



FCC TEST REPORT

Report No.: SET2018-15658

Product Name: Power Bank

FCC ID: 2AEEVLPSAN-0014-A

Model No. : LPSAN-0014-A

Applicant: Otter Products, LLC

Address: 209 South Meldrum Street Fort Collins, Colorado 80521

Tested Date: 11/26/2018-12/10/2018

Issued by: CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

Lab Location: Building 28/29, East of Shigu Xili Industrial Zone, Nanshan District
Shenzhen, Guangdong 518055, China

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Test Report

Product Name : Power Bank

Model No. : LPSAN-0014-A

Applicant..... : Otter Products,LLC

Applicant Address : 209 South Meldrum Street Fort Collins, Colorado 80521

Manufacturer..... : Dongguan NVT Technology Co., Ltd

Manufacturer Address : No.8 Xingguo Middle Road, Jiaoshe Village, Dongkeng Town, Dongguan, Guangdong, P.R.China, 523407

Test Standards..... : 47 CFR Part 15 Subpart C: Radio Frequency Devices

Test Result : PASS

Tested by : Yun Lei Fang 2018.12.10

Yun Lei Fang, Test Engineer

Reviewed by..... : Chris You 2018.12.10

Chris You, Senior Engineer

Approved by : Zhu Qi 2018.12.10

Zhu Qi, Manager



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Change History		
Issue	Date	Reason for change
1.0	2018.12.14	First edition



1. GENERAL INFORMATION

1.1 EUT Description

EUT Name : Power Bank
Trade Name..... : N/A
Brand Name..... : OTTERBOX
Input(Type-C Port) AC 5V===3.0A 9V===1.7A 12V===1.3A
Output wireless Power 10W
Hardware Version..... : V1.0
Software Version : V1.0

Note 1: The EUT is a Power Bank; It could support the following operating mode and frequency band:115~205KHz;

Note 2: For a more detailed description, please refer to Specification or User’s Manual supplied by the applicant and/or manufacturer.



1.2 Test Standards and Results

The objective of the report is to perform testing according to following:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C 2017	Radio Frequency Devices

Test detailed items/section required by FCC and IC rules and results are as below:

No.	FCC/IC Section	Description	Result
1	15.207	Conducted Emission	PASS
2	15.209	Radiated Emission	PASS
3	2.202	99% Occupy Bandwidth	Reported only

NOTE:

(1) The EUT has been tested according to 47 CFR Part 15 Subpart C, The test procedure is according to ANSI C63.10:2013.



1.3 Facilities and Accreditations

1.3.1 Facilities

CNAS-Lab Code: L1659

CCIC-SET is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

FCC-Registration No.: CN5031

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN5031, valid time is until December 31, 2019.

ISED Registration: 11185A-1

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until Aug. 03, 2019.

NVLAP Lab Code: 201008-0

CCIC-SET is a third party testing organization accredited by NVLAP according to ISO/IEC 17025. The accreditation certificate number is 201008-0.

1.3.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15°C - 35°C
Relative Humidity (%):	25% -75%
Atmospheric Pressure (kPa):	86kPa-106kPa

1.3.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission:	Uc = 3.6 dB (k=2)
Uncertainty of Radiated Emission:	Uc = 4.5 dB (k=2)



2. TEST CONDITIONS SETTING

2.1 Test Peripherals

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Support Equipment:

Description	Brand name	Model	Serial No.	FCCID
Mobile Phone	Apple	IPhone8 Plus	/	N/A
AC adapter	ZTE	LPL-A005050100	/	N/A

