SGS-CSTC Standards Technical Services Co., Ltd.
Guangzhou Branch

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Development District, Guangzhou, China 510663

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TEST REPORT

Application No.:	GZEM1901010317CR
Applicant:	HENEX IOT Technology(Guangzhou)Inc
Address of Applicant:	3F BLD1 No. 17 Yunjun Rd Yunpu Industrial, Huangpu district Guangzhou China, 510530
Manufacturer:	The same as applicant
Address of Manufacturer:	The same as applicant
Factory:	The same as applicant
Address of Factory:	The same as applicant
Equipment Under Test (EUT):	
FCC ID: 2AUJ8HC-3208R	
EUT Name:	Wireless Barcode Scanner
Model No.:	HC-2000R, HC-3206R, HC-3208R, HC-3209R, HC-300R, HC-4208R, HC-5208R, HC-5228R, HC-2102R, HC-666R, HC-828R, HC-928R, HC-929R, HC-969R, HC-999R. ¤
¤	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Standard(s) :	47 CFR Part 15, Subpart C 15.249
Date of Receipt:	2019-01-16
Date of Test:	2019-02-26 to 2019-04-09
Date of Issue:	2019-08-19
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Kobe Jian
Lab Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2019-08-19		Original

Authorized for issue by:				
Tested By		Lily_Kuang /Project Engineer		2019-02-26 to 2019-04-09 **Date**
Checked By		Ricky_Liu /Reviewer		2019-04-16 **Date**

SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch Testing Center, EEC Laboratory.
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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Field Strength of the Fundamental Signal (15.249(a))	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass

¤ Declaration of EUT Family Grouping:

Model No.: HC-2000R, HC-3206R, HC-3208R, HC-3209R, HC-300R, HC-4208R, HC-5208R, HC-5228R, HC-2102R, HC-666R, HC-828R, HC-928R, HC-929R, HC-969R, HC-999R.

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference on the model name.

Therefore only one model HC-2000R was tested in this report.

3 Contents

4 General Information

4.1 Details of E.U.T.

Power Supply:	Powered by built-in battery as below Rated: DC 3.7V DC 5V for charging mode
Test Voltage:	AC 230V, 50Hz with AC/DC adapter refer to section 4.2
Cable:	1.5m cable for data transmitting and charging mode
Antenna Gain	0 dBi
Antenna Type	Integrated Antenna
Modulation Type	ASK
Number of Channels	1
Operation Frequency	2478MHz

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	IBM	T30	S/N78-3VMLX 06/01
AC/DC Adapter	SGS	DC 5V	REF. No.SEA0500

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	±5.5 x 10-8
2	Duty cycle	±0.57%
3	Occupied Bandwidth	±3%
4	RF Conducted power	±0.68dB
5	RF Power Density	±1.50dB
6	Conducted Spurious Emissions	±1.04dB
7	RF Radiated Power	±4.5dB (below 1GHz)
		±4.8dB (above 1GHz)
8	Radiated Spurious Emission Test	±4.5dB (30MHz-1GHz)
		±4.8dB (1GHz-18GHz)
9	Temperature	±0.4℃
10	Humidity	±1.3%
11	Supply Voltages	±1.5%
12	Time	±3%

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,

198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to

ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services 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. Registration 282399, May 31, 2002.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited 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: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

- **Industry Canada (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-10449 and T-11179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584，G-10449 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	Zhong Yu	8m x 3m x 3.8m	EMC0306	N/A	N/A
Two-Line V-Netwok	R&S	ENV216	EMC0118	2019-01-11	2020-01-10
LISN	R&S	ENV216	EMC2135	2018-09-21	2019-09-20
EMI Test Receiver	Rohde & Schwarz	ESCS30	EMC0506	2018-11-19	2019-11-18
Coaxial Cable	HangTianXing	2m	EMC0107	2017-07-23	2019-07-22
Voltage Probe	SGS	N/A	EMC0106	2018-04-04	2020-04-03
Conical Metal Housing	SGS-EMC	N/A	EMC0167	2018-04-19	2020-04-18
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2019-01-20	2020-01-19
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2019-01-20	2020-01-19
Chamber cable	HangTianXing	N/A	EMC0542	2017-06-30	2019-06-30
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2019-01-07	2020-01-08
Amplifier	HP	8447F	EMC2065	2018-06-01	2019-05-31
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2020-03-04

High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2019-01-11	2020-01-10
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2019-01-11	2020-01-10
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2017-06-18	2019-06-18
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2019-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2018-11-19	2019-11-18
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2018-11-19	2019-11-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2016-06-29	2019-06-28
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

