RF Emissions Test Report

FCC Part 15.247

For

Kyocera Corporation
c/o Kyocera Communication Inc.

Product:	Dual-Band CDMA Phone
Model:	M9300

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ATTESTATION

The tested device complies with the requirements in respect of all parameters subject to the test.

The test results and statements relate only to the items tested.

The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating parameters.

The test methods were consistent with the methods described in the relevant standards.

Product:	Dual-Band CDMA Cellular Phone with Bluetooth+EDR
Model #:	M9300
FCC ID:	V65M9300
Tested in accordance with:	FCC Part 15.247
Test performed by:	Comptest Services LLC
Test Requested by:	KYOCERA Corporation C/o KYOCERA Communication Inc 8611 Balboa Avenue San Diego, CA92121
Date of Test:	December 21-22, 2010

Responsible Engineer

Benjamin Nguyen

Benjamin Nguyen
Test Engineer

Reviewed and approved by:

Tammy To
Quality Manager

1 SUMMARY OF TESTING

Section #	Rule Part	Test Description	Verdict
4	FCC § 15.247 b1, IC RSS-210 §A8.4 (2)	Peak Output Power	Pass
5	FCC § 15.247 a1, IC RSS-210 §6.2.2(o) a1	20 dB Bandwidth	Pass
6	FCC § 15.247 a1, IC RSS-210 §A8.1(2)	Carrier Frequency Separation	Pass
7	FCC § 15.247 a1 iii, IC RSS-210 §A8.1 (4)	Number of Hopping Frequencies	Pass
8	FCC § 15.247 a1 iii, § 15.247 f, IC RSS-210 §A8.1 (4)	Time of Occupancy	Pass
9	FCC § 15.247 d, IC RSS-210 §A8.5	Band-edge Compliance of Conducted Emissions	Pass
10	FCC § 15.247 d, IC RSS-210 §A8.5	Spurious RF Conducted Emissions	Pass
11	FCC § 15.107 § 15.207, IC RSS-210 §6.6	AC Power Line Conducted Emissions	Pass
12	FCC § 15.109, § 15.209, IC RSS-210 §A2.9(2)	Spurious Radiated Emissions	Pass

2 EQUIPMENT UNDER TEST INFORMATION

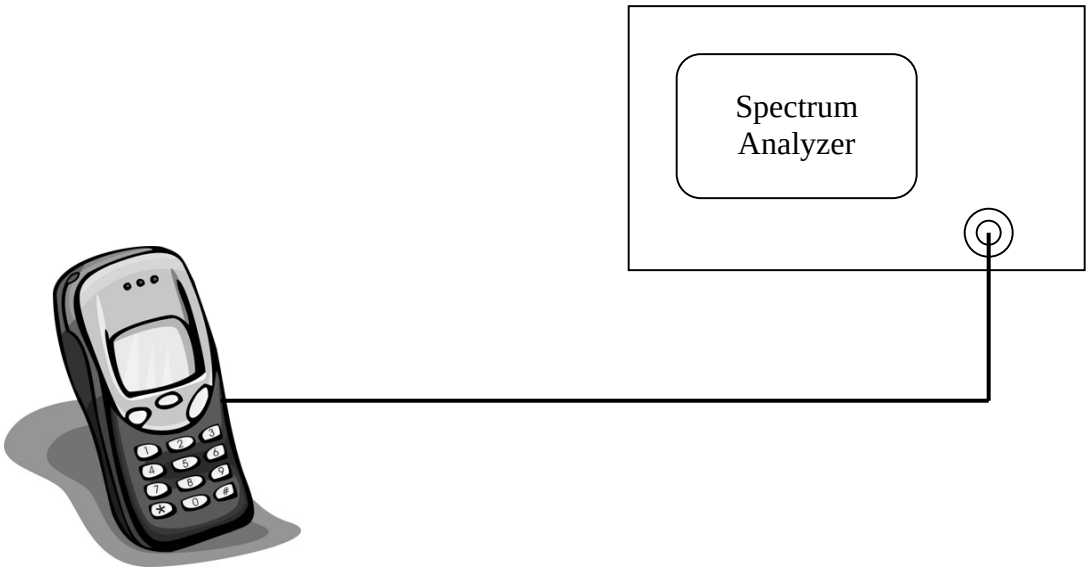
EUT Serial Number:	9300B185
Type:	[ ] Prototype, [X] Pre-Production, [ ] Production
Equipment Category:	Portable
TX Frequency (MHz):	2402 to 2480
Channel Numbers:	79
Channel Spacing (MHz):	1
Bluetooth version:	☐ 1.1 ☐ 1.2 ☐ 2.0 ☒ 2.0 + EDR
Modulation:	Frequency Hopping Spread Spectrum (FHSS)
Max. Output Power (dBm)	5.18 dBm
Antenna:	Internal
Antenna Gain (dBi):	-1.0 (Peak)

3 TEST FACILITIES

The test sites and measurement facilities used to collect data are located at 10300 Campus Point Drive San Diego, CA 92121, USA

4 TEST SETUP

The Bluetooth RF output of the equipment under test (EUT) was connected to the input of the spectrum analyzer through a RF cable with a specialized RF connector. The amplitude of the spectrum analyzer is corrected for the cable insertion loss and any other applicable losses. A fully charged battery was used as power supply voltage.



5 PEAK OUTPUT POWER

5.1 Test Configuration

FCC:	**§ 15.247 b1**
IC:	**RSS-210 §A8.4 (2)**

The Bluetooth transmitter was enabled at low, mid and high channels of separately to investigate the peak output power for each channel.

Frequencies of Interest: Spectrum was investigated from 2400 MHz – 2483.5 MHz.

Limits: < 1 watt (for systems with at least 75 hopping channels)

5.2 Results and Limits:

Figure	Channel	Modulation	Results
5-1	0	Basic Rate	2.12 dBm
5-1a		EDR DQPSK	3.92 dBm
5-1b		EDR D8PSK	4.33 dBm
5-2	39	Basic Rate	2.93 dBm
5-2a		EDR DQPSK	4.72 dBm
5-2b		EDR D8PSK	5.18 dBm
5-3	78	Basic Rate	2.82 dBm
5-3a		EDR DQPSK	4.54 dBm
5-3b		EDR D8PSK	4.98 dBm

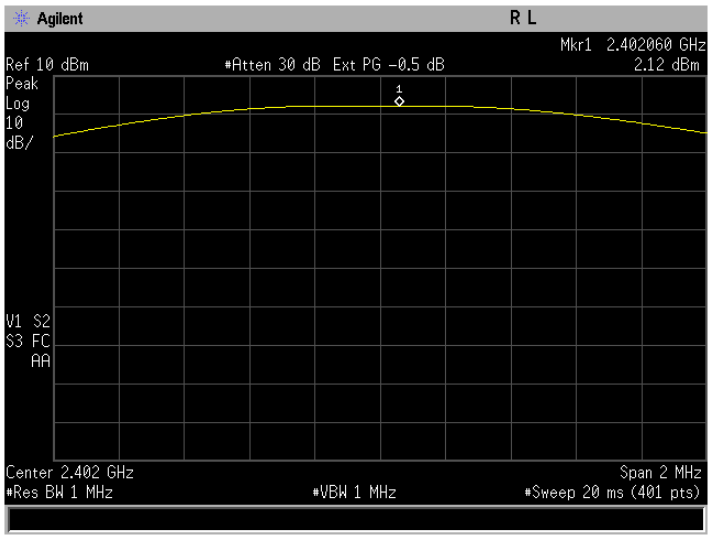


Figure 5-1: Peak Output Power, Basic Rate Channel 0.

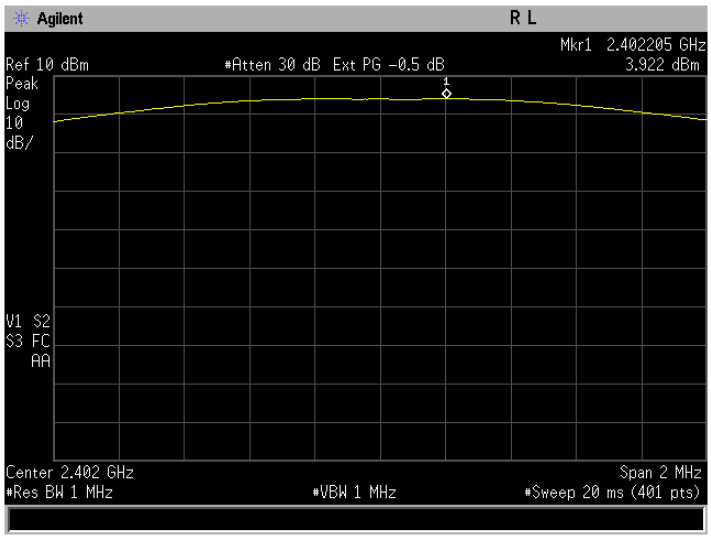


Figure 5-1a: Peak Output Power, EDR DQPSK Channel 0.

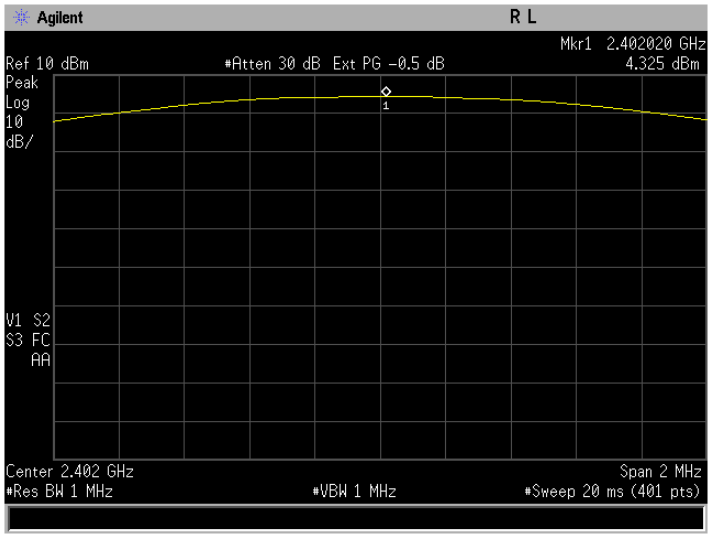


Figure 5-1b: Peak Output Power, EDR D8PSK Channel 0.

