

## Test Report

on

### Single-Band CDMA Cellular Phone with Bluetooth

#### Certification

FCC Part 15.247

FCC ID: **OVFKWC-M1000-2J0**

Models: **M1000-2J0**

#### STATEMENT OF CERTIFICATION

*The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the measurements of the sample's radio frequency interference emissions characteristics as of the dates and at the times of the test under the conditions herein specified.*

#### STATEMENT OF COMPLIANCE

*This product has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C-63.4-2001.*

**Date of Test:** May 29, 2007 – May 30, 2007

**Test performed by:** Kyocera Wireless Corp.  
10300 Campus Point Drive  
San Diego, CA – 92121

**Report Prepared by:** Thuy To, Regulatory Engineer

**Report Reviewed by:** C. K. Li, Principal Hardware Engineer

Compliance Certification Services performed the tests that required an OATS site.

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**1 General Information**

<b>Applicant:</b>	Kyocera Wireless Corp. 10300 Campus Point Drive San Diego CA 92121
<b>FCC ID:</b>	OVFKWC-M1000-2J0
<b>Product:</b>	Single-Band CDMA Cellular Phone with Bluetooth
<b>Model Numbers:</b>	M1000-2J0
<b>EUT Serial Number:</b>	FFMK0000001409
<b>Type:</b>	<input checked="" type="checkbox"/> Prototype, <input type="checkbox"/> Pre-Production, <input type="checkbox"/> Production
<b>Equipment Category:</b>	Short Range Device
<b>TX Frequency (MHz):</b>	2402 to 2480
<b>Channel Number:</b>	79
<b>Channel Spacing (MHz):</b>	1
<b>Modulation:</b>	Frequency Hopping Spread Spectrum (FHSS)
<b>Max. Output Power (dBm)</b>	3.63 dBm
<b>Antenna:</b>	Internal
<b>Antenna Gain (dBi):</b>	+2.6 (Peak)
<b>FCC Rule Parts:</b>	§15.247

## **2 Description of Bluetooth Transmitter**

The OVFKWC-M1000-2J0 phones offer Bluetooth as a feature. The Bluetooth transmitter uses Frequency Hopping Spread Spectrum (FHSS) technique and operates in the 2400 – 2483 MHz band. The transmitter is a Class 2 Bluetooth device and designed to communicate with other Bluetooth devices as per the industrial standard. The maximum gain of the internal Bluetooth antenna is measured to be 2.6 dBi.

### 3 Carrier Frequency Separation

**FCC:** § 15.247 a1

**Measurement Procedure:**

The Bluetooth RF output port of the EUT was directly connected to the input of the spectrum analyzer with sufficient attenuation. Subsequently, the Bluetooth transmitter was set in hopping mode to investigate the carrier frequency separation between mid-channel and its adjacent channels. A fully charged battery was used as supply voltage.

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

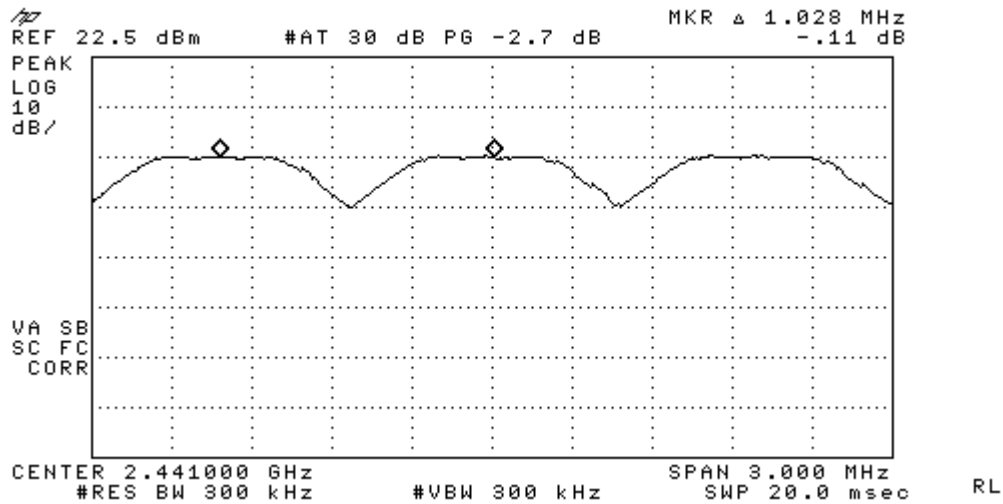


Figure 3. Carrier Frequency Separation between channels 38, 39 (mid-channel) & 40.

