



CERTIFICATION TEST REPORT

Report Number. : 4789831808-FR1V3

Applicant : EnMovi Ltd.
Unit 1I, Inovo Building, 121 George St, Glasgow G1 1RD, United Kingdom

Model : MSC 2.0

FCC ID : 2AY5U-A

EUT Description : Wireless Charger

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
March 23, 2021

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Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	03/16/21	Initial issue	Robby Lee
V2	03/22/21	Change the applied rule	Robby Lee
V3	03/23/21	Remove the occupied bandwidth	Robby Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: EnMovi Ltd.
EUT DESCRIPTION: Wireless Charger
MODEL NUMBER: MSC 2.0
SERIAL NUMBER: AE106-99000140 V:06_190315a A:05022021
DATE TESTED: FEB 15, 2021 – FEB 24, 2021;

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC 47 CFR PART 15 Subpart C	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:



Anthony Kim
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Robby Lee
Suwon Lab Engineer
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
<input type="checkbox"/> Chamber 1
<input type="checkbox"/> Chamber 2
<input type="checkbox"/> Chamber 3
<input checked="" type="checkbox"/> 10m Chamber

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.31 dB
Radiated Disturbance, 9 kHz to 30 MHz	4.40 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.94 dB

Uncertainty figures are valid to a confidence level of 95%.

4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is Wireless Charger that charges the wearable sensor.

5.2. MAXIMUM E-FIELD STRENGTH

- Wireless charging mode

Fundamental Frequency (MHz)	Mode	E field (30m distance) FCC (dBuV/m)
1.047	Charging	26.40

5.3. WORST-CASE CONFIGURATION AND MODE

Mode	Test Case	Description
Wireless charging mode	1	Client placed to the left
	2	Client placed to the right
	3	Client placed to the both
Idle mode	4	Idle status (Non-charging)

For radiated test, All the above cases were tested, and the results were reported for test case 1, which is the worst case.

5.4. MODIFICATIONS

No modifications were made during testing.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT & PERIPHERALS

Support Equipment List				
Description	Manufacturer	Model	Serial Number	Note
Wearable Sensor * 2ea	EnMovi Ltd.	MS 2.0	None	Client
Adapter	HDP Power	HDP05-MD05010U	None	-
USB Cable	None	None	None	-

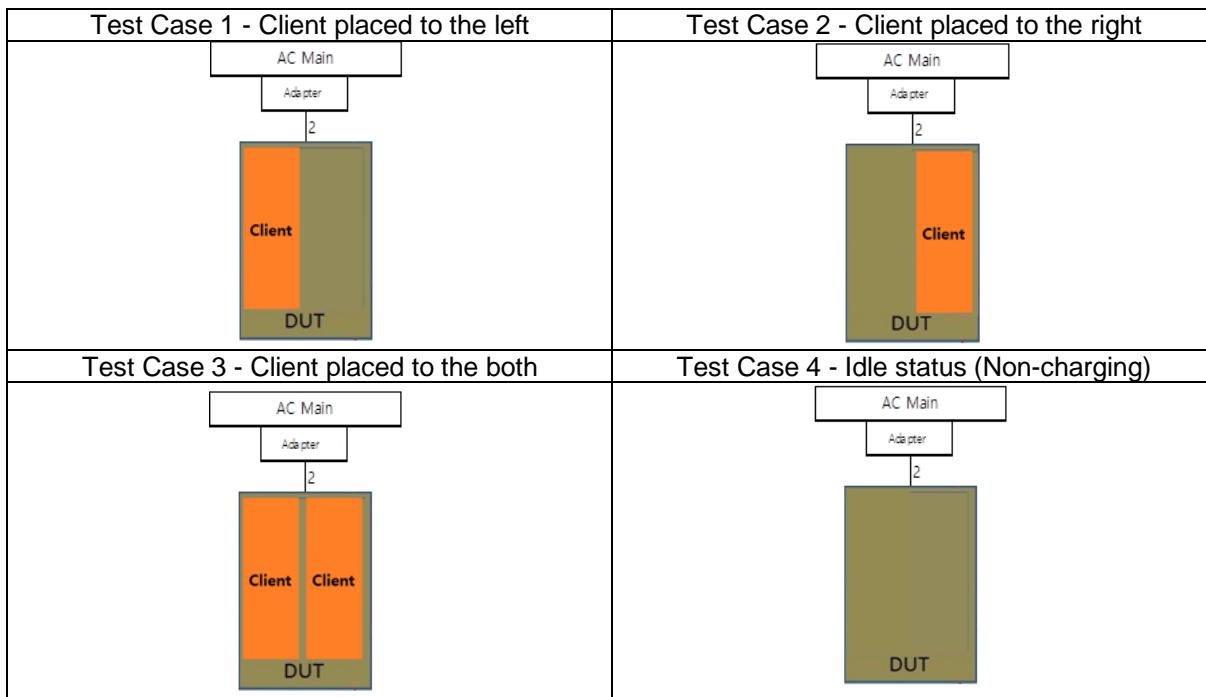
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.1m	N/A

