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FCC PART 15 SUBPART C
FCC PART 15.247
TEST REPORT

FCC ID:2BYJQ-SW

Report No: CTSL2620830320E

Product Name: Electronic bicycle shifter / Controller

Main Test Model: SW

Series Models:

Applicant: Hangzhou leoseek sports technology Co.,Ltd.

EXECUTIVE SUMMARY

A sample of this product was tested and found to be in compliance with
FCC PART 15C, FCC PART 15 SUBPART C (15.247).

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CTSL Testing (Dongguan) Co., Ltd.
Main company address: Building 1, Houjie Road, Houjie Town, Guangdong Province
Dongguan City, China

Test Report

FCC ID:2BYJQ-SW

Applicant Name	Hangzhou leoseek sports technology Co.,Ltd.				
Applicant Address	Unit 5208, Building 5, No.4 Fengdu Road, Pingyao Town, Yuhang District, Hangzhou City, Zhejiang Province, China				
Manufacturer Name	Hangzhou leoseek sports technology Co.,Ltd.				
Manufacturer Address	Unit 5208, Building 5, No.4 Fengdu Road, Pingyao Town, Yuhang District, Hangzhou City, Zhejiang Province, China				
Trade Mark	leoseek				
Product name	Electronic bicycle shifter / Controller				
Main Test Model	SW				
Series Models					
Standard	**FCC Part 15 Subpart C (15.247)** **ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024** **FCC KDB 558074 D01 15.247 Meas Guidance v05r02**				
Test Location	ISO/IEC 17025 by ILAC-MRA is A2LA 7556.01 CTSL Testing (Dongguan) Co., Ltd. 1/F, Building 1, No. 15, Jiaoyuansongshan Hetian Village, Houjie Town Dongguan City, Guangdong, People's Republic of China				
Receipt Date	2026.09.10	**Test period**	2026.09.11-2026.09.18	**Issue Date**	2026.09.24
Conclusion	**The equipment under test was found to be compliance with the requirements of the standards applied.**				
Performs Testing:	Ethan Zhao	Ethan zhao	(Special seal)		
Test Report Reviewer:	Steve Qin	Steve Qin			
Test Report Authorizer:	Alan Li	Alan Li			

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1. General Information

1.1. General Description of EUT (Equipment Under Test)

Product Information		
Product Name	:	Electronic bicycle shifter / Controller
Main Test Model	:	SW
Series Models	:	
Model Difference	:	/
Power supply	:	3V DC button cell
Battery	:	CR2450 3V
Software Version	:	V 1.0
Hardware Version	:	V 1.0
Equipment Under Test		
Testing sample ID	:	CTSL2620830320-S1 (Engineer sample) CTSL2620830320-S2 (Normal sample)
Test supplied	:	☐ supplied by the manufacturer ☐ supplied by the lab (Auxiliary test equipment supplied by test Lab, Details reference Section 2.6.)
Power supply information	:	
Wireless Specification		
Supported Type	:	Bluetooth 6.0 (BLE)
Modulation Type	:	GFSK
Transmit data rate (LE)	:	LE 1 Mbps
Operation frequency	:	2402-2480MHz
Number of channels	:	40 Channels
Channel separation	:	2MHz
Max Output Power (PEAK)	:	-0.16 (0±1.0dBm)
Antenna Gain& type	:	Refer to Section 1.2 of the report.
Sample Type	:	Prototype production
Type of Device	:	☒ Portable Device; ☐ Mobile Device; ☐Modular Device

Note: For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

1.2. Antenna Information

Ant No.	Band	Model Name	Antenna Type	Connector	Gain (dBi)
1	2400- 2500MHz	OA-L05	SMD Antenna	/	5.6

Note:
1. The antenna gain is declared by the customer and the laboratory is not responsible for the accuracy of the antenna gain.
2. The test results of this report only apply to the sample as received.

1.3. Information of RF Cable

Cable Loss(dB)	Provided by
1.0	Hangzhou leoseek sports technology Co.,Ltd.

Note:
1. The customer declared the loss value of the RF Cable. and the test results of this report only apply to the sample as received.
2. The laboratory is not responsible for the accuracy of the cable loss.

2. SUMMARY OF TEST

2.1. Test Standards

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024: American National Standard for Testing Unlicensed Wireless Devices
FCC KDB 558074 D01 15.247 Meas Guidance v05r02

2.2. Summary of test result

No.	Description of Test Item	FCC Standard Section	Results
1	6dB Bandwidth & 99% Bandwidth	§15.247(a)(2)	PASS
2	Maximum Peak Output Power	15.247(b)(3)	PASS
3	Power Spectral Density	15.247(e)	PASS
4	Conducted Band Edge	15.247(d)	PASS
5	Conducted Spurious Emissions	15.247(d)	PASS
6	Radiated Spurious Emissions and Band Edge	15.109/ 15.205/ 15.209/ 15.247(d)	PASS
7	AC Power Line Conducted Emissions	15.207	N/A(Note1)
8	Antenna Requirement	15.203	PASS

Note: “N/A” denotes test is not applicable in this test report.
Note1: The EUT is powered by a 3V DC button cell battery and cannot be directly or indirectly connected to the public AC power supply network. This test is not applicable.

2.3. Test Facilities

EMC Lab :

A2LA Certificate Number: 7556.01;
CTSL Testing (Dongguan) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.
The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

FCC Designation Number: CN1425;
Test Firm Registration Number:750639;
CTSL Testing (Dongguan) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

Industry Canada Registration Number. Is: 34801;
CAB identifier: CN0192;
CTSL Testing (Dongguan) Co., Ltd. The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

Name of Firm : CTSL Testing (Dongguan) Co.,ltd.

Main company address:
Building 1, Houjie Road, Houjie Town, Guangdong Province Dongguan City, China
EMC test location/satellite location:
1/F, Building 1, No. 15, Jiaoyuansongshan Hetian Village, Houjie Town Dongguan City, Guangdong, People's Republic of China

2.4. Measurement uncertainty

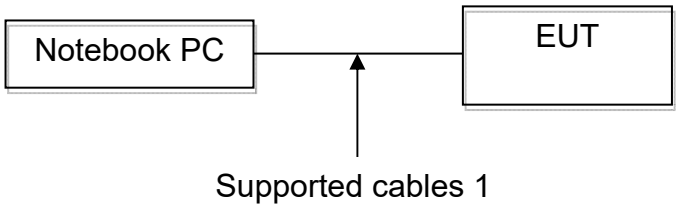
Item	Uncertainty
Uncertainty for Conduction emission test	3.72dB (9kHz-150kHz) 3.24dB (150kHz-30MHz)
Uncertainty for spurious emissions test	3.18dB (Below 30MHz) 4.90dB (30-1000MHz) 5.61dB (Above 1GHz)
Uncertainty for radio frequency	1.0 ppm
Uncertainty for conducted RF Power	0.7dB
Uncertainty for Power density test	0.6dB
Uncertainty of bandwidth test	0.34 dB
Uncertainty for Temperature	0.5℃
Uncertainty for Relative Humidity	1.8%RH
Uncertainty for Atmospheric Pressure	0.16 kPa

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

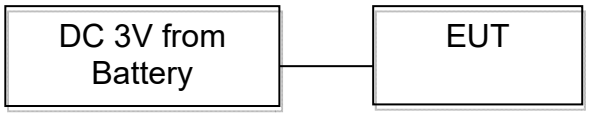
2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 (or 1.5) meter high above ground. EUT was beset into Bluetooth test mode by software before test.

Connect EUT Antenna Terminal, Radiated Spurious Emissions& Band Edge Test



Radiated Emission Test (30-1000MHz):



(**EUT**: Electronic bicycle shifter / Controller)

2.6. Assistant equipment used for test

Item	Equipment	Brand	Model Name/Type No.	FCC ID	Series No.
1	Notebook PC	-	Inspiron 14R-5421 (Manufacturer: Dell)	-	25TZHW1

Supported cables				
Item	**Shielded Type**	**Ferrite Core**	**Length**	**Note**
1	NO	NO	1.5m	USB Extension Cable (supplied by the Lab.)

2.7. Test mode

Combining all the rates, modulations, and packet types, the Pre-scans had been carried out. The worst-case test mode was selected for the final test as listed below.

Test Item	Mode	Date Rate	Test Channel
6dB Bandwidth & 99% Bandwidth	GFSK BLE 1M	1Mbps	Low / Middle / High
Maximum Peak Output Power	GFSK BLE 1M	1Mbps	Low / Middle / High
Power Spectral Density	GFSK BLE 1M	1Mbps	Low / Middle / High
Conducted Band Edge	GFSK BLE 1M	1Mbps	Low / High
Conducted Spurious Emissions	GFSK BLE 1M	1Mbps	Low / Middle / High
Radiated Spurious Emissions (Below 1GHz)	Only worse case is reported		
Radiated Spurious Emissions (Above 1GHz)	GFSK BLE 1M	1Mbps	Low / Middle / High
Radiated Band Edge	GFSK BLE 1M	1Mbps	Low / High
AC Power Line Conducted Emissions	N/A		

Note: In radiated measurement, the EUT had been pre-scan on the positioned of each 3 axis (X, Y, Z), the worst case was found when positioned on **X-plane.**

2.8. Channel List

BLE 1M							
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
00	**2402**	01	2404	02	2406	03	2408
04	2410	05	2412	06	2414	07	2416
08	2418	09	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	**19**	**2440**
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	**39**	**2480**

2.9. Power Setting of Test Software

Software Name	nrfconnect-setup-5.2.0		
Frequency (MHz)	2402	2440	2480
BLE 1M-GFSK Setting	7	7	7

Note: This information is provided by the applicant.

2.10. Test Equipment

For Conducted Emission Test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESCI 3	AT005	GUANGZHOU NEM	May 28,26	May 27,27
LISN	Rohde & Schwarz	ENV216	AT006	GUANGZHOU NEM	May 28,26	May 27,27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	AT007	GUANGZHOU NEM	May 28,26	May 27,27
CE Cable	Times Microwave	LMR195UF-NMNM-1.50M	AT041	GUANGZHOU NEM	May 28,26	May 27,27
Test Software	FARAD	EZ-EMC Ver.3A1.1+	N/A	N/A	N/A	N/A

For Radiated Emission Test (9kHz-30MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI TestReceiver	Rohde& Schwarz	ESCI 7	AT001	GUANGZHOU NEM	May 28,26	May 27,27
Active Loop Antenna	HCT	6505	AT064	GRG METROLOGY	Mar 22,26	Mar 21,27
Test Software	FARAD	EZ-EMC Ver.3A1.1+	N/A	N/A	N/A	N/A
9kHz-30MHz Cable	Times Microwave	LMR195UF-NMNM-9M	AT045	GUANGZHOU NEM	May 28,26	May 27,27

For Radiated Emissions Test (30MHz-1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde& Schwarz	ESCI 7	AT001	GUANGZHOU NEM	May 28,26	May 27,27
Trilog-Broadband Antenna (Includes 6db attenuator)	SCHWARZBECK	VULB 9168	AT002	LISAI	May 30,26	May 29,27
Test Software	FARAD	EZ-EMC Ver.3A1.1+	N/A	N/A	N/A	N/A
30-1000MHz Cable	Times Microwave Systems	LMR195UF-NMRNMR-3.00M+ LMR400UF-NMNM-3.00M+ LMR400UF-NMNM-3.00M	AT042+AT043+AT044	GUANGZHOU NEM	May 28,26	May 27,27

For Radiated Emission test (Above 1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Horn Antenna 1-18G	SCHWARZBECK	BBHA 9120 D	AT003	LISAI	May 30,26	May 29,27
Horn Antenna 18-40GHz	XIBAO	XB-WDB18-40K	AT064	LISAI	May 30,26	May 29,27
Broadband Preamplifier	SCHWARZBECK	BBV 9718 D	AT004	GUANGZHOU NEM	May 28,26	May 27,27
Low Noise Amplifier	MWRFtest	DLA8-18-40G-2078	AT065	GUANGZHOU NEM	May 28,26	May 27,27
Spectrum Analyzer 40G	Keysight	N9020B	AT066	GUANGZHOU NEM	May 28,26	May 27,27
Spectrum Analyzer 26.5G	Keysight	N9020A	AT050	GUANGZHOU NEM	May 28,26	May 27,27
Radio switching unit	TiGroup	SU319	AT055	N/A	N/A	N/A
Filtering unit	TiGroup	SU319F	AT056	N/A	N/A	N/A
Test Software	BL	BL410-E V25.5 en	N/A	N/A	N/A	N/A
Above 1GHz Cable	Times Microwave Systems	SFT205-NMNM-7.0M+ SFT205-NMNM-2.0M	AT057+ AT058	GUANGZHOU NEM	May 28,26	May 27,27

For Connect EUT Antenna Terminal Test (RF Test system)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Spectrum analyzer	Keysight	N9020A	AT050	GUANGZHOU NEM	May 28,26	May 27,27
Analog signal source	Keysight	N5173B	AT051	GUANGZHOU NEM	May 28,26	May 27,27
WIDEBAND RADIO COMMUNICATION TESTER	Rohde& Schwarz	CMW500	AT052	GUANGZHOU NEM	May 28,26	May 27,27
Power probe unit	Ti Group	SU319P	AT053	GUANGZHOU NEM	May 28,26	May 27,27
Switch unit	Ti Group	SU319S	AT054	N/A	N/A	N/A
Test Software	BL	BL410R 3.5.2.621	N/A	N/A	N/A	N/A

3. DUTY CYCLE

3.1. Limit

None; for reporting purpose only.

