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Measured Radio Frequency Emissions
From

College Park iPECS Sensor
FCC ID: YYU104450
IC: 9356A-104450

Test Report No. 417124-590
November 22, 2010

For:
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Summary

Tests for compliance with FCC Regulations, CFR 47, Part 15 and with Industry Canada RSS-210/Gen, were performed on a College Park, FCC ID: KSME1007830, IC: 2004A-E1007830. This device under test (DUT) is subject to the rules and regulations as a Transceiver.

In testing completed on May 5, 2009, the DUT tested met the allowed specifications for fundamental radiated emissions by 16.3 dB. Band edge and restricted band radiated emissions met the specified limit by more than 1.4 dB. Emissions from digital circuitry met the FCC Class A emissions limits by more than 19.9 dB. AC mains power emissions meet the allowed specifications for conducted emissions by 15.3 dB.

Table of Contents

1. Introduction

This College Park Transceiver was tested for compliance with FCC Regulations, Part 15, adopted under Docket 87-389, April 18, 1989 as subsequently amended, and with Industry Canada RSS-210/Gen, Issue 7, June 2007. 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).

2. 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. The quality system employed at the University of Michigan Radiation Laboratory Willow Run Test Range has been established to ensure all equipment has a clearly identifiable classification, calibration expiry date, and that all calibrations are traceable to national standards.

Table 2.1 Test Equipment.

Test Instrument	Used	Manufacturer/Model	Q Number
Spectrum Analyzer (9kHz-26GHz)	X	Hewlett-Packard 8593E, SN: 3412A01131	HP8593E1
Spectrum Analyzer (9kHz-6.5GHz)	X	Hewlett-Packard 8595E, SN: 3543A01546	JDB8595E
Power Meter		Hewlett-Packard, 432A	HP432A1
Harmonic Mixer (26-40 GHz)		Hewlett-Packard 11970A, SN: 3003A08327	HP11970A1
Harmonic Mixer (40-60 GHz)		Hewlett-Packard 11970U, SN: 2332A00500	HP11970U1
Harmonic Mixer (75-110 GHz)		Hewlett-Packard 11970W, SN: 2521A00179	HP11970W1
Harmonic Mixer (140-220 GHz)		Pacific Millimeter Prod., GMA, SN: 26	PMPGMA1
S-Band Std. Gain Horn	X	S/A, Model SGH-2.6	SBAND1
C-Band Std. Gain Horn	X	University of Michigan, NRL design	CBAND1
XN-Band Std. Gain Horn	X	University of Michigan, NRL design	XNBAND1
X-Band Std. Gain Horn		S/A, Model 12-8.2	XBAND1
X-band horn (8.2- 12.4 GHz)		Narda 640	XBAND2
X-band horn (8.2- 12.4 GHz)	X	Scientific Atlanta , 12-8.2, SN: 730	XBAND3
K-band horn (18-26.5 GHz)	X	FXR, Inc., K638KF	KBAND1
Ka-band horn (26.5-40 GHz)		FXR, Inc., U638A	KABAND1
U-band horn (40-60 GHz)		Custom Microwave, HO19	UBAND1
W-band horn(75-110 GHz)		Custom Microwave, HO10	WBAND1
G-band horn (140-220 GHz)		Custom Microwave, HO5R	GBAND1
Bicone Antenna (30-250 MHz)	X	University of Michigan, RLBC-1	LBBIC1
Bicone Antenna (200-1000 MHz)	X	University of Michigan, RLBC-2	HBBIC1
Dipole Antenna Set (30-1000 MHz)	X	University of Michigan, RLDP-1,-2,-3	UMDIP1
Dipole Antenna Set (30-1000 MHz)		EMCO 3121C, SN: 992 (Ref. Antennas)	EMDIP1
Active Rod Antenna (30 Hz-50 MHz)		EMCO 3301B, SN: 3223	EMROD1
Active Loop Antenna (30 Hz-50 MHz)		EMCO 6502, SN:2855	EMLOOP1
Ridge-horn Antenna (300-5000 MHz)	X	University of Michigan	UMRH1
Amplifier (5-1000 MHz)	X	Avantek, A11-1, A25-1S	AVAMP1
Amplifier (5-4500 MHz)	X	Avantek	AVAMP2
Amplifier (4.5-13 GHz)	X	Avantek, AFT-12665	AVAMP3
Amplifier (6-16 GHz)		Trek	TRAMP1
Amplifier (16-26 GHz)	X	Avantek	AVAMP4
LISN Box		University of Michigan	UMLISN1
Signal Generator		Hewlett-Packard 8657B	HPSG1

