

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

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# TEST REPORT

Application No.:	ication No.: SHCR2112000912HS	
FCC ID:	ZT5-TIANIHARMONY	
IC:	9798A-LELOTIANI	
Applicant:	Suzhou Armocon Technology Co.,Ltd.	
Address of Applicant:	No77 SuHong Middle Road SIP Jiangsu China	
Manufacturer:	Suzhou Armocon Technology Co.,Ltd.	
Address of Manufacturer:	No77 SuHong Middle Road SIP Jiangsu China	
Factory:	Suzhou Armocon Technology Co.,Ltd.	
Address of Factory:	No77 SuHong Middle Road SIP Jiangsu China	
Equipment Under Test (EU	Т):	
EUT Name:	Handheld Massager	
Model No.:	TIANIHARMONY	
Trade mark:	LELO	
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:	2021-12-02	
Date of Test:	2021-12-08 to 2021-12-14	
Date of Issue:	2021-12-23	
Test Result:	Pass*	

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

parlan 2han

Parlam Zhan Laboratory Manager



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Revision Record			
Version	Description	Date	Remark
00	Original	2021-12-23	1

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



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#### 2 **Test Summary**

Radio Spectrum Tech	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				
Item	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	.2 Pass	
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 3.7V 200mAh rechargeable battery
Test voltage:	DC 3.7V
Antenna Gain:	2dBi (Provided by manufacturer)
Antenna Type:	Chip Antenna
Data Rate:	1Mbps
Bluetooth Version:	V5.0 LE
Channel Spacing:	2MHz
Modulation Type:	GFSK
Number of Channels:	40
Operation Frequency:	2402MHz to 2480MHz
S/N:	8632eXCdM2495R
Firmware Version:	Harmony_F.REV.A_SVN2972

# 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
BT test board	/	Test Plate 2	/
Laptop	Lenovo	ThinkPad X100e	/

### 4.3 Power level setting using in test:

Channel	Level
2402	10.05
2440	10.05
2480	10.05



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# 4.4 Measurement Uncertainty

ltem	Measurement Uncertainty
Radio Frequency	8.4 x 10 <sup>-8</sup>
Timeout	2s
Duty Cycle	0.37%
Occupied Bandwidth	3%
RF Conducted Power	0.6dB
RF Power Density	2.9dB
Conducted Spurious Emissions	0.75dB
DE Dedicted Dever	5.2dB (Below 1GHz)
RF Radiated Power	5.9dB (Above 1GHz)
	4.2dB (Below 30MHz)
Dedicted Onurious Emission Test	4.5dB (30MHz-1GHz)
Radiated Spurious Emission Test	5.1dB (1GHz-18GHz)
	5.4dB (Above 18GHz)
Temperature Test	1°C
Humidity Test	3%
Supply Voltages	1.5%
Time	3%
	Radio Frequency         Timeout         Duty Cycle         Occupied Bandwidth         RF Conducted Power         RF Power Density         Conducted Spurious Emissions         RF Radiated Power         RF Radiated Power         Temperature Test         Humidity Test         Supply Voltages

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			<b>,</b>		
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2020-12-20	2021-12-19
Spectrum Analyzer	Keysight	N9020B	SHEM241-1	2021-08-30	2021-08-29
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2021-08-13	2022-08-12
Signal Generator	R&S	SMR20	SHEM006-1	2021-08-13	2022-08-12
Signal Generator	Agilent	N5182A	SHEM182-1	2021-08-13	2022-08-12
Communication Tester	R&S	CMW270	SHEM183-1	2021-07-28	2022-07-27
Communication Tester	R&S	CMW500	SHEM183-2	2021-04-16	2022-04-15
Switcher	Tonscend	JS0806	SHEM184-1	2021-08-13	2022-08-12
Power Sensor	Keysight	U2021XA * 4	SHEM184-1	2021-08-13	2022-08-12
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2019-09-25	2022-09-24
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	/	/
RF Radiated Test	L				
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
Communication Tester	R&S	CMW500	SHEM183-2	2021-04-16	2022-04-15
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2020-12-20	2021-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2021-09-11	2023-09-10
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2020-04-30	2022-04-29
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2019-10-24	2022-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2021-09-18	2023-09-17
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2021-09-18	2023-09-17
Pre-Amplifier	HP	8447D	SHEM236-1	2021-05-27	2022-05-26
Pre-Amplifier	PANSHAN	LNA 1-18G	SHEM235-1	2021-05-27	2022-05-26
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2020-12-20	2021-12-19
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: 6.111221a	/	/



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

The detailed test data see: Appendix A for SHCR211200091201



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# 7 Radio Spectrum Matter Test Results

# 7.1 Minimum 6dB Bandwidth

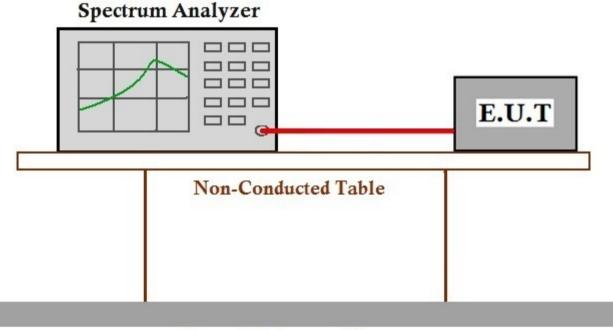
Test Requirement	47 CFR Part 15, Subpart C 15.247a(2)
Test Method:	ANSI C63.10 (2013) Section 11.8.1
Limit:	≥500 kHz

