TEST REPORT

Reference No.	:	WTD19S12084505W002 V1
FCC ID	:	2AVDQ-ESKY008083
Applicant.....	:	Shenzhen Zonda Hobby Co.,Ltd
Address.....	:	Rm 609, Block A, Dachong Business Center, #9678 Shennan Rd. Nanshan District, Shenzhen, China
Manufacturer	:	The same as above
Address.....	:	The same as above
Product.....	:	Remote Controller
Model(s).	:	ESKY008083
Brand Name.....	:	Esky
Standards.....	:	FCC CFR47 Part 15.247:2018
Date of Receipt sample	:	2019-12-04
Date of Test	:	2019-12-05 to 2019-12-17
Date of Issue.....	:	2020-01-02
Test Result.....	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD19S12084505W002	2019-12-04	2019-12-05 to 2019-12-17	2019-12-18	original	-	Replaced
WTD19S12084505W002 V1	2019-12-04	2019-12-05 to 2019-12-17	2020-01-02	Version 1	Updated	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	Remote Controller
Model(s):	ESKY008083
Model Description:	N/A
Hardware Version:	V1
Software Version:	V1

4.2 Details of E.U.T.

Operation Frequency:	2406~2475MHz
Max. RF output power:	19.72dBm
Type of Modulation:	GFSK
Antenna installation:	Fixed antenna
Antenna Gain:	2.0dBi
Ratings:	DC 6V from battery

4.3 Channel List

Normal

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2406	1	2407	2	2408	3	2409
4	2410	5	2411	6	2412	7	2413
8	2414	9	2415	10	2416	11	2417
12	2418	13	2419	14	2420	15	2421
16	2422	17	2423	18	2424	19	2425
20	2426	21	2427	22	2428	23	2429
24	2430	25	2431	26	2432	27	2433
28	2434	29	2435	30	2436	31	2437
32	2438	33	2439	34	2440	35	2441
36	2442	37	2443	38	2444	39	2445
40	2446	41	2447	42	2448	43	2449
44	2450	45	2451	46	2452	47	2453
48	2454	49	2455	50	2456	51	2457
52	2458	53	2459	54	2460	55	2461
56	2462	57	2463	58	2464	59	2465
60	2466	61	2467	62	2468	63	2469
64	2470	65	2471	66	2472	67	2473
68	2474	69	2475				

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests; the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting	2406MHz	2440MHz	2475MHz

4.5 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Services(Shenzhen) Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

5 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Conducted Spurious emissions	15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
Conducted Emission	15.207	N/A
20dB Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Antenna Requirement	15.203	Complies

6 Equipment Used during Test

6.1 Equipments List

Conducted Emissions Test Site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	100947	2019-09-12	2020-09-11
2.	LISN	R&S	ENV216	101215	2019-09-12	2020-09-11
3.	Cable	Top	TYPE16(3.5M)	-	2019-09-12	2020-09-11
Conducted Emissions Test Site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	101155	2019-09-12	2020-09-11
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2019-09-12	2020-09-11
3.	Limiter	York	MTS-IMP-136	261115-001-0024	2019-09-12	2020-09-11
4.	Cable	LARGE	RF300	-	2019-09-12	2020-09-11
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP	100091	2019-04-29	2020-04-28
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2019-04-09	2020-04-08
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2019-04-09	2020-04-08
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2019-09-12	2020-09-11
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2019-04-09	2020-04-08
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2019-04-09	2020-04-08
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2019-04-13	2020-04-12
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2019-04-13	2020-04-12
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2019-04-13	2020-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2019-04-09	2020-04-08
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	2019-04-13	2020-04-12
4	Cable	HUBER+SUHNER	CBL2	525178	2019-04-13	2020-04-12

RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2019-09-12	2020-09-11
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2019-09-12	2020-09-11
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2019-09-12	2020-09-11

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

6.3 Measurement Uncertainty

Parameter	Uncertainty
Conducted Emission	± 3.64 dB(AC mains 150KHz~30MHz)
Radiated Spurious Emissions	± 5.08 dB (Bilog antenna 30M~1000MHz)
	± 4.99 dB (Horn antenna 1000M~25000MHz)
Radio Frequency	± 1 x 10^{-7}Hz
RF Power	± 0.42 dB
Dwell time	1.0%
Conducted Spurious Emissions	± 2.76 dB (9kHz~26500MHz)
Confidence interval：95%. Confidence factor:k=2	

6.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.205 &15.209 & 15.247

Test Method: ANSI C63.10: 2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

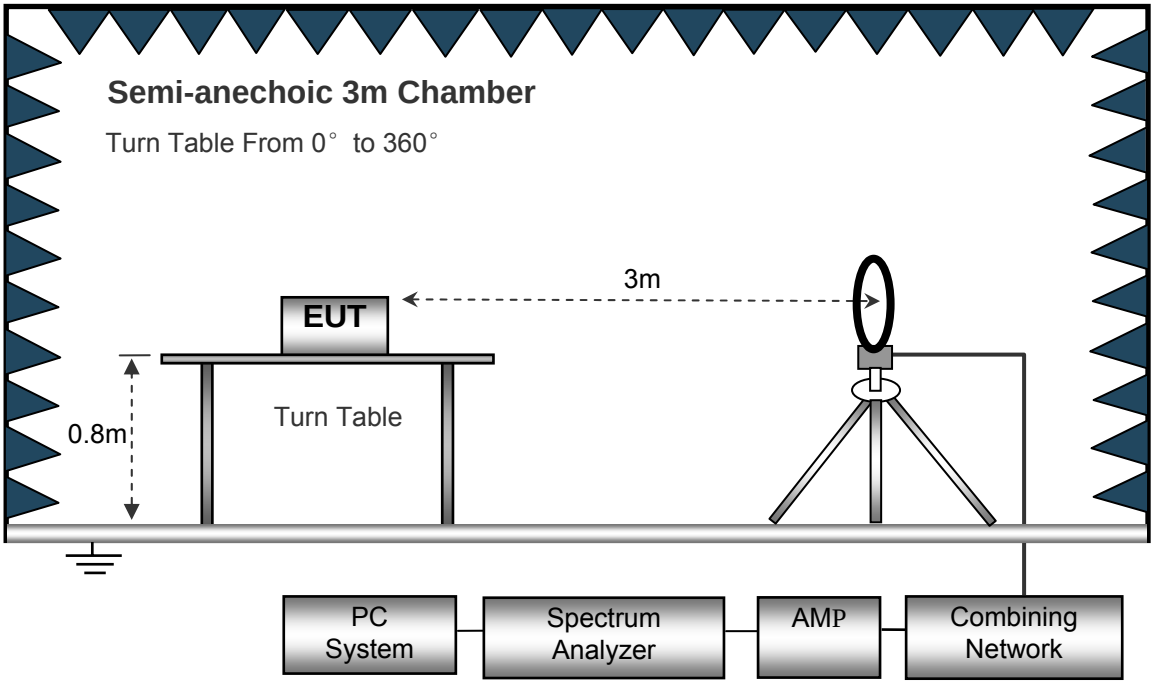
EUT Operation :

The test was performed in TX Transmitting mode, the test data were shown in the report.