3. Device Under Test

3.1 Description & Block Diagram

The DUT is a low power transceiver operating in the 2400 - 2483.5 MHz band. The DUT measures 4.6 x 7 x 8.2 cm and has two PCB antennas internal to the unit. The DUT was designed and manufactured by College Park Industries Inc., 17505 Helro Drive, Fraser, MI 48026. It is identified as:

Device	[Make], Model	[S/N],P/N	EMC Consideration
DUT	[College Park], 104450-01	#2	FCC 15.249 IC RSS-210 Commercial Product
AC Charger	[College Park], GT-41076-0605	10444200	Class B

3.2 Variants & Samples

There is only a single variant of the DUT. One normal operating test sample was provided, and remote test software was used to control channel selection and data rate for testing purposes.

3.3 Modes of Operation

This device operates in only a single mode, data transmission and is for use in commercial research facilities. The operating mode of this transceiver does not influence peak output power. There is only one transmitter which is driven by identical input parameters regardless of DUT data rate. Maximum DUT on time in a 100 ms window occurred at the highest data rate, as tested.

3.4 Exemptions

None.

3.5 EMC Relevant Modifications

No EMI relevant modifications were performed by this test laboratory.

4. Emissions Limits

4.1 Radiated Emissions Limits

The DUT tested falls under the category of an Intentional Radiator. The applicable testing frequencies and corresponding emission limits set by both the FCC and IC are given in Tables 4.1 and 4.2 below.

Table 4.1. TX Emission Limits (FCC: 15.249; IC: RSS-210e A2.9).

Frequency (MHz)	Field Strength of Fundamental (mV/m)	Field Strength of Harmonics (μV/m)
902.0 – 928.0	50	500
2400 - 2483.5	50	500
5725.0 – 5875.0	50	500
24000.0 – 24250.0	250	2500

1) Field strength limits are specified at a distance of 3 meters.
2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209 (Class B), whichever is the lesser attenuation.
3) Peak field strength of any emission above 1GHz shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. (15.35)

Table 4.2. Spurious Emission Limits (FCC: 15.33, .35, .109/209; IC: RSS-210 2.7, T2)

Freq. (MHz)	E_{lim} (3m) μV/m	E_{lim} dB(μV/m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-2000	500	54.0

Note: Average readings apply above 1000 MHz (1 MHz BW), Quasi-Peak readings apply to 1000 MHz (120 kHz RBW), PRF of intentional emissions > 20 Hz for QPK to apply.

4.2 Power Line Conducted Emissions Limits

Table 4.3 Emission Limits (FCC:15.107 (CISPR); IC: RSS-Gen, 7.2.2 T2).

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

5. Measurement Procedures

5.1 Semi-Anechoic Chamber Radiated Emissions

To become familiar with the radiated emission behavior of the DUT, the device is first studied and measured in our shielded semi-anechoic chamber. In the 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.

The DUT is laid on the test table as shown in the included block diagram and/or photographs. A shielded loop antenna is employed when studying emissions from 9 kHz to 30 MHz. Above 30 MHz and below 250 MHz a biconical antenna is employed. Above 250 MHz a ridge or and standard gain horn antennas are used. The spectrum analyzer resolution and video bandwidths are set so as to measure the DUT emission without decreasing the emission bandwidth (EBW) of the device. Emissions are studied for all orientations (3-axes) of the DUT and all test antenna polarizations. In the chamber, spectrum and modulation characteristics of intentional carriers are recorded. Receiver spurious emissions are measured with an appropriate carrier signal applied. Associated test data is presented in subsequent sections.

5.2 Outdoor Radiated Emissions

After measurements are performed indoors, emissions on our outdoor 3-meter Open Area Test Site (OATS) are made. If the DUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.4 are employed. Alternatively, an on-table layout more representative of actual use may be employed if the resulting emissions appear to be worst-case in such a configuration. Any intentionally radiating elements are placed on the test table flat, on their side, and on their end (3-axes) and worst case emissions are recorded. For each configuration the DUT is rotated 360 degrees about its azimuth and the receive antenna is raised and lowered between 1 and 4 meters to maximize radiated emissions from the device. Receiver spurious emissions are measured with an appropriate carrier signal applied. For devices with intentional emissions below 30 MHz, our shielded loop antenna at a 1 meter received height is used. Low frequency field extrapolation to the regulatory limit distance is employed as needed. Emissions between 30 MHz and 1 GHz are measured using tuned dipoles and/or biconical antennas. Care is taken to ensure that the RBW and VBW used meet the regulatory requirements, and that the EBW of the DUT is not reduced. The Photographs included in this report show the DUT on the OATS.

