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Report No.: GZEM190601370601  
Page: 1 of 42

## TEST REPORT

**Application No.:** GZEM1906013706CR  
**Applicant:** COREIOT Pty Ltd.  
**Address of Applicant:** Suite 11, 162 Colin Street, West Perth, Australia - 6005  
**Manufacturer:** COREIOT Pty Ltd.  
**Address of Manufacturer:** Suite 11, 162 Colin Street, West Perth, Australia - 6005  
**Equipment Under Test (EUT):**  
**EUT Name:** CORE BLE TAG  
**Model No.:** CBLE-SN014  
**Trade Mark:** COREIoT  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.247  
**Date of Receipt:** 2019-06-20  
**Date of Test:** 2019-06-24 to 2019-06-28  
**Date of Issue:** 2019-07-02

<b>Test Result:</b>	Pass*
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\* 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.

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2019-07-02		Original

Authorized for issue by:			
Tested By	 Jackson Yuan		2019-06-24 to 2019-06-28
	Jackson_Yuan /Project Engineer	Date	
Checked By	 Ricky Liu		2019-07-02
	Ricky_Liu /Reviewer	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
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

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## 4 General Information

### 4.1 Details of E.U.T.

Power Supply:	DC 3.6 V (2 x "AA" 3.6V battery)
Test Voltage:	DC 3.6 V
Cable:	None
Antenna Gain	- 1.61 dBi
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

Description	Manufacturer	Model No.	Serial No.
DC power	ZHAOXIN	RXN-305D	REF. No. SEA2700

### 4.3 Measurement Uncertainty

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

### 4.4 Test Location

All tests were performed at:

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Guangzhou, China 510663

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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)

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### ● ACMA

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### ● 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)

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### ● FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

### ● FCC Recognized Accredited Test Firm(Registration No.: 486818)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

### ● Industry Canada (Registration No.: 4620B, CAB identifier: CN0052)

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

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### ● CBTL (Lab Code: TL129)

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**4.6 Deviation from Standards**

None

**4.7 Abnormalities from Standard Conditions**

None

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## 5 Equipment List

Minimum 6dB Bandwidth						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analyzer	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	0.8M	EMC2136	2017-11-02	2019-11-01	
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01	

Conducted Peak Output Power						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analyzer	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	0.8M	EMC2136	2017-11-02	2019-11-01	
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01	

Power Spectrum Density						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analyzer	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	0.8M	EMC2136	2017-11-02	2019-11-01	
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01	

Conducted Band Edges Measurement						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
MXA Signal Analyzer	AgilentTechnologies	N9020A	SEM004-10	2019-02-24	2020-02-23	
ESG Vector Signal Generator	Keysight	E4438C	SEM006-03	2019-04-05	2020-04-04	
EXG Analog Signal Generator	AgilentTechnologies	N5171B	SEM006-04	2017-07-26	2020-07-25	
Power Meter	AgilentTechnologies	U2021XA_Ch2	SEM009-02	2018-09-20	2019-09-19	
Power Meter	AgilentTechnologies	U2021XA_Ch3	SEM009-03	2018-09-20	2019-09-19	
EXA Signal Analyzer	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	0.8M	EMC2136	2017-11-02	2019-11-01	
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01	

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**Conducted Spurious Emissions**

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	Agilent Technologies	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	0.8M	EMC2136	2017-11-02	2019-11-01
MI CABLE	SGS	0.8M	EMC2137	2017-11-02	2019-11-01

**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	2019-06-28	2021-06-27
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-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	2019-05-29	2020-05-28
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2020-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2019-01-11	2020-01-10
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2019-01-11	2020-01-10
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2018-12-08	2019-12-07
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	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
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	2019-06-28	2021-06-27
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-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	2019-05-29	2020-05-28
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2020-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2019-01-11	2020-01-10
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2019-01-11	2020-01-10
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2018-12-08	2019-12-07
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	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
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:

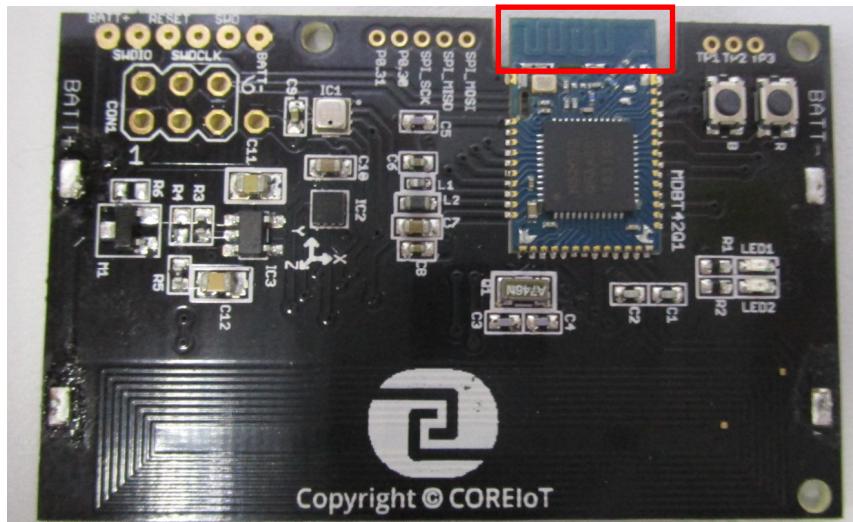
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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 - 1.61 dBi.



Test result: The unit does meet the FCC requirements.



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## 7 Radio Spectrum Matter Test Results

### 7.1 Minimum 6dB Bandwidth

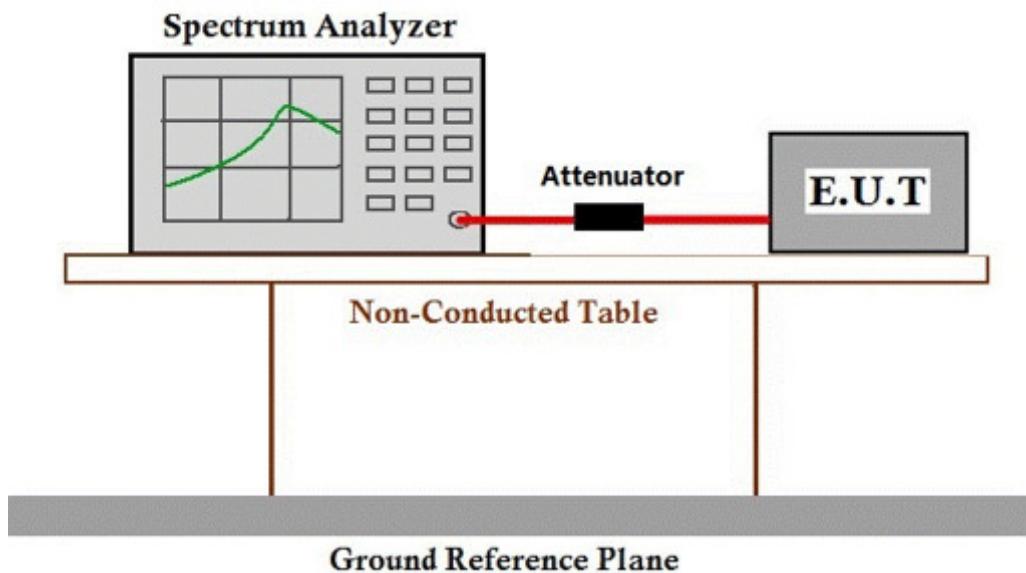
Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)  
Test Method: ANSI C63.10 (2013) Section 11.8.1  
Limit:  $\geq 500$  kHz

#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25.8 °C Humidity: 54.9 % RH Atmospheric Pressure: 1020 mbar  
Test mode a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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## 7.2 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 $\geq 50$ hopping channels
	0.25 for $25 \leq$ hopping channels $< 50$
	1 for digital modulation
2400-2483.5	1 for $\geq 75$ 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

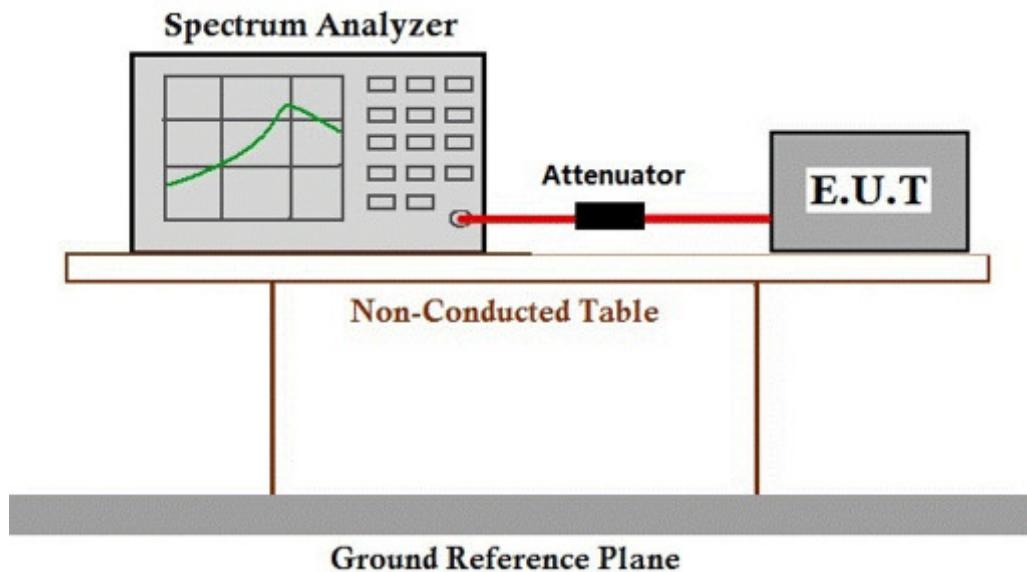
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.8 °C Humidity: 54.9 % RH Atmospheric Pressure: 1020 mbar

