The University of Michigan
Radiation Laboratory
3228 EECS Building
Ann Arbor, MI 48109-2122
Tel: (734) 764-0500

Measured Radio Frequency Emissions
From

JCI Bluetooth Transceiver
FCC ID: CB2BLUEC08
Model(s): CB2BLUEC08

Report No. 415031-372
May 21, 2007

For:
Johnson Controls Interiors L.L.C
One Prince Center, Holland, MI 49423

Contact:
Nisa Huyser
nisa.huyser@jci.com
Tel: (616) 394-6098
Fax: (616) 394-6100
PO: Verbal

Measurements made by: Joseph D. Brunett

Test Report written by: Joseph D. Brunett

Tests supervised by:
Report approved by:
Valdis V. Liepa
Research Scientist

Summary
Tests for compliance with FCC Regulations, Part 15.247, and with Industry Canada (IC) Regulations, RSS-210 (A8.1) and RSS-GEN, were performed on JCI model(s) CB2BLUEC08 frequency hopping spread spectrum (FHSS) transceiver. The DUT is subject to the Rules and Regulations as a transceiver.

In testing competed on May 10, 2007, transmitter radiated emissions in restricted bands are met by 5.9 dB (p. 8). Receiver emissions meet the Class B limit by more than 6.8 dB (p. 9). AC line conducted emissions tests do not apply, since the device is powered from a 12 VDC automotive system. The DUT is exempt as a digital device since it is used in a transportation vehicle.

Introduction

JCI model(s) CB2BLUEC08 was(were) tested for compliance with FCC Regulations, Part 15, Subpart C, adopted under Docket 87-389, April 18, 1989, and with Industry Canada RSS-210, Issue 5, November, 2001. The tests were performed at the University of Michigan Radiation Laboratory Willow Run Test Range following the procedures described in ANSI C63.4-2003 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The Site description and attenuation characteristics of the Open Site facility are on file with FCC Laboratory, Columbia, Maryland (FCC Reg. No: 91050) and with Industry Canada, Ottawa, ON (File Ref. No: IC 2057A-1).

1. Test Procedure and Equipment Used

The pertinent test equipment commonly used in our facility for measurements is listed in Table 2.1 below. The middle column identifies the specific equipment used in these tests.

Table 2.1 Test Equipment

Test Instrument	Eqpt. Used	Manufacturer/Model
Spectrum Analyzer (0.1-1500 MHz)		Hewlett-Packard, 182T/8558B
Spectrum Analyzer (9kHz-22GHz)	X	Hewlett-Packard 8593A SN: 3107A01358
Spectrum Analyzer (9kHz-26GHz)	X	Hewlett-Packard 8593E, SN: 3412A01131
Spectrum Analyzer (9kHz-26GHz)		Hewlett-Packard 8563E, SN: 3310A01174
Spectrum Analyzer (9kHz-40GHz)		Hewlett-Packard 8564E, SN: 3745A01031
Power Meter		Hewlett-Packard, 432A
Power Meter		Anritsu, ML4803A/MP
Peak Power Meter		Pacific Instruments 1018B
Harmonic Mixer (26-40 GHz)		Hewlett-Packard 11970A, SN: 3003A08327
Harmonic Mixer (40-60 GHz)		Hewlett-Packard 11970U, SN: 2332A00500
Harmonic Mixer (75-110 GHz)		Hewlett-Packard 11970W, SN: 2521A00179
Harmonic Mixer (140-220 GHz)		Pacific Millimeter Prod., GMA, SN: 26
S-Band Std. Gain Horn	X	S/A, Model SGH-2.6
C-Band Std. Gain Horn	X	University of Michigan, NRL design
XN-Band Std. Gain Horn	X	University of Michigan, NRL design
X-Band Std. Gain Horn	X	S/A, Model 12-8.2
X-band horn (8.2- 12.4 GHz)	X	Narda 640
X-band horn (8.2- 12.4 GHz)		Scientific Atlanta , 12-8.2, SN: 730
K-band horn (18-26.5 GHz)	X	FXR, Inc., K638KF
Ka-band horn (26.5-40 GHz)	X	FXR, Inc., U638A
U-band horn (40-60 GHz)		Custom Microwave, HO19
W-band horn(75-110 GHz)		Custom Microwave, HO10
G-band horn (140-220 GHz)		Custom Microwave, HO5R
Bicone Antenna (30-250 MHz)	X	University of Michigan, RLBC-1
Bicone Antenna (200-1000 MHz)	X	University of Michigan, RLBC-2
Dipole Antenna Set (30-1000 MHz)	X	University of Michigan, RLDP-1,-2,-3
Dipole Antenna Set (30-1000 MHz)		EMCO 2131C, SN: 992
Active Rod Antenna (30 Hz-50 MHz)		EMCO 3301B, SN: 3223
Active Loop Antenna (30 Hz-50 MHz)		EMCO 6502, SN:2855
Ridge-horn Antenna (300-5000 MHz)	X	University of Michigan
Amplifier (5-1000 MHz)	X	Avantak, A11-1, A25-1S
Amplifier (5-4500 MHz)	X	Avantak
Amplifier (4.5-13 GHz)	X	Avantek, AFT-12665
Amplifier (6-16 GHz)	X	Trek
Amplifier (16-26 GHz)	X	Avantek
LISN Box		University of Michigan
Signal Generator		Hewlett-Packard 8657B

2. Device Under Test

2.1 Identification

The DUT is a frequency hopping spread spectrum (FHSS) transmitter operating in the 2400 - 2483.5 MHz band. The DUT measures 3 x 4 x 0.75 inches. The system has been designed to operate with 79 channels spaced 1 MHz apart, 2402-2480 MHz.

The DUT was designed and manufactured by Kimball Electronics, 1600 Royal Street, Jasper, Indiana 47549. It is identified as:

JCI Bluetooth Transceiver
Model(s): CB2BLUEC08
FCC ID: CB2BLUEC08
IC: 279B-BLUEC08

2.2 Variants

There are a total of 18 North American part numbers associated with this module. All parts contain identical PCB's with minor digital software changes and variations in plastic housing. For these 18 part numbers there are 7 housing variants, drawings of which are detailed in the variants exhibit. The data reported herein outlines the complete set of emissions for the worst case configuration. In addition to a standard unit, a modified unit was provided by the manufacturer which had the internal antenna disabled and an SMA connector attached for conducted antenna measurement purposes. The DUT has only one antenna built into the PCB and has been setup to connect to a peripheral laptop computer via a serial interface for testing purposes.

2.3 Modes of Operation

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device do not influence the channel spacing or peak output power. There is only one transmitter which is driven by identical input parameters concerning these values. Additionally, measured dwell time may not indicate the actual single channel dwell time of the DUT. A dwell time of 0.3797 seconds within a 30 second period in data mode is independent from the packet type (packet length) for all Bluetooth devices. (Therefore, all Bluetooth compliant devices comply with the FCC dwell time requirements.)

