

Report No.: SZEM190101000902

Page: 1 of 59

TEST REPORT

Application No.: SZEM1901010009CR

Applicant: Huawei Technologies Co., Ltd.

Address of Applicant: Administration Building, Headquarters of Huawei Technologies Co., Ltd.,

Bantian, Longgang District, Shenzhen, China.

Manufacturer: Huawei Technologies Co., Ltd.

Address of Manufacturer: Administration Building, Headquarters of Huawei Technologies Co., Ltd.,

Bantian, Longgang District, Shenzhen, China.

Factory: Tiinlab Acoustic Technology (Shenzhen) Co., Ltd.

Address of Factory: Tianliao Building F14 East Block (New Materials Industrial Park), Xueyuan

Road, Nanshan District, Shenzhen

Equipment Under Test (EUT):

EUT Name: Wireless Bluetooth Earphones

Model No.: AM-H1CL, CM-H1CL ♣

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

actually tested and which were electrically identical.

Trade mark: HUAWEI, HONOR

FCC ID: QISAM-H1CL

Standard(s): 47 CFR Part 15, Subpart C 15.247

Date of Receipt: 2018-12-23

Date of Test: 2018-12-23 to 2018-12-26

Date of Issue: 2019-01-03

Test Result: Pass*

Keny Xu EMC Laboratory Manager

Ceny. Ku



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



Report No.: SZEM190101000902

Page: 2 of 59

	Revision Record					
Version Chapter Date Modifier Rem						
01		2019-01-03		Original		

Authorized for issue by:		
	fore & Boro	
	Powell Bao /Project Engineer	
	EvicFu	
	Eric Fu /Reviewer	



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Report No.: SZEM190101000902

Page: 3 of 59

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	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Bandwidth	Subpart C 15.247	Section 11.8.1	C 15.247a(2)			
Conducted Peak	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Output Power	Subpart C 15.247	Section 11.9.1	C 15.247(b)(3)			
Power Spectrum	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Density	Subpart C 15.247	Section 11.10.2	C 15.247(e)			
Conducted Band	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Edges Measurement	Subpart C 15.247	Section 11.13.3.2	C 15.247(d)			
Conducted Spurious	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Emissions	Subpart C 15.247	Section 11.11	C 15.247(d)			
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	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Emissions	Subpart C 15.247	Section 6.4,6.5,6.6	C 15.205 & 15.209			

Remark:

Model No.: AM-H1CL, CM-H1CL

Only the model AM-H1CL was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for the above models, with only difference on brand names and model names.



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Report No.: SZEM190101000902

Page: 4 of 59

3 Contents

		P	age
1	COVE	ER PAGE	1
2	TEST	SUMMARY	3
3	CONT	TENTS	,
J	CON	IENIS	4
4	GENE	ERAL INFORMATION	6
		DETAILS OF E.U.T.	
		DESCRIPTION OF SUPPORT UNITS	
		MEASUREMENT UNCERTAINTY	
		TEST LOCATIONTEST FACILITY	
		TEST FACILITY	
		ABNORMALITIES FROM STANDARD CONDITIONS	
_		PMENT LIST	
5	EQUI	PMENT LIST	9
6	RADI	O SPECTRUM TECHNICAL REQUIREMENT	13
	6.1	ANTENNA REQUIREMENT	13
	6.1.1		
	6.1.2	Conclusion	13
7	RADI	O SPECTRUM MATTER TEST RESULTS	14
		MINIMUM 6DB BANDWIDTH	
	7.1.1		
	7.1.2	•	
	7.1.3	Measurement Procedure and Data	
	7.2	CONDUCTED PEAK OUTPUT POWER	15
	7.2.1	· · · - p - · · · · · · · · · · · ·	
	7.2.2		
	7.2.3	Measurement Procedure and Data	
		POWER SPECTRUM DENSITY	
	7.3.1	•	
	7.3.2 7.3.3	Test Setup Diagram Measurement Procedure and Data	
		CONDUCTED BAND EDGES MEASUREMENT	
	7.4.1	E.U.T. Operation	
	7.4.2	Test Setup Diagram	
	7.4.3	Measurement Procedure and Data	
	7.5	CONDUCTED SPURIOUS EMISSIONS	
	7.5.1	E.U.T. Operation	18
	7.5.2	Test Setup Diagram	
	7.5.3	Measurement Procedure and Data	
		RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	
	7.6.1	E.U.T. Operation	
	7.6.2	Test Setup Diagram	
	7.6.3	Measurement Procedure and Data	21
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Report No.: SZEM190101000902

Page: 5 of 59

	7.7 F	RADIATED SPURIOUS EMISSIONS	30
	7.7.1	E.U.T. Operation	31
		Test Setup Diagram	
	7.7.3	Measurement Procedure and Data	32
8	PHOT	OGRAPHS	41
	8.1 T	TEST SETUP PHOTOS	41
	8.2 E	EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS)	41
9	ΔPPF	NDIX	42-59



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Report No.: SZEM190101000902

Page: 6 of 59

General Information

4.1 Details of E.U.T.

Power supply:	Powered by DC3.7V rechargeable battery and can be charged by charging base
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V4.2 Dual mode
	This report is for BLE.
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Gain:	-0.73dBi
Antenna Type:	Chip Antenna

4.2 Description of Support Units

The EUT has been tested as an independent unit.



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Report No.: SZEM190101000902

Page: 7 of 59

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)
8	Dedicted Couriers emission test	± 4.5dB (Below 1GHz)
8	Radiated Spurious emission test	± 4.8dB (Above 1GHz)
9	Temperature test	± 1 ℃
10	Humidity test	± 3%
11	Supply voltages	± 1.5%
12	Time	± 3%



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Report No.: SZEM190101000902

Page: 8 of 59

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 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 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.

