FCC CERTIFICATION TEST REPORT FOR

FCC ID:2ABHP-MSHXXX

Report Reference No. ..... :	13EAS12011 11
Date of issue ..... :	2013-12-06
Testing Laboratory ..... :	ATT Product Service Co., Ltd.
Address ..... :	No. 3, ChangLianShan Industrial Park, ChangAn Town, DongGuan City, GuangDong, China.
Applicant's name ..... :	Dusun (Xiamen) Kitchen & Bathroom Products Co., Ltd.
Address ..... :	Putou Industrial Park, No.2002, Tongji Middle Road, Tong'an District Xiamen P.R.China
Manufacturer ..... :	Dusun (Xiamen) Kitchen & Bathroom Products Co., Ltd.
Test specification:	
Test item description ..... :	SPEAKER
Trade Mark ..... :	
Model/Type reference ..... :	MSH001 (MSH002,MSH003…MSHxxx （x=a-z, 0-9）) Refer to page 5 for details.
Ratings ..... :	DC 5V

Responsible Engineer

Approved by

（Bin Jiang/ Engineer）

（Tomy Wu /EMC Manager）

TABLE OF CONTENTS

TEST REPORT DECLARE

Applicant	:	Dusun (Xiamen) Kitchen & Bathroom Products Co., Ltd.
Address	:	Putou Industrial Park, No.2002, Tongji Middle Road, Tong'an District Xiamen P.R.China
Equipment under Test	:	SPEAKER
Model No	:	MSH001 (MSH002,MSH003…MSHxxx （x=a-z, 0-9）)
Trade Mark	:	
Manufacturer	:	Dusun (Xiamen) Kitchen & Bathroom Products Co., Ltd
Address	:	Putou Industrial Park, No.2002, Tongji Middle Road, Tong'an District Xiamen P.R.China

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C: 2010

Test procedure used: ANSI C63.10:2009
FCC Public Notice DA 00-705

FCC ID: 2ABHP-MSHXXX

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. 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:	13EAS12011 11		
Date of Test:	2013-12-2---2013-12-6	**Date of Report**:	2013-12-6

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 Standards and results

The EUT have been tested according to the applicable standards as referenced below.

Description of Test Item	Standard	Results
Maximum Peak Output Power	15.247(b)(1) ANSI C63.10 :2009	PASS
20dB Bandwidth	15. 247(a)(1) ANSI C63.10 :2009	PASS
Carrier Frequency Separation	15.247(a)(1) ANSI C63.10 :2009	PASS
Number Of Hopping Channel	15.247(a)(1)(iii) ANSI C63.10 :2009	PASS
Dwell Time	15.247(a)(1)(iii) ANSI C63.10 :2009	PASS
Radiated Emission	15.209 15.247(d) ANSI C63.10 :2009	PASS
Band Edge Compliance	15.247(d) ANSI C63.10 :2009	PASS
Power Line Conducted Emissions	15.207 ANSI C63.10 :2009	NA
Antenna requirement	15.203	PASS
RF Exposure	15.247(i) 1.1310&2.1093	PASS

2.General test information

2.1ACCRESITATIONS

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA FCC Registration Number :923232
Canada INDUSTRY CANADA Registration Number 11033A

2.2Description of EUT

EUT* Name	:	SPEAKER
Model Number	:	MSH001
Trade Mark	:	
EUT function description	:	Please reference user manual of this device
Power supply	:	DC 5V
Radio Specification	:	Bluetooth V3.0+EDR
Operation frequency	:	2402MHz -2480MHz
Modulation	:	GFSK, Pi/4-QPSK, 8-DPSK
Data rate	:	1Mpbs；2Mpbs；3Mpbs
Antenna Type	:	built-in “F” shape PCB antenna, maximum PK gain:0dBi
Date of Receipt	:	2013-12-6
Sample Type	:	Series production

Note: EUT is the ab. of equipment under test.

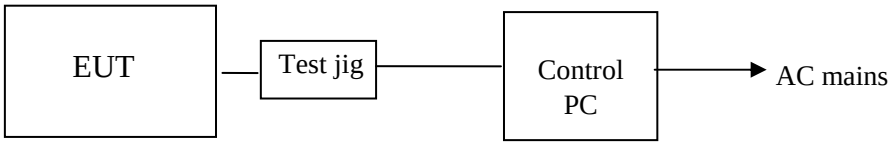
2.3Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Other
/	/	/	/

2.4Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	Other
PC	Lenovo	E R500	/
TRAVEL ADAPTER	SAMSUNG	ETA0U81EBE	/

2.5Block diagram of EUT configuration for test



EUT's Bluetooth module was connected to a special test jig provided by manufacturer which has a standard RSS-232 connector to connect to control PC, and the control PC will run a special test software
"HC_Data_Test.exe" provided by manufacturer to control EUT work in test mode as blow table.

Tested mode, channel, information		
Mode	Channel	Frequency (MHz)
GFSK hopping on Tx Mode	CH0 to CH78	2402 to 2480
GFSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480
π/4 QPSK hopping on Tx Mode	CH0 to CH78	2402 to 2480
π/4 QPSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480
8-QPSK hopping on Tx Mode	CH0 to CH78	2402 to 2480
8-DPSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480

.

2.6Test 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

2.7Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.44dB
Uncertainty for Radiation Emission test (150KHz-30MHz)	3.21dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.14 dB (Polarize: V)
	3.16 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	2.08dB(Polarize: V)
	2.56dB (Polarize: H)
Uncertainty for radio frequency	1×10-9
Uncertainty for conducted RF Power	0.65dB

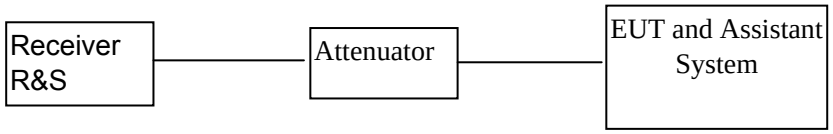
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.Maximum Peak Output Power

3.1Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2014/12/01	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/12/01	1Y
3	RF Cable	Micable	C10-01-01-1	100309	2014/12/01	1Y

3.2Block diagram of test setup



3.3Limits

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts,.

3.4Test Procedure

(1)Place the EUT on a bench and set in transmitting mode.

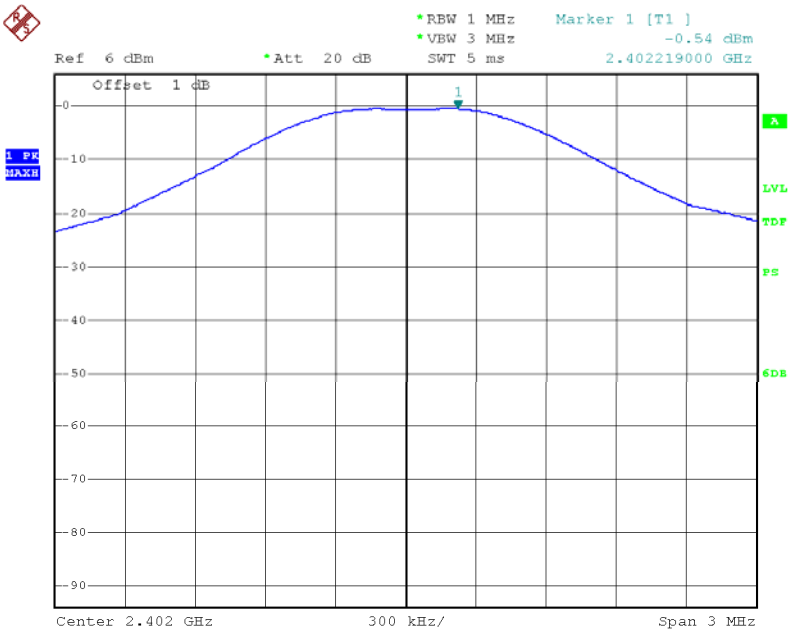
(2)Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI test receiver.

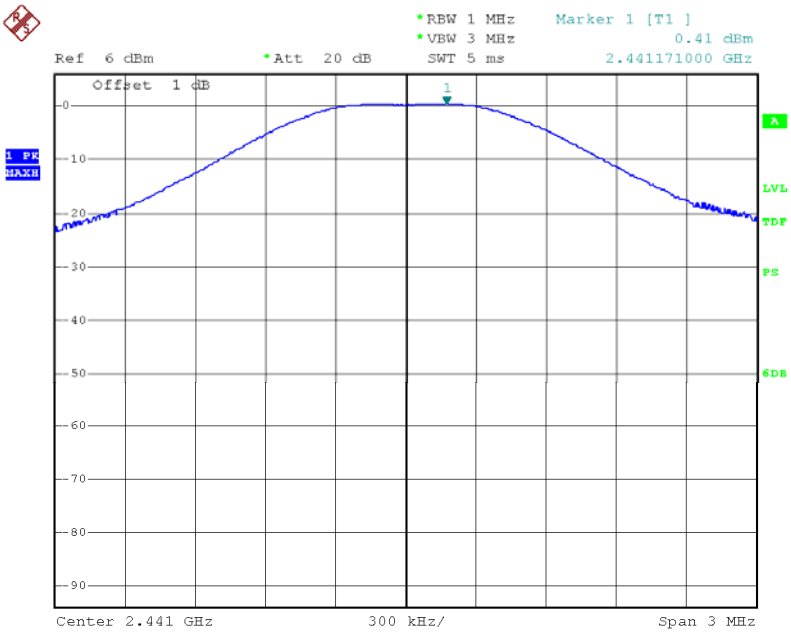
(3)Add a correction factor to the display.

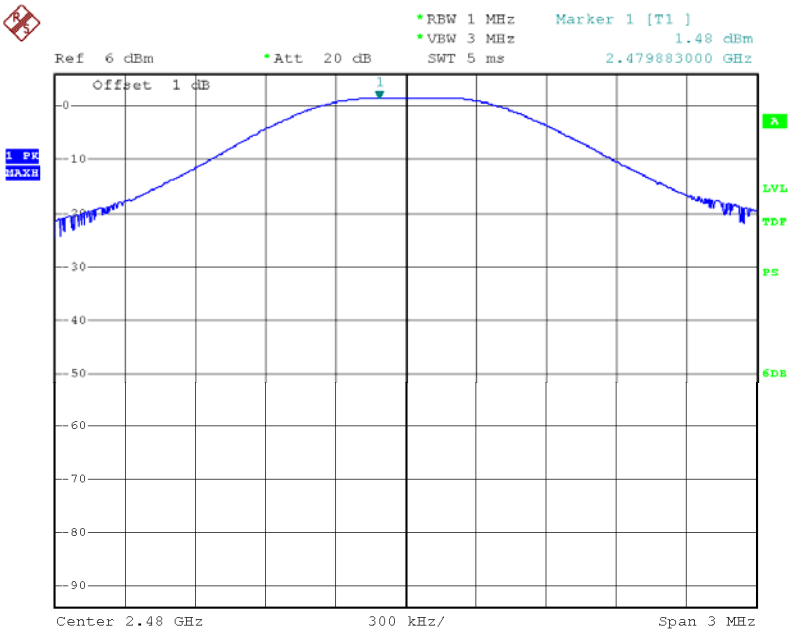
3.5Test Result

EUT: SPEAKER M/N: MSH001				
Mode	Freq (MHz)	Result (dBm)	Limit (dBm)	Conclusion
GFSK	2402	-0.54	30	PASS
	2441	0.41	30	PASS
	2480	1.48	30	PASS
π/4 QPSK	2402	-3.76	30	PASS
	2441	-2.54	30	PASS
	2480	-1.55	30	PASS
8DPSK	2402	-3.77	30	PASS
	2441	-2.55	30	PASS
	2480	-1.54	30	PASS
Test Date : 2013-12-05			Test Engineer : Bin Jiang	

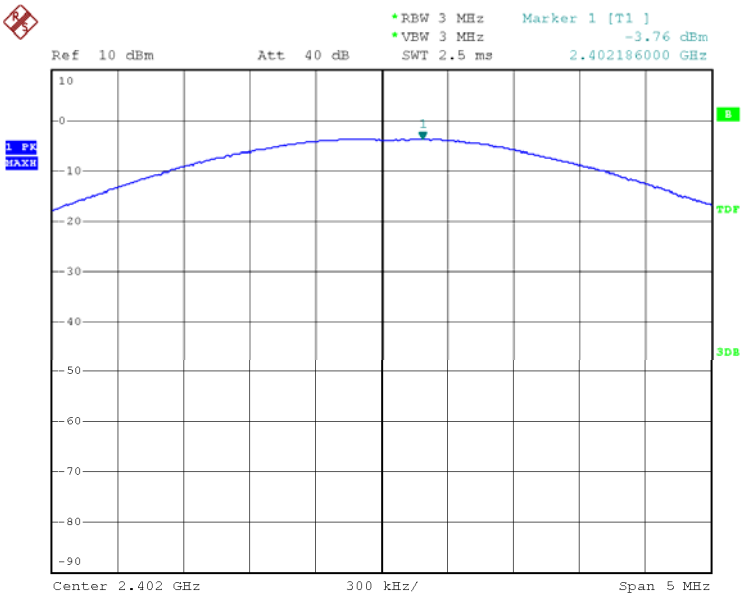
GFSK:

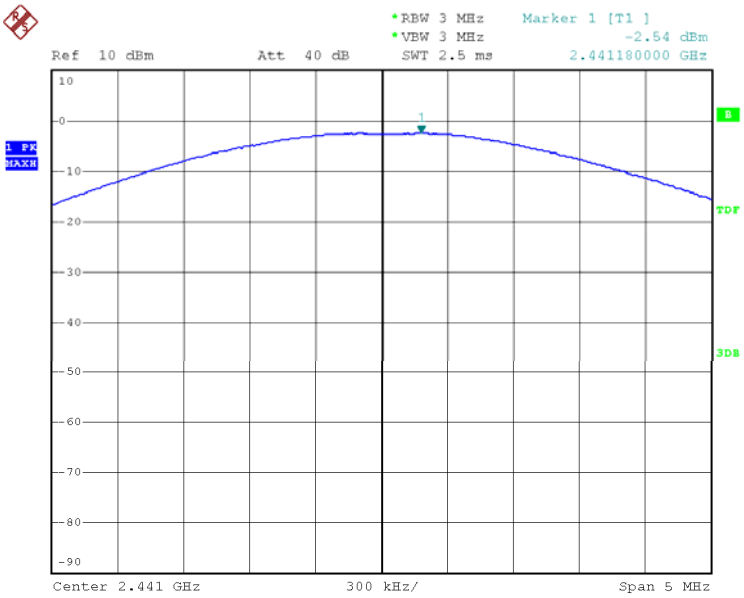

*RBW 1 MHz
*VBW 3 MHz
SWT 5 ms
Marker 1 [T1]
-0.54 dBm
2.402219000 GHz
Ref 6 dBm
*Att 20 dB
Offset 1 dB
1 PK MAXH
A
LVL
TDF
PS
6DB
Center 2.402 GHz
300 kHz/
Span 3 MHz

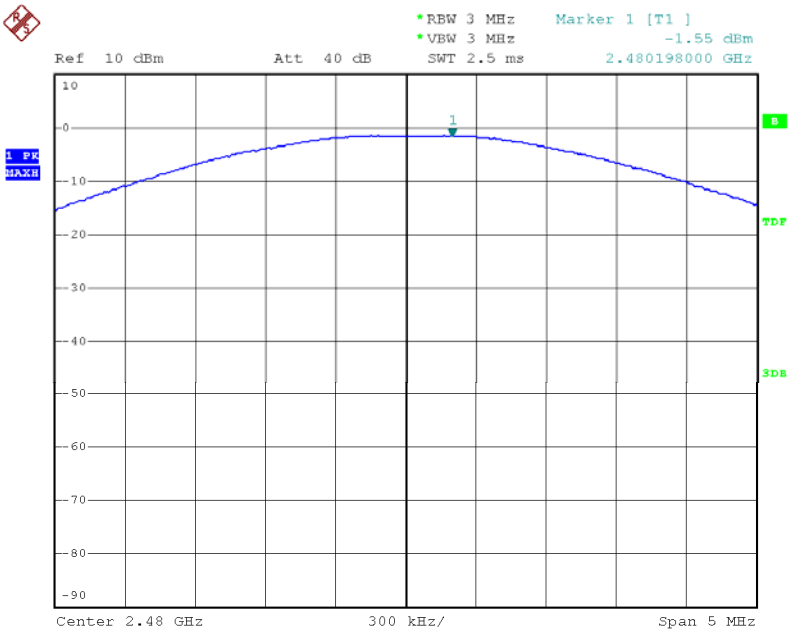

*RBW 1 MHz
*VBW 3 MHz
SWT 5 ms
Marker 1 [T1]
0.41 dBm
2.441171000 GHz
Ref 6 dBm
*Att 20 dB
Offset 1 dB
1 PK MAXH
A
LVL
TDF
PS
6DB
Center 2.441 GHz
300 kHz/
Span 3 MHz


*RBW 1 MHz
*VBW 3 MHz
SWT 5 ms
Marker 1 [T1]
1.48 dBm
2.479883000 GHz
Ref 6 dBm
*Att 20 dB
Offset 1 dB
1 PK MAXH
LVL
TDF
PS
6DB
Center 2.48 GHz
300 kHz/
Span 3 MHz

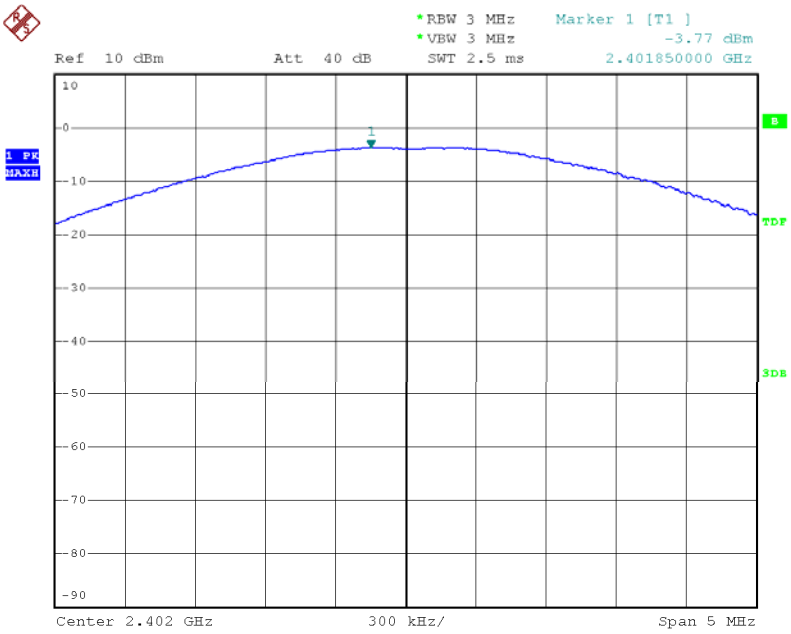
π/4 QPSK:

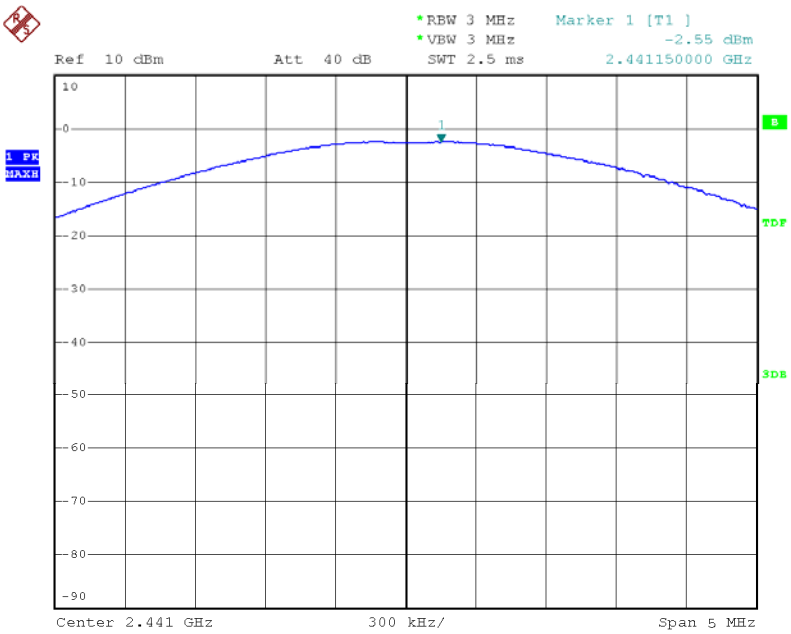

*RBW 3 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-3.76 dBm
2.402186000 GHz
Ref 10 dBm
Att 40 dB
1 PK MAXH
TDF
3DB
Center 2.402 GHz
300 kHz/
Span 5 MHz

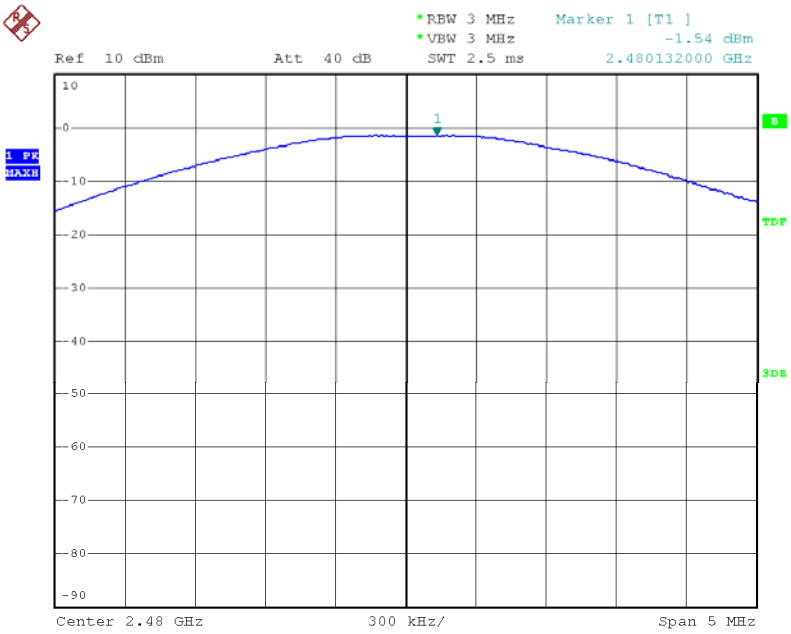

*RBW 3 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-2.54 dBm
2.441180000 GHz
Ref 10 dBm
Att 40 dB
1 PK
MAXH
TDF
3DB
Center 2.441 GHz
300 kHz/
Span 5 MHz


*RBW 3 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-1.55 dBm
2.480198000 GHz
Ref 10 dBm
Att 40 dB
1 PK
MAXH
TDF
3DB
Center 2.48 GHz
300 kHz/
Span 5 MHz

8DPSK:


*RBW 3 MHz
*VBW 3 MHz
Marker 1 [T1]
-3.77 dBm
Ref 10 dBm
Att 40 dB
SWT 2.5 ms
2.401850000 GHz
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1
B
TDF
3DB
1 PK
MAXH
Center 2.402 GHz
300 kHz/
Span 5 MHz


*RBW 3 MHz
*VBW 3 MHz
Marker 1 [T1]
-2.55 dBm
Ref 10 dBm
Att 40 dB
SWT 2.5 ms
2.441150000 GHz
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1
B
TDF
3DB
1 PK
MAXH
Center 2.441 GHz
300 kHz/
Span 5 MHz

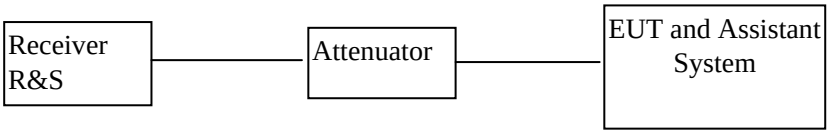


4. 20dB Bandwidth

4.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2014/12/26	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/12/27	1Y
3	RF Cable	Micable	C10-01-01-1	100309	2014/12/27	1Y

4.2 Block diagram of test setup



4.3 Limits

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..

