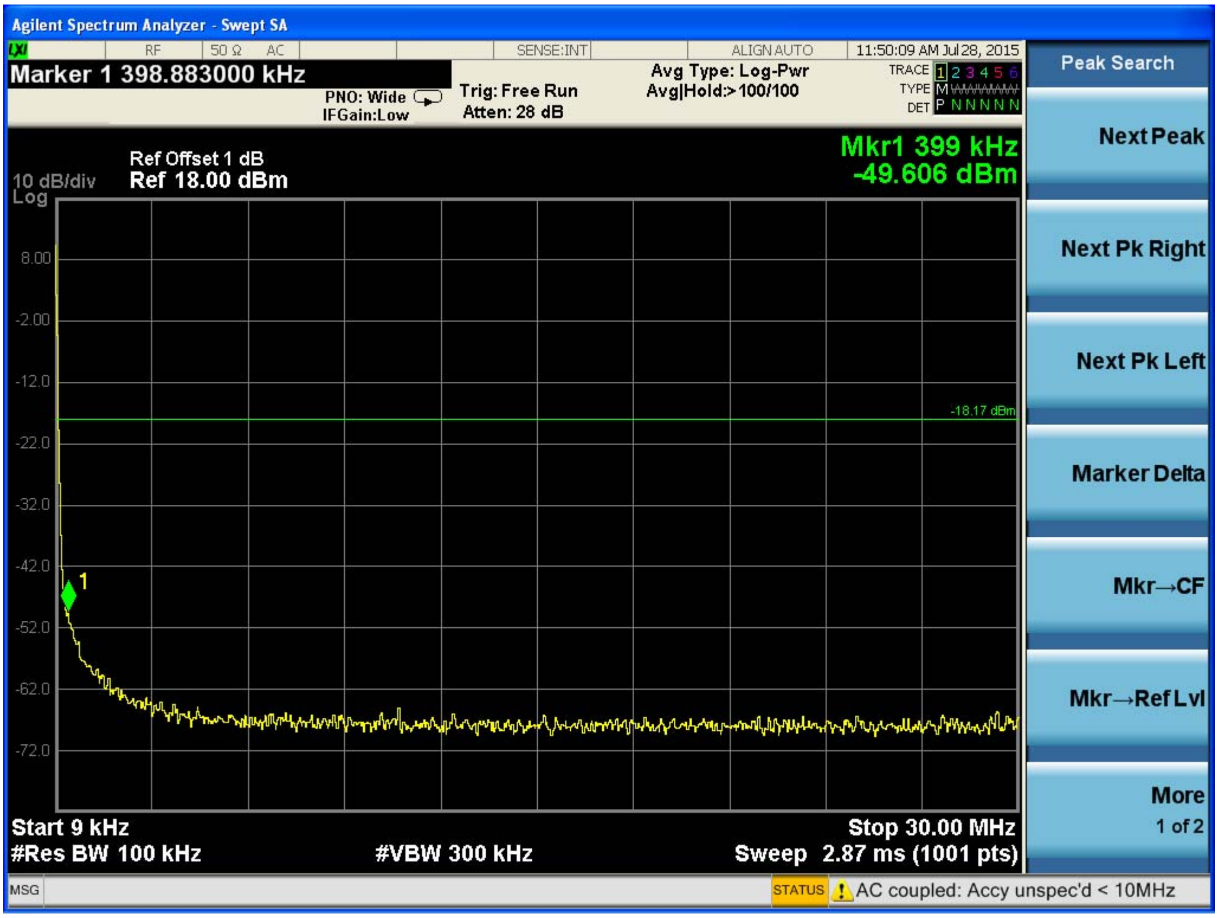
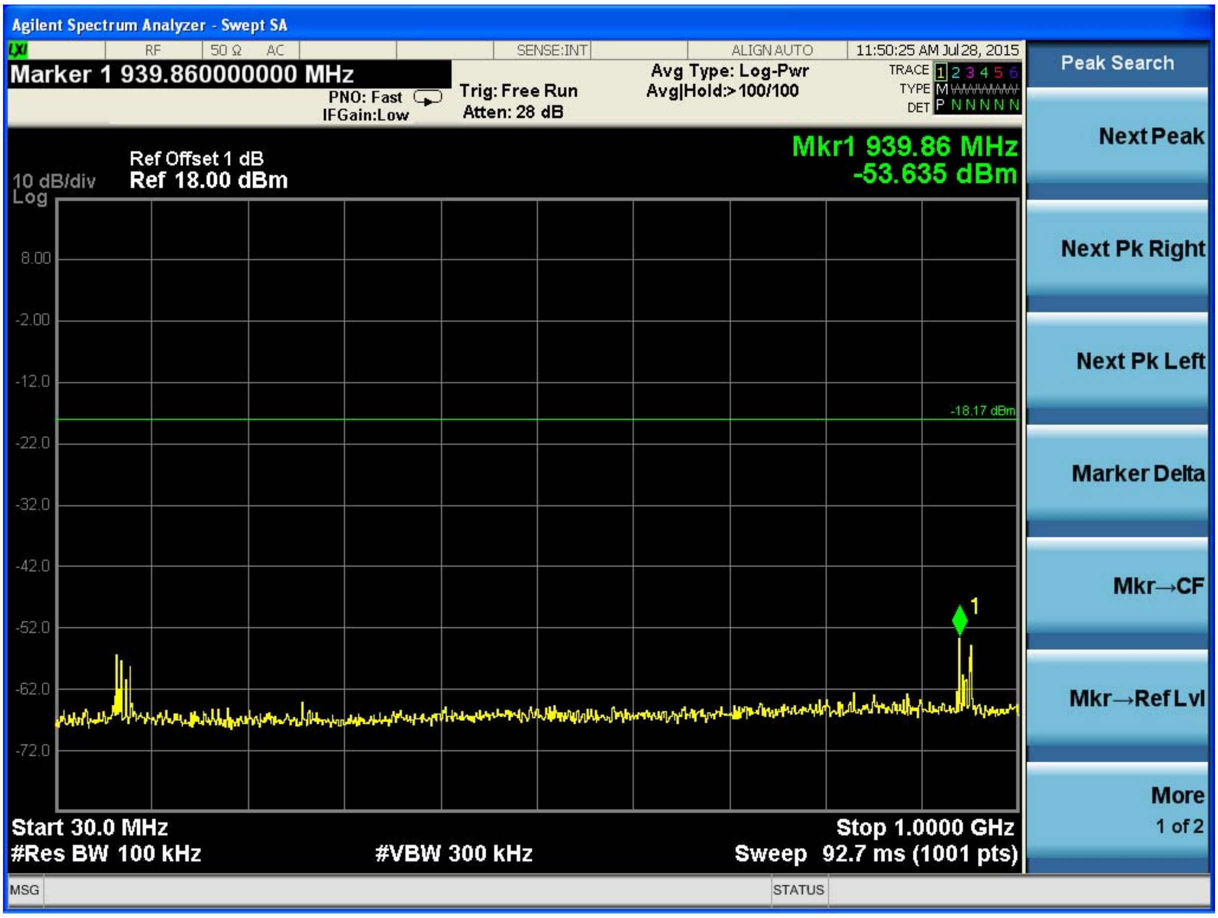
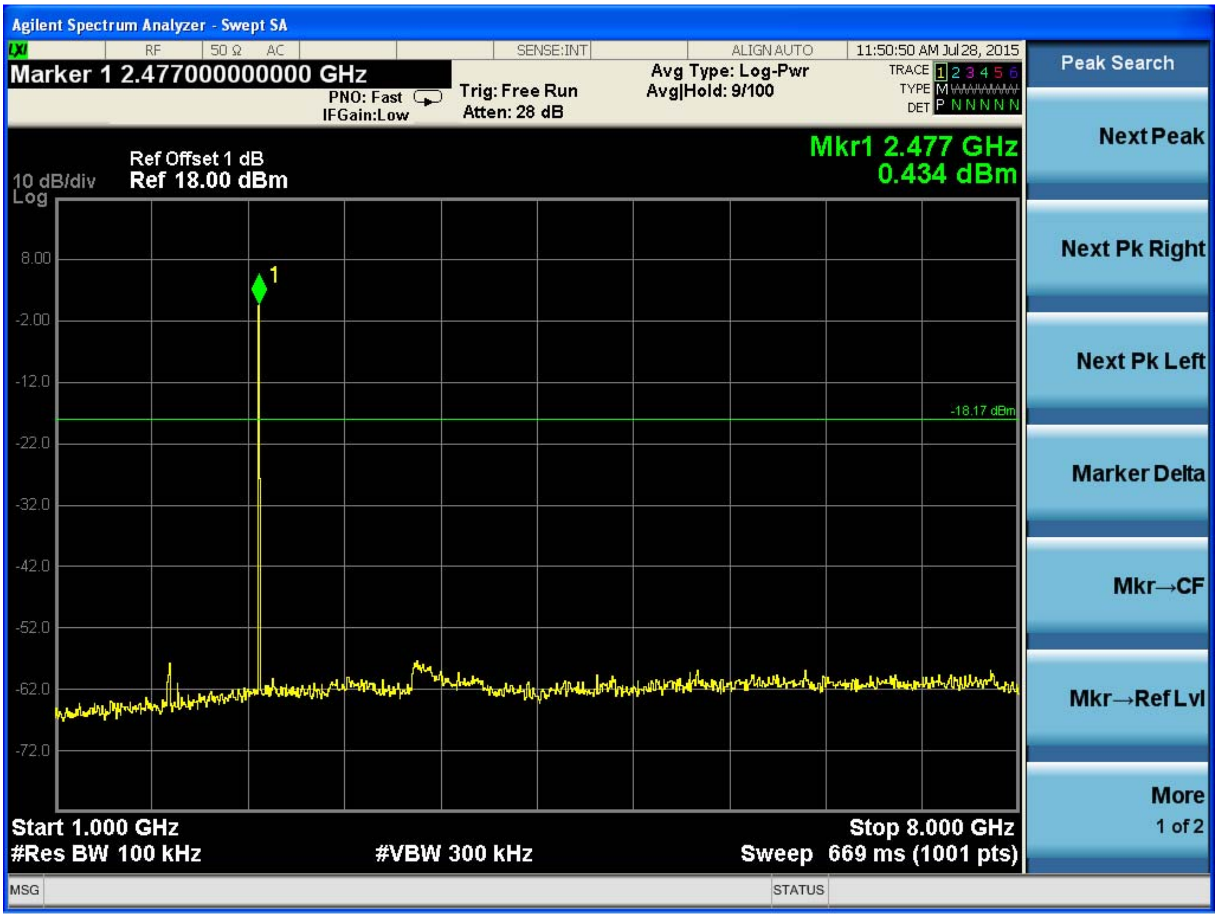
(Plot 4.7.1 C1: Channel 78: 2480MHz @ GFSK)



(Plot 4.7.1 C2: Channel 78: 2480MHz @ GFSK)

