

No. 1 Workshop, M-10, Middle section, Science & Technology Park,

Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594 Report No.: SZEM170800865001

Fax: +86 (0) 755 2671 0594 Page: 1 of 61

TEST REPORT

Application No.: SZEM1708008650CR **Applicant:** Canary Connect Inc

Address of Applicant: 606W 28th street 7th floor, New York, NY10001

Manufacturer: Canary Connect Inc

Address of Manufacturer: 606W 28th street 7th floor, New York, NY10001 **Factory:** SKY LIGHT Electronic (Shenzhen) Limited

Address of Factory: No. 6 Building, Jinbi Industrial Area, Huangtian Community, Xixiang Street,

Bao'an District, Shenzhen City, Guangdong Province, China

Equipment Under Test (EUT):

EUT Name: Canary

Model No.: CAN400XXYY (XX represent Region from A-Z, YY represent Color from A-Z) ♣

Please refer to section 2 of this report which indicates which model was actually

tested and which were electrically identical.

Trade mark: Canary

FCC ID: 2ACDL-C400

Standards: 47 CFR Part 15, Subpart C 15.247

Date of Receipt: 2017-08-16

Date of Test: 2017-08-25 to 2017-09-01

Date of Issue: 2017-09-06

Test Result : Pass*



Jack Zhang 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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^{*} In the configuration tested, the EUT complied with the standards specified above.



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	Revision Record						
Version	Version Chapter Date Modified						
01		2017-09-06		Original			

Authorized for issue by:		
	(eo ti	
	Leo Li /Project Engineer	
	Eric Fu	
	Eric Fu /Reviewer	



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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 11.9.1.1	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		

Remark:

Model No.: CAN400XXYY (XX represent Region from A-Z, YY represent Color from A-Z)

Only the model CAN400USBK was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference on Color and Region.



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4 General Information

4.1 Details of E.U.T.

Power supply: DC 5V from adapter input AC 120V/60Hz

Adapter Model:CAN100USAPT2 Input:AC 100-240V 50/60Hz 0.35A

Output:DC 5V 200mA

Test voltage AC 120V/60Hz

Cable: USB cable: 200cm unshielded

Frequency Range: 2402MHz to 2480MHz

Bluetooth Version: V4.0

Modulation Type: GFSK

Number of Channels: 40

Antenna Type: On-board antenna

Antenna Gain: 1.5dBi

4.2 Description of Support Units

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25 x 10 ⁻⁸
2	Duty cycle	0.37%
3	Occupied Bandwidth	3%
4	RF conducted power	0.75dB
5	RF power density	2.84dB
6	Conducted Spurious emissions	0.75dB
7	DE Dadiated names	4.5dB (below 1GHz)
/	RF Radiated power	4.8dB (above 1GHz)
0	Dedicted Couriers emission test	4.5dB (30MHz-1GHz)
8	Radiated Spurious emission test	4.8dB (1GHz-18GHz)
9	Temperature test	1℃
10	Humidity test	3%
11	Supply voltages	1.5%
12	Time	3%



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4.4 Test Location

All tests were performed at:

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

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC

Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

VCCI

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.: G-823, R-4188, T-1153 and C-2383 respectively.

• FCC -Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Conducted Emissions a	Conducted Emissions at AC Power Line (150kHz-30MHz)						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2017-05-10	2018-05-10		
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A		
LISN	Rohde & Schwarz	ENV216	SEM007-01	2016-10-09	2017-10-09		
LISN	ETS-LINDGREN	3816/2	SEM007-02	2017-04-14	2018-04-13		
8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN- T8-02	EMC0120	2016-09-28	2017-09-28		
4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN- T4-02	EMC0121	2016-09-28	2017-09-28		
2 Line ISN	Fischer Custom	FCC-TLISN- T2-02	EMC0122	2016-09-28	2017-09-28		

Minimum 6dB Bandwidth						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2017-04-14	2018-04-13	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09	

Conducted Peak Output Power						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2017-04-14	2018-04-13	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09	



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Power Spectrum Density						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2017-04-14	2018-04-13	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09	

Conducted Band Edges Measurement						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2017-04-14	2018-04-13	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09	

Conducted Spurious Emissions									
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date				
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09				
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09				
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A				
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2017-04-14	2018-04-13				
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09				



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Radiated Emissions which fall in the restricted bands									
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date				
3m Semi-Anechoic Chamber	ΔΙΙΙΝΧ		SEM001-02	2017-05-02	2020-05-01				
Measurement Software	AUDIX	e3 V8.2014- 6-27	N/A	N/A	N/A				
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2017-04-14	2018-04-13				
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-02	2017-03-05	2020-03-05				
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-14				
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-14	2017-06-16	2020-06-15				
Pre-amplifier (0.1-1300MHz)	· I HP		SEM005-02	2016-10-09	2017-10-09				
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA- 0118-352810	SEM005-05	2016-10-09	2017-10-09				
Pre-amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-10	2016-10-17	2017-10-17				
Pre-amplifier (26GHz-40GHz) Compliance Directions Systems Inc.		PAP-2640-50	SEM005-08	2017-04-14	2018-04-13				
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2016-10-09	2017-10-09				
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2015-08-14	2018-08-14				
Band filter	N/A	N/A	SEM023-01	N/A	N/A				



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Radiated Spurious Emissions									
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date				
3m Semi-Anechoic Chamber			SEM001-02	2017-05-02	2020-05-01				
Measurement Software	AUDIX	e3 V8.2014- 6-27	N/A	N/A	N/A				
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2017-04-14	2018-04-13				
BiConiLog Antenna (26-3000MHz) ETS-Lindgren		3142C	SEM003-02	2017-03-05	2020-03-05				
Horn Antenna (1-18GHz) Rohde & Sch		HF907	SEM003-07	2015-06-14	2018-06-14				
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-14	2017-06-16	2020-06-15				
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2016-10-09	2017-10-09				
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA- 0118-352810	SEM005-05	2016-10-09	2017-10-09				
Pre-amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-10	2016-10-17	2017-10-17				
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2017-04-14	2018-04-13				
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2016-10-09	2017-10-09				
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2015-08-14	2018-08-14				
Band filter	N/A	N/A	SEM023-01	N/A	N/A				

General used equipment									
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date				
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2016-10-12	2017-10-12				
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2016-10-12	2017-10-12				
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2016-10-12	2017-10-12				
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-18				



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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

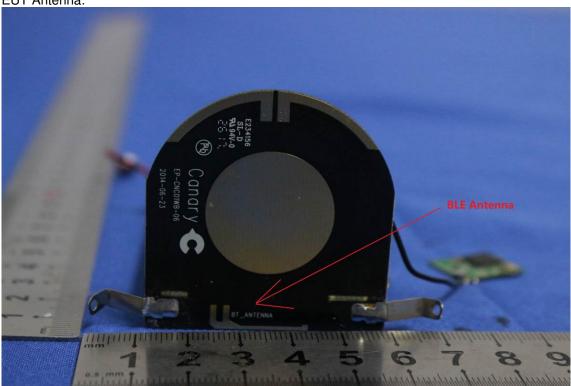
Standard Requirement:

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.





