



Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (Low-CH)



Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (Mid-CH)



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305R12	Date of Issue: May 21, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE465G

Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (High-CH)



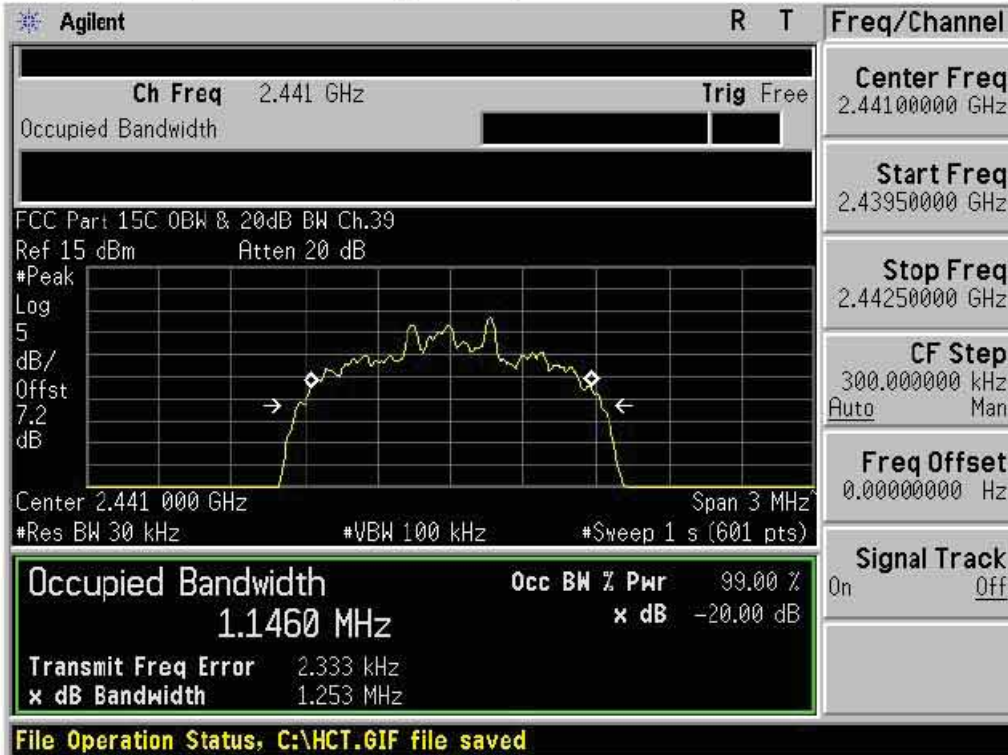
Test Plots (8DPSK)

20 dB Bandwidth & Occupied Bandwidth (Low-CH)



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**Test Plots (8DPSK)
20 dB Bandwidth & Occupied Bandwidth (Mid-CH)**



**Test Plots (8DPSK)
20 dB Bandwidth & Occupied Bandwidth (High-CH)**



Test Plots ($\pi/4$ DQPSK)
20 dB Bandwidth & Occupied Bandwidth (Low-CH)



Test Plots ($\pi/4$ DQPSK)
20 dB Bandwidth & Occupied Bandwidth (Mid-CH)



Test Plots ($\pi/4$ DQPSK)
20 dB Bandwidth & Occupied Bandwidth (High-CH)

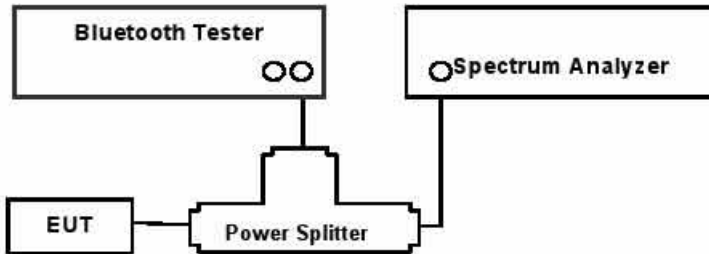


8.4 NUMBER OF HOPPING FREQUENCY

LIMIT

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

Test Configuration



TEST PROCEDURE

The Bluetooth frequency hopping function of the EUT was enabled.

The Spectrum Analyzer is set to (DA 00-705)

Span = the frequency band of operation

RBW \geq 1% of the span

VBW \geq RBW

Sweep = Auto

Detector = Peak

Trace = Max hold

The trace was allowed to stabilize.

TEST RESULTS

No non-compliance noted

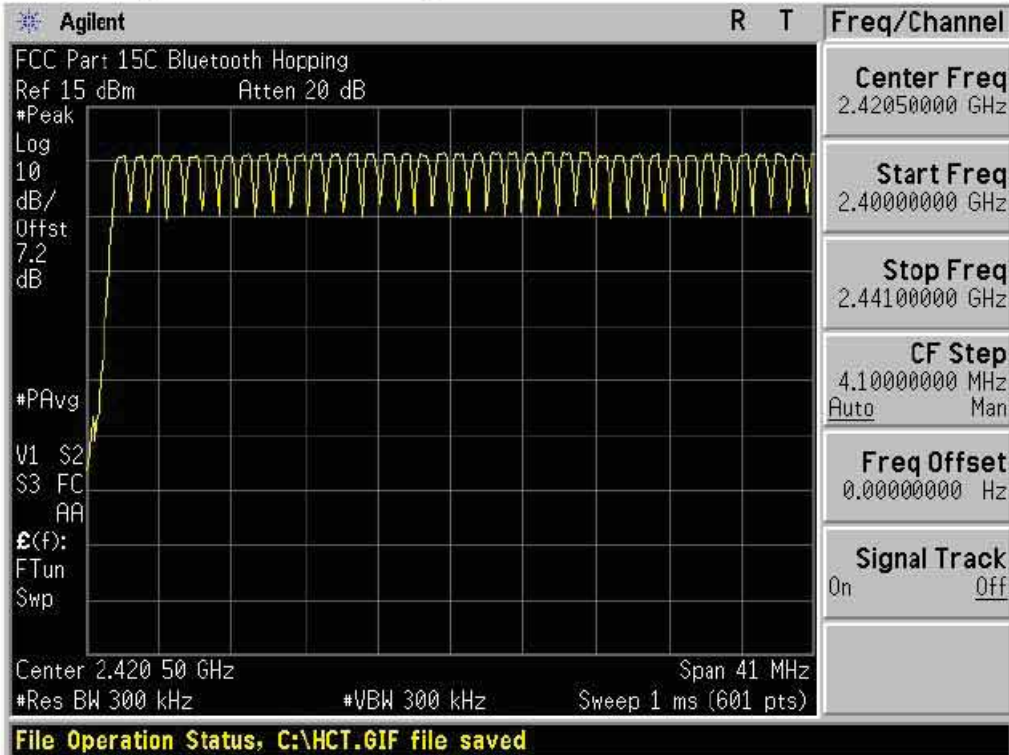
Test Data

Result (No. of CH)			Limit	Result
GFSK	8DPSK	$\pi/4$ DQPSK		
79	79	79	>15	Pass

Note : In case of AFH mode, minimum number of hopping channels is 20.

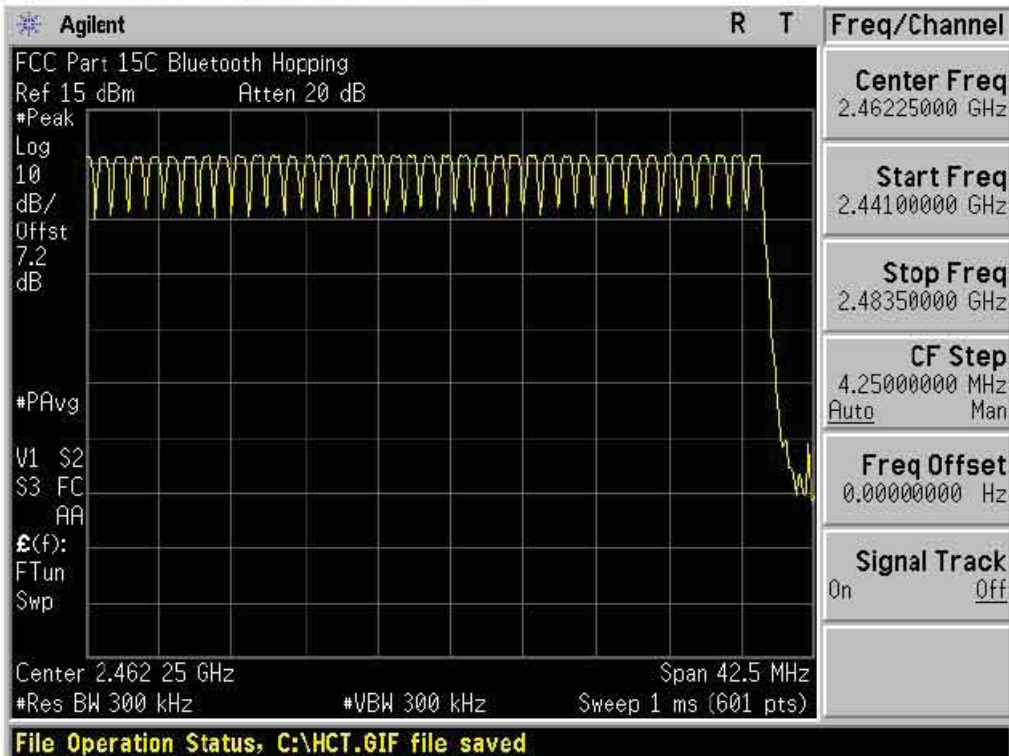
Test Plots (GFSK)

