SGS-CSTC Standards Technical Services Co., Ltd.
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TEST REPORT

Application No.:	GZEM1803001069CR
Applicant:	Freefly Systems
Address of Applicant:	15540 Woodinville Redmond Rd Building A, Suite 800, Woodinville, Washington 98072, United States
Manufacturer:	Jabil Circuit Ltd
Address of Manufacturer:	128, JunCheng Road, Guangzhou Economic and Technological Development District, GuangDong Province, PRC P.C.: 510530
Factory:	Jabil Circuit Ltd
Address of Factory:	128, JunCheng Road, Guangzhou Economic and Technological Development District, GuangDong Province, PRC P.C.: 510530
Equipment Under Test (EUT):	
EUT Name:	Movi
FCC ID:	2AQIO-MOVICR
Model No.:	Movi Cinema Robot
Trade Mark:	Freefly
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2018-03-06
Date of Test:	2018-03-12 to 2018-06-27
Date of Issue:	2018-07-02
Test Result:	**Pass***

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

Kobe Jian
EMC Laboratory 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		2018-07-02		Original

Authorized for issue by:				
Tested By		 **Curry_Wu /Project Engineer**		2018-03-12 to 2018-06-27 **Date**
Checked By		 **Ricky_Liu /Reviewer**		2018-07-02 **Date**

2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.13	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.12	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

3 Contents

4 General Information

4.1 Details of E.U.T.

Power Supply:	DC 5V from USB port for charging
	DC 3.7 V 2000mAh x 2 internal rechargeable batteries
Test Voltage:	AC 120V
Cable:	About 1.2m unscreened USB cable
Adaptive Type	Non-LBT based DAA
Antenna Gain	0dBi
Antenna Type	Integral Antenna
Channel Spacing	2MHz
Modulation Type	GFSK
Number of Channels	40
Operation Frequency	2402MHz to 2480MHz

4.2 Description of Support Units

The EUT has been tested with corresponding accessories as below:

Supplied by client:

Description	Manufacturer	Model No.	SN/Certificate NO
adaptor	apple	A1385	N/A
BT board	N/A	N/A	N/A

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25 x 10-8
2	Timeout	2s
3	Duty cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted power	0.75dB
6	RF Power Density	2.84dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
9	Radiated Spurious Emission Test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
10	Temperature	0.4℃
11	Humidity	1.3%
12	Supply Voltages	1.5%
13	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-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

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-2460, C-2584，G-449 and T-1179 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.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emission						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date (YYYY-MM-DD)	Cal.Due date (YYYY-MM-DD)
EMC0306	Shielding Room	Zhong Yu	8 x 3 x 3.8 m^3	N/A	2016-12-27	2019-12-26
EMC0118	Two-line v-netwok	R&S	ENV216	100359	2018-01-19	2019-01-18
EMC2135	Two-line v-netwok	R&S	ENV216	102259	2017-09-22	2018-09-21
EMC0102	LISN	SCHAFFNER CHASE	MN2050D/1	1421	2017-09-20	2018-09-19
EMC0506	EMI Test Receiver	Rohde & Schwarz	ESCS30	100085	2017-11-27	2018-11-26
EMC0107	Coaxial Cable	SGS	2m	N/A	2017-07-23	2019-07-22
EMC0106	Voltage Probe	SGS	N/A	N/A	2018-04-04	2020-04-03
EMC2123	8 Line ISN Cat 6	SCHWARZBECK MESS-ELEKTRONIK	NTFM 8158	NTFM 8158 0151	2018-05-29	2019-05-29
EMC2124	8 Line ISN Cat 5	SCHWARZBECK MESS-ELEKTRONIK	CAT5 8158	CAT5 8158-188	2018-05-29	2019-05-29
EMC2126	8 Line ISN Cat 3	SCHWARZBECK MESS-ELEKTRONIK	CAT3 8158	CAT38158-0081	2018-05-29	2019-05-29
EMC2122	ISN S8	SCHWARZBECK MESS-ELEKTRONIK	ISN S8	57	2018-05-29	2019-05-29
EMC2121	ISN S1	SCHWARZBECK MESS-ELEKTRONIK	ISN S1	10	2018-05-29	2019-05-29
EMC2125	2 wires ISN	SCHWARZBECK MESS-ELEKTRONIK	NTFM 8131	8131-198	2018-05-29	2019-05-29
EMC2047	CDN	Elektronik-Feinmechanik	L-801:AF2	2793	2015-09-19	2018-09-18
EMC2048	CDN	Elektronik-Feinmechanik	L-801:M2/M3	2738	2015-09-25	2018-09-24
EMC2062	6dB Attenuator	HP	8491A	24487	2018-04-04	2020-04-03
EMC0167	Conical metal housing	SGS-EMC	N/A	N/A	2018-04-19	2020-04-18

Minimum 6dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14

Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14

Power Spectrum Density					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14

Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
MXA Signal Analyzer	AgilentTechnologies	N9020A	SEM004-10	2018-03-10	2019-03-09
ESG Vector Signal Generator	Keysight	E4438C	SEM006-03	2018-04-10	2019-04-10
EXG Analog Signal Generator	AgilentTechnologies	N5171B	SEM006-04	2017-07-26	2020-07-25
Power Meter	AgilentTechnologies	U2021XA_Ch2	SEM009-02	2017-09-19	2018-09-18
Power Meter	AgilentTechnologies	U2021XA_Ch3	SEM009-03	2017-09-19	2018-09-18
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14

Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14

Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2018-01-19	2019-01-18
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2018-01-19	2019-01-18
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	2018-01-08	2019-01-07
Amplifier	HP	8447F	EMC2065	2018-06-01	2019-05-31
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2017-11-20	2018-11-19
Active Loop Antenna	EMCO	6502	EMC0523	2018-02-24	2019-02-23
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2018-01-19	2019-01-18
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2018-01-08	2019-01-07
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	2017-11-29	2018-11-28
MXE EMI Receiver	Keysight	N9038A	EMC2139	2017-11-15	2018-11-14
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2017-11-15	2018-11-14

Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2018-01-19	2019-01-18
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2018-01-19	2019-01-18
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	2018-01-08	2019-01-07
Amplifier	HP	8447F	EMC2065	2018-06-01	2019-05-31
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2017-11-20	2018-11-19
Active Loop Antenna	EMCO	6502	EMC0523	2018-02-24	2019-02-23
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2018-01-19	2019-01-18
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2018-01-08	2019-01-07
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	2017-11-29	2018-11-28
MXE EMI Receiver	Keysight	N9038A	EMC2139	2017-11-15	2018-11-14
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2017-11-15	2018-11-14

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DMM	Fluke	73	EMC0006	2017-07-26	2018-07-25
DMM	Fluke	73	EMC0007	2017-07-26	2018-07-25
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(c)

6.1.2 Conclusion

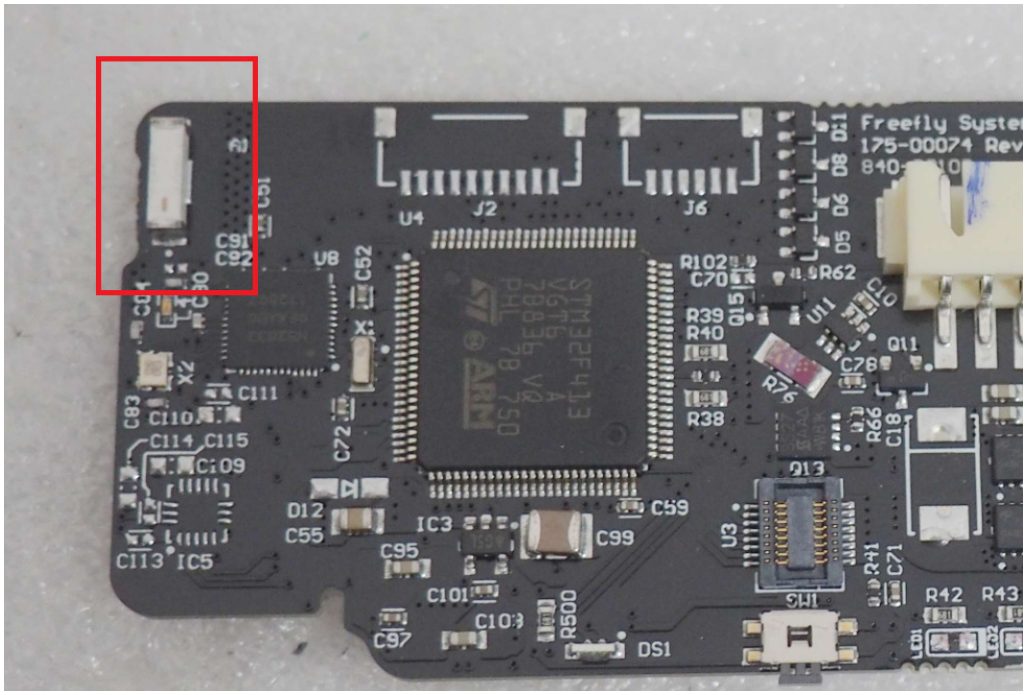
Standard Requirement:

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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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 of emission(MHz)	Conducted limit(dBμV)	
	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.		

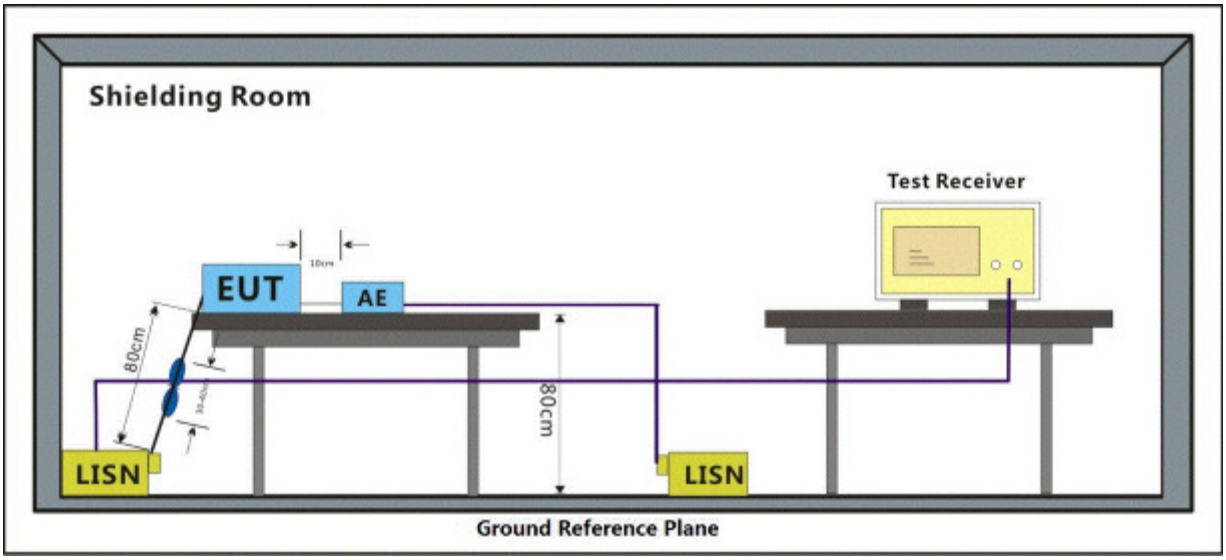
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 21.8 °C Humidity: 53.9 % RH Atmospheric Pressure: 1020 mbar

Test mode: c: Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.1.2 Test Setup Diagram



7.1.3 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.

