FCC RF TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

8BitDo PCE 2.4g wireless gamepad

ISSUED TO
SHENZHEN 8BITDO TECH CO., LTD.

Room 210, Building 1, Nanhai Ecool, No.6 Xinghua Road, Shekou, Nanshan District, Shenzhen

Tested by: Heng Aiping
Date Mar. 03 2020

Approved by: Wei Yanquan (Chief Engineer)
Date Mar. 03, 2020

Report No.:	BL-SZ2020087-601
EUT Name:	8BitDo PCE 2.4g wireless gamepad
Model Name:	81FA (refer section 2.4)
Brand Name:	8BITDO
Test Standard:	47 CFR Part 15 Subpart C
FCC ID:	2AOWF-24GPCE
Test Conclusion:	Pass
Test Date:	Feb. 16, 2020 ~ Feb. 21, 2020
Date of Issue:	Mar. 03, 2020

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Revision History

Version	Issue Date	Revisions
Rev. 01	Feb. 28, 2020	Initial Issue
Rev. 02	Mar. 03, 2020	Revise the power limit on page 31.

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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.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation(A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20℃ to 25℃
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 v2.2.

(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.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	SHENZHEN 8BITDO TECH CO., LTD.
Address	Room 210, Building 1, Nanhai Ecool, No.6 Xinghua Road, Shekou, Nanshan District, Shenzhen

2.2 Manufacturer Information

Manufacturer	Shenzhen Zhongxingda Electronic Co., Ltd.
Address	3-4/F, Bldg 10, Tongfuyu Industrial Zone,Lezhujiao Village, Xixiang, Baoan District, Shenzhen

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Type	8BitDo PCE 2.4g wireless gamepad
Model Name Under Test	81FA
Series Model Name	81F
Description of Model name differentiation	All models have the same electrical parameters and internal circuit structure, but only different model name and appearance.
Hardware Version	1.0
Software Version	1.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

Network and Wireless connectivity	2.4G ISM Band (GFSK modulation)

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

Modulation Technology	FHSS
Modulation Type	GFSK
Product Type	☐ Mobile ☒ Portable ☐ Fix Location
Transfer Rate	0.25 Mbps
Frequency Range	The frequency range used is 2402 MHz – 2480 MHz; The frequency block is 2400 MHz to 2483.5 MHz.
Number of channel	15 (See note 1)
Tested Channel	Low channel (2402 MHz), Middle channel (2441 MHz), High channel (2480 MHz)
Antenna Type	PCB Antenna
Antenna Gain	0.84 dBi (In test items related to antenna gain, the final results reflect this figure.)
Adaptive or non-adaptive	non-adaptive
The Max RF Output power	-4.50 dBm

Channel List

Number	Frequency (MHz)	Number	Frequency (MHz)
1	2402(Low)	9	2445
2	2406	10	2448
3	2410	11	2462
4	2414	12	2466
5	2418	13	2470
6	2433	14	2474
7	2437	15	2480(High)
8	2441(Middle)		

Test Case	Test Conditions			
	Modulation Technology	Modulation Type	Date rate	Channel
Number of Hopping Frequency	FHSS	GFSK	0.25 Mbps	Hopping
Peak Output Power	FHSS	GFSK	0.25 Mbps	Low/Middle/High
Occupied Bandwidth	FHSS	GFSK	0.25 Mbps	Low/Middle/High
Carrier Frequency Separation	FHSS	GFSK	0.25 Mbps	Hopping
Time of Occupancy (Dwell time)	FHSS	GFSK	0.25 Mbps	Hopping
Conducted Spurious Emission	FHSS	GFSK	0.25 Mbps	Low/Middle/High
Conducted Emission	FHSS	GFSK	0.25 Mbps	Low/Middle/High
Radiated Emission	FHSS	GFSK	0.25 Mbps	Low/Middle/High
Band Edge	FHSS	GFSK	0.25 Mbps	Low/High

2.6 Additional Instructions

EUT Software Settings:

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

Power level setup in software		
Test Software Version	N/A	
Mode	Channel	Soft Set
GFSK	All	TX LEVEL is built-in set parameters and cannot be changed and selected.

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 Publication 558074 D01v05r02	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	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	--	Pass Note 1
2	Number of Hopping Frequency	15.247(a)	ANNEX A.1	Pass
3	Peak Output Power	15.247(b)	ANNEX A.2	Pass
4	Occupied Bandwidth	15.247(a)	ANNEX A.3	Pass
5	Carrier Frequency Separation	15.247(a)	ANNEX A.4	Pass
6	Time of Occupancy (Dwell time)	15.247(a)	ANNEX A.5	Pass
7	Conducted Spurious Emission& Authorized-band band-edge	15.247(d)	ANNEX A.6	Pass
8	Conducted Emission	15.207	ANNEX A.7	Pass
9	Radiated Spurious Emission	15.209 15.247(d)	ANNEX A.8	Pass
10	Band Edge (Restricted-band band-edge)	15.209 15.247(d)	ANNEX A.9	Pass
11	Receiver Spurious Emissions	--	--	N/A Note 2

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	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	20℃ to +25℃
Working Voltage of the EUT	NV (Normal Voltage)	5 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2019.06.13	2020.06.12
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	260592	2019.06.13	2020.06.12
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2019.08.23	2020.08.22
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2019.06.13	2020.06.12
Spectrum Analyzer	AGILENT	E4440A	MY44020181	2019.02.28	2020.02.27
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2019.06.13	2020.06.12
LISN	SCHWARZBECK	NSLK 8127	8127-687	2019.06.13	2020.06.12
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2019.06.15	2020.06.14
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2019.06.18	2020.06.17
Power Splitter	KMW	DCPD-LDC	1305003215	--	--
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2019.06.15	2020.06.14
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2019.07.02	2020.07.01
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2019.11.09	2021.11.08
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2018.08.22	2020.08.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2019.07.22	2021.07.21
Test Antenna-Horn(15-26.5 GHz)	SCHWARZBECK	BBHA 9170	9170-305	2019.06.21	2020.06.20
Test Antenna-Horn (18-40 GHz)	A-INFO	LB-180400KF	J211060273	2019.01.06	2021.01.05
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2022.02.20
Anechoic Chamber	EMC TECHNOLOGY LTD	21.1m*11.6m*7.35m	N/A	2018.07.19	2020.07.18
Shielded Enclosure	ChangNing	CN-130701	130703	--	--
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2019.06.15	2020.06.14
Power Amplifier	OPHIR RF	5225F	1037	2020.02.19	2021.02.18

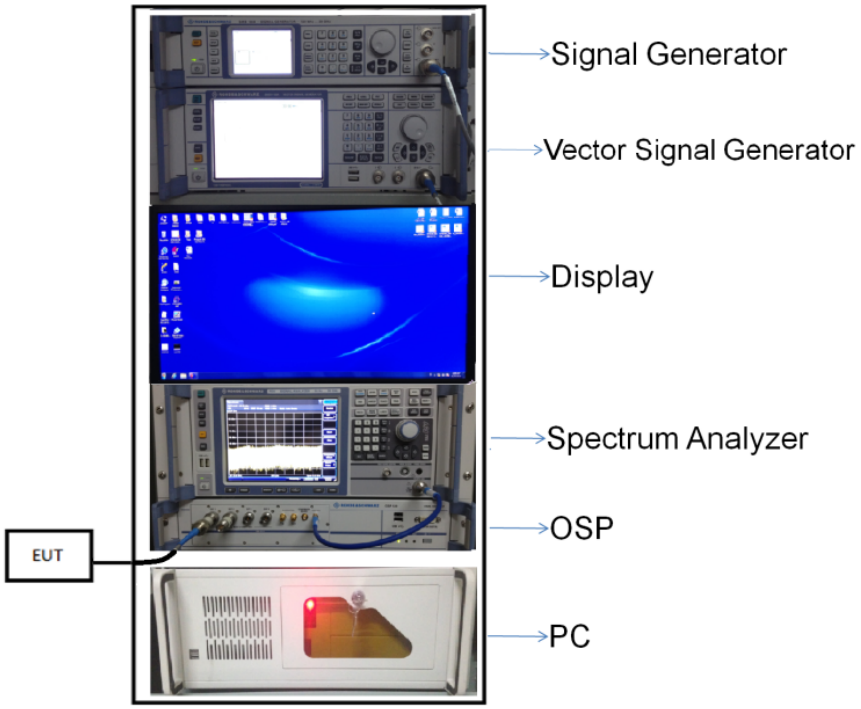
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Power Amplifier	OPHIR RF	5273F	1016	2020.02.19	2021.02.18
Directional Coupler	Werlantone	C5982-10	109275	N/A	N/A
Directional Coupler	Werlantone	CHP-273E	S00801z-01	N/A	N/A
Feld Strength Meter	Narda	EP601	511WX51129	2019.05.22	2020.05.21
Sound Level Meter	B&K	NL-20	00844023	2019.11.12	2020.11.11
Ear Simulator	B&K	4185	2409449	2019.11.12	2020.11.11
Ear Simulator	B&K	4195	2418189	2019.11.12	2020.11.11
Audio analyzer	B&K	UPL 16	100129	2019.11.12	2020.11.11

4.3 Description of Test Setup

4.3.1 For Antenna Port Test

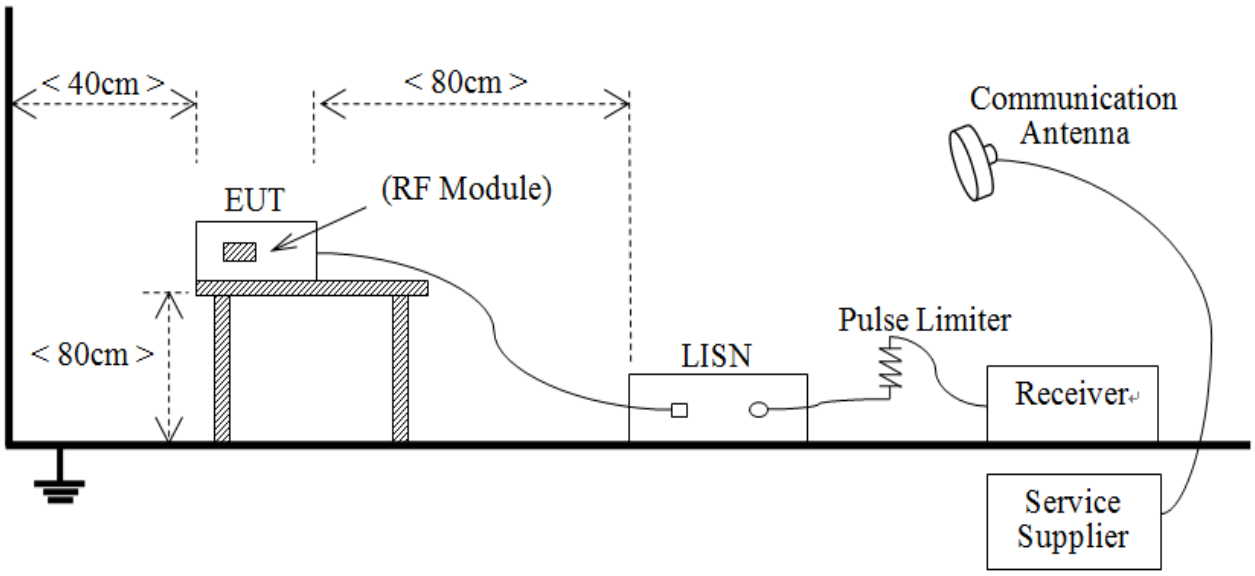
Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

For example: the measurement value is 10 dBm and the cable 0.5dBm used, then the final result of EUT:
Conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



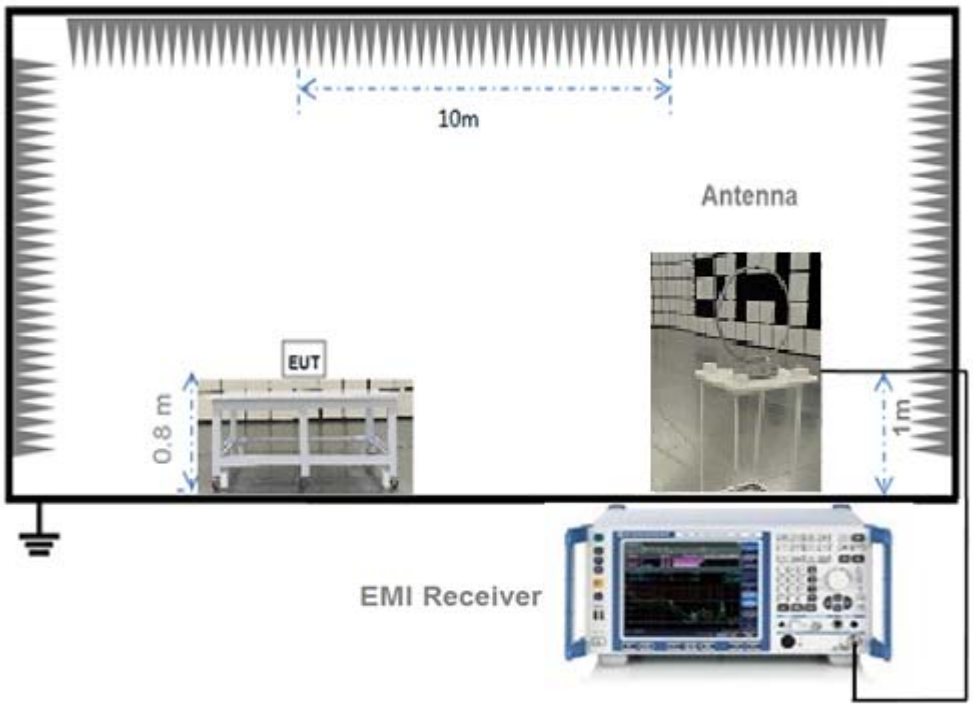
(Diagram 1)

4.3.2 For AC Power Supply Port Test



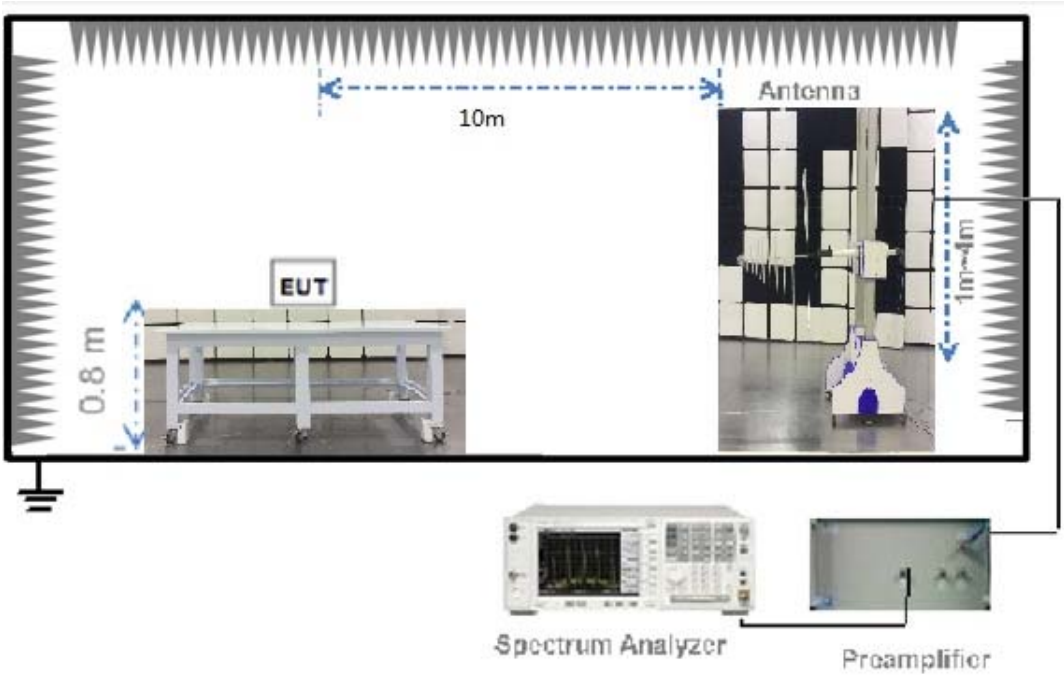
(Diagram 2)