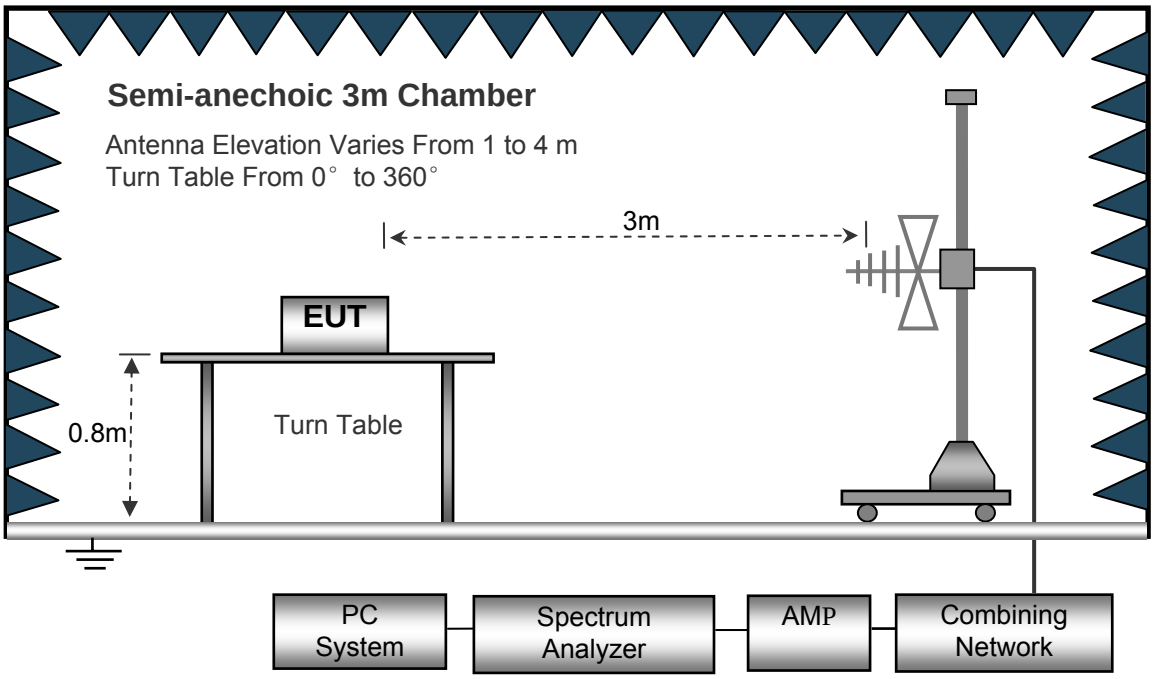
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

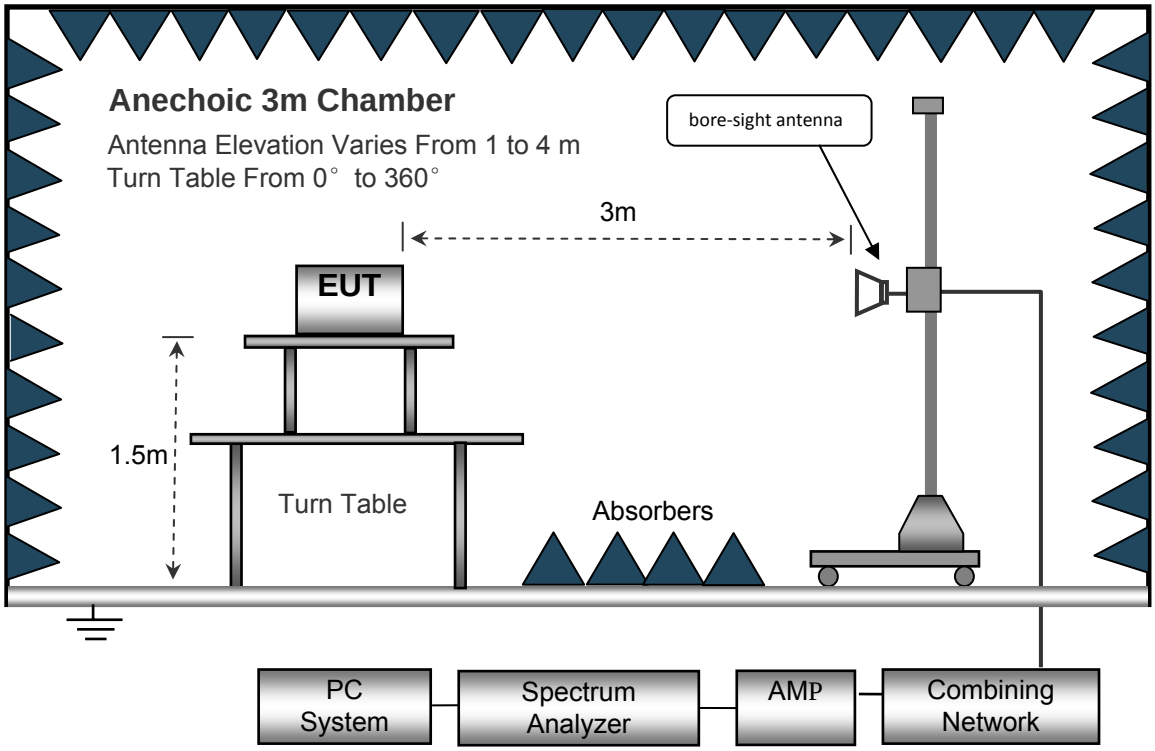
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz

Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz
Detector ..... Ave.
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 10Hz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the Z position. So the data shown was the Z position only.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

7.6 Summary of Test Results

Test Frequency: 9KHz~30MHz

Remark: only the worst data (GFSK modulation Low channel mode) were reported

Frequency	Measurement results dBμV @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dBμV/m @30m	Limits dBμV/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
6.021	25.30	QP	21.84	40.00	7.14	29.54	-22.40
15.730	24.58	QP	21.35	40.00	5.93	29.54	-23.61
25.680	25.26	QP	20.67	40.00	5.93	29.54	-23.61

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Test Frequency: 30MHz ~ 8GHz

Remark: only the worst data (GFSK modulation mode) were reported.

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel									
268.32	36.61	QP	319	1.5	H	-13.35	23.26	46.00	-22.74
268.32	40.47	QP	59	1.6	V	-13.35	27.12	46.00	-18.88
4812.00	47.10	PK	230	1.1	V	-1.06	46.04	74.00	-27.96
4812.00	43.14	Ave	230	1.1	V	-1.06	42.08	54.00	-11.92
7218.00	39.63	PK	283	1.2	H	1.33	40.96	74.00	-33.04
7218.00	35.45	Ave	283	1.2	H	1.33	36.78	54.00	-17.22
2310.51	45.09	PK	299	2.0	V	-13.19	31.90	74.00	-42.10
2310.51	37.30	Ave	299	2.0	V	-13.19	24.11	54.00	-29.89
2352.13	42.19	PK	215	1.3	H	-13.14	29.05	74.00	-44.95
2352.13	36.09	Ave	215	1.3	H	-13.14	22.95	54.00	-31.05
2495.21	44.68	PK	210	1.9	V	-13.08	31.60	74.00	-42.40
2495.21	38.00	Ave	210	1.9	V	-13.08	24.92	54.00	-29.08

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel									
268.32	38.22	QP	235	1.2	H	-13.35	24.87	46.00	-21.13
268.32	41.37	QP	119	1.0	V	-13.35	28.02	46.00	-17.98
4882.00	46.93	PK	125	1.9	V	-0.62	46.31	74.00	-27.69
4882.00	45.67	Ave	125	1.9	V	-0.62	45.05	54.00	-8.95
7323.00	41.18	PK	8	1.3	H	2.21	43.39	74.00	-30.61
7323.00	33.96	Ave	8	1.3	H	2.21	36.17	54.00	-17.83
2331.82	45.74	PK	305	1.2	V	-13.19	32.55	74.00	-41.45
2331.82	37.52	Ave	305	1.2	V	-13.19	24.33	54.00	-29.67
2375.31	43.09	PK	138	1.2	H	-13.14	29.95	74.00	-44.05
2375.31	37.19	Ave	138	1.2	H	-13.14	24.05	54.00	-29.95
2483.69	42.98	PK	244	1.1	V	-13.08	29.90	74.00	-44.10
2483.69	38.36	Ave	244	1.1	V	-13.08	25.28	54.00	-28.72