The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 1.5dBi.

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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:

Francisco (MILIA)	Conducted limit(dBμV)						
Frequency of emission(MHz)	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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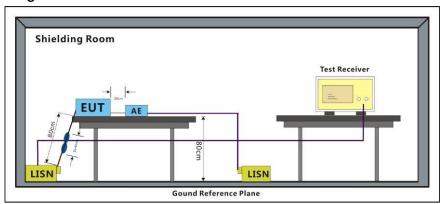
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7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 53 % RH Atmospheric Pressure: 1005 mbar Test mode b: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

- 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.

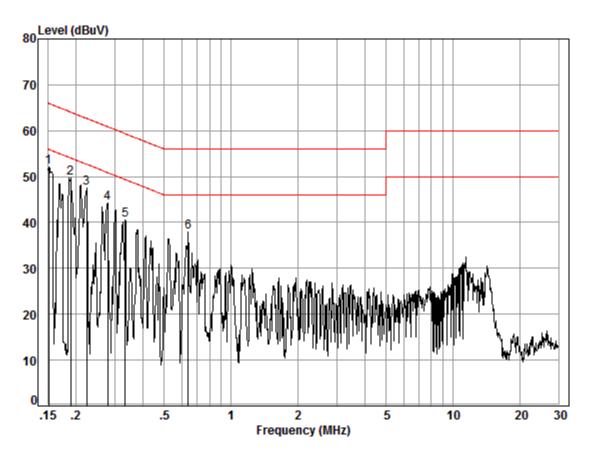
Remark: LISN=Read Level+ Cable Loss+ LISN Factor



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Mode:b; Line:Live Line



Site : Shielding Room

Condition: Line Job No. : 08650CR

Test mode: b

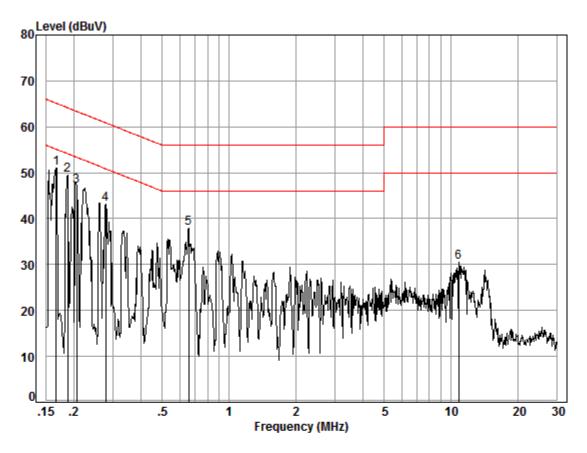
		Cable	LISN	Read		Limit	0ver	
	Freq	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15	0.02	9.64	42.42	52.08	55.96	-3.88	Peak
2	0.19	0.02	9.63	40.08	49.73	54.06	-4.33	Peak
3	0.22	0.02	9.63	37.94	47.59	52.70	-5.11	Peak
4	0.28	0.01	9.63	34.63	44.27	50.85	-6.58	Peak
5	0.33	0.01	9.63	30.80	40.44	49.35	-8.91	Peak
6	0.64	0.02	9.63	28.27	37.92	46.00	-8.08	Peak



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Mode:b; Line:Neutral Line



Site : Shielding Room

Condition: Neutral Job No. : 08650CR

Test mode: b

			LISN					
	Freq	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.17	0.02	9.63	41.46	51.11	55.12	-4.01	Peak
2	0.19	0.02	9.63	39.77	49.42	54.15	-4.73	Peak
3	0.21	0.02	9.63	37.54	47.19	53.36	-6.17	Peak
4	0.28	0.01	9.63	33.61	43.25	50.85	-7.60	Peak
5	0.66	0.02	9.64	28.28	37.94	46.00	-8.06	Peak
6	10.85	0.01	9.87	20.61	30.49	50.00	-19.51	Peak



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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

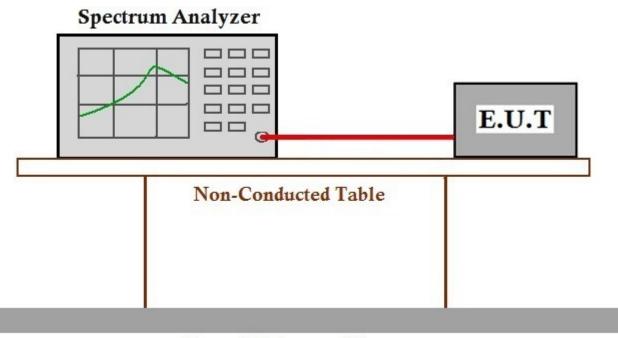
Limit: ≥500 kHz

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.2.2 Test Setup Diagram



Ground Reference Plane

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 11.9.1.1

Limit:

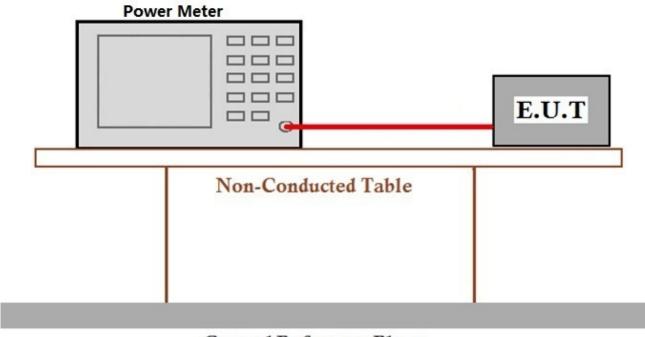
Frequency range(MHz)	Output power of the intentional radiator(watt)				
	1 for ≥50 hopping channels				
902-928	0.25 for 25≤ hopping channels <50				
	1 for digital modulation				
	1 for ≥75 non-overlapping hopping channels				
2400-2483.5	0.125 for all other frequency hopping systems				
	1 for digital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

