

5. CONDUCTED SPURIOUS EMISSIONS

5.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum	Agilent	N9030A	MY51380221	Oct.31, 13	1 Year
2.	Attenuator (20dB)	Agilent	8491B	MY39262165	Apr. 28,14	1 Year
3.	RF Cable	Hubersuhner	SUCOFLEX102	28620/2	Apr. 28,14	1 Year

5.2. Limit

In any 100kHz 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.

5.3. Test Procedure

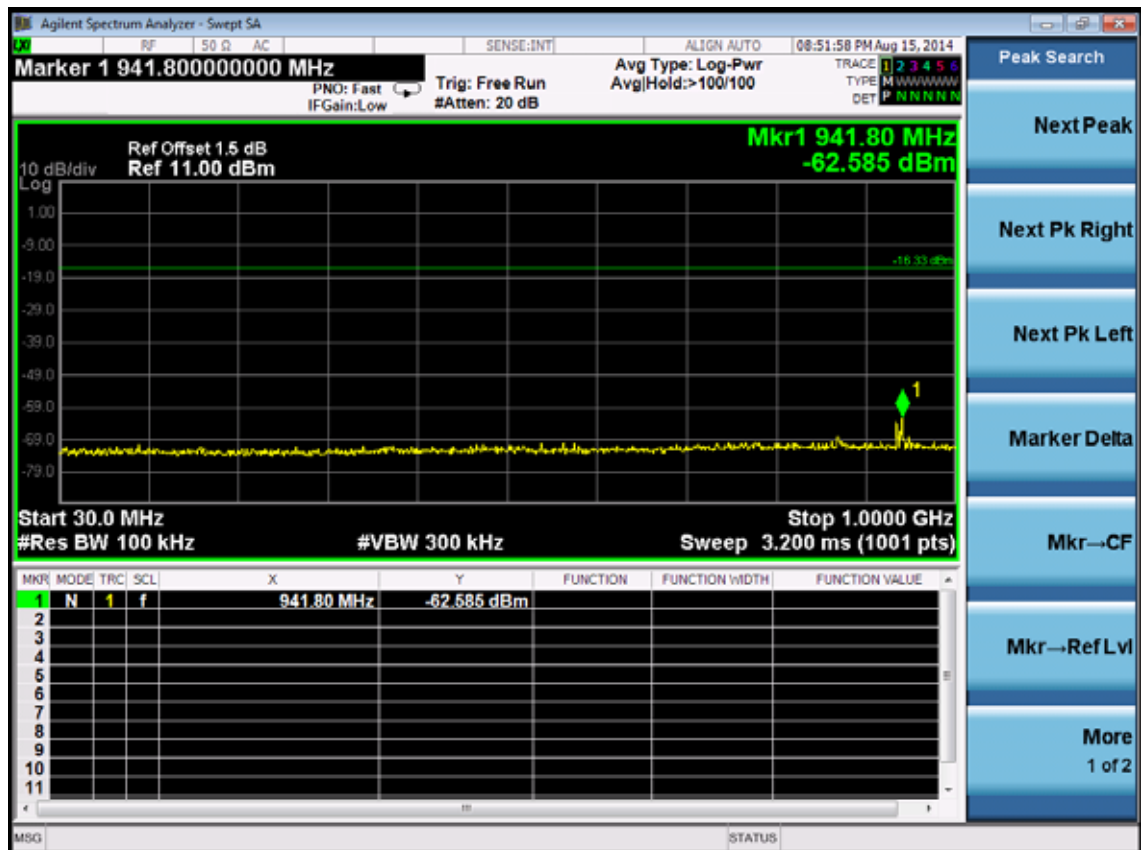
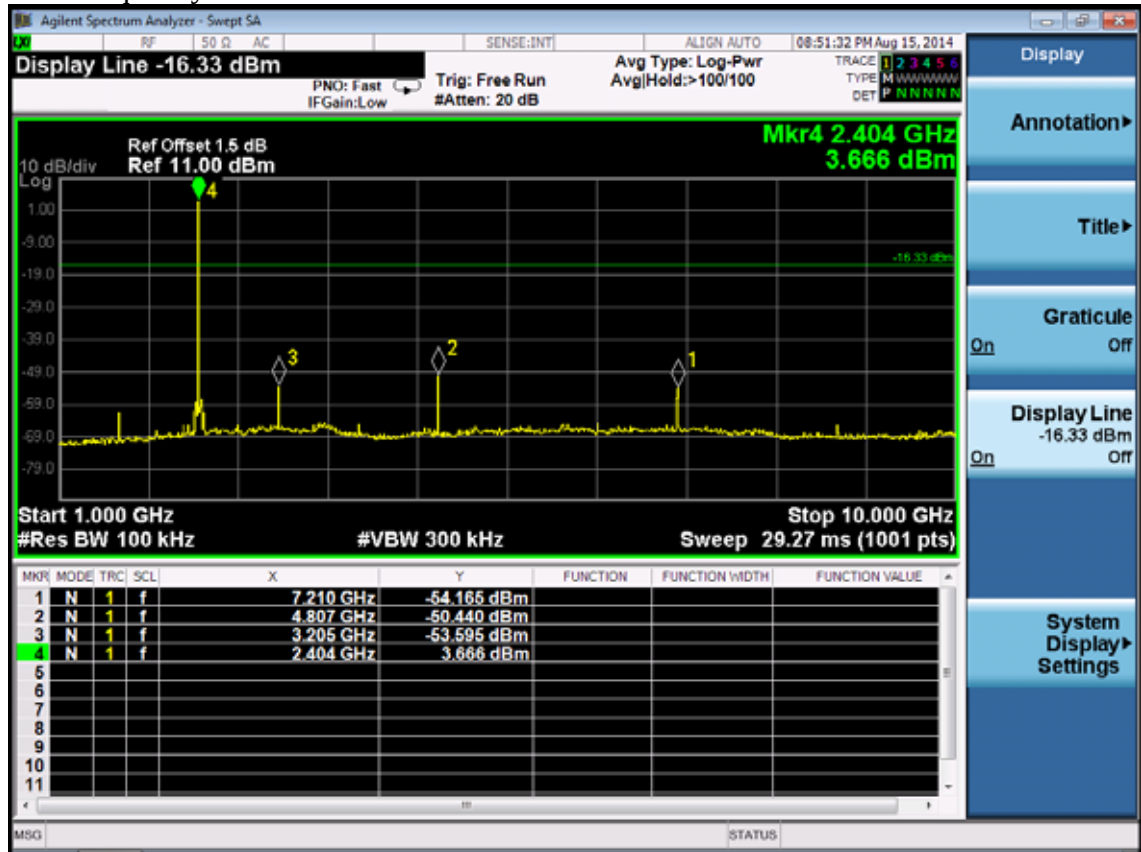
The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions detected.

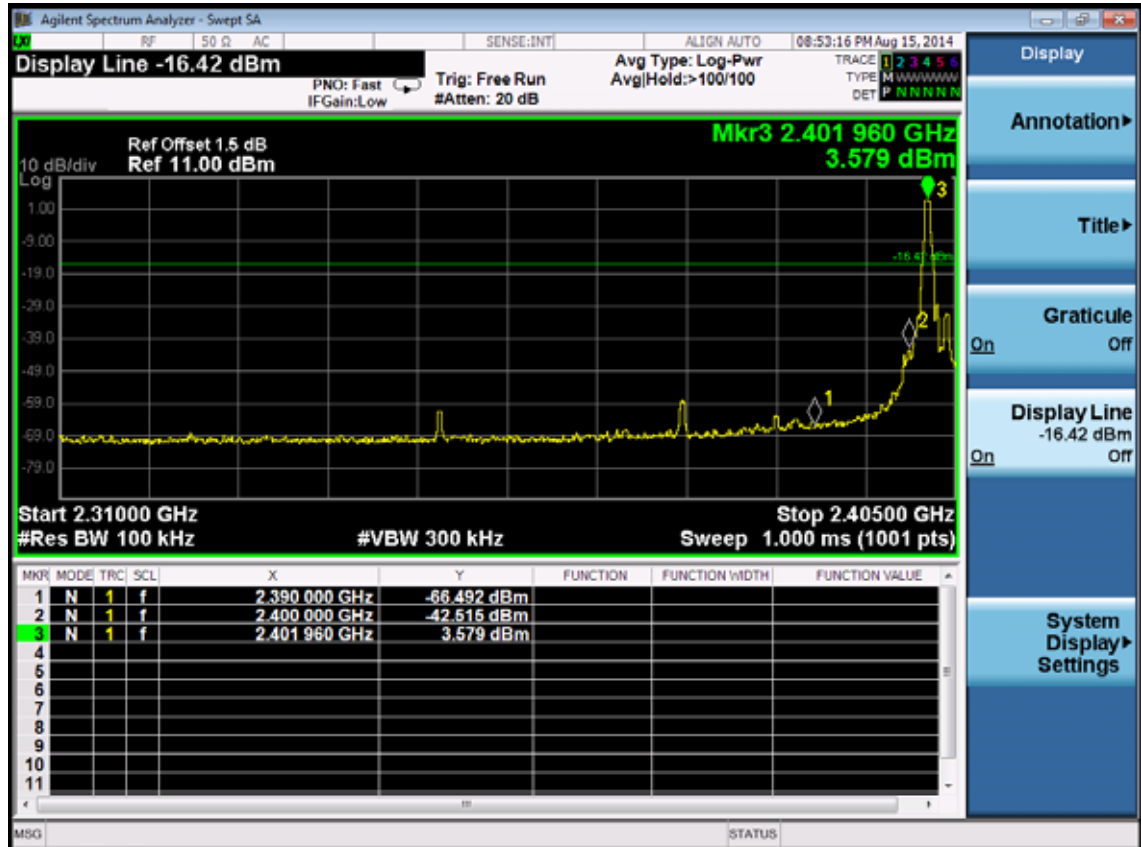
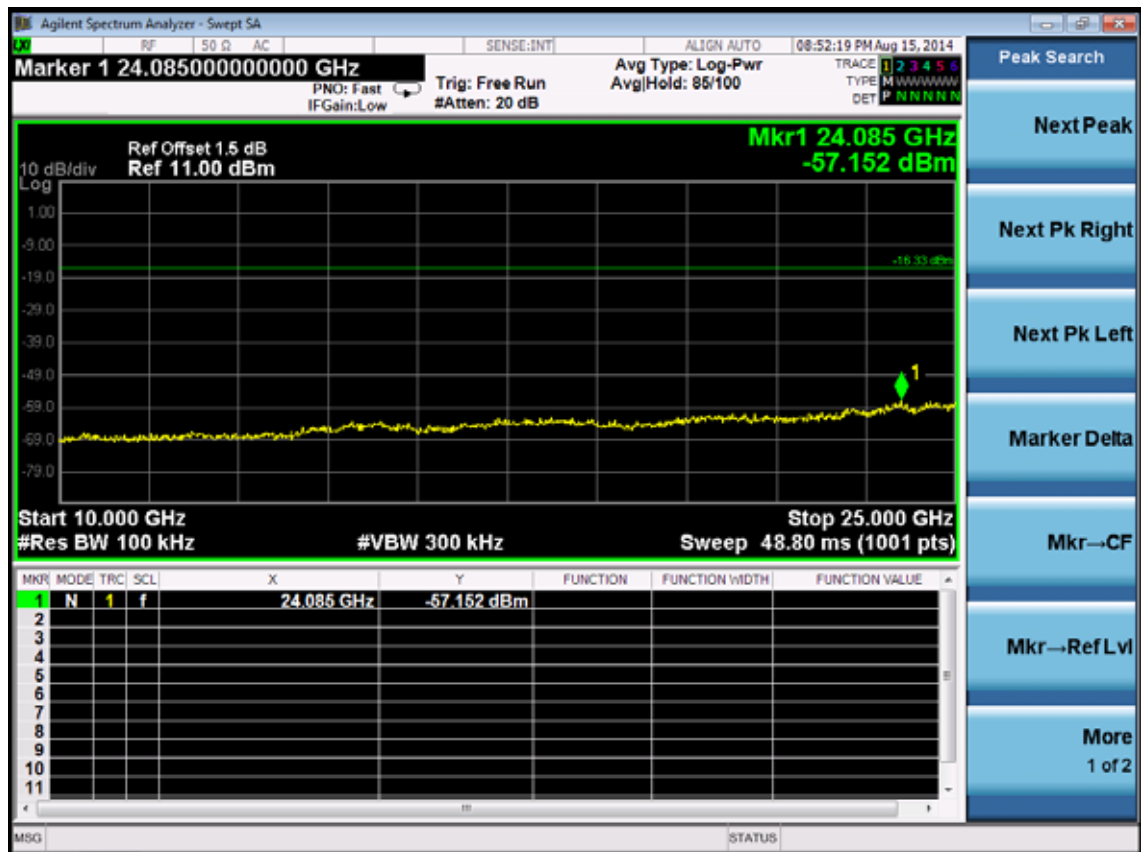
5.4. Test result

PASS (The testing data was attached in the next pages.)

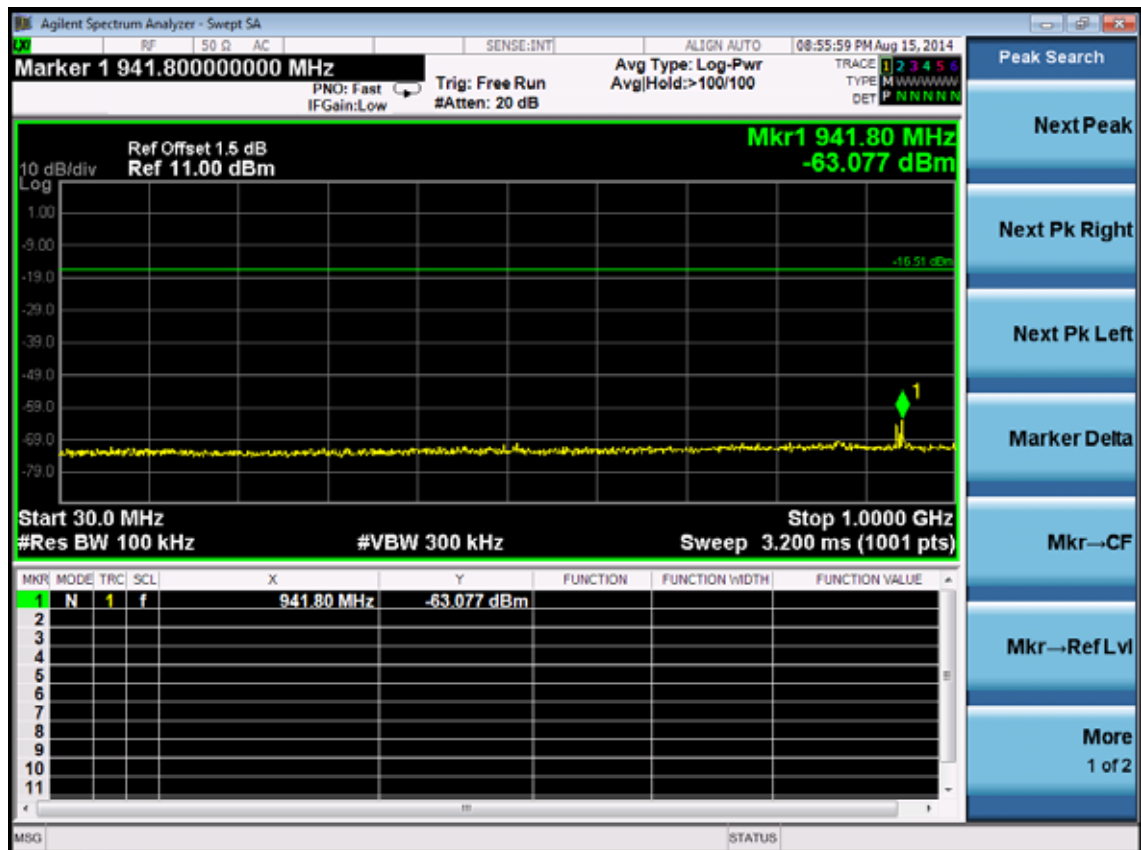
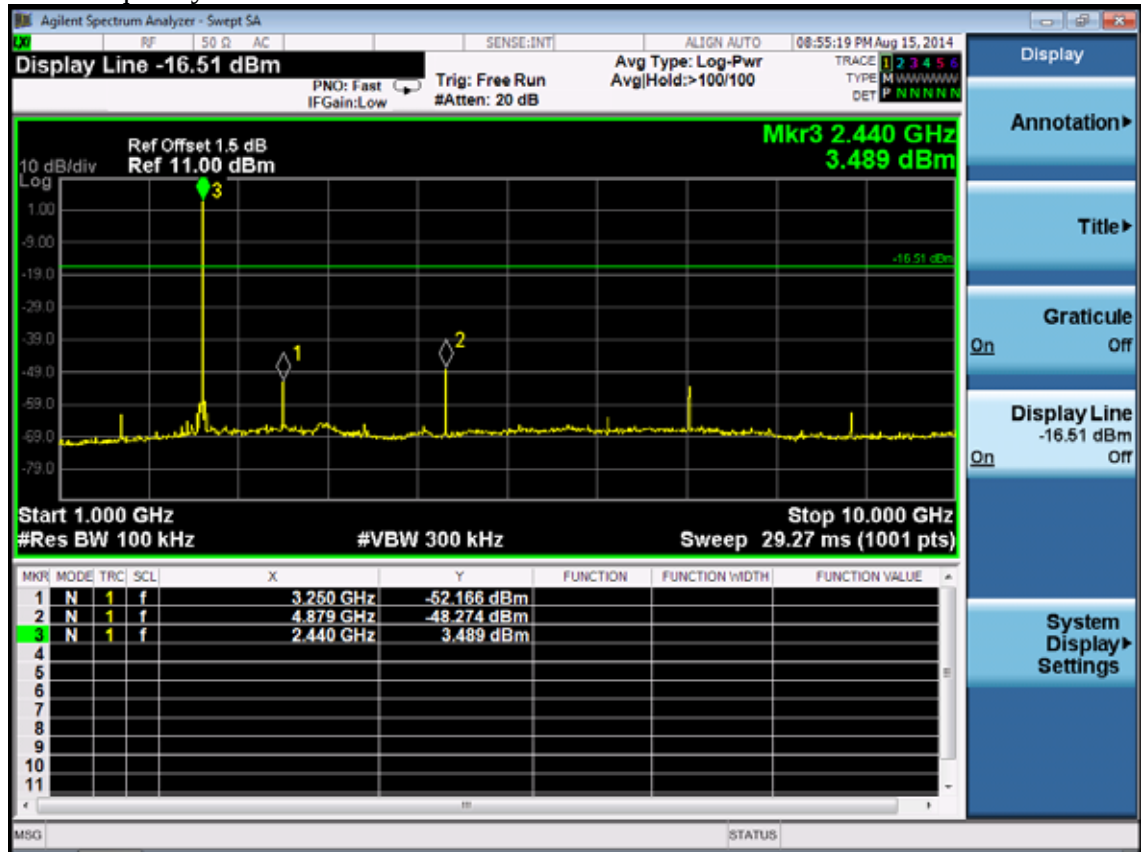
GFSK

