FCC TEST REPORT

FOR

Shenzhen Heiman Technology Co.,Ltd.

Smart Smoke Sensor

Model No.: HS1SA-Z

Prepared for	:	Shenzhen Heiman Technology Co.,Ltd.
Address	:	Heiman Industrial Park, No. 84 Fuqian Road, Yuexingwei Community, Guanlan, Longhua New District, Shenzhen, China

Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd
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Date of receipt of test sample	:	March 20, 2017
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	March 20, 2017 - April 13, 2017
Date of Report	:	April 13, 2017

FCC TEST REPORT

FCC CFR 47 PART 15 C(15.249)

Report Reference No.	**:**	**LCS1703202522E**
Date of Issue.....	:	April 13, 2017
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	**:**	**Shenzhen Heiman Technology Co.,Ltd.**
Address.....	:	Heiman Industrial Park, No. 84 Fuqian Road, Yuexingwei Community, Guanlan, Longhua New District, Shenzhen, China
Test Specification		
Standard.....	:	FCC CFR 47 PART 15 C(15.249)
Test Report Form No.....	:	LCSEMC-1.0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

Test Item Description.	**:**	**Smart Smoke Sensor**
Trade Mark.....	:	**HEIMAN**
Model/ Type reference.....	:	HS1SA-Z
Ratings.....	:	DC 3V by battery
Result	**:**	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Dick Su/ File administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS1703202522E	April 13, 2017 Date of issue

Type / Model.....	: HS1SA-Z
EUT.....	: Smart Smoke Sensor
Applicant.....	**: Shenzhen Heiman Technology Co.,Ltd.**
Address.....	: Heiman Industrial Park, No. 84 Fuqian Road, Yuexingwei Community, Guanlan, Longhua New District, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Shenzhen Heiman Technology Co.,Ltd.**
Address.....	: Heiman Industrial Park, No. 84 Fuqian Road, Yuexingwei Community, Guanlan, Longhua New District, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Factory.....	**: Shenzhen Heiman Technology Co.,Ltd.**
Address.....	: Heiman Industrial Park, No. 84 Fuqian Road, Yuexingwei Community, Guanlan, Longhua New District, Shenzhen, China
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
00	April 13, 2017	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Smart Smoke Sensor

Test Model : HS1SA-Z

Power Supply : DC 3V by battery

Channel frequency : 908.42MHz, 908.40MHz, 916.00MHz

Channel number : 3

Modulation Technology : FSK/GFSK

Antenna Type and Gain : Internal Antenna, 3.0 dBi(Max.)

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
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1.3. External I/O

I/O Port Description	Quantity	Cable
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1.4. Description of Test Facility

Site Description

EMC Lab. : CNAS Registration Number. is L4595.
FCC Registration Number. is 899208.
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

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	±4.00dB	(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 operates in the unlicensed ISM band at 908.40MHz-916.00MHz. The following operating modes were applied for the related test items. And the new battery is used during the measurement.
The EUT received DC 3V power by battery.
All test modes were tested, only the result of the worst case was recorded in the report.

The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

Mode of Operations	Transmitting Frequency (MHz)
FSK	908.42
	908.40
GFSK	916.00
For Conducted Emission	
Test Mode	N/A
For Radiated Emission	
Test Mode	TX Mode

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

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, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

3. CONNECTION DIAGRAM OF TEST SYSTEM

3.1. Justification

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

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (MP_Kit_HS1SAZ_Tool.) 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

FCC Rules	Description Of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	N/A
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Radiated Emissions Measurement	Compliant
§15.249	Band Edges Measurement	Compliant
§15.249, §15.215	20 dB Bandwidth	Compliant

5. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Sensor	R&S	NRV-Z51	100458	2016-06-18	2017-06-17
2	Power Sensor	R&S	NRV-Z32	10057	2016-06-18	2017-06-17
3	Power Meter	R&S	NRVS	100444	2016-06-18	2017-06-17
4	DC Filter	MPE	23872C	N/A	2016-06-18	2017-06-17
5	RF Cable	Harbour Industries	1452	N/A	2016-06-18	2017-06-17
6	SMA Connector	Harbour Industries	9625	N/A	2016-06-18	2017-06-17
7	Spectrum Analyzer	Agilent	N9020A	MY50510140	2016-10-27	2017-10-26
8	Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	2016-06-16	2017-06-15
9	RF Cable	Hubersuhne	Sucoflex104	FP2RX2	2016-06-18	2017-06-17
10	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2016-06-18	2017-06-17
11	Amplifier	SCHAFFNER	COA9231A	18667	2016-06-18	2017-06-17
12	Amplifier	Agilent	8449B	3008A02120	2016-06-16	2017-06-15
13	Amplifier	MITEQ	AMF-6F-260400	9121372	2016-06-16	2017-06-15
14	Loop Antenna	R&S	HFH2-Z2	860004/001	2016-06-18	2017-06-17
15	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2016-06-10	2017-06-09
16	Horn Antenna	EMCO	3115	6741	2016-06-10	2017-06-09
17	Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	2016-06-10	2017-06-09
18	RF Cable-R03m	Jye Bao	RG142	CB021	2016-06-18	2017-06-17
19	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2016-06-18	2017-06-17
20	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	101142	2016-06-18	2017-06-17
21	Artificial Mains	ROHDE & SCHWARZ	ENV216	101288	2016-06-18	2017-06-17
22	EMI Test Software	AUDIX	E3	N/A	2016-06-18	2017-06-17
23	Spectrum Analyzer	Agilent	E4407B	MY41440292	2016-06-16	2017-06-15