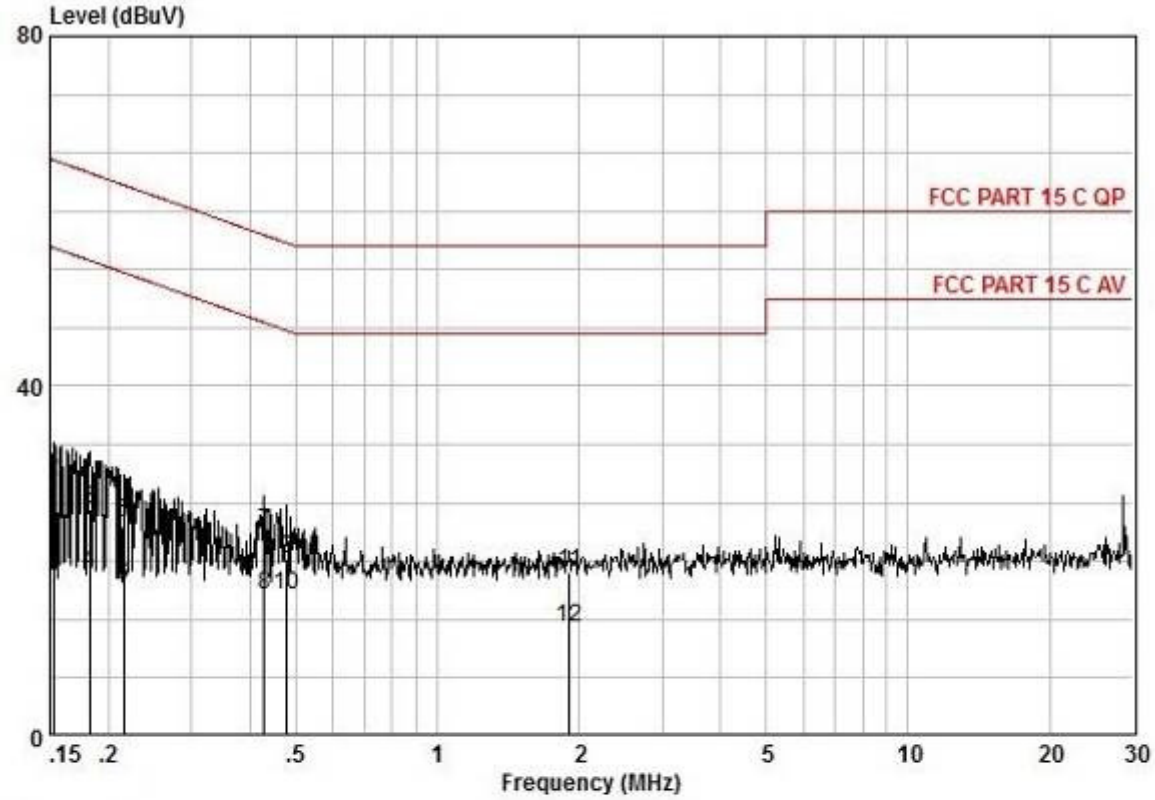
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

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

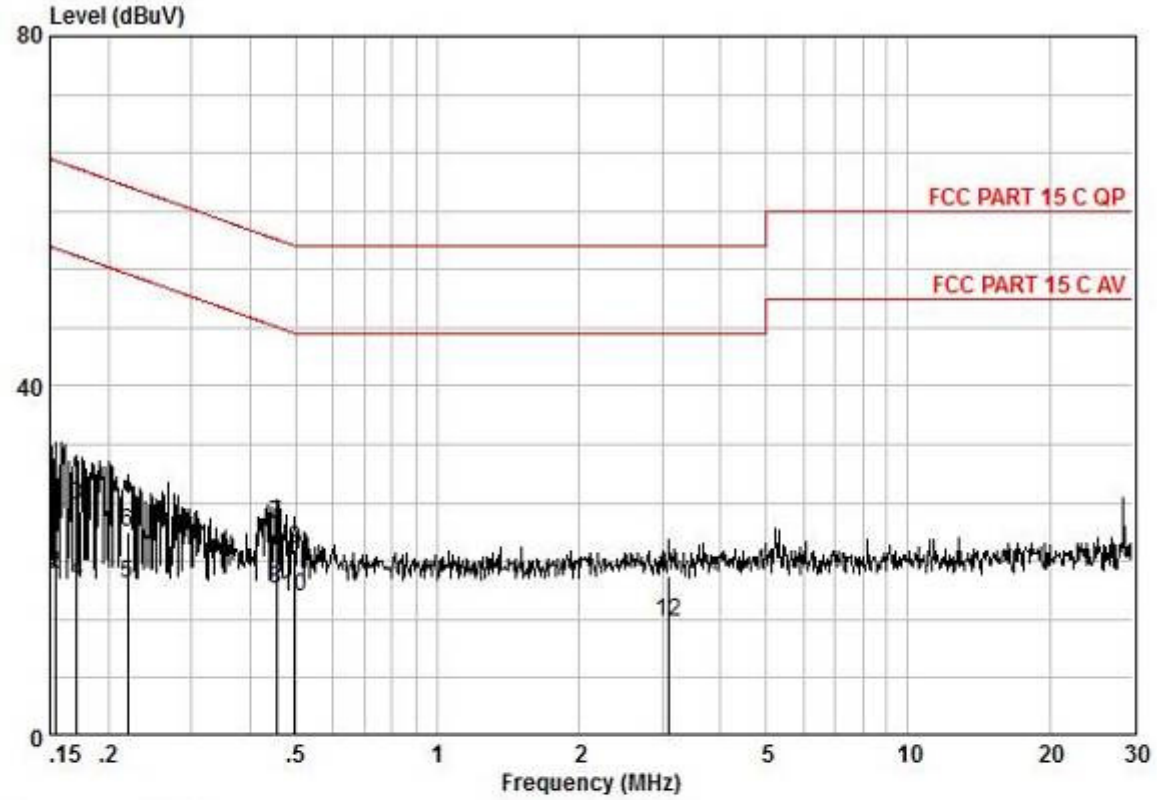
Mode:c; Line:Live Line



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

Mode:c; 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

7.2 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)

Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit: ≥500 kHz

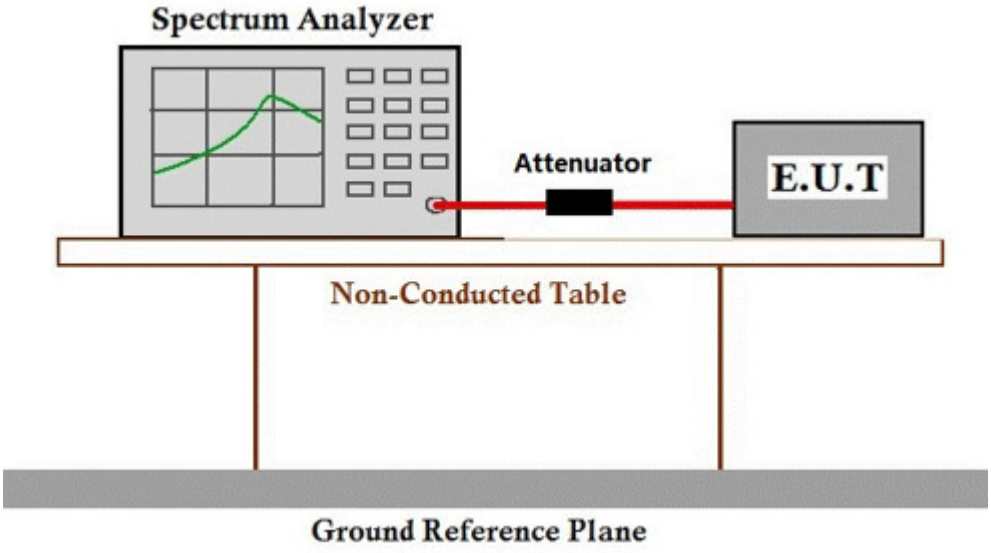
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23.4 °C Humidity: 45.9 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.3 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

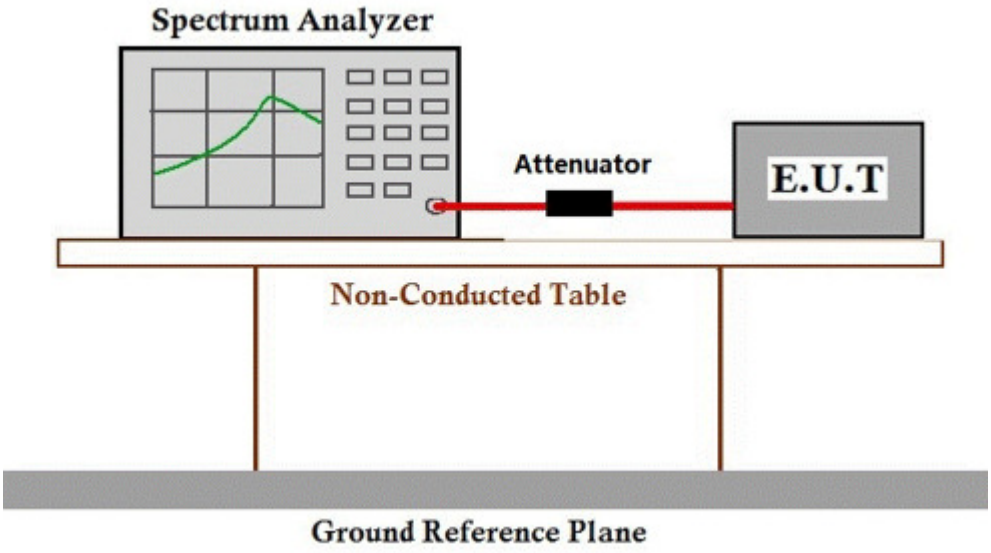
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.4 °C Humidity: 45.9 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.4 Power Spectrum Density

Test Requirement	47 CFR Part 15, Subpart C 15.247(e)
Test Method:	ANSI C63.10 (2013) Section 11.10.2
Limit:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

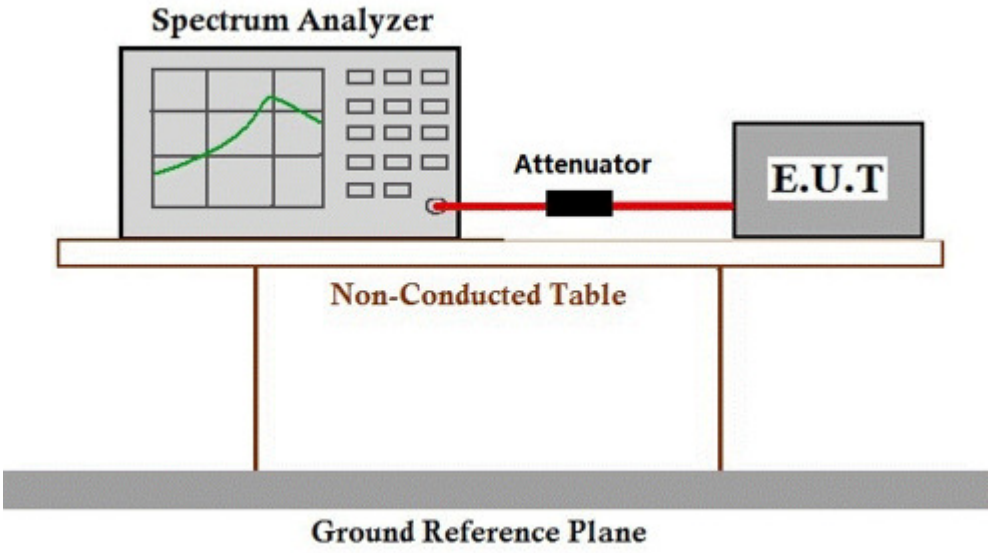
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23.4 °C Humidity: 45.9 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.5 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 11.13
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)

