

FCC

RF

TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
Smart Doorsensor

ISSUED TO
Excenon Mobile Technology Co., Ltd.

5th Floor, Building 1, Software Park, Kejizhong 2nd Rd. High-Tech
Zone. Nanshan Shenzhen, Guangdong, China



Tested by:

Cao Shaodong
(Engineer)

Date:

Apr. 16, 2016

Approved by:

Wei Yanquan
(Chief Engineer)

Date:

Apr. 26, 2016

Report No.: BL-SZ1630174-601

EUT Type: Smart Doorsensor

Model Name: FS211, FS216

Brand Name: Mr.j

Test Standard: 47 CFR Part 15 Subpart C

FCC ID: 2AHZY-FS211

Test conclusion: Pass

Test Date: Apr. 3, 2016~ Apr. 13, 2016

Date of Issue: Apr. 26, 2016

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Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
<u>Rev. 01</u>	<u>Apr. 26, 2016</u>	<u>Initial Issue</u>
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1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	<p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1.</p> <p>The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625.</p> <p>The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.</p>
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20 to 25°C
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

- (1) The test report reference to the report template version v2.1.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without

prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Excenon Mobile Technology Co., Ltd.
Address	5th Floor, Building 1, Software Park, Kejizhong 2nd Rd. High-Tech Zone. Nanshan Shenzhen, Guangdong, China

2.2 Manufacturer Information

Manufacturer	Excenon Mobile Technology Co., Ltd.
Address	5th Floor, Building 1, Software Park, Kejizhong 2nd Rd. High-Tech Zone. Nanshan Shenzhen, Guangdong, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Type	Smart Doorsensor
Under Test Model Name	FS211
Series Model Name	FS211, FS216
Description of Model name differentiation	The equipment model FS211 and FS216 are the Smart Doorsensor model, the electrical parameters and internal structure of circuit are same, only the model name is different.
Hardware Version	FS211-PCBA-V1.0 (FS211) , FS216-PCBA-V1.0 (FS216)
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A
Network and Wireless connectivity	433.75 MHz

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	CR2477
	Serial No.	N/A
	Capacitance	950 mAh
	Rated Voltage	3.0 V
	Extreme Voltage	3.3 V

2.6 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

TX Operating Range	433.75 MHz
Modulation Type	FSK
Antenna Type	Dipole Antenna
Antenna Gain	2.15 dBi

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-14 Edition)	Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	Note 1	Pass
2	Conducted Emission	15.207	N/A	Note 2
3	20 dB Bandwidth	15.231(c)	ANNEX A.1	Pass
4	Duty Cycle	15.35	ANNEX A.2	Pass
5	Field Strength of Fundamental Emissions	15.231(b)	ANNEX A.3	Pass
6	Radiated Emissions	15.209 15.231(b)	ANNEX A.4	Pass
7	Transmitting Time	15.231(a)	ANNEX A.5	Pass

Note 1: Please refer to section 5.1

Note 2: The EUT is only powered by battery, So the conducted emission test was not applicable.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

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

Relative Humidity	45% - 55%	
Atmospheric Pressure	100 kPa -102 kPa	
Temperature	NT (Normal Temperature)	+22°C to +25°C
Working Voltage of the EUT	NV (Normal Voltage)	3 V

