

# **RF Test Report**

# For

#### **Applicant Name:**

## ORAIMO TECHNOLOGY LIMITED

Address:

EUT Name:

Brand Name:

Model Number:

Series Model Number: Refer to section 2

#### FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG Smart Watch oraimo OSW-30

# **Issued By**

#### Company Name:

Address:

**BTF Testing Lab (Shenzhen) Co., Ltd.** F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

Report Number: Test Standards: BTF230706R00102 47 CFR Part 15.247

Test Conclusion: FCC ID: Test Date: Date of Issue: Pass 2AXYP-OSW-30 2023-06-24 to 2023-07-02 2023-07-04

Prepared By:

Date:

Approved By:

Date:

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Chris Liu / Proport Engineer	
2023-07-04 2	
Figure 1 ab 1	
Ryan.CJ / EMC Manager	
2023-07-04	

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Revision History			
Version	Issue Date	Revisions Content	
R_V0	2023-07-04	Original	

Note: Once the revision has been made, then previous versions reports are invalid.

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## 1 Introduction

#### 1.1 Identification of Testing Laboratory

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130

#### 1.2 Identification of the Responsible Testing Location

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130
FCC Registration Number:	518915
Designation Number:	CN1330

#### 1.3 Announcement

(1) The test report reference to the report template version v0.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.

(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

(6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.



#### 2 **Product Information**

#### **Application Information** 2.1

Company Name:	ORAIMO TECHNOLOGY LIMITED
Address:	FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG

#### 2.2 Manufacturer Information

Company Name:	ORAIMO TECHNOLOGY LIMITED
Address:	FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG

#### **Factory Information** 2.3

Company Name:	Jiangsu SOP Technology Co.,Ltd
Address:	4th Floor, Block F, Enterprise Aviation Science and Technology Park, No.1008, Songbai Road, XiLi Nanshan, Shenzhen

#### General Description of Equipment under Test (EUT) 2.4

EUT Name:	Smart Watch		
Test Model Number:	OSW-30		
Series Model Number:	N/A		

#### 2.5 **Technical Information**

Power Supply:	Rechargeable Li-ion Battery: ZWD402226V Nominal Voltage: 3.8V Rated Capacity: 260mAh/0.988Wh Limited Charge Voltage: 4.35V
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	40
Modulation Type:	GFSK
Antenna Type:	Wire antenna
Antenna Gain <sup>#</sup> :	-0.91 dBi

#### Note:

#: The antenna gain provided by the applicant, and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.

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# 3 Summary of Test Results

#### 3.1 Test Standards

The tests were performed according to following standards: 47 CFR Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

#### 3.2 Uncertainty of Test

Item	Measurement Uncertainty
Conducted Emission (150 kHz-30 MHz)	±2.64dB
The following measurement uncertainty levels have been estimated for tests	performed on the EUT as
specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty	ainty expressed at approximately

#### 3.3 Summary of Test Result

the 95% confidence level using a coverage factor of k=2.

Item	Standard	Requirement	Result
Antenna requirement	47 CFR Part 15.247	Part 15.203	Pass
Conducted Emission at AC power line	47 CFR Part 15.247	47 CFR 15.207(a)	Pass
Occupied Bandwidth	47 CFR Part 15.247	47 CFR 15.247(a)(2)	Pass
Maximum Conducted Output Power	47 CFR Part 15.247	47 CFR 15.247(b)(3)	Pass
Power Spectral Density	47 CFR Part 15.247	47 CFR 15.247(e)	Pass
Emissions in non-restricted frequency bands	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Band edge emissions (Radiated)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (below 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (above 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass



#### **Test Configuration** 4

#### **Test Equipment List** 4.1

Conducted Emission at AC power line					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Pulse Limiter	SCHWARZBECK	VTSD 9561-F	00953	2022-11-24	2023-11-23
Coaxial Switcher	SCHWARZBECK	CX210	CX210	2022-11-24	2023-11-23
V-LISN	SCHWARZBECK	NSLK 8127	01073	2022-11-24	2023-11-23
LISN	AFJ	LS16/110VAC	16010020076	2023-02-23	2024-02-22
EMI Receiver	ROHDE&SCHWA RZ	ESCI3	101422	2022-11-24	2023-11-23

<b>Occupied Bandwidth</b>					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Maximum Conducted Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Power Spectral Densi	ty				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RFTest software	/	V1.00	/	/	/

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RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Emissions in non-restricted frequency bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Band edge emissions (Radiated)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2023-03-24	2024-03-23
Preamplifier	SCHWARZBECK	BBV9744	00246	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1 0m	21101566	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1 m	21101568	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	1	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2021-11-28	2023-11-27
EMI TEST RECEIVER	ROHDE&SCHWA RZ	ESCI7	101032	2022-11-24	2023-11-23
SIGNAL ANALYZER	ROHDE&SCHWA RZ	FSQ40	100010	2022-11-24	2023-11-23

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POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplilifier	SCHWARZBECK	BBV9718D	00008	2023-03-24	2024-03-23
Horn Antenna	SCHWARZBECK	BBHA9120D	2597	2022-05-22	2024-05-21
EZ_EMC	Frad	FA-03A2 RE+	/	/	/
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2021-11-28	2023-11-27

<b>Emissions in restricte</b>	ed frequency band	s (below 1GHz)			
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2023-03-24	2024-03-23
Preamplifier	SCHWARZBECK	BBV9744	00246	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1 0m	21101566	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1 m	21101568	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2021-11-28	2023-11-27
EMI TEST RECEIVER	ROHDE&SCHWA RZ	ESCI7	101032	2022-11-24	2023-11-23
SIGNAL ANALYZER	ROHDE&SCHWA RZ	FSQ40	100010	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplilifier	SCHWARZBECK	BBV9718D	00008	2023-03-24	2024-03-23
Horn Antenna	SCHWARZBECK	BBHA9120D	2597	2022-05-22	2024-05-21
EZ_EMC	Frad	FA-03A2 RE+	/	/	/
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	1
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2021-11-28	2023-11-27