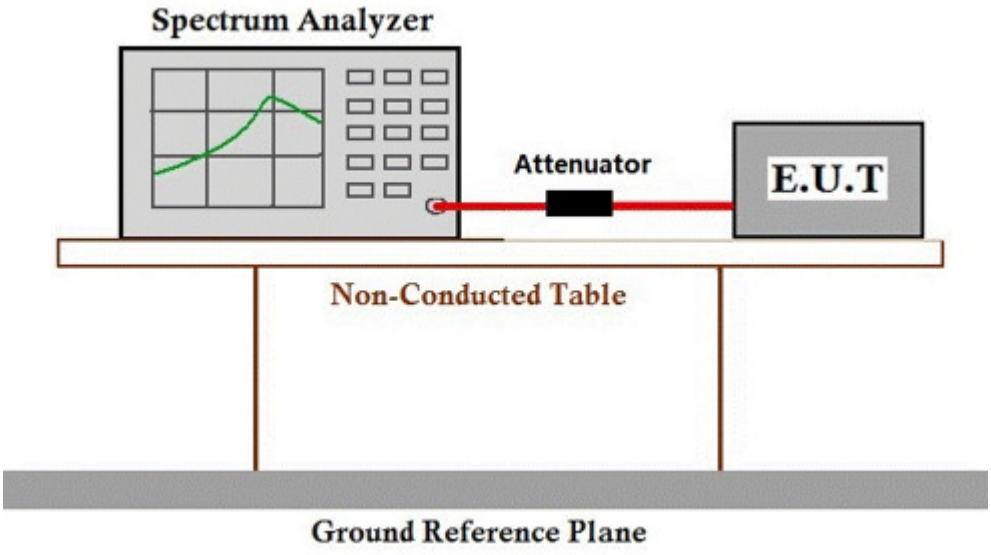
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.4 °C Humidity: 45.9 % RH Atmospheric Pressure: 1020 mbar

Test Mode b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.6 Conducted Spurious Emissions

Test Requirement: 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 11.11

Limit: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)

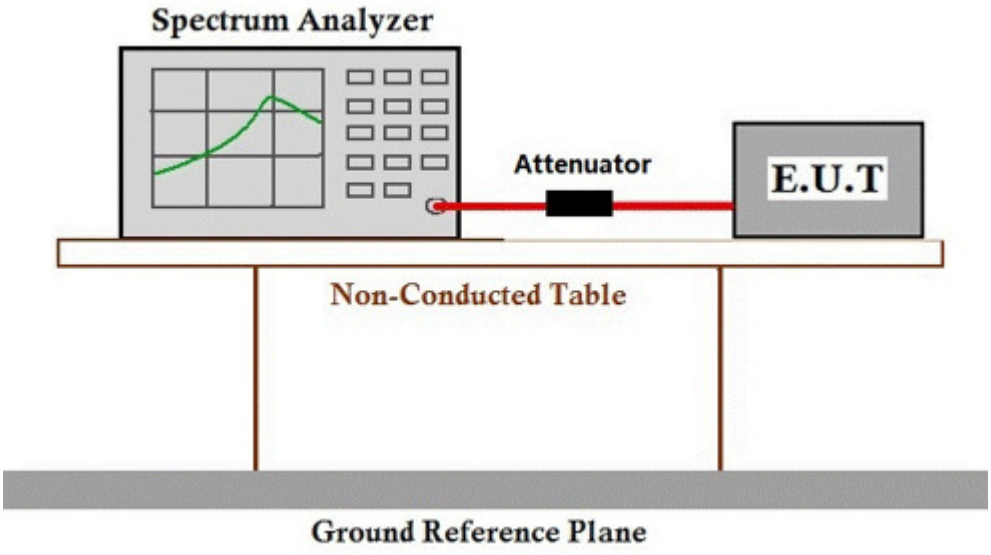
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.4 °C Humidity: 45.9 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.6.2 Test Setup Diagram



7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.7 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 11.12

Measurement Distance: 3m

Limit:

Frequency(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
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.		

7.7.1 E.U.T. Operation

Operating Environment:

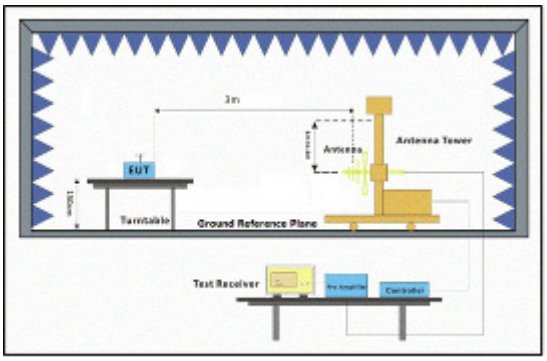
Temperature: 23 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

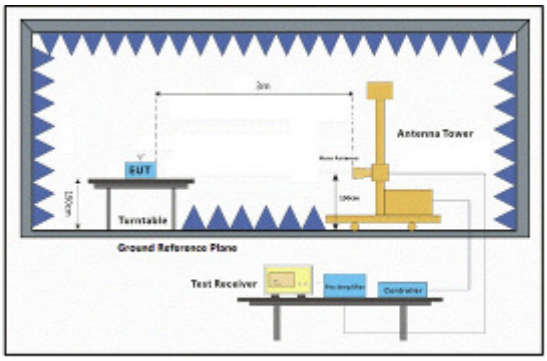
Pretest these modes to find the worst case: b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

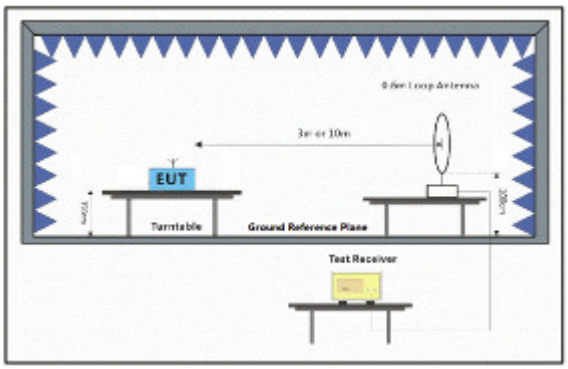
c: Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

The worst case for final test: b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.7.2 Test Setup Diagram







7.7.3 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 meters 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 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits 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 the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Mode:b; Polarization:Horizontal; Modulation:GFSK; Channel:Low

	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	2310.000	31.42	26.25	5.03	37.44	25.26	54.00	-28.74	HORIZONTAL	Average
2	2310.000	45.36	26.25	5.03	37.44	39.20	74.00	-34.80	HORIZONTAL	Peak
3	2390.000	31.76	26.43	4.88	37.42	25.65	54.00	-28.35	HORIZONTAL	Average
4	2390.000	44.13	26.43	4.88	37.42	38.02	74.00	-35.98	HORIZONTAL	Peak
5	2483.500	31.24	26.58	5.23	37.40	25.65	54.00	-28.35	HORIZONTAL	Average
6	2483.500	43.88	26.58	5.23	37.40	38.29	74.00	-35.71	HORIZONTAL	Peak
7	2500.000	31.15	26.60	4.95	37.39	25.31	54.00	-28.69	HORIZONTAL	Average
8	2500.000	44.03	26.60	4.95	37.39	38.19	74.00	-35.81	HORIZONTAL	Peak

Mode:b; Polarization:Vertical; Modulation:GFSK; Channel:Low

	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	2310.000	30.91	26.25	5.03	37.44	24.75	54.00	-29.25	VERTICAL	Average
2	2310.000	44.36	26.25	5.03	37.44	38.20	74.00	-35.80	VERTICAL	Peak
3	2390.000	32.84	26.43	4.88	37.42	26.73	54.00	-27.27	VERTICAL	Average
4	2390.000	44.17	26.43	4.88	37.42	38.06	74.00	-35.94	VERTICAL	Peak
5	2483.500	30.52	26.58	5.23	37.40	24.93	54.00	-29.07	VERTICAL	Average
6	2483.500	44.22	26.58	5.23	37.40	38.63	74.00	-35.37	VERTICAL	Peak
7	2500.000	31.71	26.60	4.95	37.39	25.87	54.00	-28.13	VERTICAL	Average
8	2500.000	44.70	26.60	4.95	37.39	38.86	74.00	-35.14	VERTICAL	Peak

Mode:b; Polarization:Horizontal; Modulation:GFSK; Channel:High

	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	2310.000	31.19	26.25	5.03	37.44	25.03	54.00	-28.97	HORIZONTAL	Average
2	2310.000	44.84	26.25	5.03	37.44	38.68	74.00	-35.32	HORIZONTAL	Peak
3	2390.000	30.62	26.43	4.88	37.42	24.51	54.00	-29.49	HORIZONTAL	Average
4	2390.000	44.71	26.43	4.88	37.42	38.60	74.00	-35.40	HORIZONTAL	Peak
5	2483.500	41.56	26.58	5.23	37.40	35.97	54.00	-18.03	HORIZONTAL	Average
6	2483.500	54.31	26.58	5.23	37.40	48.72	74.00	-25.28	HORIZONTAL	Peak
7	2500.000	32.98	26.60	4.95	37.39	27.14	54.00	-26.86	HORIZONTAL	Average
8	2500.000	45.00	26.60	4.95	37.39	39.16	74.00	-34.84	HORIZONTAL	Peak

Mode:b; Polarization:Vertical; Modulation:GFSK; Channel:High

	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	2310.000	31.27	26.25	5.03	37.44	25.11	54.00	-28.89	VERTICAL	Average
2	2310.000	45.26	26.25	5.03	37.44	39.10	74.00	-34.90	VERTICAL	Peak
3	2390.000	30.99	26.43	4.88	37.42	24.88	54.00	-29.12	VERTICAL	Average
4	2390.000	44.51	26.43	4.88	37.42	38.40	74.00	-35.60	VERTICAL	Peak
5	2483.500	36.51	26.58	5.23	37.40	30.92	54.00	-23.08	VERTICAL	Average
6	2483.500	49.11	26.58	5.23	37.40	43.52	74.00	-30.48	VERTICAL	Peak
7	2500.000	32.67	26.60	4.95	37.39	26.83	54.00	-27.17	VERTICAL	Average
8	2500.000	43.54	26.60	4.95	37.39	37.70	74.00	-36.30	VERTICAL	Peak

7.8 Radiated Spurious Emissions

Test Requirement: 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 11.11

Measurement Distance: 3m

Limit:

Frequency(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
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.		