4.4 Test Procedure

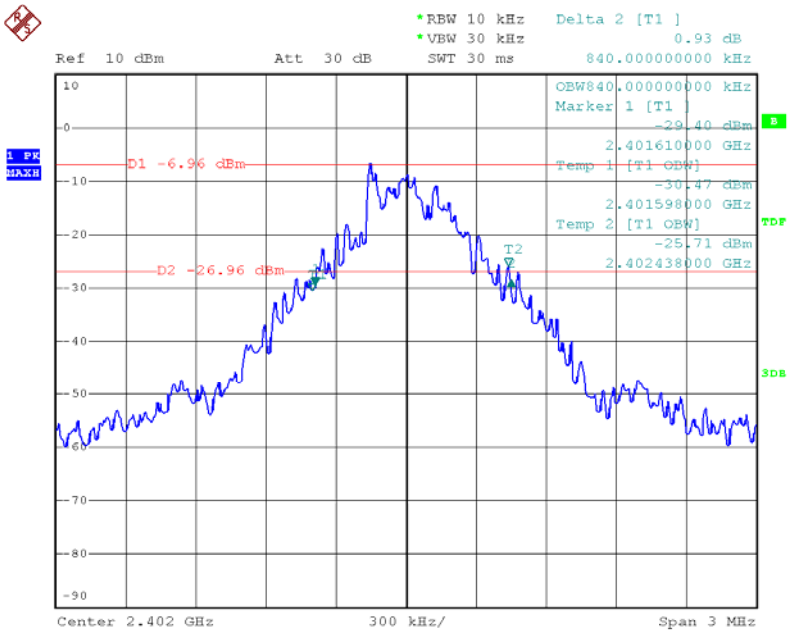
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete..

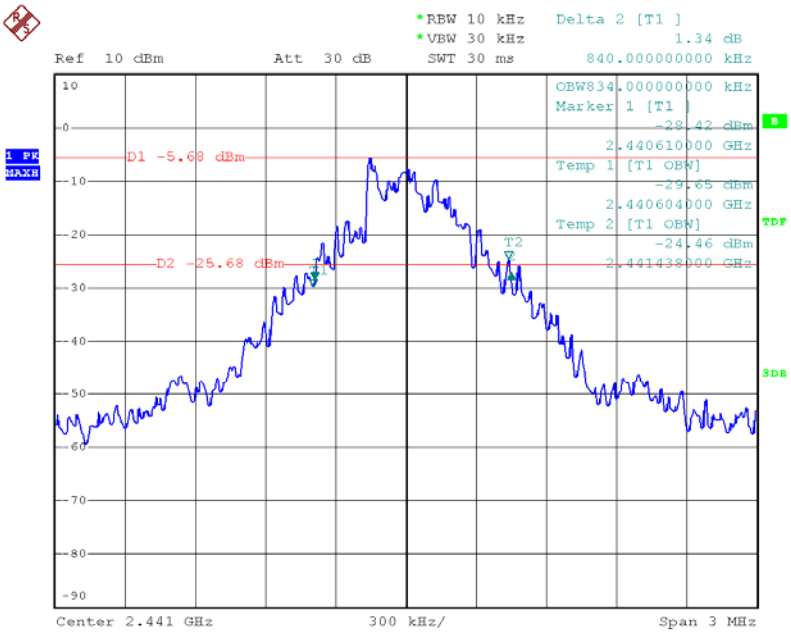
4.5 Test Result

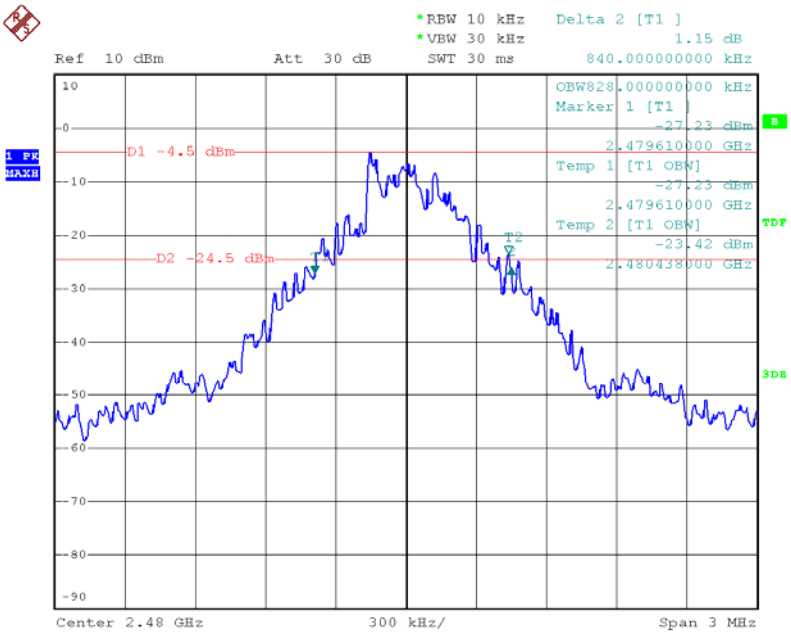
EUT: SPEAKER M/N: MSH001					
Mode	Freq (MHz)	Result (MHz)	Limit (MHz)	Margin (MHz)	Conclusion
GFSK	2402	0.840	/	/	PASS
	2441	0.840	/	/	PASS
	2480	0.840	/	/	PASS
π/4 QPSK	2402	1.212	/	/	PASS
	2441	1.224	/	/	PASS
	2480	1.218	/	/	PASS
8DPSK	2402	1.242	/	/	PASS
	2441	1.230	/	/	PASS
	2480	1.236	/	/	PASS
Test Date : 2013-12-5			Test Engineer : Bin Jang		

4.6 Original test data

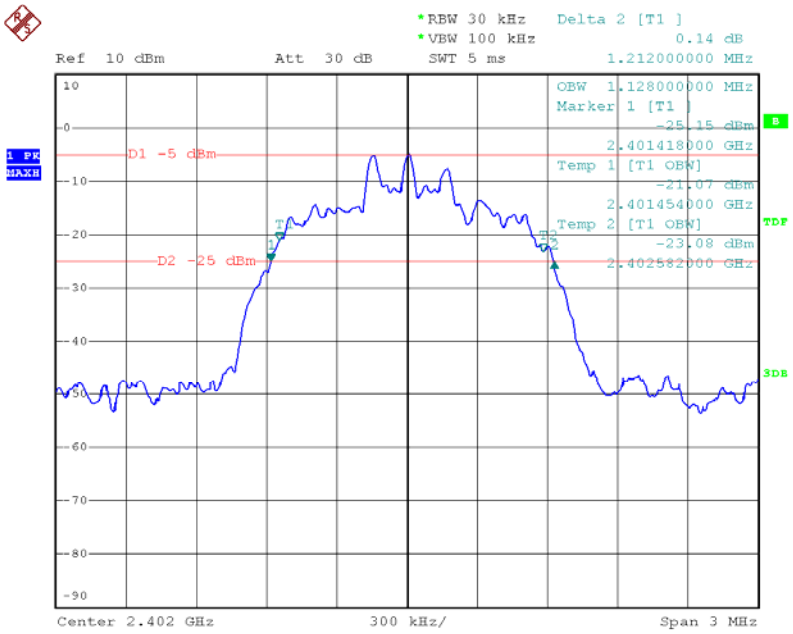
GFSK Mode:

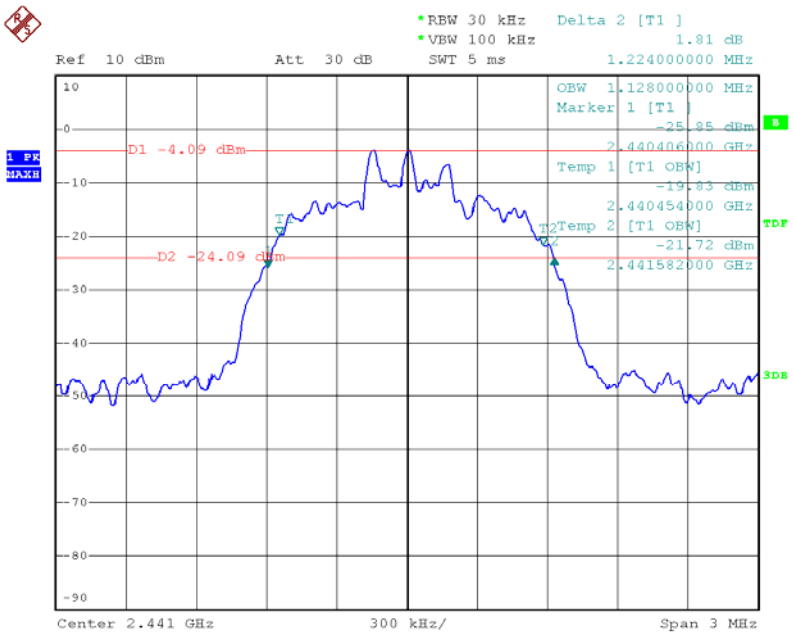


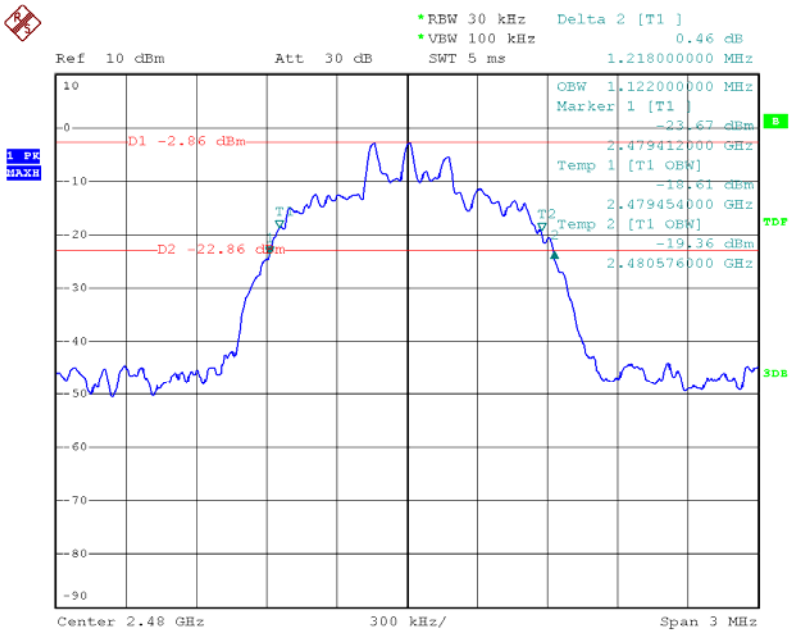

RBW 10 kHz
VBW 30 kHz
SWT 30 ms
Delta 2 [T1]
1.34 dB
840.000000000 kHz
Ref 10 dBm
Att 30 dB
OBW834.000000000 kHz
Marker 1 [T1]
-28.42 dBm
2.440610000 GHz
Temp 1 [T1 OBW]
-29.65 dBm
2.440604000 GHz
Temp 2 [T1 OBW]
-24.46 dBm
2.441438000 GHz
D1 -5.68 dBm
D2 -25.68 dBm
Center 2.441 GHz
300 kHz/
Span 3 MHz


RBW 10 kHz
VBW 30 kHz
SWT 30 ms
Delta 2 [T1]
1.15 dB
840.000000000 kHz
Ref 10 dBm
Att 30 dB
OBW828.000000000 kHz
Marker 1 [T1]
-27.23 dBm
2.479610000 GHz
Temp 1 [T1 OBW]
-27.23 dBm
2.479610000 GHz
Temp 2 [T1 OBW]
-23.42 dBm
2.480438000 GHz
D1 -4.5 dBm
D2 -24.5 dBm
Center 2.48 GHz
300 kHz/
Span 3 MHz

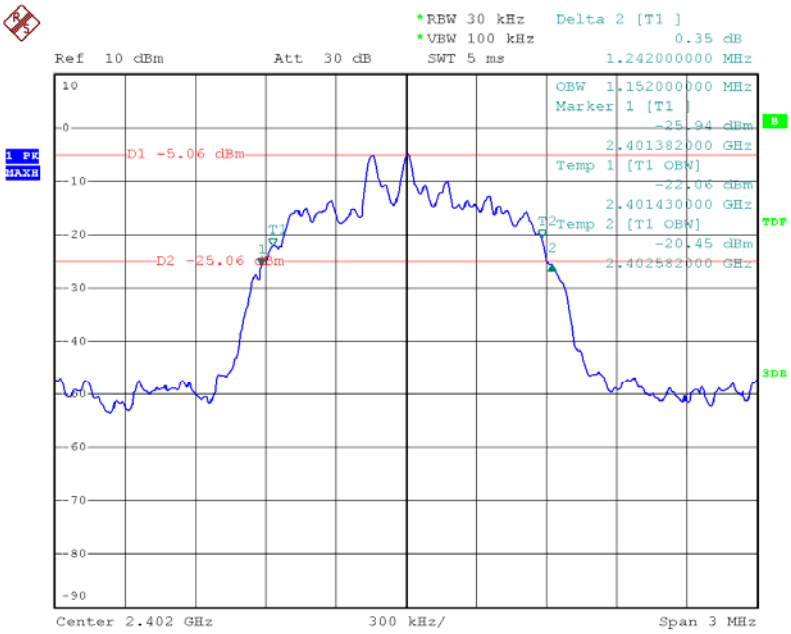
π/4 QPSK:

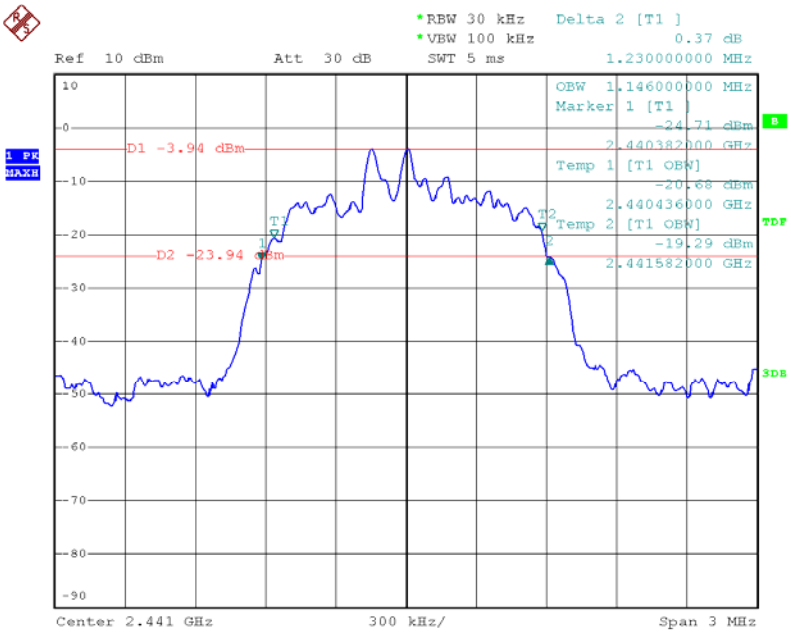

*RBW 30 kHz
*VBW 100 kHz
SWT 5 ms
Delta 2 [T1]
0.14 dB
1.212000000 MHz
Ref 10 dBm
Att 30 dB
OBW 1.128000000 MHz
Marker 1 [T1]
-25.15 dBm
2.401418000 GHz
Temp 1 [T1 OBW]
-21.07 dBm
2.401454000 GHz
Temp 2 [T1 OBW]
-23.08 dBm
2.402582000 GHz
D1 -5 dBm
D2 -25 dBm
Center 2.402 GHz
300 kHz/
Span 3 MHz

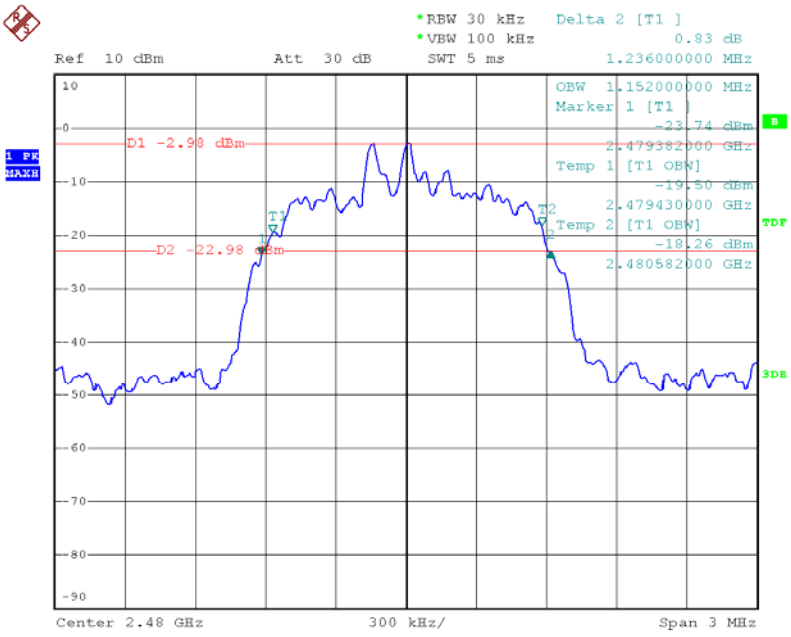

*RBW 30 kHz
*VBW 100 kHz
SWT 5 ms
Delta 2 [T1]
1.81 dB
1.224000000 MHz
Ref 10 dBm
Att 30 dB
OBW 1.128000000 MHz
Marker 1 [T1]
-25.85 dBm
2.440406000 GHz
Temp 1 [T1 OBW]
-19.83 dBm
2.440454000 GHz
Temp 2 [T1 OBW]
-21.72 dBm
2.441582000 GHz
D1 -4.09 dBm
D2 -24.09 dBm
Center 2.441 GHz
300 kHz/
Span 3 MHz


*RBW 30 kHz
*VBW 100 kHz
SWT 5 ms
Delta 2 [T1]
0.46 dB
1.218000000 MHz
Ref 10 dBm
Att 30 dB
OBW 1.122000000 MHz
Marker 1 [T1]
-23.67 dBm
2.479412000 GHz
Temp 1 [T1 OBW]
-18.61 dBm
2.479454000 GHz
Temp 2 [T1 OBW]
-19.36 dBm
2.480576000 GHz
D1 -2.86 dBm
D2 -22.86 dBm
1 PK MAXH
B
TDF
3DB
Center 2.48 GHz
300 kHz/
Span 3 MHz

8DPSK:


*RBW 30 kHz
*VBW 100 kHz
SWT 5 ms
Delta 2 [T1]
0.35 dB
1.242000000 MHz
Ref 10 dBm
Att 30 dB
OBW 1.152000000 MHz
Marker 1 [T1]
-25.94 dBm
2.401382000 GHz
Temp 1 [T1 OBW]
-22.06 dBm
2.401430000 GHz
Temp 2 [T1 OBW]
-20.45 dBm
2.402582000 GHz
D1 -5.06 dBm
D2 -25.06 dBm
1 PK MAXH
B
TDF
3DB
Center 2.402 GHz
300 kHz/
Span 3 MHz


*RBW 30 kHz
*VBW 100 kHz
SWT 5 ms
Delta 2 [T1]
0.37 dB
1.230000000 MHz
Ref 10 dBm
Att 30 dB
OBW 1.146000000 MHz
Marker 1 [T1]
-24.71 dBm
2.440382000 GHz
Temp 1 [T1 OBW]
-20.68 dBm
2.440436000 GHz
Temp 2 [T1 OBW]
-19.29 dBm
2.441582000 GHz
D1 -3.94 dBm
D2 -23.94 dBm
1 PK MAXH
TDF
3DB
Center 2.441 GHz
300 kHz/
Span 3 MHz

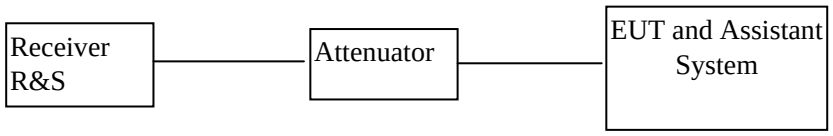

*RBW 30 kHz
*VBW 100 kHz
SWT 5 ms
Delta 2 [T1]
0.83 dB
1.236000000 MHz
Ref 10 dBm
Att 30 dB
OBW 1.152000000 MHz
Marker 1 [T1]
-23.74 dBm
2.479382000 GHz
Temp 1 [T1 OBW]
-19.50 dBm
2.479430000 GHz
Temp 2 [T1 OBW]
-18.26 dBm
2.480582000 GHz
D1 -2.98 dBm
D2 -22.98 dBm
1 PK MAXH
TDF
3DB
Center 2.48 GHz
300 kHz/
Span 3 MHz

5. Carrier Frequency Separation

5.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2014/12/26	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/12/27	1Y
3	RF Cable	Micable	C10-01-01-1	100309	2014/12/27	1Y

5.2 Block diagram of test setup



5.3 Limits

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.

5.4 Test Procedure

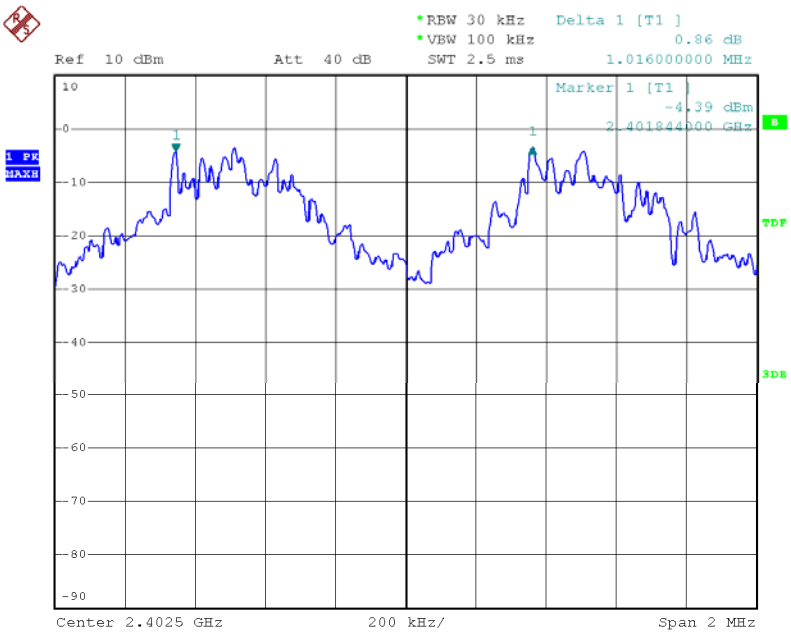
1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another truce
3. Measure the channel separation.