Restricted Band Around Fundamental Frequency					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2019-01-20	2020-01-19
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2019-01-20	2020-01-19
Chamber cable	HangTianXing	N/A	EMC0542	2017-06-30	2019-06-30
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2019-01-07	2020-01-08
Amplifier	HP	8447F	EMC2065	2018-06-01	2019-05-31
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2020-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2019-01-11	2020-01-10
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2019-01-11	2020-01-10
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2017-06-18	2019-06-18
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2019-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2018-11-19	2019-11-18
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2018-11-19	2019-11-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2016-06-29	2019-06-28
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

Radiated Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2019-01-20	2020-01-19
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2019-01-20	2020-01-19
Chamber cable	HangTianXing	N/A	EMC0542	2017-06-30	2019-06-30
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2019-01-07	2020-01-08
Amplifier	HP	8447F	EMC2065	2018-06-01	2019-05-31
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2020-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2019-01-11	2020-01-10
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2019-01-11	2020-01-10
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2017-06-18	2019-06-18
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2019-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2018-11-19	2019-11-18
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2018-11-19	2019-11-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2016-06-29	2019-06-28
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DMM	Fluke	73	EMC0006	2018-07-20	2019-07-19
DMM	Fluke	73	EMC0007	2018-07-19	2019-07-18

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

Limit:

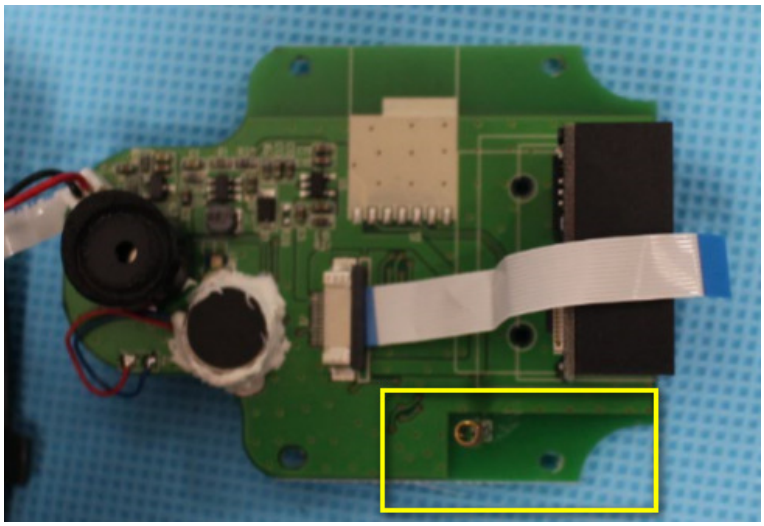
15.203 requirement:

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, 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.

6.1.2 Conclusion

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.



7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 21.3 °C Humidity: 60.2 % RH Atmospheric Pressure: 1020 mbar

Test mode: a:TX mode_Keep the EUT in transmitting with modulation mode.

7.1.2 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

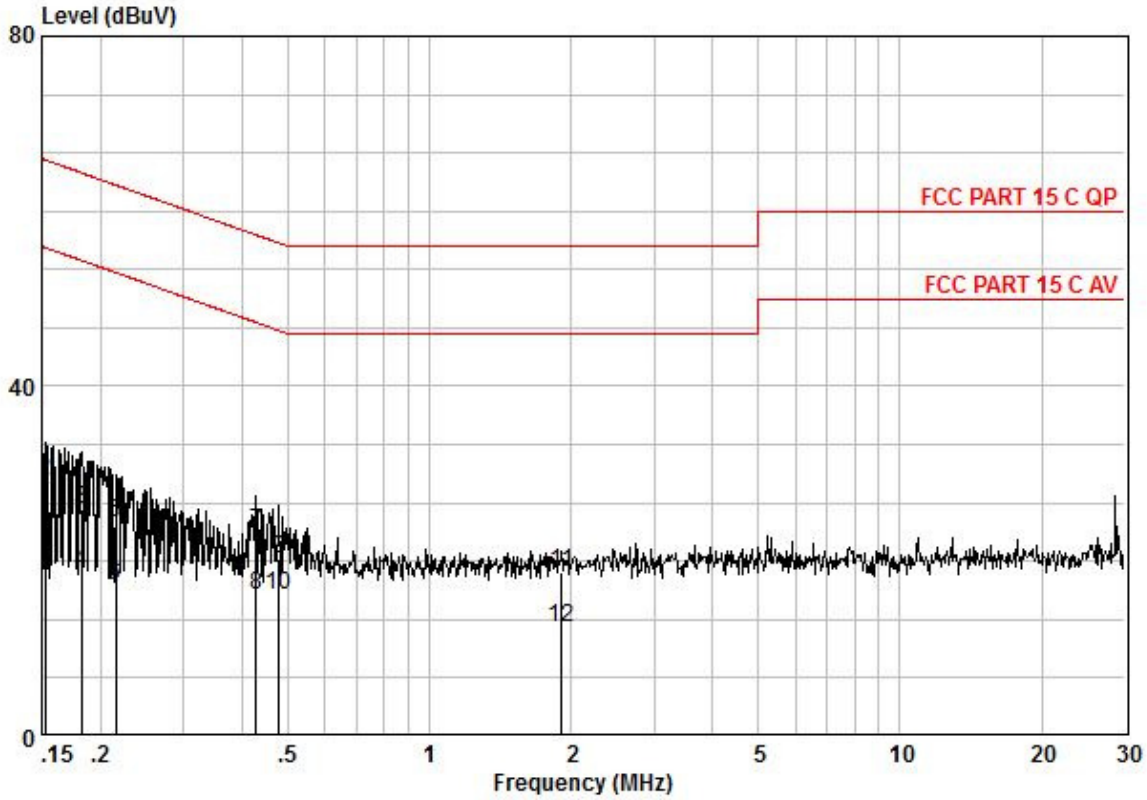
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

