Excellence in Compliance Testing

Certification Test Report

FCC ID: VRA-SG9011079
IC: 7420A-SG9011079

FCC Rule Part: CFR Part 90 Subpart I, Part 90 Subpart M
IC Radio Standards Specification: RSS 137

ACS Report Number: 10-2041.W06.11.A

Applicant: Sagrad, Inc.
Model: SG901-1075

Test Begin Date: 06-25-2010
Test End Date: 07-16-2010

Report Issue Date: 08-05-2010

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200897-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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This report contains 32 pages

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1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 2 Subpart J and Part 90 Subpart I and Subpart M of the FCC's Code of Federal Regulations; and RSS 137 of Industry Canada's Radio Standard Specifications.

1.2 Product Description

The SG901-1075 is a RFID Tag Reader operating in the 900 MHz band intended to work with standard transportation passive RFID tags. When power is applied, the Tag Reader initializes and begins transmitting the CW Tone at a frequency selectable from 902 - 904 MHz and 909.75 - 921.75 in 0.25MHz steps. The passive RFID tag is powered by this CW tone, and modulates its antenna impedance to transmit its stored message. The Tag Reader detects this modulation and from it decodes the message.

Manufacturer Information:
Sagrad, Inc.
751 North Drive Ste 10
Melbourne, FL 32934

Test Sample Serial Numbers: ACS#3

Test Sample Condition: The unit was provided in good physical condition with no noticeable functional defects.

1.3 Test Configurations and Justification

For the measurements, the unit was put in continuous transmitting mode. The unit was powered by a 15 VDC power supply and was communicating with a laptop computer and an evaluation board.

1.4 Emission Designators

The SG901-1075 transmitter only transmits a CW signal. The emissions designator for the SG901-1075 transmitter is as follows:

EMISSIONS DESIGNATOR:
224HN0N

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 581606
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200897-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with continuous metallic loaded springs. An EMCO Model 1051 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

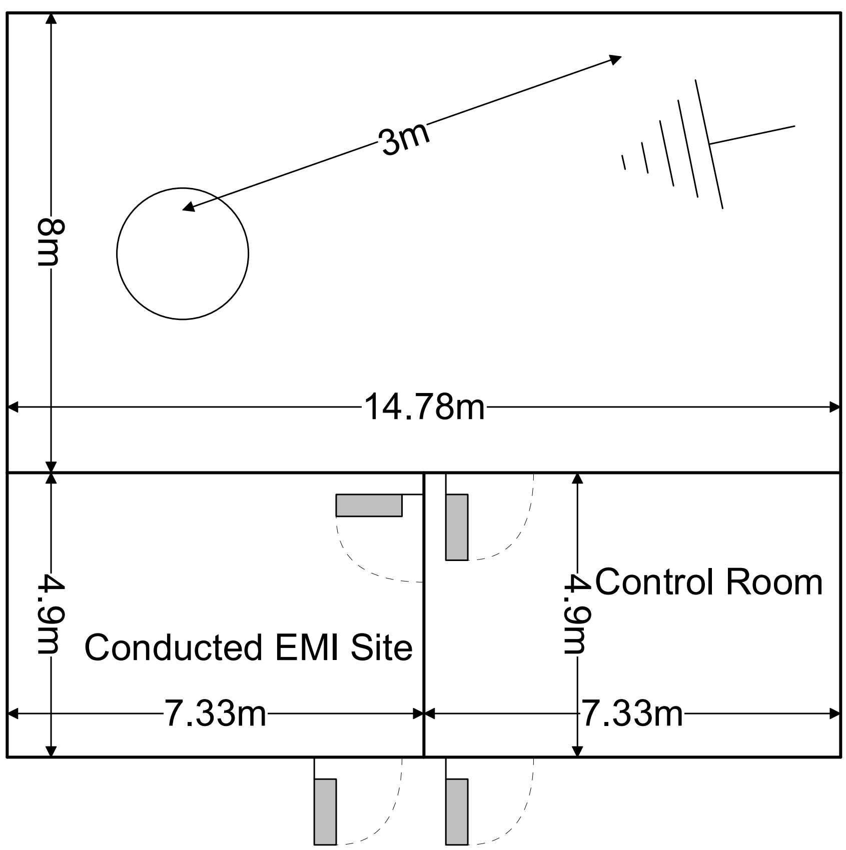

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 220 V ELGAR Model 1001B variable frequency generator set to 50 Hz, to filter the conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:

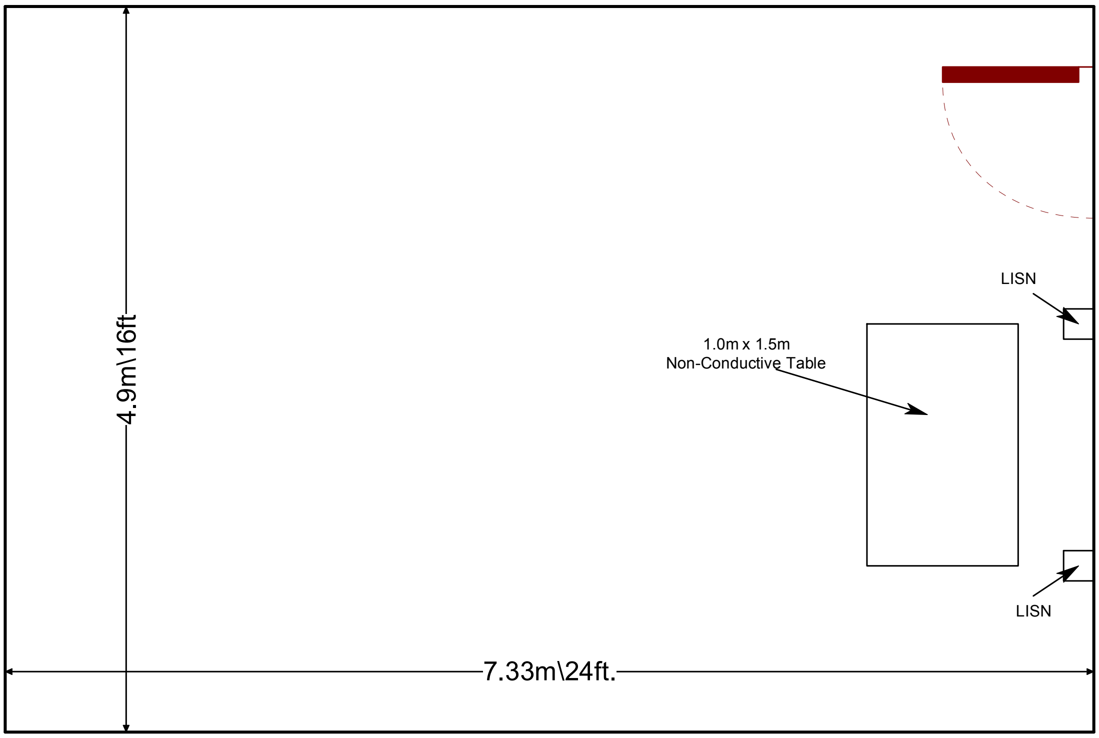

Figure 2.3.2-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

1 - ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 kHz to 40 GHz - 2003
2 -US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures - 2010
3 - US Code of Federal Regulations (CFR): Title 47, Part 90: Private Land Mobile Radio Services - 2010
4 – TIA-603-C: Land Mobile FM or PM - Communications Equipment - Measurement and Performance Standards – 2004
5 - Industry Canada Radio Standards Specification: RSS-137 - Location and Monitoring Service in the Band 902-928 MHz - Issue 2, February 2009

4.0 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Cal Due Date
RE39	Rohde & Schwarz, Inc.	FSU46	Spectrum Analyzers	200009	7/9/2011
426	Thermotron	S-8 Mini Max	Environmental Chamber	25-2888-10	8/30/2010
267	Agilent	N1911A	Meters	MY45100129	11/16/2010
268	Agilent	N1921A	Sensors	MY45240184	11/16/2010
339	Aeroflex/Weinschel	AS-18	Attenuators	7142	7/2/2011
2002	EMCO	3108	Antennas	2147	9/10/2011
2004	EMCO	3146	Antennas	1385	9/10/2011
2006	EMCO	3115	Antennas	2573	2/21/2011
2011	Hewlett-Packard	HP 8447D	Amplifier	2443A03952	1/4/2011
2012	Hewlett-Packard	HP83017A	Amplifier	3123A00324	12/30/2010
2013	Hewlett Packard	HP8566B	Spectrum Analyzers	2407A03233	8/7/2010
2014	Hewlett Packard	HP 85650A	Quasi Peak Adapter	2430A00559	8/7/2010
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	12/30/2010

5.0 Support Equipment

Table 5-1: Support Equipment

Diagram #	Manufacturer	Equipment Type	Model Number	Serial Number
1	Interface Board	IAR Systems	STM32-SK Rev. B	N/A
2	5 VDC Power Supply	CUI, Inc.	3A-061WP05	EMS050120-P5P-SZ
3	Laptop	Dell	Latitude D610	N/A
4	Power Supply	Dell	LA65NS0-00	CN-ODF263-71615-6AO-188E

6.0 EQUIPMENT UNDER TEST SETUP AND BLOCK DIAGRAM

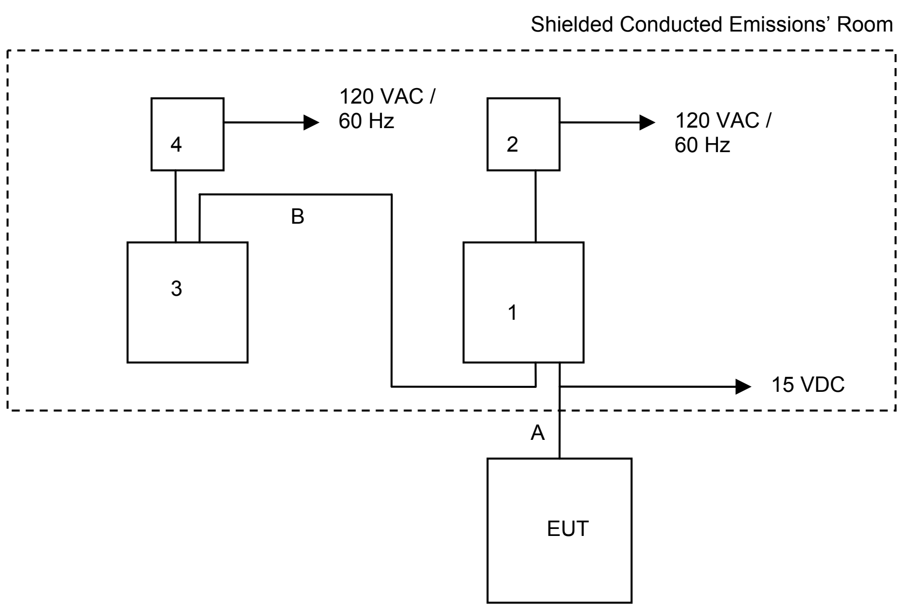

Figure 6-1: EUT Test Setup

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 RF Power Output – FCC Part 2.1046, Part 90.205 (l); IC RSS-137 6.4

7.1.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through a 20 dB passive attenuator. The resolution and video bandwidths of the spectrum analyzer were set at sufficient levels, >> signal bandwidth, to produce accurate results. The internal correction factors of the spectrum analyzer were employed to correct for any cable or attenuator losses. Results are shown below in Table 7.1.2-1.

7.1.2 Measurement Results

Table 7.1.2-1: Peak Output Power

Frequency (MHz)	Output Power (dBm)
902.25	30.42
903.75	30.41
910	30.34
915	30.28
921.5	30.18

7.2 Occupied Bandwidth (Emission Limits) - FCC Part 2.1049, Part 90.210 (K); IC RSS-137 6.1.2

7.2.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through a 20 dB passive attenuator. The spectrum analyzer resolution and video bandwidths were set to 100 Hz and 300 Hz respectively. The internal correction factors of the spectrum analyzer were employed to correct for any cable or attenuator losses. Results of the test are shown below for all modes of operation. Results are shown below in Figures 7.2.2-1 through 7.2.2-5.

