


Produkte  
 Products

<b>Prüfbericht - Nr.:</b> 19660188 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>	Wireless Vitals Monitor																
<b>Bezeichnung:</b> <i>Identification:</i>	VA06	<b>Serien-Nr.:</b> Engineering Sample <i>Serial No.</i>															
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>	1803095548	<b>Eingangsdatum:</b> 26.08.2015 <i>Date of receipt:</i>															
<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 <b>FCC Registration No.:</b> 176555																
<div style="display: flex; justify-content: space-between;"> <div> <b>geprüft / tested by:</b>   <div style="display: flex; justify-content: space-between;"> <div>           21.09.2015   Girish Kumar.G             Test Engineer         </div> <div>           26.09.2015   Raghavendra Kulkarni             Sr. Manager         </div> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Datum <i>Date</i></th> <th>Name/Stellung <i>Name/Position</i></th> <th>Unterschrift <i>Signature</i></th> </tr> </thead> <tbody> <tr> <td>21.09.2015</td> <td>Girish Kumar.G</td> <td></td> </tr> <tr> <td>26.09.2015</td> <td>Raghavendra Kulkarni</td> <td></td> </tr> </tbody> </table> </div> <div> <b>kontrolliert / reviewed by:</b>   <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Datum <i>Date</i></th> <th>Name/Stellung <i>Name/Position</i></th> <th>Unterschrift <i>Signature</i></th> </tr> </thead> <tbody> <tr> <td>26.09.2015</td> <td>Raghavendra Kulkarni</td> <td></td> </tr> </tbody> </table> </div> </div>			Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	21.09.2015	Girish Kumar.G		26.09.2015	Raghavendra Kulkarni		Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	26.09.2015	Raghavendra Kulkarni	
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<b>Sonstiges / Other Aspects:</b>	FCC ID : 2AFV6-AMI-BU-01																
<b>Abkürzungen:</b>	<b>Abbreviations:</b> <table style="width: 100%;"> <tr> <td>P(ass) = entspricht Prüfgrundlage</td> <td>P(ass) = passed</td> </tr> <tr> <td>F(ail) = entspricht nicht Prüfgrundlage</td> <td>F(ail) = failed</td> </tr> <tr> <td>N/A = nicht anwendbar</td> <td>N/A = not applicable</td> </tr> <tr> <td>N/T = nicht getestet</td> <td>N/T = not tested</td> </tr> </table>		P(ass) = entspricht Prüfgrundlage	P(ass) = passed	F(ail) = entspricht nicht Prüfgrundlage	F(ail) = failed	N/A = nicht anwendbar	N/A = not applicable	N/T = nicht getestet	N/T = not tested							
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<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>																	

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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	

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## General Product Information

### Product Function and Intended Use

Wireless Vitals Monitor is a Non Invasive medical gadget that combines multiple vital physiological parameters into a small form factor device which gets controlled from a mobile device. Wireless Vitals Monitor is a cloud enabled solution. With Wireless Vitals Monitor your health vitals can be stored in your personal health cloud. For Wireless Vitals Monitor to be in your hands, all you need is any leading mobile device that operates with the compatible Operating System. It is used to measure the vital signs like Blood Pressure, Body temperature, Blood oxygen saturation level & Blood glucose, hemoglobin, cholesterol levels etc.

### 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	-13.93dBm	
Number of antenna	One	
Antenna Gain and Antenna type	0.5dBi and Trace 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: +24.6 ° C      RH: 55%

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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.

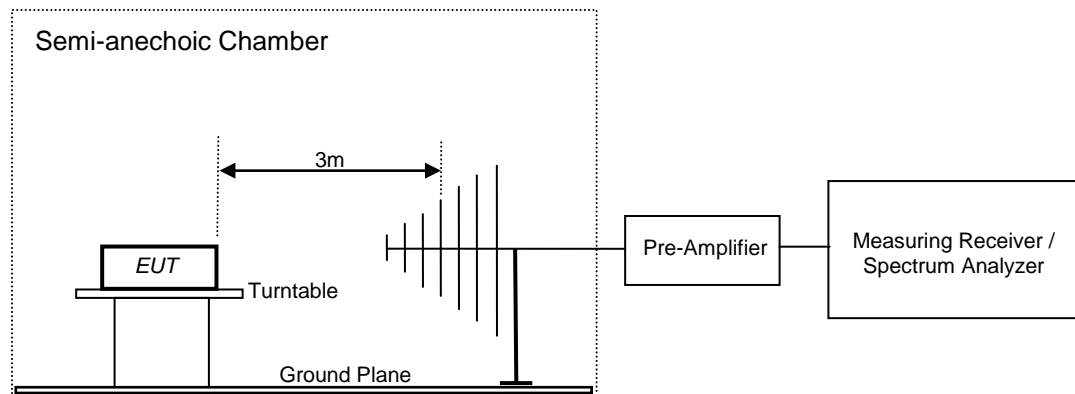
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## Test Methodology

### Radiated Emission Test

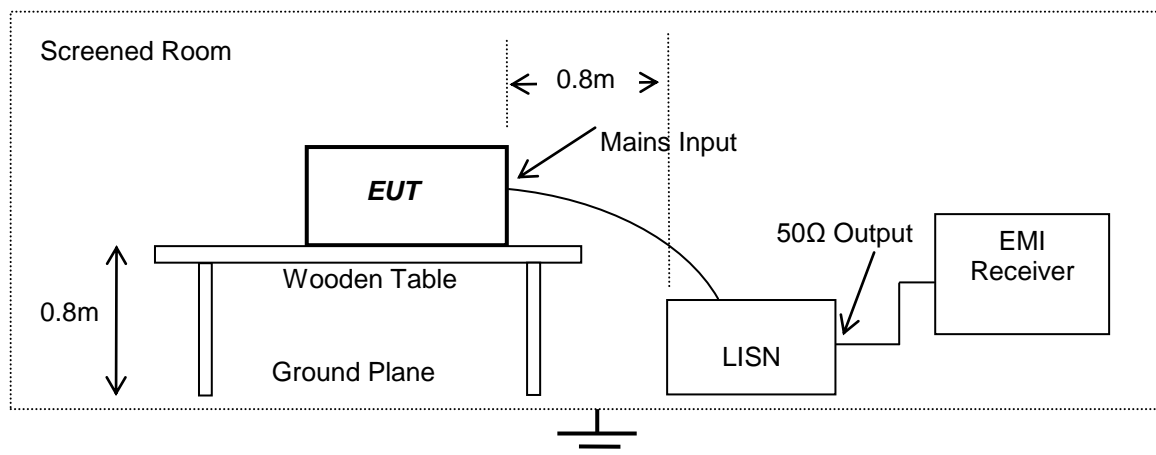
The radiated emission measurement was performed according to the procedures in ANSI C63.10 - 2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1GHz and 150 cm high turntable for above 1GHz, and the EUT is 3 meters far from the measuring antenna. The turntable 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: Trace Antenna
2. Peak Gain: 0.5dBi

### Pseudorandom Frequency Hopping Sequence

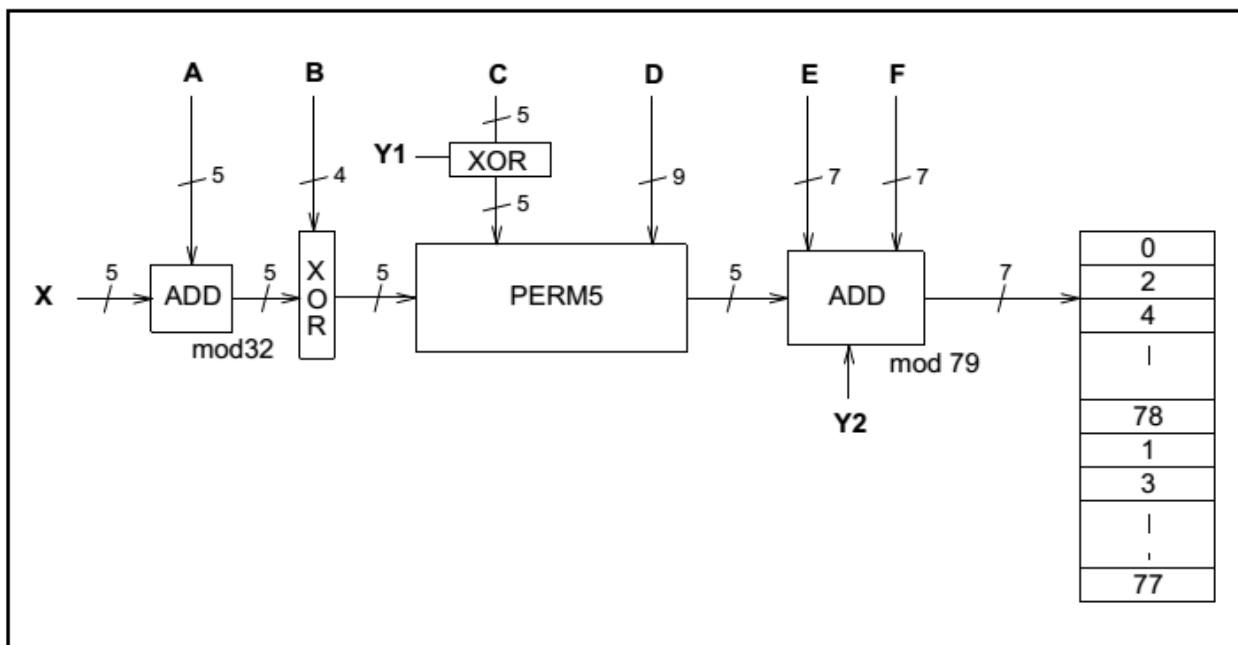
Section 15.247 (a)

#### 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

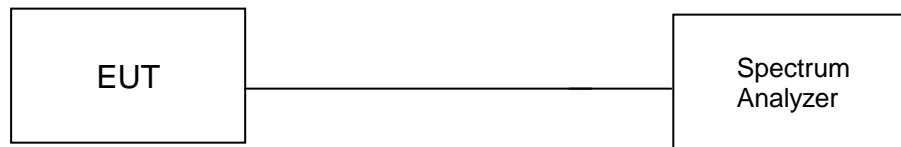
Section 15.247 (b) (1)

Result

Pass

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

Test Method:

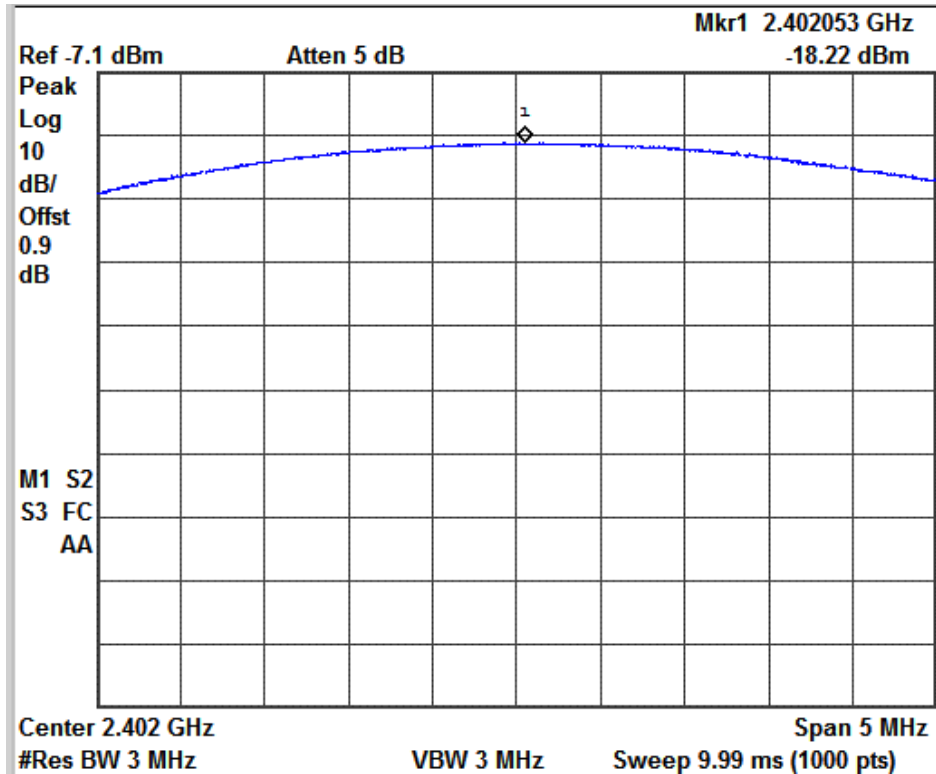


Test Result:

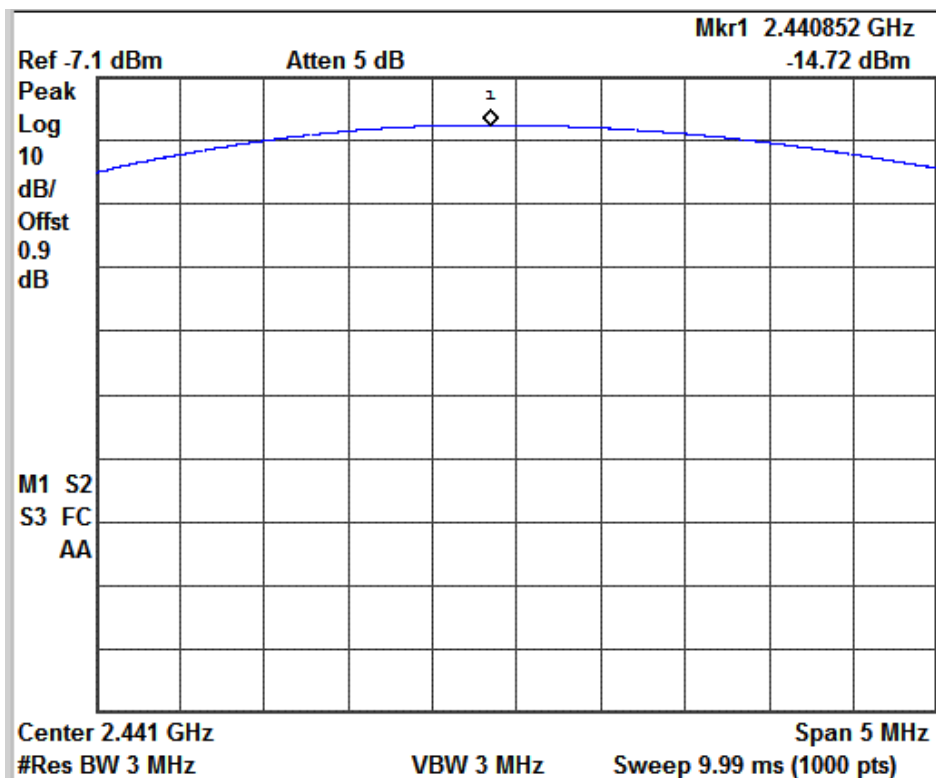
Modulation Type: GFSK

Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2402	-18.22	30
Mid	2441	-14.72	30
High	2480	-13.93	30

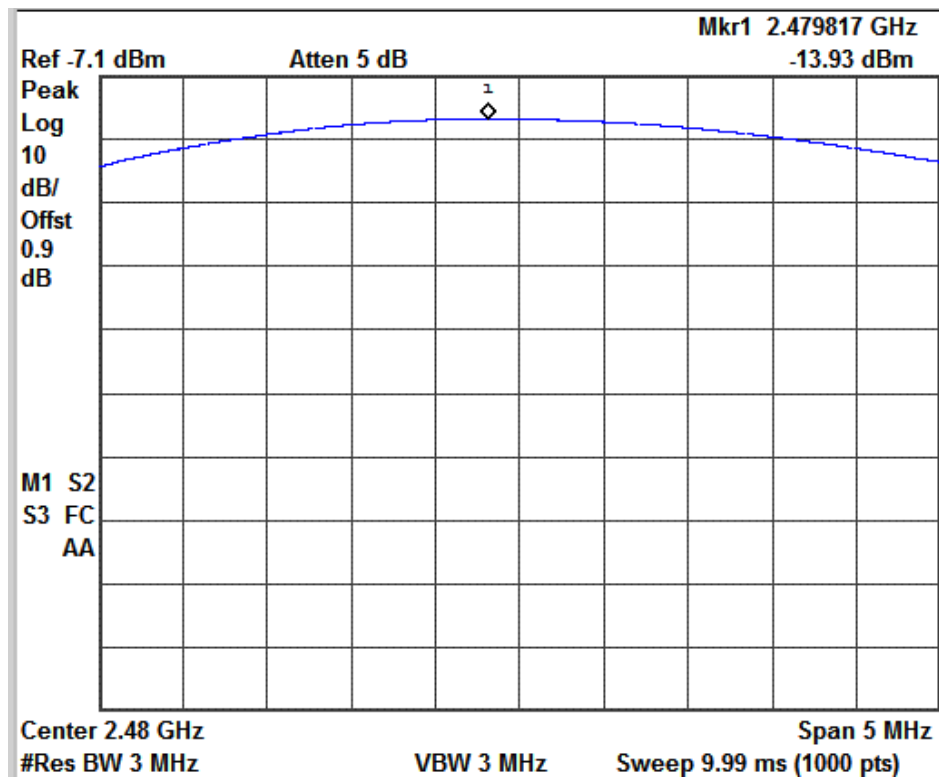
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Channel Frequency: 2402 MHz



