FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

Power Monitoring Module

MODEL NUMBER: P5T3

REPORT NUMBER: 10006685B-1

ISSUE DATE: March 3, 2014
REVISION DATE: March 14, 2014

Prepared for
Packet Power LLC
2095 Salem Ct.
Orono
MN, 55356, USA

Prepared by
UL LLC
333 Pfingsten Rd.
Northbrook, IL 60446, U.S.A.
TEL: (847) 272-8800
FAX: (847) 272-8129

NVLAP Lab code: 100414-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/04/14	Initial Issue	M.Ferrer
1	03/14/14	Updated 8.3.1-8.3.3, added 11	M.Ferrer

UL LLC - Consumer Technology Division FORM NO: CCSUP4701I
333 Pfingsten Rd., Northbrook, IL 60446, USA TEL: (847) 272-8800 FAX: (847) 272-8129

TABLE OF CONTENTS

UL LLC - Consumer Technology Division FORM NO: CCSUP4701I
333 Pfingsten Rd., Northbrook, IL 60446, USA TEL: (847) 272-8800 FAX: (847) 272-8129

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Packet Power LLC
2095 Salem Ct
Orono, MN, 55356, USA

EUT DESCRIPTION: Power Monitoring Module

MODEL: P5T3

SERIAL NUMBER: None

DATE TESTED: March 3, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL By:

Bart Mucha
Staff ENGINEER
UL LLC

Tested By:

MICHAEL FERRER
PROJECT LEAD
UL LLC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60062, USA.
UL NBK is accredited by NVLAP, Laboratory Code 100414-0

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring 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.

4.2. SAMPLE CALCULATION

Sample Calculations
Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)
Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)
Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.27dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.28dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.33dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.39dB
Radiated Emissions	1-6GHz	Horn	5.02dB
Radiated Emissions	6-18GHz	Horn	5.34dB
Radiated Emissions	18-26GHz	Horn	6.60dB
Conducted Ant Port	30MHz-26GHz	Spectrum Analyzer	2.94dB
RF Power	dB	Power Meter	0.45dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a wireless monitoring device of AC power.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
902.4-927.6	Basic GFSK	-13.96	0.04

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a ¼ wave length 82mm antenna, with a maximum gain of 0.5 dBi. Antenna in integral, therefore Radiated Emissions represented Conducted Antenna port measurements.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

Line Conducted test, EUT was setup on 80cm table

UL LLC - Consumer Technology Division FORM NO: CCSUP4701I
333 Pfingsten Rd., Northbrook, IL 60446, USA TEL: (847) 272-8800 FAX: (847) 272-8129

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Use	Product Type	Manufacturer	Model	Comments
EUT	Power Monitoring Module	Packet Power L L C	P5T3	None
Note: **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)				

I/O CABLES

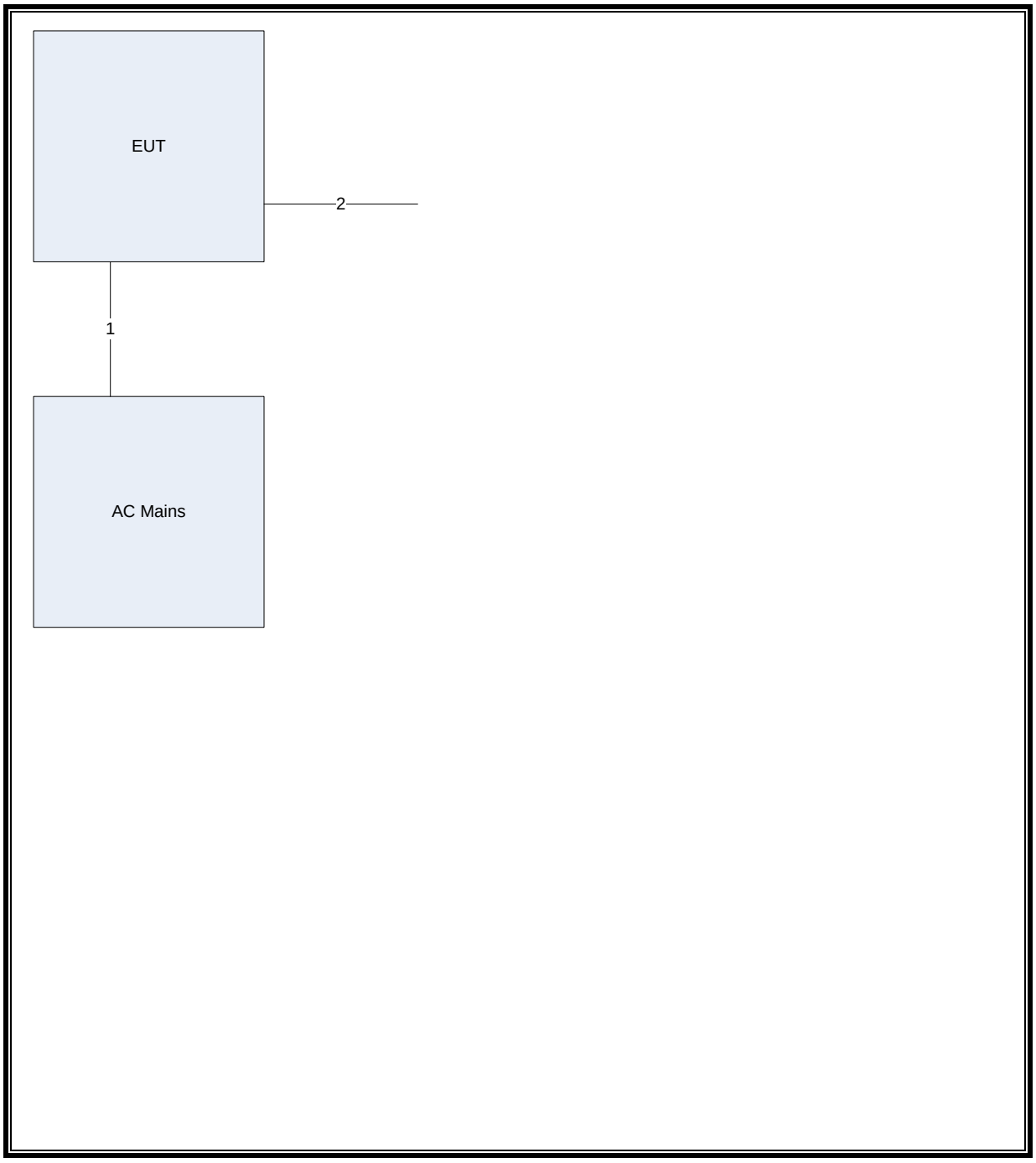
Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
1	Mains	AC	N	N	AC Input
2	Mains	AC	N	N	AC Output, no termination

Note:
AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

TEST SETUP

The EUT is not installed in a conduit box during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



UL LLC - Consumer Technology Division FORM NO: CCSUP4701I
333 Pfingsten Rd., Northbrook, IL 60446, USA TEL: (847) 272-8800 FAX: (847) 272-8129

6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List						
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**	**Test**
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20131220	20141231	RE
Bicon Antenna	Chase	VBA6106A	EMC4078	20130213	20140228	RE
Bicon Antenna	Electro-Metrics	EM-6981A	EMC4070	20130911	20140930	RE
Log-P Antenna	Chase	UPA6109	EMC4313	20131003	20141031	RE
Spectrum Analyzer	Agilent	E4446A	MY45300099	20130129	20150129	RE
Spectrum Analyzer	Rohde & Schwarz	FSEK	EMC4182	20131217	20143112	RE
Antenna Array	UL	BOMS	EMC4276	20130913	20140913	RE
EMI Test Receiver	Agilent	N9030A	EMC4360	20131221	20141221	OBW, Dwell
Antenna	EMCO	-	-	N/A	N/A	OBW, Dwell
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20131217	20141231	CE
LISN	Solar	8602-50-TS-50-N	EMC4052	20140116	20150116	CE
LISN	Solar	8602-50-TS-50-N	EMC4064	20140116	20150116	CE
LISN	Solar	8602-50-TS-50-N	EMC4067	20140116	20150116	CE
LISN	Solar	8602-50-TS-50-N	EMC4065	20140116	20150116	CE

7. ANTENNA PORT TEST RESULTS

8. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

8.1. ON TIME AND DUTY CYCLE RESULTS

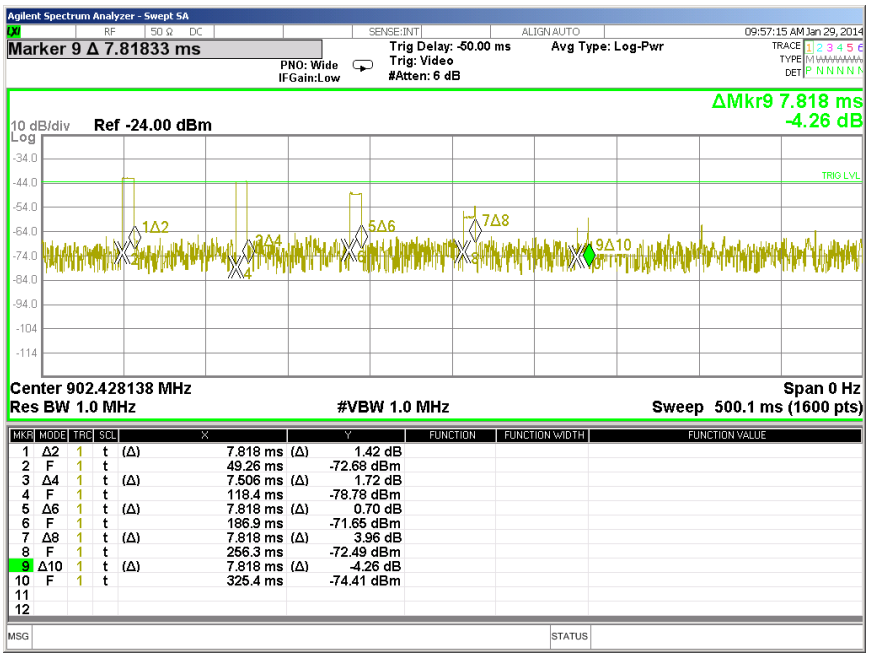
.

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
900MHz band (Hopping ON)						
EUT	15.600	100	0.156	15.60%	16.14	N/A

8.2. DUTY CYCLE PLOTS

HOPPING ON

DUTY CYCLE



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	1	t	(Δ) 7.818 ms	(Δ) 1.42 dB			
2	F	1	t	49.26 ms	-72.68 dBm			
3	Δ4	1	t	(Δ) 7.506 ms	(Δ) 1.72 dB			
4	F	1	t	118.4 ms	-78.78 dBm			
5	Δ6	1	t	(Δ) 7.818 ms	(Δ) 0.70 dB			
6	F	1	t	186.9 ms	-71.65 dBm			
7	Δ8	1	t	(Δ) 7.818 ms	(Δ) 3.96 dB			
8	F	1	t	256.3 ms	-72.49 dBm			
9	Δ10	1	t	(Δ) 7.818 ms	(Δ) -4.26 dB			
10	F	1	t	325.4 ms	-74.41 dBm			
11								
12								