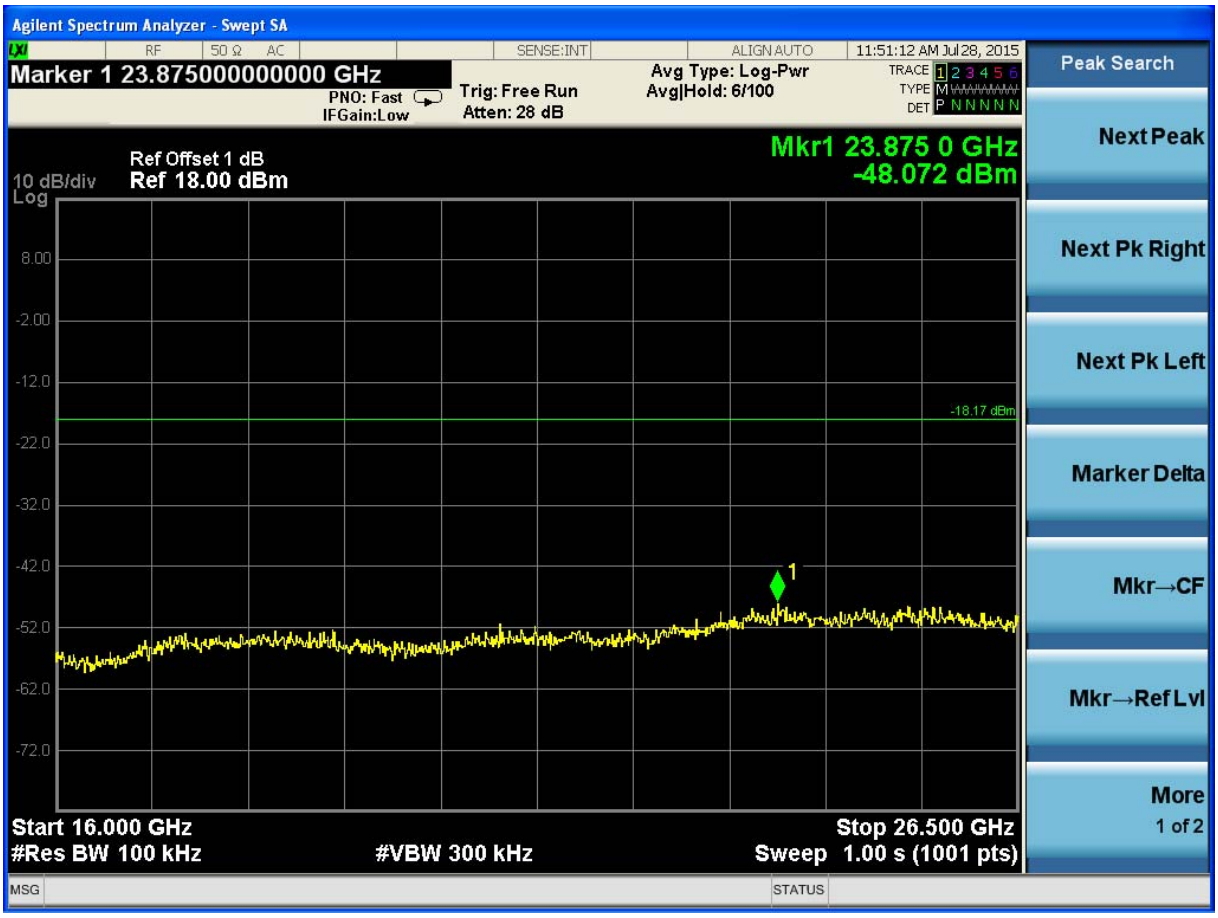


(Plot 4.7.1 C3: Channel 78: 2480MHz @ GFSK)



(Plot 4.7.1 C4: Channel 78: 2480MHz @ GFSK)

(Plot 4.7.1 C5: Channel 78: 2480MHz @ GFSK)



(Plot 4.7.1 C6: Channel 78: 2480MHz @ GFSK)

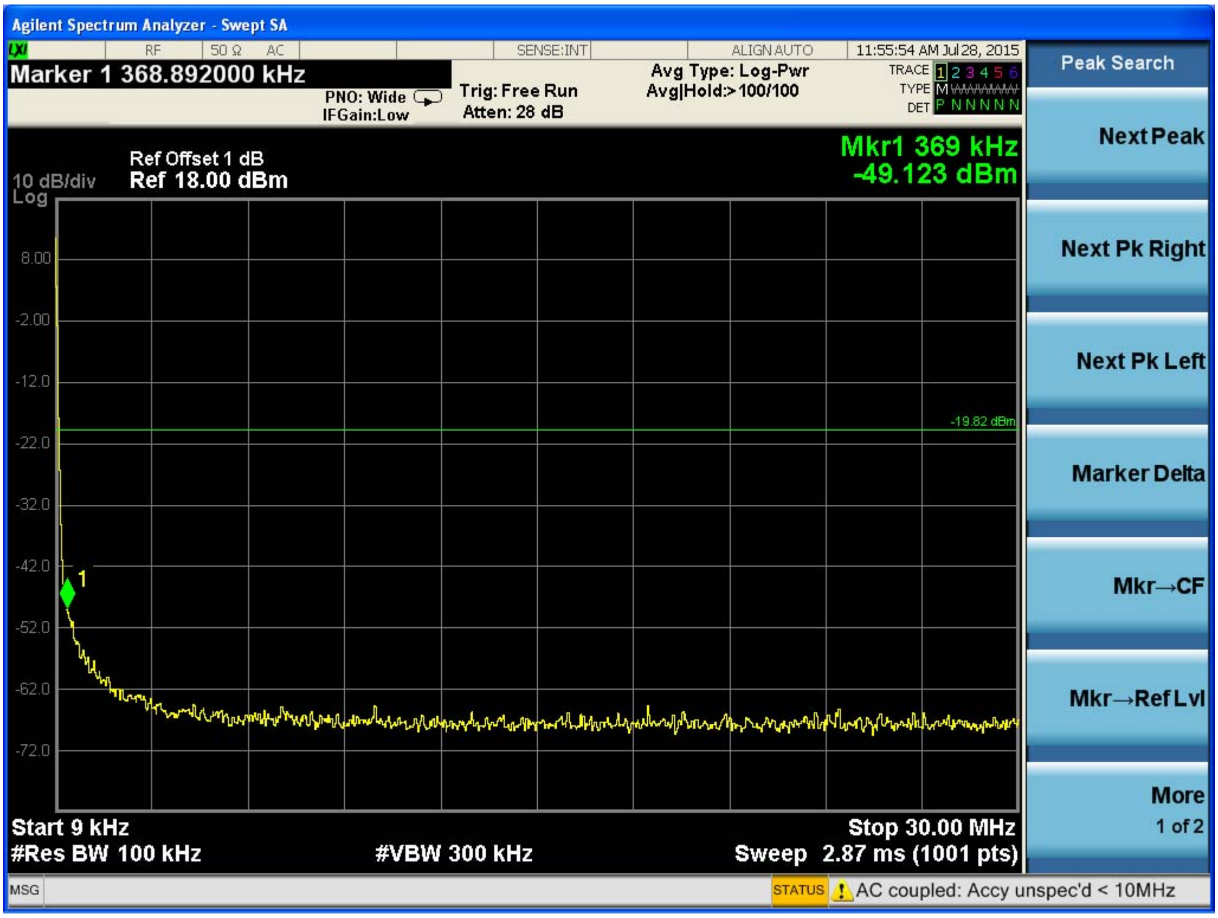
4.7.2 8DPSK Test Mode

A. Test Verdict

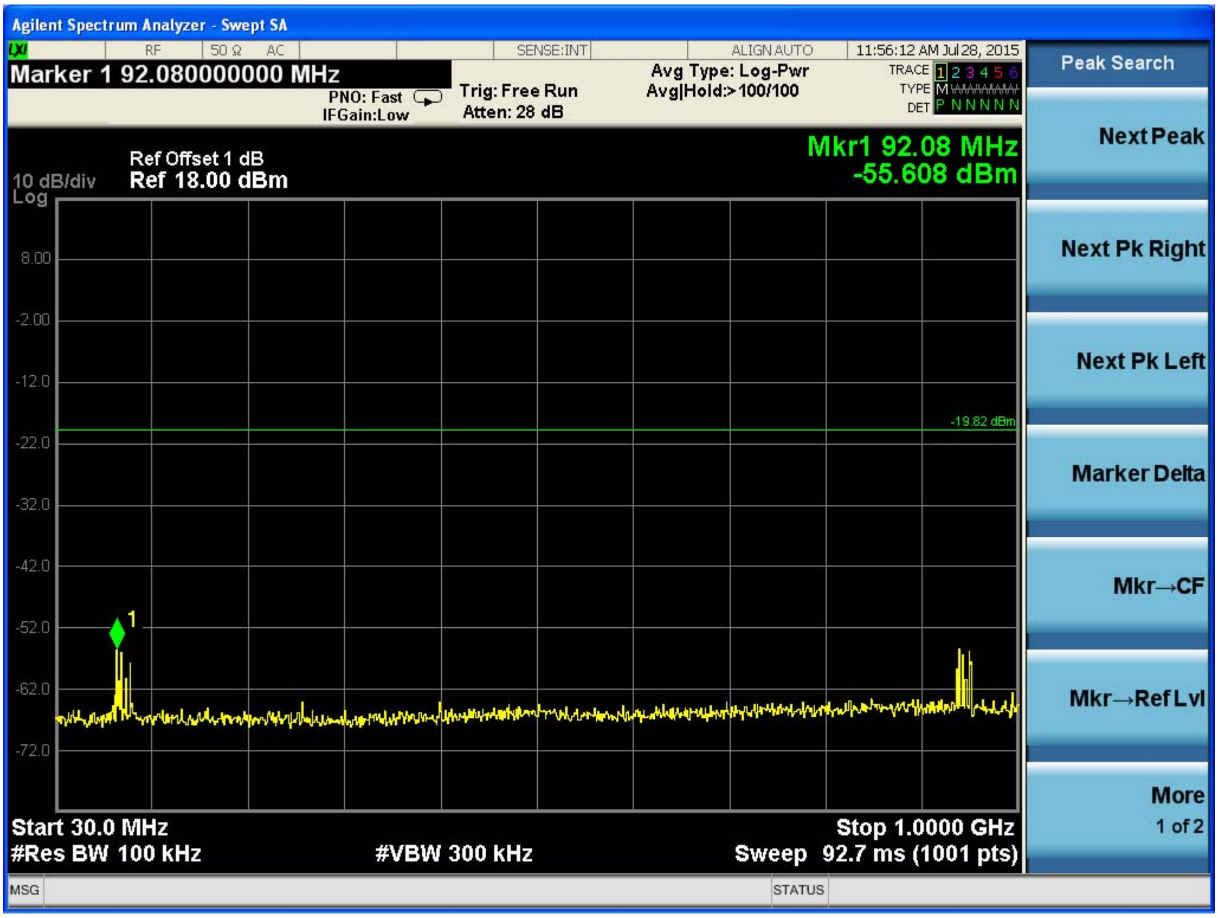
Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
00	2402	2402MHz	Plot 4.7.2 A1	N/A	PASS
		9KHz-30MHz	Plot 4.7.2 A2	-20	PASS
		30MHz-1GHz	Plot 4.7.2 A3	-20	PASS
		1GHz-8GHz	Plot 4.7.2 A4	-20	PASS
		8GHz-16GHz	Plot 4.7.2 A5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.2 A6	-20	PASS
19	2440	2440MHz	Plot 4.7.2 B1	N/A	PASS
		9KHz-30MHz	Plot 4.7.2 B2	-20	PASS
		30MHz-1GHz	Plot 4.7.2 B3	-20	PASS
		1GHz-8GHz	Plot 4.7.2 B4	-20	PASS
		8GHz-16GHz	Plot 4.7.2 B5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.2 B6	-20	PASS
39	2480	2480MHz	Plot 4.7.2 C1	N/A	PASS
		9KHz-30MHz	Plot 4.7.2 C2	-20	PASS
		30MHz-1GHz	Plot 4.7.2 C3	-20	PASS
		1GHz-8GHz	Plot 4.7.2 C4	-20	PASS
		8GHz-16GHz	Plot 4.7.2 C5	-20	PASS
		16GHz-26.5GHz	Plot 4.7.2 C6	-20	PASS