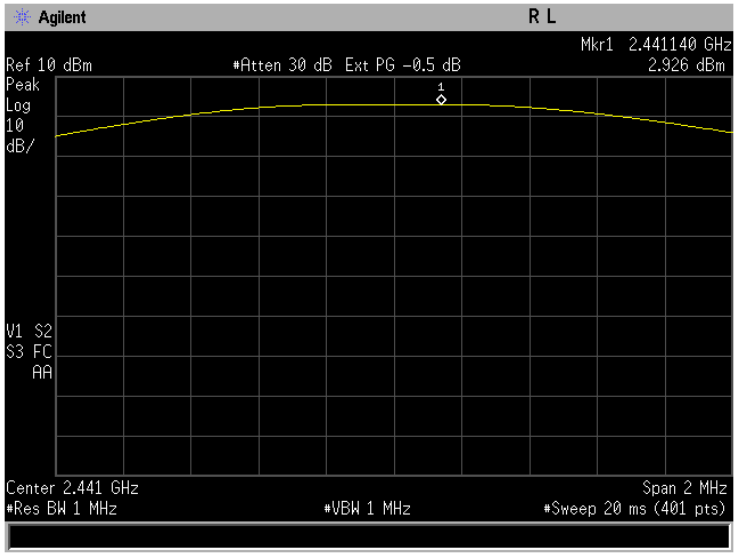


Figure 5-2: Peak Output Power, Channel 39.

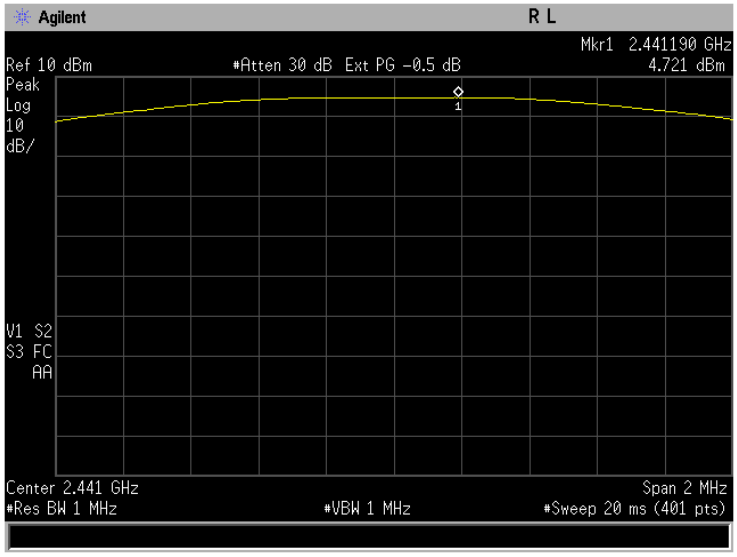


Figure 5-2a: Peak Output Power, EDR DQPSK Channel 39.

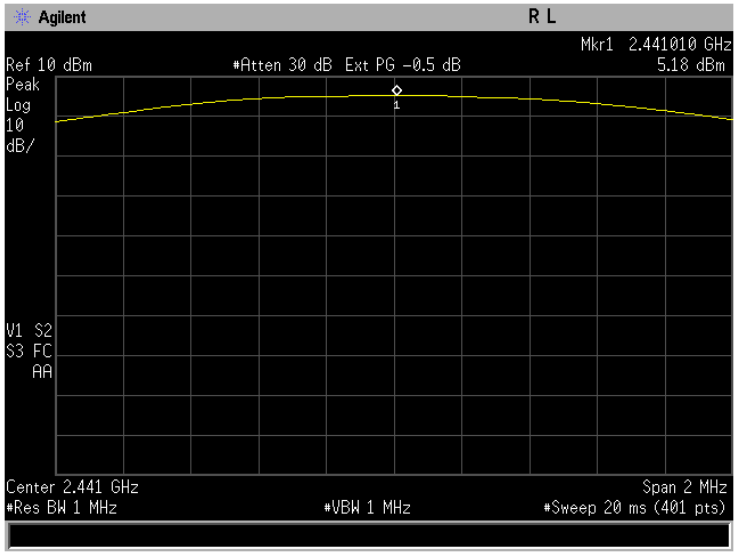


Figure 5-2b: Peak Output Power, EDR D8PSK Channel 39.

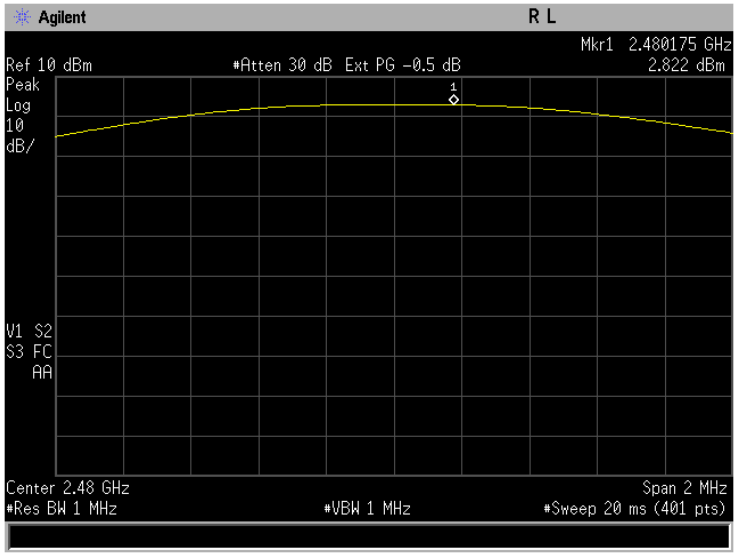


Figure 5-3: Peak Output Power, Channel 78.

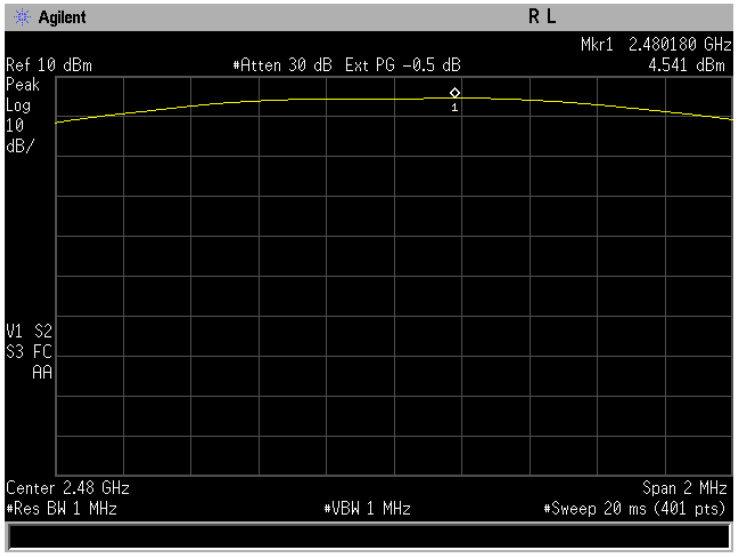


Figure 5-3a: Peak Output Power, EDR DQPSK Channel 78.

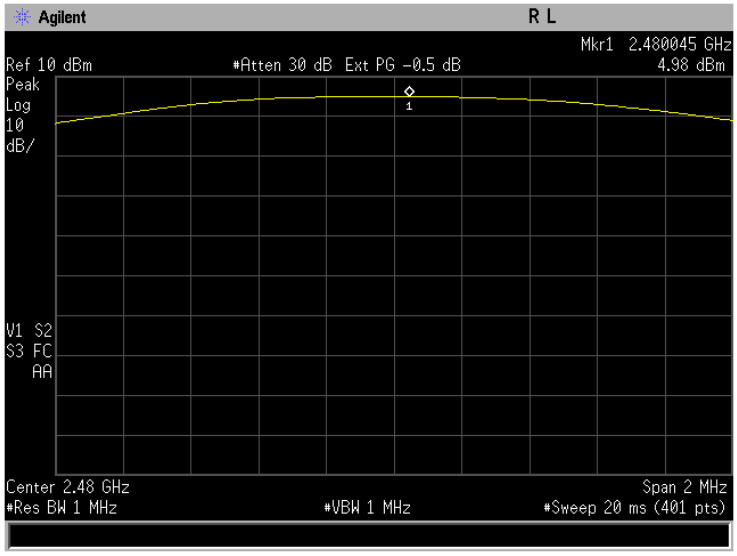


Figure 5-3b: Peak Output Power, EDR D8PSK Channel 78.

6 20 DB BANDWIDTH

6.1 Test Configuration

FCC:	**§ 15.247 a1**
IC:	**RSS-210 §6.2.2(o) a1**

The Bluetooth transmitter was enabled at low, mid, high channels and at each supporting modulation scheme separately to investigate the 20dB-bandwidth for each channel. Delta marker on the spectrum analyzer was moved from the center frequency until –20dBc to measure the 20dB-bandwidth.

Frequencies of Interest: Spectrum was investigated from 2402 MHz – 2480 MHz.

6.2 20dB Bandwidth Plots and Results

Figure	Channel	Modulation	Results
6-1a	0	Basic Rate	1.02 MHz
6-1b		EDR DQPSK	1.28 MHz
6-2c		EDR D8PSK	1.21 MHz
6-2a	39	Basic Rate	915 kHz
6-2b		EDR DQPSK	1.28 MHz
6-2c		EDR D8PSK	1.22 MHz
6-3a	78	Basic Rate	955 kHz
6-3b		EDR DQPSK	1.26 MHz
6-3c		EDR D8PSK	1.22 MHz

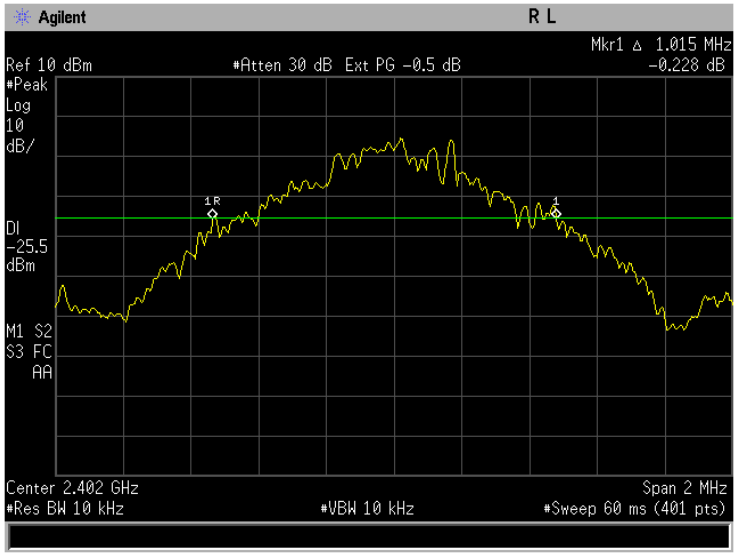


Figure 6-1a: 20dB Bandwidth Basic rate, Channel 0.