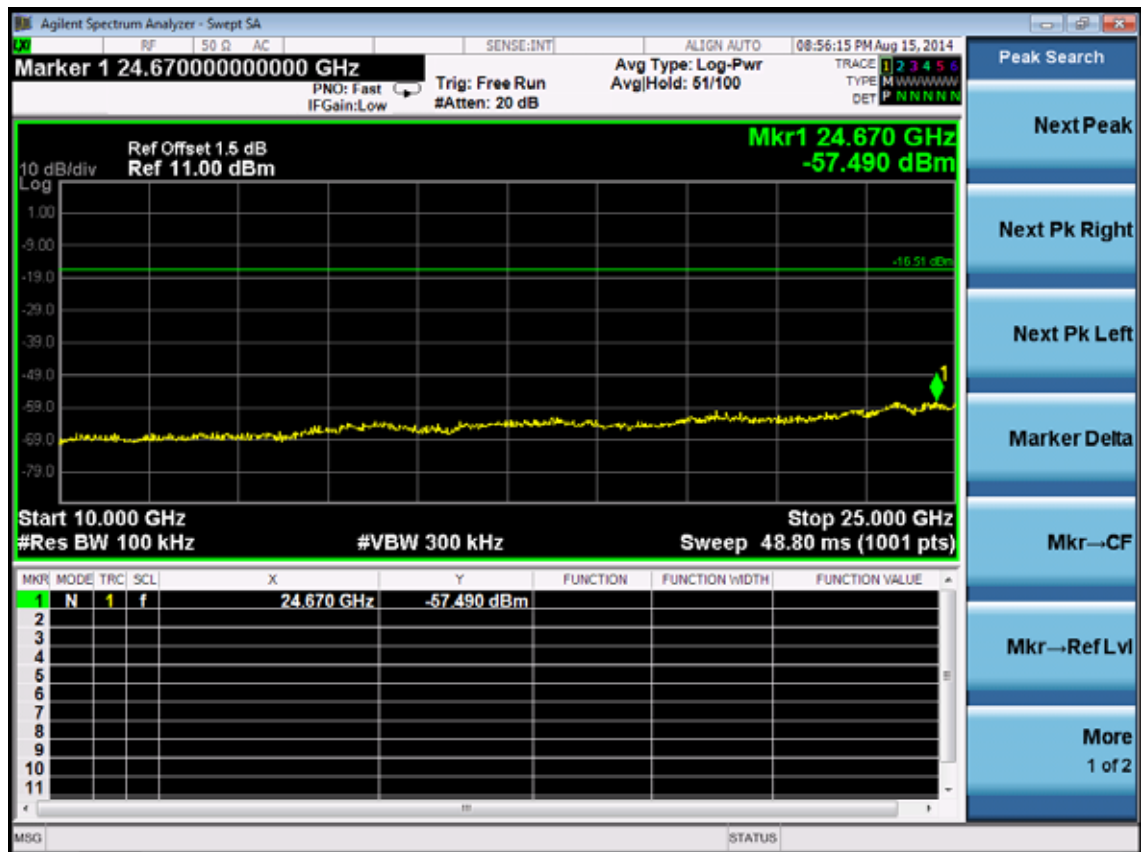
Test Frequency: 2402MHz



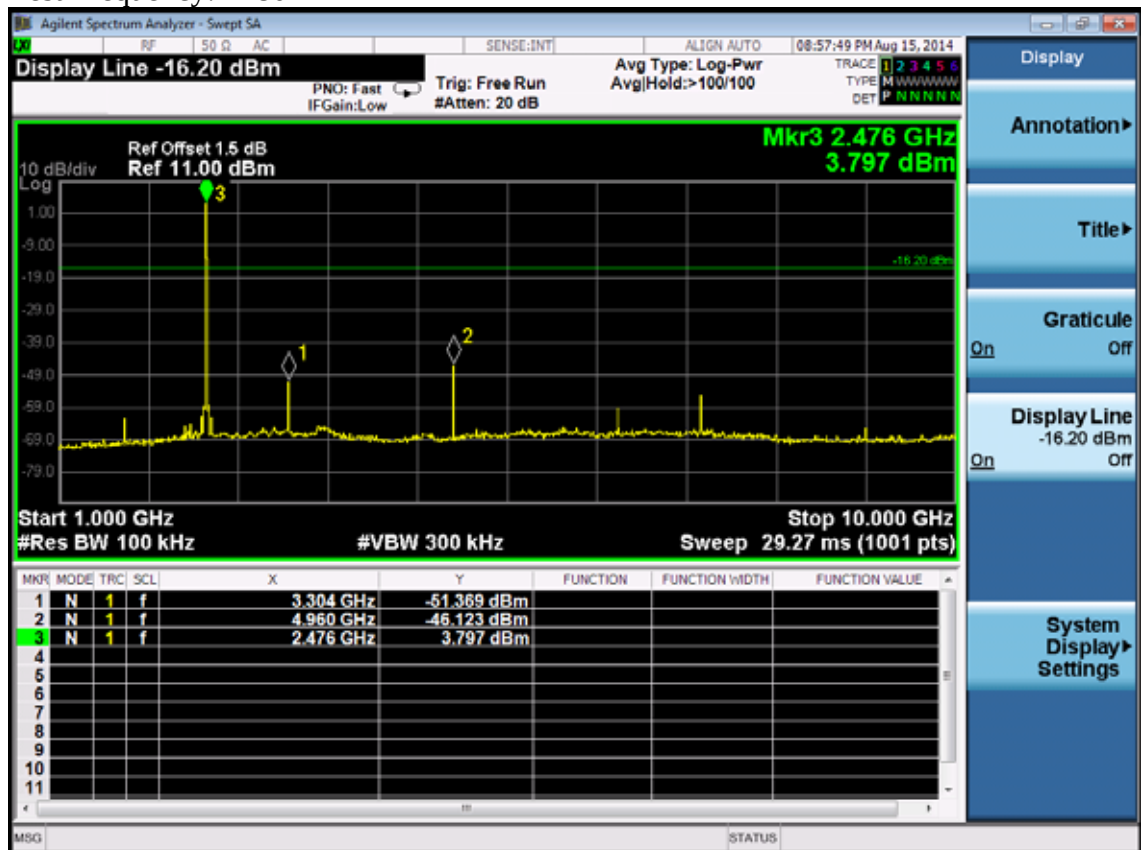


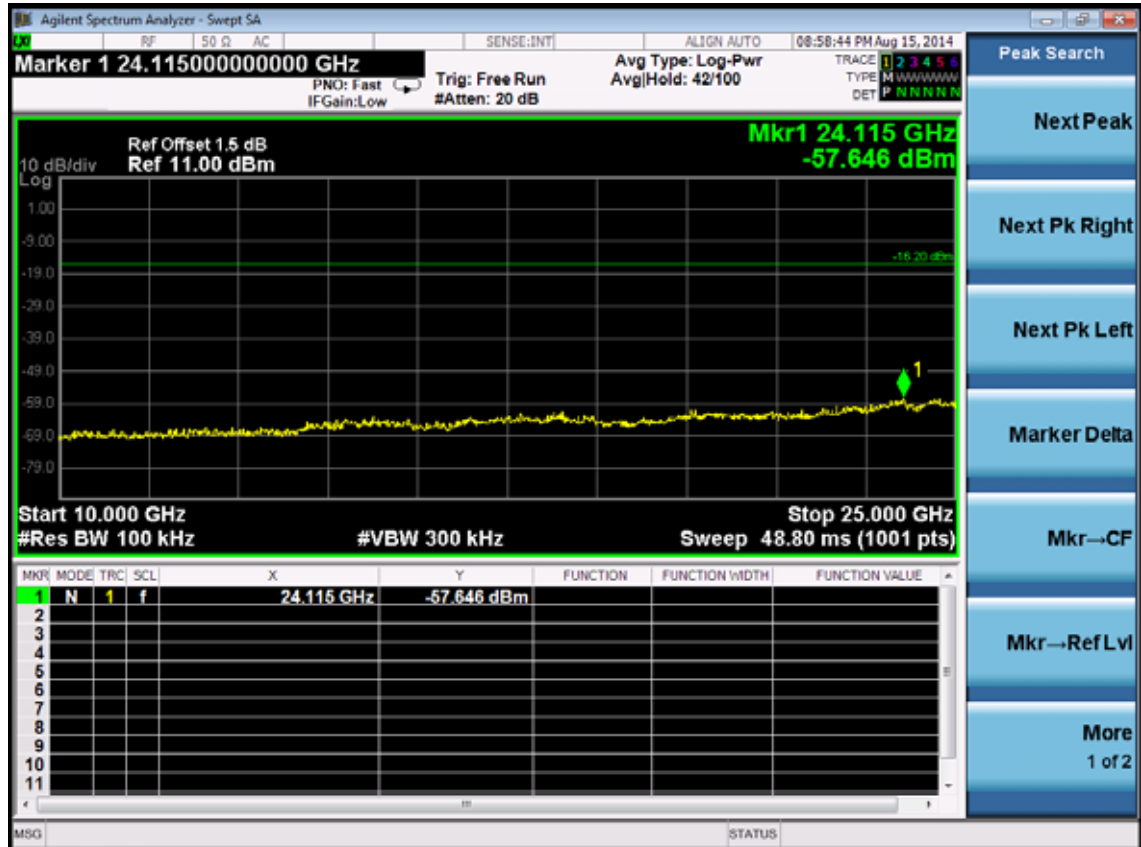
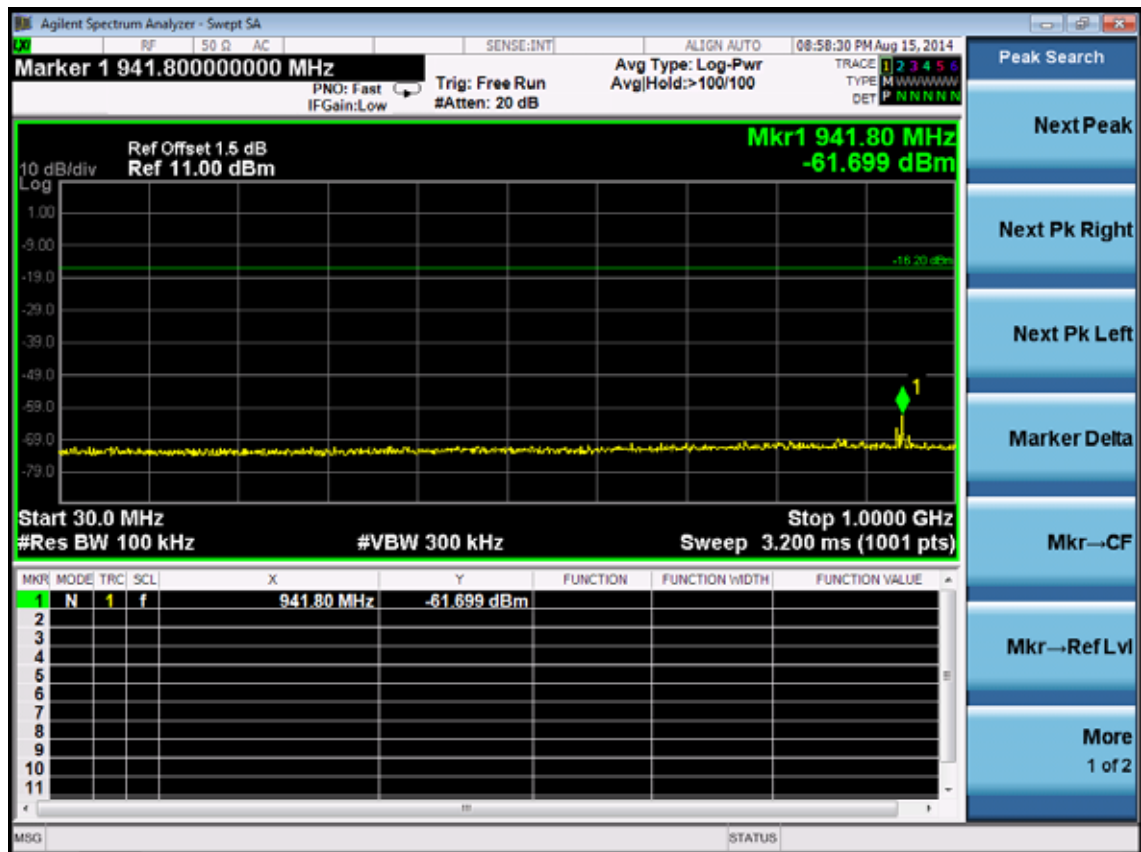
Test Frequency: 2441MHz





Test Frequency: 2480MHz

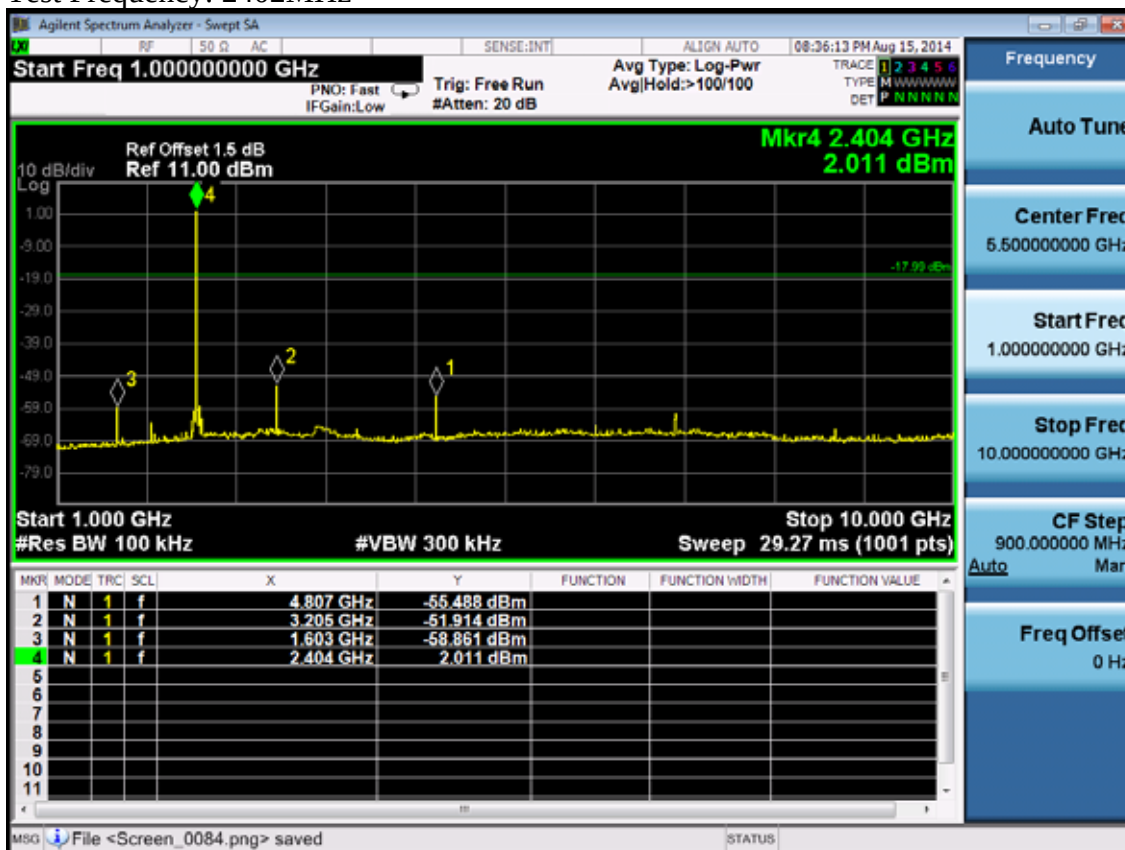


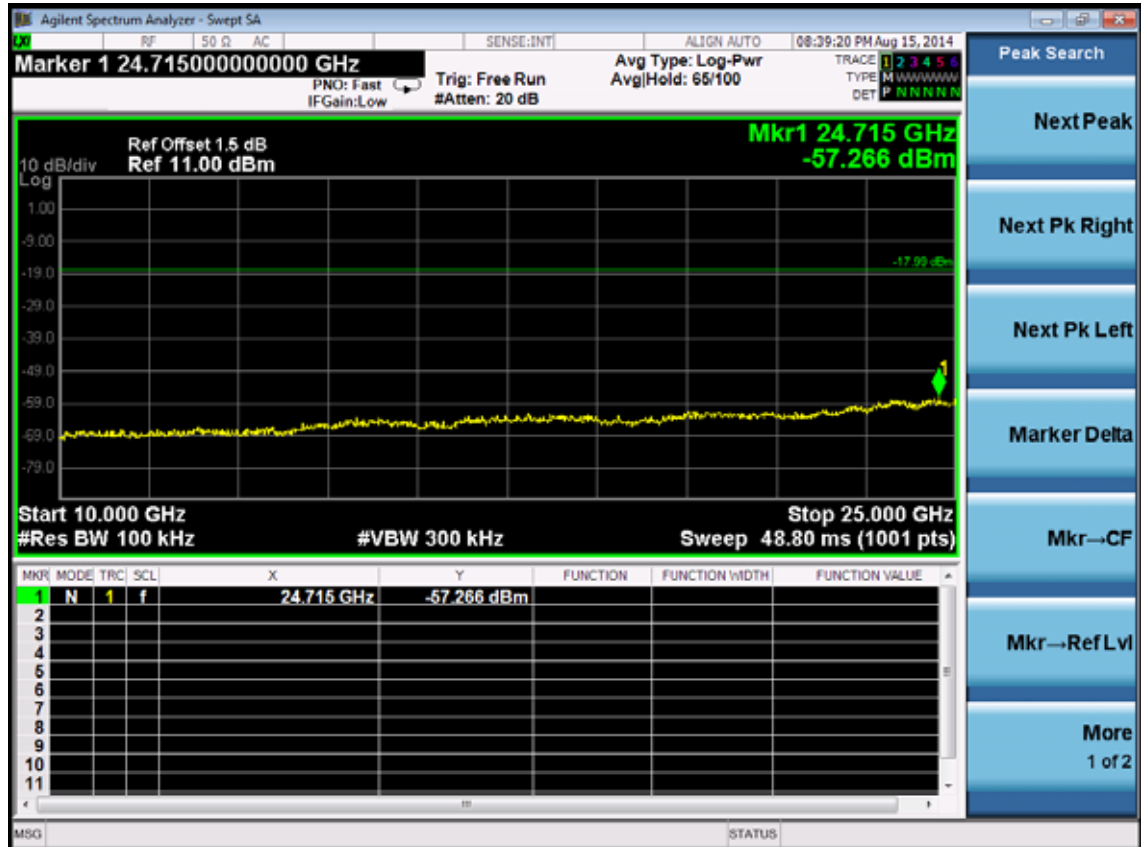
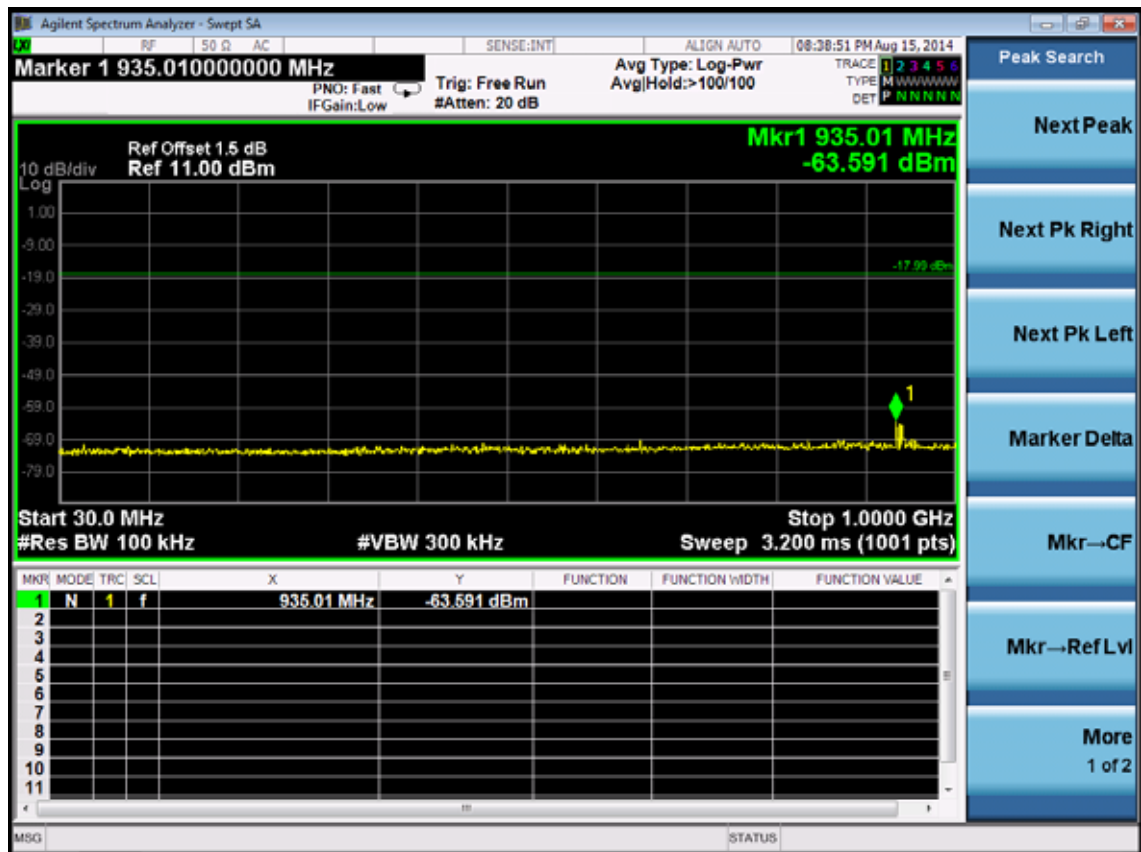