6. ANTENNA REQUIREMENT

6.1. Standard Applicable

According to §15.203, Antenna requirement.

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.

6.2. Antenna Connected Construction

6.2.1. 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.

6.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 3.0dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

6.2.3. Results: Compliance.

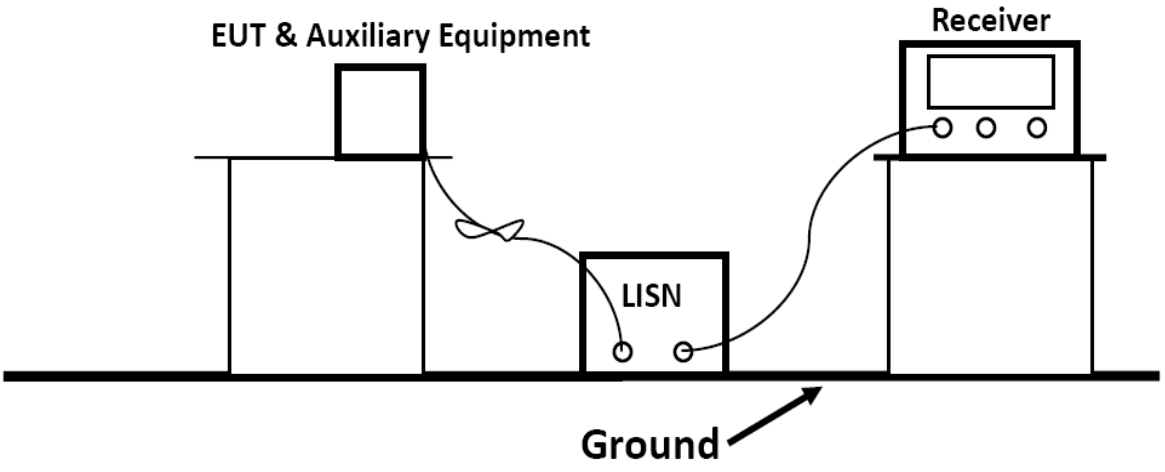
7. LINE CONDUCTED EMISSIONS

7.1 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 microvolt (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

7.2 Block Diagram of Test Setup



7.3 Test Results

N/A.

8. RADIATED EMISSION MEASUREMENT

8.1. Standard Applicable

1. 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.
2. 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) and 15.249 limit in the table below has to be followed.

Fundamental Frequency	Field Strength of fundamental (millivolts/meter)	Field Strength of harmonics (microvolts/meter)
902-928MHz	50	500
2400-2483.5MHz	50	500
5725-5875MHz	50	500
24.0-24.25GHz	250	2500

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

8.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

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

8.3. Test Procedure

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 1.5 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:

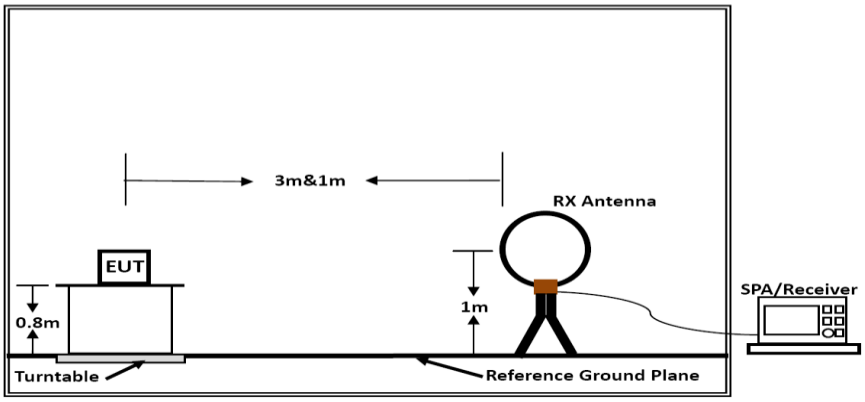
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