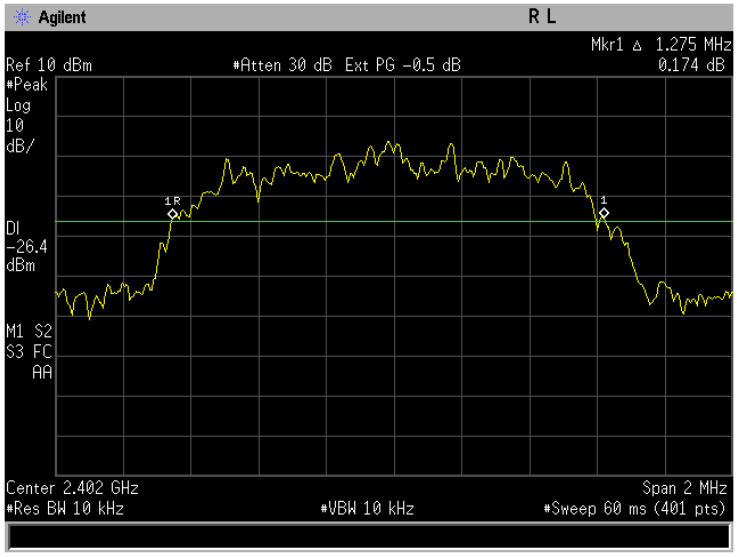


Figure 6-1b: 20dB Bandwidth EDR DQPSK, Channel 0.

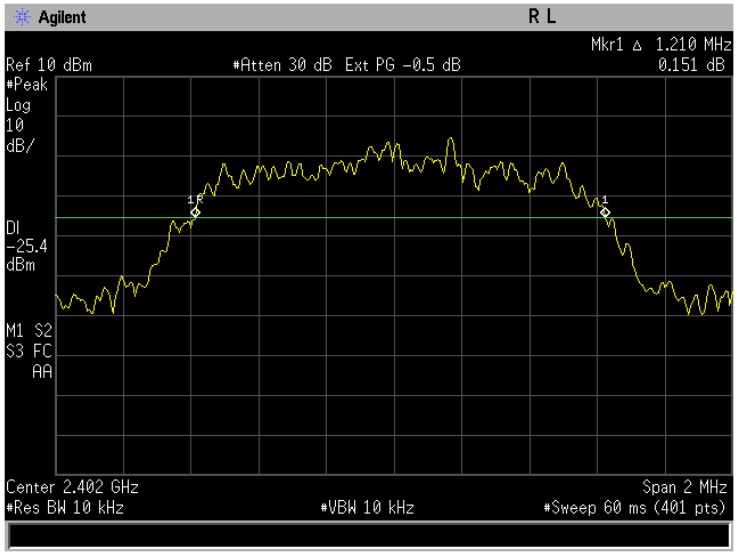


Figure 6-1c: 20dB Bandwidth EDR D8PSK, Channel 0.

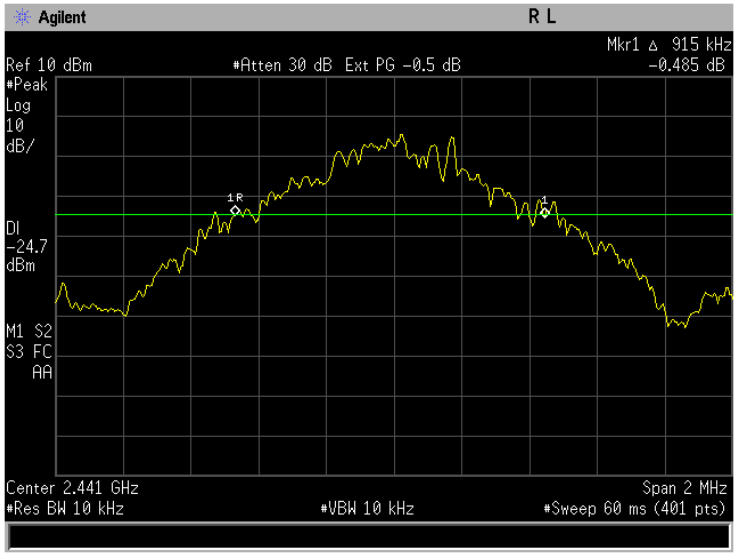


Figure 6-2a: 20dB Bandwidth Basic rate, Channel 39.

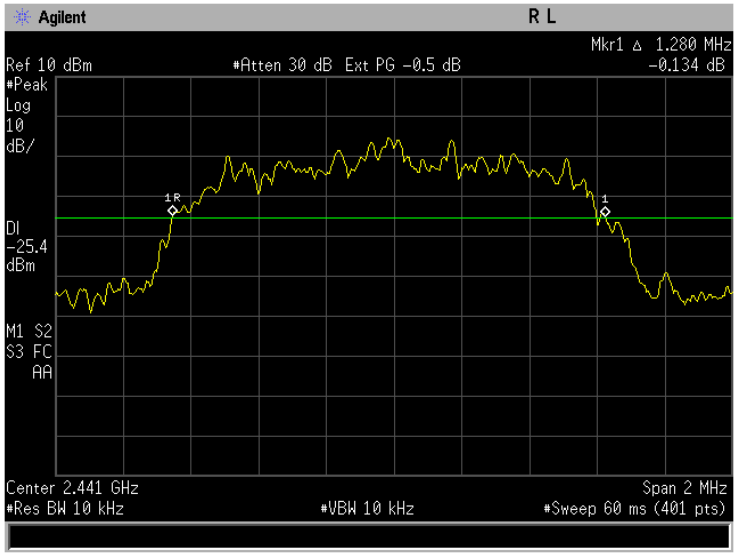


Figure 6-2b: 20dB Bandwidth EDR DQPSK, Channel 39.

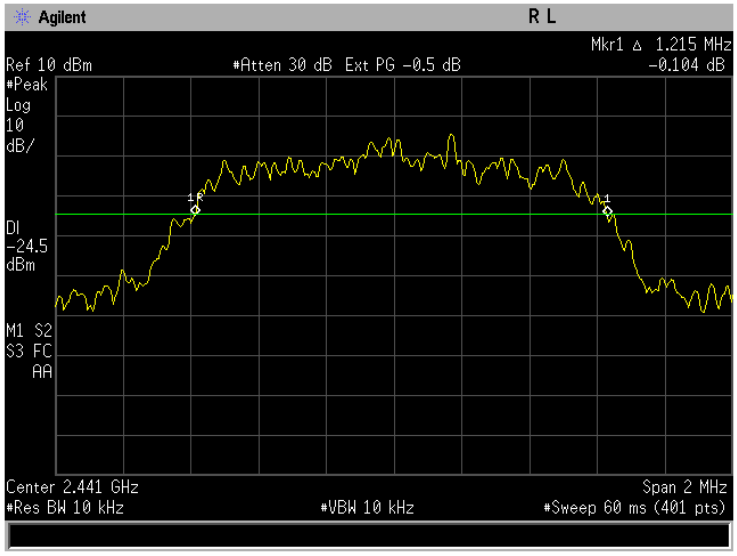


Figure 6-2c: 20dB Bandwidth EDR D8PSK, Channel 39.

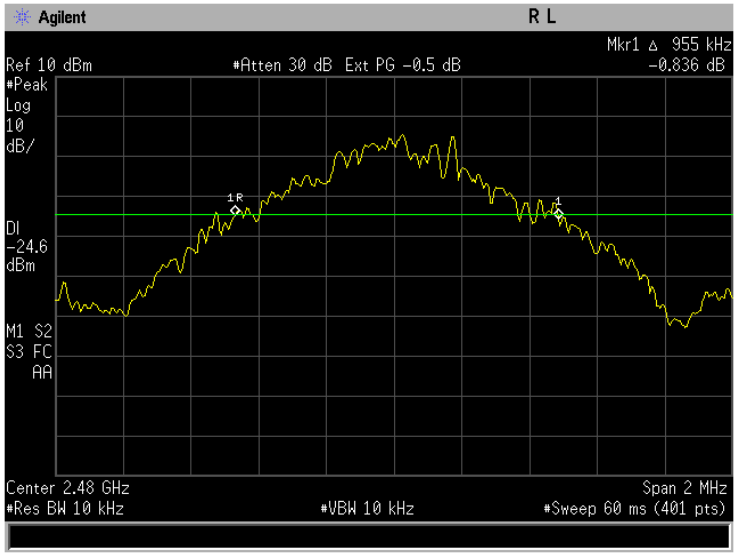


Figure 6-3a: 20dB Bandwidth Basic rate, Channel 78.