4.3.3 For Radiated Test (Below 30 MHz)



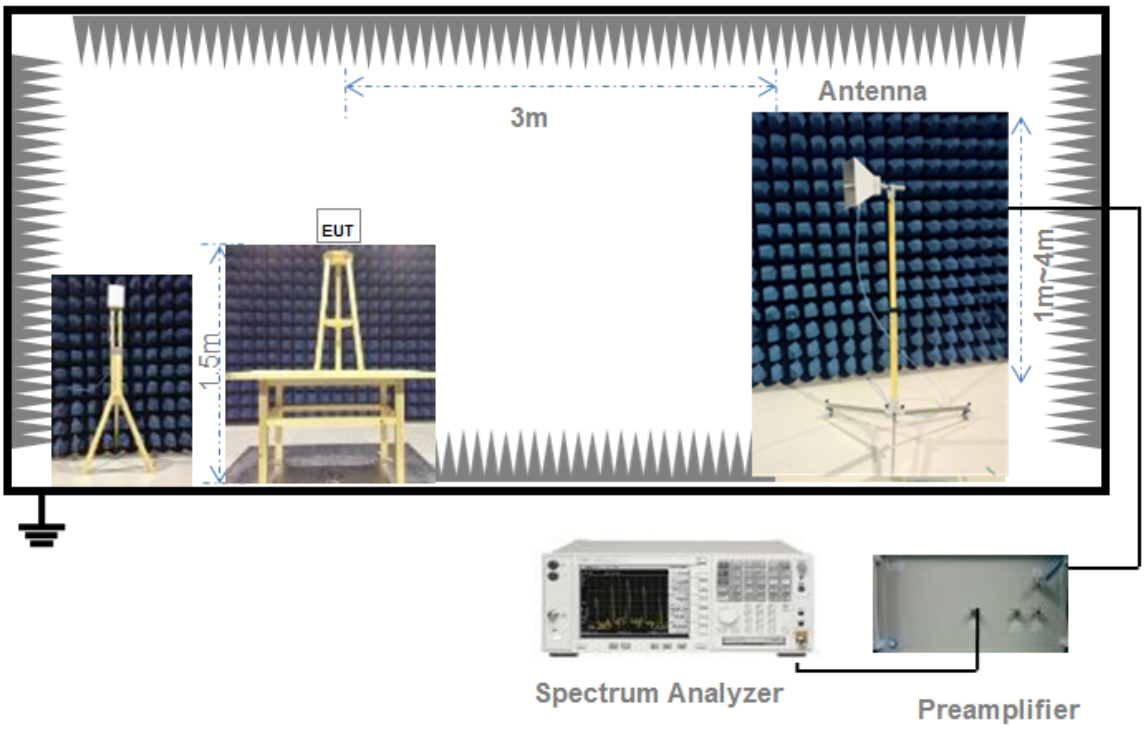
(Diagram 3)

4.3.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.3.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.4 Measurement Results Explanation Example

4.4.1 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.

4.4.2 For radiated band edges and spurious emission test:

Per part 15.35(c), the EUT Bluetooth average emission level could be determined by the peak emission level applying duty cycle correction factor, to represent averaging over the whole pulse train.
The average level is derived from the peak level corrected with “Duty cycle correction factor”.
Average Emission Level (dBuV/m) = Peak Emission Level (dBuV/m) + Duty cycle correction factor (dB)
Duty cycle correction factor (dB) = 20 * log (Duty cycle).
Duty cycle = on time / 100 milliseconds
On time = dwell time * hopping number in 100 ms
For example: bluetooth with dwell time 2.9 ms and 3 hops in 100 ms, then
Duty cycle correction factor (dB) = 20 * log ((2.9 * 3) / 100) = -21.21 dB
Following shows an average computation example with duty cycle correction factor = -21.21 dB, and the peak emission level is 45.61 dBuV/m.
Example:
Average Emission Level (dBuV/m) = Peak Emission Level (dBuV/m) + duty cycle correction factor (dB)
= 45.61 + (-21.21) = 24.4 (dBuV/m)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203 & 15.247(b); RSS-247, 5.4 (6)

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 product.	The antenna is welded on the mainboard, can't be replaced by the consumer

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 Number of Hopping Frequency

5.2.1 Limit

FCC §15.247(a) (1) (iii); RSS-247, 5.1 (4)

Frequency hopping systems operating in the 2400 MHz to 2483.5 MHz bands shall use at least 15 hopping frequencies.

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

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 Peak Output Power

5.3.1 Test Limit

FCC § 15.247(b)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247, 5.4 (2)

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

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

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Occupied Bandwidth

5.4.1 Limit

FCC §15.247(a); RSS-247, 5.1 (1)

Measurement of the 20dB bandwidth of the modulated signal.

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

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.4.4 Test Result

Please refer to ANNEX A.3.

5.5 Carrier Frequency Separation

5.5.1 Limit

FCC §15.247(a); RSS-247, 5.1 (2)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

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 EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

5.5.4 Test Result

Please refer to ANNEX A.4.

5.6 Time of Occupancy (Dwell time)

5.6.1 Limit

FCC §15.247(a); RSS-247, 5.1 (4)

Frequency hopping systems in the 2400 MHz - 2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.6.2 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.

5.6.3 Test Procedure

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

5.6.4 Test Result

Please refer to ANNEX A.5

5.7 Conducted Spurious Emission & Authorized-band band-edge

5.7.1 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.

5.7.2 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.

5.7.3 Test Procedure

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.
RBW = 100 kHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.7.4 Test Result

Please refer to ANNEX A.6.

5.8 Conducted Emission

5.8.1 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 50μH/50Ω line impedance stabilization network (LISN).

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

5.8.2 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.

5.8.3 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.

5.8.4 Test Result

Please refer to ANNEX A.7.

5.9 Radiated Spurious Emission

5.9.1 Limit

FCC §15.209&15.247(d); 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 (dBμV/m) = 20*log[Field Strength (μV/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).

5.9.2 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.

5.9.3 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 ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ 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.

5.9.4 Test Result

Please refer to ANNEX A.8.

5.10 Band Edge (Restricted-band band-edge)

5.10.1 Limit

FCC §15.209&15.247(d); 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).

5.10.2 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.

5.10.3 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 ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ 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.

5.10.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

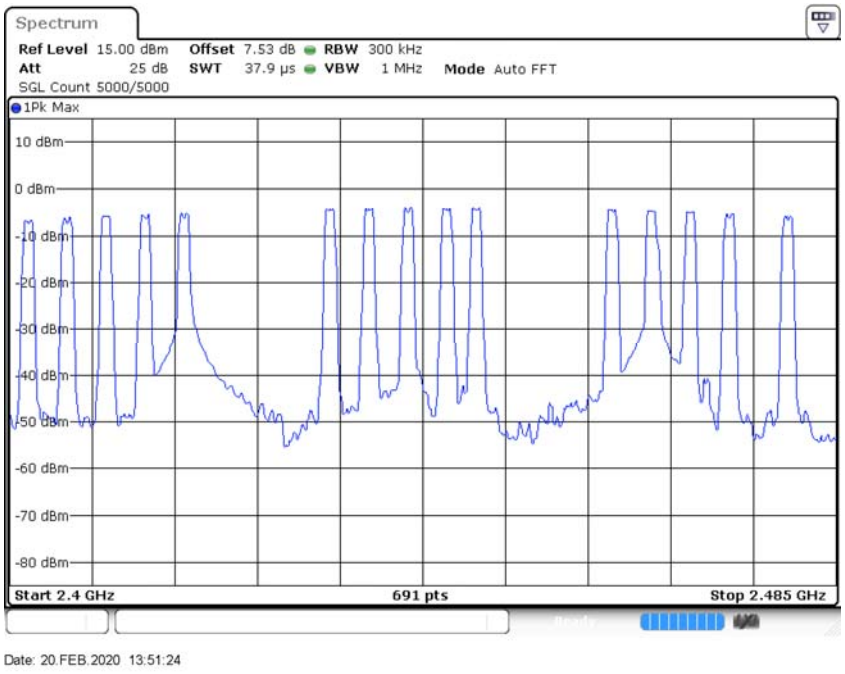
A.1 Number of Hopping Frequency

Test Data

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	15	15	Pass

Test plots

GFSK 2.4 GHz ~ 2.4835 GHz



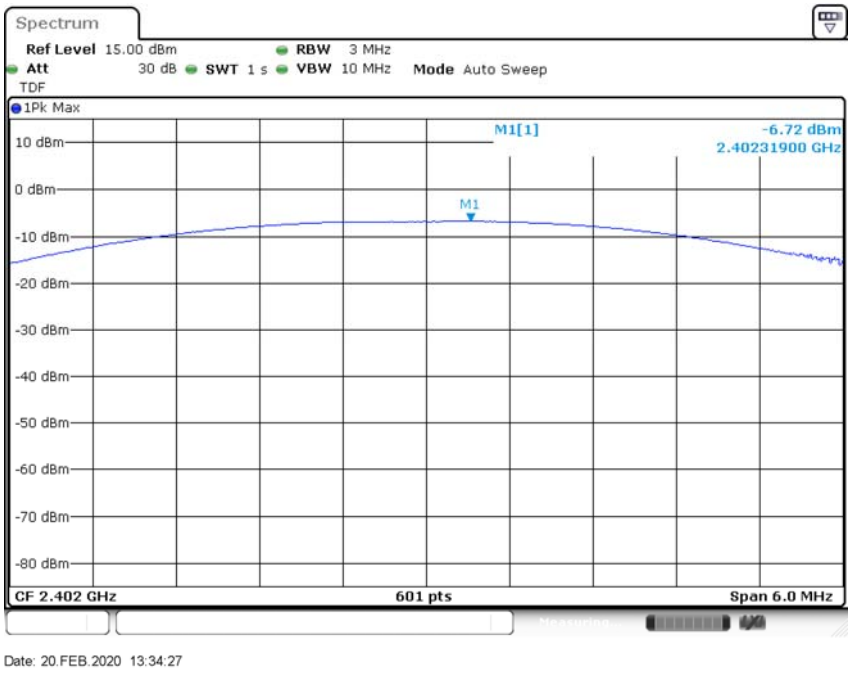
A.2 Peak Output Power

Peak Power Test Data

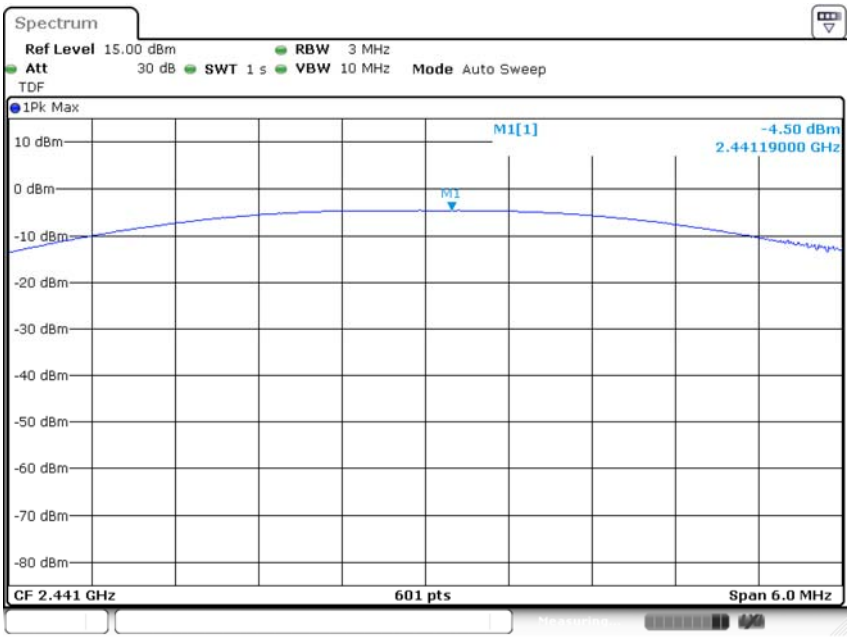
Channel	Measured Output Peak Power		Limit		Verdict
	dBm	mW	dBm	mW	
Low	-6.72	0.21	21	125	Pass
Middle	-4.50	0.35			Pass
High	-6.44	0.23			Pass

Test plots

GFSK LOW CHANNEL

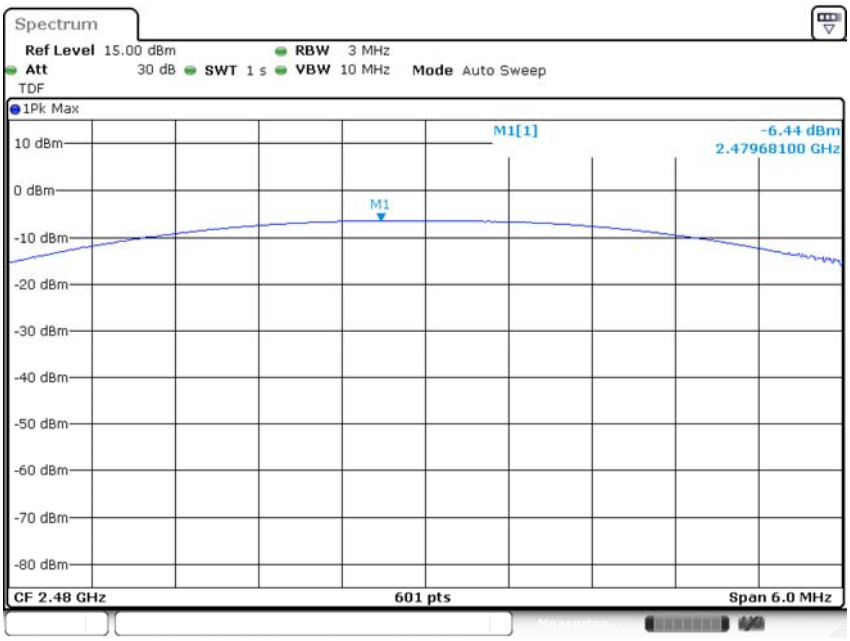


GFSK MIDDLE CHANNEL



Date: 20.FEB.2020 13:38:16

GFSK HIGH CHANNEL



Date: 20.FEB.2020 13:41:45

A.3 20 dB and 99% bandwidth

Test Data

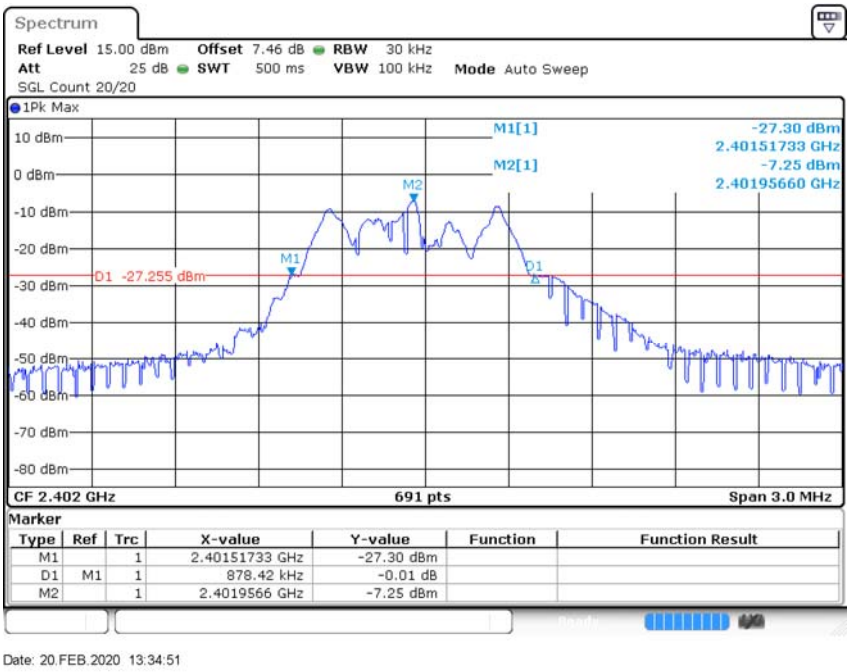
GFSK Mode:

Channel	20 dB Bandwidth (MHz)	99% Bandwidth (kHz)
Low	0.878418	0.863965
Middle	0.886963	0.868307
High	0.995605	0.937771

