



**Produkte**  
*Products*

<b>Prüfbericht - Nr.:</b> 19660184 001		<b>Seite 1 von 50</b>	
<i>Test Report No.:</i>		<i>Page 1 of 50</i>	
<b>Auftraggeber:</b> <i>Client:</i>		American Megatrends India Private Limited Kumaran Nagar, Off Old Mahabalipuram Road Semmanchery, Chennai-600119, India	
<b>Gegenstand der Prüfung:</b> <i>Test item:</i>		Chest ECG	
<b>Bezeichnung:</b> <i>Identification:</i>	VA07	<b>Serien-Nr.:</b> <i>Serial No.</i>	Engineering Sample
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>	1803095548	<b>Eingangsdatum:</b> <i>Date of receipt:</i>	26.08.2015
<b>Prüfart:</b> <i>Testing location:</i>		Refer Page 4 of 50 for test facilities	
<b>Prüfgrundlage:</b> <i>Test specification:</i>		FCC Part 15: Subpart C Section 15.247 ANSI C63.10-2013	
<b>Prüfergebnis:</b> <i>Test Result:</i>		Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test items passed the test specification(s).</i>	
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>		TÜV Rheinland (India) Pvt. Ltd. 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100, India  FCC Registration No.: 176555	
<b>geprüft / tested by:</b>		<b>kontrolliert / reviewed by:</b>	
15.09.2015    Girish Kumar.G  Test Engineer		18.09.2015    Raghavendra Kulkarni  Sr. Manager	
<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>
<b>Sonstiges / Other Aspects:</b>		FCC ID : 2AFV6-AMI-ECG-01	
<b>Abkürzungen:</b>	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	<b>Abbreviations:</b>	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
<p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b></p> <p><i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i></p>			

TÜV Rheinland India Pvt. Ltd. 82/A, 3rd Main, West Wing Electronic City Phase 1, Hosur Road, Bangalore-560100, India  
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**Test Result Summary**

Clause	Test Item	Result
Section 15.203 and 15.204	Antenna Requirement	Pass
Section 15.247 (a)	Pseudorandom Frequency Hopping Sequence	Pass
Section 15.247 (a)	Equal Hopping Frequency Use	Pass
Section 15.247 (a)	Receiver Input Bandwidth	Pass
Section 15.247 (a)	Receiver Hopping Capability	Pass
Section 15.247 (b) (1)	Peak Output Power	Pass
Section 15.247 (a)(1)	20dB Bandwidth	Pass
Section 15.247 (a)(1)(ii)	Number of Hopping Channels	Pass
Section 15.247 (a)(1)	Carrier Frequency Separation	Pass
Section 15.247 (a)(1)(iii)	Time of Occupancy	Pass
Section 15.247 (d)	Band-edge compliance of RF Conducted Emissions	Pass
Section 15.209 & 15.205	Spurious Radiated Emissions and Restricted bands of operation	Pass
Section 15.207	Conducted emission test on a.c Power line	Pass

**Note:** Conducted measurements are done according to the procedure given in KDB No. **DA 00-705**  
March 2000

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## List of Test and Measurement Instruments

### Testing Facilities

- 1) TÜV Rheinland (India) Pvt. Ltd.  
82/A, 3rd Main, West Wing, Electronic City,  
West Phase, Hosur Road  
Bangalore - 560 100.

Equipment	Manufacturer	Model Name	Serial Number	Calibration Due Date	Periodicity	Used for Test Items
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	15.04.2016	Yearly	Antenna - Port Conducted Tests

- 2) TUV Rheinland (India) Private Limited  
108 , Beside ISBR Business School,  
Electronic city Phase I  
Bangalore - 560 100.

Equipment	Manufacturer	Model Name	Serial Number	Calibration Due Date	Periodicity	Used for Test Items
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	20.06.2016	Yearly	Spurious Radiated Emissions
Broadband Antenna	Frankonia	ALX-4000	ALX-4000-806	22.06.2016	Yearly	
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	22.06.2016	Yearly	
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	22.06.2016	Yearly	
Emission Horn Antenna	ETS Lindgren	116706	00107323	22.06.2016	Yearly	
Anechoic Chamber	Frankonia	-	-	-	-	Conducted Emission on AC power lines
EMI Test Receiver	Rohde & Schwarz	ESR7	101133	19.11.2015	Yearly	
Two Line V-Network (LISN)	Rohde & Schwarz	ENV216	100022	04.09.2016	Yearly	

## General Product Information

### Product Function and Intended Use

Chest ECG device is a portable diagnostic system which can measure/monitor the electrical activity of the heart over a period of time using the ECG electrodes placed on the user's body. The device monitors the ECG waveform from the chest Left, Right alone with a reference Electrode. The acquired and processed ECG data obtained from the device is transmitted to a mobile device wirelessly for further processing and analysis. The ECG data acquired by the device can be used to obtain clinical consultation from cardiologists or healthcare practitioners.

### Ratings and System Details

Operating Frequency Range	2400MHz – 2483.50MHz	
No. of channel	79	
Channel Spacing	1MHz	
Modulation	1Mbps	GFSK
	2Mbps	$\pi/4$ -DQPSK
	3Mbps	8DPSK
Transmitted Power	01.22dBm	
Number of antenna	One	
Antenna Gain and Antenna type	0.5dBi and Chip Antenna	
Supply Voltage to Product	5V DC from Power Charger	
Environmental	Operational Temperature: 16°C to 35°C	

### Test Conditions:

Supply Voltage: 5V DC from Power Charger

### Environmental conditions:

Temperature: +24.2 °C      RH: 58%

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## **Test Set-up and Operation Mode**

### **Principle of Configuration Selection**

Transmission was enabled with 100% duty cycle duty on low, mid and high channel.

### **Test Operation and Test Software**

Test software was used to enable the transmission with 100% duty cycle, changing channels (low/mid/high) and data rates on the EUT for the tests in this report.

### **Special Accessories and Auxiliary Equipment**

- None

### **Countermeasures to achieve EMC Compliance**

- Testing was conducted with the Power adaptor cable connected to the AC mains (5v supply for charging EUT).

### **Test Modes – Data Rates and Modulations**

For Radiated spurious emissions, the tests were performed for all data rates and only worst case results are reported in this report.

For Conducted emission, the tests was performed, both in normal operating mode and channel selection mode in charging condition, power adaptor cable connected to AC mains. And only worst case results are reported in this report.

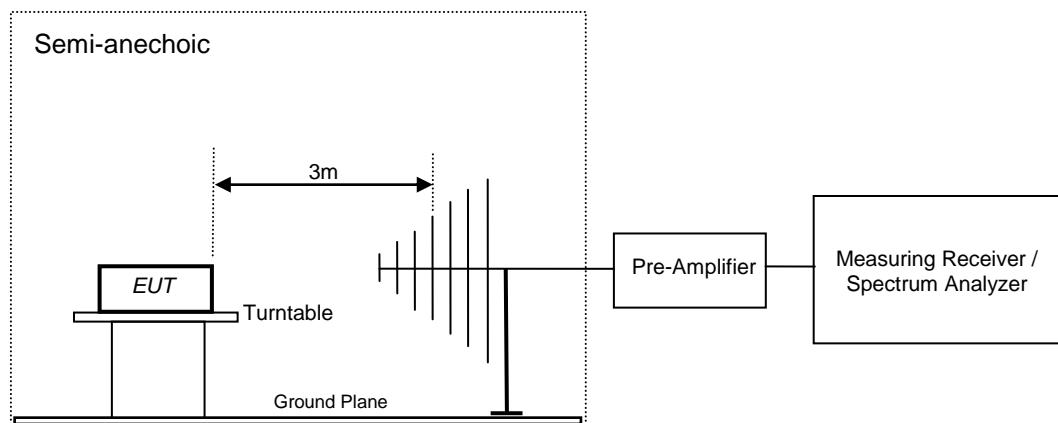
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## Test Methodology

### Radiated Emission Test

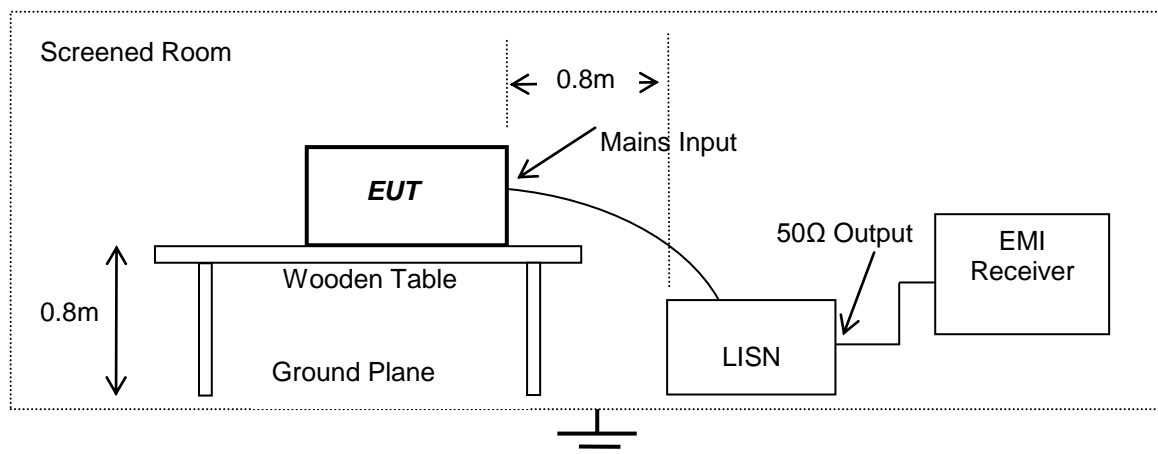
The radiated emission measurement was performed according to the procedures in ANSI C63.10 - 2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1GHz and 1.5m high turntable for above 1GHz, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.



### Conducted Emission Test on A.C. mains line

The equipment under test (EUT) was placed on a wooden table 80cm above the ground plane, the LISN was placed 80cm away from the EUT. The test was performed in accordance with ANSI C63.10 - 2013, with the following: an initial measurement was performed in peak and average detection mode on the live and neutral lines. The pre-scan was performed by peak detection on both live and neutral conductors. Any emissions recorded within 20dB of the relevant limit line were re-measured using quasi-peak and average detections, the 6 worst cases were recorded in the table of results.



## Test Results

### Antenna Requirement

Section 15.203 and 15.204

#### Result

Pass

**FCC Requirement:** No antenna other than that furnished by the responsible party shall be used With the device. Permanently attached antenna is used in the device.

Antenna details:

1. Antenna Type: Chip Antenna
2. Manufacturer: Johanson Technology
3. Model no.: 2450AT18A100
4. Peak Gain: 0.5dBi

### Pseudorandom Frequency Hopping Sequence

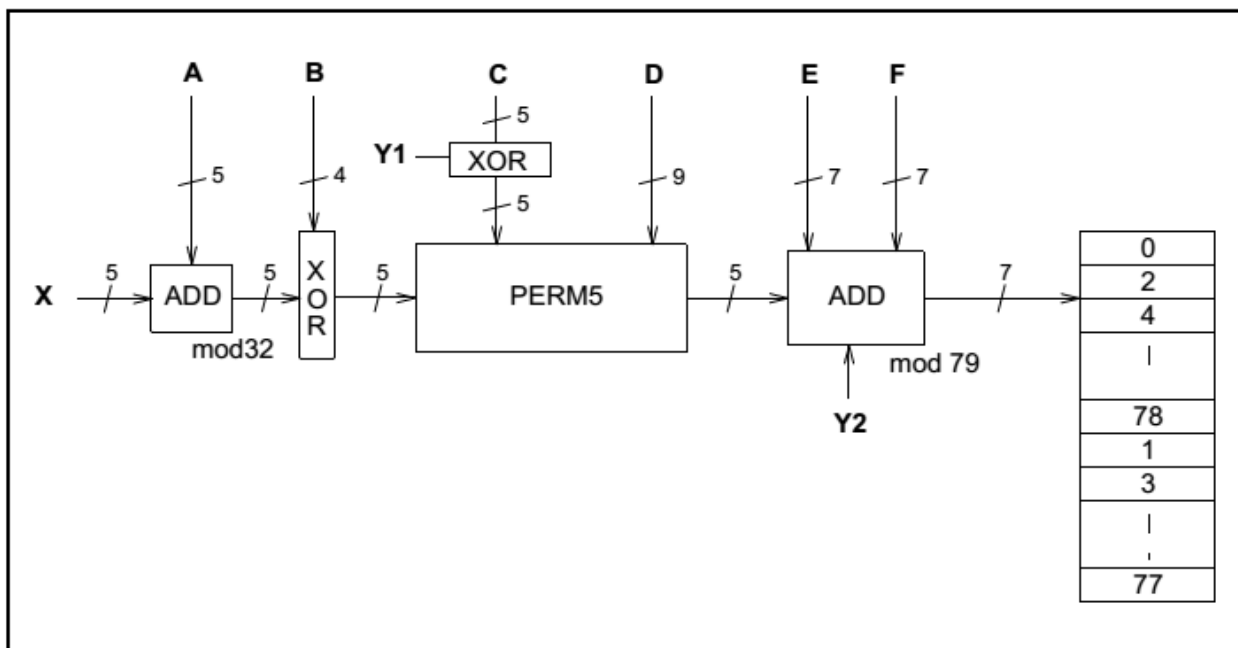
Section 15.247 (a)

#### Result

Pass

**FCC Requirement:** The Hopping Sequence is generated and provided with an example

The adapted channel hopping selection kernel is described in The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies. The kernel addresses a register containing the RF channel indices. This list is ordered so that first all even RF channel indices are listed and then all odd hop frequencies. In this way, a 32-hop segment spans about 64 MHz.





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Example data:

Hop Sequence {k} for CONNECTION STATE (Adapted channel hopping sequence with all channel used; ie, AFH(79)):

CLK start: 0x0000010

ULAP: 0x00000000

Used Channels:0x7fffffffffffffff

#ticks: 00 02 | 04 06 | 08 0a | 0c 0e | 10 12 | 14 16 | 18 1a | 1c 1e |

```
-----
0x0000010 08 08 | 10 10 | 12 12 | 14 14 | 16 16 | 18 18 | 20 20 | 22 22 |
0x0000030 24 24 | 26 26 | 28 28 | 30 30 | 32 32 | 34 34 | 36 36 | 38 38 |
0x0000050 40 40 | 42 42 | 44 44 | 46 46 | 48 48 | 50 50 | 52 52 | 54 54 |
0x0000070 56 56 | 58 58 | 60 60 | 62 62 | 32 32 | 36 36 | 34 34 | 38 38 |
0x0000090 40 40 | 44 44 | 42 42 | 46 46 | 48 48 | 52 52 | 50 50 | 54 54 |
0x00000b0 56 56 | 60 60 | 58 58 | 62 62 | 64 64 | 68 68 | 66 66 | 70 70 |
0x00000d0 72 72 | 76 76 | 74 74 | 78 78 | 01 01 | 05 05 | 03 03 | 07 07 |
0x00000f0 09 09 | 13 13 | 11 11 | 15 15 | 64 64 | 66 66 | 68 68 | 70 70 |
0x0000110 01 01 | 03 03 | 05 05 | 07 07 | 72 72 | 74 74 | 76 76 | 78 78 |
0x0000130 09 09 | 11 11 | 13 13 | 15 15 | 17 17 | 19 19 | 21 21 | 23 23 |
0x0000150 33 33 | 35 35 | 37 37 | 39 39 | 25 25 | 27 27 | 29 29 | 31 31 |
0x0000170 41 41 | 43 43 | 45 45 | 47 47 | 17 17 | 21 21 | 19 19 | 23 23 |
0x0000190 33 33 | 37 37 | 35 35 | 39 39 | 25 25 | 29 29 | 27 27 | 31 31 |
0x00001b0 41 41 | 45 45 | 43 43 | 47 47 | 49 49 | 53 53 | 51 51 | 55 55 |
0x00001d0 65 65 | 69 69 | 67 67 | 71 71 | 57 57 | 61 61 | 59 59 | 63 63 |
0x00001f0 73 73 | 77 77 | 75 75 | 00 00 | 49 49 | 51 51 | 57 57 | 59 59 |
0x0000210 53 53 | 55 55 | 61 61 | 63 63 | 65 65 | 67 67 | 73 73 | 75 75 |
0x0000230 69 69 | 71 71 | 77 77 | 00 00 | 02 02 | 04 04 | 10 10 | 12 12 |
0x0000250 06 06 | 08 08 | 14 14 | 16 16 | 18 18 | 20 20 | 26 26 | 28 28 |
0x0000270 22 22 | 24 24 | 30 30 | 32 32 | 02 02 | 06 06 | 10 10 | 14 14 |
0x0000290 04 04 | 08 08 | 12 12 | 16 16 | 18 18 | 22 22 | 26 26 | 30 30 |
0x00002b0 20 20 | 24 24 | 28 28 | 32 32 | 34 34 | 38 38 | 42 42 | 46 46 |
0x00002d0 36 36 | 40 40 | 44 44 | 48 48 | 50 50 | 54 54 | 58 58 | 62 62 |
0x00002f0 52 52 | 56 56 | 60 60 | 64 64 | 34 34 | 36 36 | 50 50 | 52 52 |
0x0000310 38 38 | 40 40 | 54 54 | 56 56 | 42 42 | 44 44 | 58 58 | 60 60 |
0x0000330 46 46 | 48 48 | 62 62 | 64 64 | 66 66 | 68 68 | 03 03 | 05 05 |
0x0000350 70 70 | 72 72 | 07 07 | 09 09 | 74 74 | 76 76 | 11 11 | 13 13 |
0x0000370 78 78 | 01 01 | 15 15 | 17 17 | 66 66 | 70 70 | 03 03 | 07 07 |
0x0000390 68 68 | 72 72 | 05 05 | 09 09 | 74 74 | 78 78 | 11 11 | 15 15 |
0x00003b0 76 76 | 01 01 | 13 13 | 17 17 | 19 19 | 23 23 | 35 35 | 39 39 |
0x00003d0 21 21 | 25 25 | 37 37 | 41 41 | 27 27 | 31 31 | 43 43 | 47 47 |
0x00003f0 29 29 | 33 33 | 45 45 | 49 49 | 19 19 | 21 21 | 23 23 | 25 25 |
```

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**Equal Hopping Frequency Use**

**Section 15.247 (a)**

**Result**

**Pass**

**FCC Requirement:** Each of the Transmitter's hopping channels is used equally on average.

The EUT Complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

**Receiver Input Bandwidth**

**Section 15.247 (a)**

**Result**

**Pass**

**FCC Requirement:** The associated receiver(s) complies with the requirement that its bandwidth matches the bandwidth of the transmitted signal.

