RF TEST REPORT

Report No.: 17020664-FCC-R1
Supersede Report No.: N/A

Applicant	Ningbo Lumiaudio Electronic Technology LTD
Product Name	Bluetooth ceiling speaker
Model No.	FLC-6BTS
Serial No.	FLC-6BT, 24760
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013
Test Date	June 12 to June 28, 2017
Issue Date	June 28, 2017
Test Result	☑ **Pass** ☐ **Fail**
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Trety Lu	Deon Dai	
Trety Lu **Test Engineer**	**Deon Dai** **Engineer Reviewer**	

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Test result presented in this test report is applicable to the tested sample only

Issued by:
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Laboratories Introduction

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Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
17020664-FCC-R1	NONE	Original	June 28, 2017

2. Customer information

Applicant Name	Ningbo Lumiaudio Electronic Technology LTD
Applicant Add	22/F., Building 1,Lisi Plaza, Huifeng East Road ,Ningbo,China 315100
Manufacturer	Ningbo Lumiaudio Electronic Technology LTD
Manufacturer Add	22/F., Building 1,Lisi Plaza, Huifeng East Road ,Ningbo,China 315100

3. Test site information

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	986914
IC Test Site No.	4842B-1
Test Software	EZ_EMC (Ver.ICP-03A1)

Operating channel list

Channel	Frequency(MHz)	Channel	Frequency(MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency(MHz)
00	2402	17	2419	34	2436	51	2453	68	2470
01	2403	18	2420	35	2437	52	2454	69	2471
02	2404	19	2421	36	2438	53	2455	70	2472
03	2405	20	2422	37	2439	54	2456	71	2473
04	2406	21	2423	38	2440	55	2457	72	2474
05	2407	22	2424	39	2441	56	2458	73	2475
06	2408	23	2425	40	2442	57	2459	74	2476
07	2409	24	2426	41	2443	58	2460	75	2477
08	2410	25	2427	42	2444	59	2461	76	2478
09	2411	26	2428	43	2445	60	2462	77	2479
10	2412	27	2429	44	2446	61	2463	78	2480
11	2413	28	2430	45	2447	62	2464		
12	2414	29	2431	46	2448	63	2465		
13	2415	30	2432	47	2449	64	2466		
14	2416	31	2433	48	2450	65	2467		
15	2417	32	2434	49	2451	66	2468		
16	2418	33	2435	50	2452	67	2469		

4. Equipment under Test (EUT) Information

Description of EUT:	Bluetooth ceiling speaker
Main Model:	FLC-6BTS
Serial Model:	FLC-6BT, 24760
Date EUT received:	June 08, 2017
Test Date(s):	June 12 to June 28, 2017
Antenna Gain:	0 dBi
Antenna Type:	PCB antenna
Type of Modulation:	Bluetooth: GFSK, π/4DQPSK, 8DPSK
RF Operating Frequency (ies):	Bluetooth: 2402-2480 MHz
Max. Output Power:	-1.877dBm
Number of Channels:	Bluetooth: 79CH
Port:	Power Port、Earphone Port
Input Power:	Adapter Input:100-240V 50/60Hz 1.6A Output:24V/2.5A
Trade Name :	N/A
FCC ID:	2AKKHFLC

5. Test Summary

The product was tested in accordance with the following specifications.
All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247(a)(1)	Channel Separation	Compliance
§15.247(a)(1)	20 dB Bandwidth	Compliance
§15.247(b)(1)	Peak Output Power	Compliance
§15.247(a)(1)(iii)	Number of Hopping Channel	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(d)	Band Edge& Restricted Band	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions& Restricted Band	Compliance

Measurement Uncertainty

Emissions		
Test Item	**Description**	**Uncertainty**
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.

b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit. And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 1 antenna:
A permanently attached PCB antenna for Bluetooth, the gain is 0 dBi for Bluetooth.

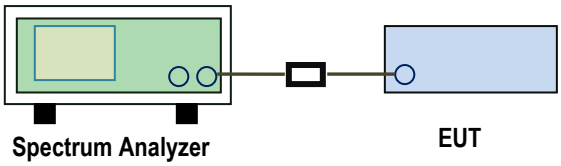
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	23℃
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	June 26, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(a)(1)	a)	Channel Separation < 20dB BW and 20dB BW < 25KHz ; Channel Separation Limit=25KHz Chanel Separation < 20dB BW and 20dB BW > 25kHz ; Channel Separation Limit=2/3 20dB BW	☑
Test Setup			
Test Procedure		The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - The EUT must have its hopping function enabled - Span = wide enough to capture the peaks of two adjacent channels - Resolution (or IF) Bandwidth (RBW) ≥1% of the span - Video (or Average) Bandwidth (VBW) ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.	
Remark			
Result		☑ Pass ☐ Fail	

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Channel Separation measurement result

Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	0.993	0.9426	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	0.990	0.9389	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.9407	Pass
	Adjacency Channel	2479			
CH Separation π/4 DQPSK	Low Channel	2402	1.002	0.842	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.823	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.002	0.823	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.011	0.852	Pass
	Adjacency Channel	2403			
	Mid Channel	2440	1.002	0.841	Pass
	Adjacency Channel	2441			
	High Channel	2480	1.008	0.841	Pass
	Adjacency Channel	2479			

Test Plots

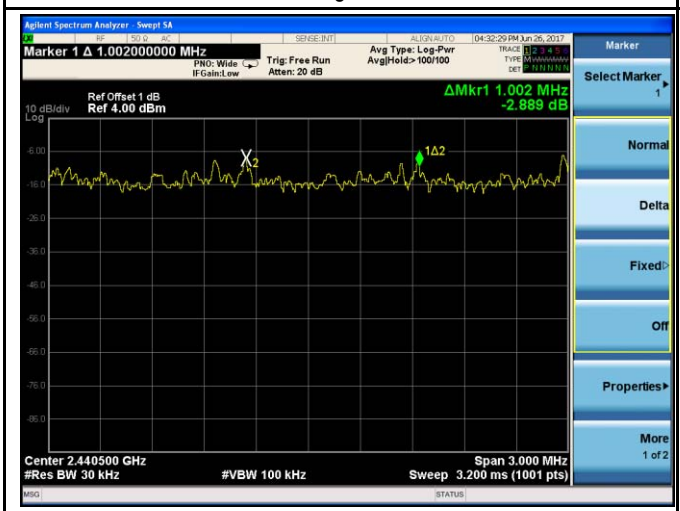
Channel Separation measurement result

GFSK - Low Channel

GFSK - Middle Channel

GFSK - High Channel

π/4 DPSK - Low Channel



π/4 DQPSK - Middle Channel

π/4 DQPSK - High Channel

8DPSK - Low Channel

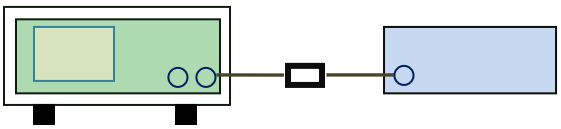
8DPSK - Middle Channel

8DPSK - High Channel

6.3 20dB Bandwidth

Temperature	23℃
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	June 26, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)	a)	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.	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW ≥1% of the 20 dB bandwidth - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold. - The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

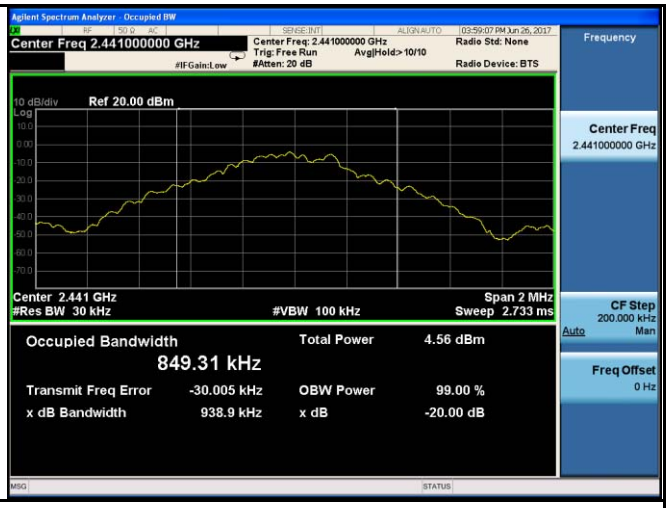
Test Plot ☑ Yes (See below) ☐ N/A

Measurement result

Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.9426	0.8566
	Mid	2441	0.9389	0.8493
	High	2480	0.9407	0.8511
π/4 DQPSK	Low	2402	1.263	1.1827
	Mid	2441	1.234	1.1848
	High	2480	1.234	1.1828
8-DPSK	Low	2402	1.278	1.1714
	Mid	2441	1.261	1.1841
	High	2480	1.262	1.1831

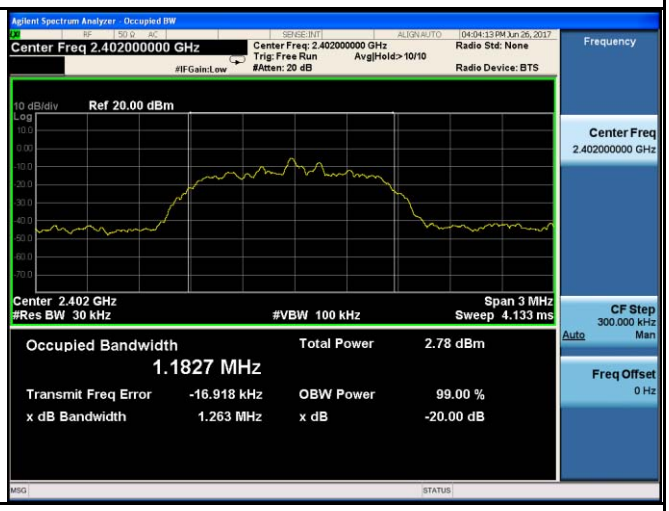
Test Plots
20dB Bandwidth measurement result

GFSK - Low Channel

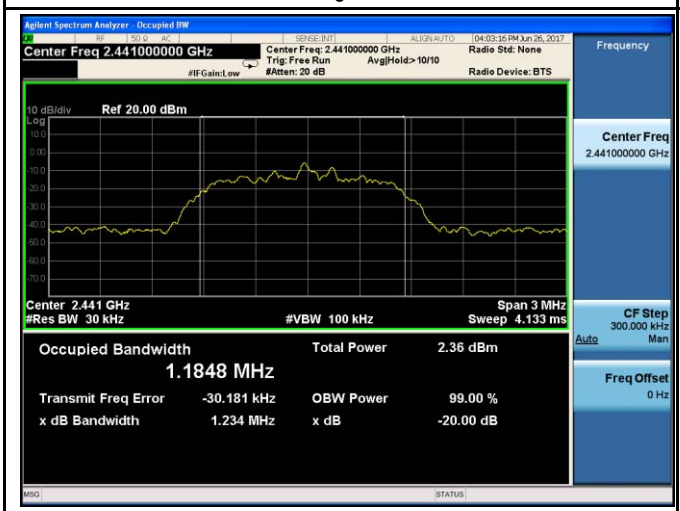


GFSK - Middle Channel

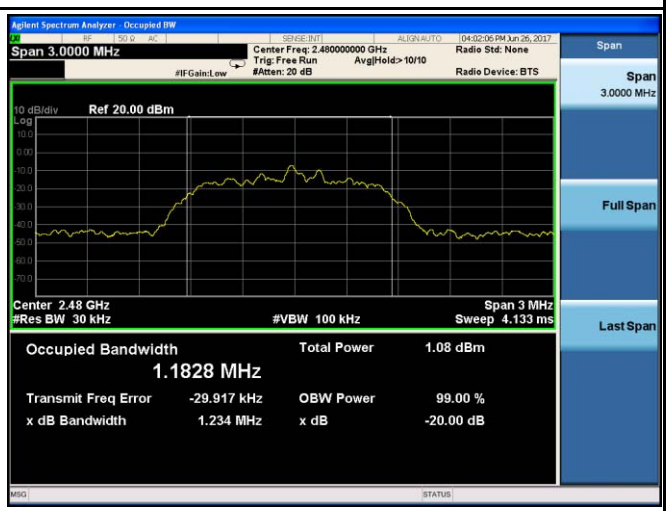
GFSK - High Channel



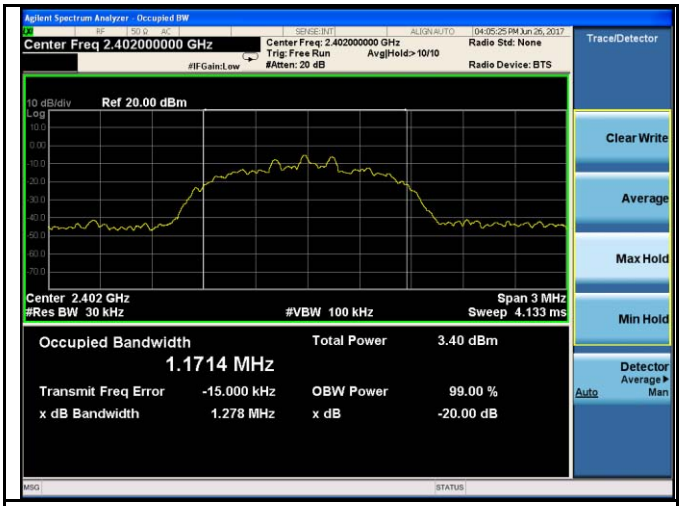
π/4 DQPSK - Low Channel



π/4 DQPSK - Middle Channel



π/4 DQPSK - High Channel



8DPSK - Low Channel

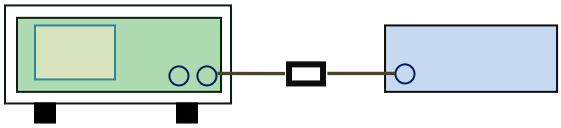
8DPSK - Middle Channel

8DPSK - High Channel

6.4 Peak Output Power

Temperature	23℃
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	June 26, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (3)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤1 Watt	☑
	b)	FHSS in 5725-5850MHz: ≤1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤0.125 Watt.	☑
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤0.25 Watt	☐
	f)	DTS in 902-928MHz, 2400-2483.5MHz: ≤1 Watt	☐
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel - RBW > the 20 dB bandwidth of the emission being measured - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. - Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (see the note above regarding external attenuation and cable loss). The limit is specified in one of the subparagraphs of this Section. Submit this plot. A peak responding power meter may be used instead of a spectrum analyzer.		
Remark			
Result	☑ Pass ☐ Fail		

