FCC TEST REPORT

For

TownSteel Inc.

TS Smart Deadbolt

Test Model: e-Smart 5000-RF

Additional Model No.: e-Smart 8000-RF

Prepared for	:	TownSteel Inc.
Address	:	17901 Railroad Street, City of Industry, CA 91748, United States
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
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Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	October 31, 2018
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	October 31, 2018~ March 20, 2019
Date of Report	:	March 20, 2019

FCC TEST REPORT
FCC CFR 47 PART 15 C(15.249)

Report Reference No.	**:**	**LCS181025038AEB**
Date of Issue	:	March 20, 2019
Testing Laboratory Name.....	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
**Applicant's Name ..... **	**:**	**TownSteel Inc.**
Address	:	17901 Railroad Street, City of Industry, CA 91748, United States
Test Specification		
Standard	:	FCC CFR 47 PART 15 C(15.249) / ANSI C63.10: 2013
**Test Report Form No. ..... **	**:**	LCSEMC-1.0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2019-03

**EUT Description. ..... **	**:**	**TS Smart Deadbolt**
Trade Mark	:	N/A
Test Model.....	:	e-Smart 5000-RF
Ratings	:	DC 6V by 4*AA Battery
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Lh Li	Calvin Weng	Gavin Liang
Lh Li/ Administrators	Calvin Weng/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCS181025038AEB**	March 20, 2019 Date of issue

Test Model.....	: e-Smart 5000-RF
EUT.....	: TS Smart Deadbolt
Applicant.....	**: TownSteel Inc.**
Address.....	: 17901 Railroad Street, City of Industry, CA 91748, United States
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: TownSteel Inc.**
Address.....	: 17901 Railroad Street, City of Industry, CA 91748, United States
Telephone.....	: /
Fax.....	: /
Factory.....	**: TownSteel Inc.**
Address.....	: 17901 Railroad Street, City of Industry, CA 91748, United States
Telephone.....	: /
Fax.....	: /

Test Result	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	March 20, 2019	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	: TS Smart Deadbolt
Test Model	: e-Smart 5000-RF
Model Number	: e-Smart 5000-RF, e-Smart 8000-RF
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Hardware Version	: TSB HW V2.0
Software Version	: TSB FW V2.0
Power Supply	: DC 6V by 4*AA Battery
RFID Technology	
Operating Frequency	: 13.56MHz
Channel Number	: 1
Modulation Technology	: ASK
Antenna Description	: Internal Antenna, -2.0dBi (Max.)
915 MHz Transmitter	
Frequency Range	: 915 MHz
Modulation Type	: ASK
Antenne Description	: Internal antenna, 3.37dBi (Max.)

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
--	--	--	--	--

1.3. External I/O Cable

I/O Port Description	Quantity	Cable
--	--	--

1.4. Description of Test Facility

FCC Registration Number. is 254912.
Industry Canada Registration Number. is 9642A-1.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001.
NVLAP Registration Code is 600167-0.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX mode.

***Note: Using a temporary antenna connector for the EUT when conducted measurements are performed.

Channel List and Frequency			
Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	915	--	--

Mode of Operations	Transmitting Frequency (MHz)
ASK	915
For Conducted Emission	
Test Mode	TX Mode
For Radiated Emission	
Test Mode	TX Mode

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.249 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, expiatory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition by software (YL_800T.exe) provided by application.

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document.

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C		
FCC Rules	**Description of Test**	**Result**
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Radiated Emissions Measurement	Compliant
§15.205, §15.249(d)	Emissions at Restricted Band	Compliant
§15.215	99% and 20dB Bandwidth	Compliant
§15.207(a)	AC Line Conducted Emissions	N/A*
§15.203	Antenna Requirements	Compliant

Remark:
1. Note 1 – Test results inside test report;
2. Note 2 – N/A: Not Applicable!*

5. TEST RESULT

5.1. Radiated Emission Measurement

5.1.1. Standard Applicable

1). According to §15.249 (d): Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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
88~216	150	3
216~960	200	3
Above 960	500	3

2). According to §15.249 (a): Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	millivolts/meter	dBuV/m	microvolts/meter	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth

5.1.2. Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/Average
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/Average
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.1.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