<b>Emissions in restricte</b>	Emissions in restricted frequency bands (above 1GHz)				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2023-03-24	2024-03-23
Preamplifier	SCHWARZBECK	BBV9744	00246	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1 0m	21101566	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1 m	21101568	2022-11-24	2023-11-23
RE Cable	<b>REBES</b> Talent	UF2-NMNM-1m	21101576	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2022-11-24	2023-11-23

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POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2021-11-28	2023-11-27
EMI TEST RECEIVER	ROHDE&SCHWA RZ	ESCI7	101032	2022-11-24	2023-11-23
SIGNAL ANALYZER	ROHDE&SCHWA RZ	FSQ40	100010	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplilifier	SCHWARZBECK	BBV9718D	00008	2023-03-24	2024-03-23
Horn Antenna	SCHWARZBECK	BBHA9120D	2597	2022-05-22	2024-05-21
EZ_EMC	Frad	FA-03A2 RE+	/	/	/
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	1
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2021-11-28	2023-11-27



#### 4.2 Test Auxiliary Equipment

The EUT was tested as an independent device.

#### 4.3 Test Modes

Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is

plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

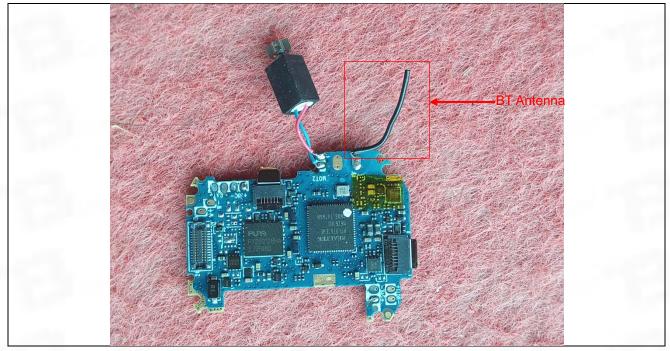


# 5 Evaluation Results (Evaluation)

#### 5.1 Antenna requirement

Test Requirement:An intentional radiator shall be designed to ensure that no antenna other than that<br/>furnished by the responsible party shall be used with the device. The use of a<br/>permanently attached antenna or of an antenna that uses a unique coupling to the<br/>intentional radiator shall be considered sufficient to comply with the provisions of<br/>this section.

#### 5.1.1 Conclusion:



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# 6 Radio Spectrum Matter Test Results (RF)

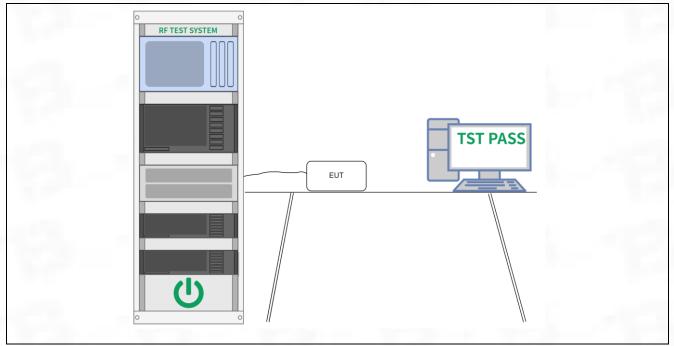
## 6.1 Occupied Bandwidth

Test Requirement:	Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.					
Test Method:	DTS bandwidth					
Test Limit:	Section (a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.					
Procedure:	<ul> <li>a) Set RBW = 100 kHz.</li> <li>b) Set the VBW &gt;= [3 x RBW].</li> <li>c) Detector = peak.</li> <li>d) Trace mode = max hold.</li> <li>e) Sweep = auto couple.</li> <li>f) Allow the trace to stabilize.</li> <li>g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.</li> </ul>					

#### 6.1.1 E.U.T. Operation:

Operating Environment:				
Temperature:	25.8 °C			
Humidity:	49.9 %			
Atmospheric Pressure:	1010 mbar			

#### 6.1.2 Test Setup Diagram:



#### 6.1.3 Test Data:

Please Refer to Appendix for Details.



# 6.2 Maximum Conducted Output Power

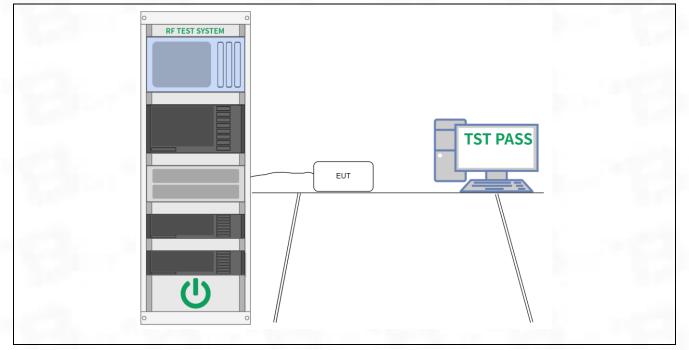
Test Requirement:	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Test Method:	Maximum peak conducted output power
Test Limit:	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Procedure:	ANSI C63.10-2013, section 11.9.1 Maximum peak conducted output power
6.2.1 E.U.T. Operation:	

#### 6.2.1 E.U.I. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar



#### 6.2.2 Test Setup Diagram:



#### 6.2.3 Test Data:

Please Refer to Appendix for Details.



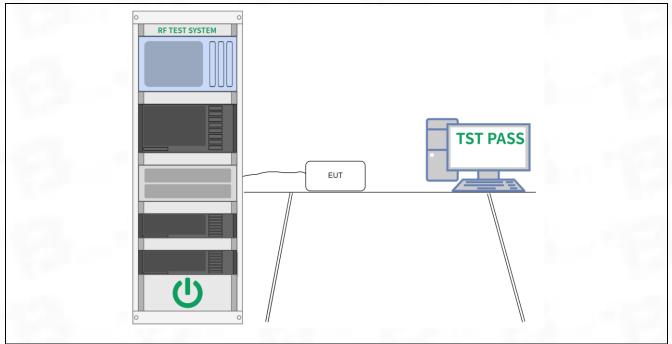
#### 6.3 Power Spectral Density

Test Requirement:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	Maximum power spectral density level in the fundamental emission
Test Limit:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

#### 6.3.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

#### 6.3.2 Test Setup Diagram:



# 6.3.3 Test Data:

Please Refer to Appendix for Details.