Number of Channels (2.4 GHz - 2.441 GHz)



Test Plots (GFSK)

Number of Channels (2.441 GHz - 2.4835 GHz)

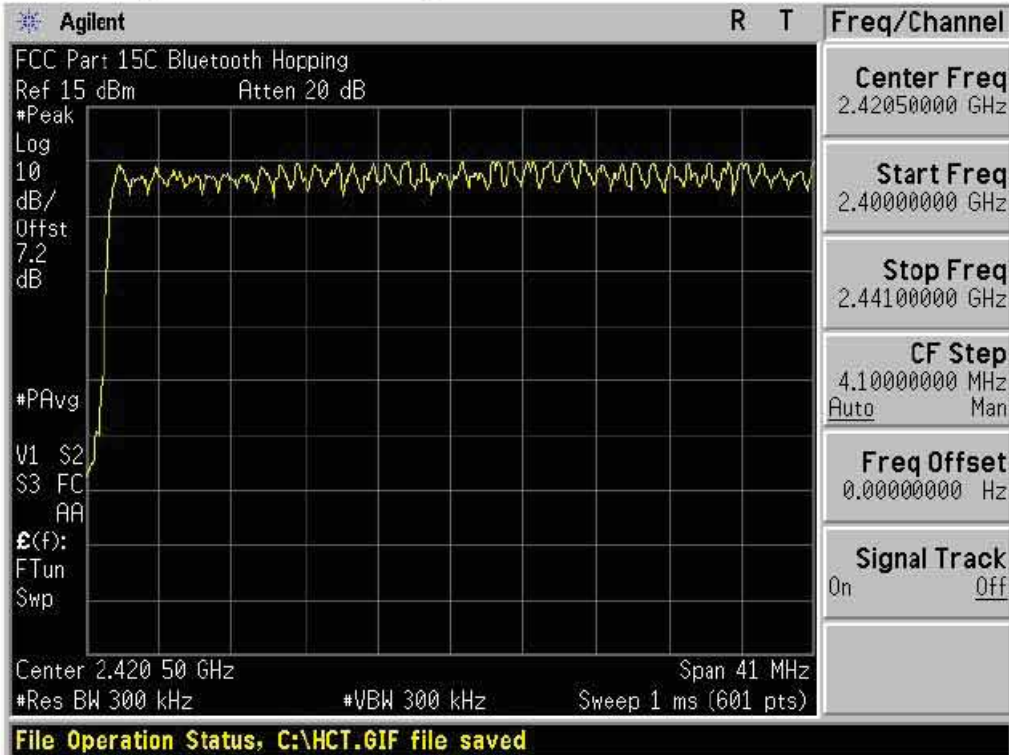


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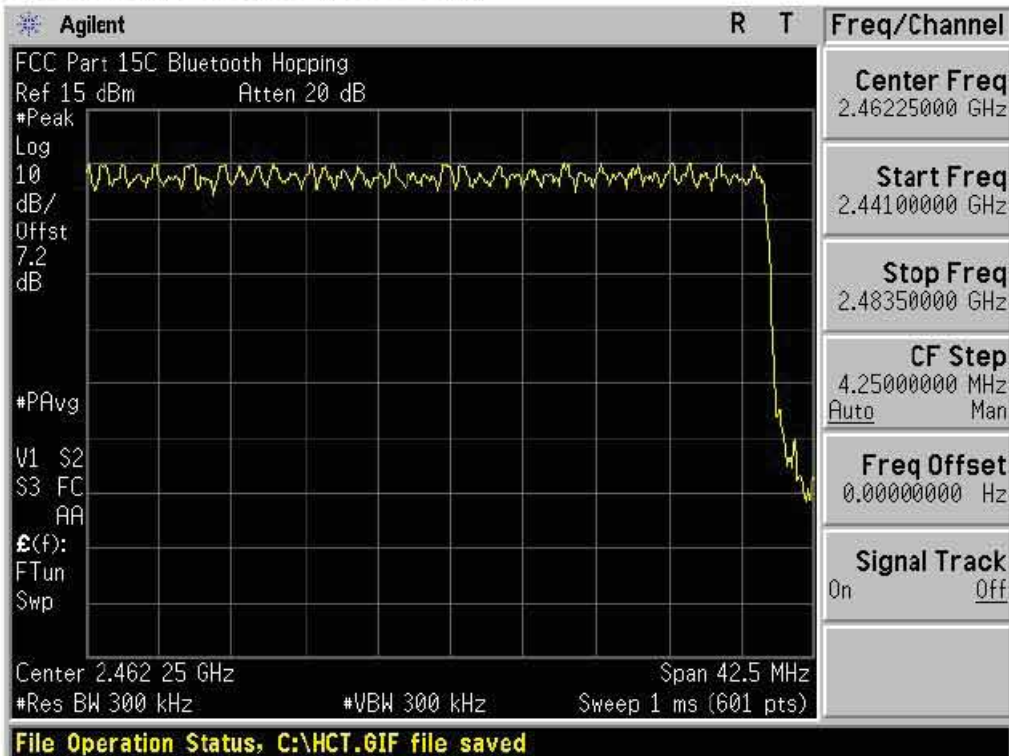
Test Plots (8DPSK)

Number of Channels (2.4 GHz - 2.441 GHz)



Test Plots (8DPSK)

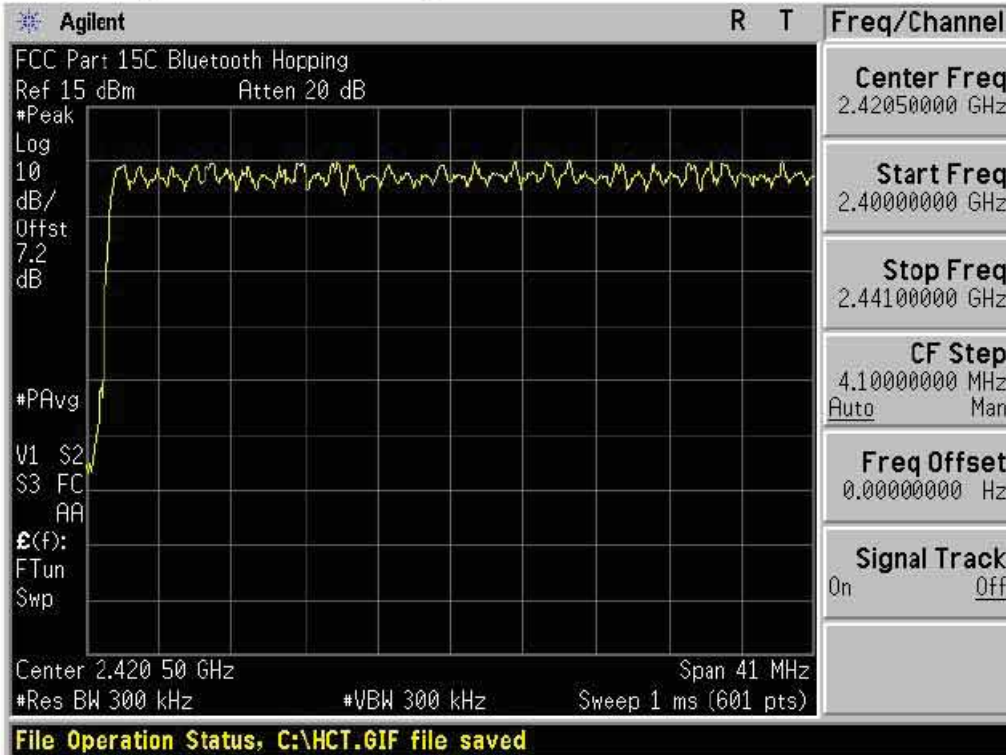
Number of Channels (2.441 GHz - 2.4835 GHz)



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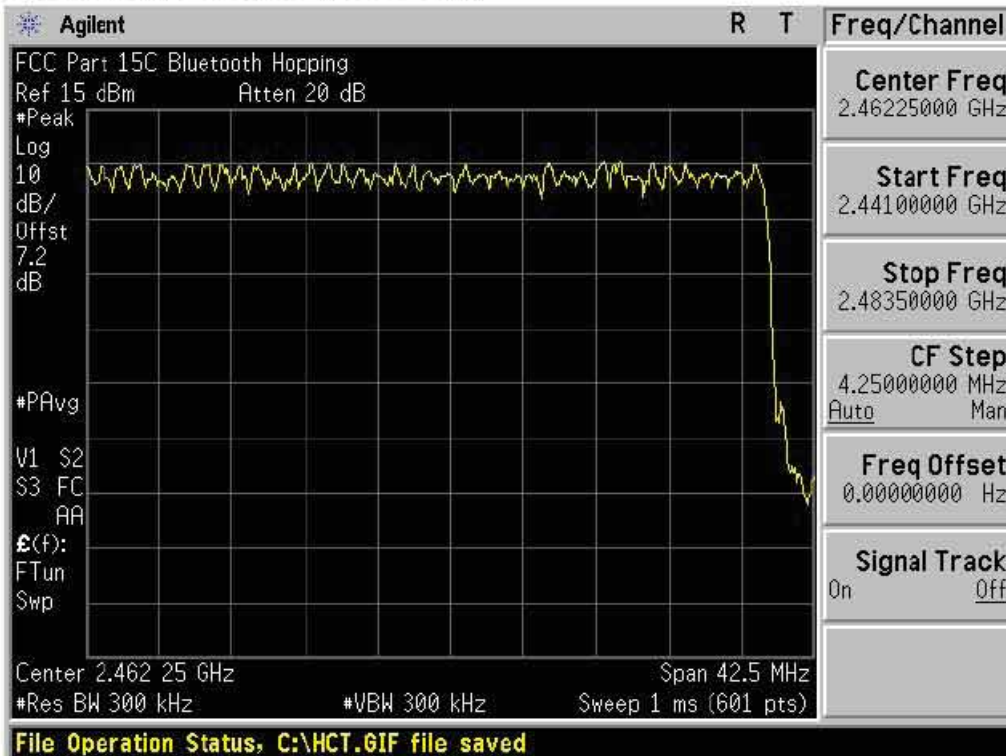
Test Plots ($\pi/4$ DQPSK)