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

**Operating Environment:** 

Temperature:22 °CHumidity:50 % RHAtmospheric Pressure:1001 mbarTest modea:TX mode\_Keep the EUT in continuously transmitting mode with GFSK<br/>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 SHCR211200091201



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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:	

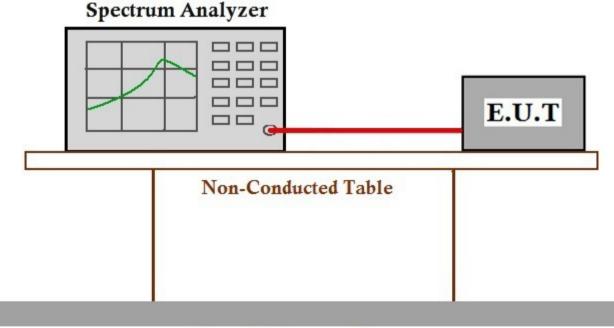
Frequency range(MHz)	Output power of the intentional radiator(watt)
	1 for ≥50 hopping channels
902-928	0.25 for 25≤ hopping channels <50
	1 for digital modulation
	1 for ≥75 non-overlapping hopping channels
2400-2483.5	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850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

#### 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<br/>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 SHCR211200091201





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## 7.3 Power Spectrum Density

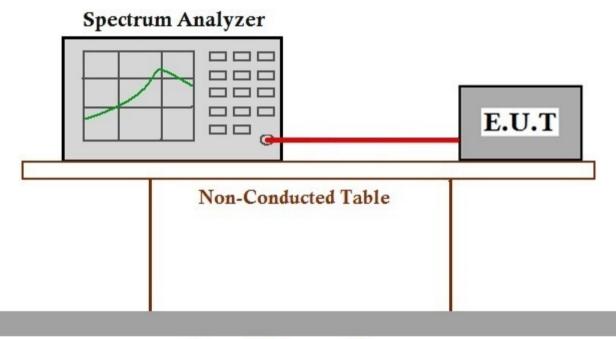
Test Requirement	47 CFR Part 15, Subpart C 15.247(e)
Test Method:	ANSI C63.10 (2013) Section 11.10.2
Limit:	${\leq}8\text{dBm}$ in any 3 kHz band during any time interval of continuous transmission

#### 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<br/>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 SHCR211200091201



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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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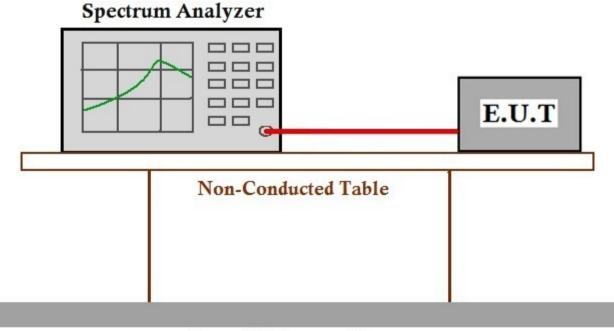


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#### 7.4.1 E.U.T. Operation

Operating Environment:						
Temperature:	22 °C	Humidity:	50	% RH	Atmospheric Pressure: 1001	mbar
Test mode	a:TX mode_ł modulation	Keep the EUT	in cor	ntinuousl	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 SHCR211200091201



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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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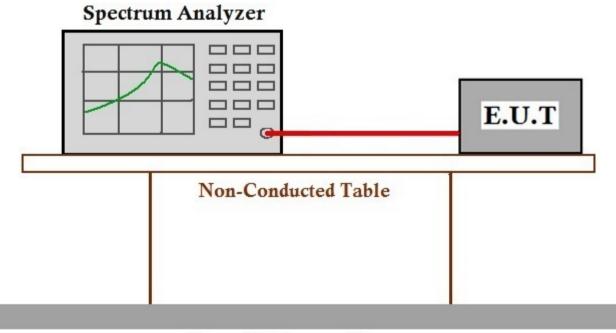
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#### 7.5.1 E.U.T. Operation

Operating Enviro	onment:	
<b>T</b>	00 00	

Temperature:	22 °C	Humidity:	50	% RH	Atmospheric Pressure: 1001	mbar
Test mode	a:TX mode_K modulation	eep the EUT	in cor	ntinuously	transmitting 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 SHCR211200091201



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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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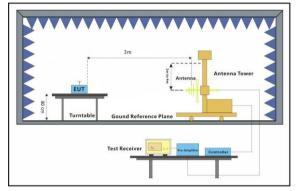
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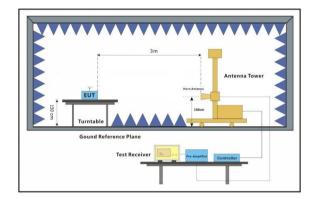
#### 7.6.1 E.U.T. Operation

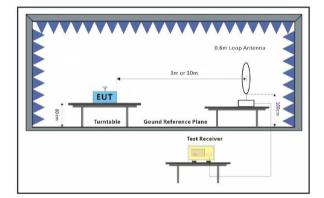
**Operating Environment:** 

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

#### 7.6.2 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.

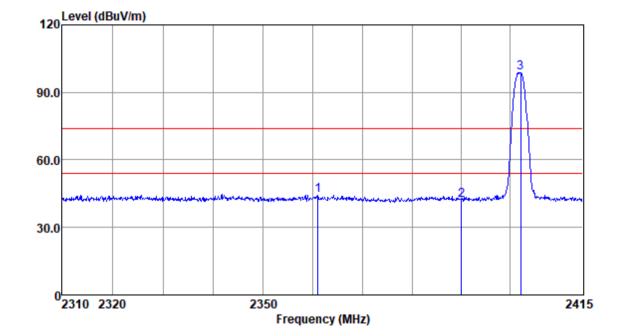


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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low

#### Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2360.97	47.80	28.92	2.74	35.16	44.30	74.00	-29.70	Peak
2390.00	45.69	28.97	2.77	35.18	42.25	74.00	-31.75	Peak
2402.15	101.98	29.01	2.79	35.19	98.59	74.00	24.59	Peak

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

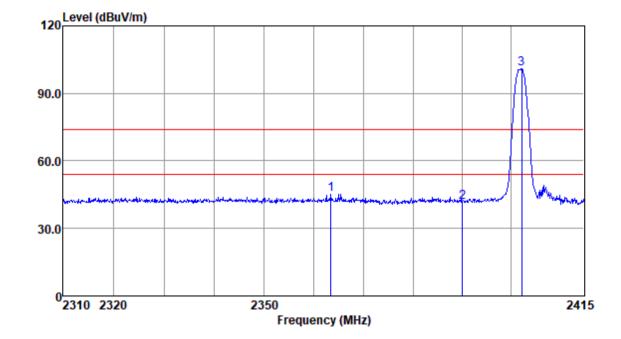


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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low

#### Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2363.39	48.81	28.94	2.75	35.16	45.34	74.00	-28.66	Peak
2390.00	45.14	28.97	2.77	35.18	41.70	74.00	-32.30	Peak
2402.15	104.14	29.01	2.79	35.19	100.75	74.00	26.75	Peak

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



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Level (dBuV/m) 120 90.0 60.0 3 30.0 2475 2500 2550

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	
2479.66	100.55	29.10	2.88	35.25	97.28	74.00	23.28	Peak
2483.50	46.88	29.11	2.88	35.26	43.61	74.00	-30.39	Peak
2503.98	46.52	29.21	2.90	35.28	43.35	74.00	-30.65	Peak

Frequency (MHz)

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



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Level (dBuV/m) 120 90.0 60.0 3 30.0 2500 2550 2475 Frequency (MHz)

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	
2479.66	104.04	29.10	2.88	35.25	100.77	74.00	26.77	Peak
2483.50	47.11	29.11	2.88	35.26	43.84	74.00	-30.16	Peak
2487.22	50.12	29.11	2.88	35.26	46.85	74.00	-27.15	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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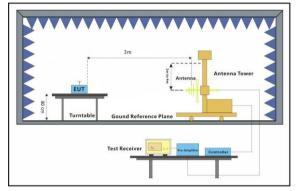
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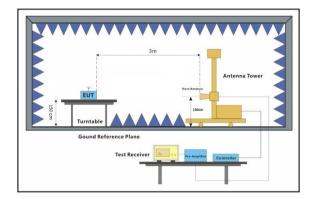
#### 7.7.1 E.U.T. Operation

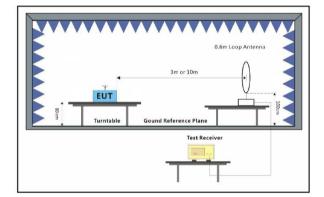
**Operating Environment:** 

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



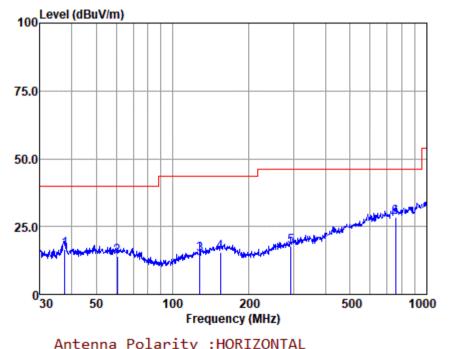
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Below 1GHz




		Read	Antenna	Cable	Preamp	Emission	n Limit	0ver	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	37.548	34.82	12.82	0.85	31.93	16.56	40.00	-23.44	QP
2	60.492	31.54	13.04	1.12	31.63	14.07	40.00	-25.93	QP
3	128.113	33.24	11.66	1.70	31.67	14.93	43.50	-28.57	QP
4	154.279	31.79	13.03	1.89	31.31	15.40	43.50	-28.10	QP
5	292.058	33.13	13.11	2.79	31.24	17.79	46.00	-28.21	QP
6	755.387	32.92	22.12	4.37	30.89	28.52	46.00	-17.48	QP

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

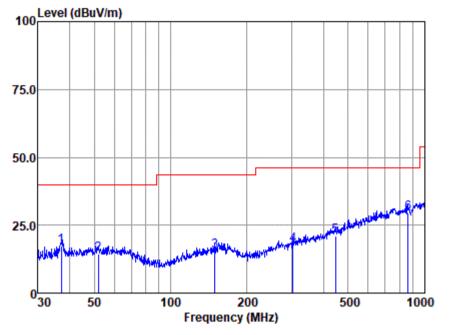


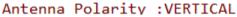
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	Freq		Antenna Factor						Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	37.155	35.53	12.76	0.84	31.93	17.20	40.00	-22.80	QP
2	51.843	31.82	13.58	1.03	31.97	14.46	40.00	-25.54	QP
3	149.486	32.11	12.88	1.86	31.39	15.46	43.50	-28.04	QP
4	303.544	32.53	13.40	2.84	31.08	17.69	46.00	-28.31	QP
5	446.414	32.29	16.82	3.31	31.21	21.21	46.00	-24.79	QP
6	863.056	34.02	22.80	4.70	31.99	29.53	46.00	-16.47	QP