8.3. BASIC DATA RATE GFSK MODULATION

8.3.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

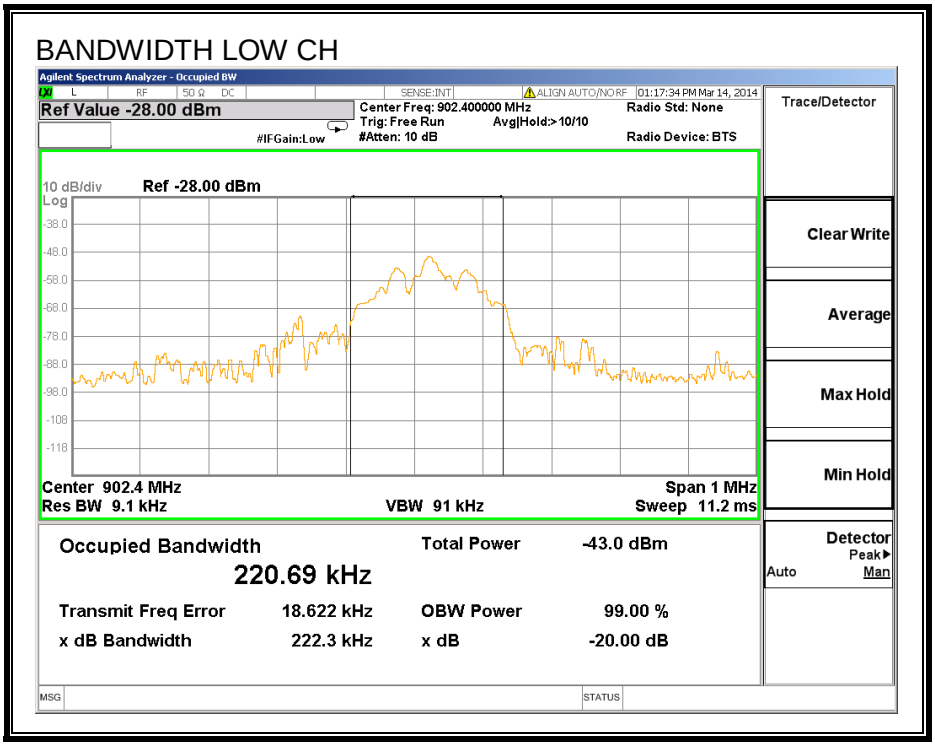
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

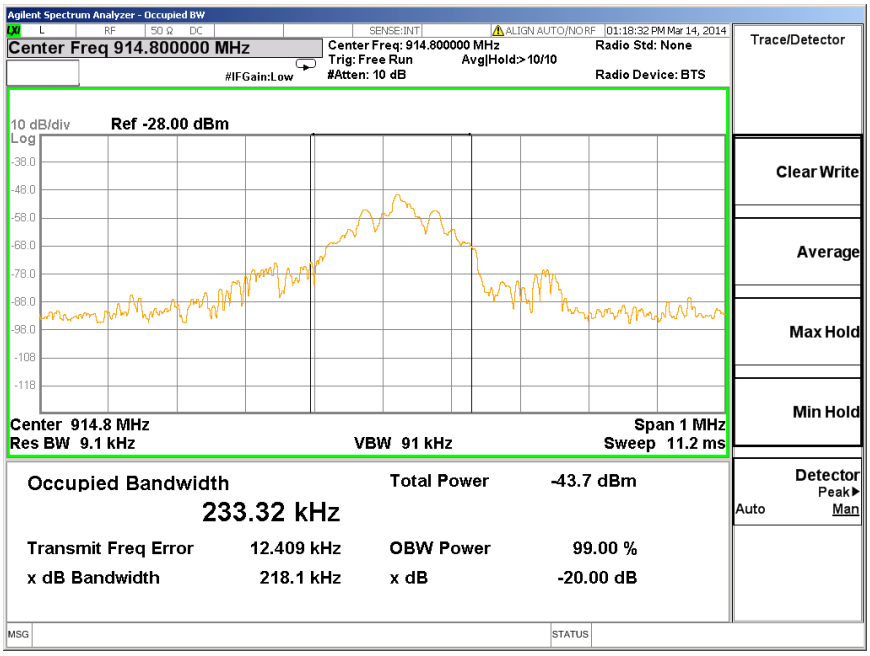
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	902.4	222.3	225.38
Middle	914.8	218.1	215.43
High	927.6	217.4	207.26

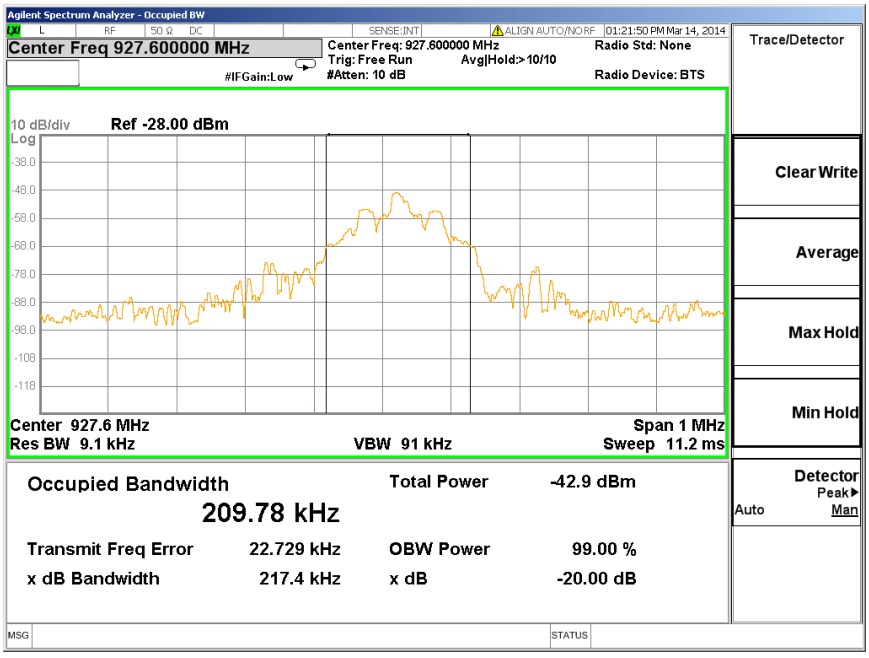
20 dB BANDWIDTH



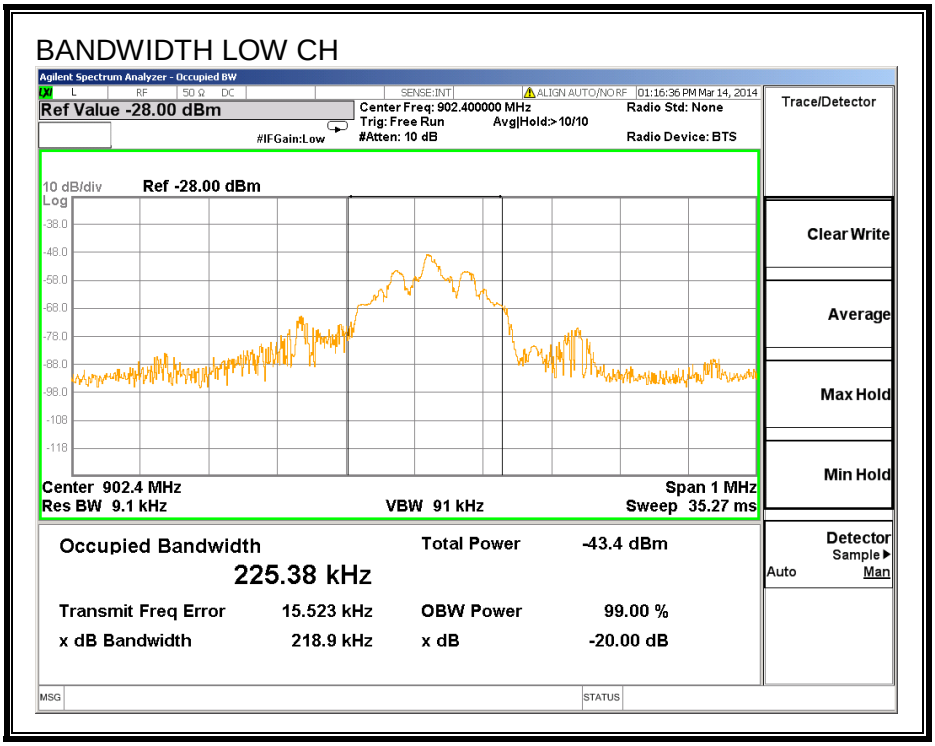
BANDWIDTH MID CH



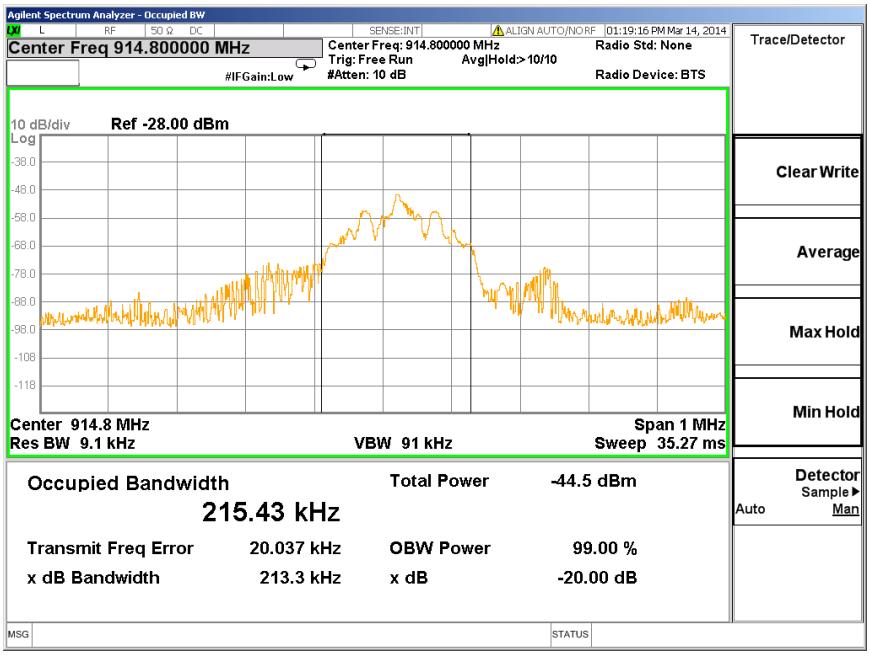
BANDWIDTH HIGH CH



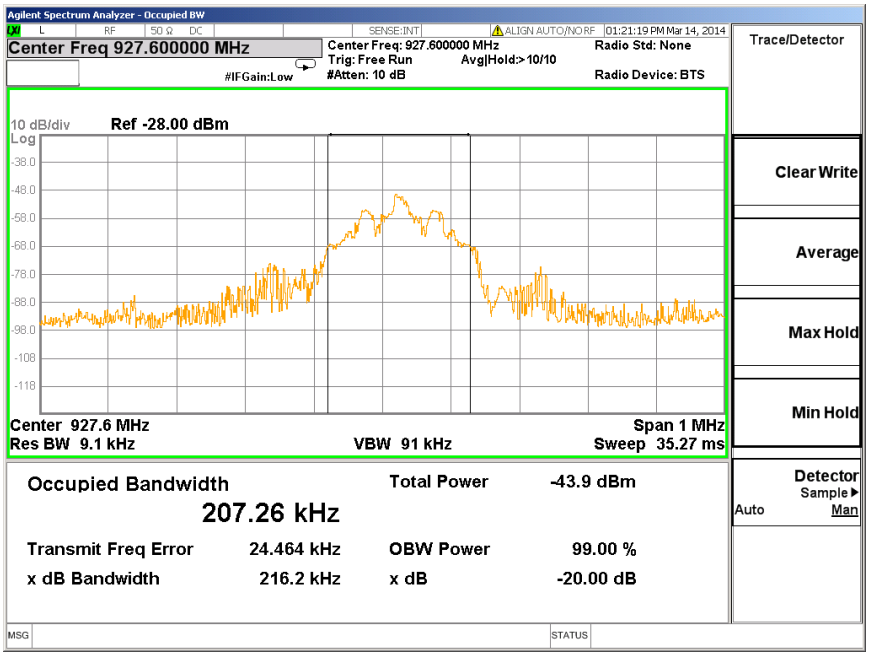
99% BANDWIDTH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