Test mode a: 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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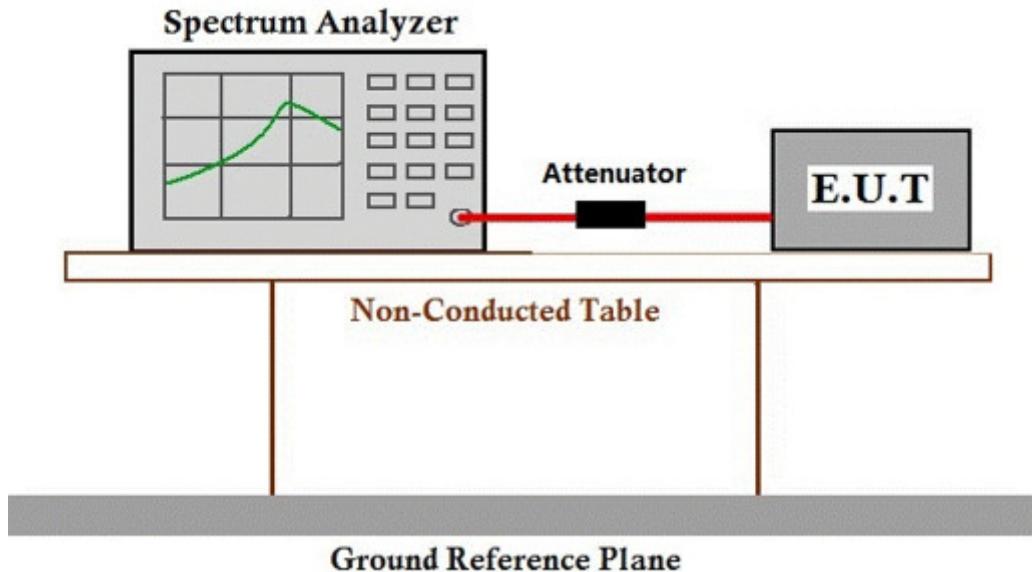
### 7.3 Power Spectrum Density

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

#### 7.3.1 E.U.T. Operation

Operating Environment:  
Temperature: 25.8 °C Humidity: 54.9 % RH Atmospheric Pressure: 1020 mbar  
Test mode a: 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 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))

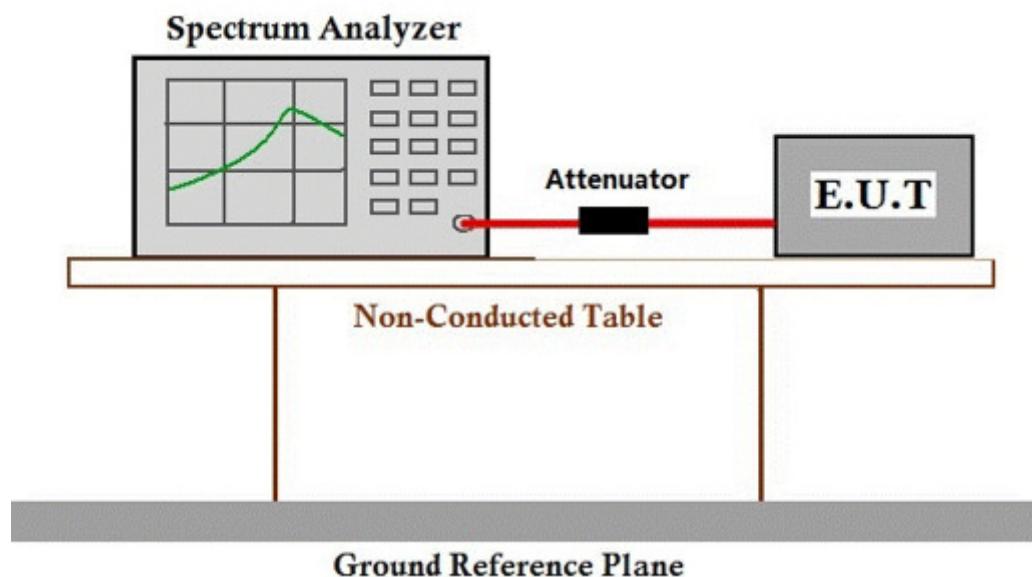
### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25.8 °C Humidity: 54.9 % RH Atmospheric Pressure: 1020 mbar

Test mode a: 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 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))

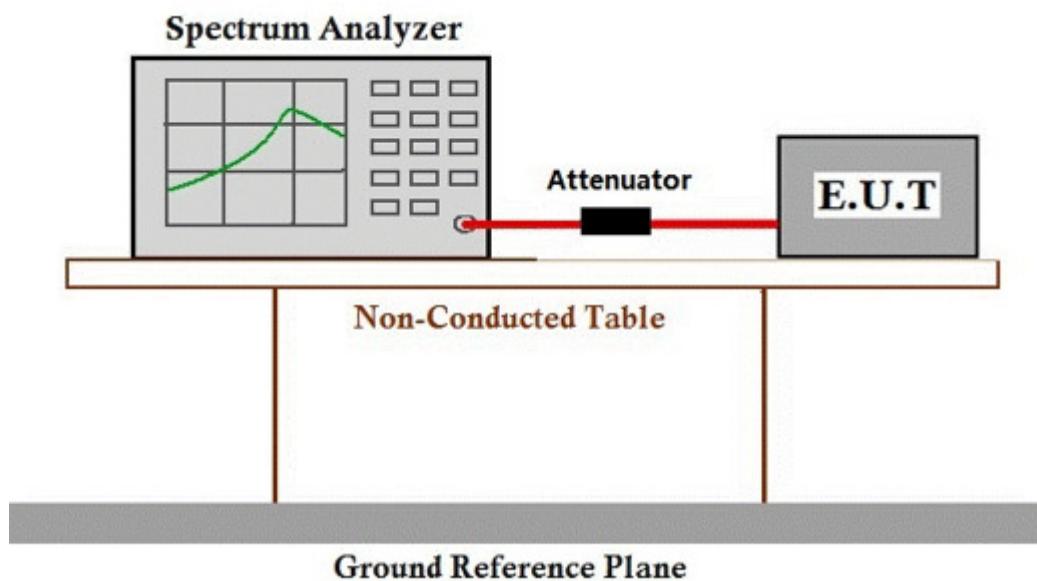
### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.8 °C Humidity: 54.9 % RH Atmospheric Pressure: 1020 mbar

Test mode a: 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 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.

### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C Humidity: 52.9 % RH Atmospheric Pressure: 1020 mbar

Test mode a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

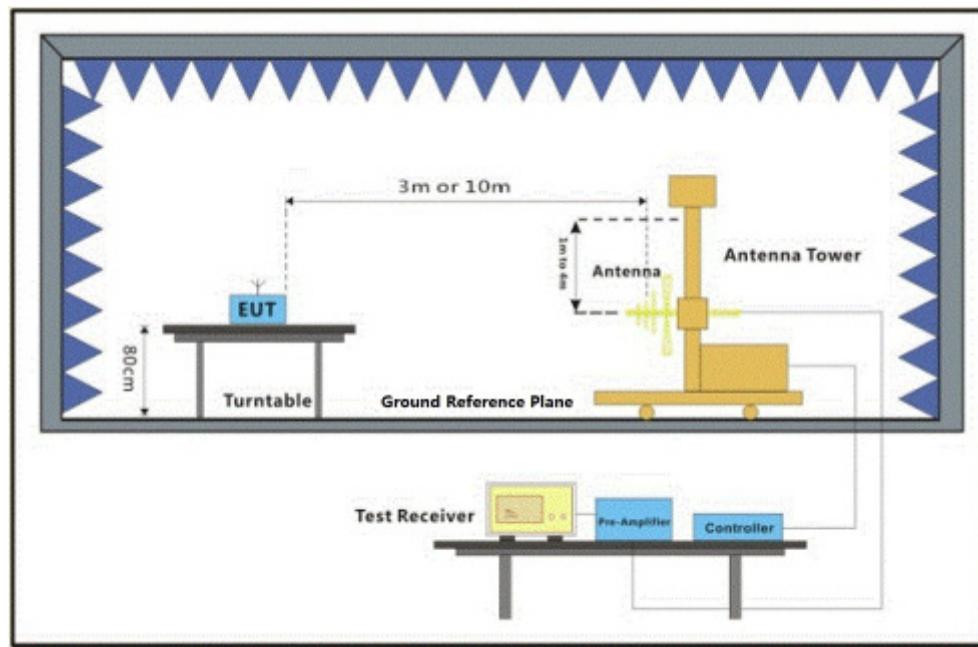
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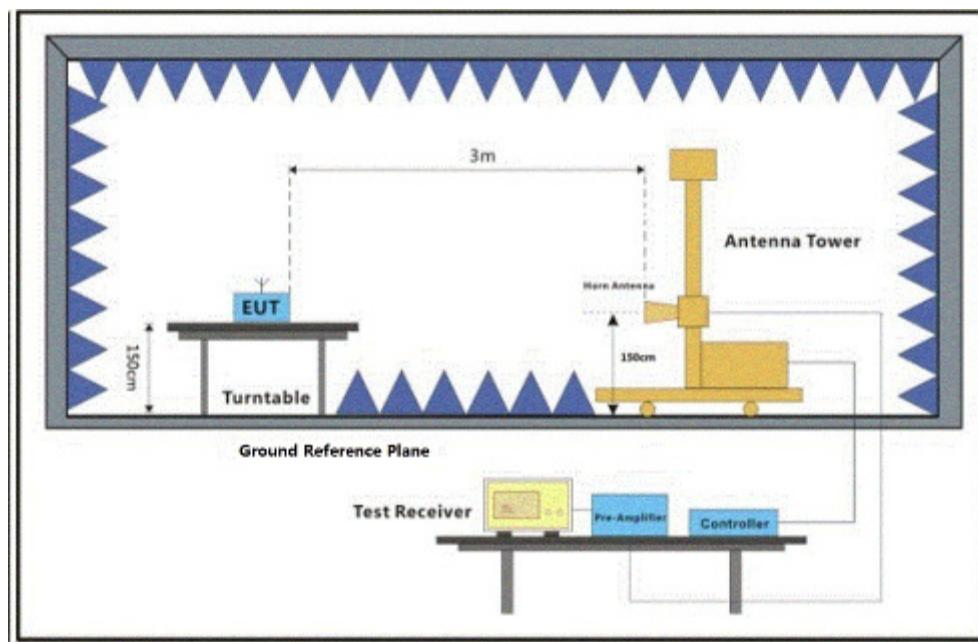


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## 7.6.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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### 7.6.3 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:a; Polarization:Horizontal; Modulation:GFSK; Channel:Low

Freq	ReadAntenna		Cable Preamp		Level	Limit Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2310.000	30.73	26.25	5.03	37.44	24.57	54.00	-29.43 HORIZONTAL
2	2310.000	45.57	26.25	5.03	37.44	39.41	74.00	-34.59 HORIZONTAL
3	2390.000	31.65	26.43	4.88	37.42	25.54	54.00	-28.46 HORIZONTAL
4	2390.000	45.13	26.43	4.88	37.42	39.02	74.00	-34.98 HORIZONTAL
5	2483.500	31.97	26.58	5.23	37.40	26.38	54.00	-27.62 HORIZONTAL
6	2483.500	46.85	26.58	5.23	37.40	41.26	74.00	-32.74 HORIZONTAL
7	2500.000	33.57	26.60	4.95	37.39	27.73	54.00	-26.27 HORIZONTAL
8	2500.000	45.21	26.60	4.95	37.39	39.37	74.00	-34.63 HORIZONTAL