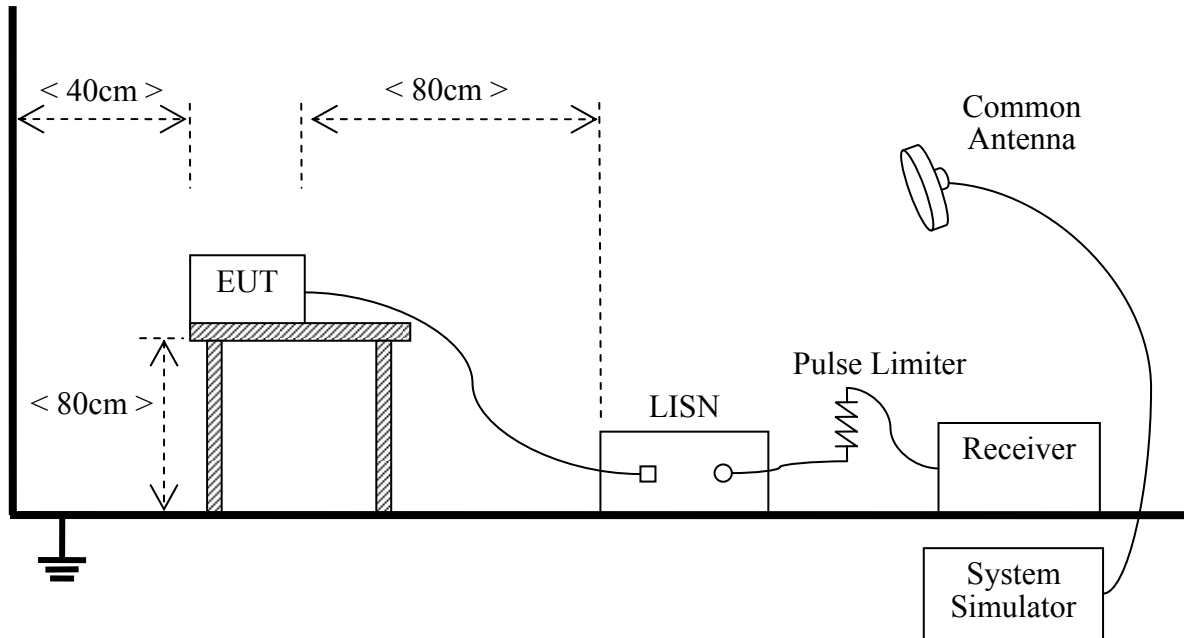
2.2 Test Mode

The EUT is Single fixed power transfer zone, single client

The EUT configuration of the emission tests is transmitting + Charging from adapter + WPT Client device.

2.3 Test Setup and Equipments List

2.3.1 Conducted Emission

A. Test Setup:


The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides $50\Omega/50\mu\text{H}$ of coupling impedance for the measuring instrument. The Common Antenna is used for the call between the EUT and the System Simulator (SS). A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

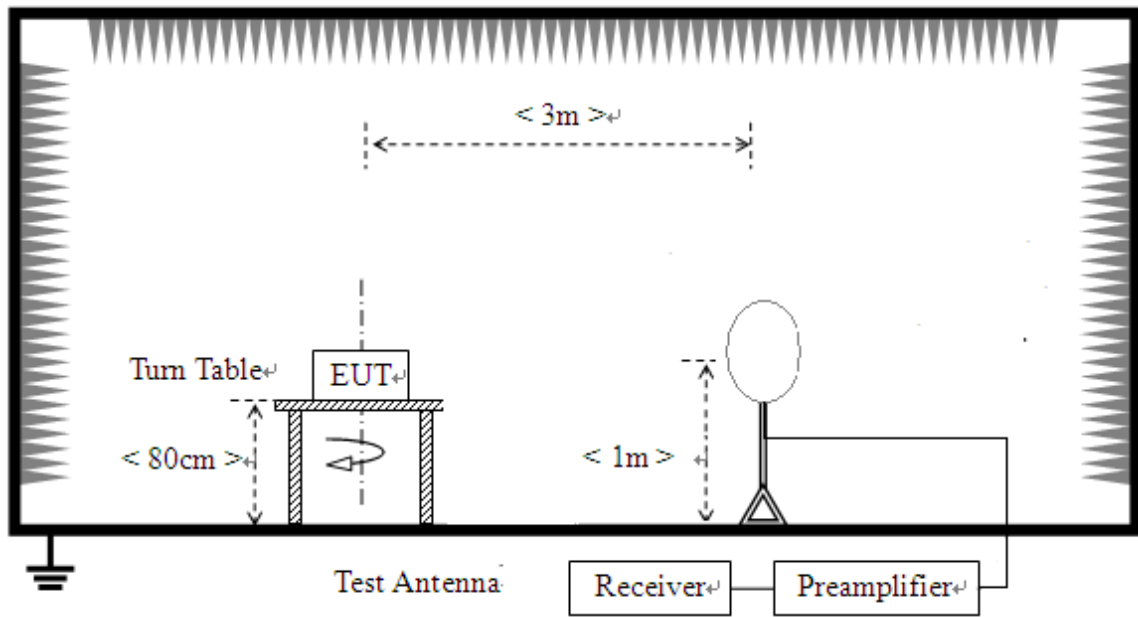
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due. Date
Test Receiver	KEYSIGHT	N9038A	A141202036	2017.12.13	2018.12.12
LISN	ROHDE&SCHWARZ	ENV216	A140701847	2018.01.08	2019.01.07
Cable	MATCHING PAD	W7	/	2018.04.02	2019.04.01

