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FCC PART 15.247 DSS

TEST REPORT

APPLICANT	Light-O-Rama, Inc.
ADDRESS	500 Outwater Lane
	Garfield, NJ 07026 USA
FCC ID	TU7-RF02
MODEL NUMBER	RF-V4
PRODUCT DESCRIPTION	902 – 928 MHz Wireless Interconnect
DATE SAMPLE RECEIVED	March 23, 2006
DATE TESTED	March 31, 2006
TESTED BY	Nam Nyguen
APPROVED BY	Mario R. de Aranzeta C.E.T.
TIMCO REPORT NO.	2604YUT5TestReport
TEST RESULTS	☒ PASS ☐ FAIL

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GENERAL INFORMATION

EUT SPECIFICATION

The test results relate only to the items tested.		
FCC ID	TU7-RF02	
Model Number	RF-V4	
Serial Number	N/A	
Product Description	DIRECT SEQUENCE WIRELESS INTERCONNECT	
Operating Frequency	902 – 928 MHz	
Max. output power	1.68 mW EIRP	
Type of Modulation	FSK	
EUT Power	*Primary Power*	110VAC/60HZ
	Secondary Power	N/A
Test Item	☒ Prototype	
	☐ Pre-Production	
	☐ Production	
Type of Equipment	☐ Fixed	
	☒ Mobile	
	☐ Portable	
Antenna	Center Fed Dipole	
Antenna Connector	Reverse SMA	

MODIFICATION TO THE DUT

No modification was made to the DUT during testing.

TEST EXERCISE (e.g software description, test signal, etc.)

The EUT was set in continuous transmit mode of operation.

TEST STANDARDS ANSI C63.4 - 2003

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/04	3/26/07
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
Biconnical Antenna	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Biconnical Antenna	Eaton	94455-1	1096	CAL 8/17/04	8/17/06
Biconnical Antenna	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/05	12/7/07
LISN	Electro-Metrics	ANS-25/2	2604	CAL 8/27/04	8/27/06
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/05	4/28/07
Log-Periodic Antenna	Eaton	96005	1243	CAL 12/14/05	12/14/07
Double-Ridged Horn Antenna – ETS-1	ETS-Lindgren	3117	00035923	9/27/04	9/27/06

TEST PROCEDURE

GENERAL: This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC.

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-2003 using a 50uH LISN. Both lines were observed with the UUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed. The ambient temperature of the UUT was 76°F with a humidity of 55%.

BANDWIDTH 6 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

POWER OUTPUT: The RF power output was measured at the antenna feed point using a peak power meter.

ANTENNA CONDUCTED EMISSIONS: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 76°F with a humidity of 55%.

POWER LINE CONDUCTED INTERFERENCE

RULES PART NO.: 15.107(a)

REQUIREMENTS:

Part 15.107 (a)		
Emission Frequency (MHz)	FCC Conducted Limit (dBµV)	
	Quasi-peak (QP)	Average (AV)
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.		