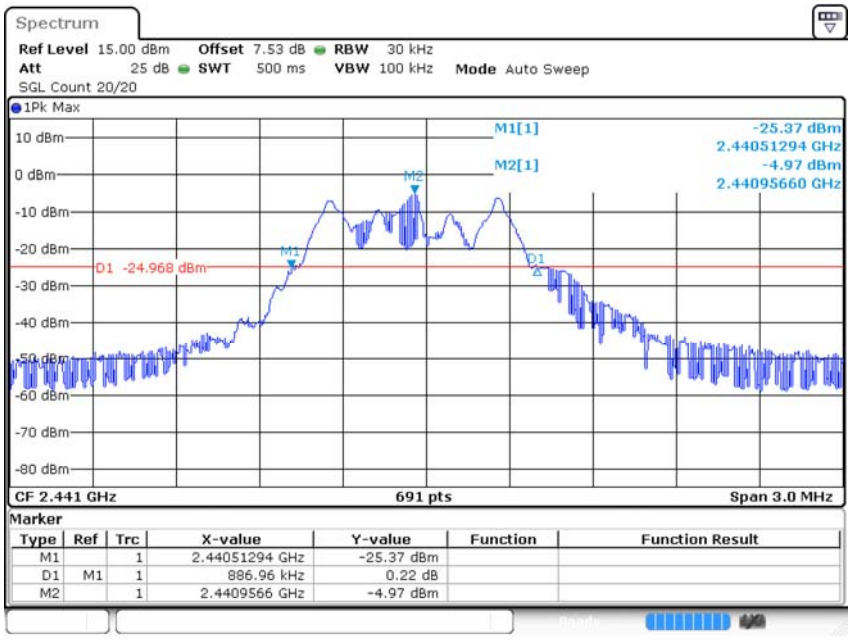
Test plots

20 dB Bandwidth

GFSK LOW CHANNEL

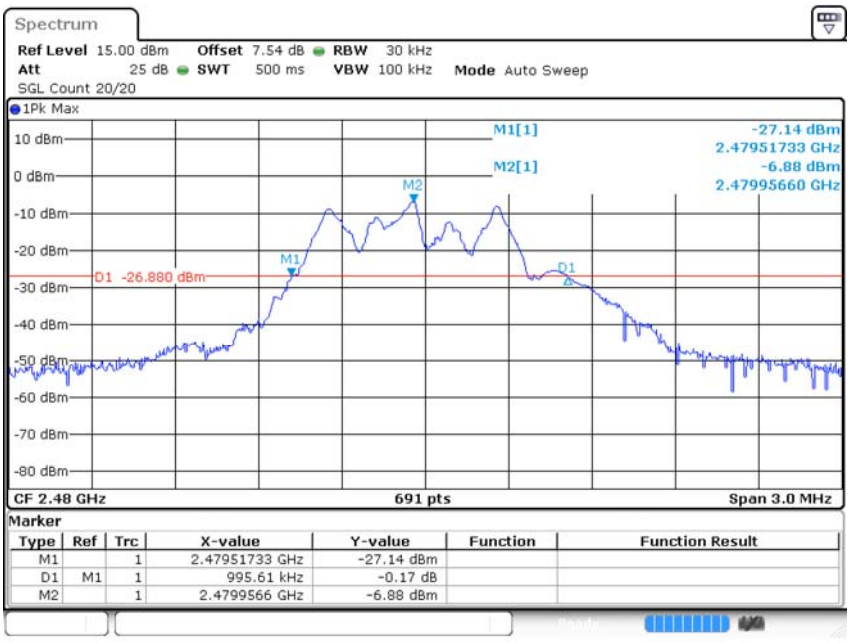


GFSK MIDDLE CHANNEL



Date: 20.FEB.2020 13:38:49

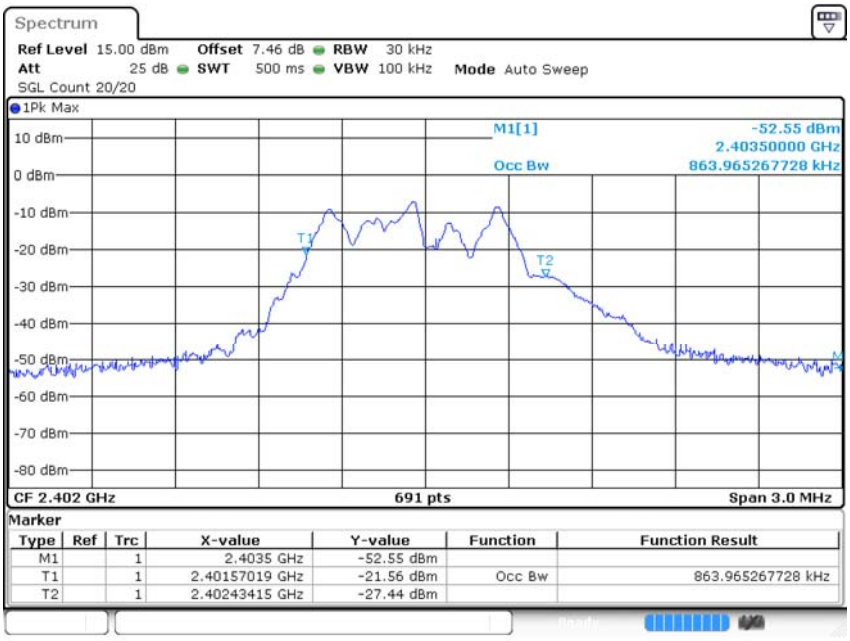
GFSK HIGH CHANNEL



Date: 20.FEB.2020 13:42:03

99% Bandwidth

GFSK LOW CHANNEL

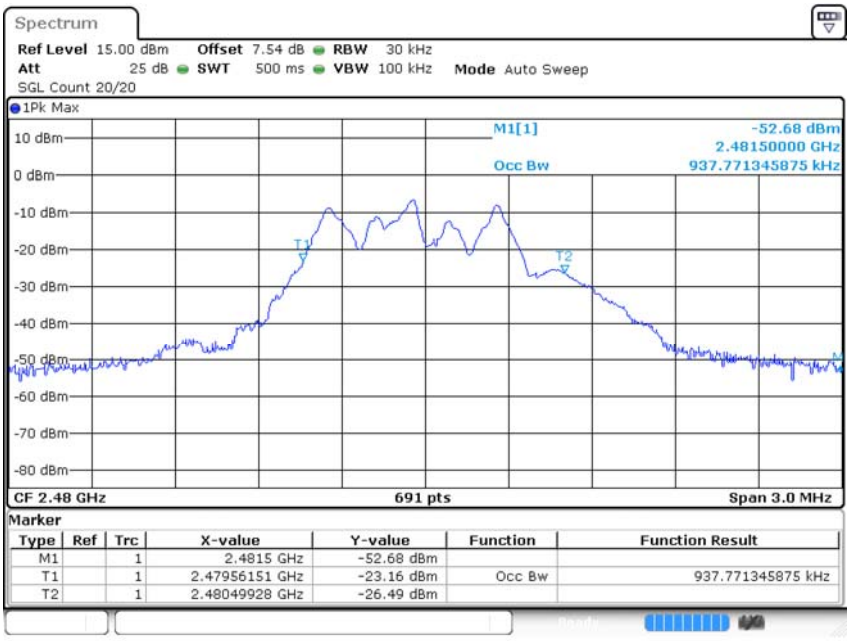


Date: 20.FEB.2020 13:35:13

GFSK MIDDLE CHANNEL

Date: 20.FEB.2020 13:39:07

GFSK HIGH CHANNEL



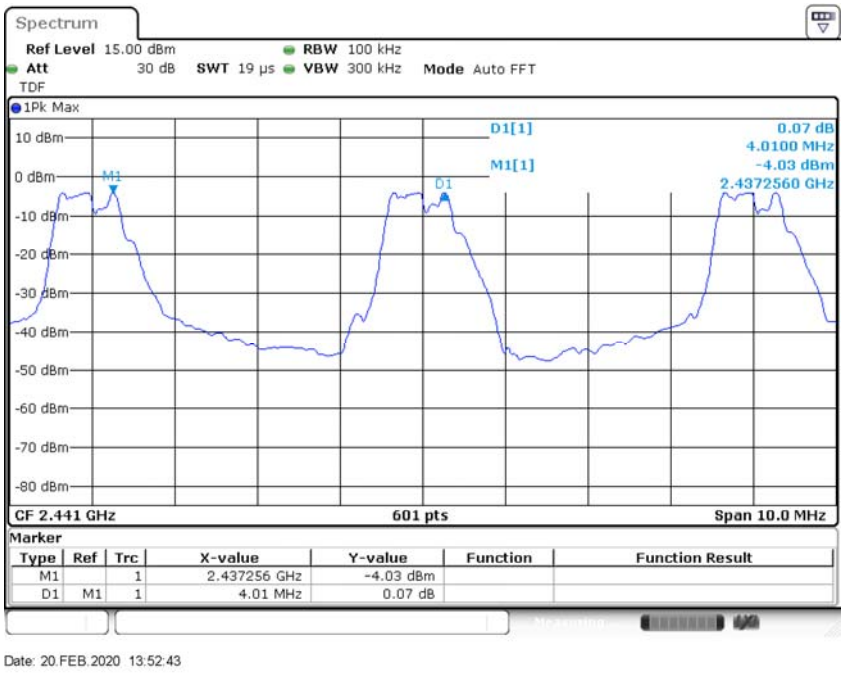
A.4 Hopping Frequency Separation

Test Data

Mode	Frequency separation (MHz)	Max 20 dB Bandwidth (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Verdict
GFSK	4.01	0.995605	0.663737	Pass

Test Plots

GFSK



A.5 Average Time of Occupancy

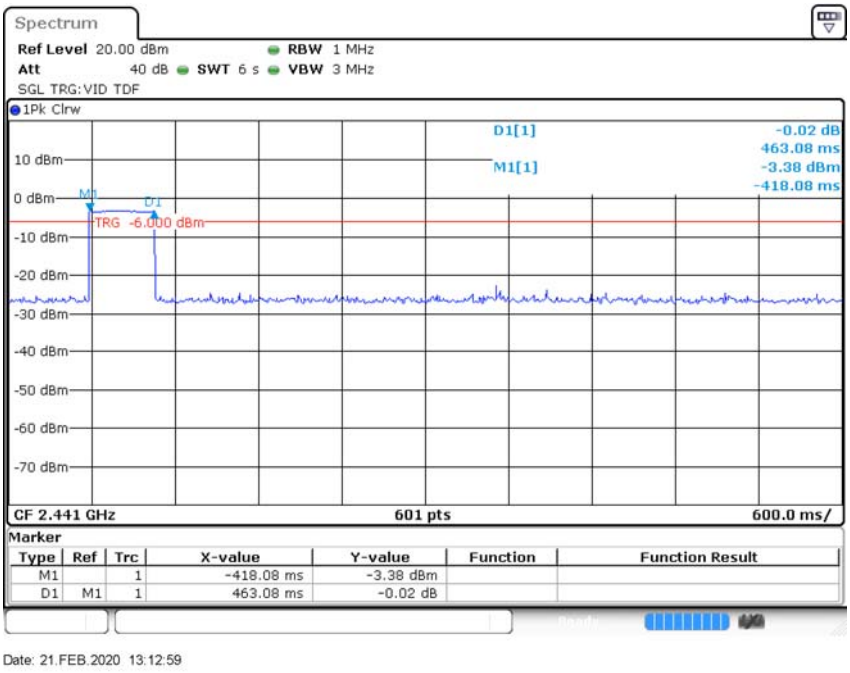
Test Data

GFSK Mode:

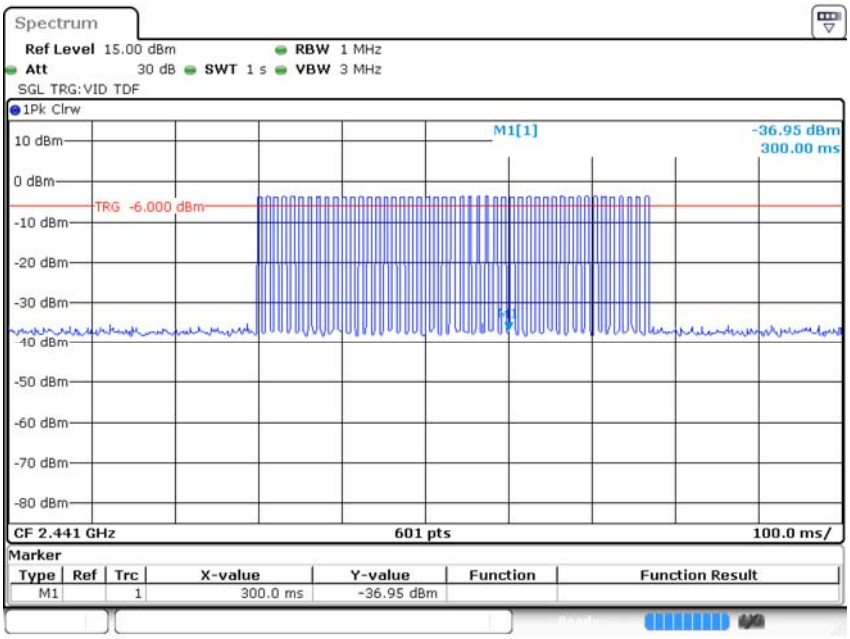
Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
4.68330	220.115	0.4	Pass

Test Plots

GFSK 1

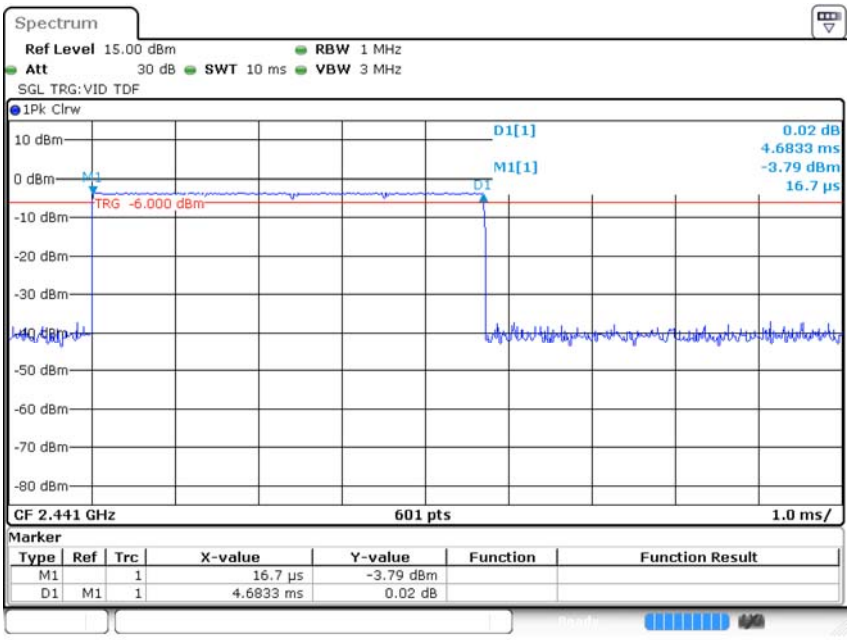


GFSK 2



Date: 20.FEB.2020 14:15:20

GFSK 3



Date: 20.FEB.2020 14:16:47

A.6 Conducted Spurious Emissions & Authorized-band band-edge

Test Data

GFSK Mode:

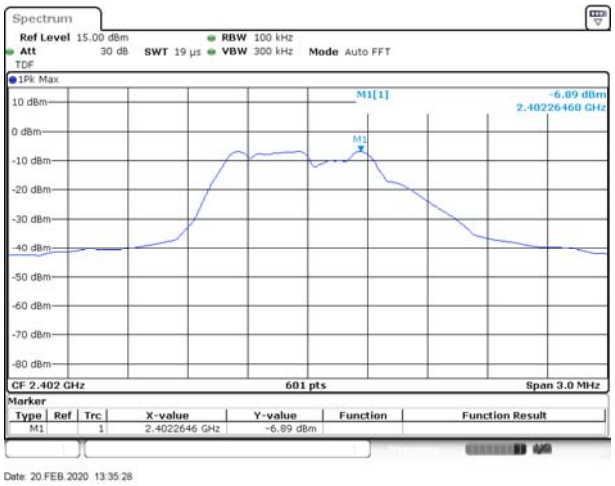
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-37.70	-6.89	-26.89	Pass
Middle	-33.19	-4.72	-24.72	Pass
High	-37.60	-6.63	-26.63	Pass

Hopping Mode:

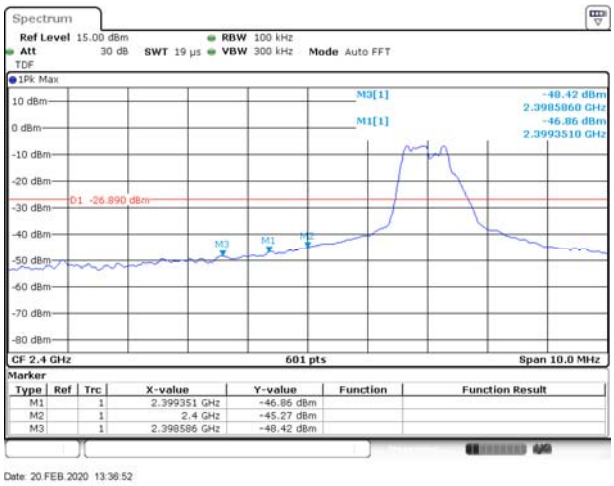
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
GFSK	-32.62	-3.93	-23.93	Pass

Test Plots

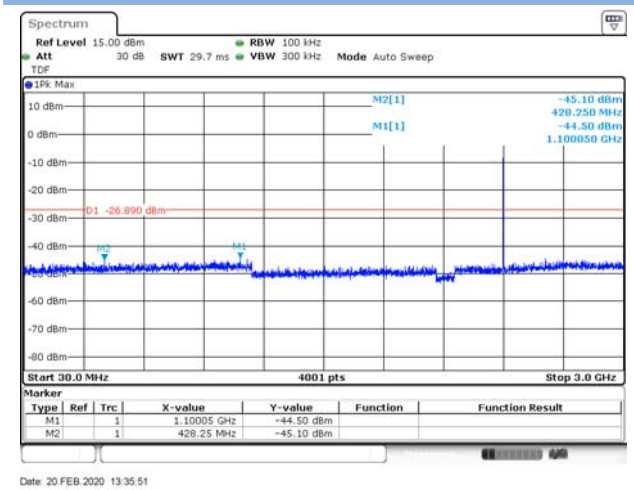
GFSK LOW CHANNEL, CARRIER LEVEL



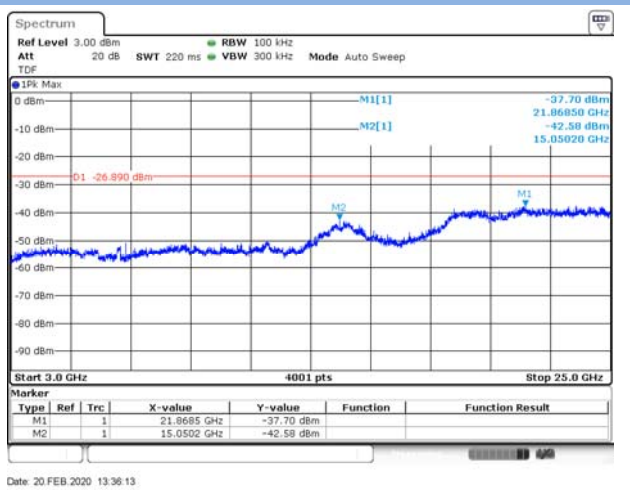
GFSK LOW CHANNEL, BAND EDGE



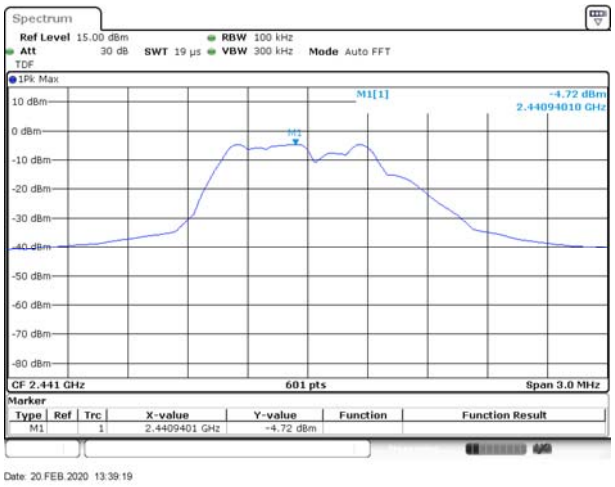
GFSK LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



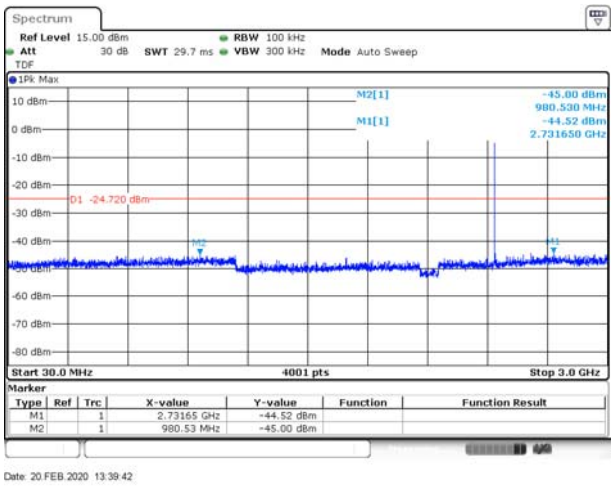
GFSK LOW CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



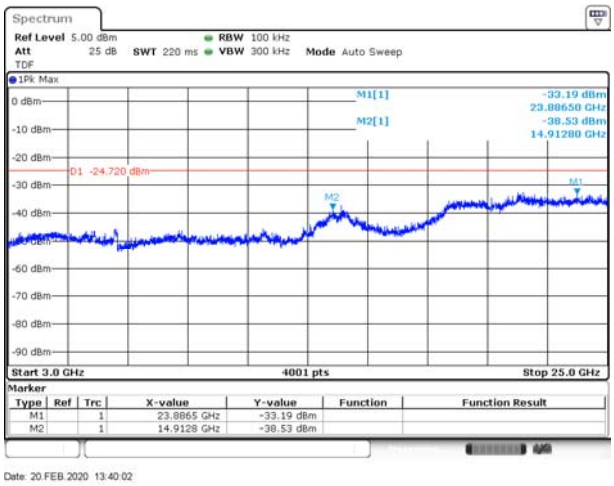
GFSK MIDDLE CHANNEL, CARRIER LEVEL



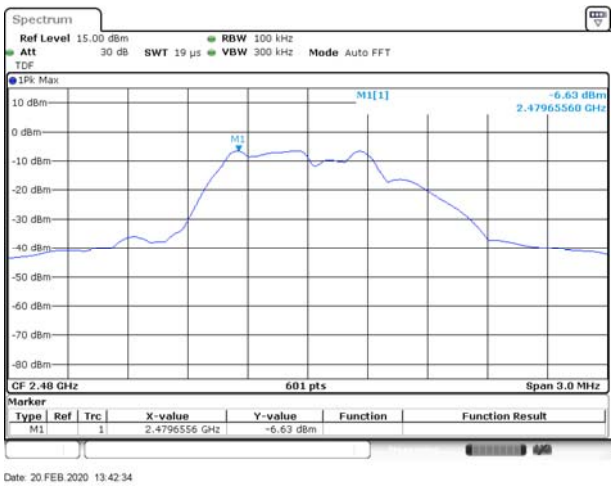
GFSK MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



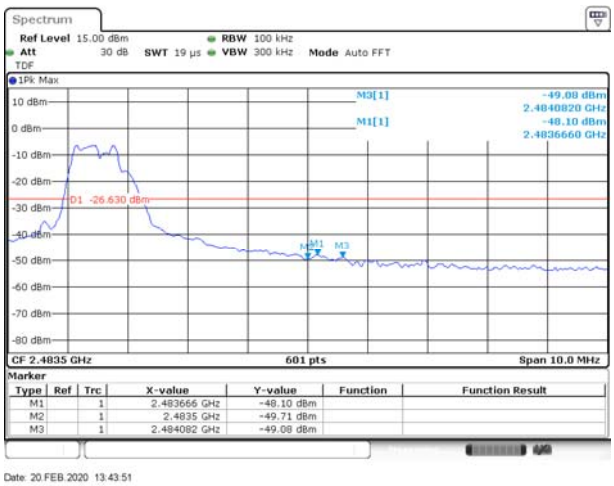
GFSK MIDDLE CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



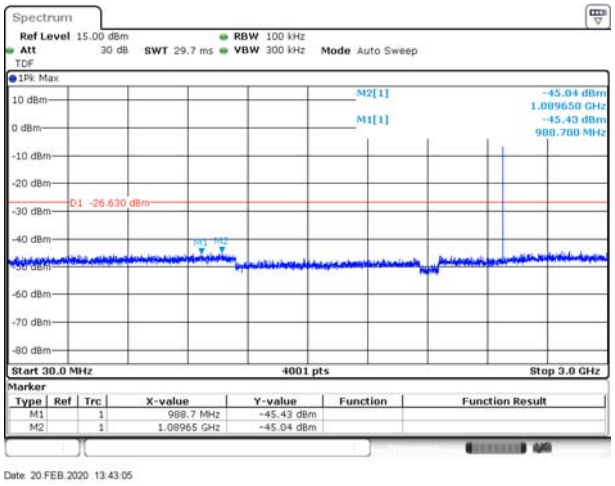
GFSK HIGH CHANNEL, CARRIER LEVEL



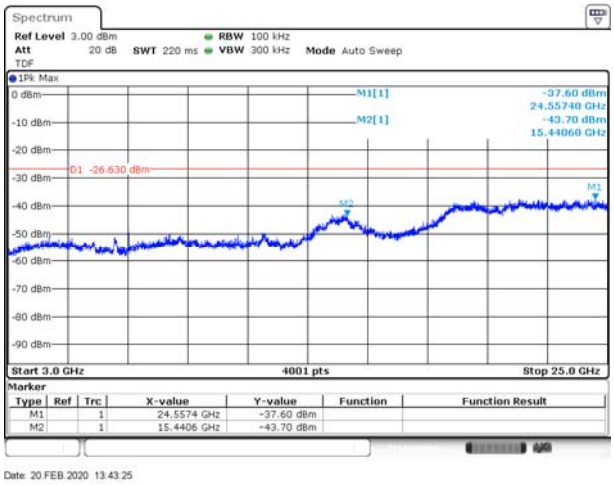
GFSK HIGH CHANNEL, BAND EDGE



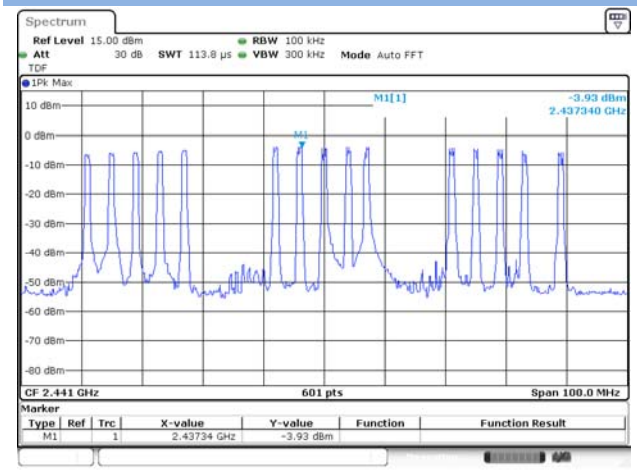
GFSK HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



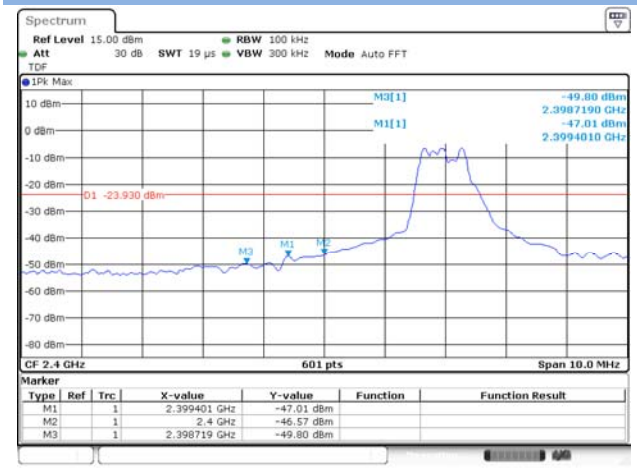
GFSK HIGH CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



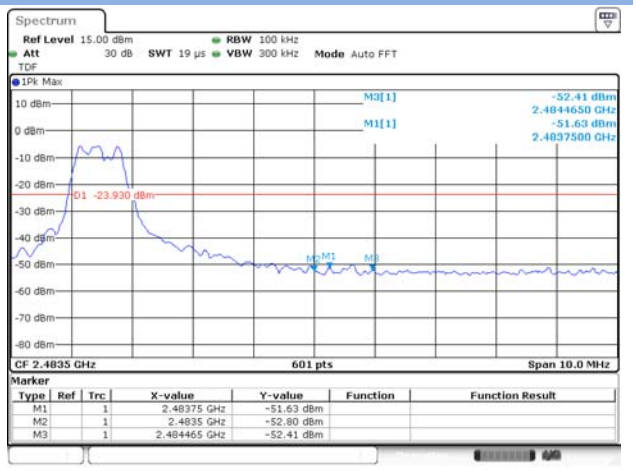
GFSK HOPPING, CARRIER LEVEL



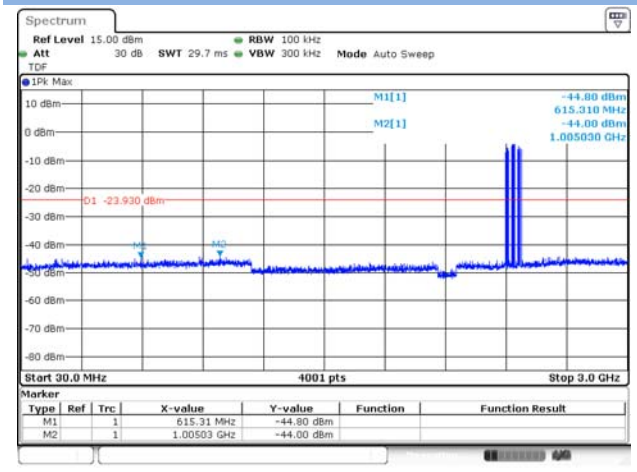
GFSK HOPPING BAND EDGE (LOW)



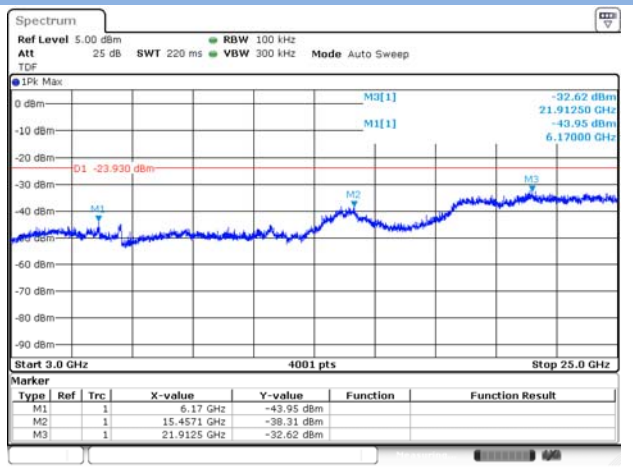
GFSK HOPPING BAND EDGE (HIGH)



GFSK Hopping Mode, SPURIOUS 30 MHz ~ 3 GHz



GFSK Hopping Mode, SPURIOUS 30 3GHz ~ 25 GHz

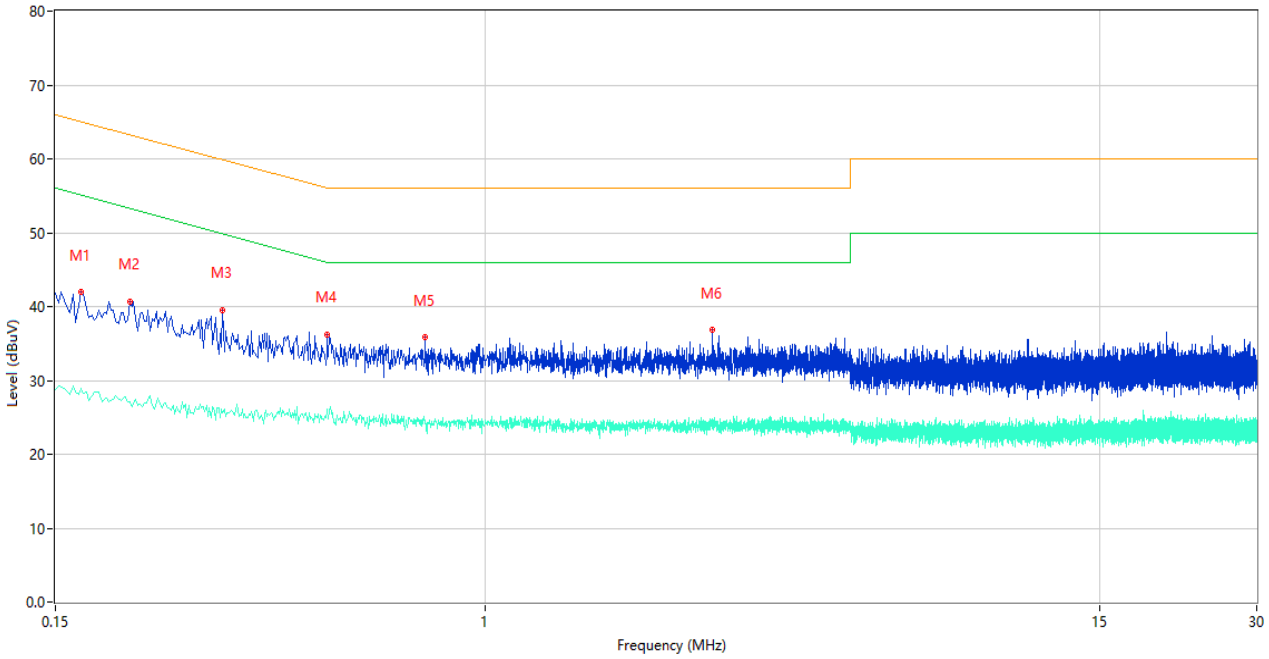


A.7 Conducted Emissions

Note: All configurations have been tested, only the worst configuration (GFSK High Channel) shown here.