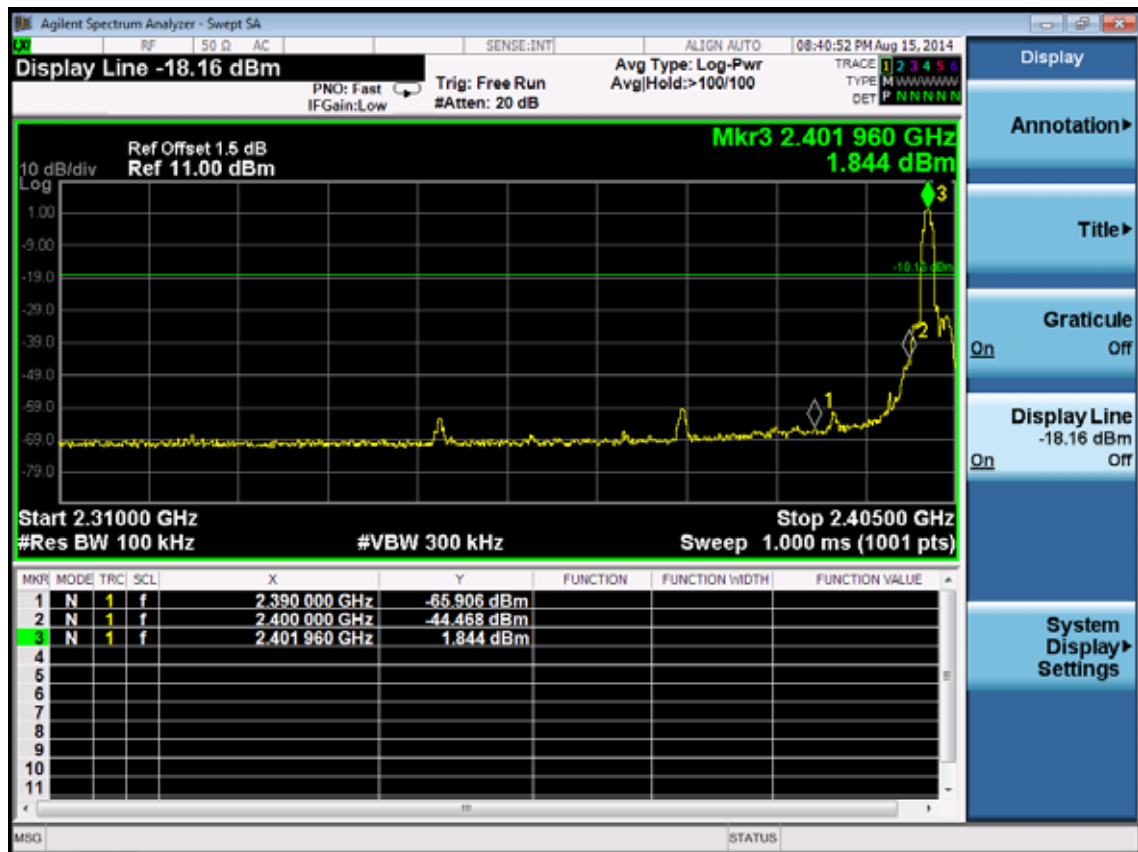


8-DPSK

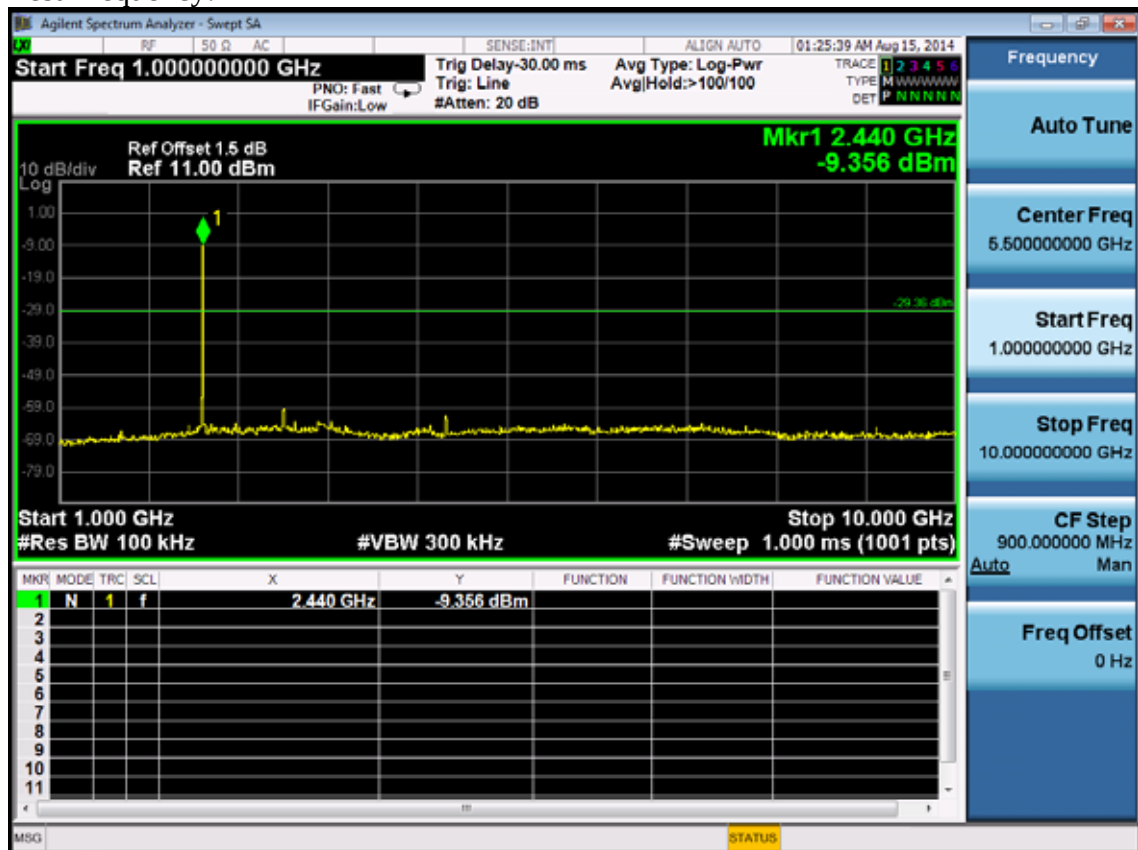
Test Frequency: 2402MHz

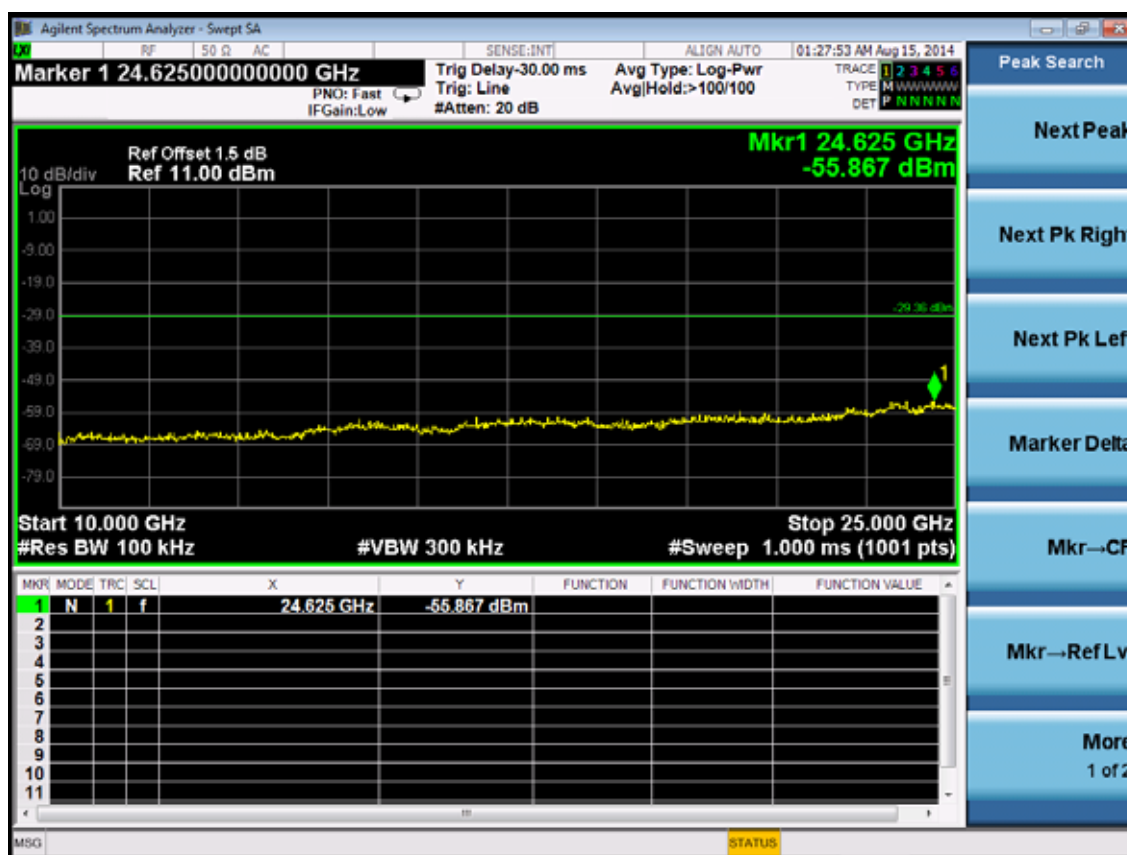
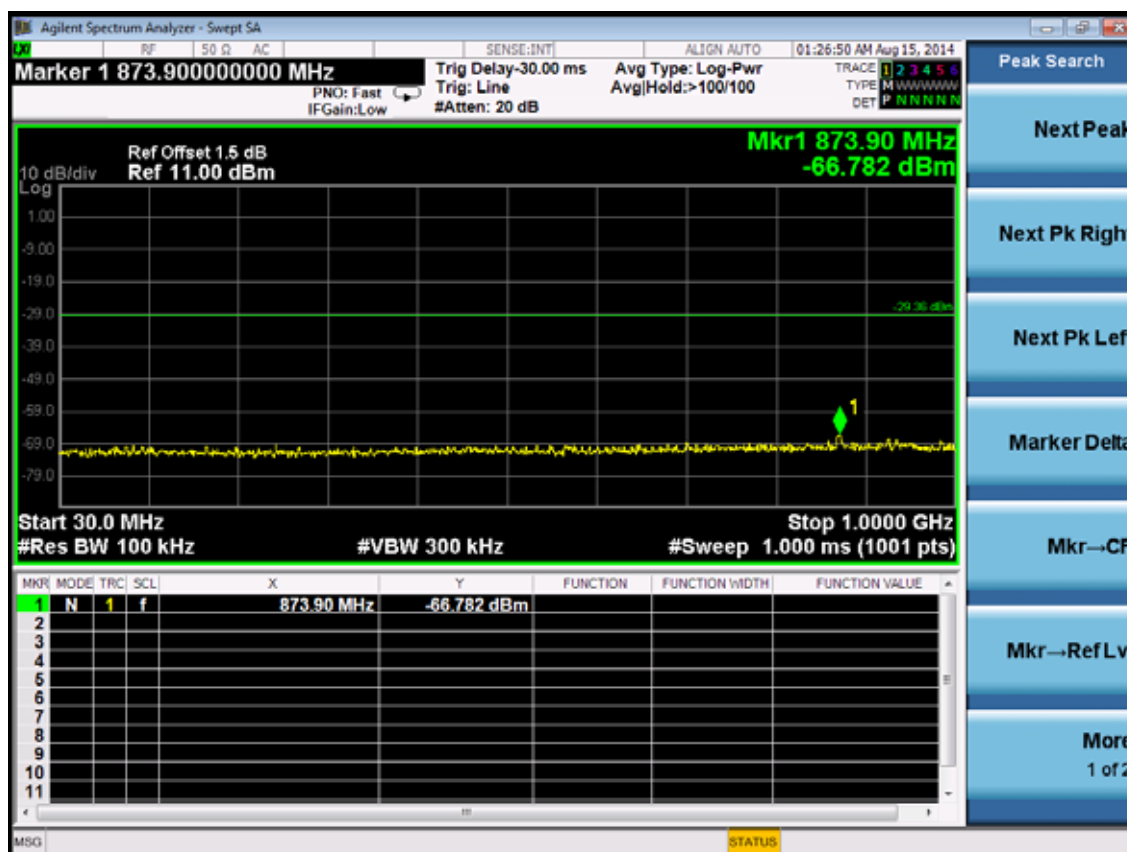




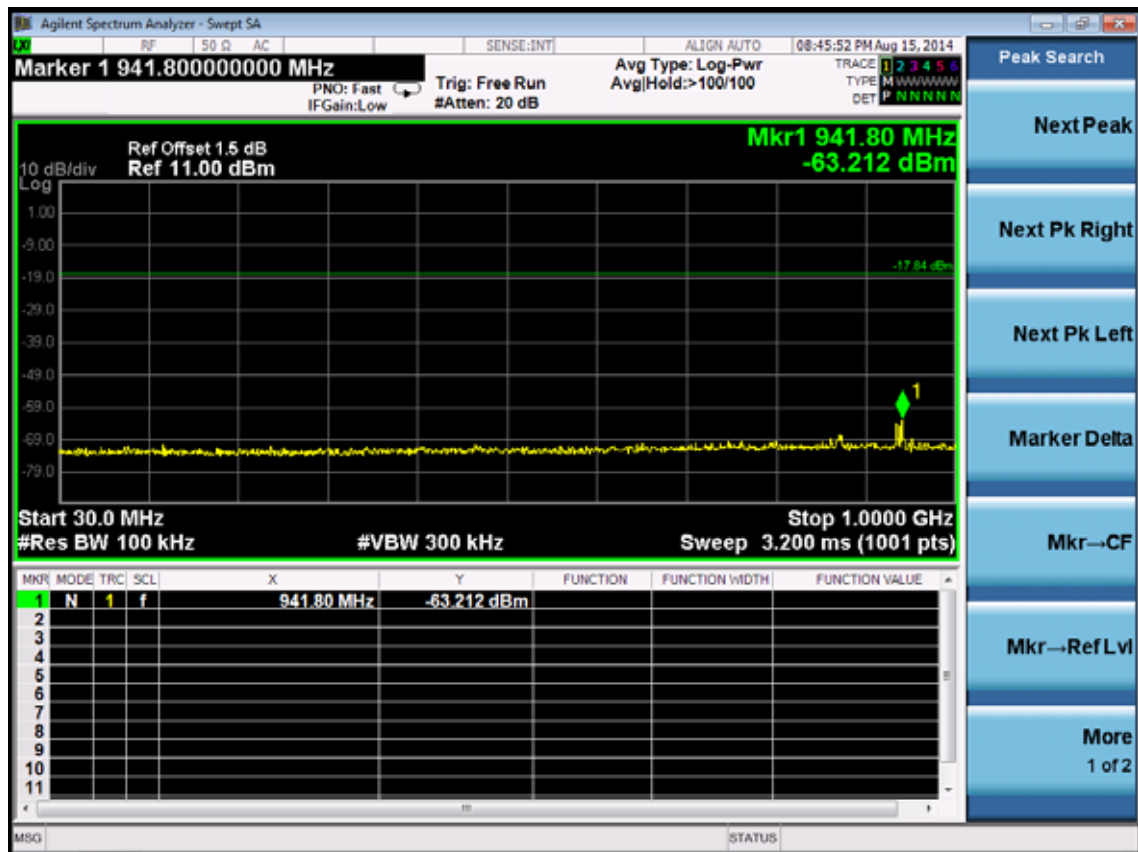
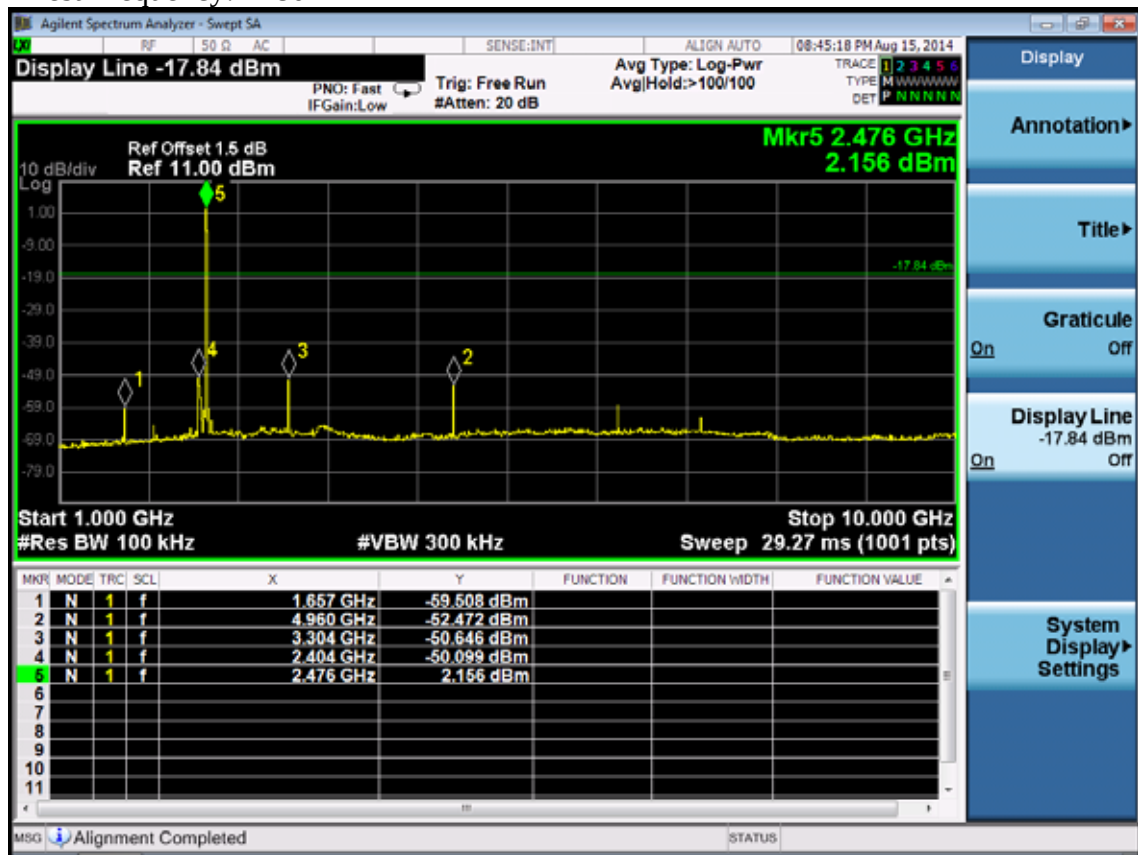