**Results and Limits:**

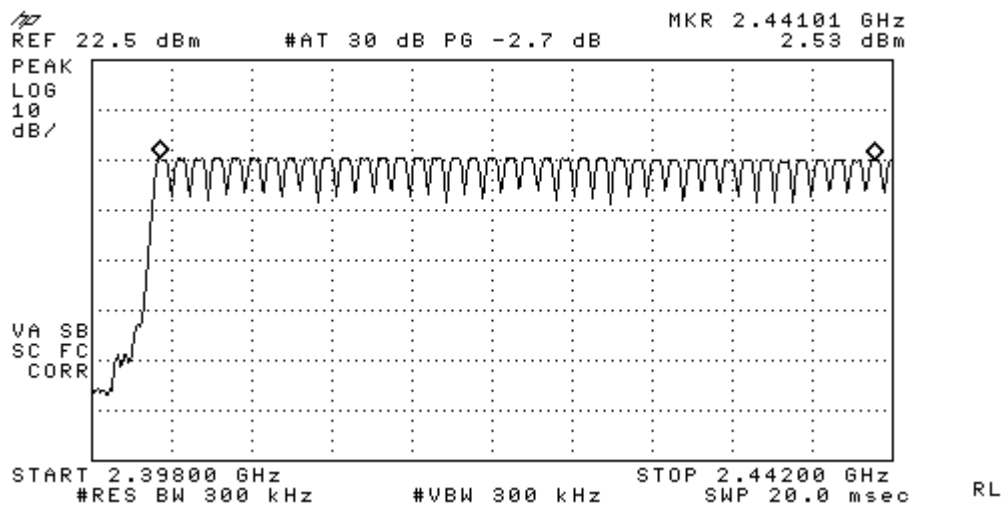
Limits	Channel	Results	Comments
≥ 25 kHz or 20 dB BW	Hopping	1.028 MHz	Carrier frequency separation between channels 38 and 39.

#### 4 Number of Hopping Frequencies

<b>FCC:</b> § 15.247 a1 iii
<b>Measurement Procedure:</b>
<p>The Bluetooth RF output port of the EUT was directly connected to the input of the spectrum analyzer with sufficient attenuation. Subsequently, the Bluetooth transmitter was set in hopping mode to investigate the number of hopping frequencies. A fully charged battery was used as supply voltage.</p>
<p><u>Frequencies of Interest:</u> Spectrum was investigated from 2400 MHz – 2483.5 MHz.</p>

**List of Figures:**

Figure	Channel	Plot Description
4a	Hopping	Number of Hopping Frequencies (Channels 0-39)
4b		Number of Hopping Frequencies (Channels 39-78)



**Figure 4a. Number of Hopping Frequencies (Channels 0-39)**

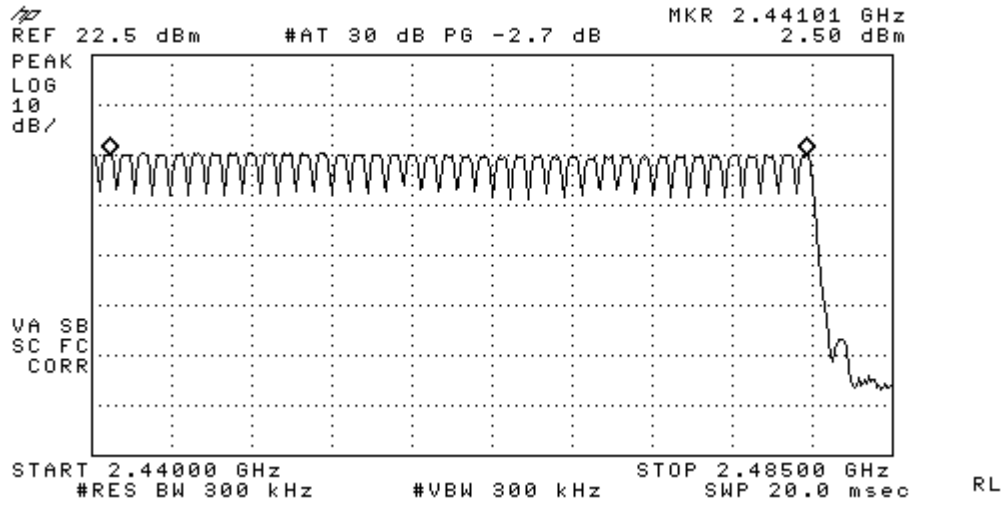


Figure 4b. Number of Hopping Frequencies (Channels 39-78)

**Results and Limits:**

Limits	Channel	Results	Comments
At least 15 non-overlapping channels	Hopping	79 (Channels 0-78)	Complies

5 Time of Occupancy (Dwell Time)

**FCC:** § 15.247 a1 ii, § 15.247 f

**Measurement Procedure:**

The Bluetooth RF output port of the EUT was directly connected to the input of the spectrum analyzer with sufficient attenuation. Subsequently, the Bluetooth transmitter was set in hopping mode to capture one of the transmissions of mid-channel. A fully charged battery was used as supply voltage.