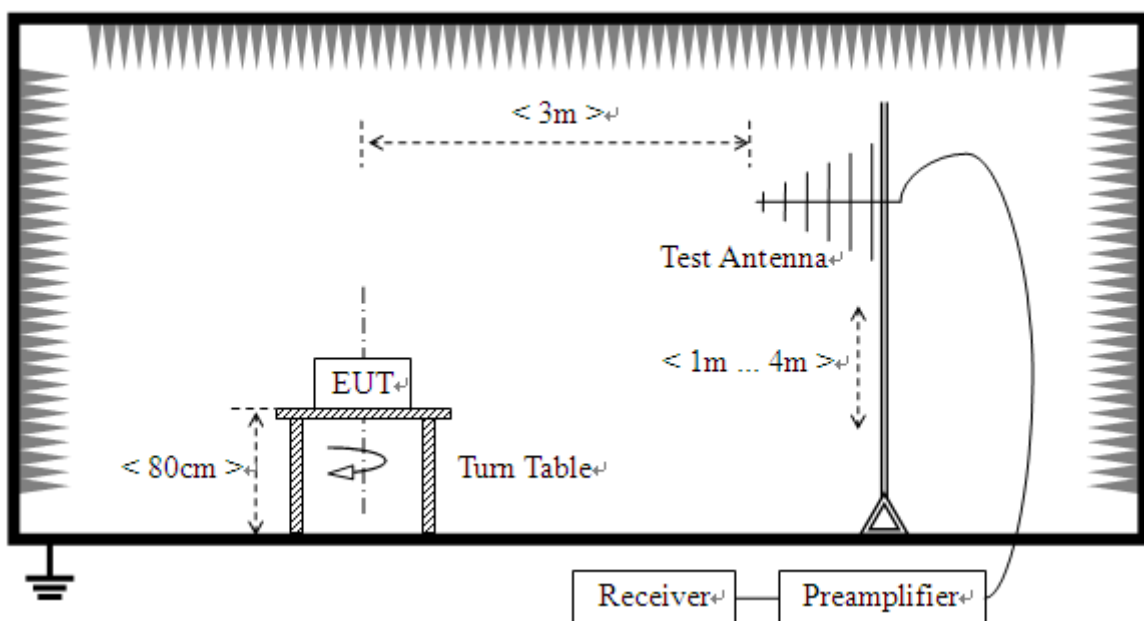
2.3.2 Radiated Emission

A. Test Setup:

- 1) For radiated emissions from 9kHz to 30MHz



- 2) For radiated emissions from 30MHz to 1GHz



**B. Test Procedure**

The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

- 1) In the frequency range of 9 kHz to 30MHz, magnetic field is measured with Loop Test Antenna.

The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

- 2) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

C. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due. Date
Receiver	R&S	ESIB26	A0304218	2018.05.25	2019.05.24
Passive Loop Antenna	R&S	HFH2-Z6	0837.1866.54	2018.05.25	2019.05.24
Semi-Anechoic Chamber	Albatross	9m*6m*6m	A0412372	2018.05.09	2019.05.09
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2018.05.25	2019.05.24
Anechoic Chamber	Albatross	SAC-5MA C 12.8x6.8x6.4m	A0304210	2018.05.09	2019.05.09
Amplifier	Compliance Direction System	PAP-0203 H	A0509377	2018.06.04	2019.06.03
Cable	SUNHNER	SUCOFLE X 100	/	2018.06.04	2019.06.03
Cable	SUNHNER	SUCOFLE X 104	MY1758/4	2018.06.04	2019.06.03



3. 47 CFR PART 15C REQUIREMENTS

3.1 Conducted Emission

3.1.1 Requirement

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 range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

3.1.2 Test Description

See section 2.3.1 of this report.