5.3 Radiated Field Computations

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

$$E3(dB\mu V/m) = 107 + PR + KA - KG + KE - CF$$

where	PR	=	power recorded on spectrum analyzer, dB, measured at 3 m
	KA	=	antenna factor, dB/m
	KG	=	pre-amplifier gain, including cable loss, dB
	KE	=	duty correction factor, dB
	CF	=	distance conversion (employed only if limits are specified at alternate distance), dB

When presenting the data at each frequency, the highest measured emission under all of the possible DUT orientations (3-axes) is given.

5.4 Indoor Power Line Conducted Emissions

When applicable, power line conducted emissions are measured in our semi-anechoic chamber. If the DUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.4 are employed. Alternatively, an on-table layout more representative of actual use may be employed if the resulting emissions appear to be worst-case in such a configuration.

The conducted emissions measured with the spectrum analyzer and recorded (in dBμV) from 0-2 MHz and 2-30 MHz for both the ungrounded (Hi) and grounded (Lo) conductors. The spectrum analyzer is set to peak-hold mode in order to record the highest peak throughout the course of functional operation. Only when the emission exceeds or is near the limit are quasi-peak and average detection used.

5.5 Supply Voltage Variation

Measurements of the variation in the fundamental radiated emission were performed with the supply voltage varied by no less than 85% and 115% of the nominal rated value. For battery operated equipment, tests were performed using a fully charged battery, and worst case emissions are re-checked employing a fully charged battery.

6. Test Results

6.1 Radiated Emissions

6.1.1 Peak to Average Ratio

The DUT in normal operating mode is capable of a number of duty cycles depending on the data transfer rate set selected by the user. However, the worst case (maximum on-time) transmission rate is limited to a packet width of 307 us with a packet period of 1.1775 ms. All other transmission rates exhibit a shorter packet width with the same packet period. See Figure 6.1. This results in a worst case duty cycle of:

$$K_E = 0.307 \text{ ms} / 1.1775 \text{ ms} = 0.261 = -11.7 \text{ dB}.$$

6.1.2 Emission Bandwidth

The emission bandwidth of the signal is shown in Figure 6.2. Therein the worst case 99% emission bandwidth was measured to be 2.325 MHz.

6.1.3 Supply Voltage and Supply Voltage Variation

The DUT has been designed to be powered by a 3.7 VDC lithium ion battery. For this test, relative radiated power was measured at the fundamental as the voltage decreased from 4.2 to 3.3 volts. The emission variation is shown in Figure 6.3.

Battery:	before testing	V_{oc} =	4.2 VDC
	after testing	V_{oc} =	3.8 VDC

6.2 Conducted Emissions

Results of AC mains conducted emissions are depicted in Table 6.3. Emissions were measured with the DUT in a charging state drawing maximum current.

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Table 6.1(a) Highest Emissions Measured

