

FCC Test Report

Report No.: AGC01628180406FE01

FCC ID : 2APQC-WI-DG
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : miniDSP Wi-DG
BRAND NAME : miniDSP
MODEL NAME : Wi-DG
CLIENT : miniDSP Ltd
DATE OF ISSUE : May 14, 2018
STANDARD(S) : FCC Part 15 Rules
REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	May 14, 2018	Valid	Initial Release

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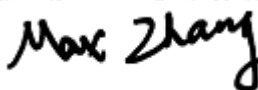
1. VERIFICATION OF CONFORMITY

Applicant	miniDSP Corp.
Address	Unit 307, Kingsford Industrial Centre, 13 Wang Hoi Road, Kowloon Bay, Kowloon, Hong Kong
Manufacturer	miniDSP Ltd
Address	Unit 307, Kingsford Industrial Centre, 13 Wang Hoi Road, Kowloon Bay, Kowloon, Hong Kong
Product Designation	miniDSP Wi-DG
Brand Name	miniDSP
Test Model	Wi-DG
Date of test	May 07, 2018 to May 14, 2018
Deviation	None
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BR/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2014) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15 subpart B.

Tested By



Max Zhang(Zhang Yi)

May 14, 2018

Reviewed By



Bart Xie(Xie Xiaobin)

May 14, 2018

Approved By



Forrest Lei(Lei Yonggang)
 Authorized Officer

May 14, 2018

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

Hardware Version	WIFI-DG_rev-a
Software Version	lks7688_miniDSP_v0.9.4
Highest Operate Frequency	2462MHz(Radiated emission up to 12.5GHz)
EUT Supply	DC5V

2.2. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2APQC-WI-DG** filing to comply with Section 15.107&109 of the FCC Part 15, Subpart B Rules.

2.3. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (2014). Radiated testing was performed at an antenna to EUT distance 3 meters.

2.4. SPECIAL ACCESSORIES

Refer to section 5.1.

2.5. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

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3. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI.

- Uncertainty of Conducted Emission, $U_c = \pm 3.2$ dB
- Uncertainty of Radiated Emission below 1GHz, $U_c = \pm 3.9$ dB
- Uncertainty of Radiated Emission above 1GHz, $U_c = \pm 4.8$ dB

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4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Connected to PC for data exchange by USB port
2	Communicated with Ethernet by RJ45 port

Note: All the test modes had been tested, the mode 1 was the worst case recorded in the test report.

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5. SYSTEM TEST CONFIGURATION

5.1. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Dual band wireless adapter	XHT-6B06	2APQC-WI-DG	EUT
2	PC	HP Pavilion 15	N/A	Support
3	PC adapter	HP 4411SS G4	DC19V/4.74A	Support

5.2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.109	Radiated Emission	Compliant
§15.107	Conducted Emission	Compliant

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6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2F., Bldg.2, No.1-4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District B112-B113, Bldg.12, Baoan Bldg Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen 518012
NVLAP LAB CODE	600153-0
Designation Number	CN5028
FCC Test Firm Registration Number	682566
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by National Voluntary Laboratory Accreditation program, NVLAP Code 600153-0

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Jun.20, 2017	Jun.19, 2018
LISN	R&S	ESH2-Z5	100086	Aug.21, 2017	Aug.20, 2018

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun.20, 2017	Jun.19, 2018
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec.08, 2017	Dec.07, 2018
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep.20, 2017	Sep.19, 2018
preamplifier	ChengYi	EMC184045SE	980508	Sep.15, 2017	Sep.14, 2018
Active loop antenna (9K-30MHz)	A.H.	SAS-562B	N/A	Mar.01, 2018	Feb.28, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May.18, 2017	May.17, 2019
Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-205	Jun.20, 2017	Jun.19, 2018
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep.28, 2017	Sep.27, 2018

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7. RADIATED EMISSION

7.1. MEASUREMENT PROCEDURE

1. Configure the EUT according to ANSI C63.4. 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. For emissions below 1GHz, use 120KHz RBW and VBW \geq 3RBW for QP reading.
7. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
8. 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 values.
9. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
10. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
11. 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. High - Low scan is not required in this case.
12. Only the worst case is reported.

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The following table is the setting of spectrum analyzer and receiver.

