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

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

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TEST REPORT

Application No.:	GZEM1810002089CR
Applicant:	Kysho Multimedia Ltd.
Address of Applicant:	Flat F, 5/F Valiant Industrial Centre, 2-12 Au Pui Wan ST, Fo Tan, Shatin
Manufacturer:	Kysho Multimedia Ltd.
Address of Manufacturer:	Flat F, 5/F Valiant Industrial Centre, 2-12 Au Pui Wan ST, Fo Tan, Shatin
Factory:	1, Huizhou ShenKe XinFei Technology Co. Ltd 2, Dongguan Longyi Electronics Co., Ltd
Address of Factory:	1, Building C Tangxia Area, Chanjing Village Xinxu Town, Huiyang District, Huizhou, Guangdong Province, China 2, Jieling Industrial Zone No.8, GuanJingTou Village, Fenggang, Dongguan, 523690
Equipment Under Test (EUT):	
FCC ID: SP9-00011H	
EUT Name:	Bluetooth Speaker
Model No.:	IMW899, IMW901. ¤
¤	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	Altec Lansing
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2018-10-29
Date of Test:	2018-11-21 to 2019-01-18
Date of Issue:	2019-05-20
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.

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2019-05-20		Original

Authorized for issue by:				
Tested By		**Curry_Wu /Project Engineer**		2018-11-21 to 2019-01-18 **Date**
Checked By		**Ricky_Liu /Reviewer**		2019-02-18 **Date**

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	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 11.9.1	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 11.13.3.2	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 6.10.5	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 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

¤ **Declaration of EUT Family Grouping:**

Model No.: IMW899, IMW901

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 **IMW899** was tested in this report.

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4 General Information

4.1 Details of E.U.T.

Power Supply:	adapter model:JT012-1802500 input:100-240V AC 50/60Hz 1.5A output:DC 18V 2500mA
Test Voltage:	AC 120V
Cable:	About 1.8m x 2 wires unscreened DC mains cable
Antenna Gain	0dBi
Antenna Type	PCB 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 as an independent unit.

4.3 Measurement Uncertainty

RF

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%

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4.4 Test Location

All tests were performed at:

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No tests were sub-contracted.

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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-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

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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

Minimum 6dB 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
MI CABLE	SGS	1102098	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	1111736	EMC2137	2017-11-02	2019-11-01

Conducted Peak Output Power					
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
MI CABLE	SGS	1102098	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	1111736	EMC2137	2017-11-02	2019-11-01

Power Spectrum Density					
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

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MI CABLE	SGS	1102098	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	1111736	EMC2137	2017-11-02	2019-11-01

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Conducted Band Edges Measurement					
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
MI CABLE	SGS	1102098	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	1111736	EMC2137	2017-11-02	2019-11-01

Conducted Spurious Emissions					
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
MI CABLE	SGS	1102098	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	1111736	EMC2137	2017-11-02	2019-11-01

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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	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	2018-02-24	2019-02-23
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

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Radiated Spurious 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	2018-02-24	2019-02-23
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

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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)

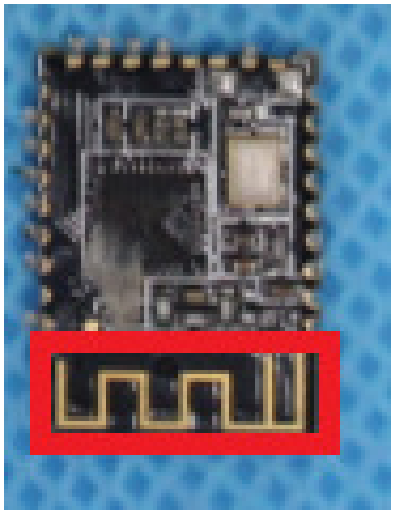
6.1.2 Conclusion

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.

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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.		

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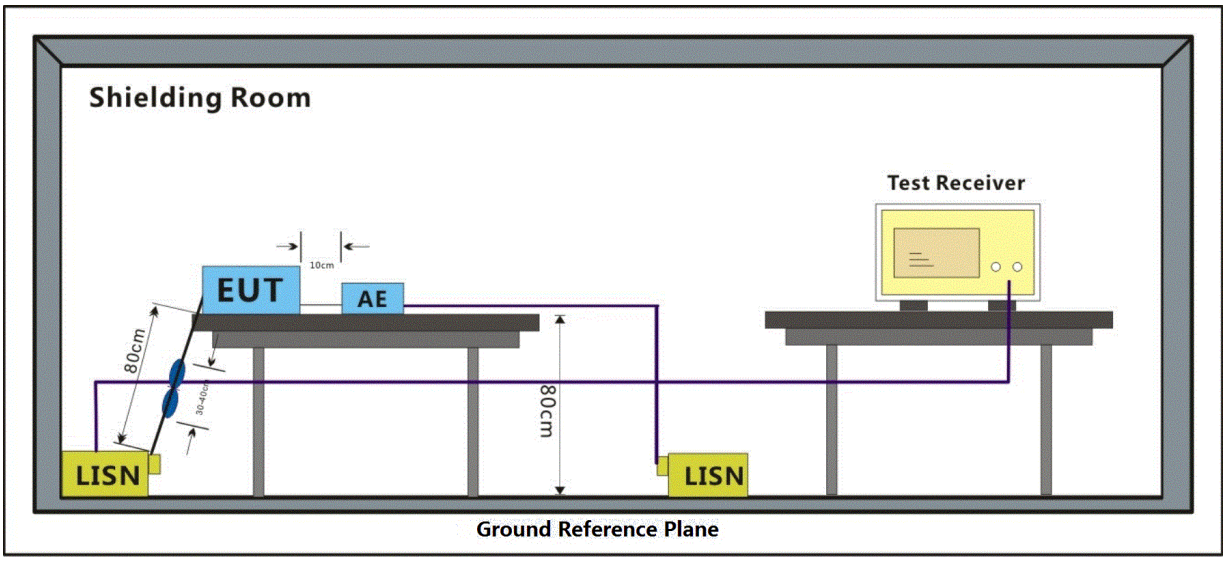
7.1.1 E.U.T. Operation

Operating Environment:

Temperature:	25.2 °C	Humidity:	60	% RH	Atmospheric Pressure:	1020	mbar

Pretest these modes to find the worst case:	d:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation e:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.
The worst case for final test:	e: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

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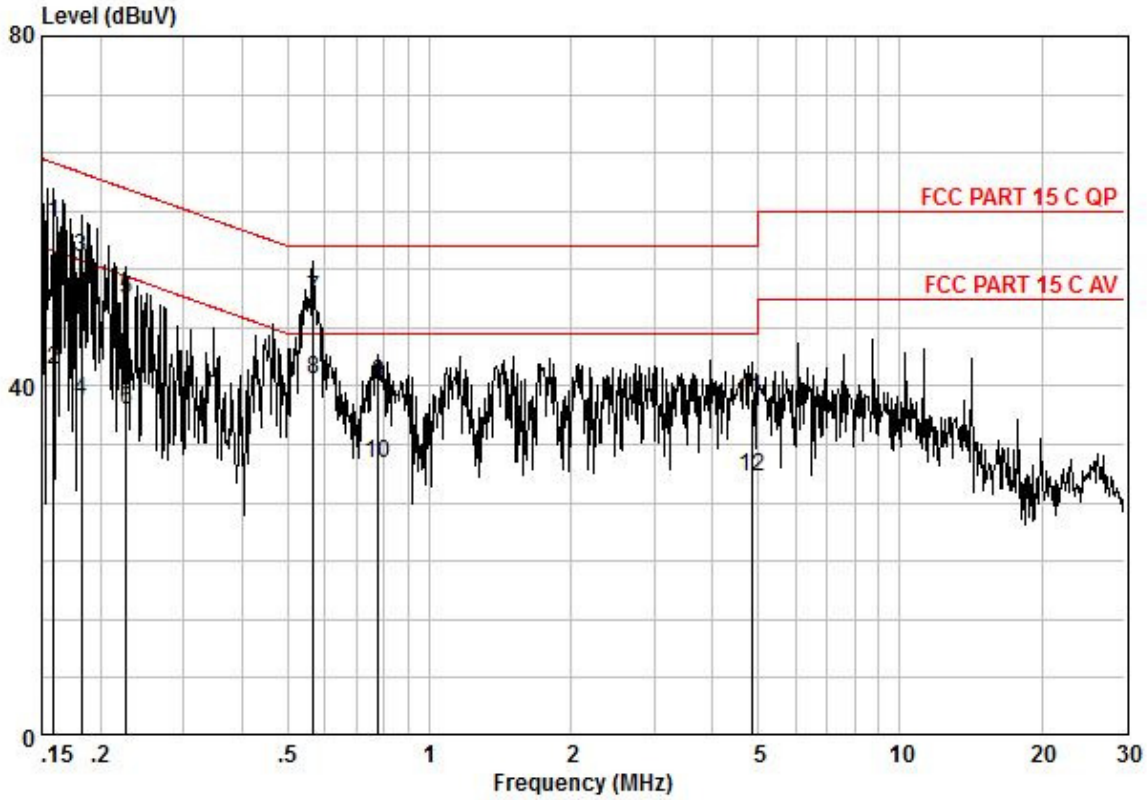
Mode:e; Line:Live Line



Pol :LIVE
No :RT
Model :BT

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.16	48.97	0.10	9.49	58.56	65.52	-6.95	QP
0.16	32.19	0.10	9.49	41.78	55.52	-13.73	AVERAGE
0.18	45.03	0.10	9.57	54.70	64.37	-9.67	QP
0.18	28.69	0.10	9.57	38.36	54.37	-16.01	AVERAGE
0.23	40.23	0.11	9.62	49.97	62.57	-12.60	QP
0.23	27.44	0.11	9.62	37.18	52.57	-15.39	AVERAGE
0.57	40.06	0.22	9.63	49.91	56.00	-6.09	QP
0.57	30.97	0.22	9.63	40.82	46.00	-5.18	AVERAGE
0.78	30.45	0.26	9.62	40.33	56.00	-15.67	QP
0.78	21.29	0.26	9.62	31.17	46.00	-14.83	AVERAGE
4.85	28.32	0.69	9.63	38.64	56.00	-17.36	QP
4.85	19.26	0.69	9.63	29.58	46.00	-16.42	AVERAGE

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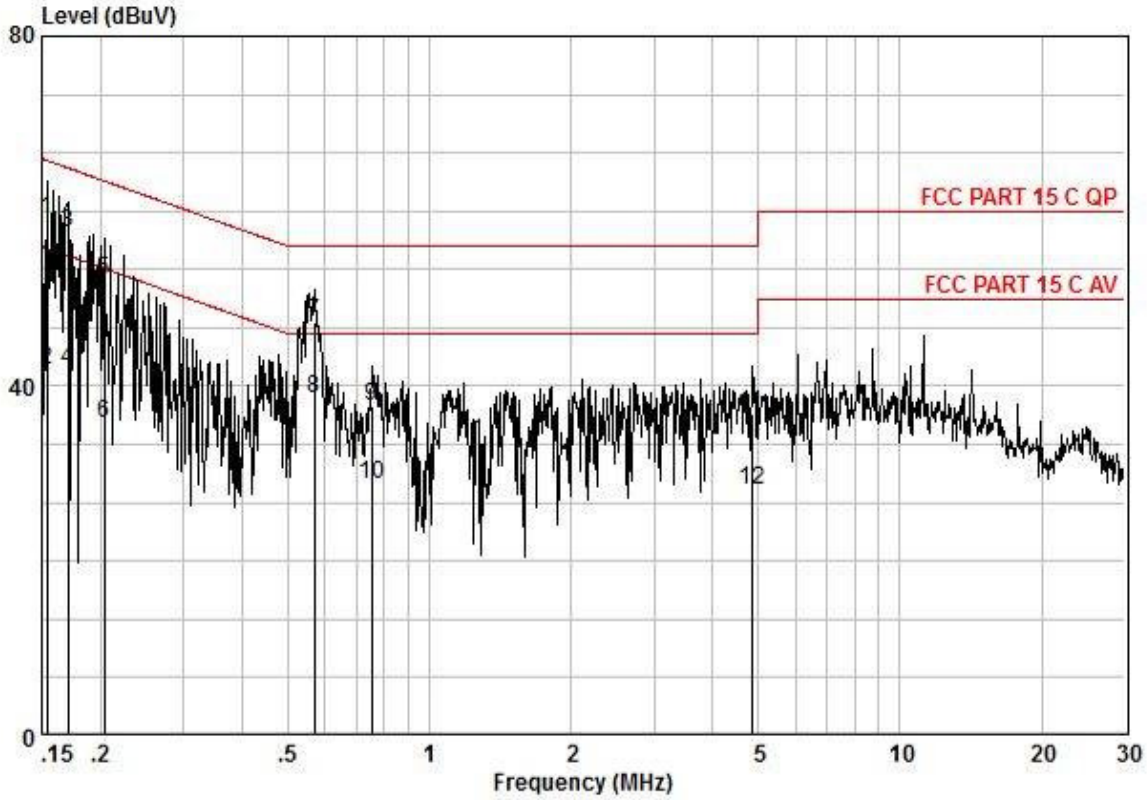
Mode:e; Line:Neutral Line