TEST SETUP

The EUT is installed in a typical configuration. Charging from EUT.

TEST SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Radiated test				
Description	Manufacture	Model	S/N	Next Cal. Due
EMI Receiver	R&S	ESW44	101848	2021.08.03
Signal Analyzor	Keysight	N9030B	MY60070693	2022.01.13
Open Switch and Control Platform	R&S	OSP220	101456	N/A
Bilog Antenna	SCHWARZBECK	VULB9163	1241	2021.09.30
Pre-Amplifier	R&S	SCU08F2	100725	2021.08.03
Active Loop Antenna	R&S	HFH2-Z2E	100900	2021.09.30
AC Conducted test				
Test Receiver	R&S	ESR-3	102592	2021.08.06
LISN	R&S	ENV216	102478	2021.08.07

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.10: 2013

These test was performed at 3m distance.

The highest clock frequency generated or used in the EUT is 1.047 MHz therefore the frequency range was investigated from 9 kHz to 200 MHz.

LIMIT

FCC §15.209 (a)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (m)
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 to 216	150	3
216 to 960	200	3
Above 960 MHz	500	3

Note: The lower limit shall apply at the transition frequency.

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (uV/m)

Distance factor (dB): 40Log(Measurement Distance(m) / 3m) (Below 30MHz)

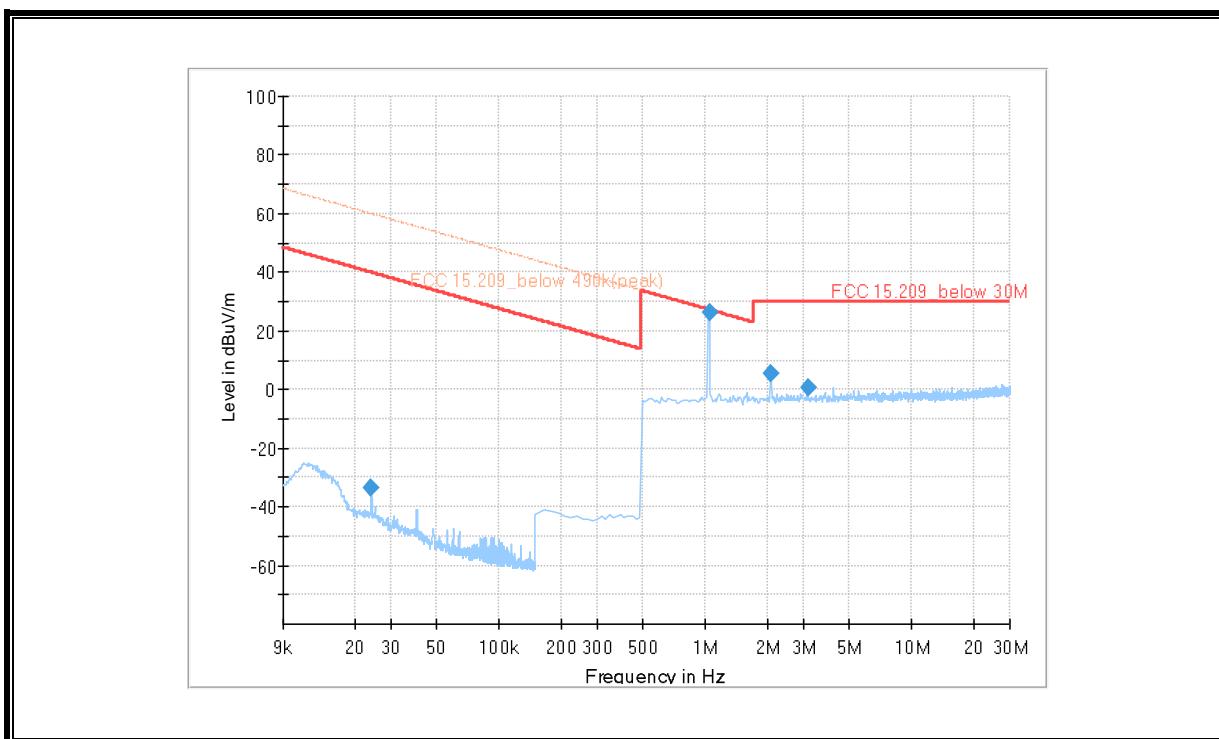
Distance factor (dB): 20Log(Measurement Distance(m) / 3m) (Above 30MHz)

