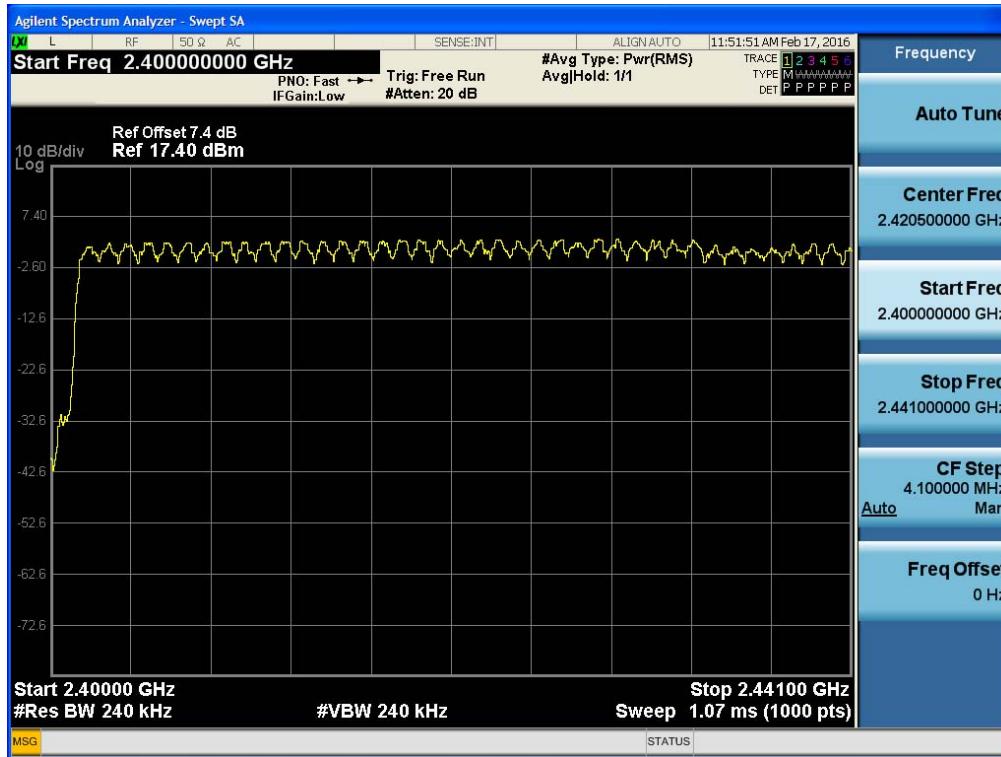


Test Plots ($\pi/4$ DQPSK)

Number of Channels (2.4 GHz - 2.441 GHz)



Test Plots ($\pi/4$ DQPSK)

Number of Channels (2.441 GHz - 2.4835 GHz)

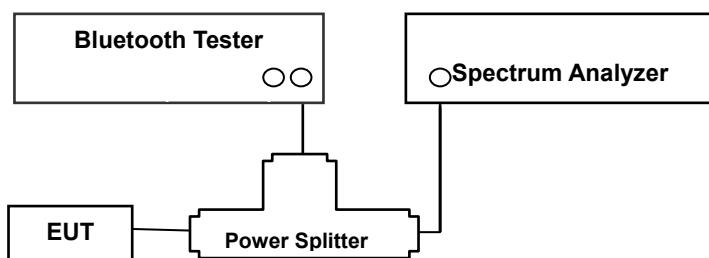


8.5 TIME OF OCCUPANCY (DWELL TIME)

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 (7.8.4 in ANSI 63.10-2013)

- 1) Span: Zero span, centered on a hopping channel
- 2) RBW shall be \leq channel spacing and where possible RBW should be set $\gg 1 / T$, where T is the expected dwell time per channel.
- 3) Sweep = as necessary to capture the entire dwell time per hopping channel
- 4) Detector: Peak
- 5) 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 : $2.905 * (1600/6)/79 * 31.6 = 309.87$ (ms)

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

CH Mid : $2.915 * (1600/6)/79 * 31.6 = 310.93$ (ms)

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

CH Mid : $2.915 * (1600/6)/79 * 31.6 = 310.93$ (ms)

AFH Mode

DH 5(The longest packet type for GFSK)

CH Mid : $2.905 * (800/6)/20 * 8.0 = 154.93$ (ms)

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

CH Mid : $2.915 * (800/6)/20 * 8.0 = 155.47$ (ms)

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

CH Mid : $2.915 * (800/6)/20 * 8.0 = 155.47$ (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 2.892 ms.

Dwell time = Tx-time * 106.7

TEST RESULTS

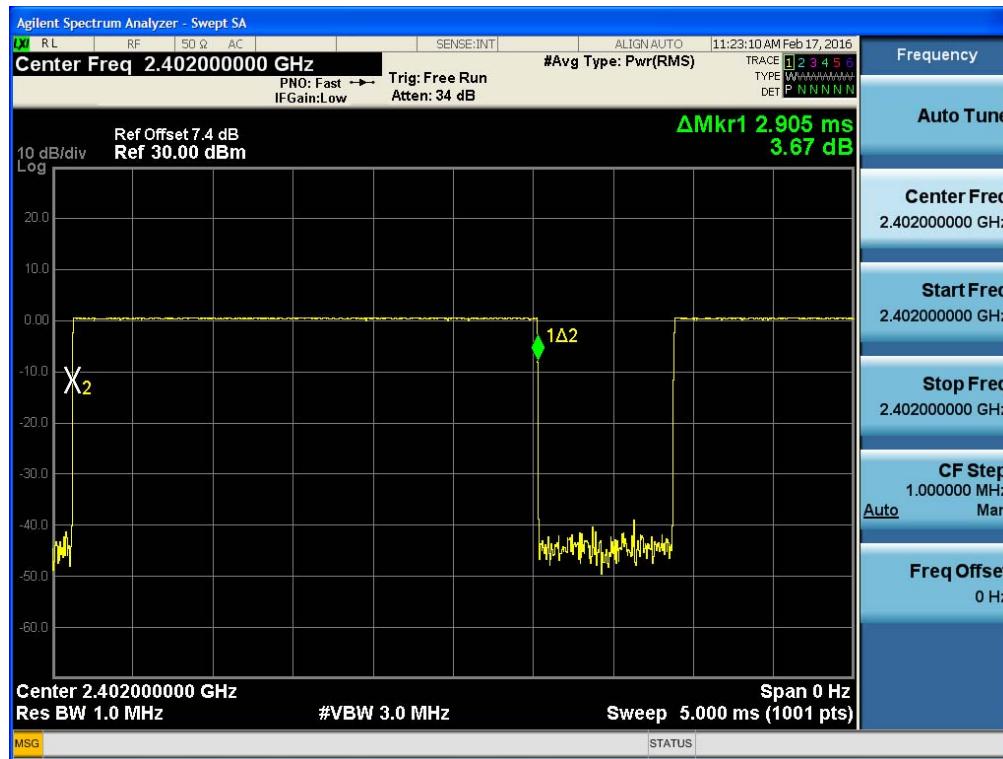
See the table.

	Channel	GFSK	8DPSK	$\pi/4$ DQPSK
Pulse Time (ms)	Low	2.905	2.915	2.915
	Mid	2.905	2.915	2.915
	High	2.905	2.915	2.915

	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)	Result
Total of Dwell (ms)	Low	309.87	310.93	310.93	31.6	400	PASS
	Mid	309.87	310.93	310.93	31.6		PASS
	High	309.87	310.93	310.93	31.6		PASS

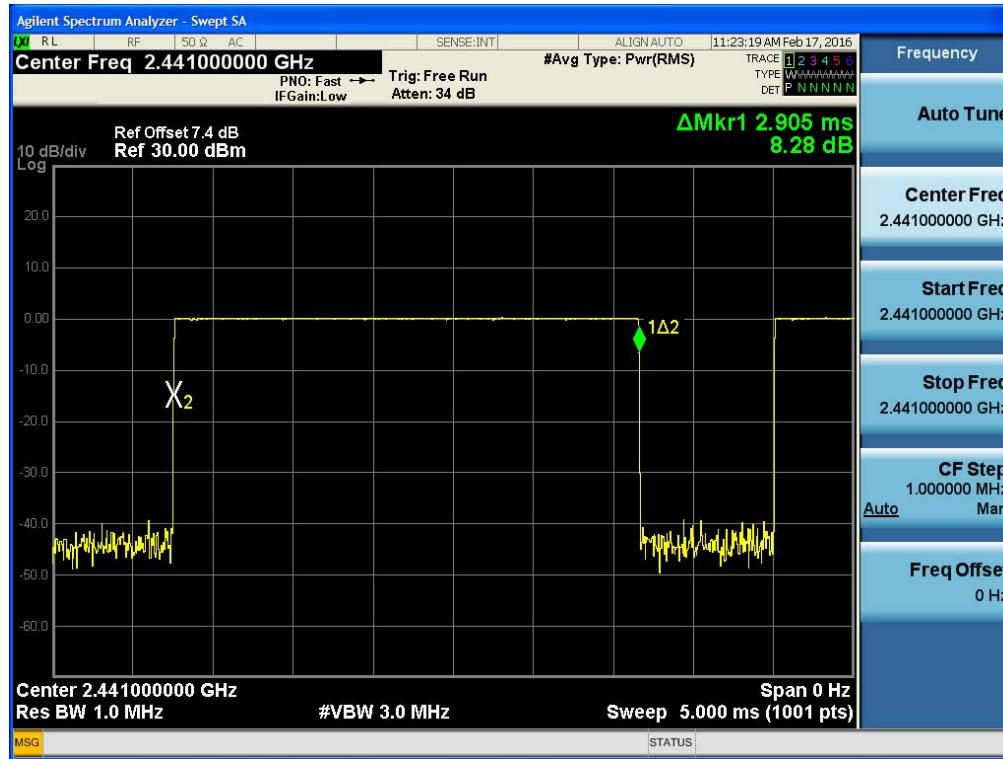
Test Plots (GFSK)

Dwell Time (Low-CH)



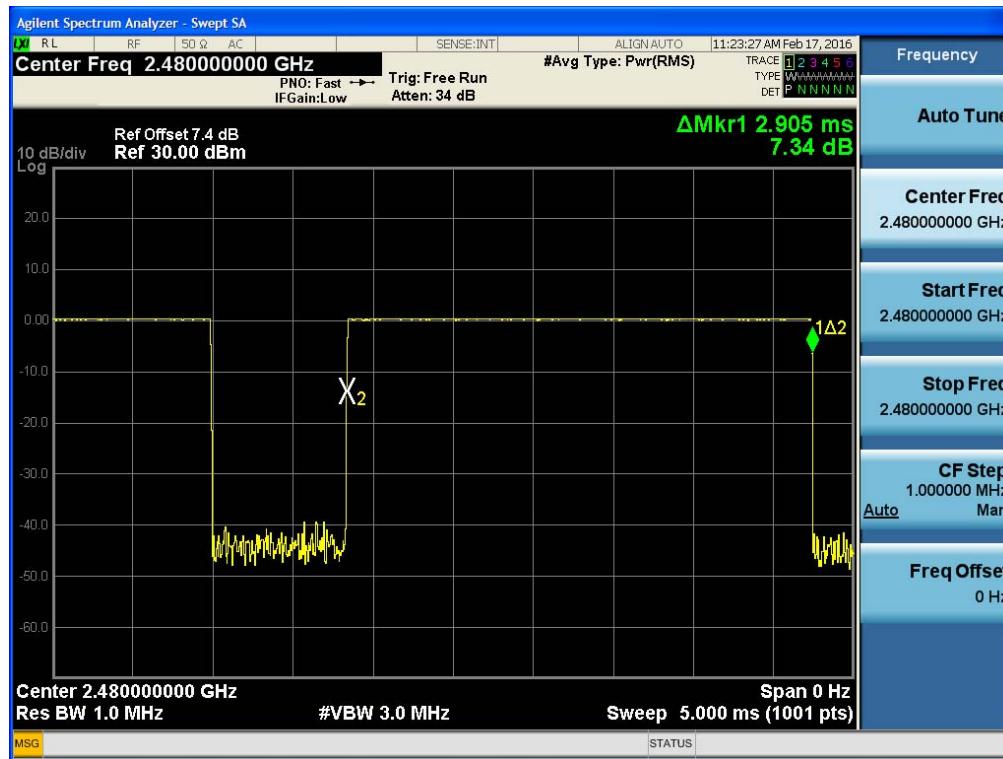
Test Plots (GFSK)