	Radiated Emission - RF										College Park, iPECS; FCC/IC
#	Freq. MHz	Ant. Used	Ant. Pol.	Pr (Pk)* dBm	Pr (Avg)** Used	Ka dB/m	Kg dB	E3 dBμV/m	E3lim dBμV/m	Pass dB	Comments
1	**Fundamental Emission**										
2	2402.0	Horn S	H	-40.3	-52.0	21.5	- 1.2	77.7	94.0	**16.3**	low channel
3	2441.0	Horn S	H	-41.4	-53.1	21.5	- 1.2	76.6	94.0	17.4	mid channel
4	2480.0	Horn S	H	-41.1	-52.8	21.5	- 1.2	76.9	94.0	17.1	high channel
5	**Band Edges**										
6	2400.0	Horn S	H	-75.6	See Line 8	21.5	- 1.2	42.4	54.0	11.6	band edge, CH 2402
7	"Delta Method", Pr(Pk) = -40.1 dBm in (3MHz/3MHz), band-edge delta = (-47.9 dBm - -83.4 dBm) in (30 kHz / 3MHz										
8	2400.0	Horn S	H	-67.8	-79.5	21.5	- 1.2	50.2	54.0	**3.8**	band edge, CH 2403
9	2400.0	Horn S	H	-78.3	-90.0	21.5	- 1.2	39.7	54.0	14.3	band edge, CH 2441
10	2400.0	Horn S	H	-78.1	-89.8	21.5	- 1.2	39.9	54.0	14.1	band edge, CH 2480
11	2483.5	Horn S	H	-77.3	-89.0	21.5	- 1.2	40.7	54.0	13.3	band edge, CH 2401
12	2483.5	Horn S	H	-78.2	-89.9	21.5	- 1.2	39.8	54.0	14.2	band edge, CH 2441
13	2483.5	Horn S	H	-76.0	-87.7	21.5	- 1.2	42.0	54.0	12.0	band edge, CH 2480
14											
15	**Harmonics**										
16	4804.0	Horn C	H	-51.5	-63.2	24.6	21.1	47.3	54.0	6.7	low channel
17	4882.0	Horn C	H	-52.5	-64.2	24.6	20.9	46.5	54.0	7.5	mid channel
18	4960.0	Horn C	H	-52.5	-64.2	24.6	20.7	46.8	54.0	7.2	high channel
19	7206.0	Horn XN	H	-58.3	-70.0	25.1	21.7	40.4	54.0	13.6	low channel
20	7323.0	Horn XN	H	-58.6	-70.3	25.2	21.9	40.0	54.0	14.0	mid channel
21	7440.0	Horn XN	H	-56.5	-68.2	25.3	22.1	42.0	54.0	12.0	high channel
22	9608.0	Horn X	H	-61.2	-72.9	27.8	18.0	43.9	54.0	10.1	low channel, noise
23	9764.0	Horn X	H	-60.0	-71.7	27.9	17.9	45.3	54.0	8.7	mid channel, noise
24	9920.0	Horn X	H	-60.2	-71.9	28.0	17.9	45.1	54.0	8.9	high channel, noise
25	12010.0	Horn X	H	-60.5	-72.2	31.7	17.0	49.5	54.0	4.5	low channel, noise
26	12205.0	Horn X	H	-60.7	-72.4	31.8	16.6	49.9	54.0	4.1	mid channel, noise
27	12400.0	Horn X	H	-60.4	-72.1	32.0	16.2	50.6	54.0	3.4	high channel, noise
28	14412.0	Horn Ku	H	-58.2	-69.9	33.2	20.7	49.6	54.0	4.4	low channel, noise
29	14646.0	Horn Ku	H	-58.1	-69.8	33.3	20.9	49.6	54.0	4.4	mid channel, noise
30	14880.0	Horn Ku	H	-57.7	-69.4	33.4	21.1	49.9	54.0	4.1	high channel, noise
31	16814.0	Horn Ku	H	-57.1	-68.8	34.6	21.9	50.9	54.0	3.1	low channel, noise
32	17087.0	Horn Ku	H	-57.4	-69.1	34.8	22.0	50.7	54.0	3.3	mid channel, noise
33	17360.0	Horn Ku	H	-56.0	-67.7	35.0	22.2	52.1	54.0	1.9	high channel, noise
34	19216.0	Horn K	H	-57.6	-69.3	32.2	21.6	48.3	54.0	5.7	low channel, noise
35	19528.0	Horn K	H	-56.7	-68.4	32.3	20.2	50.7	54.0	3.3	mid channel, noise
36	19840.0	Horn K	H	-57.2	-68.9	32.3	17.8	52.6	54.0	**1.4**	high channel, noise
37	21618.0	Horn K	H	-52.2	-63.9	32.7	40.0	35.8	54.0	18.2	low channel, noise
38	21969.0	Horn K	H	-51.3	-63.0	32.8	40.0	36.8	54.0	17.2	mid channel, noise
39	22320.0	Horn K	H	-50.2	-61.9	32.8	40.0	37.9	54.0	16.1	high channel, noise
40	24020.0	Horn K	H	-51.0	-62.7	33.2	40.0	37.5	54.0	16.5	low channel, noise
41	24410.0	Horn K	H	-49.9	-61.6	33.3	40.0	38.7	54.0	15.3	mid channel, noise
42	24800.0	Horn K	H	-47.7	-59.4	33.3	40.0	40.9	54.0	13.1	high channel, noise
43	* Pr (Pk) measured with RBW = 3 MHz, VBW = 3 MHz.										
44	** Avg is computed from Pr (Pk) employing a 11.7 dB duty cycle.										

Meas. 10/29/2010; U of Mich.