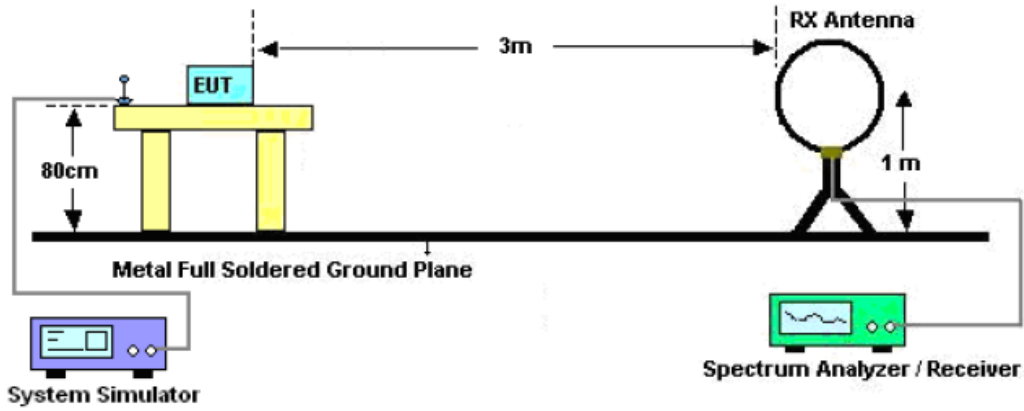
Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RBW 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RBW 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RBW 120KHz for QP
Start ~Stop Frequency	1GHz~12.5GHz 1MHz/3MHz for Peak, 1MHz/10Hz for Average

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RBW 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RBW 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RBW 120KHz for QP

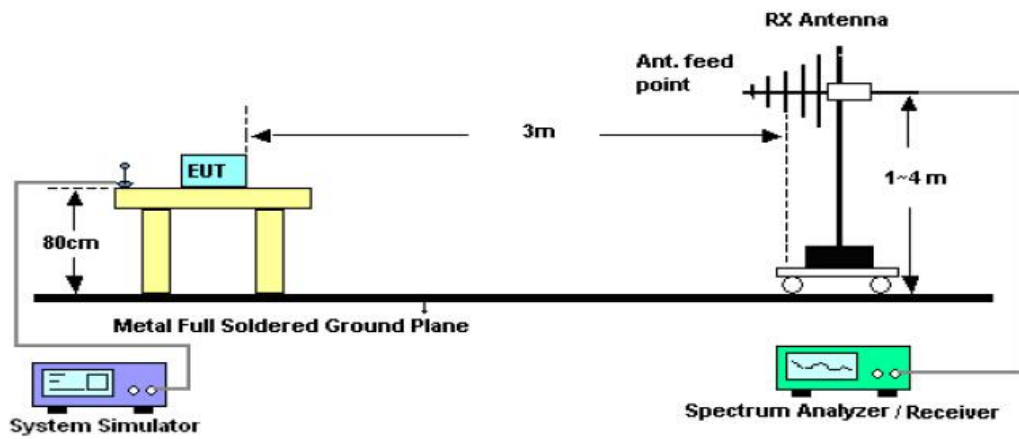
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7.2. TEST SETUP

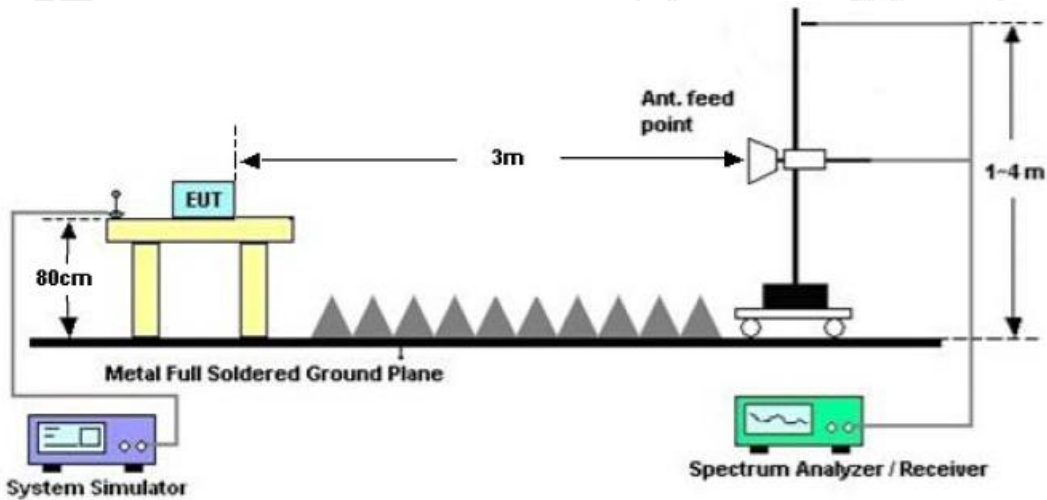
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



