

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

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TEST REPORT

Application No.:	SHEM2107007293CR
FCC ID:	2ATEV-BL3385-P
IC:	25062-BL3385P
Applicant:	Hangzhou BroadLink Technology Co.,Ltd
Address of Applicant:	Unit C,Building 1,No.57 Jiang'er Road, Changhe Street,Binjiang District,Hangzhou,Zhejiang,China
Manufacturer:	Hangzhou BroadLink Technology Co.,Ltd
Address of Manufacturer:	Unit C,Building 1,No.57 Jiang'er Road, Changhe Street,Binjiang District,Hangzhou,Zhejiang,China
Factory:	Hangzhou Gubei Intelligent Manufacturing Co.,Ltd
Address of Factory:	D218,Building 2,Hangzhou Xiaoshan(China) Hardware Machinery Technology Innovation Park,Liansan Village,Yiqiao Town,Xiaoshan District,Hangzhou,310052
Equipment Under Test (EU	Т):
EUT Name:	WIFI+BT module
Model No.:	BL3385-P
Standard(s) :	47 CFR Part 15, Subpart C 15.247
	RSS-247 Issue 2, February 2017
	RSS-Gen Issue 5 Amendment 2 (February 2021)
Date of Receipt:	2021-07-05
Date of Test:	2021-07-09 to 2021-07-27
Date of Issue:	2021-08-05
Test Result:	Pass*

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

parlan share

Parlam Zhan Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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Revision Record			
Version	Description	Date	Remark
00	Original	2021-08-05	1

Authorized for issue by:	
	Bril Wu
	Bill Wu / Project Engineer
	Parlam zhan
	Parlam Zhan / Reviewer



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2 **Test Summary**

Radio Spectrum Technical Requirement				
ltem	FCC Requirement	IC Requirement	Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	RSS-Gen Clause 6.8	N/A	Customer Declaration
N/A: Not applicable	· · ·			
Radio Spectrum Matt	er Part			
ltem	FCC Requirement	IC Requirement	Method	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.207	RSS-Gen Clause 8.8	ANSI C63.10 (2013) Section 6	6.2 N/A
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247a(2)	RSS-247 Clause 5.2(a)	ANSI C63.10 (2013) Section 11.8.1	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247(b)(3)	RSS-247 Clause 5.4(d)	ANSI C63.10 (2013) Section 11.9.1	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247(e)	RSS-247 Clause 5.2(b)	ANSI C63.10 (2013) Section 11.10.2	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247(d)	RSS-247 Clause 5.5	ANSI C63.10 (2013) Section 11.13.3.2	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247(d)	RSS-247 Clause 5.5	ANSI C63.10 (2013) Section 11.11	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	RSS-247 Section 3.3 & RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.10.5	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	RSS-247 Section 3.3 & RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.4,6.5,6.6	Pass
99% Bandwidth	-	RSS-Gen Section 6.7	ANSI C63.10 Section 6.9.3	Pass



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General Information 4

4.1 Details of E.U.T.

Power supply:	DC 3.3V
Test voltage:	DC 3.3V (AC 120V 60Hz for Conducted Emission test)
Antenna Gain:	2dBi (Provided by manufacturer)
Antenna Type:	PCB Antenna
Data Rate:	1Mbps
Bluetooth Version:	V4.0 LE
Channel Spacing:	2MHz
Modulation Type:	GFSK
Number of Channels:	40
Operation Frequency:	2402MHz to 2480MHz
S/N:	c8f742fee236
Firmware version:	V1.0

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	LENOVO	X100e	/

4.3 Power level setting using in test:

U	
Channel	BLE
0	Default
19	Default
39	Default



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4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4 x 10 ⁻⁸
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
0	DE Dediated Dewar	5.2dB (Below 1GHz)
8	RF Radiated Power	5.9dB (Above 1GHz)
		4.2dB (Below 30MHz)
9	Radiated Spurious Emission Test	4.5dB (30MHz-1GHz)
9		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666 Fax: +86 21 6191 5678

No tests were sub-contracted.

4.6 Test Facility

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

• CNAS (No. CNAS L0599)

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2017 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. 6332.01)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

• FCC (Designation Number: CN1301)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

• ISED (CAB Identifier: CN0020)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 8617A

VCCI (Member No.: 3061)

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions



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5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Conducted Test					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2020-12-20	2021-12-19
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2020-08-13	2021-08-12
Signal Generator	R&S	SMR20	SHEM006-1	2020-08-13	2021-08-12
Signal Generator	Agilent	N5182A	SHEM182-1	2020-08-13	2021-08-12
Communication Tester	R&S	CMW270	SHEM183-1	2020-08-13	2021-08-12
Switcher	Tonscend	JS0806	SHEM184-1	2020-08-13	2021-08-12
Power Sensor	Keysight	U2021XA * 4	SHEM184-1	2020-08-13	2021-08-12
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2018-09-25	2021-09-24
AC Power Stabilizer	APC	KDF-31020T-V0-F0	SHEM216-1	2020-12-20	2021-12-19
DC Power Supply	MCH	MCH-303A	SHEM210-1	2020-12-20	2021-12-19
Conducted test Cable	/	RF01~RF04	/	2020-12-20	2021-12-19
Test software	Tonscend	JS Tonscend BT/WIFI System	Version: 2.6	1	/
RF Radiated Test					
EMI test Receiver	R&S	ESU40	SHEM051-1	2020-12-20	2021-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2020-12-20	2021-12-19
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2020-12-20	2021-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2019-10-14	2021-10-13
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2020-04-30	2022-04-29
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2018-10-24	2021-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2019-10-14	2021-10-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2018-10-31	2021-10-30
Pre-amplifier (9KHz-2GHz)	CLAVIIO	BDLNA-0001	SHEM164-1	2020-08-13	2021-08-12
Pre-amplifier (1-18GHz)	CLAVIIO	BDLNA-0118	SHEM050-2	2020-08-13	2021-08-12
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2020-12-20	2021-12-19
Signal Generator	R&S	SMR40	SHEM058-1	2020-08-13	2021-08-12
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020-05-25	2023-05-24
RE test Cable	/	RE01, RE02, RE06	/	2020-12-20	2021-12-19
Test software	ESE	E3	Version: 6.1112 21a	1	/



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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(b)(4)

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 PCB antenna and no consideration of replacement. The best case gain of the antenna is 2dBi.