Number of Channels (2.4 GHz - 2.441 GHz)



Test Plots ($\pi/4$ DQPSK)

Number of Channels (2.441 GHz - 2.4835 GHz)

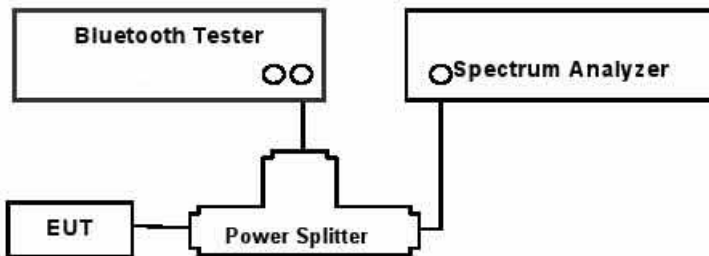


8.5 TIME OF OCCUPANCY (DWELL TIME)

LIMIT

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

Test Configuration



TEST PROCEDURE

This test is performed with hopping off.

EUT was set to transmit the longest packet type (DH5)

The Spectrum Analyzer is set to (DA 00-705)

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 = Peak

Trace = Max hold

The marker-delta function was used to determine the dwell time.

Normal Mode / EDR Mode

DH 5(The longest packet type for GFSK)

CH Mid : $2.875 * (1600/6)/79 * 31.6 = 306.67$ (ms)

2-DH 5(The longest packet type for $\pi/4$ DQPSK)

CH Mid : $2.875 * (1600/6)/79 * 31.6 = 306.67$ (ms)

3-DH 5(The longest packet type for 8DPSK)

CH Mid : $2.875 * (1600/6)/79 * 31.6 = 306.67$ (ms)

AFH Mode

DH 5(The longest packet type for GFSK)

CH Mid : $2.875 * (800/6)/20 * 8.0 = 153.33$ (ms)

2-DH 5(The longest packet type for $\pi/4$ DQPSK)

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CH Mid : $2.875 * (800/6)/20 * 8.0 = 153.33$ (ms)

3-DH 5(The longest packet type for 8DPSK)

CH Mid : $2.875 * (800/6)/20 * 8.0 = 153.33$ (ms)

Note :

A DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 hops per second with 79 channels. So the system have each channel 3.3755 times per second and so for 31.6 seconds the system have 106.7 times of appearance.

Each tx-time per appearance of DH5 is 2.883 ms.

Dwell time = Tx-time * 106.7

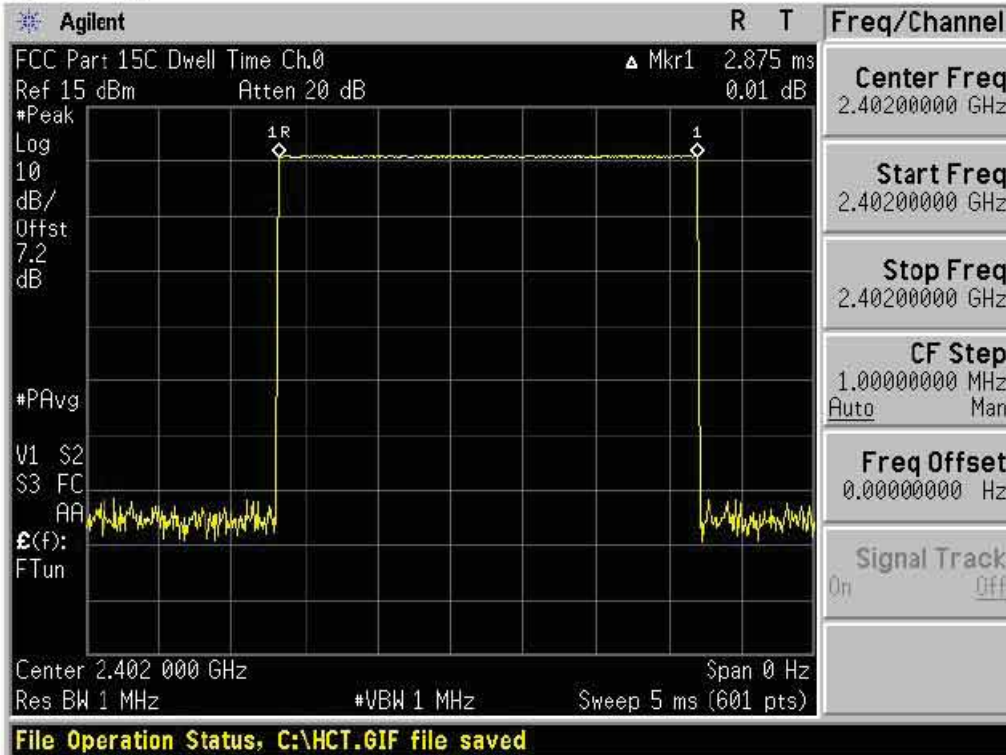
TEST RESULTS

See the table.

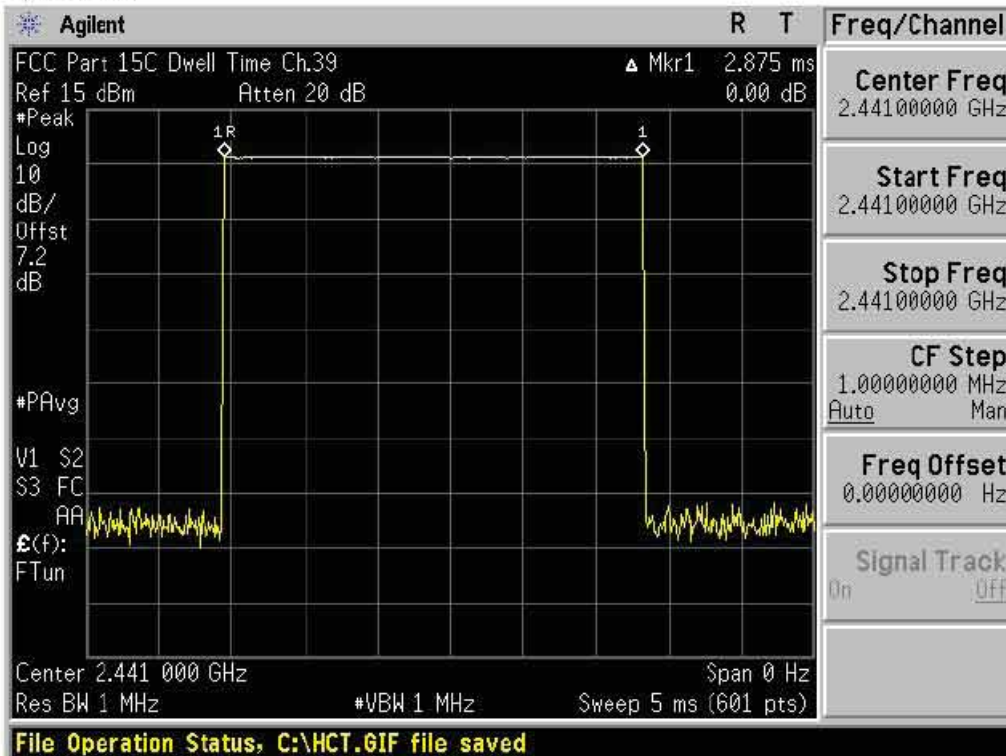
Channel	Pulse Time (ms)		Total of Dwell (ms)		Period Time (s)	Limit (ms)	Result
	GFSK	8DPSK	GFSK	8DPSK			
Low	2.875	2.883	306.67	307.52	31.6	400	PASS
Mid	2.875	2.875	306.67	306.67	31.6		PASS
High	2.875	2.875	306.67	306.67	31.6		PASS

Channel	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
	π/4DQPSK				
Low	2.883	307.52	31.6	400	PASS
Mid	2.875	306.67	31.6		PASS
High	2.875	306.67	31.6		PASS

