RF TEST REPORT

ISSUED BY Shenzhen BALUN Technology Co., Ltd.



FOR Tablet PC

ISSUED TO Lenovo (Shanghai) Electronics Technology Co., Ltd.

Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA



Report No.:	BL-SZ2170450-601
EUT Name:	Tablet PC
Model Name:	IP Duet 5 Chromebook 13Q7C6
	(refer section 2.3)
Brand Name:	Lenovo
Test Standard:	47 CFR Part 15 Subpart C
	(refer section 3.1)
FCC ID:	O57DUET5CB7C
ISED Number:	10407A-DUET5CB7C
Test Conclusion:	Pass
Test Date:	Jul. 19, 2021 ~ Aug. 10, 2021
Date of Issue:	Aug. 24, 2021
	EUT Name: Model Name: Brand Name: Test Standard: FCC ID: ISED Number: Test Conclusion:

NOTE: This test report of test results only related to testing samples, which can be duplicated completely for the legal use with the approval of the applicant; it shall not be reproduced except in full, without the written approval of Shenzhen BALUN Technology Co., Ltd. Any objections should be raised within thirty days from the date of issue. To validate the report, please contact us.

Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055 TEL: +86-755-66850100, FAX: +86-755-61824271 Email: qc@baluntek.com www.baluntek.com



Revision History

Version	
<u>Rev. 01</u>	

Issue Date Aug. 24, 2021 Revisions Content Initial Issue

TABLE OF CONTENTS

1	ADMIN	ISTRATIVE DATA (GENERAL INFORMATION)	5
	1.1	Identification of the Testing Laboratory	5
	1.2	Identification of the Responsible Testing Location	5
	1.3	Laboratory Condition	5
	1.4	Announce	5
2	PRODU	JCT INFORMATION	6
	2.1	Applicant Information	6
	2.2	Manufacturer Information	6
	2.3	General Description for Equipment under Test (EUT)	6
	2.4	Technical Information	7
	2.5	Additional Instructions	8
3	SUMM	ARY OF TEST RESULTS	9
	3.1	Test Standards	9
	3.2	Verdict	10
4	GENEF	RAL TEST CONFIGURATIONS	11
	4.1	Test Environments	11
	4.2	Test Equipment List	11
	4.3	Measurement Uncertainty	11
	4.4	Description of Test Setup	12
	4.4.1	For Antenna Port Test	12
	4.4.2	For AC Power Supply Port Test	12
	4.4.3	For Radiated Test (Below 30 MHz)	13
	4.4.4	For Radiated Test (30 MHz-1 GHz)	13
	4.4.5	For Radiated Test (Above 1 GHz)	14
	4.5	Measurement Results Explanation Example	15
	4.5.1	For conducted test items:	15
	4.5.2	For radiated band edges and spurious emission test:	15



5	TEST I	TEMS	.16
5	.1	Antenna Requirements	.16
	5.1.1	Relevant Standards	.16
	5.1.2	Antenna Anti-Replacement Construction	.16
	5.1.3	Antenna Gain	.16
5	.2	Output Power	.17
	5.2.1	Test Limit	.17
	5.2.2	Test Setup	.17
	5.2.3	Test Procedure	.17
	5.2.4	Test Result	.18
5	.3	Occupied Bandwidth	.19
	5.3.1	Limit	.19
	5.3.2	Test Setup	.19
	5.3.3	Test Procedure	.19
	5.3.4	Test Result	.19
5	.4	Conducted Spurious Emission	.20
	5.4.1	Limit	.20
	5.4.2	Test Setup	.20
	5.4.3	Test Procedure	.20
	5.4.4	Test Result	.21
5	.5	Band Edge (Authorized-band band-edge)	.22
	5.5.1	Limit	.22
	5.5.2	Test Setup	.22
	5.5.3	Test Procedure	.22
	5.5.4	Test Result	.22
5	.6	Conducted Emission	.23
	5.6.1	Limit	.23
	5.6.2	Test Setup	.23
	5.6.3	Test Procedure	.23
	5.6.4	Test Result	.23
5	.7	Radiated Spurious Emission	.24
	5.7.1	Limit	.24
	5.7.2	Test Setup	.24



5.7.3	Test Procedure	24
5.7.4	Test Result	27
5.8	Band Edge (Restricted-band band-edge)	28
5.8.1	Limit	28
5.8.2	Test Setup	28
5.8.3	Test Procedure	28
1.1.1	Test Result	28
5.9	Power Spectral density (PSD)	29
5.9.1	Limit	29
5.9.2	Test Setup	29
5.9.3	Test Procedure	29
5.9.4	Test Result	29
ANNEX A	TEST RESULT	30
A.1	Output Power, E.I.R.P, Duty Cycle	30
A.2	Occupied Bandwidth	33
A.3	Conducted Spurious Emissions	36
A.4	Band Edge (Authorized-band band-edge)	41
A.5	Conducted Emissions	45
A.6	Radiated Spurious Emission	47
A.7	Band Edge (Restricted-band band-edge)	61
A.8	Power Spectral Density (PSD)	63
ANNEX B	TEST SETUP PHOTOS	65
ANNEX C	EUT EXTERNAL PHOTOS	65
ANNEX D	EUT INTERNAL PHOTOS	65



1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road,
	Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
A dalama a a	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road,
Address	Nanshan District, Shenzhen, Guangdong Province, P. R. China
	The laboratory has been listed by Industry Canada to perform
Approditation	electromagnetic emission measurements. The recognition numbers of
Accreditation	test site are 11524A-1.
Certificate	The laboratory is a testing organization accredited by FCC as a
	accredited testing laboratory. The designation number is CN1196.
	All measurement facilities used to collect the measurement data are
Description	located at Block B, FL 1, Baisha Science and Technology Park, Shahe
Description	Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R.
	China 518055

1.3 Laboratory Condition

Ambient Temperature	20°C to 25°C
Ambient Relative Humidity	45% to 55%
Ambient Pressure	100 kPa to 102 kPa

1.4 Announce

- (1) The test report reference to the report template version v6.9.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) 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.
- (7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.



2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Lenovo (Shanghai) Electronics Technology Co., Ltd.				
Address	Section 304-305, Building No. 4, # 222, Meiyue Road, China				
Address	(Shanghai) Pilot Free Trade Zone, 200131, CHINA				

2.2 Manufacturer Information

Manufacturer	Lenovo PC HK Limited
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay,
Audress	Hong Kong, P.R.China

2.3 General Description for Equipment under Test (EUT)

EUT Name	Tablet PC		
Model Name Under Test	IP Duet 5 Chromebook 13Q7C6		
Series Model Name	IP Duet 5 Chromebook 13******		
	(* can be 0-9, a-z, A-Z, any symbol, blank or nothing)		
Description of Model name differentiation	Only differences are model names for trading purpose.		
Serial Number	AYX02JTMQ		
Hardware Version	N/A		
Software Version	N/A		
Dimensions (Approx.)	N/A		
Weight (Approx.)	N/A		

Antenna Information:

		Antenna Manufacturer		Antenna Gain (dBi)			
Antenna Port	Model Name		Antenna Type	2.4	5.15-	5.47-	5.725-
Antenna i ort				2.4 GHz	5.35	5.725	5.85
				GHZ	GHz	GHz	GHz
Main Antenna	N12-7723-R0A	South Star	PIFA	0.44	-1.01	-0.86	-0.63
Auxiliary Antenna	N12-7724-R0A	South Star	PIFA	1.77	-1.72	-0.91	-1.13
Main Antenna	2.00004363	ZhongTionYun	PIFA	1.84	1.76	1.35	1.47
Auxiliary Antenna	2.00004364	ZhongTianXun	PIFA	1.92	1.17	1.14	1.41
Note: The report only shown the antenna which matches the antenna with the highest antenna gain.							





2.4 Technical Information

	Bluetooth (BR+EDR+BLE)	
Network and Wireless	2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/40)	
connectivity	5G WIFI 802.11a, 802.11n(HT20/40), 802.11ac(VHT20/40/80),	
	U-NII-1/2A/2C/3	

The requirement for the following technical information of the EUT was tested in this report:

Modulatio	on Technology	DTS	
Modulation Type		GFSK	
Product T	уре	Portable	
		Fix Location	
Transfer I	Rate	1 Mbps, 2 Mbps	
Frequenc	y Range	The frequency range used is 2400 MHz to 2483.5 MHz.	
Number of	of Channel	40 (at intervals of 2 MHz)	
Tested Cl	hannel	0 (2402 MHz), 19 (2440 MHz), 39 (2480 MHz)	
Antenn	Main Antenna	PIFA Antenna	
а Туре	Aux. Antenna		
	Main Antonno	1.84 dBi (In test items related to antenna gain, the final results	
Antenn	Main Antenna	reflect this figure. This value is provided by the applicant.)	
a Gain	Aux. Antenna	1.92 dBi (In test items related to antenna gain, the final results	
		reflect this figure. This value is provided by the applicant.)	
Antenna Impedance		50Ω	
Antenna	System (MIMO	N/A	
Smart An	tenna)		



2.5 Additional Instructions

EUT Software Settings:

	\boxtimes	Special software is used.
Mode		The software provided by client to enable the EUT under
Mode		transmission condition continuously at specific channel
		frequencies individually.

During testing. Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power level setup in software					
Test Software Version	QRCT4				
Support Units	Description	Manufacturer	Model		
(Software installation media)	Notebook	Lenovo	YOGA 13s		
Mode	Channel	Frequency (MHz)	Soft Set		
	CH0	2402			
BLE(1 Mbps)	CH19	2440	9		
	CH39	2480			
	CH0	2402	TX LEVEL is built-in set		
BLE(2 Mbps)	CH19	2440	parameters and cannot		
	CH39	2480	be changed and selected.		

Run Software

W Qualcomm Radio Control Tool File View Se	ettings Help						o₁ ×
Target: UART_USB_BLUE - Device ID Remote	* IP Address 192.168.10.23	TCP Port 2390 Disconnect			\diamond	_^ . ∎	0
Navigation Panel ×	O Commands					© 100% 0	N D X
🔘 🛅 📄 Un-named	Bluetooth Signaling Debug Bluetooth	Low Energy $ imes$					~
Category Bluetooth -	BT Low Energy Transmitter Tests	BT Low Energy Rece	iver Tests	BT Low Energy Continuous Tx Tests			
Chipset ALL_CHIPSETS *	Test Frequency (MHz) 2402	Test Frequency (Mi	Hz) 2402	Test Frequency (MHz) 2402			
 Commands, Logs and Custom APIs 	Data Rate LE1M	Data Rate	-	Power Level (0-11) 9			
P All	Payload Length 37		Stable Modulation	Test Type LE1M -			
 Bluetooth 	Payload Type Pseudo-Rando	m bit sequence 9 *	eiver Test	Pattern Length (1 - 32)			
Bluetooth CSR8811	Transmitter Test	End Test (Get I No. Of Packets	Number Of Packets)	Pattern (Hex UNIT32) 00000000			
Bluetooth Debug Bluetooth ListMode	Tx Stop	NU. OF PALAELS		BLE TX Continuous ON			
Bluetooth Low Energy				Tx Stop			
Bluetooth Non-Signaling (EPTM)	BT Low Energy Continuous Tx Tests (QC	CA402x) BT Cap Value (QCA402x) BT Lo	w Energy Transmitter Tests V3	BT Low Energy Receiver Tests \	13		
Bluetooth QHS Bluetooth Signaling Debug	Test Frequency (MHz) 2402	Cap Value (0-FF) 0 Test	Frequency (MHz) 2402	2 Test Frequency (MHz)	2402		
··· Distroit Ognang Debog	Power Level (0-15) 15	Set Cap Value	gth Of Test Data	PHY Type			
 Platform Configuration 	Test Type CW			 Modulation Index 	0		
ର ଜେ ୧୨ ଜ ଜ	Pattern Length (1 - 32)		and the second	Expected CTE Length	0		
	Pattern (Hex UNIT32) 00000000		Length 0	Expected CTE Type Stat Duration	0		
	Activity			C. AND DEVICE.	14 B.	© 100	0%⊚ ×
	ORCT OMSL						-
	🍸 💾 🗔 📓 🖉 Status Polling						- (c) - (c)
	Time Category SEND, QLIB P	TM_61_Enable_Bibletooth()	Message			2	- 6
		M_BT_Enable_Bluetooth()					
	09:09:30.834 Info SEND: QMCC	FTM_BT_HCI_Reset()					
		TM_BT_HCI_Reset()					
		TM_BT_LE_HCI_TRANSMITTER_TEST(0, 37, M_BT_LE_HCI_TRANSMITTER_TEST()	<i>y</i> ,				0
ResourceID : udt=yes,iotype=serial,connectiondetails=			ansport				