Innovation, Science and Economic Development Canada

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

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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Report No.: SZEM190101000902

Page: 9 of 59

5 Equipment List

Minimum 6dB Bandwidth						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2018-09-27	2019-09-26	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-02	2018-07-12	2019-07-11	
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A	
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24	

Conducted Peak Output Power						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2018-09-27	2019-09-26	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-02	2018-07-12	2019-07-11	
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A	
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24	

Power Spectrum Density						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2018-09-27	2019-09-26	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-02	2018-07-12	2019-07-11	
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A	
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24	



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Report No.: SZEM190101000902

Page: 10 of 59

Conducted Band Edges Measurement						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2018-09-27	2019-09-26	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-02	2018-07-12	2019-07-11	
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A	
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24	

Conducted Spurious Emissions								
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date			
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24			
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2018-09-27	2019-09-26			
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A			
Coaxial Cable	SGS	N/A	SEM031-02	2018-07-12	2019-07-11			
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A			
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26			
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24			

Radiated Emissions wh	Radiated Emissions which fall in the restricted bands								
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date				
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12				
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A				
Coaxial Cable	SGS	N/A	SEM026-01	2018-07-12	2019-07-11				
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01				
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26				
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12				
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16				
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2018-09-25	2019-09-24				
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2018-09-27	2019-09-26				



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Report No.: SZEM190101000902

Page: 11 of 59

Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2018-04-02	2019-04-01
Pre-amplifier(26GHz- 40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2018-04-02	2019-04-01
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2018-09-25	2019-09-24
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21
Band filter	N/A	N/A	SEM023-01	N/A	N/A

Radiated Spurious Emis	sions				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2018-07-12	2019-07-11
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2018-09-25	2019-09-24
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2018-09-27	2019-09-26
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2018-04-02	2019-04-01
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2018-04-02	2019-04-01
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2018-09-25	2019-09-24
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21
Band filter	N/A	N/A	SEM023-01	N/A	N/A

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2018-09-25	2019-09-24
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017-06-27	2020-06-26



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Report No.: SZEM190101000902

Page: 12 of 59

Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2018-04-02	2019-04-01
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2018-07-12	2019-07-11

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	2018-09-27	2019-09-26		
Humidity/ Temperature Indicator			SEM002-04	2018-09-27	2019-09-26		
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2018-09-27	2019-09-26		
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2018-04-08	2019-04-07		



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Report No.: SZEM190101000902

Page: 13 of 59

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 -0.73dBi.



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Page: 14 of 59

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: ≥500 kHz

7.1.1 E.U.T. Operation

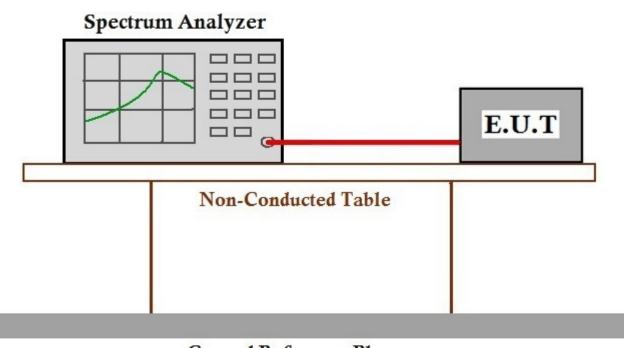
Operating Environment:

Temperature: 24.4 °C Humidity: 59.4 % RH Atmospheric Pressure: 1015 mbar

Test mode c:TX mode(left)_Keep the EUT in continuously transmitting mode with GFSK

modulation

7.1.2 Test Setup Diagram



Ground Reference Plane

7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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Report No.: SZEM190101000902

Page: 15 of 59

7.2 Conducted Peak Output Power

47 CFR Part 15, Subpart C 15.247(b)(3) Test Requirement ANSI C63.10 (2013) Section 11.9.1 Test Method:

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

7.2.1 E.U.T. Operation

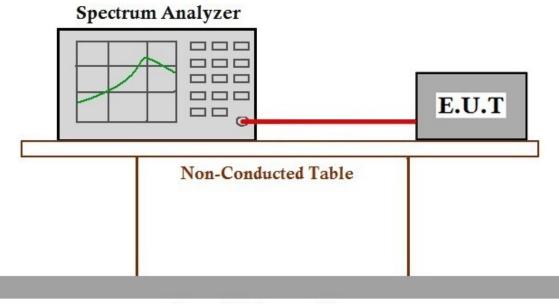
Operating Environment:

Temperature: 59.4 % RH Atmospheric Pressure: 1015 mbar 24.4 °C Humidity:

Test mode c:TX mode(left) 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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Report No.: SZEM190101000902

Page: 16 of 59

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: 24.4 °C Humidity: 59.3 % RH Atmospheric Pressure: 1015 mbar

Test mode c:TX mode(left)_Keep the EUT in continuously transmitting mode with GFSK

modulation

7.3.2 Test Setup Diagram

Spectrum Analyzer E.U.T Non-Conducted Table

Ground Reference Plane

7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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Report No.: SZEM190101000902

17 of 59 Page:

7.4 Conducted Band Edges Measurement

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

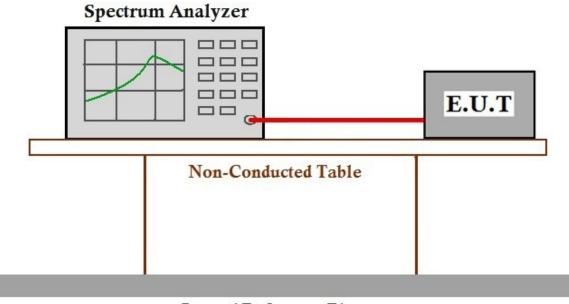
Operating Environment:

Temperature: Humidity: 59.2 % RH Atmospheric Pressure: 1015 mbar

Test mode c:TX mode(left)_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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Report No.: SZEM190101000902

Page: 18 of 59

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 kH

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

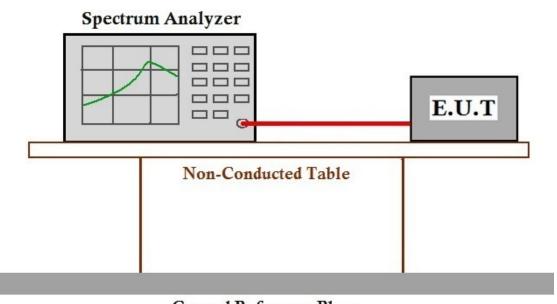
Operating Environment:

Temperature: 24.4 °C Humidity: 59.3 % RH Atmospheric Pressure: 1015 mbar

Test mode c:TX mode(left)_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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Report No.: SZEM190101000902

19 of 59 Page:

7.6 Radiated Emissions which fall in the restricted bands

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

ANSI C63.10 (2013) Section 6.10.5 Test Method:

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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Report No.: SZEM190101000902

Page: 20 of 59

7.6.1 E.U.T. Operation

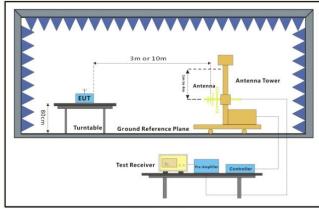
Operating Environment:

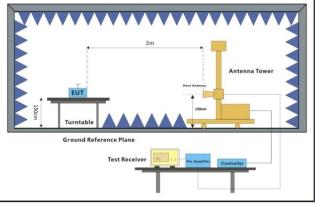
Temperature: 21.8 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Test mode c:TX mode(left)_Keep the EUT in continuously transmitting mode with GFSK

modulation

7.6.2 Test Setup Diagram





30MHz-1GHz Above 1GHz



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Report No.: SZEM190101000902

Page: 21 of 59

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.