2.4 EMI Relevant Modifications

No modifications were made to the DUT by this laboratory during testing.

3. Emission Limits

3.1 Radiated Emission Limits

Since the DUT is a spread spectrum device, wherein the radiated emissions are subject to emissions limits in the restricted bands The applicable frequencies, through ten harmonics, are given below in Table 4.1. Emission limits from digital circuitry are specified in Table 4.2.

Table 4.1 Radiated Emission Limits (FCC:15.205; IC:RSS-210, Table 1) - Transmitter

Frequency (MHz)	Fundamental Ave. E_{lim} (3m)		Spurious* Ave. E_{lim} (3m)	
	(μV/m)	dB (μV/m)	(μV/m)	dB (μV/m)
2400-2483.5	---		---	
2310-2390 2483.5-2500 4500-5250	Restricted Bands		500	54.0
7250-7750 14470-14500 17700-21400 22010-23120 23600-24000	Restricted Bands		500	54.0

* Measure up to tenth harmonic; 1 MHz res. BW, 100 Hz video BW (for average detection)

Table 4.2 Radiated Emission Limits (FCC:15.109;IC: RSS-210, Table 2) – Receiver/Digital device.

Frequency (MHz)	Class A ds = 10 m		Class B ds = 3 m	
	(μV/m)	dB (μV/m)	(μV/m)	dB (μV/m)
30-88	90	39.0	100	40.0
88-216	150	43.5	150	43.5
219-960	210	46.4	200	46.0
960-	300	49.5	500	54.0

120 kHz BW up to 1 GHz, 1 MHz BW above 1 GHz

3.2 Conducted Emission Limits

Table 4.3 Conducted Emission Limits (FCC:15.107(CISPR); IC: RSS-GEN).

Frequency MHz	Class A (dBμV)		Class B (dBμV)	
	Quasi-peak	Average	Quasi-peak	Average
.150 - 0.50	79	66	66 - 56*	56 - 46*
0.50 - 5	73	60	56	46
5 - 30	73	60	60	50

Notes:
1. The lower limit shall apply at the transition frequency
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15-0.50 MHz:

*Class B Quasi-peak: dBμV = 50.25 - 19.12*log(f)
*Class B Average: dBμV = 40.25 - 19.12*log(f)

3. 9 kHz RBW

4. Radiated Emission Tests and Results

4.1 Semi-Anechoic Chamber Measurements

In our chamber, there is a set-up similar to that of an outdoor 3-meter site, with a turntable, an antenna mast, and a ground plane. Instrumentation includes spectrum analyzers and other equipment as needed. For these tests the receiver (horn) antennas were placed on a Styrofoam block or antenna mast, at about 1.2 m height, and the DUT on a turntable at 3 meter distance.

Standard gain horn antennas are used for the measurements. Up to 4.5 GHz the horns are connected directly to a spectrum analyzer via RG-214 coaxial cable. Above 4.5 GHz a pre-amp is added. The cables and the pre-amplifier used are specially calibrated for these tests using a network analyzer. The DUT antenna was rotated in all possible ways and the maximum emission recorded. A photograph in the Test Setup portion of this submittal shows the measurement set-up.

4.2 Outdoor Measurements

None made.

4.3 Computations and Results

To convert dBm measured on the spectrum analyzer to dB(μV/m), we use the expression

$$E_3(\text{dB}\mu\text{V/m}) = 107 + P_R + K_A - K_G + K_E$$

where
- P_R = power recorded on spectrum analyzer, dB, measured at 3m
- K_A = antenna factor, dB/m
- K_G = pre-amplifier gain, including cable loss, dB
- K_E = pulse operation correction factor, dB

When presenting the data, the dominant measured emissions at each frequency, under all of the possible orientations, are given. Computations and results are given in Table 5.1. There we see that in the worst case the DUT meets the limit by 5.9 dB.

4.4 Duty Factor / Peak-to-Average Ratio (15.35(b))

No duty factor is used. The measured difference between peak and average is always greater than 20 dB for a Bluetooth device, and this was verified in our measurements.

5. Other Measurements and Computations

5.1 20 dB Bandwidth (15.247(a)(1)(ii))

For this test, the DUT was put in a test mode for continuous data transmission (hopping disabled). The DUT was placed in front of the horn antenna oriented for maximum radiation. The analyzer was set for RBW = 30 kHz ≤VBW, SPAN= 2 MHz. The 20-dB bandwidth was measured for low, mid, and high channels used by the DUT. The maximum limit for 20dB bandwidth of a single channel is 1 MHz. The resulting measured data is below, and plots are shown in Figure 6.1.

Channel	Frequency	20 dB BW	Limit (max)
1	2.402 GHz	920 kHz	1 MHz
39	2.441 GHz	920 kHz	1 MHz
79	2.480 GHz	935 kHz	1 MHz

5.2 Carrier Frequency Separation (15.247(a)(1))

For this test, the DUT was put in a test mode for data transmission (hopping enabled). The DUT was placed in front of the horn antenna at the location of maximum radiation. The analyzer was set for RBW=30 kHz ≤ VBW, SPAN= 1.8 MHz. The Carrier Frequency Separation was measured for low, mid, and high channels used by the DUT. A minimum carrier separation of 25 kHz, or the 20 dB bandwidth of the hopping channel, whichever is larger, is required. The resulting measured data is below, and plots are shown in Figure 6.2.

Channel	Frequency	Separation	Limit (min)
1-2	2.402-2.403 GHz	994 kHz	920 kHz
39	2.440-2.441 GHz	1004 kHz	920 kHz
79	2.479-2.480 GHz	990 kHz	935 kHz

5.3 Number of Hopping Frequencies (15.247(a)(1)(ii))

For this test, the DUT was put in a test mode for data transmission (hopping enabled). The DUT was placed in front of the horn antenna at the location of maximum radiation. The analyzer was set for RBW = 30 kHz ≤ VBW, SPAN as needed. The total number of hopping channels must be 75 or greater. The number of measured channels is below, and plots are shown in Figure 6.3.

Frequency Range	Number of Channels	Total	Limit
2402.0 – 2429.5	28		
2429.5 – 2454.5	25	79	>75
2455.0 – 2483.5	26		

5.4 Single-Channel Dwell Time (15.247(a)(1)(ii))

For this test, the DUT was put in a test mode for data transmission (hopping enabled). The DUT was placed in front of the horn antenna at the location of maximum radiation. The analyzer was set for RBW= 1 MHz ≤ VBW, SPAN = 0 Hz. The limit for total average dwell time in a single channel must be less than 0.4 sec in a 30 sec period. The dwell time was measured at low, mid, and high channels and the results are listed below. Sample plots are shown in Figure 6.4.