Dwell Time (Mid-CH)



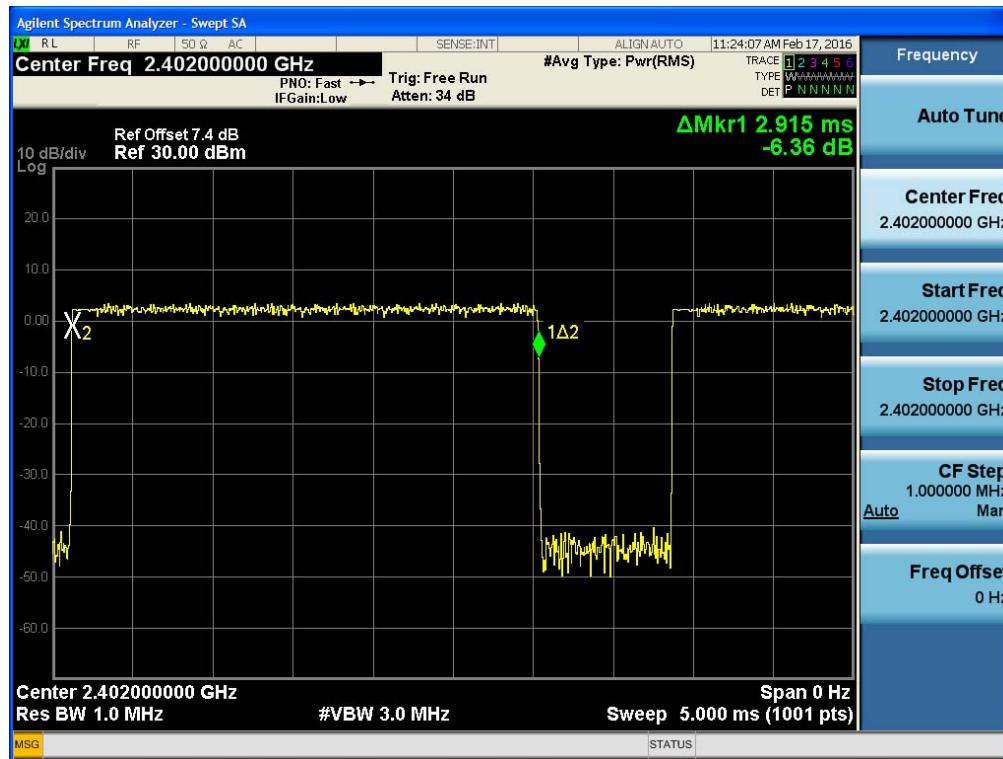
Test Plots (GFSK)

Dwell Time (High-CH)



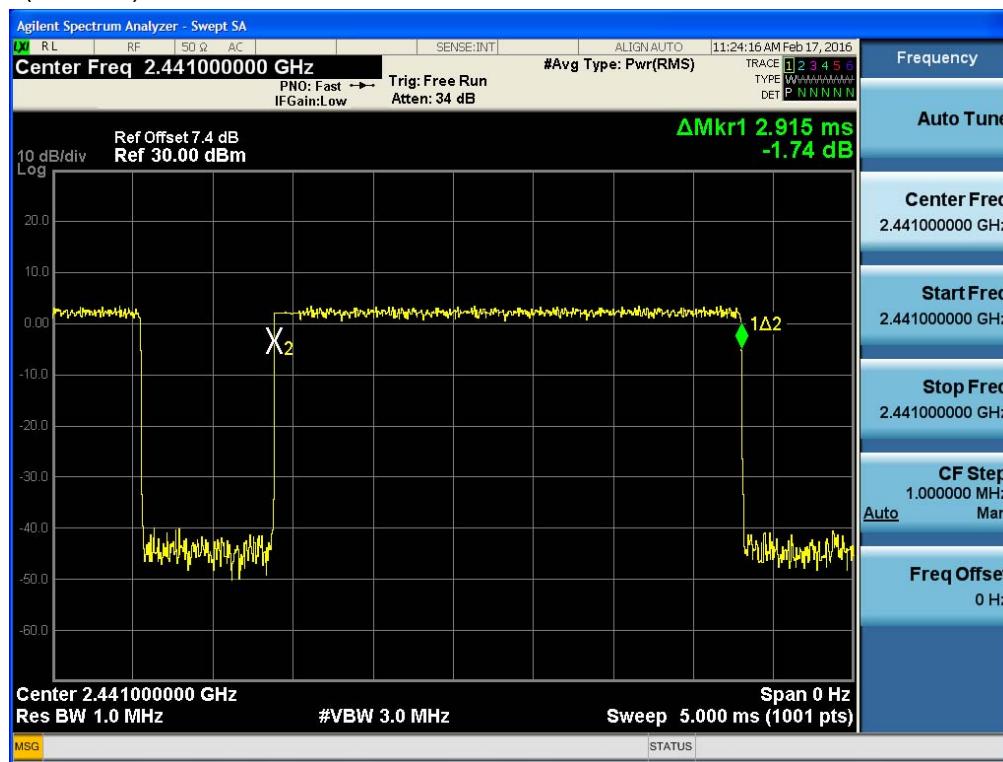
Test Plots (8DPSK)

Dwell Time (Low-CH)



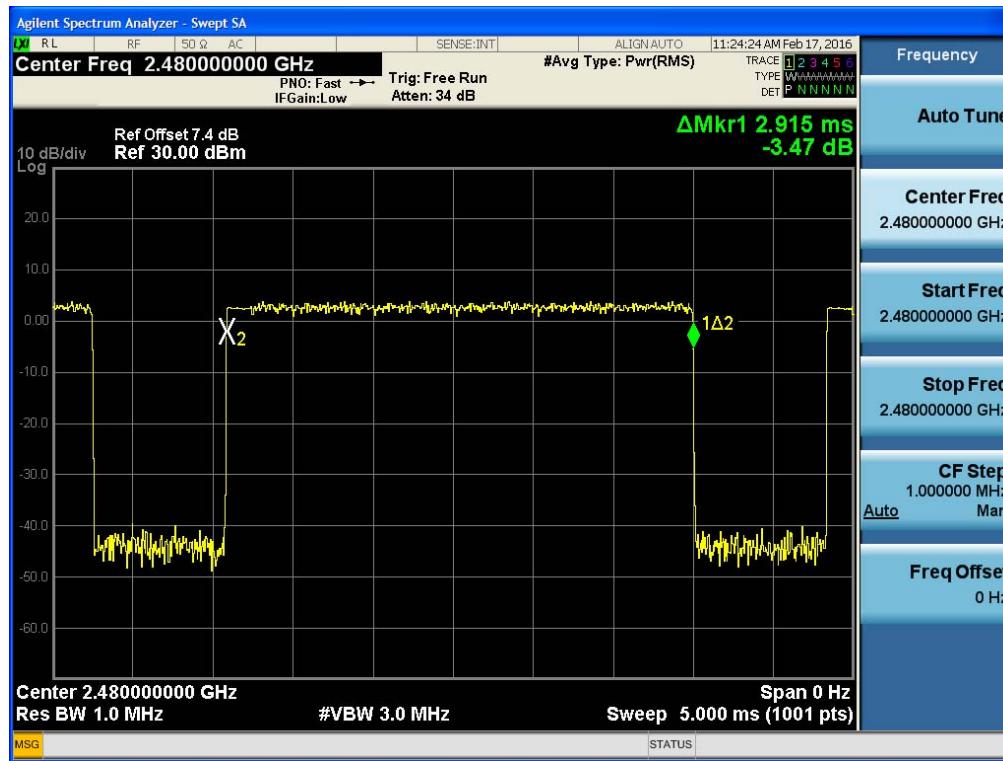
Test Plots (8DPSK)

Dwell Time (Mid-CH)



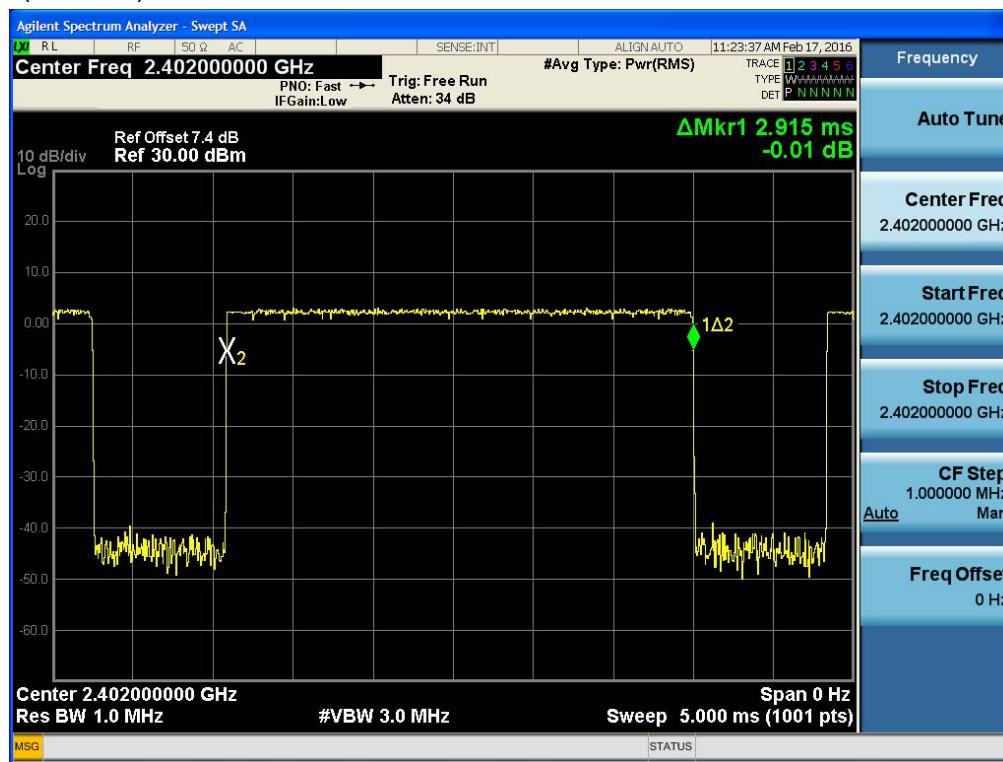
Test Plots (8DPSK)

Dwell Time (High-CH)

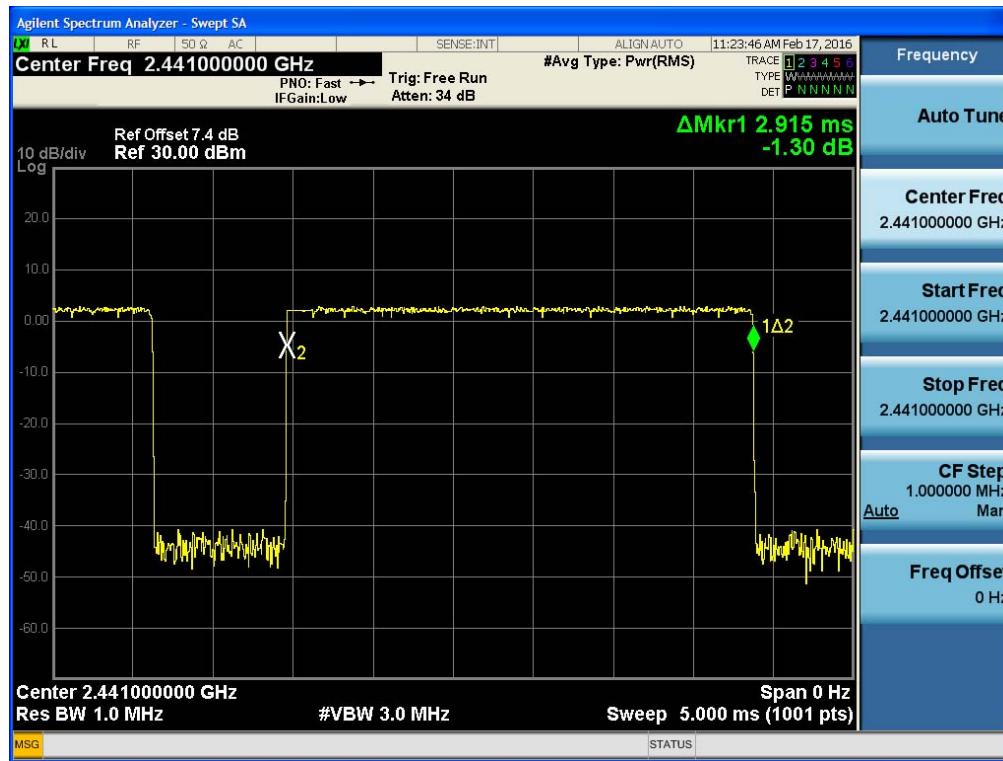


Test Plots ($\pi/4$ DQPSK)

Dwell Time (Low-CH)


Test Plots ($\pi/4$ DQPSK)

Dwell Time (Mid-CH)



Test Plots ($\pi/4$ DQPSK)

Dwell Time (High-CH)



8.6 SPURIOUS EMISSIONS

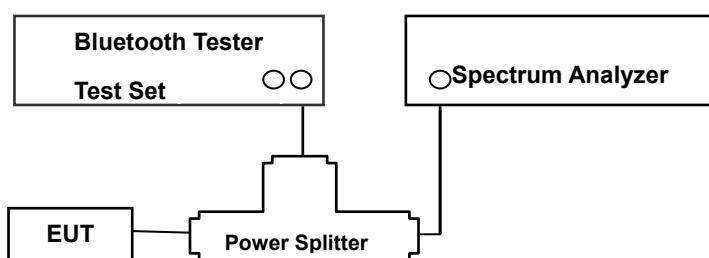
8.6.1 CONDUCTED SPURIOUS EMISSIONS

Test Requirements and limit, §15.247(d) / RSS-247(Issue 1) Section 5.5

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 / Section 5.4.4, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) / RSS-Gen 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 (7.8.8 in ANSI 63.10-2013)

- 1) Span: 30 MHz to 10 times the operating frequency in GHz.
- 2) RBW: 100 kHz
- 3) VBW: 300 kHz
- 4) Sweep: Coupled
- 5) Detector: Peak

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.