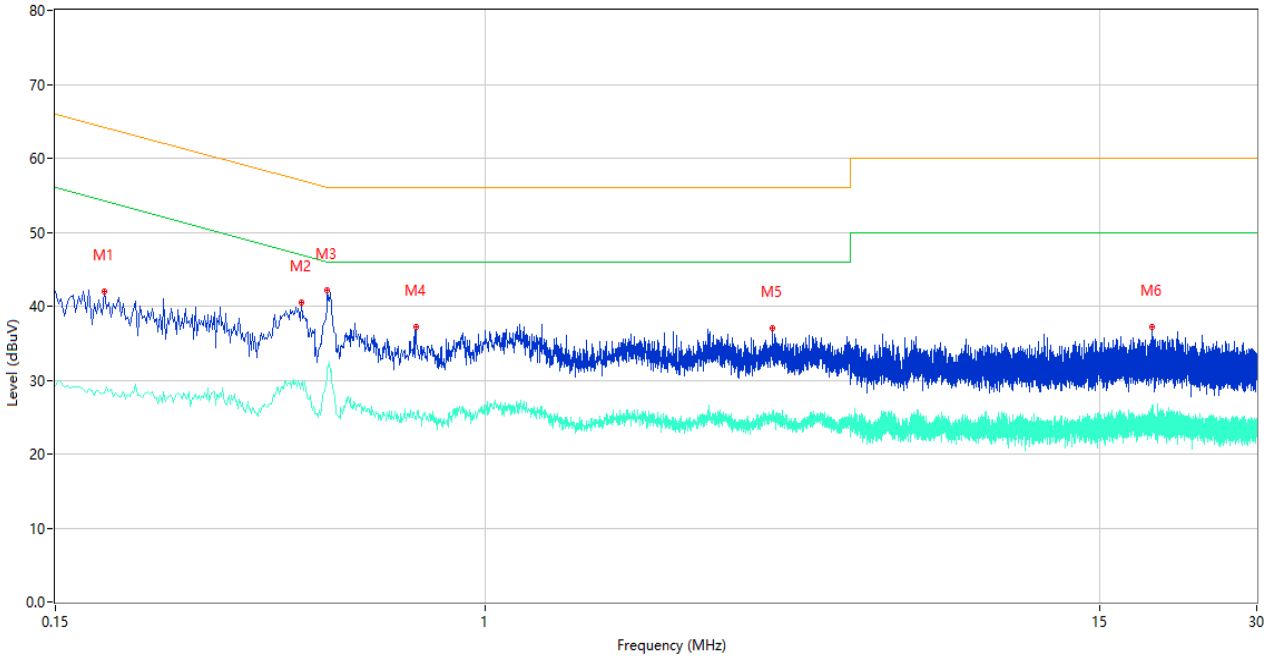
Test Data and Plots

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.168	41.95	10.40	65.06	-23.11	Peak	L	Pass
1**	0.168	28.94	10.40	55.06	-26.12	AV	L	Pass
2	0.208	40.72	10.38	63.28	-22.56	Peak	L	Pass
2**	0.208	27.07	10.38	53.28	-26.21	AV	L	Pass
3	0.314	39.56	10.33	59.86	-20.30	Peak	L	Pass
3**	0.314	25.61	10.33	49.86	-24.25	AV	L	Pass
4	0.498	36.28	10.29	56.03	-19.75	Peak	L	Pass
4**	0.498	26.15	10.29	46.03	-19.88	AV	L	Pass
5	0.766	35.86	10.26	56.00	-20.14	Peak	L	Pass
5**	0.766	24.68	10.26	46.00	-21.32	AV	L	Pass
6	2.720	36.85	10.28	56.00	-19.15	Peak	L	Pass
6**	2.720	24.77	10.28	46.00	-21.23	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.186	41.99	10.39	64.21	-22.22	Peak	N	Pass
1**	0.186	28.29	10.39	54.21	-25.92	AV	N	Pass
2	0.444	40.43	10.30	56.99	-16.56	Peak	N	Pass
2**	0.444	29.38	10.30	46.99	-17.61	AV	N	Pass
3	0.498	42.10	10.29	56.03	-13.93	Peak	N	Pass
3**	0.498	31.63	10.29	46.03	-14.40	AV	N	Pass
4	0.736	37.16	10.27	56.00	-18.84	Peak	N	Pass
4**	0.736	25.10	10.27	46.00	-20.90	AV	N	Pass
5	3.546	36.99	10.30	56.00	-19.01	Peak	N	Pass
5**	3.546	25.71	10.30	46.00	-20.29	AV	N	Pass
6	18.952	37.15	10.52	60.00	-22.85	Peak	N	Pass
6**	18.952	25.49	10.52	50.00	-24.51	AV	N	Pass

A.8 Radiated 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.

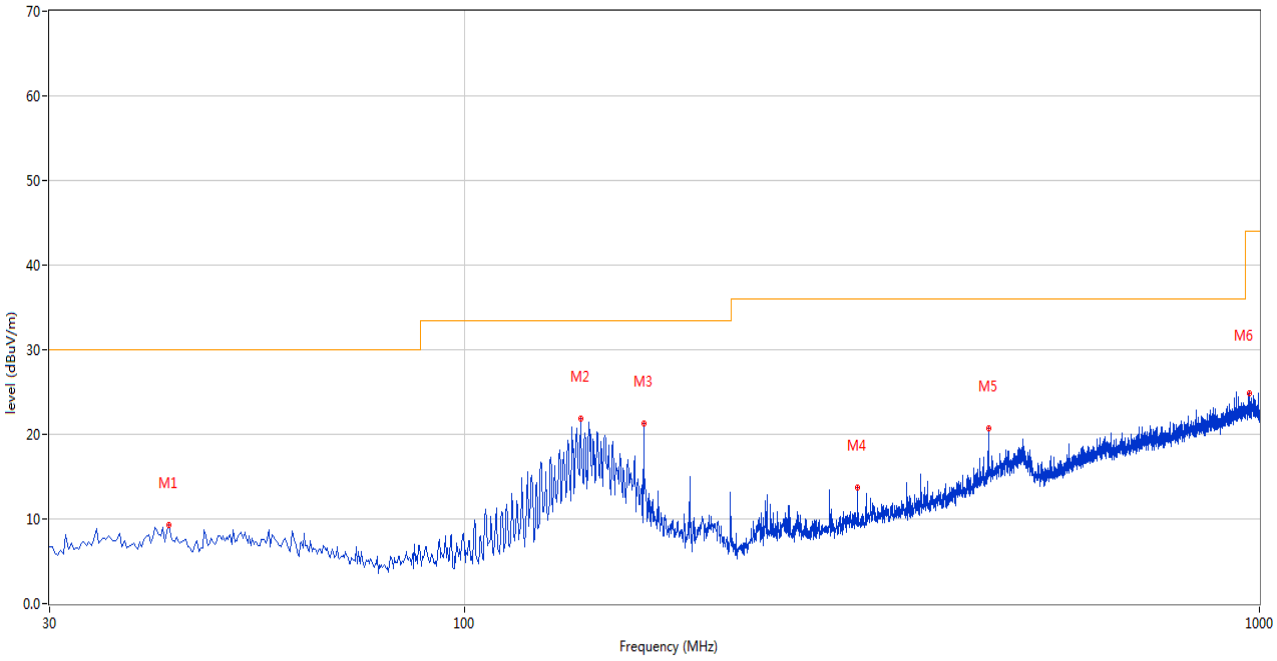
Note [3]: All configurations have been tested, only the worst configuration (GFSK High Channel) shown here.

Note [4]: The spurious from 18G to the 10th harmonic of the fundamental frequency is noise only, do not show on the report.

Test Data and Plots

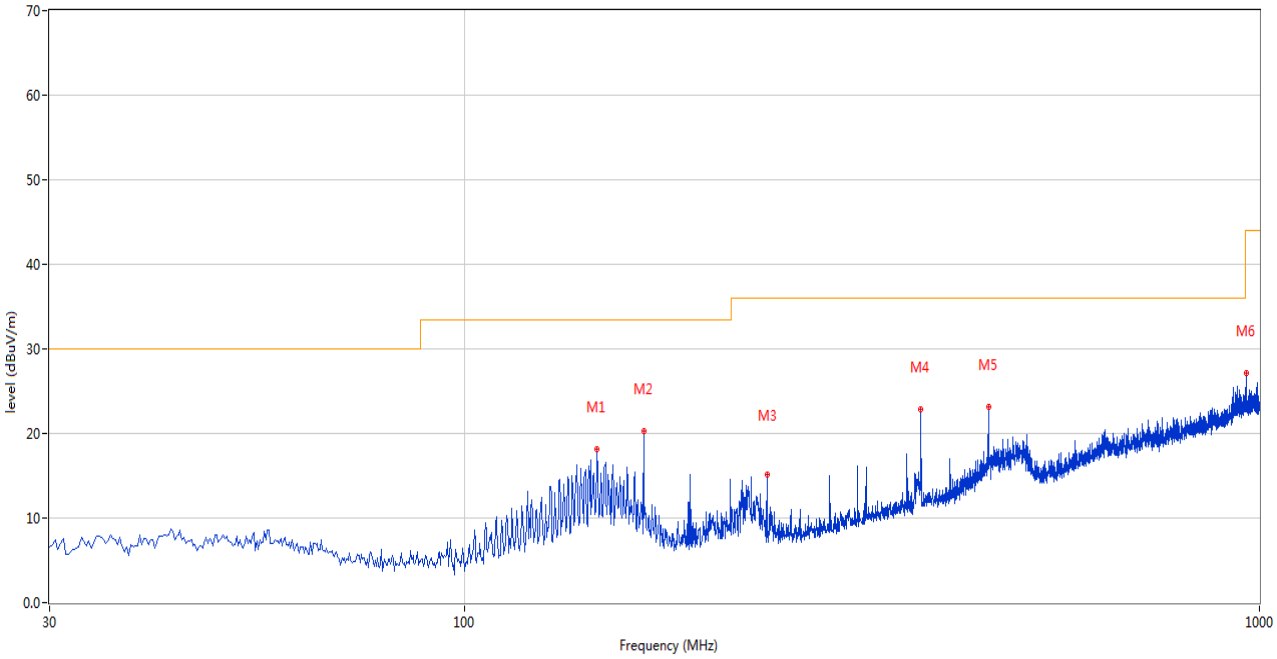
The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	42.364	9.28	-26.74	30.0	-20.72	Peak	0.00	300	Vertical	Pass
2	139.825	21.91	-26.39	33.5	-11.59	Peak	342.00	100	Vertical	Pass
3	167.948	21.30	-26.50	33.5	-12.20	Peak	186.00	100	Vertical	Pass
4	311.957	13.75	-25.46	36.0	-22.25	Peak	206.00	100	Vertical	Pass
5	455.966	20.67	-21.36	36.0	-15.33	Peak	181.00	300	Vertical	Pass
6	970.907	24.90	-11.36	44.0	-19.10	Peak	210.00	200	Vertical	Pass

30 MHz to 1 GHz, ANT H

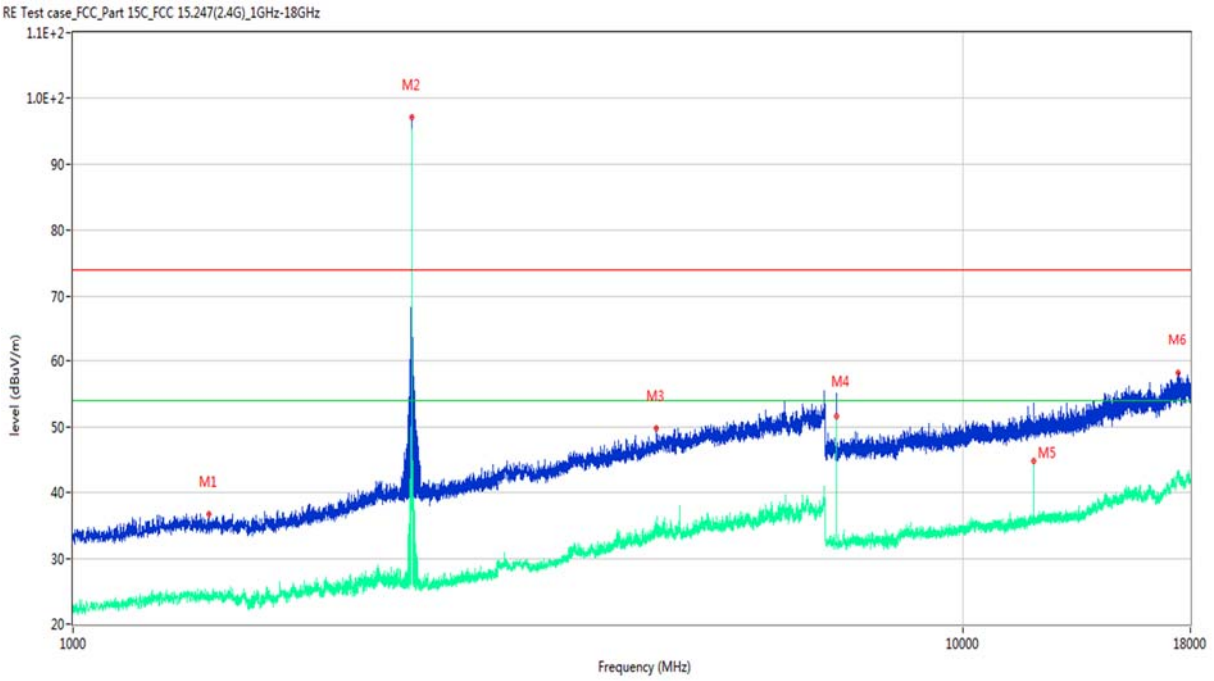


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	146.613	18.09	-25.95	33.5	-15.41	Peak	120.00	200	Horizontal	Pass
2	167.948	20.32	-26.50	33.5	-13.18	Peak	104.00	300	Horizontal	Pass
3	239.953	15.13	-27.87	36.0	-20.87	Peak	48.00	300	Horizontal	Pass
4	374.991	22.92	-23.84	36.0	-13.08	Peak	140.00	200	Horizontal	Pass
5	455.966	23.13	-21.36	36.0	-12.87	Peak	115.00	200	Horizontal	Pass
6	962.422	27.10	-11.40	44.0	-16.90	Peak	330.00	300	Horizontal	Pass