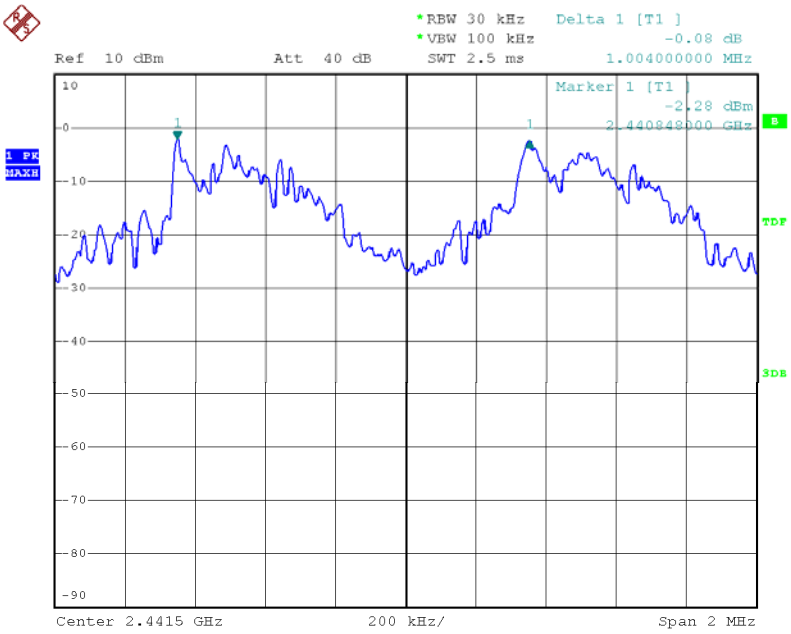
5.5 Test Result

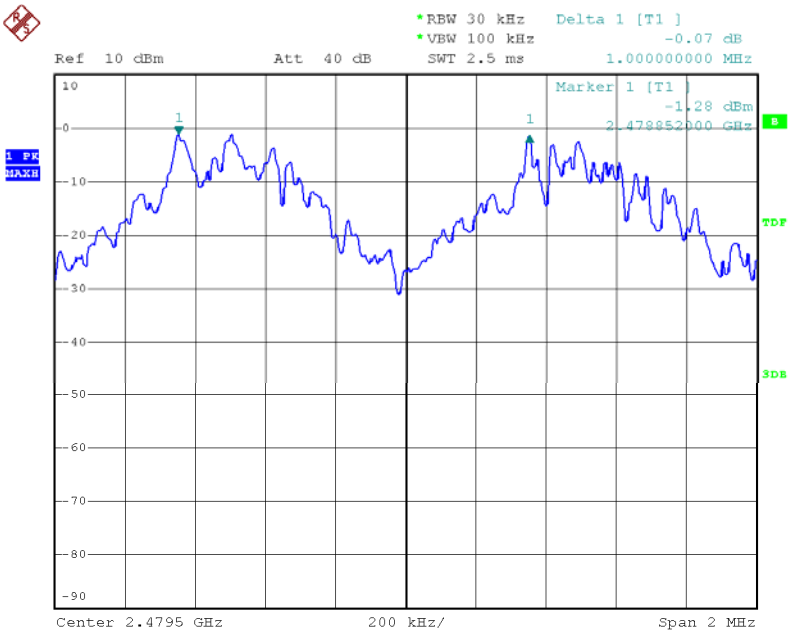
EUT: SPEAKER M/N: MSH001				
Mode	Channel separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz) 2/3 of 20dB bandwidth	Conclusion
GFSK	1.016	0.840	0.560	PASS
π/4 QPSK	1.020	1.224	0.816	PASS
8GFSK	1.012	1.242	0.828	PASS
Test Date :2013-12-5			Test Engineer : Bin Jang	

5.6 Original test data

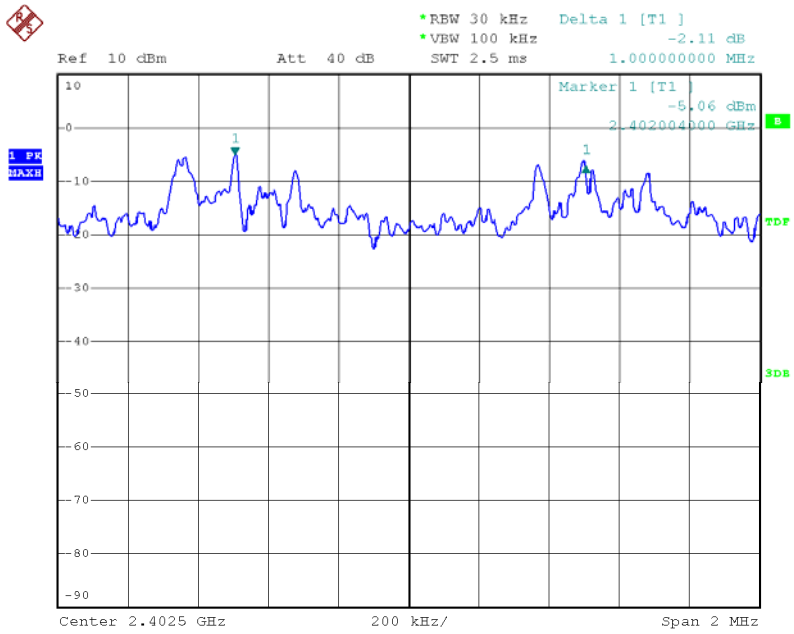
GFSK

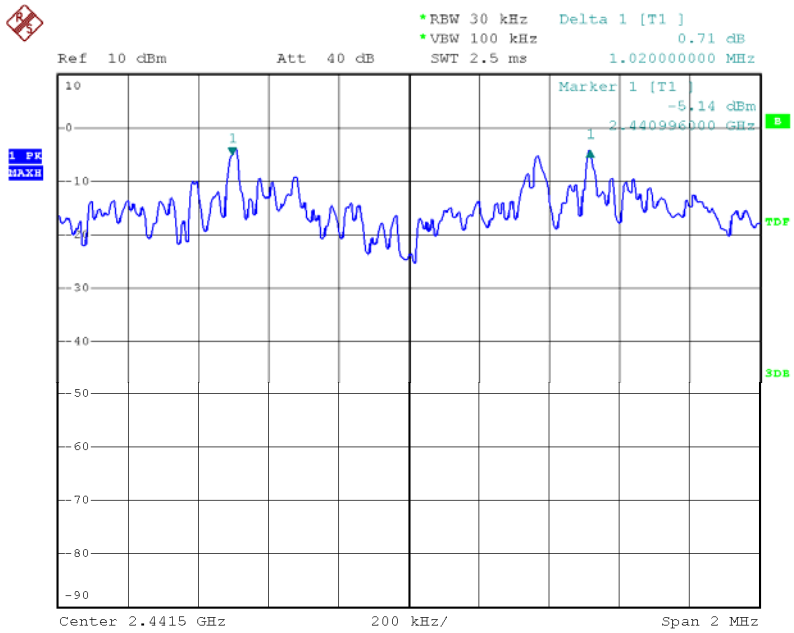


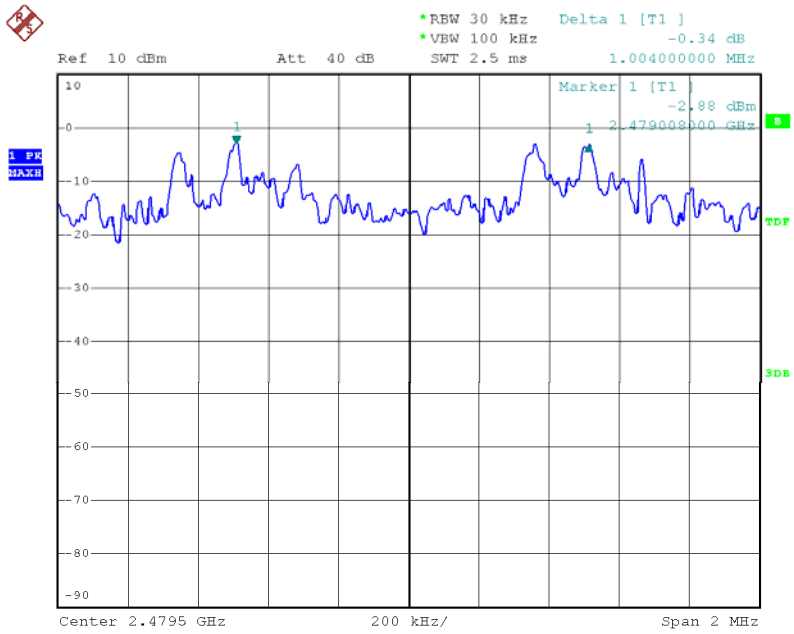

*RBW 30 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.08 dB
1.004000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-2.28 dBm
2.440848000 GHz
1 PK
MAXH
TDF
3DB
Center 2.4415 GHz
200 kHz/
Span 2 MHz


*RBW 30 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.07 dB
1.000000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-1.28 dBm
2.479852000 GHz
1 PK
MAXH
TDF
3DB
Center 2.4795 GHz
200 kHz/
Span 2 MHz

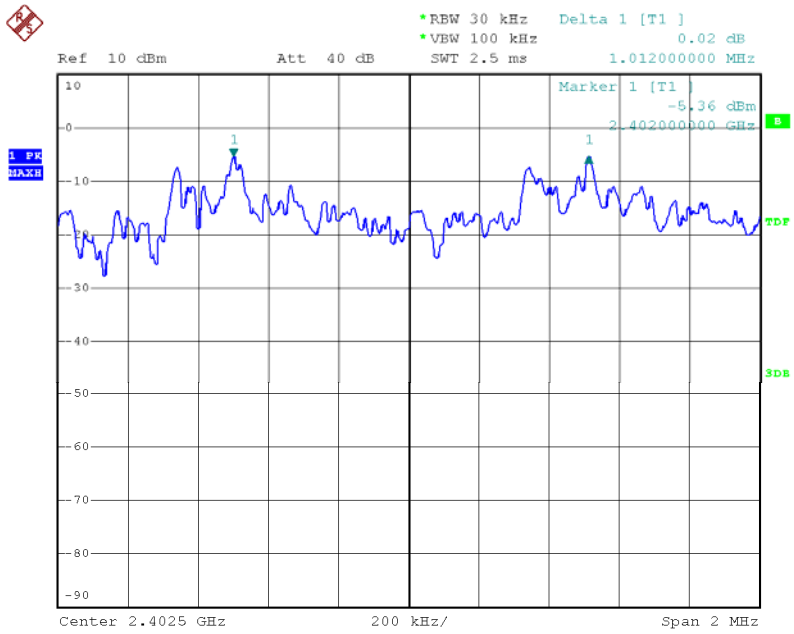
π/4 QPSK

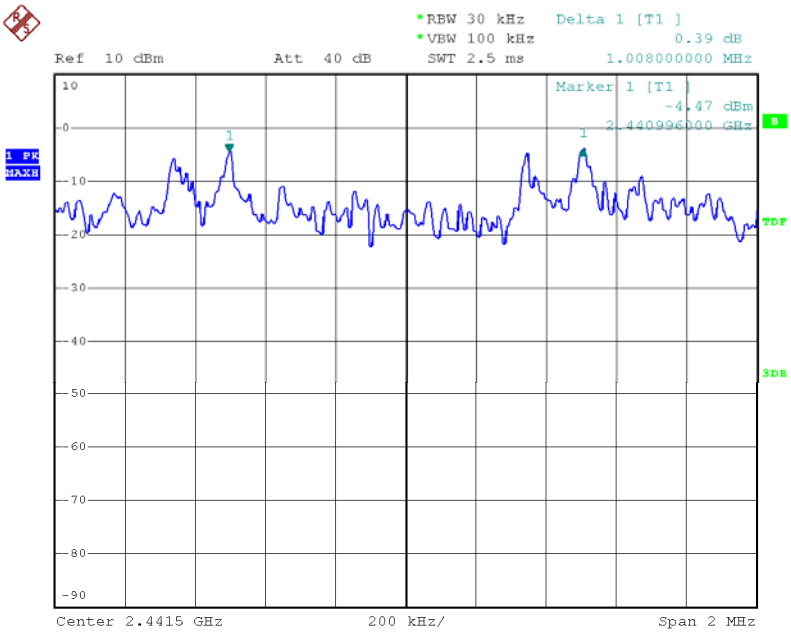

*RBW 30 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 1 [T1]
-2.11 dB
1.000000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-5.06 dBm
2.402004000 GHz
1 PK MAXH
TDF
3DB
Center 2.4025 GHz
200 kHz/
Span 2 MHz

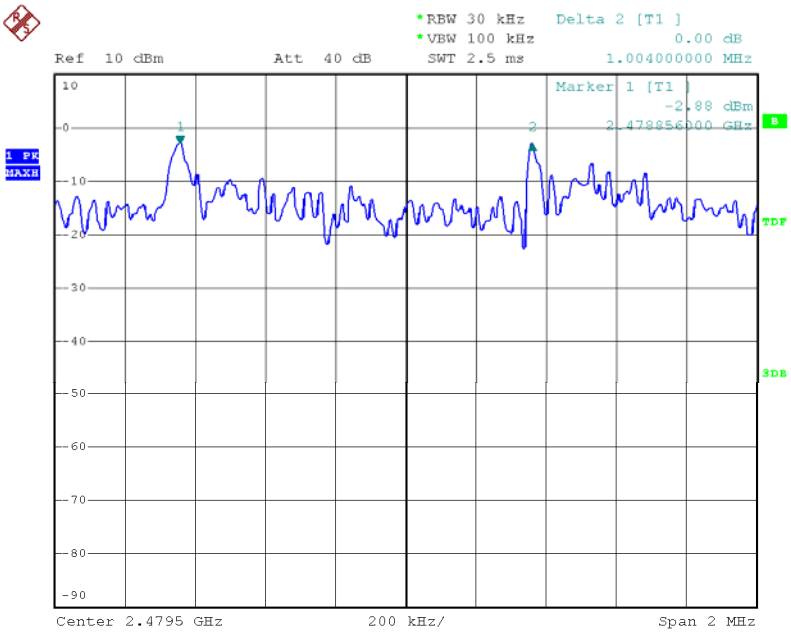

*RBW 30 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 1 [T1]
0.71 dB
1.020000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-5.14 dBm
2.440996000 GHz
1 PK MAXH
TDF
3DB
Center 2.4415 GHz
200 kHz/
Span 2 MHz


*RBW 30 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.34 dB
1.004000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-2.88 dBm
2.479008000 GHz
1 PK MAXH
B
TDF
3DB
Center 2.4795 GHz
200 kHz/
Span 2 MHz

8QPSK


*RBW 30 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 1 [T1]
0.02 dB
1.012000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-5.36 dBm
2.402000000 GHz
1 PK MAXH
B
TDF
3DB
Center 2.4025 GHz
200 kHz/
Span 2 MHz


*RBW 30 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 1 [T1]
0.39 dB
1.008000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-4.47 dBm
2.440996000 GHz
1 PK MAXH
B
TDF
3DB
Center 2.4415 GHz
200 kHz/
Span 2 MHz

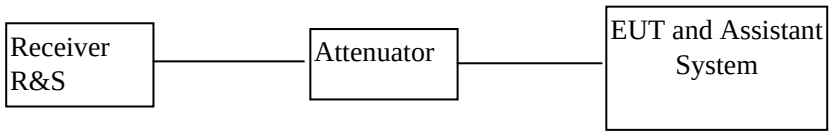

*RBW 30 kHz
*VBW 100 kHz
SWT 2.5 ms
Delta 2 [T1]
0.00 dB
1.004000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-2.88 dBm
2.478856000 GHz
1 PK MAXH
B
TDF
3DB
Center 2.4795 GHz
200 kHz/
Span 2 MHz

6. Number Of Hopping Channel

6.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2014/12/26	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/12/27	1Y
3	RF Cable	Micable	C10-01-01-1	100309	2014/12/27	1Y

6.2 Block diagram of test setup



6.3 Limits

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

6.4 Test Procedure

(1)Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

(2)Set the EUT in hopping mode from first channel to last.

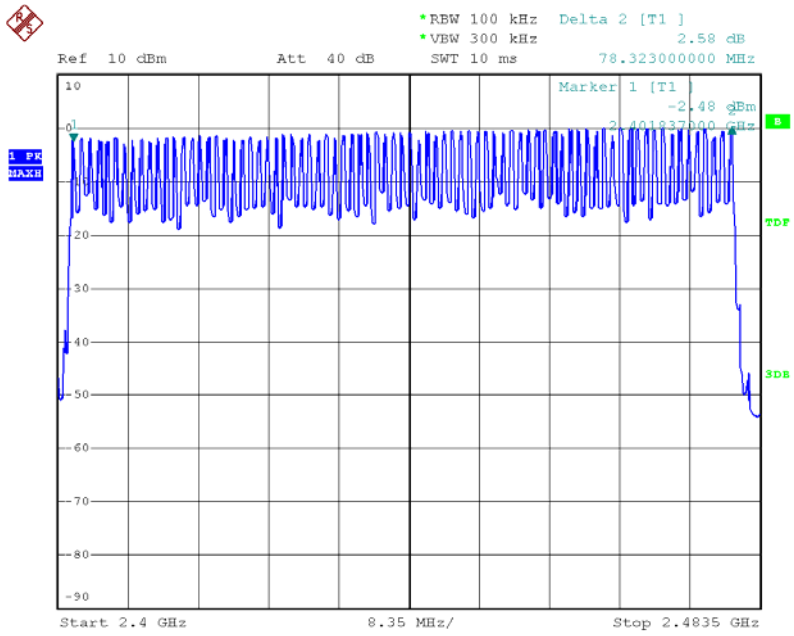
(3)By using the Max-Hold function record the Quantity of the channel.

6.5 Test Result

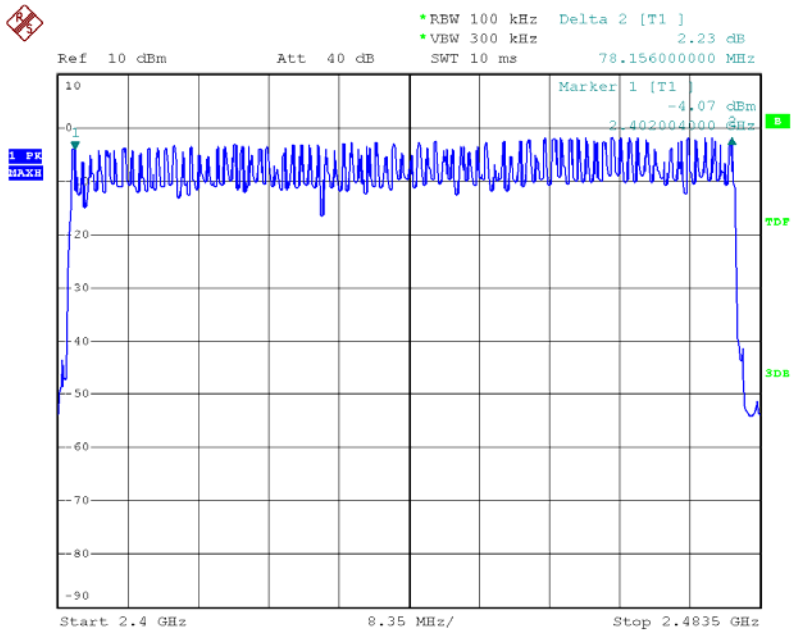
EUT: SPEAKER M/N: MSH001			
Mode	Number of hopping channel	Limit	Conclusion
GFSK	79	>15	PASS
π/4 QPSK	79	>15	PASS
8QPSK	79	>15	PASS
Test Date : 2013-12-5		Test Engineer : Bin Jiang	

6.6 Original test data

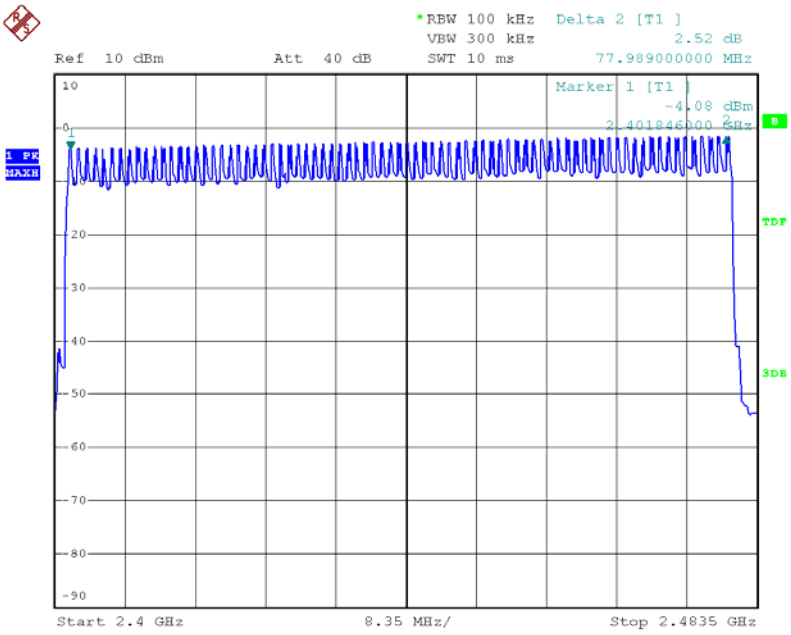
GFSK:



π/4 QPSK



8 QPSK:

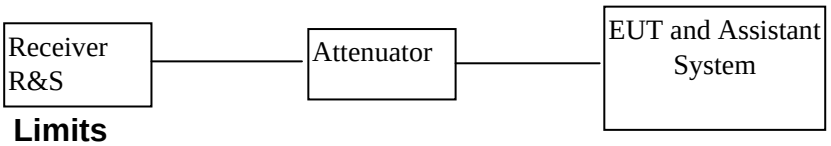

*RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Delta 2 [T1]
2.52 dB
77.989000000 MHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-4.08 dBm
2.401846000 GHz
1 PK
MAXH
TDF
3DB
Start 2.4 GHz
8.35 MHz/
Stop 2.4835 GHz

7. Dwell Time

7.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	EMI Test Receiver	R&S	ESU8	100316	2014/11/25	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/12/27	1Y
3	RF Cable	Micable	C10-01-01-1	100309	2014/12/27	1Y

7.2 Block diagram of test setup



7.3 Limits

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.

