849 NW State Road 45
Newberry, FL 32669 USA
Ph: 888.472.2424 or 352.472.5500
Fax: 352.472.2030
Email: info@timcoengr.com
Website: www.timcoengr.com

FCC PART 15.247 AN IC RSS-210

TEST REPORT

DIGITAL SPREAD SPECTRUM

Applicant	T&D CORPORATION
Address	817-1 SHIMADACHI
	MATSUMOTO 390-0852 JAPAN
FCC ID	SRD10040
IC	5558A-10040
Model Number	RTR-500AW
Product Description	900 MHz ISM BAND TRANSMITTER
Date Sample Received	7/1/2010
Date Tested	7/27/2010
Tested By	Joe Scoglio
Approved By	Mario R. de Aranzeta
Report Number	1595AT10TestReport.doc
Test Results	☒ PASS ☐ FAIL

ACCREDITED

Testing Certificate # 0955-01

TABLE OF CONTENT

GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:
☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, Fl 32669

Authorized Signatory Name:

Mario de Aranzeta C.E.T.
Compliance Engineer/ Lab. Supervisor

Date: 7/27/2010

GENERAL INFORMATION

DUT Specification

Applicable Standard	Part 15.247		
DUT Description	900 MHz ISM BAND TRANSMITTER		
FCC ID	SRD10040		
IC	5558A-10040		
Operating Frequency	TX/RX: 902 to 928 MHz		
DUT Power Source	☒ 110–120Vac/50– 60Hz		
	☐ DC Power		
	☐ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☒ Fixed	☐ Mobile	☐ Portable
Antenna Connector	Reverse SMA		
Antenna	Dipole		
Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.		
Test Conditions	Temperature: 26ºC Relative humidity: 50%		
Test Exercise	The DUT was placed in continuous transmit mode of operation.		

Test Supporting Equipment

Supporting Device	Manufacturer	Model / FCC ID	Serial Number
N/A			

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 3/10/10	3/10/12
AC Voltmeter	HP	400FL	2213A14499	CAL 3/23/09	3/23/11
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	153	CHAR 6/10/09	6/10/11
Frequency Counter	HP	5385A	3242A07460	CAL 5/26/09	5/26/11
Hygro-Thermometer	Extech	445703	0602	CAL 1/30/09	1/30/11
Modulation Analyzer	HP	8901A	3435A06868	CAL 5/26/09	5/26/11
Digital Multimeter	Fluke	FLUKE-77-3	79510405	CAL 5/18/09	5/18/11
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 11/21/09	11/21/11
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 11/22/09	11/22/11
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 11/21/09	11/21/11
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 11/24/09	11/24/11
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 4/25/10	4/25/12

TEST PROCEDURES

Radiation Interference: ANSI C63.4-2003 using a spectrum analyzer, a preselector, a quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3 MHz above 1 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

Formula Of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBµV) to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:			
Freq (MHz)	Meter Reading	+ ACF	+ CL = FS
33	20 dBµV	+ 10.36 dB	+ 0.5 = 30.86 dBµV/m @ 3m

Power Line Conducted Interference: The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

Bandwidth 6.0dB: 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 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.

ANSI C63.4-2003 10.1 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The DUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. Emissions attenuated more than 20 dB below the permissible value are not reported.

RADIATION INTERFERENCE

Rules Part No.: 15.247, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) µV/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) µV/m @ 30 meters
1705 kHz to 30 MHz	29.54 dBµV/m @ 30 meters
30 – 88	40.0 dBµV/m @ 3 meters
80 – 216	43.5 dBµV/m @ 3 meters
216 – 960	46.0 dBµV/m @ 3 meters
Above 960	54.0 dBµV/m @ 3 meters
Part 15.247	
Fundamental 902 – 928 MHz	127.37 dBµV/m @ 3 meters
Fundamental 2.4 – 2.4835 MHz	127.37 dBµV/m @ 3 meters
Harmonics	54.0 dBµV/m @ 3 meters

Any emissions that fall in the restricted bands (15.205) must be less than or equal to 54 dBµV/m. Spurious emissions not in a restricted band must be 20 dBc. Harmonics were checked through the 10th harmonic.