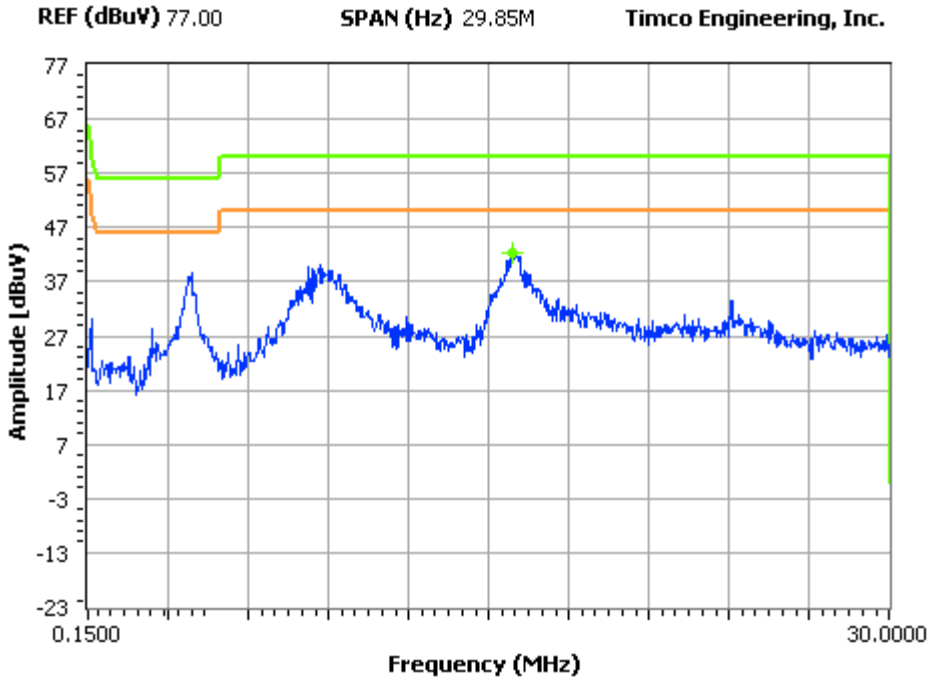
TEST PROCEDURE: ANSI C63.4-2003. The spectrum was scanned from .15 to 30 MHz.

TEST DATA: Please refer to the following plots.

NOTES:

LIGHT-O-RAMA - FCC ID: TU7RF02
POWER LINE CONDUCTED INTERFERENCE - LINE 1

FCC 15.107 Mask Class B



RBW	VBW	ST (sec)
10 kHz	10 kHz	750m

Center Frequency (Hz) 15.075M

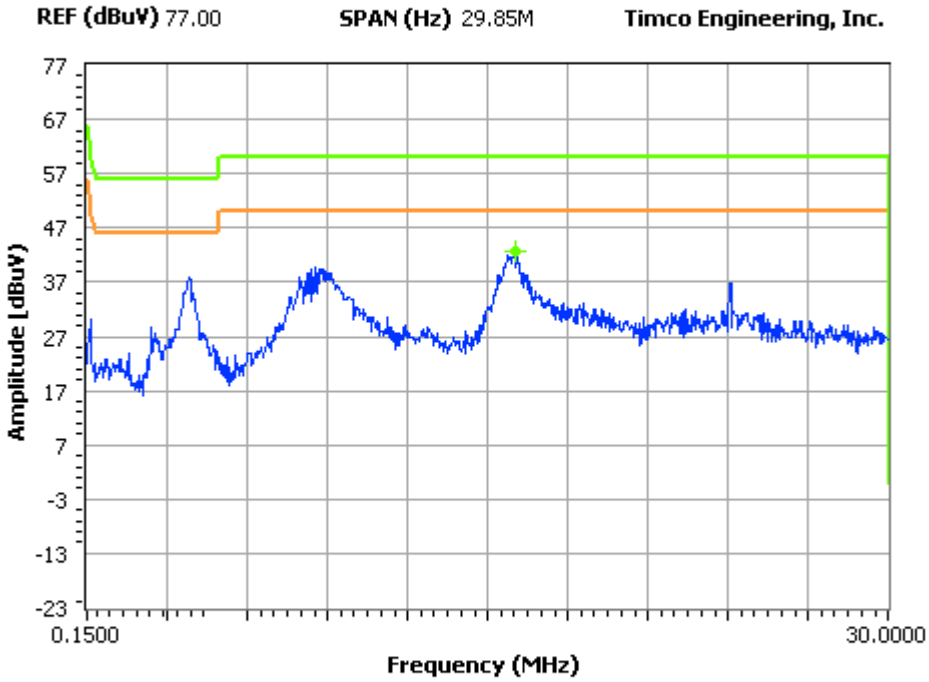
Marker Delta (Hz) 0.00

Peak	15.941	42.20
MKR2	0.000	0.00
MKR3	0.000	0.00
HWMK	23.076	6.27

NOTES:

LIGHT-O-RAMA - FCC ID: TU7RF02
POWER LINE CONDUCTED INTERFERENCE - LINE 2

FCC 15.107 Mask Class B



RBW	VBW	ST (sec)
10 kHz	10 kHz	750m

Center Frequency (Hz) 15.075M

Marker Delta (Hz) 0.00

Peak	16.150	42.50
MKR2	0.000	0.00
MKR3	0.000	0.00
HWMK	23.076	6.27

6 dB BANDWIDTH

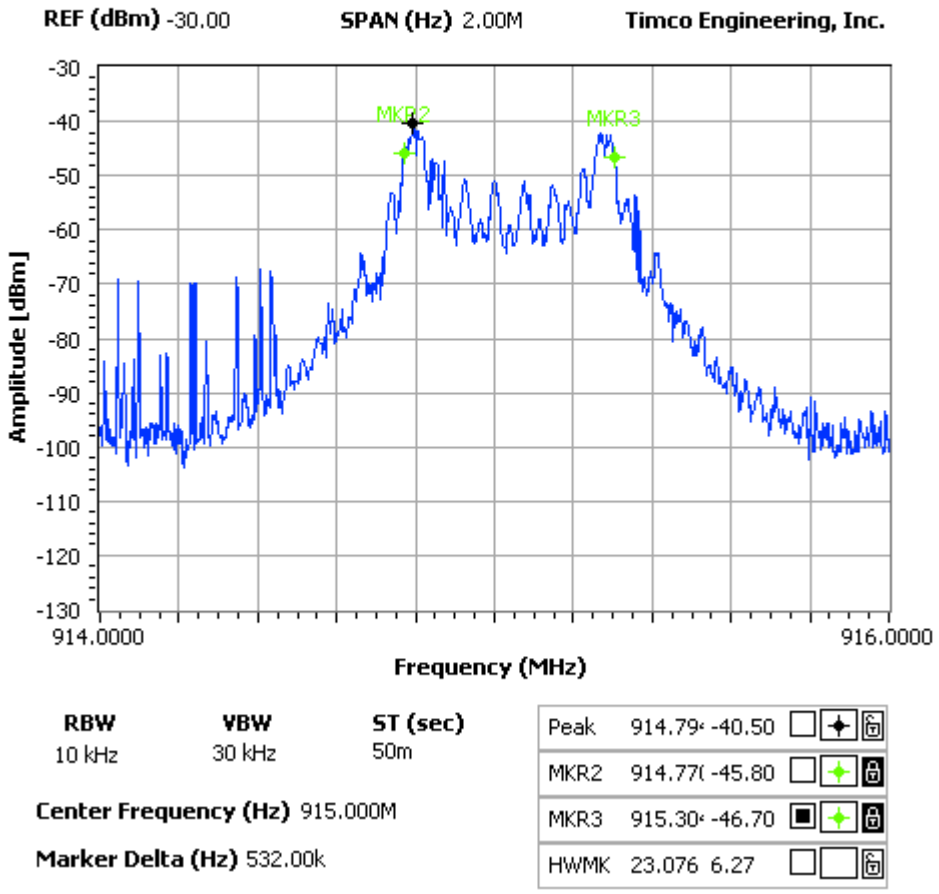
RULES PART NO.: 15.247(a)(2)

REQUIREMENTS: The 6.0dB bandwidth must be greater than 500 kHz.

TEST DATA: The device was checked in 3 places in the band and the worst Case is reported below.