Pol :NEUTRAL
No :RT
Model :BT

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.15	49.53	0.10	9.40	59.03	65.78	-6.75	QP
0.15	32.30	0.10	9.40	41.80	55.78	-13.98	AVERAGE
0.17	48.07	0.10	9.48	57.65	64.94	-7.30	QP
0.17	32.18	0.10	9.48	41.76	54.94	-13.19	AVERAGE
0.20	42.41	0.10	9.59	52.10	63.45	-11.35	QP
0.20	26.00	0.10	9.59	35.69	53.45	-17.76	AVERAGE
0.57	37.46	0.22	9.57	47.24	56.00	-8.76	QP
0.57	28.75	0.22	9.57	38.53	46.00	-7.47	AVERAGE
0.75	27.89	0.26	9.59	37.74	56.00	-18.26	QP
0.75	18.97	0.26	9.59	28.82	46.00	-17.18	AVERAGE
4.85	26.45	0.69	9.61	36.75	56.00	-19.25	QP
4.85	17.91	0.69	9.61	28.21	46.00	-17.79	AVERAGE

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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

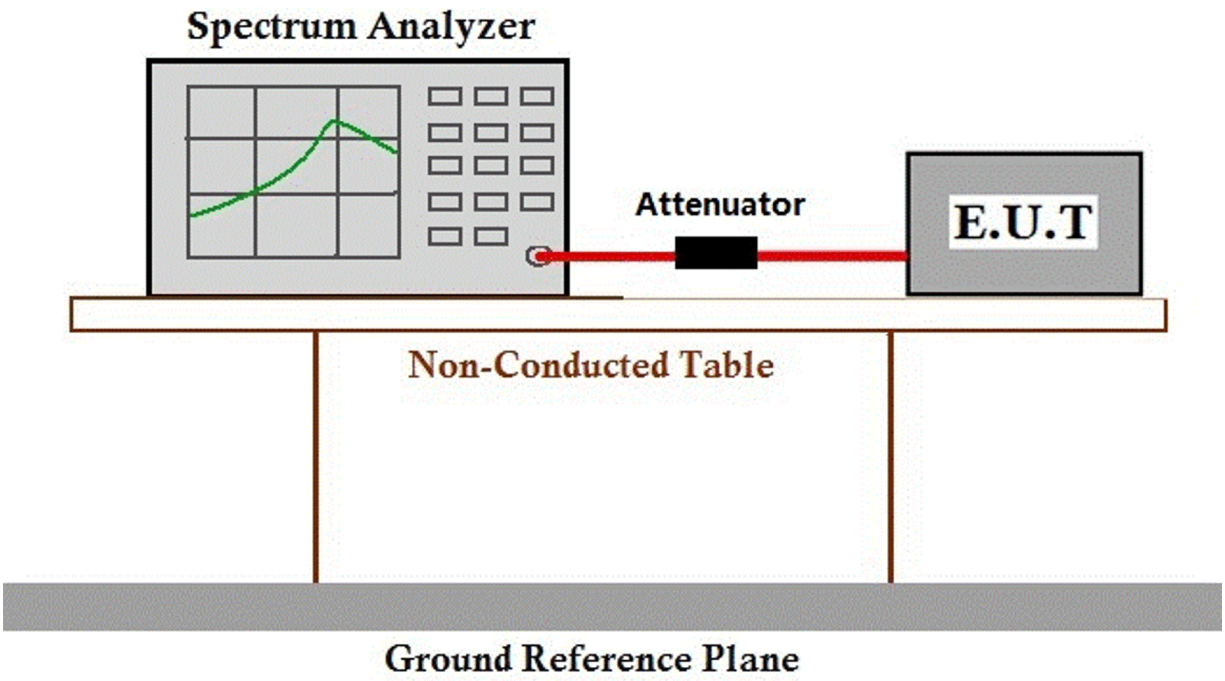
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C Humidity: 58.3 % RH Atmospheric Pressure: 1020 mbar

Test mode d: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

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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 11.9.1

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

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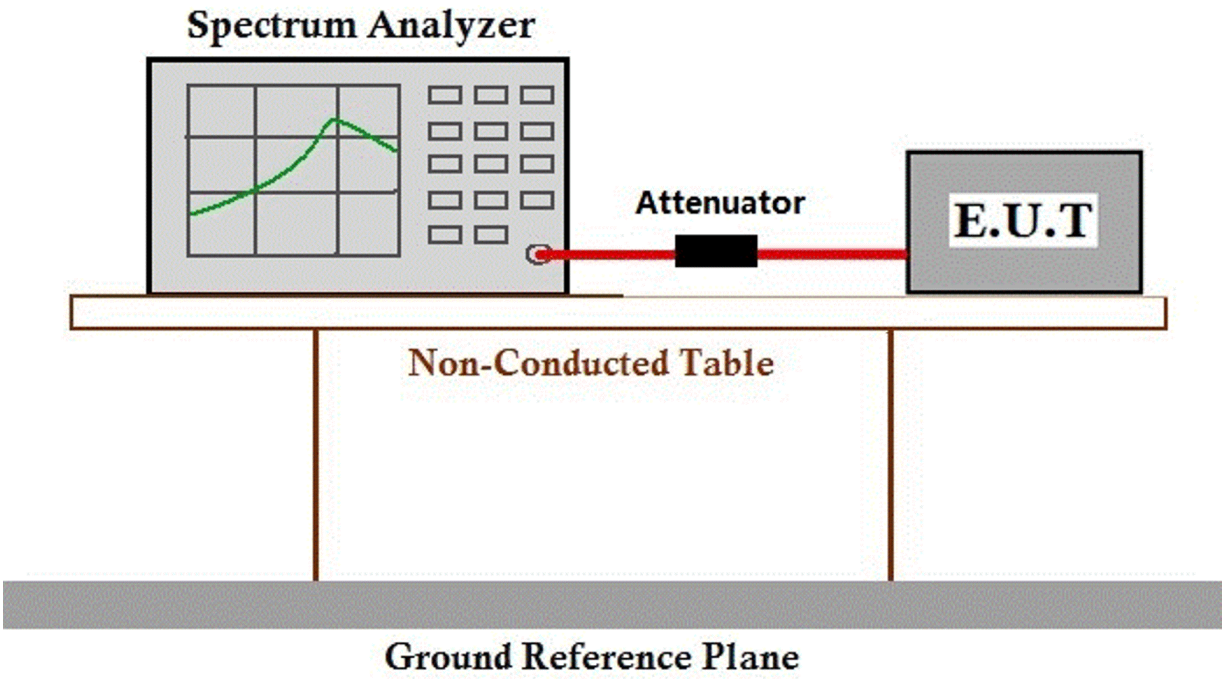
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C Humidity: 58.3 % RH Atmospheric Pressure: 1020 mbar

Test mode d: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

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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

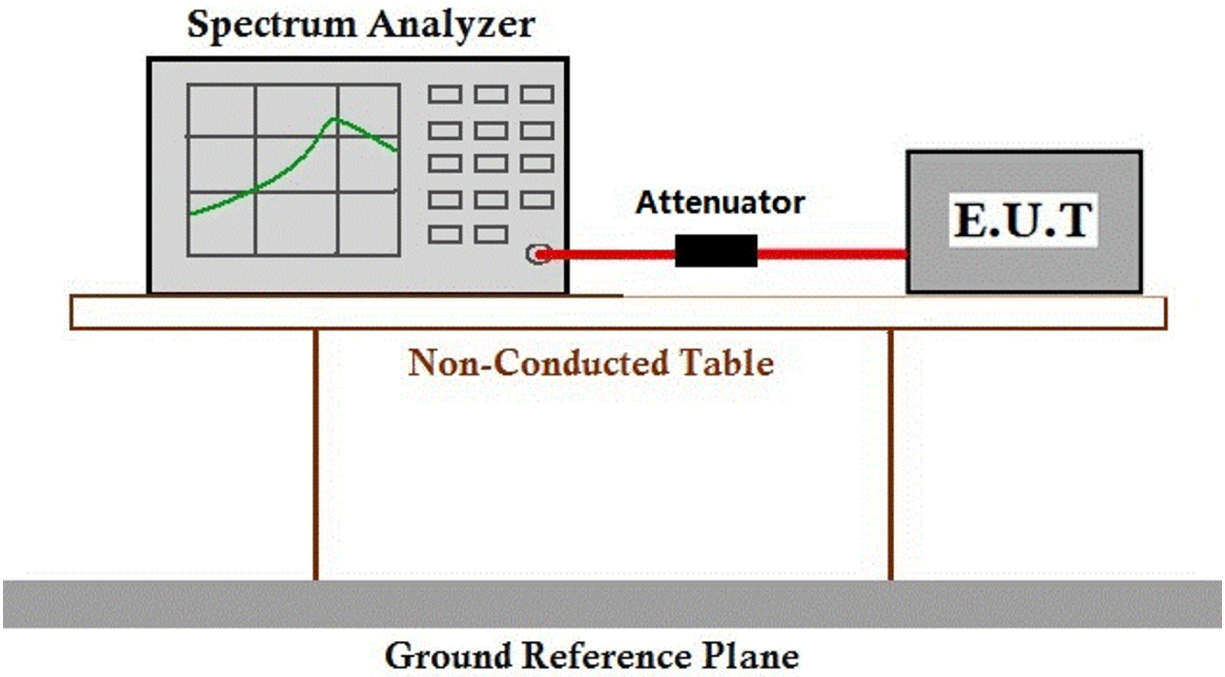
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C Humidity: 58.3 % RH Atmospheric Pressure: 1020 mbar

Test mode: d: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

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7.5 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 11.13.3.2
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)

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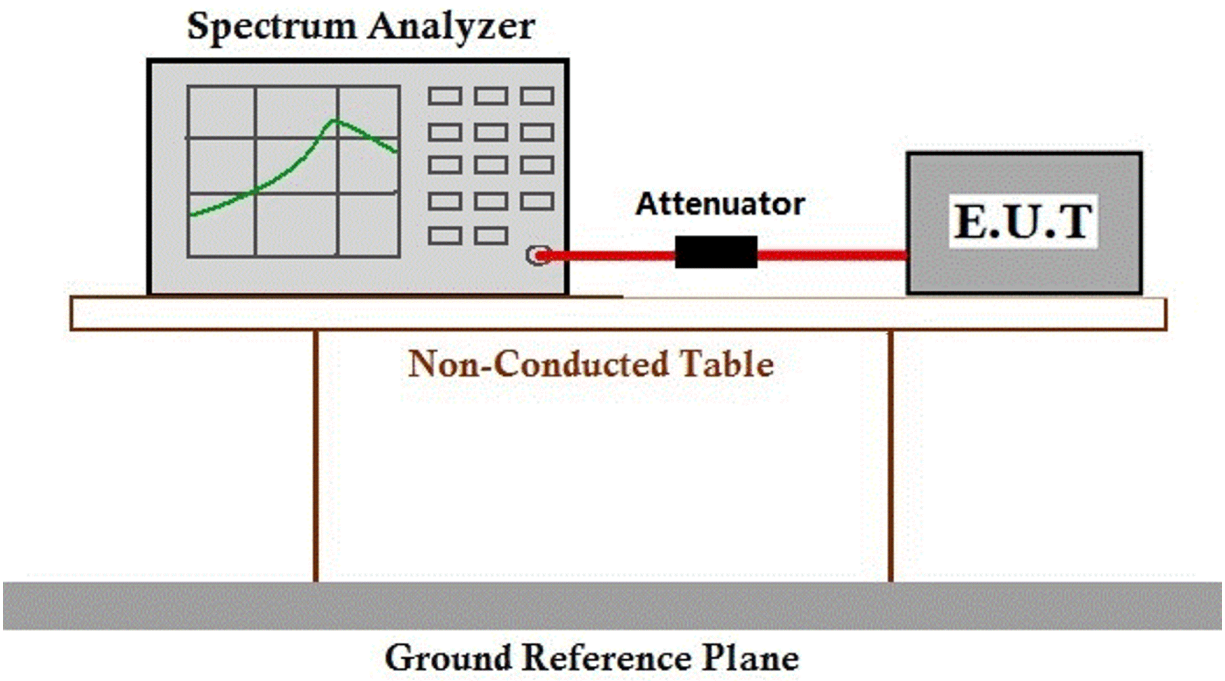
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C Humidity: 58.3 % RH Atmospheric Pressure: 1020 mbar

Test mode d: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

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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)

