ACS
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Certification Test Report

FCC ID: SDBSLC20
IC: 2220A-SLC20

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

ACS Report Number: 12-2117.W06.1A

Applicant: Sensus Metering Systems, Inc.
Model: SLC20

Test Begin Date: November 3, 2012
Test End Date: November 13, 2012

Report Issue Date: December 3, 2012

For The Scope of Accreditation Under Certificate Number AT-1533

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.

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This report contains 52 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

Sensus Lighting Control model SLC20 powered by the FlexNet™ communications network, allows efficient management of the lighting of large public areas with full control down to an individual lamp. The system utilizes induction and LED lamps that provide brighter, whiter light and excellent color rendering compared to the dim yellow orange glow offered by older lighting technologies. The SLC20 allows smarter use of resources – ranging from shorter operational hours to virtually imperceptible light reduction during non-critical hours for additional cost savings. The Sensus Lighting Control control board includes an integrated metrology chipset to measure energy consumption for each lamp. The system is comprised of power supply, metrology and radio modules. The Power Supply and Metrology modules are combined to form one module where the radio is separate and usually resides in a different compartment within the luminare. The radio operates from a power source provided by the power supply module and is FlexNet based.

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

Test Sample Serial Numbers: 52000718

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 unit was powered using a 3.6 VDC power source. The unit provides different modes of operations corresponding to different modulations and where applicable data is provided for the configuration leading to the highest readings.

The radiated emissions evaluations were performed with a 50 ohm termination at RF port up to the 10^{th} harmonic. The unit set in the orientation of typical installation during the testing.

The RF conducted measurements were performed directly at the RF port through suitable attenuation.

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	1 near top and 1 near bottom	941.4875
101	952.0 – 953.0	Middle	952.5000
101	959.85 – 960.0	Middle	959.9250

1.4 Emission Designators

The SLC20 transmitter produces seven distinct modulation formats. The emissions designators for the modulation types used by the SLC20 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)
Boost Mode:	1K10F2D (7-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:

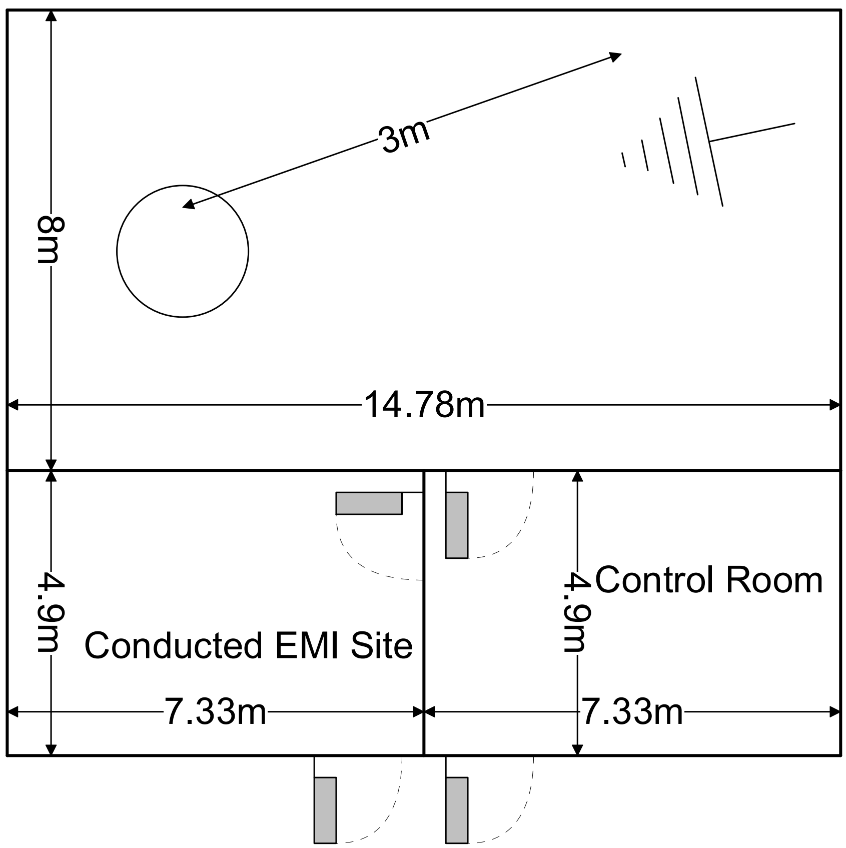


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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:

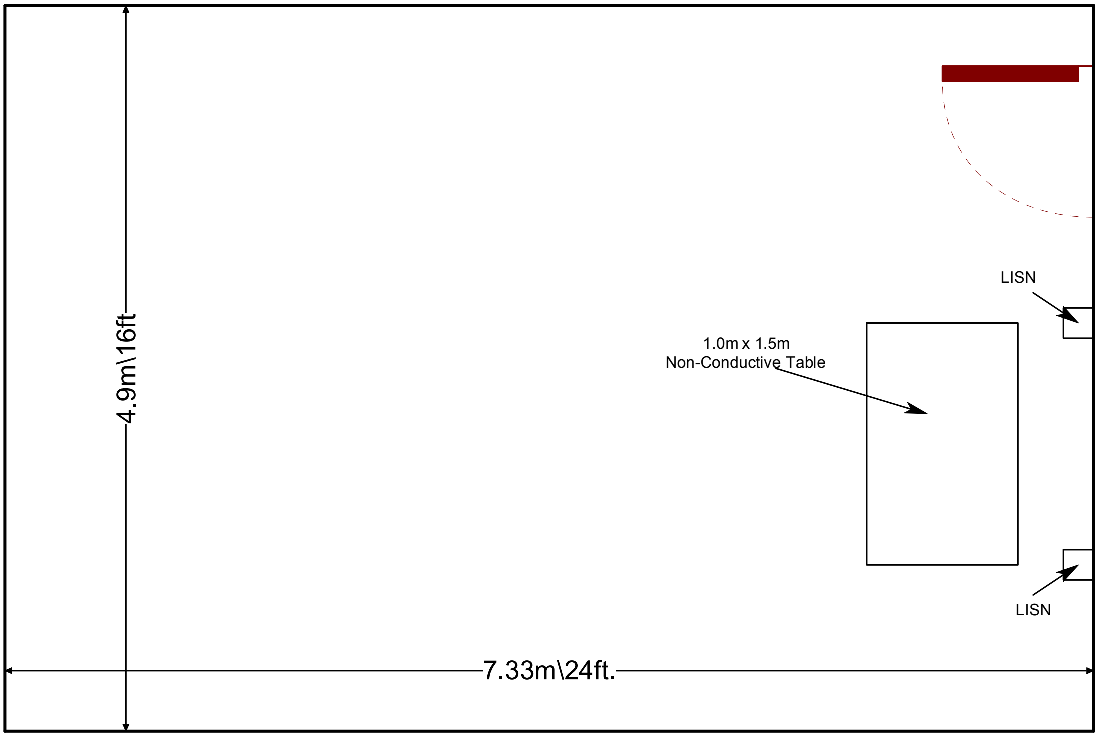


Figure 2.3.2-1: AC Mains Conducted EMI Site

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
43	Agilent	6286A	Power Supplies	2109A-06095	NCR	NCR
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
371	Fluke	Fluke 115	Meters	93872717	8/1/2012	8/1/2014
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

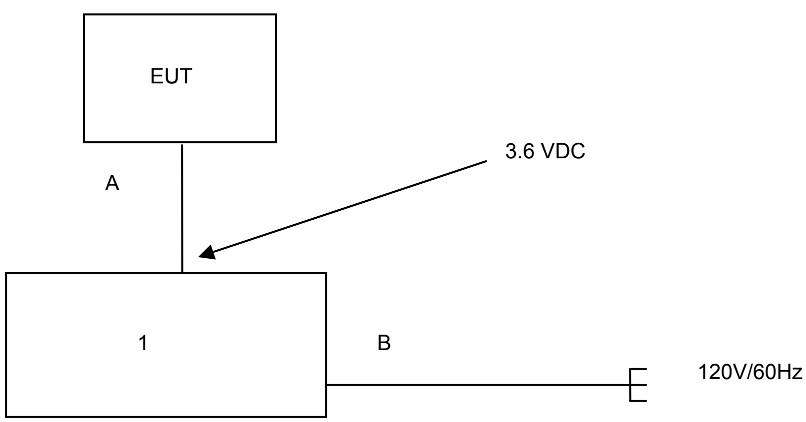
Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	DC Power Supply	MPJA	HY5003	003700278
	DC Power Supply	BK Precision	1692	S940035931
	DC Power Supply	Agilent	6286A	2109A-06095

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	2 Wire Power	1.83 m	No	EUT to Power Supply
B	Power	1.83 m	No	Power Supply to AC Mains

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



Notes:
The DC power supply is not part of the equipment under test.
The EUT was terminated by a 50Ohm load for the radiated emissions evaluation.

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	28.99
930.5000	24D	28.95
940.0125	24D	28.79
928.9250	101	28.93
932.2500	101	28.93
941.4875	101	28.95
952.5000	101	29.21
959.9250	101	28.34

Part 24.132 / RSS-134 5.4(a)