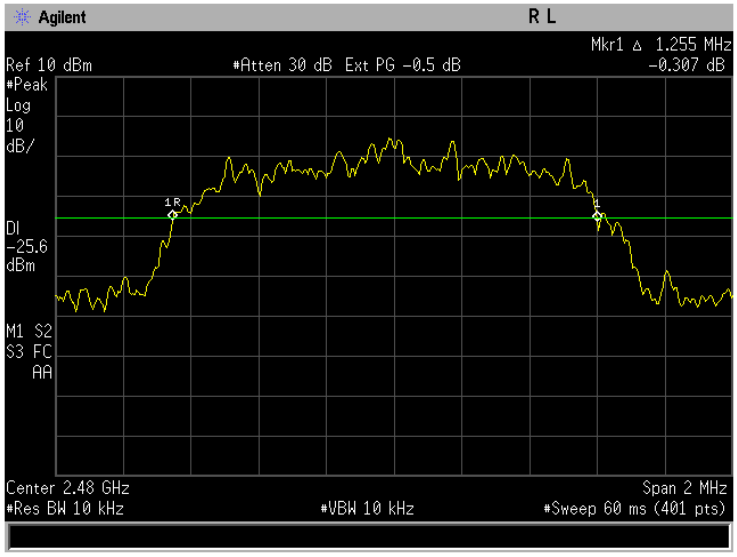


Figure 6-3b: 20dB Bandwidth EDR DQPSK, Channel 78.

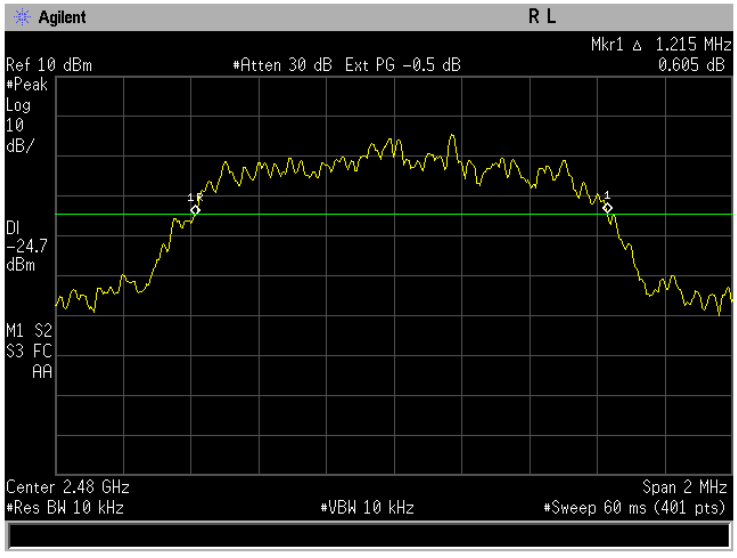


Figure 6-3c: 20dB Bandwidth EDR D8PSK, Channel 78.

7 CARRIER FREQUENCY SEPARATION

7.1 Test Configuration

FCC:	**§ 15.247 a1**
IC:	**RSS-210 §A8.1(2)**

The Bluetooth transmitter was set in hopping mode to investigate the carrier frequency separation between mid-channel and its adjacent channels. The carrier frequency separation is independent of modulation and packet length (DH1, DH3, etc.).

Limits:

a) ≥ 25 kHz or 20 dB Bandwidth, whichever is greater
b) For FH systems operating in 2400-2483.5MHz and with output power less than 125mW the carrier frequency separation should be greater than 25kHz or 2/3 of 20dB Bandwidth.

7.2 Results: Carrier Frequency

Figure	Frequency Separation	Limits > 2/3 of 20 dB Bandwidth	Result
7	1.005 GHz	853 kHz (2/3)*1.28 MHz = 853.3 kHz	Pass

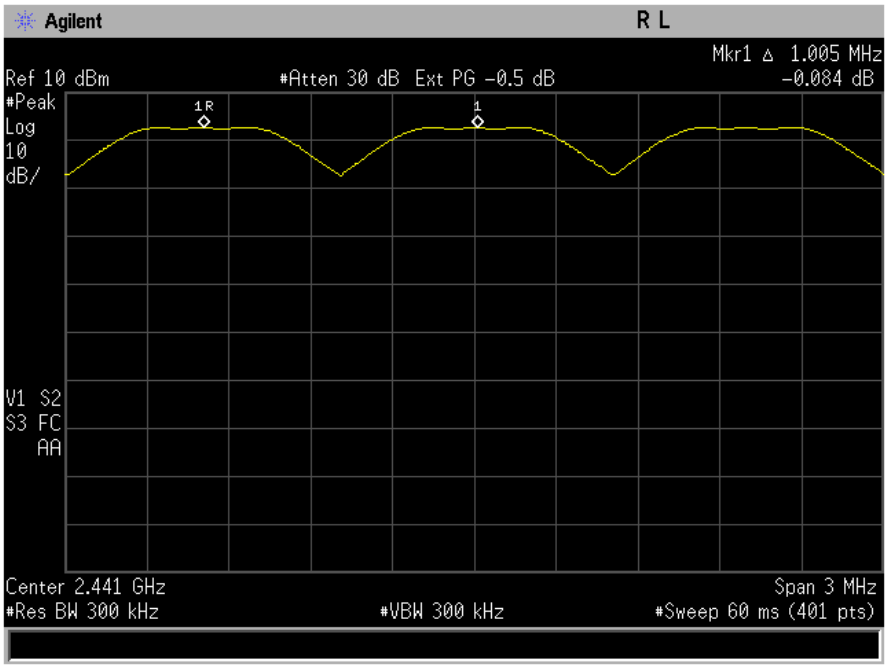


Figure 7: Carrier Frequency Separation between channels 38, 39 (mid-channel) & 40.

8 NUMBER OF HOPPING FREQUENCIES

8.1 Test Configuration

FCC:	**§ 15.247 a1 iii**
IC:	**RSS-210 §A8.1 (4)**

The Bluetooth transmitter was set in hopping mode to investigate the number of hopping frequencies. The number of frequency hopping is independent of modulation and packet length (DH1, DH3, etc.).

Limits:

At least 15 non-overlapping channels

8.2 Results: Number of Hopping Frequencies

Figure	Channel	Plot Description	Results
8a	Hopping	Number of Hopping Frequencies (Channels 0-39)	79 (Channels 0-78)
8b		Number of Hopping Frequencies (Channels 39-78)	
Comments: Pass			

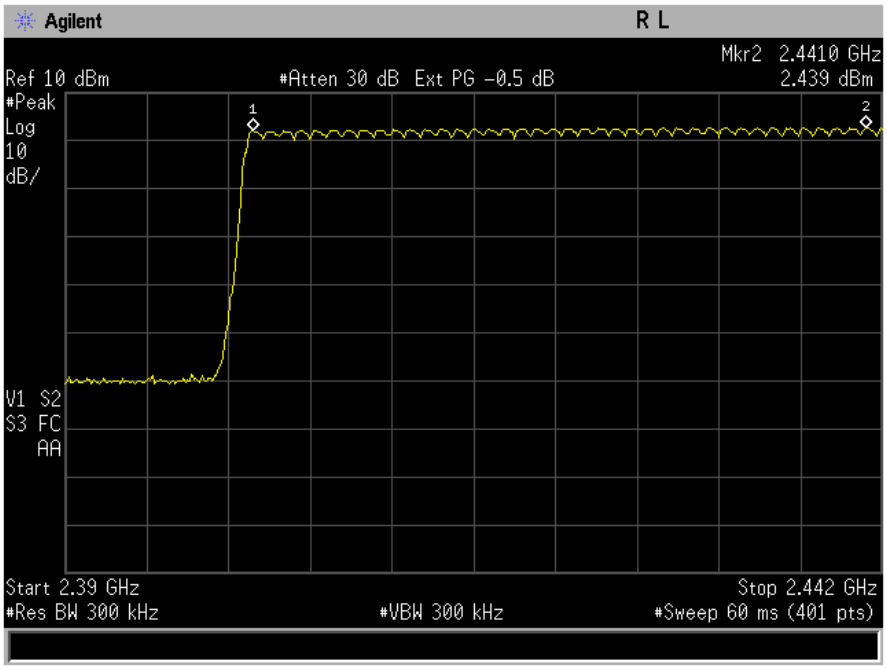


Figure 8a: Number of Hopping Frequencies (Channels 0-39).

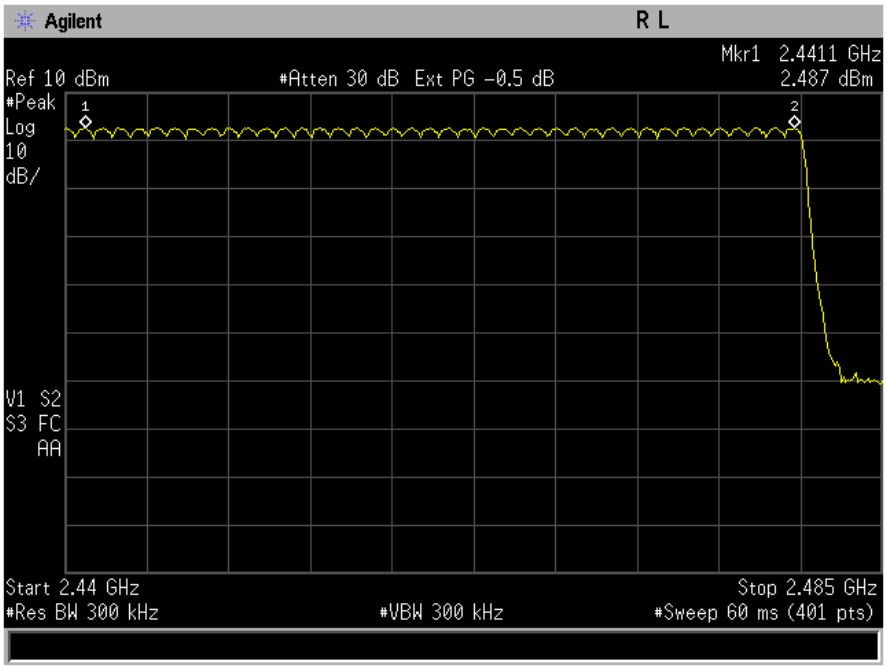


Figure 8b: Number of Hopping Frequencies (Channels 39-78).

9 TIME OF OCCUPANCY (DWELL TIME)

9.1 Test Configuration

FCC:	**§ 15.247 a1 iii, § 15.247 f**
IC:	**RSS-210 §A8.1 (4)**

The Bluetooth transmitter was set in hopping mode to capture one of the transmissions of mid-channel. Mid-channel (CH 39) was measured here.

Comments:
The dwell time is independent of modulation and packet length (DH1, DH3, etc.).