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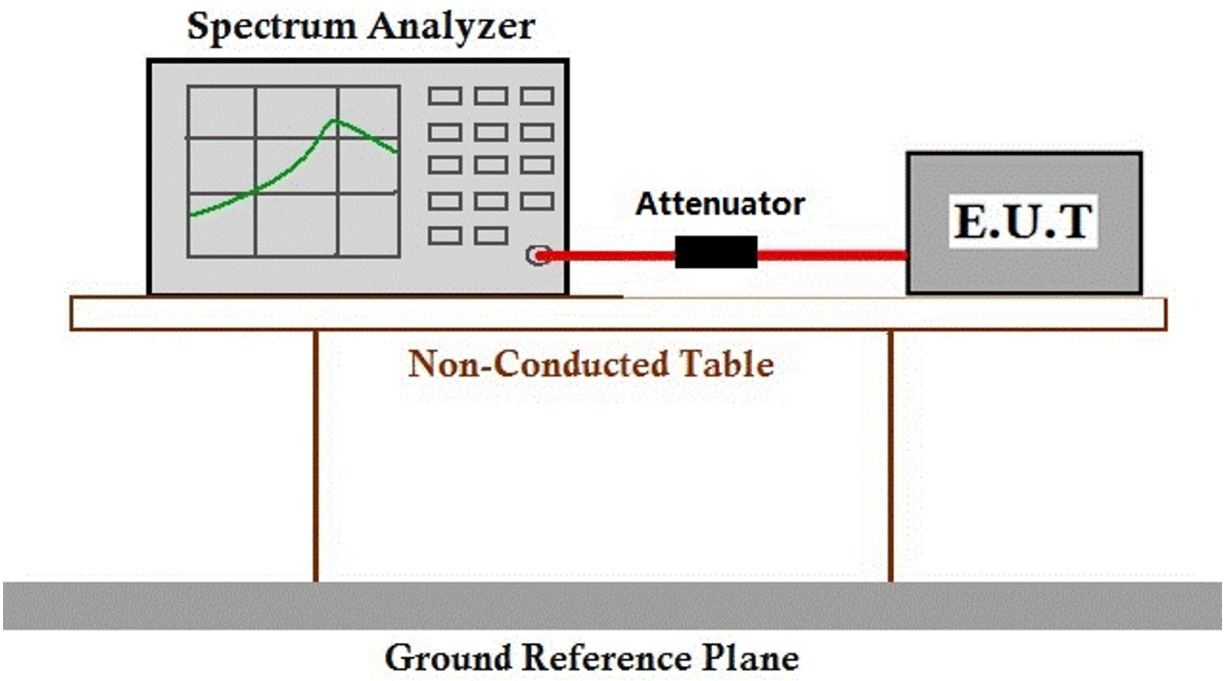
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C Humidity: 58.3 % RH Atmospheric Pressure: 1020 mbar

Test mode d: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

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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 6.10.5
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.		

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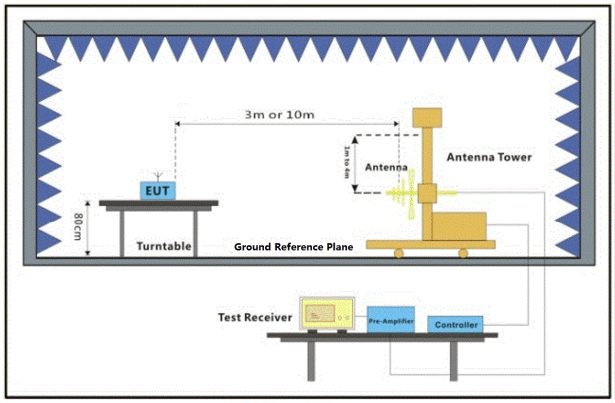
7.7.1 E.U.T. Operation

Operating Environment:

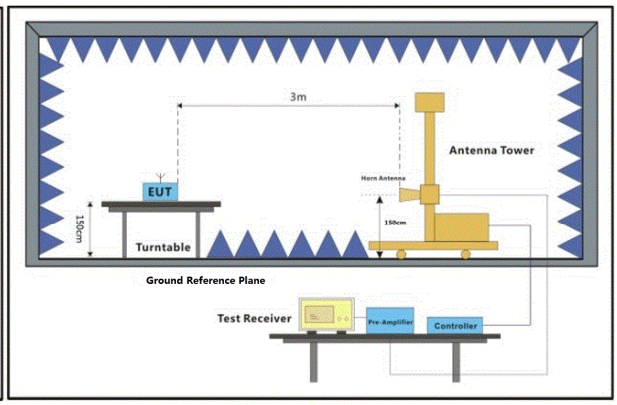
Temperature:	24.1 °C	Humidity:	70.5 % RH	Atmospheric Pressure:	1020	mbar

Pretest these modes to find the worst case:	d:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation e:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.
The worst case for final test:	d:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.7.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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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 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 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.

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

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

	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	34.05	26.25	5.03	37.44	27.89	54.00	-26.11	HORIZONTAL	Average
2	2310.000	45.82	26.25	5.03	37.44	39.66	74.00	-34.34	HORIZONTAL	Peak
3	2390.000	35.74	26.43	4.88	37.42	29.63	54.00	-24.37	HORIZONTAL	Average
4	2390.000	45.44	26.43	4.88	37.42	39.33	74.00	-34.67	HORIZONTAL	Peak
5	2483.500	34.99	26.58	5.23	37.40	29.40	54.00	-24.60	HORIZONTAL	Average
6	2483.500	45.78	26.58	5.23	37.40	40.19	74.00	-33.81	HORIZONTAL	Peak
7	2500.000	34.04	26.60	4.95	37.39	28.20	54.00	-25.80	HORIZONTAL	Average
8	2500.000	46.25	26.60	4.95	37.39	40.41	74.00	-33.59	HORIZONTAL	Peak

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

	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	32.95	26.25	5.03	37.44	26.79	54.00	-27.21	VERTICAL	Average
2	2310.000	45.71	26.25	5.03	37.44	39.55	74.00	-34.45	VERTICAL	Peak
3	2390.000	34.87	26.43	4.88	37.42	28.76	54.00	-25.24	VERTICAL	Average
4	2390.000	46.28	26.43	4.88	37.42	40.17	74.00	-33.83	VERTICAL	Peak
5	2483.500	33.89	26.58	5.23	37.40	28.30	54.00	-25.70	VERTICAL	Average
6	2483.500	45.28	26.58	5.23	37.40	39.69	74.00	-34.31	VERTICAL	Peak
7	2500.000	33.58	26.60	4.95	37.39	27.74	54.00	-26.26	VERTICAL	Average
8	2500.000	46.69	26.60	4.95	37.39	40.85	74.00	-33.15	VERTICAL	Peak

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

	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	33.92	26.25	5.03	37.44	27.76	54.00	-26.24	HORIZONTAL	Average
2	2310.000	46.01	26.25	5.03	37.44	39.85	74.00	-34.15	HORIZONTAL	Peak
3	2390.000	34.81	26.43	4.88	37.42	28.70	54.00	-25.30	HORIZONTAL	Average
4	2390.000	46.74	26.43	4.88	37.42	40.63	74.00	-33.37	HORIZONTAL	Peak
5	2483.500	33.54	26.58	5.23	37.40	27.95	54.00	-26.05	HORIZONTAL	Average
6	2483.500	45.56	26.58	5.23	37.40	39.97	74.00	-34.03	HORIZONTAL	Peak
7	2500.000	33.04	26.60	4.95	37.39	27.20	54.00	-26.80	HORIZONTAL	Average
8	2500.000	47.10	26.60	4.95	37.39	41.26	74.00	-32.74	HORIZONTAL	Peak

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

	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	34.95	26.25	5.03	37.44	28.79	54.00	-25.21	VERTICAL	Average
2	2310.000	45.55	26.25	5.03	37.44	39.39	74.00	-34.61	VERTICAL	Peak
3	2390.000	33.75	26.43	4.88	37.42	27.64	54.00	-26.36	VERTICAL	Average
4	2390.000	45.86	26.43	4.88	37.42	39.75	74.00	-34.25	VERTICAL	Peak
5	2483.500	31.38	26.58	5.23	37.40	25.79	54.00	-28.21	VERTICAL	Average
6	2483.500	44.86	26.58	5.23	37.40	39.27	74.00	-34.73	VERTICAL	Peak
7	2500.000	32.89	26.60	4.95	37.39	27.05	54.00	-26.95	VERTICAL	Average
8	2500.000	45.01	26.60	4.95	37.39	39.17	74.00	-34.83	VERTICAL	Peak

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7.8 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6
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.		

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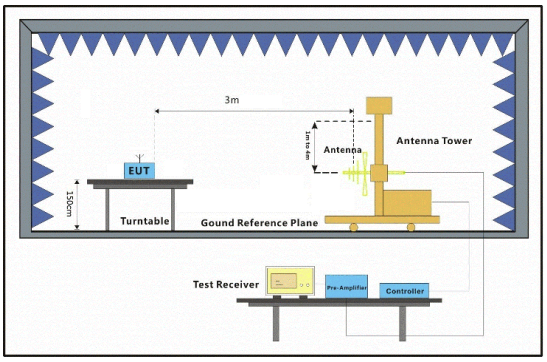
7.8.1 E.U.T. Operation

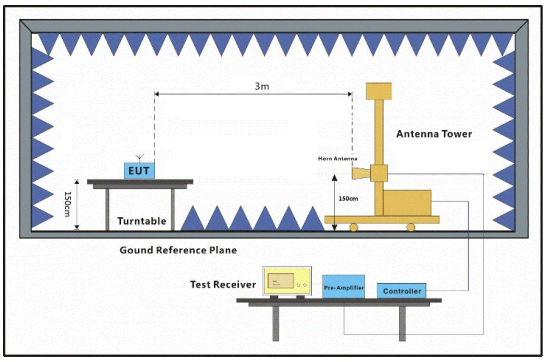
Operating Environment:

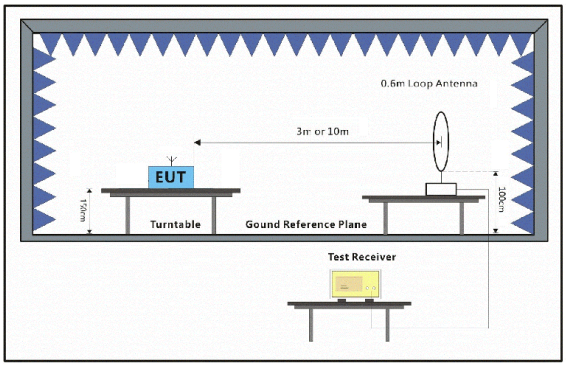
Temperature:	24.1 °C	Humidity:	70.5 % RH	Atmospheric Pressure:	1020	mbar

Pretest these modes to find the worst case:	d:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation e:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.
The worst case for final test:	d:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.8.2 Test Setup Diagram







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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 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:

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

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

	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	31.955	25.35	12.25	0.11	21.90	15.81	40.00	-24.19	HORIZONTAL	QP
2	36.766	29.25	12.52	0.34	23.01	19.10	40.00	-20.90	HORIZONTAL	QP
3	59.025	23.36	12.25	0.58	25.21	10.98	40.00	-29.02	HORIZONTAL	QP
4	166.068	28.90	13.22	1.29	28.09	15.32	43.50	-28.18	HORIZONTAL	QP
5	813.112	29.14	22.83	2.77	28.61	26.13	46.00	-19.87	HORIZONTAL	QP
6	896.997	34.24	23.98	2.85	27.93	33.14	46.00	-12.86	HORIZONTAL	QP

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

	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	4027.554	32.92	29.52	7.17	36.90	32.71	54.00	-21.29	HORIZONTAL	Average
2	4027.554	44.90	29.52	7.17	36.90	44.69	74.00	-29.31	HORIZONTAL	Peak
3	4804.993	36.20	30.79	5.87	36.94	35.92	54.00	-18.08	HORIZONTAL	Average
4	4804.993	46.61	30.79	5.87	36.94	46.33	74.00	-27.67	HORIZONTAL	Peak
5	7206.262	31.25	35.45	7.34	36.93	37.11	54.00	-16.89	HORIZONTAL	Average
6	7206.262	42.32	35.45	7.34	36.93	48.18	74.00	-25.82	HORIZONTAL	Peak
7	8021.160	30.31	36.49	8.35	36.90	38.25	54.00	-15.75	HORIZONTAL	Average
8	8021.160	43.25	36.49	8.35	36.90	51.19	74.00	-22.81	HORIZONTAL	Peak
9	9608.820	42.32	37.51	8.15	37.08	50.90	54.00	-3.10	HORIZONTAL	Average
10	9608.820	45.77	37.51	8.15	37.08	54.35	74.00	-19.65	HORIZONTAL	Peak
11	12010.220	29.73	39.50	10.67	37.20	42.70	54.00	-11.30	HORIZONTAL	Average
12	12010.220	41.52	39.50	10.67	37.20	54.49	74.00	-19.51	HORIZONTAL	Peak