Channel	Frequency	Num. Pulses	Active Time	Total	Limit (max)
1	2.402 GHz	68/30sec	2.938 ms	0.200 sec	0.4 sec
39	2.441 GHz	63/30sec	2.938 ms	0.185 sec	0.4 sec
79	2.480 GHz	63/30sec	2.938 ms	0.185 sec	0.4 sec

5.5 Peak and Average Output Power (15.247(b))

For this test, the DUT was put in a test mode for data transmission (hopping disabled). Peak power measurements were made using 1 MHz RBW and 3 MHz VBW on the Spectrum Analyzer. The power was measured from the RF port of DUT (a modified module was provided from the manufacturer for this purpose; the antenna is not generally removable). Table 5.1(b) presents the results. The maximum peak output power limit is 30dBm (1 Watt).

5.6 Potential Health Hazard EM Radiation Level

The following table summarizes the power density at a distance of 20 cm from the device as calculated from FCC OET Bulletin 65.

Table 6.3 Potential Health Hazard Radiation Level

Ant.	Ant.Gain (dBi)	Po (mW)	EIRP (mW)	S (mW/cm^2)
PCB	1	1.70	2.14	0.000425

The following equations were used in calculating the operating distance (R).

$$EIRP(mW) = Po(mW) \cdot 10^{\frac{Gain(dB)}{10}}$$

and

$$S(mW/cm^2) = \frac{EIRP(mW)}{4 \cdot \Pi \cdot R(cm)^2},\ R = 20\text{ cm}$$

5.7 AC Power Line Conducted Emissions (15.270)

No power line conducted emissions were measured as this device operates from a 12 VDC automotive system.

5.8 RF Antenna Spurious Emissions (15.247(c))

For this test, the DUT was put in a test mode for data transmission (hopping disabled). The spectrum analyzer was connected where the antenna attaches to the system. The analyzer was set for RBW= 100 kHz, VBW= 300 kHz, the frequency was swept from 0 to 25 GHz. The DUT was measured for 3 channels used in the system. See Figure 6.5. In all cases, the noise is at least 30 dB below the carrier. (Limit -20.0 dB below carrier).

5.9 Band Edge Emissions (15.247(c))

For this test, the DUT was put in a test both hopping and non-hopping test modes. The spectrum analyzer was connected where the antenna attaches to the system. The analyzer was set for RBW=100 kHz, VBW=300 kHz, with the SPAN=5 MHz. The DUT was measured for low and high channels used in the system. Figures 6.6 and 6.7 show the band edge emissions, as summarized below.

Channel	Band Edge	Attenuation (not hopping)	Attenuation (hopping)	Limit(max)
1	2400.0 MHz	37.4 dBc	37.9 dBc	> 20 dBc
79	2483.5 MHz	38.2 dBc	37.8 dBc	> 20 dBc

5.10 Effect of Supply Voltage Variation

The DUT has been designed to operate from 12 VDC power. Using a spectrum analyzer, relative radiated emissions were recorded at the center channel as voltage was varied from 8.0 to 18.0 VDC. Figure 6.8 shows the emission variation.

The University of Michigan
Radiation Laboratory
3228 EECS Building
Ann Arbor, Michigan 48109-2122
(734) 764-0500

Table 5.1(a) Highest Emissions Measured

Restricted Band Radiated Emissions											JCI, CB2BLUEC08; FCC/IC
#	Freq. MHz	Ant. Used	Ant. Pol.	Pr dBm	Det.* Used	Ka dB/m	Kg dB	E3** dBµV/m	E3lim dBµV/m	Pass dB	Comments
1	2390.0	Horn S	H/V	-70.6	Pk	21.5	26.6	11.3	54.0	42.7	Low Channel, 2402 MHz
2	2390.0	Horn S	H/V	-69.6	Pk	21.5	26.6	12.3	54.0	41.7	Mid Channel, 2441 MHz
3	2390.0	Horn S	H/V	-69.8	Pk	21.5	17.3	21.4	54.0	32.6	High Channel, 2480 MHz
4	2483.5	Horn S	H/V	-75.8	Pk	21.5	17.3	15.4	54.0	38.6	Low, noise
5	2483.5	Horn S	H/V	-68.4	Pk	21.5	17.3	22.8	54.0	31.2	Mid
6	2483.5	Horn S	H/V	-67.9	Pk	21.5	18.3	22.3	54.0	31.7	High
7	4804.0	Horn C	H/V	-26.6	Pk	24.6	38.0	47.0	54.0	7.0	Low
8	4882.0	Horn C	H/V	-27.9	Pk	24.6	38.0	45.7	54.0	8.3	Mid
9	4960.0	Horn C	H/V	-25.5	Pk	24.6	38.0	48.1	54.0	**5.9**	High
10	7206.0	Horn XN	H/V	-45.6	Pk	25.1	36.8	29.7	N/A	-	Low
11	7323.0	Horn XN	H/V	-45.0	Pk	25.2	36.8	30.4	54.0	23.6	Mid
12	7440.0	Horn XN	H/V	-45.5	Pk	25.3	36.8	30.0	54.0	24.0	High
13	9608.0	Horn X	H/V	-	Pk	27.8	36.8	-	N/A	-	Low
14	9764.0	Horn X	H/V	-	Pk	27.9	36.8	-	N/A	-	Mid
15	9920.0	Horn X	H/V	-	Pk	28.0	36.8	-	N/A	-	High
16	12010.0	Horn X	H/V	-52.5	Pk	31.7	35.8	30.4	54.0	23.6	Low, noise
17	12205.0	Horn X	H/V	-53.0	Pk	31.8	34.1	31.7	54.0	22.3	Mid, noise
18	12400.0	Horn X	H/V	-53.2	Pk	32.0	32.4	33.3	54.0	20.7	High, noise
19	14412.0	Horn Ku	H/V	-	Pk	33.2	17.3	-	N/A	-	Low
20	14646.0	Horn Ku	H/V	-	Pk	33.3	17.3	-	N/A	-	Mid
21	14880.0	Horn Ku	H/V	-	Pk	33.4	17.3	-	N/A	-	High
22	16814.0	Horn Ku	H/V	-	Pk	34.6	34.0	-	N/A	-	Low
23	17087.0	Horn Ku	H/V	-	Pk	34.8	34.0	-	N/A	-	Mid
24	17360.0	Horn Ku	H/V	-	Pk	35.0	34.0	-	N/A	-	High
25	19216.0	Horn K	H/V	-57.9	Pk	32.2	32.0	29.3	54.0	24.7	Low, noise
26	19528.0	Horn K	H/V	-57.3	Pk	32.3	32.0	30.0	54.0	24.0	Mid, noise
27	19840.0	Horn K	H/V	-57.0	Pk	32.3	32.0	30.3	54.0	23.7	High, noise
28	21618.0	Horn K	H/V	-	Pk	32.7	32.0	-	N/A	-	Low
29	21969.0	Horn K	H/V	-	Pk	32.8	32.0	-	N/A	-	Mid
30	22320.0	Horn K	H/V	-53.0	Pk	32.8	32.0	34.8	54.0	19.2	High, noise
31	24020.0	Horn Ka	H/V	-	Pk	33.2	32.0	-	N/A	-	Low
32	24410.0	Horn Ka	H/V	-	Pk	33.3	32.0	-	N/A	-	Mid
33	24800.0	Horn Ka	H/V	-	Pk	33.3	32.0	-	N/A	-	High
34											
35	* Peak measured with 1 MHz RBW and 3 MHz VBW, Avg. more than 20 dB below Peak.										
36	** 20 dB maximum permissible duty cycle applied.										
37											

Meas. 05/12/2007; U of Mich.