Channel Frequency: 2441 MHz



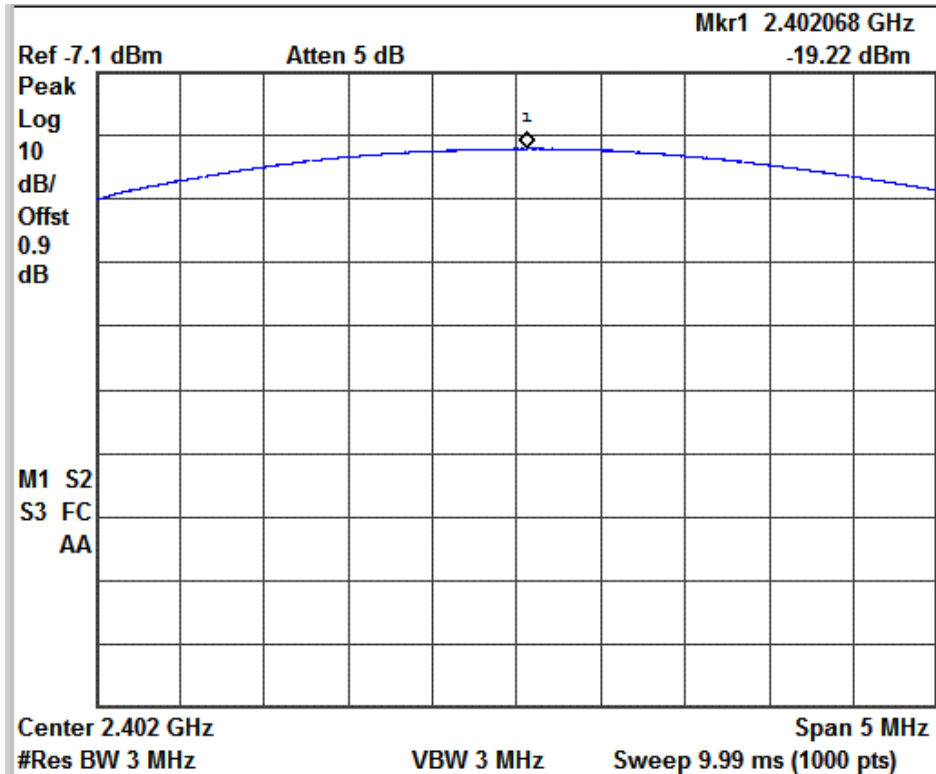
Channel Frequency: 2480 MHz

Modulation Type: Pi/4 DQPSK

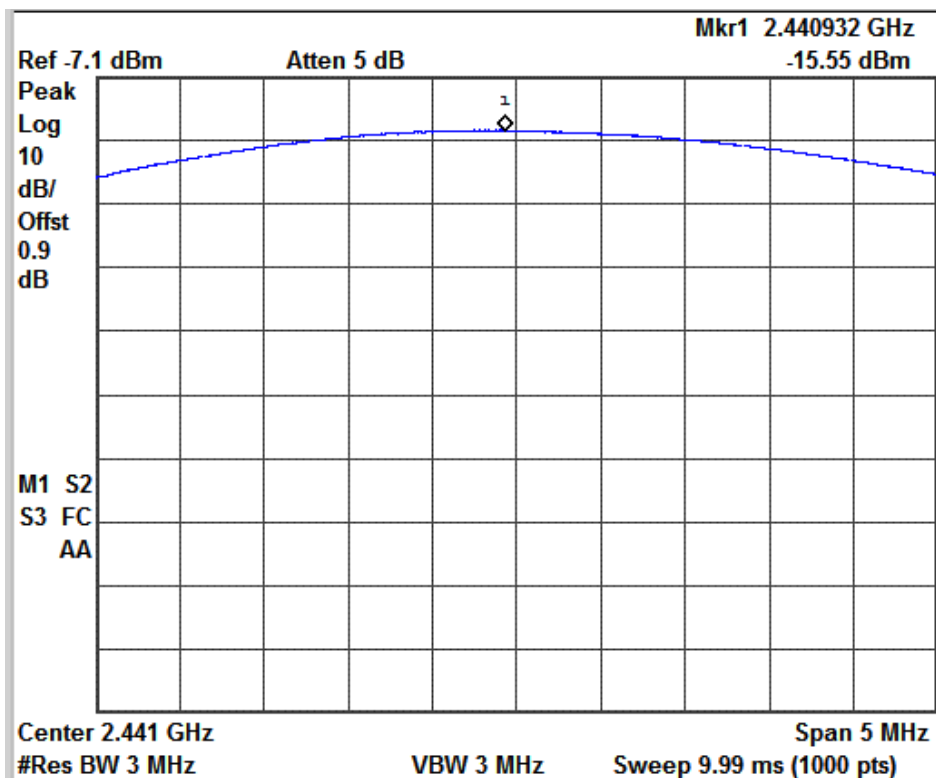
Test Results:

Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2402	-19.22	20.96
Mid	2441	-15.55	20.96
High	2480	-14.83	20.96

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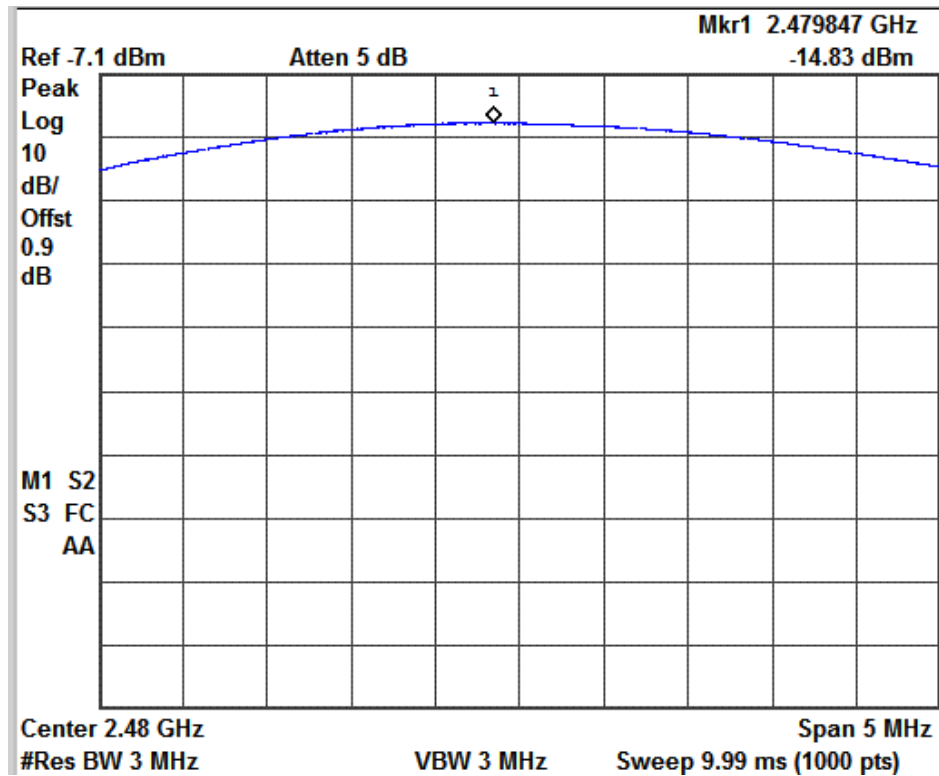


Channel Frequency: 2402 MHz



Channel Frequency: 2441 MHz

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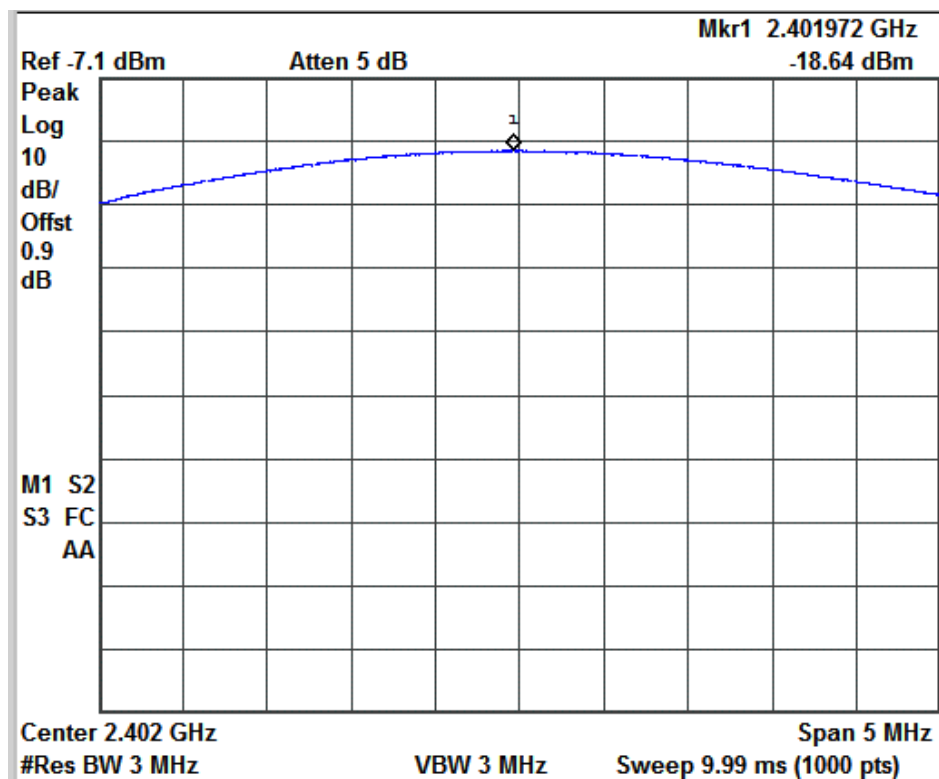
Channel Frequency: 2480 MHz

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Modulation Type: 8 DPSK

**Test Results:**

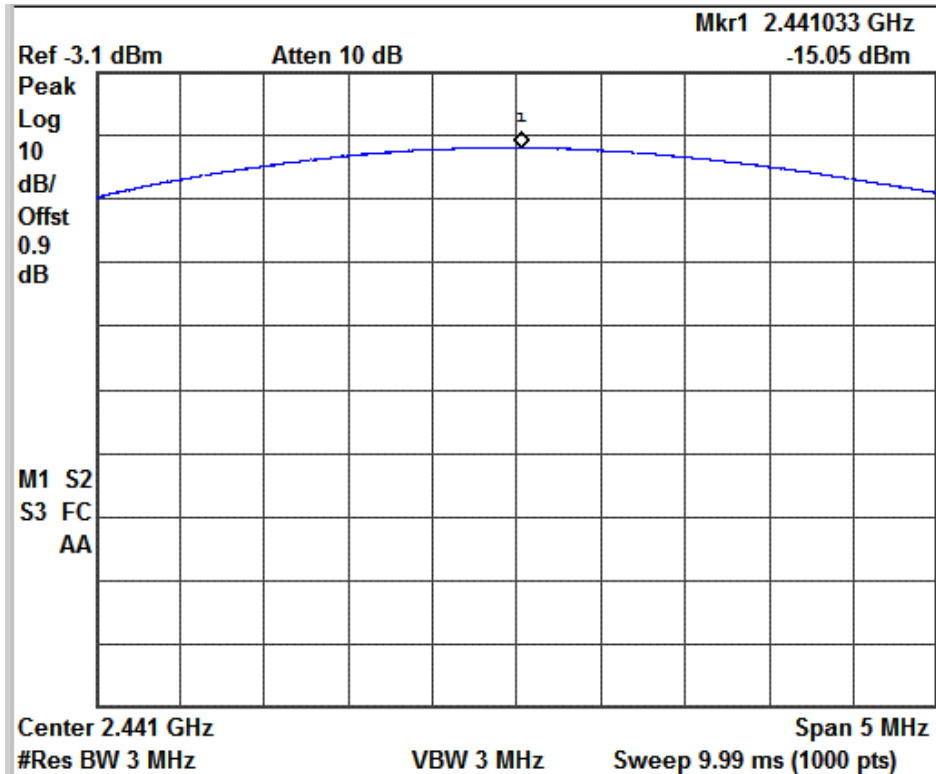
Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2402	-18.64	20.96
Mid	2441	-15.05	20.96
High	2480	-14.28	20.96



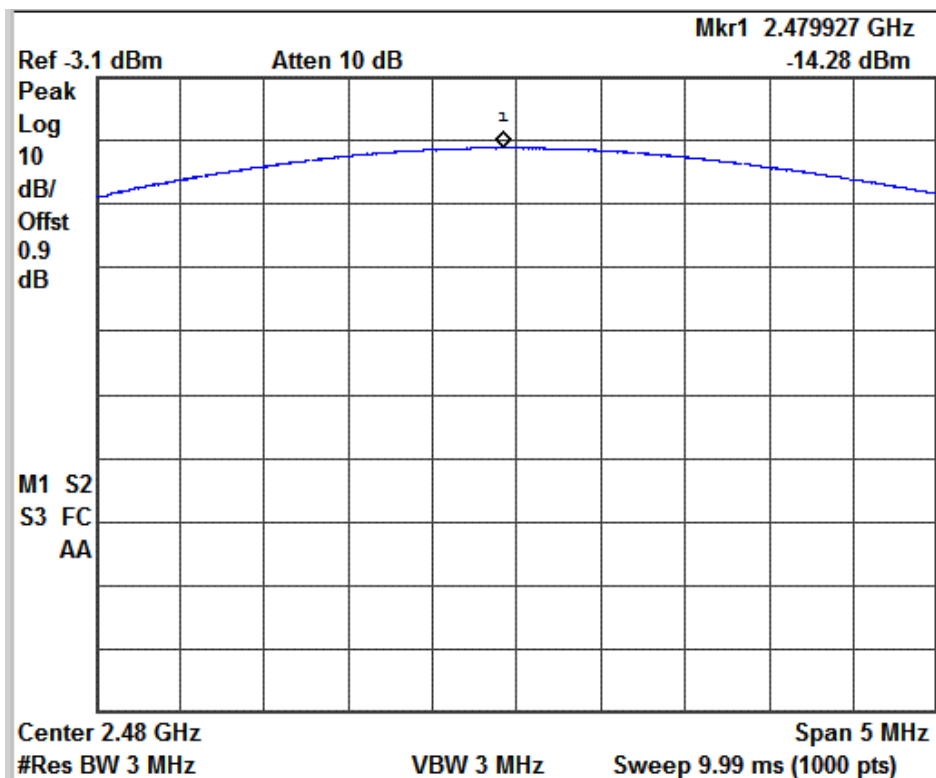
**Channel Frequency: 2402 MHz**



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Channel Frequency: 2441 MHz



Channel Frequency: 2480 MHz

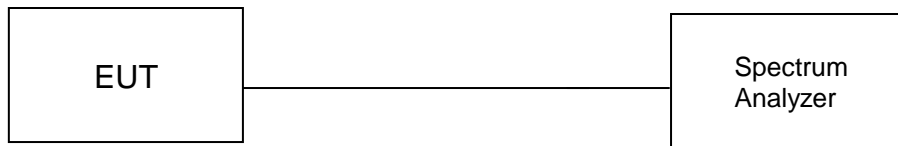
## Result

Pass

Test Specification  
Detector Function  
Port of testing  
RequirementFCC 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.

