



RF TEST REPORT

Report No.: SET2018-04681

Product Name: Mobile Data Terminal

FCC ID: 2AC6AC3000

Model No. : C3000

Applicant: ShenZhen Chainway Information Technology Co.,Ltd.

Address: 6F,Building A,Tsinghua Information Harbor, Hi-tech& Industrial
Park, Nanshan, Shenzhen, Guangdong, China

Dates of Testing: 04/10/2018 — 04/12/2018

Issued by: CCIC-SET

Lab Location: Electronic Testing Building, No. 43 Shahe Road, Xili Jiedao,
Nanshan District, Shenzhen, Guangdong, China

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Test Report

Product Name: Mobile Data Terminal

Brand Name: CHAINWAY

Trade Name: CHAINWAY

Applicant: ShenZhen Chainway Information Technology Co.,Ltd.

Applicant Address: 6F,Building A,Tsinghua Information Harbor, Hi-tech& Industrial Park, Nanshan, Shenzhen, Guangdong, China

Manufacturer: ShenZhen Chainway Information Technology Co.,Ltd.

Manufacturer Address: 6F,Building A,Tsinghua Information Harbor, Hi-tech& Industrial Park, Nanshan, Shenzhen, Guangdong, China

Test Standards: 47 CFR FCC Part 15.209

Test Result: PASS

Tested by

2018.04.12

Shallwe Yang, Test Engineer

Reviewed by

2018.04.12

Zhu Qi, Senior Engineer

Approved by

2018.04.12

Smart Li, Manager



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Change History		
Issue	Date	Reason for change
1.0	2018.04.12	First edition

1. General Information

1.1. EUT Description

EUT Type	Mobile Data Terminal
Hardware Version	N/A
Software Version	N/A
Power Supply	5.0Vdc(adapter or host equipment) 3.7Vdc(Li-ion battery)
Frequency Range	125kHz
Operating Rang	125kHz
Number of channel	1
Modulation Type	ASK
Antenna Type	PATCH Antenna
Antenna Gain	0dBi

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C 2017	Radio Frequency Devices
2	ANSI C63.10 2013	American National Standard for Testing Unlicensed Wireless Devices

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

No.	Ref. Std Clause	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.207	Conducted Emission	PASS
3	15.209	Radiated Band Edges and Spurious Emission	PASS
4	15.215(C)	20 dB bandwidth	PASS

1.3. Facilities and Accreditations

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.

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.

FCC- Designation Number: 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, 2018.

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



2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, 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.

And according to FCC 47 CFR Section 15.247(c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

2.1.2. Antenna Information

Antenna Category: Integral antenna

Antenna General Information:

No.	EUT Model	Ant. Cat.	Gain(dBi)
1	C3000	PATCH antenna	0

2.1.3. Result: comply

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. AC Power-line Conducted Emission

2.2.1. Limit of Conducted Emission

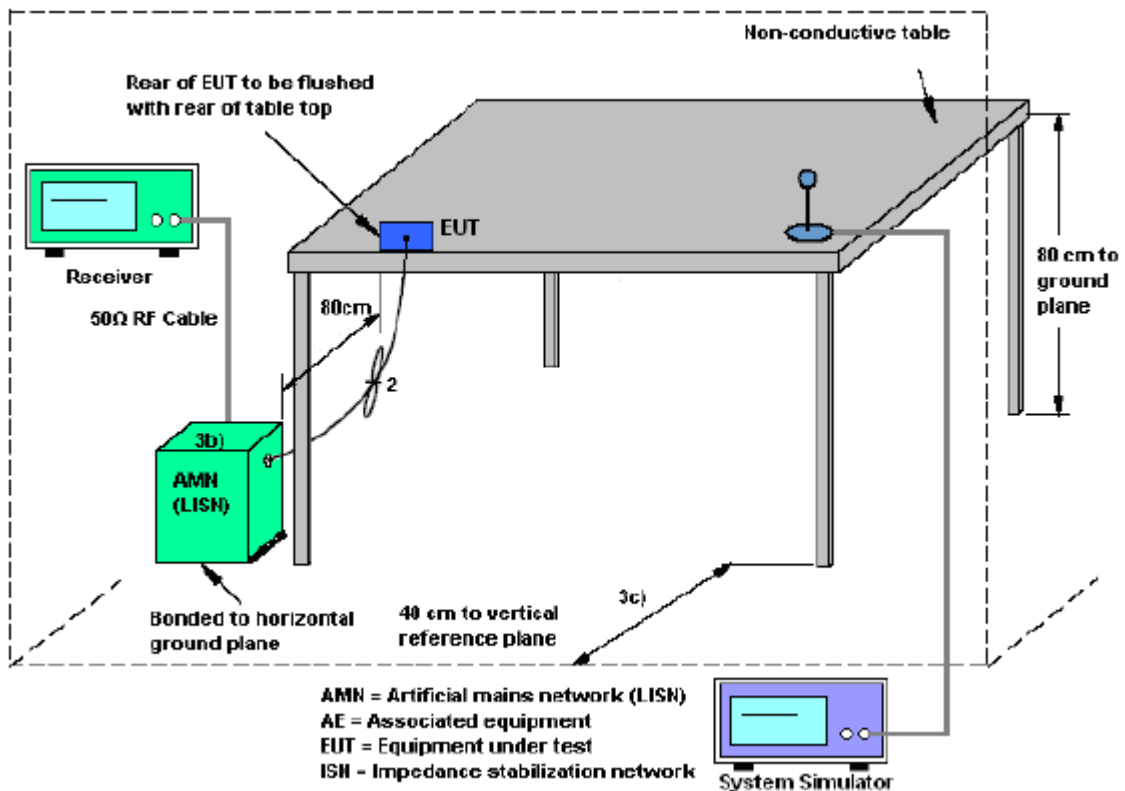
For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency 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
0.50 - 30	60	50