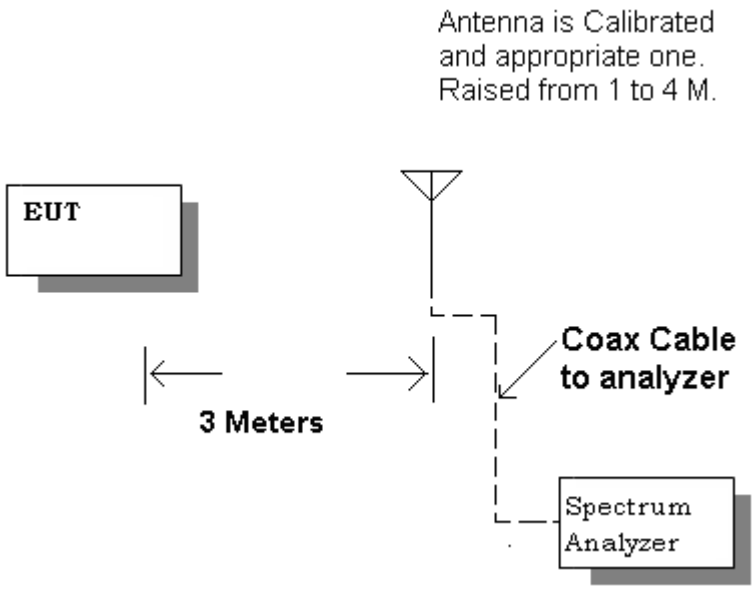
Test Data: All values are peak unless noted.
Items mark with an * designate a frequency in a restricted band.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Pol	Coax Loss dB	Correction Factor dB	Field Strength dBµV/m	Margin dB
902.9	902.90	73.2	H	1.95	23.33	98.48	28.90
902.9	902.90	76.2	V	1.95	22.67	100.82	26.56
902.9	1,805.80	16.1	H	2.74	29.96	48.80	32.02
902.9	1,805.80	18.0	V	2.74	29.96	50.70	30.12
902.9	2,708.70	8.8	H	3.40	32.54	44.74	9.26
902.9	2,708.70	11.6	V	3.40	32.54	47.54	6.46
902.9	3,611.60	9.5	H	4.15	32.98	46.63	7.37
902.9	3,611.60	10.5	V	4.15	32.98	47.63	6.37
914.4	914.40	73.6	H	1.97	23.36	98.93	28.45
914.4	914.40	76.9	V	1.97	22.60	101.47	25.91
914.4	1,828.80	16.5	H	2.76	30.10	49.36	32.11
914.4	1,828.80	17.5	V	2.76	30.10	50.36	31.11
914.4	2,743.20	8.4	H	3.42	32.55	44.37	9.63
914.4	2,743.20	10.7	V	3.42	32.55	46.67	7.33
914.4	3,657.60	6.4	H	4.19	33.05	43.64	10.36
914.4	3,657.60	7.5	V	4.19	33.05	44.74	9.26
927.1	927.10	68.2	H	1.99	23.44	93.63	33.75

TEST DATA CONTD.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Pol	Coax Loss dB	Correction Factor dB	Field Strength dBµV/m	Margin dB
927.1	927.10	74.2	V	1.99	22.67	98.86	28.52
927.1	2,781.40	7.2	H	3.45	32.56	43.21	10.79
927.1	2,781.40	8.8	V	3.45	32.56	44.81	9.19
927.1	3,708.60	7.2	V	4.24	33.13	44.57	9.43

Method of Measuring Radiated Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was ANSI standard C63.4-2003 & the FCC/OET Guidance on Measurements for Spread Spectrum Systems – Public Notice DA 00-705 dated March 30th, 2000.

