FCC&IC RF TEST REPORT
No. 170600597SHA-001

Applicant	:	DYNAUDIO A/S. Sverigesvej 15, 8660 Skanderborg, Denmark.
Manufacturer	:	GoerTek Dynaudio Co., Ltd. No. 8877 Yingqian Road, High-tech Industrial Development District,Weifang Shandong Province, China
Product Name	:	Intelligent Wireless Music System
Type/Model	:	Music 1
TEST RESULT	**:**	**PASS**

SUMMARY

The equipment complies with the requirements according to the following standard(s) or specification:

47CFR Part 15 (2014): Radio Frequency Devices

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-247 Issue 2 (Feb 2017): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 4 (December 2014): General Requirements for Compliance of Radio Apparatus

Date of issue: July 20, 2017

Prepared by: Reviewed by:

Jesse Xu (*Project Engineer*) Daniel Zhao (*Reviewer*)

FCC ID: 2AK4D-M001
IC: 12734A-M001

Description of Test Facility

Name: Intertek Testing Service Limited Shanghai
Address: Building No.86, 1198 Qinzhou Road(North), Shanghai 200233, P.R. China

FCC Registration Number: 236597
IC Assigned Code: 2402B-1

Name of contact: Jonny Jing
Tel: 86 21 61278271
Fax: 86 21 54262353

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1 GENERAL INFORMATION

1.1 Description of Client

Applicant	:	DYNAUDIO A/S. Sverigesvej 15, 8660 Skanderborg, Denmark.
Name of contact	:	Krestian Pedersen
Tel	:	+45 8652 3411
Fax	:	-
Email	:	KMP@dynaudio.com
Manufacturer	:	GoerTek Dynaudio Co., Ltd. No. 8877 Yingqian Road, High-tech Industrial Development District,Weifang Shandong Province, China

1.2 Identification of the EUT

Product Name	:	Intelligent Wireless Music System
Type/model	:	Music 1
FCC ID	:	2AK4D-M001
IC	:	12734A-M001

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1.3 Technical Specification

Operation Frequency Band	:	2400 – 2483.5 MHz
Protocol	:	Bluetooth Base Rate + EDR
Type of Modulation	:	GFSK, π/4-DQPSK, 8DPSK
Channel Number	:	79 channels
Description of EUT	:	EUT is a bluethooth+WIFI device.This report is only assessed for BT function. We tested it and listed the worst data in this report.
Antenna	:	PCB antenna, 2.0dBi
Rating	:	Adapter: Input :100-240V~50/60Hz 1.3A MAX Output:19V,2A
Category of EUT	:	Class B
EUT type	:	☒ Table top ☐ Floor standing
Sample received date	:	May 15, 2017
Date of test	:	May 16, 2017 –June 05, 2017

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2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2014)
RSS-247 Issue 2 (Feb 2017)
RSS-Gen Issue 4 (December 2014)
ANSI C63.10 (2013)

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

The lowest, middle and highest channel were tested as representatives.

Freq. Band (MHz)	Modulation	Lowest (MHz)	Middle (MHz)	Highest (MHz)
2400-2483.5	GFSK	2402	2441	2480
	π/4-DQPSK	2402	2441	2480
	8DPSK	2402	2441	2480

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	HP, EliteBook 2530P	-
2	Mobile phone	Iphone 6, A1586	

2.5 Instrument list

Selected	Instrument	EC no.	Model	Valid until date
☒	Shielded room	EC 2838	GB88	2018-1-8
☒	EMI test receiver	EC 2107	ESCS 30	2017-10-19
☒	A.M.N.	EC 3119	ESH2-Z5	2017-12-16
☐	A.M.N.	EC 3394	ENV 216	2017-8-1
☒	Semi anechoic chamber	EC 3048	-	2018-5-11
☒	EMI test receiver	EC 3045	ESIB26	2017-10-19
☒	Broadband antenna	EC 4206	CBL 6112D	2018-4-27
☒	Horn antenna	EC 3049	HF906	2018-4-27
☐	Horn antenna	EC 4792-1	3117	2018-4-21
☒	Horn antenna	EC 4792-3	HAP18-26W	2018-6-11
☐	Pre-amplifier	EC 5262	pre-amp 18	2018-5-25
☒	Pre-amplifier	EC 4792-2	TPA0118-40	2018-4-10
☐	High Pass Filter	EC 4797-1	WHKX 1.0/15G-10SS	2018-1-8
☒	High Pass Filter	EC 4797-2	WHKX 2.8/18G-12SS	2018-1-8
☐	High Pass Filter	EC 4797-3	WHKX 7.0/1.8G-8SS	2018-1-8
☒	Band Reject Filter	EC 4797-4	WRCGV2400/2483/10SS	2018-1-8
☐	Test Receiver	EC 4501	ESCI 7	2018-1-13
☒	PXA Signal Analyzer	EC5338	N9030A	2018-5-14
☒	Power sensor/Power meter	EC4318	N1911A/N1921A	2018-4-8
☐	Power sensor	EC5338-1	U2021XA	2018-3-5
☐	MXG Analog Signal Generator	EC5338-2	N5181A	2018-3-5
☐	MXG Vector Signal Generator	EC5175	N51812B	2018-1-8

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2.6 Test Summary

This report applies to tested sample only. The test results have been compared directly with the limits, and the measurement uncertainty is recorded. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
20 dB bandwidth	15.247(a)(1)	RSS-247 Issue 2 Clause 5.1	Tested
Carrier frequency separation	15.247(a)(1)	RSS-247 Issue 2 Clause 5.1	Pass
Maximum peak output power	15.247(b)(1)	RSS-247 Issue 2 Clause 5.4	Pass
Radiated emissions	15.205 & 15.209	RSS-Gen Issue 4 Clause 8.9	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 2 Clause 5.5	Pass
Number of hopping frequencies	15.247(a)(1)(iii)	RSS-247 Issue 2 Clause 5.1	Pass
Dwell time	15.247(a)(1)(iii)	RSS-247 Issue 2 Clause 5.1	Pass
Power line conducted emission	15.207	RSS-Gen Issue 4 Clause 8.8	Pass
Occupied bandwidth	-	RSS-Gen Issue 4 Clause 6.6	Tested

Notes: 1: NA =Not Applicable
2: This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

2.7 Measurement uncertainty

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

TEST ITEM	MEASUREMENT UNCERTAINTY
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

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3 20 dB Bandwidth

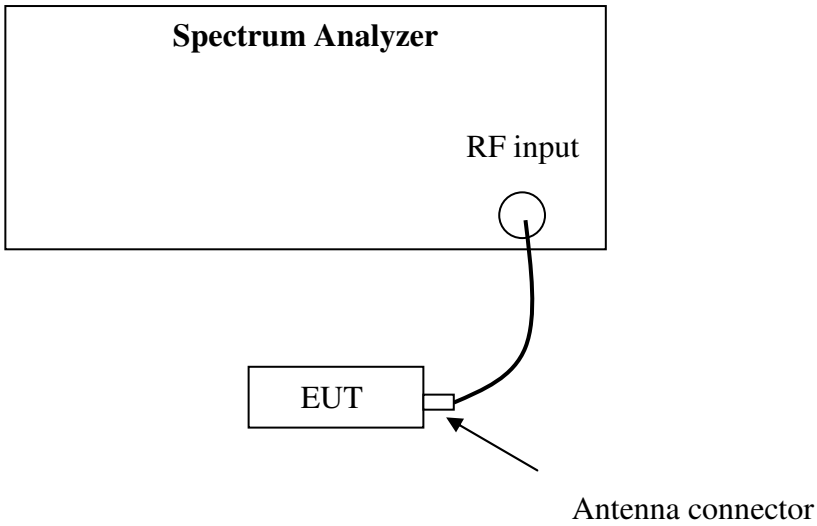
Test result: Pass

3.1 Limit

☐ 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.

☒ 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 125mW.

3.2 Test Configuration



3.3 Test Procedure and test setup

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

The 20 bandwidth per FCC § 15.247(a)(1) is measured using the Spectrum Analyzer with Span = 2 to 3 times the 20 dB bandwidth, RBW≥1% of the 20 dB bandwidth, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).

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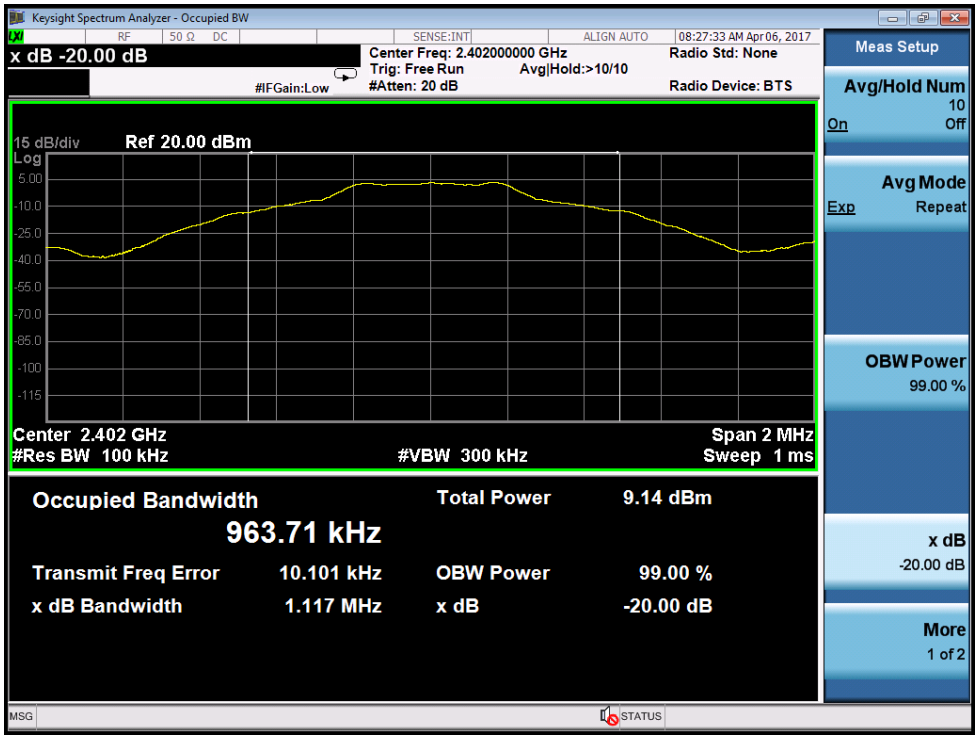
3.4 Test Protocol

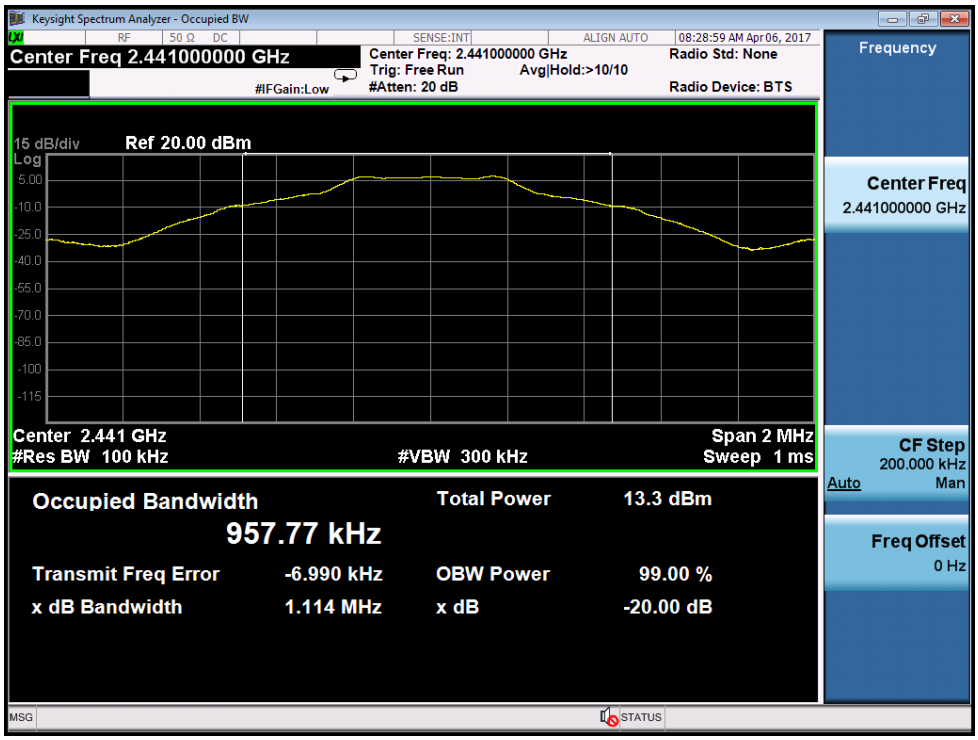
Temperature: 22°C
Relative Humidity: 54%

Modulation	Channel	20dB Bandwidth (kHz)	Two-thirds of Bandwidth (kHz)
GFSK	L	1117	744.67
	M	1114	742.70
	H	1113	742.03

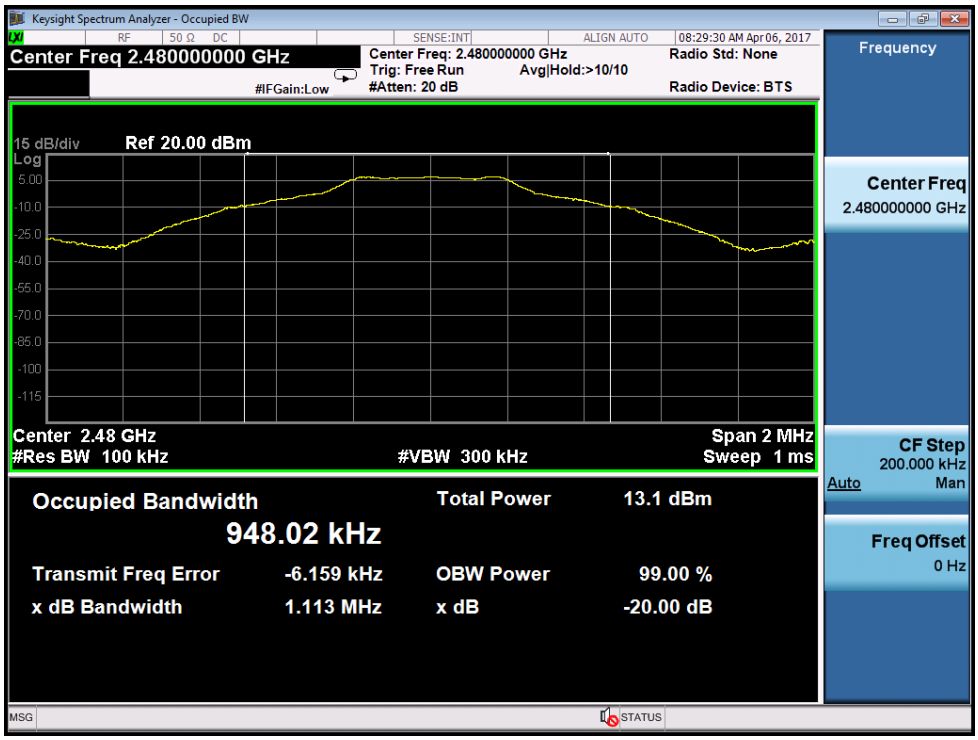
Channel L



Channel M

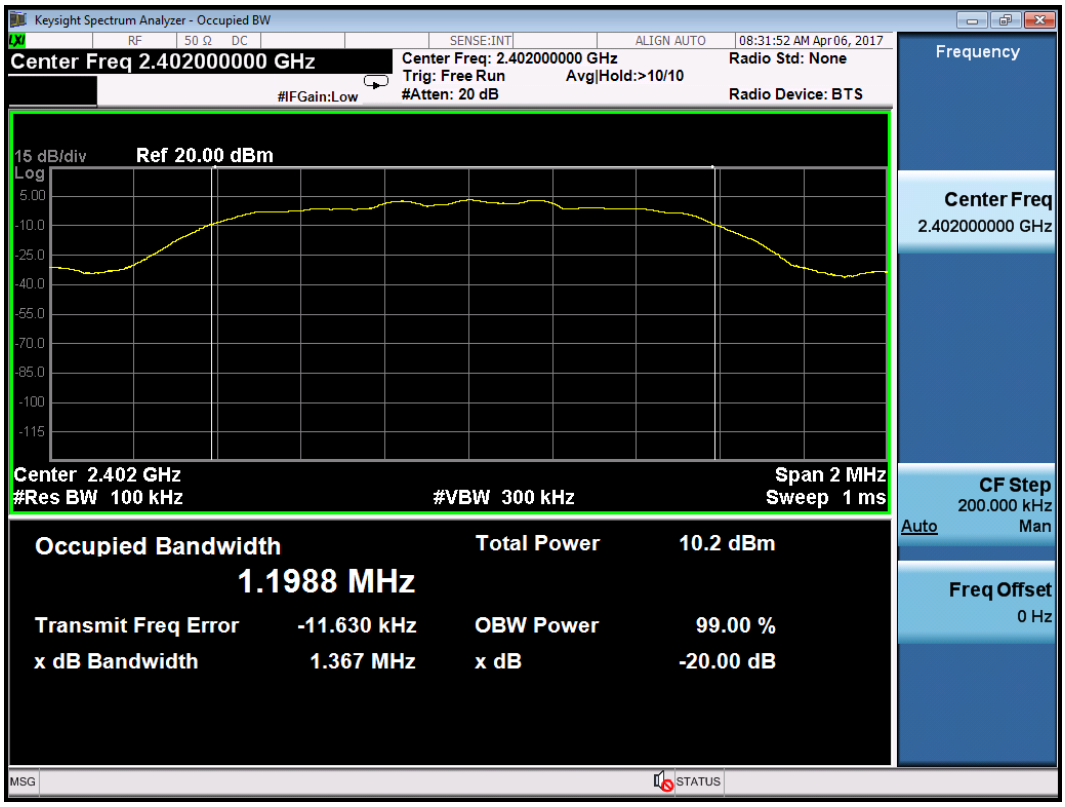


Channel H

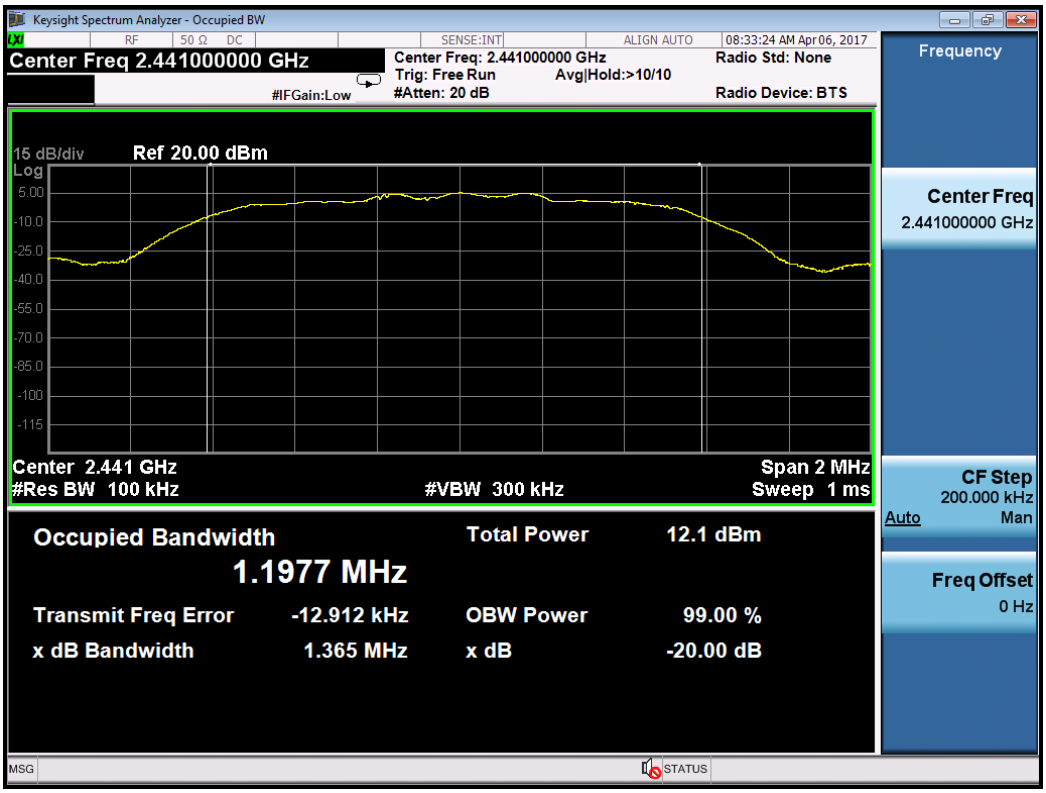


Modulation	Channel	20dB Bandwidth (kHz)	Two-thirds of Bandwidth (kHz)
π/4-DQPSK	L	1367	911.37
	M	1365	910.04
	H	1365	910.04

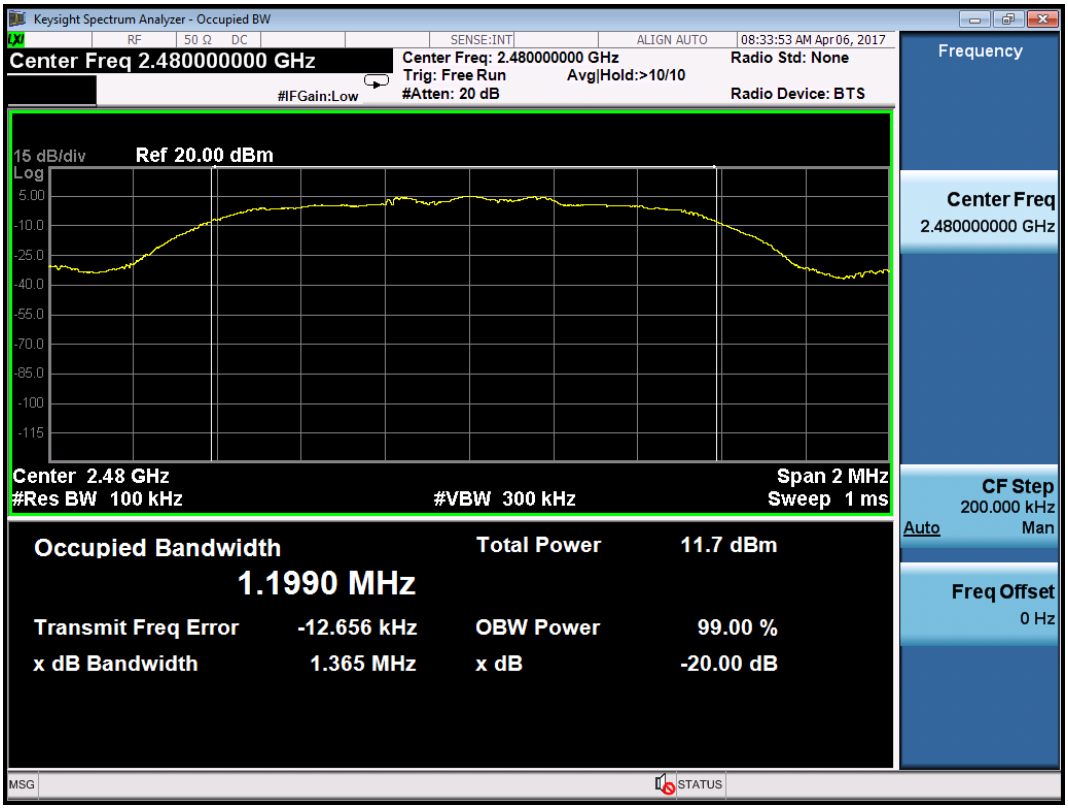
Channel L



Channel M

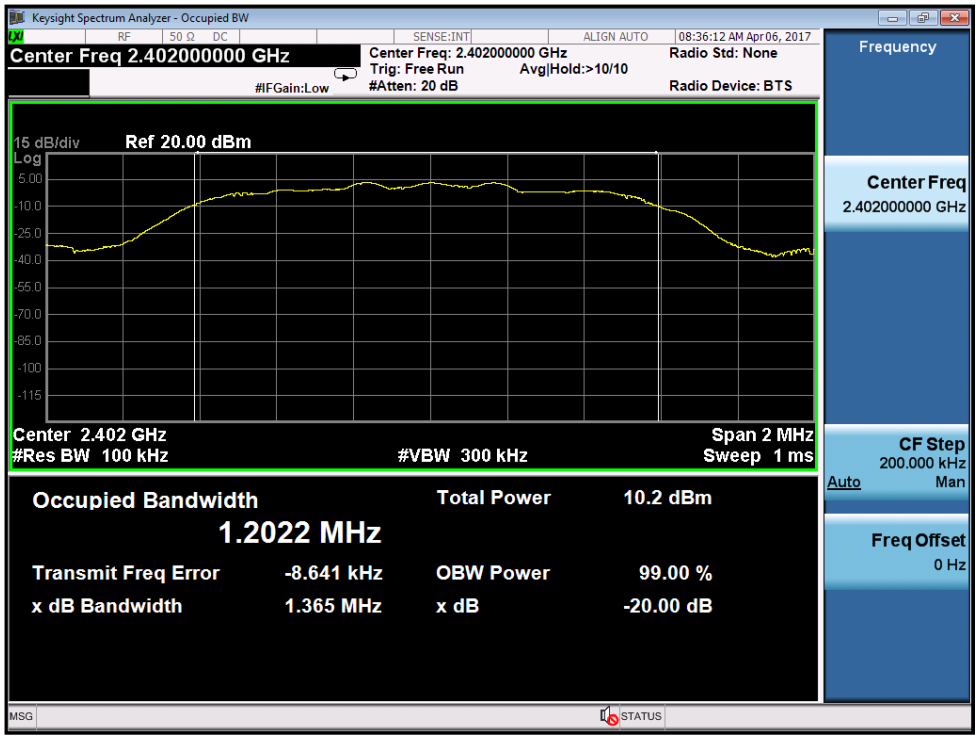


Channel H



Modulation	Channel	20dB Bandwidth (kHz)	Two-thirds of Bandwidth (kHz)
8DPSK	L	1365	910.00
	M	1370	913.37
	H	1367	911.37