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

	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	31.955	25.66	12.25	0.11	21.90	16.12	40.00	-23.88	VERTICAL	QP
2	36.766	28.91	12.52	0.34	23.01	18.76	40.00	-21.24	VERTICAL	QP
3	64.887	25.06	11.50	0.65	25.38	11.83	40.00	-28.17	VERTICAL	QP
4	159.784	27.41	13.40	1.26	28.10	13.97	43.50	-29.53	VERTICAL	QP
5	694.417	28.99	21.38	2.25	28.87	23.75	46.00	-22.25	VERTICAL	QP
6	935.546	28.08	24.35	3.64	28.26	27.81	46.00	-18.19	VERTICAL	QP

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

	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	3890.255	33.75	29.27	7.61	36.91	33.72	54.00	-20.28	VERTICAL	Average
2	3890.255	44.72	29.27	7.61	36.91	44.69	74.00	-29.31	VERTICAL	Peak
3	4804.058	35.89	30.79	5.87	36.94	35.61	54.00	-18.39	VERTICAL	Average
4	4804.058	46.76	30.79	5.87	36.94	46.48	74.00	-27.52	VERTICAL	Peak
5	7206.015	31.66	35.45	7.34	36.93	37.52	54.00	-16.48	VERTICAL	Average
6	7206.015	44.05	35.45	7.34	36.93	49.91	74.00	-24.09	VERTICAL	Peak
7	8416.584	30.78	36.15	8.07	36.93	38.07	54.00	-15.93	VERTICAL	Average
8	8416.584	43.40	36.15	8.07	36.93	50.69	74.00	-23.31	VERTICAL	Peak
9	9608.430	38.08	37.51	8.15	37.08	46.66	54.00	-7.34	VERTICAL	Average
10	9608.430	45.85	37.51	8.15	37.08	54.43	74.00	-19.57	VERTICAL	Peak
11	12010.070	28.84	39.50	10.67	37.20	41.81	54.00	-12.19	VERTICAL	Average
12	12010.070	41.96	39.50	10.67	37.20	54.93	74.00	-19.07	VERTICAL	Peak

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	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	3790.361	33.07	28.97	7.83	36.92	32.95	54.00	-21.05	HORIZONTAL	Average
2	3790.361	44.19	28.97	7.83	36.92	44.07	74.00	-29.93	HORIZONTAL	Peak
3	4884.993	34.87	30.95	6.86	36.95	35.73	54.00	-18.27	HORIZONTAL	Average
4	4884.993	45.71	30.95	6.86	36.95	46.57	74.00	-27.43	HORIZONTAL	Peak
5	7326.349	30.60	35.74	7.39	36.92	36.81	54.00	-17.19	HORIZONTAL	Average
6	7326.349	43.20	35.74	7.39	36.92	49.41	74.00	-24.59	HORIZONTAL	Peak
7	8613.468	29.06	36.18	7.97	36.95	36.26	54.00	-17.74	HORIZONTAL	Average
8	8613.468	43.24	36.18	7.97	36.95	50.44	74.00	-23.56	HORIZONTAL	Peak
9	9768.390	31.26	37.74	8.37	37.09	40.28	54.00	-13.72	HORIZONTAL	Average
10	9768.390	43.14	37.74	8.37	37.09	52.16	74.00	-21.84	HORIZONTAL	Peak
11	12210.420	28.05	39.21	10.98	37.06	41.18	54.00	-12.82	HORIZONTAL	Average
12	12210.420	40.25	39.21	10.98	37.06	53.38	74.00	-20.62	HORIZONTAL	Peak

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

	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	4157.664	33.84	29.66	6.72	36.90	33.32	54.00	-20.68	VERTICAL	Average
2	4157.664	45.67	29.66	6.72	36.90	45.15	74.00	-28.85	VERTICAL	Peak
3	4884.497	33.28	30.95	6.86	36.95	34.14	54.00	-19.86	VERTICAL	Average
4	4884.497	45.47	30.95	6.86	36.95	46.33	74.00	-27.67	VERTICAL	Peak
5	7326.063	31.80	35.74	7.39	36.92	38.01	54.00	-15.99	VERTICAL	Average
6	7326.063	42.58	35.74	7.39	36.92	48.79	74.00	-25.21	VERTICAL	Peak
7	8514.456	30.33	36.11	8.02	36.94	37.52	54.00	-16.48	VERTICAL	Average
8	8514.456	43.81	36.11	8.02	36.94	51.00	74.00	-23.00	VERTICAL	Peak
9	9768.151	30.43	37.74	8.37	37.09	39.45	54.00	-14.55	VERTICAL	Average
10	9768.151	43.02	37.74	8.37	37.09	52.04	74.00	-21.96	VERTICAL	Peak
11	12210.850	28.75	39.21	10.98	37.06	41.88	54.00	-12.12	VERTICAL	Average
12	12210.850	40.58	39.21	10.98	37.06	53.71	74.00	-20.29	VERTICAL	Peak

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

	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	3834.438	30.22	29.12	7.80	36.91	30.23	54.00	-23.77	HORIZONTAL	Average
2	3834.438	44.23	29.12	7.80	36.91	44.24	74.00	-29.76	HORIZONTAL	Peak
3	4960.490	30.28	31.05	7.84	36.96	32.21	54.00	-21.79	HORIZONTAL	Average
4	4960.490	42.32	31.05	7.84	36.96	44.25	74.00	-29.75	HORIZONTAL	Peak
5	7440.516	32.04	35.92	7.43	36.92	38.47	54.00	-15.53	HORIZONTAL	Average
6	7440.516	42.51	35.92	7.43	36.92	48.94	74.00	-25.06	HORIZONTAL	Peak
7	8416.584	30.41	36.15	8.07	36.93	37.70	54.00	-16.30	HORIZONTAL	Average
8	8416.584	43.95	36.15	8.07	36.93	51.24	74.00	-22.76	HORIZONTAL	Peak
9	9920.390	31.81	37.92	8.63	37.10	41.26	54.00	-12.74	HORIZONTAL	Average
10	9920.390	42.77	37.92	8.63	37.10	52.22	74.00	-21.78	HORIZONTAL	Peak
11	12400.220	27.97	38.93	11.17	36.90	41.17	54.00	-12.83	HORIZONTAL	Average
12	12400.220	40.97	38.93	11.17	36.90	54.17	74.00	-19.83	HORIZONTAL	Peak

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

	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	3515.957	34.49	27.94	6.05	36.95	31.53	54.00	-22.47	VERTICAL	Average
2	3515.957	45.30	27.94	6.05	36.95	42.34	74.00	-31.66	VERTICAL	Peak
3	4960.490	30.88	31.05	7.84	36.96	32.81	54.00	-21.19	VERTICAL	Average
4	4960.490	42.87	31.05	7.84	36.96	44.80	74.00	-29.20	VERTICAL	Peak
5	7440.516	28.77	35.92	7.43	36.92	35.20	54.00	-18.80	VERTICAL	Average
6	7440.516	42.62	35.92	7.43	36.92	49.05	74.00	-24.95	VERTICAL	Peak
7	8368.069	29.13	36.18	8.11	36.93	36.49	54.00	-17.51	VERTICAL	Average
8	8368.069	42.75	36.18	8.11	36.93	50.11	74.00	-23.89	VERTICAL	Peak
9	9920.603	30.72	37.92	8.63	37.10	40.17	54.00	-13.83	VERTICAL	Average
10	9920.603	41.07	37.92	8.63	37.10	50.52	74.00	-23.48	VERTICAL	Peak
11	12400.420	27.43	38.93	11.17	36.90	40.63	54.00	-13.37	VERTICAL	Average
12	12400.420	40.71	38.93	11.17	36.90	53.91	74.00	-20.09	VERTICAL	Peak

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8 Appendix

8.1 Appendix 15.247

1.6dB Bandwidth

Test Mode	Test Channel	Ant	OBW[MHz]	EBW[MHz]	Limit	Verdict
BLE	2402	Ant1	1.0256	0.7005	0.5	PASS
BLE	2442	Ant1	1.0261	0.6952	0.5	PASS
BLE	2480	Ant1	1.0813	0.7014	0.5	PASS

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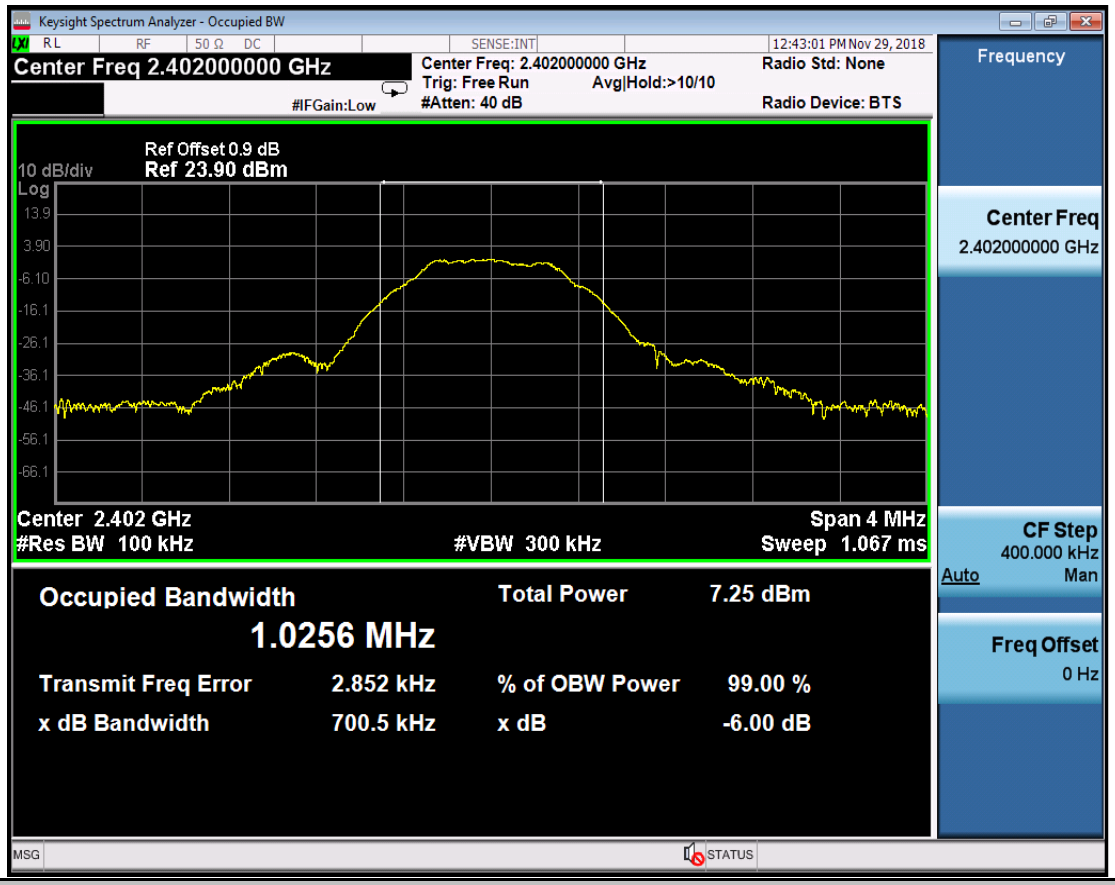
TEST PLOT

6dB Bandwidth_BLE_2402_Ant1



6dB Bandwidth_BLE_2442_Ant1

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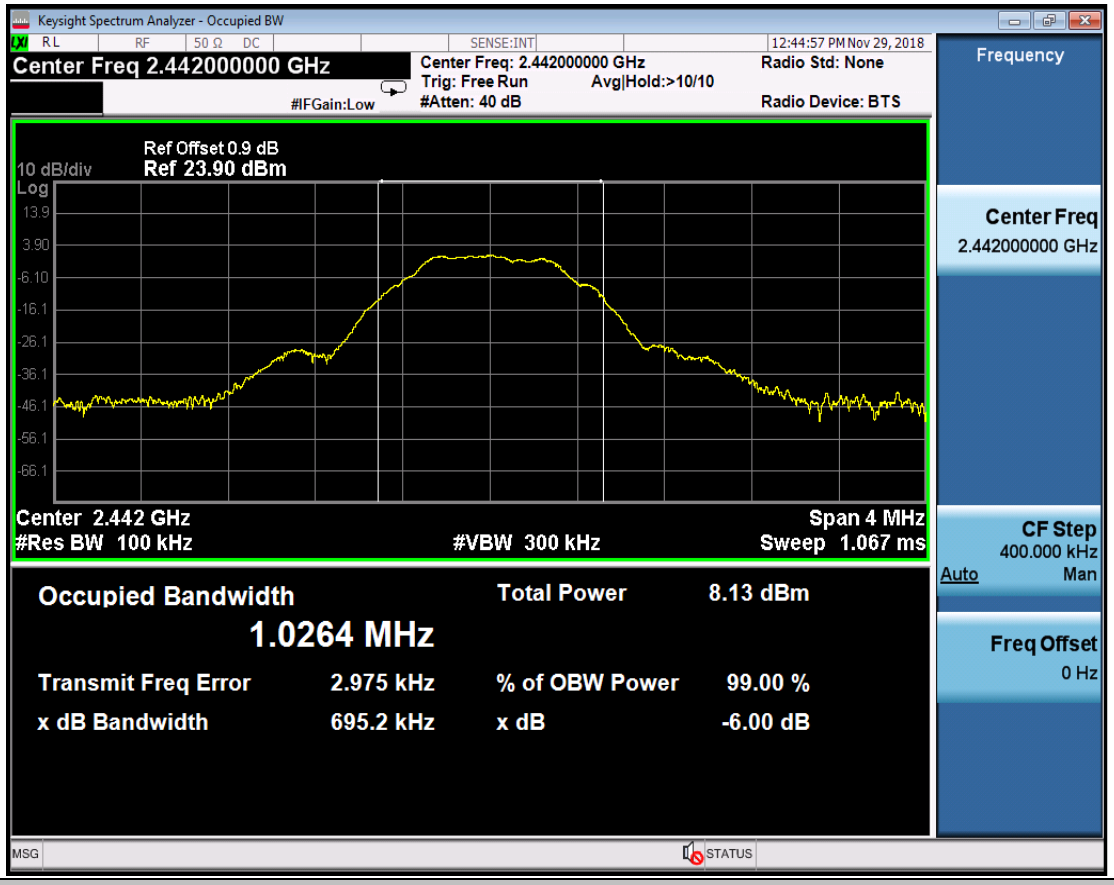