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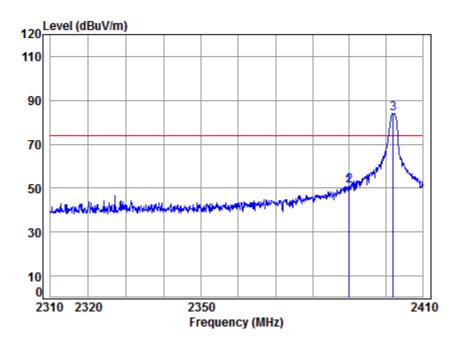
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Report No.: SZEM190101000902

Page: 22 of 59

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



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00039CR

Mode : 2402 Band edge

NOTE : BLE

> 1 2 3

		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		
	2389.862	5.47	28.52	41.17	58.03	50.85	74.00	-23.15	peak	
2	2390.000	5.47	28.52	41.17	58.15	50.97	74.00	-23.03	peak	
*	2402.000	5.49	28.54	41.18	91.15	84.00	74.00	10.00	peak	



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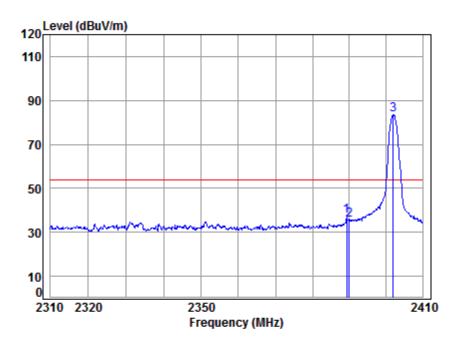
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Report No.: SZEM190101000902

Page: 23 of 59

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



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00039CR

Mode : 2402 Band edge

NOTE : BLE

> 1 2 3

Freq			Preamp Factor					Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	——dB	
2389.254	5.47	28.52	41.17	44.48	37.30	54.00	-16.70	Average
2390.000 * 2402.000								_



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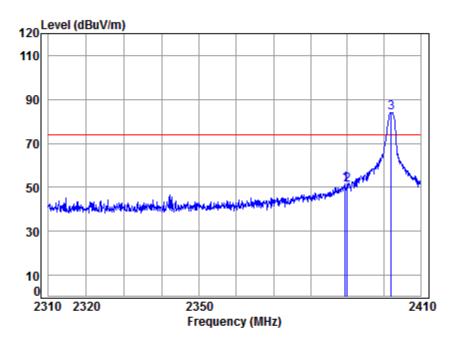
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Report No.: SZEM190101000902

Page: 24 of 59

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



Site : chamber

Condition: 3m VERTICAL Job No : 00039CR

Mode : 2402 Band edge

NOTE : BLE

1 2 3

_		-								
		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		
	2389.356	5.47	28.52	41.17	58.59	51.41	74.00	-22.59	Peak	
	2390.000	5.47	28.52	41.17	58.41	51.23	74.00	-22.77	Peak	
*	2402.000	5.49	28.54	41.18	91.11	83.96	74.00	9.96	Peak	



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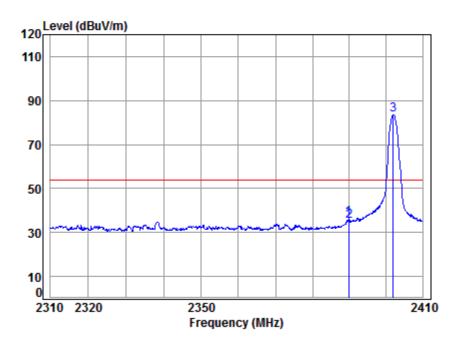
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Report No.: SZEM190101000902

Page: 25 of 59

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



Site : chamber

Condition: 3m VERTICAL Job No : 00039CR

Mode : 2402 Band edge

NOTE : BLE

> 1 2 3

Freq			Preamp Factor					Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
2389.761 2390.000 * 2402.000	5.47	28.52	41.17	42.48	35.30	54.00	-18.70	Average



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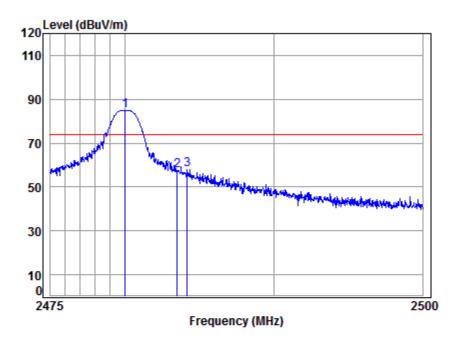
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Report No.: SZEM190101000902

Page: 26 of 59

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



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00039CR

Mode : 2480 Band edge

NOTE : BLE

1 2 3

	_			Preamp						
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark	
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		-
*	2480.000	5.59	28.67	41.21	91.88	84.93	74.00	10.93	peak	
	2483.500	5.60	28.67	41.21	64.66	57.72	74.00	-16.28	peak	
	2/12/1 1/16	5 60	28 67	/11 21	65 01	52 10	7/ 00	15 00	nook	



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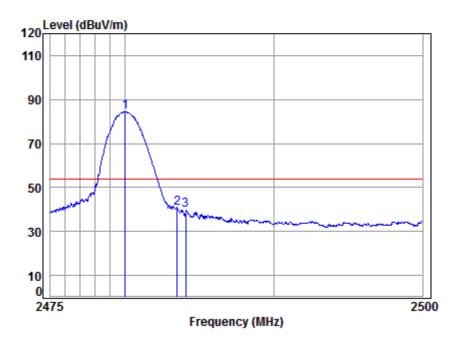
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Report No.: SZEM190101000902

Page: 27 of 59

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



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00039CR

Mode : 2480 Band edge

NOTE : BLE

1 2 3

	Freq			Preamp Factor					Remark	
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		_
	* 2480.000 2483.500								Average Average	
;	2484.071	5.60	28.67	41.21	46.85	39.91	54.00	-14.09	Average	



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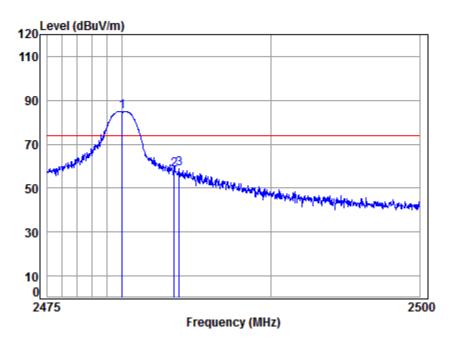
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Report No.: SZEM190101000902