The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing.

**Receiver Hopping Capability**

**Section 15.247 (a)**

**Result**

**Pass**

**FCC Requirement:** The associated receiver has the ability to shift frequencies in synchronization with the transmitted signals.

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

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**Peak Output Power**

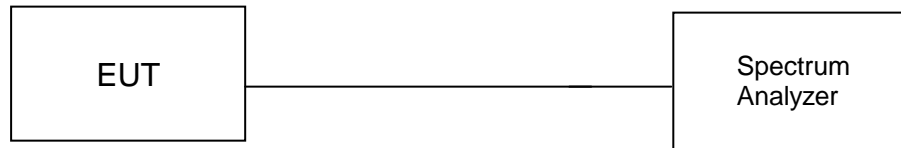
**Section 15.247 (b) (1)**

**Result**

**Pass**

Test Specification	FCC Part 15C
Measurement Bandwidth (RBW)	3MHz
Detector	Peak
Requirement	<125 mW

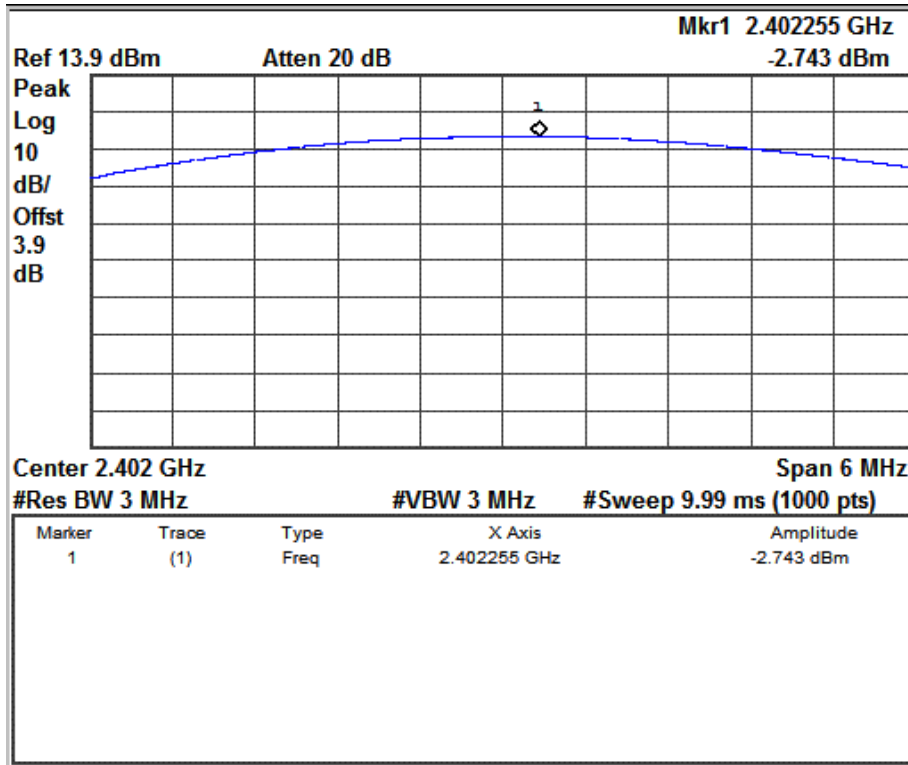
**Test Method:**



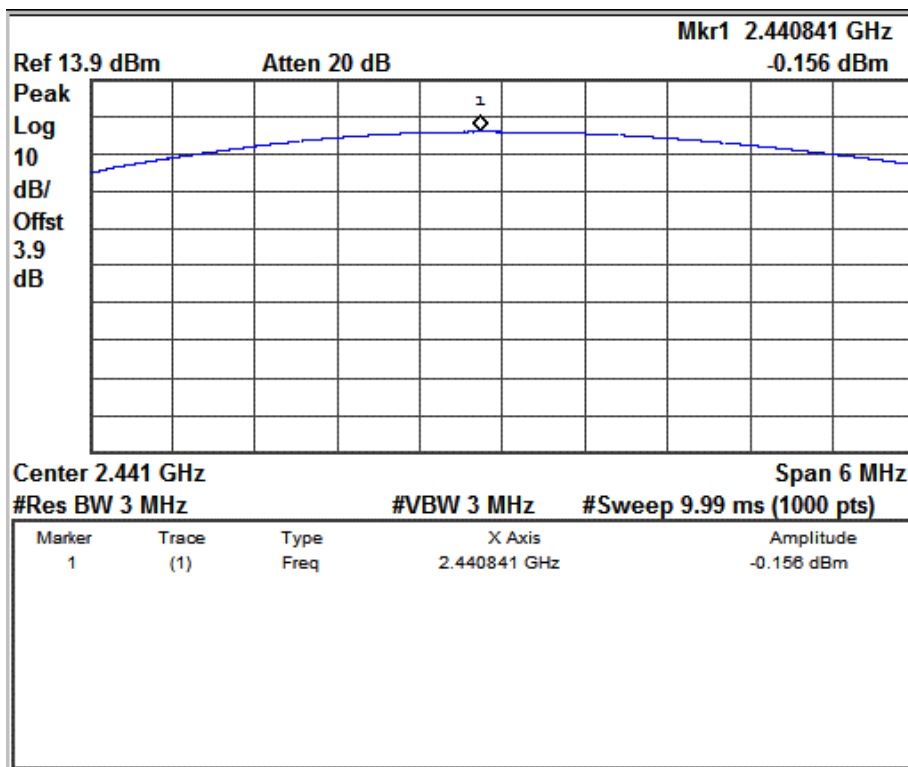
**Test Result:**

**Modulation Type: GFSK**

Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2402	-2.74	30
Mid	2441	-0.16	30
High	2480	1.22	30

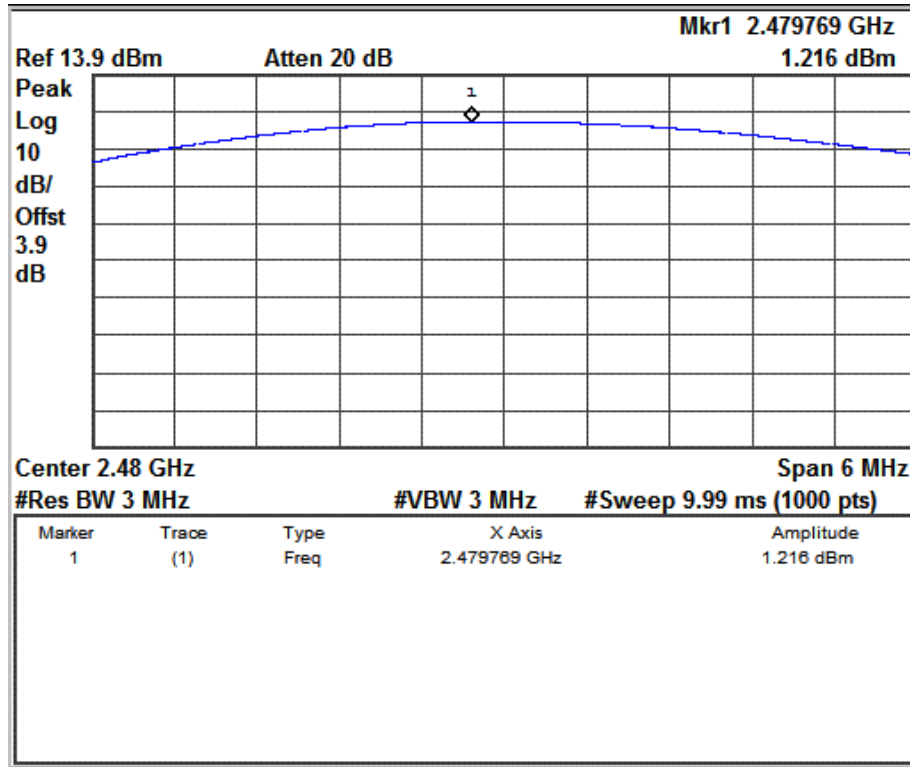


Channel Frequency: 2402 MHz



Channel Frequency: 2441 MHz

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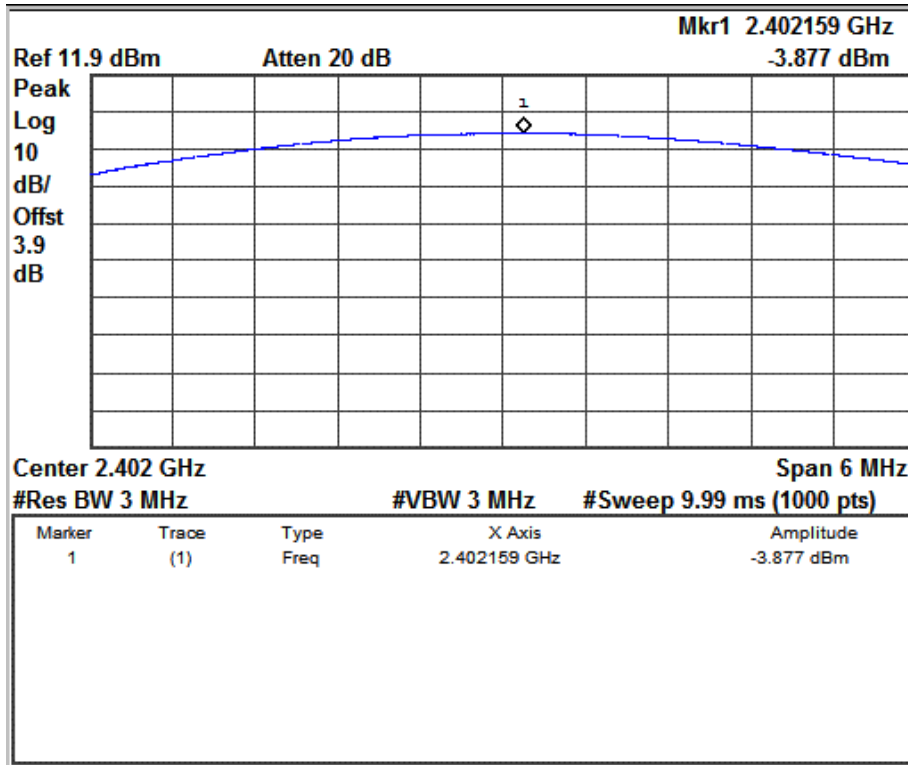


Channel Frequency: 2480 MHz

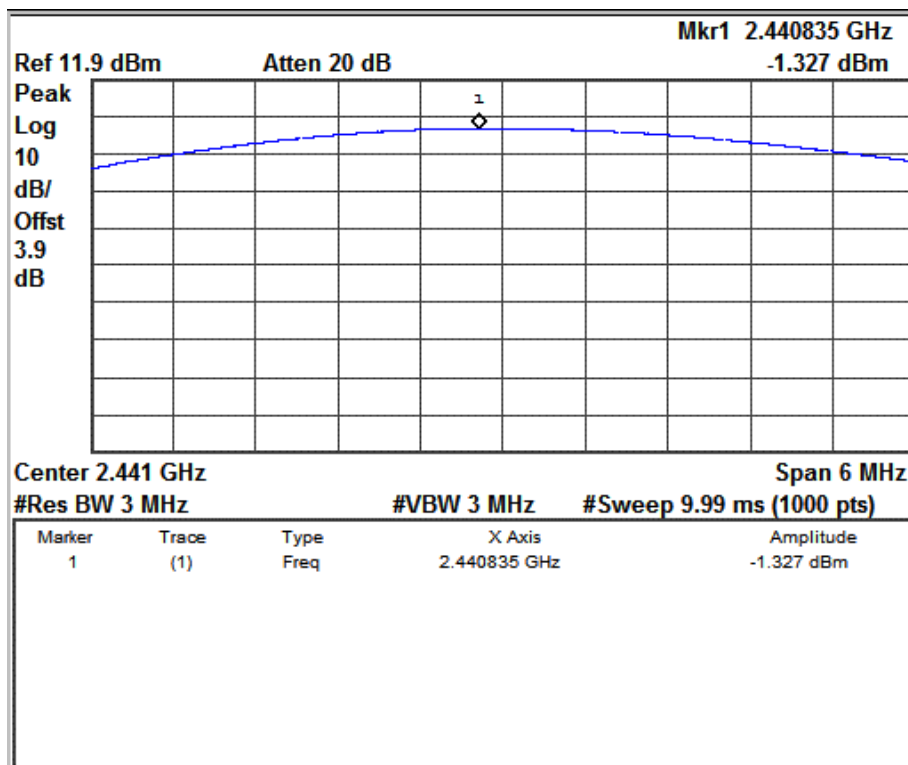
Modulation Type: Pi/4 DQPSK

Test Results:

Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2402	-3.88	20.96
Mid	2441	-1.33	20.96
High	2480	0.04	20.96

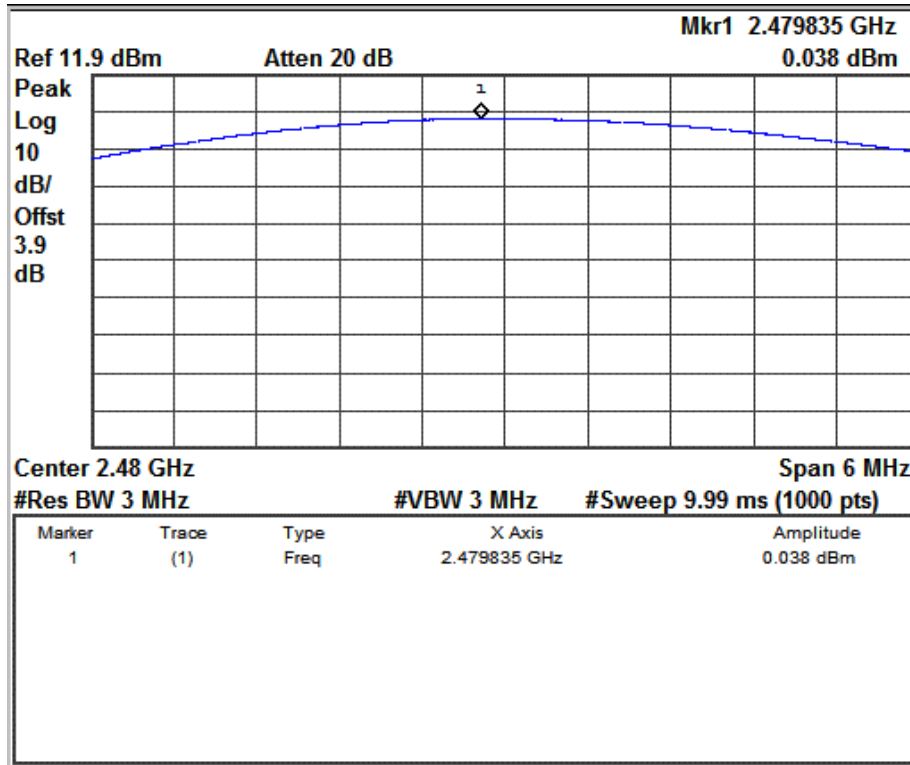


Channel Frequency: 2402 MHz



Channel Frequency: 2441 MHz

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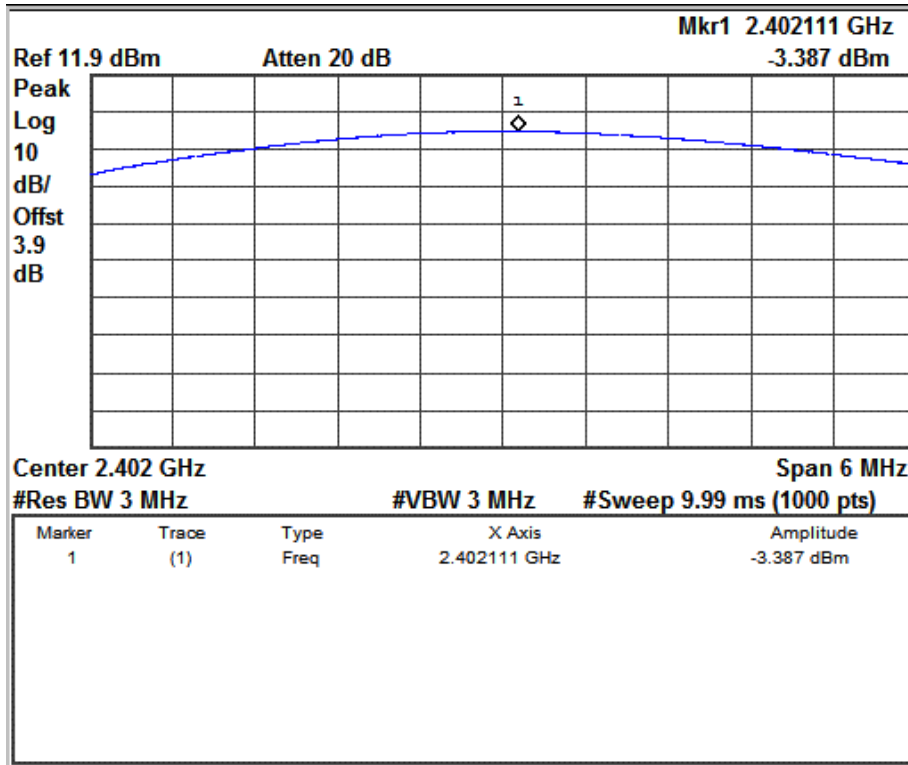