6dB Bandwidth_BLE_2480_Ant1

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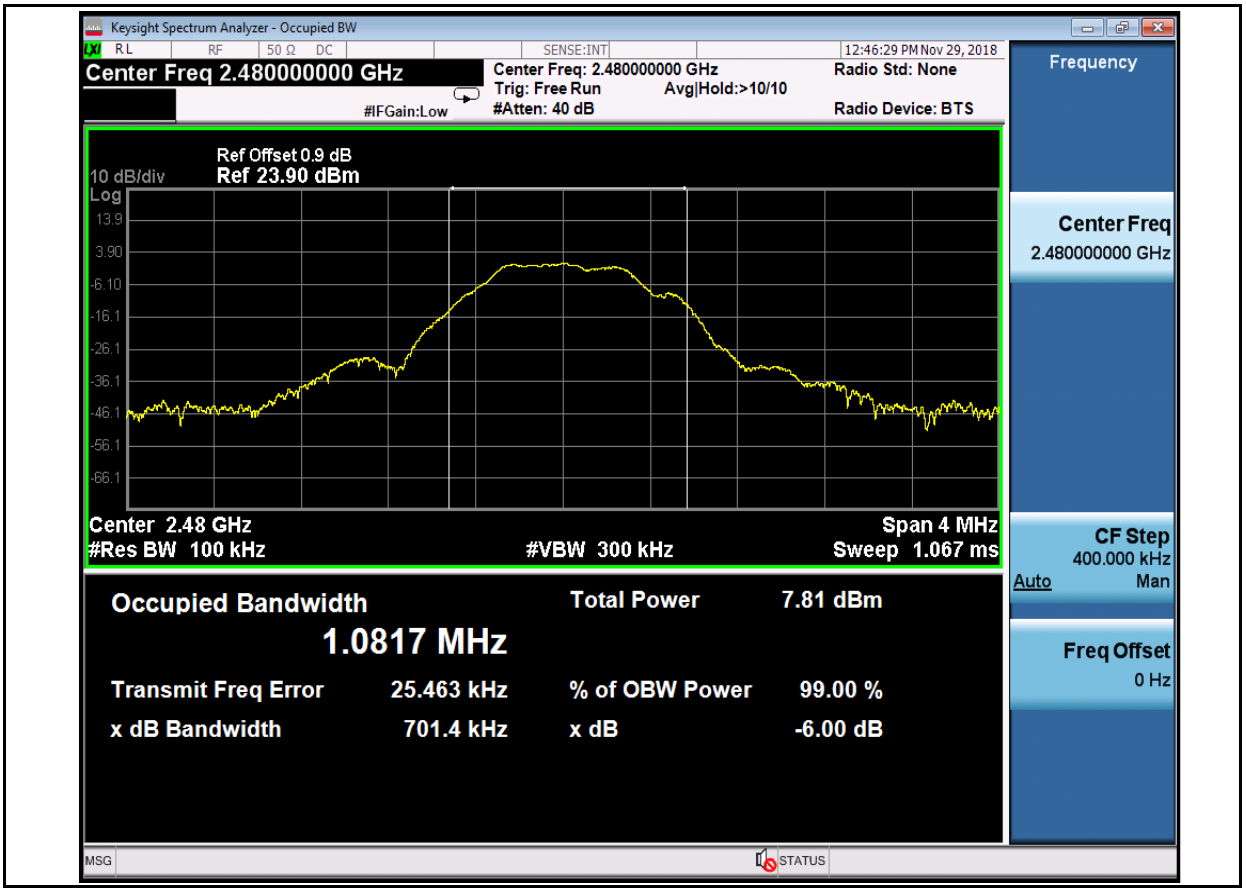

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2.Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	1.429	30	PASS
BLE	2442	Ant1	2.285	30	PASS
BLE	2480	Ant1	1.874	30	PASS

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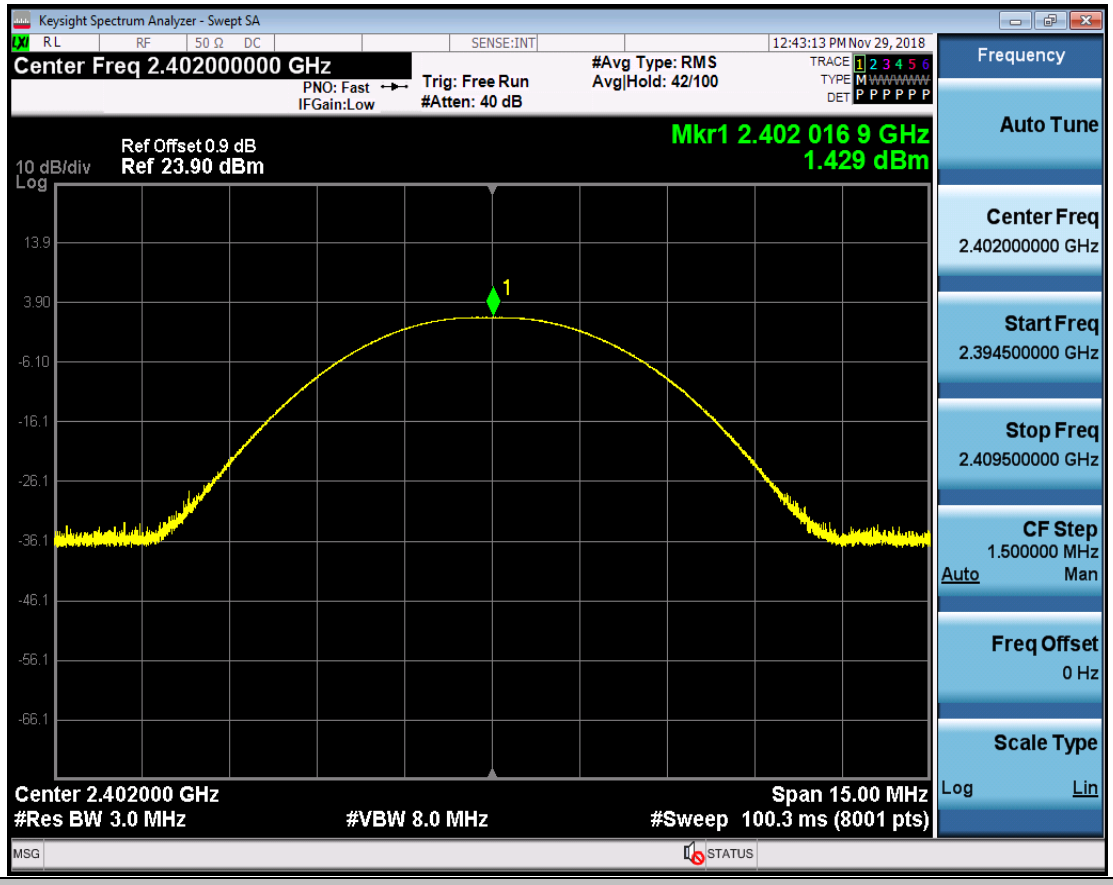
Maximum peak conducted output power_BLE_2402_Ant1



Maximum peak conducted output power_BLE_2442_Ant1

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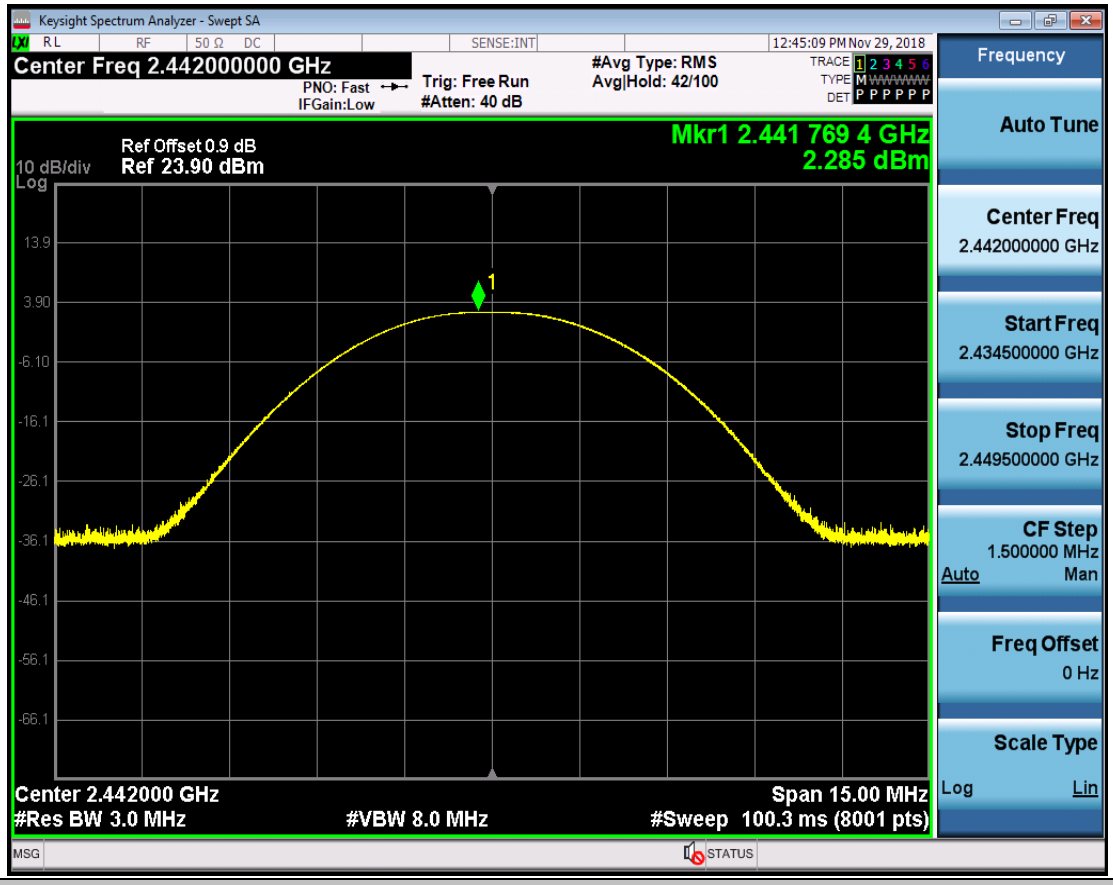