3.2. Test Setup

3.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
Centre frequency	2440MHz
RBW	8
VBW	8
Span	0
Sweep Time	Auto
Detector	Peak
Trace Mode	Single hold

3.4. Test Procedure

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 3.3.
c. When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.
d. Duty Cycle= Transmission Duration (Tx On (s))/ Transmission Period(s)
e. Repeat above procedures until all channels and test modes were measured.
f. Record the results in the test report.

3.5. Test Conditions

EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	24.0℃	**Humidity:**	56 % RH
Atmosphere Pressure:	100.9kPa		

3.6. Test Result

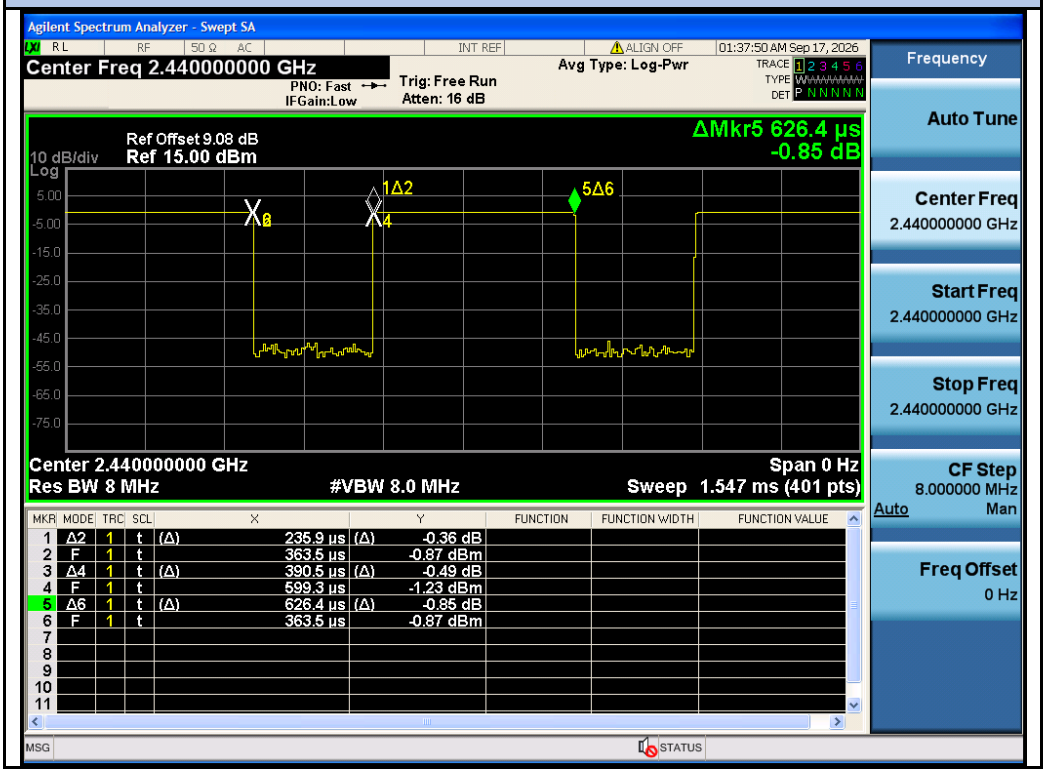
Mode	Channel	Center Frequency (MHz)	RBW (MHz)	Detector	Tx On (s)	Tx Off (s)	Period (s)	Duty Cycle
GFSK BLE 1M	CH19	2440	8	Peak	0.000391	0.000236	0.000626	62.35%

Note:

1. If duty cycle <98 %, the conducted average output power and average power spectral density should be add duty factor.
2. If duty cycle≥98 %, the EUT is consider to be transmitting continuously, the conducted average output power and average power spectral density no need to add duty factor (consider to be zero).
3. The conducted peak output power and peak power spectral density no need to consider duty factor.
4. Tx On time is transmission duration(s).

3.7. Original Test record

BLE 1M-GFSK_Ant1_CH19 2440MHz

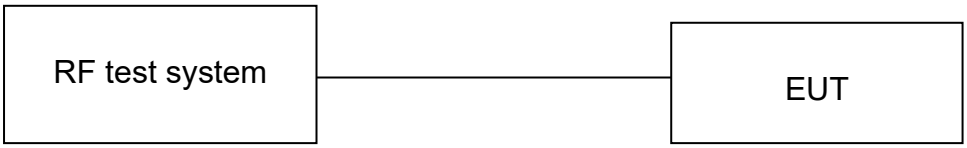


4. 6DB BANDWIDTH

4.1. Limit

Systems using digital modulation techniques operate in the 2400-2483.5 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

4.2. Test Setup



4.3. Spectrum Analyzer Setting

6dB Bandwidth	
Spectrum Parameters	**Setting**
RBW	100KHz
VBW	300KHz
Span	2MHz(BLE 1M mode)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

4.4. Test Procedure

a. The test according to ANSI C63.10 clause 11.8.
b. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
c. Spectrum analyzer setting parameters in accordance with section 4.3.
d. Set the EUT transmit continuously with maximum output power.
e. Allow 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.
f. Repeat above procedures until all channels and test modes were measured.
g. Record the results in the test report.

4.5. Test Conditions

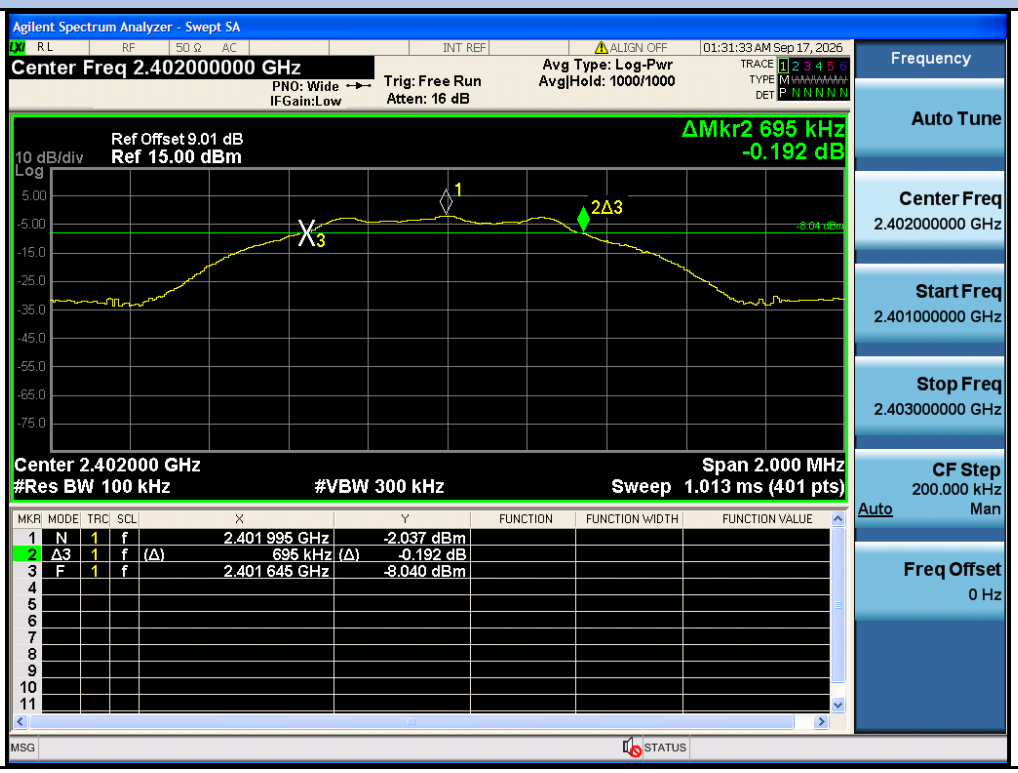
EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	24.0℃	**Humidity:**	56 % RH
Atmosphere Pressure:	100.9kPa		

4.6. Test Result

Test Mode	Antenna	Channel& Frequency	6dB Bandwidth	6dB Bandwidth Conducted Limit	Result
		MHz	MHz	KHz	
BLE 1M-GFSK	Ant1	CH00 2402	0.695	≥500	PASS
		CH19 2440	0.720		
		CH39 2480	0.715		

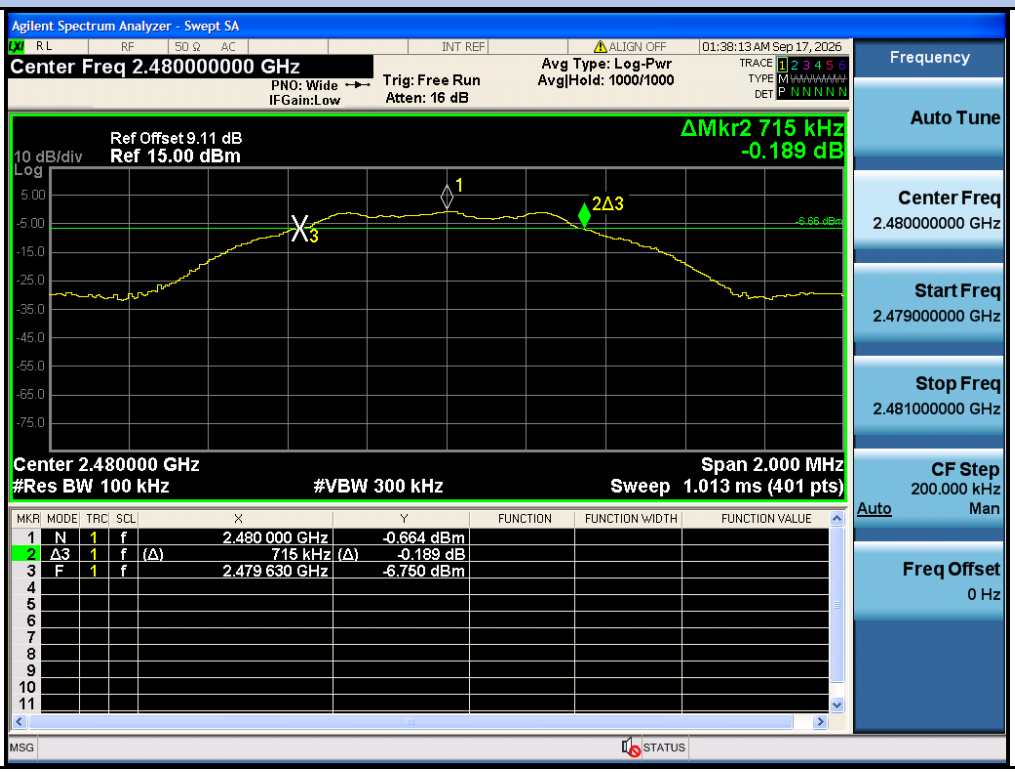
4.7.Original Test record

BLE 1M-GFSK_Ant1_CH00 2402MHz



BLE 1M-GFSK_Ant1_CH19 2440MHz

BLE 1M-GFSK_Ant1_CH39 2480MHz

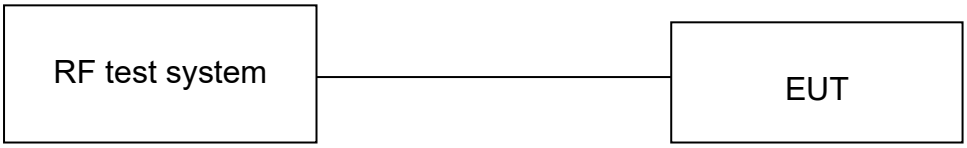


5. 99% BANDWIDTH

5.1.Limit

None; for reporting purpose only.

5.2. Test Setup



5.3. Spectrum Analyzer Setting

99% Occupied Bandwidth	
Spectrum Parameters	**Setting**
RBW	1-5% OBW
VBW	≥3*RBW
Span	1.5*BW
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

5.4. Test Procedure

a. The test according to ANSI C63.10 clause 6.9.3.
b. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
c. Spectrum analyzer setting parameters in accordance with section 5.3.
d. Set the EUT transmit continuously with maximum output power.
e. Repeat above procedures until all channels and test modes were measured.
f. Record the results in the test report.