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.3.2 Test Setup Diagram



Ground Reference Plane

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

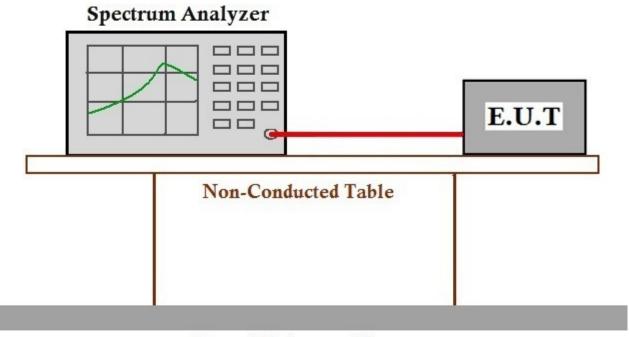
transmission

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.4.2 Test Setup Diagram



Ground Reference Plane

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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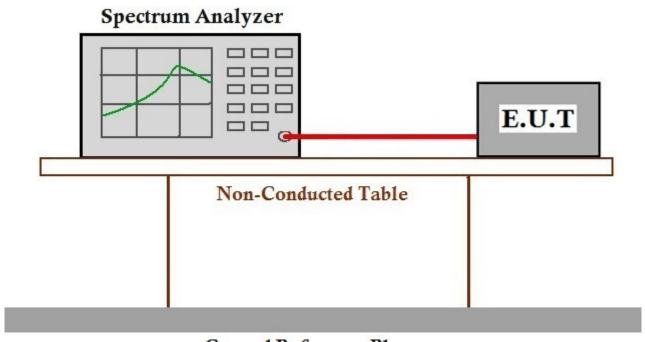
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7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.5.2 Test Setup Diagram



Ground Reference Plane

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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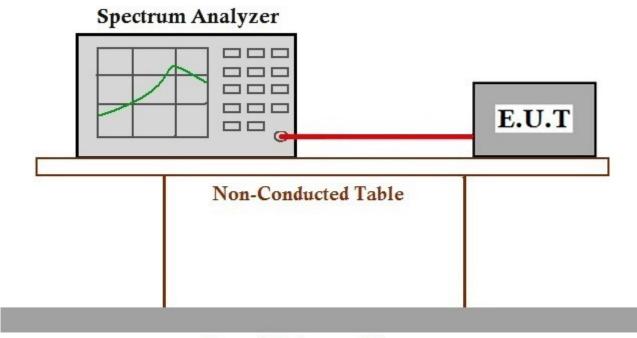
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7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.6.2 Test Setup Diagram



Ground Reference Plane

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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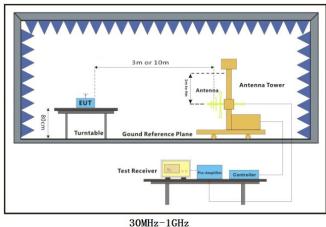
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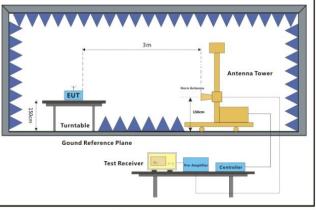
7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1005 mbar Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.7.2 Test Setup Diagram





Iz-1GHz Above 1GHz

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.

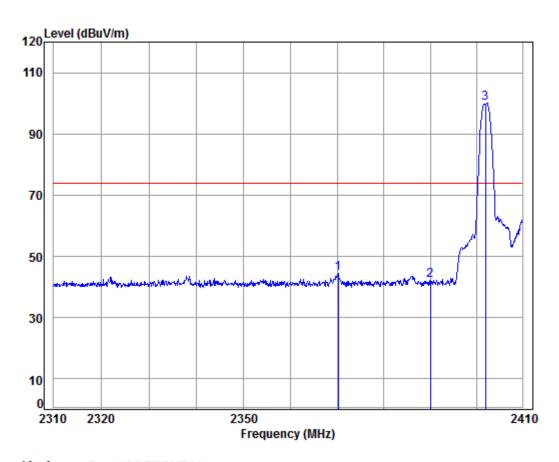
Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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



Condition: 3m HORIZONTAL

Job No : 08650CR

Mode : 2402 Band edge

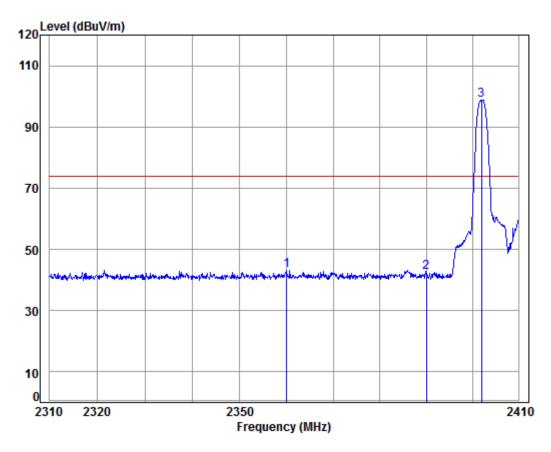
	Freq					Level			Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2370.194	5.45	29.02	37.96	47.96	44.47	74.00	-29.53	peak
2	2390.000	5.47	29.08	37.96	45.75	42.34	74.00	-31.66	peak
3 p	p 2402.000	5.49	29.11	37.95	103.38	100.03	74.00	26.03	peak



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



Condition: 3m VERTICAL Job No : 08650CR

Mode : 2402 Band edge

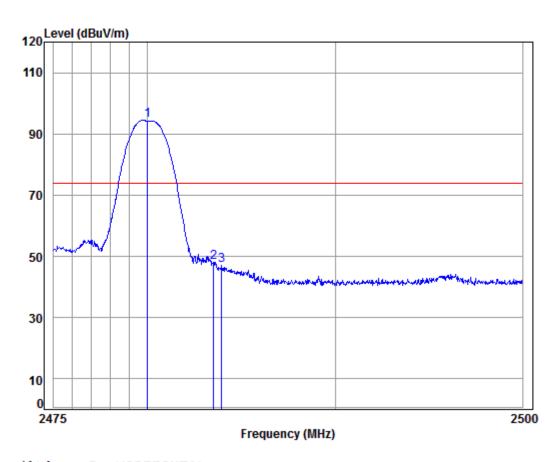
	Freq					Level			Remark
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2360.070	5.43	28.99	37.96	46.80	43.26	74.00	-30.74	peak
2	2390.000	5.47	29.08	37.96	45.96	42.55	74.00	-31.45	peak
3 pp	2402.000	5.49	29.11	37.95	102.17	98.82	74.00	24.82	peak