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

Freq	ReadAntenna		Cable Preamp		Level	Limit Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2310.000	32.96	26.25	5.03	37.44	26.80	54.00	-27.20 VERTICAL
2	2310.000	44.81	26.25	5.03	37.44	38.65	74.00	-35.35 VERTICAL
3	2390.000	33.46	26.43	4.88	37.42	27.35	54.00	-26.65 VERTICAL
4	2390.000	44.81	26.43	4.88	37.42	38.70	74.00	-35.30 VERTICAL
5	2483.500	29.81	26.58	5.23	37.40	24.22	54.00	-29.78 VERTICAL
6	2483.500	44.91	26.58	5.23	37.40	39.32	74.00	-34.68 VERTICAL
7	2500.000	32.55	26.60	4.95	37.39	26.71	54.00	-27.29 VERTICAL
8	2500.000	45.28	26.60	4.95	37.39	39.44	74.00	-34.56 VERTICAL

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

Freq	ReadAntenna		Cable Preamp		Level	Limit Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2310.000	32.45	26.25	5.03	37.44	26.29	54.00	-27.71 HORIZONTAL
2	2310.000	45.41	26.25	5.03	37.44	39.25	74.00	-34.75 HORIZONTAL
3	2390.000	34.66	26.43	4.88	37.42	28.55	54.00	-25.45 HORIZONTAL
4	2390.000	45.87	26.43	4.88	37.42	39.76	74.00	-34.24 HORIZONTAL
5	2483.500	44.54	26.58	5.23	37.40	38.95	54.00	-15.05 HORIZONTAL
6	2483.500	63.26	26.58	5.23	37.40	57.67	74.00	-16.33 HORIZONTAL
7	2500.000	32.50	26.60	4.95	37.39	26.66	54.00	-27.34 HORIZONTAL
8	2500.000	43.76	26.60	4.95	37.39	37.92	74.00	-36.08 HORIZONTAL

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

Freq	ReadAntenna		Cable Preamp		Level	Limit Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2310.000	32.45	26.25	5.03	37.44	26.29	54.00	-27.71 VERTICAL
2	2310.000	45.27	26.25	5.03	37.44	39.11	74.00	-34.89 VERTICAL
3	2390.000	32.22	26.43	4.88	37.42	26.11	54.00	-27.89 VERTICAL
4	2390.000	45.03	26.43	4.88	37.42	38.92	74.00	-35.08 VERTICAL
5	2483.500	44.87	26.58	5.23	37.40	39.28	54.00	-14.72 VERTICAL
6	2483.500	58.76	26.58	5.23	37.40	53.17	74.00	-20.83 VERTICAL
7	2500.000	31.76	26.60	4.95	37.39	25.92	54.00	-28.08 VERTICAL
8	2500.000	46.05	26.60	4.95	37.39	40.21	74.00	-33.79 VERTICAL

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## 7.7 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.

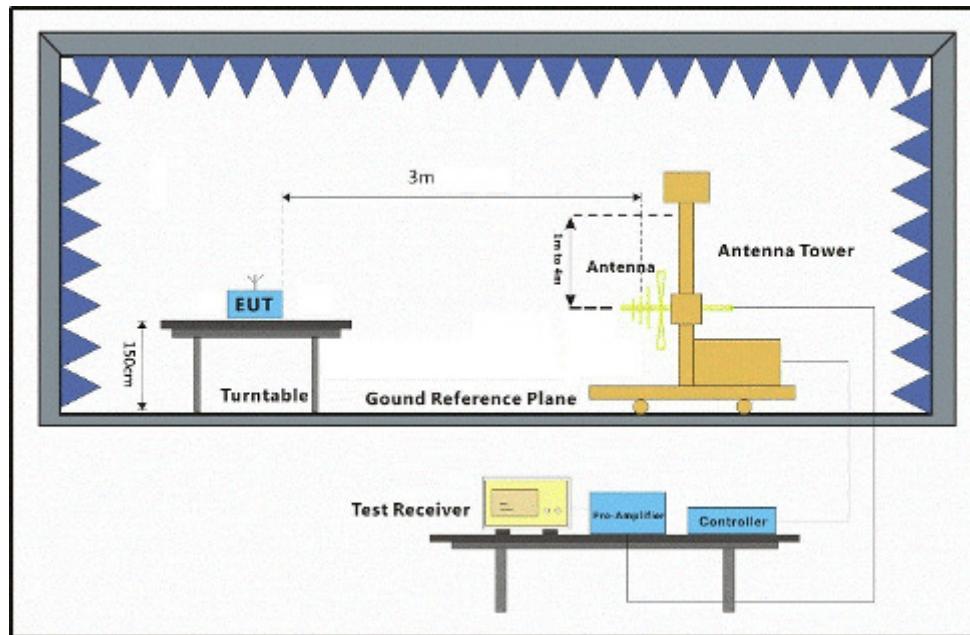
### 7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C Humidity: 52.9 % RH Atmospheric Pressure: 1020 mbar

Test mode a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

### 7.7.2 Test Setup Diagram



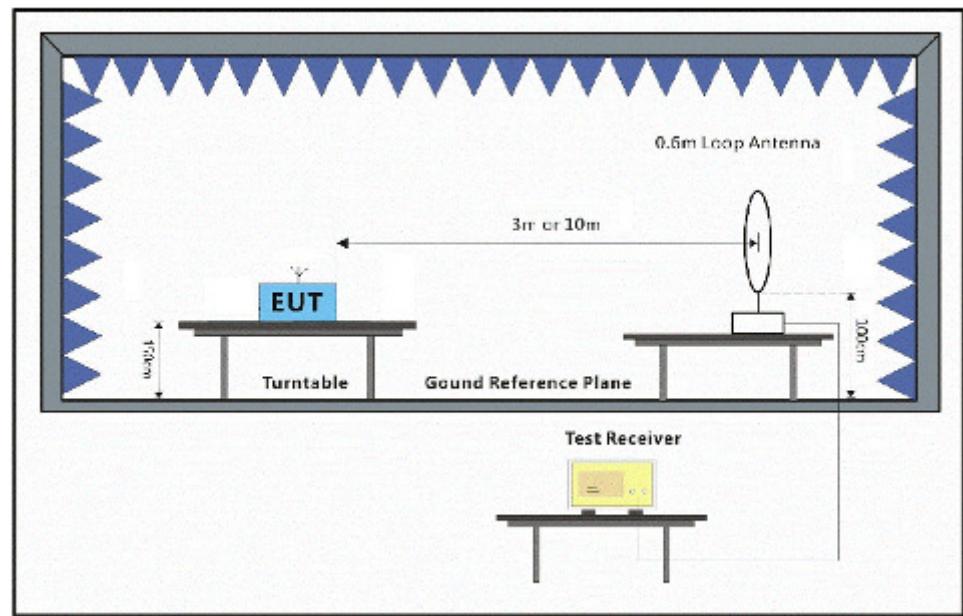
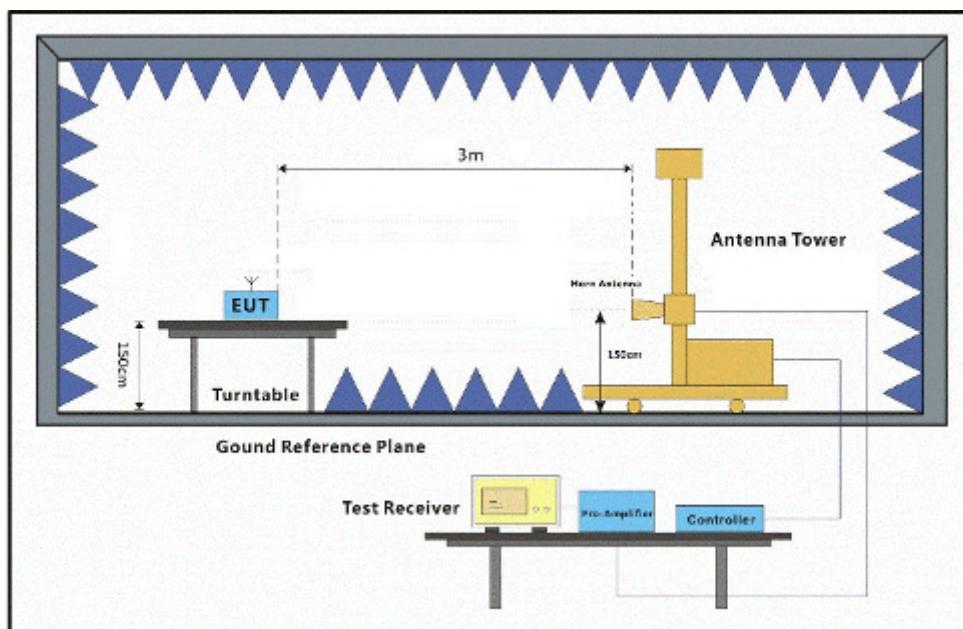
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### 7.7.3 Measurement Procedure and Data

- 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 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

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

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	50.409	25.14	12.98	0.60	29.50	9.22	40.00	-30.78 HORIZONTAL
2	61.995	25.94	12.00	0.60	29.46	9.08	40.00	-30.92 HORIZONTAL
3	142.324	29.12	13.13	1.06	29.40	13.91	43.50	-29.59 HORIZONTAL
4	240.830	30.40	12.41	1.57	29.47	14.91	46.00	-31.09 HORIZONTAL
5	560.693	30.52	19.90	2.01	29.54	22.89	46.00	-23.11 HORIZONTAL
6	851.035	30.13	23.41	2.93	29.14	27.33	46.00	-18.67 HORIZONTAL

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

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	4804.016	45.41	30.79	5.87	36.94	45.13	54.00	-8.87 HORIZONTAL
2	4804.016	53.10	30.79	5.87	36.94	52.82	74.00	-21.18 HORIZONTAL
3	5730.396	34.45	32.08	6.99	36.99	36.53	54.00	-17.47 HORIZONTAL
4	5730.396	44.42	32.08	6.99	36.99	46.50	74.00	-27.50 HORIZONTAL
5	7206.122	32.07	35.45	7.34	36.93	37.93	54.00	-16.07 HORIZONTAL
6	7206.122	44.51	35.45	7.34	36.93	50.37	74.00	-23.63 HORIZONTAL
7	8738.852	30.13	36.30	7.98	36.96	37.45	54.00	-16.55 HORIZONTAL
8	8738.852	44.58	36.30	7.98	36.96	51.90	74.00	-22.10 HORIZONTAL
9	9608.018	30.04	37.51	8.15	37.08	38.62	54.00	-15.38 HORIZONTAL
10	9608.018	44.97	37.51	8.15	37.08	53.55	74.00	-20.45 HORIZONTAL
11	12010.920	26.53	39.50	10.67	37.20	39.50	54.00	-14.50 HORIZONTAL
12	12010.920	41.32	39.50	10.67	37.20	54.29	74.00	-19.71 HORIZONTAL