Mode:a; Line:Live Line



Pol :LIVE
No :
Model :

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0,15	8,57	0,10	9,65	18,32	55,87	-37,55	AVERAGE
0,15	19,44	0,10	9,65	29,19	65,87	-36,68	QP
0,18	16,10	0,10	9,65	25,85	64,37	-38,53	QP
0,18	8,96	0,10	9,65	18,71	54,37	-35,67	AVERAGE
0,22	14,56	0,11	9,64	24,31	63,01	-38,70	QP
0,22	7,57	0,11	9,64	17,32	53,01	-35,69	AVERAGE
0,43	13,44	0,18	9,64	23,26	57,29	-34,02	QP
0,43	6,24	0,18	9,64	16,06	47,29	-31,22	AVERAGE
0,48	10,40	0,20	9,64	20,24	56,36	-36,13	QP
0,48	6,24	0,20	9,64	16,08	46,36	-30,29	AVERAGE
1,91	8,62	0,38	9,66	18,66	56,00	-37,34	QP
1,91	2,44	0,38	9,66	12,48	46,00	-33,52	AVERAGE

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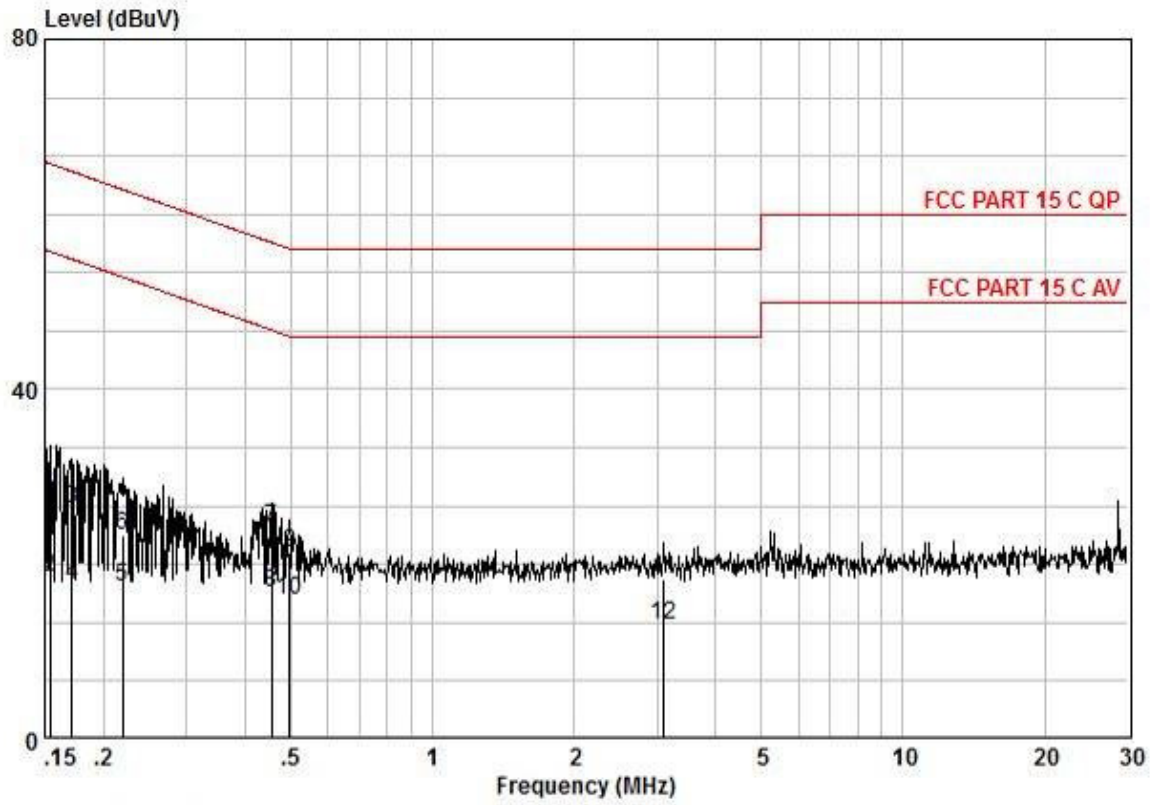
Mode:a; Line:Neutral Line