Maximum peak conducted output power_BLE_2480_Ant1

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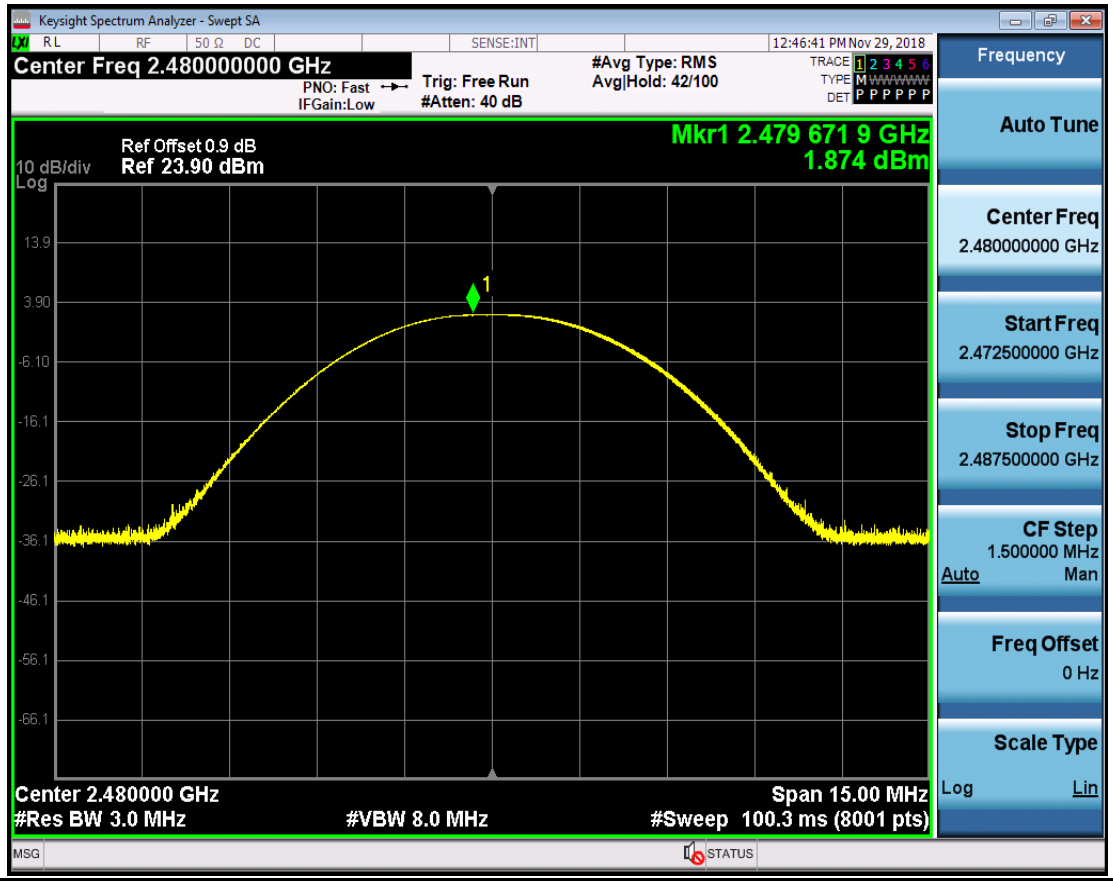

3.Maximum Peak power spectral density

Test Mode	Test Channel	Ant	Result	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-14.277	8.00	PASS
BLE	2442	Ant1	-13.136	8.00	PASS
BLE	2480	Ant1	-12.91	8.00	PASS

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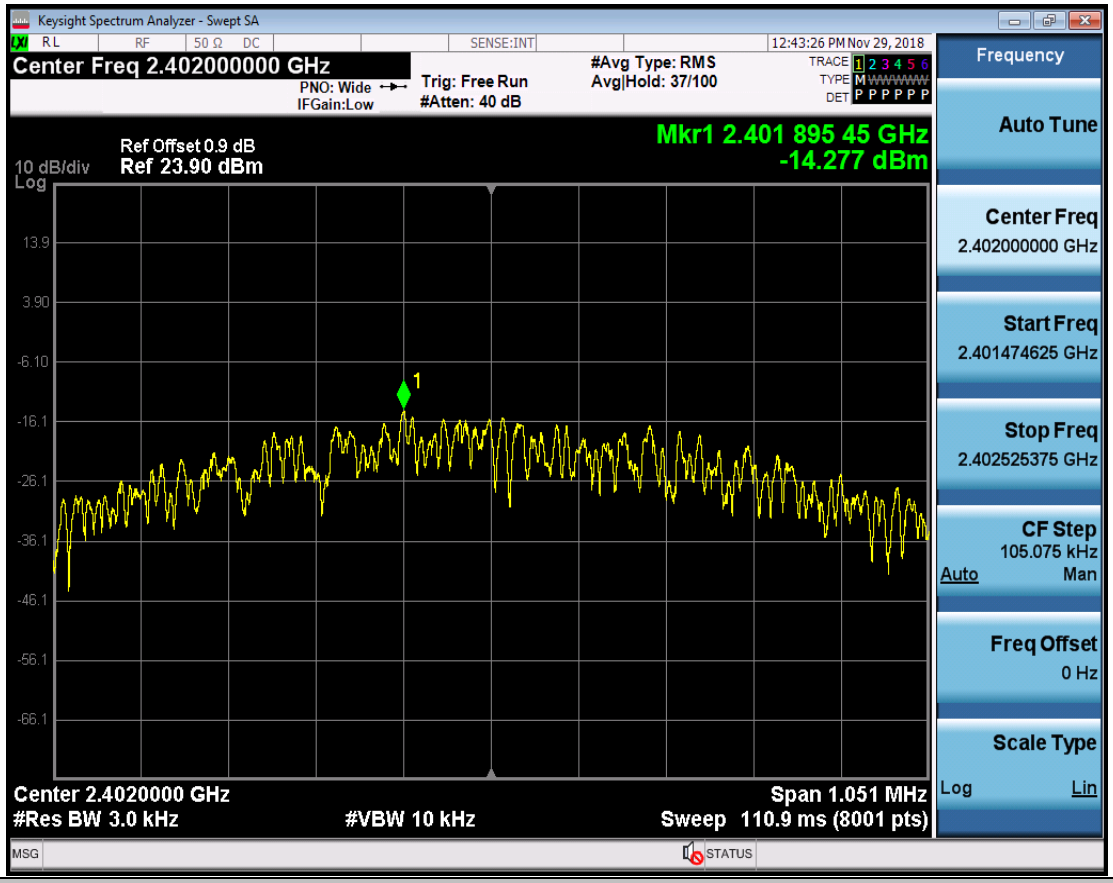
Maximum Peak power spectral density_BLE_2402_Ant1



Maximum Peak power spectral density_BLE_2442_Ant1

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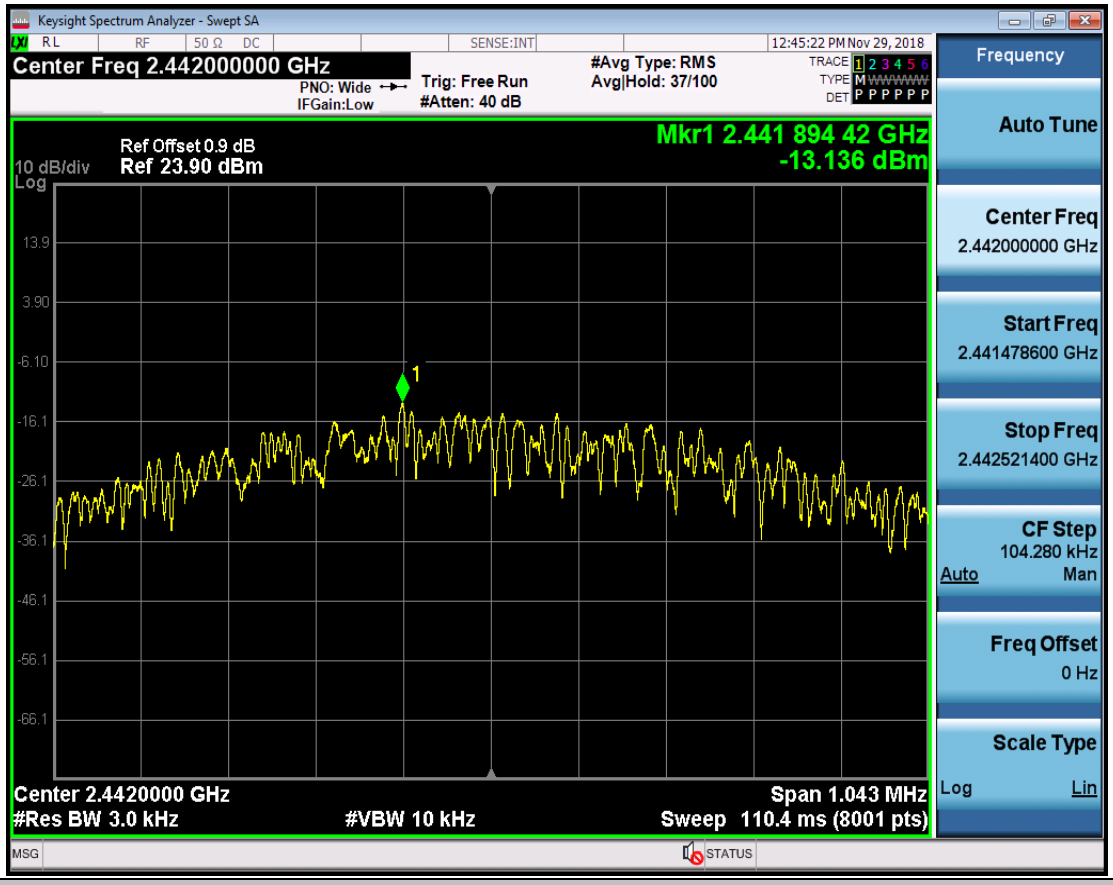

Maximum Peak power spectral density_BLE_2480_Ant1

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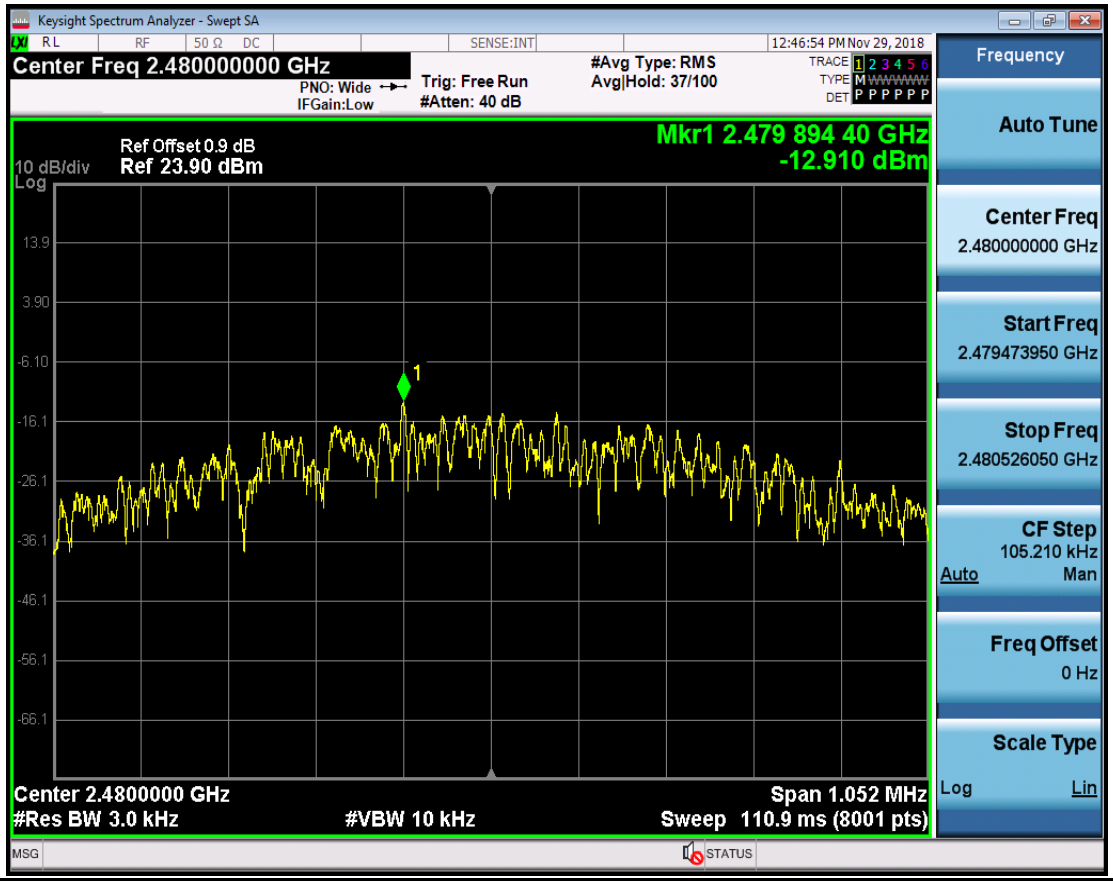

4.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	0.225	-48.371	-19.78	PASS
BLE	2480	Ant1	1.058	-48.634	-18.94	PASS