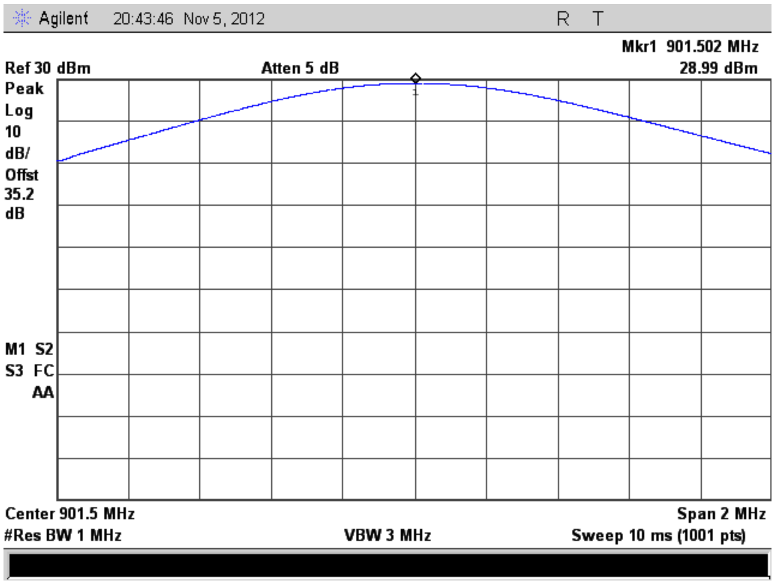


Figure 7.1.2-1: Peak Output Power 901.5 MHz

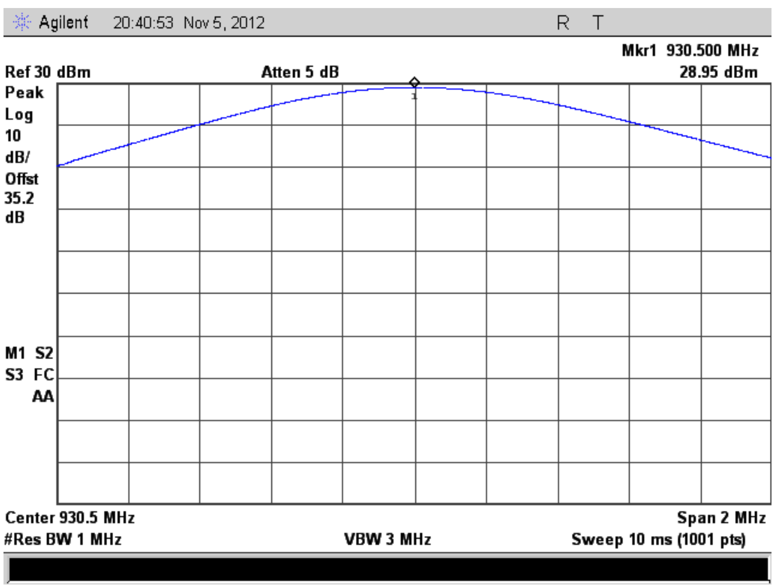


Figure 7.1.2-2: Peak Output Power 930.5 MHz

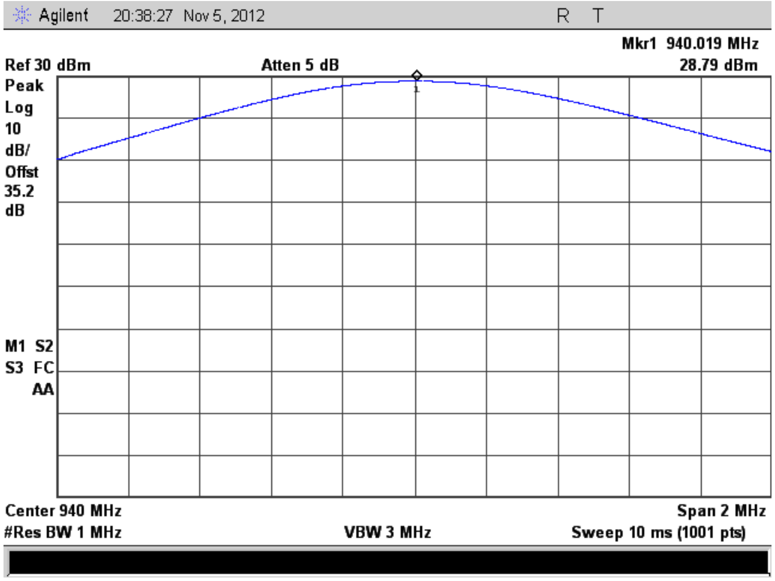


Figure 7.1.2-3: Peak Output Power 940.0125 MHz

Part 101.113(a) / RSS-119 5.41

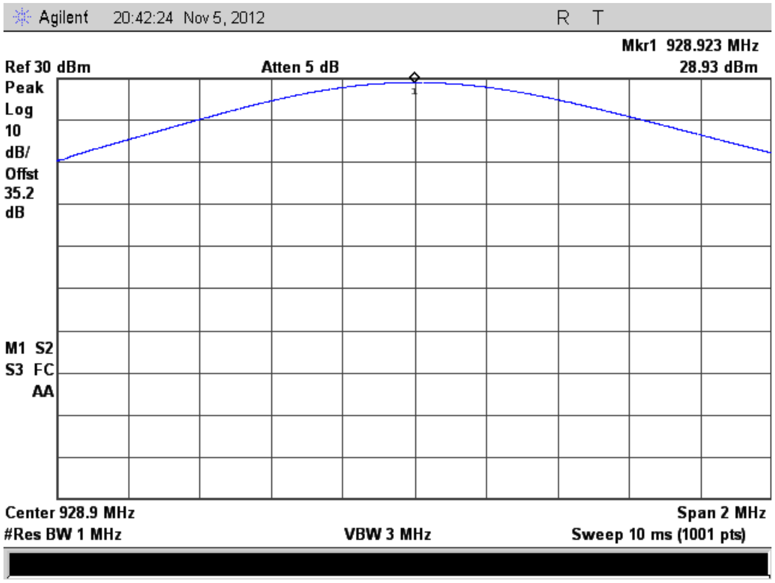


Figure 7.1.2-4: Peak Output Power 928.925 MHz

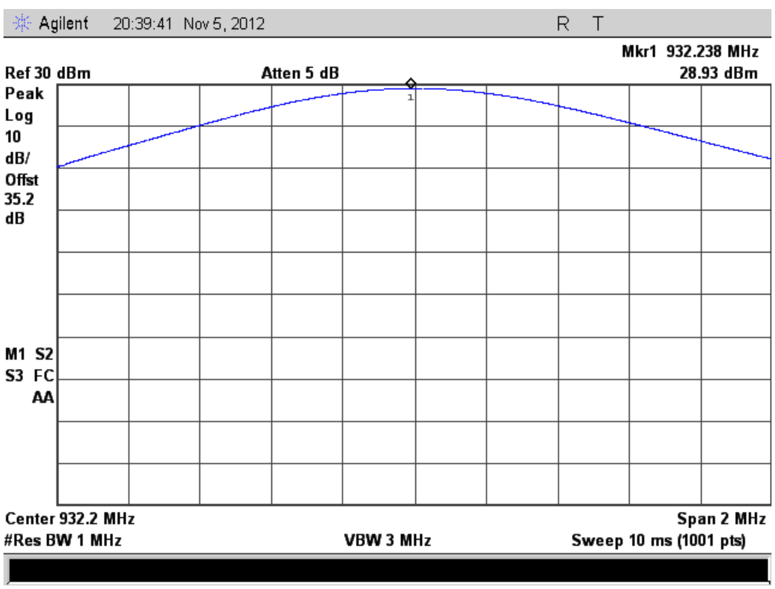


Figure 7.1.2-5: Peak Output Power 932.25 MHz

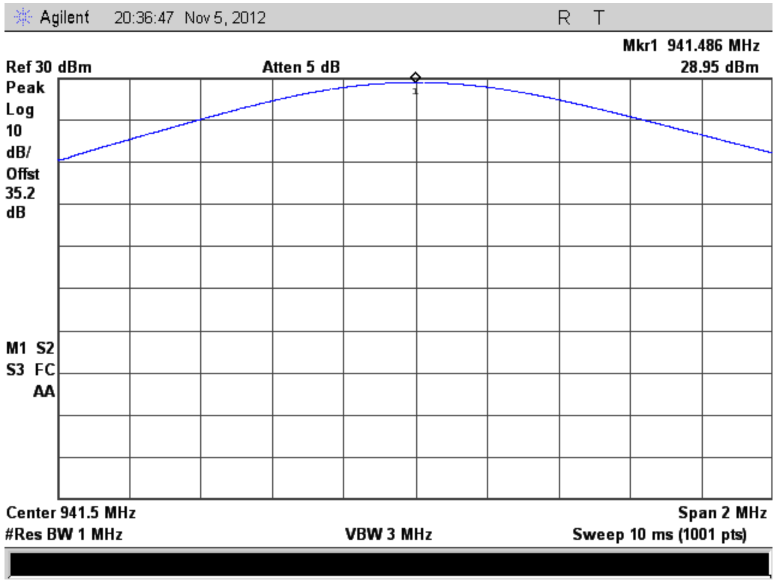


Figure 7.1.2-6: Peak Output Power 941.4875 MHz

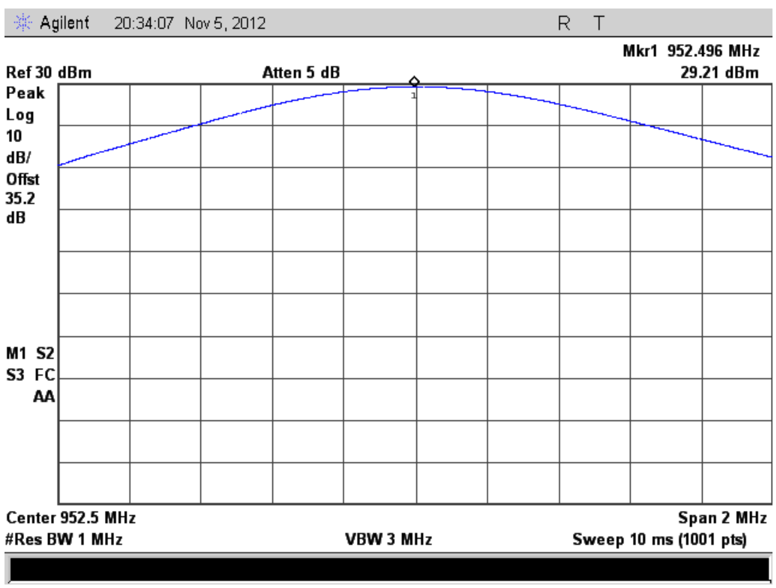


Figure 7.1.2-7: Peak Output Power 952.5 MHz

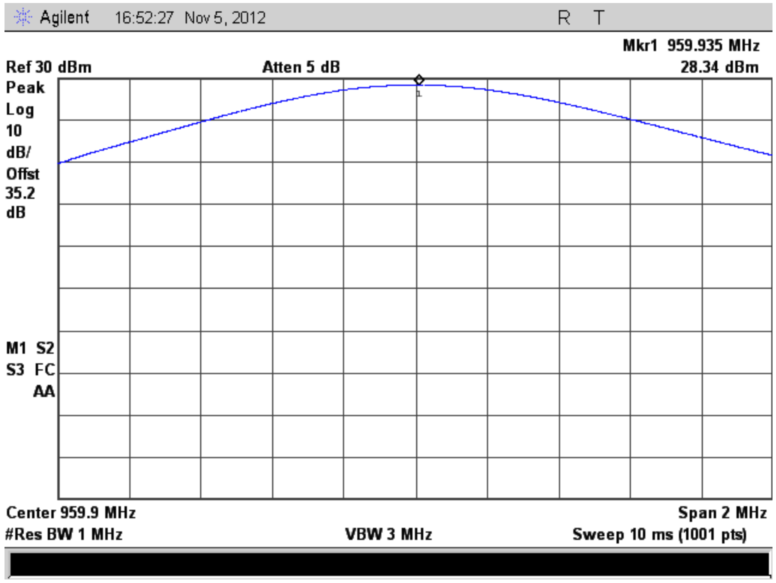


Figure 7.1.2-8: Peak Output Power 959.925 MHz

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)

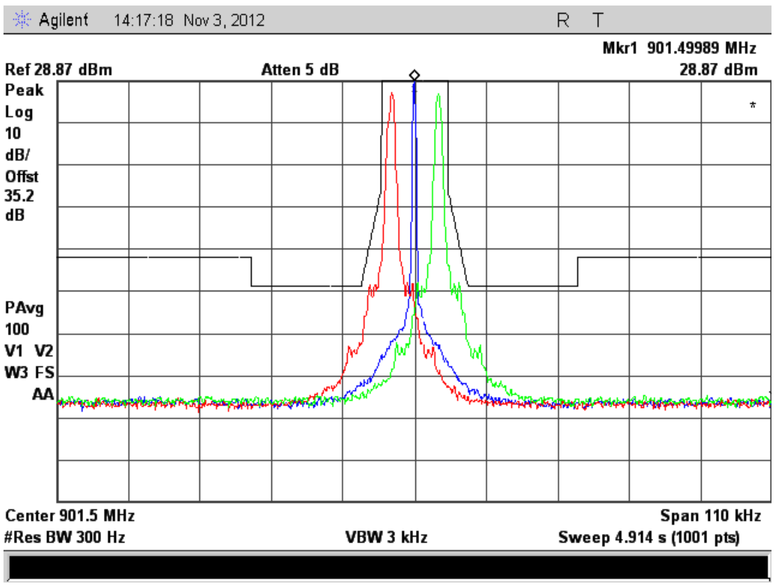


Figure 7.2.2-1: 901.5 MHz – 12.5 kHz Channel Spacing – Boost Mode Offset Channel of +/- 6 (+/- 3600 Hz)