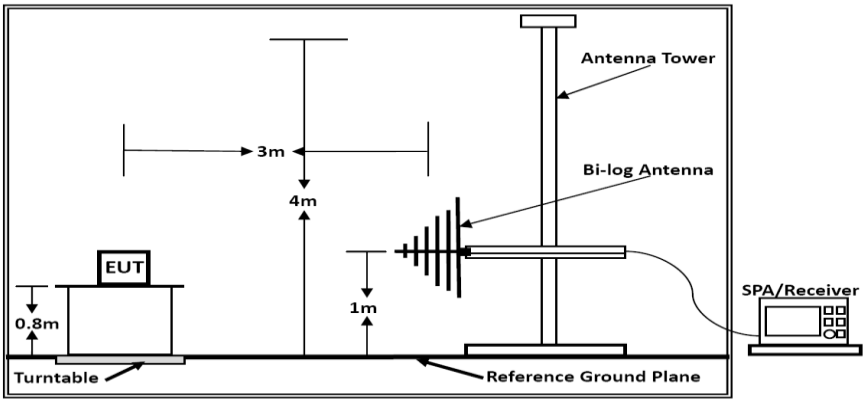
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- 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.

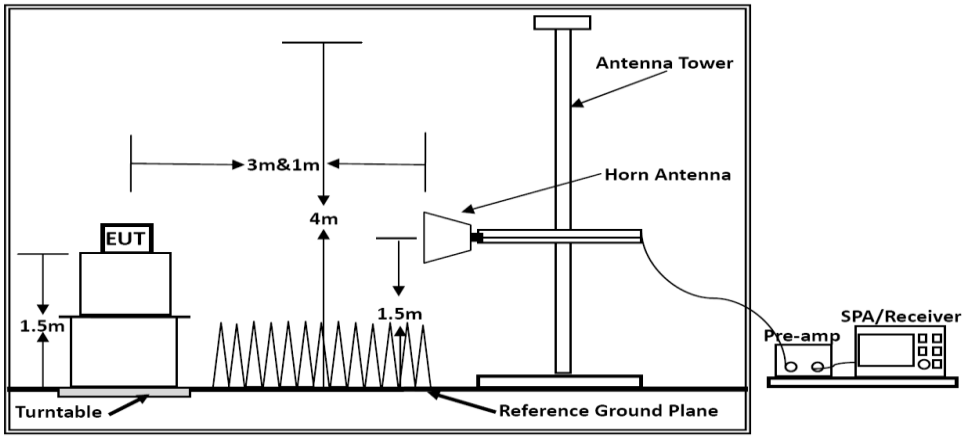
8.4. Block Diagram of Test Setup



Below 30MHz



Below 1GHz



Above 1GHz

Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

8.5. Test Results

Results of Radiated Emissions (9kHz~30MHz)

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
				See Note

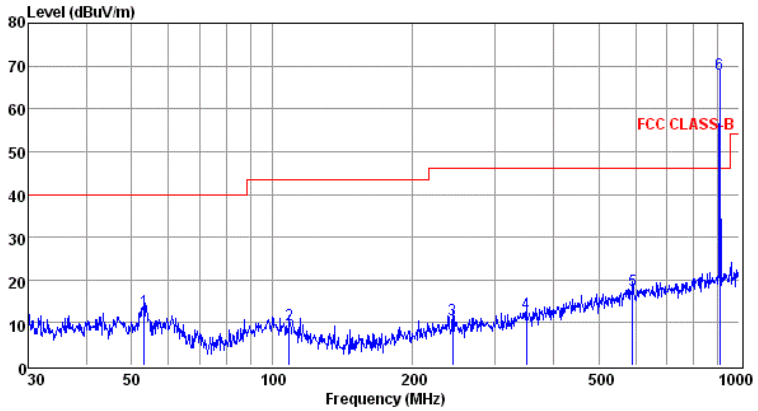
Note:

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.

Results of Radiated Emissions (30MHz~1000MHz)

Test Mode (908.42MHz)



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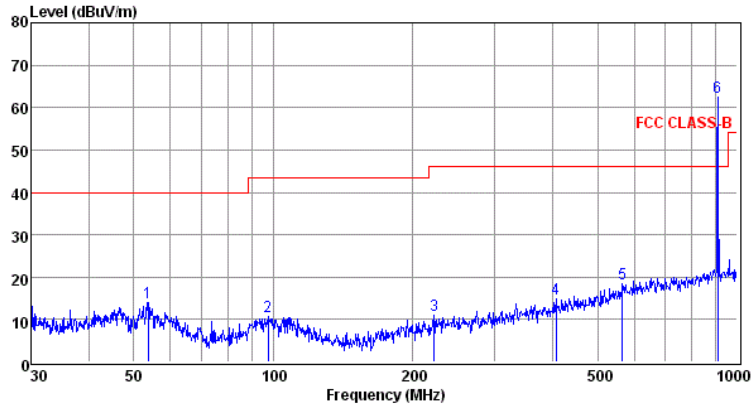
	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	53.13	-0.83	0.46	13.11	12.74	40.00	-27.26	QP
2	108.65	-3.58	0.68	12.37	9.47	43.50	-34.03	QP
3	243.38	-2.23	0.90	12.08	10.75	46.00	-35.25	QP
4	350.48	-3.37	1.15	14.28	12.06	46.00	-33.94	QP
5	590.97	-2.33	1.54	18.28	17.49	46.00	-28.51	QP
6	908.42	44.98	1.88	21.14	68.00	46.00	22.00	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



