



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Big Blue 200

Model: AR108A4BKA

Brand: Brookstone

Test Report Number:

C170309Z01-RP1-1

Issued for

Zylux Acoustic Corporation

3F, 22, Lane 35, Jihu Road, Neihu Technology Park, Taipei 114 Taiwan

Issued by:

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Issued Date: March 21, 2017



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TESTING CERT #2861.01

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	March 21, 2017	Initial Issue	ALL	Sabrina Wang



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1. TEST RESULT CERTIFICATION

Product	Big Blue 200
Model	AR108A4BKA
Brand	Brookstone
Tested	March 9~21, 2017
Applicant	Zylux Acoustic Corporation 3F, 22, Lane 35, Jihu Road, Neihu Technology Park, Taipei 114 Taiwan
Manufacturer	Zylux Acoustic Corporation 3F, 22, Lane 35, Jihu Road, Neihu Technology Park, Taipei 114 Taiwan

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services (Shenzhen) Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.207, 15.209 and 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Sunday Hu
Supervisor of EMC Dept.
Compliance Certification Services (Shenzhen)
Inc.

Reviewed by:

Ruby Zhang
Supervisor of Report Dept.
Compliance Certification Services (Shenzhen)
Inc.



2. EUT DESCRIPTION

Product	Big Blue 200
Model Number	AR108A4BKA
Brand	Brookstone
Model Discrepancy	N/A
Identify Number	C170309Z01-RP1-1
Received Date	March 9, 2017
Power Supply	DC 25V supplied by adapter or DC10.8V supplied by the battery
Adapter Manufacturer / Model No.	Brookstone / DYS902-250360W Input: 100-240V ~ 50/60Hz 1.5A MAX Output: DC25V 3.6A DC Output Cable: Unshielded 1.80m
Battery spec.	Dongguan Large Electronics Co., Ltd / 18650-3S2P-01B02232 Voltage: 10.8V Capacity: 4400mAh/47.52Wh
Frequency Range	2402 ~ 2480 MHz
Transmit Power	Antenna 1: GFSK: 5.70dBm $\pi/4$ -DQPSK: 8.70dBm 8DPSK: 9.00dBm Antenna 2: GFSK: 5.90dBm $\pi/4$ -DQPSK: 8.70dBm 8DPSK: 9.00dBm
Modulation Technique	FHSS (GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8DPSK for 3Mbps)
Number of Channels	79 Channels
Antenna Specification	Embedded Antenna 1 with 3.24dBi gain (Max) Embedded Antenna 2 with 3.24dBi gain (Max)
Temperature Range	0°C ~ +45°C
Hardware Version	B
Software Version	ns-mmi-FS5332-0000-0039_1.0.47-13.ota

Note: This submittal(s) (test report) is intended for FCC ID: XN6-AR108A4BKA filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



3. TEST METHODOLOGY

3.1 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Test Item	Test mode	Worse mode
Conducted Emission	Mode 1: TX(AC120V/60Hz)	<input checked="" type="checkbox"/>
	Mode 2: TX(AC240V/50Hz)	<input checked="" type="checkbox"/>
Radiated Emission	Mode 1: TX	<input checked="" type="checkbox"/>

Note:

1. Channel Low (2402MHz), Mid (2441MHz) and High (2480MHz) were chosen for pre-testing for GFSK, $\pi/4$ -DQPSK and 8DPSK, GFSK and 8DPSK were the worse case and print in the report.
2. Radiated band edges were tested with both fixed and hopping mode, the fixed mode was the worse case and recorded in the report.
3. For $\pi/4$ QPSK its same modulation type with 8-DPSK, and based exploratory test, there is no significant difference of that two types test result, so except output power, all other items final test were only performed with the worst case 8-DPSK and GFSK.



4. FACILITIES AND ACCREDITATIONS

4.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ **No.10-1, Mingkeda Logistics Park, No.18, Huanguan South Rd.,
Guan Lan Town, Baoan District, Shenzhen, China**

The sites are constructed in conformance with the requirements of ANSI C63.10:2013, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

USA	A2LA
China	CNAS

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

USA	FCC
Japan	VCCI(C-4815, R-4320, T-2317, G-10624)
Canada	INDUSTRY CANADA

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccssz.com>

4.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Parameter	Uncertainty
Radiated Emission, 30 to 200 MHz Test Site : 966(2)	+/-3.6880dB
Radiated Emission, 200 to 1000 MHz Test Site : 966(2)	+/-3.6695dB
Radiated Emission, 1 to 8 GHz	+/-5.1782dB
Radiated Emission, 8 to 18 GHz	+/-5.2173dB
Conducted Emissions	+/-3.6836dB
Band Width	178kHz
Peak Output Power MU	+/-1.906dB
Band Edge MU	+/-0.182dB
Channel Separation MU	416.178Hz
Duty Cycle MU	0.054ms
Frequency Stability MU	226Hz

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

The measured result is above (below) the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance (non-compliance) is more probable than non-compliance) with the specification limit.



5. SETUP OF EQUIPMENT UNDER TEST

5.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

5.2 SUPPORT EQUIPMENT

No.	Equipment	Model No.	Serial No.	FCC	Brand	Data Cable	Power Cord
1	Notebook	Probook 5310M	N/A	DoC	HP	Unshielded 1.80m	Shielded 1.80m (AC cable) Unshielded 1.70m (DC cable)

Notes:

Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



6. FCC PART 15.247 REQUIREMENTS

6.1 20DB BANDWIDTH

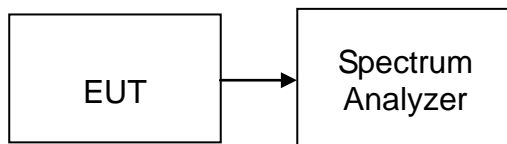
None; for reporting purpose only.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT, then connect a low loss RF cable from antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=30 kHz, VBW=100 kHz, Span=3MHz, Sweep = auto.
4. Mark the peak frequency and 20dB (upper and lower) frequency.
5. Repeat until all the test channels are investigated.

TEST RESULTS

No non-compliance noted

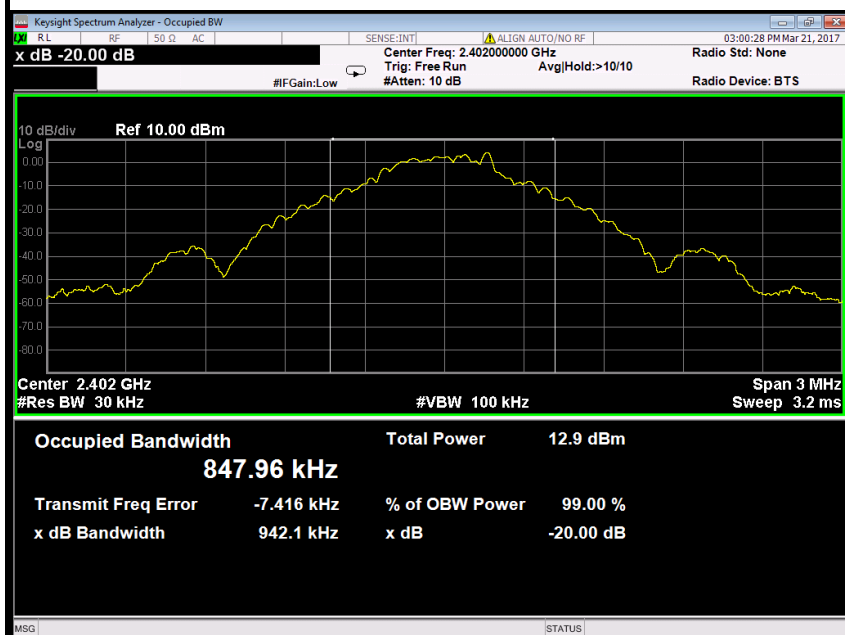


Test plot

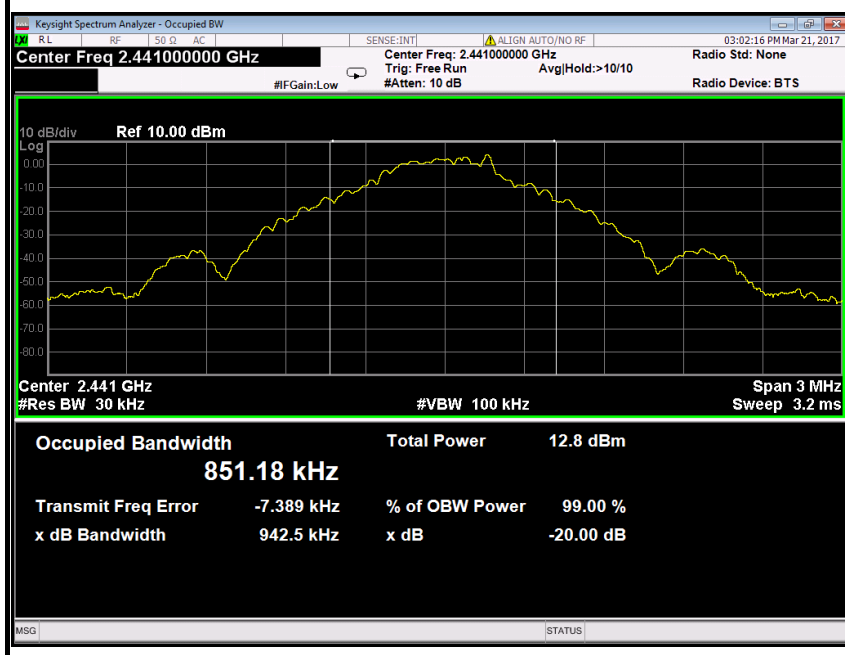
Antenna 1

GFSK

20dB Bandwidth(CH Low)

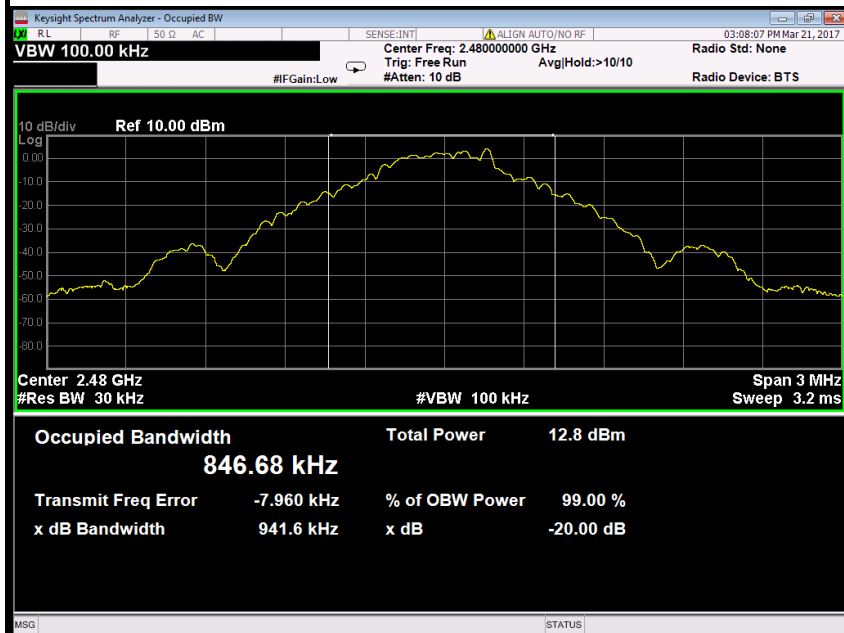


20dB Bandwidth (CH Mid)



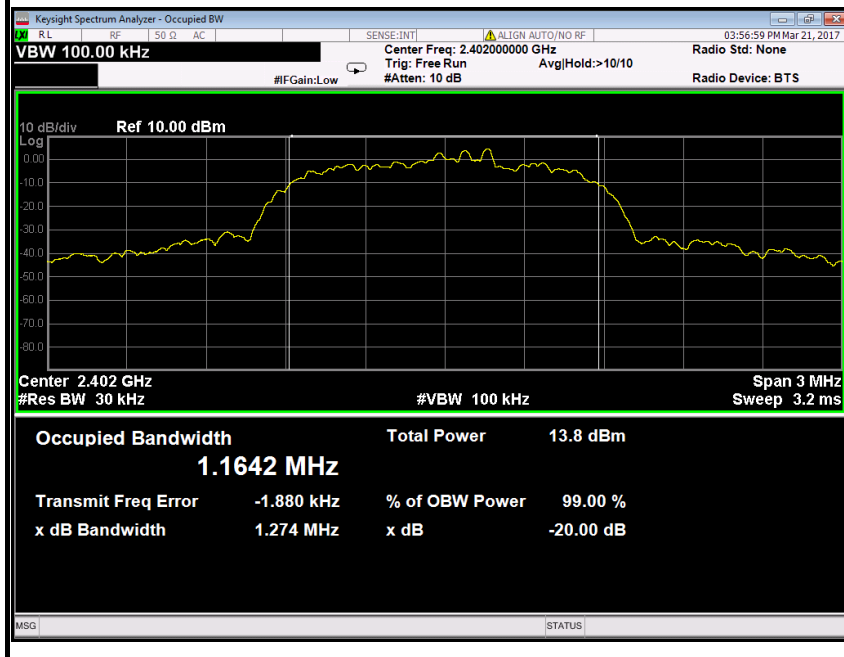


20dB Bandwidth (CH High)



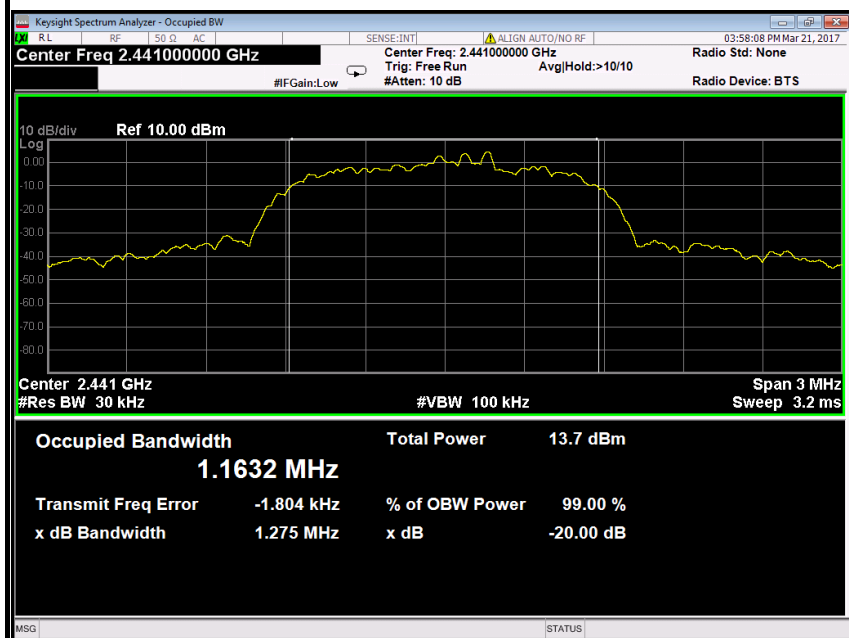
8DPSK

20dB Bandwidth (CH Low)