NOTES:

LIGHT-O-RAMA - FCC ID: TU7RF02
6.0dB BANDWIDTH PLOT



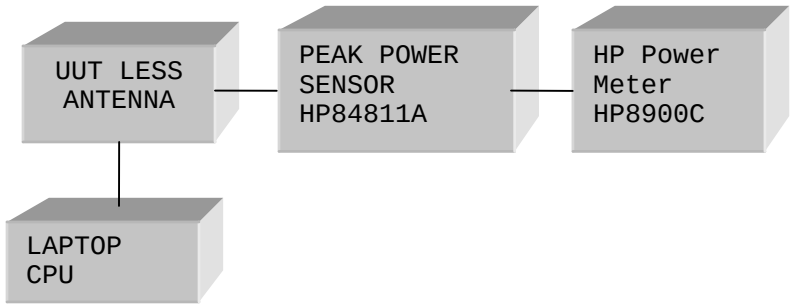
POWER OUTPUT

RULES PART NO.: 15.247(b)

REQUIREMENTS: The maximum peak output power shall not exceed 1 watt (30 dBm). If directional-transmitting antennas with a gain of more than 6 dBi that are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST METHOD: Power was measured by disconnecting the antennas and measuring across a 50 ohm load as recommended by the manufacturer using a HP peak power meter Model 8900C. The antennas are non-directional and do not exceed 6 dBi gain. The power output was measured at three places in the band highest is reported below.

The RF power output was measured at the antenna feed point by removing the permanent antenna and connecting the UUT to a peak power meter, HP Model No. 8900C.



TEST DATA:

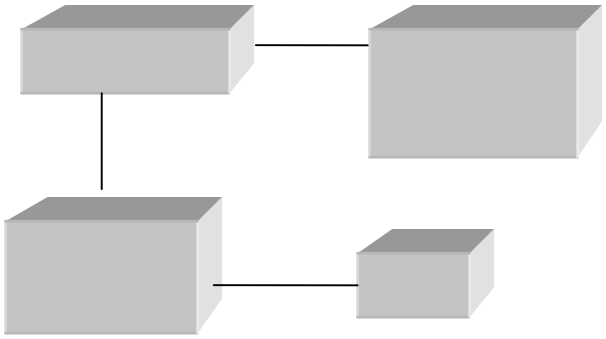
903 MHz	2.19 mW
915 MHz	3.55 mW
926 MHz	1.29 mW

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

RULES PART NO.: 15.247(c)

REQUIREMENTS: Emissions must be at least 20dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

METHOD OF MEASURING:



Note: The spectrum was checked to the tenth harmonic.
Three places in the band were checked and the worst case presented below

TEST DATA: see below

Frequency MHz	Level dBuV
903	79.3
1805	50.1
2709	26
3610	27.8
4513	42.5
5418	/

FIELD_STRENGTH_OF_SPURIOUS_EMISSIONS

RULES PART NO.: 15.247(c), 15.205 &15.209(b)

REQUIREMENTS:

§15.247(c)& §15.205	
Fundamental Frequency	(Field Strength) Limits
902 – 928MHz	127.37dBuV/m
2.4 – 2.4835GHz	
§15.209	
30 - 88 MHz	40 dBuV/m @3M
88 -216 MHz	43.5 dBuV/m @3M
216 -960 MHz	46 dBuV/m @3M
ABOVE 960 MHz	54dBuV/m @3M

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 db below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.

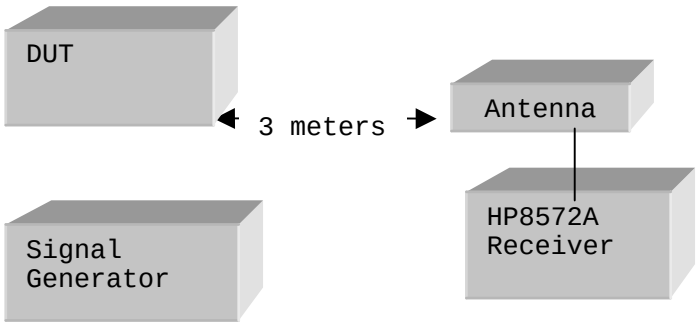
Emissions that fall in the restricted bands (15.205) must be less than 54dBuV/m.