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK High Channel									
268.32	34.76	QP	95	1.2	H	-13.35	21.41	46.00	-24.59
268.32	40.81	QP	150	1.1	V	-13.35	27.46	46.00	-18.54
4950.00	45.58	PK	265	1.5	V	-0.24	45.34	74.00	-28.66
4950.00	43.34	Ave	265	1.5	V	-0.24	43.10	54.00	-10.90
7425.00	37.51	PK	42	1.2	H	2.84	40.35	74.00	-33.65
7425.00	36.18	Ave	42	1.2	H	2.84	39.02	54.00	-14.98
2343.06	46.46	PK	35	1.9	V	-13.19	33.27	74.00	-40.73
2343.06	37.19	Ave	35	1.9	V	-13.19	24.00	54.00	-30.00
2360.74	43.47	PK	273	1.6	H	-13.14	30.33	74.00	-43.67
2360.74	36.54	Ave	273	1.6	H	-13.14	23.40	54.00	-30.60
2498.62	44.98	PK	11	1.2	V	-13.08	31.90	74.00	-42.10
2498.62	36.93	Ave	11	1.2	V	-13.08	23.85	54.00	-30.15

Test Frequency: 8GHz~25GHz

The measurements were more than 20 dB below the limit and not recorded

8 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10: 2013

Test Result: PASS

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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

8.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:

Blow 30MHz:

RBW = 100kHz, VBW = 300kHz, Sweep = auto

Detector function = peak, Trace = max hold

Above 30MHz:

RBW = 100kHz, VBW = 300kHz, Sweep = auto

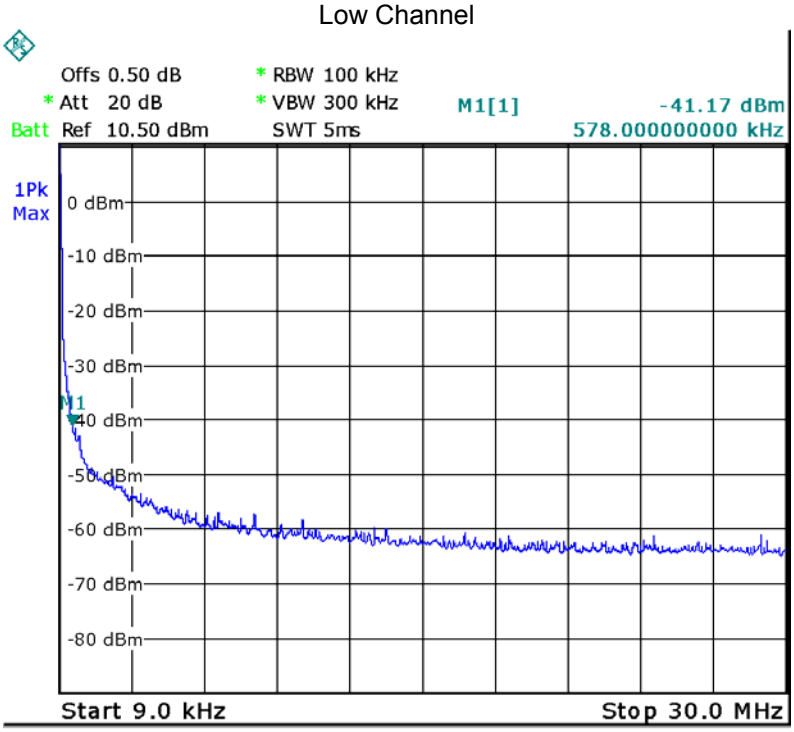
Detector function = peak, Trace = max hold