2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.2.3. Test Setup

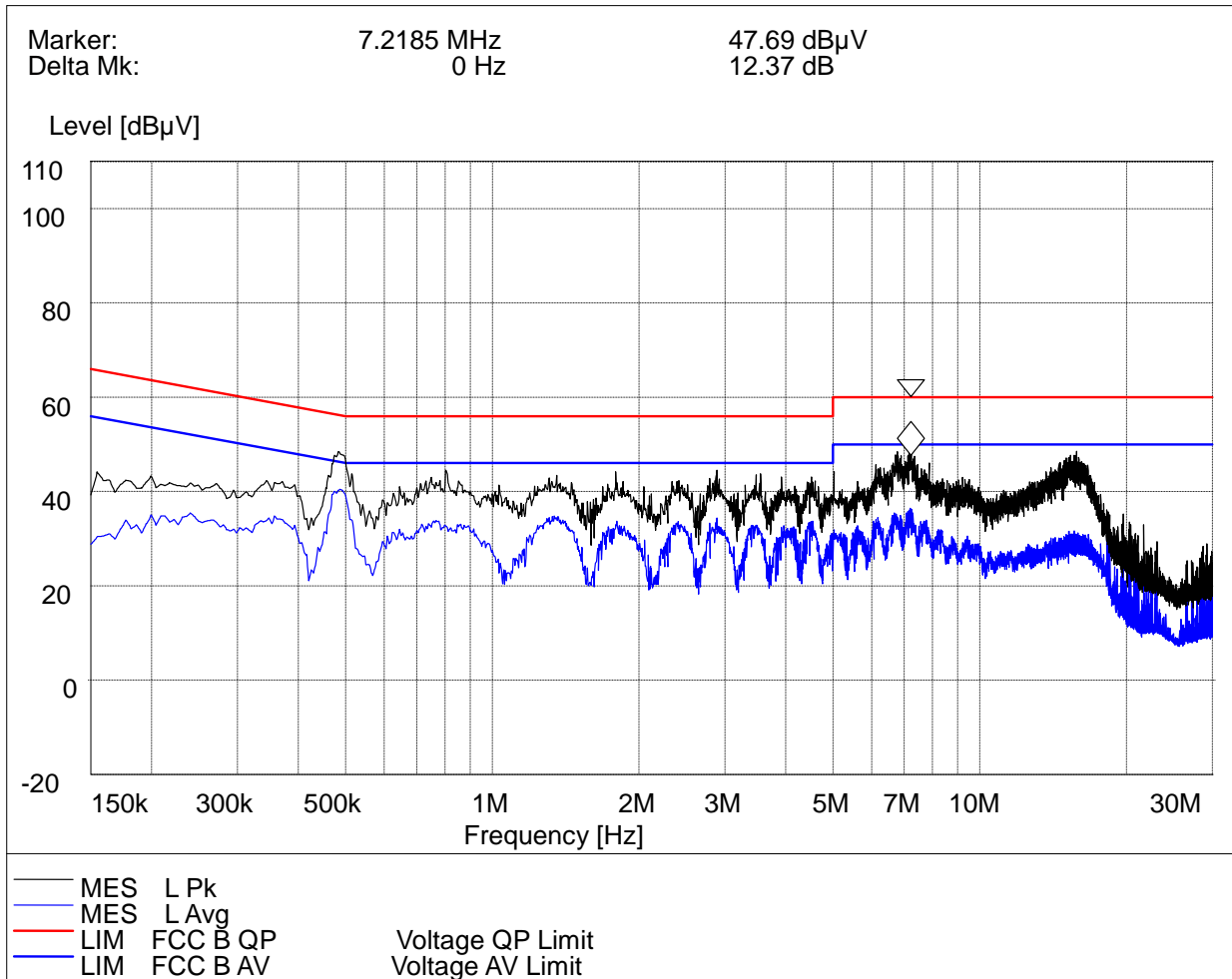


2.2.4. Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room 