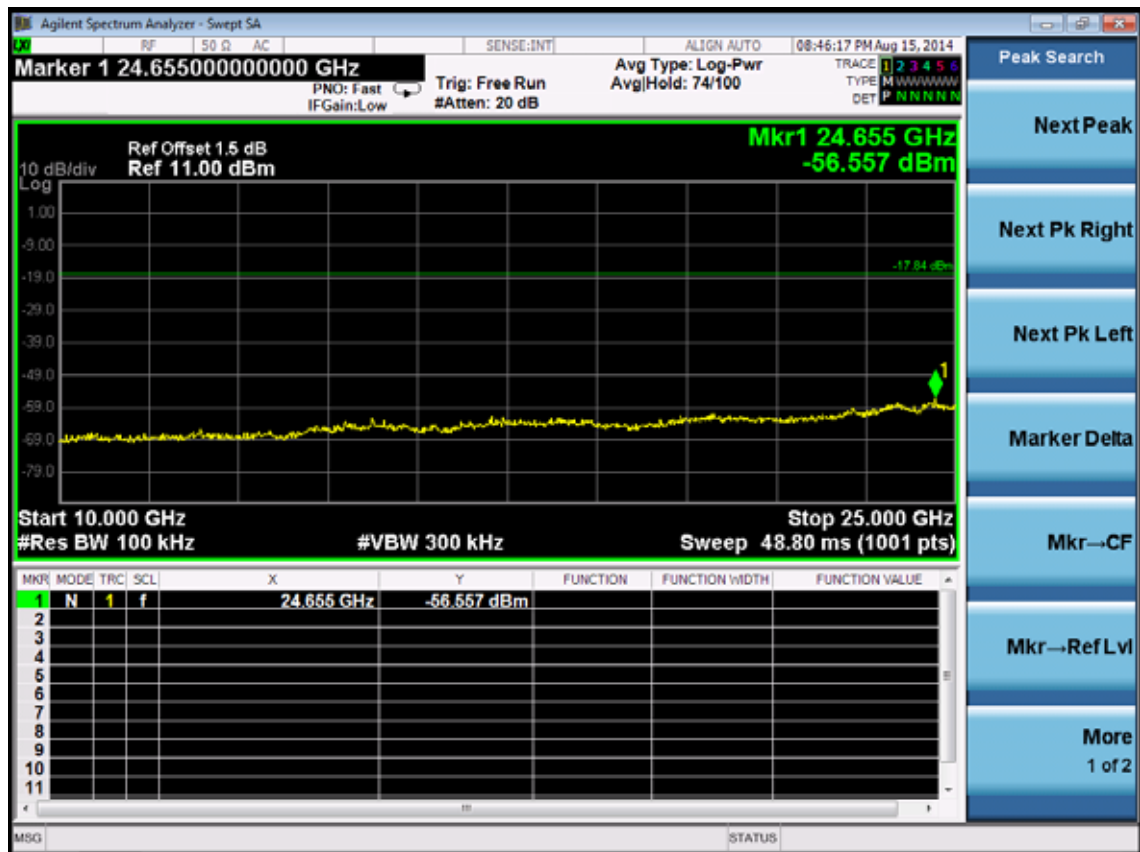
Test Frequency: 2441MHz



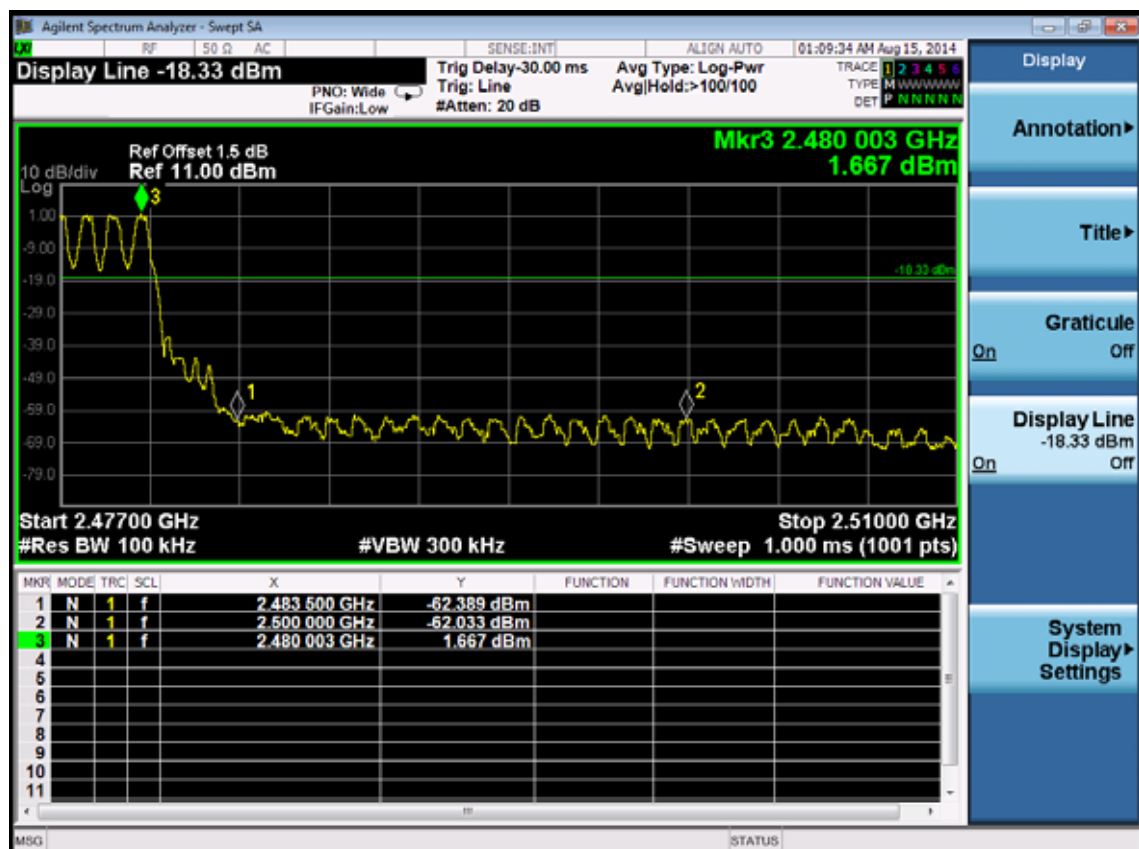
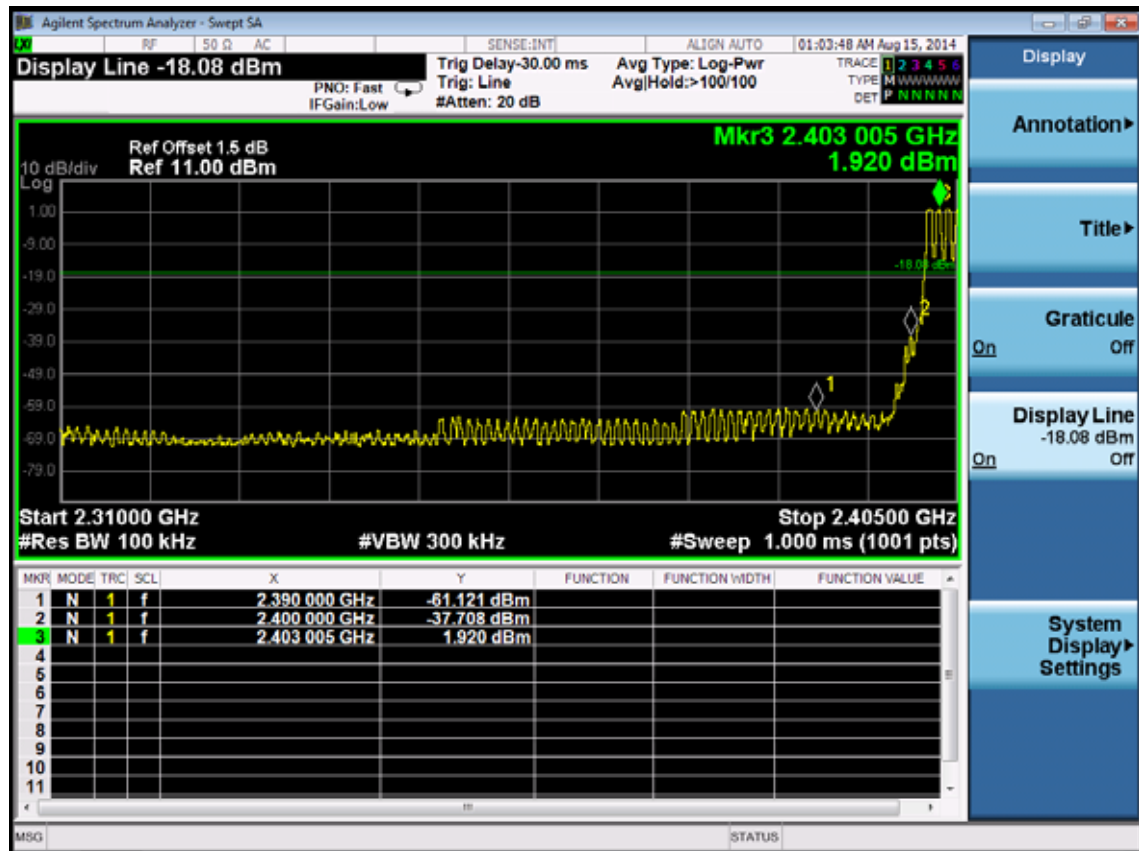


Test Frequency: 2480MHz

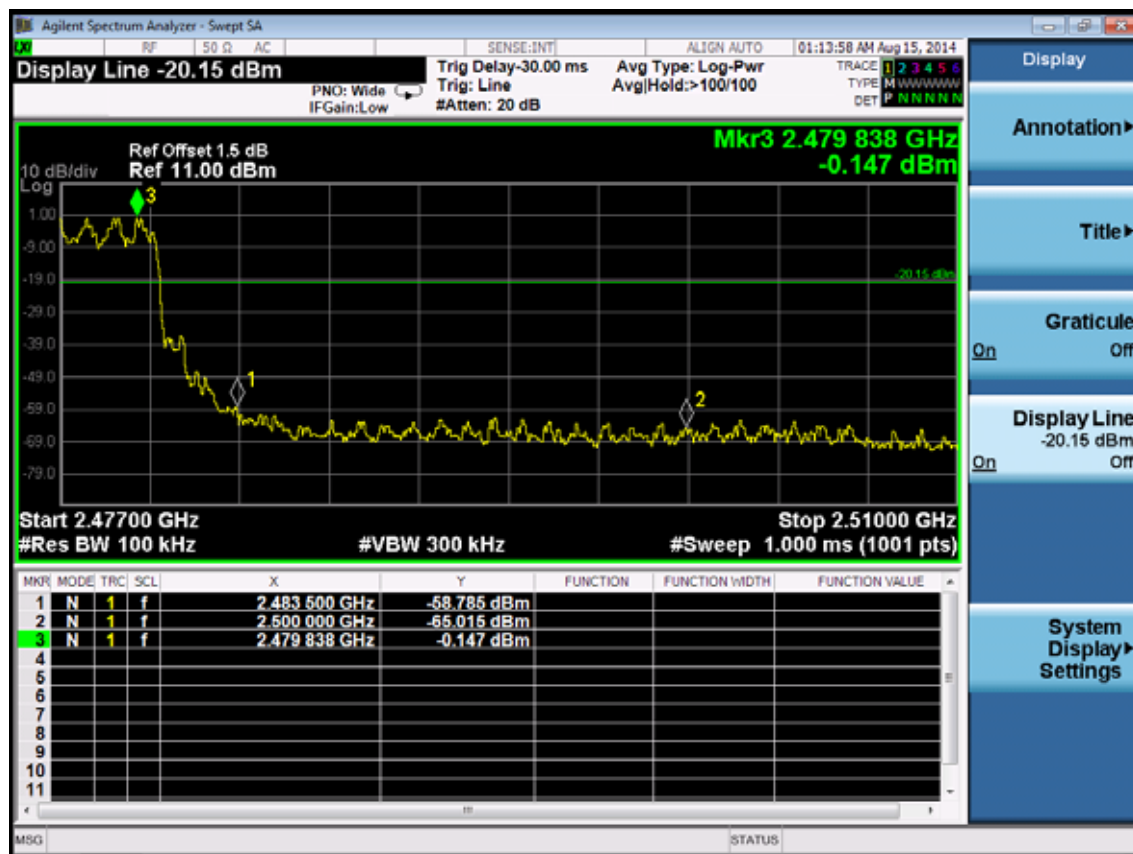
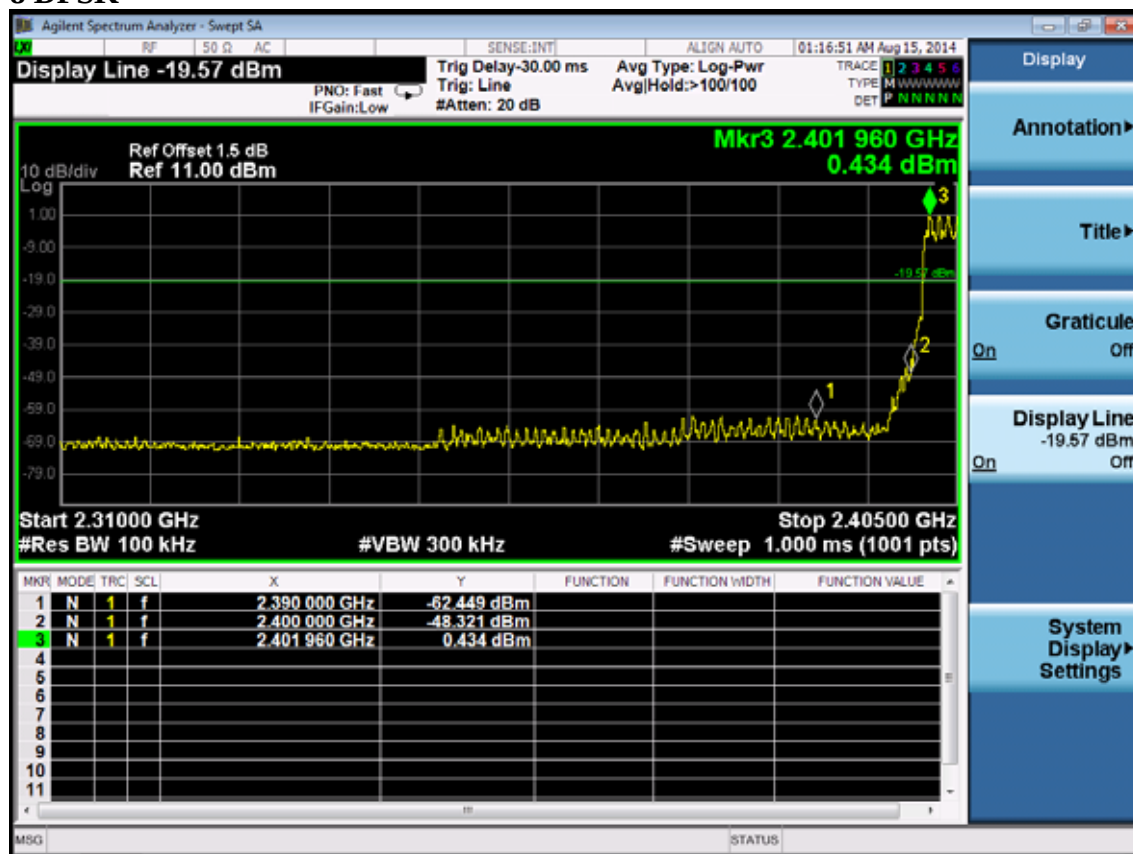




Hopping on GFSK



8 DPSK



6. CARRIER FREQUENCY SEPARATION TEST

6.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A	MY51380221	Oct.31, 13	1Year

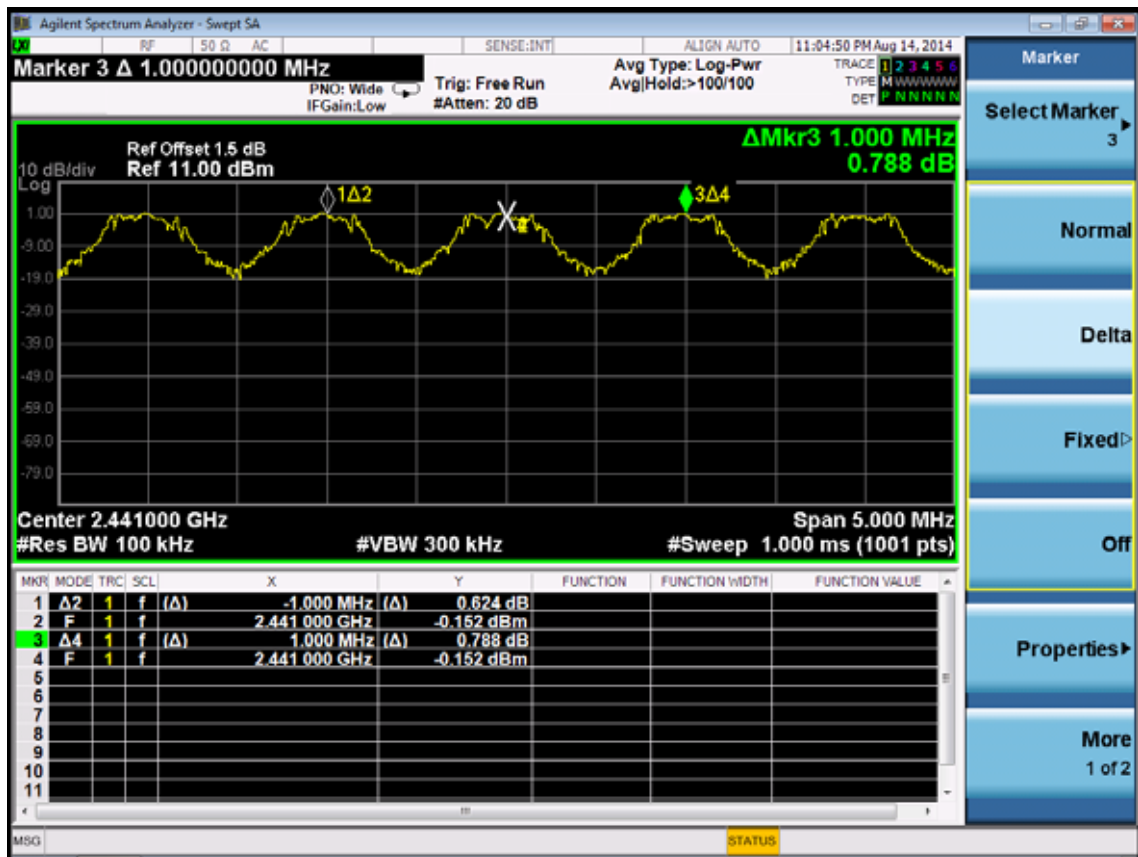
6.2. Limit

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. 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.

6.3. Test Results.

EUT: Bluetooth Module		
M/N:TBM-CBC5		
Test date: 2014-08-14	Pressure: 101.4 $\pm$ 1.0 kpa	Humidity: 52.7 $\pm$ 3.0%
Tested by: Kevin_Hu	Test site: RF site	Temperature:21.7 $\pm$ 0.6 °C

Test Mode	Channel separation	Conclusion
8-DPSK	1.0MHz	PASS
GFSK	1.0MHz	PASS



7. 20 DB BANDWIDTH TEST

7.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum	Agilent	N9030A	MY51380221	Oct.31, 13	1Year
2.	Attenuator (20dB)	Agilent	8491B	MY39262165	Apr. 28,14	1 Year
3.	RF Cable	Hubersuhner	SUCOFLEX102	28620/2	Apr. 28,14	1 Year

7.2.Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

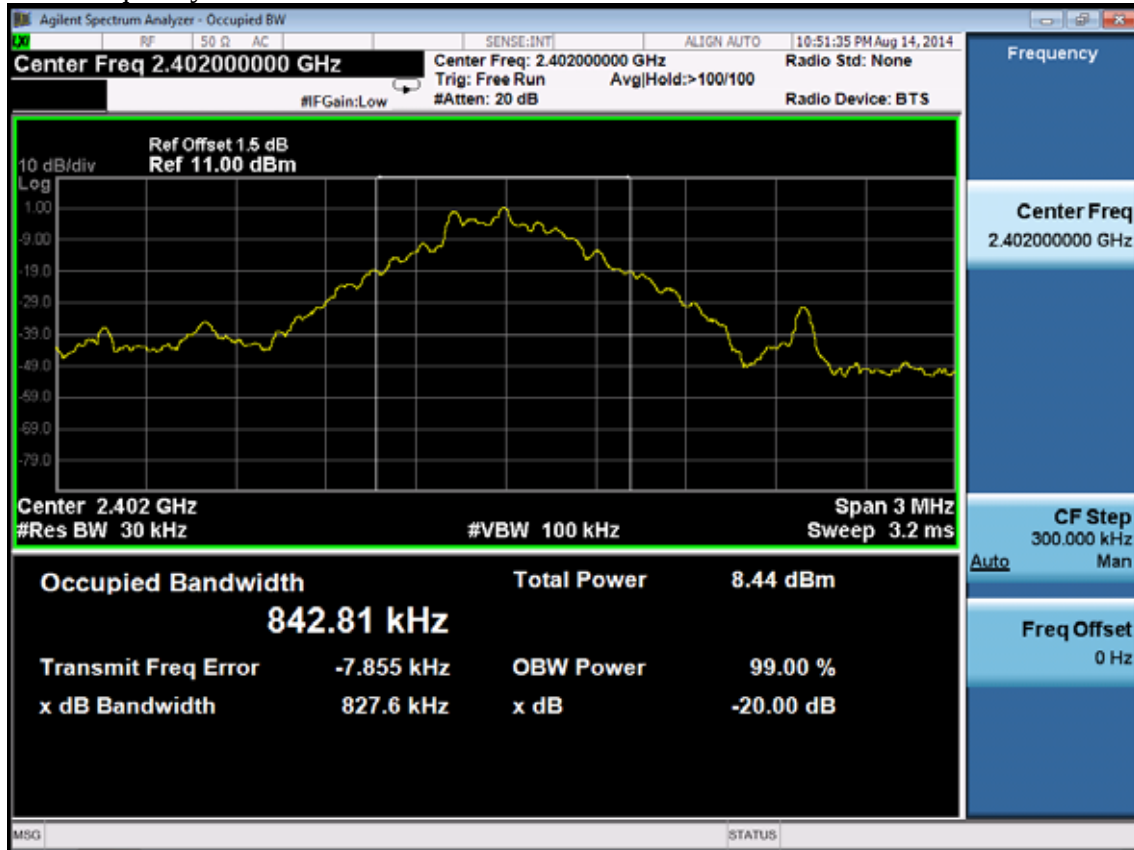
7.3.Test Results

EUT: Bluetooth Module		
M/N: TBM-CBC5		
Test date: 2014-08-14	Pressure: 101.1±1.0 kpa	Humidity: 50.3±3.0%
Tested by: Kobe_Huang	Test site: RF Site	Temperature : 22 .5±0.6°C