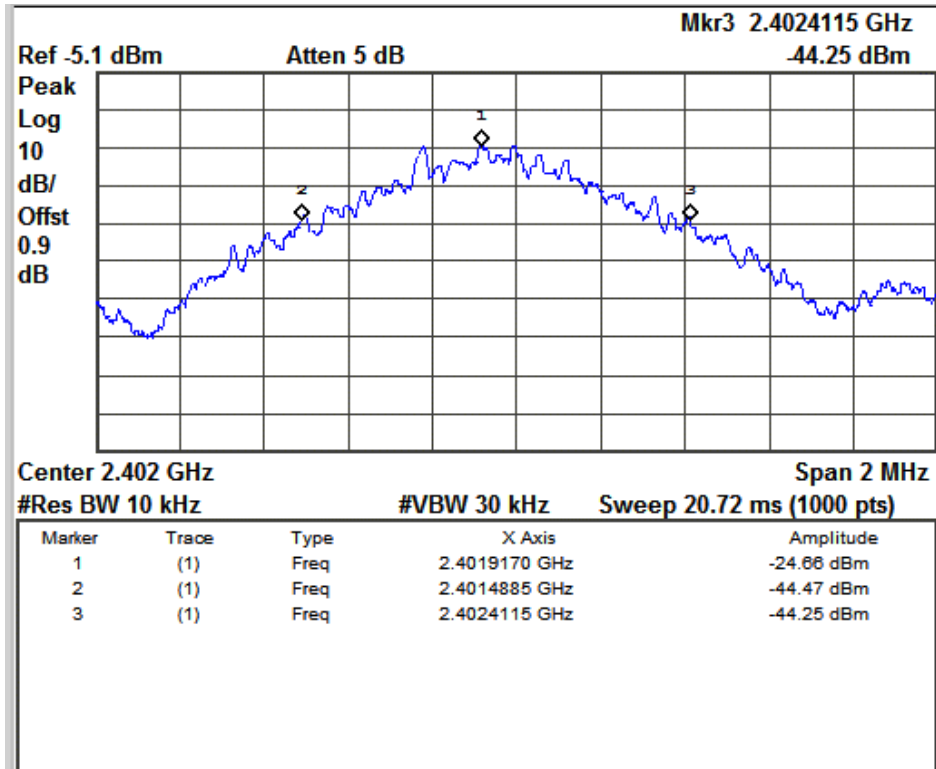
## Test Method:



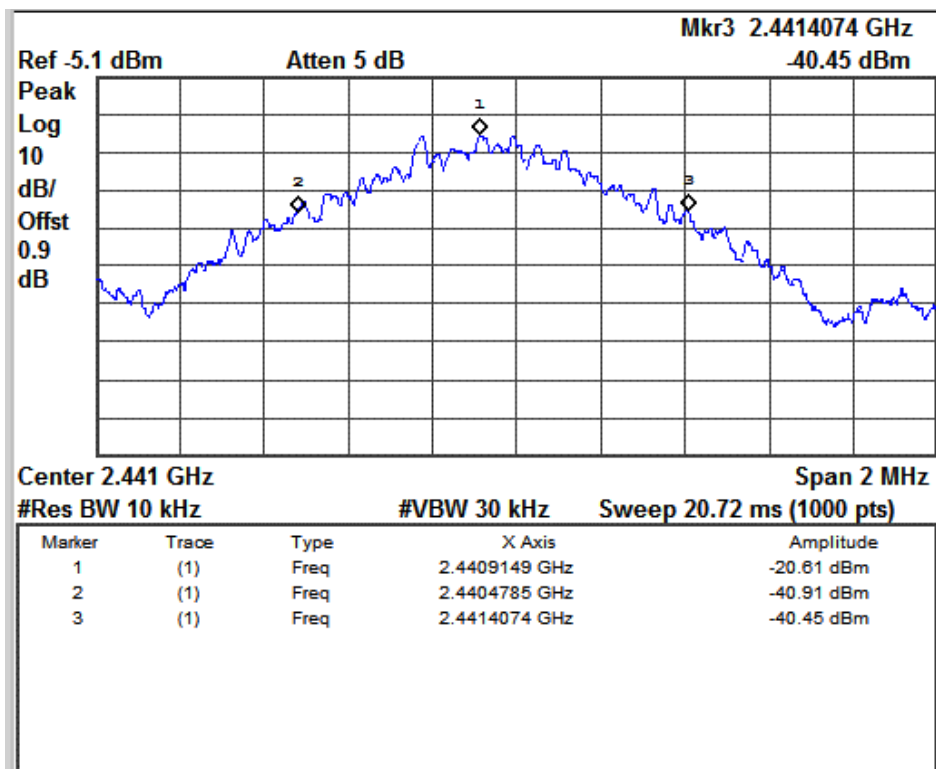
## Test Result:

## Modulation Type: GFSK

Channel	Channel Frequency (MHz)	Lower 20dB Frequency (MHz)	Higher 20dB Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
Low	2402	2401.4885	2402.4115	0.92	0.97
Mid	2441	2440.4785	2441.4074	0.93	0.96
High	2480	2479.4805	2480.4074	0.93	0.96

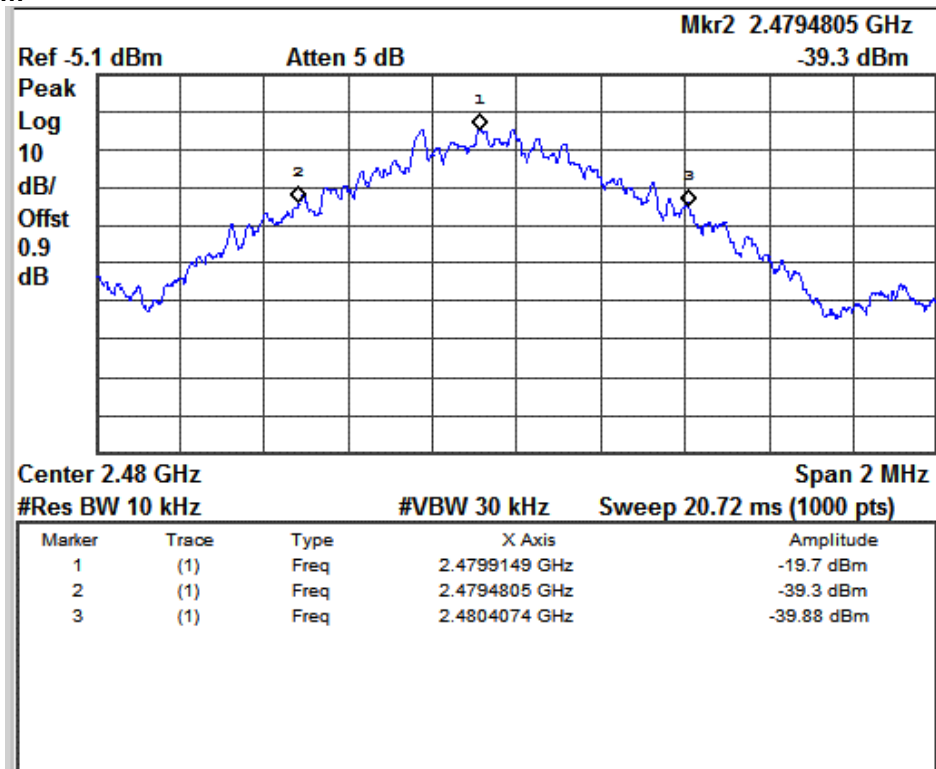


Channel Low: 20dB Bandwidth Measurement

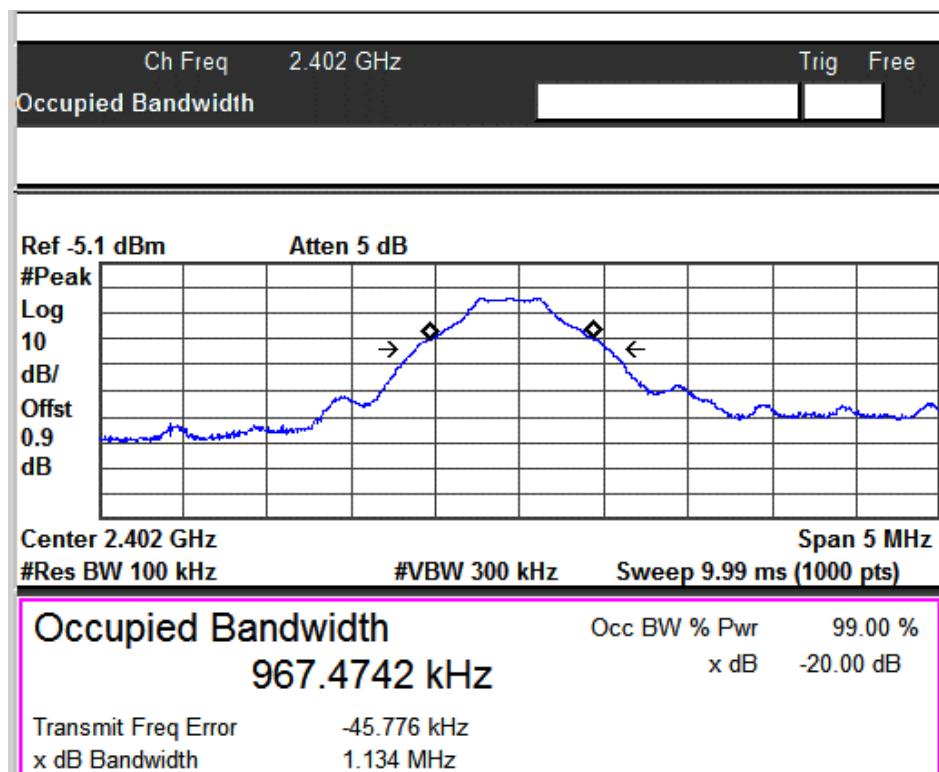


Channel Mid: 20dB Bandwidth Measurement

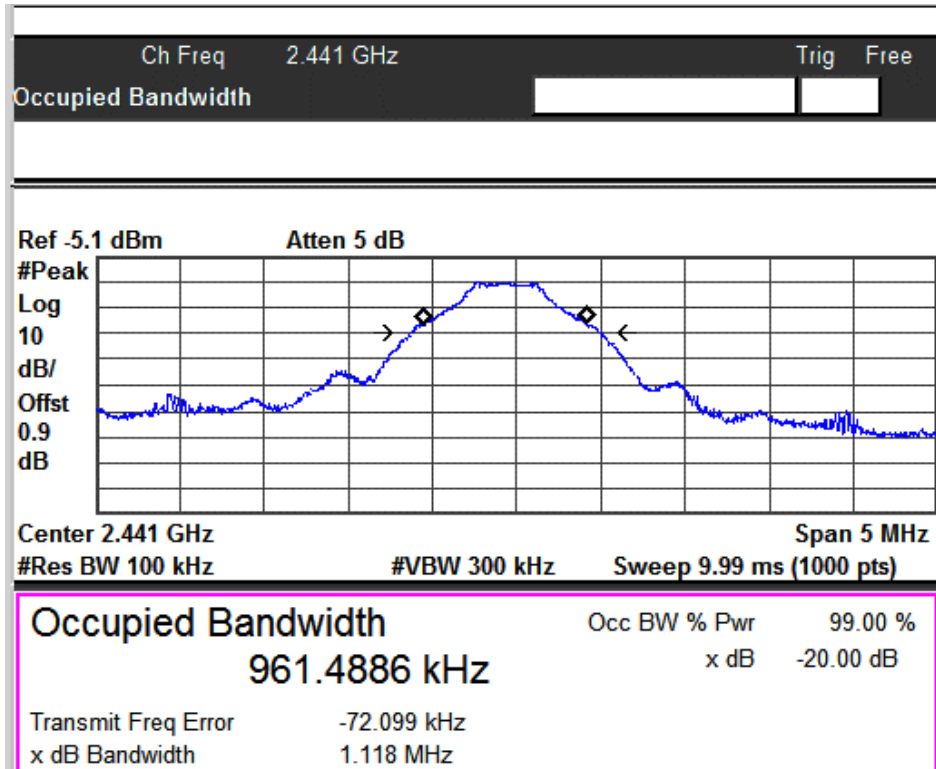
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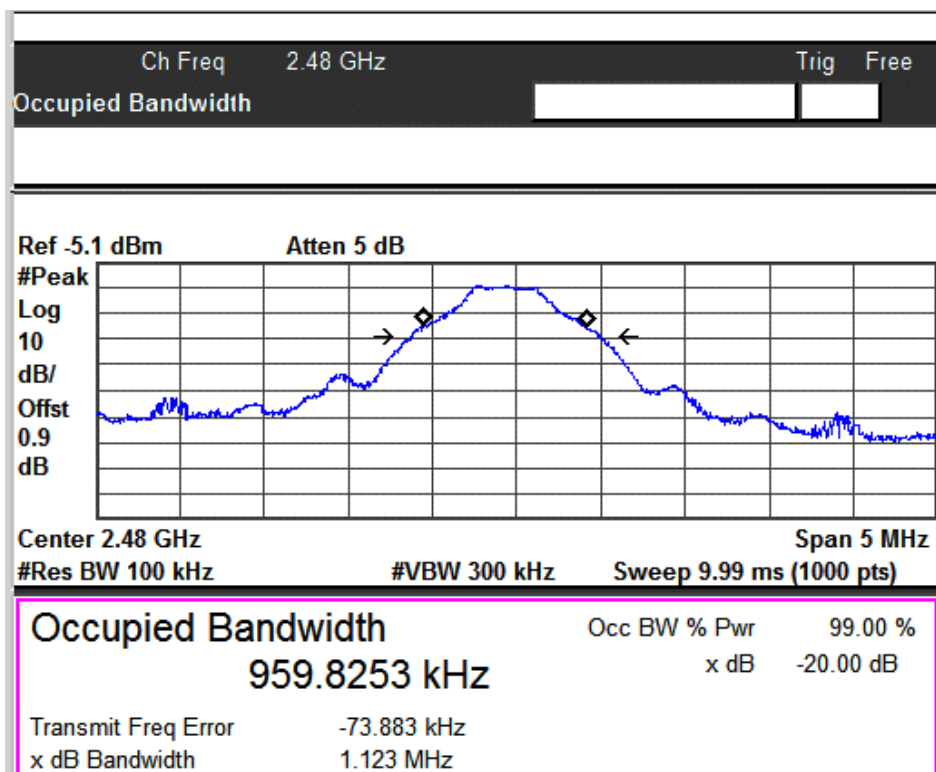
Channel High: 20dB Bandwidth Measurement



99% Occupied Bandwidth: Channel Low



**99% Occupied Bandwidth: Channel Mid**



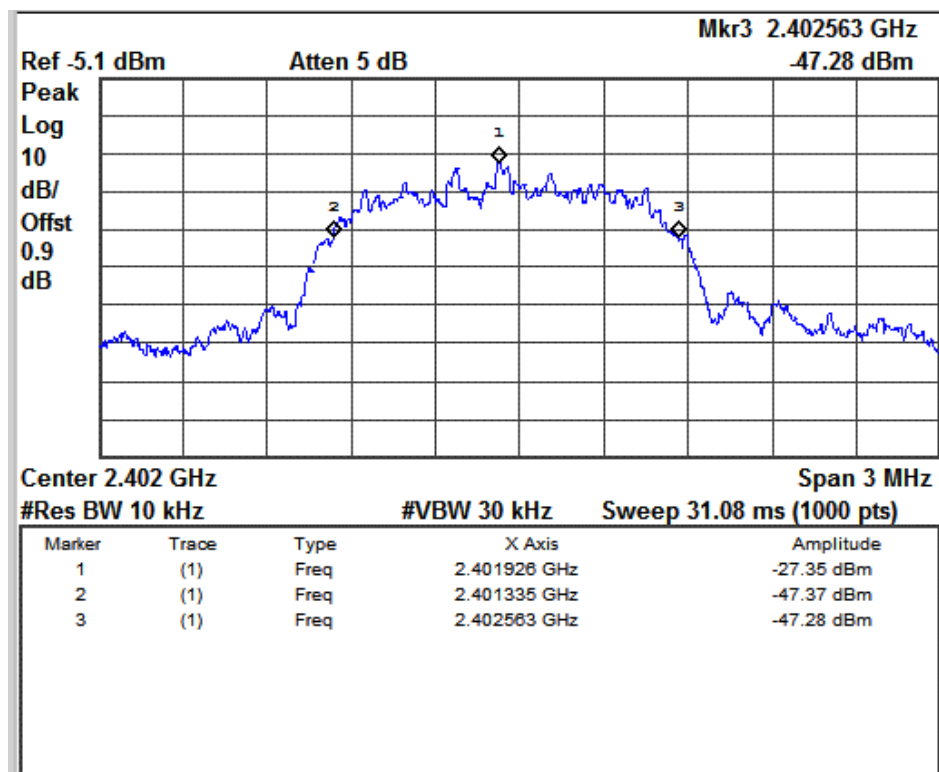
**99% Occupied Bandwidth: Channel High**

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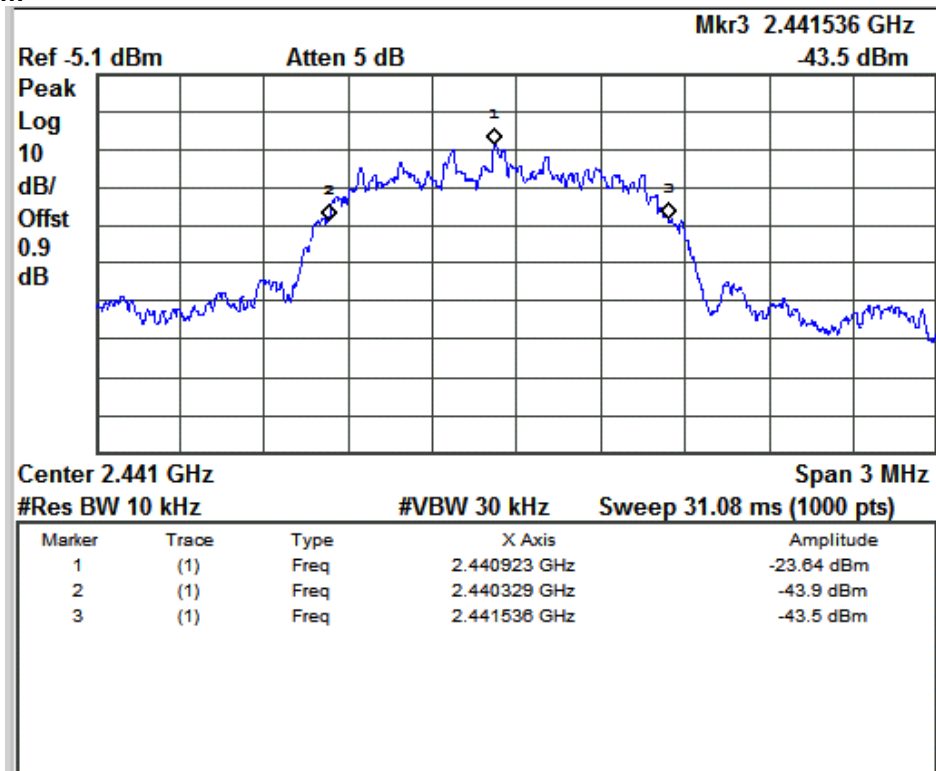
Modulation Type: Pi/4 DQPSK