8.3.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

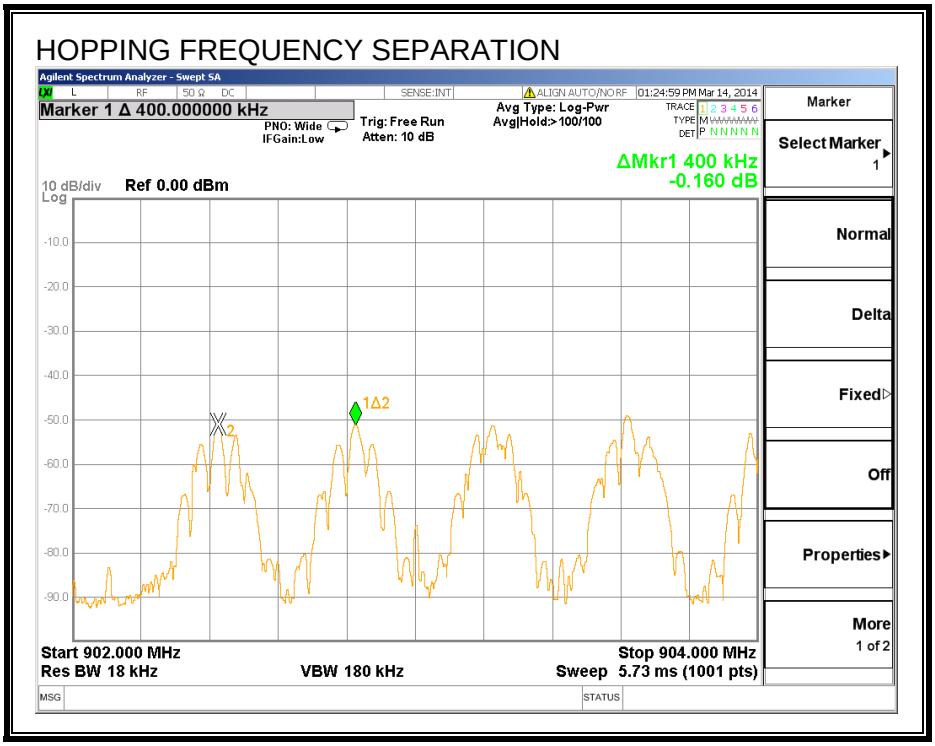
For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% of the span and the VBW $\geq$ RBW. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION



8.3.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies

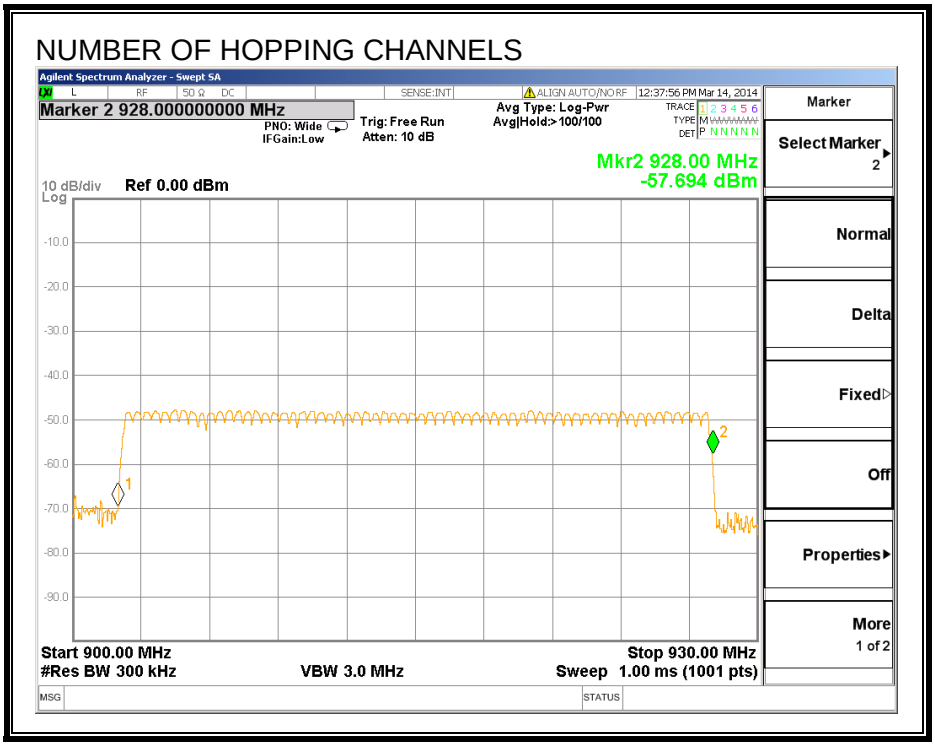
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

Normal Mode: 64 Channels observed

NUMBER OF HOPPING CHANNELS



8.3.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 25.6 second scan, to enable resolution of each occurrence.

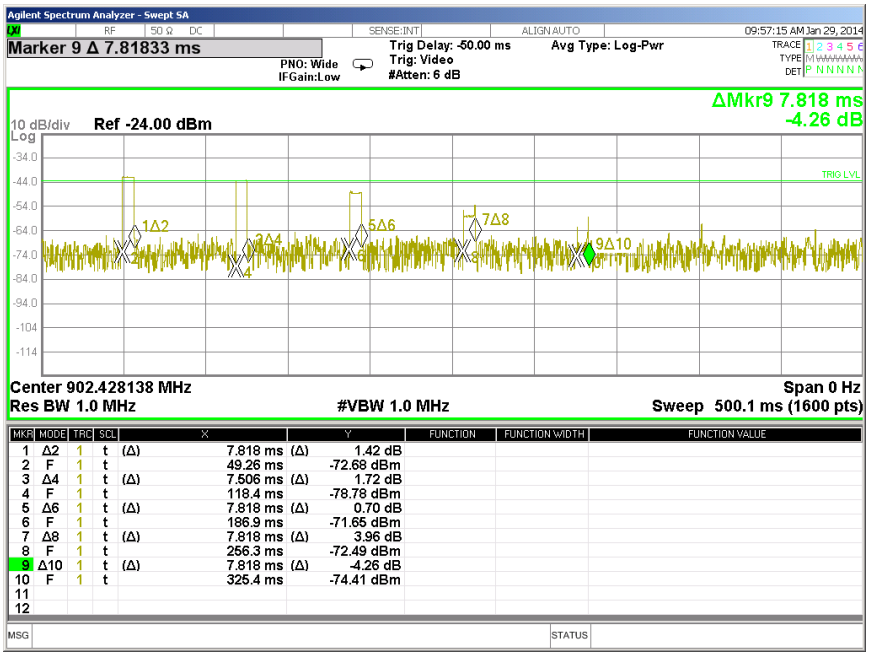
The average time of occupancy in the specified 25.6 second period (64 channels * 0.4 s) is equal to pulse width.

RESULTS

	Pulse Width (msec)	Number of Pulses in 20sec	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
EUT	7.8	25	0.195	0.4	-0.205

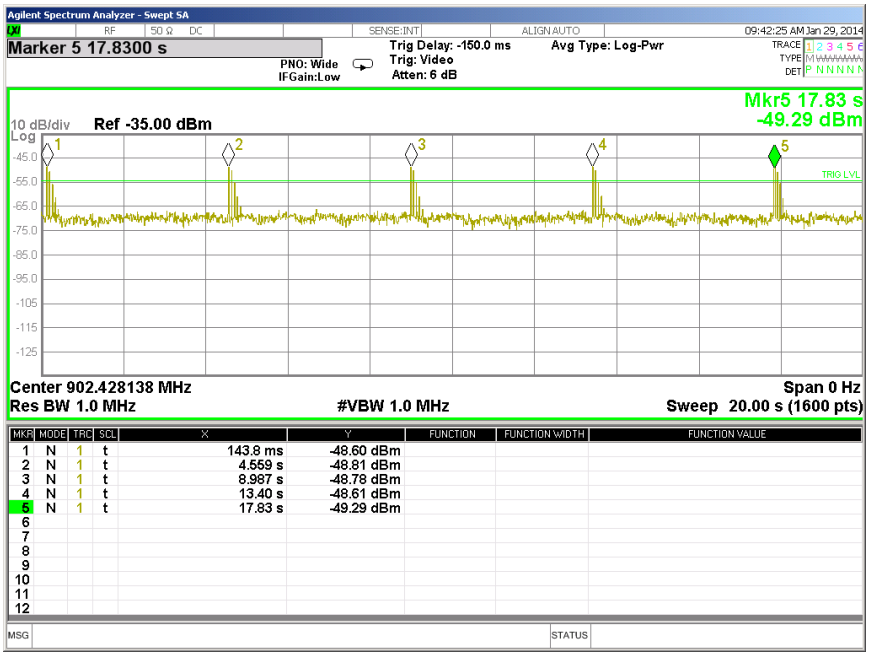
PULSE WIDTH

PULSE WIDTH



NUMBER OF PULSES OBSERVATION PERIOD

NUMBER OF PULSES - 25



5 pulses per train.

8.3.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output power was found using calculation from field strength measurement. See below for calculation.

RESULTS

Channel	Frequency (MHz)	Field Strength dBuV/m	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	902.4	81.95	-14.14	30	-44.14
Middle	914.8	81.93	-14.16	30	-44.16
High	927.6	82.13	-13.96	30	-43.96

The Maximum Peak Output Power was calculated from equitation
$P=(E \times d)^2/30G$, where
P is the power in watts;
E is the measured field strength in V/m;
d is the measurement distance, d = 3m;
G is the numerical antenna gain of the transmitter G = 0.5dBi , or G = 1.122 (numerical)

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 900MHz band.

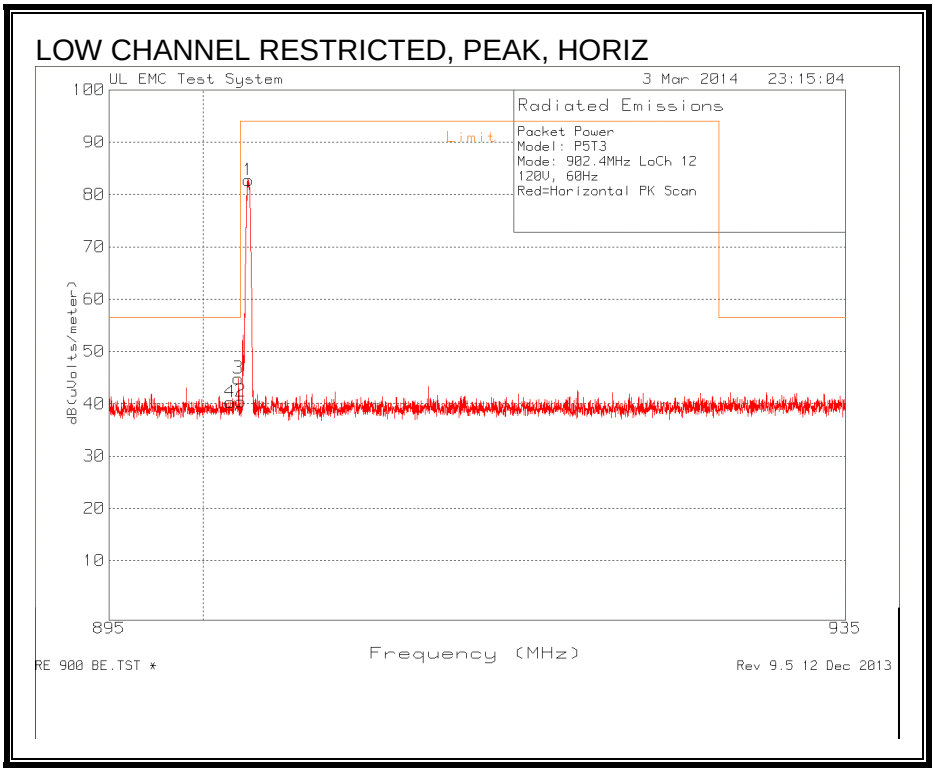
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Note: Bandedge scans shows at least 20dB margin at the bandedge. This is shown because EUT antenna port was not available for conducted antenna port measurements.