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

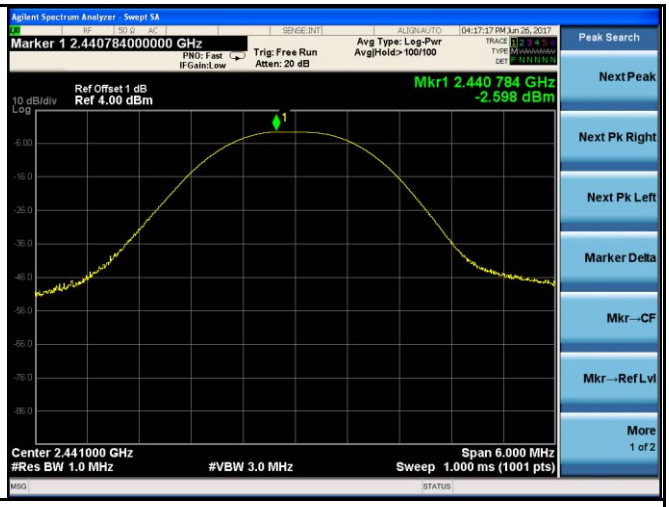
Peak Output Power measurement result

Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Limit (mW)	Result
Output power	GFSK	Low	2402	**-1.877**	0.649	1000	Pass
		Mid	2441	-2.598	0.550	1000	Pass
		High	2480	-3.851	0.412	1000	Pass
	π/4 DQPSK	Low	2402	-3.145	0.485	125	Pass
		Mid	2441	-3.718	0.425	125	Pass
		High	2480	-4.957	0.319	125	Pass
	8-DPSK	Low	2402	-2.879	0.515	125	Pass
		Mid	2441	-3.442	0.453	125	Pass
		High	2480	-4.696	0.339	125	Pass

Test Plots

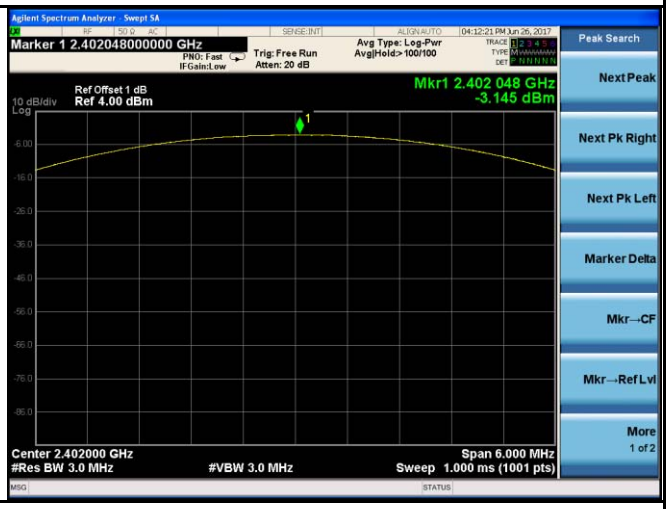
Output Power measurement result

GFSK Output power - Low CH 2402



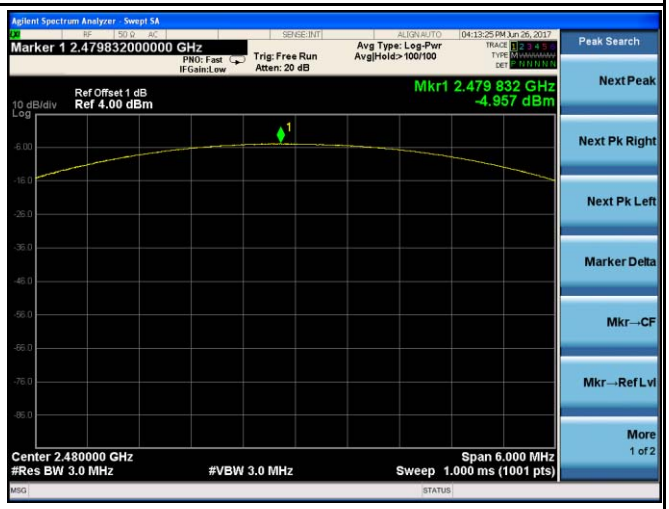
GFSK Output power - Mid CH 2441

GFSK Output power - High CH 2480



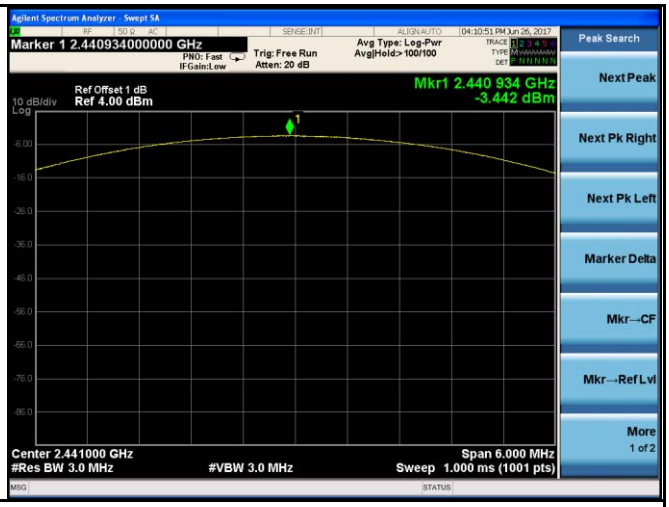
π/4 DQPSK Output power - Low CH 2402

π/4 DQPSK Output power - Mid CH 2441



π/4 DQPSK Output power - High CH 2480

8DPSK Output power - Low CH 2402



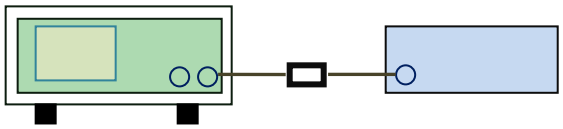
8DPSK Output power - Mid CH 2441

8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	23℃
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	June 26, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	FHSS in 2400-2483.5MHz ≥ 15 channels	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: The EUT must have its hopping function enabled. - Span = the frequency band of operation - RBW ≥1% of the span - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow trace to fully stabilize. - It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).		
Remark			
Result	☑ Pass	☐ Fail	

Test Data ☑ Yes ☐ N/A

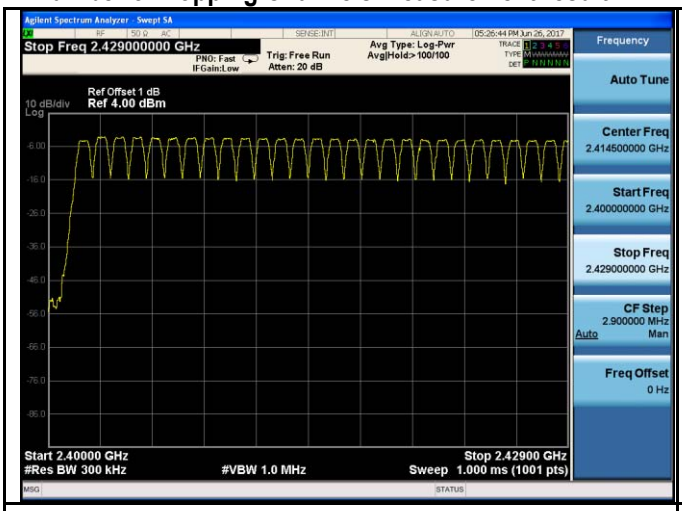
Test Plot ☑ Yes (See below) ☐ N/A

Number of Hopping Channel measurement result

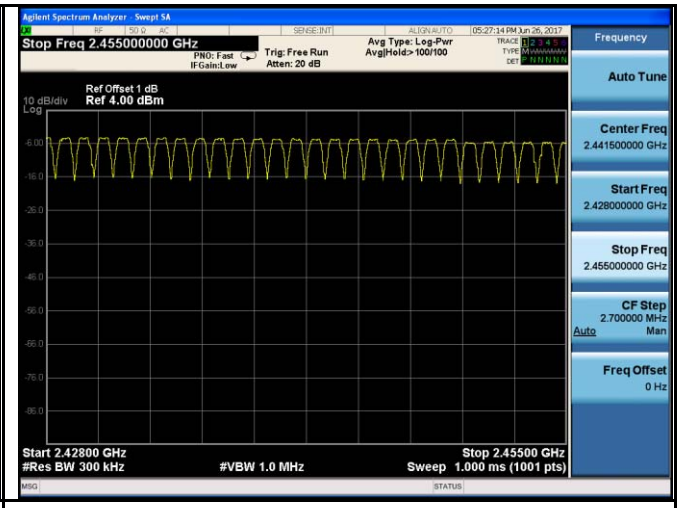
Type	Modulation	Frequency Range	Number of Hopping Channel	Limit
Number of Hopping Channel	GFSK	2400-2483.5	79	15
	π/4 DQPSK	2400-2483.5	79	15
	8-DPSK	2400-2483.5	79	15