B. Test Plots

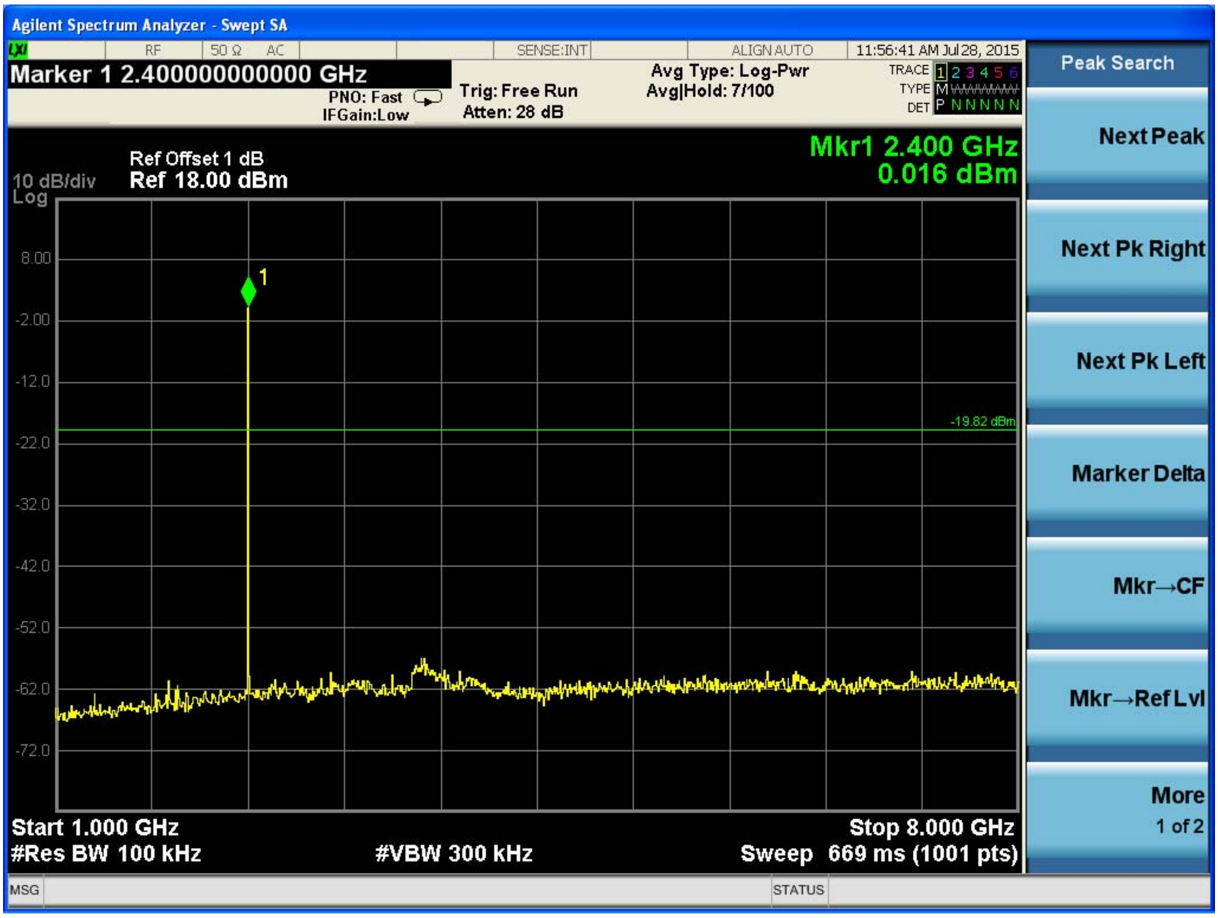
(Plot 4.7.2 A1: Channel 00: 2402MHz @8DPSK)



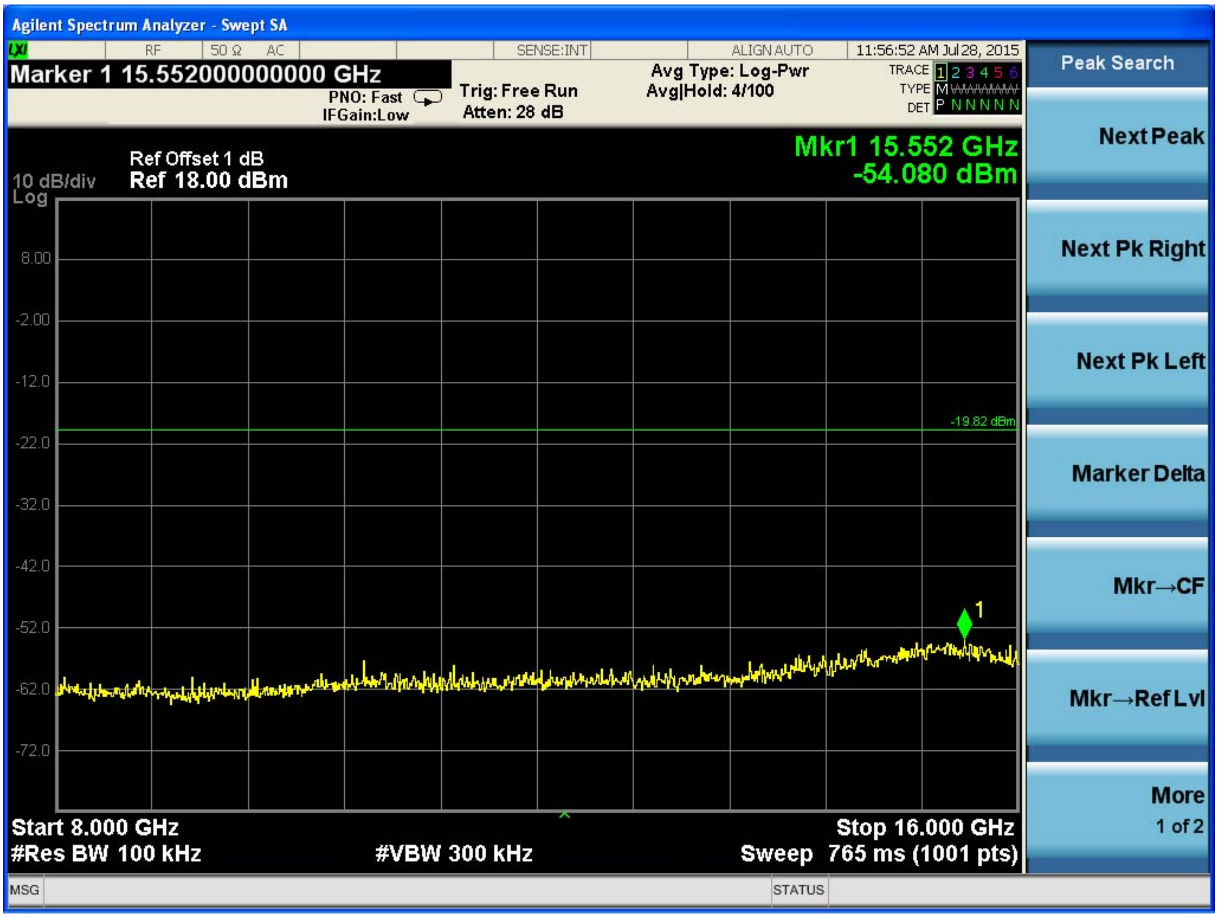
(Plot 4.7.2 A2: Channel 00: 2402MHz @8DPSK)



(Plot 4.7.2 A3: Channel 00: 2402MHz @8DPSK)



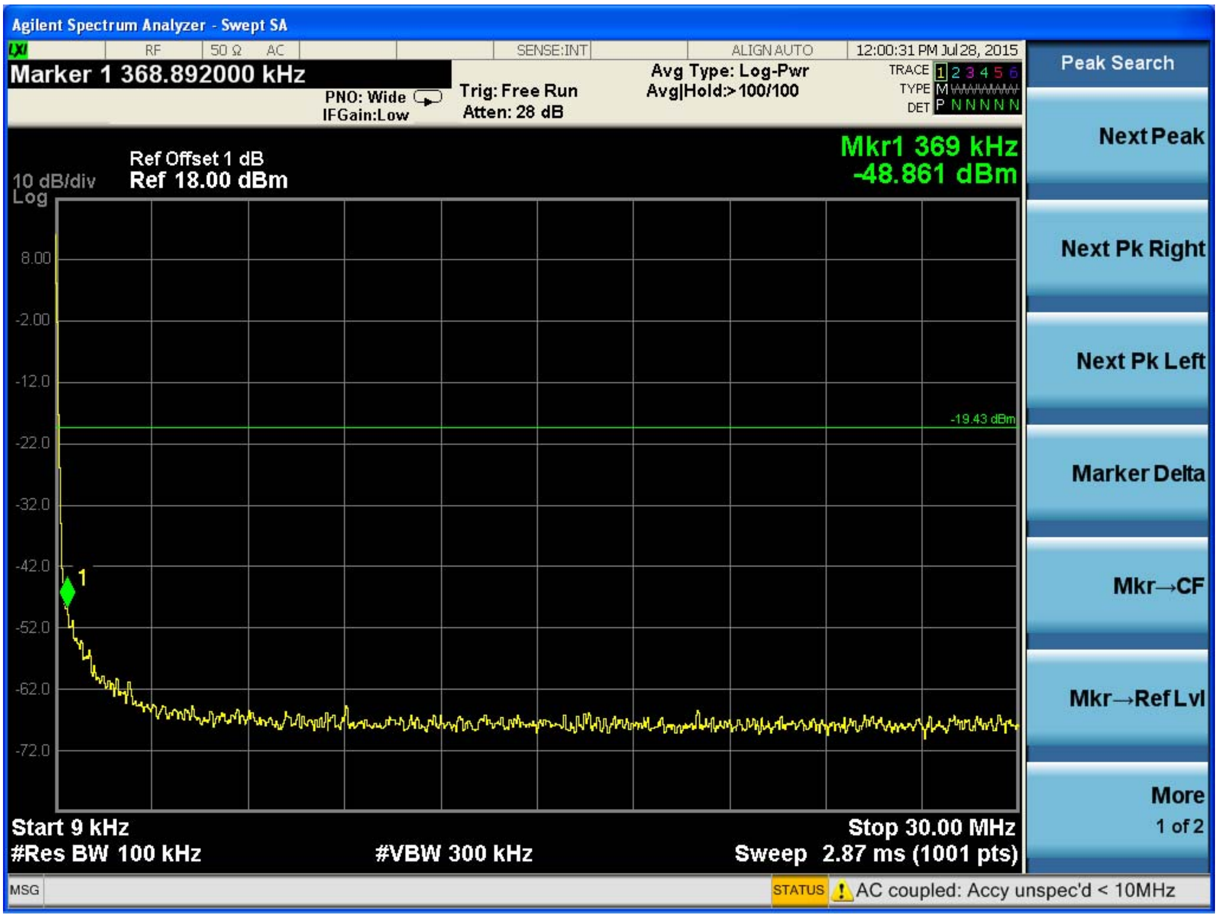
(Plot 4.7.2 A4: Channel 00: 2402MHz @8DPSK)



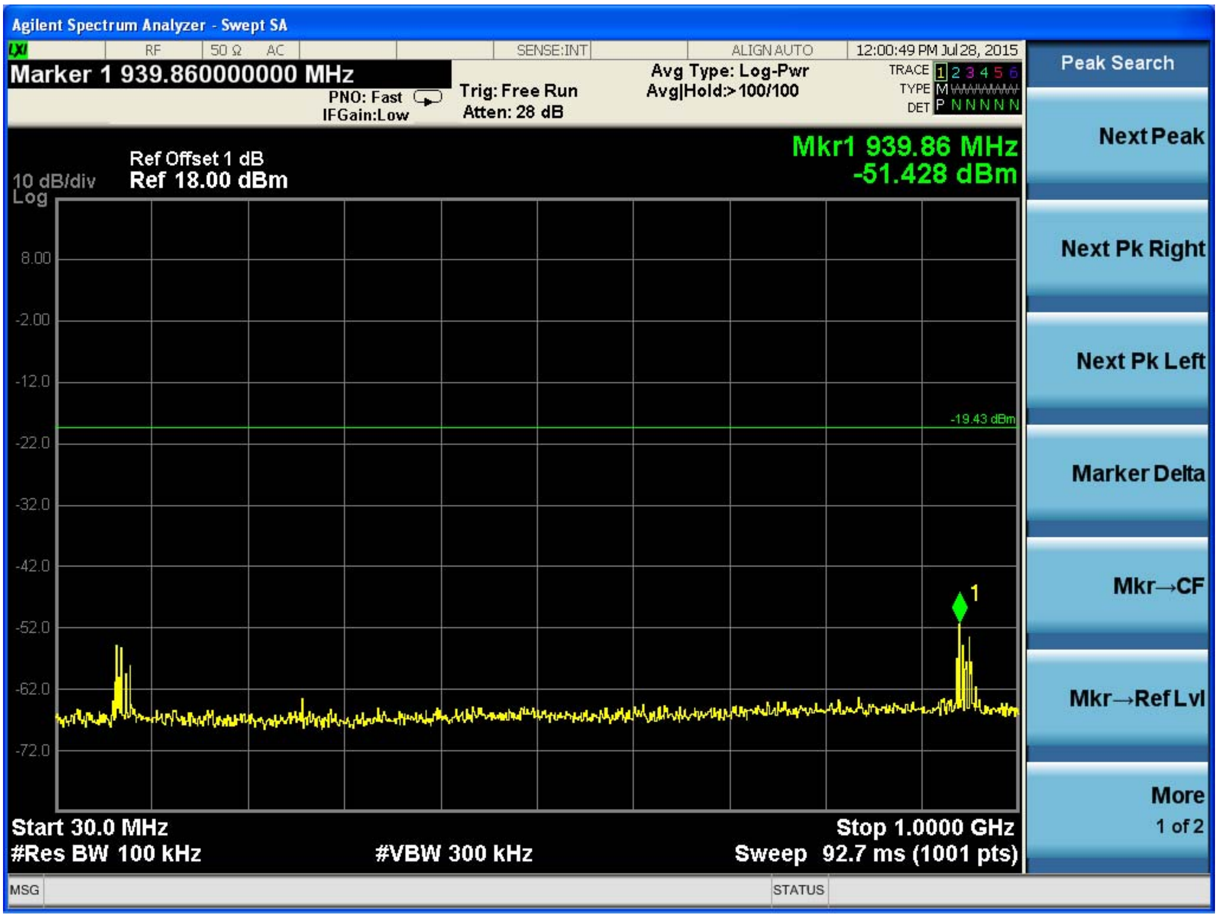
(Plot 4.7.2 A5: Channel 00: 2402MHz @8DPSK)