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 micrometry 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.

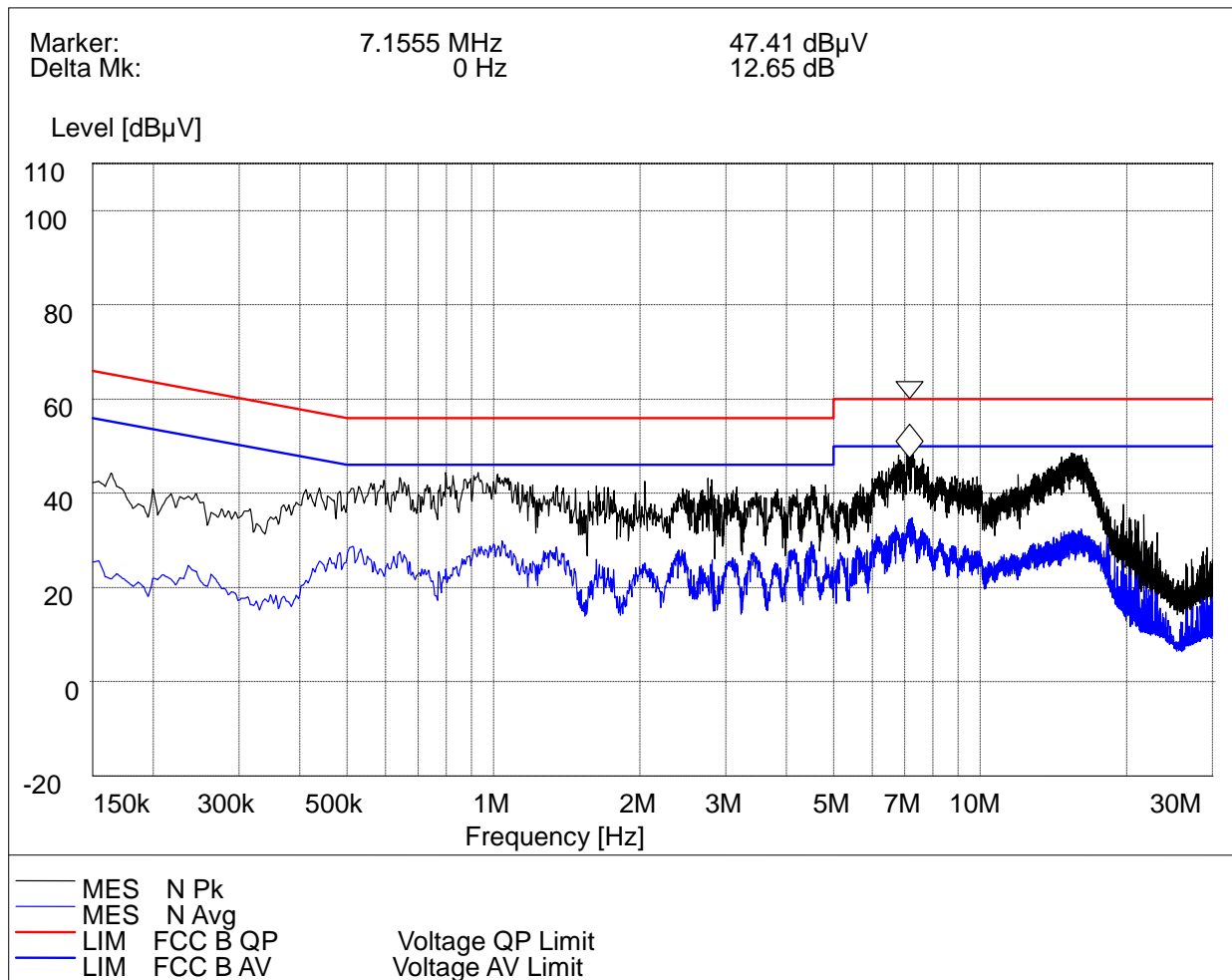
2.9.3. Test Results of Conducted Emission