Table 5.1(b) Highest Emissions Measured

Conducted Peak Output Power — JCI, CB2BLUEC08; FCC/IC

#	Freq. MHz	Ant. Used	Ant. Pol.	Pr dBm	Det.* Used	Ka dB/m	Kg dB	P dBm	Plim dBm	Pass dB	Comments
1	2402.0	Cond	H/V	2.03	Pk	0.0	0.0	2.0	30.0	28.0	Lowest channel, conducted
2	2441.0	Cond	H/V	2.31	Pk	0.0	0.0	2.3	30.0	27.7	Middle channel, conducted
3	2480.0	Cond	H/V	2.25	Pk	0.0	0.0	2.3	30.0	27.8	Highest channel, conducted
4											
5	* Peak measured with 1 MHz RBW and 3 MHz VBW										
6	Note: The different operating modes (data-mode, acquisition-mode) of this Bluetooth device do not influence										
7	the output power. There is only one transmitter which is driven by identical input with regard to this parameter.										

Receiver Spurious Emissions

#	Freq. MHz	Ant. Used	Ant. Pol.	Pr* dBm	Det.* Used	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
8	1020.0	R-Horn	H/V	-68.4	Pk	19.7	28.0	30.3	54.0	23.7	max all, noise
9	1108.0	R-Horn	H/V	-67.6	Pk	20.1	28.1	31.4	54.0	22.6	max all, noise
10	1198.0	R-Horn	H/V	-67.6	Pk	20.4	28.1	31.7	54.0	22.3	max all, noise
11	1473.0	R-Horn	H/V	-68.1	Pk	21.2	28.1	32.0	54.0	22.0	max all, noise
12	1835.0	R-Horn	H/V	-68.0	Pk	22.1	28.1	33.0	54.0	21.0	max all, noise
13	2445.5	R-Horn	H/V	-66.2	Pk	23.7	26.2	38.3	54.0	15.7	max all, noise
14	2454.5	R-Horn	H/V	-66.5	Pk	23.7	26.2	38.0	54.0	16.0	max all, noise
15	2465.0	R-Horn	H/V	-65.6	Pk	23.7	26.2	39.0	54.0	15.0	max all, noise
16	2663.8	R-Horn	H/V	-66.7	Pk	24.3	25.5	39.1	54.0	14.9	max all, noise
17	2812.3	R-Horn	H/V	-66.4	Pk	24.8	24.8	40.5	54.0	13.5	max all, noise
18	2968.0	R-Horn	H/V	-68.6	Pk	25.2	24.2	39.5	54.0	14.5	max all, noise
19	2992.0	R-Horn	H/V	-69.6	Pk	25.3	24.1	38.6	54.0	15.4	max all, noise
20	3144.0	R-Horn	H/V	-69.2	Pk	25.8	23.6	40.0	54.0	14.0	max all, noise
21	3916.0	R-Horn	H/V	-69.5	Pk	28.2	22.3	43.3	54.0	10.7	max all, noise
22	4136.0	R-Horn	H/V	-68.5	Pk	28.8	20.1	47.2	54.0	**6.8**	max all, noise
23											
24											
25											
26	* Note: Rx LO sweeps 1602-1664 MHz. Emissions below 1 GHz are considered Digital Emissio										
27											

Digital Radiated Emissions*

#	Freq. kHz	Ant. Used	Ant. Pol.	Pr dBm	Det. Used	Ka dB/m	Kg dB	E3 dBμV/m	E3lim dBμV/m	Pass dB	Comments
28											
29											
30											
31	* For devices used in transportation vehicles, digital emissions are exempt per FCC 15.103(a), ICES-003/RSS-GEN										

Meas. 05/18/2007; U of Mich.