9.2. TRANSMITTER ABOVE 1 GHz

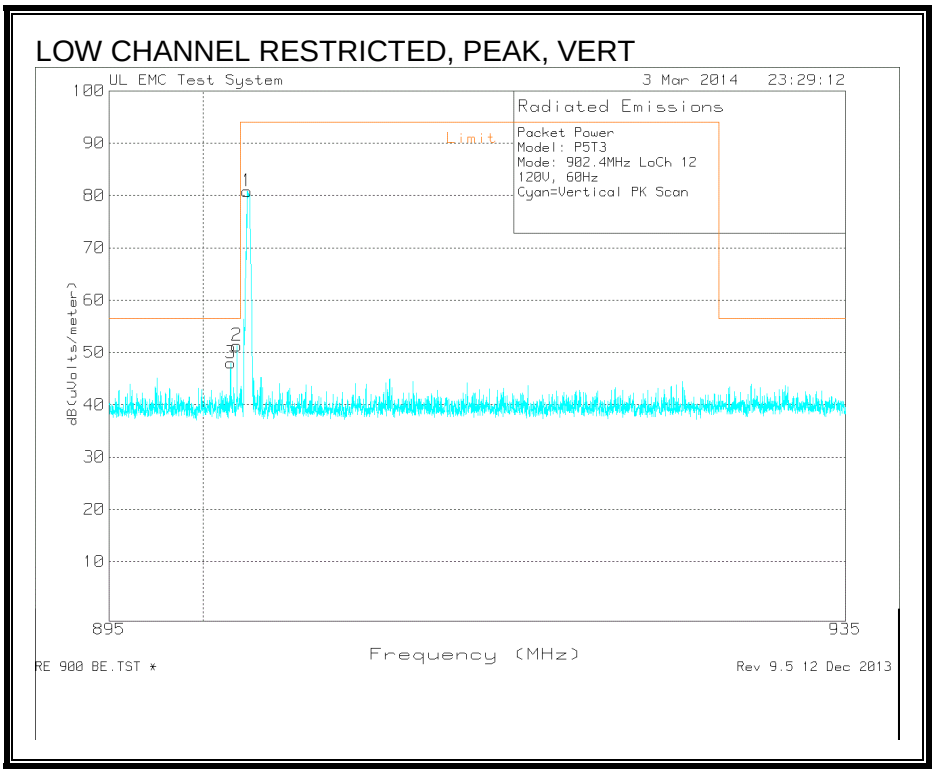
9.2.1. GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



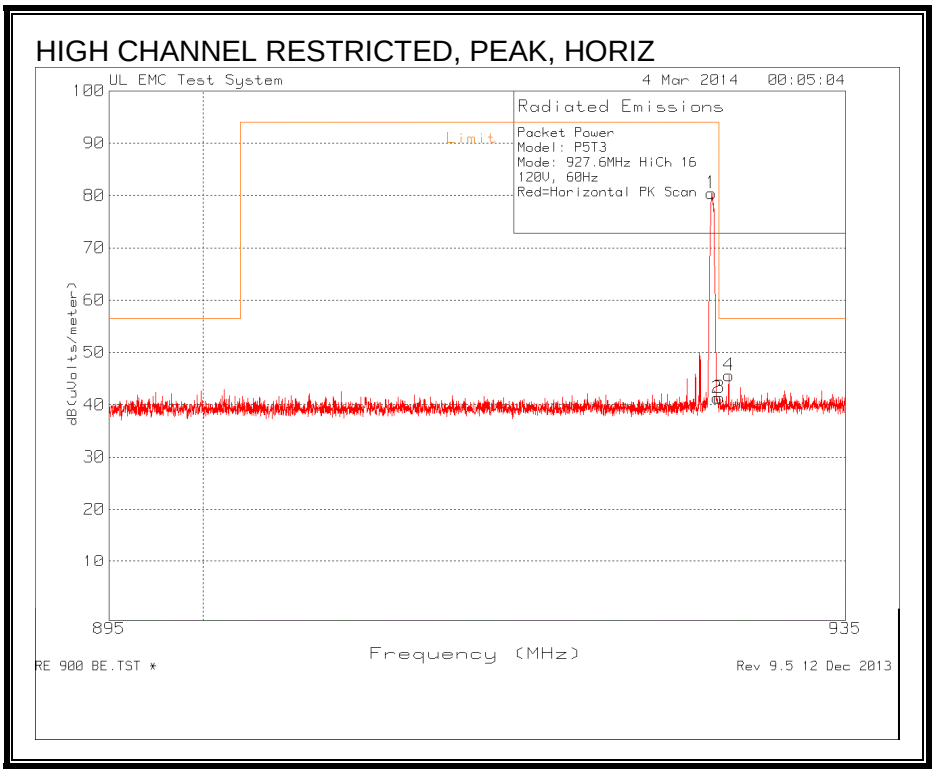
Packet Power											
Model: P5T3											
Mode: 902.4MHz LoCh 12											
120V, 60Hz											
Red=Horizontal PK Scan											
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Cable Factor dB	Corrected Reading dB(uVolts /meter)	Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	902.43	49.9	PK	22.9	9.9	82.7	94	-11.3	0-360	154	H
2	902.02	7.59	PK	22.9	9.9	40.39	94	-53.61	0-360	199	H
3	901.9	11.99	PK	22.9	9.9	44.79	56.48	-11.69	0-360	199	H
4	901.44	7.45	PK	22.9	9.9	40.25	56.48	-16.23	0-360	199	H
PK - Peak detector											

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Packet Power											
Model: P5T3											
Mode: 902.4MHz LoCh 12											
120V, 60Hz											
Cyan=Vertical PK Scan											
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Cable Factor dB	Corrected Reading dB(uVolts/ meter)	Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	902.375	47.97	PK	22.9	9.9	80.77	94	-13.23	0-360	199	V
2	901.82	18.51	PK	22.9	9.9	51.31	56.48	-5.17	0-360	199	V
3	901.48	15.19	PK	22.9	9.9	47.99	56.48	-8.49	0-360	199	V
PK - Peak detector											

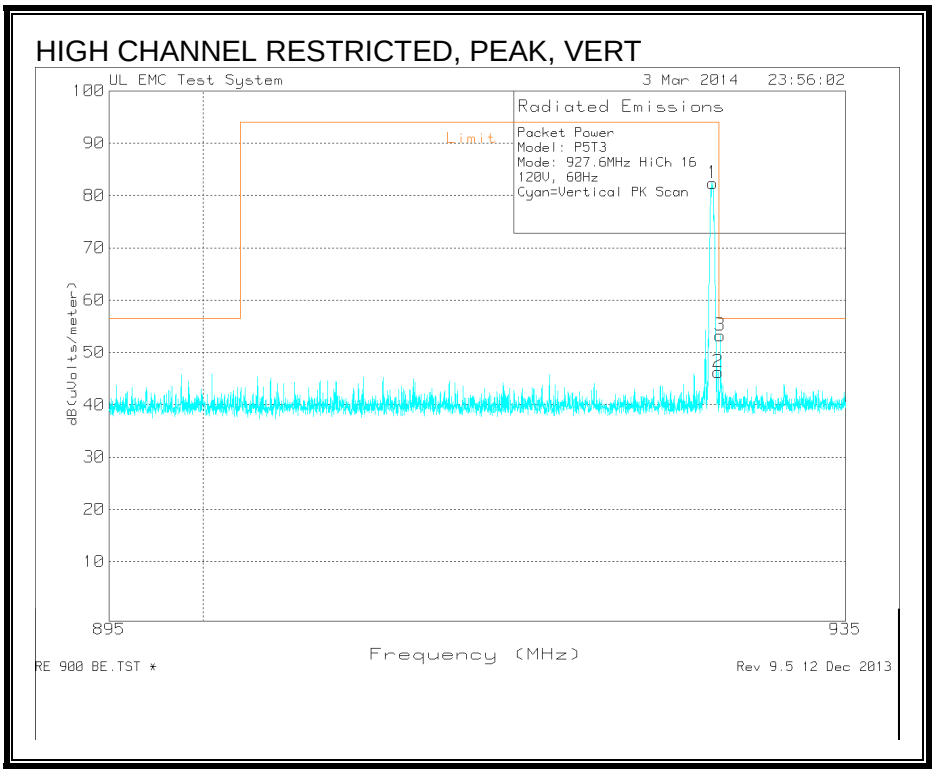
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



UL LLC - Consumer Technology Division FORM NO: CCSUP4701I
333 Pfingsten Rd., Northbrook, IL 60446, USA TEL: (847) 272-8800 FAX: (847) 272-8129

Packet Power											
Model: P5T3											
Mode: 927.6MHz HiCh 16											
120V, 60Hz											
Red=Horizontal PK Scan											
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Cable Factor dB	Corrected Reading dB(uVolts /meter)	Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	927.6	47.15	PK	23.3	10	80.45	94	-13.55	0-360	101	H
2	927.91	7.98	PK	23.3	10	41.28	94	-52.72	0-360	101	H
3	928.05	7.99	PK	23.3	10	41.29	56.48	-15.19	0-360	101	H
4	928.55	12.3	PK	23.3	10	45.6	56.48	-10.88	0-360	199	H
PK - Peak detector											

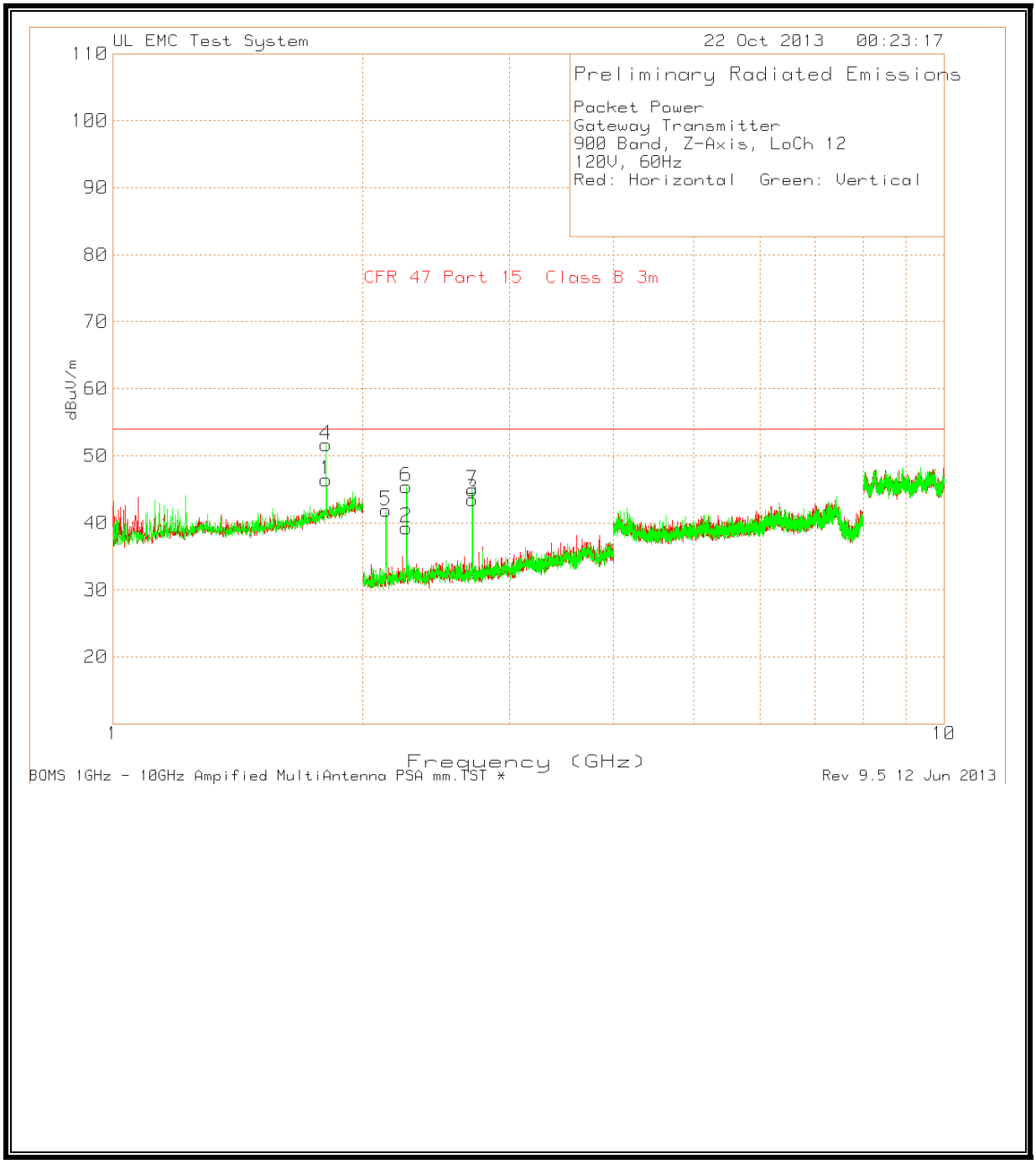
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Packet Power											
Model: P5T3											
Mode: 927.6MHz HiCh 16											
120V, 60Hz											
Cyan=Vertical PK Scan											
Marker No.	Test Frequency (MHz)	Meter Reading(dBuV)	Detector	UPA6109 SN24423 EMC43133M	3 meter with LogP Emissions Ca	Corrected Reading dB(uVolts/meter)	Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	927.66	49.03	PK	23.3	10	82.33	94	-11.67	0-360	199	V
2	927.98	12.94	PK	23.3	10	46.24	94	-47.76	0-360	199	V
3	928.09	19.94	PK	23.3	10	53.24	56.48	-3.24	0-360	101	V
PK - Peak detector											