Test Plots

Number of Hopping Channels measurement result

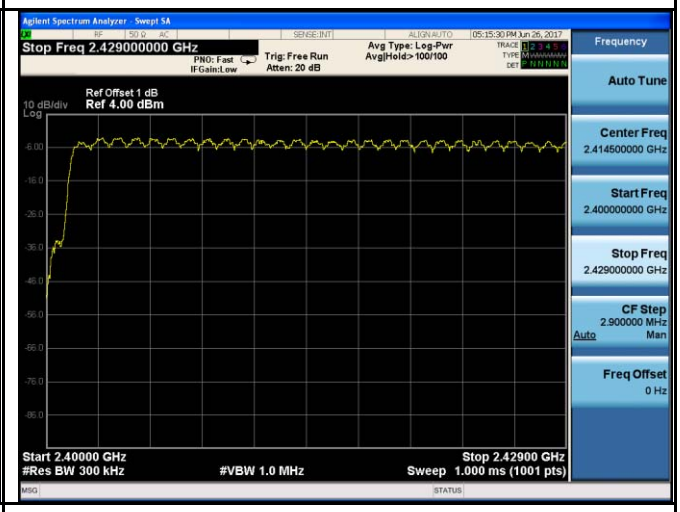


GFSK

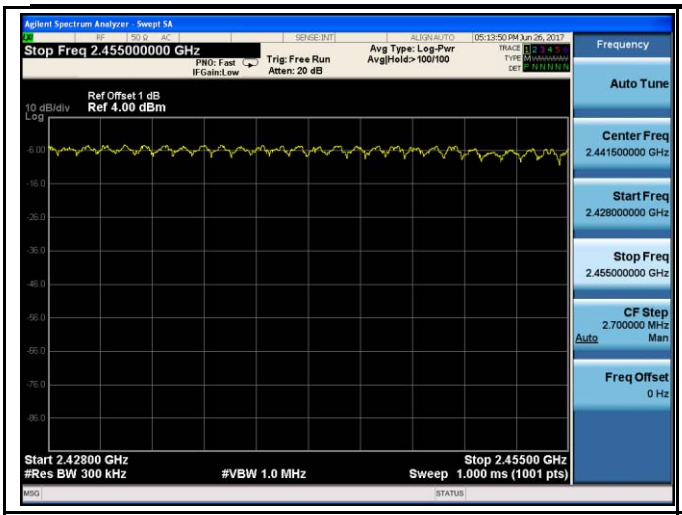


GFSK

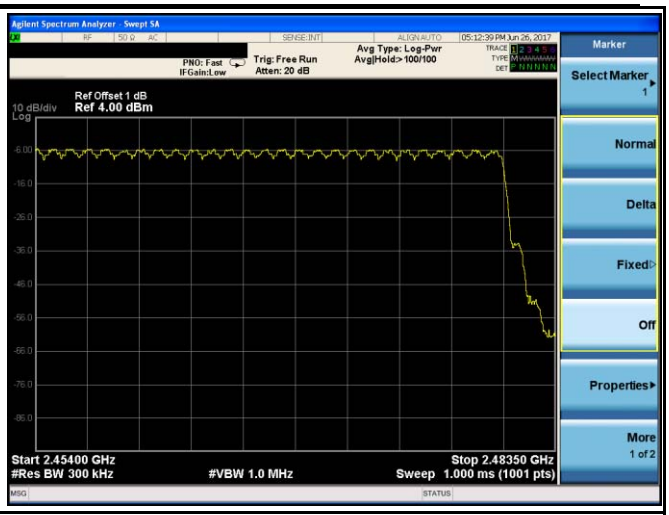
GFSK



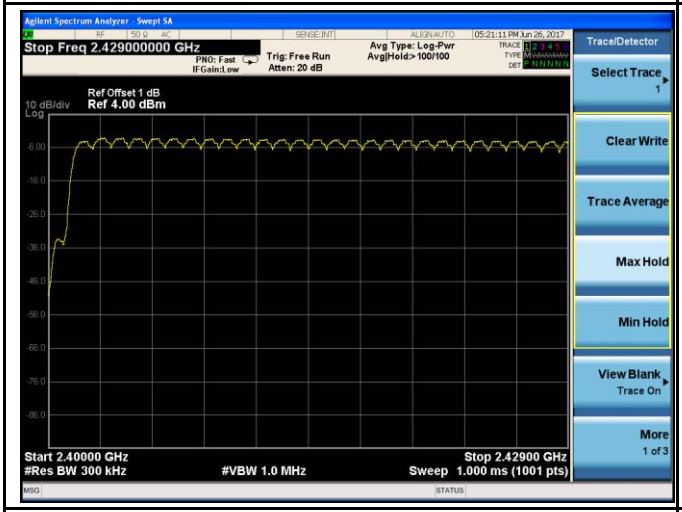
π/4DQPSK



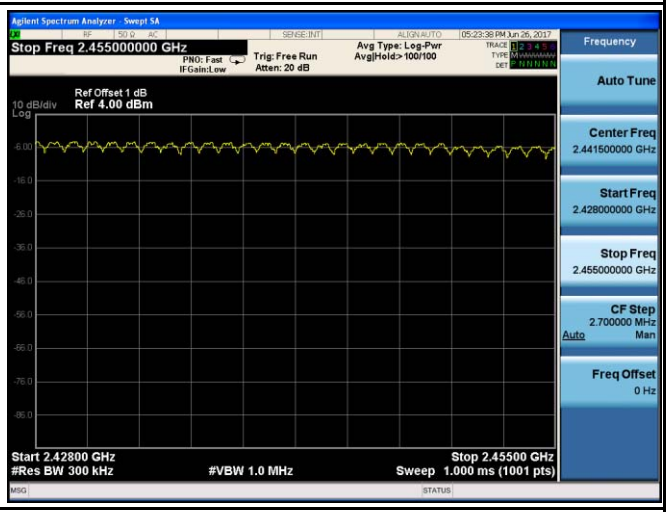
π/4DQPSK



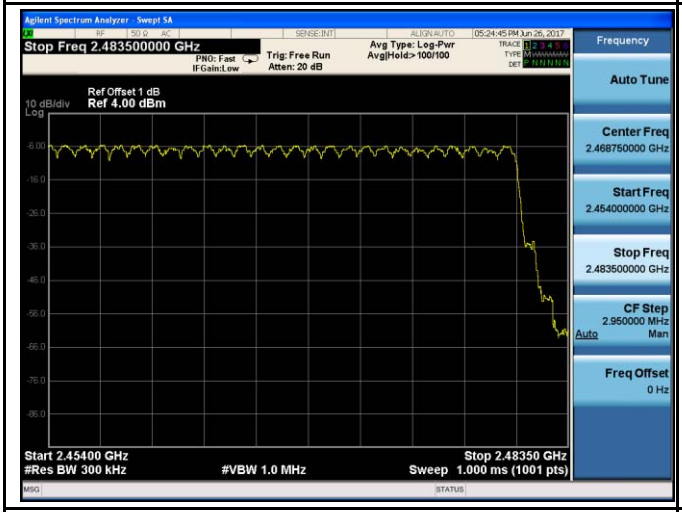
π/4DQPSK



8DPSK



8DPSK

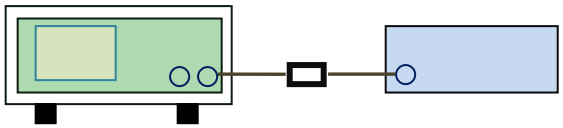


8DPSK

6.6 Time of Occupancy (Dwell Time)

Temperature	23℃
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	June 26, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	Dwell Time < 0.4s	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer - Span = zero span, centered on a hopping channel - RBW = 1 MHz - VBW ≥RBW - Sweep = as necessary to capture the entire dwell time per hopping channel - Detector function = peak - Trace = max hold - use the marker-delta function to determine the dwell time		
Remark			
Result	☑ Pass ☐ Fail		

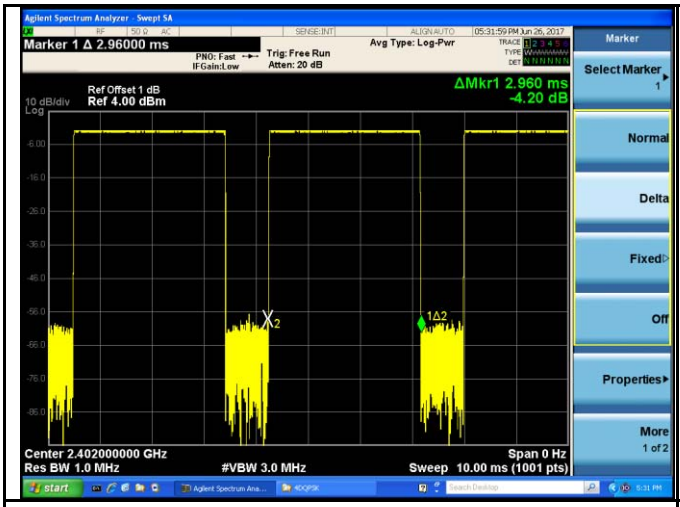
Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

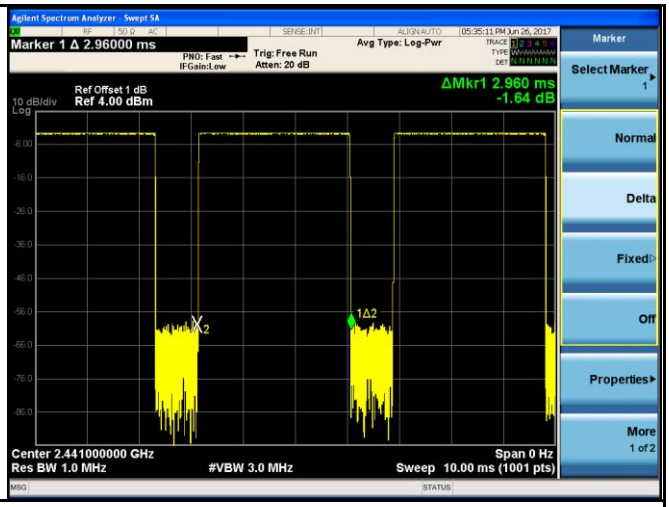
Dwell Time measurement result

Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.960	315.733	400	Pass
		Mid	2.960	315.733	400	Pass
		High	2.980	317.867	400	Pass
	π/4 DQPSK	Low	2.990	318.933	400	Pass
		Mid	2.980	317.867	400	Pass
		High	2.970	316.800	400	Pass
	8-DPSK	Low	2.950	314.667	400	Pass
		Mid	2.940	313.600	400	Pass
		High	2.980	317.867	400	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6						

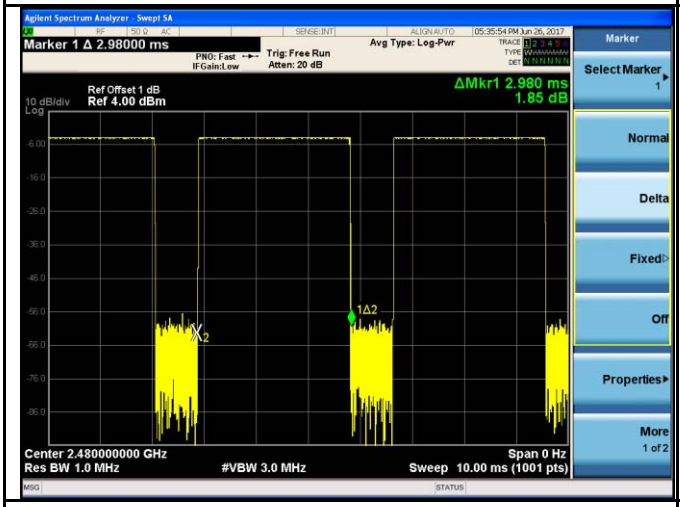
Test Plots
Dwell Time measurement result