4.2 Test Equipment List

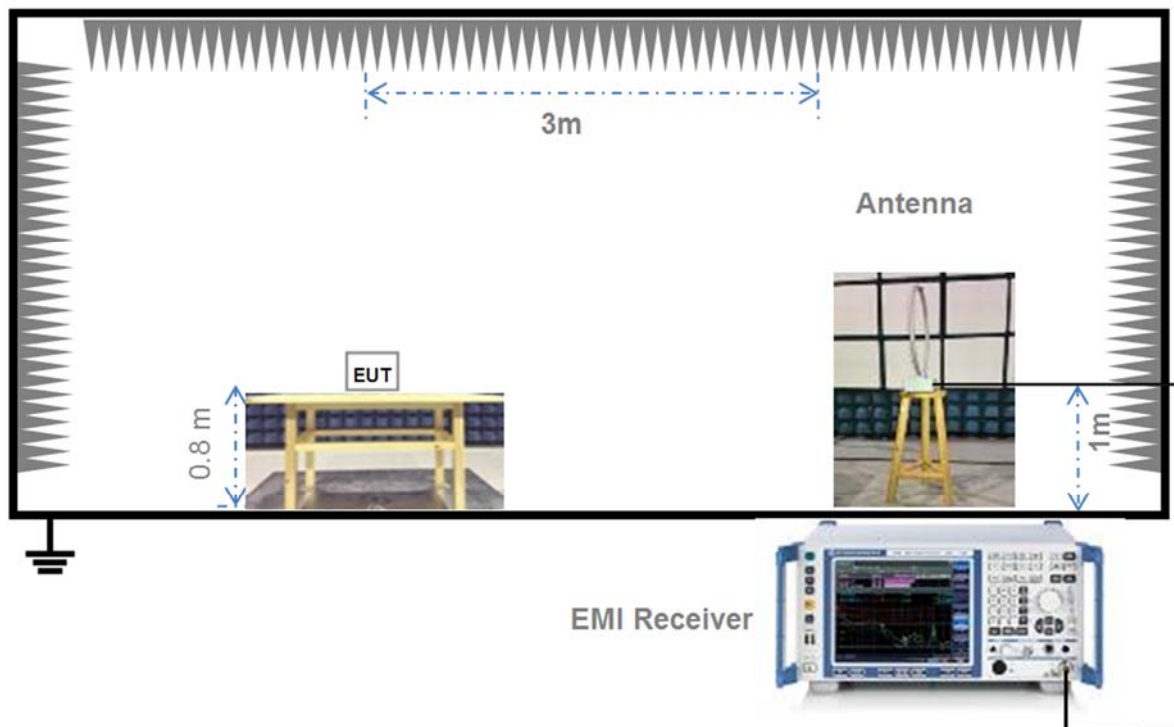
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2015.07.16	2016.07.15
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	177746	2015.07.16	2016.07.15
Signal Generator	ROHDE&SCHWARZ	SMB100A	260592	2015.07.16	2016.07.15
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2015.07.16	2016.07.15
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2015.10.15	2016.10.14
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2015.07.14	2016.07.13
LISN	SCHWARZBECK	NSLK 8127	8127-687	2015.07.14	2016.07.13
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2015.07.16	2016.07.15
Power Splitter	KMW	DCPD-LDC	1305003215	2015.07.01	2016.06.30
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2015.07.21	2016.07.20
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	18141664	2015.07.17	2016.07.16
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2015.11.20	2016.11.19
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2015.07.22	2017.07.21
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2015.07.22	2017.07.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21
Test Antenna-Horn(15-26.5 GHz)	SCHWARZBECK	BBHA 9170	9170-305	2015.07.22	2017.07.21
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2015.02.28	2017.02.27
Shielded Enclosure	ChangNing	CN-130701	130703	--	--

4.3 Test Configurations

Test Configurations (TC) NO.	Description	
	Signal Description	Operating Frequency
Transmitter		
TC01	ASK	433.75 MHz