5.5. Test Conditions

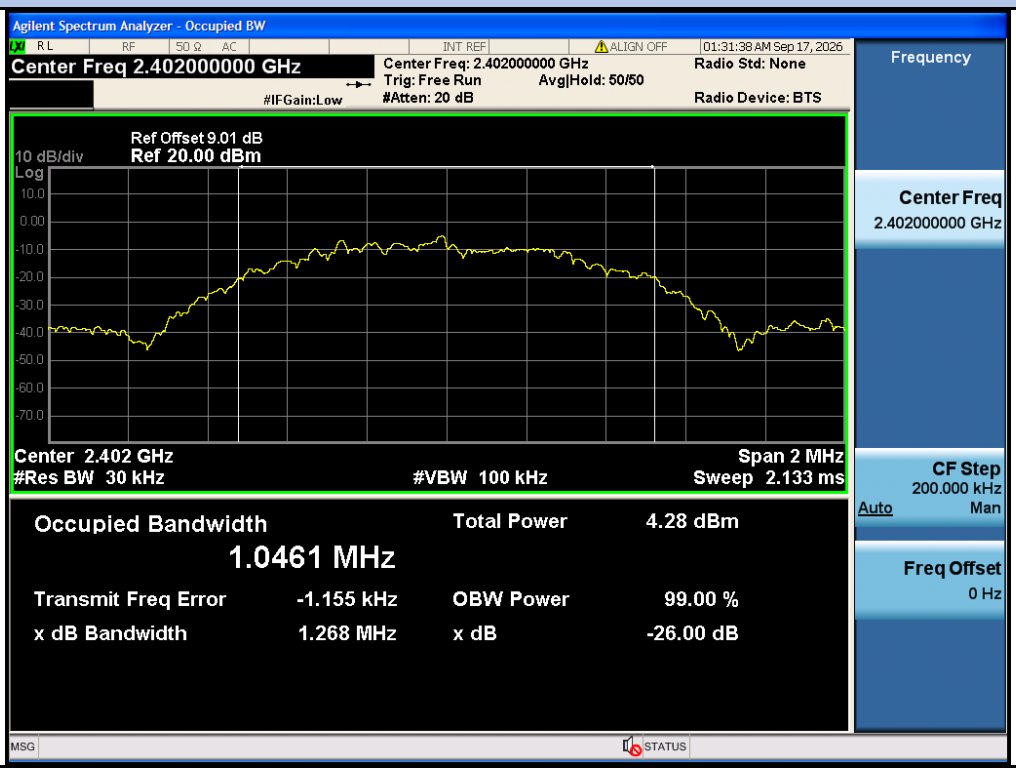
EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	24.0℃	**Humidity:**	56 % RH
Atmosphere Pressure:	100.9kPa		

5.6.Test Data

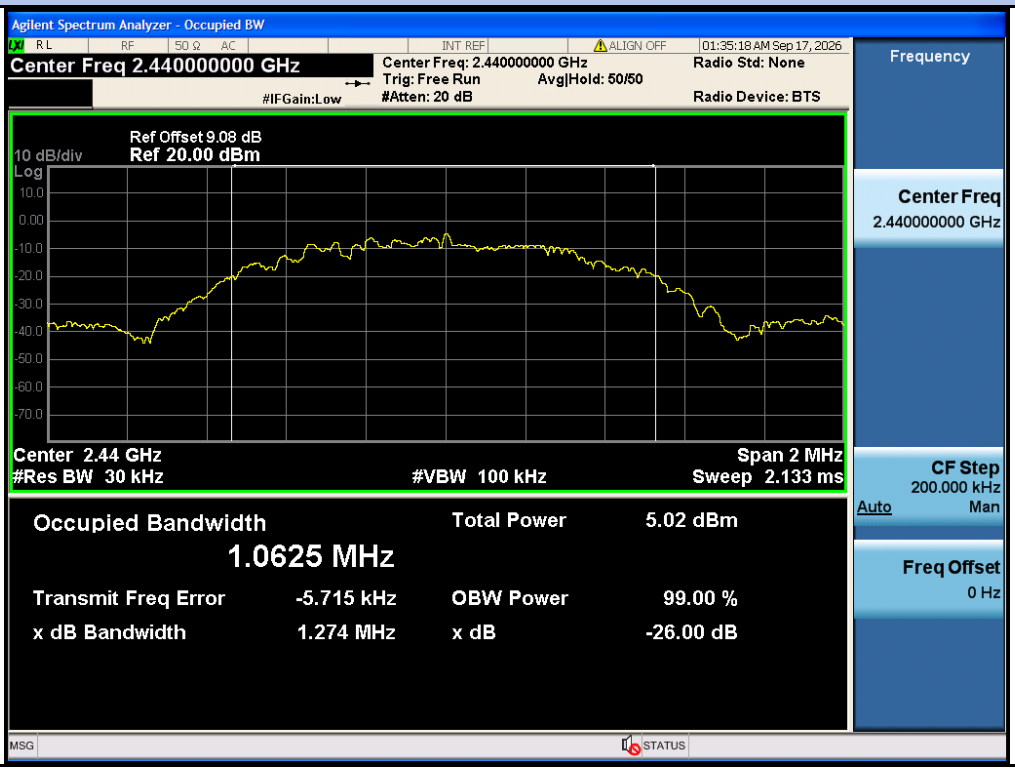
Test Mode	Antenna	Channel& Frequency	Occupied Channel Bandwidth
		MHz	MHz
BLE 1M-GFSK	Ant1	CH00 2402	1.046
		CH19 2440	1.063
		CH39 2480	1.050

5.7.Original Test record

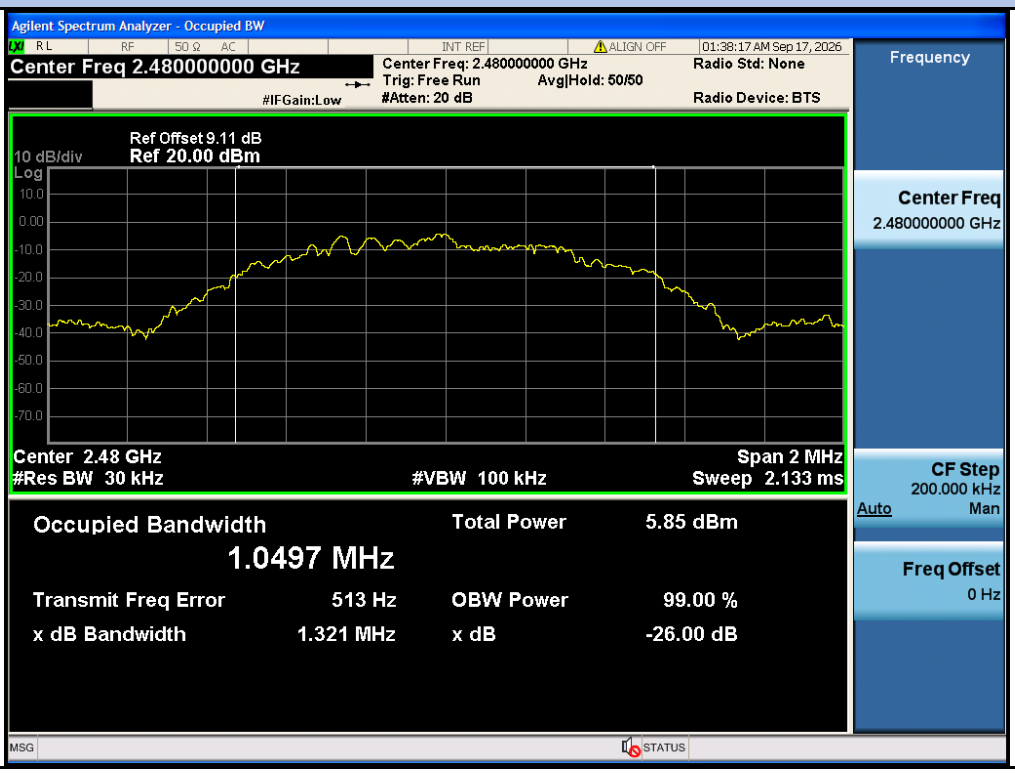
BLE 1M-GFSK_Ant1_CH00 2402MHz



BLE 1M-GFSK_Ant1_CH19 2440MHz



BLE 1M-GFSK_Ant1_CH39 2480MHz

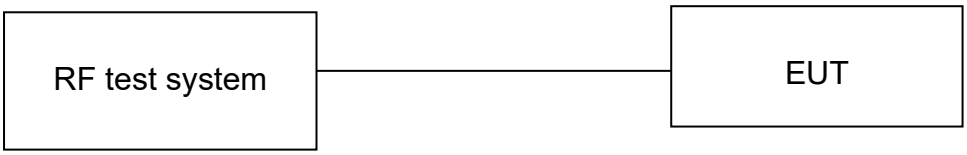


6. MAXIMUM PEAK OUTPUT POWER

6.1. Limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.
If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate,by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.2. Test Setup



6.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	2MHz
VBW	6MHz
Span	10MHz
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

6.4. Test Procedure

a. The test according to ANSI C63.10 clause 11.9.2.3.
b. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
c. Spectrum analyzer setting parameters in accordance with section 6.3.
d. Set the EUT transmit continuously with maximum output power.
e. Use the channel power function to measure maximum peak output power, allow trace to stabilize, save test pictures.
f. Repeat above procedures until all modes and channels were measured.
g. Record the results in the test report.

6.5. Test Conditions

EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	24.0℃	**Humidity:**	56 % RH
Atmosphere Pressure:	100.9kPa		

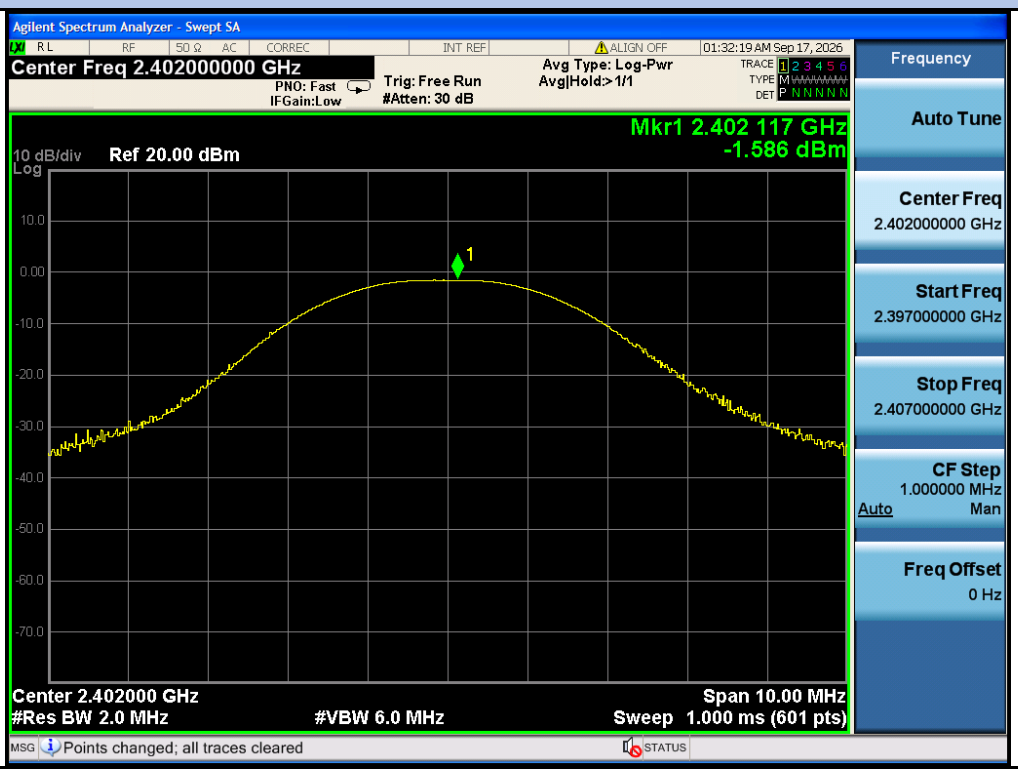
6.6. Test Result

Test Mode	Antenna	Channel& Frequency	Peak Output Power	Limit	Result
		MHz	dBm	dBm	
BLE 1M-GFSK	Ant1	CH00 2402	-1.59	≤30	PASS
		CH19 2440	-0.77		
		CH39 2480	-0.16		