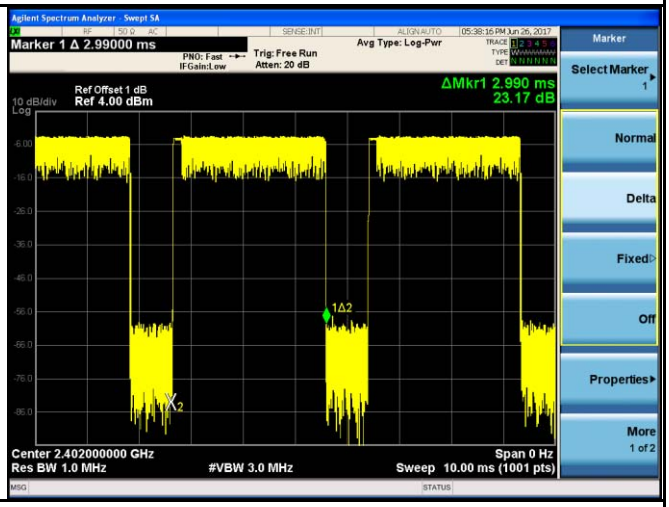
GFSK - Low CH 2402



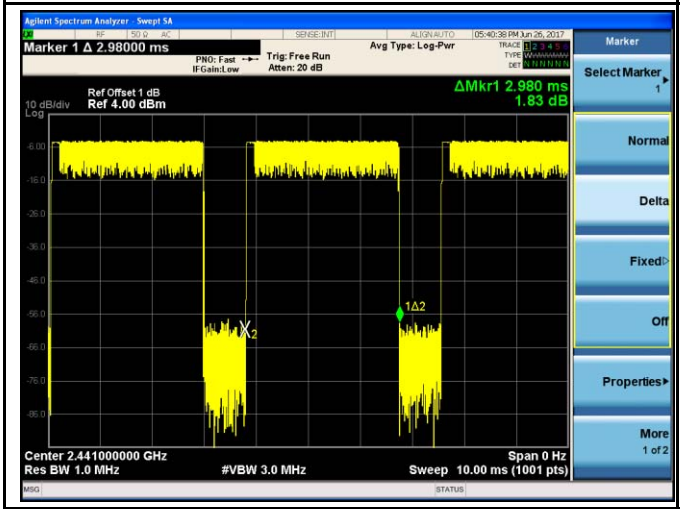
GFSK - Mid CH 2441



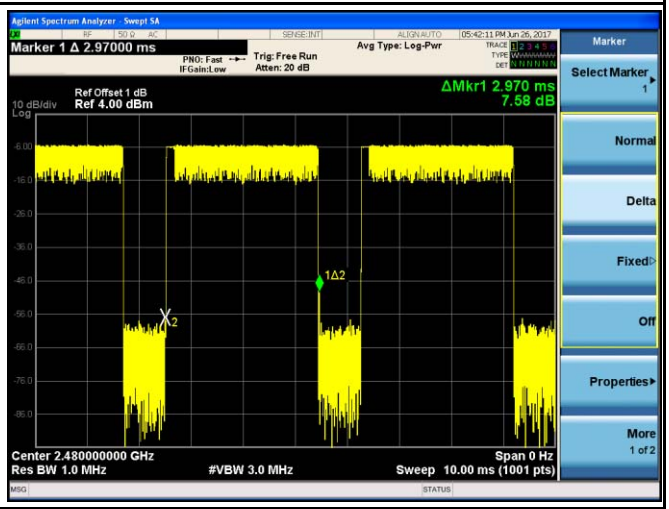
GFDK - High CH 2480



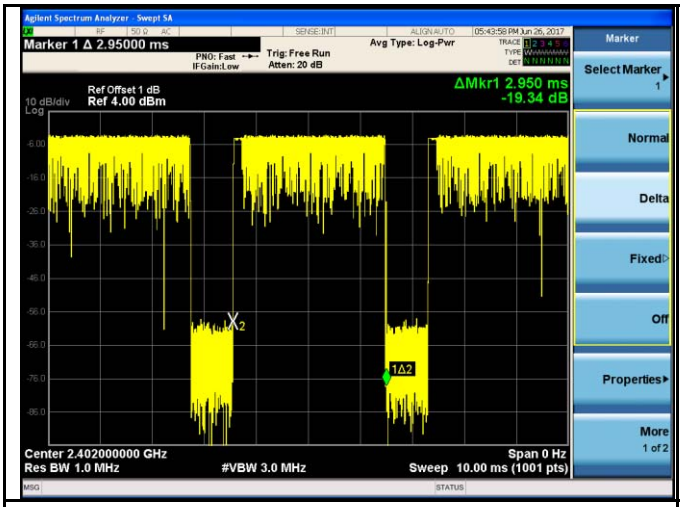
π/4 DQPSK - Low CH 2402



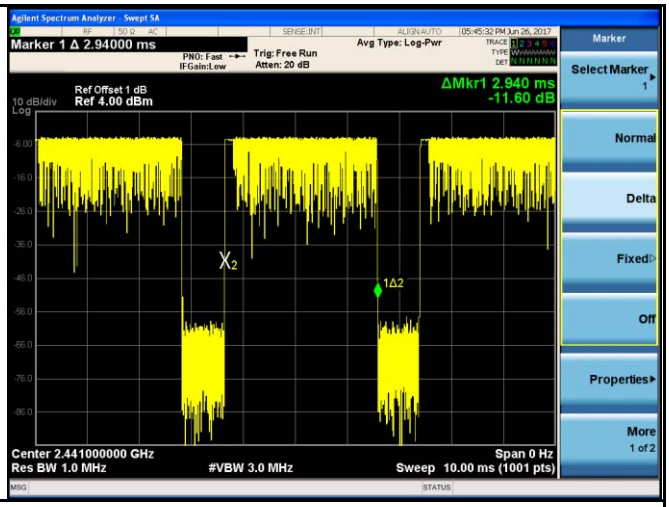
π/4 DQPSK - Mid CH 2441



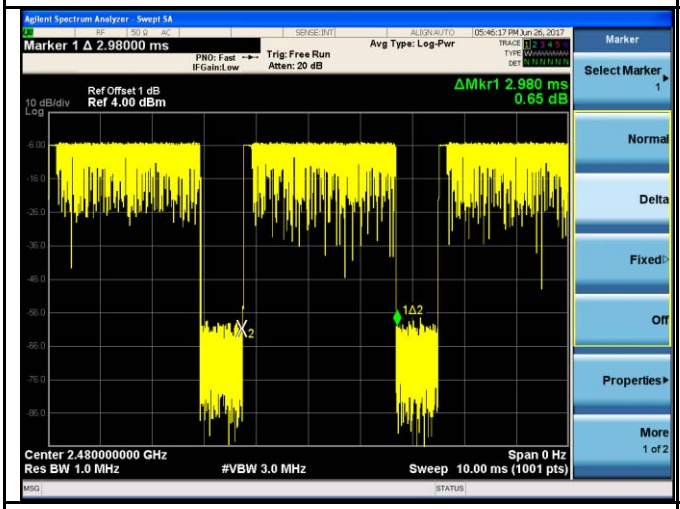
π/4 DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441



8DPSK - High CH 2480

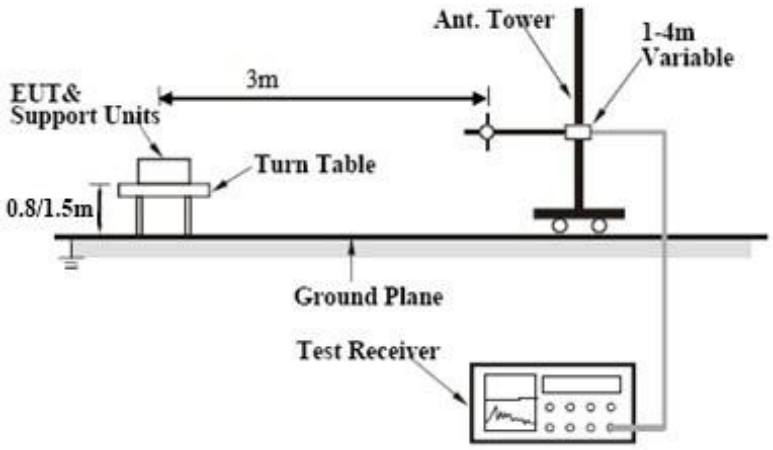
6.7 Band Edge & Restricted Band

Temperature	23℃
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	June 28, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.	☑

Test Setup



Test Procedure

The test follows FCC Public Notice DA 00-705 Measurement Guidelines.

Radiated Method Only

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below:
  a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.
  b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.
  c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.
- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 5. Repeat above procedures until all measured frequencies were complete.

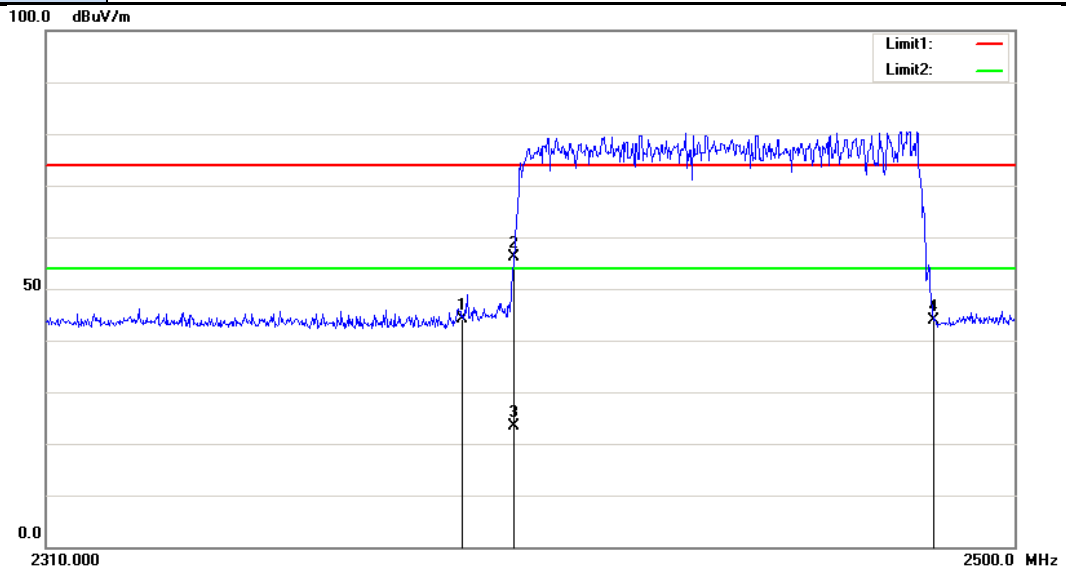
Remark

Result	☑ Pass ☐ Fail

Test Data ☐ Yes ☑ N/A

Test Plot ☑ Yes (See below) ☐ N/A

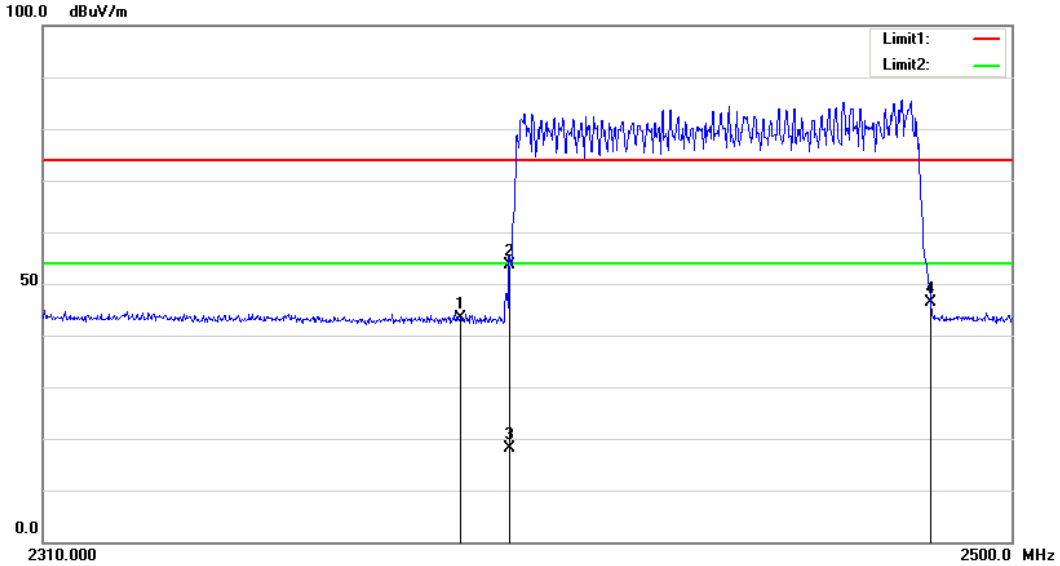
Test Mode:	GFSK Hopping Mode



Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	61.21	peak	31.53	52.55	4.02	44.21	74.00	-29.79	100	151
2	2400.000	73.16	peak	31.54	52.56	4.01	56.15	74.00	-17.85	100	56
3	2400.000	40.51	AVG	31.54	52.56	4.01	23.50	54.00	-30.50	100	56
4	2483.500	60.88	peak	31.59	52.63	4.06	43.90	74.00	-30.10	100	246

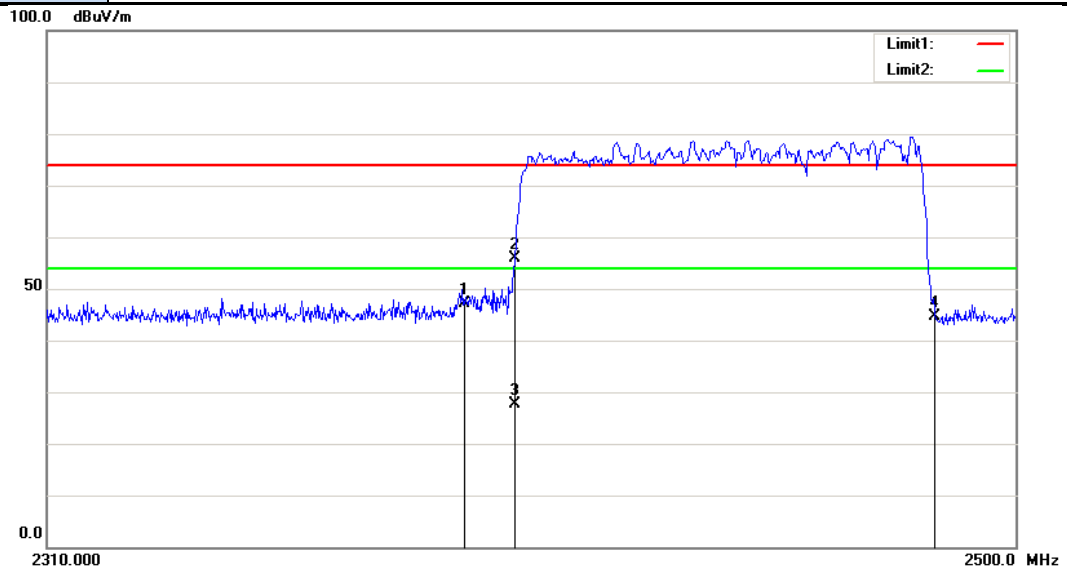


Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	60.27	peak	31.53	52.55	4.02	43.27	74.00	-30.73	300	101
2	2400.000	70.53	peak	31.54	52.56	4.01	53.52	74.00	-20.48	200	318
3	2400.000	35.21	AVG	31.54	52.56	4.01	18.20	54.00	-35.80	200	318
4	2483.500	63.45	peak	31.59	52.63	4.06	46.47	74.00	-27.53	100	303