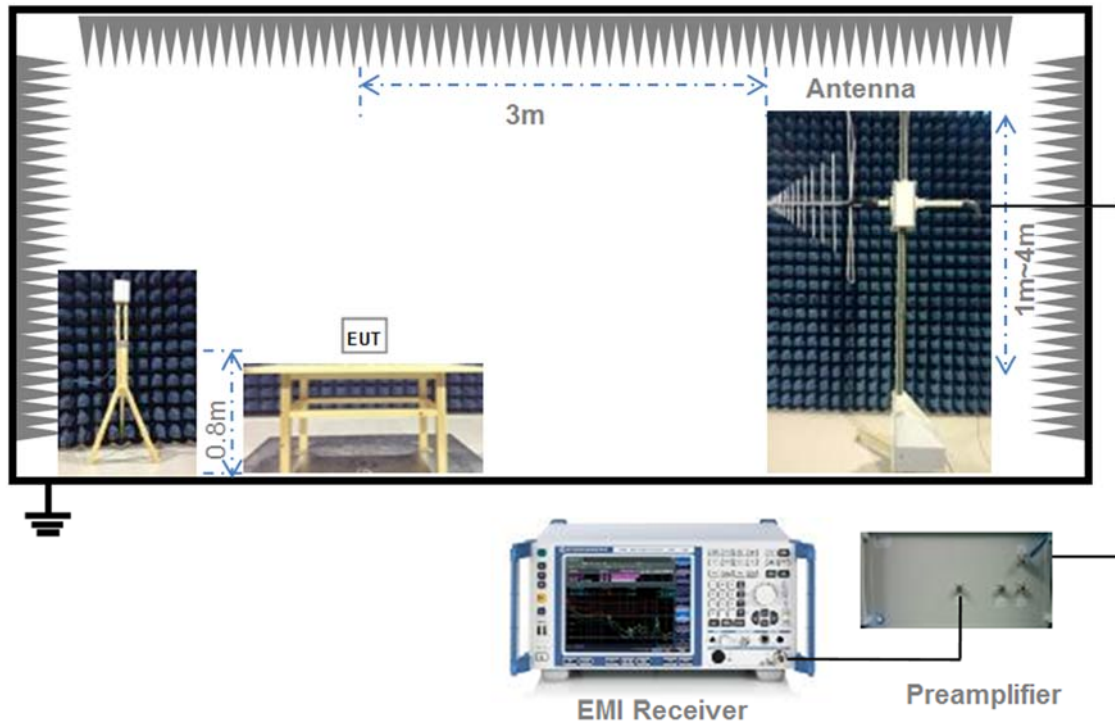
4.4 Description of Test Setup

4.4.1 For Radiated Test (Below 30 MHz)



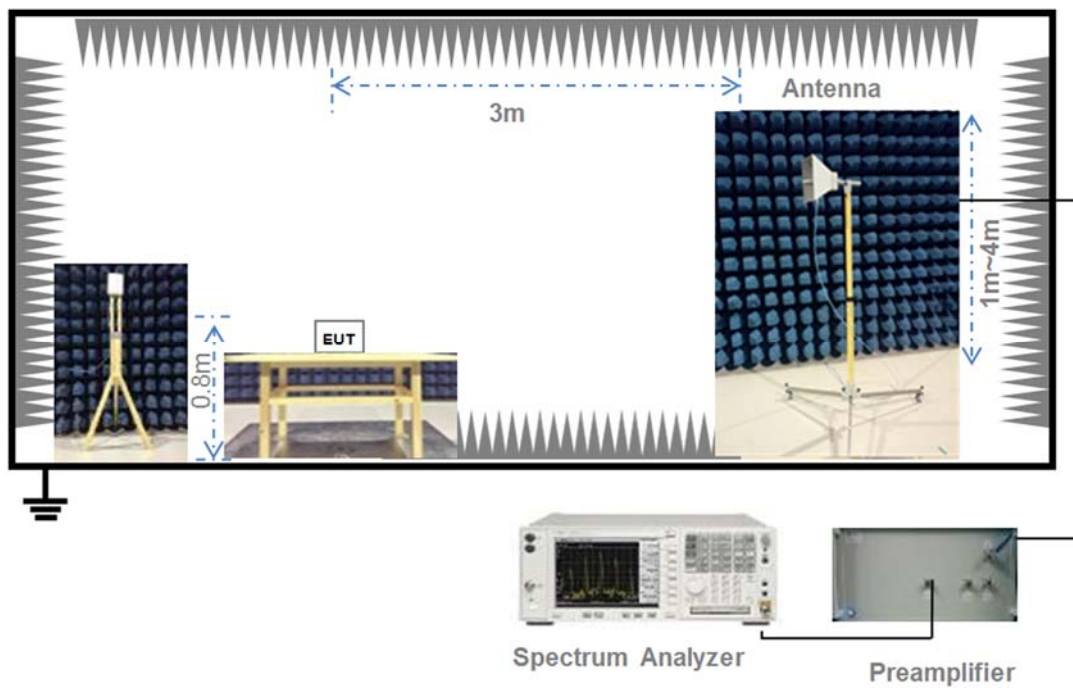
(Diagram 1)