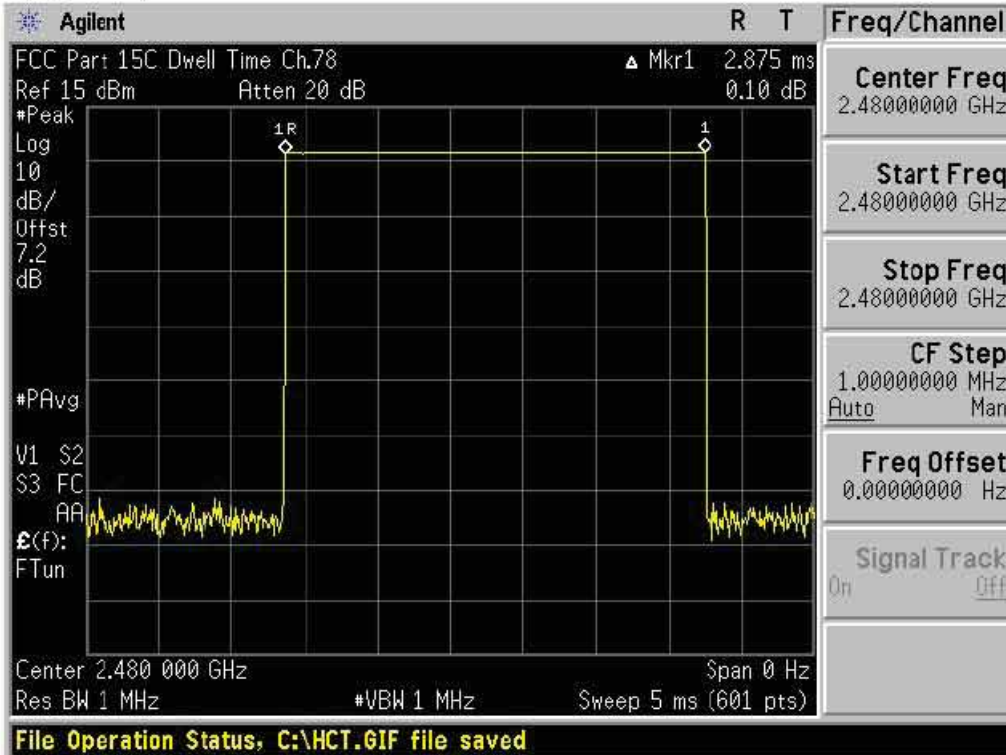
Test Plots (GFSK)
Dwell Time (Low-CH)



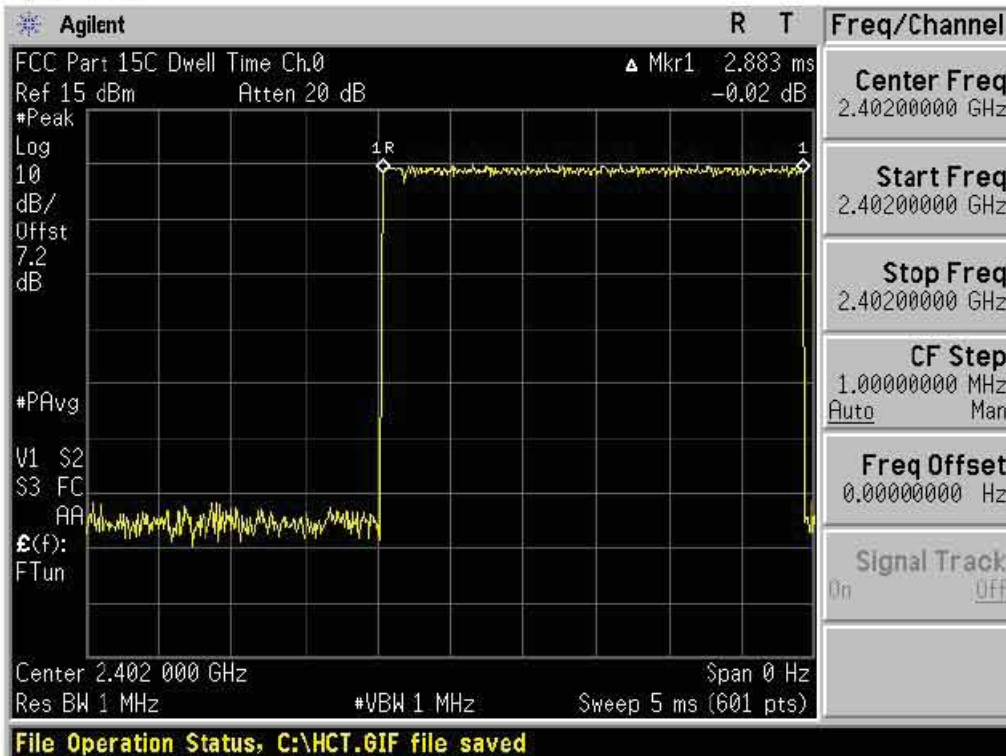
Test Plots (GFSK)
Dwell Time (Mid-CH)



**Test Plots (GFSK)
Dwell Time (High-CH)**

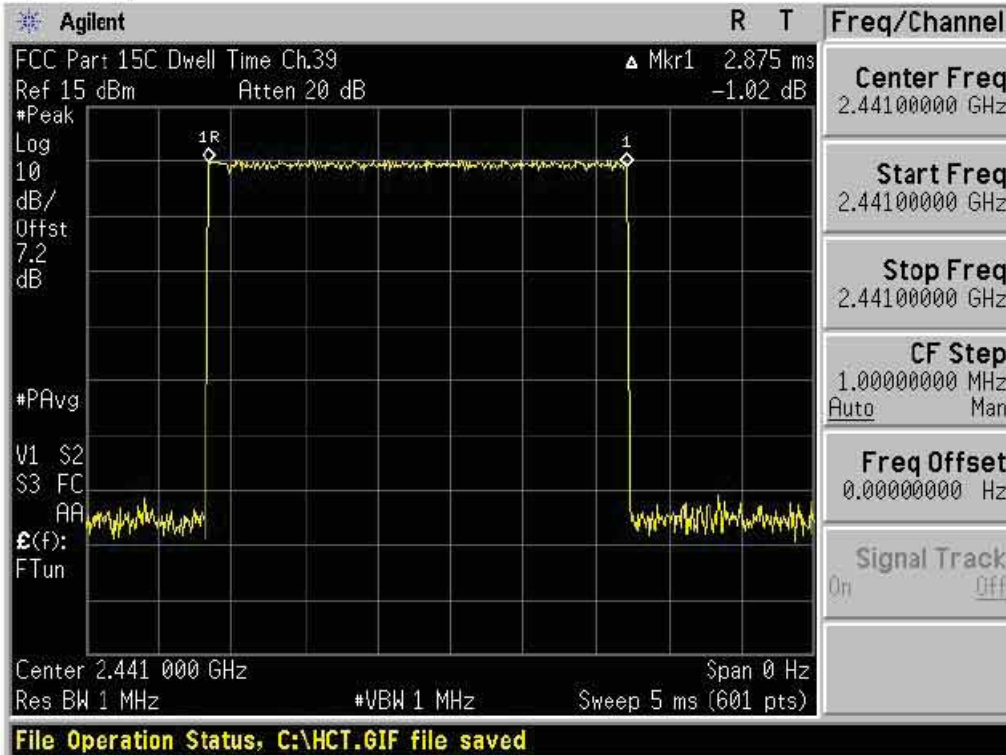


**Test Plots (8DPSK)
Dwell Time (Low-CH)**

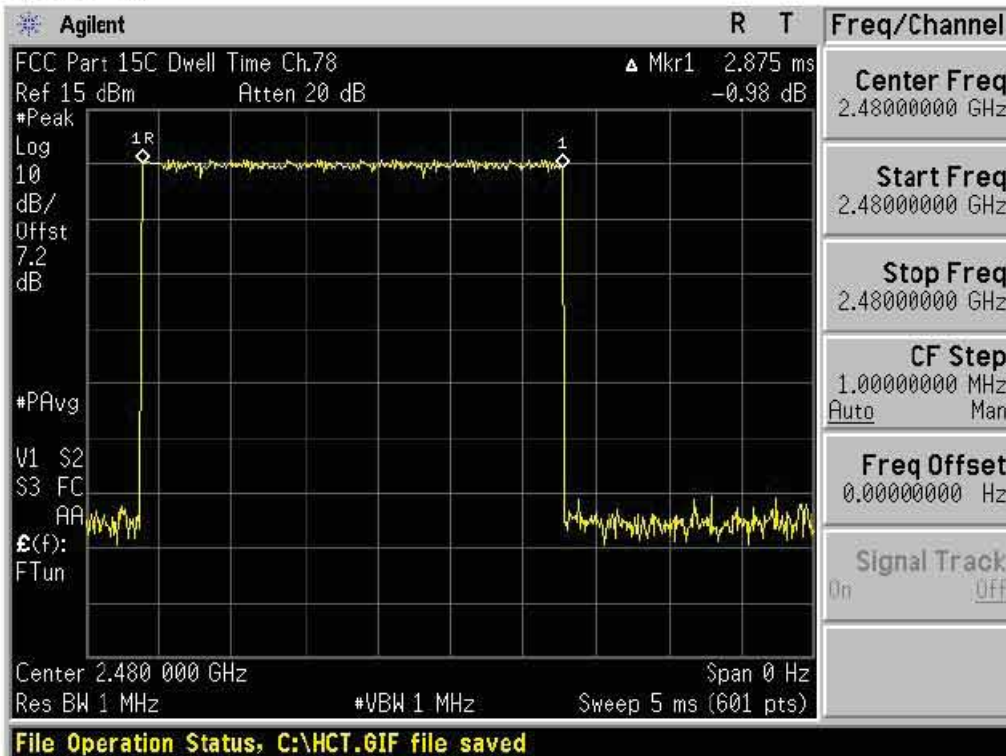




Test Plots (8DPSK)
Dwell Time (Mid-CH)