NOTE: Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 300 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788 D01.

RESULTS

FCC §15.209(a)

RADIATED EMISSIONS 9 KHz to 30 MHz – Face On (Test Case 1)



TEST DATA

[Face On]

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Corr. (dB/m)	Azimuth (deg)
0.023962	-33.55	40.00	73.55	-59.6	250.0
**1.045500	26.40	27.24	0.84	-19.6	181.0
2.090250	5.34	30.00	24.66	-19.5	176.0
3.135000	0.80	30.00	29.20	-19.5	154.0

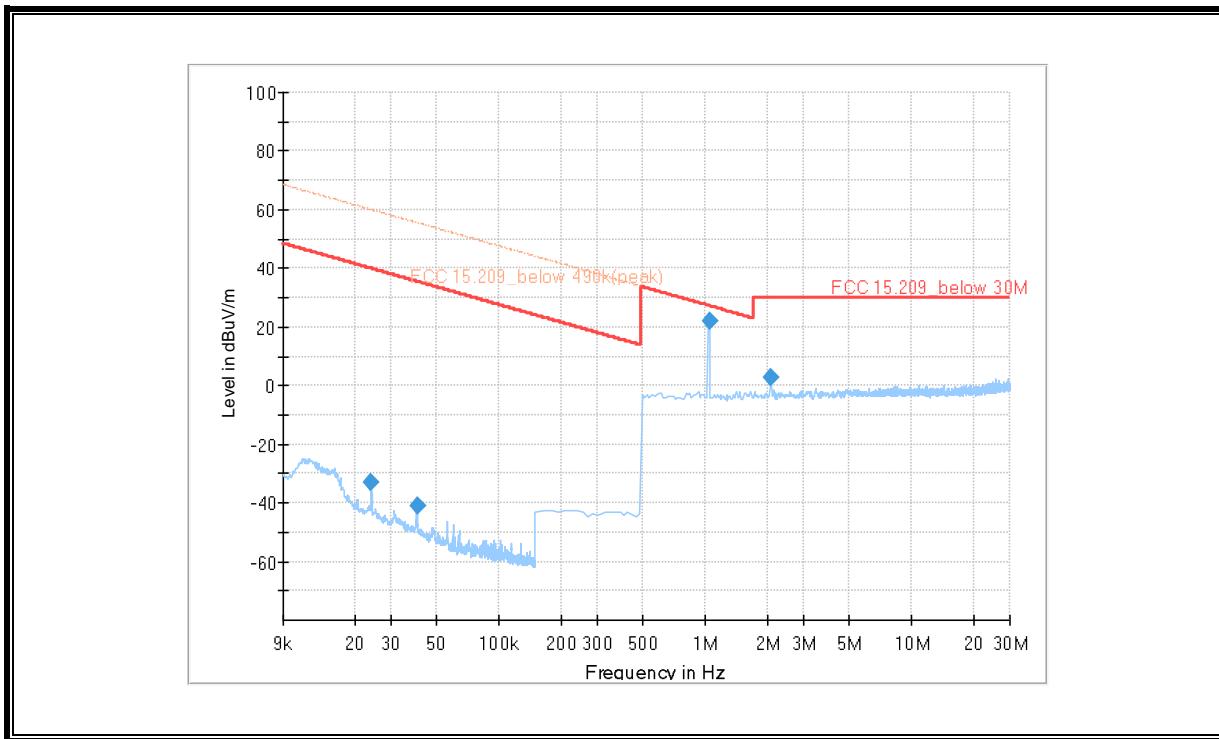
Quasi-Pk detector

**Fundamental

MaxPeak (dBuV/m) = Reading value (dBuV) + Corr. (dB/m)