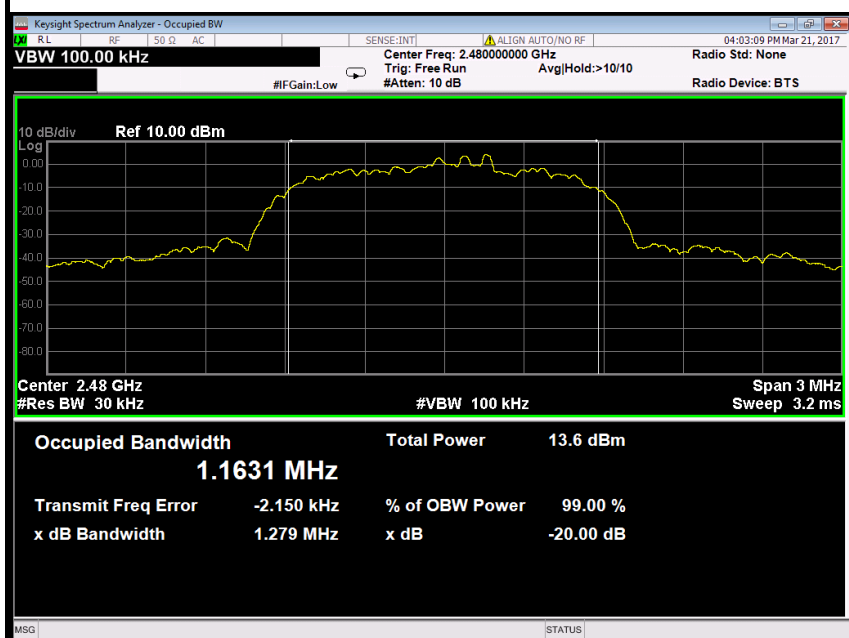




20dB Bandwidth (CH Mid)



20dB Bandwidth (CH High)

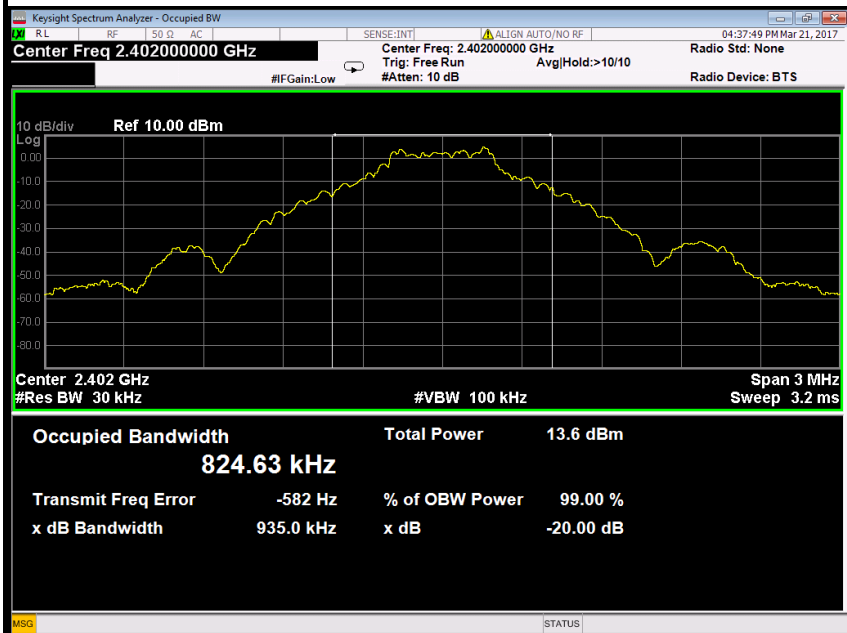




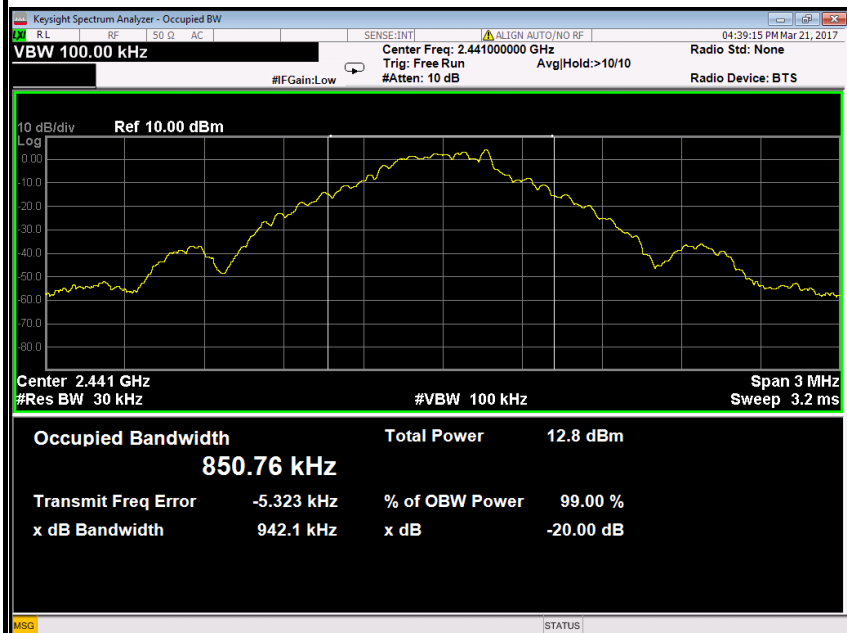
Antenna 2

GFSK

20dB Bandwidth(CH Low)

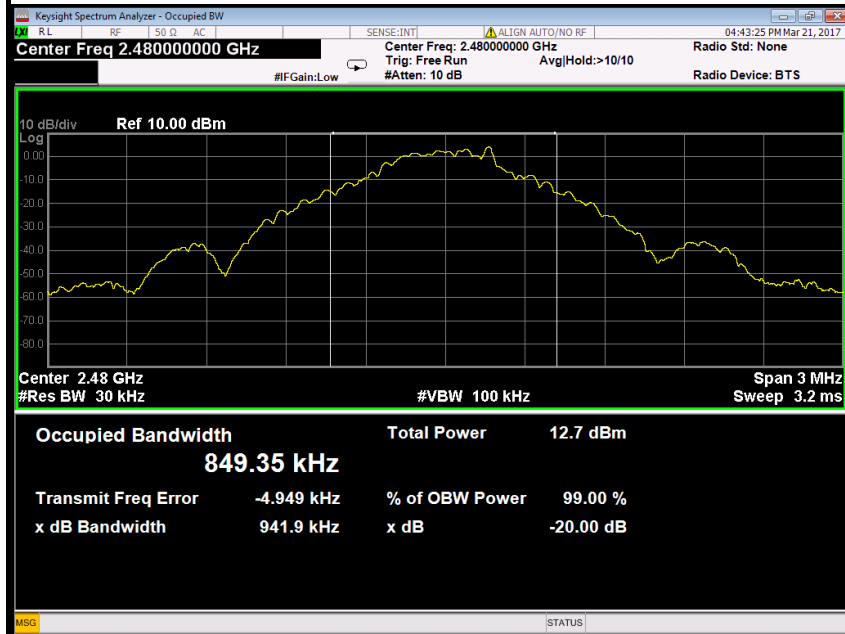


20dB Bandwidth (CH Mid)



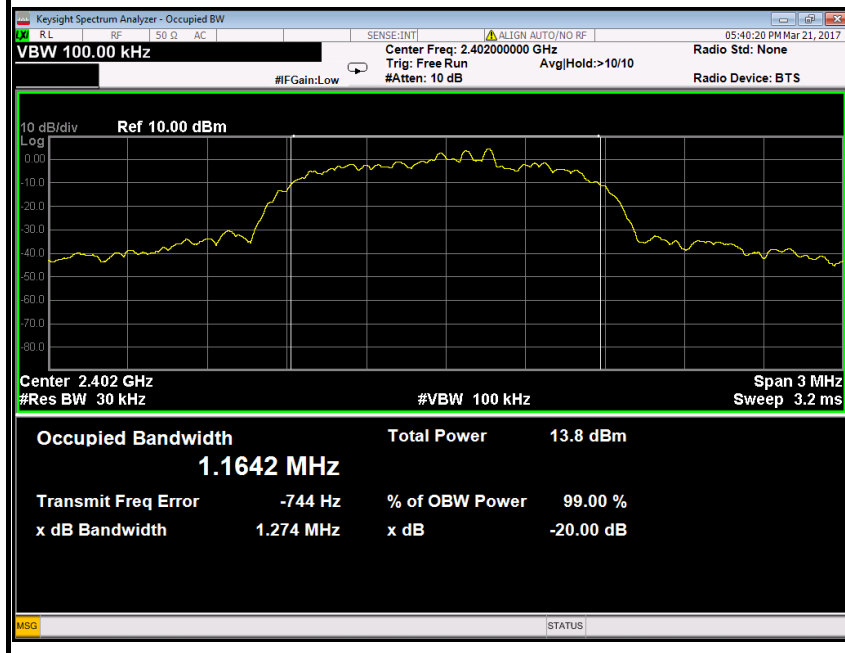


20dB Bandwidth (CH High)



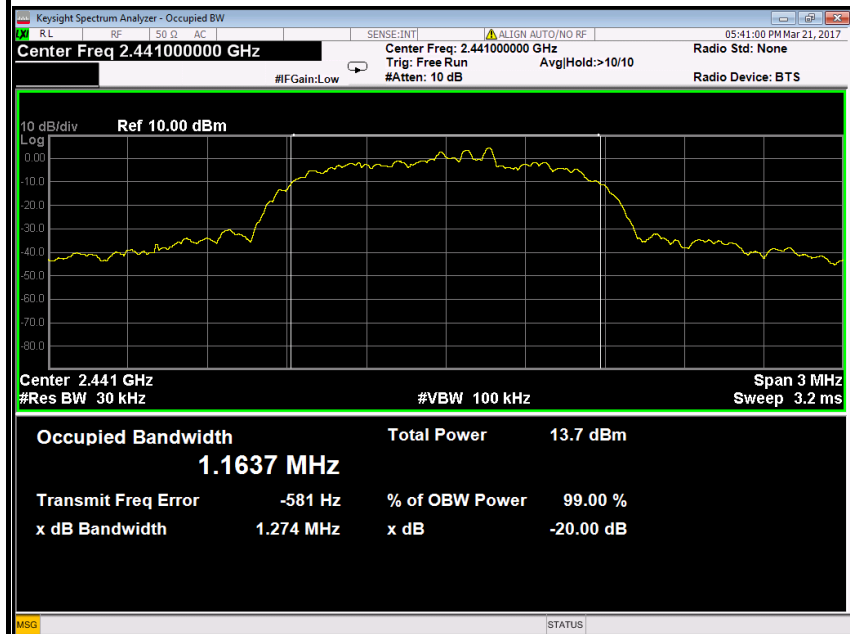
8DPSK

20dB Bandwidth (CH Low)

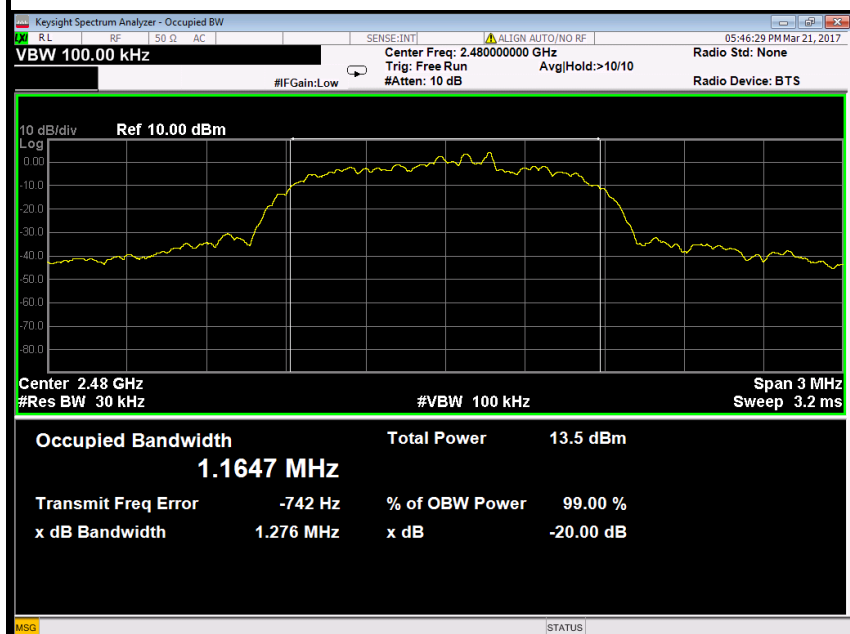




20dB Bandwidth (CH Mid)



20dB Bandwidth (CH High)





6.2 ANTENNA GAIN

MEASUREMENT

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal BT devices, the GFSK mode is used.

MEASUREMENT PARAMETERS

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Trace-Mode	Max hold

LIMITS

FCC	IC
Antenna Gain	
6 dBi	

TEST RESULTS

Antenna 1

GFSK

T _{nom}	V _{nom}	Lowest channel 2402MHz	Middle channel 2441MHz	Highest channel 2480MHz
Conducted power [dBm] Measured with GFSK modulation		5.70	5.70	5.60
Radiated power [dBm] Measured with GFSK modulation		8.67	8.59	8.34
Gain [dBi] Calculated		2.97	2.89	2.74
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

**8DPSK**

T _{nom}	V _{nom}	Lowest channel 2402MHz	Middle channel 2441MHz	Highest channel 2480MHz
Conducted power [dBm] Measured with 8DPSK modulation		9.00	8.90	8.70
Radiated power [dBm] Measured with 8DPSK modulation		11.37	11.26	11.18
Gain [dBi] Calculated		2.37	2.36	2.48
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

Antenna 2**GFSK**

T _{nom}	V _{nom}	Lowest channel 2402MHz	Middle channel 2441MHz	Highest channel 2480MHz
Conducted power [dBm] Measured with GFSK modulation		5.90	5.80	5.50
Radiated power [dBm] Measured with GFSK modulation		8.16	8.23	8.27
Gain [dBi] Calculated		2.26	2.43	2.77
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

8DPSK

T _{nom}	V _{nom}	Lowest channel 2402MHz	Middle channel 2441MHz	Highest channel 2480MHz
Conducted power [dBm] Measured with 8DPSK modulation		9.00	8.90	8.70
Radiated power [dBm] Measured with 8DPSK modulation		11.28	11.37	11.65
Gain [dBi] Calculated		2.28	2.47	2.95
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		



6.3 PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

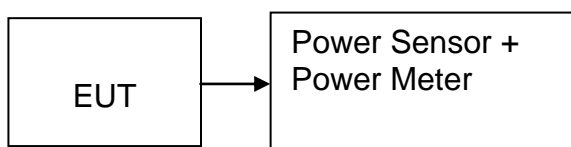
1. For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.
3. The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Power Meter	Anritsu	ML2495A	1204003	02/21/2017	02/20/2018
Power Sensor	Anritsu	MA2411B	1126150	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the RF Power Meter. The RF Power Meter is set to the peak power detection.