HARMONICS AND SPURIOUS EMISSIONS

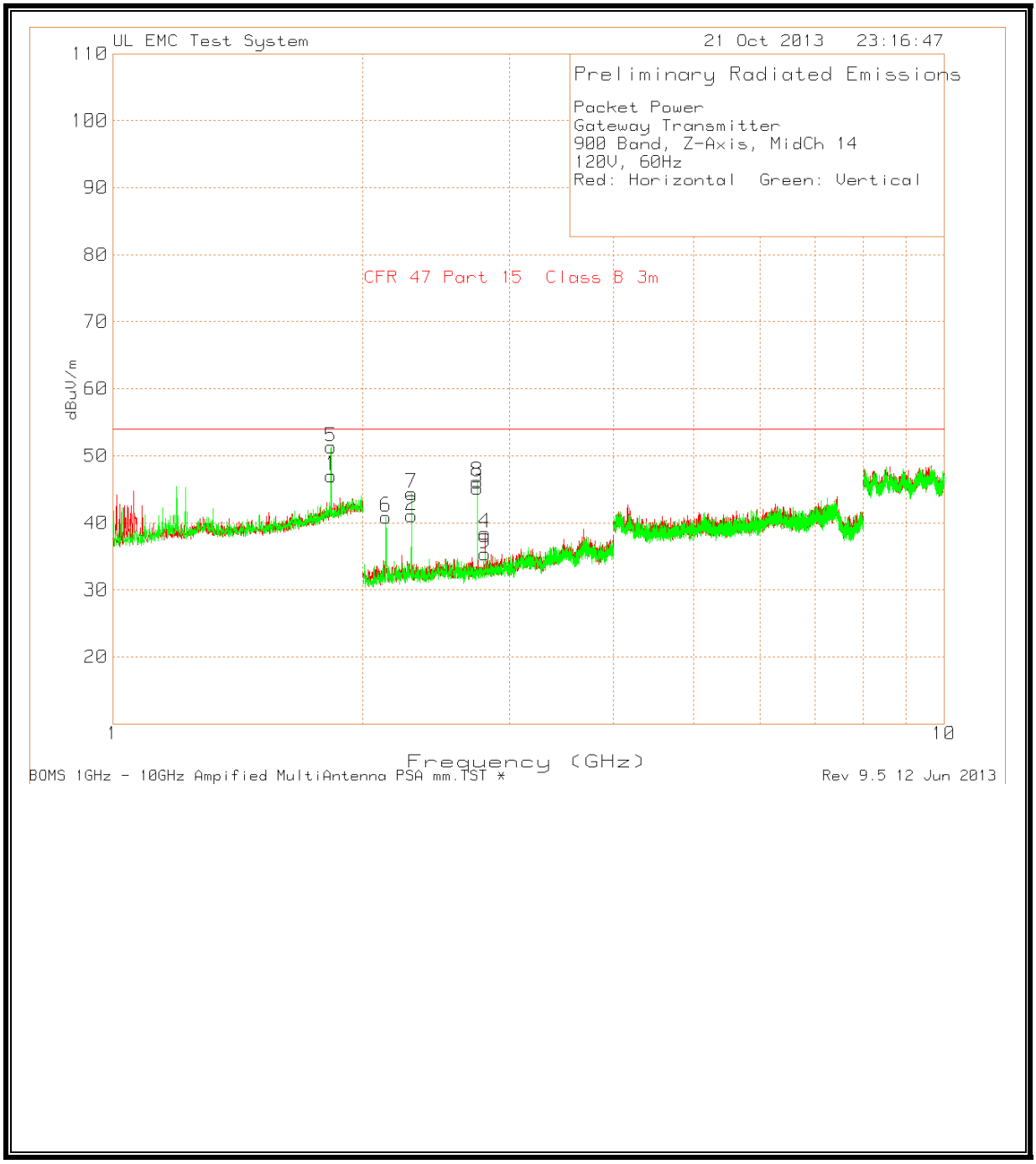
Lo Channel



Packet Power											
Gateway Transmitter											
900 Band, Z-Axis, LoCh 12											
120V, 60Hz											
Red: Horizontal Green: Vertical											
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna factor dB/m	BOMS Factor (dB)	Corrected Reading dBuV/m	Limit dB	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.805	15.63	PK	26.8	3.98	46.41	54	-7.59	0-360	100	H
2	2.256	68.99	PK	21.7	-51.44	39.25	54	-14.75	0-360	100	H
3	2.707	72.06	PK	22.1	-50.69	43.47	54	-10.53	0-360	100	H
4	1.805	20.87	PK	26.8	3.98	51.65	54	-2.35	0-360	100	V
5	2.131	72.45	PK	21.5	-52.11	41.84	54	-12.16	0-360	100	V
6	2.256	75.13	PK	21.7	-51.44	45.39	54	-8.61	0-360	100	V
7	2.707	73.51	PK	22.1	-50.69	44.92	54	-9.08	0-360	100	V
PK - Peak detector											

HARMONICS AND SPURIOUS EMISSIONS

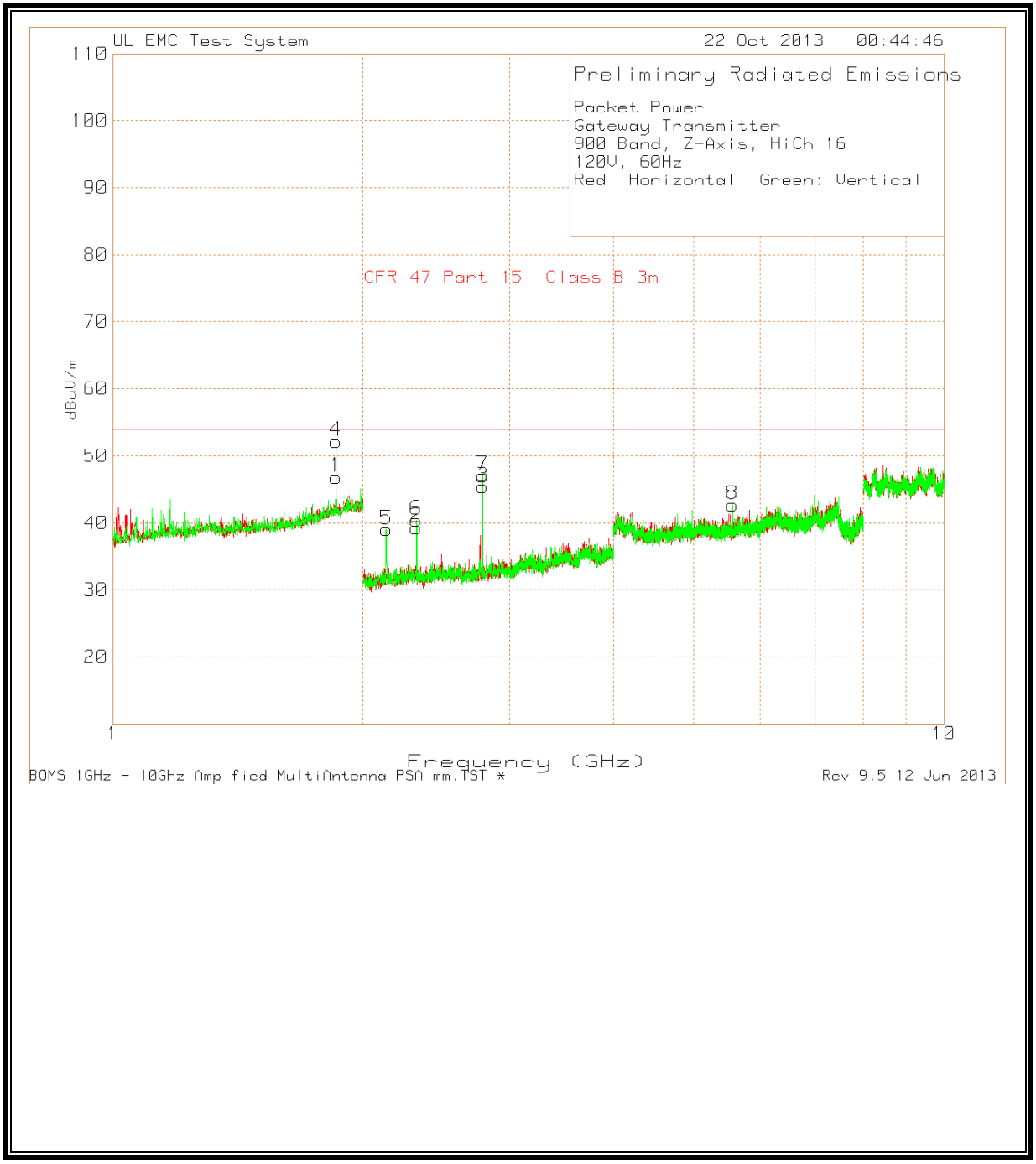
Mid Channel



Packet Power											
Gateway Transmitter											
900 Band, Z-Axis, MidCh 14											
120V, 60Hz											
Red: Horizontal Green: Vertical											
Marker No.	Test Frequency (GHz)	Meter Reading(dBuV)	Detector	Antenna factor dB/m	BOMS Factor (dB)	Corrected Reading dBuV/m	Limit dB	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.83	16.15	PK	26.9	3.97	47.02	54	-6.98	0-360	100	H
2	2.287	70.25	PK	21.7	-50.87	41.08	54	-12.92	0-360	100	H
3	2.744	73.75	PK	22.1	-50.67	45.18	54	-8.82	0-360	100	H
4	2.803	66.57	PK	22.2	-50.3	38.47	54	-15.53	0-360	100	H
5	1.83	20.44	PK	26.9	3.97	51.31	54	-2.69	0-360	149	V
6	2.131	71.51	PK	21.5	-52.11	40.9	54	-13.1	0-360	100	V
7	2.287	73.56	PK	21.7	-50.87	44.39	54	-9.61	0-360	100	V
8	2.745	74.72	PK	22.1	-50.67	46.15	54	-7.85	0-360	100	V
9	2.804	63.5	PK	22.2	-50.29	35.41	54	-18.59	0-360	149	V
PK - Peak detector											