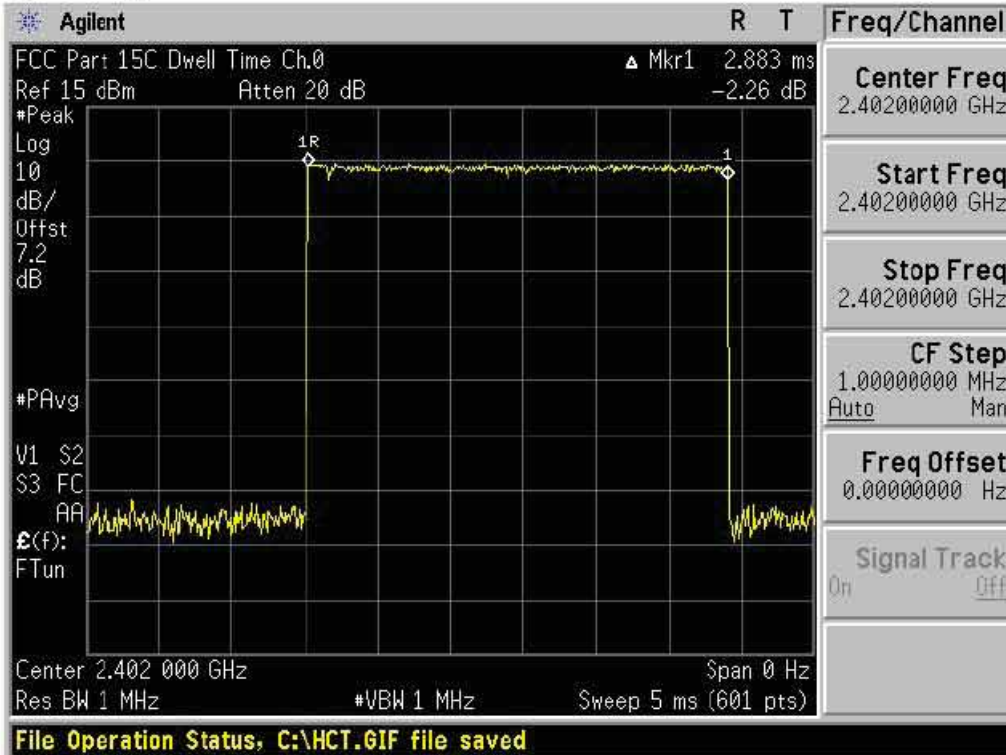
Test Plots (8DPSK)
Dwell Time (High-CH)



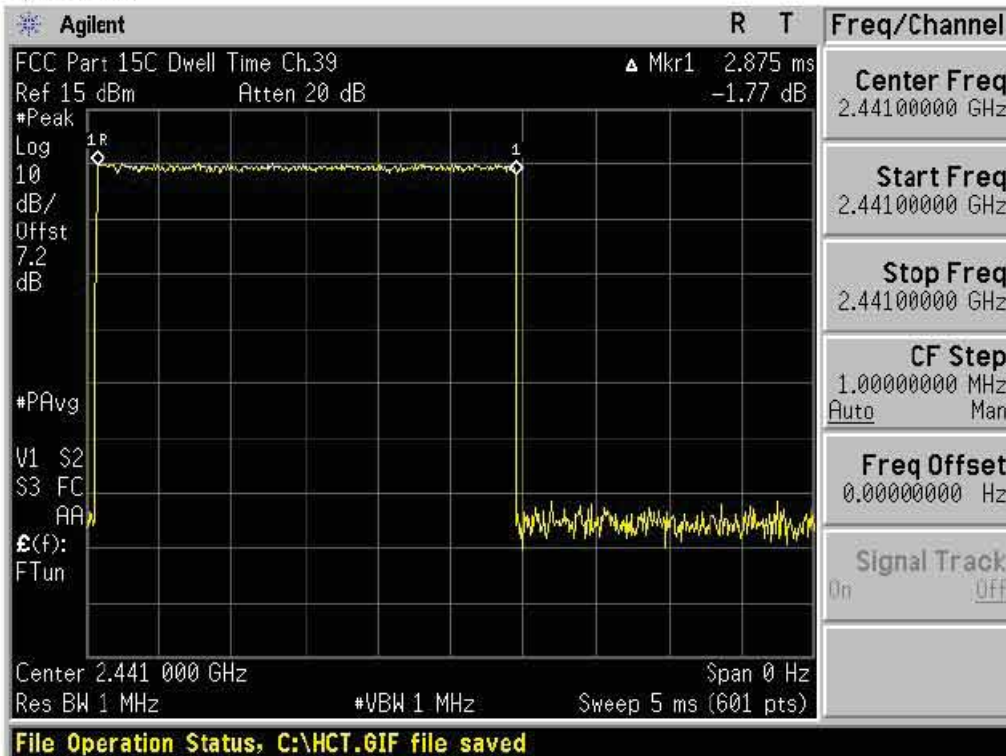
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Test Plots ($\pi/4$ DQPSK)
Dwell Time (Low-CH)



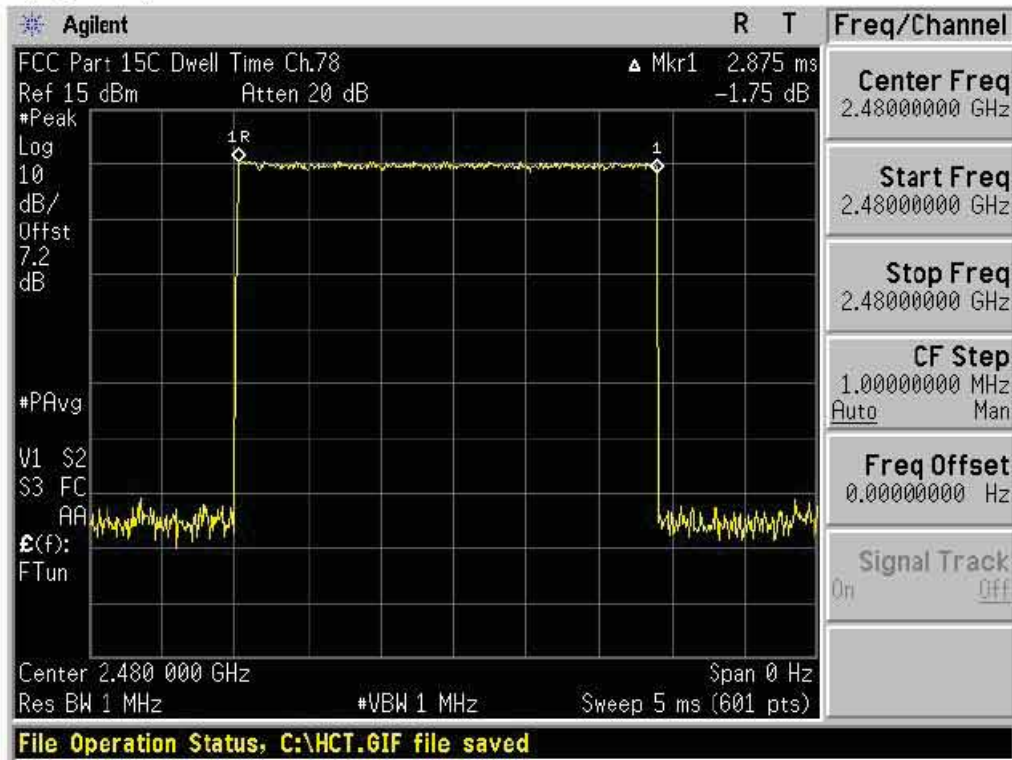
Test Plots ($\pi/4$ DQPSK)
Dwell Time (Mid-CH)



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Test Plots ($\pi/4$ DQPSK)
Dwell Time (High-CH)



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8.6 SPURIOUS EMISSIONS

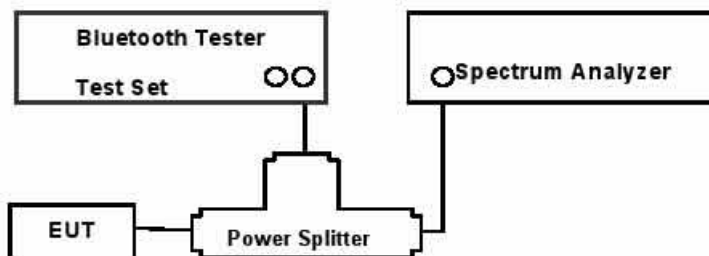
8.6.1 CONDUCTED SPURIOUS EMISSIONS

Test Requirements and limit, §15.247(d)

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. 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) (see § 15.205(c)).

Limit : 20 dBc

Test Configuration



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer.

The Spectrum Analyzer is set to (DA 00-705)

1. Span = wide enough to capture the peak level of the in-band emission and all spurious emissions(e.g.,harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.
2. RBW = 100 kHz(Upon 1 GHz = 1 MHz)
3. VBW ≥ 300 kHz(Upon 1 GHz = 3 MHz)
4. Sweep = auto
5. Sweep point ≥ 2*span/RBW
5. Detector function = peak

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6. Trace = max hold

Measurements are made over the 30 MHz to 26 GHz range with the transmitter set to the lowest, middle, and highest channels.

This test is performed with hopping off.

TEST RESULTS

No non-compliance noted.