8.2 Test Result

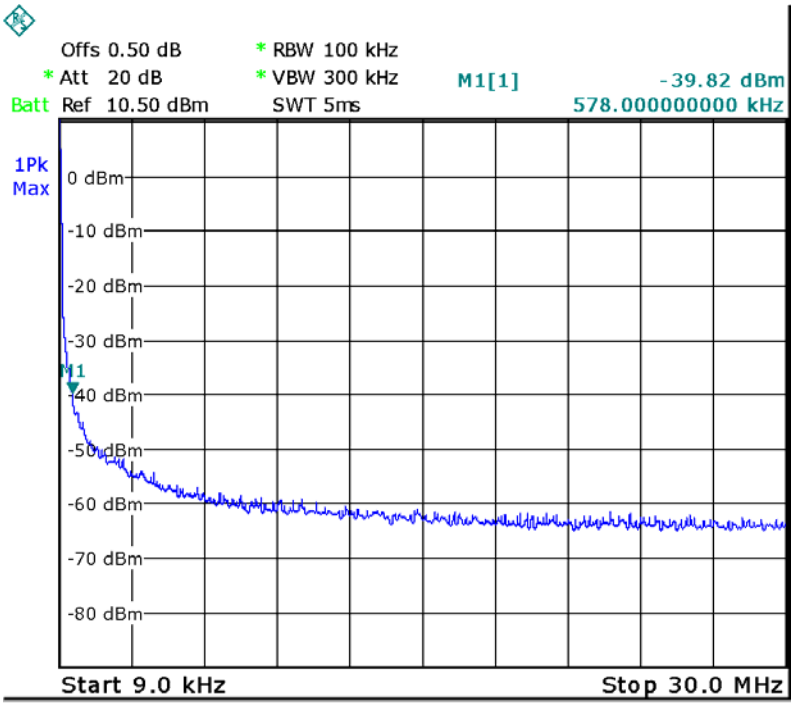
9KHz - 30MHz

GFSK

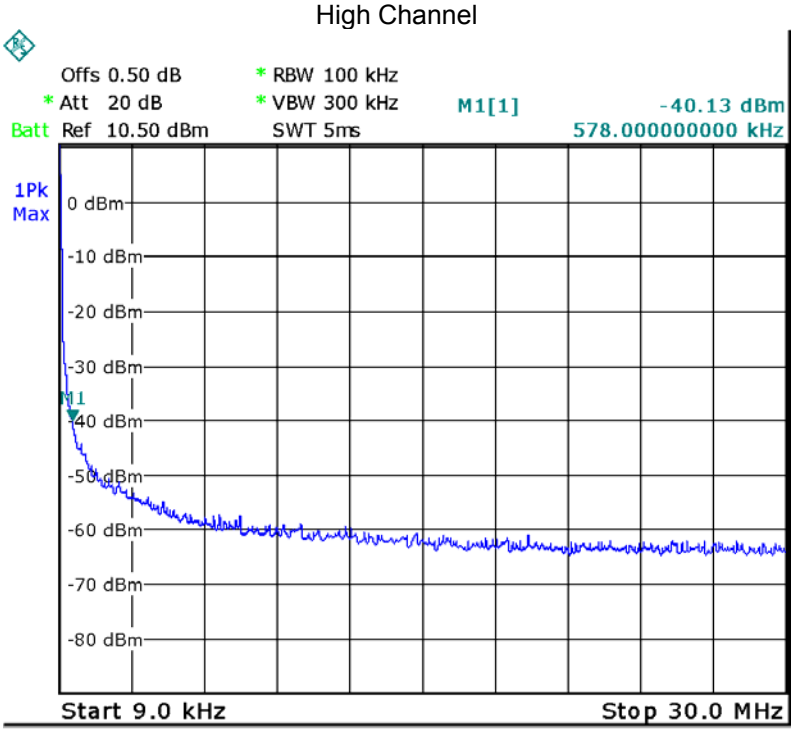
Low Channel



Middle Channel



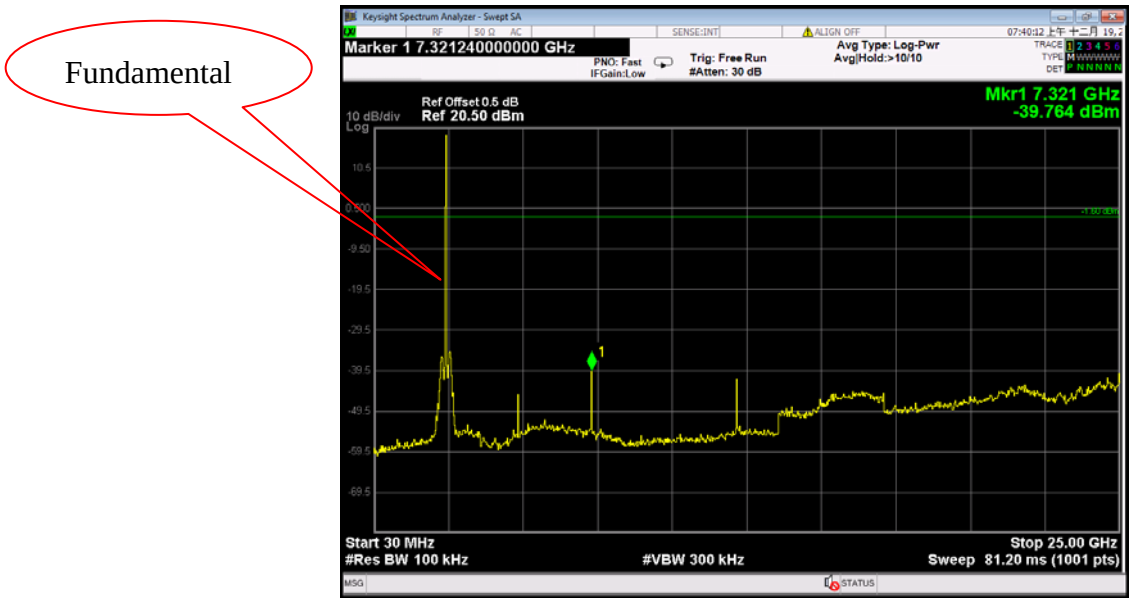
High Channel



30MHz – 25GHz

GFSK Low Channel

GFSK Middle Channel



GFSK High Channel

9 Band Edge Measurement

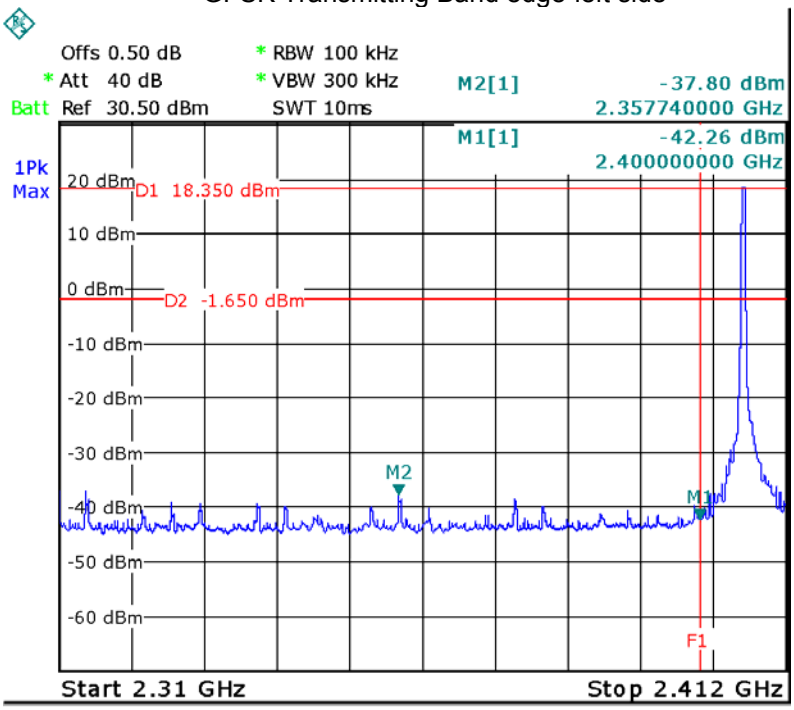
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	ANSI C63.10: 2013
Test Limit:	Regulation 15.247 (d),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)).
Test Mode:	Transmitting

9.1 Test Procedure

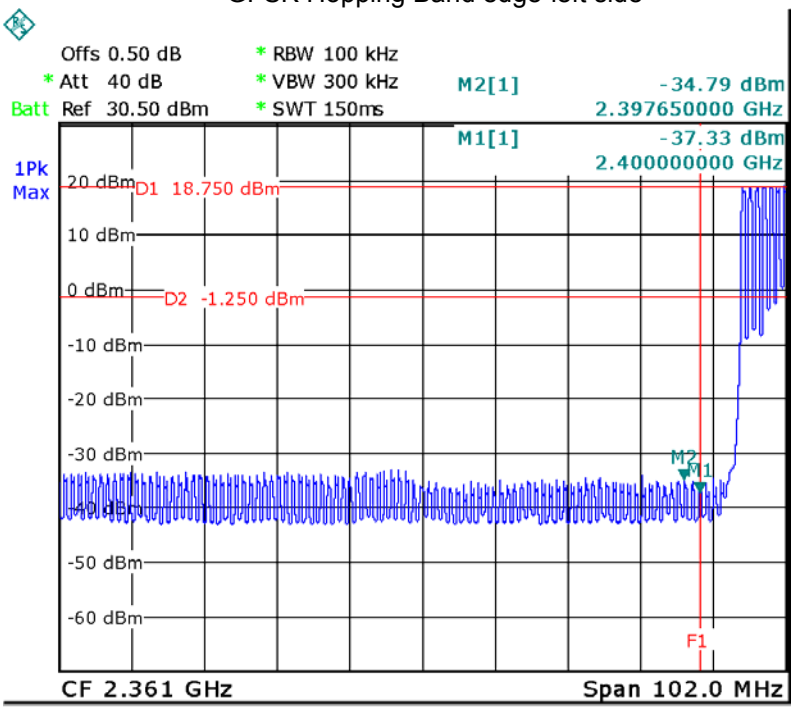
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
   Detector function = peak, Trace = max hold