Env./Ins: 24℃/56%
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	53.69	0.53	0.46	13.08	14.07	40.00	-25.93	QP
2	97.46	-2.87	0.61	13.00	10.74	43.50	-32.76	QP
3	222.17	-1.26	0.95	11.30	10.99	46.00	-35.01	QP
4	407.51	-1.65	1.17	15.21	14.73	46.00	-31.27	QP
5	566.62	-0.97	1.48	17.83	18.34	46.00	-27.66	QP
6	909.67	39.46	1.88	21.15	62.49	46.00	16.49	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

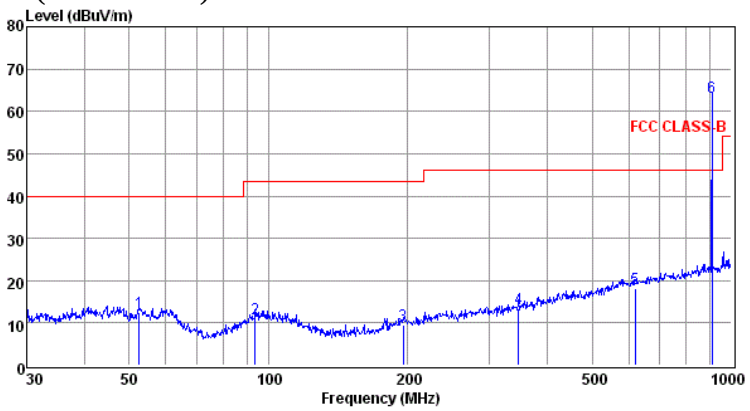
Field strength of fundamental:

Frequency (MHz)	Pol.	Measure Result (QP, dBuV/m)	Limit (dBuV/m)	Result
908.42	H	68.00	94	Pass
908.42	V	62.49	94	Pass

The worst test result for Tx:

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
1816.84	49.94	33.01	35.00	3.86	51.81	74	-22.19	Peak	Horizontal
1816.84	36.65	33.01	35.00	3.86	38.52	54	-15.48	Average	Horizontal
2725.26	52.68	33.03	35.02	3.91	54.60	74	-19.40	Peak	Horizontal
2725.26	37.68	33.03	35.02	3.91	39.60	54	-14.40	Average	Horizontal
1816.84	50.86	33.01	35.00	3.86	52.73	74	-21.27	Peak	Vertical
1816.84	40.27	33.01	35.00	3.86	42.14	54	-11.86	Average	Vertical
2725.26	56.27	33.03	35.02	3.91	58.19	74	-15.81	Peak	Vertical
2725.26	39.09	33.03	35.02	3.91	41.01	54	-12.99	Average	Vertical

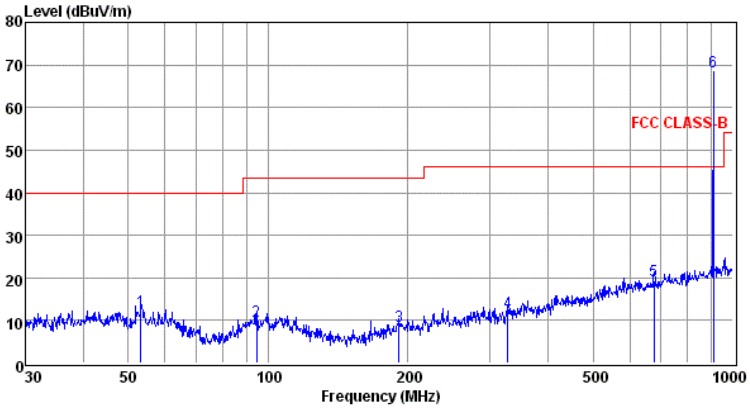
Test Mode (908.40MHz)