Note : In order to simplify the report, attached plots were only the worst case channel and data rate.

FACTORS FOR FREQUENCY

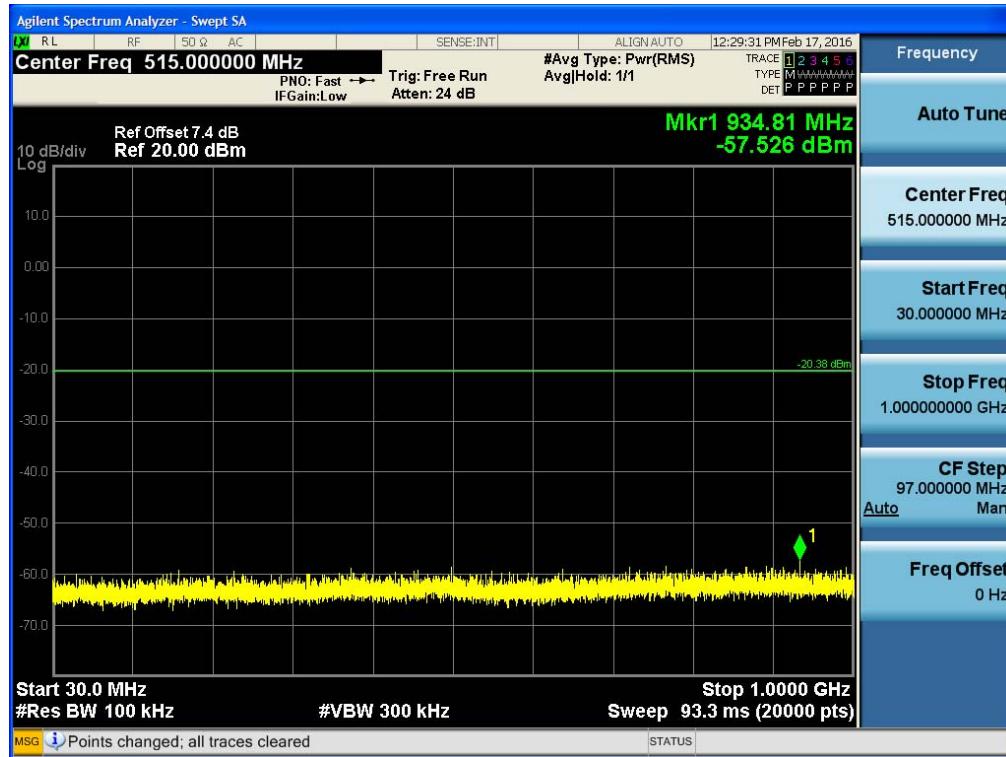
Freq(MHz)	Factor(dB)
30	7.18
100	6.35
200	7.04
300	6.58
400	6.26
500	5.95
600	6.17
700	6.34
800	6.72
900	7.08
1000	7.38
2000	7.78
2400*	7.36
2500*	7.44
3000	7.88
4000	8.95
5000	9.57
6000	6.68
7000	9.99
8000	8.34
9000	9.61
10000	10.47
11000	8.96
12000	9.73
13000	8.84
14000	9.50
15000	11.54
16000	8.14
17000	11.73
18000	9.71
19000	10.40
20000	11.69
21000	10.72
22000	12.31
23000	9.85
24000	12.52
25000	11.07
26000	10.50

Note : 1. '*' is fundamental frequency range.

2. Factor = Cable loss + Splitter loss

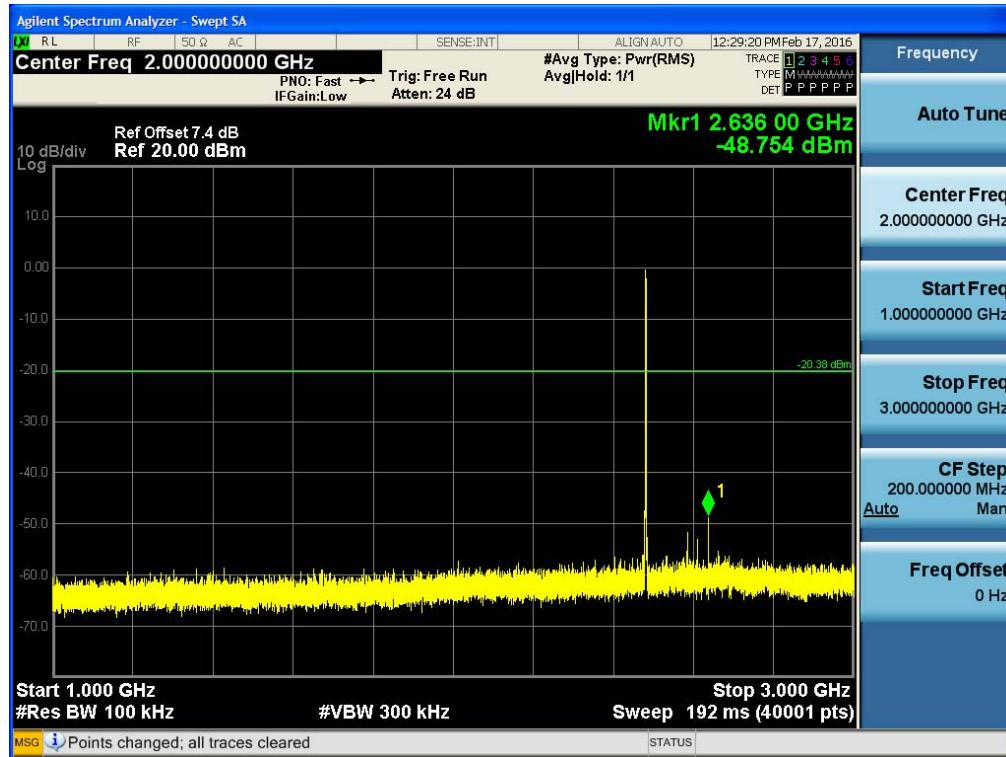
Test Plots (8DPSK)- 30 MHz - 1 GHz

Spurious Emission (High-CH)

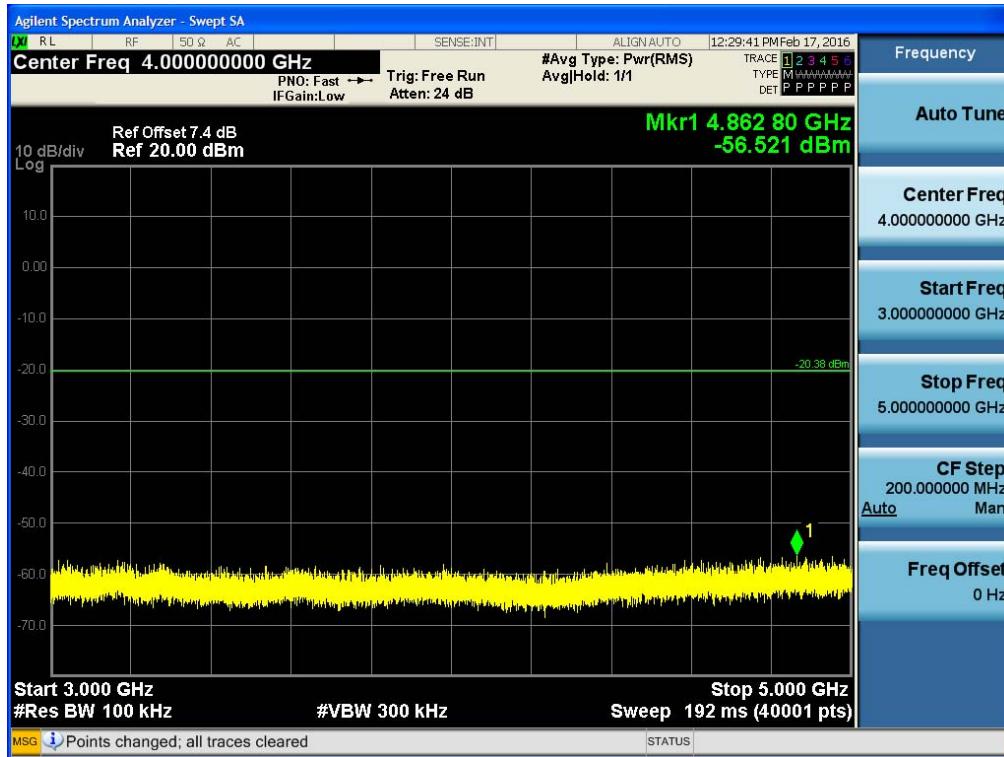


Test Plots (8DPSK)- 1 GHz – 3 GHz

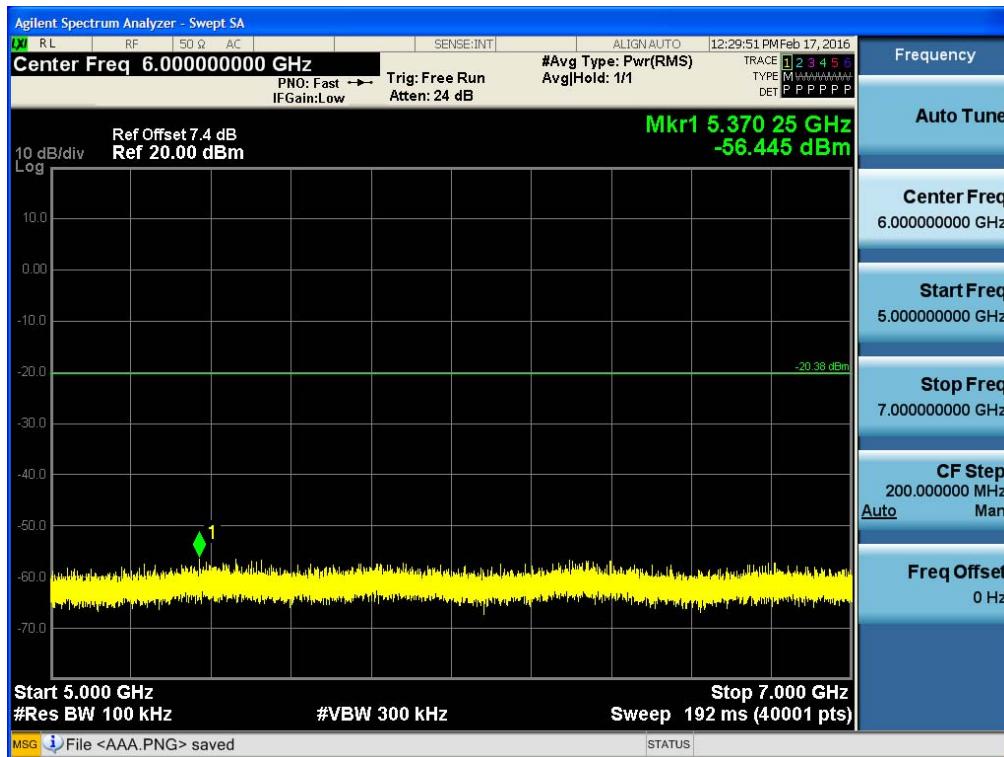
Spurious Emission (High-CH)