Channel L



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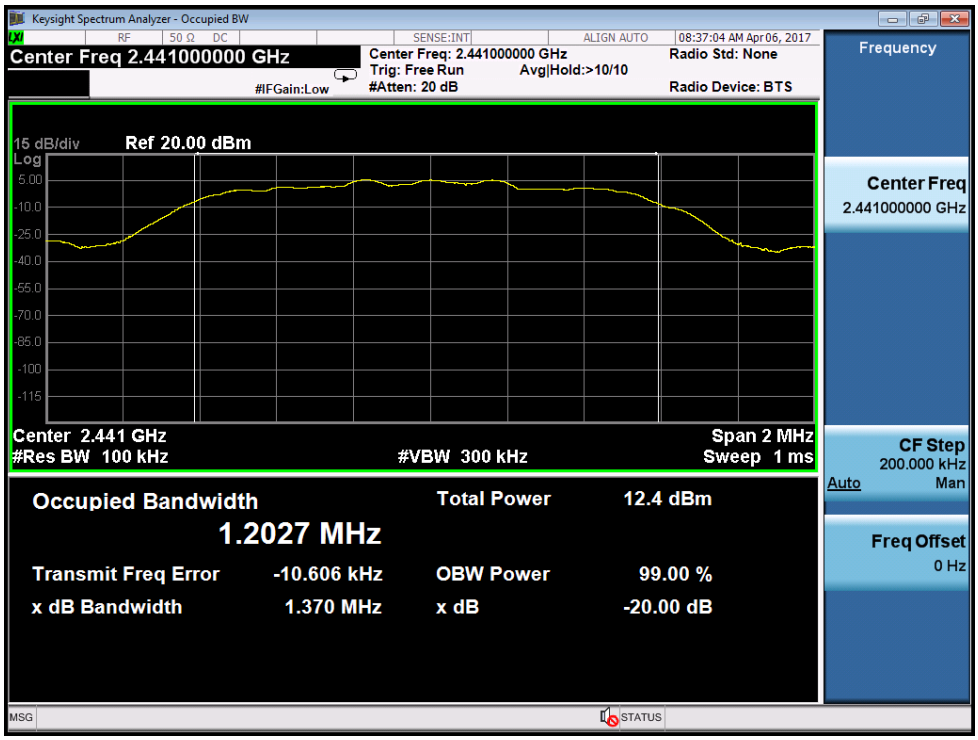
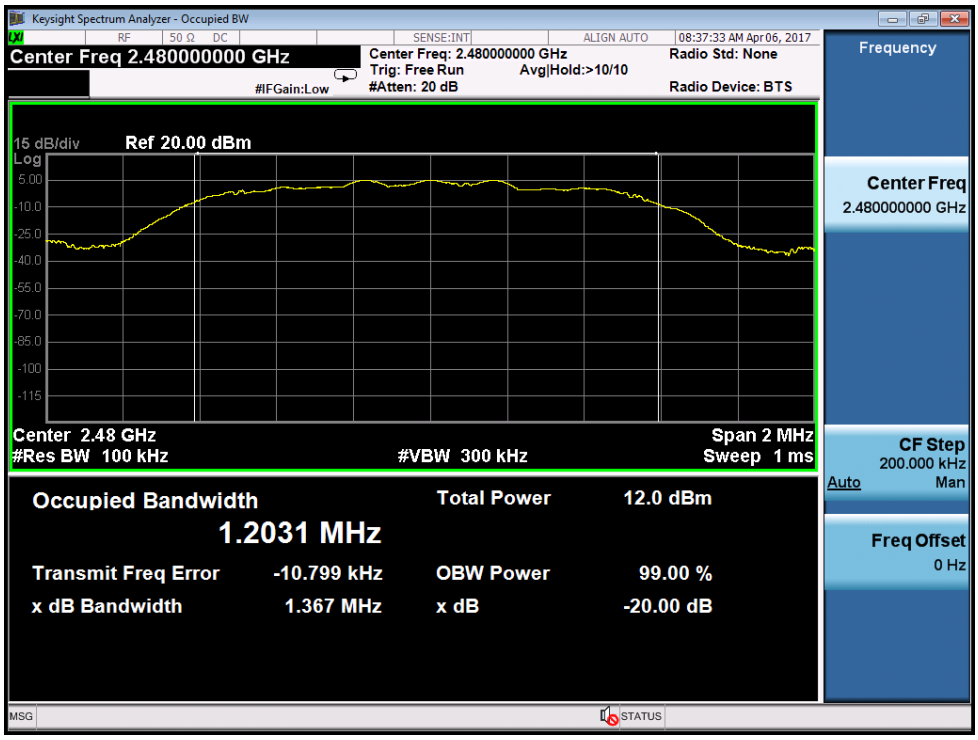
Channel M



Channel H



4 Carrier frequency separation

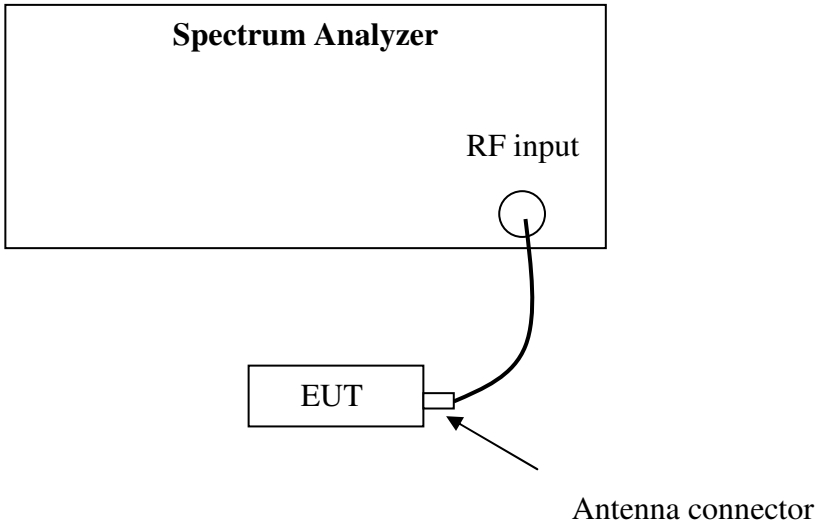
Test result: Pass

4.1 Test limit

☐ Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

☒ 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 125mW.

4.2 Test Configuration



4.3 Test procedure and test setup

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

The Carrier frequency separation per FCC § 15.247(a)(1) is measured using the Spectrum Analyzer with Span can capture two adjacent channels, RBW≥1% of the span, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).

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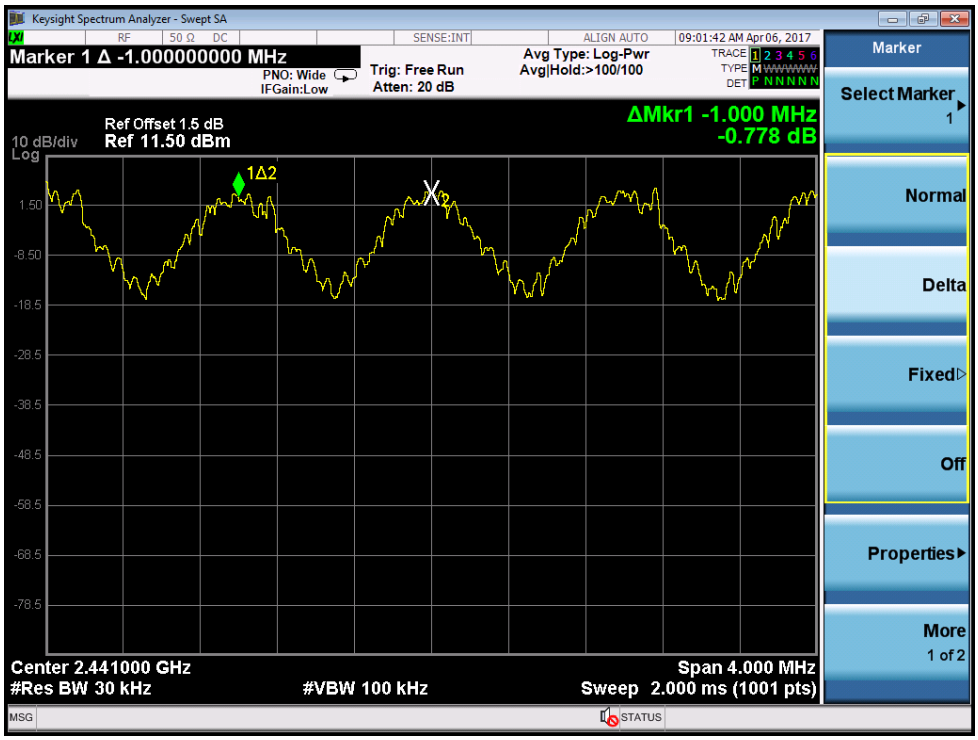
4.4 Test protocol

Temperature: 22 °C
Relative Humidity: 54 %

Modulation	Channel	Frequency Separation (kHz)	Limit (kHz)
GFSK	L	1004	≥744.67
	M	1000	≥742.70
	H	1000	≥742.03

Channel L

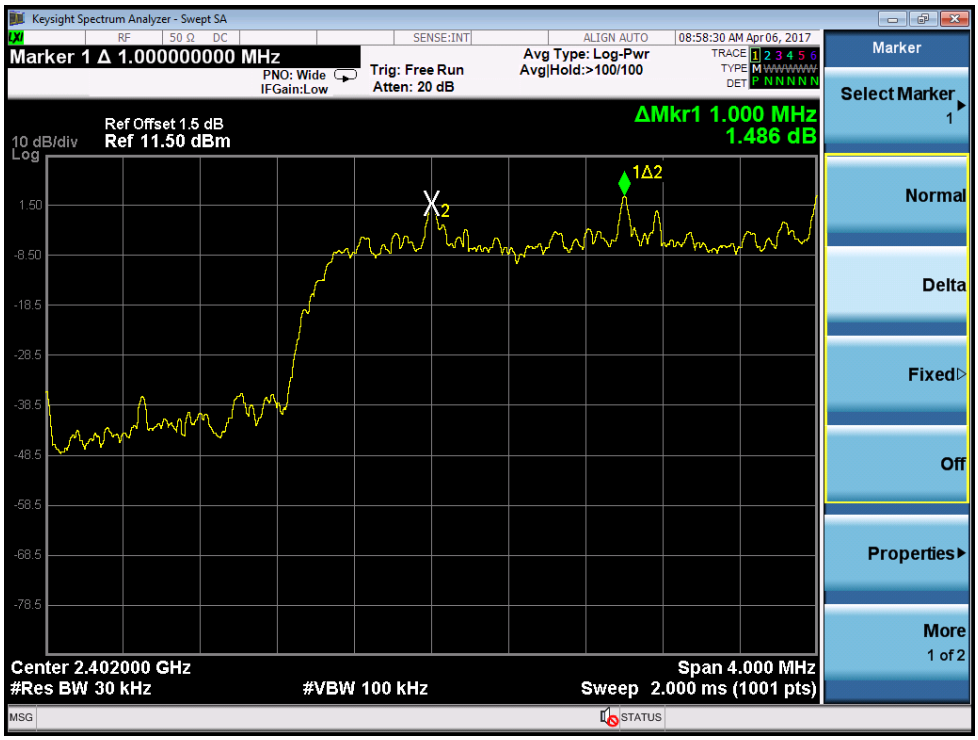
Channel M



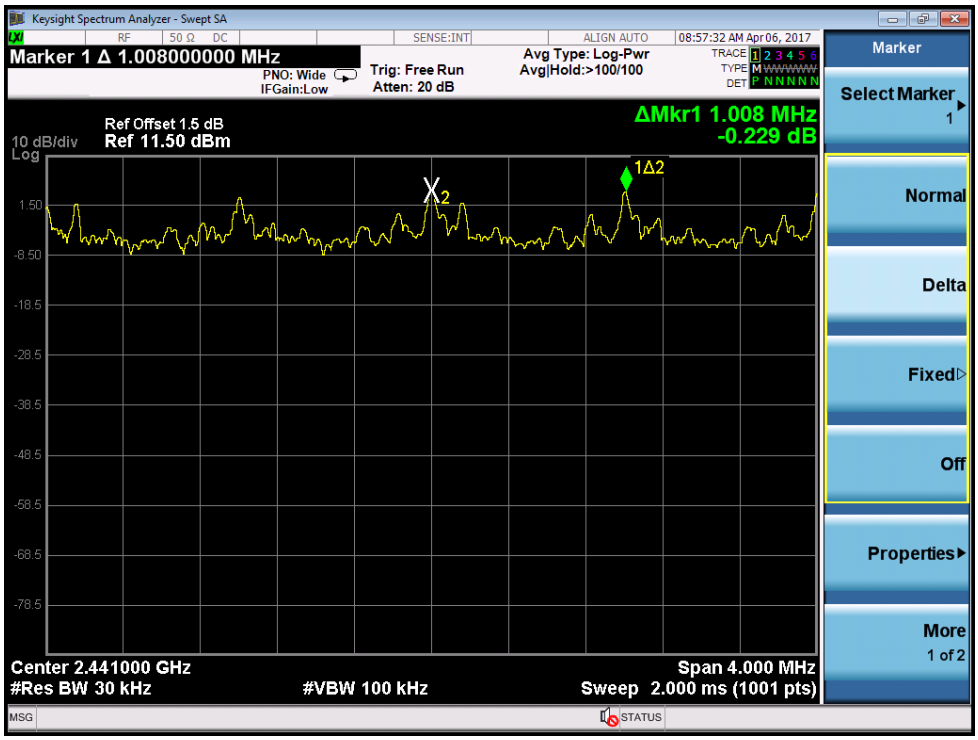
Channel H

Modulation	Channel	Frequency Separation (kHz)	Limit (kHz)
π/4-DQPSK	L	1000	≥ 911.37
	M	1008	≥ 910.04
	H	1008	≥ 910.04

Channel L



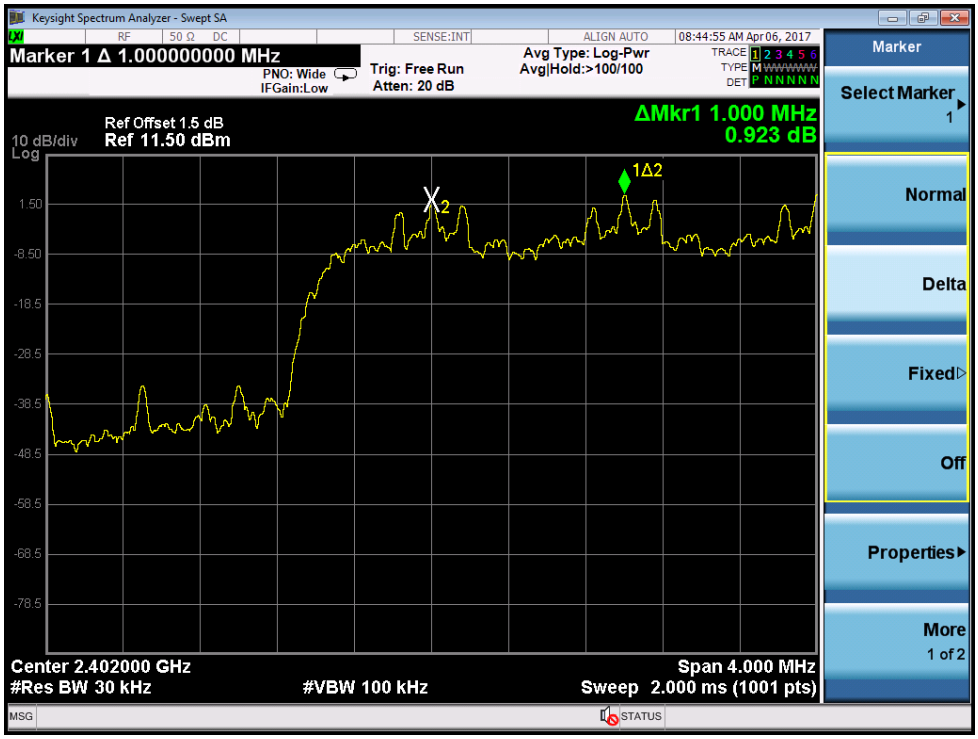
Channel M



Channel H

Modulation	Channel	Frequency Separation (kHz)	Limit (kHz)
8DPSK	L	1004	≥ 910.00
	M	1000	≥ 913.37
	H	1004	≥ 911.37

Channel L



Channel M

Channel H

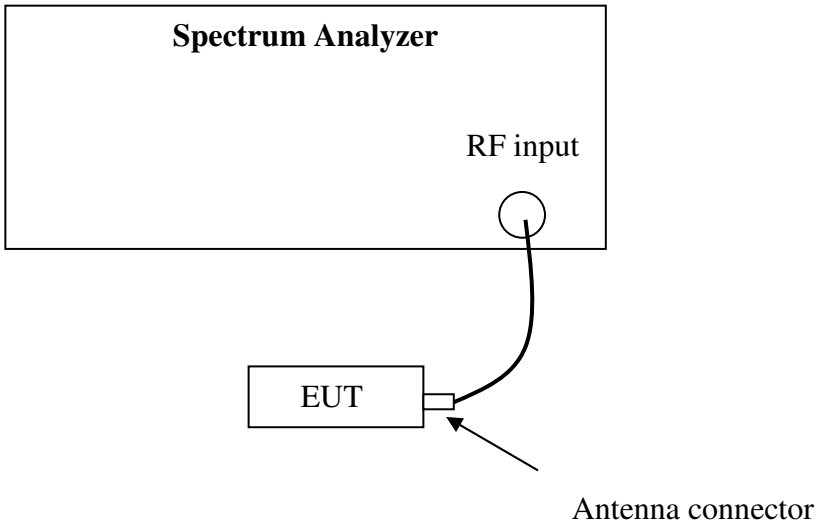
5 Maximum peak output power

Test result: Pass

5.1 Test limit

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
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

5.2 Test Configuration



5.3 Test procedure and test setup

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

The Maximum peak output power per FCC § 15.247(b) is measured using the Spectrum Analyzer with Span = 5 times the 20 dB bandwidth, RBW≥ the 20 dB bandwidth, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).

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5.4 Test Protocol

Temperature: 22°C
Relative Humidity: 54%

Modulation	Channel	Conducted Power (dBm)	Limit (dBm)
GFSK	L	7.23	≤ 21.00
	M	8.52	≤ 21.00
	H	8.40	≤ 21.00

Conclusion: The maximum EIRP = 8.52dBm+2.0dBi = 11.27mW which is lower than the limit of 4W listed in RSS-247.

Modulation	Channel	Conducted Power (dBm)	Limit (dBm)
π/4-DQPSK	L	4.87	≤ 21.00
	M	6.88	≤ 21.00
	H	6.68	≤ 21.00

Conclusion: The maximum EIRP = 6.88dBm+2.0dBi = 7.72mW which is lower than the limit of 4W listed in RSS-247.

Modulation	Channel	Conducted Power (dBm)	Limit (dBm)
8DPSK	L	4.92	≤ 21.00
	M	6.95	≤ 21.00
	H	6.69	≤ 21.00

Conclusion: The maximum EIRP = 6.95dBm+2.0dBi = 7.85mW which is lower than the limit of 4W listed in RSS-247.

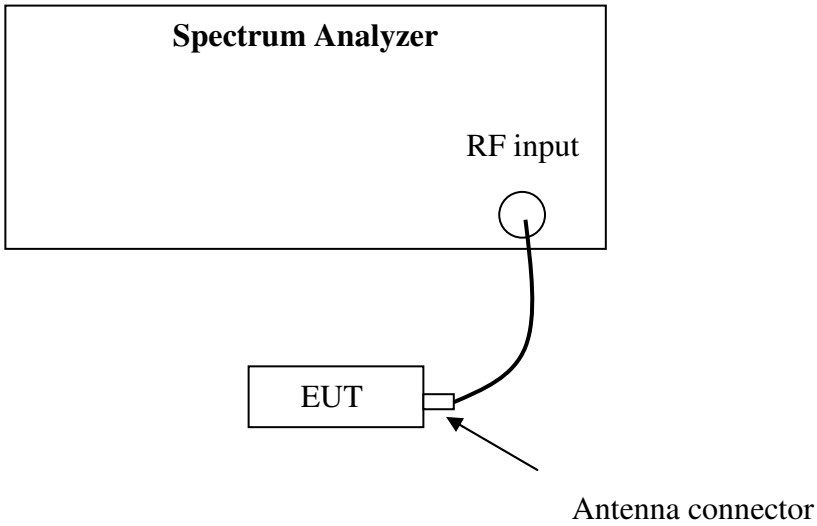
6 Emission outside the frequency band

Test result: Pass

6.1 Test limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

6.2 Test Configuration



6.3 Test procedure and test setup

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

The Emission outside the frequency band per FCC § 15.247(d) is measured using the Spectrum Analyzer with Span wide enough capturing all spurious from the lowest emission frequency of the EUT up to 10th harmonics, RBW = 100kHz, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 3 channels (lowest, middle and highest channel).