7.2.2 Measurement Results

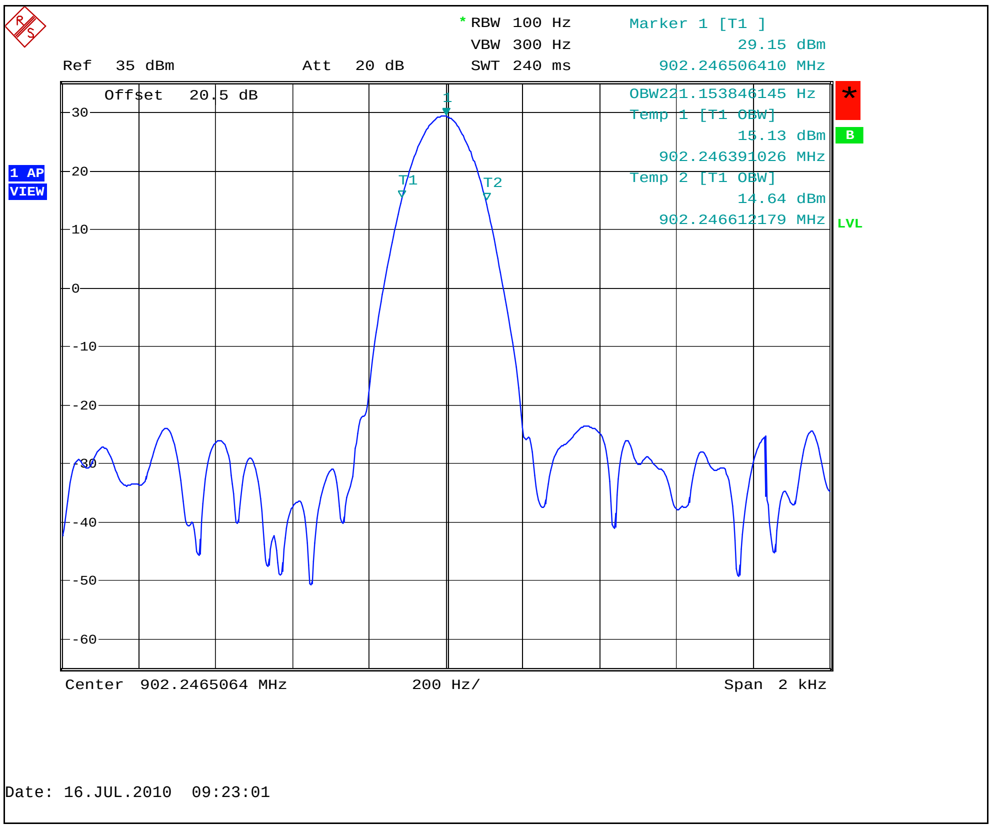

Figure 7.2.2-1: Occupied Bandwidth – 902.25 MHz

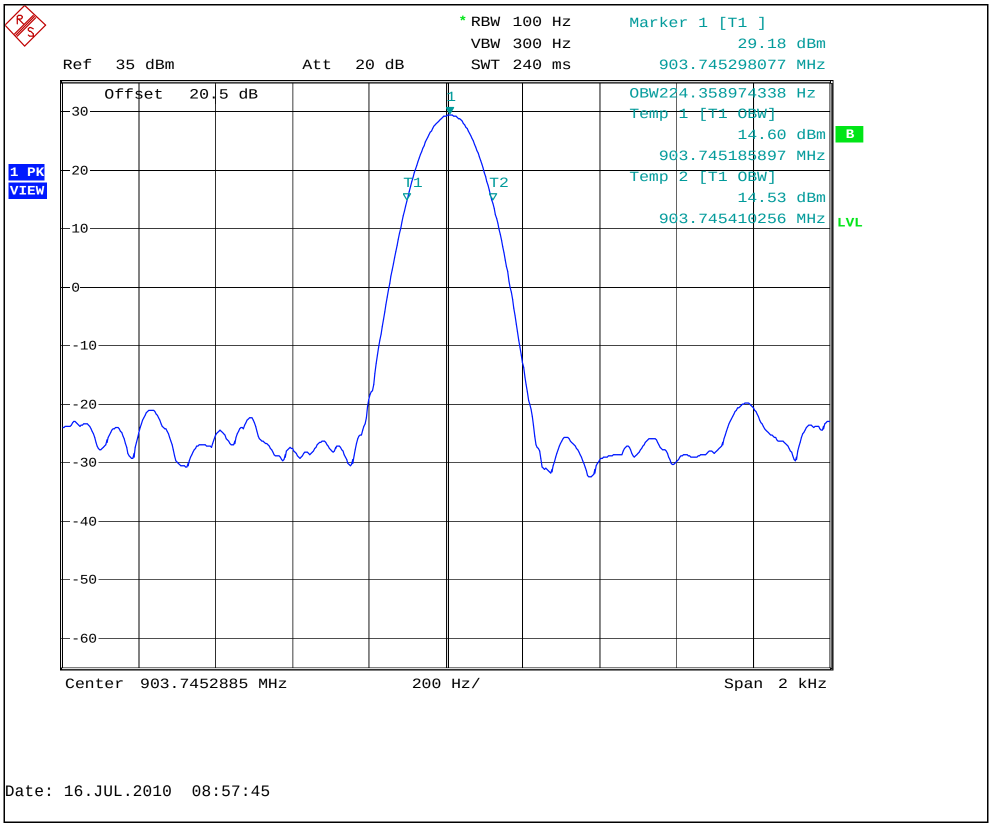

Figure 7.2.2-2: Occupied Bandwidth – 903.75 MHz

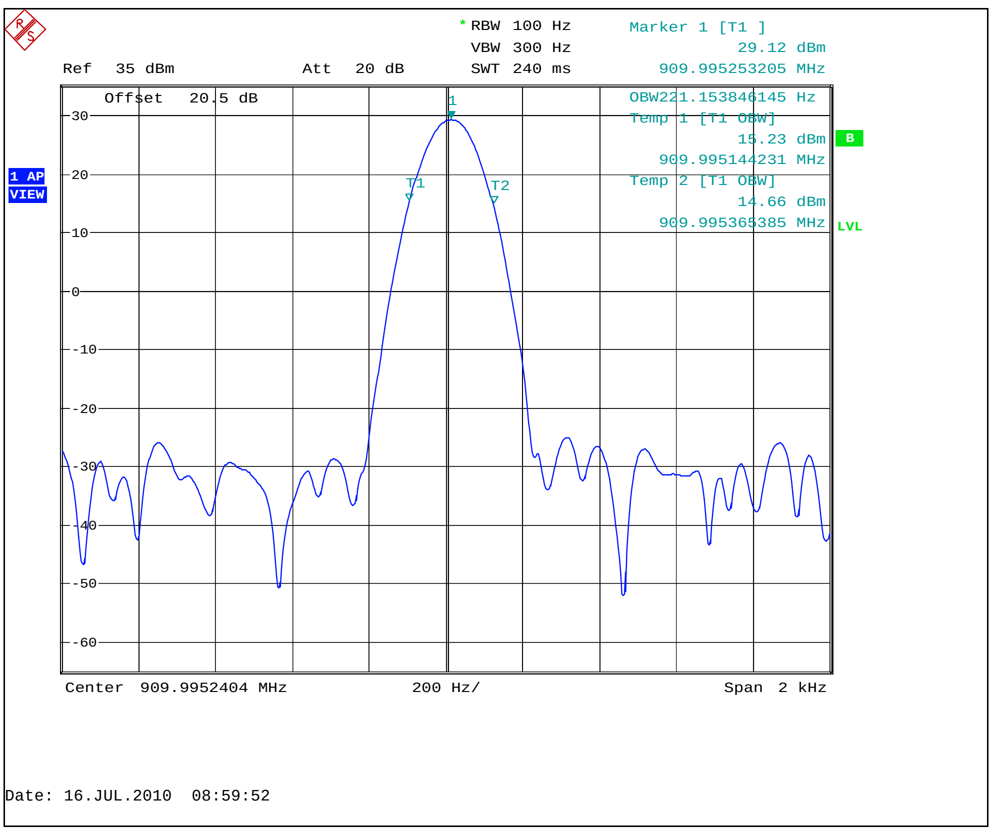

Figure 7.2.2-3: Occupied Bandwidth – 910 MHz

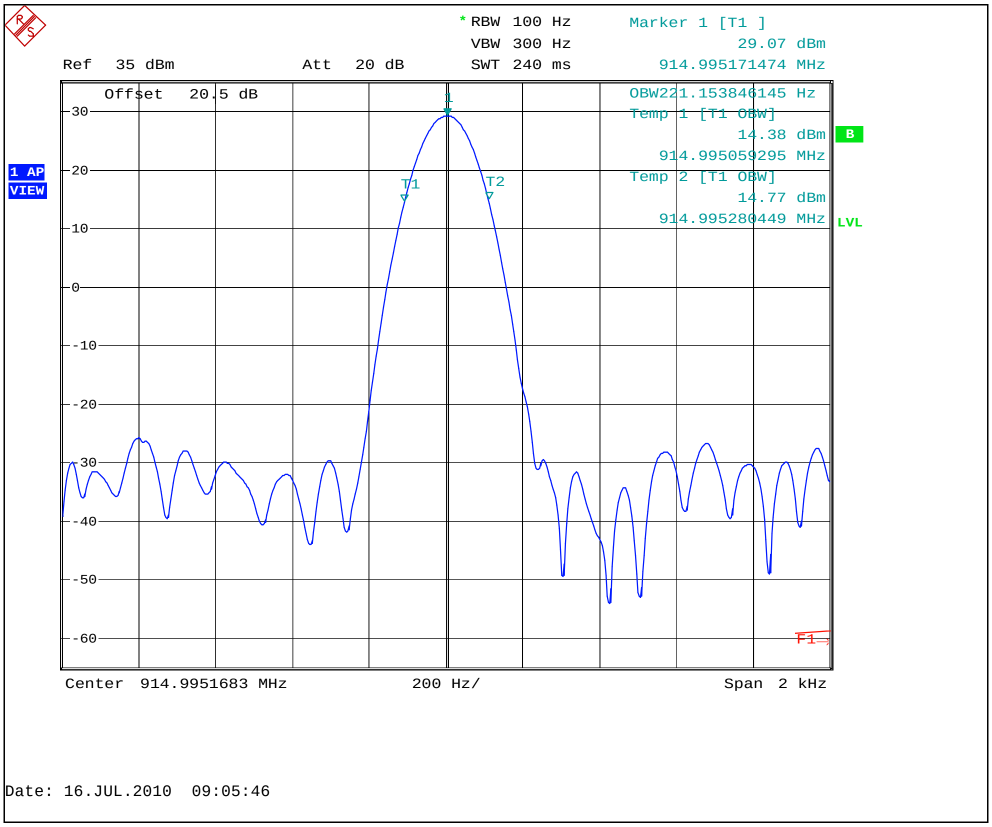

Figure 7.2.2-4: Occupied Bandwidth – 915 MHz

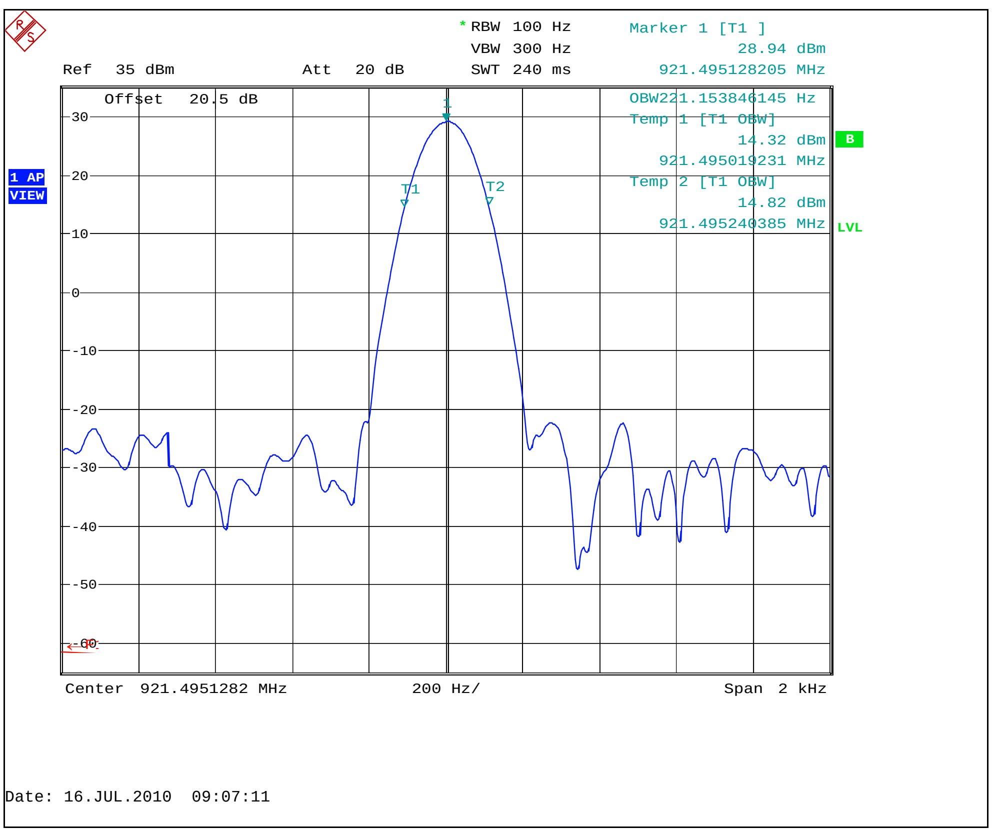

Figure 7.2.2-5: Occupied Bandwidth – 921.5 MHz

7.3 Band Edge at the Antenna Terminals – FCC Part 2.1051, Part 90.210 (K); IC RSS-137 6.5.3

7.3.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through a 20 dB passive attenuator. The spectrum analyzer resolution bandwidth was set to 10 kHz and the video bandwidth to 30 kHz. The internal correction factors of the spectrum analyzer were employed to correct for any cable or attenuator losses. Results are shown below in Figures 7.3.2-1 through 7.3.2-4.