FACTORS FOR FREQUENCY

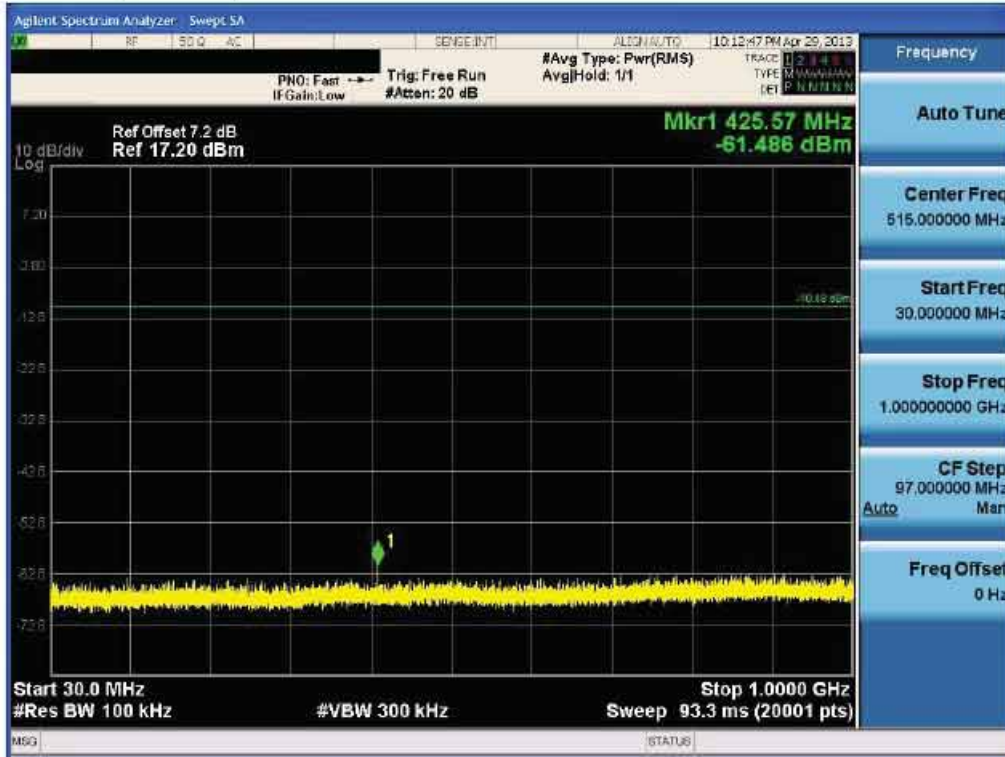
Freq(MHz)	Factor(dB)
30	10.01
100	10.02
200	10.10
300	10.09
400	10.13
500	10.21
600	10.13
700	10.31
800	10.18
900	10.30
1000	10.17
2000	8.53
2400*	7.18
2500*	7.21
3000	8.59
4000	10.02
5000	9.88
6000	5.70
7000	10.21
8000	6.13
9000	8.79
10000	12.46
11000	8.11
12000	9.52
13000	8.98
14000	8.13
15000	11.82
16000	6.92
17000	13.23
18000	10.25
19000	10.28
20000	9.10
21000	10.94
22000	11.54
23000	8.81
24000	11.71
25000	9.37
26000	9.34

Note : 1. ** is fundamental frequency range.

2. Factor = Cable loss + Splitter loss

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Test Plots (GFSK) - 30 MHz - 1 GHz
Spurious Emission (Low-CH)



Test Plots (GFSK) - 30 MHz - 1 GHz
Spurious Emission (Mid-CH)

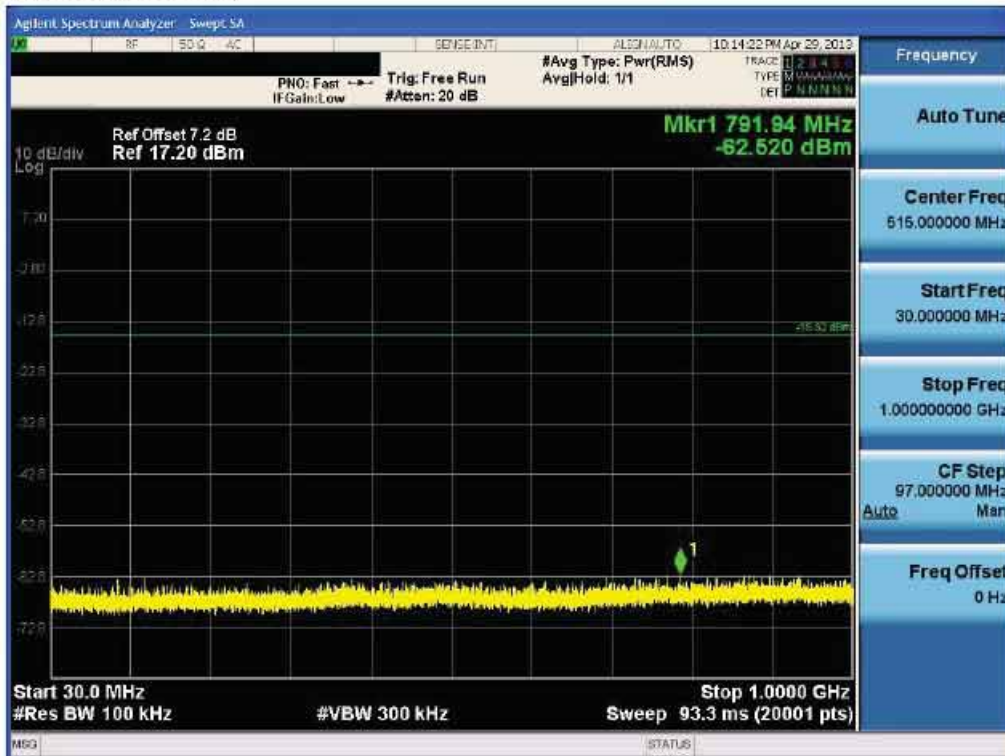


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**Test Plots (GFSK) - 30 MHz - 1 GHz
Spurious Emission (High-CH)**

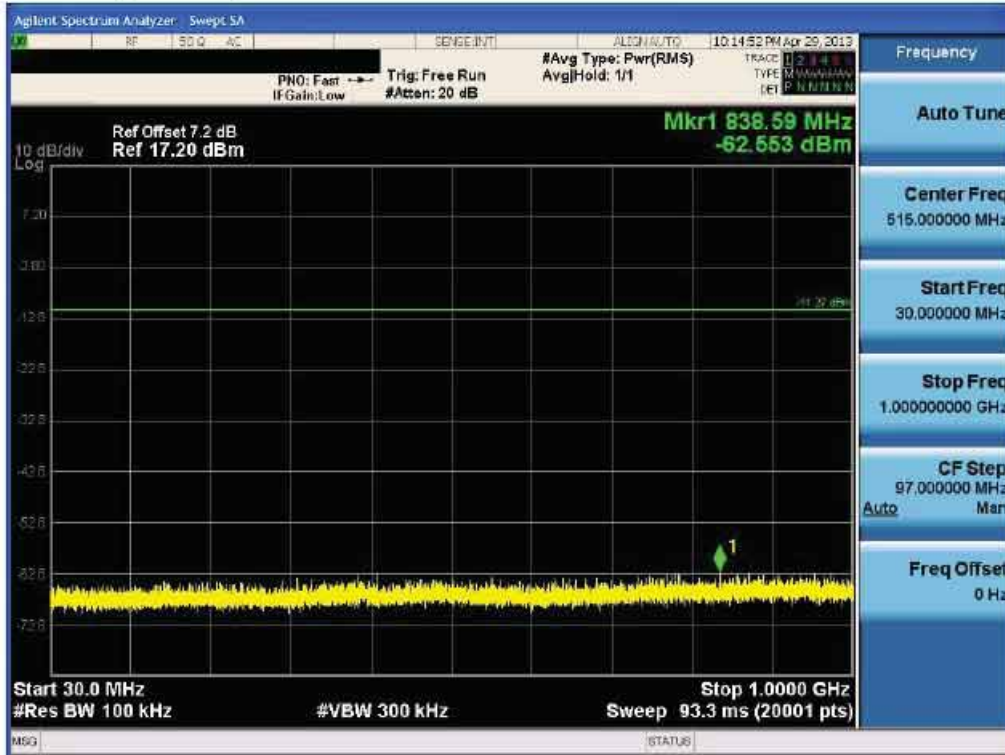


**Test Plots (8DPSK) - 30 MHz - 1 GHz
Spurious Emission (Low-CH)**



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Test Plots (8DPSK) - 30 MHz - 1 GHz
Spurious Emission (Mid-CH)

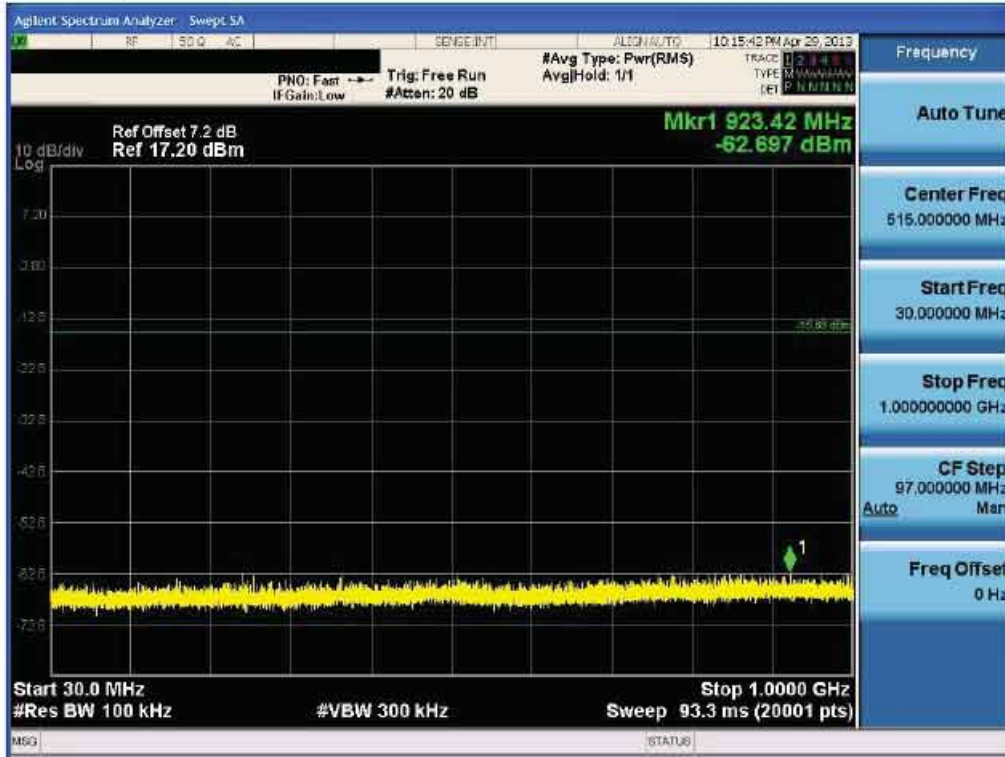


Test Plots (8DPSK) - 30 MHz - 1 GHz
Spurious Emission (High-CH)