The EUT configuration of the emission tests is RFID Link + USB Cable (Charging from Adapter)



(Plot A: L Phase)

Conducted Disturbance at Mains Terminals					
L Test Data					
QP			AV		
Frequency (MHz)	Limits (dB μ V)	Measurement Value (dB μ V)	Frequency (MHz)	Limits (dB μ V)	Measurement Value (dB μ V)
0.483	56.30	45.30	0.483	46.30	40.40
1.356	56.00	39.10	1.356	46.00	34.10
7.219	60.00	42.50	7.219	50.00	35.10



(Plot B: N Phase)

Conducted Disturbance at Mains Terminals					
N Test Data					
QP			AV		
Frequency (MHz)	Limits (dB μ V)	Measurement Value (dB μ V)	Frequency (MHz)	Limits (dB μ V)	Measurement Value (dB μ V)
0.929	56.00	38.80	0.929	46.00	27.80
7.155	60.00	43.10	7.155	50.00	32.60

Test Result: PASS

2.3. Radiated Spurious Emission

2.3.1. Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

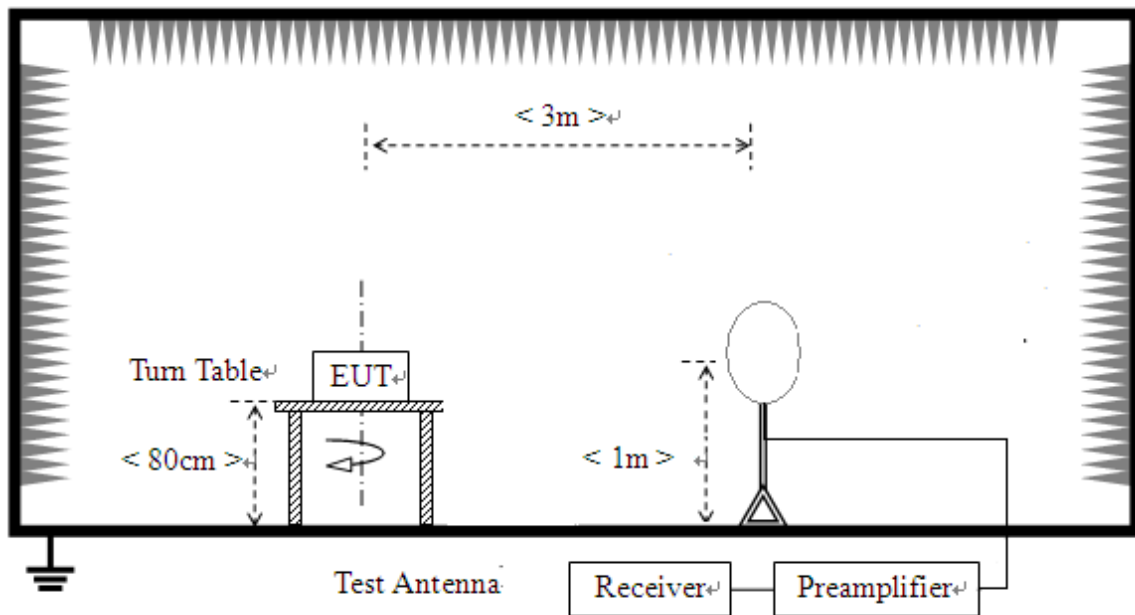
Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Field Strength (dBuV/m)	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	48.5 - 13.8	300
0.490 - 1.705	$24000/F(\text{kHz})$	33.8 - 23	30
1.705 - 30.0	30	29	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