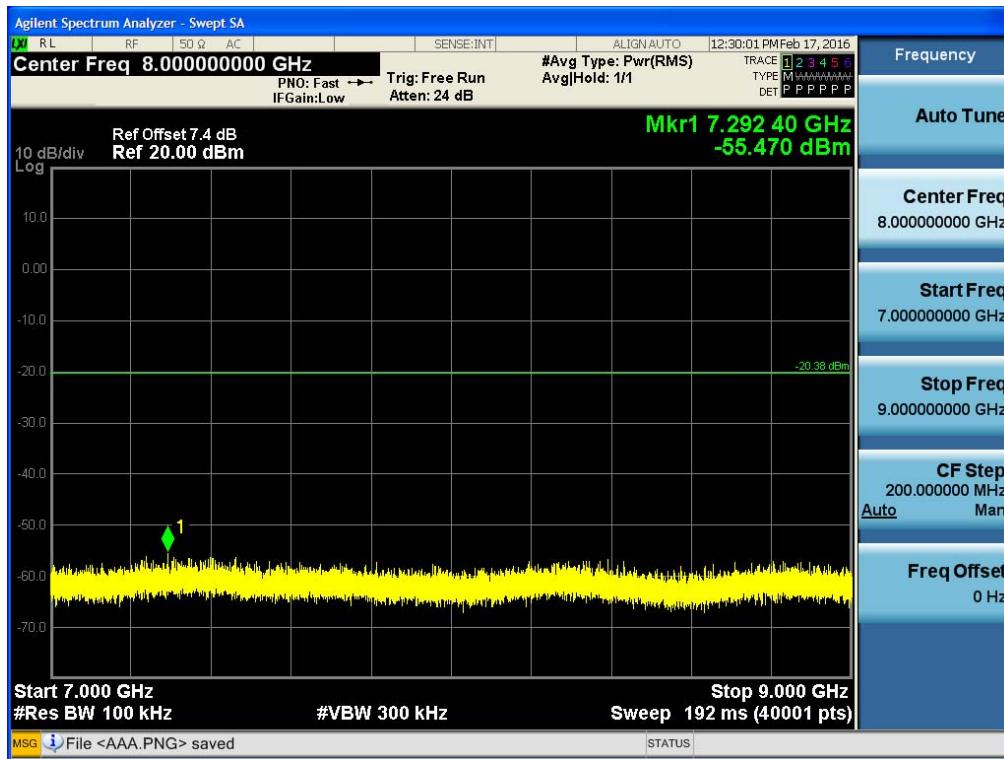
Test Plots (8DPSK)- 3 GHz - 5 GHz Spurious Emission (High-CH)



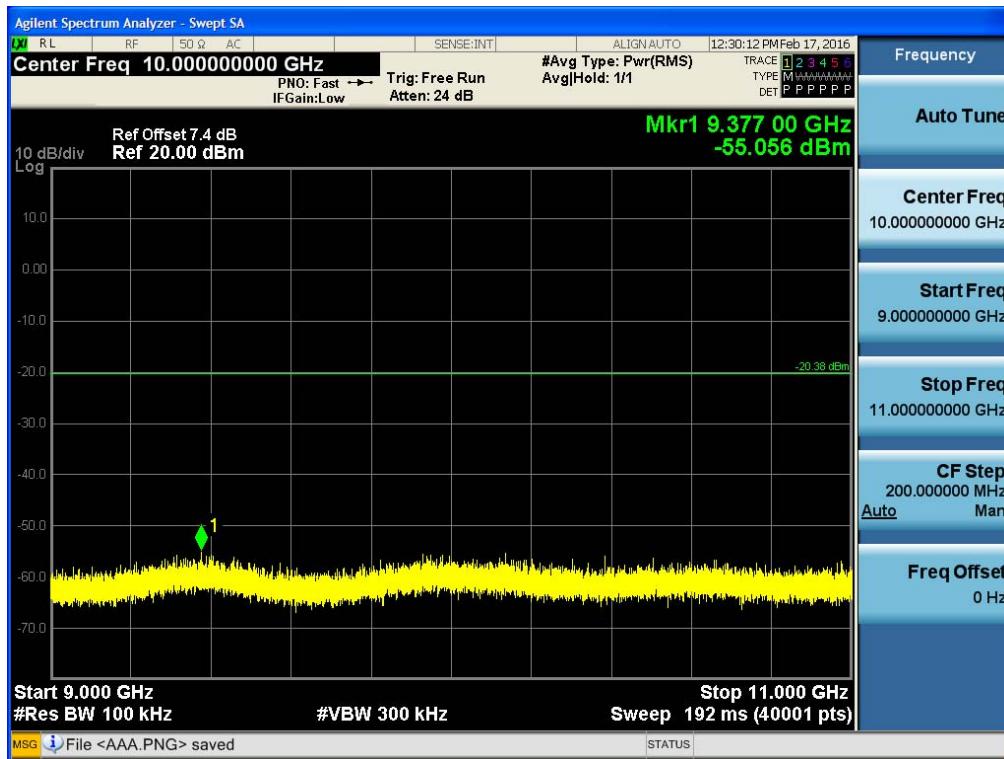
Test Plots (8DPSK)- 5 GHz - 7 GHz Spurious Emission (High-CH)



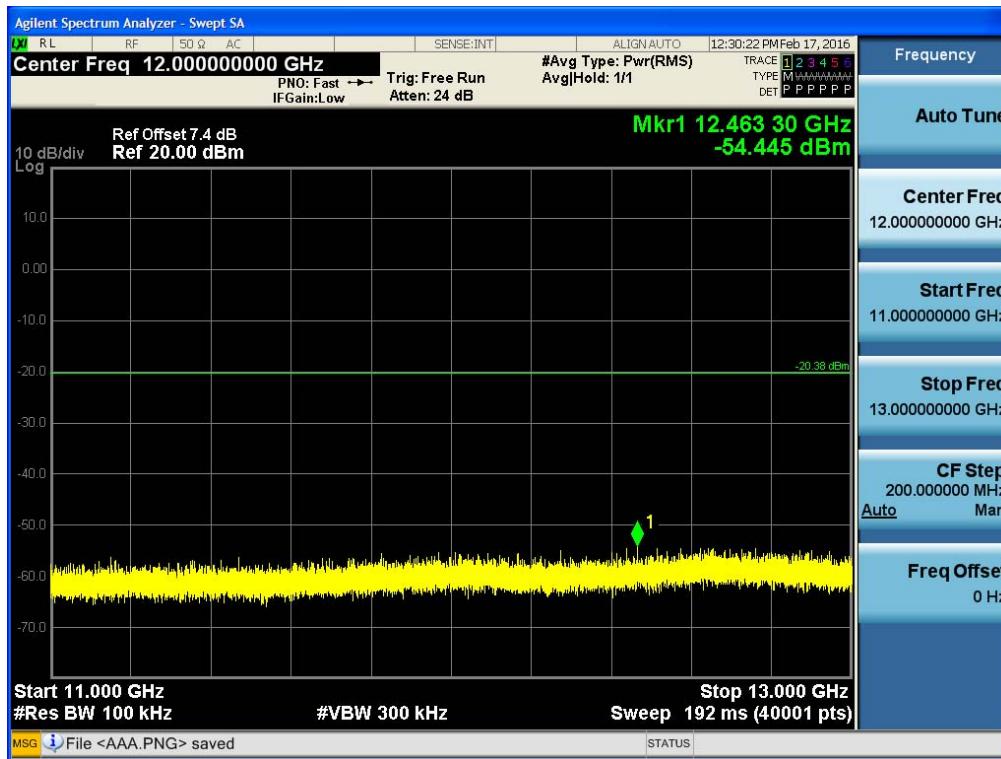
Test Plots (8DPSK)- 7 GHz - 9 GHz Spurious Emission(High-CH)



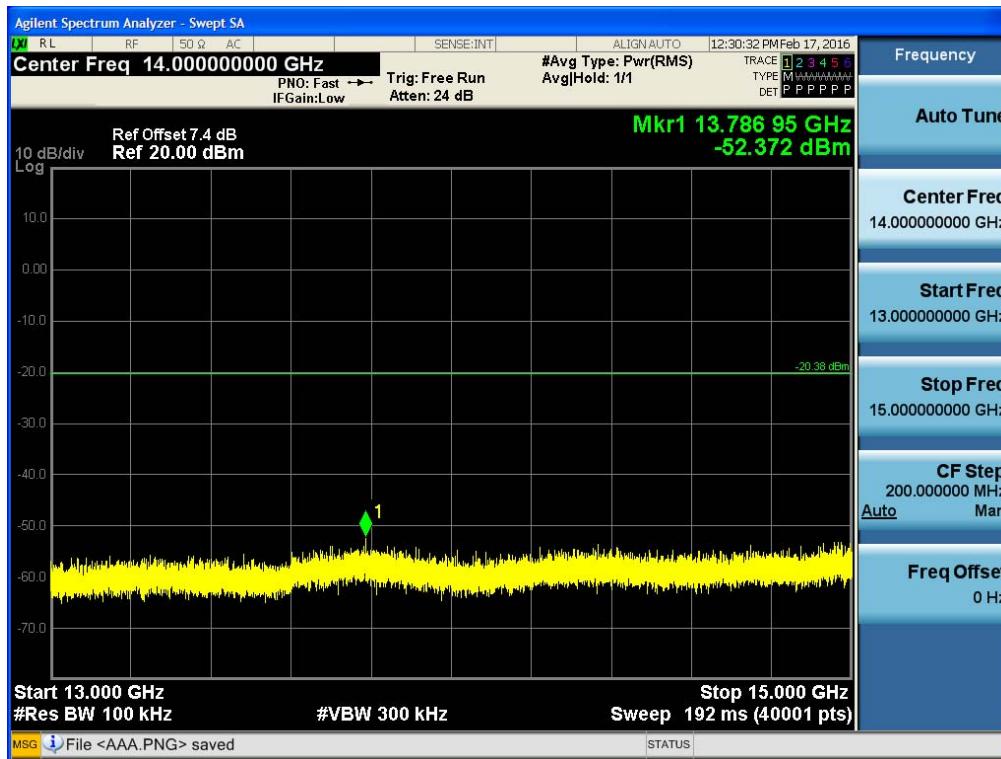
Test Plots (8DPSK)- 9 GHz - 11 GHz Spurious Emission(High-CH)



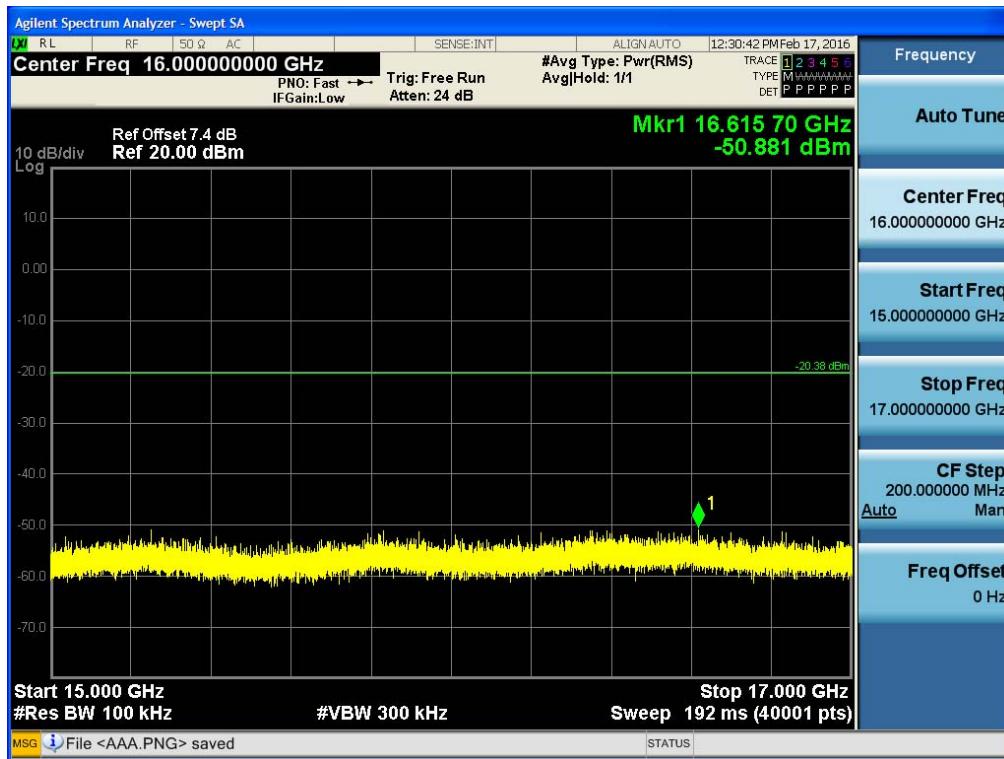
Test Plots (8DPSK)- 11 GHz - 13 GHz Spurious Emission(High-CH)