Pol :NEUTRAL
No :
Model :

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0,15	18,22	0,10	9,67	27,99	65,78	-37,79	QP
0,15	8,80	0,10	9,67	18,57	55,78	-37,21	AVERAGE
0,17	16,68	0,10	9,67	26,45	64,90	-38,45	QP
0,17	7,96	0,10	9,67	17,73	54,90	-37,17	AVERAGE
0,22	7,57	0,11	9,67	17,35	52,83	-35,49	AVERAGE
0,22	13,46	0,11	9,67	23,24	62,83	-39,60	QP
0,45	14,40	0,19	9,67	24,26	56,80	-32,54	QP
0,45	7,03	0,19	9,67	16,89	46,80	-29,91	AVERAGE
0,50	11,46	0,20	9,67	21,33	56,05	-34,73	QP
0,50	6,03	0,20	9,67	15,90	46,05	-30,16	AVERAGE
3,11	8,04	0,54	9,70	18,28	56,00	-37,72	QP
3,11	2,89	0,54	9,70	13,13	46,00	-32,87	AVERAGE

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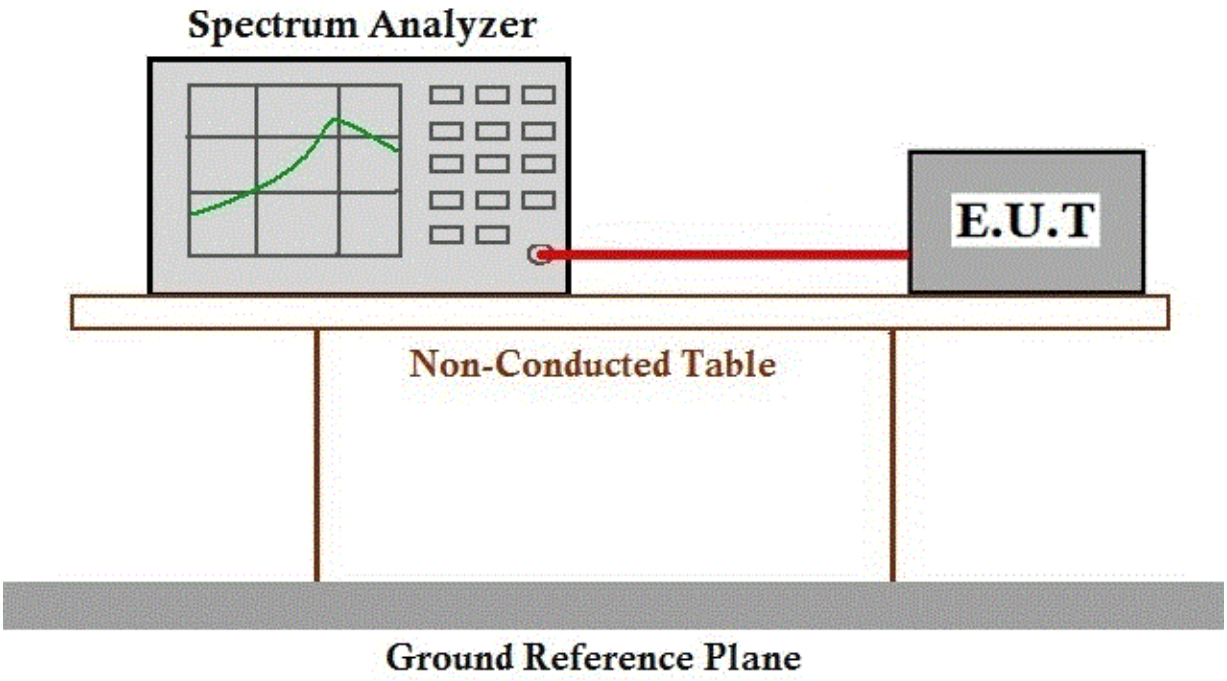
7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215
Test Method: ANSI C63.10 (2013) Section 6.9
Limit: N/A