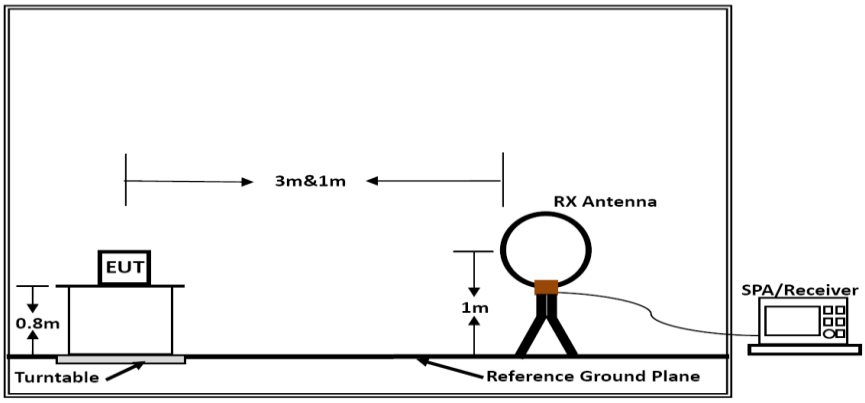
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

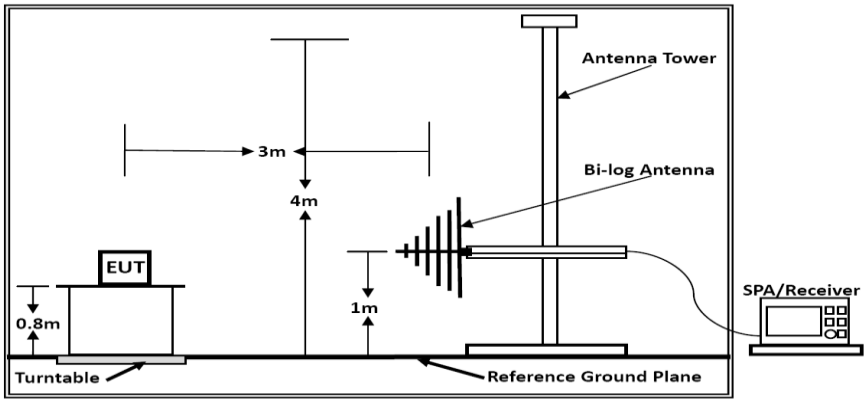
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

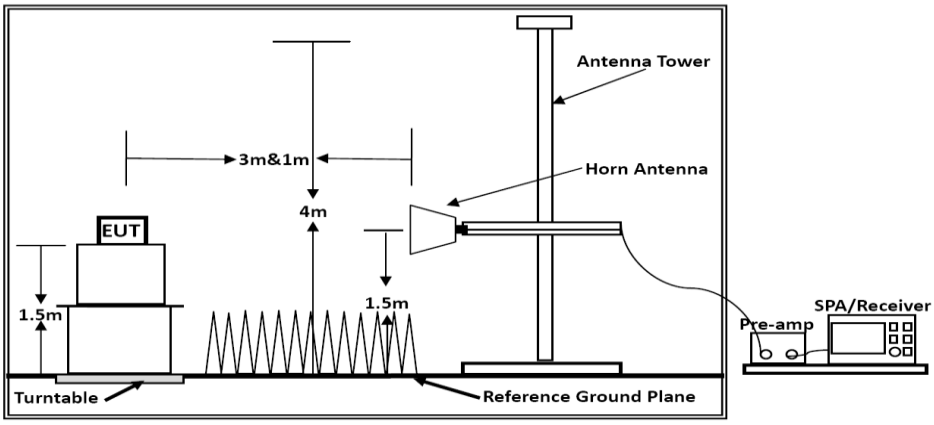
5.1.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.6. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	24.0℃	Humidity	56%
Test Engineer	AKING JIN	Configurations	TX

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dB)	Remark
-	-	-	-	See Note

Note:

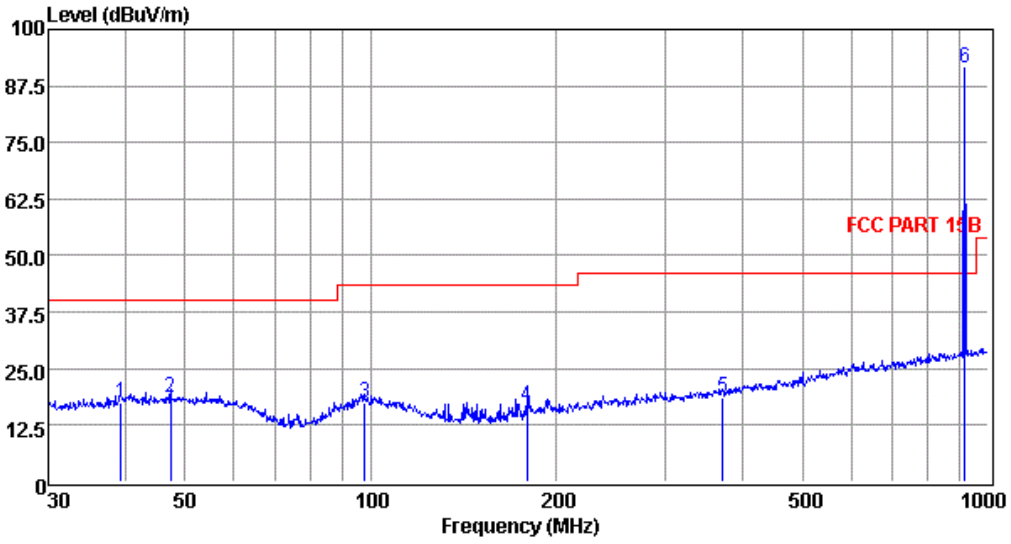
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.1.7. Results of Radiated Emissions (30MHz~1GHz)