Channel Frequency: 2480 MHz

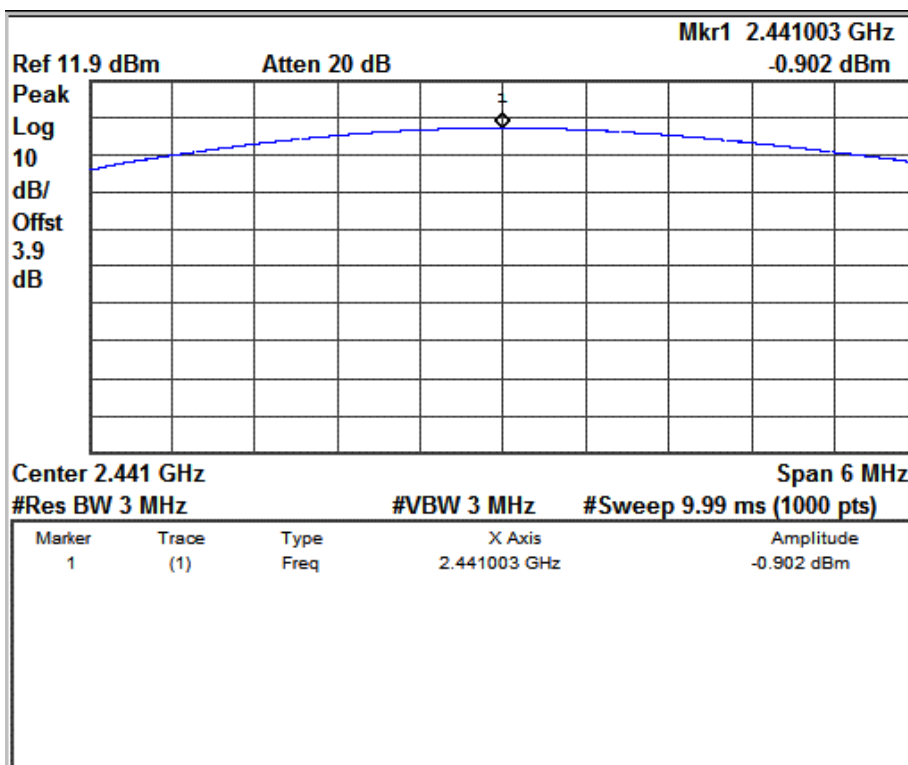
Modulation Type: 8 DPSK

Test Results:

Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2402	-3.39	20.96
Mid	2441	-0.90	20.96
High	2480	0.39	20.96



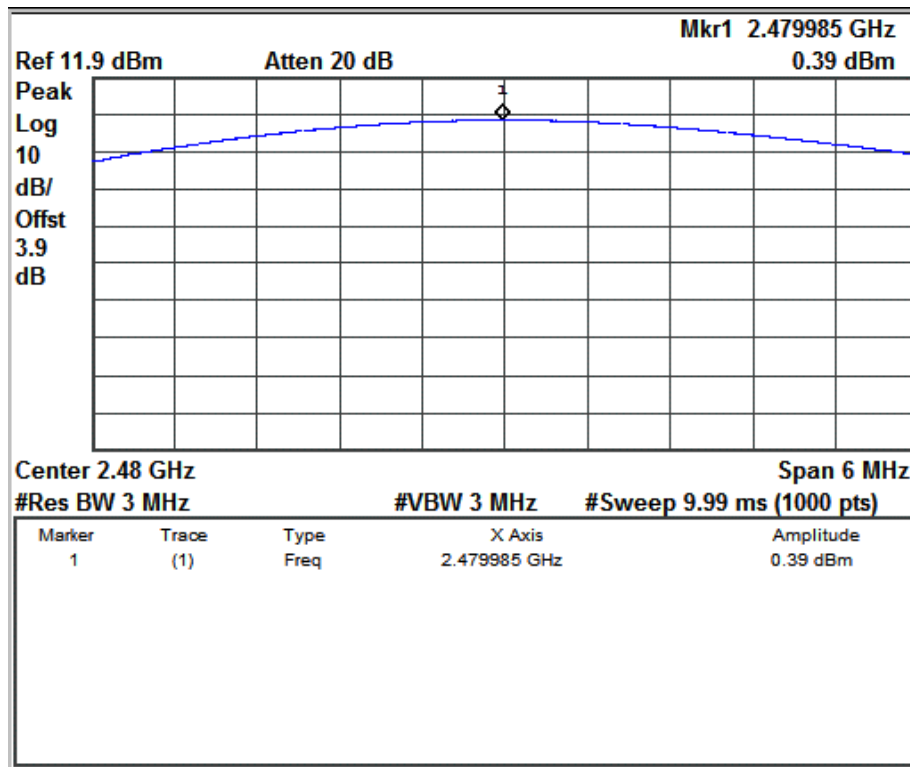
Channel Frequency: 2402 MHz



Channel Frequency: 2441 MHz



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Channel Frequency: 2480 MHz

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20dB Bandwidth

Section 15.247 (a) (1)

Result

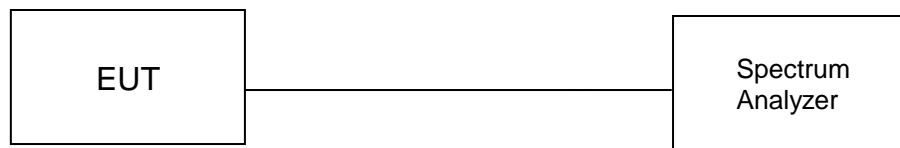
Pass

Test Specification  
Detector Function  
Port of testing  
Requirement

FCC Part 15C  
Peak  
Antenna port

The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset while the long-term distribution appears evenly distributed.

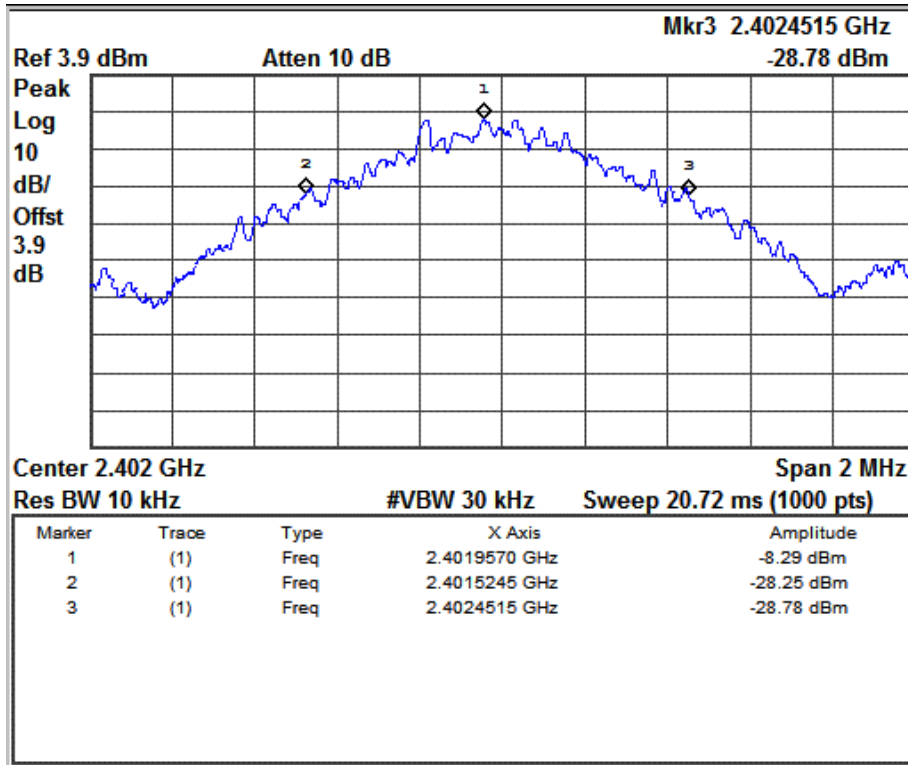
Test Method:



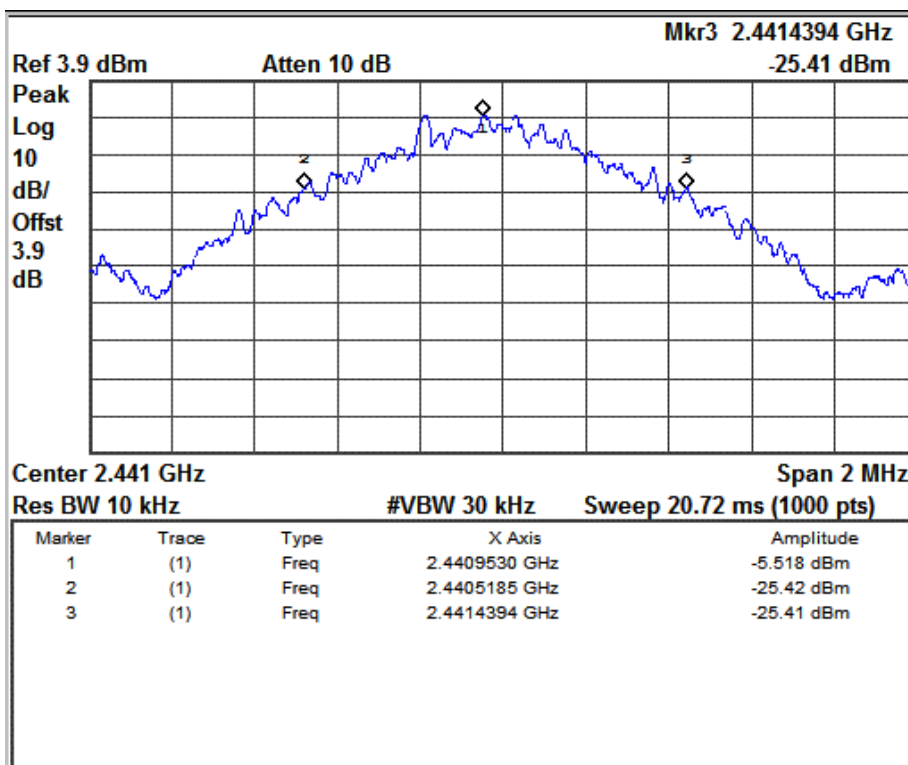
Test Result:

Modulation Type: GFSK

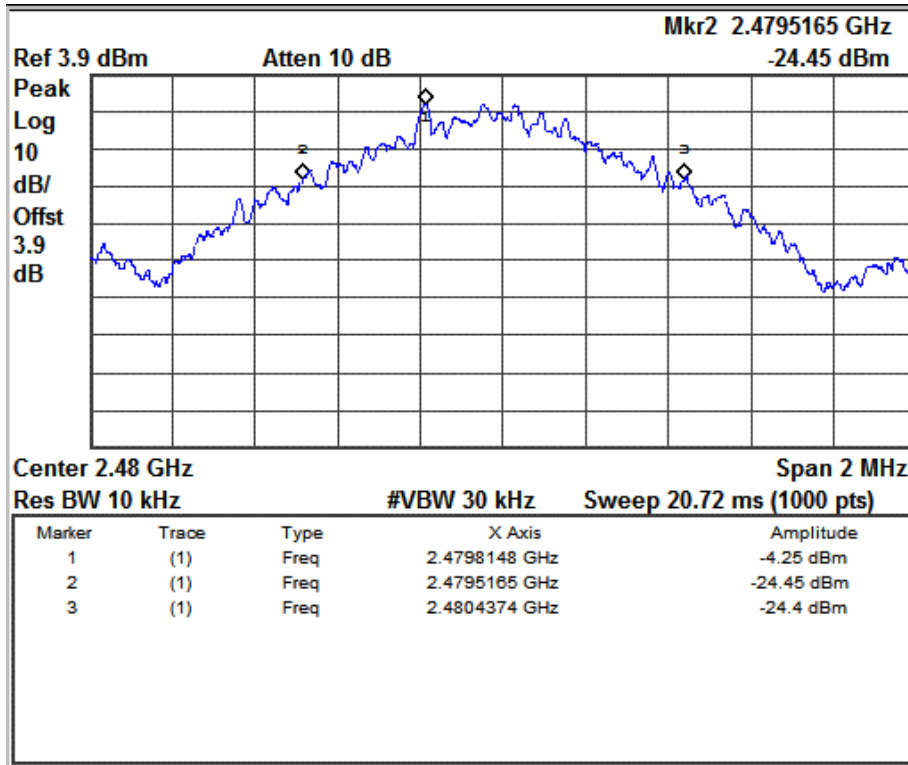
Channel	Channel Frequency (MHz)	Lower 20dB Frequency (MHz)	Higher 20dB Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
Low	2402	2401.5245	2402.4515	0.93	0.97
Mid	2441	2440.5185	2441.4394	0.92	0.97
High	2480	2479.5165	2480.4374	0.92	0.97



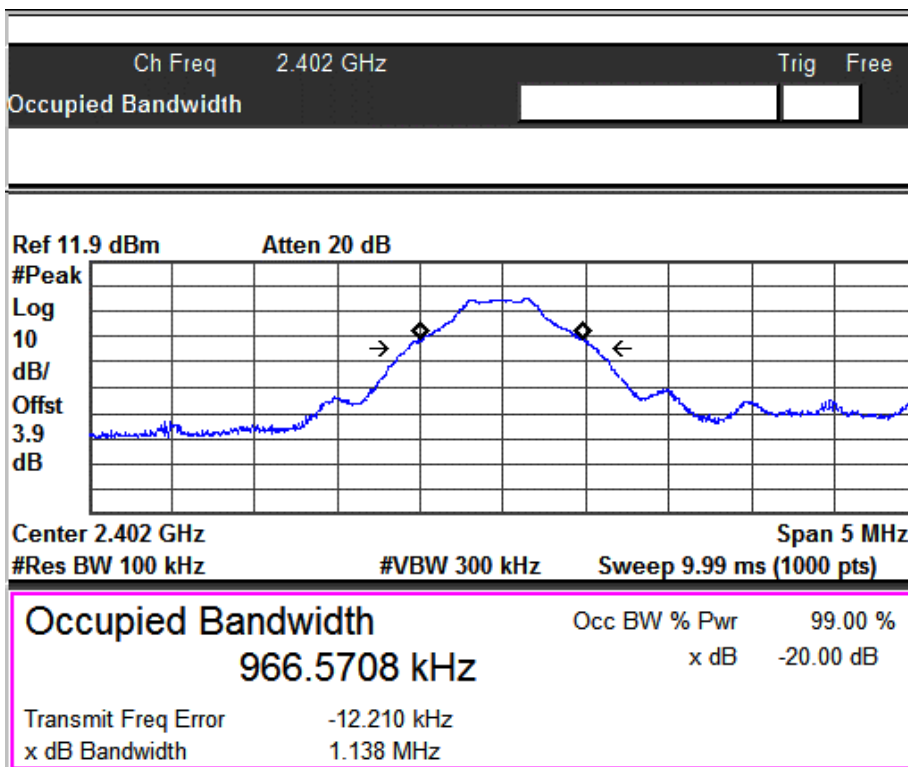
Channel Low: 20dB Bandwidth Measurement



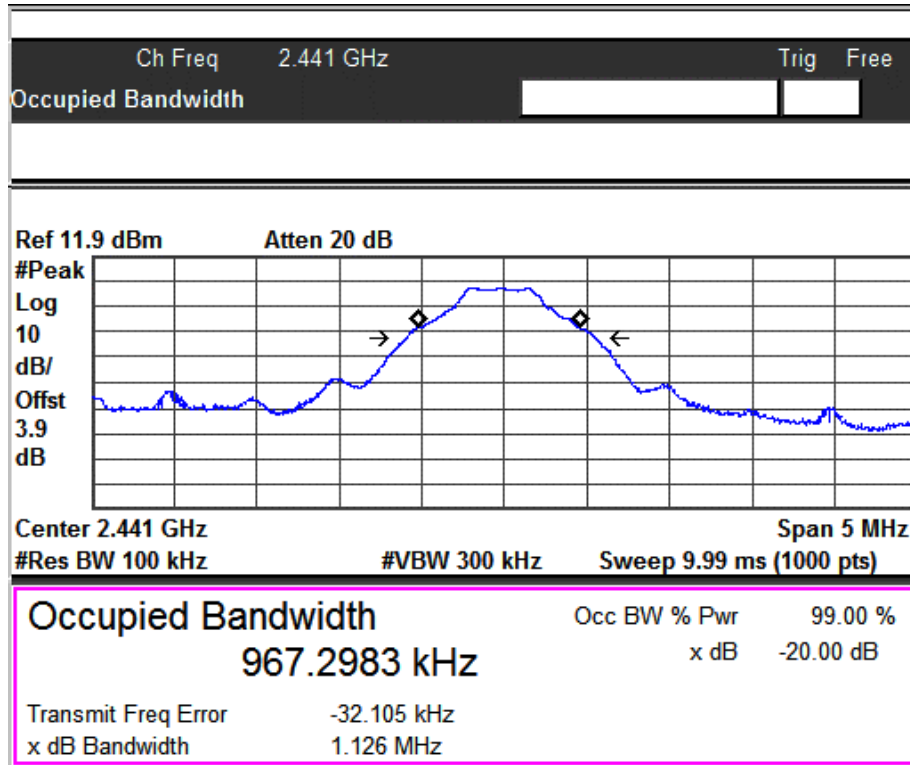
Channel Mid: 20dB Bandwidth Measurement



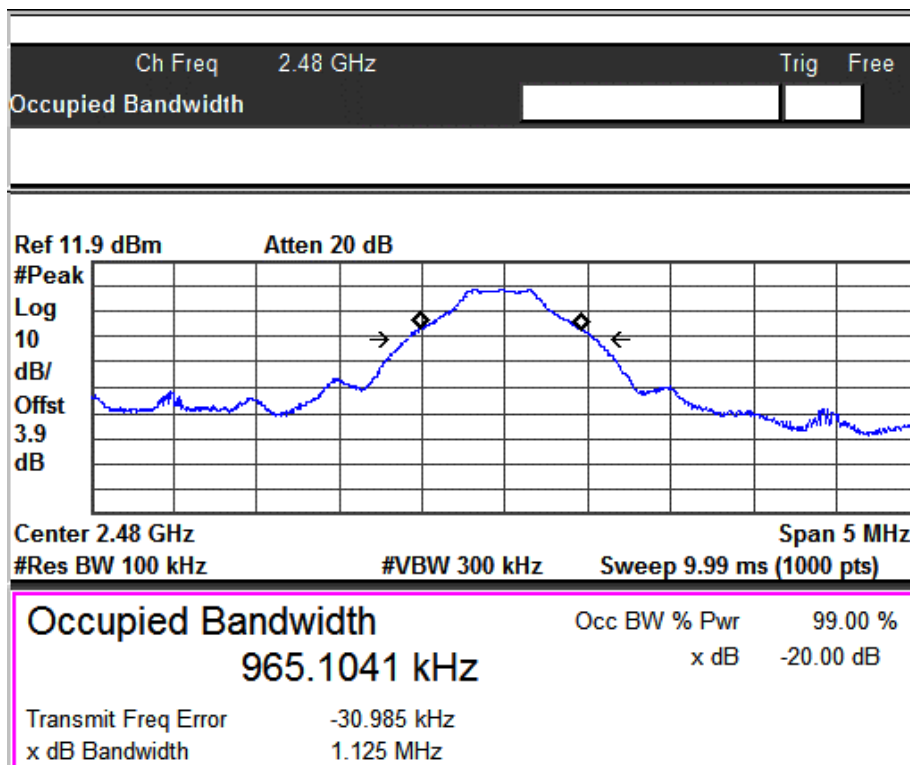
Channel High: 20dB Bandwidth Measurement