7.8.1 E.U.T. Operation

Operating Environment:

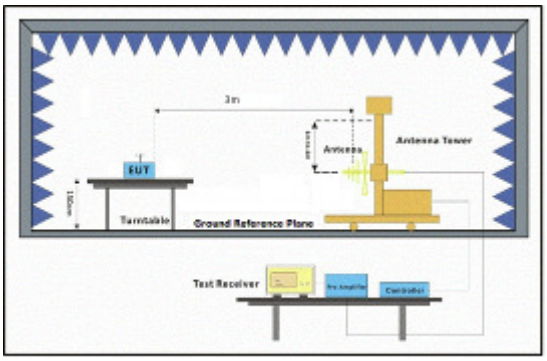
Temperature: 23 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

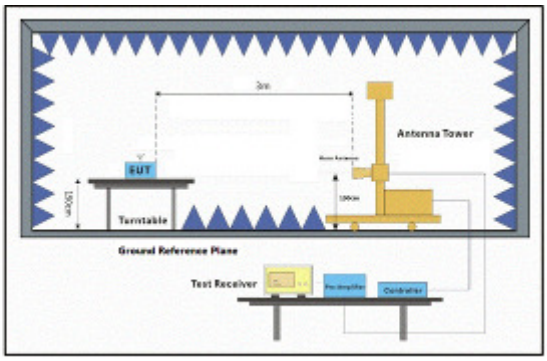
Pretest these modes to find the worst case: b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

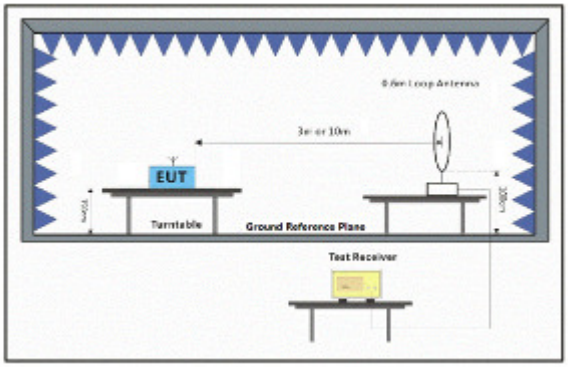
c: Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

The worst case for final test: b: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.8.2 Test Setup Diagram







7.8.3 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 meters 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:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) For frequencies above 1GHz, the field strength limits 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 the emissions whose peak level is lower than the average limit, only the peak measurement is shown

Mode:b; Polarization:Horizontal; Modulation:GFSK; Channel:Low

	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	39.024	36.54	12.58	0.56	23.55	26.13	40.00	-13.87	HORIZONTAL	QP
2	75.977	45.42	9.29	0.79	25.84	29.66	40.00	-10.34	HORIZONTAL	QP
3	135.032	50.63	12.84	1.00	28.17	36.30	43.50	-7.20	HORIZONTAL	QP
4	241.676	51.45	12.42	1.57	29.20	36.24	46.00	-9.76	HORIZONTAL	QP
5	627.274	38.22	20.78	2.10	29.13	31.97	46.00	-14.03	HORIZONTAL	QP
6	818.834	41.21	22.90	2.79	28.59	38.31	46.00	-7.69	HORIZONTAL	QP

Mode:b; Polarization:Horizontal; Modulation:GFSK; Channel:Low

	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	3214.623	31.68	27.90	5.91	37.01	28.48	54.00	-25.52	HORIZONTAL	Average
2	3214.623	44.35	27.90	5.91	37.01	41.15	74.00	-32.85	HORIZONTAL	Peak
3	3958.309	30.99	29.42	7.35	36.90	30.86	54.00	-23.14	HORIZONTAL	Average
4	3958.309	43.16	29.42	7.35	36.90	43.03	74.00	-30.97	HORIZONTAL	Peak
5	4804.760	30.63	30.79	5.87	36.94	30.35	54.00	-23.65	HORIZONTAL	Average
6	4804.760	42.16	30.79	5.87	36.94	41.88	74.00	-32.12	HORIZONTAL	Peak
7	7206.026	27.57	35.45	7.34	36.93	33.43	54.00	-20.57	HORIZONTAL	Average
8	7206.026	40.58	35.45	7.34	36.93	46.44	74.00	-27.56	HORIZONTAL	Peak
9	9608.664	29.74	37.51	8.15	37.08	38.32	54.00	-15.68	HORIZONTAL	Average
10	9608.664	42.53	37.51	8.15	37.08	51.11	74.00	-22.89	HORIZONTAL	Peak
11	12010.180	26.02	39.50	10.67	37.20	38.99	54.00	-15.01	HORIZONTAL	Average
12	12010.180	40.15	39.50	10.67	37.20	53.12	74.00	-20.88	HORIZONTAL	Peak

Mode:b; Polarization:Vertical; Modulation:GFSK; Channel:Low

	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	52.575	40.16	12.85	0.60	24.94	28.67	40.00	-11.33	VERTICAL	QP
2	128.563	43.93	12.17	0.96	28.18	28.88	43.50	-14.62	VERTICAL	QP
3	191.074	50.54	11.80	1.27	28.21	35.40	43.50	-8.10	VERTICAL	QP
4	241.676	54.92	12.42	1.57	29.20	39.71	46.00	-6.29	VERTICAL	QP
5	578.670	41.48	20.30	1.90	29.21	34.47	46.00	-11.53	VERTICAL	QP
6	818.834	36.49	22.90	2.79	28.59	33.59	46.00	-12.41	VERTICAL	QP

Mode:b; Polarization:Vertical; Modulation:GFSK; Channel:Low

	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	3890.255	33.82	29.27	7.61	36.91	33.79	54.00	-20.21	VERTICAL	Average
2	3890.255	44.37	29.27	7.61	36.91	44.34	74.00	-29.66	VERTICAL	Peak
3	4804.058	35.44	30.79	5.87	36.94	35.16	54.00	-18.84	VERTICAL	Average
4	4804.058	46.61	30.79	5.87	36.94	46.33	74.00	-27.67	VERTICAL	Peak
5	7206.516	29.96	35.45	7.34	36.93	35.82	54.00	-18.18	VERTICAL	Average
6	7206.516	42.58	35.45	7.34	36.93	48.44	74.00	-25.56	VERTICAL	Peak
7	7989.893	31.35	36.50	8.36	36.90	39.31	54.00	-14.69	VERTICAL	Average
8	7989.893	43.03	36.50	8.36	36.90	50.99	74.00	-23.01	VERTICAL	Peak
9	9608.540	31.90	37.51	8.15	37.08	40.48	54.00	-13.52	VERTICAL	Average
10	9608.540	43.87	37.51	8.15	37.08	52.45	74.00	-21.55	VERTICAL	Peak
11	12010.710	30.09	39.50	10.67	37.20	43.06	54.00	-10.94	VERTICAL	Average
12	12010.710	40.51	39.50	10.67	37.20	53.48	74.00	-20.52	VERTICAL	Peak

Mode:b; Polarization:Horizontal; Modulation:GFSK; Channel:middle

	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	3123.039	32.64	27.90	5.52	37.03	29.03	54.00	-24.97	HORIZONTAL	Average
2	3123.039	43.81	27.90	5.52	37.03	40.20	74.00	-33.80	HORIZONTAL	Peak
3	4884.062	28.47	30.95	6.86	36.95	29.33	54.00	-24.67	HORIZONTAL	Average
4	4884.062	42.69	30.95	6.86	36.95	43.55	74.00	-30.45	HORIZONTAL	Peak
5	5915.516	29.36	32.25	7.37	37.00	31.98	54.00	-22.02	HORIZONTAL	Average
6	5915.516	42.37	32.25	7.37	37.00	44.99	74.00	-29.01	HORIZONTAL	Peak
7	7326.906	30.34	35.74	7.39	36.92	36.55	54.00	-17.45	HORIZONTAL	Average
8	7326.906	41.76	35.74	7.39	36.92	47.97	74.00	-26.03	HORIZONTAL	Peak
9	9768.123	31.26	37.74	8.37	37.09	40.28	54.00	-13.72	HORIZONTAL	Average
10	9768.123	44.98	37.74	8.37	37.09	54.00	74.00	-20.00	HORIZONTAL	Peak
11	12210.760	28.83	39.21	10.98	37.06	41.96	54.00	-12.04	HORIZONTAL	Average
12	12210.760	41.79	39.21	10.98	37.06	54.92	74.00	-19.08	HORIZONTAL	Peak

Mode:b; Polarization:Vertical; Modulation:GFSK; Channel:middle

	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	2990.531	33.38	27.89	4.63	37.08	28.82	54.00	-25.18	VERTICAL	Average
2	2990.531	46.90	27.89	4.63	37.08	42.34	74.00	-31.66	VERTICAL	Peak
3	4884.058	33.55	30.95	6.86	36.95	34.41	54.00	-19.59	VERTICAL	Average
4	4884.058	48.07	30.95	6.86	36.95	48.93	74.00	-25.07	VERTICAL	Peak
5	7326.267	30.97	35.74	7.39	36.92	37.18	54.00	-16.82	VERTICAL	Average
6	7326.267	44.17	35.74	7.39	36.92	50.38	74.00	-23.62	VERTICAL	Peak
7	8764.146	30.83	36.33	8.00	36.97	38.19	54.00	-15.81	VERTICAL	Average
8	8764.146	43.34	36.33	8.00	36.97	50.70	74.00	-23.30	VERTICAL	Peak
9	9768.164	31.43	37.74	8.37	37.09	40.45	54.00	-13.55	VERTICAL	Average
10	9768.164	44.24	37.74	8.37	37.09	53.26	74.00	-20.74	VERTICAL	Peak
11	12210.580	26.96	39.21	10.98	37.06	40.09	54.00	-13.91	VERTICAL	Average
12	12210.580	39.66	39.21	10.98	37.06	52.79	74.00	-21.21	VERTICAL	Peak

Mode:b; Polarization:Horizontal; Modulation:GFSK; Channel:High

	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	2990.531	34.94	27.89	4.63	37.08	30.38	54.00	-23.62	HORIZONTAL	Average
2	2990.531	47.00	27.89	4.63	37.08	42.44	74.00	-31.56	HORIZONTAL	Peak
3	4960.662	29.79	31.05	7.84	36.96	31.72	54.00	-22.28	HORIZONTAL	Average
4	4960.662	41.72	31.05	7.84	36.96	43.65	74.00	-30.35	HORIZONTAL	Peak
5	6564.209	30.36	34.37	7.11	36.98	34.86	54.00	-19.14	HORIZONTAL	Average
6	6564.209	41.93	34.37	7.11	36.98	46.43	74.00	-27.57	HORIZONTAL	Peak
7	7440.836	30.47	35.92	7.43	36.92	36.90	54.00	-17.10	HORIZONTAL	Average
8	7440.836	42.52	35.92	7.43	36.92	48.95	74.00	-25.05	HORIZONTAL	Peak
9	9920.510	30.15	37.92	8.63	37.10	39.60	54.00	-14.40	HORIZONTAL	Average
10	9920.510	42.75	37.92	8.63	37.10	52.20	74.00	-21.80	HORIZONTAL	Peak
11	12400.750	28.37	38.93	11.17	36.90	41.57	54.00	-12.43	HORIZONTAL	Average
12	12400.750	41.81	38.93	11.17	36.90	55.01	74.00	-18.99	HORIZONTAL	Peak