Temperature	24.0℃	Humidity	56%
Test Engineer	AKING JIN	Configurations	TX

Horizontal

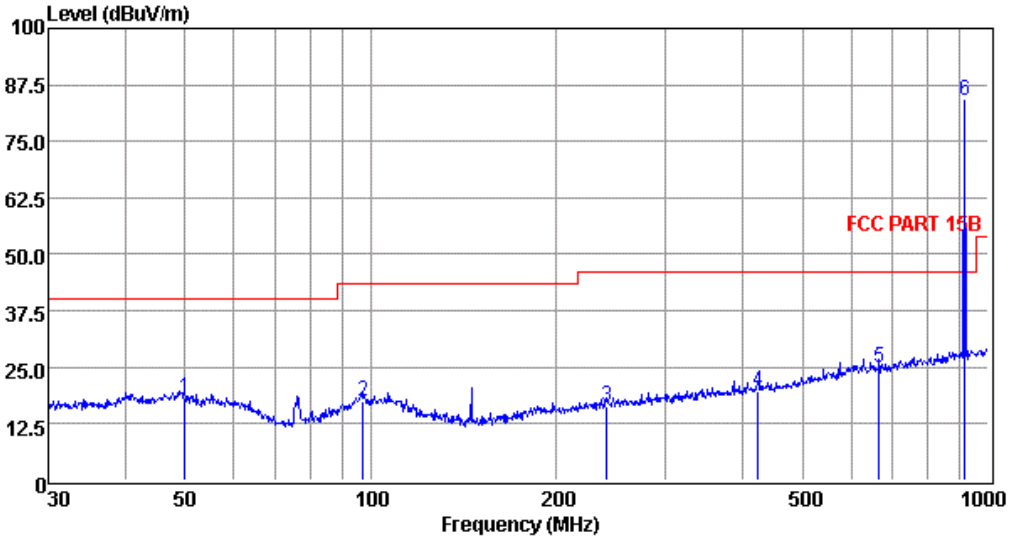


pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	39.30	3.79	0.38	13.40	17.57	40.00	-22.43	QP
2	47.33	4.75	0.35	13.41	18.51	40.00	-21.49	QP
3	97.80	3.86	0.61	13.02	17.49	43.50	-26.01	QP
4	178.76	6.32	0.89	9.59	16.80	43.50	-26.70	QP
5	372.00	2.70	1.20	14.53	18.43	46.00	-27.57	QP
6	916.07	68.08	2.04	21.19	91.31	46.00	45.31	Peak

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Vertical



pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	49.88	4.29	0.54	13.26	18.09	40.00	-21.91	QP
2	97.11	3.91	0.61	12.98	17.50	43.50	-26.00	QP
3	240.83	3.16	1.01	12.09	16.26	46.00	-29.74	QP
4	423.54	3.18	1.16	15.49	19.83	46.00	-26.17	QP
5	665.80	4.60	1.55	18.69	24.84	46.00	-21.16	QP
6	916.07	60.64	2.04	21.19	83.87	46.00	37.87	Peak