7.4 Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 * channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested. Dwell Time= time slot length * hope rate/ number of hopping channels * 31.6s Hop rate=1600/s

7.5 Test Result

GFSK:

Mode	Channel	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
DH1	Low	0.430	137.6	400	pass
	Middle	0.425	136	400	pass
	High	0.440	140.8	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.700	272	400	pass
	Middle	1.700	272	400	pass
	High	1.694	271.04	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.940	313.6	400	pass
	Middle	2.990	318.93	400	pass
	High	2.945	314.13	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

π/4 QPSK

Mode	Channel	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
2DH1	Low	0.435	139.00	400	pass
	Middle	0.437	139.84	400	pass
	High	0.433	138.56	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
2DH3	Low	1.693	270.88	400	pass
	Middle	1.711	273.76	400	pass
	High	1.711	273.76	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
2DH5	Low	2.950	314.66	400	pass
	Middle	2.950	314.66	400	pass
	High	2.940	313.6	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

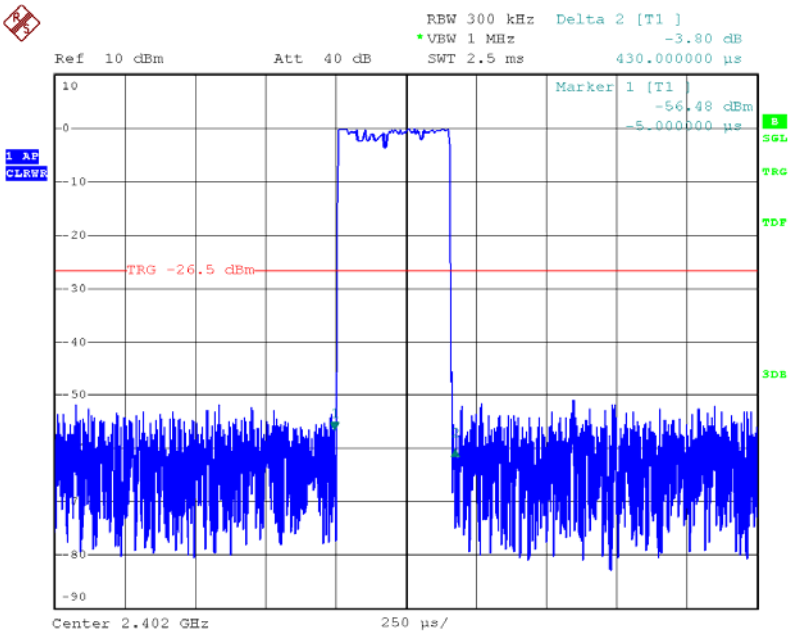
8 QPSK

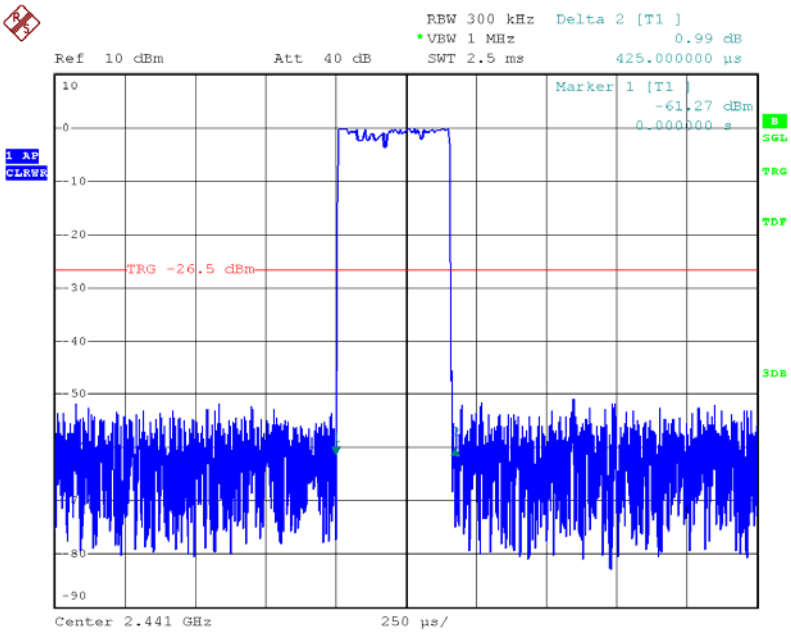
Mode	Channel	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
2DH1	Low	0.432	138.24	400	pass
	Middle	0.432	138.24	400	pass
	High	0.432	138.24	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
2DH3	Low	1.698	271.68	400	pass
	Middle	1.698	271.68	400	pass
	High	1.692	270.72	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
2DH5	Low	2.948	314.45	400	pass
	Middle	2.948	314.45	400	pass
	High	2.948	314.45	400	pass
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

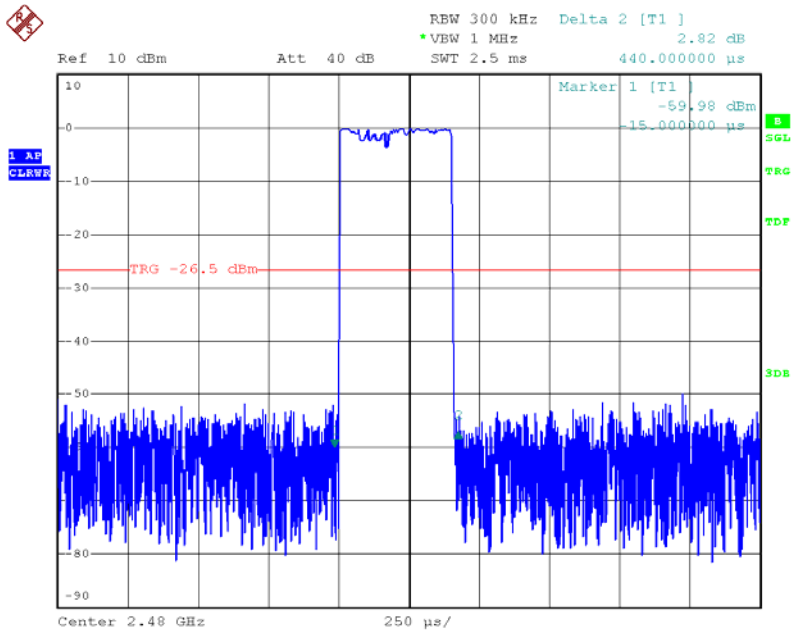
7.6 Original test data

GFSK

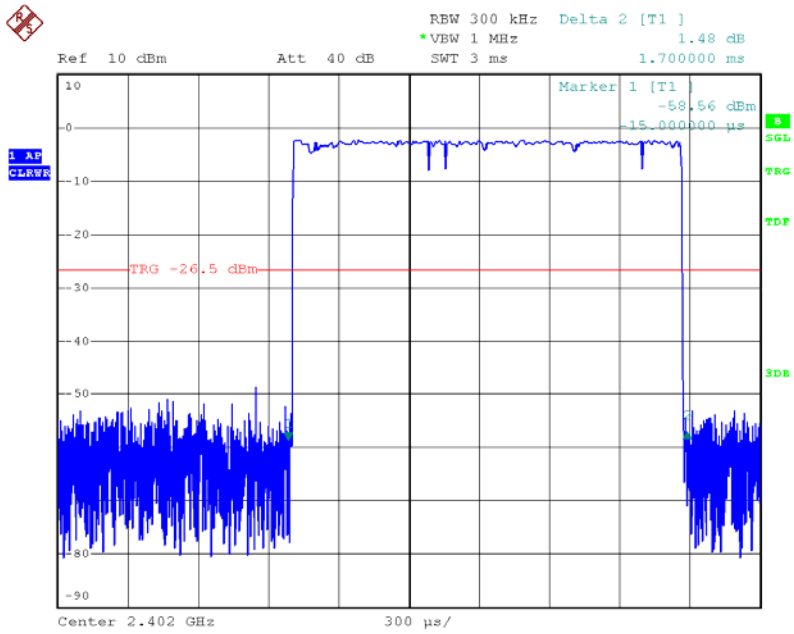
DH1

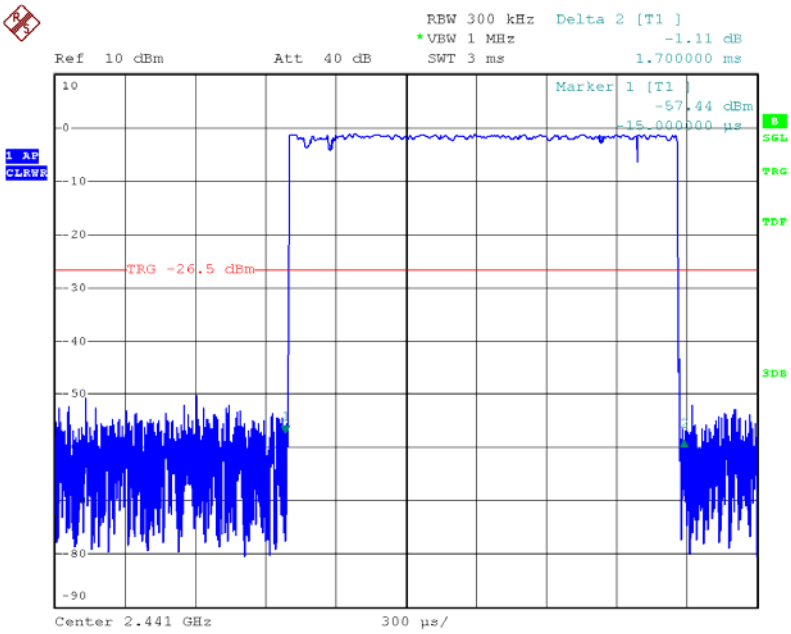


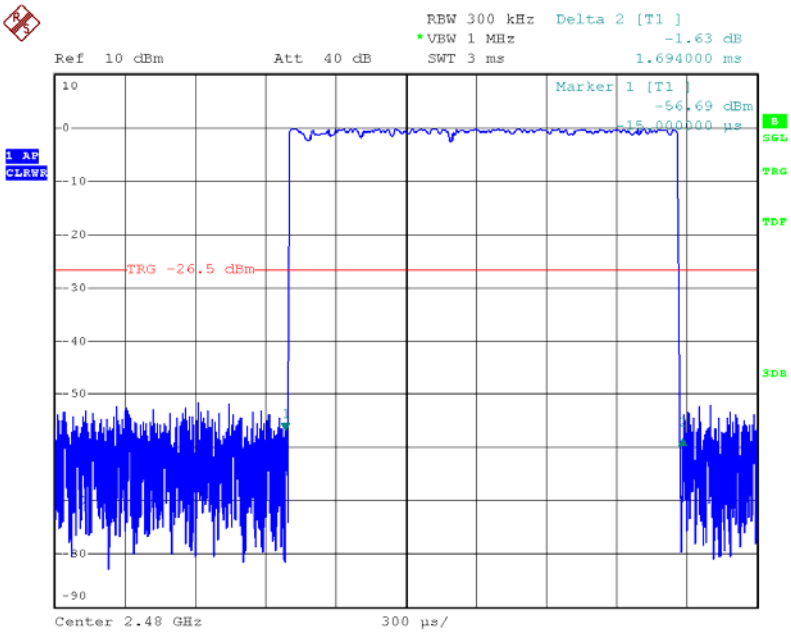



RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
2.82 dB
Ref 10 dBm
Att 40 dB
SWT 2.5 ms
440.000000 µs
Marker 1 [T1]
-59.98 dBm
-15.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
10
0
-10
-20
-30
-40
-50
-80
-90
Center 2.48 GHz
250 µs/

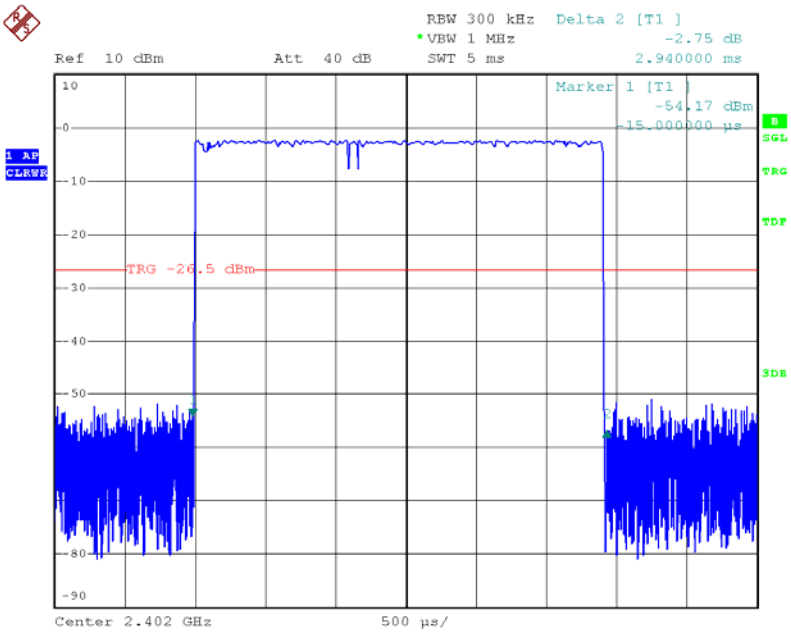
DH3

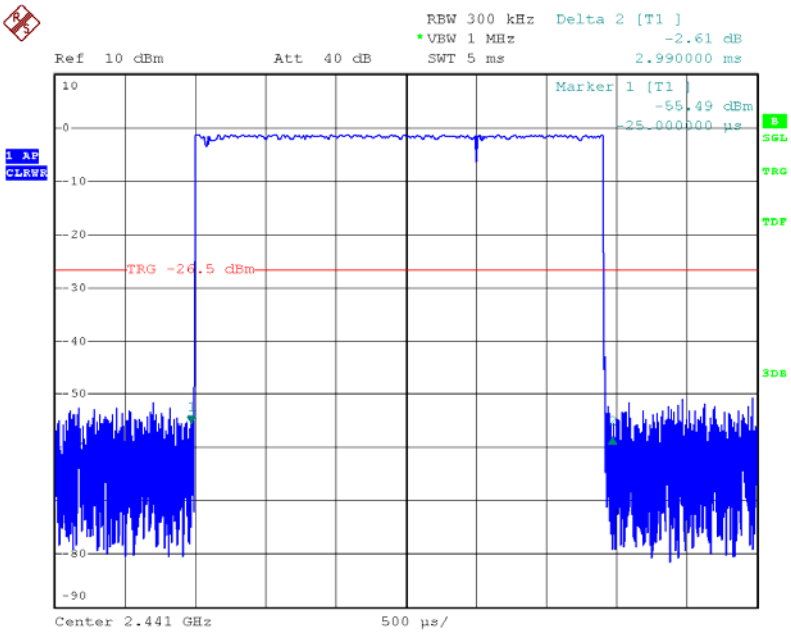

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
1.48 dB
Ref 10 dBm
Att 40 dB
SWT 3 ms
1.700000 ms
Marker 1 [T1]
-58.56 dBm
-15.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
10
0
-10
-20
-30
-40
-50
-80
-90
Center 2.402 GHz
300 µs/

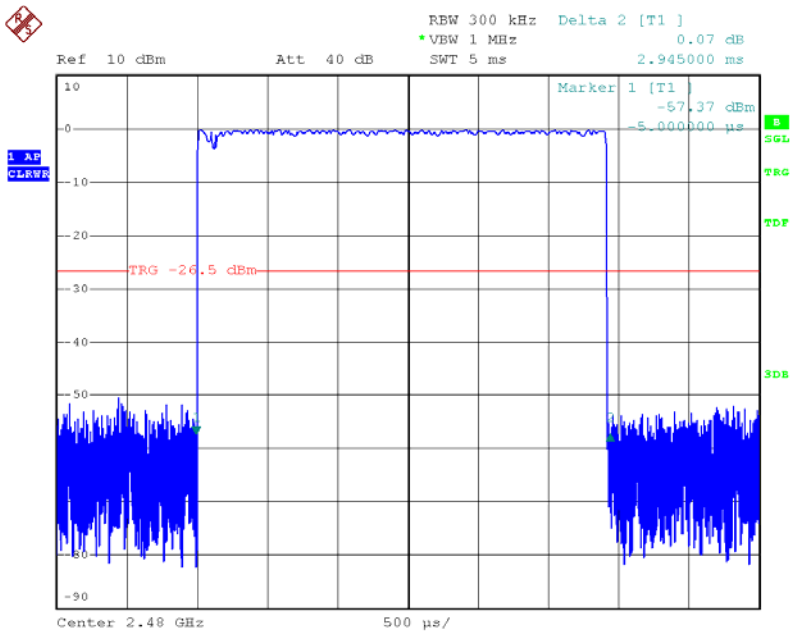

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
-1.11 dB
Ref 10 dBm
Att 40 dB
SWT 3 ms
1.700000 ms
Marker 1 [T1]
-57.44 dBm
-15.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
Center 2.441 GHz
300 µs/


RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
-1.63 dB
Ref 10 dBm
Att 40 dB
SWT 3 ms
1.694000 ms
Marker 1 [T1]
-56.69 dBm
-15.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
Center 2.48 GHz
300 µs/

DH5

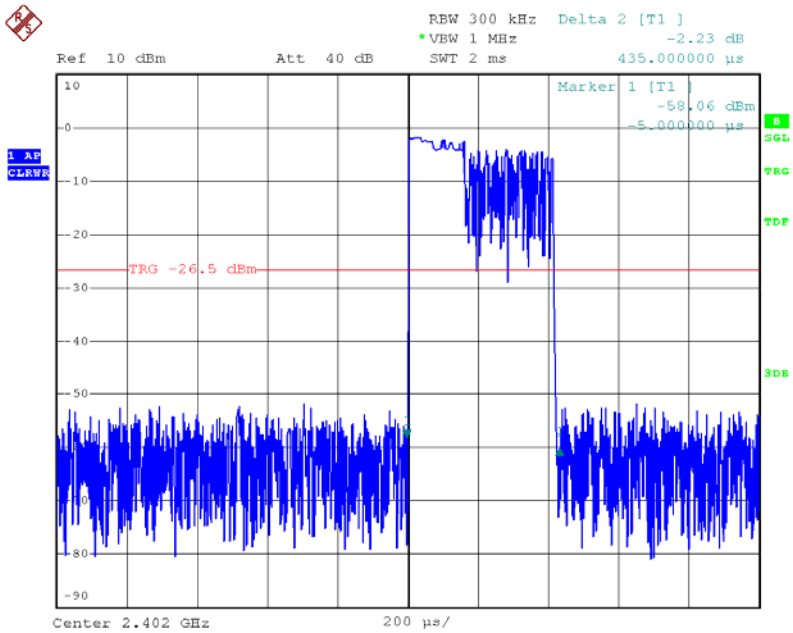

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
-2.75 dB
Ref 10 dBm
Att 40 dB
SWT 5 ms
2.940000 ms
Marker 1 [T1]
-54.17 dBm
-15.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
Center 2.402 GHz
500 µs/

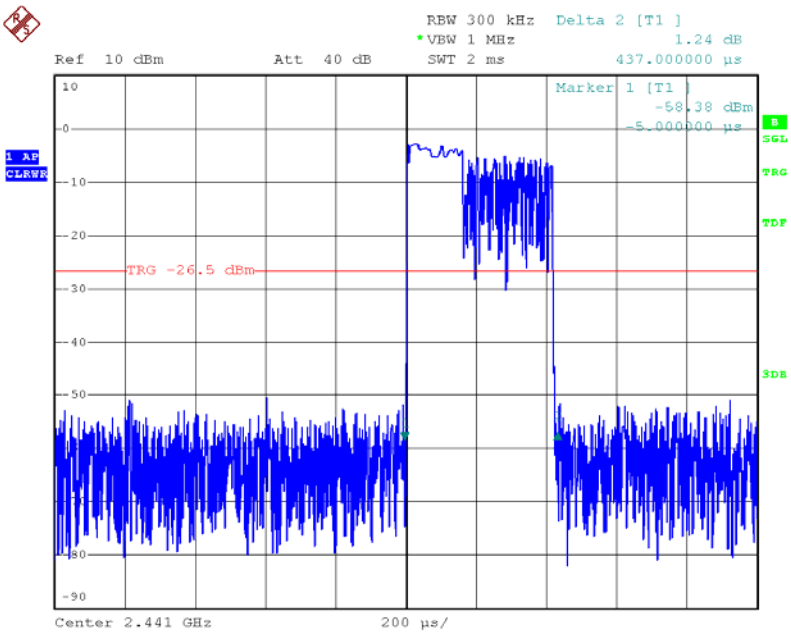

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
-2.61 dB
Ref 10 dBm
Att 40 dB
SWT 5 ms
2.990000 ms
Marker 1 [T1]
-55.49 dBm
-25.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
Center 2.441 GHz
500 µs/

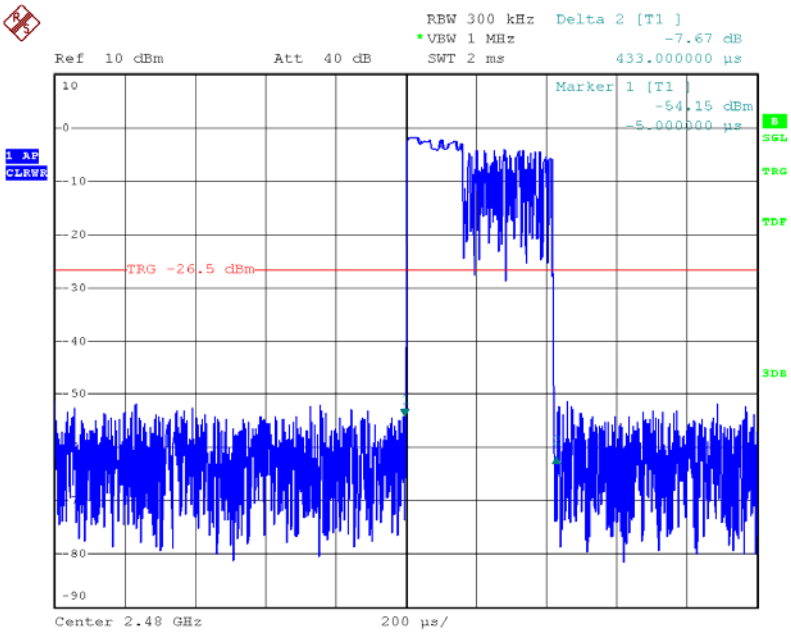

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
0.07 dB
Ref 10 dBm
Att 40 dB
SWT 5 ms
2.945000 ms
Marker 1 [T1]
-57.37 dBm
-5.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
Center 2.48 GHz
500 µs/