Antenna location: Refer to Appendix (Internal Photos)



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7 Radio Spectrum Matter Test Results

7.1 Minimum 6dB Bandwidth

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

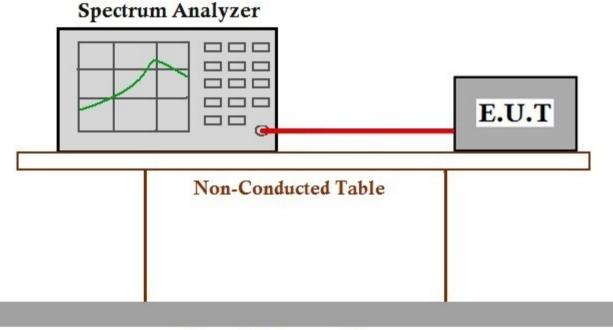
7.1.1 E.U.T. Operation

Operating Environment:

 Temperature:
 22 °C
 Humidity:
 50 % RH
 Atmospheric Pressure:
 1001 mbar

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

7.1.2 Test Setup Diagram



Ground Reference Plane

7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210700729301



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7.2 Conducted Peak Output Power

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

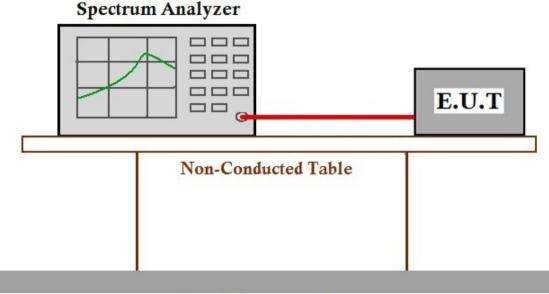
Frequency range(MHz)	Output power of the intentional radiator(watt)
	1 for ≥50 hopping channels
902-928	0.25 for 25≤ hopping channels <50
	1 for digital modulation
	1 for ≥75 non-overlapping hopping channels
2400-2483.5	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850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

7.2.1 E.U.T. Operation

Operating Environment:

Temperature:22 °CHumidity:50 % RHAtmospheric Pressure:1001 mbarTest modea: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 A for SHEM210700729301





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7.3 Power Spectrum Density

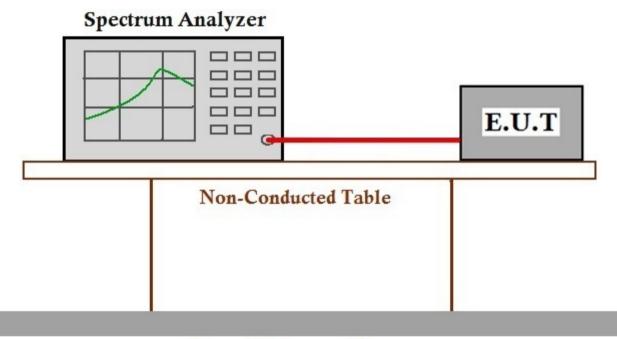
Test Requirement	47 CFR Part 15, Subpart C 15.247(e)
Test Method:	ANSI C63.10 (2013) Section 11.10.2
Limit:	${\leq}8\text{dBm}$ in any 3 kHz band during any time interval of continuous transmission

7.3.1 E.U.T. Operation

Operating Environment:

Temperature:22 °CHumidity:50 % RHAtmospheric Pressure:1001 mbarTest modea: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 A for SHEM210700729301



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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)



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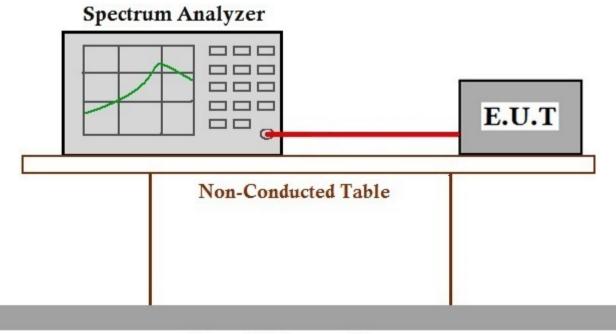
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mbar

7.4.1 E.U.T. Operation

Operating Enviro	onment:				
Temperature:	22 °C	Humidity:	50	% RH	Atmospheric Pressure: 1001
Test mode	a:TX mode_ modulation	Keep the EUT	in coi	ntinuously	y transmitting mode with GFSK

7.4.2 Test Setup Diagram



Ground Reference Plane

7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210700729301



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7.5 Conducted Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 11.11
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)



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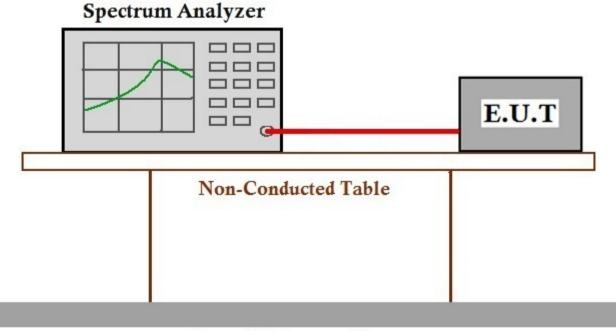
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7.5.1 E.U.T. Operation

Operating Enviro	onment:	
T	00 00	1.1

Temperature:	22 °C	Humidity:	50	% RH	Atmospheric Pressure: 10	01 mbar
Test mode	a:TX mode_Ke modulation	ep the EUT	in coi	ntinuously tr	ansmitting mode with GFSK	

7.5.2 Test Setup Diagram



Ground Reference Plane

7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210700729301



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7.6 Radiated Emissions which fall in the restricted bands

47 CFR Part 15, Subpart C 15.205 & 15.209 **Test Requirement** ANSI C63.10 (2013) Section 6.10.5 Test Method: Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.