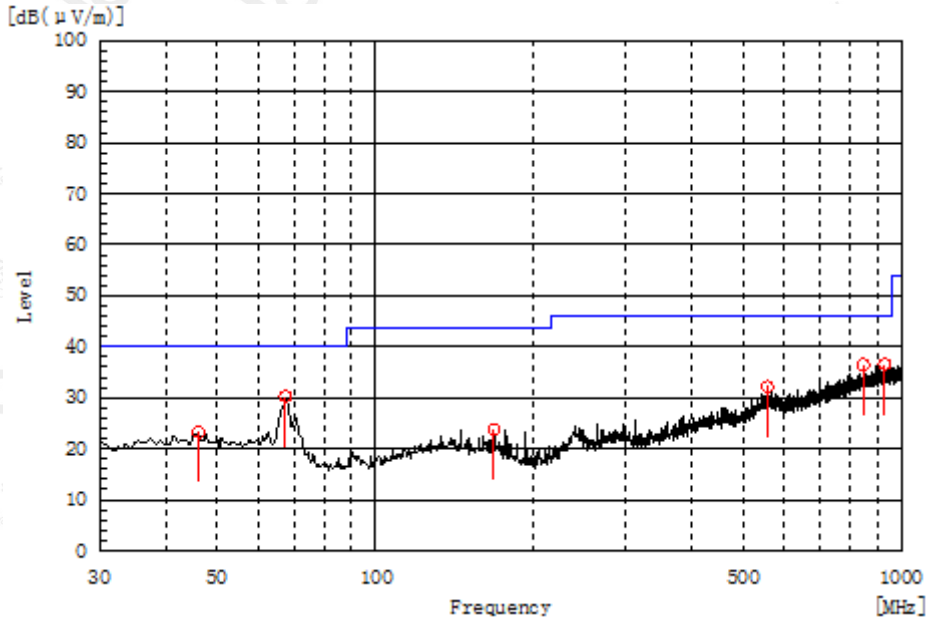
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7.3. TEST RESULT

RADIATED EMISSION BELOW 30MHz

No emission found between lowest internal used/generated frequencies to 30MHz.