METHOD OF MEASUREMENT: The procedure used was ANSI STANDARD C63.4-2003 & the FCC/OET Guidance on Measurements for Direct Sequence Spread Spectrum Systems – Public Notice 54797 Dated July 12, 1995. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 849 N.W. State Road 45, Newberry, FL 32669.

Equipment placed 80cm above ground on a rotatable platform.

Harmonics were checked through the 10th harmonic*

TEST SETUP



TEST DATA:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB	Field Strength dBuV/m	Margin dB
903	902.96	84.2	V	1.95	22.33	97.48	29.87
903	902.96	73.1	H	1.95	23.30	87.35	40.00
903	1,805.92	24.7	V	2.74	30.04	46.48	7.52
903	1,805.92	24.5	H	2.74	30.04	46.28	7.72
903	2,708.88	20.5	H	3.4	32.85	45.75	8.25
903	2,708.88	19.2	V	3.4	32.85	44.45	9.55
903	3,611.84	16.6	V	4.15	33.39	43.14	10.86
903	3,611.84	14.8	H	4.15	33.39	41.34	12.66
903	4,514.80	19.5	V	4.76	34.11	47.37	6.63
903	4,514.80	15.8	H	4.76	34.11	43.67	10.33
903	5,417.76	7.4	V	5.13	35.00	36.53	17.47
903	5,417.76	4.7	H	5.13	35.00	33.83	20.17
903	6,320.72	10.1	H	5.4	35.96	40.46	13.54

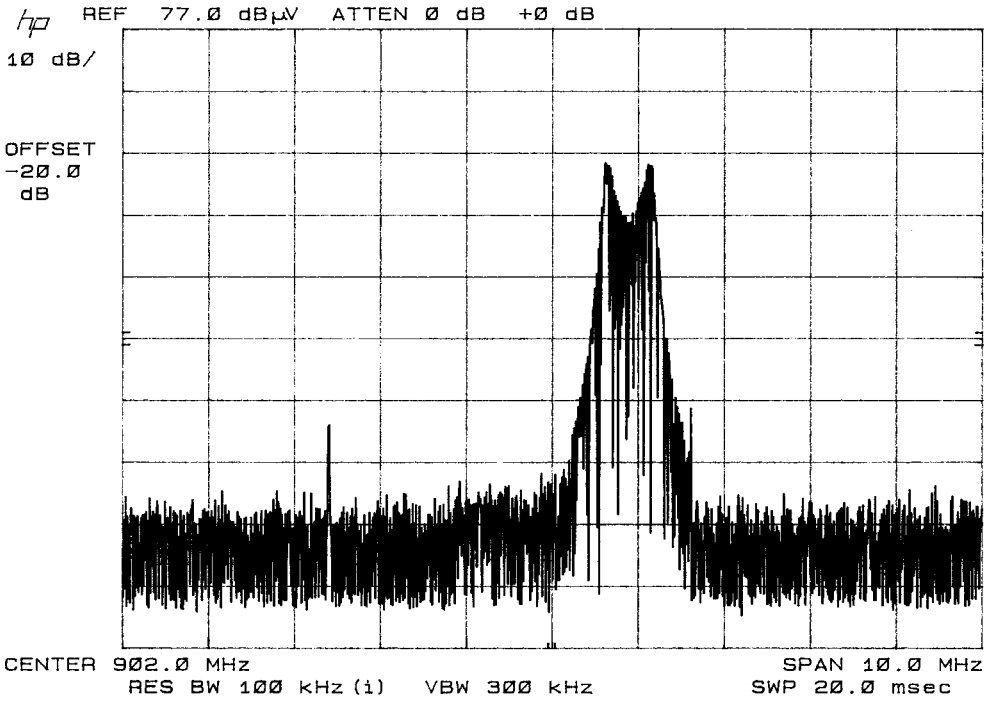
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB	Field Strength dBuV/m	Margin dB
915	915	83.8	V	1.97	22.55	97.32	30.05
915	915	72	H	1.97	23.4	86.37	41.00
915	1,830.00	23.2	V	2.76	30.18	45.14	8.86
915	1,830.00	21.3	H	2.76	30.18	43.24	10.76
915	2,745.00	22.5	H	3.42	32.89	47.81	6.19
915	2,745.00	20.5	V	3.42	32.89	45.81	8.19
915	3,660.00	12.2	V	4.19	33.43	38.82	15.18
915	3,660.00	9.4	H	4.19	33.43	36.02	17.98
915	4,575.00	20.7	V	4.79	34.16	48.65	5.35
915	4,575.00	16.4	H	4.79	34.16	44.35	9.65