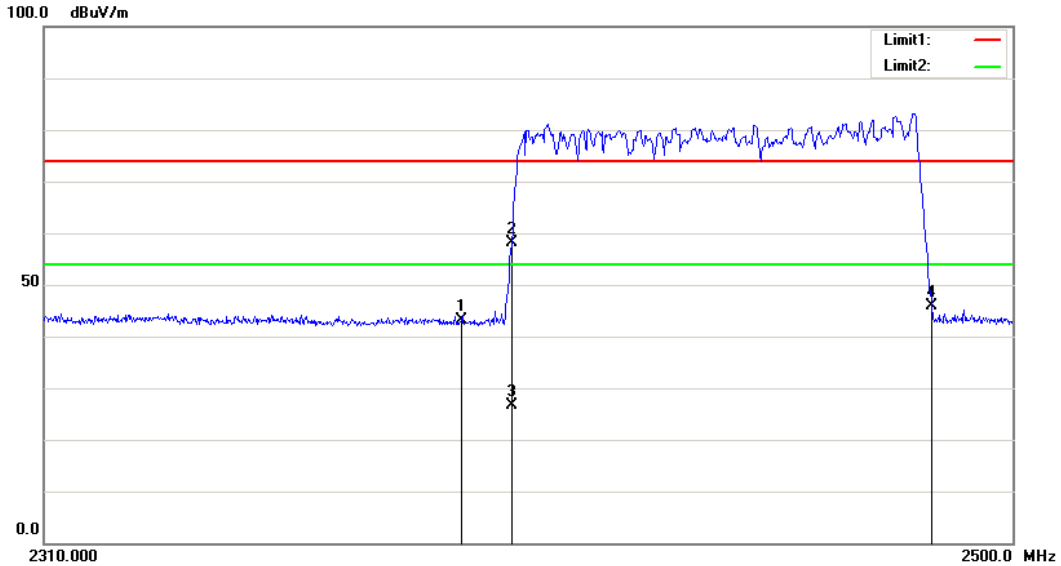
Test Mode:	π/4 DQPSK Hopping Mode



Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	64.24	peak	31.53	52.55	4.02	47.24	74.00	-26.76	100	208
2	2400.000	72.90	peak	31.54	52.56	4.01	55.89	74.00	-18.11	200	41
3	2400.000	44.71	AVG	31.54	52.56	4.01	27.70	54.00	-26.30	200	41
4	2483.500	61.59	peak	31.59	52.63	4.06	44.61	74.00	-29.39	300	160

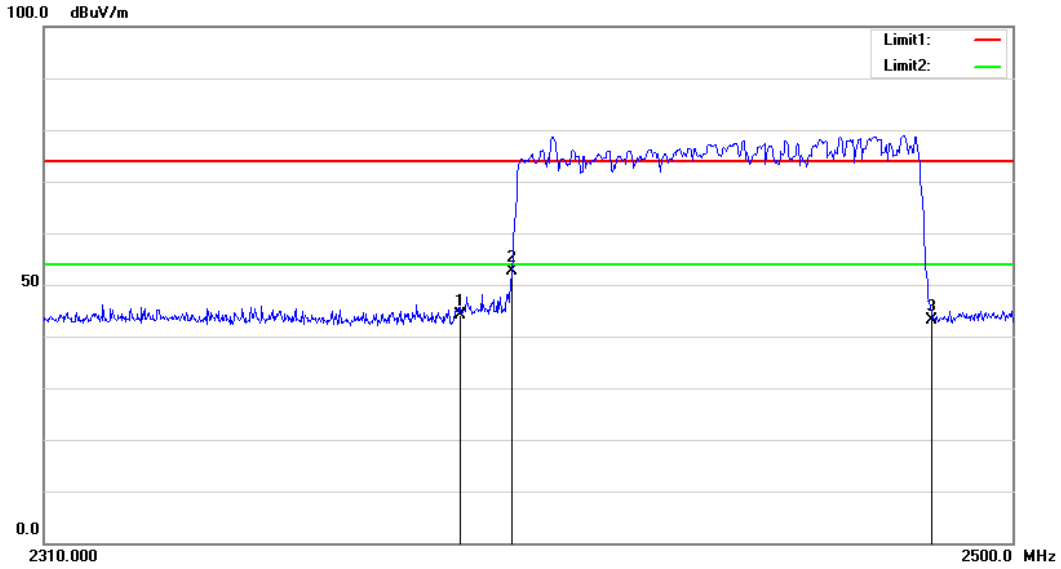


Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	60.20	peak	31.53	52.55	4.02	43.20	74.00	-30.80	100	232
2	2400.000	75.22	peak	31.54	52.56	4.01	58.21	74.00	-15.79	200	92
3	2400.000	43.61	AVG	31.54	52.56	4.01	26.60	54.00	-27.40	200	92
4	2483.500	62.78	peak	31.59	52.63	4.06	45.80	74.00	-28.20	200	354

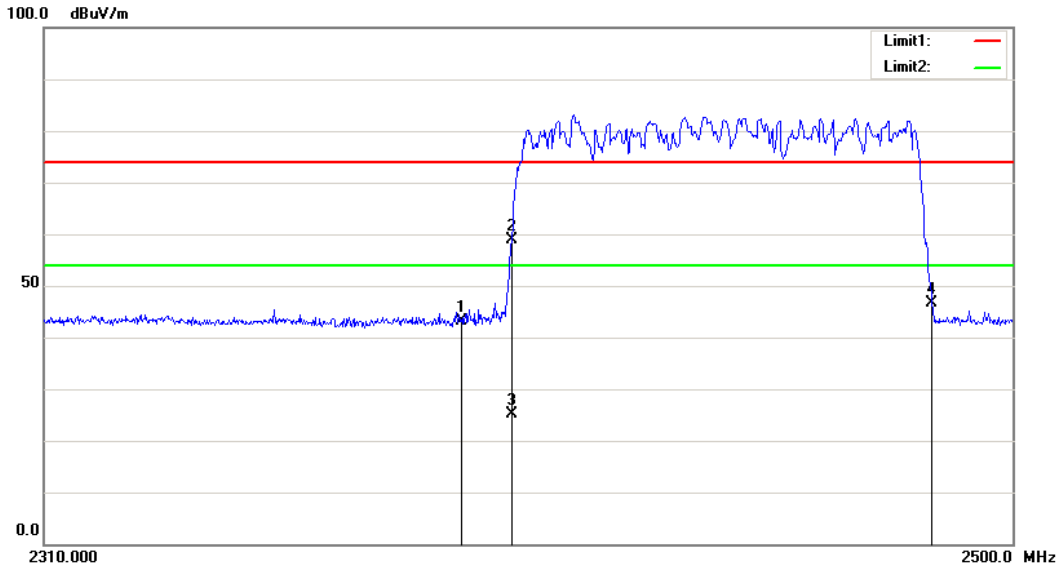
Test Mode:	8DPSK Hopping Mode



Test Data

Vertical Polarity Plot @3m

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	2390.000	61.18	peak	31.53	52.55	4.02	44.18	74.00	-29.82	100	173
2	2400.000	69.69	peak	31.54	52.56	4.01	52.68	74.00	-21.32	200	330
3	2483.500	60.21	peak	31.59	52.63	4.06	43.23	74.00	-30.77	200	282

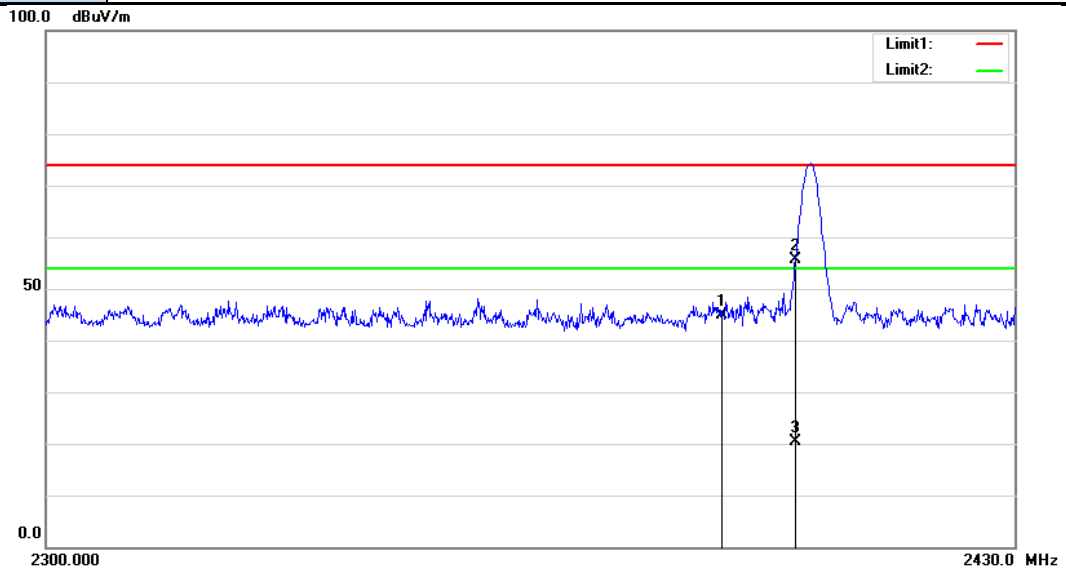


Test Data

Horizontal Polarity Plot @3m

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	2390.000	60.07	peak	31.53	52.55	4.02	43.07	74.00	-30.93	300	125
2	2400.000	75.80	peak	31.54	52.56	4.01	58.79	74.00	-15.21	100	256
3	2400.000	42.21	AVG	31.54	52.56	4.01	25.20	54.00	-28.80	100	256
4	2483.500	63.57	peak	31.59	52.63	4.06	46.59	74.00	-27.41	200	92

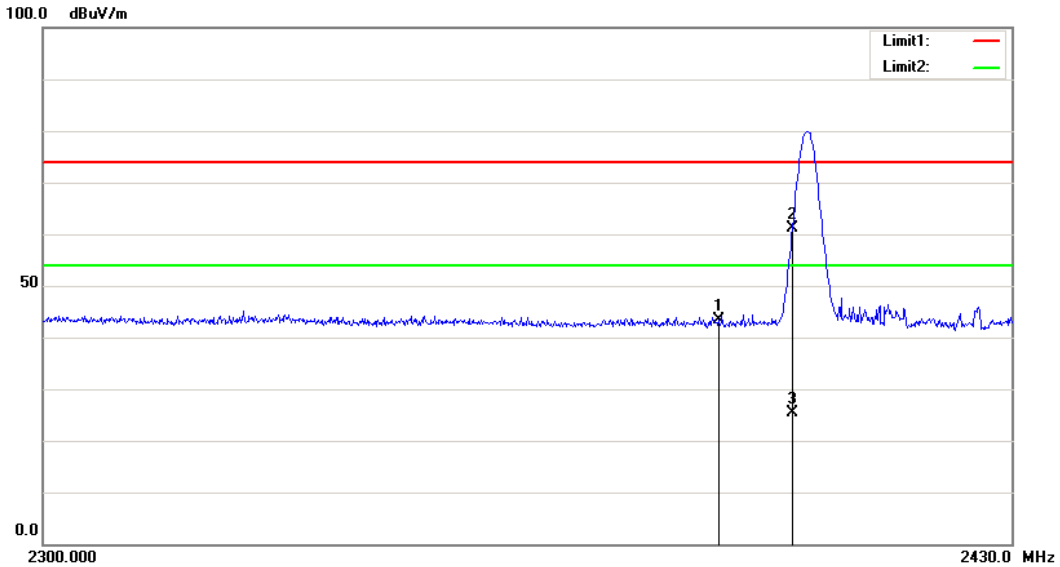
Test Mode:	GFSK Mode – Left



Test Data

Vertical Polarity Plot @3m

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	2390.000	61.98	peak	31.53	52.55	4.02	44.98	74.00	-29.02	200	149
2	2400.000	72.56	peak	31.54	52.56	4.01	55.55	74.00	-18.45	100	42
3	2400.000	37.34	AVG	31.54	52.56	4.01	20.33	54.00	-33.67	100	42

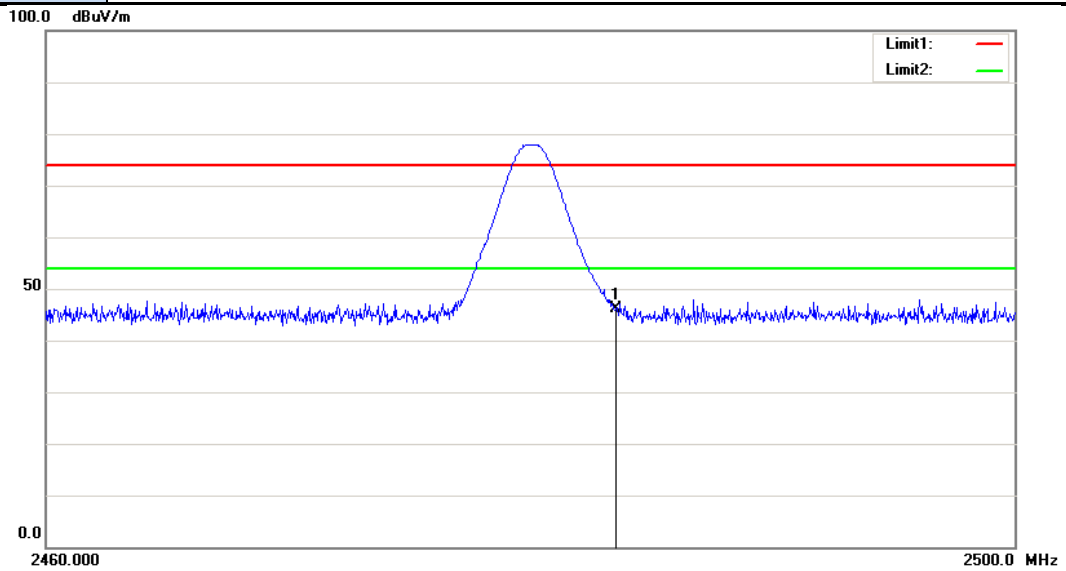


Test Data

Horizontal Polarity Plot @3m

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	2390.000	60.26	peak	31.53	52.55	4.02	43.26	74.00	-30.74	100	113
2	2400.000	78.20	peak	31.54	52.56	4.01	61.19	74.00	-12.81	200	258
3	2400.000	42.35	AVG	31.54	52.56	4.01	25.34	54.00	-28.66	200	258