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



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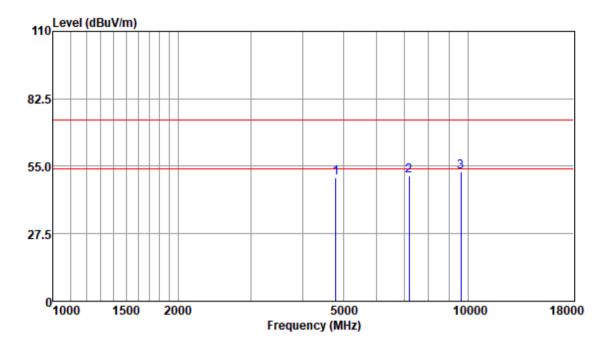
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#### Above 1GHz

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	48.97	33.72	4.46	36.79	50.36	74.00	-23.64	Peak
7206.00	44.82	36.28	5.72	35.53	51.29	74.00	-22.71	Peak
9608.00	42.01	37.70	6.53	33.58	52.66	74.00	-21.34	Peak

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



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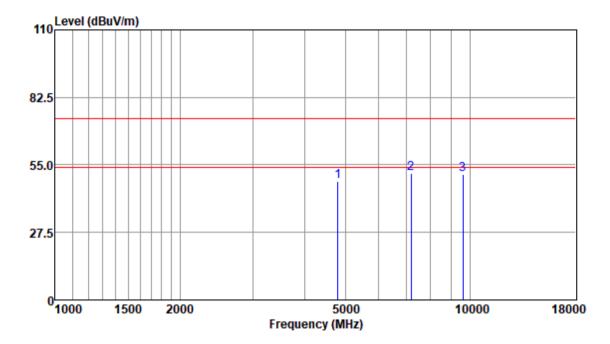
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#### Antenna Polarity :VERTICAL

	Read	Antenna	Cable	Preamp	Emission	Limit	0ver	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	46.87	33.72	4.46	36.79	48.26	74.00	-25.74	Peak
7206.00	45.18	36.28	5.72	35.53	51.65	74.00	-22.35	Peak
9608.00	40.64	37.70	6.53	33.58	51.29	74.00	-22.71	Peak

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



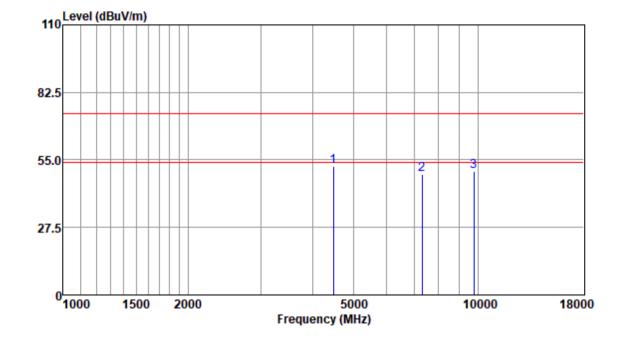
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 SHCR211200091201

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

#### Antenna Polarity :HORIZONTAL

Freq					Emission Level			Remark
 MH7	dBuv	dB/m	dB	dB	dBuv/m	dBuy/m	dB	
		-			52.26	-		Peak
					49.29			
9760.00	39.58	37.68	6.50	33.50	50.26	74.00	-23.74	Peak

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

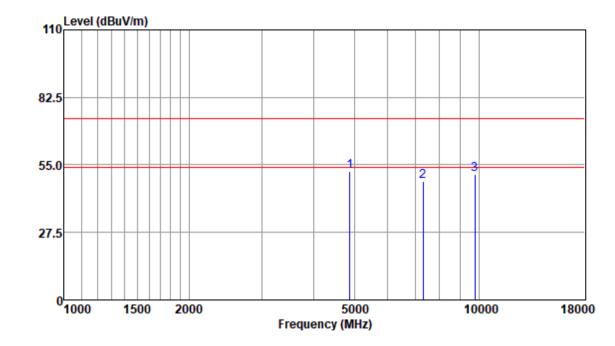


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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:middle

#### Antenna Polarity :VERTICAL

Freq					Emission Level			Remark
MHZ	dBuv	dB/m	qR	dB	dBuv/m	dBuv/m	dB	
4880.00	50.67	33.93	4.47	36.81	52.26	74.00	-21.74	Peak
7320.00	41.39	36.47	5.85	35.42	48.29	74.00	-25.71	Peak
9760.00	40.61	37.68	6.50	33.50	51.29	74.00	-22.71	Peak

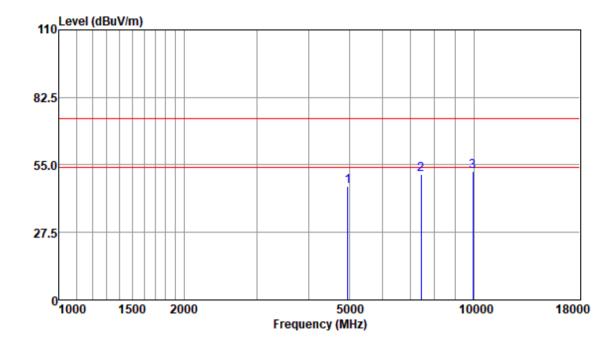
Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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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	44.63	33.98	4.48	36.83	46.26	74.00	-27.74	Peak
7440.00	44.23	36.40	5.97	35.34	51.26	74.00	-22.74	Peak
9920.00	41.40	37.81	6.47	33.41	52.27	74.00	-21.73	Peak