Corr. (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) - Distance factor (dB)

RADIATED EMISSIONS 9 KHz to 30 MHz – Face Off (Test Case 1)



TEST DATA

[Face Off]

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Corr. (dB/m)	Azimuth (deg)
0.023962	-33.05	40.00	73.04	-59.6	60.0
0.040020	-41.06	35.55	76.61	-59.5	43.0
**1.045500	22.03	27.24	5.20	-19.6	266.0
2.090250	2.96	30.00	27.04	-19.5	274.0

Quasi-Pk detector

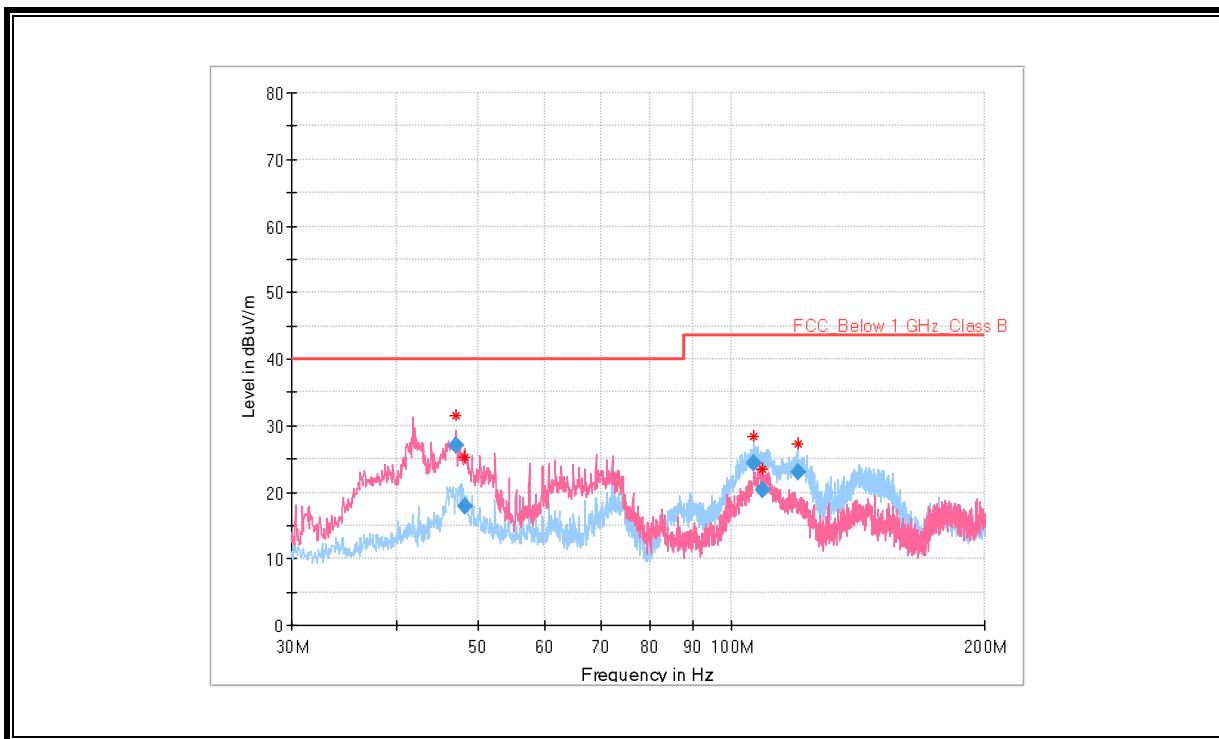
**Fundamental

MaxPeak (dBuV/m) = Reading value (dBuV) + Corr. (dB/m)

Corr. (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) - Distance factor (dB)

Note : Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

RADIATED EMISSIONS 30 MHz to 200 MHz (Test Case 1)



TEST DATA

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Corr. (dB/m)	Pol	Height (cm)	Azimuth (deg)
47.112000	27.13	40.00	12.87	-20.5	V	100.0	162.0
48.125500	17.80	40.00	22.20	-20.5	H	305.0	104.0
106.113500	24.42	43.50	19.08	-23.1	H	262.0	94.0
108.664500	20.24	43.50	23.26	-23.3	V	100.0	45.0
119.822000	23.04	43.50	20.46	-24.7	H	278.0	257.0

Quasi-Pk detector

MaxPeak (dBuV/m) = Reading value (dBuV) + Corr. (dB/m)

Corr. (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Amp Gain (dB)

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.10: 2013

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

Line conducted data is recorded for both NEUTRAL and HOT lines.