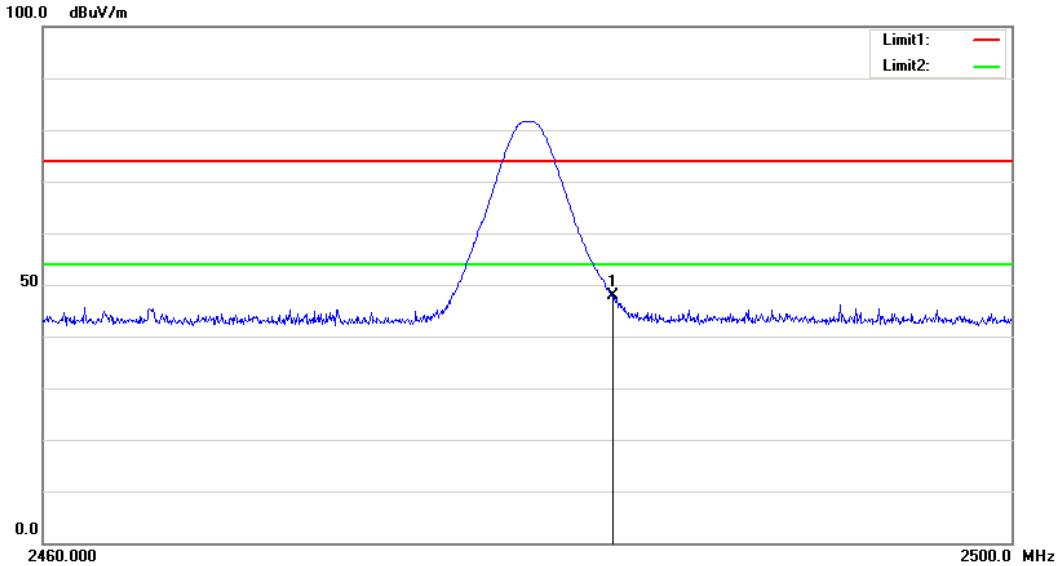
Test Mode:	GFSK Mode – Right



Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2483.500	63.10	peak	31.59	52.63	4.06	46.12	74.00	-27.88	300	256

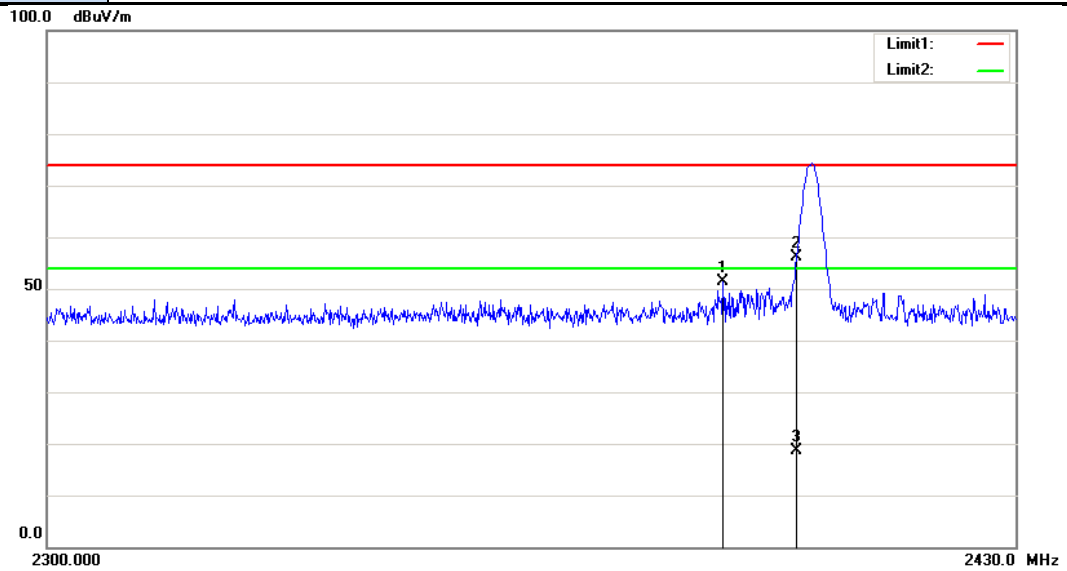


Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2483.500	64.79	peak	31.59	52.63	4.06	47.81	74.00	-26.19	200	247

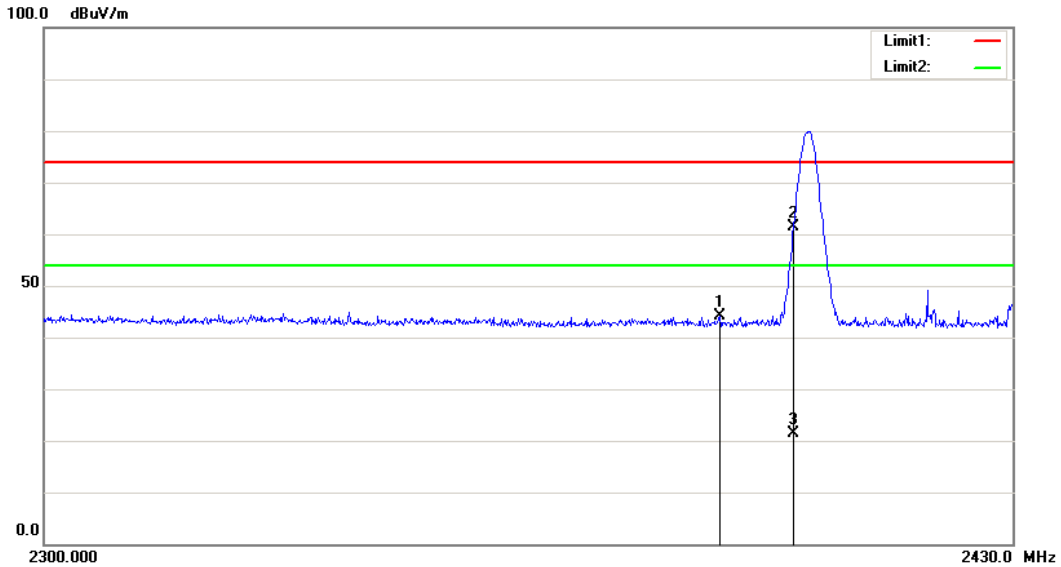
Test Mode:	π /4 DQPSK Mode – Left



Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	68.41	peak	31.53	52.55	4.02	51.41	74.00	-22.59	100	175
2	2400.000	73.04	peak	31.54	52.56	4.01	56.03	74.00	-17.97	300	44
3	2400.000	35.61	AVG	31.54	52.56	4.01	18.60	54.00	-35.40	300	44

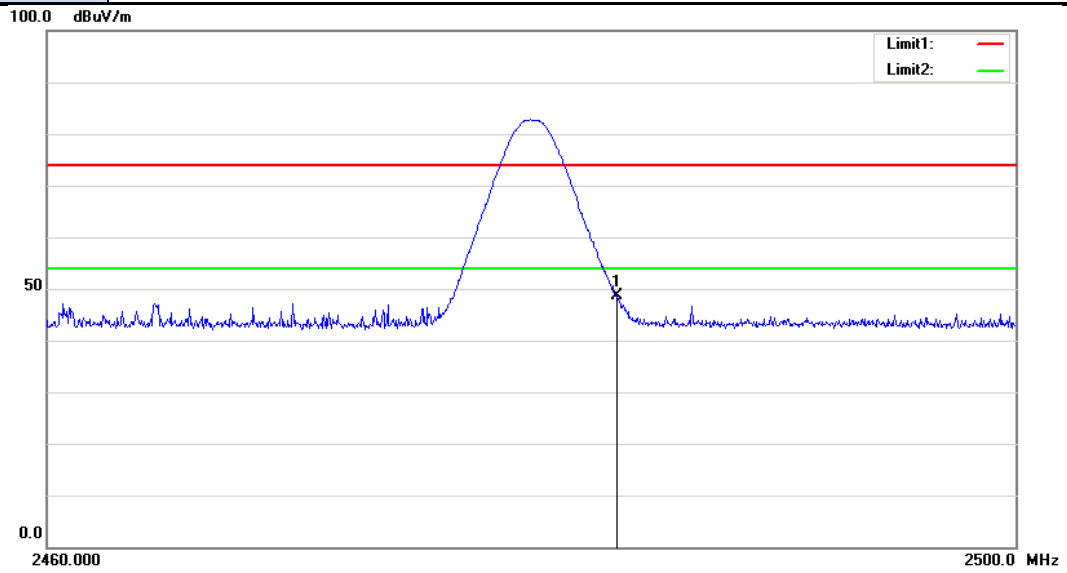


Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	61.05	peak	31.53	52.55	4.02	44.05	74.00	-29.95	100	113
2	2400.000	78.39	peak	31.54	52.56	4.01	61.38	74.00	-12.62	200	246
3	2400.000	38.31	AVG	31.54	52.56	4.01	21.30	54.00	-32.70	200	246

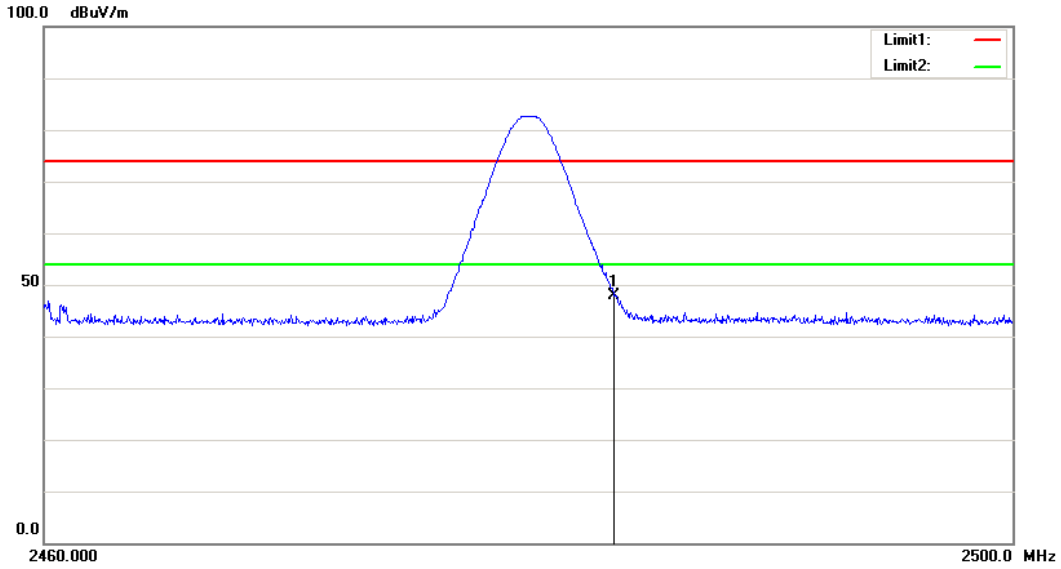
Test Mode:	π /4 DQPSK Mode – Right



Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2483.500	65.61	peak	31.59	52.63	4.06	48.63	74.00	-25.37	200	92