HARMONICS AND SPURIOUS EMISSIONS

Hi Channel

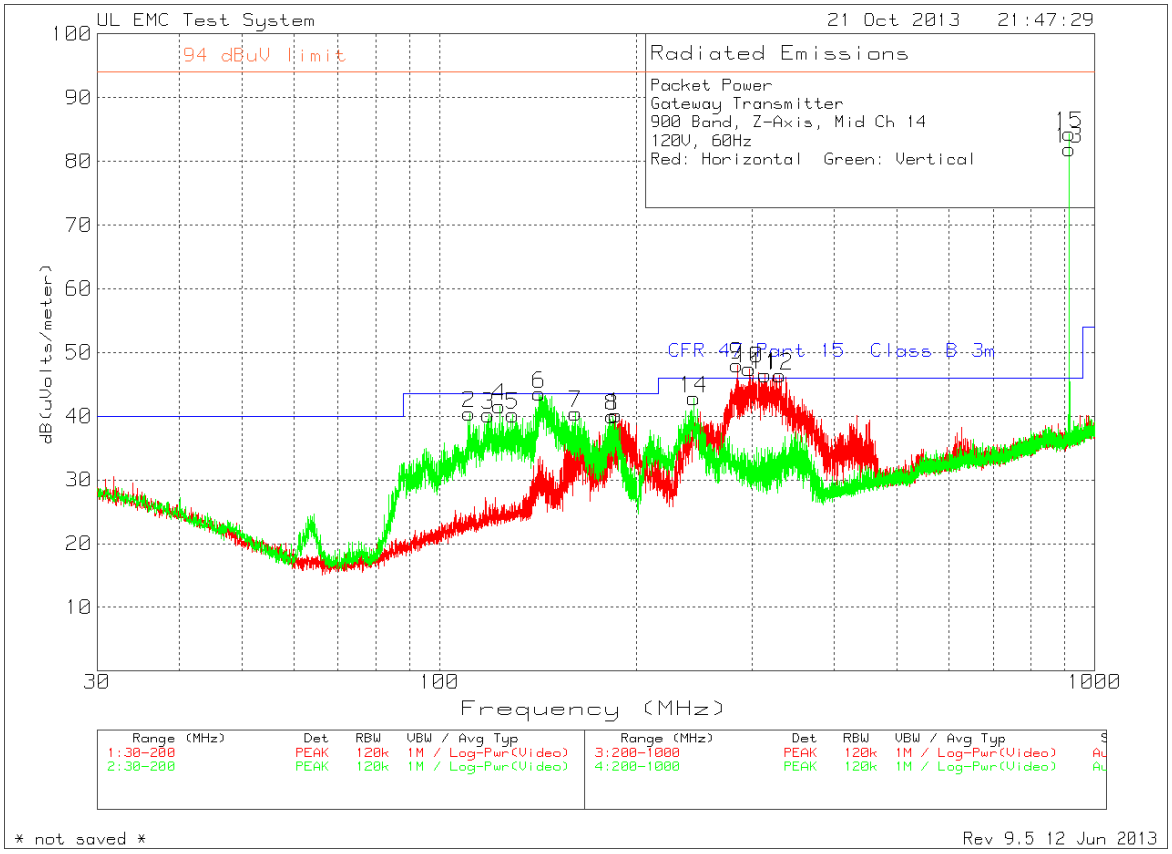


Packet Power											
Gateway Transmitter											
900 Band, Z-Axis, HiCh 16											
120V, 60Hz											
Red: Horizontal Green: Vertical											
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna factor dB/m	BOMS Factor (dB)	Corrected Reading dBuV/m	Limit dB	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.855	15.71	PK	27.1	3.99	46.8	54	-7.2	0-360	149	H
2	2.319	68.52	PK	21.7	-50.91	39.31	54	-14.69	0-360	100	H
3	2.783	73.64	PK	22.2	-50.45	45.39	54	-8.61	0-360	100	H
4	1.855	21.06	PK	27.1	3.99	52.15	54	-1.85	0-360	149	V
5	2.132	69.59	PK	21.5	-52.1	38.99	54	-15.01	0-360	149	V
6	2.319	69.66	PK	21.7	-50.91	40.45	54	-13.55	0-360	100	V
7	2.783	75.31	PK	22.2	-50.45	47.06	54	-6.94	0-360	100	V
8	5.566	63.81	PK	28.3	-49.45	42.66	54	-11.34	0-360	100	V
PK - Peak detector											

9.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION

HORIZONTAL PLOT

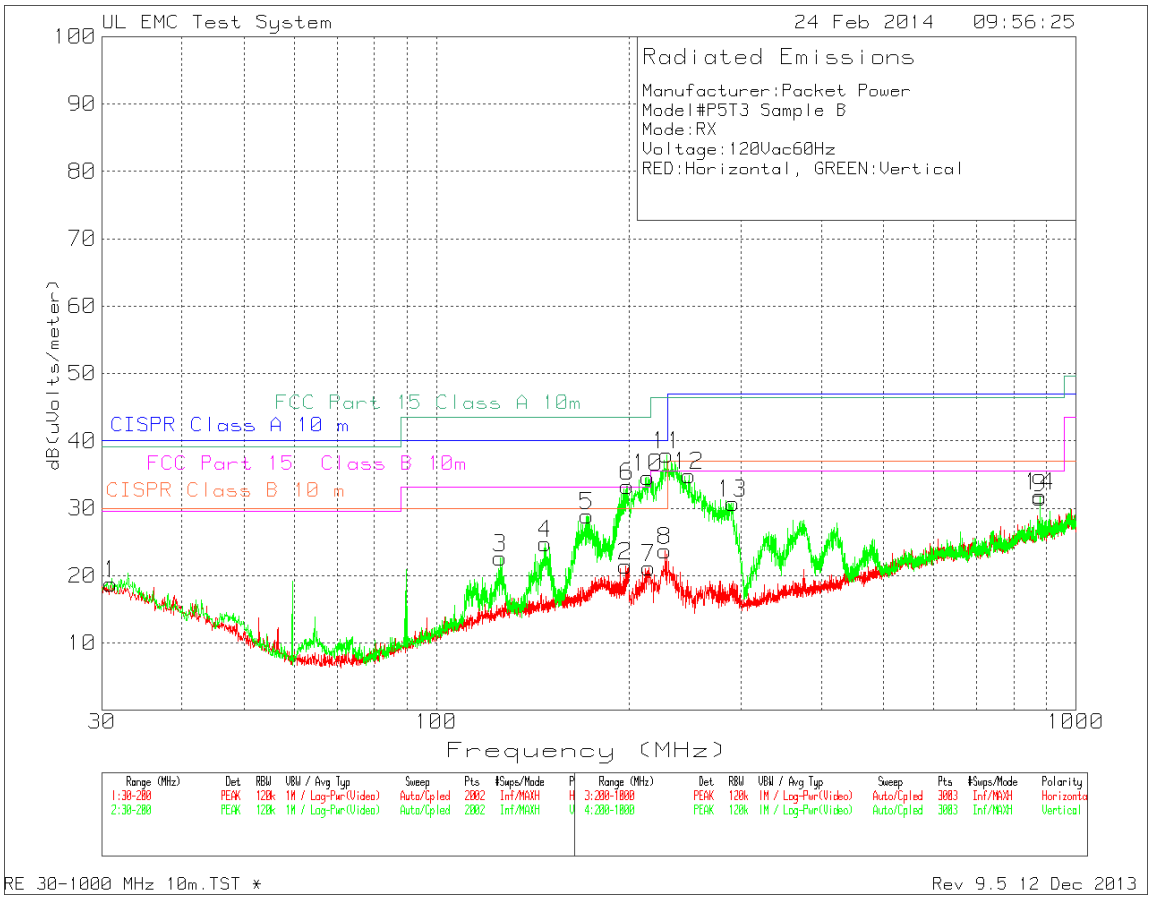


Packet Power												
Gateway Transmitter												
900 Band, Z-Axis, Mid Ch 14												
120V, 60Hz												
Red: Horizontal Green: Vertical												
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna factor dB/m	Cable factor dB	10m to 3m	Corrected Reading dB(uVolts /meter)	Limit dB	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	185.72	42.89	PK	15.9	-29.1	10.5	40.19	43.52	-3.33	0-360	400	H
2	111.0475	47.45	PK	12.3	-29.8	10.5	40.45	43.52	-3.07	0-360	99	V
3	118.74	46.41	PK	13.1	-29.8	10.5	40.21	43.52	-3.31	0-360	99	V
4	123.4575	47.3	PK	13.6	-29.8	10.5	41.6	43.52	-1.92	0-360	99	V
5	129.3225	45.53	PK	13.9	-29.7	10.5	40.23	43.52	-3.29	0-360	99	V
6	141.945	48.33	PK	14.3	-29.6	10.5	43.53	43.52	0.01	0-360	99	V
7	161.24	44.28	PK	15.2	-29.5	10.5	40.48	43.52	-3.04	0-360	99	V
8	183.595	42.69	PK	15.9	-29.1	10.5	39.99	43.52	-3.53	0-360	99	V
9	284.6667	50.64	PK	13.1	-26.2	10.5	48.04	46.02	2.02	0-360	300	H
10	297.0667	49.76	PK	13.4	-26.2	10.5	47.46	46.02	1.44	0-360	300	H
11	314	48.28	PK	13.7	-26	10.5	46.48	46.02	0.46	0-360	300	H
12	330.4	47.7	PK	14.1	-25.9	10.5	46.4	46.02	0.38	0-360	300	H
13	914.9333	72.94	PK	23.1	-24.6	10.5	81.94	46.02	35.92	0-360	99	H
14	244.4	46.92	PK	12	-26.6	10.5	42.82	46.02	-3.2	0-360	99	V
15	914.9333	75.36	PK	23.1	-24.6	10.5	84.36	46.02	38.34	0-360	199	V
Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna factor dB/m	Cable factor dB	10m to 3m	Corrected Reading dB(uVolts /meter)	Limit dB	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity	
186.0009	36.3	QP	16	-29.1	10.5	33.7	43.52	-9.82	297	345	H	
111.0146	39.2	QP	12.3	-29.8	10.5	32.2	43.52	-11.32	249	105	V	
118.7408	38.27	QP	13.1	-29.8	10.5	32.07	43.52	-11.45	170	113	V	
123.4234	37.31	QP	13.6	-29.8	10.5	31.61	43.52	-11.91	184	104	V	
129.3383	39.16	QP	13.9	-29.7	10.5	33.86	43.52	-9.66	342	105	V	
141.98	41.48	QP	14.3	-29.6	10.5	36.68	43.52	-6.84	69	100	V	
161.2429	35.21	QP	15.2	-29.5	10.5	31.41	43.52	-12.11	254	100	V	
183.5338	35.93	QP	15.9	-29.2	10.5	33.13	43.52	-10.39	222	100	V	
284.6771	41	QP	13.1	-26.2	10.5	38.4	46.02	-7.62	145	316	H	
297.0517	42.42	QP	13.4	-26.2	10.5	40.12	46.02	-5.9	164	323	H	
314.0188	41.84	QP	13.7	-26	10.5	40.04	46.02	-5.98	338	276	H	
330.2244	40.31	QP	14.1	-25.9	10.5	39.01	46.02	-7.01	155	286	H	
244.2246	34.16	QP	12	-26.6	10.5	30.06	46.02	-15.96	265	116	V	
PK - Peak detector												
QP - Quasi-Peak detector												

9.4. DIGITAL DEVICE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (DIGITAL DEVICE, HORIZONTAL)

PLOT



Manufacturer:Packet Power
Model#P5T3 Sample B
Mode:RX
Voltage:120Vac60Hz
RED:Horizontal, GREEN:Vertical