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



Condition: 3m HORIZONTAL

Job No : 08650CR

Mode : 2480 Band edge

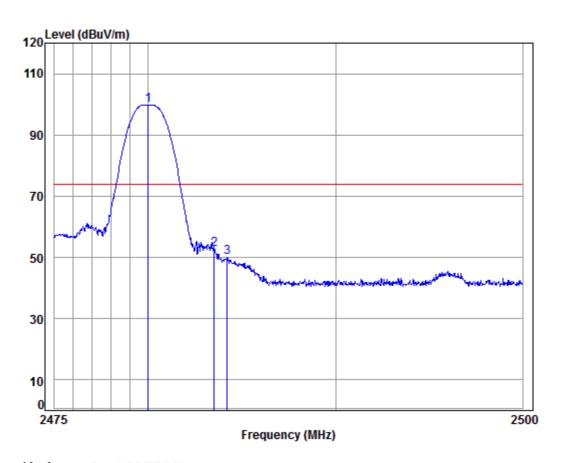
		Freq			Preamp Factor					Remark
	-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	рр	2480.000	5.59	29.34	37.95	97.45	94.43	74.00	20.43	peak
2		2483.500	5.60	29.35	37.95	50.91	47.91	74.00	-26.09	peak
3		2483.946	5.60	29.35	37.95	50.17	47.17	74.00	-26.83	peak



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



Condition: 3m VERTICAL Job No : 08650CR

Mode : 2480 Band edge

		Freq					Level			Remark
	-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	рр	2480.000	5.59	29.34	37.95	102.91	99.89	74.00	25.89	peak
2		2483.500	5.60	29.35	37.95	55.65	52.65	74.00	-21.35	peak
3		2484.196	5.60	29.35	37.95	53.18	50.18	74.00	-23.82	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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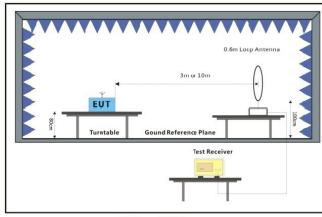
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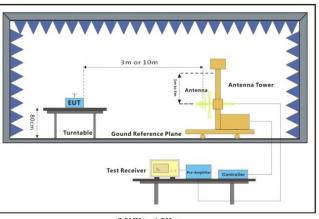
7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1005 mbar
Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

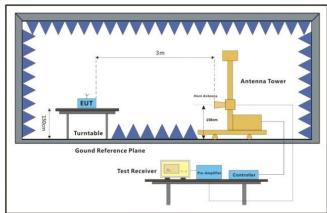
7.8.2 Test Setup Diagram





Below 30MHz

30MHz-1GHz



Above 1GHz



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

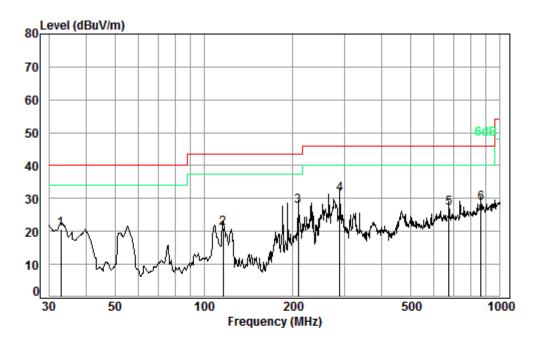


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For 30MHz-1GHz

Mode:b; Polarization:Horizontal;



Condition: 3m HORIZONTAL

Job No. : 08650CR

Test Mode: b

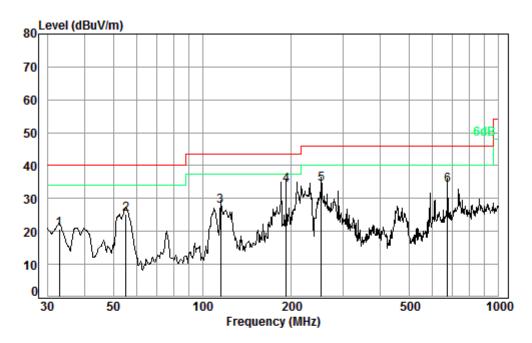
	Freq			Preamp Factor				Over Limit
_	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	32.86	0.60	17.10	27.35	30.31	20.66	40.00	-19.34
2	116.13	1.24	8.17	27.09	38.76	21.08	43.50	-22.42
3	208.58	1.45	10.65	26.67	42.10	27.53	43.50	-15.97
4 pp	287.99	1.85	13.37	26.43	42.41	31.20	46.00	-14.80
5	672.84	2.85	21.33	27.45	30.42	27.15	46.00	-18.85
6	863.06	3.46	22.71	26.96	29.43	28.64	46.00	-17.36



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Mode:b; Polarization:Vertical;



Condition: 3m VERTICAL Job No. : 08650CR

Test Mode: b

		Cable	Ant	Preamp	Read		Limit	0ver
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	32.86	0.60	17.10	27.35	30.26	20.61	40.00	-19.39
2	55.22	0.80	7.92	27.28	43.95	25.39	40.00	-14.61
3	115.32	1.24	8.23	27.10	45.19	27.56	43.50	-15.94
4 pp	191.75	1.39	10.12	26.73	49.17	33.95	43.50	-9.55
5	252.06	1.68	12.34	26.53	46.94	34.43	46.00	-11.57
6	672.84	2.85	21.33	27.45	37.39	34.12	46.00	-11.88

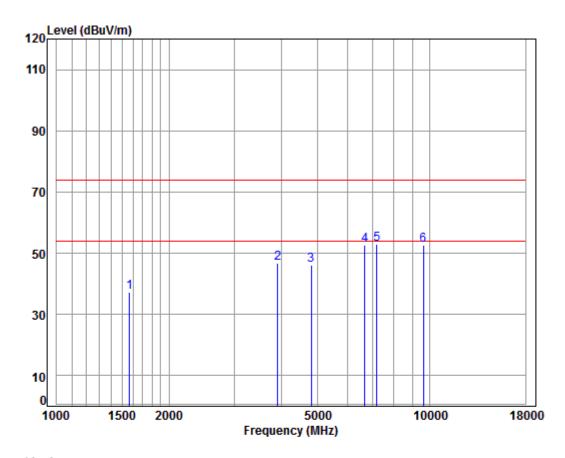


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For Above 1GHz

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



Condition: 3m HORIZONTAL

Job No : 08650CR

Mode : 2402 TX RSE

: BLE

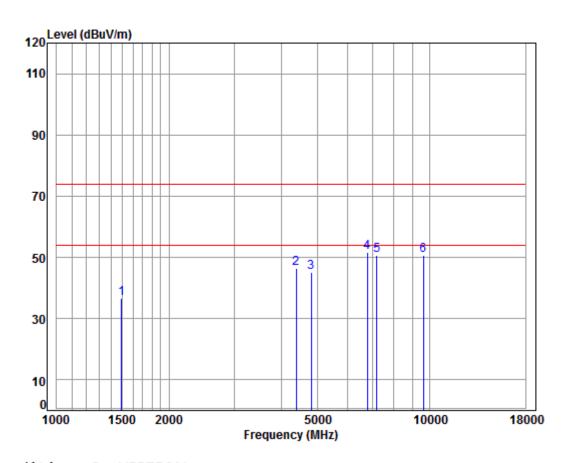
					Preamp					
		Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	-									
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1		1569.721	5.39	26.12	38.03	43.87	37.35	74.00	-36.65	neak
2		3912.809								•
3		4804.000								•
4		6679.040	11.02	35.61	37.60	43.77	52.80	74.00	-21.20	peak
5	pp	7206.000	10.08	36.42	37.10	43.42	52.82	74.00	-21.18	peak
6		9608.000	10.75	37.52	35.09	39.40	52.58	74.00	-21.42	peak



