

FCC CERTIFICATION TEST REPORT

For
FCC ID: IKQBTfMA
IC:6955A-BTFMA

Report Reference No. : 19EFCS07002 0911
Date of issue : 2019-07-30
Testing Laboratory : DongGuan ShuoXin Electronic Technology Co., Ltd.
Address : Zone A, 1F, No. 6, XinGang Road YuanGang Street,
XinAn District, ChangAn Town, DongGuan City,
GuangDong, China

Applicant's name..... : Scosche Industries, Inc.
Address : 1550 Pacific Ave, Oxnard, CA 93033
Manufacturer..... : Scosche Industries, Inc.

Test specification:
Test item description..... : Bluetooth FM Transmitter
Trade Mark..... : Scosche
Model/Type reference : FCC:BTfM,BTFMA,BTFM2A,BTFMI,
BTfMSR-SP, BTfMSR-SP1
IC:BTfMA
Ratings : I/P: 12VDC 1A
O/P: 5VDC 2.1A

Responsible Engineer :


Smile Wang

Authorized Signatory:

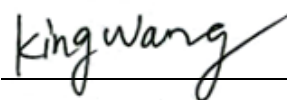

King Wang

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TEST REPORT DECLARE

Applicant	:	Scosche Industries, Inc.
Address	:	1550 Pacific Ave, Oxnard, CA 93033
Equipment under Test	:	Bluetooth FM Transmitter
Model No	:	FCC:BTfMA,BTFMA,BTFM2A,BTFMI,BTFMSR-SP,BTFMSR-SP1 IC:BTfMA
Manufacturer	:	Scosche Industries, Inc.
Address	:	1550 Pacific Ave, Oxnard, CA 93033

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C (15.247),RSS-247 Issue 2 February 2017,RSS-Gen Issue 5 March 2019 Amendment 1

Test procedure used: ANSI C63.10:2013, 558074 D01 15.247 Meas Guidance v05

We Declare:

The equipment described above is tested by DongGuan ShuoXin Electronic Technology Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and DongGuan ShuoXin Electronic Technology Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	19EFCS07002 0911		
Date of Test:	2019-07-02---2019-07-30	Date of Report:	2019-07-31

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of DongGuan ShuoXin Electronic Technology Co., Ltd.

1. SUMMARY OF TEST RESULTS

The EUT have been tested according to the applicable standards as referenced below.		
Description of Test Item	Standard	Results
Bandwidth	FCC Part 15: 15.247(a)(1) RSS-247 section 5.1(a) ,RSS-GEN section 6.7	PASS
Carrier Frequency Separation Test	FCC Part 15: 15.247(a)(1) RSS-247 section 5.1(b)	PASS
Number Of Hopping Frequency	FCC Part 15: 15.247(a)(1)(iii) RSS-247 section 5.1(d)	PASS
Dwell Time Test	FCC Part 15: 15.247(a)(1)(iii) RSS-247 section 5.1(d)	PASS
Maximum Output Power	FCC Part 15: 15.247(b)(1) RSS-247 section 5.4(b)	PASS
Band Edge Emission	FCC Part 15: 15.247(c) RSS-247 section 5.5	PASS
Radiated Spurious Emissions	FCC Part 15.205 / 15.209 RSS-Gen section 6.13	PASS
Antenna requirement	FCC Part 15: 15.203 RSS-GEN section 6.8	PASS
Power Line Conducted Emission	FCC Part 15.207 RSS-Gen section 8.8	PASS
Frequency Stability	RSS-GEN section 6.11	PASS

2. GENERAL TEST INFORMATION

2.1. DESCRIPTION OF EUT

EUT* Name	:	Bluetooth FM Transmitter
Model Number	:	FCC:BTFM,BTFMA,BTFM2A,BTFMI,BTFMSR-SP,BTFMSR-SP1 IC:BTfMA
EUT function description	:	Please reference user manual of this device
Power supply	:	I/P: 12VDC 1A O/P: 5VDC 2.1A
Adaptor	:	N/A
Radio Technology	:	BT V5.0
Operation frequency	:	2402-2480MHz
Modulation	:	GFSK, π /4-DQPSK,8DPSK
Antenna Type	:	Internal Antenna, maximum PK gain: 0dBi
Date of Receipt	:	2019/07/02
Sample Type	:	Single production

2.2. ACCESSORIES OF EUT

Description of Accessories	Manufacturer	Model number or Type	Output.
/	/	/	/

2.3. ASSISTANT EQUIPMENT USED FOR TEST

Description of Assistant equipment	Manufacturer	Model number or Type	EMC Compliance	SN
/	/	/	/	/

2.4. BLOCK DIAGRAM OF EUT CONFIGURATION FOR TEST



EUT enters the engineering interface by clicking the system version ,control EUT work in Continuous TX mode, and select test channel, wireless mode and data rate.

Remark: GFSK,8DPSK, π /4DQPSK all these modulation all have been tested , GFSK is found as worst case and only reported for radiated emission.

Tested mode, channel, and data rate information			
Mode	data rate (Mbps) (see Note)	Channel	Frequency (MHz)
GFSK	1	Low :CH0	2402
	1	Middle: CH39	2441
	1	High: CH78	2480
π /4DQPSK	2	Low :CH0	2402
	2	Middle: CH39	2441
	2	High: CH78	2480
8DPSK	3	Low :CH0	2402
	3	Middle: CH39	2441
	3	High: CH78	2480
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.			

2.5. TEST ENVIRONMENT CONDITIONS

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

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa

2.6. MEASUREMENT UNCERTAINTY

Test Item	Uncertainty
Uncertainty for Conduction emission test (9kHz-150kHz)	3.7 dB
Uncertainty for Conduction emission test (150kHz-30MHz)	3.3 dB
Uncertainty for Radiation Emission test (30MHz-200MHz)	4.60 dB (Polarize: V)
	4.60 dB (Polarize: H)
Uncertainty for Radiation Emission test (200MHz-1GHz)	6.10 dB (Polarize: V)
	5.08 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz-6GHz)	5.01 dB (Polarize: V)
	5.01 dB (Polarize: H)
Uncertainty for Radiation Emission test (6GHz-18GHz)	5.26 dB (Polarize: V)
	5.26 dB (Polarize: H)
Uncertainty for Radiation Emission test (18GHz-40GHz)	5.06 dB (Polarize: V)
	5.06 dB (Polarize: H)
Uncertainty for radio frequency	$\pm 0.048\text{kHz}$
Uncertainty for conducted RF Power	$\pm 0.32\text{dB}$

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

2.7. TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

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

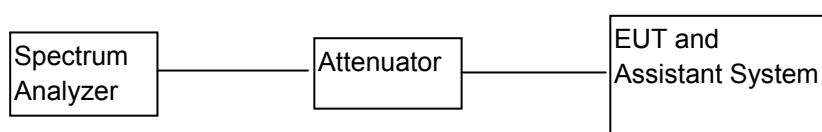
Test Software Version	Actions(BT FCC ToolV2.21)		
Frequency (MHz)	2402	2441	2480
Power Parameters (GFSK)	3	3	3
Power Parameters ($\pi/4$ -DQPSK)	3	3	3
Power Parameters (8DPSK)	3	3	3

3. 20dB BANDWIDTH & 99% BANDWIDTH

3.1. TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

3.2. BLOCK DIAGRAM OF TEST SETUP



3.3. LIMITS

No limit requirement.

3.4. TEST PROCEDURE

- (1) Configure EUT and assistant system according clause 2.4 and 3.2.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

RBW:	30KHz
VBW:	100KHz
Detector Mode:	Peak
Sweep time:	auto
Trace mode:	Max hold

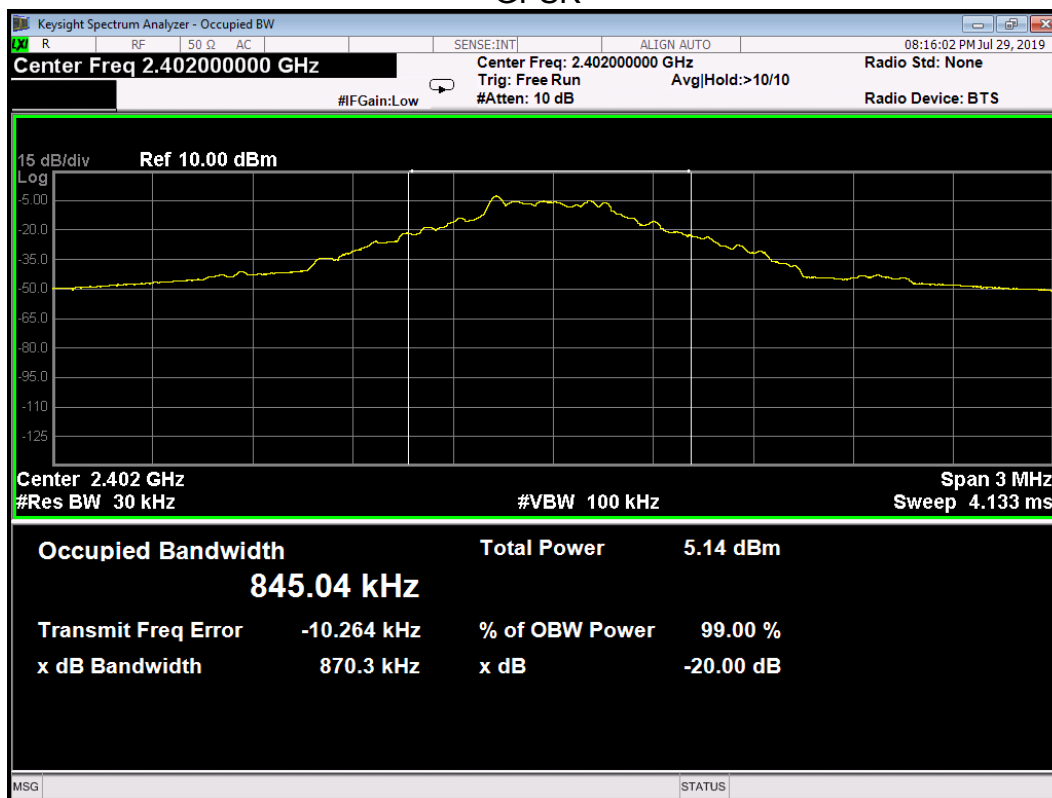
- (5) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB and 99% bandwidth relative to the maximum level measured in the fundamental emission.

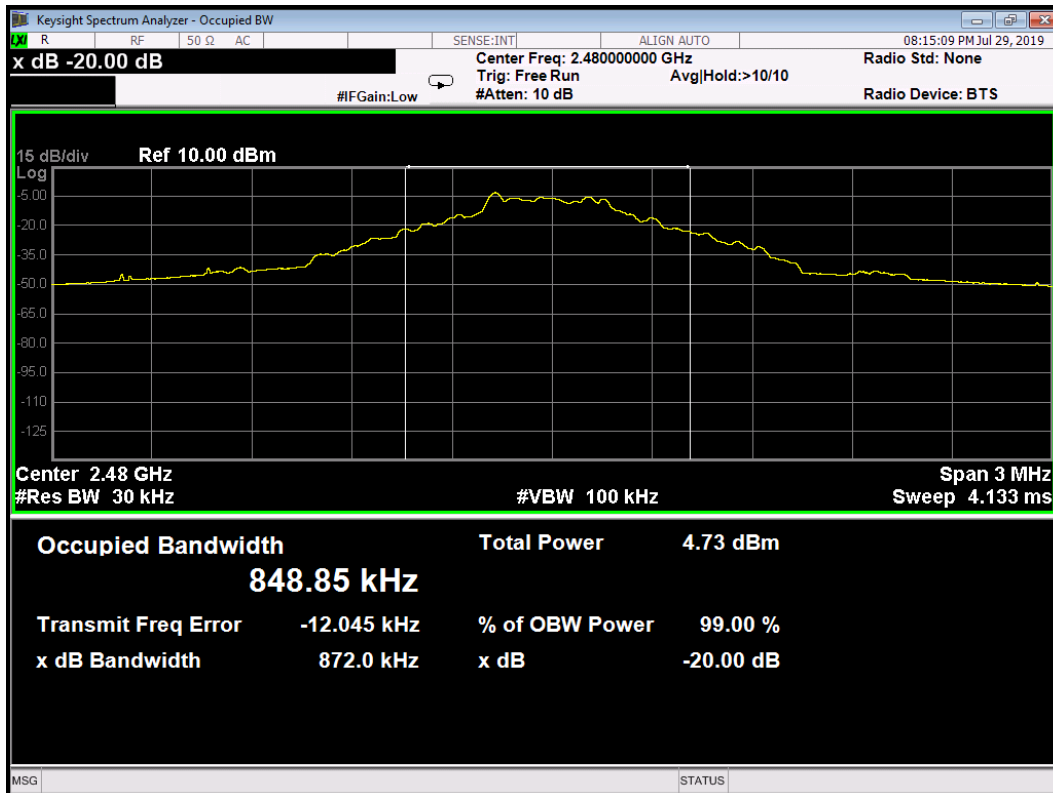
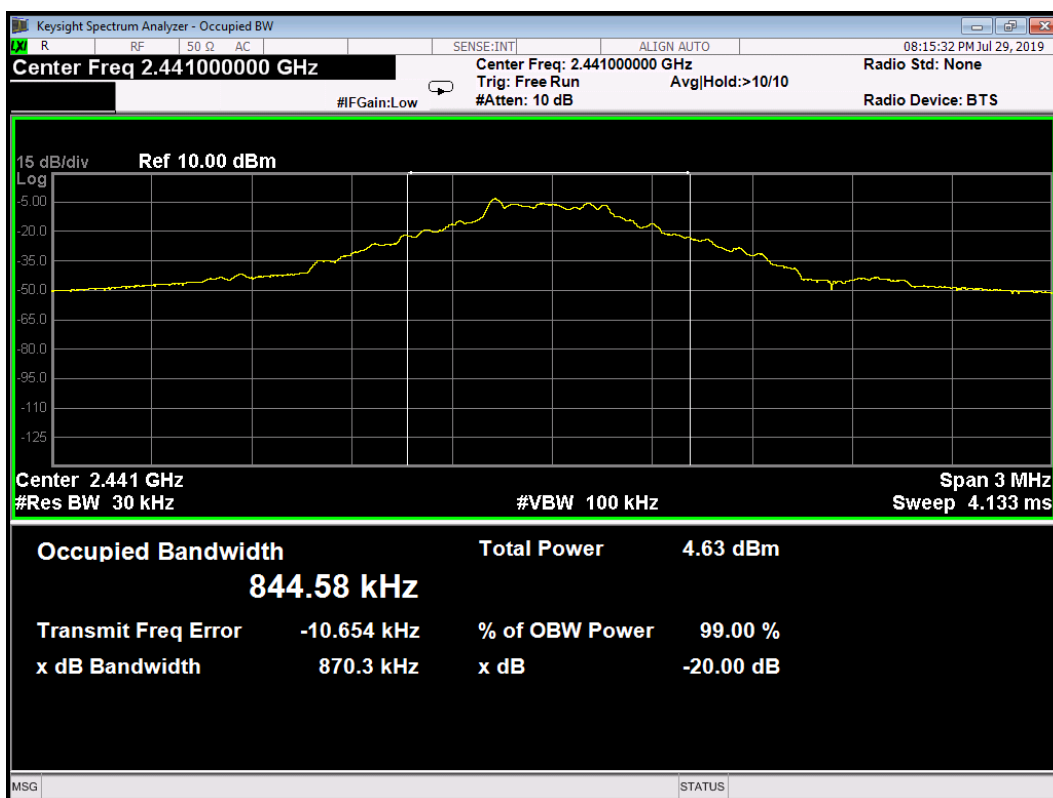
3.5. TEST RESULT

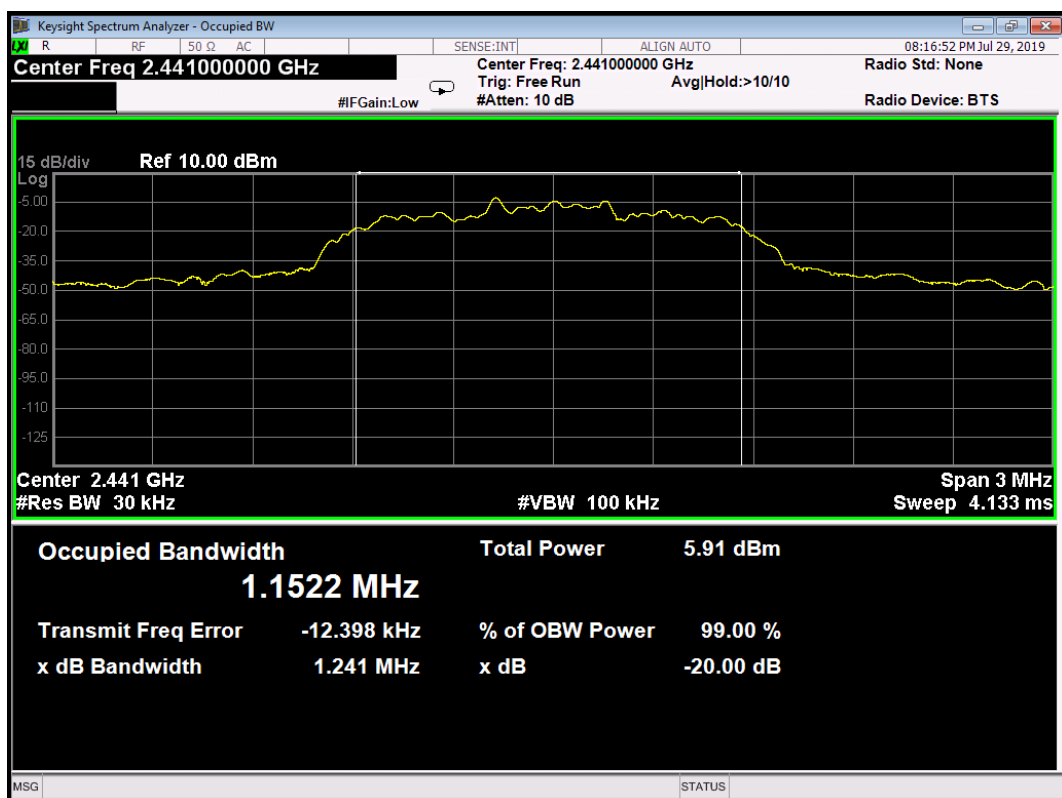
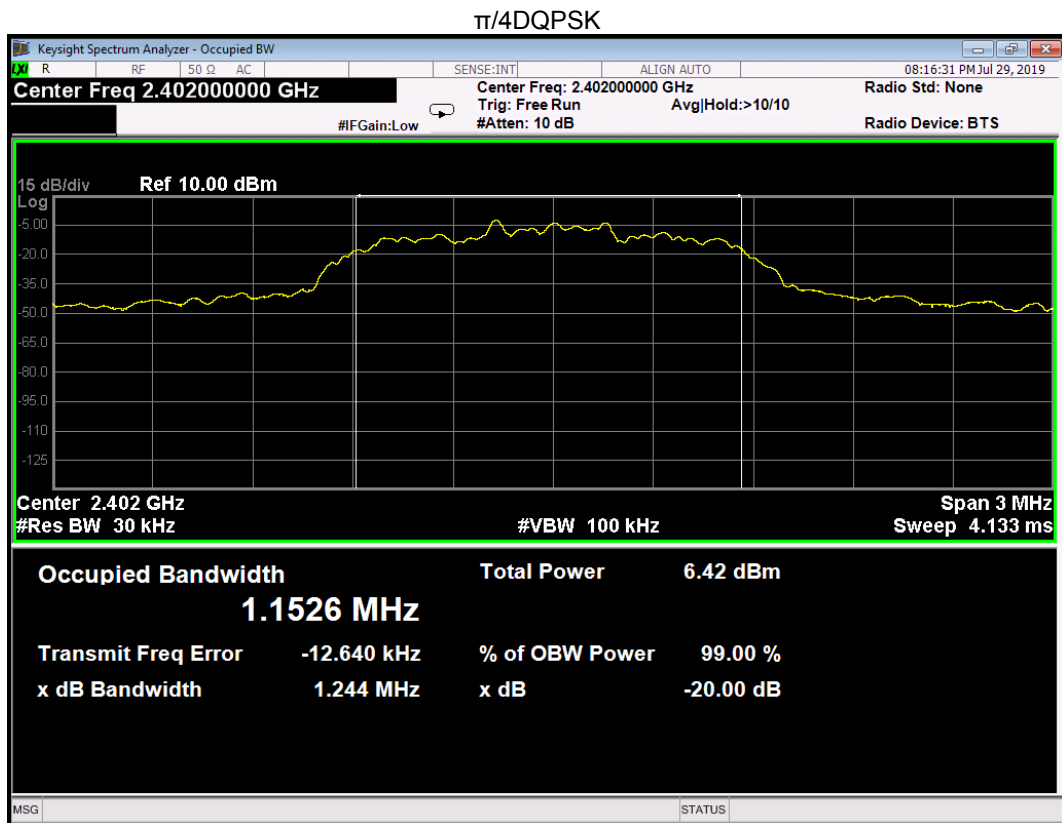
Mode	Freq	20dB	99%OBW	Conclusion
	(MHz)	(MHz)	(MHz)	
GFSK	2402	0.87	0.85	PASS
	2441	0.87	0.84	PASS
	2480	0.87	0.85	PASS
$\pi/4$ DQPSK	2402	1.24	1.15	PASS
	2441	1.24	1.15	PASS
	2480	1.25	1.15	PASS
8DPSK	2402	1.26	1.15	PASS
	2441	1.25	1.15	PASS
	2480	1.26	1.15	PASS