π/4 QPSK

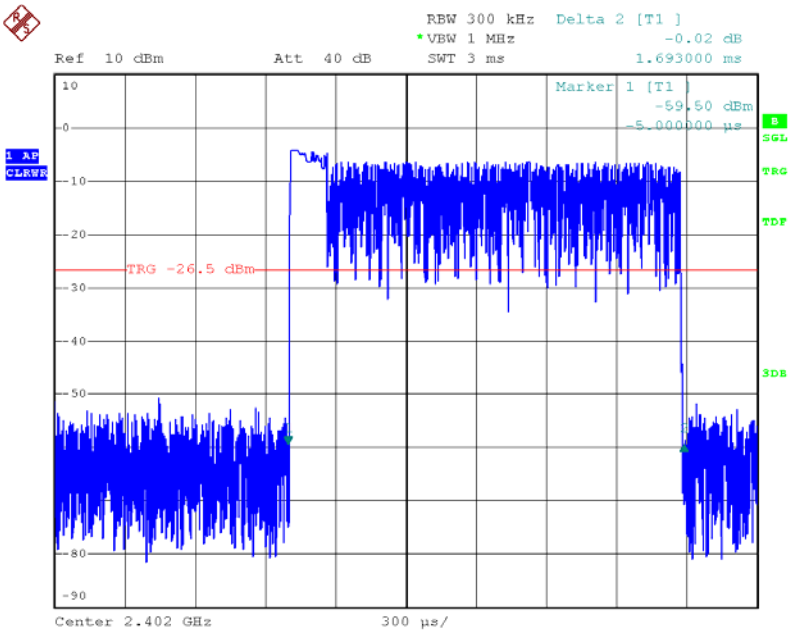
2DH1

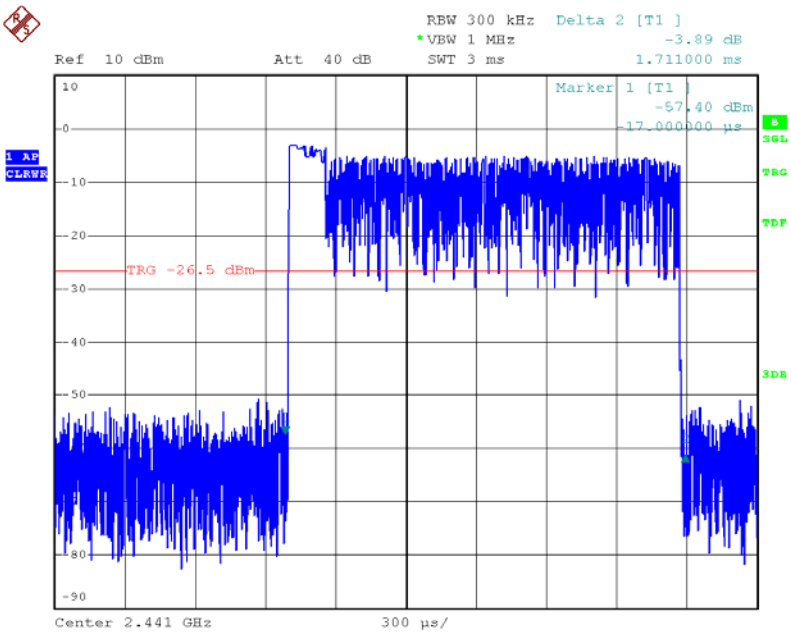

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
-2.23 dB
Ref 10 dBm
Att 40 dB
SWT 2 ms
435.000000 µs
Marker 1 [T1]
-58.06 dBm
-5.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
Center 2.402 GHz
200 µs/

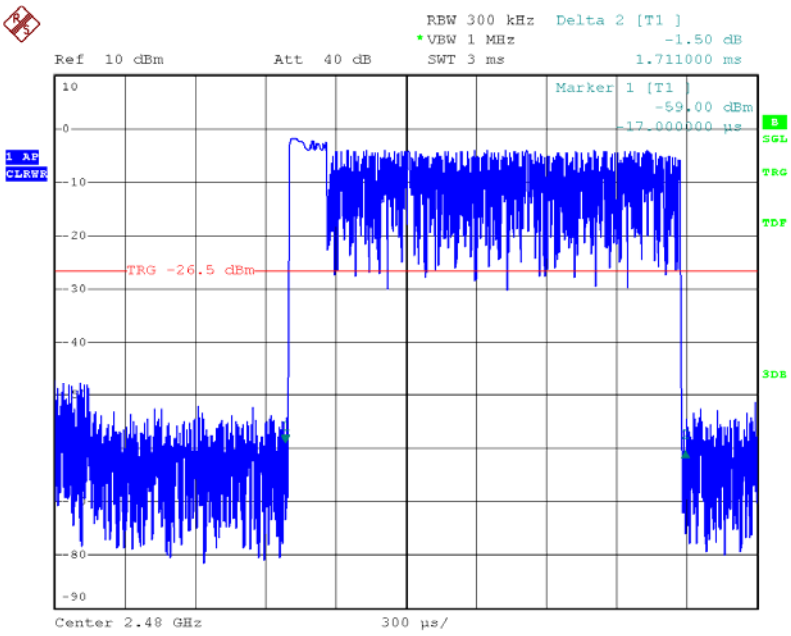

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
1.24 dB
Ref 10 dBm
Att 40 dB
SWT 2 ms
437.000000 µs
Marker 1 [T1]
-58.38 dBm
-5.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
Center 2.441 GHz
200 µs/


RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
-7.67 dB
Ref 10 dBm
Att 40 dB
SWT 2 ms
433.000000 µs
Marker 1 [T1]
-54.15 dBm
-5.000000 µs
1 AP
CLRWR
B
SGL
TRG
TDF
3DB
TRG -26.5 dBm
Center 2.48 GHz
200 µs/

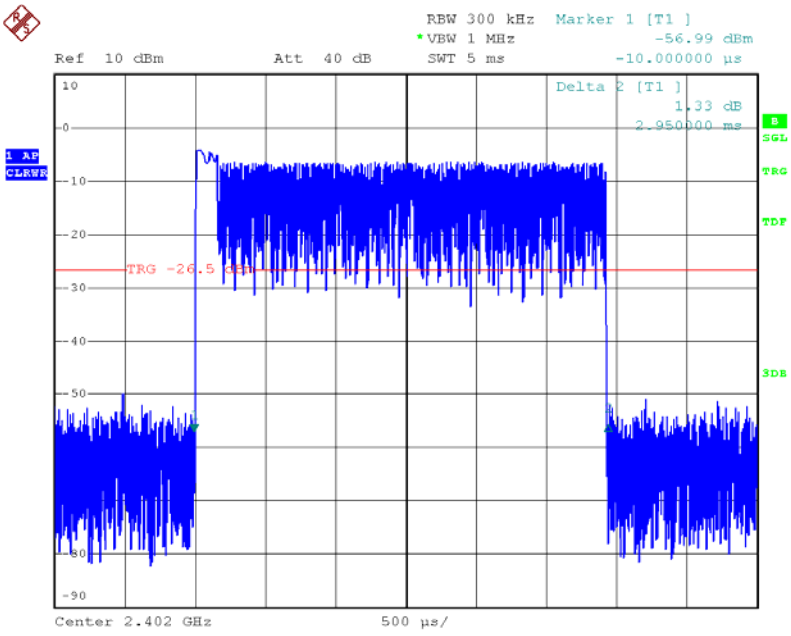
2DH3

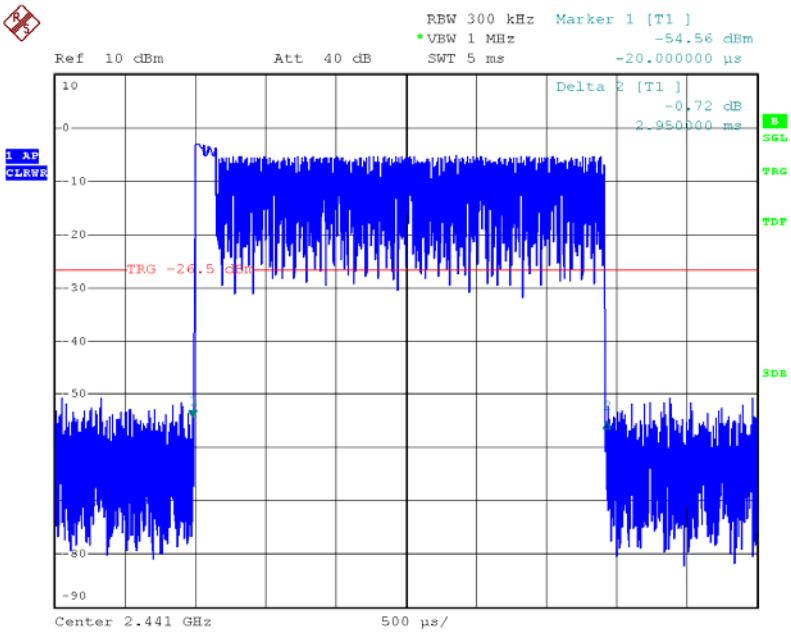

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
-0.02 dB
Ref 10 dBm
Att 40 dB
SWT 3 ms
1.693000 ms
Marker 1 [T1]
-59.50 dBm
-5.000000 µs
TRG -26.5 dBm
Center 2.402 GHz
300 µs/

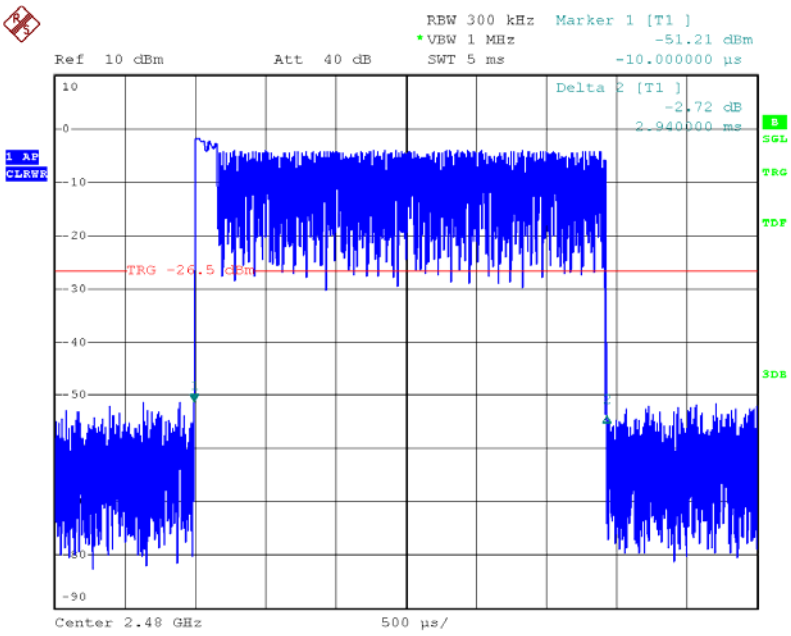

RBW 300 kHz
Delta 2 [T1]
*VBW 1 MHz
-3.89 dB
Ref 10 dBm
Att 40 dB
SWT 3 ms
1.711000 ms
Marker 1 [T1]
-57.40 dBm
-17.000000 µs
TRG -26.5 dBm
Center 2.441 GHz
300 µs/


RBW 300 kHz
*VBW 1 MHz
SWT 3 ms
Delta 2 [T1]
-1.50 dB
1.711000 ms
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-59.00 dBm
-17.000000 µs
TRG -26.5 dBm
Center 2.48 GHz
300 µs/

2DH5

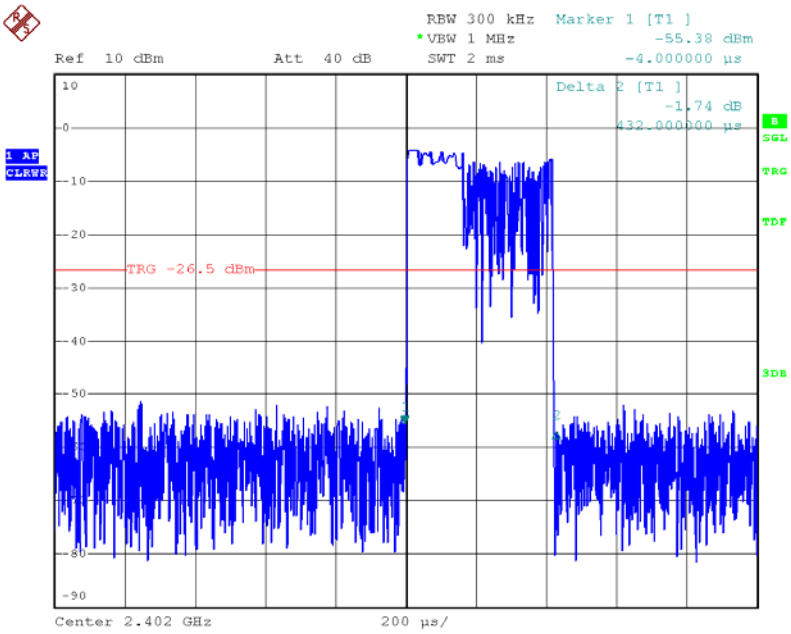

RBW 300 kHz
*VBW 1 MHz
SWT 5 ms
Marker 1 [T1]
-56.99 dBm
-10.000000 µs
Delta 2 [T1]
1.33 dB
2.950000 ms
Ref 10 dBm
Att 40 dB
TRG -26.5 dBm
Center 2.402 GHz
500 µs/

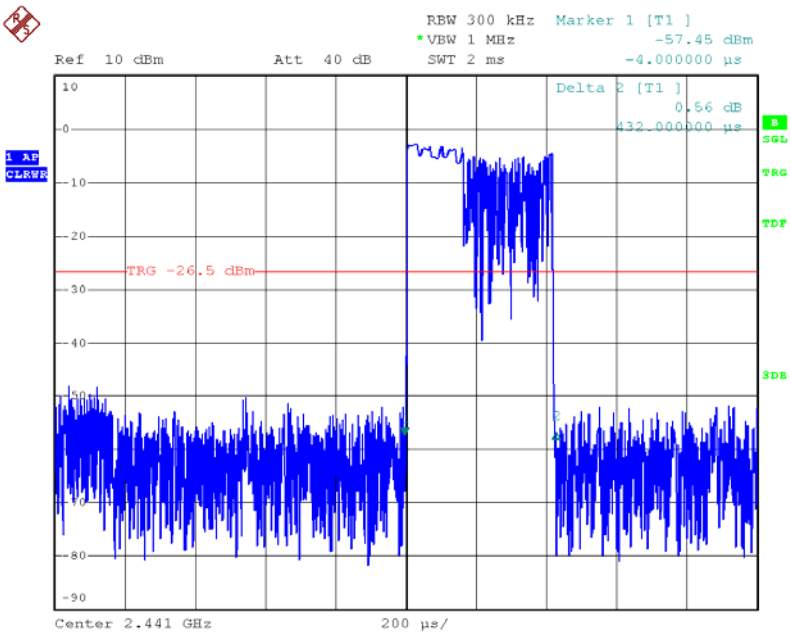

RBW 300 kHz
*VBW 1 MHz
SWT 5 ms
Marker 1 [T1]
-54.56 dBm
-20.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
-0.72 dB
2.950000 ms
TRG -26.5 dBm
Center 2.441 GHz
500 µs/
SGL
TRG
TDF
3DB
CLRWR

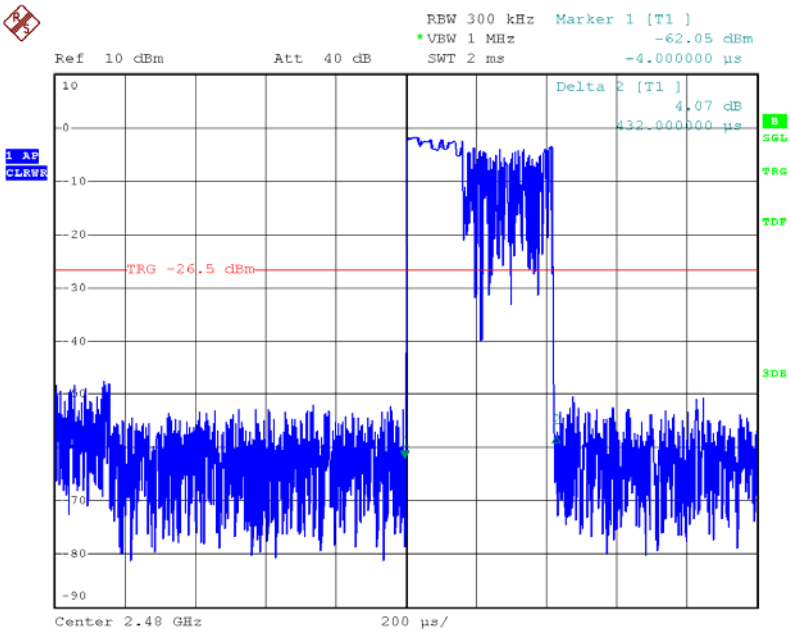

RBW 300 kHz
*VBW 1 MHz
SWT 5 ms
Marker 1 [T1]
-51.21 dBm
-10.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
-2.72 dB
2.940000 ms
TRG -26.5 dBm
Center 2.48 GHz
500 µs/
SGL
TRG
TDF
3DB
CLRWR

8 QPSK

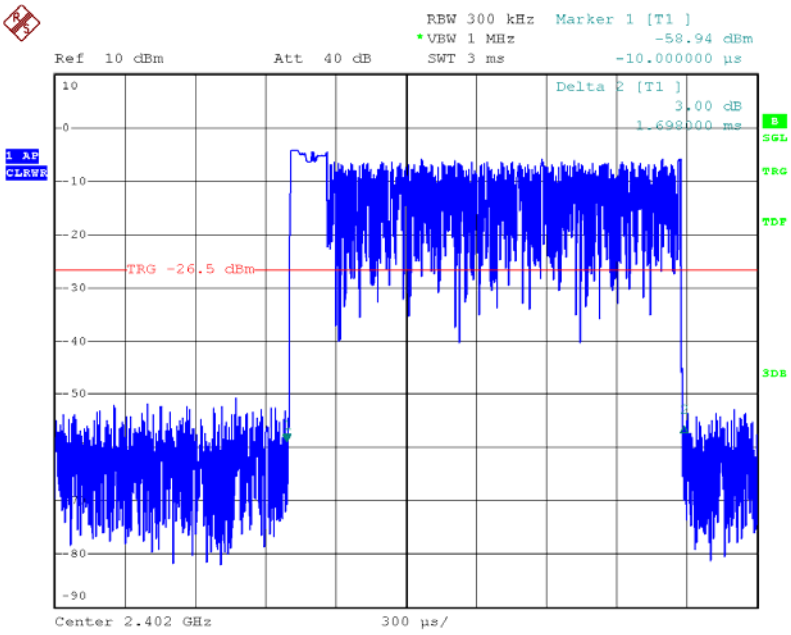
3DH1

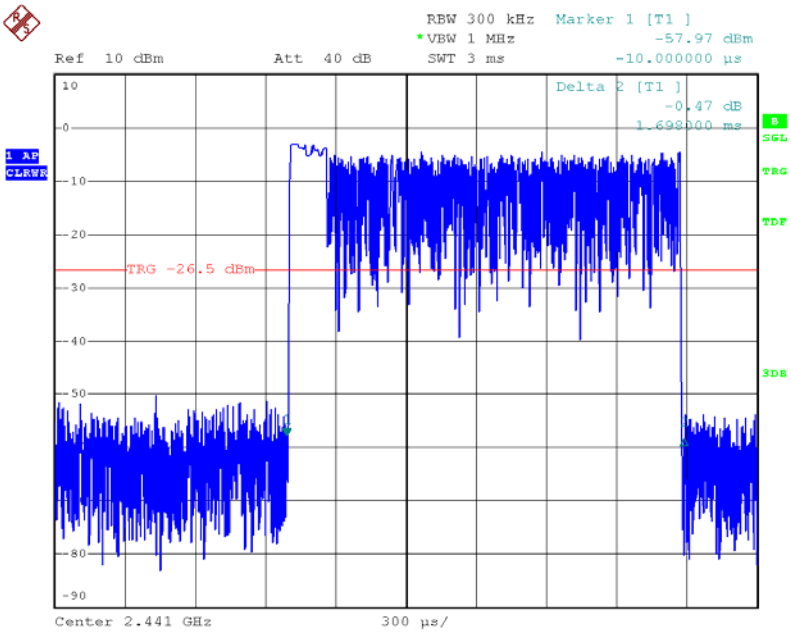

RBW 300 kHz
*VBW 1 MHz
SWT 2 ms
Marker 1 [T1]
-55.38 dBm
-4.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
-1.74 dB
432.000000 µs
TRG -26.5 dBm
Center 2.402 GHz
200 µs/

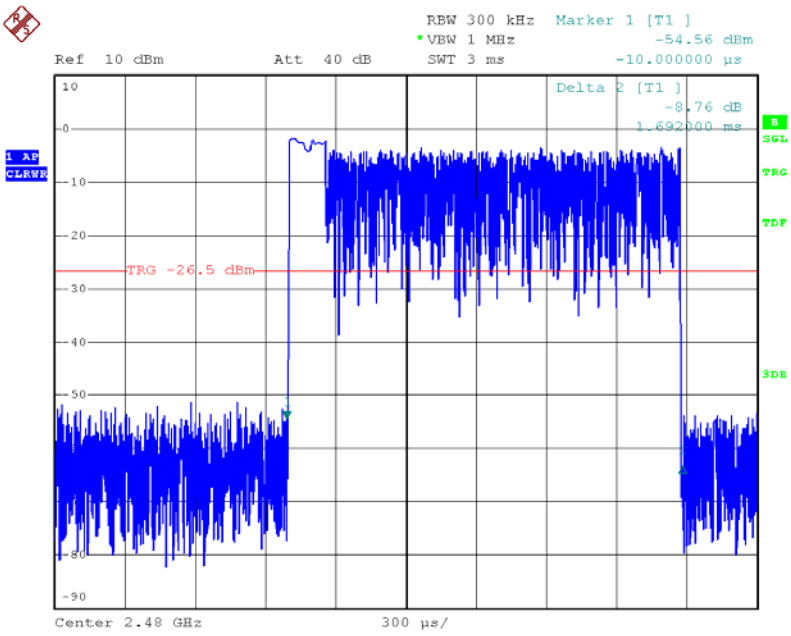

RBW 300 kHz
*VBW 1 MHz
SWT 2 ms
Marker 1 [T1]
-57.45 dBm
-4.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
0.56 dB
432.000000 µs
TRG -26.5 dBm
Center 2.441 GHz
200 µs/


RBW 300 kHz
*VBW 1 MHz
SWT 2 ms
Marker 1 [T1]
-62.05 dBm
-4.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
4.07 dB
432.000000 µs
TRG -26.5 dBm
Center 2.48 GHz
200 µs/

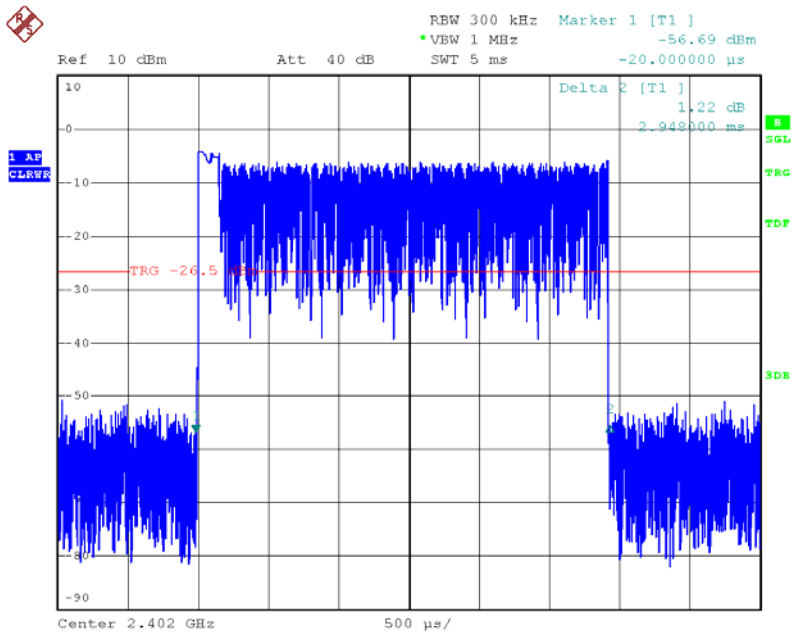
3DH3

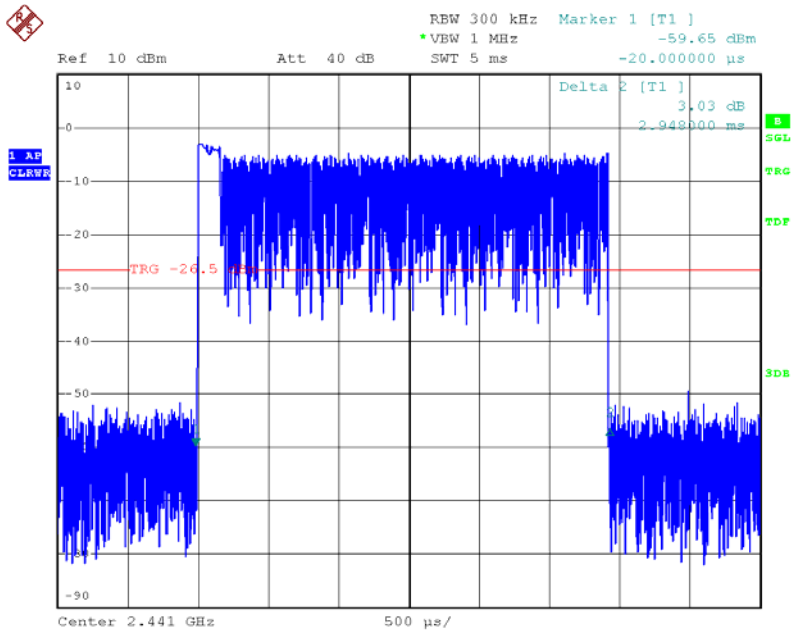

RBW 300 kHz
*VBW 1 MHz
SWT 3 ms
Marker 1 [T1]
-58.94 dBm
-10.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
3.00 dB
1.698000 ms
TRG -26.5 dBm
Center 2.402 GHz
300 µs/