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

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Pol/Phase
	MHz	dBuV	dB/m	dB				
1	50.764	24.56	12.96	0.60	29.50	8.62	40.00	-31.38 VERTICAL
2	172.599	27.25	12.91	1.32	29.40	12.08	43.50	-31.42 VERTICAL
3	359.186	30.52	15.71	2.01	29.86	18.38	46.00	-27.62 VERTICAL
4	530.101	30.15	18.80	2.26	29.58	21.63	46.00	-24.37 VERTICAL
5	726.805	29.44	21.69	3.52	29.43	25.22	46.00	-20.78 VERTICAL
6	935.546	29.00	24.35	3.64	28.30	28.69	46.00	-17.31 VERTICAL

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

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Pol/Phase
	MHz	dBuV	dB/m	dB				
1	4804.977	33.90	30.79	5.87	36.94	33.62	54.00	-20.38 VERTICAL
2	4804.977	46.57	30.79	5.87	36.94	46.29	74.00	-27.71 VERTICAL
3	6451.353	28.02	34.15	7.03	36.98	32.22	54.00	-21.78 VERTICAL
4	6451.353	43.68	34.15	7.03	36.98	47.88	74.00	-26.12 VERTICAL
5	7206.122	30.76	35.45	7.34	36.93	36.62	54.00	-17.38 VERTICAL
6	7206.122	44.93	35.45	7.34	36.93	50.79	74.00	-23.21 VERTICAL
7	8688.480	32.04	36.25	7.94	36.96	39.27	54.00	-14.73 VERTICAL
8	8688.480	45.02	36.25	7.94	36.96	52.25	74.00	-21.75 VERTICAL
9	9608.430	32.15	37.51	8.15	37.08	40.73	54.00	-13.27 VERTICAL
10	9608.430	44.60	37.51	8.15	37.08	53.18	74.00	-20.82 VERTICAL
11	12010.100	27.06	39.50	10.67	37.20	40.03	54.00	-13.97 VERTICAL
12	12010.100	40.99	39.50	10.67	37.20	53.96	74.00	-20.04 VERTICAL

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

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	4884.151	45.30	30.95	6.86	36.95	46.16	54.00	-7.84 HORIZONTAL
2	4884.151	51.56	30.95	6.86	36.95	52.42	74.00	-21.58 HORIZONTAL
3	6322.136	29.20	33.68	6.97	36.99	32.86	54.00	-21.14 HORIZONTAL
4	6322.136	44.63	33.68	6.97	36.99	48.29	74.00	-25.71 HORIZONTAL
5	7326.015	31.44	35.74	7.39	36.92	37.65	54.00	-16.35 HORIZONTAL
6	7326.015	45.14	35.74	7.39	36.92	51.35	74.00	-22.65 HORIZONTAL
7	8248.005	32.81	36.30	8.21	36.92	40.40	54.00	-13.60 HORIZONTAL
8	8248.005	45.12	36.30	8.21	36.92	52.71	74.00	-21.29 HORIZONTAL
9	9768.149	28.93	37.74	8.37	37.09	37.95	54.00	-16.05 HORIZONTAL
10	9768.149	43.51	37.74	8.37	37.09	52.53	74.00	-21.47 HORIZONTAL
11	12210.130	26.27	39.21	10.98	37.06	39.40	54.00	-14.60 HORIZONTAL
12	12210.130	41.19	39.21	10.98	37.06	54.32	74.00	-19.68 HORIZONTAL

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

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	4884.948	33.95	30.95	6.86	36.95	34.81	54.00	-19.19 VERTICAL
2	4884.948	46.76	30.95	6.86	36.95	47.62	74.00	-26.38 VERTICAL
3	5932.638	32.08	32.26	7.32	37.00	34.66	54.00	-19.34 VERTICAL
4	5932.638	45.17	32.26	7.32	37.00	47.75	74.00	-26.25 VERTICAL
5	7326.429	29.23	35.74	7.39	36.92	35.44	54.00	-18.56 VERTICAL
6	7326.429	44.18	35.74	7.39	36.92	50.39	74.00	-23.61 VERTICAL
7	8764.146	29.48	36.33	8.00	36.97	36.84	54.00	-17.16 VERTICAL
8	8764.146	44.92	36.33	8.00	36.97	52.28	74.00	-21.72 VERTICAL
9	9768.603	29.84	37.74	8.37	37.09	38.86	54.00	-15.14 VERTICAL
10	9768.603	44.53	37.74	8.37	37.09	53.55	74.00	-20.45 VERTICAL
11	12210.950	28.02	39.21	10.98	37.06	41.15	54.00	-12.85 VERTICAL
12	12210.950	41.44	39.21	10.98	37.06	54.57	74.00	-19.43 VERTICAL

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

Freq	ReadAntenna		Cable Preamp		Level	Limit Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	4959.993	43.44	31.05	7.84	36.96	45.37	54.00	-8.63 HORIZONTAL
2	4959.993	49.46	31.05	7.84	36.96	51.39	74.00	-22.61 HORIZONTAL
3	6621.375	31.67	34.46	7.14	36.98	36.29	54.00	-17.71 HORIZONTAL
4	6621.375	44.07	34.46	7.14	36.98	48.69	74.00	-25.31 HORIZONTAL
5	7440.788	28.66	35.92	7.43	36.92	35.09	54.00	-18.91 HORIZONTAL
6	7440.788	43.34	35.92	7.43	36.92	49.77	74.00	-24.23 HORIZONTAL
7	8240.473	30.92	36.30	8.21	36.92	38.51	54.00	-15.49 HORIZONTAL
8	8240.473	44.65	36.30	8.21	36.92	52.24	74.00	-21.76 HORIZONTAL
9	9920.420	29.82	37.92	8.63	37.10	39.27	54.00	-14.73 HORIZONTAL
10	9920.420	42.96	37.92	8.63	37.10	52.41	74.00	-21.59 HORIZONTAL
11	12400.350	27.15	38.93	11.17	36.90	40.35	54.00	-13.65 HORIZONTAL
12	12400.350	41.65	38.93	11.17	36.90	54.85	74.00	-19.15 HORIZONTAL

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

Freq	ReadAntenna		Cable Preamp		Level	Limit Line	Over Limit	Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	4960.993	30.62	31.05	7.84	36.96	32.55	54.00	-21.45 VERTICAL
2	4960.993	44.27	31.05	7.84	36.96	46.20	74.00	-27.80 VERTICAL
3	6451.353	30.95	34.15	7.03	36.98	35.15	54.00	-18.85 VERTICAL
4	6451.353	43.52	34.15	7.03	36.98	47.72	74.00	-26.28 VERTICAL
5	7440.914	28.15	35.92	7.43	36.92	34.58	54.00	-19.42 VERTICAL
6	7440.914	44.72	35.92	7.43	36.92	51.15	74.00	-22.85 VERTICAL
7	8738.852	29.19	36.30	7.98	36.96	36.51	54.00	-17.49 VERTICAL
8	8738.852	44.62	36.30	7.98	36.96	51.94	74.00	-22.06 VERTICAL
9	9920.432	29.30	37.92	8.63	37.10	38.75	54.00	-15.25 VERTICAL
10	9920.432	44.14	37.92	8.63	37.10	53.59	74.00	-20.41 VERTICAL
11	12400.250	26.86	38.93	11.17	36.90	40.06	54.00	-13.94 VERTICAL
12	12400.250	41.00	38.93	11.17	36.90	54.20	74.00	-19.80 VERTICAL

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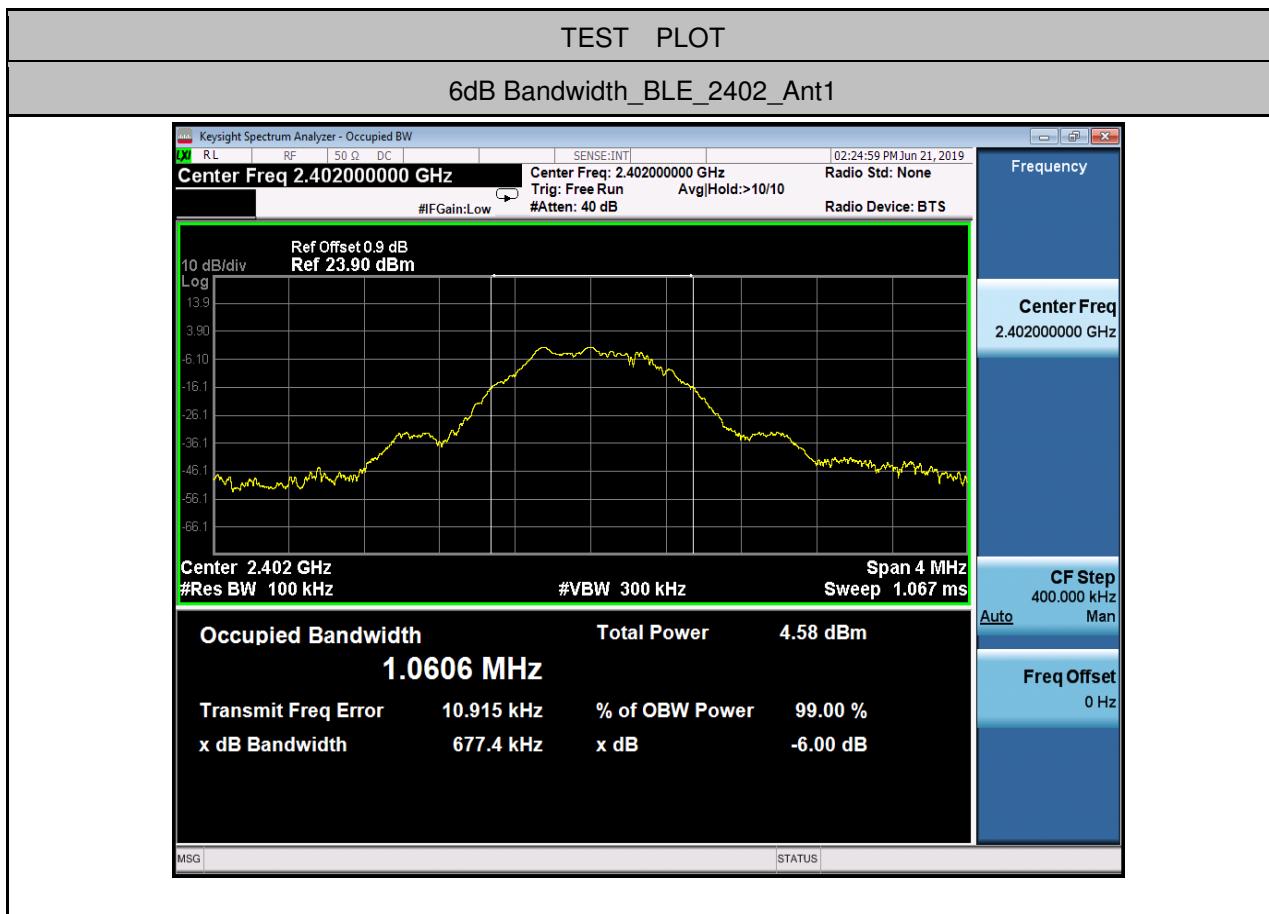
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## 8 Appendix