3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Miscellaneous Wireless Communications Services
2	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules
3	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
4	RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems(FHSs) and Licence-Exemp Local Area Network (LE- LAN) Devices
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices



3.2 Verdict

No.	Description	FCC Part No.	ISED Part No.	Channel	Test Result	Verdict
1	Antenna Requirement	15.203	RSS-247, 5.4 (f)	N/A		Pass ^{Note1}
2	Output Power	15.247(b)	RSS-247, 5.4 (d)	Low/Middle/ High	ANNEX A.1	Pass
3	Occupied Bandwidth	15.247(a)	RSS-GEN, 6.7; RSS-247, 5.2 (a)	Low/Middle/ High	ANNEX A.2	Pass
4	Conducted Spurious Emission	15.247(d)	RSS-247, 5.5	Low/Middle/ High	ANNEX A.3	Pass
5	Band Edge(Authorized- band band-edge)	15.247(d)	RSS-247, 5.5;	Low/ High	ANNEX A.4	Pass
6	Conducted Emission	15.207	RSS-GEN, 8.8	Low/Middle/ High	ANNEX A.5	Pass
7	Radiated Spurious Emission	15.209 15.247(d)	RSS-247, 5.5	Low/Middle/ High	ANNEX A.6	Pass
8	Band Edge(Restricted- band band-edge)	15.209 15.247(d)	RSS-247, 5.5	Low/Middle/ High	ANNEX A.7	Pass
9	Power spectral density (PSD)	15.247(e)	RSS-247, 5.2 (b)	Low/Middle/ High	ANNEX A.8	Pass
10	Receiver Spurious Emissions		RSS-Gen, 7.4		N/A	N/A ^{Note2}

Note ¹: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

Note ²: Only radio communication receivers operating in stand-alone mode within the band 30-960 MHz, as well as scanner receivers, are subject to Industry Canada requirements, so this test is not applicable.



4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	45% to 55%		
Atmospheric Pressure	00 kPa to 102 kPa		
Temperature	NT (Normal Temperature) +22°C to +25°C		
Working Voltage of the EUT	NV (Normal Voltage)	7.72 V	

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2021.04.01	2022.03.31
Bluetooth Signaling Unit	ROHDE&SCHWARZ	CMW500	142028	2021.06.01	2022.05.31
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2021.06.01	2022.05.31
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2021.06.01	2022.05.31
LISN	SCHWARZBECK	NSLK 8127	8127-687	2021.06.01	2022.05.31
Test Antenna- Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2019.10.29	2021.10.28
Test Antenna- Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2019.07.02	2022.07.01
Test Antenna- Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1917	2019.07.02	2022.07.01
Test Antenna- Horn (18-40 GHz)	A-INFO	LB- 180400KF	J211060273	2021.01.05	2023.01.04
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2022.02.20
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60 *7.35m	N/A	2019.08.08	2022.08.07
Shielded Enclosure	ChangNing	CN-130701	130703		

4.3 Measurement Uncertainty

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

Measurement	Value
Occupied Channel Bandwidth	±2.8%
RF output power, conducted	±1.28 dB
Power Spectral Density, conducted	±1.30 dB
Unwanted Emissions, conducted	±1.84 dB
All emissions, radiated	±5.36 dB
Temperature	±0.82°C
Humidity	±4.1%

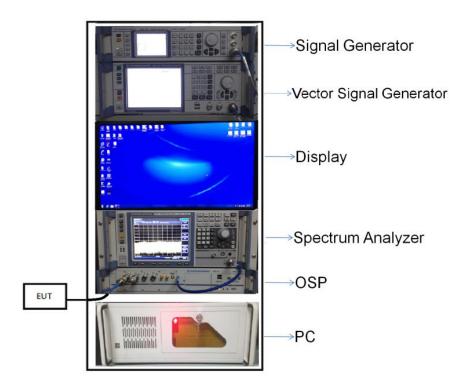


4.4 Description of Test Setup

4.4.1 For Antenna Port Test

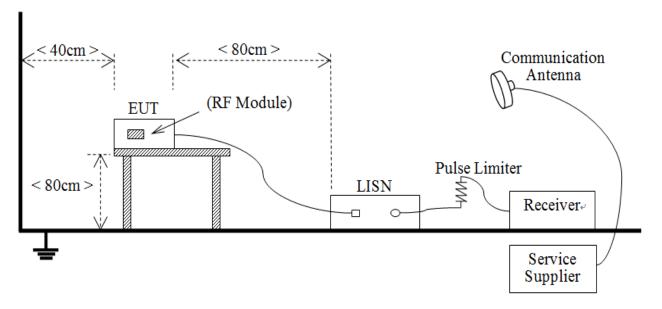
Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

For example: the measurement value is 10 dBm and the cable loss is 0.5dB, then the conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



(Diagram 1)

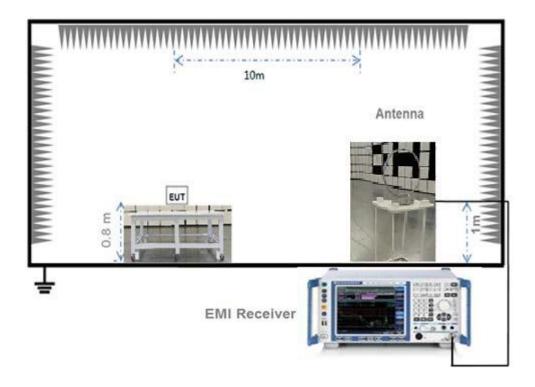




(Diagram 2)

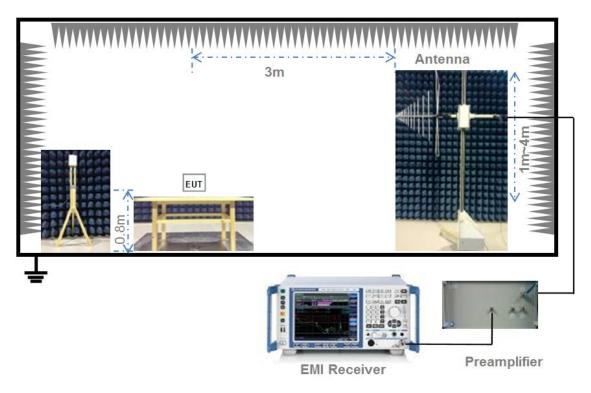


4.4.3 For Radiated Test (Below 30 MHz)





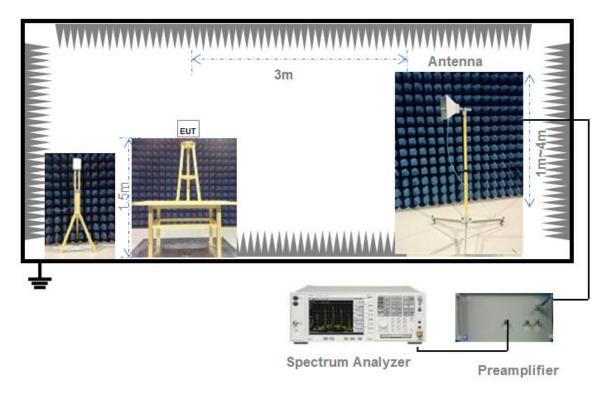
4.4.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)



4.4.5 For Radiated Test (Above 1 GHz)



(Diagram 5)



4.5 Measurement Results Explanation Example

4.5.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

4.5.2 For radiated band edges and spurious emission test:

E = EIRP - 20log D + 104.8

where:

E = electric field strength in $dB\mu V/m$,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.





5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203 & 15.247(b); RSS-247, 5.4 (f)

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the	An embedded-in antenna design is used.
product.	

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



5.2 Output Power

5.2.1 Test Limit

FCC § 15.247(b)

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 antennas antennas and antennas and antennas and antennas and antennas and antennas and antennas antenn

RSS-247, 5.4 (d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

5.2.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

a) Maximum peak conducted output power

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

Set the RBW \geq DTS bandwidth.

Set VBW \geq 3 x RBW.

Set span ≥ 3 x RBW

Sweep time = auto couple.

Detector = peak.

Trace mode = max hold.

Allow trace to fully stabilize.

Use peak marker function to determine the peak amplitude level.

b) Measurements of duty cycle

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

Set the center frequency of the instrument to the center frequency of the transmission.

Set RBW \geq OBW if possible; otherwise, set RBW to the largest available value.

Set VBW \geq RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T \leq 16.7 microseconds.)



5.2.4 Test Result

Please refer to ANNEX A.1.



5.3 Occupied Bandwidth

5.3.1 Limit

FCC §15.247(a); RSS-247, 5.2 (a); RSS-GEN, 6.7

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW. The 6 dB bandwidth must be greater than 500 kHz.

5.3.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

Use the following spectrum analyzer settings:

Set RBW = 100 kHz.

Set the video bandwidth (VBW) \geq 3 RBW.

Detector = Peak.

Trace mode = max hold.

Sweep = auto couple.

Allow the trace to stabilize.

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.

5.3.4 Test Result

Please refer to ANNEX A.2.



5.4 Conducted Spurious Emission

5.4.1 Limit

FCC §15.247(d); RSS-247, 5.5

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.

5.4.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The DTS rules specify that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

a) If the maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

 b) If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

c) In either case, attenuation to levels below the 15.209 general radiated emissions limits is not required.

The following procedures shall be used to demonstrate compliance to these limits. Note that these procedures can be used in either an antenna-port conducted or radiated test set-up. Radiated tests must conform to the test site requirements and utilize maximization procedures defined herein.

Reference level measurement:

Establish a reference level by using the following procedure:

Set instrument center frequency to DTS channel center frequency.

Set the span to \geq 1.5 times the DTS bandwidth.

Set the RBW = 100 kHz.

Set the VBW \geq 3 x RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum PSD level.



Emission level measurement:

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

Set the RBW = 100 kHz.

Set the VBW \geq 3 x RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

5.4.4 Test Result

Please refer to ANNEX A.3.



5.5 Band Edge (Authorized-band band-edge)

5.5.1 Limit

FCC §15.247(d); RSS-247, 5.5

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.

5.5.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The following procedures may be used to determine the peak or average field strength or power of an unwanted emission that is within 2 MHz of the authorized band edge. If a peak detector is utilized, use the procedure described in 13.2.1. Use the procedure described in 13.2.2 when using an average detector and the EUT can be configured to transmit continuously (i.e., duty cycle \ge 98%). Use the procedure described in 13.2.3 when using an average detector and the EUT cannot be configured to transmit continuously but the duty cycle is constant (i.e., duty cycle variations are less than \pm 2 percent). Use the procedure described in 13.2.4 when using an average detector for those cases where the EUT cannot be configured to transmit continuously and the duty cycle is not constant (duty cycle variations equal or exceed 2 percent).

When using a peak detector to measure unwanted emissions at or near the band edge (within 2 MHz of the authorized band), the following integration procedure can be used.

Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).

Set span to 2 MHz

RBW = 100 kHz.

VBW \geq 3 x RBW.

Detector = peak.

Sweep time = auto.

Trace mode = max hold.