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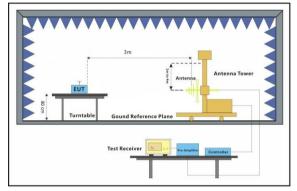
7.6.1 E.U.T. Operation

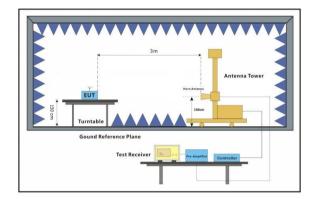
Operating Environment:

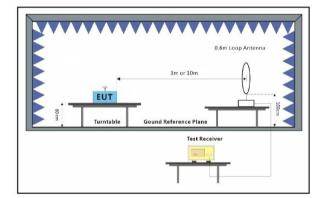
 Temperature:
 22 °C
 Humidity:
 50 % RH
 Atmospheric Pressure:
 1001 mbar

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

7.6.2 Test Setup Diagram









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7.6.3 Measurement Procedure and Data

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

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

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

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

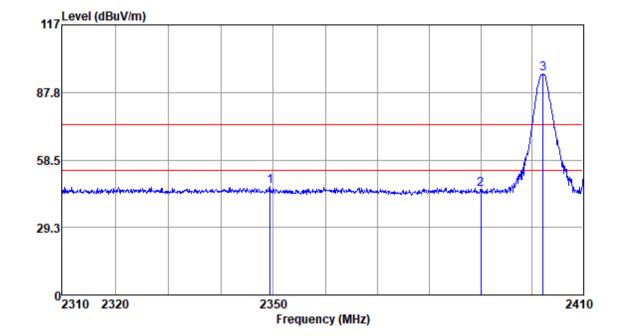


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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low

Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2349.39	50.49	28.87	2.73	35.15	46.94	74.00	-27.06	Peak
2390.00	49.02	28.97	2.77	35.18	45.58	74.00	-28.42	Peak
2402.15	99.03	29.01	2.79	35.19	95.64	74.00	21.64	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

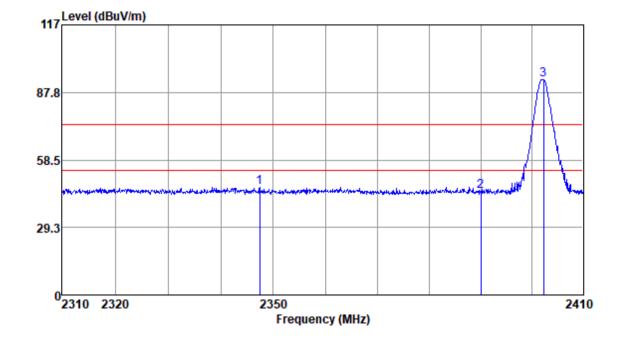


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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low

Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHZ	dBuv	dB/m	qR	dB	dBuv/m	dBuv/m	dB	
2347.40	50.19	28.87	2.72	35.14	46.64	74.00	-27.36	Peak
2390.00	48.22	28.97	2.77	35.18	44.78	74.00	-29.22	Peak
2402.25	96.83	29.01	2.79	35.19	93.44	74.00	19.44	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

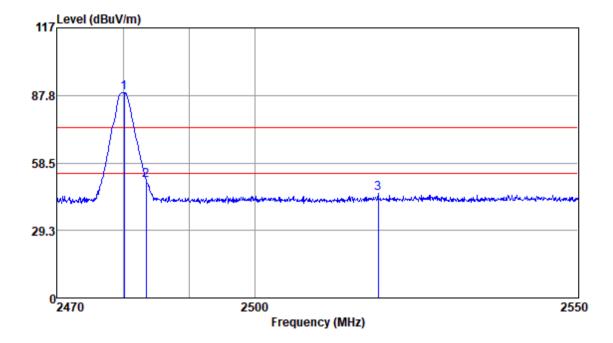


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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Antenna Polarity :HORIZONTAL

Freq				-	Emission Level			Remark
2480.18 2483.50	92.09 54.34	29.10 29.11	2.88 2.88	35.25 35.26	dBuv/m 88.82 51.07 45.45	74.00 74.00	14.82 -22.93	Peak

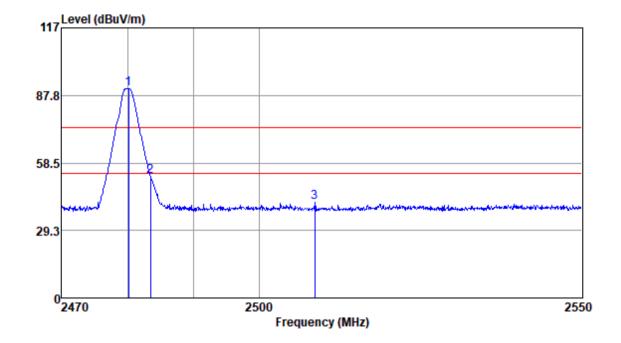
Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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

Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2480.18	93.99	29.10	2.88	35.25	90.72	74.00	16.72	Peak
2483.50	55.92	29.11	2.88	35.26	52.65	74.00	-21.35	Peak
2508.56	44.49	29.21	2.90	35.28	41.32	74.00	-32.68	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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7.7 Radiated Spurious Emissions

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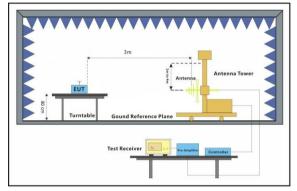
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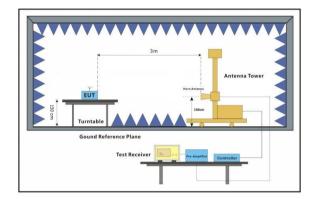
7.7.1 E.U.T. Operation

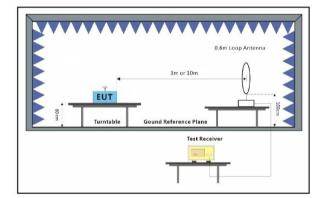
Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1001 mbar a:TX mode Keep the EUT in continuously transmitting mode with GFSK Test mode modulation

7.7.2 Test Setup Diagram









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7.7.3 Measurement Procedure and Data