TEST RESULTS

No non-compliance noted

Test Data

Antenna 1

GFSK

Channel	Frequency (MHz)	Reading Power (dBm)	Cable loss (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak /AVG	Result
Low	2402	1.90	3.50	5.40	0.00347	1	peak	PASS
Mid	2441	2.20	3.50	5.70	0.00372			PASS
High	2480	2.10	3.50	5.60	0.00363			PASS
Low	2402	1.70	3.50	5.20	0.00331	1	AVG	PASS
Mid	2441	2.10	3.50	5.60	0.00363			PASS
High	2480	1.90	3.50	5.40	0.00347			PASS

$\pi/4$ -DQPSK

Channel	Frequency (MHz)	Reading Power (dBm)	Cable loss (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak /AVG	Result
Low	2402	5.20	3.50	8.70	0.00741	0.125	peak	PASS
Mid	2441	5.10	3.50	8.60	0.00724			PASS
High	2480	4.90	3.50	8.40	0.00692			PASS
Low	2402	2.60	3.50	6.10	0.00407	0.125	AVG	PASS
Mid	2441	2.50	3.50	6.00	0.00398			PASS
High	2480	2.30	3.50	5.80	0.00380			PASS

8DPSK

Channel	Frequency (MHz)	Reading Power (dBm)	Cable loss (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak /AVG	Result
Low	2402	5.50	3.50	9.00	0.00794	0.125	peak	PASS
Mid	2441	5.40	3.50	8.90	0.00776			PASS
High	2480	5.20	3.50	8.70	0.00741			PASS
Low	2402	2.50	3.50	6.00	0.00398	0.125	AVG	PASS
Mid	2441	2.40	3.50	5.90	0.00389			PASS
High	2480	2.20	3.50	5.70	0.00372			PASS

**Antenna 2****GFSK**

Channel	Frequency (MHz)	Reading Power (dBm)	Cable loss (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak /AVG	Result
Low	2402	2.40	3.50	5.90	0.00389	1	peak	PASS
Mid	2441	2.30	3.50	5.80	0.00380			PASS
High	2480	2.00	3.50	5.50	0.00355			PASS
Low	2402	2.00	3.50	5.50	0.00355	1	AVG	PASS
Mid	2441	1.90	3.50	5.40	0.00347			PASS
High	2480	1.80	3.50	5.30	0.00339			PASS

 $\pi/4$ -DQPSK

Channel	Frequency (MHz)	Reading Power (dBm)	Cable loss (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak /AVG	Result
Low	2402	5.20	3.50	8.70	0.00741	0.125	peak	PASS
Mid	2441	5.00	3.50	8.50	0.00708			PASS
High	2480	4.90	3.50	8.40	0.00692			PASS
Low	2402	2.50	3.50	6.00	0.00398	0.125	AVG	PASS
Mid	2441	2.30	3.50	5.80	0.00380			PASS
High	2480	2.20	3.50	5.70	0.00372			PASS

8DPSK

Channel	Frequency (MHz)	Reading Power (dBm)	Cable loss (dB)	Output Power (dBm)	Output Power (W)	Limit (W)	Peak /AVG	Result
Low	2402	5.50	3.50	9.00	0.00794	0.125	peak	PASS
Mid	2441	5.40	3.50	8.90	0.00776			PASS
High	2480	5.20	3.50	8.70	0.00741			PASS
Low	2402	2.50	3.50	6.00	0.00398	0.125	AVG	PASS
Mid	2441	2.40	3.50	5.90	0.00389			PASS
High	2480	2.20	3.50	5.70	0.00372			PASS



6.4 PEAK POWER SPECTRAL DENSITY

LIMIT

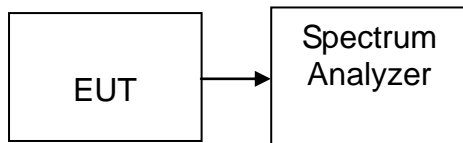
1. For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.
2. The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST RESULTS

Not applicable. Since EUT is the Bluetooth device.



6.5 BAND EDGES MEASUREMENT

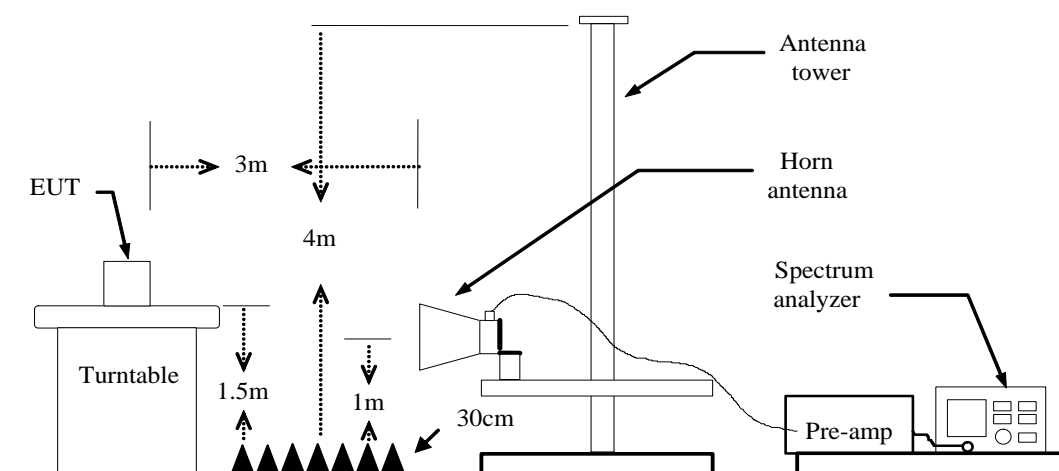
LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

MEASUREMENT EQUIPMENT USED

Radiated Emission Test Site 966 (2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	02/21/2017	02/20/2018
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2017	02/20/2018
Amplifier	EMEC	EM330	060661	03/18/2017	03/17/2018
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2017	02/20/2018
Loop Antenna	COM-POWER	AL-130	121044	09/25/2016	09/24/2017
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2017	02/20/2018
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/28/2017	02/27/2018
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/28/2017	02/27/2018
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2017	02/20/2018
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

Test Configuration





TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=330Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

TEST RESULTS

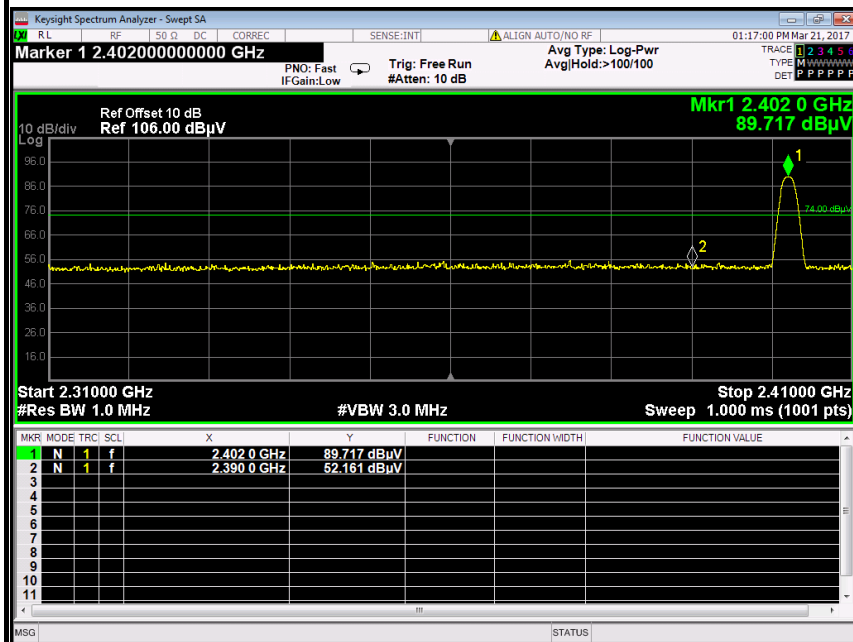
Refer to attach spectrum analyzer data chart.



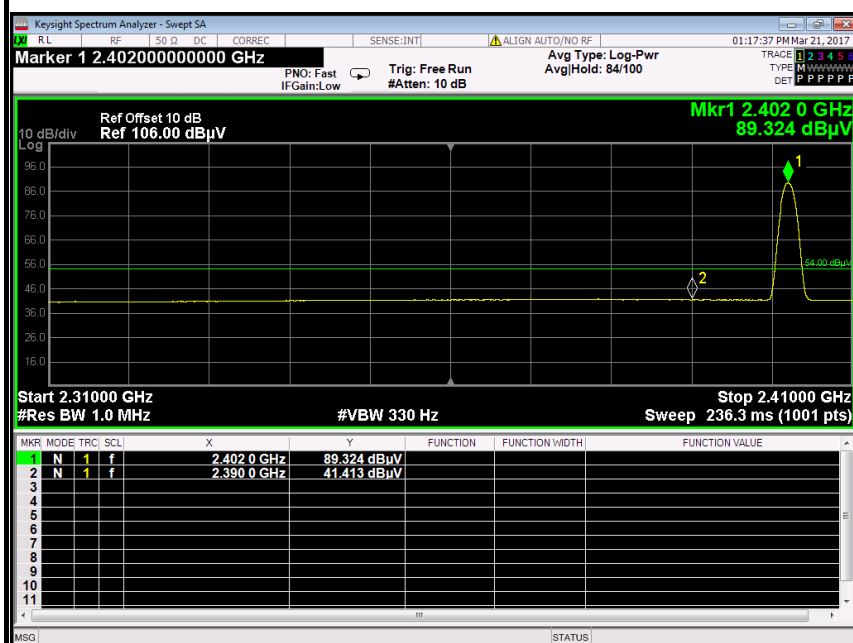
Antenna 1
Test Data (GFSK)

Band Edges (CH-Low)

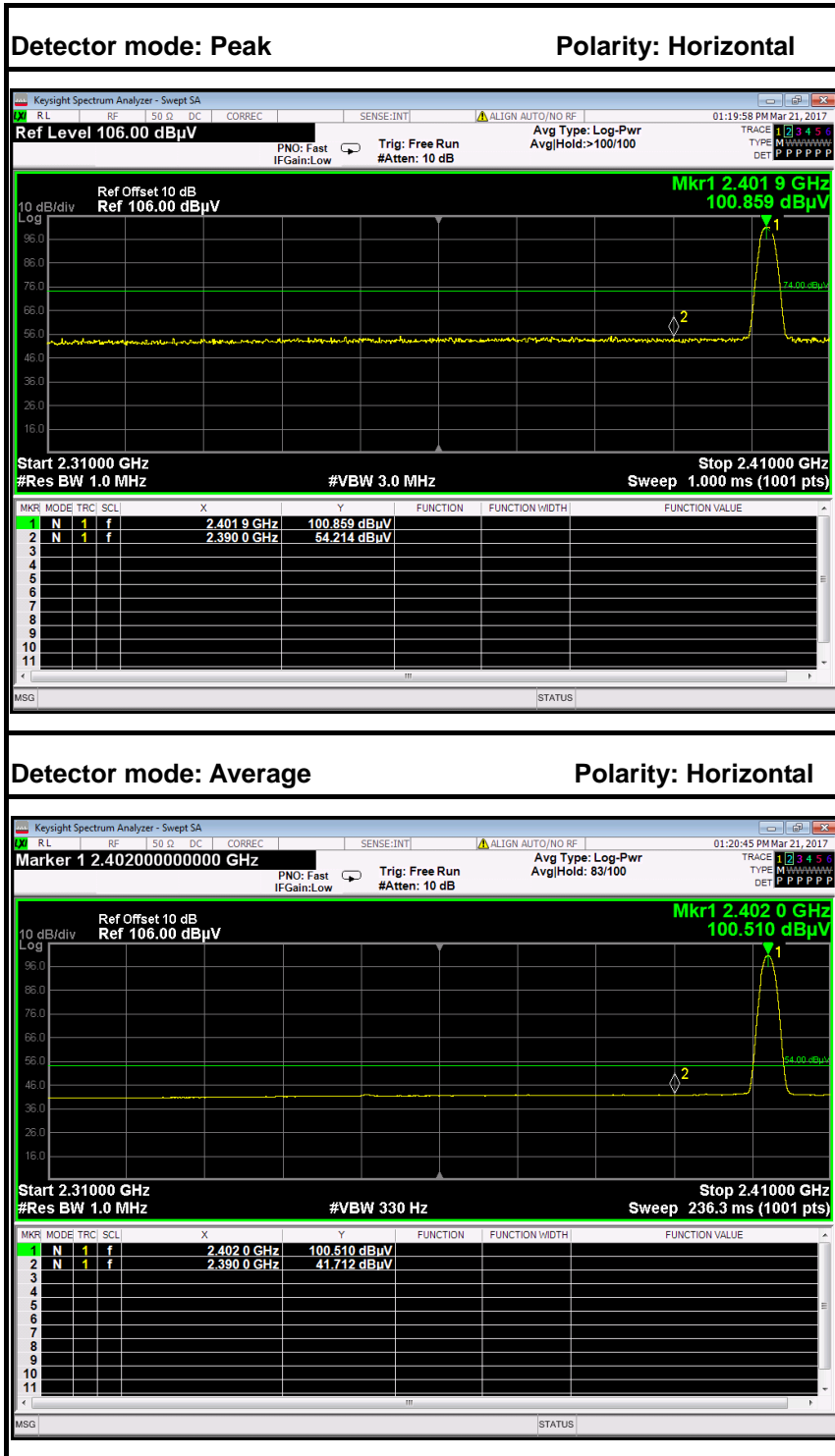
Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



No.	Frequency (MHz)	Reading (dBu V)	Corrected (dB/m)	Result (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	49.30	-2.86	52.16	74.00	-21.84	Peak	Vertical
2	2390.0000	38.55	-2.86	41.41	54.00	-12.59	Average	Vertical