3.1.3 Test Result

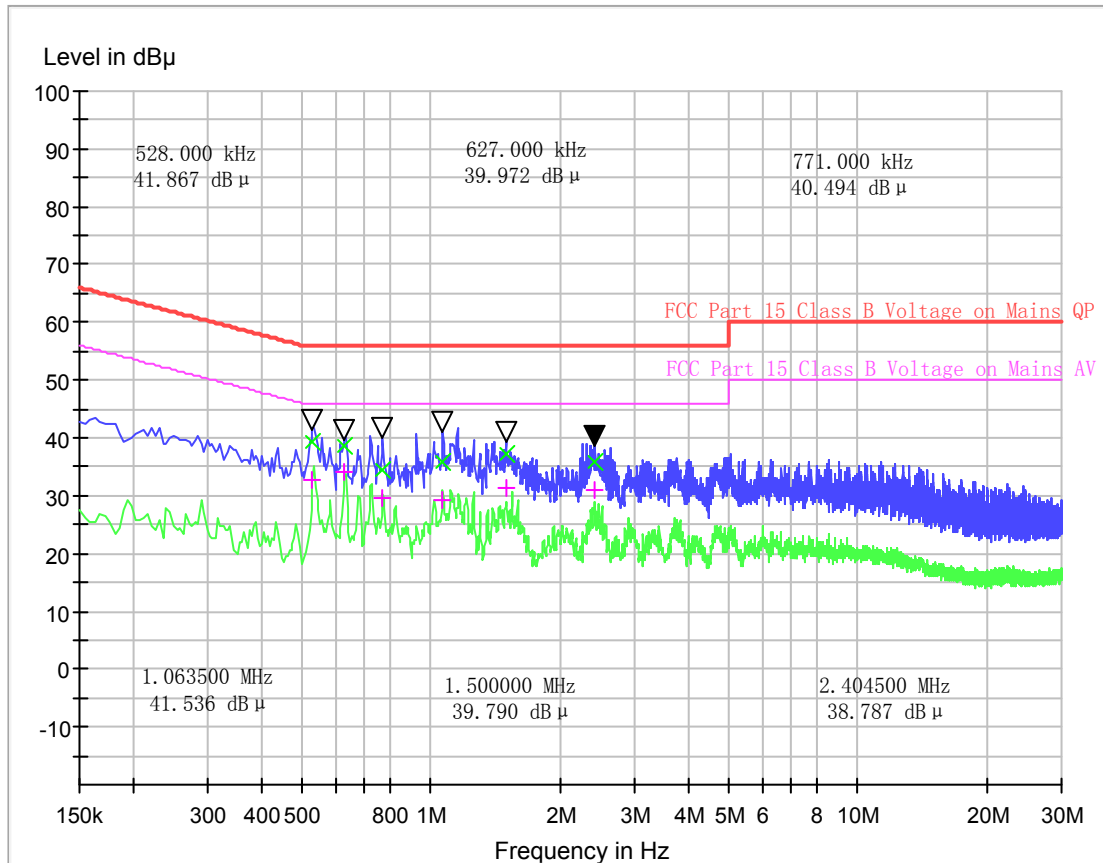
The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

Note:

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a Nominal 120V AC,50/60Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

Test voltage and frequency (120V AC,60Hz)