Allow sweep to continue until the trace stabilizes (required measurement time may increase for low duty cycle applications)

Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency (femission) \pm 0.5 MHz. If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by femission \pm 0.5 MHz.

5.5.4 Test Result

Please refer to ANNEX A.4.



5.6 Conducted Emission

5.6.1 Limit

FCC §15.207; RSS-GEN, 8.8

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μ H/ 50Ω line impedance stabilization network (LISN).

Frequency range	Conducted Limit (dBµV)		
(MHz)	Quai-peak	Average	
0.15 - 0.50	66 to 56	56 to 46	
0.50 - 5	56	46	
0.50 - 30	60	50	

5.6.2 Test Setup

See section 4.4.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.6.4 Test Result

Please refer to ANNEX A.5.



5.7 Radiated Spurious Emission

5.7.1 Limit

FCC §15.209&15.247(d); RSS-GEN, 8.9; RSS-247, 5.5

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
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

Note:

- 1. Field Strength (dB μ V/m) = 20*log[Field Strength (μ V/m)].
- 2. In the emission tables above, the tighter limit applies at the band edges.
- 3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
- 4. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.7.2 Test Setup

See section 4.4.3 to 4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

Since the emission limits are specified in terms of radiated field strength levels, measurements performed to demonstrate compliance have traditionally relied on a radiated test configuration. Radiated measurements remain the principal method for demonstrating compliance to the specified limits; however antenna-port conducted measurements are also now acceptable to demonstrate compliance (see below for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in ANSI C63.10 shall be followed.

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.



General Procedure for conducted measurements in restricted bands:

a) Measure the conducted output power (in dBm) using the detector specified (see guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see guidance on determining the applicable antenna gain)

c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies \leq 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).

d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).

e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

E = EIRP - 20log D + 104.8

where:

E = electric field strength in $dB\mu V/m$,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

f) Compare the resultant electric field strength level to the applicable limit.

g) Perform radiated spurious emission test.

Quasi-Peak measurement procedure

The specifications for measurements using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Frequency Interference (CISPR) of the International Electrotechnical Commission.

As an alternative to CISPR quasi-peak measurement, compliance can be demonstrated to the applicable emission limits using a peak detector.

Peak power measurement procedure:

Peak emission levels are measured by setting the instrument as follows:

a) RBW = as specified in Table 1.

b) VBW \geq 3 x RBW.

c) Detector = Peak.

d) Sweep time = auto.

e) Trace mode = max hold.

f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be longer for low duty cycle applications).

Table 1—RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Trace averaging across on and off times of the EUT transmissions followed by duty cycle correction:

If continuous transmission of the EUT (i.e., duty cycle \geq 98 percent) cannot be achieved and the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then the following procedure shall be used:

a) The EUT shall be configured to operate at the maximum achievable duty cycle.

b) Measure the duty cycle, x, of the transmitter output signal as described in section 6.0.

c) RBW = 1 MHz (unless otherwise specified).

d) VBW \geq 3 x RBW.

e) Detector = RMS, if span/(# of points in sweep) \leq (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

f) Averaging type = power (i.e., RMS).

1) As an alternative, the detector and averaging type may be set for linear voltage averaging.

2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.

g) Sweep time = auto.

h) Perform a trace average of at least 100 traces.

i) A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

1) If power averaging (RMS) mode was used in step f), then the applicable correction factor is $10 \log(1/x)$, where x is the duty cycle.

2) If linear voltage averaging mode was used in step f), then the applicable correction factor is $20 \log(1/x)$, where x is the duty cycle.

3) If a specific emission is demonstrated to be continuous (\geq 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

NOTE: Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.



Determining the applicable transmit antenna gain:

A conducted power measurement will determine the maximum output power associated with a restricted band emission; however, in order to determine the associated EIRP level, the gain of the transmitting antenna (in dBi) must be added to the measured output power (in dBm).

Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

See KDB 662911 for guidance on calculating the additional array gain term when determining the effective antenna gain for a EUT with multiple outputs occupying the same or overlapping frequency ranges in the same band.

Radiated spurious emission test:

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in ANSI C63.10. All detected emissions shall comply with the applicable limits.

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured RBW = 1 MHz for $f \ge 1$ GHz, 100 kHz for f < 1 GHz VBW \ge RBW Sweep = auto Detector function = peak Trace = max hold

5.7.4 Test Result

Please refer to ANNEX A.6.



5.8 Band Edge (Restricted-band band-edge)

5.8.1 Limit

FCC §15.209&15.247(d); RSS-GEN, 8.10; RSS-247, 5.5

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

5.8.2 Test Setup

See section 4.4.3 to 4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.8.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured RBW = 1 MHz for $f \ge 1$ GHz, 100 kHz for f < 1 GHz VBW \ge RBW Sweep = auto Detector function = peak Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

For transmitters operating above 1 GHz repeat the measurement with an average detector.

1.1.1 Test Result

Please refer to ANNEX A.7.



5.9 Power Spectral density (PSD)

5.9.1 Limit

FCC §15.247(e); RSS-247, 5.2 (b)

The same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used.

The transmitter power spectral density conducted from the transmitter 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 Section 5.4(4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

5.9.2 Test Setup

See section 4.4.1 (Diagram 1) for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.9.3 Test Procedure

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.

Set the VBW \geq 3 RBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.9.4 Test Result

Please refer to ANNEX A.7.



ANNEX A TEST RESULT

A.1 Output Power, E.I.R.P, Duty Cycle

Peak Power Test Data

	Measured Output	ut Peak Power	Limit		
Channel	GFSK (BLE 1Mbps)		dBm mW		Verdict
	dBm	mW	UDIII	IIIVV	
Low	6.26	4.23			Pass
Middle	7.42	5.52	30	1000	Pass
High	7.05	5.07			Pass

	Measured Output	ut Peak Power	Limit				
Channel	GFSK (BLI	E 2Mbps)	dBm mW		dDm mW/ Verdi		Verdict
	dBm	mW	UDIII	IIIVV			
Low	1.24	1.33			Pass		
Middle	2.58	1.81	30	1000	Pass		
High	2.57	1.81			Pass		

E.I.R.P Test Data (For ISED)

	E.I.R.P Limit				
Channel	GFSK (BLE	GFSK (BLE 1Mbps) dBm mW		Verdict	
	dBm	mW	UDIII	IIIVV	
Low	8.18	6.58			Pass
Middle	9.34	8.59	36	4000	Pass
High	8.97	7.89			Pass

	E.I.R	.P	Limit		
Channel	GFSK (BLE 2Mbps)		dBm mW		Verdict
	dBm	mW	UDIII	IIIVV	
Low	3.16	2.07			Pass
Middle	4.50	2.82	36	4000	Pass
High	4.49	2.81	•		Pass



Test plots

GFSK (BLE 1Mbps) LOW CHANNEL



GFSK (BLE 1Mbps) MIDDLE CHANNEL



GFSK (BLE 1Mbps) HIGH CHANNEL

Center Freq 2.48000000 G	PND: Fast Caline Low #Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>1/1	01:52:28 PM Aug 05, 2021 TRACE 2:3:4 5 TVPE MUMANIN DET P NNNNN	Frequency
0 dBJdiv Ref 15.00 dBm	Concow Concord	Mkr1	2.479 895 GHz 7.049 dBm	Auto Tune
5:00	* ¹			Center Free 2.480000000 GH
5.00				Start Free 2.478500000 GH
20				Stop Free 2.481500000 GH
45.0				CF Stej 300.000 kH <u>Auto</u> Mai
50				Freq Offse 0 H
750 Center 2.480000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Swaan	Span 3.000 MHz 1.000 ms (601 pts)	

GFSK (BLE 2Mbps) LOW CHANNEL

Marker 1 2.402030000000 G	HZ NO: Fast C GainLow #Atten: 30 dB	Avg Type: Log-Pwr Avg[Hold:>1/1	02:28:28 PH Aug 09, 2021 TRACE 02:3:4:5 TV/PE M 400000000000000000000000000000000000	Peak Search
o dBJdiv Ref 15.00 dBm		Mkr	1 2.402 03 GHz 1.242 dBm	Next Peak
5.00	• ¹			Next Pk Right
500				Next Pk Lef
80				Marker Delta
60				Mkr→Cf
50				Mkr→RefLv
2enter 2.402000 GHz Res BW 3.0 MHz	#VBW 8.0 MHz	Swaan	Span 6.000 MHz 1.000 ms (601 pts)	More 1 of 2

GFSK (BLE 2Mbps) MIDDLE CHANNEL

AL RE 1999 AC Marker 1 2.440070000000	CONVEC GHZ PNO: Fast	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr Avg[Hold>1/1	02:31:30 PM Aug 09, 2021 TRACE 1 2 3 4 5 TYPE MUSEUM	Peak Search
IO dB/div Ref 15.00 dBm	Posnitow	antan. oo ab	Mkr	1 2.440 07 GHz 2.579 dBm	NextPeak
5.00		¢1			Next Pk Righ
5 00					Next Pk Lei
50					Marker Del
50					Mkr⊸C
60					Mkr→RefL
rso Center 2.440000 GHz Res BW 3.0 MHz		8.0 MHz		Span 6.000 MHz 1.000 ms (601 pts)	Mor 1 of



GFSK (BLE 2Mbps) HIGH CHANNEL



Duty Cycle Test Data

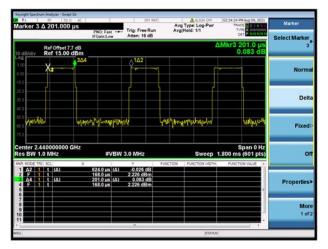
GFSK (BLE 1Mbps)

Band	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)
GFSK (BLE 1Mbps)	10.06	10.06	100.00
GFSK (BLE 2Mbps)	0.201	0.624	32.21

Test plots

weep Time 10.06 ms	PNO: Fast +++ IFGain:Low	Trig: Free Run Atten: 18 dB	Avg Type: Log-Pwr Avg/Hold: 1/1	11:29:48 AM Aug 05, 2021 TRACE 2 2 3 4 TVPE A	Sweep/Control
Ref Offset 7.7 dE	s m				10.06 m
:00					
.00					
5.0					
s.ó					
6.0					
50					
60					Gate
50					[Off,LO]
enter 2.440000000 GH				Span 0 Hz	Point 100
es BW 1.0 MHz	#VBW	3.0 MHz	Sweep 1	0.06 ms (1000 pts)	

GFSK (BLE 2Mbps)





A.2 Occupied Bandwidth

Test Data

Test Mode	GFSK (BLE 1Mbps)		
Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth
	(kHz)	(kHz)	Limits (kHz)
Low Channel	755.000	1016.200	≥500
Middle Channel	755.000	1016.300	≥500
High Channel	755.000	1015.000	≥500

Test Mode	GFSK (BLE 2Mbps)		
Channel	6 dB Bandwidth	99% Bandwidth	6 dB Bandwidth
	(kHz)	(kHz)	Limits (kHz)
Low Channel	1170.000	1999.700	≥500
Middle Channel	1180.000	1997.800	≥500
High Channel	1170.000	2005.300	≥500

Test plots

6 dB Bandwidth



GFSK (BLE 1Mbps) MIDDLE CHANNEL



GFSK (BLE 1Mbps) HIGH CHANNEL

ΔMkr2 755 kHz 0.021 dB
2480000000 GHz
Start Freq 2.47850000 GHz
Stop Free 2.481500000 GHz
Span 3.000 MHz Sweep 1.000 ms (601 pts) schon Evernonwer - Auto Mar
Freq Offset 0 Hz