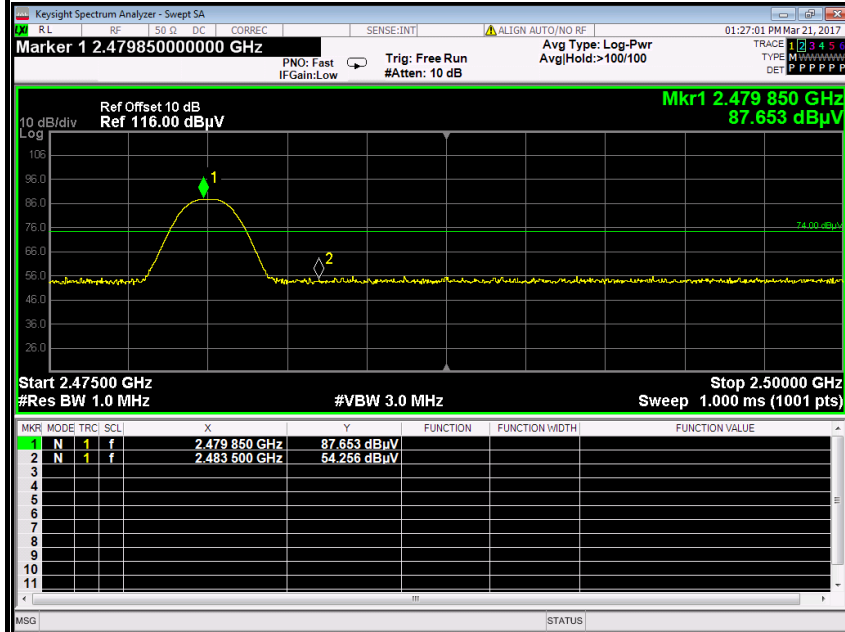
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	51.35	-2.86	54.21	74.00	-19.79	Peak	Horizontal
2	2390.0000	38.85	-2.86	41.71	54.00	-12.29	Average	Horizontal



Band Edges (CH-High)

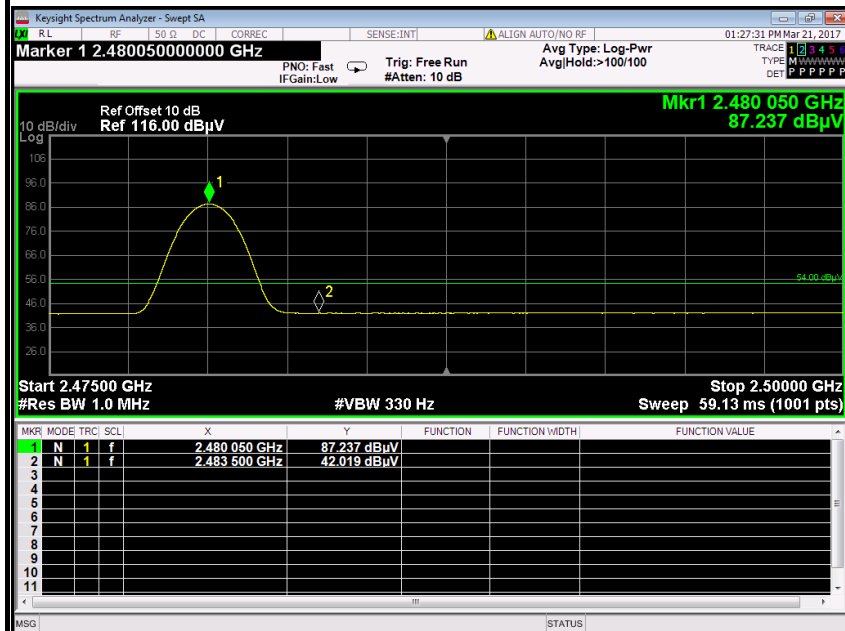
Detector mode: Peak

Polarity: Vertical

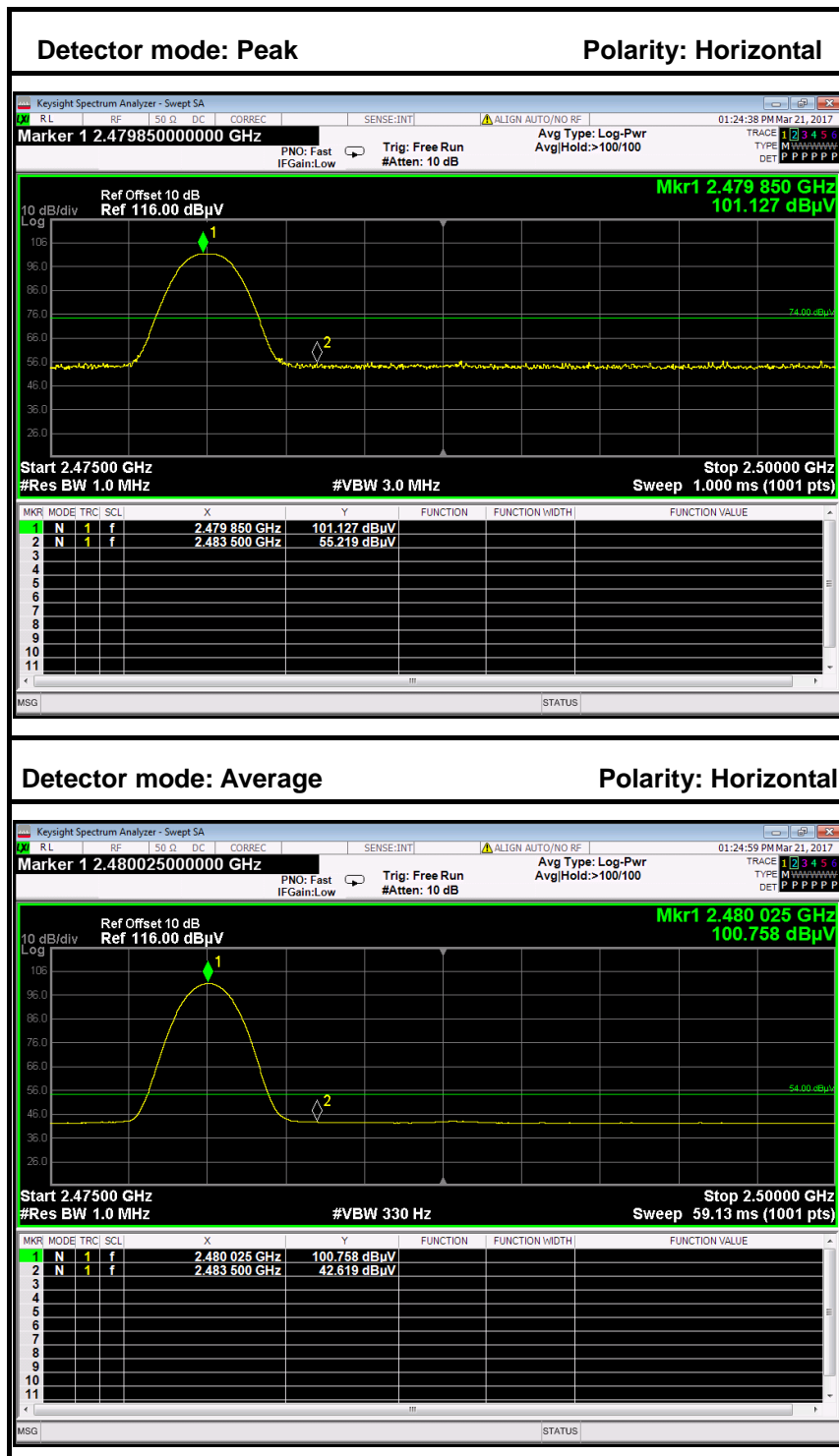


Detector mode: Average

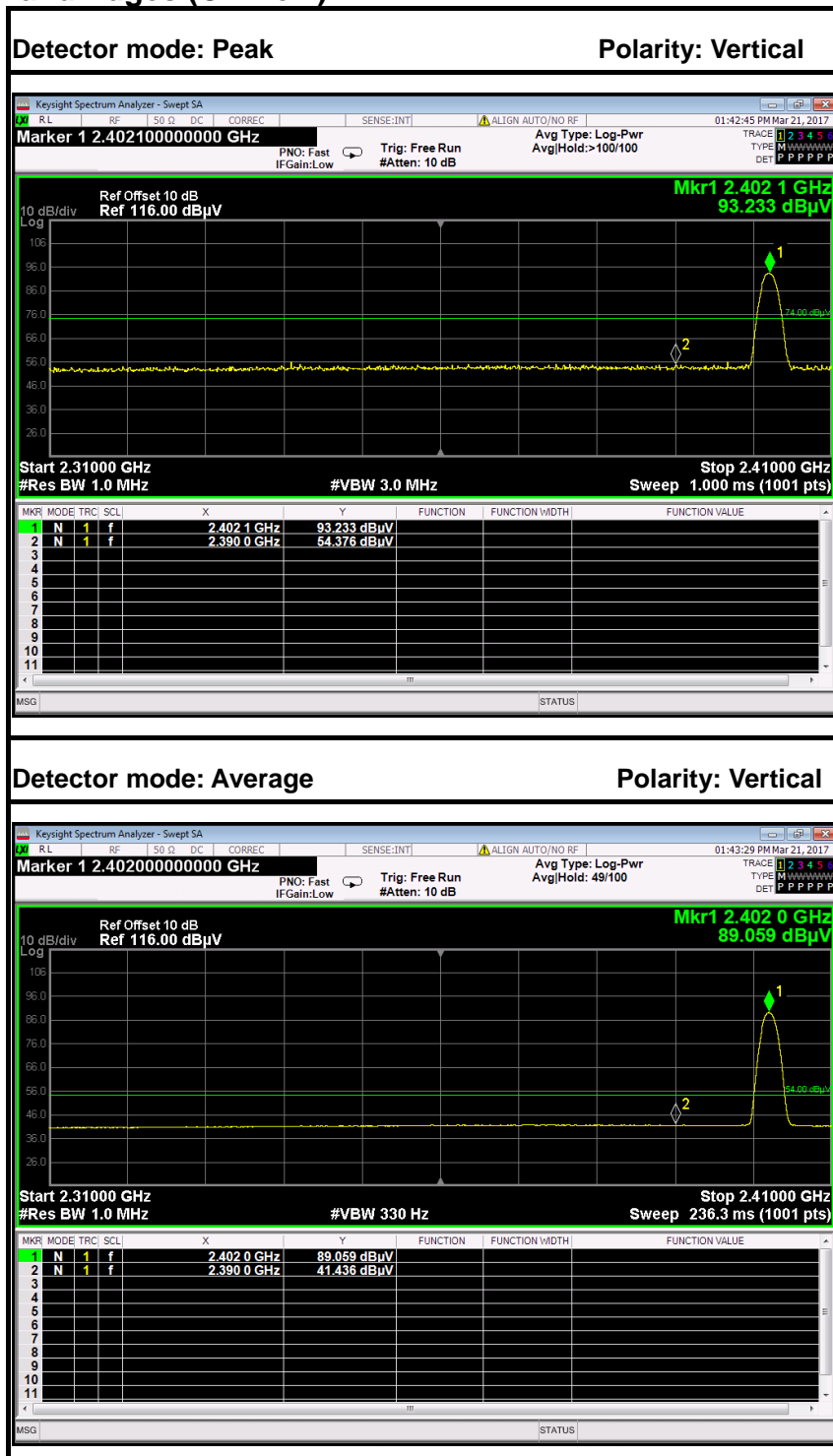
Polarity: Vertical



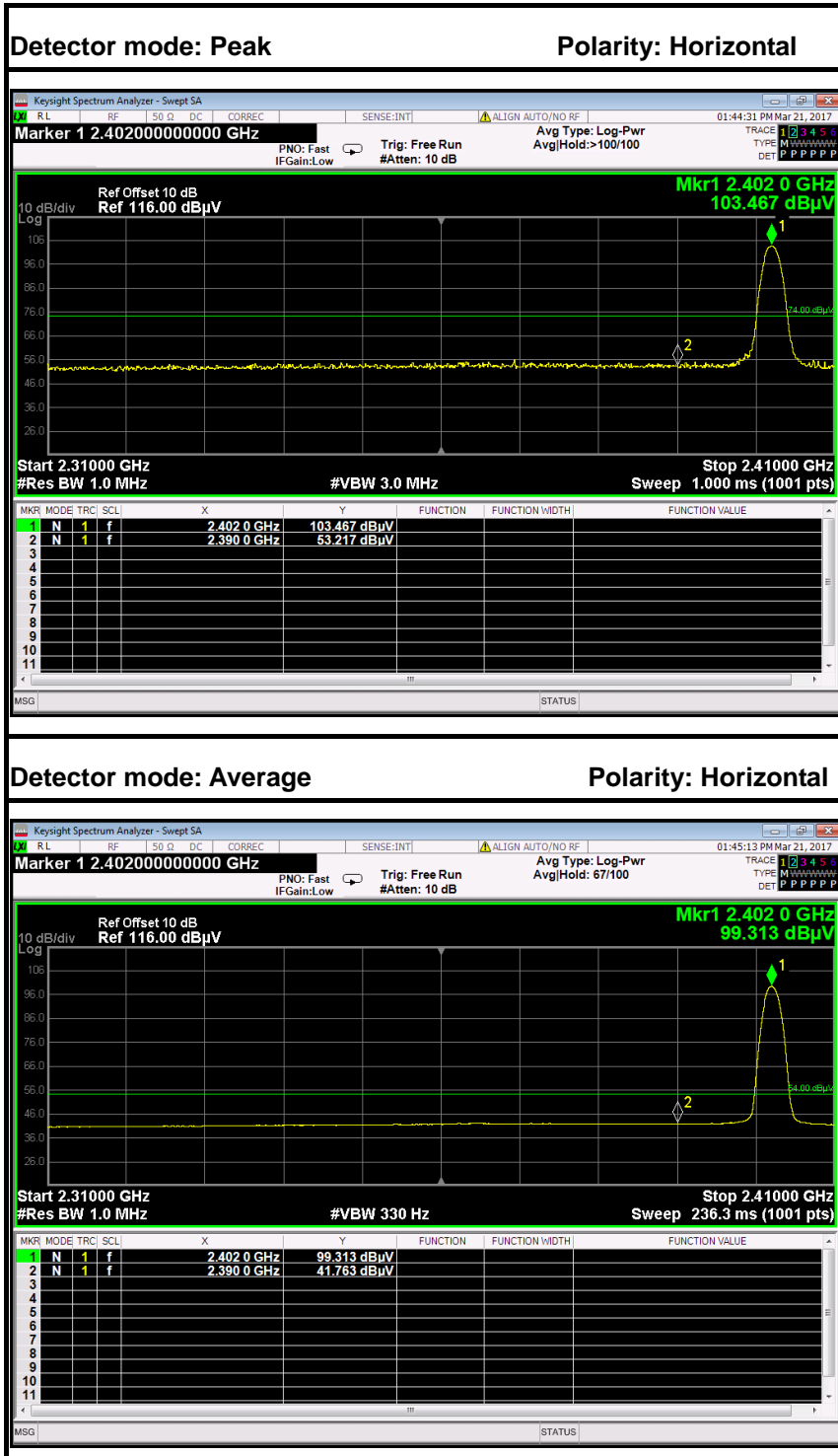
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	51.91	-2.35	54.26	74.00	-19.74	Peak	Vertical
2	2483.5000	49.67	-2.35	52.02	54.00	-1.98	Average	Vertical



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	52.87	-2.35	55.22	74.00	-18.78	Peak	Horizontal
2	2483.5000	40.27	-2.35	42.62	54.00	-11.38	Average	Horizontal

**8DPSK****Band Edges (CH-Low)**

No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	51.52	-2.86	54.38	74.00	-19.62	Peak	Vertical
2	2390.0000	38.58	-2.86	41.44	54.00	-12.56	Average	Vertical