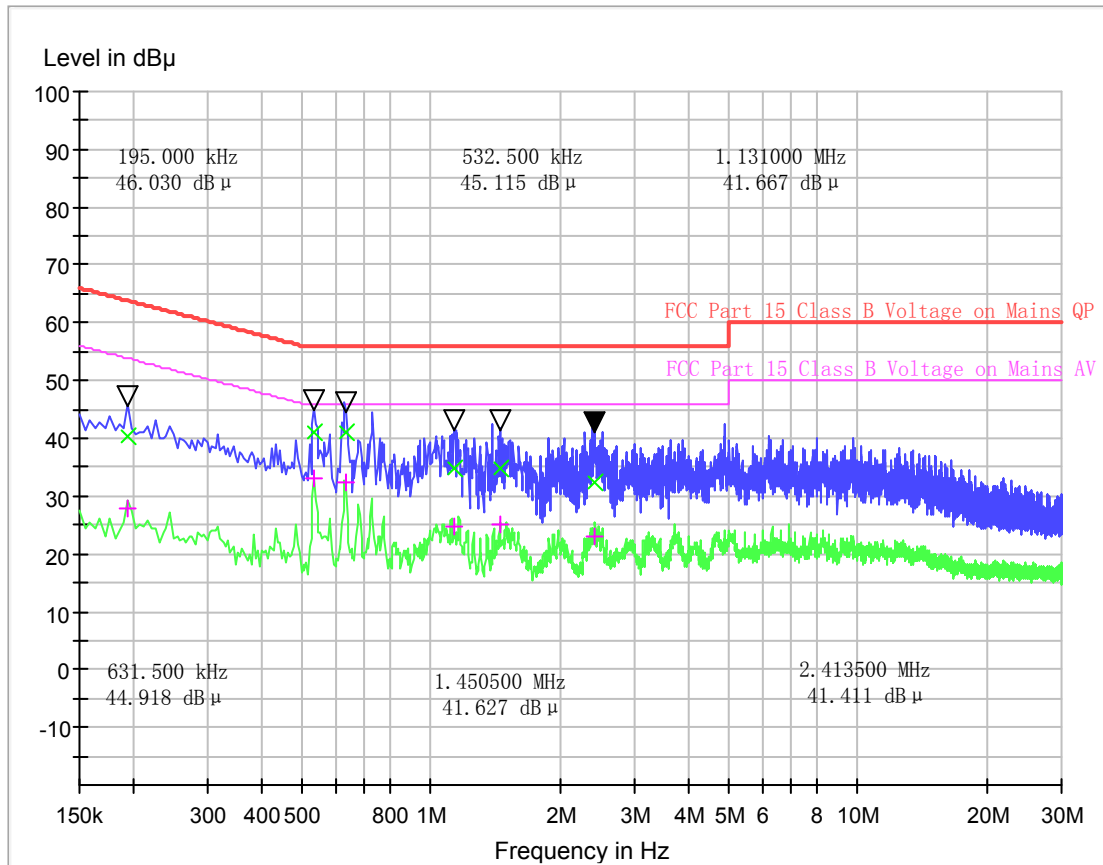
A. Mains terminal disturbance voltage, L phase



(Plot A: L Phase)

Conducted Disturbance at Mains Terminals							
L Test Data							
QP				AV			
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Margin (dB)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Margin (dB)
0.5280	56.0	39.26	16.74	0.5280	46.0	32.79	13.21
0.6270	56.0	38.75	17.25	0.6270	46.0	33.98	12.02
0.7710	56.0	34.32	21.68	0.7710	46.0	29.44	16.56
1.0635	56.0	35.84	20.16	1.0635	46.0	29.15	16.85
1.5000	56.0	37.06	18.94	1.5000	46.0	31.27	14.73
2.4045	56.0	35.78	20.22	2.4045	46.0	30.84	15.16

B. Mains terminal disturbance voltage, N phase



(Plot B: N Phase)

Conducted Disturbance at Mains Terminals							
N Test Data							
QP				AV			
Frequency (MHz)	Limits (dBµV)	Measurement Value (dBµV)	Margin (dB)	Frequency (MHz)	Limits (dBµV)	Measurement Value (dBµV)	Margin (dB)
0.1950	63.8	40.50	23.32	0.1950	53.8	27.97	25.85
0.5325	56.0	41.20	14.80	0.5325	46.0	33.12	12.88
0.6315	56.0	41.03	14.97	0.6315	46.0	32.24	13.76
1.1310	56.0	34.80	21.20	1.1310	46.0	24.63	21.37
1.4505	56.0	34.96	21.04	1.4505	46.0	25.09	20.91
2.4135	56.0	32.45	23.55	2.4135	46.0	23.12	22.88

Test Result: PASS

3.2 Radiated Emission

3.2.1 Requirement

According to FCC section 15.209, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength		Field Strength Limitation at 3m Measurement Dist	
	$\mu\text{V/m}$	Dist	(uV/m)	(dBuV/m)
0.009 - 0.490	$2400/F(\text{kHz})$	300m	$10000 * 2400/F(\text{kHz})$	$20\log 2400/F(\text{kHz}) + 80$
0.490 - 1.705	$2400/F(\text{kHz})$	30m	$100 * 2400/F(\text{kHz})$	$20\log 2400/F(\text{kHz}) + 40$
1.705 - 30.00	30	30m	$100 * 30$	$20\log 30 + 40$
30.0 - 88.0	100	3m	100	$20\log 100$
88.0 - 216.0	150	3m	150	$20\log 150$
216.0 - 960.0	200	3m	200	$20\log 200$
Above 960.0	500	3m	500	$20\log 500$

- a) As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.
- b) Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.
- c) For below 1G :QP detector RBW 120kHz ,VBW 300kHz.
- d) For Above 1G: PK detector RBW 1MHz,VBW 3MHz for PK value ;AV detector RBW 1MHz, VBW 10Hz for AV value.

