Reliability and Compliance
639 Davis Drive
Morrisville, NC 27560 USA

T: 919-317-6351
F: 919-317-6210
www.sensus.com

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(1)

LETTER OF AUTHORIZATION

Tuesday December 4, 2012

To whom it may concern:

I hereby appoint Sam Wismer of Advanced Compliance Solutions, Inc. to act as our agent in the preparation of an application for equipment authorization of the IDTB004 to the FCC Rules and Regulations.

I certify that all exhibits contained within this filing properly describe the device or system for which authorization is sought.

I further certify that appropriate arrangements have been made to assure that production units of this equipment bearing the name IDTB004 and FCC IDENTIFIER ***SDBIDTB004*** listed in this application will continue to comply with the Commission's requirements.

I further certify by signature below that no party (per 47 CFR 1.2002(b)) to the application is subject to a denial of Federal benefits, including FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

This appointment also includes the authority to complete FCC Form 731 on our behalf and sign the application as an authorized agent.

This authorization is valid for ***IDTB004 ONLY***, and shall not be utilized for any other matters on the behalf of Sensus.

Sincerely,

SENSUS

Al Servais | Reliability and Compliance Program Manager
639 Davis Drive | Morrisville, NC 27560 USA
Phone: 919-317-6351 | Mobile: 919-208-8983| al.servais@sensus.com | www.sensus.com

Excellence in Compliance Testing

5015 B. U. Bowman Dr.
Buford, GA 30518

January 7, 2013

ACS TCB
5015 B.U. Bowman Drive
Buford, GA 30518

Re: FCC ID: SDBIDTB004

To Whom It May Concern:

The following application is submitted on behalf of our client, Sensus Metering Systems, Inc., for evaluation of their model IDTB004 for certification under FCC Part 24 Subpart D and Part 101 Subpart C..

The IDTB004 is a stand-alone module consisting of a single printed circuit board which is designed to be integrated into specific host devices. For the radiated emissions evaluation, the unit was set in the orientation of typical installation.

The IDTB004 was tested in full to the requirements of the aforementioned rules and was found to be in compliance.

Sincerely,

Sam Wismer
Vice President, Technology
Advanced Compliance Solutions, Inc.

Reliability and Compliance
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Morrisville, NC 27560 USA

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Sensus Non-Disclosure Memorandum

December 04, 2012

Sensus OEMs:

This memorandum serves as an additional agreement between Sensus and its OEMs stating that the OEMs will use the Sensus IDTB004 module (See Appendix 1) in accordance with the FCC rules on modular approved devices. The Sensus FlexNet Transceiver is professionally installed within various Sensus host devices (See Appendix 2). The module label will be located in a visible area on the host and will display all necessary and pertinent information about the modular device. Confidentiality of the internal photos and the technical manual is being requested because this is a non-consumer device which is not accessible by the general public, professionally installed, and is only serviceable by Sensus, or designated technicians. The modular device lies beneath multiple layers of poly carbonate that are mounted a steel meter pan and the device is either collar locked or ring locked according to the utility process for security of metering devices. The assembly hardware is sealed with looping wire that is crimped and sealed. These mechanisms along with the alarm features make it near impossible for any person to try and make contact with the modular device.

Please feel free to contact me directly should there be any questions regarding this matter.

Respectfully,

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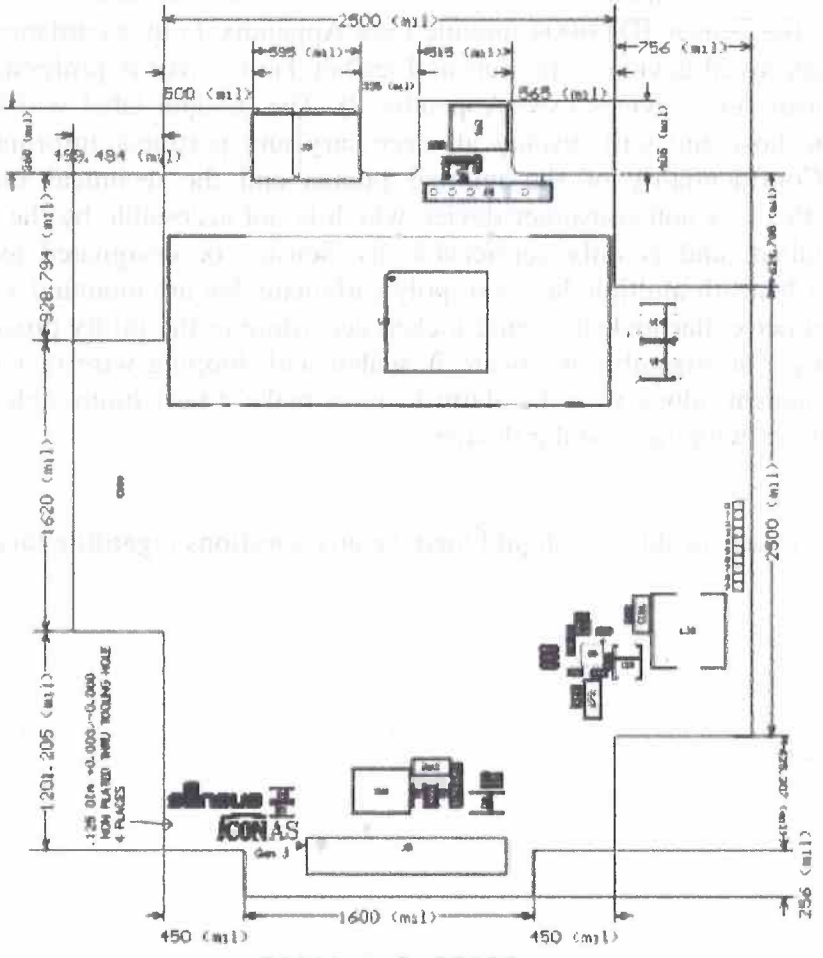
Sensus Non-Disclosure Memorandum

Appendix 1



70012-112-35000

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Sensus Non-Disclosure Memorandum

Appendix 2

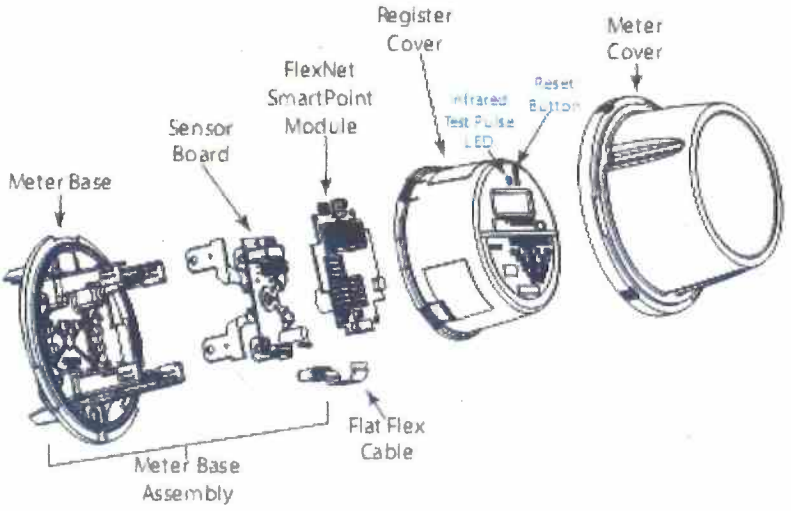

Figure 2-1: Basic iCon A Meter Components

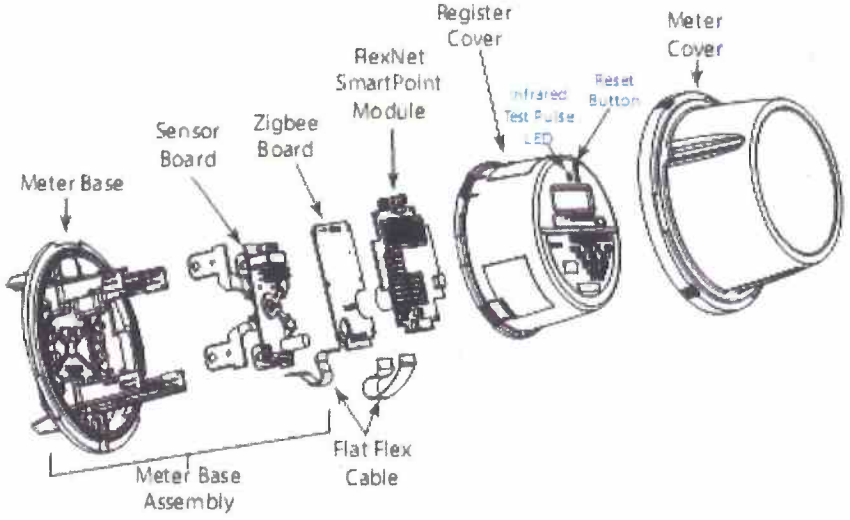

Figure 2-2: iCon A non-RD with Zigbee Components

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MODULAR APPROVAL REQUEST FORM

12/4/2012

Subject: Modular Approval Requirements for FCC certification for Sensus IDTB004 Product.

Reference: FCC ID: SDBIDTB004

Dear Application Examiner,

Sensus IDBT004 Product is seeking modular approval for FCC ID: SDBIDTB004

This document is to attest that the radio bearing the FCC ID: SDBIDTB004 meets the requirements for a modular approval as detailed in the FCC public notice DA00-1407. Compliance to each requirement is described below:

1. The modular transmitter has its own RF shielding.
2. The modular transmitter has buffered modulation/data inputs.
3. The modular transmitter has its own power supply regulation.
4. The modular transmitter complies with the antenna requirements of Section 15.203 and 15.204(c).

(The antenna must either be permanently attached or employ a "unique" antenna coupler (at all connections between the module and the antenna, including the cable).

5. The modular transmitter has been tested in a stand-alone configuration,
6. The modular transmitter is labeled with its own FCC ID number.
7. The modular transmitter complies with any specific rule or operating requirements applicable to the transmitter and the manufacturer must provide adequate instructions along with the module to explain any such requirements.
8. The modular transmitter complies with applicable RF exposure requirements.

Sincerely,

Al Servais | Reliability and Compliance Program Manager
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Tuesday, December 04, 2012

Federal Communications Commission
Authorization and Evaluation Division
1435 Oakland Mills Road
Columbia, MD 21046

Subject: Confidentiality Request regarding application for certification of FCC ID: SDBIDTB004

Pursuant to Sections 0.457 and 0.459 of the Commission's Rules, we hereby request confidential treatment of information accompanying this application as outlined below:

Exhibit Type	File Name	Justification
Schematic	12-2108 - Schematics.pdf	Proprietary Information and Trade Secret
Parts List	12-2108 - BOM_Parts List.pdf	Proprietary Information and Trade Secret
Theory Of Operation	12-2108 - Theory of Operation.pdf	Proprietary Information and Trade Secret
Manual	12-2108 - User Manual.pdf	Proprietary Information and Trade Secret
Internal Photos	12-2108 - Internal Photos.pdf	Proprietary Information and Trade Secret
Tune-Up Procedure	12-2108 - Tune-Up Procedure.pdf	Proprietary Information and Trade Secret
Block Diagram	12-2108 - Block Diagram.pdf	Proprietary Information and Trade Secret

Confidentiality of the Internal Photos is being requested because this is a non-consumer device which is not accessible by the general public and is only serviceable by the applicant or designated technicians. The Manual is technical and is not provided to the consumer because the consumer cannot service or install the device. Therefore confidentiality of the Manual is also requested.

The above materials contain trade secrets and proprietary information not customarily released to the public. The public disclosure of these materials may be harmful to the applicant and provide unjustified benefits to its competitors. The product covered by this Confidentiality Request may or may not be sold to any OEM and is only installed in Sensus Products by Sensus Employees or Contractors.

The applicant understands that pursuant to Section 0.457 of the Rules, disclosure of this application and all accompanying documentation will not be made before the date of the Grant for this application.

Sincerely,

Al Servais | Reliability and Compliance Program Manager
639 Davis Drive | Morrisville, NC 27560 USA
T: 919-317-6351 | C: 919-208-8983 | al.servais@sensus.com | www.sensus.com

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Certification Exhibit

FCC ID: SDBIDTB004
IC: 2220A-IDTB004

FCC Rule Part: CFR 47 Part 24 Subpart D, Part 101 Subpart C
IC Radio Standards Specification: RSS 119, RSS 134

ACS Project: 12-2108

Manufacturer: Sensus Metering Systems, Inc.
Model: IDTB004

External Photos

The IDTB004 is a modular device in which internal photos have been held confidential. There are no associated external photographs considering the modular classification.

Excellence in Compliance Testing

Certification Exhibit

FCC ID: SDBIDTB004
IC: 2220A-IDTB004

FCC Rule Part: CFR 47 Part 24 Subpart D, Part 101 Subpart C
IC Radio Standards Specification: RSS 119, RSS 134

ACS Project: 12-2108

Manufacturer: Sensus Metering Systems, Inc.
Model: IDTB004

Label Information

CONTAINS FCC ID: SDBIDTB004 IC: 2220A-IDTB004 Model: IDTB004

This device complies with Part 15 of the FCC rules.
Operation is subject to the following two conditions.
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received,
including interference that may cause undesired operation.

P/N 70022-086-00006 rev 18 Sensus, Raleigh, NC 27615

FIGURE 1: Host Label non-RD meter

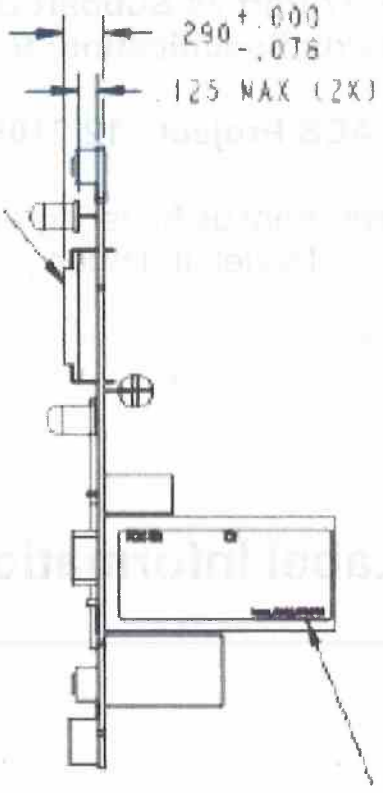


FIGURE 2: Label Location on Capacitor.

FCC ID: SDBIDTB004 IC: 2220A-IDTB004 Model: IDTB004

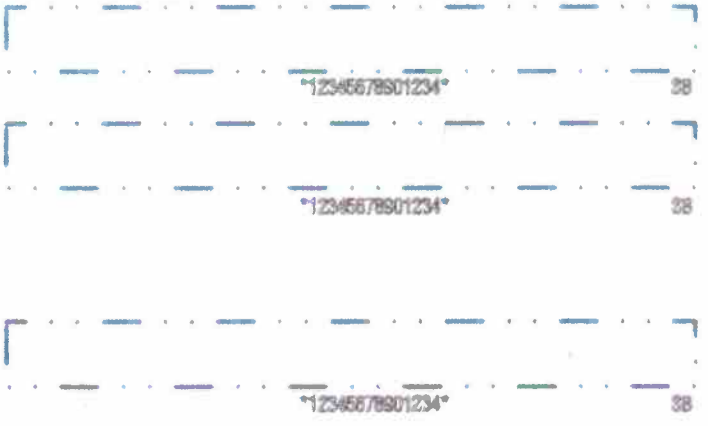
This device complies with Part 15 of the FCC rules.
Operation is subject to the following two conditions.
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received,
including interference that may cause undesired operation.

P/N 70022-086-00005 rev 18 Sensus, Raleigh, NC 27615

FIGURE 3: Module Label

CONTAINS FCC ID: SDBIDTB004 IC: 2220A-IDTB004 Model: IDTB004

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions. (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.



P/N 70014-086-00004 rev 18 Sensus, Raleigh, NC 27615

FIGURE 3: Host Label RD meter

Excellence in Compliance Testing

Certification Exhibit

FCC ID: SDBIDTB004
IC: 2220A-IDTB004

FCC Rule Part: CFR 47 Part 24 Subpart D, Part 101 Subpart C
IC Radio Standards Specification: RSS 119, RSS 134

ACS Project Number: 12-2108

Manufacturer: Sensus Metering Systems, Inc.
Model: IDTB004

RF Exposure

General Information:

Applicant: Sensus Metering Systems, Inc.
ACS Project: 12-2108
Device Category: Mobile
Environment: General Population/Uncontrolled Exposure

Technical Information:

Antenna Type: Printed Monopole Antenna
Antenna Gain: 0 dBi
Maximum Transmitter Conducted Power: 31.06 dBm, 1276.44 mW
Maximum System EIRP: 31.06 dBm, 1276.44 mW
Exposure Conditions: Greater than 20 centimeters

MPE Calculation

The Power Density (mW/cm^2) is calculated as follows:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

MPE Calculator for Mobile Equipment Limits for General Population/Uncontrolled Exposure*							
Transmit Frequency (MHz)	Radio Power (dBm)	Power Density Limit (mW/Cm2)	Radio Power (mW)	Antenna Gain (dBi)	Antenna Gain (mW eq.)	Distance (cm)	Power Density (mW/cm^2)
900	31.06	0.60	1276.44	0	1.000	20	0.254

Installation Guidelines

The installation manual should contain text similar to the following advising how to install the equipment to maintain compliance with the FCC RF exposure requirements:

RF Exposure

In accordance with FCC requirements of human exposure to radio frequency fields, the radiating element shall be installed such that a minimum separation distance of 20 centimeters will be maintained.

Conclusion

This device complies with the MPE requirements by providing adequate separation between the device, any radiating structure and the general population.