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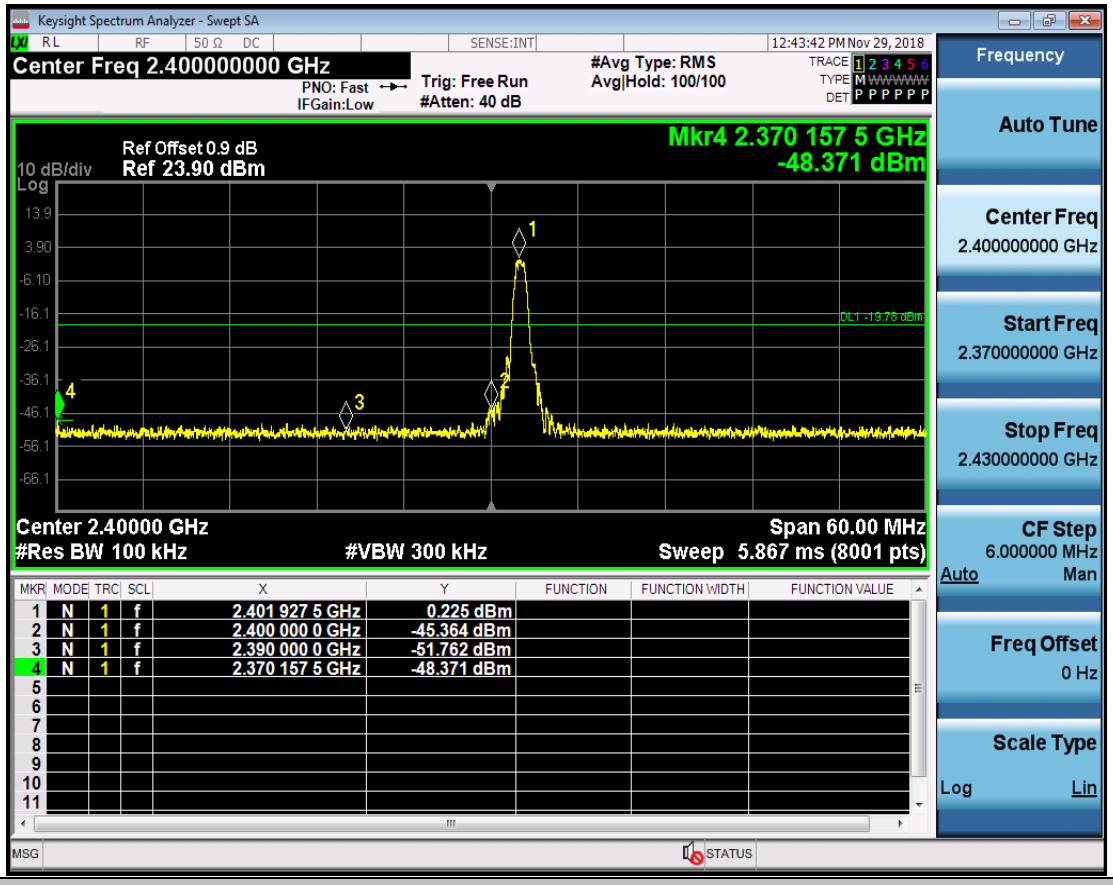
Band-edge for RF Conducted Emissions_BLE_2402_Ant1



Band-edge for RF Conducted Emissions_BLE_2480_Ant1

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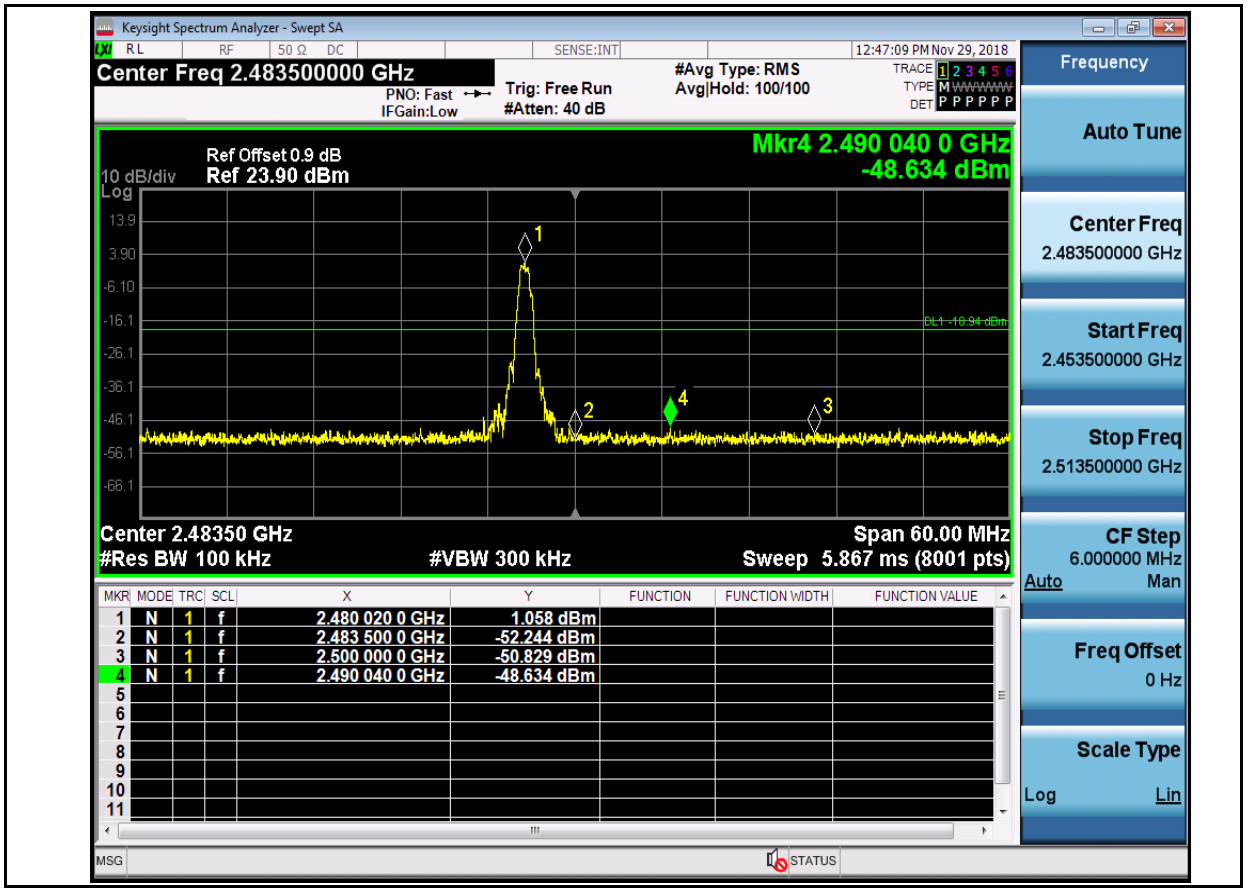

5.RF Conducted Spurious Emissions

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	0.177	-49.077	<-19.823	PASS
BLE	2402	Ant1	10000	26000	100	300	0.177	-49.085	<-19.823	PASS
BLE	2442	Ant1	30	10000	100	300	1.032	-42.652	<-18.968	PASS
BLE	2442	Ant1	10000	26000	100	300	1.032	-47.620	<-18.968	PASS
BLE	2480	Ant1	30	10000	100	300	0.608	-43.541	<-19.392	PASS
BLE	2480	Ant1	10000	26000	100	300	0.608	-51.925	<-19.392	PASS

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RF Conducted Spurious Emissions_BLE_2402_Ant1	
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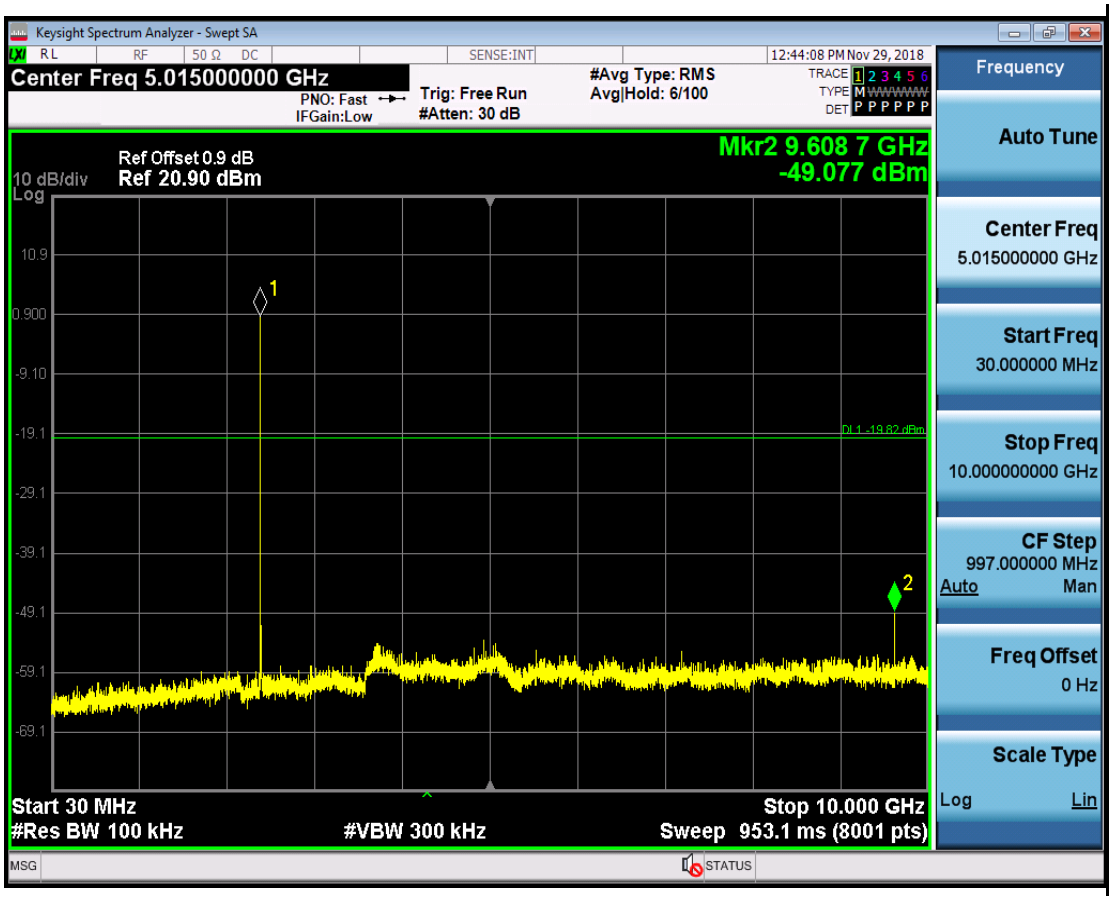
CSE_1	

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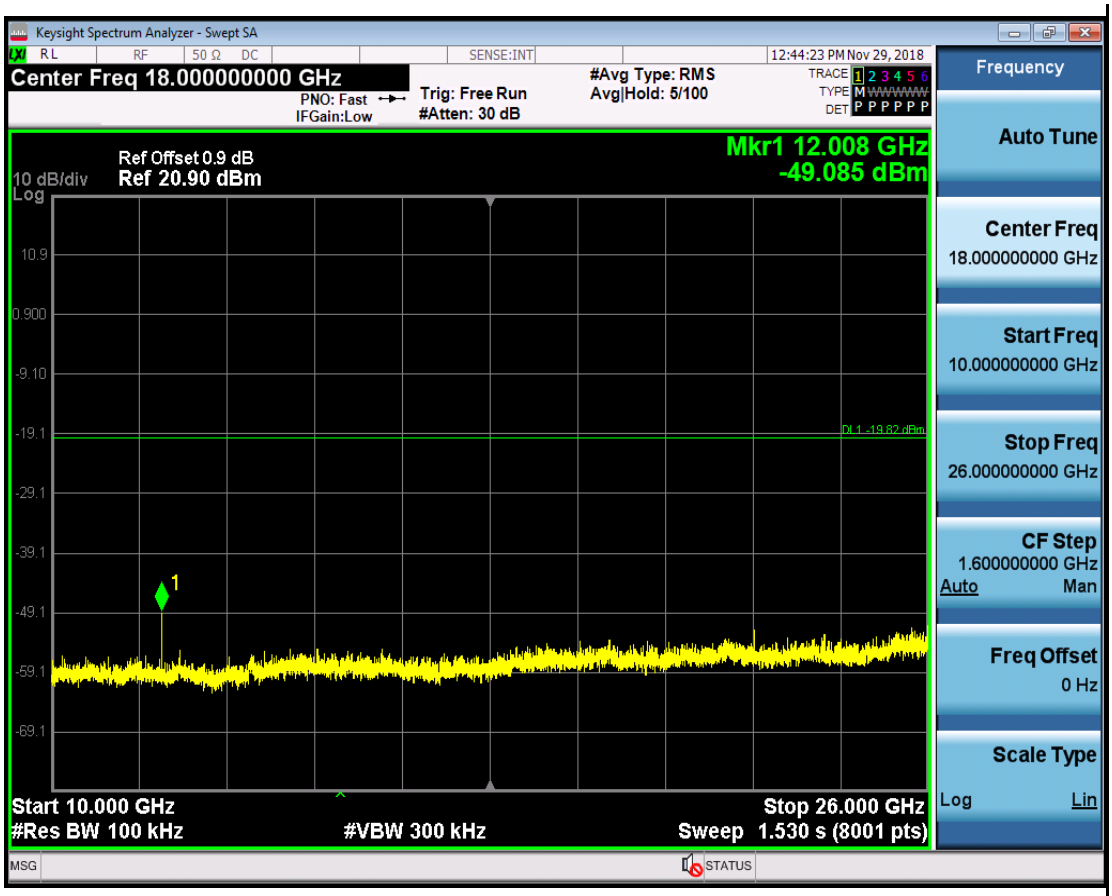