(Plot 4.7.2 A6: Channel 00: 2402MHz @8DPSK)

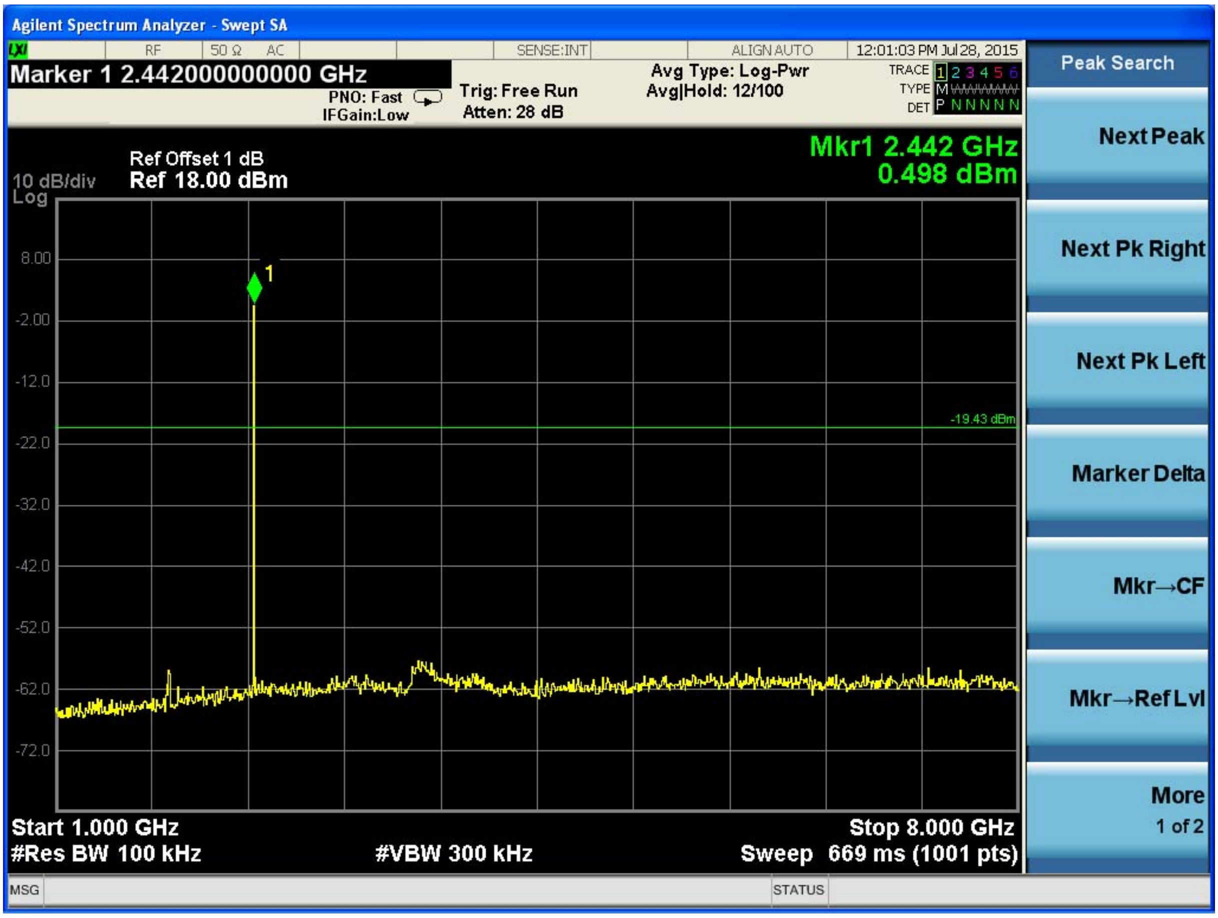
(Plot 4.7.2 B1: Channel 39: 2441MHz @8DPSK)



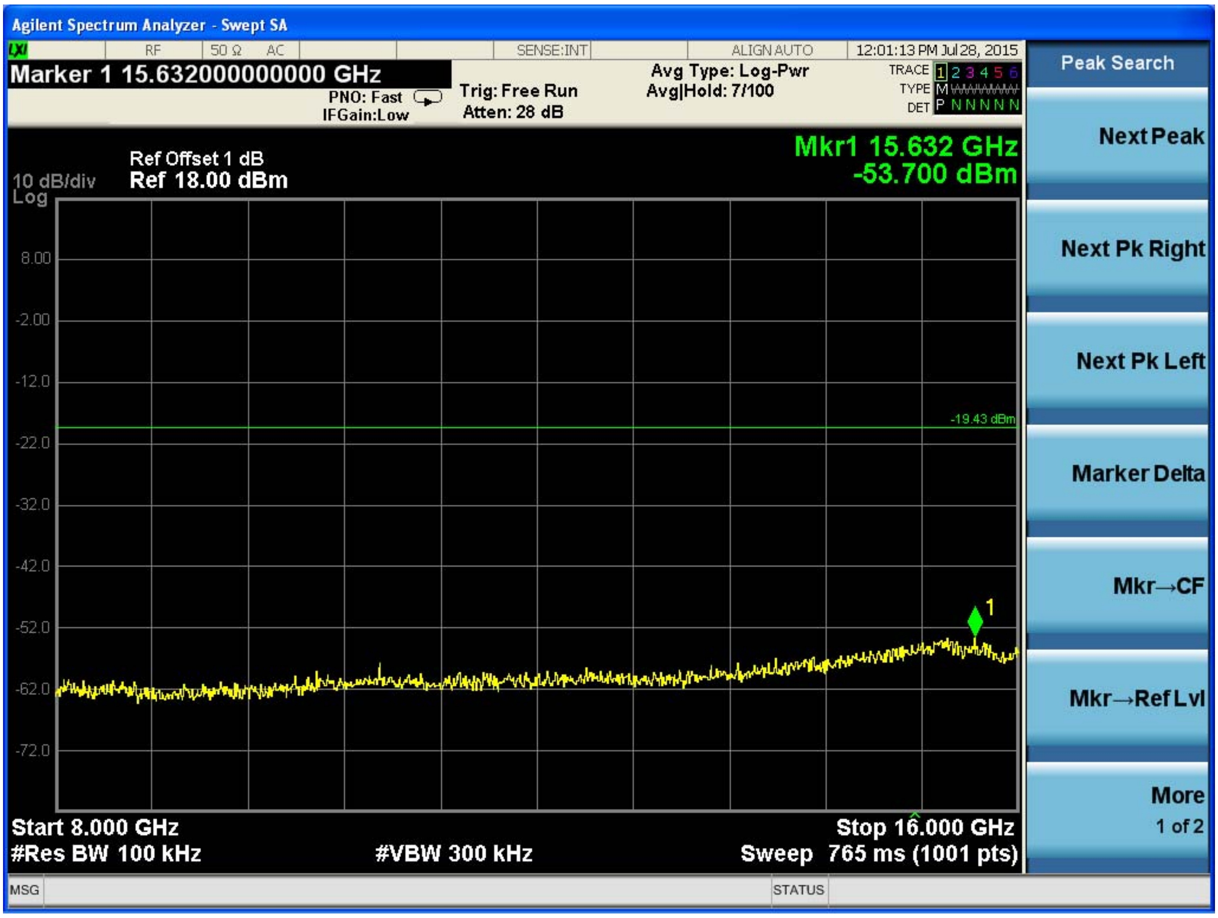
(Plot 4.7.2 B2: Channel 39: 2441MHz @8DPSK)



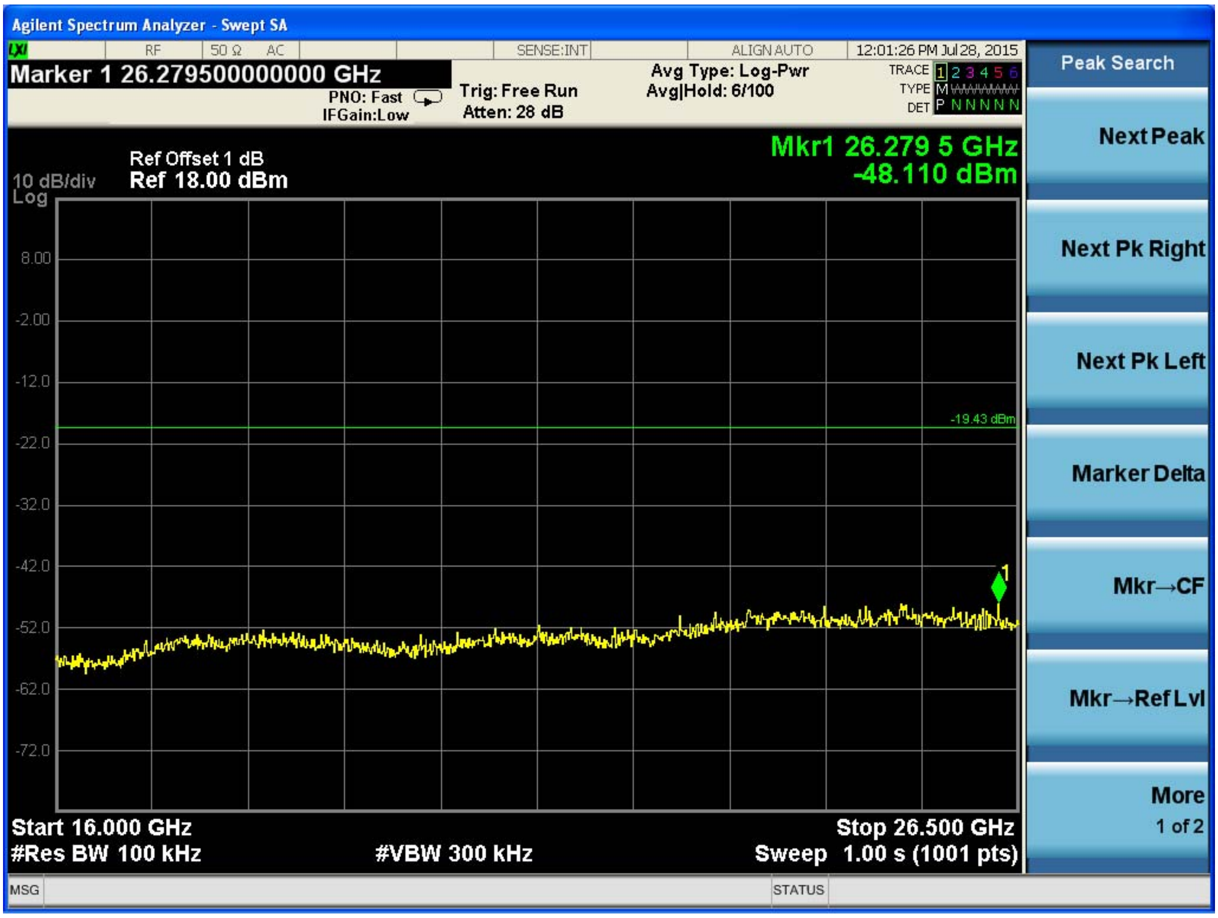
(Plot 4.7.2 B3: Channel 39: 2441MHz @8DPSK)



(Plot 4.7.2 B4: Channel 39: 2441MHz @8DPSK)