According to the Bluetooth Core Specification v1.1, we have 1600 hops in a second for a one slot packet type. One frequency hop lasts 625 μs; this increment is called a time slot. In a period of 31.6 seconds, the time of occupancy for any given channel is calculated as follows:

Duration of one transmission*(1600 hops/sec)/(No. of time-slots)/(79 channels)*31.6 sec

For a DH1 (1 time-slot) packet type, ideally the duration of one transmission is 625 μs. Therefore, the dwell time is given by:

625 μs*1600/s/(1 time-slot)/79*31.6 s= 0.4 s.

Spectrum Analyzer Parameters:
The measurement is conducted with zero span centered at mid-channel (2441 MHz) with sweep time sufficient enough to capture one transmission (in this case, ≥ 625 μs).

Limits:
≤ 0.4 s
(in a period of 31.6 s)

9.2 Results: Dwell Time

Figure	Channel	Results
9	Hopping	0.2387s

Comments: PASS

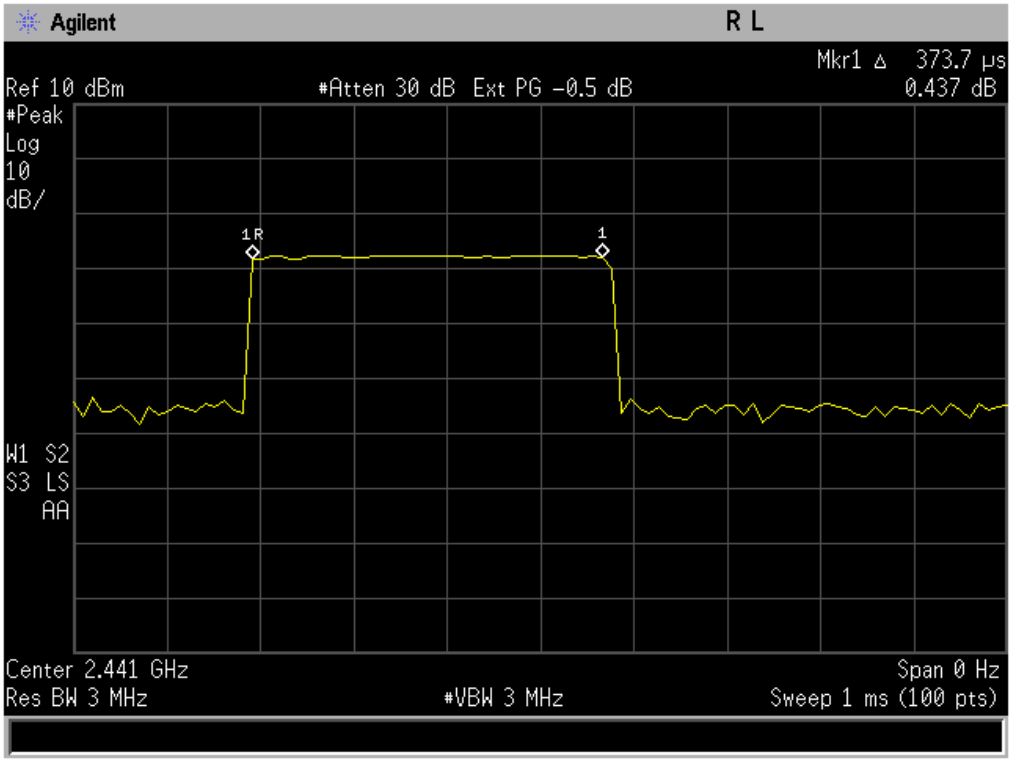


Figure 9: Duration of one transmission (Channel 39).

10 BANDEDGE

10.1 Test Configuration

FCC:	**§ 15.247 d**
IC:	**RSS-210 §A8.5**

The Bluetooth RF output port of the EUT was directly connected to the input of the spectrum analyzer with sufficient attenuation. Subsequently, the low and high channels of Bluetooth transmitter were enabled separately to investigate the band-edge compliance of conducted emissions. To ensure the band-edge compliance when the channels are hopping, measurements were also conducted at low and high channels in this mode. A fully charged battery was used as supply voltage

Frequencies of Interest: Spectrum was investigated from 2400 MHz – 2483.5 MHz.

Limits: ≤ -20 dBc
In any 100kHz band, the highest radio frequency power outside the band (2400-2483.5 MHz) is measured to be at least 20 dB below the desired power of intentional radiator within the band.

10.2 Results: Bandedge

Figure	Channel/Edge	Modulation	Plot Description	Results
10-1a	0 -- Low Band Edge	Basic Rate	Hopping disabled	-53.16 dBc
10-1b			Hopping enabled	-53.24 dBc
10-2a		EDR DQPSK	Hopping disabled	-51.51 dBc
10-2b			Hopping enabled	-53.00 dBc
10-3a		EDR D8PSK	Hopping disabled	-51.01 dBc
10-3b			Hopping enabled	-53.48 dBc
10-4a	78 -- High Band Edge	Basic Rate	Hopping disabled	-54.39 dBc
10-4b			Hopping enabled	-55.08 dBc
10-5a		EDR DQPSK	Hopping disabled	-53.39 dBc
10-5b			Hopping enabled	-54.85 dBc
10-6a		EDR D8PSK	Hopping disabled	-54.54 dBc
10-6b			Hopping enabled	-55.62 dBc

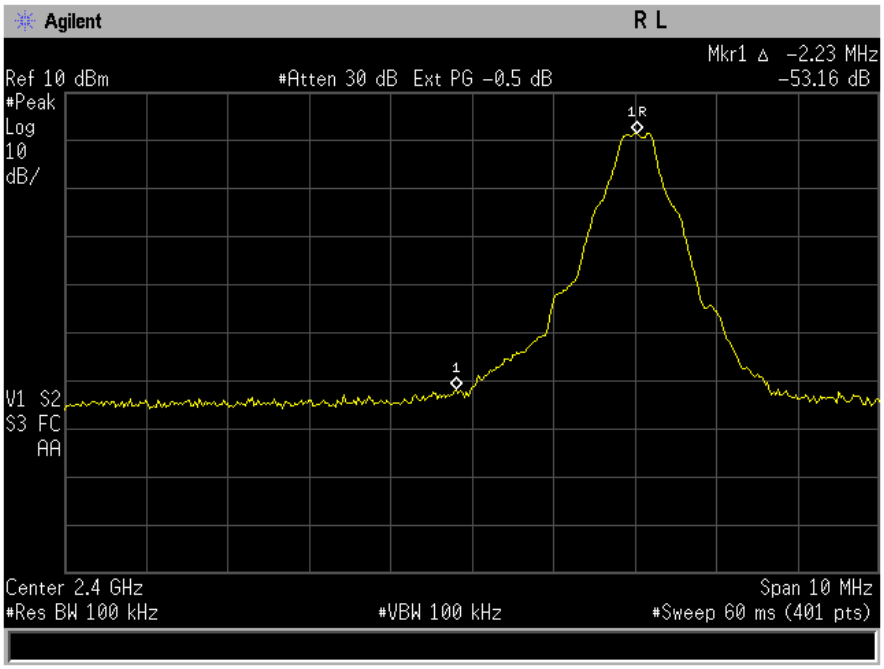


Figure 10-1a: Basic Rate Low band edge with hopping disabled.

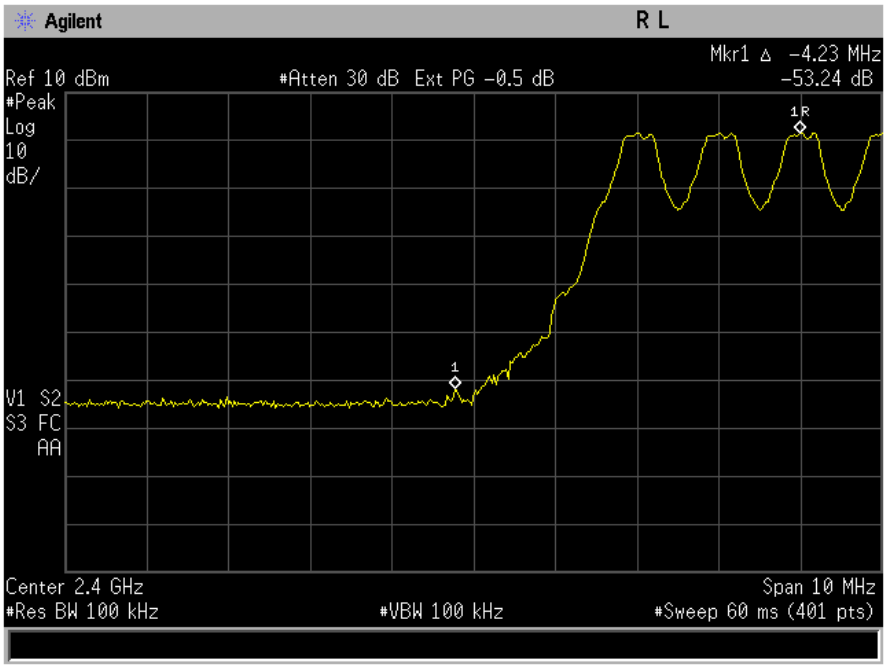


Figure 10-1b: Basic Rate Low band edge with hopping enabled.