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

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark:

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

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

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

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

4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown



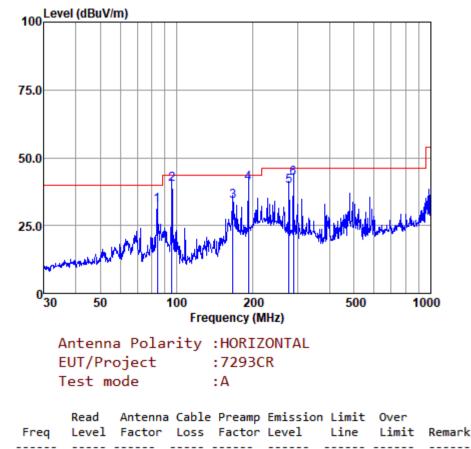
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Below 1GHz



	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	83.816	54.17	8.61	1.35	31.51	32.62	40.00	-7.38	QP
2	95.762	61.96	8.30	1.45	31.59	40.12	43.50	-3.38	QP
3	166.651	50.43	12.93	1.96	31.27	34.05	43.50	-9.45	QP
4	191.745	59.63	10.38	2.18	31.75	40.44	43.50	-3.06	QP
5	277.094	55.36	12.75	2.73	31.40	39.44	46.00	-6.56	QP
6	287.990	57.90	13.01	2.78	31.30	42.39	46.00	-3.61	QP

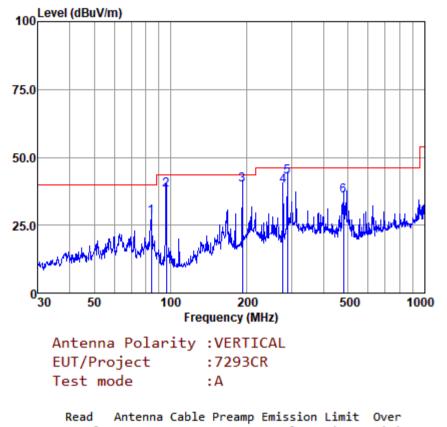
Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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		Neau	Ancenna	Capie	r i camp	CIIIT22201	LTWITC	over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	83.816	49.61	8.61	1.35	31.51	28.06	40.00	-11.94	QP
2	96.099	59.98	8.33	1.45	31.59	38.17	43.50	-5.33	QP
3	191.745	59.00	10.38	2.18	31.75	39.81	43.50	-3.69	QP
4	277.094	55.41	12.75	2.73	31.40	39.49	46.00	-6.51	QP
5	287.990	58.18	13.01	2.78	31.30	42.67	46.00	-3.33	QP
6	480.528	45.52	17.31	3.46	30.57	35.72	46.00	-10.28	QP

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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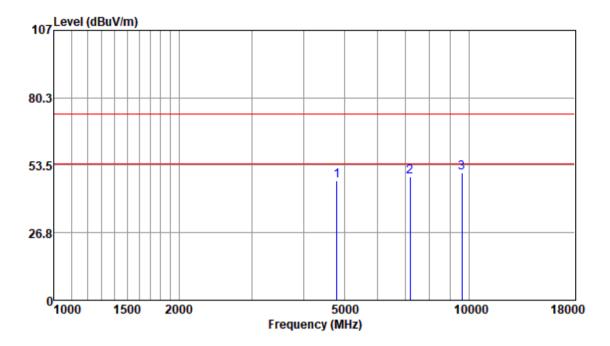
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Above 1GHz

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



Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	47.78	33.72	4.46	38.71	47.25	74.00	-26.75	Peak
7206.00	44.24	36.28	5.72	37.18	49.06	74.00	-24.94	Peak
9608.00	40.57	37.70	6.53	34.18	50.62	74.00	-23.38	Peak

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

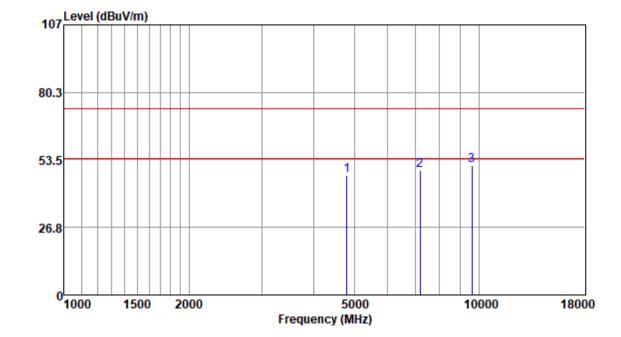


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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low

Antenna Polarity :VERTICAL

Freq				-	Emission Level			Remark
4804.00	47.73	33.72	4.46	38.71	dBuv/m 47.20 49.16	74.00	-26.80	
9608.00	41.31	37.70	6.53	34.18	51.36	74.00	-22.64	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

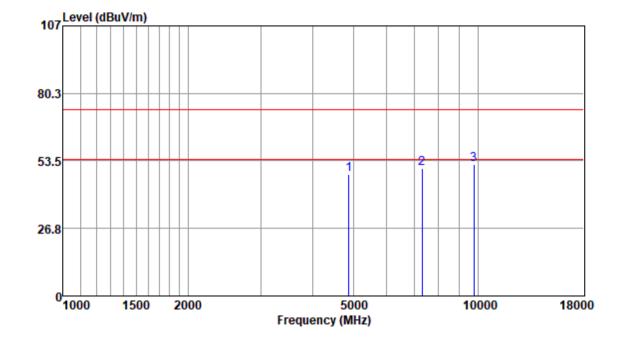


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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle

Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4880.00	48.64	33.93	4.47	38.78	48.26	74.00	-25.74	Peak
7320.00	45.43	36.47	5.85	37.10	50.65	74.00	-23.35	Peak
9760.00	42.23	37.68	6.50	34.15	52.26	74.00	-21.74	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