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



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Level (dBuV/m) 110 82.5 55.0 2 27.5 1000 1500 2000 5000 10000 18000 Frequency (MHz)

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	48.63	33.98	4.48	36.83	50.26	74.00	-23.74	Peak
7440.00	42.23	36.40	5.97	35.34	49.26	74.00	-24.74	Peak
9920.00	40.39	37.81	6.47	33.41	51.26	74.00	-22.74	Peak

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



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#### 7.8 99% Bandwidth

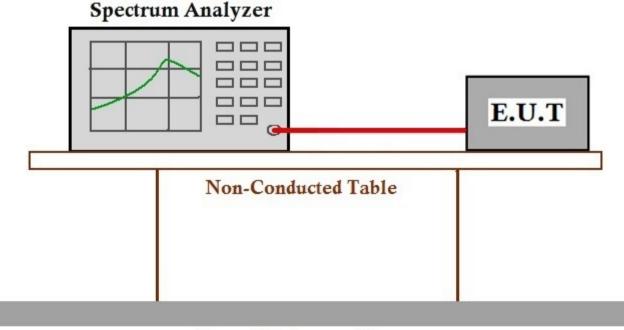
Test Requirement	RSS-Gen Section 6.7
Test Method:	ANSI C63.10 Section 6.9.3

#### 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 SHCR211200091201



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# 8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

# 9 EUT Constructional Details

Refer to the < External Photos > & < Internal Photos >.

# Appendix A for SHCR211200091201

#### 1.6dB Bandwidth

Test Mode	Test Channel	EBW[MHz]	Limit	Verdict
BLE	2402	0.69	0.5	PASS
BLE	2440	0.70	0.5	PASS
BLE	2480	0.72	0.5	PASS



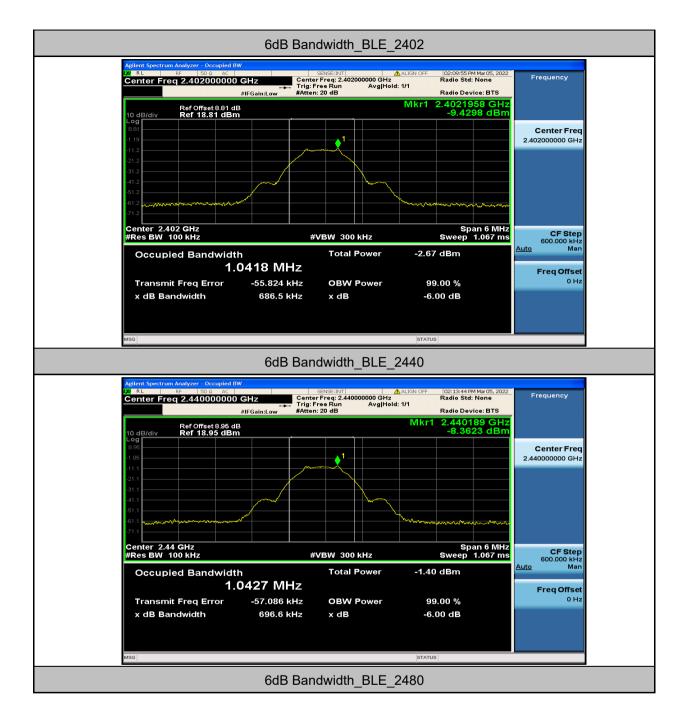
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RL         RF         50 Ω           Center Freq 2.48000		SENSE:INT Center Freq: 2.480000 Trig: Free Run #Atten: 20 dB	ALIGN OFF	Radio Std		Frequency
Ref Offset 10 dB/div Ref 18.95	3.95 dB i dBm		Mkr1	2.47993 -8.61	318 GHz 06 dBm	
Log 8.95 -1.05		<b>1</b>				Center Free 2.480000000 GH
-11.1						
-31.1			~			
-51.1 -61.1			mune	Manna -		
Center 2.48 GHz #Res BW 100 kHz		#VBW 300 kF	z	Sp Sweep	an 6 MHz 1.067 ms	CF Step 600.000 kHz
Occupied Band		Total Po	wer -1.2	25 dBm		<u>Auto</u> Mar
	1.0415 MH			00.00 %		Freq Offse
Transmit Freq Erro x dB Bandwidth	or -56.381 k 720.9 ki			99.00 % 6.00 dB		
MSG			STAT	TUS		



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#### 2.Occupied Bandwidth

Test Mode	Test Channel	OBW[MHz]	Limit[MHz]	Verdict
BLE	2402	1.05		PASS
BLE	2440	1.04		PASS
BLE	2480	1.04		PASS