2.3.2. Measuring Instruments

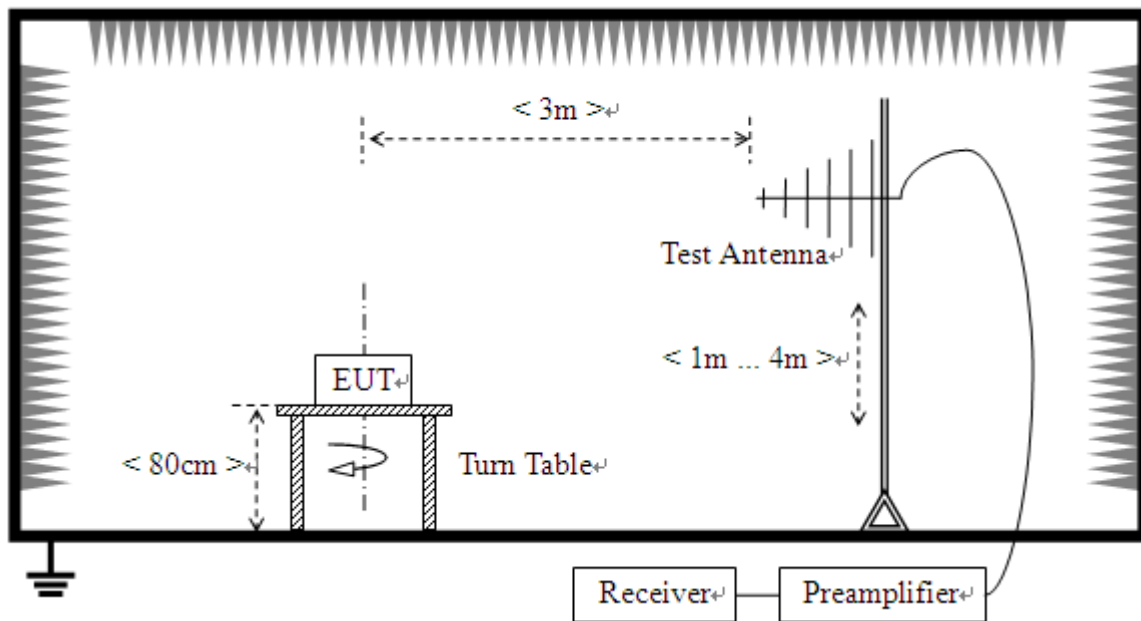
The measuring equipment is listed in the section 3 of this test report.

2.3.3. Test Setup

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



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



2.3.1. Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1 \text{ GHz}$, RBW=1MHz for $f > 1\text{GHz}$; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement: use duty cycle correction factor method per 15.35(c).
Duty cycle = On time/100 milliseconds

$$\text{On time} = N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{N_{n-1}} + N_n * L_n$$

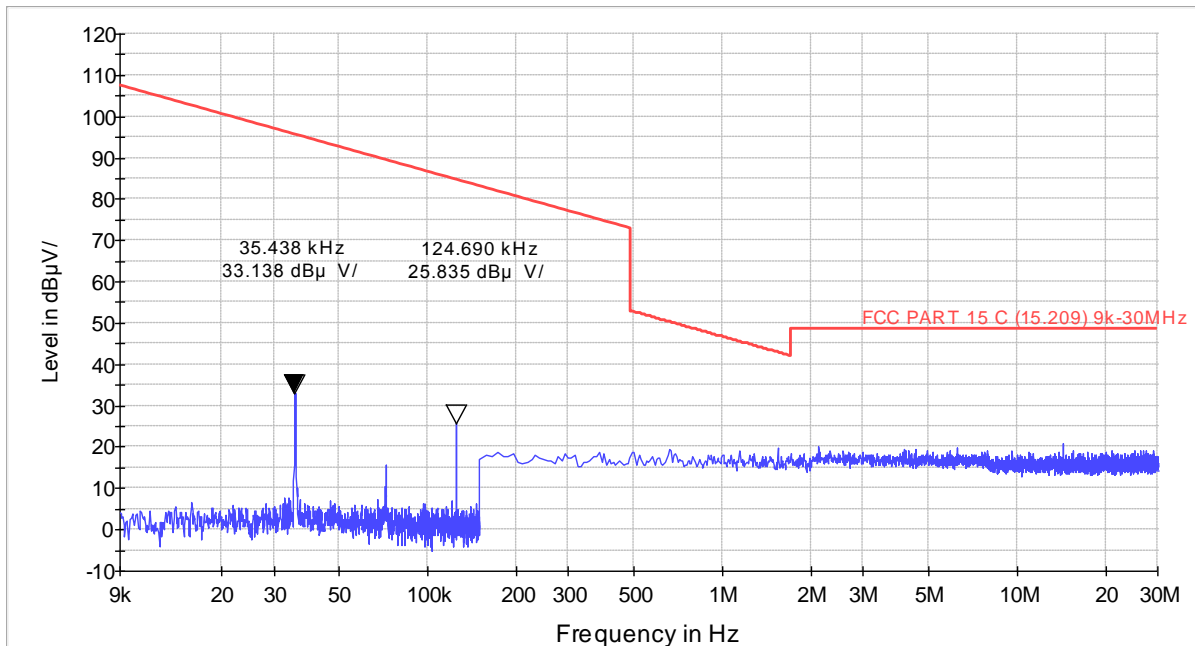
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.