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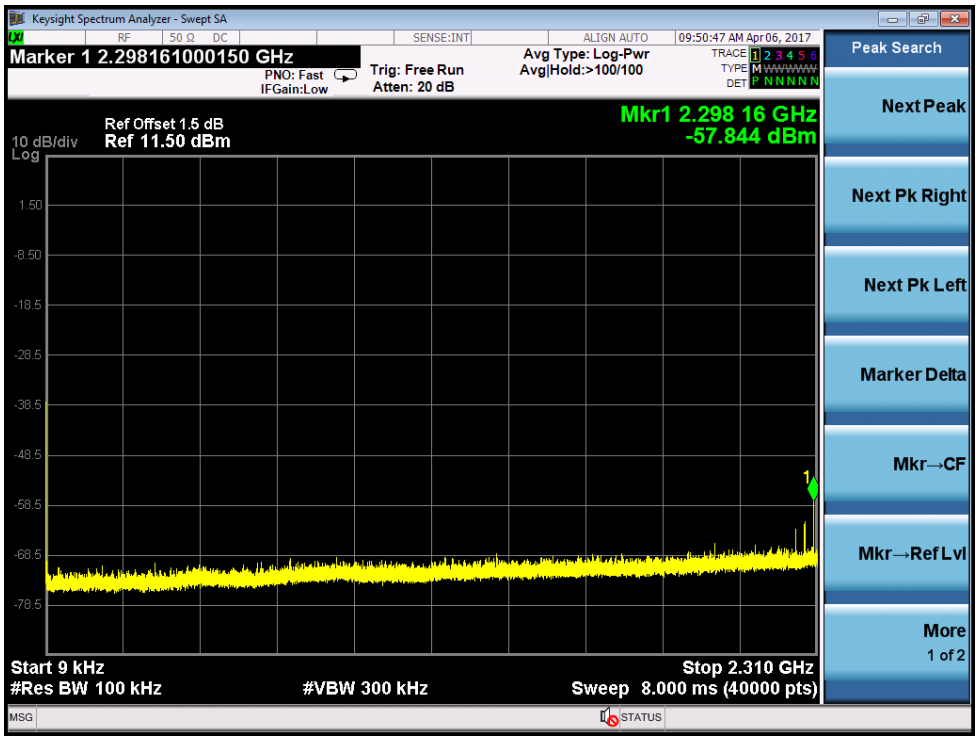
6.4 Test Protocol

Temperature: 22°C
Relative Humidity: 54%

Modulation	Channel	Max reading among band (dBm)	Results	Limit (dBm)
GFSK	L	6.130	Pass	≥20
	M	7.332	Pass	≥20
	H	7.166	Pass	≥20
	Hopping	7.381	Pass	≥20

Channel L



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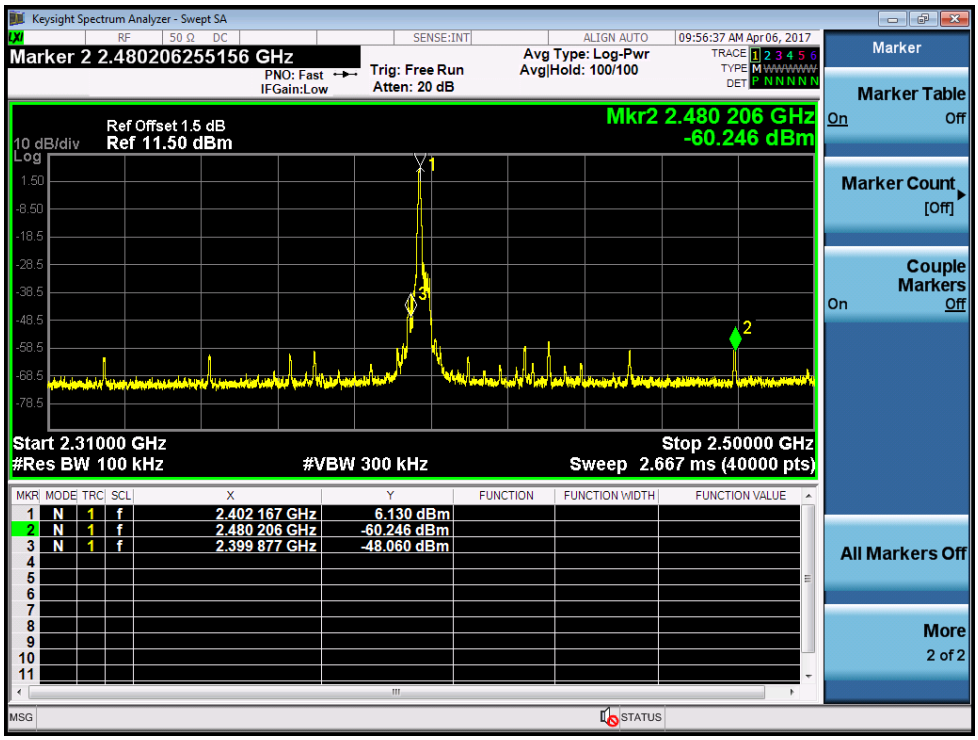
Keysight Spectrum Analyzer - Swept SA
Marker 2 2.480206255156 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
09:56:37 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr2 2.480 206 GHz
-60.246 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.402 167 GHz 6.130 dBm
2 N 1 f 2.480 206 GHz -60.246 dBm
3 N 1 f 2.399 877 GHz -48.060 dBm
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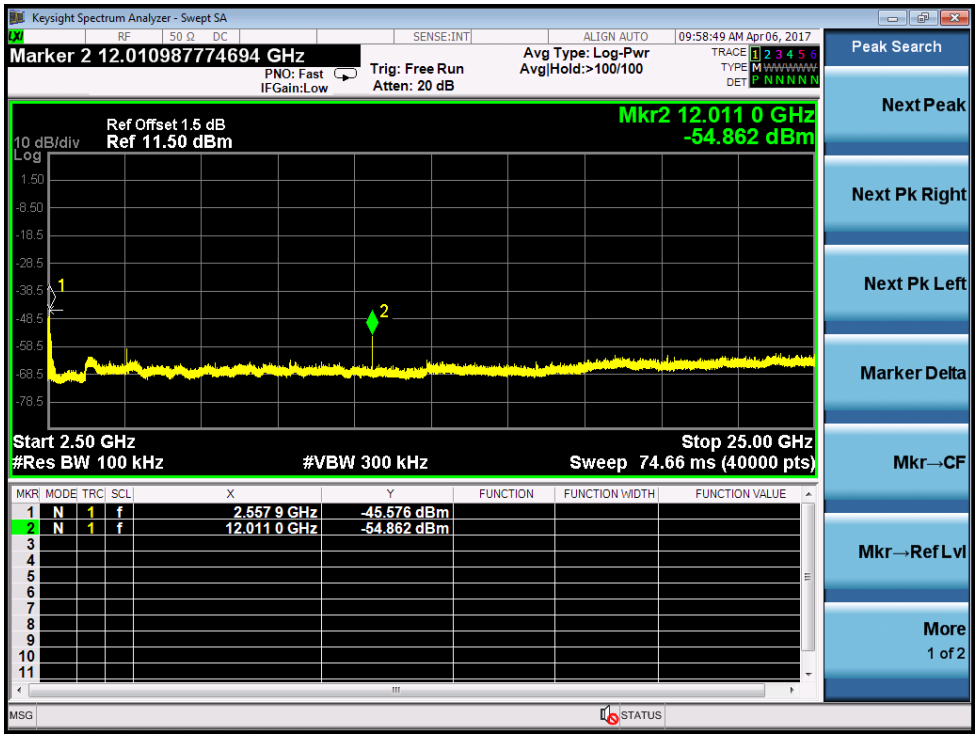
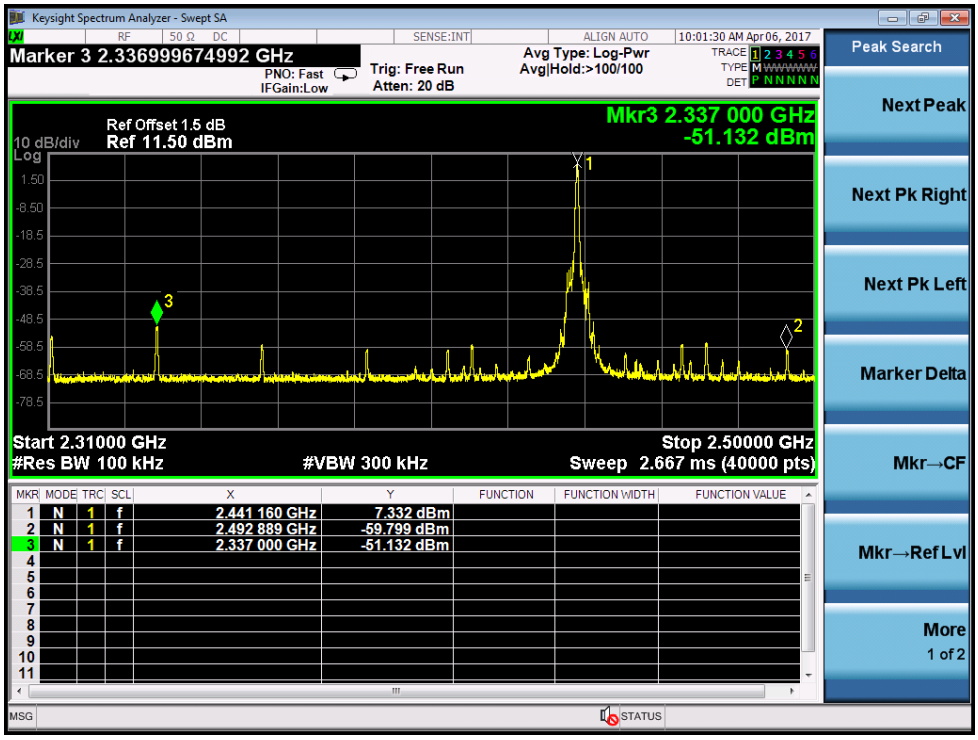
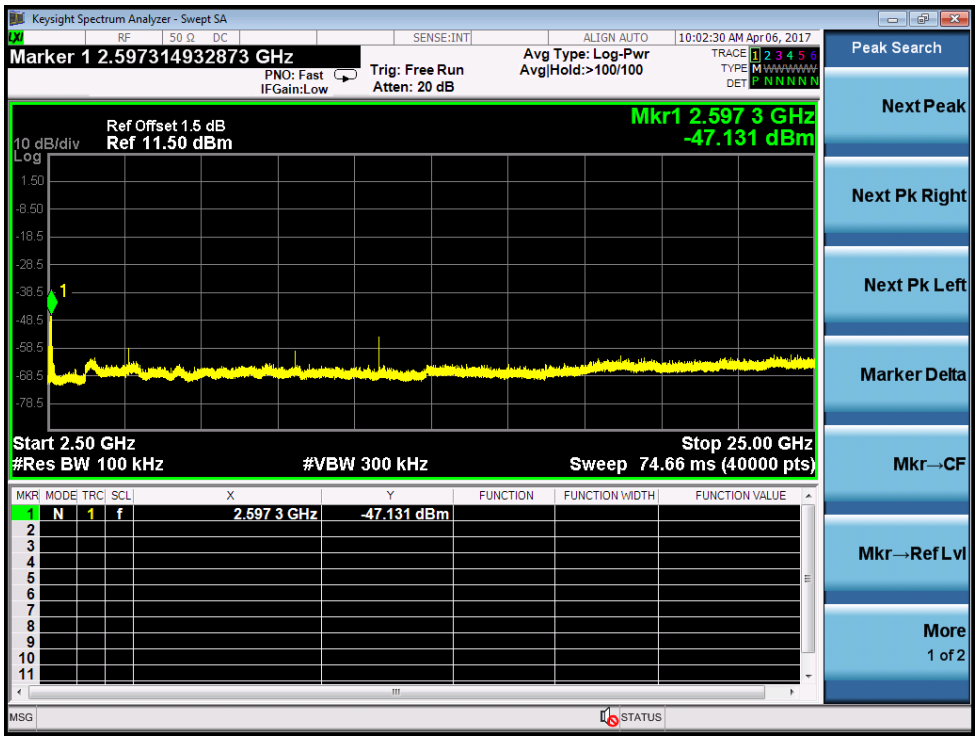
All Markers Off
More
2 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 2 12.010987774694 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
09:58:49 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr2 12.011 0 GHz
-54.862 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
1 N 1 f 2.557 9 GHz -45.576 dBm
2 N 1 f 12.011 0 GHz -54.862 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Channel M

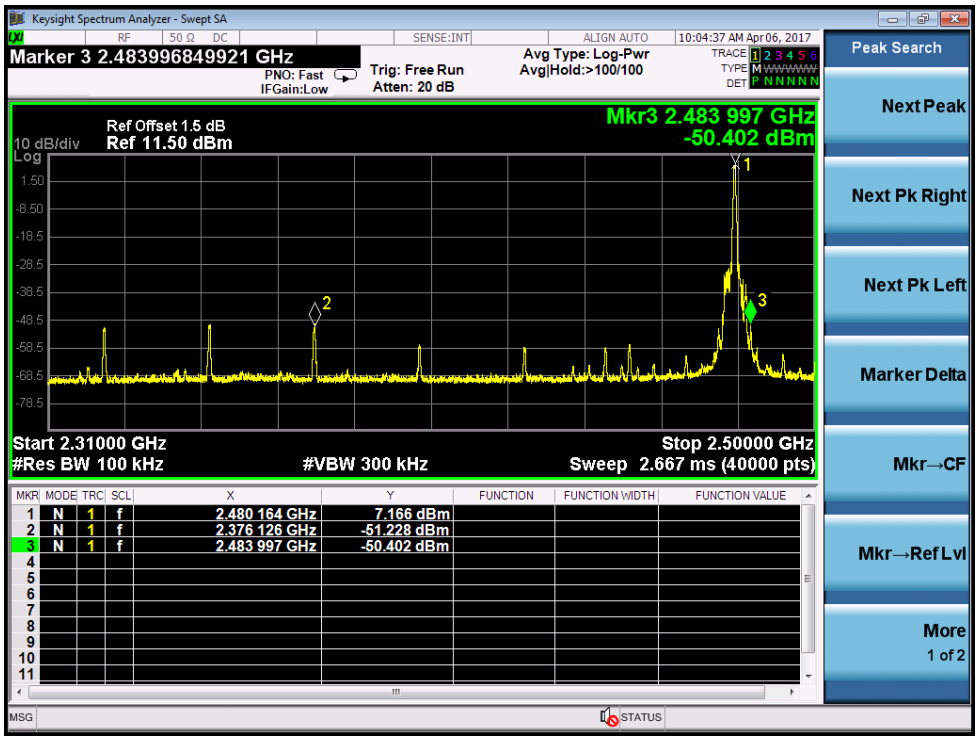
Keysight Spectrum Analyzer - Swept SA
Marker 1 2.284820468612 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:00:01 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.284 82 GHz
-57.899 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.310 GHz
Sweep 8.000 ms (40000 pts)
1 N 1 f 2.284 82 GHz -57.899 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

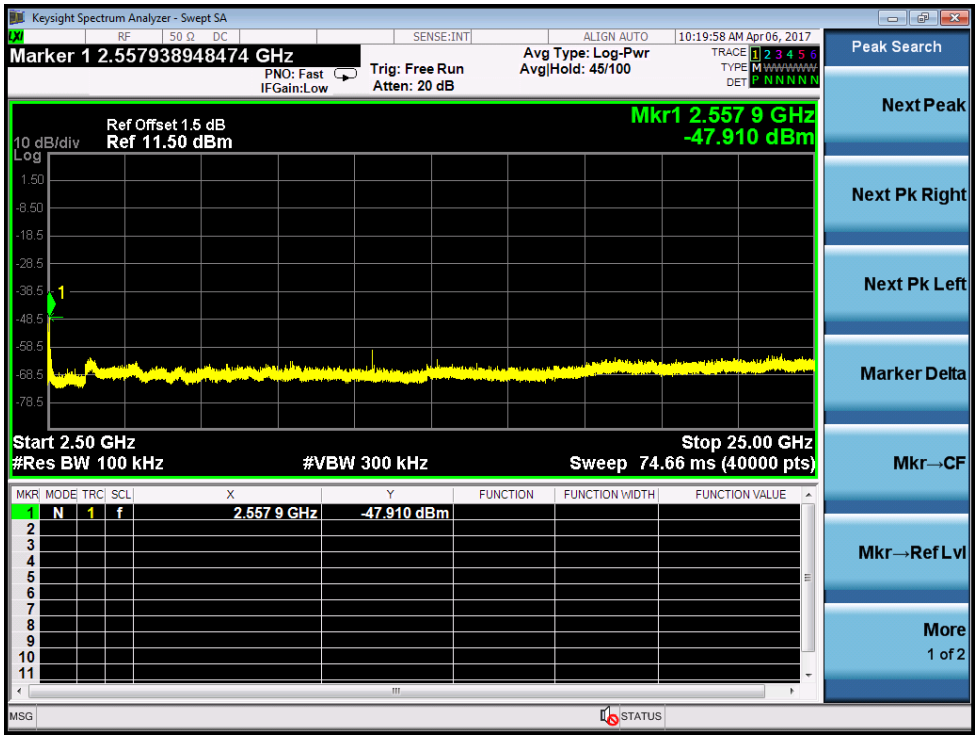

Keysight Spectrum Analyzer - Swept SA
Marker 3 2.336999674992 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:01:30 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr3 2.337 000 GHz
-51.132 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.441 160 GHz 7.332 dBm
2 N 1 f 2.492 889 GHz -59.799 dBm
3 N 1 f 2.337 000 GHz -51.132 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.597314932873 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:02:30 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.597 3 GHz
-47.131 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
1 N 1 f 2.597 3 GHz -47.131 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Channel H

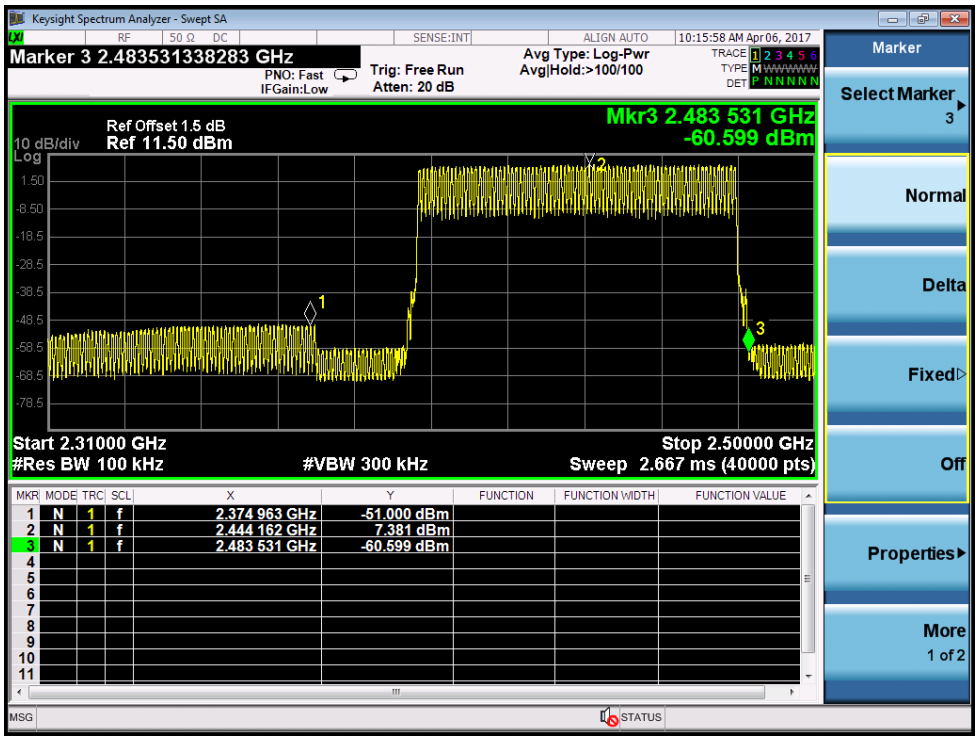
Keysight Spectrum Analyzer - Swept SA
Marker 1 2.298161000150 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:05:22 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.298 16 GHz
-62.114 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.310 GHz
Sweep 8.000 ms (40000 pts)
1 N 1 f 2.298 16 GHz -62.114 dBm
2 N 1 f 2.297 99 GHz -62.710 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 3 2.483996849921 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:04:37 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr3 2.483 997 GHz
-50.402 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.480 164 GHz 7.166 dBm
2 N 1 f 2.376 126 GHz -51.228 dBm
3 N 1 f 2.483 997 GHz -50.402 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.557938948474 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 45/100
10:19:58 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.557 9 GHz
-47.910 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
1 N 1 f 2.557 9 GHz -47.910 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

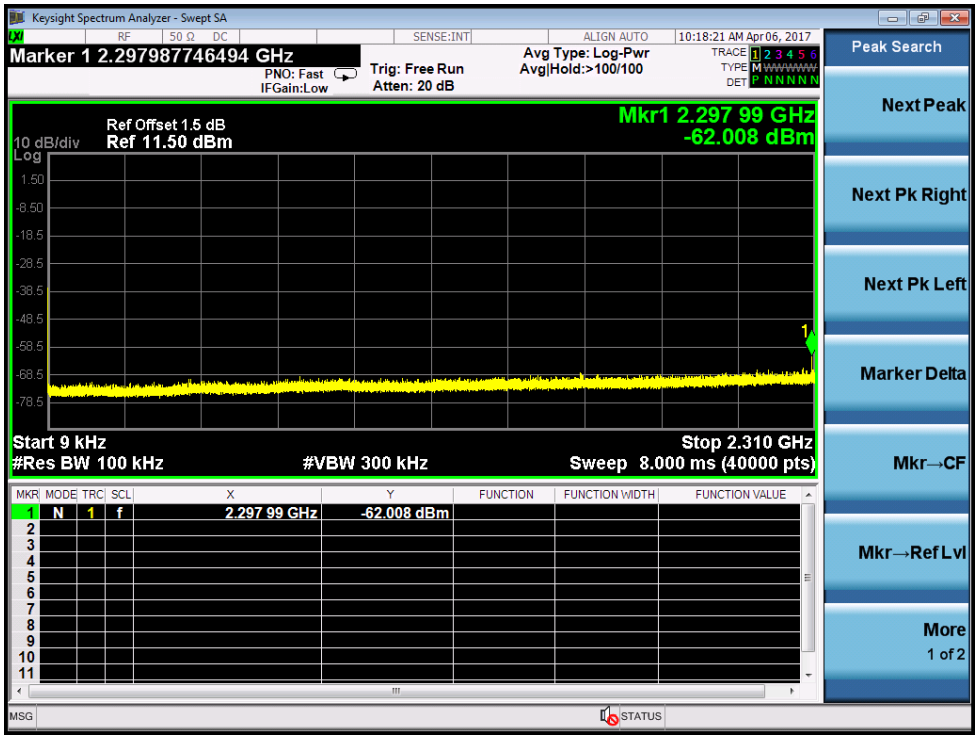
Hopping

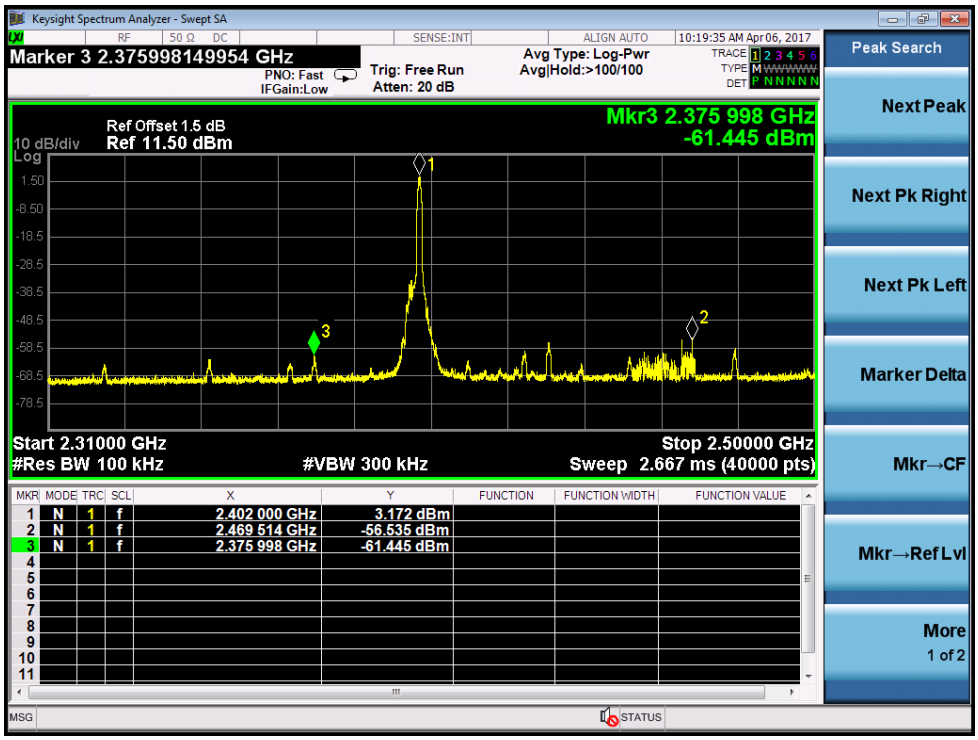
Keysight Spectrum Analyzer - Swept SA
RF 50 Ω DC
SENSE:INT
ALIGN AUTO
10:14:24 AM Apr 06, 2017
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Log
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.310 GHz
Sweep 8.000 ms (40000 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.309 94 GHz -54.713 dBm
Marker
Select Marker 2
Normal
Delta
Fixed
Off
Properties
More 1 of 2
MSG
STATUS