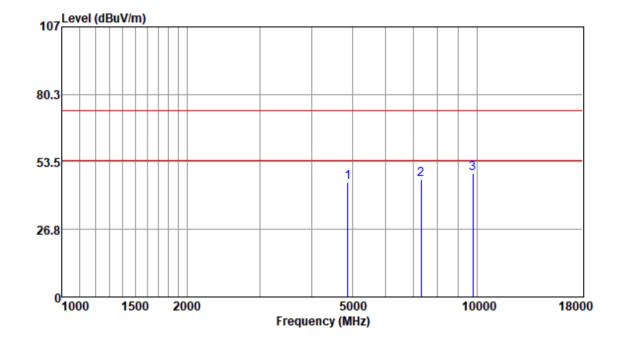


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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:middle

Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4880.00	45.67	33.93	4.47	38.78	45.29	74.00	-28.71	Peak
7320.00	41.50	36.47	5.85	37.10	46.72	74.00	-27.28	Peak
9760.00	38.96	37.68	6.50	34.15	48.99	74.00	-25.01	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

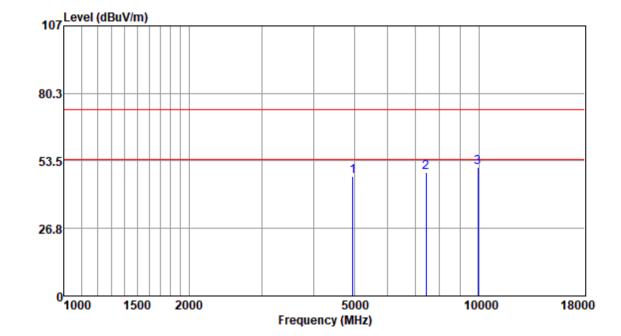


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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High

Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	47.66	33.98	4.48	38.87	47.25	74.00	-26.75	Peak
7440.00	43.68	36.40	5.97	37.03	49.02	74.00	-24.98	Peak
9920.00	40.69	37.81	6.47	34.11	50.86	74.00	-23.14	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

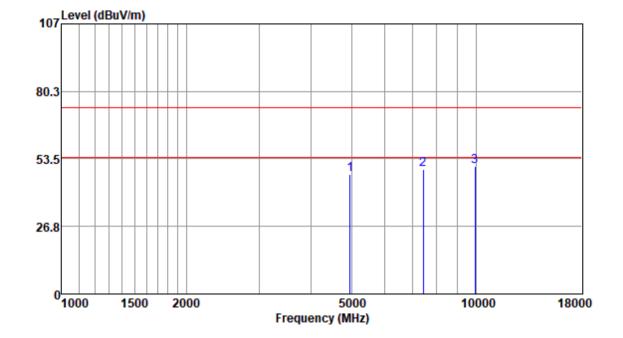


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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:High

Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	47.70	33.98	4.48	38.87	47.29	74.00	-26.71	Peak
7440.00	43.92	36.40	5.97	37.03	49.26	74.00	-24.74	Peak
9920.00	40.45	37.81	6.47	34.11	50.62	74.00	-23.38	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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7.8 99% Bandwidth

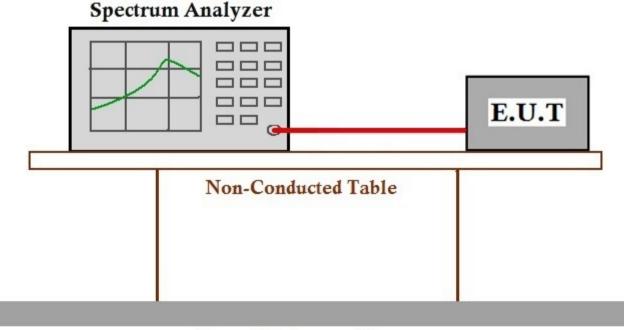
Test Requirement	RSS-Gen Section 6.7
Test Method:	ANSI C63.10 Section 6.9.3

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1001 mbar Test mode a:TX mode Keep the EUT in continuously transmitting mode with GFSK modulation

7.8.2 Test Setup Diagram



Ground Reference Plane

7.8.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210700729301



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8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

9 EUT Constructional Details

Refer to the < Photos >.

Appendix A for SHEM210700729301

1.6dB Bandwidth

Test Mode	Test Channel	EBW[MHz]	Limit	Verdict
BLE	2402	0.67	0.5	PASS
BLE	2440	0.66	0.5	PASS
BLE	2480	0.67	0.5	PASS



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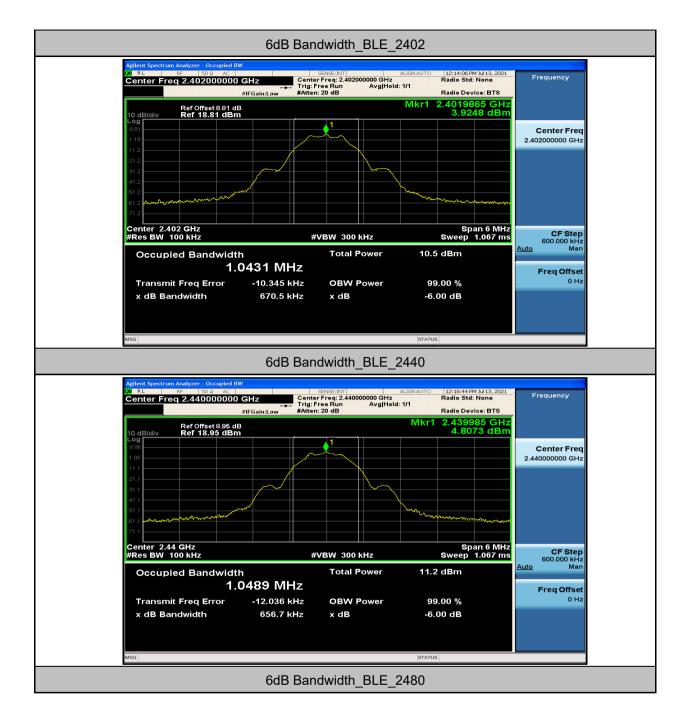
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IX RL RF 50 Q Al Center Freq 2.4800000 Center Freq 2.48000000 Center Freq 2.480000000 Center Freq 2.480000000 Center Freq 2.480000000 Center Freq 2.480000000 Center Freq 2.4800000000 Center Freq 2.48000000000000000000000000000000000000	00 GHz Ce	SENSE:INT nter Freq: 2.480000000 G g: Free Run Avg tten: 20 dB	Hz Radio St Hold: 1/1	PM Jul 13, 2021 d: None evice: BTS	Frequency
Ref Offset 8.94 10 dB/div Ref 18.95 d			Mkr1 2.4799 4.64	858 GHz 136 dBm	
Log 8.95 -1.05					Center Fre 2.480000000 GH
-11.1			~		
-41.1 -51.1 -51.1 -71.1				mindramon	
Center 2.48 GHz #Res BW 100 kHz		#VBW 300 kHz	Sj Sweep	pan 6 MHz 1.067 ms	CF Step 600.000 kHz
Occupied Bandwi	_{dth} 1.0454 MHz	Total Power	11.2 dBm		<u>Auto</u> Man Freg Offsel
Transmit Freq Error x dB Bandwidth	-12.478 kHz 670.8 kHz	OBW Power x dB	99.00 % -6.00 dB		0 Hz
MSG			STATUS		