Note:

- 1) The tighter limit shall apply at the boundary between two frequency range.
- 2) Limitation expressed in dBuV/m is calculated by $20\log$ Emission Level(uV/m).
- 3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^2$.

Example:

F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 3m distance is adjusted as

$$Ld1 = L1 = 30\text{uV/m} * (10)^2 = 100 * 30\text{uV/m}.$$



3.2.2 Test Description

See section 2.3.2 of this report.

3.2.3 Test Result

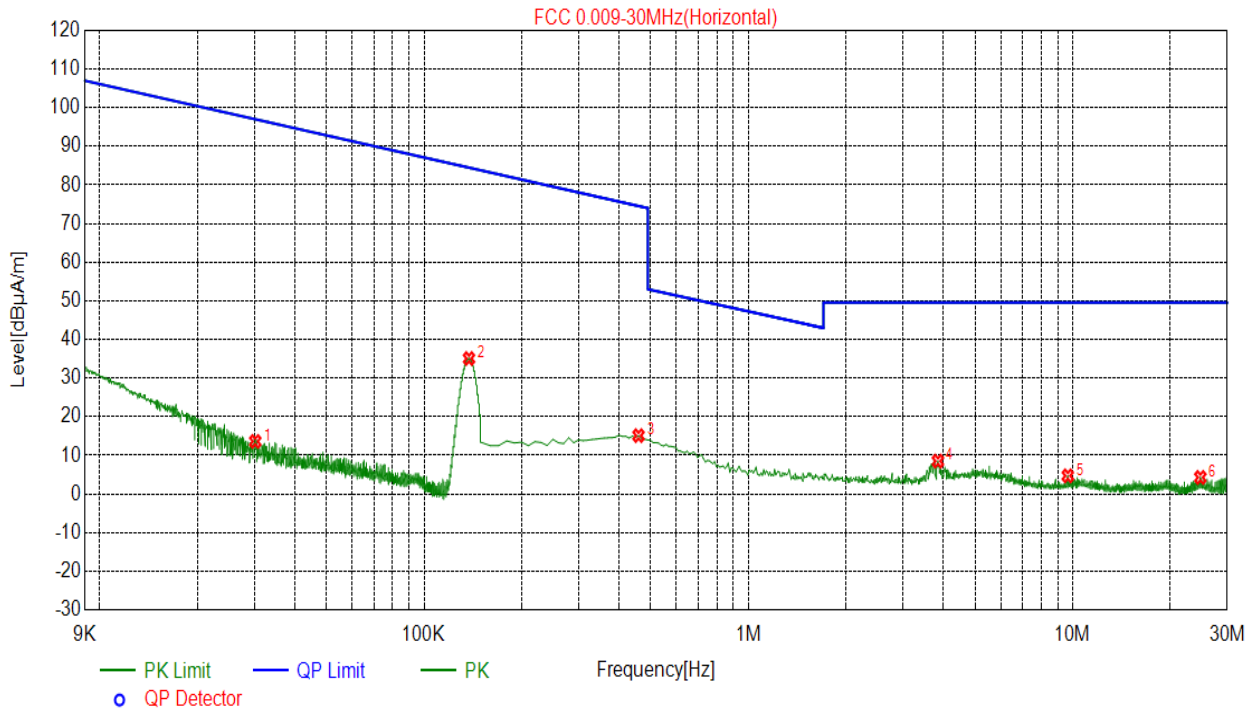
The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