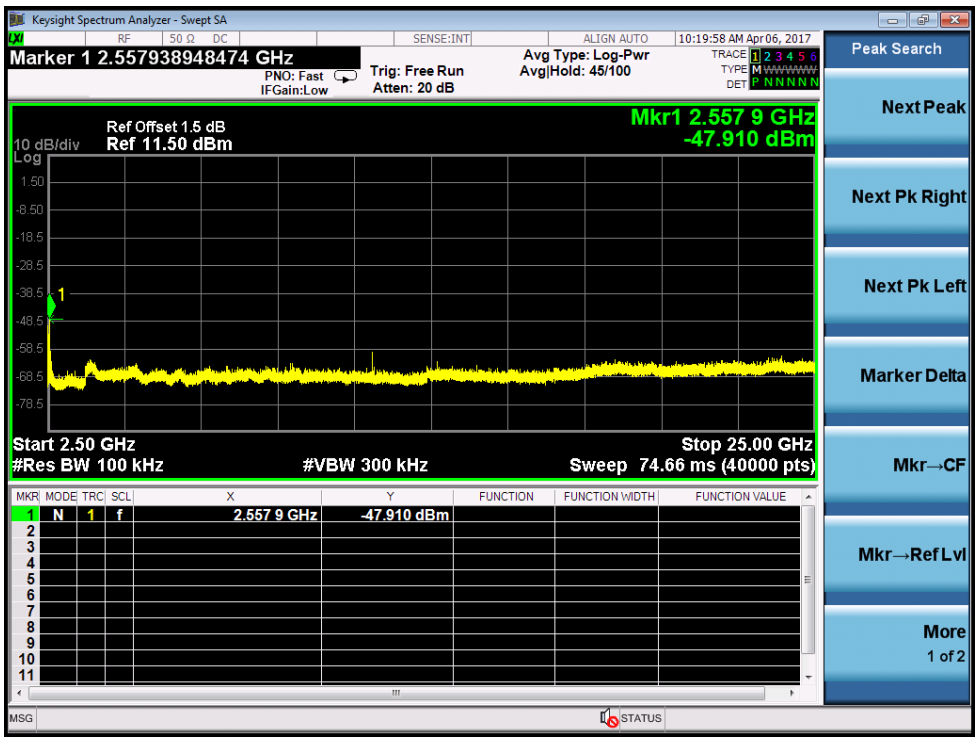

Keysight Spectrum Analyzer - Swept SA
RF 50 Ω DC
SENSE:INT
ALIGN AUTO
10:15:58 AM Apr 06, 2017
Marker 3 2.483531338283 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Log
Mkr3 2.483 531 GHz
-60.599 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.374 963 GHz -51.000 dBm
2 N 1 f 2.444 162 GHz 7.381 dBm
3 N 1 f 2.483 531 GHz -60.599 dBm
Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More 1 of 2
MSG
STATUS

Modulation	Channel	Max reading among band (dBm)	Results	Limit (dBm)
π/4-DQPSK	L	3.172	Pass	≥20
	M	5.222	Pass	≥20
	H	4.949	Pass	≥20
	Hopping	4.347	Pass	≥20

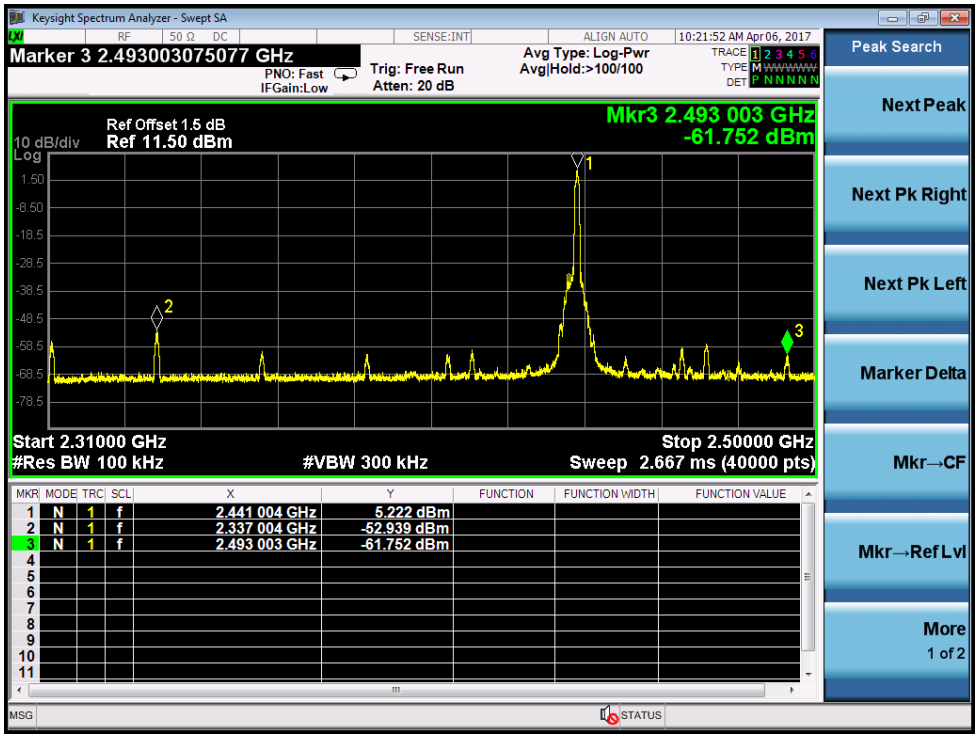
Channel L




Keysight Spectrum Analyzer - Swept SA
Marker 3 2.375998149954 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:19:35 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr3 2.375 998 GHz
-61.445 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.402 000 GHz 3.172 dBm
2 N 1 f 2.469 514 GHz -56.535 dBm
3 N 1 f 2.375 998 GHz -61.445 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.557938948474 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 45/100
10:19:58 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.557 9 GHz
-47.910 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
1 N 1 f 2.557 9 GHz -47.910 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Channel M



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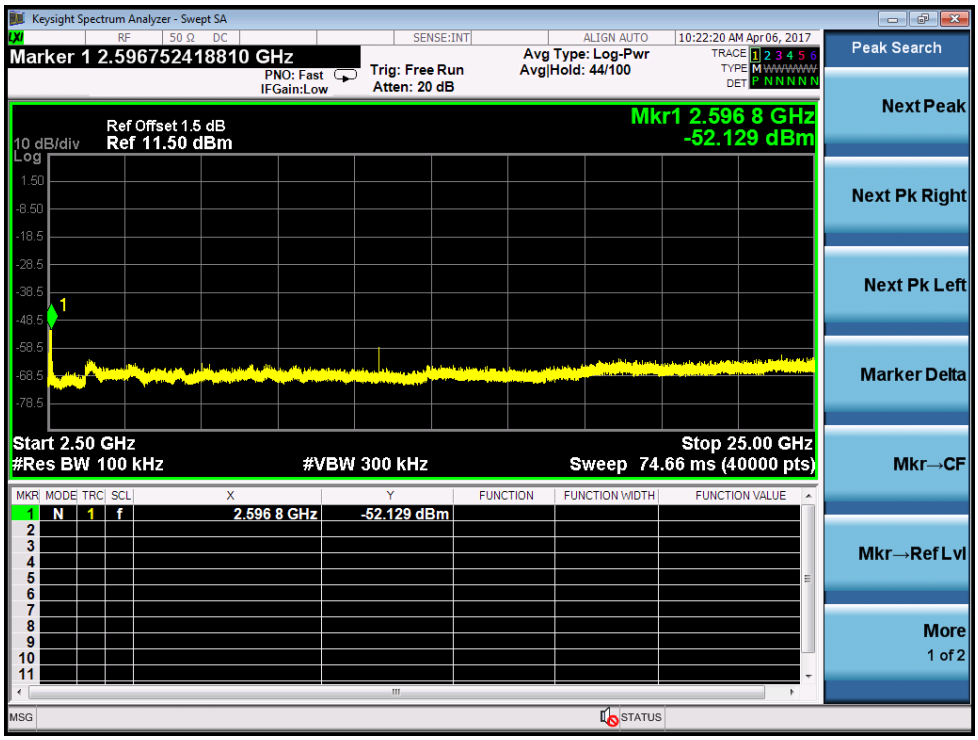
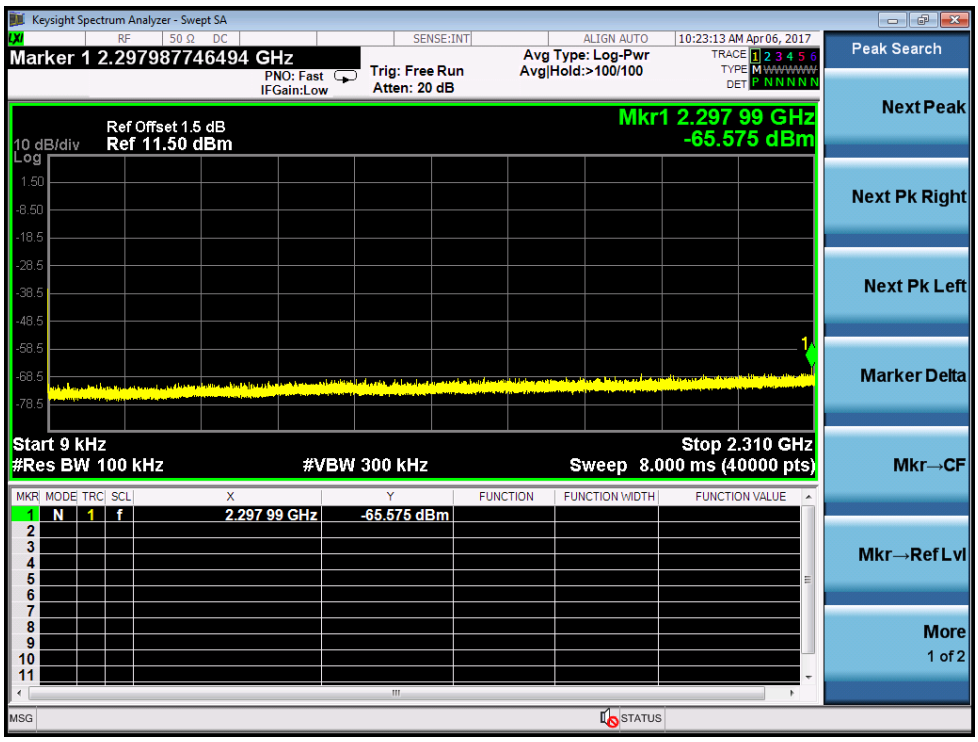
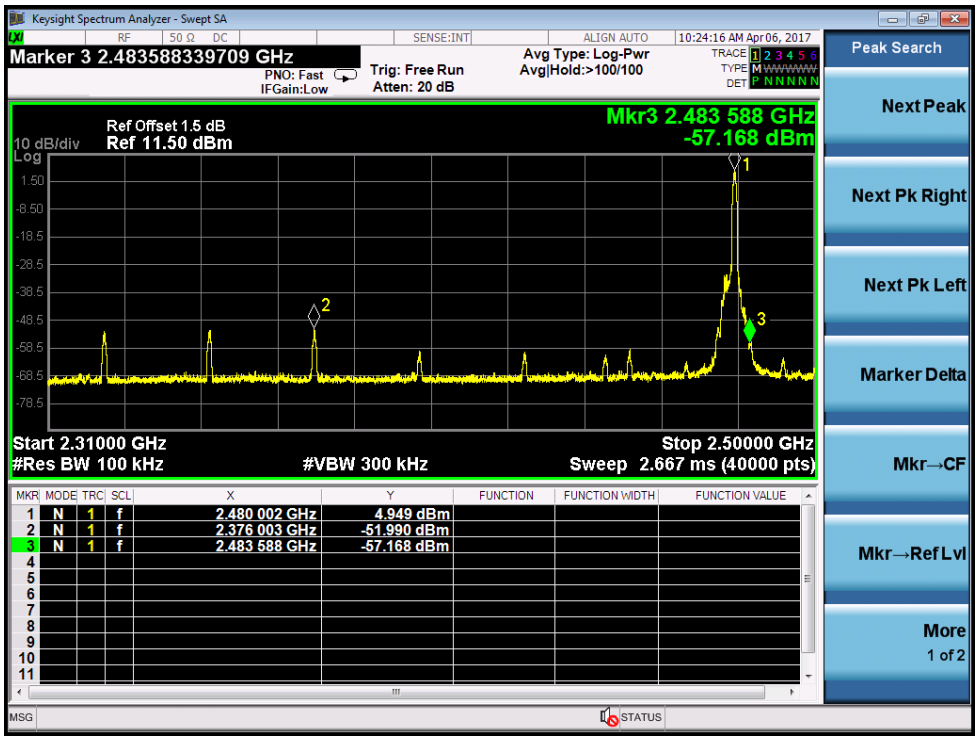
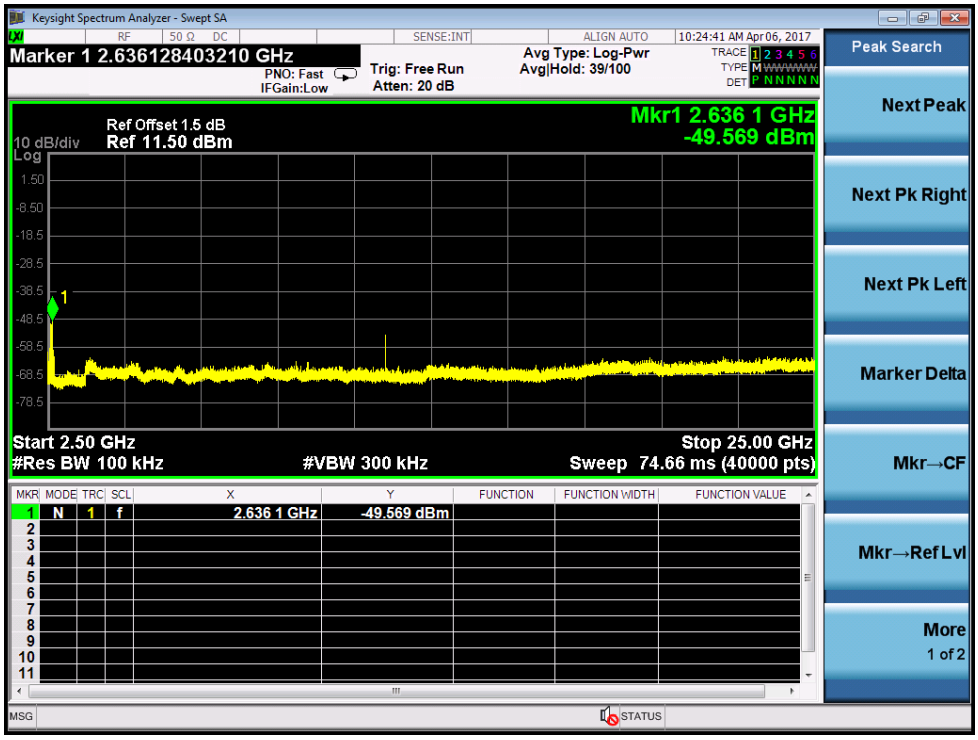

Keysight Spectrum Analyzer - Swept SA
Marker 1 2.596752418810 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 44/100
10:22:20 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.596 8 GHz
-52.129 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
1 N 1 f 2.596 8 GHz -52.129 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

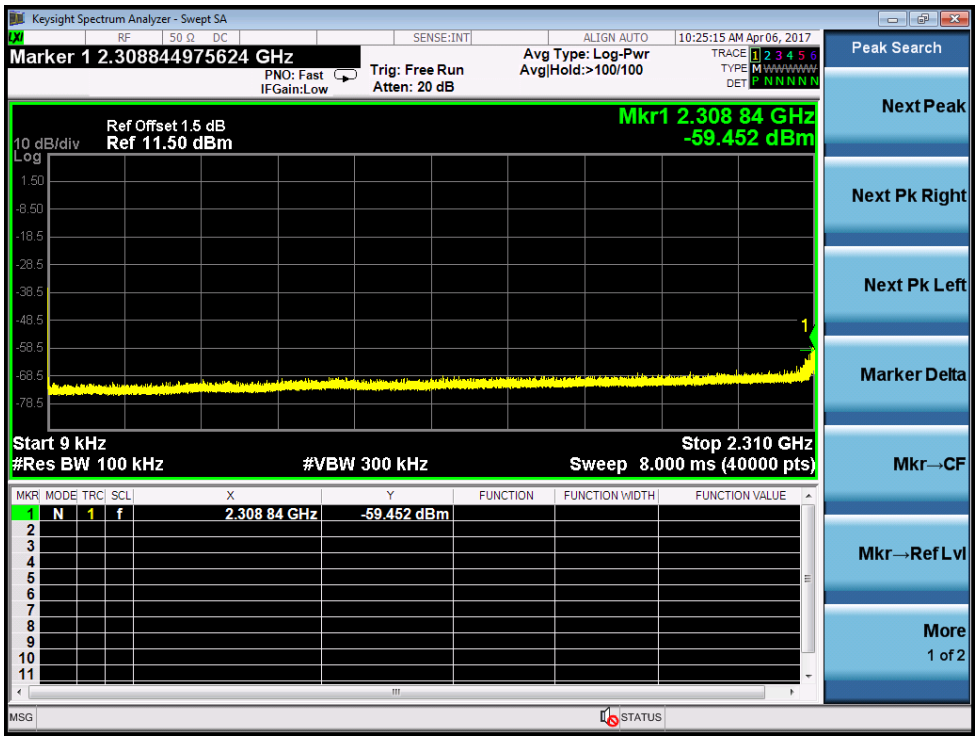
Channel H

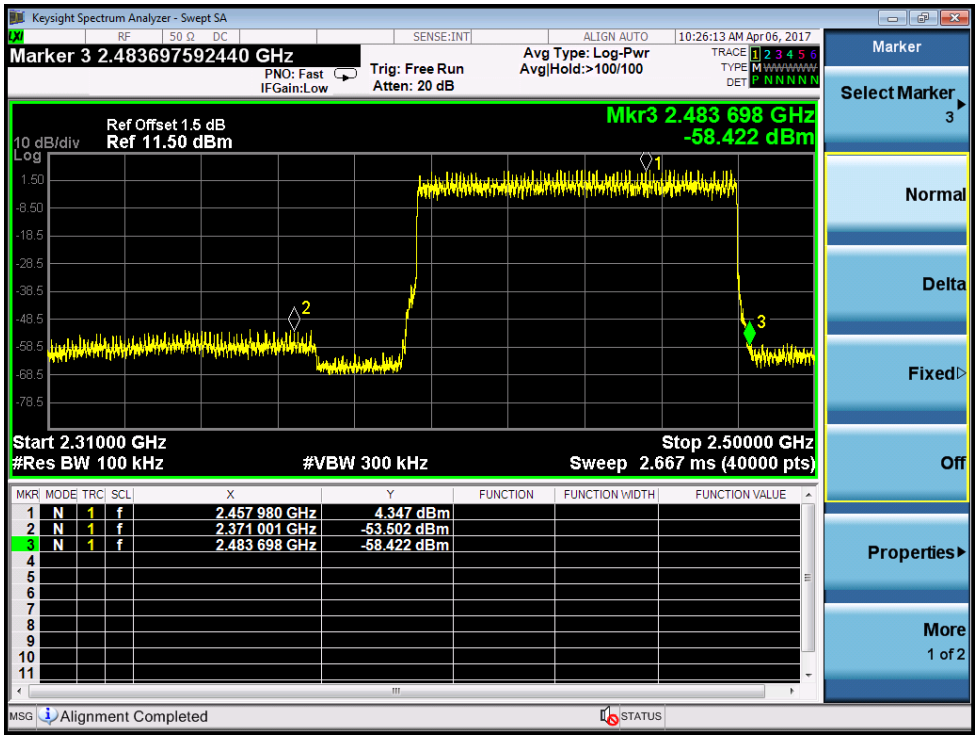

Keysight Spectrum Analyzer - Swept SA
Marker 1 2.297987746494 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:23:13 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.297 99 GHz
-65.575 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.310 GHz
Sweep 8.000 ms (40000 pts)
1 N 1 f 2.297 99 GHz -65.575 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

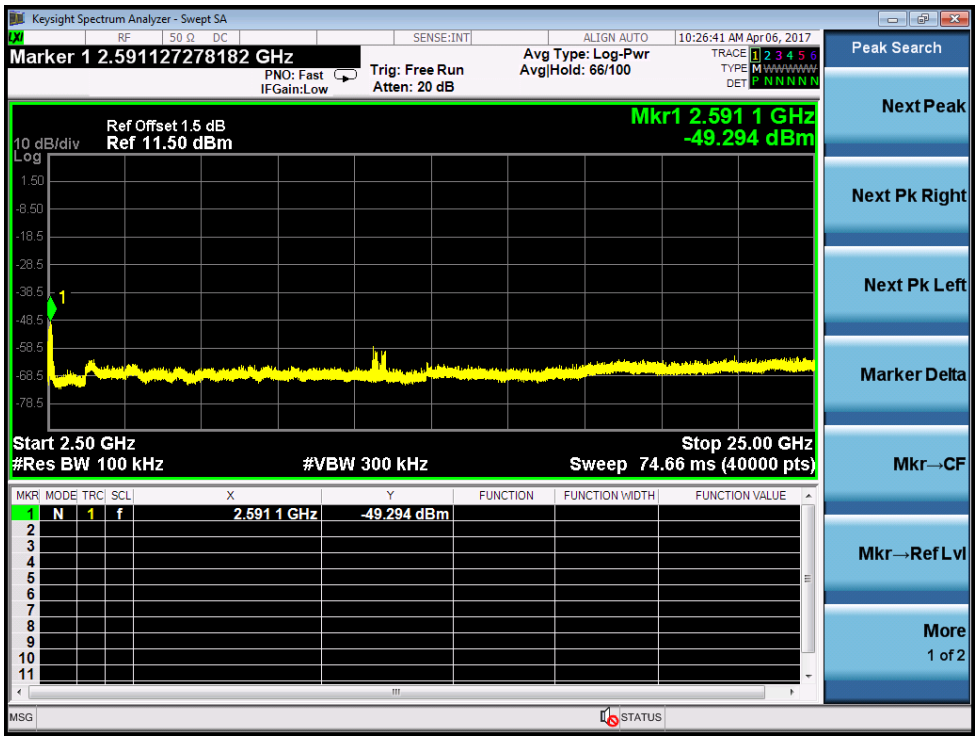

Keysight Spectrum Analyzer - Swept SA
Marker 3 2.483588339709 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:24:16 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr3 2.483 588 GHz
-57.168 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.480 002 GHz 4.949 dBm
2 N 1 f 2.376 003 GHz -51.990 dBm
3 N 1 f 2.483 588 GHz -57.168 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.636128403210 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 39/100
10:24:41 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.636 1 GHz
-49.569 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
1 N 1 f 2.636 1 GHz -49.569 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Hopping