9.2 Test Result

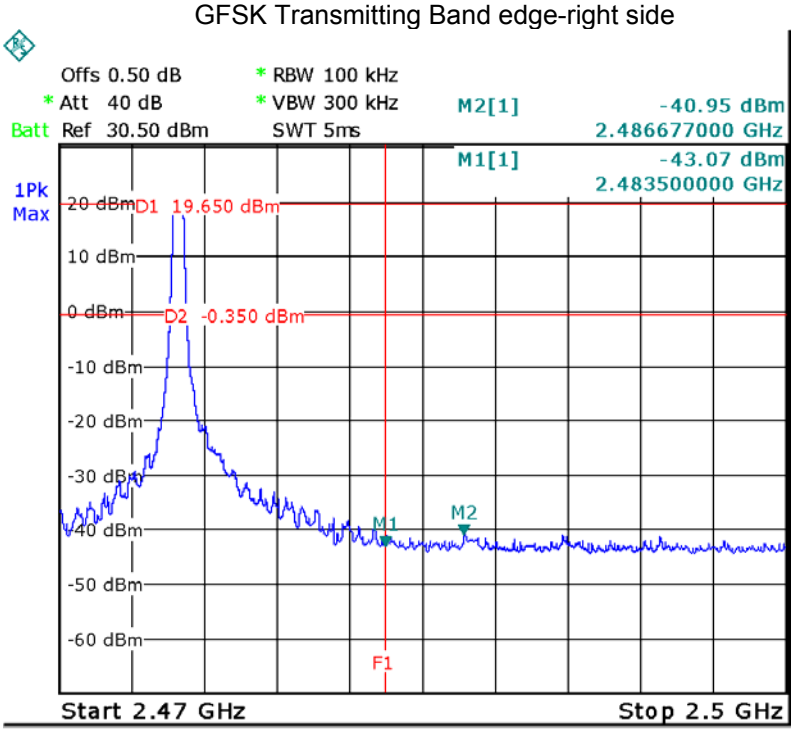
GFSK Transmitting Band edge-left side



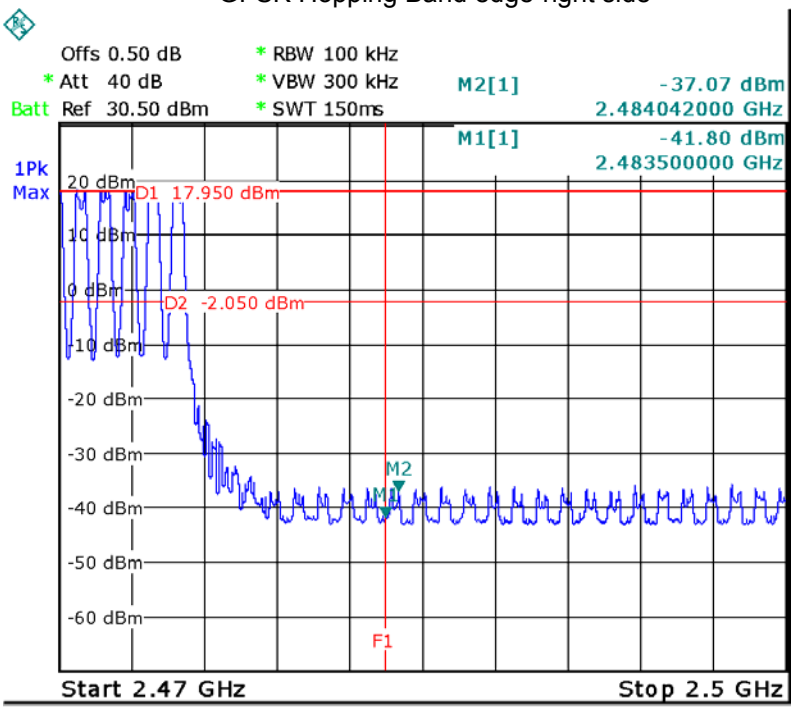
GFSK Hopping Band edge-left side



GFSK Transmitting Band edge-right side



GFSK Hopping Band edge-right side



10 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10: 2013

Test Mode: Test in fixing operating frequency at low, Middle, high channel.

10.1 Test Procedure

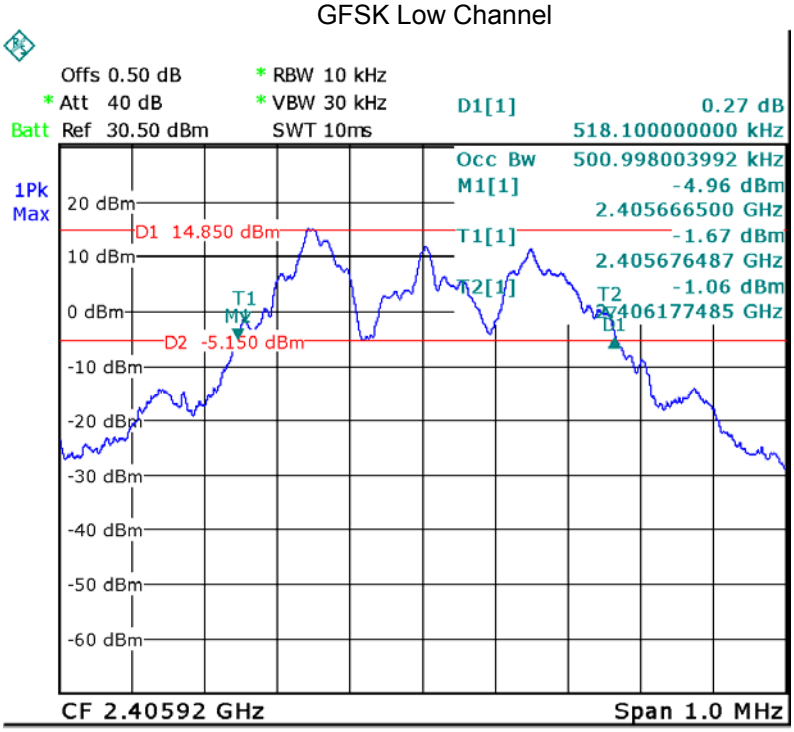
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 30kHz, VBW = 100kHz

10.2 Test Result

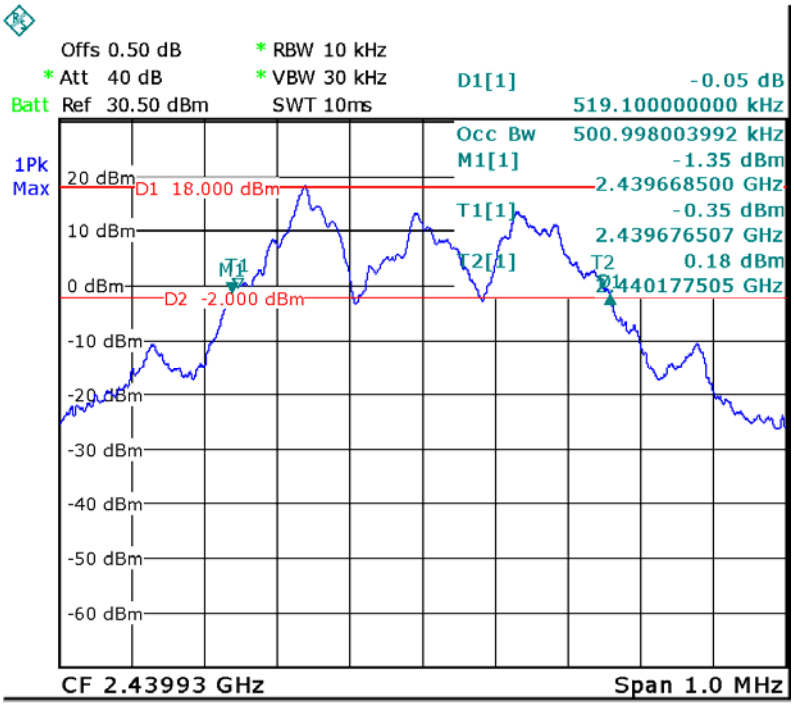
Modulation	Test Channel	Bandwidth(MHz)
GFSK	Low	0.518
GFSK	Middle	0.519
GFSK	High	0.521

Test plots

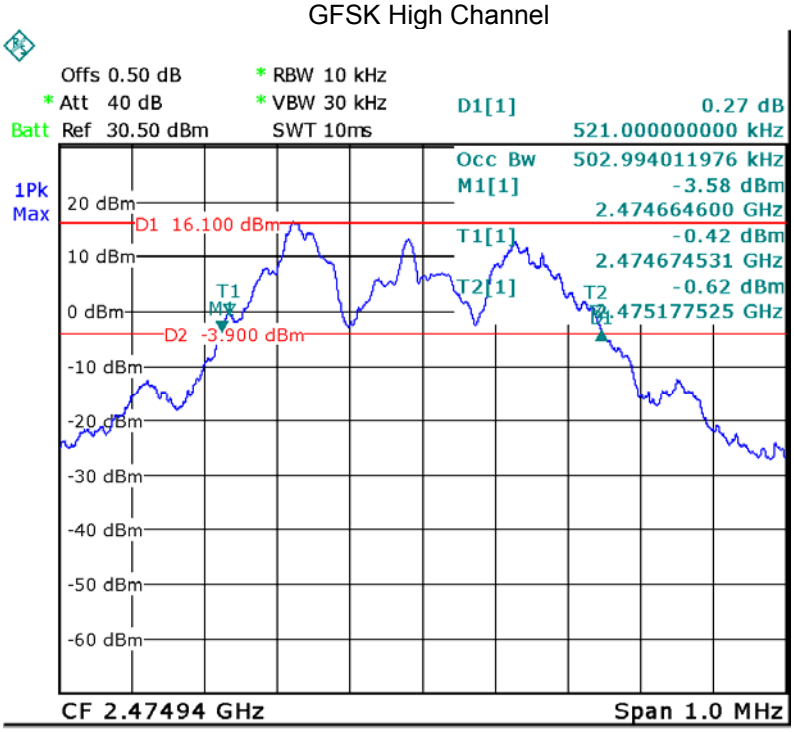
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



11 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10: 2013

Test Limit: Regulation 15.247 (a)(1), For frequency hopping systems operating in the 2400 2483.5 MHz band by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater 0.125 watts..

Test mode: Test in fixing frequency transmitting mode.