Trace Markers

No.	Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading	Limit:1 dB(uVolts/meter)	2	3	4	5	6
Bicon Horizonta 30 - 200MHz											
1	30.9345	31.36dBuV PK	17.5	-30.1	18.76	40	30	39.08	29.55	-	-
		Azimuth:0-360	Height:250 Horz		Margin (dB)	-21.24	-11.24	-20.32	-10.79	-	-
2	197.7061	34.14dBuV PK	16.1	-28.8	21.44	40	30	43.52	33.07	-	-
		Azimuth:0-360	Height:250 Horz		Margin (dB)	-18.56	-8.56	-22.08	-11.63	-	-
Bicon Vertical 30 - 200MHz											
3	125.7471	38.65dBuV PK	13.7	-29.7	22.65	40	30	43.52	33.07	-	-
		Azimuth:0-360	Height:99 Vert		Margin (dB)	-17.35	-7.35	-20.87	-10.42	-	-
4	148.091	39.8dBuV PK	14.6	-29.6	24.8	40	30	43.52	33.07	-	-
		Azimuth:0-360	Height:99 Vert		Margin (dB)	-15.2	-5.2	-18.72	-8.27	-	-
5	172.1339	42.95dBuV PK	15.3	-29.4	28.85	40	30	43.52	33.07	-	-
		Azimuth:0-360	Height:99 Vert		Margin (dB)	-11.15	-1.15	-14.67	-4.22	-	-
6	198.8106	45.95dBuV PK	16	-28.7	33.25	40	30	43.52	33.07	-	-
		Azimuth:0-360	Height:99 Vert		Margin (dB)	-6.75	3.25	-10.27	.18	-	-
LogP Horizontal 200 - 1000MHz											
7	214.9234	37.04dBuV PK	10.9	-26.8	21.14	40	30	43.52	33.07	-	-
		Azimuth:0-360	Height:399 Horz		Margin (dB)	-18.86	-8.86	-22.38	-11.93	-	-
8	227.9813	39.61dBuV PK	10.8	-26.7	23.71	40	30	46.44	35.57	-	-
		Azimuth:0-360	Height:299 Horz		Margin (dB)	-16.29	-6.29	-22.73	-11.86	-	-
9	879.8135	33.62dBuV PK	22.8	-24.9	31.52	47	37	46.44	35.57	-	-
		Azimuth:0-360	Height:99 Horz		Margin (dB)	-15.48	-5.48	-14.92	-4.05	-	-
LogP Vertical 200 - 1000MHz											
10	214.3904	50.47dBuV PK	10.9	-26.8	34.57	40	30	43.52	33.07	-	-
		Azimuth:0-360	Height:99 Vert		Margin (dB)	-5.43	4.57	-8.95	1.5	-	-
11	229.5803	53.76dBuV PK	10.8	-26.6	37.96	40	30	46.44	35.57	-	-
		Azimuth:0-360	Height:99 Vert		Margin (dB)	-2.04	7.96	-8.48	2.39	-	-
12	248.7675	49.58dBuV PK	11.9	-26.6	34.88	47	37	46.44	35.57	-	-
		Azimuth:0-360	Height:99 Vert		Margin (dB)	-12.12	-2.12	-11.56	-.69	-	-
13	290.6063	43.89dBuV PK	13.2	-26.3	30.79	47	37	46.44	35.57	-	-
		Azimuth:0-360	Height:99 Vert		Margin (dB)	-16.21	-6.21	-15.65	-4.78	-	-
14	879.547	33.89dBuV PK	22.8	-24.9	31.79	47	37	46.44	35.57	-	-
		Azimuth:0-360	Height:299 Vert		Margin (dB)	-15.21	-5.21	-14.65	-3.78	-	-

LIMIT 1: CISPR Class A 10 m
LIMIT 2: CISPR Class B 10 m
LIMIT 3: FCC Part 15 Class A 10m
LIMIT 4: FCC Part 15 Class B 10m
LIMIT 5: NONE
LIMIT 6: NONE

PK - Peak detector

Radiated Emission Data

Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit:1	2	3	4	5	6
Bicon Vertical 30 - 200MHz										
198.66637	38.81dBuV QP	16	-28.7	26.11	40	30	43.52	33.07	-	-
Azimuth: 115	Height:100 Vert			Margin (dB): -13.89		-3.89	-17.41	-6.96	-	-
172.22685	34.58dBuV QP	15.3	-29.4	20.48	40	30	43.52	33.07	-	-
Azimuth: 318	Height:100 Vert			Margin (dB): -19.52		-9.52	-23.04	-12.59	-	-
148.10703	27.13dBuV QP	14.6	-29.6	12.13	40	30	43.52	33.07	-	-
Azimuth: 139	Height:104 Vert			Margin (dB): -27.87		-17.87	-31.39	-20.94	-	-
LogP Horizontal 200 - 1000MHz										
879.62489	31.41dBuV QP	22.8	-24.9	29.31	47	37	46.44	35.57	-	-
Azimuth: 180	Height:331 Horz			Margin (dB): -17.69		-7.69	-17.13	-6.26	-	-
LogP Vertical 200 - 1000MHz										
229.52261	45.87dBuV QP	10.8	-26.6	30.07	40	30	46.44	35.57	-	-
Azimuth: 1	Height:118 Vert			Margin (dB): -9.93		.07	-16.37	-5.5	-	-
214.41444	43.47dBuV QP	10.9	-26.8	27.57	40	30	43.52	33.07	-	-
Azimuth: 163	Height:100 Vert			Margin (dB): -12.43		-2.43	-15.95	-5.5	-	-
249.0191	41.45dBuV QP	11.9	-26.5	26.85	47	37	46.44	35.57	-	-
Azimuth: 168	Height:100 Vert			Margin (dB): -20.15		-10.15	-19.59	-8.72	-	-
290.45085	36.49dBuV QP	13.2	-26.3	23.39	47	37	46.44	35.57	-	-
Azimuth: 81	Height:100 Vert			Margin (dB): -23.61		-13.61	-23.05	-12.18	-	-
879.63194	31.29dBuV QP	22.8	-24.9	29.19	47	37	46.44	35.57	-	-
Azimuth: 171	Height:318 Vert			Margin (dB): -17.81		-7.81	-17.25	-6.38	-	-

LIMIT 1: CISPR Class A 10 m
LIMIT 2: CISPR Class B 10 m
LIMIT 3: FCC Part 15 Class A 10m
LIMIT 4: FCC Part 15 Class B 10m
LIMIT 5: NONE
LIMIT 6: NONE

QP - Quasi-Peak detector

Rev 9.5 12 Dec 2013

Radiated Emission Data

Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit:1	2	3	4	5	6
Bicon Vertical 30 - 200MHz										
196.16892	36.5dBuV QP	16	-28.8	23.7	40	30	43.52	33.07	-	-
Azimuth: 38	Height:100 Vert			Margin (dB):	-16.3	-6.3	-19.82	-9.37	-	-
196.16892	36.57dBuV QP	16	-28.8	23.77	40	30	43.52	33.07	-	-
Azimuth: 38	Height:100 Vert			Margin (dB):	-16.23	-6.23	-19.75	-9.3	-	-
170.33862	34.12dBuV QP	15.2	-29.4	19.92	40	30	43.52	33.07	-	-
Azimuth: 162	Height:101 Vert			Margin (dB):	-20.08	-10.08	-23.6	-13.15	-	-
LogP Vertical 200 - 1000MHz										
233.27584	47.65dBuV QP	10.9	-26.6	31.95	47	37	46.44	35.57	-	-
Azimuth: 0	Height:107 Vert			Margin (dB):	-15.05	-5.05	-14.49	-3.62	-	-
216.34715	42.97dBuV QP	10.9	-26.7	27.17	40	30	46.44	35.57	-	-
Azimuth: 92	Height:100 Vert			Margin (dB):	-12.83	-2.83	-19.27	-8.4	-	-
208.50837	41.61dBuV QP	11	-26.8	25.81	40	30	43.52	33.07	-	-
Azimuth: 167	Height:100 Vert			Margin (dB):	-14.19	-4.19	-17.71	-7.26	-	-
257.67859	43.64dBuV QP	12.4	-26.4	29.64	47	37	46.44	35.57	-	-
Azimuth: 128	Height:102 Vert			Margin (dB):	-17.36	-7.36	-16.8	-5.93	-	-
879.66667	29.87dBuV QP	22.8	-24.9	27.77	47	37	46.44	35.57	-	-
Azimuth: 40	Height:354 Horz			Margin (dB):	-19.23	-9.23	-18.67	-7.8	-	-
352.43491	33.7dBuV QP	14.8	-25.9	22.6	47	37	46.44	35.57	-	-
Azimuth: 100	Height:100 Vert			Margin (dB):	-24.4	-14.4	-23.84	-12.97	-	-

LIMIT 1: CISPR Class A 10 m
LIMIT 2: CISPR Class B 10 m
LIMIT 3: FCC Part 15 Class A 10m
LIMIT 4: FCC Part 15 Class B 10m
LIMIT 5: NONE
LIMIT 6: NONE

QP - Quasi-Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

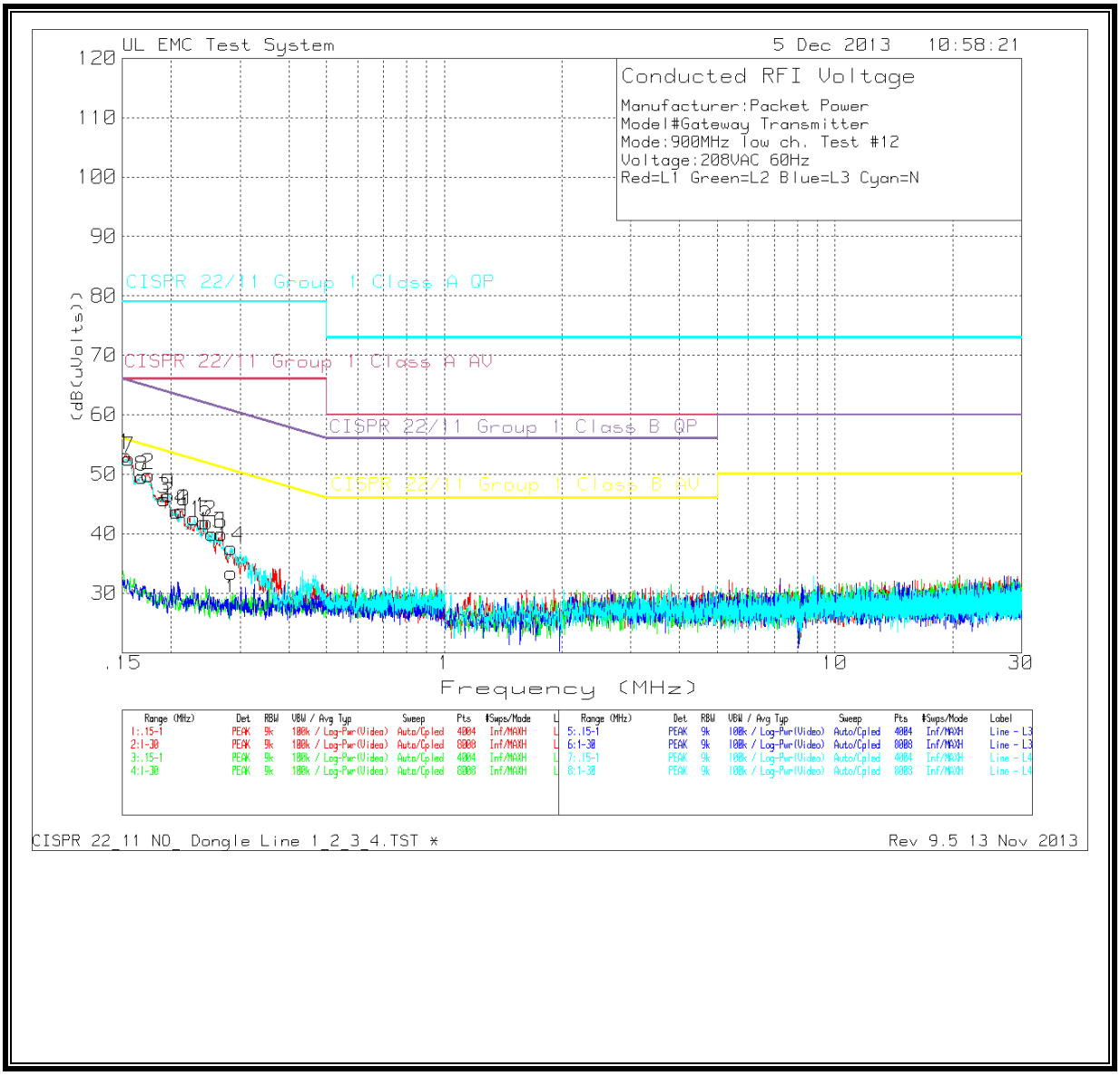
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