ACS
Excellence in Compliance Testing

Certification Test Report

FCC ID: SDBIDTB004
IC: 2220A-IDTB004

FCC Rule Part: CFR 47 Part 24 Subpart D, Part 101 Subpart C
IC Radio Standards Specification: RSS 119, RSS 134

ACS Report Number: 12-2108.W06.1A

Applicant: Sensus Metering Systems, Inc.
Model: IDTB004

Test Begin Date: September 15, 2012
Test End Date: October 11, 2012

Report Issue Date: October 16, 2012

ACLASS ACCREDITED TESTING

For The Scope of Accreditation Under Certificate Number AT-1533

NVLAP®

For The Scope of Accreditation Under Lab Code 200612-0

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

Project Manager:

Thierry Jean-Charles
EMC Engineer
Advanced Compliance Solutions, Inc.

Reviewed by:

Kirby Munroe
Director, Wireless Certifications
Advanced Compliance Solutions, Inc.

This report contains 49 pages

Table of Content

1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 2 Subpart J, Part 24 Subpart D and Part 101 Subpart C of the FCC's Code of Federal Regulations, and Industry Canada Radio Standards Specifications RSS-119 and RSS-134 for a modular approval.

1.2 Product Description

The Sensus Integrated Display Transceiver Board, Model IDTB004, is a wireless module with meter display circuitry. The device mounts into the Sensus iCon electric meter. The device acts as the "Integrated Communications Device" and provides the RF functionality for the meter.

The IDTB monitors meter reading and diagnostic information which is transmitted via the Sensus fixed wireless telemetry network to the utility provider.

Manufacturer Information:
Sensus Metering Systems, Inc.
639 Davis Drive
Morrisville, NC 27560

Test Sample Serial Numbers: 211411049062820, 211511049062852

Test Sample Condition: The unit was in good operating conditions with no physical damages.

1.3 Test Methodology

1.3.1 Configurations and Justification

The IDTB004 was tested for RF conducted and radiated emissions while powered with a 26VDC power source.

The RF conducted measurements were performed using a sample with a temporary sma connector at the antenna port. The radiated emissions evaluations were performed up to the 10th harmonic with the unit set in the orientation of typical installation.

The evaluation for unintentional emission is documented separately in a verification report.

1.3.2 In-Band Testing Methodology

The EUT is designed to operate in multiple bands under the requirements of CFR 47 Parts 24 and 101. The following is a list of the frequency bands of operation sorted based on the FCC rule parts in which the band is associated.

CFR Title 47 Rule Part	Frequency Band of Operation (MHz)
24D	901.0 - 902.0
24D	930.0 - 931.0
24D	940.0 - 941.0
101	928.85 - 929.0
101	932.0 - 932.5
101	941.0 - 941.5
101	952.0 – 953.0
101	959.85 - 960.0

Based on the requirements set forth in accordance 47 CFR 2.1046-2.1057 as stated above, the methodology in selecting the places to test in the available bands of operation is outlined in the following table.

CFR Title 47 Rule Part	Frequency Band of Operation (MHz)	Location in the Range of Operation	Approx. Test Freq.
24D	901.0 - 902.0	Middle	901.5000
101	928.85 - 929.0	Middle	928.9250
24D	930.0 - 931.0	Middle	930.5000
101	932.0 - 932.5	Middle	932.2500
24D	940.0 - 941.0	1 near top and 1 near bottom	940.0125
101	941.0 - 941.5		941.4875
101	952.0 – 953.0	Middle	952.5000
101	959.85 – 960.0	Middle	959.9250

1.4 Emission Designators

The IDTB004 transmitter produces six distinct modulation formats. The emissions designators for the modulation types used by the IDTB004 transmitter are as follows:

EMISSIONS DESIGNATORS:

Normal Mode:	9K60F2D (7-FSK)
Double Density Mode:	9K60F2D (13-FSK)
C&I Mode (Half-Baud):	4K80F2D (7-FSK)
Priority Mode:	4K80F2D (13-FSK)
MPass Mode (5 kbps):	5K90F1D (2-GFSK)
MPass Mode (10 kbps):	11K8F1D (2-GFSK)

2.0 TEST FACILITIES

2.1 Location

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

Site 1
Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

Site 2
Advanced Compliance Solutions, Inc.
5015 B.U. Bowman Drive
Buford GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598
www.acstestlab.com

2.2 Laboratory Accreditations/Recognitions/Certifications

Site 1
ACS, Boca Raton, Florida, is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation.

Site 2
ACS, Buford, GA is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP).

Unless otherwise specified, all test methods described within this report are covered under the respective test site 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 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:

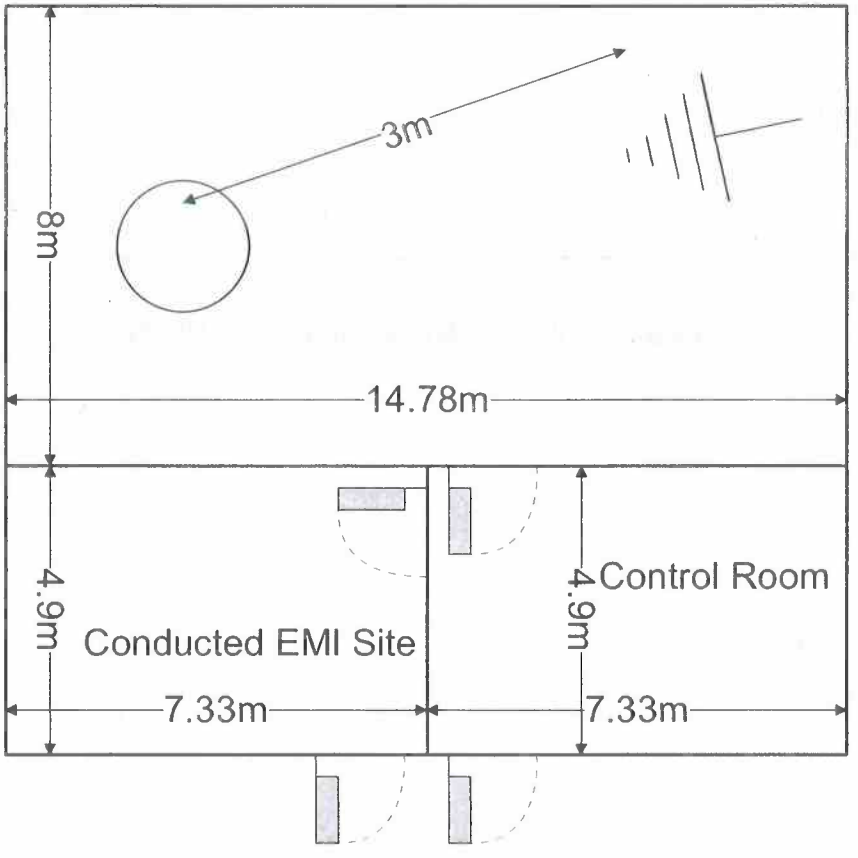


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

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

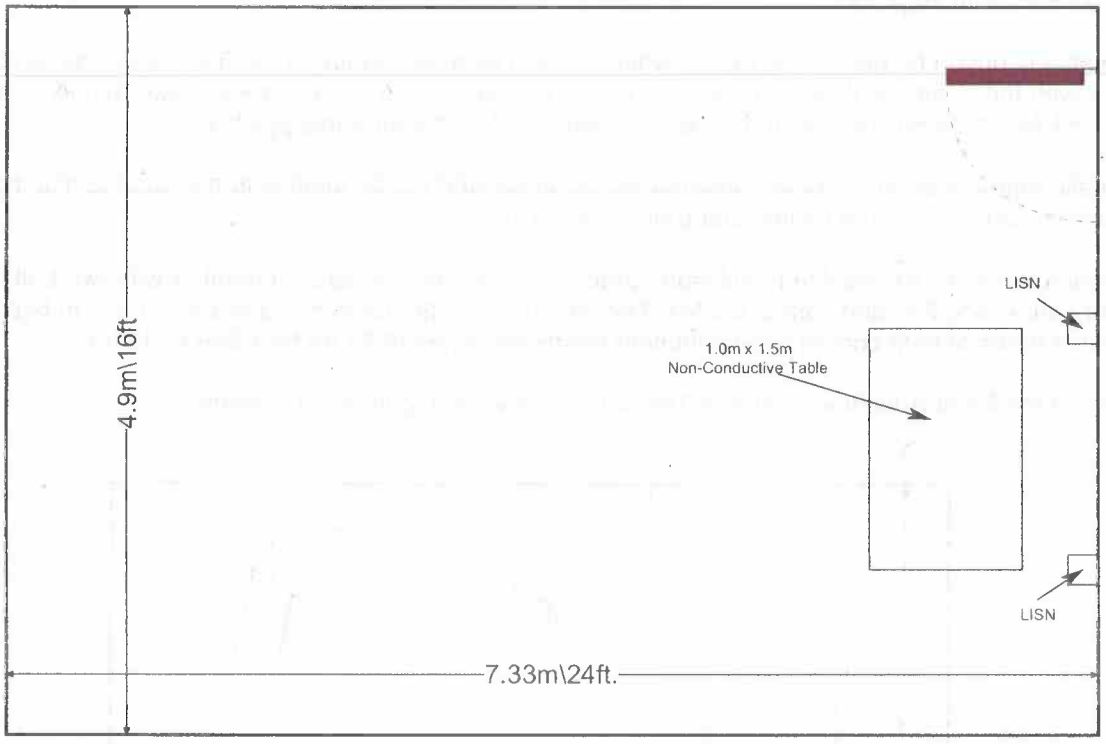


Figure 2.3.2-1: AC Mains Conducted EMI Site

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 40GHz - 2003
2 - US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures - 2012
3 - US Code of Federal Regulations (CFR): Title 47, Part 24, Subpart D: Personal Communications Services – 2012
4 - US Code of Federal Regulations (CFR): Title 47, Part 101, Subpart C: Fixed Microwave Services - 2012
5 – TIA-603-C: Land Mobile FM or PM - Communications Equipment - Measurement and Performance Standards – 2004
6 – Industry Canada Radio Standards Specification: RSS-119 - Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41-960 MHz, Issue 11, June 2011
7 – Industry Canada Radio Standards Specification: RSS-134 - 900 MHz Narrow Band Personal Communication Service, Issue 1, March 2000

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 #	Last Calibration Date	Calibration Due Date
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/1/2012	8/1/2013
339	Aeroflex/Weinschel	AS-18	Attenuators	7142	6/4/2012	6/4/2013
426	Thermotron	S-8 Mini Max	Environmental Chamber	25-2888-10	8/2/2012	8/2/2013
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/5/2011	1/5/2013
524	Chase	CBL6111	Antennas	1138	1/7/2011	1/7/2013
562	United Microwave Products, Inc.	AA-190-00.48.0	Cables	562	7/31/2012	7/31/2013
2006	EMCO	3115	Antennas	2573	3/2/2011	3/2/2013
2007	EMCO	3115	Antennas	2419	1/18/2012	1/18/2014
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/2/2012	1/2/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/2/2012	1/2/2013
2071	Trilithic, Inc.	4HC1400-1-KK	Filter	9643263	1/19/2012	1/19/2013
2075	Hewlett Packard	8495B	Attenuators	2626A11012	1/2/2012	1/2/2013
2078	ACS Boca	Substitution Cable Set	Cable Set	2078	1/12/2012	1/12/2013
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2012	5/31/2013
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/22/2011	12/22/2012
2091	Agilent Technologies, Inc.	8573A	Spectrum Analyzers	2407A03233	12/12/2011	12/12/2013
RE563	Hewlett Packard	8673D	Signal Generators	3034A01078	2/22/2011	2/22/2013
RE587	Fairview Microwave Inc.	SA3N511-15	Attenuators	RE587	4/18/2012	4/18/2013

NCR=No Calibration Required

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Diagram #	Manufacturer	Equipment Type	Model Number	Serial Number
1	Lambda	DC Power Supply	LPD-422A-FM	A82600
	TryGon Electronics	DC Power Supply	DL40-1	489512

6.0 EQUIPMENT UNDER TEST SETUP AND BLOCK DIAGRAM

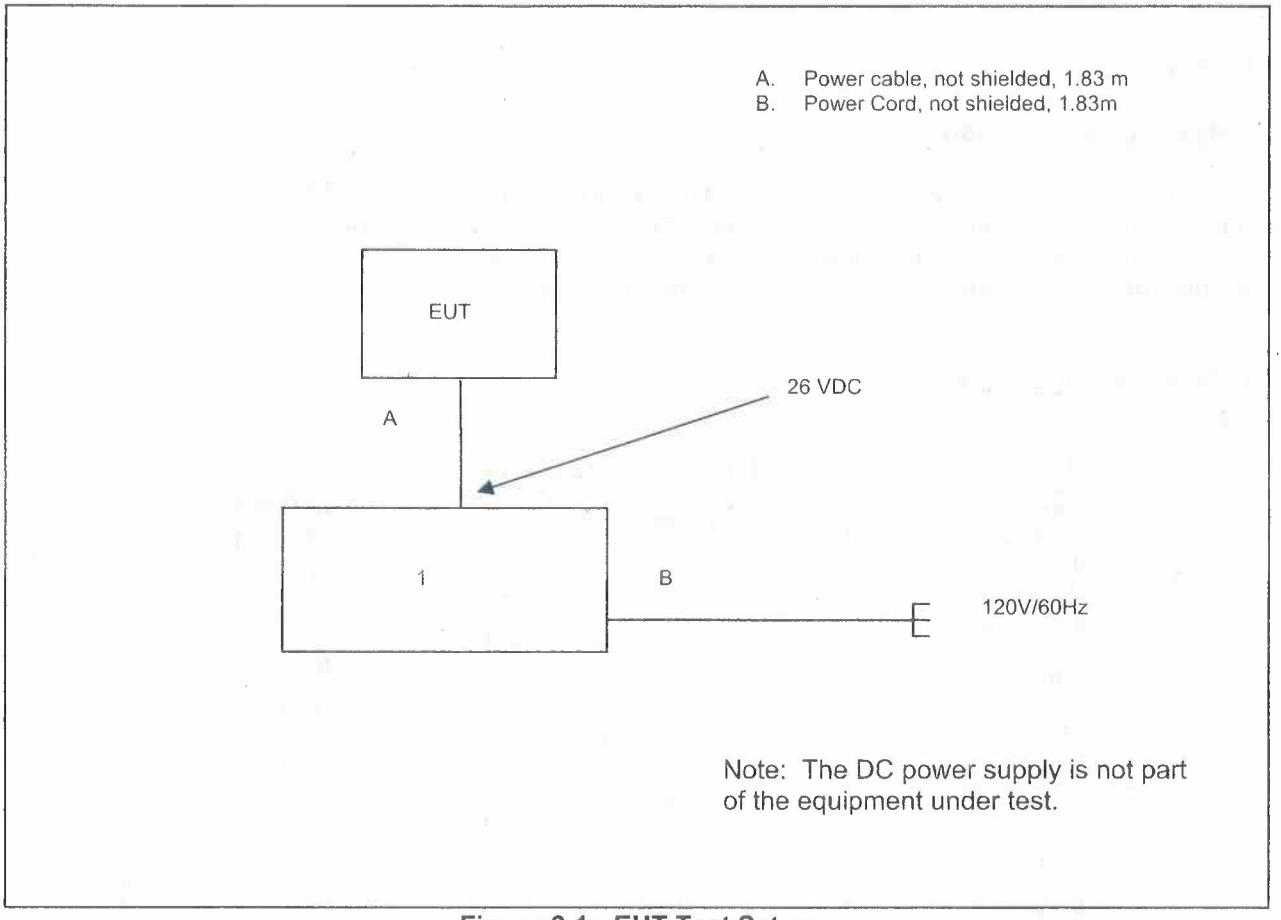


Figure 6-1: EUT Test Setup

7.0 SUMMARY OF TESTS

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

Table 7-1: Test Results Summary

Test Parameter	Test Site	Test Summary
RF Power Output	1	Pass
Occupied Bandwidth (Emissions Limits)	1	Pass
Spurious Emissions at Antenna Terminals	1	Pass
Field Strength of Spurious Emissions	1	Pass
Frequency Stability	2	Pass

7.1 RF Power Output

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 35 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.