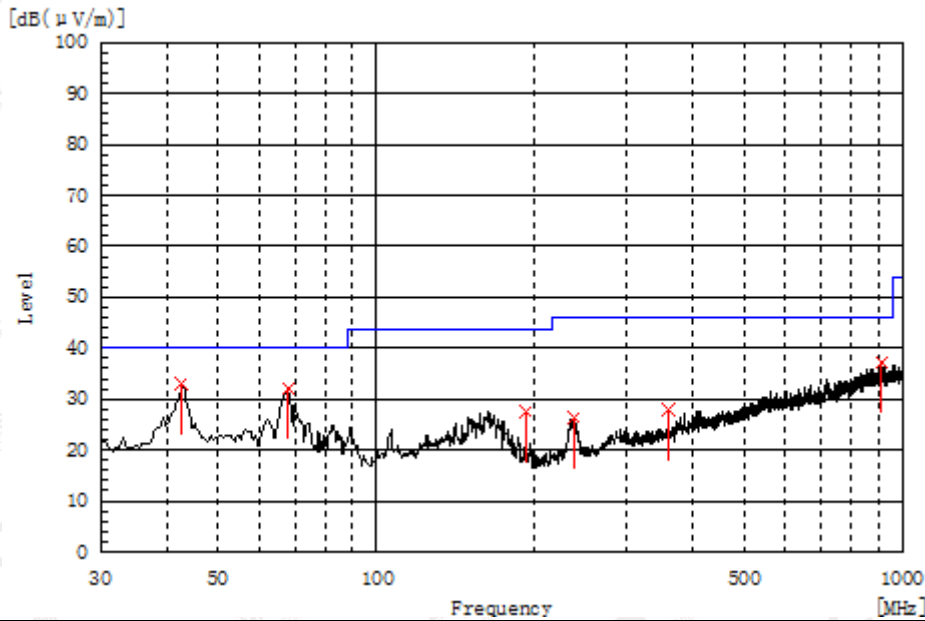
RADIATED EMISSION BELOW 1GHZ-Horizontal



Frequency MHz	Polarization	Reading dB(uV)	Factor dB (1/m)	Level dB(uV/m) PK	Limit dB(uV/m) QP	Margin dB	Pass/Fail	Height cm	Angle deg
46.005	H	5.9	17.3	23.2	40.0	16.8	Pass	200.0	92.1
67.345	H	15.2	15.1	30.3	40.0	9.7	Pass	150.0	288.6
167.740	H	7.7	16.1	23.8	43.5	19.7	Pass	150.0	288.6
556.710	H	8.2	24.0	32.2	46.0	13.8	Pass	100.0	73.1
847.225	H	7.0	29.5	36.5	46.0	9.5	Pass	150.0	216.5
930.645	H	6.1	30.5	36.6	46.0	9.4	Pass	100.0	73.1

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RADIATED EMISSION BELOW 1GHZ-Vertical



Frequency MHz	Polarization	Reading dB(uV)	Factor dB (1/m)	Level dB(uV/m) PK	Limit dB(uV/m) QP	Margin dB	Pass/Fail	Height cm	Angle deg
42.610	V	15.6	17.4	33.0	40.0	7.0	Pass	200.0	268.4
67.830	V	17.0	15.0	32.0	40.0	8.0	Pass	150.0	324.2
191.990	V	13.8	13.7	27.5	43.5	16.0	Pass	100.0	70.5
237.095	V	10.2	16.1	26.3	46.0	19.7	Pass	200.0	342.0
359.800	V	8.7	19.3	28.0	46.0	18.0	Pass	200.0	52.1
911.245	V	6.9	30.3	37.2	46.0	8.8	Pass	150.0	181.5

RESULT: PASS

- Note:**
1. Factor=Antenna Factor + Cable loss - Amplifier gain, Margin=Measurement-Limit.
 2. The "Factor" value can be calculated automatically by software of measurement system.
 3. Emissions range from 1GHz to 12.5GHz have 20dB margin. No recording in the test report.
 4. All the test modes had been tested, the mode 1 was the worst case. Only the data of the worst case would be record in this test report.

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8. FCC LINE CONDUCTED EMISSION TEST

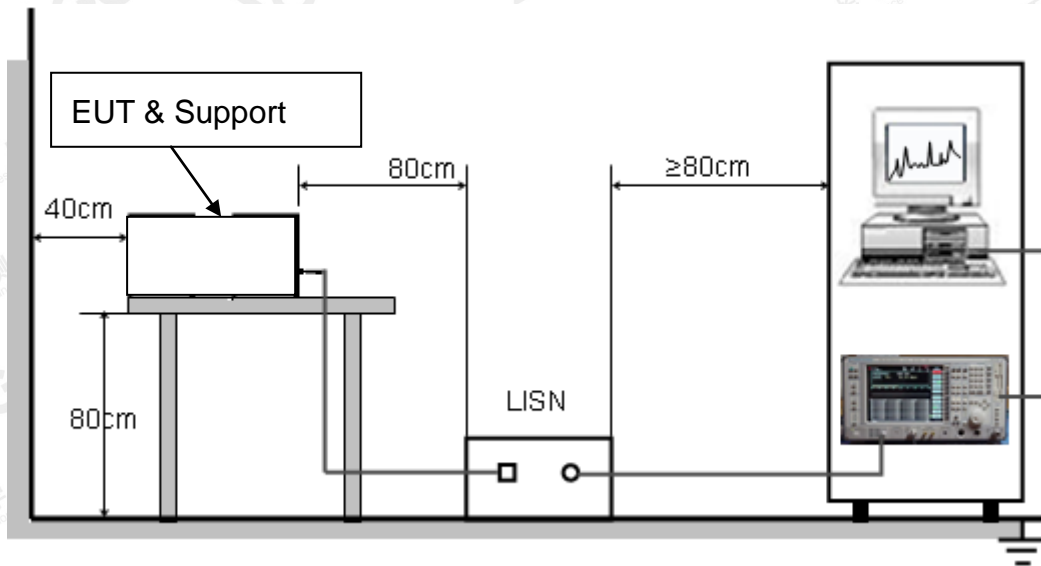
8.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