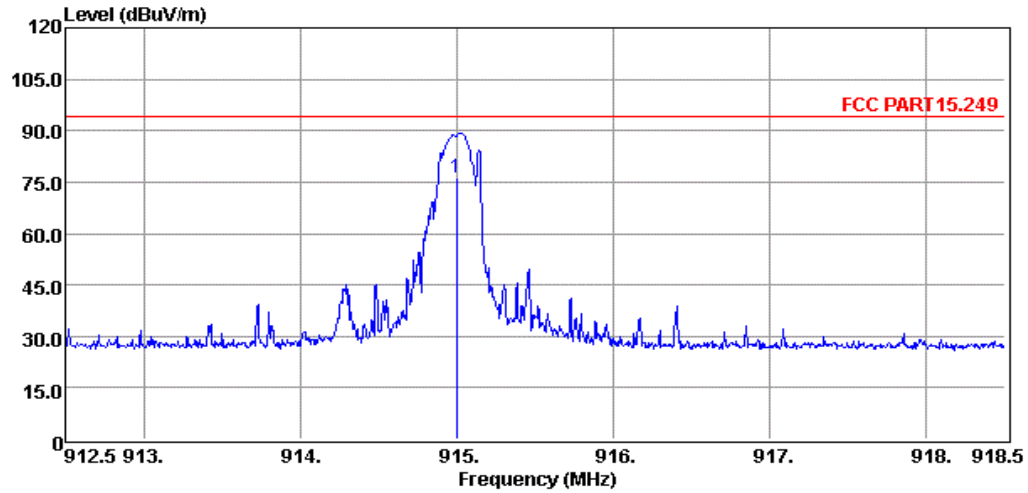
Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Note:
1). Pre-scan all modes and recorded the worst case results in this report (TX).
2). Emission level (dBuV/m) = 20 log Emission level (uV/m).
3). Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.
4.). For the fundamental emission limit at 915MHz, please refer to following page.

5.1.8. Results of the Fundamental Frequency (915MHz)

Temperature	24.0℃	Humidity	56%
Test Engineer	AKING JIN	Configurations	TX Mode

Horizontal

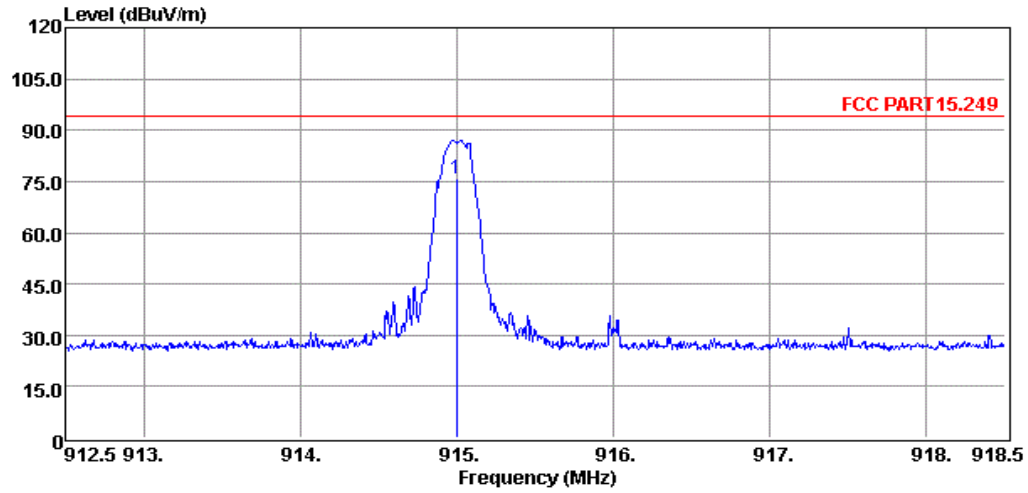


pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	915.00	53.00	2.04	21.19	76.23	94.00	-17.77	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Vertical



pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	915.00	52.50	2.04	21.19	75.73	94.00	-18.27	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

5.1.9. Results of Radiated Emissions (Above 1GHz)

Temperature	24.0℃	Humidity	56%
Test Engineer	AKING JIN	Configurations	TX

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
TX-Mode									
1830.022	51.45	33.06	35.04	2.10	51.57	74.00	-22.43	Peak	Horizontal
1830.022	44.70	33.06	35.04	2.10	44.82	54.00	-9.18	Average	Horizontal
1830.022	52.30	33.06	35.04	2.10	52.42	74.00	-21.58	Peak	Vertical
1830.022	47.32	33.06	35.04	2.10	47.44	54.00	-6.56	Average	Vertical
2745.033	56.47	33.11	35.09	2.68	57.17	74.00	-16.83	Peak	Horizontal
2745.033	42.11	33.11	35.09	2.68	42.81	54.00	-11.19	Average	Horizontal
2745.033	60.70	33.11	35.09	2.68	61.40	74.00	-12.60	Peak	Vertical
2745.033	44.24	33.11	35.09	2.68	44.94	54.00	-9.06	Average	Vertical
3660.044	57.60	33.03	35.07	3.10	58.66	74.00	-15.34	Peak	Horizontal
3660.044	42.46	33.03	35.07	3.10	43.52	54.00	-10.48	Average	Horizontal
3660.044	60.45	33.03	35.07	3.10	61.51	74.00	-12.49	Peak	Vertical
3660.044	43.77	33.03	35.07	3.10	44.83	54.00	-9.17	Average	Vertical
9150.110	52.20	33.26	35.14	3.94	54.26	74.00	-19.74	Peak	Horizontal
9150.110	44.75	33.26	35.14	3.94	46.81	54.00	-7.19	Average	Horizontal
9150.110	56.43	33.26	35.14	3.94	58.49	74.00	-15.51	Peak	Vertical
9150.110	47.42	33.26	35.14	3.94	49.48	54.00	-4.52	Average	Vertical