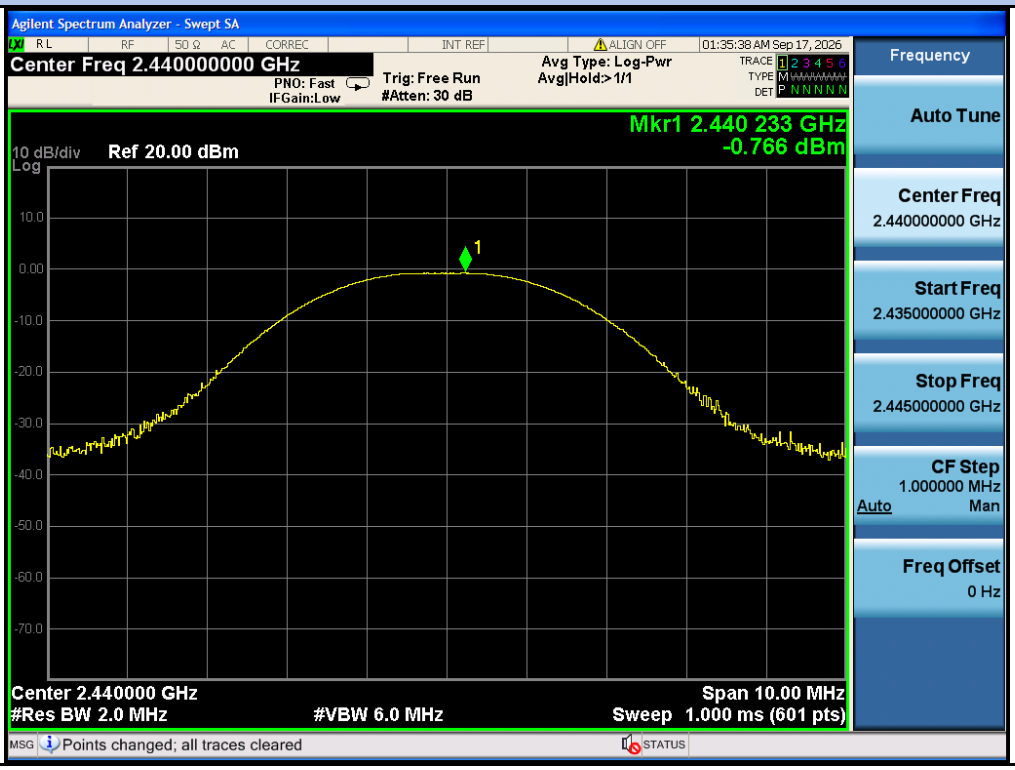
Note:
1) If the test results under the Peak detector meet the limit requirements, then there is no need to consider the coefficient obtained by multiplying by the Duty cycle.

6.7.Original Test record

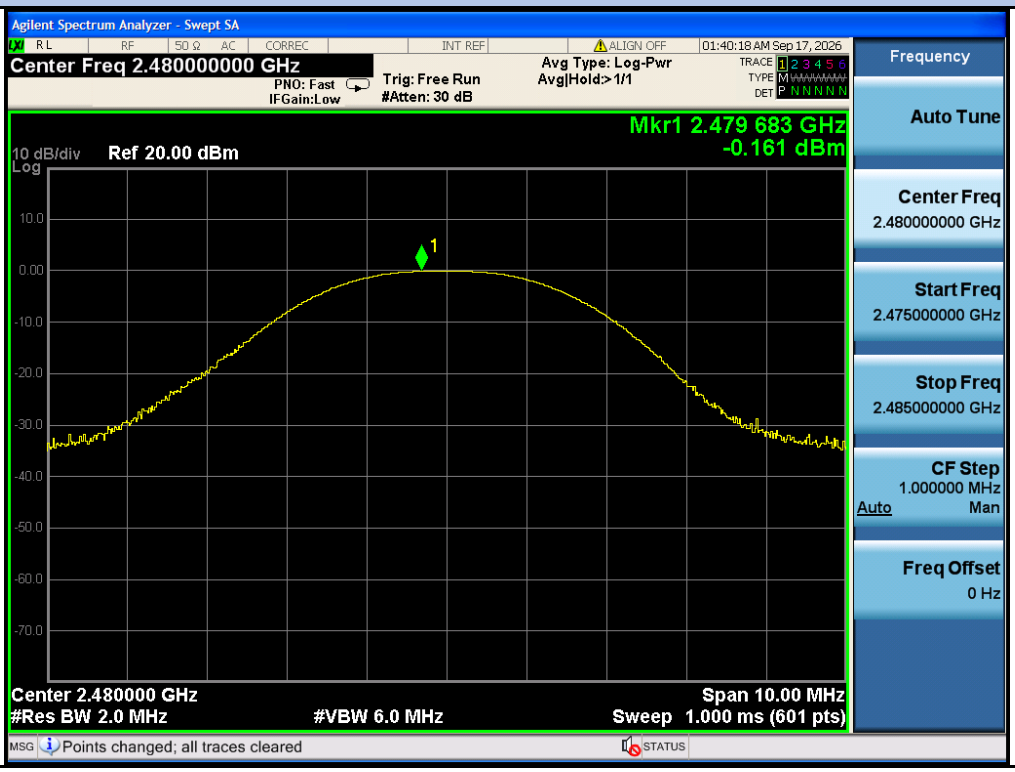
BLE 1M-GFSK_Ant1_CH00 2402MHz



BLE 1M-GFSK_Ant1_CH19 2440MHz



BLE 1M-GFSK_Ant1_CH39 2480MHz



7. POWER SPECTRAL DENSITY

7.1.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.

7.2.Test Setup

7.3.Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	3KHz
VBW	10KHz
Span	1.5MHz(BLE 1M mode) (Set the span >1.5 times the DTS bandwidth.)
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

7.4.Test Procedure

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 7.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.

7.5. Test Conditions

EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	24.0℃	**Humidity:**	56 % RH
Atmosphere Pressure:	100.9kPa		

7.6.Test Result

Test Mode	Antenna	Channel& Frequency	Peak Power Spectral Density	Limit	Result
		MHz	dBm/3KHz	dBm/3KHz	
BLE 1M-GFSK	Ant1	CH00 2402	-16.49	8.00	PASS
		CH19 2440	-15.90		
		CH39 2480	-15.12		

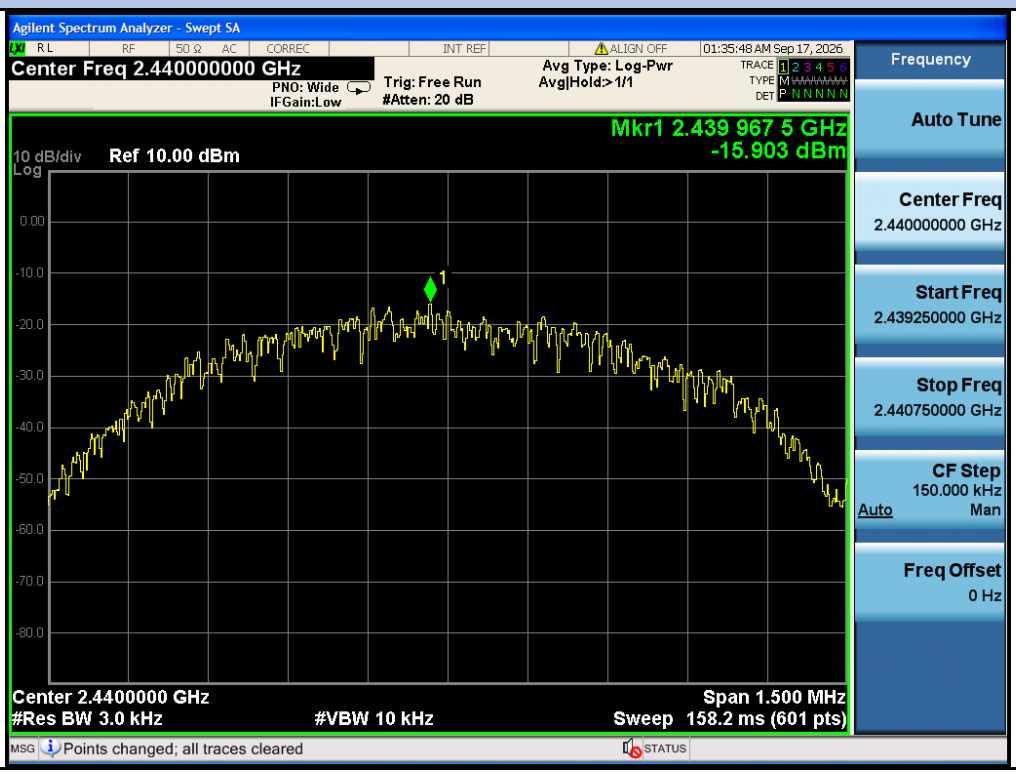
Note:

1) If the test results under the Peak detector meet the limit requirements, then there is no need to consider the coefficient obtained by multiplying by the Duty cycle.

7.7.Original Test record

BLE 1M-GFSK_Ant1_CH00 2402MHz

BLE 1M-GFSK_Ant1_CH19 2440MHz



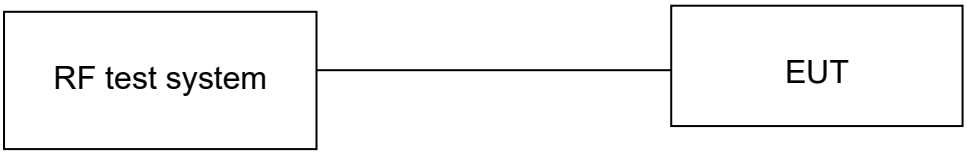
BLE 1M-GFSK_Ant1_CH39 2480MHz

8. CONDUCTED BAND EDGE

8.1. Limit

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

8.2. Test Setup



8.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	100KHz
VBW	300KHz
Span	2310-2410MHz: 100MHz 2475-2500MHz: 25MHz
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

8.4. Test Procedure

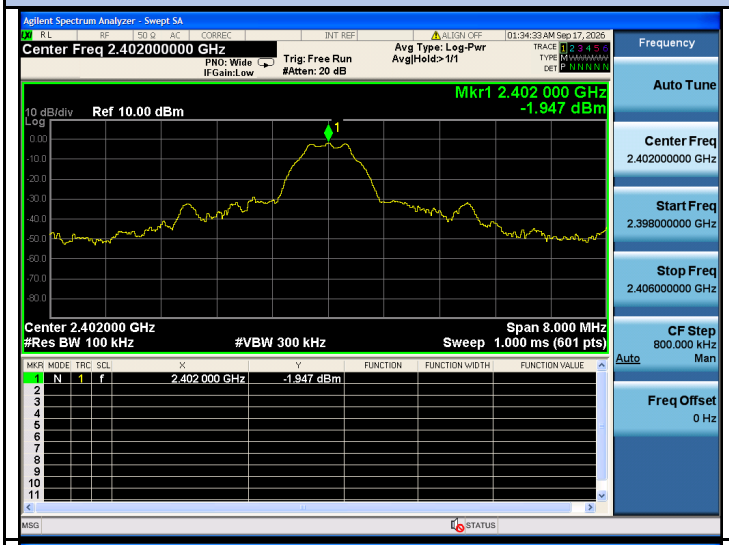
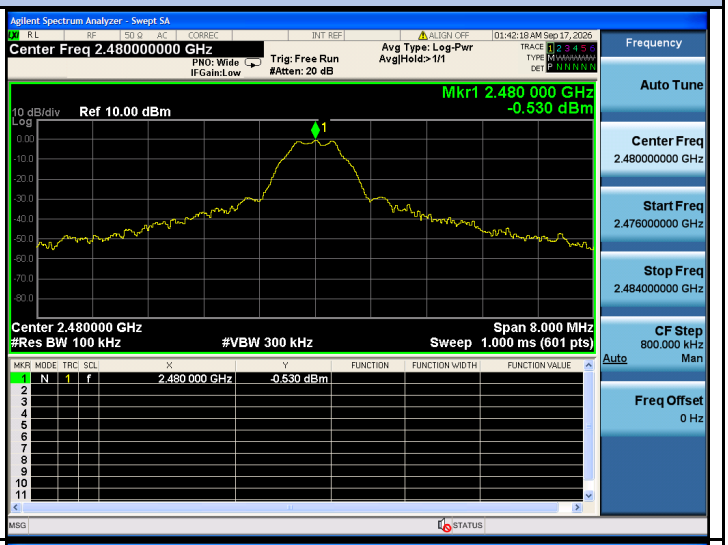
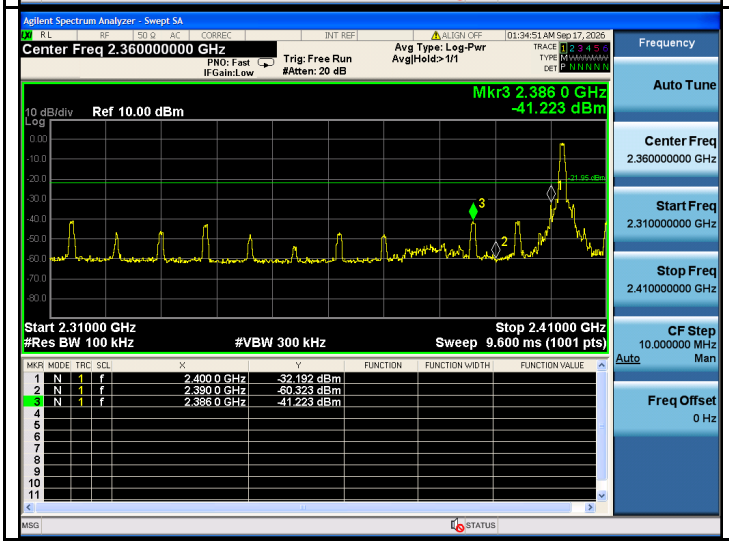
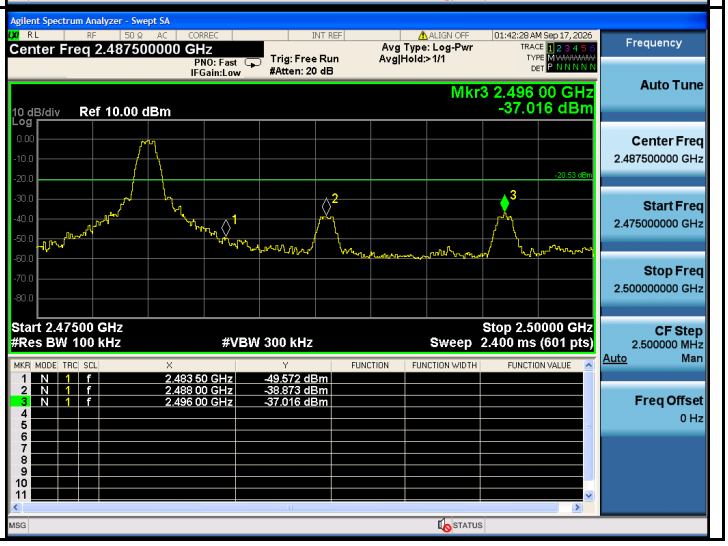
a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 8.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, use the marker function to mark the highest emission level outside the authorized band.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report