99% Occupied Bandwidth: Channel Low



**99% Occupied Bandwidth: Channel Mid**



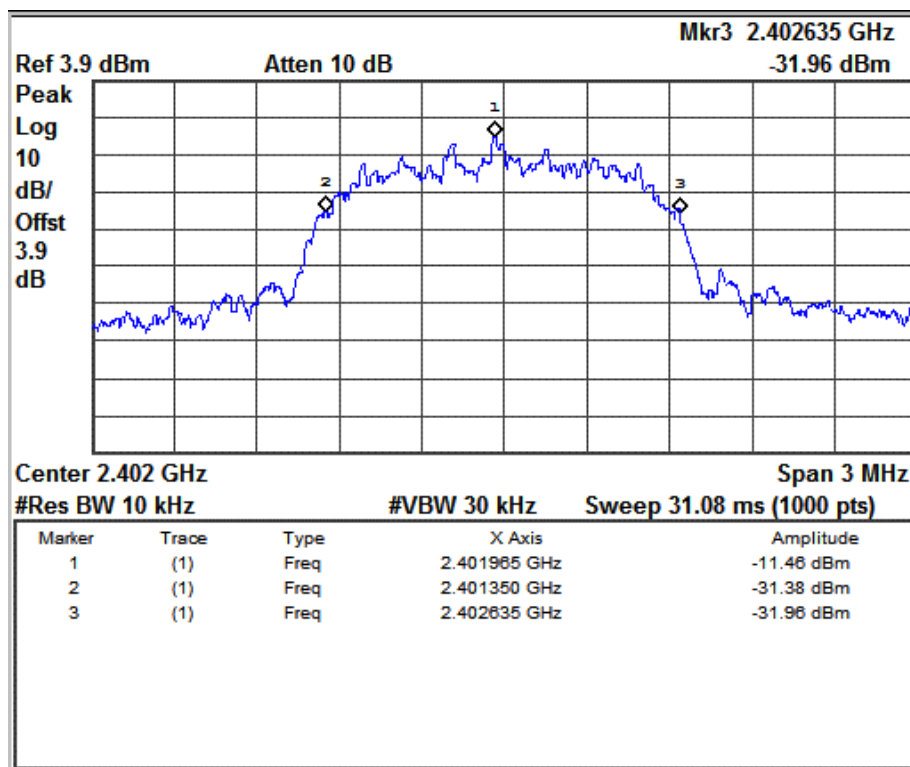
**99% Occupied Bandwidth: Channel High**

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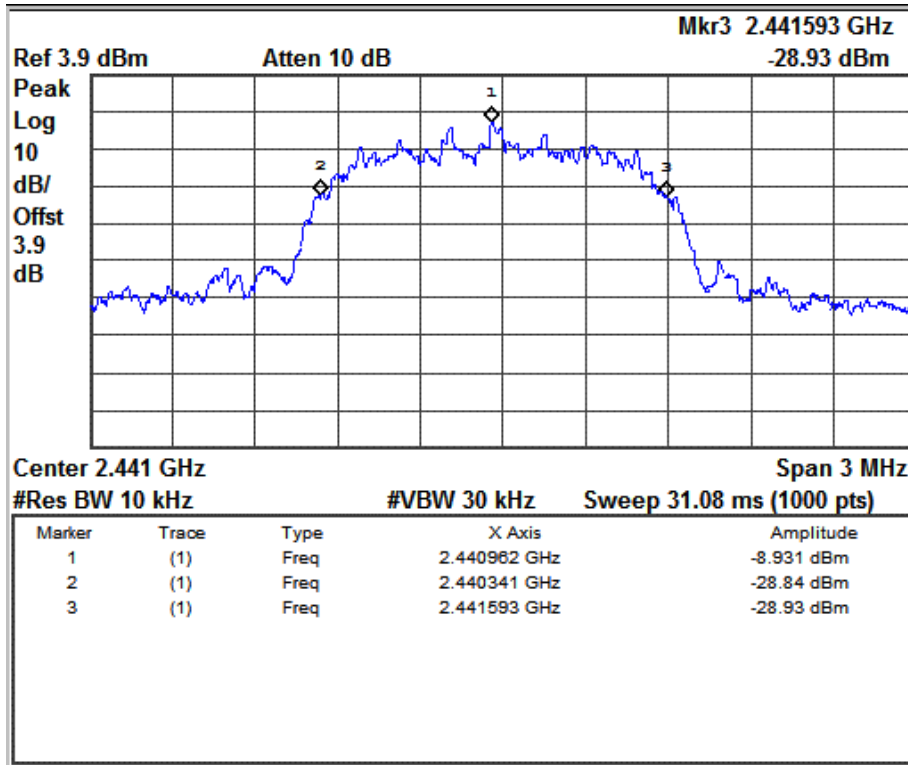
Modulation Type: Pi/4 DQPSK

Test Results:

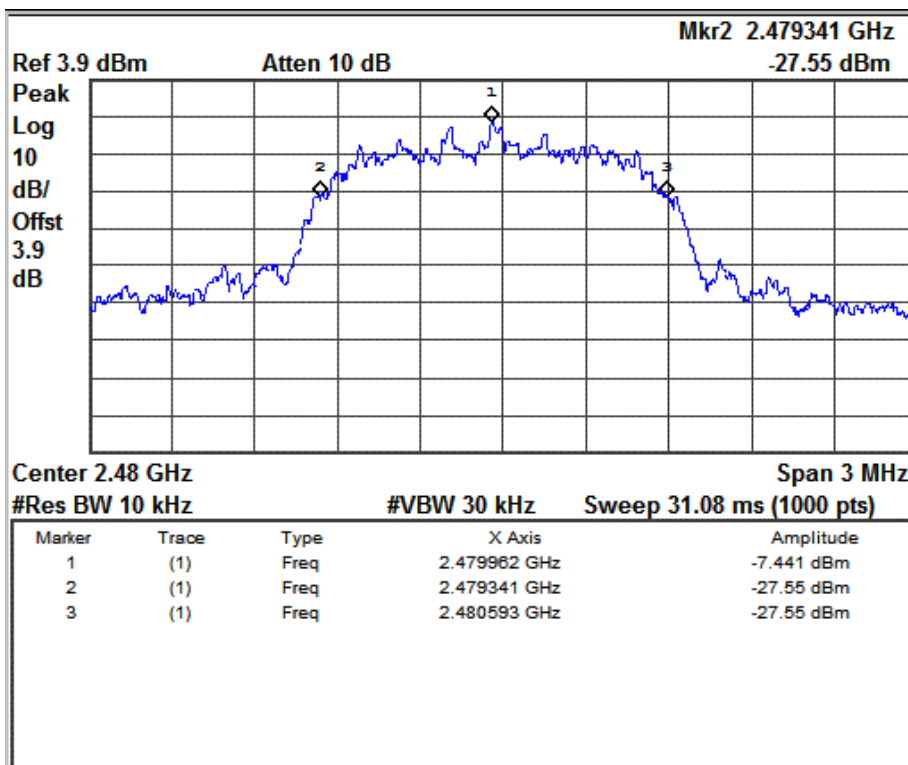
Channel	Channel Frequency (MHz)	Lower 20dB Frequency (MHz)	Higher 20dB Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
Low	2402	2401.350	2402.635	1.29	1.21
Mid	2441	2440.341	2441.593	1.25	1.21
High	2480	2479.341	2480.593	1.25	1.21



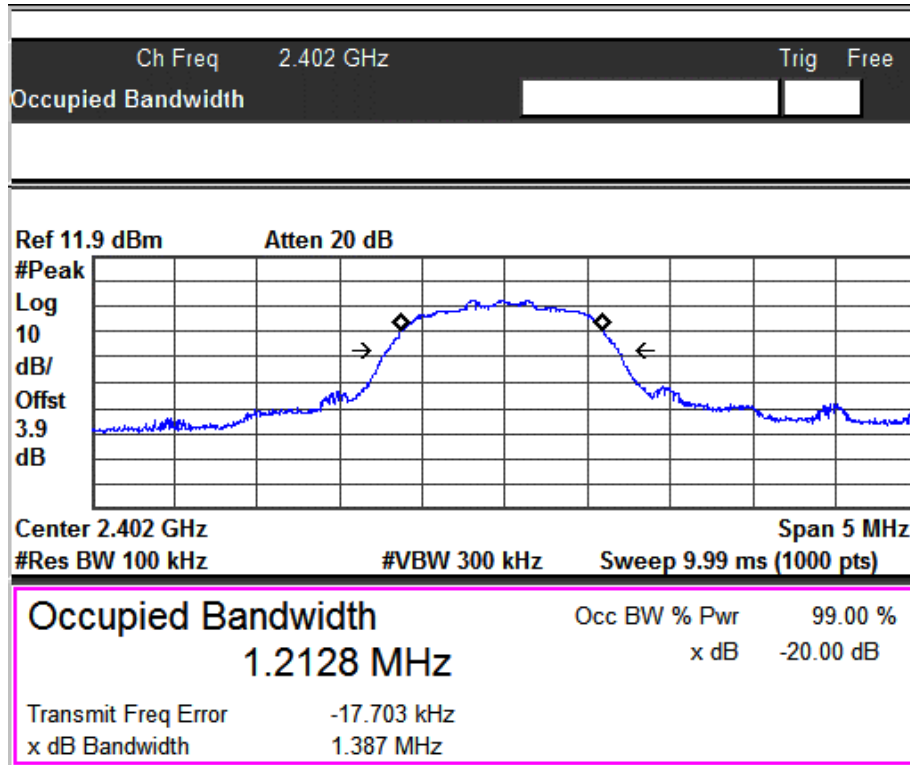
Channel Low: 20dB Bandwidth Measurement



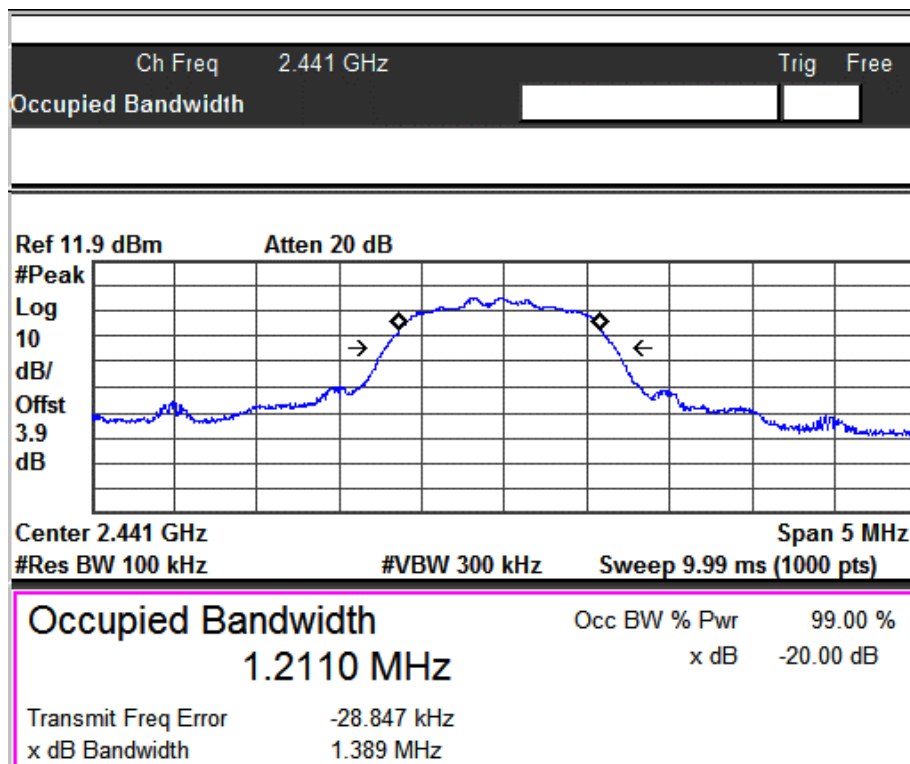
Channel Mid: 20dB Bandwidth Measurement



Channel High: 20dB Bandwidth Measurement



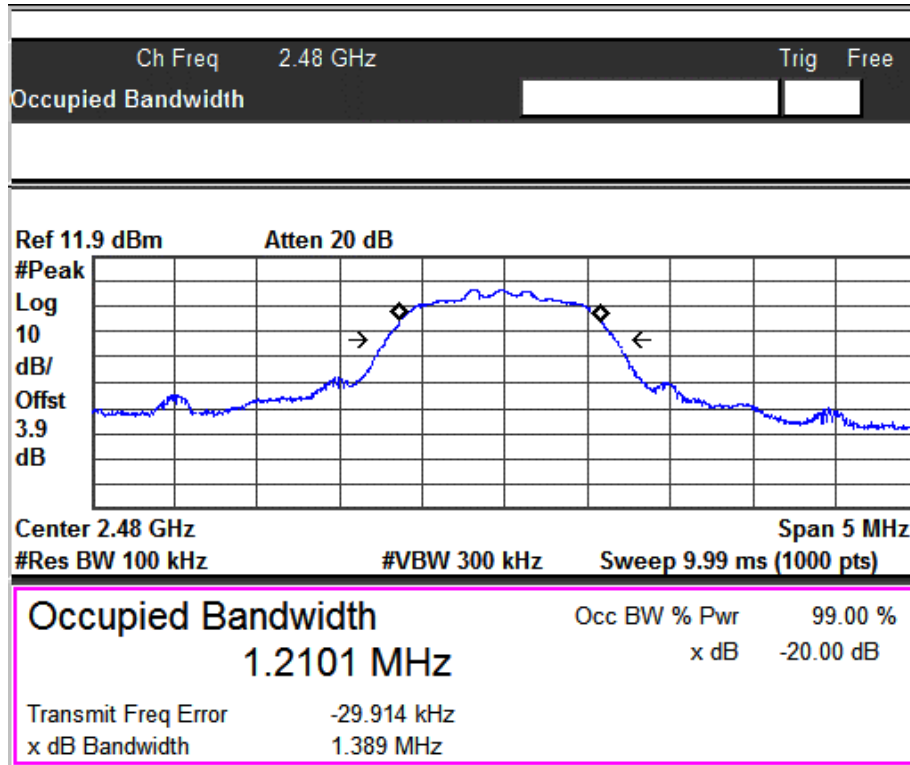
**99% Occupied Bandwidth: Channel Low**



**99% Occupied Bandwidth: Channel Mid**



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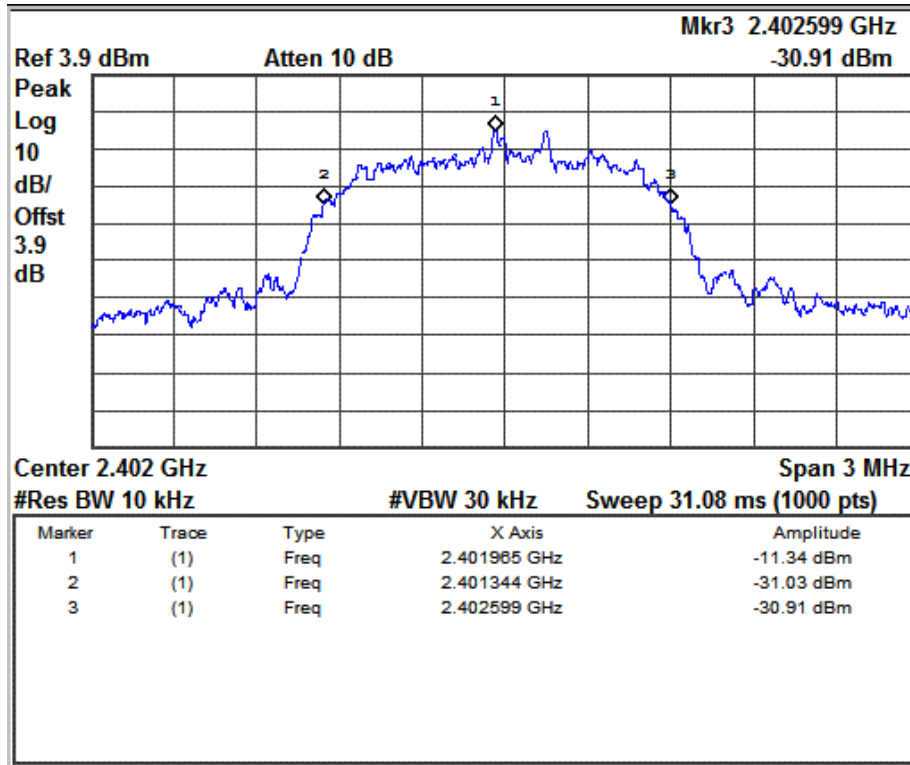