Page: 28 of 59

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



Site : chamber

Condition: 3m VERTICAL Job No : 00039CR

Mode : 2480 Band edge

NOTE : BLE

> 1 2 3

_		-								
		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		
*	2480.000	5.59	28.67	41.21	91.90	84.95	74.00	10.95	Peak	
	2483.500	5.60	28.67	41.21	65.16	58.22	74.00	-15.78	Peak	
	2483.821	5.60	28.67	41.21	65.71	58.77	74.00	-15.23	Peak	



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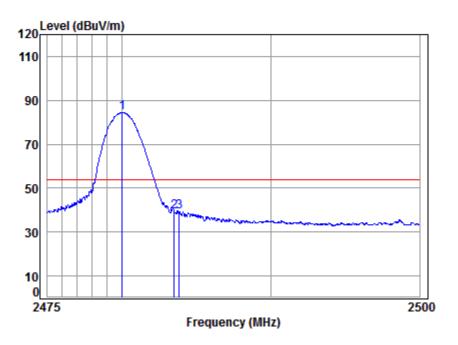
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Page: 29 of 59

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



Site : chamber

Condition: 3m VERTICAL Job No : 00039CR

Mode : 2480 Band edge

NOTE : BLE

1 2 3

_		_								
		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		
*	2480.000	5.59	28.67	41.21	91.43	84.48	54.00	30.48	Average	
	2483.500	5.60	28.67	41.21	46.17	39.23	54.00	-14.77	Average	
	2483.821	5.60	28.67	41.21	46.38	39.44	54.00	-14.56	Average	



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Report No.: SZEM190101000902

Page: 30 of 59

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.



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Report No.: SZEM190101000902

Page: 31 of 59

7.7.1 E.U.T. Operation

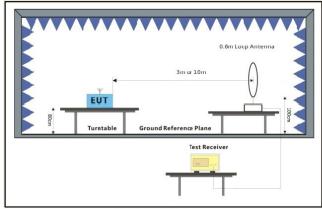
Operating Environment:

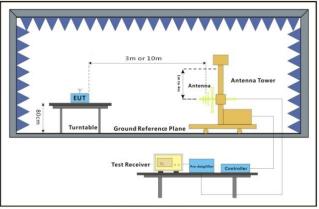
Humidity: 58 % RH Temperature: 21.8 °C Atmospheric Pressure: 1020 mbar

Test mode c:TX mode(left)_Keep the EUT in continuously transmitting mode with GFSK

modulation

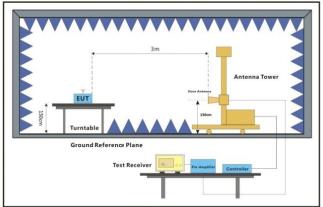
7.7.2 Test Setup Diagram





Below 30MHz

30MHz-1GHz



Above 1GHz



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Report No.: SZEM190101000902

Page: 32 of 59

7.7.3 Measurement Procedure and Data

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

- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark:

- 1) 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 in the report.



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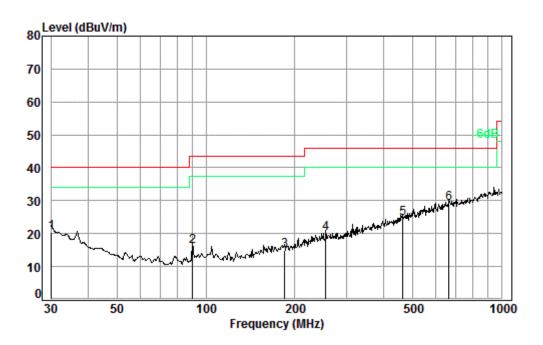


Report No.: SZEM190101000902

Page: 33 of 59

Radiated Emission below 1GHz

30MHz~1GHz (QP) Polarization:Horizontal;



Condition: 3m HORIZONTAL

Job No. : 09820CR

Test mode: c

		Cable	Ant	Preamp	Read		Limit	0ver
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
_	MII-					JD: A//	JD: 3//	
	MHz	dB	ab/m	dB	авич	abuv/m	abuv/m	dB
1	30.11	0.60	22.44	27.36	24.55	20.23	40.00	-19.77
2	90.22	1.10	13.12	27.21	29.09	16.10	43.50	-27.40
3	184.49	1.38	16.04	26.75	24.17	14.84	43.50	-28.66
4	254.73	1.70	19.02	26.52	25.82	20.02	46.00	-25.98
5	462.35	2.46	23.83	27.52	25.78	24.55	46.00	-21.45
6 pp	663.47	2.83	27.45	27.46	26.46	29.28	46.00	-16.72



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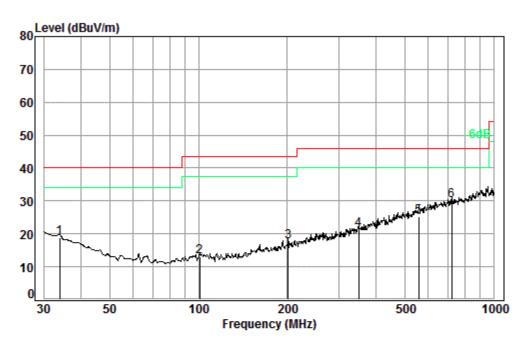
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Report No.: SZEM190101000902

Page: 34 of 59

Polarization:Vertical;



Condition: 3m VERTICAL Job No. : 09820CR

Test mode: c

		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
	22.02	0.60	20. 27	27.24	25 20	40.03	40.00	24 47
1	33.92	0.60	20.37	27.34	25.20	18.83	40.00	-21.1/
2	100.93	1.20	13.95	27.19	25.01	12.97	43.50	-30.53
3	201.39	1.41	16.55	26.69	26.26	17.53	43.50	-25.97
4	348.03	2.05	21.05	26.77	24.96	21.29	46.00	-24.71
5	556.77	2.66	25.78	27.61	24.46	25.29	46.00	-20.71
6 pp	719.20	2.96	28.02	27.39	26.60	30.19	46.00	-15.81



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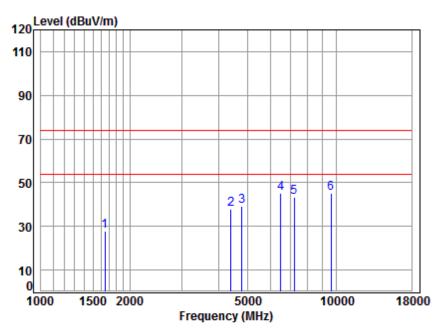