Mode:b; Polarization:Vertical; Modulation:GFSK; Channel:High

	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	3007.868	37.84	27.90	4.65	37.07	33.32	54.00	-20.68	VERTICAL	Average
2	3007.868	48.57	27.90	4.65	37.07	44.05	74.00	-29.95	VERTICAL	Peak
3	4960.058	33.11	31.05	7.84	36.96	35.04	54.00	-18.96	VERTICAL	Average
4	4960.058	47.51	31.05	7.84	36.96	49.44	74.00	-24.56	VERTICAL	Peak
5	7440.914	32.42	35.92	7.43	36.92	38.85	54.00	-15.15	VERTICAL	Average
6	7440.914	44.22	35.92	7.43	36.92	50.65	74.00	-23.35	VERTICAL	Peak
7	8392.292	31.86	36.16	8.09	36.93	39.18	54.00	-14.82	VERTICAL	Average
8	8392.292	43.42	36.16	8.09	36.93	50.74	74.00	-23.26	VERTICAL	Peak
9	9920.432	28.88	37.92	8.63	37.10	38.33	54.00	-15.67	VERTICAL	Average
10	9920.432	40.16	37.92	8.63	37.10	49.61	74.00	-24.39	VERTICAL	Peak
11	12400.070	28.02	38.93	11.17	36.90	41.22	54.00	-12.78	VERTICAL	Average
12	12400.070	40.73	38.93	11.17	36.90	53.93	74.00	-20.07	VERTICAL	Peak

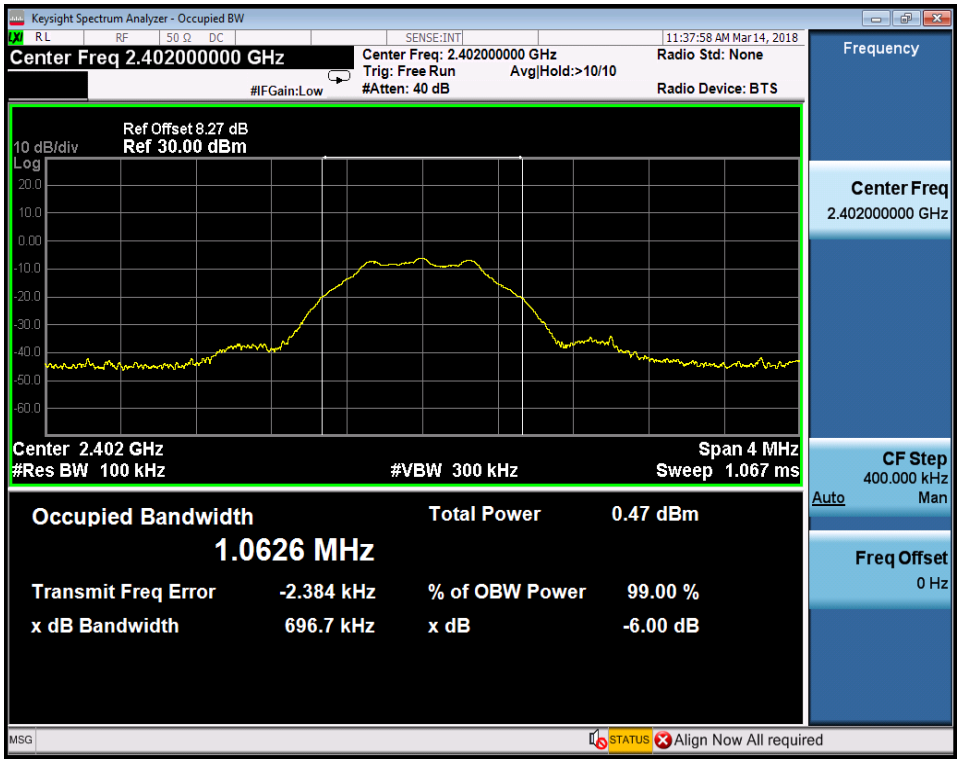
8 Appendix

8.1 Appendix 15.247

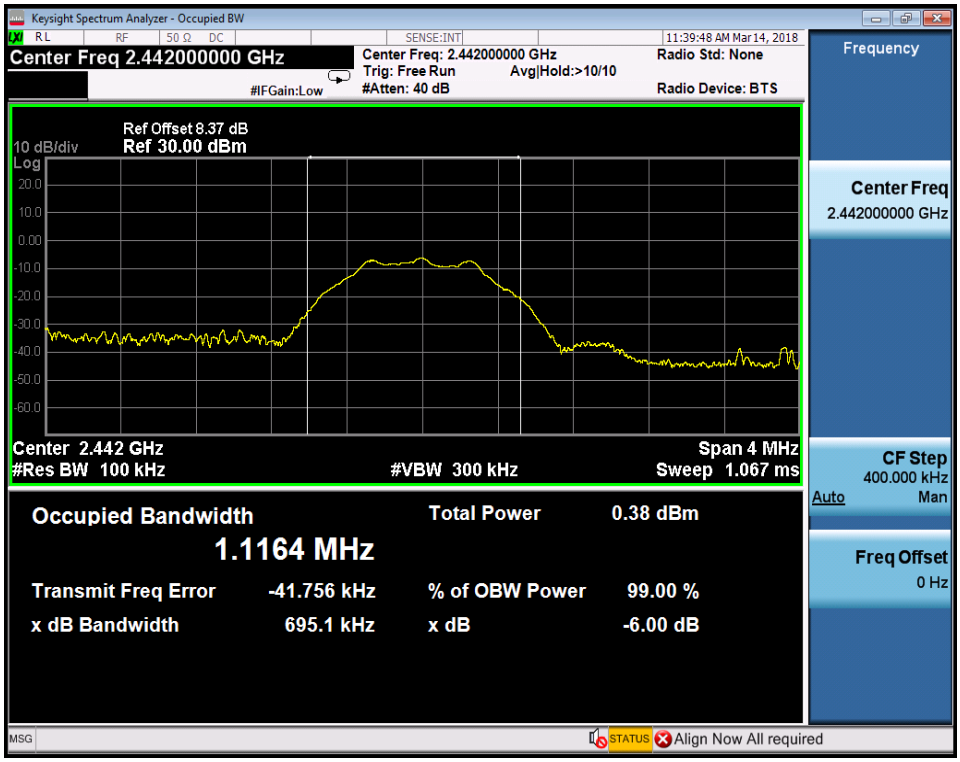
1. 6dB Bandwidth

Test Mode	Test Channel	Ant	OBW[MHz]	EBW[MHz]	Limit	Verdict
BLE	2402	Ant1	1.0626	0.6967	0.5	PASS
BLE	2442	Ant1	1.1164	0.6951	0.5	PASS
BLE	2480	Ant1	1.0730	0.6910	0.5	PASS