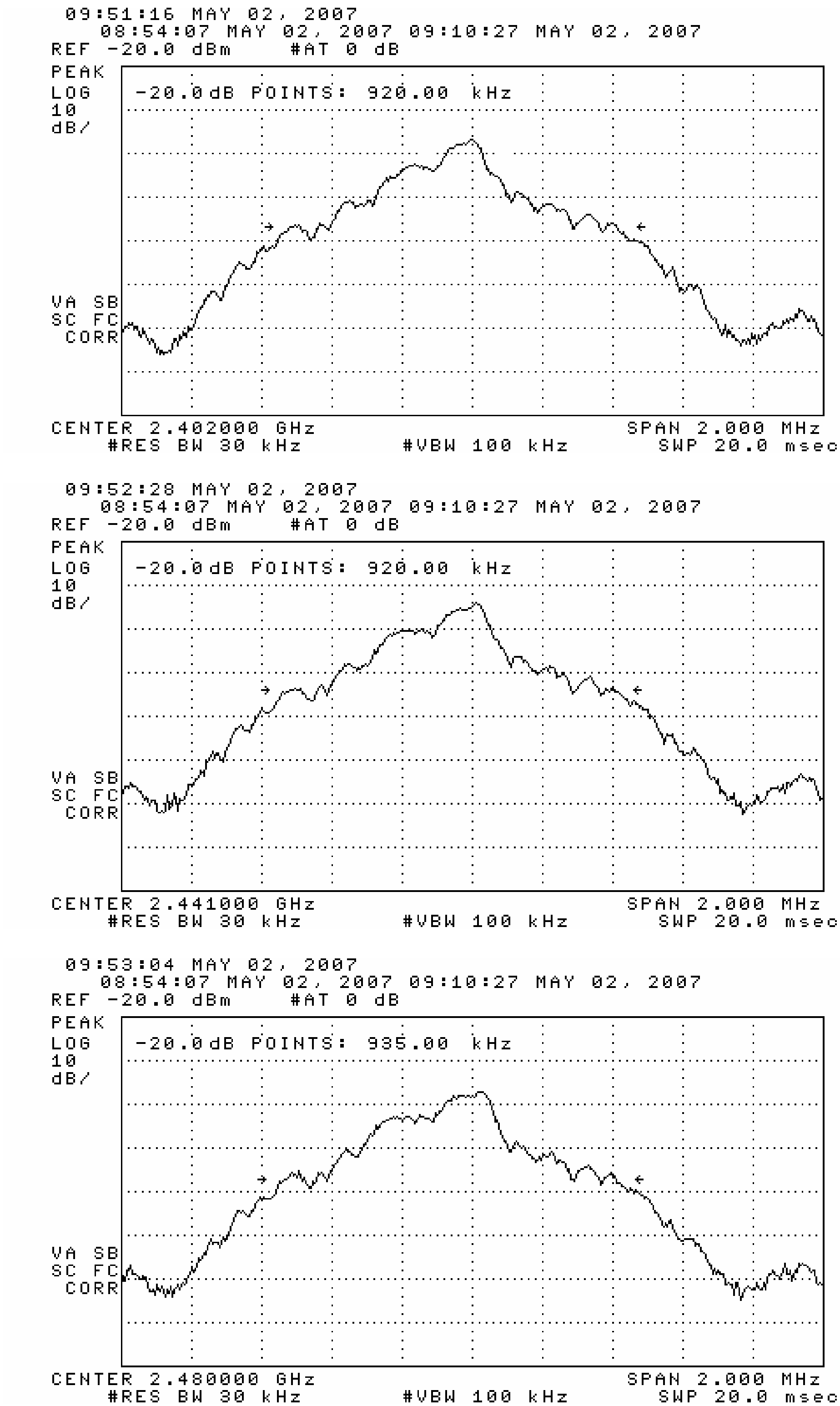


Figure 6.1 Measurement of channel 20 dB bandwidth.
(top) Low Channel, (middle) Middle Channel, (bottom) High Channel

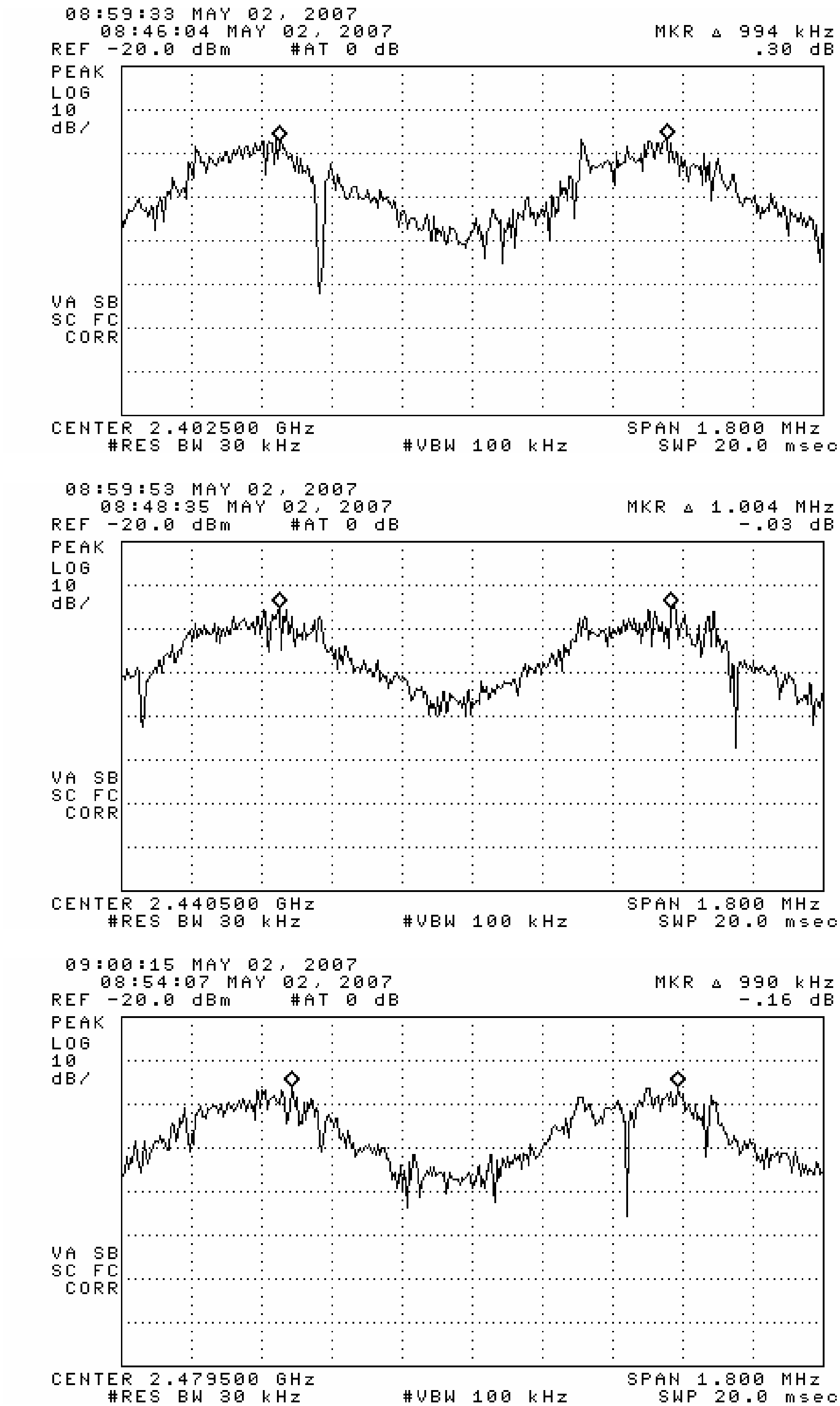


Figure 6.2 Carrier Frequency Separation.
(top) Low Channel, (middle) Middle Channel, (bottom) High Channel