BLE 1M-GFSK all have been tested, the test data was recorded in report.

8.5. Test Conditions

EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	24.0℃	**Humidity:**	56 % RH
Atmosphere Pressure:	100.9kPa		

8.6.Test Result

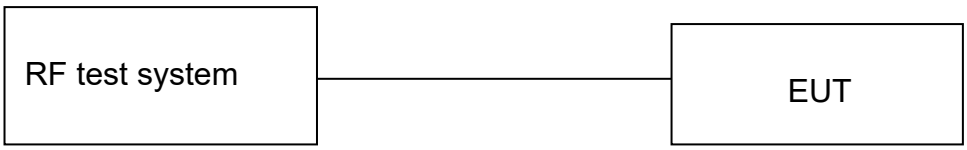
BLE 1M-GFSK_Ant1_Low_CH00 2402MHz	BLE 1M-GFSK_Ant1_High_CH39 2480MHz
Left Band edge	**Right Band edge**
	
	

9. CONDUCTED SPURIOUS EMISSIONS

9.1. Limit

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

9.2. Test Setup



9.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting	
RBW	100KHz	
VBW	300KHz	
Start frequency	30MHz	1.0GHz
Stop frequency	1000MHz	25.0GHz
Sweep Time	Auto	
Detector	Peak	
Trace Mode	Max Hold	

9.4. Test Procedure

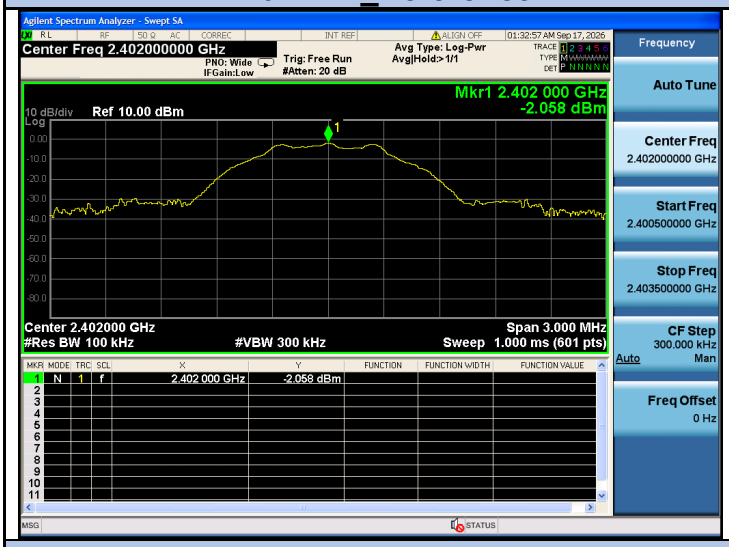
a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 9.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, use the marker function to mark the highest emission level outside the authorized band.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.
g. BLE 1M-GFSK all have been tested, the test data was recorded in report.

9.5. Test Conditions

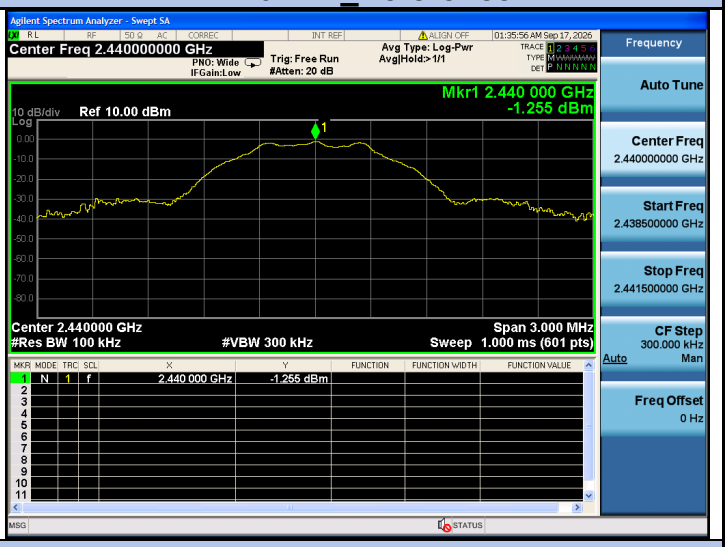
EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	24.0℃	**Humidity:**	56 % RH
Atmosphere Pressure:	100.9kPa		

9.6.Test Result

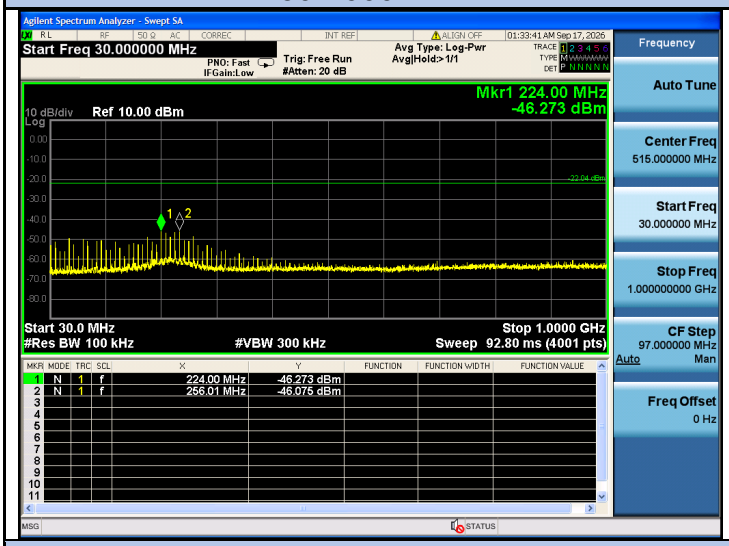
BLE 1M-GFSK_Ant1_CH00 2402MHz_Reference



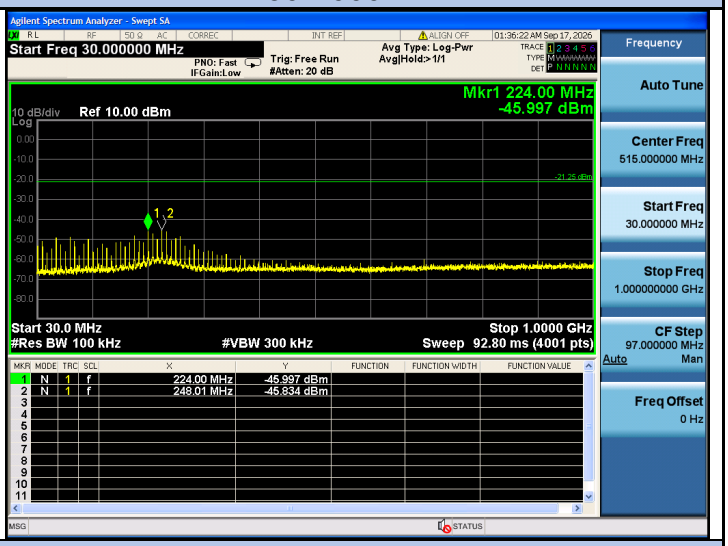
BLE 1M-GFSK_Ant1_CH19 2440MHz_Reference



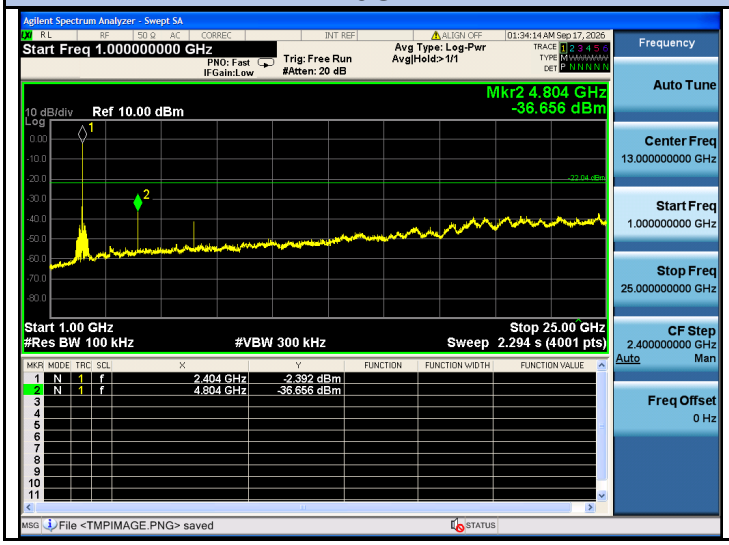
BLE 1M-GFSK_Ant1_CH00 2402MHz 30-1000MHz



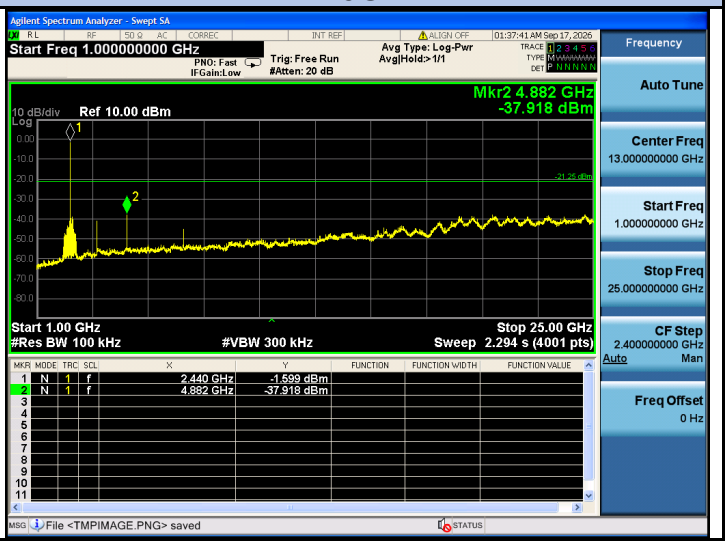
BLE 1M-GFSK_Ant1_CH19 2440MHz 30-1000MHz