Report No.: SZEM190101000902

Page: 35 of 59

Transmitter emission above 1GHz

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



Site : chamber

Condition: 3m HORIZONTAL

Job No : 09820CR Mode : 2402 TX RSE

Note : BLE

		_							
		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	1648.778	5.29	26.46	41.50	37.63	27.88	74.00	-46.12	peak
2	4405.090	7.46	33.44	42.40	39.43	37.93	74.00	-36.07	peak
3	4804.000	7.89	33.97	42.47	39.77	39.16	74.00	-34.84	peak
4	6488.754	11.52	35.59	41.22	39.47	45.36	74.00	-28.64	peak
5	7206.000	10.08	36.07	40.71	37.83	43.27	74.00	-30.73	peak
6	9608.000	10.75	37.67	37.74	34.60	45.28	74.00	-28.72	neak



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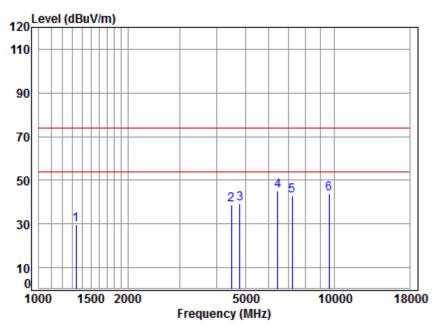
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Report No.: SZEM190101000902

Page: 36 of 59

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



Site : chamber Condition: 3m VERTICAL

Job No : 09820CR

Mode : 2402 TX RSE

Note : BLE

	Freq			Preamp Factor					Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1335.141	4.93	25.17	41.29	40.91	29.72	74.00	-44.28	peak
2	4482.150	7.54	33.57	42.41	39.87	38.57	74.00	-35.43	peak
3	4804.000	7.89	33.97	42.47	39.71	39.10	74.00	-34.90	peak
	6432.732								
5	7206.000	10.08	36.07	40.71	37.42	42.86	74.00	-31.14	peak
6	9608.000	10.75	37.67	37.74	33.28	43.96	74.00	-30.04	peak



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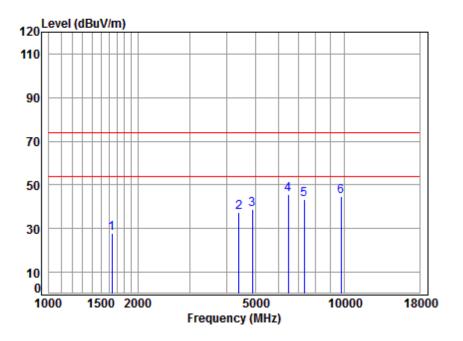
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Report No.: SZEM190101000902

Page: 37 of 59

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



Site : chamber

Condition: 3m HORIZONTAL

Job No : 09820CR Mode : 2440 TX RSE

Note : BLE

		_							
		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	1634.543	5.31	26.40	41.49	37.83	28.05	74.00	-45.95	peak
2	4405.090	7.46	33.44	42.40	38.71	37.21	74.00	-36.79	peak
3	4880.000	7.97	34.06	42.48	39.39	38.94	74.00	-35.06	peak
4	6470.026	11.48	35.57	41.24	39.85	45.66	74.00	-28.34	peak
5	7320.000	10.05	36.16	40.63	37.71	43.29	74.00	-30.71	peak
6	9760.000	10.82	37.76	37.53	33.87	44.92	74.00	-29.08	peak



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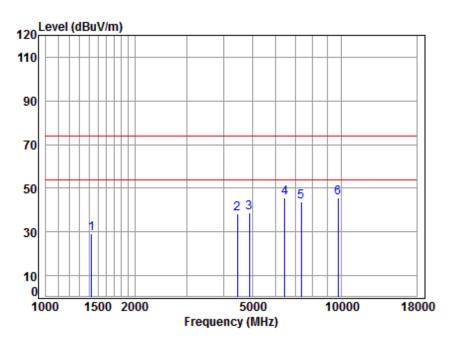
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Page: 38 of 59

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



Site : chamber Condition: 3m VERTICAL

Job No : 09820CR

Mode : 2440 TX RSE

Note : BLE

		_							
		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	
	4406 046	F 04	25 52	44.36	20.62	20.04	74.00	44.06	
1	1426.916	5.24	25.53	41.36	39.63	29.04	74.00	-44.96	peak
2	4456.315	7.51	33.53	42.41	39.91	38.54	74.00	-35.46	peak
3	4880.000	7.97	34.06	42.48	39.40	38.95	74.00	-35.05	peak
4	6432.732	11.41	35.54	41.27	40.06	45.74	74.00	-28.26	peak
5	7320.000	10.05	36.16	40.63	38.10	43.68	74.00	-30.32	peak
6	9760.000	10.82	37.76	37.53	34.79	45.84	74.00	-28.16	peak



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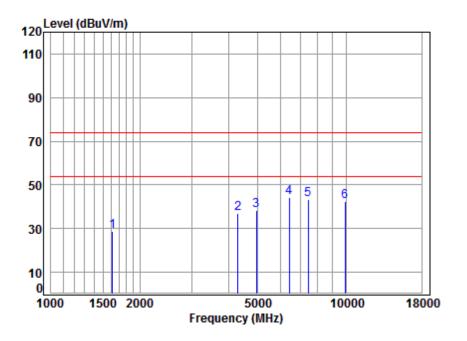
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Report No.: SZEM190101000902

Page: 39 of 59

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



Site : chamber

Condition: 3m HORIZONTAL

Job No : 09820CR Mode : 2480 TX RSE

Note : BLE

		_							
		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	1615.754	5.33	26.32	41.48	38.62	28.79	74.00	-45.21	peak
2	4304.400	7.34	33.26	42.38	38.62	36.84	74.00	-37.16	peak
3	4960.000	8.05	34.15	42.49	38.66	38.37	74.00	-35.63	peak
4	6414.167	11.38	35.52	41.28	38.70	44.32	74.00	-29.68	peak
5	7440.000	10.02	36.25	40.56	37.86	43.57	74.00	-30.43	peak
6	9920.000	10.90	37.85	37.31	31.16	42.60	74.00	-31.40	peak



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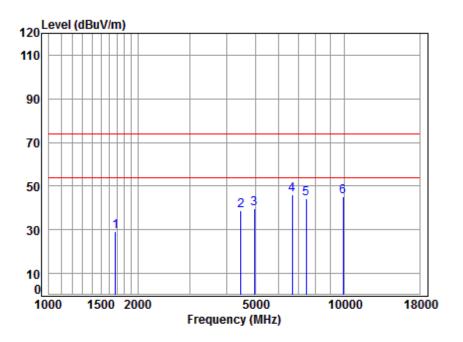
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Report No.: SZEM190101000902