$$\text{Average Emission Level} = \text{Peak Emission Level} + 20 * \log(\text{Duty cycle})$$

7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

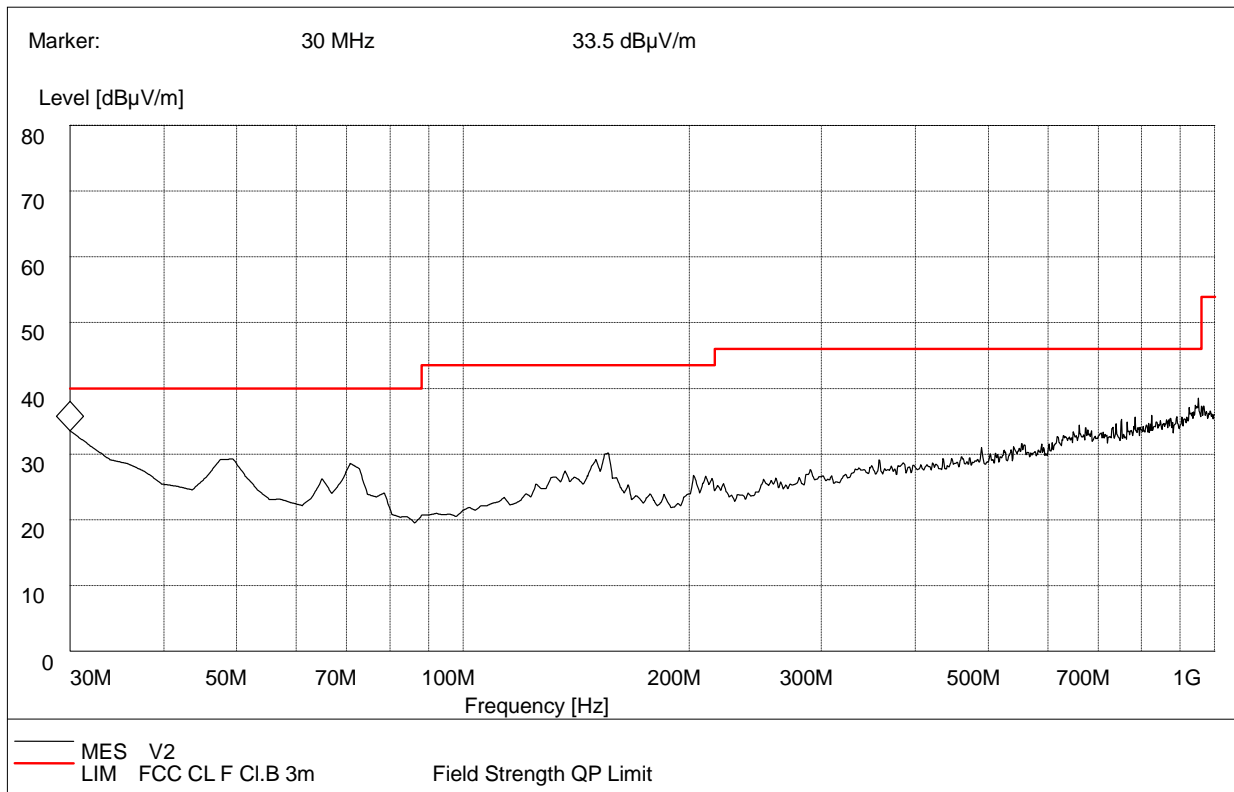
2.3.2. Test Results of Radiated Band Edge and Spurious Emission