**99% Occupied Bandwidth: Channel High**

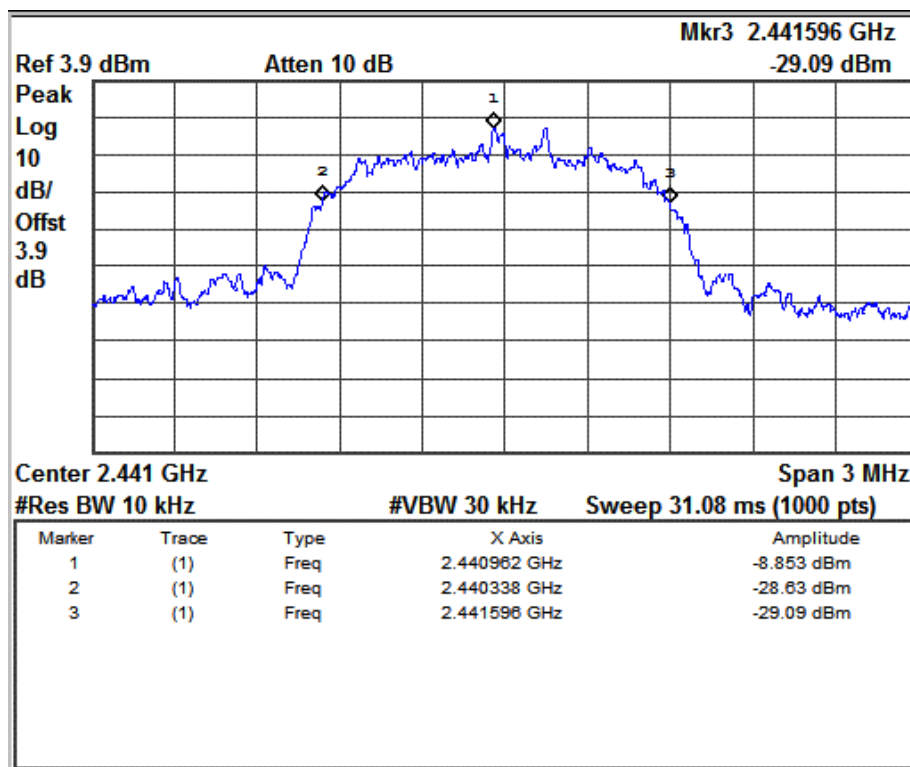
**Modulation Type: 8 DPSK**

**Test Results:**

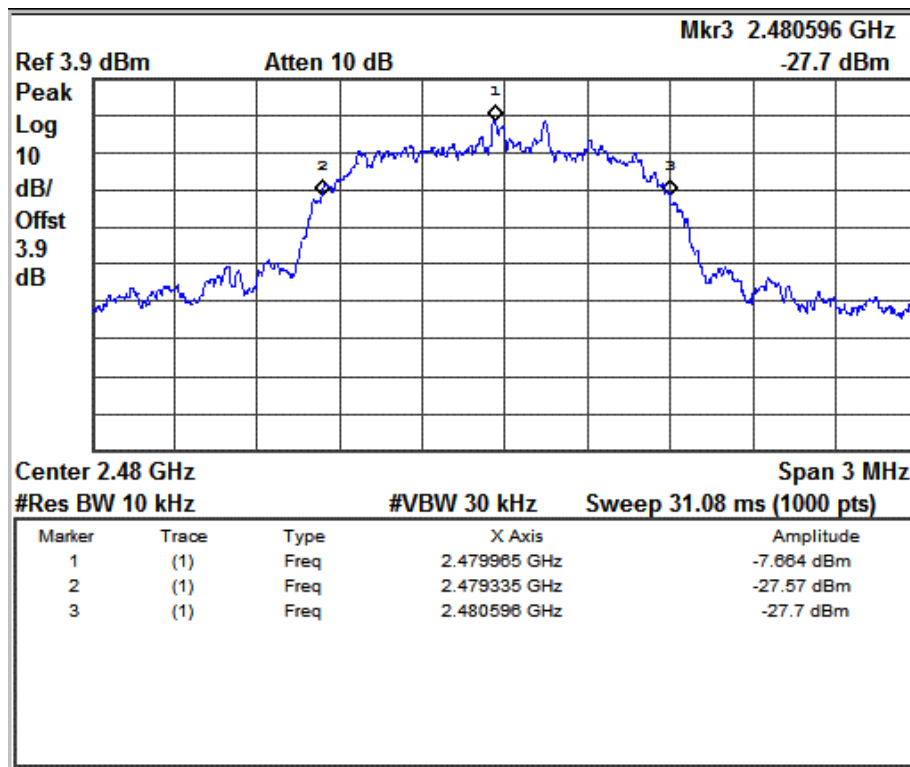
Channel	Channel Frequency (MHz)	Lower 20dB Frequency (MHz)	Higher 20dB Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
Low	2402	2401.344	2402.599	1.25	1.23
Mid	2441	2440.338	2441.596	1.26	1.22
High	2480	2479.335	2480.596	1.26	1.22



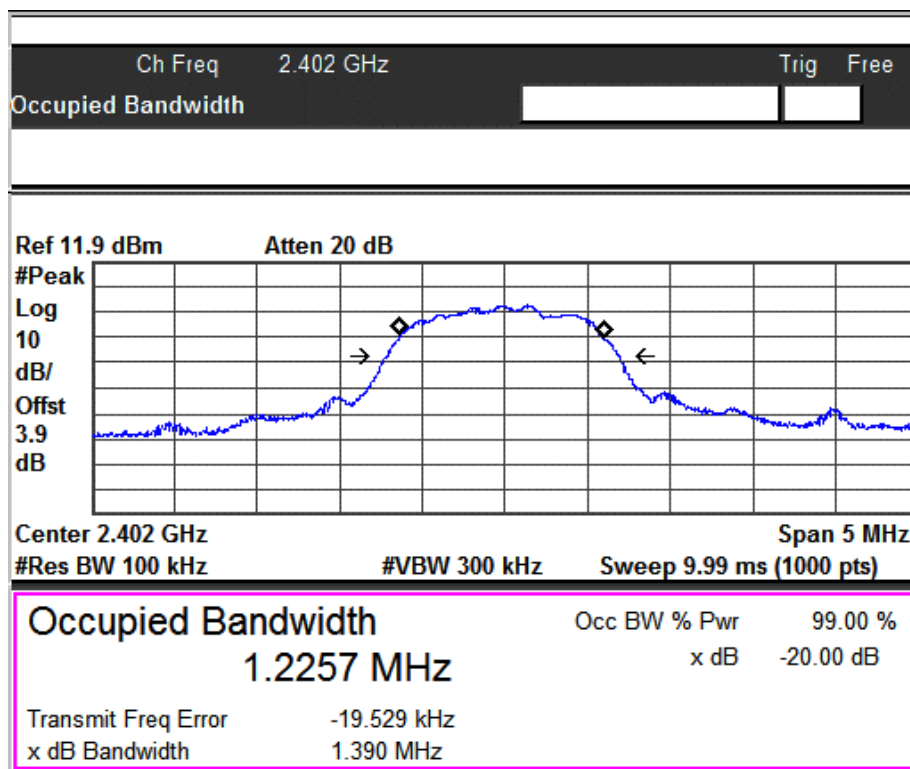
**Channel Low: 20dB Bandwidth Measurement**



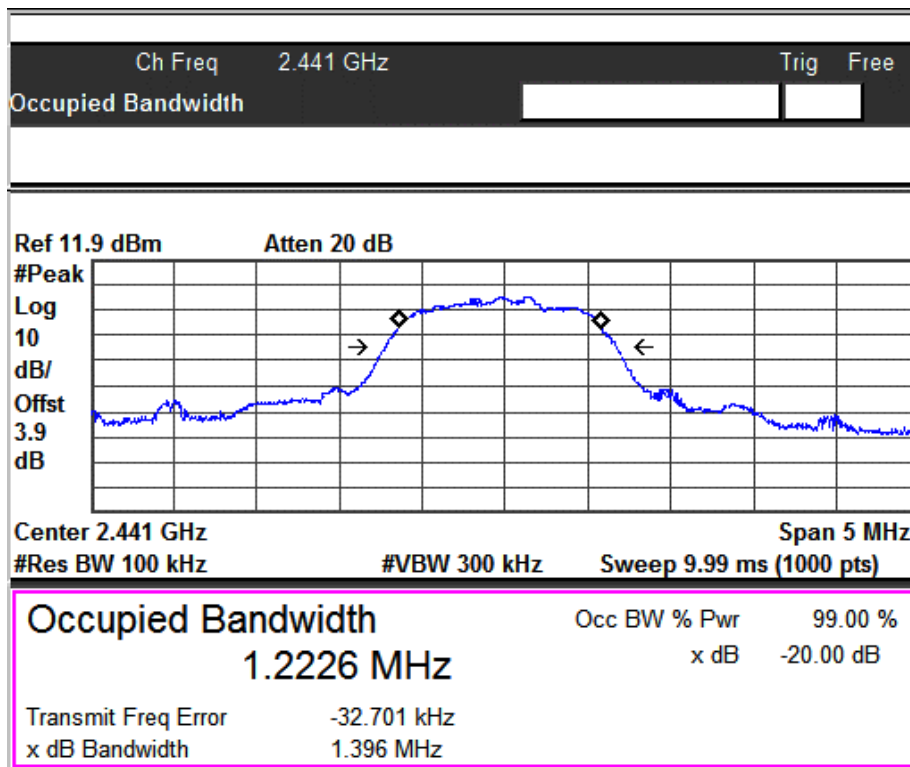
**Channel Mid: 20dB Bandwidth Measurement**



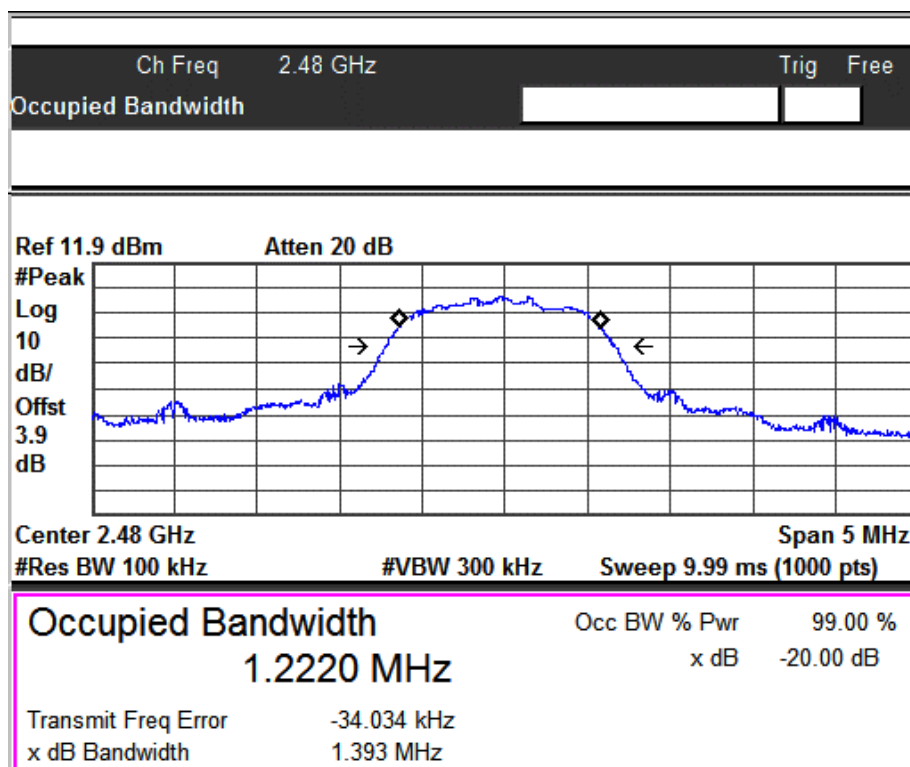
Channel High: 20dB Bandwidth Measurement



99% Occupied Bandwidth: Channel Low



**99% Occupied Bandwidth: Channel Mid**



**99% Occupied Bandwidth: Channel High**

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**Number of Hopping Channels**

**Section (a) (1) (iii)**

**Result**

**Pass**

Test Specification

FCC part 15C

Detector Function

Peak

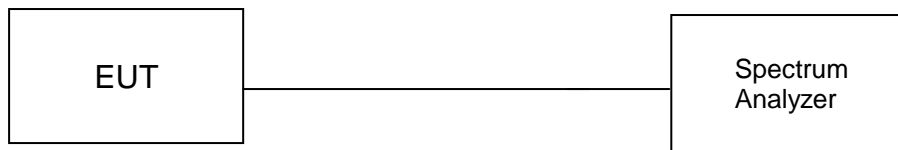
Port of testing

Antenna port

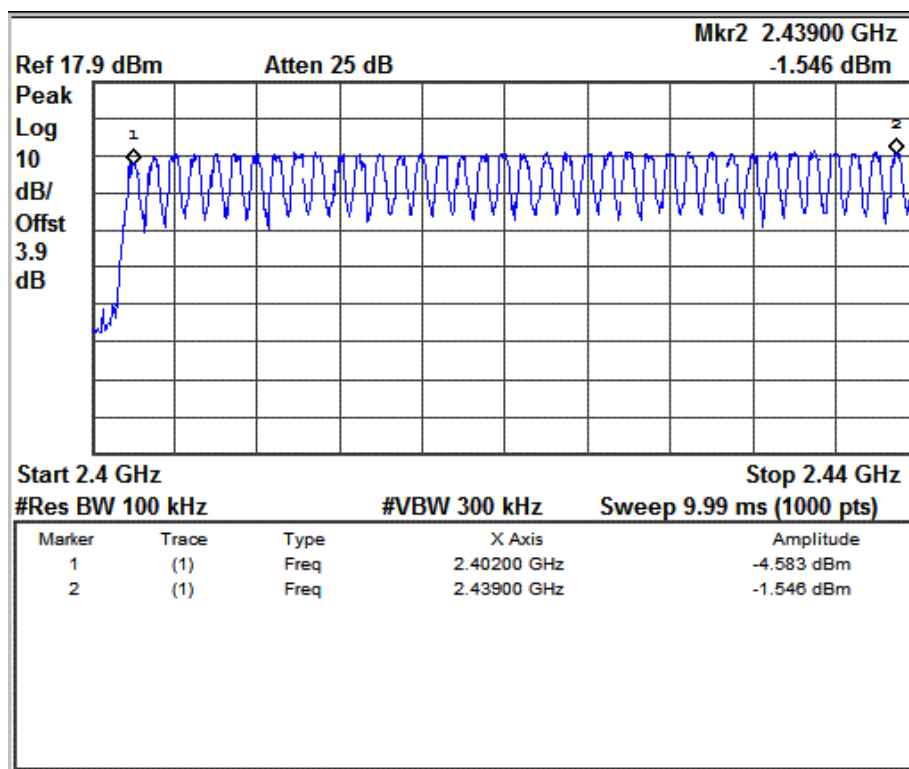
Requirement

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

**Test Method:**

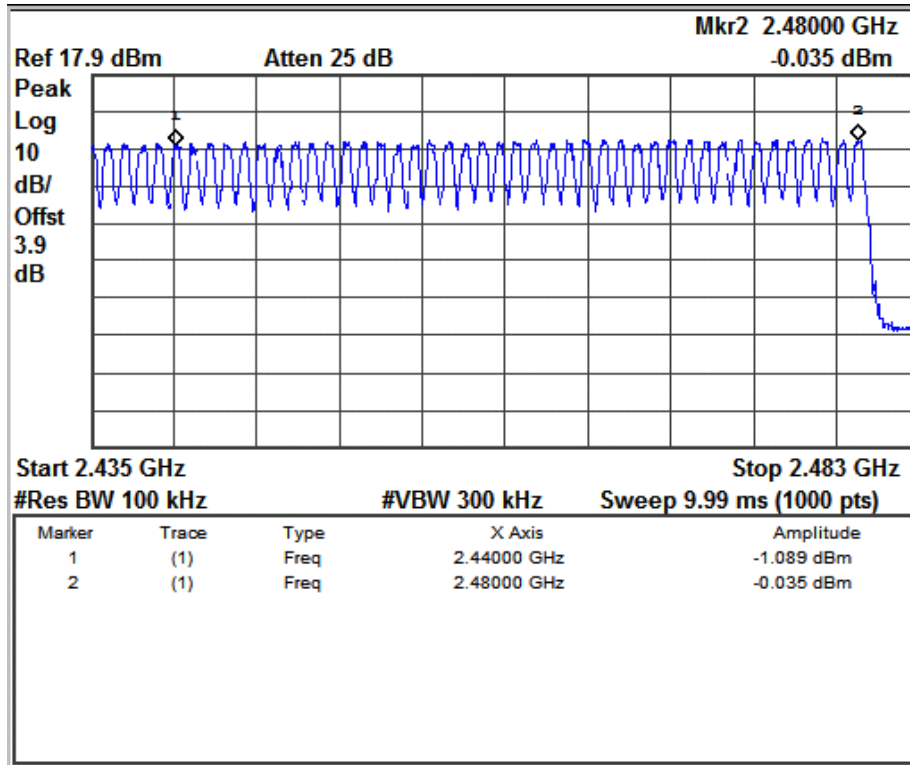


**Test Result:**



**Number of Hopping Channels: 38**

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Number of Hopping Channels: 41

Total Number of hopping channels = 79 (38+41)

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# Carrier Frequency Separation

Section 15.247 (a) (1)

Result

Pass

Test Specification  
Detector Function  
Port of testing  
Requirement

FCC Part 15C

Peak

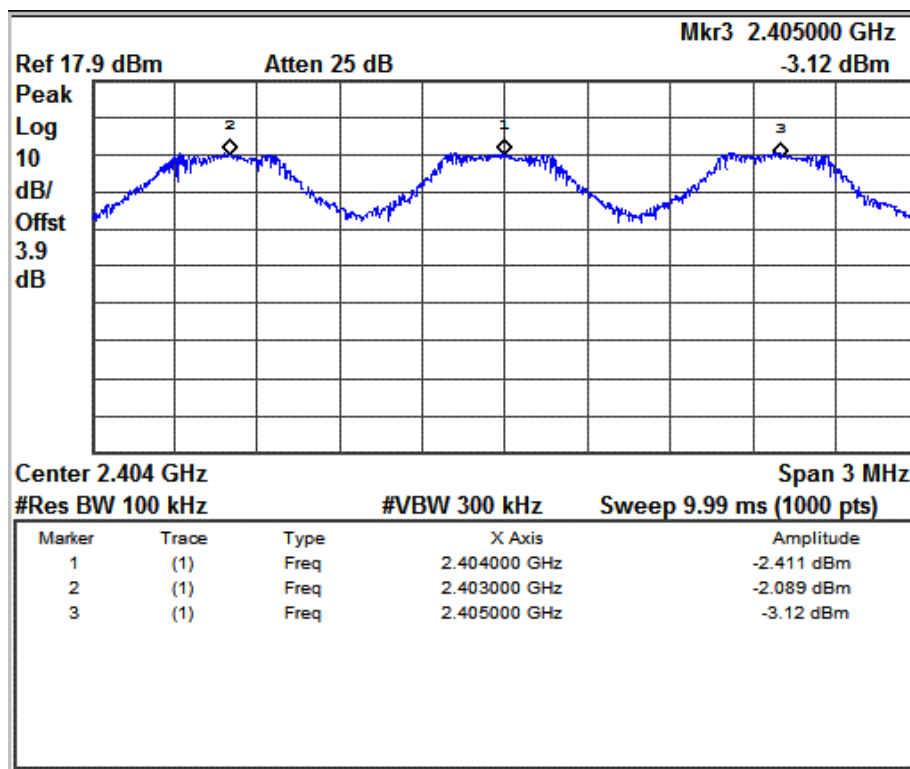
Antenna port

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

Test Method:



Test Result:



Channel Separation

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**Time of Occupancy (Dwell Time)**

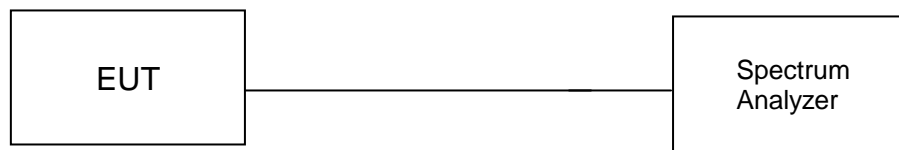
**Section 15.247 (a)(1)(III)**

**Result**

**Pass**

Test Specification RSS-210 Issue 7, A8.1 (c)  
Detector Function Peak  
Port of testing Antenna port  
Requirement 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

**Test Method:**



**Test Result:**

Time slot		Time Slot (s)
DH	Measurement Value (sec)	
DH5	0.00287	0.3061
2DH5	0.00168	0.1792
3DH5	0.00284	0.3029

**Measurement Method**

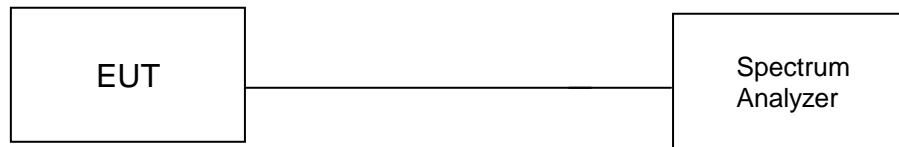
Period Time = 0.4(sec)\*79 (hopping channel) = 31.6 s

DH Time slot = Measurement value (Sec)\*(1600/ (6\*79))\*Period time

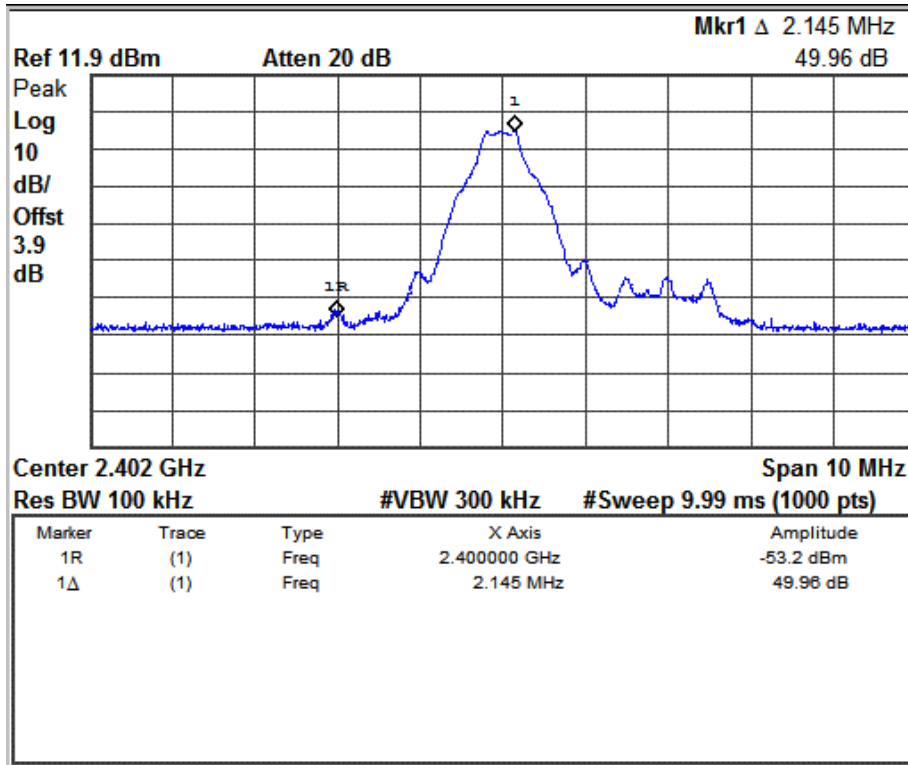


**Band-edge Compliance of RF Conducted Emissions****Section 15.257 (d)****Result****Pass**

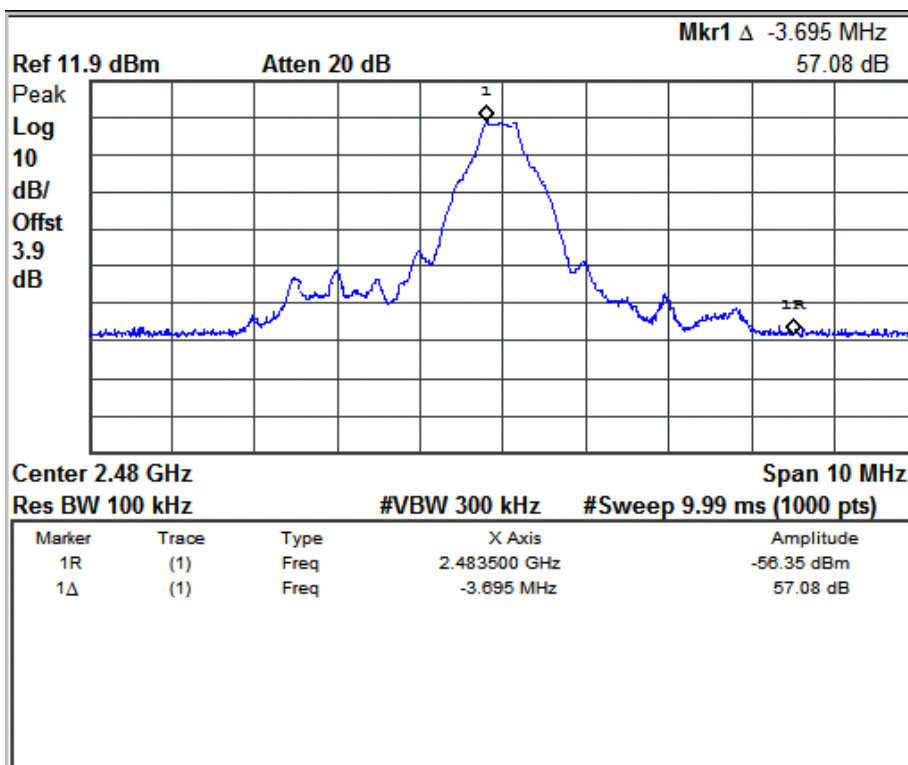
Test Specification	FCC Part 15C
Detector Function	Peak
Port of testing	Antenna port
Requirement	In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz 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.

**Test Method:****Modulation Type: GFSK****Test Result:**

Channel	Fundamental Frequency (MHz)	Value at Band Edge		Limit (dBc)
		Frequency (MHz)	Value (dBc)	
Low	2402.00	2400.0	-49.96	-20
High	2480.00	2483.5	-57.08	-20



Channel Low



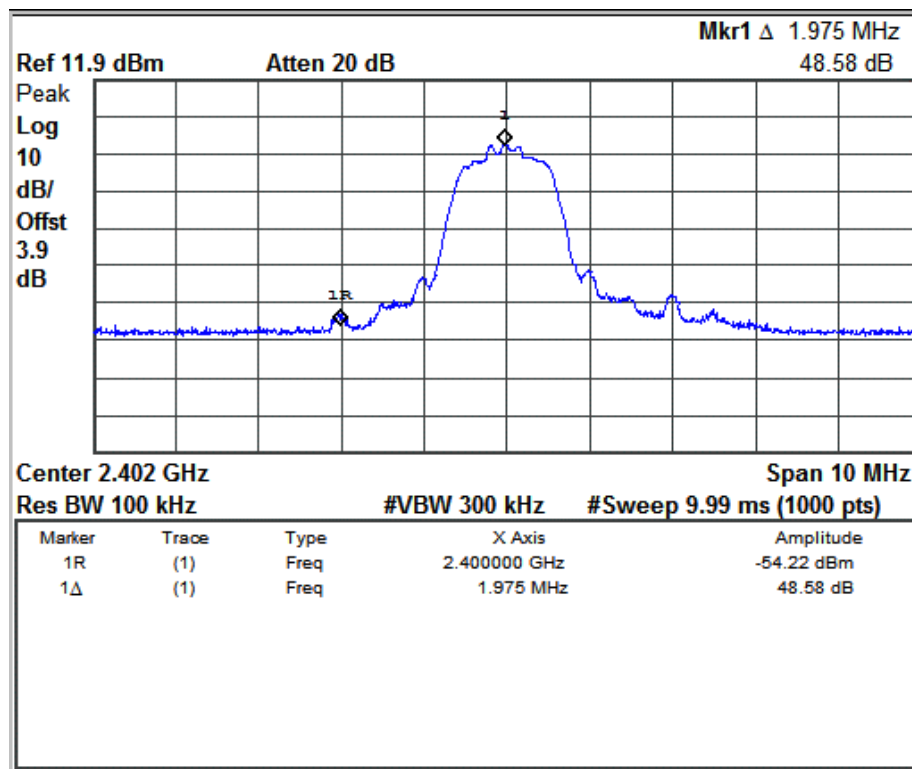
Channel High

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Modulation Type: Pi/4 DQPSK

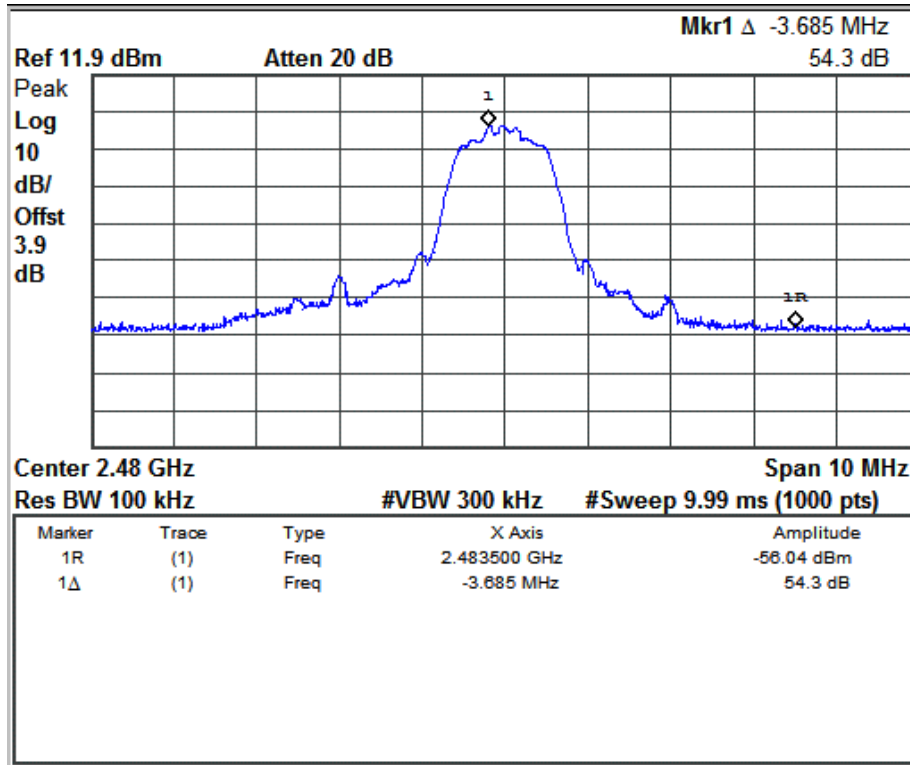
Test Results:

Channel	Fundamental Frequency (MHz)	Value at Band Edge		Limit (dBc)
		Frequency (MHz)	Value (dBc)	
Low	2402.00	2400.0	-48.58	-20
High	2480.00	2483.5	-54.3	-20



Channel Low

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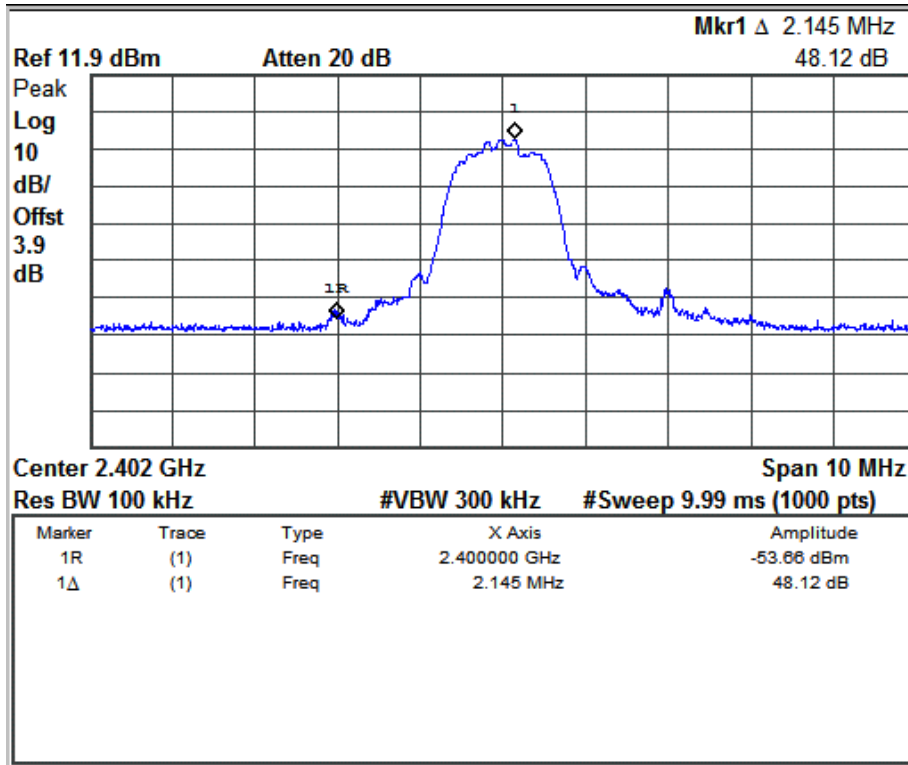


Channel High

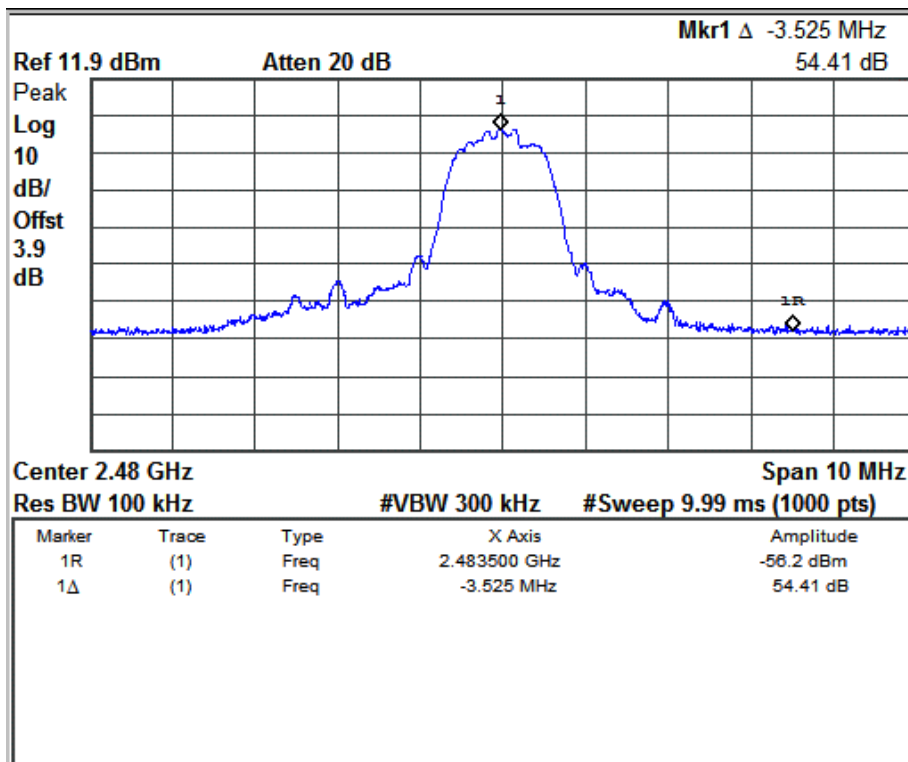
Modulation Type: 8 DPSK

Test Results:

Channel	Fundamental Frequency (MHz)	Value at Band Edge		Limit (dBc)
		Frequency (MHz)	Value (dBc)	
Low	2402.00	2400.0	-48.12	-20
High	2480.00	2483.5	-54.41	-20