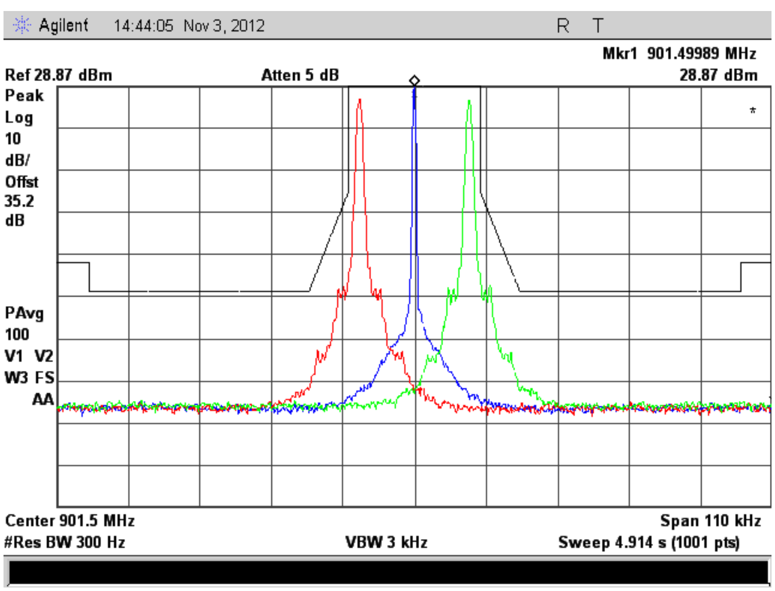


Figure 7.2.2-2: 901.5 MHz – 25 kHz Channel Spacing – Boost Mode Offset Channel of +/- 14 (+/- 8400 Hz)