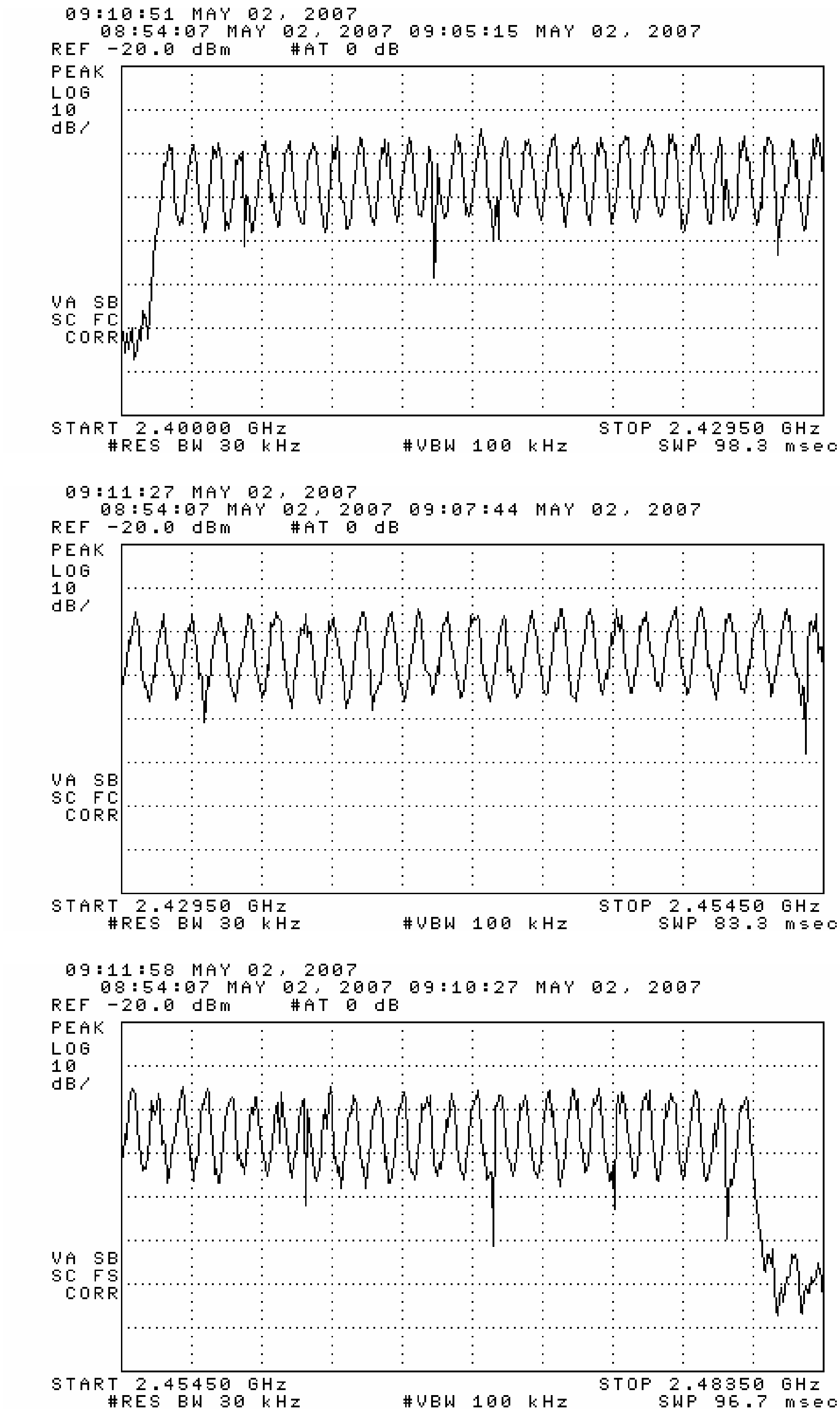
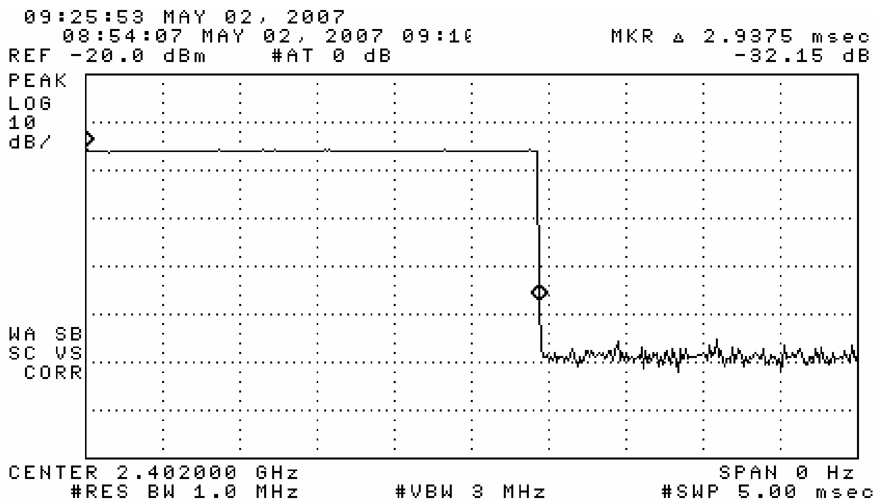


Figure 6.2 Number of Hopping Frequencies. (top) low, (middle) middle, (bottom) high portion of band



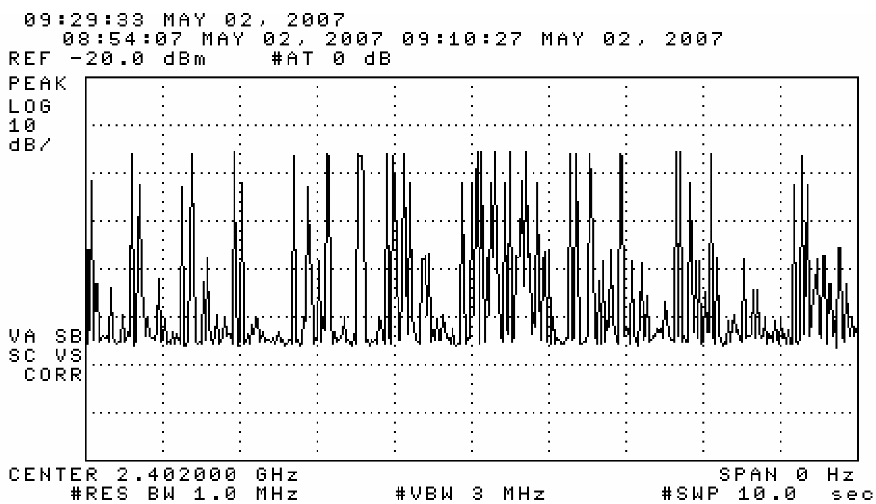


Figure 6.4 Single Channel Dwell Time. (top) Maximum Pulse Width, (bottom) 1 of 3 10 second sample windows. (only Low Channel shown)