Table 6.1(b) Highest Radiated Emissions Measured

College Park, iPEC Sensor; FCC/IC Class A											
#	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	48.0	Bic	H	-75.7	Pk	9.4	39.6	1.1	49.5	48.4	noise
2	48.0	Bic	V	-75.5	Pk	9.4	39.6	1.3	49.5	48.2	noise
3	72.0	Bic	H	-74.8	Pk	7.6	39.0	0.7	49.5	48.8	noise
4	72.0	Bic	V	-74.7	Pk	7.6	39.0	0.8	49.5	48.7	noise
5	84.0	Bic	H	-77.3	Pk	7.7	38.7	-1.3	49.5	50.8	noise
6	84.0	Bic	V	-77.2	Pk	7.7	38.7	-1.2	49.5	50.7	noise
7	108.0	Bic	H	-80.0	Pk	9.0	38.3	-2.3	54.0	56.3	noise
8	108.0	Bic	V	-79.8	Pk	9.0	38.3	-2.1	54.0	56.1	noise
9	118.0	Bic	H	-81.0	Pk	9.8	38.1	-2.3	54.0	56.3	noise
10	118.0	Bic	V	-80.8	Pk	9.8	38.1	-2.1	54.0	56.1	noise
11	144.0	Bic	H	-80.2	Pk	12.0	37.6	1.2	54.0	52.8	noise
12	144.0	Bic	V	-80.1	Pk	12.0	37.6	1.3	54.0	52.7	noise
13	156.0	Bic	H	-79.1	Pk	12.9	37.5	3.3	54.0	50.7	noise
14	156.0	Bic	V	-78.9	Pk	12.9	37.5	3.5	54.0	50.5	noise
15	168.0	Bic	H	-79.2	Pk	13.6	37.3	4.1	54.0	49.9	noise
16	168.0	Bic	V	-78.9	Pk	13.6	37.3	4.4	54.0	49.6	noise
17	234.0	Bic	H	-73.7	Pk	14.7	36.2	11.8	56.9	45.1	noise
18	234.0	Bic	V	-73.6	Pk	14.7	36.2	11.9	56.9	45.0	noise
19	240.0	Bic	H	-73.5	Pk	14.7	36.2	12.0	56.9	44.9	noise
20	240.0	Bic	V	-73.3	Pk	14.7	36.2	12.2	56.9	44.7	noise
21	266.0	Sbic	H	-73.2	Pk	16.4	36.0	14.2	56.9	42.7	noise
22	266.0	Sbic	V	-73.0	Pk	16.4	36.0	14.4	56.9	42.5	noise
23	320.0	Sbic	H	-70.8	Pk	18.7	35.2	19.6	56.9	37.3	noise
24	320.0	Sbic	V	-70.6	Pk	18.7	35.2	19.8	56.9	37.1	noise
25	338.0	Sbic	H	-71.4	Pk	19.3	34.9	20.0	56.9	36.9	noise
26	338.0	Sbic	V	-71.2	Pk	19.3	34.9	20.2	56.9	36.7	noise
27	366.0	Sbic	H	-70.8	Pk	20.2	34.4	22.1	56.9	34.8	noise
28	366.0	Sbic	V	-70.6	Pk	20.2	34.4	22.3	56.9	34.6	noise
29	400.0	Sbic	H	-71.5	Pk	21.1	33.5	23.2	56.9	33.7	noise
30	400.0	Sbic	V	-71.4	Pk	21.1	33.5	23.3	56.9	33.6	noise
31	565.0	Sbic	H	-70.6	Pk	24.2	31.0	29.6	56.9	27.3	noise
32	565.0	Sbic	V	-70.4	Pk	24.2	31.0	29.8	56.9	27.1	noise
33	800.0	Sbic	H	-69.8	Pk	27.4	28.0	36.7	56.9	20.2	noise
34	800.0	Sbic	V	-69.5	Pk	27.4	28.0	37.0	56.9	**19.9**	noise
35											
36											
37											
38											
39											
40											
41											
42											
43											

Meas. 10/20/2010; U of Mich.