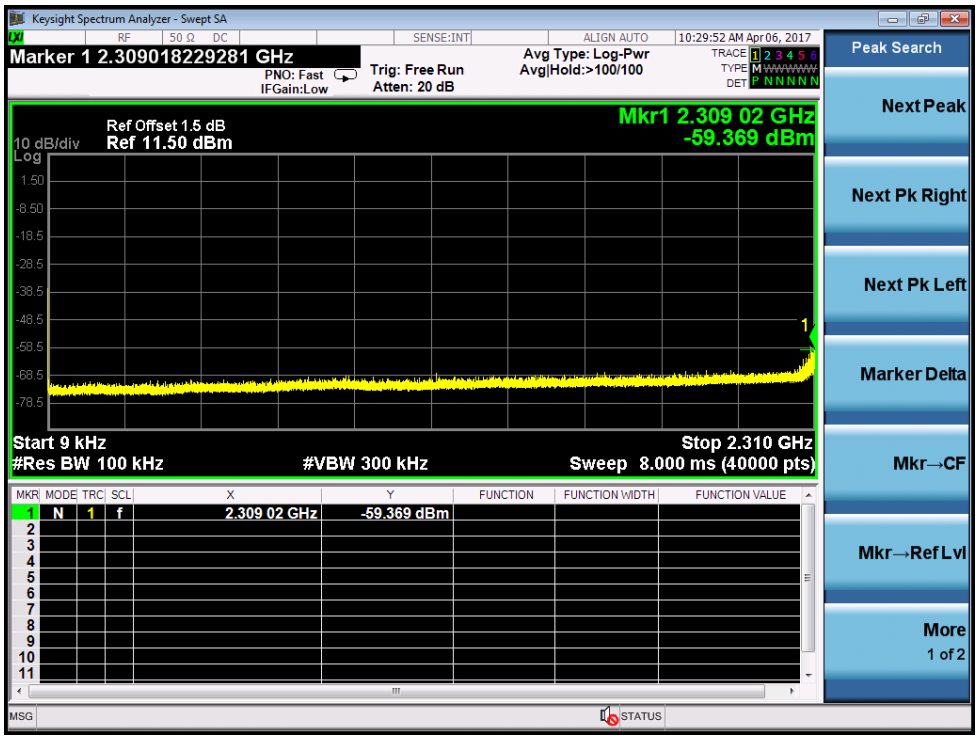

Keysight Spectrum Analyzer - Swept SA
Marker 1 2.308844975624 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:25:15 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.308 84 GHz
-59.452 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.310 GHz
Sweep 8.000 ms (40000 pts)
1 N 1 f 2.308 84 GHz -59.452 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

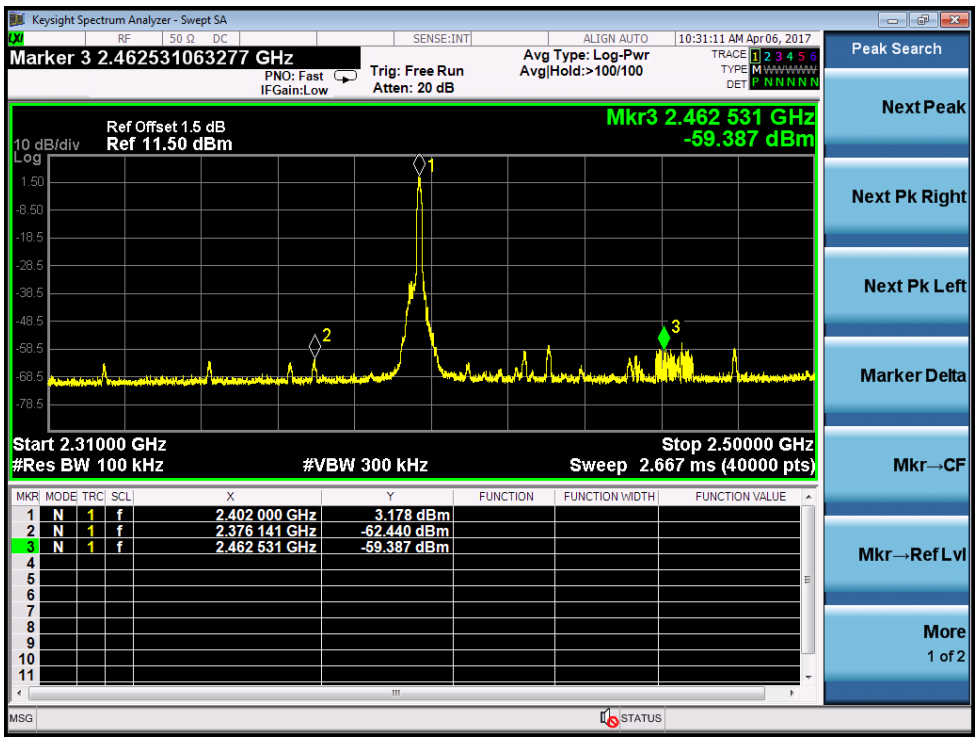

Keysight Spectrum Analyzer - Swept SA
Marker 3 2.483697592440 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:26:13 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr3 2.483 698 GHz
-58.422 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.457 980 GHz 4.347 dBm
2 N 1 f 2.371 001 GHz -53.502 dBm
3 N 1 f 2.483 698 GHz -58.422 dBm
Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More
1 of 2
Alignment Completed

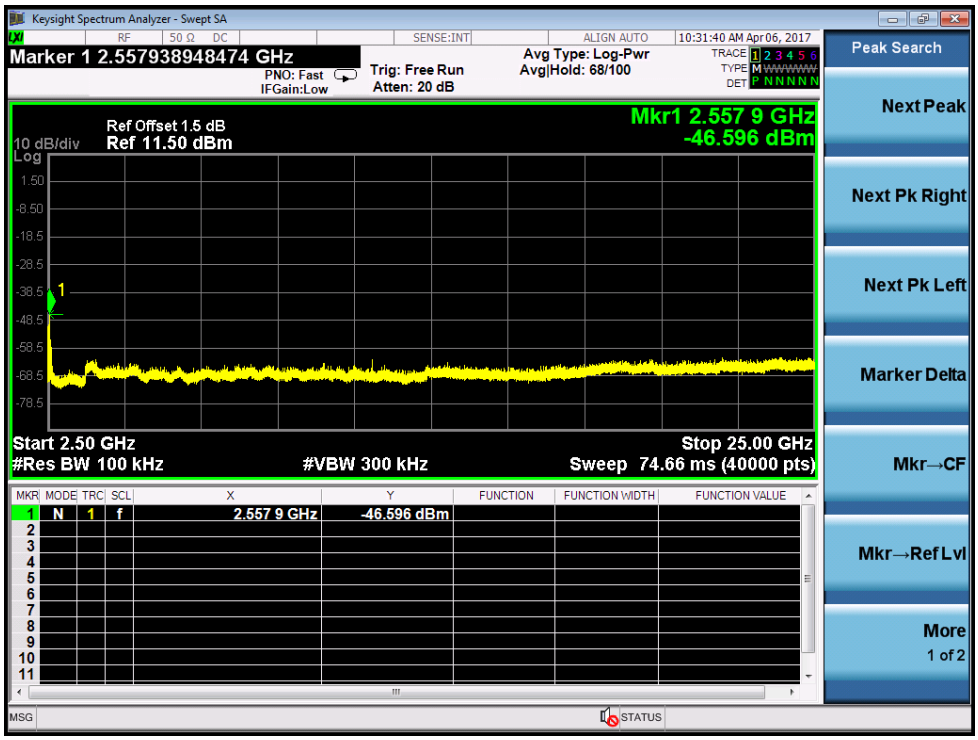


Modulation	Channel	Max reading among band (dBm)	Results	Limit (dBm)
8DPSK	L	3.178	Pass	≥20
	M	5.208	Pass	≥20
	H	4.949	Pass	≥20
	Hopping	5.192	Pass	≥20

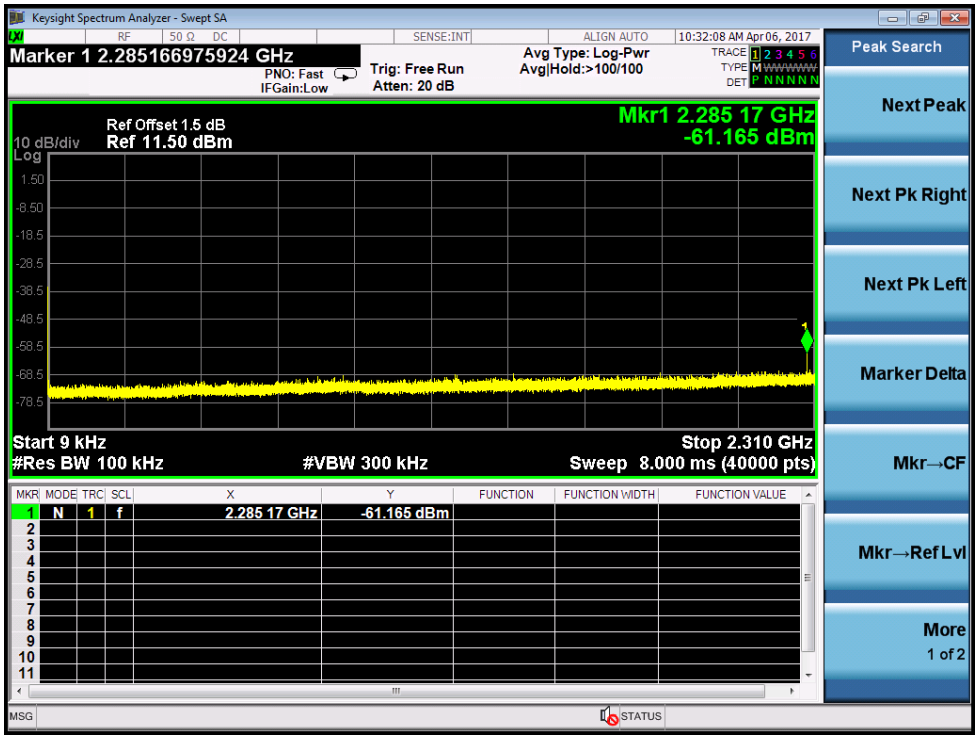
Channel L


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.309018229281 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:29:52 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Log
Mkr1 2.309 02 GHz
-59.369 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.310 GHz
Sweep 8.000 ms (40000 pts)
1 N 1 f 2.309 02 GHz -59.369 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 3 2.462531063277 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:31:11 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Log
Mkr3 2.462 531 GHz
-59.387 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.402 000 GHz 3.178 dBm
2 N 1 f 2.376 141 GHz -62.440 dBm
3 N 1 f 2.462 531 GHz -59.387 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2



Channel M



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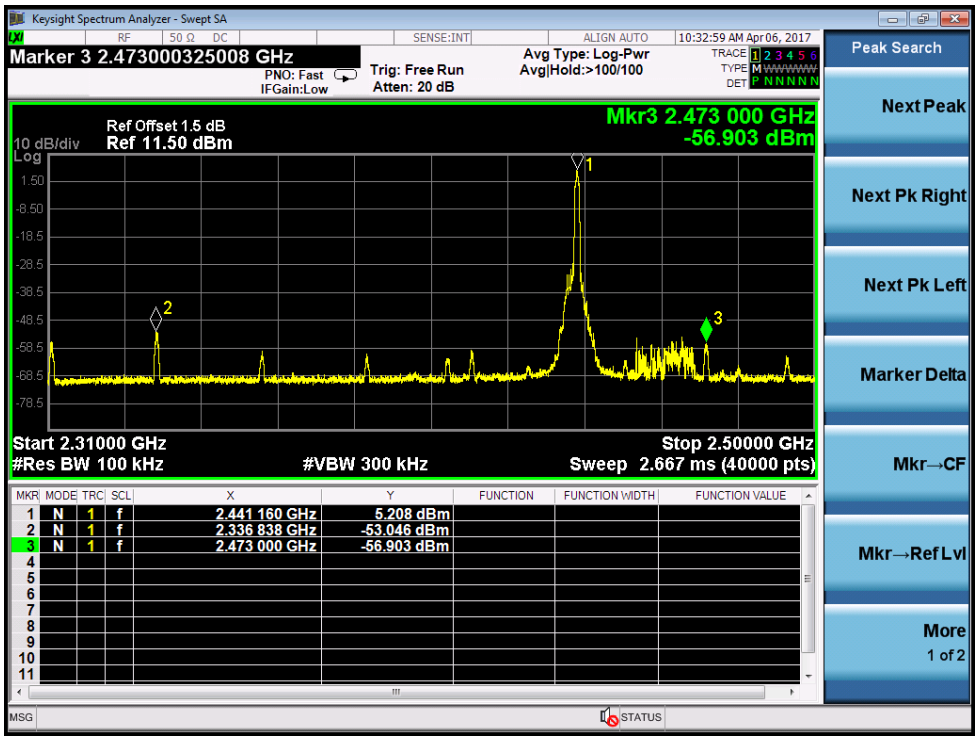
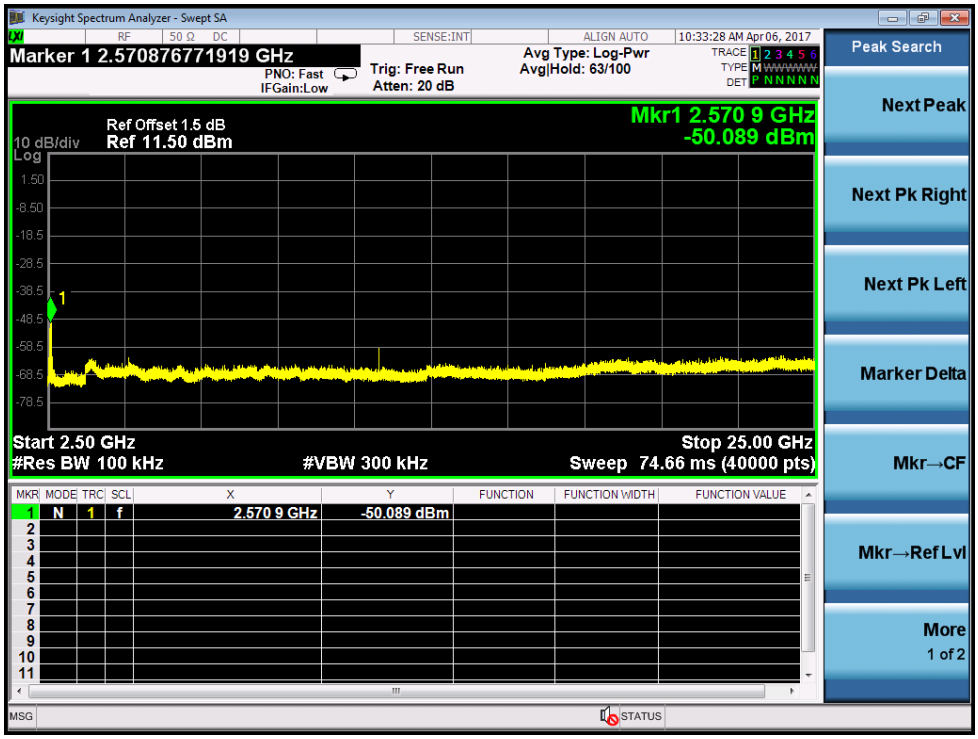
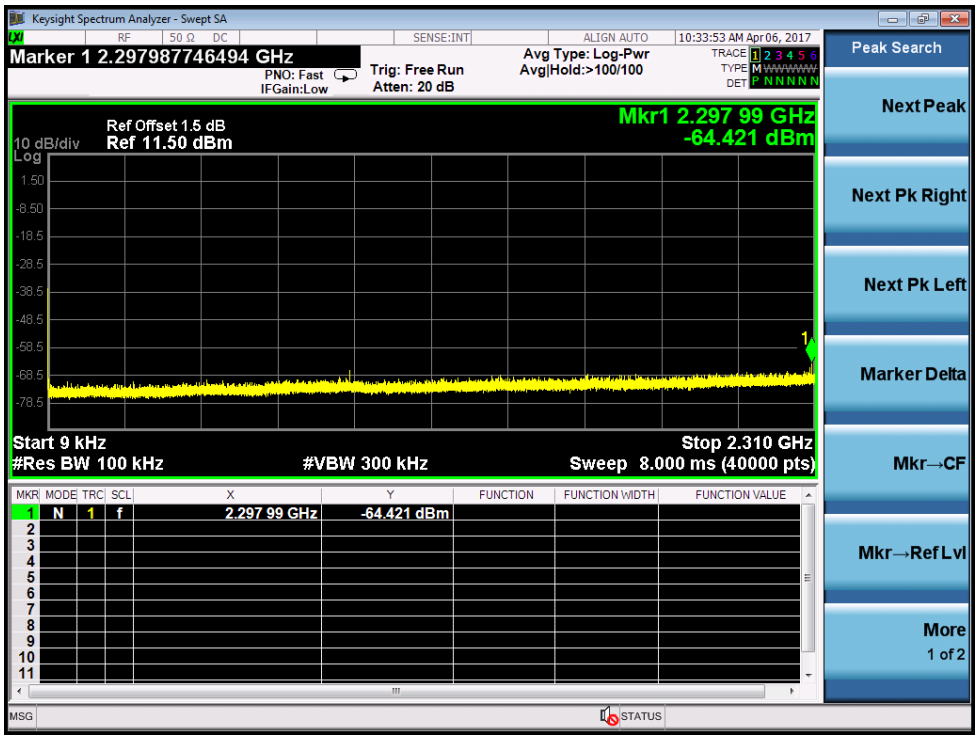
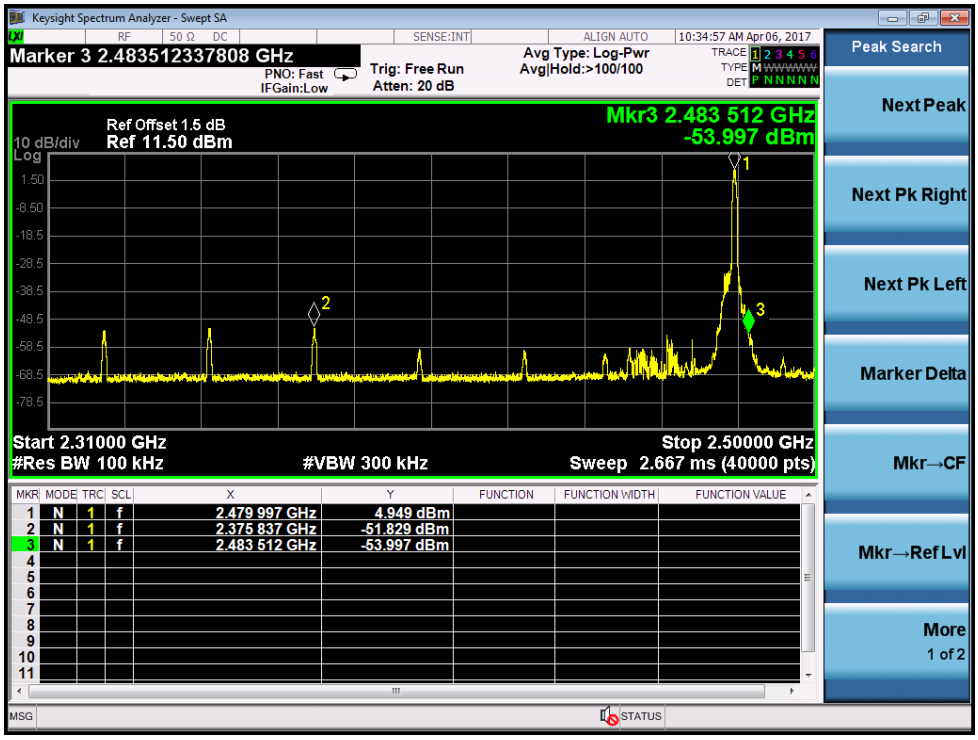
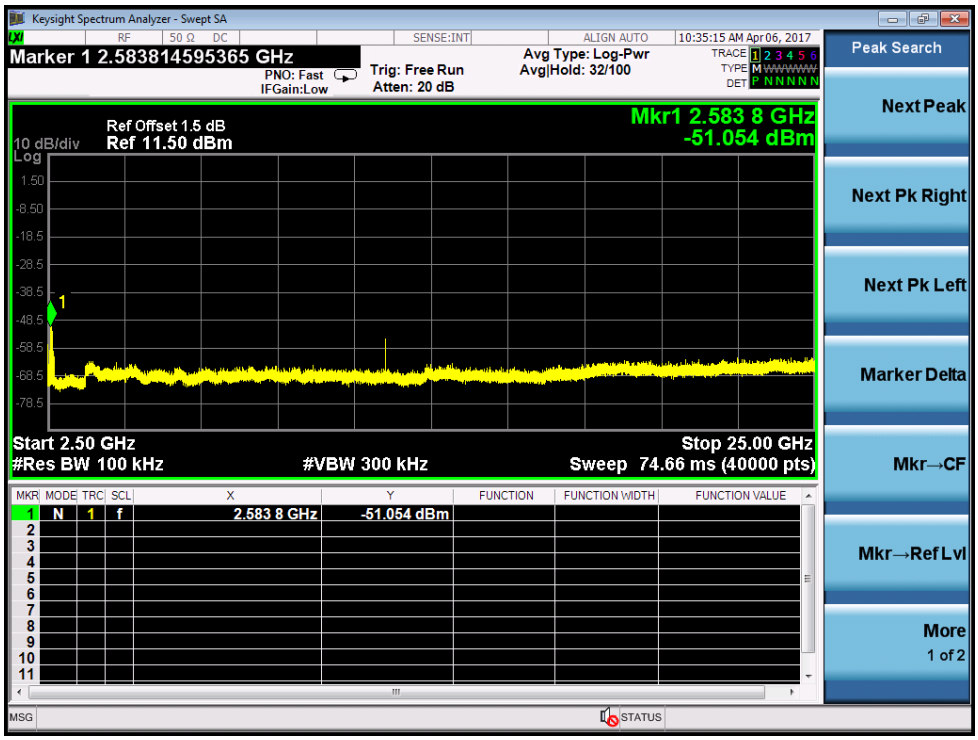

Keysight Spectrum Analyzer - Swept SA
Marker 3 2.473000325008 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:32:59 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Log
Mkr3 2.473 000 GHz
-56.903 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.441 160 GHz 5.208 dBm
2 N 1 f 2.336 838 GHz -53.046 dBm
3 N 1 f 2.473 000 GHz -56.903 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.570876771919 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 63/100
10:33:28 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Log
Mkr1 2.570 9 GHz
-50.089 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
1 N 1 f 2.570 9 GHz -50.089 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