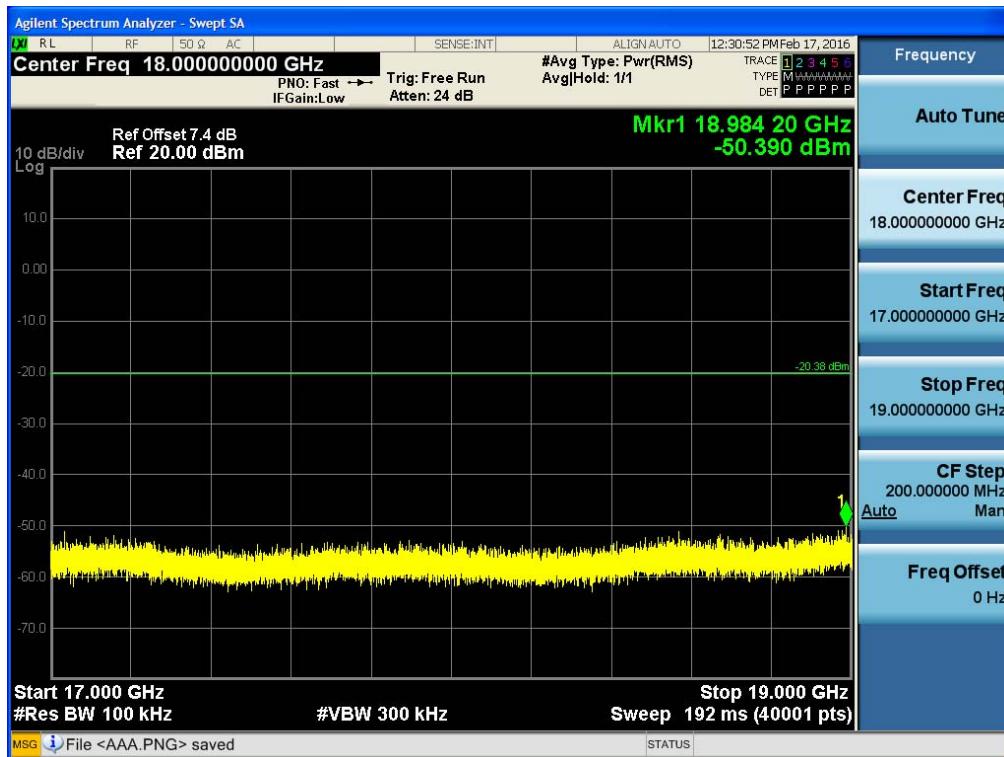
Test Plots (8DPSK)- 13 GHz – 15 GHz Spurious Emission (High-CH)



Test Plots (8DPSK)– 15 GHz - 17 GHz Spurious Emission(High-CH)

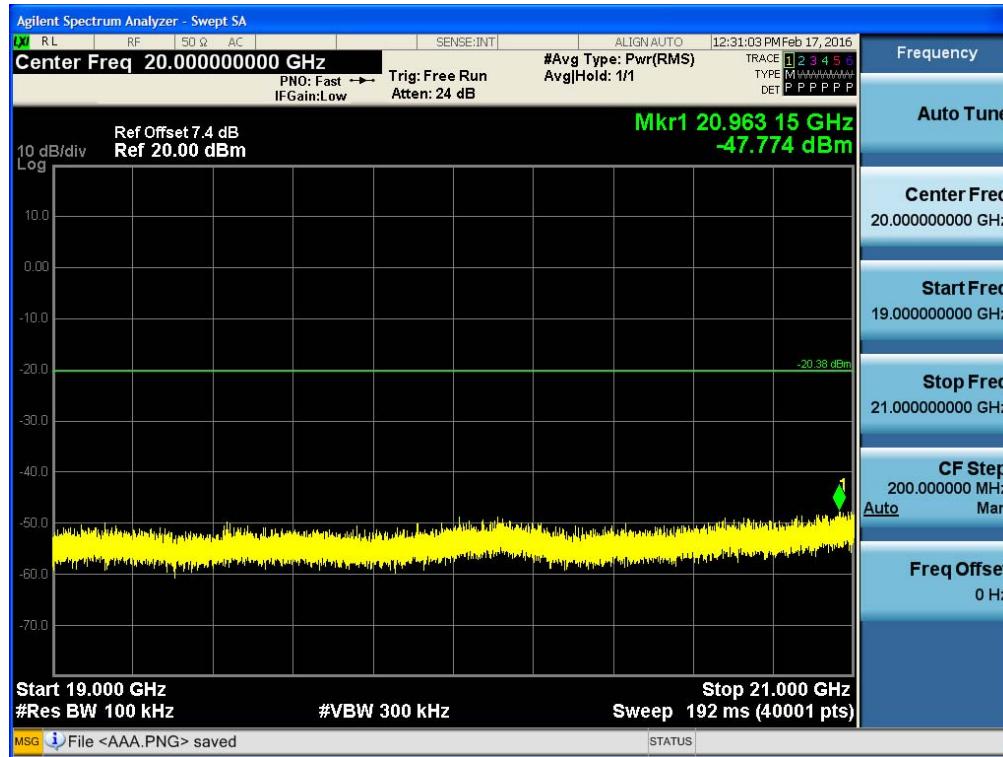


Test Plots (8DPSK)- 17 GHz - 19 GHz Spurious Emission (High-CH)



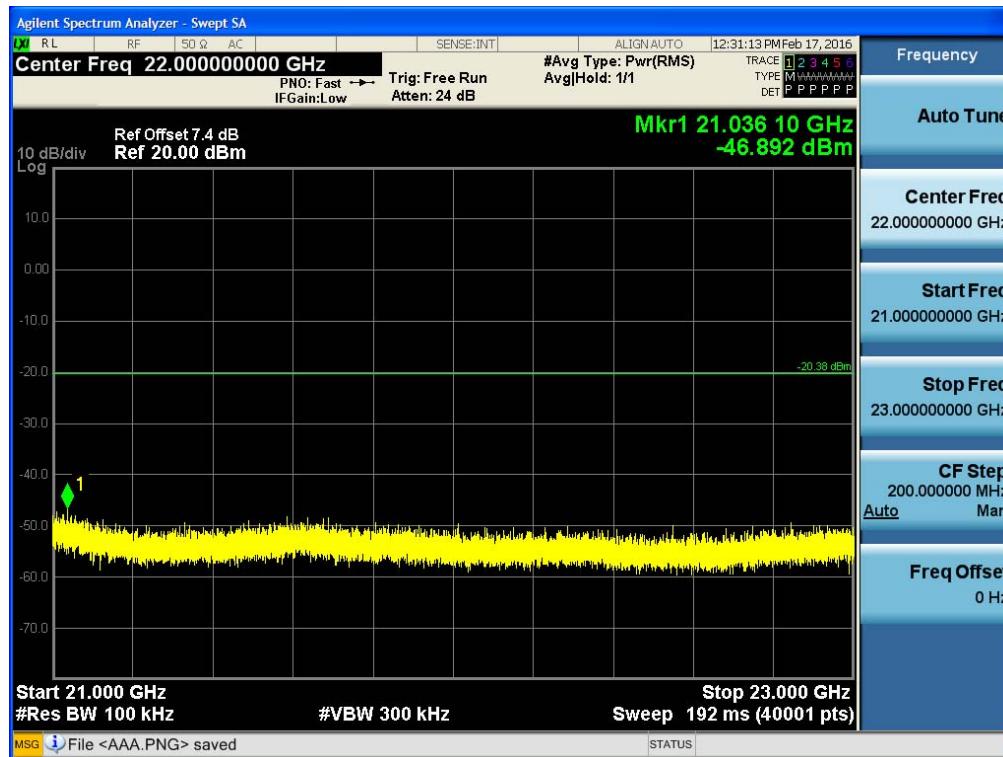
Test Plots (8DPSK)- 19 GHz - 21 GHz

Spurious Emission (High-CH)

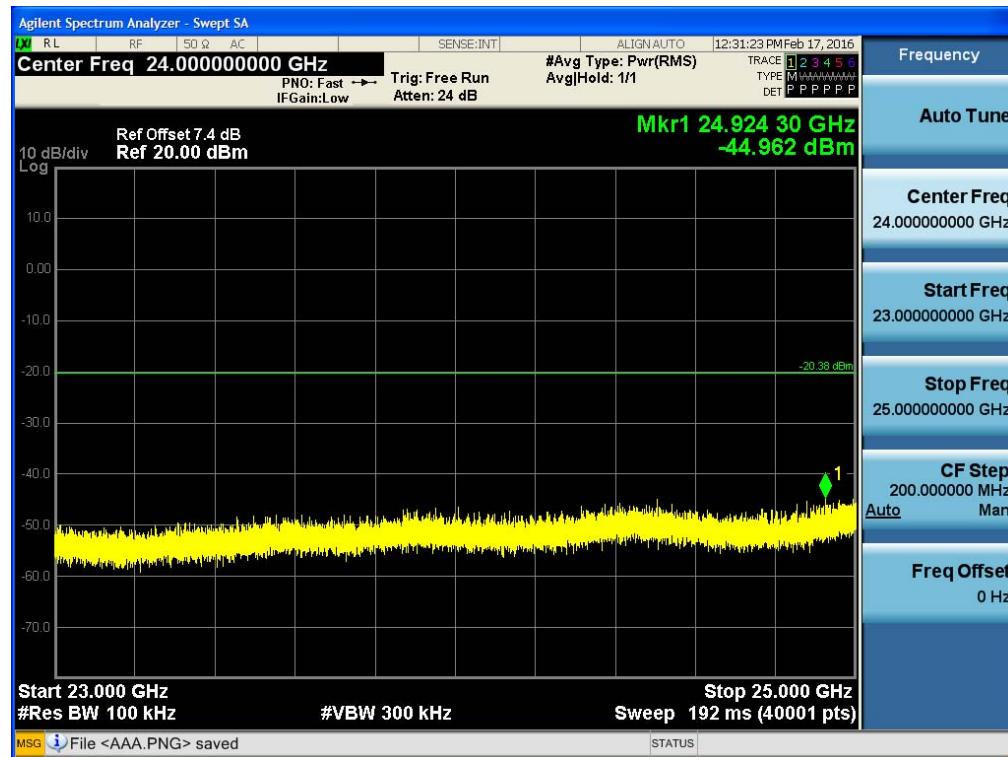


Test Plots (8DPSK)- 21 GHz - 23 GHz

Spurious Emission(High-CH)



Test Plots (8DPSK)- 23 GHz - 25 GHz Spurious Emission(High-CH)