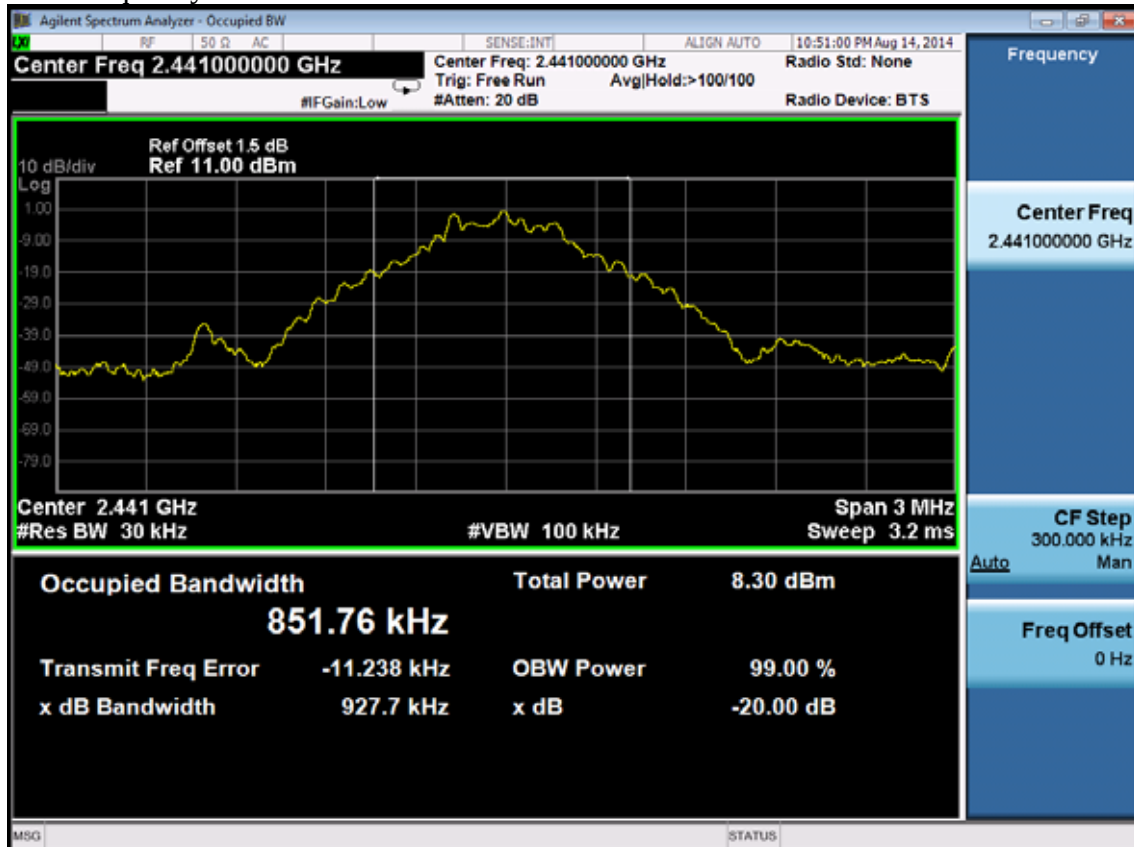
Cable loss: 1.5 dB		Attenuator loss: 0 dB	
Test Mode	CH (MHz)	20dB bandwidth (KHz)	Limit (KHz)
GFSK	2402	827.6	N/A
	2441	927.7	N/A
	2480	925.2	N/A
8-DPSK	2402	1205	N/A
	2441	1259	N/A
	2480	1257	N/A
Conclusion : PASS			

GFSK

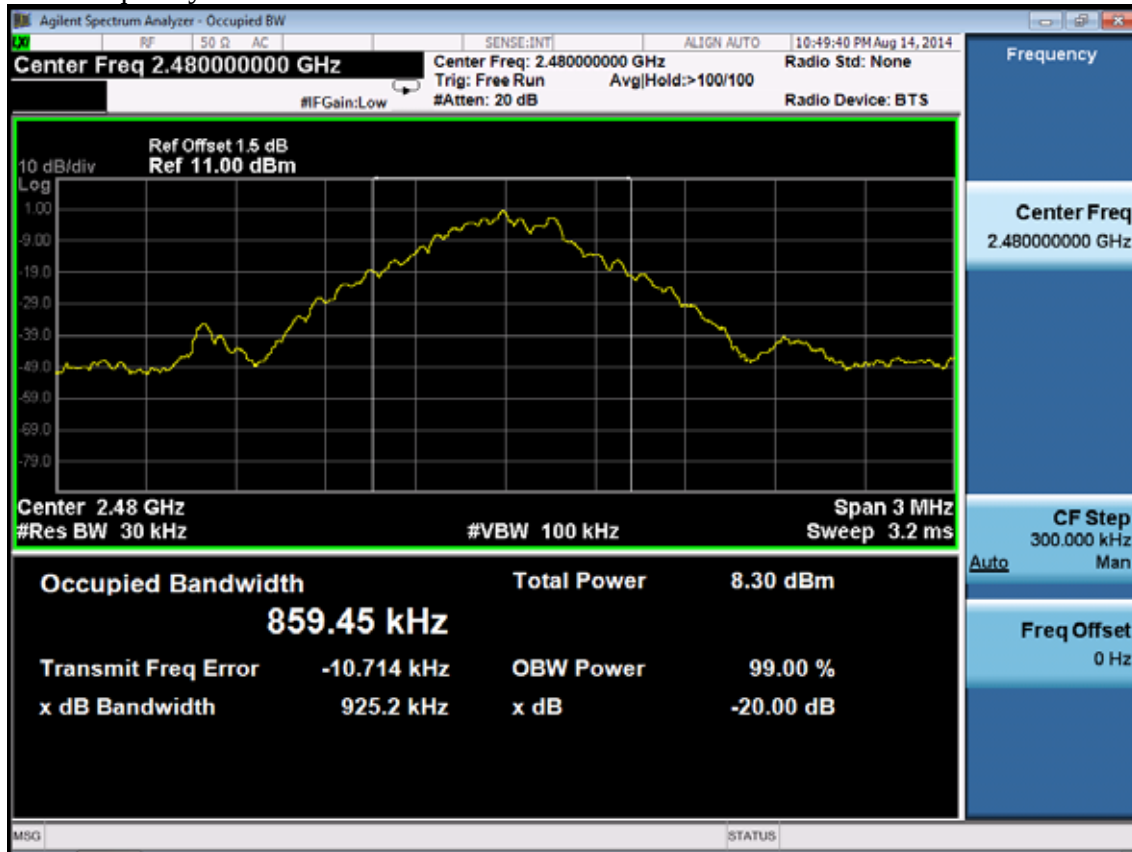
Test Frequency: 2402MHz



Test Frequency: 2441MHz



Test Frequency: 2480MHz

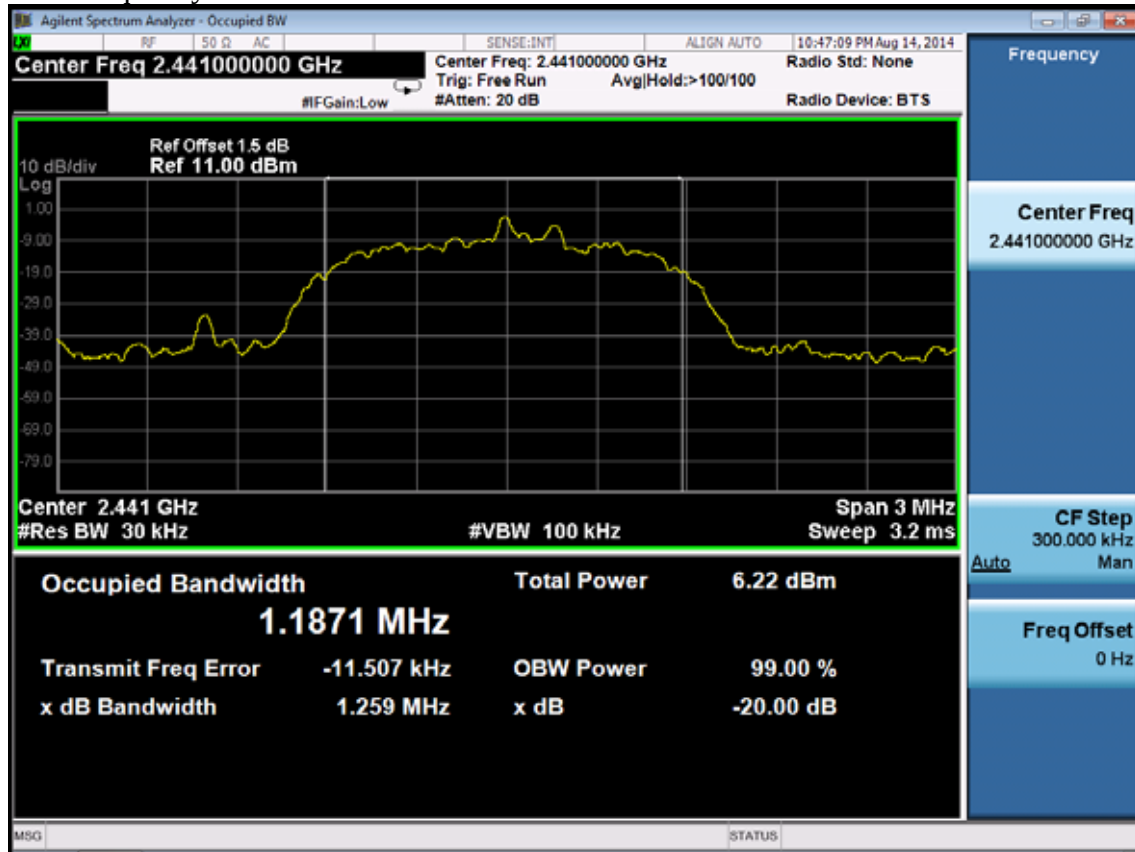


8-DPSK

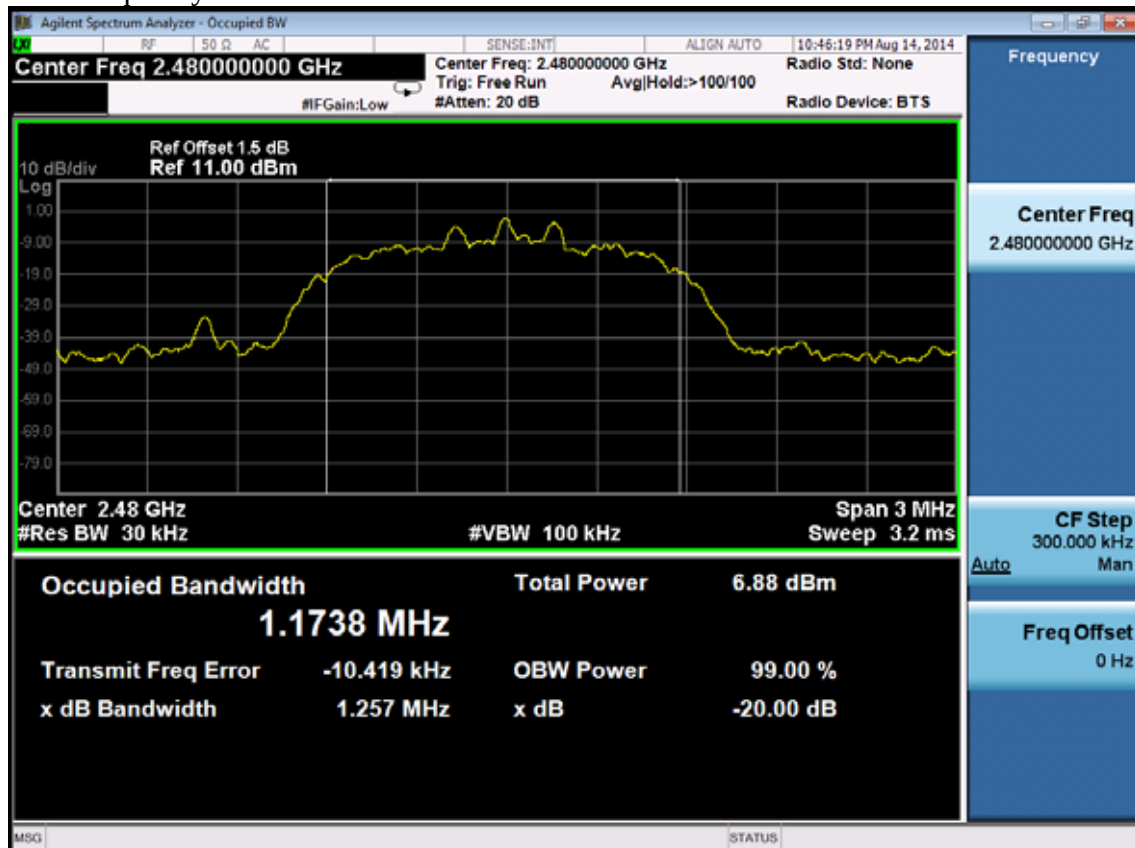
Test Frequency: 2402MHz



Test Frequency: 2441MHz



Test Frequency: 2480MHz



8. NUMBER OF HOPPING FREQUENCY TEST

8.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A	MY51380221	Oct.31, 13	1Year

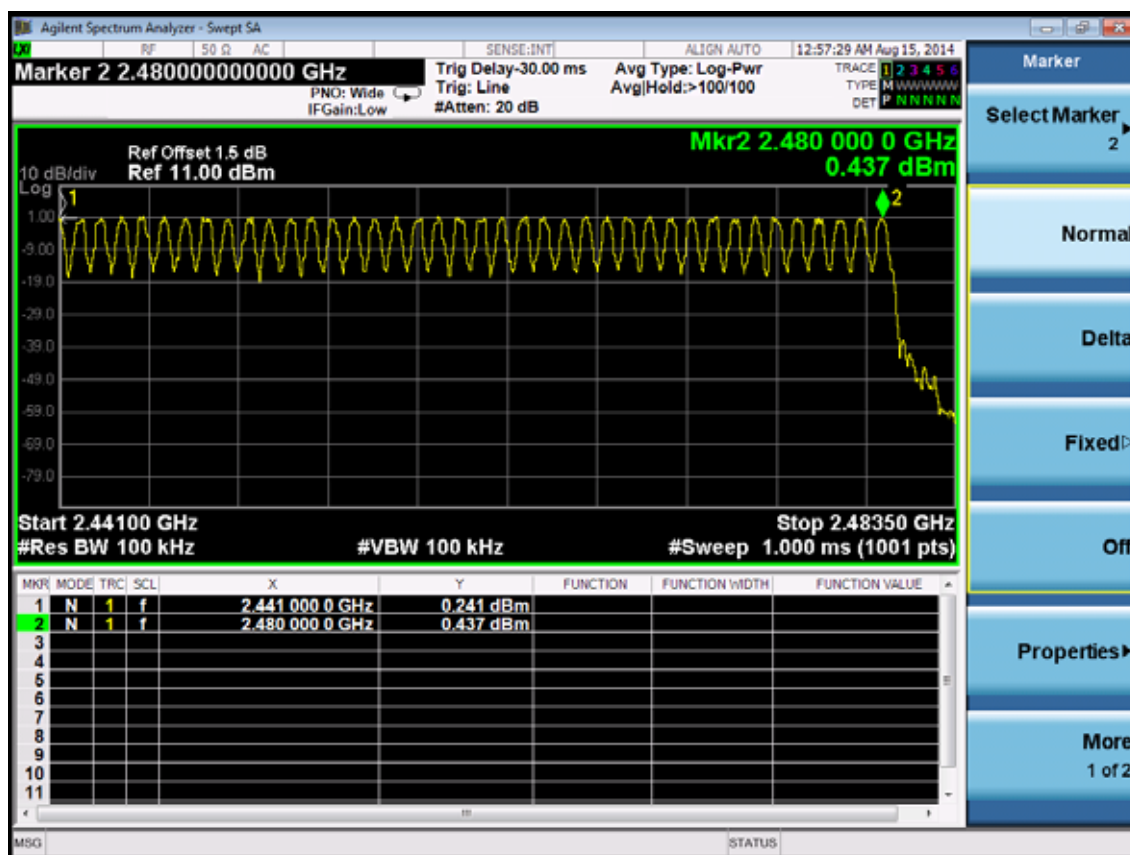
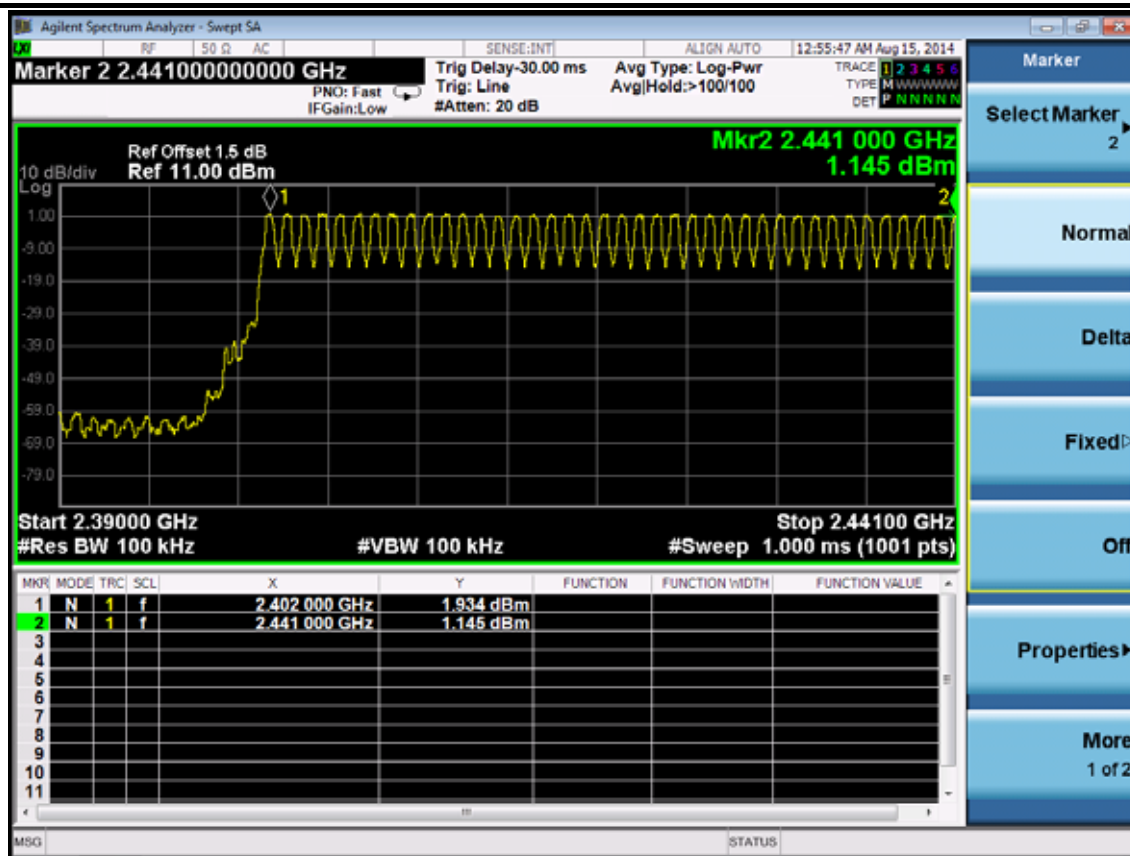
8.2. Limit

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

8.3. Test Results

EUT: Bluetooth Module		
M/N:TBM-CBC5		
Test date: 2014-08-15	Pressure: 101.4 $\pm$ 1.0 kpa	Humidity: 52.7 $\pm$ 3.0%
Tested by: Kevin_Hu	Test site: RF site	Temperature:21.7 $\pm$ 0.6 °C

Test Mode	Number of channel	Limit	Conclusion
8-DPSK	79	≥ 15	PASS
GFSK	79	≥ 15	PASS



9. DWELL TIME

9.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A	MY51380221	Oct.31, 13	1Year

9.2. Limit

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.