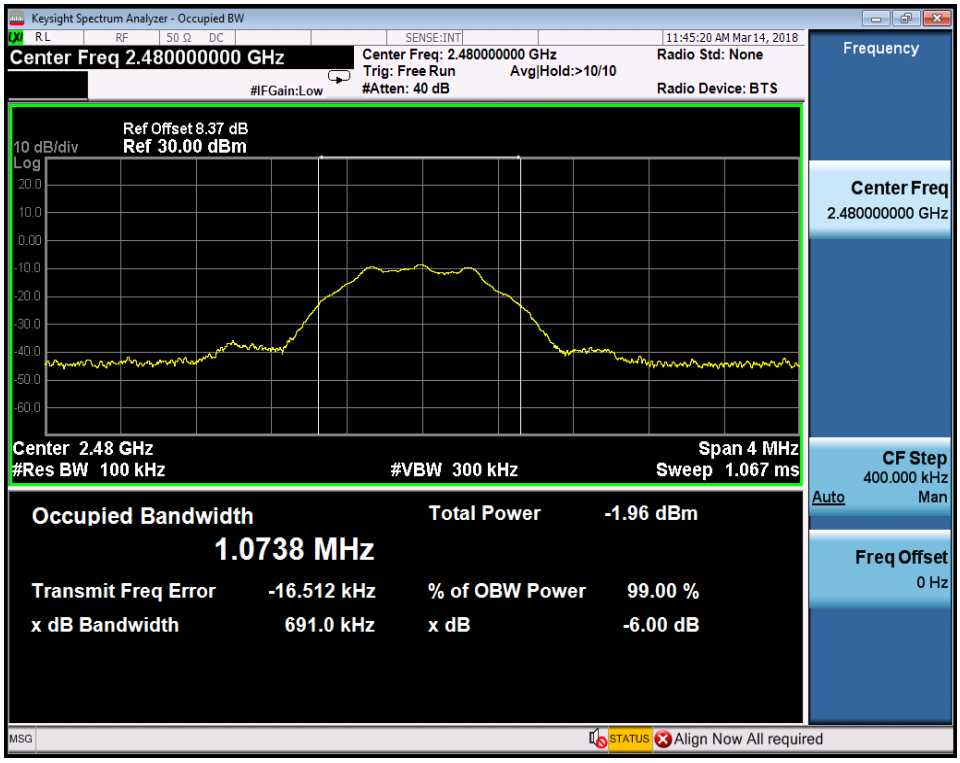
TEST PLOT
6dB Bandwidth_BLE_2402_Ant1



6dB Bandwidth_BLE_2442_Ant1



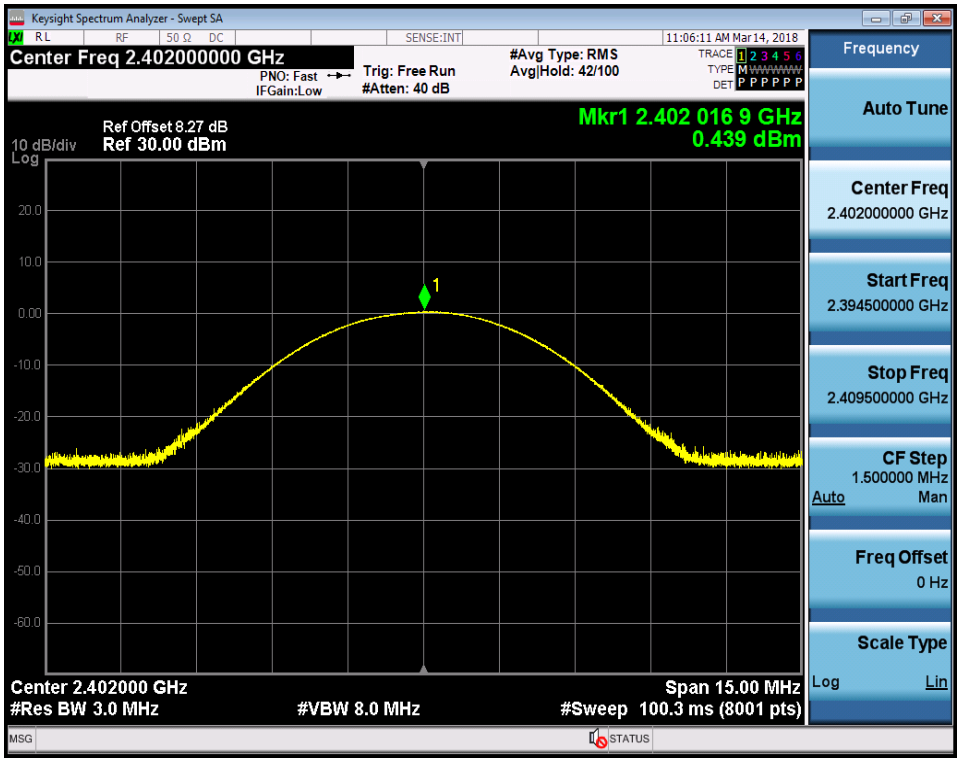
6dB Bandwidth_BLE_2480_Ant1



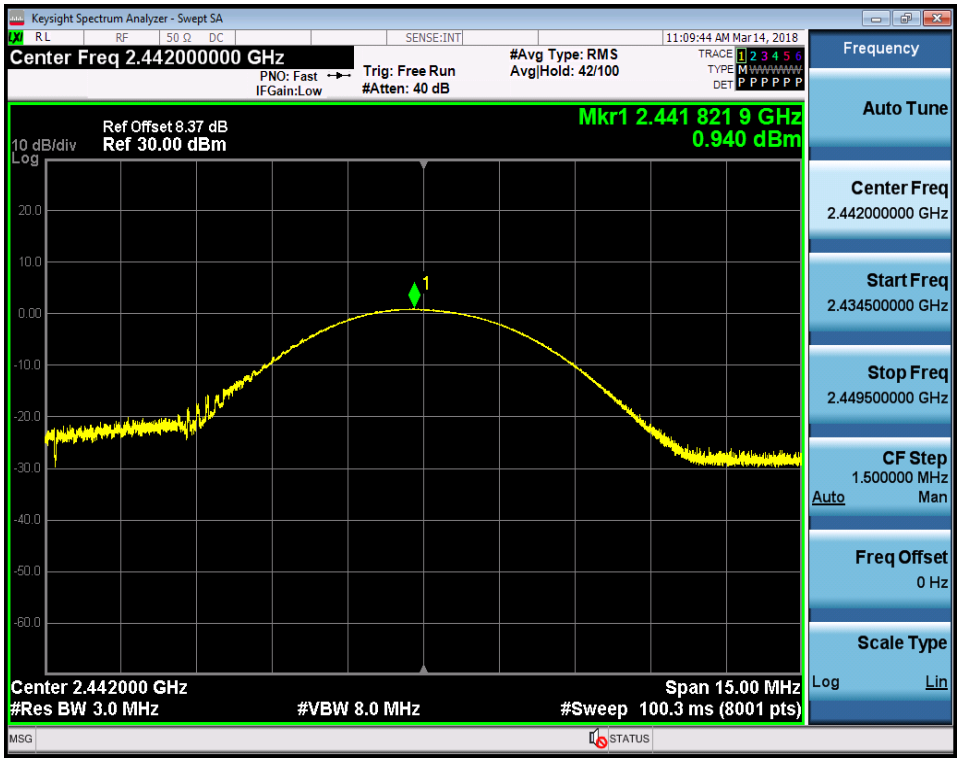
2.Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	0.439	21	PASS
BLE	2442	Ant1	0.94	21	PASS
BLE	2480	Ant1	2.145	21	PASS

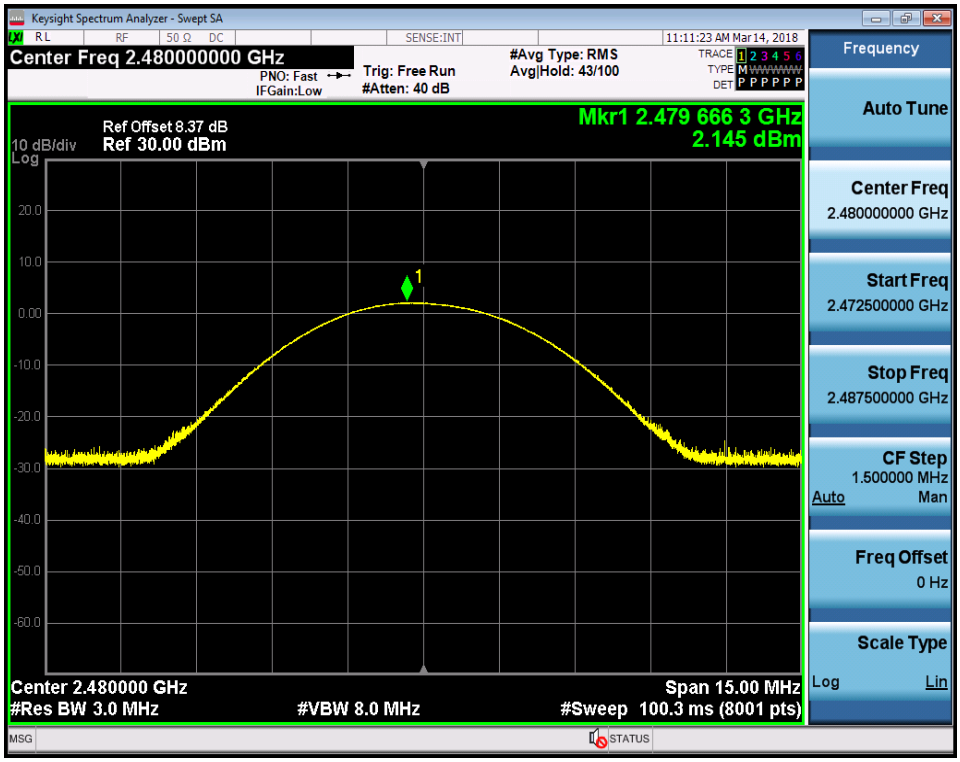
TEST PLOT
Maximum peak conducted output power_BLE_2402_Ant1



Maximum peak conducted output power_BLE_2442_Ant1



Maximum peak conducted output power_BLE_2480_Ant1

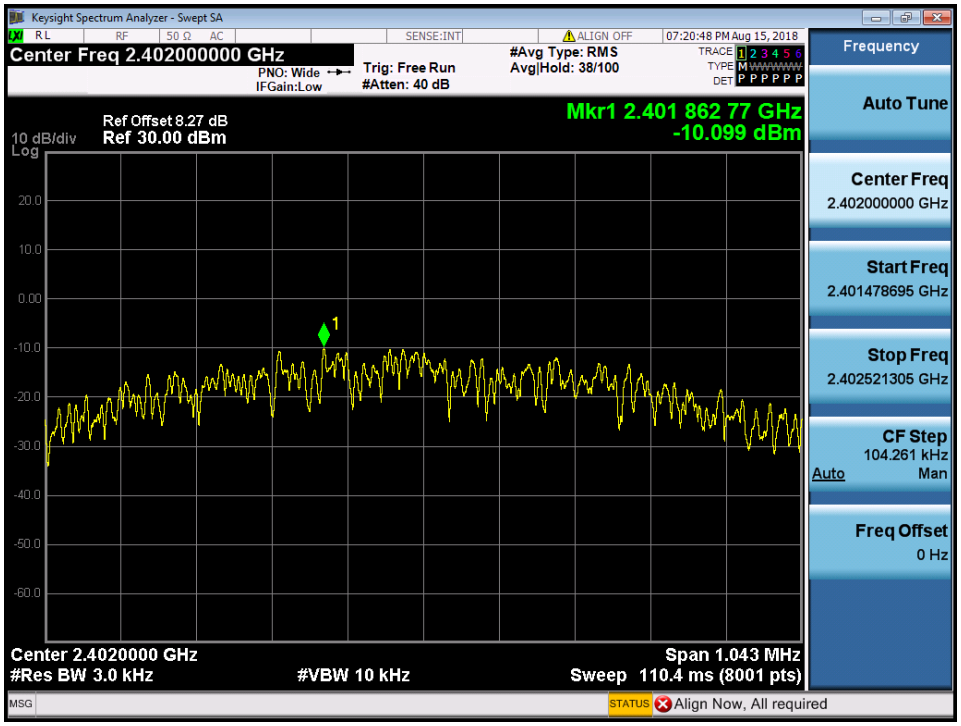


3.Maximum Peak power spectral density

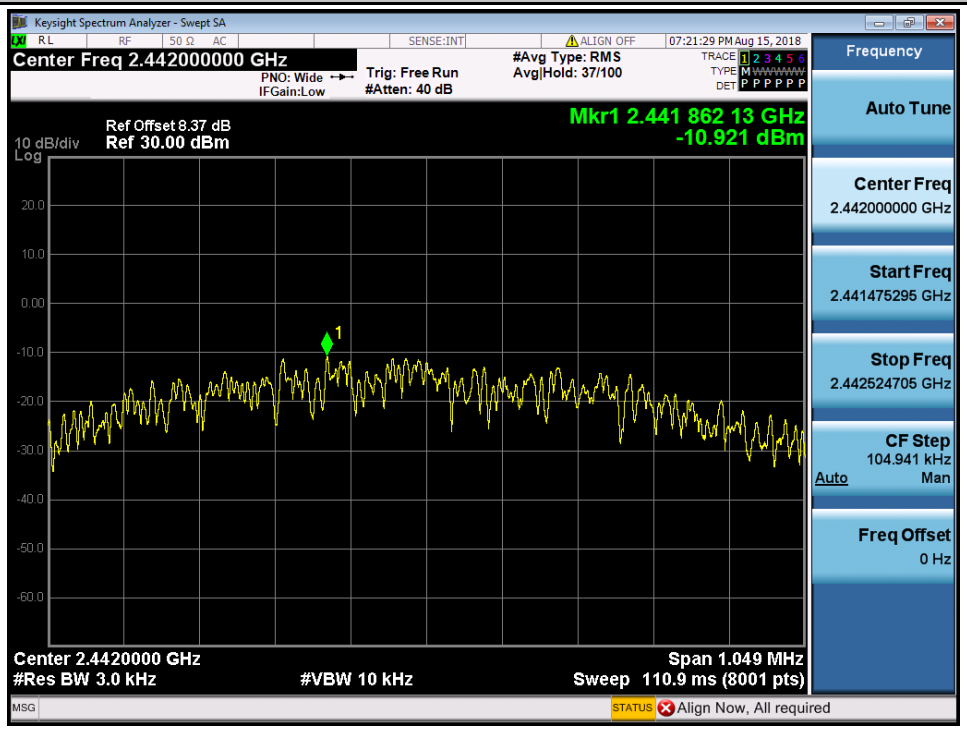
Test Mode	Test Channel	Ant	Result	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-10.099	8.00	PASS
BLE	2442	Ant1	-10.921	8.00	PASS
BLE	2480	Ant1	-11.310	8.00	PASS