11.1 Test Procedure

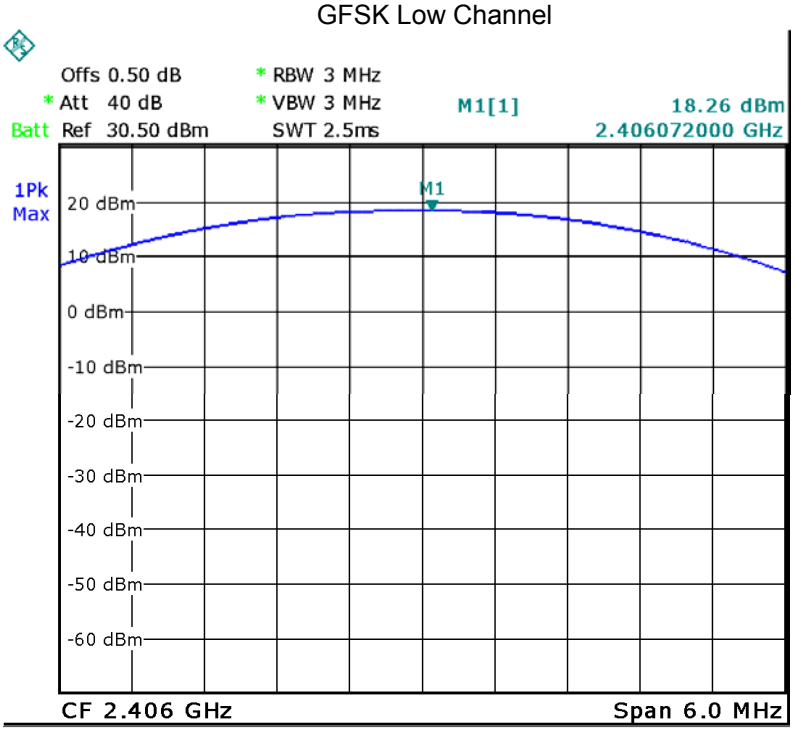
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer:
   a) Use the following spectrum analyzer settings:
      1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
      2) RBW ≥20 dB bandwidth of the emission being measured.
      3) VBW ≥ RBW.
      4) Sweep: Auto.
      5) Detector function: Peak.
      6) Trace: Max hold.
   b) Allow trace to stabilize.
   c) Use the marker-to-peak function to set the marker to the peak of the emission.
   d) The indicated level is the peak output power, after any corrections for external attenuators and cables.
   e) A plot of the test results and setup description shall be included in the test report.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

11.2 Test Result

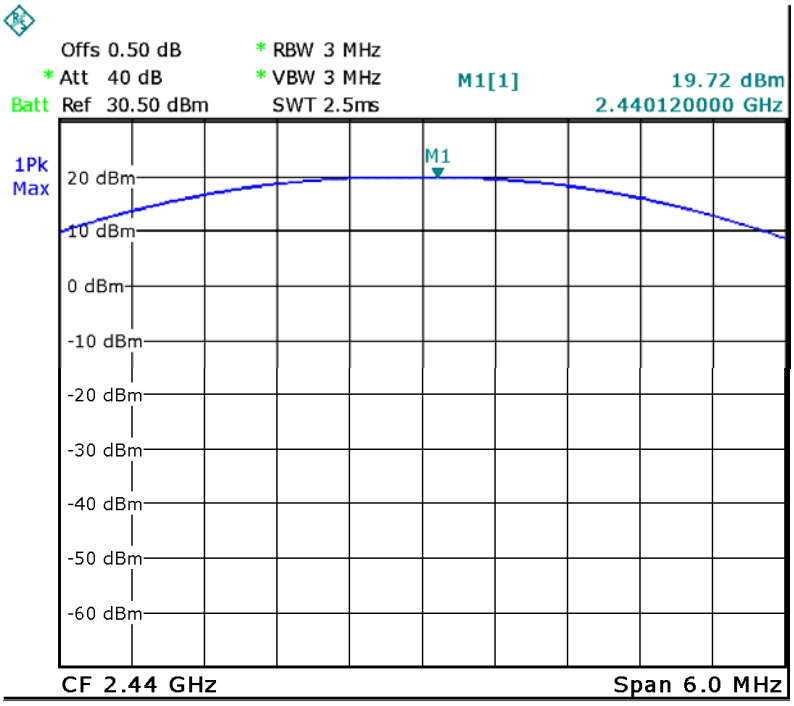
Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Low	18.26	30
GFSK	Middle	**19.72**	30
GFSK	High	19.46	30

Test plots

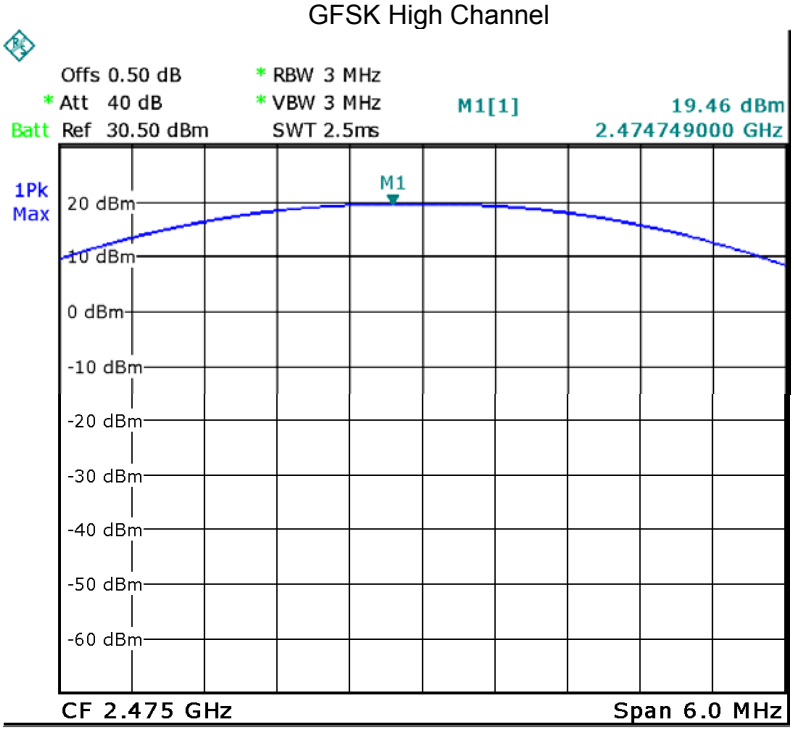
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



12 Hopping Channel Separation

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10: 2013

Test Limit: Regulation 15.247(a)(1) 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 operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with power no greater than 0.125W.

Test Mode: Test in hopping transmitting operating mode.

12.1 Test Procedure

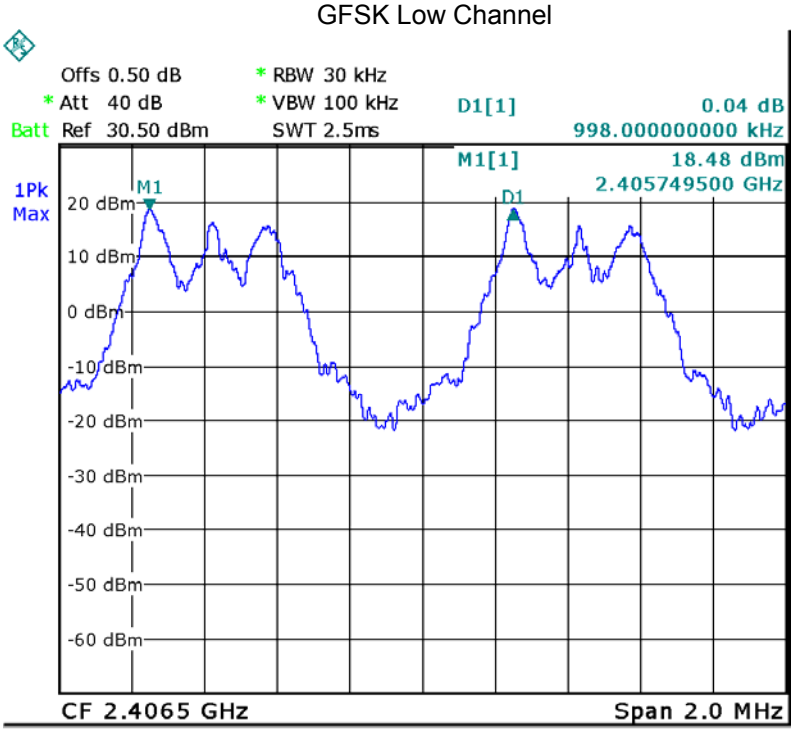
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer:
   a) Span: Wide enough to capture the peaks of two adjacent channels.
   b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
   c) Video (or average) bandwidth (VBW) ≥ RBW.
   d) Sweep: Auto.
   e) Detector function: Peak.
   f) Trace: Max hold.
   g) Allow the trace to stabilize.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