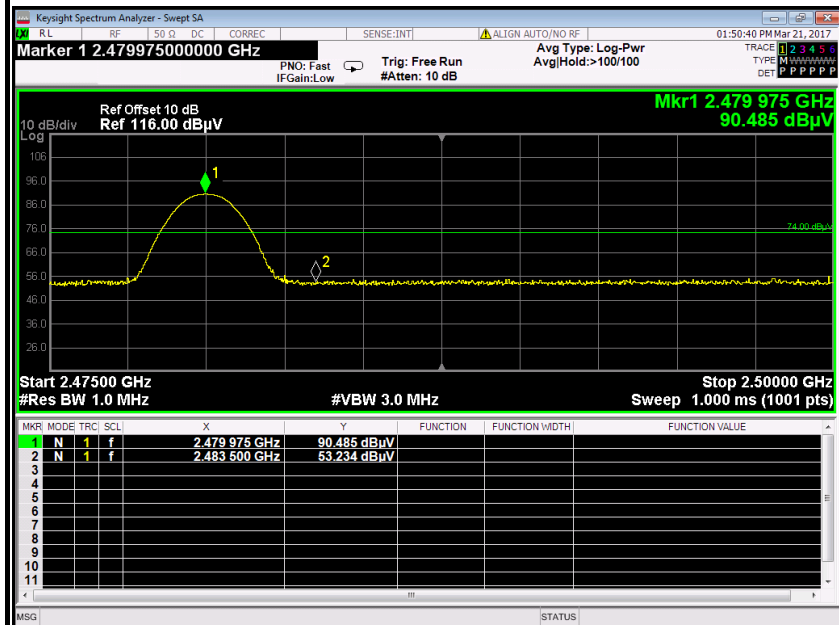
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	50.36	-2.86	53.22	74.00	-20.78	Peak	Horizontal
2	2390.0000	38.90	-2.86	41.76	54.00	-12.24	Average	Horizontal



Band Edges (CH-High)

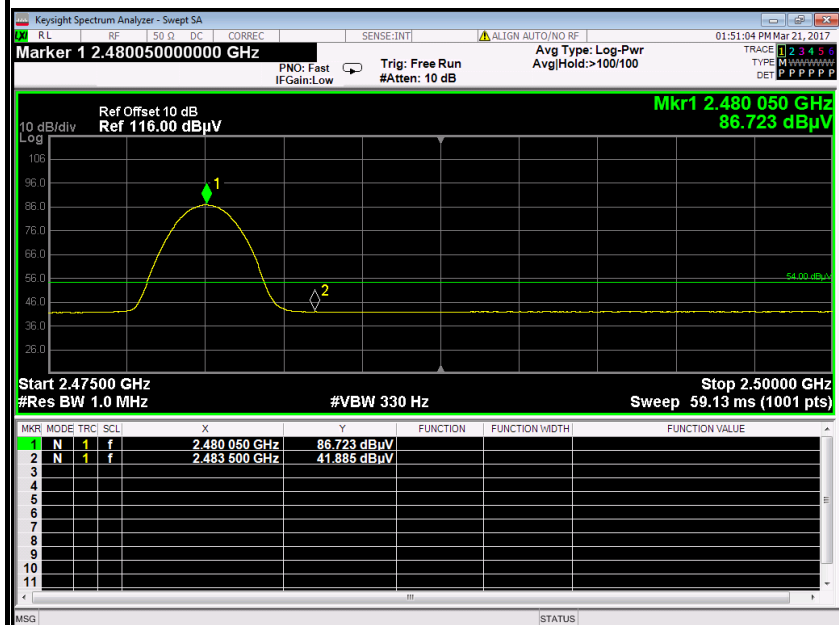
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

Polarity: Vertical

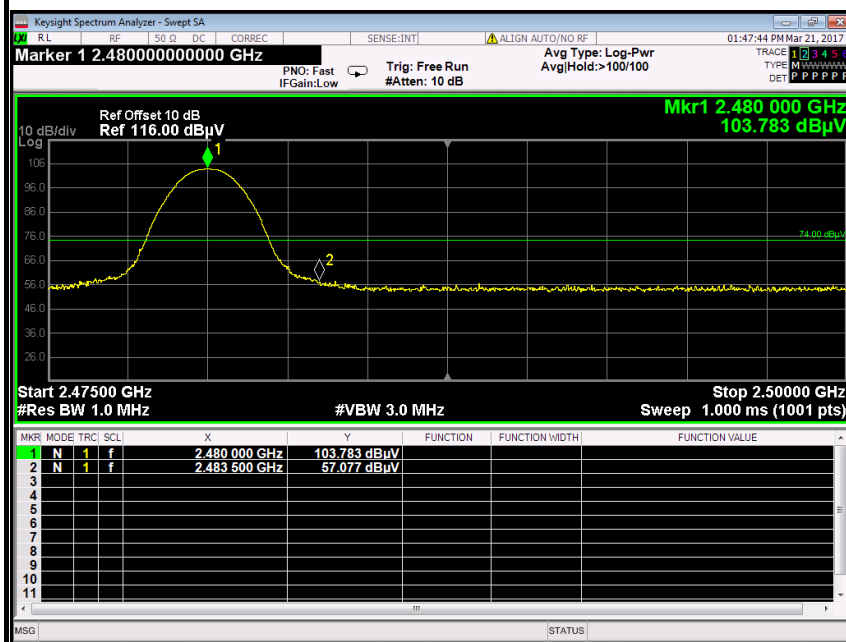


No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	50.88	-2.35	53.23	74.00	-20.77	Peak	Vertical
2	2483.5000	39.54	-2.35	41.89	54.00	-12.12	Average	Vertical



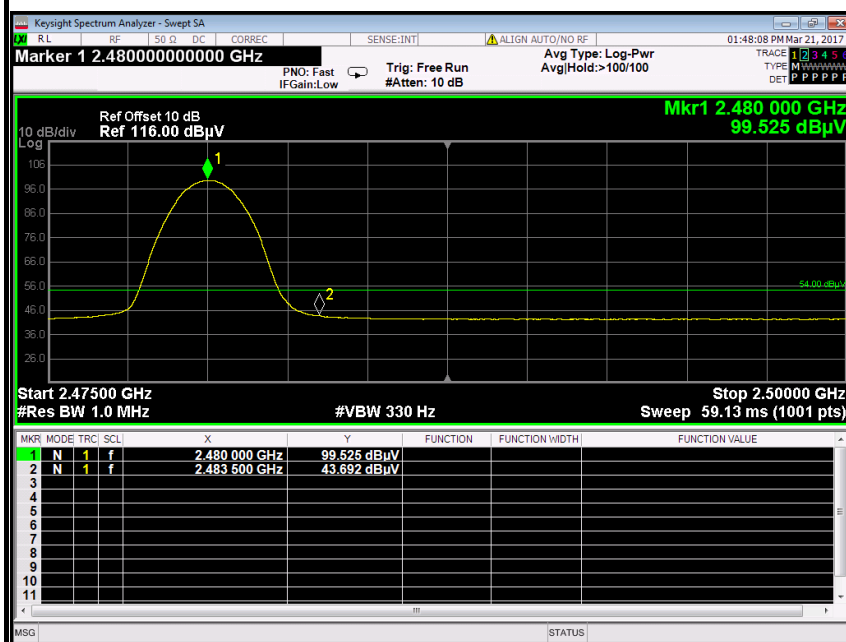
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal



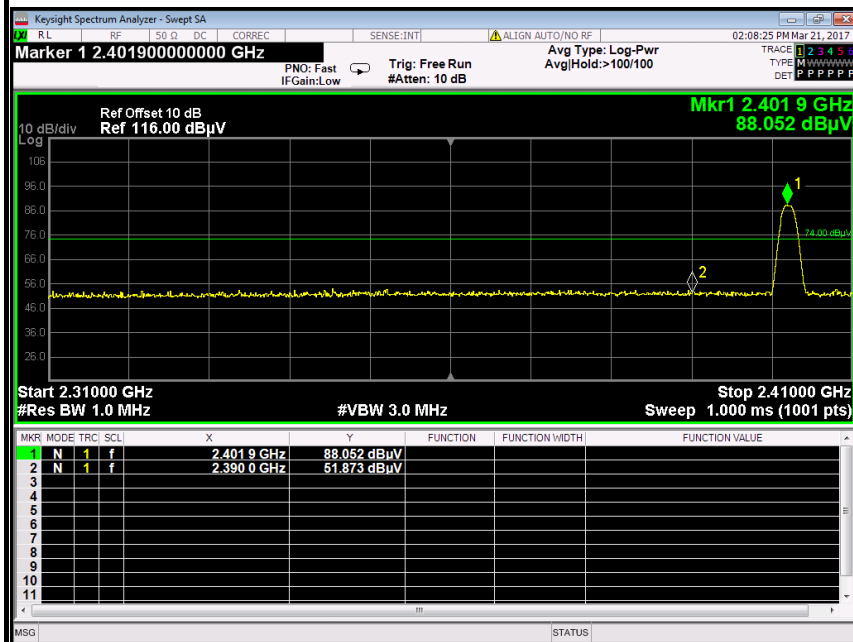
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	54.73	-2.35	57.08	74.00	-16.92	Peak	Horizontal
2	2483.5000	41.34	-2.35	43.69	54.00	-10.31	Average	Horizontal



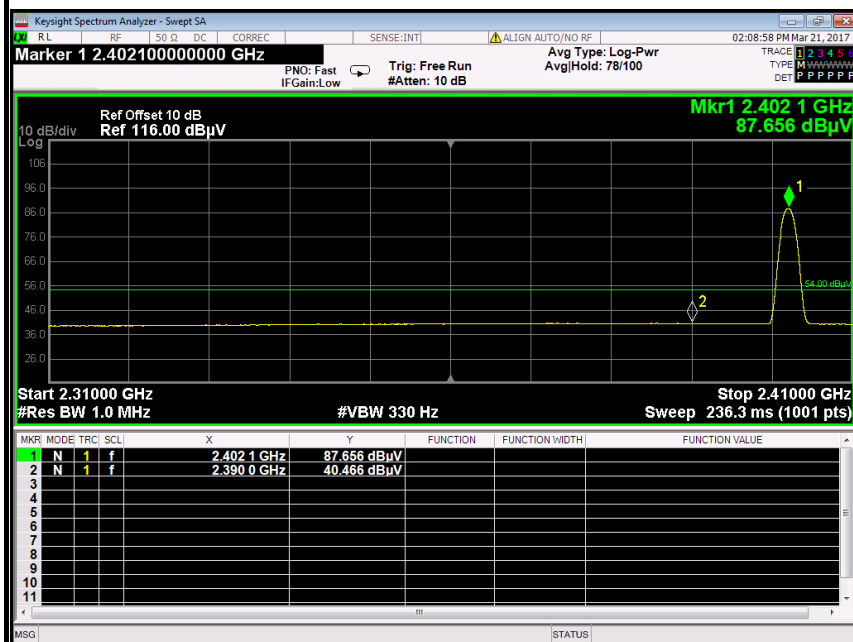
Antenna 2
Test Data (GFSK)

Band Edges (CH-Low)

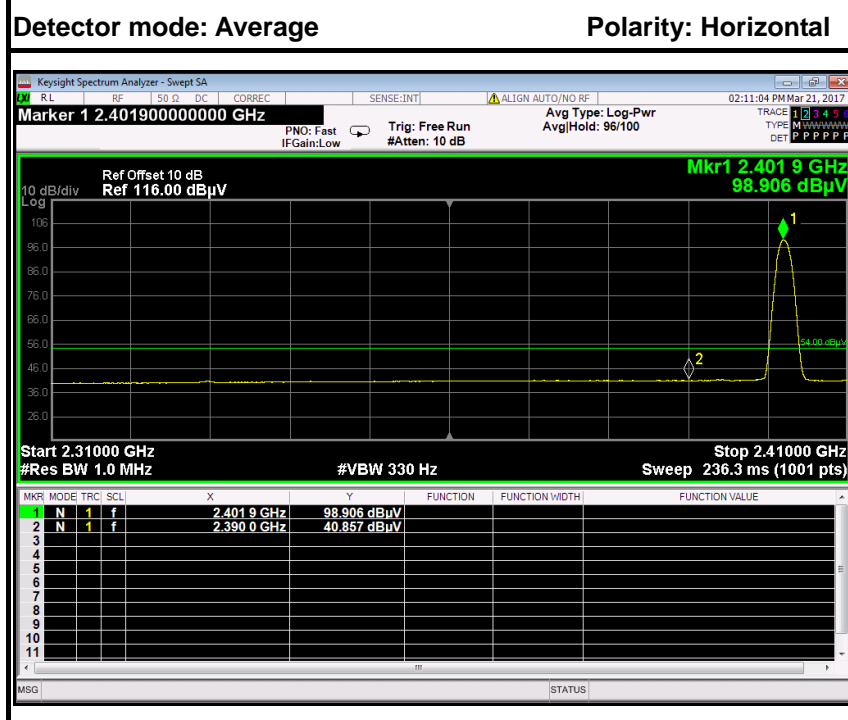
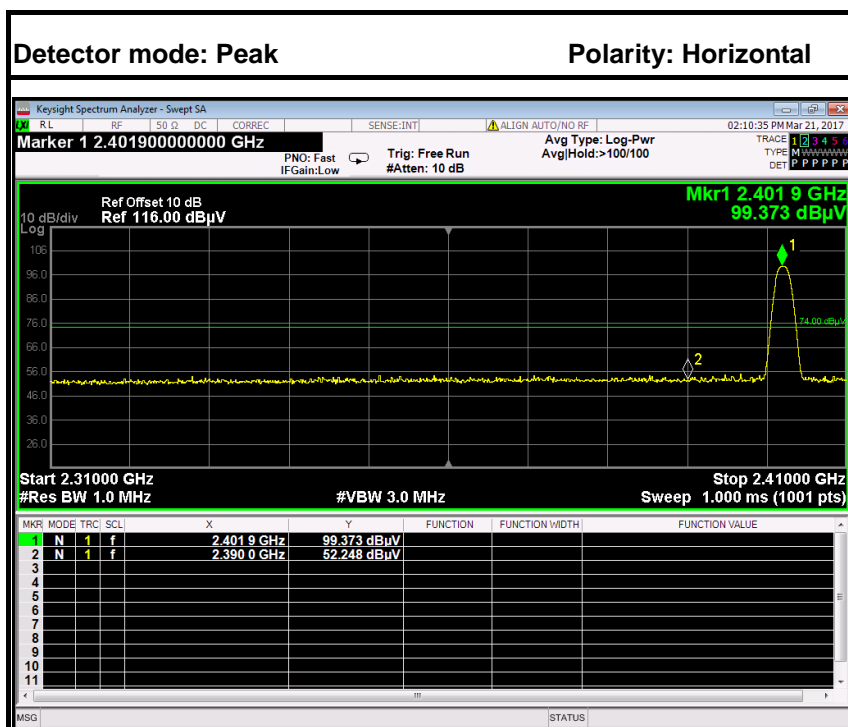
Detector mode: Peak **Polarity: Vertical**