**Comments:**

The dwell time is independent of 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:

$625 \mu\text{s} * 1600/\text{s} / (1 \text{ time-slot}) / 79 * 31.6 \text{ s} = 0.4 \text{ s}.$

**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).

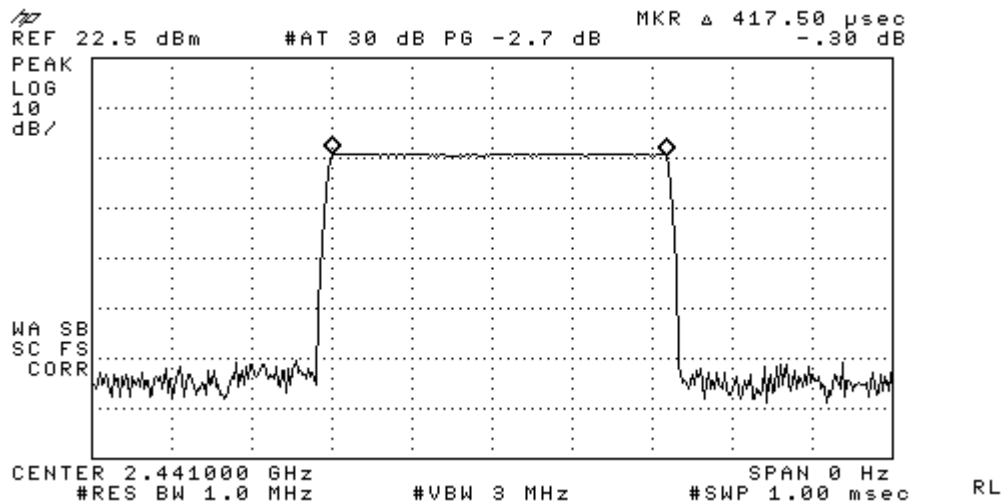


Figure 5. Duration of one transmission (Channel 39)



**Results and Limits:**

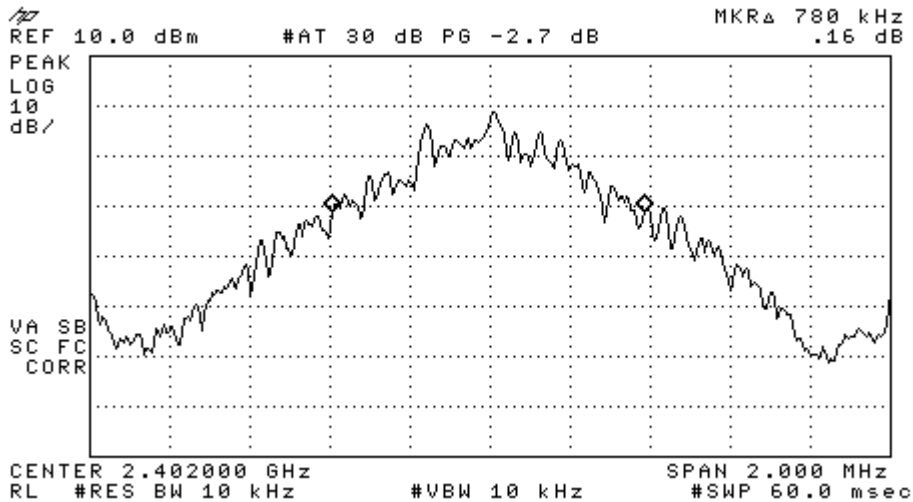
Limits	Channel	Results	Comments
≤ 0.4 s (in a period of 31.6 s)	Hopping (DH1 packet)	0.267 s {[(417.5μ*1600)/1] /79}*31.6	Mid-channel (CH 39) was measured here.

**6 20 dB Bandwidth**

<p><b>FCC: § 15.247 a1</b></p> <p><b>Measurement Procedure:</b></p> <p>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 to investigate the 20dB-bandwidth for each channel. A fully charged battery was used as supply voltage.</p> <p><u>Frequencies of Interest:</u> Spectrum was investigated from 2400 MHz – 2483.5 MHz.</p>
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**List of Figures:**

Figure	Channel	Plot Description
6a	0	20 dB Bandwidth, Channel 0
6b	39	20 dB Bandwidth, Channel 39
6c	78	20 dB Bandwidth, Channel 78



**Figure 6a. 20 dB Bandwidth, Channel 0.**

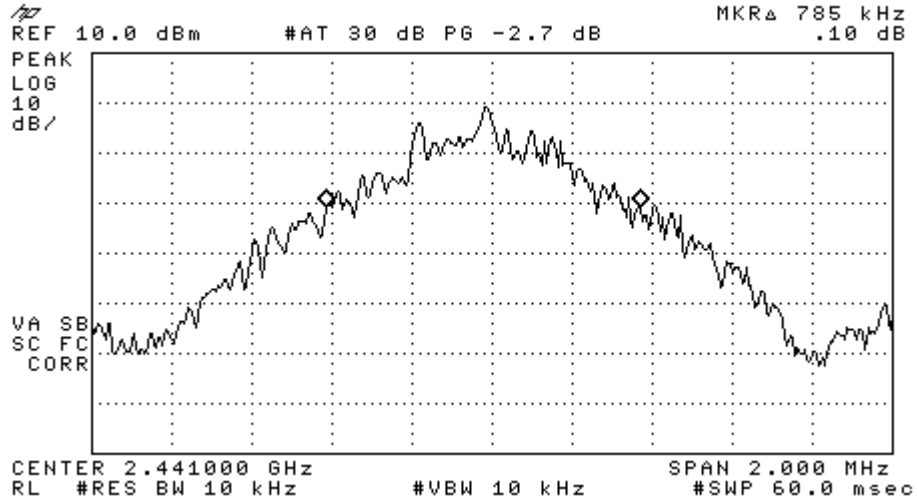


Figure 6b. 20 dB Bandwidth, Channel 39.