Page: 40 of 59

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



Site : chamber Condition: 3m VERTICAL

Job No : 09820CR

Mode : 2480 TX RSE

Note : BLE

		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	1677.621	5.25	26.58	41.52	38.92	29.23	74.00	-44.77	peak
2	4469.214	7.53	33.55	42.41	40.02	38.69	74.00	-35.31	peak
3	4960.000	8.05	34.15	42.49	39.91	39.62	74.00	-34.38	peak
4	6659.763	11.08	35.70	41.10	40.53	46.21	74.00	-27.79	peak
5	7440.000	10.02	36.25	40.56	38.62	44.33	74.00	-29.67	peak
6	9920.000	10.90	37.85	37.31	33.81	45.25	74.00	-28.75	peak



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Report No.: SZEM190101000902

Page: 41 of 59

8 Photographs

8.1 Test Setup Photos

Refer to test setup photos.

8.2 EUT Constructional Details (EUT Photos)

Refer to external and internal photos.



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Report No.: SZEM190101000902

Page: 42 of 59

9 Appendix

Appendix 15.247

1.6dB Bandwidth

Test Mode	Test	Ant	EBW[MHz]	Limit[MHz]	Verdict
BLE	2402	Ant1	0.756	>=0.5	PASS
BLE	2440	Ant1	0.753	>=0.5	PASS
BLE	2480	Ant1	0.753	>=0.5	PASS



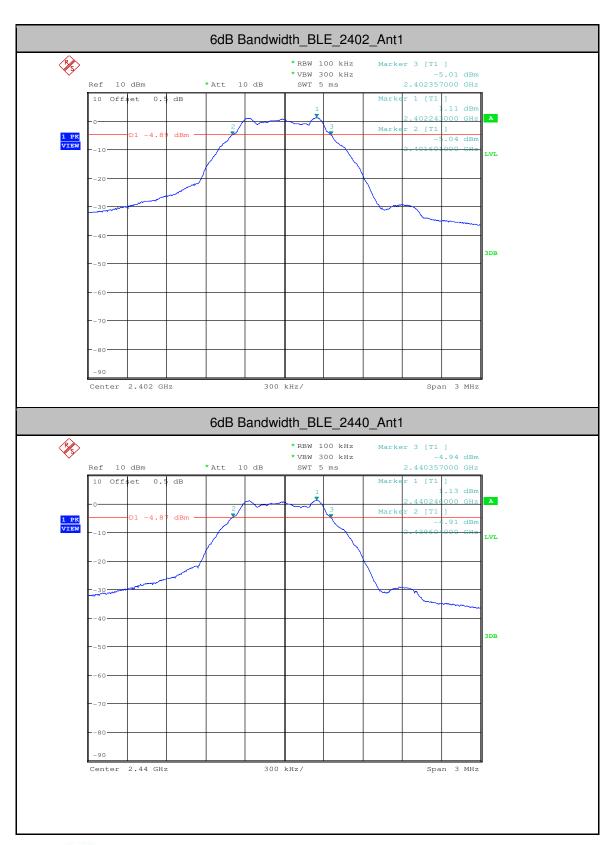
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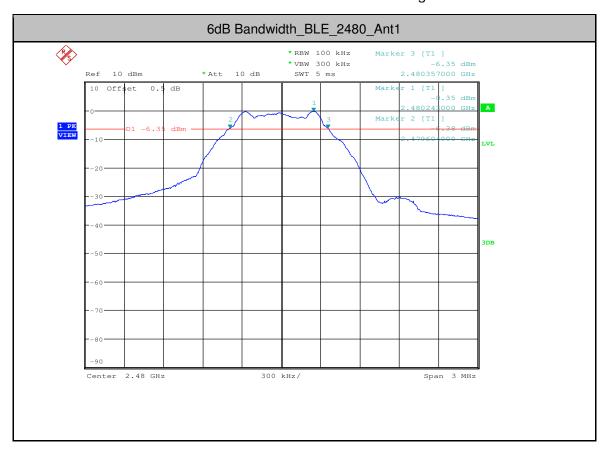
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Report No.: SZEM190101000902

Page: 45 of 59

2.Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	0.15	<30	PASS
BLE	2440	Ant1	0.09	<30	PASS
BLE	2480	Ant1	-1.45	<30	PASS



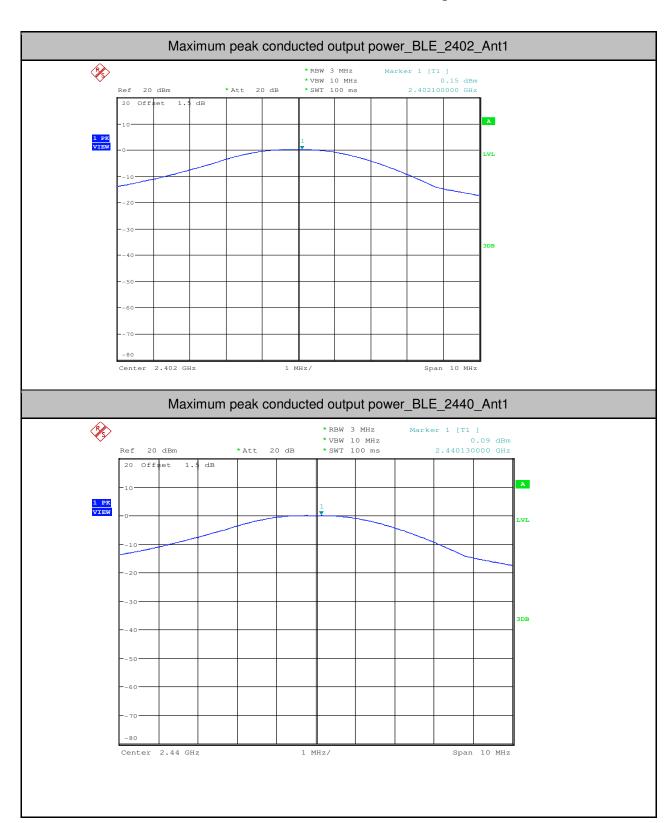
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Page: 48 of 59

3.Maximum Peak power spectral density

Test Mode	Test Channel	Ant	PSD[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-15.37	<8.00	PASS
BLE	2440	Ant1	-15.71	<8.00	PASS
BLE	2480	Ant1	-17.14	<8.00	PASS