9.3. Test Results

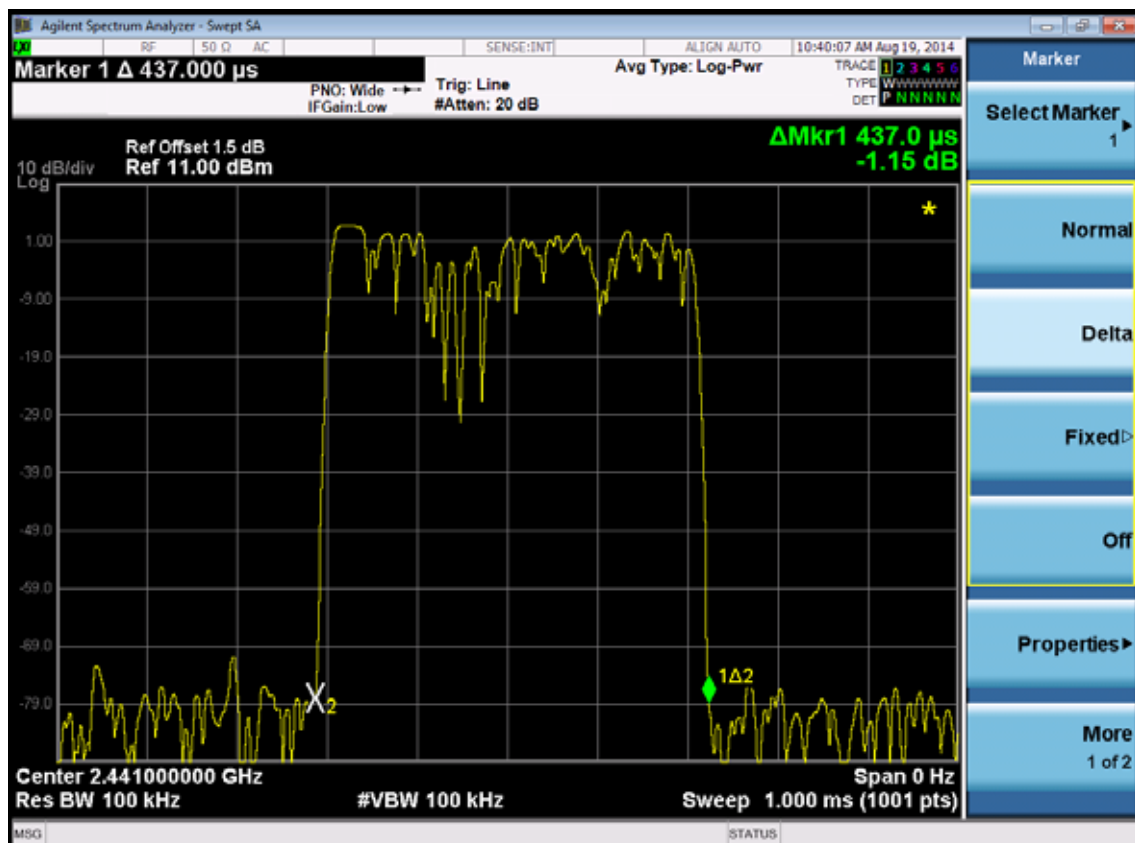
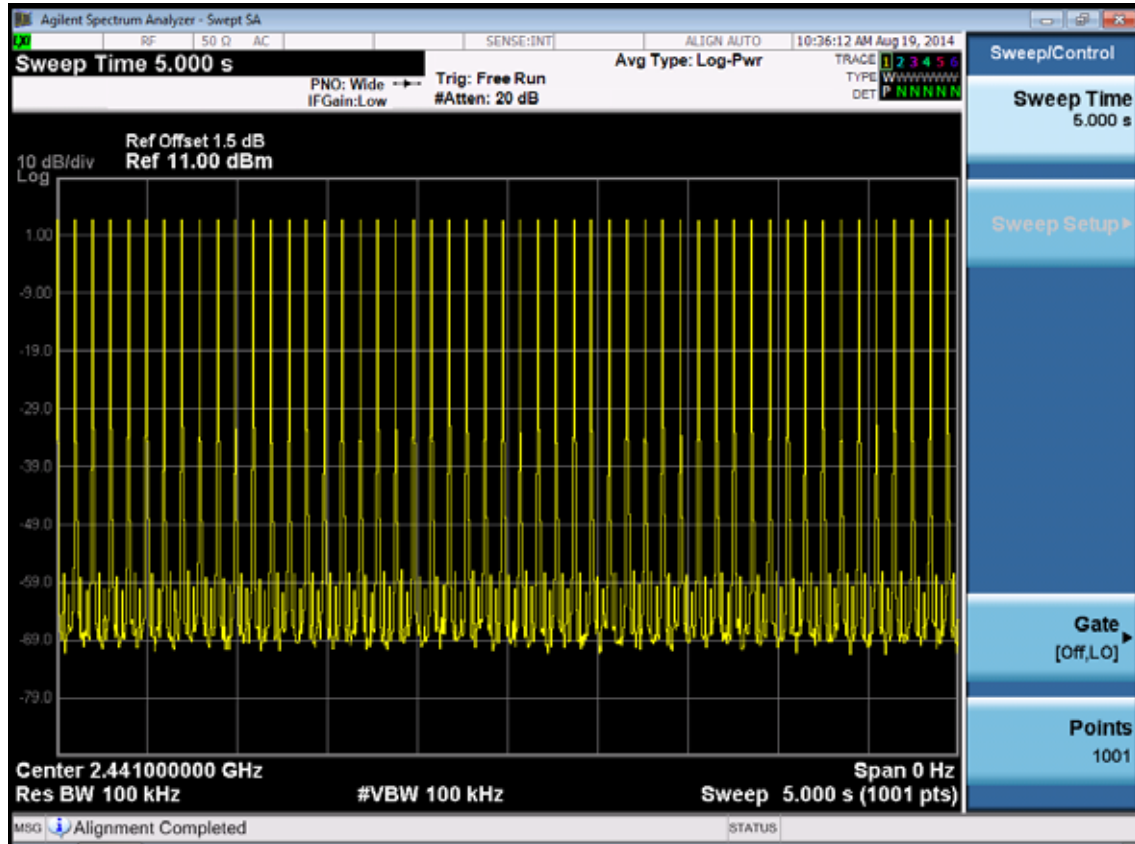
EUT: Bluetooth Module		
M/N:TBM-CBC5		
Test date: 2014-08-19	Pressure: 101.4 $\pm$ 1.0 kpa	Humidity: 52.7 $\pm$ 3.0%
Tested by: Kevin_Hu	Test site: RF site	Temperature:21.7 $\pm$ 0.6 °C

Mode		dwel time	Limit	Conclusion
GFSK	DH1	53hops/5s*0.4*79chanel*0.437ms =146.38ms	<400ms	PASS
	DH3	26hops/5s*0.4*79chanel*1.698ms =279.02ms	<400ms	PASS
	DH5	17hops/5s*0.4*79chanel*2.950ms=316.95ms	<400ms	PASS
8-DPSK	DH1	50hops/5s*0.4*79chanel*0.456ms =144.09ms	<400ms	PASS
	DH3	25hops/5s*0.4*79chanel*1.731ms =273.49ms	<400ms	PASS
	DH5	17hops/5s*0.4*79chanel*2.965ms =318.56ms	<400ms	PASS

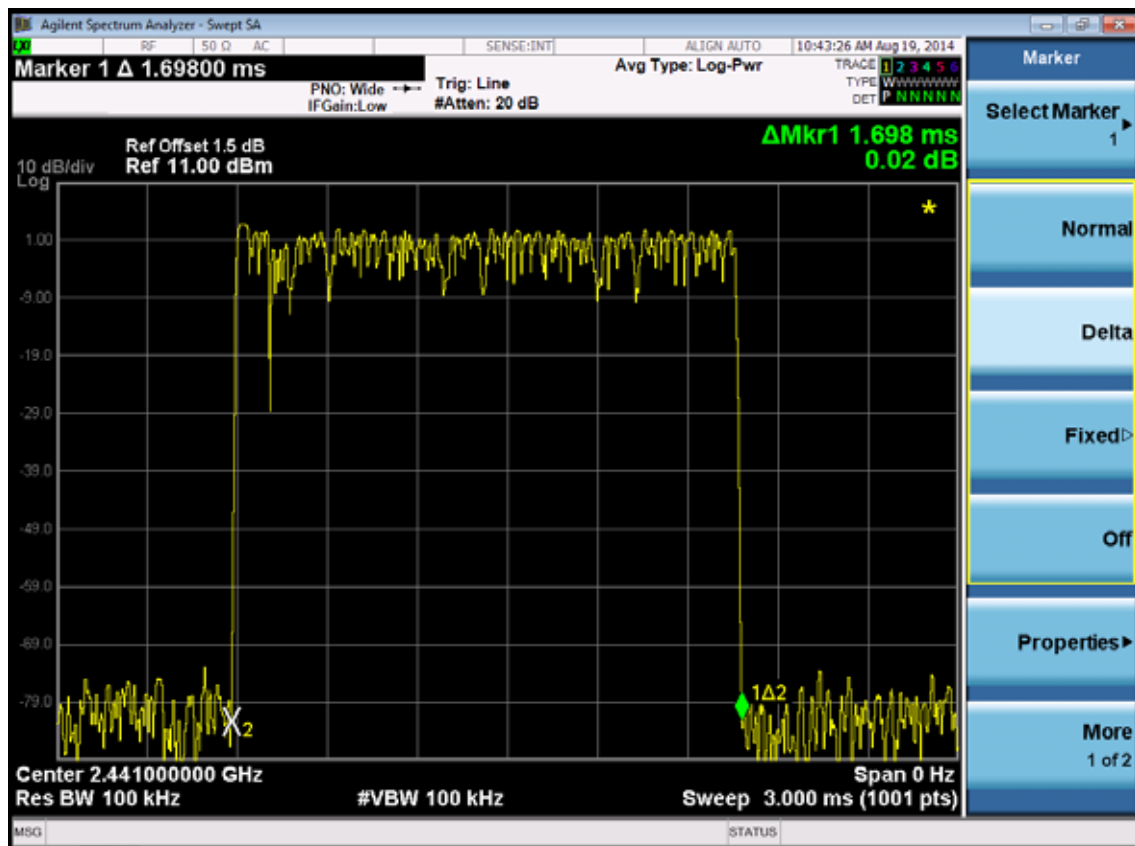
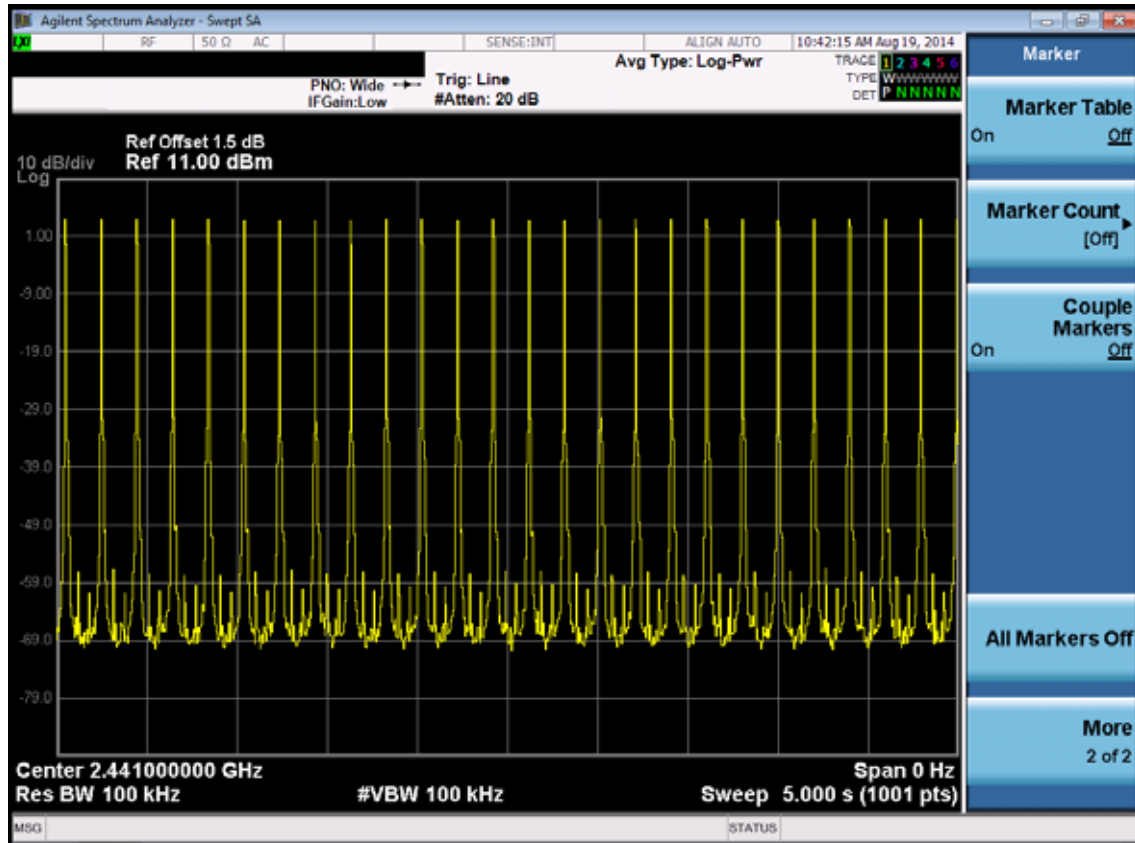
Note: All the lower levels were signal from receiver's, and should not considered in here.

Test Mode: GFSK

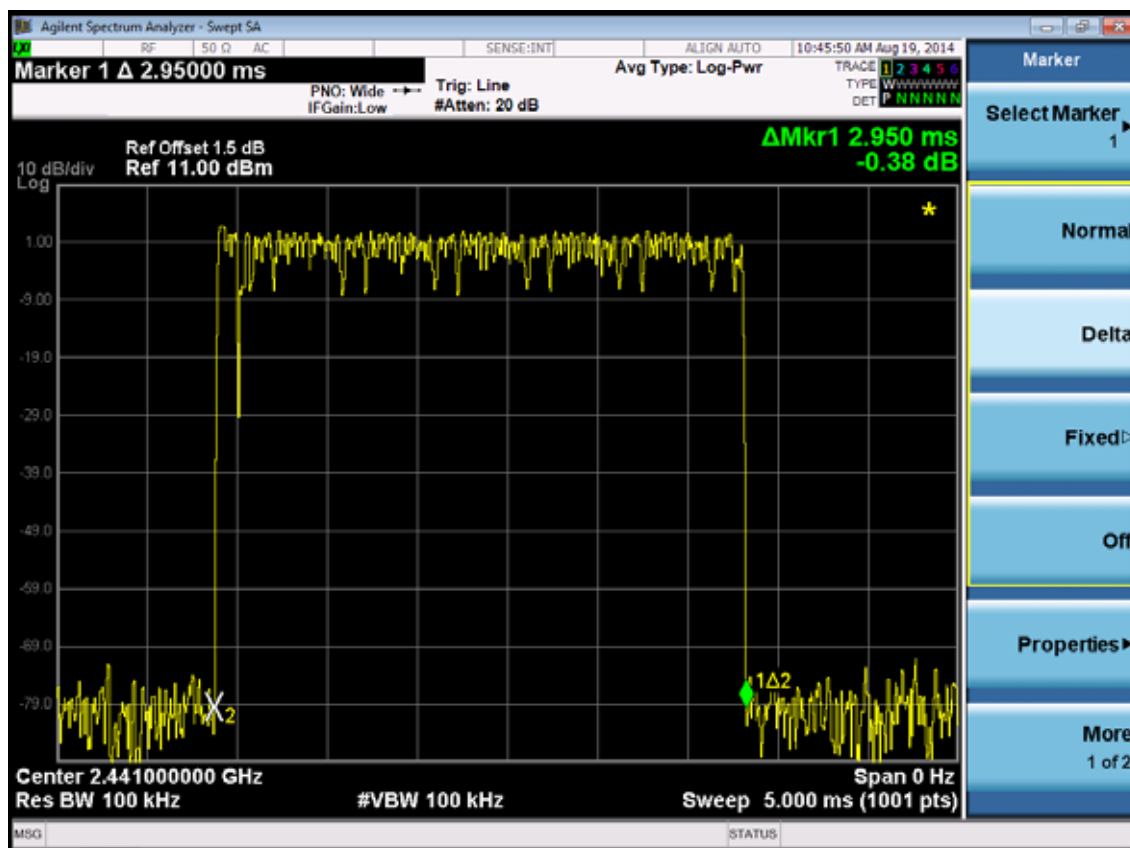
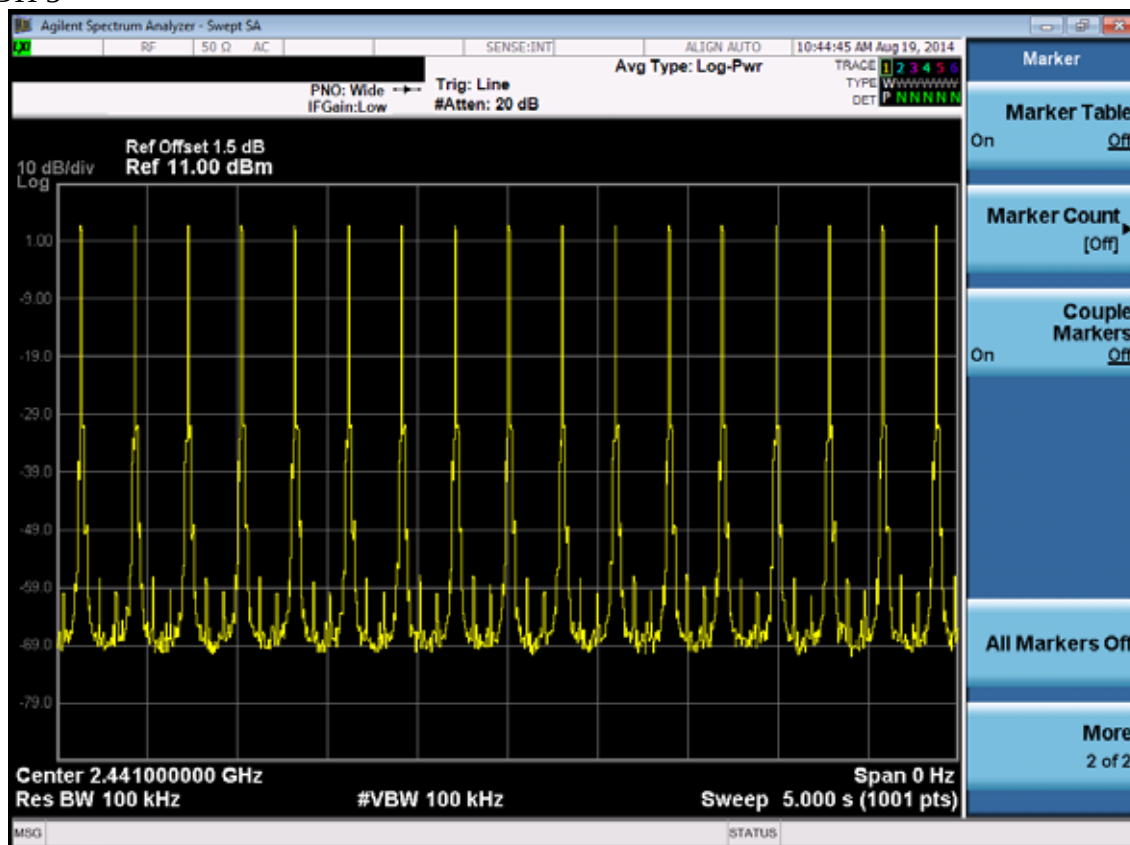
DH 1



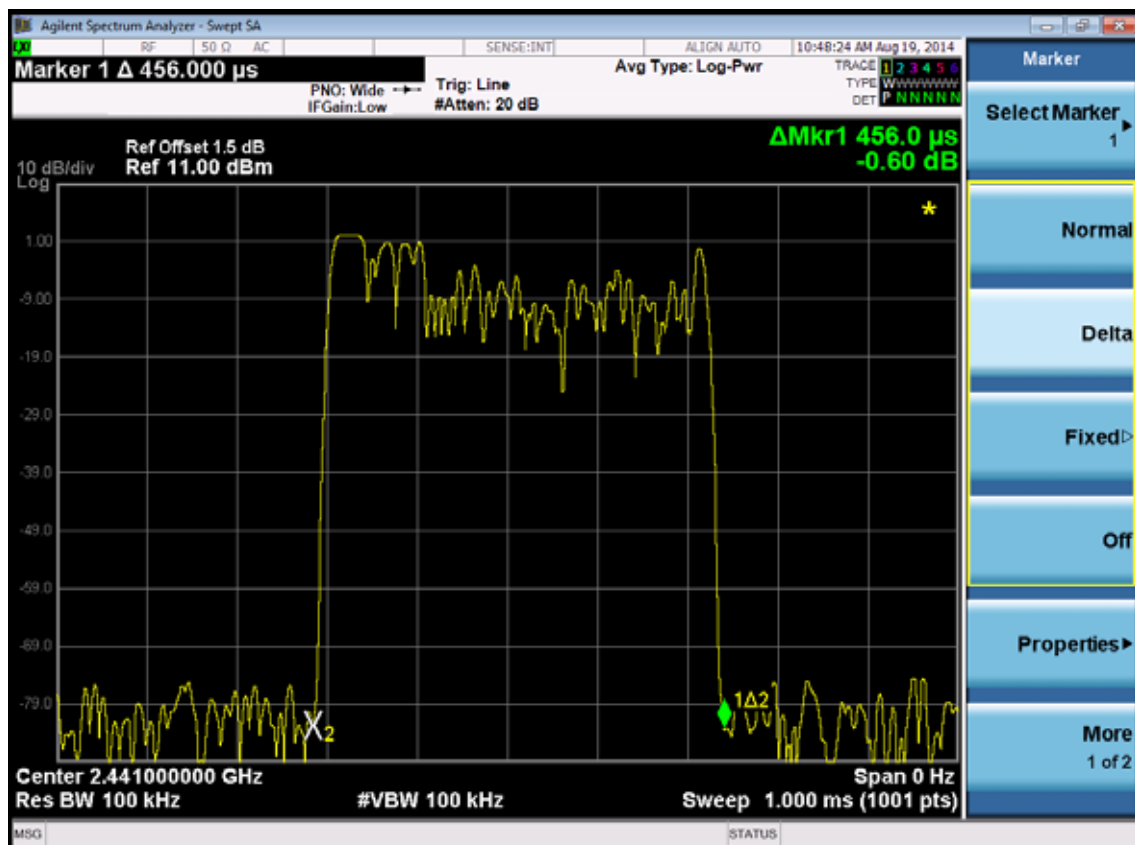
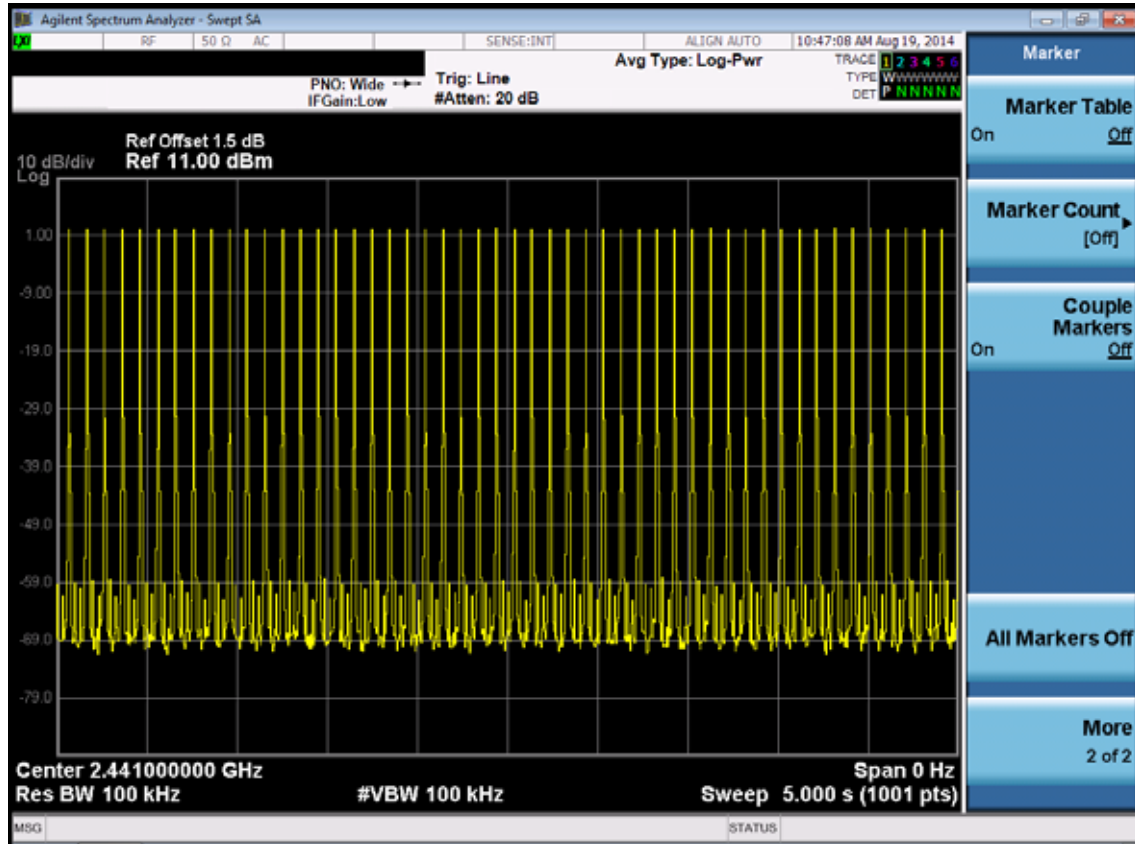
DH 3