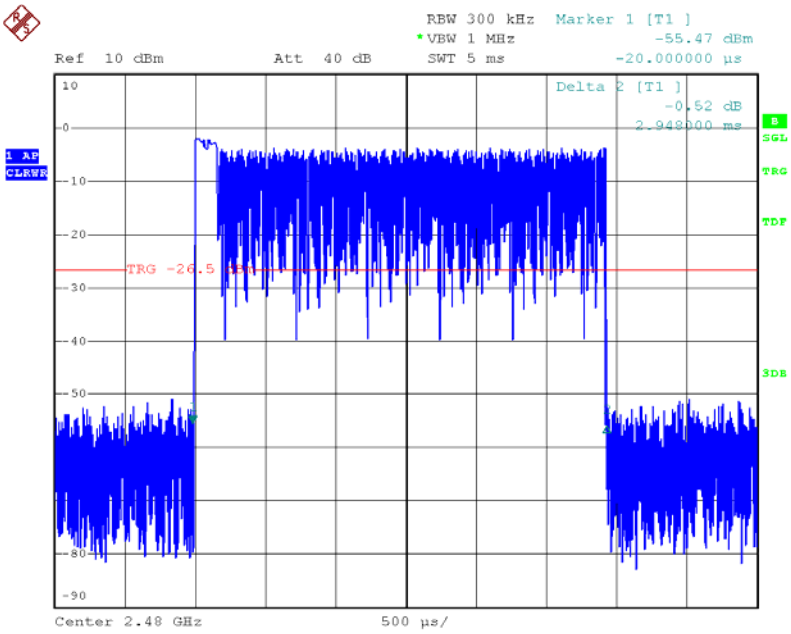

RBW 300 kHz
*VBW 1 MHz
SWT 3 ms
Marker 1 [T1]
-57.97 dBm
-10.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
-0.47 dB
1.698000 ms
TRG -26.5 dBm
Center 2.441 GHz
300 µs/
SGL
TRG
TDF
3DB
CLRWR


RBW 300 kHz
*VBW 1 MHz
SWT 3 ms
Marker 1 [T1]
-54.56 dBm
-10.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
-8.76 dB
1.692000 ms
TRG -26.5 dBm
Center 2.48 GHz
300 µs/
SGL
TRG
TDF
3DB
CLRWR

3DH5


RBW 300 kHz
Marker 1 [T1]
*VBW 1 MHz
-56.69 dBm
Ref 10 dBm
Att 40 dB
SWT 5 ms
-20.000000 µs
Delta 2 [T1]
1.22 dB
2.948000 ms
1 AP
CLRWR
TRG -26.5 dBm
B
SGL
TRG
TDF
3DB
Center 2.402 GHz
500 µs/


RBW 300 kHz
Marker 1 [T1]
*VBW 1 MHz
-59.65 dBm
Ref 10 dBm
Att 40 dB
SWT 5 ms
-20.000000 µs
Delta 2 [T1]
3.03 dB
2.948000 ms
1 AP
CLRWR
TRG -26.5 dBm
B
SGL
TRG
TDF
3DB
Center 2.441 GHz
500 µs/


RBW 300 kHz
*VBW 1 MHz
SWT 5 ms
Marker 1 [T1]
-55.47 dBm
-20.000000 µs
Ref 10 dBm
Att 40 dB
Delta 2 [T1]
-0.52 dB
2.948000 ms
TRG -26.5 dBm
Center 2.48 GHz
500 µs/
SGL
TRG
TDF
3DB
CLRWR

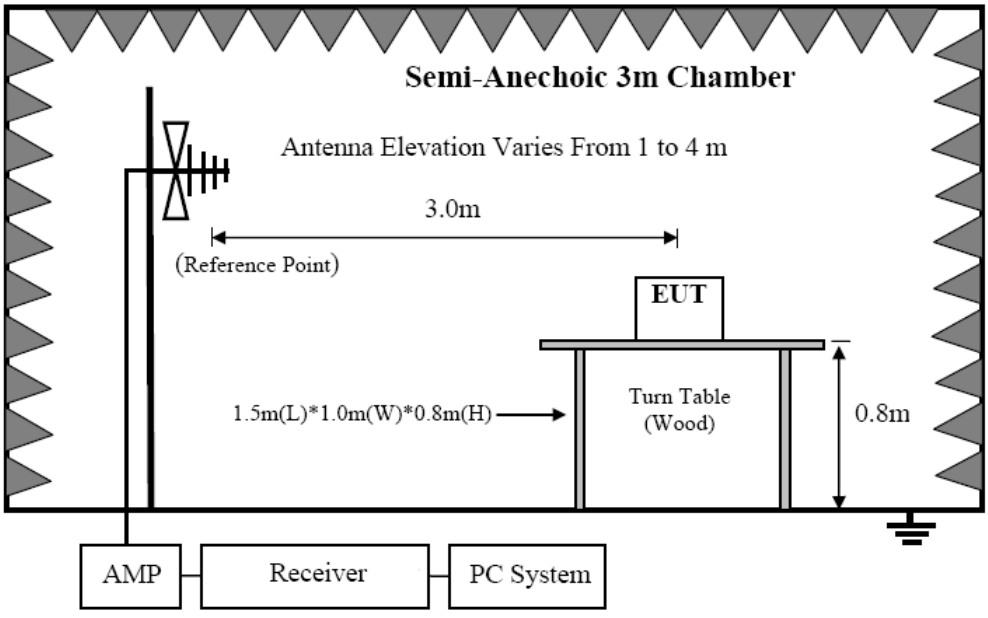
8. Radiated emission

8.1 Test equipment

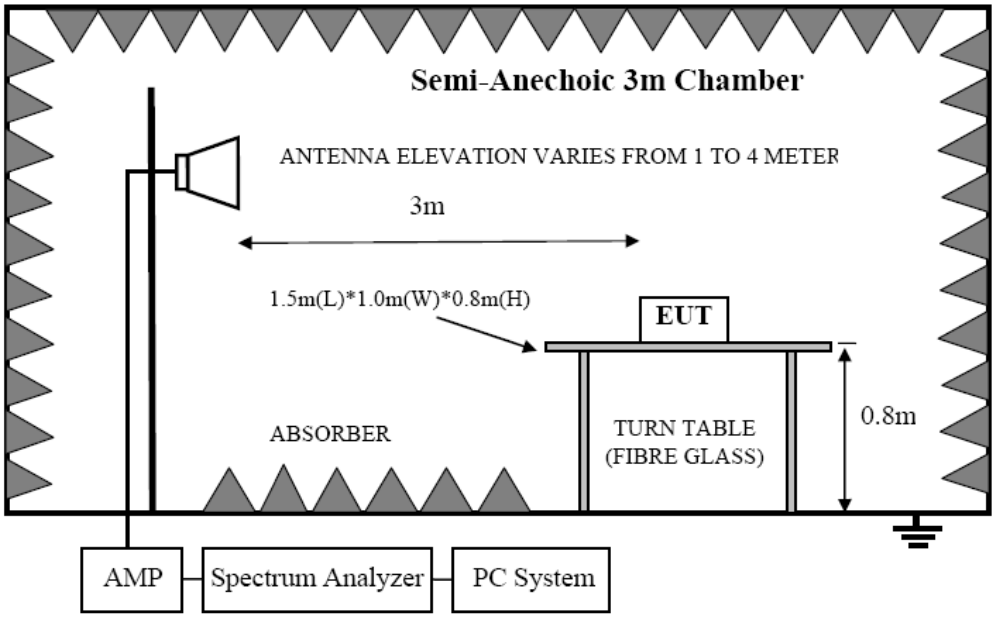
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2014/12/26	1Y
2	Spectrum analyzer	Agilent	E4407B	US40240708	2014/07/17	1Y
3	Loop antenna	Chase	HLA6120	20129	2014/12/27	1Y
4	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2014/12/27	1Y
5	Double Ridged Horn Antenna	R&S	HF907	100276	2014/12/27	1Y
6	Pre-Amplifier	R&S	SCU-01	10049	2014/12/27	1Y
7	Pre-amplifier	A.H.	PAM0-0118	360	2014/12/27	1Y
8	RF Cable	R&S	R01	10403	2014/12/27	1Y
9	RF Cable	R&S	R02	10512	2014/12/27	1Y
10	Horn Antenna	EMCO	3116	9608-4877	2014/12/27	1Y

8.2 Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for below 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 FCC 15.205 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 FCC 15.209 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
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)	

8.3.3 Limit for this EUT

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC 15.209, and FCC 15.247 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 8.2

(3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.

(a) Change work frequency or channel of device if practicable.

(b) Change modulation type of device if practicable.

(c) Change power supply range from 85% to 115% of the rated supply voltage

(d) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

(4) Spectrum frequency from 9MHz to 25GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so below final test was performed with frequency range from 30MHz to 18GHz.

(5) For final emissions measurements at each frequency of interest, the EUT were 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 2009 on Radiated Emission test.

(6) For emissions from 30MHz to 1GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 KHz.

(7)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, Detector is at PK; RBW is set at 1MHz, VBW is set at 10Hz for Average measure, Detector is at PK..

8.5 Test result

PASS. (See below detailed test result)

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, and section 15.205, 15.209 and 15.247, Vertical and Horizontal mode all have been tested ，Horizontal mode is the worse case .with the worst margin reading of:

5.6 dB at 2483.5 MHz in the Pi/4GFSK Horizontal polarization.

Radiated Emission Test Result

Test Site : 3m Chamber
Test Date : 2013-12-7
Tested By : Rock Huang
EUT : SPEAKER
Model Number : M/N: MSH001
Power : DC 5V
Test Mode : Tx mode GFSK
Condition : Temp:24.5'C,Humi:55%
Antenna/Distance : 3m

Frequency	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
(MHz)	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel (2402)									
2402	75.62	PK	H	28	3.65	0	101.27	N/A	N/A
2402	58.26	AV	H	28	3.65	0	89.91	N/A	N/A
2402	69.25	PK	V	28	3.65	0	100.9	N/A	N/A
2402	53.44	AV	V	28	3.65	0	85.09	N/A	N/A
2390	29.26	PK	H	28.4	3.57	0	61.23	74	12.77
2390	15.13	AV	H	28.4	3.57	0	47.1	54	6.9
4804	49.62	PK	H	32.3	5.91	31.78	56.05	74	17.95
4804	33.16	AV	H	32.3	5.91	31.78	39.59	54	14.41
7206	46.27	PK	H	36.3	6.34	30.97	57.94	74	16.06
7206	29.87	AV	H	36.3	6.34	30.97	41.54	54	12.46
9608	44.35	PK	H	37.9	8.01	30.86	59.4	74	14.6
9608	28.12	AV	H	37.9	8.01	30.86	43.17	54	10.83
230.79	42.34	QP	H	12.6	2.41	26.8	30.55	46	15.45
Middle Channel (2441)									
2441	75.09	PK	H	28.7	3.74	0	107.53	N/A	N/A
2441	57.67	AV	H	28.7	3.74	0	90.11	N/A	N/A
2441	70.89	PK	V	28.7	3.74	0	103.33	N/A	N/A
2441	54.88	AV	V	28.7	3.74	0	87.32	N/A	N/A
4882	49.72	PK	H	32.6	6.15	31.78	56.69	74	17.31
4882	33.26	AV	H	32.6	6.15	31.78	40.23	54	13.77
7323	46.18	PK	H	36.7	6.22	30.97	58.13	74	15.87
7323	29.34	AV	H	36.7	6.22	30.97	41.29	54	12.71
9764	44.63	PK	H	38.2	8.11	30.86	60.08	74	13.92
9764	28.14	AV	H	38.2	8.11	30.86	43.59	54	10.41
230.84	42.16	QP	H	12.6	2.41	26.8	30.37	46	15.63
High Channel (2480)									
2480	77.27	PK	H	29.1	3.81	0	106.18	N/A	N/A
2480	60.66	AV	H	29.1	3.81	0	87.57	N/A	N/A
2480	70.71	PK	V	29.1	3.81	0	99.62	N/A	N/A
2480	55.38	AV	V	29.1	3.81	0	84.29	N/A	N/A
2483.5	32.02	PK	H	28.7	3.62	0	62.34	74	9.66
2483.5	16.08	AV	H	28.7	3.62	0	47.98	54	6.02

4960	49.81	PK	H	32.8	6.17	31.78	57	74	17
4960	33.17	AV	H	32.8	6.17	31.78	40.36	54	13.64
7440	46.37	PK	H	36.8	6.26	30.97	58.46	74	15.54
7440	29.58	AV	H	36.8	6.26	30.97	41.67	54	12.33
9920	44.72	PK	H	38.4	8.17	30.86	60.43	74	13.57
9920	28.42	AV	H	38.4	8.17	30.86	44.13	54	9.87
230.66	42.25	QP	H	12.8	2.63	27.2	30.48	46	15.52

Test Site : 3m Chamber
Test Date : 2013-12-7 **Tested By** : Rock Huang
EUT : SPEAKER **Model Number** : M/N: MSH001
Power Supply : DC 5V **Test Mode** : Tx mode Pi/4QPSK
Condition : Temp:24.5'C,Humi:55% **Antenna/Distance** : 3m

Frequency	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
(MHz)	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel (2402)									
2402	73.44	PK	H	28	3.65	0	105.19	N/A	N/A
2402	57.21	AV	H	28	3.65	0	88.86	N/A	N/A
2402	65.58	PK	V	28	3.65	0	97.23	N/A	N/A
2402	51.17	AV	V	28	3.65	0	82.82	N/A	N/A
2390	29.38	PK	H	28.4	3.57	0	61.35	74	12.65
2390	15.42	AV	H	28.4	3.57	0	47.39	54	6.61
4804	48.65	PK	H	32.3	5.91	31.78	55.08	74	18.92
4804	32.64	AV	H	32.3	5.91	31.78	39.07	54	14.93
7206	46.14	PK	H	36.3	6.34	30.97	57.81	74	16.19
7206	29.76	AV	H	36.3	6.34	30.97	41.43	54	12.57
9608	44.51	PK	H	37.9	8.01	30.86	59.56	74	14.44
9608	28.37	AV	H	37.9	8.01	30.86	43.42	54	10.58
230.74	42.63	QP	H	12.8	2.63	27.2	30.86	46	15.14
Middle Channel (2441)									
2441	72.11	PK	H	28.7	3.74	0	104.55	N/A	N/A
2441	54.67	AV	H	28.7	3.74	0	87.11	N/A	N/A
2441	65.81	PK	V	28.7	3.74	0	83.88	N/A	N/A
2441	51.44	AV	V	28.7	3.74	0	84.32	N/A	N/A
4882	48.92	PK	H	32.6	6.15	31.78	55.89	74	18.11
4882	32.72	AV	H	32.6	6.15	31.78	39.69	54	14.31
7323	46.35	PK	H	36.7	6.22	30.97	58.3	74	15.7
7323	30.28	AV	H	36.7	6.22	30.97	42.23	54	11.77
9764	44.24	PK	H	38.2	8.11	30.86	59.69	74	14.31
9764	27.88	AV	H	38.2	8.11	30.86	43.33	54	10.67
230.53	42.14	QP	H	12.8	2.63	27.2	30.37	46	15.63
High Channel (2480)									
2480	74.09	PK	H	29.1	3.81	0	107	N/A	N/A
2480	57.11	AV	H	29.1	3.81	0	90.02	N/A	N/A
2480	65.43	PK	V	29.1	3.81	0	98.34	N/A	N/A
2480	54.26	AV	V	29.1	3.81	0	87.17	N/A	N/A
2483.5	31.25	PK	H	28.7	3.62	0	63.57	74	10.43
2483.5	16.08	AV	H	28.7	3.62	0	48.4	54	5.6

4960	49.75	PK	H	32.8	6.17	31.78	56.94	74	17.06
4960	33.14	AV	H	32.8	6.17	31.78	40.33	54	13.67
7440	46.73	PK	H	36.8	6.26	30.97	58.82	74	15.18
7440	23.34	AV	H	36.8	6.26	30.97	35.43	54	18.57
9920	45.12	PK	H	38.4	8.17	30.86	60.83	74	13.17
9920	28.35	AV	H	38.4	8.17	30.86	44.06	54	9.94
230.27	41.89	QP	H	12.8	2.63	27.2	30.12	46	15.88

Test Site : 3m Chamber
Test Date : 2013-12-7 **Tested By** : Rock Huang
EUT : SPEAKER **Model Number** : M/N: MSH001
Power Supply : DC 5V **Test Mode** : Tx mode 8DPSK
Condition : Temp:24.5'C,Humi:55% **Antenna/Distance** : 3m

Frequency	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
(MHz)	Reading (dBμV)	Detector (PK/QP/ AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/ m)	Margin (dB)
Low Channel (2402)									
2402	73.15	PK	H	28	3.65	0	104.8	N/A	N/A
2402	56.33	AV	H	28	3.65	0	87.98	N/A	N/A
2402	65.97	PK	V	28	3.65	0	97.62	N/A	N/A
2402	51.09	AV	V	28	3.65	0	82.74	N/A	N/A
2390	30.74	PK	H	28.4	3.57	0	62.71	74	11.29
2390	16.05	AV	H	28.4	3.57	0	48.02	54	5.98
4804	49.31	PK	H	32.3	5.91	31.78	55.74	74	18.26
4804	33.02	AV	H	32.3	5.91	31.78	39.45	54	14.55
7206	46.82	PK	H	36.3	6.34	30.97	58.49	74	15.51
7206	29.96	AV	H	36.3	6.34	30.97	41.63	54	12.37
9608	44.67	PK	H	37.9	8.01	30.86	59.72	74	14.28
9608	28.43	AV	H	37.9	8.01	30.86	43.48	54	10.52
230.39	42.54	QP	H	12.8	2.63	27.2	30.77	46	15.23
Middle Channel (2441)									
2441	73.96	PK	H	28.7	3.74	0	106.4	N/A	N/A
2441	57.03	AV	H	28.7	3.74	0	89.47	N/A	N/A
2441	66.31	PK	V	28.7	3.74	0	98.75	N/A	N/A
2441	53.28	AV	V	28.7	3.74	0	85.72	N/A	N/A
4882	49.22	PK	H	32.6	6.15	31.78	56.19	74	17.81
4882	33.03	AV	H	32.6	6.15	31.78	40	54	14
7323	46.52	PK	H	36.7	6.22	30.97	58.47	74	15.53
7323	30.27	AV	H	36.7	6.22	30.97	42.22	54	11.78
9764	45.12	PK	H	38.2	8.11	30.86	60.57	74	13.43
9764	28.64	AV	H	38.2	8.11	30.86	44.09	54	9.91
230.86	42.18	QP	H	12.8	2.63	27.2	30.41	46	15.59
High Channel (2480)									
2480	74.02	PK	H	29.1	3.81	0	106.93	N/A	N/A
2480	56.67	AV	H	29.1	3.81	0	89.58	N/A	N/A
2480	66.77	PK	V	29.1	3.81	0	99.68	N/A	N/A
2480	51.91	AV	V	29.1	3.81	0	84.82	N/A	N/A
2483.5	29.89	PK	H	28.7	3.62	0	62.21	74	11.79
2483.5	15.87	AV	H	28.7	3.62	0	48.19	54	5.81

4960	49.83	PK	H	32.8	6.17	31.78	57.02	74	16.98
4960	33.45	AV	H	32.8	6.17	31.78	40.64	54	13.36
7440	45.76	PK	H	36.8	6.26	30.97	57.85	74	16.15
7440	29.26	AV	H	36.8	6.26	30.97	41.35	54	12.65
9920	44.37	PK	H	38.4	8.17	30.86	60.08	74	13.92
9920	28.13	AV	H	38.4	8.17	30.86	43.84	54	10.16
231.12	42.86	QP	H	12.8	2.63	27.2	31.09	46	14.91

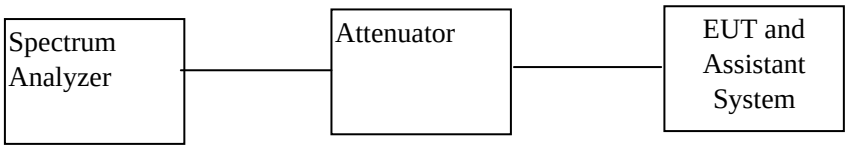
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor
2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit
3. Both restriction band and non- restriction band have been tested ， Only worse cases is reported in tables as above

9.Band Edge Compliance

9.1Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	Spectrum analyzer	Agilent	E4407B	US40240708	2012/07/31	1Y
2	RF Cable	R&S	R02	10512	2012/12/28	1Y

9.2Block diagram of test setup



9.3Limit

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)).

9.4Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. 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.
5. Repeat above procedures until all measured frequencies were complete..