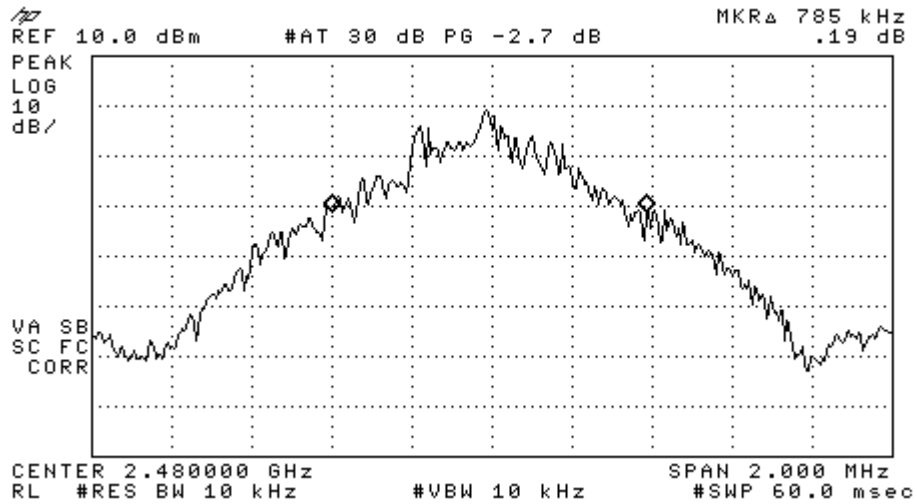


Figure 6c. 20 dB Bandwidth, Channel 78.

**Results and Limits:**

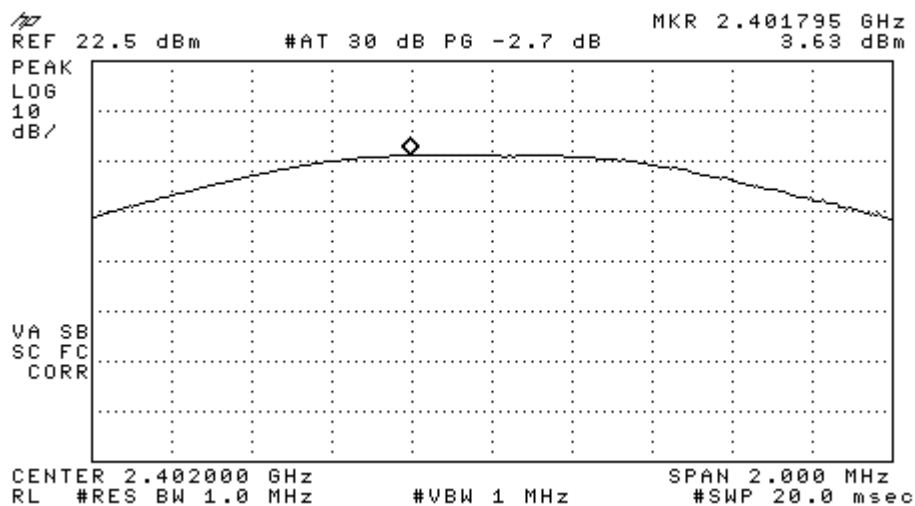
Limits	Channel	Results	Comments
< 1 MHz	0	780 KHz	Delta marker on the spectrum analyzer was moved from the center frequency until -20dBc to measure the 20dB-bandwidth.
	39	785 KHz	
	78	785 KHz	

## 7 Peak Output Power

<b>FCC:</b> § 15.247 b1
<b>Measurement Procedure:</b>
<p>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 to investigate the peak output power for each channel. A fully charged battery was used as supply voltage.</p>
<p><u>Frequencies of Interest:</u> Spectrum was investigated from 2400 MHz – 2483.5 MHz.</p>

**List of Figures:**

Figure	Channel	Plot Description
7a	0	Peak Output Power, Channel 0
7b	39	Peak Output Power, Channel 39
7c	78	Peak Output Power, Channel 78



**Figure 7a. Peak Output Power, Channel 0.**

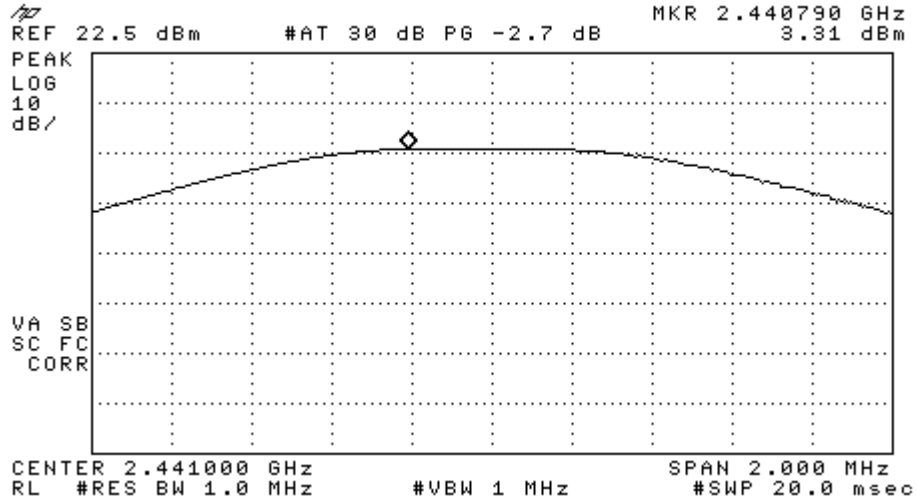


Figure 7b. Peak Output Power, Channel 39.