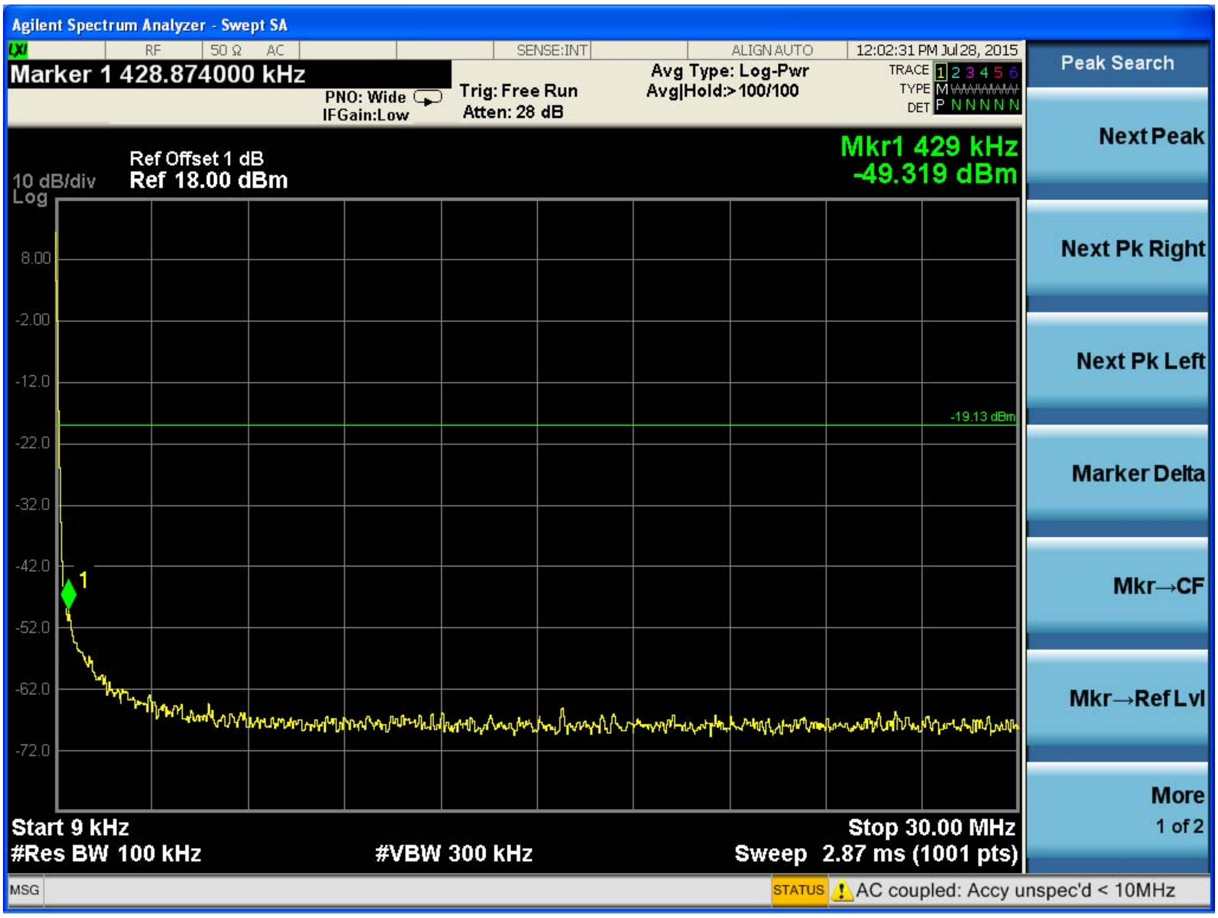


(Plot 4.7.2 B5: Channel 39: 2441MHz @8DPSK)

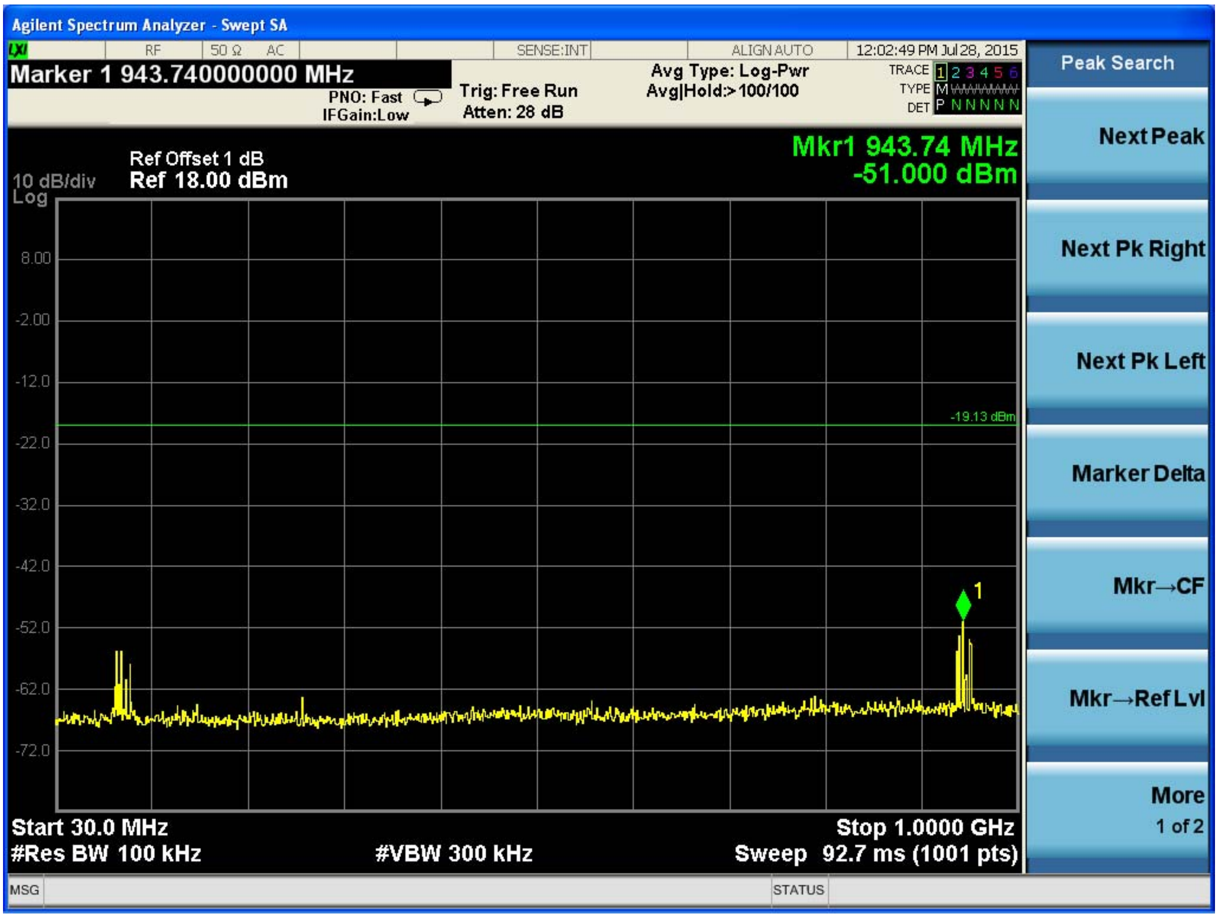


(Plot 4.7.2 B6: Channel 39: 2441MHz @8DPSK)

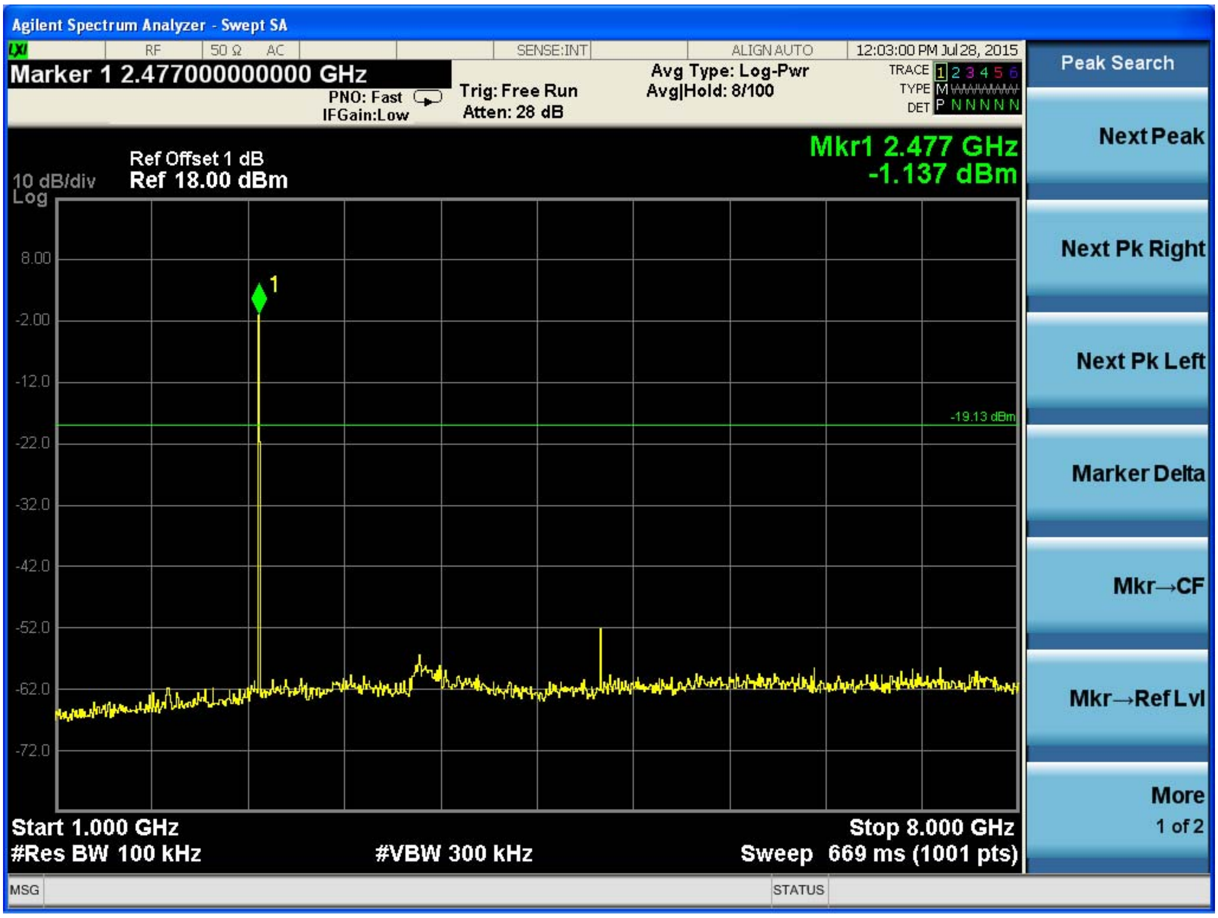
(Plot 4.7.2 C1: Channel 78: 2480MHz @8DPSK)