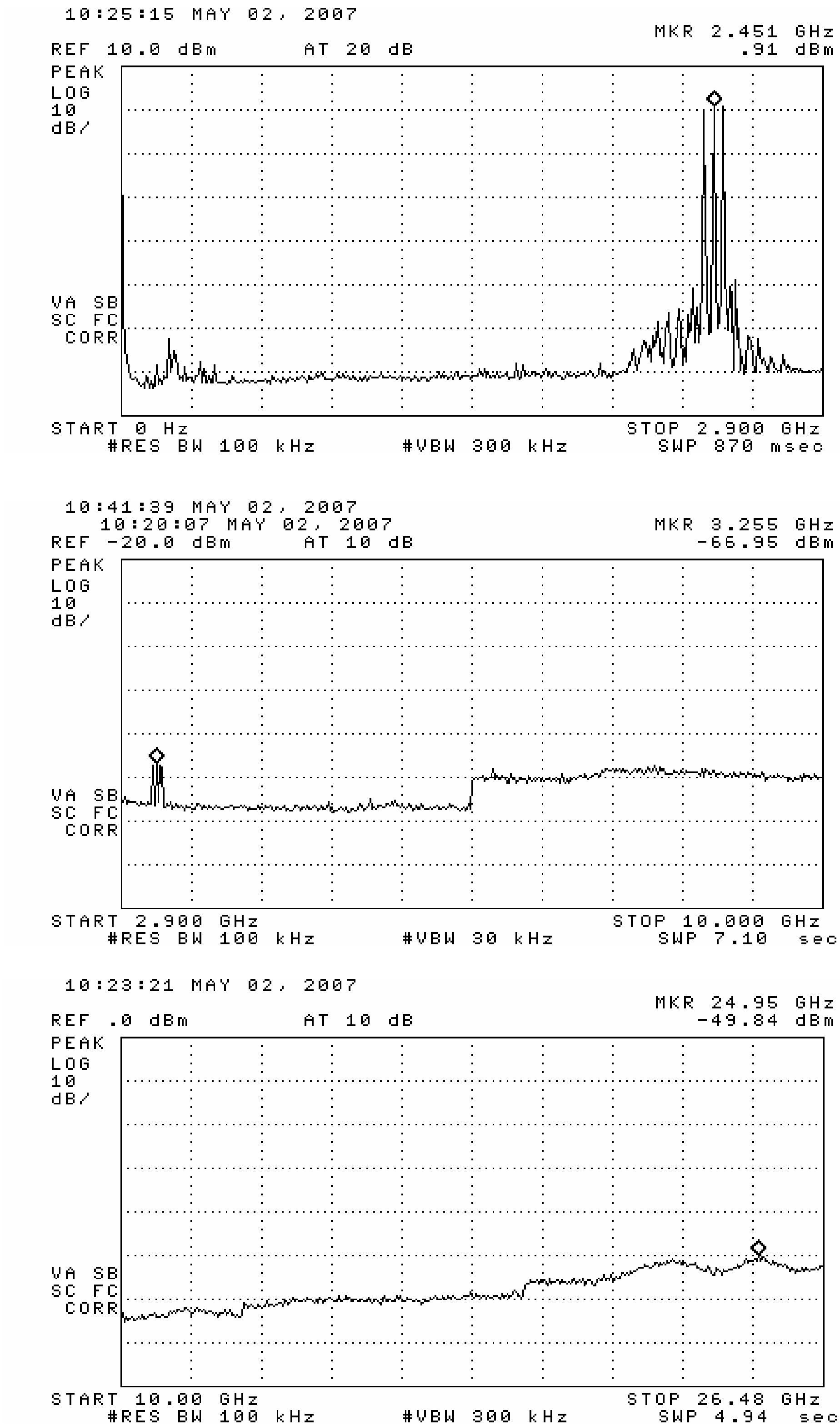


Figure 6.5 Antenna Conducted Spurrious Emissions.
(low, mid, and high channels)

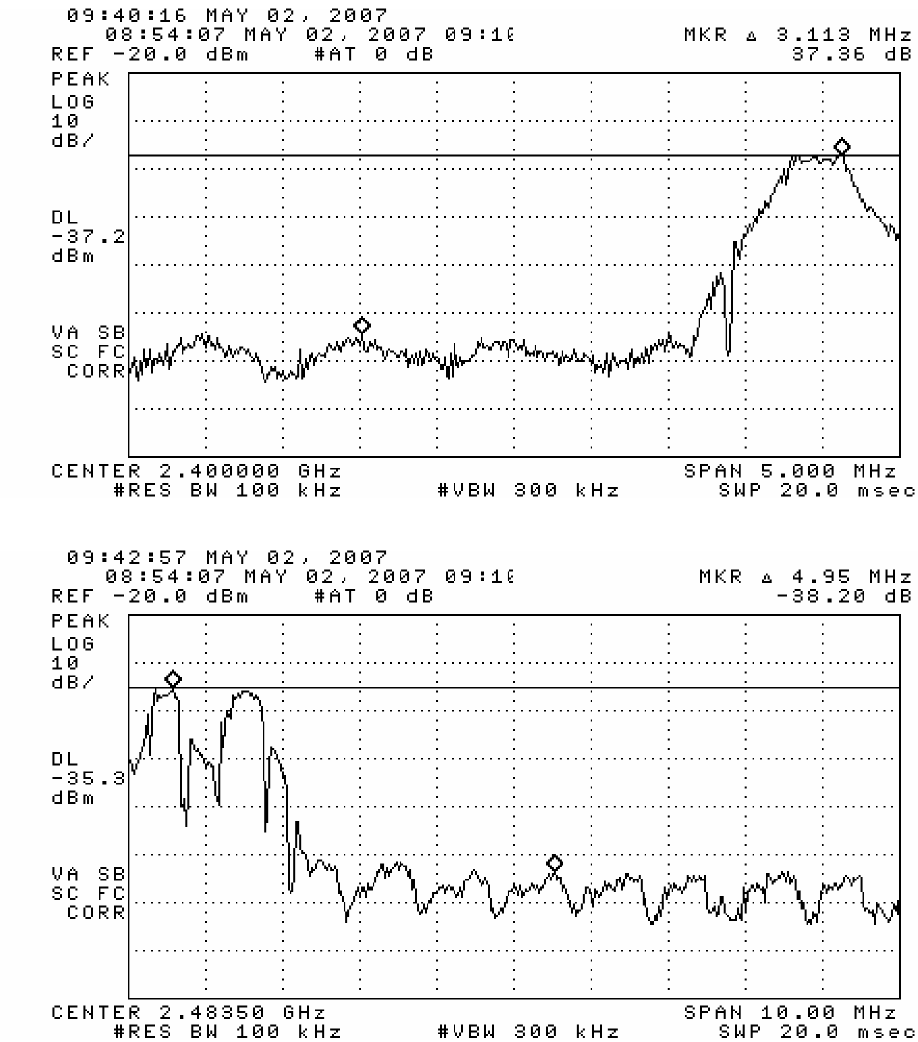
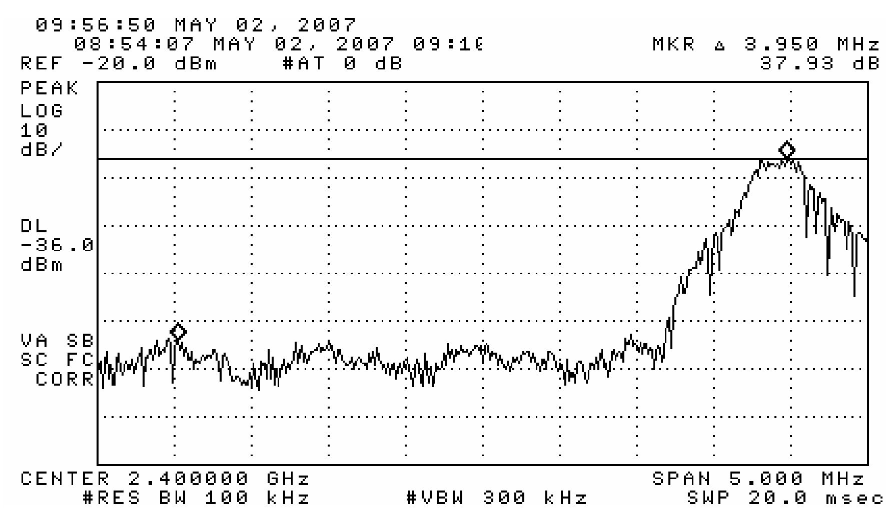