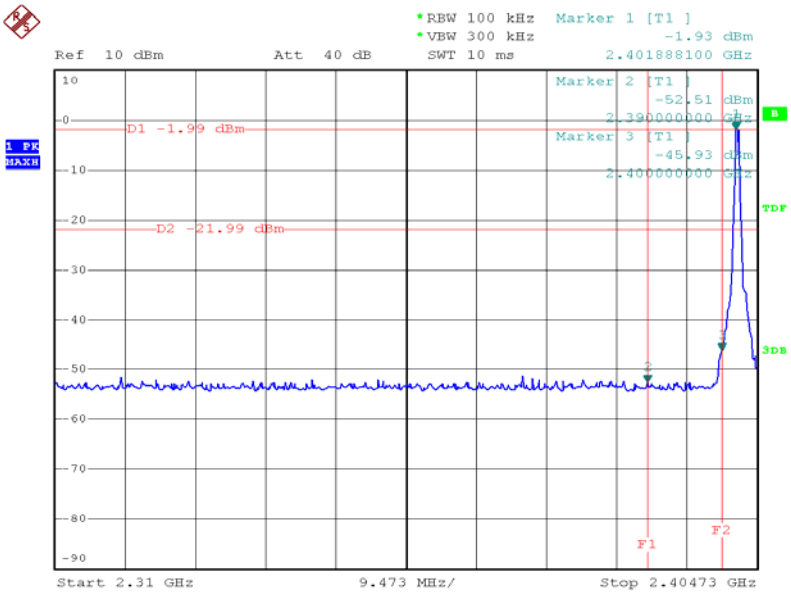
9.5Test result

PASS. (hopping on and hopping off mode all have been tested ，hopping off mode is the worse case ,See below detailed test result)

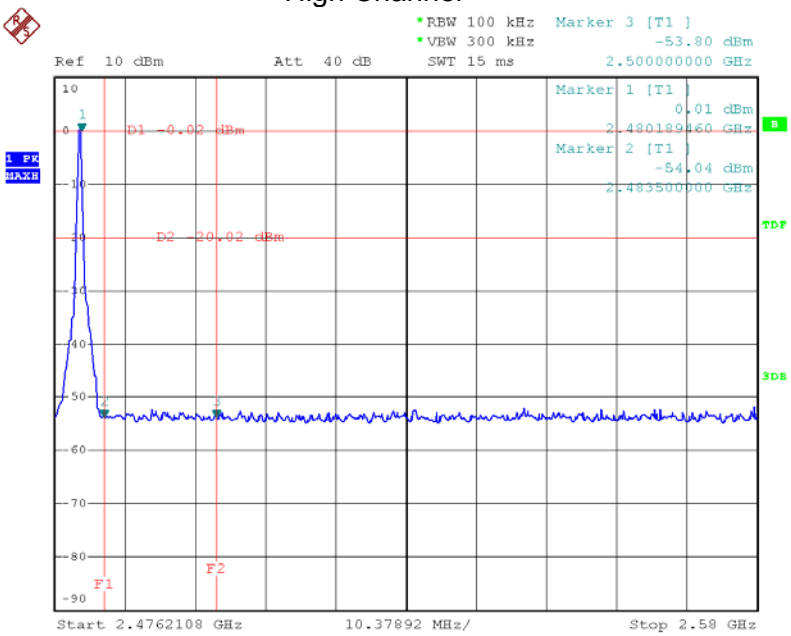
Test Result

GFSK

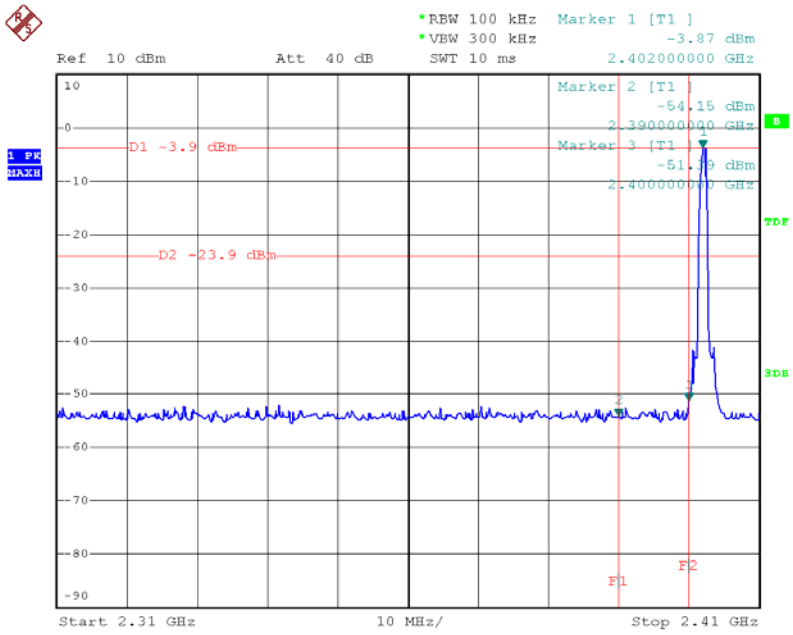
Low Channel

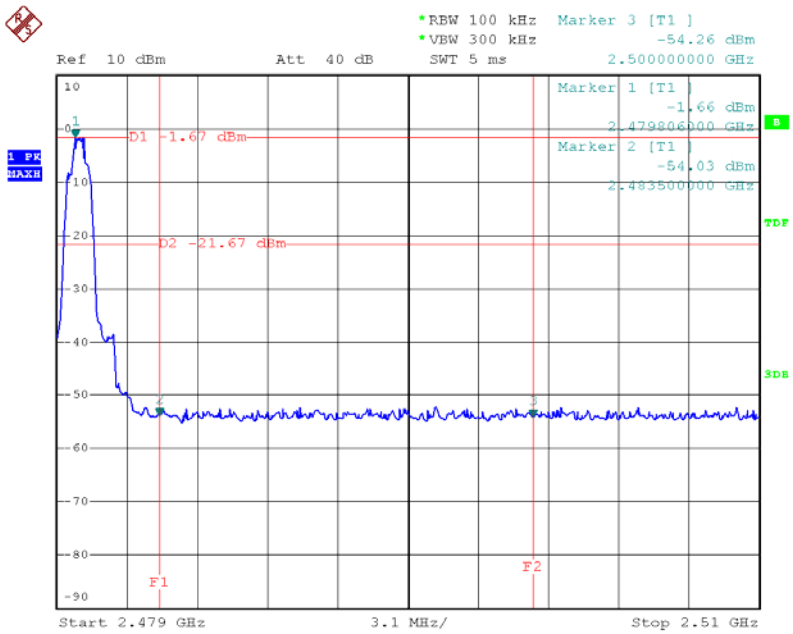


High Channel

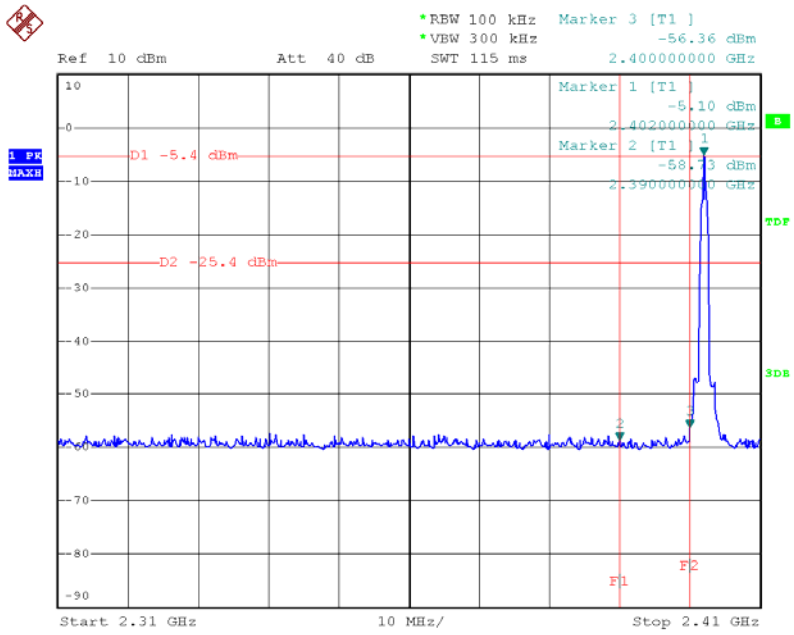


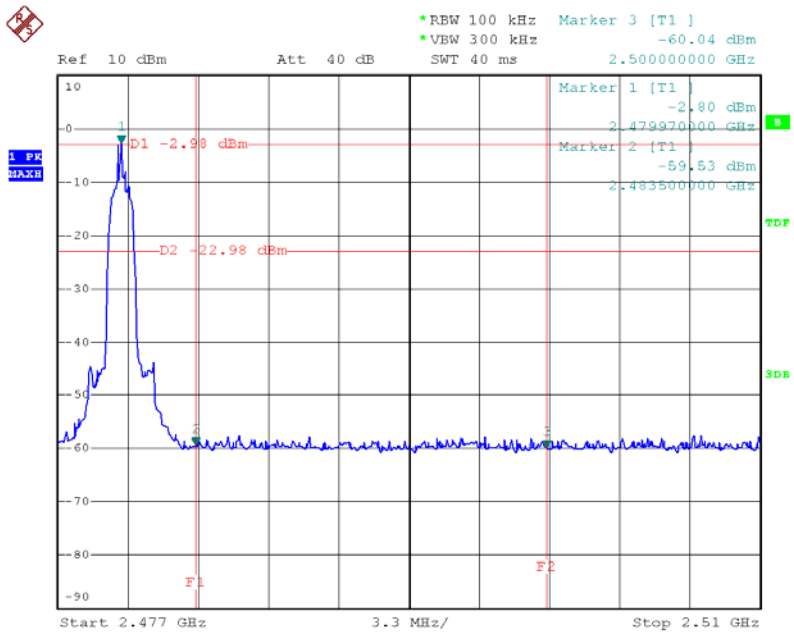
π/4 QPSK:


RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 40 dB
SWT 10 ms
Marker 1 [T1]
-3.87 dBm
2.402000000 GHz
Marker 2 [T1]
-54.15 dBm
2.390000000 GHz
Marker 3 [T1]
-51.89 dBm
2.400000000 GHz
D1 -3.9 dBm
D2 -23.9 dBm
1 PK MAXH
TDF
3DB
F1
F2
Start 2.31 GHz
10 MHz/
Stop 2.41 GHz


RBW 100 kHz
VBW 300 kHz
Ref 10 dBm
Att 40 dB
SWT 5 ms
Marker 3 [T1]
-54.26 dBm
2.500000000 GHz
Marker 1 [T1]
-1.66 dBm
2.479806000 GHz
Marker 2 [T1]
-54.03 dBm
2.483500000 GHz
D1 -1.67 dBm
D2 -21.67 dBm
1 PK MAXH
TDF
3DB
F1
F2
Start 2.479 GHz
3.1 MHz/
Stop 2.51 GHz

8QPSK:


*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
Att 40 dB
SWT 115 ms
Marker 3 [T1]
-56.36 dBm
2.400000000 GHz
Marker 1 [T1]
-5.10 dBm
2.402000000 GHz
Marker 2 [T1]
-58.73 dBm
2.390000000 GHz
D1 -5.4 dBm
D2 -25.4 dBm
1 PK MAXH
TDF
3DB
F1
F2
Start 2.31 GHz
10 MHz/
Stop 2.41 GHz

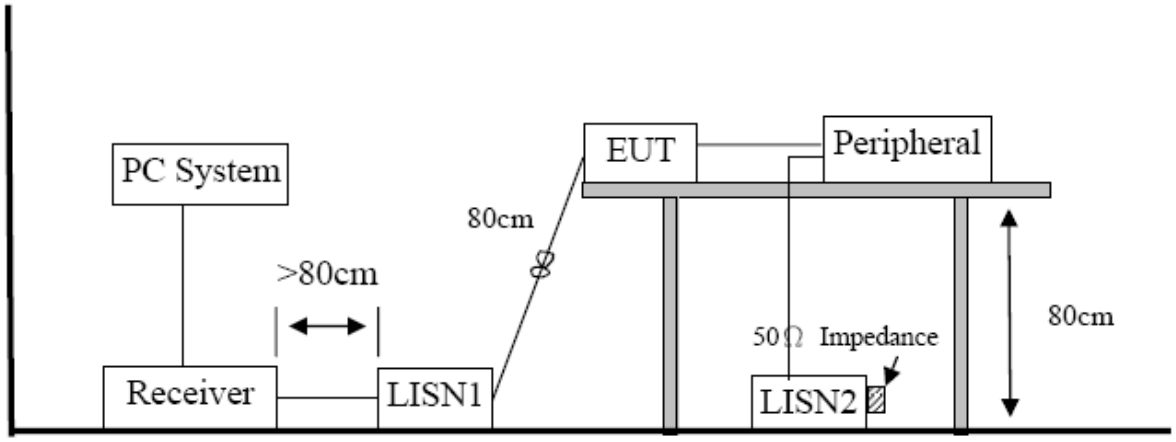

*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
Att 40 dB
SWT 40 ms
Marker 3 [T1]
-60.04 dBm
2.500000000 GHz
Marker 1 [T1]
-2.80 dBm
2.479970000 GHz
Marker 2 [T1]
-59.53 dBm
2.483500000 GHz
D1 -2.98 dBm
D2 -22.98 dBm
1 PK MAXH
TDF
3DB
F1
F2
Start 2.477 GHz
3.3 MHz/
Stop 2.51 GHz

10.Power Line Conducted Emission

10.1Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	Test Receiver	R&S	ESCI	101308	2012/11/26	1 Year
2	LISN 1	AFJ	LS16	16011103219	2012/12/28	1 Year
3	LISN 2	R&S	ESH2-Z5	100309	2012/12/28	1 Year
4	Pulse Limiter	MTS-systemtechnik	MTS-IMP-136	261115-010-0024	2012/12/28	1 Year

10.2Block diagram of test setup



10.3Power 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.

10.4Test 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.

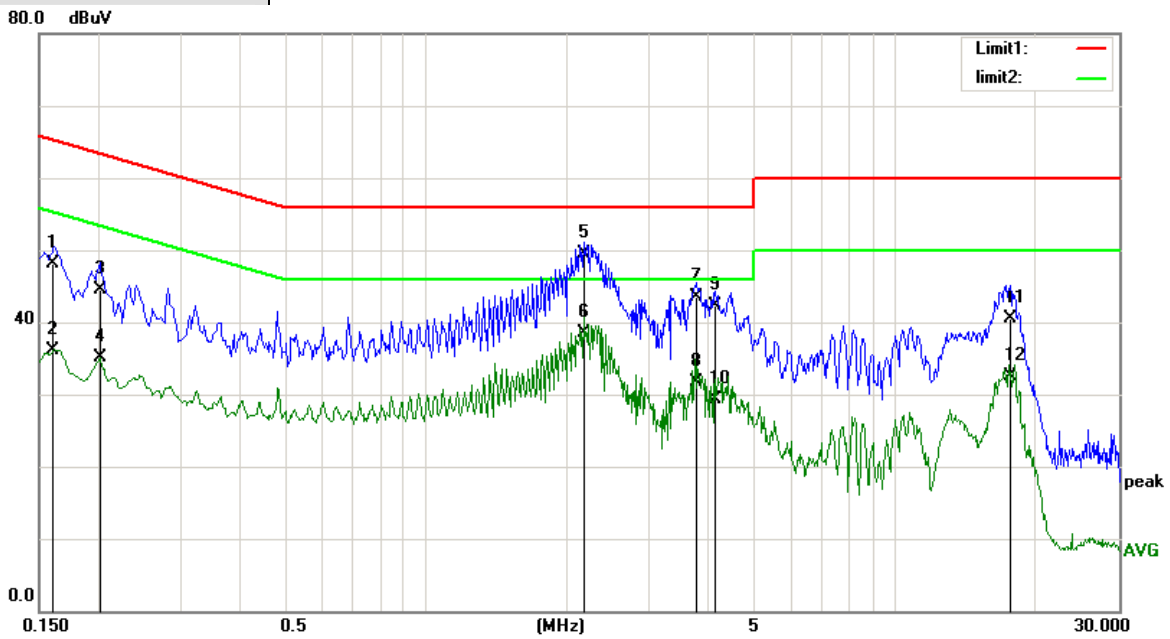
The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 KHz.

10.5 Test Result

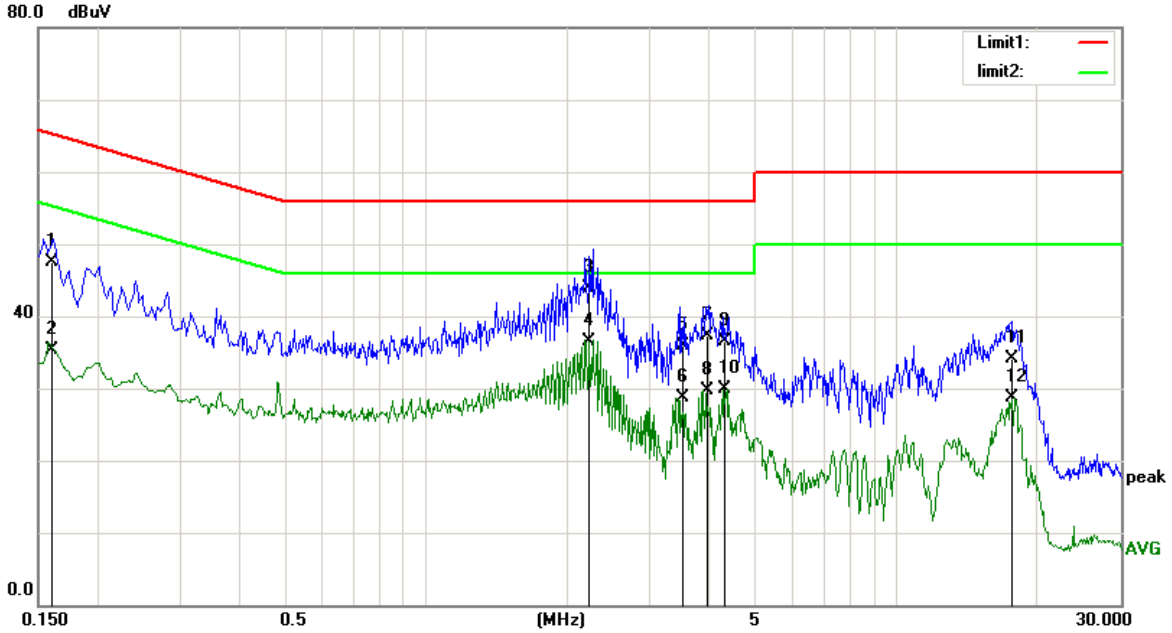
PASS. (See below detailed test result)

EUT:	Power Supply	Model No.:	MSH001
Temperature:	24℃	Relative Humidity:	55%
Probe:	L	Test Power:	120Vac/60Hz
Standard:	(CE)FCC PART 15 classB_OP	Test Result:	Pass
Test Mode:	Working	Test By:	Rock
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1607	36.30	11.71	48.01	65.42	-17.41	QP
2	0.1607	24.49	11.71	36.20	55.42	-19.22	AVG
3	0.2011	33.11	11.34	44.45	63.56	-19.11	QP
4	0.2011	23.79	11.34	35.13	53.56	-18.43	AVG
5	2.1723	39.19	10.22	49.41	56.00	-6.59	QP
6	2.1723	28.27	10.22	38.49	46.00	-7.51	AVG
7	3.7787	33.13	10.37	43.50	56.00	-12.50	QP
8	3.7787	21.35	10.37	31.72	46.00	-14.28	AVG
9	4.1407	31.89	10.41	42.30	56.00	-13.70	QP
10	4.1407	18.86	10.41	29.27	46.00	-16.73	AVG
11	17.6043	29.47	11.09	40.56	60.00	-19.44	QP
12	17.6043	21.49	11.09	32.58	50.00	-17.42	AVG

EUT:	Power Supply	Model No.:	MSH001
Temperature:	24℃	Relative Humidity:	55%
Probe:	N	Test Power:	120Vac/60Hz
Standard:	(CE)FCC PART 15 classB_OP	Test Result:	Pass
Test Mode:	Working	Test By:	Rock
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1607	35.88	11.71	47.59	65.42	-17.83	QP
2	0.1607	23.57	11.71	35.28	55.42	-20.14	AVG
3	2.2263	33.62	10.23	43.85	56.00	-12.15	QP
4	2.2263	26.32	10.23	36.55	46.00	-9.45	AVG
5	3.5231	25.46	10.35	35.81	56.00	-20.19	QP
6	3.5231	18.39	10.35	28.74	46.00	-17.26	AVG
7	3.9659	26.89	10.39	37.28	56.00	-18.72	QP
8	3.9659	19.36	10.39	29.75	46.00	-16.25	AVG
9	4.3284	26.06	10.42	36.48	56.00	-19.52	QP
10	4.3284	19.44	10.42	29.86	46.00	-16.14	AVG
11	17.5775	23.01	11.09	34.10	60.00	-25.90	QP
12	17.5775	17.52	11.09	28.61	50.00	-21.39	AVG

Note1: All emissions not reported below are too low against the prescribed limits.
Note2: "-----" means average detection; "-----" mans peak detection

11. CONDUCTED SPURIOUS EMISSIONS

11.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	Spectrum analyzer	Agilent	E4407B	US40240708	2012/07/31	1Y
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2012/12/28	1 Y
3	RF Cable	Micable	C10-01-01-1	100309	2012/12/28	1Y

11.2. Limit

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

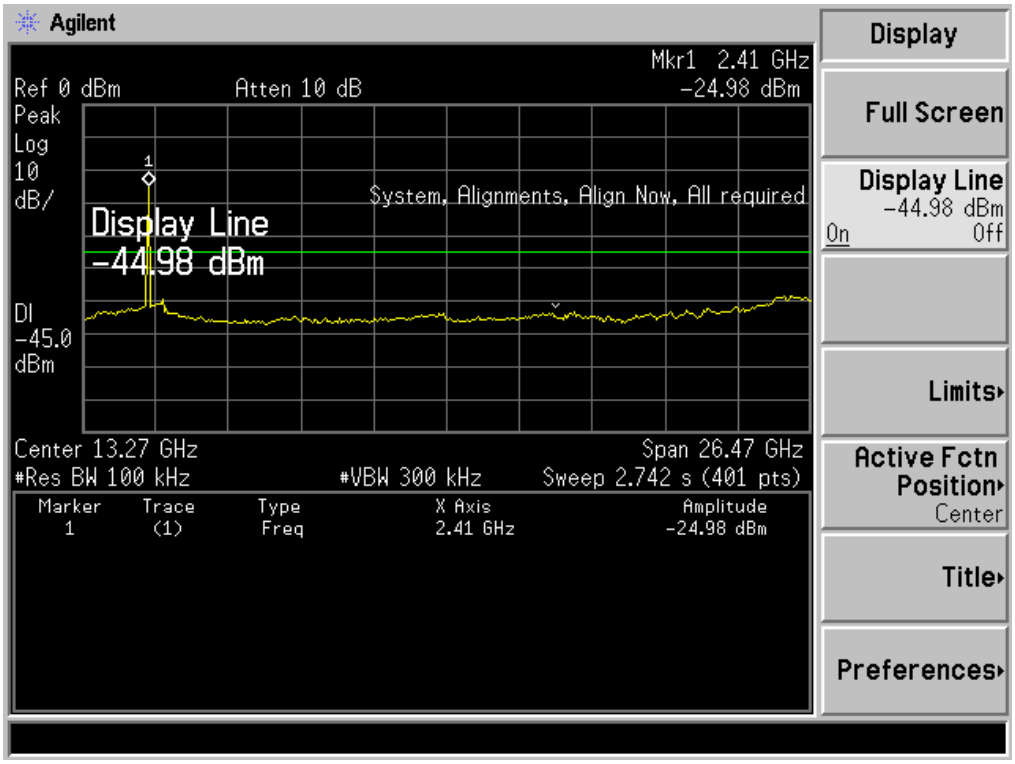
11.3. Test Procedure

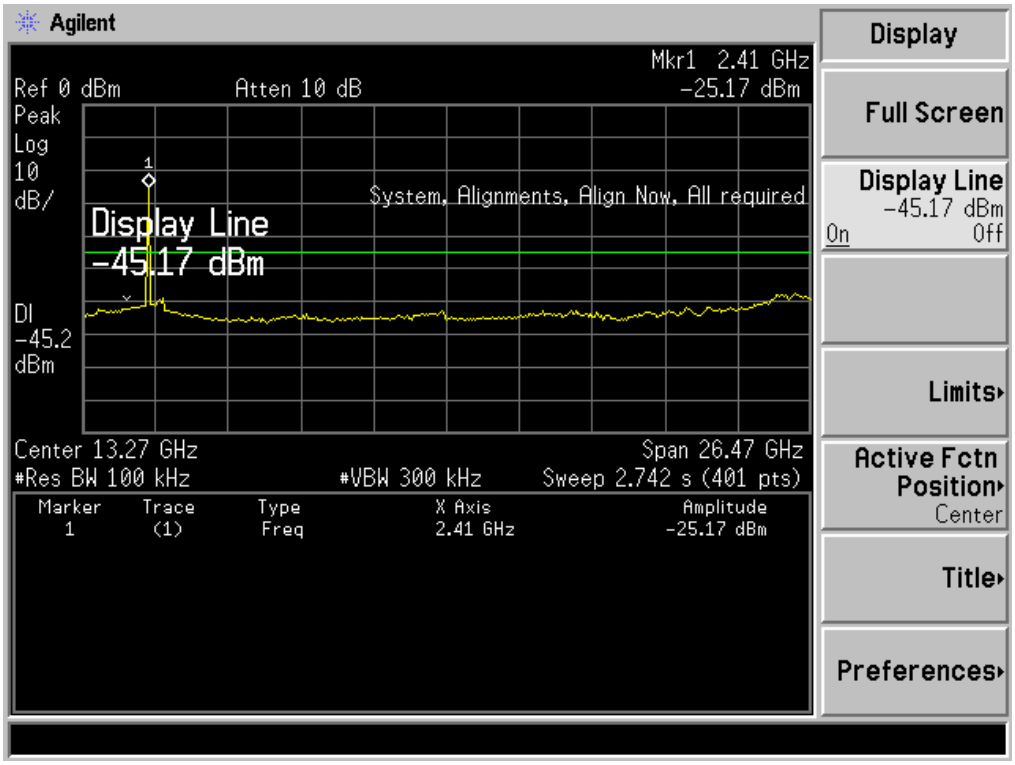
The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions detected.