7.2.1 E.U.T. Operation

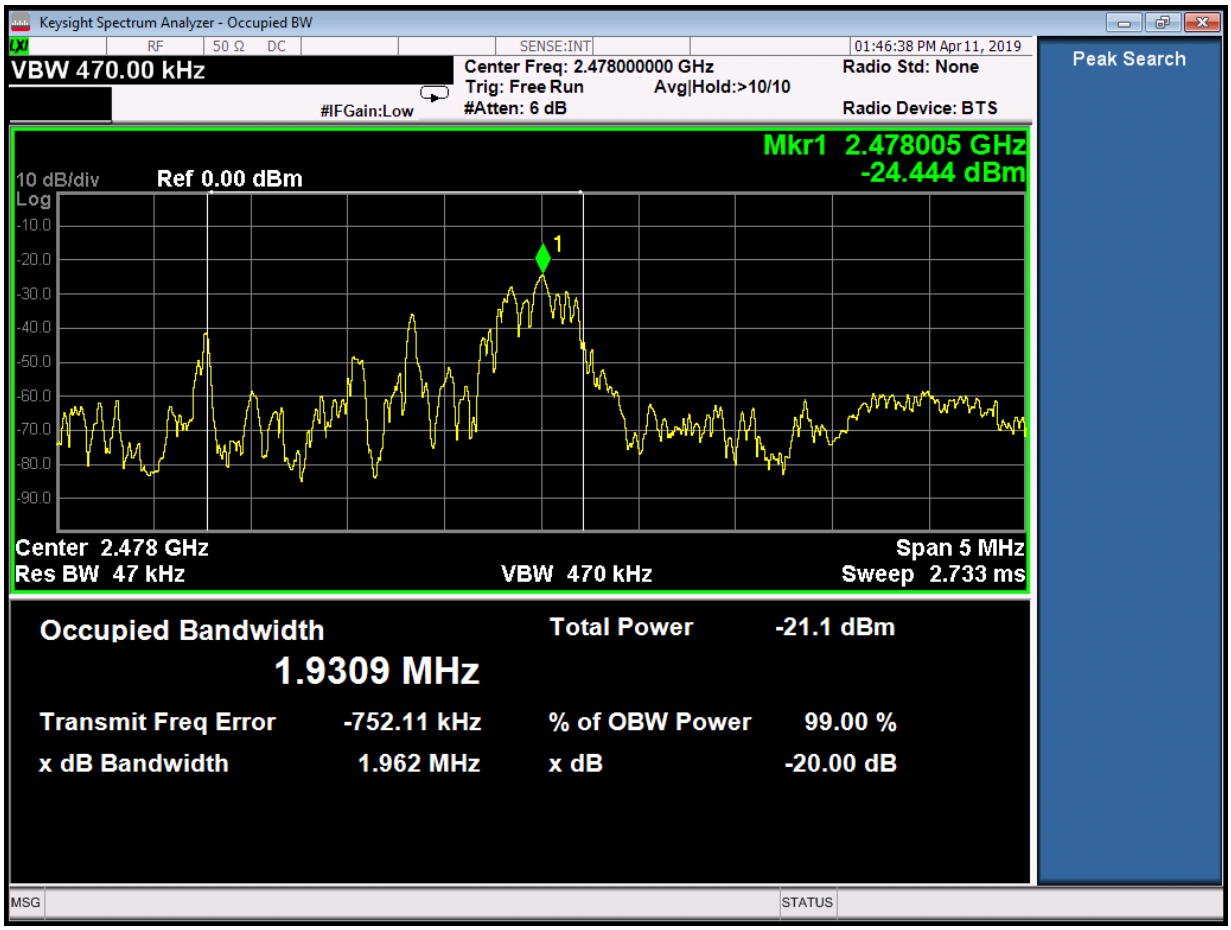
Operating Environment:
Temperature: 24.6 °C Humidity: 66.4 % RH Atmospheric Pressure: 1020 mbar
Test mode: a:TX mode_Keep the EUT in transmitting with modulation mode.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

Mode:a;



7.3 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)
Test Method: ANSI C63.10 (2013) Section 6.5&6.6
Measurement Distance: 3m
Limit:

Fundamental frequency(MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500
Remark: The frequencies above 1000MHz 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.		