## 6.4 Emissions in non-restricted frequency bands

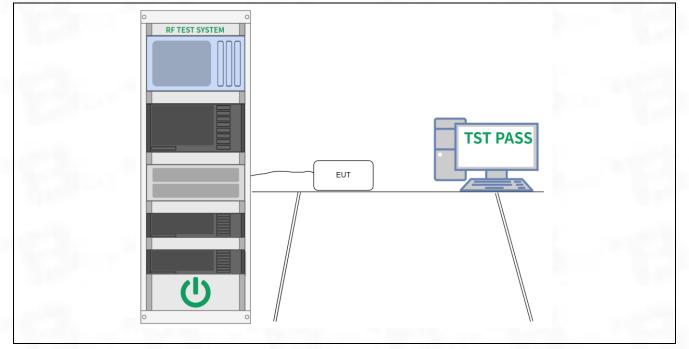
Test Requirement:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band 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.
Test Method:	Emissions in nonrestricted frequency bands
Test 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.
Procedure:	ANSI C63.10-2013 Section 11.11.1, Section 11.11.2, Section 11.11.3

## 6.4.1 E.U.T. Operation:

Operating Environment:			
Temperature:	25.8 °C		
Humidity:	49.9 %	 1	
Atmospheric Pressure:	1010 mbar		



#### 6.4.2 Test Setup Diagram:



## 6.4.3 Test Data:

Please Refer to Appendix for Details.



## 6.5 Band edge emissions (Radiated)

Test Requirement:	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)).				
Test Method:	Radiated emissions tests	3	Transfer Contractor		
	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		
Test Limit:	88-216	150 **	3		
	216-960	200 **	3		
	Above 960	500	3		
	** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.				
Procedure:	ANSI C63.10-2013 section 6.6.4				
6.5.1 E.U.T. Operation:					

Operating Environment:	
Temperature:	22.1 °C
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar



#### 6.5.2 Test Data:

#### Test result for GFSK Mode (the worst case)

Frequency	Reading	Correct Factor	Emission Level	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
			Low Cha	nnel			
2390	60.82	-8.76	52.06	74	21.94	Н	PK
2390	54.03	-8.76	45.27	54	8.73	н	AV
2390	61.75	-8.73	53.02	74	20.98	V	PK
2390	57.61	-8.73	48.88	54	5.12	V	AV
			High Cha	nnel			
2483.5	64.72	-8.76	55.96	74	18.04	Η	PK
2483.5	53.51	-8.76	44.75	54	9.25	Η	AV
2483.5	60.02	-8.73	51.29	74	22.71	V	PK
2483.5	57.85	-8.73	49.12	54	4.88	V	AV



# 6.6 Emissions in restricted frequency bands (below 1GHz)

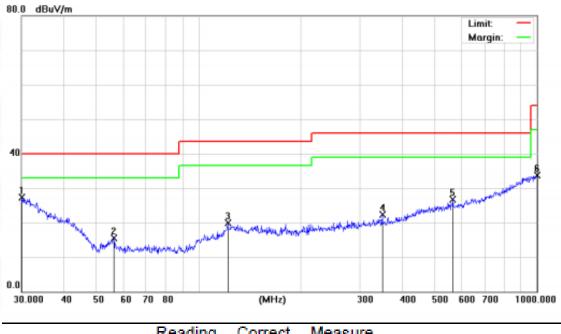
Test Requirement:	15.205(a), must also co	In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).				
Test Method:	Radiated emissions test	Radiated emissions tests				
	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			
Test Limit:	88-216	150 **	3			
	216-960	200 **	3			
	Above 960	500	3			
	radiators operating unde 54-72 MHz, 76-88 MHz,	** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.				
Procedure:	ANSI C63.10-2013 sect	ANSI C63.10-2013 section 6.6.4				
6.6.1 E.U.T. Operation	n:	the second s	Sector States			

Operating Environment:	
Temperature:	22.1 °C
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar



#### 6.6.2 Test Data:

Note: All the mode have been tested, and only the worst case of GFSK mode are in the report Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H

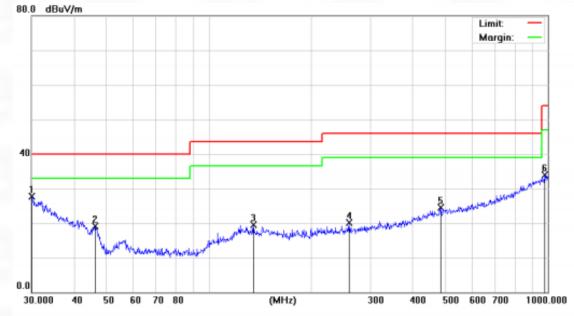


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	30.1054	21.99	5.40	27.39	40.00	-12.61	QP
2		56.1974	24.82	-9.26	15.56	40.00	-24.44	QP
3		121.9755	23.10	-3.23	19.87	43.50	-23.63	QP
4		349.2500	24.16	-1.84	22.32	46.00	-23.68	QP
5		564.6389	24.38	2.32	26.70	46.00	-19.30	QP
6		1000.000	22.38	11.32	33.70	54.00	-20.30	QP

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Polarization: Vertical / Band: 2.4G / BW: 1 / CH: H

No.	. Mk. Freq.		3		Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	30.0000	22.29	5.39	27.68	40.00	-12.32	QP
2		46.1779	21.31	-2.22	19.09	40.00	-20.91	QP
3		135.5062	23.14	-3.69	19.45	43.50	-24.05	QP
4		259.2338	24.10	-4.04	20.06	46.00	-25.94	QP
5		483.9094	23.89	0.59	24.48	46.00	-21.52	QP
6		979.1804	26.11	7.70	33.81	54.00	-20.19	QP