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



Condition: 3m VERTICAL Job No : 08650CR

Mode : 2402 TX RSE

· RIF

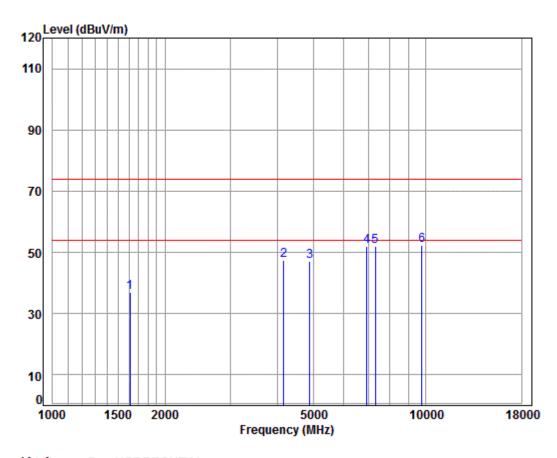
	. DLL								
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1494.455	5.46	25.78	38.04	43.35	36.55	74.00	-37.45	peak
2	4379.699	7.43	33.60	38.20	43.63	46.46	74.00	-27.54	peak
3	4804.000	7.89	34.16	38.41	41.51	45.15	74.00	-28.85	peak
4 pp	6795.879	10.69	35.94	37.49	42.50	51.64	74.00	-22.36	peak
5	7206.000	10.08	36.42	37.10	41.16	50.56	74.00	-23.44	peak
6	9608,000	10.75	37.52	35.09	37.63	50.81	74.00	-23.19	neak



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



Condition: 3m HORIZONTAL

Job No : 08650CR

Mode : 2440 TX RSE

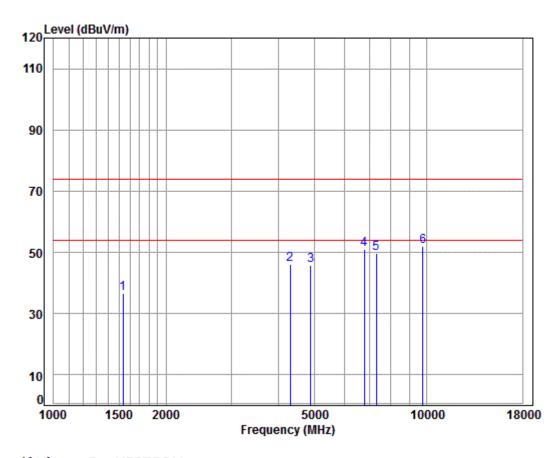
		Freq			Preamp Factor					Remark
	-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1		1611.091	5.34	26.30	38.03	43.34	36.95	74.00	-37.05	peak
2		4157.664	7.17	33.60	38.09	44.71	47.39	74.00	-26.61	peak
3		4880.000	7.97	34.29	38.45	43.23	47.04	74.00	-26.96	peak
4		6934.778	10.31	36.32	37.36	42.57	51.84	74.00	-22.16	peak
5		7320.000	10.05	36.37	37.00	42.61	52.03	74.00	-21.97	peak
		9760.000								-



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



Condition: 3m VERTICAL Job No : 08650CR

Mode : 2440 TX RSE

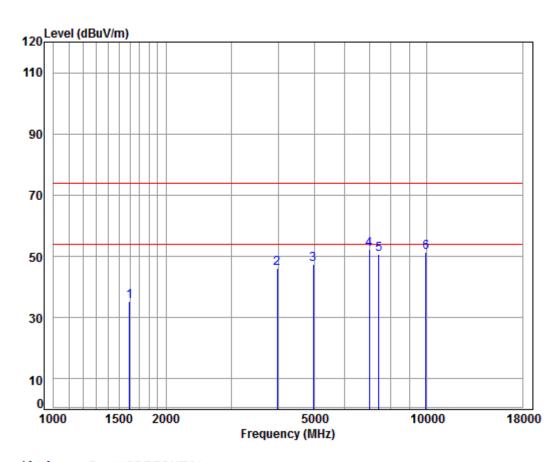
		Freq			Preamp Factor					Remark
	-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1		1533.841	5.44	25.96	38.04	43.29	36.65	74.00	-37.35	peak
2		4304.400	7.34	33.60	38.16	43.46	46.24	74.00	-27.76	peak
3		4880.000	7.97	34.29	38.45	42.10	45.91	74.00	-28.09	peak
4		6795.879	10.69	35.94	37.49	41.79	50.93	74.00	-23.07	peak
5		7320.000	10.05	36.37	37.00	40.24	49.66	74.00	-24.34	peak
6	pp	9760.000	10.82	37.55	35.02	38.74	52.09	74.00	-21.91	peak



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



Condition: 3m HORIZONTAL

Job No : 08650CR

Mode : 2480 TX RSE

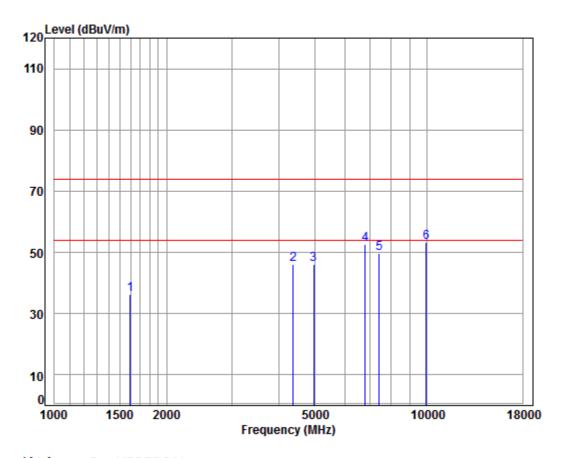
		Freq			Preamp Factor					Remark
	-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1		1597.181	5.35	26.24	38.03	41.83	35.39	74.00	-38.61	peak
2		3969.767	6.95	33.52	38.00	43.53	46.00	74.00	-28.00	peak
3		4960.000	8.05	34.43	38.48	43.46	47.46	74.00	-26.54	peak
4 p	р	6995.172	10.14	36.49	37.30	42.83	52.16	74.00	-21.84	peak
5		7440.000	10.02	36.32	36.89	41.10	50.55	74.00	-23.45	peak
6		9920.000	10.90	37.58	34.94	37.91	51.45	74.00	-22.55	peak



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



Condition: 3m VERTICAL Job No : 08650CR

Mode : 2480 TX RSE

		Freq			Preamp Factor					Remark
	-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1		1597.181	5.35	26.24	38.03	42.61	36.17	74.00	-37.83	peak
2		4367.058	7.41	33.60	38.20	43.16	45.97	74.00	-28.03	peak
3		4960.000	8.05	34.43	38.48	41.94	45.94	74.00	-28.06	peak
4		6815.551	10.64	36.00	37.47	43.55	52.72	74.00	-21.28	peak
5		7440.000	10.02	36.32	36.89	40.19	49.64	74.00	-24.36	peak
6	pp	9920.000	10.90	37.58	34.94	39.74	53.28	74.00	-20.72	peak



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Remark:

1) 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

- 2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) As shown in this section, 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. So, only the peak measurements were shown in the report.



