FCC CERTIFICATION TEST REPORT

For

FCC ID: 2AHYVCRSHMICRO

Report Reference No.	:	17FAS05047 11
FCC 2.948 No	:	923232
Date of issue	:	2017-06-19
Testing Laboratory	:	ATT Product Service Co., Ltd.
Address	:	No. 3, ChangLianShan Industrial Park, ChangAn Town, DongGuan City, GuangDong, China.
Applicant's name	:	PEAG LLC DBA JLABAUDIO
Address	:	3402 piazza d'oro way, suite 230 oceanside, ca 92056
Manufacturer	:	Musilab Electronic (DongGuan) Co., Ltd

Test specification:

Test item description	:	Speaker with bluetooth
Trade Mark	:	Jlab
Model/Type reference	:	Crasher Micro
Ratings	:	I/P: 3.7V by inside the battery

Responsible Engineer :

Smile Wang

Smile Wang

Approved by:

Maoxing Wang

Maoxing Wang

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TEST REPORT DECLARE

Applicant	:	PEAG LLC DBA JLABAUDIO
Address	:	3402 piazza d'oro way, suite 230 oceanside, ca 92056
Equipment under Test	:	Speaker with bluetooth
Test Model No	:	Crasher Micro
Manufacturer	:	Musilab Electronic (DongGuan) Co., Ltd
Address	:	No.5 Huanwei Street,Fugang,Qingxi Town, Dongguan,Guangdong,China

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C .:2015

Test procedure used: ANSI C63.4: 2014, ANSI C63.10-2013 , DA 00-705.

We Declare:

The equipment described above is tested by ATT Product Service 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 ATT Product Service Co., Ltd., 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:	17FAS05047 11		
Date of Test:	2017-6-11 To 2017-6-11	**Date of Report**:	2017-6-19

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of ATT Product Service 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)	PASS
Carrier Frequency Separation Test	FCC Part 15: 15.247(a)(1)	PASS
Number Of Hopping Frequency	FCC Part 15: 15.247(a)(1)(iii)	PASS
Dwell Time Test	FCC Part 15: 15.247(a)(1)(iii)	PASS
Maximum Output Power	FCC Part 15: 15.247(b)(1)	PASS
Band Edge Emission	FCC Part 15: 15.247(c)	PASS
Radiated Spurious Emissions	FCC Part 15.205 / 15.209	PASS
AC Line Conducted Emissions	§15.207 (a)	PASS
Antenna requirement	FCC Part 15: 15.203	PASS

2. GENERAL TEST INFORMATION

2.1. DESCRIPTION OF EUT

EUT* Name	:	Speaker with bluetooth
Model Number	:	Crasher Micro
EUT function description	:	Please reference user manual of this device
Power supply	:	3.7V by inside the battery
Radio Technology	:	BT V4.2
Operation frequency	:	2402-2480MHz
Modulation	:	GFSK, π/4DQPSK,8DPSK
Antenna Type	:	PIFA antenna, maximum PK gain: 0 dBi
Date of Receipt	:	2017/5/21
Sample Type	:	Single production

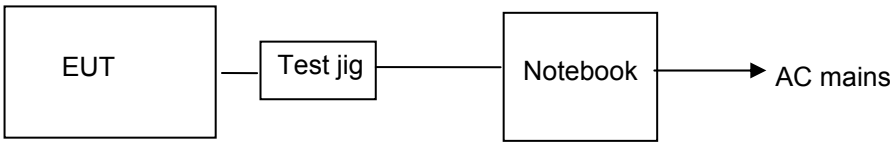
2.2. ACCESSORIES OF EUT

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
Notebook	acer	Aspire E1-472G	FCC Doc	/

2.4. BLOCK DIAGRAM OF EUT CONFIGURATION FOR TEST



EUT was connected to control to a special test jig provided by manufacturer which has a Micro USB connector to connect to Notebook, and the Notebook will run a special test software to 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 (Mpbs) (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	2.44dB
Uncertainty for Radiation Emission test (9KHz-30MHz)	3.21dB
Uncertainty for Radiation Emission test (30MHz-200MHz)	3.42 dB (Polarize: V)
	3.52 dB (Polarize: H)
Uncertainty for Radiation Emission test (200MHz-1GHz)	3.52 dB (Polarize: V)
	3.54 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	4.20 dB (Polarize: V)
	4.20 dB (Polarize: H)
Uncertainty for radio frequency	1×10-9
Uncertainty for conducted RF Power	0.65dB

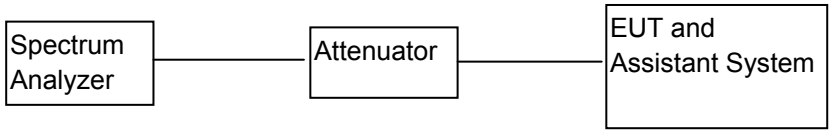
Note：This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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	2018/05/26	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2017/12/18	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2017/12/18	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

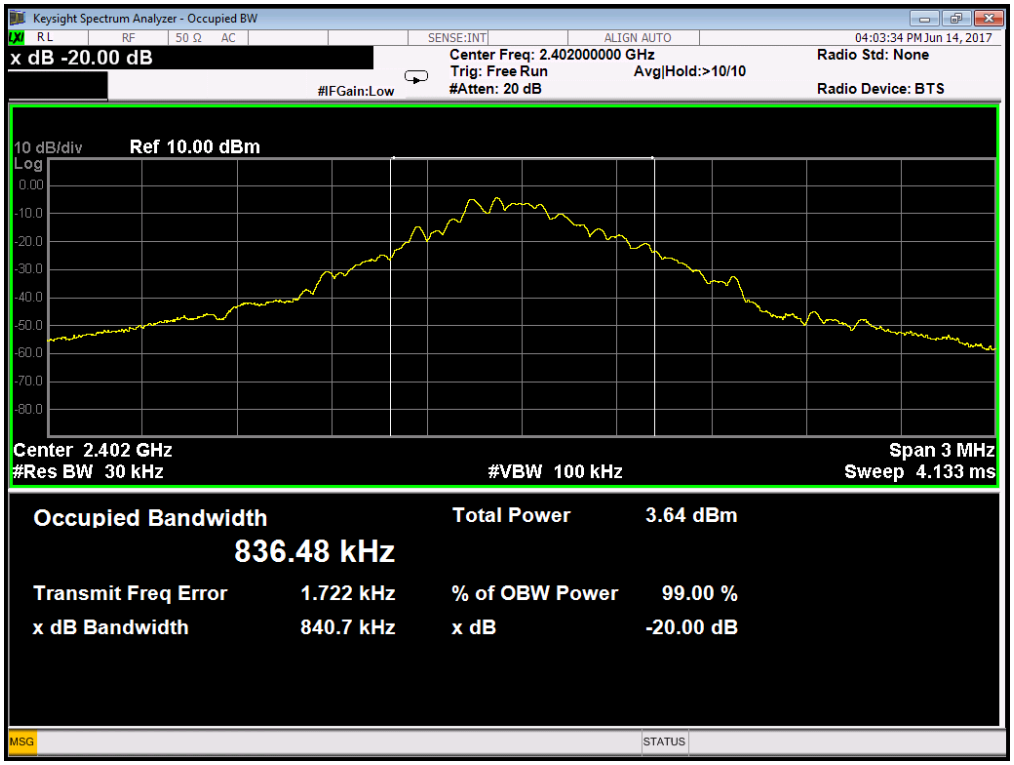
(5) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB and 99% bandwidth relative to the maximum level measured in the fundamental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

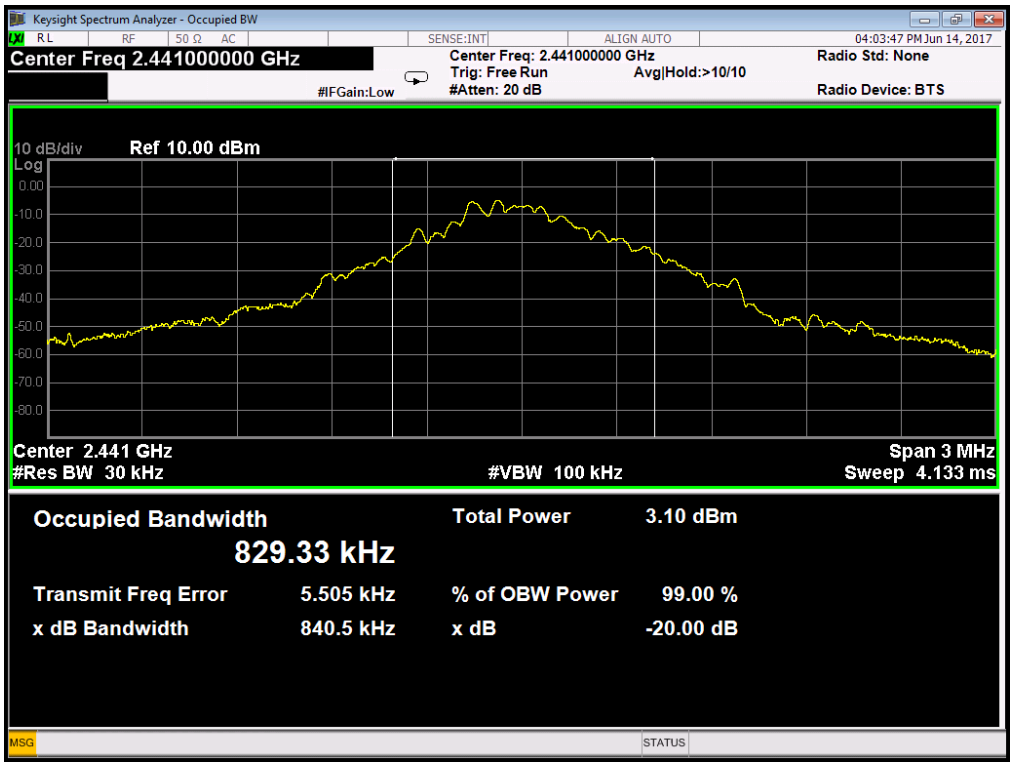
3.5. TEST RESULT

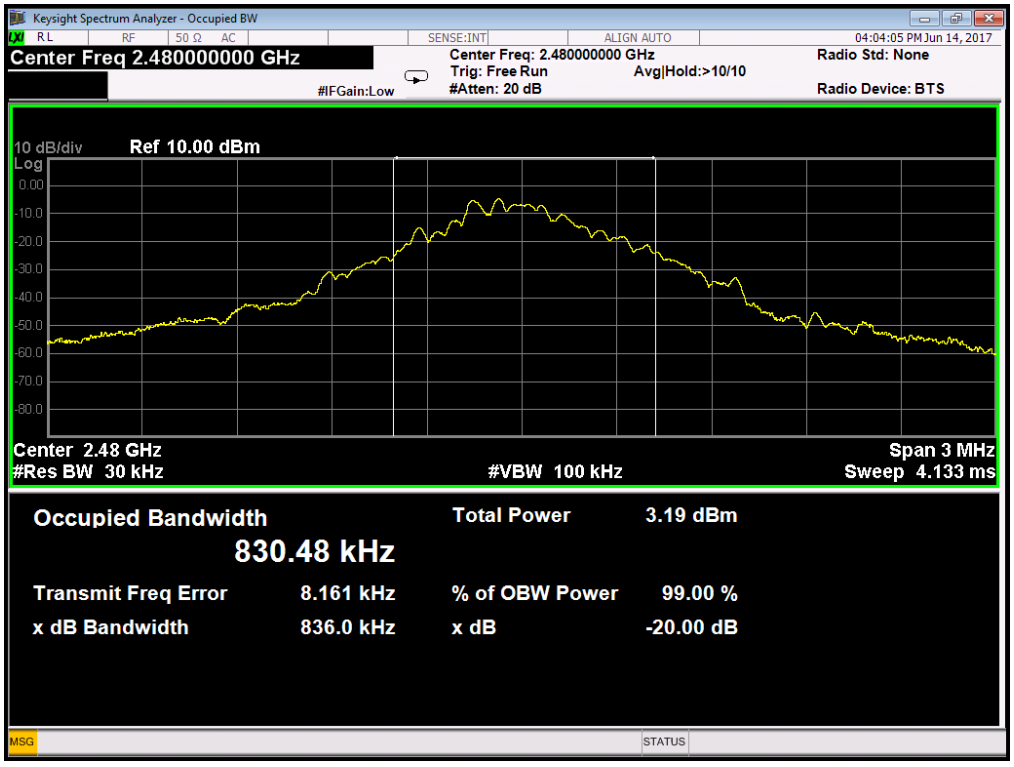
Mode	Freq (MHz)	20dB BW (MHz)	99%OBW (MHz)	Conclusion
GFSK	2402	0.841	0.836	PASS
	2441	0.841	0.829	PASS
	2480	0.836	0.830	PASS
8DPSK	2402	1.262	1.176	PASS
	2441	1.265	1.177	PASS
	2480	1.259	1.184	PASS