GFSK (BLE 2Mbps) LOW CHANNEL



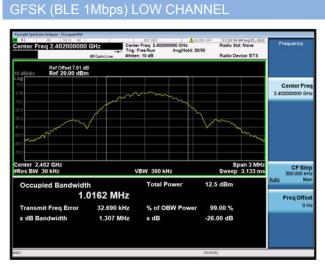
GFSK (BLE 2Mbps) MIDDLE CHANNEL



GFSK (BLE 2Mbps) HIGH CHANNEL



99% Bandwidth



GFSK (BLE 1Mbps) MIDDLE CHANNEL





GFSK (BLE 1Mbps) HIGH CHANNEL



GFSK (BLE 2Mbps) LOW CHANNEL



GFSK (BLE 2Mbps) MIDDLE CHANNEL



GFSK (BLE 2Mbps) HIGH CHANNEL





A.3 Conducted Spurious Emissions

<u>Test Data</u>

GFSK (BLE 1Mbps)				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		
		Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-38.00	4.70	-15.30	Pass
Middle	-38.29	5.29	-14.71	Pass
High	-36.20	5.28	-14.72	Pass

GFSK (BLE 2Mbps)				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		
		Carrier Level	Calculated 20 dBc Limit	Verdict
Low	-36.27	0.69	-19.31	Pass
Middle	-37.41	2.10	-17.91	Pass
High	-37.56	2.07	-17.93	Pass



Test Plots

GFSK (BLE 1Mbps) LOW CHANNEL, CARRIER

LEVEL



GFSK (BLE 1Mbps) LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

Marker	01:58:14 PH Aug 05, 2021 TRACE 2:34:5 TVPE	Type: Log-Pwr Hold:>1/1	Ave	Trig: Free Run	Hz PND: Fast C	5000000 G	er 1 2.660485
Select Marker	DET PANNING			#Atten: 30 dB	FGain:Low		
1	r1 2.660 5 GHz -48.547 dBm	Mk				0 dBm	div Ref 15.0
Norma	(15.35.020)						
Delta	0 ² ∳ ¹						
Fixed		لى مەلەرلىرىنى بىرى مەلەرلىرىنى بىرى			nd-m _{an} unitat	*	nen an air an
Fixed	Stop 3.000 GHz 83.9 ms (1001 pts)	Sweep 28		300 kHz			0.030 GHz BW 100 kHz
	Stop 3.000 GHz 83.9 ms (1001 pts) Function wave		PUNCTION			× 2.656 2.535	0.030 GHz

GFSK (BLE 1Mbps) LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

larker 2 21.12450000000	GHz PNO: Fast	Trig: Free Run #Atten: 30 dB		e: Log-Pwr t>1/1	TRA	M Aug 05, 2021	Peak Search
o dB/div Ref 15.00 dBm	FGanLow	axtien: 30 GB		Mkr2	21.124	50 GHz 96 dBm	NextPeak
60 500 15.0						-15.30 alim	Next Pk Righ
35.0 36.0 46.0				- l'ar	2 ²		Next Pk Lef
65.0 75.0							Marker Delta
Start 2.00 GHz Res BW 100 kHz	#VB	W 300 kHz	PUNCTION PU	Sweep	2.198 s	5.00 GHz (4001 pts)	Mkr→Cf
1 N 1 f 19.048	75 GHz 50 GHz	-40.745 dBm -37.996 dBm	FORCTON	NUTION HIDTH	FUNCT	ON VALUE	Mkr→RefLv
7 8 9 10							More 1 of 2

GFSK (BLE 1Mbps) MIDDLE CHANNEL, CARRIER LEVEL





GFSK (BLE 1Mbps) MIDDLE CHANNEL SPURIOUS 30 MHz ~ 3 GHz

arker 1 2.98361000	PND: East	Trig: Free Run	Avg Type: Log-Pw Avg[Hold:>1/1	02:05:40 PH Aug 05, 2021	Marker
aBidiy Ref 15.00 c	IFGainLow	#Atten: 30 dB	N	lkr1 2.983 6 GHz -49.454 dBm	Select Marker
					Norma
50				02 1	Delta
50 50 50		an than a shirt of the second s	6447-6-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	and a second	Fixed
tart 0.030 GHz Res BW 100 kHz	#VB	W 300 kHz	Sweep	Stop 3.000 GHz 283.9 ms (1001 pts)	of
1 N 1 f 2 N 1 f 3 4 5	2 983 6 GHz 2.658 5 GHz	-49.454 dBm -49.308 dBm	PONCTION PONCTION NO		Properties
6 7 8 9 9 0 1					Mor 1 of 2
			STA		

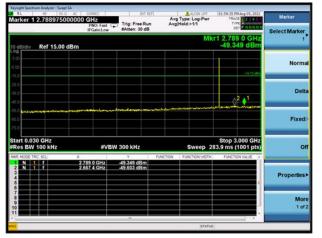
GFSK (BLE 1Mbps) MIDDLE CHANNEL SPURIOUS 2 GHz ~ 25 GHz



GFSK (BLE 1Mbps) HIGH CHANNEL, CARRIER LEVEL

Peak Search	01:59:05 PH Aug 05, 2021 TRACE 2 2 4 9 TVPE 007	ALICN OFF Type: Log-Pwr Hold:>1/1		Trig: Free Run #Atten: 30 dB	CHZ PNO: Wide G		arker 1 2.48009
NextPea	dB/div Ref 15.00 dBm 5.281 dBm						
Next Pk Righ			-				00 00
Next Pk Le		\searrow				\sim	50
MarkerDet							5.0
Mkr→C	Span 3.000 MHz 000 ms (601 pts)	Sweep 1	PUNCTION	300 kHz	#VBV		enter 2.480000 G Res BW 100 kHz
Mkr→RefL				5.281 dBm	095 GHz	2,480	N 1 1
Mor 1 of							6 7 8 9 0 1
		STATUS		- H.			

GFSK (BLE 1Mbps) HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



GFSK (BLE 1Mbps) HIGH CHANNEL, SPURIOUS 2 GHz ~ 25 GHz





GFSK (BLE 2Mbps) LOW CHANNEL, CARRIER

0 R AC CORREC 5000000 GHz PNO: Wide C IFGalecLow	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr Avg[Hold:>1/1	02:28:57 PH Aug 09, 2021 TRACE 2:34 5 TYPE M WWWWWW DET P INN N N	Peak Search
0 dBm		Mkr1	2.402 035 GHz 0.691 dBm	NextPea
				Next Pk Rig
			\sum	Next Pk Le
				Marker Del
				Mkr→C
x 2.402 035 GHz	0.691.dBm	INCTION : FUNCTION WIDTH	FUNCTION VALUE	Mkr→RefL
				Mo 1 of
	PRC:Md8 (FCalcLow 0 dBm tz #VB	PICO Male Configuration of the first set	MC Was C Trig Fre Run Avgihidit>VT MC Was C Trig Fre Run MC Market Stri	Stotogoog CH2 Indextow Trig: Free Run Aktin: 30 db Avg Type: Log Part Avg Type: Log Part Trig: Free Run Avg Type: Log Part Trig: Free Run Part Avg Type: Log Part Avg Type: Log Par

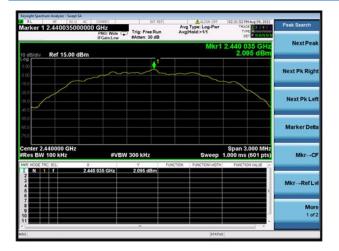
GFSK (BLE 2Mbps) LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz

larker 1 2.75843500000	PNO: Fast	Trig: Free Run	Ave	Type: Log-Pwr Hold:>1/1	02:29:30 PM Aug 09, 2021 TRACE 2 3 4 5 TVPE	Marker
	IFGain:Low	#Atten: 30 dB			DET PNNNNN	Select Marker
IO dEldiv Ref 15.00 dBm				Mk	r1 2.758 4 GHz -48.365 dBm	1
5 00						Norma
25.0 25.0 45.0					2 ↓ 2 ↓ 1	Deita
55.0 	and designances	and the state of the		فامتخلفو مبريجور ليغن		Fixed
750						10.000
75 0 Start 0.030 GHz #Res BW 100 kHz	#VB\	W 300 kHz			Stop 3.000 GHz 83.9 ms (1001 pts)	no
WRes BW 100 kHz	#VB\ 2.758 4 GHz 2.649 5 GHz	W 300 kHz -48.365 dBm -48.125 dBm	PUNCTION	Sweep 2: Function with		
WRes BW 100 kHz	2.758 4 GHz	Y -48.365 dBm	FUNCTION		83.9 ms (1001 pts)	
Res BW 100 kHz	2.758 4 GHz	Y -48.365 dBm	FUNCTION		83.9 ms (1001 pts)	Of Properties Mor 1 of 2

GFSK (BLE 2Mbps) LOW CHANNEL, SPURIOUS 2 GHz ~ 25 GHz

larker 2 21.13025000000	PNO: Fast 💭 Trig: Free Run	Avg Type: Log-Pwr Avg[Hold>1/1	02:29:43 PM Aug 09, 2021 TRACE 2 2 4 5 TVPE M WWWWWWW DET P N N N N N	Peak Search
o dB/div Ref 15.00 dBm	FGein:Low #Atten: 30 dB	Mkr2	21.130 25 GHz -36.265 dBm	Next Peak
500				Next Pk Right
15.0 25.5 26.0 26.0			2	Next Pk Lef
26.0 66.0 75.0				Marker Delta
start 2.00 GHz Res BW 100 kHz	#VBW 300 kHz	Sweep	Stop 25.00 GHz 2.198 s (4001 pts)	Mkr→Cf
WR MODE TRC: SCL X 1 N 1 f 17962 2 N 1 f 21.130 4 5 5	00 GHz -41.018 dBm 25 GHz -36.265 dBm	AUCTION PUNCTION WIDTH	FUNCTION VALUE	Mkr→RefLv
				More 1 of 2

GFSK (BLE 2Mbps) MIDDLE CHANNEL, CARRIER LEVEL





GFSK (BLE 2Mbps) MIDDLE CHANNEL SPURIOUS 30 MHz ~ 3 GHz

arker 1 2.639025000000	PND: Fast C	Trig: Free Run	Ave	ALIGN OFF Type: Log-Pwr Hold:>1/1	02:32:26 PH Aug 09, 2021 TRACE 2 2 4 9 TVPE MANNEE	Marker
dB/div Ref 15.00 dBm	IFGain:Low	#Atten: 30 dB		Mk	r1 2.639 0 GHz -47.862 dBm	Select Marker
						Norma
50					 0 ² ∳1	Delta
50 	han an a	ar yang diser di termana di sedan s	4249- 4 -440-44	and the second second		Fixed
Res BW 100 kHz	#VBV	V 300 kHz	PUNCTION	Sweep 2	Stop 3.000 GHz 83.9 ms (1001 pts)	or
N 1 f 2	639 0 GHz 545 6 GHz	47.862 dBm 48.587 dBm	PORCION	FURN THUR WILLIN	POWERUN HADE	Properties
6 7 9 9 0						More 1 of:
				STATUS		

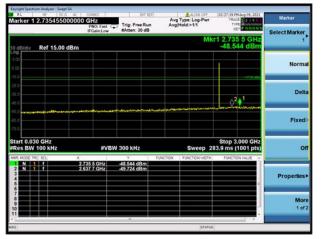
GFSK (BLE 2Mbps) MIDDLE CHANNEL SPURIOUS 2 GHz ~ 25 GHz



GFSK (BLE 2Mbps) HIGH CHANNEL, CARRIER LEVEL

Peak Search	25:43 PMAug 09, 2021 TRACE 2 2 14 9 TYPE M DET PAUL NUMBER	ALIGN OFF pe: Log-Pwr Id:>1/1	Avg	Trig: Free Run #Atten: 30 dB	ORREC CHZ PNO: Wide C FGain:Low	35000000 0	arker 1 2.48003
NextPea	80 035 GHz 2.074 dBm	Mkr1				5.00 dBm	dB/div Ref 15.
Next Pk Rig		~		1	~		00
Next Pk Le							
Marker Del							.0 .0
Mkr→C	oan 3.000 MHz 0 ms (601 pts) FUNCTION VALUE	Sweep 1	FUNCTION	300 kHz	#VBV		enter 2.480000 C tes BW 100 kHz R MODE TRO SCU
Mkr→RefL				2.074 dBm	35 GHz	2,480 0	N 1 1
Mor 1 of							
		STATUS					

GFSK (BLE 2Mbps) HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



GFSK (BLE 2Mbps) HIGH CHANNEL, SPURIOUS 2 GHz ~ 25 GHz





A.4 Band Edge (Authorized-band band-edge)

Note: The lowest and highest channels are tested to verify the band edge emissions. Please refer to the following the plots for emissions values.