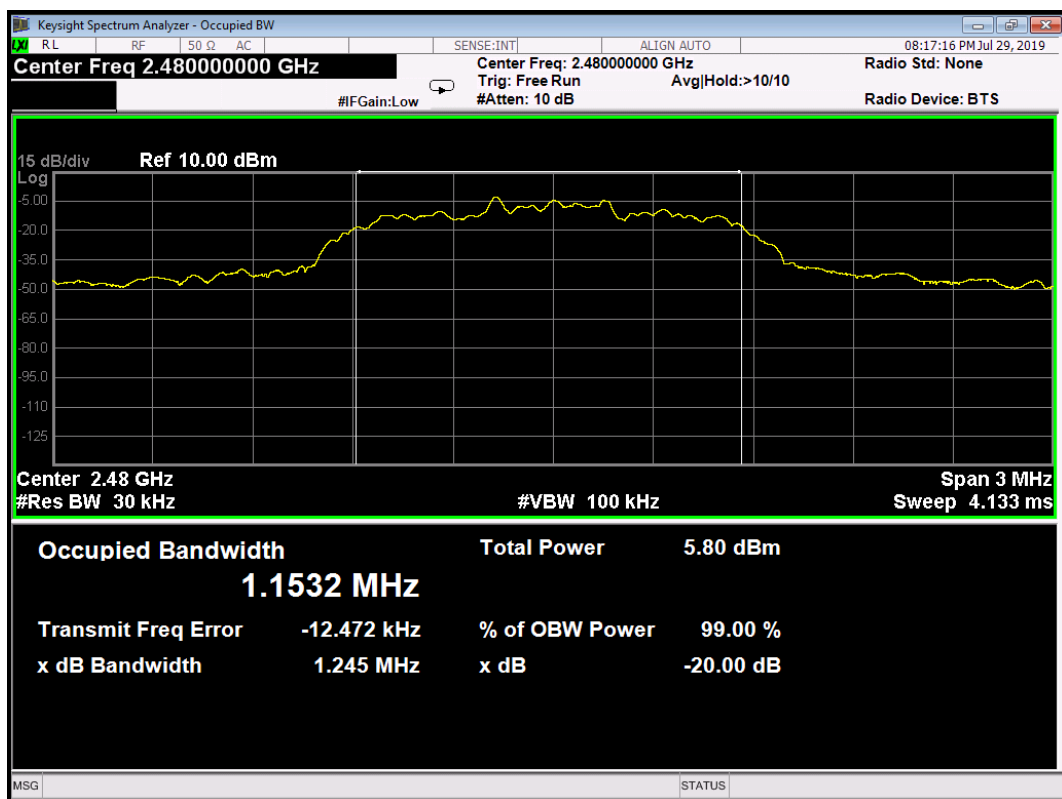
3.6. ORIGINAL TEST DATA

GFSK

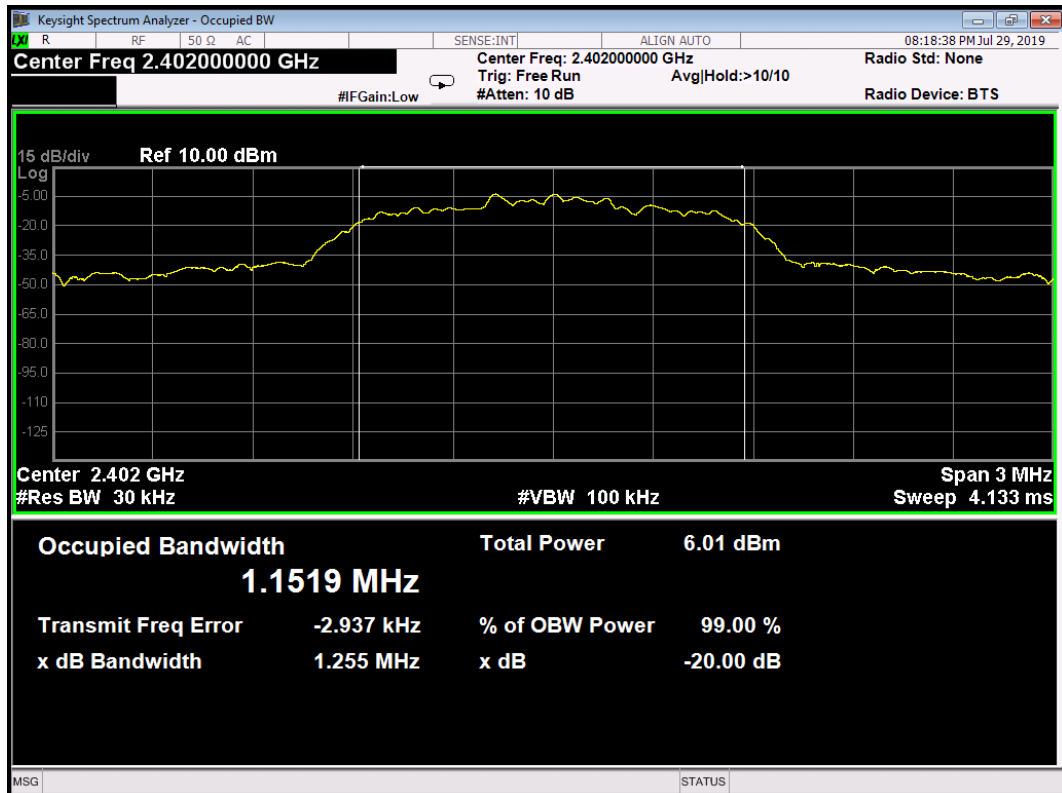


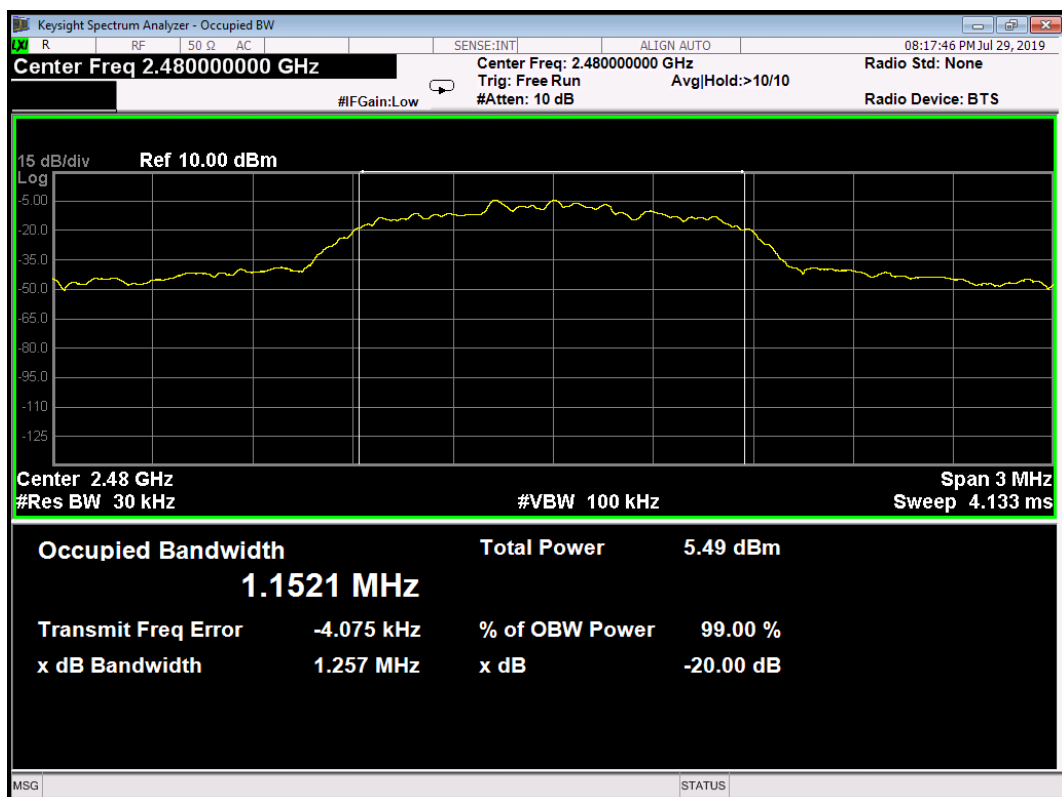
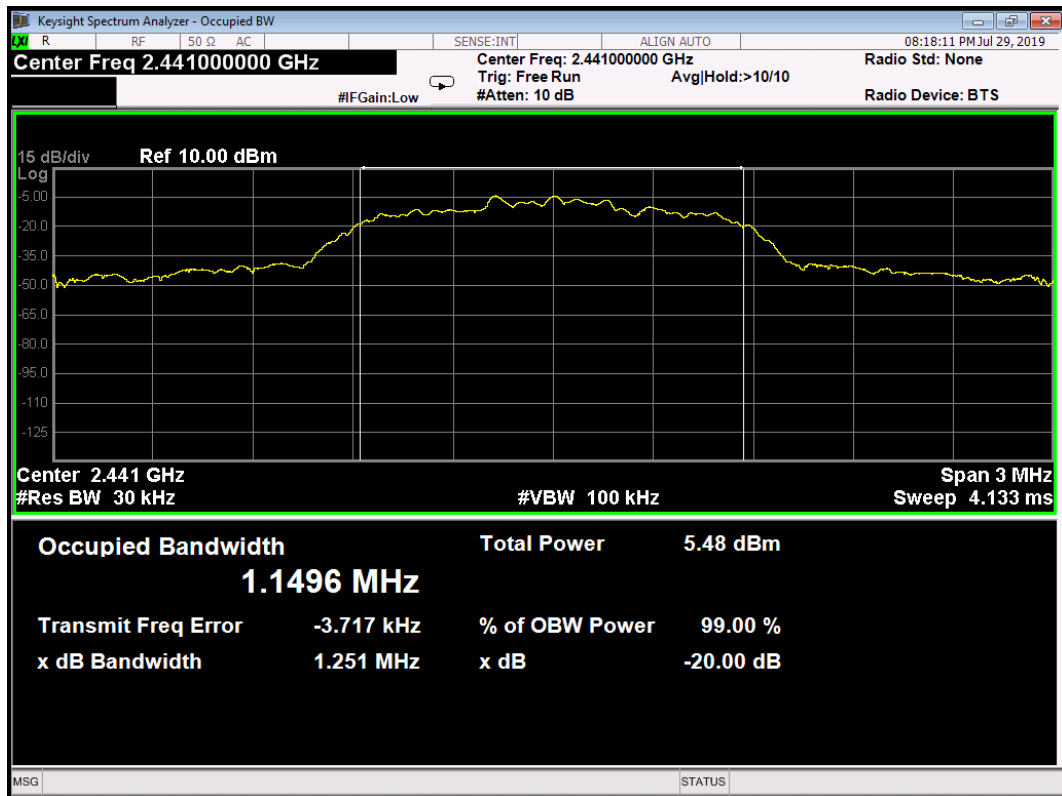






8DPSK





4. CARRIER FREQUENCY SEPARATION TEST

4.1. TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

4.2. THE REQUIREMENT FOR SECTION 15.247(A)(1)

Section 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 an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly

ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

4.3. EUT CONFIGURATION ON MEASUREMENT

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

4.4. OPERATING CONDITION OF EUT

- (1) Setup the EUT and simulator as shown as Section 6.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz.
We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

4.5. TEST PROCEDURE

- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) .Set RBW of spectrum analyzer to 30 kHz and VBW to 100 kHz. Adjust Span to 3 MHz.
- (3) Set the adjacent channel of the EUT maxhold another trace.

(4) Measurement the channel separation

4.6. TEST RESULT**GFSK**

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.002	>(25KHz or 2/3*20dB Bandwidth)	PASS
Middle	2441	0.996	>(25KHz or 2/3*20dB Bandwidth)	PASS
High	2479	0.999	>(25KHz or 2/3*20dB Bandwidth)	PASS

 $\pi/4$ DQPSK

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.005	>(25KHz or 2/3*20dB Bandwidth)	PASS
Middle	2441	1.011	>(25KHz or 2/3*20dB Bandwidth)	PASS
High	2479	1.002	>(25KHz or 2/3*20dB Bandwidth)	PASS

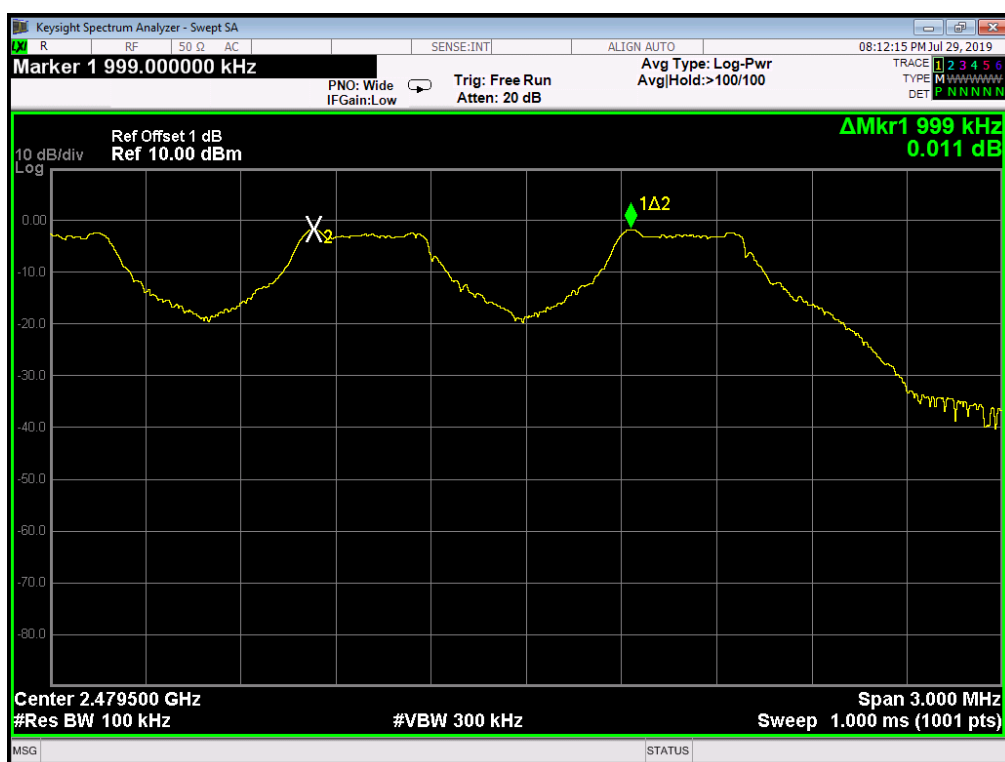
8DPSK

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	0.996	>(25KHz or 2/3*20dB Bandwidth)	PASS
Middle	2441	0.999	>(25KHz or 2/3*20dB Bandwidth)	PASS
High	2480	1.002	>(25KHz or 2/3*20dB Bandwidth)	PASS

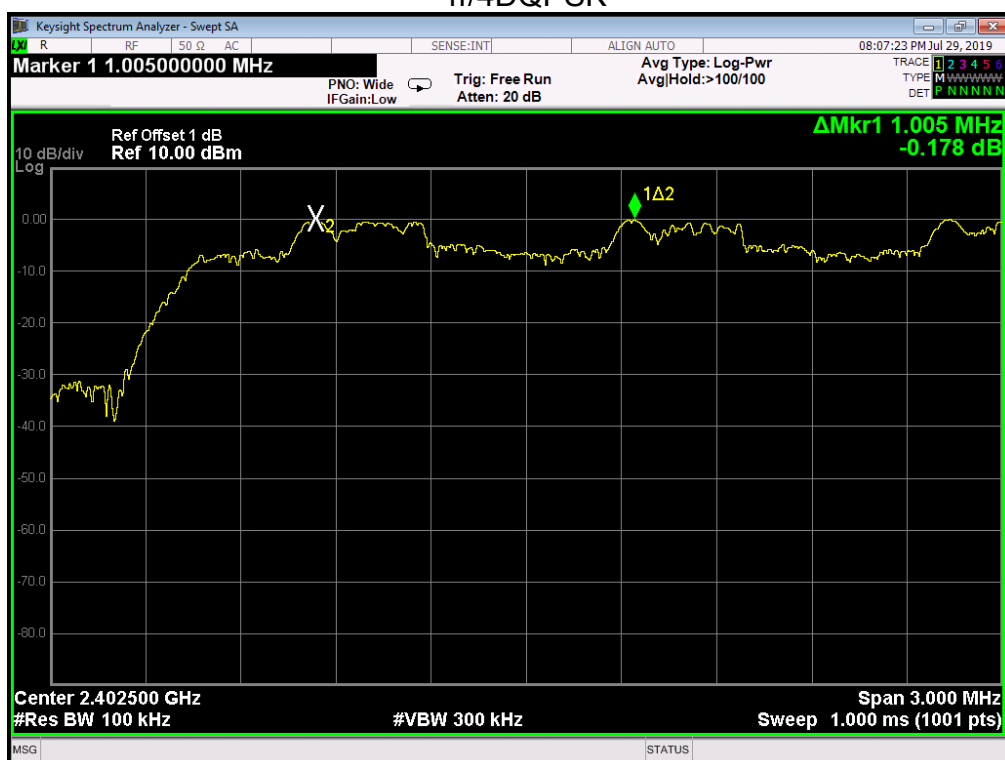
The spectrum analyzer plots are attached as below.

GFSK



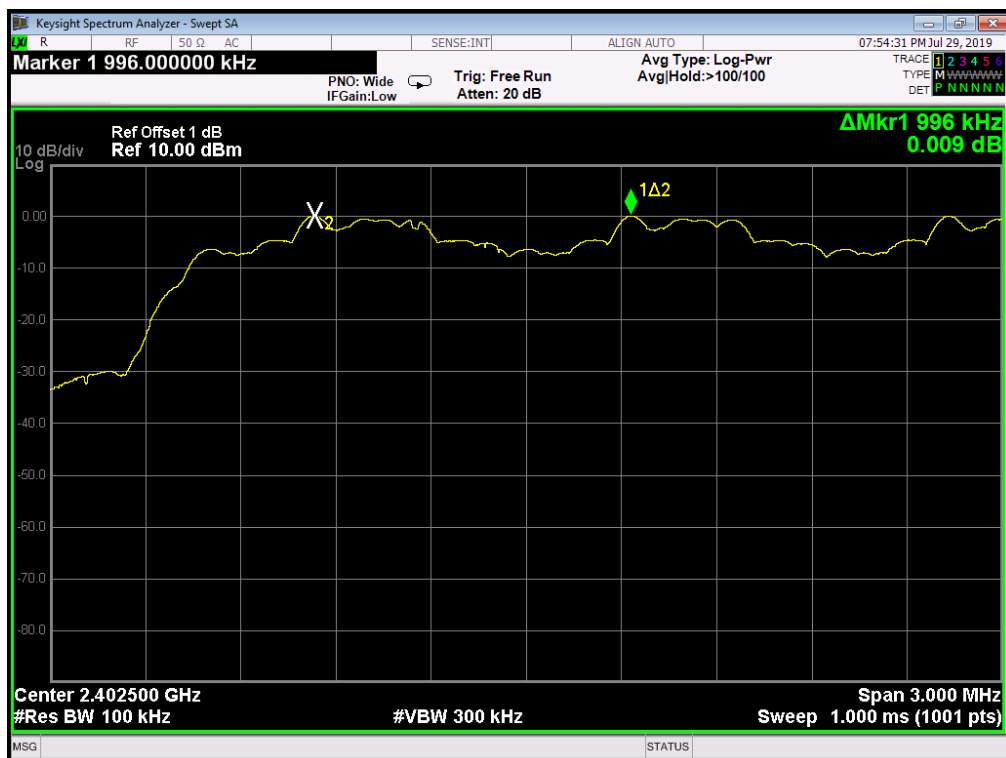


$\pi/4$ DQPSK





8DPSK





5. NUMBER OF HOPPING FREQUENCY TEST

5.1. TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

5.2. THE REQUIREMENT FOR SECTION 15.247(a)(1)(iii)

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

5.3. EUT CONFIGURATION ON MEASUREMENT

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4. OPERATING CONDITION OF EUT

- (1) Setup the EUT and simulator as shown as Section 7.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it.

5.5. TEST PROCEDURE

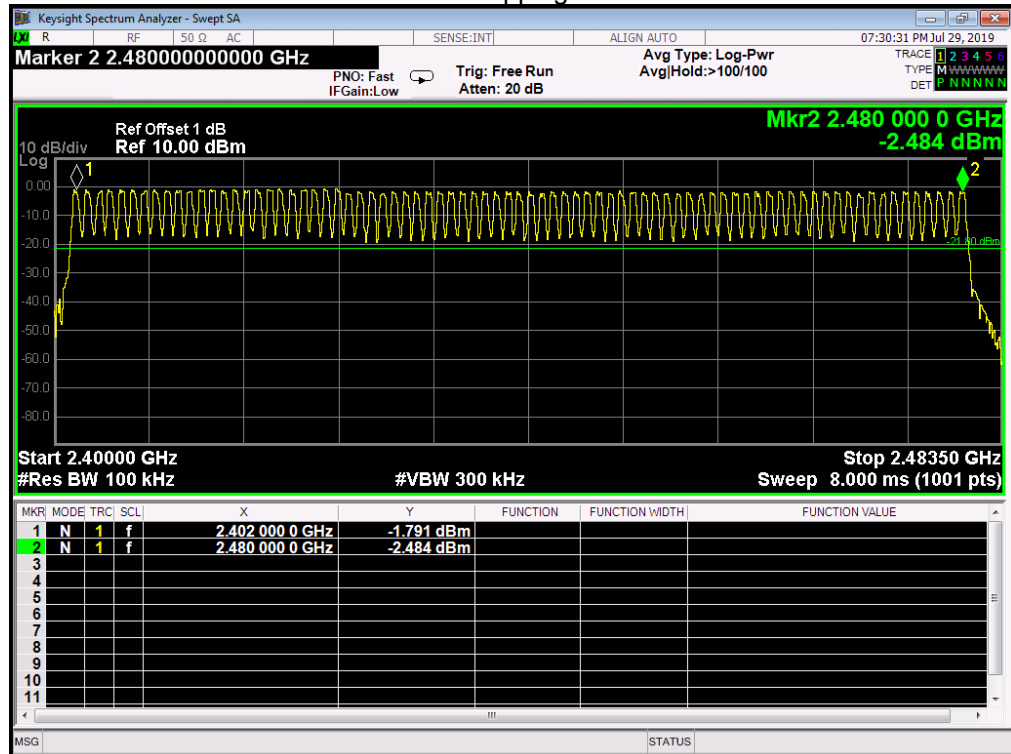
- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) Set the spectrum analyzer as Span=83.5MHz, RBW=100 kHz, VBW=300 kHz.
- (3) Max hold, view and count how many channel in the band.

5.6. TEST RESULT

Total number of hopping channel	Measurement result(CH)	Limit(CH)
	79	≥15

The spectrum analyzer plots are attached as below

Number of hopping channels



Channle information

CH	Frequency	CH	Frequency	CH	Frequency	CH	Frequency	CH	Frequency
0	2402	16	2418	32	2434	48	2450	64	2466
1	2403	17	2419	33	2435	49	2451	65	2467
2	2404	18	2420	34	2436	50	2452	66	2468
3	2405	19	2421	35	2437	51	2453	67	2469
4	2406	20	2422	36	2438	52	2454	68	2470
5	2407	21	2423	37	2439	53	2455	69	2471
6	2408	22	2424	38	2440	54	2456	70	2472
7	2409	23	2425	39	2441	55	2457	71	2473
8	2410	24	2426	40	2442	56	2458	72	2474
9	2411	25	2427	41	2443	57	2459	73	2475
10	2412	26	2428	42	2444	58	2460	74	2476
11	2413	27	2429	43	2445	59	2461	75	2477
12	2414	28	2430	44	2446	60	2462	76	2478
13	2415	29	2431	45	2447	61	2463	77	2479
14	2416	30	2432	46	2448	62	2464	78	2480
15	2417	31	2433	47	2449	63	2465	-	-

6.DWELL TIME TEST

6.1. TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

6.2. THE REQUIREMENT FOR SECTION 15.247(a)(1)(iii)

Section 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.

6.3. EUT CONFIGURATION ON MEASUREMENT

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. OPERATING CONDITION OF EUT

- (1) Setup the EUT and simulator as shown as Section 8.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz.
We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

6.5. TEST PROCEDURE

- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) Set center frequency of spectrum analyzer = operating frequency.
- (3) Detector Mode: Peak
- (4) Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz
 $A \text{ Period Time} = (\text{channel number}) * 0.4$
 DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)
 DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)
 DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)

6.6. TEST RESULT**GFSK Mode**

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2441	0.402	128.64	400
DH3	2441	1.680	268.80	400
DH5	2441	2.960	315.73	400

 π /4DQPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2441	0.396	126.72	400
DH3	2441	1.660	265.60	400
DH5	2441	2.960	315.73	400

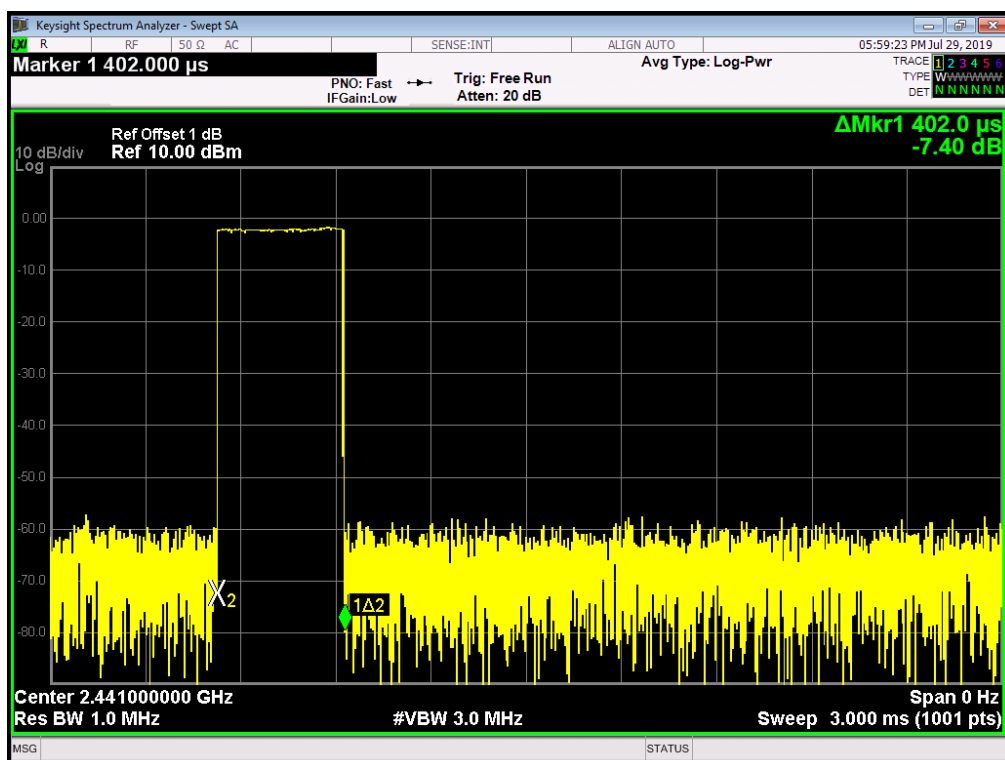
8DPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2441	0.402	128.64	400
DH3	2441	1.660	265.60	400
DH5	2441	2.920	311.48	400

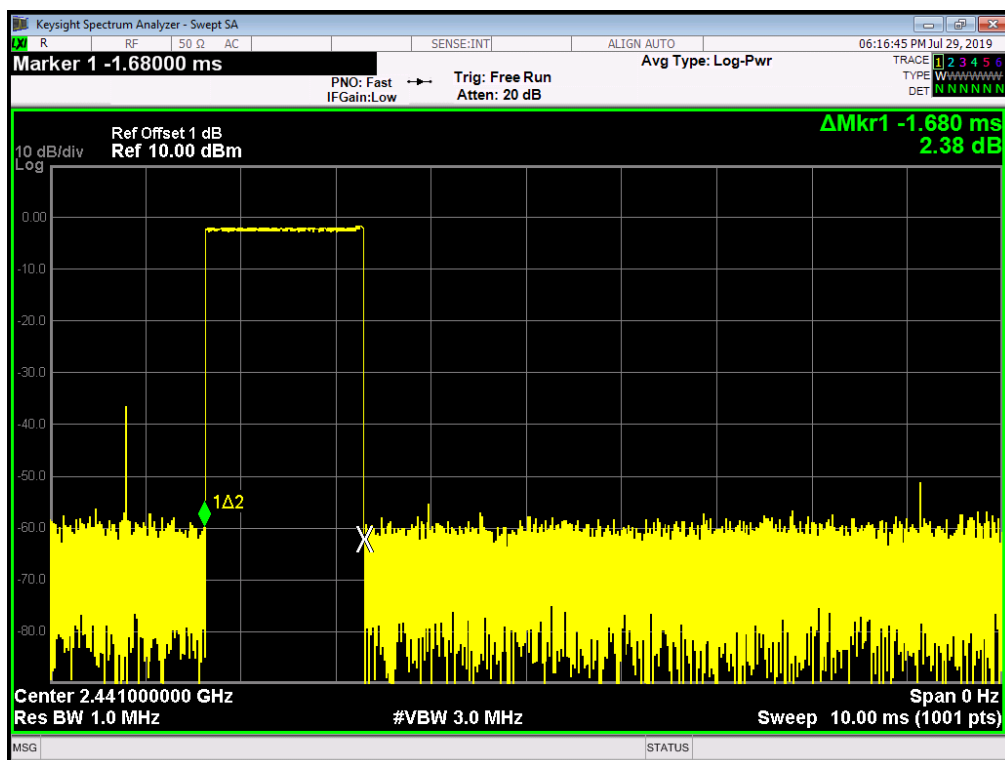
The spectrum analyzer plots are attached as below:

GFSK Mode

DH1



DH3

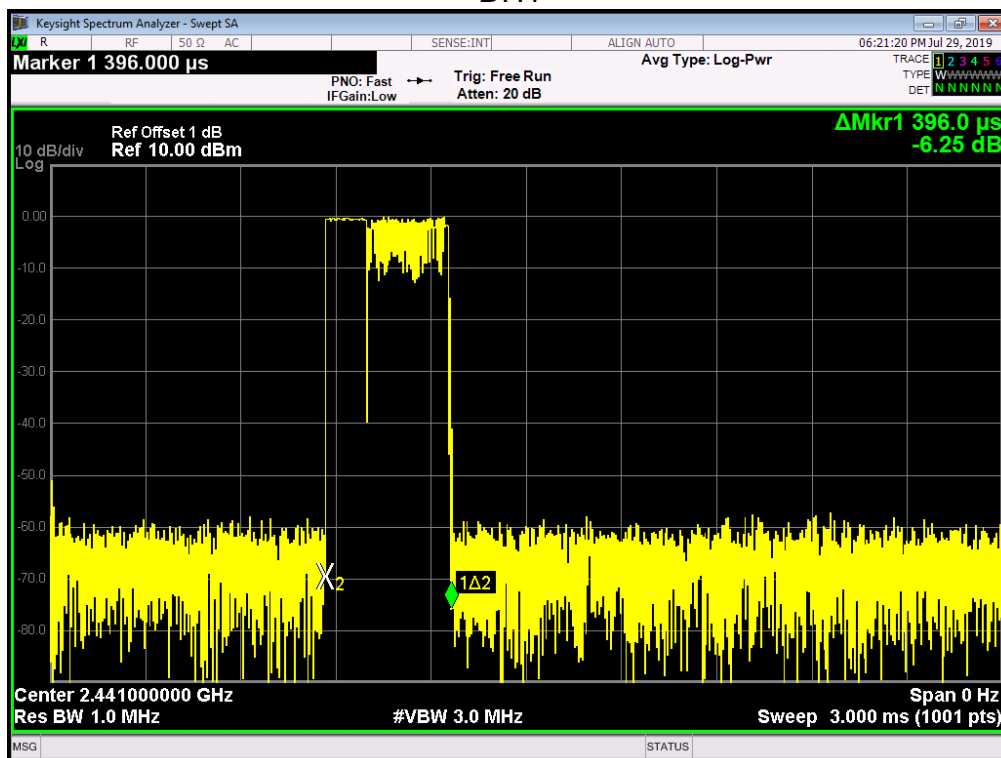


DH5



$\pi/4$ DQPSK Mode

DH1



DH3

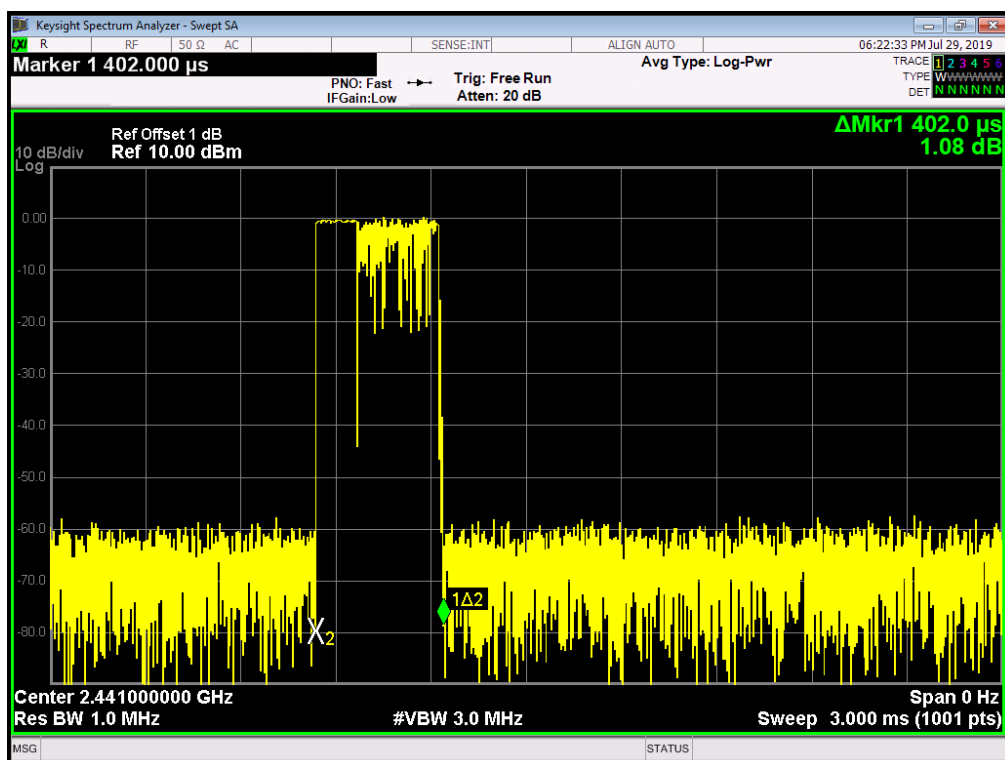


DH5

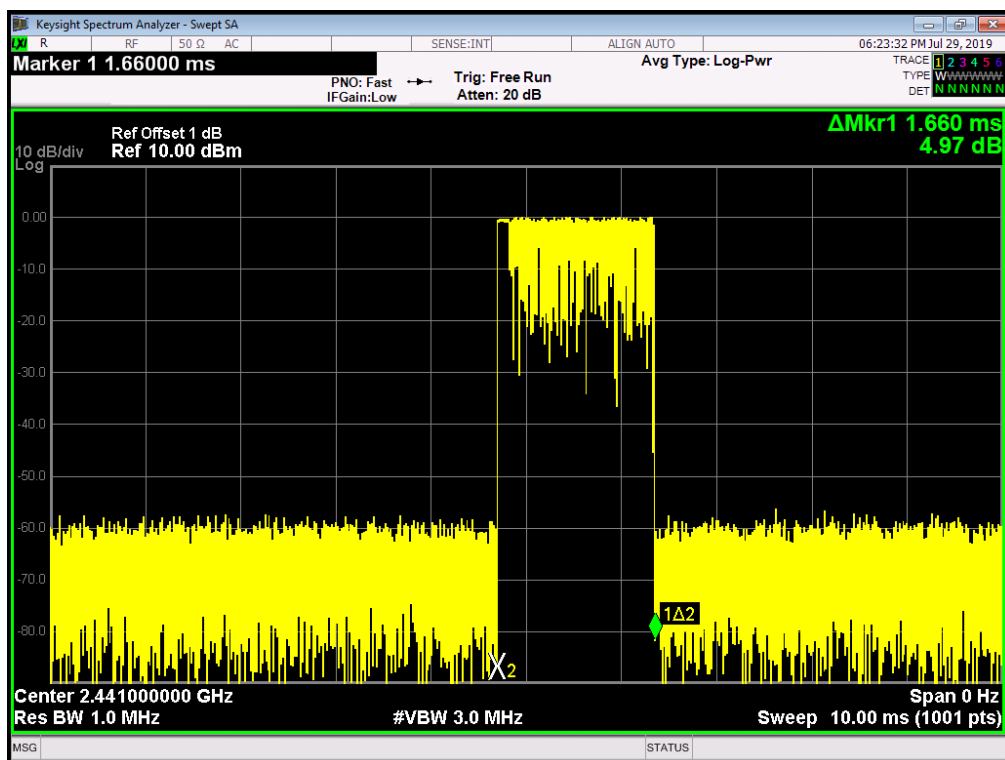


8DPSK Mode

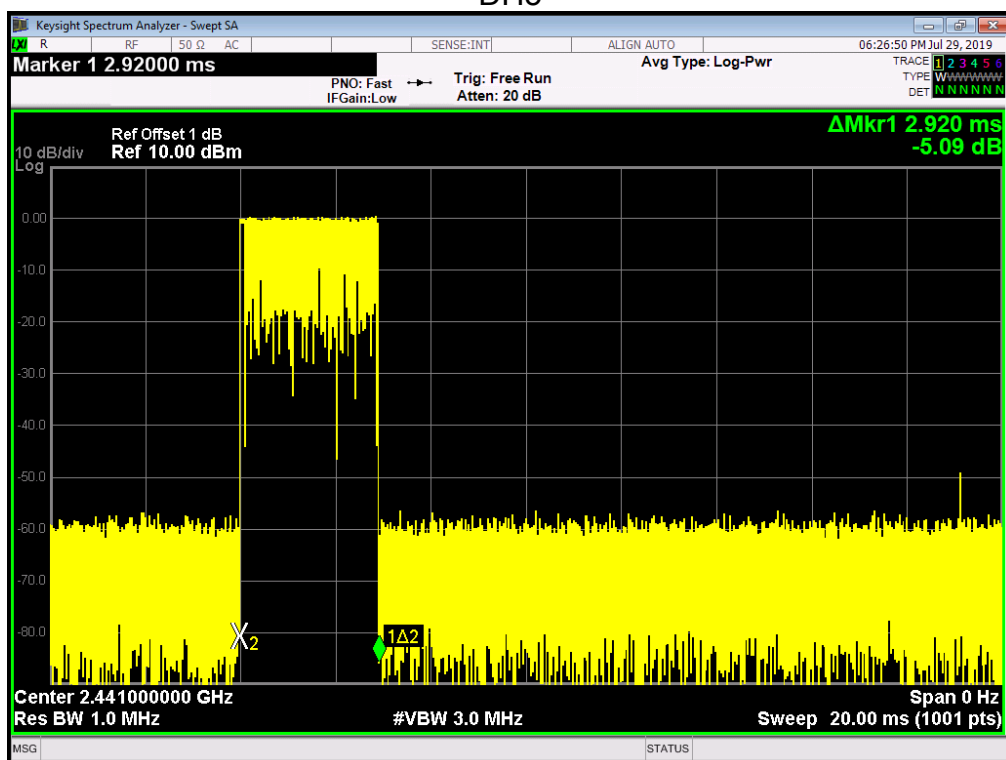
DH1



DH3



DH5



7. MAXMUM OUTPUT POWER

7.1. TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

7.2. BLOCK DIAGRAM OF TEST SETUP

FCC: Same with 3.2

7.3. LIMITS

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz bands: 0.125 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.

7.4. TEST PROCEDURE

- (1) Configure EUT and assistant system according clause 2.4 and 3.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

GFSK	RBW:	1MHz
	VBW:	3MHz
$\pi/4$ DQPSK	RBW:	3MHz
	VBW:	3MHz
8DPSK	RBW:	3MHz
	VBW:	3MHz
Span		>1.5x 20dB bandwidth
Detector Mode:		Peak
Sweep time:		auto
Trace mode		Max hold

- (5) Allow the trace to stabilize, Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges measure out the Average and PK output power.

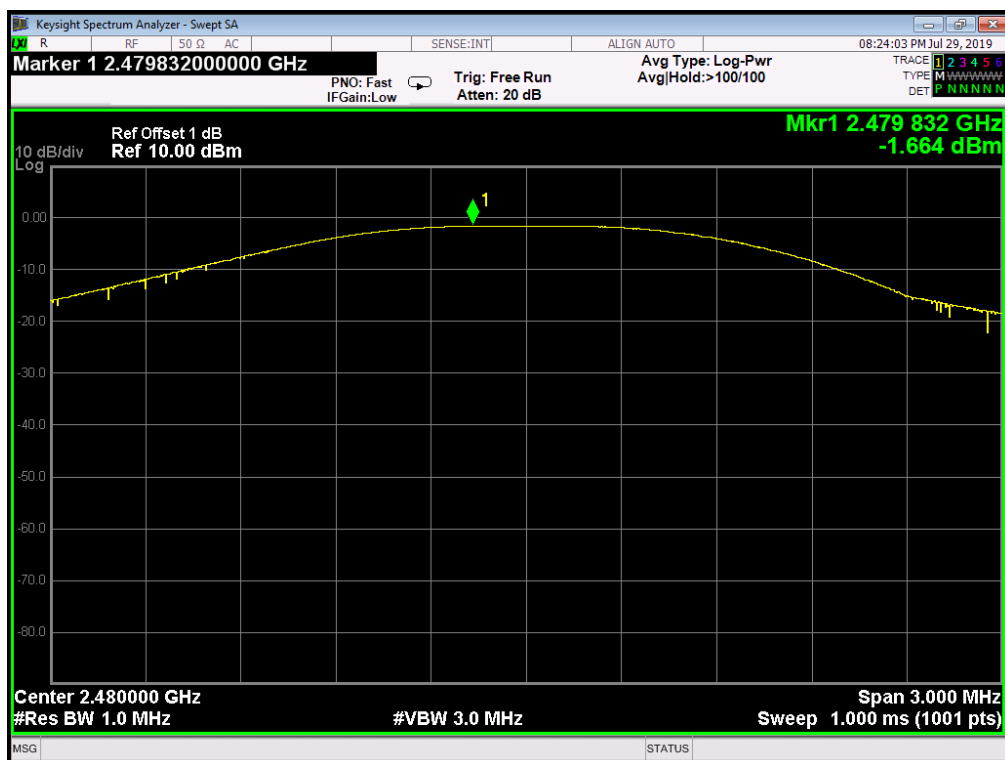
7.5. TEST RESULT

EUT Set Mode	Data Rate (Mbps)	Frequency (MHz)	Result(dBm)
			Peak
GFSK	1	2402	-1.141
		2441	-1.681
		2480	-1.664
π/4DQPSK	2	2402	0.899
		2441	0.367
		2480	0.368
8DPSK	3	2402	1.270
		2441	0.708
		2480	0.679
Limit: 21dBm		Conclusion: PASS	

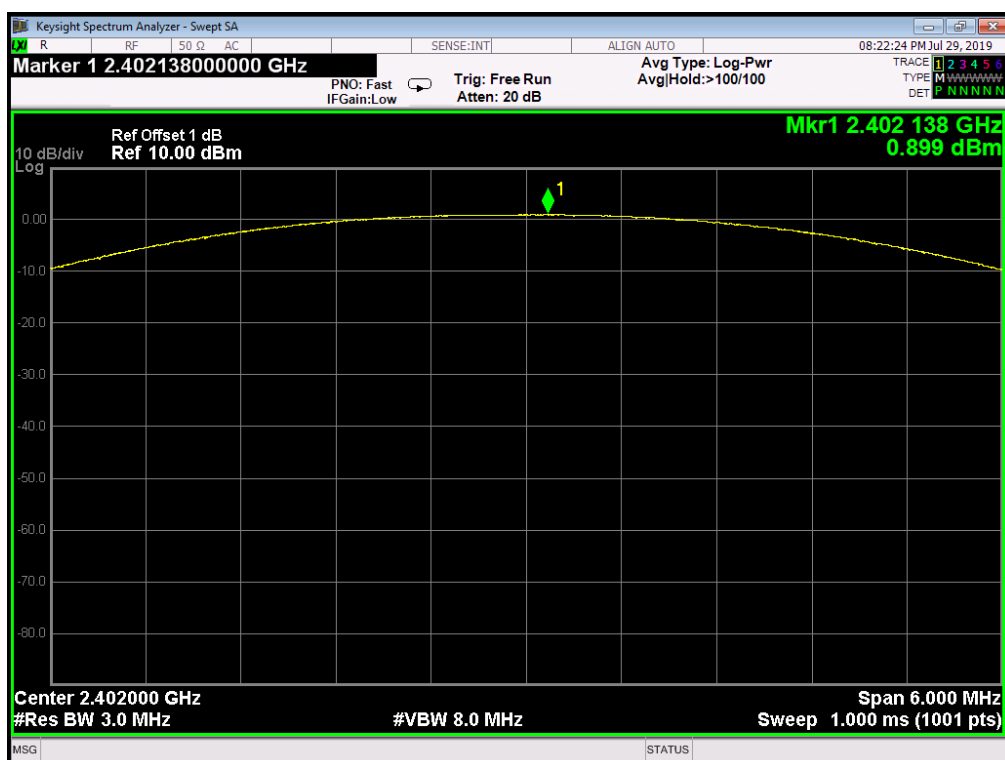
Original test data

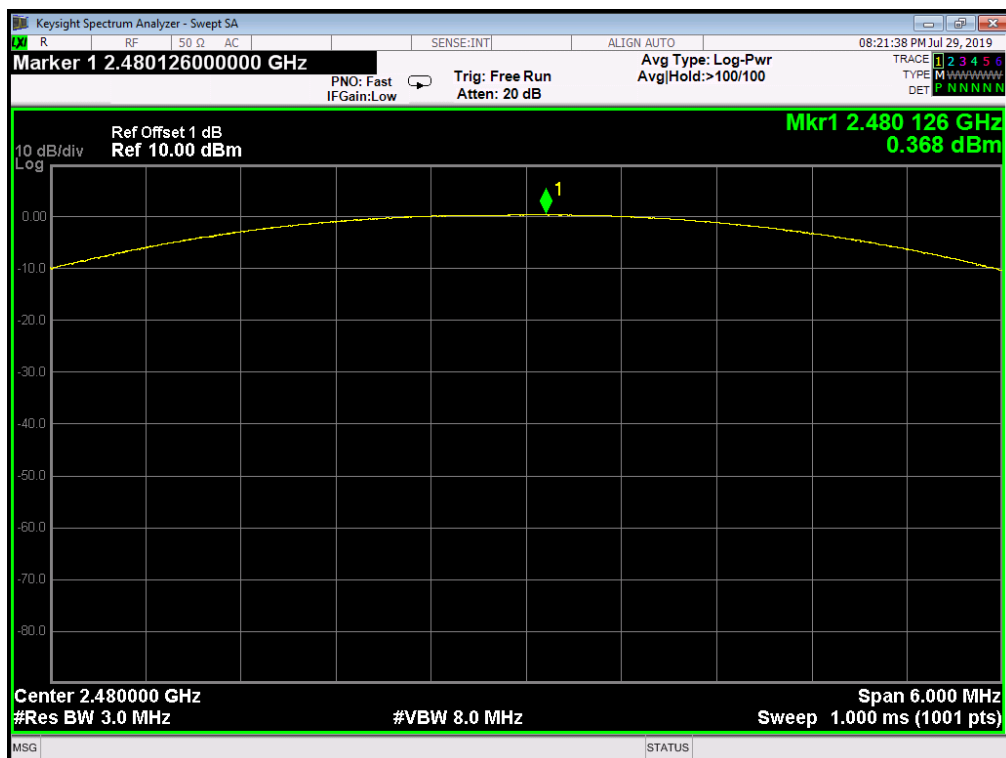
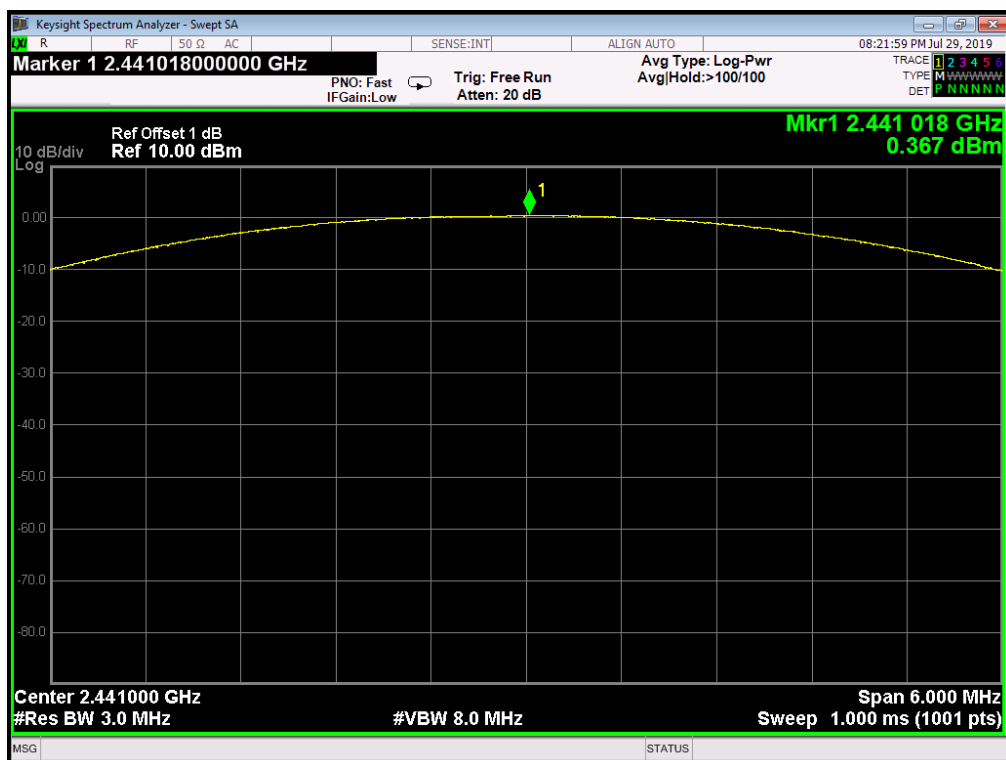
GFSK



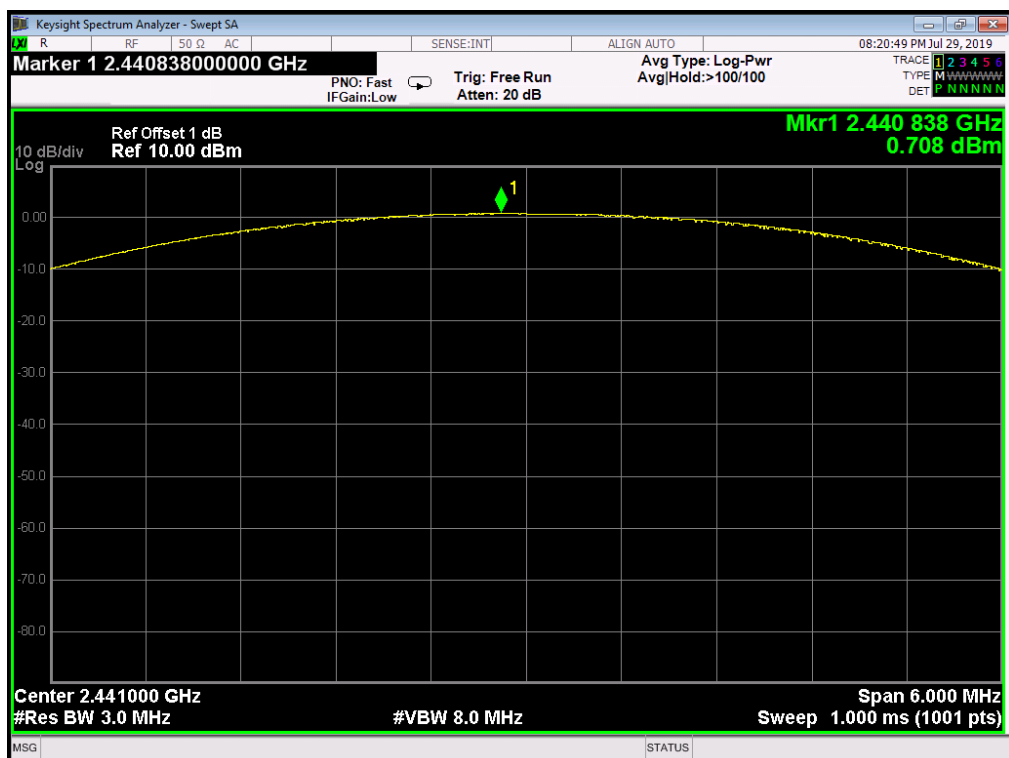
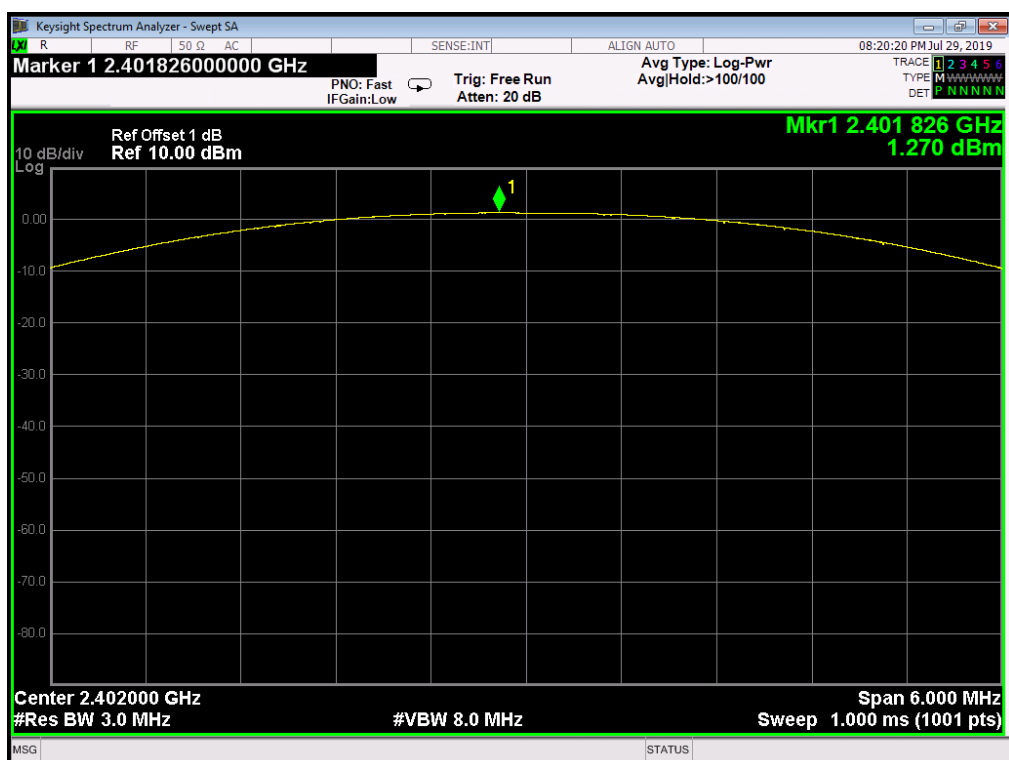