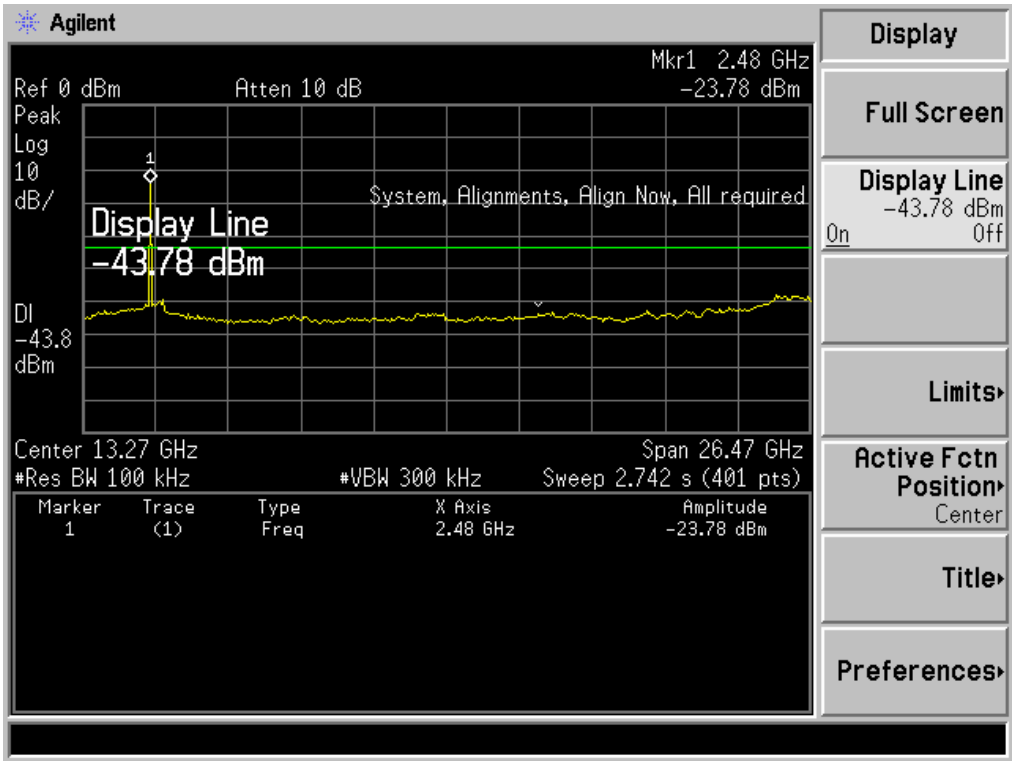
11.4. Test result

PASS (The testing data was attached in the next pages.)

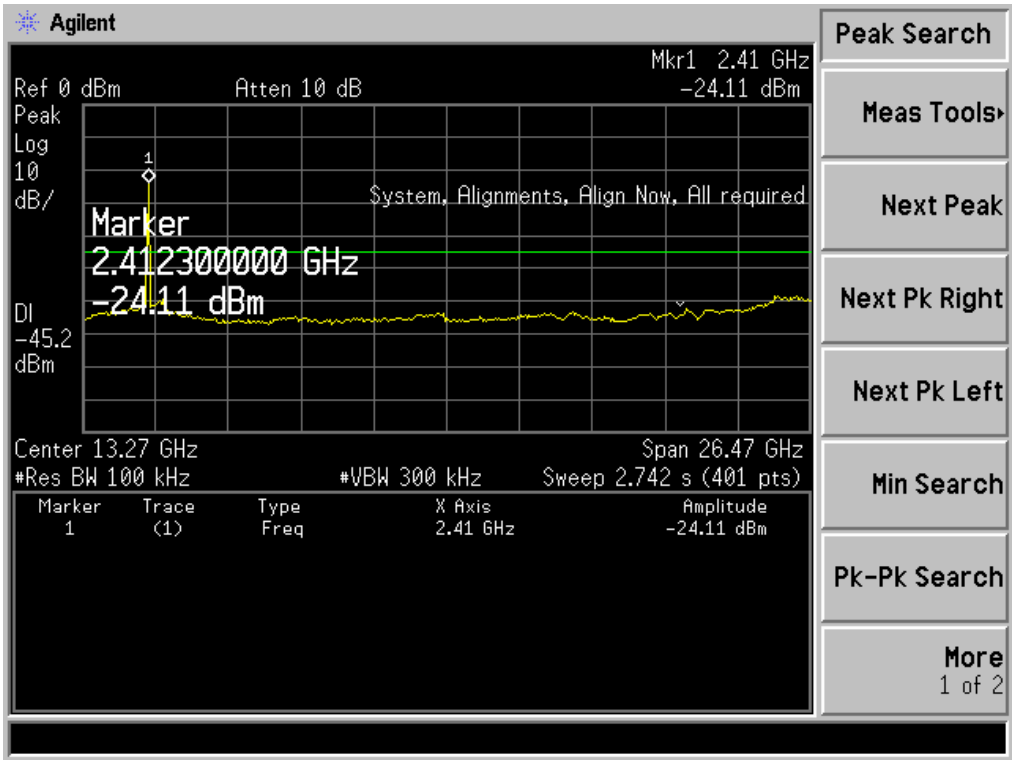
GFSK

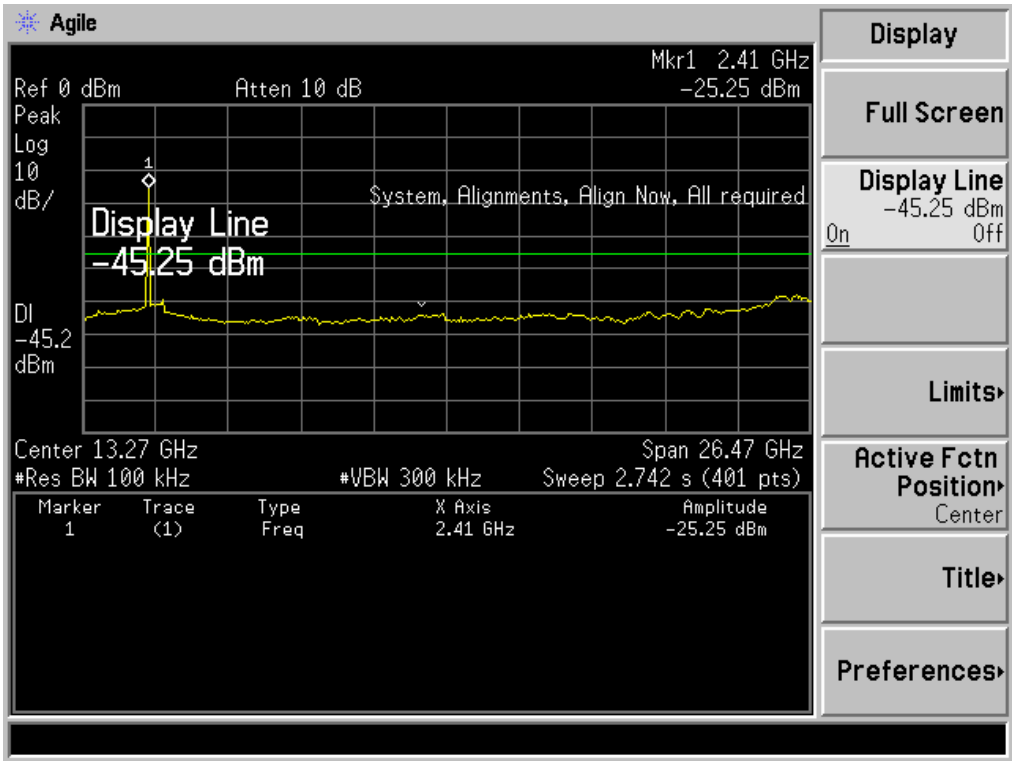

Agilent
Mkr1 2.41 GHz
Ref 0 dBm
Atten 10 dB
-24.98 dBm
Peak
Log
10
dB/
System, Alignments, Align Now, All required
Display Line
-44.98 dBm
Dl
-45.0
dBm
Center 13.27 GHz
Span 26.47 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.742 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.41 GHz -24.98 dBm
Display
Full Screen
Display Line
-44.98 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences

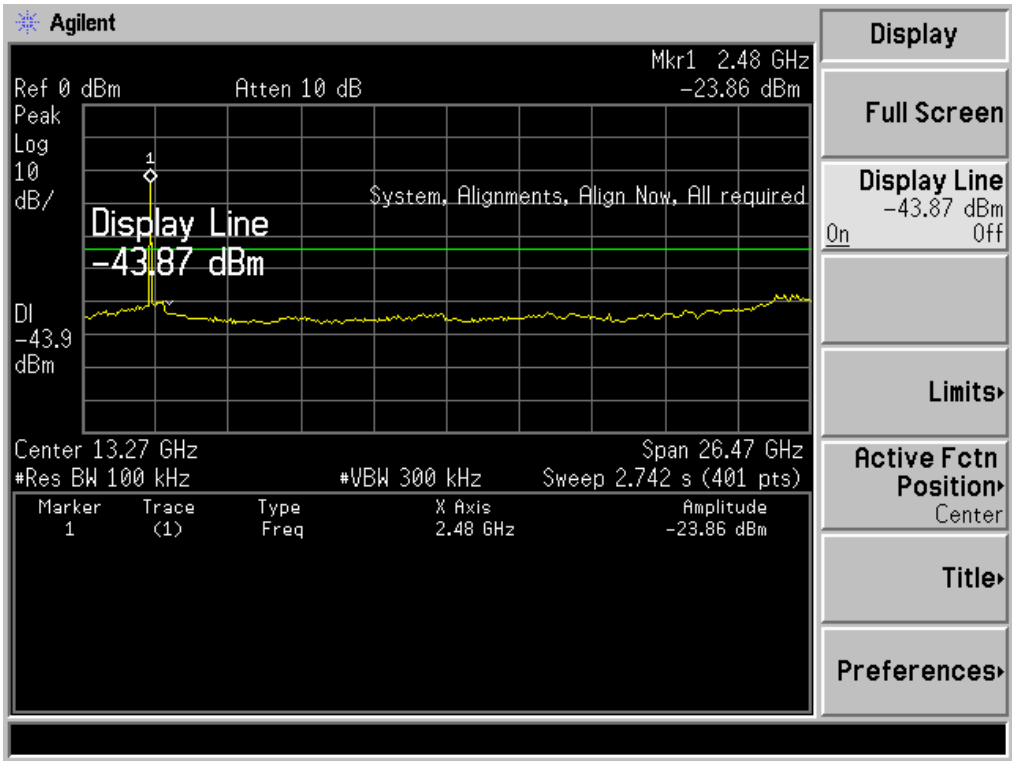

Agilent
Mkr1 2.41 GHz
Ref 0 dBm
Atten 10 dB
-25.17 dBm
Peak
Log
10
dB/
System, Alignments, Align Now, All required
Display Line
-45.17 dBm
Dl
-45.2
dBm
Center 13.27 GHz
Span 26.47 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.742 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.41 GHz -25.17 dBm
Display
Full Screen
Display Line
-45.17 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences


Agilent
Mkr1 2.48 GHz
Ref 0 dBm
Atten 10 dB
-23.78 dBm
Peak
Log
10
dB/
System, Alignments, Align Now, All required
Display Line
-43.78 dBm
Dl
-43.8
dBm
Center 13.27 GHz
Span 26.47 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.742 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.48 GHz -23.78 dBm
Display
Full Screen
Display Line
-43.78 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences

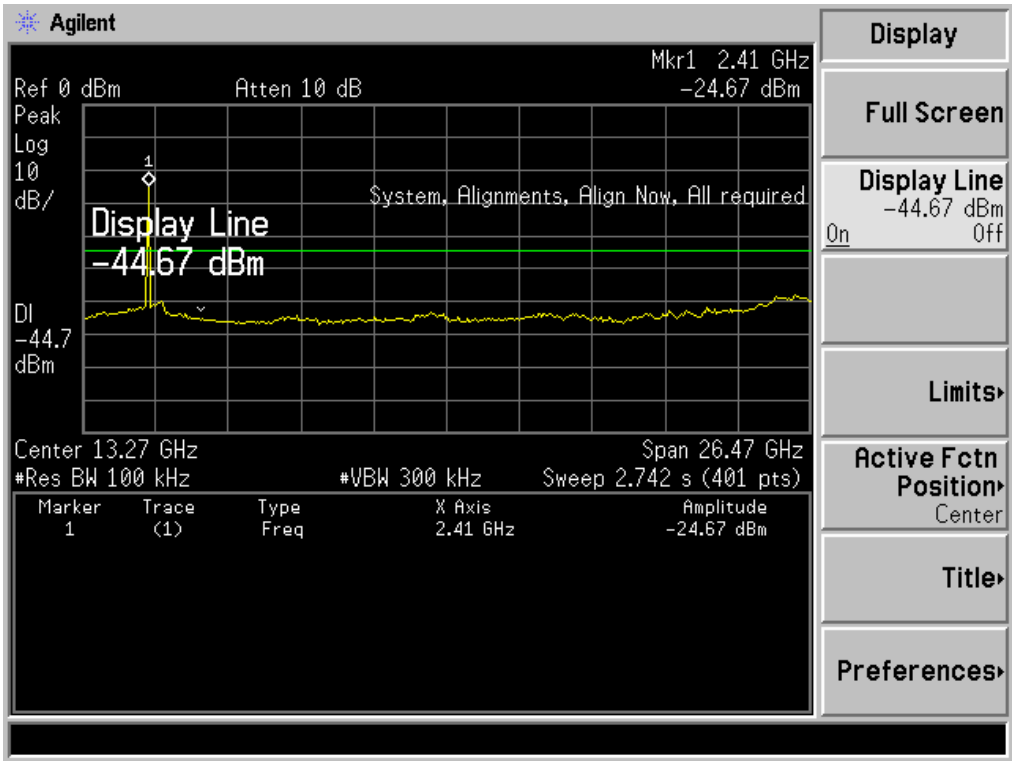
π/4 QPSK

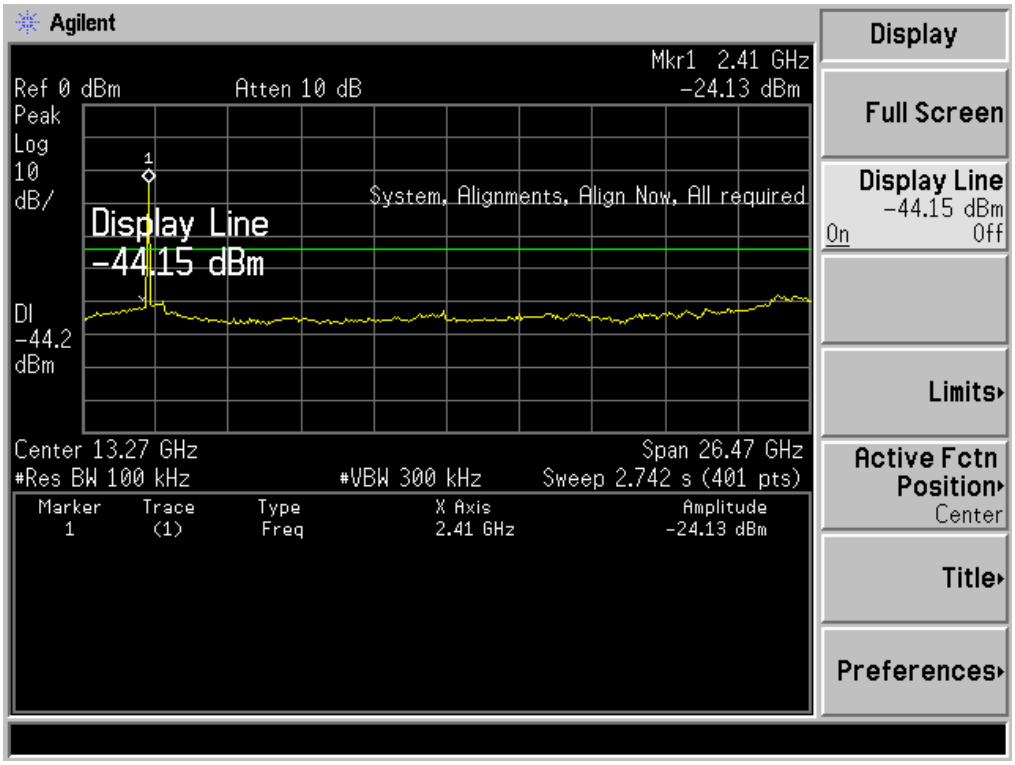

Agilent
Mkr1 2.41 GHz
Ref 0 dBm
Atten 10 dB
-24.11 dBm
Peak
Log
10
dB/
System, Alignments, Align Now, All required
Marker
2.412300000 GHz
-24.11 dBm
Dl
-45.2
dBm
Center 13.27 GHz
Span 26.47 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.742 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.41 GHz -24.11 dBm
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

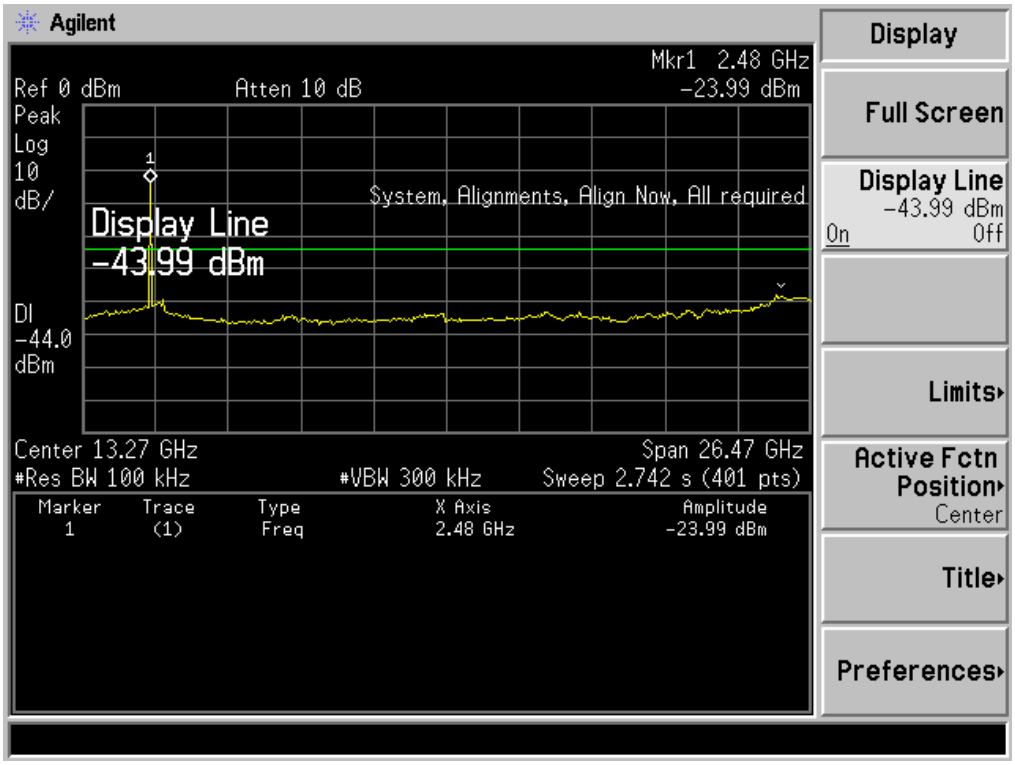

Agile
Mkr1 2.41 GHz
Ref 0 dBm
Atten 10 dB
-25.25 dBm
Peak
Log
10
dB/
System, Alignments, Align Now, All required
Display Line
-45.25 dBm
Dl
-45.2
dBm
Center 13.27 GHz
Span 26.47 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.742 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.41 GHz -25.25 dBm
Display
Full Screen
Display Line
-45.25 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences


Agilent
Mkr1 2.48 GHz
Ref 0 dBm
Atten 10 dB
-23.86 dBm
Peak
Log
10
dB/
System, Alignments, Align Now, All required
Display Line
-43.87 dBm
Dl
-43.9
dBm
Center 13.27 GHz
Span 26.47 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.742 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.48 GHz -23.86 dBm
Display
Full Screen
Display Line
-43.87 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences

8 QPSK


Agilent
Mkr1 2.41 GHz
Ref 0 dBm
Atten 10 dB
-24.67 dBm
Peak
Log
10
dB/
System, Alignments, Align Now, All required
Display Line
-44.67 dBm
Dl
-44.7
dBm
Center 13.27 GHz
Span 26.47 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.742 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.41 GHz -24.67 dBm
Display
Full Screen
Display Line
-44.67 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences


Agilent
Mkr1 2.41 GHz
Ref 0 dBm
Atten 10 dB
-24.13 dBm
Peak
Log
10
dB/
System, Alignments, Align Now, All required
Display Line
-44.15 dBm
Dl
-44.2
dBm
Center 13.27 GHz
Span 26.47 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.742 s (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.41 GHz -24.13 dBm
Display
Full Screen
Display Line
-44.15 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences



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 Result

The antennas used for this product are built-in undetachable dipole antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi.

END OF REPORT