7.3.2 Measurement Results

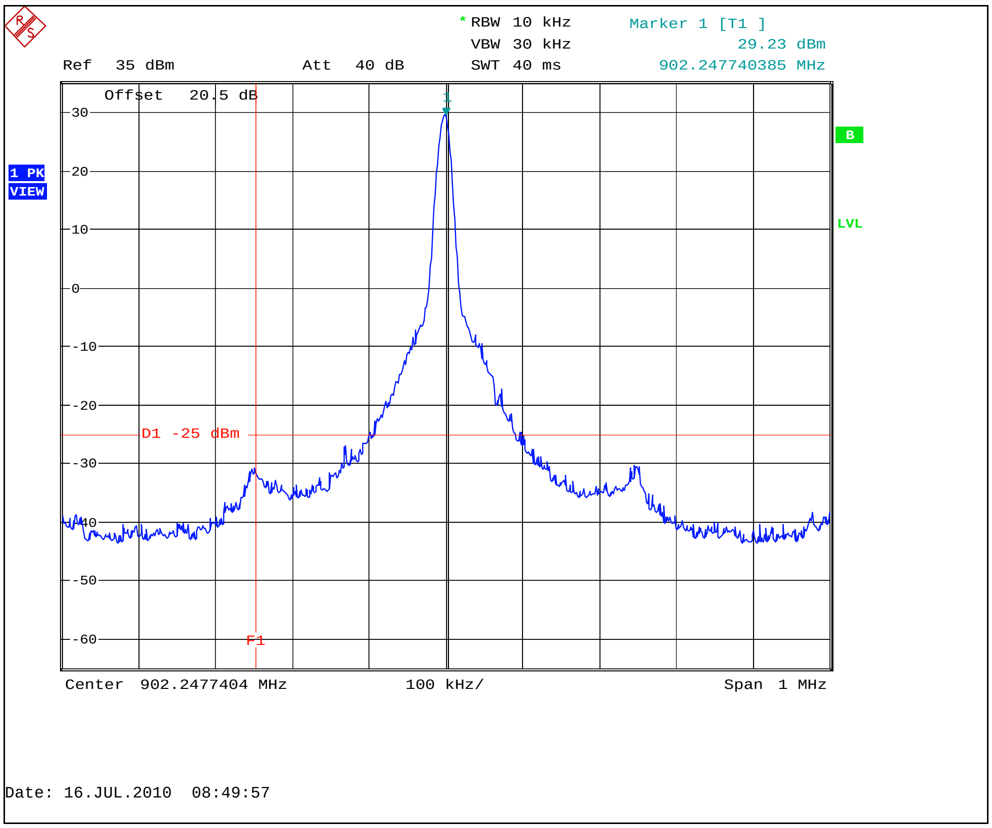

Figure 7.3.2-1: Band Edge – 902.25 MHz

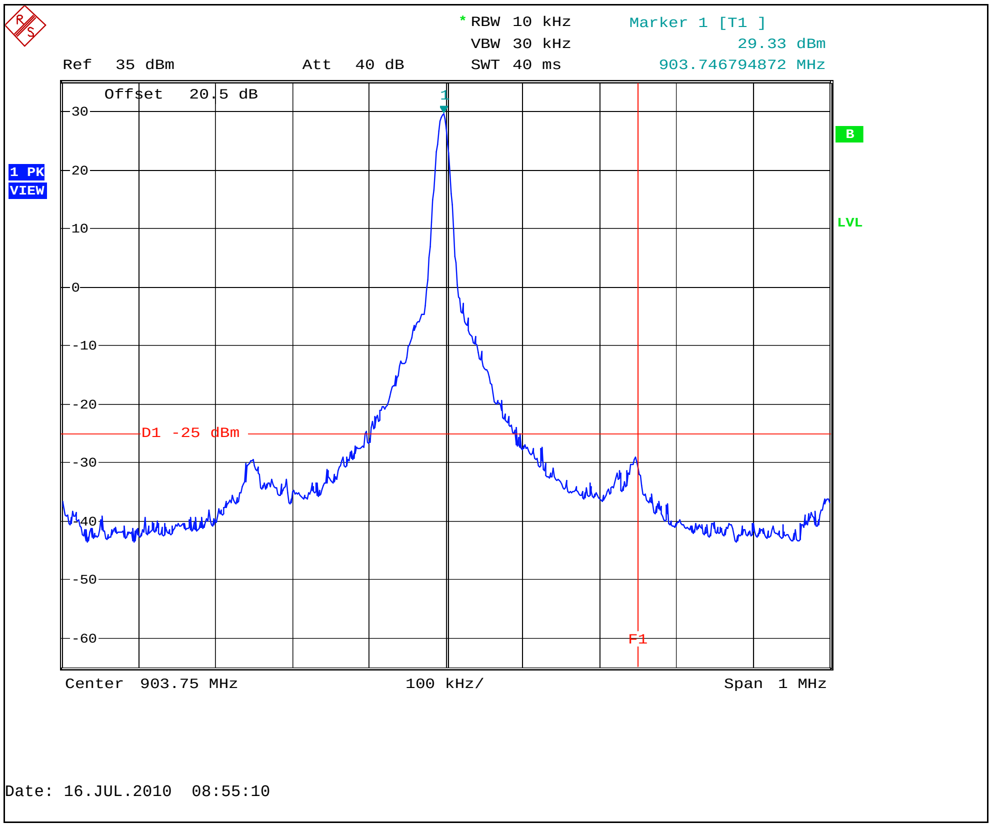

Figure 7.3.2-2: Band Edge – 903.75 MHz

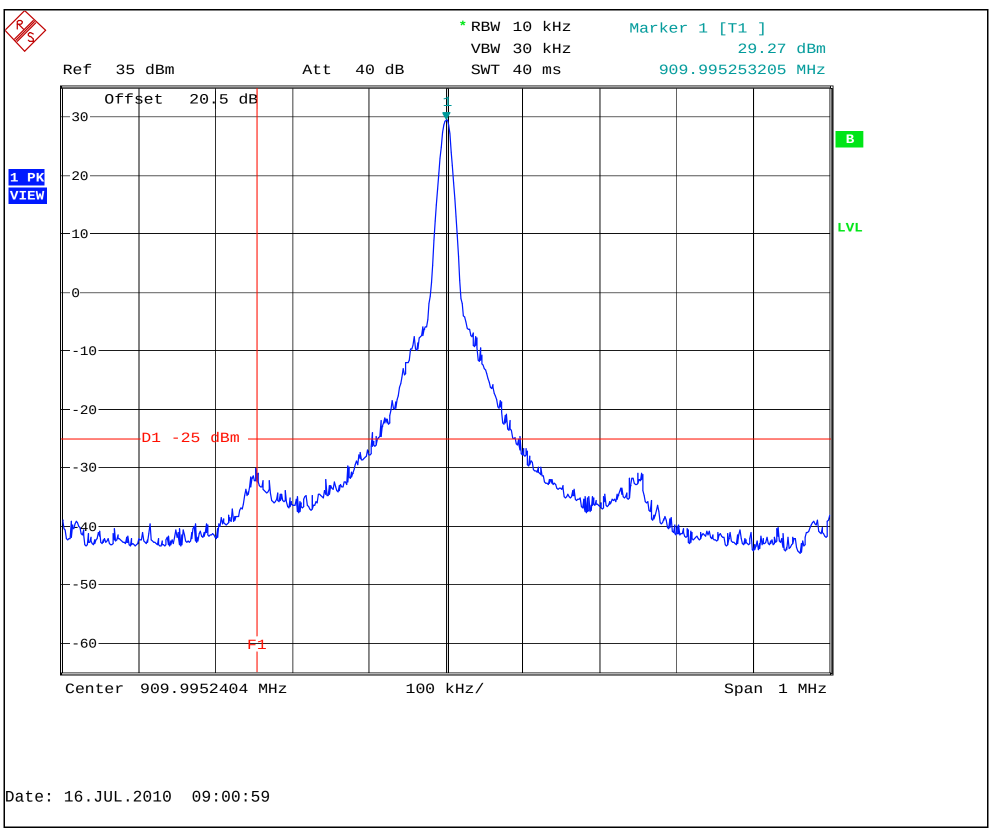

Figure 7.3.2-3: Band Edge – 910 MHz

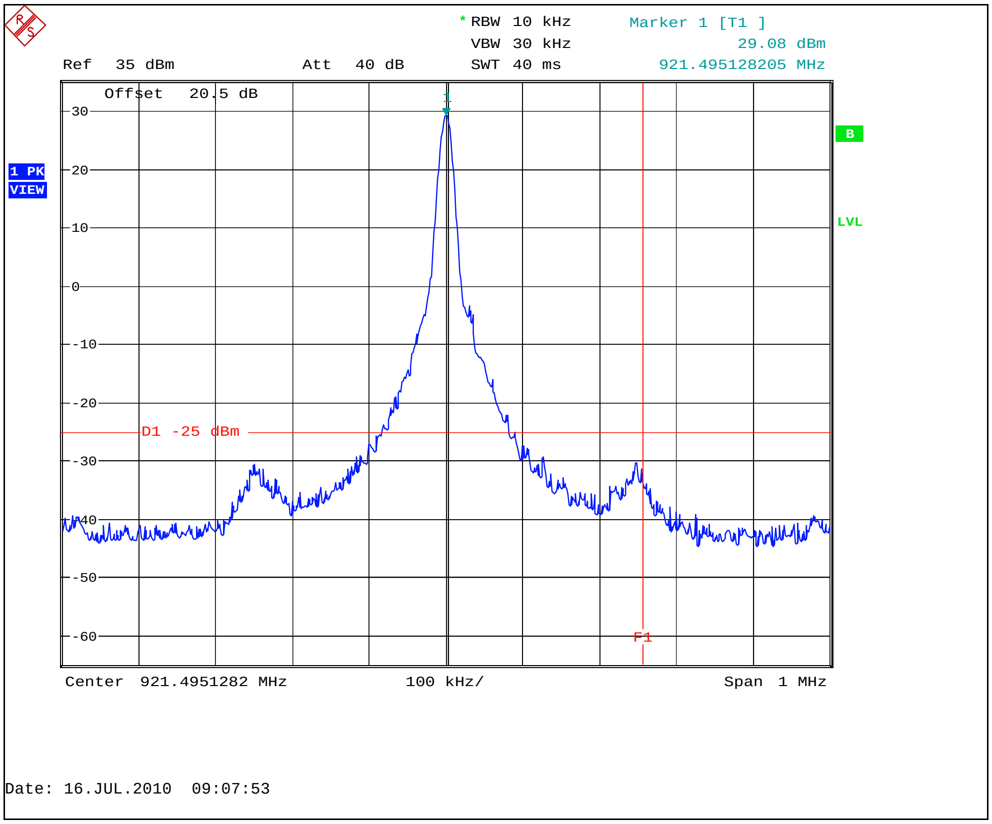

Figure 7.3.2-4: Band Edge – 921.5 MHz

7.4 Spurious Emissions at Antenna Terminals – FCC Part 2.1051, Part 90.210 (K); IC RSS-137 6.5.3

7.4.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through a 20 dB passive attenuator. The spectrum analyzer resolution bandwidth was set to 100 kHz and the internal correction factors of the spectrum analyzer were employed to correct for any cable or attenuator losses. The spectrum was investigated in accordance to CFR 47 Part 2.1057. Results are shown below in Figures 7.4.2-1 through 7.4.2-6.