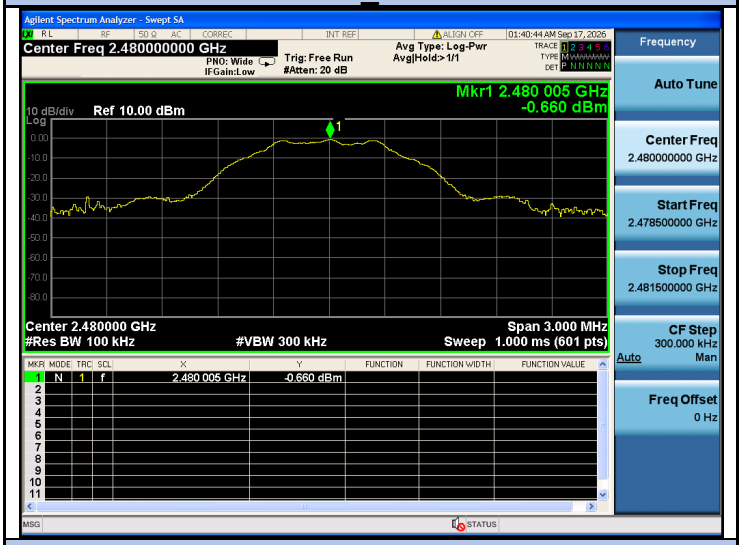
BLE 1M-GFSK_Ant1_CH00 2402MHz 1-25GHz



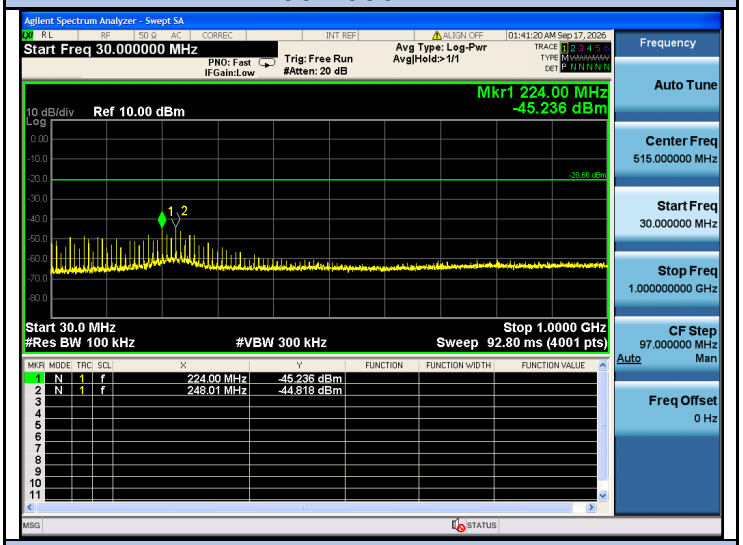
BLE 1M-GFSK_Ant1_CH19 2440MHz 1-25GHz



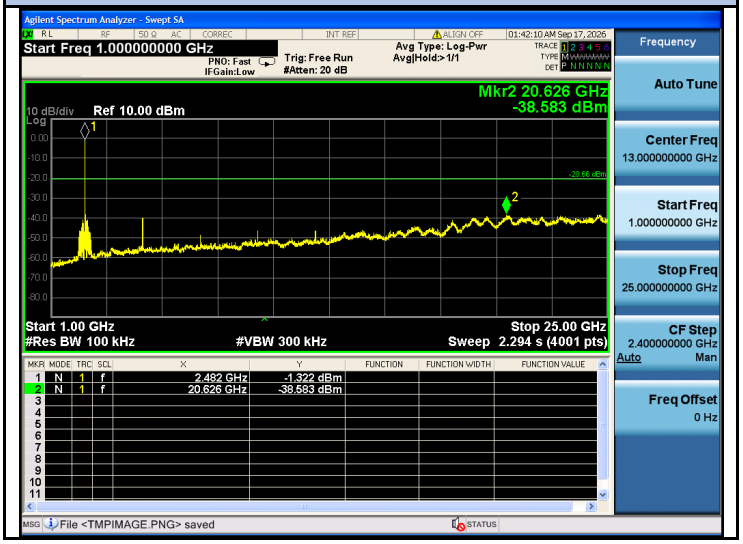
BLE 1M-GFSK_Ant1_CH39 2480MHz_Reference



BLE 1M-GFSK_Ant1_CH39 2480MHz 30-1000MHz



BLE 1M-GFSK_Ant1_CH39 2480MHz 1-25GHz



10. Radiated Spurious Emissions and Band Edge

10.1. Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band			
MHZ	**MHz**	**MHZ**	**GHZ**
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)

15.209 Limit		
Frequency (MHz)	**Field Strength(μV/m)**	**Distance(m)**
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

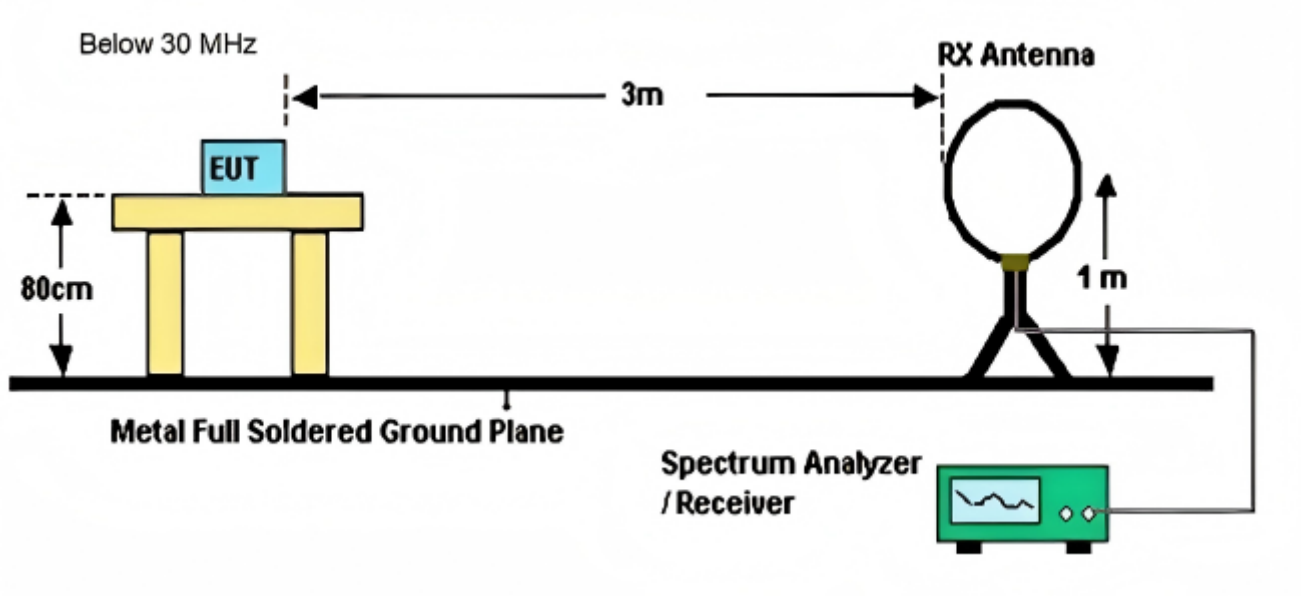
(1) Emission level dBμV = 20 log Emission level μV/m.

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

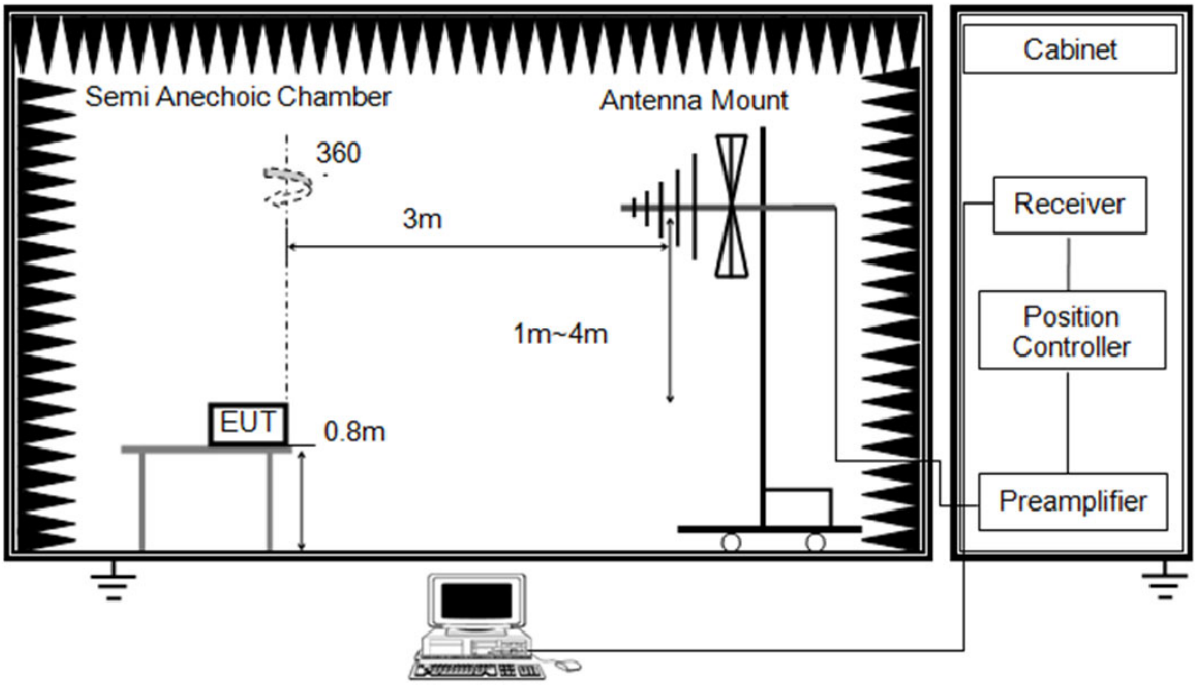
10.2. Test Setup

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



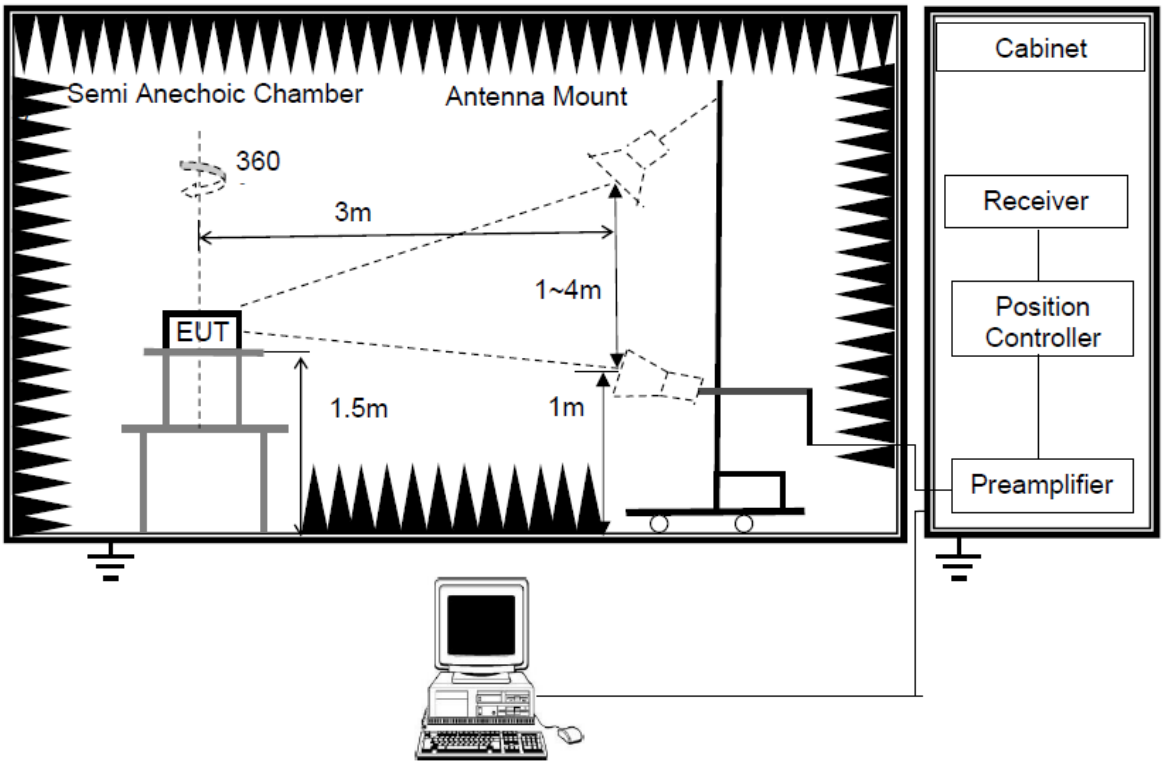
(B) Radiated Emission Test Set-Up, Frequency below 1000MHz

Below 1 GHz and above 30 MHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz

Above 1GHz



10.3. Spectrum Analyzer Setting

For 9KHz-150KHz	
Spectrum Parameters	**Setting**
RBW	300Hz (for Peak&AVG)/CISPR 200Hz (for QP)
VBW	300Hz (for Peak&AVG)/CISPR 200Hz (for QP)
Start frequency	9KHz
Stop frequency	150KHz
Sweep Time	Auto
Detector	PEAK/QP/AVG
Trace Mode	Max Hold

Note: For 9KHz-90KHz&110KHz-150KHz,the detector is average,other frequency is CISPR QP detector.