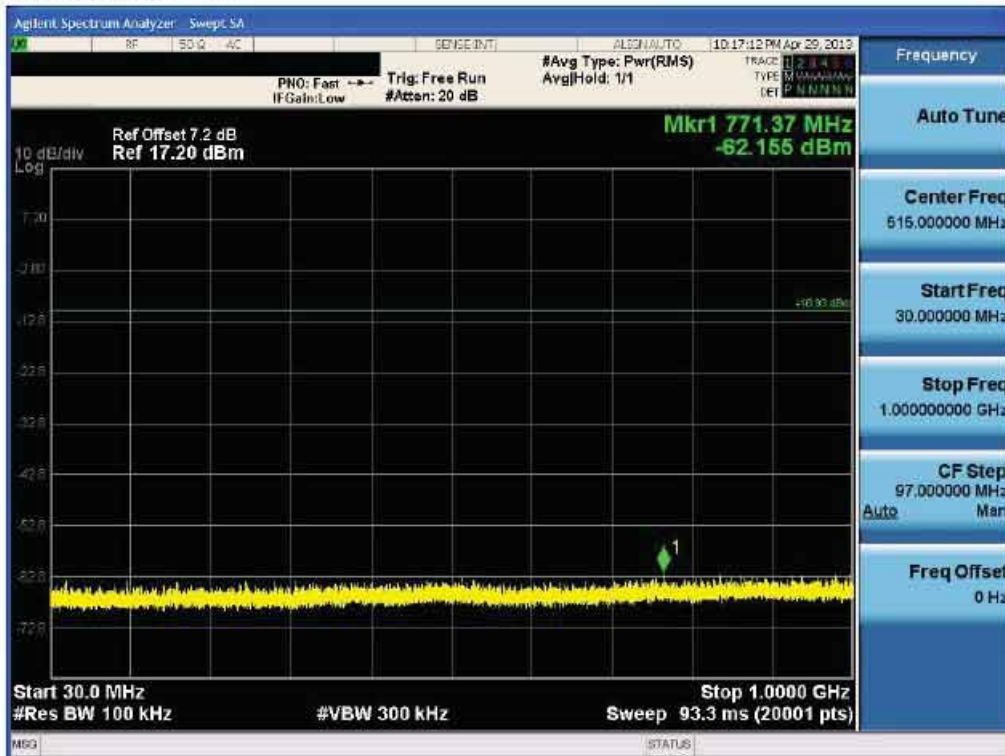


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Test Plots ($\pi/4$ DQPSK) - 30 MHz - 1 GHz
Spurious Emission (Low-CH)

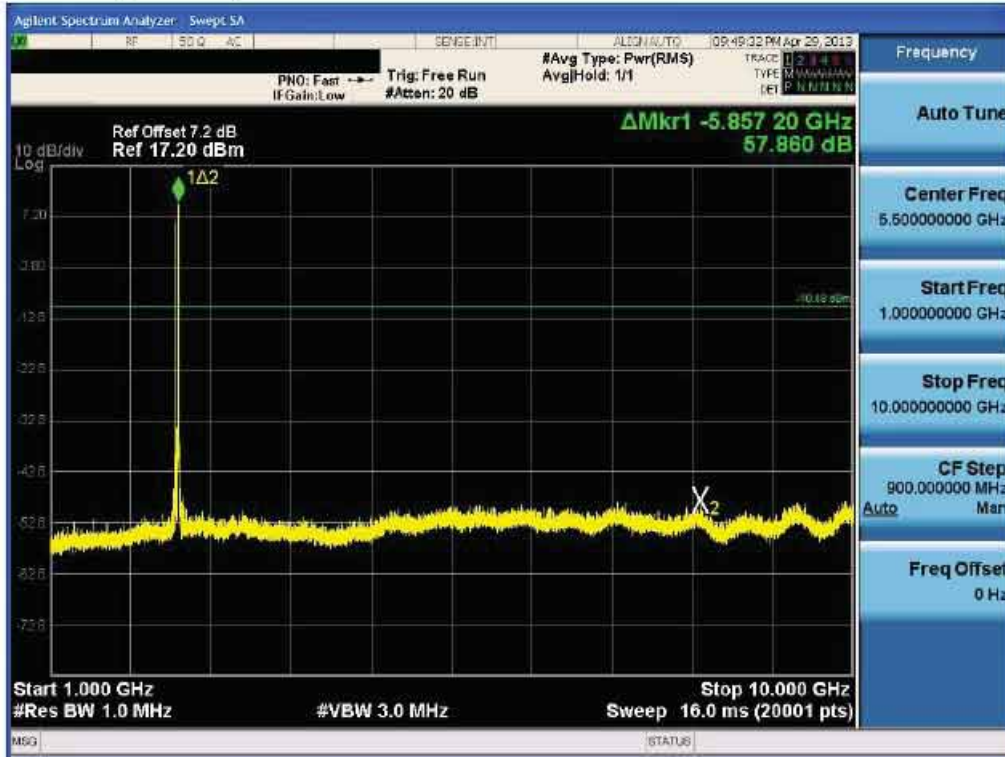


Test Plots ($\pi/4$ DQPSK) - 30 MHz - 1 GHz
Spurious Emission (Mid-CH)



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Test Plots (GFSK) - 1 GHz - 10 GHz
Spurious Emission (Low-CH)

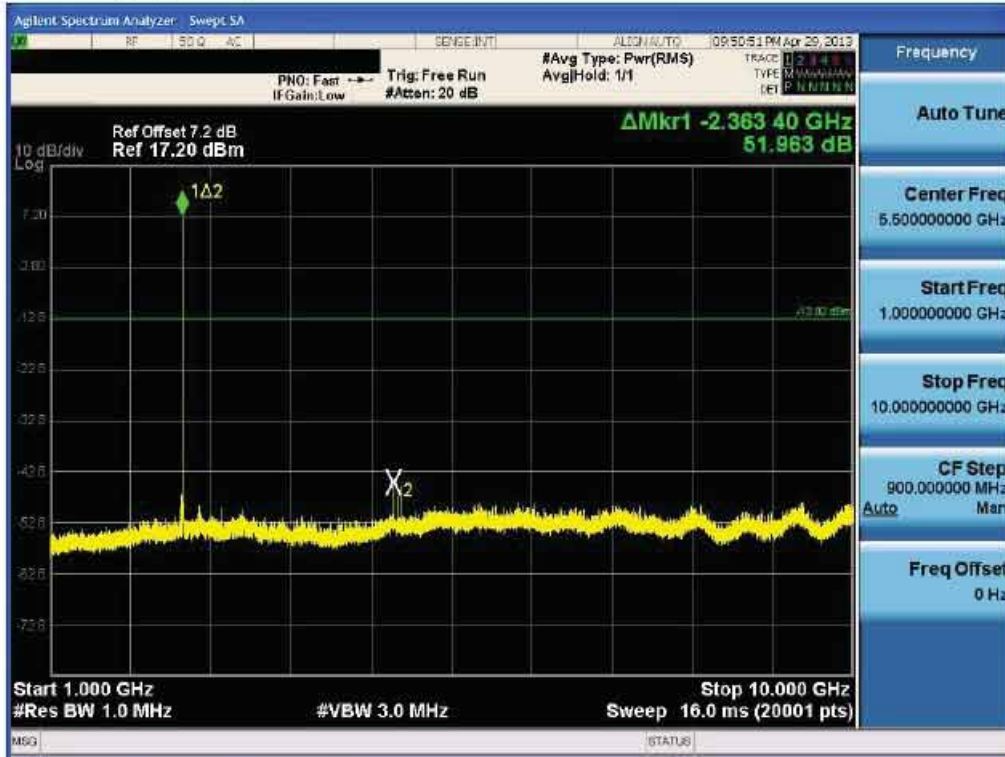


Test Plots (GFSK) - 1 GHz - 10 GHz
Spurious Emission (Mid-CH)