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

8.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



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8.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.4.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC charging voltage by PC which received 120V/60Hz power by a LISN..
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

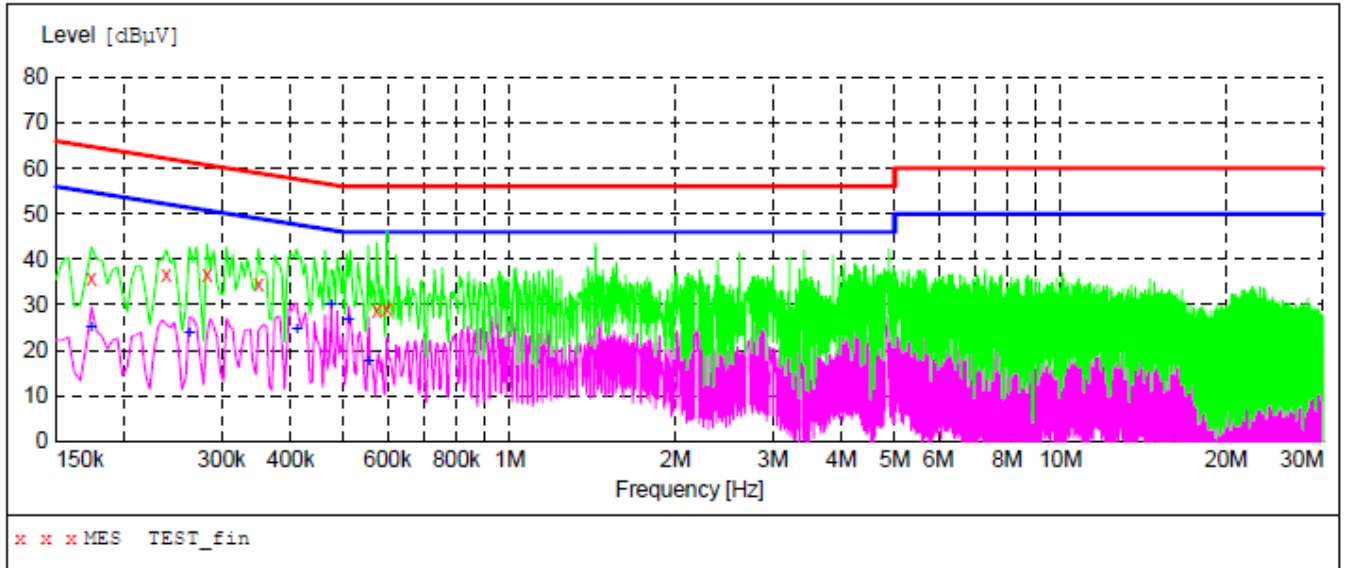
8.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

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8.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



MEASUREMENT RESULT: "TEST_fin"