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

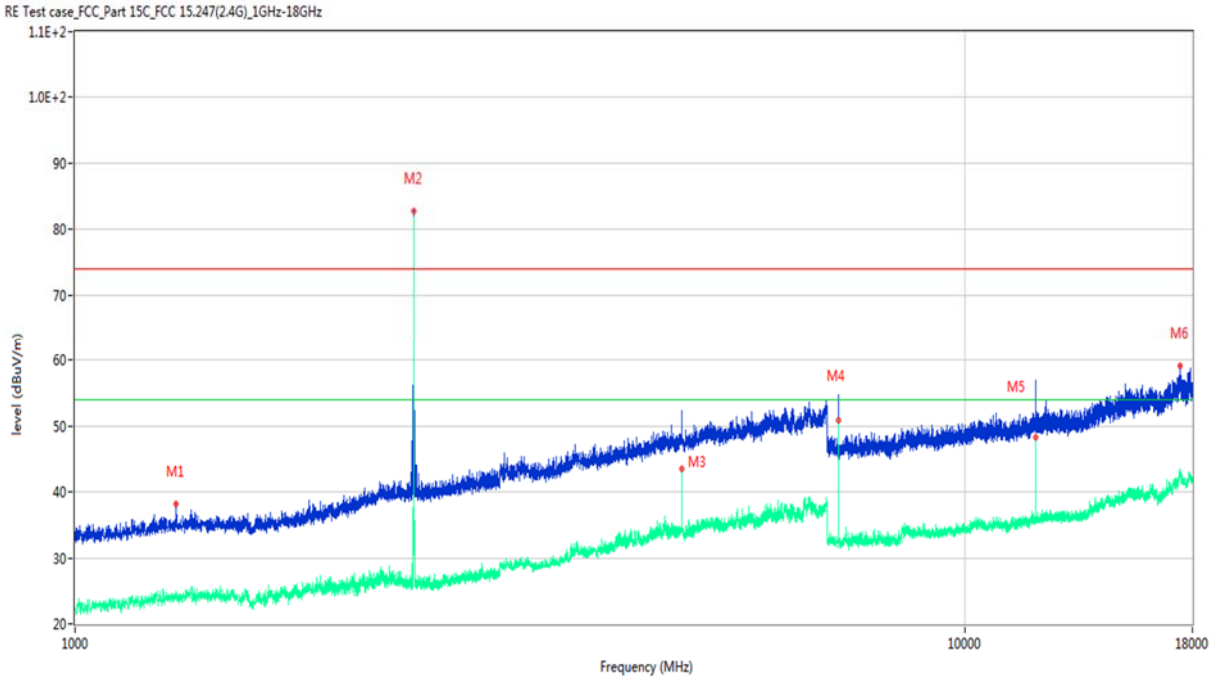
Test Data and Plots (1 GHz ~ 10th Harmonic)

GFSK LOW CHANNEL 1 GHz to 18 GHz, ANT H



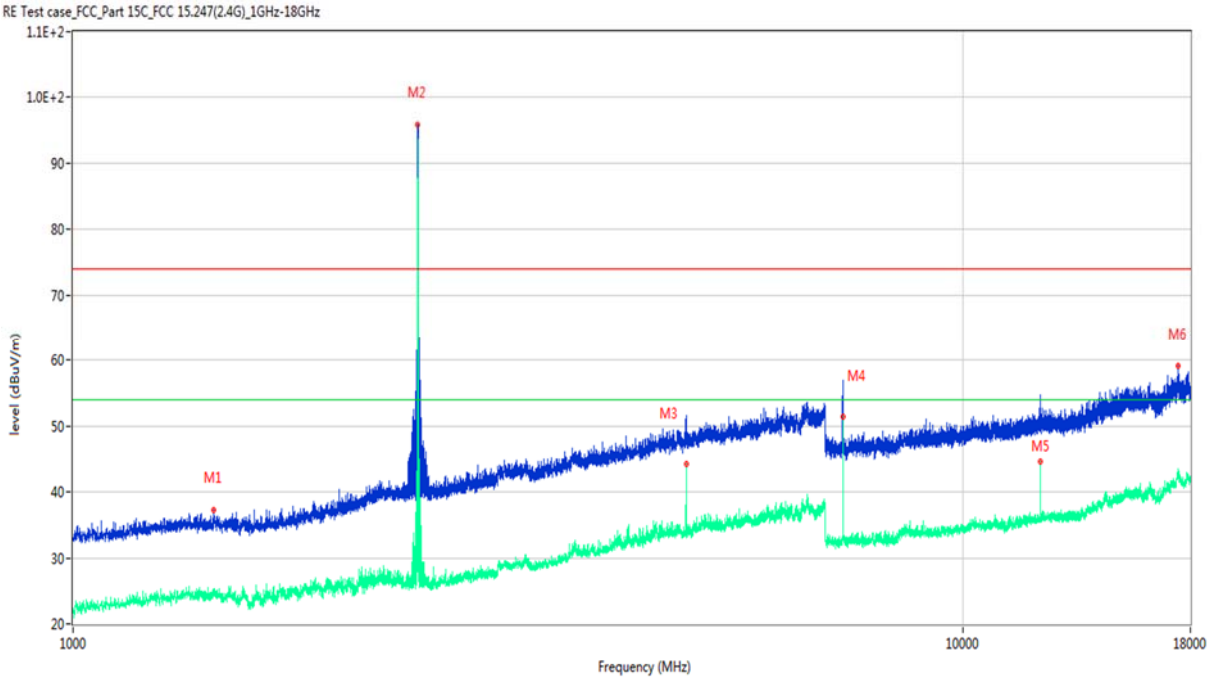
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1420.500	36.75	-17.51	74.0	-37.25	Peak	318.00	150	Horizontal	Pass
1**	1420.500	23.05	-17.51	54.0	-30.95	AV	318.00	150	Horizontal	Pass
2	2401.500	97.13	-12.08	74.0	23.13	Peak	40.00	150	Horizontal	N/A
2**	2401.500	84.12	-12.08	54.0	30.12	AV	40.00	150	Horizontal	N/A
3	4519.000	49.75	-3.52	74.0	-24.25	Peak	65.00	150	Horizontal	Pass
3**	4519.000	33.52	-3.52	54.0	-20.48	AV	65.00	150	Horizontal	Pass
4	7207.000	55.85	-3.48	74.0	-18.15	Peak	361.00	150	Horizontal	Pass
4**	7207.000	51.97	-3.48	54.0	-2.03	AV	361.00	150	Horizontal	Pass
5	12012.562	50.94	1.34	74.0	-23.06	Peak	205.00	150	Horizontal	Pass
5**	12012.562	44.73	1.34	54.0	-9.27	AV	205.00	150	Horizontal	Pass
6	17421.187	58.27	4.81	74.0	-15.73	Peak	176.00	150	Horizontal	Pass
6**	17421.187	43.11	4.81	54.0	-10.89	AV	176.00	150	Horizontal	Pass

GFSK LOW CHANNEL 1 GHz to 18 GHz, ANT V



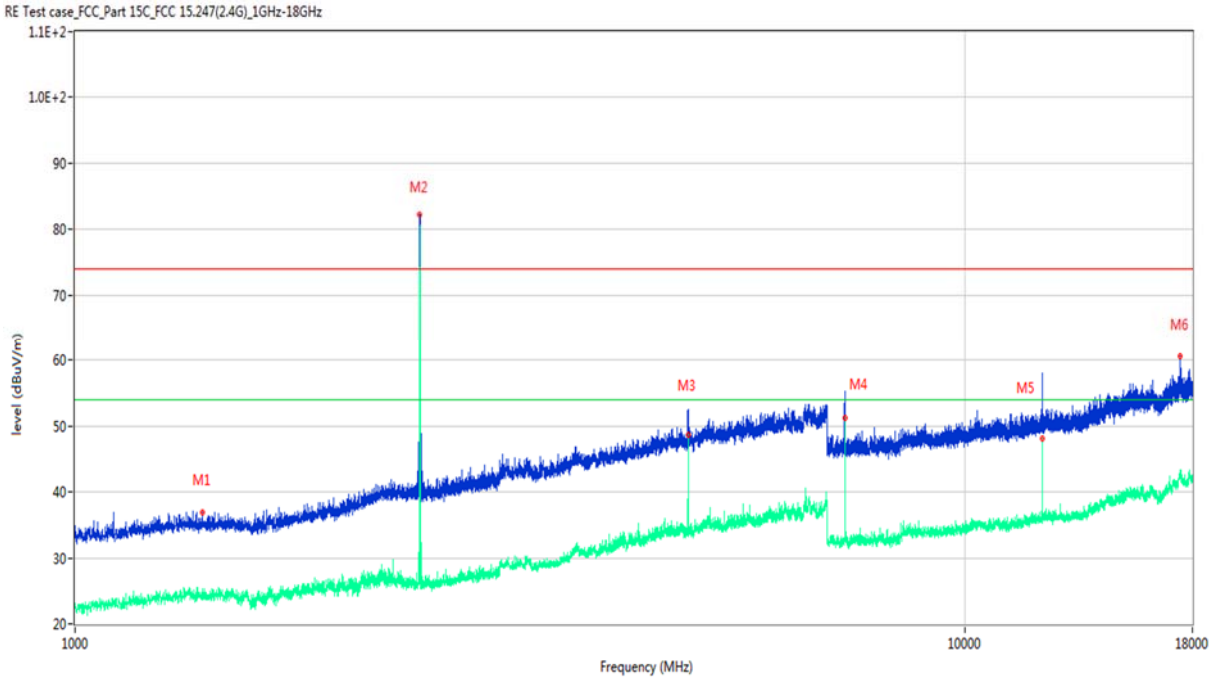
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1300.000	38.18	-17.31	74.0	-35.82	Peak	139.00	150	Vertical	Pass
1**	1300.000	24.90	-17.31	54.0	-29.10	AV	139.00	150	Vertical	Pass
2	2401.500	82.81	-12.08	74.0	8.81	Peak	257.00	150	Vertical	N/A
2**	2401.500	70.49	-12.08	54.0	16.49	AV	257.00	150	Vertical	N/A
3	4805.000	51.27	-2.74	74.0	-22.73	Peak	351.00	150	Vertical	Pass
3**	4805.000	43.59	-2.74	54.0	-10.41	AV	351.00	150	Vertical	Pass
4	7207.000	54.36	-3.48	74.0	-19.64	Peak	322.00	150	Vertical	Pass
4**	7207.000	50.98	-3.48	54.0	-3.02	AV	322.00	150	Vertical	Pass
5	12012.562	51.68	1.34	74.0	-22.32	Peak	351.00	150	Vertical	Pass
5**	12012.562	48.35	1.34	54.0	-5.65	AV	351.00	150	Vertical	Pass
6	17435.625	59.05	4.34	74.0	-14.95	Peak	229.00	150	Vertical	Pass
6**	17435.625	42.40	4.34	54.0	-11.60	AV	229.00	150	Vertical	Pass

GFSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT H



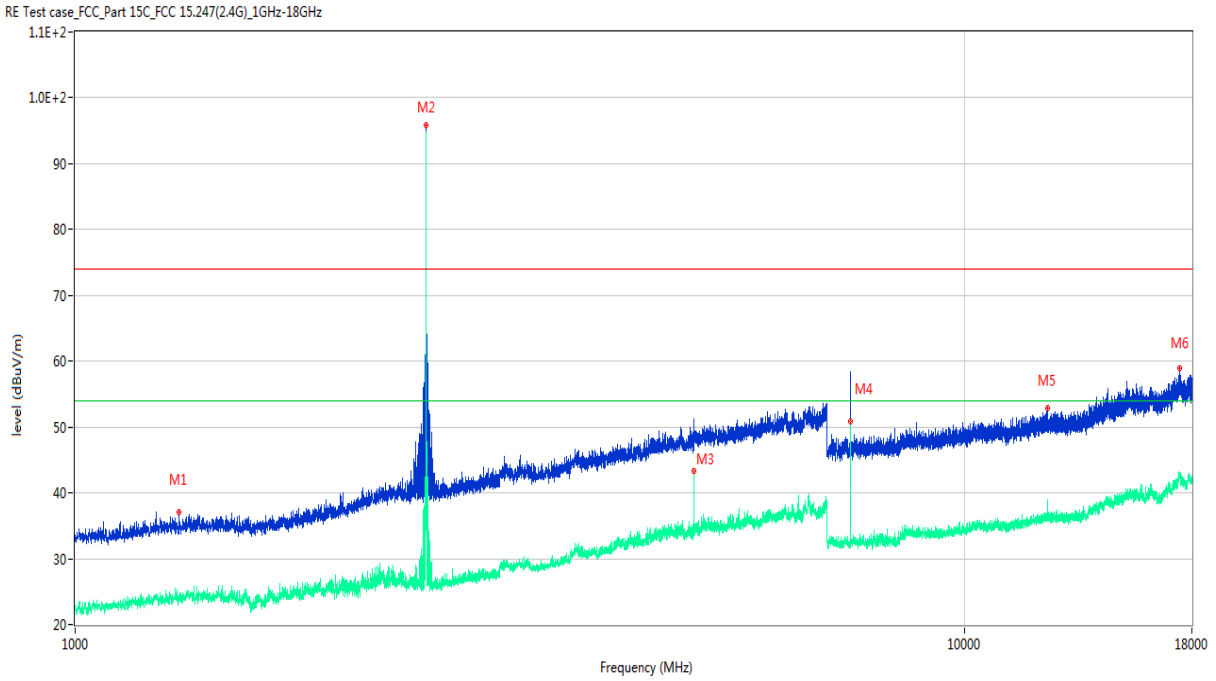
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1438.000	37.25	-17.54	74.0	-36.75	Peak	15.00	150	Horizontal	Pass
1**	1438.000	24.72	-17.54	54.0	-29.28	AV	15.00	150	Horizontal	Pass
2	2440.500	95.90	-12.73	74.0	21.90	Peak	37.00	150	Horizontal	N/A
2**	2440.500	82.98	-12.73	54.0	28.98	AV	37.00	150	Horizontal	N/A
3	4883.000	51.62	-3.32	74.0	-22.38	Peak	54.00	150	Horizontal	Pass
3**	4883.000	44.26	-3.32	54.0	-9.74	AV	54.00	150	Horizontal	Pass
4	7324.875	56.61	-3.32	74.0	-17.39	Peak	335.00	150	Horizontal	Pass
4**	7324.875	51.63	-3.32	54.0	-2.37	AV	335.00	150	Horizontal	Pass
5	12206.625	53.07	1.21	74.0	-20.93	Peak	222.00	150	Horizontal	Pass
5**	12206.625	44.70	1.21	54.0	-9.30	AV	222.00	150	Horizontal	Pass
6	17419.874	59.07	4.83	74.0	-14.93	Peak	163.00	150	Horizontal	Pass
6**	17419.874	42.61	4.83	54.0	-11.39	AV	163.00	150	Horizontal	Pass

GFSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT V



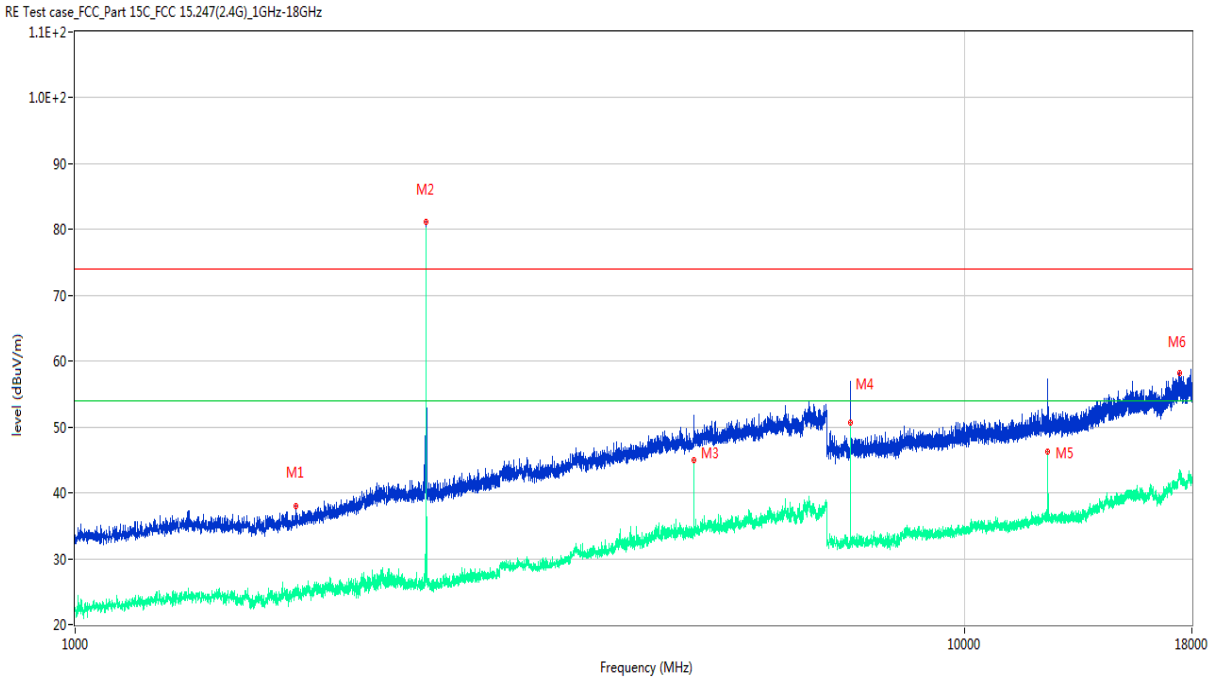
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1391.000	36.84	-17.47	74.0	-37.16	Peak	229.00	150	Vertical	Pass
1**	1391.000	23.68	-17.47	54.0	-30.32	AV	229.00	150	Vertical	Pass
2	2440.500	82.26	-12.73	74.0	8.26	Peak	181.00	150	Vertical	N/A
2**	2440.500	69.92	-12.73	54.0	15.92	AV	181.00	150	Vertical	N/A
3	4883.000	52.17	-3.32	74.0	-21.83	Peak	15.00	150	Vertical	Pass
3**	4883.000	48.65	-3.32	54.0	-5.35	AV	15.00	150	Vertical	Pass
4	7324.875	55.00	-3.32	74.0	-19.00	Peak	169.00	150	Vertical	Pass
4**	7324.875	51.52	-3.32	54.0	-2.48	AV	169.00	150	Vertical	Pass
5	12208.062	50.18	1.29	74.0	-23.82	Peak	236.00	150	Vertical	Pass
5**	12208.062	48.04	1.29	54.0	-5.96	AV	236.00	150	Vertical	Pass
6	17422.500	60.50	4.77	74.0	-13.50	Peak	333.00	150	Vertical	Pass
6**	17422.500	43.08	4.77	54.0	-10.92	AV	333.00	150	Vertical	Pass

GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1309.000	37.03	-17.34	74.0	-36.97	Peak	159.00	150	Horizontal	Pass
1**	1309.000	23.48	-17.34	54.0	-30.52	AV	159.00	150	Horizontal	Pass
2	2479.500	95.81	-12.27	74.0	21.81	Peak	42.00	150	Horizontal	N/A
2**	2479.500	84.72	-12.27	54.0	30.72	AV	42.00	150	Horizontal	N/A
3	4961.000	49.45	-3.08	74.0	-24.55	Peak	73.00	150	Horizontal	Pass
3**	4961.000	43.26	-3.08	54.0	-10.74	AV	73.00	150	Horizontal	Pass
4	7441.312	57.74	-3.36	74.0	-16.26	Peak	330.00	150	Horizontal	Pass
4**	7441.312	50.89	-3.36	54.0	-3.11	AV	330.00	150	Horizontal	Pass
5	12400.687	52.92	1.71	74.0	-21.08	Peak	315.00	150	Horizontal	Pass
5**	12400.687	38.05	1.71	54.0	-15.95	AV	315.00	150	Horizontal	Pass
6	17417.251	58.89	4.78	74.0	-15.11	Peak	101.00	150	Horizontal	Pass
6**	17417.251	42.52	4.78	54.0	-11.48	AV	101.00	150	Horizontal	Pass

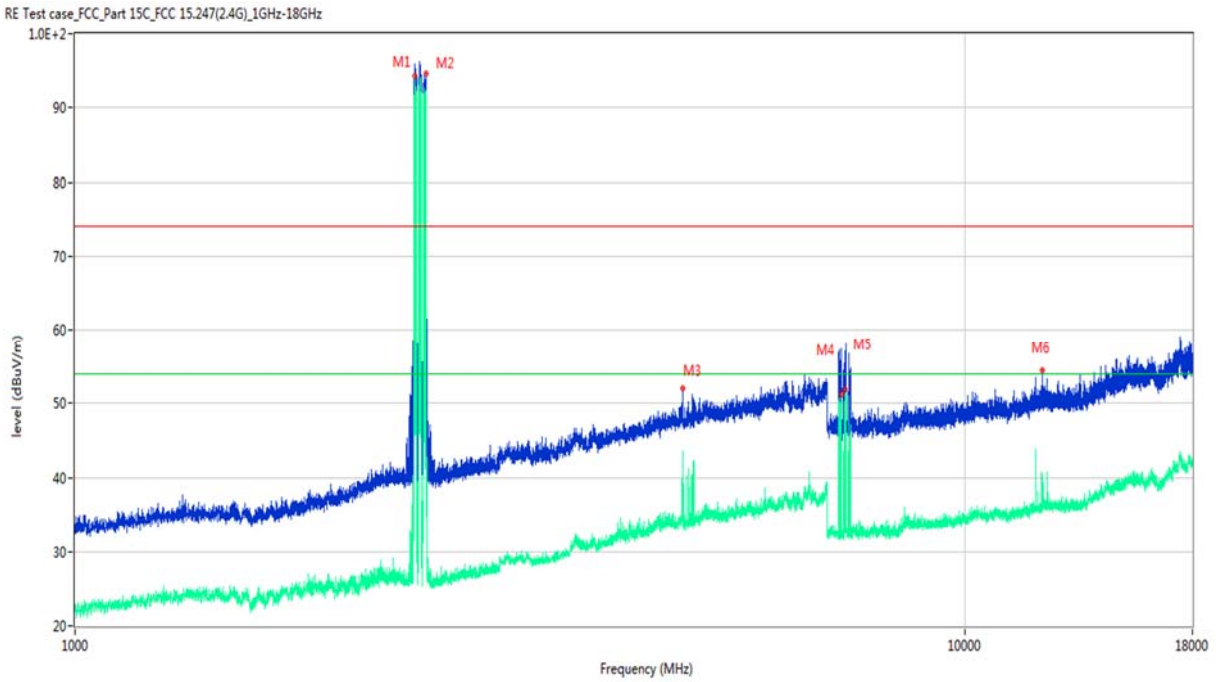
GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1770.500	38.08	-17.14	74.0	-35.92	Peak	62.00	150	Vertical	Pass
1**	1770.500	25.67	-17.14	54.0	-28.33	AV	62.00	150	Vertical	Pass
2	2479.500	81.15	-12.27	74.0	7.15	Peak	268.00	150	Vertical	N/A
2**	2479.500	69.49	-12.27	54.0	15.49	AV	268.00	150	Vertical	N/A
3	4961.000	51.60	-3.08	74.0	-22.40	Peak	43.00	150	Vertical	Pass
3**	4961.000	44.96	-3.08	54.0	-9.04	AV	43.00	150	Vertical	Pass
4	7439.875	56.62	-3.48	74.0	-17.38	Peak	170.00	150	Vertical	Pass
4**	7439.875	50.71	-3.48	54.0	-3.29	AV	170.00	150	Vertical	Pass
5	12402.125	57.30	1.69	74.0	-16.70	Peak	192.00	150	Vertical	Pass
5**	12402.125	46.18	1.69	54.0	-7.82	AV	192.00	150	Vertical	Pass
6	17438.251	58.13	4.21	74.0	-15.87	Peak	316.00	150	Vertical	Pass
6**	17438.251	42.42	4.21	54.0	-11.58	AV	316.00	150	Vertical	Pass

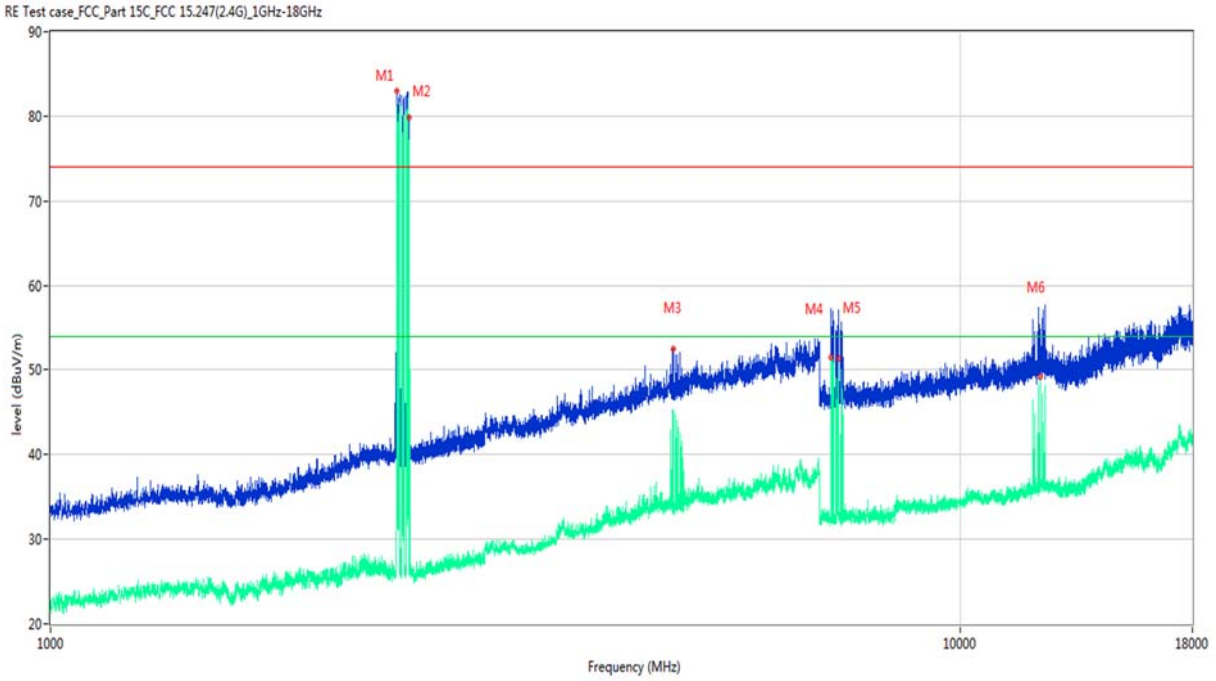
Hopping Mode:

GFSK MODE 1 GHz to 18 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2402.000	93.85	-12.11	74.0	19.85	Peak	272.00	150	Horizontal	N/A
1**	2402.000	90.18	-12.11	54.0	36.18	AV	272.00	150	Horizontal	N/A
2	2479.500	94.59	-12.27	74.0	20.59	Peak	26.00	150	Horizontal	N/A
2**	2479.500	82.43	-12.27	54.0	28.43	AV	26.00	150	Horizontal	N/A
3	4819.000	52.05	-3.08	74.0	-21.95	Peak	50.00	150	Horizontal	Pass
3**	4819.000	33.34	-3.08	54.0	-20.66	AV	50.00	150	Horizontal	Pass
4	7255.875	55.84	-3.21	74.0	-18.16	Peak	338.00	150	Horizontal	Pass
4**	7255.875	50.82	-3.21	54.0	-3.18	AV	338.00	150	Horizontal	Pass
5	7324.875	54.66	-3.32	74.0	-19.34	Peak	357.00	150	Horizontal	Pass
5**	7324.875	51.76	-3.32	54.0	-2.24	AV	357.00	150	Horizontal	Pass
6	12203.750	54.40	1.10	74.0	-19.60	Peak	229.00	150	Horizontal	Pass
6**	12203.750	35.42	1.10	54.0	-18.58	AV	229.00	150	Horizontal	Pass

GFSK MODE 1 GHz to 18 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2401.500	82.97	-12.08	74.0	8.97	Peak	240.00	150	Vertical	N/A
1**	2401.500	69.98	-12.08	54.0	15.98	AV	240.00	150	Vertical	N/A
2	2479.500	79.83	-12.27	74.0	5.83	Peak	187.00	150	Vertical	N/A
2**	2479.500	65.82	-12.27	54.0	11.82	AV	187.00	150	Vertical	N/A
3	4836.000	52.49	-3.54	74.0	-21.51	Peak	1.00	150	Vertical	Pass
3**	4836.000	42.43	-3.54	54.0	-11.57	AV	1.00	150	Vertical	Pass
4	7218.500	56.48	-3.74	74.0	-17.52	Peak	331.00	150	Vertical	Pass
4**	7218.500	51.87	-3.74	54.0	-2.13	AV	331.00	150	Vertical	Pass
5	7346.438	47.75	-3.31	74.0	-26.25	Peak	40.00	150	Vertical	Pass
5**	7346.438	51.80	-3.31	54.0	-2.20	AV	40.00	150	Vertical	Pass
6	12239.688	53.56	1.41	74.0	-20.44	Peak	174.00	150	Vertical	Pass
6**	12239.688	49.20	1.41	54.0	-4.80	AV	174.00	150	Vertical	Pass

A.9 Band Edge (Restricted-band band-edge)

Test Data

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.

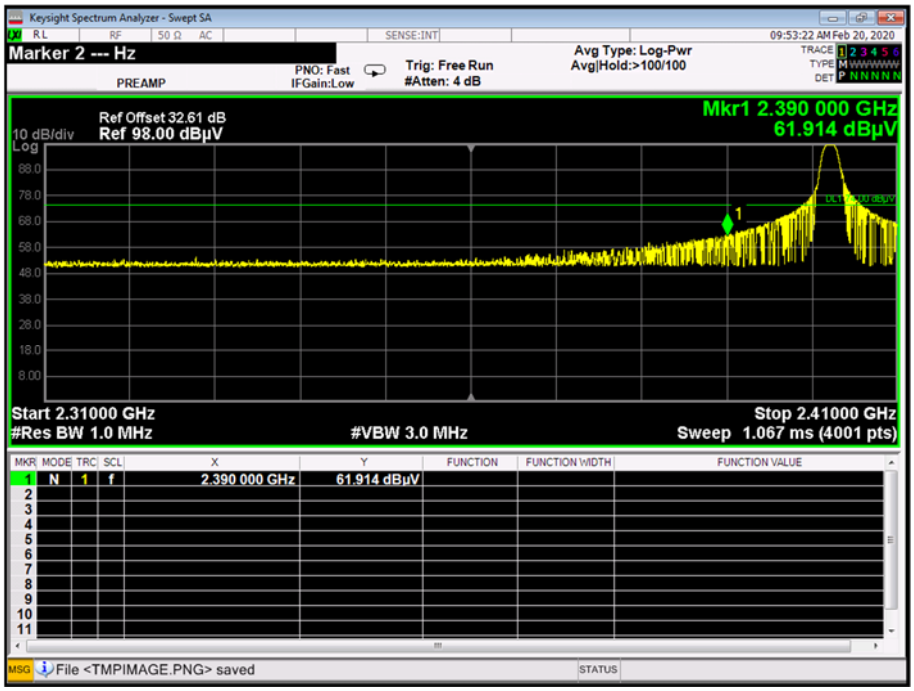
Note [3]: The average levels were calculated from the peak level corrected with duty cycle correction factor (-31.73 dB) derived from 20log (dwell time/100 ms).

For example: Average level = 62.29 dBuV/m – 31.73 (dB) = 30.56 dBuV/m.