### 8.1 Appendix 15.247

#### 1.6dB Bandwidth

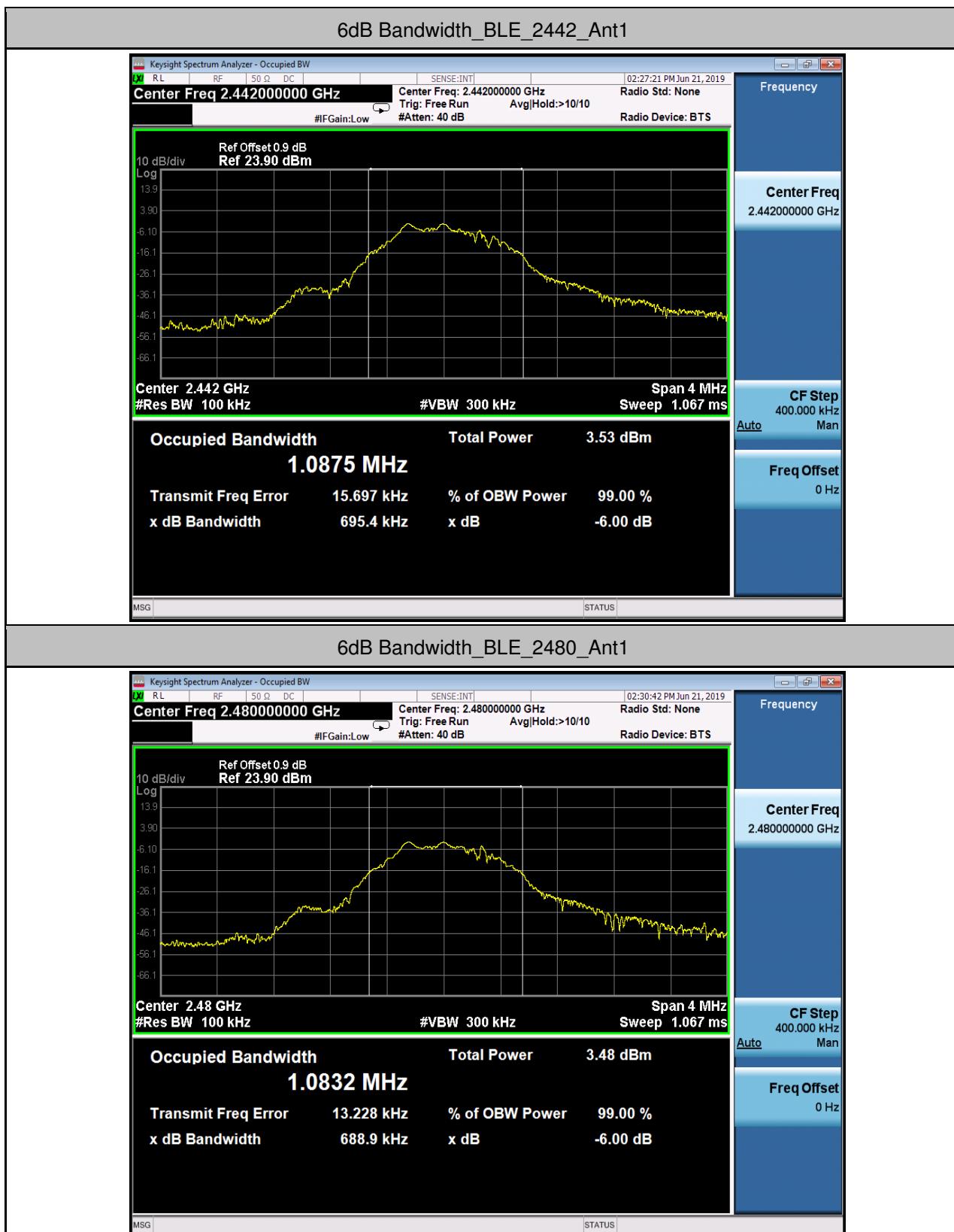
Test Mode	Test Channel	Ant	6dB Bandwidth [MHz]	Limit	Verdict
BLE	2402	Ant1	0.6774	0.5	PASS
BLE	2442	Ant1	0.6954	0.5	PASS
BLE	2480	Ant1	0.6889	0.5	PASS



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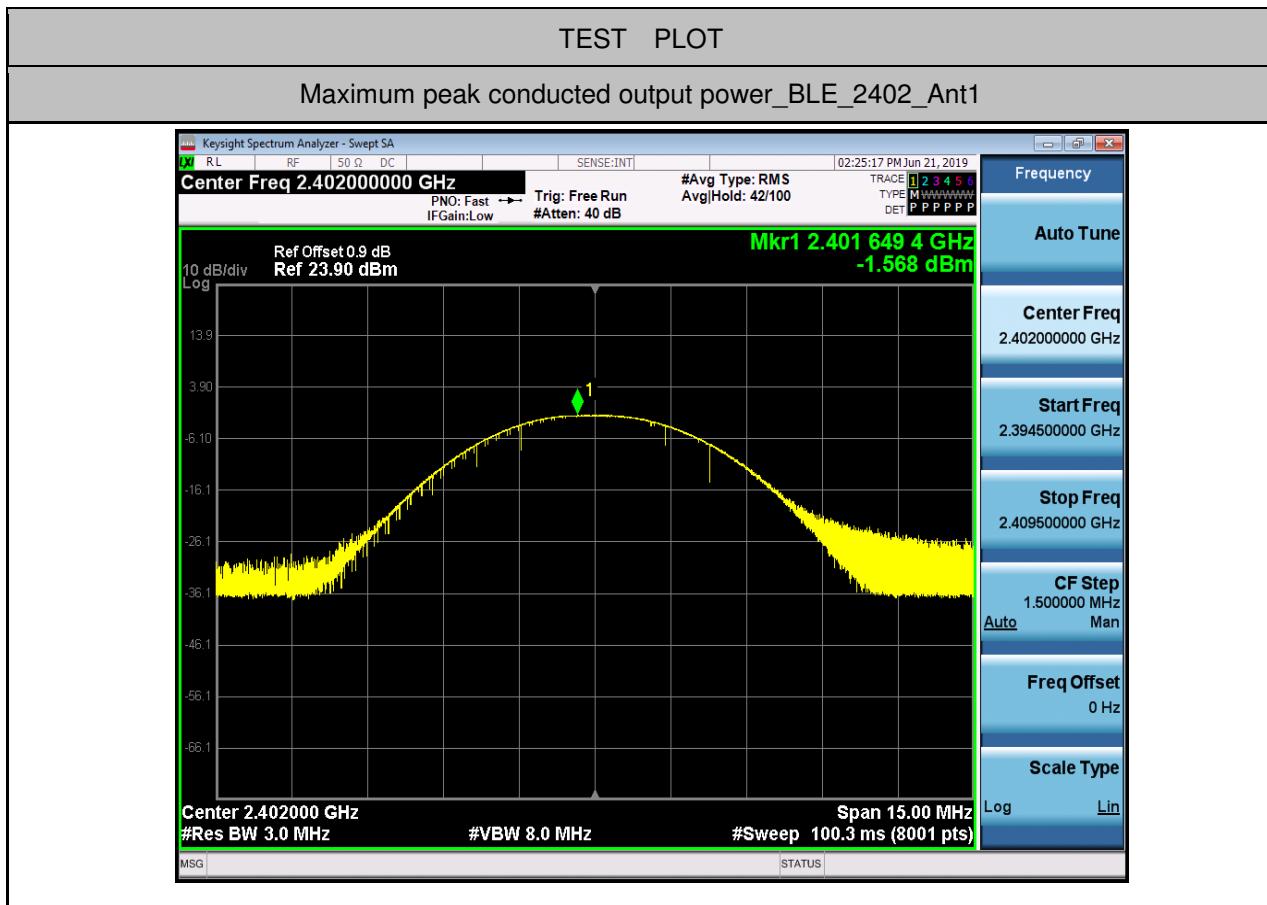
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## 2. Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	-1.568	30	PASS
BLE	2442	Ant1	-2.326	30	PASS
BLE	2480	Ant1	-2.454	30	PASS