For 9 KHz to 30MHz



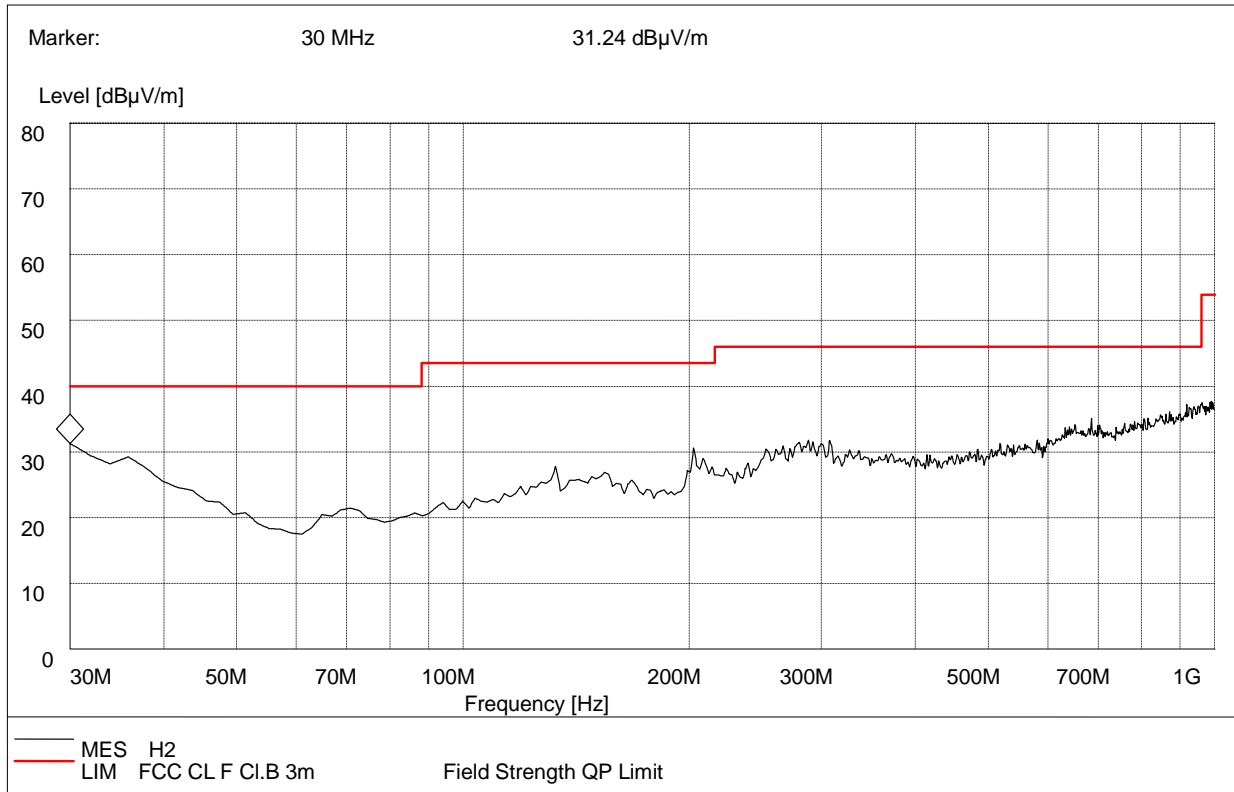
Frequency (kHz)	AV (dBµ V/m)	Antenna height (cm)	Verdict
35.438	33.138	100.0	Pass
124.690	25.835	100.0	Pass

For 30MHz to 1000MHz



Frequency (MHz)	QuasiPeak (dBµ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµ V/m)	Antenna	Verdict
30.00	33.50	120.000	100.0	40.00	Vertical	Pass

(Plot A: 30MHz to 1GHz, Antenna Vertical)



Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Antenna	Verdict
30.00	31.24	120.000	100.0	40.0	Horizontal	Pass

(Plot B: 30MHz to 1GHz, Antenna Horizontal)

2.4. Bandwidth

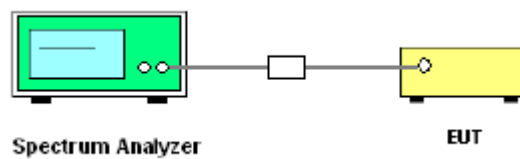
2.4.1. Definition

According to FCC §15.215(C), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth ($10 \cdot \log 1\% = 20\text{dB}$) taking the total RF output power.