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# 6.7 Emissions in restricted frequency bands (above 1GHz)

Test Requirement:	15.205(a), must also co	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)).						
Test Method:	Radiated emissions test	Radiated emissions tests						
	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					
Test Limit:	88-216	150 **	3					
	216-960	200 **	3					
	Above 960	500	3					
	radiators operating unde 54-72 MHz, 76-88 MHz,	d in paragraph (g), fundamental emissions from intentional nder this section shall not be located in the frequency bands Hz, 174-216 MHz or 470-806 MHz. However, operation withir ds is permitted under other sections of this part, e.g., 1						
Procedure:	ANSI C63.10-2013 sect	ion 6.6.4						
6.7.1 E.U.T. Operation	n:	the second s	and the second second second					

Operating Environment:						
Temperature:	22.1 °C					
Humidity:	46.3 %					
Atmospheric Pressure:	1010 mbar					



#### 6.7.2 Test Data:

E e e e	Low channel: 2402MHz								
Freq.	Ant.Pol	Emission I	_evel(dBuV)	Limit 3m	(dBuV/m)	Over(dB)			
(MHz)	H/V	PK	AV	PK	AV	PK	AV		
4804	V	59.66	41.88	74	54	-14.34	-12.12		
7206	V	58.20	40.31	74	54	-15.80	-13.69		
4804	Н	59.20	40.31	74	54	-14.80	-13.69		
7206	Н	58.97	39.97	74	54	-15.03	-14.03		

Freq.	Middle channel: 2440MHz								
	Ant.Pol	Emission I	_evel(dBuV)	Limit 3m	(dBuV/m)	Over(dB)			
(MHz)	H/V	PK	AV	PK	AV	PK	AV		
4880	V	60.11	40.86	74	54	-13.89	-13.14		
7320	V	59.53	40.06	74	54	-14.47	-13.94		
4880	Н	59.67	39.53	74	54	-14.33	-14.47		
7320	Н	59.46	40.46	74	54	-14.54	-13.54		

Freq.	High channel: 2480 MHz								
	Ant.Pol	Emission L	_evel(dBuV)	Limit 3m	(dBuV/m)	Over(dB)			
(MHz)	H/V	PK	AV	PK	AV	PK	AV		
4960	V	59.44	40.57	74	54	-14.56	-13.43		
7440	V	59.44	39.83	74	54	-14.56	-14.17		
4960	Н	58.31	39.15	74	54	-15.69	-14.85		
7440	Н	58.56	39.56	74	54	-15.44	-14.44		

Note:

1. All emissions not reported were more than 20dB below the specified limit or in the noise floor.

2. Emission Level= Reading Level+ Probe Factor +Cable Loss.3. Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.



# Appendix

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# 1. Bandwidth

## 1.1 BW

# 1.1.1 Test Result

#### BLE 1M

Test channel	6dB Emission I	Bandwidth (kHz)	
Test channel	BT LE mode	Limit	Result
Lowest	0.644	>500k	
Middle	0.645	>500k	PASS
Highest	0.643	>500k	

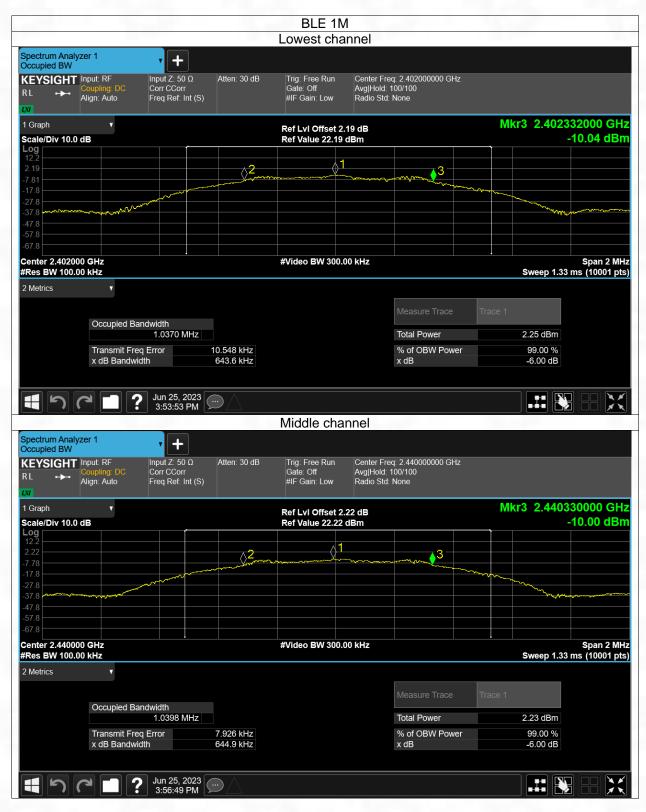
#### BLE 2M

Test shapped	6dB Emission	Bandwidth (kHz)	
Test channel	BT LE mode	Limit	Result
Lowest	1.092	>500k	
Middle	1.108	>500k	PASS
Highest	1.091	>500k	

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#### 1.1.2 Test Graph



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				Highest cha	annel				
Spectrum Analyze Occupied BW	er 1	• +							
	nput: RF oupling: DC lign: Auto	Input Ζ: 50 Ω Corr CCorr Freq Ref: Int (S)	Atten: 30 dB	Trig: Free Run Gate: Off #IF Gain: Low	Center Fre Avg Hold: 1 Radio Std:				
1 Graph Scale/Div 10.0 d	T B			Ref LvI Offset 2. Ref Value 22.29			M		32000 GHz -10.76 dBm
Log 12.3 2.29 -7.71 -17.7			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	×	1	3			
-27.7 -37.7 -47.7 -57.7	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~							and how and how and how and	·····
-67.7 Center 2.480000 #Res BW 100.00				#Video BW 300.0	00 kHz			Sweep 1.33	Span 2 MHz ms (10001 pts)
2 Metrics	¥					Measure Trace	Trace 1		
	Occupied Ba	ndwidth 1.0412 MHz				Total Power		1.33 dBm	
	Transmit Fre x dB Bandwi		10.226 kHz 642.8 kHz			% of OBW Power x dB		99.00 % -6.00 dB	
1 h		Jun 25, 2023 3:58:35 PM							