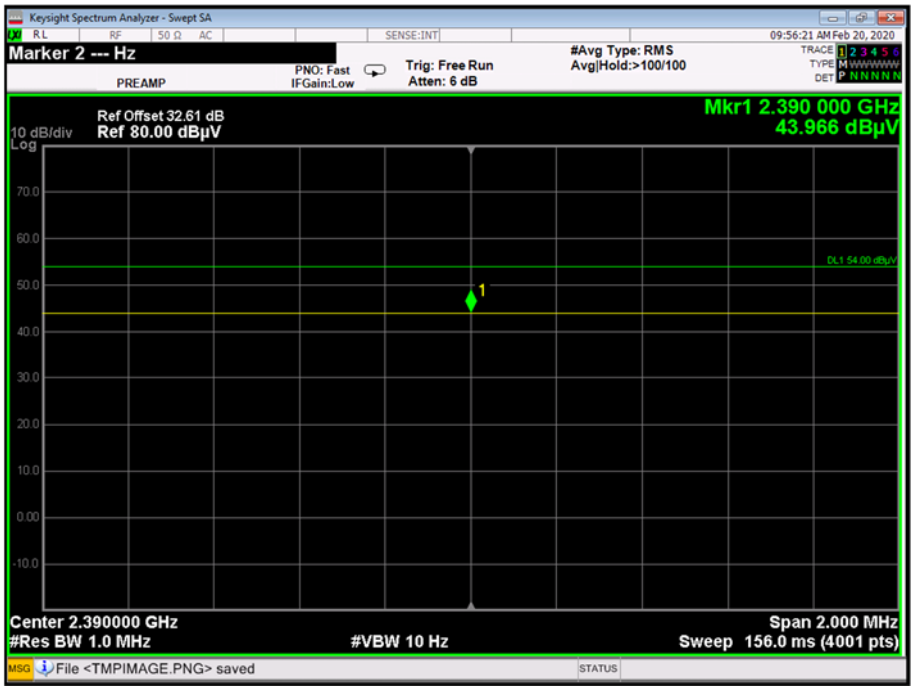
Test Plots

Test Mode	Test Channel	Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark	Verdict
GFSK	Low	2390	61.914	74	12.086	PEAK	Pass
		2390	43.966	54	10.034	AVERAGE	Pass
GFSK	HIGH	2491.3	72.816	74	1.184	PEAK	Pass
		2491.3	49.633	54	4.367	AVERAGE	Pass
GFSK (Hopping)	Low	2389.6	62.702	74	11.298	PEAK	Pass
		2389.6	43.984	54	10.016	AVERAGE	Pass
GFSK (Hopping)	HIGH	2484.8	69.808	74	4.192	PEAK	Pass
		2484.8	50.120	54	3.880	AVERAGE	Pass

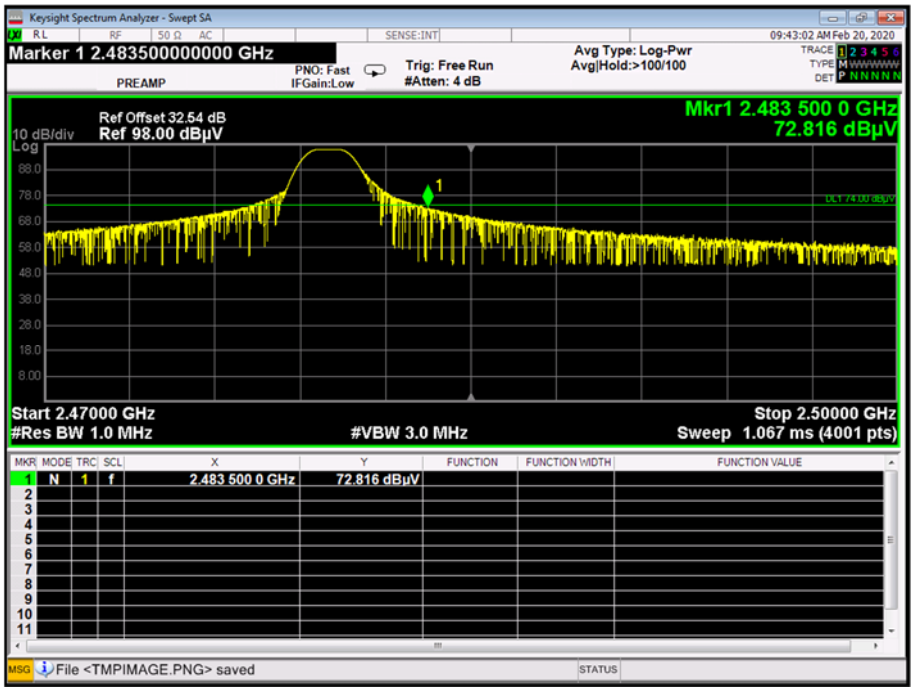
GFSK LOW CHANNEL, PEAK



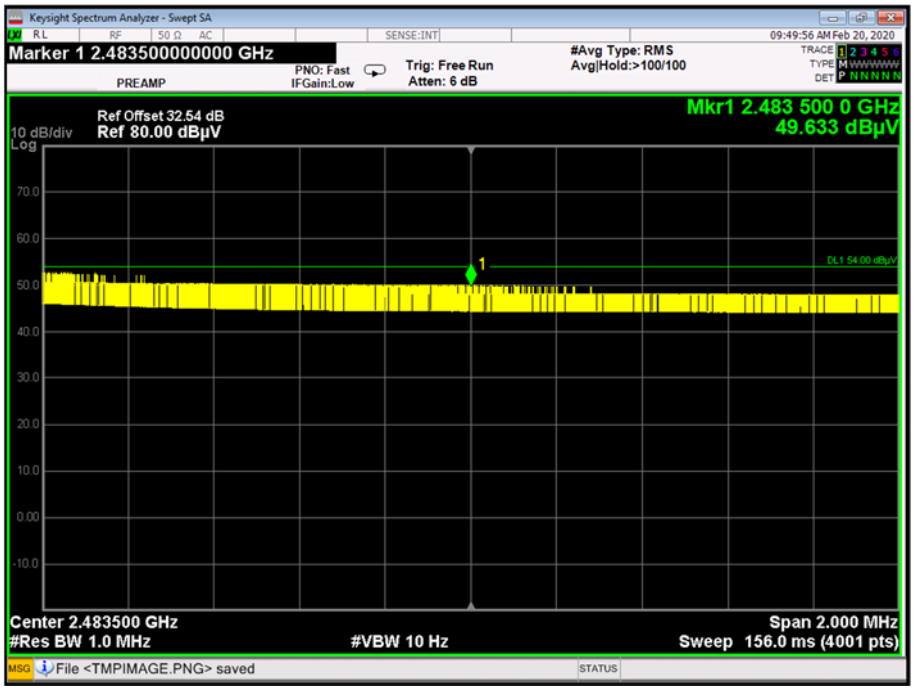
GFSK LOW CHANNEL, AV



GFSK HIGH CHANNEL, PEAK

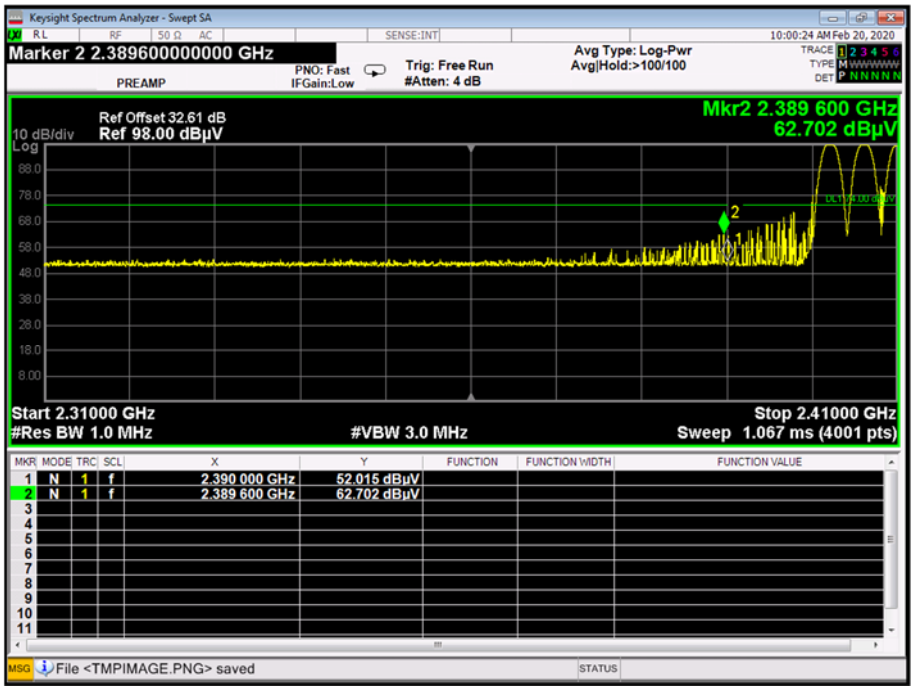


GFSK HIGH CHANNEL, AV

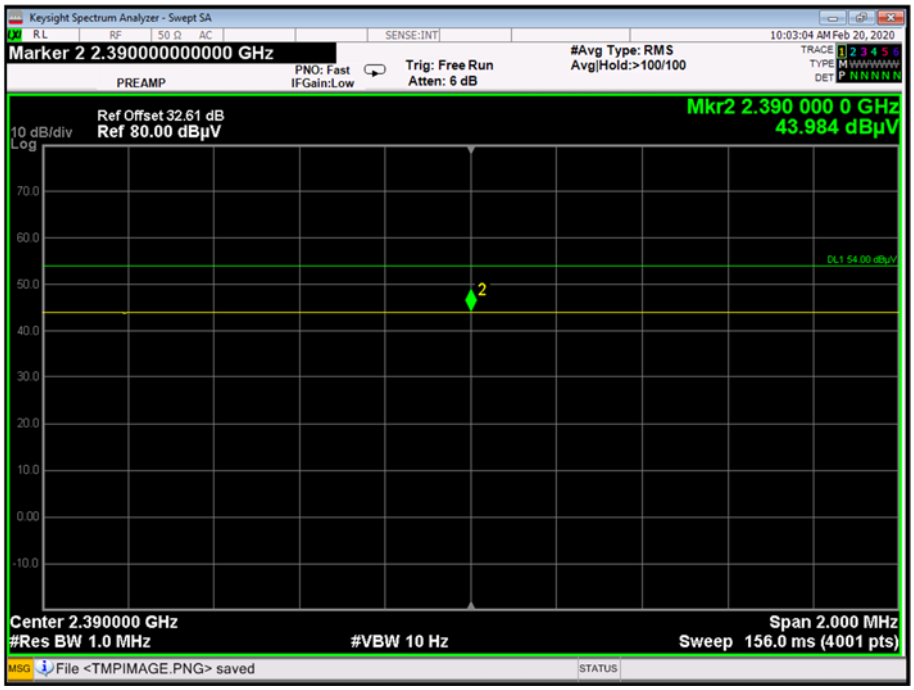


Hopping Mode:

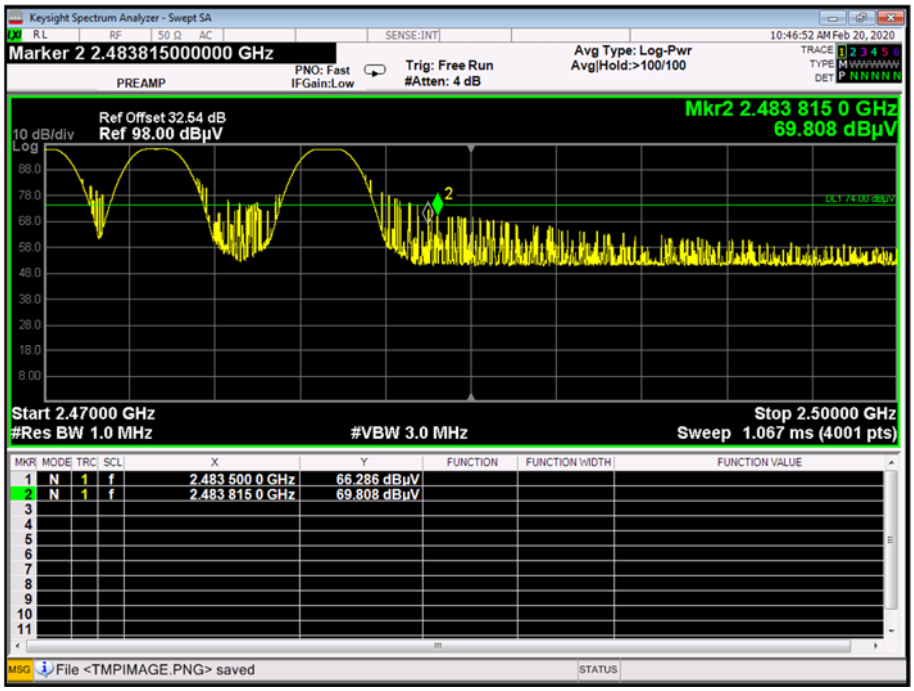
GFSK LOW FREQUENCY BAND, PEAK



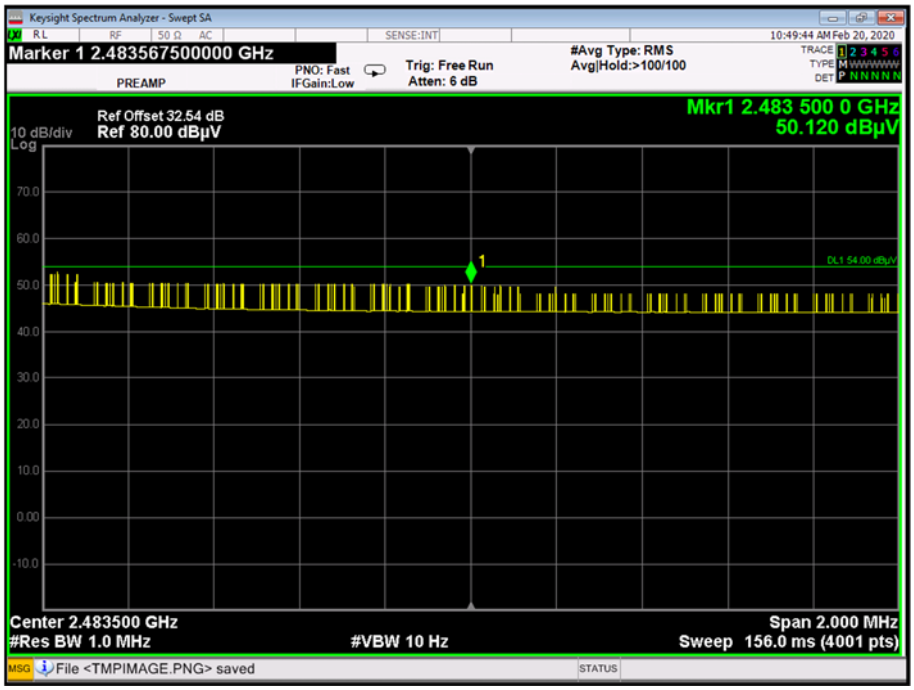
GFSK LOW FREQUENCY BAND, AV



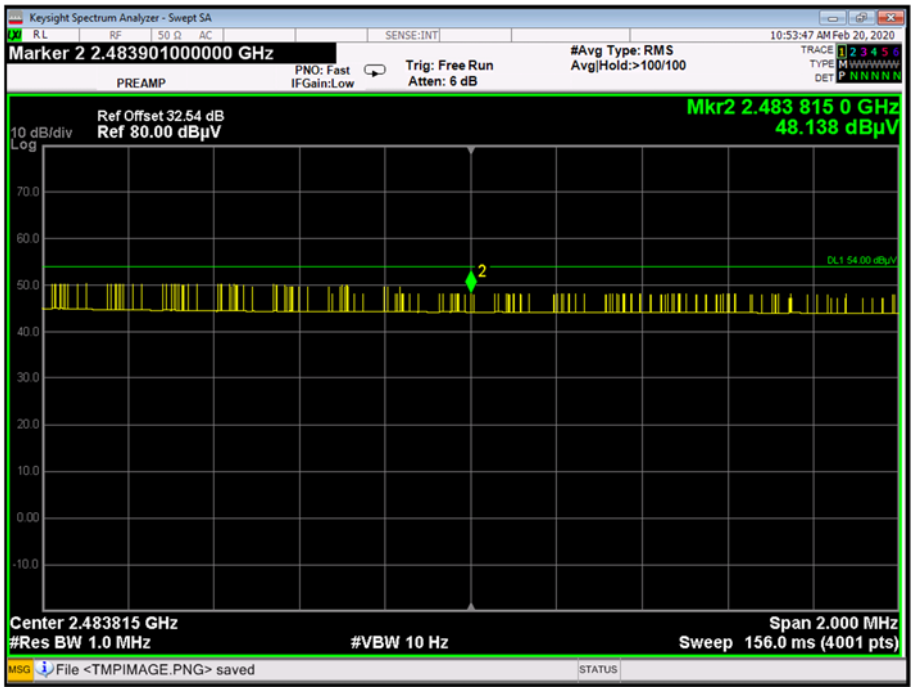
GFSK HIGH FREQUENCY BAND, PEAK



GFSK HIGH FREQUENCY BAND, AV 1



GFSK HIGH FREQUENCY BAND, AV 2



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2020087-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2020087-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2020087-AI.PDF”.

--END OF REPORT--