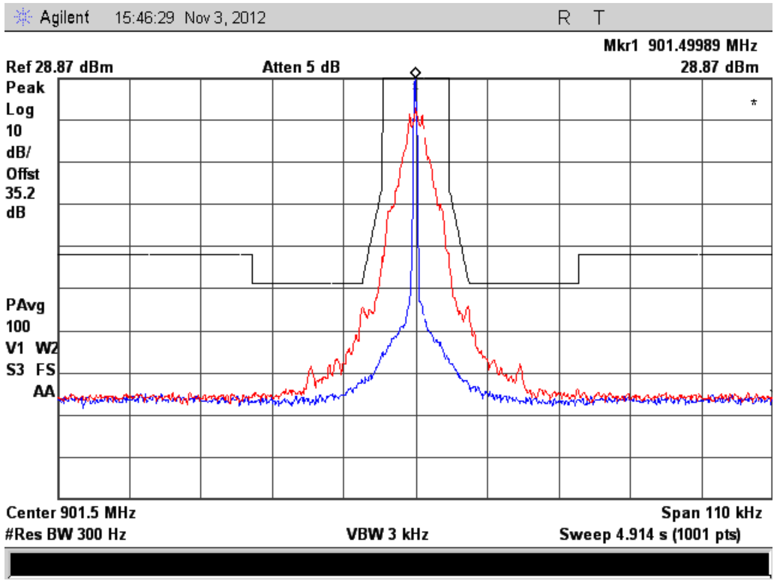


Figure 7.2.2-3: 901.5 MHz – 12.5 kHz Channel Spacing – C&I Mode

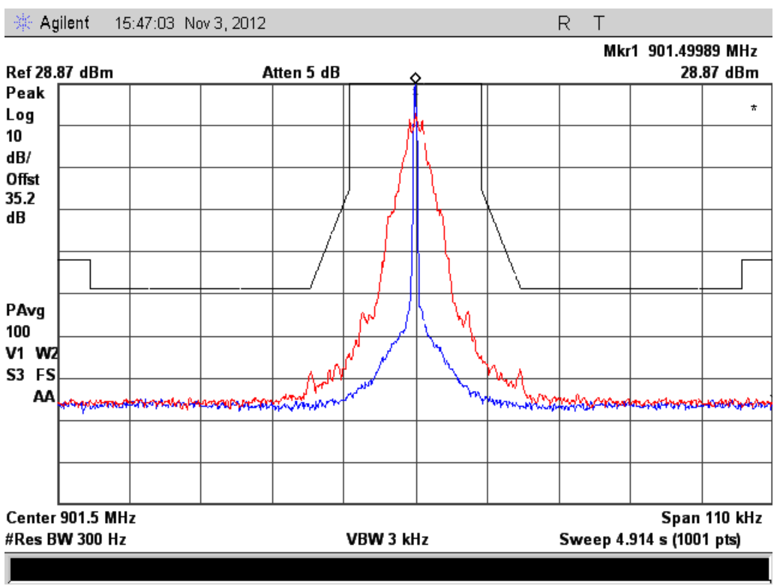


Figure 7.2.2-4: 901.5 MHz – 25 kHz Channel Spacing – C&I Mode

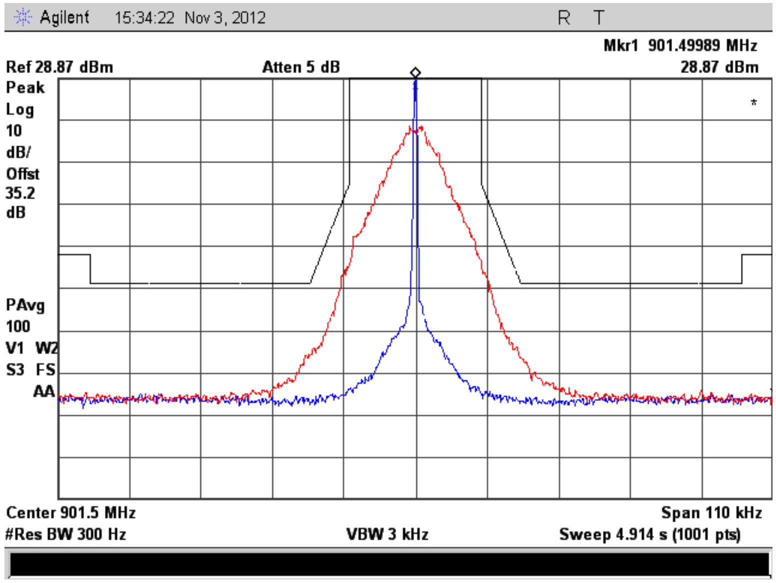


Figure 7.2.2-5: 901.5 MHz – 25 kHz Channel Spacing – Double Density Mode

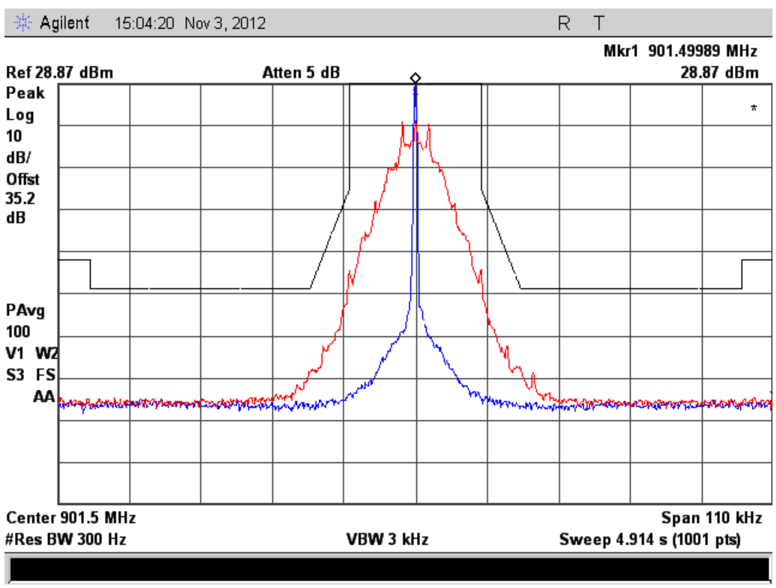


Figure 7.2.2-6: 901.5 MHz – 25 kHz Channel Spacing – Normal Mode

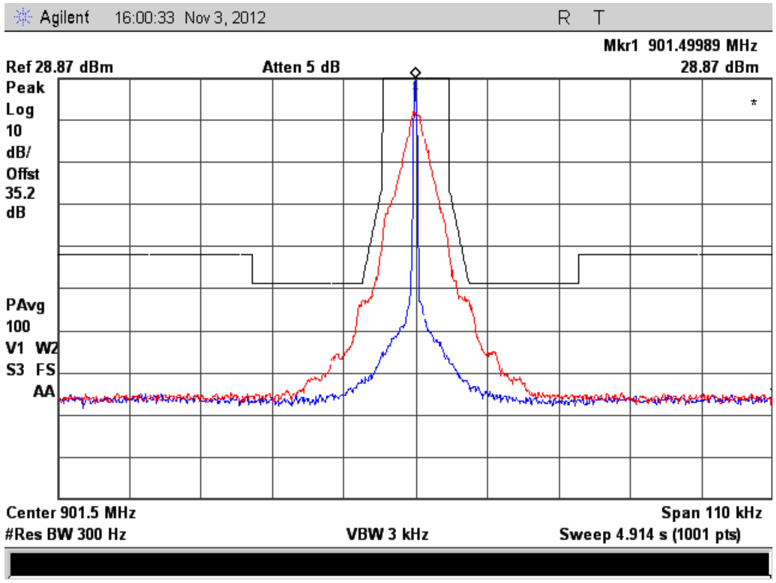


Figure 7.2.2-7: 901.5 MHz – 12.5 kHz Channel Spacing – Priority Mode

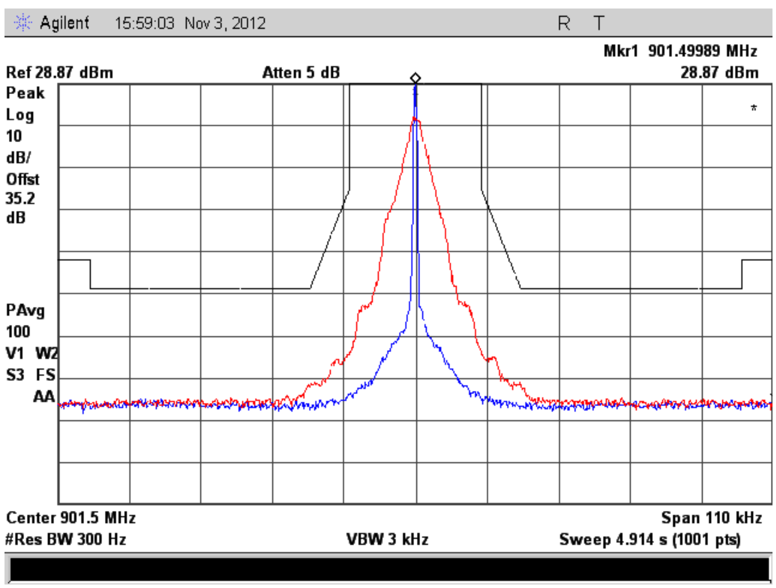


Figure 7.2.2-8: 901.5 MHz – 25 kHz Channel Spacing – Priority Mode

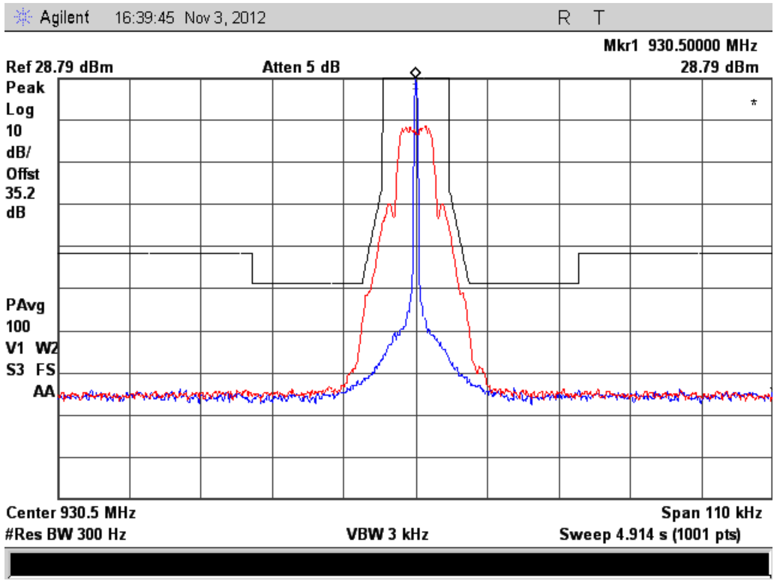


Figure 7.2.2-9: 930.5 MHz – 12.5 kHz Channel Spacing – mPass 5k Mode