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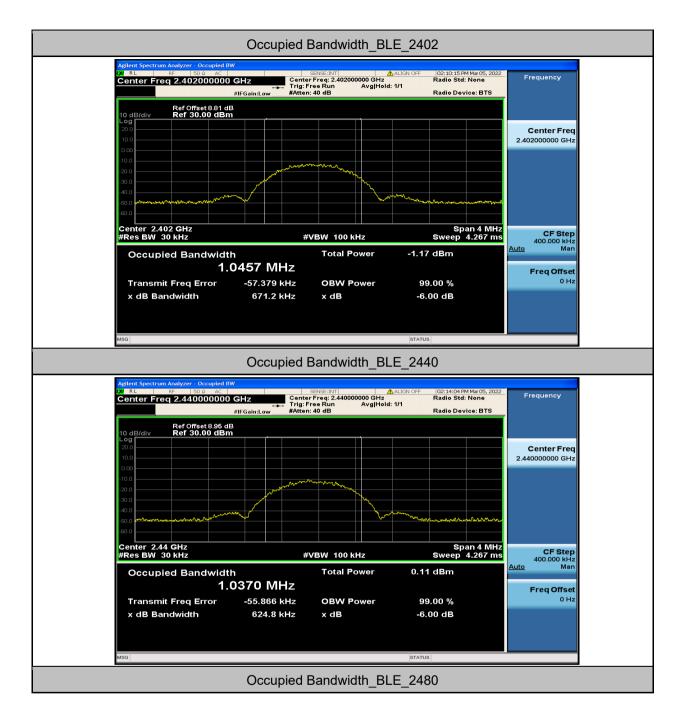
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RL         RF         S0.2         AC         AC           Center Freq 2.480000000 GHz         #IFGain:Low         #IFGain:Low         #IFGain:Low	SENSE:INT ALIGN OF Center Freq: 2.480000000 GHz Trig: Free Run Avg Hold: 1/1 #Atten: 40 dB	F 02:16:33 PM Mar 05, 2022 Radio Std: None Radio Device: BTS	Frequency
Ref Offset 8.95 dB 10 dB/div Ref 30.00 dBm			
20.0			Center Freq 2.48000000 GHz
-10.0	A Marine and a second		
-30.0 -40.0 -50.0		mpr Intraction of the second	
Center 2.48 GHz #Res BW 30 kHz	#VBW 100 kHz	Span 4 MHz Sweep 4.267 ms	CF Step 400.000 kHz
Occupied Bandwidth 1.0415 M		01 dBm	Auto Man Freq Offset
Transmit Freq Error -57.119 x dB Bandwidth 743.7		99.00 % -6.00 dB	0 Hz



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Test Mode	Test Channel	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	-9.05	30	PASS
BLE	2440	-7.75	30	PASS
BLE	2480	-7.65	30	PASS

#### 3.Maximum peak conducted output power



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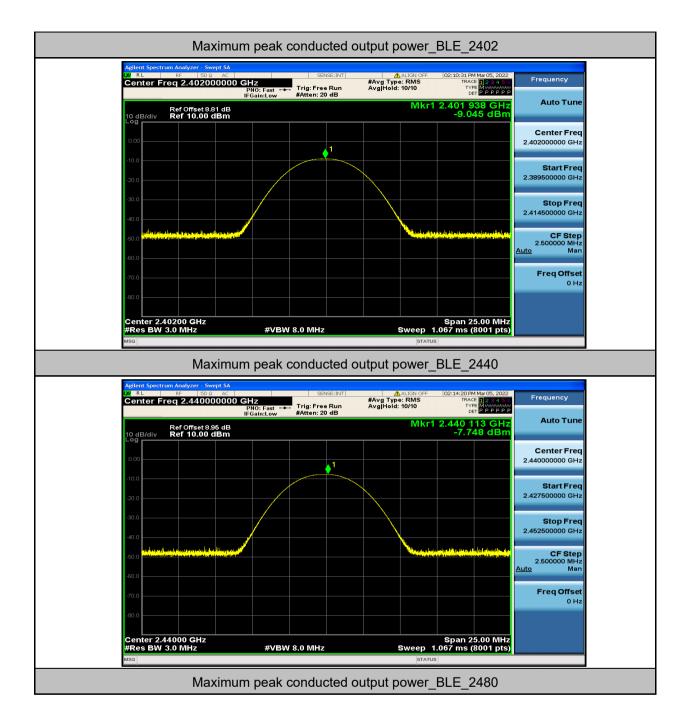
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Center Freq 2.480000000 GP	SENSE:INT IZ NO: Fast ↔ Trig: Free Run Gain:Low #Atten: 20 dB	ALIGN OFF #Avg Type: RMS Avg Hold: 10/10	02:16:52 PM Mar 05, 2022 TRACE 1 2 3 4 5 6 TYPE MVM/WMM DET P P P P P	Frequency
Ref Offset 8.95 dB 10 dB/div Ref 10.00 dBm		Mkr1	2.479 903 GHz -7.652 dBm	Auto Tun
0.00	1			Center Free 2.480000000 GH
-10.0				<b>Start Fred</b> 2.467500000 GHz
-30.0		+		Stop Freq 2.492500000 GHz
-40.0 -50.0 Abhabhahanting Alkars, paper or trainet Athan		Multime	l na staviše dala (tanta) ma kom a na pred tanta y poslan ( <sup>1</sup> 1) na stavišna dala na pred tanta y na na stavistica da na stavistica.	CF Step 2.500000 MHz
-60.0				Auto Mar Freq Offset
-70.0				0 Hz
Center 2.48000 GHz #Res BW 3.0 MHz	#VBW 8.0 MHz		Span 25.00 MHz .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	-18.95	8.00	PASS
BLE	2440	-17.55	8.00	PASS
BLE	2480	-18.5	8.00	PASS