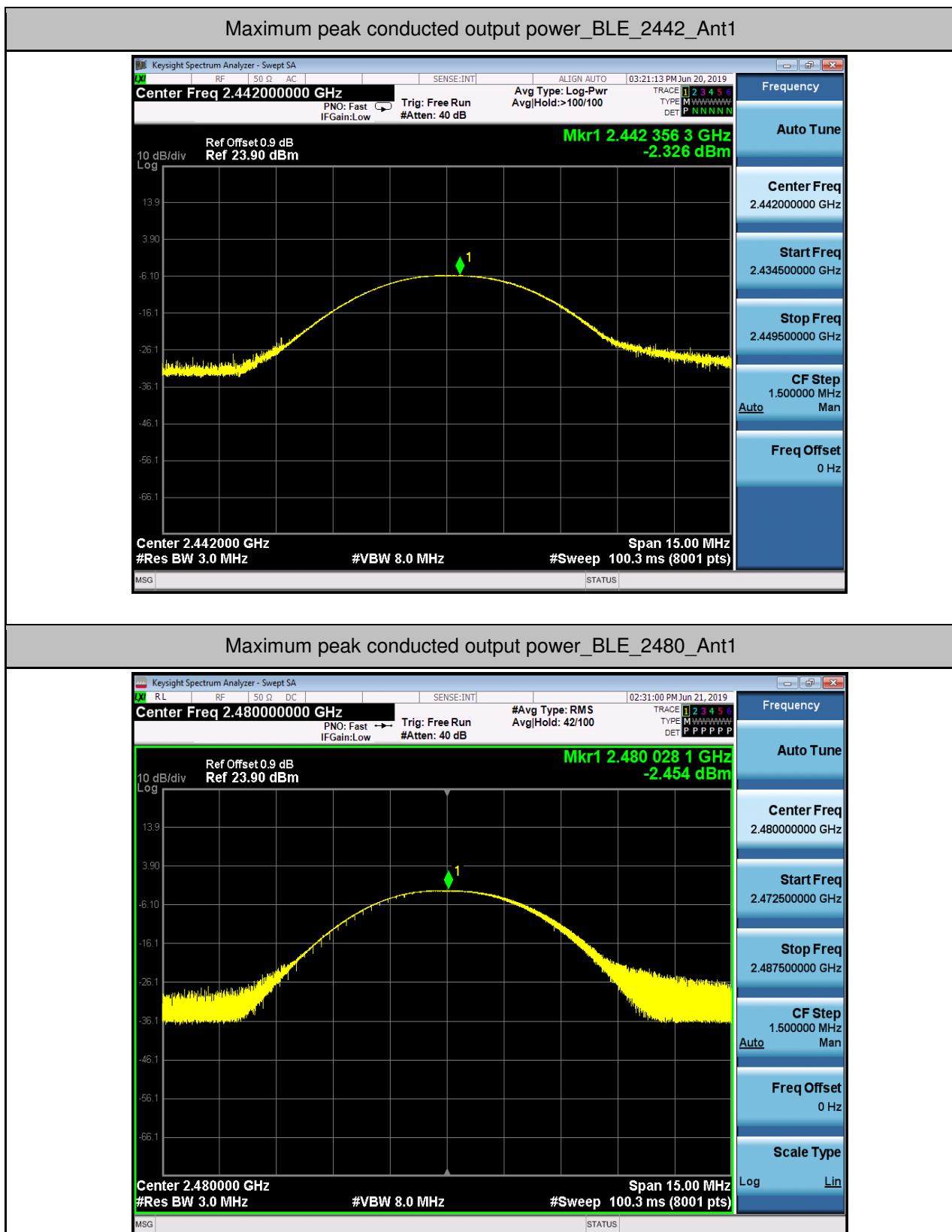
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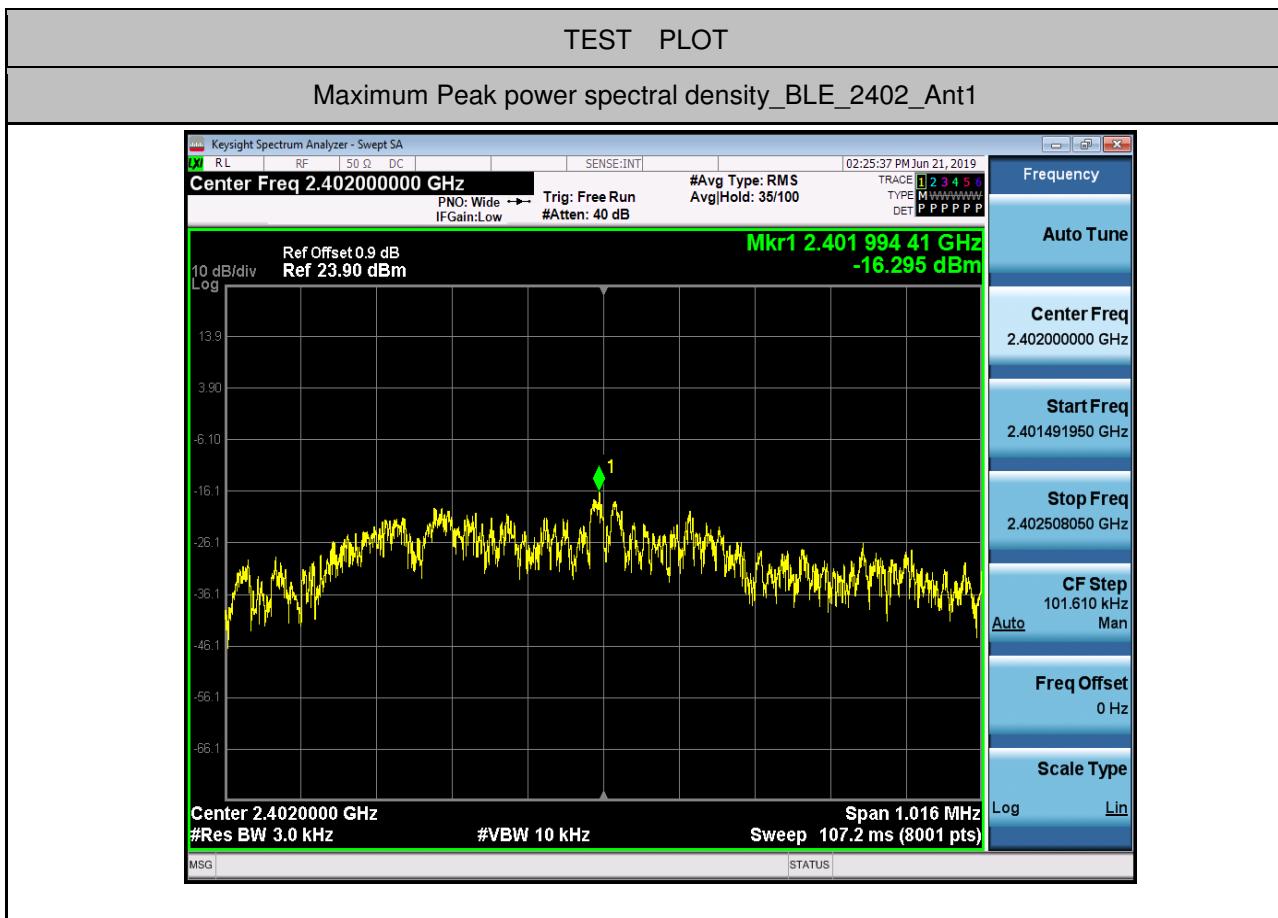
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## 3. Maximum Peak power spectral density

Test Mode	Test Channel	Ant	Result	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-16.295	8.00	PASS
BLE	2442	Ant1	-17.05	8.00	PASS
BLE	2480	Ant1	-17.505	8.00	PASS