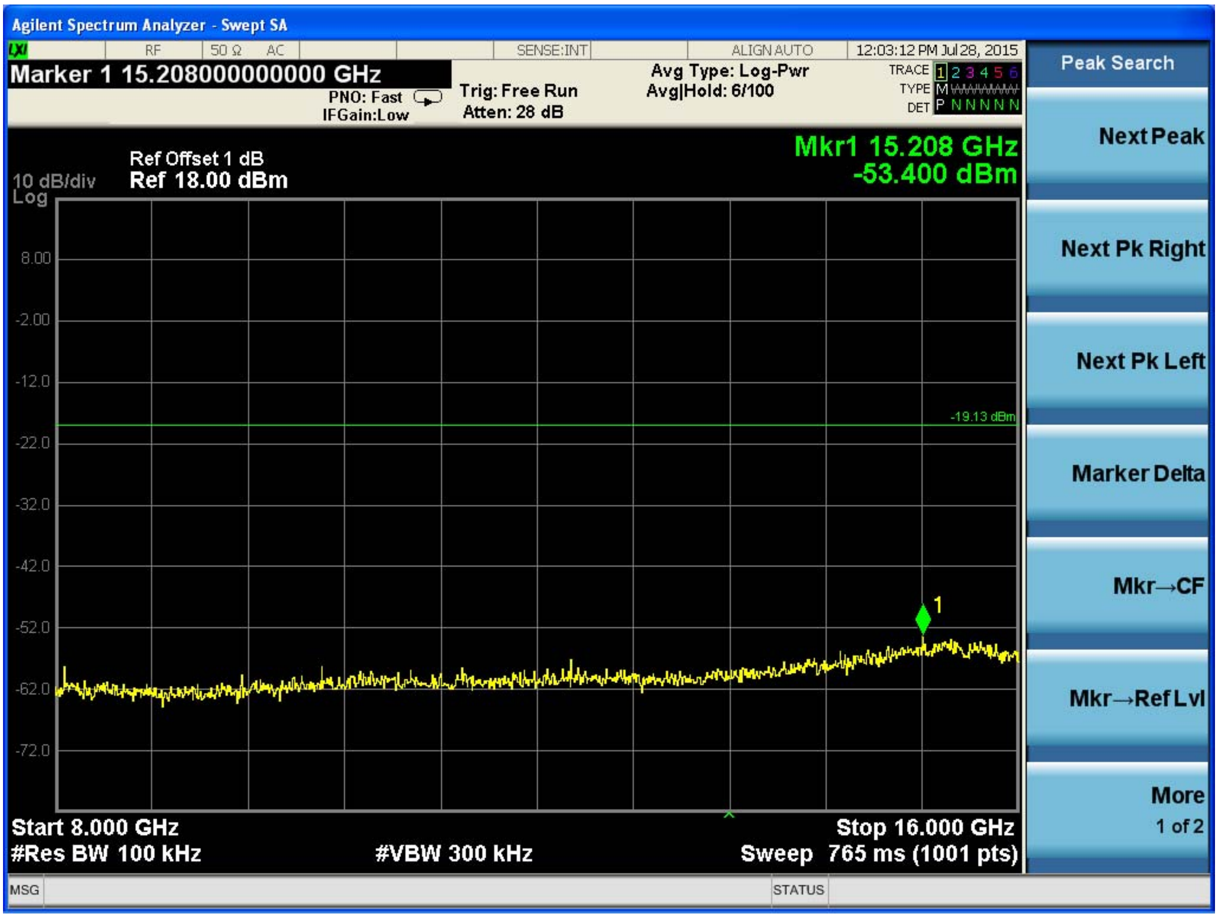
(Plot 4.7.2 C2: Channel 78: 2480MHz @8DPSK)



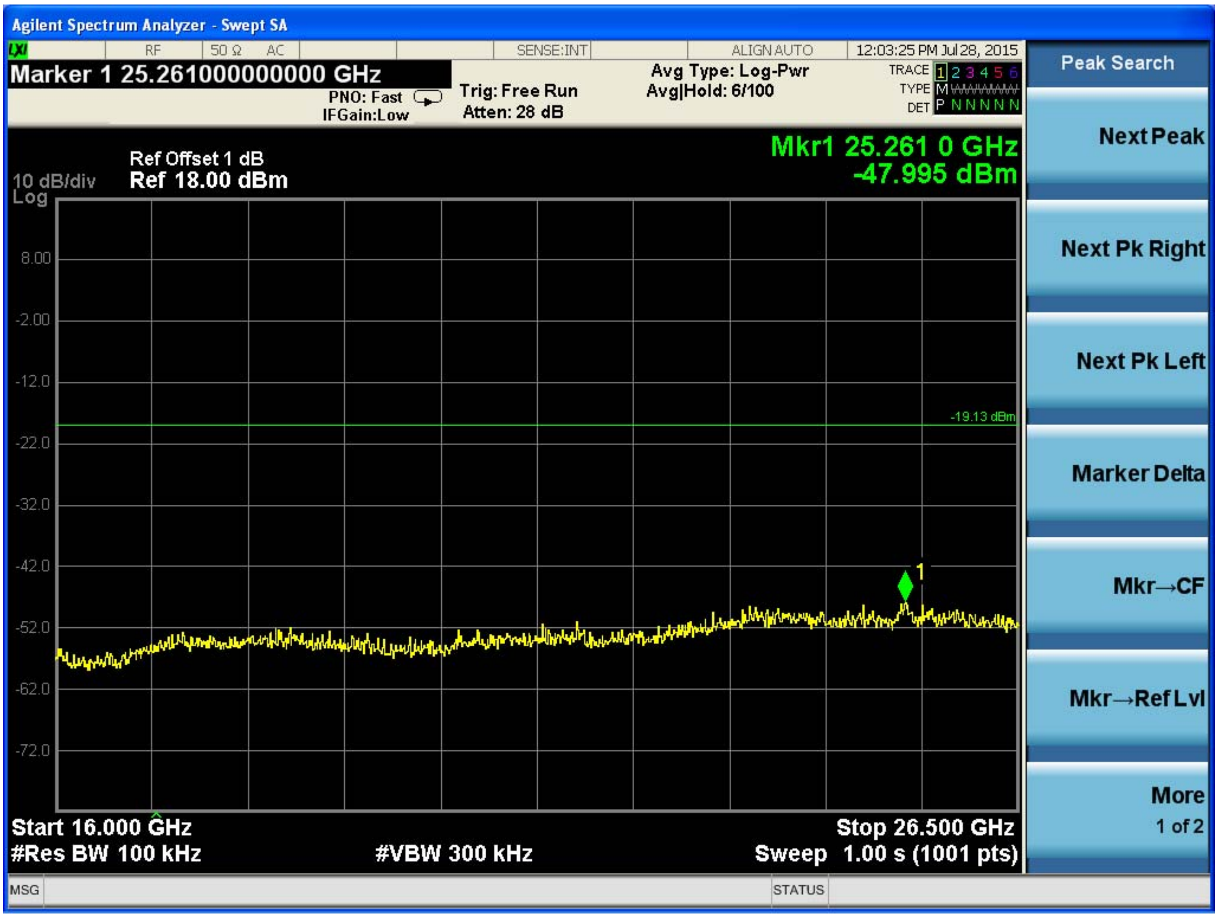
(Plot 4.7.2 C3: Channel 78: 2480MHz @8DPSK)



(Plot 4.7.2 C4: Channel 78: 2480MHz @8DPSK)



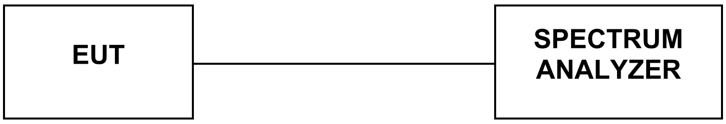
(Plot 4.7.2 C5: Channel 78: 2480MHz @8DPSK)



(Plot 4.7.2 C6: Channel 78: 2480MHz @8DPSK)

4.8. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator.Set spectrum analyzer start 2400MHz to 2483.5MHz with RBW=30 KHz and VBW=100KHz.

LIMIT

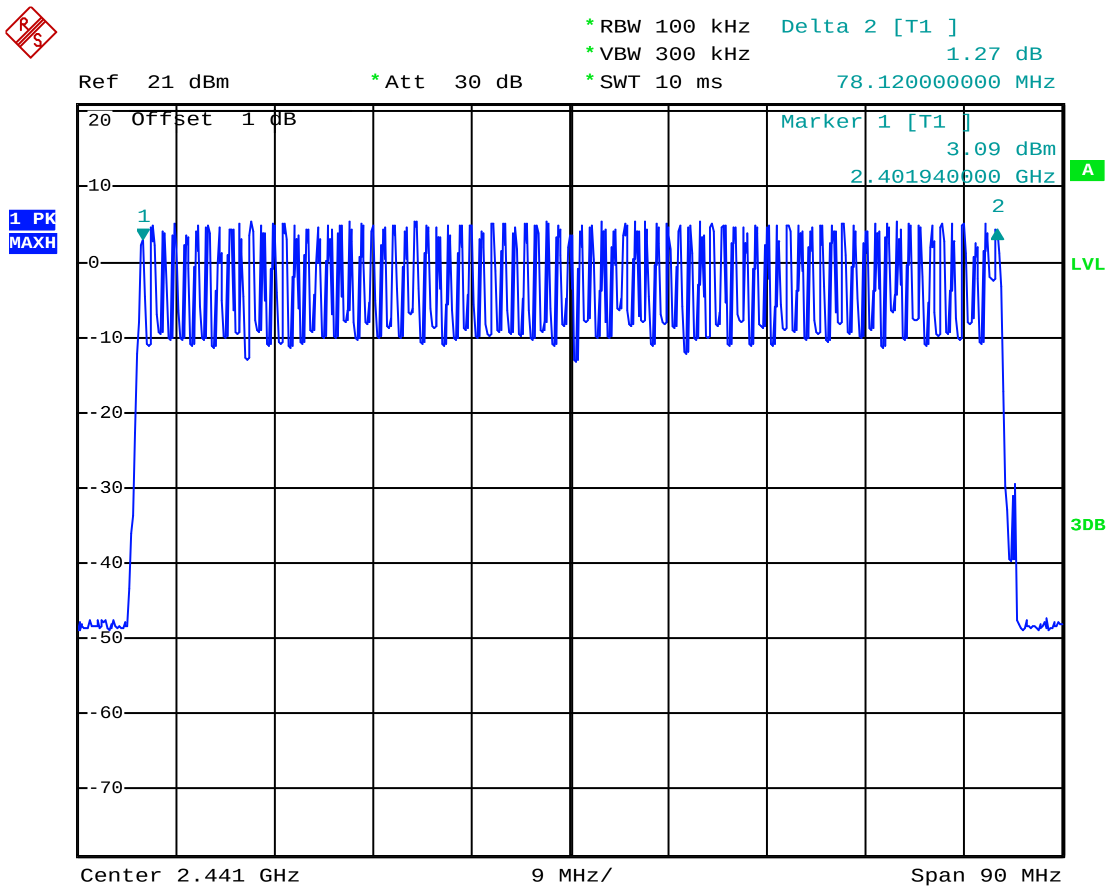
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

4.8.1 GFSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.8.1 A1	≥15	PASS

B. Test Plots



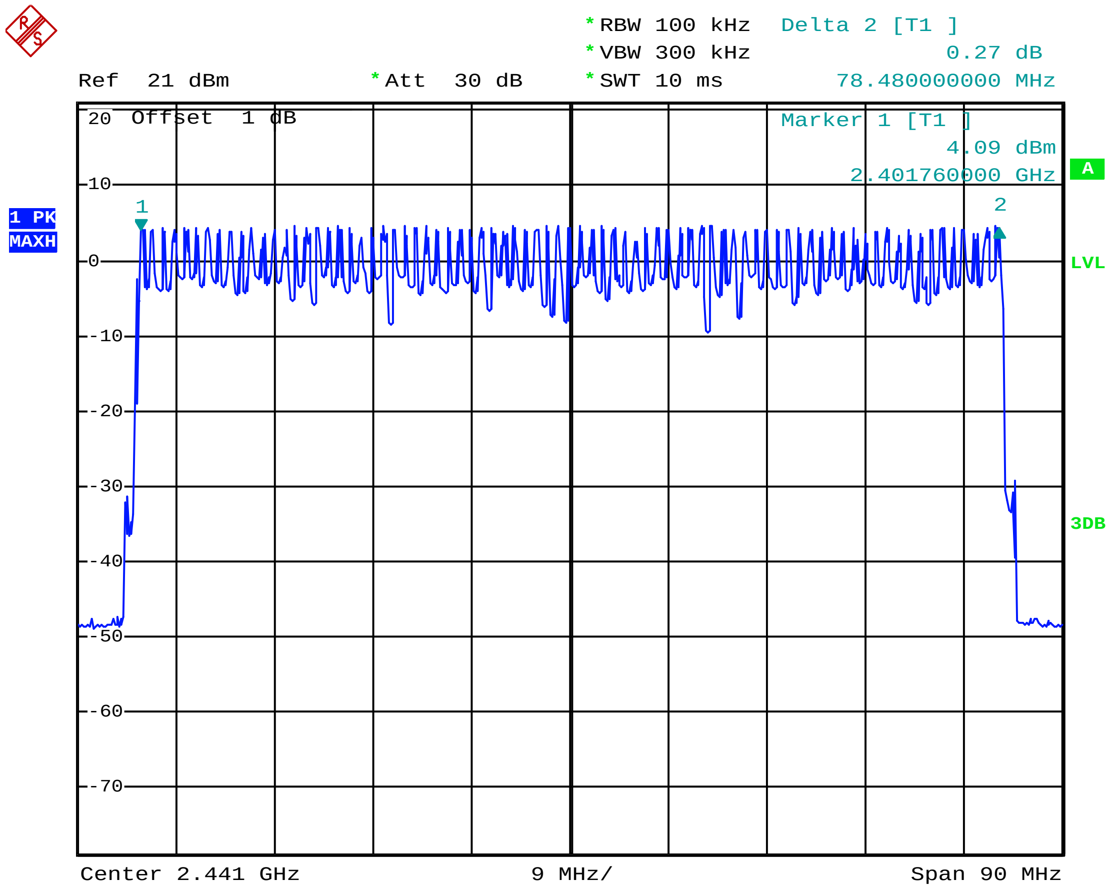
(Plot 4.8.1 A: @ GFSK)

4.8.2 8DPSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.8.2 A1	≥15	PASS

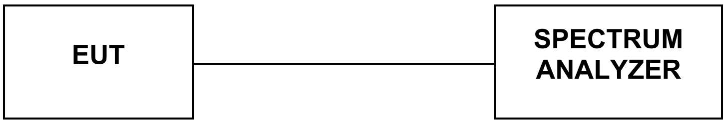
B. Test Plots



(Plot 4.7.2 A1: @ 8DPSK)

4.9. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with RBW=1MHz and VBW=3MHz,Span=0Hz.