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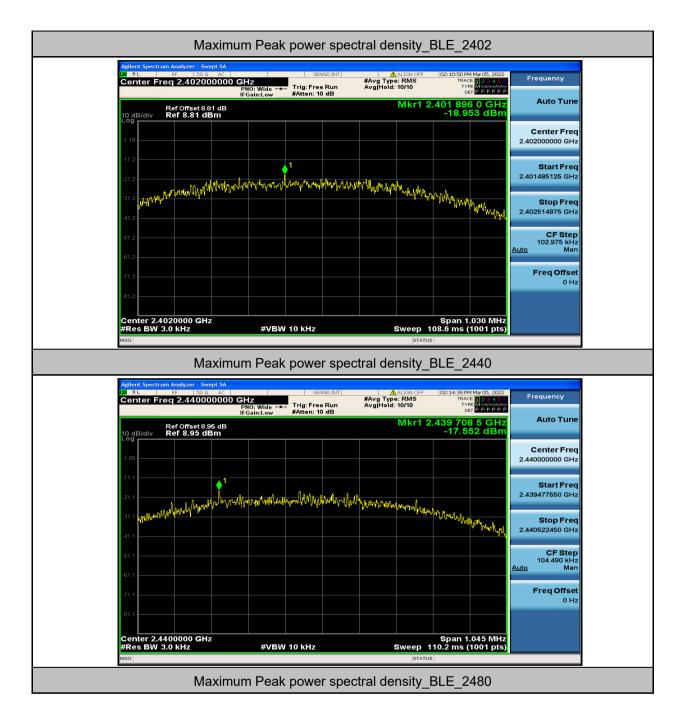
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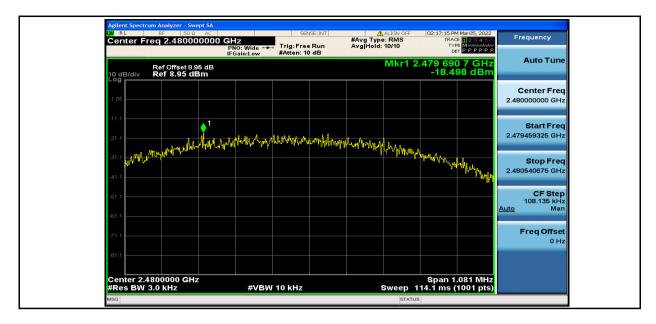
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#### 5.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	-9.79	-64.76	-29.79	PASS
BLE	2480	-8.34	-70.02	-28.34	PASS



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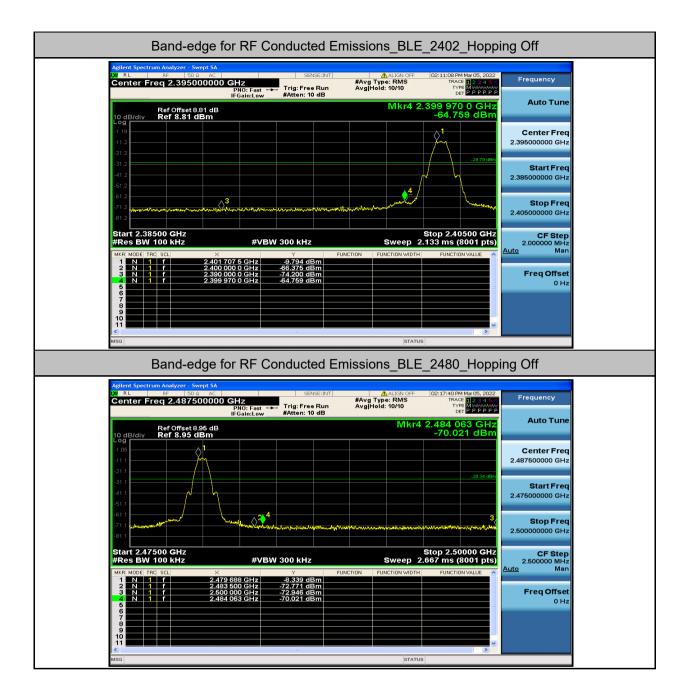
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#### 6.RF Conducted Spurious Emissions

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	-9.69	-35.64	<-29.69	PASS
BLE	2402	10000	26000	100	300	-9.693	-45.334	<- 29.693	PASS
BLE	2440	30	10000	100	300	-8.37	-36.07	<-28.37	PASS
BLE	2440	10000	26000	100	300	-8.369	-45.023	<- 28.369	PASS
BLE	2480	30	10000	100	300	-8.40	-51.91	<-28.40	PASS
BLE	2480	10000	26000	100	300	-8.404	-44.967	<- 28.404	PASS