LIMIT

FCC §15.207 (a)

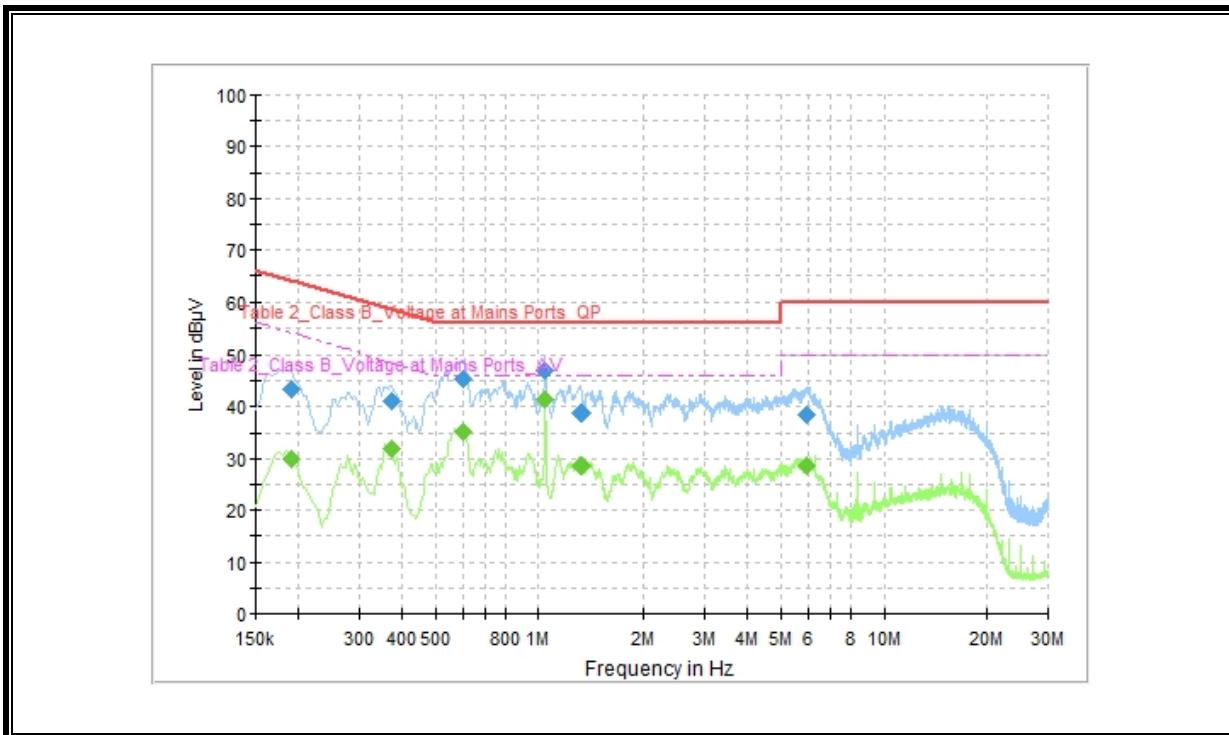
Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

RESULTS

FCC §18.307 (b)
WORST EMISSIONS(Test Case 3)