POWER LINE CONDUCTED INTERFERENCE

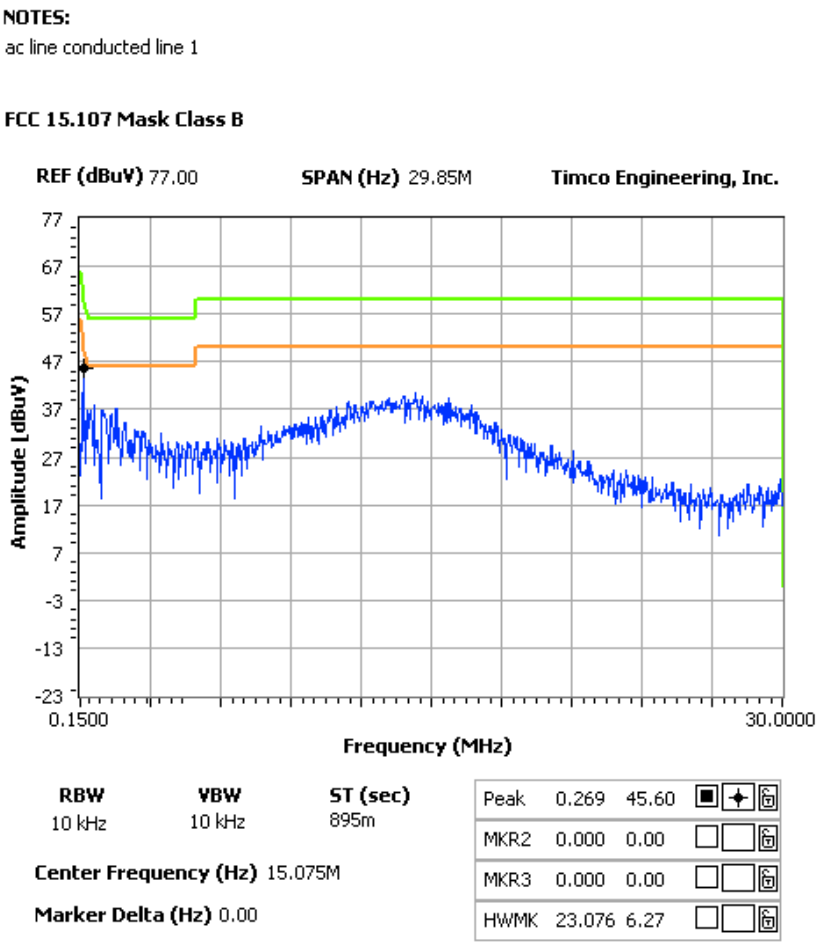
Rules Part No.: Part 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBµV)	Average Limits (dBµV)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50
* Decrease with logarithm of frequency		

Test Data: The following plots represent the emissions read for power line conducted. Both lines were observed.