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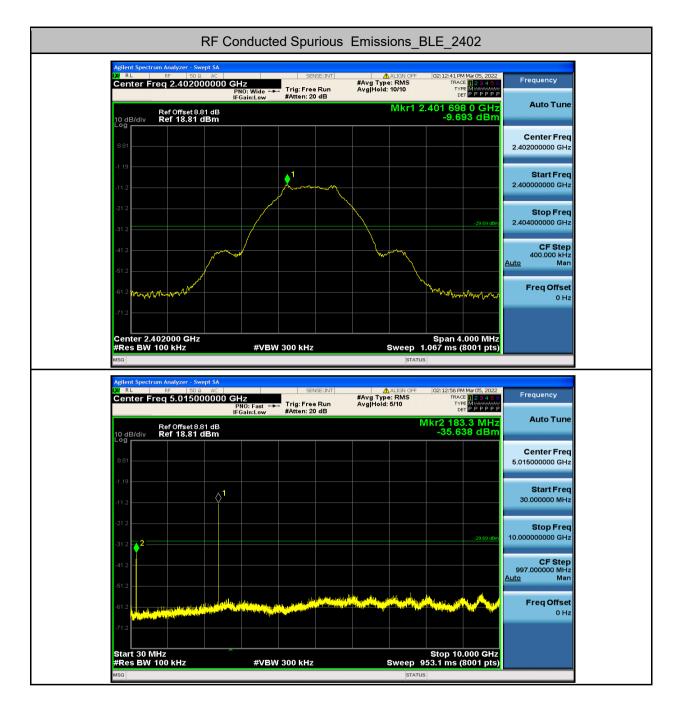
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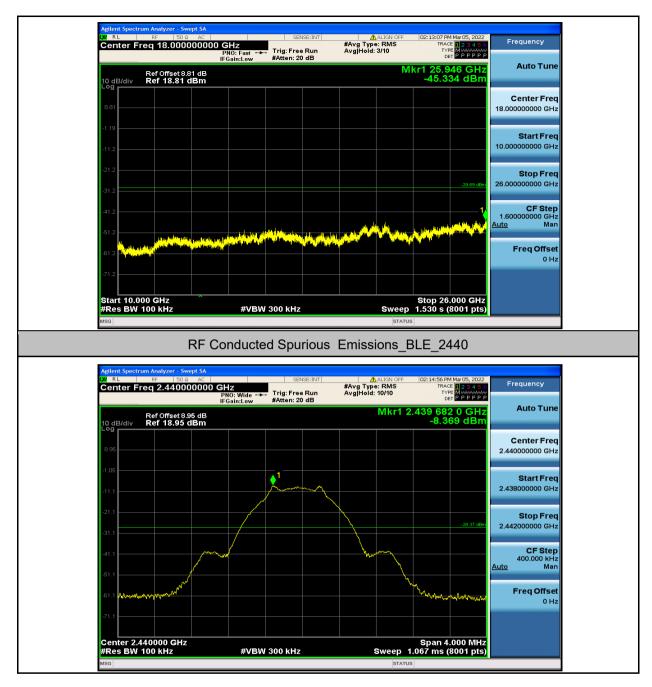


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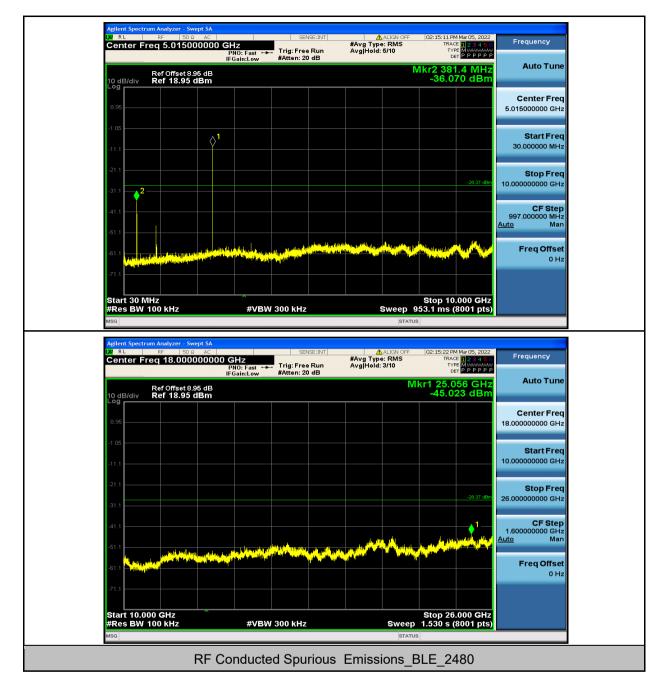
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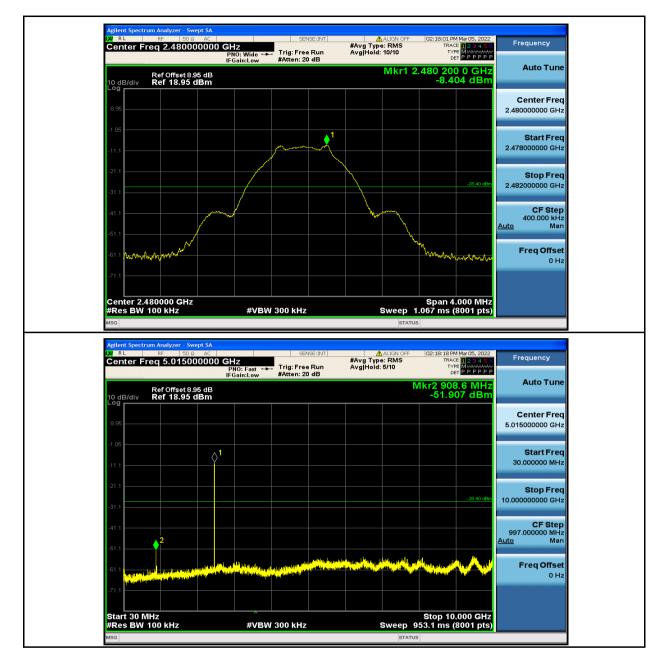
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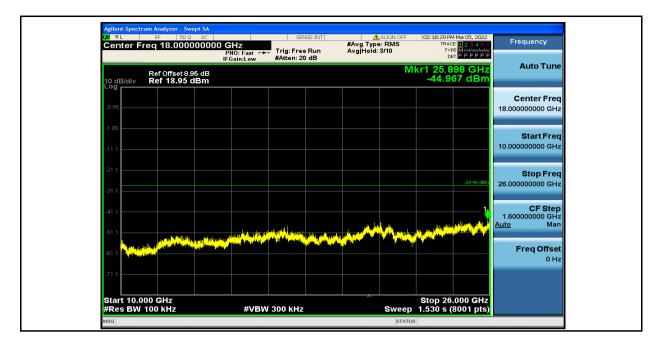
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