Notes:

1). Measuring frequencies from 9 KHz~10th harmonic (ex. 10GHz), No emission found between lowest internal used/generated frequency to 30MHz.

2). Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 10GHz) were made with an instrument using Peak detector mode.

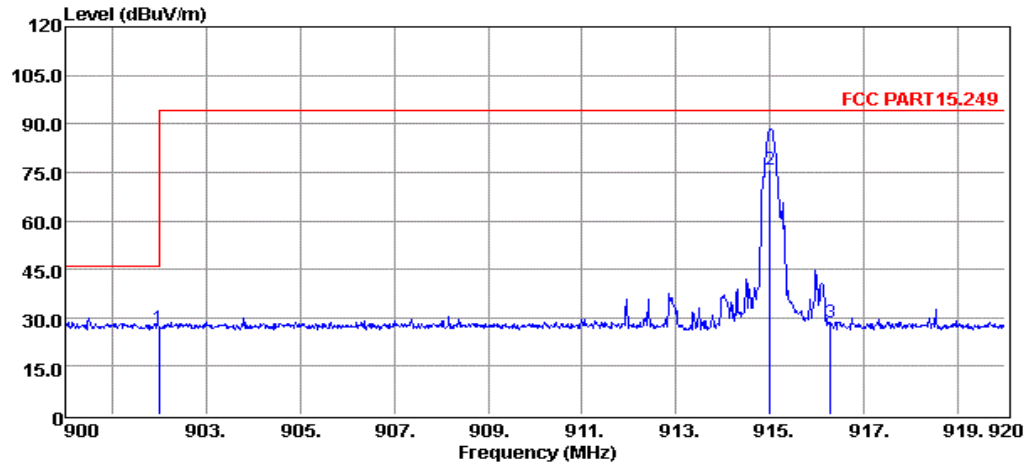
3). No emission was be recorded above 18GHz means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5.1.10. Results for Restricted Band Edge Testing

Temperature	24.0℃	Humidity	56%
Test Engineer	AKING JIN	Configurations	TX

Test Frequency Range: 900MHz-916MHz

Horizontal

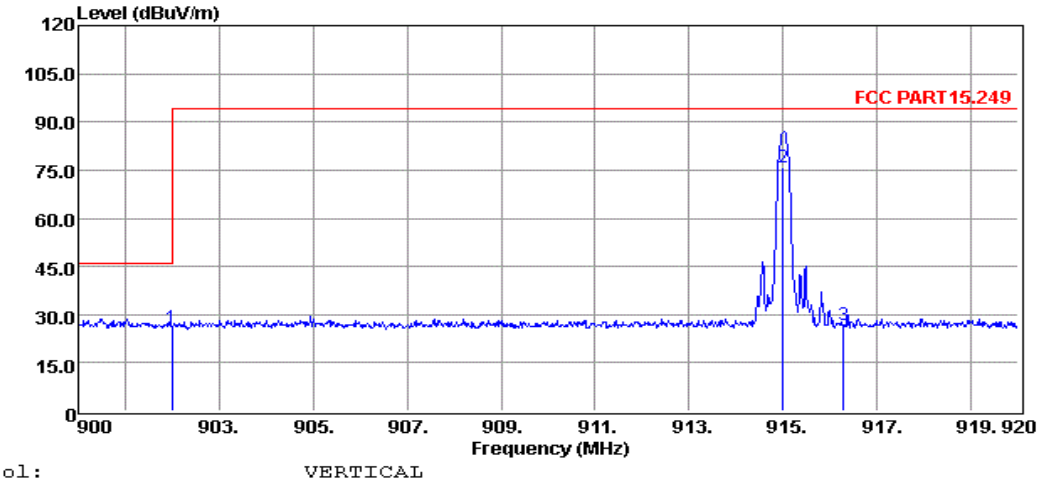


pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	902.00	4.01	1.87	21.10	26.98	46.00	-19.02	QP
2	915.00	52.66	2.04	21.19	75.89	94.00	-18.11	QP
3	916.29	5.14	2.04	21.20	28.38	94.00	-65.62	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Vertical