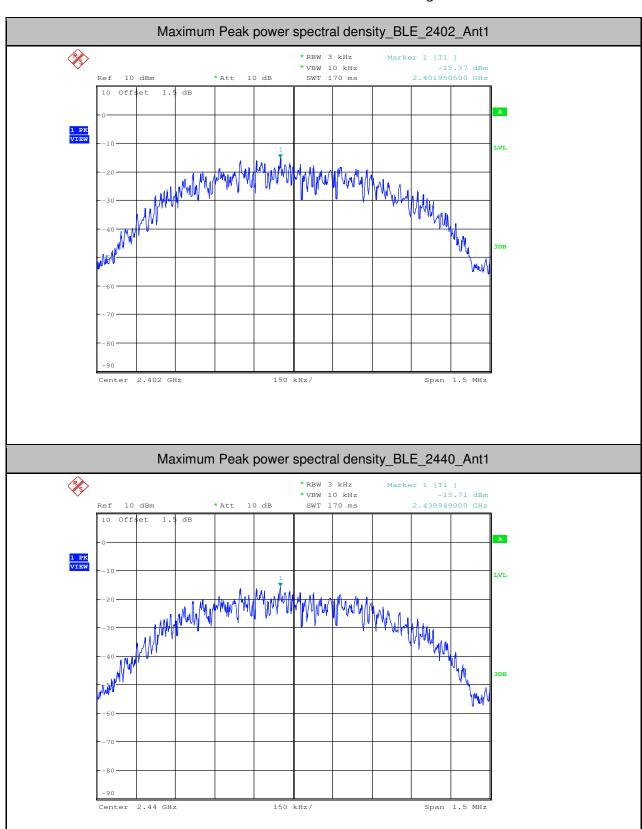
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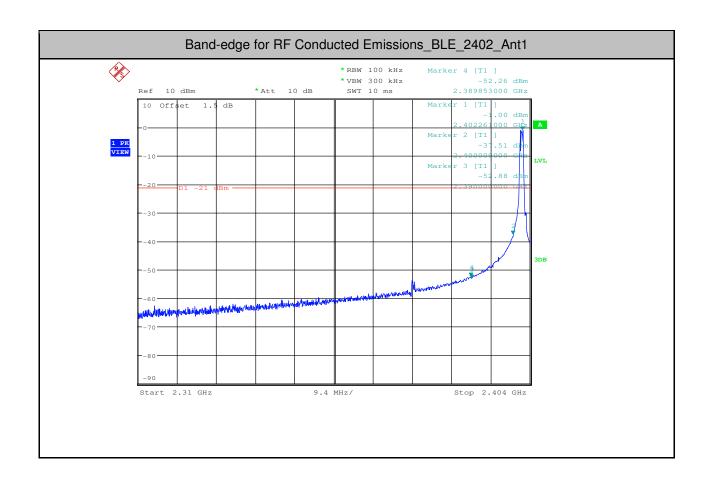


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Page: 51 of 59

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	-1.000	-52.256	<-21	PASS
BLE	2480	Ant1	-2.820	-46.641	<-22.82	PASS





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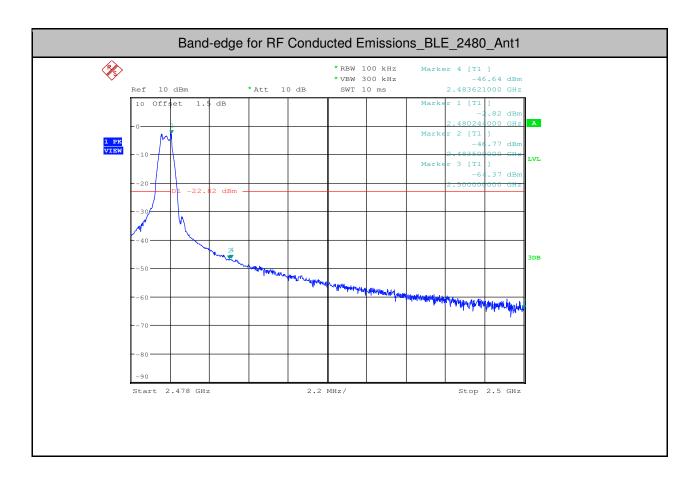
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Report No.: SZEM190101000902

Page: 53 of 59

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	-1.03	-50.820	<-21.03	PASS
BLE	2402	10000	25000	1000	3000	-1.03	-64.660	<-21.03	PASS
BLE	2440	30	10000	1000	3000	-1.06	-47.420	<-21.06	PASS
BLE	2440	10000	25000	1000	3000	-1.06	-63.110	<-21.06	PASS
BLE	2480	30	10000	1000	3000	-2.93	-45.320	<-22.93	PASS
BLE	2480	10000	25000	1000	3000	-2.93	-63.950	<-22.93	PASS



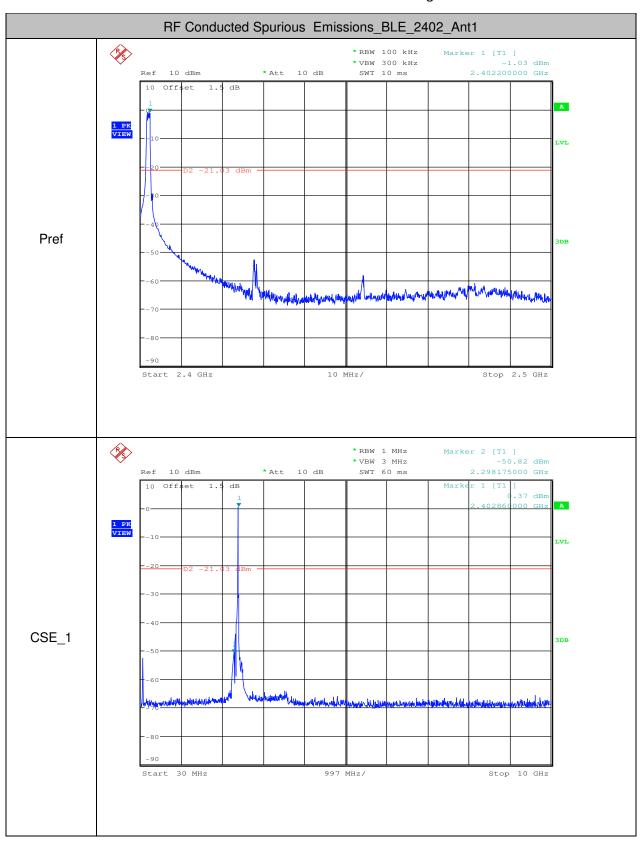
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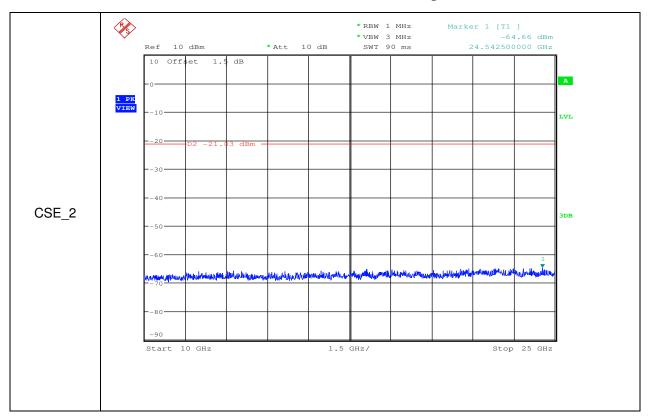
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Page: 55 of 59