3.6. ORIGINAL TEST DATA

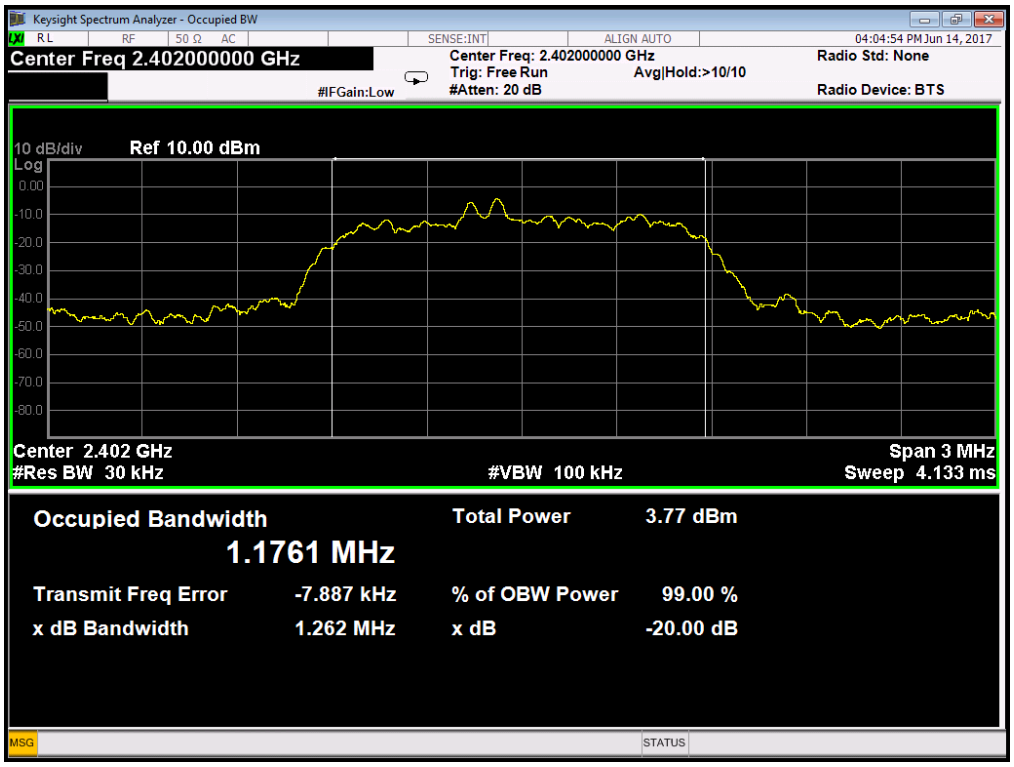
GFSK

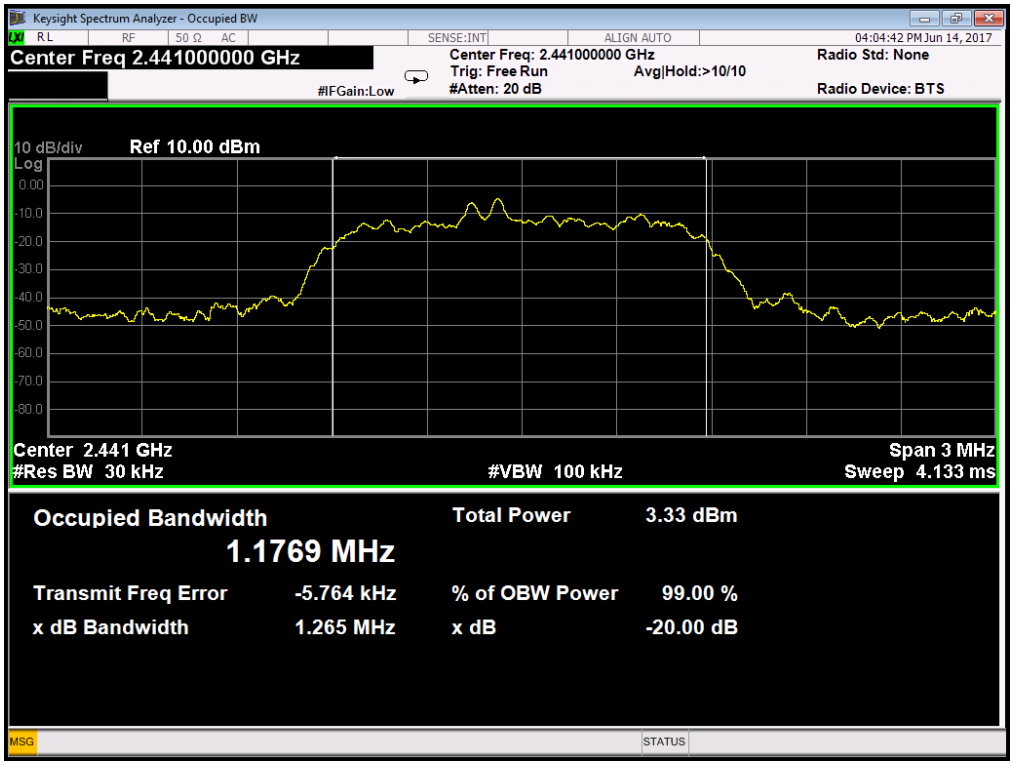


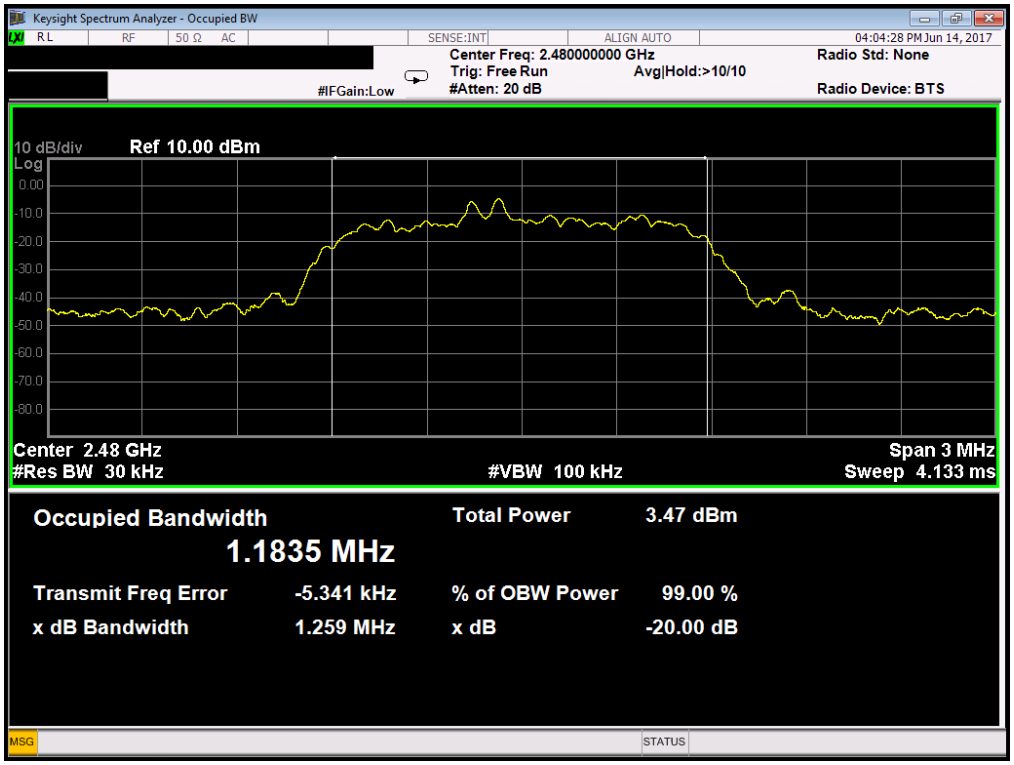

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
04:03:47 PM Jun 14, 2017
Center Freq 2.441000000 GHz
Center Freq: 2.441000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.441 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
829.33 kHz
Total Power 3.10 dBm
Transmit Freq Error 5.505 kHz
% of OBW Power 99.00 %
x dB Bandwidth 840.5 kHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
04:04:05 PM Jun 14, 2017
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
830.48 kHz
Total Power 3.19 dBm
Transmit Freq Error 8.161 kHz
% of OBW Power 99.00 %
x dB Bandwidth 836.0 kHz
x dB -20.00 dB
MSG
STATUS

8DPSK


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
04:04:54 PM Jun 14, 2017
Center Freq 2.402000000 GHz
Center Freq: 2.402000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.402 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
1.1761 MHz
Total Power 3.77 dBm
Transmit Freq Error -7.887 kHz
% of OBW Power 99.00 %
x dB Bandwidth 1.262 MHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
04:04:42 PM Jun 14, 2017
Center Freq 2.441000000 GHz
Center Freq: 2.441000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.441 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
1.1769 MHz
Total Power 3.33 dBm
Transmit Freq Error -5.764 kHz
% of OBW Power 99.00 %
x dB Bandwidth 1.265 MHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
04:04:28 PM Jun 14, 2017
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
1.1835 MHz
Total Power 3.47 dBm
Transmit Freq Error -5.341 kHz
% of OBW Power 99.00 %
x dB Bandwidth 1.259 MHz
x dB -20.00 dB
MSG
STATUS

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	2018/05/26	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2017/12/18	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2017/12/18	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

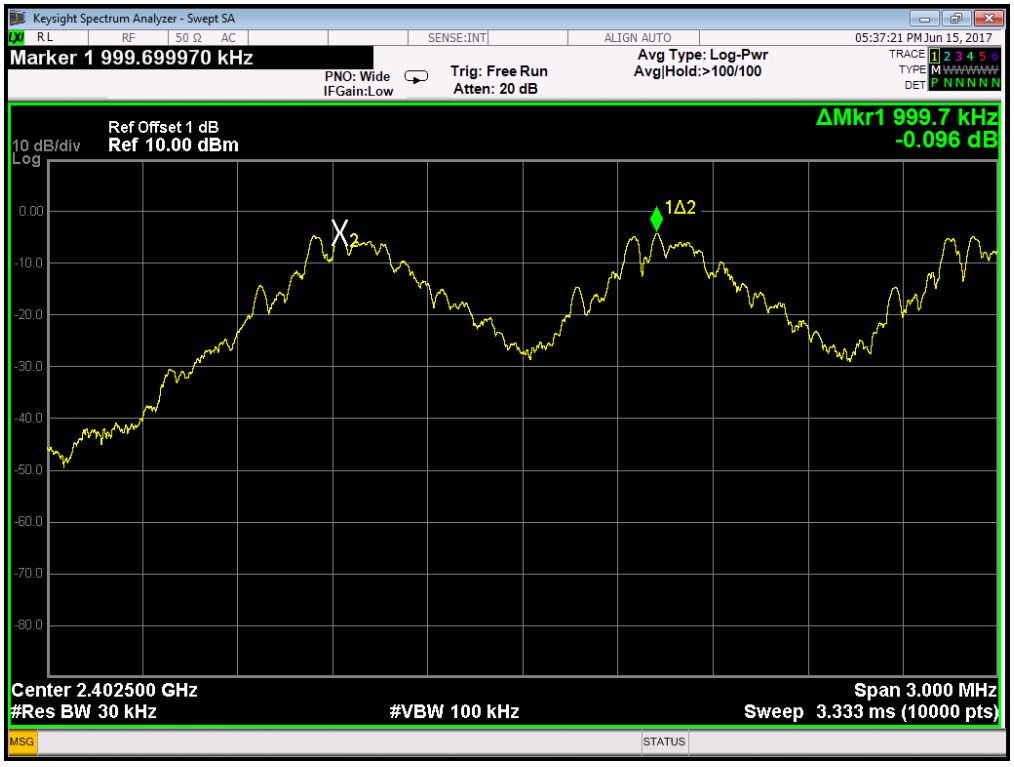
Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.000	>(25KHz or 2/3*20dB Bandwidth)	PASS
Middle	2441	1.000	>(25KHz or 2/3*20dB Bandwidth)	PASS
High	2479	1.000	>(25KHz or 2/3*20dB Bandwidth)	PASS

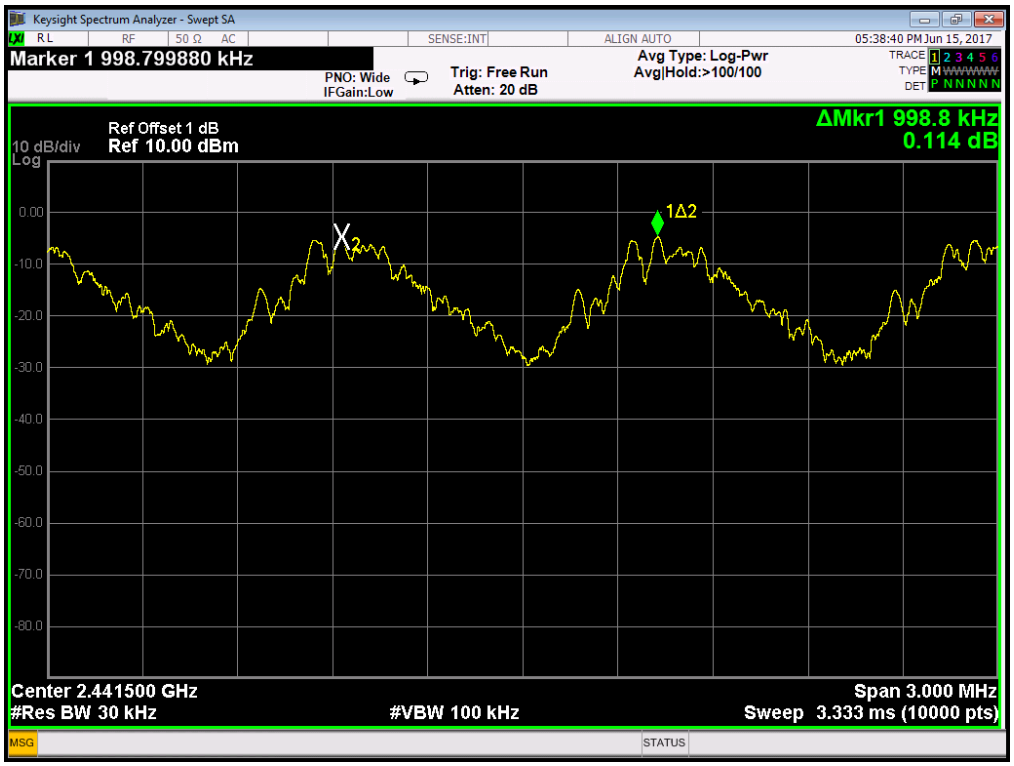
8DPSK

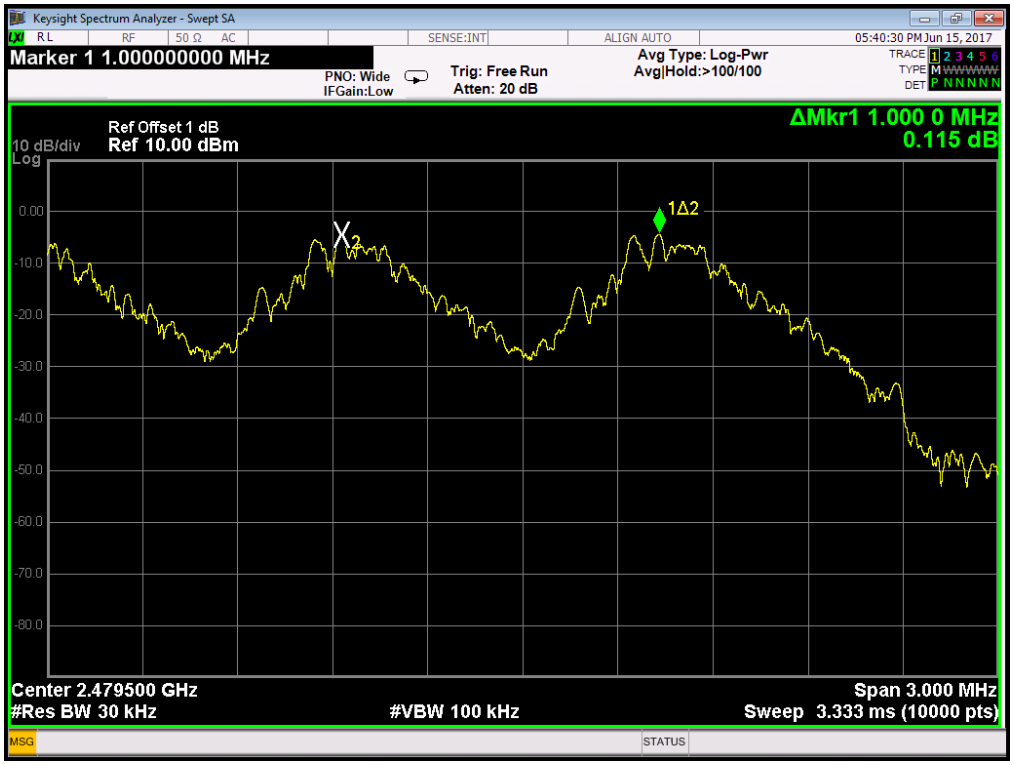
Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.000	>(25KHz or 2/3*20dB Bandwidth)	PASS
Middle	2441	1.000	>(25KHz or 2/3*20dB Bandwidth)	PASS
High	2479	1.000	>(25KHz or 2/3*20dB Bandwidth)	PASS

The spectrum analyzer plots are attached as below.