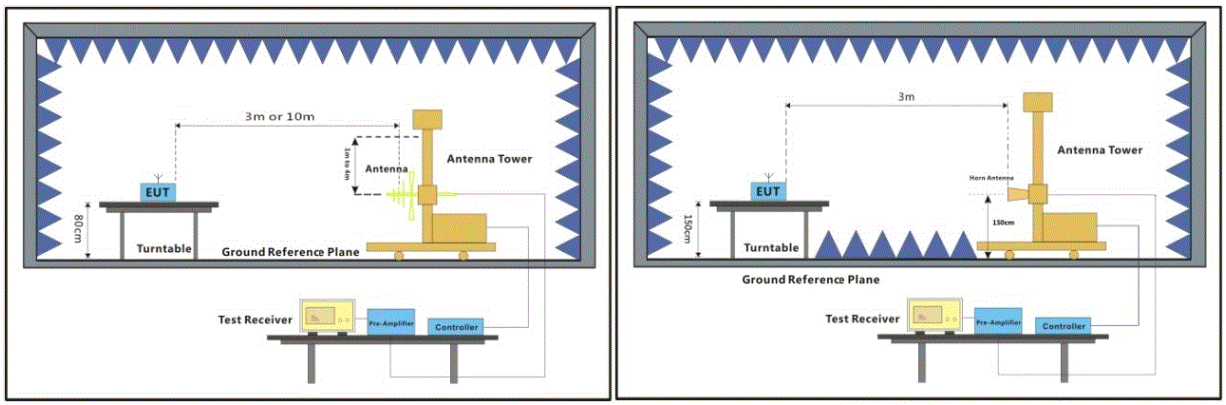
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 21.1 °C Humidity: 62.4 % RH Atmospheric Pressure: 1020 mbar

Test mode: a:TX mode_Keep the EUT in transmitting with modulation mode.

7.3.2 Test Setup Diagram



30MHz-1GHz Above 1GHz

7.3.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Mode:a; Polarization:Horizontal; Modulation:GFSK; ;

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2478.000	85.99	26.57	5.37	37.40	80.53	114.00	-33.47	HORIZONTAL	Peak

Mode:a; Polarization:Vertical; Modulation:GFSK; ;

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2478.000	88.65	26.57	5.37	37.40	83.19	114.00	-30.81	VERTICAL	Peak

Remark:

Since the maximum peak data=83.19dBuV/m <94dBuV/m(average limit), so the average data wasn't shown in the report.

7.4 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6
Measurement Distance: 3m
Limit:

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
Above 1GHz	74.0	Peak Value
Emission 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.		

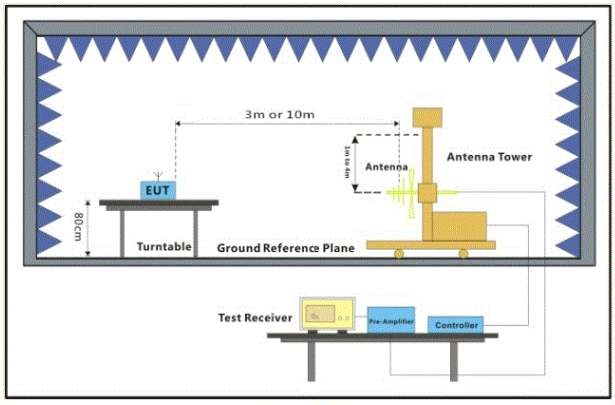
7.4.1 E.U.T. Operation

Operating Environment:

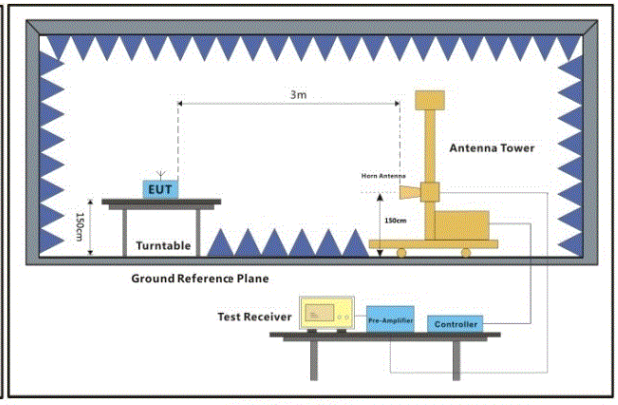
Temperature: 21.1 °C Humidity: 62.2 % RH Atmospheric Pressure: 1020 mbar

Test mode: a:TX mode_Keep the EUT in transmitting with modulation mode.