7.4.2 Measurement Results

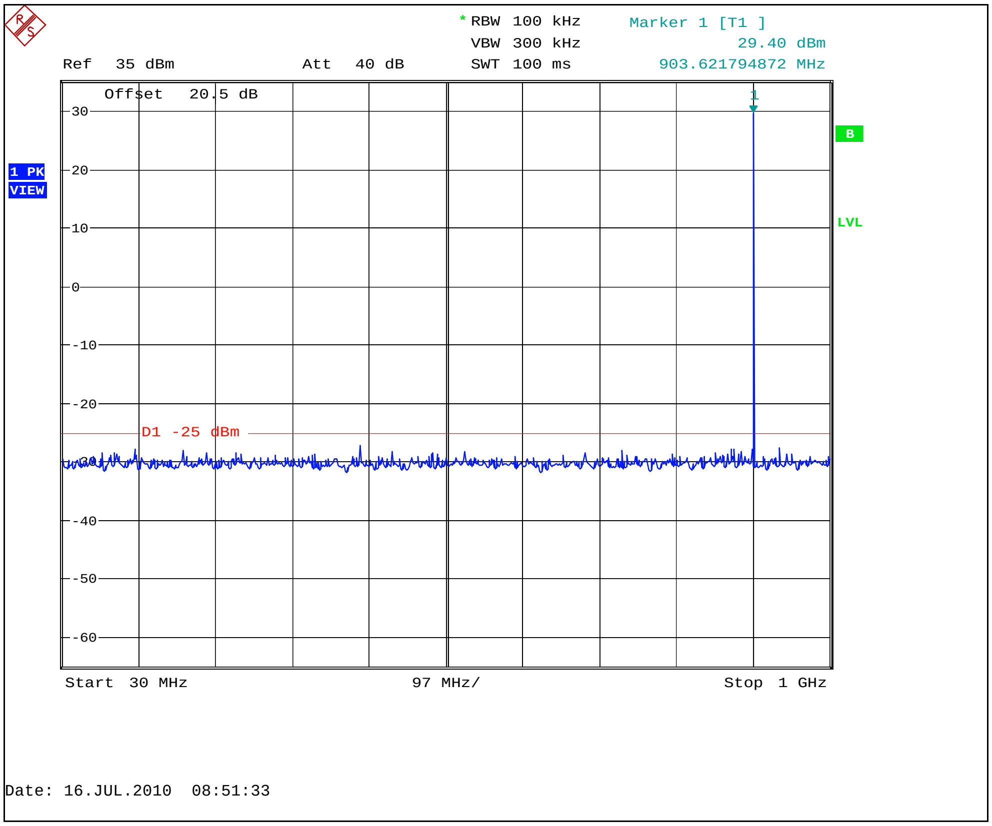

Figure 7.4.2-1: Spurious Emissions – 902.25 MHz – 30MHz to 1GHz

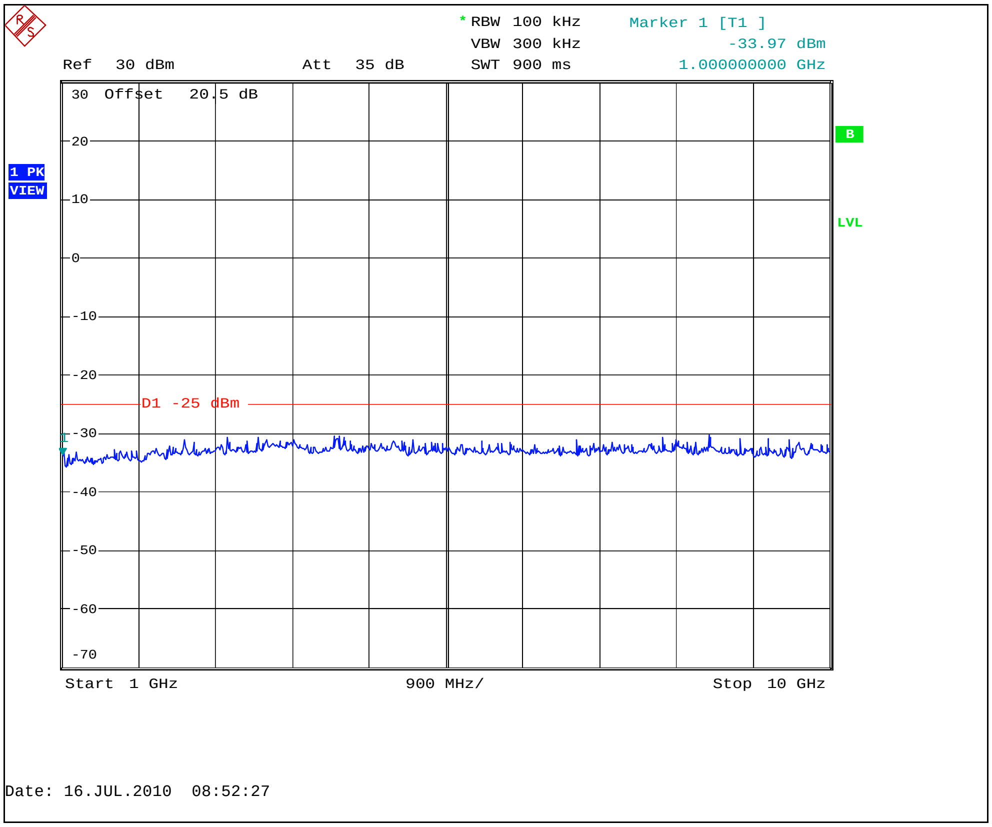

Figure 7.4.2-2: Spurious Emissions – 902.25 MHz – 1GHz to 10GHz

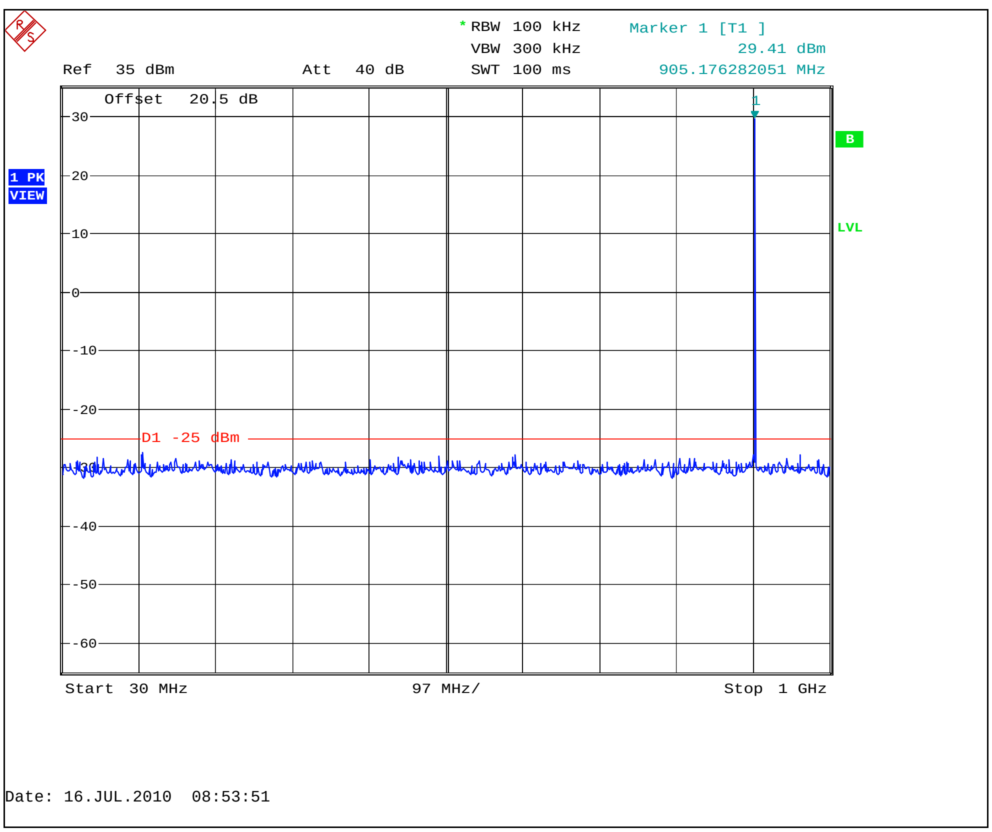

Figure 7.4.2-3: Spurious Emissions – 903.75 MHz – 30MHz to 1GHz

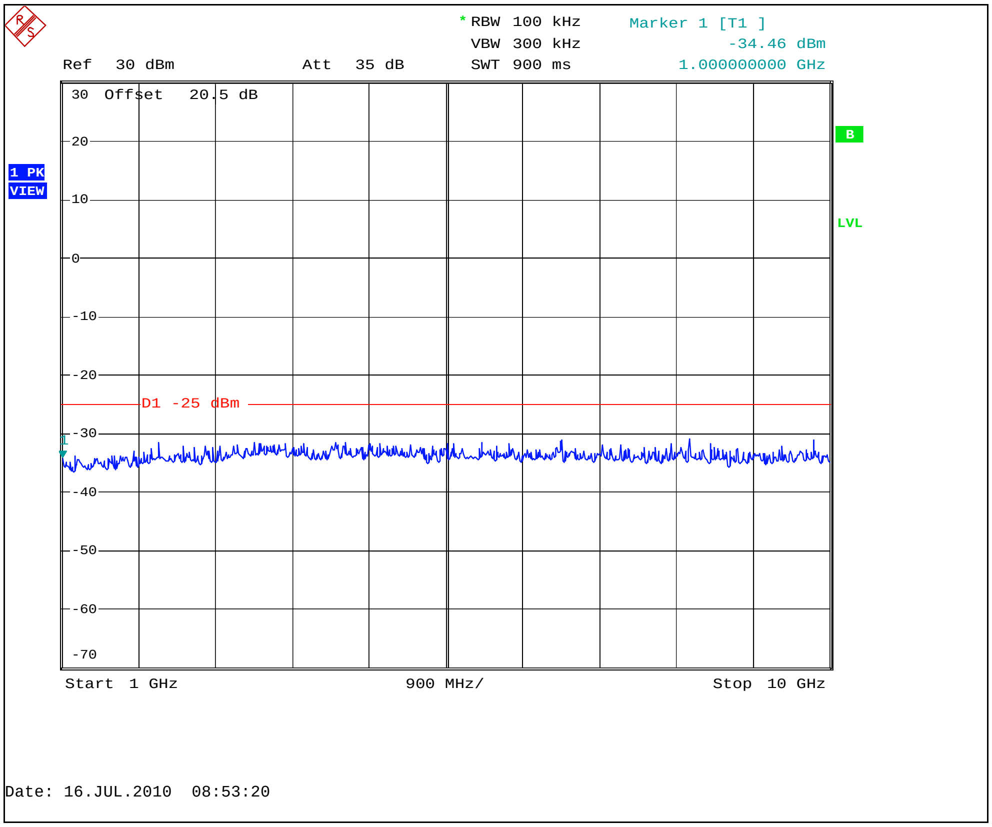

Figure 7.4.2-4: Spurious Emissions – 903.75 MHz – 1GHz to 10GHz

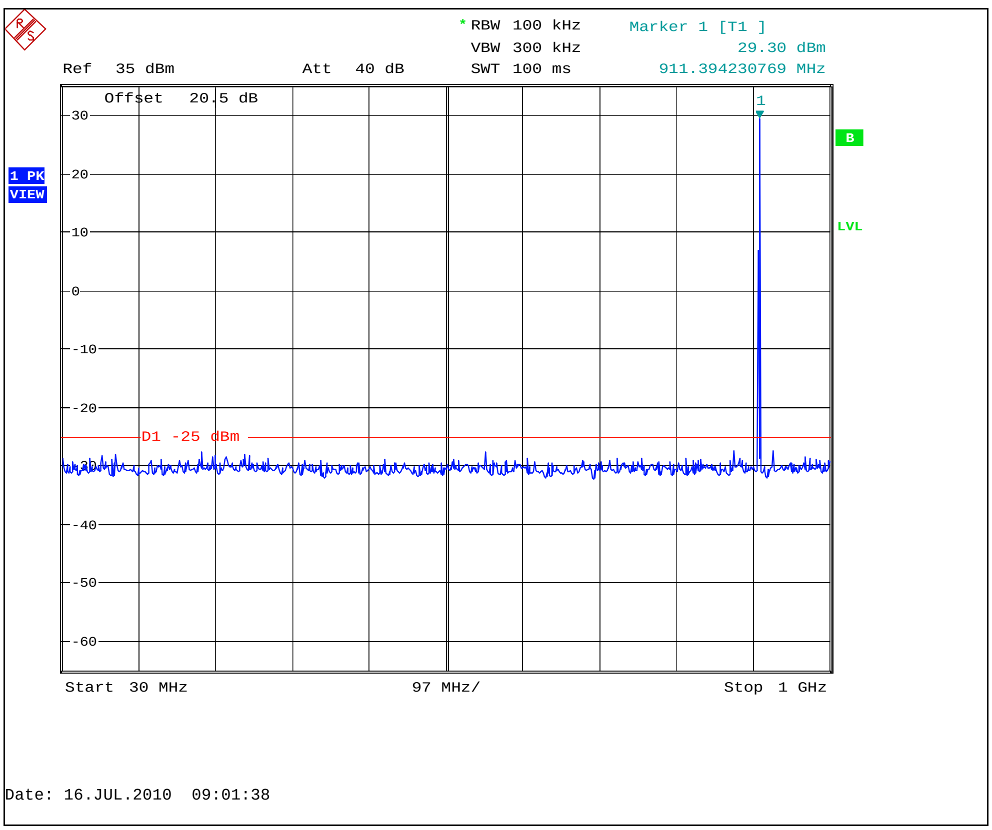

Figure 7.4.2-5: Spurious Emissions – 910 MHz – 30MHz to 1GHz

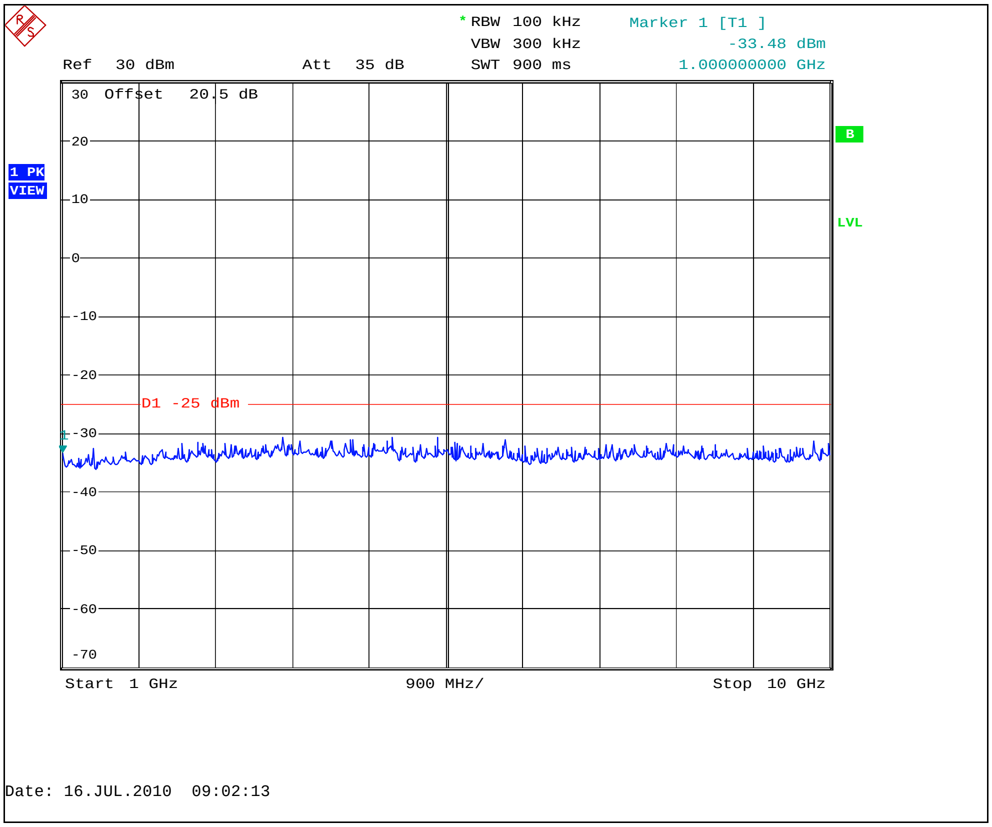

Figure 7.4.2-6: Spurious Emissions – 910 MHz – 1GHz to 10GHz

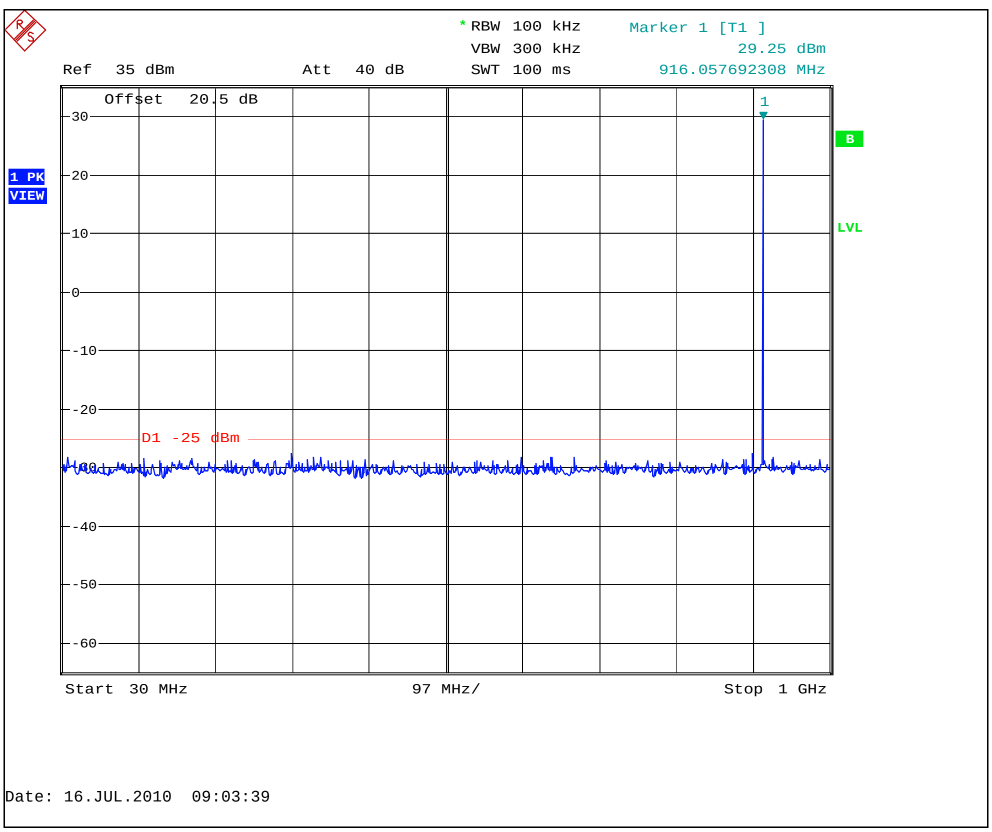

Figure 7.4.2-7: Spurious Emissions – 915 MHz – 30MHz to 1GHz

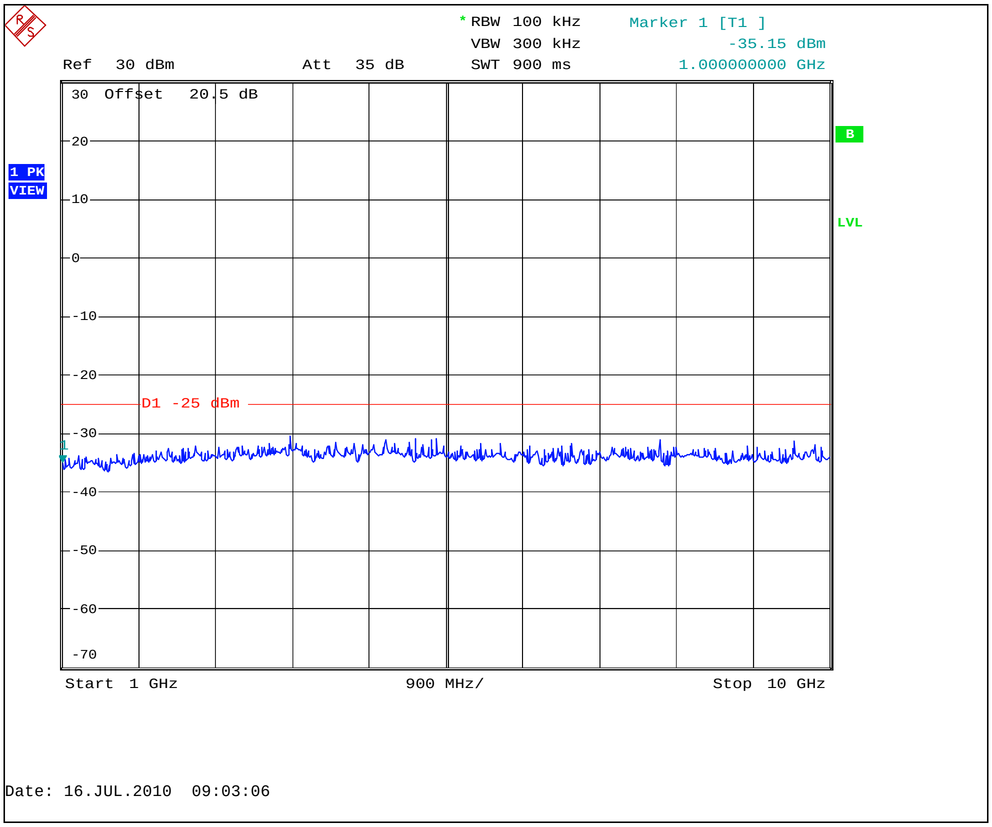

Figure 7.4.2-8: Spurious Emissions – 915 MHz – 1GHz to 10GHz

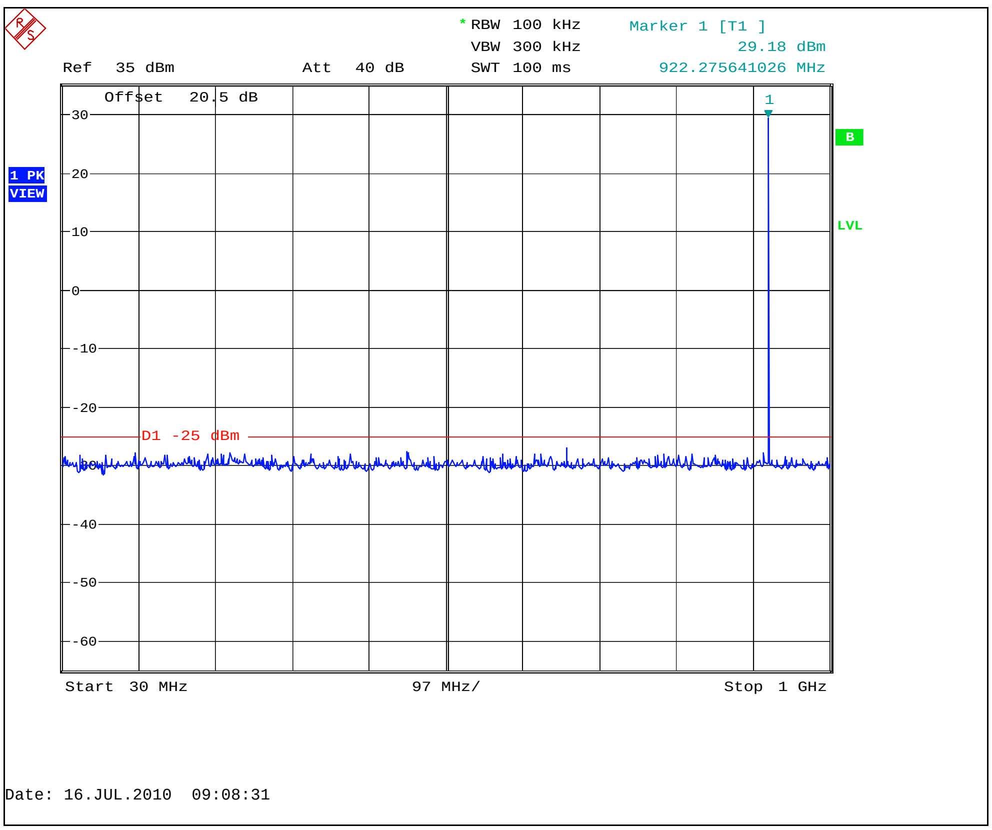

Figure 7.4.2-9: Spurious Emissions – 921.5 MHz – 30MHz to 1GHz

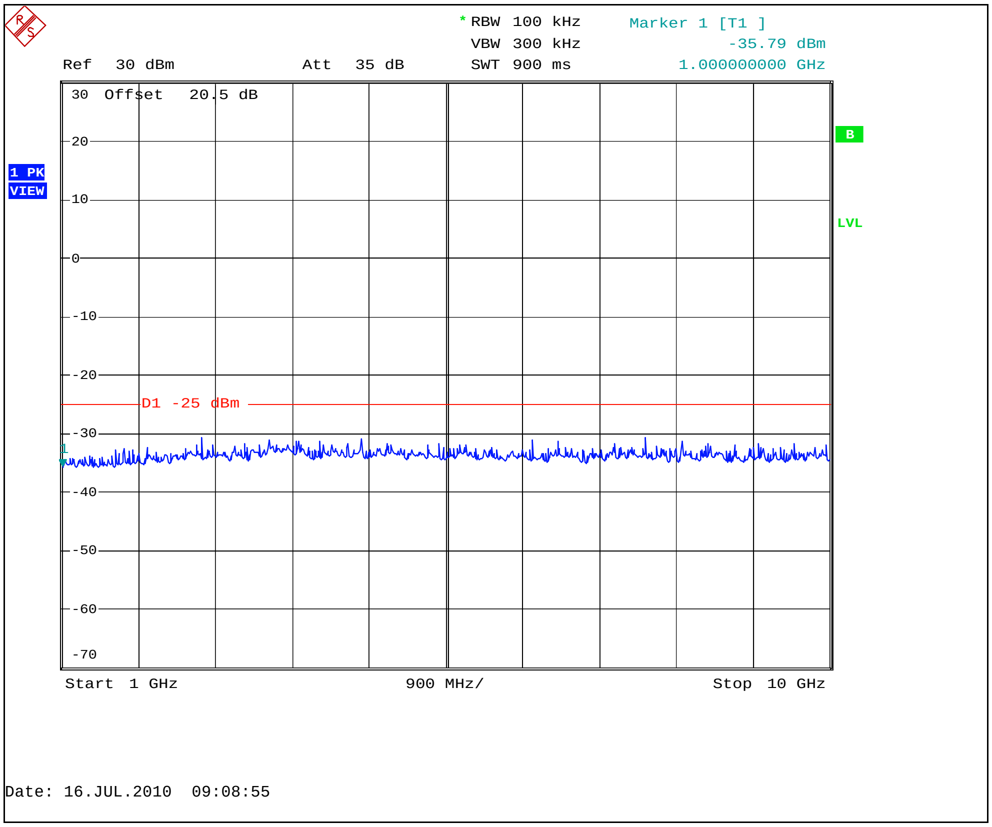

Figure 7.4.2-10: Spurious Emissions – 921.5 MHz – 1GHz to 10GHz

7.5 Field Strength of Spurious Emissions – FCC Part 2.1053, Part 90.210 (K); IC RSS-137 6.5.3

7.4.1 Measurement Procedure

The equipment under test is placed in the Semi-Anechoic Chamber (described in section 2.3.1) on a wooden table at the turntable center. For each spurious emission, the antenna mast is raised and lowered from one (1) to four (4) meters and the turntable is rotated 360º and the maximum reading on the spectrum analyzer is recorded. This was repeated for both horizontal and vertical polarizations of the receive antenna.

The equipment under test is then replaced with a substitution antenna fed by a signal generator. The signal generator's frequency is set to that of the spurious emission recorded from the equipment under test. The antenna mast is raised and lowered from one (1) to four (4) meters to obtain a maximum reading on the spectrum analyzer. The output of the signal generator is then adjusted until the reading on the spectrum analyzer matches that obtained from the equipment under test. The signal generator level is recorded. The power in dBm of each spurious emission is calculated by correcting the signal generator level for the cable loss and gain of the substitution antenna referenced to a dipole. The spectrum was investigated in accordance to CFR 47 Part 2.1057.

The magnitude of all spurious emissions not reported were attenuated below the noise floor of the measurement system and therefore not specified in this report. Results are shown below in Figures 7.5.2-1 through 7.5.2-5.

7.5.2 Measurement Results