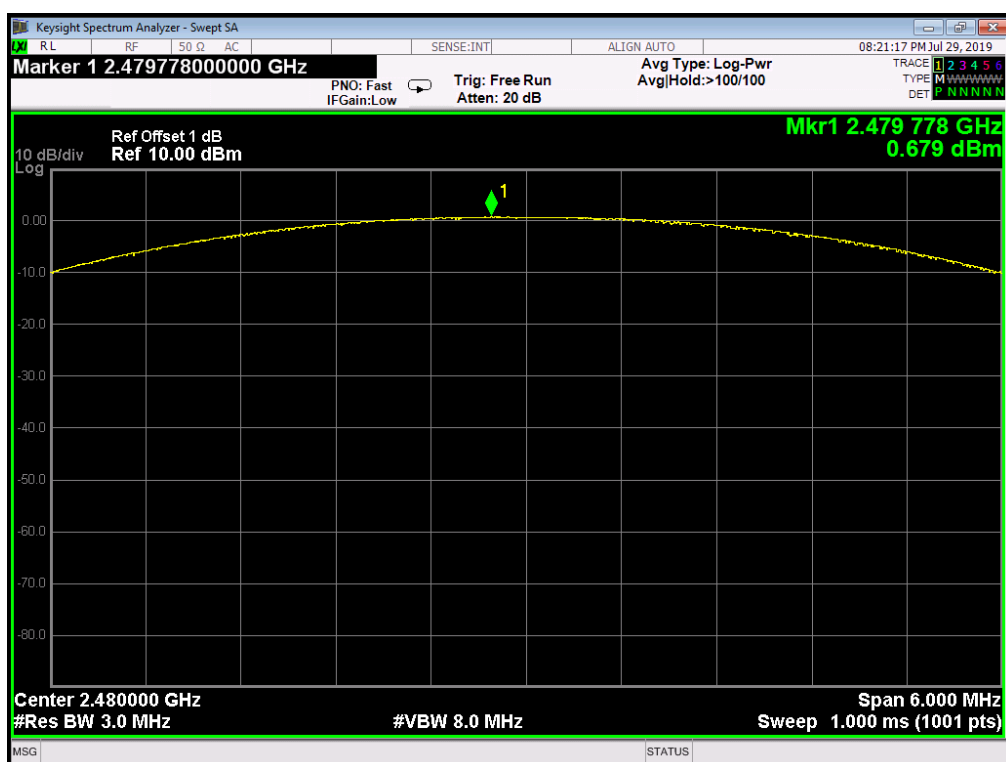
$\pi/4$ DQPSK





8DPSK





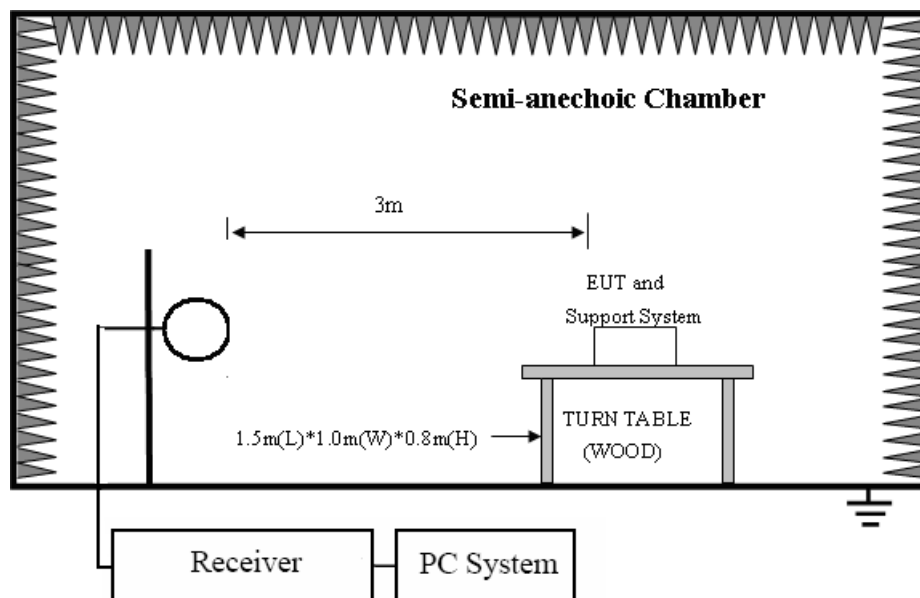
8. SPURIOUS EMISSION

8.1. Test equipment

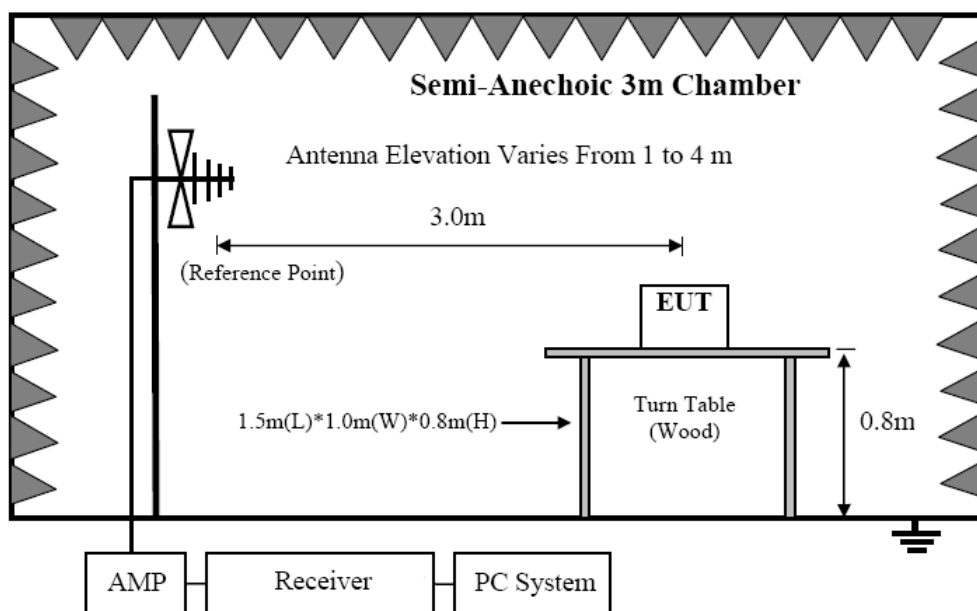
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2019/12/16	1 Year
2	Spectrum Analyzer	Agilent	E4407B	US40240708	11/20/2019	1 Year
3	Spectrum analyzer	R&S	FSU	1166.1660.26	2019/12/16	1 Year
4	Loop antenna	TESEQ	HLA6120	20129	2019/12/16	1 Year
5	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2019/12/16	1 Year
6	Double Ridged Horn Antenna	Schwarzbeck	BBHA9120D	9120D 1065	2019/12/16	1 Year
7	Horn Antenna	Schwarzbeck	BBHA 9170	9170 1248	2019/12/16	1 Year
8	Pre-amplifier	A.H.	PAM-1840VH	562	2019/12/16	1 Year
9	Pre-amplifier	R&S	AFS33-18002 650-30-8P-44	SEL0080	2019/12/16	1 Year
10	Pre-Amplifier	HP	8449B	3274A06298	2019/12/16	1 Year
11	RF Cable	R&S	R01	10403	2019/12/16	1 Year
12	RF Cable	R&S	R02	10512	2019/12/16	1 Year
13	Measurement Software	Farad	EZ-EMC (Ver.ATT-03A)	N/A	N/A	N/A

8.2. Block diagram of test setup

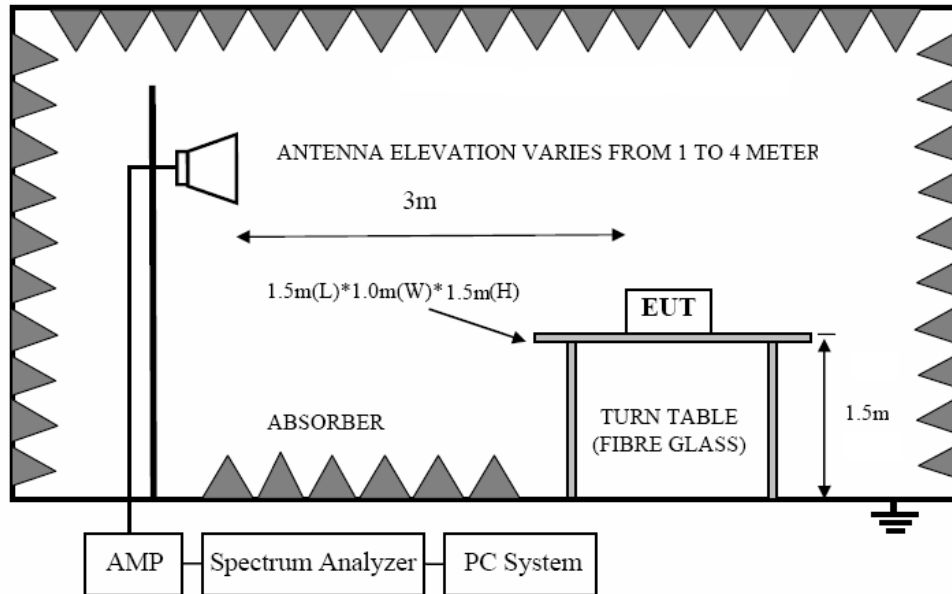
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for 30MHz-1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

8.3. Limit

8.3.1 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 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)

8.3.2. Limit.

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	2400/F(KHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(KHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz.

Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V/m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V/m}) + 40\text{Log}(30\text{m}/3\text{m})$$

8.3.3. Limit for this EUT

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 30dB below the fundamental emissions, or comply with 15.209 limits.

8.4. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.4 and 7.2
- (3) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used
9KHz-30MHz	Active Loop antenna
30MHz-1GHz	Trilog Broadband Antenna
1GHz-26.5GHz	Double Ridged Horn Antenna(1GHz-26.5GHz)

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (4) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9KHz to 25GHz:
 - (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m(Except loop antenna, it's fixed 1m above ground.)
 - (b) Change work frequency or channel of device if practicable.
 - (c) Change modulation type of device if practicable.
 - (d) new battery is used during testing
 - (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (5) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.
- (6) The emissions from 9KHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz, for emissions from 9KHz-90KHz, 110KHz-490KHz and above 1GHz were measured based on average detector, for emissions above 1GHz, peak emissions also be

measured and need comply with Peak limit.

- (7) The emissions from 9KHz to 1GHz, QP or average values were measured with EMI receiver with below RBW

Frequency band	RBW
9KHz-150KHz	200Hz
150KHz-30MHz	9KHz
30MHz-1GHz	120KHz

- (8) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure(according ANSI C63.10:2013 clause 4.2.3.2.3 procedure for average measure). Peak detector is used for Peak and AV measurement both.

8.5. Test Result

Remark: The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

Below 30M

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	--	Test Result:	Pass
Test Mode:	Keeping TX mode	Test By:	Blue Qiu

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

Note:

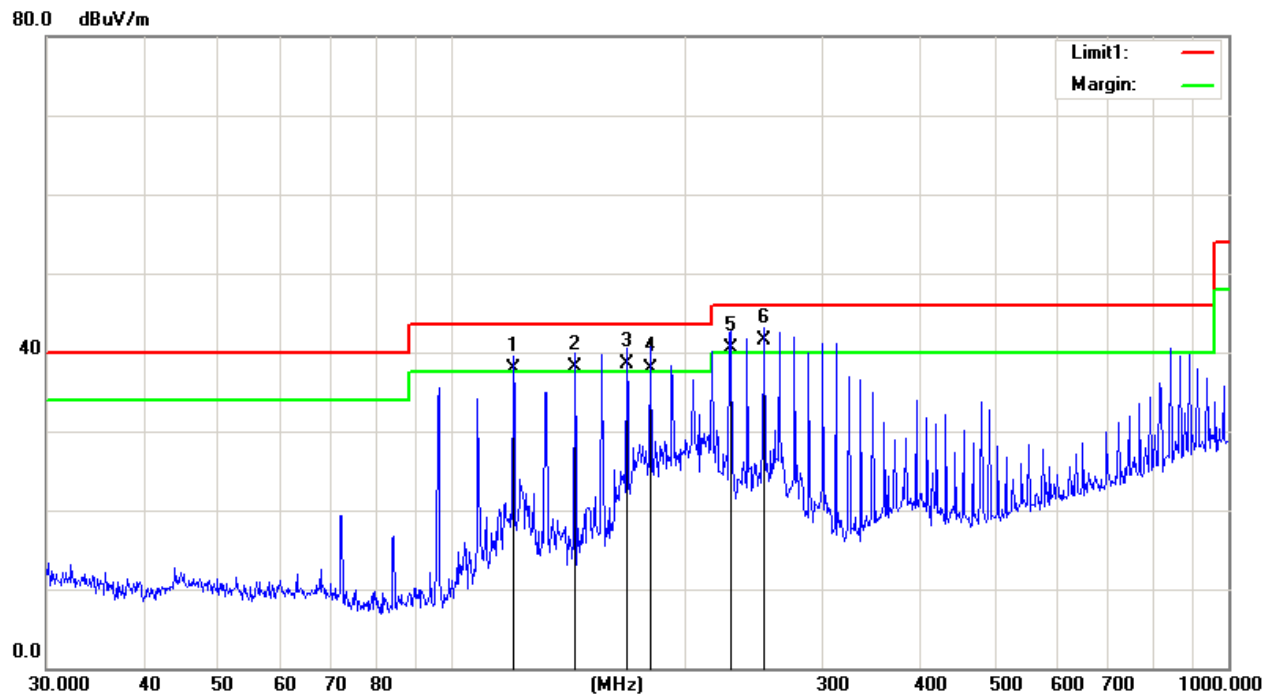
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $20 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor

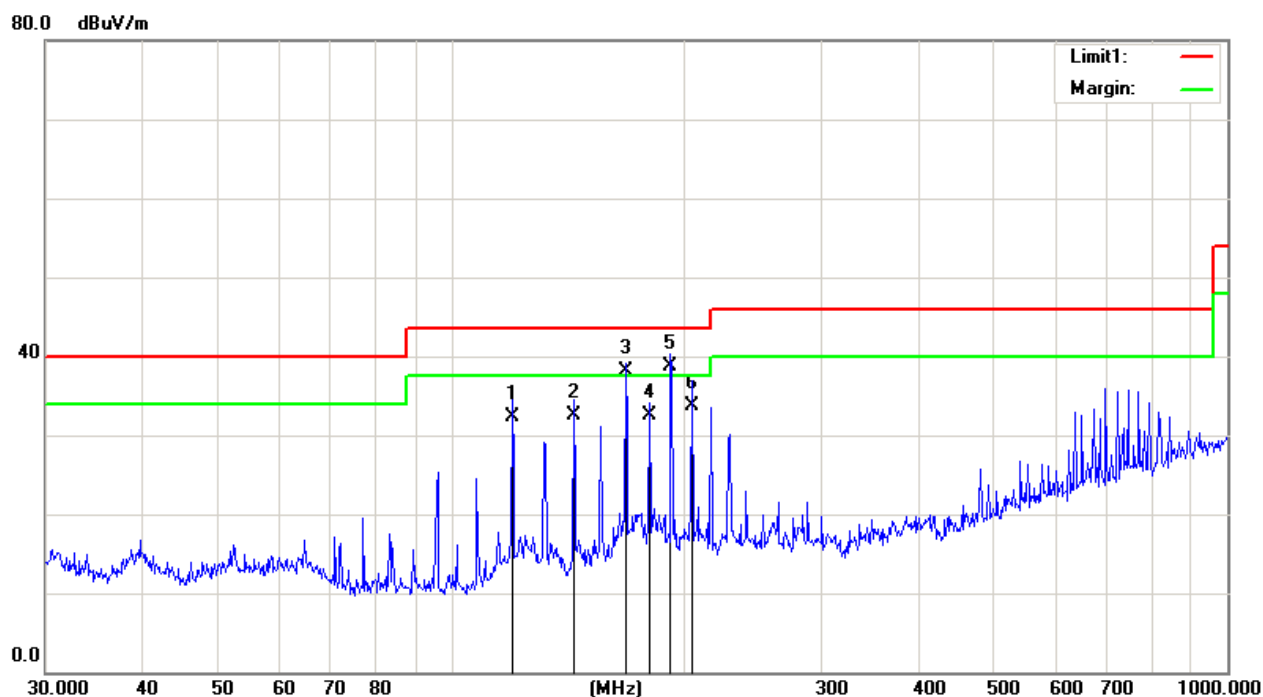
Between 30M – 1000 MHz(GFSK is worst case)

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2019-7-29	Test By:	Blue
Standard:	(RE)FCC PART 15 class B 3m		
Test Mode:	TX, DH1_2402MHz		
Note:	WORSE CASE		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	119.8555	52.51	-14.67	37.84	43.50	-5.66	QP
2	143.8294	51.76	-13.56	38.20	43.50	-5.30	QP
3	167.8242	50.13	-11.69	38.44	43.50	-5.06	QP
4	180.0165	48.27	-10.46	37.81	43.50	-5.69	QP
5	228.4903	49.57	-9.05	40.52	46.00	-5.48	QP
6	252.0627	48.17	-6.60	41.57	46.00	-4.43	QP

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2019-7-29	Test By:	Blue
Standard:	(RE)FCC PART 15 class B 3m		
Test Mode:	TX, DH1_2402MHz		
Note:	WORSE CASE		

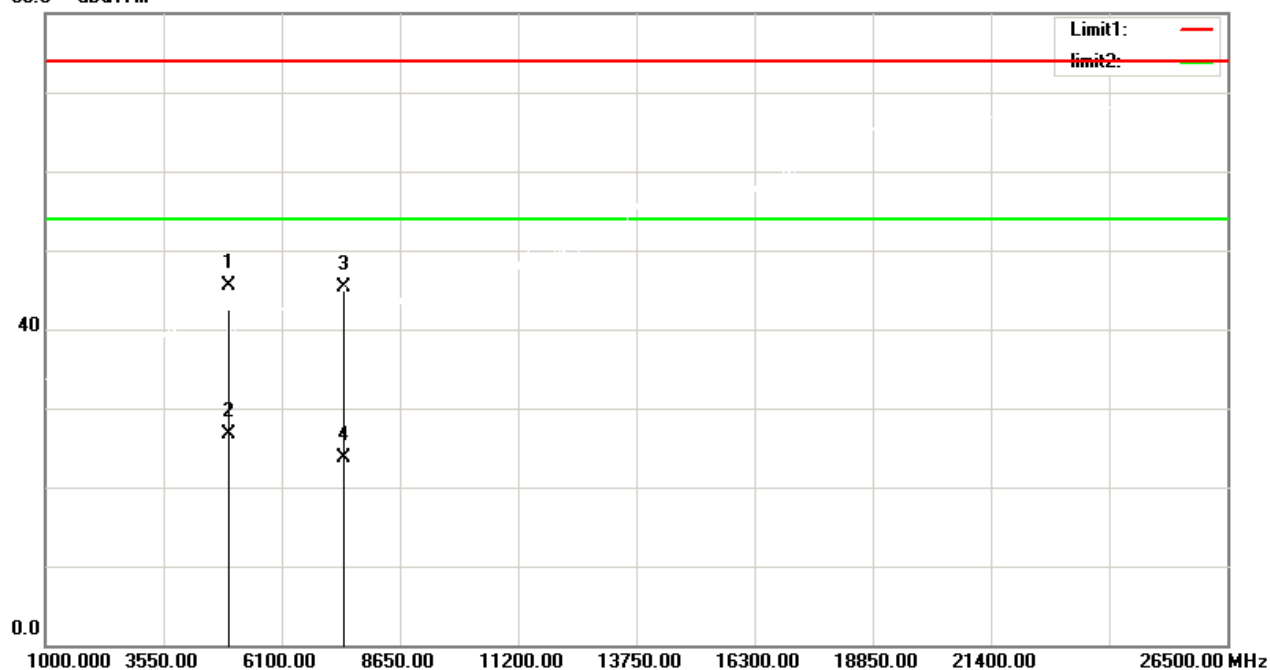


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	119.8555	45.93	-13.67	32.26	43.50	-11.24	QP
2	143.8294	45.30	-12.80	32.50	43.50	-11.00	QP
3	167.8242	49.40	-11.26	38.14	43.50	-5.36	QP
4	180.0165	45.01	-12.46	32.55	43.50	-10.95	QP
5	191.7450	50.90	-12.19	38.71	43.50	-4.79	QP
6	204.2376	45.24	-11.55	33.69	43.50	-9.81	QP

Between 1000MHz – 25000 MHz(GFSK is worst case)

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2480MHz		
Note:	WORSE CASE		

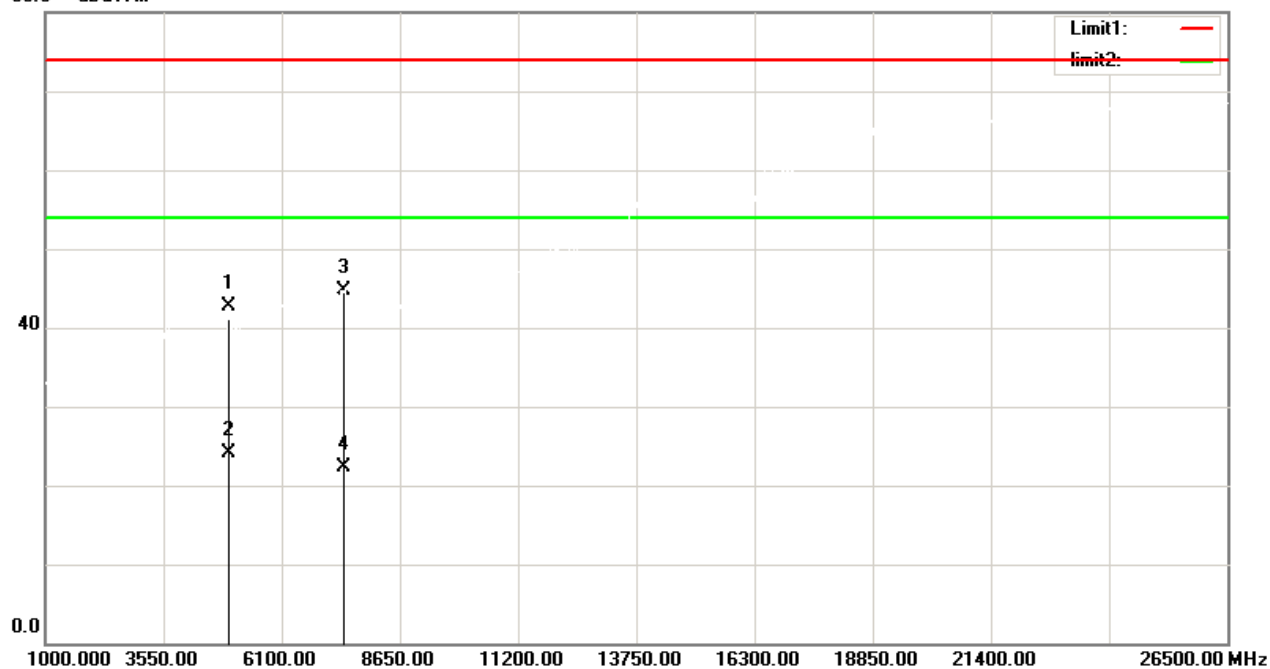
80.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.421	56.00	-10.44	45.56	74.00	-28.44	peak
2	4960.421	37.13	-10.44	26.69	54.00	-27.31	AVG
3	7440.000	48.31	-3.00	45.31	74.00	-28.69	peak
4	7440.000	26.65	-3.00	23.65	54.00	-30.35	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2480MHz		
Note:	WORSE CASE		

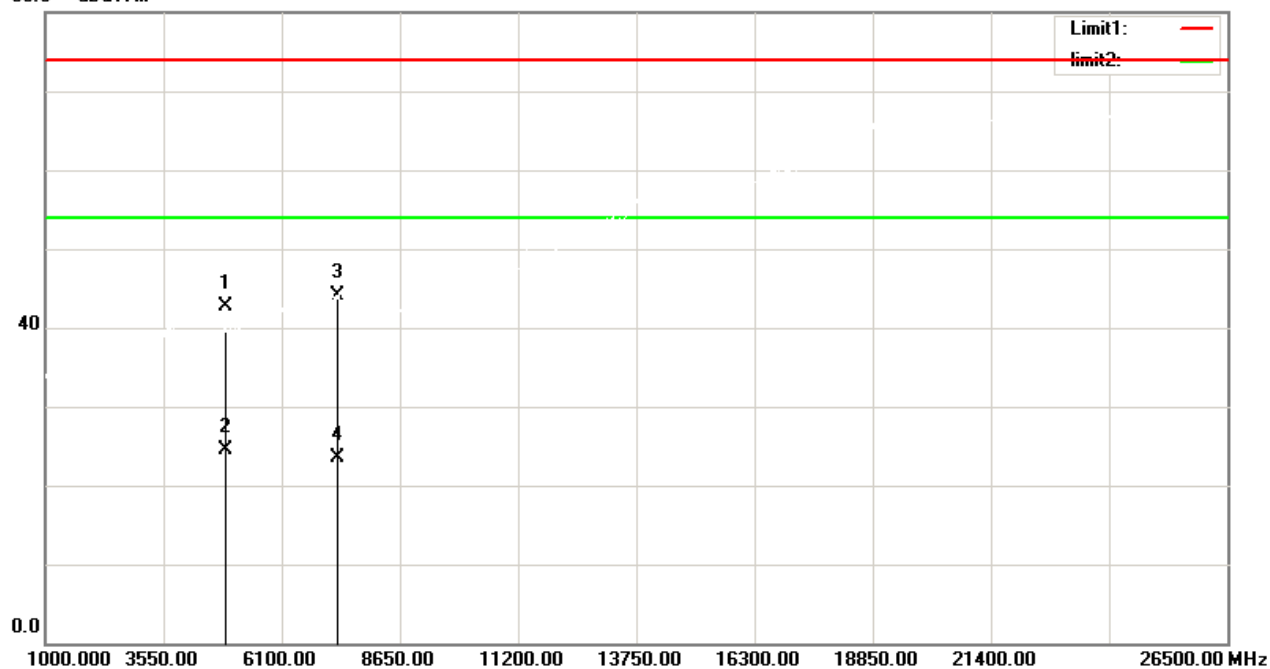
80.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.421	53.23	-10.44	42.79	74.00	-31.21	peak
2	4960.421	34.58	-10.44	24.14	54.00	-29.86	AVG
3	7440.000	47.76	-3.00	44.76	74.00	-29.24	peak
4	7440.000	25.30	-3.00	22.30	54.00	-31.70	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2441MHz		
Note:	WORSE CASE		