For 150KHz-30MHz	
Spectrum Parameters	**Setting**
RBW	9KHz
VBW	30KHz
Start frequency	150KHz
Stop frequency	30MHz
Sweep Time	Auto
Detector	QP
Trace Mode	Max Hold

Note : For 150KHz-490KHz,the detector is average,other frequency is CISPR QP detector.

For 30MHz-1GHz	
Spectrum Parameters	**Setting**
RBW	100KHz
VBW	300KHz
Start frequency	30MHz
Stop frequency	1GHz
Sweep Time	Auto
Detector	QP
Trace Mode	Max Hold

For Above 1GHz		
Spectrum Parameters	**Setting**	
RBW	1MHz	
VBW	PEAK Measurement	AVG Measurement
	3MHz	Duty cycle≥98%, VBW=10Hz
		Duty cycle＜98%,VBW≥1/T
Start frequency	1GHz	
Stop frequency	40GHz	
Sweep Time	Auto	
Detector	PEAK	
Trace Mode	Max Hold	

Note: T is the on-time time of the duty cycle, when EUT transmit continuously with maximum output power, unit is seconds. reference section 3 for the on-time time.

10.4. Test Procedure

a. EUT was placed on a turn table, which is 0.8-meter high above ground for below 1GHz test, and which is 1.5-meter high above ground for above 1GHz test.
b. The diameter of the turntable is 2 meters. The EUT is located at the center of the edge of the test support table. Since the turntable is large enough, the EUT is placed at the center of the edge of the test support table as well as at the center of the turntable.
c. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower.
d. Set the EUT transmit continuously with maximum output power.
e. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
f. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.
g. Spectrum analyzer setting parameters in accordance with section 10.3.
h. Repeat above procedures until all channels and test modes were measured.
i. Record the results in the test report.

Note:

1. For emissions above 1GHz, if peak level complies with average limit, then the average level is deemed to comply with average limit.
2. The frequency 2402MHz ,2440MHz and 2480MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.
3. For 30-1000MHz Radiation emissions, BLE 1M-GFSK mode all have been tested, only worse case: BLE 1M-GFSK mode with CH39 2480MHz is reported.
4. Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9KHz to 30MHz and not recorded in this report.
5. The amplitude of 18GHz to 25GHz spurious emission-that-is attenuated by more than 20dB below the-permissible-limit has no need-to-be-reported.
6. Radiated emission test from 25GHz to 40GHz of fundamental was verified, and no emission found except system noise floor in 25GHz to 40GHz and not recorded in this report.

10.5. Test Conditions

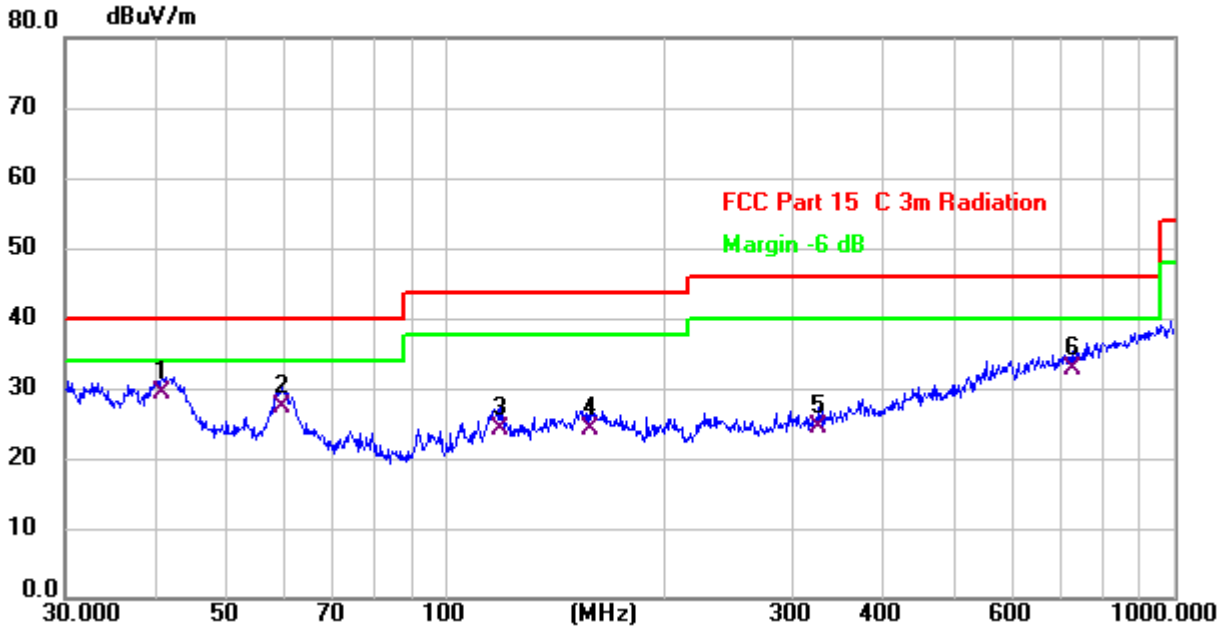
Radiated Emissions 30-1000MHz			
EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	25.8℃	**Humidity:**	45 % RH
Atmosphere Pressure:	101.1kPa		

Radiated Emissions Above 1GHz & Radiated Band Edge			
EUT:	Electronic bicycle shifter / Controller	**M/N:**	SW
Test Voltage:	3V DC button cell		
Temperature:	25.8℃	**Humidity:**	45 % RH
Atmosphere Pressure:	101.1kPa		

10.6. Test Result

Radiated Emissions 30-1000MHz

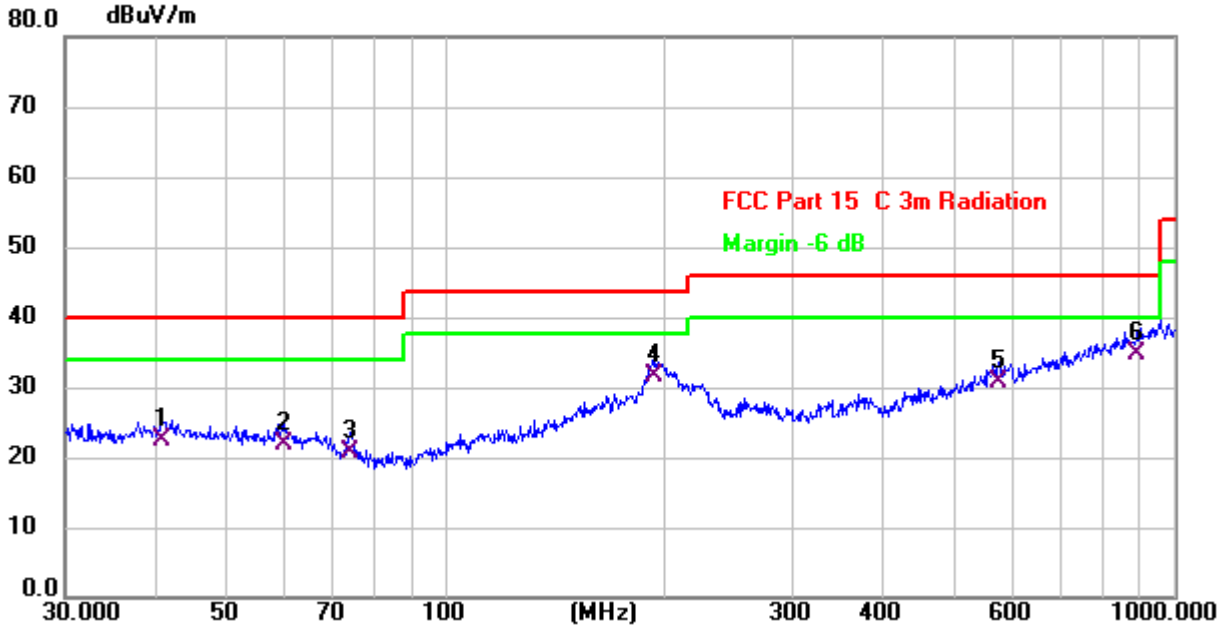
EUT: Electronic bicycle shifter / Controller
M/N: SW
Test Voltage: 3V DC button cell
Ant. Pol.: Vertical
Test Mode: TX Mode
Note: only worse case: BLE 1M-GFSK mode with CH39 2480MHz is reported
Detailed results are shown below



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	**40.844**	9.47	19.94	29.41	40.00	**-10.59**	**QP**
2	**59.441**	8.58	18.83	27.41	40.00	**-12.59**	**QP**
3	**118.601**	5.90	18.30	24.20	43.50	**-19.30**	**QP**
4	**157.559**	3.94	20.28	24.22	43.50	**-19.28**	**QP**
5	**325.596**	3.53	20.80	24.33	46.00	**-21.67**	**QP**
6	**724.261**	4.05	28.53	32.58	46.00	**-13.42**	**QP**

Remarks: 1). Level (dBμV/m) = Reading (dBμV/m) + Factor (dB/m)
2). Factor(dB/m) =Antenna Factor (dB/m) + Cable loss (dB)
3). Margin(dB) = Level (dBμV/m) - Limit (dBμV/m)

EUT: Electronic bicycle shifter / Controller
M/N: SW
Test Voltage: 3V DC button cell
Ant. Pol.: Horizontal
Test Mode: TX Mode
Note: only worse case: BLE 1M-GFSK mode with CH39 2480MHz is reported
Detailed results are shown below



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	**40.844**	2.47	19.94	22.41	40.00	**-17.59**	**QP**
2	**59.859**	3.00	18.96	21.96	40.00	**-18.04**	**QP**
3	**73.876**	4.37	16.29	20.66	40.00	**-19.34**	**QP**
4	**193.094**	14.64	16.80	31.44	43.50	**-12.06**	**QP**
5	**574.626**	4.34	26.36	30.70	46.00	**-15.30**	**QP**
6 *	**890.728**	3.74	31.10	34.84	46.00	**-11.16**	**QP**

Remarks: 1). Level (dBμV/m) = Reading (dBμV/m) + Factor (dB/m)
2). Factor(dB/m) = Antenna Factor (dB/m) + Cable loss (dB)
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Radiated Emissions Above 1GHz - BLE 1M-GFSK

BLE 1M-GFSK-CH00 2402MHz										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2317.500	40.76	-19.58	74.0	33.24	Peak	288.00	150	Horizontal	Pass
1**	2317.500	30.96	-19.58	54.0	23.04	AV	288.00	150	Horizontal	Pass
2	4756.000	49.08	-10.49	74.0	24.92	Peak	324.00	150	Horizontal	Pass
2**	4756.000	39.83	-10.49	54.0	14.17	AV	324.00	150	Horizontal	Pass
3	4804.000	48.37	-11.07	74.0	25.63	Peak	360.00	150	Horizontal	Pass
3**	4804.000	42.55	-11.07	54.0	11.45	AV	360.00	150	Horizontal	Pass
4	7205.750	48.29	-6.87	74.0	25.71	Peak	72.00	150	Horizontal	Pass
4**	7205.750	42.05	-6.87	54.0	11.95	AV	72.00	150	Horizontal	Pass
5	7899.750	52.60	-6.18	74.0	21.40	Peak	288.00	150	Horizontal	Pass
5**	7899.750	42.69	-6.18	54.0	11.31	AV	288.00	150	Horizontal	Pass
6	17937.000	52.54	1.57	74.0	21.46	Peak	72.00	150	Horizontal	Pass
6**	17937.000	44.17	1.57	54.0	9.83	AV	72.00	150	Horizontal	Pass

BLE 1M-GFSK-CH00 2402MHz										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2313.900	41.02	-19.56	74.0	32.98	Peak	144.00	150	Vertical	Pass
1**	2313.900	31.95	-19.56	54.0	22.05	AV	144.00	150	Vertical	Pass
2	4766.750	49.21	-10.55	74.0	24.79	Peak	36.00	150	Vertical	Pass
2**	4766.750	40.22	-10.55	54.0	13.78	AV	36.00	150	Vertical	Pass
3	4804.000	46.42	-11.07	74.0	27.58	Peak	360.00	150	Vertical	Pass
3**	4804.000	40.61	-11.07	54.0	13.39	AV	360.00	150	Vertical	Pass
4	7205.750	50.74	-6.87	74.0	23.26	Peak	108.00	150	Vertical	Pass
4**	7205.750	43.20	-6.87	54.0	10.80	AV	108.00	150	Vertical	Pass
5	7681.000	52.79	-6.44	74.0	21.21	Peak	288.00	150	Vertical	Pass
5**	7681.000	42.59	-6.44	54.0	11.41	AV	288.00	150	Vertical	Pass
6	17947.501	53.38	1.22	74.0	20.62	Peak	360.00	150	Vertical	Pass
6**	17947.501	44.73	1.22	54.0	9.27	AV	360.00	150	Vertical	Pass