Table 7.5.2-1: Field Strength of Spurious Emissions – 902.75 MHz

Frequency (MHz)	Antenna Polarization	Maximum Reading (dBm)	Output Power (dBm)	Antenna Gain (dBd)	ERP (dBm)	Limits (dBm)	Margin (dBm)
1805.500	Horizontal	-54.08	-52.46	6.33	-46.13	-25.00	21.13
1805.500	Vertical	-54.72	-53.54	6.33	-47.21	-25.00	22.21
2708.250	Horizontal	-58.54	-54.84	8.00	-46.84	-25.00	21.84
2708.250	Vertical	-59.24	-53.30	8.00	-45.30	-25.00	20.30
3611.000	Horizontal	-57.04	-48.99	7.97	-41.02	-25.00	16.02
3611.000	Vertical	-54.05	-44.52	7.97	-36.55	-25.00	11.55
4513.750	Horizontal	-62.39	-52.16	9.00	-43.16	-25.00	18.16
4513.750	Vertical	-62.56	-51.73	9.00	-42.73	-25.00	17.73
5416.500	Horizontal	-63.79	-48.80	8.32	-40.48	-25.00	15.48
5416.500	Vertical	-63.28	-48.04	8.32	-39.72	-25.00	14.72
6319.250	Horizontal	-50.80	-44.80	9.27	-35.54	-25.00	10.54
6319.250	Vertical	-49.10	-44.00	9.27	-34.74	-25.00	9.74
7222.000	Horizontal	-57.70	-49.20	9.29	-39.92	-25.00	14.92
7222.000	Vertical	-60.05	-52.75	9.29	-43.47	-25.00	18.47
8124.750	Horizontal	-62.65	-53.35	9.33	-44.02	-25.00	19.02
8124.750	Vertical	-60.75	-52.50	9.33	-43.17	-25.00	18.17
9027.500	Horizontal	-60.85	-53.10	9.50	-43.60	-25.00	18.60
9027.500	Vertical	-60.00	-53.50	9.50	-44.00	-25.00	19.00

Table 7.5.2-2: Field Strength of Spurious Emissions – 903.75 MHz

Frequency (MHz)	Antenna Polarization	Maximum Reading (dBm)	Output Power (dBm)	Antenna Gain (dBd)	ERP (dBm)	Limits (dBm)	Margin (dBm)
1807.500	Horizontal	-52.86	-51.13	6.33	**-44.80**	-25.00	19.80
1807.500	Vertical	-55.45	-54.17	6.33	**-47.84**	-25.00	22.84
2711.250	Horizontal	-58.18	-54.06	8.00	**-46.06**	-25.00	21.06
2711.250	Vertical	-59.03	-53.01	8.00	**-45.01**	-25.00	20.01
3615.000	Horizontal	-58.49	-50.39	7.97	**-42.42**	-25.00	17.42
3615.000	Vertical	-55.96	-45.96	7.97	**-37.99**	-25.00	12.99
4518.750	Horizontal	-63.63	-53.26	9.00	**-44.26**	-25.00	19.26
4518.750	Vertical	-64.19	-53.42	9.00	**-44.42**	-25.00	19.42
5422.500	Horizontal	-60.23	-44.48	8.32	**-36.16**	-25.00	11.16
5422.500	Vertical	-61.25	-45.35	8.32	**-37.03**	-25.00	12.03
6326.250	Horizontal	-51.25	-45.48	9.27	**-36.22**	-25.00	11.22
6326.250	Vertical	-50.95	-46.03	9.27	**-36.77**	-25.00	11.77
7230.000	Horizontal	-62.65	-54.20	9.29	**-44.92**	-25.00	19.92
7230.000	Vertical	-61.20	-53.80	9.29	**-44.52**	-25.00	19.52
8133.750	Horizontal	-62.80	-53.60	9.33	**-44.27**	-25.00	19.27
8133.750	Vertical	-61.60	-53.80	9.33	**-44.47**	-25.00	19.47
9037.500	Horizontal	-61.35	-53.09	9.50	**-43.59**	-25.00	18.59
9037.500	Vertical	-61.05	-54.14	9.50	**-44.64**	-25.00	19.64

Table 7.5.2-3: Field Strength of Spurious Emissions – 910 MHz