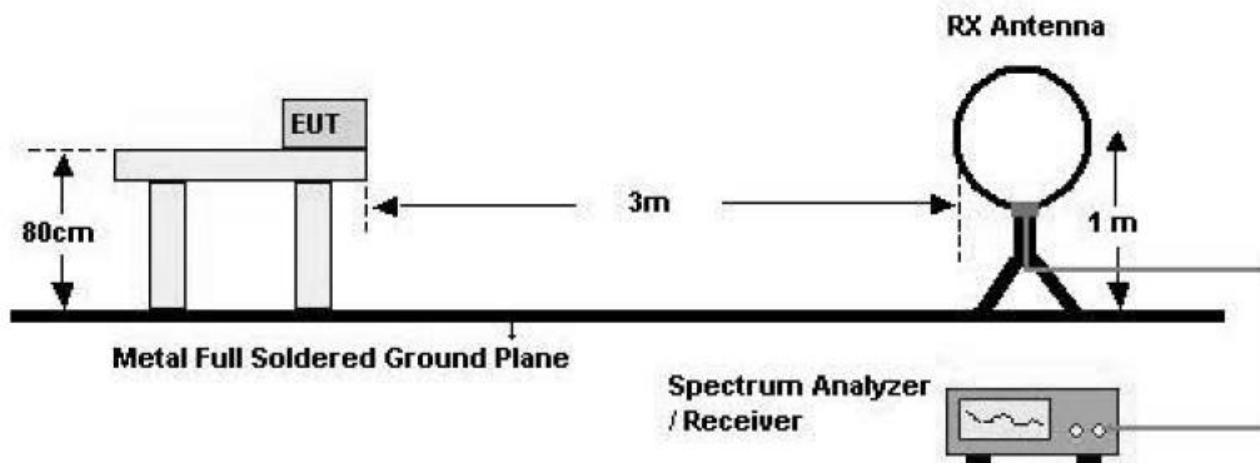
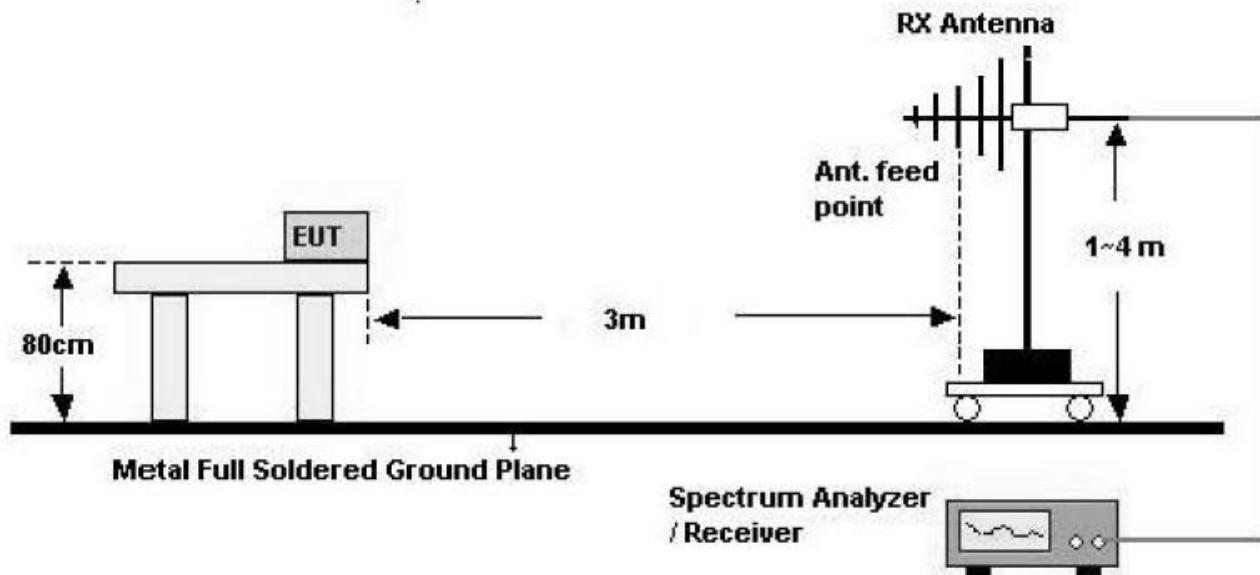


8.6.2 RADIATED SPURIOUS EMISSIONS

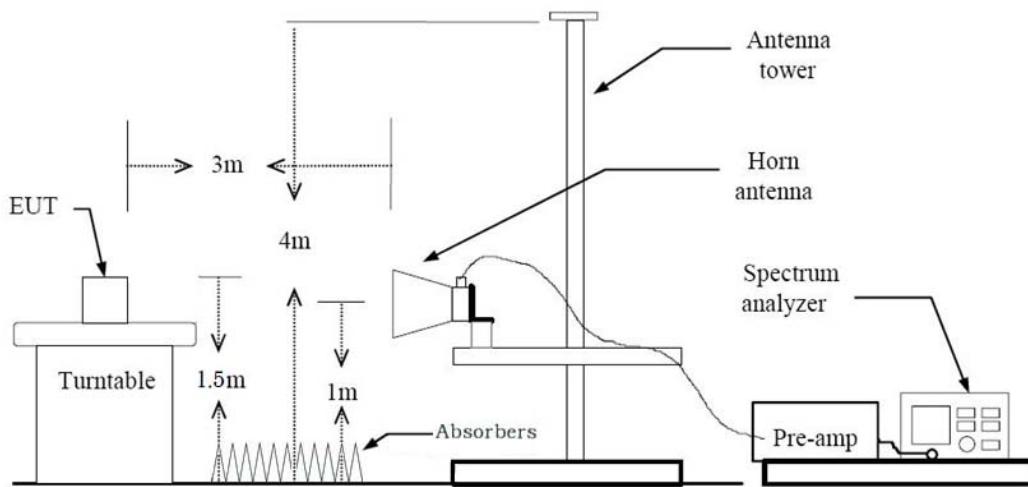
LIMIT : §15.247(d), §15.205, §15.209 / RSS-GEN(Issue 4) Section 8.9

1. 20dBc in any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration**Below 30 MHz****30 MHz - 1 GHz**

Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. Spectrum Setting
 - a. Peak: 1 GHz – 25 GHz, RBW = 1 MHz, VBW $\geq 3 \times \text{RBW}$
 - b. Average: 1 GHz – 25 GHz, RBW = 1 MHz, VBW $\geq 1/\tau$ Hz, where τ = pulse width in seconds.

Note :

We are performed the RSE and radiated band edge using standard radiated method.

BT Mode	T_{on} (ms)	VBW($1/T$) (Hz)	The actual setting value of VBW (Hz)
	2.905	344	1000
	2.915	343	1000

TEST RESULTS**9 kHz – 30MHz****Operation Mode:** Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dB μ V	dB /m	dB	(H/V)	dB μ V/m	dB μ V/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
4. Limit line = specific Limits (dB μ V) + Distance extrapolation factor
5. This test is performed with hopping off.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

TEST RESULTS**Below 1 GHz****Operation Mode:** Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dB μ N	dB /m	dB	(H/V)	dB μ N/m	dB μ N/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. This test is performed with hopping off.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Above 1 GHz
Operation Mode: CH Low(GFSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	60.63	-7.66	V	0	52.97	73.98	21.01	PK
4804	55.61	-7.66	V	-24.73	23.22	53.98	30.76	AV
7206	56.56	-1.98	V	0	54.58	73.98	19.40	PK
7206	46.86	-1.98	V	-24.73	20.15	53.98	33.83	AV
4804	59.84	-7.66	H	0	52.18	73.98	21.80	PK
4804	54.36	-7.66	H	-24.73	21.97	53.98	32.01	AV
7206	55.78	-1.98	H	0	53.80	73.98	20.18	PK
7206	45.96	-1.98	H	-24.73	19.25	53.98	34.73	AV

Operation Mode: CH Low(8DPSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	58.41	-7.66	V	0	50.75	73.98	23.23	PK
4804	48.48	-7.66	V	-24.73	16.09	53.98	37.89	AV
7206	55.09	-1.98	V	0	53.11	73.98	20.87	PK
7206	42.76	-1.98	V	-24.73	16.05	53.98	37.93	AV
4804	57.12	-7.66	H	0	49.46	73.98	24.52	PK
4804	48.21	-7.66	H	-24.73	15.82	53.98	38.16	AV
7206	54.79	-1.98	H	0	52.81	73.98	21.17	PK
7206	42.46	-1.98	H	-24.73	15.75	53.98	38.23	AV

Operation Mode: CH Low($\pi/4$ DQPSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	59.19	-7.66	V	0	51.53	73.98	22.45	PK
4804	48.51	-7.66	V	-24.73	16.12	53.98	37.86	AV
7206	55.51	-1.98	V	0	53.53	73.98	20.45	PK
7206	43.32	-1.98	V	-24.73	16.61	53.98	37.37	AV
4804	58.25	-7.66	H	0	50.59	73.98	23.39	PK
4804	47.89	-7.66	H	-24.73	15.50	53.98	38.48	AV
7206	54.69	-1.98	H	0	52.71	73.98	21.27	PK
7206	42.94	-1.98	H	-24.73	16.23	53.98	37.75	AV

※ A·F: ANTENNA FACTOR

C·L: CABLE LOSS

AMP GAIN: AMPLIFIER GAIN

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
 - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
 - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW $\geq 1/\tau$ Hz, where τ = pulse width in seconds.

We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done Normal Mode and EDR Mode test.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode: CH Mid(GFSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	57.99	-7.45	V	0	50.54	73.98	23.44	PK
4882	50.97	-7.45	V	-24.73	18.79	53.98	35.19	AV
7323	54.86	-1.66	V	0	53.20	73.98	20.78	PK
7323	44.46	-1.66	V	-24.73	18.07	53.98	35.91	AV
4882	57.26	-7.45	H	0	49.81	73.98	24.17	PK
4882	50.12	-7.45	H	-24.73	17.94	53.98	36.04	AV
7323	54.10	-1.66	H	0	52.44	73.98	21.54	PK
7323	43.89	-1.66	H	-24.73	17.50	53.98	36.48	AV

Operation Mode: CH Mid(8DPSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	56.37	-7.45	V	0	48.92	73.98	25.06	PK
4882	45.36	-7.45	V	-24.73	13.18	53.98	40.80	AV
7323	55.03	-1.66	V	0	53.37	73.98	20.61	PK
7323	41.28	-1.66	V	-24.73	14.89	53.98	39.09	AV
4882	55.69	-7.45	H	0	48.24	73.98	25.74	PK
4882	45.26	-7.45	H	-24.73	13.08	53.98	40.90	AV
7323	54.83	-1.66	H	0	53.17	73.98	20.81	PK
7323	41.10	-1.66	H	-24.73	14.71	53.98	39.27	AV

Operation Mode: CH Mid($\pi/4$ DQPSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	56.35	-7.45	V	0	48.90	73.98	25.08	PK
4882	45.23	-7.45	V	-24.73	13.05	53.98	40.93	AV
7323	54.35	-1.66	V	0	52.69	73.98	21.29	PK
7323	41.60	-1.66	V	-24.73	15.21	53.98	38.77	AV
4882	55.86	-7.45	H	0	48.41	73.98	25.57	PK
4882	44.82	-7.45	H	-24.73	12.64	53.98	41.34	AV
7323	54.29	-1.66	H	0	52.63	73.98	21.35	PK
7323	41.55	-1.66	H	-24.73	15.16	53.98	38.82	AV

※ A·F: ANTENNA FACTOR

C·L: CABLE LOSS

AMP GAIN: AMPLIFIER GAIN

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
 - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
 - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW $\geq 1/\tau$ Hz, where τ = pulse width in seconds.

We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done Normal Mode and EDR Mode test.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode: CH High(GFSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	59.45	-7.29	V	0	52.16	73.98	21.82	PK
4960	53.77	-7.29	V	-24.73	21.75	53.98	32.23	AV
7440	56.89	-1.08	V	0	55.81	73.98	18.17	PK
7440	52.13	-1.08	V	-24.73	26.32	53.98	27.66	AV
4960	58.97	-7.29	H	0	51.68	73.98	22.30	PK
4960	52.79	-7.29	H	-24.73	20.77	53.98	33.21	AV
7440	56.05	-1.08	H	0	54.97	73.98	19.01	PK
7440	51.59	-1.08	H	-24.73	25.78	53.98	28.20	AV

Operation Mode: CH High(8DPSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	56.04	-7.29	V	0	48.75	73.98	25.23	PK
4960	44.85	-7.29	V	-24.73	12.83	53.98	41.15	AV
7440	55.02	-1.08	V	0	53.94	73.98	20.04	PK
7440	44.20	-1.08	V	-24.73	18.39	53.98	35.59	AV
4960	55.80	-7.29	H	0	48.51	73.98	25.47	PK
4960	43.92	-7.29	H	-24.73	11.90	53.98	42.08	AV
7440	54.68	-1.08	H	0	53.60	73.98	20.38	PK
7440	43.19	-1.08	H	-24.73	17.38	53.98	36.60	AV

Operation Mode: CH High ($\pi/4$ DQPSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	56.24	-7.29	V	0	48.95	73.98	25.03	PK
4960	45.05	-7.29	V	-24.73	13.03	53.98	40.95	AV
7440	55.27	-1.08	V	0	54.19	73.98	19.79	PK
7440	43.95	-1.08	V	-24.73	18.14	53.98	35.84	AV
4960	55.92	-7.29	H	0	48.63	73.98	25.35	PK
4960	44.87	-7.29	H	-24.73	12.85	53.98	41.13	AV
7440	54.56	-1.08	H	0	53.48	73.98	20.50	PK
7440	42.81	-1.08	H	-24.73	17.00	53.98	36.98	AV