Figure 6.6 Band edge emissions – NOT HOPPING. (top) Low Channel, (bottom) High Channel



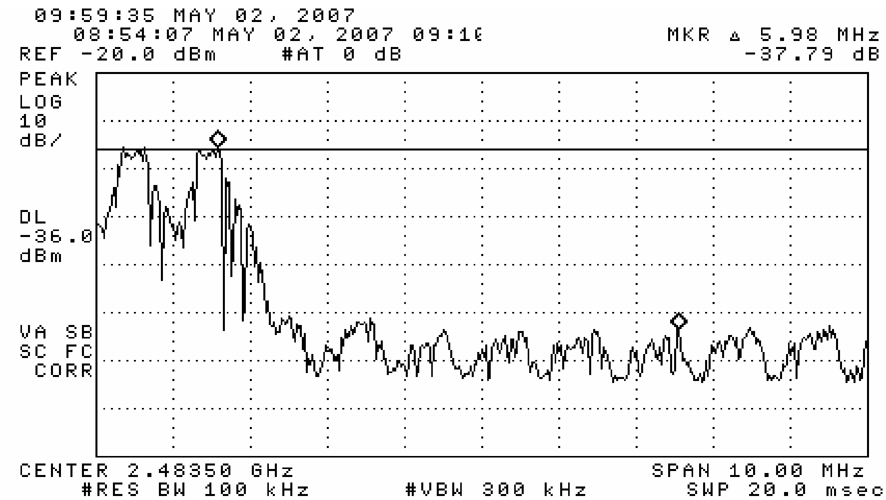


Figure 6.7 Band edge emissions - HOPPING. (top) Low Channel, (bottom) High Channel

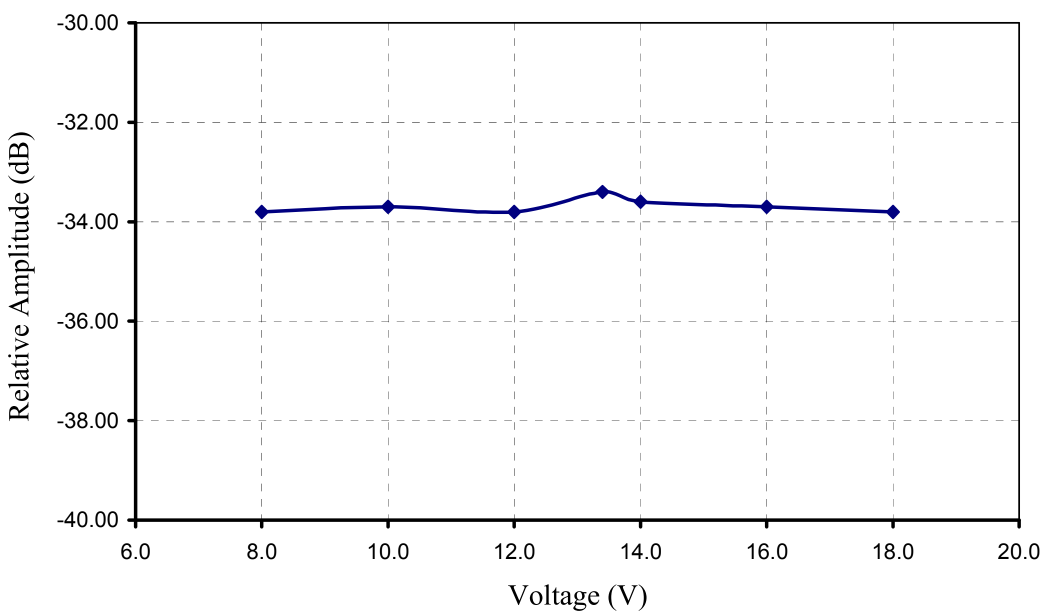
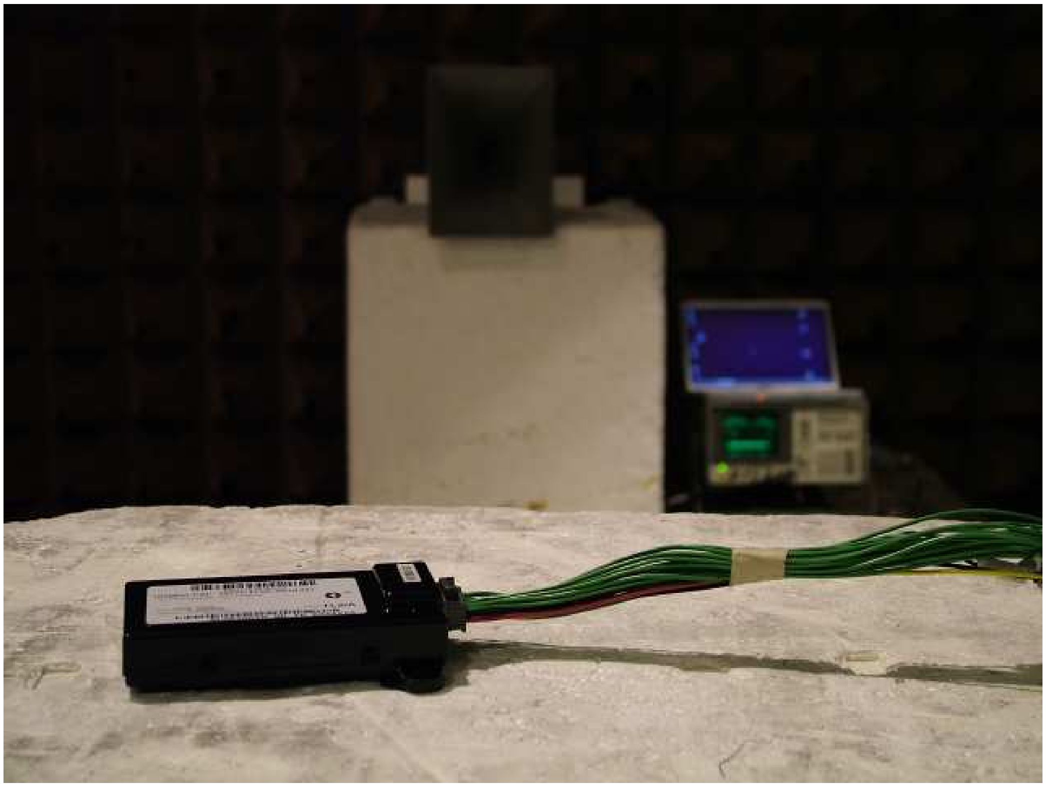


Figure 6.8 Relative emission vs. supply voltage, center channel.



Test Setup (Radiated Emissions)

Test Setup (Antenna Conducted Emissions)