Frequency (MHz)	Antenna Polarization	Maximum Reading (dBm)	Output Power (dBm)	Antenna Gain (dBd)	ERP (dBm)	Limits (dBm)	Margin (dBm)
1820.000	Horizontal	-57.89	-56.35	6.33	**-50.02**	-25.00	25.02
1820.000	Vertical	-56.73	-55.54	6.33	**-49.21**	-25.00	24.21
2730.000	Horizontal	-57.89	-54.31	8.00	**-46.31**	-25.00	21.31
2730.000	Vertical	-57.78	-52.25	8.00	**-44.25**	-25.00	19.25
3640.000	Horizontal	-60.16	-51.77	7.97	**-43.80**	-25.00	18.80
3640.000	Vertical	-58.60	-48.41	7.97	**-40.44**	-25.00	15.44
4550.000	Horizontal	-61.85	-49.97	9.00	**-40.97**	-25.00	15.97
4550.000	Vertical	-60.38	-48.40	9.00	**-39.40**	-25.00	14.40
5460.000	Horizontal	-60.49	-45.14	8.32	**-36.82**	-25.00	11.82
5460.000	Vertical	-60.72	-45.52	8.32	**-37.20**	-25.00	12.20
6370.000	Horizontal	-49.25	-43.35	9.27	**-34.09**	-25.00	9.08
6370.000	Vertical	-47.95	-43.35	9.27	**-34.09**	-25.00	9.09
7280.000	Horizontal	-62.50	-53.92	9.29	**-44.64**	-25.00	19.64
7280.000	Vertical	-59.75	-52.07	9.29	**-42.79**	-25.00	17.79
8190.000	Horizontal	-61.45	-53.19	9.33	**-43.86**	-25.00	18.86
8190.000	Vertical	-60.65	-52.94	9.33	**-43.61**	-25.00	18.61
9100.000	Horizontal	-60.10	-52.05	9.57	**-42.48**	-25.00	17.48
9100.000	Vertical	-58.35	-51.70	9.57	**-42.13**	-25.00	17.13

Table 7.5.2-4: Field Strength of Spurious Emissions – 915 MHz

Frequency (MHz)	Antenna Polarization	Maximum Reading (dBm)	Output Power (dBm)	Antenna Gain (dBd)	ERP (dBm)	Limits (dBm)	Margin (dBm)
1830.000	Horizontal	-57.25	-55.18	6.33	**-48.85**	-25.00	23.85
1830.000	Vertical	-58.01	-56.39	6.33	**-50.06**	-25.00	25.06
2745.000	Horizontal	-57.18	-52.83	8.00	**-44.83**	-25.00	19.83
2745.000	Vertical	-57.74	-51.09	8.00	**-43.09**	-25.00	18.09
3660.000	Horizontal	-59.15	-50.72	7.97	**-42.75**	-25.00	17.75
3660.000	Vertical	-60.07	-49.69	7.97	**-41.72**	-25.00	16.72
4575.000	Horizontal	-61.36	-50.71	9.00	**-41.71**	-25.00	16.71
4575.000	Vertical	-58.91	-48.21	9.00	**-39.21**	-25.00	14.21
5490.000	Horizontal	-62.58	-47.60	8.32	**-39.28**	-25.00	14.28
5490.000	Vertical	-61.49	-46.91	8.32	**-38.59**	-25.00	13.59
6405.000	Horizontal	-52.50	-46.50	9.73	**-36.77**	-25.00	11.77
6405.000	Vertical	-51.75	-46.65	9.73	**-36.92**	-25.00	11.92
7320.000	Horizontal	-62.65	-54.20	8.91	**-45.29**	-25.00	20.29
7320.000	Vertical	-62.35	-54.95	8.91	**-46.04**	-25.00	21.04
8235.000	Horizontal	-60.50	-52.35	9.33	**-43.02**	-25.00	18.02
8235.000	Vertical	-60.60	-53.30	9.33	**-43.97**	-25.00	18.97
9150.000	Horizontal	-60.30	-52.05	9.57	**-42.48**	-25.00	17.48
9150.000	Vertical	-58.55	-51.55	9.57	**-41.98**	-25.00	16.98

NOTE: All frequencies not listed were below the noise floor if the spectrum analyzer.