2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.4.3. Test Setup



2.4.4. Test Procedure

2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel;

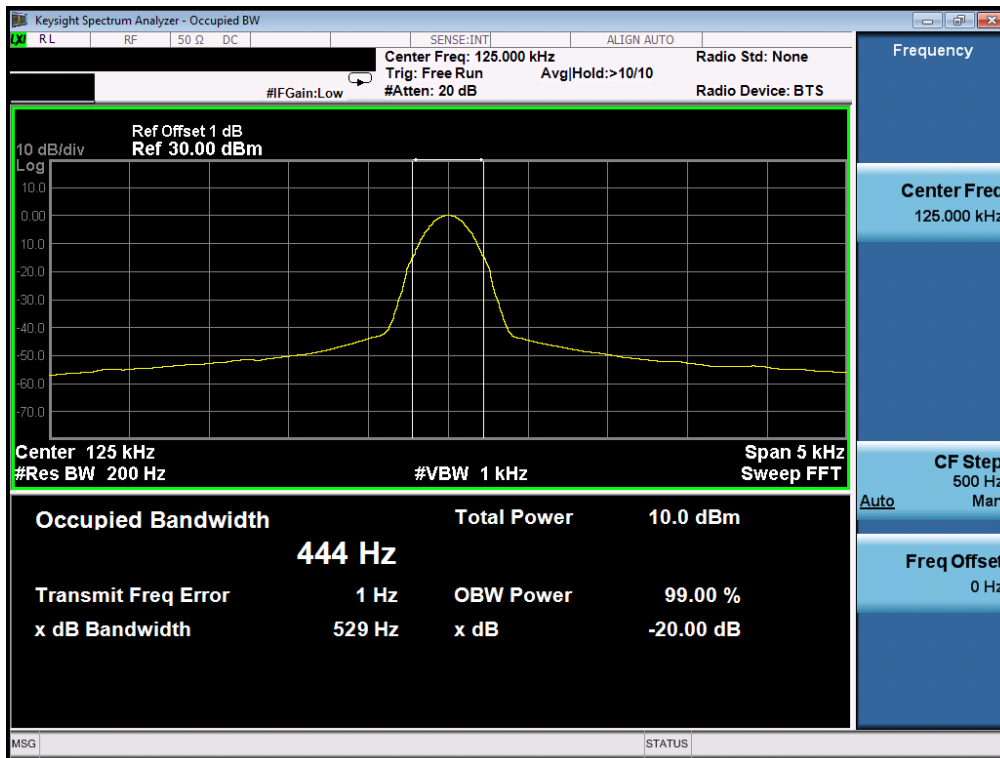
RBW=200Hz; VBW=1KHz; Sweep = auto; Detector function = peak;

Trace = max hold.
5. Measure and record the results in the test report.

2.4.5. Test Results of 20dB Bandwidth

Frequency (KHz)	20dB Bandwidth (Hz)
125	550

2.4.6. Test Results (plots) of Bandwidth





3. List of measuring equipment

Description	Manufacturer	Model	Serial No.	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESIB26	A0304218	06/02/2017	06/01/2018	Radiation
Full-Anechoic Chamber	Albatross	12.8m*6.8m* 6.4m	A0412372	11/12/2017	11/11/2018	Radiation
Loop Antenna	Schwarz beck	HFH2-Z2	100047	11/12/2017	11/11/2018	Radiation
Bilog Antenna	Schwarzbeck	VULB 9163	9163-274	06/02/2017	06/01/2018	Radiation
Double ridge horn antenna	R&S	HF906	100150	06/02/2017	06/01/2018	Radiation
Ultra-wideband antenna	R&S	HL562	100089	06/02/2017	06/01/2018	Radiation
Amplifier 20M~3GHz	R&S	PAP-0203H	22018	06/02/2017	06/01/2018	Radiation
Spectrum Analyzer	R&S	FSP40	1164.4391.40	11/12/2017	11/11/2018	Conducted
LISN	ROHDE&SC HWARZ	ESH2-Z5	A0304221	06/02/2017	06/01/2018	Conducted
Test Receiver	R&S	ESCS30	A0304260	06/02/2017	06/01/2018	Conducted
Cable	SUNHNER	SUCOFLEX 100	/	06/02/2017	06/01/2018	Radiation
Cable	SUNHNER	SUCOFLEX 104	/	06/02/2017	06/01/2018	Radiation

** END OF REPORT **