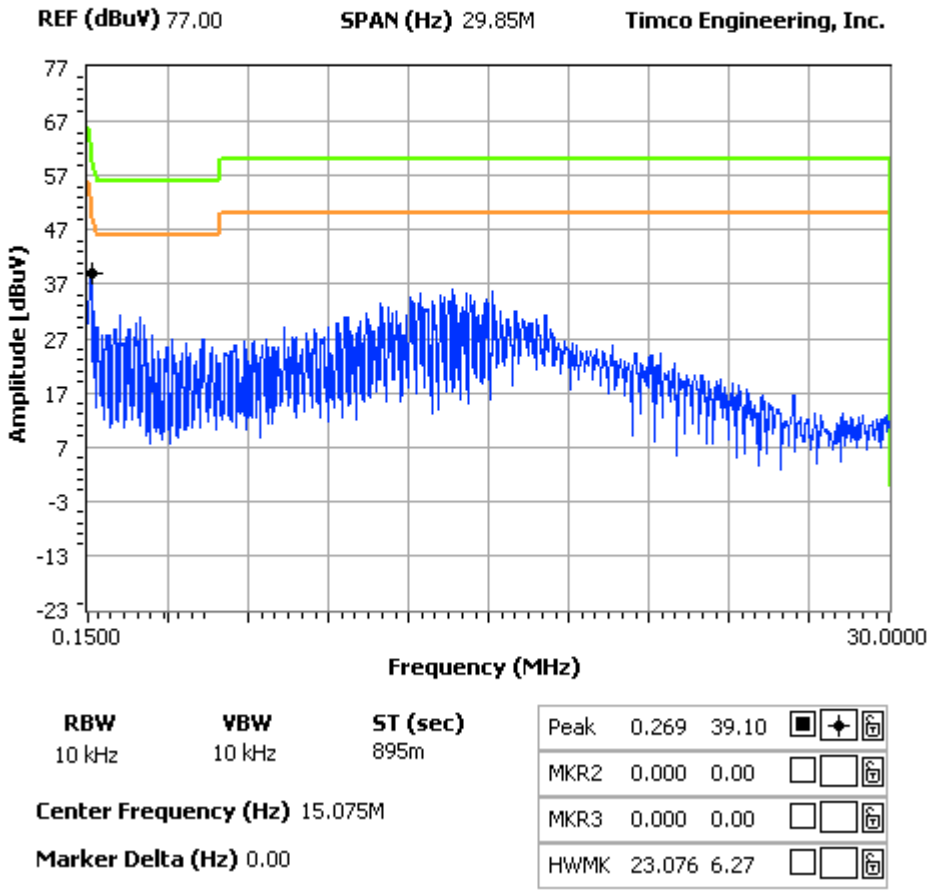
POWERLINE CONDUCTED PLOT – LINE 1



POWERLINE CONDUCTED PLOT – LINE 2

NOTES:
ac line conducted line 2

FCC 15.107 Mask Class B



OCCUPIED BANDWIDTH

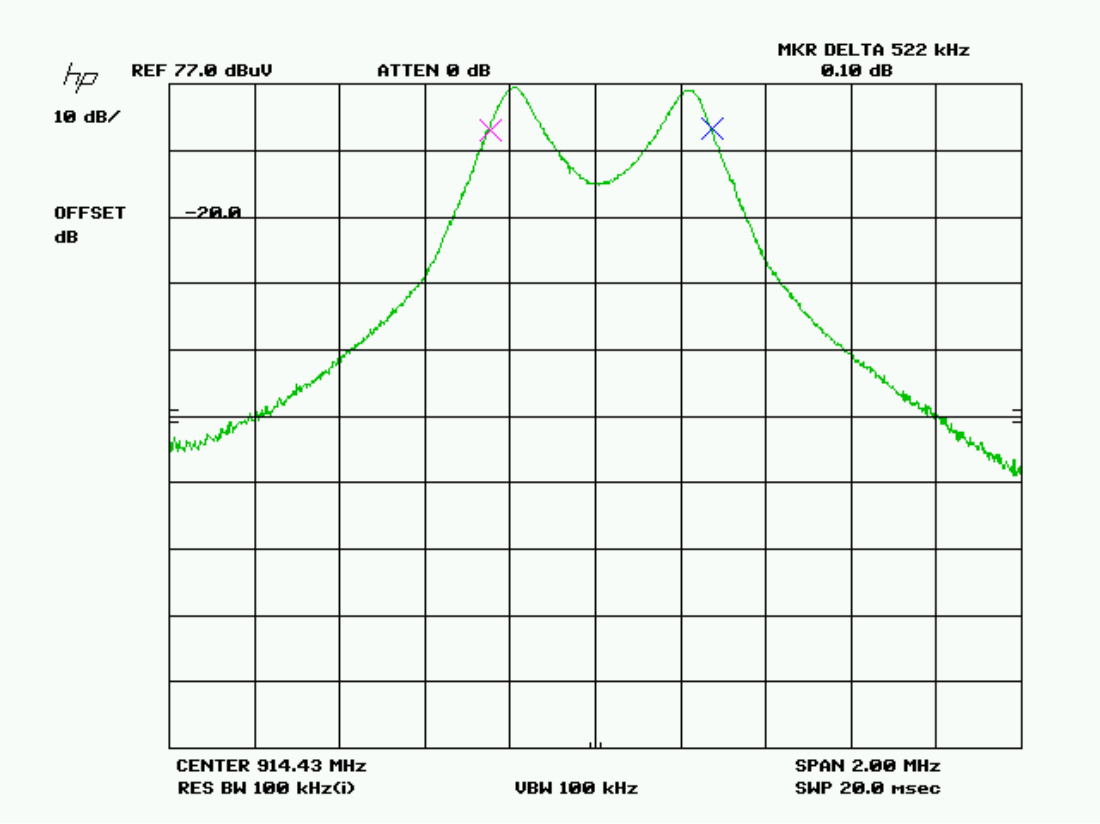
Rules Part No.: 15.247(a)(2

Requirements: The 6 dB bandwidth must be greater than 500 kHz.

Test Data:

Three places in the band were measured and the worst case reported.