Test Results:

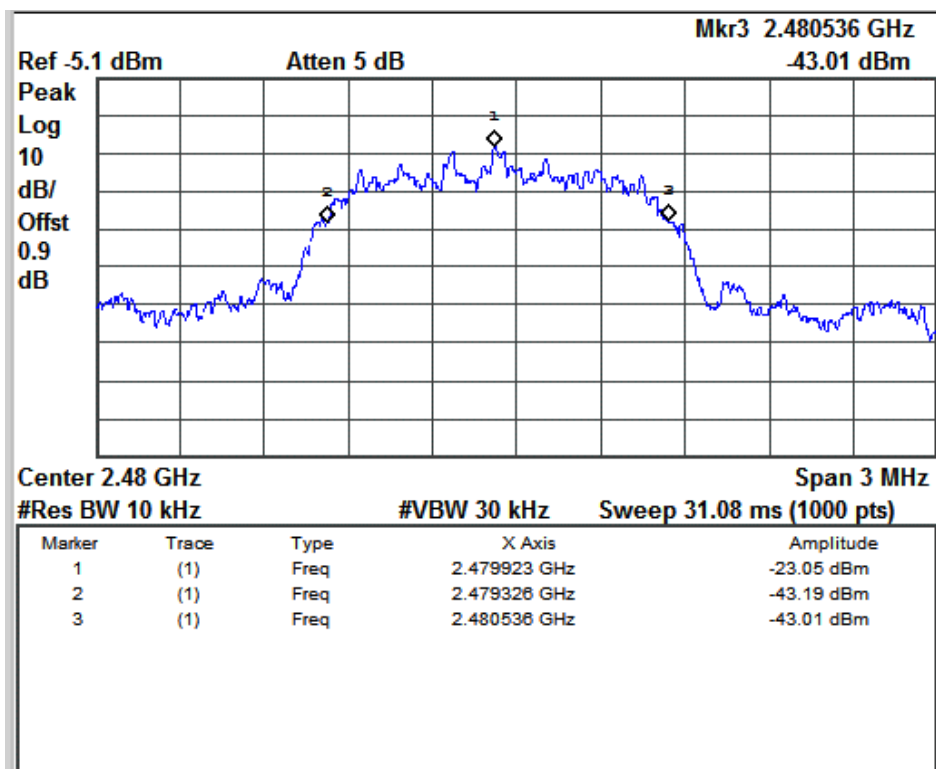
Channel	Channel Frequency (MHz)	Lower 20dB Frequency (MHz)	Higher 20dB Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
Low	2402	2401.3350	2402.5630	1.23	1.21
Mid	2441	2440.3290	2441.5360	1.21	1.22
High	2480	2479.3260	2480.5360	1.21	1.21



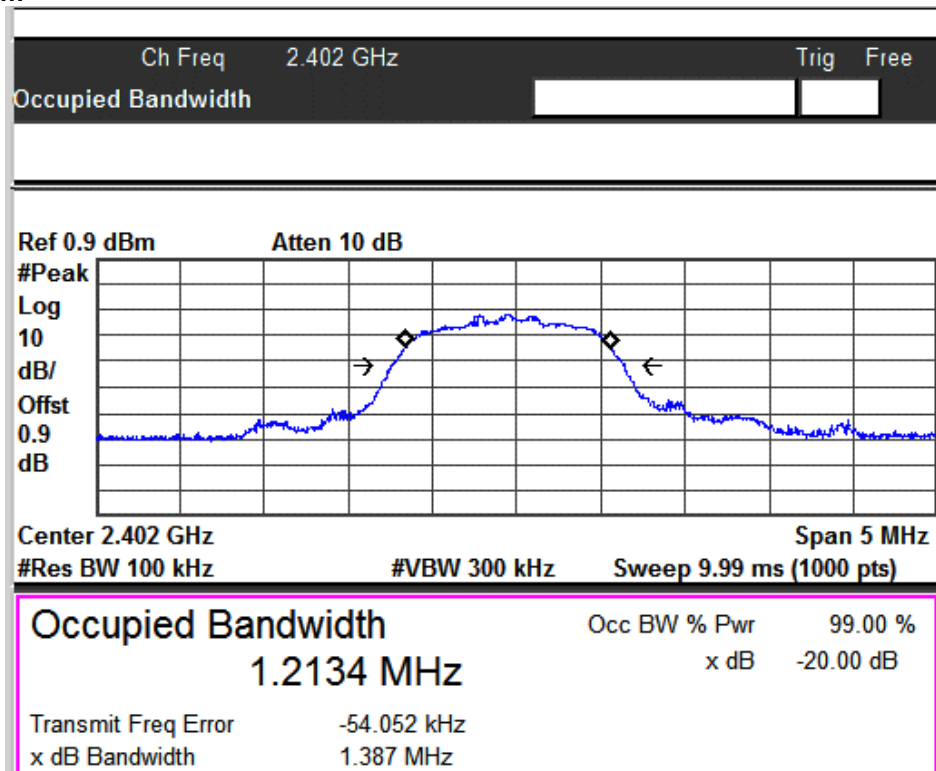
Channel Low: 20dB Bandwidth Measurement



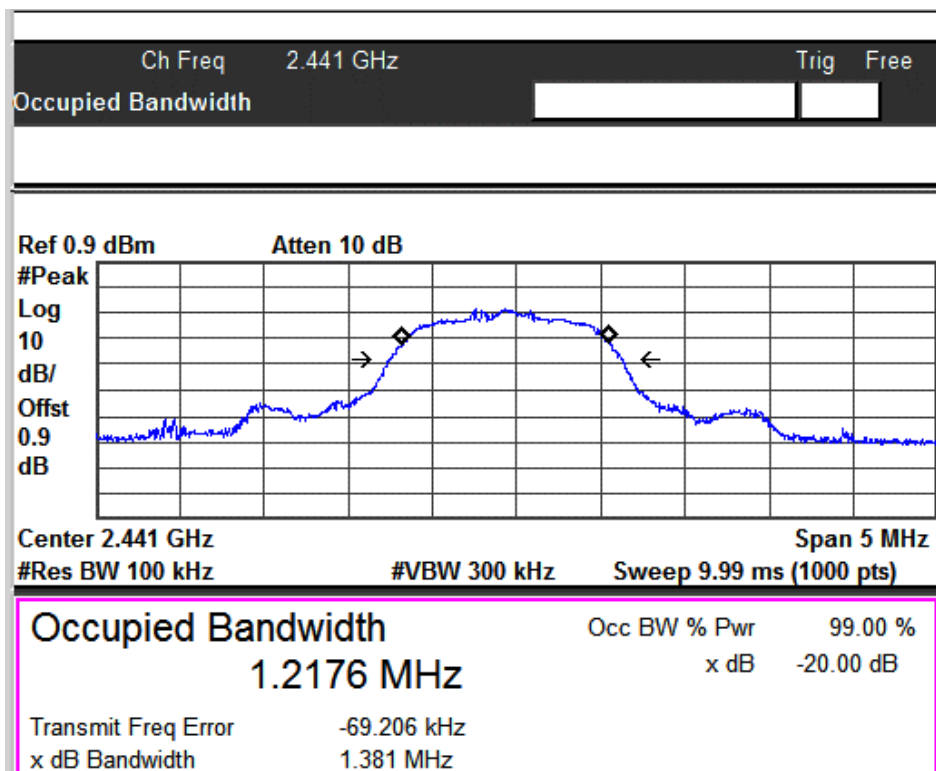
Channel Mid: 20dB Bandwidth Measurement



Channel High: 20dB Bandwidth Measurement



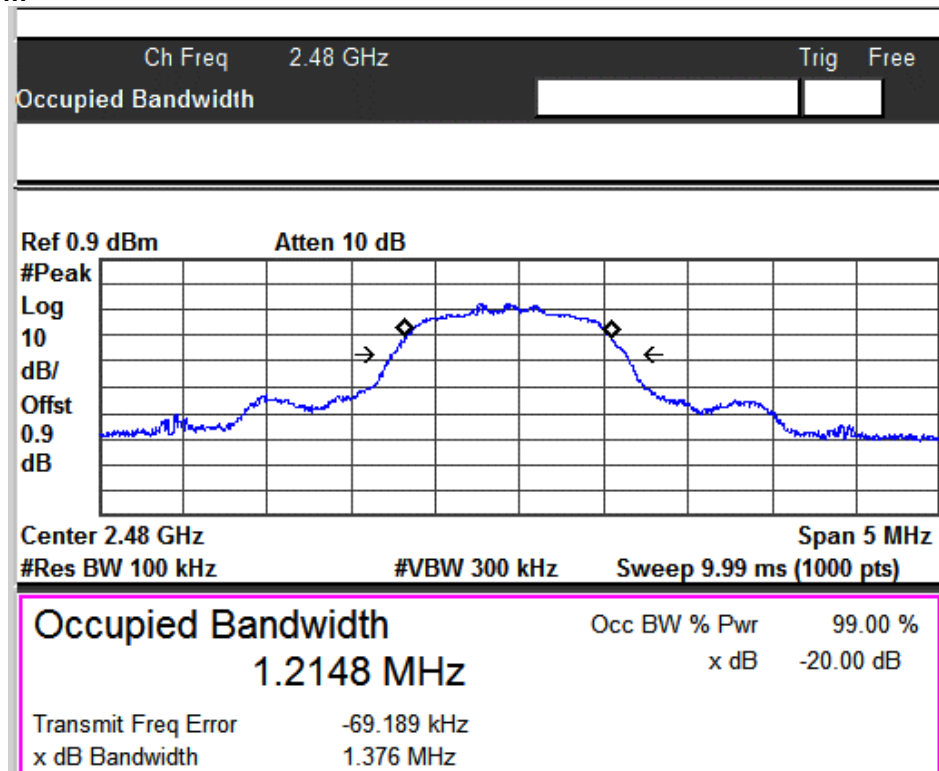
99% Occupied Bandwidth: Channel Low



99% Occupied Bandwidth: Channel Mid



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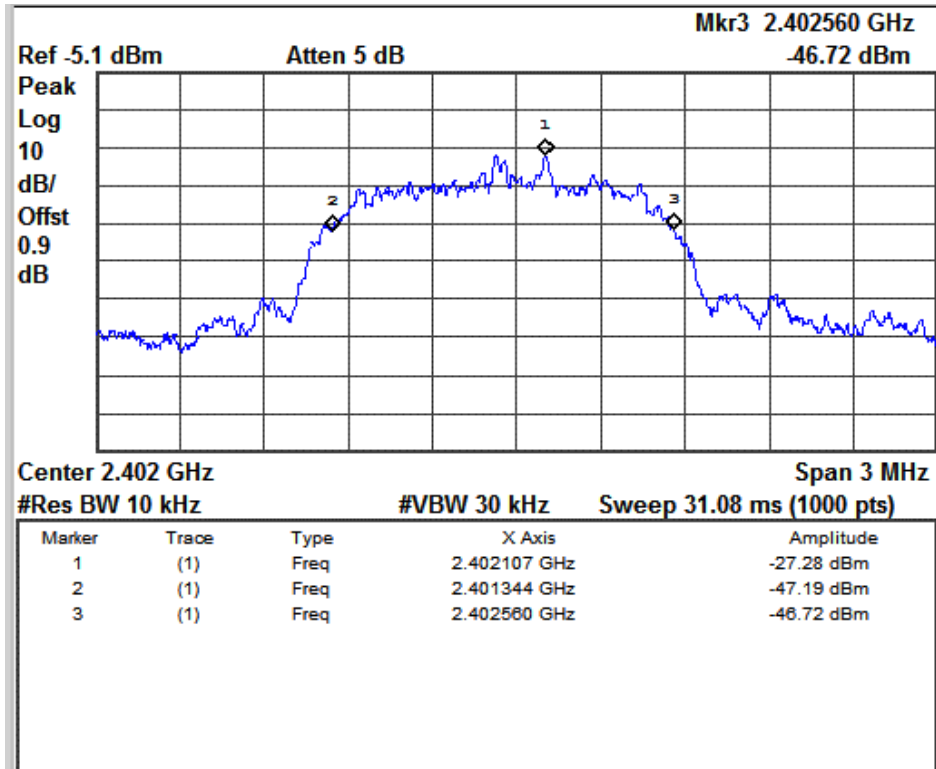


**99% Occupied Bandwidth: Channel High**

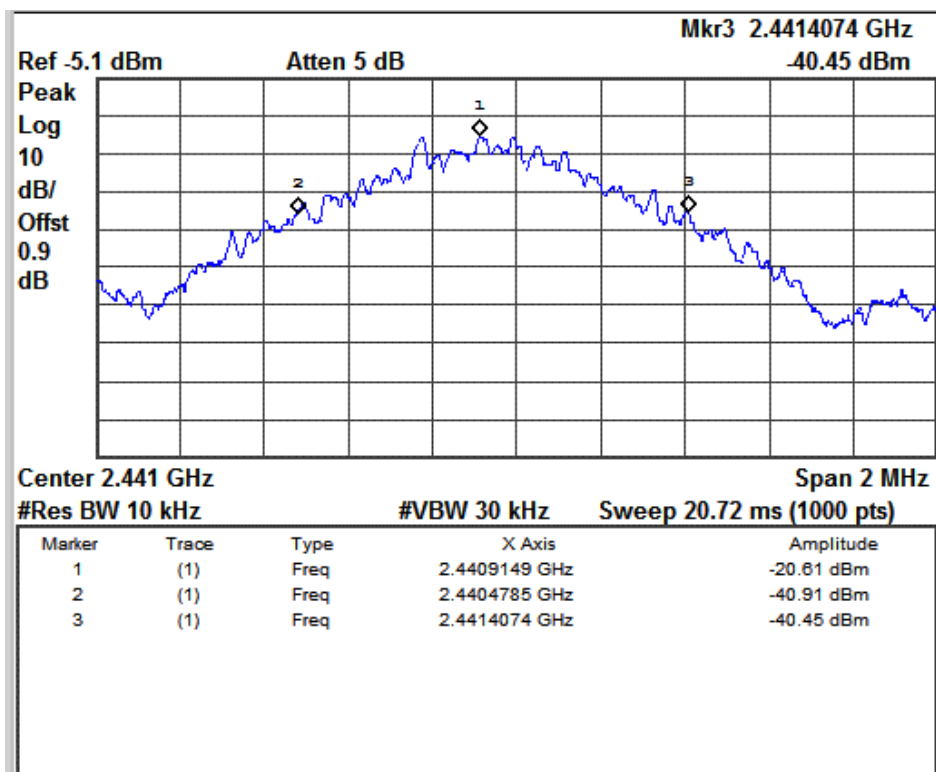
**Modulation Type: 8 DPSK**

**Test Results:**

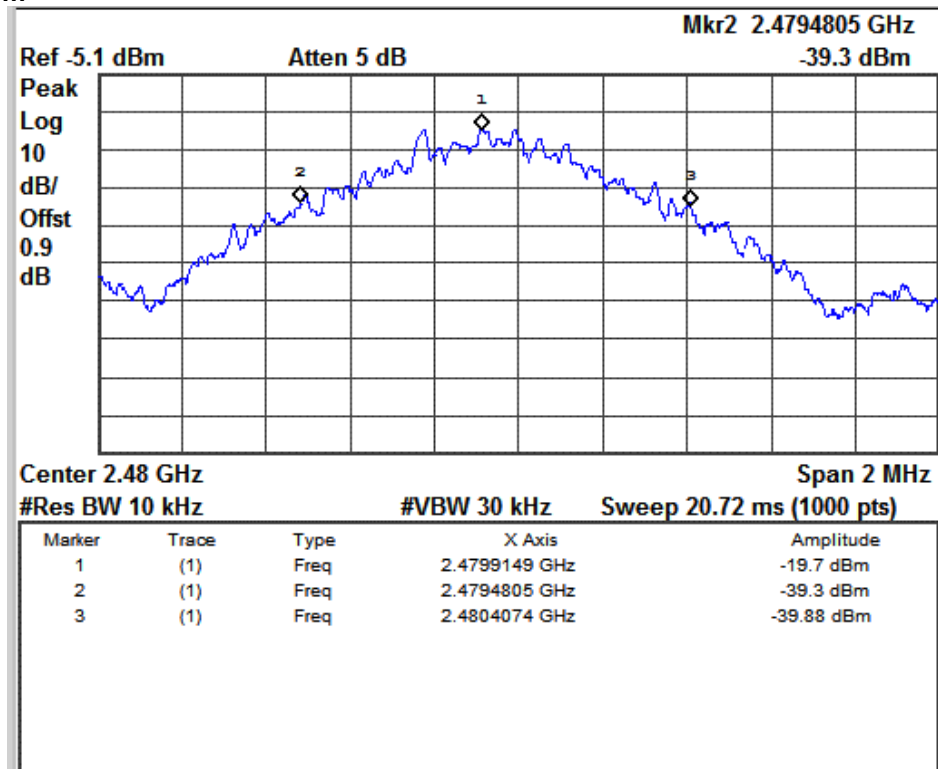
Channel	Channel Frequency (MHz)	Lower 20dB Frequency (MHz)	Higher 20dB Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
Low	2402	2401.3440	2402.5600	1.22	1.22
Mid	2441	2440.4785	2441.4074	0.93	1.22
High	2480	2479.4805	2480.4074	0.93	1.22