Detector mode: Average **Polarity: Vertical**



No.	Frequency (MHz)	Reading (dBu V)	Corrected (dB/m)	Result (dBu V/m)	Limit (dBu V/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	49.01	-2.86	51.87	74.00	-22.13	Peak	Vertical
2	2390.0000	37.61	-2.86	40.47	54.00	-13.53	Average	Vertical



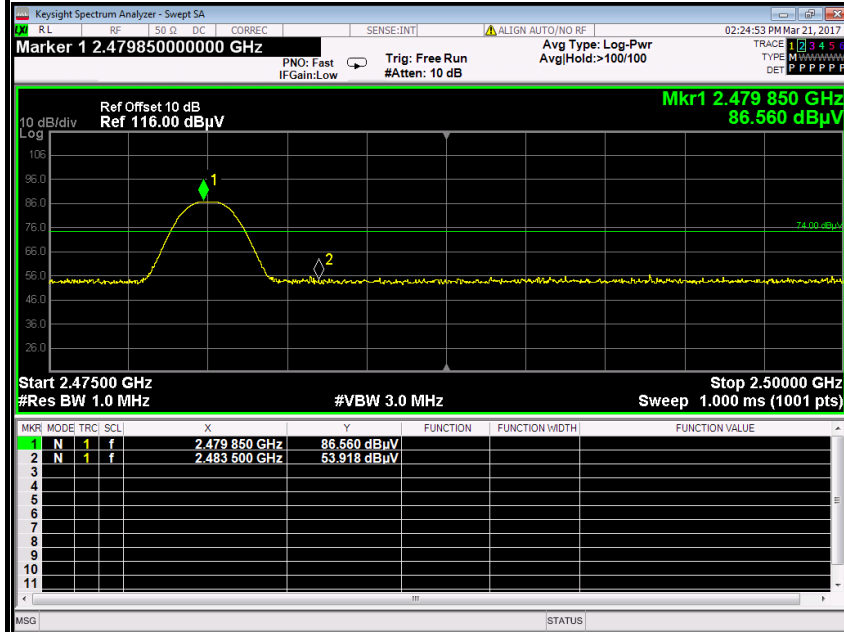
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	49.39	-2.86	52.25	74.00	-21.75	Peak	Horizontal
2	2390.0000	38.00	-2.86	40.86	54.00	-13.14	Average	Horizontal



Band Edges (CH-High)

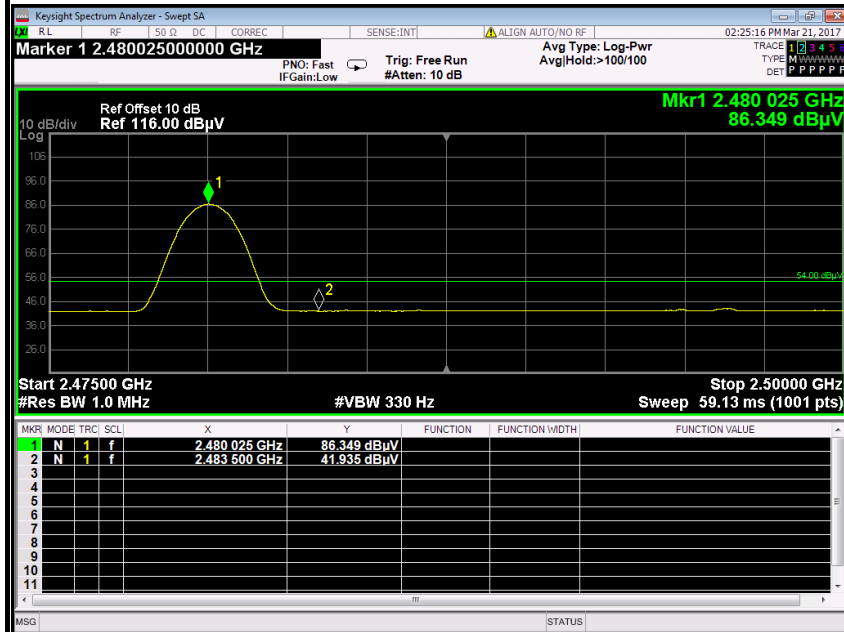
Detector mode: Peak

Polarity: Vertical

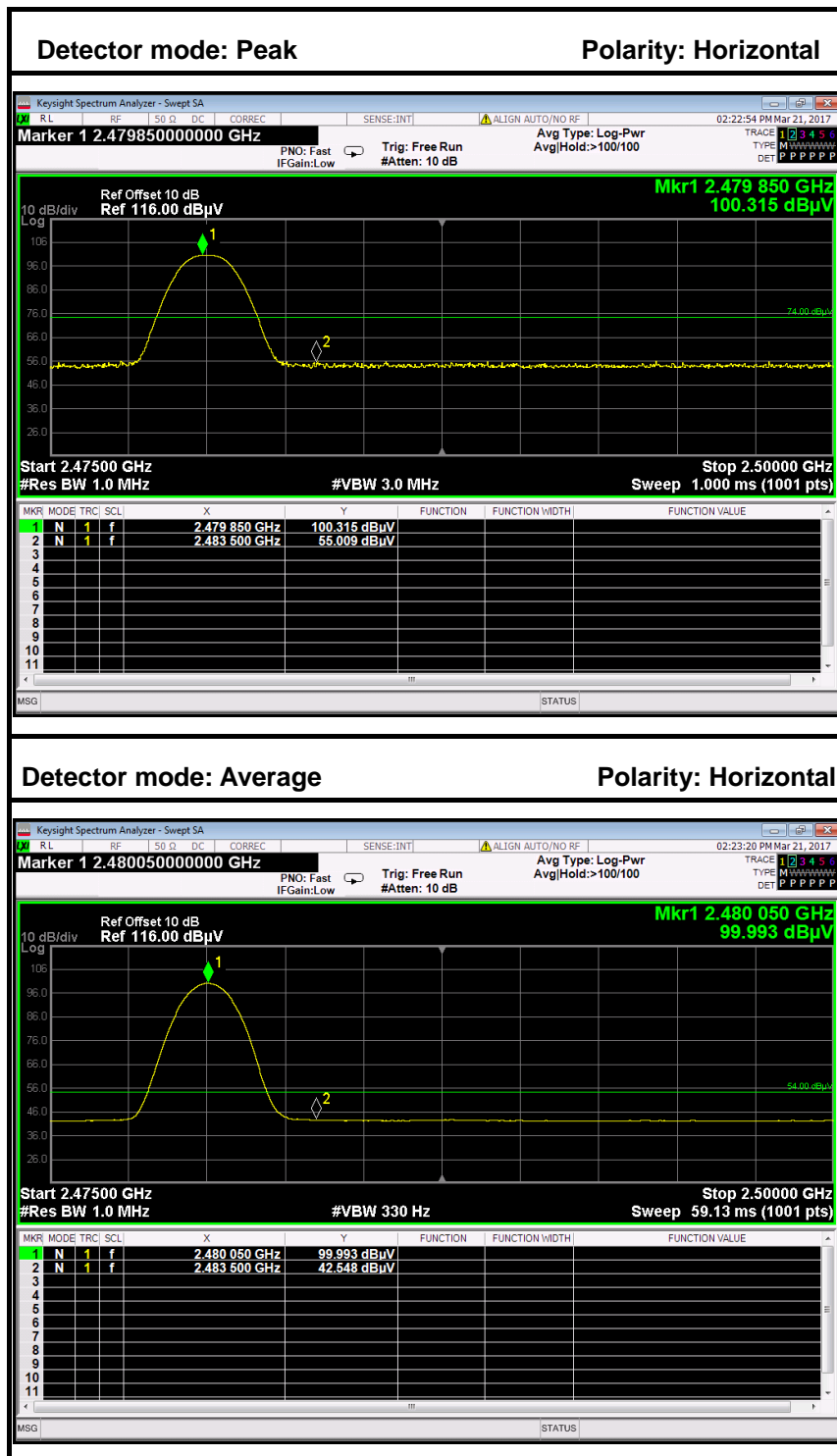


Detector mode: Average

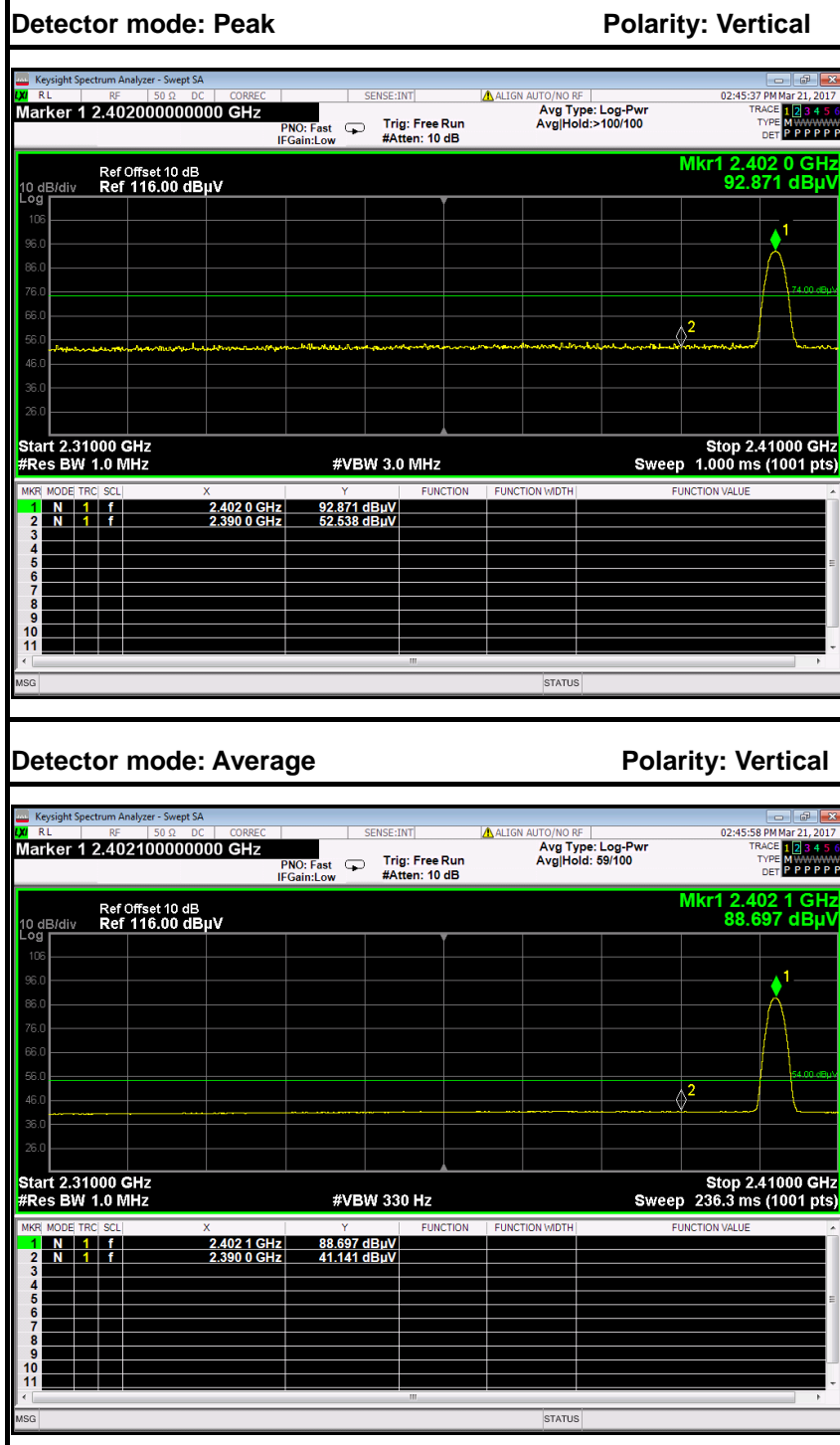
Polarity: Vertical



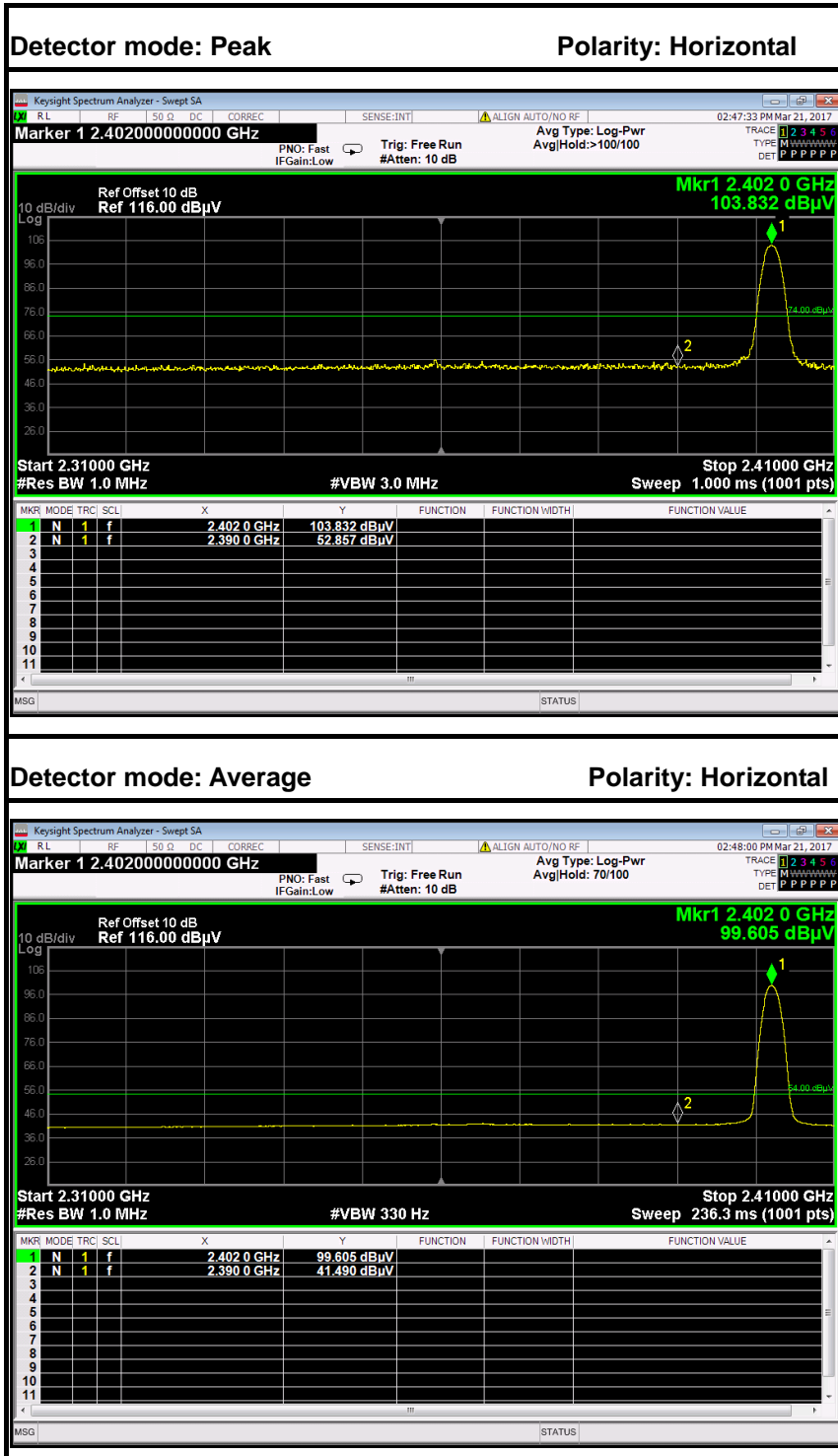
No.	Frequency (MHz)	Reading (dBμV)	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	51.57	-2.35	53.92	74.00	-20.08	Peak	Vertical
2	2483.5000	39.59	-2.35	41.94	54.00	-12.07	Average	Vertical