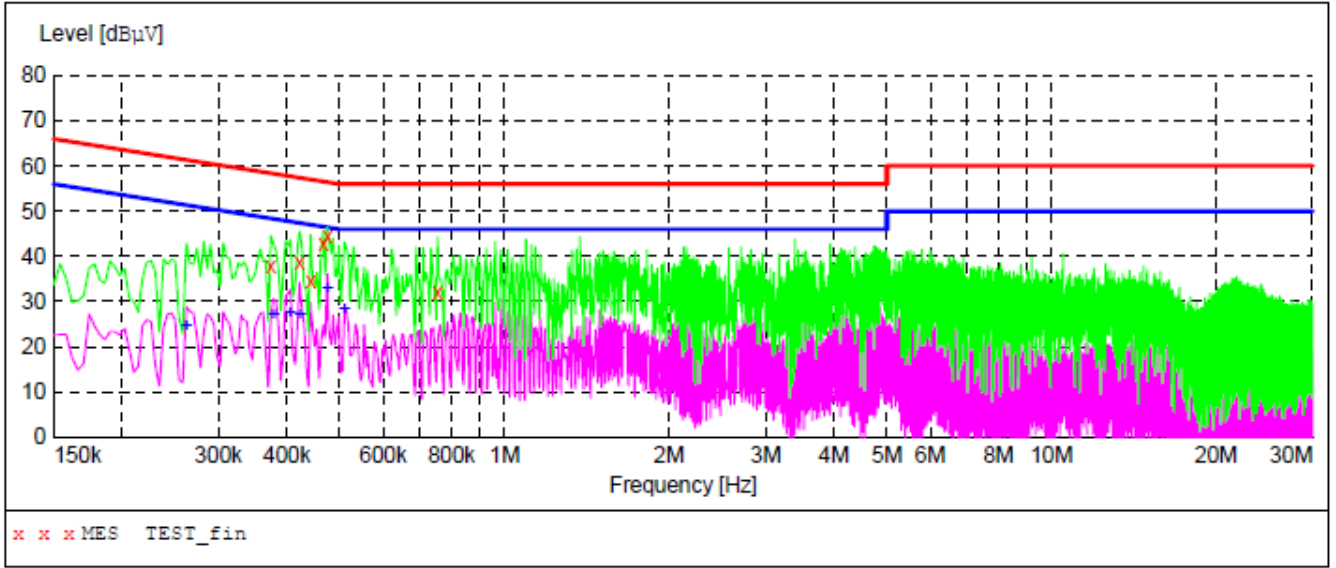
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.174000	35.80	10.0	65	29.0	QP	L1	FLO
0.238000	36.60	10.1	62	25.6	QP	L1	FLO
0.282000	36.40	10.1	61	24.4	QP	L1	FLO
0.350000	34.40	10.0	59	24.6	QP	L1	FLO
0.574000	28.60	9.9	56	27.4	QP	L1	FLO
0.598000	29.30	9.9	56	26.7	QP	L1	FLO

MEASUREMENT RESULT: "TEST_fin2"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.174000	25.00	10.0	55	29.8	AV	L1	FLO
0.262000	23.80	10.1	51	27.6	AV	L1	FLO
0.410000	24.50	10.0	48	23.1	AV	L1	FLO
0.474000	29.80	10.0	46	16.6	AV	L1	FLO
0.510000	26.80	9.9	46	19.2	AV	L1	FLO
0.554000	17.60	9.9	46	28.4	AV	L1	FLO

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Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "TEST_fin"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.374000	37.80	10.0	58	20.6	QP	N	FLO
0.422000	38.60	10.0	57	18.8	QP	N	FLO
0.442000	34.70	10.0	57	22.3	QP	N	FLO
0.466000	42.70	10.0	57	13.9	QP	N	FLO
0.474000	44.60	10.0	56	11.8	QP	N	FLO
0.754000	32.20	10.0	56	23.8	QP	N	FLO

MEASUREMENT RESULT: "TEST_fin2"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.262000	24.50	10.1	51	26.9	AV	N	FLO
0.378000	27.00	10.0	48	21.3	AV	N	FLO
0.406000	27.30	10.0	48	20.4	AV	N	FLO
0.422000	27.20	10.0	47	20.2	AV	N	FLO
0.474000	32.80	10.0	46	13.6	AV	N	FLO
0.510000	28.30	9.9	46	17.7	AV	N	FLO