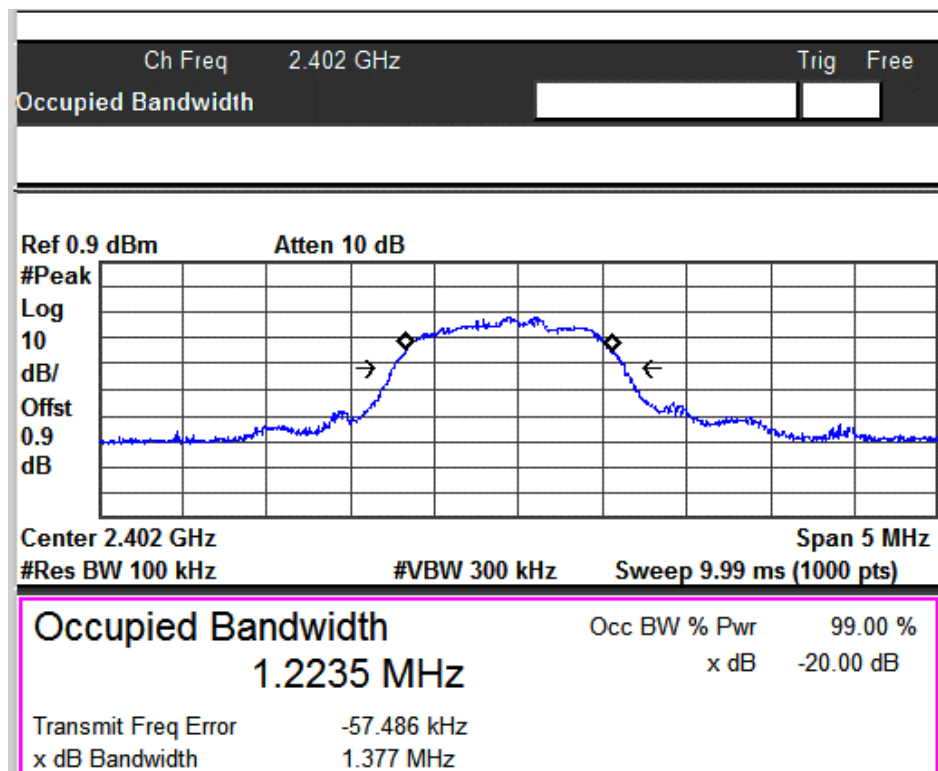
Channel Low: 20dB Bandwidth Measurement



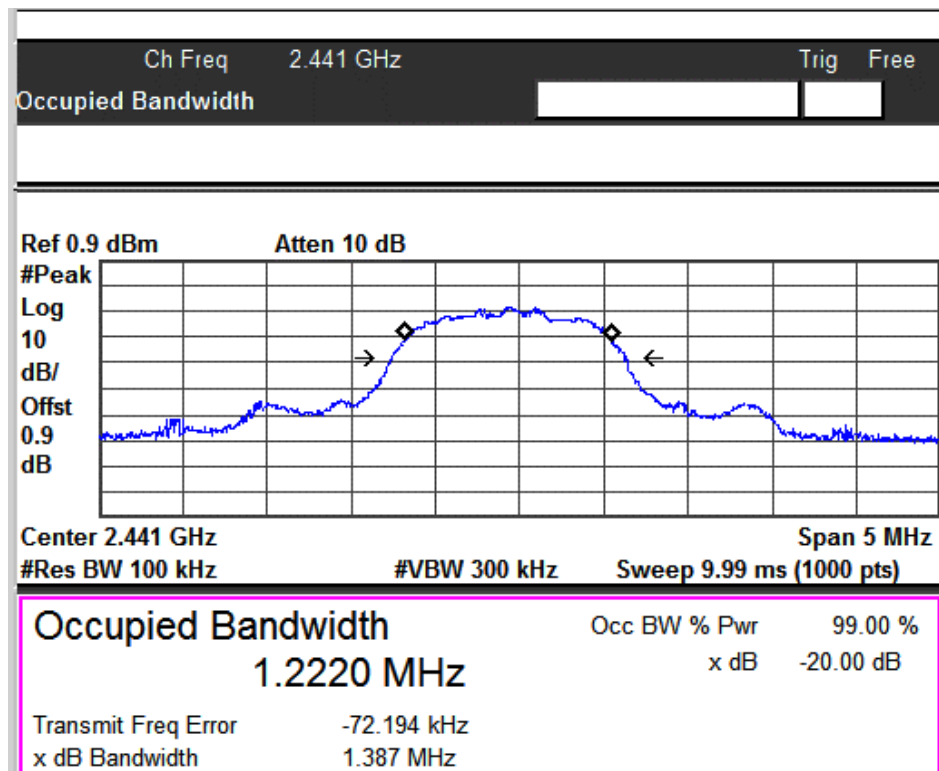
Channel Mid: 20dB Bandwidth Measurement



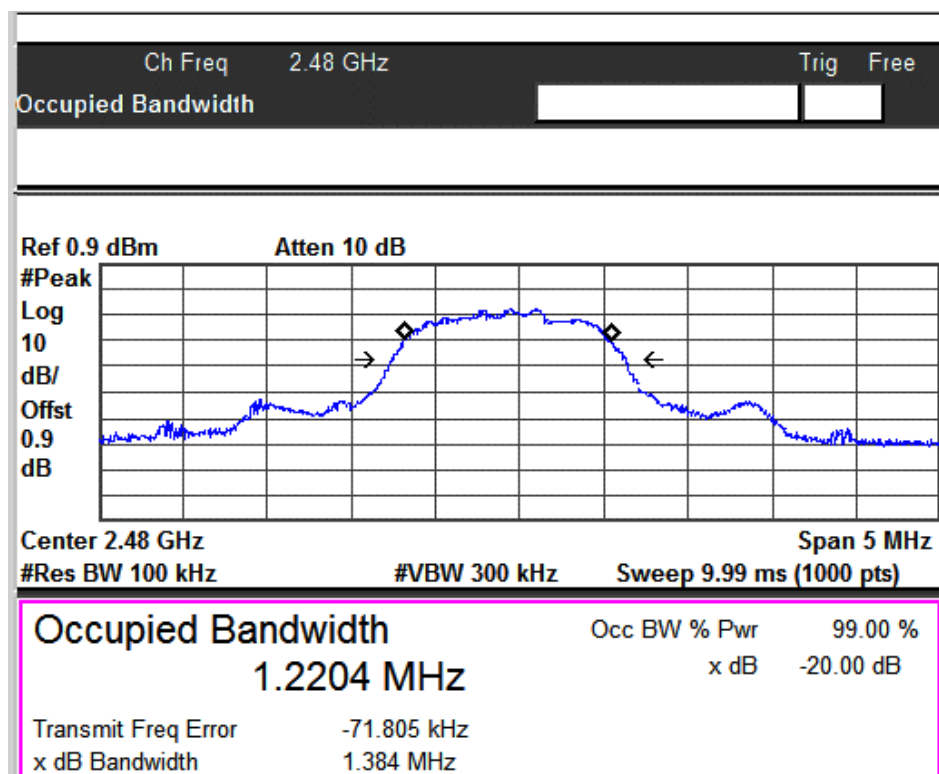
Channel High: 20dB Bandwidth Measurement



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)

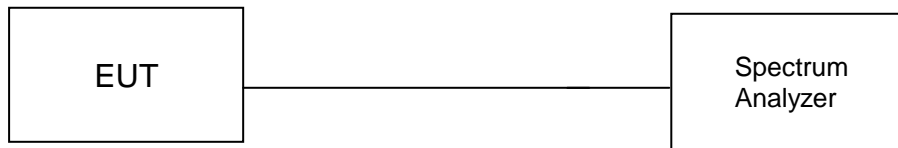
Result

Pass

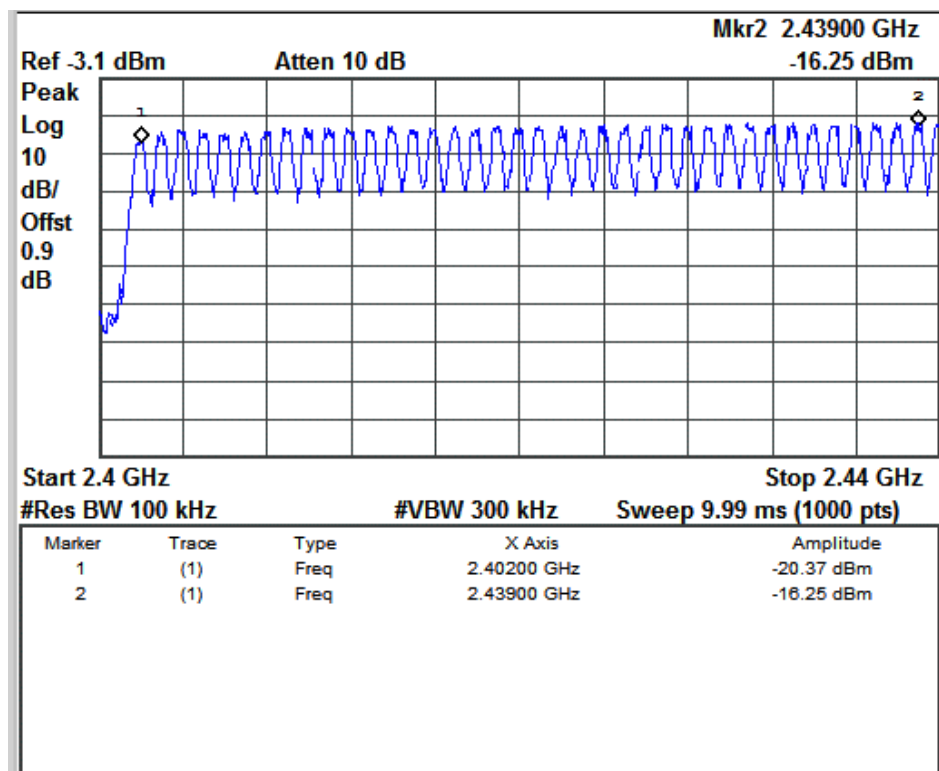
Test Specification  
Detector Function  
Port of testing  
Requirement

FCC part 15C  
Peak  
Antenna port  
Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels

Test Method:

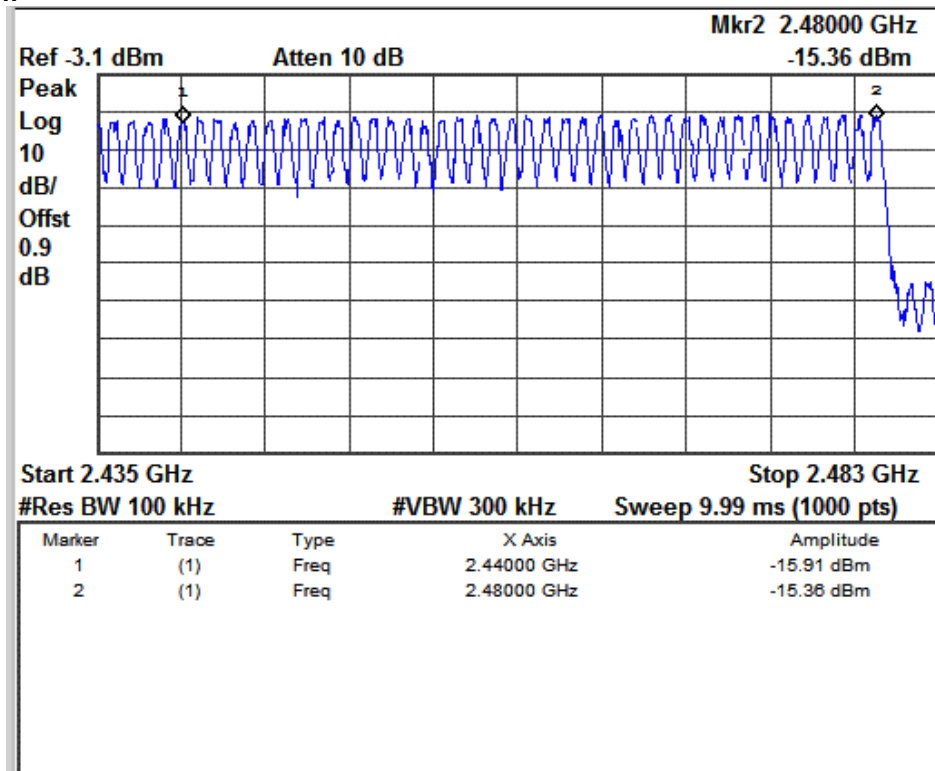


Test Result:



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**

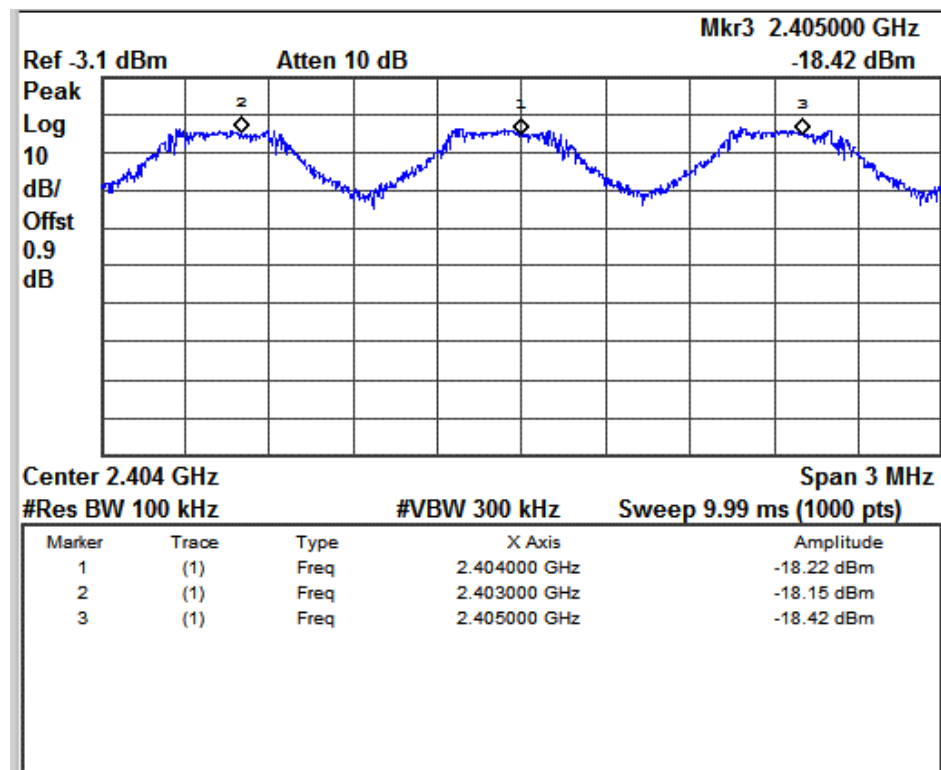
**Pass**

Test Specification	FCC Part 15C
Detector Function	Peak
Port of testing	Antenna port
Requirement	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)**