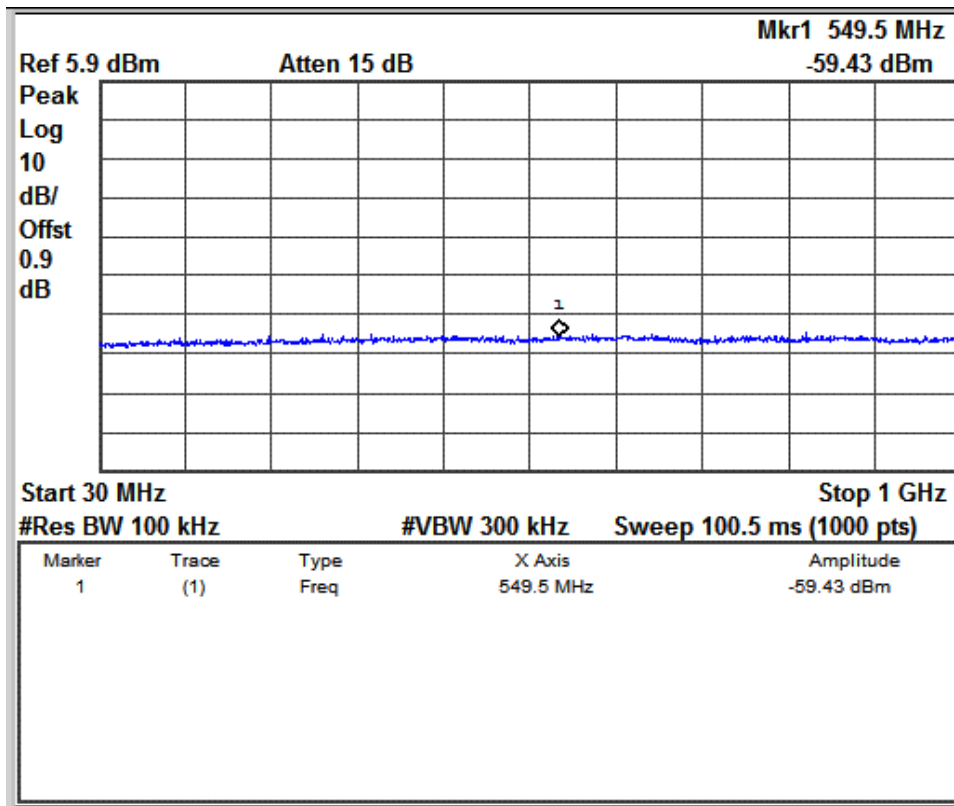


Channel Low

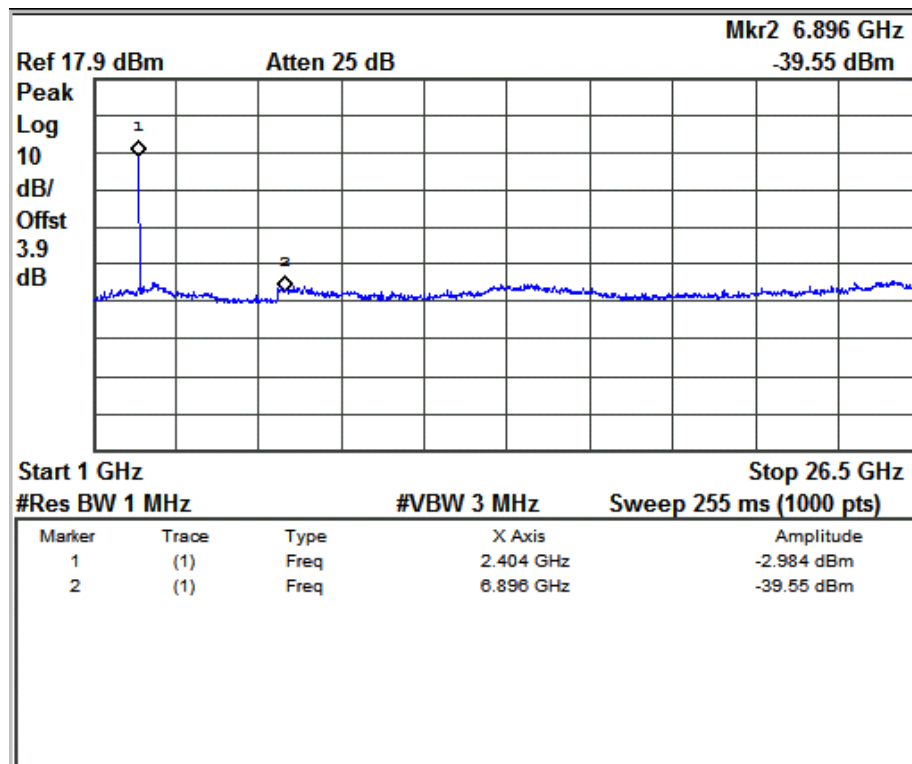


Channel High

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Conducted Spurious Emissions