12.2 Test Result

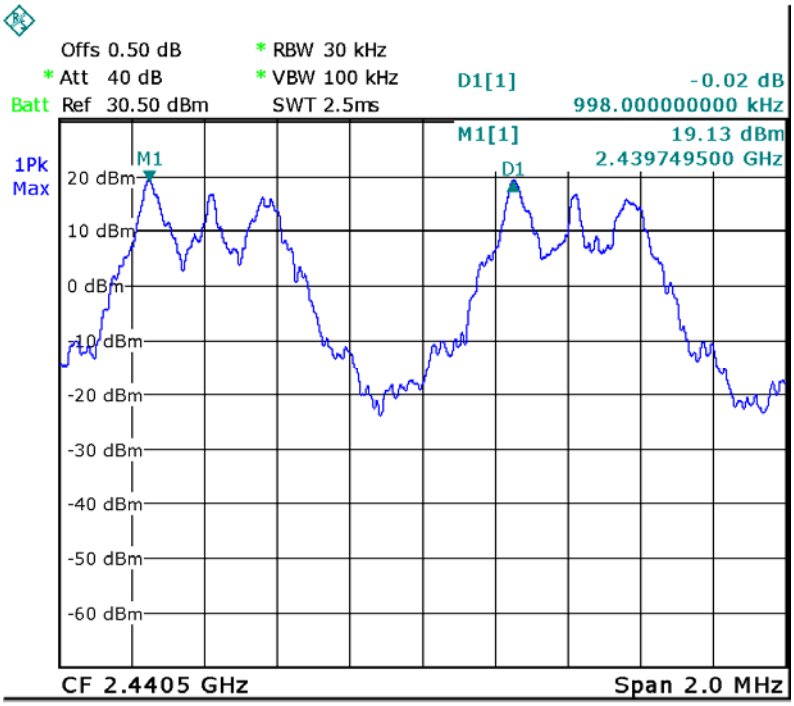
Modulation	Test Channel	Separation (MHz)	Limit(MHz)	Result
GFSK	Low	0.998	0.518	PASS
GFSK	Middle	0.998	0.519	PASS
GFSK	High	0.998	0.521	PASS

Test plots

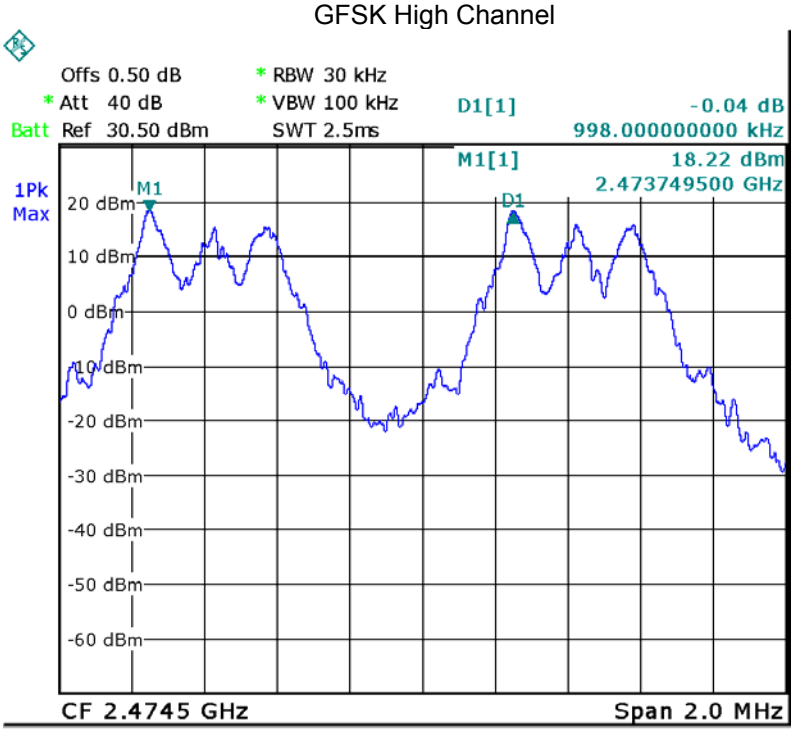
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



13 Number of Hopping Frequency

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10: 2013

Test Limit: Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

Test Mode: Test in hopping transmitting operating mode.

13.1 Test Procedure

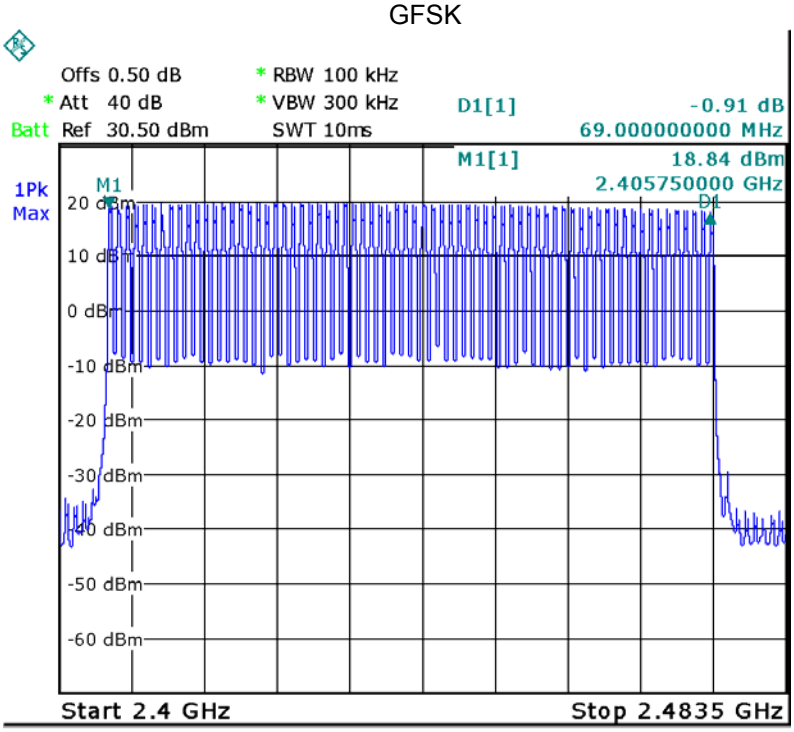
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer:
   a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
   b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
   c) VBW ≥ RBW.
   d) Sweep: Auto.
   e) Detector function: Peak.
   f) Trace: Max hold.
   g) Allow the trace to stabilize..
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

13.2 Test Result

Test Plots:

70 Channels in total

GFSK



14 Dwell Time

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10: 2013

Test Limit: Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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.

Test Mode: Test in hopping transmitting operating mode.