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8 Photographs

8.1 Conducted Emissions at AC Power Line (150kHz-30MHz) Test Setup



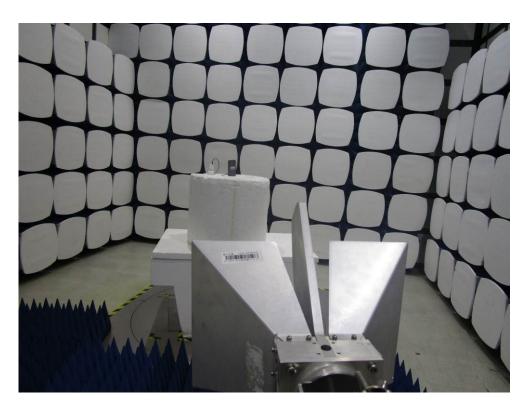


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8.2 Radiated Spurious Emissions Test Setup



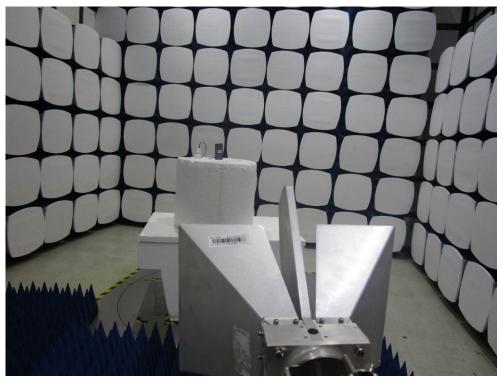




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8.3 Radiated Emissions which fall in the restricted bands



8.4 EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM1708008650CR.



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9 Appendix

9.1 Appendix 15.247

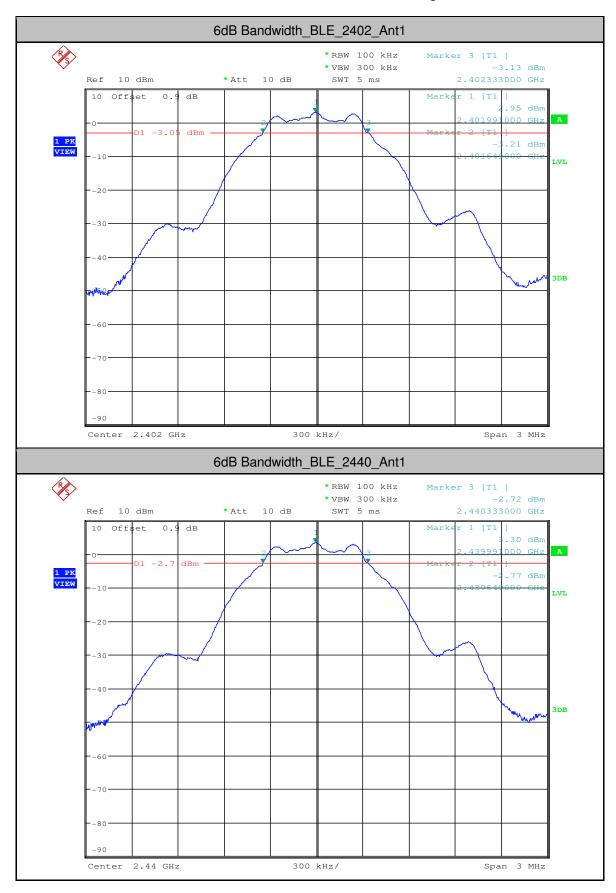
1.6dB Bandwidth

Test Mode	Test Channel	Ant	EBW[MHz]	Limit	Verdict
BLE	2402	Ant1	0.684	>=0.5	PASS
BLE	2440	Ant1	0.684	>=0.5	PASS
BLE	2480	Ant1	0.687	>=0.5	PASS



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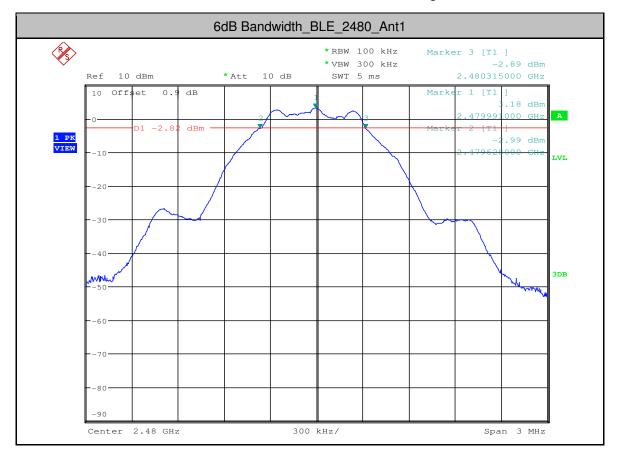


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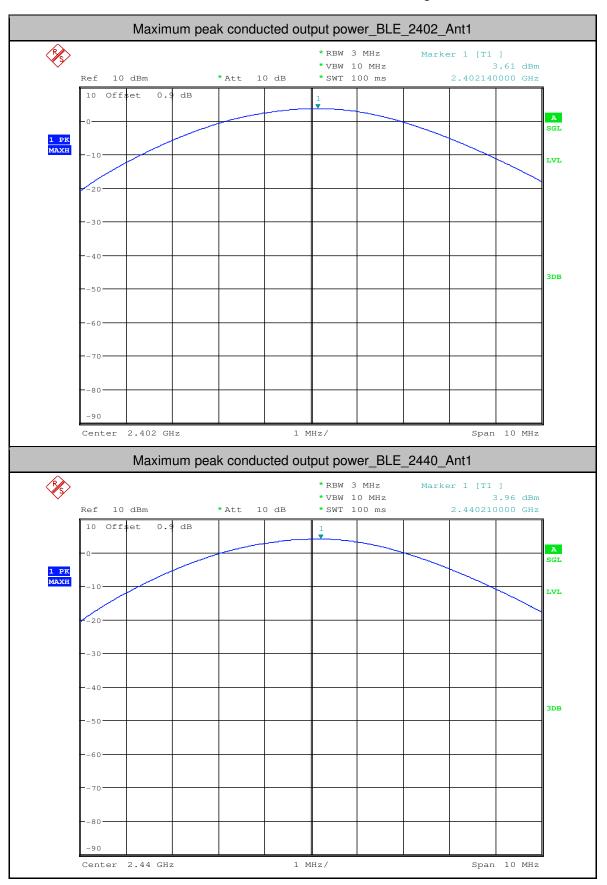
2.Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	3.61	<30	PASS
BLE	2440	Ant1	3.96	<30	PASS
BLE	2480	Ant1	3.89	<30	PASS