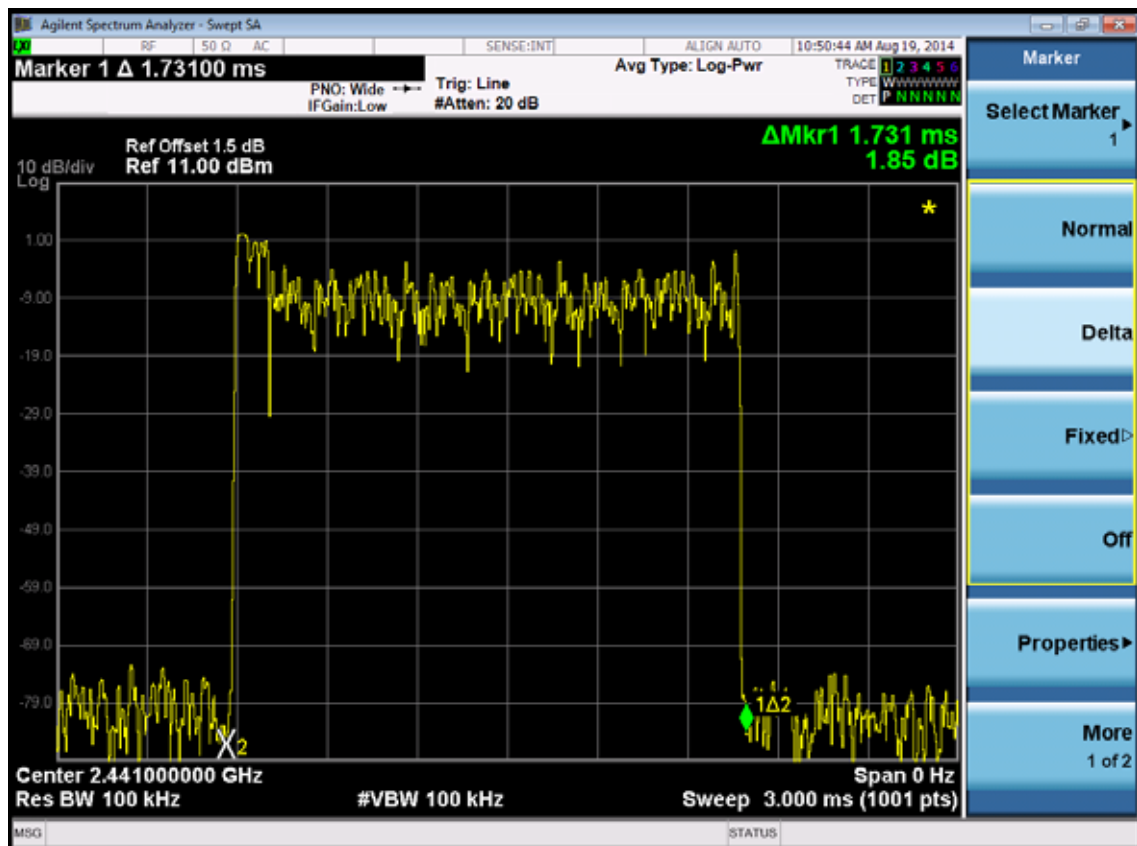
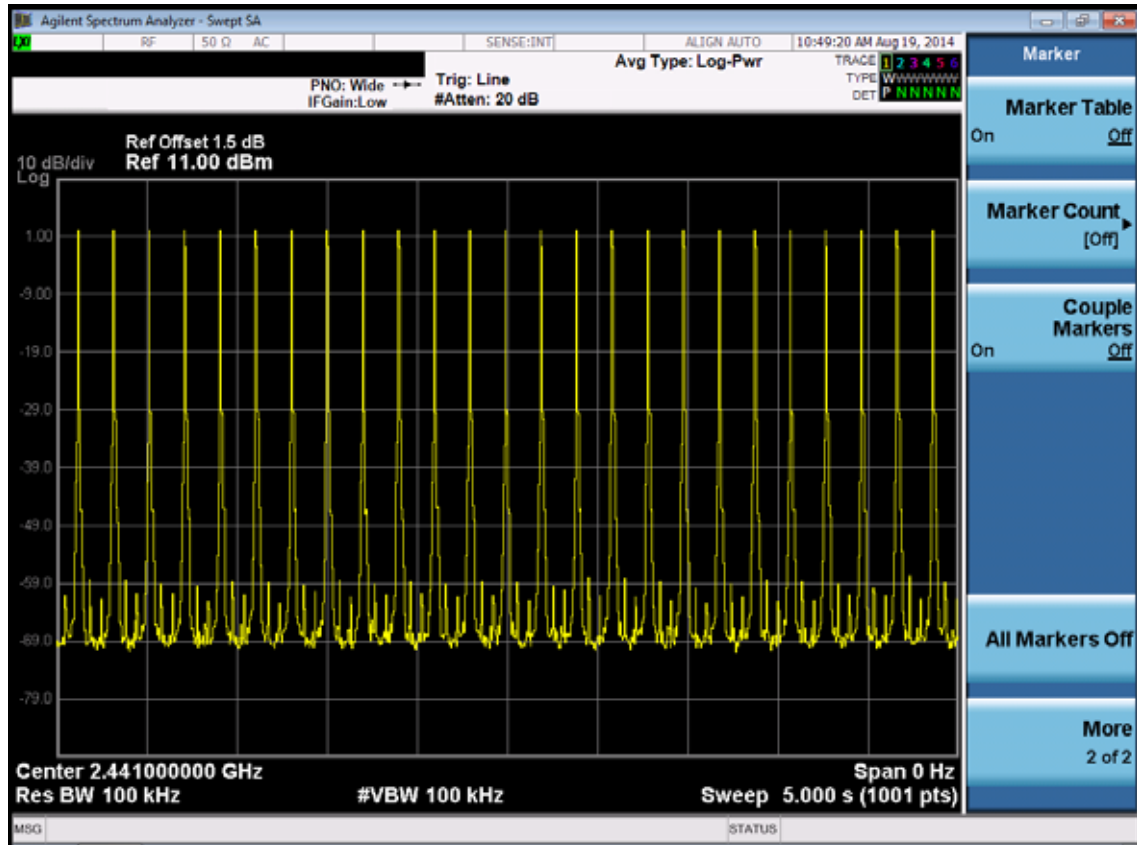
DH 5



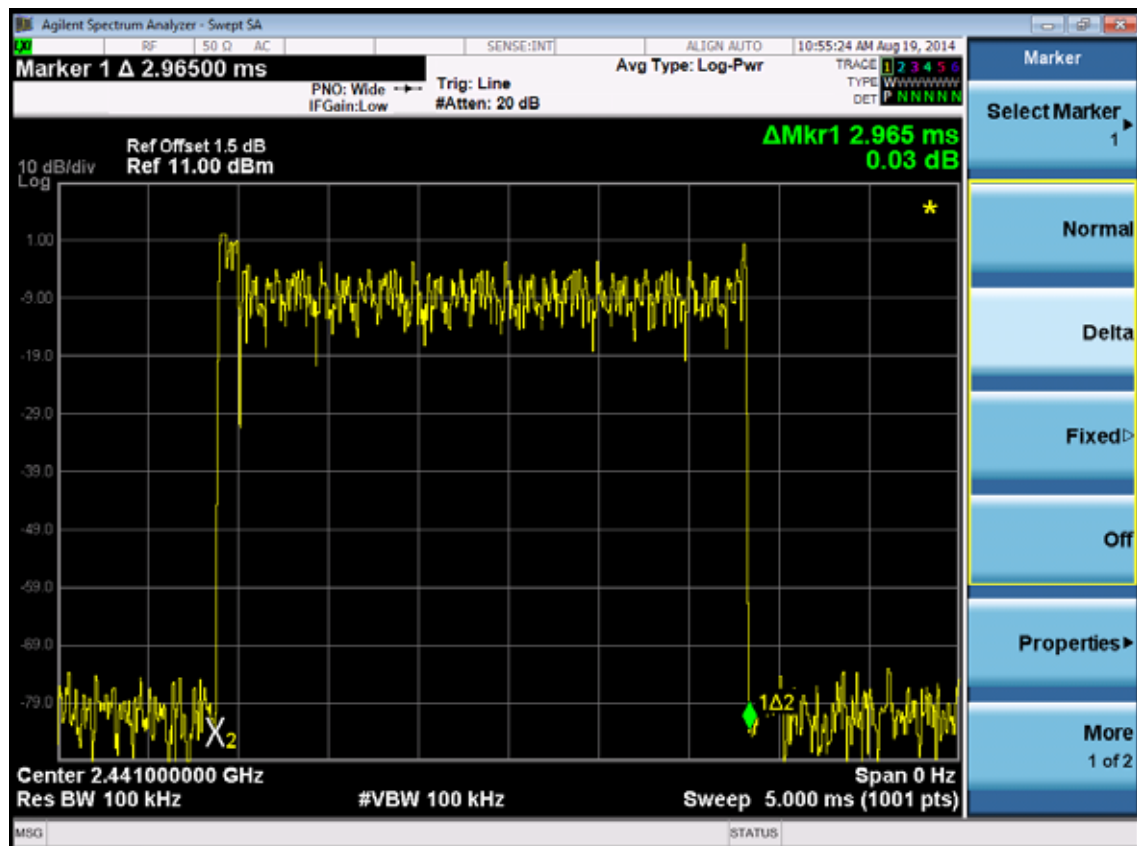
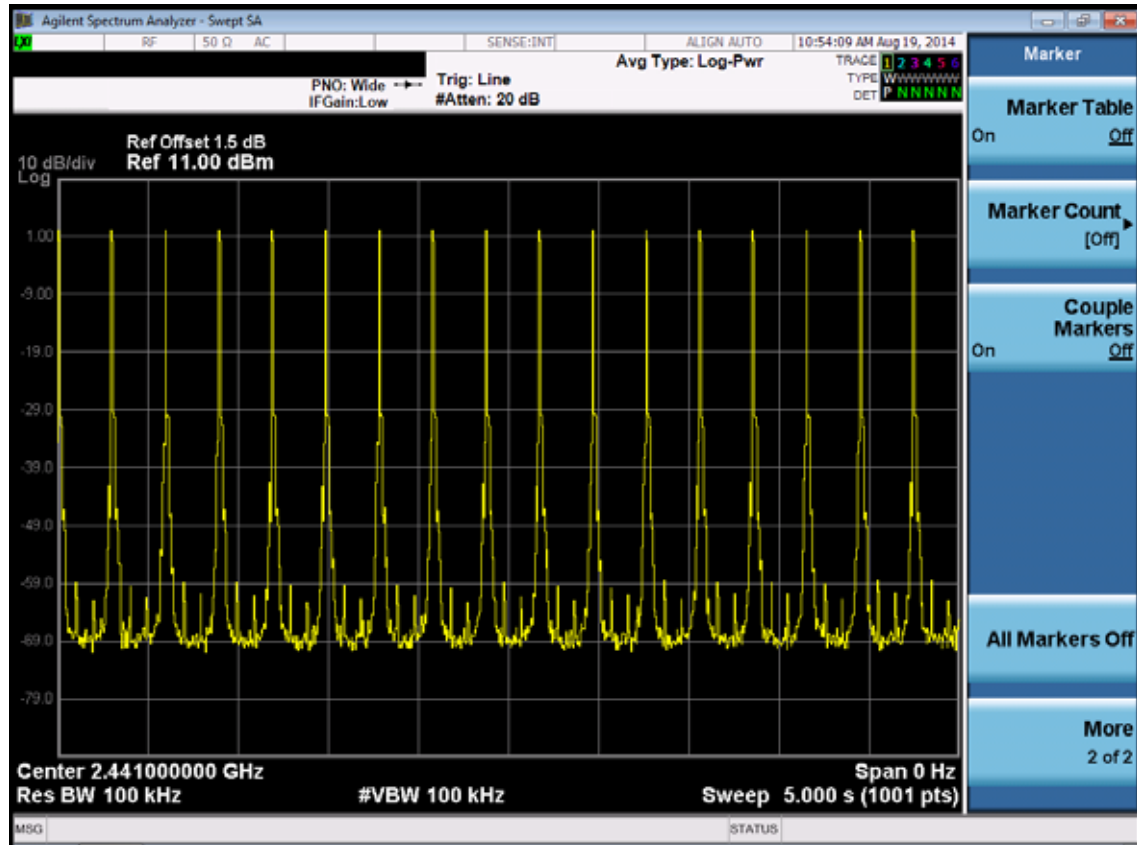
Test Mode: 8-DPSK DH 1



DH 3



DH 5



10. MAXIMUM PEAK OUTPUT POWER TEST

10.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum	Agilent	N9030A	MY51380221	Oct.31, 13	1Year
2.	Power meter	Anritsu	ML2487A	6K00002472	Apr. 28,14	1Year
3.	Power sensor	Anritsu	MA2491A	0033005	Apr. 28,14	1Year
4.	Attenuator (20dB)	Agilent	8491B	MY39262165	Apr. 28,14	1Year
5.	RF Cable	Hubersuhner	SUCOFLEX102	28610/2	Apr. 28,14	1Year

10.2. Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

10.3. Test Procedure

Connected the EUT's antenna port to Power Sensor, and use power meter to test peak output power Directly.

10.4. Test Results

EUT: Bluetooth Module			
M/N: TBM-CBC5			
Test date: 2014-08-11		Pressure: 101.1±1.0 kpa	Humidity: 51.2±1.0%
Tested by: Kobe_Huang		Test site: RF site	Temperature: 22.5±1.0 °C
Cable loss: 1.5dB		Attenuator loss: 20 dB	
Test Mode	CH (MHz)	Peak output Power (dBm)	Limit (dBm)
GFSK	2402	3.891	30
	2441	3.086	30
	2480	3.843	30
8-DPSK	2402	2.961	30
	2441	2.261	30
	2480	2.913	30
Conclusion: PASS			

11.BAND EDGE COMPLIANCE TEST

11.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Amp	HP	8449B	3008A02495	Apr. 28,14	1 Year
2.	Horn Antenna	ETS	3115	9510-4580	Jun. 06, 14	1 Year
3.	HF Cable	Hubersuhner	Sucoflex104	274094/4	Apr. 28,14	1 Year
4.	RF Cable	Hubersuhner	Sucoflex102	28610/2	Apr. 28,14	1 Year

11.2.Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

11.3.Test Produce

For upper band emissions that are up to two bandwidths(2MHz) away (2483.5MHz to 2485.5MHz) from the band-edge use below produce:

1. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 100KHz and with a video bandwidth 300KHz. Record the peak levels of the fundamental emission and the relevant band-edge emission, Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.
2. Subtract the delta measured in step (1) from the maximum field strengths measured in clause 4 .The resultant field strengths are then used to determine band-edge compliance as required by Section 15.205

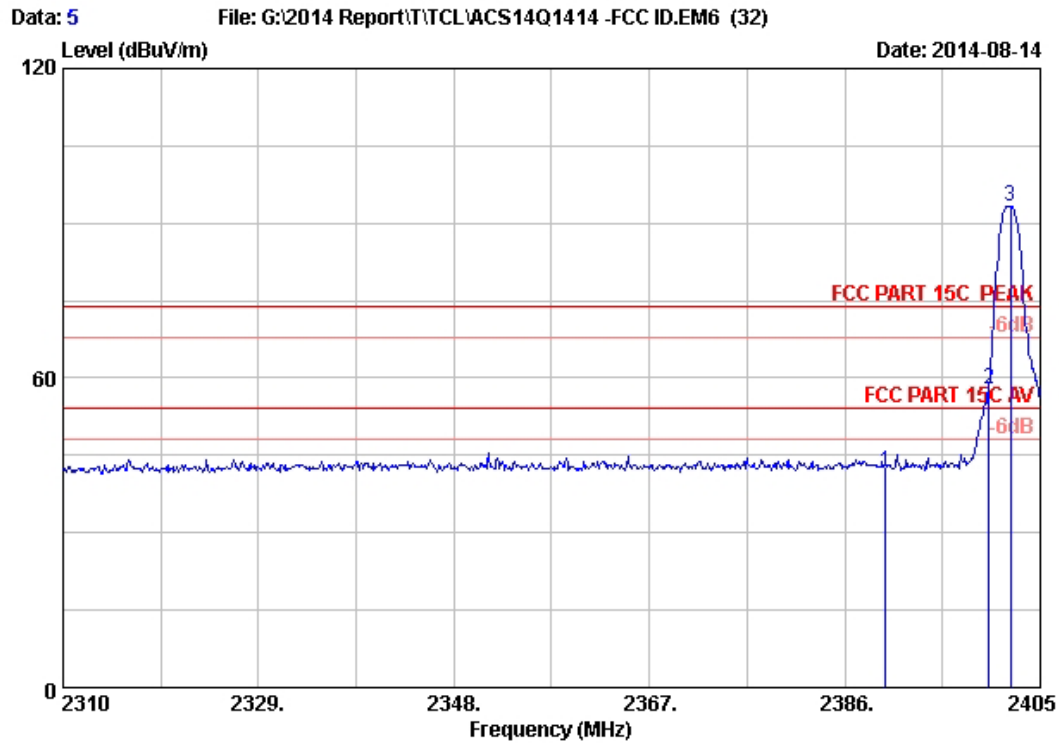
For emissions above two bandwidths away from the band-edge use below produce:

1. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
2. The turntable was 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 upperband-edges of the emission:
 - (a) PEAK: RBW=1MHz ;VBW=3MHz, PK detector, Sweep=AUTO
 - (b) This is pulse Modulation device a duty cycle factor was used to calculate average level based measured peak level.

11.4.Test Results

Pass (The testing data was attached in the next pages.)

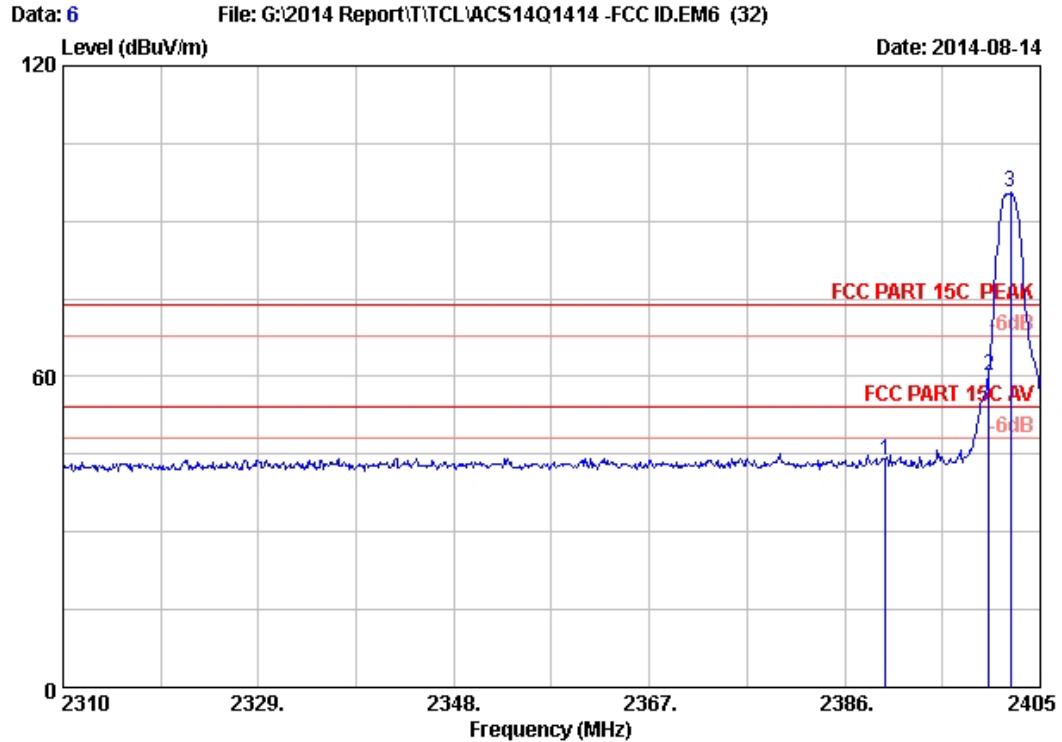
Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.