7.1.2 Measurement Results

Table 7.1.2-1: Peak Output Power

Frequency (MHz)	FCC Rule Part	Output Power (dBm)
901.5000	24D	30.91
930.5000	24D	30.97
940.0125	24D	30.92
928.9250	101	31.06
932.2500	101	31.00
941.4875	101	30.92
952.5000	101	30.76
959.9250	101	30.57

Part 24.132 / RSS-134 5.4(a)

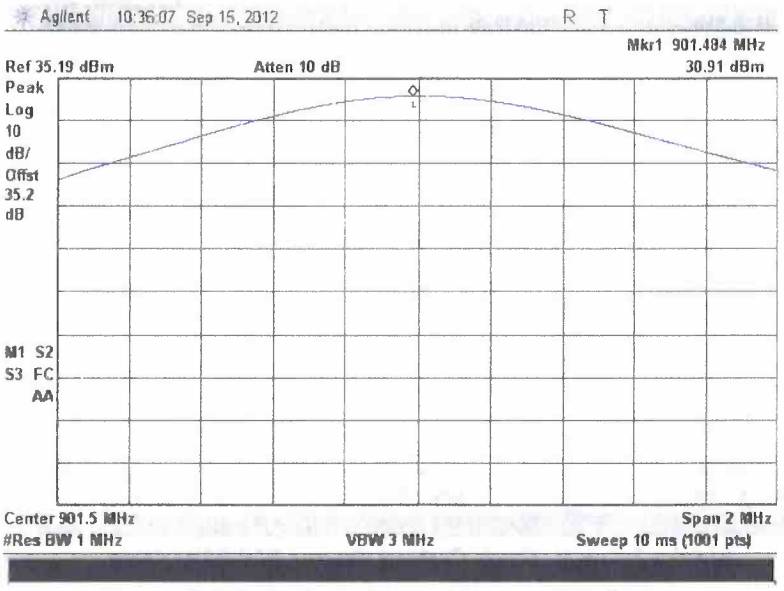


Figure 7.1.2-1: Peak Output Power 901.5 MHz

Figure 7.1.2-2: Peak Output Power 930.5 MHz

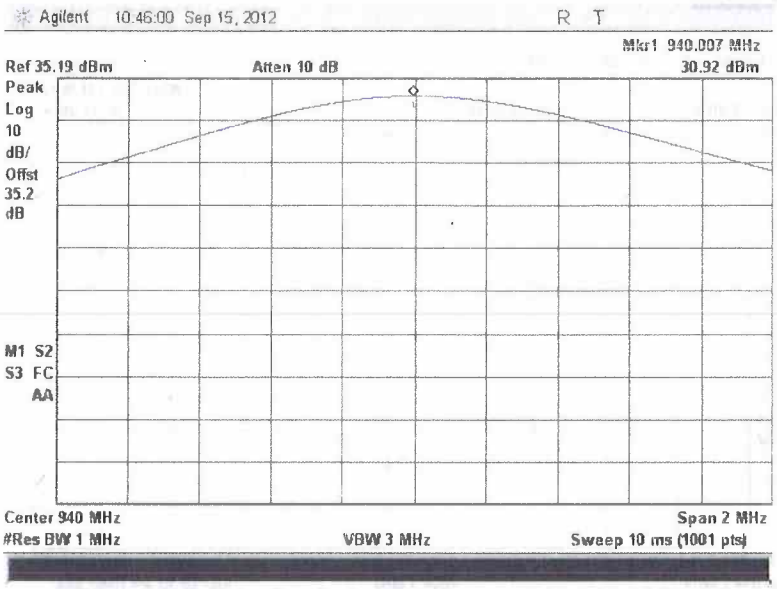


Figure 7.1.2-3: Peak Output Power 940.0125 MHz

Part 101.113(a) / RSS-119 5.41

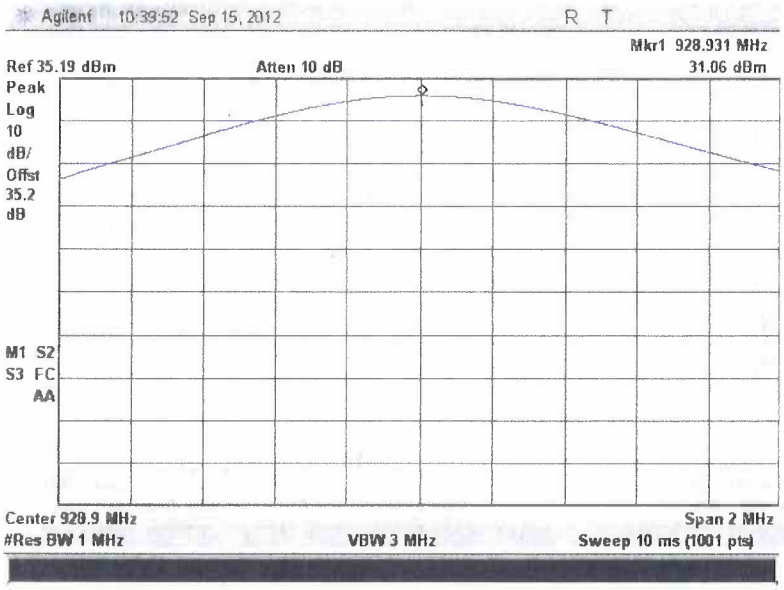


Figure 7.1.2-4: Peak Output Power 928.925 MHz

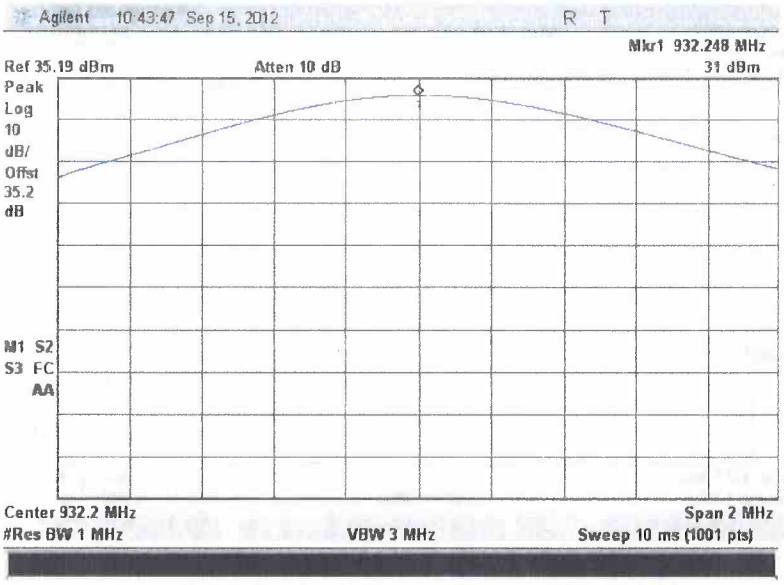


Figure 7.1.2-5: Peak Output Power 932.25 MHz

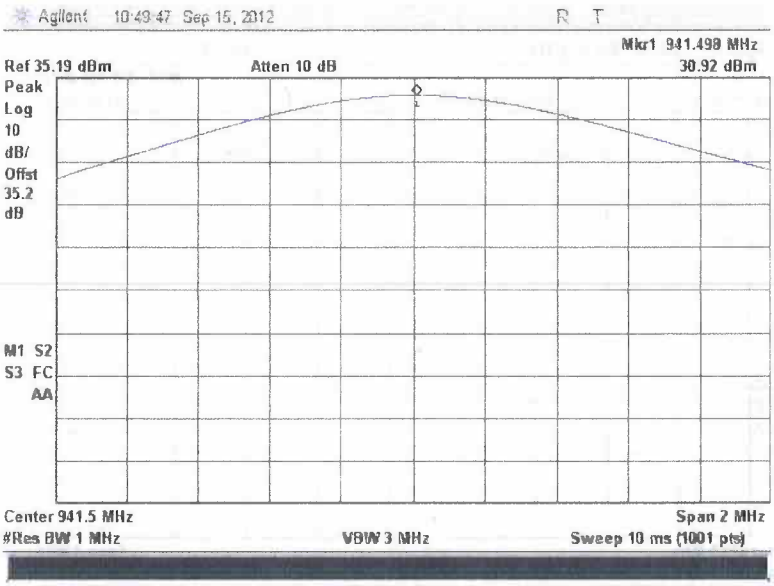


Figure 7.1.2-6: Peak Output Power 941.4875 MHz

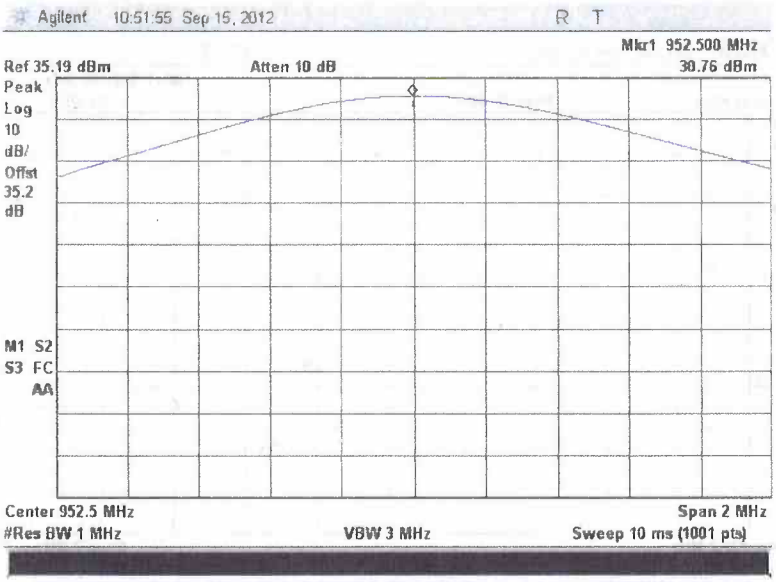


Figure 7.1.2-7: Peak Output Power 952.5 MHz

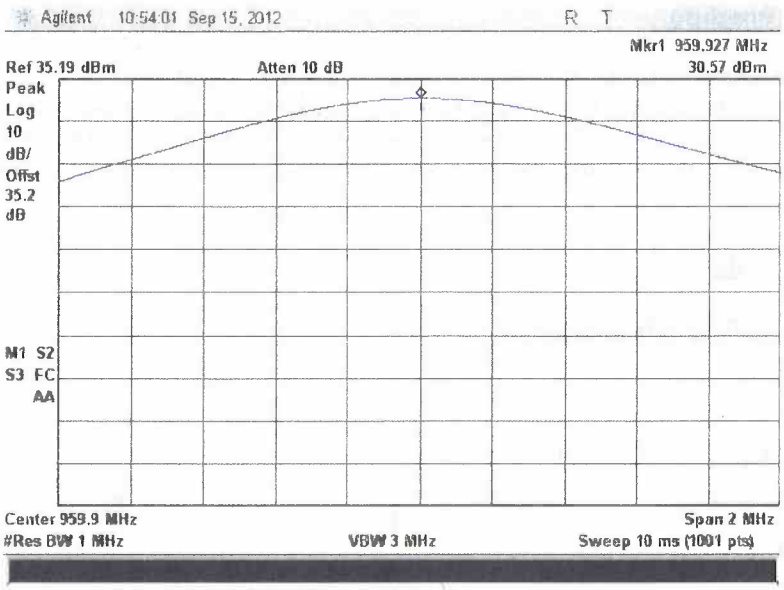


Figure 7.1.2-8: Peak Output Power 959.925 MHz

7.2 Occupied Bandwidth (Emission Limits)

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 35 dB passive attenuator. The spectrum analyzer resolution and video bandwidths were set to 300 Hz and 3000 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.

7.2.2 Measurement Results

Part 24.133 a(1), a(2), IC RSS-134 6.3(i), (ii)