Env./Ins: 24℃/56%
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	52.58	-1.24	0.46	13.13	12.35	40.00	-27.65	QP
2	93.44	-1.99	0.56	12.55	11.12	43.50	-32.38	QP
3	195.14	-2.11	0.96	10.57	9.42	43.50	-34.08	QP
4	346.81	-2.02	1.13	14.23	13.34	46.00	-32.66	QP
5	620.71	-1.90	1.62	18.52	18.24	46.00	-27.76	QP
6	908.40	40.30	1.88	21.14	63.32	46.00	17.32	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



Env./Ins: 24℃/56%
pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	53.13	-1.26	0.46	13.11	12.31	40.00	-27.69	QP
2	94.43	-3.62	0.58	12.73	9.69	43.50	-33.81	QP
3	191.07	-2.88	0.86	10.56	8.54	43.50	-34.96	QP
4	327.89	-2.89	1.04	13.64	11.79	46.00	-34.21	QP
5	677.58	-1.06	1.73	18.73	19.40	46.00	-26.60	QP
6	908.40	45.42	1.88	21.14	68.44	46.00	22.44	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

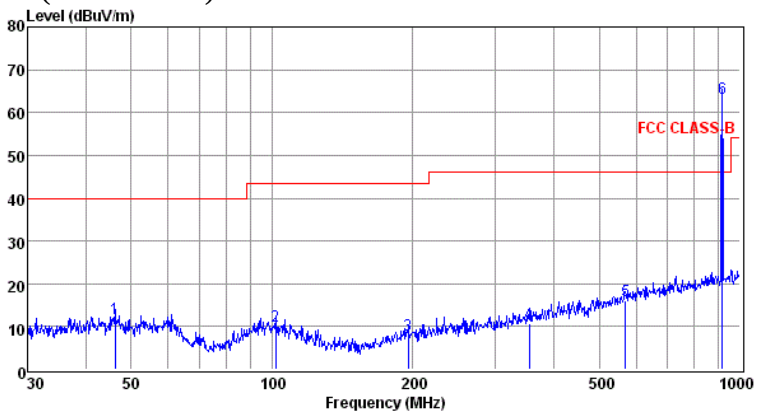
Field strength of fundamental:

Frequency (MHz)	Pol.	Measure Result (QP, dBuV/m)	Limit (dBuV/m)	Result
908.40	H	68.44	94	Pass
908.40	V	63.32	94	Pass

The worst test result for Tx:

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
1816.80	51.30	33.01	35.00	3.86	53.17	74	-20.83	Peak	Horizontal
1816.80	36.75	33.01	35.00	3.86	38.62	54	-15.38	Average	Horizontal
2725.20	51.03	33.03	35.02	3.91	52.95	74	-21.05	Peak	Horizontal
2725.20	39.10	33.03	35.02	3.91	41.02	54	-12.98	Average	Horizontal
1816.80	52.74	33.01	35.00	3.86	54.61	74	-19.39	Peak	Vertical
1816.80	40.40	33.01	35.00	3.86	42.27	54	-11.73	Average	Vertical
2725.20	56.10	33.03	35.02	3.91	58.02	74	-15.98	Peak	Vertical
2725.20	39.99	33.03	35.02	3.91	41.91	54	-12.09	Average	Vertical

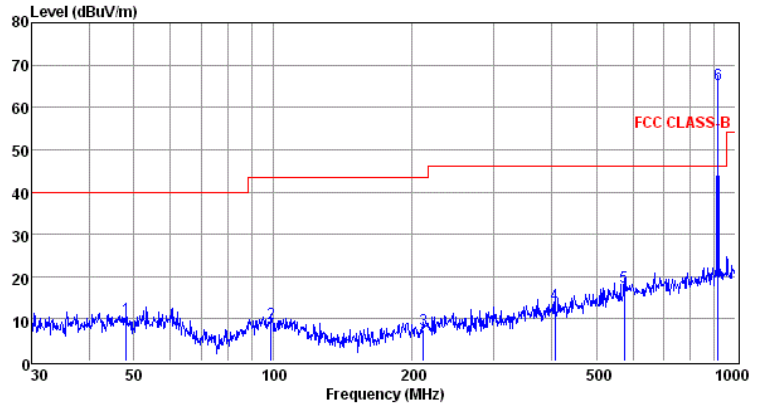
Test Mode (916.00MHz)



Env./Ins: 24℃/56%
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	46.18	-2.03	0.41	13.48	11.86	40.00	-28.14	QP
2	101.64	-3.62	0.60	13.01	9.99	43.50	-33.51	QP
3	195.14	-3.42	0.96	10.57	8.11	43.50	-35.39	QP
4	354.18	-4.70	1.15	14.34	10.79	46.00	-35.21	QP
5	568.61	-3.15	1.48	17.86	16.19	46.00	-29.81	QP
6	916.00	40.05	2.04	21.19	63.28	46.00	17.28	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