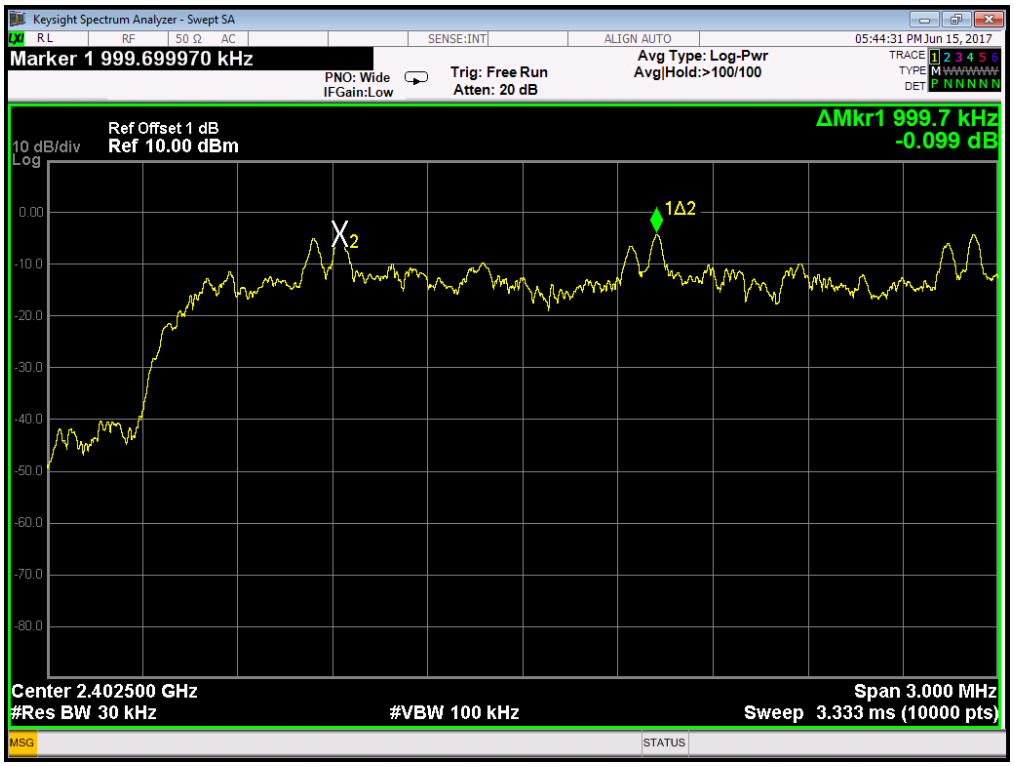
GFSK

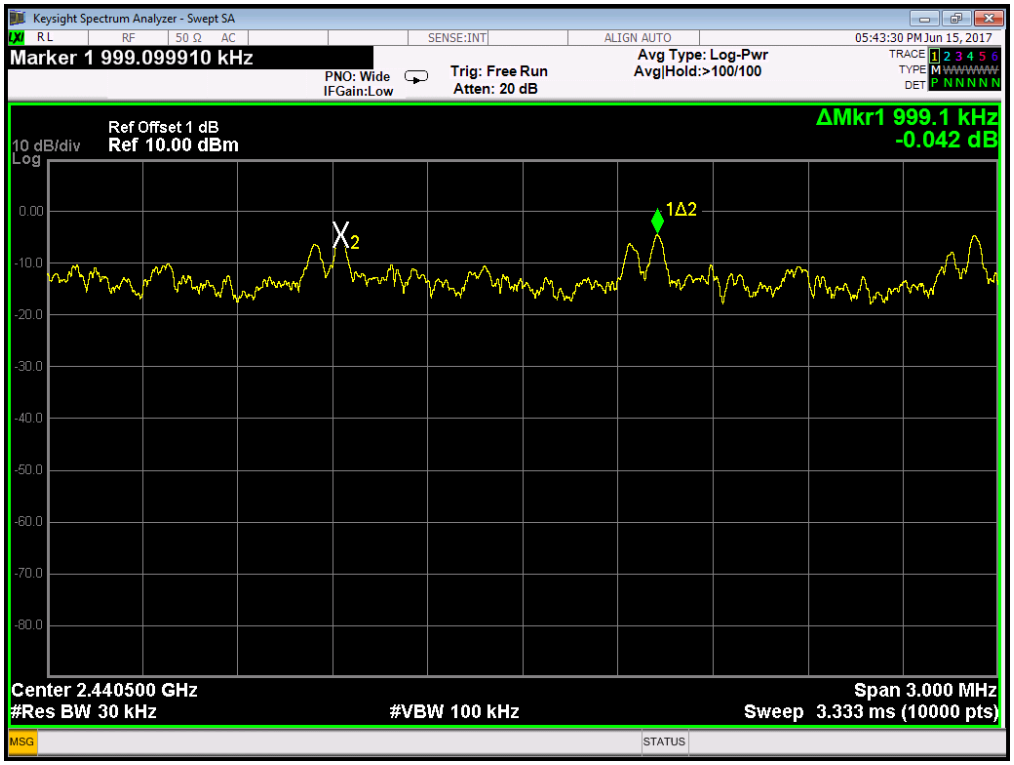

Keysight Spectrum Analyzer - Swept SA
Marker 1 999.699970 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:37:21 PM Jun 15, 2017
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 999.7 kHz
-0.096 dB
Center 2.402500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.333 ms (10000 pts)

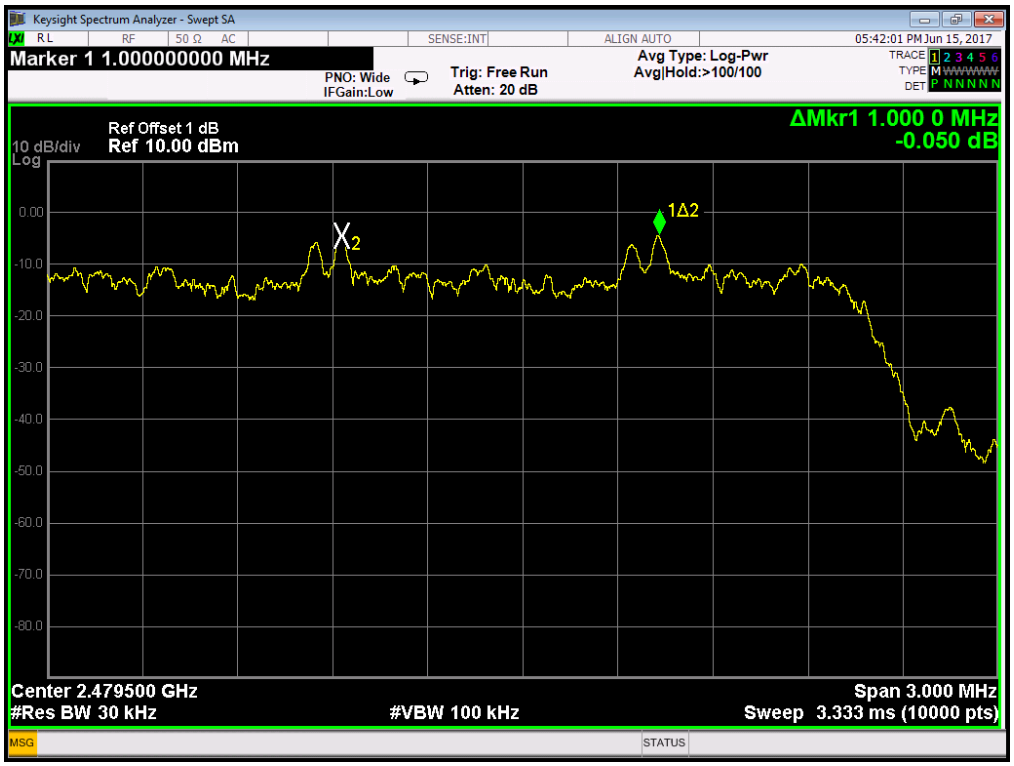

Keysight Spectrum Analyzer - Swept SA
Marker 1 998.799880 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:38:40 PM Jun 15, 2017
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 998.8 kHz
0.114 dB
Center 2.441500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.333 ms (10000 pts)


Keysight Spectrum Analyzer - Swept SA
Marker 1 1.000000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:40:30 PM Jun 15, 2017
Ref Offset 1 dB
10 dB/div
Ref 10.00 dBm
ΔMkr1 1.000 0 MHz
0.115 dB
Center 2.479500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.333 ms (10000 pts)

8DPSK


Keysight Spectrum Analyzer - Swept SA
Marker 1 999.699970 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:44:31 PM Jun 15, 2017
Ref Offset 1 dB
10 dB/div
Ref 10.00 dBm
ΔMkr1 999.7 kHz
-0.099 dB
Center 2.402500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.333 ms (10000 pts)


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:43:30 PM Jun 15, 2017
Marker 1 999.099910 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 999.1 kHz
-0.042 dB
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
X2
1Δ2
Center 2.440500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.333 ms (10000 pts)
MSG
STATUS


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:42:01 PM Jun 15, 2017
Marker 1 1.000000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 1.000 0 MHz
-0.050 dB
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
X2
1Δ2
Center 2.479500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.333 ms (10000 pts)
MSG
STATUS

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	2018/05/26	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2017/12/18	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2017/12/18	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.

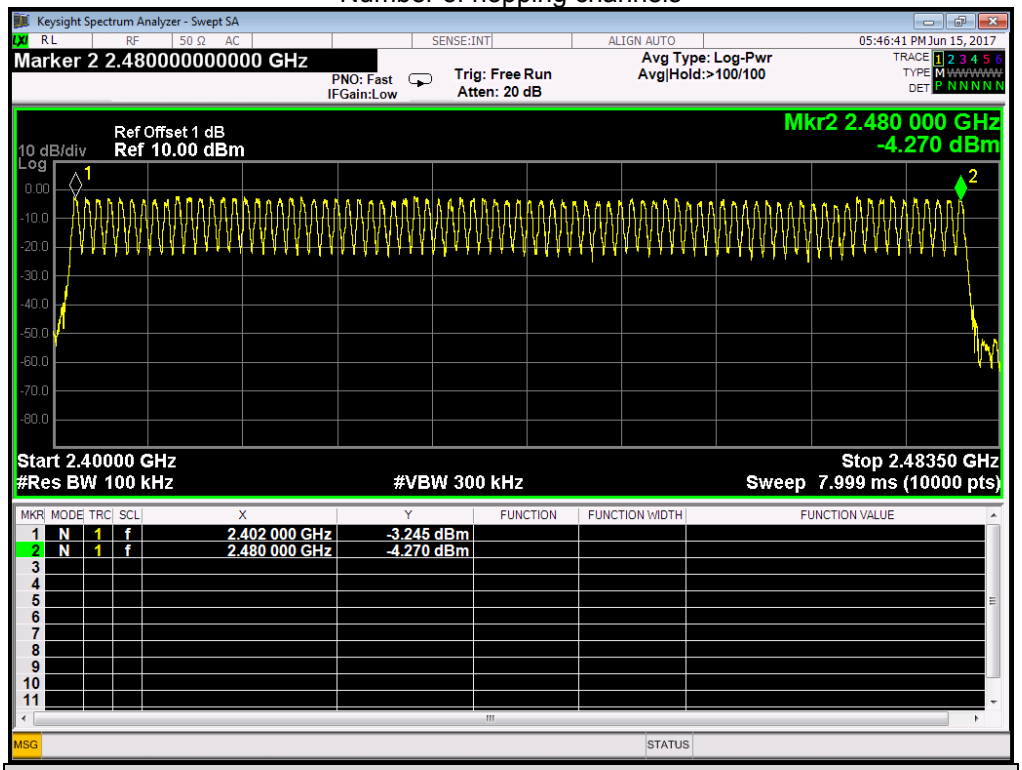
（3）Max hold, view and count how many channel in the band.

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	2018/05/26	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/12/19	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2016/12/19	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）Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz

A Period Time = (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	0.41	131.2	400
DH3	2441	1.68	268.8	400
DH5	2441	2.94	323.4	400

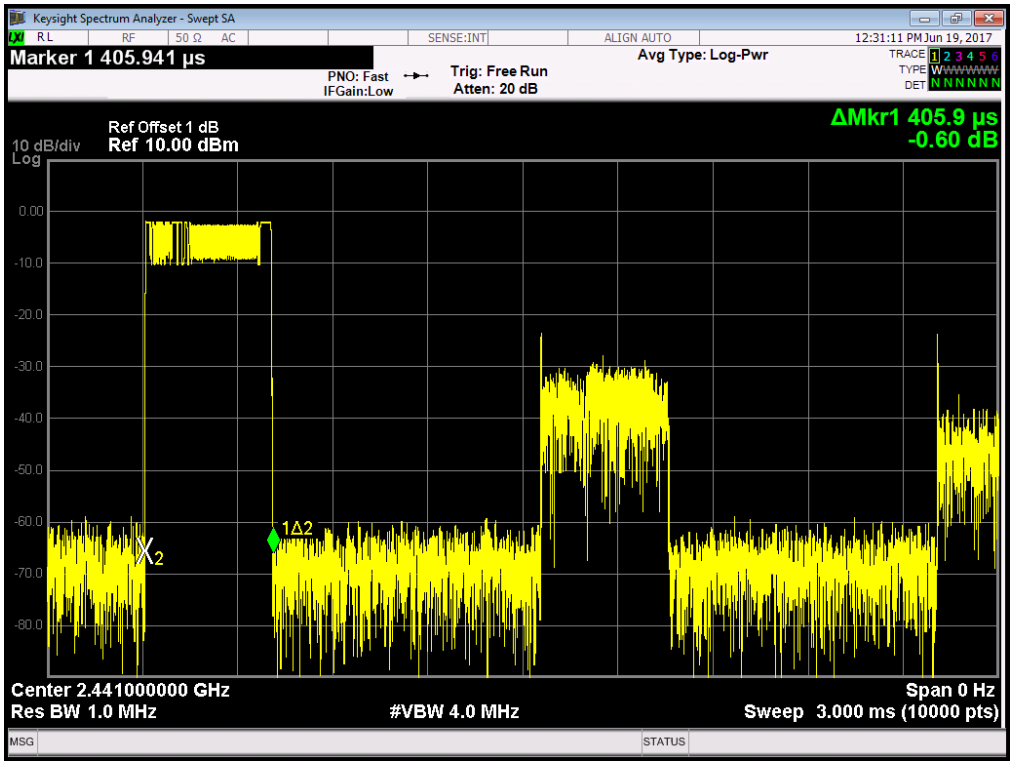
8DPSK Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2441	0.42	134.4	400
DH3	2441	1.73	276.8	400
DH5	2441	2.97	326.7	400

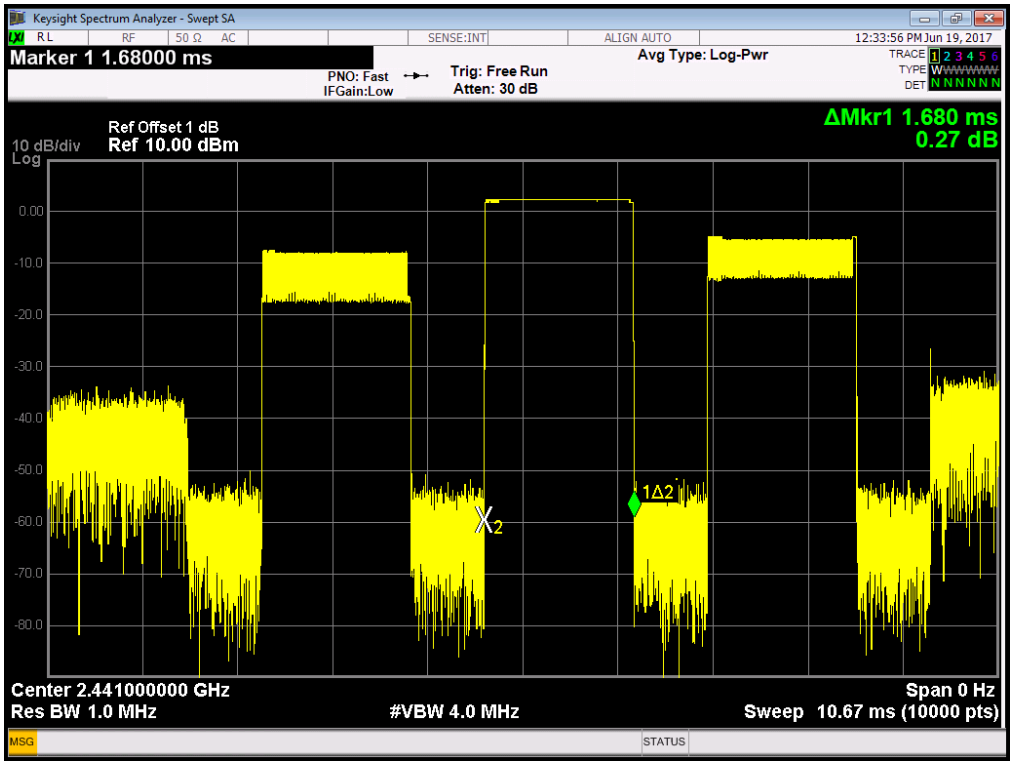
The spectrum analyzer plots are attached as below:

GFSK Mode

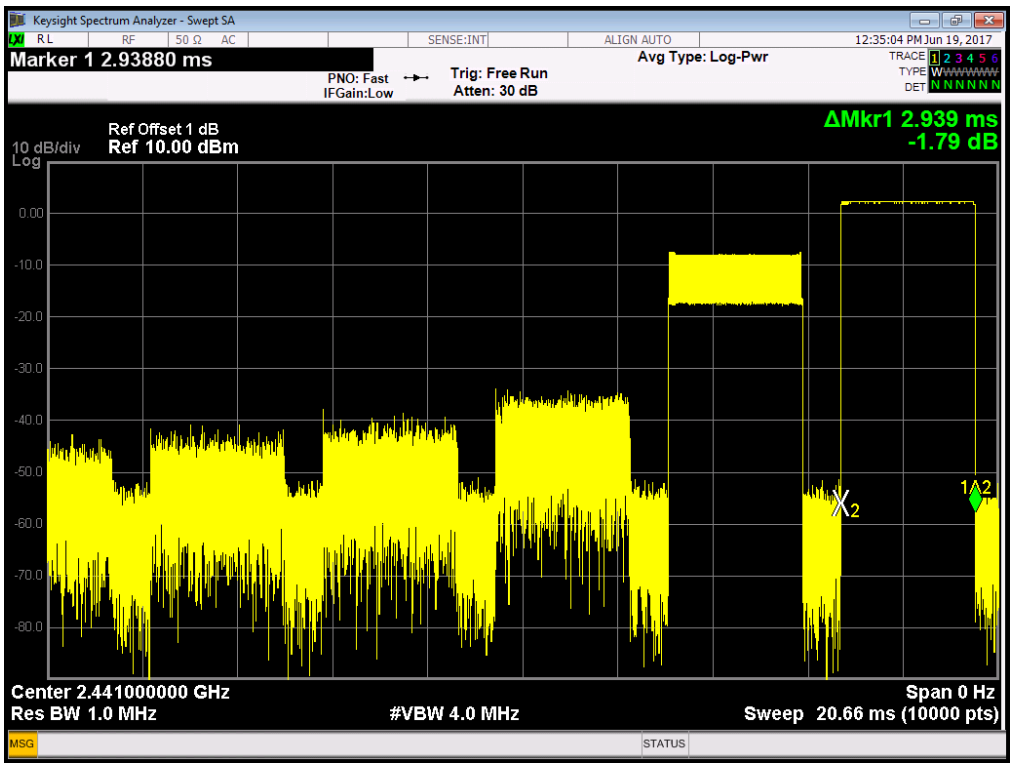
DH1



DH3

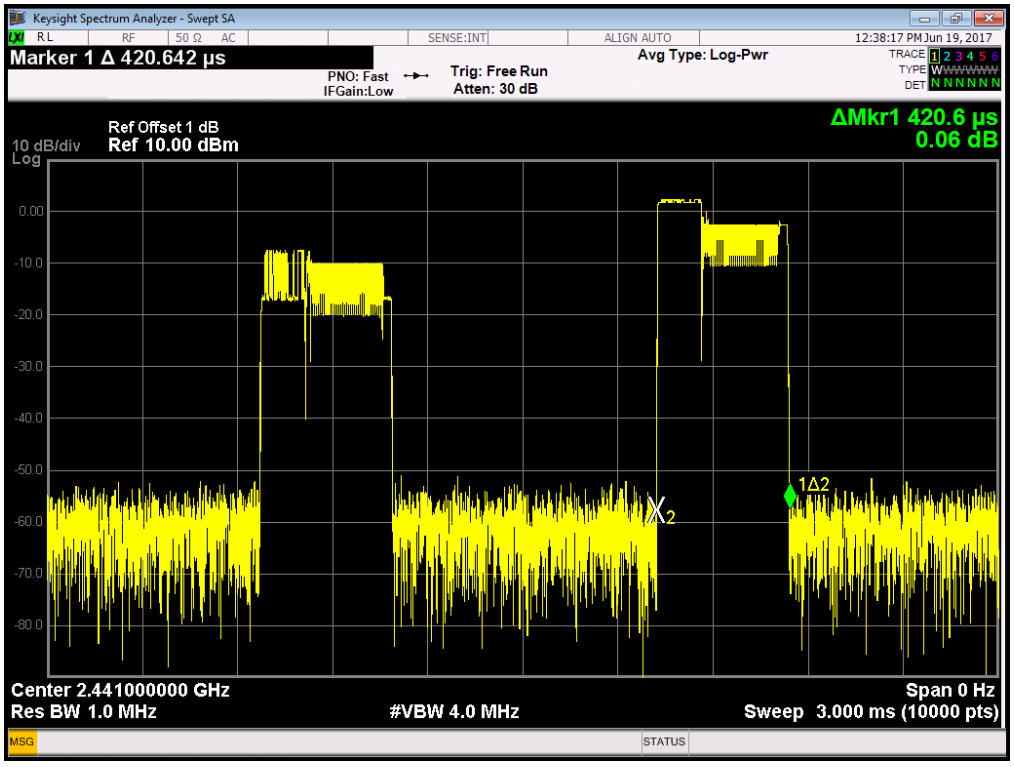


DH5

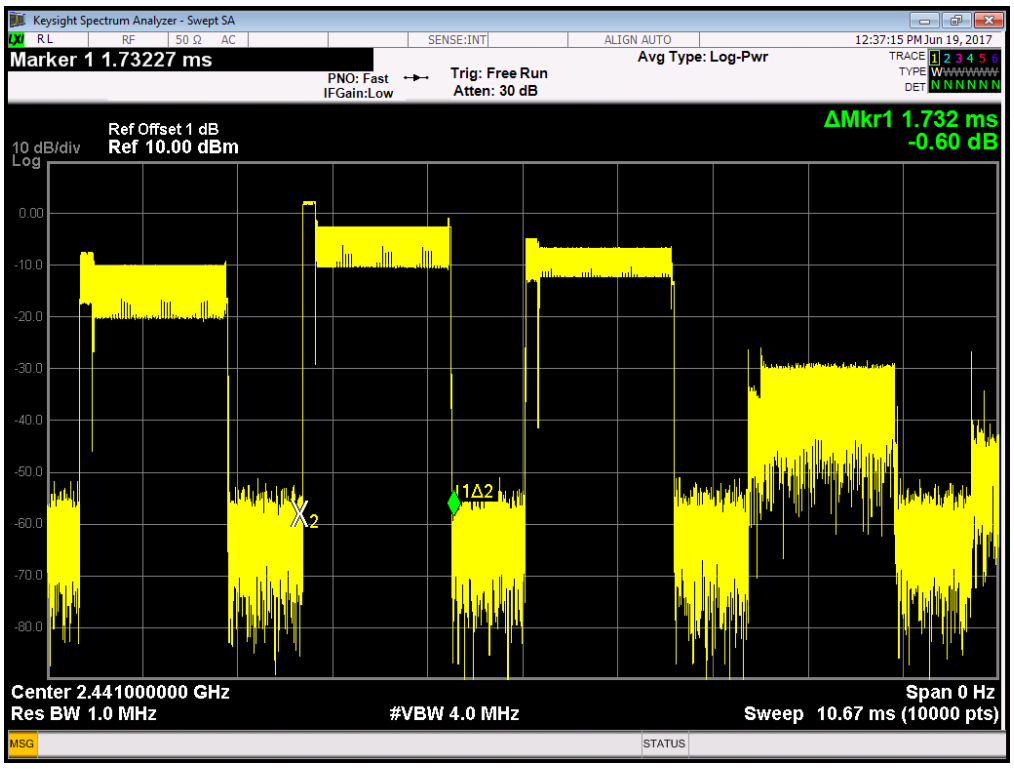


8DPSK Mode

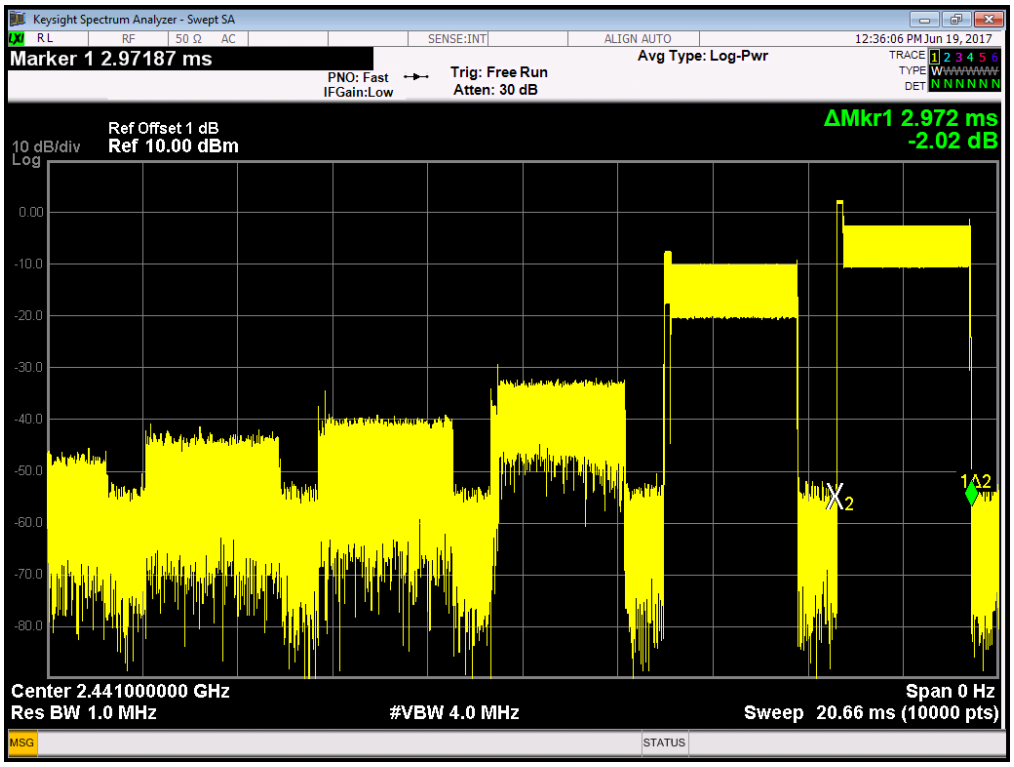
DH1



DH3


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
12:37:15 PM Jun 19, 2017
Marker 1 1.73227 ms
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE WWWWW
DET N N N N N
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
ΔMkr1 1.732 ms
-0.60 dB
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
1Δ2
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 4.0 MHz
Span 0 Hz
Sweep 10.67 ms (10000 pts)
MSG
STATUS

DH5


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
12:36:06 PM Jun 19, 2017
Marker 1 2.97187 ms
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE WWWWW
DET N N N N N
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
ΔMkr1 2.972 ms
-2.02 dB
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
1Δ2
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 4.0 MHz
Span 0 Hz
Sweep 20.66 ms (10000 pts)
MSG
STATUS

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	2018/05/26	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2017/12/18	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2017/12/18	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:	3MHz
	VBW:	3MHz
8DPSK	RBW:	3MHz
	VBW:	3MHz
Span		>1.5x 20dB bandwidth
Detector Mode:		Peak
Sweep time:		auto
Trace mode		Max hold

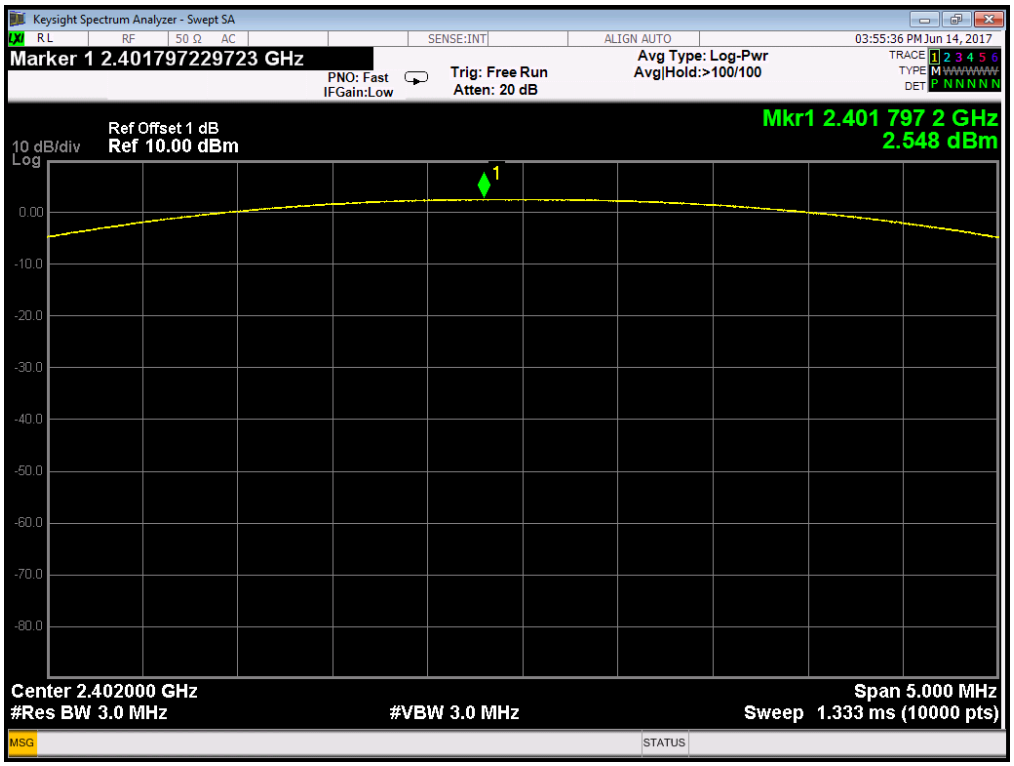
(5) Allow the trace to stabilize, Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges measure out the Average and PK output power.

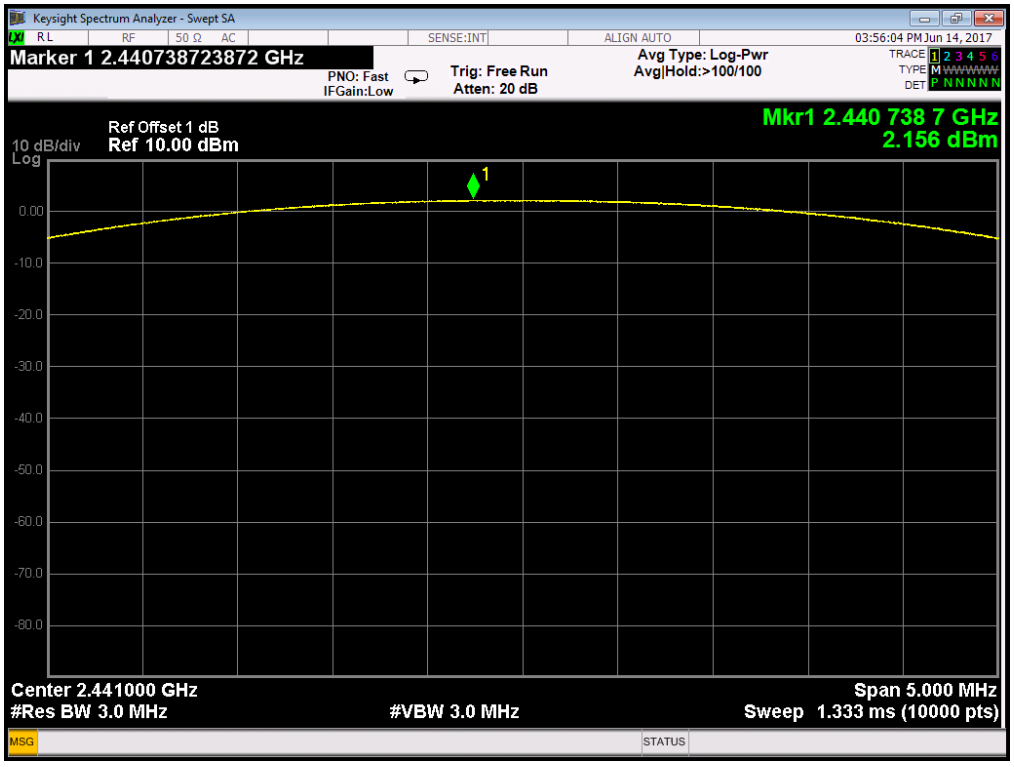
7.5. TEST RESULT

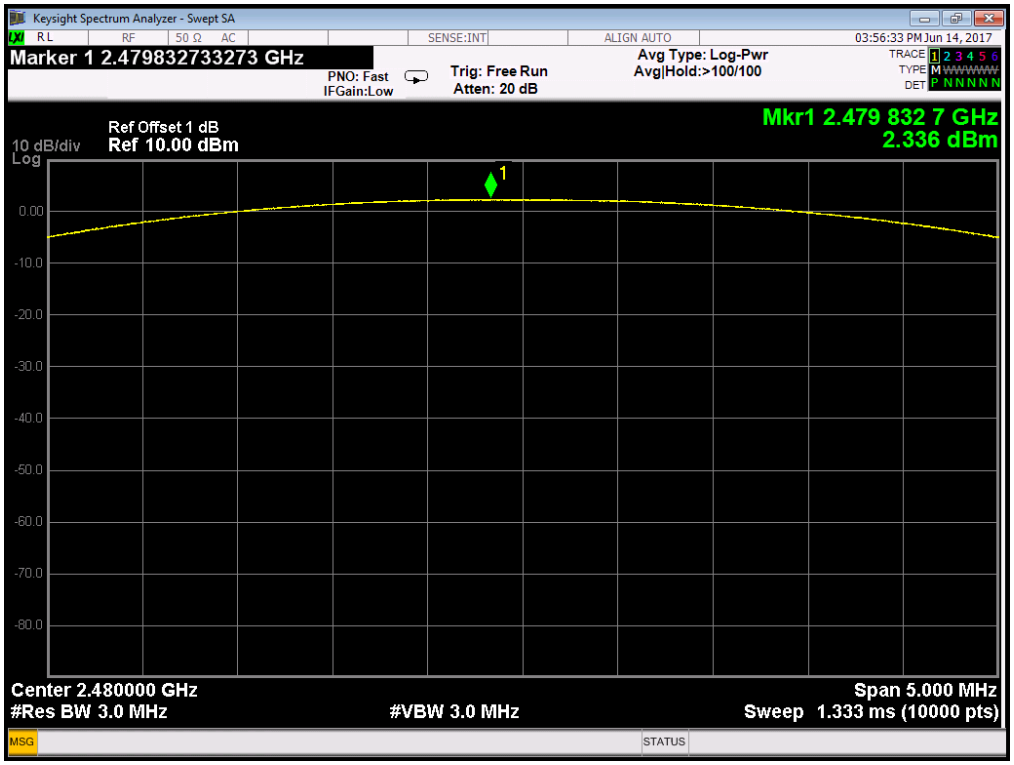
EUT Set Mode	Data Rate (Mbp/s)	Frequency (MHz)	Result(dBm)
			Peak
GFSK	1	2402	2.55
		2441	2.16
		2480	2.34
8DPSK	3	2402	1.37
		2441	0.98
		2480	0.62
Limit: 21dBm		Conclusion: PASS	