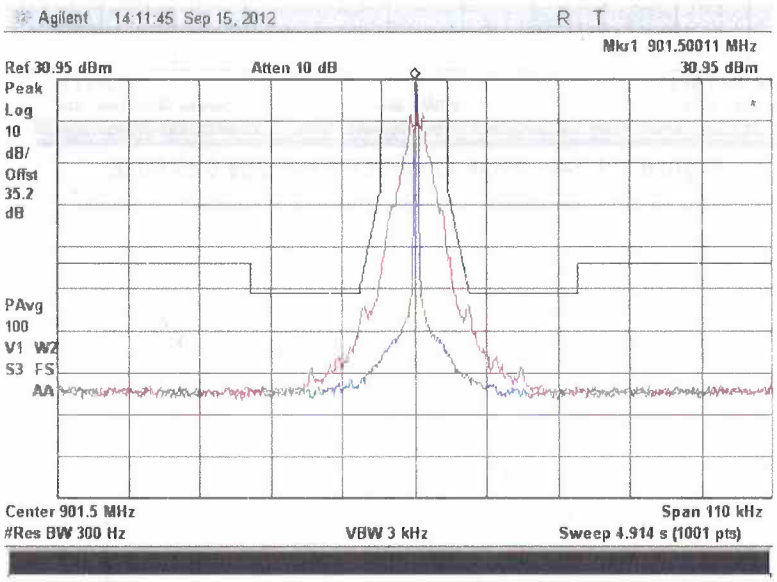


Figure 7.2.2-1: 901.5 MHz – 12.5 kHz Channel Spacing – C&I Mode

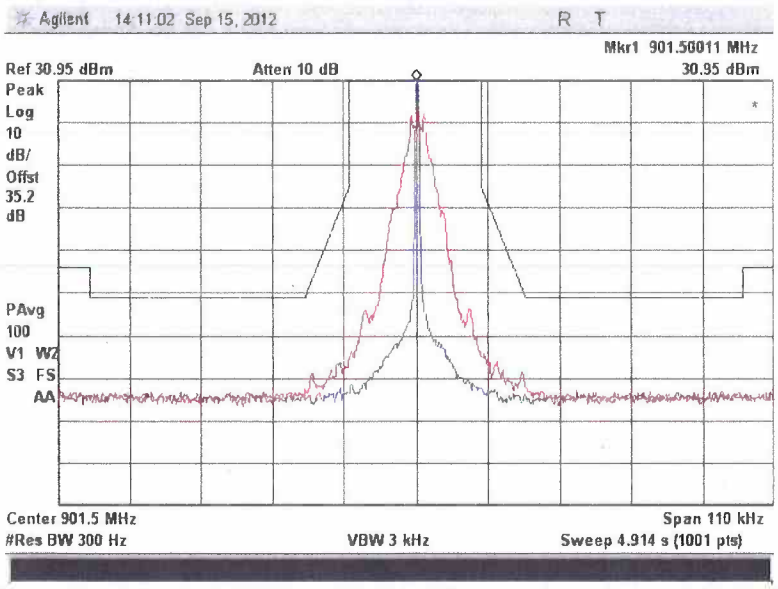


Figure 7.2.2-2: 901.5 MHz – 25 kHz Channel Spacing – C&I Mode

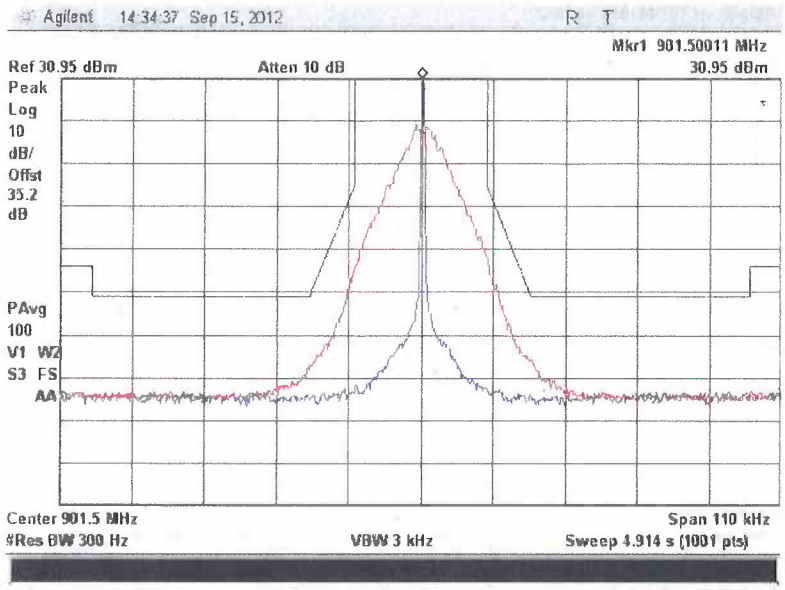


Figure 7.2.2-3: 901.5 MHz – 25 kHz Channel Spacing – Double Density Mode

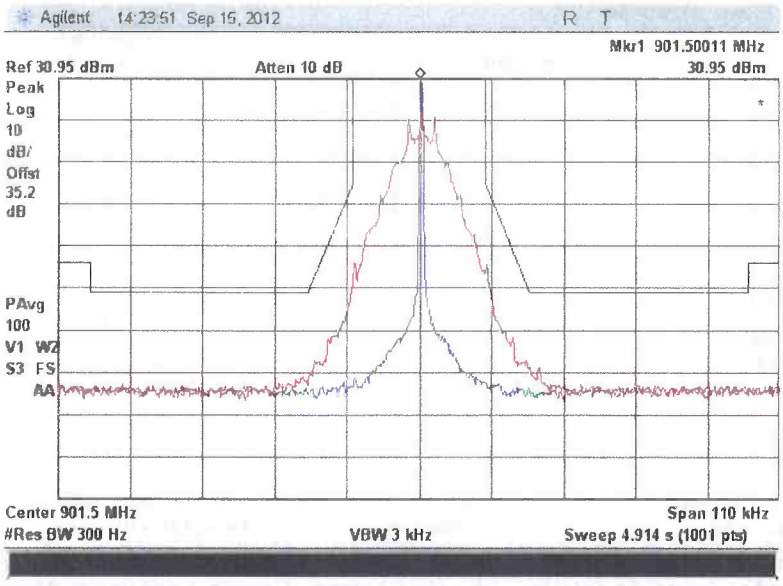


Figure 7.2.2-4: 901.5 MHz – 25 kHz Channel Spacing – Normal Mode

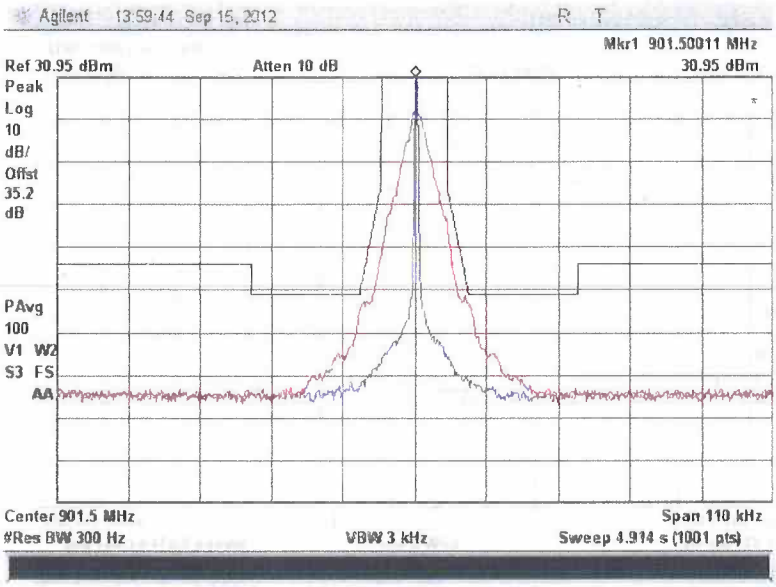


Figure 7.2.2-5: 901.5 MHz – 12.5 kHz Channel Spacing – Priority Mode

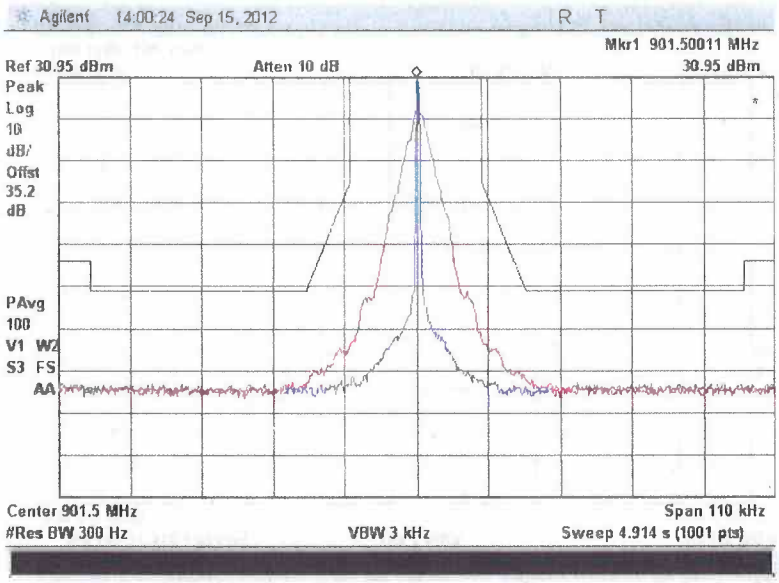


Figure 7.2.2-6: 901.5 MHz – 25 kHz Channel Spacing – Priority Mode

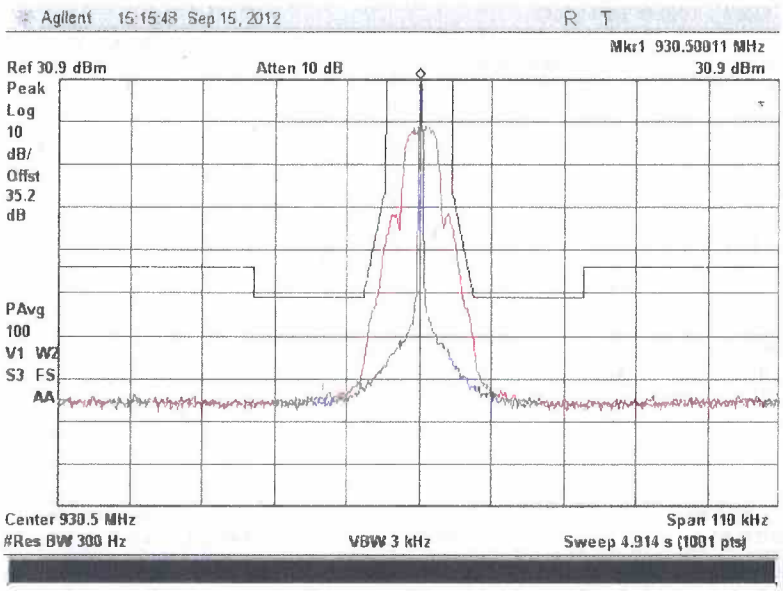


Figure 7.2.2-7: 930.5 MHz – 12.5 kHz Channel Spacing – mPass 5k Mode

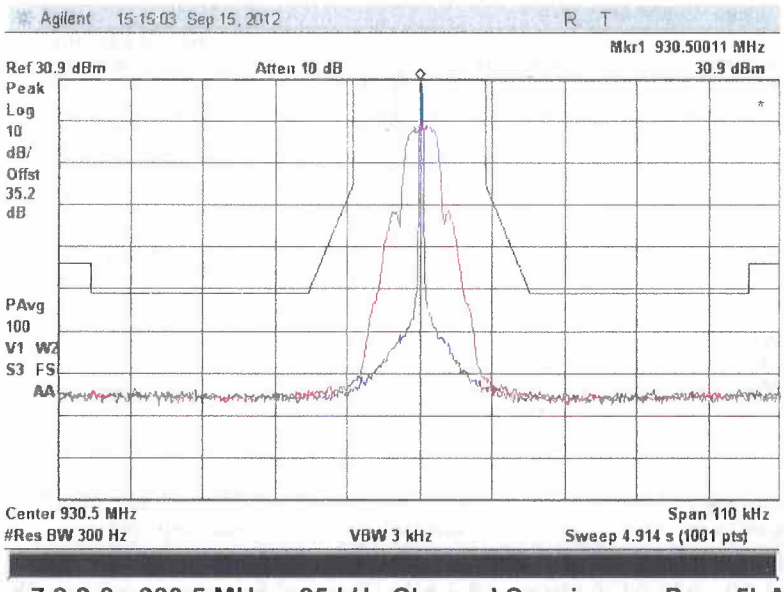


Figure 7.2.2-8: 930.5 MHz – 25 kHz Channel Spacing – mPass 5k Mode

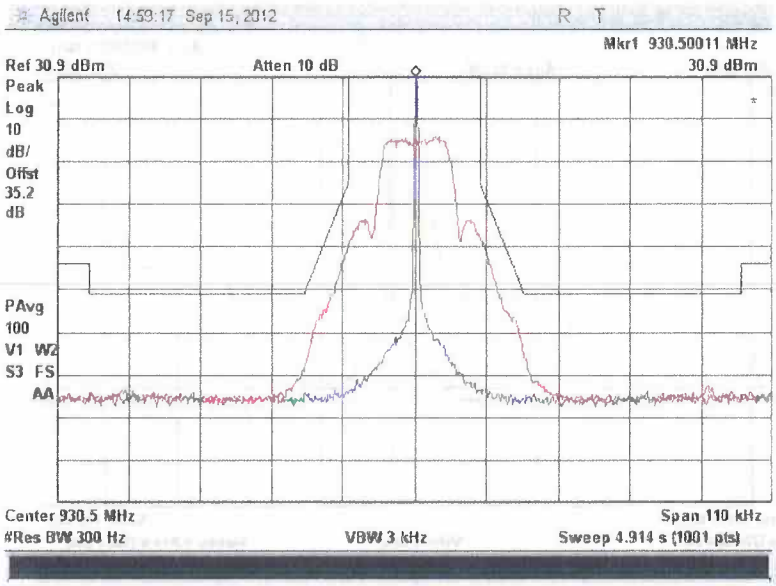


Figure 7.2.2-9: 930.5 MHz – 25 kHz Channel Spacing – mPass 10k Mode

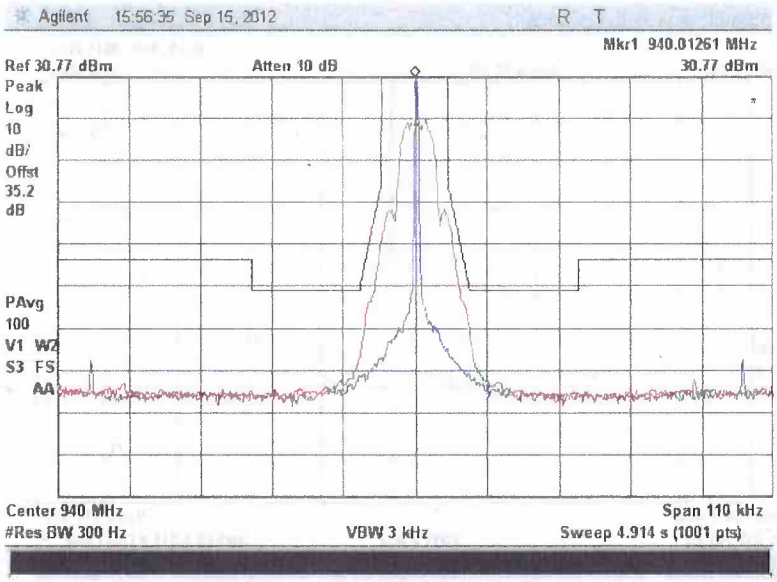


Figure 7.2.2-10: 940.0125 MHz – 12.5 kHz Channel Spacing – mPass 5k Mode

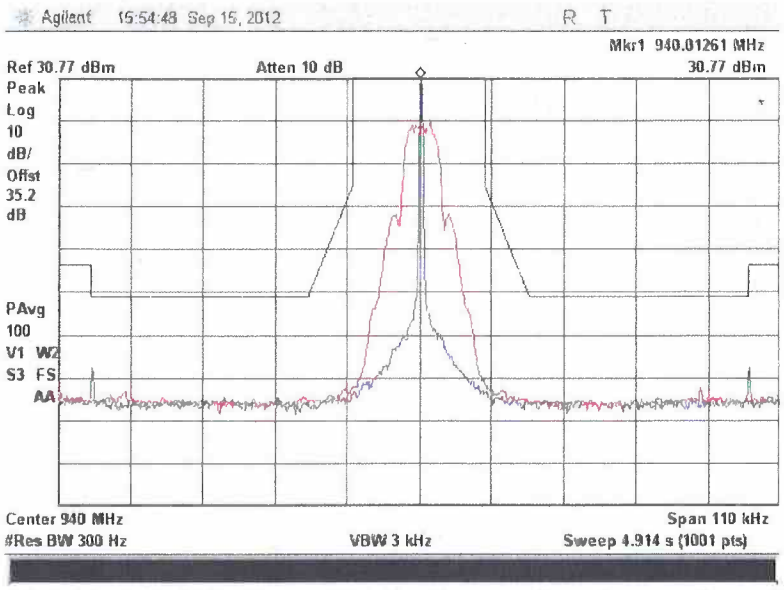


Figure 7.2.2-11: 940.0125 MHz – 25 kHz Channel Spacing – mPass 5k Mode

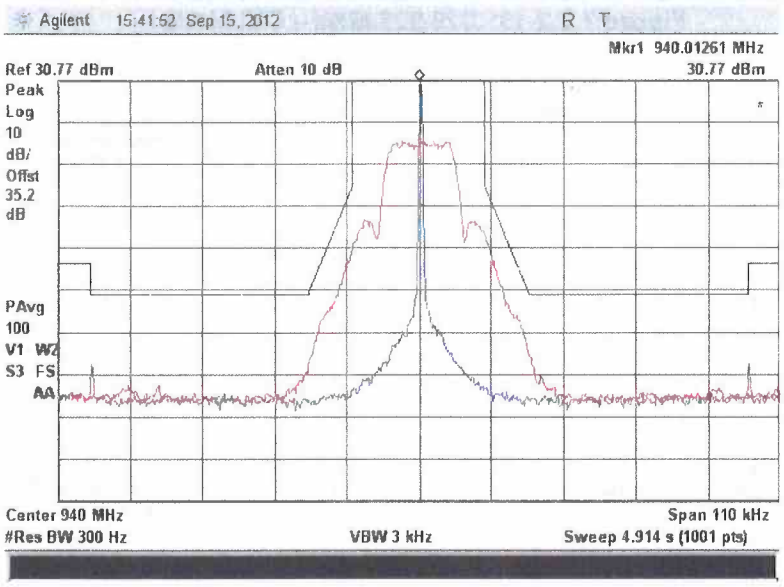


Figure 7.2.2-12: 940.0125 MHz – 25 kHz Channel Spacing – mPass 10k Mode

Part 101.111 a(6), RSS-119 5.8.6 (FCC Part 101.11a(6) provides worst case)