4.4.2 For Radiated Test (30 MHz-1 GHz)



(Diagram 2)

4.4.3 For Radiated Test (Above 1 GHz)



(Diagram 3)

4.5 Test Conditions

Test Case	Test Conditions		
	Test Env.	Test Setup ^{Note 1}	Test Configuration ^{Note 2}
20 dB Bandwidth	NTNV	Test Setup 2	TC01
Duty Cycle	NTNV	Test Setup 2	TC01
Field Strength of Fundamental Emissions	NTNV	Test Setup 2	TC01
Radiated Emissions	NTNV	Test Setup 1 Test Setup 2 Test Setup 3	TC01
Transmitting Time	NTNV	Test Setup 2	TC01
Note: 1. Please refer to section 4.4 for test setup details. 2. Please refer to section 4.3 for test configuration details.			

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Standard Applicable

FCC §15.203 & 15.247(b)

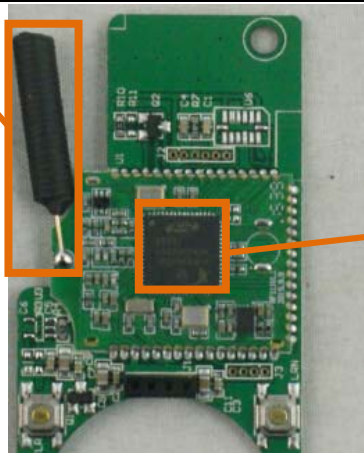
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is An embedded-in	The antenna is welded on the mainboard, can't be replaced by the consumer

Reference Documents	Item
Photo	

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 20 dB Bandwidth

5.2.1 Limit

FCC §15.231

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.2.2 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth

RBW = 10 kHz

VBW \geq 30 kHz

Sweep = auto

Detector function = peak

Trace = max hold

5.2.3 Test Result

Please refer to ANNEX A.1.

5.3 Field Strength of Fundamental Emissions and Radiated Emissions

5.3.1 Limit

FCC §15.231 & §15.209

According to FCC section 15.231(b), In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750	125 to 375
174-260	3750	375
260-470	3750 to 12500	375 to 1250
Above 470	12500	1250

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)
0.009 - 0.490	2400/F(kHz)
0.490 - 1.705	24000/F(kHz)
1.705 - 30.0	30
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Note:

- For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.3.2 Test Procedure

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented. The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.3.3 Test Result

Please refer to ANNEX A.3

5.4 Transmitting Time

5.4.1 Limit

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.4.2 Test Procedure

The EUT transmitter was activated, the spectrum analyzer single sweep was triggered while a command on the EUT was activated and plots were captured

5.4.3 Test Result

Please refer to ANNEX A.5.

ANNEX A TEST RESULT

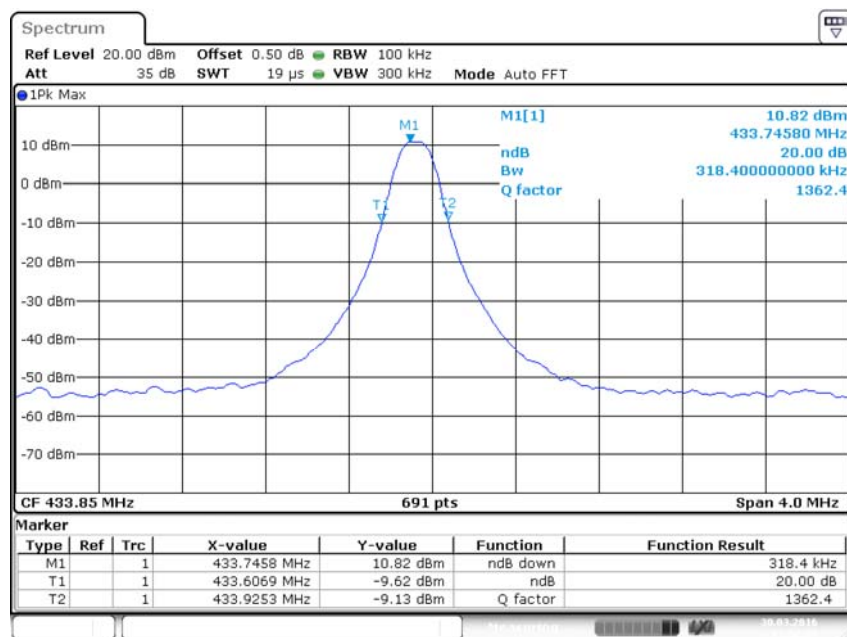
A.1 20 dB Bandwidth

Test Data

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Verdict
433.75	318.4	$372210 \times 0.25\% = 930.525$	Pass