BLE 1M-GFSK-CH19 2440MHz										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2284.600	40.93	-19.45	74.0	33.07	Peak	72.00	150	Vertical	Pass
1**	2284.600	30.73	-19.45	54.0	23.27	AV	72.00	150	Vertical	Pass
2	4573.000	48.83	-11.84	74.0	25.17	Peak	216.00	150	Vertical	Pass
2**	4573.000	40.09	-11.84	54.0	13.91	AV	216.00	150	Vertical	Pass
3	4879.750	46.66	-10.57	74.0	27.34	Peak	216.00	150	Vertical	Pass
3**	4879.750	41.25	-10.57	54.0	12.75	AV	216.00	150	Vertical	Pass
4	7319.750	51.05	-6.79	74.0	22.95	Peak	36.00	150	Vertical	Pass
4**	7319.750	44.16	-6.79	54.0	9.84	AV	36.00	150	Vertical	Pass
5	7675.500	53.23	-6.36	74.0	20.77	Peak	360.00	150	Vertical	Pass
5**	7675.500	43.55	-6.36	54.0	10.45	AV	360.00	150	Vertical	Pass
6	17486.500	52.27	1.22	74.0	21.73	Peak	360.00	150	Vertical	Pass
6**	17486.500	43.92	1.22	54.0	10.08	AV	360.00	150	Vertical	Pass

BLE 1M-GFSK-CH19 2440MHz										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2300.000	40.39	-19.51	74.0	33.61	Peak	252.00	150	Horizontal	Pass
1**	2300.000	30.81	-19.51	54.0	23.19	AV	252.00	150	Horizontal	Pass
2	4779.500	49.49	-10.48	74.0	24.51	Peak	216.00	150	Horizontal	Pass
2**	4779.500	39.95	-10.48	54.0	14.05	AV	216.00	150	Horizontal	Pass
3	4879.750	47.12	-10.57	74.0	26.88	Peak	108.00	150	Horizontal	Pass
3**	4879.750	42.13	-10.57	54.0	11.87	AV	108.00	150	Horizontal	Pass
4	7319.750	49.73	-6.79	74.0	24.27	Peak	360.00	150	Horizontal	Pass
4**	7319.750	42.80	-6.79	54.0	11.20	AV	360.00	150	Horizontal	Pass
5	7897.750	52.96	-6.15	74.0	21.04	Peak	360.00	150	Horizontal	Pass
5**	7897.750	43.72	-6.15	54.0	10.28	AV	360.00	150	Horizontal	Pass
6	17846.499	52.22	0.28	74.0	21.78	Peak	180.00	150	Horizontal	Pass
6**	17846.499	41.95	0.28	54.0	12.05	AV	180.00	150	Horizontal	Pass

BLE 1M-GFSK-CH39 2480MHz										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2171.400	40.59	-20.10	74.0	33.41	Peak	360.00	150	Horizontal	Pass
1**	2171.400	30.63	-20.10	54.0	23.37	AV	360.00	150	Horizontal	Pass
2	4736.000	48.95	-10.69	74.0	25.05	Peak	252.00	150	Horizontal	Pass
2**	4736.000	40.54	-10.69	54.0	13.46	AV	252.00	150	Horizontal	Pass
3	4959.750	47.54	-10.88	74.0	26.46	Peak	36.00	150	Horizontal	Pass
3**	4959.750	43.26	-10.88	54.0	10.74	AV	36.00	150	Horizontal	Pass
4	7439.750	49.29	-6.77	74.0	24.71	Peak	324.00	150	Horizontal	Pass
4**	7439.750	42.34	-6.77	54.0	11.66	AV	324.00	150	Horizontal	Pass
5	7719.500	52.70	-6.30	74.0	21.30	Peak	252.00	150	Horizontal	Pass
5**	7719.500	43.01	-6.30	54.0	10.99	AV	252.00	150	Horizontal	Pass
6	17945.000	53.71	1.32	74.0	20.29	Peak	360.00	150	Horizontal	Pass
6**	17945.000	43.39	1.32	54.0	10.61	AV	360.00	150	Horizontal	Pass

BLE 1M-GFSK-CH39 2480MHz										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2239.000	41.00	-19.74	74.0	33.00	Peak	180.00	150	Vertical	Pass
1**	2239.000	31.28	-19.74	54.0	22.72	AV	180.00	150	Vertical	Pass
2	4732.750	48.93	-10.72	74.0	25.07	Peak	288.00	150	Vertical	Pass
2**	4732.750	39.60	-10.72	54.0	14.40	AV	288.00	150	Vertical	Pass
3	4959.750	45.65	-10.88	74.0	28.35	Peak	360.00	150	Vertical	Pass
3**	4959.750	39.77	-10.88	54.0	14.23	AV	360.00	150	Vertical	Pass
4	7439.750	50.39	-6.77	74.0	23.61	Peak	288.00	150	Vertical	Pass
4**	7439.750	43.48	-6.77	54.0	10.52	AV	288.00	150	Vertical	Pass
5	7840.250	53.15	-6.21	74.0	20.85	Peak	216.00	150	Vertical	Pass
5**	7840.250	44.03	-6.21	54.0	9.97	AV	216.00	150	Vertical	Pass
6	17926.001	53.61	1.34	74.0	20.39	Peak	72.00	150	Vertical	Pass
6**	17926.001	45.05	1.34	54.0	8.95	AV	72.00	150	Vertical	Pass

Note:
1. Results (dBuV/m) =Raw Value (dBuV) + Factor (dB/m)
2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Pre-amplifier
3. Margin value = Limit - Results.

Radiated Band Edge - BLE 1M-GFSK

BLE 1M-GFSK-CH00 2402MHz-Low Band Edge										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2314.015	48.69	-19.40	74.0	25.31	Peak	191.20	150	Vertical	Pass
1**	2314.015	41.55	-19.40	54.0	12.45	AV	191.20	150	Vertical	Pass
2	2389.970	40.69	-19.56	74.0	33.31	Peak	151.10	150	Vertical	Pass
2**	2389.970	30.11	-19.56	54.0	23.89	AV	151.10	150	Vertical	Pass
3	2399.980	59.69	-19.64	74.0	14.31	Peak	188.80	150	Vertical	Pass
3**	2399.980	45.43	-19.64	54.0	8.57	AV	188.80	150	Vertical	Pass

BLE 1M-GFSK-CH00 2402MHz-Low Band Edge										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2386.010	48.69	-19.55	74.0	25.31	Peak	148.60	150	Horizontal	Pass
1**	2386.010	43.27	-19.55	54.0	10.73	AV	148.60	150	Horizontal	Pass
2	2389.970	40.23	-19.56	74.0	33.77	Peak	153.70	150	Horizontal	Pass
2**	2389.970	31.04	-19.56	54.0	22.96	AV	153.70	150	Horizontal	Pass
3	2399.980	67.40	-19.64	74.0	6.60	Peak	148.60	150	Horizontal	Pass
3**	2399.980	48.51	-19.64	54.0	5.49	AV	148.60	150	Horizontal	Pass

BLE 1M-GFSK-CH39 2480MHz-High Band Edge										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.485	49.17	-19.50	74.0	24.83	Peak	303.70	150	Horizontal	Pass
1**	2483.485	32.70	-19.50	54.0	21.30	AV	303.70	150	Horizontal	Pass
2	2483.710	49.39	-19.50	74.0	24.61	Peak	249.90	150	Horizontal	Pass
2**	2483.710	33.15	-19.50	54.0	20.85	AV	249.90	150	Horizontal	Pass
3	2496.085	44.42	-19.48	74.0	29.58	Peak	263.50	150	Horizontal	Pass
3**	2496.085	36.97	-19.48	54.0	17.03	AV	263.50	150	Horizontal	Pass

BLE 1M-GFSK-CH39 2480MHz-High Band Edge										
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2483.485	40.21	-19.50	74.0	33.79	Peak	13.30	150	Vertical	Pass
1**	2483.485	30.28	-19.50	54.0	23.72	AV	13.30	150	Vertical	Pass
2	2488.210	41.71	-19.50	74.0	32.29	Peak	360.00	150	Vertical	Pass
2**	2488.210	30.31	-19.50	54.0	23.69	AV	360.00	150	Vertical	Pass
3	2494.105	42.17	-19.49	74.0	31.83	Peak	17.90	150	Vertical	Pass
3**	2494.105	30.29	-19.49	54.0	23.71	AV	17.90	150	Vertical	Pass

Note:
1. Results (dBuV/m) =Raw Value (dBuV) + Factor (dB/m)
2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Pre-amplifier
3. Margin value = Limit - Results.

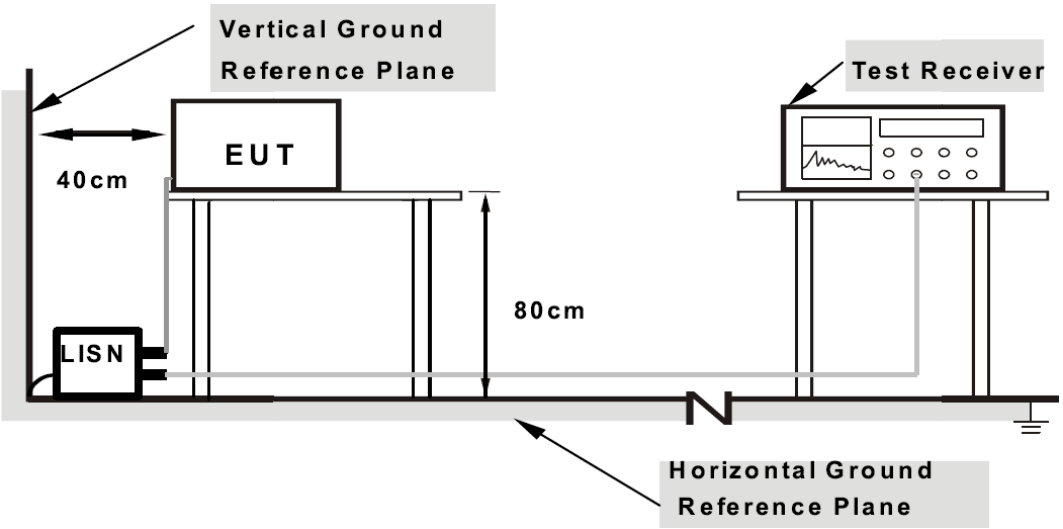
11. AC Power Line Conducted Emissions

11.1. Limit

Frequency			Maximum RF Line Voltage	
			Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz	~	500kHz	66 ~ 56*	56 ~ 46*
500kHz	~	5MHz	56	46
5MHz	~	30MHz	60	50

Note:
1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

11.2. Test Setup



11.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	9KHz
VBW	9KHz
Start frequency	150KHz
Stop frequency	30MHz
Sweep Time	Auto
Detector	QP/AVG
Trace Mode	Max Hold

11.4. Test Procedure

a. The EUT was placed on a non-metallic table, 80cm above the ground plane.
b. The EUT Power connected to the power mains through a line impedance stabilization network.
c. Provides a 50ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs).
d. Set the EUT transmit continuously with maximum output power.
e. Spectrum analyzer setting parameters in accordance with section 11.3.
f. The AC line is checked to find out the maximum conducted emission. To find the maximum emission levels, the relative positions of equipment and all the interface cables shall be changed according to ANSI C63.10 on Conducted Emission Test.

11.5. Test Conditions

EUT:		**M/N:**	
Test Voltage:			
Temperature:	℃	**Humidity:**	% RH
Atmosphere Pressure:	kPa		

11.6. Test Result

N/A

(Note: The EUT is powered by a 3V DC button cell battery and cannot be directly or indirectly connected to the public AC power supply network. This test is not applicable.)

12. ANTENNA REQUIREMENTS

12.1. Limit

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, 15.221, or §15.236. 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.

12.2. Test Result

The antennas used for this product is SMD Antenna (internal), so compliance with antenna requirements. (Please refer to the **Annex B. EUT Internal Photos** for details)

13.APPENDIX

"EUT of External Photos, EUT Internal Photos & Test Setup Photos" Please refer to the Annex A, Annex B& Annex C document.

CTSL2620830320E Annex A. EUT External Photos
CTSL2620830320E Annex B. EUT Internal Photos
CTSL2620830320E Annex C. Test Setup Photos

----------***End of Test Report***----------