7.6. Original test data

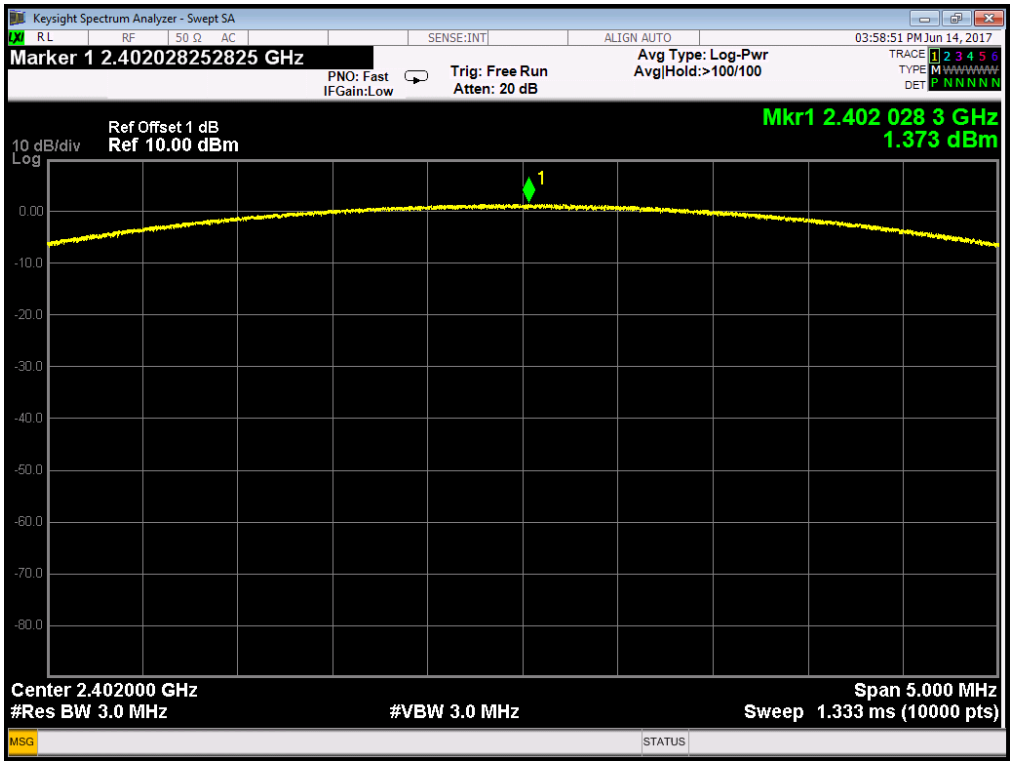
GFSK

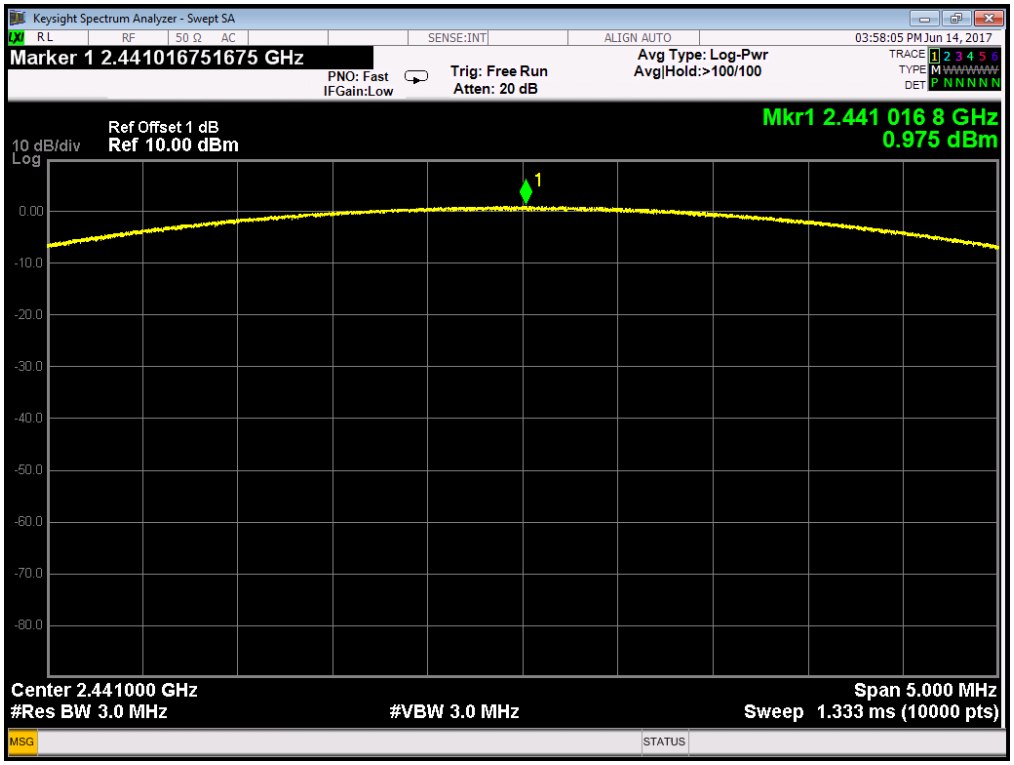


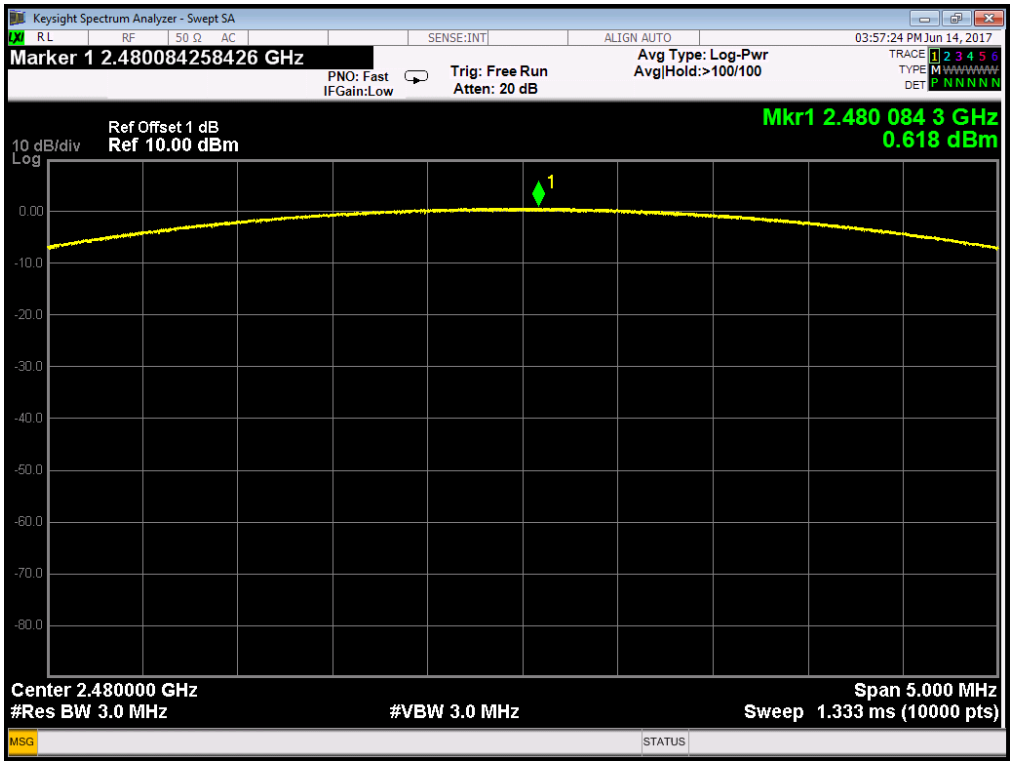



Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:56:33 PM Jun 14, 2017
Marker 1 2.479832733273 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr1 2.479 832 7 GHz
2.336 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.333 ms (10000 pts)
MSG
STATUS

8DPSK


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:58:51 PM Jun 14, 2017
Marker 1 2.402028252825 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr1 2.402 028 3 GHz
1.373 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.402000 GHz
#Res BW 3.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.333 ms (10000 pts)
MSG
STATUS


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:58:05 PM Jun 14, 2017
Marker 1 2.441016751675 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr1 2.441 016 8 GHz
0.975 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.441000 GHz
#Res BW 3.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.333 ms (10000 pts)
MSG
STATUS


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:57:24 PM Jun 14, 2017
Marker 1 2.480084258426 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr1 2.480 084 3 GHz
0.618 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.333 ms (10000 pts)
MSG
STATUS

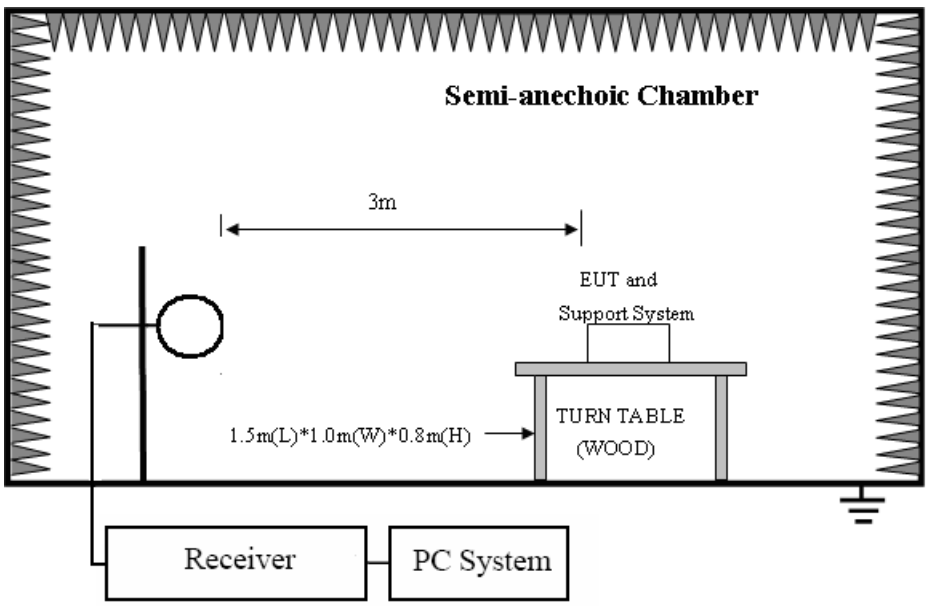
8. SPURIOUS EMISSION

8.1. Test equipment

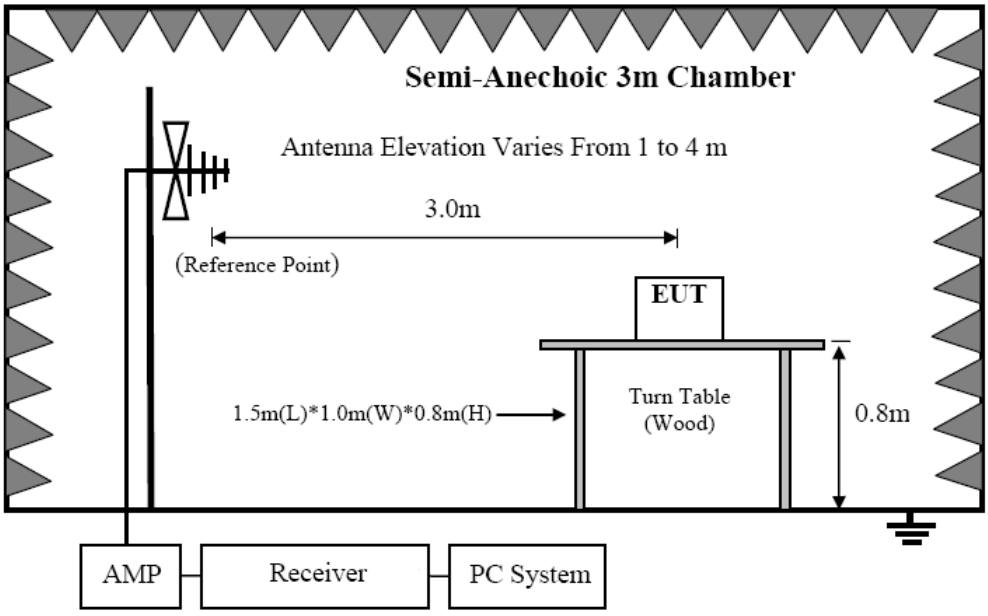
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	EMI Test Receiver	R&S	ESU8	100316	2017/12/18	1 Year
2	Spectrum analyzer	R&S	FSU	1166.1660.26	2017/12/18	1 Year
3	Loop antenna	TESEQ	HLA6120	20129	2017/12/18	1 Year
4	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2017/12/18	1 Year
5	Double Ridged Horn Antenna	Schwarzbeck	BBHA9120D	9120D 1065	2017/12/18	1 Year
6	Horn Antenna	Schwarzbeck	BBHA 9170	9170 1248	2017/12/18	1 Year
7	Pre-amplifier	A.H.	PAM-1840VH	562	2017/12/18	1 Year
8	Pre-amplifier	R&S	AFS33-18002650-30-8P-44	SEL0080	2017/12/18	1 Year
9	Pre-Amplifier	HP	8449B	3274A06298	2017/12/18	1 Year
10	RF Cable	R&S	R01	10403	2017/12/18	1 Year
11	RF Cable	R&S	R02	10512	2017/12/18	1 Year

8.2. Block diagram of test setup

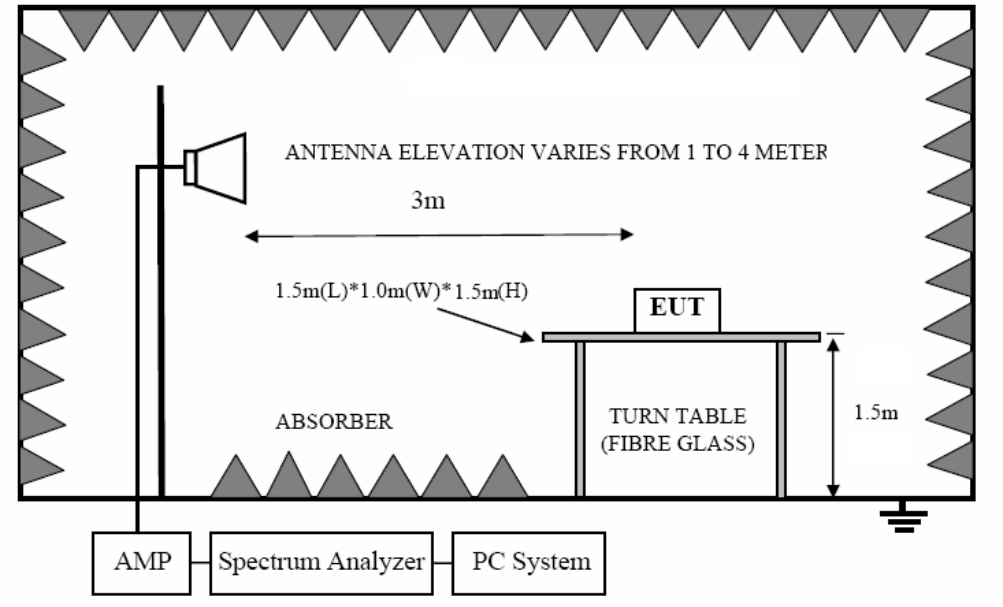
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