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2.Occupied Bandwidth

Test Mode	Test Channel	OBW[MHz]	Limit[MHz]	Verdict
BLE	2402	1.03		PASS
BLE	2440	1.04		PASS
BLE	2480	1.03		PASS



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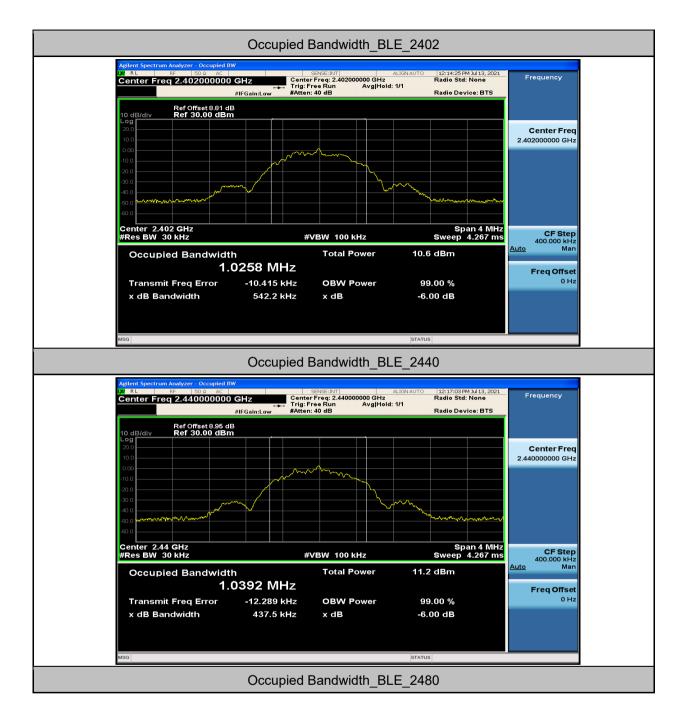
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M RL RF 50 Ω AC Center Freq 2.480000000			ALIGNAUTO [12:19:19 PM] Radio Std: N : 1/1 Radio Devic	lone Frequenc	ÿ
Ref Offset 8.95 dB 10 dB/div Ref 30.00 dBm					
Log 20.0 10.0				Center 2.48000000	
-10.0		Am			
-20.0	\sim		m		
-50.0				production and the second s	
Center 2.48 GHz #Res BW 30 kHz	#\	/BW 100 kHz	Spa Sweep 4	n 4 MHz .267 ms 400.00	Step
Occupied Bandwidth		Total Power	11.1 dBm	Auto	Man
T.U Transmit Freq Error	0290 MHz -12.337 kHz	OBW Power	99.00 %	FreqO	offset 0 Hz
x dB Bandwidth	584.4 kHz	x dB	-6.00 dB		
MSG			STATUS		



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Test Mode	Test Channel	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	3.95	30	PASS
BLE	2440	4.81	30	PASS
BLE	2480	4.65	30	PASS

3.Maximum peak conducted output power



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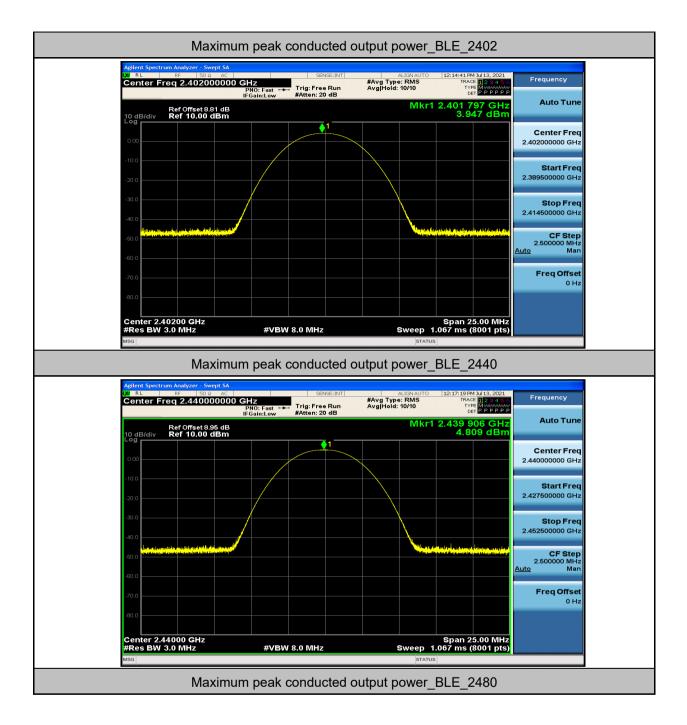
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Center Freq 2.480000000 GH:	SENSE:INT C: Fast Trig: Free Run ain:Low #Atten: 20 dB	ALIGNAUTO 12:19:35 PM Jul 13, 2021 #Avg Type: RMS TRACE 12:34 5 Avg Hold: 10/10 TYPE TWATE DET P.P.P.P.F E	Frequency
Ref Offset 8.95 dB 10 dB/div Ref 10.00 dBm		Mkr1 2.479 881 GHz 4.652 dBm	Auto Tun
0.00			Center Fre 2.480000000 GH
-10.0			Start Fred 2.467500000 GHz
-30.0			Stop Freq 2.492500000 GHz
-40.0			CF Step 2.500000 MHz
-60.0			Auto Man Freq Offsel
-70.0			0 Hz
Center 2.48000 GHz #Res BW 3.0 MHz	#VBW 8.0 MHz	Span 25.00 MHz Sweep 1.067 ms (8001 pts	