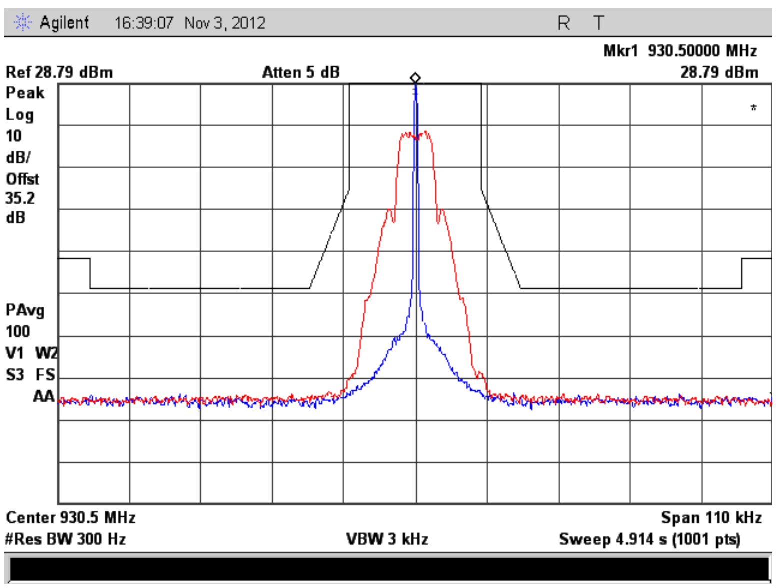


Figure 7.2.2-10: 930.5 MHz – 25 kHz Channel Spacing – mPass 5k Mode

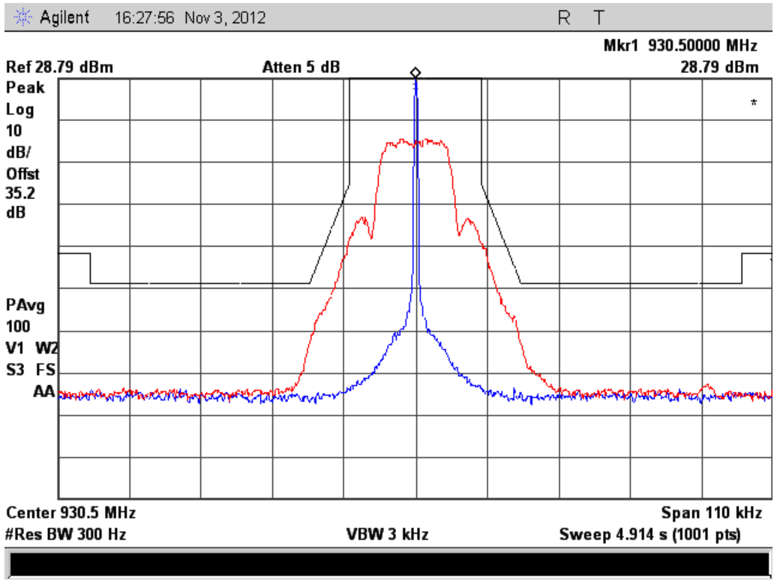


Figure 7.2.2-11: 930.5 MHz – 25 kHz Channel Spacing – mPass 10k Mode

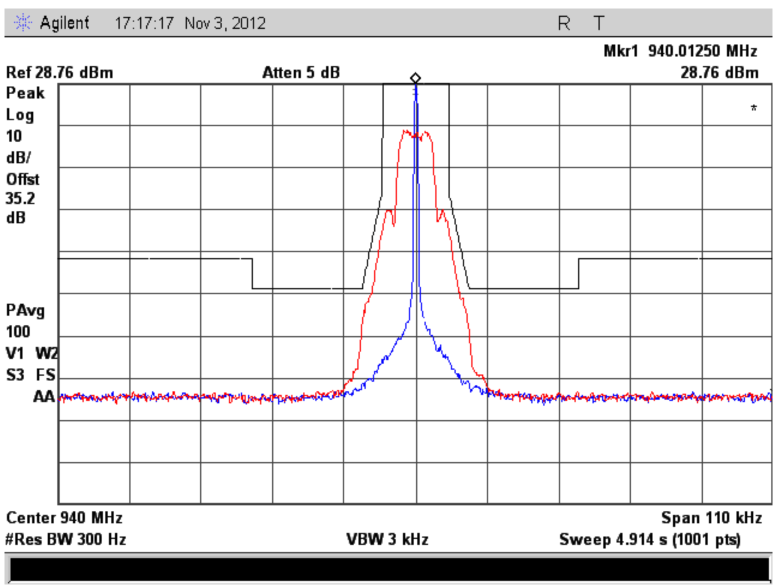


Figure 7.2.2-12: 940.0125 MHz – 12.5 kHz Channel Spacing – mPass 5k Mode

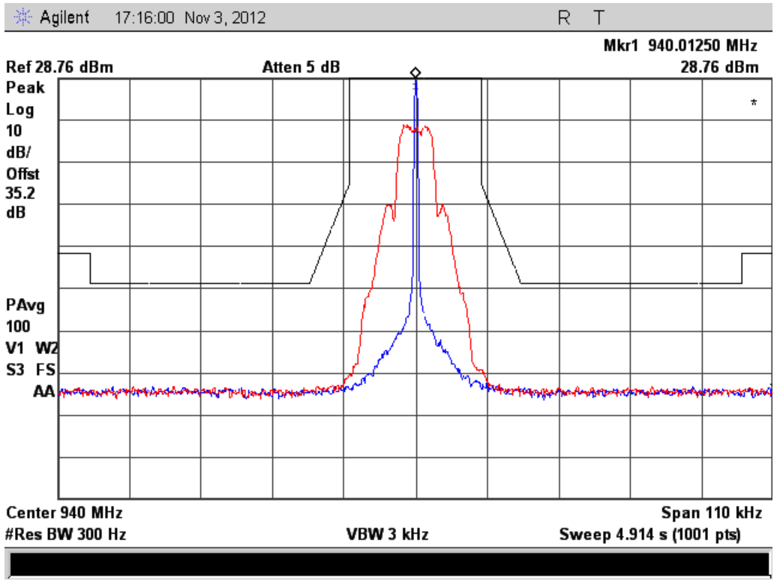


Figure 7.2.2-13: 940.0125 MHz – 25 kHz Channel Spacing – mPass 5k Mode

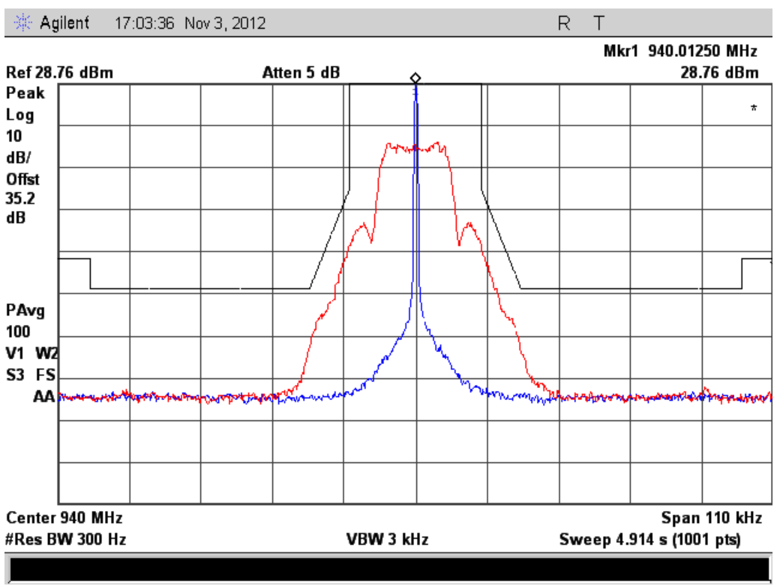


Figure 7.2.2-14: 940.0125 MHz – 25 kHz Channel Spacing – mPass 10k Mode

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

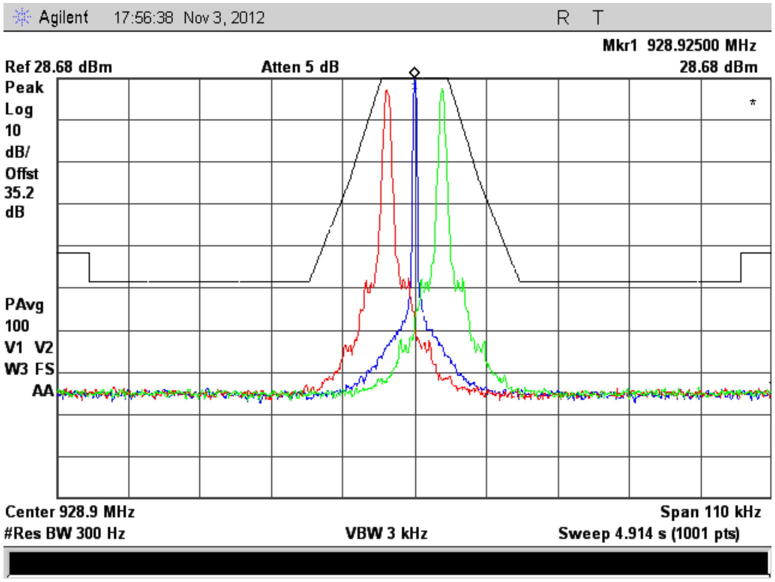


Figure 7.2.2-15: 928.925 MHz – Boost Mode
Offset Channel of +/- 7 (+/- 4200 Hz)