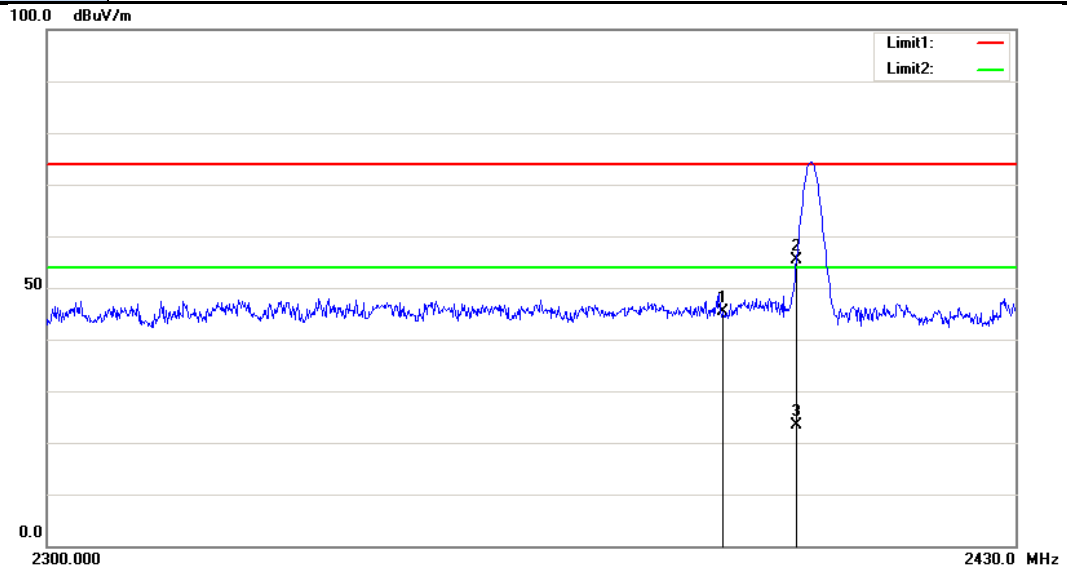


Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2483.500	65.61	peak	31.59	52.63	4.06	48.63	74.00	-25.37	200	92

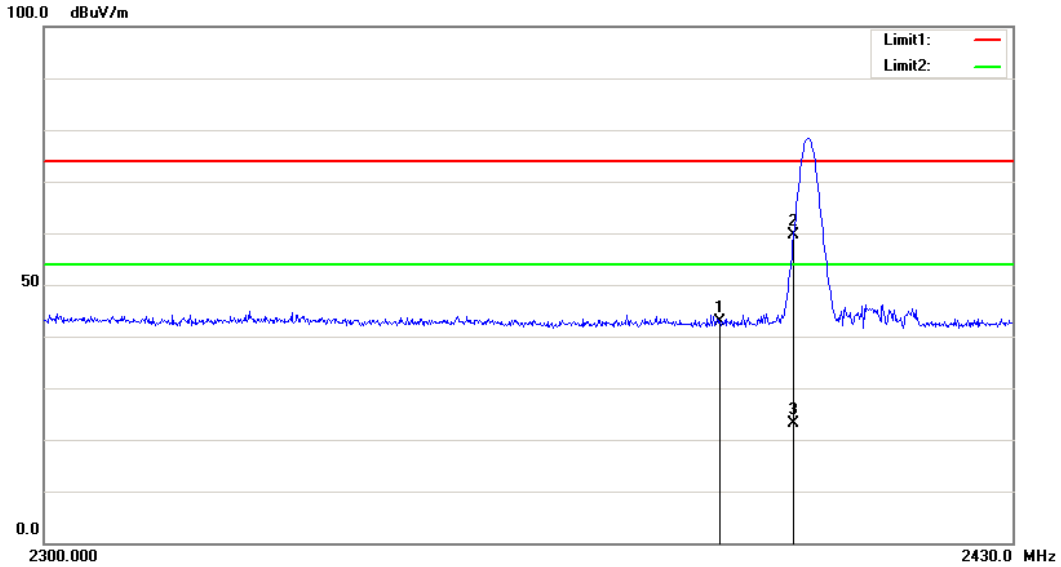
Test Mode:	8DPSK Mode – Left



Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	62.32	peak	31.53	52.55	4.02	45.32	74.00	-28.68	100	163
2	2400.000	72.41	peak	31.54	52.56	4.01	55.40	74.00	-18.60	200	44
3	2400.000	40.27	AVG	31.54	52.56	4.01	23.26	54.00	-30.74	200	44

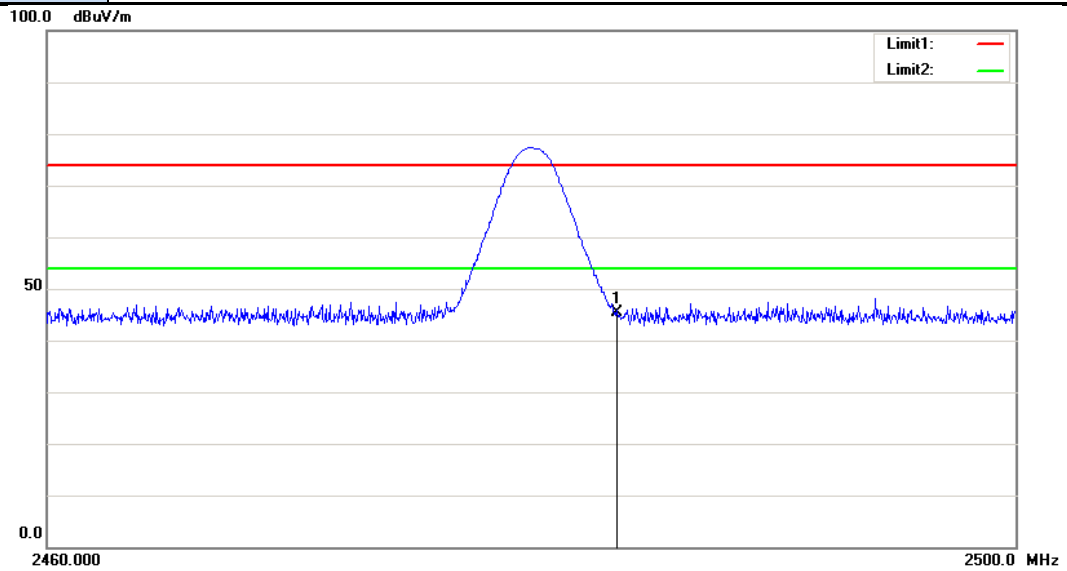


Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	59.88	peak	31.53	52.55	4.02	42.88	74.00	-31.12	300	149
2	2400.000	76.68	peak	31.54	52.56	4.01	59.67	74.00	-14.33	100	244
3	2400.000	40.21	AVG	31.54	52.56	4.01	23.20	54.00	-30.80	100	244

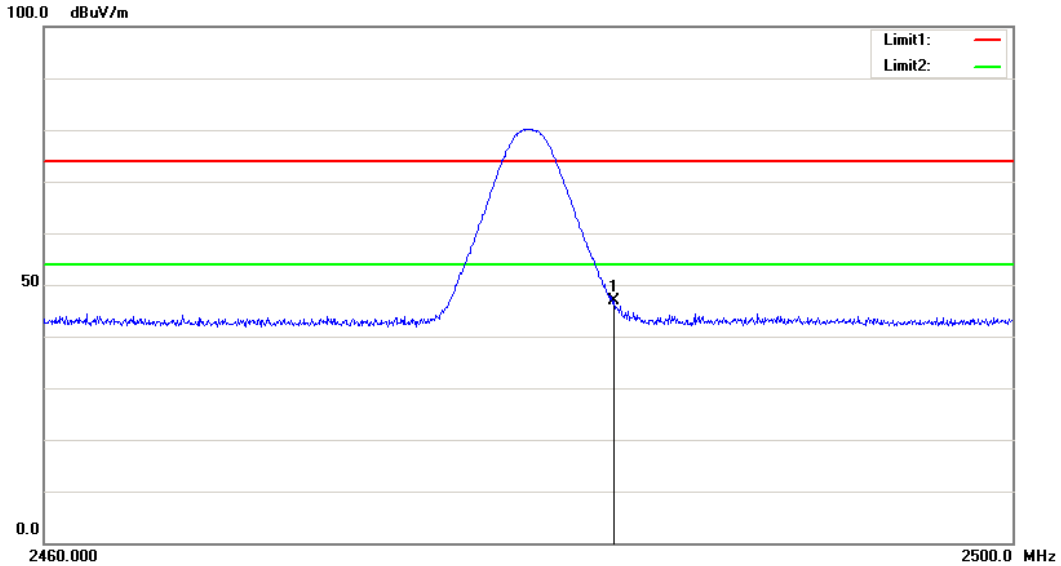
Test Mode:	8DPSK Mode – Right



Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2483.500	62.26	peak	31.59	52.63	4.06	45.28	74.00	-28.72	200	187



Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2483.500	63.74	peak	31.59	52.63	4.06	46.76	74.00	-27.24	100	77

6.8 AC Power Line Conducted Emissions

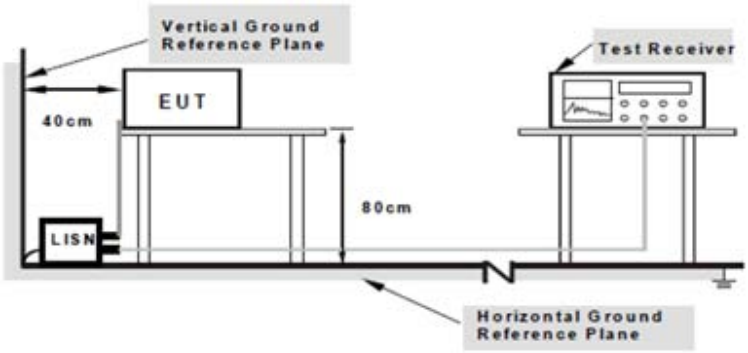
Temperature	23℃
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	June 12, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.207, RSS210 (A8.1)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.	☑

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

Procedure

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another main supply.
5. The EUT was switched on and allowed to warm up to its normal operating condition.
6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz.
8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).

Remark

we test 3 modulations ， only show GFSK test data in the report

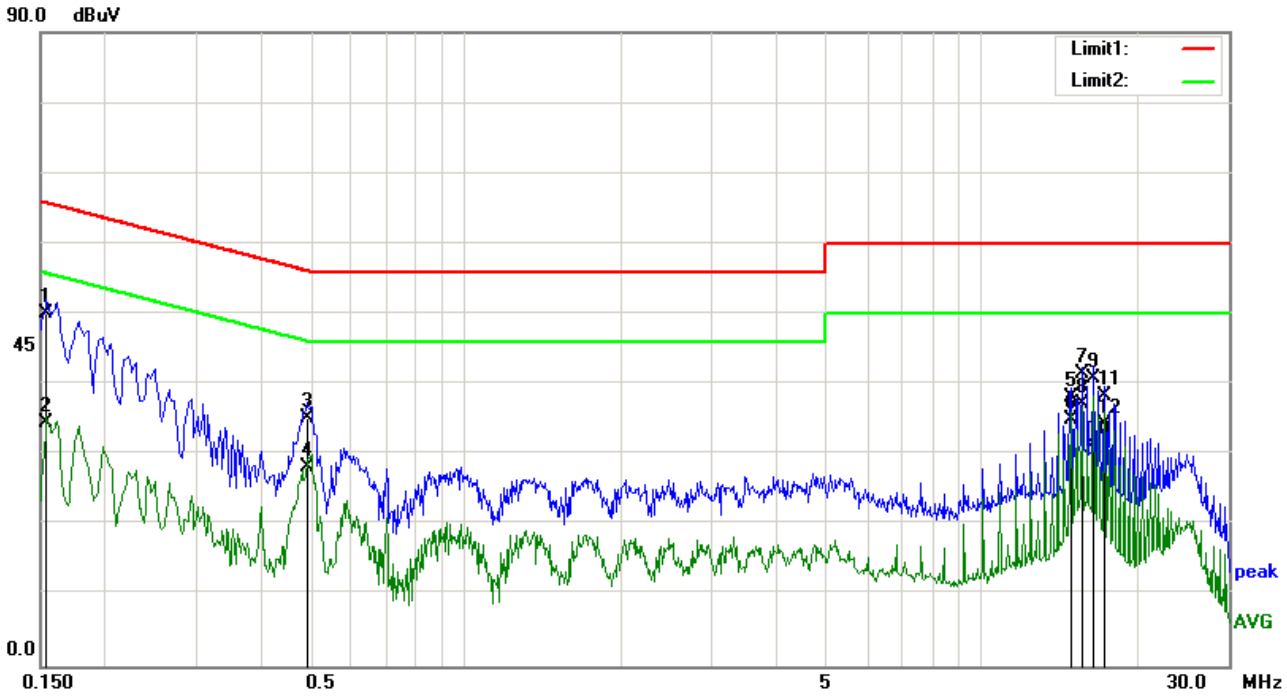
Result

☑ Pass ☐ Fail

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Test Mode :	Transmit Mode (Low channel)