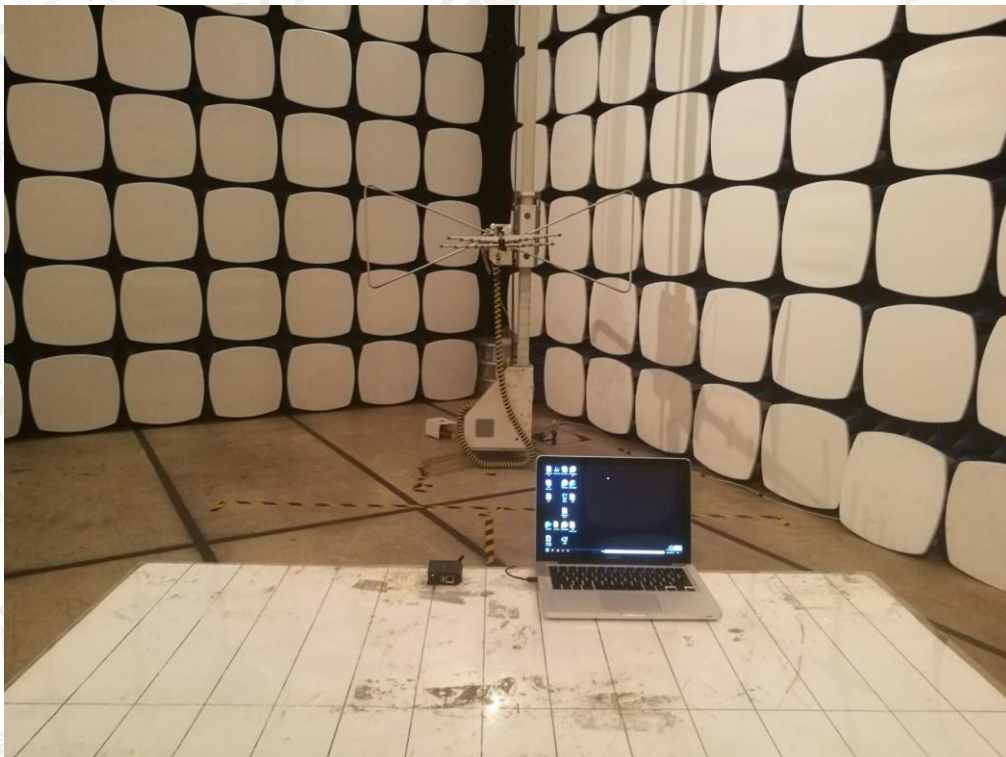
RESULT: PASS

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APPENDIX A: PHOTOGRAPHS OF TEST SETUP
FCC LINE CONDUCTED EMISSION TEST SETUP

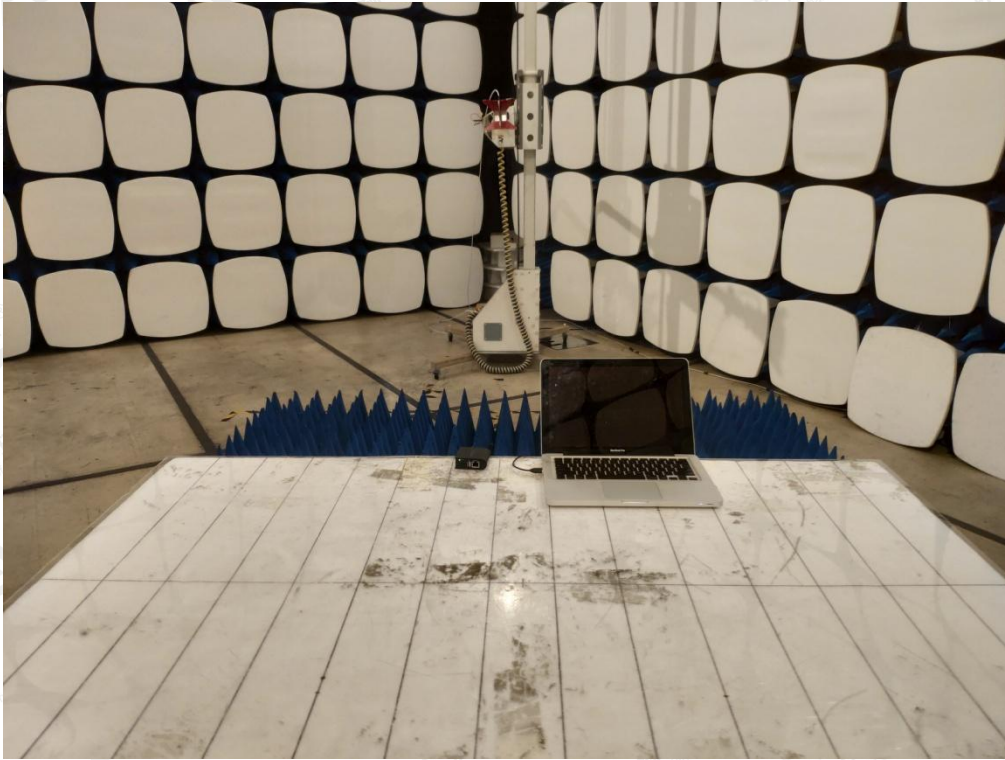


FCC RADIATED EMISSION TEST SETUP BELOW 1GHZ



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FCC RADIATED EMISSION TEST SETUP ABOVE 1GHZ



----END OF REPORT----

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