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					Highest cha	annel				
	rum Anal bied BW	yzer 1	• +							
KEY RL	SIGHT ++-	Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr Freq Ref: Int (S)	Atten: 30 dB	Trig: Free Run Gate: Off #IF Gain: Low	Center Fre Avg Hold: <sup>/</sup> Radio Std:				
1 Grap	oh / <b>Div 10.</b> (	T dB			Ref Lvl Offset 2 Ref Value 22.29			MI		41000 GHz 10.19 dBm
Log		бав			Rei Value 22.29	чып				10.15 dBm
12.3 2.29 -7.71			<mark>_2</mark>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		-		<b>3</b>		
-17.7	· · · · · · · · · · · · · · · · · · ·			m m m m m m m m m m m m m m m m m m m				-www.		and the second
-37.7										
-57.7 -67.7										
	er 2.4800 BW 100.				#Video BW 300	.00 kHz			Sweep 1.33	Span 2 MHz ms (10001 pts)
2 Metr	rics	•								
		Occupied Ba	andwidth				Measure Trace			
			1.8637 MHz				Total Power		1.23 dBm	
		Transmit Fre x dB Bandw		-4.258 kHz 1.091 MHz			% of OBW Power x dB		99.00 % -6.00 dB	
		-X db Bandw					× 40		-0.00 GD	
	5		Jun 25, 2023 4:04:26 PM							



# 2. Maximum Conducted Output Power

#### 2.1 Power

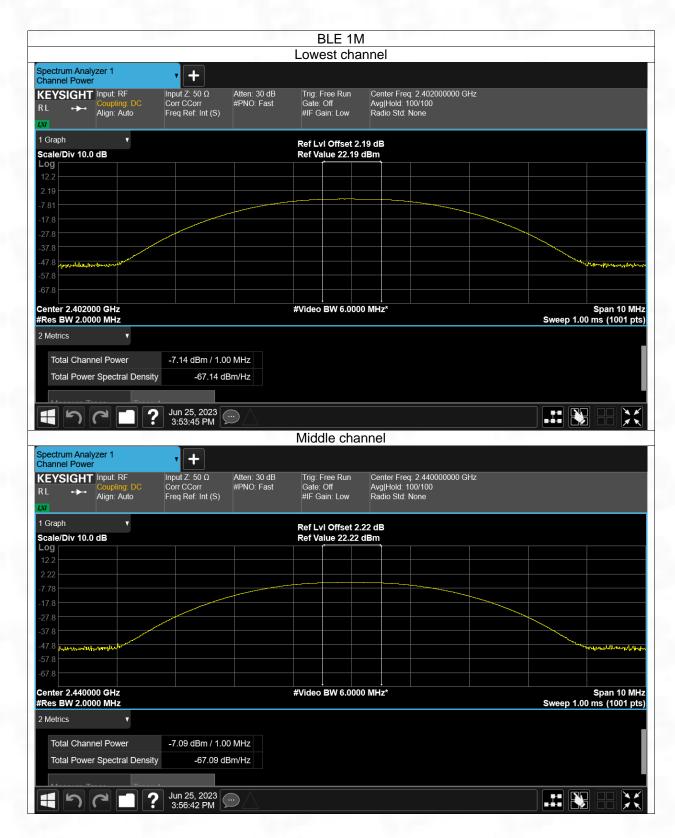
## 2.1.1 Test Result

BLE 1M								
Test channel	Maximum Conducted Output Power (dBm)	Result						
Lowest	-7.14	30.00	PASS					
Middle	-7.09	30.00	PASS					
Highest	-7.92	30.00	PASS					

BLE 2M							
Test channel	Maximum Conducted Output Power (dBm)	Limit (dBm)	Result				
Lowest	-3.96	30.00	PASS				
Middle	-4.14	30.00	PASS				
Highest	-4.92	30.00	PASS				



## 2.1.2 Test Graph



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				Highe	est cha	nnel					
Spectrum Analyzer 1 Channel Power		• +									
RL Align: Aut	DC Co		Atten: 30 dB #PNO: Fast	Gate: Off Avg			Center Freq. 2.48000000 GHz Avg Hold: 100/100 Radio Std. None				
Scale/Div 10.0 dB	dB Ref LvI Offset 2.29 dB										
12.3 2.29											
-7.71											
-27.7 -37.7 -47.7 International and the second											
-57.7 -67.7										www.well.	
Center 2.480000 GHz #Res BW 2.0000 MHz											
2 Metrics											
Total Channel Power	-7	7.92 dBm / 1.00	MHz								
Total Power Spectral	Density	-67.92 dBr	m/Hz								
<b>1</b> 7 7 1	<b>?</b> 3	un 25, 2023 3:58:27 PM									