※ A·F: ANTENNA FACTOR

C·L: CABLE LOSS

AMP GAIN: AMPLIFIER GAIN

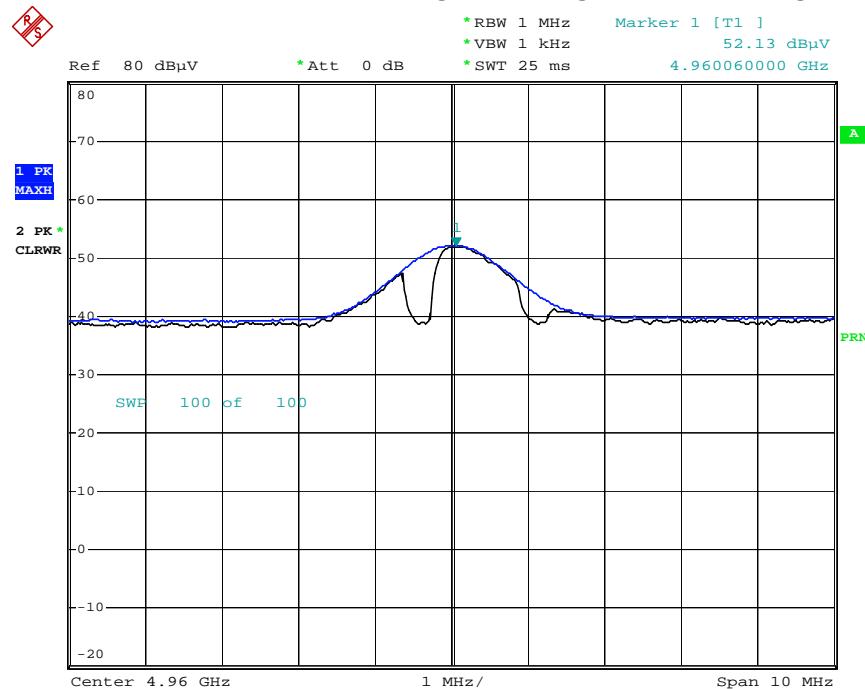
Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
 - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
 - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW $\geq 1/\tau$ Hz, where τ = pulse width in seconds.

We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done Normal Mode and EDR Mode test.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

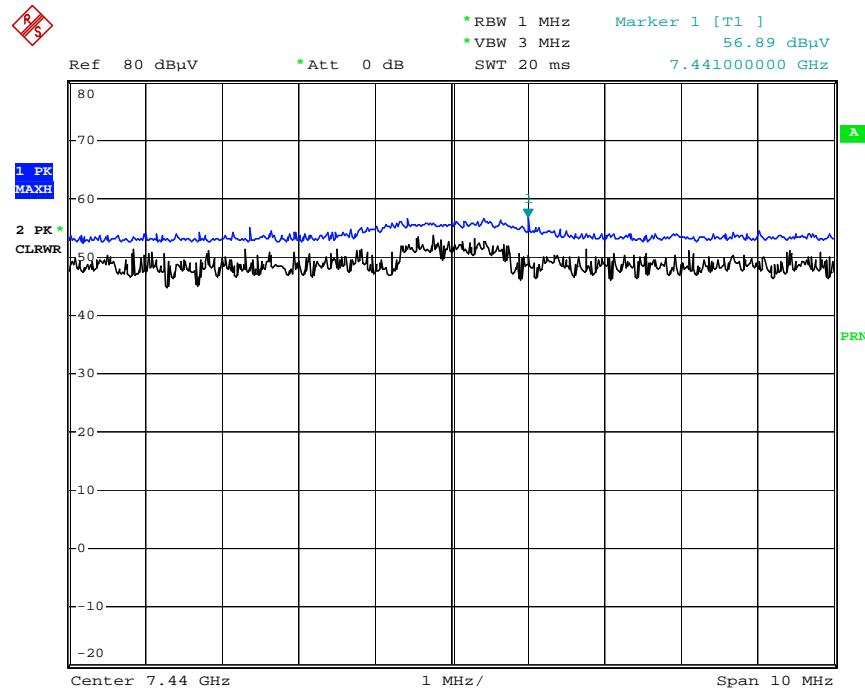
RESULT PLOTS

Radiated Spurious Emissions plot – Average Reading (GFSK, Ch. High 3rd Harmonic)



Date: 15.FEB.2016 07:14:24

Radiated Spurious Emissions plot – Peak Reading (GFSK, Ch. High 3rd Harmonic)



Date: 16.FEB.2016 01:34:42

Note : Only the worst case plots for Radiated Spurious Emissions.

8.6.3 RECEIVER SPURIOUS EMISSIONS

IC Rule(s)	RSS-GEN
Test Requirements:	Blow the table
Operating conditions:	Under normal test conditions
Method of testing:	Radiated
S/A. Settings:	F < 1 GHz: RBW: 120 kHz, VBW: 300 kHz (Quasi Peak) F > 1 GHz: RBW: 1 MHz, VBW: 1 MHz (Peak)
Mode of operation:	Receive

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

Operation Mode: Receive:

30 MHz ~ 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dB μ V	dB /m	dB	(H/V)	dB μ V/m	dB μ V/m	dB
No critical peaks found							

Above 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dB μ V	dB /m	dB	(H/V)	dB μ V/m	dB μ V/m	dB
No critical peaks found							

8.6.4 RADIATED RESTRICTED BAND EDGES

Test Requirements and limit, §15.247(d), §15.205, §15.209 / RSS-GEN(Issue 4) Section 8.10

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

Frequency [MHz]	Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	27.13	31.28	H	0	58.41	73.98	15.57	PK
2390.0	13.68	31.28	H	-24.73	20.22	53.98	33.76	AV
2390.0	26.95	31.28	V	0	58.23	73.98	15.75	PK
2390.0	13.55	31.28	V	-24.73	20.09	53.98	33.89	AV
2483.5	31.36	31.28	H	0	62.64	73.98	11.35	PK
2483.5	26.74	31.28	H	-24.73	33.28	53.98	20.70	AV
2483.5	30.46	31.28	V	0	61.74	73.98	12.25	PK
2483.5	25.24	31.28	V	-24.73	31.78	53.98	22.20	AV

Operation Mode

EDR(8DPSK)

Operating Frequency

2402 MHz , 2480 MHz

Channel No

CH 0, CH 78

Frequency [MHz]	Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	27.19	31.28	H	0	58.47	73.98	15.51	PK
2390.0	13.71	31.28	H	-24.73	20.25	53.98	33.73	AV
2390.0	26.91	31.28	V	0	58.19	73.98	15.79	PK
2390.0	13.29	31.28	V	-24.73	19.83	53.98	34.15	AV
2483.5	33.43	31.28	H	0	64.71	73.98	9.28	PK
2483.5	28.12	31.28	H	-24.73	34.66	53.98	19.32	AV
2483.5	32.23	31.28	V	0	63.51	73.98	10.48	PK
2483.5	27.12	31.28	V	-24.73	33.66	53.98	20.32	AV

Operation Mode

EDR($\pi/4$ DQPSK)

Operating Frequency

2402 MHz , 2480 MHz

Channel No

CH 0, CH 78

Frequency [MHz]	Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	27.22	31.28	H	0	58.50	73.98	15.48	PK
2390.0	13.72	31.28	H	-24.73	20.26	53.98	33.72	AV
2390.0	27.26	31.28	V	0	58.54	73.98	15.44	PK
2390.0	13.66	31.28	V	-24.73	20.20	53.98	33.78	AV
2483.5	33.88	31.28	H	0	65.16	73.98	8.83	PK
2483.5	28.16	31.28	H	-24.73	34.70	53.98	19.28	AV
2483.5	32.48	31.28	V	0	63.76	73.98	10.23	PK
2483.5	27.19	31.28	V	-24.73	33.73	53.98	20.25	AV

※ A-F: ANTENNA FACTOR

C-L: CABLE LOSS

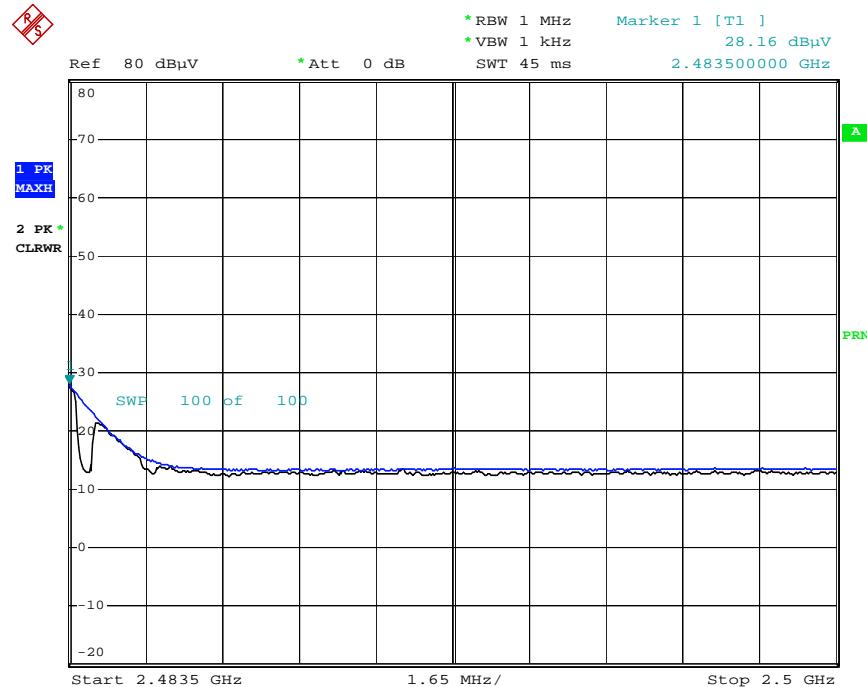
AMP GAIN: AMPLIFIER GAIN

Notes:

1. Frequency range of measurement = 2483.5 MHz ~ 2500 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Duty Cycle Correction Factor
3. Spectrum setting:
 - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
 - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW $\geq 1/\tau$ Hz, where τ = pulse width in seconds.
We performed using a reduced video BW method was done with the analyzer in linear mode.
4. FYI : Duty Cycle Correction Factor (79 channel hopping)
 - a. Time to cycle through all channels= $\Delta t = \tau$ [ms] x 79 channels = 229.100 ms, where τ = pulse width
 - b. 100 ms/ Δt [ms] = $H \rightarrow$ Round up to next highest integer, $H' = 1$
 - c. Worst Case Dwell Time = τ [ms] x $H' = 2.900$ ms
 - d. Duty Cycle Correction = $20\log (\text{Worst Case Dwell Time}/ 100\text{ms})$ dB = -30.752 dB
5. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
 - a. Time to cycle through all channels= $\Delta t = \tau$ [ms] x 20 channels = 58.00 ms, where τ = pulse width
 - b. 100 ms/ Δt [ms] = $H \rightarrow$ Round up to next highest integer, $H' = 2$
 - c. Worst Case Dwell Time = τ [ms] x $H' = 5.800$ ms
 - d. Duty Cycle Correction(AFH) = $20\log (\text{Worst Case Dwell Time}/ 100\text{ms})$ dB = -24.7314 dB
 - e. We applied DCCF in the test result which hopping channel number is 20.
6. We have done Normal Mode, EDR Mode.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

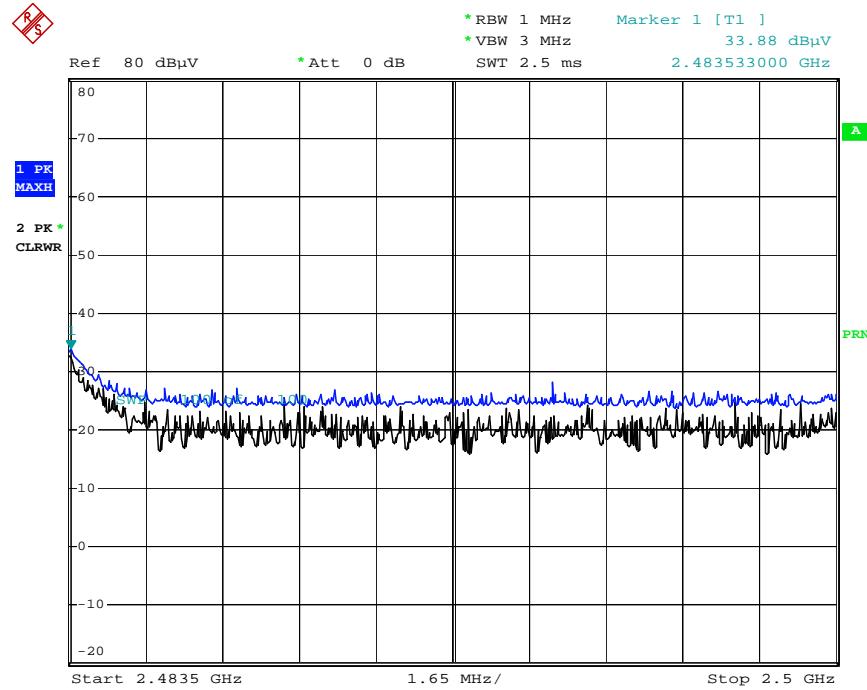
□ RESULT PLOTS

Radiated Restricted Band Edges plot – Average Reading ($\pi/4$ DQPSK, Ch.78)



Date: 11.FEB.2016 13:39:03

Radiated Restricted Band Edges plot – Peak Reading ($\pi/4$ DQPSK, Ch.78)



Date: 11.FEB.2016 13:39:27

Note : Only the worst case plots for Radiated Restricted Band Edges.