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	52.66	-2.35	55.01	74.00	-18.99	Peak	Horizontal
2	2483.5000	40.20	-2.35	42.55	54.00	-11.45	Average	Horizontal

**8DPSK****Band Edges (CH-Low)**

No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	49.68	-2.86	52.54	74.00	-21.46	Peak	Vertical
2	2390.0000	38.28	-2.86	41.14	54.00	-12.86	Average	Vertical



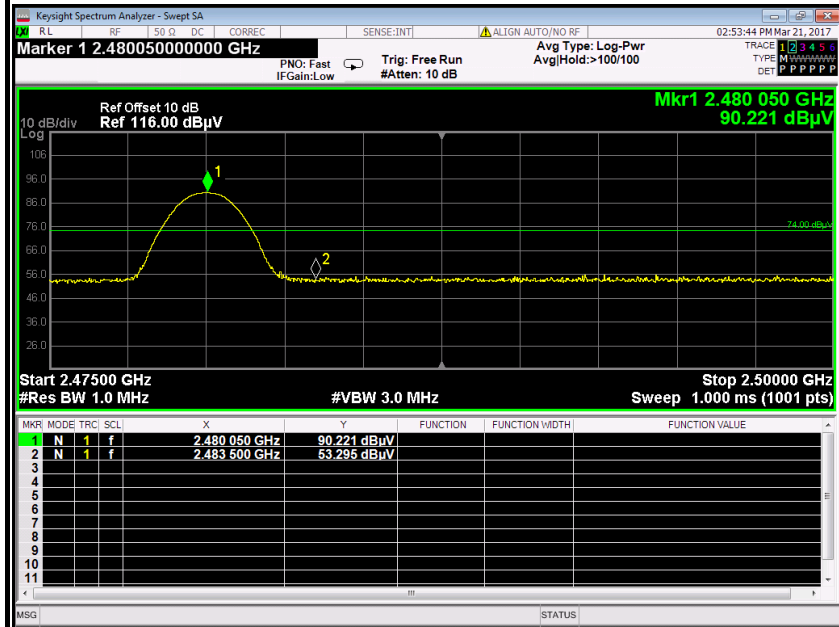
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	50.00	-2.86	52.86	74.00	-21.14	Peak	Horizontal
2	2390.0000	38.63	-2.86	41.49	54.00	-12.51	Average	Horizontal



Band Edges (CH-High)

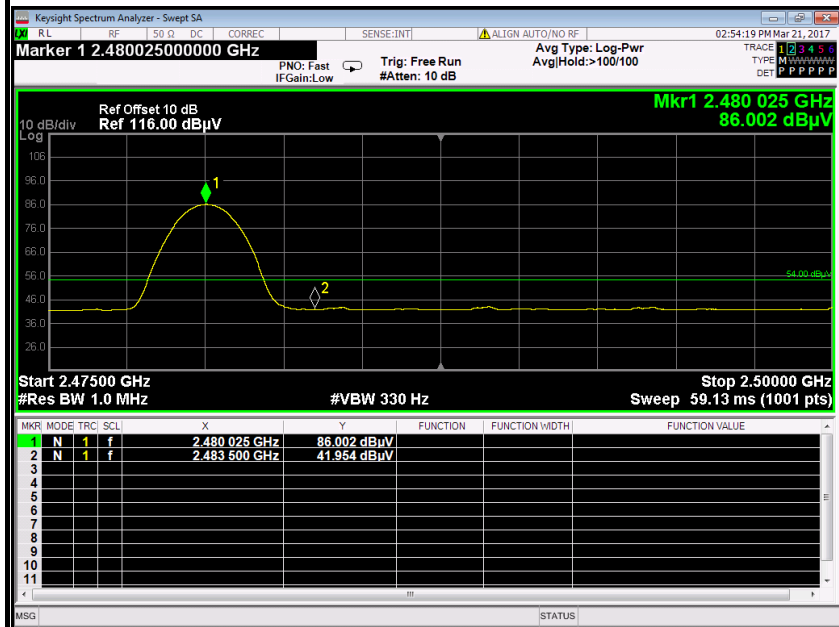
Detector mode: Peak

Polarity: Vertical

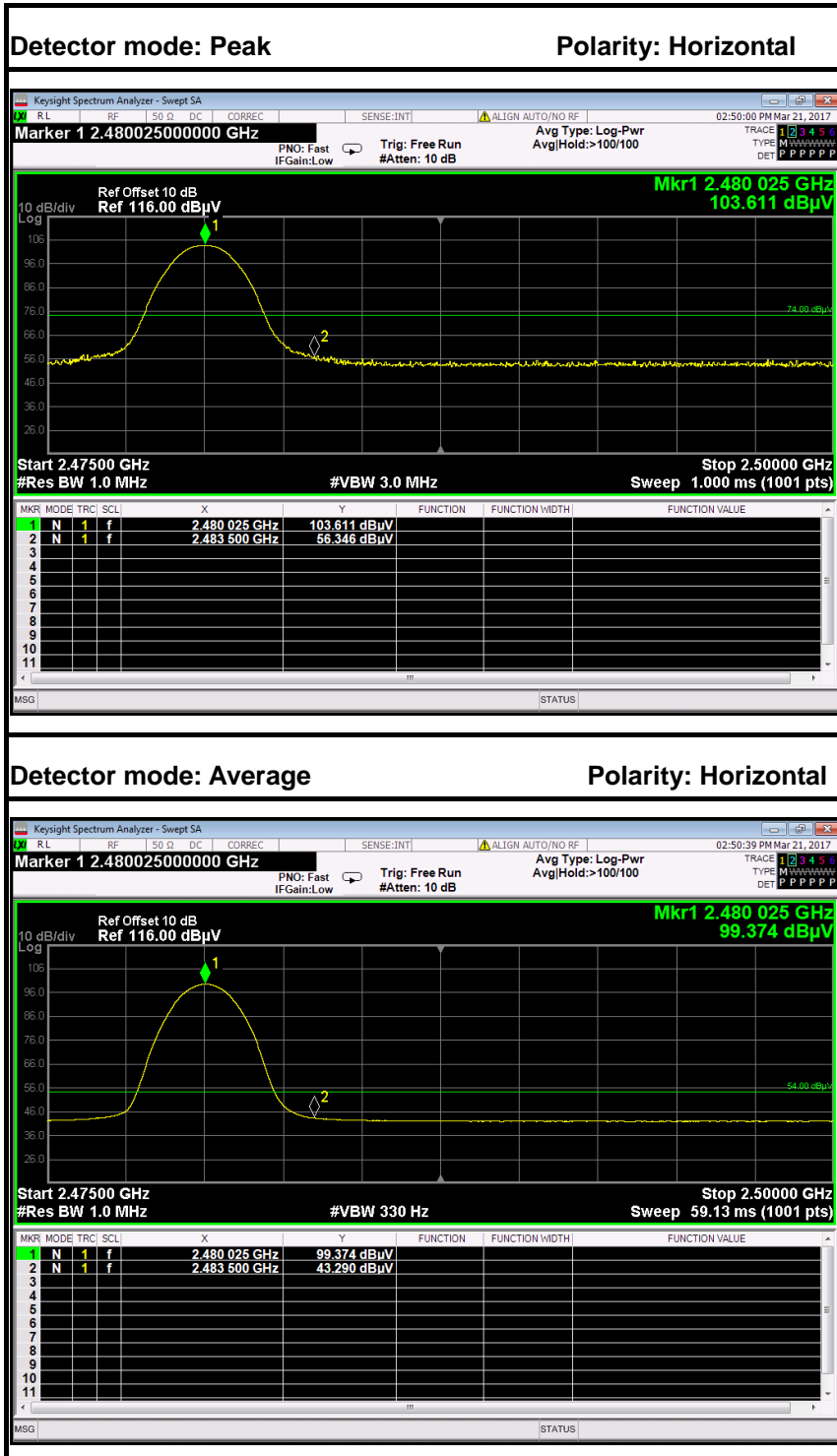


Detector mode: Average

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	50.95	-2.35	53.30	74.00	-20.71	Peak	Vertical
2	2483.5000	39.60	-2.35	41.95	54.00	-12.05	Average	Vertical



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	54.00	-2.35	56.35	74.00	-17.65	Peak	Horizontal
2	2483.5000	40.94	-2.35	43.29	54.00	-10.71	Average	Horizontal



6.6 FREQUENCY SEPARATION

LIMIT

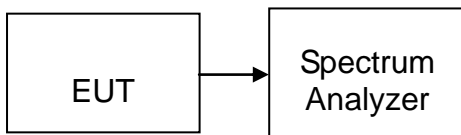
According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as RBW=30kHz, VBW=30kHz, Adjust Span to 4 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

TEST RESULTS

No non-compliance noted



Test Data

Antenna 1

GFSK

Channel Separation (MHz)	The 20 dB Bandwidth (kHz)	Channel Separation Limit	Result
1.000	942.500	>The 20 dB Bandwidth	Pass

8DPSK

Channel Separation (MHz)	Two-thirds of the 20 dB Bandwidth (kHz)	Channel Separation Limit	Result
1.000	852.667	> Two-thirds of the 20 dB Bandwidth	Pass

Antenna 2

GFSK

Channel Separation (MHz)	The 20 dB Bandwidth (kHz)	Channel Separation Limit	Result
1.000	941.900	>The 20 dB Bandwidth	Pass

8DPSK

Channel Separation (MHz)	Two-thirds of the 20 dB Bandwidth (kHz)	Channel Separation Limit	Result
1.000	850.667	> Two-thirds of the 20 dB Bandwidth	Pass

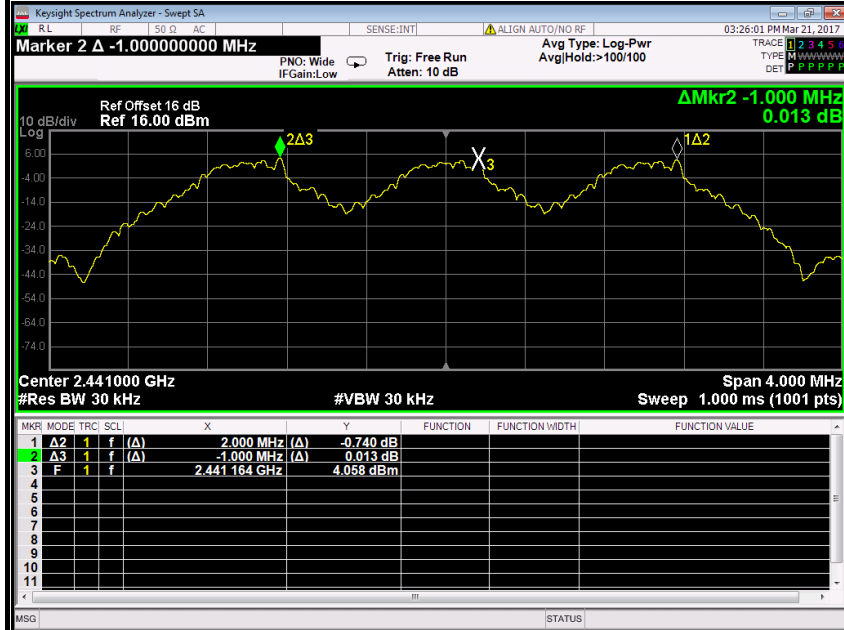


Antenna 1

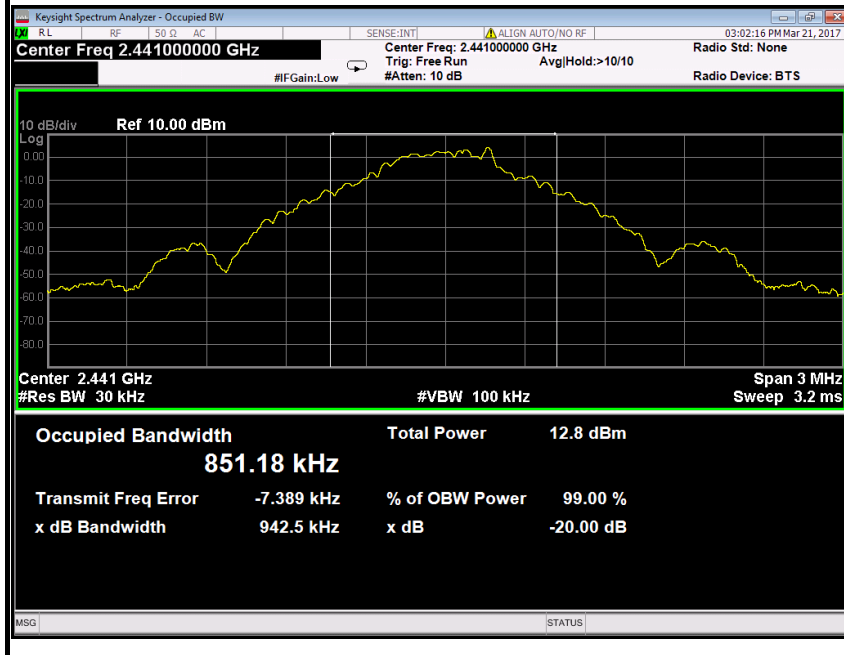
GFSK

Test Plot

Measurement of Channel Separation



20 dB bandwidth(CH Mid)