Table 6.2 Highest AC Power Line Conducted Emissions Measured

College Park, IPEC Sensor; FCC/IC/CISPR A												
	Freq.	Line Pa	Peak Det., dBµV		ss	QP Det., dBµV		Pass	Ave. Det., dBµV		Pass	
#	MHz	Side	Vtest	Vlim*	dB*	Vtest	Vlim	dB	Vtest	Vlim	dB	Comments
1	0.18	Hi	55.7	66.0	10.3	54.5	79.0	24.5	45.8	66.0	20.2	
2	0.18	Hi	56.6	66.0	9.4	55.3	79.0	23.7	46.5	66.0	19.5	
3	0.20	Hi	46.8	66.0	19.2		79.0			66.0		
4	0.24	Hi	50.7	66.0	**15.3**		79.0			66.0		
5	0.36	Hi	41.7	66.0	24.3		79.0			66.0		
6	0.36	Hi	41.0	66.0	25.0		79.0			66.0		
7	0.48	Hi	40.0	66.0	26.0		79.0			66.0		
8	0.49	Hi	40.4	66.0	25.6		79.0			66.0		
9	0.54	Hi	39.4	60.0	20.6		73.0			60.0		
10	0.60	Hi	38.3	60.0	21.7		73.0			60.0		
11	0.66	Hi	39.0	60.0	21.0		73.0			60.0		
12	0.73	Hi	38.8	60.0	21.2		73.0			60.0		
13	0.79	Hi	38.3	60.0	21.7		73.0			60.0		
14	0.84	Hi	38.0	60.0	22.0		73.0			60.0		
15	0.97	Hi	37.4	60.0	22.6		73.0			60.0		
16	1.03	Hi	36.8	60.0	23.2		73.0			60.0		
17	1.33	Hi	35.7	60.0	24.3		73.0			60.0		
18	27.20	Hi	44.8	60.0	15.3		73.0			60.0		
19	27.34	Hi	45.2	60.0	14.8		73.0			60.0		
20	27.83	Hi	45.2	60.0	14.8		73.0			60.0		
21	28.39	Hi	46.0	60.0	14.1		73.0			60.0		
22												
23	0.18	Lo	55.3	66.0	10.7	54.0	79.0	25.0	45.1	66.0	20.9	
24	0.24	Lo	49.9	66.0	**16.1**		79.0			66.0		
25	0.30	Lo	39.4	66.0	26.6		79.0			66.0		
26	0.36	Lo	40.6	66.0	25.4		79.0			66.0		
27	0.42	Lo	39.5	66.0	26.5		79.0			66.0		
28	0.48	Lo	36.3	66.0	29.7		79.0			66.0		
29	27.30	Lo	38.5	60.0	21.5		73.0			60.0		
30	15.72	Lo	38.5	60.0	21.5		73.0			60.0		
31	16.63	Lo	38.4	60.0	21.6		73.0			60.0		
32	13.62	Lo	38.1	60.0	21.9		73.0			60.0		
33	14.46	Lo	37.9	60.0	22.1		73.0			60.0		
34	18.38	Lo	37.8	60.0	22.2		73.0			60.0		
35	19.50	Lo	37.6	60.0	22.4		73.0			60.0		
36	21.04	Lo	37.4	60.0	22.6		73.0			60.0		
37	19.01	Lo	37.4	60.0	22.6		73.0			60.0		
38	20.34	Lo	37.4	60.0	22.7		73.0			60.0		
39												
40												
41												
42												
40												

**Average limit* Meas. 11/15/2010; U of Mich.

Since Vpeak >= Vqp >= Vave and if Vtestpeak < Vavelim, then Vqplim and Vavelim are met.