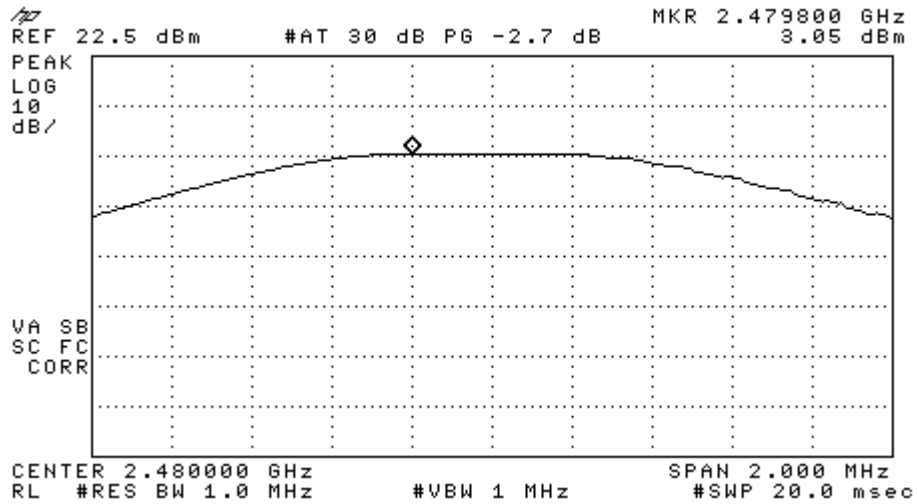


Figure 7c. Peak Output Power, Channel 78.

**Results and Limits:**

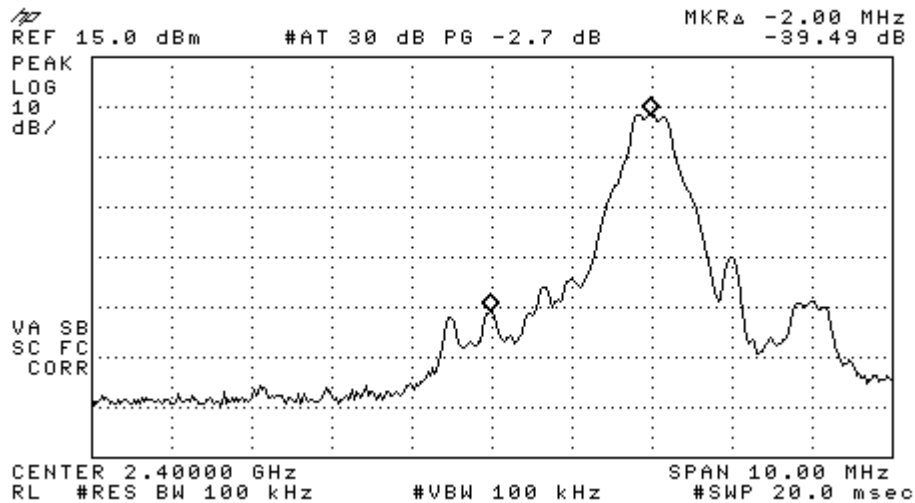
Limits	Channel	Results	Comments
< 1 watt (for systems with at least 75 hopping channels)	0	3.63 dBm	Signal loss from the cable connecting the Bluetooth output port and spectrum analyzer is calibrated out.
	39	3.31 dBm	
	78	3.05 dBm	

## 8 Band-edge Compliance of Conducted Emissions

<b>FCC:</b> § 15.247 c
<b>Measurement Procedure:</b>
<p>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.</p>
<p><u>Frequencies of Interest:</u> Spectrum was investigated from 2400 MHz – 2483.5 MHz.</p>

**List of Figures:**

Figure	Channel	Plot Description
8-1a	0	Low band edge with hopping disabled
8-1b	Hopping	Low band edge with hopping enabled
8-2a	78	High band edge with hopping disabled
8-2b	Hopping	High band edge with hopping enabled



**Figure 8-1a. Low band edge with hopping disabled.**

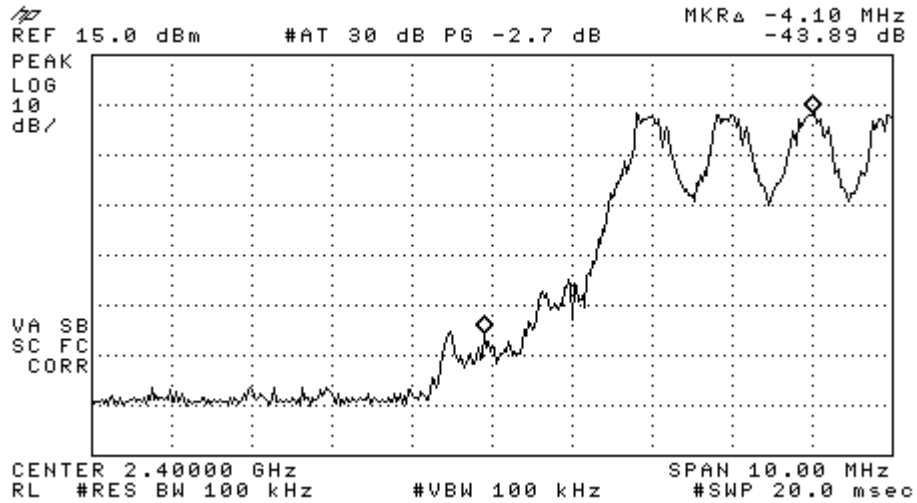


Figure 8-1b. Low band edge with hopping enabled.