Test plots

20 dB Bandwidth

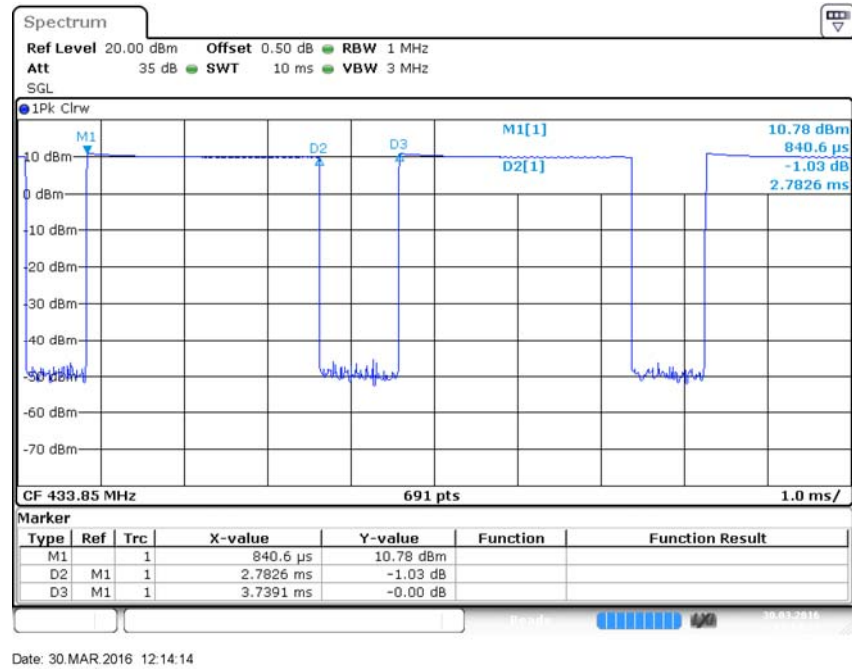


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A.2 Duty cycle

Test Data and Plot

Duty cycle



$$\text{Ton} + \text{Toff} = 3.7391 \text{ ms}$$

$$\text{Ton} = 2.7826 \text{ ms}$$

$$\text{Duty cycle} = \text{Ton} / (\text{Ton} + \text{Toff}) = 0.744$$

$$\text{Duty cycle correction factor: } 20 \cdot \log(\text{duty cycle}) = -2.57 \text{ dB}$$

A.3 Field Strength of Fundamental Emissions

Test Data

Field Strength of Fundamental Emissions and Field strength of spurious emissions Value						
Frequency (MHz)	Field Strength (dBuV/m)	Detector	Limit @3m (dBuV/m)	Margin (dB)	Antenna	Verdict
433.75	71.96	PEAK	100.8	28.84	Vertical	Pass
	86.50	PEAK	100.8	14.30	Horizontal	Pass
	50.36	AVERAGE	80.8	30.44	Vertical	Pass
	63.27	AVERAGE	80.8	17.53	Horizontal	Pass