LIMIT

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST RESULTS

The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation:0.4[s]*hopping number=0.4[s]*79[ch]=31.6[s*ch];
The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.
The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600 [ch*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch*hop/s]
The hops per second on one channel: 266.67 [ch*hops/s]/79 [ch]=3.38 [hop/s];
The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]*31.6[s*ch]=106.67 [hop*ch];
The dwell time for all channels hopping: 106.67 [hop*ch]*Burst Width [ms/hop/ch].

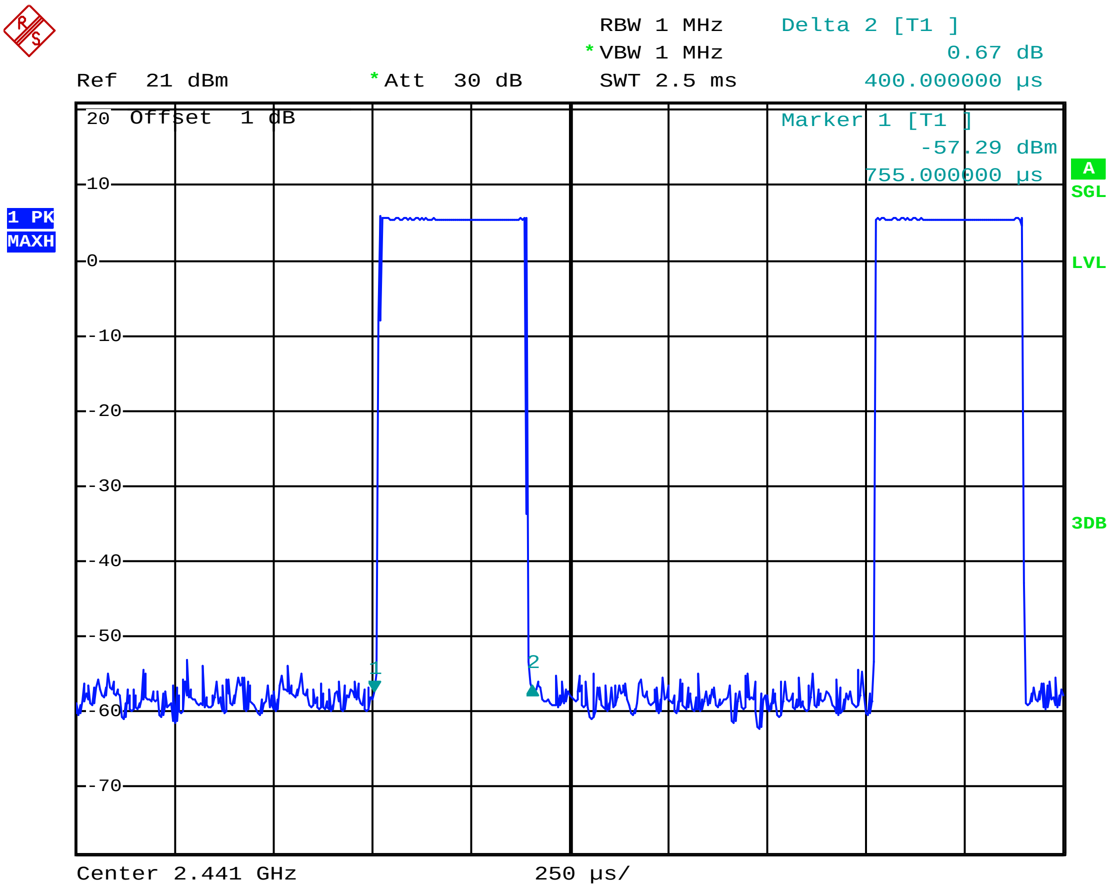
Remark: 1. We test Frequency Separation at all test channels, recorded worst case at middle channel.

4.9.1 GFSK Test Mode

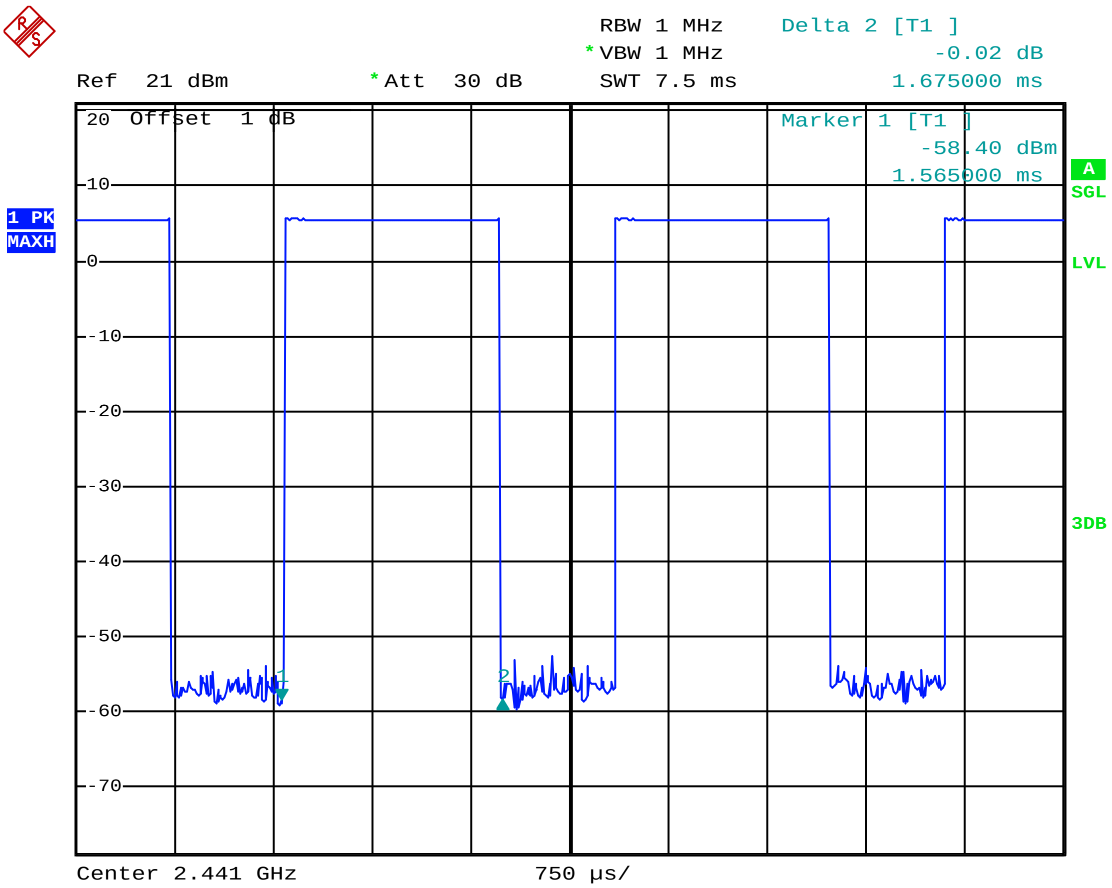
A. Test Verdict

Mode	Frequency (MHz)	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Refer to Plot	Verdict
DH 1	2441	0.4000	0.1280	0.4	Plot 4.9.1 A1	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second					
DH 3	2441	1.6750	0.2680	0.4	Plot 4.9.1 B1	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second					
DH 5	2441	2.9400	0.3136	0.4	Plot 4.9.1 C1	PASS
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second					

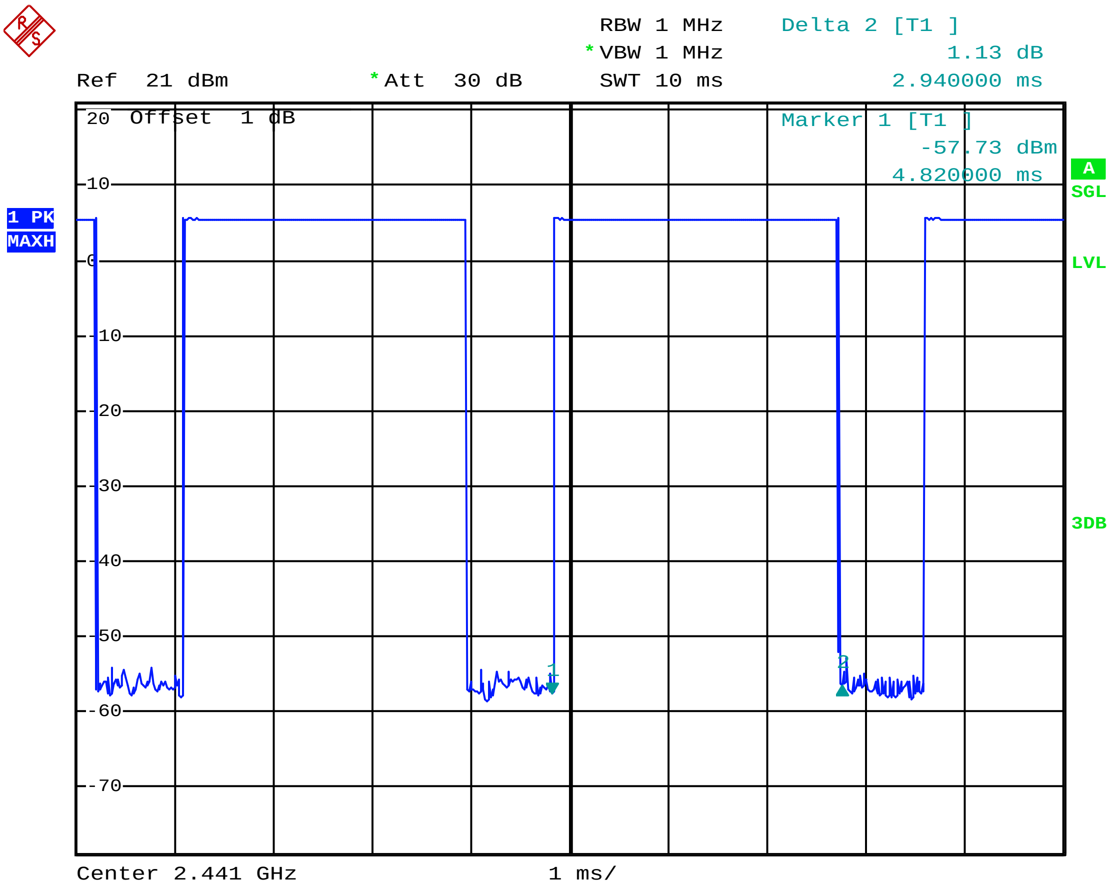
B. Test Plots



(Plot 4.9.1.A1: Channel 39: 2441MHz @ GFSK @ DH1)



(Plot 4.9.1.B1: Channel 39: 2441MHz @ GFSK @ DH3)