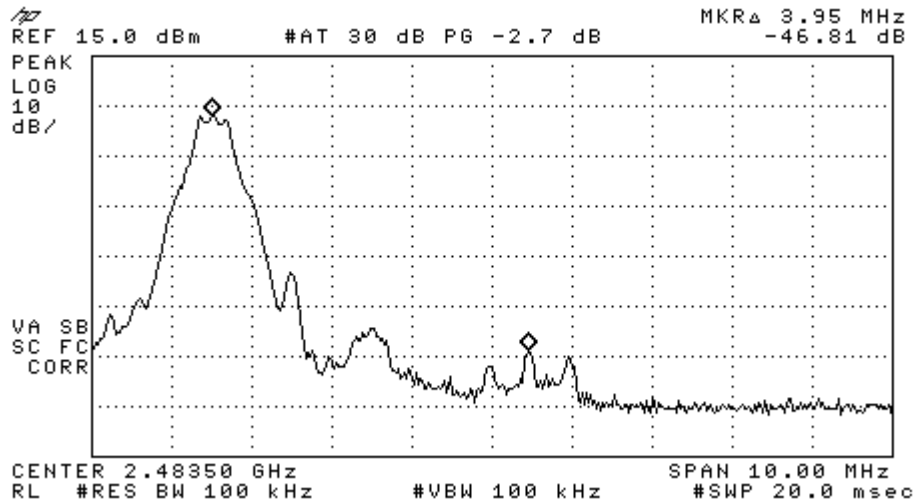


Figure 8-2a. High band edge with hopping disabled.

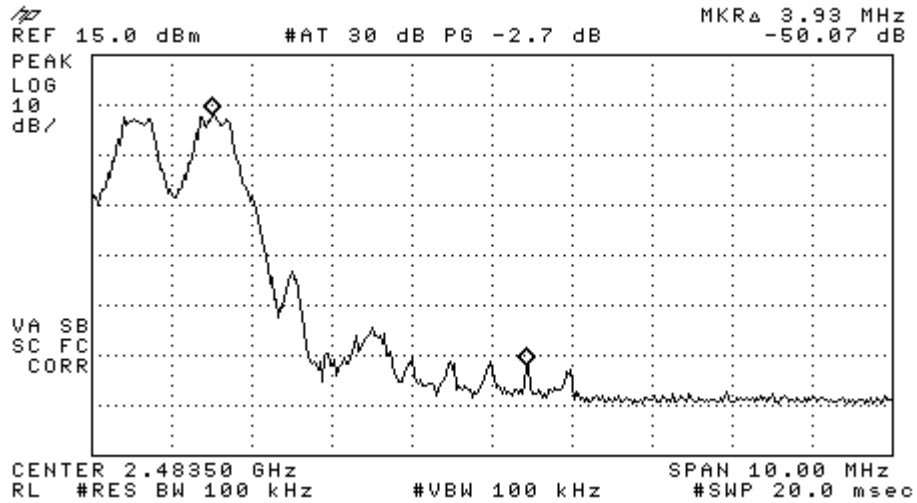


Figure 8-2b. High band edge with hopping enabled.

**Results and Limits:**

Limits	Channel	Results	Comments
≤ -20 dBc	0	-39.49 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.
	Hopping	-43.89 dBc (CH 0)	
	78	-46.81 dBc	
	Hopping	-50.07 dBc (CH 78)	

9 Spurious RF Conducted Emissions

<b>FCC:</b> § 15.247 c
<b>Measurement Procedure:</b>
<p>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.</p> <p><u>Frequencies of Interest:</u> Spectrum was investigated from 9kHz – 25 GHz.</p>

**List of Figures:**

Figure	Channel	Plot Description
9-1a	0	Conducted spurious emissions, 9kHz to 2.7GHz
9-1b		Conducted spurious emissions, 2.7GHz to 25GHz
9-2a	39	Conducted spurious emissions, 9kHz to 2.7GHz
9-2b		Conducted spurious emissions, 2.7GHz to 25GHz
9-3a	78	Conducted spurious emissions, 9kHz to 2.7GHz
9-3b		Conducted spurious emissions, 2.7GHz to 25GHz