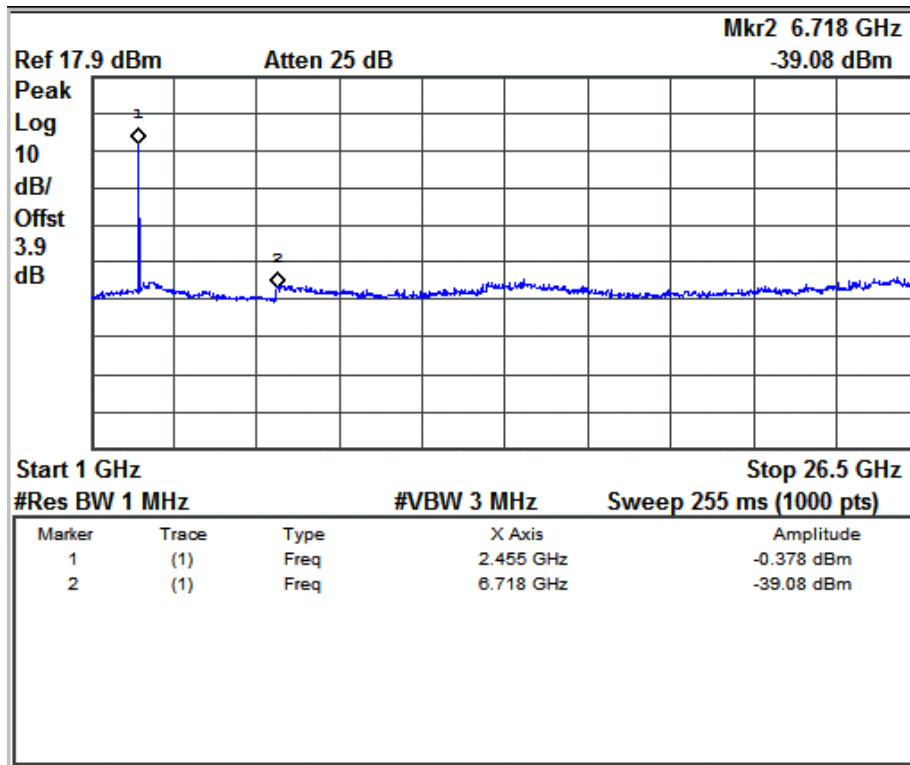


### 30MHz to 1GHz Spurious Emissions



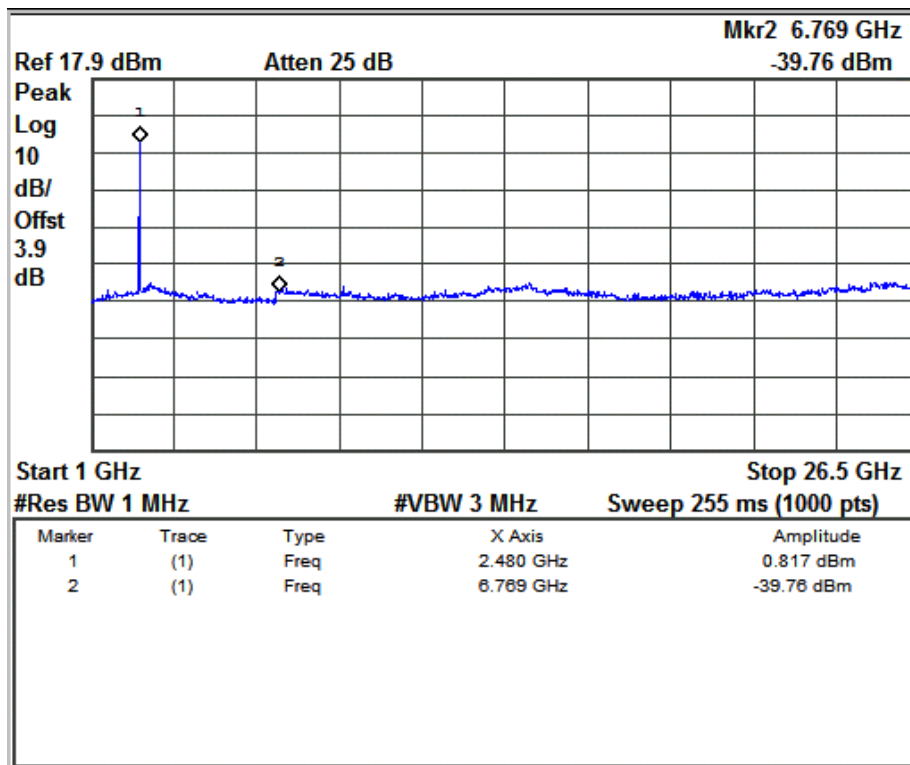
Channel: Low

Modulation: GFSK



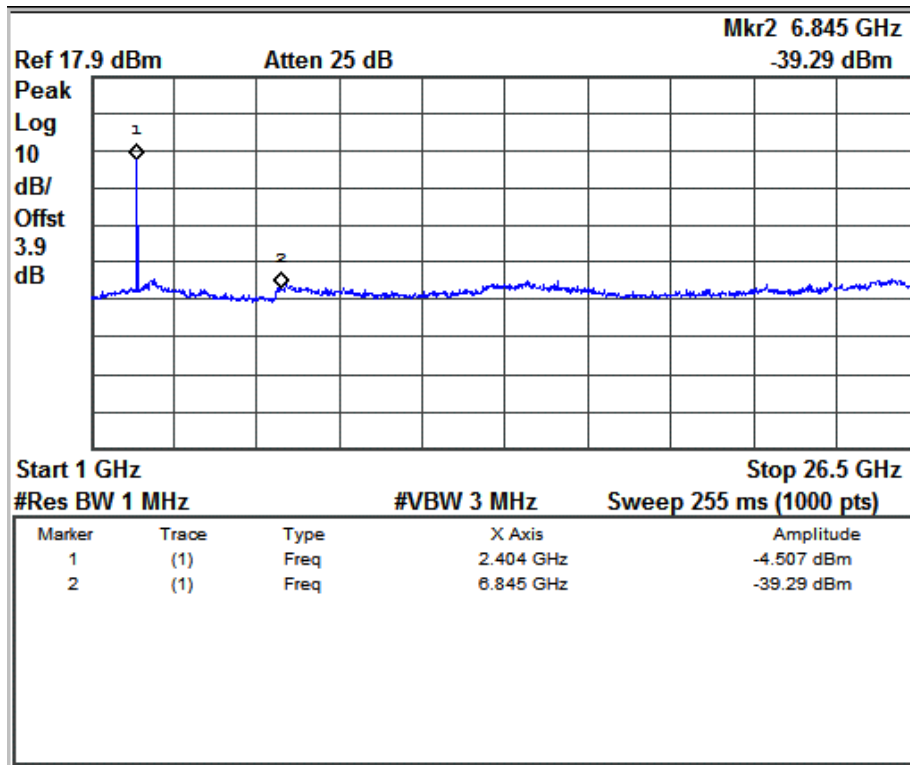
Channel: Mid

Modulation: GFSK



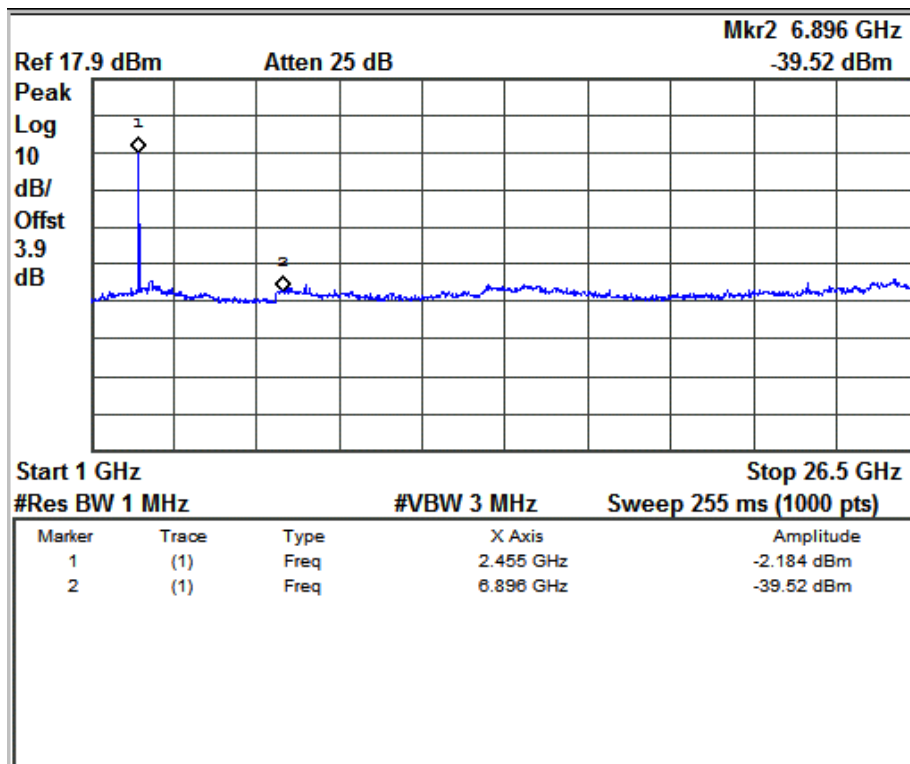
Channel: High

Modulation: GFSK



Channel: Low

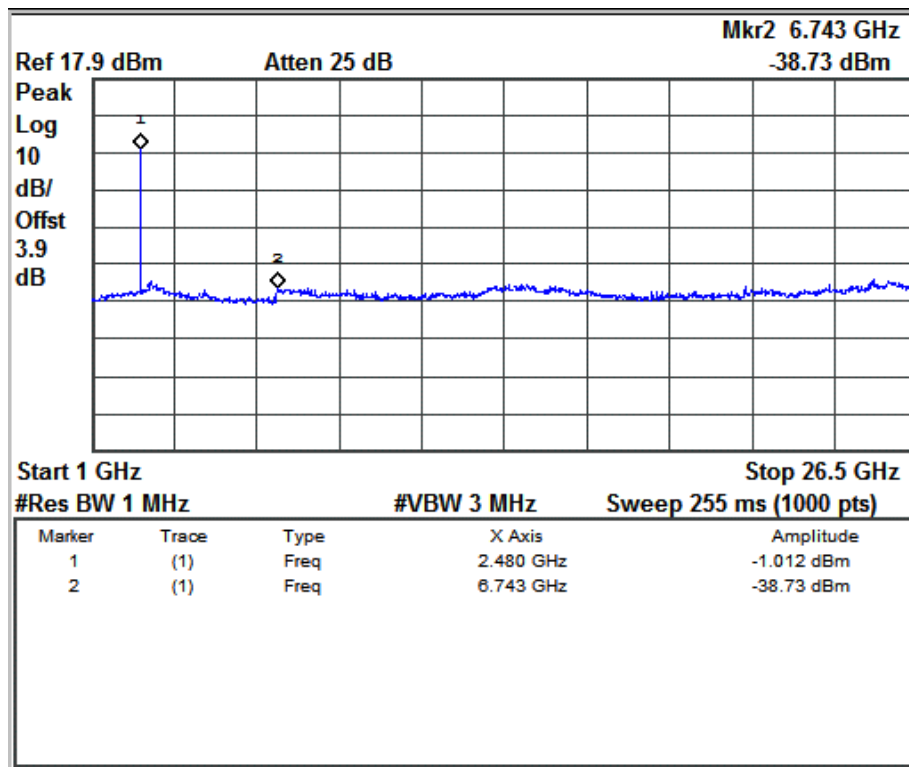
Modulation: Pi/4 DQPSK



Channel: Mid

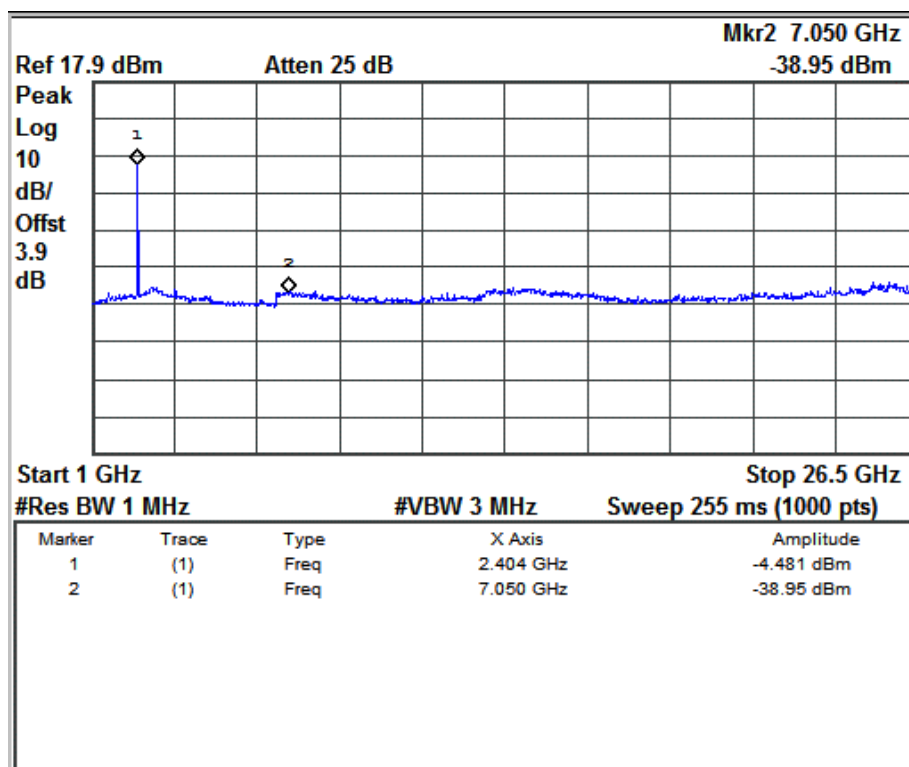
Modulation: Pi/4 DQPSK





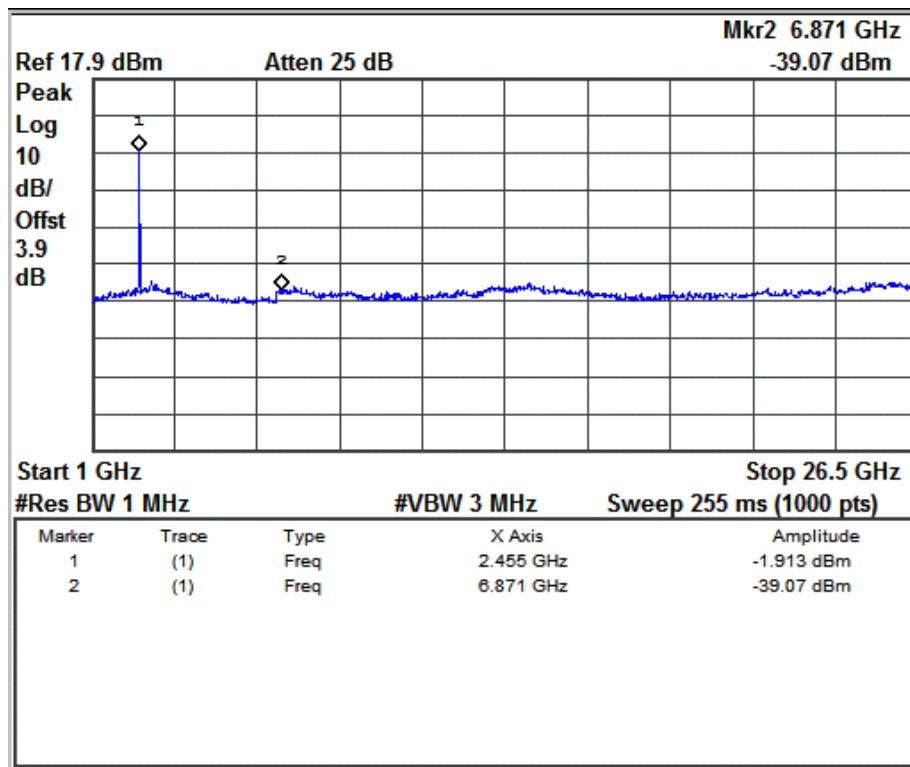
Channel: High

Modulation: Pi/4 DQPSK



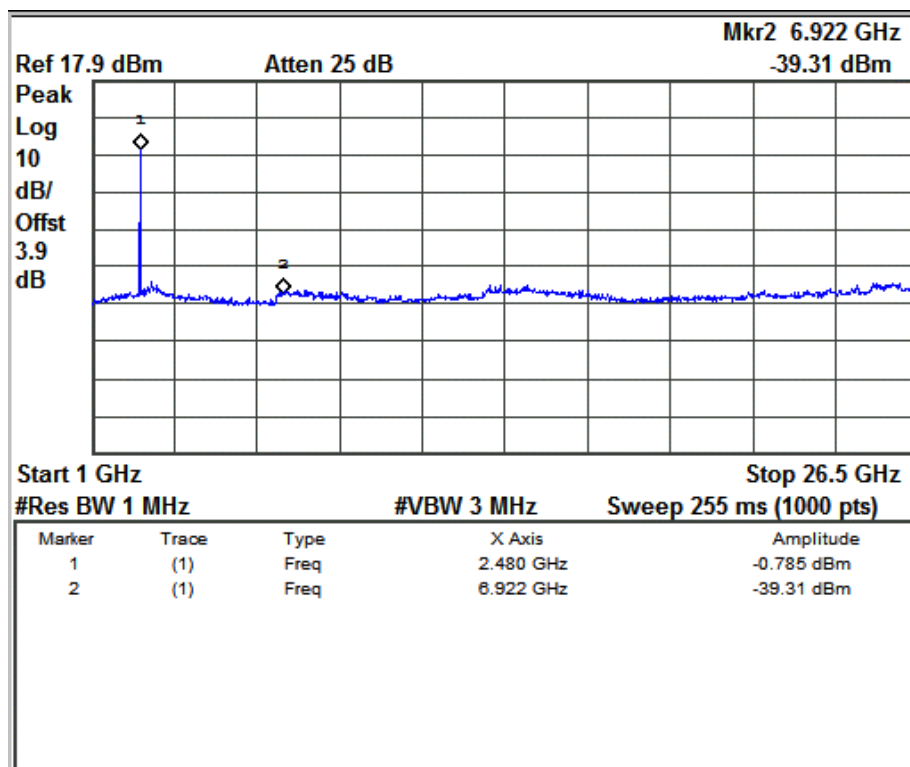
Channel: Low

Modulation: 8 DPSK



Channel: Mid

Modulation: 8 DPSK



Channel: High

Modulation: 8 DPSK

**Spurious Radiated Emissions & Restricted Bands of Operation**
**Section 15.209 & 15.205**
**Result**
**Pass**

Test Specification	FCC Part 15C
Test Method	ANSI C63.10-2013
Measurement Location	Semi Anechoic Chamber
Measuring Frequency Range	9kHz to 40GHz (Up to 10 <sup>th</sup> harmonic of the highest fundamental frequency)
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Peak, Average for frequency above 1GHz
Requirement	As per the limits mentioned in the bellow table

**Limit for Radiated Emission of Section 15.209:**

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: \* the limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 88, 50 – 53.80, 53.80 – 43.00 and 49.5dBμV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

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**Test results:**

No emissions were found in the range 9 kHz to 1GHz.

**Test results for frequencies in the range 1 GHz 26.5 GHz**

Modulation type: GFSK

Channel	Polarization	Frequency (MHz)	Measured Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
LOW	V	2390(Pk)	38.37	74	-35.63
		2390(Av)	27.13	54	-26.87
		2402(Pk)	77.36	*	*
		2402(Av)	73.21	*	*
		4804(Pk)	52.53	74	-21.47
		4804(Av)	43.40	54	-10.60
		7206(Pk)	57.92	74	-16.08
		7206(Av)	44.25	54	-09.75
	H	2390(Pk)	38.87	74	-35.13
		2390(Av)	27.04	54	-26.96
		2402(Pk)	80.85	*	*
		2402(Av)	80.45	*	*
		4804(Pk)	52.80	74	-21.20
		4804(Av)	44.22	54	-09.78
		7206(Pk)	56.18	74	-17.82
		7206(Av)	44.23	54	-09.77
MID	V	2441(Pk)	77.96	*	*
		2441(Av)	77.56	*	*
		4882(Pk)	53.65	74	-20.35
		4882(Av)	45.65	54	-08.35
		7323(Pk)	57.17	74	-16.83
		7323(Av)	44.89	54	-09.11
	H	2441(Pk)	83.19	*	*
		2441(Av)	82.15	*	*
		4882(Pk)	55.20	74	-18.80
		4882(Av)	47.73	54	-06.27
		7323(Pk)	57.23	74	-16.77
		7323(Av)	44.86	54	-09.14
HIGH	V	2483.5(Pk)	39.82	74	-34.18
		2483.5(Av)	27.10	54	-26.90
		2480(Pk)	80.72	*	*

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		2480(Av)	80.27	*	*
		4960(Pk)	52.71	74	-21.29
		4960(Av)	44.47	54	-09.53
		7440(Pk)	58.16	74	-15.84
		7440(Av)	46.10	54	-07.90
	H	2483.5(Pk)	38.74	74	-35.26
		2483.5(Av)	27.38	54	-26.62
		2480(Pk)	86.53	*	*
		2480(Av)	85.32	*	*
		4960(Pk)	55.23	74	-18.77
		4960(Av)	47.21	54	-06.79
		7440(Pk)	58.32	74	-15.68
		7440(Av)	45.74	54	-08.26

\*\* -> Fundamental Frequency

Pk - > Peak Detector

Av->Average Detector

Modulation type: Pi/4 DQPSK

Channel	Polarization	Frequency (MHz)	Measured Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
LOW	V	2390(Pk)	39.21	74	-34.79
		2390(Av)	27.19	54	-26.81
		2402(Pk)	73.01	*	*
		2402(Av)	67.41	*	*
		4804(Pk)	49.45	74	
		4804(Av)	38.47	54	
		7206(Pk)	56.52	74	
		7206(Av)	44.25	54	
	H	2390(Pk)	38.90	74	
		2390(Av)	27.11	54	
		2402(Pk)	78.87	*	*
		2402(Av)	74.89	*	*
		4804(Pk)	50.39	74	-23.61
		4804(Av)	39.09	54	-14.91
		7206(Pk)	56.56	74	-17.44
		7206(Av)	44.24	54	-09.76
MID	V	2441(Pk)	75.05	*	*
		2441(Av)	70.97	*	*
		4882(Pk)	51.54	74	-22.46
		4882(Av)	40.54	54	-13.46
		7323(Pk)	57.17	74	-16.82

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	H	7323(Av)	44.86	54	-09.14
		2441(Pk)	80.51	*	*
		2441(Av)	77.26	*	*
		4882(Pk)	52.38	74	-21.62
		4882(Av)	41.89	54	-12.11
		7323(Pk)	57.30	74	-16.70
		7323(Av)	44.87	54	-09.13
HIGH	V	2483.5(Pk)	38.36	74	-35.64
		2483.5(Av)	27.04	54	-26.96
		2480(Pk)	78.01	*	*
		2480(Av)	74.99	*	*
		4960(Pk)	50.35	74	-23.65
		4960(Av)	39.50	54	-14.50
		7440(Pk)	57.80	74	-16.20
		7440(Av)	45.65	54	-08.35
	H	2483.5(Pk)	38.20	74	-35.80
		2483.5(Av)	27.16	54	-26.84
		2480(Pk)	82.65	*	*
		2480(Av)	79.61	*	*
		4960(Pk)	52.09	74	-21.91
		4960(Av)	41.63	54	-12.37
		7440(Pk)	58.14	74	-15.86
		7440(Av)	45.63	54	-08.37

\*\* -> Fundamental Frequency

Pk -> Peak Detector

Av->Average Detector

Modulation Type: 8 DPSK

Channel	Polarization	Frequency (MHz)	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
LOW	V	2390(Pk)	38.57	74	-35.43
		2390(Av)	27.04	54	-26.96
		2402(Pk)	72.45	*	*
		2402(Av)	68.49	*	*
		4804(Pk)	49.54	74	-24.46
		4804(Av)	38.56	54	-15.44
		7206(Pk)	56.74	74	-17.26
		7206(Av)	44.28	54	-09.72
	H	2390(Pk)	38.77	74	-35.23
		2390(Av)	27.09	54	-26.91
		2402(Pk)	80.85	*	*

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		2402(Av)	76.49	*	*
		4804(Pk)	51.05	74	-22.95
		4804(Av)	39.62	54	-14.38
		7206(Pk)	57.46	74	-16.54
		7206(Av)	44.29	54	-09.71
MID	V	2441(Pk)	78.98	*	*
		2441(Av)	75.19	*	*
		4882(Pk)	51.32	74	-22.68
		4882(Av)	39.81	54	-14.19
		7323(Pk)	57.07	74	-16.93
		7323(Av)	44.91	54	-09.09
	H	2441(Pk)	82.44	*	*
		2441(Av)	78.71	*	*
		4882(Pk)	52.27	74	-21.73
		4882(Av)	41.11	54	-12.89
		7323(Pk)	57.29	74	-16.71
		7323(Av)	44.93	54	-09.07
HIGH	V	2483.5(Pk)	38.58	74	-35.42
		2483.5(Av)	27.21	54	-26.79
		2480(Pk)	79.63	*	*
		2480(Av)	75.70	*	*
		4960(Pk)	51.20	74	-22.80
		4960(Av)	39.51	54	-14.49
		7440(Pk)	58.22	74	-15.78
		7440(Av)	45.63	54	-08.37
	H	2483.5(Pk)	38.66	74	-35.34
		2483.5(Av)	27.24	54	-26.76
		2480(Pk)	84.60	*	*
		2480(Av)	79.83	*	*
		4960(Pk)	51.62	74	-22.38
		4960(Av)	40.69	54	-13.31
		7440(Pk)	57.98	74	-16.02
		7440(Av)	45.61	54	-08.39

\*\* -> Fundamental Frequency

Pk - > Peak Detector

Av->Average Detector

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**Conducted Emission Test on A.C. Power Line**

**Section 15.207**

**Result**

**Pass**

Test Specification : FCC Part 15 Section 15.207  
Test Method : ANSI C63.10-2013  
Testing Location : Screened room  
Measurement Bandwidth : 9kHz  
Frequency Range : 150kHz – 30MHz  
Supply Voltage : 120VAC,60Hz

**Limit of section 15.207**

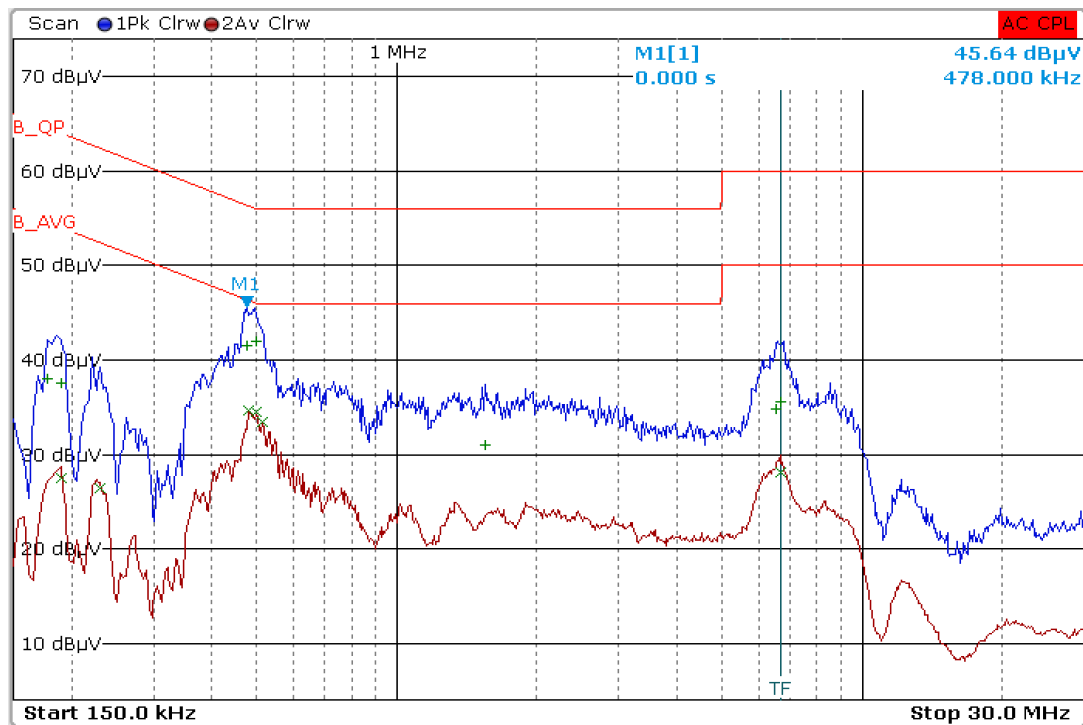
<b>Frequency of emission (MHz)</b>	<b>QP Limit (dB<math>\mu</math>V)</b>	<b>AV Limit (dB<math>\mu</math>V/m)</b>
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

\* Decreases with the logarithm of the frequency



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Test Result:

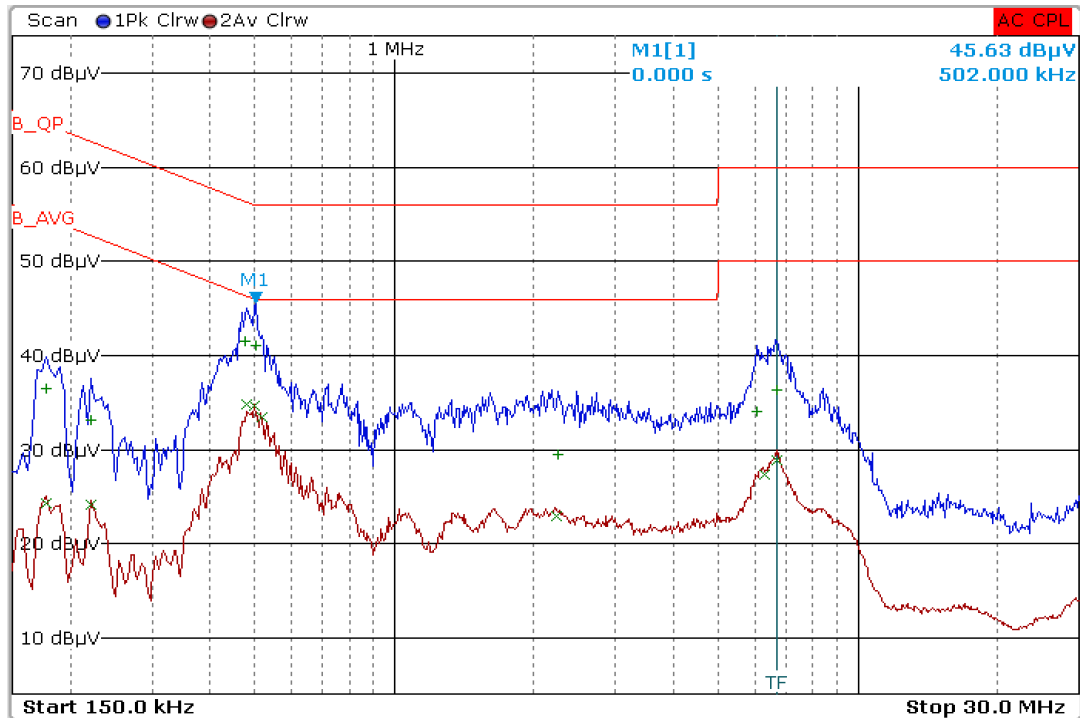


Line Graph

Frequency [MHz]	Emission Level [dBµV]	Limit [dBµV]	Detector
0.498	41.91	56.0	Quasi Peak
0.478	41.45	56.4	Quasi Peak
6.686	35.58	60.0	Quasi Peak
1.550	30.92	56.0	Quasi Peak
6.534	34.88	60.0	Quasi Peak
0.190	37.57	64.0	Quasi Peak
0.498	34.54	46.00	Average
0.482	34.67	46.30	Average
0.514	33.44	46.00	Average
6.678	28.12	50.00	Average
0.230	26.48	52.50	Average
0.190	27.53	54.00	Average

Line: Table

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Neutral: Graph

Frequency [MHz]	Emission Level [dBμV]	Limit [dBμV]	Detector
0.478	41.54	56.37	Quasi Peak
0.502	41.04	55.64	Quasi Peak
6.694	36.36	60.00	Quasi Peak
6.062	34.01	60.00	Quasi Peak
2.250	29.49	56.00	Quasi Peak
0.178	36.55	64.58	Quasi Peak
0.498	34.67	46.03	Average
0.482	34.82	46.30	Average
0.518	33.44	46.00	Average
6.678	28.89	50.00	Average
6.274	27.38	50.00	Average
2.230	22.95	46.00	Average

Neutral: Table