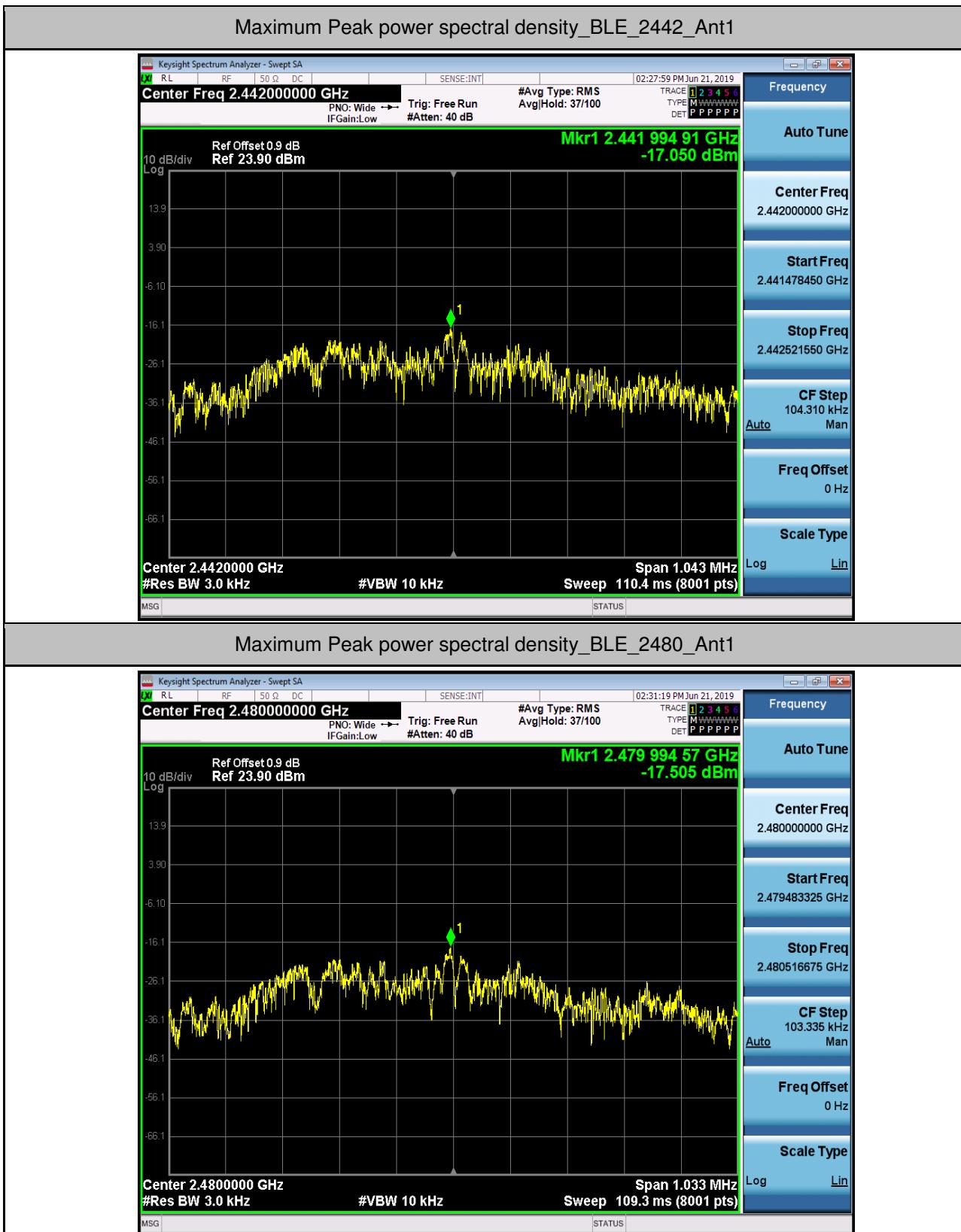


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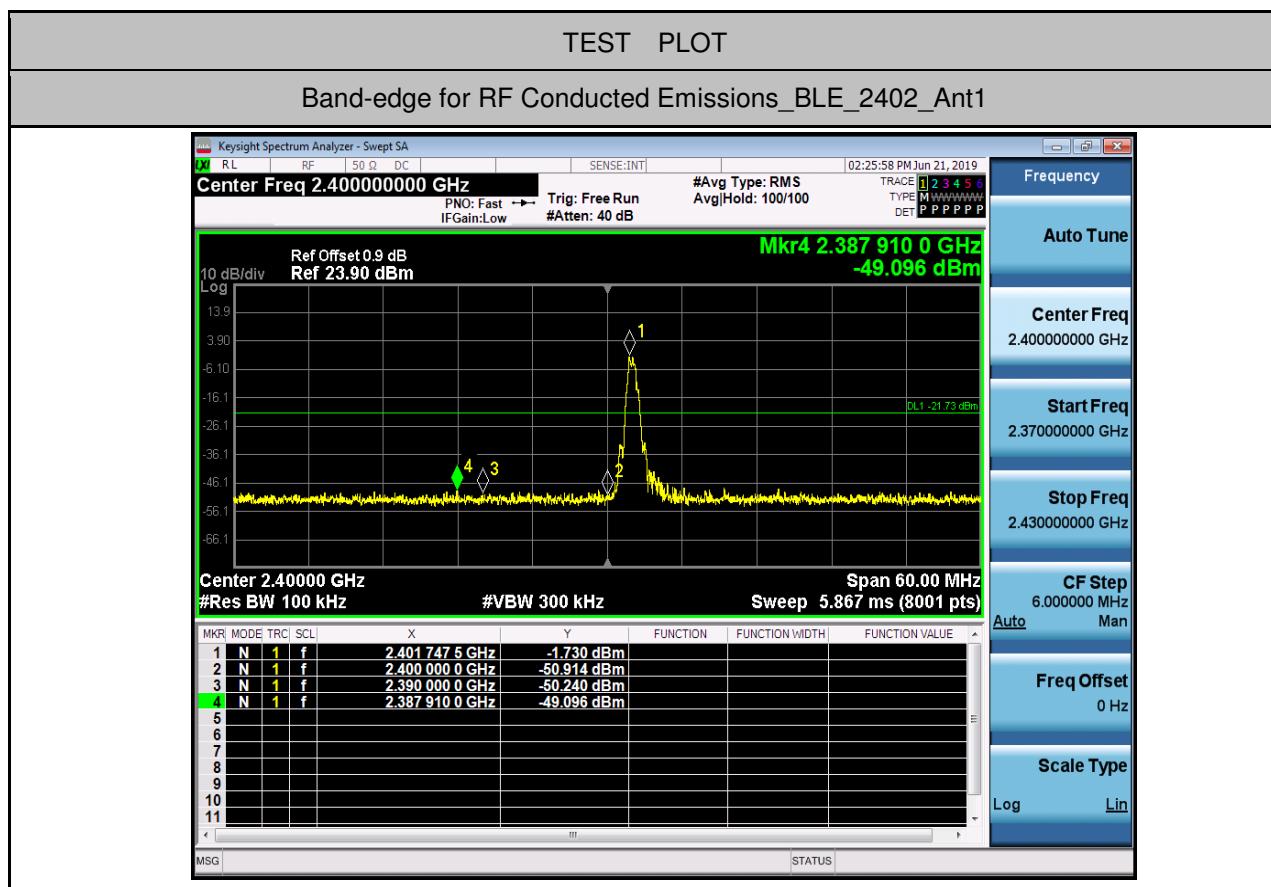
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## 4. Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	-1.730	-49.096	-21.73	PASS
BLE	2480	Ant1	-2.520	-48.609	-22.52	PASS



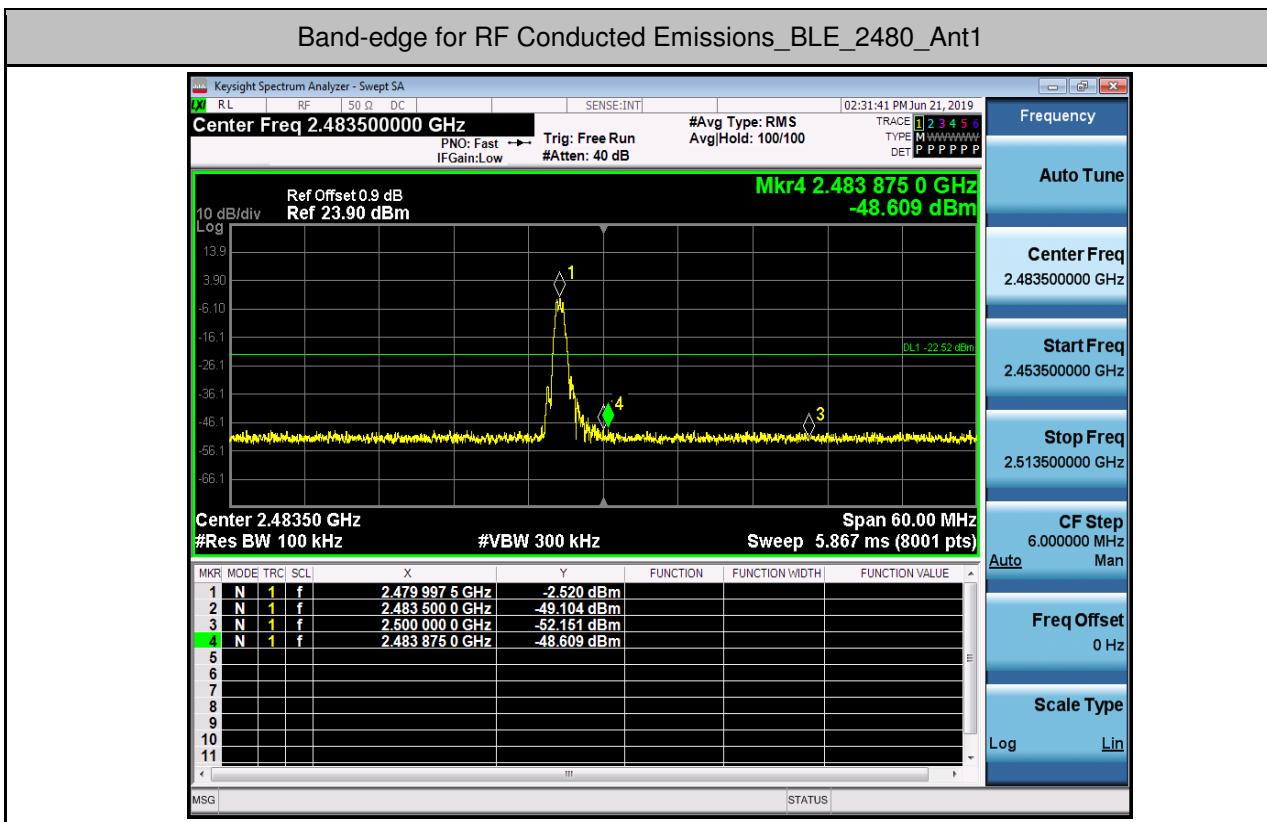
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## 5. RF Conducted Spurious Emissions

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	-1.808	-50.727	<-21.808	PASS
BLE	2402	Ant1	10000	26000	100	300	-1.808	-51.430	<-21.808	PASS
BLE	2442	Ant1	30	10000	100	300	-2.144	-46.846	<-22.144	PASS
BLE	2442	Ant1	10000	26000	100	300	-2.144	-51.404	<-22.144	PASS
BLE	2480	Ant1	30	10000	100	300	-2.662	-53.179	<-22.662	PASS
BLE	2480	Ant1	10000	26000	100	300	-2.662	-51.304	<-22.662	PASS

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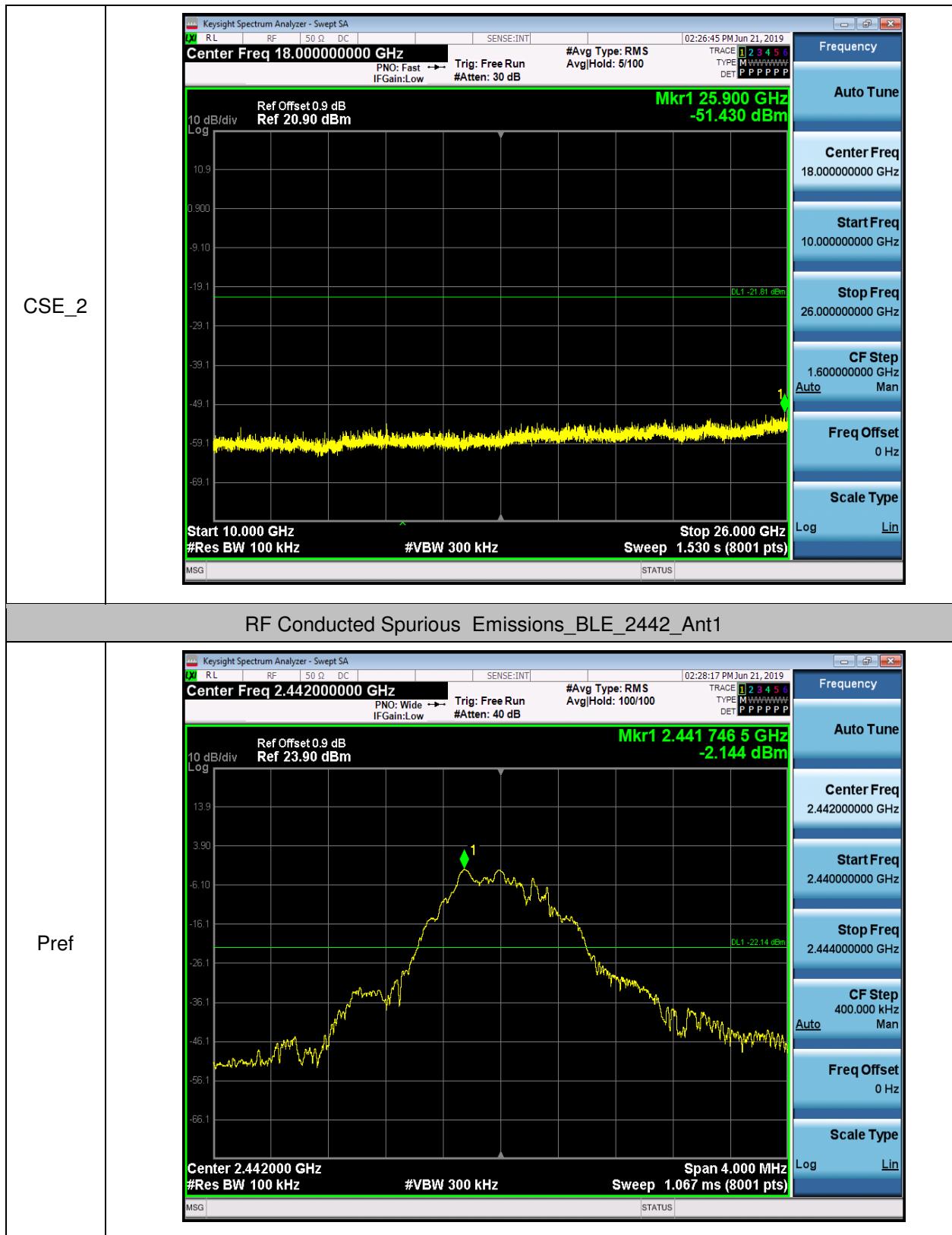