TEST PLOT

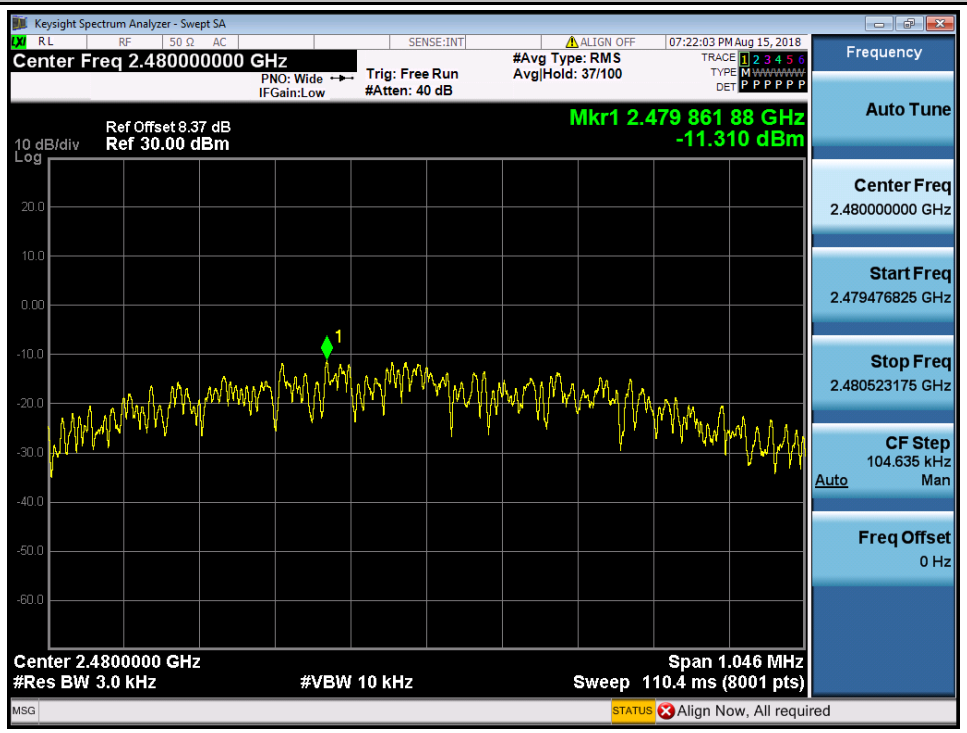
Maximum Peak power spectral density_BLE_2402_Ant1



Maximum Peak power spectral density_BLE_2442_Ant1



Maximum Peak power spectral density_BLE_2480_Ant1

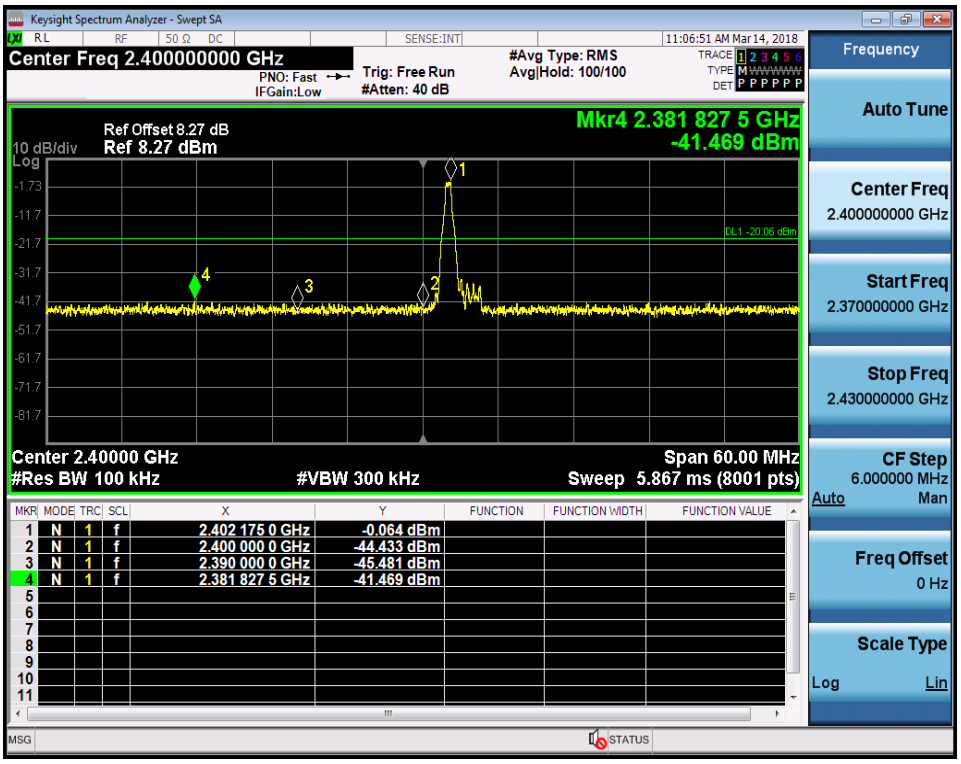


4.Band-edge for RF Conducted Emissions

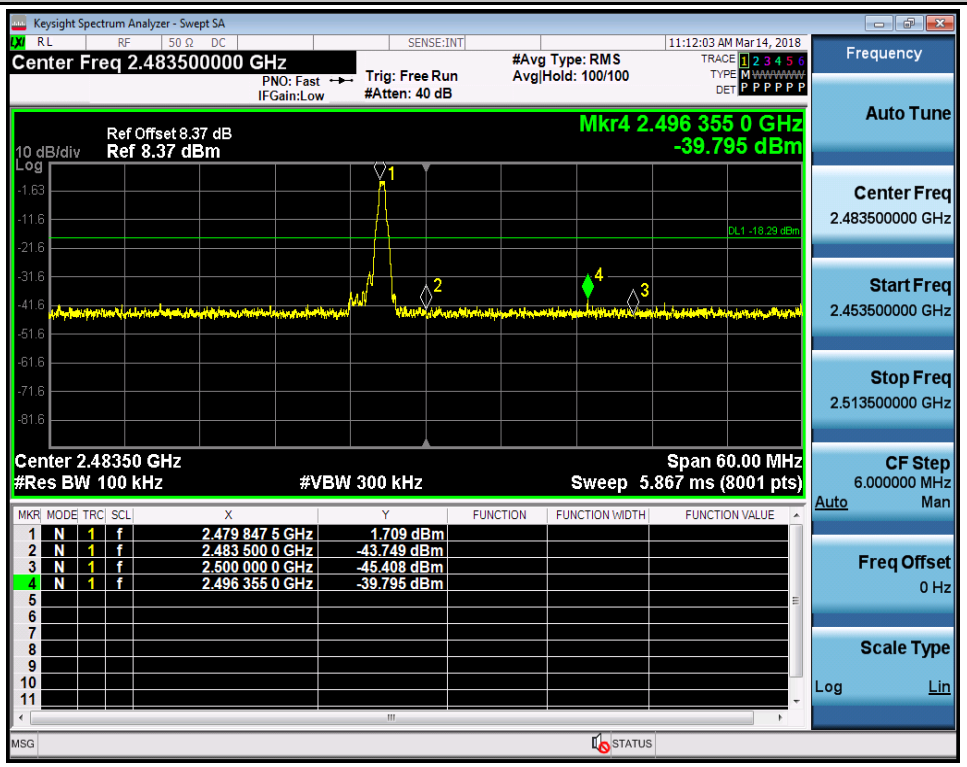
Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	-0.064	-41.469	-20.06	PASS
BLE	2480	Ant1	1.709	-39.795	-18.29	PASS

TEST PLOT

Band-edge for RF Conducted Emissions_BLE_2402_Ant1



Band-edge for RF Conducted Emissions_BLE_2480_Ant1



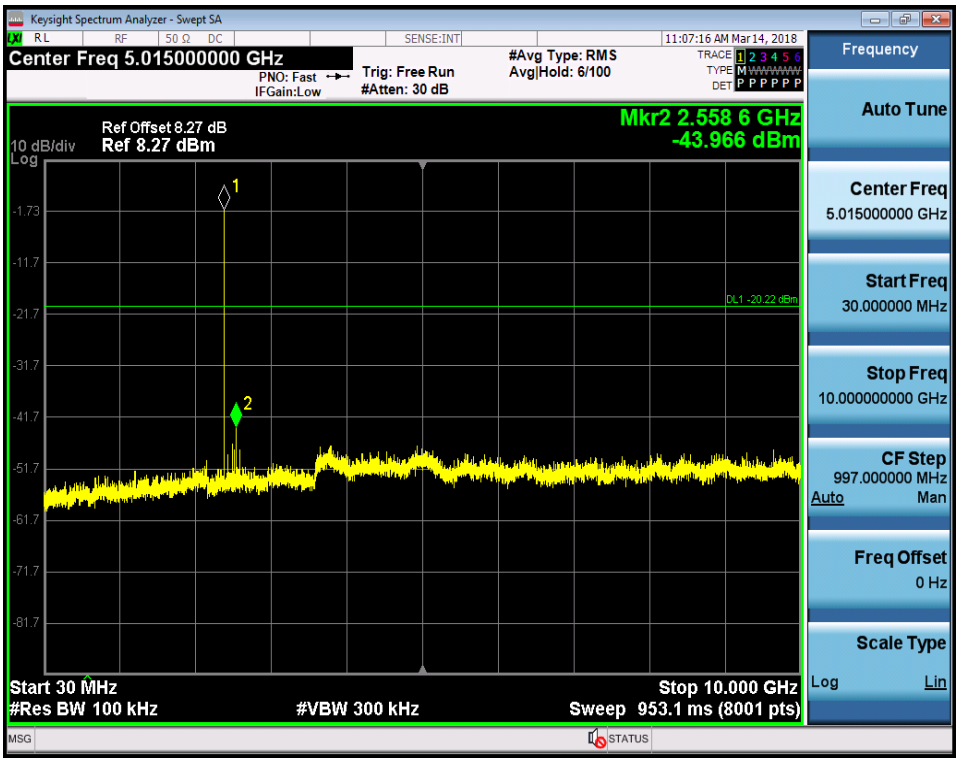
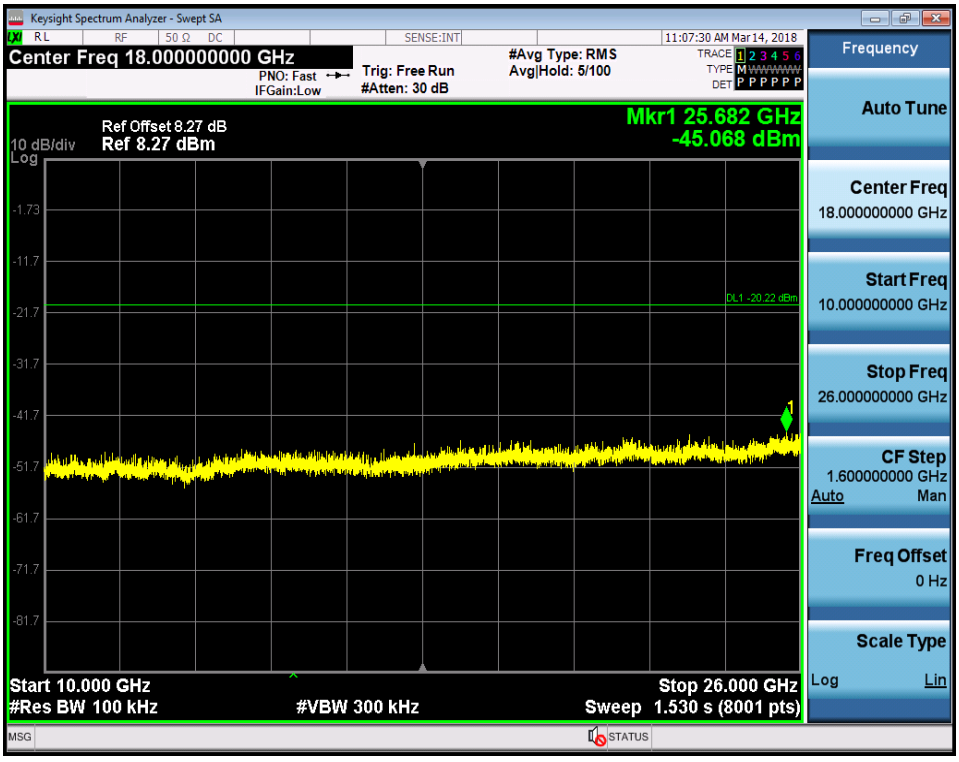
5.RF Conducted Spurious Emissions