Site no. : 3m Chamber Data no. : 5
 Dis. / Ant. : 3m 2013 3115 (4580) Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 24°C/56% Engineer : Kevin_Hu
 EUT : Bluetooth Module
 Power Rating : DC 3.3V
 Test Mode : GFSK 2402MHz
 M/N : TBM-CBC5

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission			
						Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.000	28.16	5.78	35.70	43.67	41.91	74.00	32.09	Peak
2	2400.000	28.18	5.80	35.70	59.64	57.92	74.00	16.08	Peak
3	2402.150	28.18	5.80	35.70	95.12	93.40	74.00	-19.40	Peak

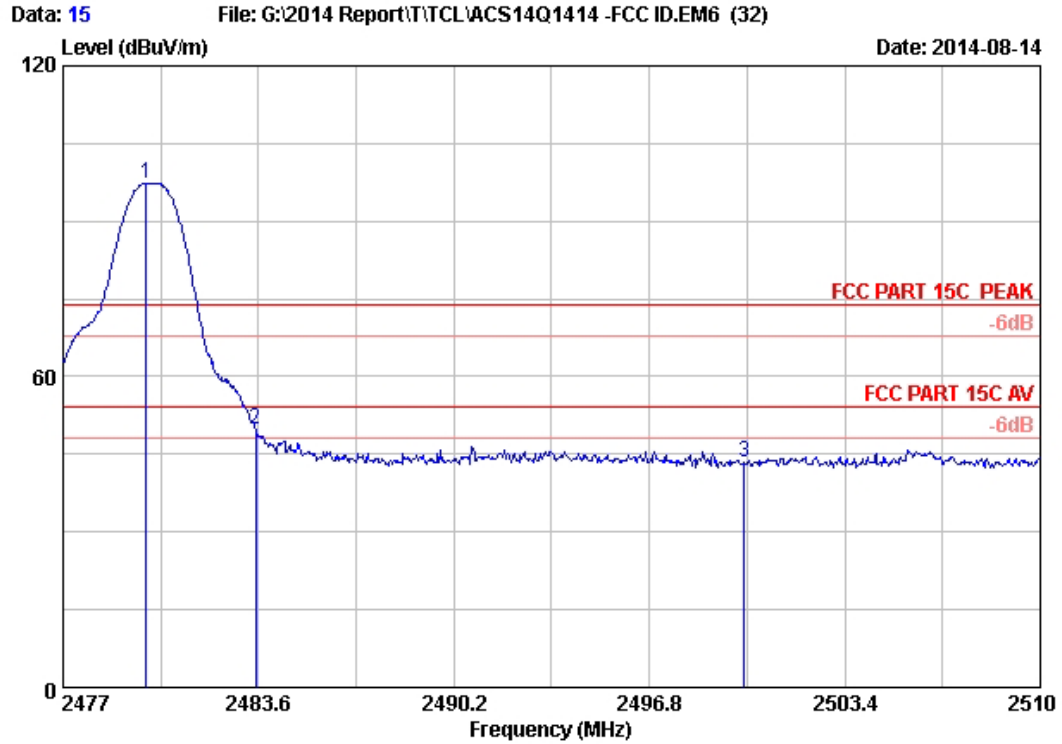
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp Factor
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 6
 Dis. / Ant. : 3m 2013 3115 (4580) Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 24°C/56% Engineer : Kevin_Hu
 EUT : Bluetooth Module
 Power Rating : DC 3.3V
 Test Mode : GFSK 2402MHz
 M/N : TBM-CBC5

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Emission				Remark
					Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	
1	2390.000	28.16	5.78	35.70	45.44	43.68	74.00	30.32	Peak
2	2400.000	28.18	5.80	35.70	61.93	60.21	74.00	13.79	Peak
3	2402.150	28.18	5.80	35.70	97.17	95.45	74.00	-21.45	Peak

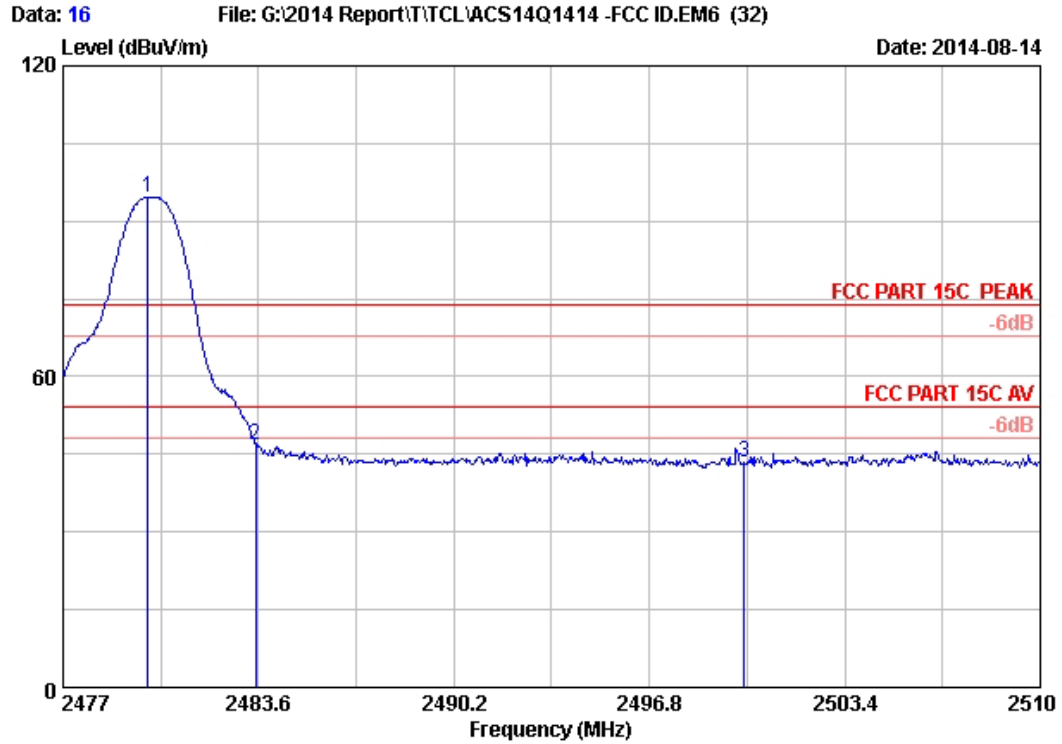
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp Factor
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 15
 Dis. / Ant. : 3m 2013 3115 (4580) Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 24°C/56% Engineer : Kevin_Hu
 EUT : Bluetooth Module
 Power Rating : DC 3.3V
 Test Mode : GFSK 2480MHz
 M/N : TBM-CBC5

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Emission				Remark
					Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	
1	2479.805	28.36	5.91	35.70	98.82	97.39	74.00	-23.39	Peak
2	2483.500	28.36	5.92	35.70	51.19	49.77	74.00	24.23	Peak
3	2500.000	28.40	5.94	35.70	44.69	43.33	74.00	30.67	Peak

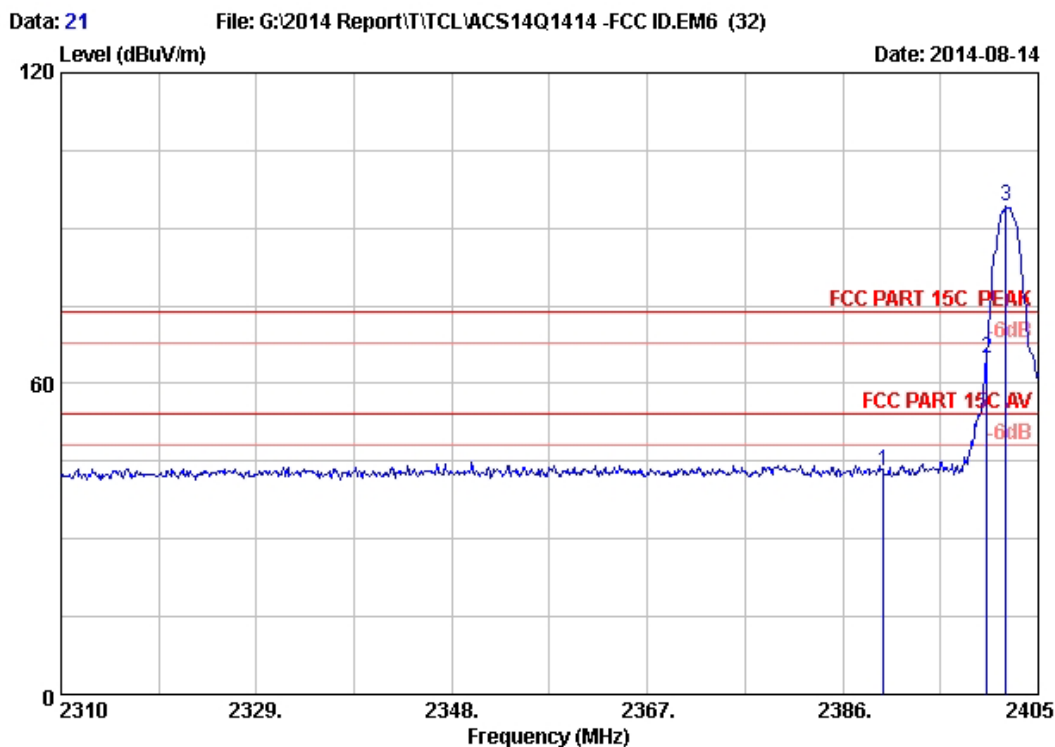
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp Factor
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 16
 Dis. / Ant. : 3m 2013 3115 (4580) Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 24°C/56% Engineer : Kevin_Hu
 EUT : Bluetooth Module
 Power Rating : DC 3.3V
 Test Mode : GFSK 2480MHz
 M/N : TBM-CBC5

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Emission				
					Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.871	28.36	5.91	35.70	96.02	94.59	74.00	-20.59	Peak
2	2483.500	28.36	5.92	35.70	48.29	46.87	74.00	27.13	Peak
3	2500.000	28.40	5.94	35.70	44.94	43.58	74.00	30.42	Peak

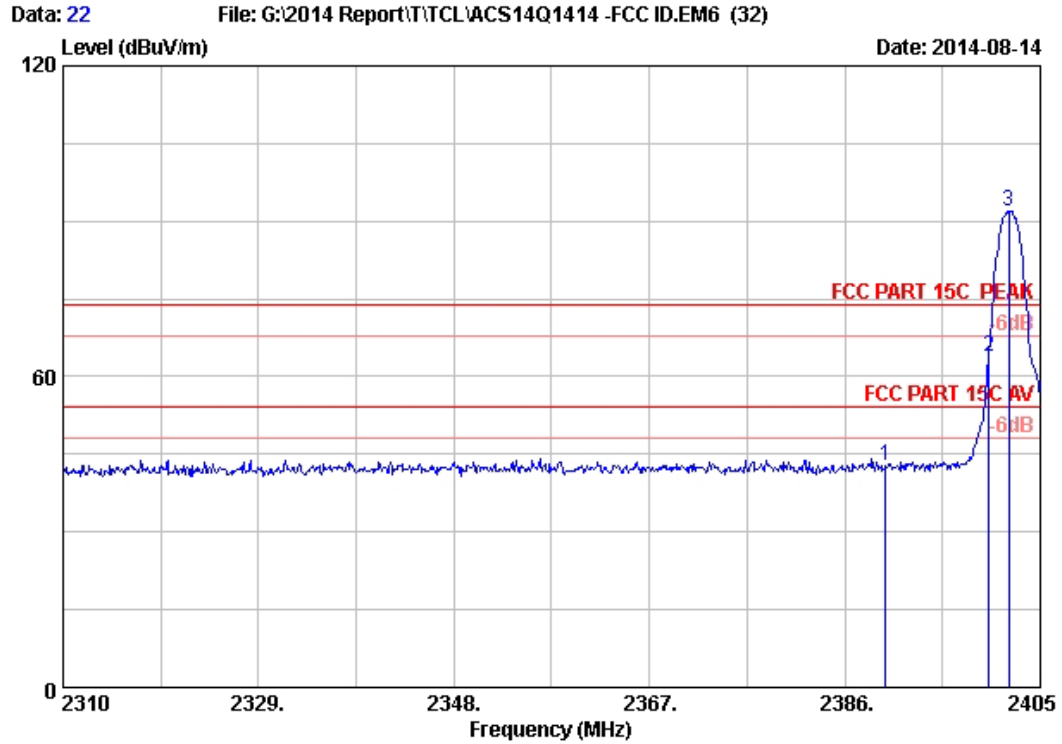
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp Factor
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 21
 Dis. / Ant. : 3m 2013 3115 (4580) Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 24°C/56% Engineer : Kevin_Hu
 EUT : Bluetooth Module
 Power Rating : DC 3.3V
 Test Mode : 8-DPSK 2402MHz
 M/N : TBM-CBC5

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Emission				Remark
					Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	
1	2390.000	28.16	5.78	35.70	44.96	43.20	74.00	30.80	Peak
2	2400.000	28.18	5.80	35.70	66.59	64.87	74.00	9.13	Peak
3	2401.865	28.18	5.80	35.70	95.88	94.16	74.00	-20.16	Peak

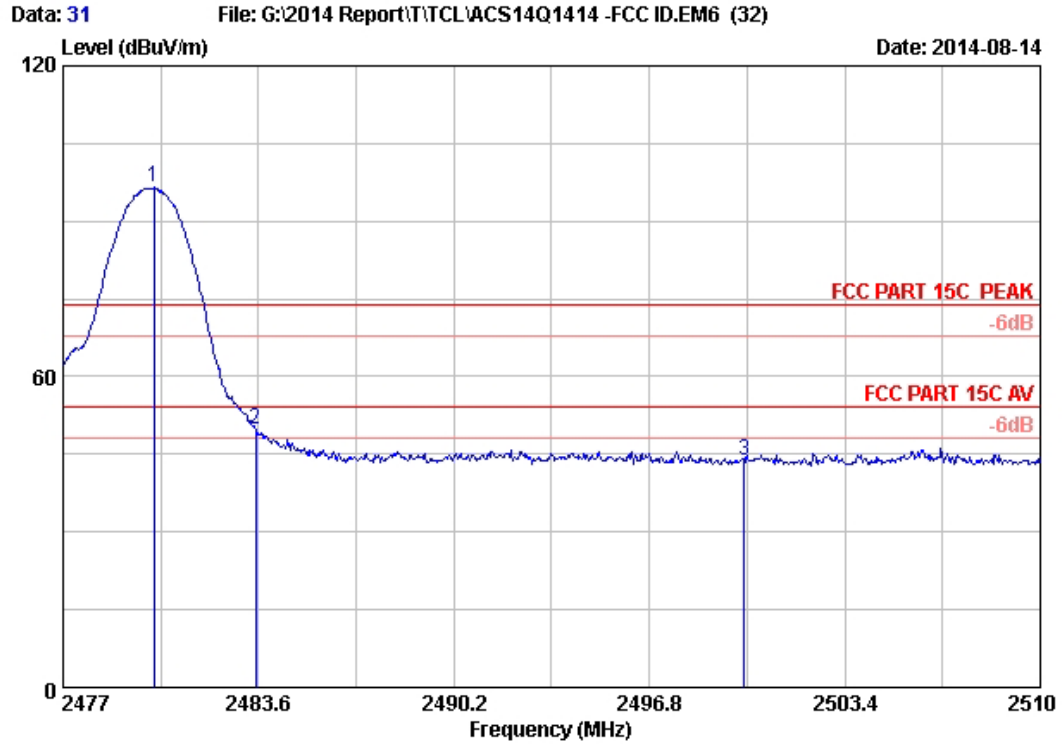
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp Factor
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 22
Dis. / Ant. : 3m 2013 3115 (4580) Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 24°C/56% Engineer : Kevin_Hu
EUT : Bluetooth Module
Power Rating : DC 3.3V
Test Mode : 8-DPSK 2402MHz
M/N : TBM-CBC5

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Emission				Remark
					Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	
1	2390.000	28.16	5.78	35.70	44.44	42.68	74.00	31.32	Peak
2	2400.000	28.18	5.80	35.70	65.56	63.84	74.00	10.16	Peak
3	2401.960	28.18	5.80	35.70	93.66	91.94	74.00	-17.94	Peak

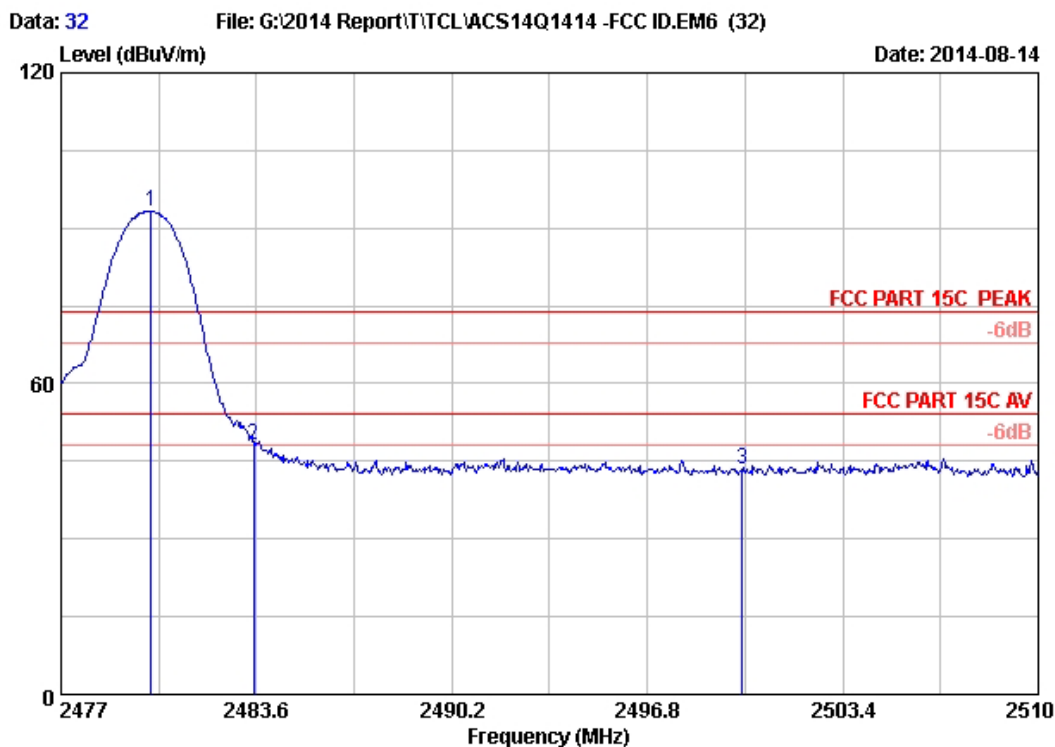
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
- Amp Factor
2. The emission levels that are 20dB below the official
limit are not reported.



Site no. : 3m Chamber Data no. : 31
 Dis. / Ant. : 3m 2013 3115 (4580) Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 24°C/56% Engineer : Kevin_Hu
 EUT : Bluetooth Module
 Power Rating : DC 3.3V
 Test Mode : 8-DPSK 2480MHz
 M/N : TBM-CBC5

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.069	28.36	5.91	35.70	97.87	96.44	74.00	-22.44	Peak
2	2483.500	28.36	5.92	35.70	51.30	49.88	74.00	24.12	Peak
3	2500.000	28.40	5.94	35.70	45.20	43.84	74.00	30.16	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp Factor
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 32
 Dis. / Ant. : 3m 2013 3115 (4580) Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 24°C/56% Engineer : Kevin_Hu
 EUT : Bluetooth Module
 Power Rating : DC 3.3V
 Test Mode : 8-DPSK 2480MHz
 M/N : TBM-CBC5

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.036	28.36	5.91	35.70	94.78	93.35	74.00	-19.35	Peak
2	2483.500	28.36	5.92	35.70	49.71	48.29	74.00	25.71	Peak
3	2500.000	28.40	5.94	35.70	44.90	43.54	74.00	30.46	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp Factor
 2. The emission levels that are 20dB below the official
 limit are not reported.

12.DEVIATION TO TEST SPECIFICATIONS

[NONE]