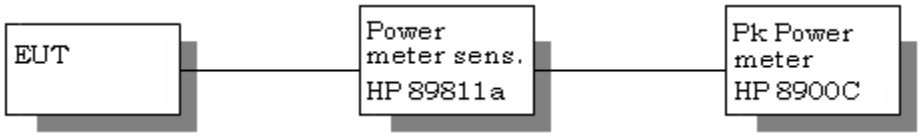
The 20 dB BW is 650 kHz



POWER OUTPUT

Rules Part #: 15.247(b) 1 Watt conducted, 4W ERP

Test Setup:



Harmonics were checked through the 10th harmonic

Test Results:

Frequency MHz	Po dBm	Po Watts
902.9	2.7	.0018
914.4	3	.002
927.1	2.2	.0016

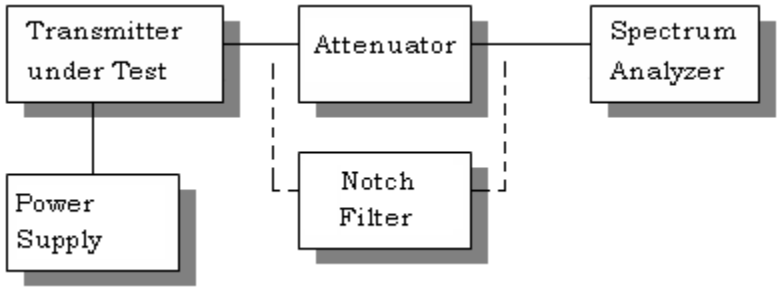
SPURIOUS EMISSIONS AT ANTENNA TERMINALS

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

Test Data:

Frequency	dBc	Frequency	dBc	Frequency	dBc
902.9	0	914.4	0	927.1	0
1805.8	61.6	1828.9	57	1854.2	61.5
2708.8	62.4	2743.3	60.5	2781.4	62.5
3611.7	67.5	3657.8	69.2	3708.5	73.7
4514.7	82.2	4572.3	85.2	4635.7	83.4
5417.6	86.7	5486.7	82.2	5562.8	81.9
6320.5	70.7	6401.2	73.3	6489.9	74.6
7223.5	76.1	7315.6	78.1	7417.1	79.5
8126.4	80.7	8230.1	79.4	8344.2	80.6
9029.4	85	9144.6	86.5	9271.4	84.8

15.247(c) Method of Measuring RF Conducted Spurious Emissions



RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

Requirements: Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 µV/m (54 dBµV/m).

Test Procedure: An in band field strength measurement of the fundamental Emission using the RBW and detector function required by C63.4-2000 and FCC Rules. The procedure was repeated with an average detector and a plot made. The calculated field strength in the adjacent restricted band is presented below.

Lower band edge peak Vertical

Lower band edge Average Vertical

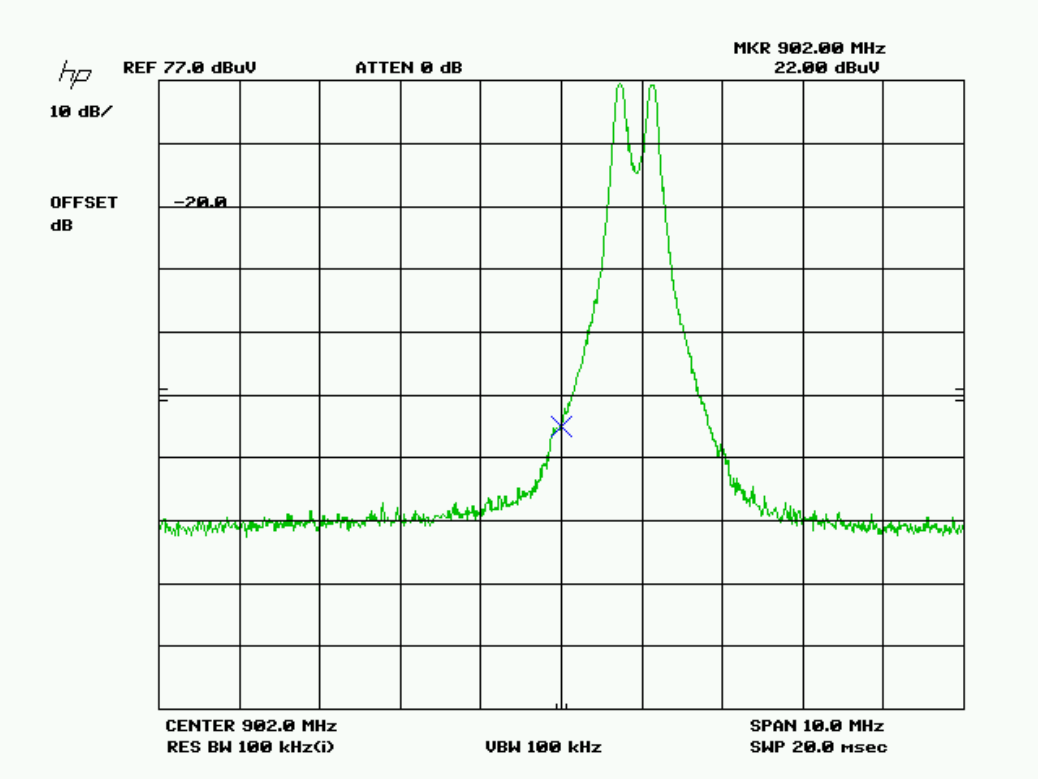
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m
902.9	902.00	22.0	V	1.95	22.68	46.63Pk
902.9	902.00	7.5	V	1.95	22.68	32.13Av