BLE 1Mbps

	Measured Max. Band	Limit	(dBm)	
Channel	Edge Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low Channel	-51.31	4.70	-15.30	Pass
High Channel	-57.57	5.28	-14.72	Pass

BLE 2Mbps

	Measured Max. Band	Limit	(dBm)	
Channel	Edge Emission (dBm)	Carrier Level	Calculated 20 dBc Limit	Verdict
Low Channel	-51.71	0.69	-19.309	Pass
High Channel	-58.03	2.07	-17.926	Pass



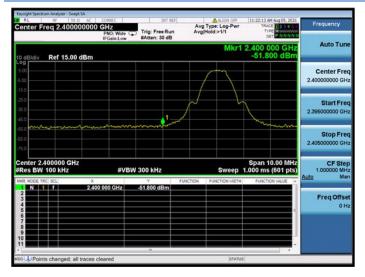
Test Plots

BLE 1Mbps

LOW CHANNEL, Carrier level



LOW CHANNEL, Reference level



LOW CHANNEL, Band Edge

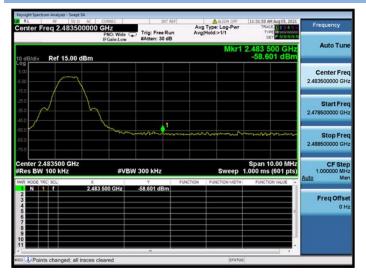


High CHANNEL, Carrier level





HIGH CHANNEL, Reference level



HIGH CHANNEL, Band Edge

nd Span 1.0000	00000 MHz	Trig: Free Run	#Avg Type: RMS Avg[Hold: 100/10	TRACE 2 3 4 5 TYPE A WWWWW DET A NNNNN	Band Adjust
dBidiv Ref 15.0	IFGein:Low	#Atten: 30 dB	Mi Band Po	r1 2.484 000 GHz wer -57.566 dBm	Band/Interva Spar 1.000000000 MH
					Band/Interva Let 2.4835000000 GH
0 G 0					Band/Interva Righ 2.4845000000 GH
nter 2.483500 GH es BW 100 kHz		W 300 kHz*	Swee	Span 2.000 MHz p 1.000 ms (601 pts)	
N 1 F	× 2.484 000 GHz	-67.270 dBm B	FUNCTION FUNCTION W and Power 1.000 N		

BLE 2Mbps

LOW CHANNEL, Carrier level

Peak Search	02:28:57 PM Aug 09, 2021 TRACE DESERVIT	ALIGN OFF		INT RE		402035000	RL arkor 1.2
	TYPE NWWWWW DET P NNNNN	Hold:>1/1	Avgi	Trig: Free Run #Atten: 30 dB	PNO: Wide C IFGain:Low	.402033000	
NextPeak	402 035 GHz 0.691 dBm	Mkr1 3				Ref 15.00 df	dB/div
Next Pk Righ				^1			
Next Pk Let	\sim						50
Marker Del							50 50 50
Mkr→C	Span 3.000 MHz 000 ms (601 pts)	Sweep 1	FUNCTION	V 300 kHz	#VB		enter 2.40 Res BW 10
Mkr→RefL			101000	0.691 dBm	2.402 035 GHz		1 N 1 2 3 4 5
							6
Mor 1 of							7

LOW CHANNEL, Reference level



LOW CHANNEL, Band Edge





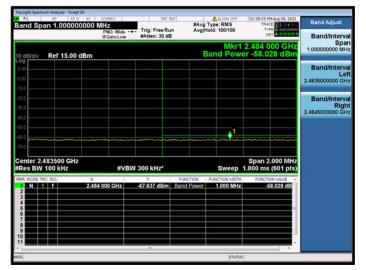
High CHANNEL, Carrier level



HIGH CHANNEL, Reference level

enter Freq 2.48	50 0 AC CORREC 3500000 GHz PNO: Wide IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr Avg[Hold:>1/1	02:37:57 PM Aug 09, 2021 TRACE 1 2 3 4 5 0 Type M WWWWWW DET P NNNN N	Frequency
dBidiv Ref 15.	00 dBm		Mkr1	2.483 500 GHz -59.965 dBm	Auto Tune
500 500 500	-				Center Fred 2.483500000 GH2
50					Start Freq 2.478500000 GHz
50 50 50	~	mar and the second	Annan ann	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Stop Fred 2.488500000 GH2
enter 2.483500 G Res BW 100 kHz		300 kHz	Sweep	Span 10.00 MHz 1.000 ms (601 pts)	CF Step 1.000000 MH Auto Mar
N 1 f 2 3 - 3 - - 6 - - 7 - - 9 - -	2.483 500 GHz	-59.965 dBm			Freq Offset 0 Hz
				-	

HIGH CHANNEL, Band Edge



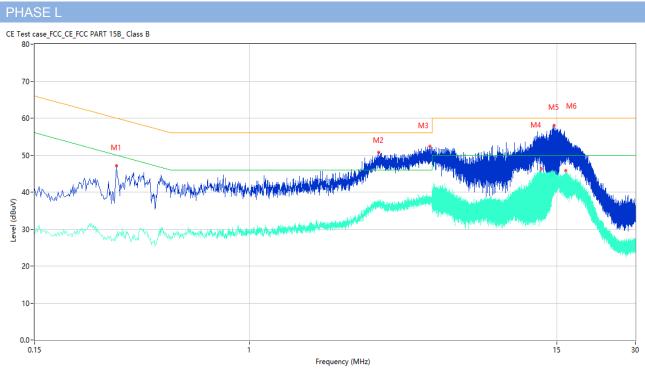


A.5 Conducted Emissions

Note ¹: The EUT is working in the Normal link mode.

Note ²: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here. Note ³: Results (dBuV) = Original reading level of Spectrum Analyzer (dBuV) + Factor (dB)

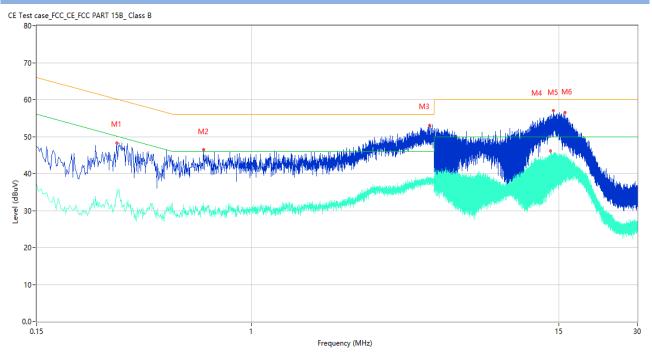
Test Data and Plots



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Line	Verdict
	(MHz)	(dBuV)	(dB)	(dBuV)	(dB)			
1	0.308	47.14	10.33	60.02	-12.88	Peak	L	Pass
1**	0.308	28.57	10.33	50.02	-21.45	AV	L	Pass
2	3.122	50.77	10.28	56.00	-5.23	Peak	L	Pass
2**	3.122	37.43	10.28	46.00	-8.57	AV	L	Pass
3	4.904	52.36	10.32	56.00	-3.64	Peak	L	Pass
3**	4.904	38.04	10.32	46.00	-7.96	AV	L	Pass
4	13.096	54.62	10.39	60.00	-5.38	Peak	L	Pass
4**	13.096	46.21	10.39	50.00	-3.79	AV	L	Pass
5	14.648	58.38	10.41	60.00	-1.62	Peak	L	N/A
5*	14.648	53.51	10.41	60.00	-6.49	QP	L	Pass
5**	14.648	44.77	10.41	50.00	-5.23	AV	L	Pass
6	16.226	49.33	10.44	60.00	-10.67	Peak	L	Pass
6**	16.226	45.77	10.44	50.00	-4.23	AV	L	Pass



PHASE N



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Line	Verdict
	(MHz)	(dBuV)	(dB)	(dBuV)	(dB)			
1	0.304	48.33	10.33	60.13	-11.80	Peak	N	Pass
1**	0.304	35.50	10.33	50.13	-14.63	AV	N	Pass
2	0.656	46.37	10.27	56.00	-9.63	Peak	N	Pass
2**	0.656	30.61	10.27	46.00	-15.39	AV	N	Pass
3	4.806	53.31	10.30	56.00	-2.69	Peak	N	N/A
3*	4.806	48.03	10.30	56.00	-7.97	QP	N	Pass
3**	4.806	38.05	10.30	46.00	-7.95	AV	N	Pass
4	13.916	54.98	10.40	60.00	-5.02	Peak	N	Pass
4**	13.916	46.07	10.40	50.00	-3.93	AV	N	Pass
5	14.296	56.96	10.40	60.00	-3.04	Peak	N	Pass
5**	14.296	44.31	10.40	50.00	-5.69	AV	N	Pass
6	15.866	56.53	10.43	60.00	-3.47	Peak	N	Pass
6**	15.866	39.27	10.43	50.00	-10.73	AV	N	Pass



A.6 Radiated Spurious Emission

Note ¹: The symbol of "--" in the table which means not application.

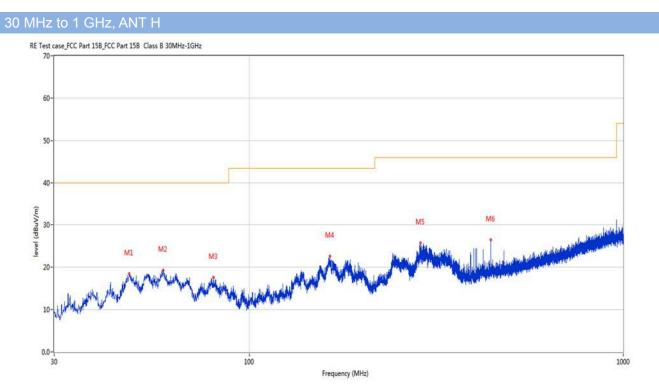
Note ²: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note ³: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Note ⁴: The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and BLE 1M-Middle channel mode is the worst.