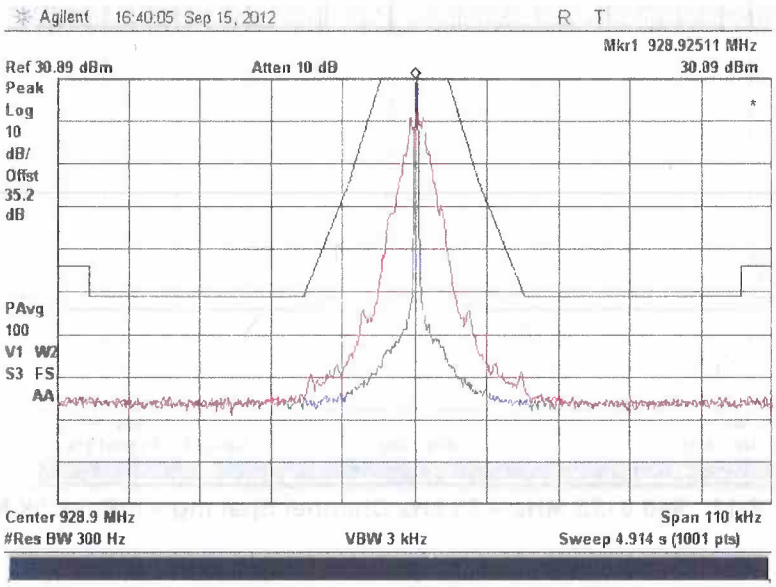


Figure 7.2.2-13: 928.925 MHz – C&I Mode

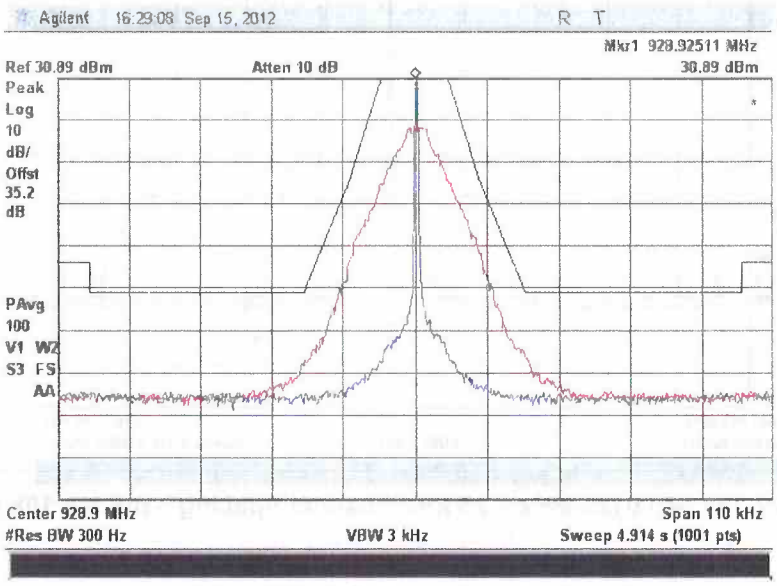


Figure 7.2.2-14: 928.925 MHz – Double Density Mode

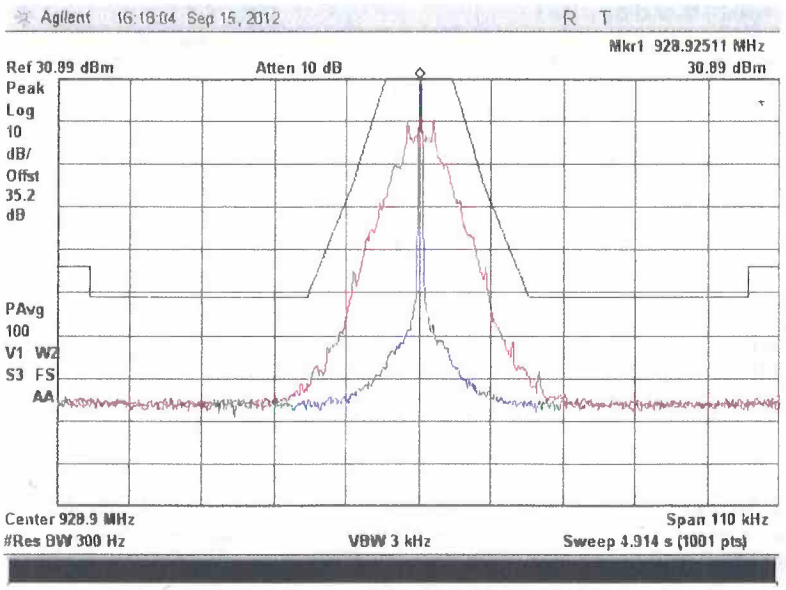


Figure 7.2.2-15: 928.925 MHz – Normal Mode

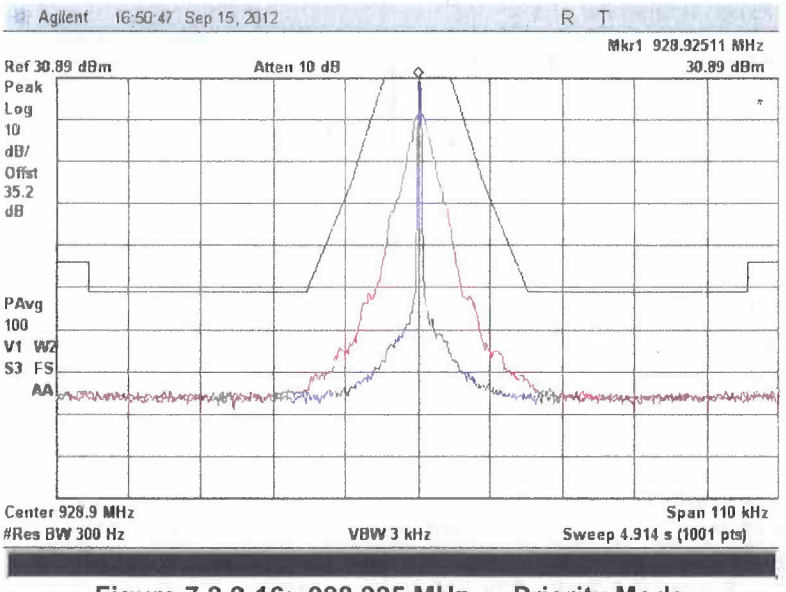


Figure 7.2.2-16: 928.925 MHz — Priority Mode

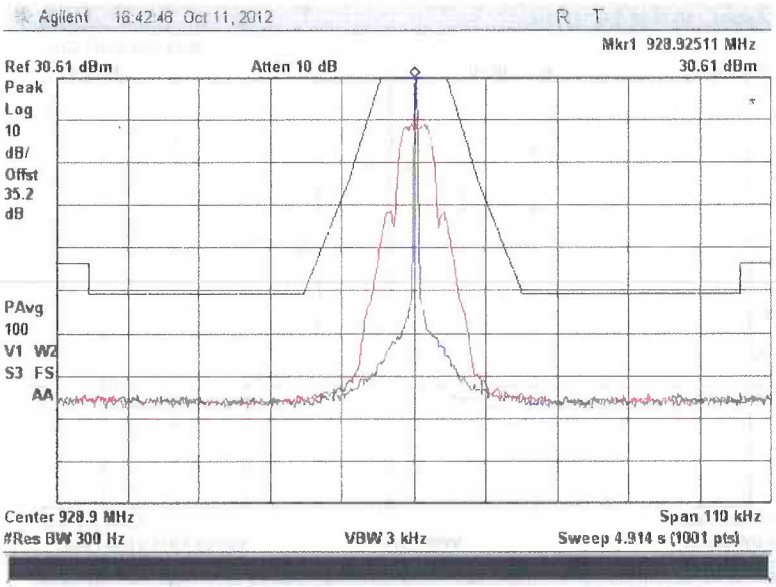


Figure 7.2.2-17: 928.925 MHz – mPass 5k Mode

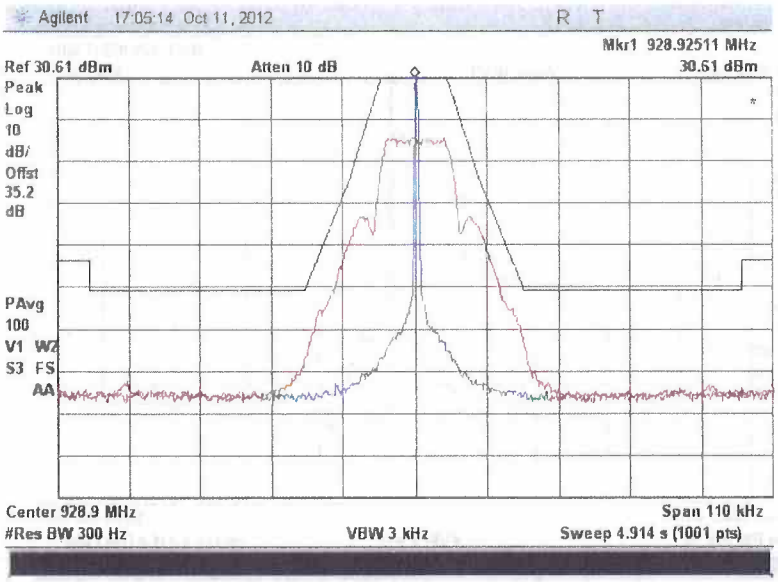


Figure 7.2.2-18: 928.925 MHz — mPass 10k Mode

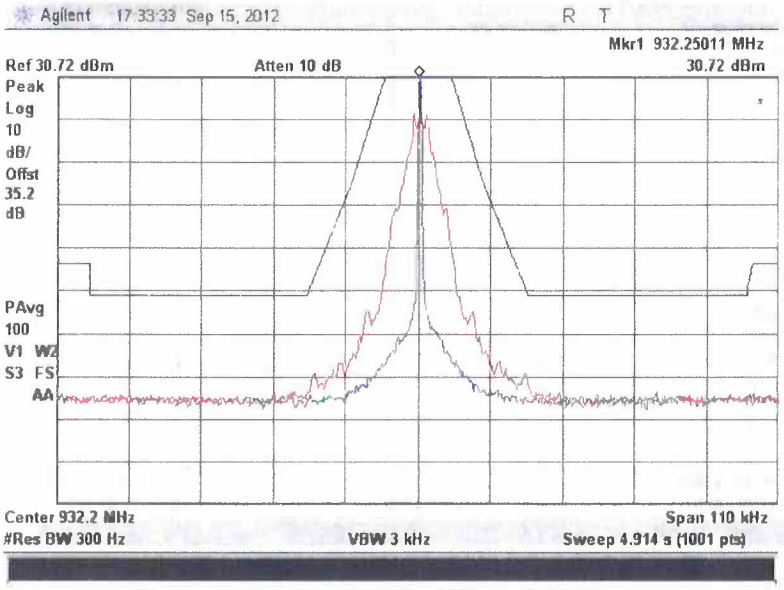


Figure 7.2.2-19: 932.25 MHz – C&I Mode

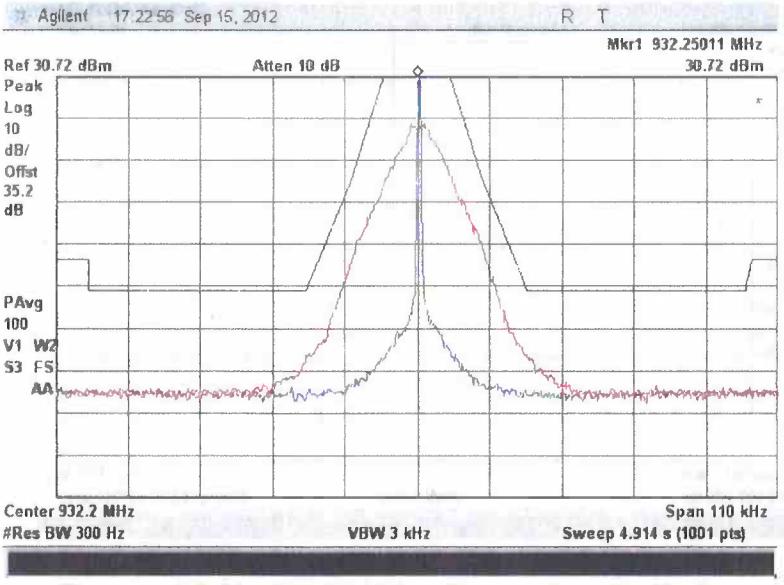


Figure 7.2.2-20: 932.25 MHz – Double Density Mode

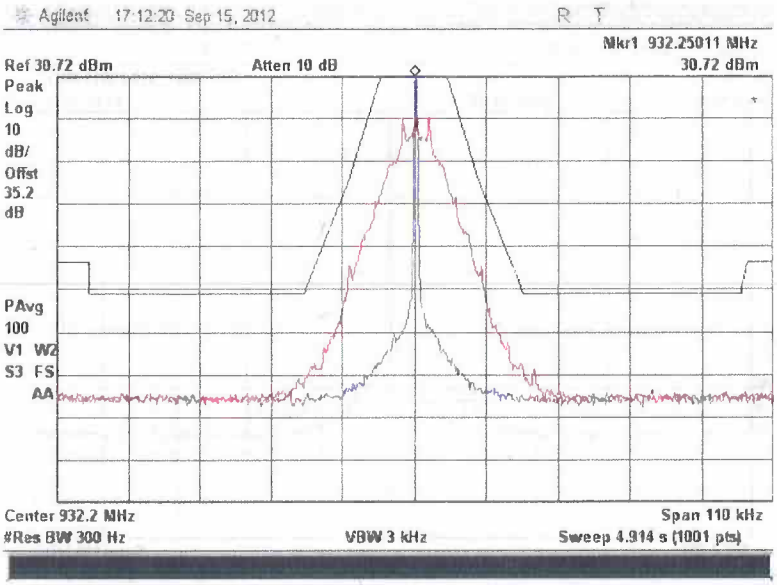


Figure 7.2.2-21: 932.25 MHz – Normal Mode

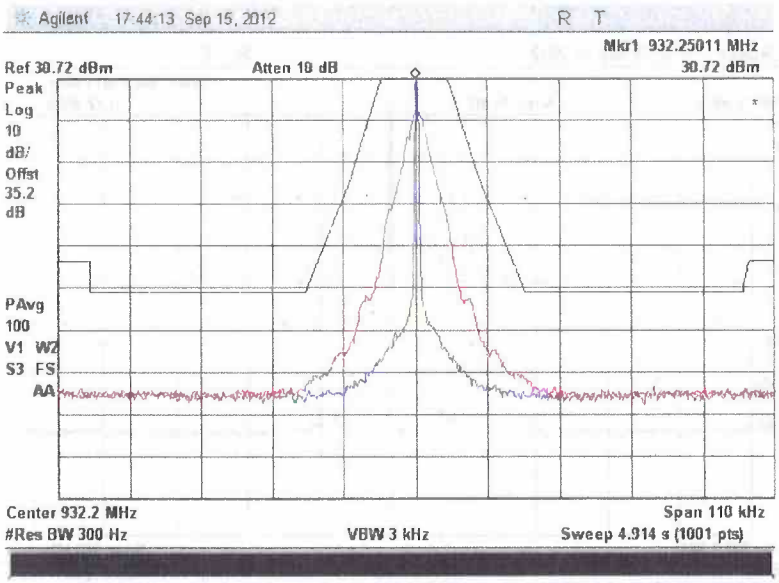


Figure 7.2.2-22: 932.25 MHz — Priority Mode

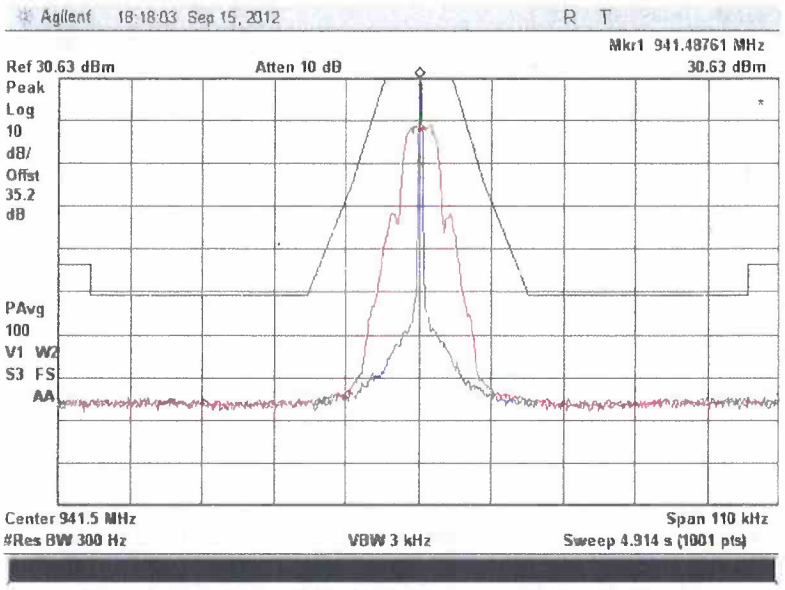


Figure 7.2.2-23: 941.4875 MHz – mPass 5k Mode

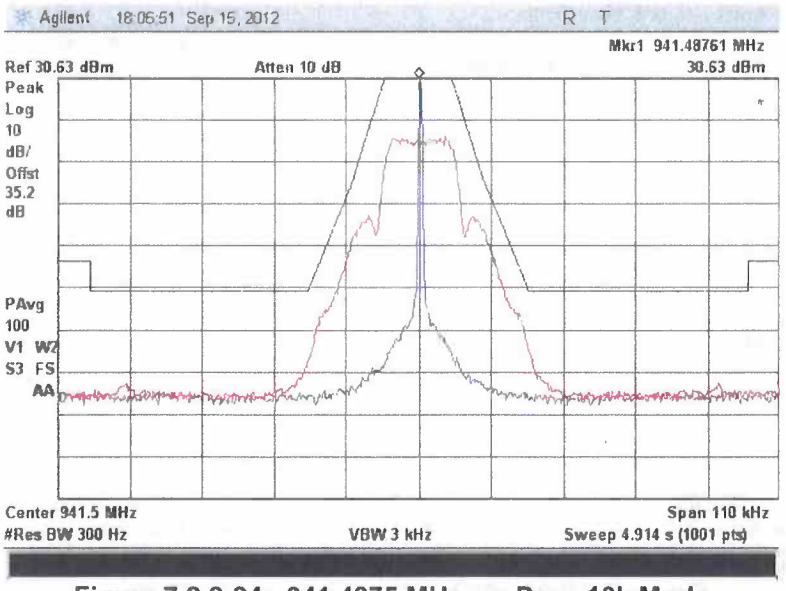


Figure 7.2.2-24: 941.4875 MHz – mPass 10k Mode

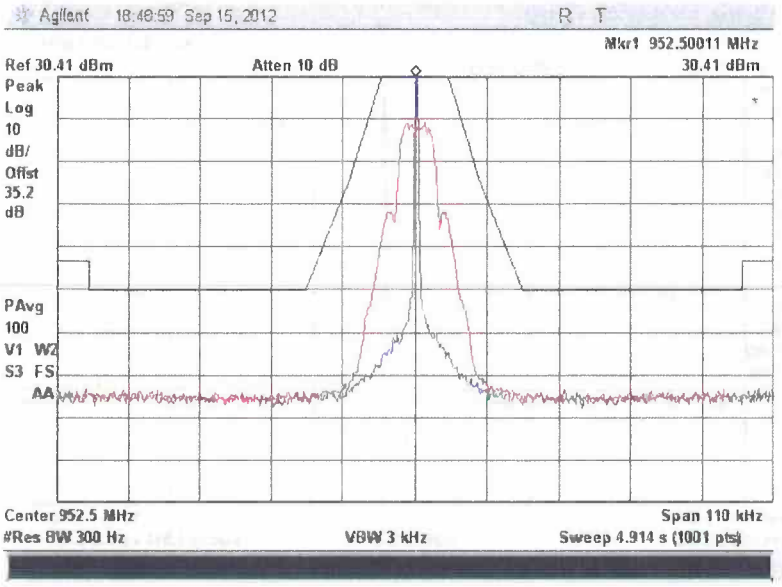


Figure 7.2.2-25: 952.5 MHz – mPass 5k Mode

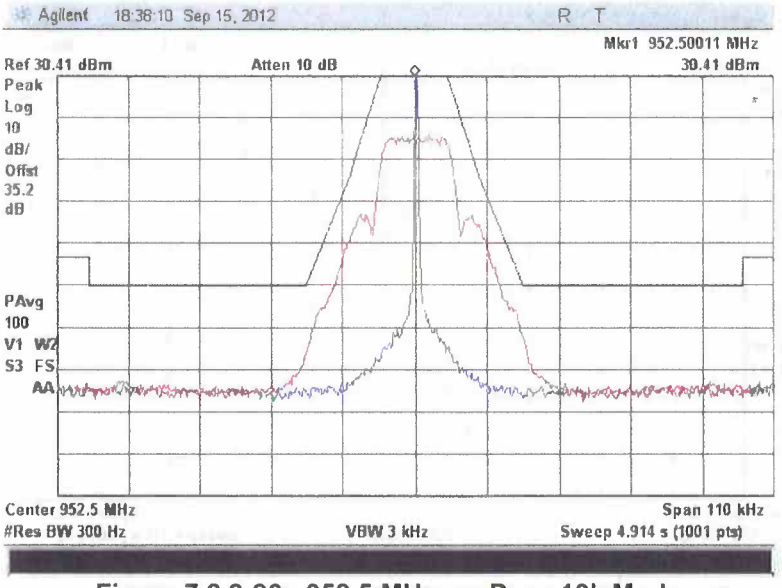


Figure 7.2.2-26: 952.5 MHz – mPass 10k Mode

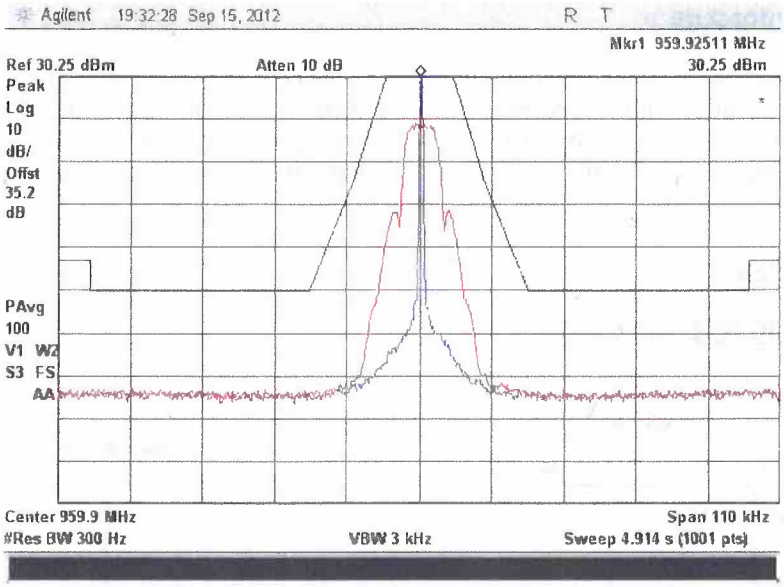


Figure 7.2.2-27: 959.925 MHz – mPass 5k Mode

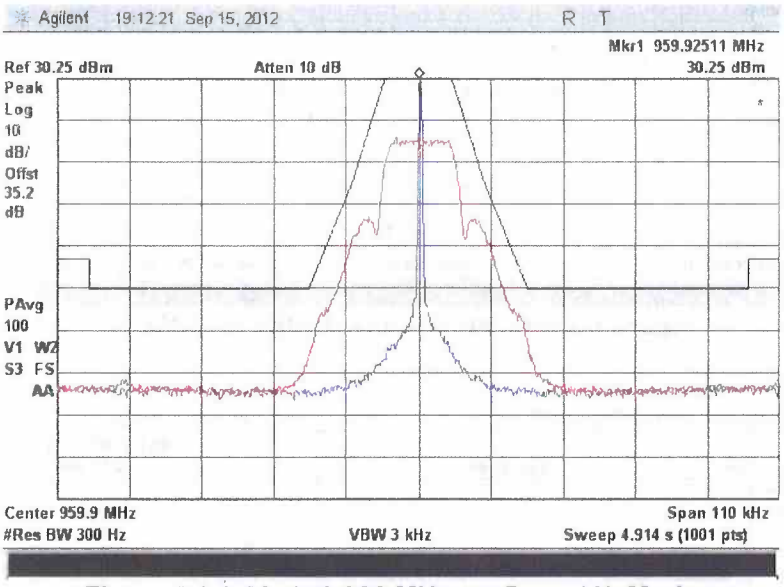


Figure 7.2.2-28: 959.925 MHz – mPass 10k Mode

7.3 Spurious Emissions at Antenna Terminals

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 35 dB passive attenuator. The spectrum analyzer resolution bandwidth was set to 100 kHz below 1000 MHz and 1 MHz above 1000 MHz. The internal correction factors of the spectrum analyzer were employed to correct for any cable, attenuator or filter losses. The spectrum was investigated in accordance to CFR 47 Part 2.1057. Results are shown below.