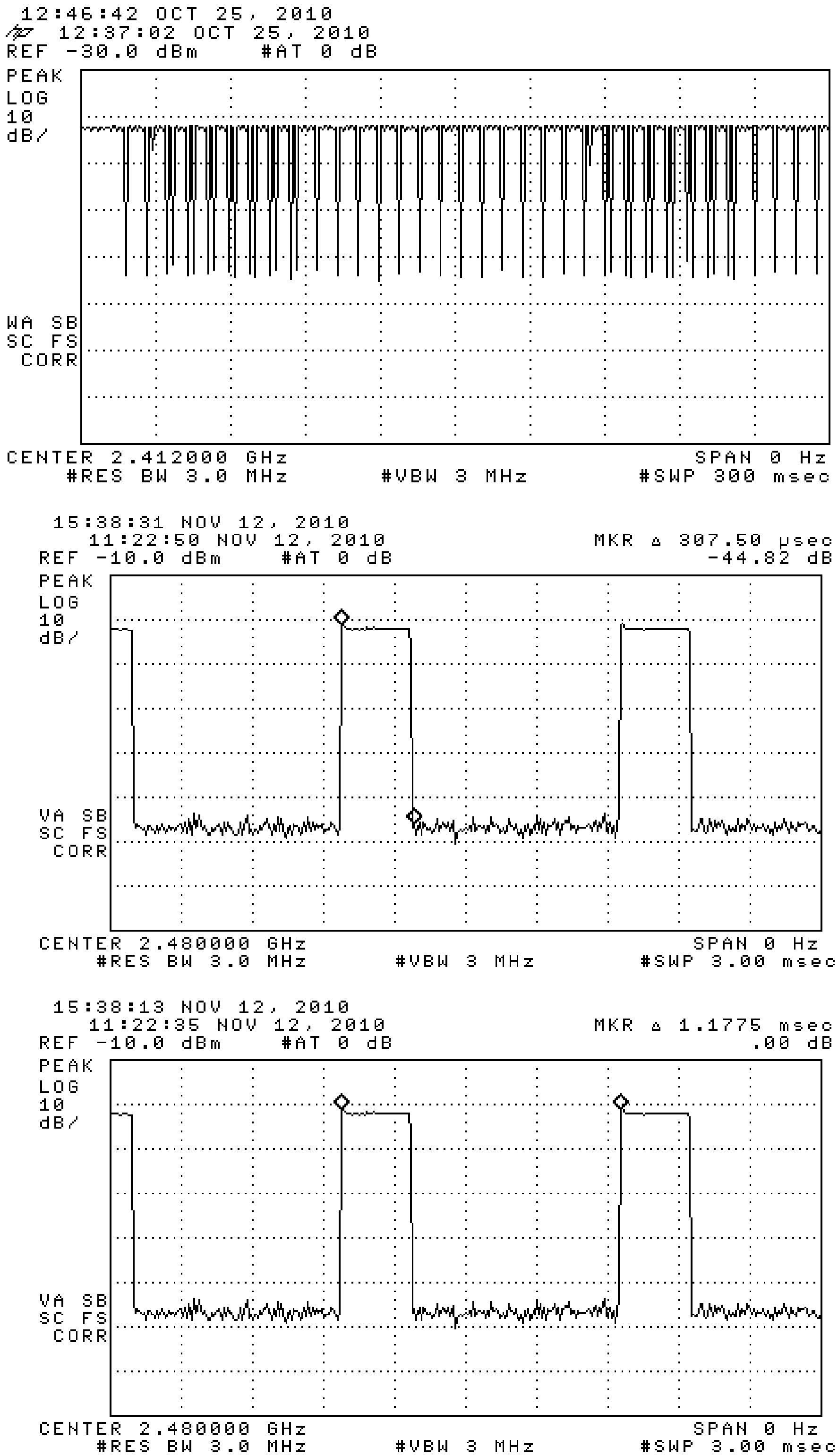

Figure 6.1. Transmission modulation characteristics. (top) continuous transmission on a single channel, (middle) maximum packet on-time, (bottom) packet period. (same for all channels)