BLE 2M									
Lowest channel									
Spectrum Anal Channel Powe	yzer 1 r	• +							
KEYSIGHT	Input: RF Coupling: DC	Input Ζ: 50 Ω Corr CCorr	Atten: 30 dB #PNO: Fast	Trig: Free Run Gate: Off	Center Free Avg Hold: 1	q: 2.402000000 G	Hz		
RL ↔	Align: Auto	Freq Ref: Int (S)	#FNO. Fasi	#IF Gain: Low	Radio Std:				
1 Graph	<b>v</b>								
Scale/Div 10.0				Ref LvI Offset 2 Ref Value 22.19					
Log 12.2									
2.19									
-7.81					· · · ·				
-17.8									
-27.8									
-47.8	Juterstone								m
-57.8									
-67.8									
Center 2.4020 #Res BW 2.00				#Video BW 6.000	00 MHz*			Sweep 1.00	Span 10 MHz 0 ms (1001 pts)
2 Metrics	•								
Total Chan	nel Power	-3.96 dBm / 2.0	0 MHz						
Total Powe	er Spectral Density	-66.97 dl	3m/Hz						
	_								
		Jun 25, 2023							
		4:00:33 PM		Middle cha	nnol				
Spectrum Anal		• +							
Channel Powe KEYSIGHT	Input: RF	Input Z: 50 Ω	Atten: 30 dB	Trig: Free Run	Center Free	q: 2.440000000 G	Hz		
RL ↔	Coupling: DC Align: Auto	Corr CCorr Freq Ref: Int (S)	#PNO: Fast	Gate: Off #IF Gain: Low	Avg Hold: 1 Radio Std:	100/100			
LXI									
1 Graph	▼			Ref LvI Offset 2					
Scale/Div 10.0	) dB			Ref Value 22.22	dBm	•			
12.2									
2.22					<u> </u>				
-7.78									
-27.8									
-37.8	1 mar and a star and a star								๚๛๚๛๚๚๛๛๚๚ <sub>๚</sub> ๚๛๚
-47.8									
-57.8									
Center 2.4400	00 GHz			#Video BW 6.000	00 MHz*				Span 10 MHz
#Res BW 2.00								Sweep 1.00	) ms (1001 pts)
2 Metrics	▼								
Total Chan	nel Power	-4.14 dBm / 2.0	0 MHz						
Total Power Spectral Density -67.15 dBm/Hz									
1	? 🗖 🖒	Jun 25, 2023 4:02:43 PM							

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# 3. Maximum Power Spectral Density

### 3.1 PSD

### 3.1.1 Test Result

Test channel	Power Spectral Density (dBm/3kHz)				
Test channel	BLE 1M	Limit	Result		
Lowest	-18.83	8 dBm/3kHz			
Middle	-19.92	8 dBm/3kHz	PASS		
Highest	-20.14	8 dBm/3kHz			

Test channel	Power Spectral Density (dBm/3kHz)				
Test channel	BLE 2M	Limit	Result		
Lowest	-20.06	8 dBm/3kHz			
Middle	-20.83	8 dBm/3kHz	PASS		
Highest	-21.87	8 dBm/3kHz			



### 3.1.2 Test Graph



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					Highest cha	annel				
Specti Swept	rum Analy: SA	zer 1	• +							
KEY RL		Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr Freq Ref: Int (S)	#Atten: 30 dB	PNO: Best Wide Gate: Off IF Gain: Low Sig Track: Off	#Avg Type: Avg Hold: 10 Trig: Free R	un M+	2 3 4 5 6 ₩₩₩₩₩ N N N N N		
1 Spec Scale Log	ctrum /Div 10 de	¥ 3			Ref LvI Offset 2 Ref Level 20.00				Mkr1 2.480	018 3 GHz 20.14 dBm
10.0										
0.00										
			- n (V)	DAA AA	n	1		1		
-30.0	w		man	ע יעעעי ע	Andre All 1	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	┟╽ӍҀ╽╷╽	$\gamma \gamma $	WWW	MMMM
-40.0 -50.0										V 1
-60.0										
-70.0	r 2.48000	00 GHz			#Video BW 10	) kHz				Span 964.5 kHz
	BW 3.0 ki									2 ms (1001 pts)
	5		? Jun 25, 2023 3:58:52 PM	$\Box$						

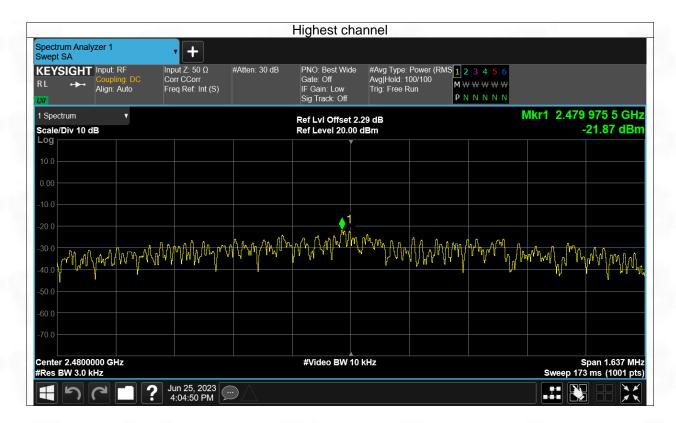
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BLE 2M							
_		Lowest cha	nnel				
Spectrum Analyzer 1 Swept SA	• +						
KEYSIGHT Input: RF RL +++ Coupling: DC Align: Auto	Input Ζ: 50 Ω # Corr CCorr Freq Ref: Int (S)	Atten: 30 dB PNO: Best Wide Gate: Off IF Gain: Low Sig Track: Off	Ing. Free Run	L 2 3 4 5 6 4 <del>W W W W W</del> P N N N N N N			
1 Spectrum v Scale/Div 10 dB Log		Ref LvI Offset 2. Ref Level 20.00		Mkr1 2.4	01 980 3 GHz -20.06 dBm		
10.0							
-10.0		1					
-20.0 -30.0 -40.0	Marther Marty Mar	af war when he was	MMMMMM	mm	WWWWWW		
-50.0							
-70.0 Center 2.4020000 GHz		#Video BW 10	kHz		Span 1.638 MHz		
#Res BW 3.0 kHz	<b>?</b> Jun 25, 2023				173 ms (1001 pts)		
	4:01:04 PM	Middle cha	nnol	[===] [[			
Spectrum Analyzer 1							
Swept SA KEYSIGHT Input: RF	Input Ζ: 50 Ω #	Atten: 30 dB PNO: Best Wide	#Avg Type: Power (RMS				
RL +++ Coupling: DC Align: Auto	Corr CCorr Freq Ref: Int (S)	Gate: Off IF Gain: Low Sig Track: Off	Avg Hold: 100/100 Trig: Free Run	I Z 3 4 5 6 1₩₩₩₩₩ ₽ N N N N N			
1 Spectrum v Scale/Div 10 dB		Ref LvI Offset 2. Ref Level 20.00		Mkr1 2.4	39 980 1 GHz -20.83 dBm		
Log							
0.00							
-10.0							
-20.0			alla a ll call co				
-30.0 -40.0	Annal Marin Marin			$\left[ \left( $	MANAN		
-50.0							
-60.0							
Center 2.4400000 GHz		#Video BW 10	kHz		Span 1.662 MHz		
#Res BW 3.0 kHz		^			175 ms (1001 pts)		
	<b>?</b> Jun 25, 2023 4:03:14 PM						