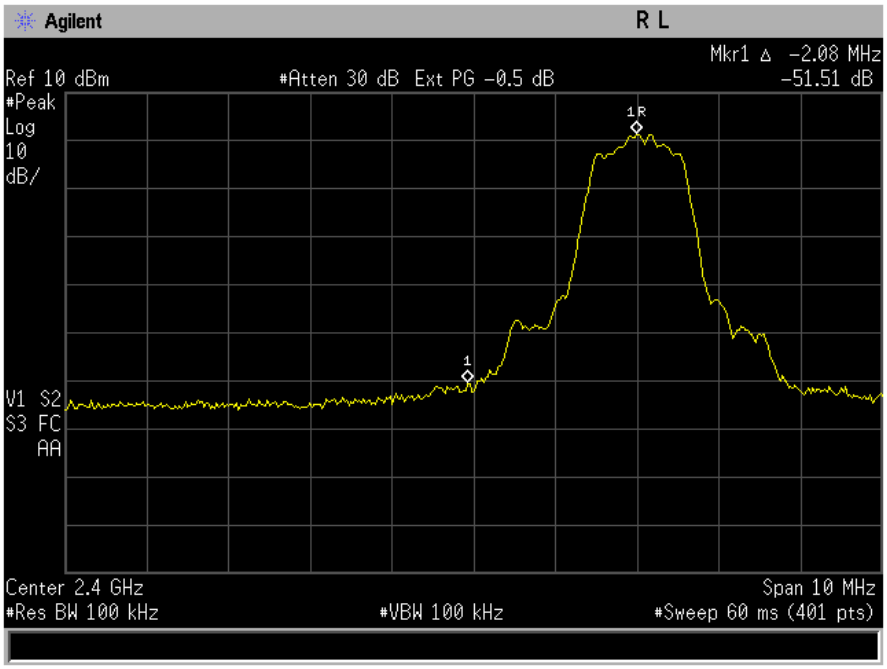


Figure 10-2a: EDR DQPSK Low band edge with hopping disabled.

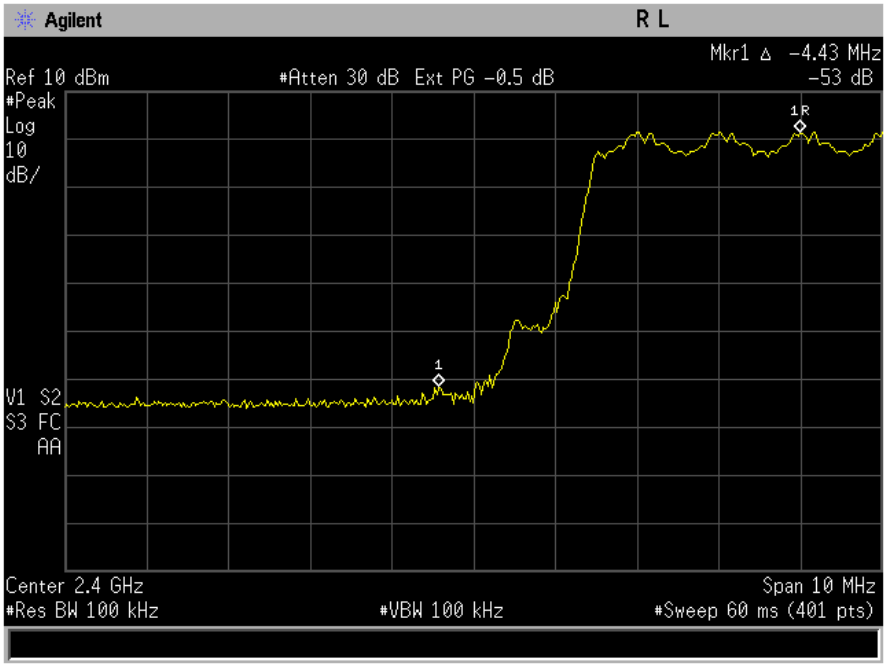


Figure 10-2b: EDR DQPSK Low band edge with hopping enabled.

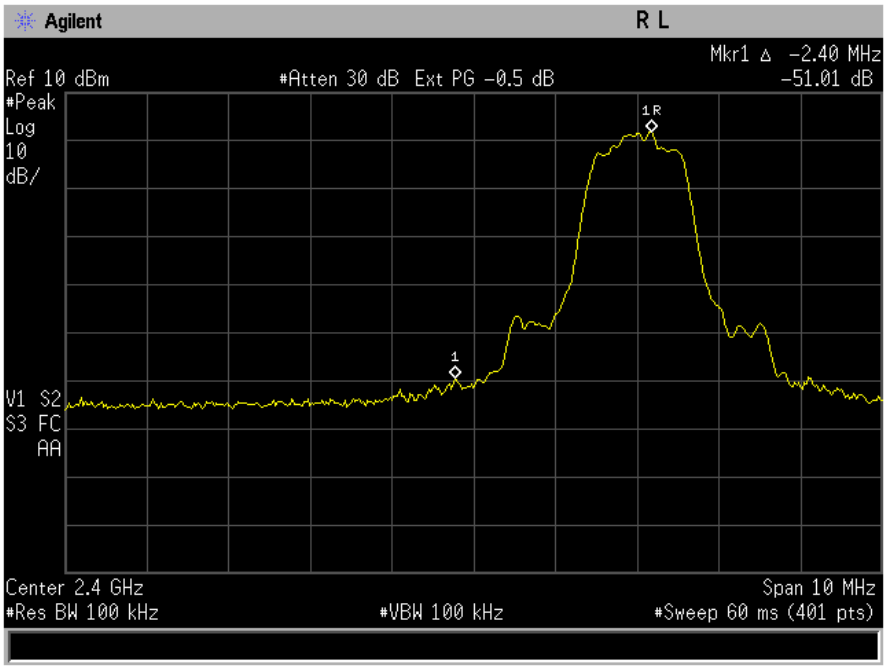


Figure 10-3a: EDR D8PSK Low band edge with hopping disabled.

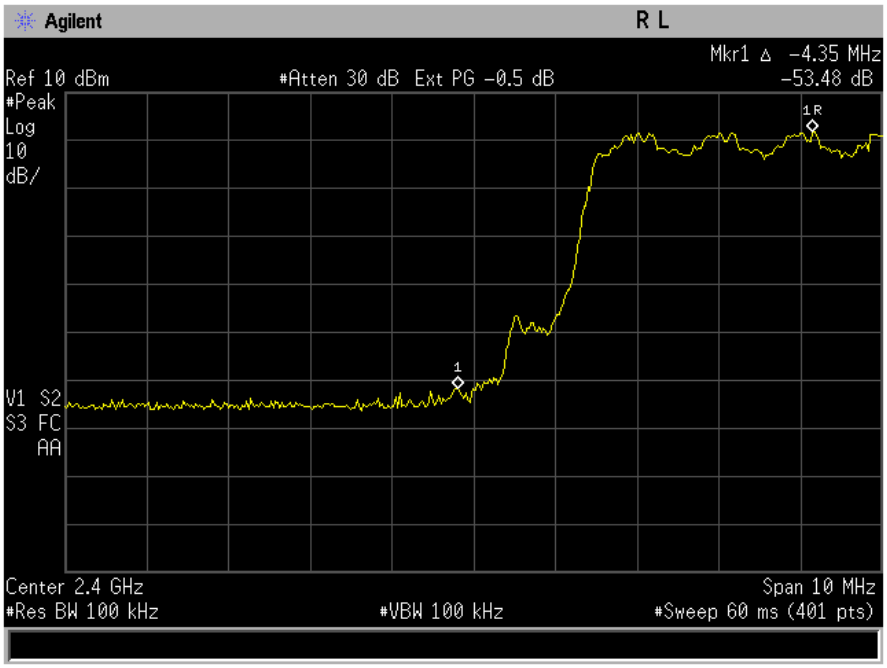


Figure 10-3b: EDR D8PSK Low band edge with hopping enabled.

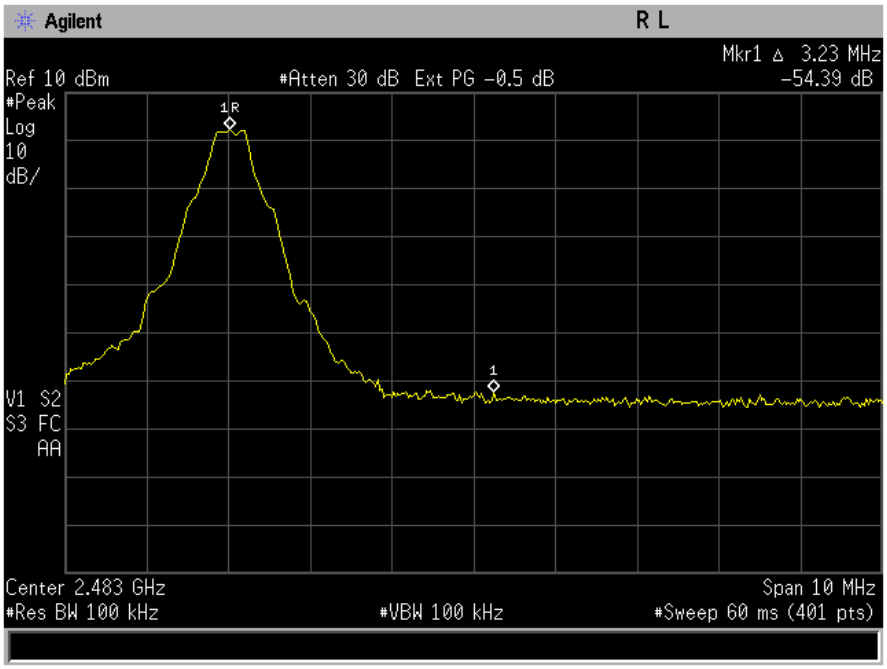


Figure 10-4a: Basic Rate High band edge with hopping disabled.

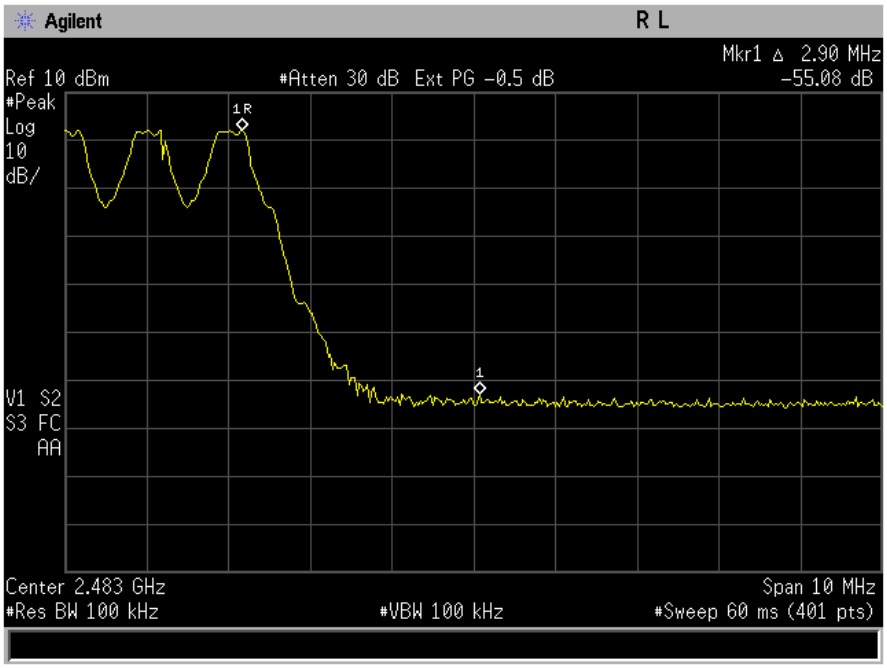


Figure 10-4b: Basic Rate High band edge with hopping enabled.