A.4 Radiated Emissions

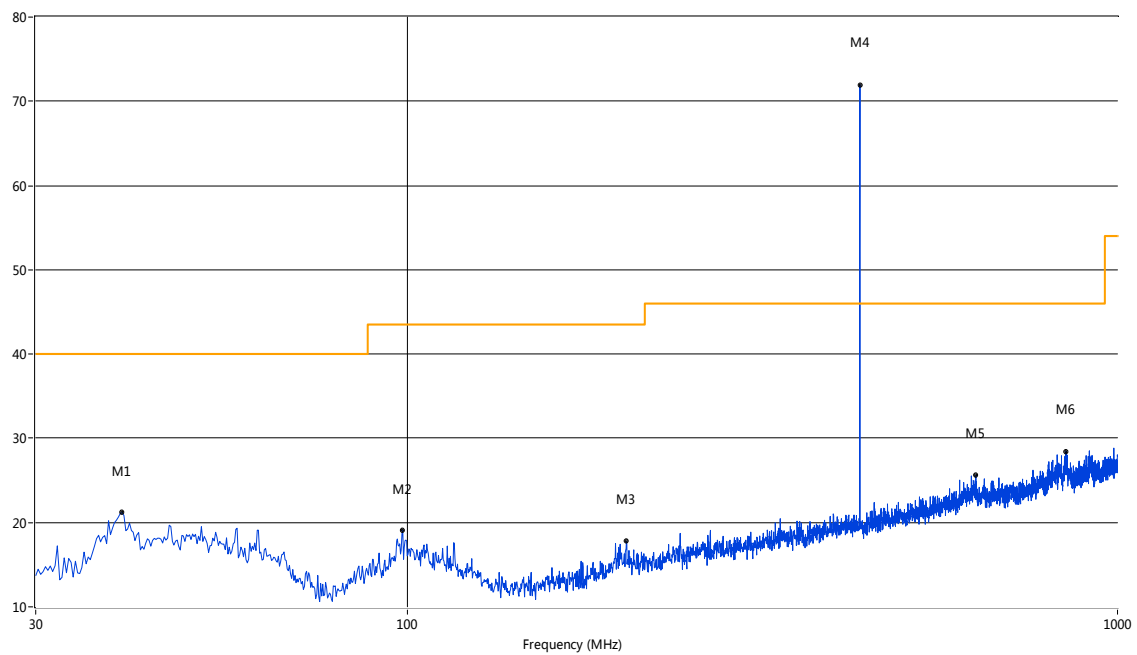
Note 1: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Note 2: The verdict please refer to the A.3 field strength of fundamental emissions and field strength of spurious emissions value.

Test Data and Plots (30 MHz ~ 10th Harmonic)

30 MHz to 1 GHz, ANT H

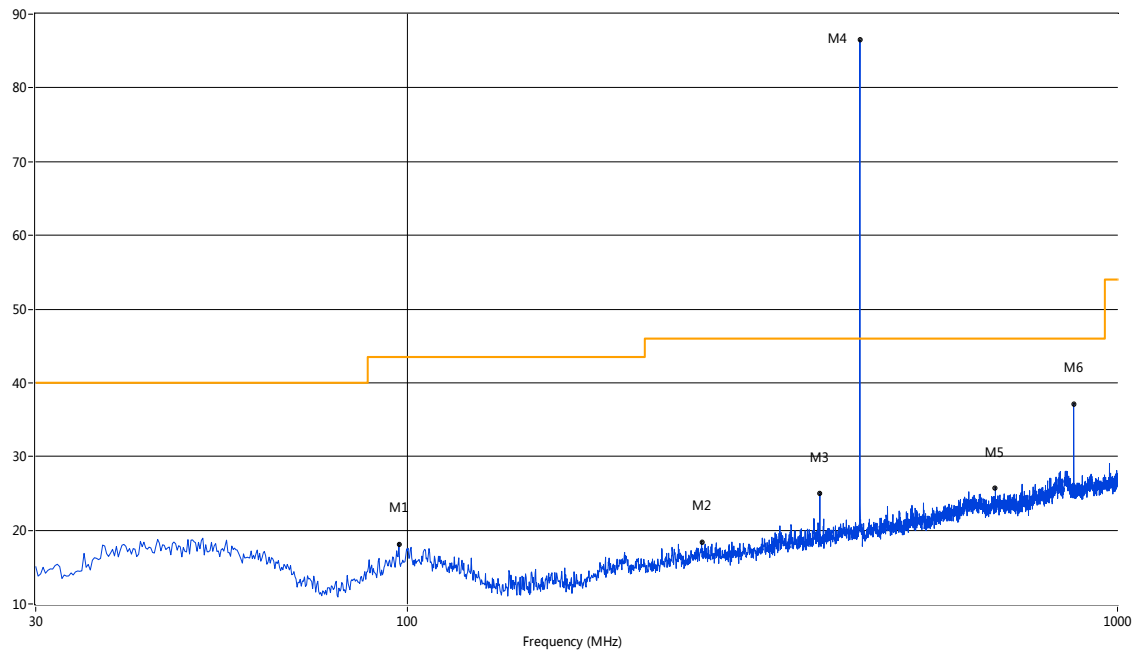
RE Test case_FCC_Part 15C_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	39.70	21.20	-21.09	40.0	18.80	Peak	360.00	100	Vertical	Pass
2	98.61	19.06	-22.20	43.5	24.44	Peak	207.90	100	Vertical	Pass
3	203.59	17.79	-22.51	43.5	25.71	Peak	187.90	100	Vertical	Pass
4	433.90	71.96	-18.23	46.0	-25.96	Peak	71.00	100	Vertical	N/A Note 2
4**	433.90	50.36	-18.23	46.0	-4.36	AV	71.00	100	Vertical	N/A Note 2
5	631.98	25.59	-14.44	46.0	20.41	Peak	0.70	100	Vertical	Pass
6	846.29	28.48	-10.66	46.0	17.52	Peak	217.70	100	Vertical	Pass