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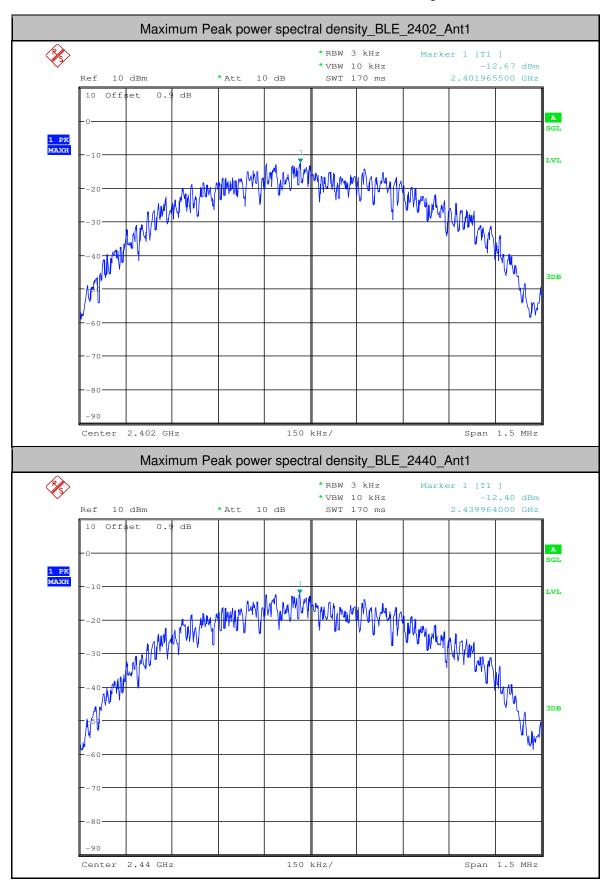
3. Maximum Peak power spectral density

Test Mode	Test Channel	Ant	PSD[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-12.67	<8.00	PASS
BLE	2440	Ant1	-12.4	<8.00	PASS
BLE	2480	Ant1	-12.23	<8.00	PASS



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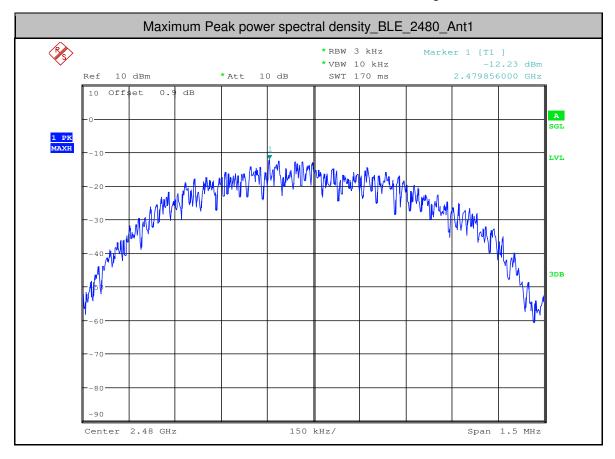
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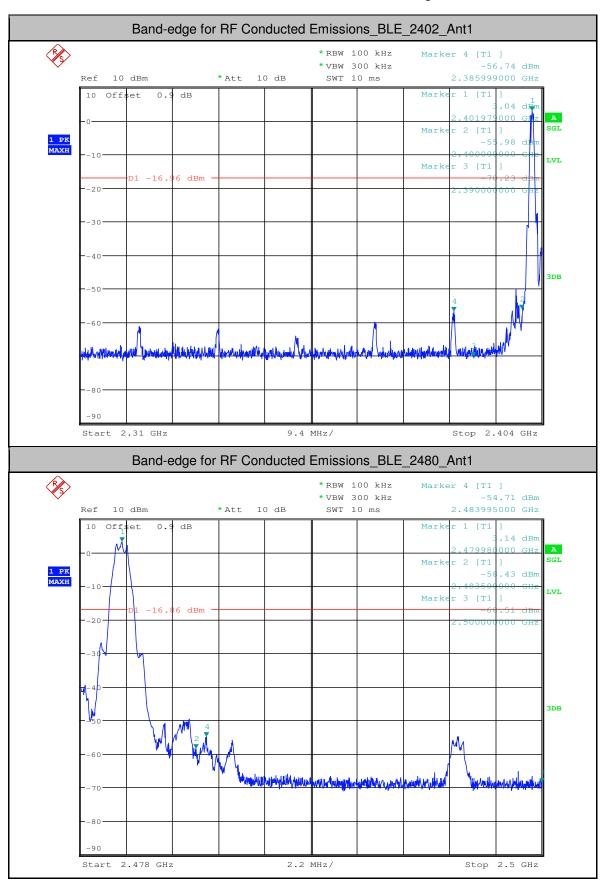
4.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	3.040	-56.737	<-16.96	PASS
BLE	2480	Ant1	3.140	-54.712	<-16.86	PASS



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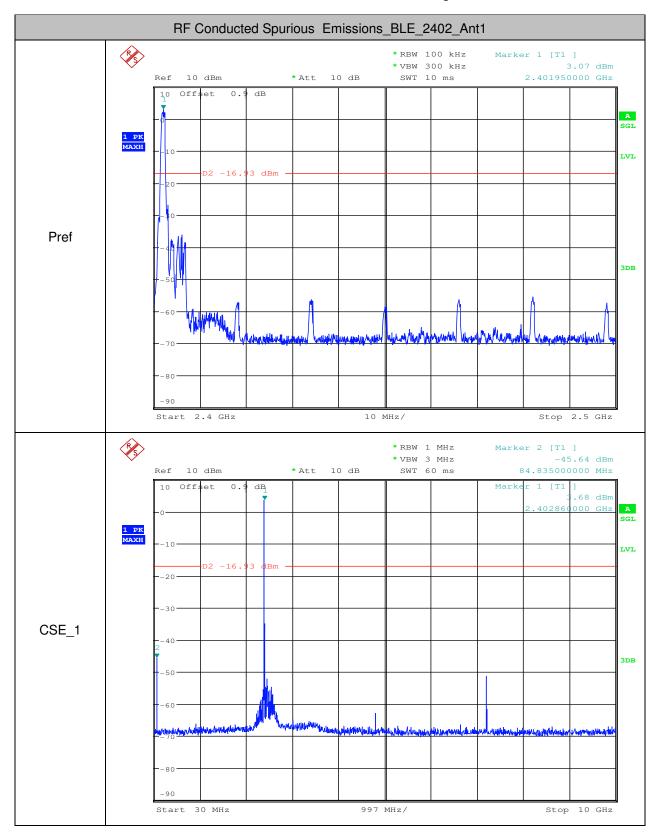
5.RF Conducted Spurious Emissions

Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BLE	2402	30	10000	1000	3000	3.07	-45.640	<- 16.93	PASS
BLE	2402	10000	25000	1000	3000	3.07	-65.210	<- 16.93	PASS
BLE	2440	30	10000	1000	3000	3.37	-45.480	<- 16.63	PASS
BLE	2440	10000	25000	1000	3000	3.37	-65.110	<- 16.63	PASS
BLE	2480	30	10000	1000	3000	3.31	-45.070	<- 16.69	PASS
BLE	2480	10000	25000	1000	3000	3.31	-64.690	<- 16.69	PASS



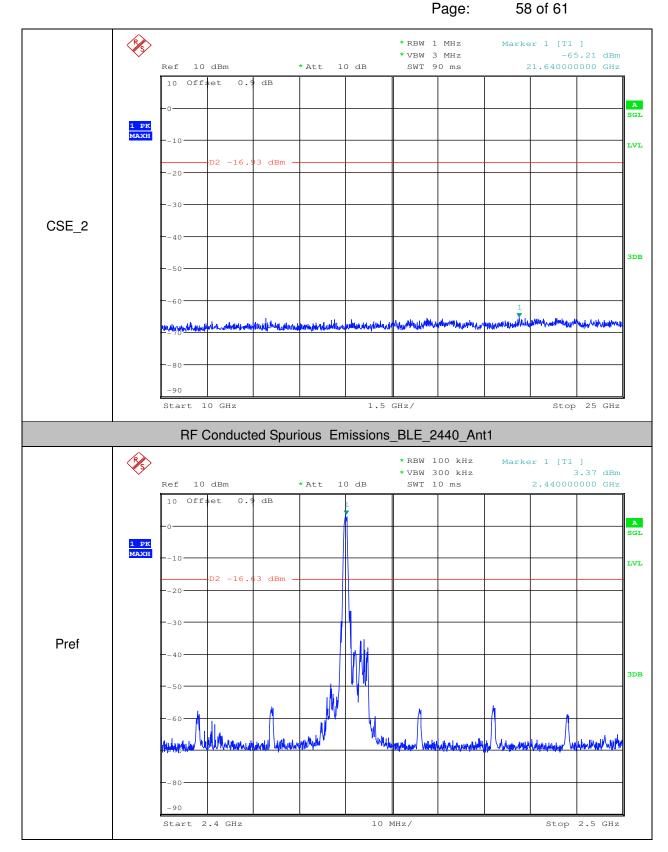
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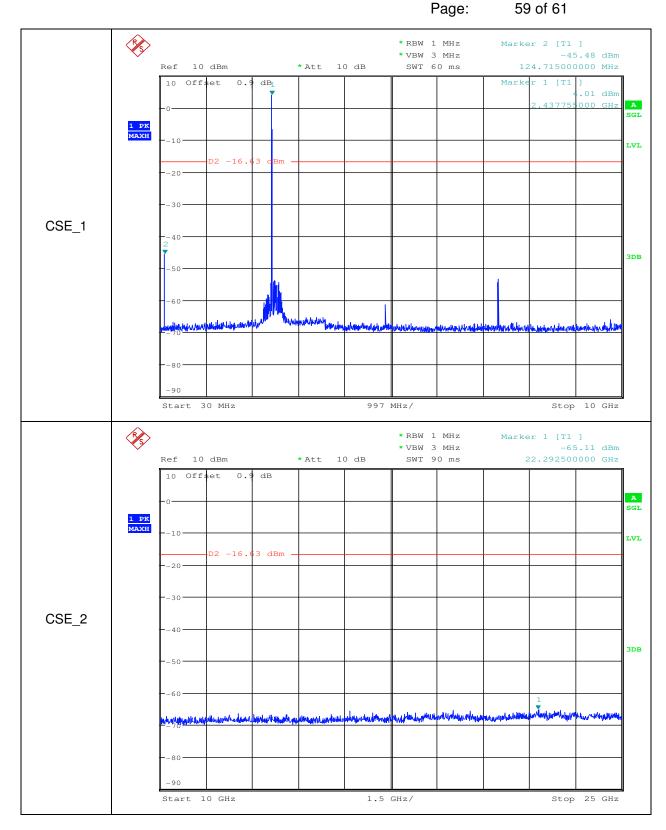


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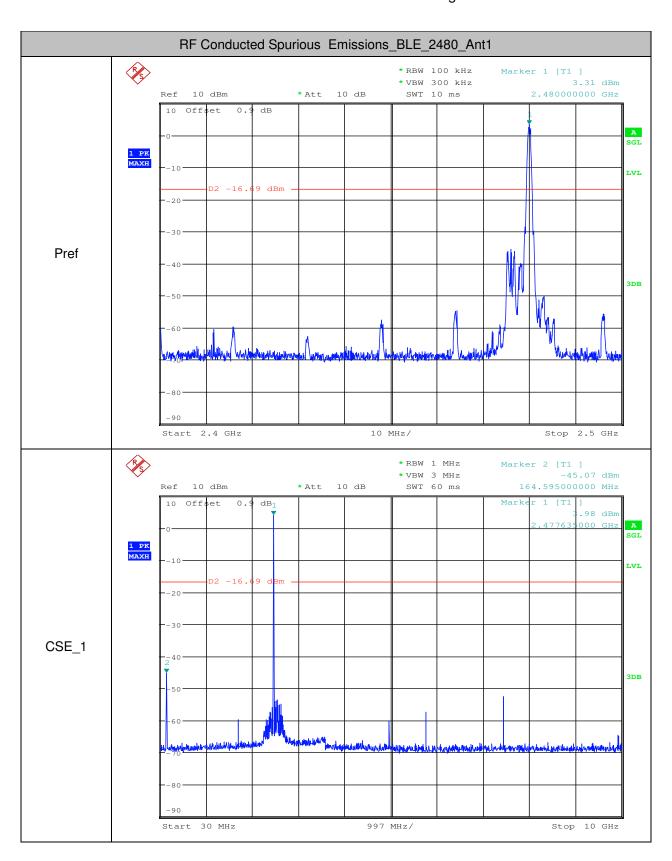
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