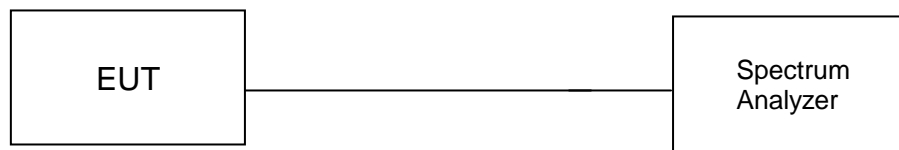
**Section 15.247 (a)(1)(III)**

**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	0.00236	0.2517
2DH5	0.00164	0.1749
3DH5	0.00275	0.2933

**Measurement Method**

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

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

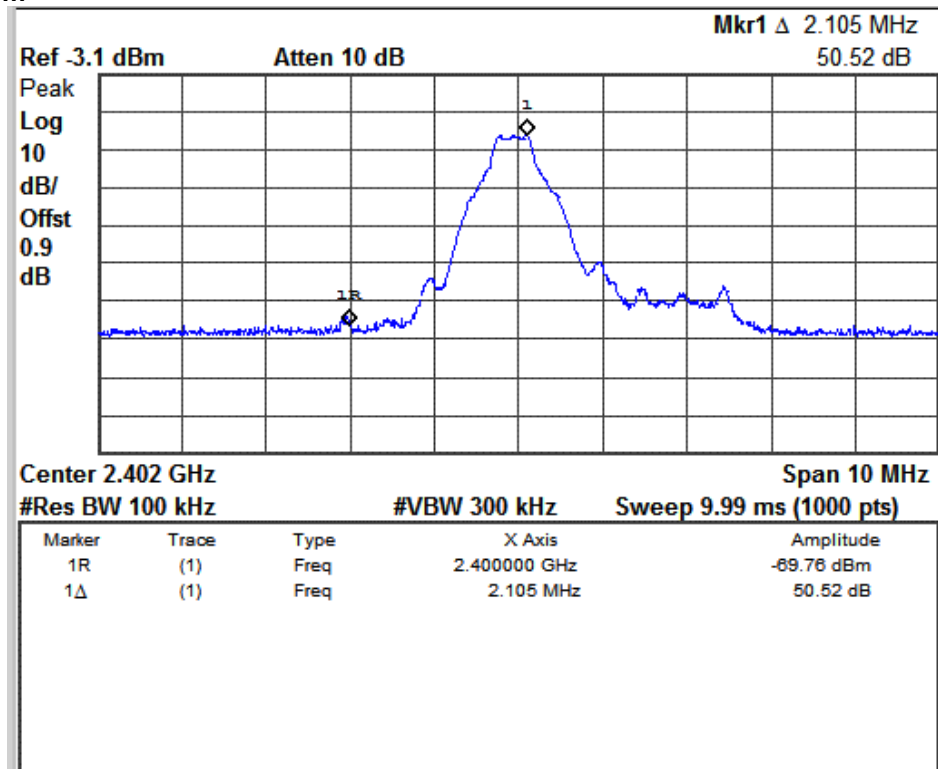


**Band-edge Compliance of RF Conducted Emissions****Section 15.257 (d)****Result****Pass**

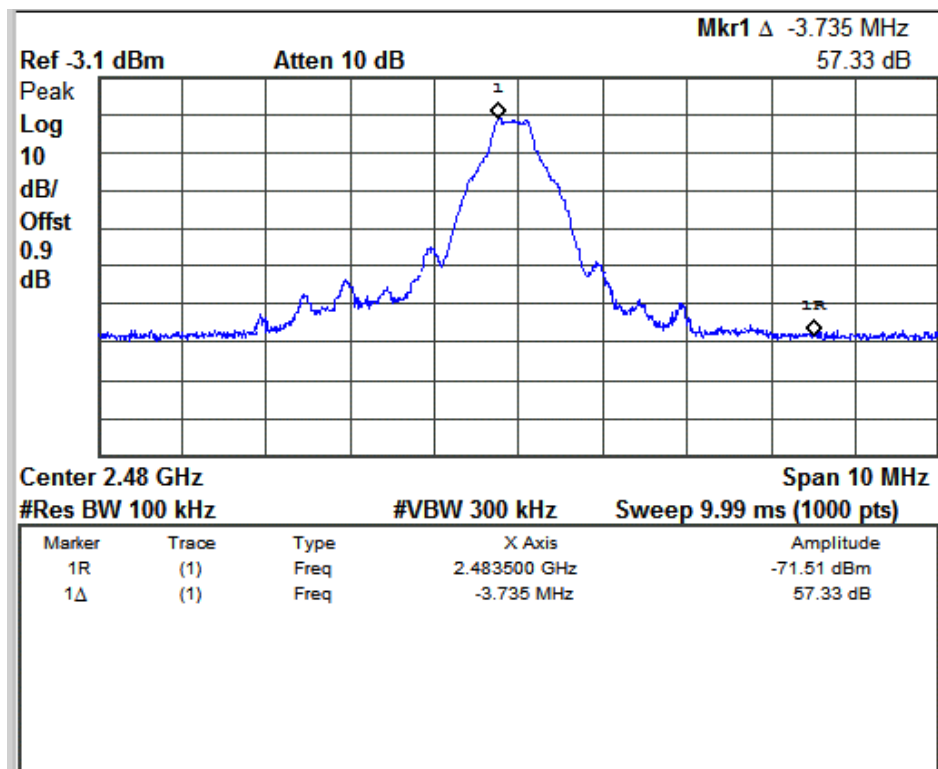
Test Specification	FCC Part 15C
Detector Function	Peak
Port of testing	Antenna port
Requirement	In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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	-50.52	-20
High	2480.00	2483.5	-57.33	-20



### Channel Low



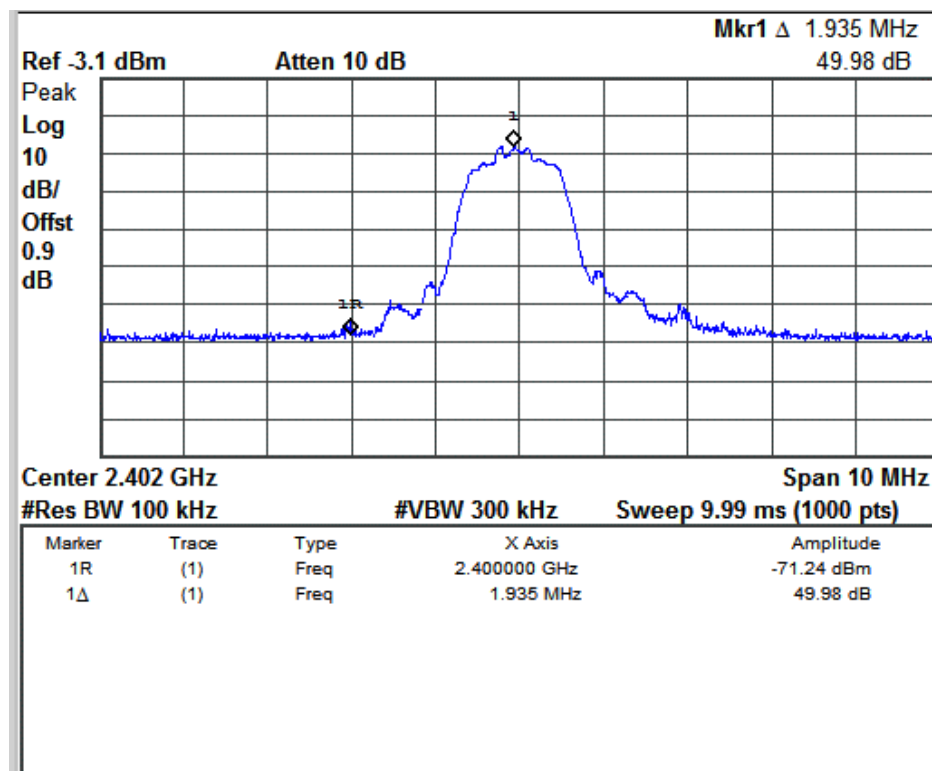
### Channel High

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Modulation Type: Pi/4 DQPSK

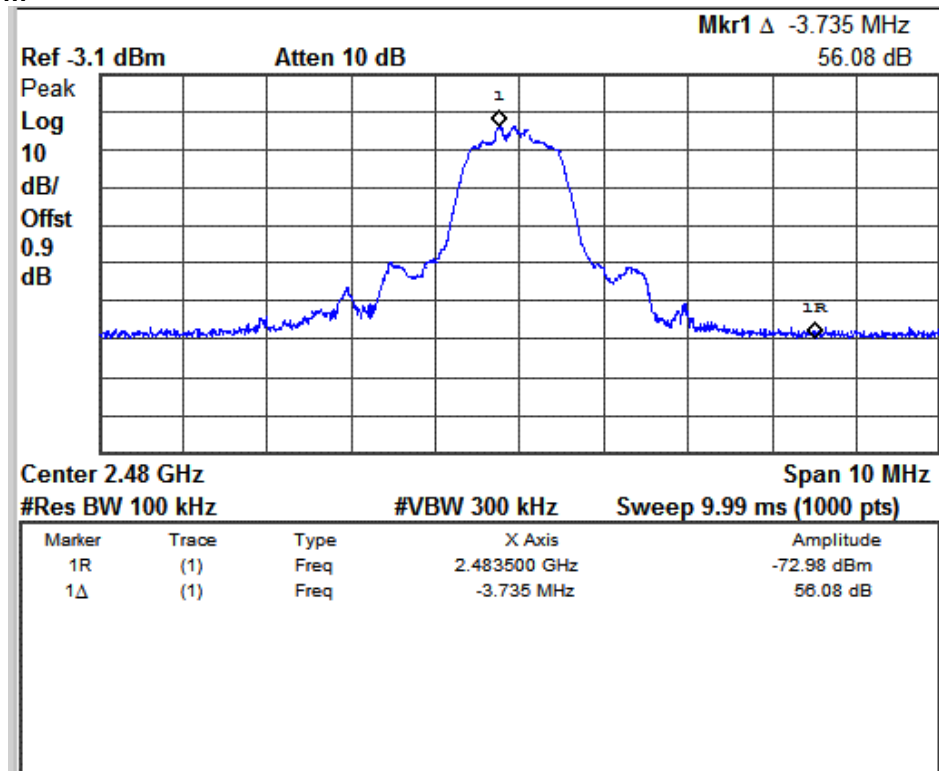
**Test Results:**

Channel	Fundamental Frequency (MHz)	Value at Band Edge		Limit (dBc)
		Frequency (MHz)	Value (dBc)	
Low	2402.00	2400.0	-49.98	-20
High	2480.00	2483.5	-56.08	-20



**Channel Low**

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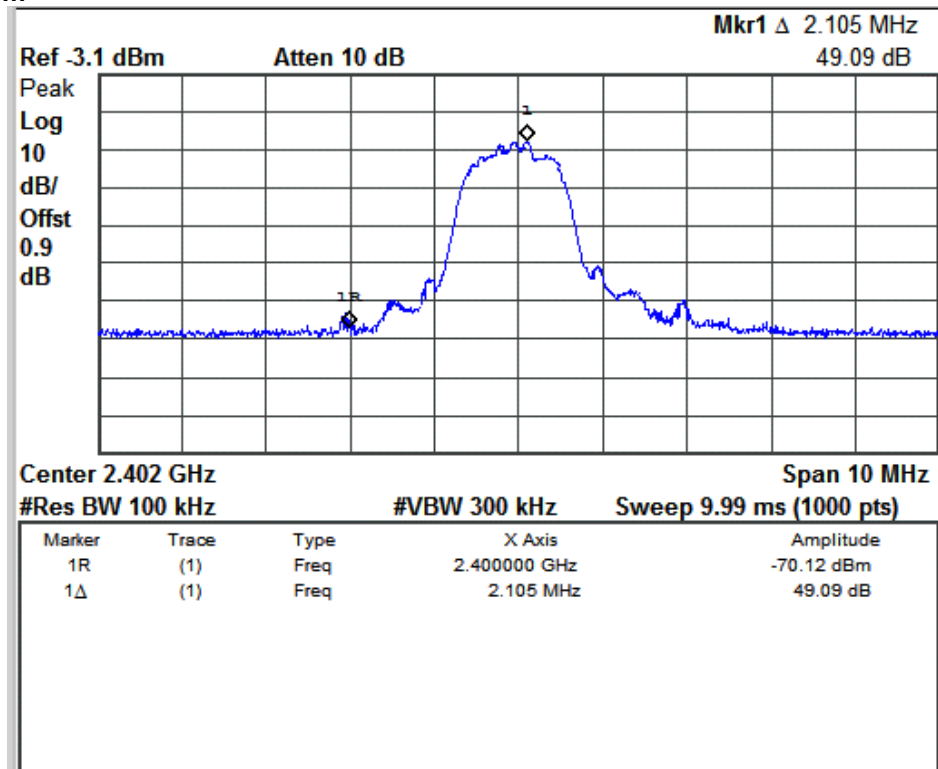


Channel High

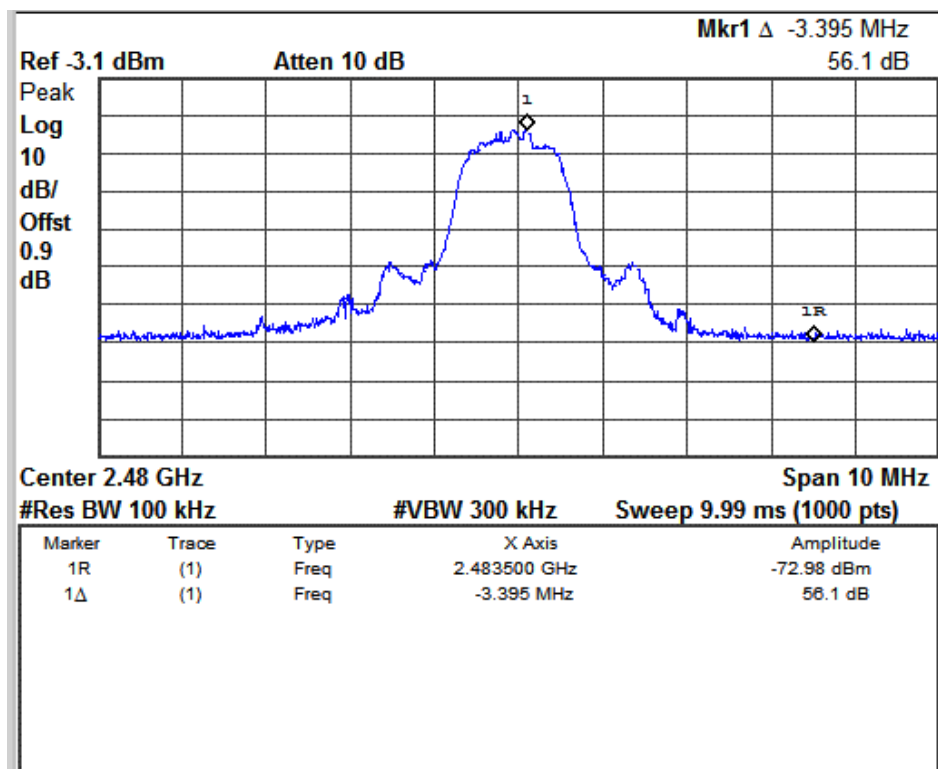
Modulation Type: 8 DPSK

Test Results:

Channel	Fundamental Frequency (MHz)	Value at Band Edge		Limit (dBc)
		Frequency (MHz)	Value (dBc)	
Low	2402.00	2400.0	-49.09	-20
High	2480.00	2483.5	-56.10	-20

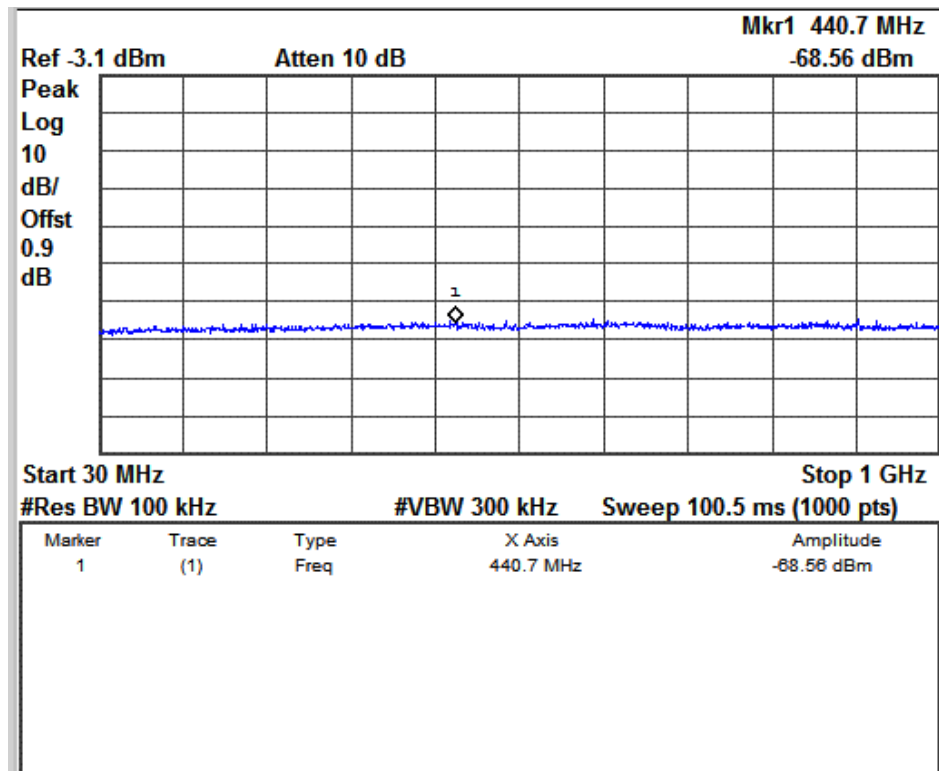


Channel Low

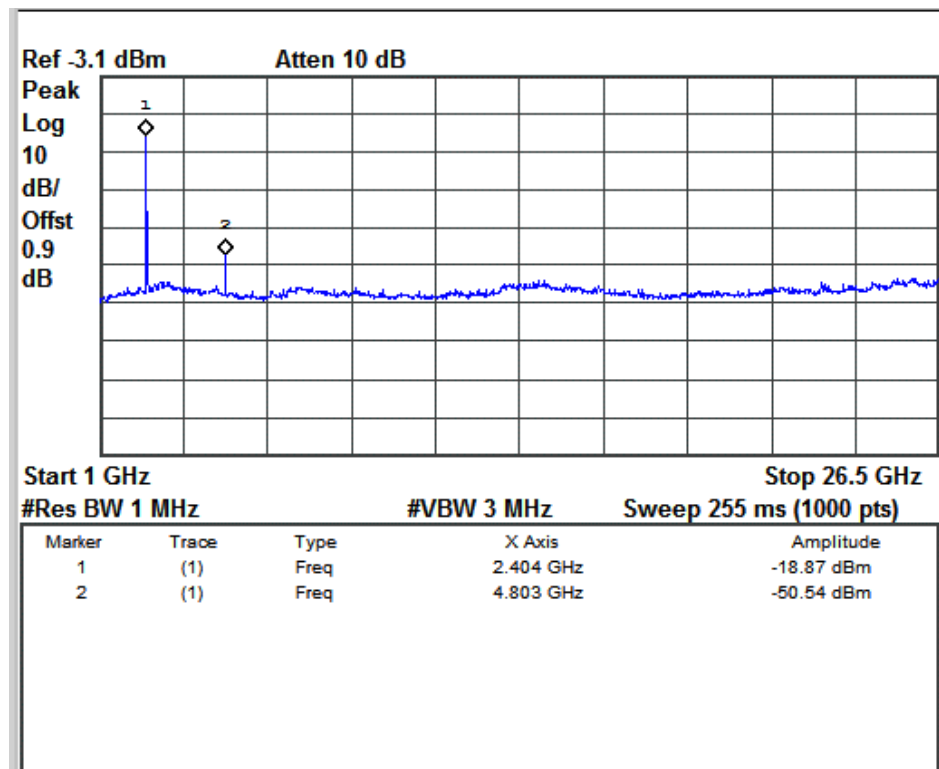


Channel High

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Conducted Spurious Emissions