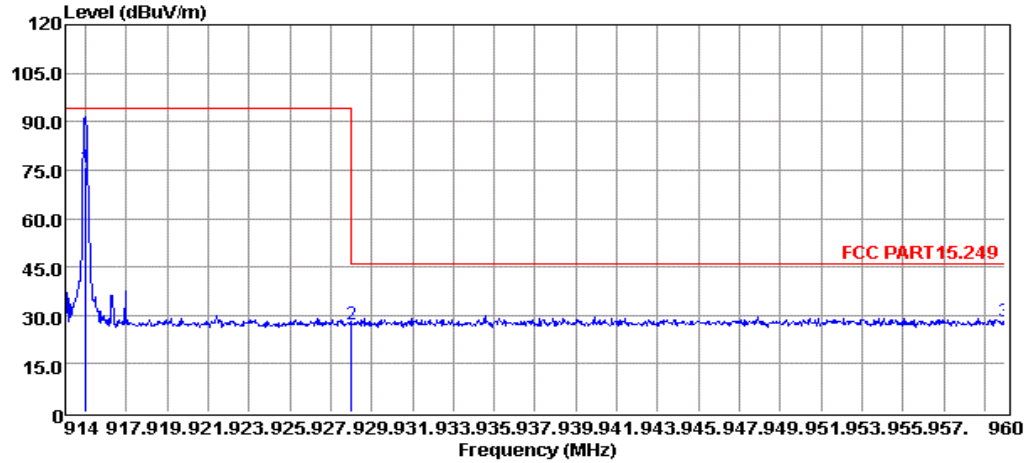
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	902.00	3.11	1.87	21.10	26.08	46.00	-19.92	QP
2	915.00	52.65	2.04	21.19	75.88	94.00	-18.12	QP
3	916.29	3.46	2.04	21.20	26.70	94.00	-67.30	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Test Frequency Range: 914MHz-960MHz

Horizontal

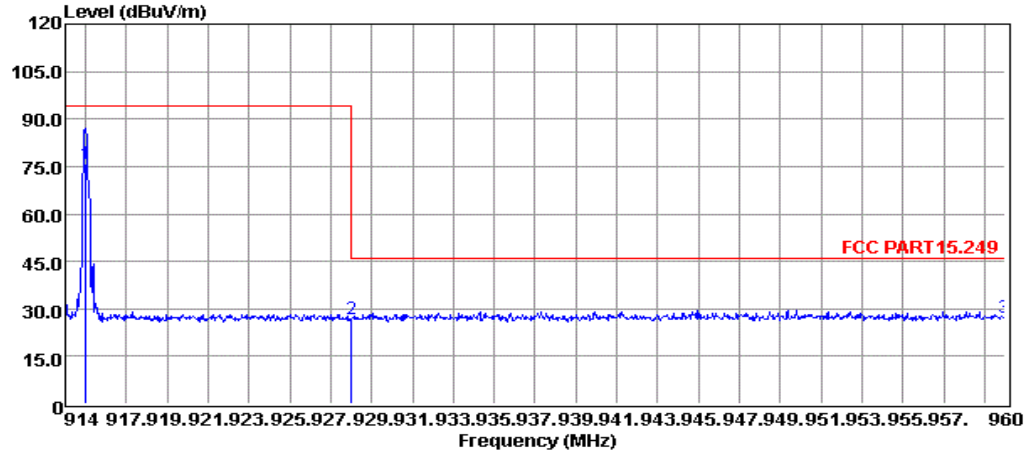


pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	915.00	52.56	2.04	21.19	75.79	94.00	-18.21	QP
2	928.02	3.99	1.90	21.27	27.16	46.00	-18.84	QP
3	960.00	4.71	1.90	21.48	28.09	46.00	-17.91	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Vertical



pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	915.00	52.60	2.04	21.19	75.83	94.00	-18.17	QP
2	928.02	3.51	1.90	21.27	26.68	46.00	-19.32	QP
3	960.00	3.82	1.90	21.48	27.20	46.00	-18.80	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

5.2. 99% and 20dB Bandwidth Measurement

5.2.1. Limit

No Limit.

5.2.2. Test Procedures

a. Place the EUT on the table and set it in transmitting mode.