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4.Maximum Peak power spectral density

Test Mode	Test Channel	PSD[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE	2402	-11.03	8.00	PASS
BLE	2440	-11.25	8.00	PASS
BLE	2480	-8.69	8.00	PASS



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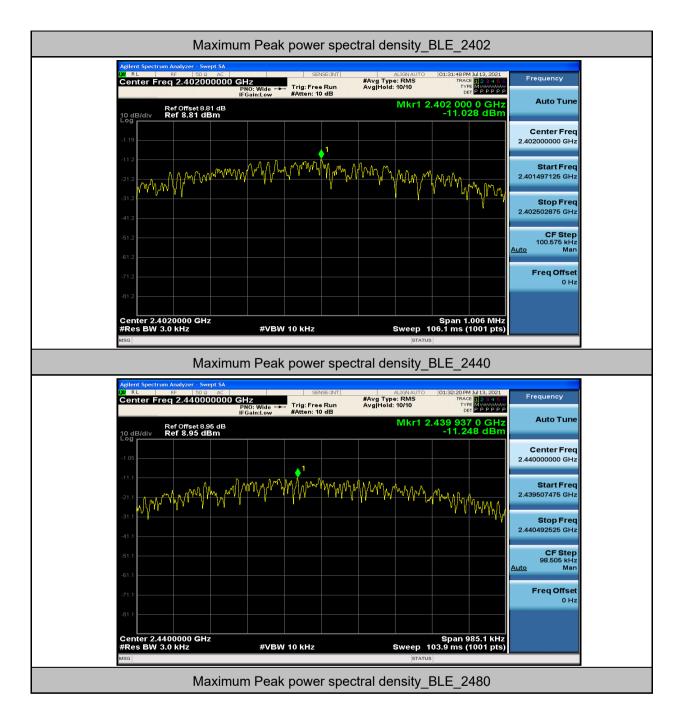
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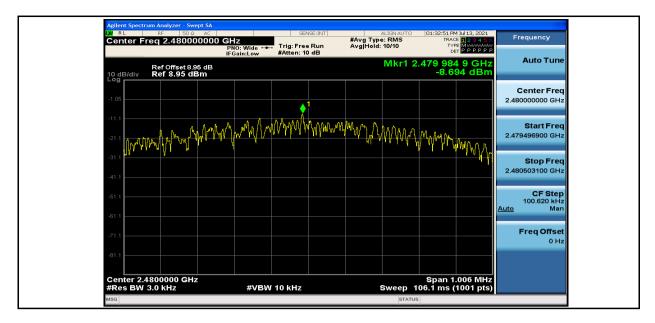
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5.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	3.99	-57.80	-16.01	PASS
BLE	2480	4.62	-63.51	-15.38	PASS



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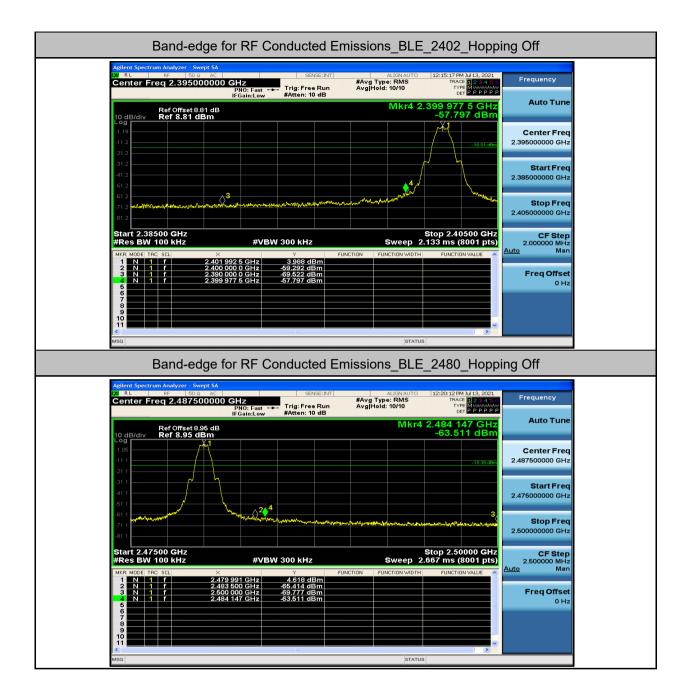
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6.RF Conducted Spurious Emissions

Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BLE	2402	30	10000	100	300	3.87	-53.04	<-16.13	PASS
BLE	2402	10000	26000	100	300	3.866	-43.918	<- 16.134	PASS
BLE	2440	30	10000	100	300	4.72	-53.65	<-15.28	PASS
BLE	2440	10000	26000	100	300	4.716	-44.505	<- 15.284	PASS
BLE	2480	30	10000	100	300	4.58	-52.83	<-15.42	PASS
BLE	2480	10000	26000	100	300	4.58	-43.584	<-15.42	PASS