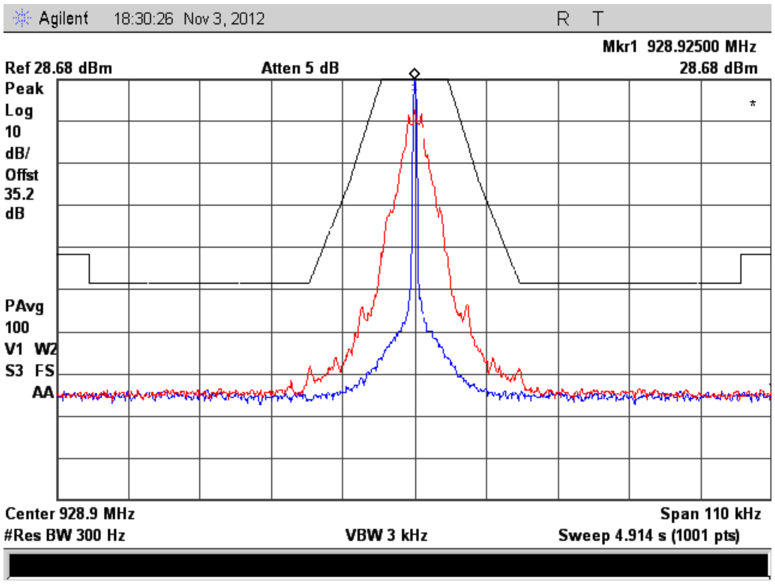


Figure 7.2.2-16: 928.925 MHz – C&I Mode

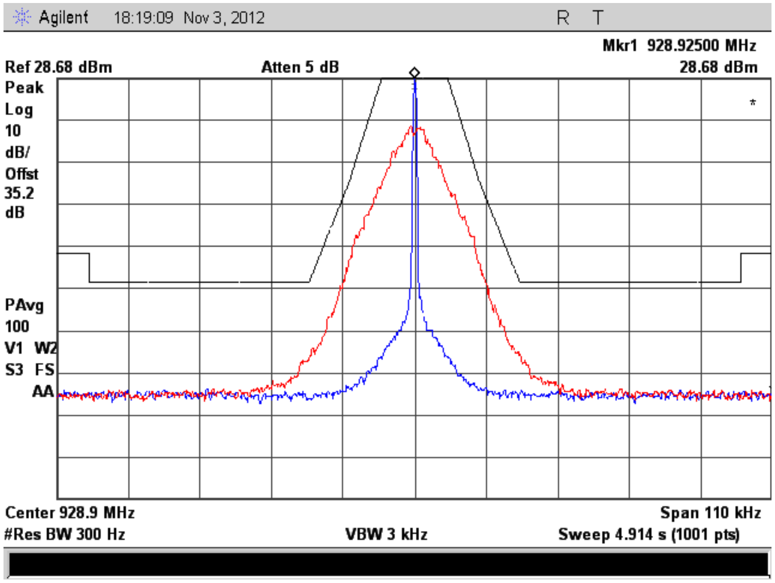


Figure 7.2.2-17: 928.925 MHz – Double Density Mode

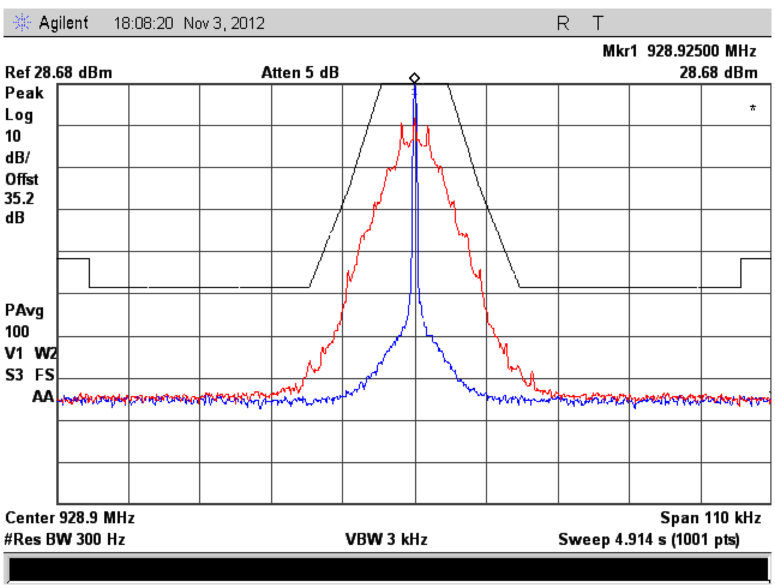


Figure 7.2.2-18: 928.925 MHz – Normal Mode

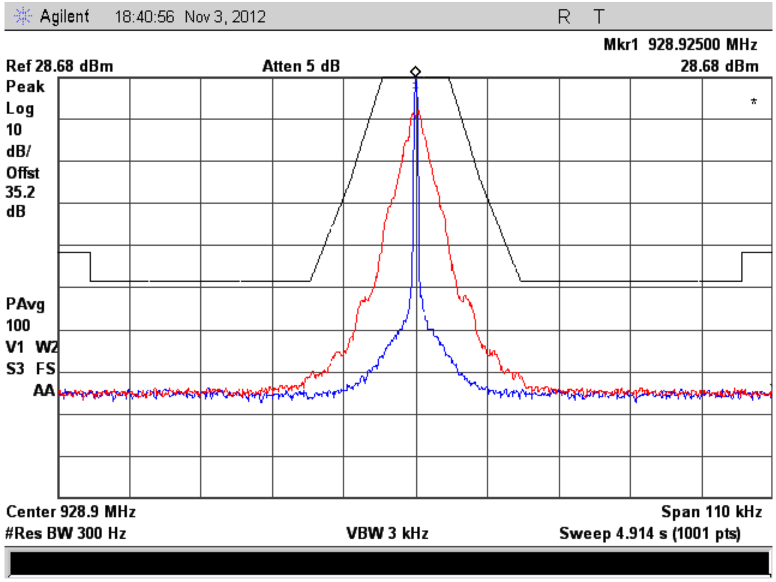


Figure 7.2.2-19: 928.925 MHz –– Priority Mode

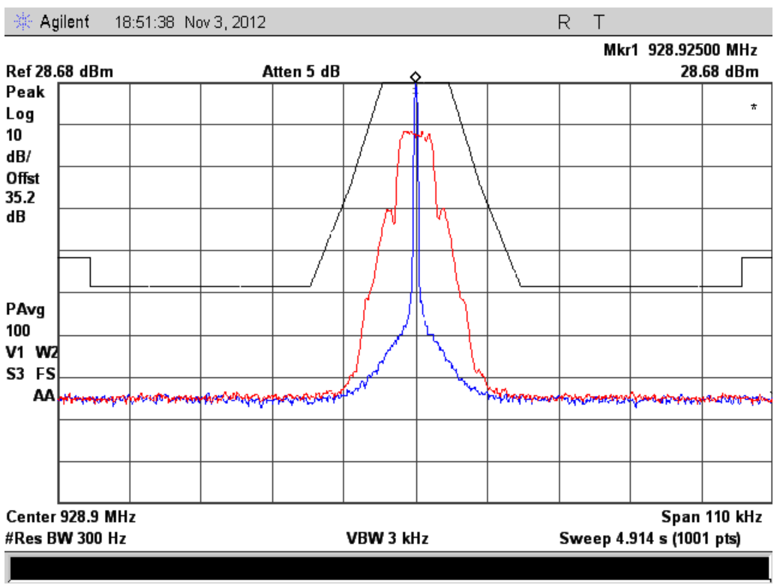


Figure 7.2.2-20: 928.925 MHz – MPass 5k Mode

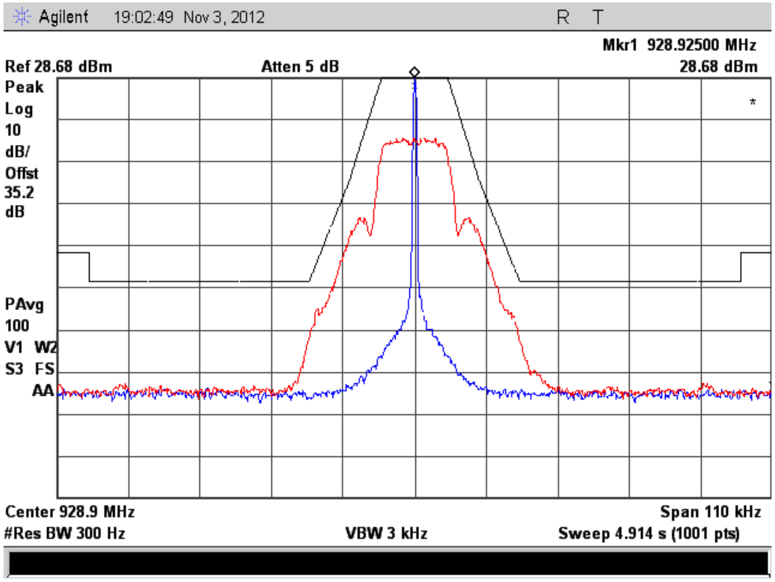


Figure 7.2.2-21: 928.925 MHz – MPass 10k Mode

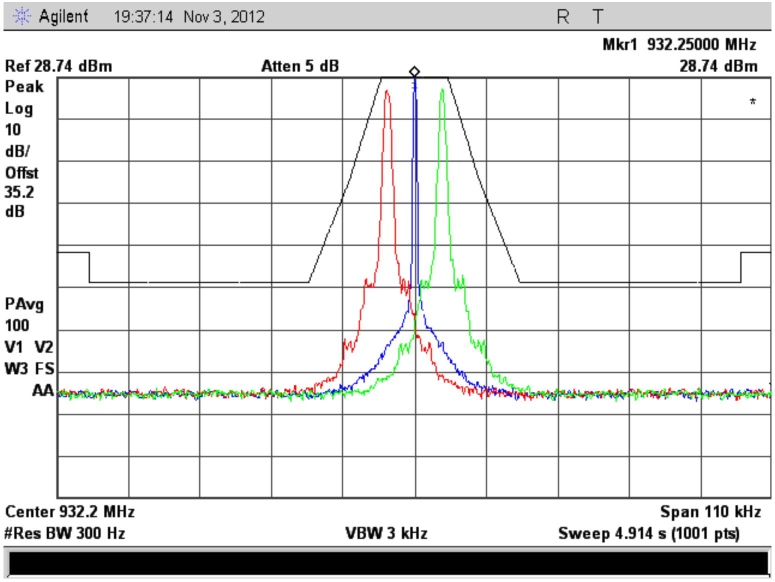


Figure 7.2.2-22: 932.25 MHz – Boost Mode
Offset Channel of +/- 7 (+/- 4200 Hz)