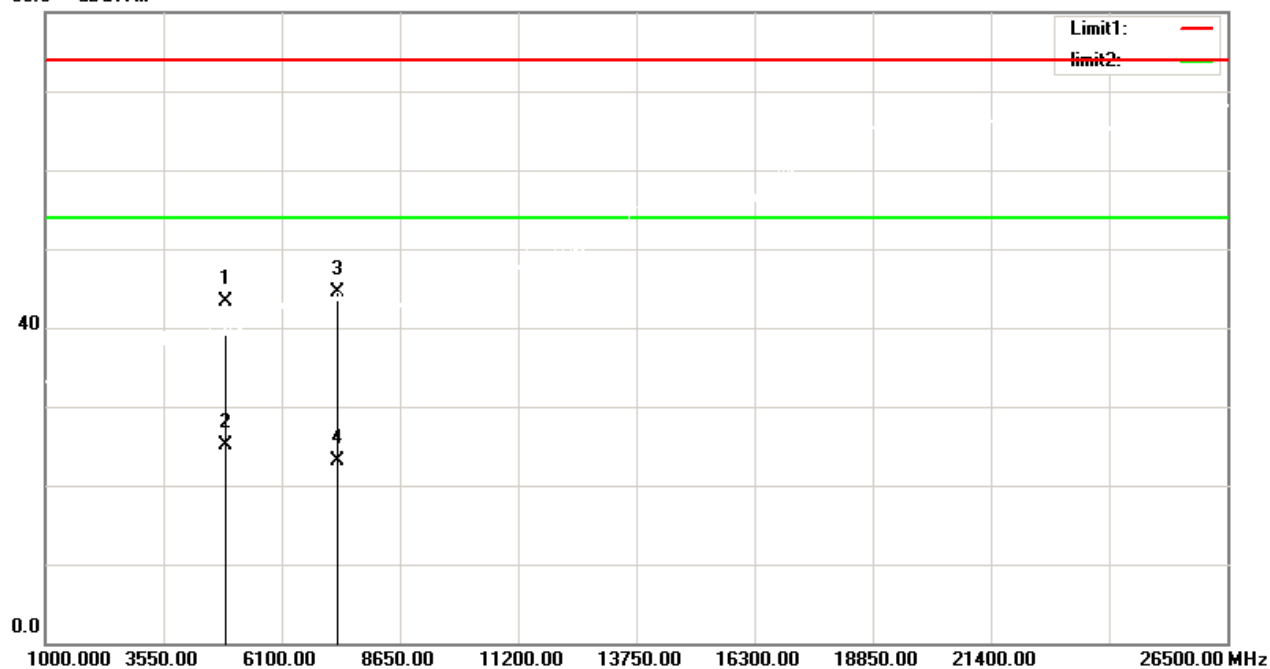
80.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4883.767	53.44	-10.71	42.73	74.00	-31.27	peak
2	4883.767	35.27	-10.71	24.56	54.00	-29.44	AVG
3	7323.150	47.41	-3.28	44.13	74.00	-29.87	peak
4	7323.150	26.84	-3.28	23.56	54.00	-30.44	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2441MHz		
Note:	WORSE CASE		

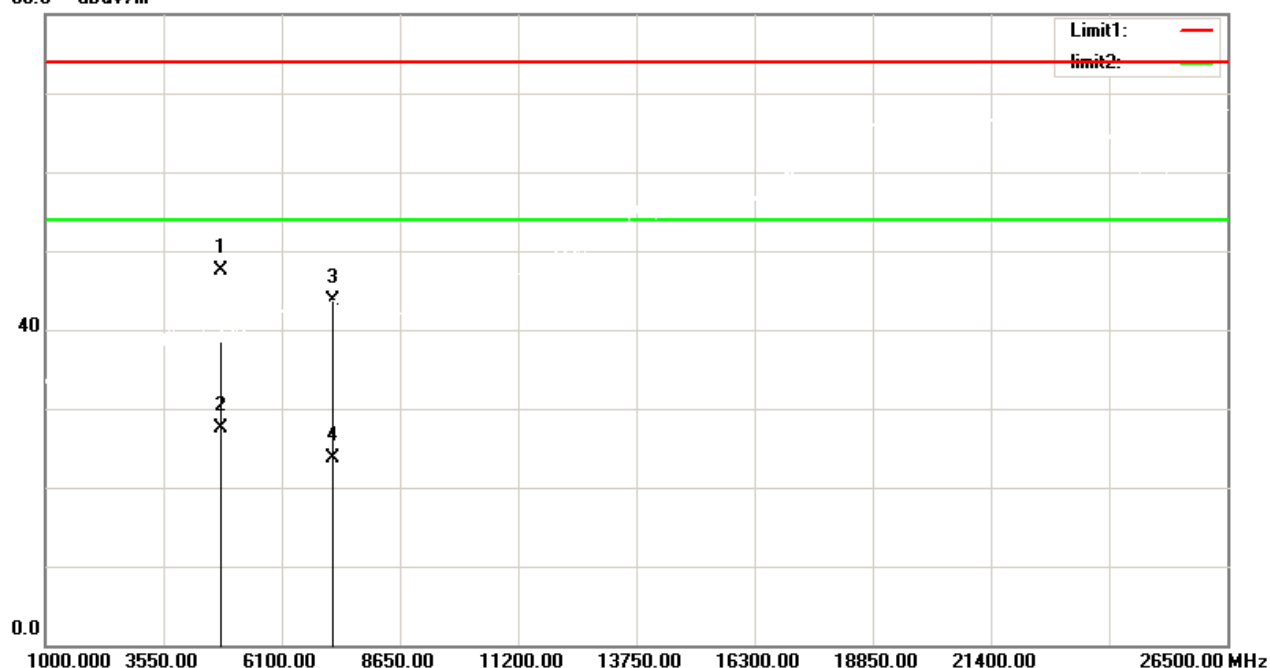
80.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4883.767	54.11	-10.71	43.40	74.00	-30.60	peak
2	4883.767	35.76	-10.71	25.05	54.00	-28.95	AVG
3	7323.150	47.80	-3.28	44.52	74.00	-29.48	peak
4	7323.150	26.44	-3.28	23.16	54.00	-30.84	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2402MHz		
Note:	WORSE CASE		

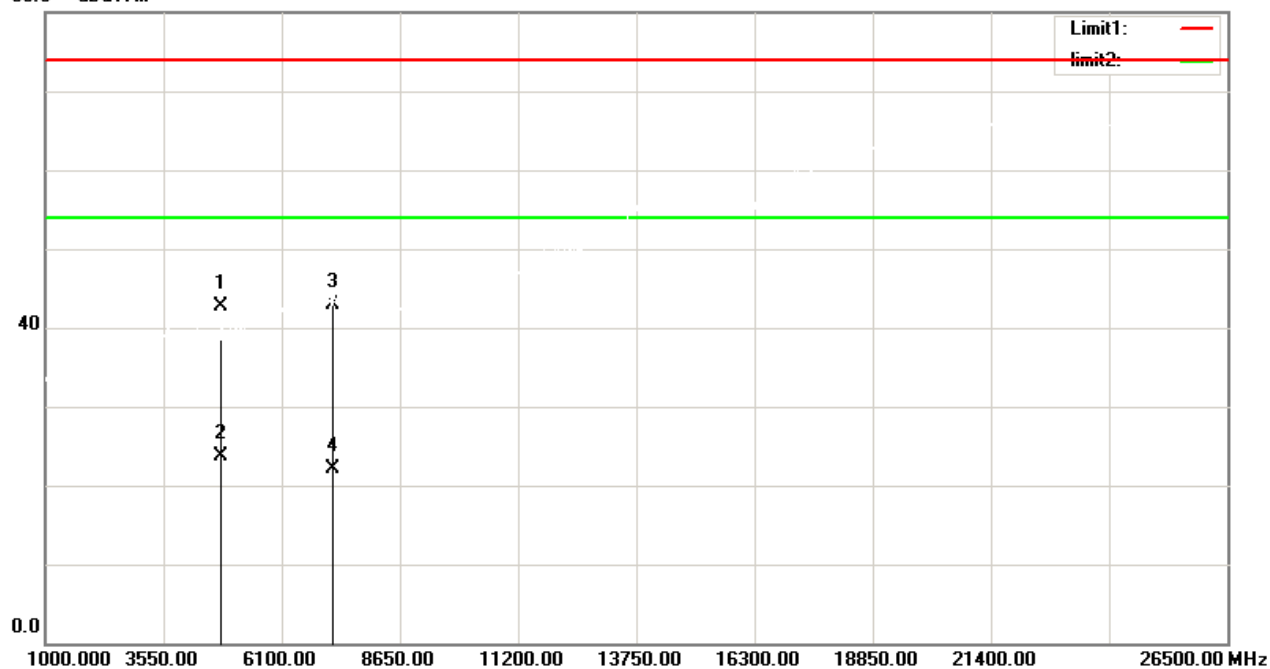
80.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4807.114	58.48	-10.97	47.51	74.00	-26.49	peak
2	4807.114	38.44	-10.97	27.47	54.00	-26.53	AVG
3	7206.000	47.20	-3.58	43.62	74.00	-30.38	peak
4	7206.000	27.22	-3.58	23.64	54.00	-30.36	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2402MHz		
Note:	WORSE CASE		

80.0 dBuV/m

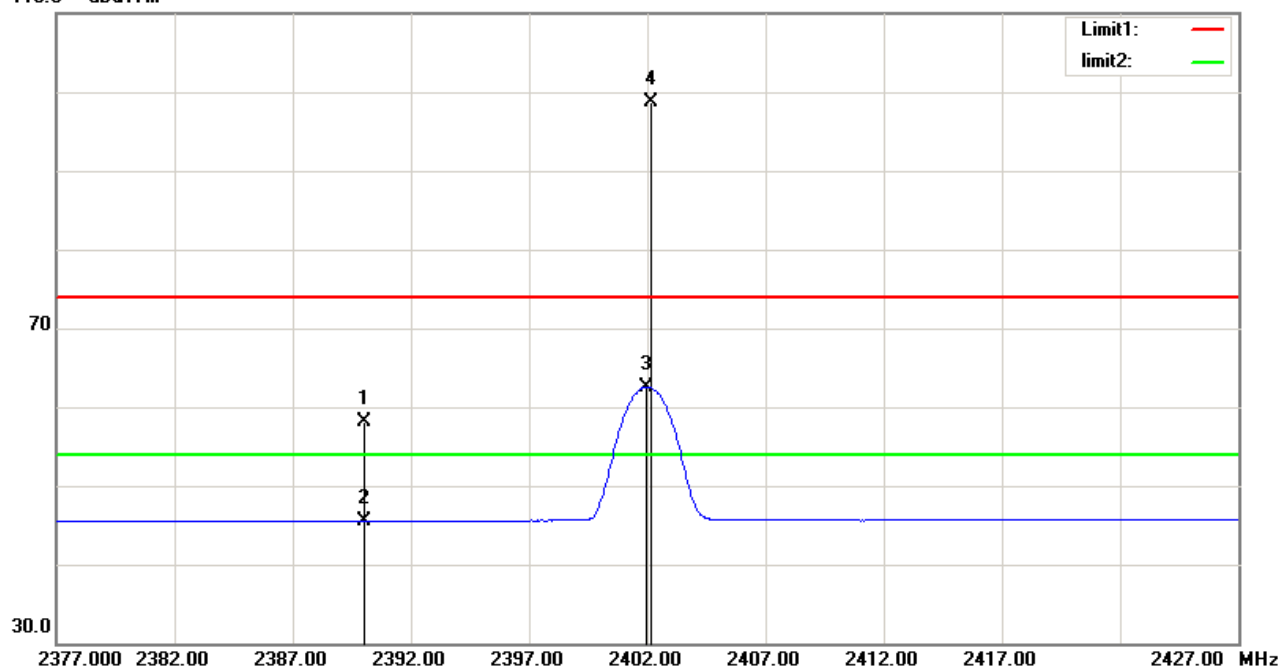


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4807.114	53.63	-10.97	42.66	74.00	-31.34	peak
2	4807.114	34.59	-10.97	23.62	54.00	-30.38	AVG
3	7206.000	46.49	-3.58	42.91	74.00	-31.09	peak
4	7206.000	25.60	-3.58	22.02	54.00	-31.98	AVG

Radiated band edge:

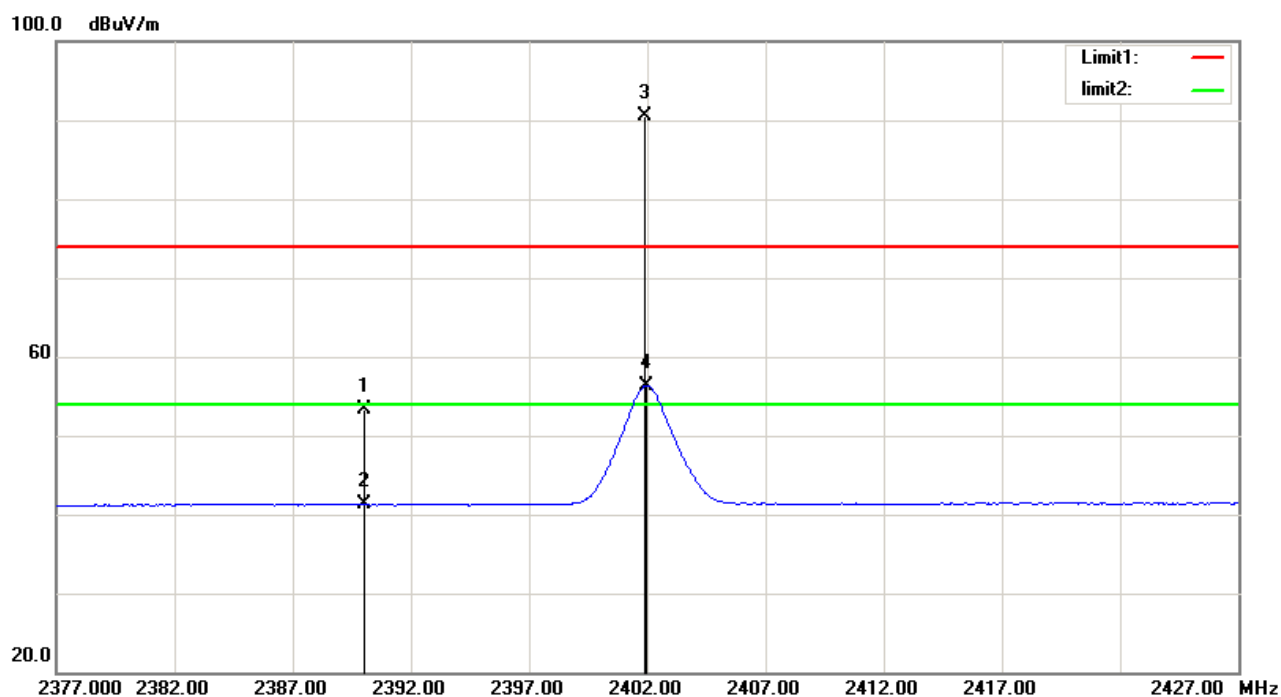
EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	PASS
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2402MHz		
Note:	WORSE CASE		

110.0 dBuV/m



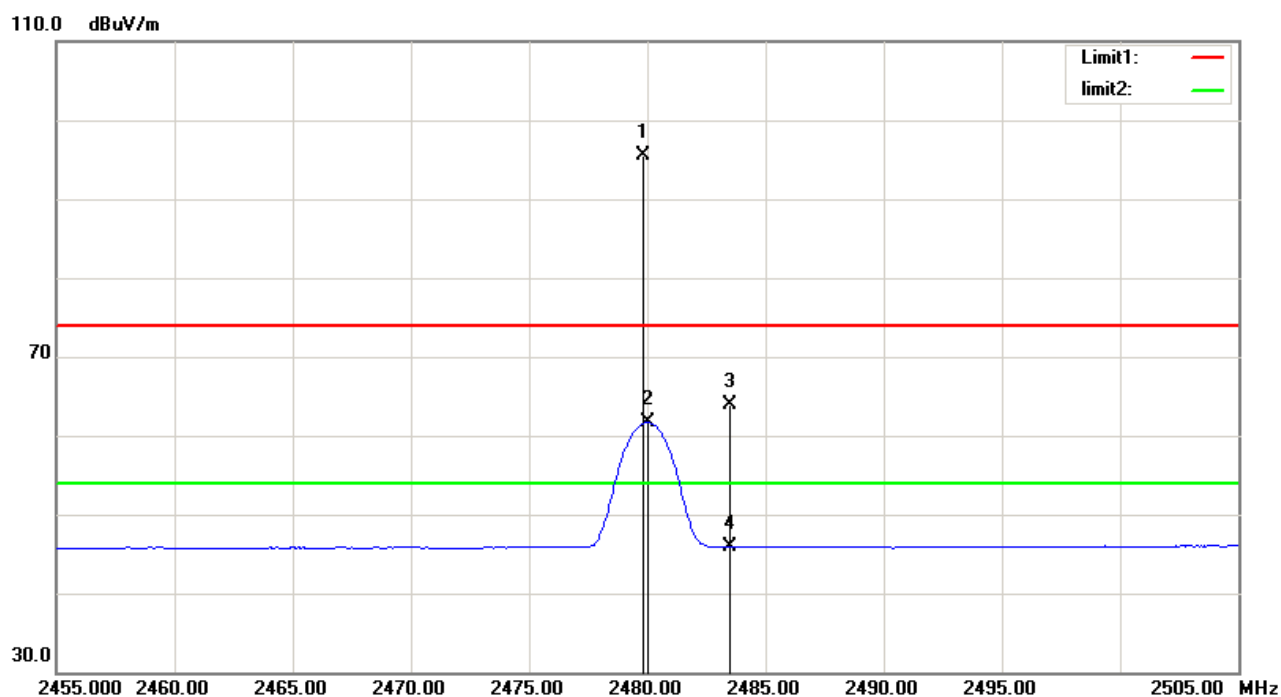
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	27.31	30.74	58.05	74.00	-15.95	peak
2	2390.000	14.79	30.74	45.53	54.00	-8.47	AVG
3	2401.950	31.75	30.77	62.52			AVG
4	2402.150	67.95	30.77	98.72			peak

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	PASS
Test Time:	2019-7-30	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2402MHz		
Note:	WORSE CASE		



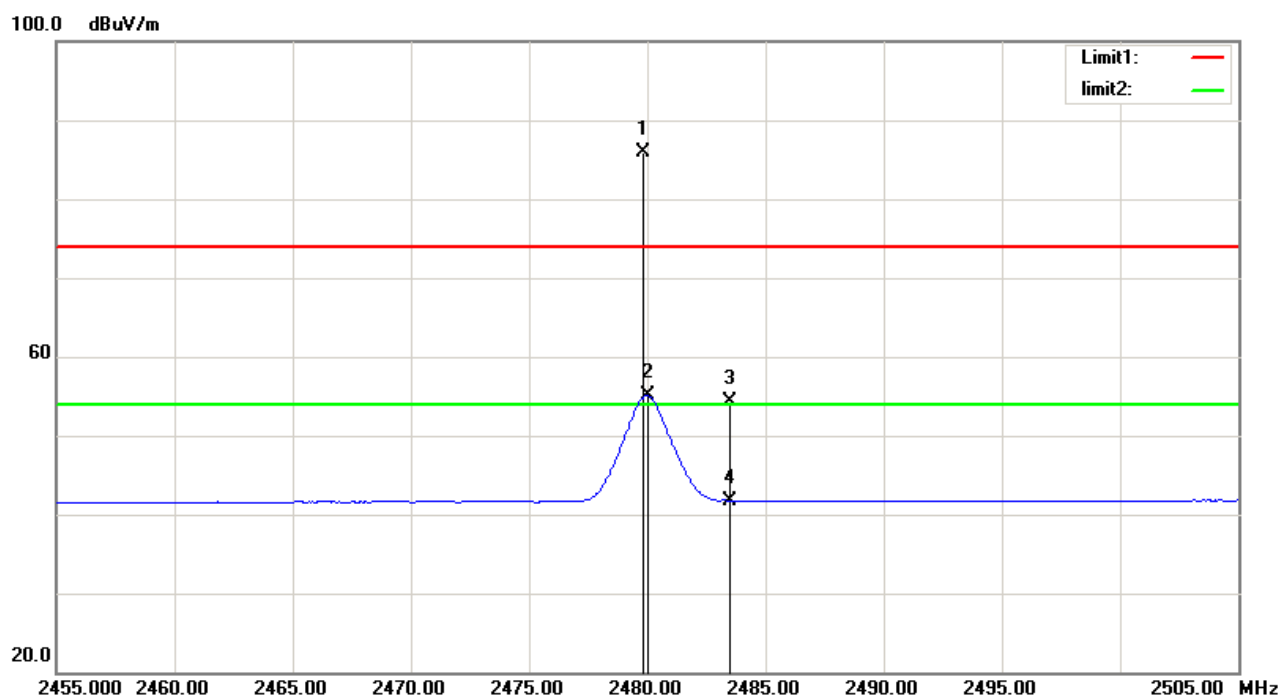
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	22.66	30.74	53.40	74.00	-20.60	peak
2	2390.000	10.55	30.74	41.29	54.00	-12.71	AVG
3	2401.900	59.83	30.77	90.60	/	/	peak
4	2401.950	25.60	30.77	56.37	/	/	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	PASS
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2480MHz		
Note:	WORSE CASE		



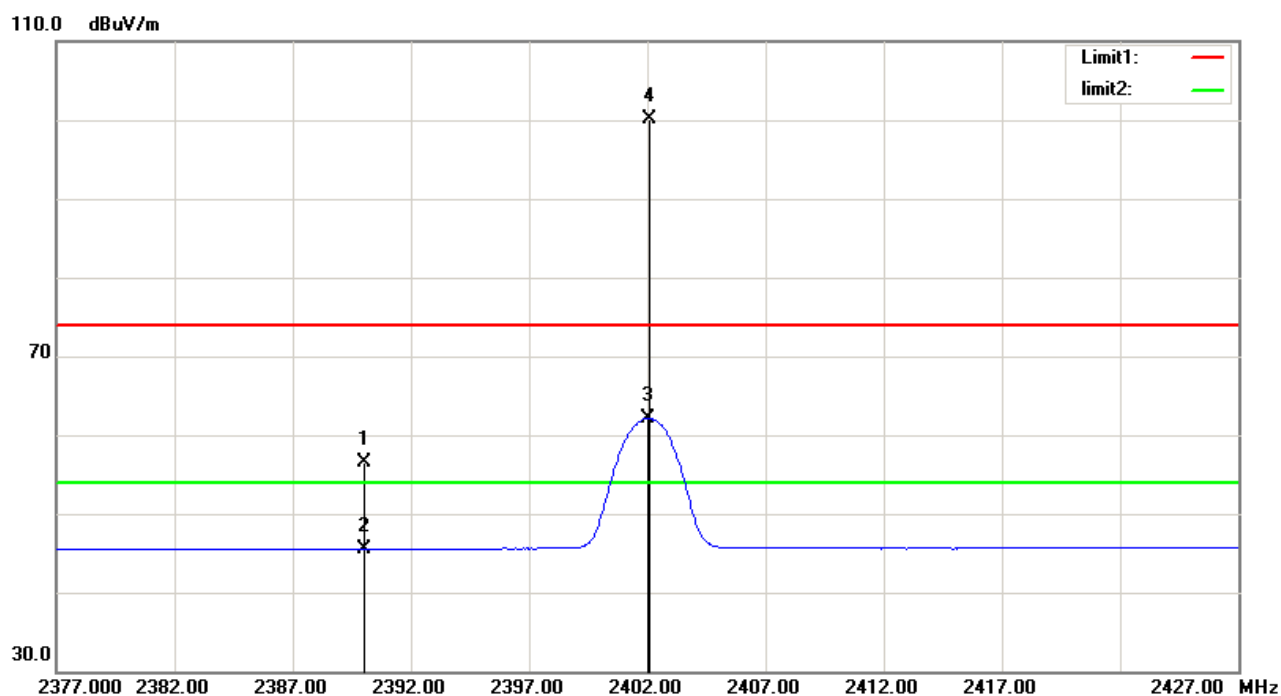
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.800	64.38	31.04	95.42	/	/	peak
2	2480.000	30.60	31.04	61.64	/	/	AVG
3	2483.500	32.78	31.05	63.83	74.00	-10.17	peak
4	2483.500	14.82	31.05	45.87	54.00	-8.13	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	PASS
Test Time:	2019-7-30	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	DH1_TX_2480MHz		
Note:	WORSE CASE		