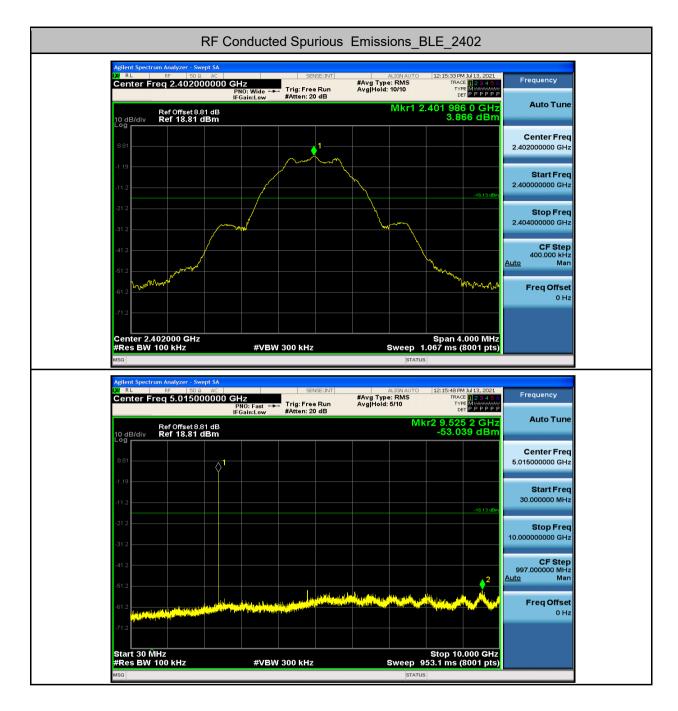
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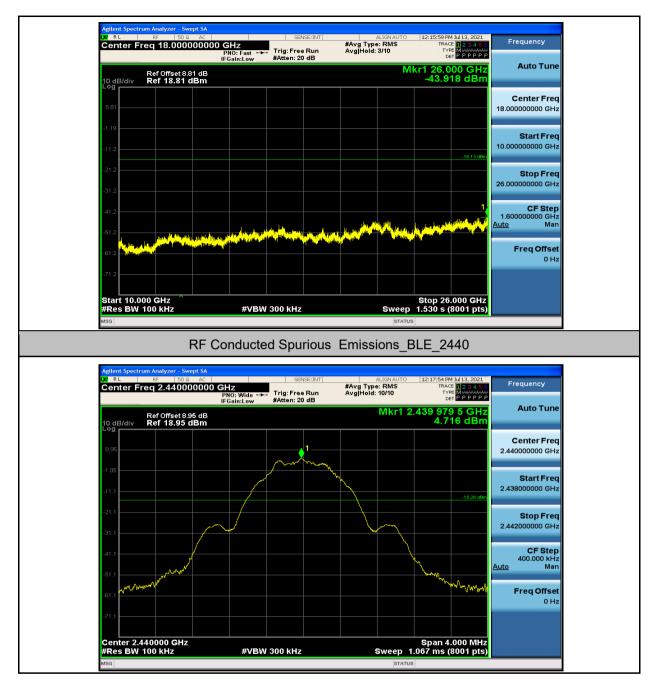
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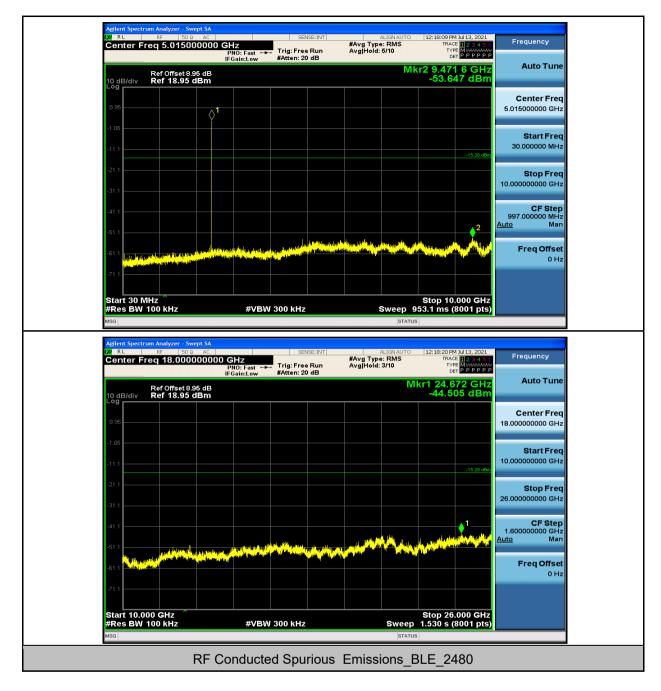
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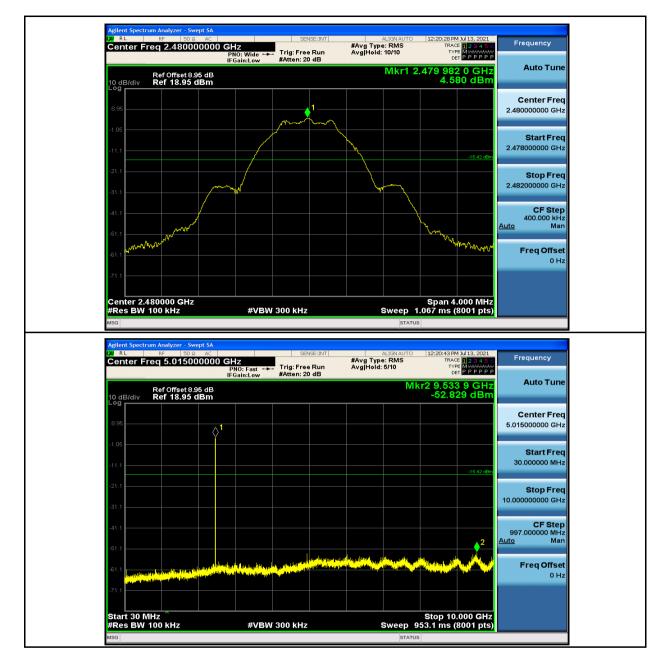
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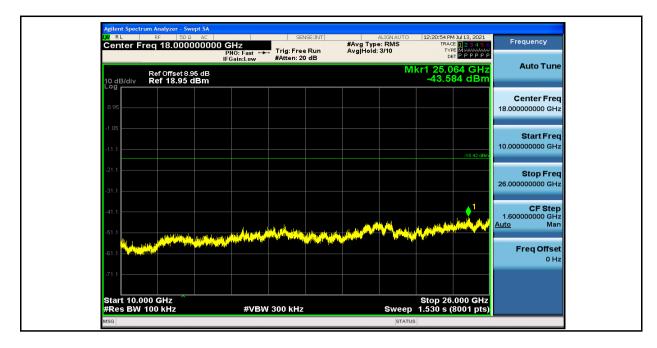
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