Env./Ins: 24℃/56%
pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	48.16	-3.49	0.35	13.36	10.22	40.00	-29.78	QP
2	98.83	-4.77	0.61	13.09	8.93	43.50	-34.57	QP
3	211.53	-4.52	0.93	10.93	7.34	43.50	-36.16	QP
4	407.51	-3.09	1.17	15.21	13.29	46.00	-32.71	QP
5	574.63	-1.93	1.49	17.98	17.54	46.00	-28.46	QP
6	916.00	42.32	2.04	21.19	65.55	46.00	19.55	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

Field strength of fundamental:

Frequency (MHz)	Pol.	Measure Result (QP, dBuV/m)	Limit (dBuV/m)	Result
916.00	H	65.55	94	Pass
916.00	V	63.28	94	Pass

The worst test result for Tx:

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
1832.00	49.71	33.01	35.00	3.86	51.58	74	-22.42	Peak	Horizontal
1832.00	36.78	33.01	35.00	3.86	38.65	54	-15.35	Average	Horizontal
2748.00	52.12	33.03	35.02	3.91	54.04	74	-19.96	Peak	Horizontal
2748.00	39.01	33.03	35.02	3.91	40.93	54	-13.07	Average	Horizontal
1832.00	52.37	33.01	35.00	3.86	54.24	74	-19.76	Peak	Vertical
1832.00	39.59	33.01	35.00	3.86	41.46	54	-12.54	Average	Vertical
2748.00	55.57	33.03	35.02	3.91	57.49	74	-16.51	Peak	Vertical
2748.00	39.91	33.03	35.02	3.91	41.83	54	-12.17	Average	Vertical

Notes:

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

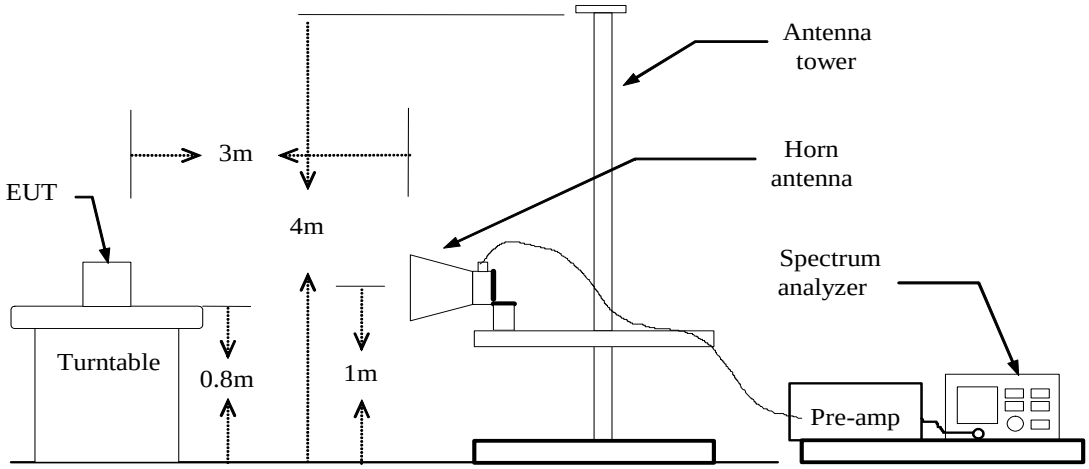
2. Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 10GHz) were made with an instrument using Peak detector mode.

9. BANDEDGES MEASUREMENT

9.1. Standard Applicable

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 Section 15.209, whichever is the lesser attenuation.

9.2. Block Diagram of Test Setup



9.3. Test Procedure

The EUT is placed on a turntable, which is 0.8m above the ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

Peak: RBW=120KHz, RBW=300KHz / Sweep=AUTO

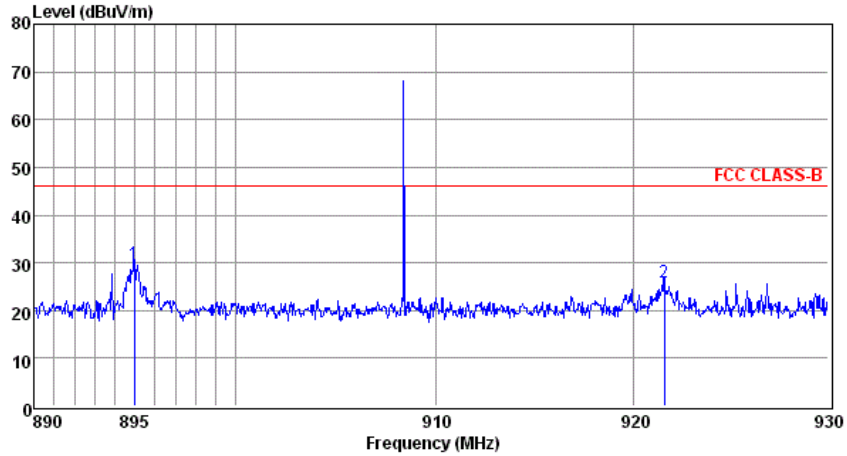
Repeat the procedures until the peak versus polarization are measured.