Table 7.5.2-5: Field Strength of Spurious Emissions – 921.5 MHz

Frequency (MHz)	Antenna Polarization	Maximum Reading (dBm)	Output Power (dBm)	Antenna Gain (dBd)	ERP (dBm)	Limits (dBm)	Margin (dBm)
1843.000	Horizontal	-59.82	-57.20	6.33	**-50.87**	-25.00	25.87
1843.000	Vertical	-59.12	-56.95	6.33	**-50.62**	-25.00	25.62
2764.500	Horizontal	-56.63	-52.98	8.00	**-44.98**	-25.00	19.98
2764.500	Vertical	-57.38	-51.18	8.00	**-43.18**	-25.00	18.18
3686.000	Horizontal	-58.45	-49.80	7.97	**-41.83**	-25.00	16.83
3686.000	Vertical	-60.48	-49.88	7.97	**-41.91**	-25.00	16.91
4607.500	Horizontal	-62.64	-51.34	8.99	**-42.35**	-25.00	17.35
4607.500	Vertical	-58.68	-47.03	8.99	**-38.04**	-25.00	13.04
5529.000	Horizontal	-62.24	-47.22	7.47	**-39.75**	-25.00	14.75
5529.000	Vertical	-59.80	-45.53	7.47	**-38.06**	-25.00	13.06
6450.500	Horizontal	-47.95	-42.02	9.73	**-32.29**	-25.00	7.29
6450.500	Vertical	-47.20	-41.77	9.73	**-32.04**	-25.00	7.04
7372.000	Horizontal	-63.50	-55.12	8.91	**-46.21**	-25.00	21.21
7372.000	Vertical	-62.15	-54.47	8.91	**-45.56**	-25.00	20.56
8293.500	Horizontal	-62.75	-54.35	9.33	**-45.02**	-25.00	20.02
8293.500	Vertical	-60.50	-52.90	9.33	**-43.57**	-25.00	18.57
9215.000	Horizontal	-62.15	-53.70	9.54	**-44.16**	-25.00	19.16
9215.000	Vertical	-61.75	-54.55	9.54	**-45.01**	-25.00	20.01

7.6 Frequency Stability – FCC Part 2.1055, Part 90.213, IC RSS-137 6.3

7.6.1 Measurement Procedure

The equipment under test is placed inside an environmental chamber. The RF output is directly coupled to the input of the measurement equipment and a power supply is attached to the primary supply voltage.

Frequency measurements were made at the extremes of the of temperature range -30º C to +50º C and at intervals of 10º C at normal supply voltage. A period of time sufficient to stabilize all components of the equipment was allowed at each frequency measurement. At a temperature 20º C the supply voltage was varied from 85% to 115% from the normal. The maximum variation of frequency was recorded.

Results of the test are shown below in Figure 7.6.2-1 though Figure 7.6.2-5.

7.6.2 Measurement Results

Frequency Stability

Frequency (MHz): 902.25

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**902.246045**	**-4.383**	100%	15.00
-20 C	**902.249545**	**-0.504**	100%	15.00
-10 C	**902.250900**	**0.998**	100%	15.00
0 C	**902.251806**	**2.002**	100%	15.00
10 C	**902.251285**	**1.424**	100%	15.00
20 C	**902.249500**	**-0.554**	100%	15.00
30 C	**902.248113**	**-2.091**	100%	15.00
40 C	**902.246570**	**-3.802**	100%	15.00
50 C	**902.245132**	**-5.395**	100%	15.00
20 C	**902.249256**	**-0.825**	85%	12.75
20 C	**902.249384**	**-0.683**	100%	17.25

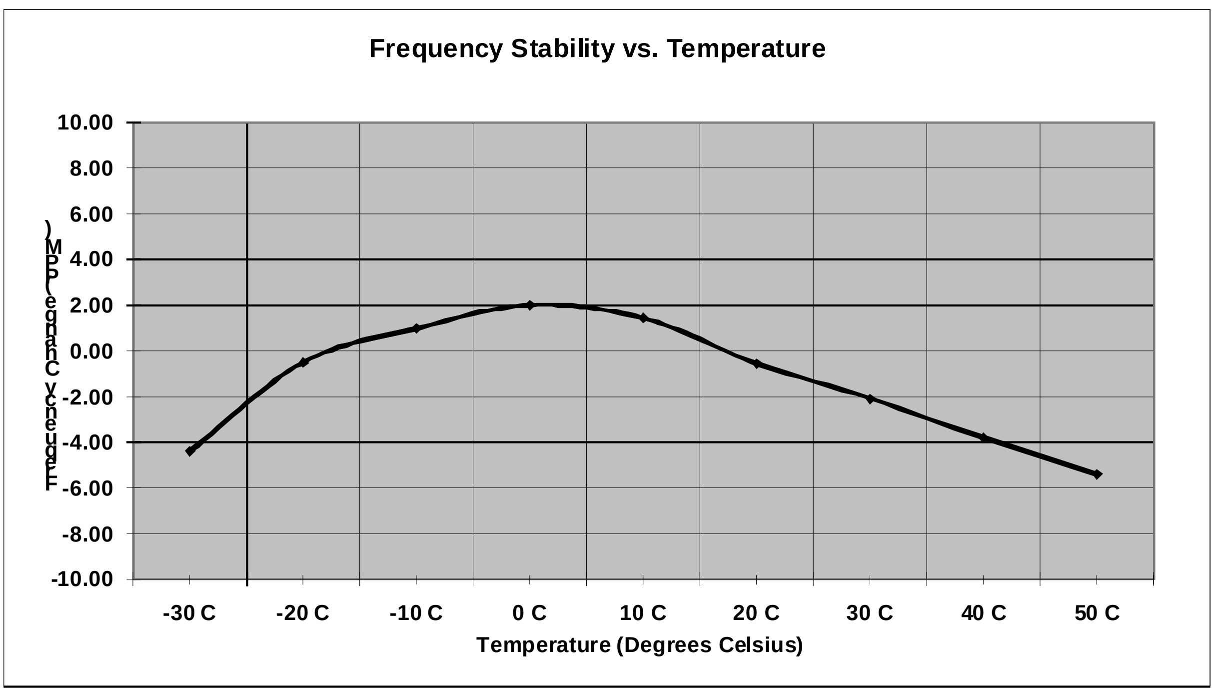

Figure 7.6.2-1: Frequency Stability – 902.25 MHz

Frequency Stability

Frequency (MHz): 903.75

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**903.746182**	**-4.225**	100%	15.00
-20 C	**903.749758**	**-0.268**	100%	15.00
-10 C	**903.751122**	**1.241**	100%	15.00
0 C	**903.751824**	**2.018**	100%	15.00
10 C	**903.751176**	**1.301**	100%	15.00
20 C	**903.749300**	**-0.775**	100%	15.00
30 C	**903.747866**	**-2.361**	100%	15.00
40 C	**903.746323**	**-4.069**	100%	15.00
50 C	**903.745020**	**-5.510**	100%	15.00
20 C	**903.748218**	**-1.972**	85%	12.75
20 C	**903.748183**	**-2.011**	100%	17.25

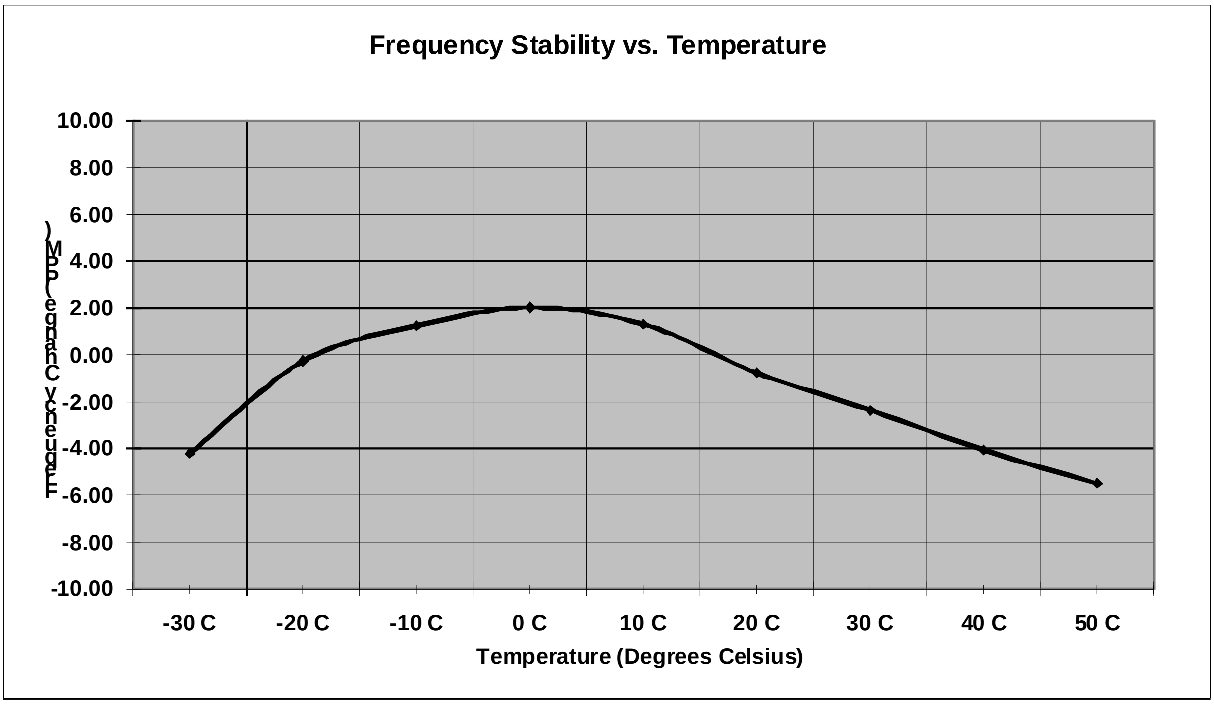

Figure 7.6.2-2: Frequency Stability – 903.75 MHz

Frequency Stability

Frequency (MHz): 910

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**909.996250**	**-4.121**	100%	15.00
-20 C	**909.999888**	**-0.123**	100%	15.00
-10 C	**910.001284**	**1.411**	100%	15.00
0 C	**910.001833**	**2.014**	100%	15.00
10 C	**910.001047**	**1.151**	100%	15.00
20 C	**909.999125**	**-0.962**	100%	15.00
30 C	**909.997637**	**-2.597**	100%	15.00
40 C	**909.996087**	**-4.300**	100%	15.00
50 C	**909.994840**	**-5.670**	100%	15.00
20 C	**909.998051**	**-2.142**	85%	12.75
20 C	**909.998105**	**-2.082**	100%	17.25

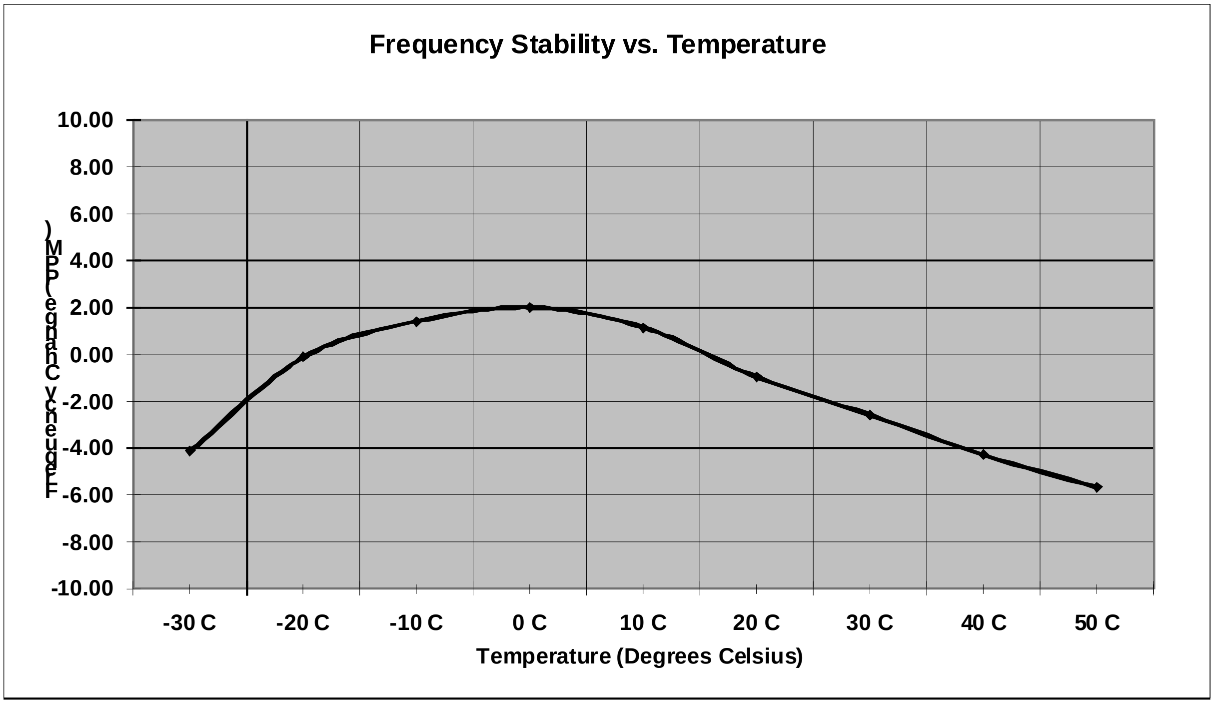

Figure 7.6.2-3: Frequency Stability – 910 MHz

Frequency Stability

Frequency (MHz): 915

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**914.996264**	**-4.083**	100%	15.00
-20 C	**914.999998**	**-0.002**	100%	15.00
-10 C	**915.001417**	**1.549**	100%	15.00
0 C	**915.001825**	**1.995**	100%	15.00
10 C	**915.000939**	**1.026**	100%	15.00
20 C	**914.998974**	**-1.121**	100%	15.00
30 C	**914.997395**	**-2.847**	100%	15.00
40 C	**914.995930**	**-4.448**	100%	15.00
50 C	**914.994723**	**-5.767**	100%	15.00
20 C	**914.997014**	**-3.263**	85%	12.75
20 C	**914.997007**	**-3.271**	100%	17.25