LINE RESULTS



Manufacturer:Packet Power
Model#Gateway Transmitter
Mode:900MHz low ch. Test #12
Voltage:208VAC 60Hz
Red=L1 Green=L2 Blue=L3 Cyan=N

Trace Markers

No.	Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading (dB(uVolts)) / Margin (dB)	Limit:1	2	3	4	5	6
Line - L1 .15 - 1MHz											
1	.15265	38.62dBuV PK	.1	14.5	53.22	79	66	65.85	55.85	-	-
					Margin (dB)	-25.78	-12.78	-12.63	-2.63	-	-
2	.17506	37.11dBuV PK	.1	12.6	49.81	79	66	64.72	54.72	-	-
					Margin (dB)	-29.19	-16.19	-14.91	-4.91	-	-
3	.19226	34.15dBuV PK	.1	11.6	45.85	79	66	63.94	53.94	-	-
					Margin (dB)	-33.15	-20.15	-18.09	-8.09	-	-
4	.21275	32.27dBuV PK	.1	11.5	43.87	79	66	63.1	53.1	-	-
					Margin (dB)	-35.13	-22.13	-19.23	-9.23	-	-
5	.24577	30.59dBuV PK	0	11.3	41.89	79	66	61.9	51.9	-	-
					Margin (dB)	-37.11	-24.11	-20.01	-10.01	-	-
6	.26912	28.83dBuV PK	0	11.1	39.93	79	66	61.15	51.15	-	-
					Margin (dB)	-39.07	-26.07	-21.22	-11.22	-	-
Line - L4 .15 - 1MHz											
7	.15595	38.34dBuV PK	.1	14.2	52.64	79	66	65.68	55.68	-	-
					Margin (dB)	-26.36	-13.36	-13.04	-3.04	-	-
8	.16805	36.22dBuV PK	.1	13.2	49.52	79	66	65.06	55.06	-	-
					Margin (dB)	-29.48	-16.48	-15.54	-5.54	-	-
9	.19693	34.84dBuV PK	.1	11.5	46.44	79	66	63.74	53.74	-	-
					Margin (dB)	-32.56	-19.56	-17.3	-7.3	-	-
10	.20648	32.11dBuV PK	.1	11.5	43.71	79	66	63.35	53.35	-	-
					Margin (dB)	-35.29	-22.29	-19.64	-9.64	-	-
11	.22899	31.06dBuV PK	.1	11.4	42.56	79	66	62.49	52.49	-	-
					Margin (dB)	-36.44	-23.44	-19.93	-9.93	-	-
12	.24216	30.57dBuV PK	.1	11.3	41.97	79	66	62.02	52.02	-	-
					Margin (dB)	-37.03	-24.03	-20.05	-10.05	-	-
13	.25437	28.67dBuV PK	.1	11.2	39.97	79	66	61.61	51.61	-	-
					Margin (dB)	-39.03	-26.03	-21.64	-11.64	-	-
14	.28441	26.58dBuV PK	0	11	37.58	79	66	60.69	50.69	-	-
					Margin (dB)	-41.42	-28.42	-23.11	-13.11	-	-

LIMIT 1: CISPR 22/11 Group 1 Class A QP
LIMIT 2: CISPR 22/11 Group 1 Class A AV
LIMIT 3: CISPR 22/11 Group 1 Class B QP
LIMIT 4: CISPR 22/11 Group 1 Class B AV
LIMIT 5: NONE
LIMIT 6: NONE

PK - Peak detector
QP - Quasi-Peak detector
Manufacturer:Packet Power
Model#Gateway Transmitter
Mode:900MHz low ch. Test #12
Voltage:208VAC 60Hz
Red=L1 Green=L2 Blue=L3 Cyan=N

Manufacturer:Packet Power
Model#Gateway Transmitter
Mode:900MHz low ch. Test #12
Voltage:208VAC 60Hz
Red=L1 Green=L2 Blue=L3 Cyan=N

Quais-peak Data

Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading(dB(uVolts))	Limit:1	2	3	4	5
Line - L1 .15 - 1MHz									
.15297	36.43dBuV QP .1	14.5	51.03	79	66	65.84	55.84	-	-
		Margin (dB):		-27.97	-14.97	-14.81	-4.81	-	-
.17486	34.18dBuV QP .1	12.6	46.88	79	66	64.73	54.73	-	-
		Margin (dB):		-32.12	-19.12	-17.85	-7.85	-	-
.19258	31.21dBuV QP .1	11.6	42.91	79	66	63.92	53.92	-	-
		Margin (dB):		-36.09	-23.09	-21.01	-11.01	-	-
.21286	29.47dBuV QP .1	11.5	41.07	79	66	63.09	53.09	-	-
		Margin (dB):		-37.93	-24.93	-22.02	-12.02	-	-
.24579	26.5dBuV QP 0	11.3	37.8	79	66	61.9	51.9	-	-
		Margin (dB):		-41.2	-28.2	-24.1	-14.1	-	-
.26891	24dBuV QP 0	11.1	35.1	79	66	61.15	51.15	-	-
		Margin (dB):		-43.9	-30.9	-26.05	-16.05	-	-
Line - L4 .15 - 1MHz									
.15553	35.75dBuV QP .1	14.3	50.15	79	66	65.7	55.7	-	-
		Margin (dB):		-28.85	-15.85	-15.55	-5.55	-	-
.16788	33.98dBuV QP .1	13.2	47.28	79	66	65.06	55.06	-	-
		Margin (dB):		-31.72	-18.72	-17.78	-7.78	-	-
.19653	30.95dBuV QP .1	11.5	42.55	79	66	63.76	53.76	-	-
		Margin (dB):		-36.45	-23.45	-21.21	-11.21	-	-
.20643	29.35dBuV QP .1	11.5	40.95	79	66	63.35	53.35	-	-
		Margin (dB):		-38.05	-25.05	-22.4	-12.4	-	-
.229	27.2dBuV QP .1	11.4	38.7	79	66	62.49	52.49	-	-
		Margin (dB):		-40.3	-27.3	-23.79	-13.79	-	-
.24219	26.25dBuV QP .1	11.3	37.65	79	66	62.02	52.02	-	-
		Margin (dB):		-41.35	-28.35	-24.37	-14.37	-	-
.25436	25.46dBuV QP .1	11.2	36.76	79	66	61.61	51.61	-	-
		Margin (dB):		-42.24	-29.24	-24.85	-14.85	-	-
.28435	22.85dBuV QP 0	11	33.85	79	66	60.69	50.69	-	-
		Margin (dB):		-45.15	-32.15	-26.84	-16.84	-	-

NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear average detector
Avg - Video bandwidth < Resolution bandwidth
Av - average detection
CAV - CISPR average detection
RMS - RMS detection
CRMS - CISPR RMS detection

PK1 - KDB 789033 Method: Peak
AD1 - KDB 789033 Method: AD Primary Power Average
VB1 - KDB 789033 Method: VB Alternative Reduced Video
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average
MAv2 - KDB558074 Option 2 Slow Sweep RMS Average
PK3 - FHSS Method: Maximum Peak
VB10Hz - FHSS Method: 10Hz Video Bandwidth
VB 1/T - FHSS Method: Reduced Video Bandwidth

LIMIT 1: CISPR 22/11 Group 1 Class A QP
LIMIT 2: CISPR 22/11 Group 1 Class A AV
LIMIT 3: CISPR 22/11 Group 1 Class B QP
LIMIT 4: CISPR 22/11 Group 1 Class B AV
LIMIT 5: NONE
LIMIT 6: NONE

Manufacturer:Packet Power
Model#Gateway Transmitter
Mode:900MHz low ch. Test #12
Voltage:208VAC 60Hz
Red=L1 Green=L2 Blue=L3 Cyan=N

Average Data

Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading(dB(uVolts))	Limit:1	2	3	4	5
Line - L1 .15 - 1MHz									
.15297	19.92dBuV Av .1	14.5	34.52	79	66	65.84	55.84	-	-
			Margin (dB):	-44.48	-31.48	-31.32	-21.32	-	-
.17486	17.24dBuV Av .1	12.6	29.94	79	66	64.73	54.73	-	-
			Margin (dB):	-49.06	-36.06	-34.79	-24.79	-	-
.19258	14.98dBuV Av .1	11.6	26.68	79	66	63.92	53.92	-	-
			Margin (dB):	-52.32	-39.32	-37.24	-27.24	-	-
.21286	12.27dBuV Av .1	11.5	23.87	79	66	63.09	53.09	-	-
			Margin (dB):	-55.13	-42.13	-39.22	-29.22	-	-
.24579	9.13dBuV Av 0	11.3	20.43	79	66	61.9	51.9	-	-
			Margin (dB):	-58.57	-45.57	-41.47	-31.47	-	-
.26891	7.84dBuV Av 0	11.1	18.94	79	66	61.15	51.15	-	-
			Margin (dB):	-60.06	-47.06	-42.21	-32.21	-	-
Line - L4 .15 - 1MHz									
.15553	18.91dBuV Av .1	14.3	33.31	79	66	65.7	55.7	-	-
			Margin (dB):	-45.69	-32.69	-32.39	-22.39	-	-
.16788	16.91dBuV Av .1	13.2	30.21	79	66	65.06	55.06	-	-
			Margin (dB):	-48.79	-35.79	-34.85	-24.85	-	-
.19653	13.84dBuV Av .1	11.5	25.44	79	66	63.76	53.76	-	-
			Margin (dB):	-53.56	-40.56	-38.32	-28.32	-	-
.20643	12.41dBuV Av .1	11.5	24.01	79	66	63.35	53.35	-	-
			Margin (dB):	-54.99	-41.99	-39.34	-29.34	-	-
.229	10.65dBuV Av .1	11.4	22.15	79	66	62.49	52.49	-	-
			Margin (dB):	-56.85	-43.85	-40.34	-30.34	-	-
.24219	8.83dBuV Av .1	11.3	20.23	79	66	62.02	52.02	-	-
			Margin (dB):	-58.77	-45.77	-41.79	-31.79	-	-
.25436	8.38dBuV Av .1	11.2	19.68	79	66	61.61	51.61	-	-
			Margin (dB):	-59.32	-46.32	-41.93	-31.93	-	-
.28435	6.77dBuV Av 0	11	17.77	79	66	60.69	50.69	-	-
			Margin (dB):	-61.23	-48.23	-42.92	-32.92	-	-

NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear average detector
Avg - Video bandwidth < Resolution bandwidth
Av - average detection

11. RF EXPOSURE

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

11.1. IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.
2. A power density of 10 W/m^2 is equivalent to 1 mW/cm^2.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

11.2. EQUATIONS

POWER DENSITY

Power density is given by:

S = EIRP / (4 * Pi * D^2)

Where

S = Power density in mW/cm^2
EIRP = Equivalent Isotropic Radiated Power in mW
D = Separation distance in cm

Power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by 10.

DISTANCE

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

Where

D = Separation distance in cm
EIRP = Equivalent Isotropic Radiated Power in mW
S = Power density in mW/cm^2

SOURCE-BASED DUTY CYCLE

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

Source-based time-averaged EIRP = (DC / 100) * EIRP

Where

DC = Duty Cycle in %, as applicable
EIRP = Equivalent Isotropic Radiated Power in W

11.3. LIMITS AND IC EXEMPTION

FIXED LIMITS

For operation in the PCS band, the 2.4 GHz band and the 5 GHz bands:

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2
From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

INDUSTRY CANADA EXEMPTION

RSS-102 Clause 2.5.2 RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

(Single chain transmitters, no colocation, 20 cm MPE distance)

Band	Mode	Separation Distance (cm)	Output AVG Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	EIRP (mW)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
900MHz	GFSK	20	-13.96	-0.50	15.6	0.006	0.000001	0.00001

The device operates below 1.5 GHz with a maximum EIRP less than or equal to 2.5 Watts as a mobile device with a minimum separation distance of 20 cm, therefore it is exempt from routine RF Exposure Evaluation under RSS-102.