7.4.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

7.4.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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Mode:a; Polarization:Horizontal; Modulation:GFSK;

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	34.60	26.25	5.03	37.44	28.44	54.00	-25.56	HORIZONTAL	Average
2	2310.000	46.33	26.25	5.03	37.44	40.17	74.00	-33.83	HORIZONTAL	Peak
3	2390.000	33.09	26.43	4.88	37.42	26.98	54.00	-27.02	HORIZONTAL	Average
4	2390.000	44.64	26.43	4.88	37.42	38.53	74.00	-35.47	HORIZONTAL	Peak
5	2483.500	31.98	26.58	5.23	37.40	26.39	54.00	-27.61	HORIZONTAL	Average
6	2483.500	45.20	26.58	5.23	37.40	39.61	74.00	-34.39	HORIZONTAL	Peak
7	2500.000	31.92	26.60	4.95	37.39	26.08	54.00	-27.92	HORIZONTAL	Average
8	2500.000	45.37	26.60	4.95	37.39	39.53	74.00	-34.47	HORIZONTAL	Peak

Mode:a; Polarization:Vertical; Modulation:GFSK;

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	33.64	26.25	5.03	37.44	27.48	54.00	-26.52	VERTICAL	Average
2	2310.000	45.09	26.25	5.03	37.44	38.93	74.00	-35.07	VERTICAL	Peak
3	2390.000	34.18	26.43	4.88	37.42	28.07	54.00	-25.93	VERTICAL	Average
4	2390.000	44.92	26.43	4.88	37.42	38.81	74.00	-35.19	VERTICAL	Peak
5	2483.500	33.06	26.58	5.23	37.40	27.47	54.00	-26.53	VERTICAL	Average
6	2483.500	44.67	26.58	5.23	37.40	39.08	74.00	-34.92	VERTICAL	Peak
7	2500.000	32.51	26.60	4.95	37.39	26.67	54.00	-27.33	VERTICAL	Average
8	2500.000	46.08	26.60	4.95	37.39	40.24	74.00	-33.76	VERTICAL	Peak

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7.5 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)
Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6
Measurement Distance: 3m
Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

7.5.1 E.U.T. Operation

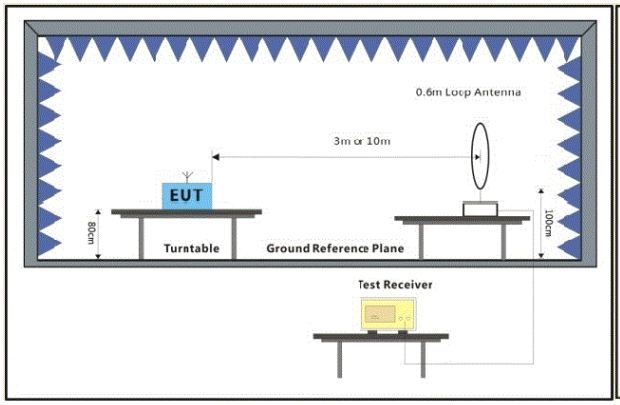
Operating Environment:

Temperature: 21.1 °C Humidity: 62.2 % RH Atmospheric Pressure: 1020 mbar

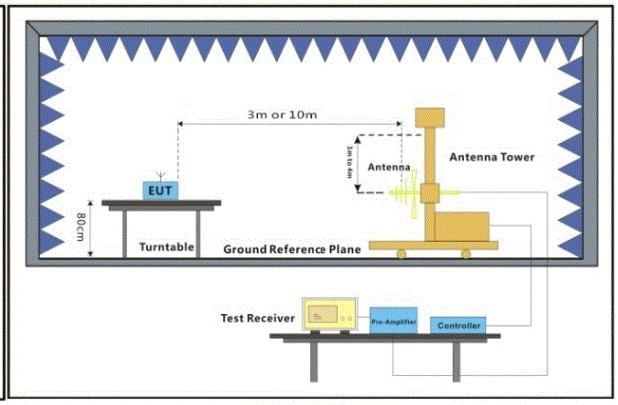
Pretest these modes to find the worst case: a:TX mode_Keep the EUT in transmitting with modulation mode.
d:Idle_Keep the EUT standby.

The worst case for final test: a:TX mode_Keep the EUT in transmitting with modulation mode.

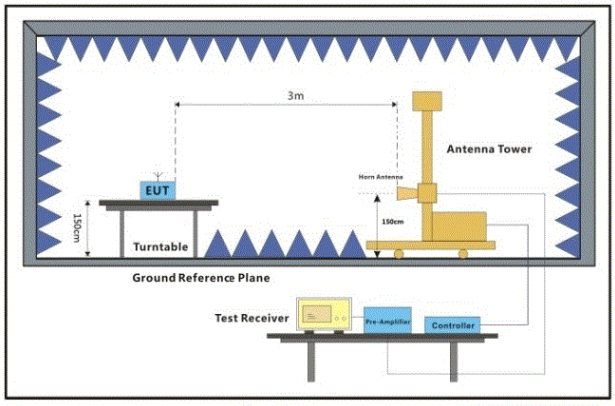
7.5.2 Test Setup Diagram



Below 30MHz



30MHz-1GHz



Above 1GHz

7.5.3 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

Measured Level l=Read Level + Antenna Factor + Cable Loss - Preamp Factor

Mode:a; Polarization:Horizontal; Modulation:GFSK; ;