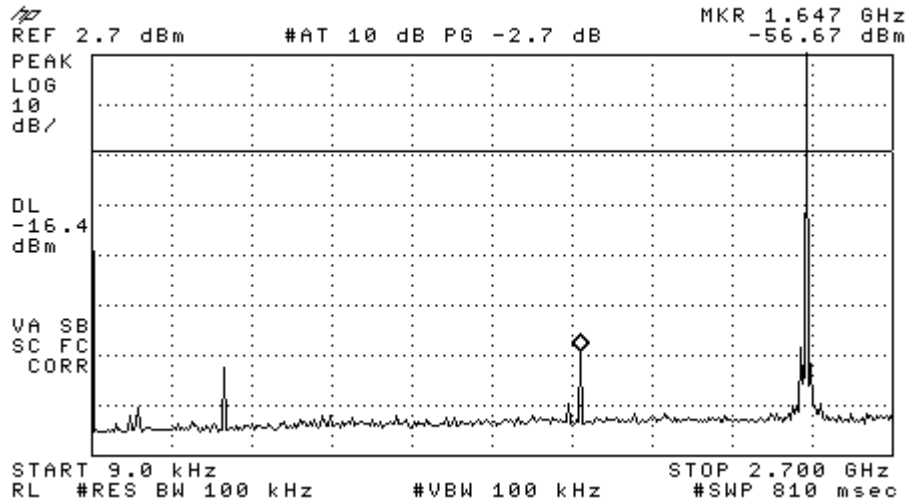


Figure 9-1a. Conducted Spurious Emissions (CH 0)

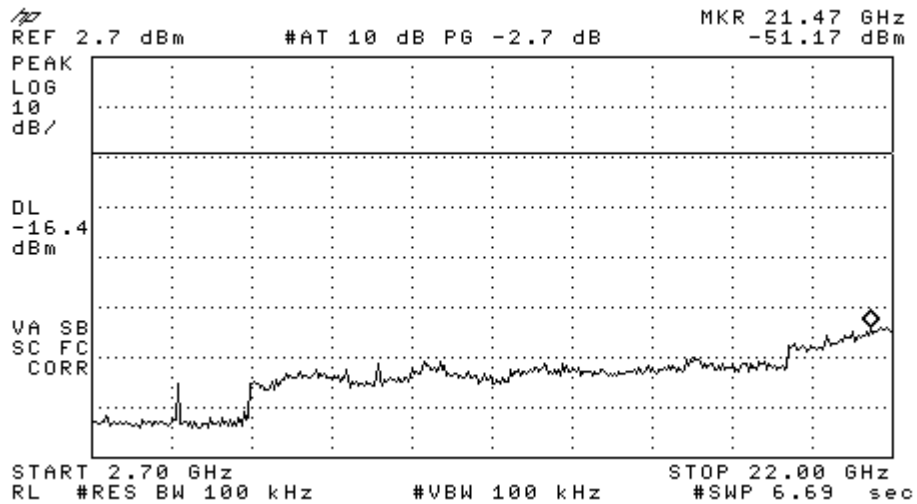


Figure 9-1b. Conducted Spurious Emissions (CH 0)

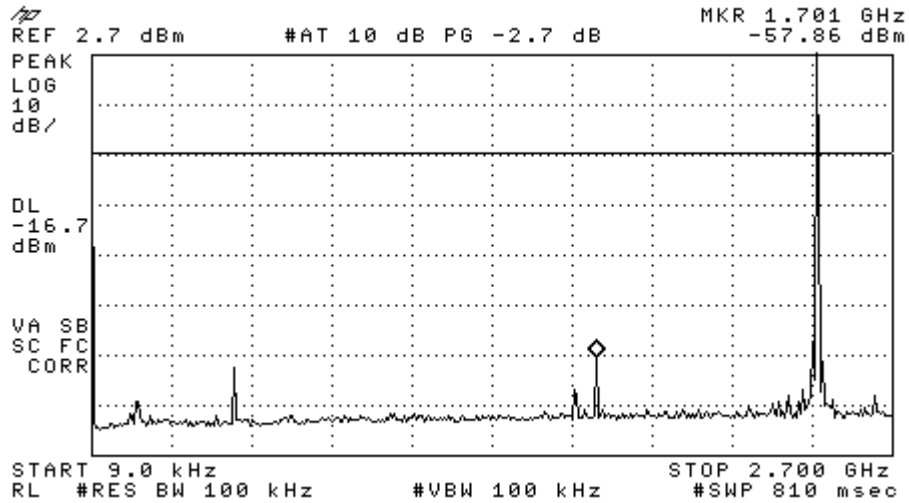


Figure 9-2a. Conducted Spurious Emissions (CH 39)