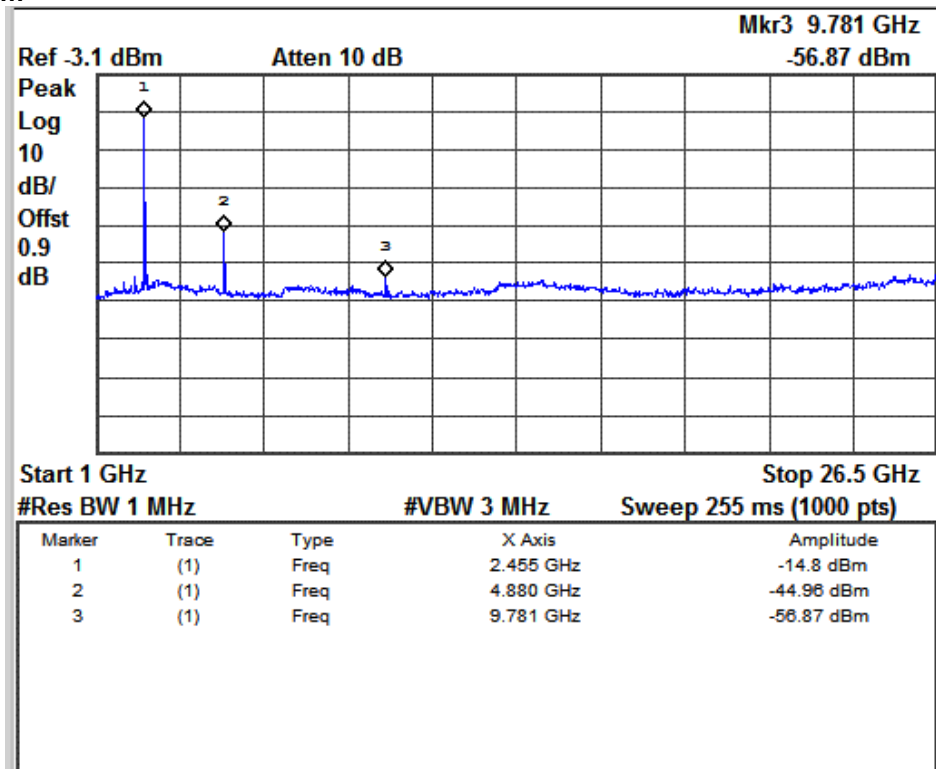


30MHz to 1GHz Spurious Emissions



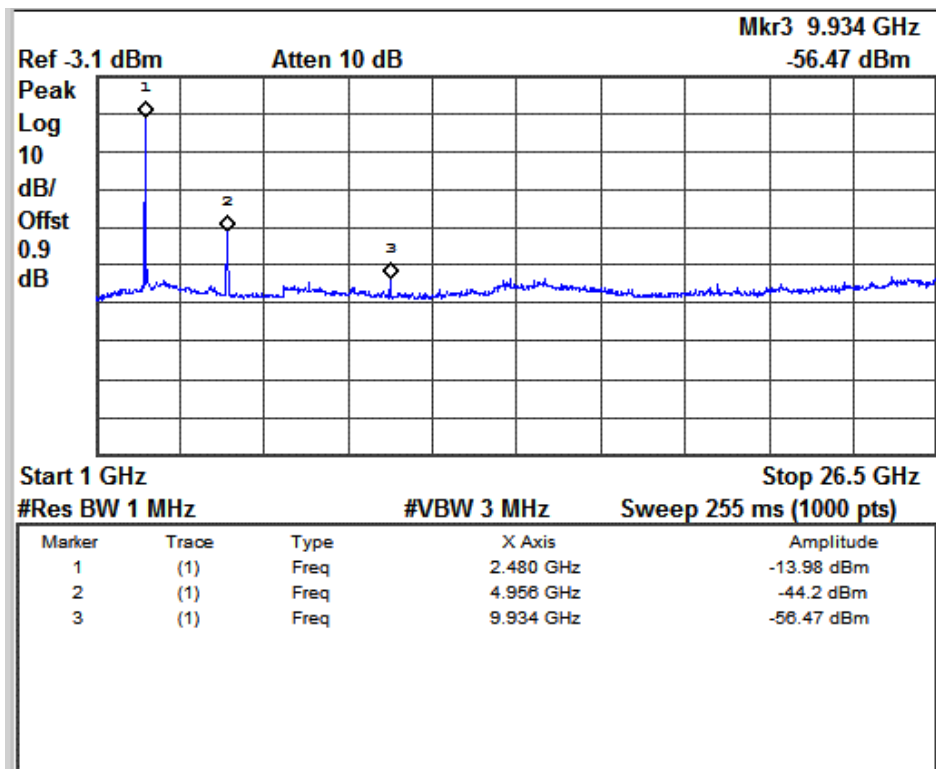
Channel: Low

Modulation: GFSK



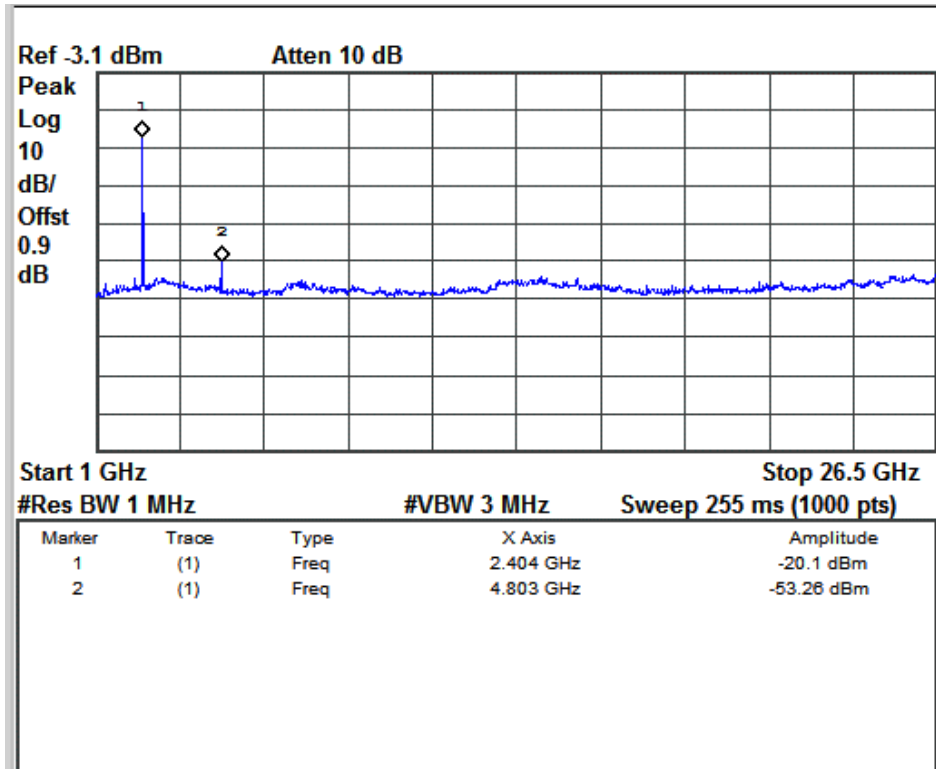
Channel: Mid

Modulation: GFSK



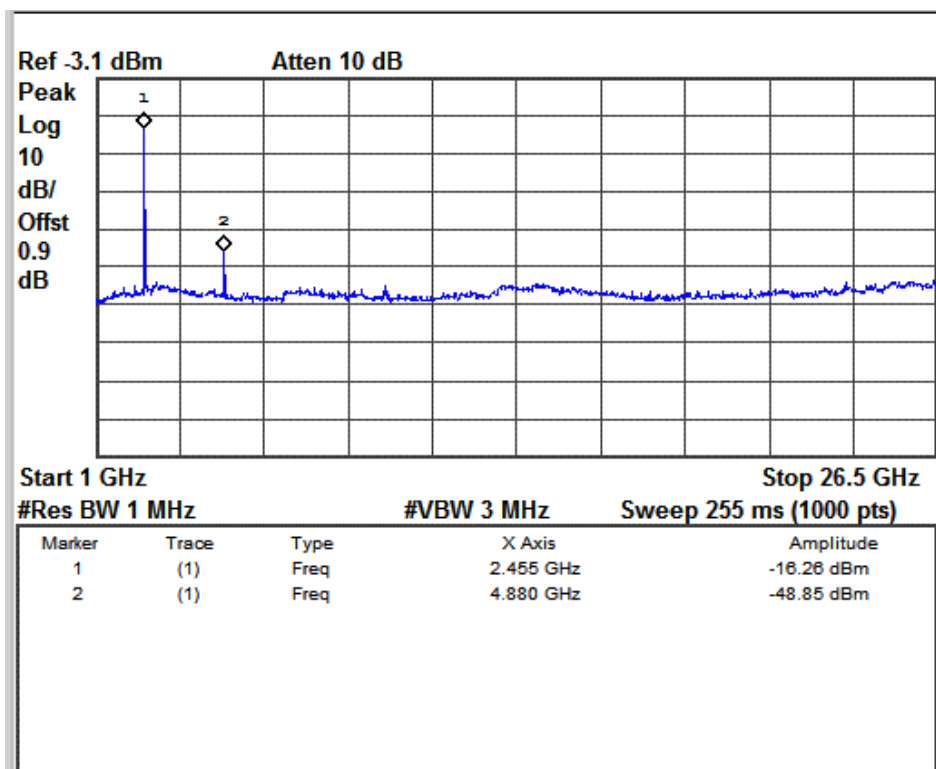
Channel: High

Modulation: GFSK



Channel: Low

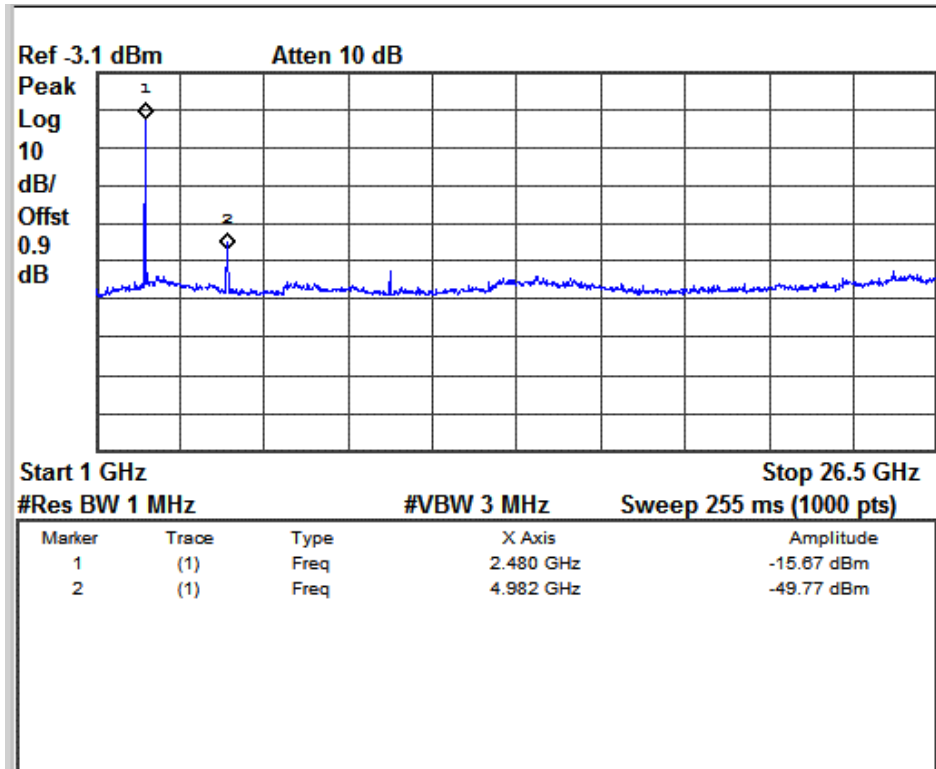
Modulation: Pi/4 DQPSK



Channel: Mid

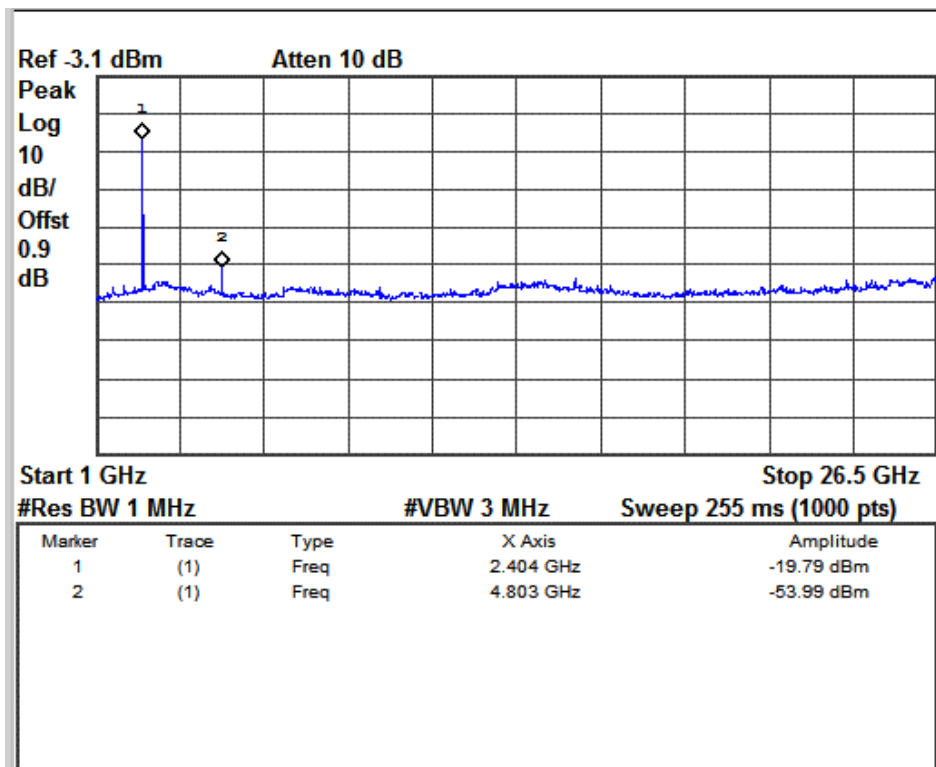
Modulation: Pi/4 DQPSK





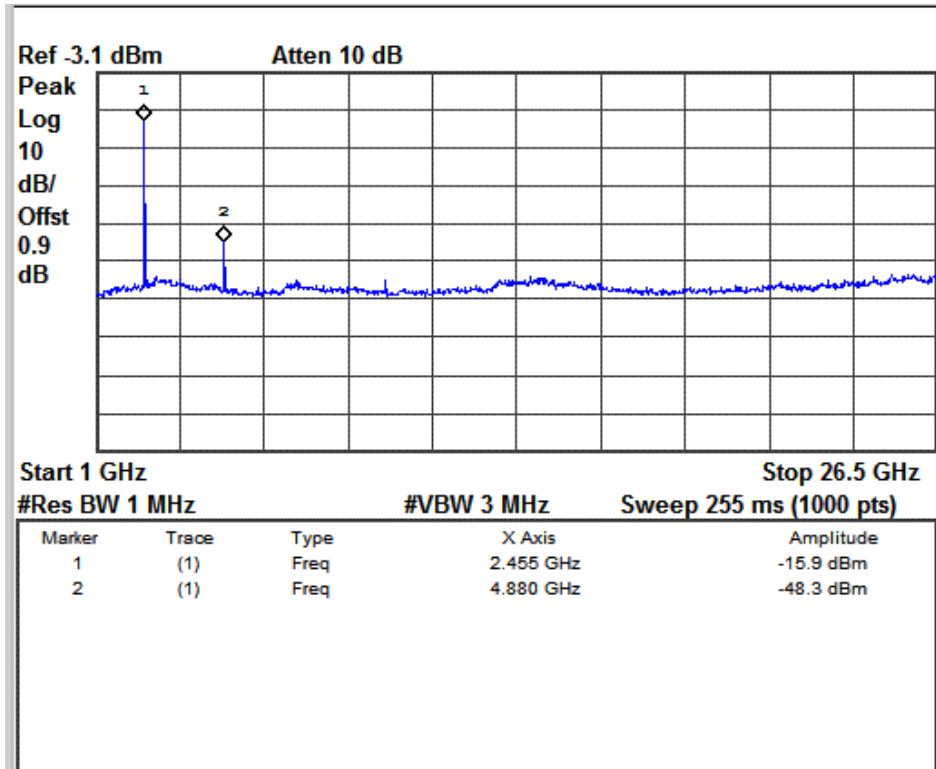
Channel: High

Modulation: Pi/4 DQPSK



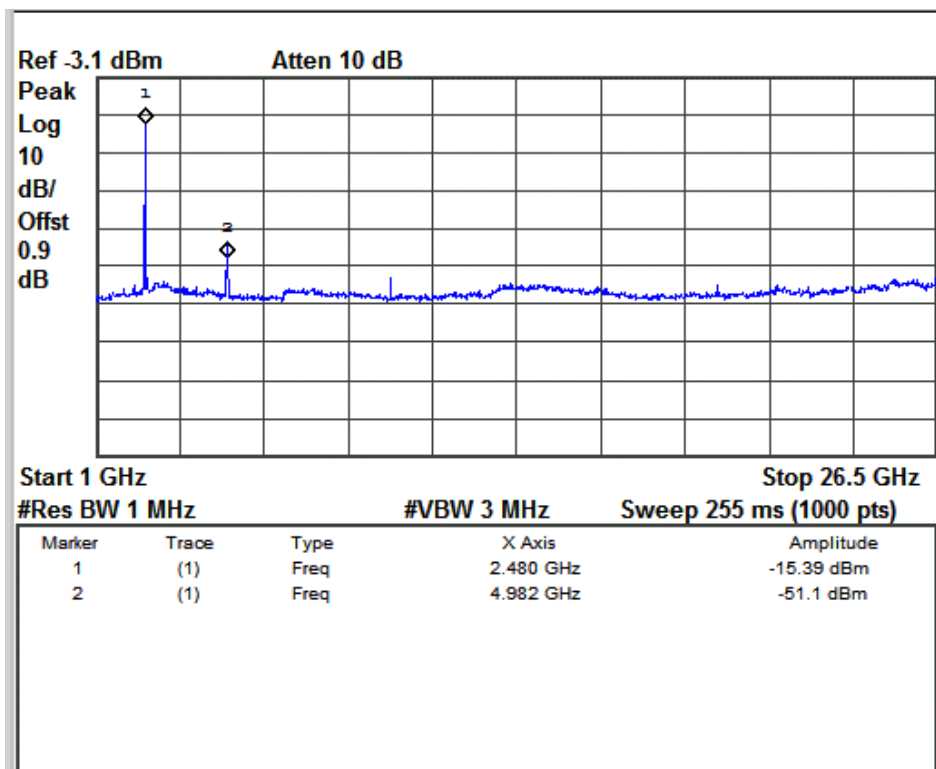
Channel: Low

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)	38.97	74	-35.03
		2390(Av)	27.09	54	-26.91
		2402(Pk)	68.85	*	*
		2402(Av)	68.22	*	*
		4804(Pk)	51.48	74	-22.52
		4804(Av)	40.73	54	-13.27
		7206(Pk)	56.14	74	-17.86
		7206(Av)	44.24	54	-09.76
	H	2390(Pk)	40.51	74	-33.49
		2390(Av)	27.11	54	-26.89
		2402(Pk)	65.90	*	*
		2402(Av)	65.21	*	*
		4804(Pk)	52.17	74	-21.83
		4804(Av)	42.53	54	-11.47
		7206(Pk)	56.41	74	-17.59
		7206(Av)	44.21	54	-09.79
MID	V	2441(Pk)	73.78	*	*
		2441(Av)	70.48	*	*
		4882(Pk)	52.75	74	-21.25
		4882(Av)	42.88	54	-11.12
		7323(Pk)	57.46	74	-16.54
		7323(Av)	44.89	54	-09.11
	H	2441(Pk)	70.14	*	*
		2441(Av)	68.99	*	*
		4882(Pk)	56.04	74	-17.96
		4882(Av)	47.77	54	-06.23
		7323(Pk)	56.78	74	-17.22
		7323(Av)	44.85	54	-09.15
HIGH	V	2483.5(Pk)	39.04	74	-34.96
		2483.5(Av)	27.25	54	-26.75

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		2480(Pk)	70.45	*	*
		2480(Av)	68.22	*	*
		4960(Pk)	52.86	74	-21.14
		4960(Av)	43.67	54	-10.33
		7440(Pk)	57.90	74	-16.10
		7440(Av)	45.60	54	-08.40
	H	2483.5(Pk)	38.91	74	-35.09
		2483.5(Av)	27.16	54	-26.84
		2480(Pk)	67.09	*	*
		2480(Av)	66.16	*	*
		4960(Pk)	57.38	74	-16.62
		4960(Av)	49.40	54	-04.60
		7440(Pk)	57.82	74	-16.18
		7440(Av)	45.60	54	-08.40

\*\* -> 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)	38.73	74	-35.27
		2390(Av)	26.99	54	-27.01
		2402(Pk)	67.67	*	*
		2402(Av)	62.53	*	*
		4804(Pk)	49.75	74	-24.25
		4804(Av)	37.47	54	-16.53
		7206(Pk)	57.85	74	-16.15
		7206(Av)	44.25	54	-09.75
	H	2390(Pk)	38.41	74	-35.59
		2390(Av)	27.16	54	-26.84
		2402(Pk)	63.25	*	*
		2402(Av)	59.31	*	*
		4804(Pk)	50.00	74	-24.00
		4804(Av)	38.32	54	-15.68
		7206(Pk)	56.50	74	-17.50
		7206(Av)	44.23	54	-09.77
MID	V	2441(Pk)	72.39	*	*
		2441(Av)	68.47	*	*
		4882(Pk)	52.50	74	-21.50
		4882(Av)	40.44	54	-13.56

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HIGH		7323(Pk)	57.63	74	-16.37
		7323(Av)	44.87	54	-09.13
	H	2441(Pk)	68.40	*	*
		2441(Av)	64.24	*	*
		4882(Pk)	53.18	74	-20.82
		4882(Av)	42.77	54	-11.23
		7323(Pk)	58.13	74	-15.87
		7323(Av)	44.83	54	-09.17
	V	2483.5(Pk)	38.94	74	-35.06
		2483.5(Av)	27.22	54	-26.78
		2480(Pk)	67.94	*	*
		2480(Av)	64.30	*	*
		4960(Pk)	51.58	74	-22.42
		4960(Av)	40.32	54	-13.68
		7440(Pk)	57.65	74	-16.35