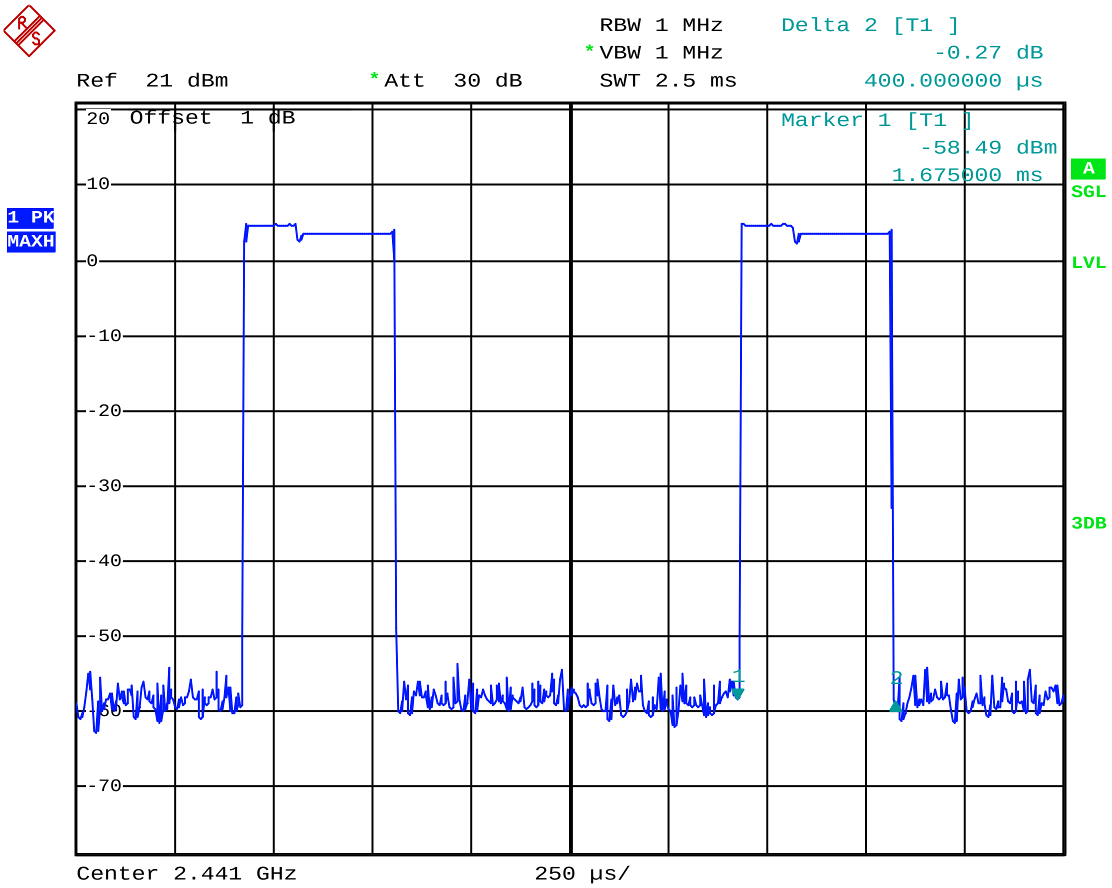
(Plot 4.9.1.C1: Channel 39: 2441MHz @ GFSK @ DH5)

4.8.2 8DPSK Test Mode

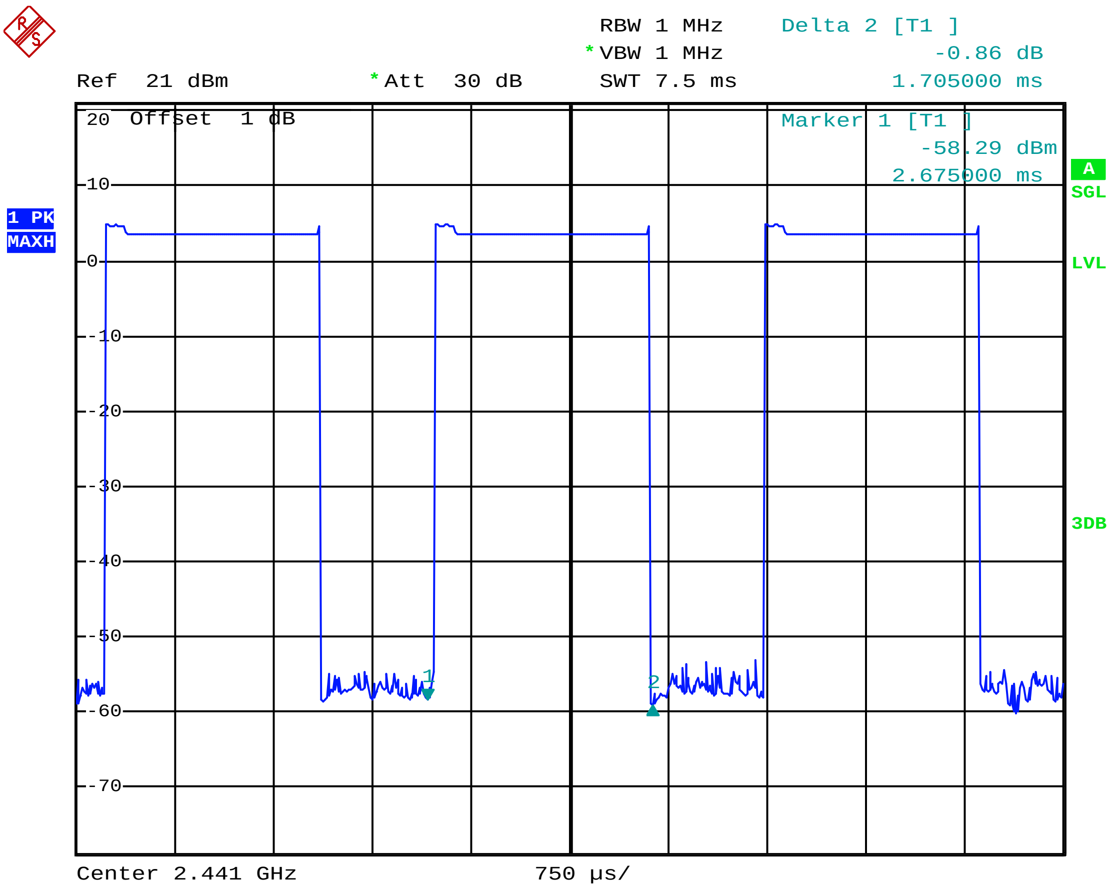
A. Test Verdict

Mode	Frequency (MHz)	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Refer to Plot	Verdict
DH 1	2441	0.4000	0.1280	0.4	Plot 4.9.2 A1	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second					
DH 3	2441	1.7050	0.2728	0.4	Plot 4.9.2 B2	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second					
DH 5	2441	2.9650	0.3163	0.4	Plot 4.9.2 C2	PASS
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second					

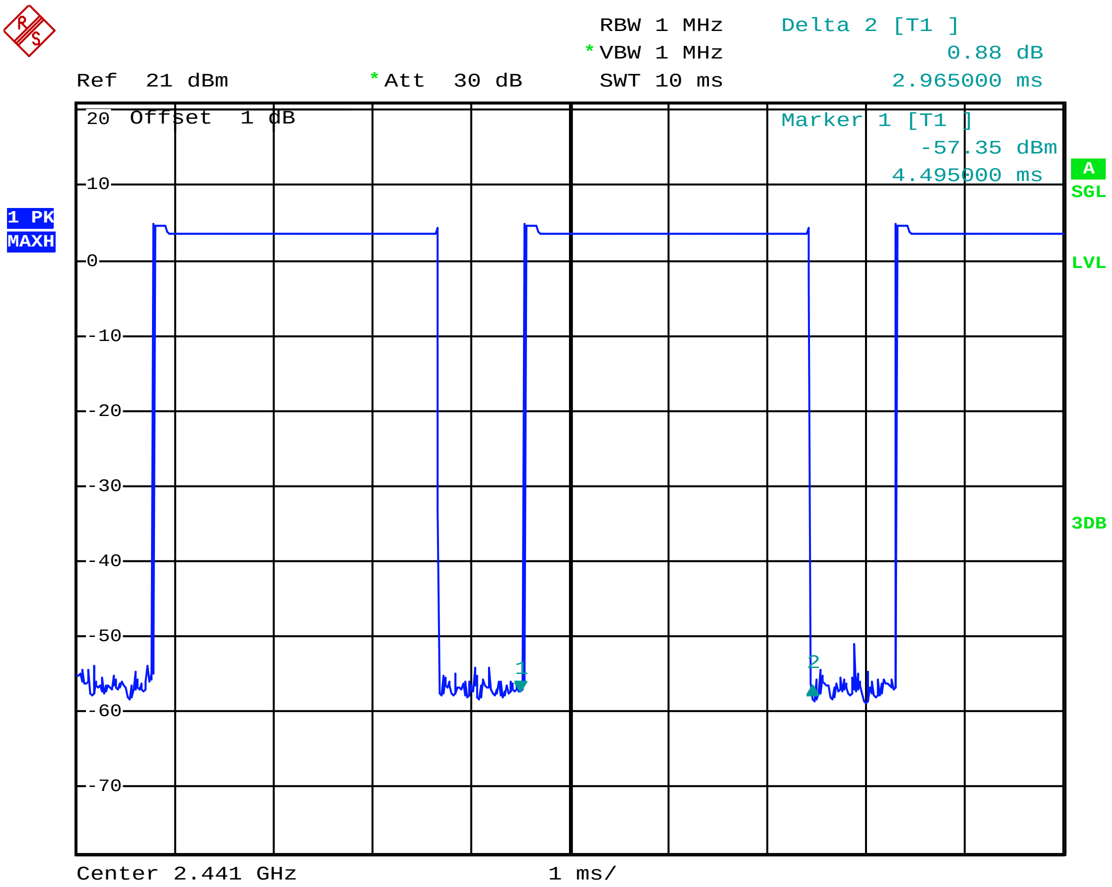
B. Test Plots



(Plot 4.9.2.A1: Channel 39: 2441MHz @ 8DPSK @ DH1)



(Plot 4.9.2.B1: Channel 39: 2441MHz @ 8DPSK @ DH3)



(Plot 4.9.2.C1: Channel 39: 2441MHz @ 8DPSK @ DH5)

4.10. Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

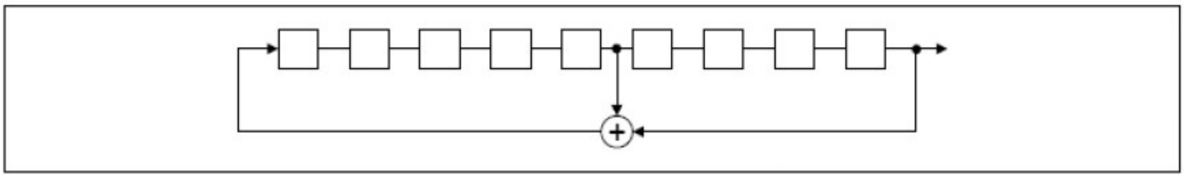
For 47 CFR Part 15C section 15.247 (a)(1) requirement:

Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies 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. The system shall hop to chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

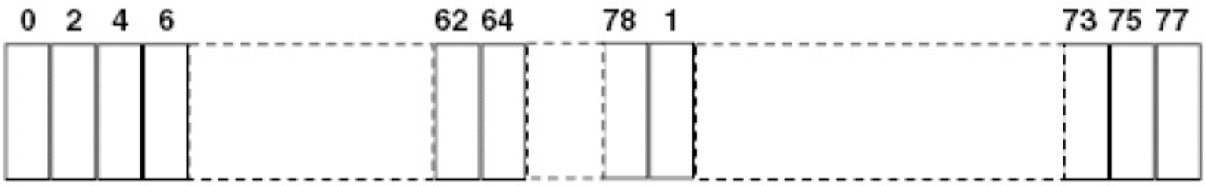
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the frist stage.The sequence begins with the frist one of 9 consecutive ones,for example:the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

4.11. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (c), if 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 6dBi.

Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

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:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

Limits

FCC	IC
Antenna Gain	
6 dBi	

Results

T_{nom}	V_{nom}	Lowest Channel 2402 MHz	Middle Channel 2440 MHz	Highest Channel 2480 MHz
Conducted power [dBm] Measured with GFSK modulation		5.341	5.905	5.472
Radiated power [dBm] Measured with GFSK modulation		3.986	4.273	4.031
Gain [dBi] Calculated		-1.355	-1.632	-1.441
Measurement uncertainty		± 0.6 dB (cond.) / ± 2.56 dB (rad.)		

......................End of Report........................