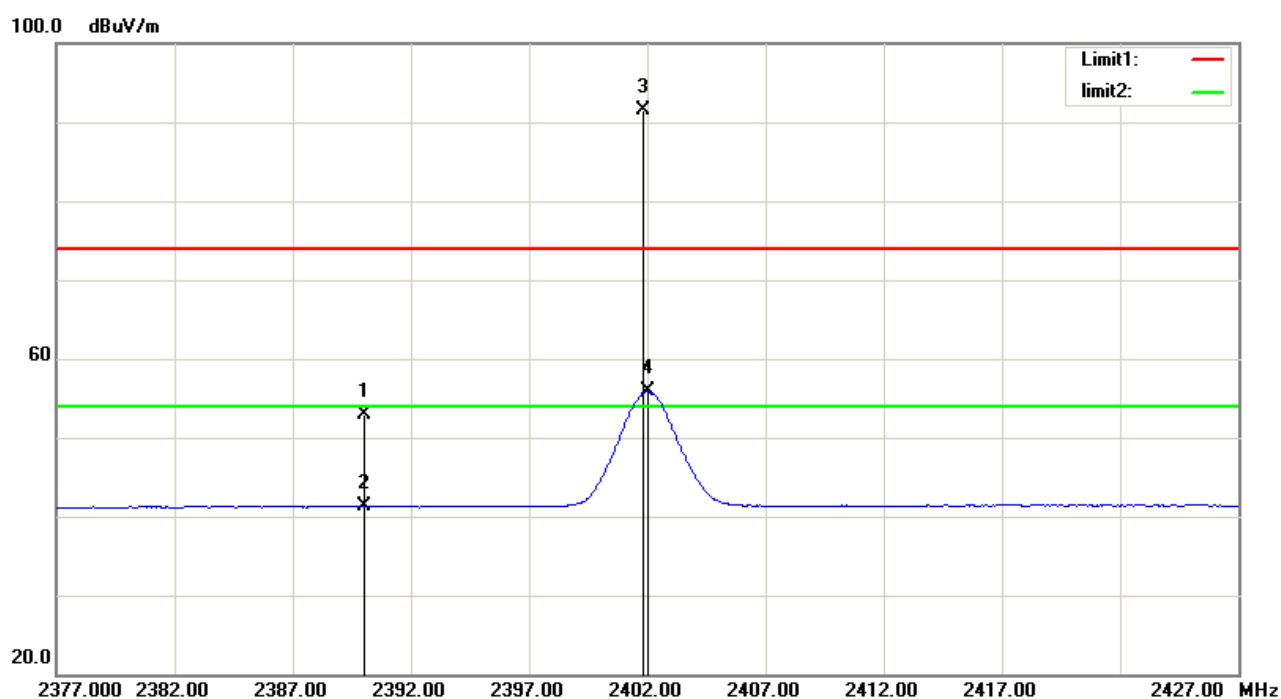
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.850	54.82	31.04	85.86	/	/	peak
2	2480.000	24.07	31.04	55.11	/	/	AVG
3	2483.500	23.30	31.05	54.35	74.00	-19.65	peak
4	2483.500	10.64	31.05	41.69	54.00	-12.31	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24°C	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	PASS
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	2DH1_TX_2402MHz		
Note:	WORSE CASE		



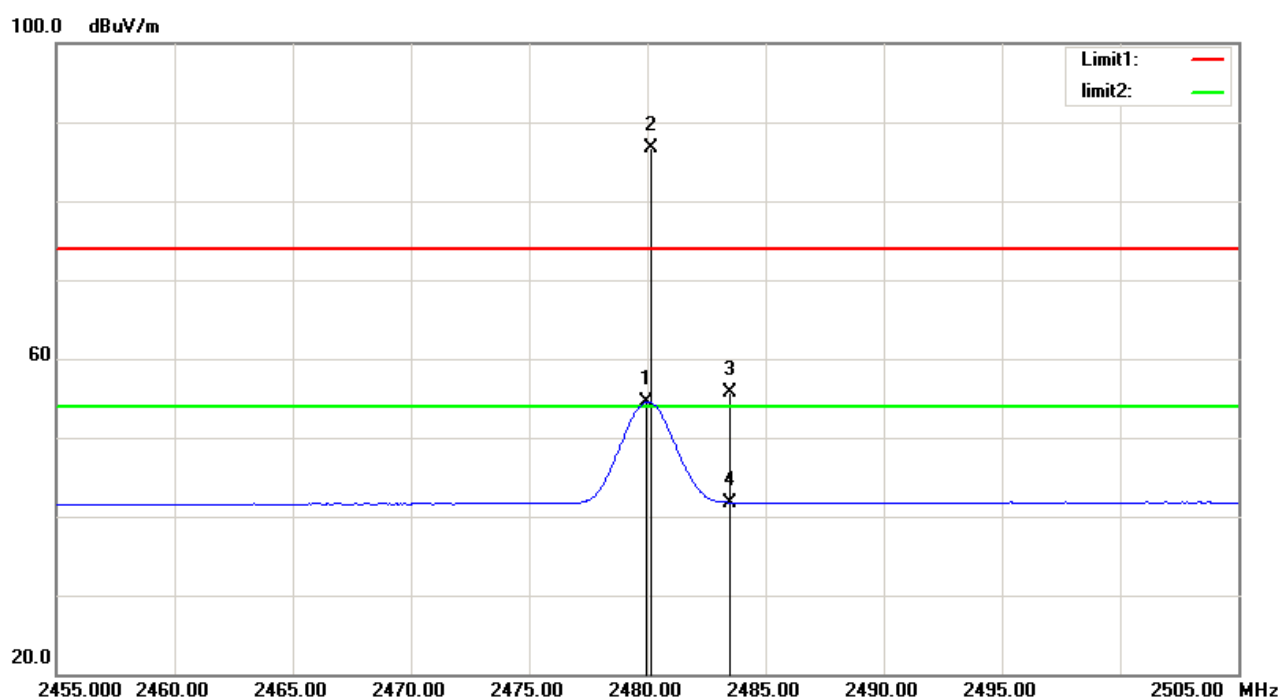
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	25.79	30.74	56.53	74.00	-17.47	peak
2	2390.000	14.77	30.74	45.51	54.00	-8.49	AVG
3	2402.050	31.37	30.77	62.14	/	/	AVG
4	2402.100	69.31	30.77	100.08	/	/	peak

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	PASS
Test Time:	2019-7-30	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	2DH1_TX_2402MHz		
Note:	WORSE CASE		



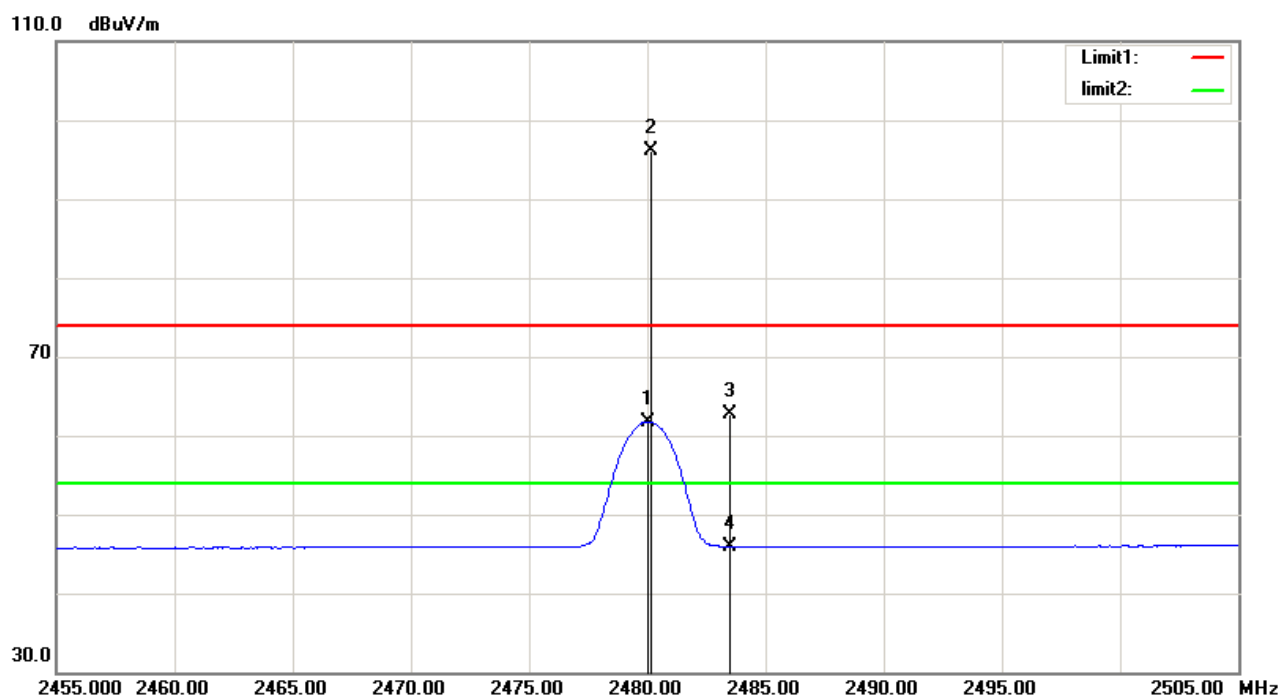
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	22.19	30.74	52.93	74.00	-21.07	peak
2	2390.000	10.50	30.74	41.24	54.00	-12.76	AVG
3	2401.800	60.74	30.77	91.51	/	/	peak
4	2402.000	25.08	30.77	55.85	/	/	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	PASS
Test Time:	2019-7-30	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	2DH1_TX_2480MHz		
Note:	WORSE CASE		



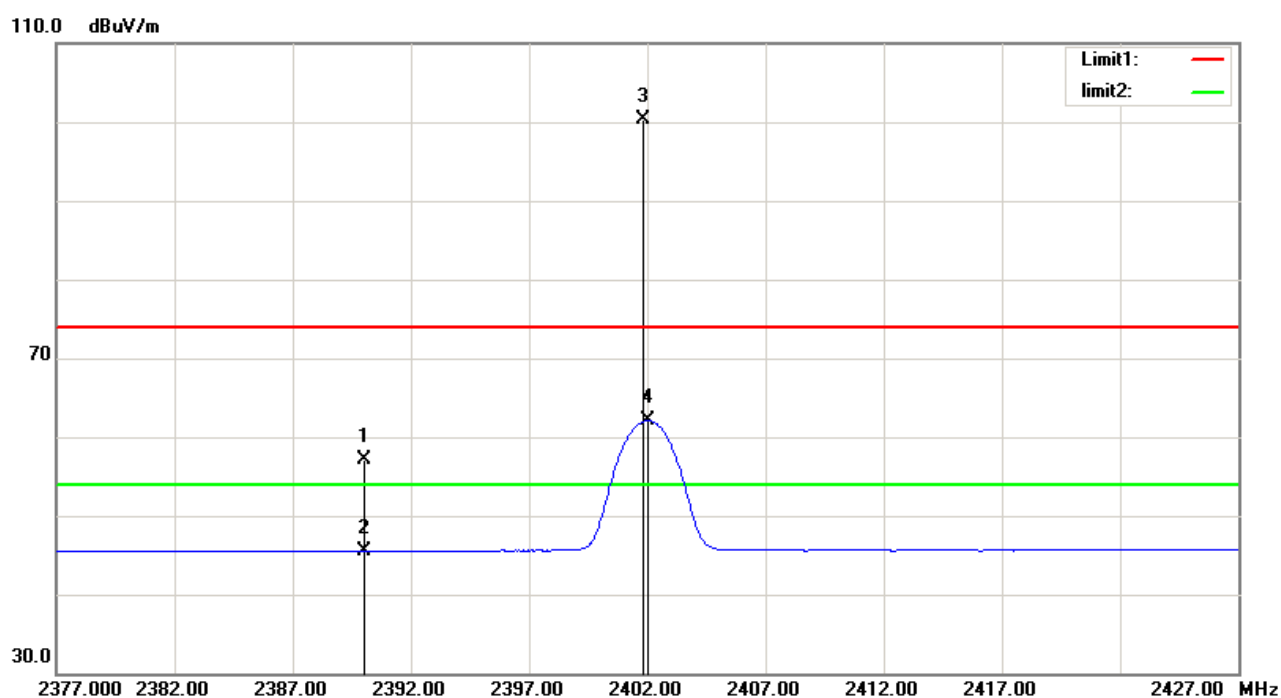
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.950	23.49	31.04	54.53	/	/	AVG
2	2480.150	55.74	31.04	86.78	/	/	peak
3	2483.500	24.73	31.05	55.78	74.00	-18.22	peak
4	2483.500	10.68	31.05	41.73	54.00	-12.27	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	PASS
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	2DH1_TX_2480MHz		
Note:	WORSE CASE		



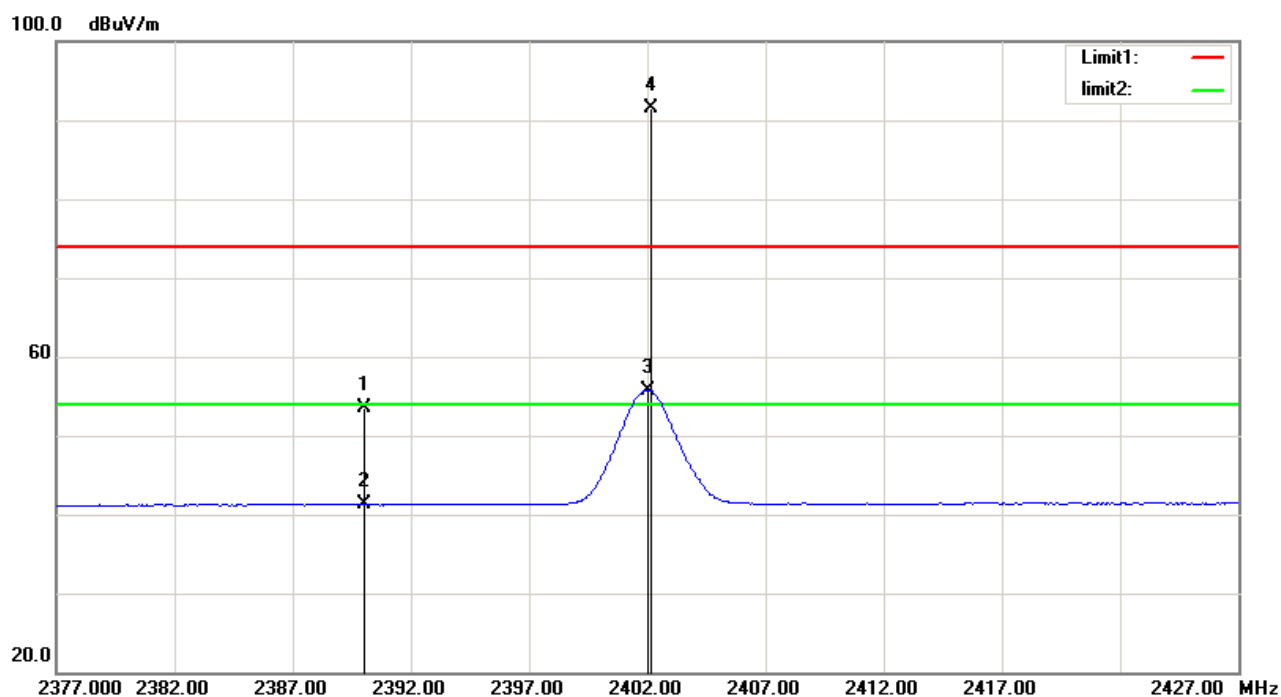
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.050	30.74	31.04	61.78	/	/	AVG
2	2480.150	65.16	31.04	96.20	/	/	peak
3	2483.500	31.71	31.05	62.76	74.00	-11.24	peak
4	2483.500	14.90	31.05	45.95	54.00	-8.05	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24°C	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	PASS
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	3DH1_TX_2402MHz		
Note:	WORSE CASE		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	26.42	30.74	57.16	74.00	-16.84	peak
2	2390.000	14.81	30.74	45.55	54.00	-8.45	AVG
3	2401.850	69.51	30.77	100.28	/	/	peak
4	2402.050	31.28	30.77	62.05	/	/	AVG

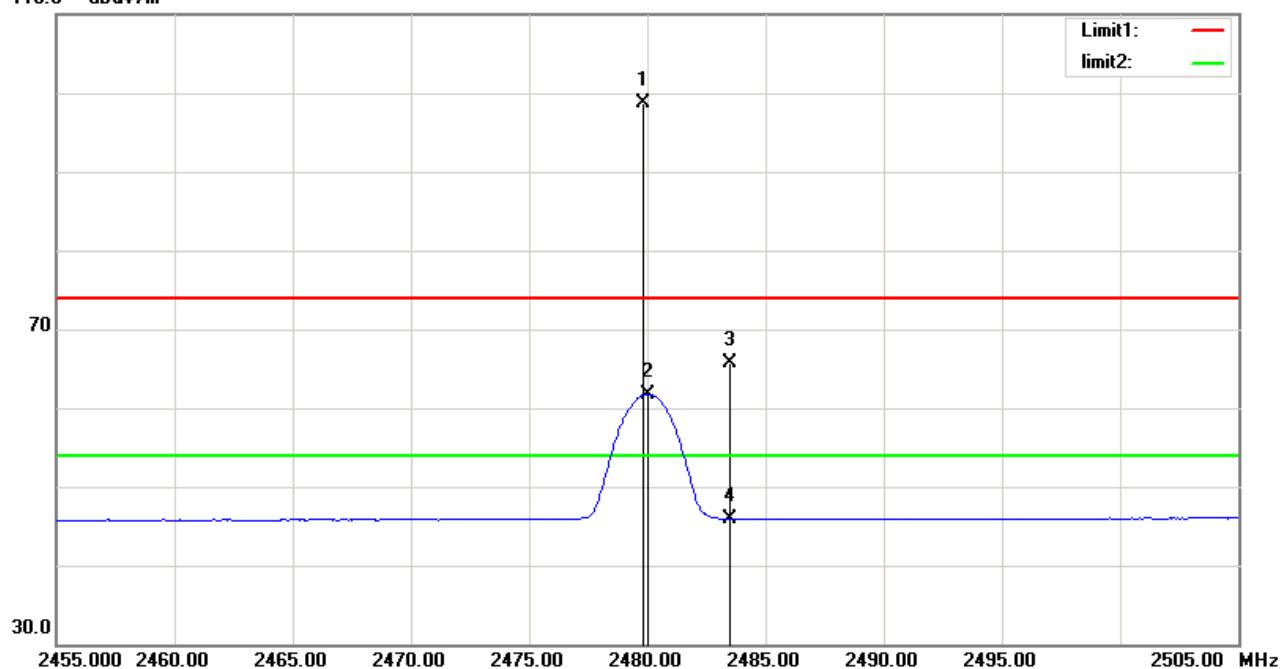
EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	PASS
Test Time:	2019-7-30	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	3DH1_TX_2402MHz		
Note:	WORSE CASE		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	22.80	30.74	53.54	74.00	-20.46	peak
2	2390.000	10.52	30.74	41.26	54.00	-12.74	AVG
3	2402.000	25.02	30.77	55.79	/	/	AVG
4	2402.200	60.78	30.78	91.56	/	/	peak

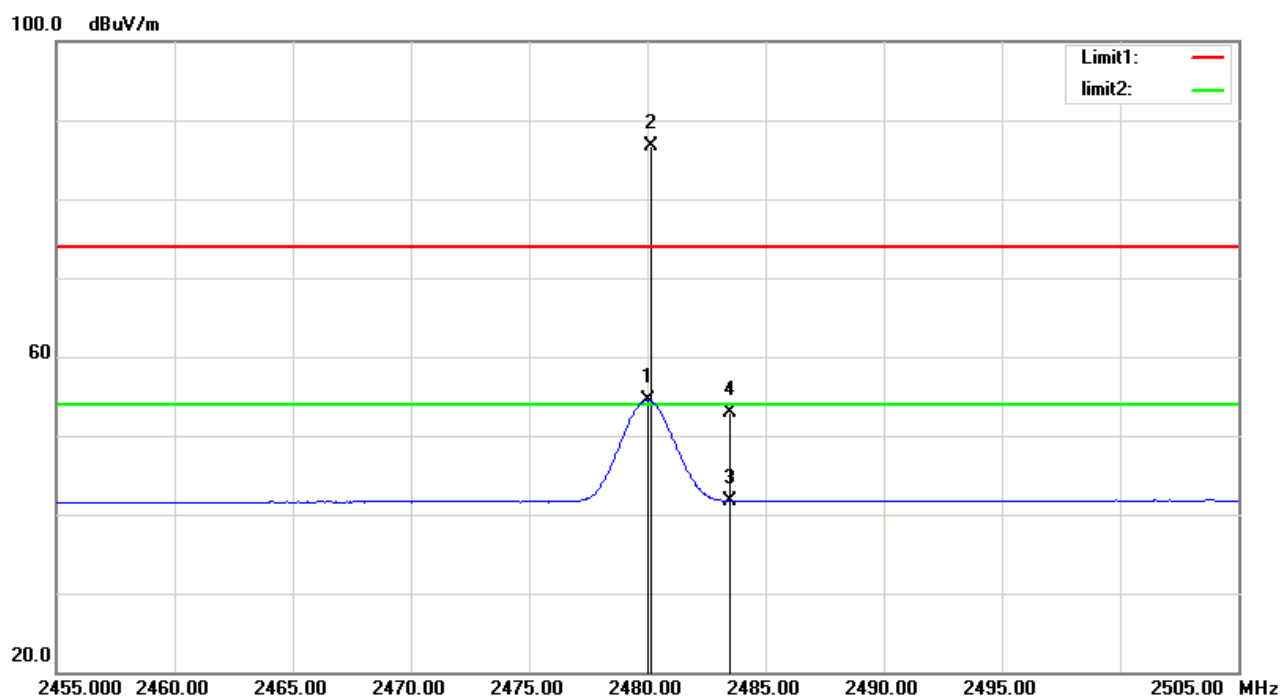
EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24°C	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Horizontal	Test Result:	PASS
Test Time:	2019-7-27	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	3DH1_TX_2480MHz		
Note:	WORSE CASE		

110.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.800	67.69	31.04	98.73	/	/	peak
2	2480.000	30.68	31.04	61.72	/	/	AVG
3	2483.500	34.70	31.05	65.75	74.00	-8.25	peak
4	2483.500	14.90	31.05	45.95	54.00	-8.05	AVG

EUT:	Bluetooth FM Transmitter	Model No.:	BTFMA
Temperature:	24℃	Relative Humidity:	66%
Distance:	3m	Test Power:	DC 12V
Polarization:	Vertical	Test Result:	PASS
Test Time:	2019-7-30	Test By:	Blue
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	3DH1_TX_2480MHz		
Note:	WORSE CASE		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	23.44	31.04	54.48	/	/	AVG
2	2480.200	55.73	31.04	86.77	/	/	peak
3	2483.500	10.68	31.05	41.73	74.00	-12.27	AVG
4	2483.500	21.78	31.05	52.83	74.00	-21.17	peak

9. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

9.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

9.2. 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)).

9.3. Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- Repeat above procedures until all measured frequencies were complete.

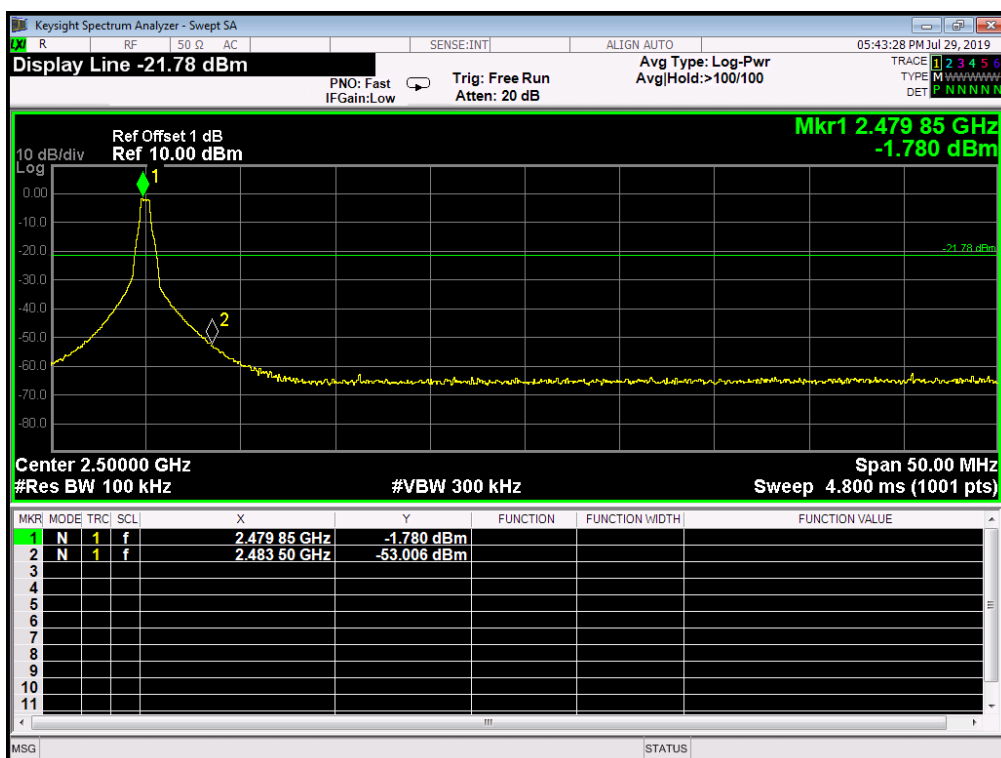
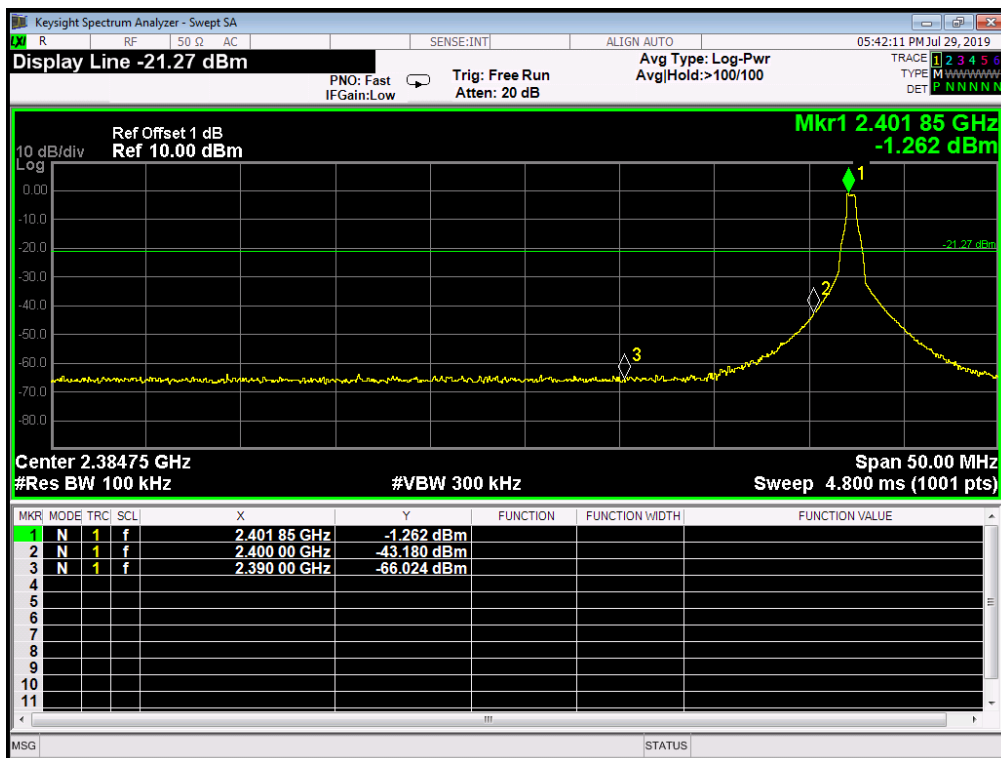
9.4. Test result

PASS (See below detailed test result.)