7.3.2 Measurement Results

Part 24.133 a(1), a(2), IC RSS-134 6.3(i), (ii)

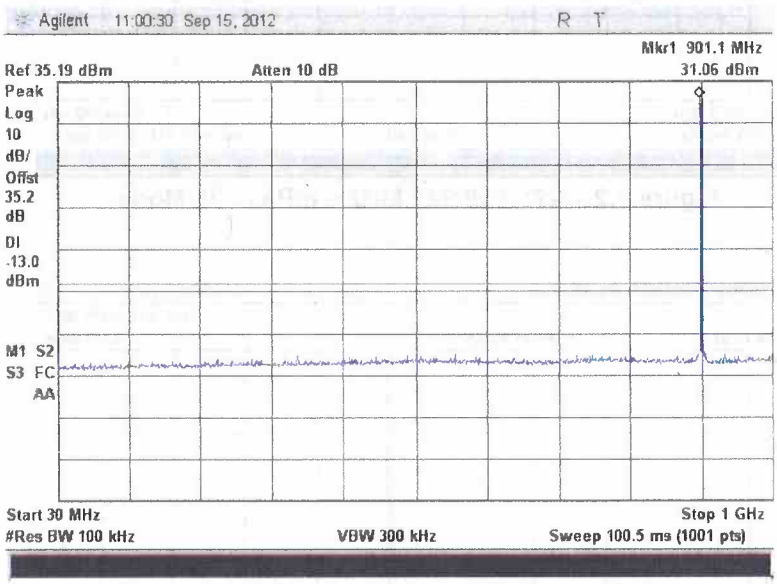


Figure 7.3.2-1: 901.5 MHz – 30MHz to 1GHz

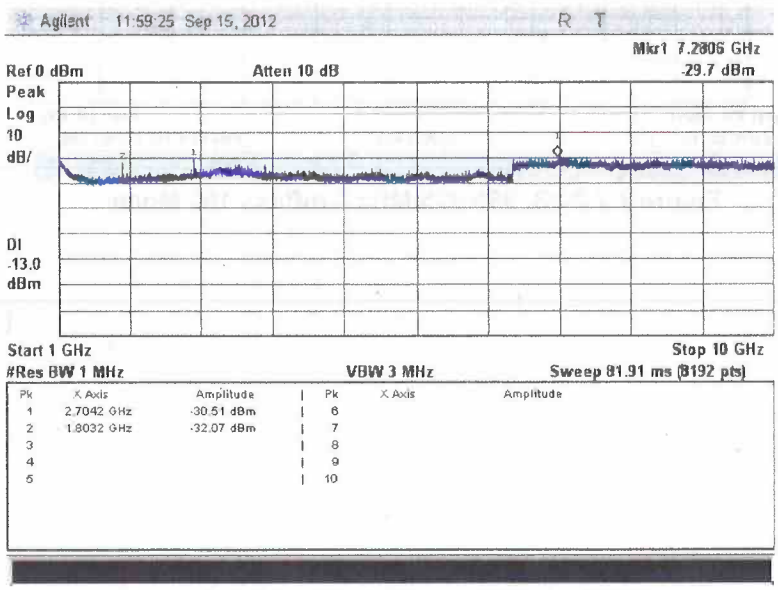


Figure 7.3.2-2: 901.5 MHz – 1GHz to 10GHz

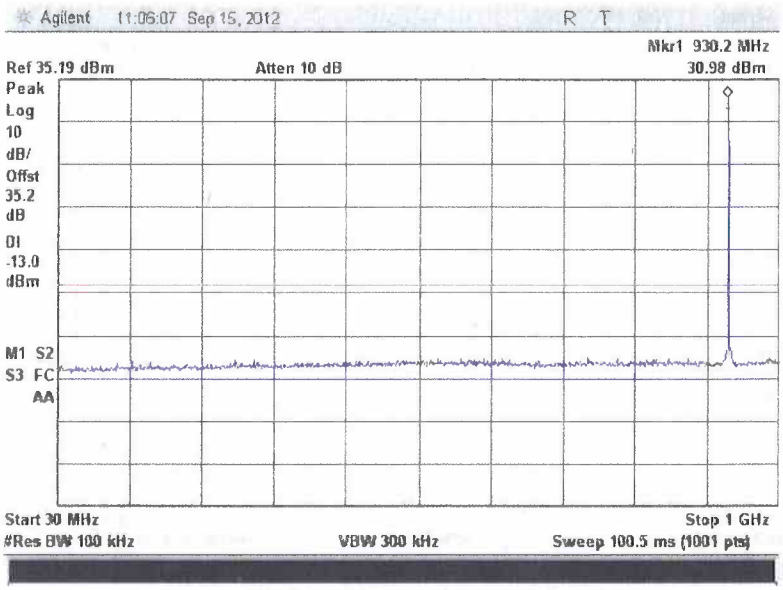


Figure 7.3.2-3: 930.5 MHz – 30MHz to 1GHz

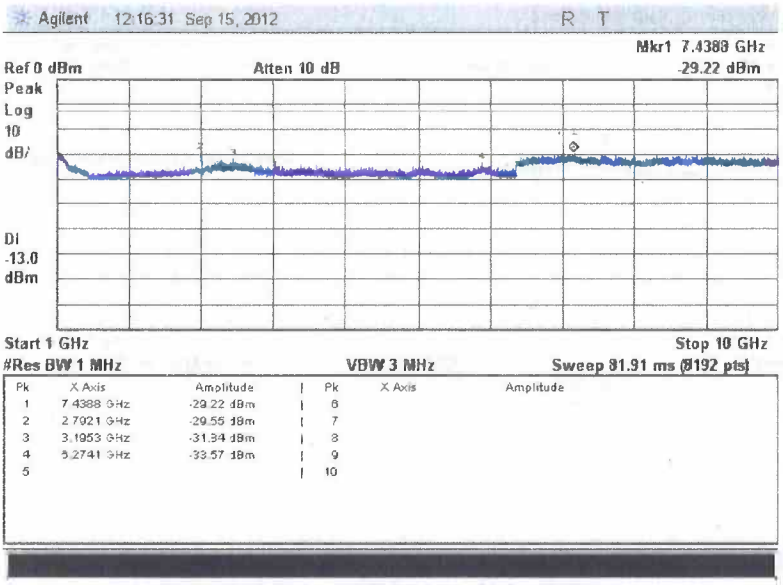


Figure 7.3.2-4: 930.5 MHz – 1GHz to 10GHz

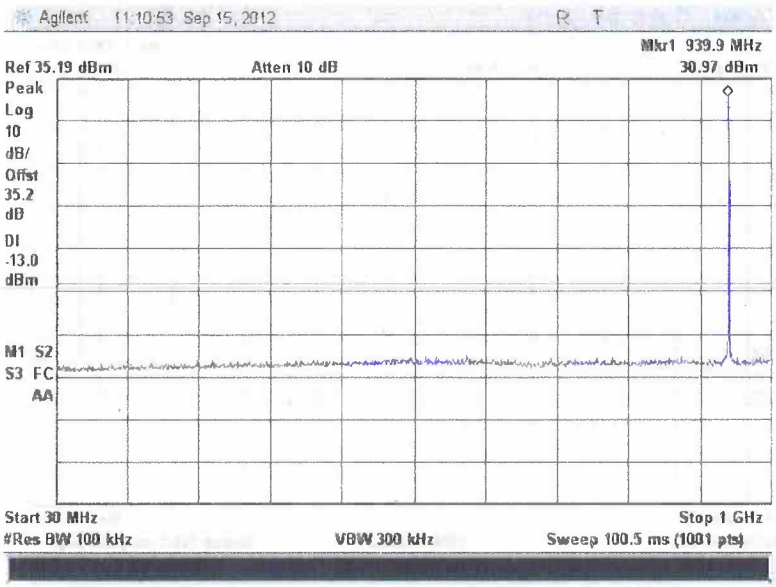


Figure 7.3.2-5: 940.0125 MHz – 30MHz to 1GHz

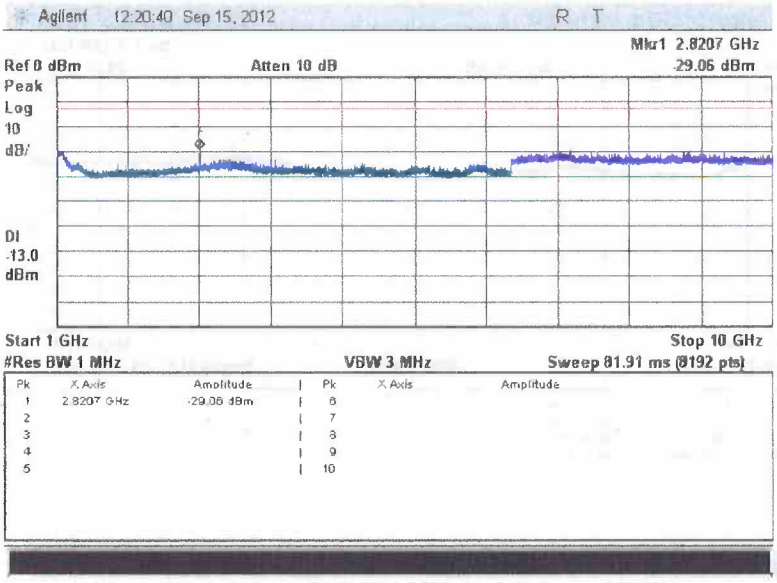


Figure 7.3.2-6: 940.0125 MHz – 1GHz to 10GHz

Part 101.111 a(6), RSS-119 5.8.6

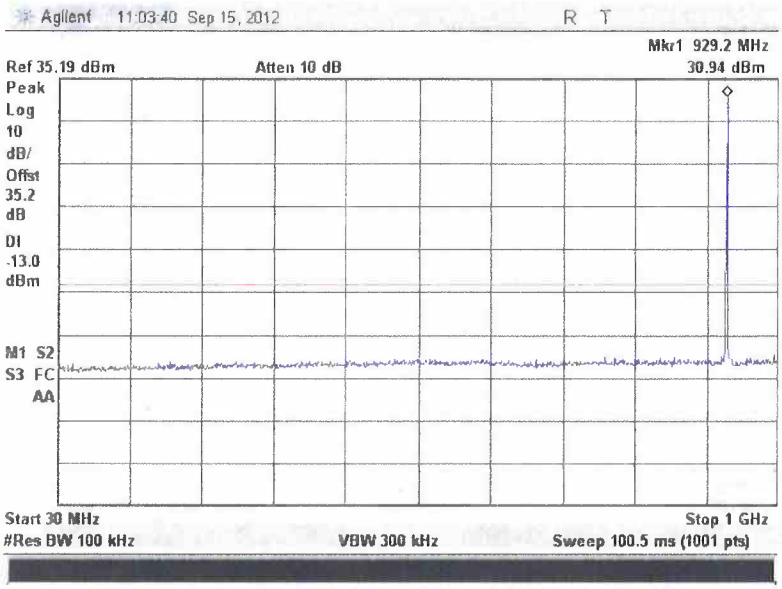


Figure 7.3.2-7: 928.925 MHz – 30MHz to 1GHz

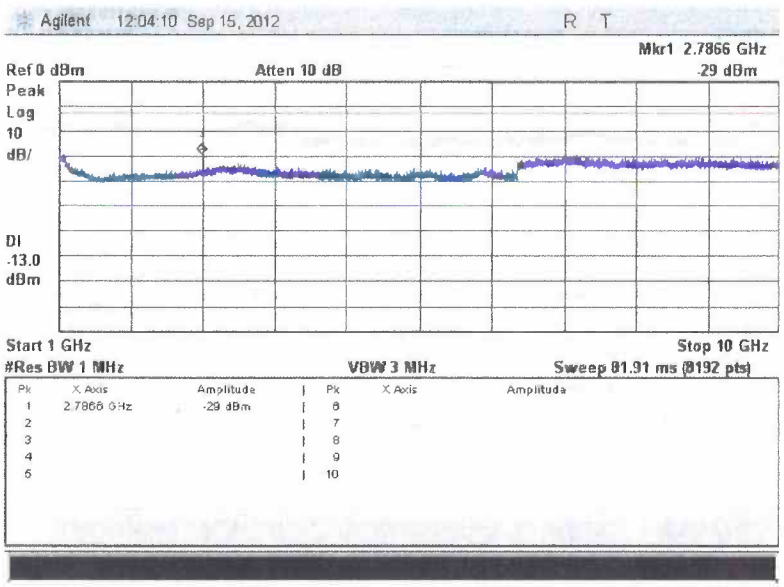


Figure 7.3.2-8: 928.925 MHz – 1GHz to 10GHz

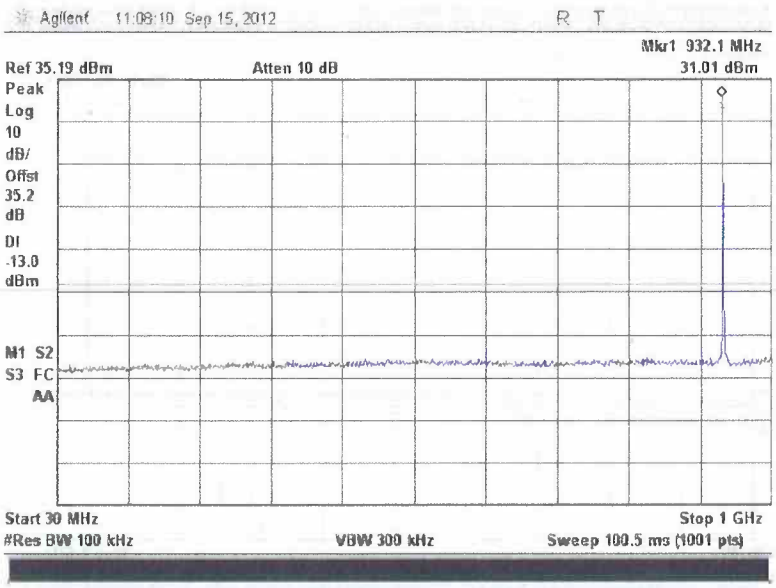


Figure 7.3.2-9: 932.25 MHz – 30MHz to 1GHz

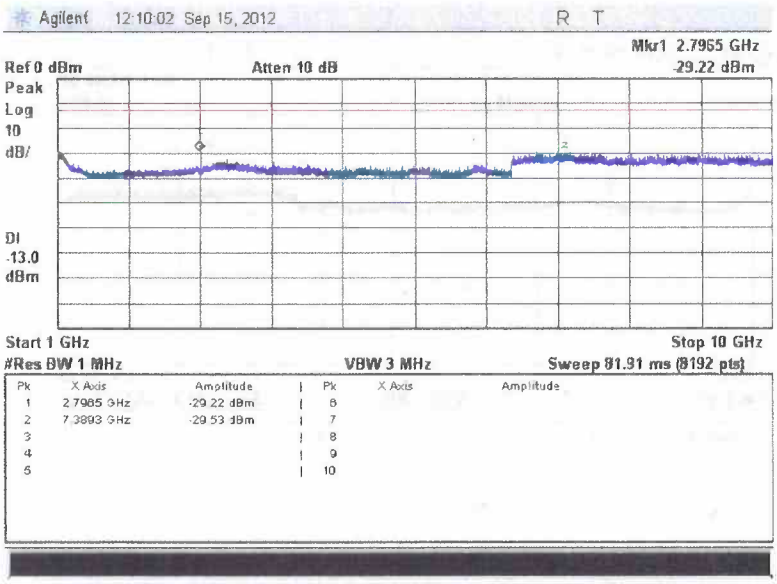


Figure 7.3.2-10: 932.25 MHz – 1GHz to 10GHz

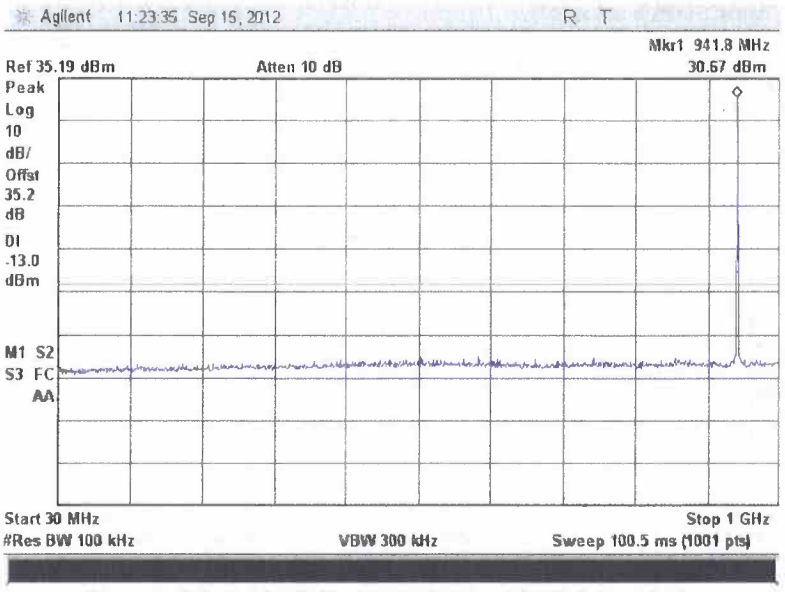


Figure 7.3.2-11: 941.4875 MHz – 30MHz to 1GHz

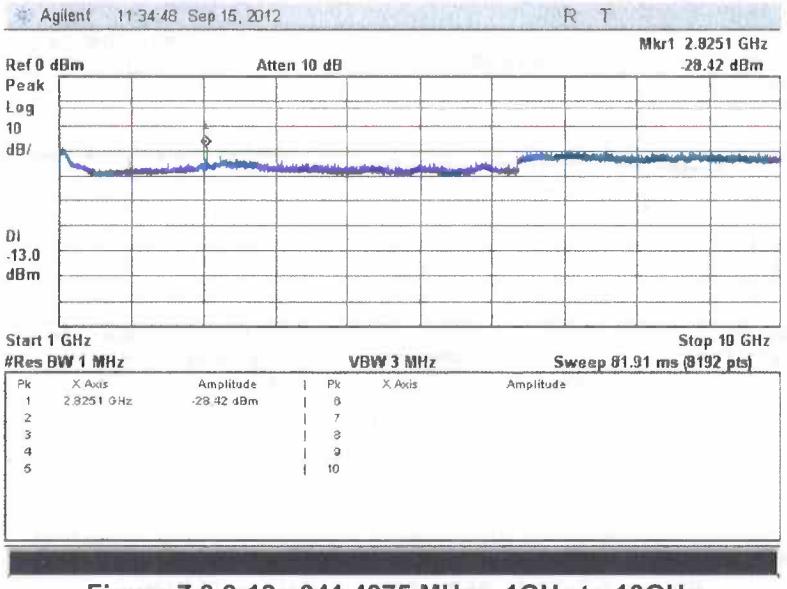


Figure 7.3.2-12: 941.4875 MHz – 1GHz to 10GHz

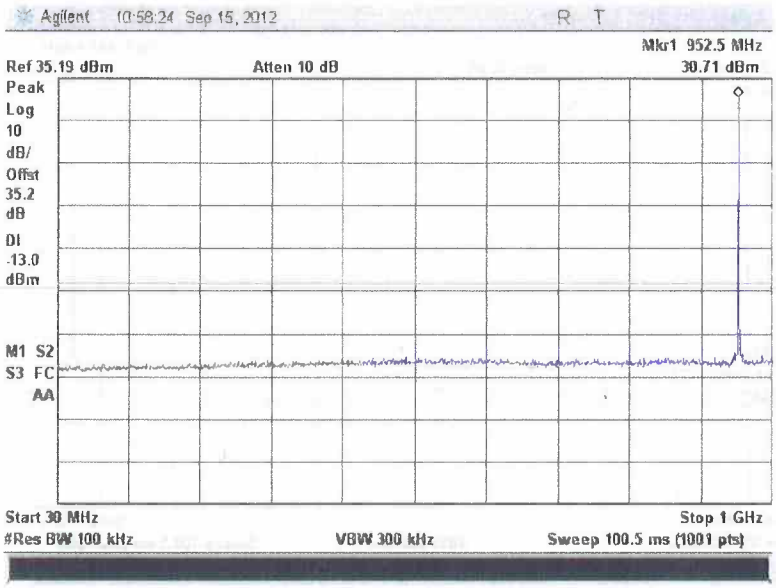


Figure 7.3.2-13: 952.5 MHz – 30MHz to 1GHz

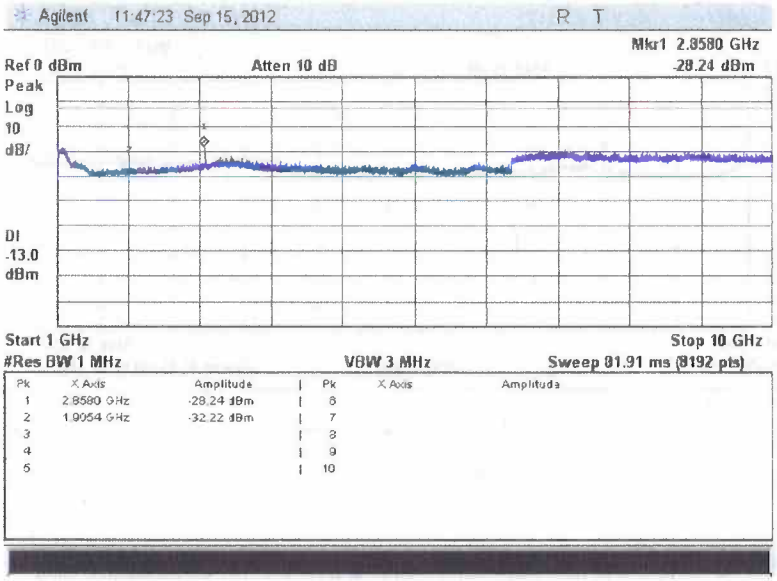


Figure 7.3.2-14: 952.5 MHz – 1GHz to 10GHz

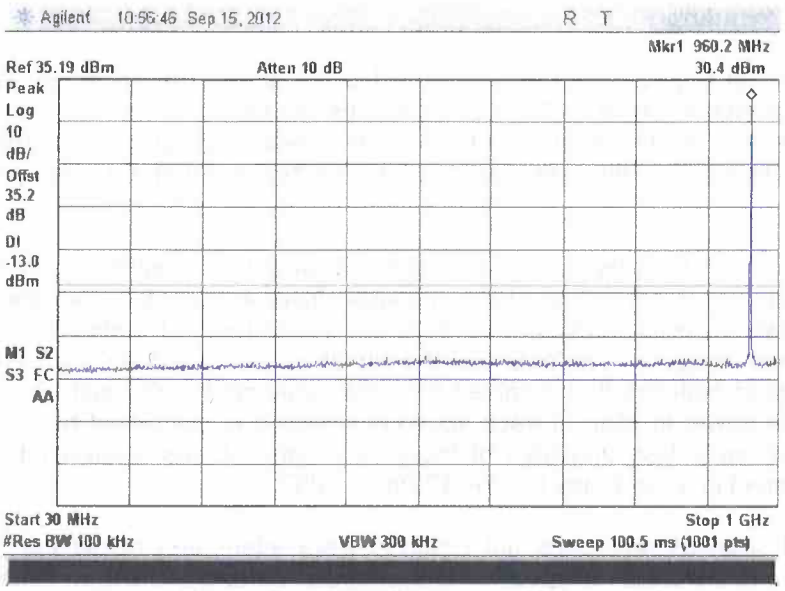


Figure 7.3.2-15: 959.925 MHz – 30MHz to 1GHz

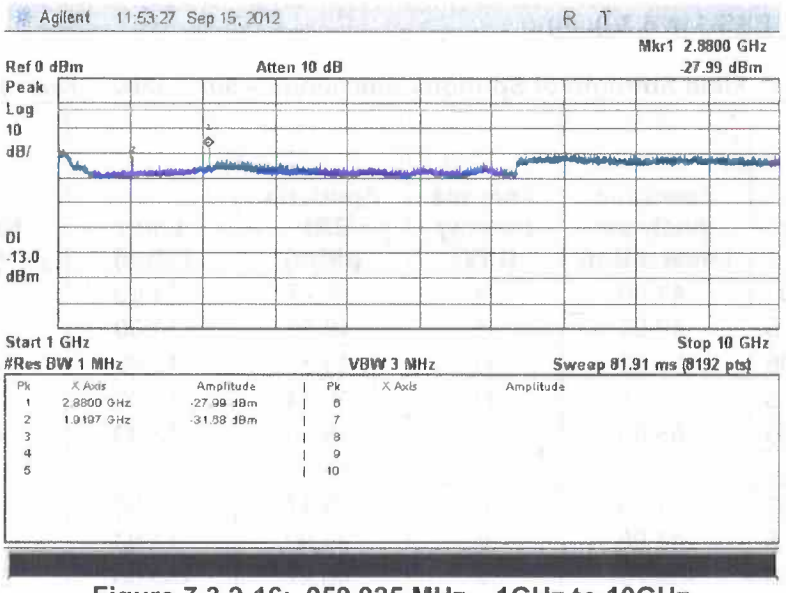


Figure 7.3.2-16: 959.925 MHz – 1GHz to 10GHz

7.4 Field Strength of Spurious Emissions

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 360° 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.

7.4.2 Measurement Results

Part 24.133 a(1), a(2), RSS-134 6.3(i), (ii)

Table 7.4.2-1: Field Strength of Spurious Emissions – 901.5 MHz – Normal Mode

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1803	-41.00	H	-39.27	-13.00	26.27
2704.5	-49.60	H	-46.87	-13.00	33.87
3606	-55.55	H	-49.57	-13.00	36.57
4507.5	-59.95	H	-56.14	-13.00	43.14
5409	-58.80	H	-45.50	-13.00	32.50
1803	-41.05	V	-39.47	-13.00	26.47
2704.5	-41.95	V	-36.92	-13.00	23.92
3606	-55.75	V	-48.27	-13.00	35.27
4507.5	-59.50	V	-54.49	-13.00	41.49
5409	-59.10	V	-58.15	-13.00	45.15

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

Table 7.4.2-2: Field Strength of Spurious Emissions – 930.5 MHz – MPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1861	-45.85	H	-43.52	-13.00	30.52
2791.5	-52.85	H	-50.07	-13.00	37.07
3722	-56.85	H	-50.69	-13.00	37.69
5583	-57.30	H	-42.43	-13.00	29.43
1861	-43.55	V	-40.72	-13.00	27.72
2791.5	-43.20	V	-35.62	-13.00	22.62
3722	-57.15	V	-50.09	-13.00	37.09
4652.5	-59.90	V	-53.96	-13.00	40.96
5583	-60.15	V	-49.83	-13.00	36.83

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

Table 7.4.2-3: Field Strength of Spurious Emissions – 940.0125 MHz – MPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1880.025	-44.65	H	-42.07	-13.00	29.07
2820.0375	-53.80	H	-51.29	-13.00	38.29
3760.05	-57.20	H	-52.34	-13.00	39.34
4700.0625	-59.65	H	-56.37	-13.00	43.37
5640.075	-58.15	H	-44.58	-13.00	31.58
1880.025	-42.50	V	-40.72	-13.00	27.72
2820.0375	-43.20	V	-35.84	-13.00	22.84