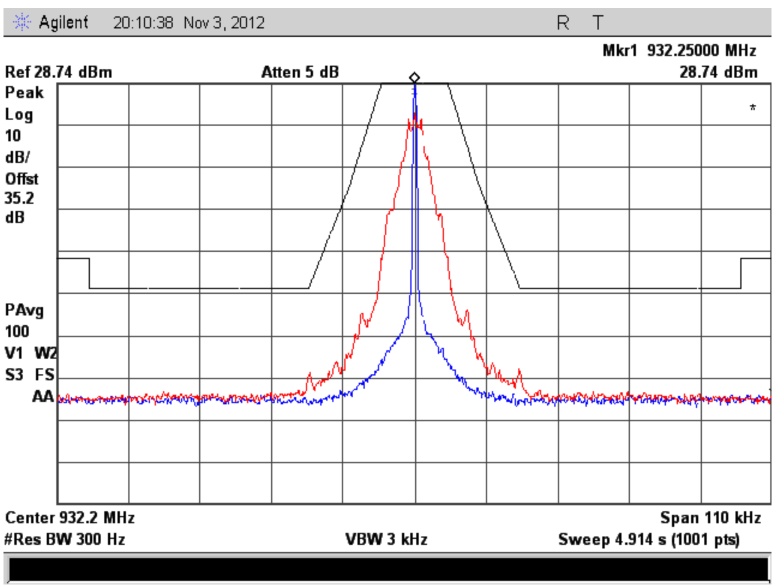


Figure 7.2.2-23: 932.25 MHz – C&I Mode

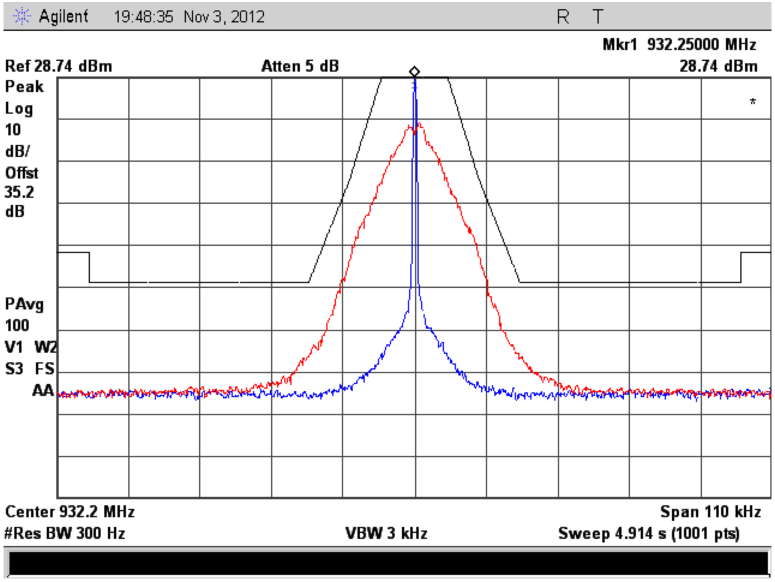


Figure 7.2.2-24: 932.25 MHz – Double Density Mode

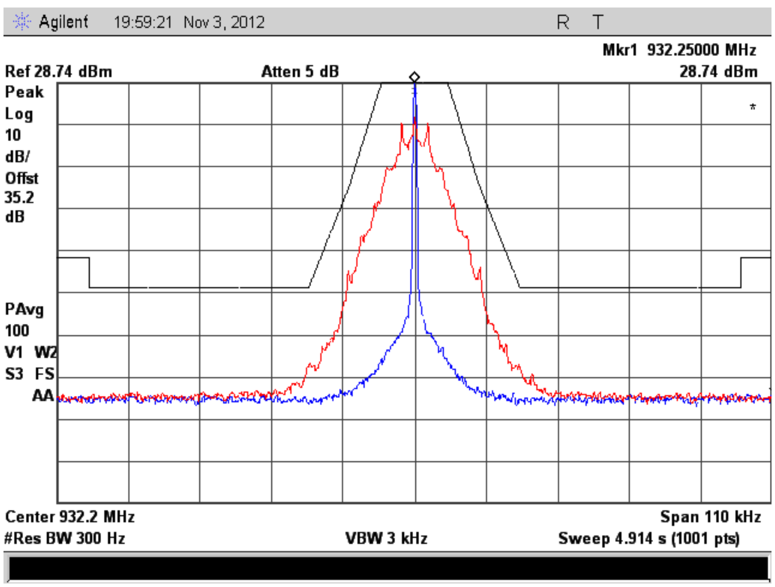


Figure 7.2.2-25: 932.25 MHz – Normal Mode

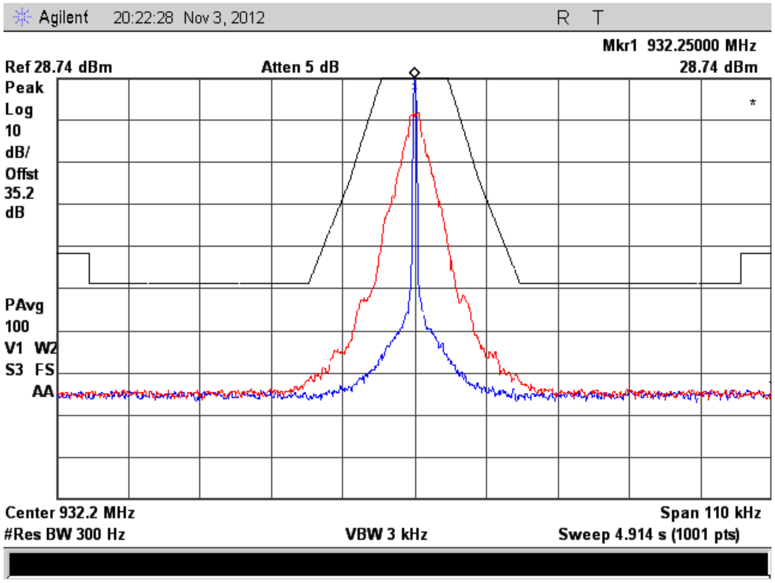


Figure 7.2.2-26: 932.25 MHz –– Priority Mode

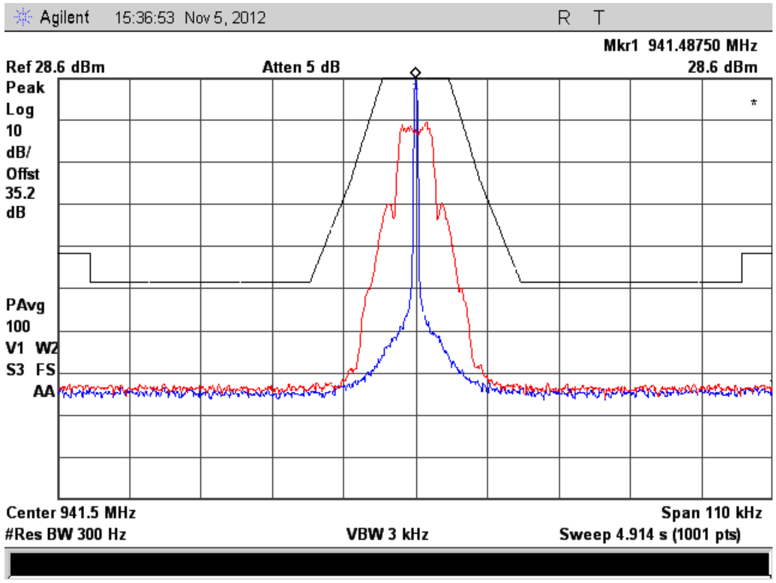


Figure 7.2.2-27: 941.4875 MHz – mPass 5k Mode

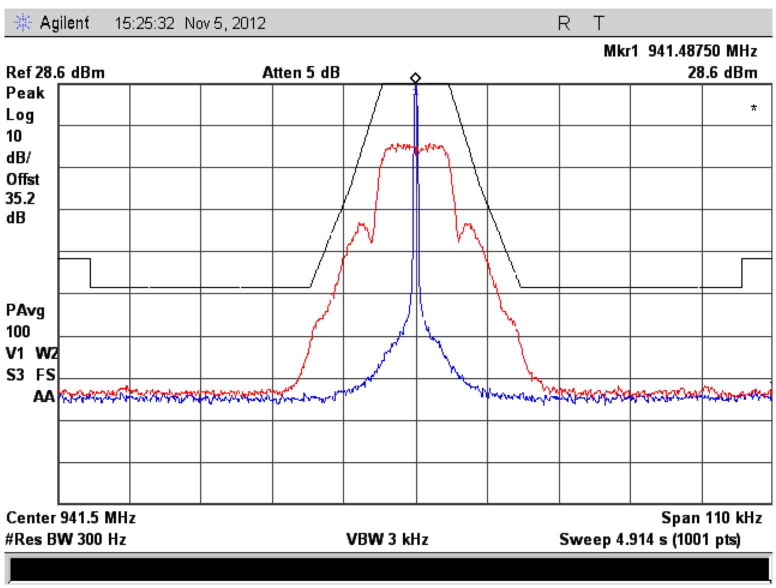


Figure 7.2.2-28: 941.4875 MHz – mPass 10k Mode

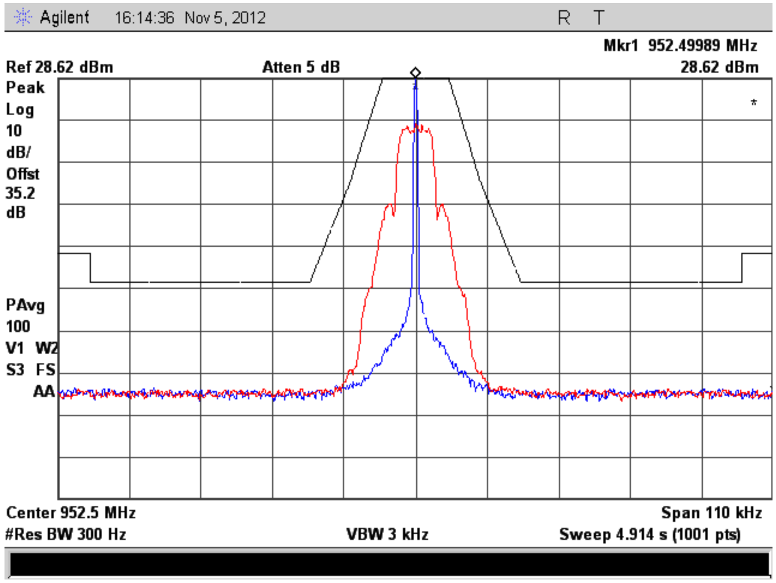


Figure 7.2.2-29: 952.5 MHz – mPass 5k Mode

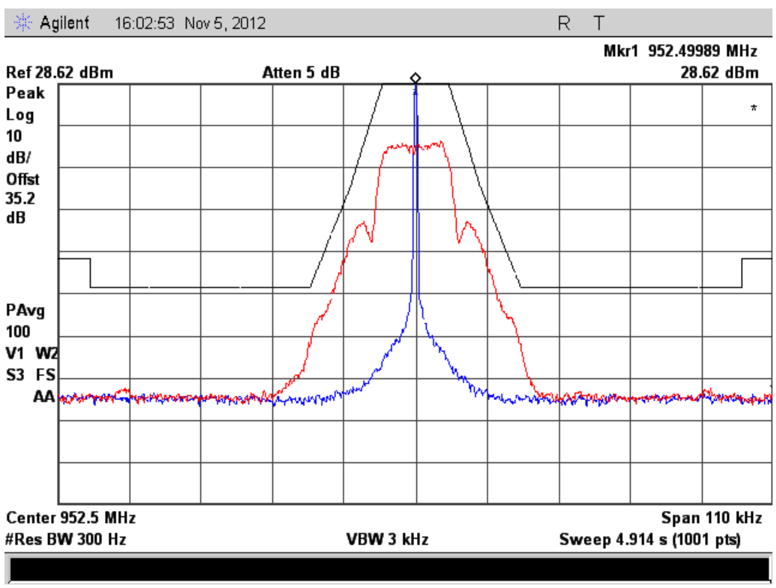


Figure 7.2.2-30: 952.5 MHz – mPass 10k Mode

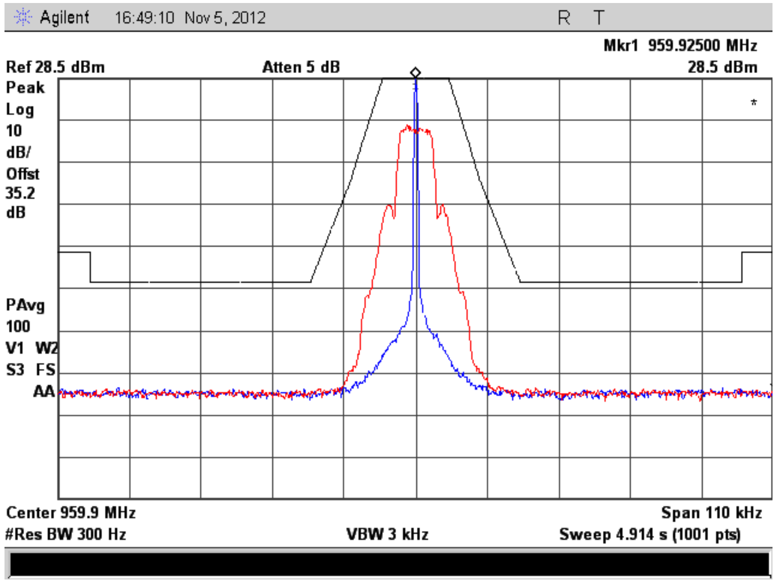


Figure 7.2.2-31: 959.925 MHz – mPass 5k Mode

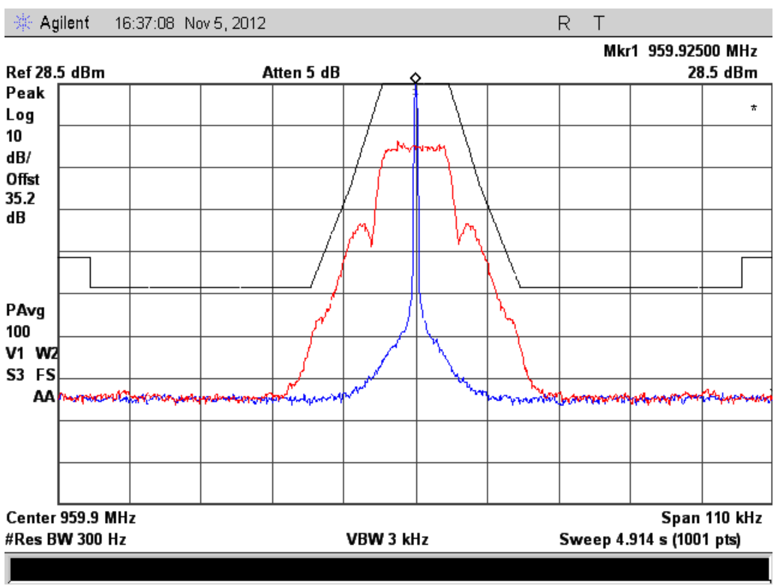


Figure 7.2.2-32: 959.925 MHz – mPass 10k Mode

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)