Note ⁵: Results (dBuV/m) = Original reading level of Spectrum Analyzer (dBuV/m) + Factor (dB)

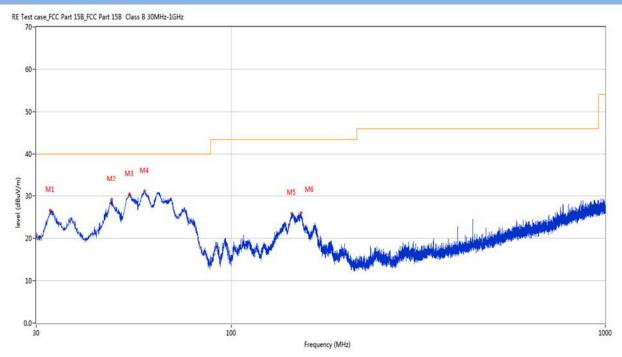
Test Data and Plots



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	47.654	18.37	-22.72	40.0	-21.63	Peak	360.00	200	Horizontal	Pass
2	58.615	19.33	-24.06	40.0	-20.67	Peak	296.10	100	Horizontal	Pass
3	80.052	17.60	-28.47	40.0	-22.40	Peak	311.80	200	Horizontal	Pass
4	164.296	22.51	-26.81	43.5	-20.99	Peak	264.80	200	Horizontal	Pass
5	286.856	25.68	-22.05	46.0	-20.32	Peak	118.30	100	Horizontal	Pass
6	441.620	26.40	-17.86	46.0	-19.60	Peak	219.80	100	Horizontal	Pass



30 MHz to 1 GHz, ANT V



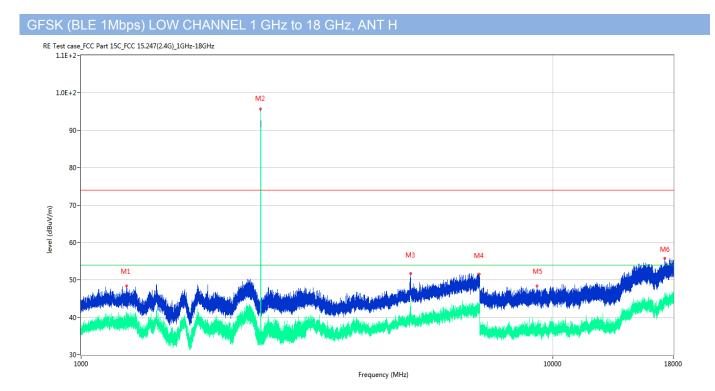
No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	32.764	26.56	-26.46	40.0	-13.44	Peak	332.10	100	Vertical	Pass
2	47.703	29.21	-22.71	40.0	-10.79	Peak	187.40	100	Vertical	Pass
3	53.377	30.37	-22.94	40.0	-9.63	Peak	273.40	100	Vertical	Pass
4	58.518	31.16	-24.07	40.0	-8.84	Peak	200.60	100	Vertical	Pass
5	145.042	25.82	-27.56	43.5	-17.68	Peak	227.10	100	Vertical	Pass
6	153.578	26.06	-27.49	43.5	-17.44	Peak	294.60	100	Vertical	Pass



Note 1: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

Note 2: The spurious from 18GHz-25GHz is noise only, do not show on the report.

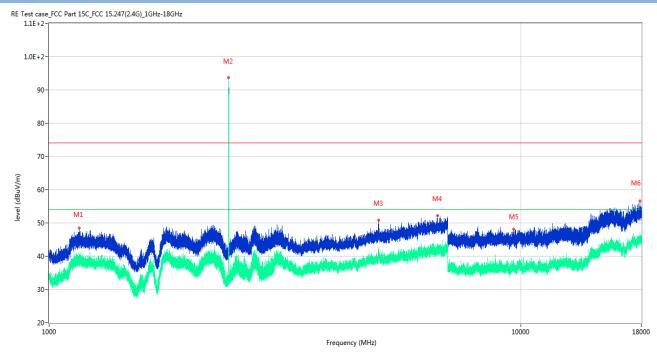
Note 3: All antenna were tested, but only the worst case has been reported in this report.



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1248.400	48.31	-14.90	74.0	-25.69	Peak	63.00	150	Horizontal	Pass
1**	1248.400	40.97	-14.90	54.0	-13.03	AV	63.00	150	Horizontal	Pass
2	2402.300	95.67	-10.73	74.0	21.67	Peak	309.00	150	Horizontal	N/A
2**	2402.300	94.35	-10.73	54.0	40.35	AV	309.00	150	Horizontal	N/A
3	4996.800	51.63	-0.92	74.0	-22.37	Peak	129.00	150	Horizontal	Pass
3**	4996.800	40.12	-0.92	54.0	-13.88	AV	129.00	150	Horizontal	Pass
4	6978.800	51.52	4.97	74.0	-22.48	Peak	26.00	150	Horizontal	Pass
4**	6978.800	42.60	4.97	54.0	-11.40	AV	26.00	150	Horizontal	Pass
5	9260.325	48.31	16.79	74.0	-25.69	Peak	216.00	150	Horizontal	Pass
5**	9260.325	36.07	16.79	54.0	-17.93	AV	216.00	150	Horizontal	Pass
6	17238.749	55.78	24.19	74.0	-18.22	Peak	108.00	150	Horizontal	Pass
6**	17238.749	45.04	24.19	54.0	-8.96	AV	108.00	150	Horizontal	Pass



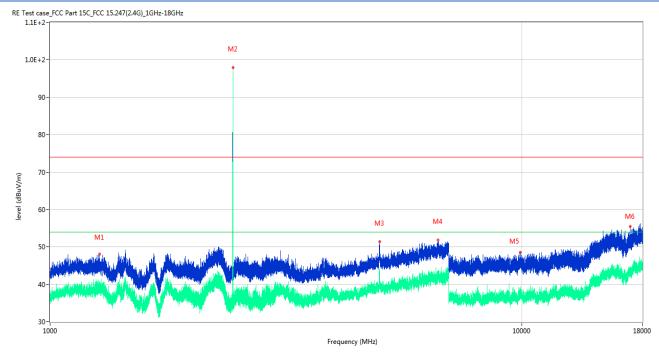
GFSK (BLE 1Mbps) LOW CHANNEL 1 GHz to 18 GHz, ANT V



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1157.200	48.48	-14.95	74.0	-25.52	Peak	140.00	150	Vertical	Pass
1**	1157.200	40.25	-14.95	54.0	-13.75	AV	140.00	150	Vertical	Pass
2	2402.300	93.65	-10.73	74.0	19.65	Peak	274.00	150	Vertical	N/A
2**	2402.300	93.08	-10.73	54.0	39.08	AV	274.00	150	Vertical	N/A
3	4989.800	50.81	-1.09	74.0	-23.19	Peak	25.00	150	Vertical	Pass
3**	4989.800	40.57	-1.09	54.0	-13.43	AV	25.00	150	Vertical	Pass
4	6655.000	52.22	4.62	74.0	-21.78	Peak	214.00	150	Vertical	Pass
4**	6655.000	42.03	4.62	54.0	-11.97	AV	214.00	150	Vertical	Pass
5	9661.100	48.13	18.82	74.0	-25.87	Peak	88.00	150	Vertical	Pass
5**	9661.100	36.97	18.82	54.0	-17.03	AV	88.00	150	Vertical	Pass
6	17867.176	56.58	24.31	74.0	-17.42	Peak	0.00	150	Vertical	Pass
6**	17867.176	45.15	24.31	54.0	-8.85	AV	0.00	150	Vertical	Pass



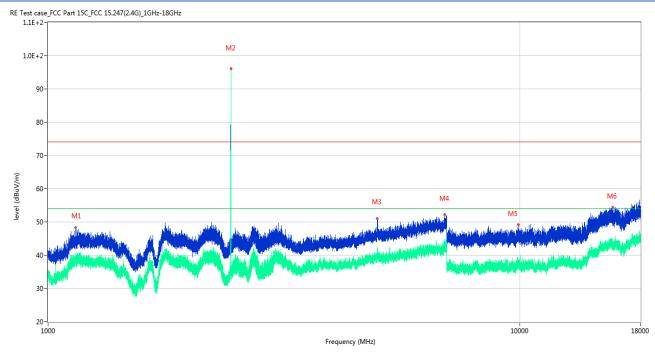
GFSK (BLE 1Mbps) MIDDLE CHANNEL 1 GHz to 18 GHz, ANT H



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1274.000	48.13	-14.81	74.0	-25.87	Peak	59.00	150	Horizontal	Pass
1**	1274.000	37.93	-14.81	54.0	-16.07	AV	59.00	150	Horizontal	Pass
2	2439.800	97.88	-10.52	74.0	23.88	Peak	305.00	150	Horizontal	N/A
2**	2439.800	95.34	-10.52	54.0	41.34	AV	305.00	150	Horizontal	N/A
3	4998.200	51.39	-0.83	74.0	-22.61	Peak	132.00	150	Horizontal	Pass
3**	4998.200	40.01	-0.83	54.0	-13.99	AV	132.00	150	Horizontal	Pass
4	6641.000	51.86	3.95	74.0	-22.14	Peak	218.00	150	Horizontal	Pass
4**	6641.000	42.72	3.95	54.0	-11.28	AV	218.00	150	Horizontal	Pass
5	9923.875	48.51	17.79	74.0	-25.49	Peak	285.00	150	Horizontal	Pass
5**	9923.875	36.78	17.79	54.0	-17.22	AV	285.00	150	Horizontal	Pass
6	16965.489	55.53	23.89	74.0	-18.47	Peak	142.00	150	Horizontal	Pass
6**	16965.489	43.06	23.89	54.0	-10.94	AV	142.00	150	Horizontal	Pass



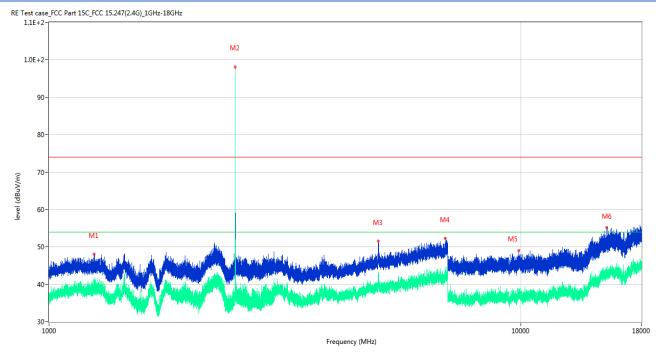
GFSK (BLE 1Mbps) MIDDLE CHANNEL 1 GHz to 18 GHz, ANT V



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1144.800	48.29	-15.06	74.0	-25.71	Peak	143.00	150	Vertical	Pass
1**	1144.800	39.08	-15.06	54.0	-14.92	AV	143.00	150	Vertical	Pass
2	2439.800	96.06	-10.52	74.0	22.06	Peak	266.00	150	Vertical	N/A
2**	2439.800	94.12	-10.52	54.0	40.12	AV	266.00	150	Vertical	N/A
3	4977.800	50.93	-1.33	74.0	-23.07	Peak	26.00	150	Vertical	Pass
3**	4977.800	40.04	-1.33	54.0	-13.96	AV	26.00	150	Vertical	Pass
4	6921.000	52.13	4.51	74.0	-21.87	Peak	117.00	150	Vertical	Pass
4**	6921.000	42.64	4.51	54.0	-11.36	AV	117.00	150	Vertical	Pass
5	9911.800	49.08	17.75	74.0	-24.92	Peak	222.00	150	Vertical	Pass
5**	9911.800	36.44	17.75	54.0	-17.56	AV	222.00	150	Vertical	Pass
6	15750.112	54.49	23.35	74.0	-19.51	Peak	101.00	150	Vertical	Pass
6**	15750.112	43.36	23.35	54.0	-10.64	AV	101.00	150	Vertical	Pass



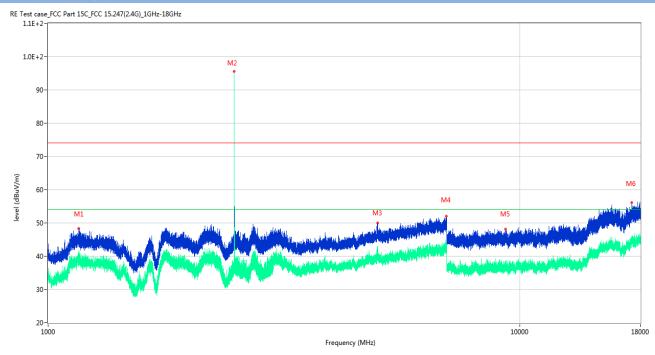
GFSK (BLE 1Mbps) HIGH CHANNEL 1 GHz to 18 GHz, ANT H