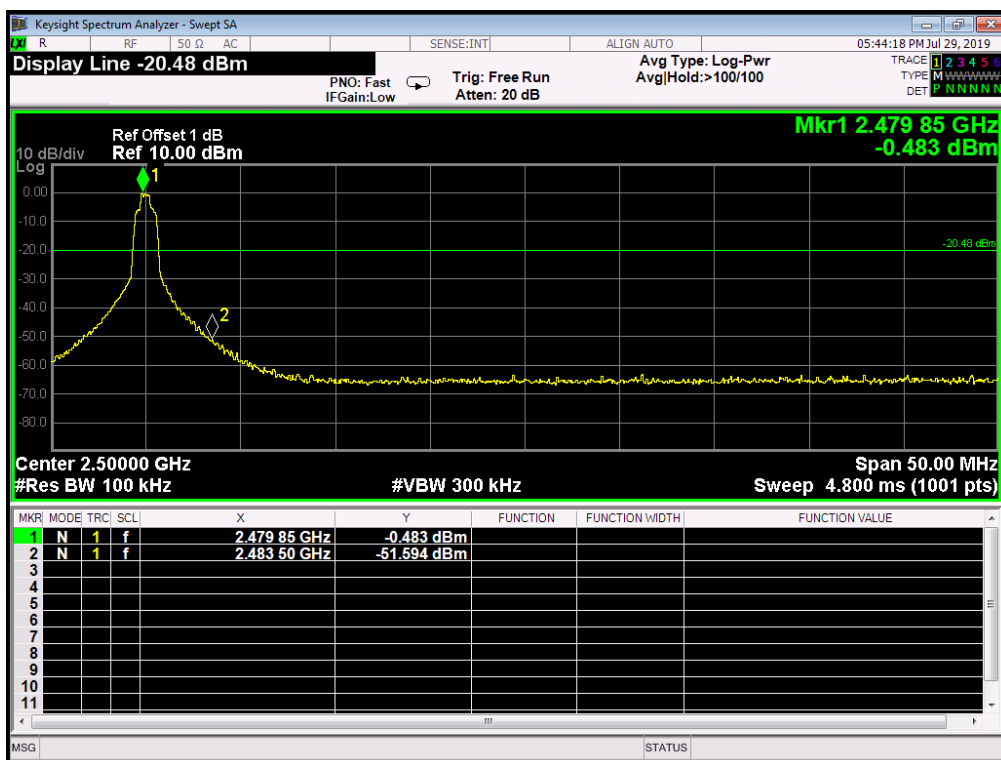
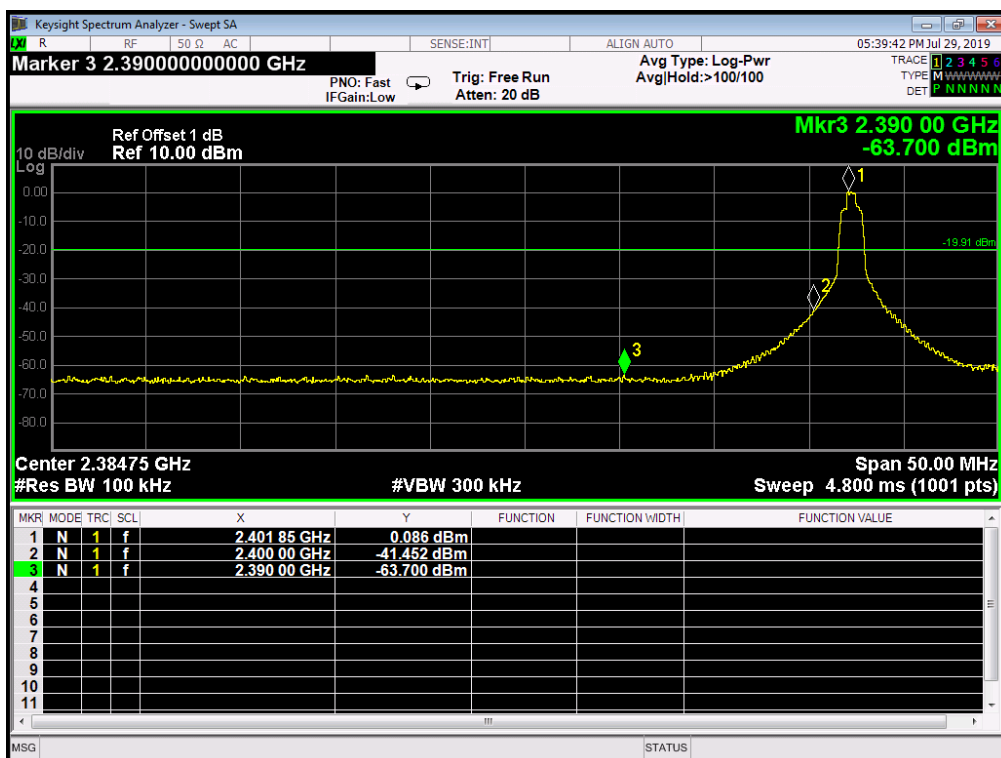
Frequency Band	Delta Peak to band emission (dBc)	>Limit (dBc)	Result
1Mbps Non-hopping			
2400	41.92	20	Pass
2483.5	51.23	20	Pass
2Mbps Non-hopping			
2400	41.54	20	Pass
2483.5	51.11	20	Pass
3Mbps Non-hopping			
2400	43.42	20	Pass
2483.5	52.11	20	Pass

Frequency Band	Delta Peak to band emission (dBc)	>Limit (dBc)	Result
1Mbps hopping			
2400	42.53	20	Pass
2483.5	52.31	20	Pass
2Mbps hopping			
2400	42.32	20	Pass
2483.5	53.20	20	Pass
3Mbps hopping			
2400	43.67	20	Pass
2483.5	51.55	20	Pass

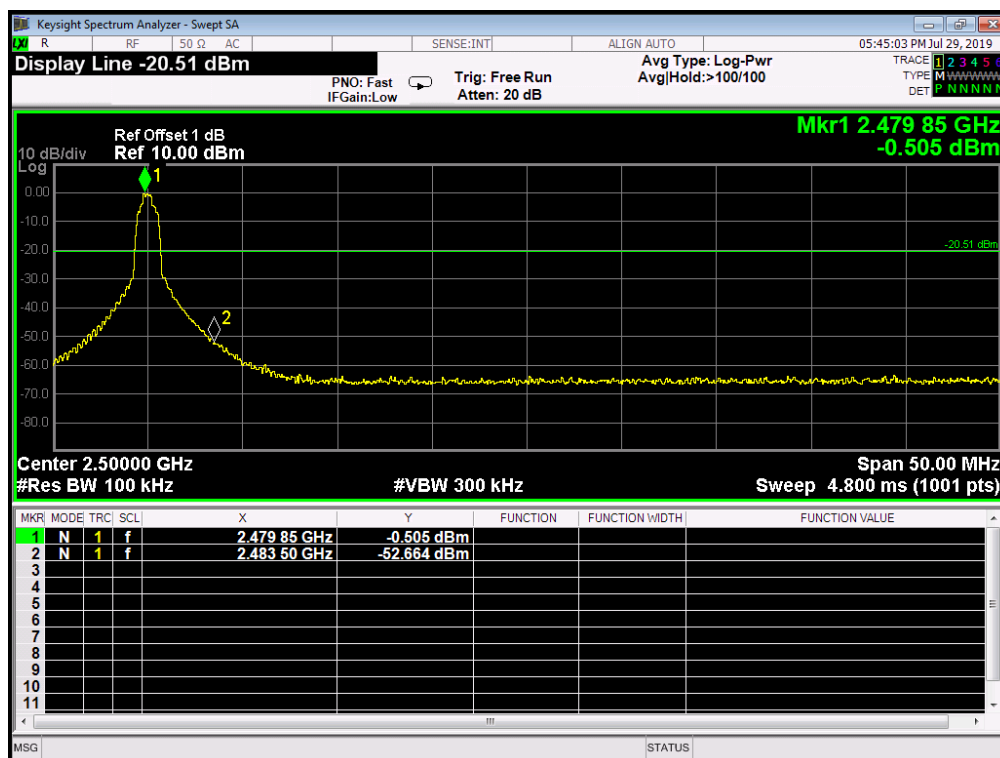
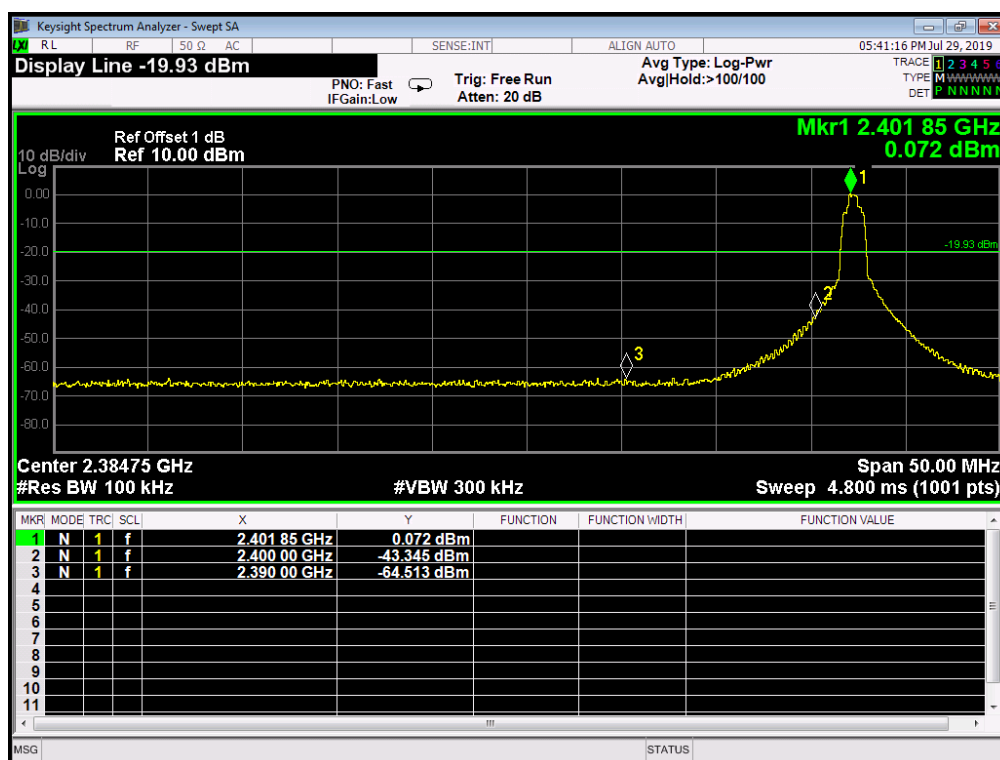
GFSK



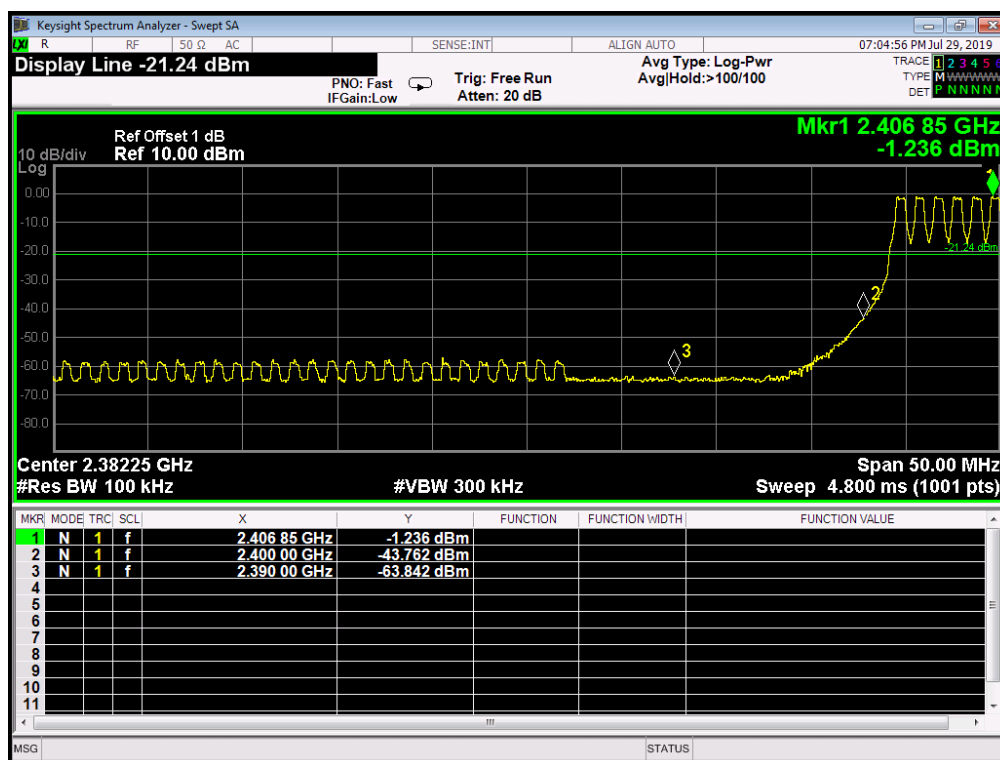
$\pi/4$ DQPSK



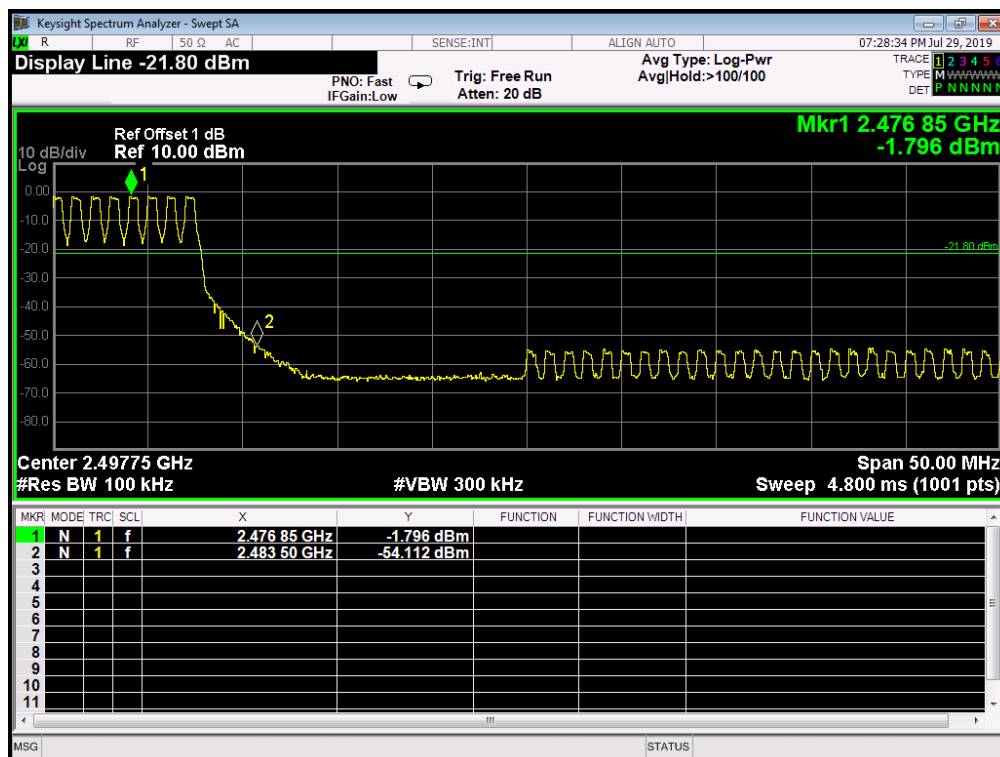
8DPSK



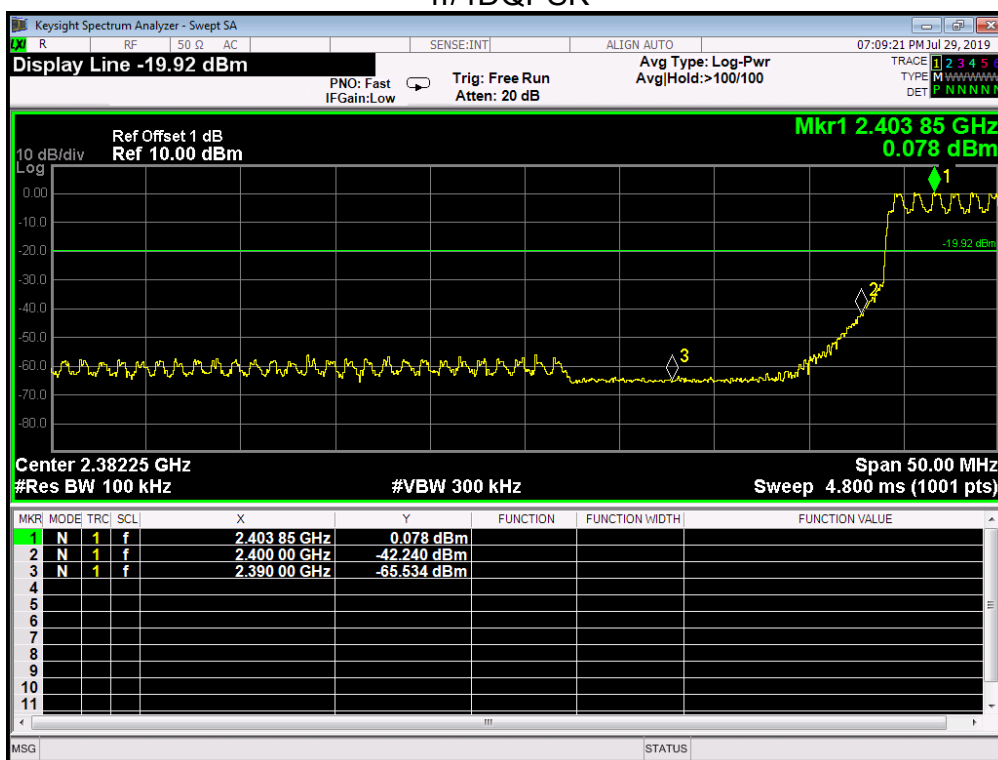
GFSK



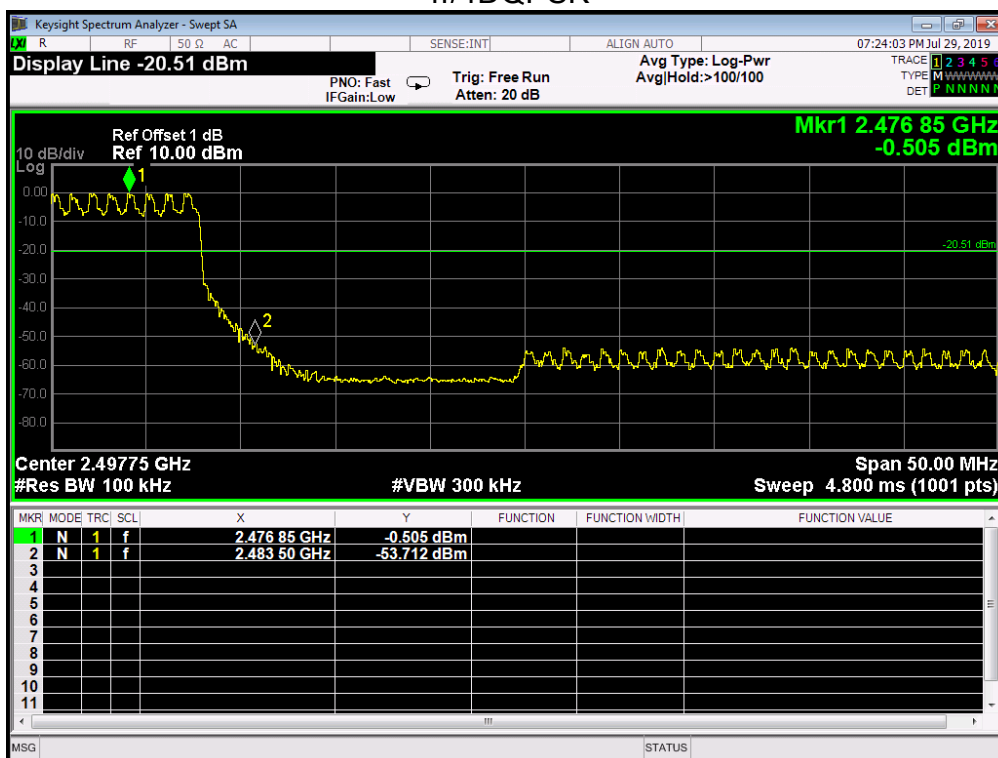
GFSK



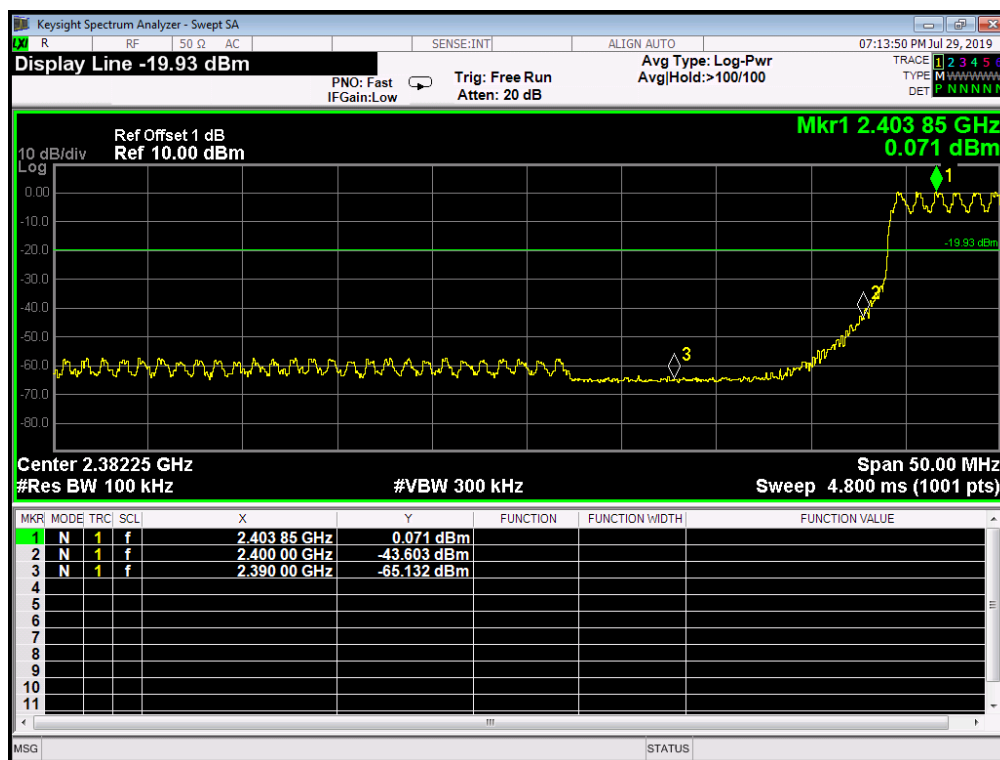
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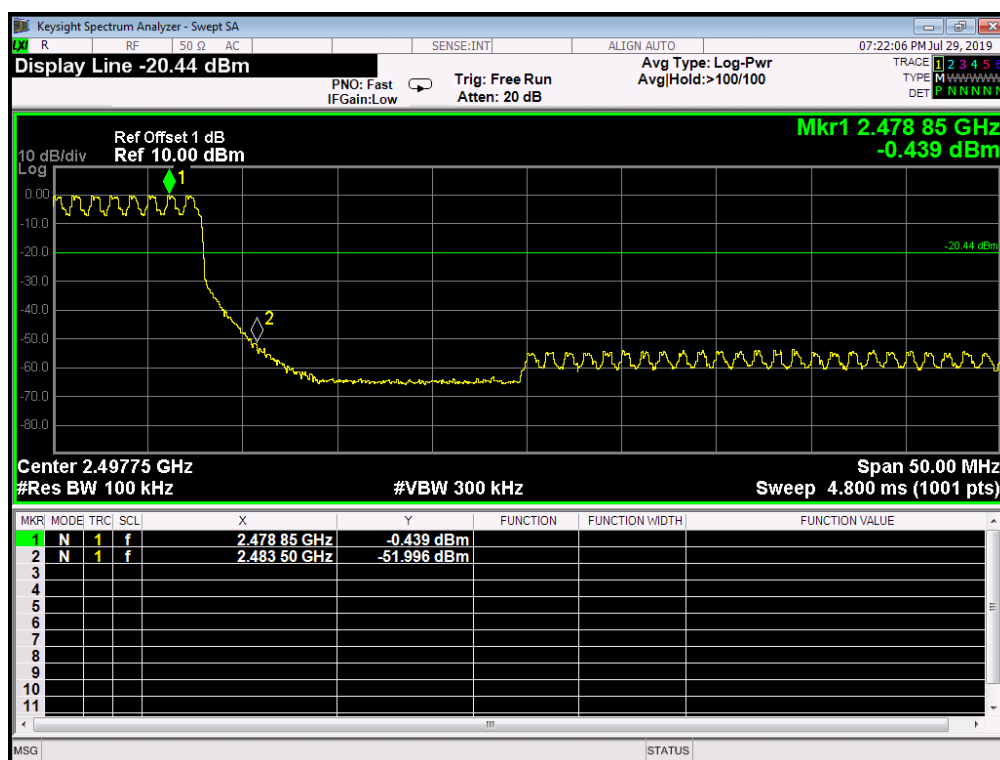
$\pi/4$ DQPSK