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	
		μV/m	dB(μV)/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 then that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$Limit_{3m}(dBuV/m) = Limit_{30m}(dBuV/m) + 40Log(30m/3m)$

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

Below 30M

EUT:	Speaker with bluetooth	**Model No.:**	Crasher Micro
Temperature:	24℃	**Relative Humidity:**	55%
Distance:	3m	**Test Power:**	3.7V by inside the battery
Polarization:	--	**Test Result:**	Pass
Test Mode:	Keeping TX mode	**Test By:**	Smile

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

Note:

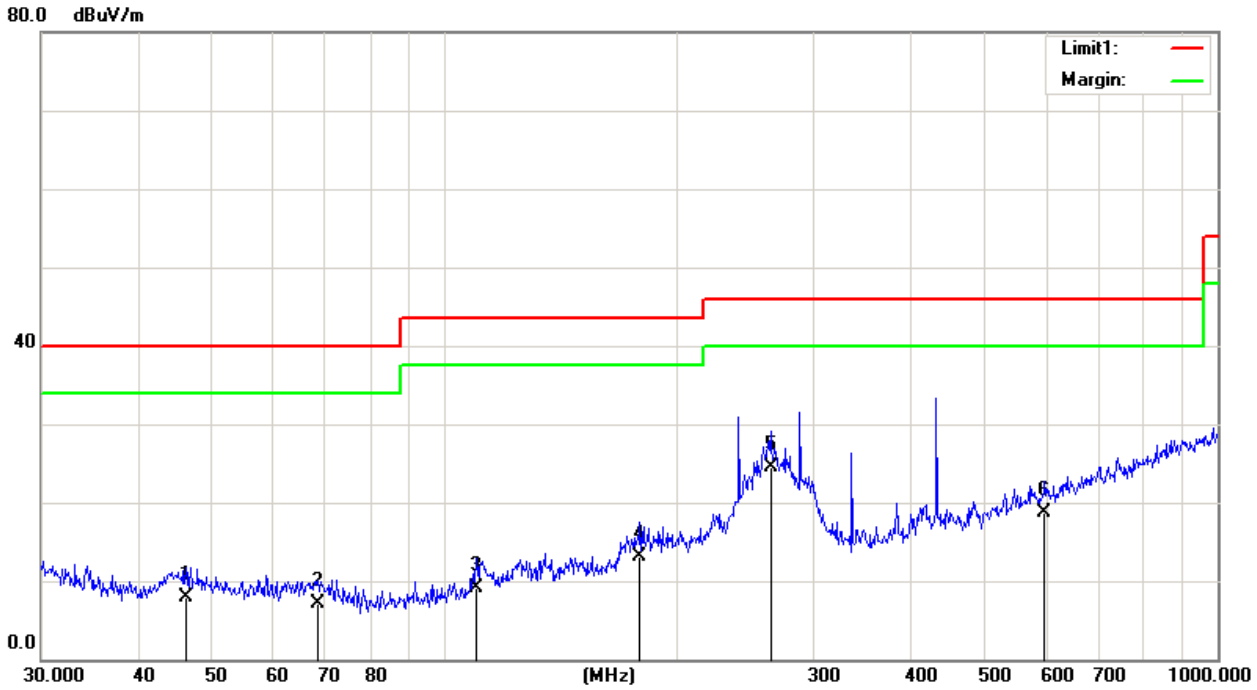
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =20 log (specific distance/test distance)(dB);

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

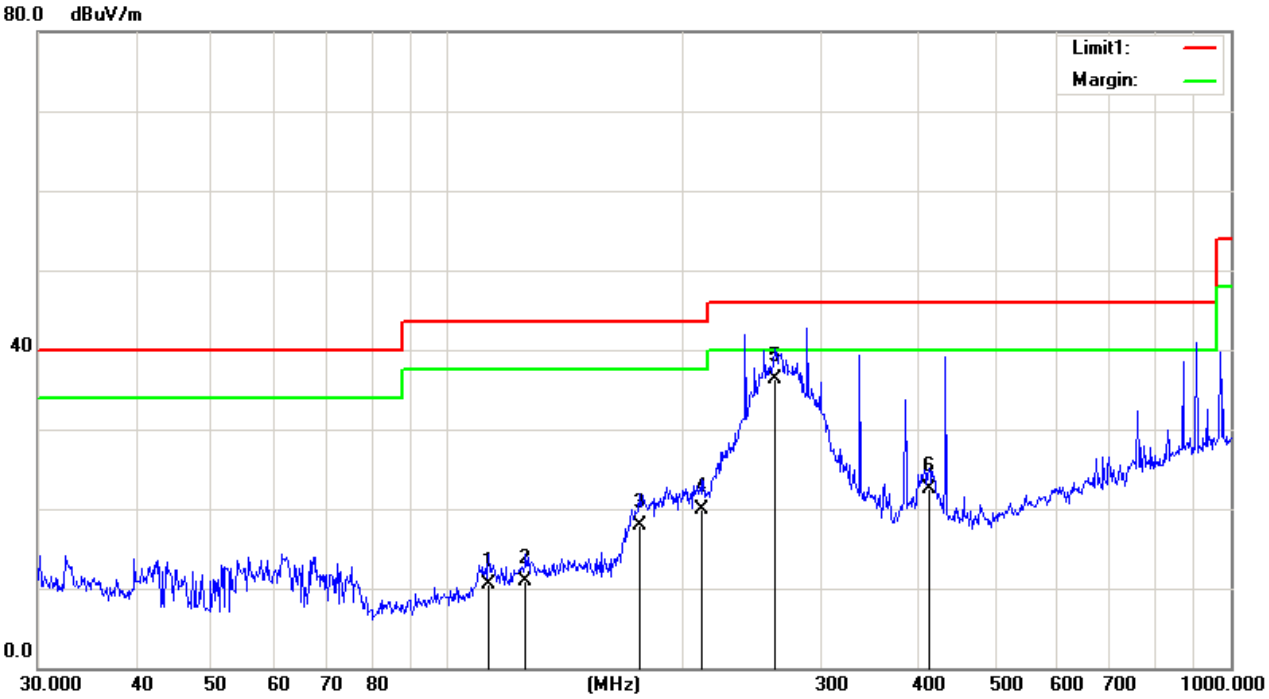
Between 30M – 1000 MHz

EUT:	Speaker with bluetooth	Model No.:	Crasher Micro
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	3.7V by inside the battery
Polarization:	Vertical	Test Result:	Pass
Standard:	(RE)FCC PART 15	Test By:	Smile
Test Mode:	Keeping TX mode		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	46.1779	22.12	-14.18	7.94	40.00	-32.06	QP
2	68.3906	21.73	-14.62	7.11	40.00	-32.89	QP
3	109.7960	24.06	-14.94	9.12	43.50	-34.38	QP
4	178.7584	25.51	-12.40	13.11	43.50	-30.39	QP
5	263.8190	33.30	-8.71	24.59	46.00	-21.41	QP
6	597.2232	23.10	-4.33	18.77	46.00	-27.23	QP

EUT:	Speaker with bluetooth	Model No.:	Crasher Micro
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	3.7V by inside the battery
Polarization:	Horizontal	Test Result:	Pass
Standard:	(RE)FCC PART 15	Test By:	Smile
Test Mode:	Keeping TX mode		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	112.9196	25.69	-15.13	10.56	43.50	-32.94	QP
2	125.8863	24.39	-13.43	10.96	43.50	-32.54	QP
3	175.6516	28.21	-10.23	17.98	43.50	-25.52	QP
4	211.5261	29.59	-9.59	20.00	43.50	-23.50	QP
5	261.9753	41.69	-5.48	36.21	46.00	-9.79	QP
6	411.8240	30.85	-8.26	22.59	46.00	-23.41	QP

Remark:"1Mbps" mode (Mid CH)is the worst mode.

Between 1000M – 25000 MHz

Test Site	:	3m Chamber			
EUT	:	Speaker with bluetooth	**Tested By**	:	Smile
Power Supply	:	3.7V by inside the battery	**Model Number**	:	Crasher Micro
Condition	:	Temp:24.5'C,Humi:55%, Press:100.1kPa	**Test Mode**	:	Tx mode
Memo	:	GFSK (worst case)	**Antenna/Distance**	:	VULB 9163 /3m

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	FCC 15.247	
(MHz)	Reading (dBμV)	PK/QP/AV	Polar (H/V)	Factor (dB)	(dB)	(dB)	(dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low Channel (2402)									
4804	41.05	PK	H	32.3	5.91	31.78	47.48	74	-26.52
4804	32.63	AV	H	32.3	5.91	31.78	39.06	54	-14.94
4804	42.08	PK	V	32.3	5.91	31.78	48.51	74	-25.49
4804	33.97	AV	V	32.3	5.91	31.78	40.40	54	-13.60
7206	41.54	PK	H	36.3	6.34	30.97	53.21	74	-20.79
7206	33.28	AV	H	36.3	6.34	30.97	44.95	54	-9.05
7206	41.41	PK	V	36.3	6.34	30.97	53.08	74	-20.92
7206	33.64	AV	V	36.3	6.34	30.97	45.31	54	-8.69
9608	41.87	PK	H	37.9	8.01	30.86	56.92	74	-17.08
9608	31.68	AV	H	37.9	8.01	30.86	46.73	54	-7.27
9608	41.21	PK	V	37.9	8.01	30.86	56.26	74	-17.74
9608	31.89	AV	V	37.9	8.01	30.86	46.94	54	-7.06
Middle Channel (2441)									
4882	42.69	PK	H	32.9	6.34	31.78	49.85	74	-24.15
4882	33.42	AV	H	32.9	6.34	31.78	40.58	54	-13.42
4882	42.05	PK	V	32.9	6.34	31.78	49.21	74	-24.79
4882	31.74	AV	V	32.9	6.34	31.78	38.90	54	-15.10
7323	40.52	PK	H	37.1	6.72	30.97	52.97	74	-21.03
7323	31.05	AV	H	37.1	6.72	30.97	43.50	54	-10.50
7323	41.34	PK	V	37.1	6.72	30.97	53.79	74	-20.21
7323	31.54	AV	V	37.1	6.72	30.97	43.99	54	-10.01
9764	41.08	PK	H	38.6	8.43	30.86	56.85	74	-17.15
9764	32.69	AV	H	38.6	8.43	30.86	48.46	54	-5.54
9764	39.51	PK	V	38.6	8.43	30.86	55.28	74	-18.72

9764	30.22	AV	V	38.6	8.43	30.86	45.99	54	-8.01
High Channel (2480)									
4960	43.05	PK	H	33.1	6.39	31.78	50.46	74	-23.54
4960	35.24	AV	H	33.1	6.39	31.78	42.65	54	-11.35
4960	45.01	PK	V	33.1	6.39	31.78	52.42	74	-21.58
4960	36.88	AV	V	33.1	6.39	31.78	44.29	54	-9.71
7440	41.14	PK	H	37.2	6.77	30.97	53.74	74	-20.26
7440	33.62	AV	H	37.2	6.77	30.97	46.22	54	-7.78
7440	42.06	PK	V	37.2	6.77	30.97	54.66	74	-19.34
7440	33.81	AV	V	37.2	6.77	30.97	46.41	54	-7.59
9920	40.61	PK	H	38.7	8.48	30.86	56.63	74	-17.37
9920	33.59	AV	H	38.7	8.48	30.86	49.61	54	-4.39
9920	40.15	PK	V	38.7	8.48	30.86	56.17	74	-17.83
9920	32.78	AV	V	38.7	8.48	30.86	48.80	54	-5.2

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss

Radiated band edge:

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	FCC 15.247	
(MHz)	Reading (dBμV)	PK/QP/AV	Polar (H/V)	Factor (dB)	(dB)	(dB)	(dBμV/m)	Limit (dBμV/m)	Margin (dB)
Lowest Channel (GFSK)									
2390	26.15	PK	H	27.8	3.57	0	57.82	74	-16.18
2390	17.31	AV	H	27.8	3.57	0	48.68	54	-5.32
2390	24.63	PK	V	27.8	3.57	0	56.00	74	-18.00
2390	15.44	AV	V	27.8	3.57	0	46.81	54	-7.19
2400	26.52	PK	H	28	3.57	0	58.09	74	-15.91
2400	16.24	AV	H	28	3.57	0	47.81	54	-6.19
2400	26.33	PK	V	28	3.57	0	57.90	74	-16.10
2400	16.15	AV	V	28	3.57	0	47.72	54	-6.28
Highest Channel (GFSK)									
2483.5	25.87	PK	H	28.7	3.72	0	58.29	74	-15.71
2483.5	14.32	AV	H	28.7	3.72	0	46.74	54	-7.26
2483.5	25.64	PK	V	28.7	3.72	0	58.06	74	-15.94
2483.5	13.02	AV	V	28.7	3.72	0	45.44	54	-8.56

Lowest Channel (8DBSK)									
2390	25.22	PK	H	27.8	3.57	0	56.59	74	-17.41
2390	17.41	AV	H	27.8	3.57	0	48.78	54	-5.22
2390	25.31	PK	V	27.8	3.57	0	56.68	74	-17.32
2390	17.24	AV	V	27.8	3.57	0	48.61	54	-5.39
2400	26.35	PK	H	28	3.57	0	57.92	74	-16.08
2400	17.54	AV	H	28	3.57	0	49.11	54	-4.89
2400	26.33	PK	V	28	3.57	0	57.90	74	-16.10
2400	17.46	AV	V	28	3.57	0	49.03	54	-4.97
Highest Channel (8DBSK)									
2483.5	27.13	PK	H	28.7	3.72	0	59.55	74	-14.45
2483.5	16.24	AV	H	28.7	3.72	0	48.66	54	-5.34
2483.5	26.34	PK	V	28.7	3.72	0	58.76	74	-15.24
2483.5	15.12	AV	V	28.7	3.72	0	47.54	54	-6.46

Note: 1. Result Level = Read Level + Antenna Factor + Cable Loss- Amplifier Gain

2. After test and evaluation hopping off mode and hopping on mode, will record worst case (hopping off mode) in this report.

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	2018/05/26	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2017/12/18	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2017/12/18	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

a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b) 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.
c) 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.
d) 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.
e) Repeat above procedures until all measured frequencies were complete.

