1	33.74	-20.26	54	26.56	30.82	4.97	28.61	-	-	Peak

Note:

3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
4. Emission level (dBμV/m) = 20 log Emission level (μV/m).
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.