9.4. Test Results

Test Mode (908.42MHz)

Test Mode	Frequency	Limit	Result
	MHz	dBuV/dBc	
Lowest	894.98	<46dBuV	Pass
Highest	921.62	<46dBuV	Pass

Test Result of Worst Case:



Env./Ins: 24℃/56%
pol: HORIZONTAL

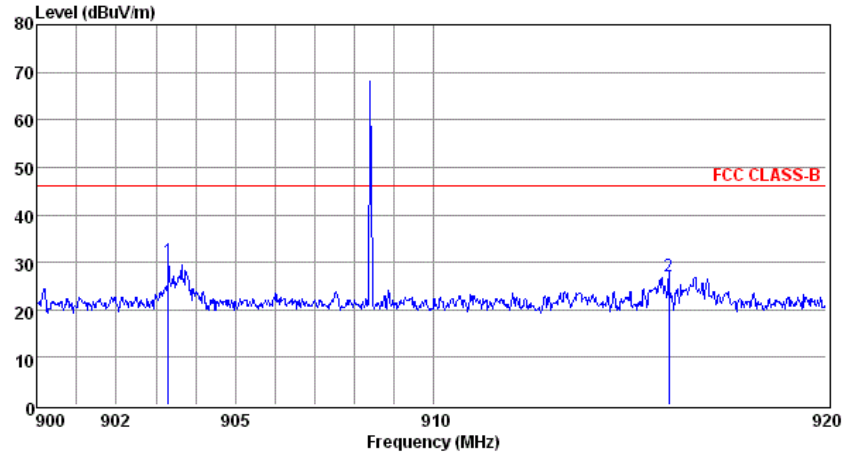
	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	894.98	6.72	1.84	21.04	29.60	46.00	-16.40	QP
2	921.62	2.83	1.90	21.23	25.96	46.00	-20.04	QP

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 Mode (908.40MHz)

Test Mode	Frequency	Limit	Result
	MHz	dBuV/dBc	
Lowest	903.31	<46dBuV	Pass
Highest	915.98	<46dBuV	Pass

Test Result of Worst Case:



Env./Ins: 24℃/56%
pol: HORIZONTAL

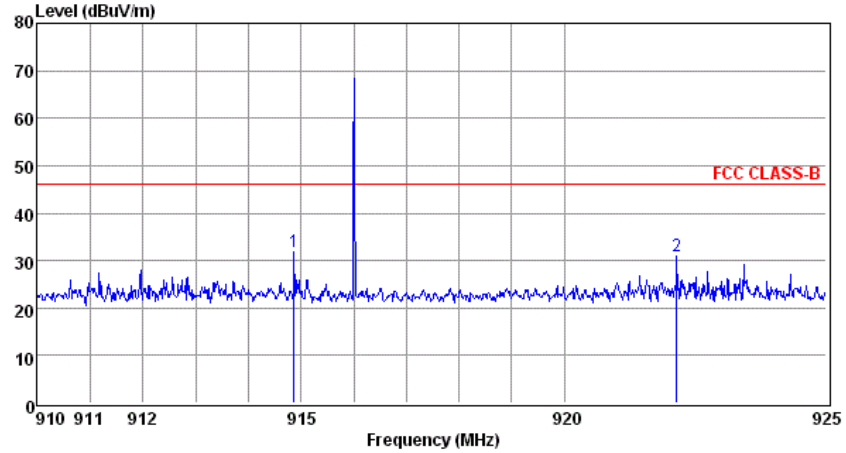
	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	903.31	7.44	1.87	21.11	30.42	46.00	-15.58	QP
2	915.98	3.74	2.04	21.19	26.97	46.00	-19.03	QP

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 Mode (916.00MHz)

Test Mode	Frequency	Limit	Result
	MHz	dBuV/dBc	
Lowest	914.86	<46dBuV	Pass
Highest	922.15	<46dBuV	Pass

Test Result of Worst Case:



Env./Ins: 24℃/56%
pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	914.86	8.69	2.04	21.19	31.92	46.00	-14.08	QP
2	922.15	7.72	1.90	21.23	30.85	46.00	-15.15	QP