Line-L1 0.15 - 30MHz

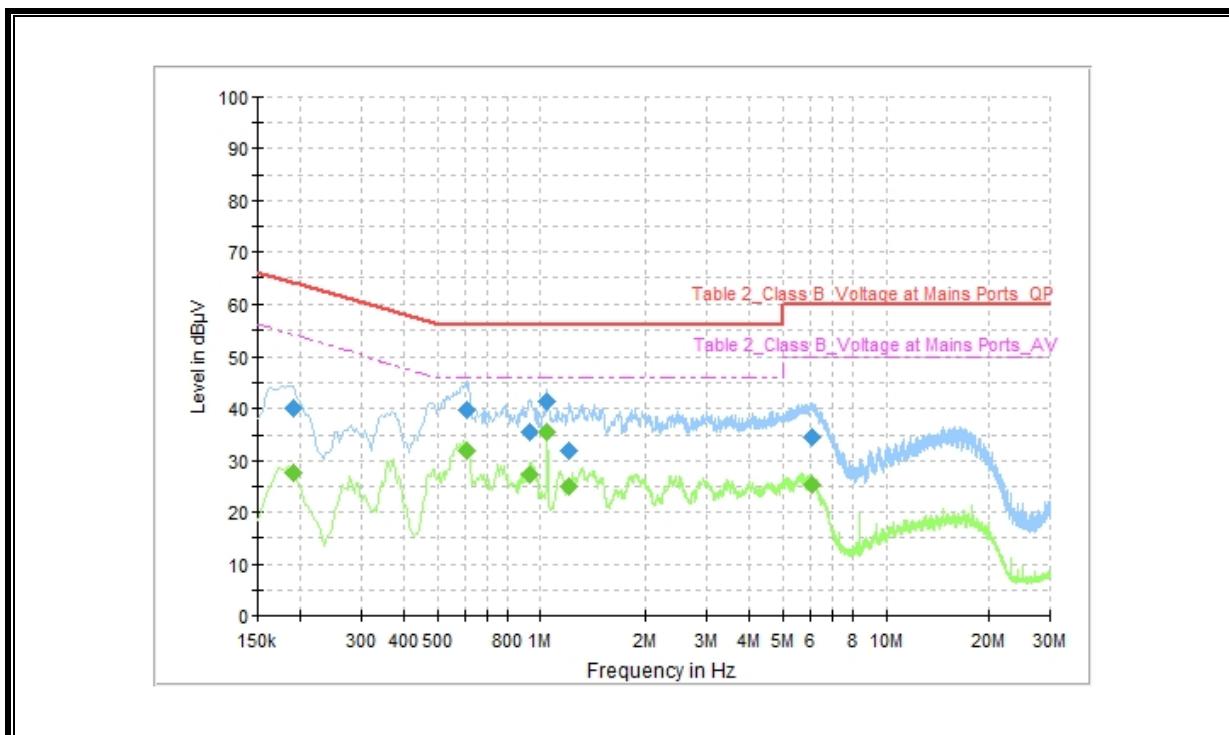


LINE 1 RESULTS

Frequency (MHz)	QuasiPeak (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Corr. (dB)
0.185118	43.13	64.25	21.12	L1	10.0
0.189507	43.27	64.06	20.79	L1	9.9
0.373875	41.05	58.41	17.37	L1	9.9
0.602140	45.33	56.00	10.67	L1	9.9
0.610919	44.12	56.00	11.88	L1	9.9
1.045500	47.11	56.00	8.89	L1	9.8
1.317662	38.39	56.00	17.61	L1	9.8
1.326441	38.93	56.00	17.07	L1	9.8
5.970750	38.53	60.00	21.47	L1	9.9
6.273640	36.54	60.00	23.46	L1	9.9

Frequency (MHz)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Corr. (dB)
0.185118	29.37	54.25	24.88	L1	10.0
0.189507	29.79	54.06	24.27	L1	9.9
0.373875	31.94	48.41	16.48	L1	9.9
0.602140	35.09	46.00	10.91	L1	9.9
0.610919	33.96	46.00	12.04	L1	9.9
1.045500	41.56	46.00	4.44	L1	9.8
1.317662	28.41	46.00	17.59	L1	9.8
1.326441	28.49	46.00	17.51	L1	9.8
5.970750	28.47	50.00	21.53	L1	9.9
6.273640	27.84	50.00	22.16	L1	9.9

Line-L2 .15 - 30MHz



LINE 2 RESULTS

Frequency (MHz)	QuasiPeak (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Corr. (dB)
0.189507	40.18	64.06	23.88	N	9.9
0.610919	39.80	56.00	16.20	N	9.9
0.926978	35.40	56.00	20.60	N	9.8
1.045500	41.28	56.00	14.72	N	9.8
1.212309	31.78	56.00	24.22	N	9.8
6.106831	34.39	60.00	25.61	N	9.9

Frequency (MHz)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Corr. (dB)
0.189507	27.56	54.06	26.50	N	9.9
0.610919	31.97	46.00	14.03	N	9.9
0.926978	27.16	46.00	18.84	N	9.8
1.045500	35.43	46.00	10.57	N	9.8
1.212309	24.93	46.00	21.07	N	9.8
6.106831	25.49	50.00	24.51	N	9.9

END OF TEST REPORT