RF Conducted Spurious Emissions_BLE_2442_Ant1

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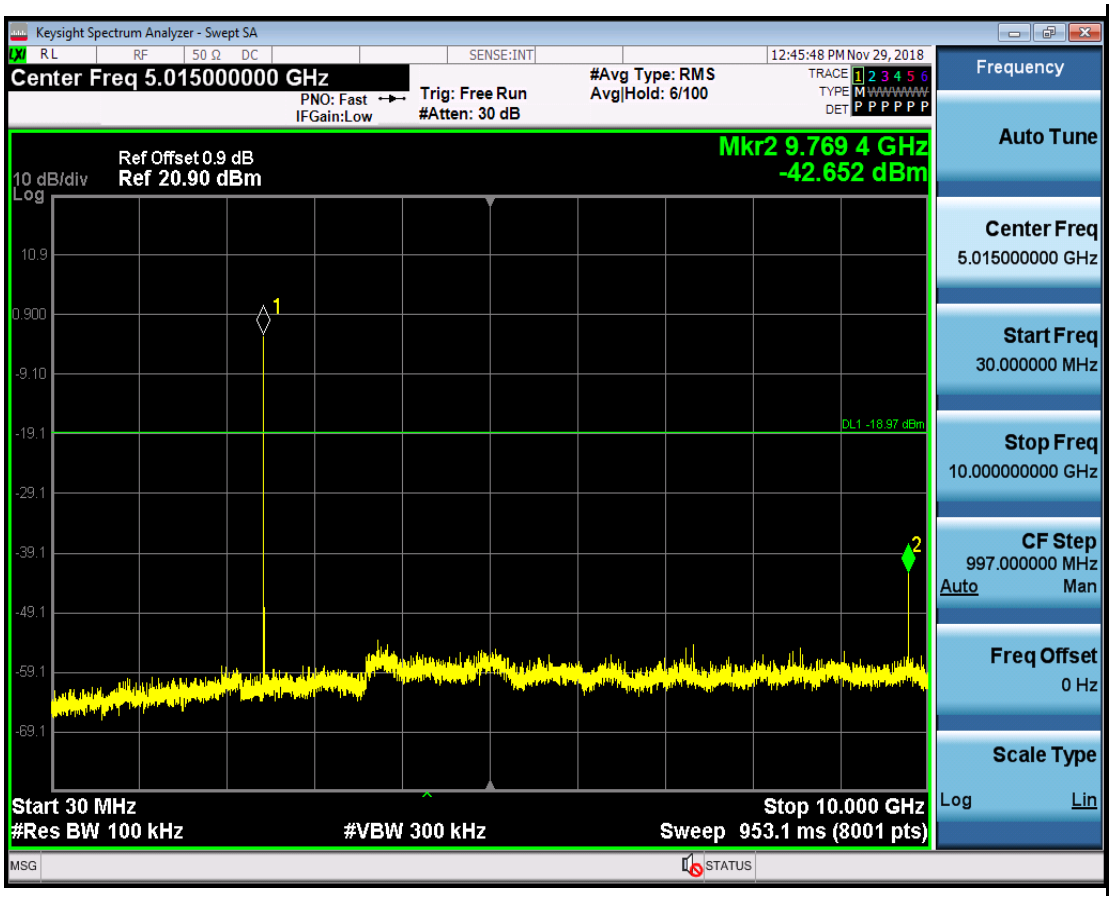
CSE_1



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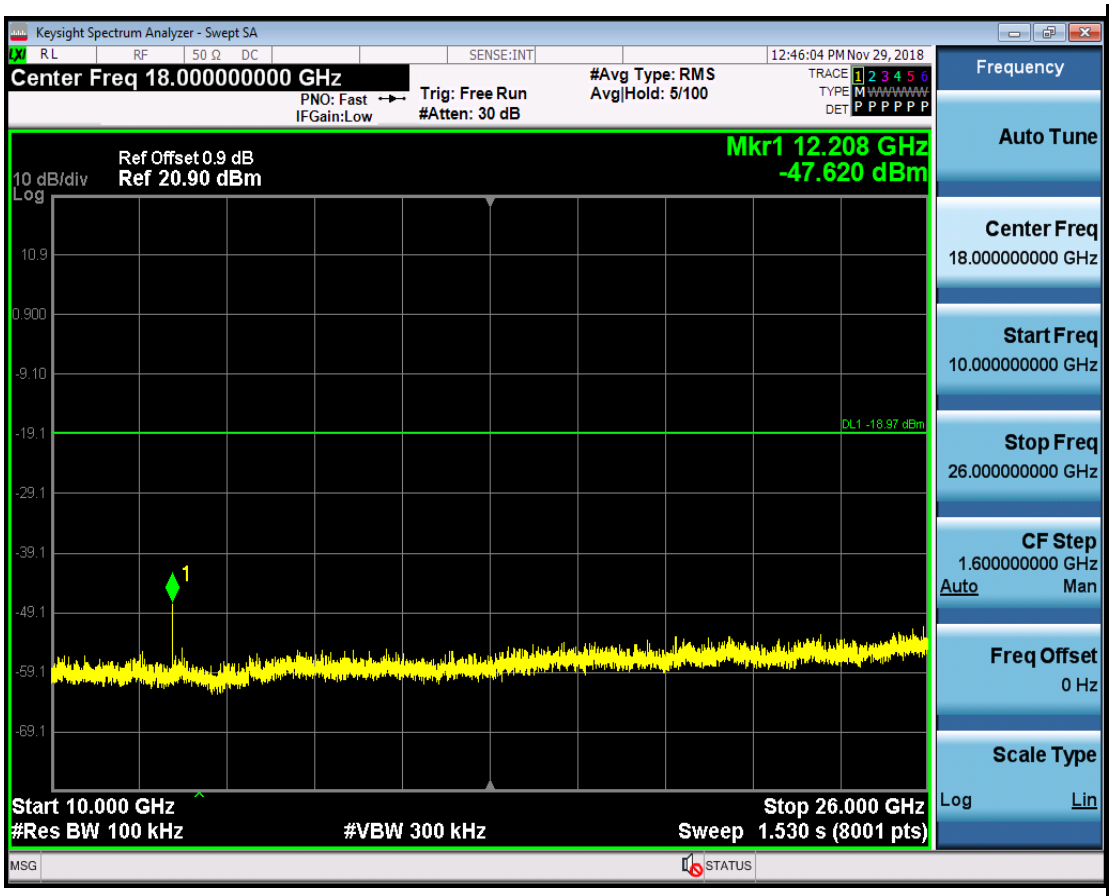

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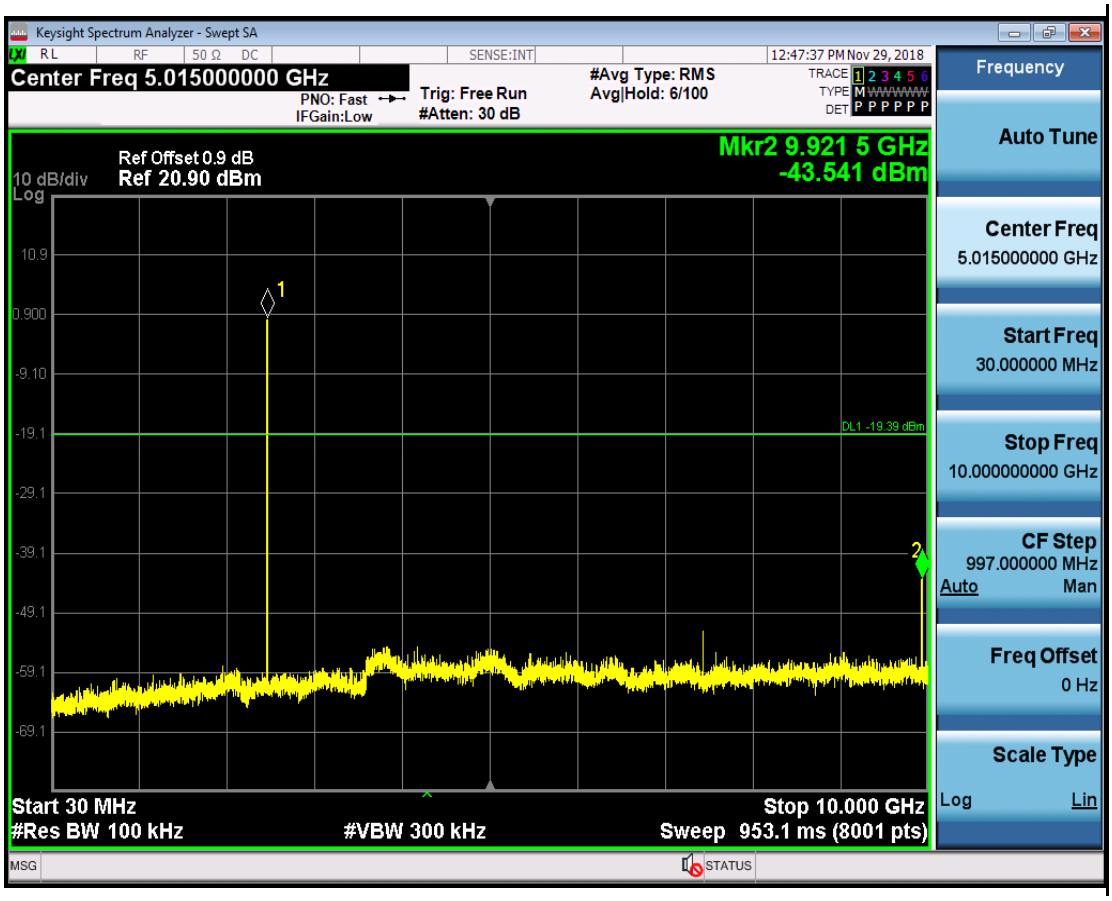

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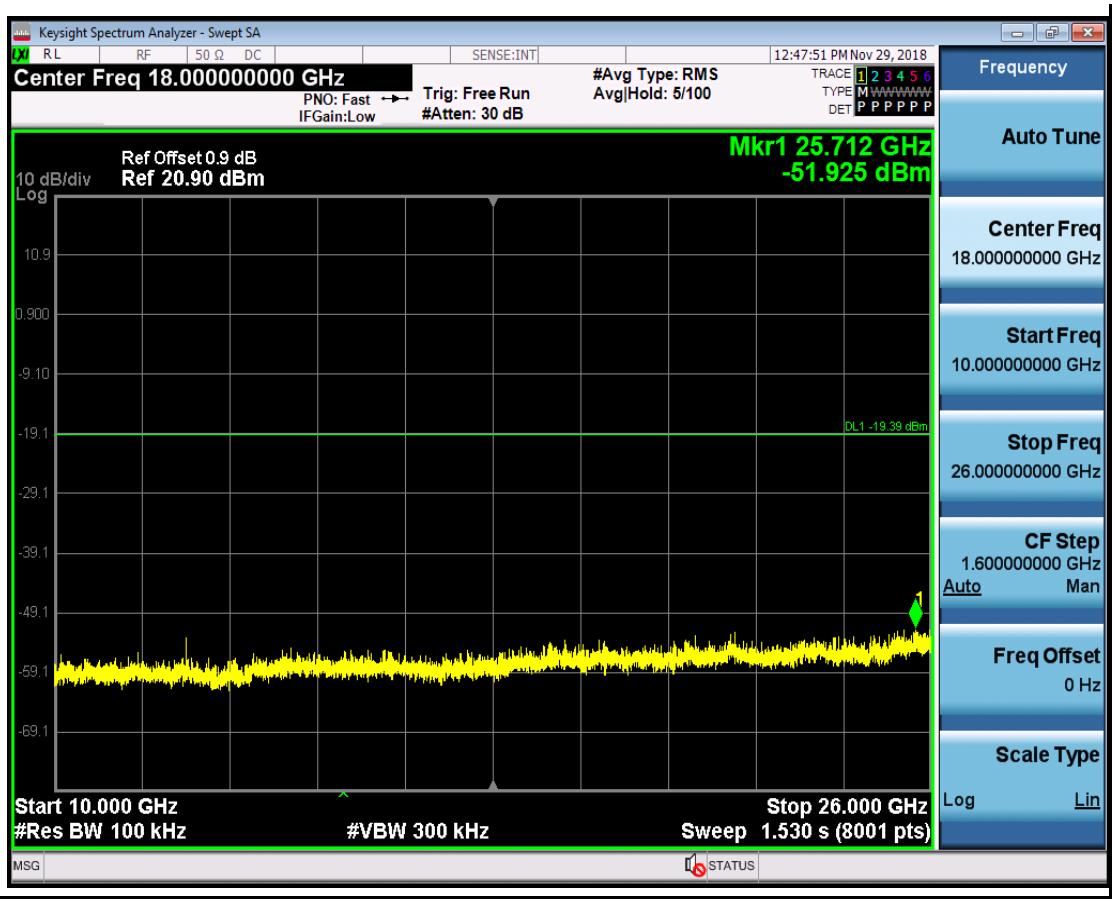
CSE_2	

--End of Report—

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