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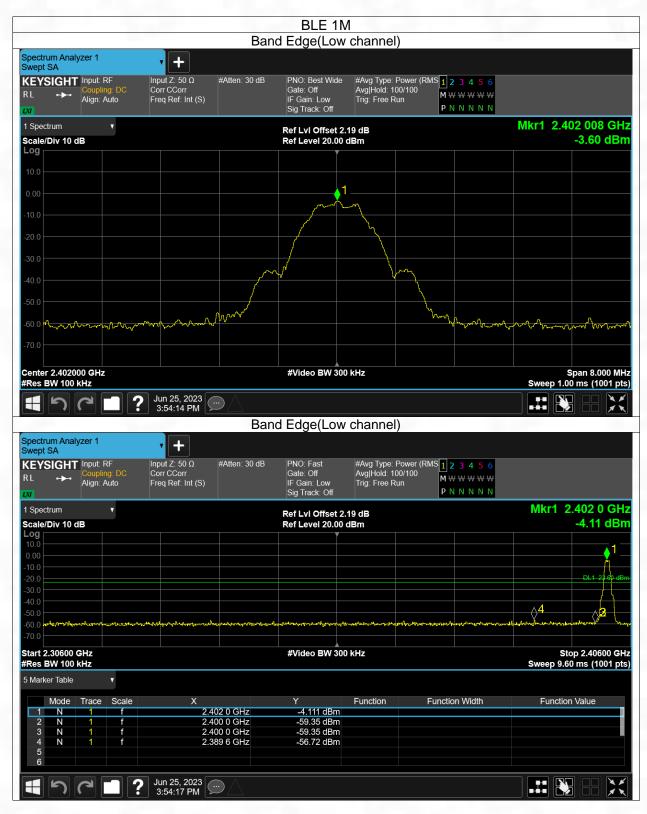


- 4. Unwanted Emissions In Non-restricted Frequency Bands
- 4.1.1Test Result(PASS)

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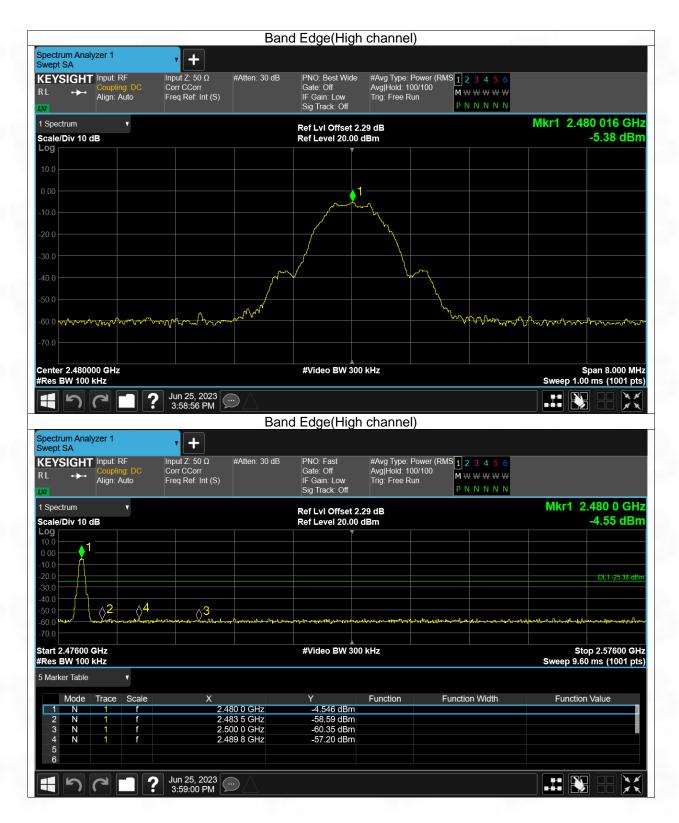