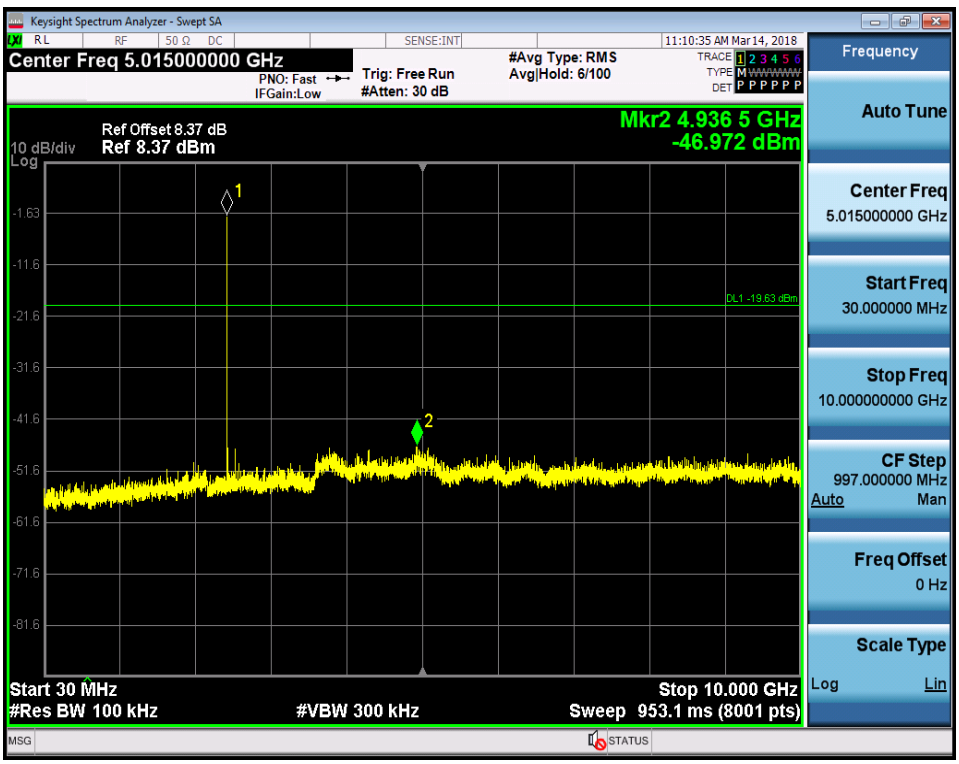
Test Mode	Test Channel	Ant	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	30	10000	100	300	-0.223	-43.966	<-20.223	PASS
BLE	2402	Ant1	10000	26000	100	300	-0.223	-45.068	<-20.223	PASS
BLE	2442	Ant1	30	10000	100	300	0.366	-46.972	<-19.634	PASS
BLE	2442	Ant1	10000	26000	100	300	0.366	-44.122	<-19.634	PASS
BLE	2480	Ant1	30	10000	100	300	1.678	-47.772	<-18.322	PASS
BLE	2480	Ant1	10000	26000	100	300	1.678	-45.003	<-18.322	PASS

TEST PLOT

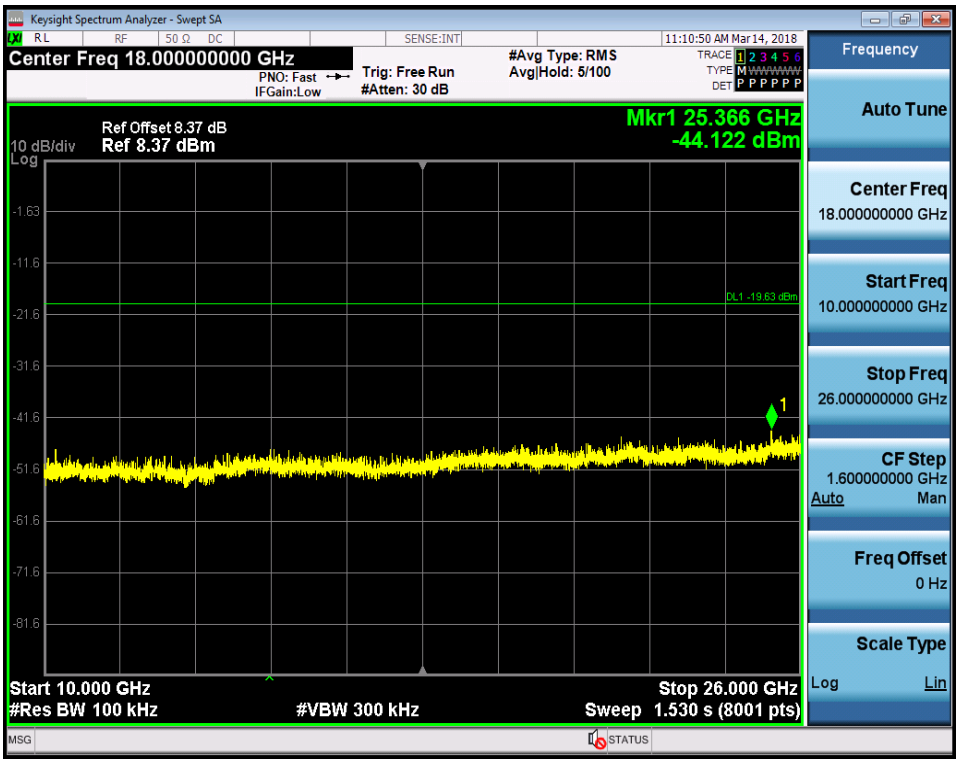
RF Conducted Spurious Emissions_BLE_2402_Ant1

Pref

CSE_1	
CSE_2	

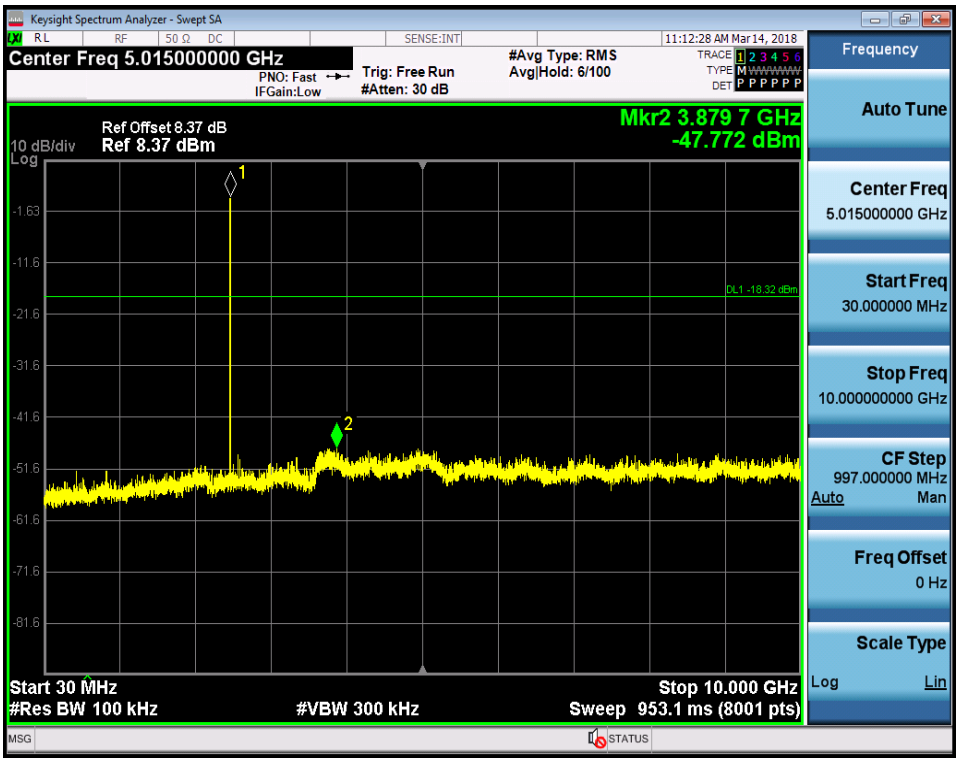
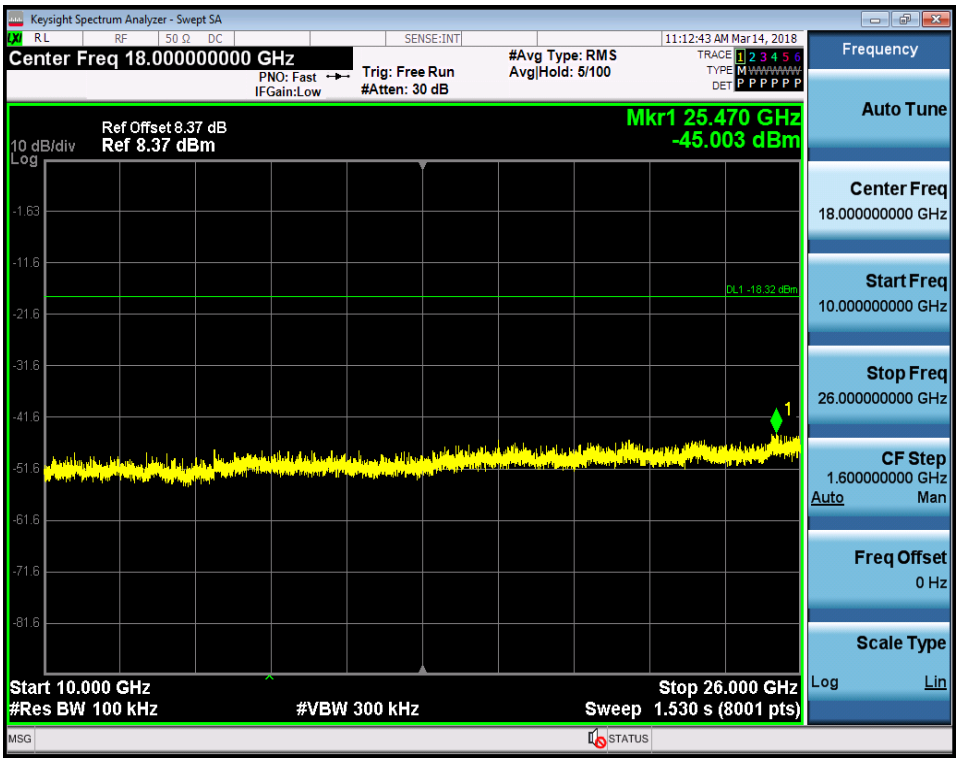
RF Conducted Spurious Emissions_BLE_2442_Ant1	
Pref	
CSE_1	

CSE_2



RF Conducted Spurious Emissions_BLE_2480_Ant1

Pref

CSE_1	
CSE_2	

--End of Report—