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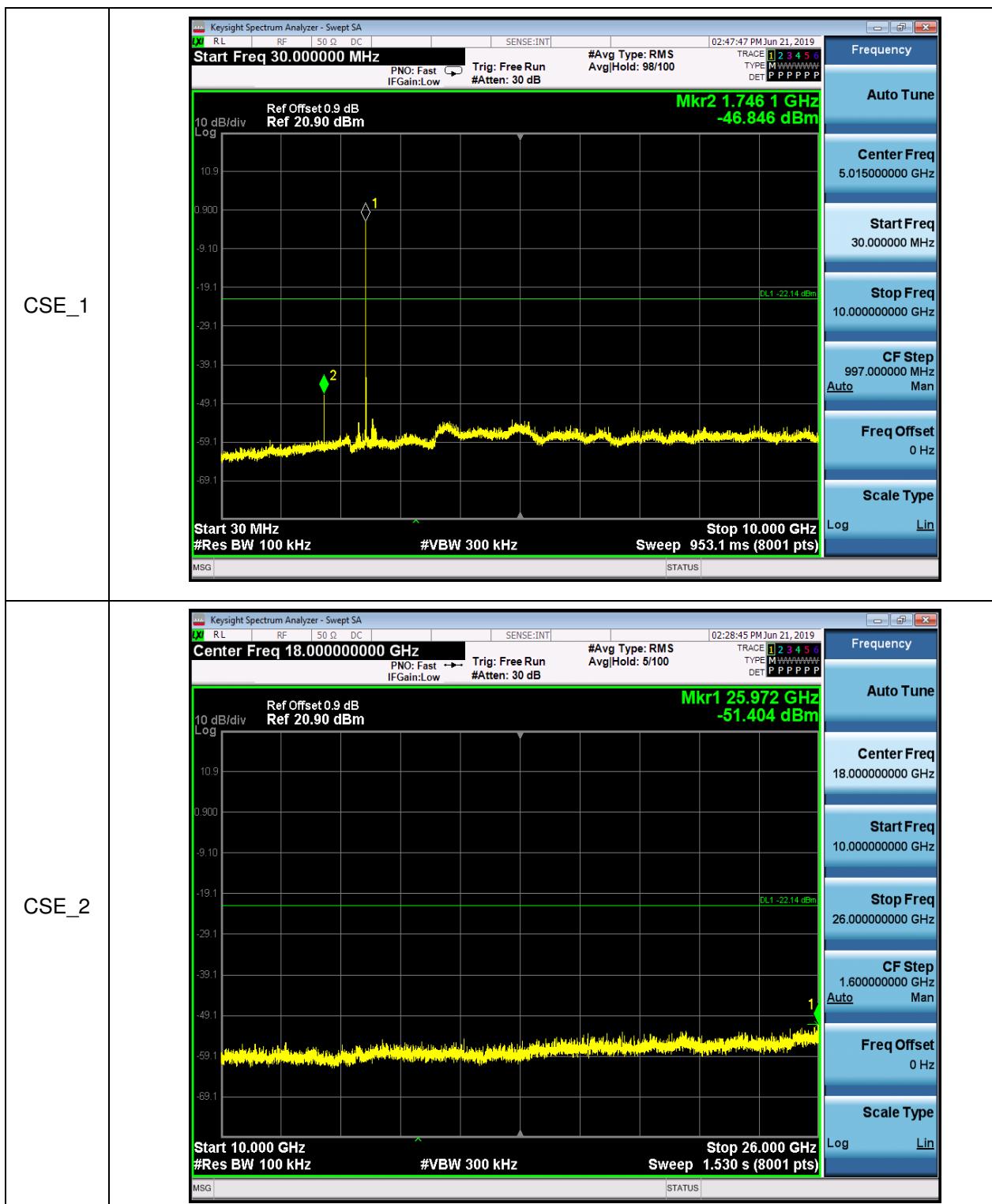


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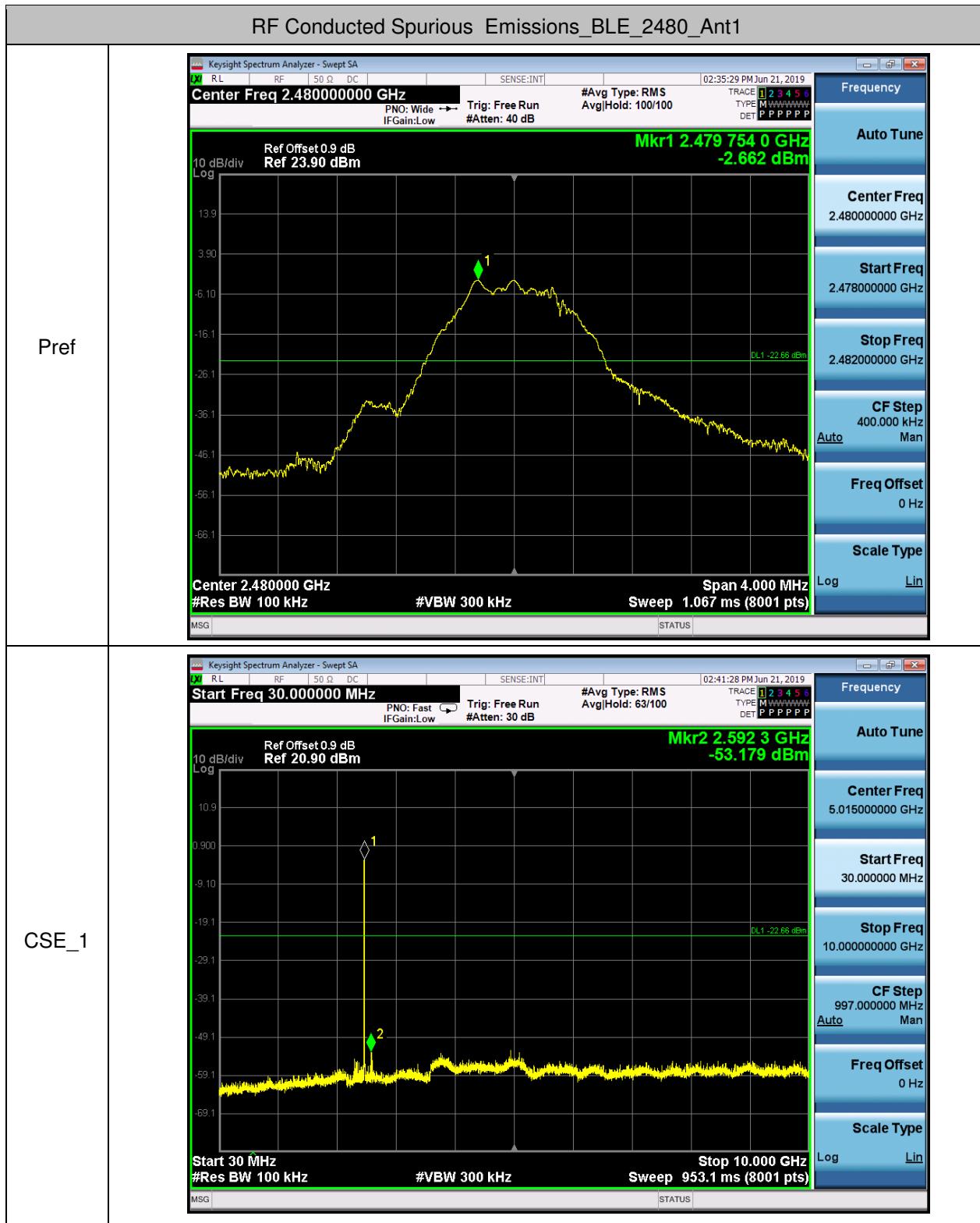
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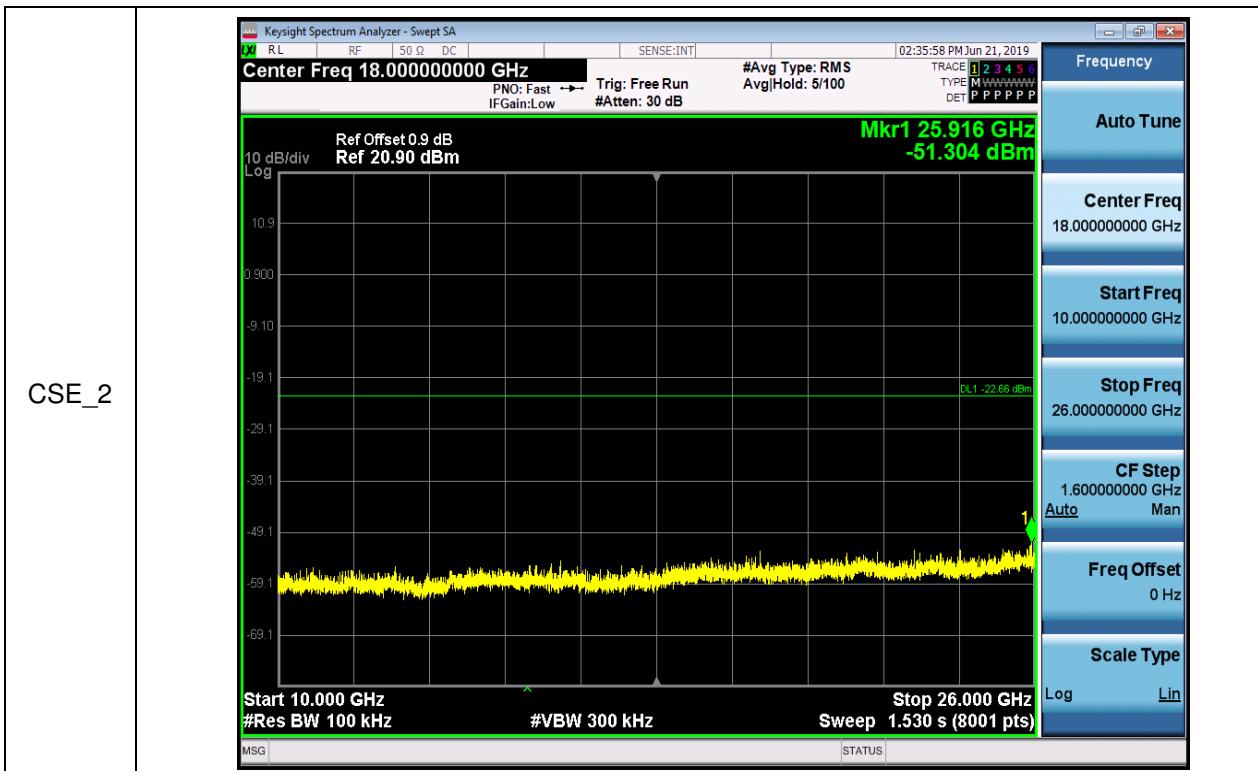
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