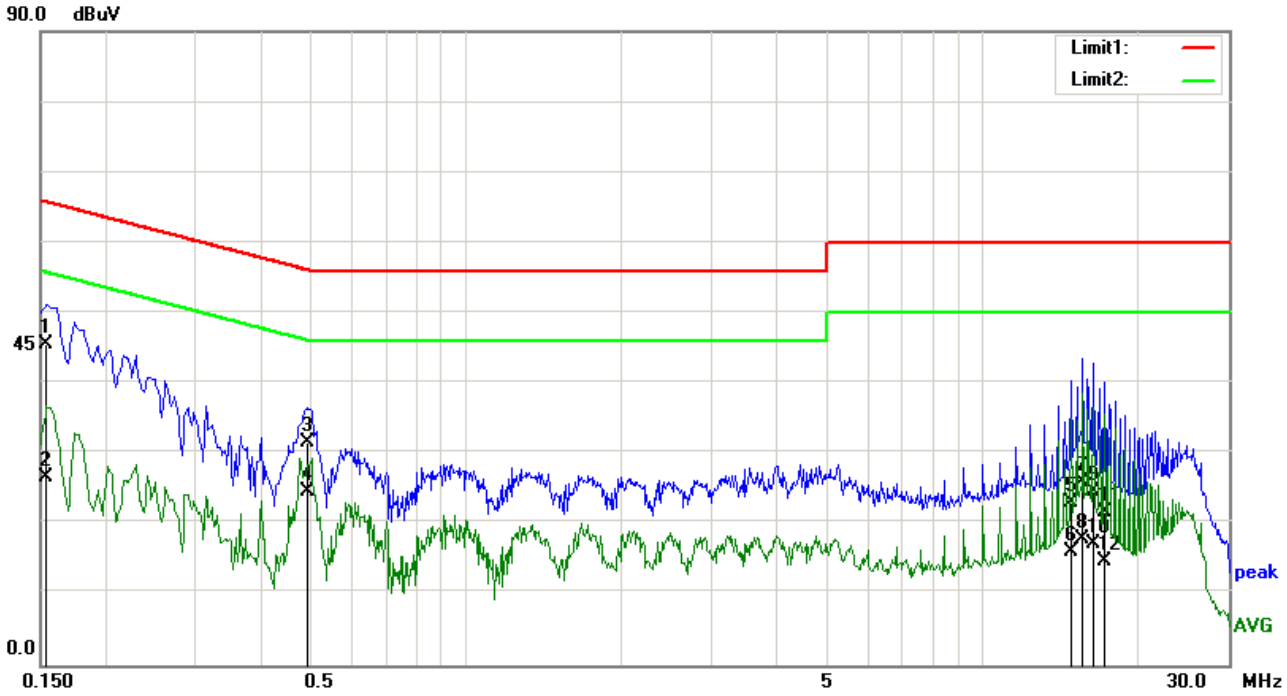


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/lsn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.1540	39.69	QP	0.10	-10.00	0.35	50.14	65.78	-15.64
2	0.1540	23.99	AVG	0.10	-10.00	0.35	34.44	55.78	-21.34
3	0.4940	24.93	QP	0.12	-10.00	0.21	35.26	56.10	-20.84
4	0.4940	18.01	AVG	0.12	-10.00	0.21	28.34	46.10	-17.76
5	14.8300	26.80	QP	0.85	-10.00	0.47	38.12	60.00	-21.88
6	14.8300	23.69	AVG	0.85	-10.00	0.47	35.01	50.00	-14.99
7	15.6340	30.09	QP	0.89	-10.00	0.47	41.45	60.00	-18.55
8	15.6340	25.99	AVG	0.89	-10.00	0.47	37.35	50.00	-12.65
9	16.4300	29.42	QP	0.92	-10.00	0.48	40.82	60.00	-19.18
10	16.4300	20.08	AVG	0.92	-10.00	0.48	31.48	50.00	-18.52
11	17.2340	26.94	QP	0.96	-10.00	0.49	38.39	60.00	-21.61
12	17.2340	22.82	AVG	0.96	-10.00	0.49	34.27	50.00	-15.73

Test Mode :	Transmit Mode(Low channel)

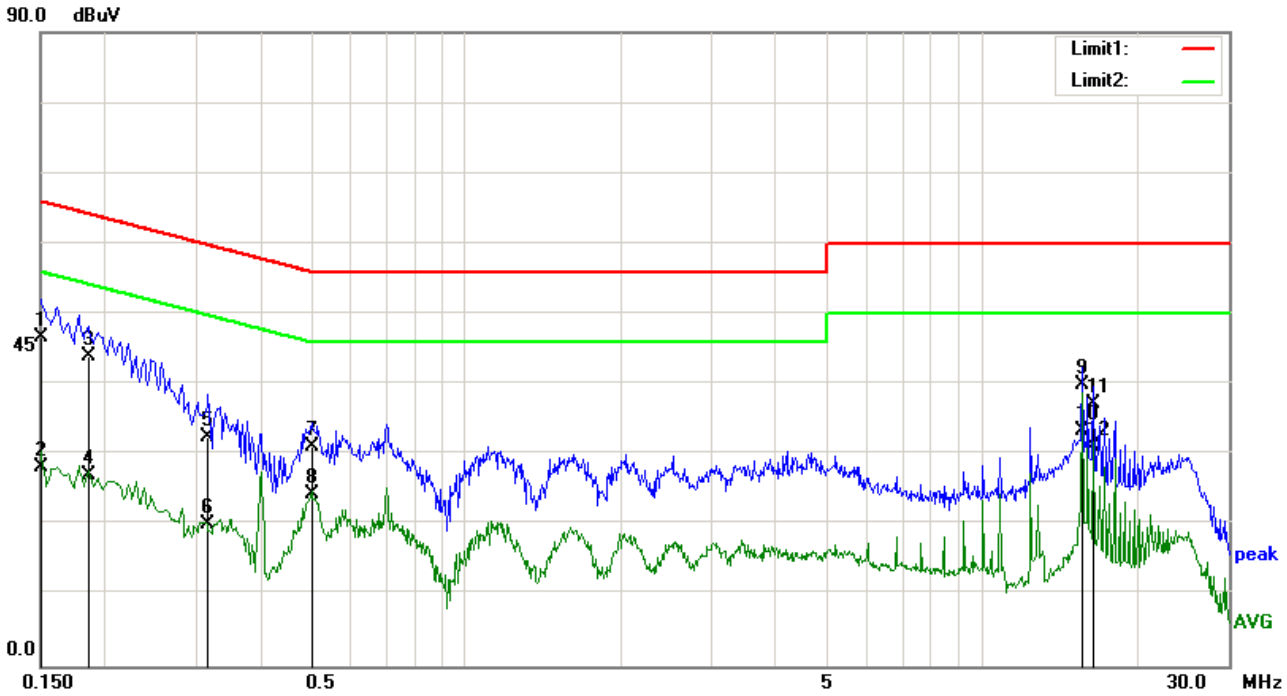


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.1540	35.04	QP	0.11	-10.00	0.35	45.50	65.78	-20.28
2	0.1540	16.11	AVG	0.11	-10.00	0.35	26.57	55.78	-29.21
3	0.4940	21.40	QP	0.11	-10.00	0.21	31.72	56.10	-24.38
4	0.4940	14.37	AVG	0.11	-10.00	0.21	24.69	46.10	-21.41
5	14.8500	11.71	QP	0.94	-10.00	0.47	23.12	60.00	-36.88
6	14.8500	4.66	AVG	0.94	-10.00	0.47	16.07	50.00	-33.93
7	15.6460	14.48	QP	0.98	-10.00	0.47	25.93	60.00	-34.07
8	15.6460	6.43	AVG	0.98	-10.00	0.47	17.88	50.00	-32.12
9	16.4460	13.19	QP	1.02	-10.00	0.49	24.70	60.00	-35.30
10	16.4460	5.65	AVG	1.02	-10.00	0.49	17.16	50.00	-32.84
11	17.2580	10.15	QP	1.06	-10.00	0.49	21.70	60.00	-38.30
12	17.2580	3.23	AVG	1.06	-10.00	0.49	14.78	50.00	-35.22

Test Mode :	Transmit Mode (Low channel)

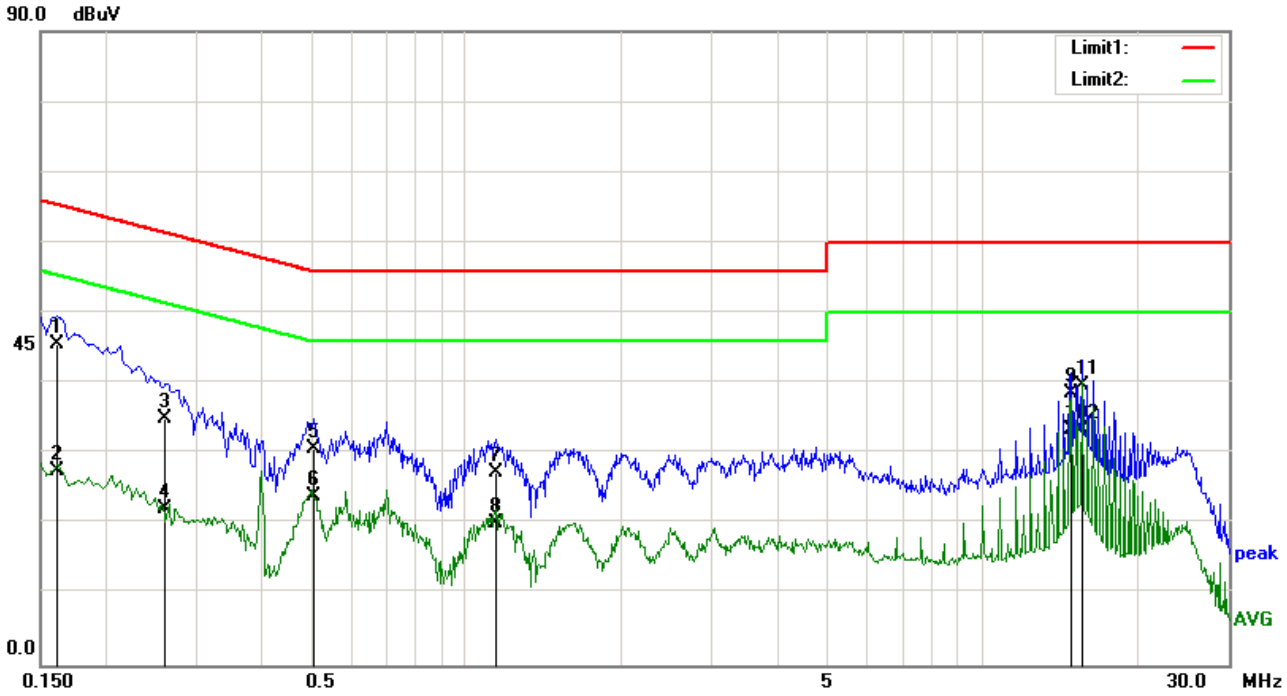


Test Data

Phase Line Plot at 230Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/lsn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.1500	36.17	QP	0.10	-10.00	0.36	46.63	66.00	-19.37
2	0.1500	17.70	AVG	0.10	-10.00	0.36	28.16	56.00	-27.84
3	0.1860	33.68	QP	0.10	-10.00	0.30	44.08	64.21	-20.13
4	0.1860	16.69	AVG	0.10	-10.00	0.30	27.09	54.21	-27.12
5	0.3180	22.30	QP	0.11	-10.00	0.20	32.61	59.76	-27.15
6	0.3180	9.91	AVG	0.11	-10.00	0.20	20.22	49.76	-29.54
7	0.5020	20.77	QP	0.12	-10.00	0.21	31.10	56.00	-24.90
8	0.5020	14.02	AVG	0.12	-10.00	0.21	24.35	46.00	-21.65
9	15.6420	28.62	QP	0.89	-10.00	0.47	39.98	60.00	-20.02
10	15.6420	22.15	AVG	0.89	-10.00	0.47	33.51	50.00	-16.49
11	16.4380	25.85	QP	0.92	-10.00	0.49	37.26	60.00	-22.74
12	16.4380	19.73	AVG	0.92	-10.00	0.49	31.14	50.00	-18.86

Test Mode :	Transmit Mode (Low channel)



Test Data

Phase Neutral Plot at 230Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.1620	35.21	QP	0.11	-10.00	0.34	45.66	65.36	-19.70
2	0.1620	17.19	AVG	0.11	-10.00	0.34	27.64	55.36	-27.72
3	0.2620	24.70	QP	0.10	-10.00	0.20	35.00	61.37	-26.37
4	0.2620	11.77	AVG	0.10	-10.00	0.20	22.07	51.37	-29.30
5	0.5100	20.50	QP	0.11	-10.00	0.21	30.82	56.00	-25.18
6	0.5100	13.71	AVG	0.11	-10.00	0.21	24.03	46.00	-21.97
7	1.1460	17.06	QP	0.14	-10.00	0.20	27.40	56.00	-28.60
8	1.1460	9.90	AVG	0.14	-10.00	0.20	20.24	46.00	-25.76
9	14.8300	27.28	QP	0.94	-10.00	0.47	38.69	60.00	-21.31
10	14.8300	21.92	AVG	0.94	-10.00	0.47	33.33	50.00	-16.67
11	15.6340	28.31	QP	0.98	-10.00	0.47	39.76	60.00	-20.24
12	15.6340	22.01	AVG	0.98	-10.00	0.47	33.46	50.00	-16.54