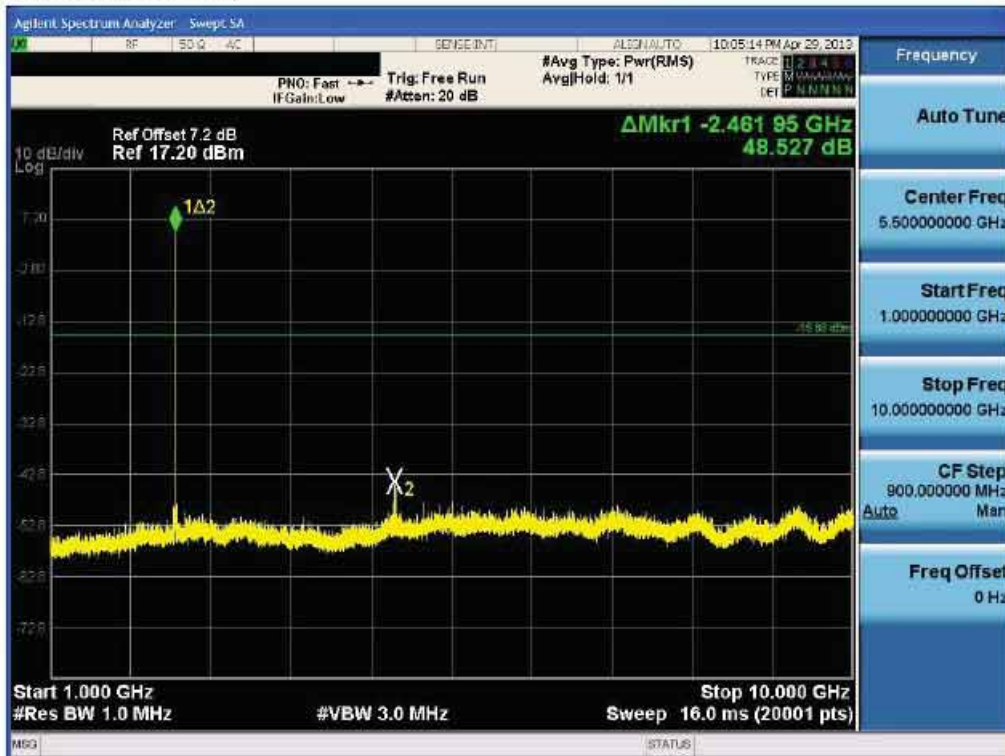


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**Test Plots (GFSK) - 1 GHz - 10 GHz
Spurious Emission (High-CH)**



**Test Plots (8DPSK) - 1 GHz - 10 GHz
Spurious Emission (Low-CH)**

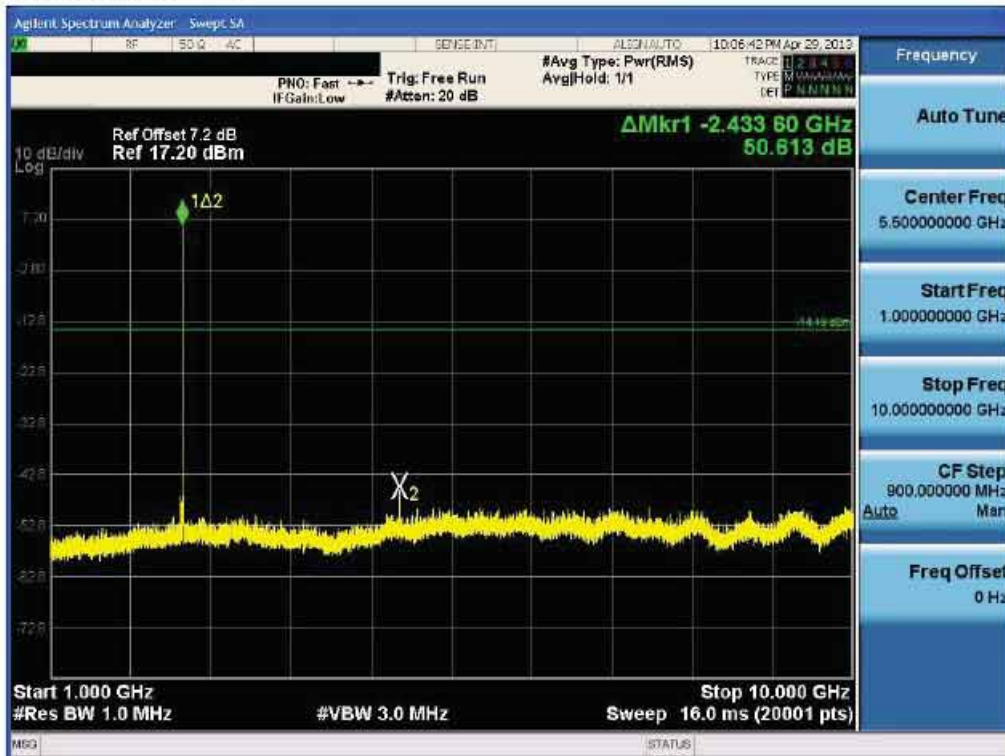


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Test Plots (8DPSK) - 1 GHz - 10 GHz
Spurious Emission (Mid-CH)

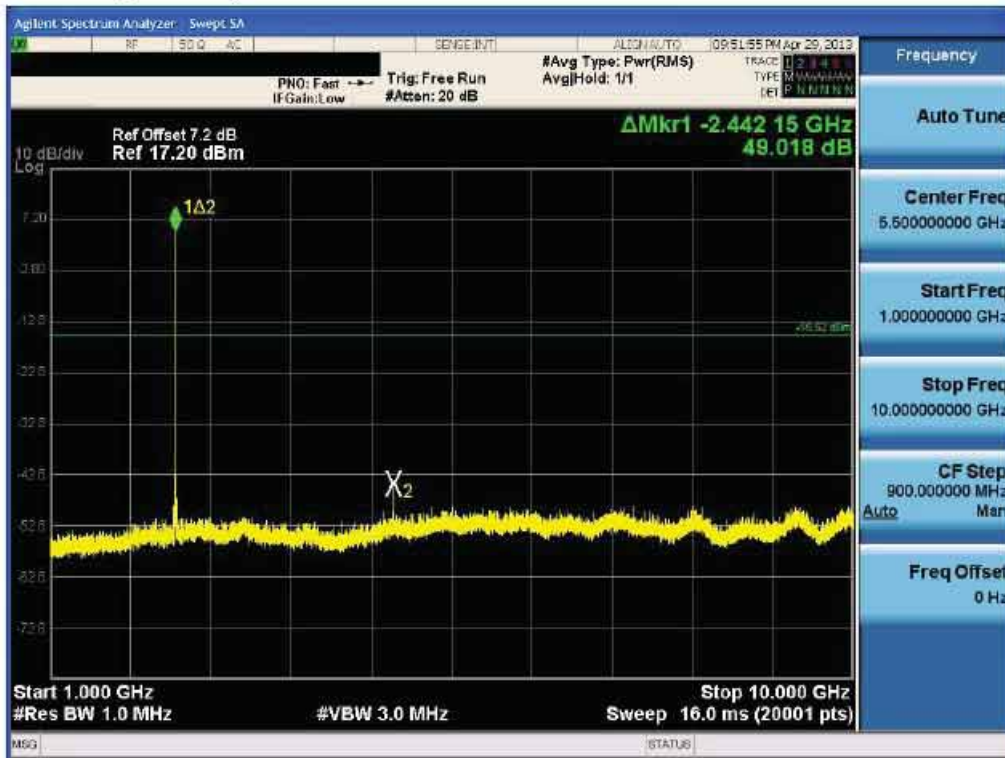


Test Plots (8DPSK) - 1 GHz - 10 GHz
Spurious Emission (High-CH)

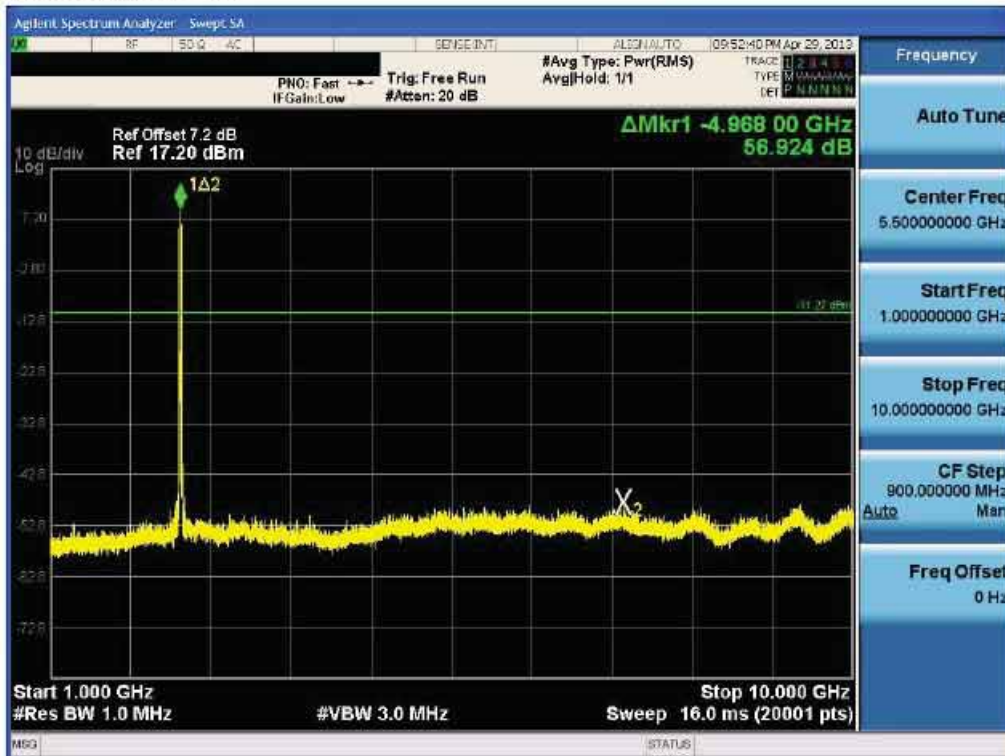


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Test Plots ($\pi/4$ DQPSK) - 1 GHz - 10 GHz
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Test Plots ($\pi/4$ DQPSK) - 1 GHz - 10 GHz
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Test Plots ($\pi/4$ DQPSK) - 1 GHz - 10 GHz
 Spurious Emission (High-CH)



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