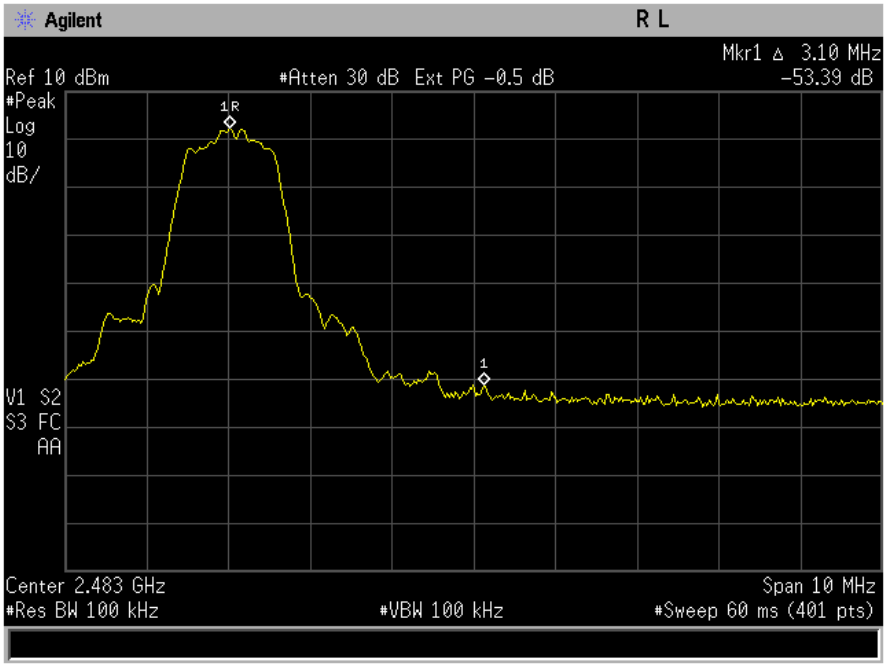


Figure 10-5a: EDR DQPSK High band edge with hopping disabled.

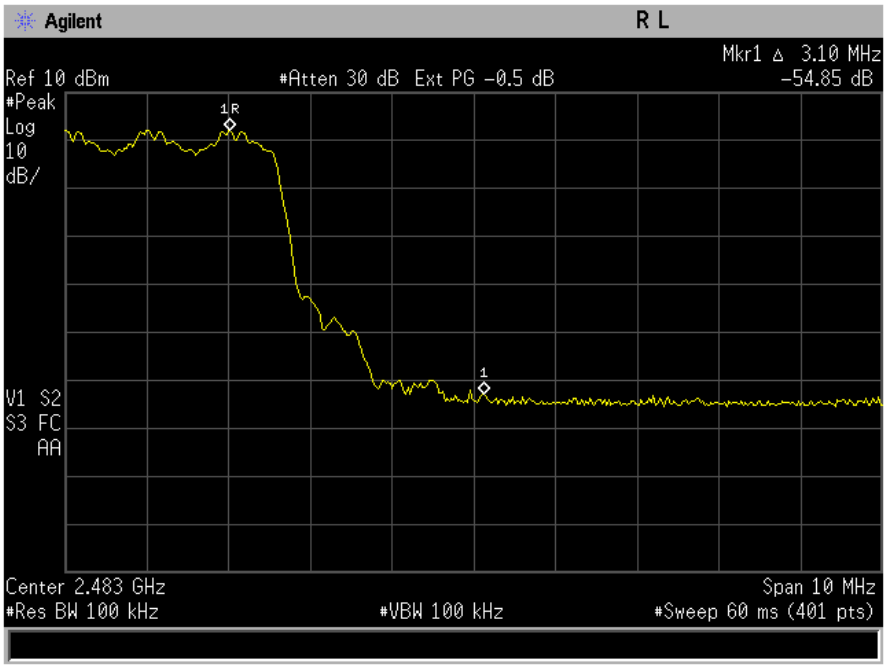


Figure 10-5b: EDR DQPSK High band edge with hopping enabled.

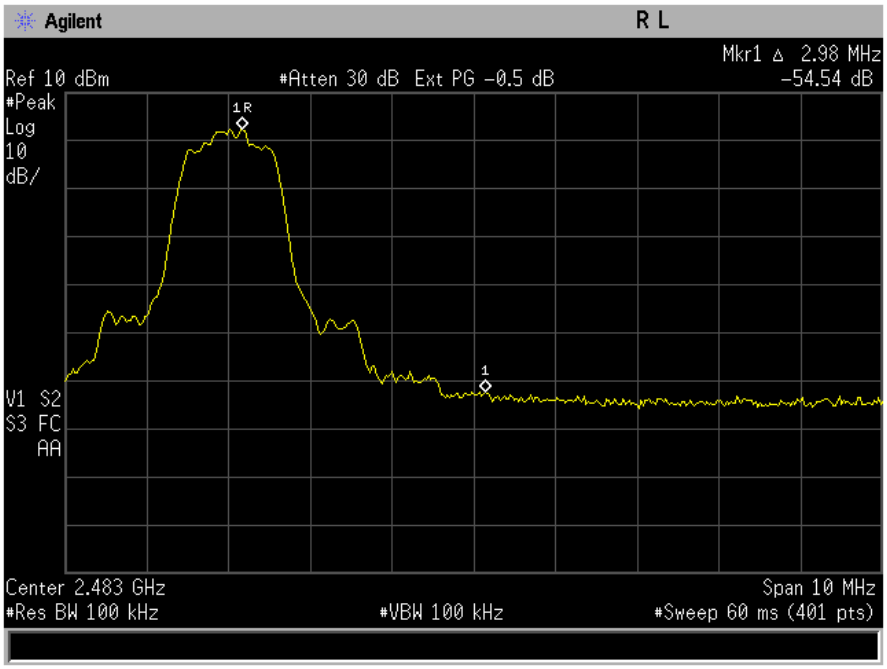


Figure 10-6a: EDR D8PSK High band edge with hopping disabled.

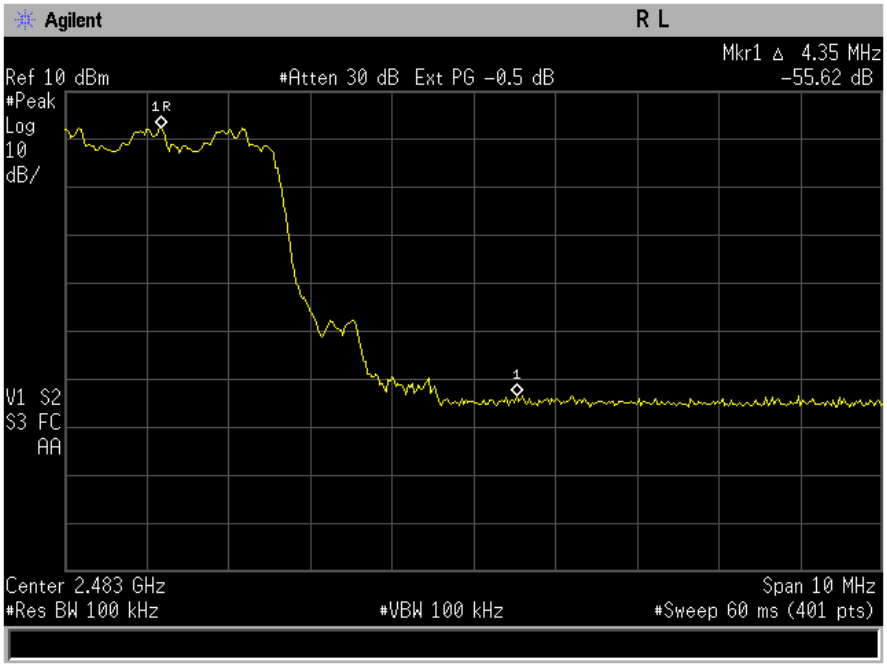


Figure 10-6b: EDR D8PSK High band edge with hopping enabled.

11 SPURIOUS RF CONDUCTED EMISSIONS

11.1 Test Configuration

FCC:	**§ 15.247 d**
IC:	**RSS-210 §A8.5**

The Bluetooth RF output port of the EUT was directly connected to the input of the spectrum analyzer with sufficient attenuation. Subsequently, the low, mid and high channels of Bluetooth transmitter were enabled separately and the frequency spectrum was investigated for any spurious emissions. A fully charged battery was used as supply voltage.

Frequencies of Interest: Spectrum was investigated from 9kHz – 25 GHz.

Limits: <-20 dBc

11.2 Results: Conducted Spurious Emissions

Figure	Channel	Plot Description	Results
11-1a	0	Conducted spurious emissions, 9kHz to 2.7GHz	-56.44 dBc
11-1b		Conducted spurious emissions, 2.7GHz to 25GHz	
11-2a	39	Conducted spurious emissions, 9kHz to 2.7GHz	-57.54 dBc
11-2b		Conducted spurious emissions, 2.7GHz to 25GHz	
11-3a	78	Conducted spurious emissions, 9kHz to 2.7GHz	-57.12 dBc
11-3b		Conducted spurious emissions, 2.7GHz to 25GHz	

Comments:

Spurious RF Conducted Emission testing was performed on the modulation that has the highest conducted power in comparison with the other modulation.