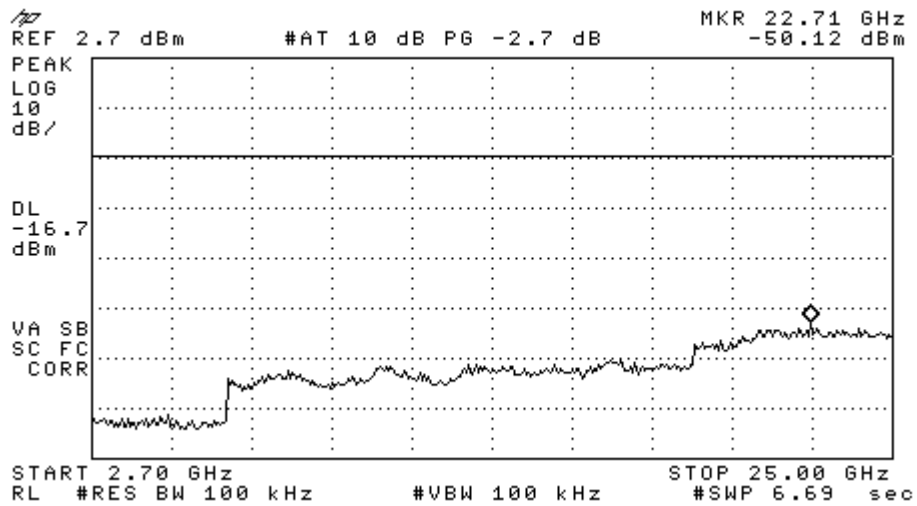


Figure 9-2b. Conducted Spurious Emissions (CH 39)

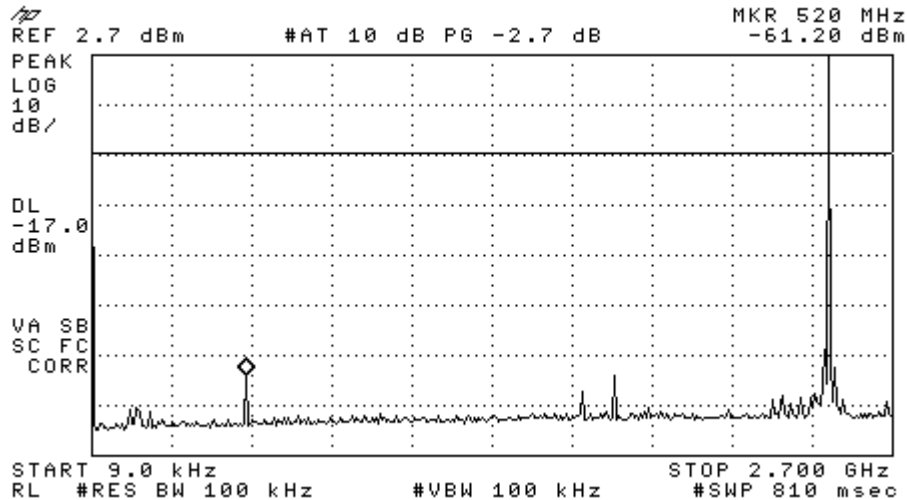


Figure 9-3a. Conducted Spurious Emissions (CH 78)

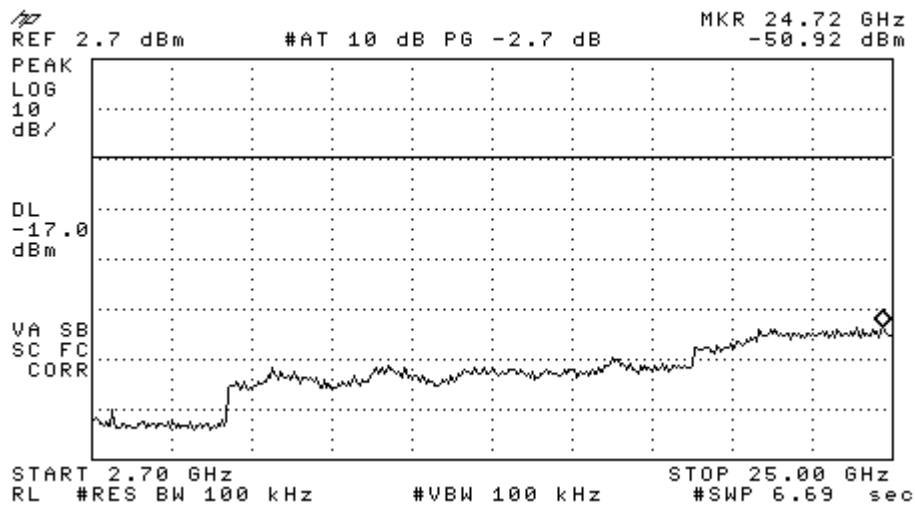


Figure 9-3b. Conducted Spurious Emissions (CH 78)

**Results and Limits:**

Limits	Channel	Result	Comments
-20 dBc	0	-54.79 dBc	Maximum of emissions is reported here, in the frequency spectrum 9kHz to 25GHz.
	39	-54.43 dBc	
	78	-53.97 dBc	

**10 AC Power Line Conducted Emissions**

<b>FCC:</b> § 15.247 c, § 15.207
<b>Measurement Procedures:</b>
The AC power line conducted emissions emission test was performed at Compliance Certification Services. The test report is attached as a separate document.

**11 Spurious Radiated Emissions**

<b>FCC:</b> § 15.247 c, § 15.209 a
<b>Measurement Procedures:</b>
The radiated spurious emission test was performed at Compliance Certification Services. The test report is attached as a separate document.

**12 Test Equipment**

Description	Manufacturer	Model Number	Serial Number	Cal Due Date
Spectrum Analyzer	Hewlett Packard	8593EM	3710A00203	03/22/2008
Spectrum Analyzer	Hewlett Packard	8594E	3810A04238	05/3/2008