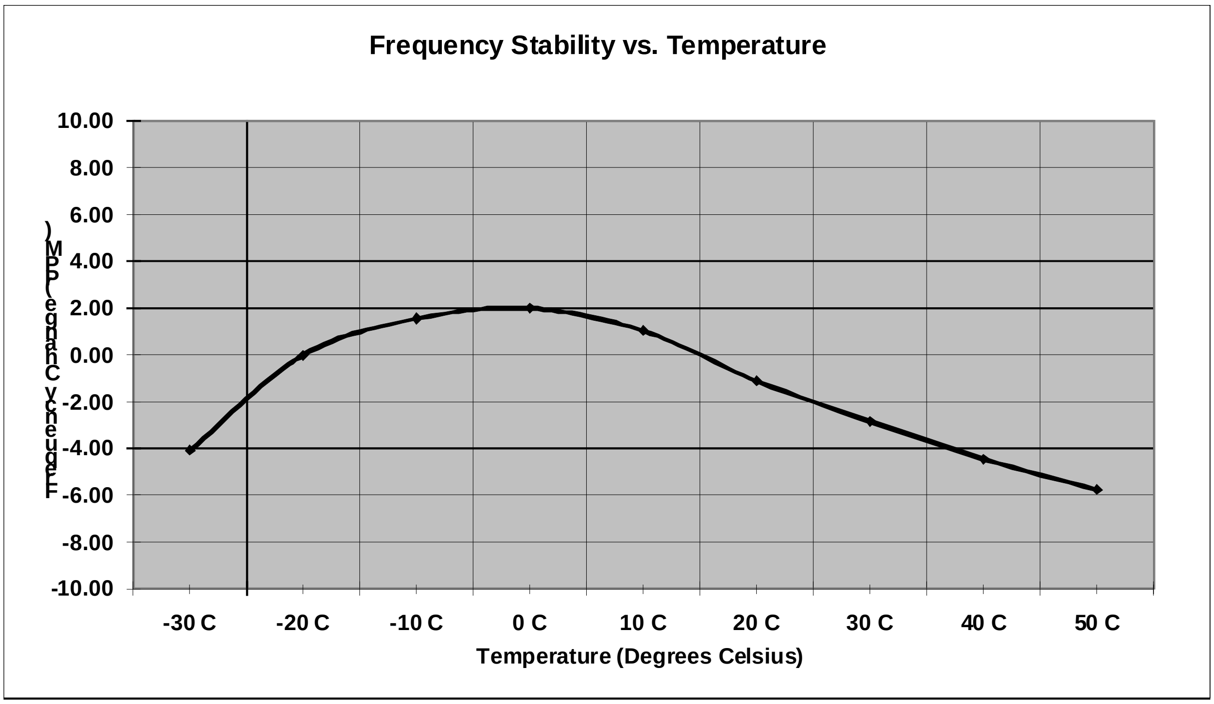

Figure 7.6.2-4: Frequency Stability – 915 MHz

Frequency Stability

Frequency (MHz): 921.5

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**921.495740**	**-4.623**	100%	15.00
-20 C	**921.499080**	**-0.998**	100%	15.00
-10 C	**921.500550**	**0.597**	100%	15.00
0 C	**921.501778**	**1.929**	100%	15.00
10 C	**921.501504**	**1.632**	100%	15.00
20 C	**921.500225**	**0.244**	100%	15.00
30 C	**921.498474**	**-1.656**	100%	15.00
40 C	**921.495740**	**-4.623**	100%	15.00
50 C	**921.494617**	**-5.842**	100%	15.00
20 C	**921.499940**	**-0.065**	85%	12.75
20 C	**921.499791**	**-0.227**	100%	17.25

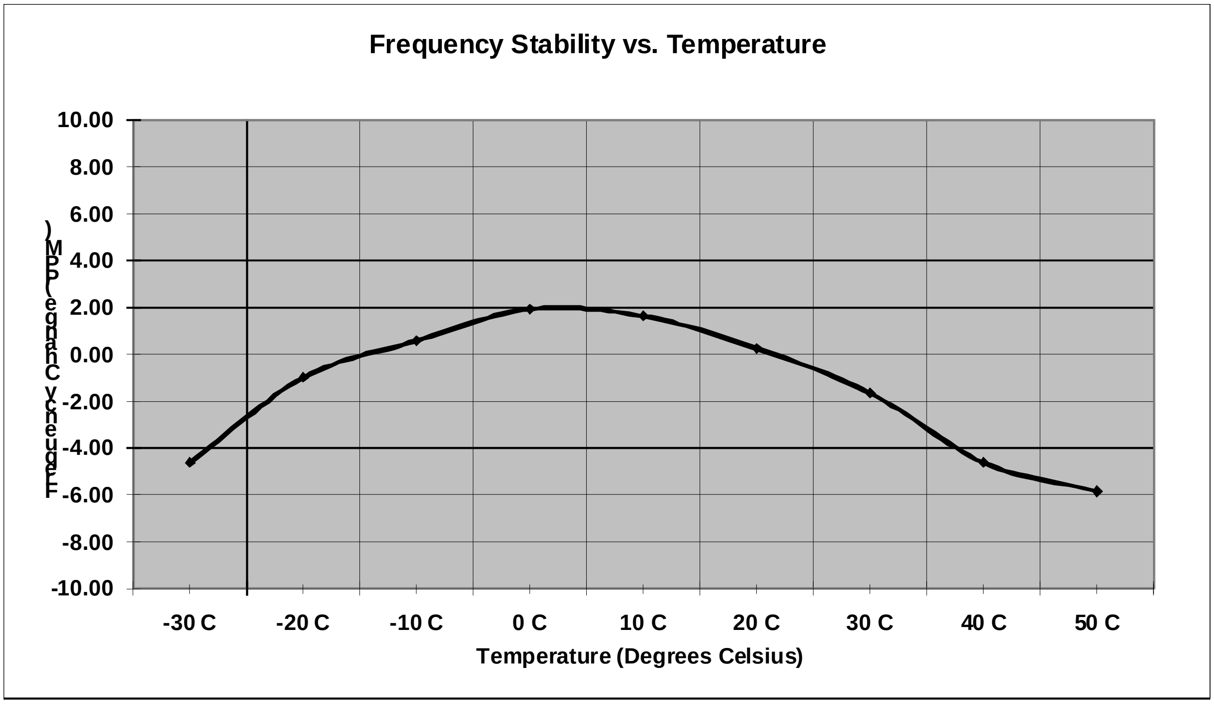

Figure 7.6.2-5: Frequency Stability – 921.5 MHz

7.7 Radiated Emissions (Unintentional Radiators/Receiver) – FCC Part 15.109, IC RSS-Gen (6)

7.7.1 Measurement Procedure

Radiated emissions tests were performed over the frequency range of 30MHz to 5 GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30MHz and below 1GHz were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz using a Quasi-peak detector. Above 1GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz and 3MHz respectively. This was repeated for both horizontal and vertical polarizations of the receive antenna.

The field strength of each radiated emission is calculated by correcting the EMI receiver level for cable loss, amplifier gain, and antenna correction factors.

Field Strength (dBuV/m) = EMI Receiver Level (dBuV) + Cable Loss (dB) – Amplifier Gain (dB) + Antenna Correction Factor (1/m)

The Class A limits were adjusted for 3 m measurements using the distance factor of 20*log(10/3) ≈ 10.45 dB. Hence, for the 216.0 to 960 MHz range, the limits are given by:

Limits @ 3m (dBuV/m) = Limits @ 10m (dBuV/m)+ 20*log(10/3) (dB)
= 46.44 (dBuV/m) + 10.45 (dB) ≈ 56.9 (dBuV/m)

Results of the test are shown below in Table 7.7.2-1.

7.7.2 Measurement Results

Table 7.7.2-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Measured Level (dBuV)		Antenna Polarization	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	
	Pk	Qpk/Av	(H/V)	(dB)	Pk	Qpk/Av	Qpk/Av	Pk	Qpk/Av
168.40	52.60	- - -	H	13.54	39.06	- - -	54.00	14.94	- - -
171.30	51.50	- - -	H	13.47	38.03	- - -	54.00	15.97	- - -
168.40	58.30	- - -	V	13.54	44.76	- - -	54.00	9.24	- - -
171.30	56.30	- - -	V	13.47	42.83	- - -	54.00	11.17	- - -
184.90	48.85	- - -	V	12.81	36.05	- - -	54.00	17.96	- - -
708.80	50.70	- - -	H	1.88	48.82	- - -	56.90	8.08	- - -
681.60	50.50	- - -	H	2.20	48.30	- - -	56.90	8.60	- - -
724.80	50.50	- - -	H	1.77	48.73	- - -	56.90	8.17	- - -
692.80	49.55	- - -	H	2.01	47.54	- - -	56.90	9.36	- - -
740.00	48.80	- - -	H	1.59	47.21	- - -	56.90	9.69	- - -
737.60	48.35	- - -	H	1.65	46.70	- - -	56.90	10.20	- - -
756.00	48.05	- - -	H	1.41	46.64	- - -	56.90	10.26	- - -
772.80	45.55	- - -	H	1.23	44.32	- - -	56.90	12.58	- - -
788.00	45.10	- - -	H	1.08	44.02	- - -	56.90	12.88	- - -
227.20	52.30	- - -	V	14.28	38.02	- - -	56.90	18.88	- - -
708.80	50.65	- - -	V	1.88	48.77	- - -	56.90	8.13	- - -
724.80	50.60	- - -	V	1.77	48.83	- - -	56.90	8.07	- - -
681.60	49.85	- - -	V	2.20	47.65	- - -	56.90	9.25	- - -
692.80	48.85	- - -	V	2.01	46.84	- - -	56.90	10.06	- - -
737.60	48.15	- - -	V	1.65	46.50	- - -	56.90	10.40	- - -
740.80	50.05	- - -	V	1.58	48.47	- - -	56.90	8.43	- - -
756.00	48.40	- - -	V	1.41	46.99	- - -	56.90	9.91	- - -
772.80	46.80	- - -	V	1.23	45.57	- - -	56.90	11.33	- - -
788.80	45.60	- - -	V	1.07	44.53	- - -	56.90	12.37	- - -
795.20	45.75	- - -	V	1.02	44.73	- - -	56.90	12.17	- - -
995.20	46.05	- - -	V	-1.27	47.32	- - -	60.00	12.68	- - -
1022.00	53.50	- - -	H	4.47	49.03	- - -	60.00	10.97	- - -
1079.00	52.20	- - -	H	4.01	48.19	- - -	60.00	11.81	- - -
1022.00	59.11	56.49	V	4.47	54.64	52.02	60.00	5.36	7.98
1105.00	57.70	- - -	V	3.81	53.89	- - -	60.00	6.11	- - -
1057.00	57.35	- - -	V	4.19	53.16	- - -	60.00	6.84	- - -
1036.00	56.90	- - -	V	4.36	52.54	- - -	60.00	7.46	- - -
1094.00	56.60	- - -	V	3.89	52.71	- - -	60.00	7.29	- - -
1073.00	56.30	- - -	V	4.06	52.24	- - -	60.00	7.76	- - -

Note: Measurements taken above 2000 MHz were below the noise floor of the measurement equipment. Part 15.109 Class A limits were applied to the digital device. Emissions determined to be from the receiver complied with the FCC Part 15.109 Class B and equivalent IC RSS-Gen limits.

8.0 CONCLUSION

In the opinion of ACS, Inc. the model SG901-1075, manufactured by Sagrad, Inc., meets all the requirements of FCC Part 90 as well as IC RSS-137 as applicable.

End Report