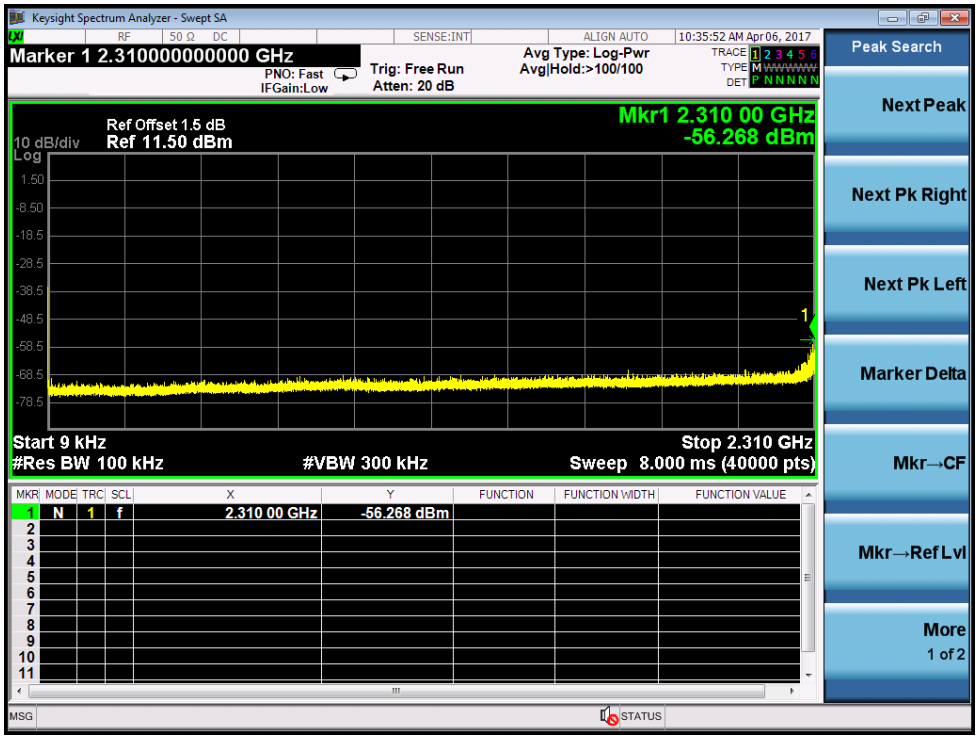
Channel H

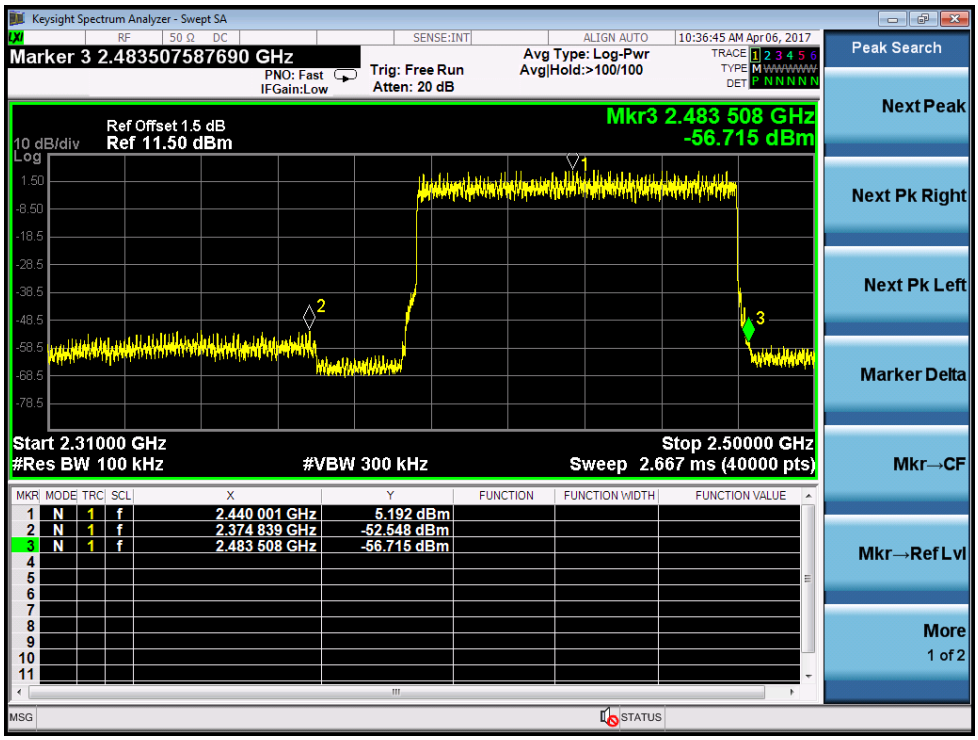

Keysight Spectrum Analyzer - Swept SA
Marker 1 2.297987746494 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:33:53 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div Ref 11.50 dBm
Log
Mkr1 2.297 99 GHz
-64.421 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.310 GHz
Sweep 8.000 ms (40000 pts)
1 N 1 f 2.297 99 GHz -64.421 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

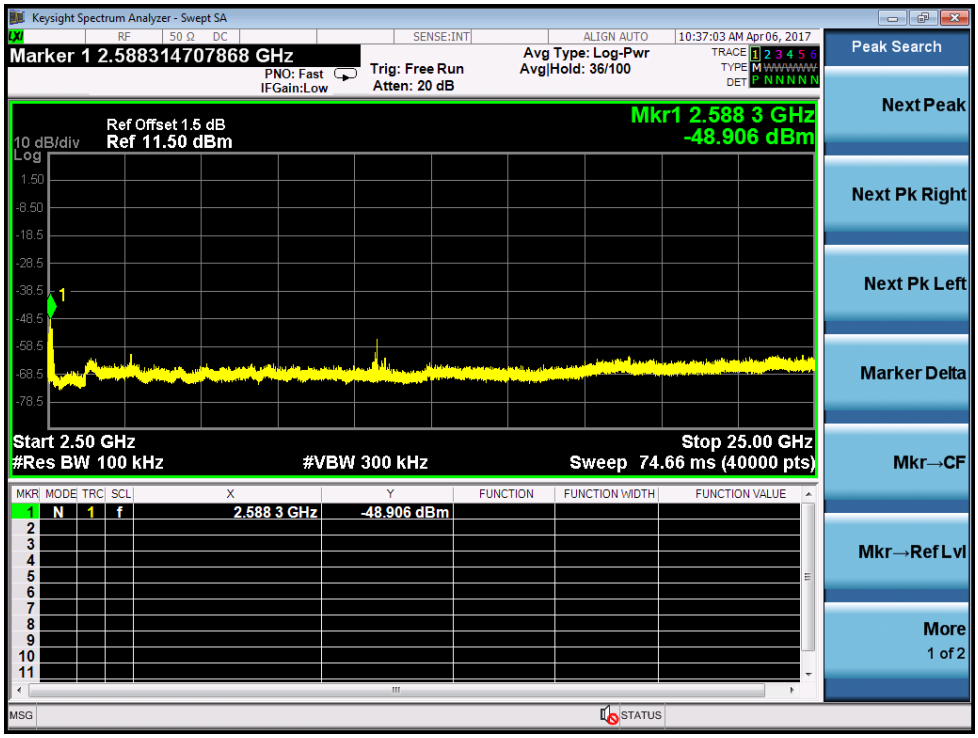

Keysight Spectrum Analyzer - Swept SA
Marker 3 2.483512337808 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:34:57 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div Ref 11.50 dBm
Log
Mkr3 2.483 512 GHz
-53.997 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.479 997 GHz 4.949 dBm
2 N 1 f 2.375 837 GHz -51.829 dBm
3 N 1 f 2.483 512 GHz -53.997 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.583814595365 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 32/100
10:35:15 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.583 8 GHz
-51.054 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
2.583 8 GHz
-51.054 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Hopping


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.310000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:35:52 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.310 00 GHz
-56.268 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.310 GHz
Sweep 8.000 ms (40000 pts)
2.310 00 GHz
-56.268 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 3 2.483507587690 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
10:36:45 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr3 2.483 508 GHz
-56.715 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.667 ms (40000 pts)
1 N 1 f 2.440 001 GHz 5.192 dBm
2 N 1 f 2.374 839 GHz -52.548 dBm
3 N 1 f 2.483 508 GHz -56.715 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.588314707868 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 36/100
10:37:03 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Mkr1 2.588 3 GHz
-48.906 dBm
Start 2.50 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 74.66 ms (40000 pts)
1 N 1 f 2.588 3 GHz -48.906 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

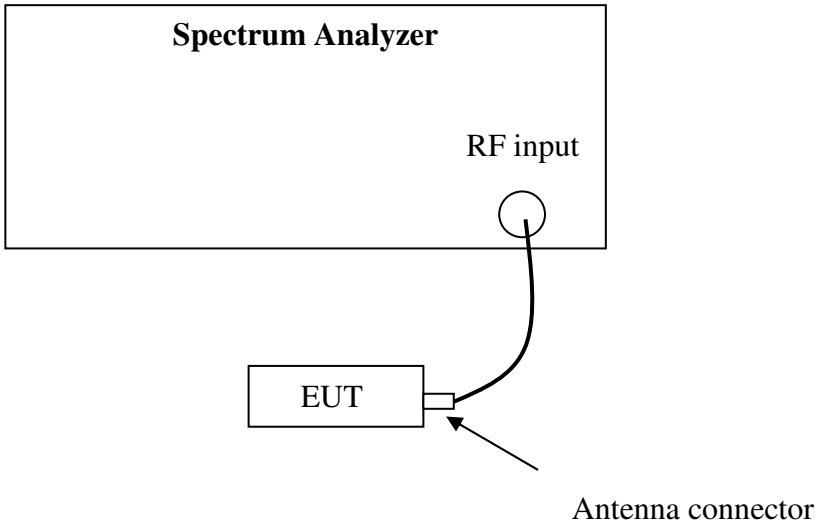
7 Number of hopping frequencies

Test result: **Pass**

7.1 Test limit

Number of Hopping Frequencies in the 2400-2483.5 MHz band shall use at least 15 channels.

7.2 Test Configuration



7.3 Test procedure and test setup

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

The Number of hopping frequencies per FCC § 15.247(a)(1)(iii) is measured using the Spectrum Analyzer with RBW=100kHz, VBW≥RBW, Sweep = auto, Detector = peak, Trace = max hold.

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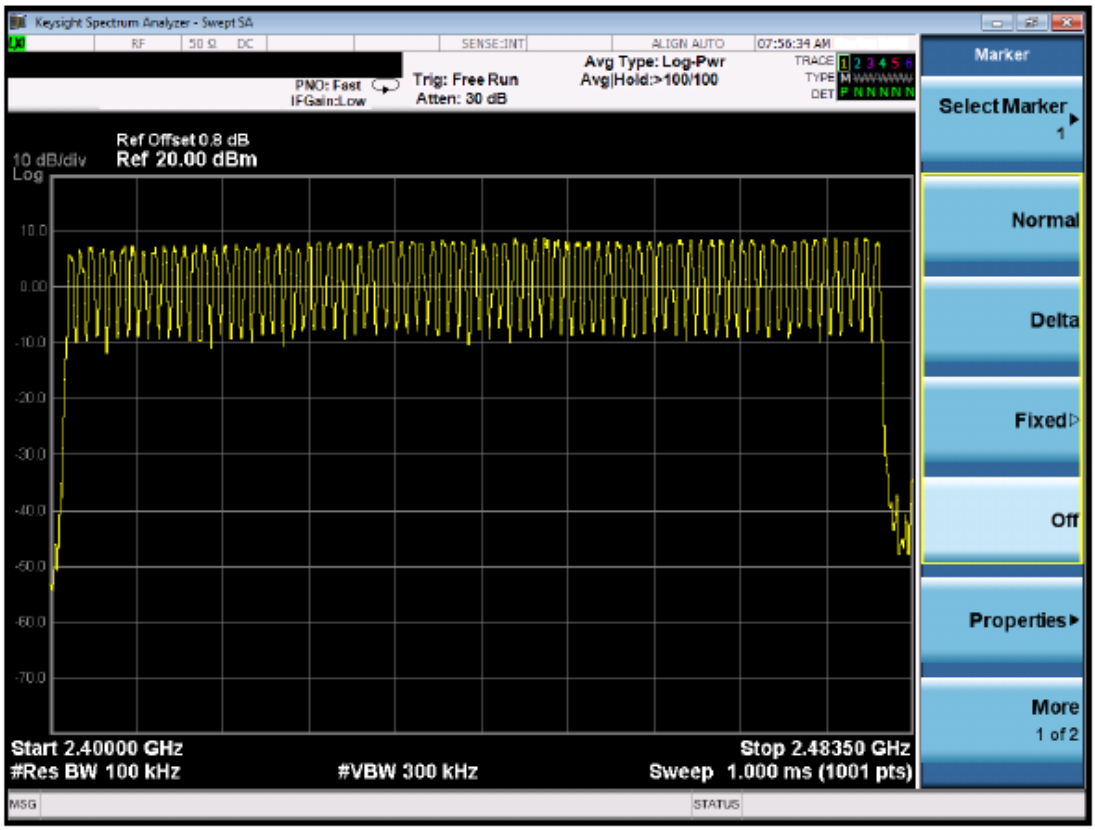
7.4 Test Protocol

Temperature: 22°C
Relative Humidity: 54%

Number of Hopping Frequencies	Limit
79	≥15



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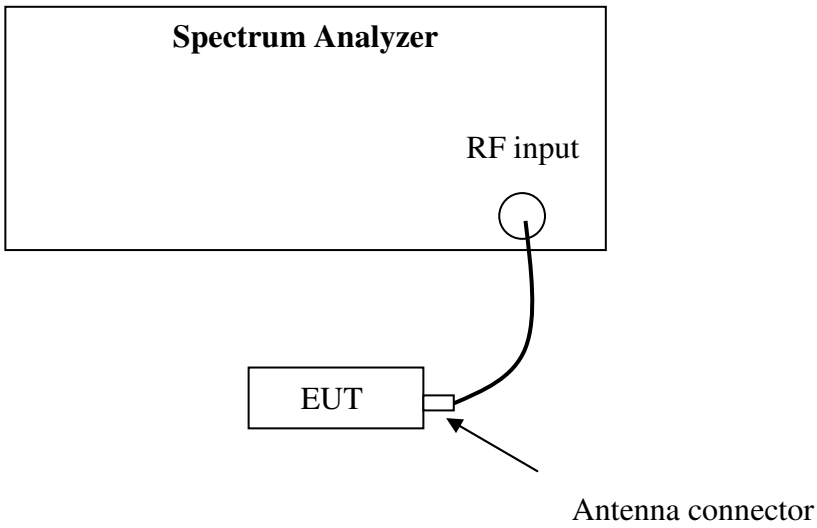
8 Dwell time

Test result: Pass

8.1 Test limit

The dwell time 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.

8.2 Test Configuration



8.3 Test procedure and test setup

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

Dwell time per FCC § 15.247(a)(1)(iii) is measured using the Spectrum Analyzer with Span = 0, RBW=1MHz, VBW≥RBW, Sweep can capture the entire dwell time, Detector = peak, Trace = max hold.

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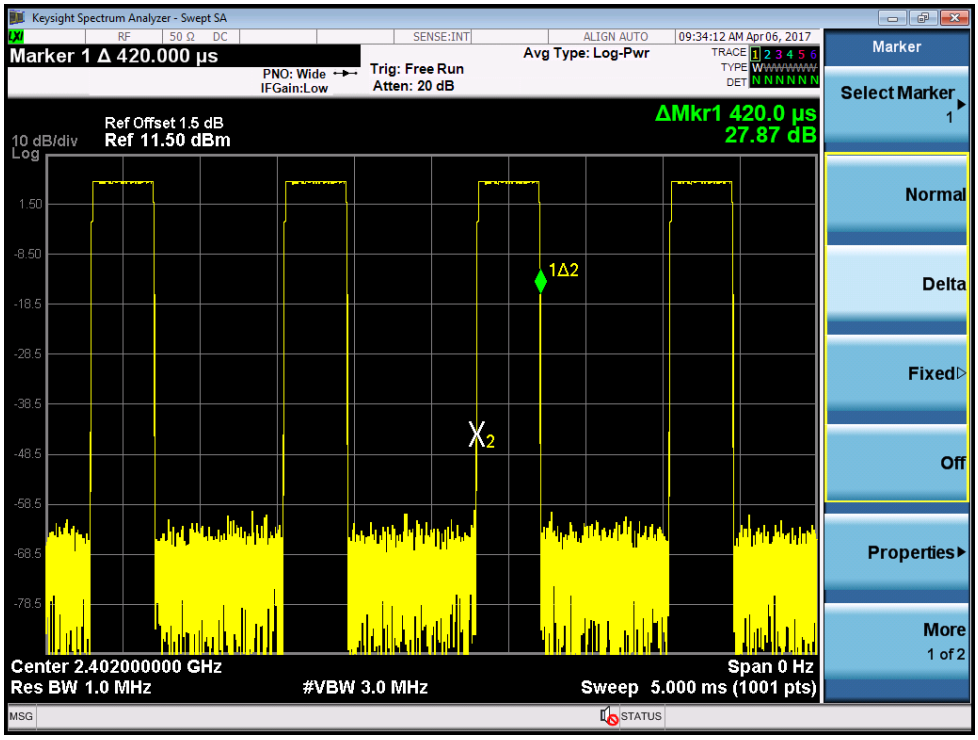
8.4 Test Protocol

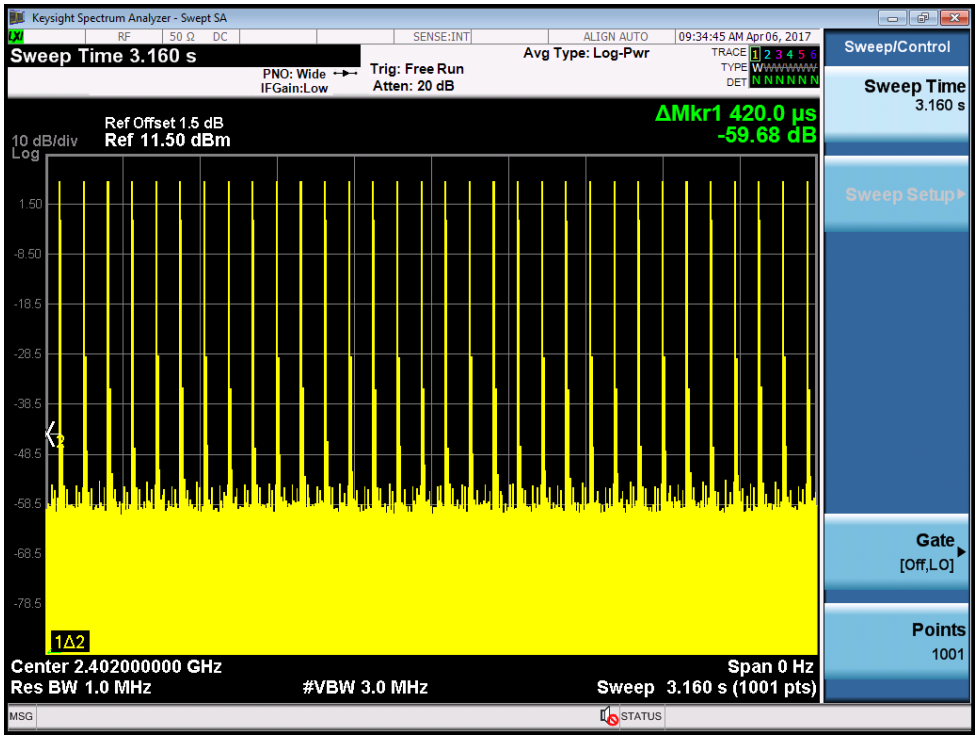
Temperature: 22°C
Relative Humidity: 54%

Packet	Occupancy time for single hop (ms) O	Channel	Real observed period (s) P	Hops among Observed period I	Dwell time (ms) T	Limit (s)
DH1	0.420	L	3.16	32	134.40	≤0.4
		M	3.16	32	134.40	
		H	3.16	32	134.40	
DH3	1.650	L	3.16	16	264.00	
		M	3.16	16	264.00	
		H	3.16	16	264.00	
DH5	3.00	L	3.16	10	300	
		M	3.16	10	300	
		H	3.16	10	300	

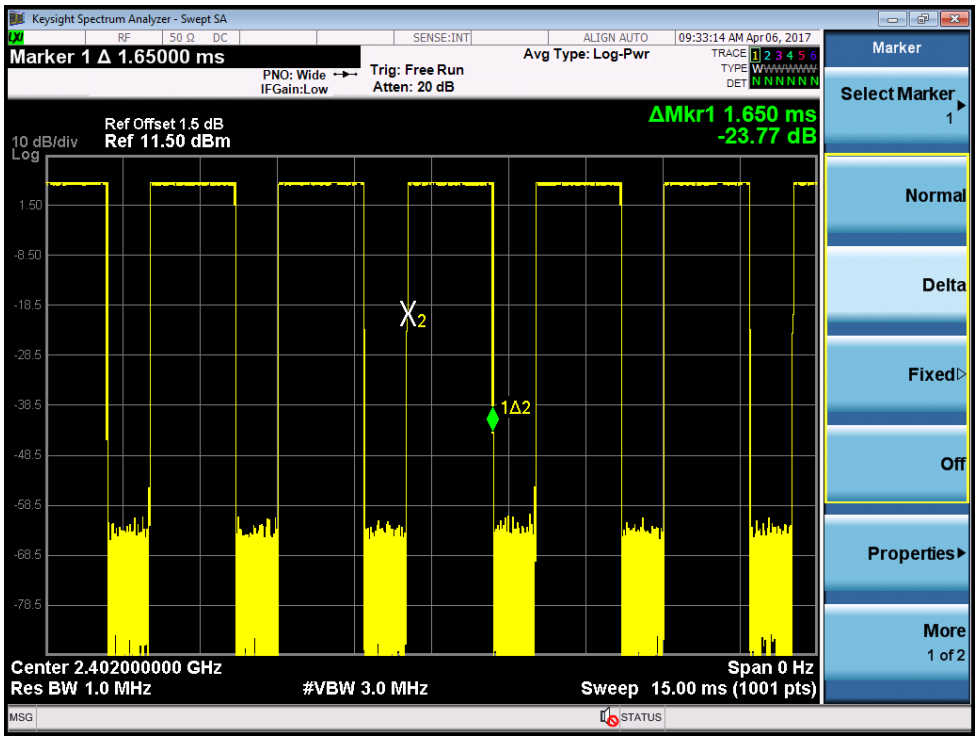
Remark: 1. There are 79 channels in all. So the complete observed period P = 0.4 * 79 = 31.6 s.
2. Average time of occupancy **T = O *I * 31.6 / P**

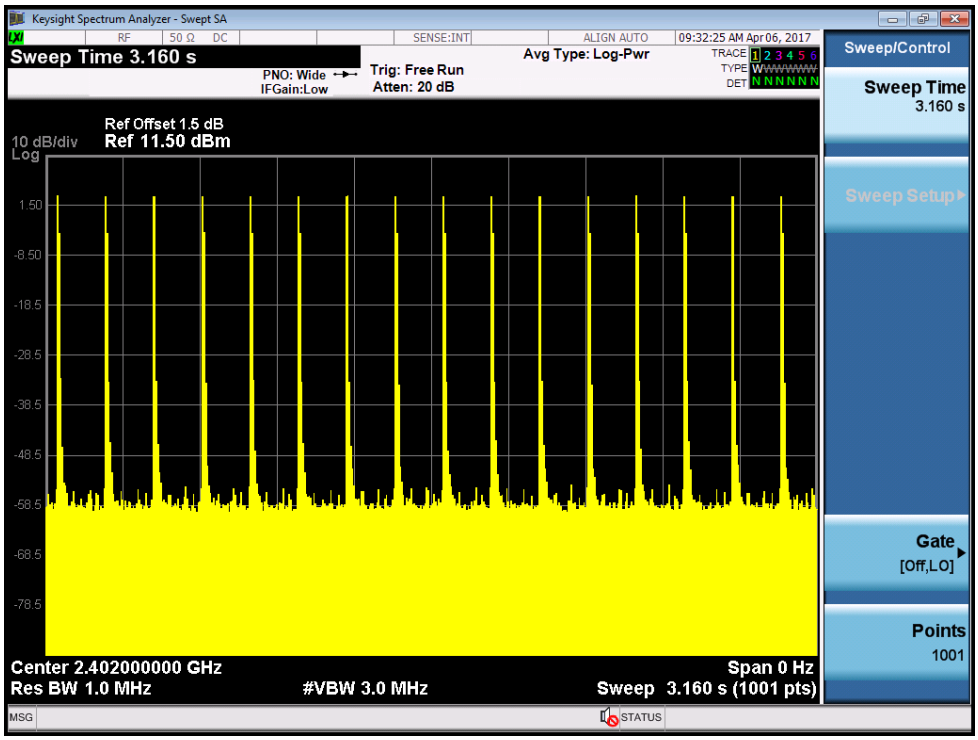
DH1


Keysight Spectrum Analyzer - Swept SA
Marker 1 Δ 420.000 µs
Avg Type: Log-Pwr
Trig: Free Run
Atten: 20 dB
PNO: Wide
IFGain:Low
09:34:12 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
ΔMkr1 420.0 µs
27.87 dB
1Δ2
Center 2.402000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