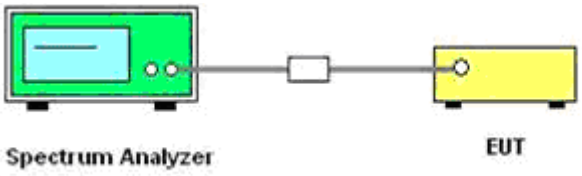
b. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

c. Set to the maximum power setting and enable the EUT transmit continuously.

d. For 99% and 20dB bandwidth measurement, use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW/VBW=10 KHz/ 30KHz; Sweep = auto; Detector function = peak; Trace = max hold.

5.2.3. Test Setup Layout



5.2.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.5. Test Result of 99% and 20 dB Bandwidth Measurement

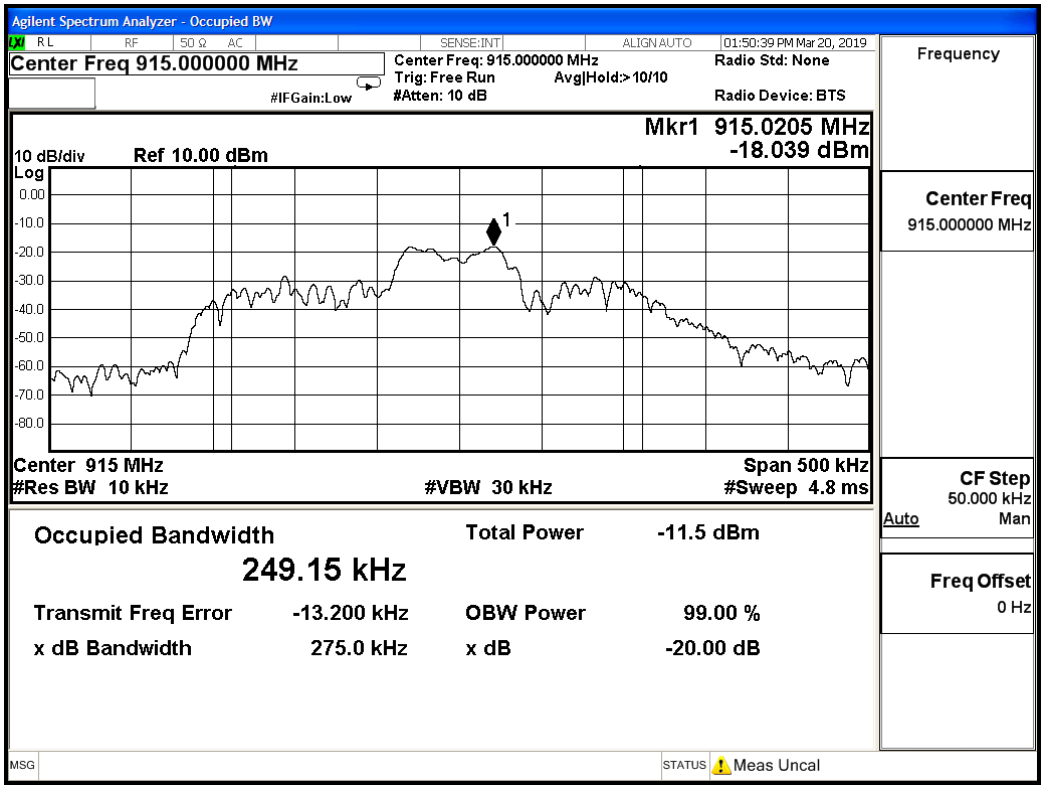
Temperature	22.6℃	Humidity	53.5%
Test Engineer	AKING JIN	Configurations	TX

Test Mode	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)	Limits	Verdict
TX	915	249.15	275.00	Non-specified	PASS

Remark:

1. *Test results including cable loss;*
2. *Please refer to following plots;*

ASK


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
01:50:39 PM Mar 20, 2019
Center Freq 915.000000 MHz
Center Freq: 915.000000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Frequency
Mkr1 915.0205 MHz
-18.039 dBm
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center Freq
915.000000 MHz
Center 915 MHz
#Res BW 10 kHz
#VBW 30 kHz
Span 500 kHz
#Sweep 4.8 ms
CF Step
50.000 kHz
Auto
Man
Occupied Bandwidth
249.15 kHz
Total Power -11.5 dBm
Transmit Freq Error -13.200 kHz
OBW Power 99.00 %
x dB Bandwidth 275.0 kHz
x dB -20.00 dB
Freq Offset
0 Hz
MSG
STATUS
Meas Uncal