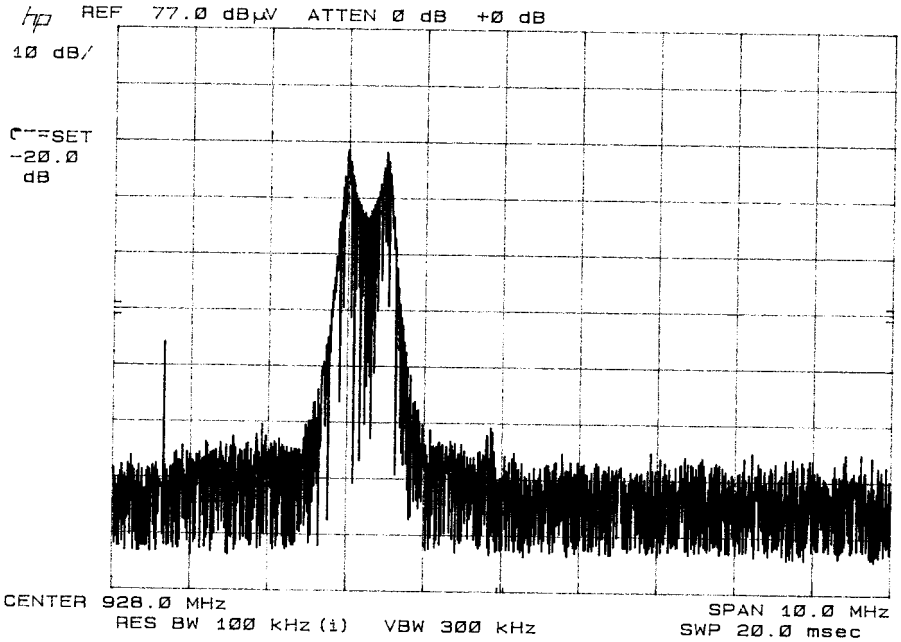
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB	Field Strength dBuV/m	Margin dB
926	926.04	81.2	V	1.99	22.76	94.95	32.42
926	926.04	73.5	H	1.99	23.98	88.47	38.9
926	1,852.08	28.4	H	2.78	30.31	50.49	3.51
926	1,852.08	27.6	V	2.78	30.31	49.69	4.31
926	2,778.12	19.9	H	3.44	32.93	45.27	8.73
926	2,778.12	18.3	V	3.44	32.93	43.67	10.33
926	3,704.16	12.9	V	4.23	33.46	39.59	14.41
926	3,704.16	9.7	H	4.23	33.46	36.39	17.61
926	4,630.20	24.2	V	4.82	34.2	52.22	1.78
926	4,630.20	17.6	H	4.82	34.2	45.62	8.38

RADIATED SPURIOUS EMISSIONS INTO ADJACENT BAND

REQUIREMENTS: Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 uV/m (54dBuV/m)or 20 dBc if not in restricted band.

TEST PROCEDURE:





POWER SPECTRAL DENSITY

RULES PART NO.: 15.247(d)

REQUIREMENTS: The peak level measured must be no greater than +8.0dBm.

TEST DATA: The device was checked in 3 places in the band and the worst Case is reported below.

The level at 915.269 MHz was -94.27 dBm.

+50 dB	Attn.
+35 dB	Correction Factor
+85 dB	
-94.27 dBm	
- 9.27 dBm