8DPSK

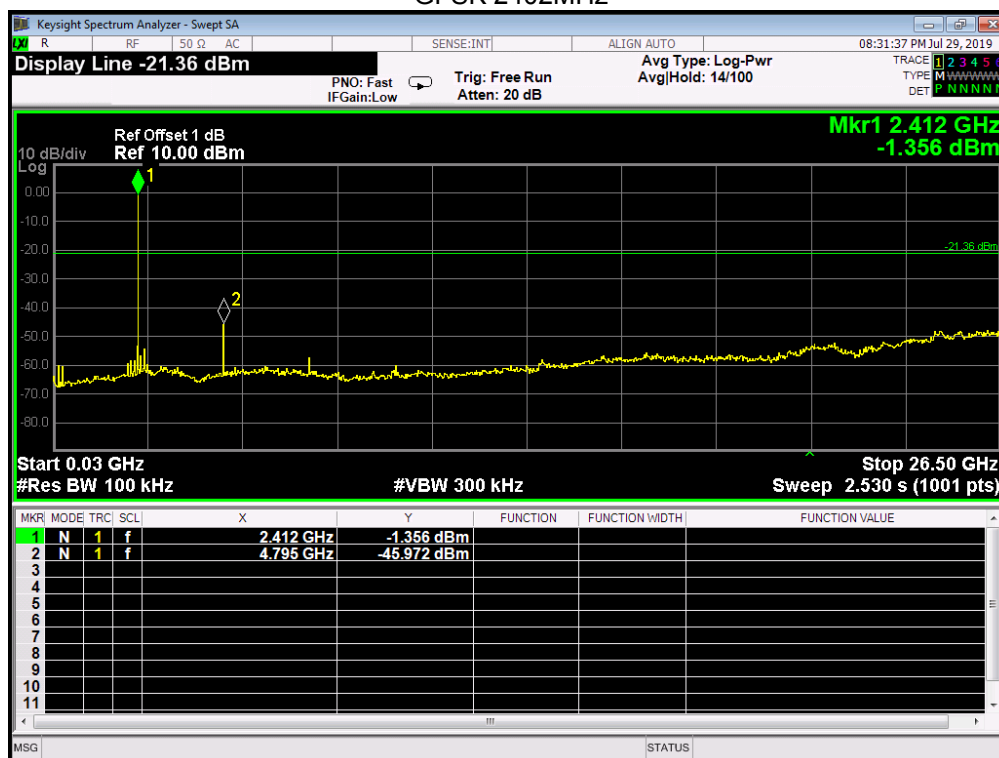


8DPSK

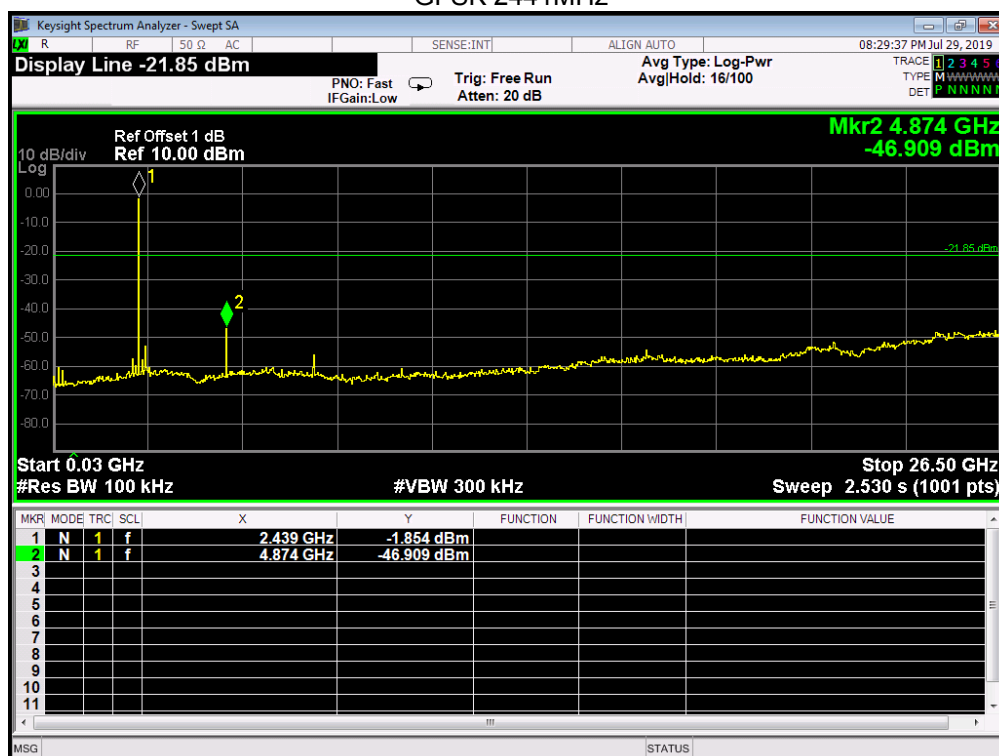


Conducted Emission

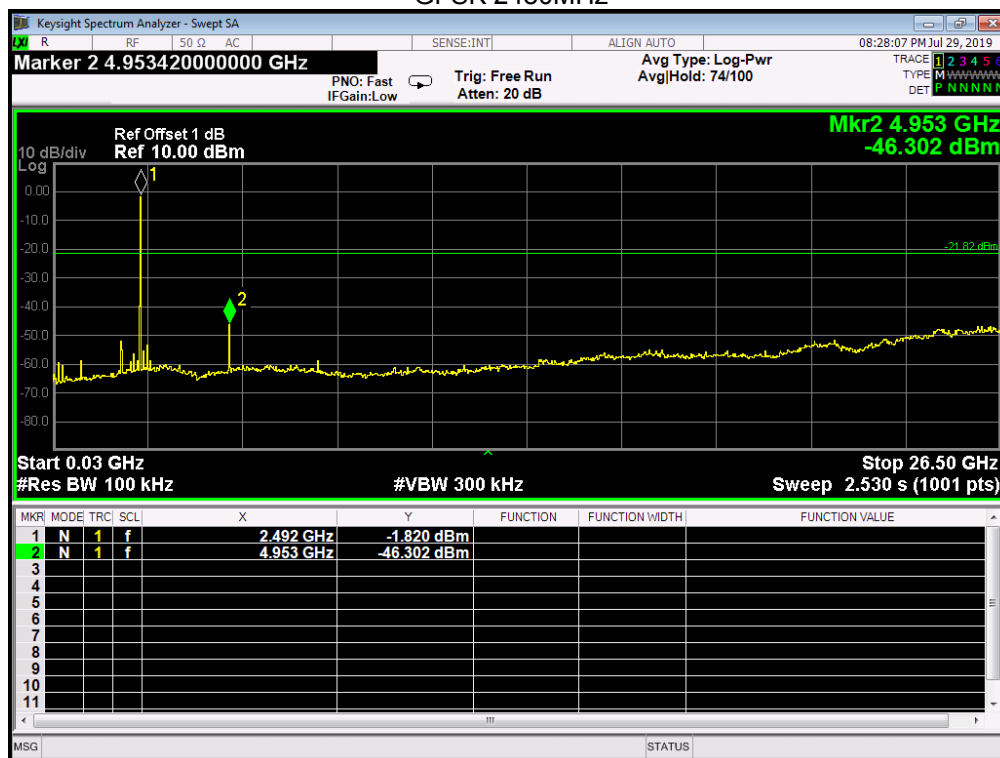
GFSK 2402MHz



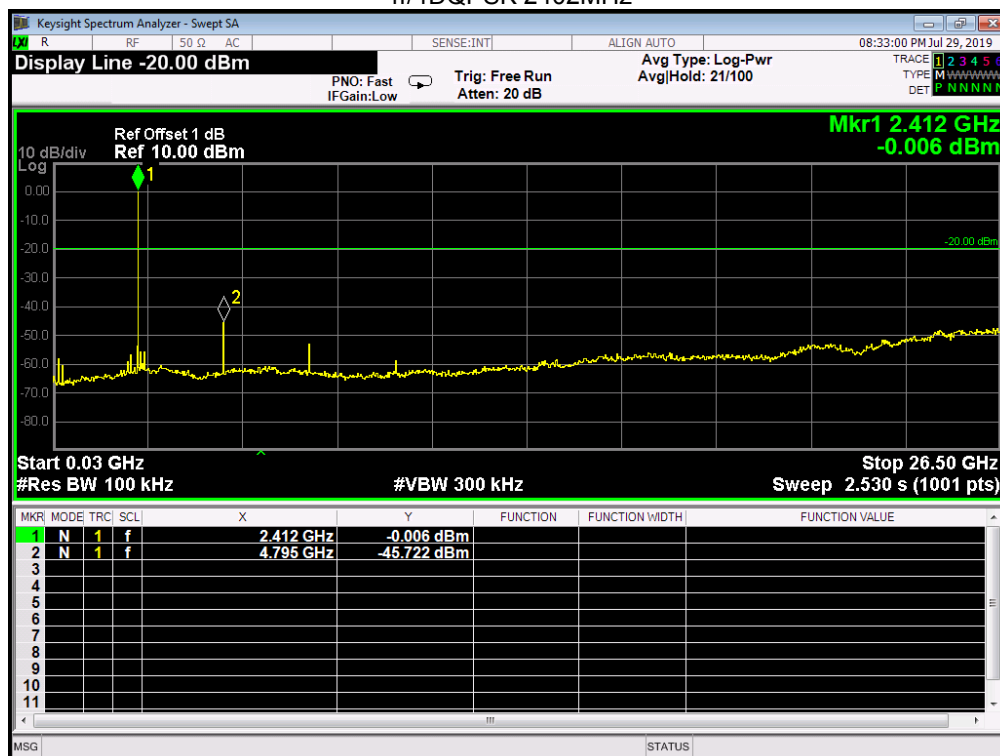
GFSK 2441MHz

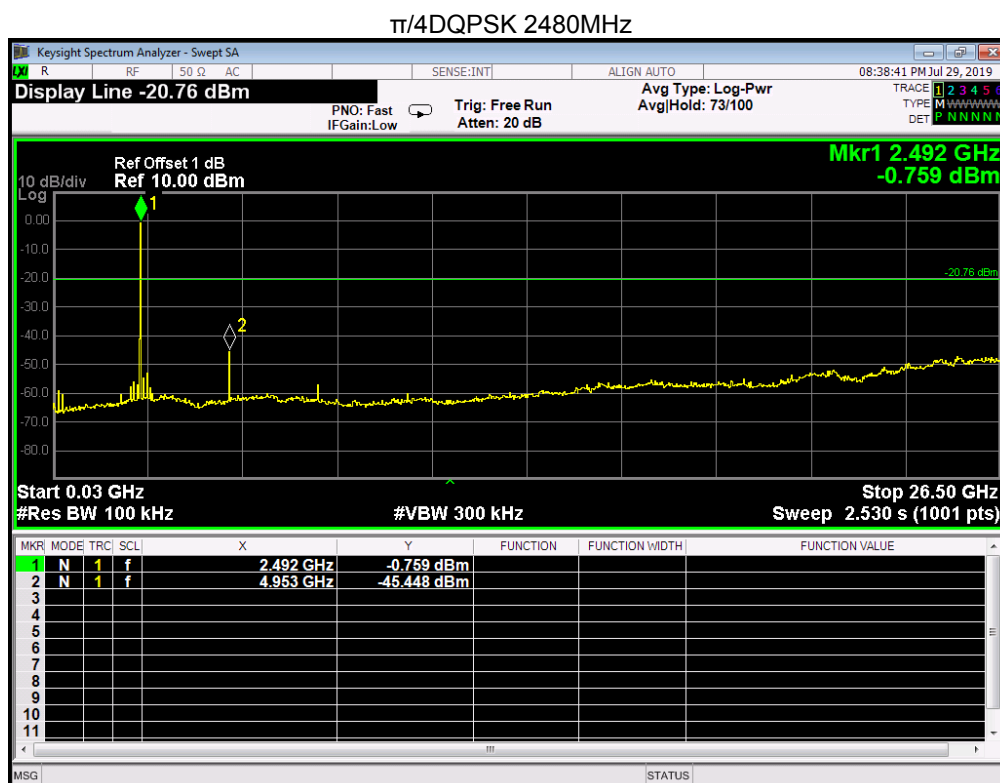
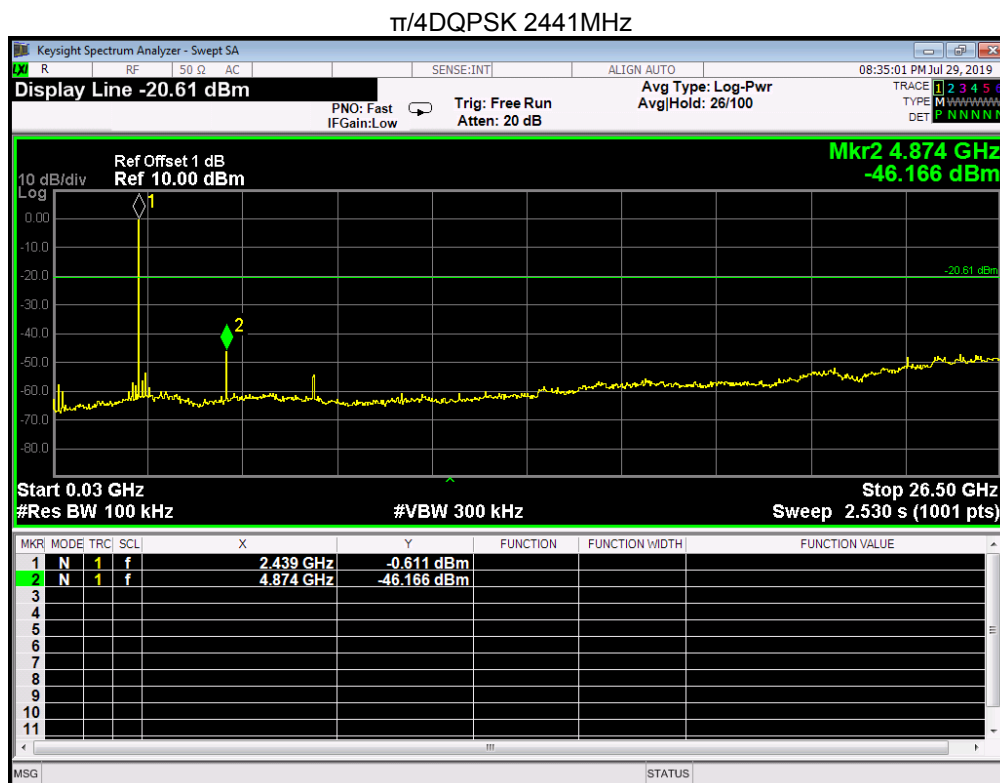


GFSK 2480MHz

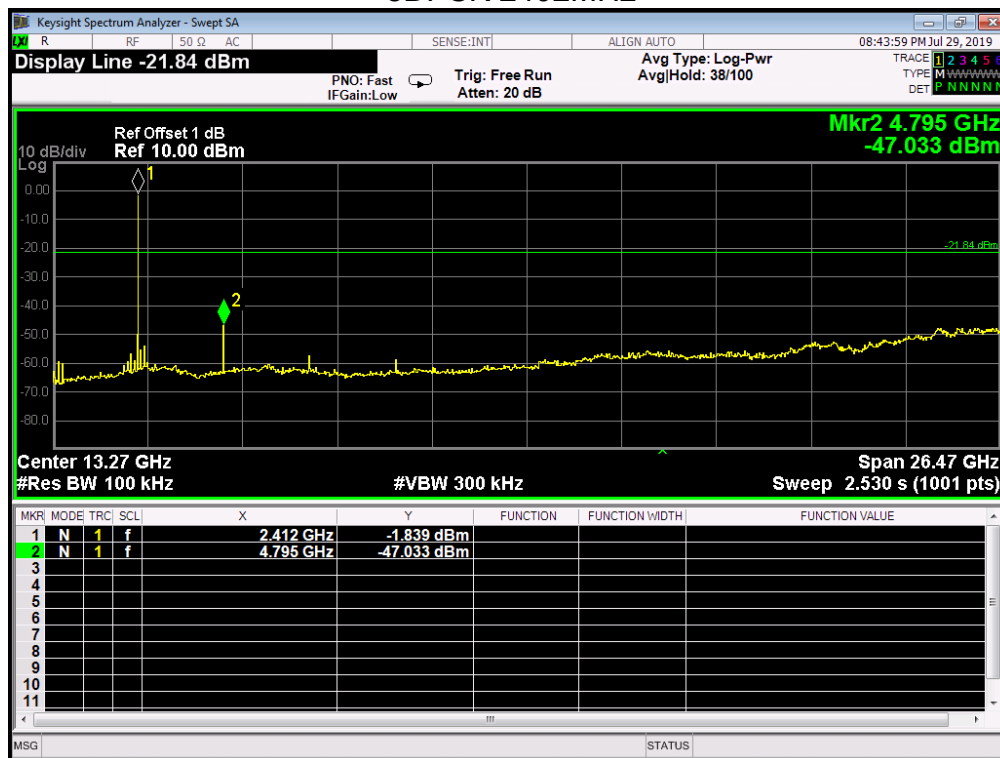


$\pi/4$ DQPSK 2402MHz

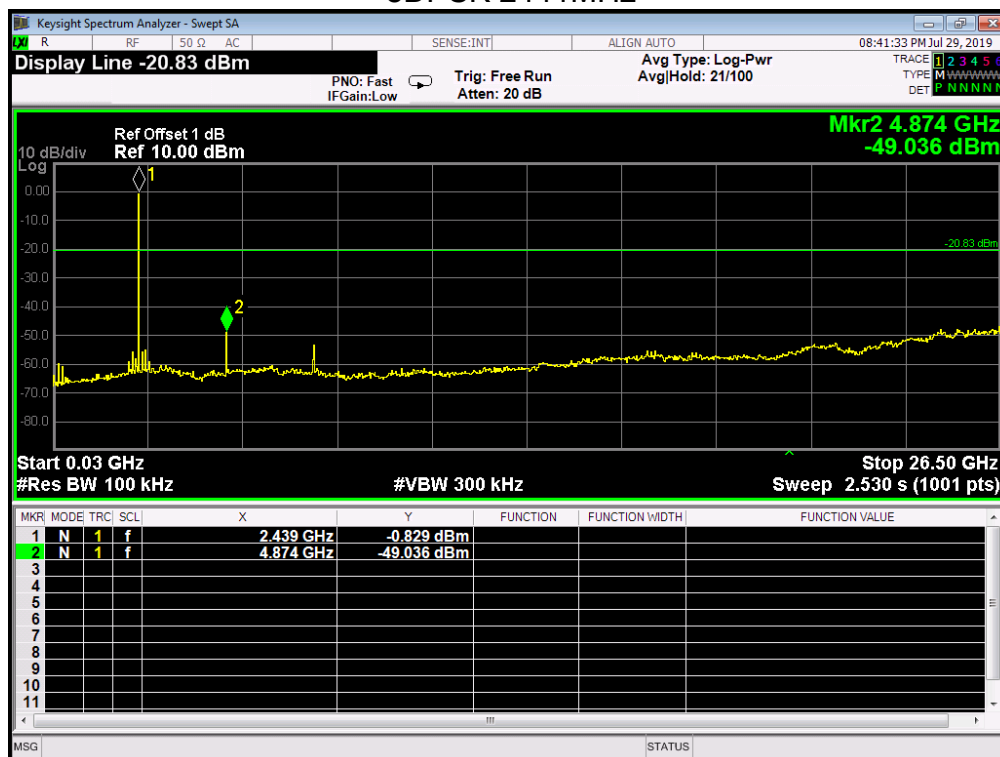




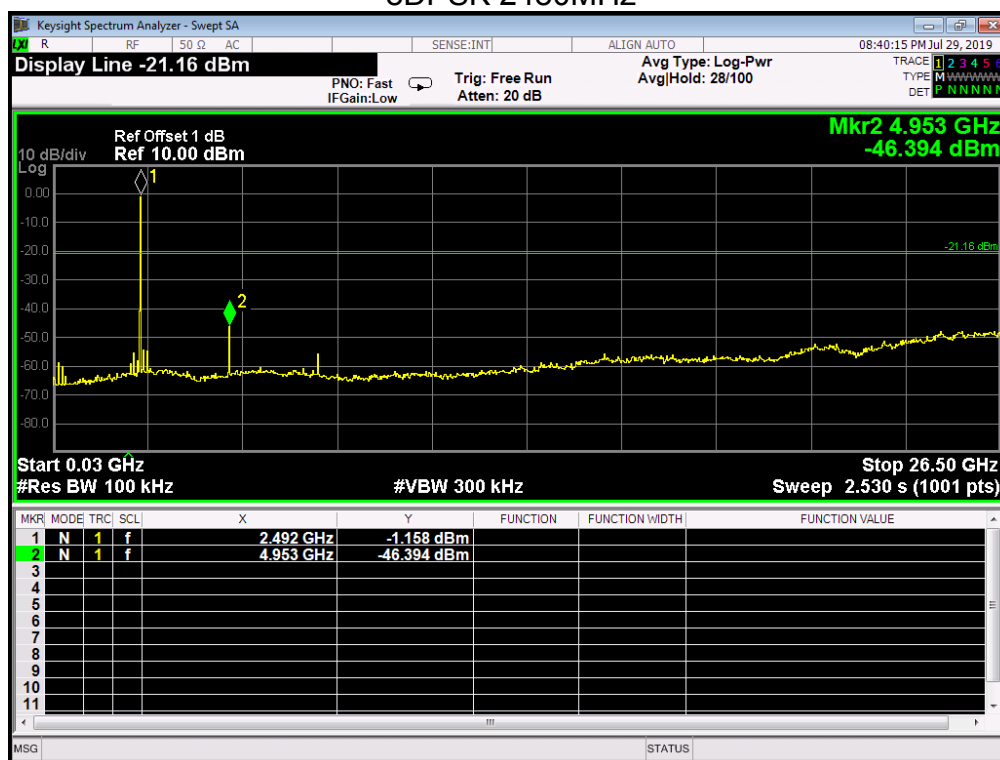
8DPSK 2402MHz



8DPSK 2441MHz



8DPSK 2480MHz

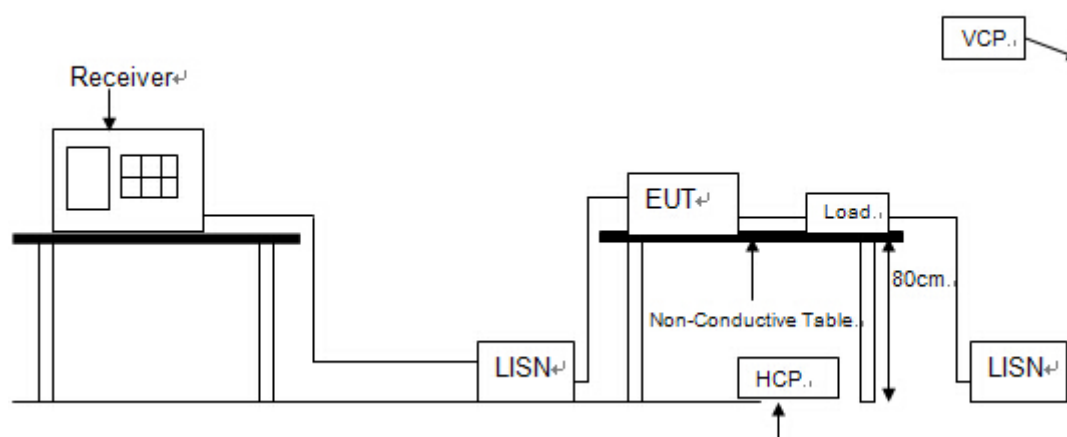


10. POWER LINE CONDUCTED EMISSION

10.1 Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Pulse Limiter	MTS-systemtechnik	MTS-IMP-136	261115-010-0024	12/16/2019
2	EMI Test Receiver	R&S	ESCI	101308	12/16/2019
3	LISN	AFJ	LS16	16011103219	12/16/2019
4	LISN	Schwarzbeck	NSLK 8127	8127-432	12/16/2019
5	Measurement Software	Farad	EZ-EMC (Ver.ATT-03A)	N/A	N/A

10.2 Block diagram of test setup



10.3 Power Line Conducted Emission Limits(Class B)

Frequency	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

10.4 Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 KHz.

10.5 Test Result

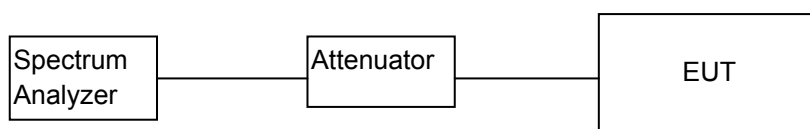
DC network power ports not applicable in this test project.

11. FREQUENCY STABILITY

11.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/17	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/17	1 Year
4	Temperature conditioning	Guan Jian.HTH1000	-20-130℃	GJ1000-10D 001	2019/12/17	1.Year
5	DC Power Supply	G.KE	IPR-10010D	010931954	2019/12/17	1.Year

11.2. Block diagram of test setup



11.3.Test Result

GFSK

Temperature vs. Frequency Stability		
Voltage	Temperature	Measurement Frequency (MHz)
12V	(°C)	2402
	-20	2401.982
	20	2401.988
	50	2401.983
7.4V	20	2401.975
	Max. Deviation (MHz)	2401.975
	Max. Deviation (ppm)	-10.41

Voltage	Temperature	Measurement Frequency (MHz)
12V	(°C)	2441
	-20	2440.981
	20	2440.988
	50	2440.979
7.4V	20	2440.985
	Max. Deviation (MHz)	2440.979
	Max. Deviation (ppm)	-8.60

Voltage	Temperature	Measurement Frequency (MHz)
12V	(°C)	2480
	-20	2479.988
	20	2479.974
	50	2479.987
7.4V	20	2479.977
	Max. Deviation (MHz)	2479.974
	Max. Deviation (ppm)	-10.48

Note:7.4V is the end point voltage,and products below 7.4V will cease working.

12 Antenna Requirements

12.1 Limit

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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

12.2 EUT Antenna

The EUT antenna is permanent attached antenna. It comply with the standard requirement.

END OF REPORT