Upper band edge peak Vertical

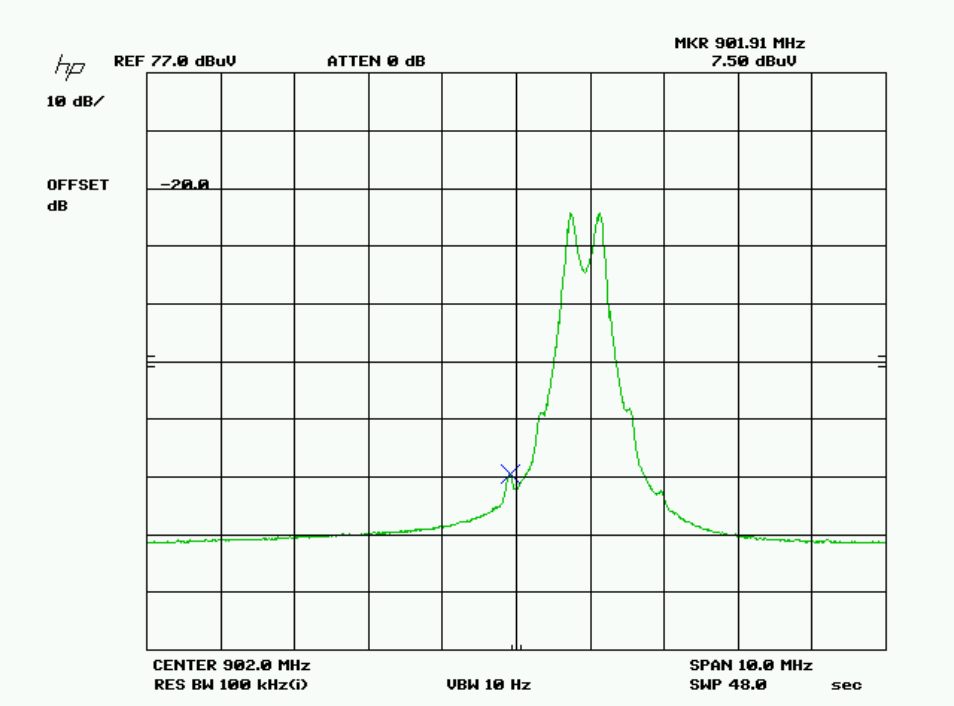
Upper band edge Average Vertical

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m
927.1	928.00	20.9	V	1.99	22.68	45.57Pk
927.1	928.00	1.8	V	1.99	22.68	26.47Av