3760.05	-58.00	V	-53.34	-13.00	40.34
4700.0625	-59.85	V	-58.17	-13.00	45.17
5640.075	-60.30	V	-51.13	-13.00	38.13

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

Part 101.111 a(6), RSS-119 5.8.6

Table 7.4.2-4: Field Strength of Spurious Emissions – 928.925 MHz – Normal Mode

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1857.85	-46.10	H	-43.87	-13.00	30.87
2786.775	-51.20	H	-46.67	-13.00	33.67
3715.7	-57.75	H	-52.29	-13.00	39.29
4644.625	-60.95	H	-56.36	-13.00	43.36
5573.55	-57.80	H	-44.43	-13.00	31.43
1857.85	-42.50	V	-39.52	-13.00	26.52
2786.775	-44.20	V	-36.32	-13.00	23.32
3715.7	-58.05	V	-50.09	-13.00	37.09
4644.625	-59.75	V	-54.01	-13.00	41.01
5573.55	-59.90	V	-48.88	-13.00	35.88

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

Table 7.4.2-5: Field Strength of Spurious Emissions – 932.25 MHz – Normal Mode

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1864.5	-45.15	H	-42.67	-13.00	29.67
2796.75	-52.15	H	-48.42	-13.00	35.42
3729	-56.65	H	-50.84	-13.00	37.84
5593.5	-57.90	H	-44.18	-13.00	31.18
1864.5	-43.25	V	-40.77	-13.00	27.77
2796.75	-43.55	V	-35.17	-13.00	22.17
3729	-57.60	V	-50.99	-13.00	37.99
4661.25	-59.85	V	-54.21	-13.00	41.21
5593.5	-59.60	V	-47.88	-13.00	34.88

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

Table 7.4.2-6: Field Strength of Spurious Emissions – 941.4875 MHz – MPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1882.975	-45.45	H	-42.37	-13.00	29.37
2824.4625	-54.75	H	-51.39	-13.00	38.39
3765.95	-58.40	H	-55.34	-13.00	42.34
4707.4375	-61.00	H	-58.22	-13.00	45.22
5648.925	-58.70	H	-45.43	-13.00	32.43
1882.975	-42.65	V	-39.92	-13.00	26.92
2824.4625	-44.75	V	-36.59	-13.00	23.59
3765.95	-58.65	V	-53.69	-13.00	40.69
4707.4375	-60.60	V	-56.62	-13.00	43.62
5648.925	-61.15	V	-52.73	-13.00	39.73

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

Table 7.4.2-7: Field Strength of Spurious Emissions – 952.5 MHz – MPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1905	-42.45	H	-39.59	-13.00	26.59
2857.5	-53.85	H	-51.79	-13.00	38.79
3810	-58.70	H	-54.73	-13.00	41.73
4762.5	-60.80	H	-55.87	-13.00	42.87
5715	-59.50	H	-46.57	-13.00	33.57
1905	-41.45	V	-39.09	-13.00	26.09
2857.5	-44.30	V	-37.29	-13.00	24.29
3810	-59.30	V	-55.78	-13.00	42.78
4762.5	-60.80	V	-56.32	-13.00	43.32

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

Table 7.4.2-8: Field Strength of Spurious Emissions – 959.925 MHz – MPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1919.85	-40.95	H	-37.49	-13.00	24.49
2879.775	-53.20	H	-50.29	-13.00	37.29
3839.7	-59.55	H	-55.28	-13.00	42.28
5759.55	-60.55	H	-49.27	-13.00	36.27
1919.85	-41.40	V	-38.49	-13.00	25.49
2879.775	-45.70	V	-39.24	-13.00	26.24
3839.7	-60.20	V	-56.33	-13.00	43.33
4799.625	-61.20	V	-58.32	-13.00	45.32
5759.55	-62.00	V	-57.32	-13.00	44.32

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

7.5 Frequency Stability

7.5.1 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 -30° C to +50° C and at intervals of 10° 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 20° C the measurements were performed at +/- 15% of the EUT nominal voltage. The maximum variation of frequency was recorded.

Results of the test are shown below.