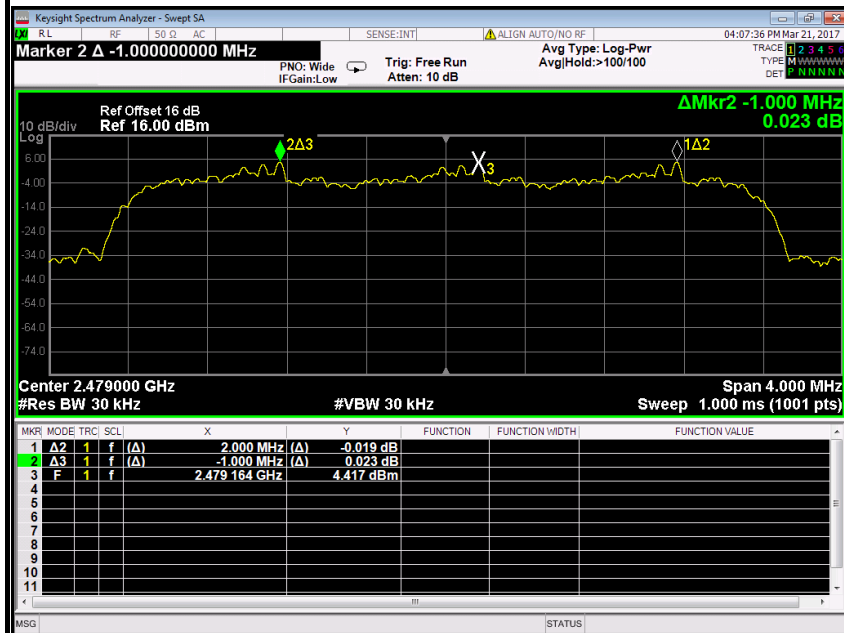




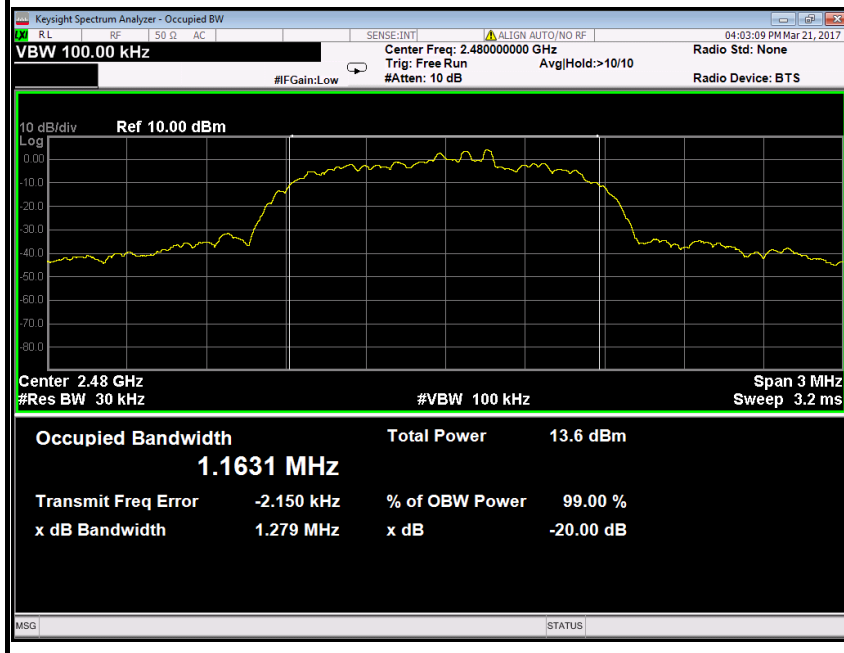
8DPSK

Test Plot

Measurement of Channel Separation



20 dB bandwidth(CH High)





Antenna 2

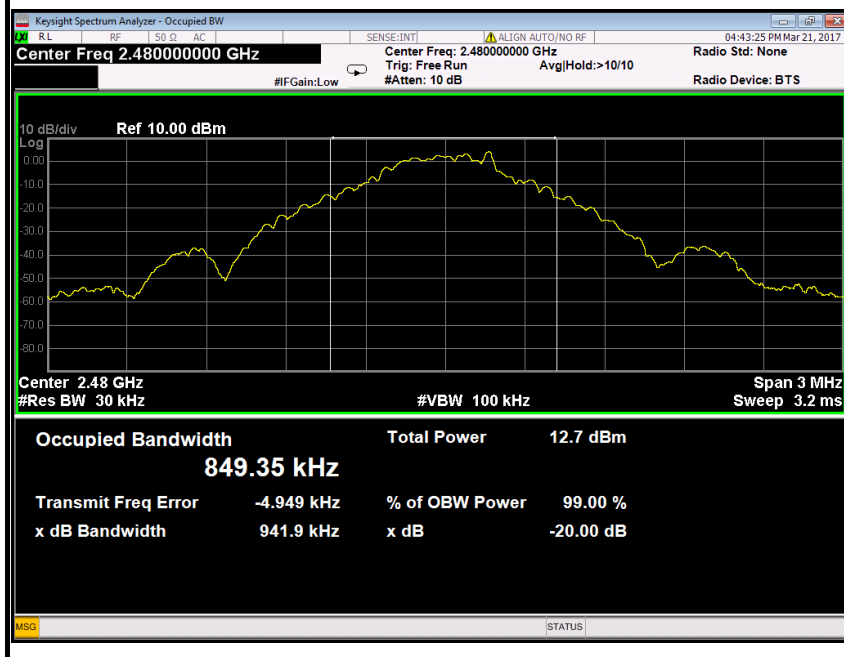
GFSK

Test Plot

Measurement of Channel Separation



20 dB bandwidth(CH Mid)

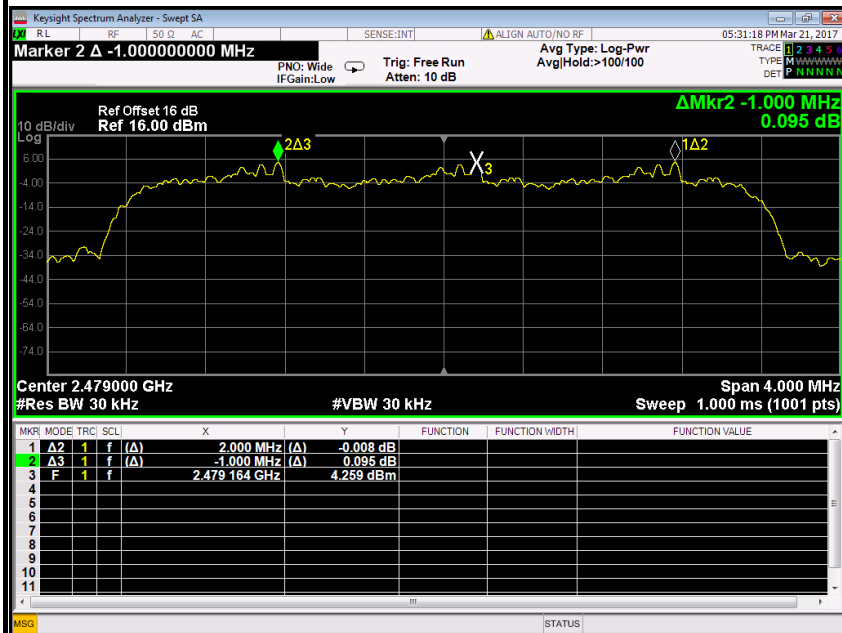




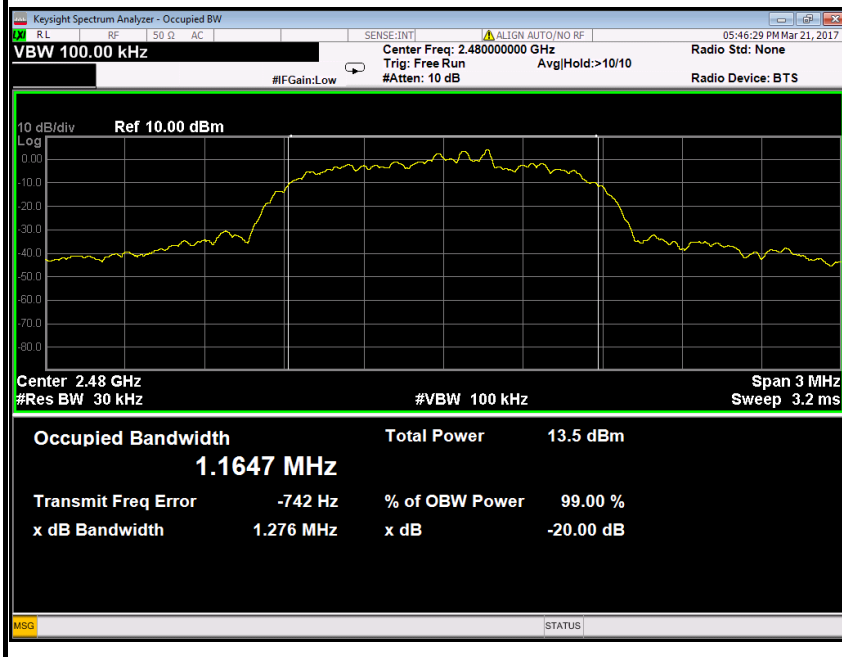
8DPSK

Test Plot

Measurement of Channel Separation



20 dB bandwidth(CH Mid)





6.7 NUMBER OF HOPPING FREQUENCY

LIMIT

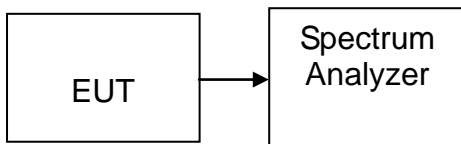
According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	02/21/2017	02/20/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = 1ms.
4. Set the spectrum analyzer as RBW, VBW=300kHz,
5. Max hold, view and count how many channel in the band.

TEST RESULTS

No non-compliance noted

Test Data

Antenna 1

Result (No. of CH)	Limit (No. of CH)	Result
79	>15	PASS

Antenna 2

Result (No. of CH)	Limit (No. of CH)	Result
79	>15	PASS

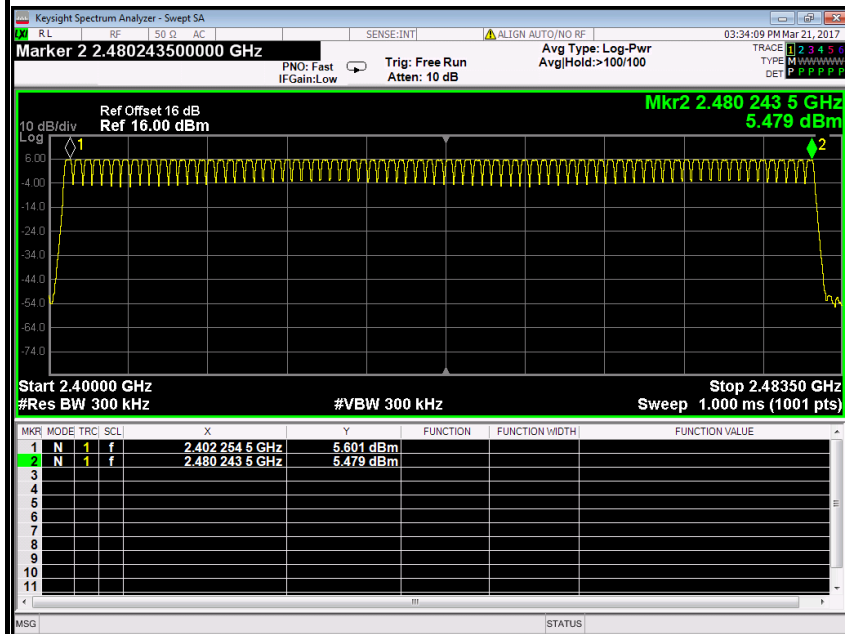


Antenna 1 Test Plot

Channel Number

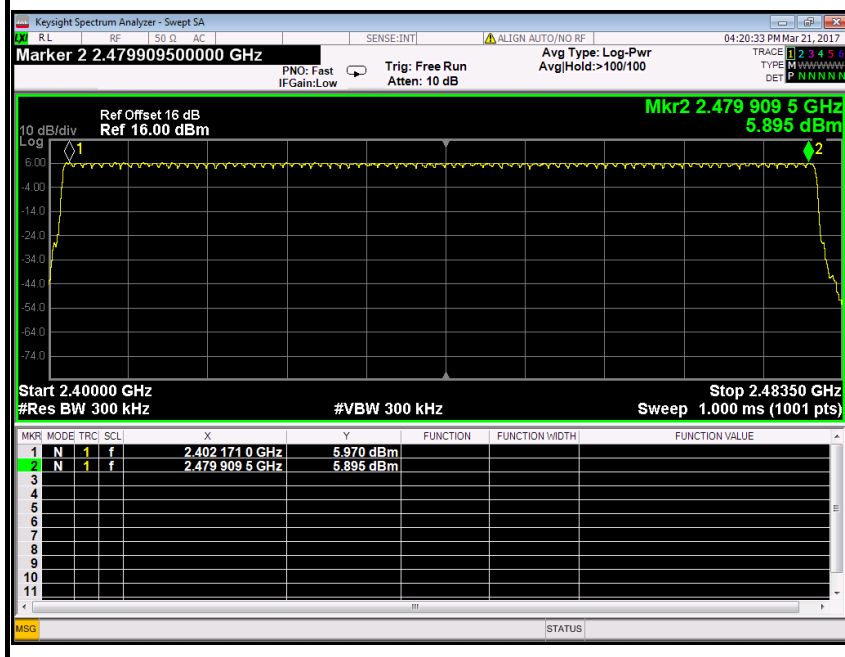
GFSK

2.400 GHz – 2.4835 GHz



8DPSK

2.400 GHz – 2.4835 GHz



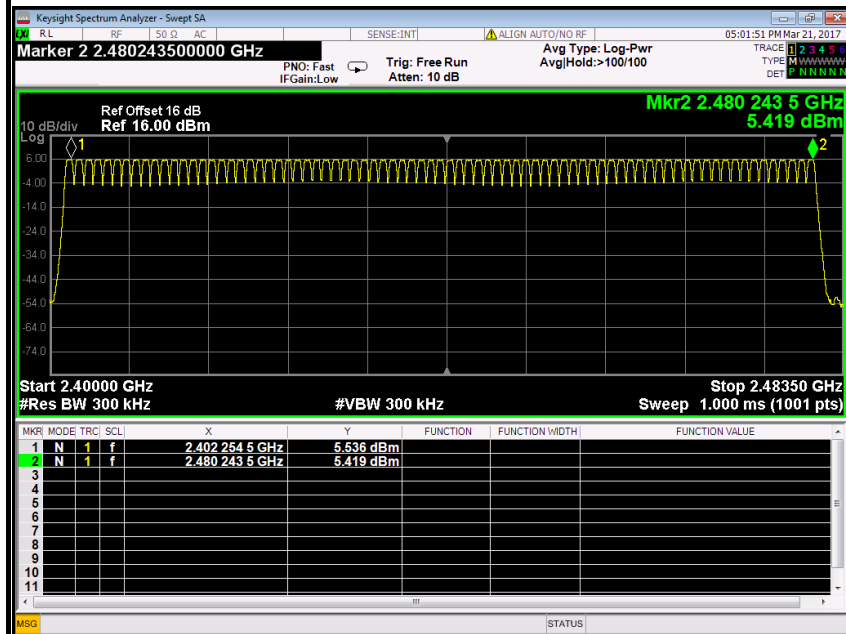


Antenna 2 Test Plot

Channel Number

GFSK

2.400 GHz – 2.4835 GHz



8DPSK

2.400 GHz – 2.4835 GHz