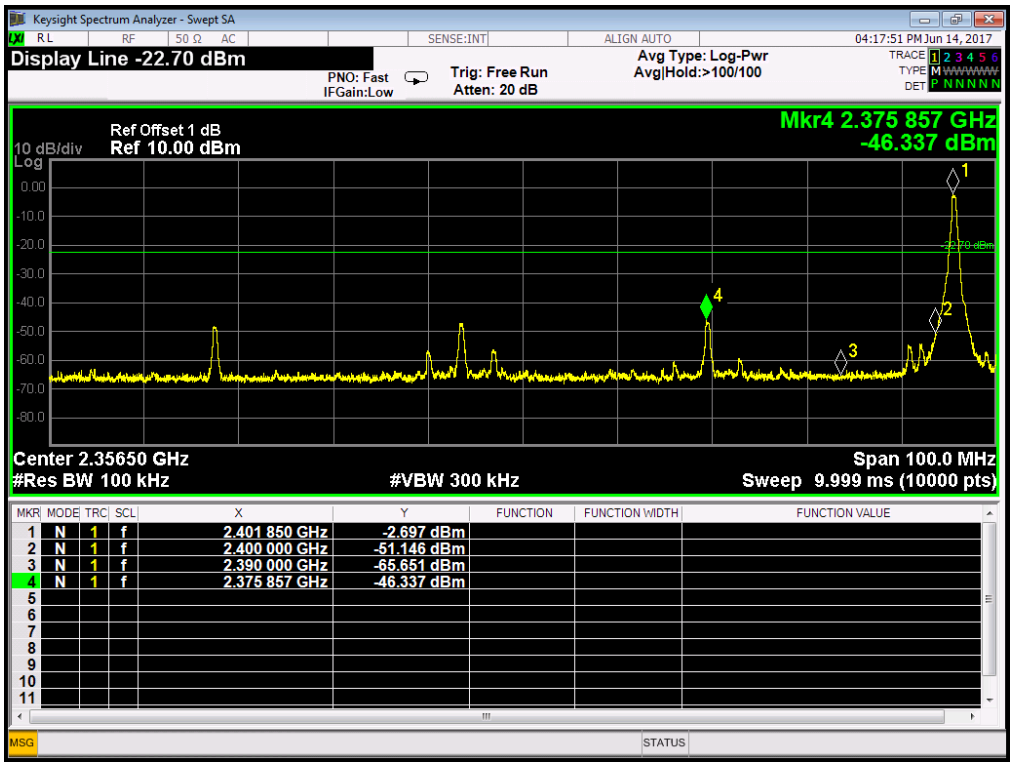
9.4. Test result

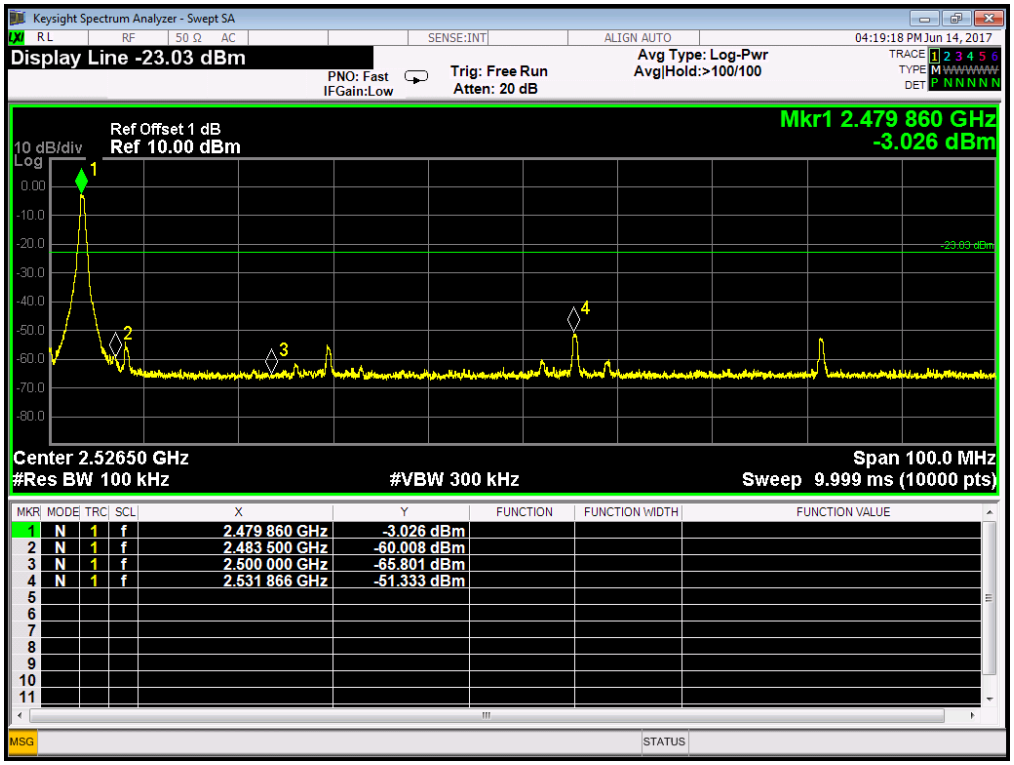
PASS (**See below detailed test result**.)

Frequency Band	Delta Peak to band emission (dBc)	＞Limit (dBc)	Result
1Mbps Non-hopping			
2400	48.45	20	Pass
2483.5	56.98	20	Pass
3Mbps Non-hopping			
2400	48.09	20	Pass
2483.5	56.00	20	Pass

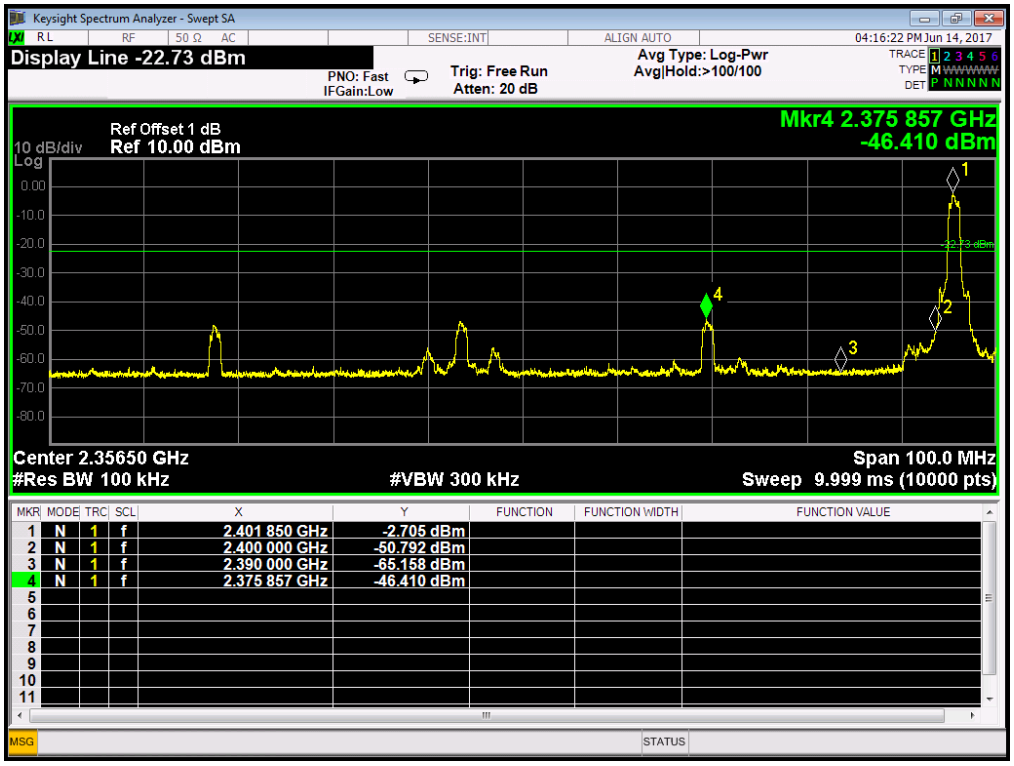
Frequency Band	Delta Peak to band emission (dBc)	＞Limit (dBc)	Result
1Mbps hopping			
2400	46.74	20	Pass
2483.5	58.45	20	Pass
3Mbps hopping			
2400	48.40	20	Pass
2483.5	54.36	20	Pass

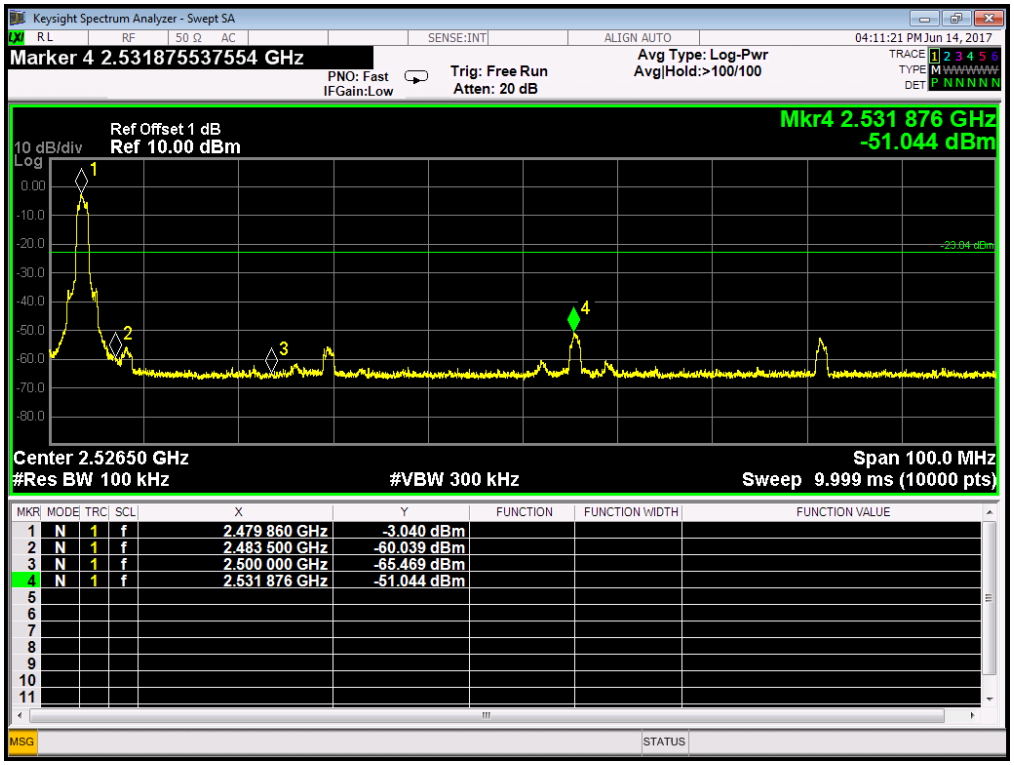
GFSK


Keysight Spectrum Analyzer - Swept SA
Display Line -22.70 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:17:51 PM Jun 14, 2017
Ref Offset 1 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr4 2.375 857 GHz
-46.337 dBm
Center 2.35650 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 100.0 MHz
Sweep 9.999 ms (10000 pts)
1 N 1 f 2.401 850 GHz -2.697 dBm
2 N 1 f 2.400 000 GHz -51.146 dBm
3 N 1 f 2.390 000 GHz -65.651 dBm
4 N 1 f 2.375 857 GHz -46.337 dBm

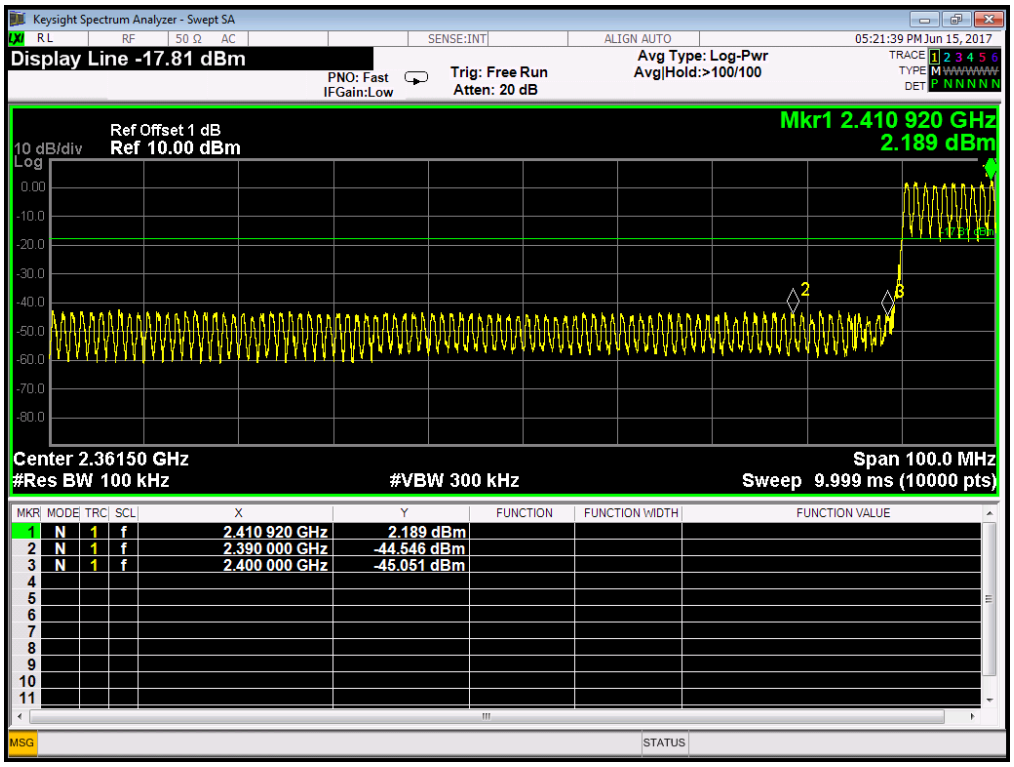

Keysight Spectrum Analyzer - Swept SA
Display Line -23.03 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:19:18 PM Jun 14, 2017
Ref Offset 1 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479 860 GHz
-3.026 dBm
Center 2.52650 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 100.0 MHz
Sweep 9.999 ms (10000 pts)
1 N 1 f 2.479 860 GHz -3.026 dBm
2 N 1 f 2.483 500 GHz -60.008 dBm
3 N 1 f 2.500 000 GHz -65.801 dBm
4 N 1 f 2.531 866 GHz -51.333 dBm

8DPSK

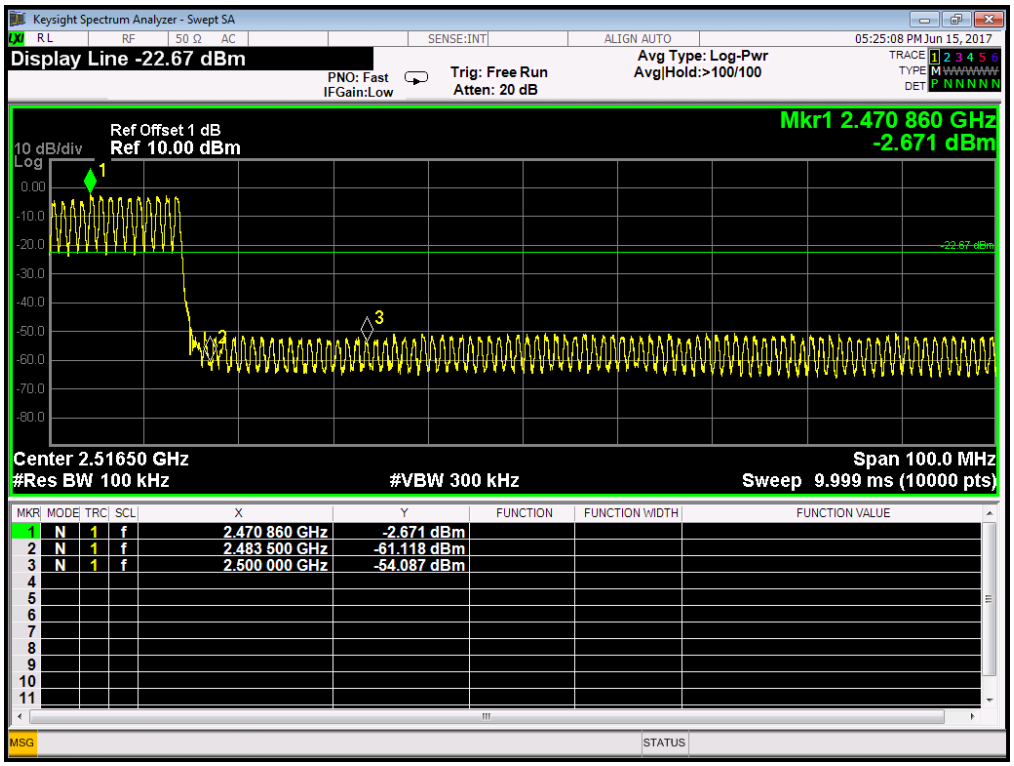

Keysight Spectrum Analyzer - Swept SA
RL RF 50 Ω AC SENSE:INT ALIGN AUTO 04:16:22 PM Jun 14, 2017
Display Line -22.73 dBm
PNO: Fast IFGain:Low
Trig: Free Run Atten: 20 dB
Avg Type: Log-Pwr Avg|Hold:>100/100
TRACE 1 2 3 4 5 6 TYPE M DET P N N N N N
Ref Offset 1 dB
10 dB/div Ref 10.00 dBm
Log
Mkr4 2.375 857 GHz
-46.410 dBm
-22.73 dBm
Center 2.35650 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 100.0 MHz
Sweep 9.999 ms (10000 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.401 850 GHz -2.705 dBm
2 N 1 f 2.400 000 GHz -50.792 dBm
3 N 1 f 2.390 000 GHz -65.158 dBm
4 N 1 f 2.375 857 GHz -46.410 dBm
MSG
STATUS


Keysight Spectrum Analyzer - Swept SA
RL RF 50 Ω AC SENSE:INT ALIGN AUTO 04:11:21 PM Jun 14, 2017
Marker 4 2.531875537554 GHz
PNO: Fast IFGain:Low
Trig: Free Run Atten: 20 dB
Avg Type: Log-Pwr Avg|Hold:>100/100
TRACE 1 2 3 4 5 6 TYPE M DET P N N N N N
Ref Offset 1 dB
10 dB/div Ref 10.00 dBm
Log
Mkr4 2.531 876 GHz
-51.044 dBm
-23.04 dBm
Center 2.52650 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 100.0 MHz
Sweep 9.999 ms (10000 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.479 860 GHz -3.040 dBm
2 N 1 f 2.483 500 GHz -60.039 dBm
3 N 1 f 2.500 000 GHz -65.469 dBm
4 N 1 f 2.531 876 GHz -51.044 dBm
MSG
STATUS