8.7 POWERLINE CONDUCTED EMISSIONS

LIMIT

For an intentional radiator which 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 250 microvolt (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

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

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

□ RESULT PLOTS**Conducted Emissions (Line 1)**

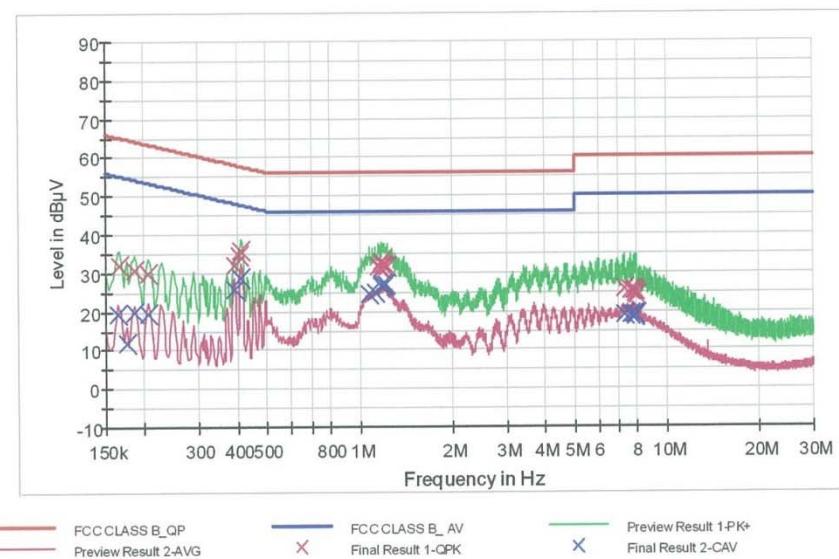
BT MODE N

1 / 2

HCT TEST Report**Common Information**

EUT: HBS-770
Manufacturer: LG
Test Site: SHIELD ROOM
Operating Conditions: BT MODE
Operator Name: SK LEE

FCC CLASS B

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	31.9	9.000	Off	N	9.6	33.3	65.2
0.186000	30.7	9.000	Off	N	9.6	33.5	64.2
0.206000	29.9	9.000	Off	N	9.6	33.5	63.4
0.392000	31.9	9.000	Off	N	9.6	26.1	58.0
0.404000	34.6	9.000	Off	N	9.6	23.2	57.8
0.412000	35.8	9.000	Off	N	9.6	21.8	57.6
1.156000	31.5	9.000	Off	N	9.7	24.5	56.0
1.176000	31.3	9.000	Off	N	9.7	24.7	56.0
1.182000	33.1	9.000	Off	N	9.7	22.9	56.0
1.190000	32.2	9.000	Off	N	9.7	23.8	56.0
1.206000	31.7	9.000	Off	N	9.7	24.3	56.0
1.230000	31.4	9.000	Off	N	9.7	24.6	56.0
7.266000	25.7	9.000	Off	N	9.9	34.3	60.0
7.596000	25.1	9.000	Off	N	9.9	34.9	60.0
7.828000	25.3	9.000	Off	N	9.9	34.7	60.0
7.884000	25.3	9.000	Off	N	9.9	34.7	60.0

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9:32:02

BT MODE N

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Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
7.932000	24.4	9.000	Off	N	9.9	35.6	60.0
7.946000	24.0	9.000	Off	N	9.9	36.0	60.0

Final Result 2

Frequency (MHz)	CAverage (dB μ V)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.164000	19.3	9.000	Off	N	9.6	36.0	55.3
0.176000	11.9	9.000	Off	N	9.6	42.8	54.7
0.186000	19.7	9.000	Off	N	9.6	34.5	54.2
0.206000	19.6	9.000	Off	N	9.6	33.8	53.4
0.392000	25.7	9.000	Off	N	9.6	22.3	48.0
0.412000	28.8	9.000	Off	N	9.6	18.8	47.6
1.076000	24.4	9.000	Off	N	9.7	21.6	46.0
1.126000	24.9	9.000	Off	N	9.7	21.1	46.0
1.182000	26.4	9.000	Off	N	9.7	19.6	46.0
1.190000	26.9	9.000	Off	N	9.7	19.1	46.0
1.206000	26.7	9.000	Off	N	9.7	19.3	46.0
1.218000	26.8	9.000	Off	N	9.7	19.2	46.0
7.262000	19.0	9.000	Off	N	9.9	31.0	50.0
7.266000	18.9	9.000	Off	N	9.9	31.1	50.0
7.616000	18.8	9.000	Off	N	9.9	31.2	50.0
7.828000	19.2	9.000	Off	N	9.9	30.8	50.0
7.882000	18.9	9.000	Off	N	9.9	31.1	50.0
7.932000	18.6	9.000	Off	N	9.9	31.4	50.0

Conducted Emissions (Line 2)

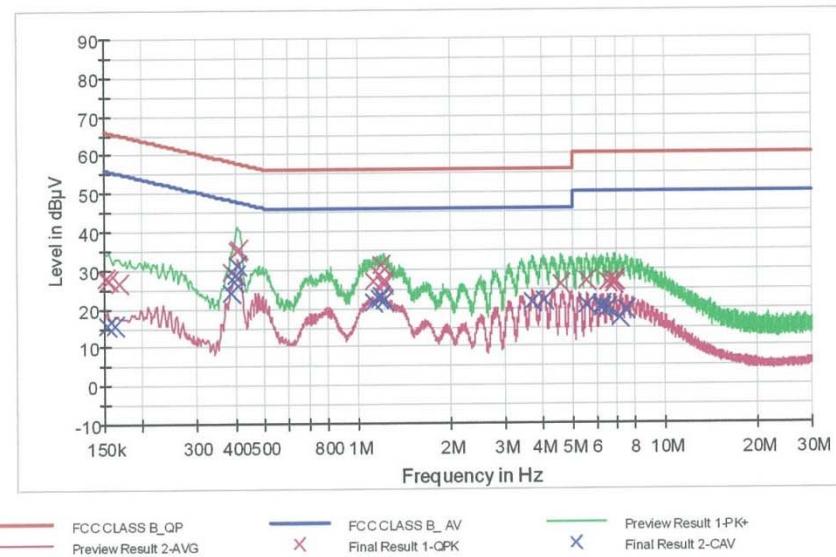
EMI Auto Test(15)

1 / 2

HCT TEST Report**Common Information**

EUT: HBS-770
Manufacturer: LG
Test Site: SHIELD ROOM
Operating Conditions: BT MODE
Operator Name: SK LEE

FCC CLASS B

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.152000	27.8	9.000	Off	L1	9.6	38.1	65.9
0.156000	27.4	9.000	Off	L1	9.6	38.3	65.7
0.168000	26.4	9.000	Off	L1	9.6	38.7	65.1
0.390000	29.7	9.000	Off	L1	9.7	28.4	58.1
0.404000	35.1	9.000	Off	L1	9.7	22.7	57.8
0.412000	35.5	9.000	Off	L1	9.7	22.1	57.6
1.124000	27.0	9.000	Off	L1	9.7	29.0	56.0
1.180000	28.6	9.000	Off	L1	9.7	27.4	56.0
1.188000	31.0	9.000	Off	L1	9.7	25.0	56.0
1.212000	27.1	9.000	Off	L1	9.7	28.9	56.0
1.224000	26.2	9.000	Off	L1	9.7	29.8	56.0
4.604000	26.2	9.000	Off	L1	9.9	29.8	56.0
5.564000	26.9	9.000	Off	L1	9.9	33.1	60.0
5.570000	26.9	9.000	Off	L1	9.9	33.1	60.0
6.504000	26.7	9.000	Off	L1	9.9	33.3	60.0
6.808000	26.0	9.000	Off	L1	9.9	34.0	60.0

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1:24:01

EMI Auto Test(15)

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Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
6.846000	27.1	9.000	Off	L1	9.9	32.9	60.0
6.854000	27.1	9.000	Off	L1	9.9	32.9	60.0

Final Result 2

Frequency (MHz)	CAverage (dB μ V)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.154000	15.7	9.000	Off	L1	9.6	40.1	55.8
0.162000	15.6	9.000	Off	L1	9.6	39.8	55.4
0.388000	23.9	9.000	Off	L1	9.7	24.2	48.1
0.396000	27.0	9.000	Off	L1	9.7	20.9	47.9
0.400000	28.7	9.000	Off	L1	9.7	19.2	47.9
0.408000	31.1	9.000	Off	L1	9.7	16.6	47.7
1.124000	21.5	9.000	Off	L1	9.7	24.5	46.0
1.180000	22.2	9.000	Off	L1	9.7	23.8	46.0
1.190000	23.1	9.000	Off	L1	9.7	22.9	46.0
1.212000	21.9	9.000	Off	L1	9.7	24.1	46.0
3.714000	21.6	9.000	Off	L1	9.8	24.4	46.0
4.030000	22.0	9.000	Off	L1	9.8	24.0	46.0
5.570000	20.7	9.000	Off	L1	9.9	29.3	50.0
6.184000	19.9	9.000	Off	L1	9.9	30.1	50.0
6.212000	20.8	9.000	Off	L1	9.9	29.2	50.0
6.504000	19.8	9.000	Off	L1	9.9	30.2	50.0
7.106000	17.2	9.000	Off	L1	9.9	32.8	50.0
7.478000	19.5	9.000	Off	L1	10.0	30.5	50.0

2/19/2016

1:24:01

9. LIST OF TEST EQUIPMENT

9.1 LIST OF TEST EQUIPMENT(Conducted Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/28/2015	Annual	100073
Rohde & Schwarz	ESCI / TEST RECEIVER	12/28/2015	Annual	100584
Agilent	E4440A/ Spectrum Analyzer	03/18/2015	Annual	US45303008
Agilent	N9020A / SIGNAL ANALYZER	06/30/2015	Annual	MY51110085
Agilent	N9020A / SIGNAL ANALYZER	07/02/2015	Annual	MY50510304
Agilent	N1911A/Power Meter	07/09/2015	Annual	MY45100523
Agilent	N1921A /POWER SENSOR	07/09/2015	Annual	MY45241059
Agilent	87300B/Directional Coupler	11/30/2015	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/15/2015	Annual	5001
Hewlett Packard	E3632A / DC POWER SUPPLY	03/11/2015	Annual	KR75303962
Agilent	8493C / Attenuator(10 dB)	07/21/2015	Annual	07560
Rohde & Schwarz	CBT / BLUETOOTH TESTER	05/11/2015	Annual	100422

9.2 LIST OF TEST EQUIPMENT(Radiated Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Schwarzbeck	VULB 9160/ TRILOG Antenna	10/10/2014	Biennial	3368
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Schwarzbeck	BBHA 9120D/ Horn Antenna	05/07/2015	Biennial	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	04/30/2015	Biennial	BBHA9170124
Rohde & Schwarz	FSP / Spectrum Analyzer	01/22/2016	Annual	839117/011
Wainwright Instrument	WHF3.0/18G-10EF / High Pass Filter	06/29/2015	Annual	8
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	06/15/2015	Annual	1
Rohde & Schwarz	LOOP ANTENNA	09/03/2014	Biennial	1513-175
CERNEX	CBL18265035 / POWER AMP	07/27/2015	Annual	22966
CERNEX	CBL06185030 / POWER AMP	07/21/2015	Annual	22965
CERNEX	CBLU1183540 / POWER AMP	07/21/2015	Annual	22964
Rohde & Schwarz	CBT / BLUETOOTH TESTER	05/11/2015	Annual	100422