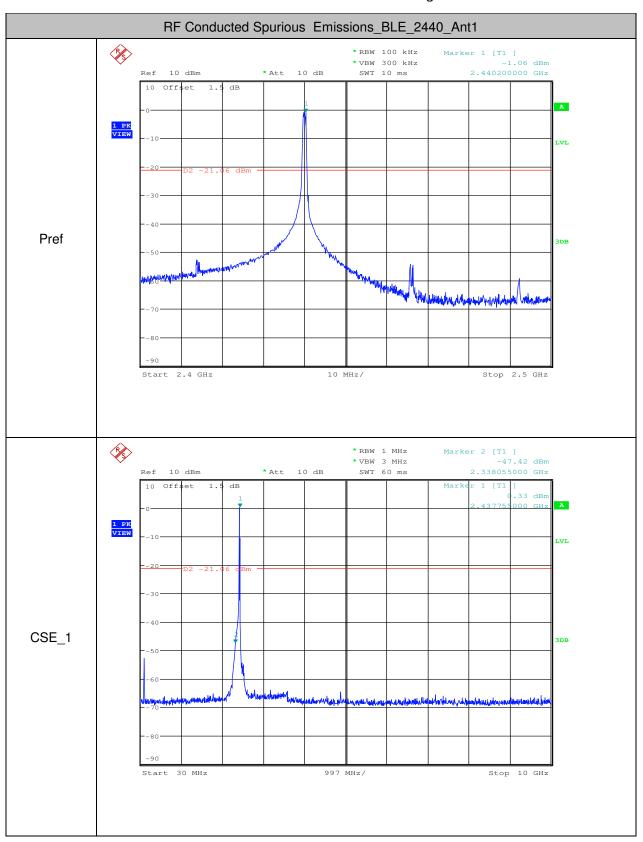
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Page: 56 of 59





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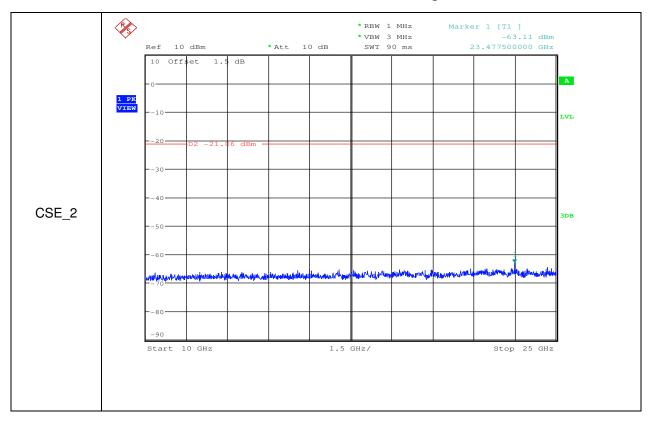
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Report No.: SZEM190101000902

Page: 57 of 59





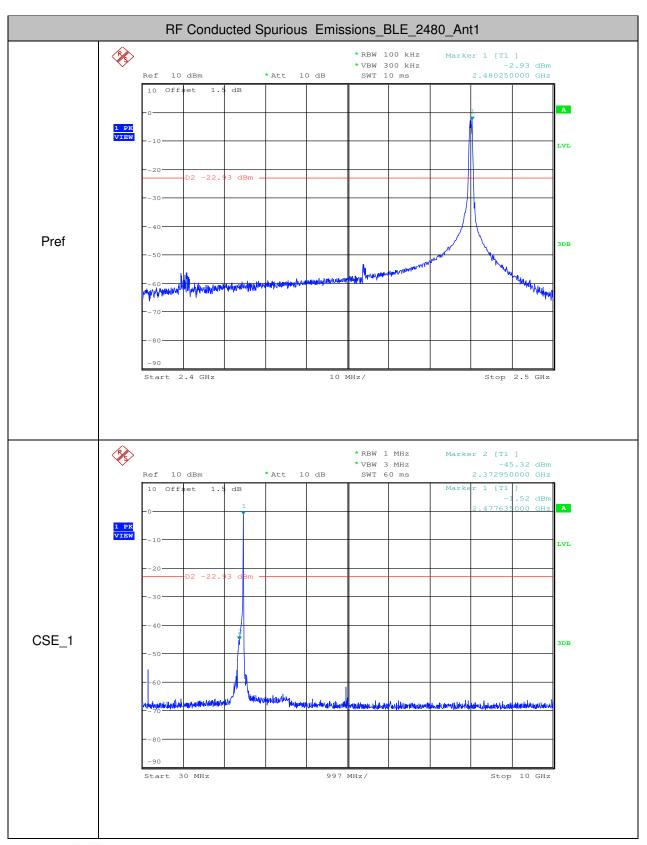
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Report No.: SZEM190101000902

58 of 59 Page:





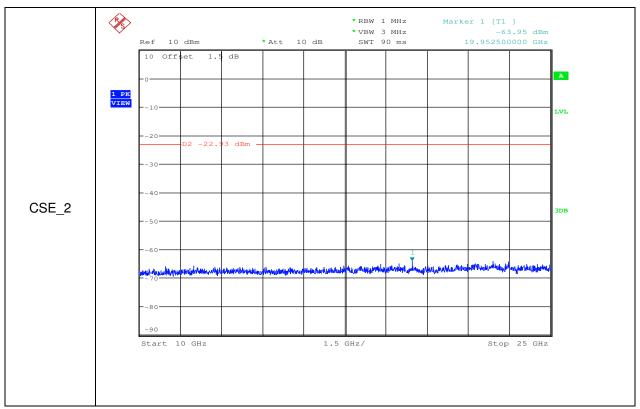
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Report No.: SZEM190101000902

Page: 59 of 59



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