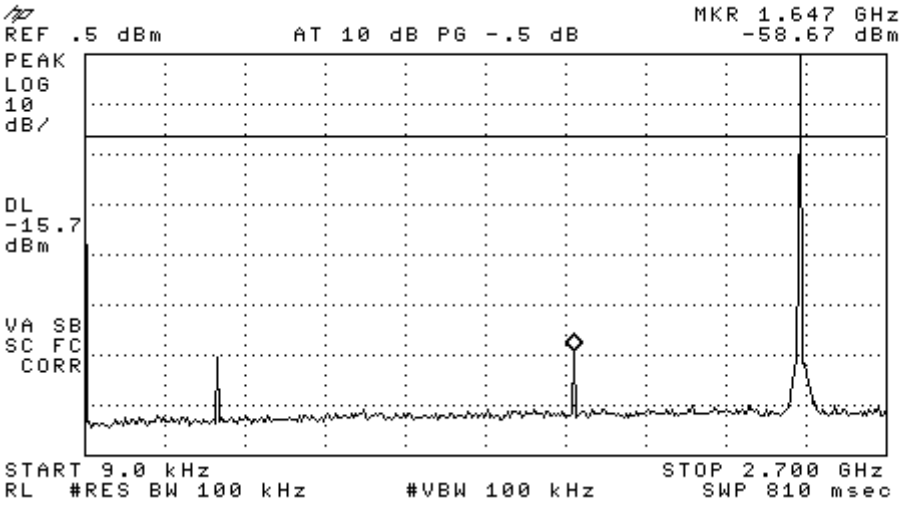


Figure 11-1a: Conducted Spurious Emissions (CH 0).

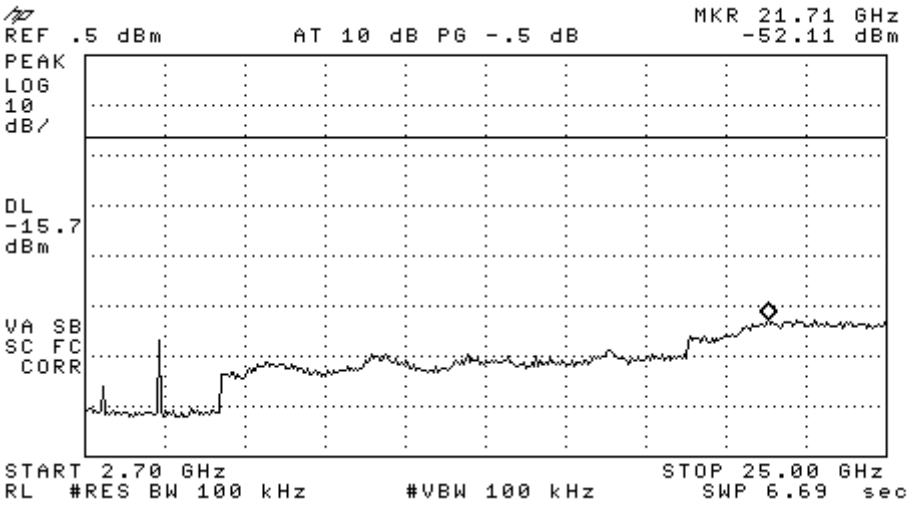


Figure 11-1b: Conducted Spurious Emissions (CH 0).

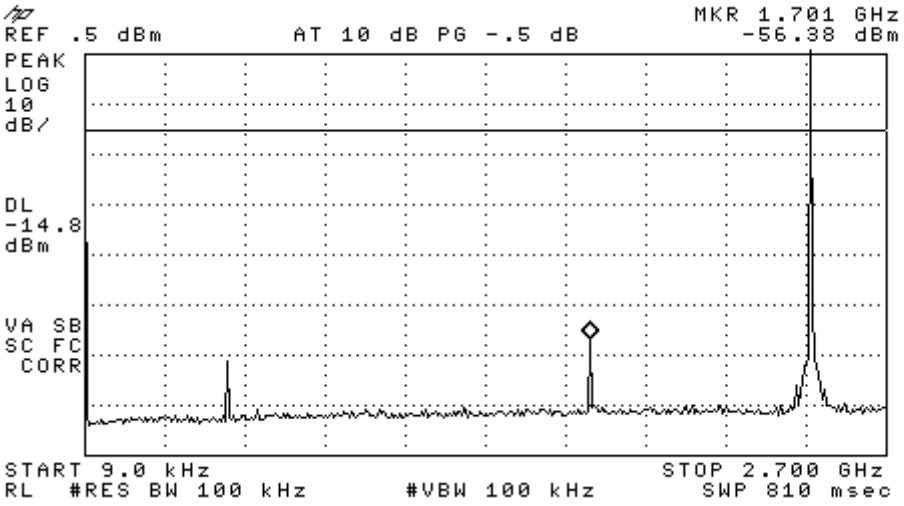


Figure 11-2a: Conducted Spurious Emissions (CH 39).

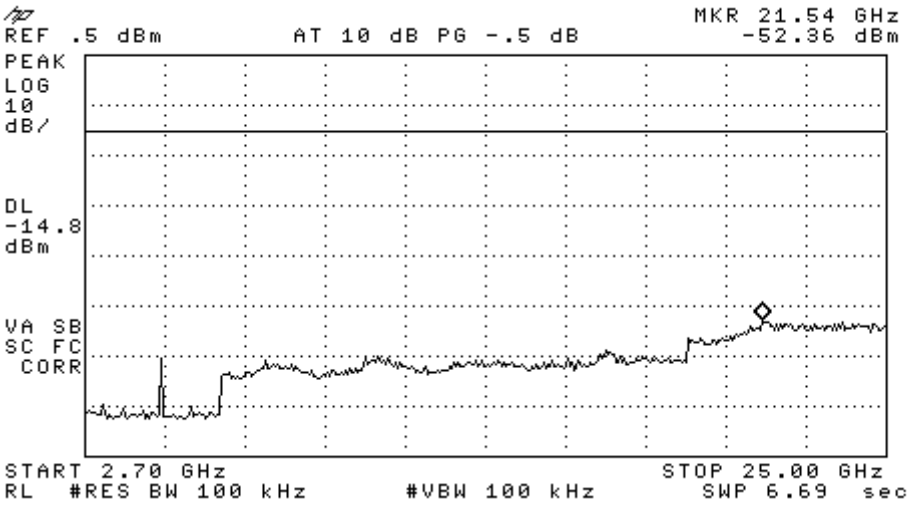


Figure 11-2b: Conducted Spurious Emissions (CH 39).

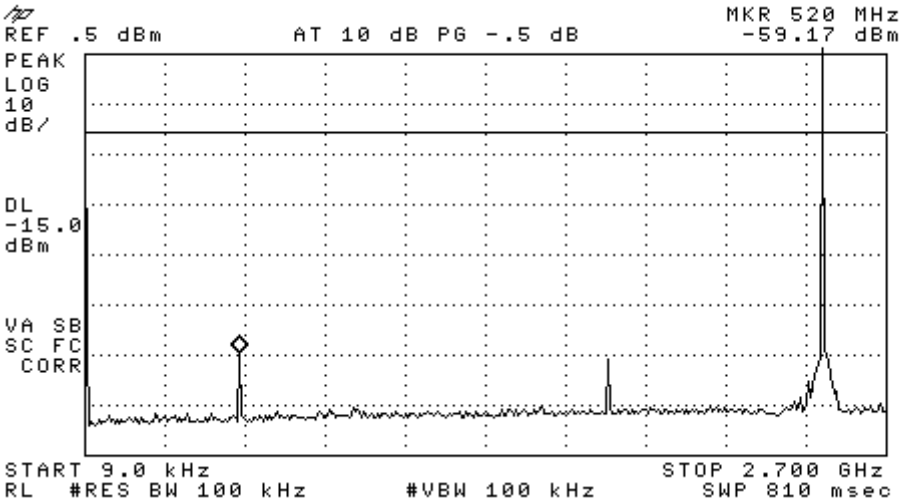


Figure 11-3a: Conducted Spurious Emissions (CH 78).

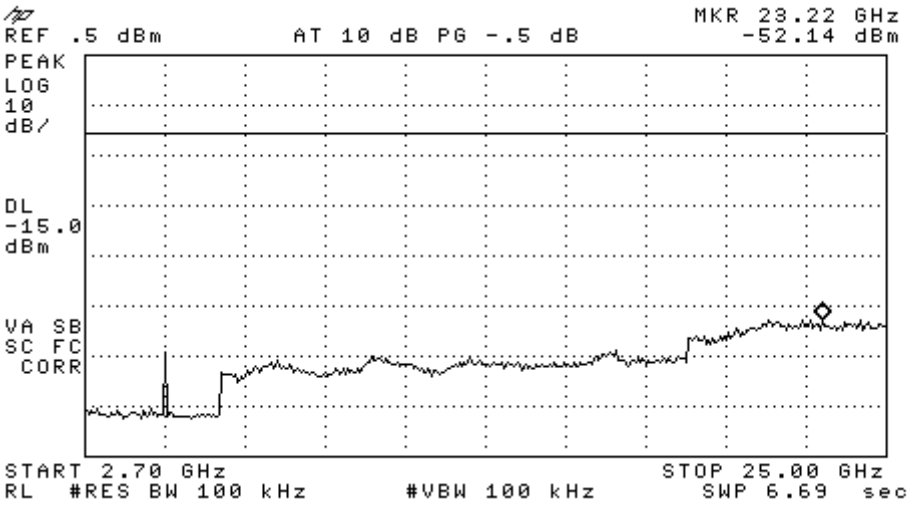


Figure 11-3b: Conducted Spurious Emissions (CH 78).

12 AC POWER LINE CONDUCTED EMISSIONS

12.1 Test Configuration & Results

FCC:	**§ 15.107 § 15.207**
IC:	**RSS-210 §6.6**

See separate report

13 RADIATED EMISSIONS

13.1 Test Configuration & Results

FCC:	**§ 15.109 § 15.209**
IC:	**RSS-210 §A2.9 (2)**

See separate report

14 TEST EQUIPMENT

The test equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

Description	Manufacturer	Model No.	Serial No.	Cal Due Date
Spectrum Analyzer	Hewlett Packard	8593EM	3710A00203	06/09/12
Spectrum Analyzer	Agilent	E4405B	US41441217	05/26/12