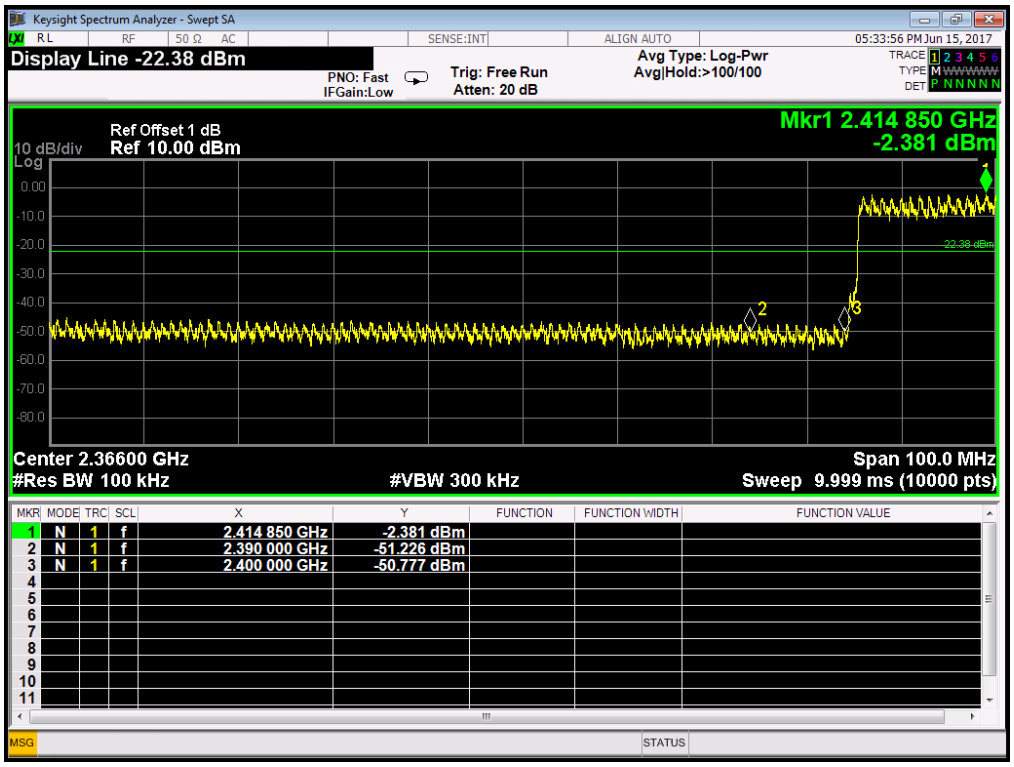
GFSK 2402MHz



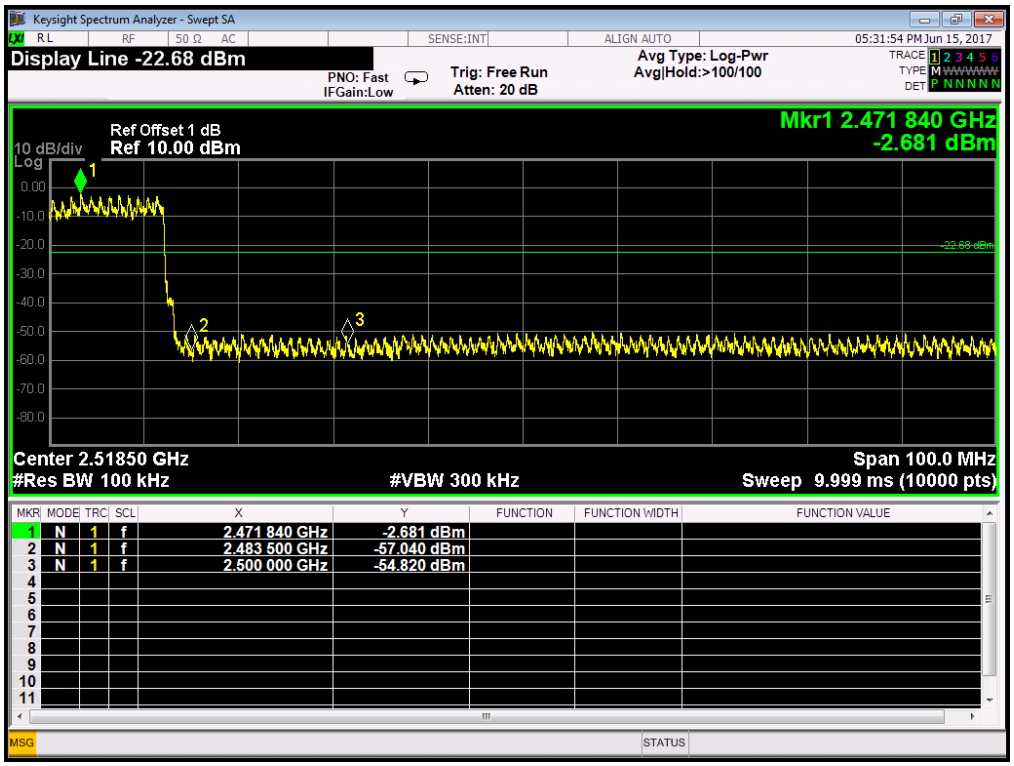
GFSK 2480MHz



8DPSK 2402MHz



8DPSK 2480MHz

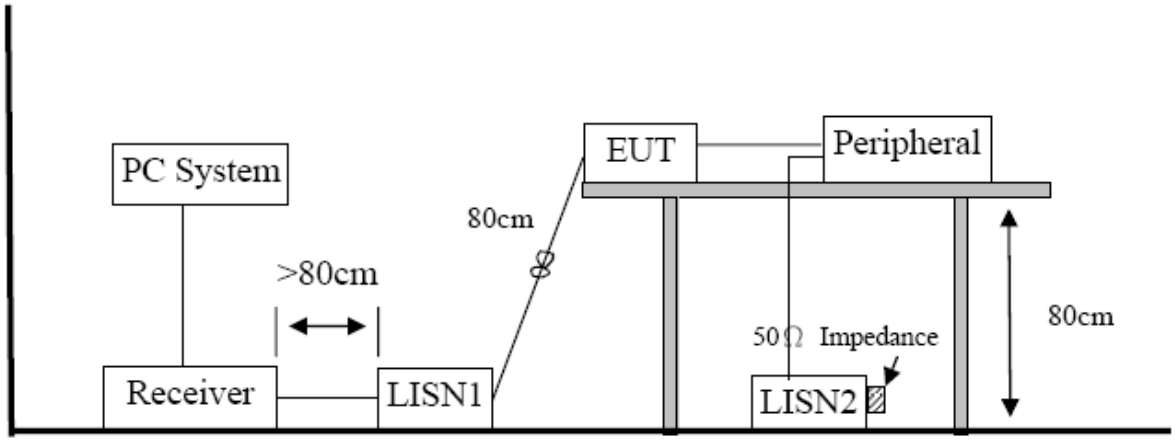


10. POWER LINE CONDUCTED EMISSION

10.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Test Receiver	R&S	ESCI	101308	2017/12/18	1 Year
2	LISN 1	AFJ	LS16	16011103219	2017/12/18	1 Year
3	LISN 2	SCHWARZBECK	NSLK 8127	8127-432	2017/12/18	1 Year
4	Pulse Limiter	MTS-systemtechnik	MTS-IMP-136	261115-010-0024	2017/12/18	1 Year
5	CABLE	R&S	EA033	JHW14012068	2017/12/18	1 Year

10.2. Block diagram of test setup



10.3. Power Line Conducted Emission Limits(Class B)

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

Note 1: * Decreasing linearly with logarithm of frequency.

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.

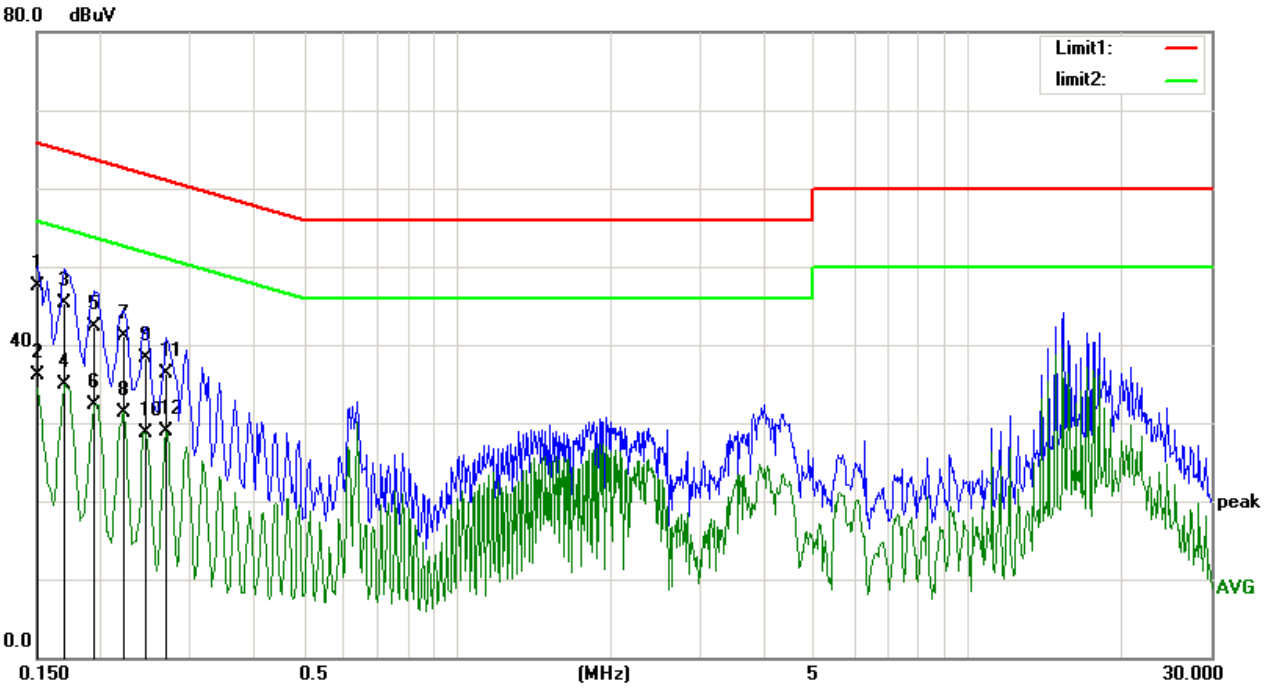
10.5. Test Result

PASS. (See below detailed test result)

Note1: All emissions not reported below are too low against the prescribed limits.

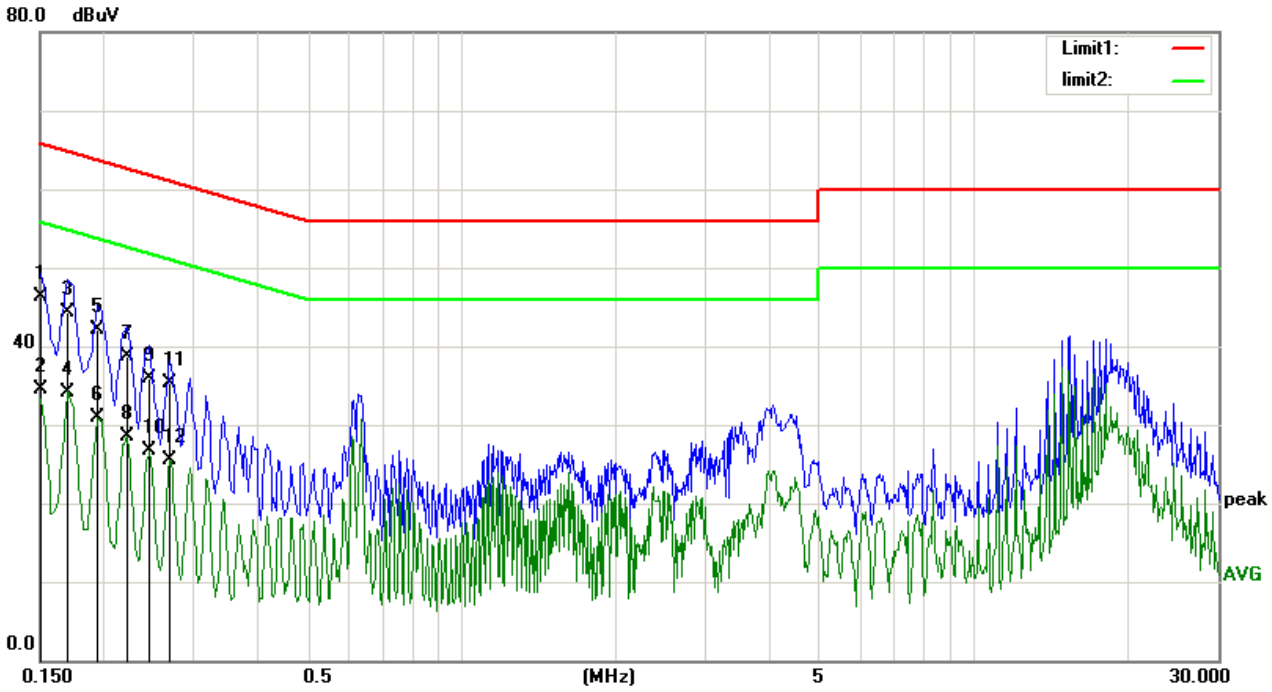
NOTE2: "-----" MEANS PEAK DETECTION; "-----" MANS AVERAGE DETECTION

EUT:	Speaker with bluetooth	Model No.:	Crasher Micro
Temperature:	24℃	Relative Humidity:	55%
Probe:	L1	Test Power:	AC 120V
Test Time:	2017-6-16	Test Result:	Pass
Standard:	FCC PART 15 class B	Test By:	Carson
Test Mode:	TX		
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	36.00	11.47	47.47	65.99	-18.52	QP
2	0.1500	24.56	11.47	36.03	55.99	-19.96	AVG
3	0.1700	33.93	11.33	45.26	64.96	-19.70	QP
4	0.1700	23.66	11.33	34.99	54.96	-19.97	AVG
5	0.1940	31.18	11.17	42.35	63.86	-21.51	QP
6	0.1940	21.22	11.17	32.39	53.86	-21.47	AVG
7	0.2220	30.22	10.97	41.19	62.74	-21.55	QP
8	0.2220	20.43	10.97	31.40	52.74	-21.34	AVG
9	0.2460	27.42	10.81	38.23	61.89	-23.66	QP
10	0.2460	17.91	10.81	28.72	51.89	-23.17	AVG
11	0.2700	25.67	10.64	36.31	61.12	-24.81	QP
12	0.2700	18.31	10.64	28.95	51.12	-22.17	AVG

EUT:	Speaker with bluetooth	Model No.:	Crasher Micro
Temperature:	24℃	Relative Humidity:	55%
Probe:	N	Test Power:	AC 120V
Test Time:	2017-6-16	Test Result:	Pass
Standard:	FCC PART 15 class B	Test By:	Carson
Test Mode:	TX		
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	34.88	11.47	46.35	65.99	-19.64	QP
2	0.1500	23.13	11.47	34.60	55.99	-21.39	AVG
3	0.1700	33.02	11.33	44.35	64.96	-20.61	QP
4	0.1700	22.87	11.33	34.20	54.96	-20.76	AVG
5	0.1940	30.95	11.17	42.12	63.86	-21.74	QP
6	0.1940	19.77	11.17	30.94	53.86	-22.92	AVG
7	0.2220	27.81	10.97	38.78	62.74	-23.96	QP
8	0.2220	17.48	10.97	28.45	52.74	-24.29	AVG
9	0.2460	25.18	10.81	35.99	61.89	-25.90	QP
10	0.2460	15.82	10.81	26.63	51.89	-25.26	AVG
11	0.2700	24.60	10.64	35.24	61.12	-25.88	QP
12	0.2700	14.90	10.64	25.54	51.12	-25.58	AVG

11. ANTENNA REQUIREMENTS

11.1. 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.

11.2. EUT ANTENNA

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

END OF REPORT