14.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. Centred on a hopping channel;
3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

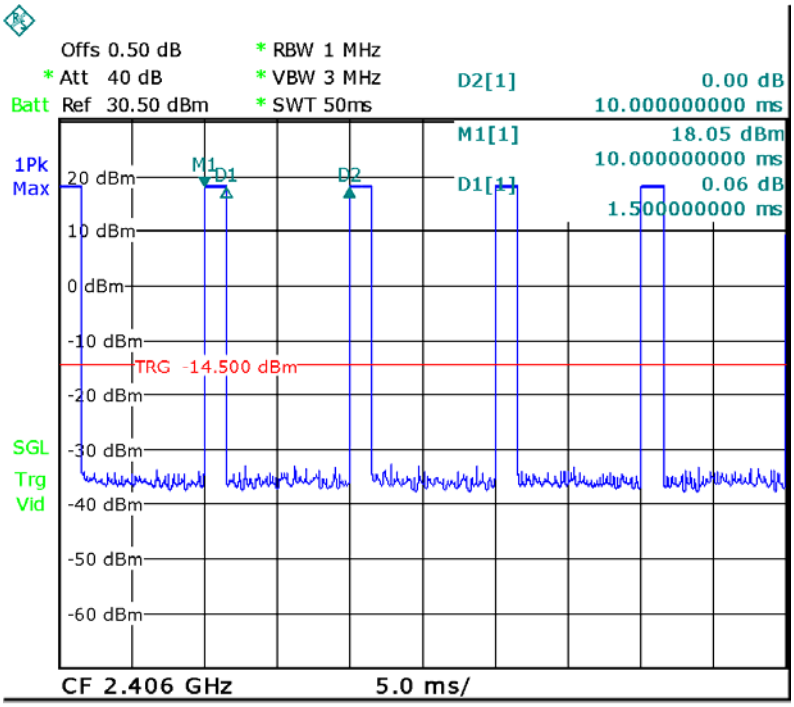
14.2 Test Result

Modulation	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
GFSK	Low	1.500	0.030	0.4
	middle	1.500	0.030	0.4
	High	1.500	0.030	0.4

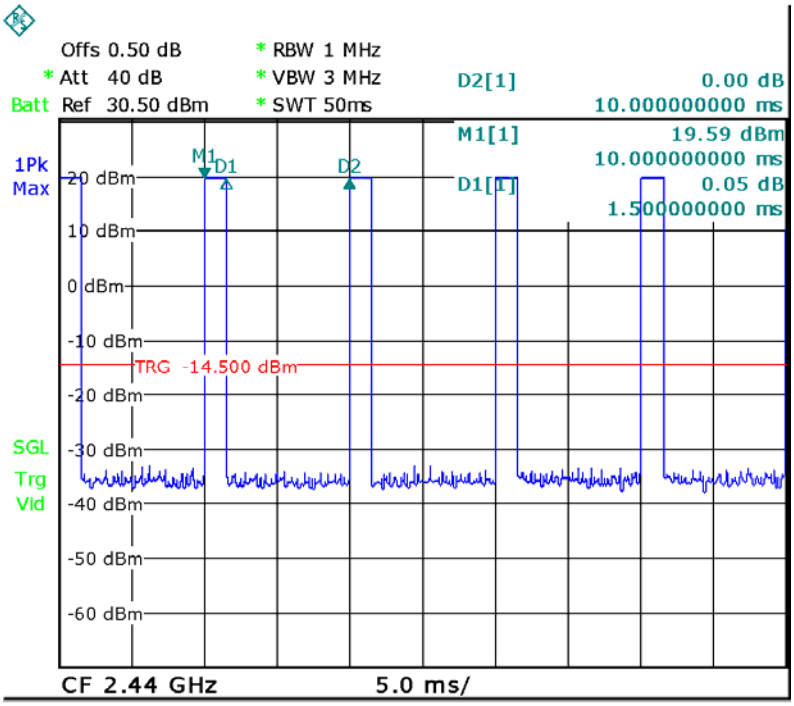
Remark: The manufacturer claims the device trasmitting every 10ms ,

Dwell Time = 1000/10/70/2*0.4*70*(MkrDelta)/1000

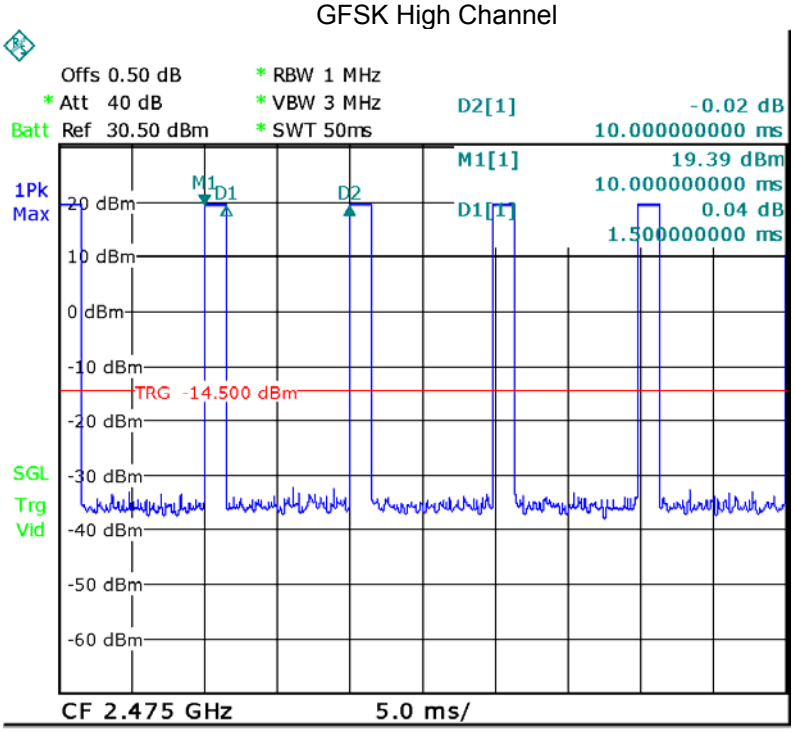
Test Plots
GFSK Low Channel



GFSK Middle Channel



GFSK High Channel



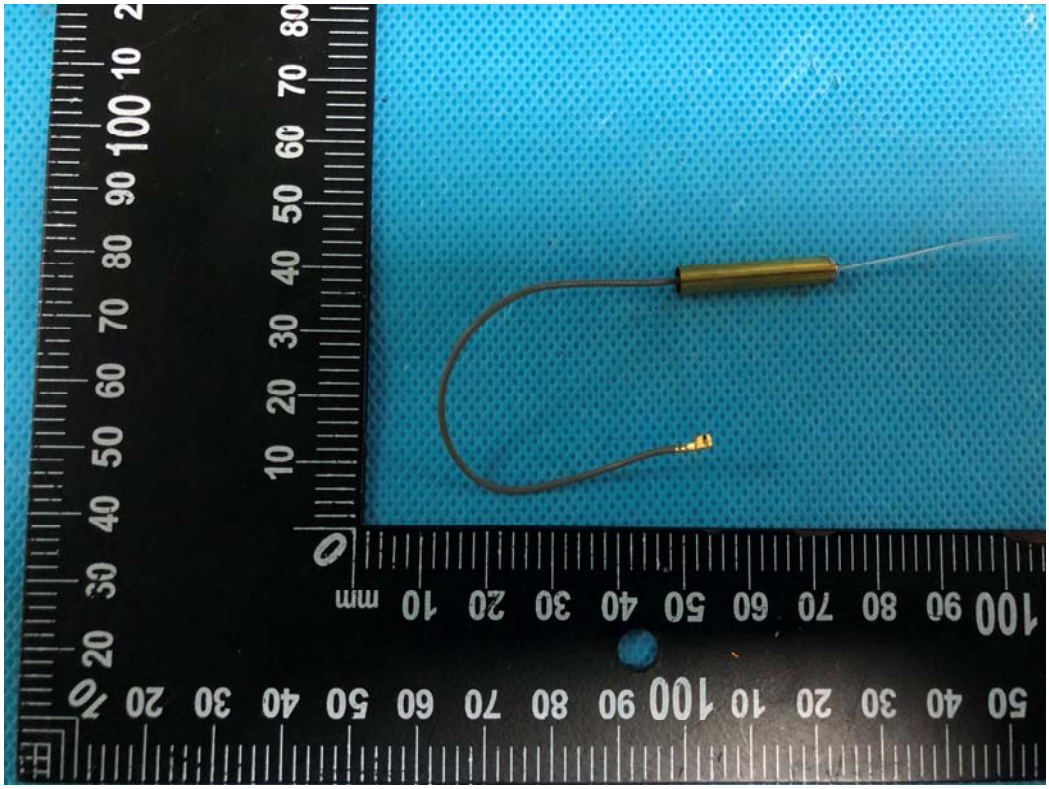
15 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator 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.

For intentional device, according to FCC 47 CFR Section 15.203, 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.

Result:

The EUT has one Fixed antenna, the gain is 2.0 dBi. meets the requirements of FCC 15.203.



16 RF Exposure

Remark: refer to SAR report: WTD19S12084505W001

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-ESKY008083-Photos.

======End of Report======