7.5.2 Measurement Results

Part 24.135, RSS-134 (7)

Frequency Stability

Frequency (MHz): 901.5
Deviation Limit (PPM): 1ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**901.500055**	**0.061**	100%	26.00
-20 C	**901.500088**	**0.098**	100%	26.00
-10 C	**901.500183**	**0.203**	100%	26.00
0 C	**901.500214**	**0.237**	100%	26.00
10 C	**901.500238**	**0.264**	100%	26.00
20 C	**901.500236**	**0.262**	100%	26.00
30 C	**901.500144**	**0.160**	100%	26.00
40 C	**901.500079**	**0.088**	100%	26.00
50 C	**901.500093**	**0.103**	100%	26.00
20 C	**901.500232**	**0.257**	85%	22.10
20 C	**901.500231**	**0.256**	115%	29.90

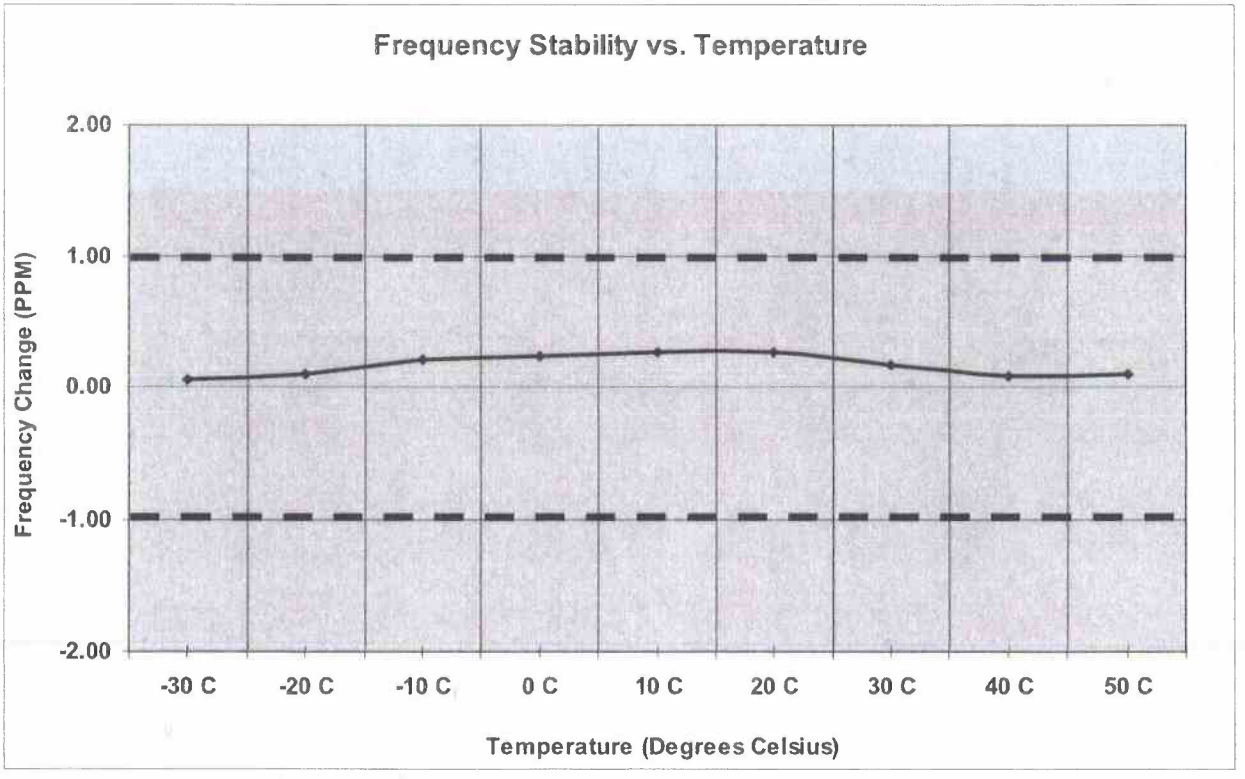


Figure 7.5.2-1: Frequency Stability – 901.5 MHz

Part 24.135, RSS-134 (7)

Frequency Stability

Frequency (MHz): 930.5
Deviation Limit (PPM): 1ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**930.500041**	**0.044**	100%	26.00
-20 C	**930.500086**	**0.092**	100%	26.00
-10 C	**930.500182**	**0.196**	100%	26.00
0 C	**930.500220**	**0.236**	100%	26.00
10 C	**930.500239**	**0.257**	100%	26.00
20 C	**930.500238**	**0.256**	100%	26.00
30 C	**930.500142**	**0.153**	100%	26.00
40 C	**930.500081**	**0.087**	100%	26.00
50 C	**930.500089**	**0.096**	100%	26.00
20 C	**930.500237**	**0.255**	85%	22.10
20 C	**930.500234**	**0.251**	115%	29.90

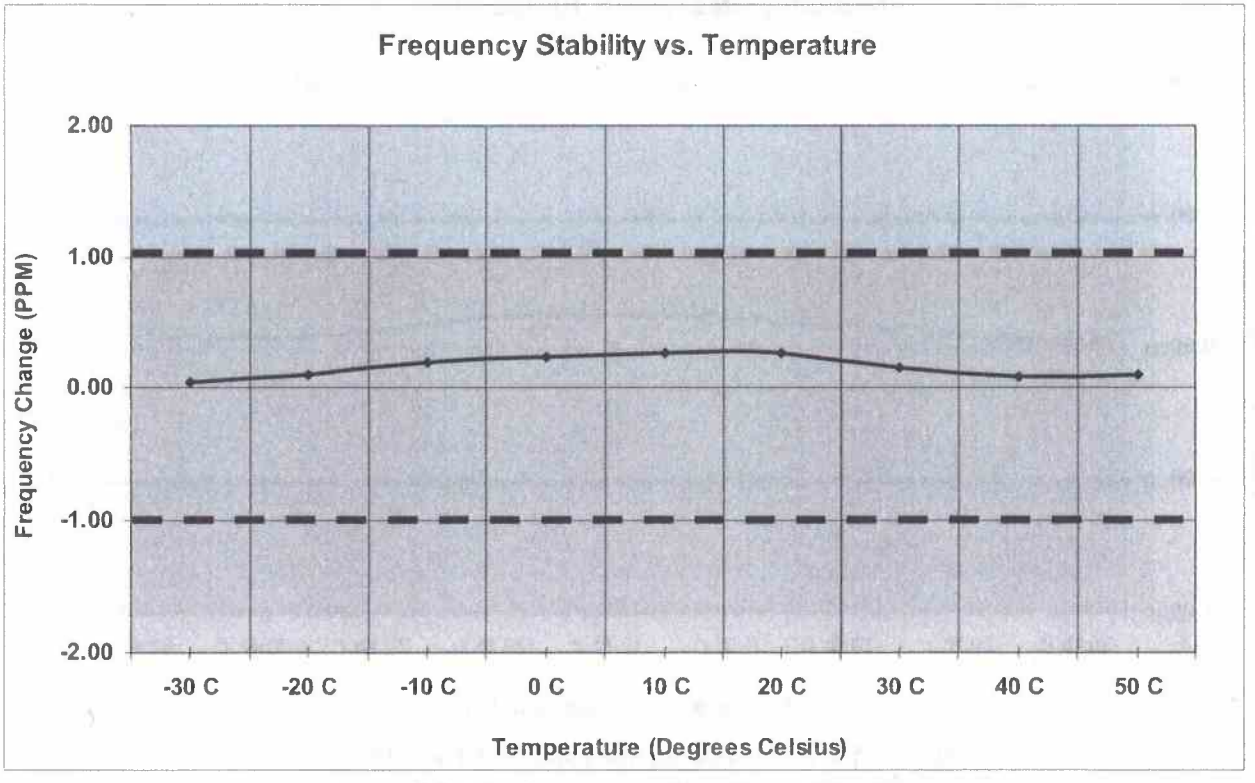


Figure 7.5.2-2: Frequency Stability – 930.5 MHz

Part 101.107, RSS-119 5.3

Frequency Stability

Frequency (MHz): 959.925
Deviation Limit (PPM): 1ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	959.925046	0.048	100%	26.00
-20 C	959.925091	0.095	100%	26.00
-10 C	959.925181	0.189	100%	26.00
0 C	959.925227	0.236	100%	26.00
10 C	959.925242	0.252	100%	26.00
20 C	959.925236	0.246	100%	26.00
30 C	959.925139	0.145	100%	26.00
40 C	959.925084	0.088	100%	26.00
50 C	959.925093	0.097	100%	26.00
20 C	959.925239	0.249	85%	22.10
20 C	959.925231	0.241	115%	29.90

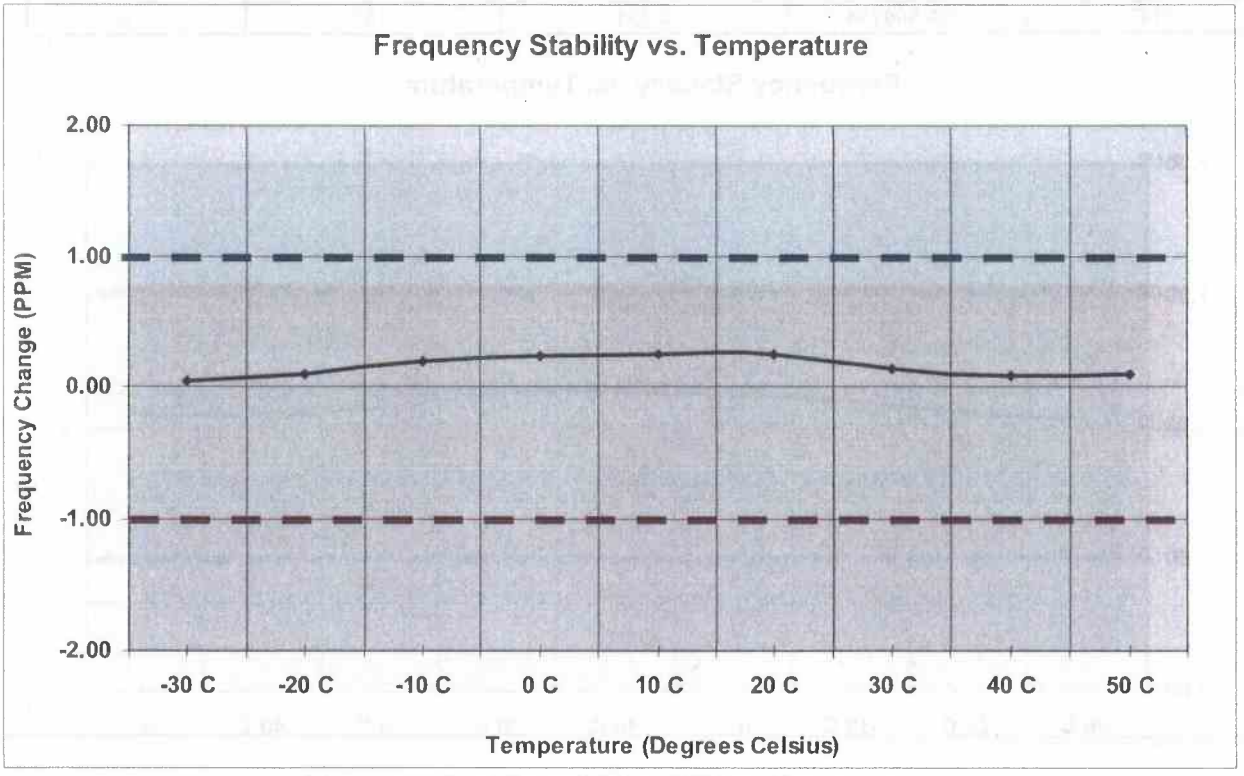


Figure 7.5.2-3: Frequency Stability – 959.925 MHz

8.0 CONCLUSION

In the opinion of ACS, Inc. the model IDTB004, manufactured by Sensus Metering Systems, Inc., meets all the requirements of FCC Part 24D and Part 101 as well as Industry Canada RSS-119 and RSS-134 were applicable.

End Report

Excellence in Compliance Testing

Certification Exhibit

FCC ID: SDBIDTB004
IC: 2220A-IDTB004

FCC Rule Part: CFR 47 Part 24 Subpart D, Part 101 Subpart C
IC Radio Standards Specification: RSS 119, RSS 134

ACS Project: 12-2108

Manufacturer: Sensus Metering Systems, Inc.
Model: IDTB004

Test Setup Photos

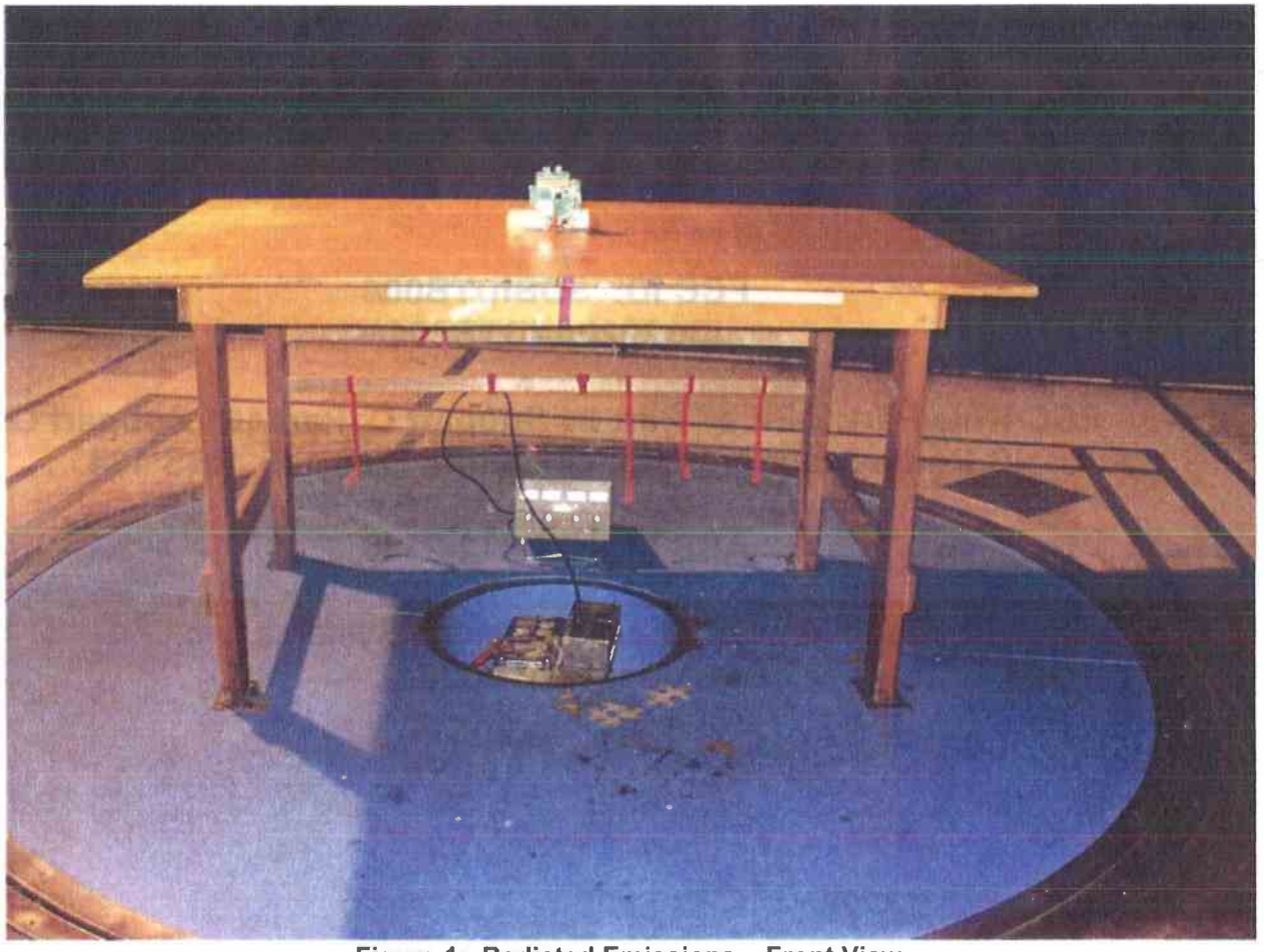


Figure 1: Radiated Emissions – Front View

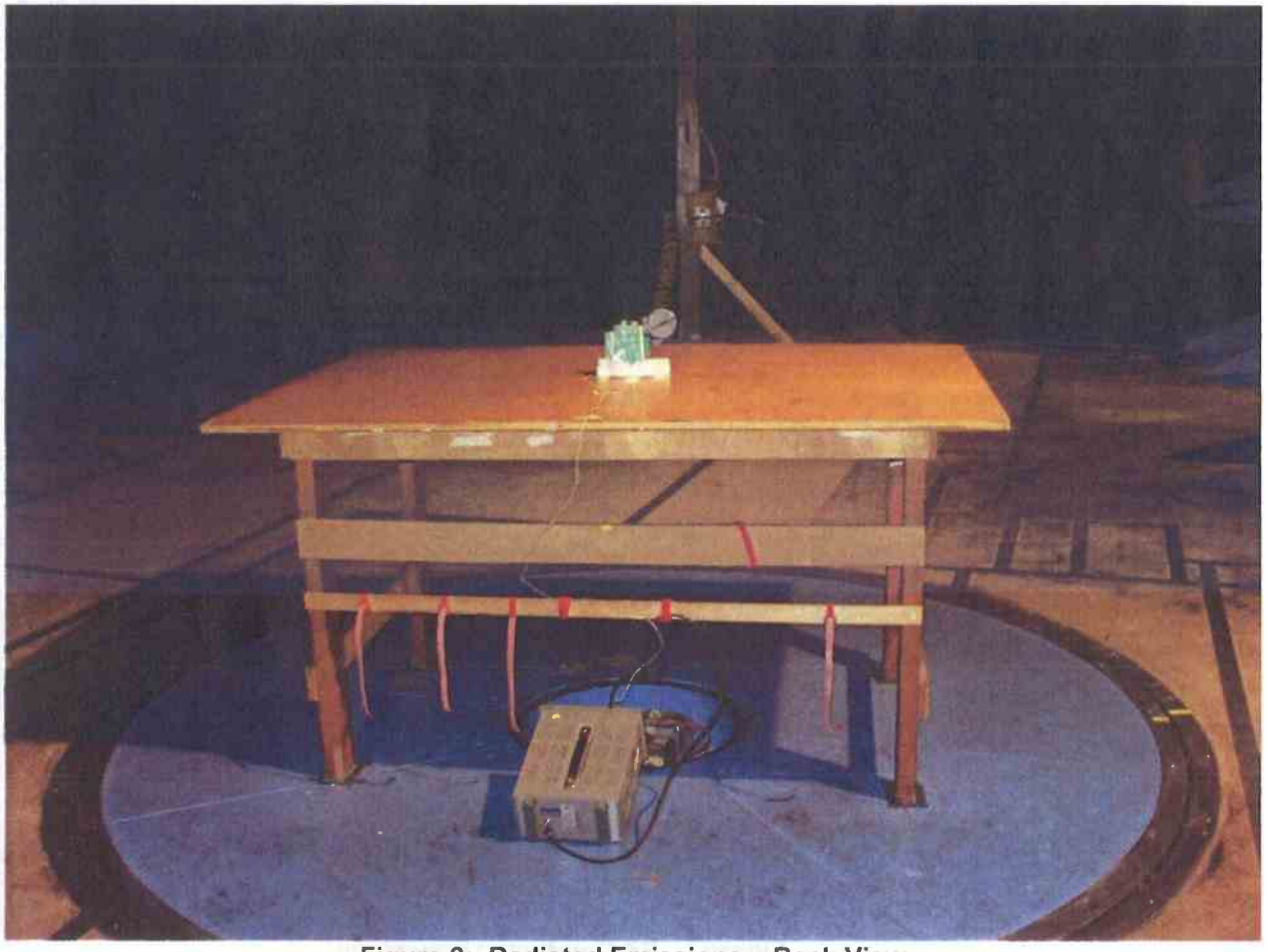


Figure 2: Radiated Emissions – Back View

Figure 3: RF Conducted Emissions