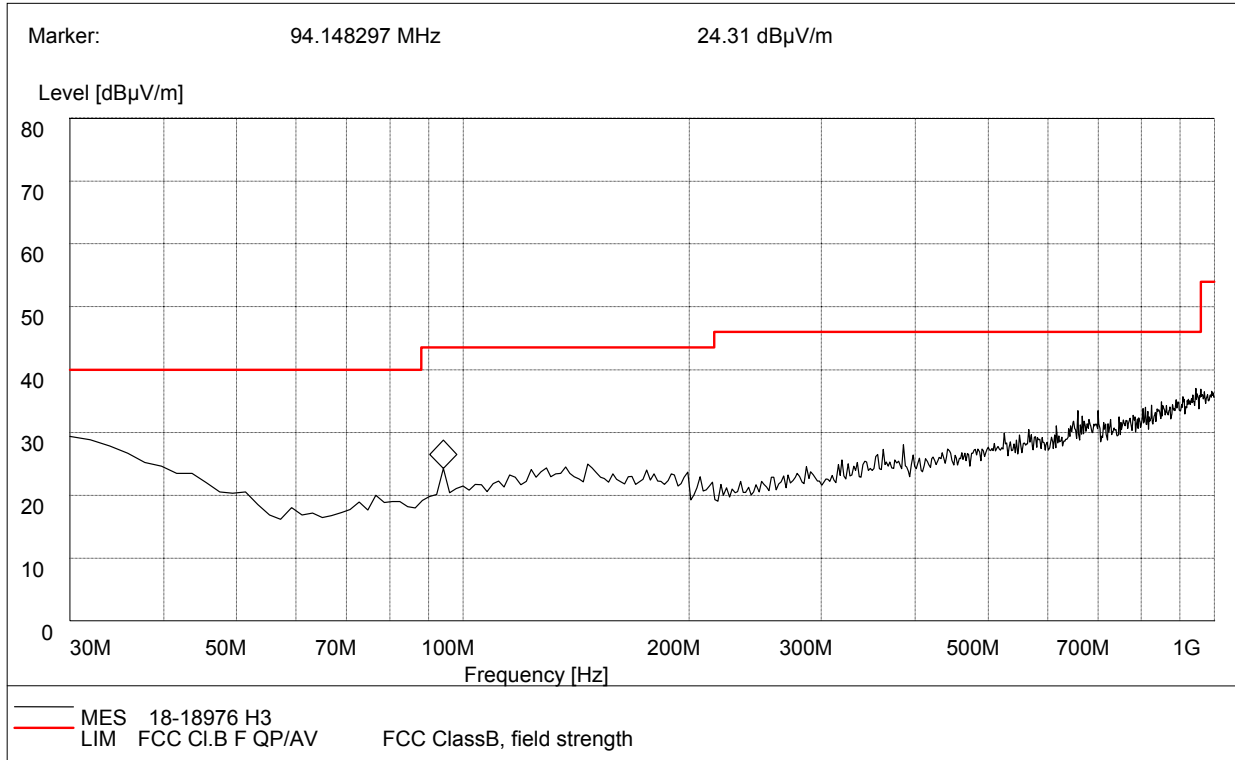
C. Radiation disturbances

9KHz-30MHz



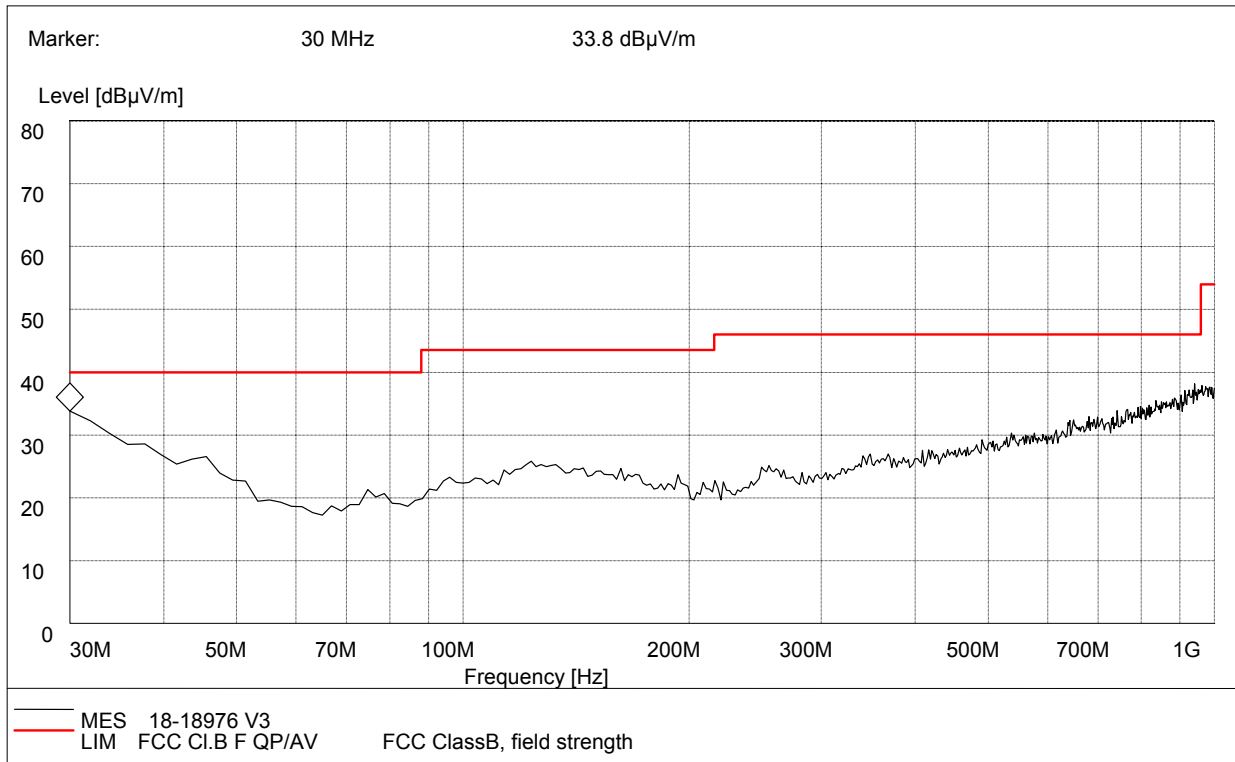
(Plot C: 9K – 30MHz)

NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]
1	0.0302	13.61	97.02	83.41	100
2	0.1376	35.07	84.48	49.41	100
3	0.4586	15.11	74.55	59.44	100
4	3.8427	8.5	49.54	41.04	100
5	9.6654	4.7	49.54	44.84	100
6	24.7745	4.29	49.54	45.25	100



(Plot D: Test Antenna Horizontal 30M - 1G)

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Margin (dB)	Antenna	Verdict
94.148297	24.31	120.000	103.0	43.50	19.19	Horizontal	Pass



Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Margin (dB)	Antenna	Verdict
30	33.8	120.000	110.0	43.50	9.7	Vertical	Pass

Test Result: PASS

3.3 Occupied bandwidth

3.3.1 99%Bandwidth

3.3.2 Limits

Note; for reporting purposes only.

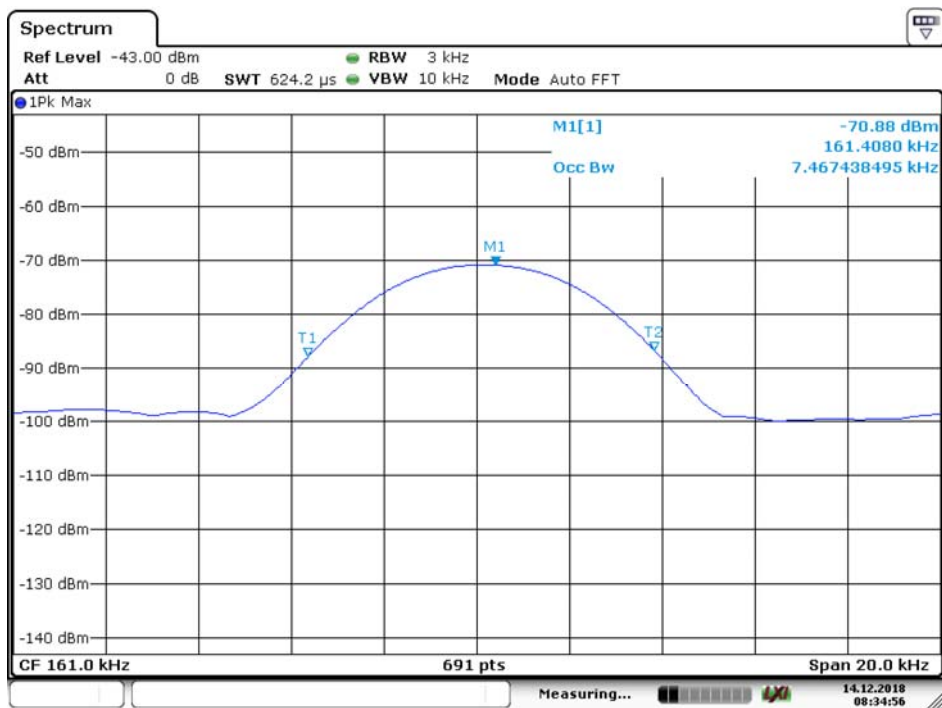
3.3.3 Test Procedure

The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the emission bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

3.3.4 Results

Frequency(KHz)	99%Bandwidth(KHz)
161	7.47

99% Bandwidth



Date: 14.DEC.2018 08:34:55