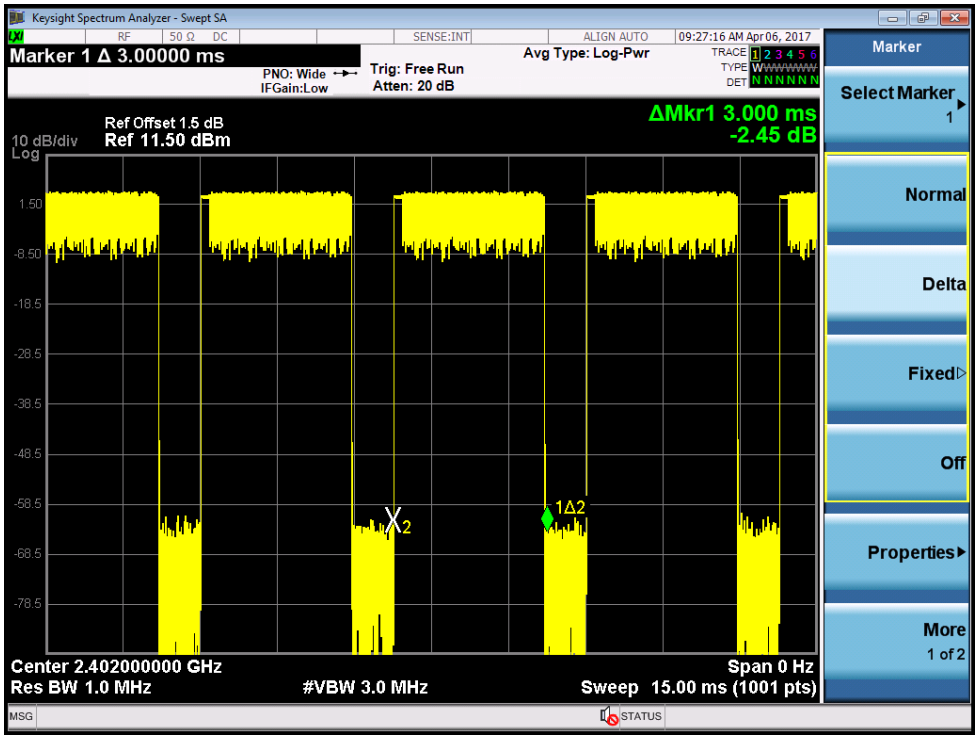

Keysight Spectrum Analyzer - Swept SA
Sweep Time 3.160 s
Avg Type: Log-Pwr
Trig: Free Run
Atten: 20 dB
PNO: Wide
IFGain:Low
09:34:45 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
ΔMkr1 420.0 µs
-59.68 dB
1Δ2
Center 2.402000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 3.160 s (1001 pts)
Sweep/Control
Sweep Time
3.160 s
Sweep Setup
Gate
[Off,LO]
Points
1001

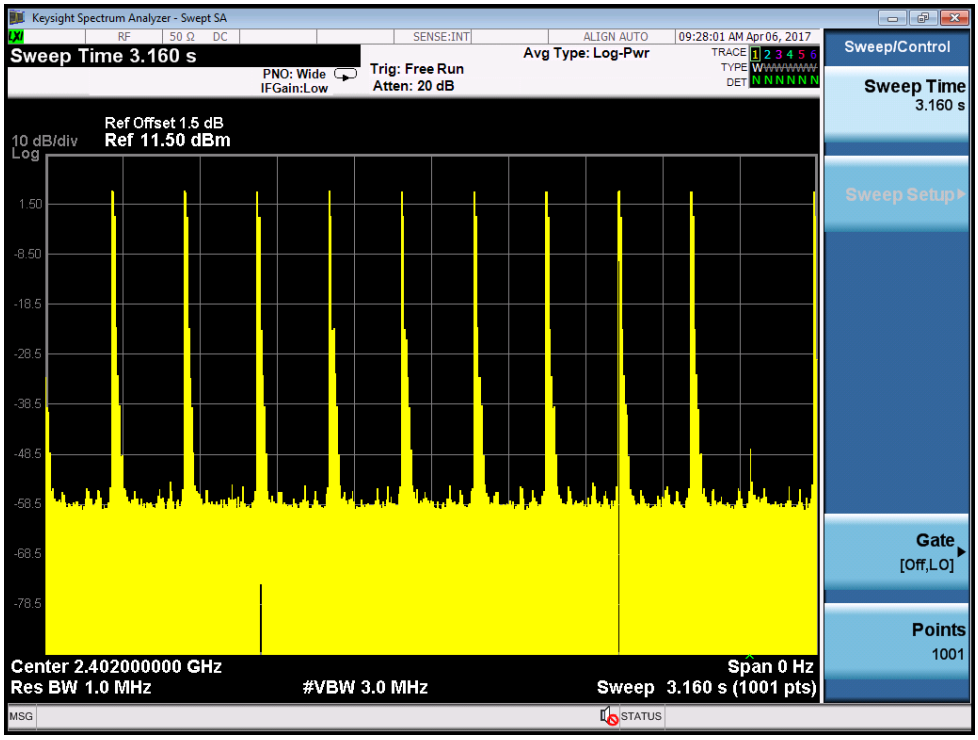
DH3


Keysight Spectrum Analyzer - Swept SA
Marker 1 Δ 1.65000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
09:33:14 AM Apr 06, 2017
ΔMkr1 1.650 ms
-23.77 dB
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Log
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
-78.5
X2
1Δ2
Center 2.402000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 15.00 ms (1001 pts)
Marker
Select Marker
1
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS


Keysight Spectrum Analyzer - Swept SA
Sweep Time 3.160 s
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
09:32:25 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Log
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
-78.5
Center 2.402000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 3.160 s (1001 pts)
Sweep/Control
Sweep Time
3.160 s
Sweep Setup
Gate
[Off,LO]
Points
1001
MSG
STATUS

DH5


Keysight Spectrum Analyzer - Swept SA
Marker 1 Δ 3.00000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
09:27:16 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
ΔMkr1 3.000 ms
-2.45 dB
Center 2.402000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 15.00 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Sweep Time 3.160 s
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
09:28:01 AM Apr 06, 2017
Ref Offset 1.5 dB
10 dB/div
Ref 11.50 dBm
Center 2.402000000 GHz
Res BW 1.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 3.160 s (1001 pts)
Sweep/Control
Sweep Time
3.160 s
Sweep Setup
Gate
[Off,LO]
Points
1001

9 Radiated Emissions

Test result: Pass

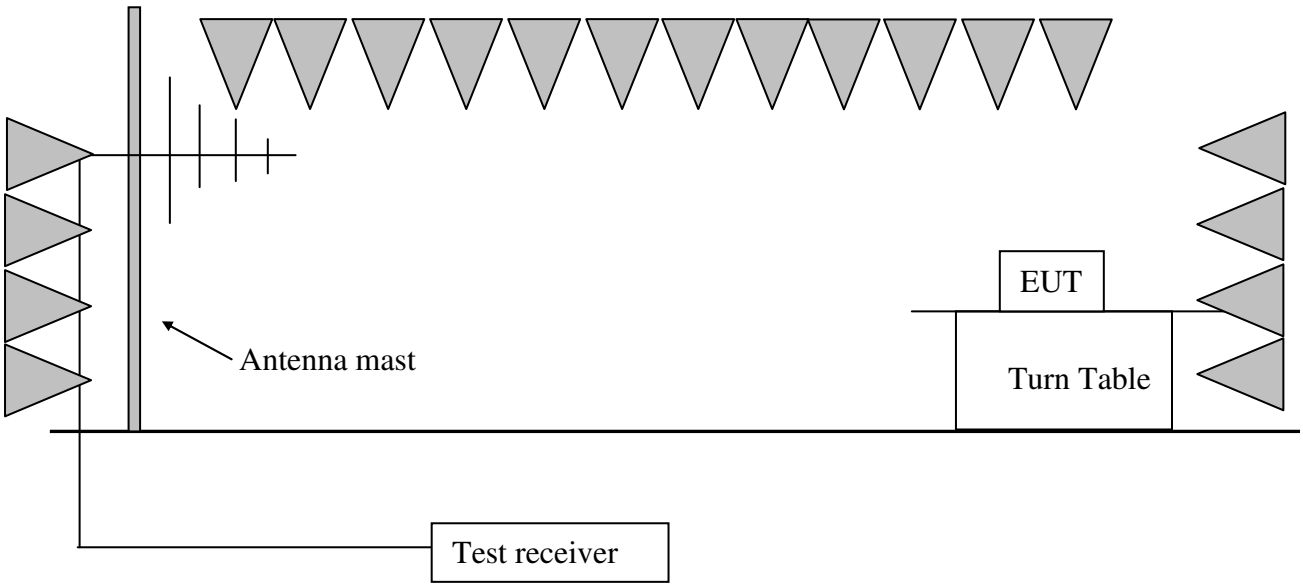
9.1 Test limit

The 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) showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

9.2 Test Configuration

Frequency range below 1GHz:



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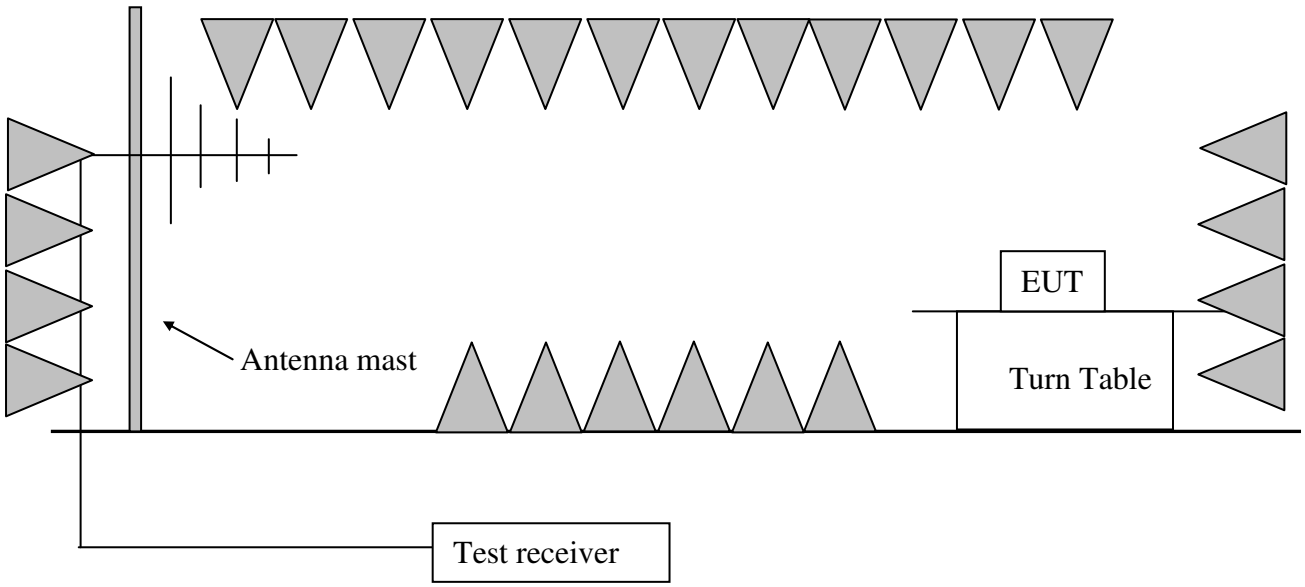
Frequency range above 1GHz:



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9.3 Test procedure and test setup

The radiated emissions were tested according to the procedure of ANSI C63.10 for compliance to FCC 47CFR 15.247 requirements.

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 300 Hz, VBW = 1 kHz (9 kHz~150 kHz);
RBW = 10 kHz, VBW = 30 kHz (150 kHz~30MHz);
RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz for PK)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

Remark:
1. Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Measured level= Original Receiver Reading + Factor
3. Margin = Limit – Measured level
4. If the PK measured level is lower than AV limit, the AV test can be elided.

Example:

Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Measured level = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m,
Measured level = 10.20dBuV/m, then Margin = 54 - 10.20 = 43.80dBuV/m.

9.4 Test Protocol

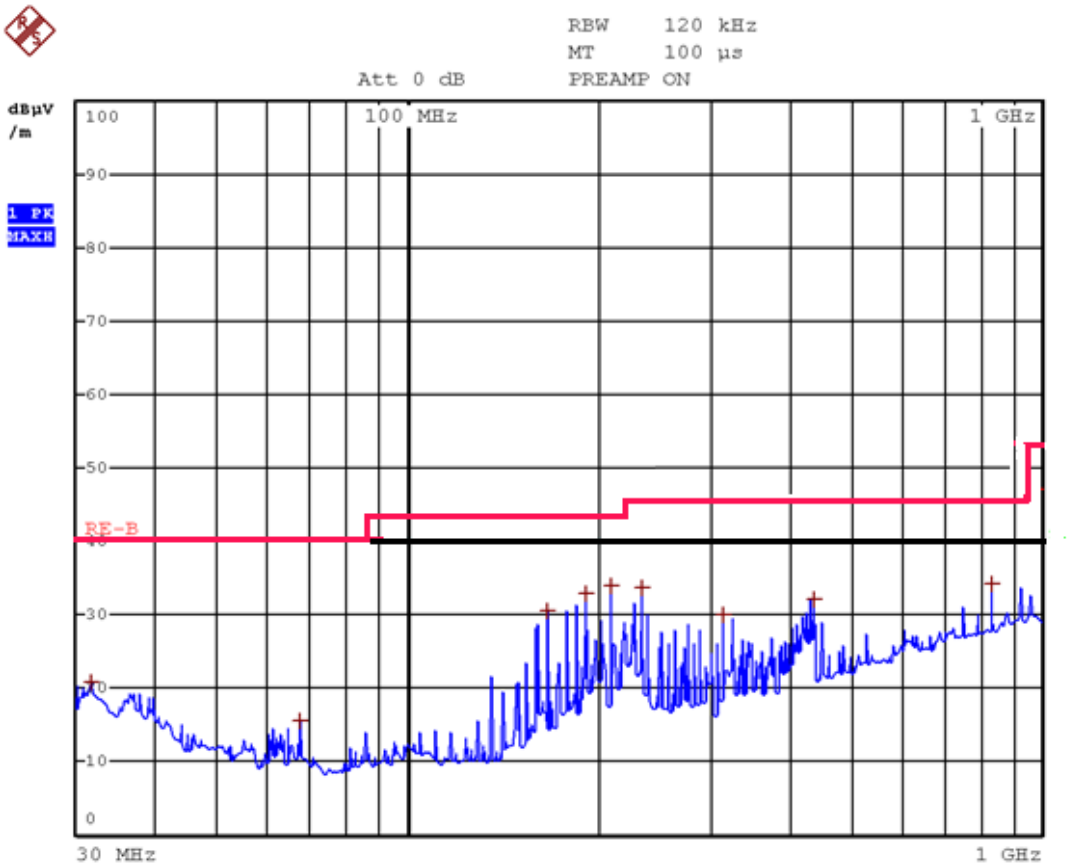
Temperature: 22°C
Relative Humidity: 54%

All the two models of product were tested and the worst data was listed in the report.

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

The worst waveform from 30MHz to 1000MHz (GFSK, 2402MHz) is listed as below:

Horizontal



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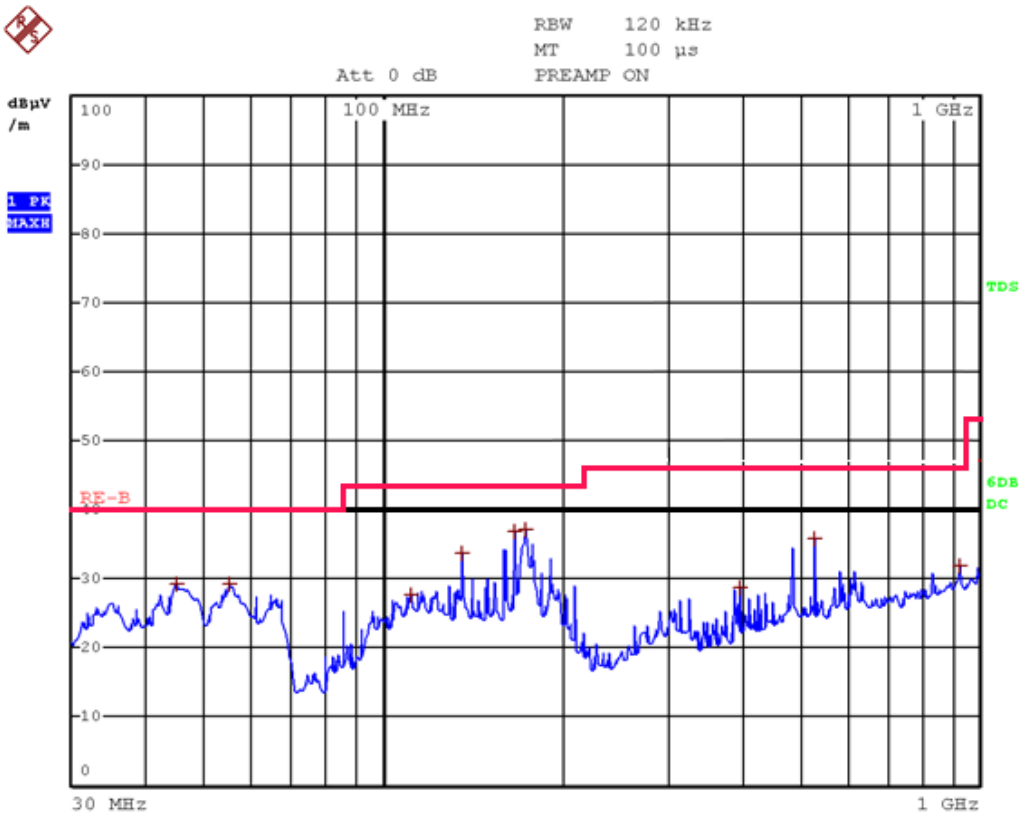
Vertical



Test result below 1GHz:

Channel	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	H	190.48	31.8	13.18	43.50	11.70	QP
	H	208.88	32.9	24.79	43.50	10.06	QP
	V	135.20	32.3	12.70	43.50	11.20	QP
	V	165.88	35.7	10.22	43.50	7.80	QP
	V	173.08	36.2	9.30	43.50	7.30	QP
Remark: If the margin higher than 20dB, it would be marked as *.							

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Test result above 1GHz:

The emission within the frequency range of 1GHz to 25GHz was tested.

GFSK:

Channel	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.20	94.40	34.34	Fundamental	/	PK
	H	2389.30	45.20	34.29	74.00	28.80	PK
	H	4803.61	48.20	-3.55	74.00	25.80	PK
M	H	2441.20	95.80	34.60	Fundamental	/	PK
	H	4883.77	50.14	-3.35	74.00	23.86	PK
H	H	2480.20	95.92	34.62	Fundamental	/	PK
	H	2483.80	50.40	34.63	74.00	23.60	PK
	H	4963.93	50.60	-3.16	74.00	23.40	PK

π/4-DQPSK:

Channel	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.20	93.20	34.34	Fundamental	/	PK
	H	2385.20	49.00	34.25	74.00	25.00	PK
	H	4803.61	48.50	-3.55	74.00	25.50	PK
M	H	2441.20	93.60	34.60	Fundamental	/	PK
	H	4883.77	47.50	-3.35	74.00	26.50	PK
H	H	2480.20	93.45	34.62	Fundamental	/	PK
	H	2483.72	50.65	34.65	74.00	23.35	PK
	H	4963.93	52.20	-3.16	74.00	21.80	PK

8DPSK:

Channel	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.20	93.40	34.34	Fundamental	/	PK
	H	2389.00	52.30	34.30	74.00	21.70	PK
	H	4803.61	48.80	-3.55	74.00	25.20	PK
M	H	2441.20	92.84	34.60	Fundamental	/	PK
	H	4883.77	49.50	-3.35	74.00	24.50	PK
H	H	2480.20	94.14	34.62	Fundamental	/	PK
	H	2483.72	51.65	34.65	74.00	22.35	PK
	H	4963.93	51.70	-3.16	74.00	22.30	PK

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Test mode: with WIFI connected(worst case list as below)

Channel	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.20	93.20	34.34	Fundamental	/	PK
	H	2389.27	54.20	34.30	74.00	19.80	PK
	H	4803.61	48.80	-3.55	74.00	25.20	PK
M	H	2441.20	92.84	34.60	Fundamental	/	PK
	H	4883.77	49.50	-3.35	74.00	24.50	PK
H	H	2480.20	94.14	34.62	Fundamental	/	PK
	H	2484.60	51.00	34.65	74.00	23.00	PK
	H	4963.93	51.70	-3.16	74.00	22.30	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = limit – Corrected Reading

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m, Corrected Reading = 10.20dBuV/m, then
Margin = 54 -10.20 = 43.80dBuV/m

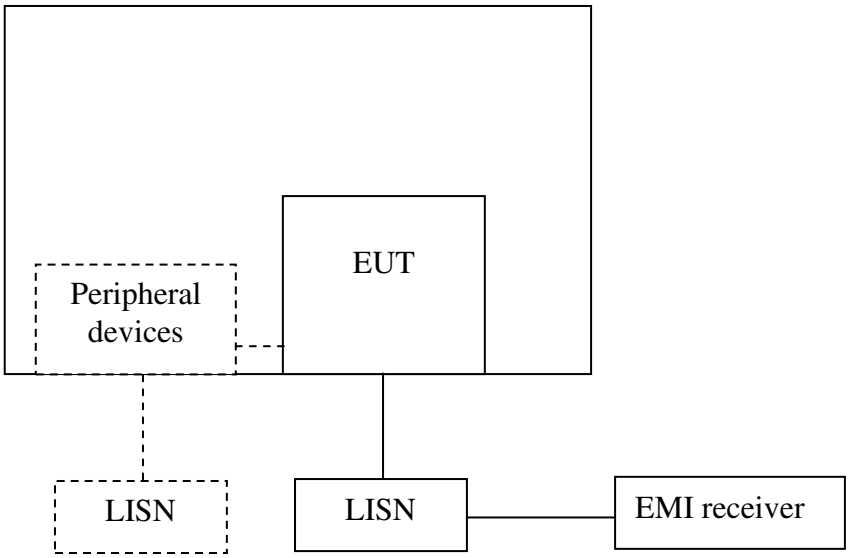
10 Power line conducted emission

Test result: **Pass**

10.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

10.2 Test configuration



☒ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

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10.3 Test procedure and test set up

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

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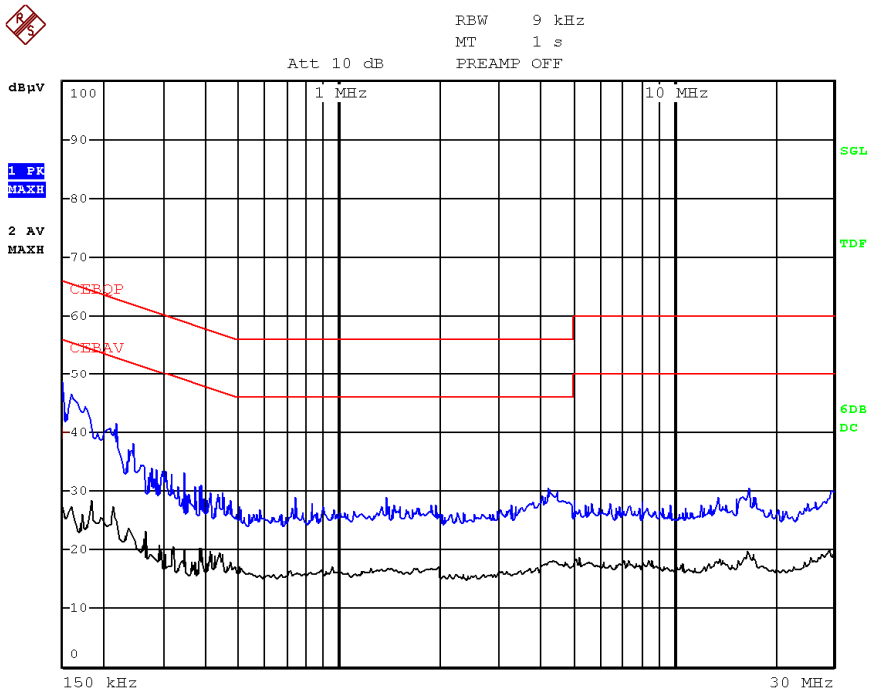
10.4 Test protocol

Temperature: 22°C
Relative Humidity: 54%

All the three models of product were tested and the worst data (GFSK, 2402MHz) was listed in the report.