915 MHz

5.3. AC Power Line Conducted Emissions (Not Applicable)

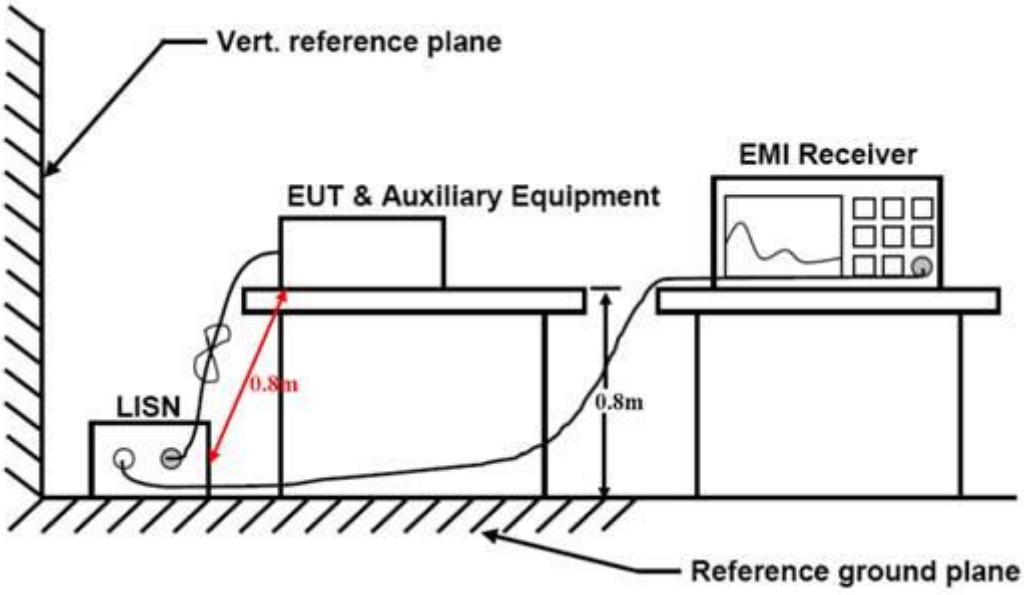
5.3.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	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

* Decreasing linearly with the logarithm of the frequency

5.3.2 Block Diagram of Test Setup



5.3.3 Test Results

Not Applicable!!

The device was powered by AA battery!

5.4. Antenna Requirements

5.4.1 Standard Applicable

According to antenna requirement of §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. The manufacturer may design the unit so that a broken antenna can be re-placed 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 Sections 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 Section 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.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

5.4.2 Antenna Connected Construction

5.4.2.1. Standard Applicable

According to § 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.

5.4.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 3.37dBi (Max.), and the antenna is an Internal Antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.4.2.3. Results: Compliance.

6. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Meter	R&S	NRVS	100444	2018-06-16	2019-06-15
2	Power Sensor	R&S	NRV-Z81	100458	2018-06-16	2019-06-15
3	Power Sensor	R&S	NRV-Z32	10057	2018-06-16	2019-06-15
4	ESA-E SERIES SPECTRUM ANALYZER	Agilent	E4407B	MY41440754	2018-06-16	2019-06-15
5	MXA Signal Analyzer	Agilent	N9020A	MY49100699	2018-06-16	2019-06-15
6	SPECTRUM ANALYZER	R&S	FSP	100503	2018-06-16	2019-06-15
7	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2018-06-16	2019-06-15
8	Positioning Controller	MF	MF-7082	/	2018-06-16	2019-06-15
9	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
10	EMI Test Receiver	R&S	ESR 7	101181	2018-06-16	2019-06-15
11	AMPLIFIER	QuieTek	QTK-A2525G	CHM10809065	2018-06-16	2019-06-15
12	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2018-06-22	2019-06-21
13	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-05-01	2019-04-30
14	Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1925	2018-07-02	2019-07-01
15	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2018-06-16	2019-06-15
16	Broadband Preamplifier	SCHWARZBECK	BBV 9719	9719-025	2018-06-16	2019-06-15
17	RF Cable-R03m	Jye Bao	RG142	CB021	2018-06-16	2019-06-15
18	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2018-06-16	2019-06-15
19	TEST RECEIVER	R&S	ESCI	101142	2018-06-16	2019-06-15
20	RF Cable-CON	UTIFLEX	3102-26886-4	CB049	2018-06-16	2019-06-15
21	10dB Attenuator	SCHWARZBECK	MTS-IMP136	261115-001-0032	2018-06-16	2019-06-15
22	Artificial Mains	R&S	ENV216	101288	2018-06-16	2019-06-15
23	RF Control Unit	JS Tonscend Corporation	JS0806-2	178060073	2018-06-16	2019-06-15
24	JS1120-3 BT/WIFI Test Software	JS Tonscend Corporation	JS1120-3	/	N/A	N/A
Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO.,LTD.						

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------