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1244.700	48.15	-14.85	74.0	-25.85	Peak	69.00	150	Horizontal	Pass
1**	1244.700	38.54	-14.85	54.0	-15.46	AV	69.00	150	Horizontal	Pass
2	2479.800	98.14	-10.36	74.0	24.14	Peak	305.00	150	Horizontal	N/A
2**	2479.800	95.51	-10.36	54.0	41.51	AV	305.00	150	Horizontal	N/A
3	4982.000	51.52	-1.23	74.0	-22.48	Peak	82.00	150	Horizontal	Pass
3**	4982.000	40.37	-1.23	54.0	-13.63	AV	82.00	150	Horizontal	Pass
4	6914.800	52.22	4.81	74.0	-21.78	Peak	166.00	150	Horizontal	Pass
4**	6914.800	42.42	4.81	54.0	-11.58	AV	166.00	150	Horizontal	Pass
5	9885.350	48.94	17.66	74.0	-25.06	Peak	50.00	150	Horizontal	Pass
5**	9885.350	36.14	17.66	54.0	-17.86	AV	50.00	150	Horizontal	Pass
6	15210.937	55.10	22.14	74.0	-18.90	Peak	230.00	150	Horizontal	Pass
6**	15210.937	44.72	22.14	54.0	-9.28	AV	230.00	150	Horizontal	Pass



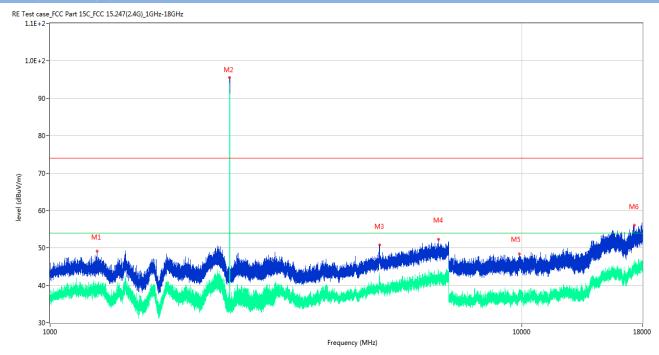
GFSK (BLE 1Mbps) HIGH CHANNEL 1 GHz to 18 GHz, ANT V



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1162.600	48.26	-15.01	74.0	-25.74	Peak	142.00	150	Vertical	Pass
1**	1162.600	39.35	-15.01	54.0	-14.65	AV	142.00	150	Vertical	Pass
2	2480.100	95.56	-10.33	74.0	21.56	Peak	277.00	150	Vertical	N/A
2**	2480.100	95.15	-10.33	54.0	41.15	AV	277.00	150	Vertical	N/A
3	4992.800	49.99	-1.03	74.0	-24.01	Peak	28.00	150	Vertical	Pass
3**	4992.800	39.83	-1.03	54.0	-14.17	AV	28.00	150	Vertical	Pass
4	6969.400	51.99	5.13	74.0	-22.01	Peak	181.00	150	Vertical	Pass
4**	6969.400	42.66	5.13	54.0	-11.34	AV	181.00	150	Vertical	Pass
5	9320.412	48.10	17.00	74.0	-25.90	Peak	189.00	150	Vertical	Pass
5**	9320.412	36.30	17.00	54.0	-17.70	AV	189.00	150	Vertical	Pass
6	17267.626	56.11	24.34	74.0	-17.89	Peak	99.00	150	Vertical	Pass
6**	17267.626	45.09	24.34	54.0	-8.91	AV	99.00	150	Vertical	Pass



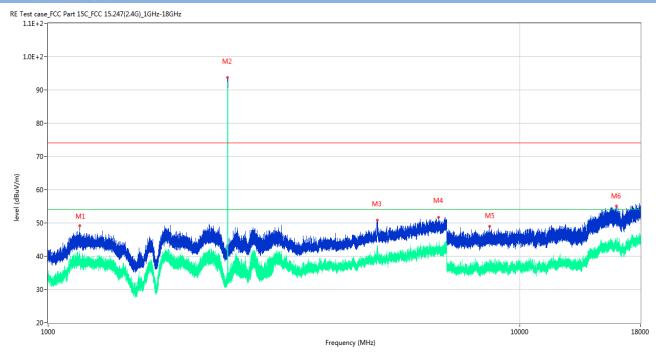
GFSK (BLE 2Mbps) LOW CHANNEL 1 GHz to 18 GHz, ANT H



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1257.300	49.12	-14.92	74.0	-24.88	Peak	67.00	150	Horizontal	Pass
1**	1257.300	39.99	-14.92	54.0	-14.01	AV	67.00	150	Horizontal	Pass
2	2402.500	95.50	-10.72	74.0	21.50	Peak	296.00	150	Horizontal	N/A
2**	2402.500	92.21	-10.72	54.0	38.21	AV	296.00	150	Horizontal	N/A
3	4992.400	50.86	-1.01	74.0	-23.14	Peak	122.00	150	Horizontal	Pass
3**	4992.400	42.16	-1.01	54.0	-11.84	AV	122.00	150	Horizontal	Pass
4	6650.200	52.28	4.62	74.0	-21.72	Peak	218.00	150	Horizontal	Pass
4**	6650.200	43.44	4.62	54.0	-10.56	AV	218.00	150	Horizontal	Pass
5	9878.162	48.42	17.64	74.0	-25.58	Peak	18.00	150	Horizontal	Pass
5**	9878.162	37.88	17.64	54.0	-16.12	AV	18.00	150	Horizontal	Pass
6	17288.624	56.00	24.54	74.0	-18.00	Peak	314.00	150	Horizontal	Pass
6**	17288.624	45.59	24.54	54.0	-8.41	AV	314.00	150	Horizontal	Pass



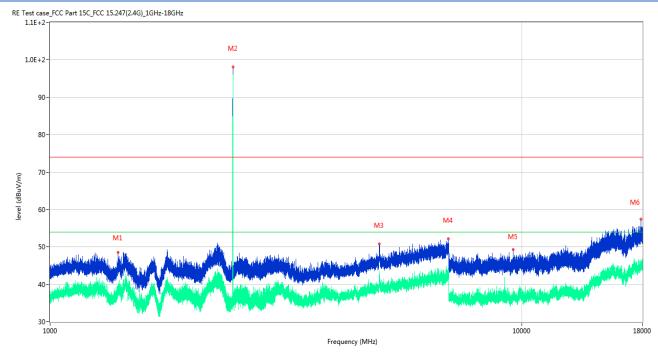
GFSK (BLE 2Mbps) LOW CHANNEL 1 GHz to 18 GHz, ANT V



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1166.500	49.12	-14.97	74.0	-24.88	Peak	149.00	150	Vertical	Pass
1**	1166.500	38.34	-14.97	54.0	-15.66	AV	149.00	150	Vertical	Pass
2	2402.500	93.69	-10.72	74.0	19.69	Peak	269.00	150	Vertical	N/A
2**	2402.500	91.31	-10.72	54.0	37.31	AV	269.00	150	Vertical	N/A
3	4987.000	50.80	-1.22	74.0	-23.20	Peak	26.00	150	Vertical	Pass
3**	4987.000	40.96	-1.22	54.0	-13.04	AV	26.00	150	Vertical	Pass
4	6720.800	51.63	3.73	74.0	-22.37	Peak	53.00	150	Vertical	Pass
4**	6720.800	42.96	3.73	54.0	-11.04	AV	53.00	150	Vertical	Pass
5	8635.875	48.99	18.11	74.0	-25.01	Peak	260.00	150	Vertical	Pass
5**	8635.875	38.42	18.11	54.0	-15.58	AV	260.00	150	Vertical	Pass
6	15993.975	55.11	24.01	74.0	-18.89	Peak	207.00	150	Vertical	Pass
6**	15993.975	42.99	24.01	54.0	-11.01	AV	207.00	150	Vertical	Pass



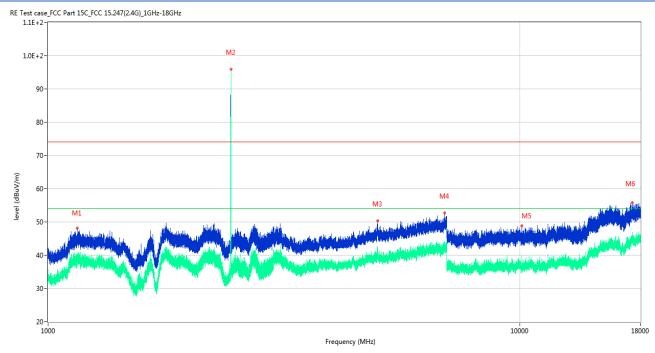
GFSK (BLE 2Mbps) MIDDLE CHANNEL 1 GHz to 18 GHz, ANT H



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1394.300	48.47	-14.91	74.0	-25.53	Peak	83.00	150	Horizontal	Pass
1**	1394.300	39.05	-14.91	54.0	-14.95	AV	83.00	150	Horizontal	Pass
2	2440.600	98.06	-10.52	74.0	24.06	Peak	305.00	150	Horizontal	N/A
2**	2440.600	93.65	-10.52	54.0	39.65	AV	305.00	150	Horizontal	N/A
3	4987.600	50.77	-1.21	74.0	-23.23	Peak	127.00	150	Horizontal	Pass
3**	4987.600	39.74	-1.21	54.0	-14.26	AV	127.00	150	Horizontal	Pass
4	6973.000	52.11	5.11	74.0	-21.89	Peak	57.00	150	Horizontal	Pass
4**	6973.000	43.81	5.11	54.0	-10.19	AV	57.00	150	Horizontal	Pass
5	9581.175	49.33	18.49	74.0	-24.67	Peak	162.00	150	Horizontal	Pass
5**	9581.175	37.99	18.49	54.0	-16.01	AV	162.00	150	Horizontal	Pass
6	17876.363	57.45	24.39	74.0	-16.55	Peak	0.00	150	Horizontal	Pass
6**	17876.363	45.40	24.39	54.0	-8.60	AV	0.00	150	Horizontal	Pass



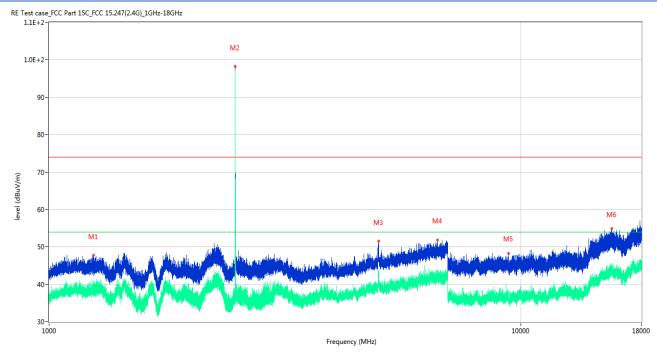
GFSK (BLE 2Mbps) MIDDLE CHANNEL 1 GHz to 18 GHz, ANT V



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1152.300	48.07	-14.93	74.0	-25.93	Peak	140.00	150	Vertical	Pass
1**	1152.300	37.84	-14.93	54.0	-16.16	AV	140.00	150	Vertical	Pass
2	2440.500	96.26	-10.52	74.0	22.26	Peak	259.00	150	Vertical	N/A
2**	2440.500	92.79	-10.52	54.0	38.79	AV	259.00	150	Vertical	N/A
3	4991.400	50.27	-1.01	74.0	-23.73	Peak	169.00	150	Vertical	Pass
3**	4991.400	40.08	-1.01	54.0	-13.92	AV	169.00	150	Vertical	Pass
4	6926.000	52.68	4.22	74.0	-21.32	Peak	182.00	150	Vertical	Pass
4**	6926.000	42.24	4.22	54.0	-11.76	AV	182.00	150	Vertical	Pass
5	10100.975	48.81	17.42	74.0	-25.19	Peak	206.00	150	Vertical	Pass
5**	10100.975	36.67	17.42	54.0	-17.33	AV	206.00	150	Vertical	Pass
6	17294.662	55.83	24.57	74.0	-18.17	Peak	84.00	150	Vertical	Pass
6**	17294.662	46.29	24.57	54.0	-7.71	AV	84.00	150	Vertical	Pass