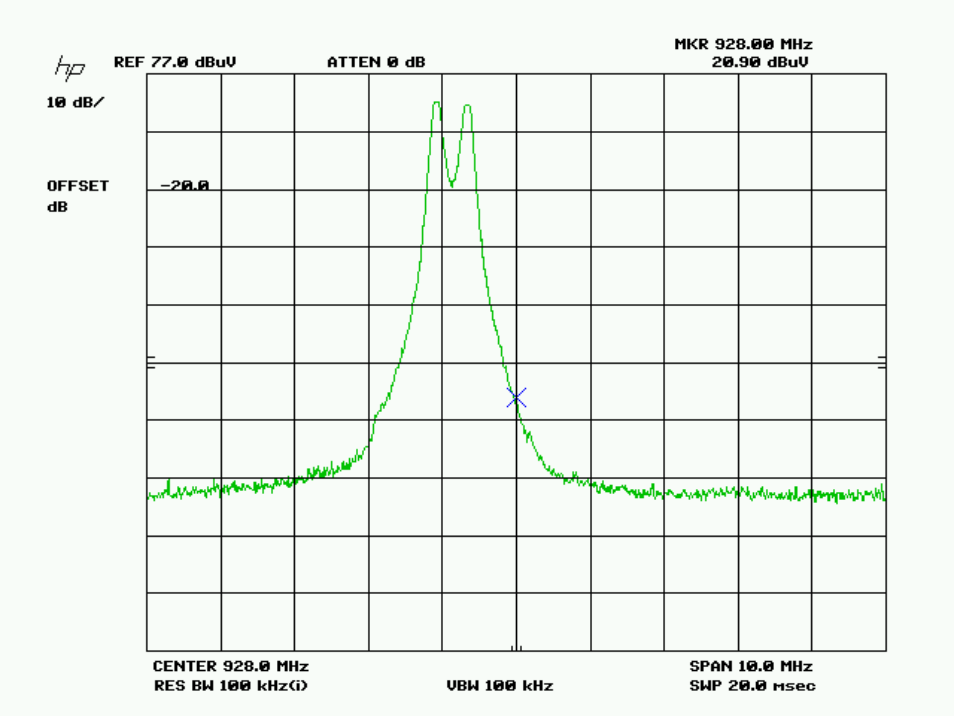
Lower band edge peak Vertical



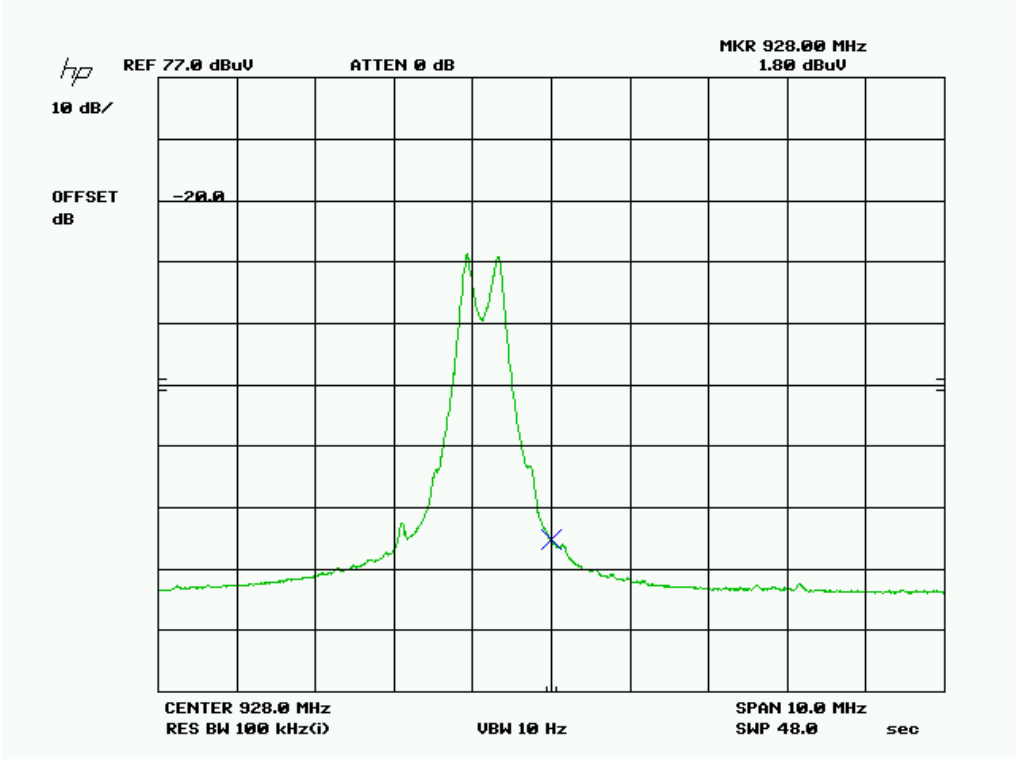
Lower band edge Average Vertical



Upper bandedge Peak Vertical



Upper bandedge average – Vertical



POWER SPECTRAL DENSITY

Rules Part No.: 15.247(d)

Requirements: The peak level measured must be less than +8.0 dBm.

Test Data: SEE THE FOLLOWING PLOTS

802.11b

Three places in the band were measured and the worst case reported.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m
914.6	914.60	17.7	V	1.97	22.60	42.27

42.27 dBµV/m
+35 dB CF for 1 Hz to 3 kHz RBW

The output power isn't high enough for the PSD to exceed +8 dBm.