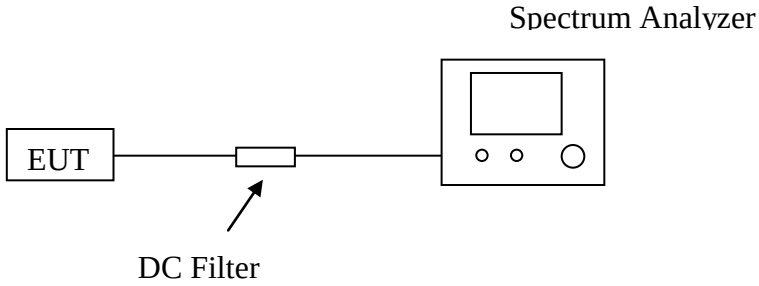
Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

10. 20 DB BANDWIDTH MEASUREMENT

10.1. Standard Applicable

According to §15.215

10.2. Block Diagram of Test Setup



10.3. Test Procedure

Use the following spectrum analyzer settings:

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

RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

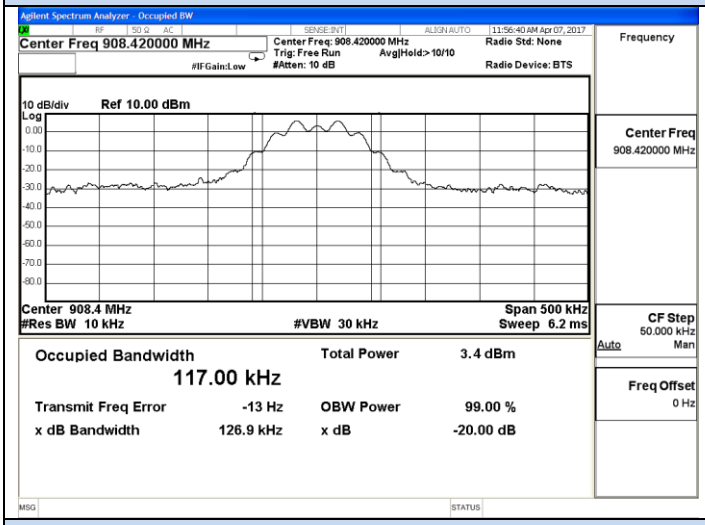
10.4. Test Results

Please refer to the following page.
Result: Pass

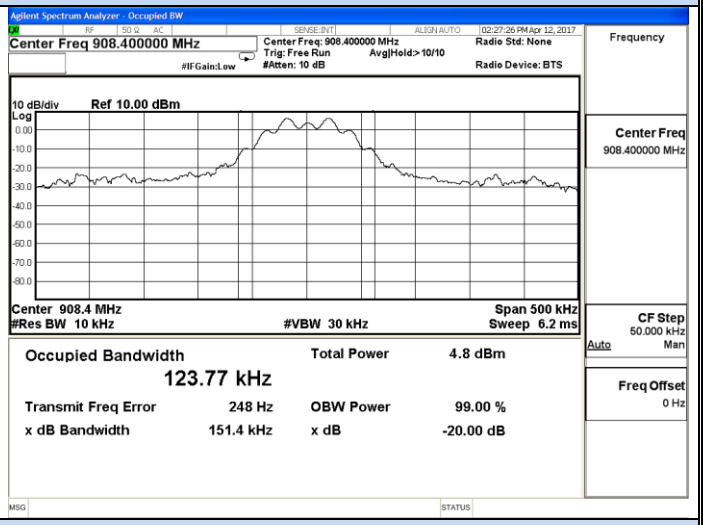
Test Mode	Frequency (MHz)	20dB Bandwidth (KHz)
FSK	908.42	126.9
	908.40	151.4
GFSK	916.00	153.0

Test Plot of Test Result

FSK

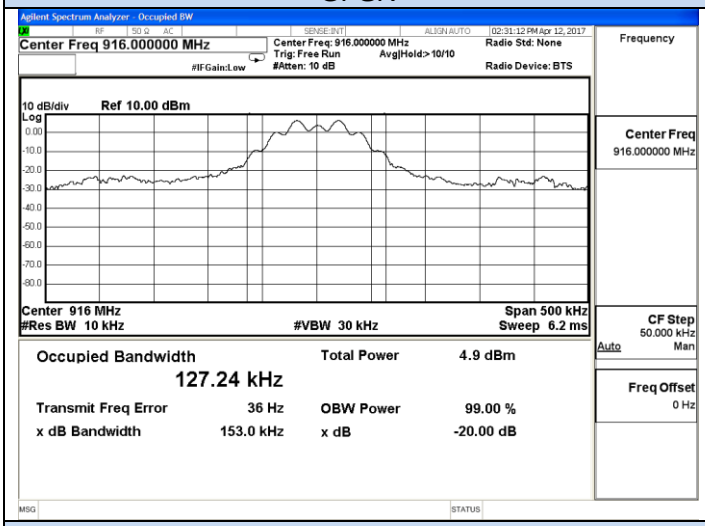


908.42 MHz



908.40 MHz

GFSK



916.00 MHz

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