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	39.715	36.18	12.60	0.60	29.58	19.80	40.00	-20.20	HORIZONTAL	QP
2	92.139	44.85	7.96	0.84	29.40	24.25	43.50	-19.25	HORIZONTAL	QP
3	171.393	27.77	12.96	1.31	29.40	12.64	43.50	-30.86	HORIZONTAL	QP
4	221.392	30.80	11.55	1.04	29.43	13.96	46.00	-32.04	HORIZONTAL	QP
5	607.787	27.52	20.65	2.10	29.50	20.77	46.00	-25.23	HORIZONTAL	QP
6	854.025	27.60	23.47	2.94	29.12	24.89	46.00	-21.11	HORIZONTAL	QP

Mode:a; Polarization:Horizontal; Modulation:GFSK; ;

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2806.288	55.73	27.54	4.70	37.22	50.75	54.00	-3.25	HORIZONTAL	Average
2	2806.288	59.60	27.54	4.70	37.22	54.62	74.00	-19.38	HORIZONTAL	Peak
3	4956.293	48.08	31.05	7.84	36.96	50.01	54.00	-3.99	HORIZONTAL	Average
4	4956.293	63.40	31.05	7.84	36.96	65.33	74.00	-8.67	HORIZONTAL	Peak
5	7433.914	44.56	35.92	7.43	36.92	50.99	54.00	-3.01	HORIZONTAL	Average
6	7433.914	58.89	35.92	7.43	36.92	65.32	74.00	-8.68	HORIZONTAL	Peak
7	8688.480	32.19	36.25	7.94	36.96	39.42	54.00	-14.58	HORIZONTAL	Average
8	8688.480	44.93	36.25	7.94	36.96	52.16	74.00	-21.84	HORIZONTAL	Peak
9	9912.991	34.44	37.92	8.63	37.10	43.89	54.00	-10.11	HORIZONTAL	Average
10	9912.991	44.96	37.92	8.63	37.10	54.41	74.00	-19.59	HORIZONTAL	Peak
11	12390.270	28.63	38.93	11.17	36.90	41.83	54.00	-12.17	HORIZONTAL	Average
12	12390.270	41.28	38.93	11.17	36.90	54.48	74.00	-19.52	HORIZONTAL	Peak

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Mode:a; Polarization:Vertical; Modulation:GFSK;

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	66.967	30.76	11.11	0.69	29.43	13.13	40.00	-26.87	VERTICAL	QP
2	98.833	38.18	9.46	0.85	29.40	19.09	43.50	-24.41	VERTICAL	QP
3	129.015	39.04	12.23	0.96	29.40	22.83	43.50	-20.67	VERTICAL	QP
4	159.225	33.18	13.40	1.26	29.40	18.44	43.50	-25.06	VERTICAL	QP
5	318.817	30.18	14.30	1.82	29.80	16.50	46.00	-29.50	VERTICAL	QP
6	721.726	26.97	21.63	3.60	29.43	22.77	46.00	-23.23	VERTICAL	QP

Mode:a; Polarization:Vertical; Modulation:GFSK;

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	4956.993	47.47	31.05	7.84	36.96	49.40	54.00	-4.60	VERTICAL	Average
2	4956.993	59.18	31.05	7.84	36.96	61.11	74.00	-12.89	VERTICAL	Peak
3	6267.553	33.49	33.41	6.94	36.99	36.85	54.00	-17.15	VERTICAL	Average
4	6267.553	44.21	33.41	6.94	36.99	47.57	74.00	-26.43	VERTICAL	Peak
5	7433.914	44.31	35.92	7.43	36.92	50.74	54.00	-3.26	VERTICAL	Average
6	7433.914	58.27	35.92	7.43	36.92	64.70	74.00	-9.30	VERTICAL	Peak
7	8232.187	34.12	36.33	8.23	36.92	41.76	54.00	-12.24	VERTICAL	Average
8	8232.187	44.30	36.33	8.23	36.92	51.94	74.00	-22.06	VERTICAL	Peak
9	9912.670	32.75	37.92	8.63	37.10	42.20	54.00	-11.80	VERTICAL	Average
10	9912.670	44.41	37.92	8.63	37.10	53.86	74.00	-20.14	VERTICAL	Peak
11	12390.470	30.29	38.93	11.17	36.90	43.49	54.00	-10.51	VERTICAL	Average
12	12390.470	42.07	38.93	11.17	36.90	55.27	74.00	-18.73	VERTICAL	Peak

--End of Report—