		7440(Av)	45.62	54	-08.38
	H	2483.5(Pk)	39.07	74	-34.93
		2483.5(Av)	27.17	54	-26.83
		2480(Pk)	65.73	*	*
		2480(Av)	60.65	*	*
		4960(Pk)	53.99	74	-20.01
		4960(Av)	43.30	54	-10.70
		7440(Pk)	58.31	74	-15.69
		7440(Av)	45.56	54	-08.44

\*\* -> 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)	39.35	74	-34.65
		2390(Av)	27.17	54	-26.83
		2402(Pk)	67.42	*	*
		2402(Av)	62.28	*	*
		4804(Pk)	49.23	74	-24.77
		4804(Av)	37.38	54	-16.62
		7206(Pk)	56.70	74	-17.30
		7206(Av)	44.21	54	-09.79
	H	2390(Pk)	39.36	74	-34.64
		2390(Av)	27.15	54	-26.85

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		2402(Pk)	64.41	*	*
		2402(Av)	60.58	*	*
		4804(Pk)	49.50	74	-24.50
		4804(Av)	38.42	54	-15.58
		7206(Pk)	56.63	74	-17.37
		7206(Av)	44.26	54	-09.74
MID	V	2441(Pk)	72.45	*	*
		2441(Av)	66.44	*	*
		4882(Pk)	51.20	74	-22.80
		4882(Av)	40.25	54	-13.75
		7323(Pk)	57.26	74	-16.74
		7323(Av)	44.86	54	-09.14
	H	2441(Pk)	68.44	*	*
		2441(Av)	64.81	*	*
		4882(Pk)	54.66	74	-19.34
		4882(Av)	43.43	54	-10.57
		7323(Pk)	56.34	74	-17.66
		7323(Av)	44.12	54	-09.88
HIGH	V	2483.5(Pk)	39.17	74	-34.83
		2483.5(Av)	27.11	54	-26.89
		2480(Pk)	68.76	*	*
		2480(Av)	63.29	*	*
		4960(Pk)	51.69	74	-22.31
		4960(Av)	40.34	54	-13.66
		7440(Pk)	57.64	74	-16.36
		7440(Av)	45.59	54	-08.41
	H	2483.5(Pk)	38.86	74	-35.14
		2483.5(Av)	27.18	54	-26.82
		2480(Pk)	64.76	*	*
		2480(Av)	60.11	*	*
		4960(Pk)	53.99	74	-20.01
		4960(Av)	43.52	54	-10.48
		7440(Pk)	57.79	74	-16.21
		7440(Av)	45.69	54	-08.31

\*\* -> Fundamental Frequency

Pk - > Peak Detector

Av->Average Detector

**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**

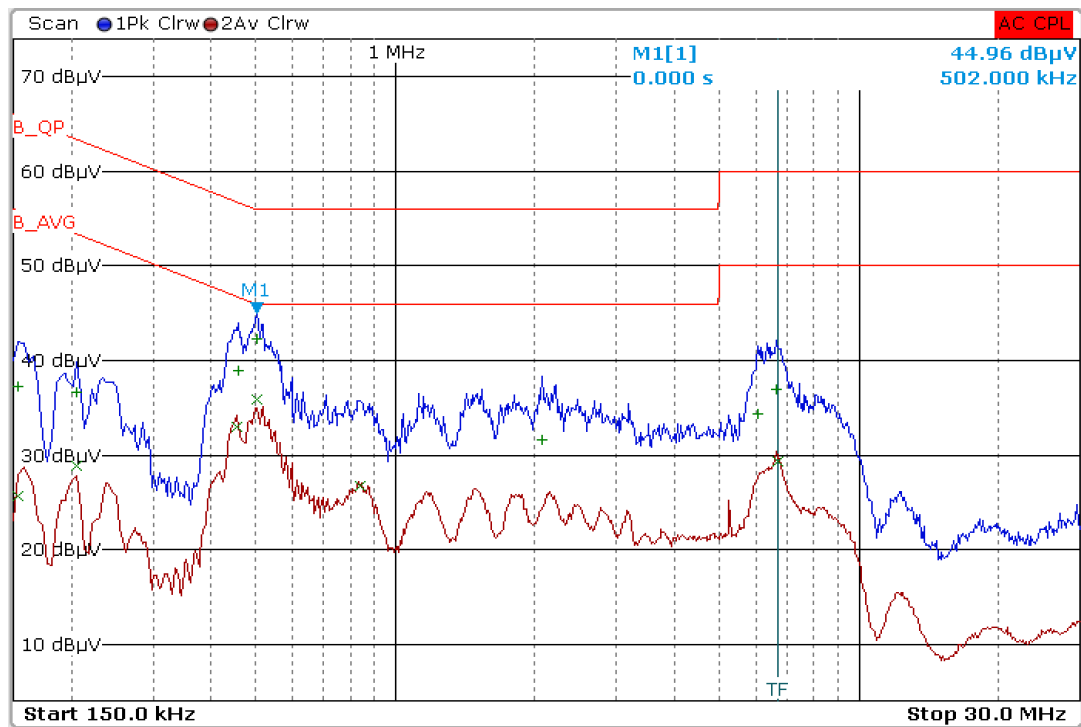
<b>Frequency of emission (MHz)</b>	<b>QP Limit (dB<math>\mu</math>V)</b>	<b>AV Limit (dB<math>\mu</math>V/m)</b>
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

\* Decreases with the logarithm of the frequency



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Test Result:

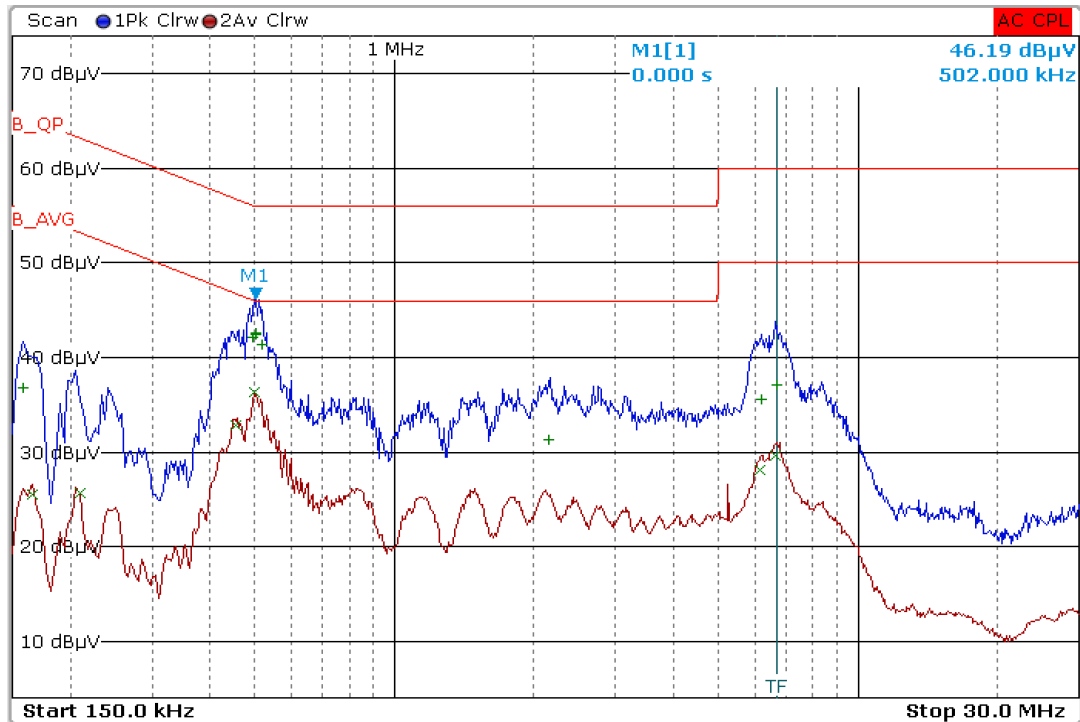


Line Graph

Frequency [MHz]	Emission Level [dBμV]	Limit [dBμV]	Detector
0.502	42.30	56.0	Quasi Peak
0.458	38.93	56.7	Quasi Peak
6.634	36.93	60.0	Quasi Peak
2.074	31.64	56.0	Quasi Peak
6.058	34.35	60.0	Quasi Peak
0.206	36.64	63.4	Quasi Peak
0.502	35.84	46.0	Average
0.454	33.02	46.8	Average
0.838	26.71	46.0	Average
6.678	29.34	50.0	Average
0.206	28.90	53.4	Average
0.154	25.73	55.8	Average

Line: Table

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Neutral: Graph

Frequency [MHz]	Emission Level [dBμV]	Limit [dBμV]	Detector
0.502	42.55	56.0	Quasi Peak
0.494	42.17	56.1	Quasi Peak
0.518	41.32	56.0	Quasi Peak
6.714	37.13	60.0	Quasi Peak
6.198	35.53	60.0	Quasi Peak
2.150	31.24	56.0	Quasi Peak
0.498	36.28	46.0	Average
0.454	32.88	46.8	Average
6.622	29.66	50.0	Average
6.146	28.03	50.0	Average
0.210	25.73	53.2	Average
0.166	25.57	55.2	Average

Neutral: Table