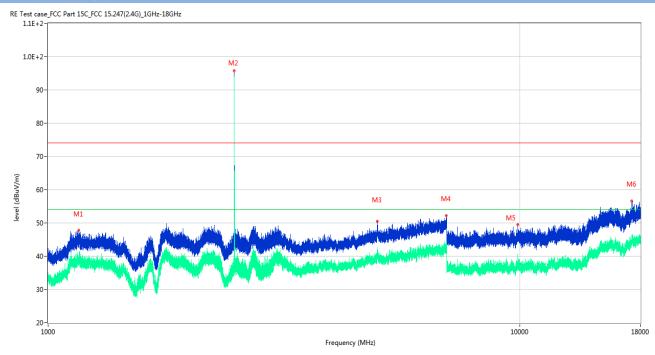
GFSK (BLE 2Mbps) HIGH CHANNEL 1 GHz to 18 GHz, ANT H



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1243.300	47.73	-14.90	74.0	-26.27	Peak	66.00	150	Horizontal	Pass
1**	1243.300	37.70	-14.90	54.0	-16.30	AV	66.00	150	Horizontal	Pass
2	2479.500	98.21	-10.38	74.0	24.21	Peak	298.00	150	Horizontal	N/A
2**	2479.500	92.30	-10.38	54.0	38.30	AV	298.00	150	Horizontal	N/A
3	4992.200	51.55	-1.01	74.0	-22.45	Peak	125.00	150	Horizontal	Pass
3**	4992.200	43.36	-1.01	54.0	-10.64	AV	125.00	150	Horizontal	Pass
4	6649.600	51.84	4.66	74.0	-22.16	Peak	316.00	150	Horizontal	Pass
4**	6649.600	42.29	4.66	54.0	-11.71	AV	316.00	150	Horizontal	Pass
5	9410.113	48.27	17.36	74.0	-25.73	Peak	71.00	150	Horizontal	Pass
5**	9410.113	35.38	17.36	54.0	-18.62	AV	71.00	150	Horizontal	Pass
6	15560.325	54.91	23.58	74.0	-19.09	Peak	111.00	150	Horizontal	Pass
6**	15560.325	43.34	23.58	54.0	-10.66	AV	111.00	150	Horizontal	Pass



GFSK (BLE 2Mbps) HIGH CHANNEL 1 GHz to 18 GHz, ANT V



No.	Frequency	Results	Factor	Limit	Over Limit	Detector	Table	Height	Antenna	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(Degree)	(cm)		
1	1162.800	47.76	-15.00	74.0	-26.24	Peak	144.00	150	Vertical	Pass
1**	1162.800	39.18	-15.00	54.0	-14.82	AV	144.00	150	Vertical	Pass
2	2479.600	95.69	-10.37	74.0	21.69	Peak	276.00	150	Vertical	N/A
2**	2479.600	92.46	-10.37	54.0	38.46	AV	276.00	150	Vertical	N/A
3	4985.600	50.49	-1.23	74.0	-23.51	Peak	157.00	150	Vertical	Pass
3**	4985.600	40.85	-1.23	54.0	-13.15	AV	157.00	150	Vertical	Pass
4	6971.600	52.16	5.08	74.0	-21.84	Peak	255.00	150	Vertical	Pass
4**	6971.600	43.12	5.08	54.0	-10.88	AV	255.00	150	Vertical	Pass
5	9903.462	49.53	17.73	74.0	-24.47	Peak	244.00	150	Vertical	Pass
5**	9903.462	37.24	17.73	54.0	-16.76	AV	244.00	150	Vertical	Pass
6	17248.725	56.58	24.20	74.0	-17.42	Peak	249.00	150	Vertical	Pass
6**	17248.725	44.58	24.20	54.0	-9.42	AV	249.00	150	Vertical	Pass



A.7 Band Edge (Restricted-band band-edge)

Note ¹: The lowest and highest channels are tested to verify the band edge emissions. Please refer to the following the plots for emissions values.

Note ²: The test data all are tested in the vertical and horizontal antenna which the trace is max hold. So these plots have shown the worst case.

Note ³: According the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note ⁴: The Level (dBuV/m) has been corrected by factor.

Test Mode	Test Channel	Frequency (MHz)	Level (dBuV/m)	Factor (dB)	Limit Line (dBuV/m)	Margin (dB)	Remark	Verdict
GFSK	L ou r	2390	53.864	31.47	74	20.136	PEAK	Pass
(BLE 1Mbps)	Low	2390	N/A	N/A	54	N/A	AVERAGE	Pass
GFSK		2483.5	53.525	31.40	74	20.475	PEAK	Pass
(BLE 1Mbps)	HIGH	2483.5	N/A	N/A	54	N/A	AVERAGE	Pass
GFSK	L ou r	2390	53.594	31.47	74	20.406	PEAK	Pass
(BLE 2Mbps)	Low	2390	N/A	N/A	54	N/A	AVERAGE	Pass
GFSK		2483.5	53.940	31.40	74	20.060	PEAK	Pass
(BLE 2Mbps)	HIGH	2483.5	N/A	N/A	54	N/A	AVERAGE	Pass

Note ⁵: All antenna were tested, but only the worst case has been reported in this report.





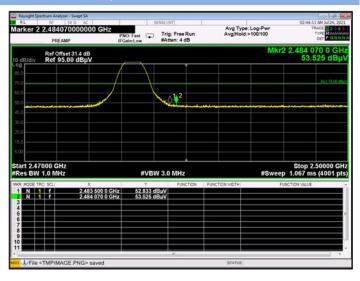
Test plots

BLE 1Mbps

LOW CHANNEL, PEAK

rker 2 2.370600 PREAMP	PN		g: Free Run ten: 4 dB	Avg Type: I Avg[Hold:>	100/100	TRACE 2 2 TYPE NUMBER OFT P NN
Ref Offset Bidiv Ref 95.0	31.47 dB 0 dBμV				Mkr	2 2.370 600 G 53.864 dB
						Des 7400
0				2		
	****	**************************************	***************	*****	man	www.man
0						
0						
rt 2.31000 GHz						Stop 2.41000 G
es BW 1.0 MHz		#VBW 3.0	MHz		Sweep	1.067 ms (4001 p
MODE TRC SCL N 1 1 N 1 1	× 2.390 000 GHz 2.370 600 GHz	Y 51.395 dBµV 53.864 dBµV	FUNCTION	FUNCTION WOTH	FUN	CTION VALUE
<u>م م</u>						

HIGH CHANNEL, PEAK

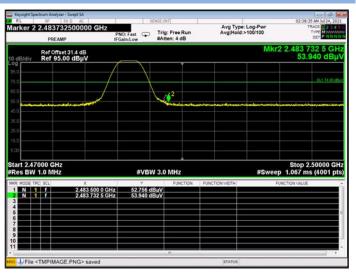


BLE 2Mbps

LOW CHANNEL, PEAK

	PREAMP	D00000 GHz PNC IFG8		Trig: Free Run #Atten: 4 dB	Avg Type: L Avg[Hold:>1	100/100	TRACE 2 3 4 TYPE M
dB/div	Ref Offset 3 Ref 95.00	1.47 dB dBµV				Mkr2	2.346 425 GH 53.594 dBµ
0							04174.00.00
0			¢2			01	
0	ميدر الرونط ويتراجهم		anang tanà ilay ang	ang tina an d _a ng pagang tinakin	1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 1999, 19	an an an an Inan Andrea Baran	ament No.
0 0							
0							
art 2.310 es BW 1			#VBW	3.0 MHz		Sweep 1.	Stop 2.41000 GH 067 ms (4001 pt
N 1	SCL	× 2.390 000 GHz 2.346 425 GHz	y 52.218 dB 53.594 dB	FUNCTION	FUNCTION WOTH	FUNCTIO	
		2.346 425 GHZ	53.594 dB	uv			

HIGH CHANNEL, PEAK





A.8 Power Spectral Density (PSD)

<u>Test Data</u>

BLE 1Mbps

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
Low Channel	-11.10	8	Pass
Middle Channel	-10.07	8	Pass
High Channel	-10.51	8	Pass

BLE 2Mbps

Channel	Spectral power density (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
Low Channel	-16.92	8	Pass
Middle Channel	-15.52	8	Pass
High Channel	-15.64	8	Pass

Test plots

BLE 1Mbps

GFSK (BLE) LOW CHANNEL

RL NF 50 R AC CORRC Marker 1 2.402035000000 GHz PN0: Wide IFGaincLow	Trig: Free Run #Atten: 20 dB	Avg Type: Log-Pwr Avg Hold>1/1	11-23-32 AM Aug 05, 2021 TRACE 1 2 3 4 5 TYPE M WWWWWW DET P NN N N	Peak Search
0 dB/dly Ref 10.00 dBm		Mkr1 2.	402 035 0 GHz -11.102 dBm	NextPea
0.00				Next Pk Rig
	ANDRACH	<u>ulululululululu</u>	Manager and a second	Next Pk Le
				Marker De
0.0				Mkr-+C
eo				Mkr→RefL
enter 2.4020000 GHz Res BW 3.0 kHz #VE	W 10 kHz	Swaan 1	Span 1.000 MHz 05.4 ms (601 pts)	Mo 1 of

GFSK (BLE) MIDDLE CHANNEL

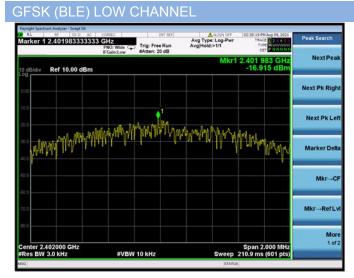
RL MF 50 0 AC COMPLET Marker 1 2.440035000000 GHz PNO: W IFGain:	ide C Trig: Free Run .cw #Atten: 20 dB	Avg Type: Log-Pwr Avg[Hold:>1/1	11:29:27 AM Aug 05, 2021 TRACE 2 2 4 5 TYPE M WWWWWW DET P N N N N	Peak Search Next Peal	
0 dB/div Ref 10.00 dBm10.071 dBm					
0,00				Next Pk Righ	
	<u>Alalalalalalala</u>	<u>hubble hubble hub</u>		Next Pk Le	
0.0				Marker Del	
				Mkr→C	
200				Mkr→RefL	
enter 2.4400000 GHz Res BW 3.0 kHz	≠VBW 10 kHz		Span 1.000 MHz 105.4 ms (601 pts)	Mor 1 of	



GFSK (BLE) HIGH CHANNEL



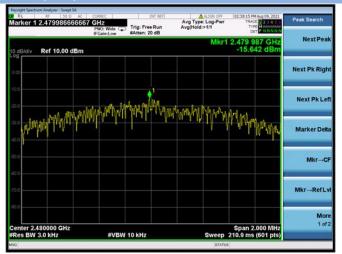
BLE 2Mbps



GFSK (BLE) MIDDLE CHANNEL

Marker 1 2.4399866666667	CONSEC DNT REF	Avg Type: Log-Pwr Avg[Hold:>1/1	02:32:47 PM Aug 09, 2021 TRACE 2 2 4 5 TVPE MUNICIPAL DET P MUNICIPAL	Peak Search	
Digitalities Activity: 20105 Mkr1 2,439 987 GHz 10 g8/day Ref 10.00 dBm -15.515 dBm					
0.00				Next Pk Righ	
20.0	มและ เฟรีกลไป ^{เป} ็นไป เ	themedra (Naraha	lat.a	Next Pk Lef	
200 ANARA MANA	MUS da La	, n M T . M	L Top Manut	Marker Delta	
50.0 50.0				Mkr→Cl	
70.0				Mkr→RefLv	
© 0 Center 2.440000 GHz #Res BW 3.0 kHz	#VBW 10 kHz	Sween	Span 2.000 MHz 210.9 ms (601 pts)	More 1 of 2	

GFSK (BLE) HIGH CHANNEL





ANNEX B TEST SETUP PHOTOS

Please refer the document "BL-SZ2170450-AR.PDF".

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document "BL-SZ2170450-AW.PDF".

ANNEX D EUT INTERNAL PHOTOS

Please refer the document "BL-SZ2170450-AI.PDF".

--END OF REPORT--