30 MHz to 1 GHz, ANT H

RE Test case_FCC_Part 15C_FCC 15C 30MHz-1GHz



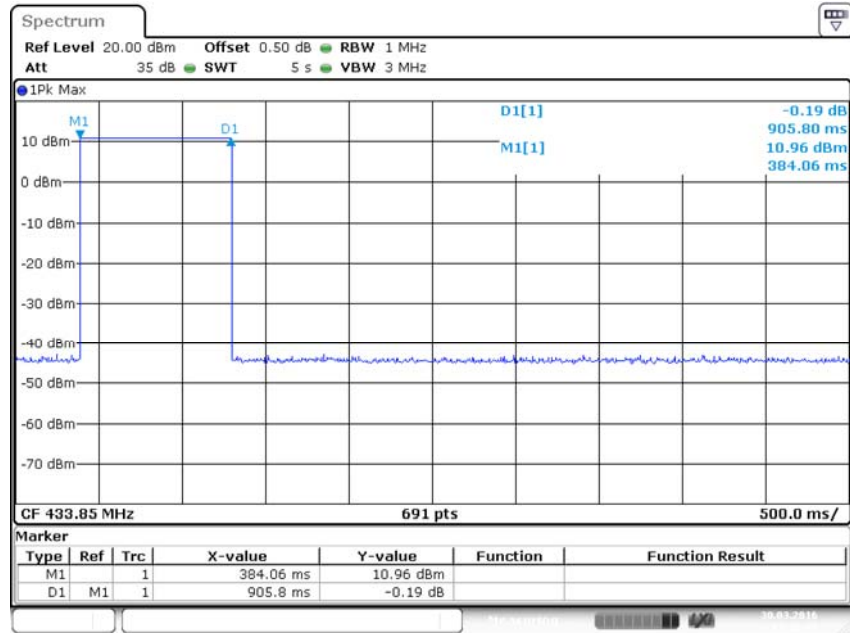
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	97.40	18.14	-22.39	43.5	25.36	Peak	240.30	100	Horizontal	Pass
2	259.83	18.37	-21.39	46.0	27.63	Peak	200.00	100	Horizontal	Pass
3	381.30	24.96	-18.97	46.0	21.04	Peak	123.50	100	Horizontal	Pass
4	433.90	86.50	-18.23	46.0	-40.50	Peak	146.90	100	Horizontal	N/A Note 2
4**	433.90	63.27	-18.23	46.0	-17.27	Peak	146.90	100	Horizontal	N/A Note 2
5	673.19	25.78	-13.87	46.0	20.22	Peak	307.00	100	Horizontal	Pass
6	867.87	37.16	-11.20	46.0	8.84	Peak	153.30	100	Horizontal	Pass

A.5 Transmitter Time

Test Data and Plot

The active time is less than 5 seconds

Active time



Date: 30.MAR.2016 12:18:49

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ1630174-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL- SZ1630174-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL- SZ1630174-AI.PDF”.

--END OF REPORT--