#### 4.1.2 Test Graph

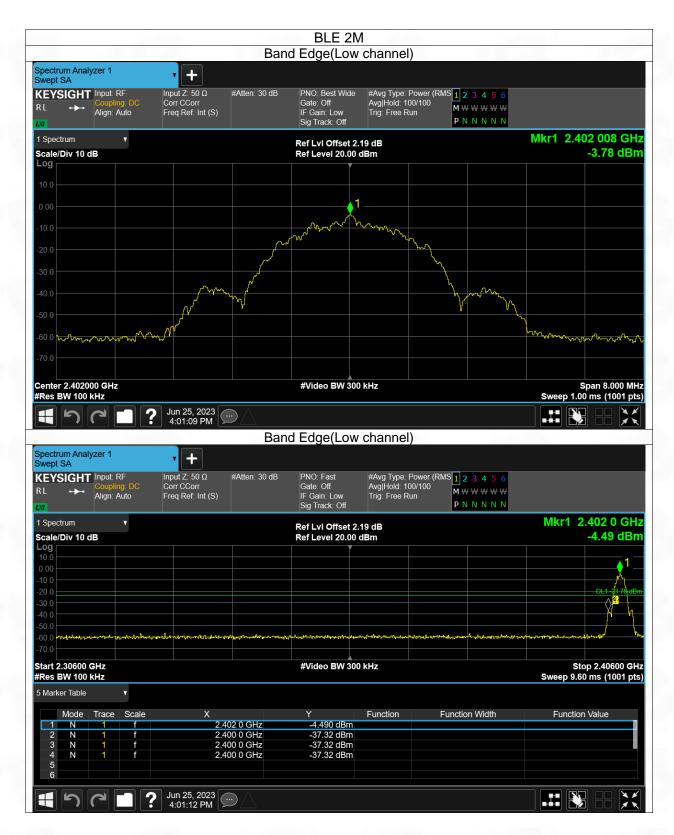


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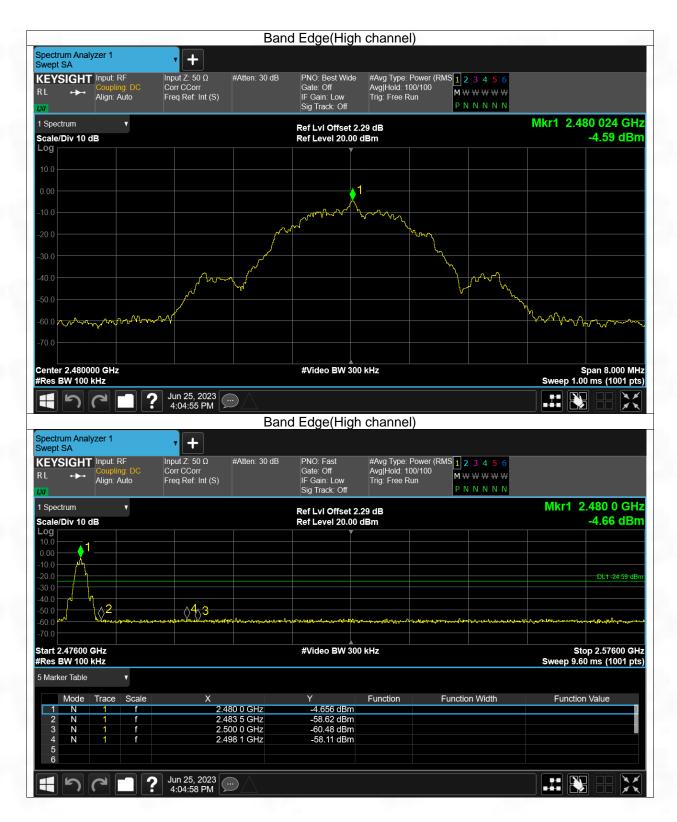














#### Conducted RF Spurious Emission



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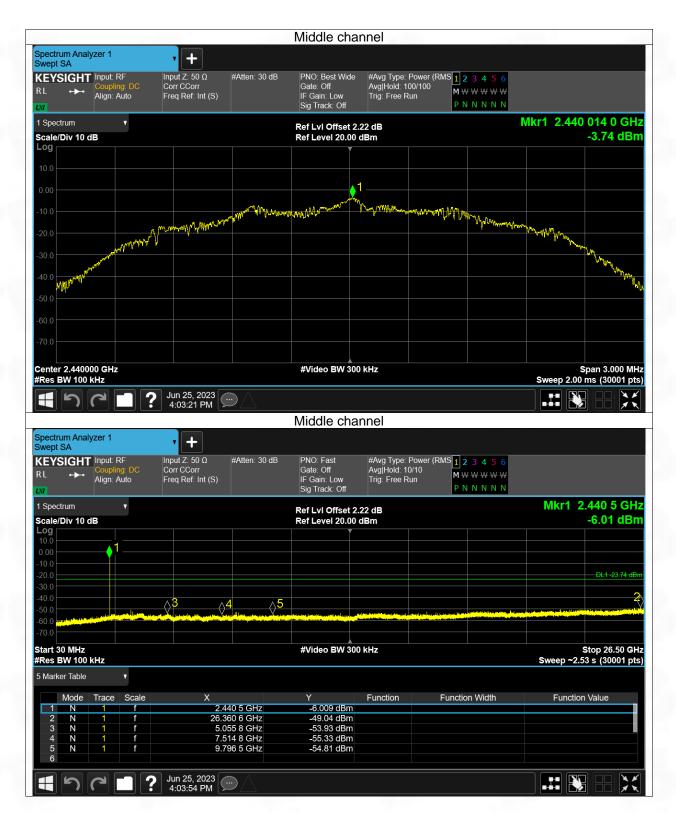




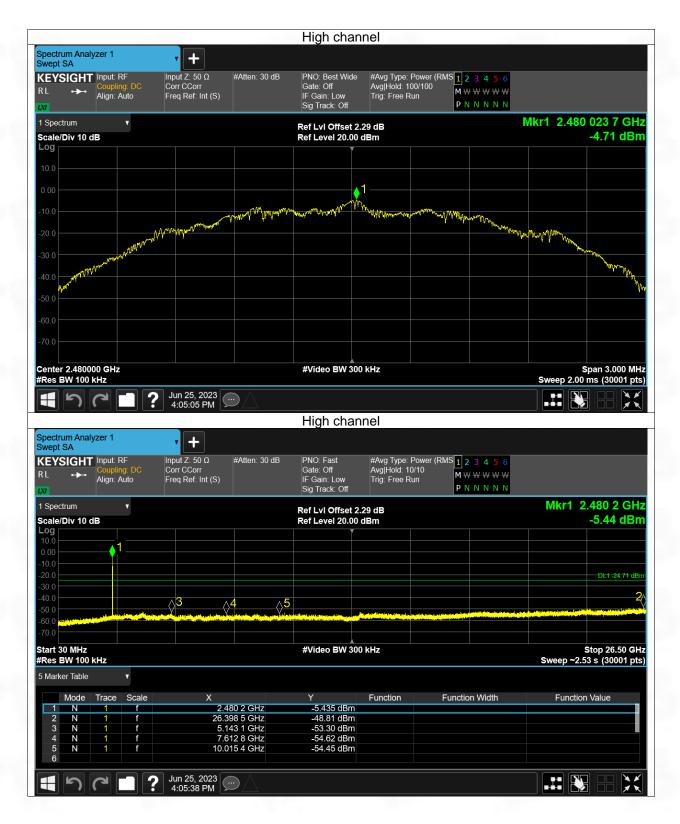














Test Report Number: BTF230706R00102



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