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.15	*	*	*	*	*	*
0.663	*	*	*	*	*	*
1.167	*	*	*	*	*	*
1.719	*	*	*	*	*	*
2.229	*	*	*	*	*	*
25.863	*	*	*	*	*	*
Remark: If the margin higher than 20dB, it would be marked as *.						

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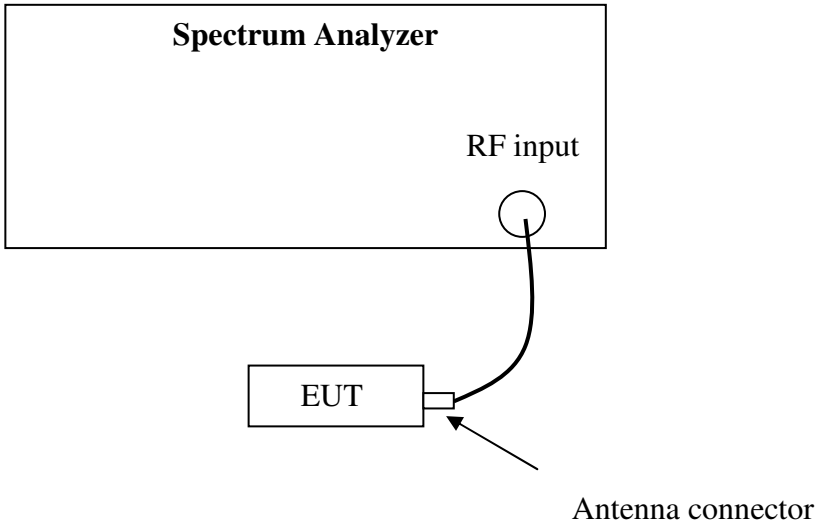
11 Occupied Bandwidth

Test Status: Tested

11.1 Test limit

None

11.2 Test Configuration



11.3 Test procedure and test setup

The occupied bandwidth per RSS-Gen Issue 4 Clause 6.6 was measured using the Spectrum Analyzer.

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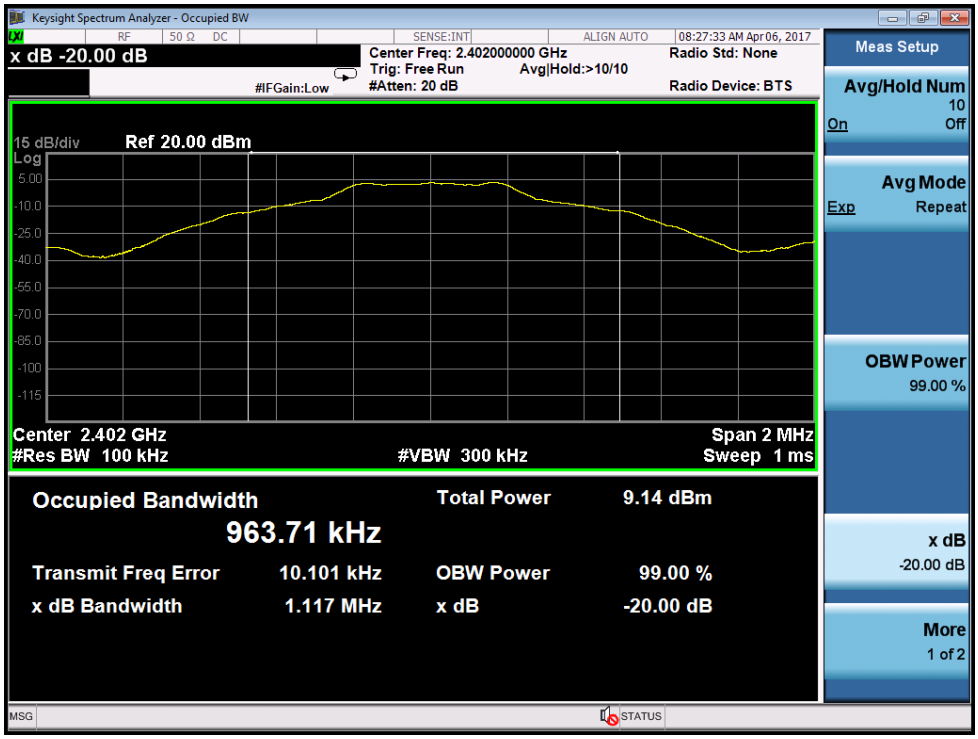
11.4 Test protocol

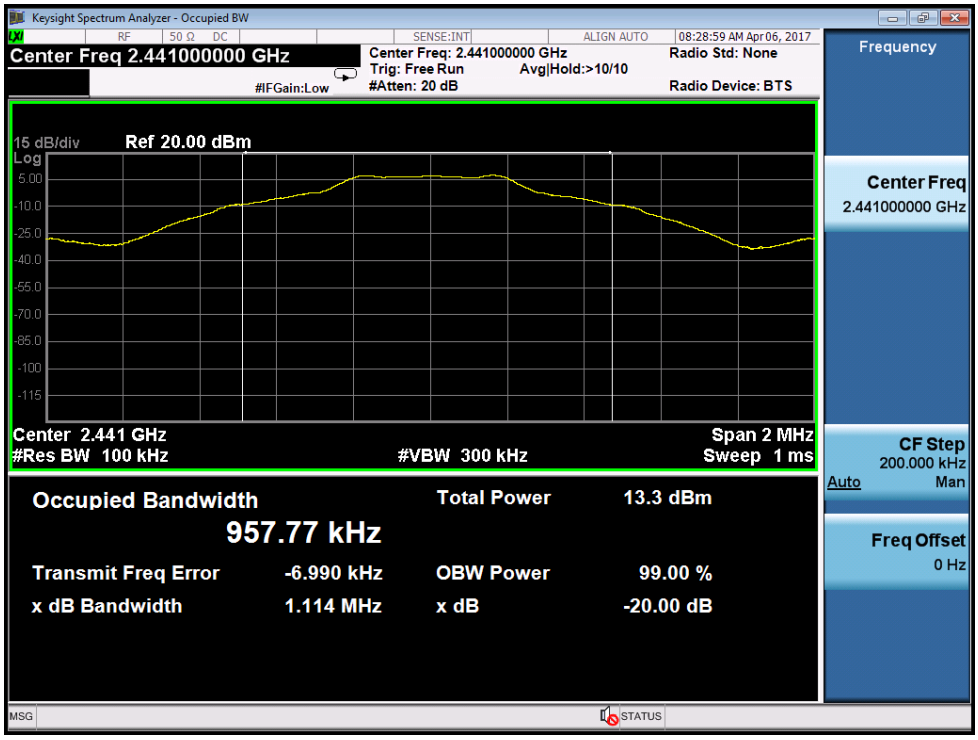
Temperature : 25 °C
Relative Humidity : 55 %

Modulation	Mode	99% Bandwidth (KHz)
GFSK	L	963.71
	M	957.77
	H	948.02

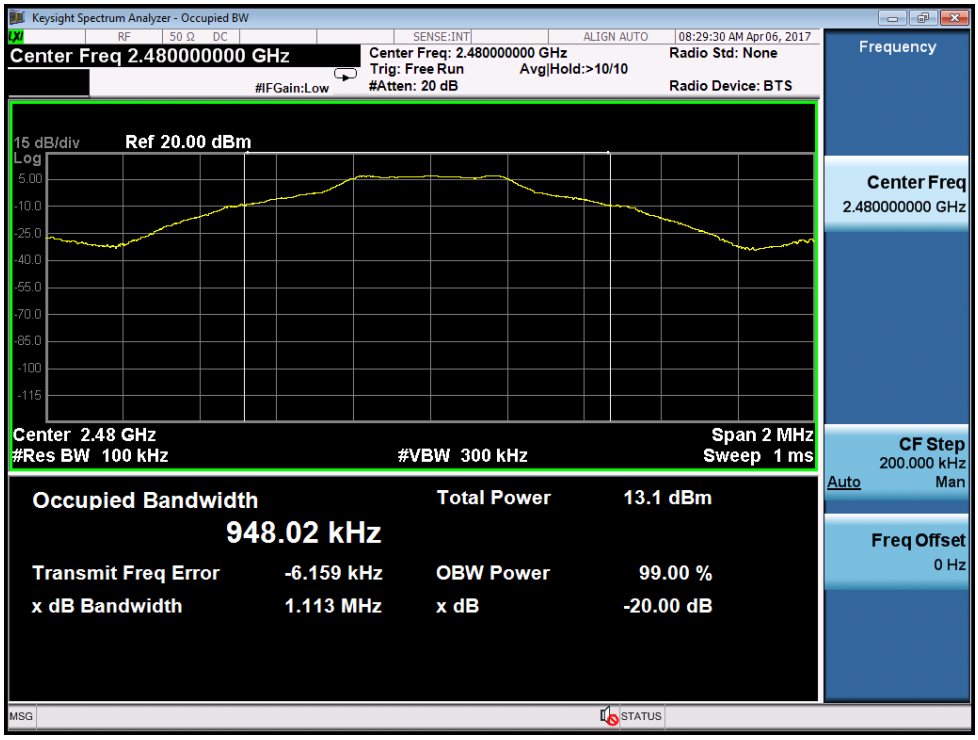
Channel L



Channel M

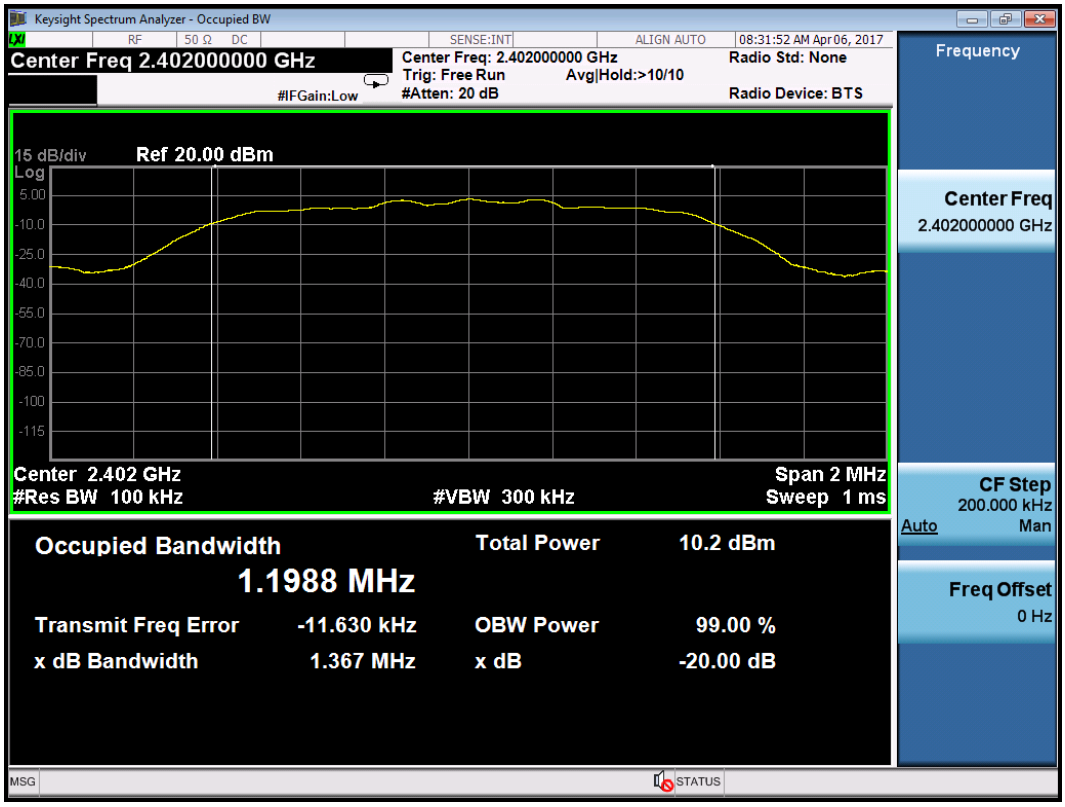


Channel H



Modulation	Mode	99% Bandwidth (MHz)
π/4-DQPSK	L	1.1988
	M	1.1977
	H	1.1990

Channel L



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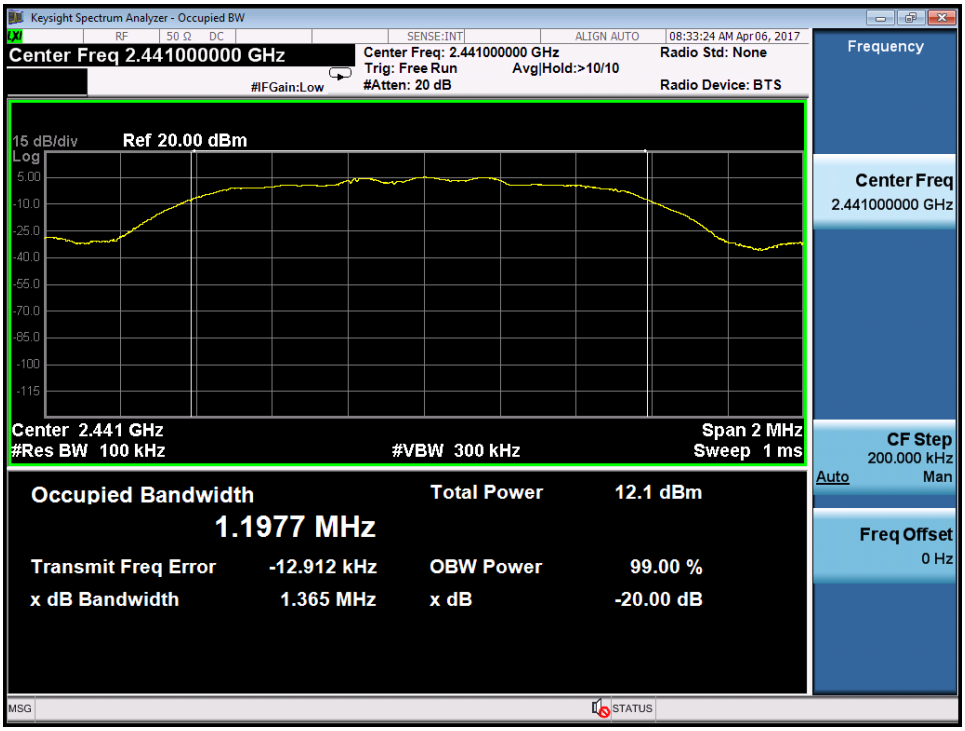
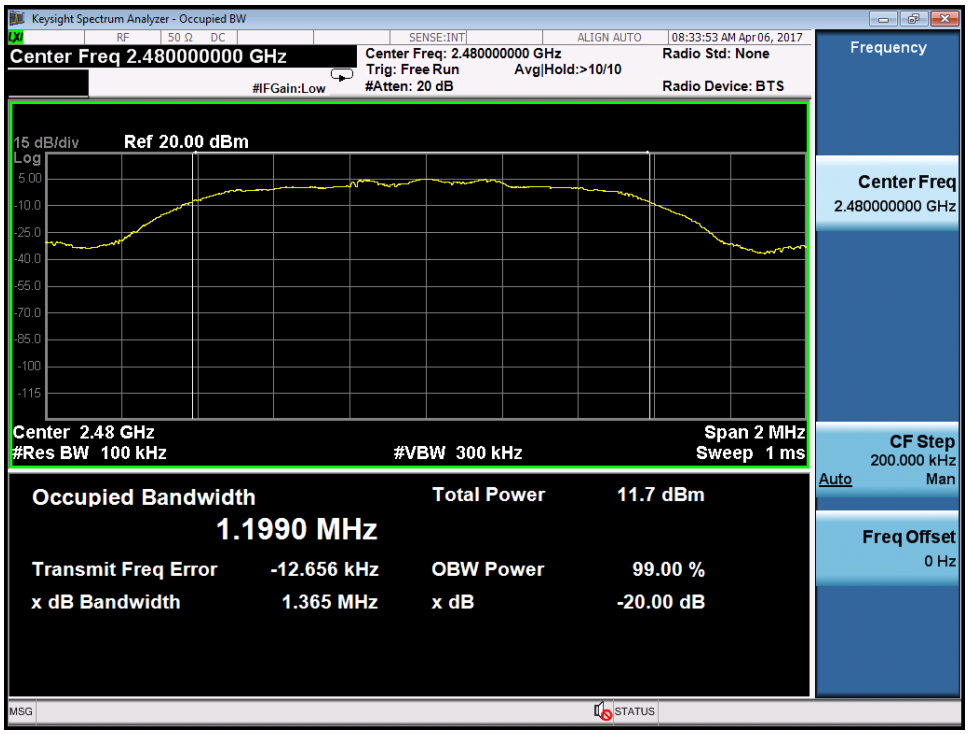
Channel M

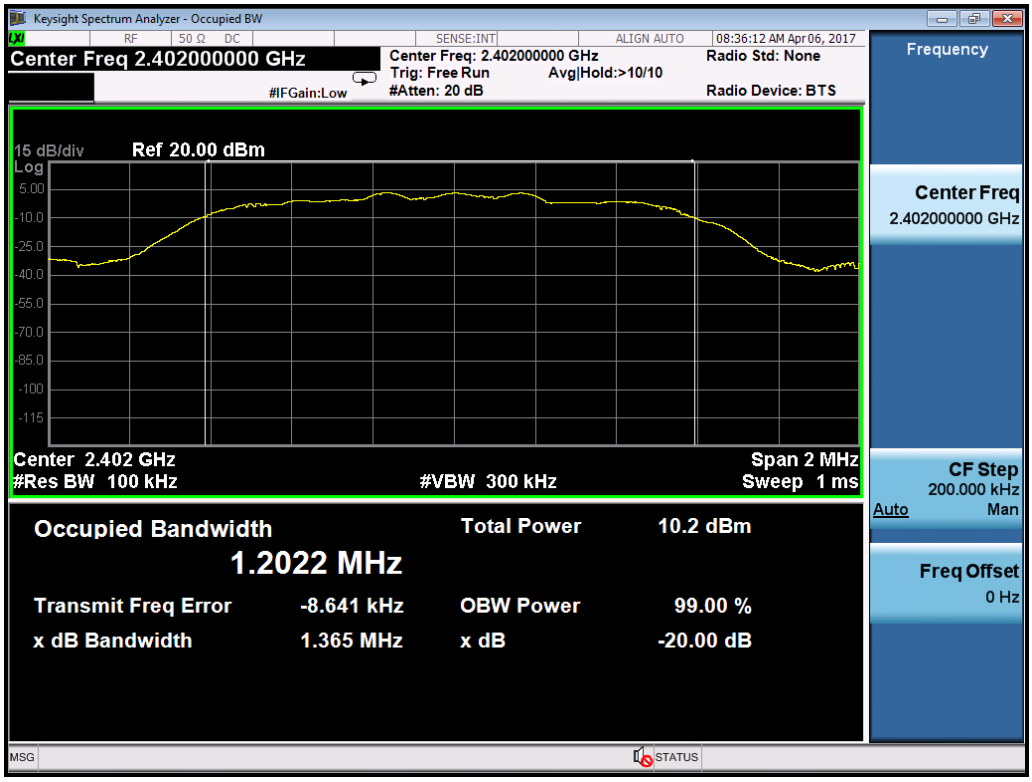


Channel H



Modulation	Mode	99% Bandwidth (MHz)
8DPSK	L	1.2022
	M	1.2027
	H	1.2031

Channel L



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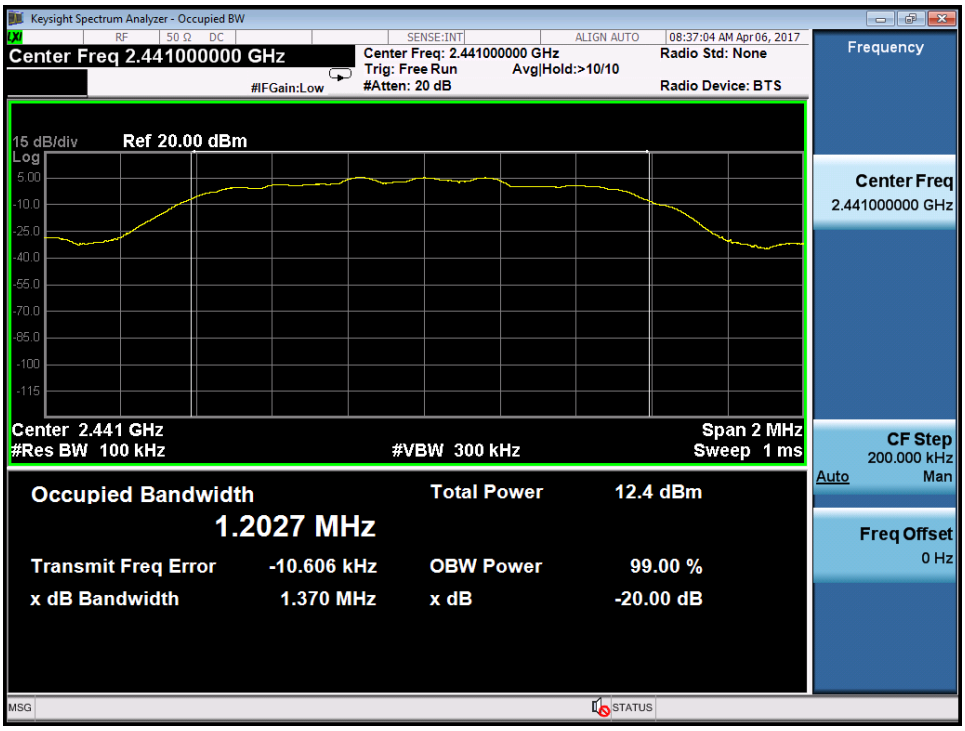
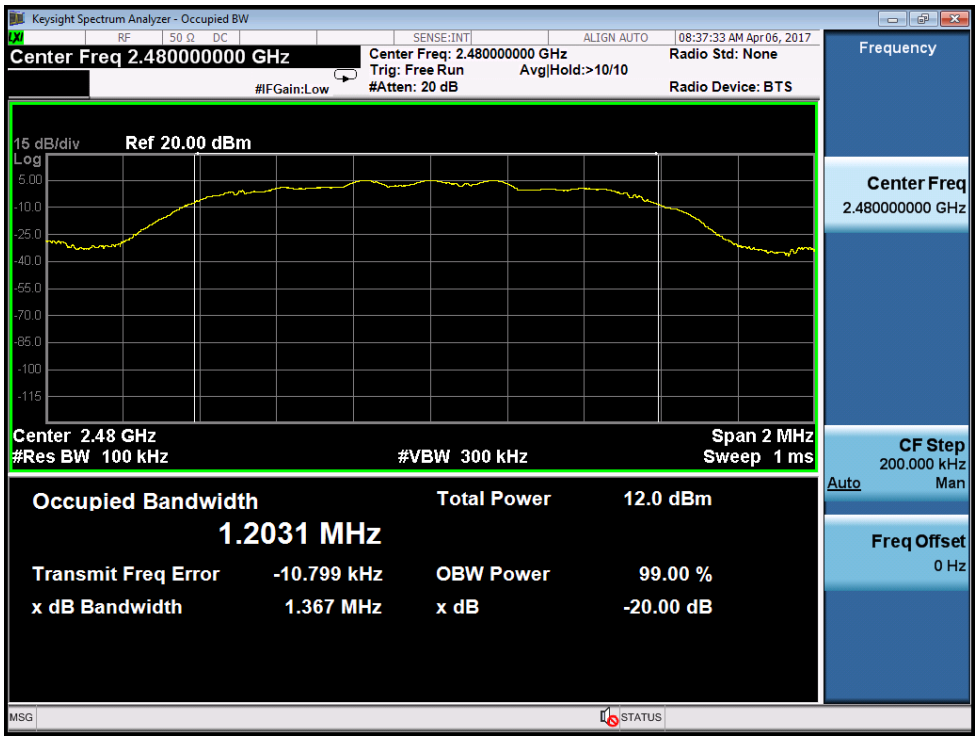
Channel M



Channel H