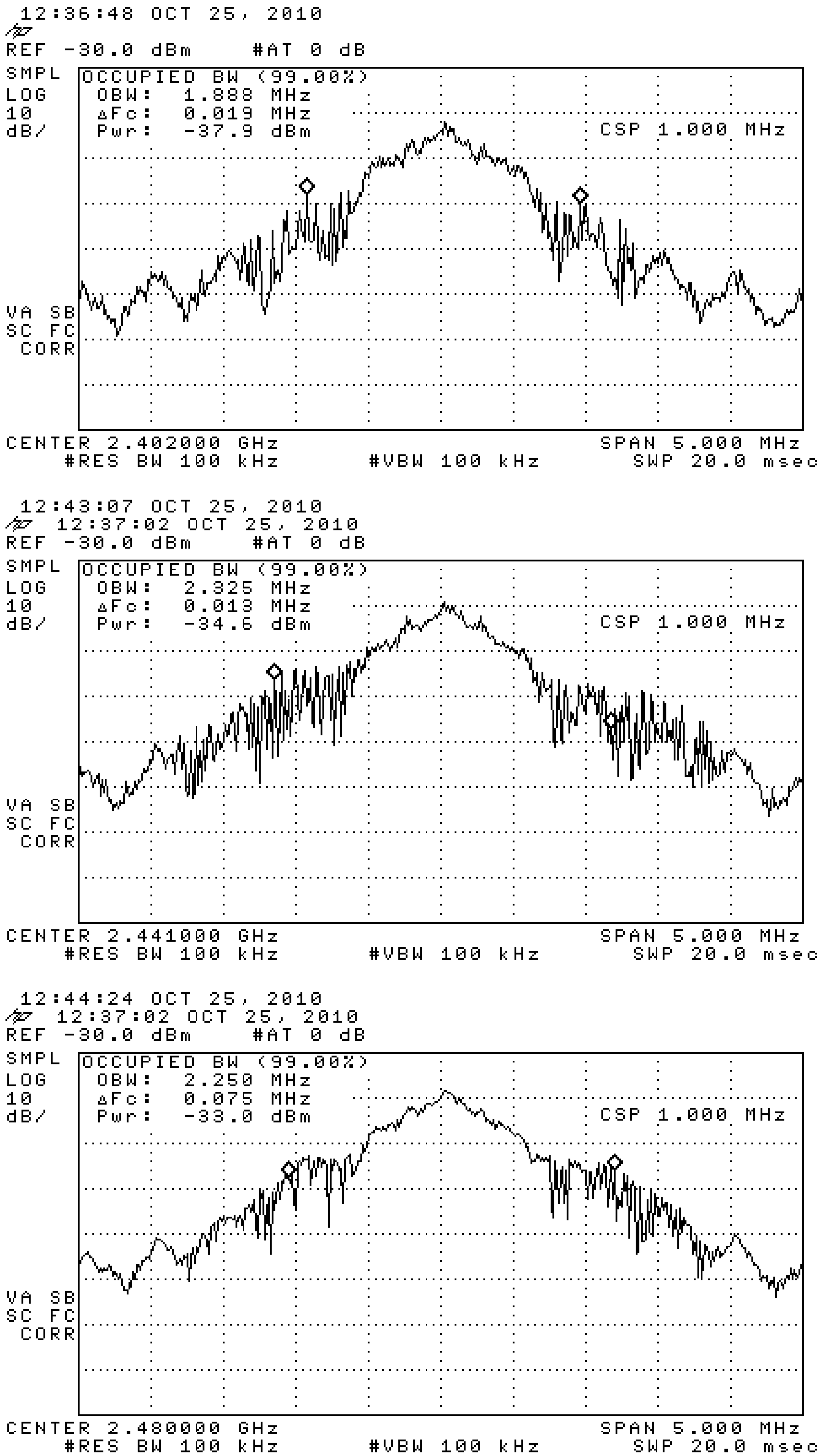

Figure 6.2. Measured emission bandwidth of the DUT (pulsed). (top) low channel, (middle) middle channel, (bottom) high channel.

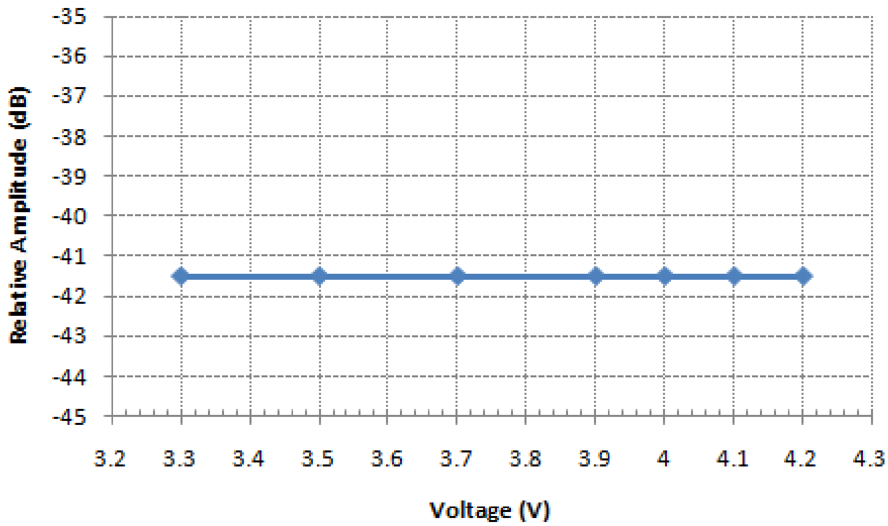

Figure 6.3. Relative emission at fundamental vs. supply voltage (pulsed).

Photograph 6.4. (left) DUT on OATS, (right) Close-up on OATS (one of three axes tested)

Photograph 6.5. (left) DUT on Conducted Emissions Table, (right) Indoor Setup (one of three axes tested)