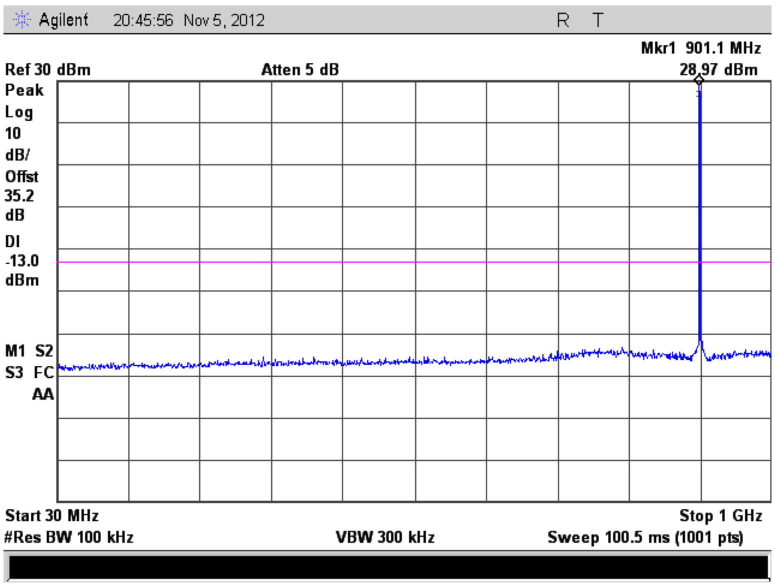


Figure 7.3.2-1: 901.5 MHz – 30MHz to 1GHz

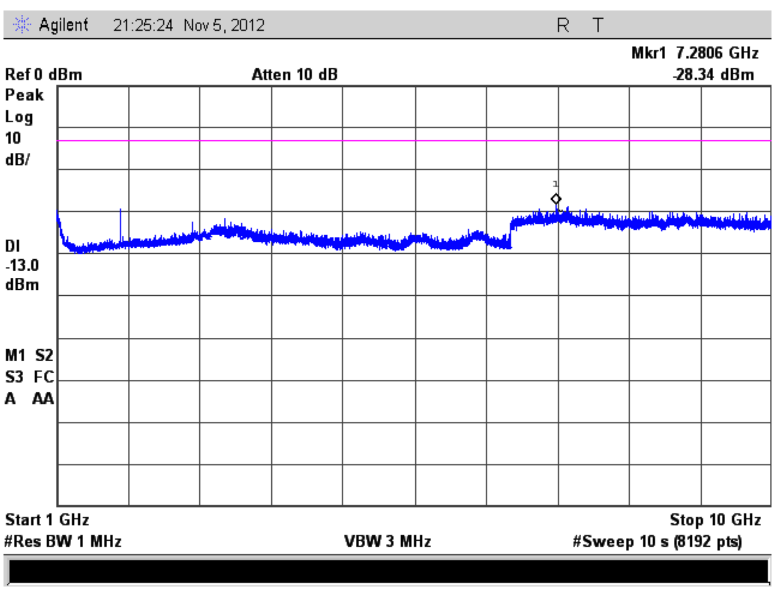


Figure 7.3.2-2: 901.5 MHz – 1GHz to 10GHz

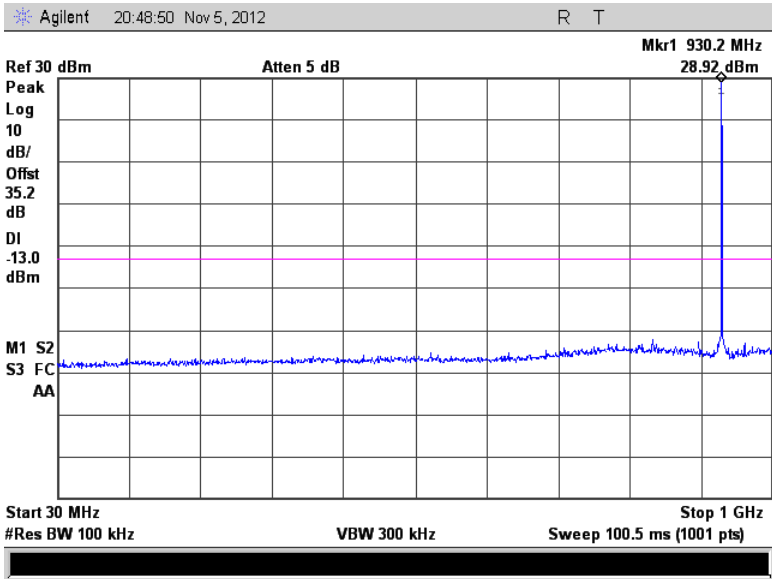


Figure 7.3.2-3: 930.5 MHz – 30MHz to 1GHz

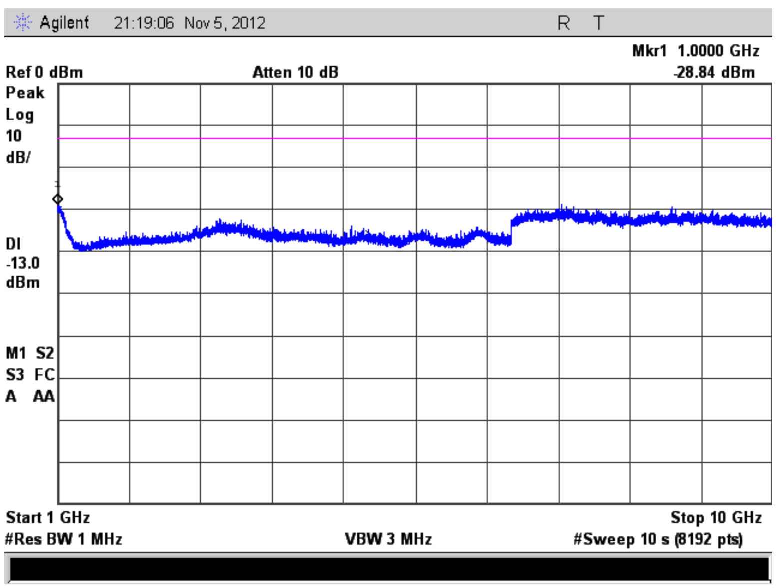


Figure 7.3.2-4: 930.5 MHz – 1GHz to 10GHz

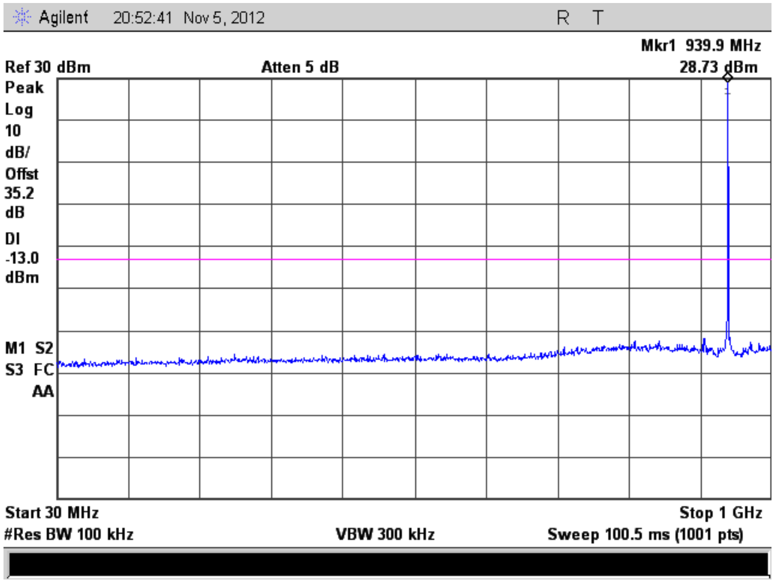


Figure 7.3.2-5: 940.0125 MHz – 30MHz to 1GHz

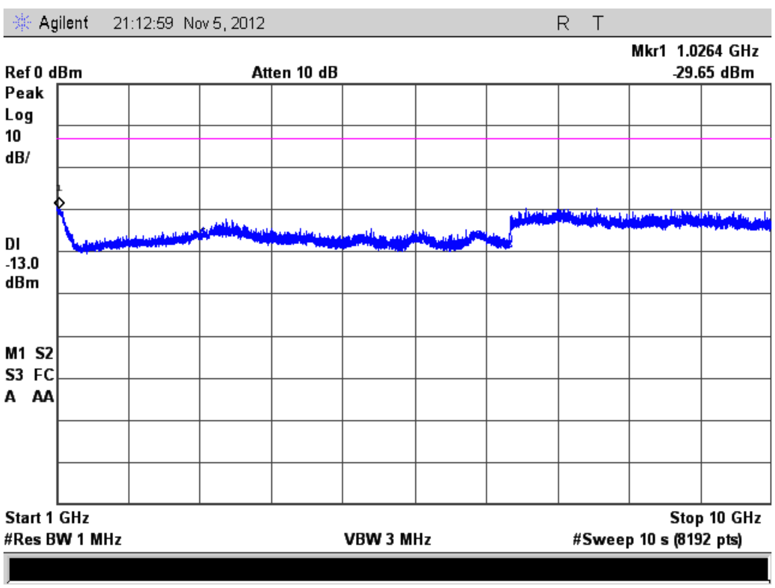


Figure 7.3.2-6: 940.0125 MHz – 1GHz to 10GHz

Part 101.111 a(6), RSS-119 5.8.6

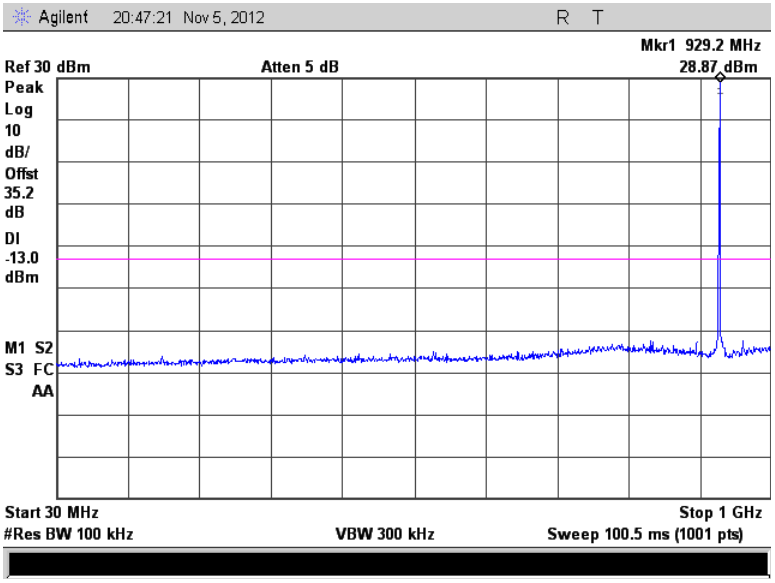


Figure 7.3.2-7: 928.925 MHz – 30MHz to 1GHz

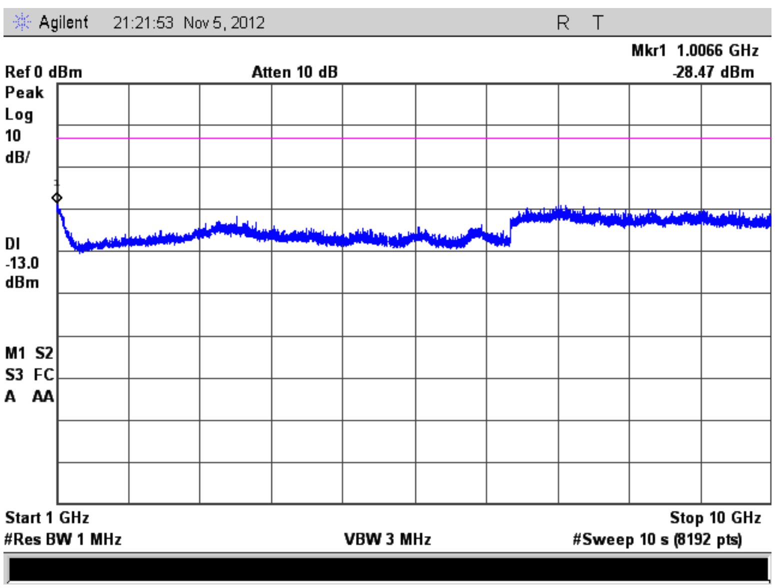


Figure 7.3.2-8: 928.925 MHz – 1GHz to 10GHz

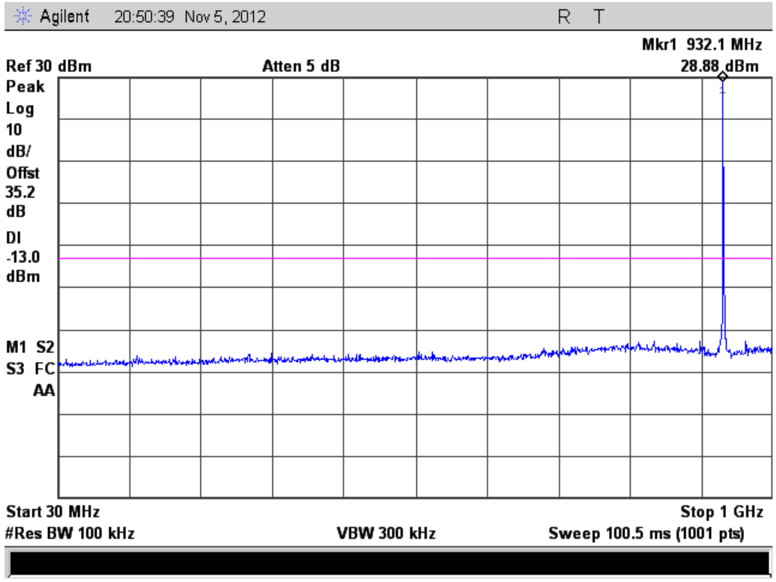


Figure 7.3.2-9: 932.25 MHz – 30MHz to 1GHz

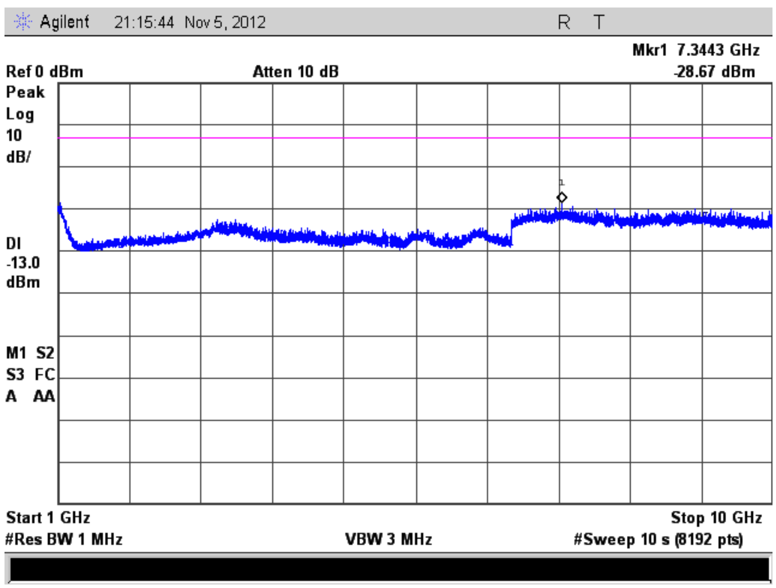


Figure 7.3.2-10: 932.25 MHz – 1GHz to 10GHz

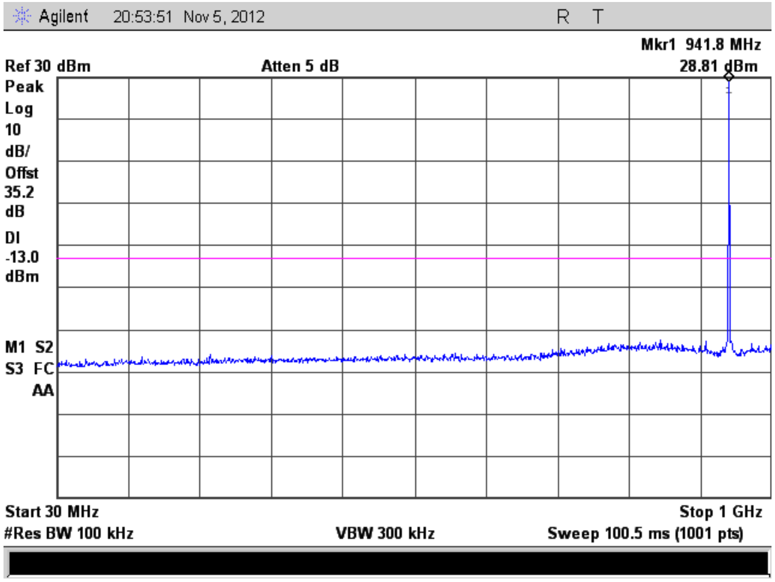


Figure 7.3.2-11: 941.4875 MHz – 30MHz to 1GHz

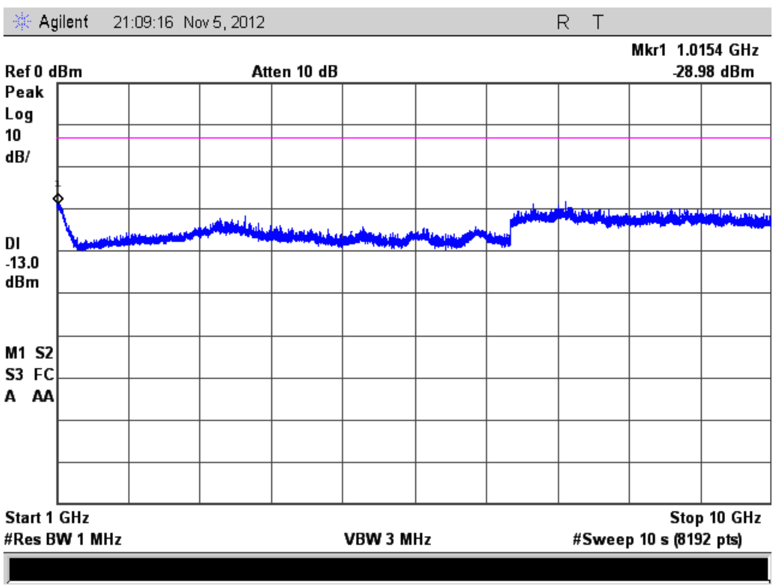


Figure 7.3.2-12: 941.4875 MHz – 1GHz to 10GHz

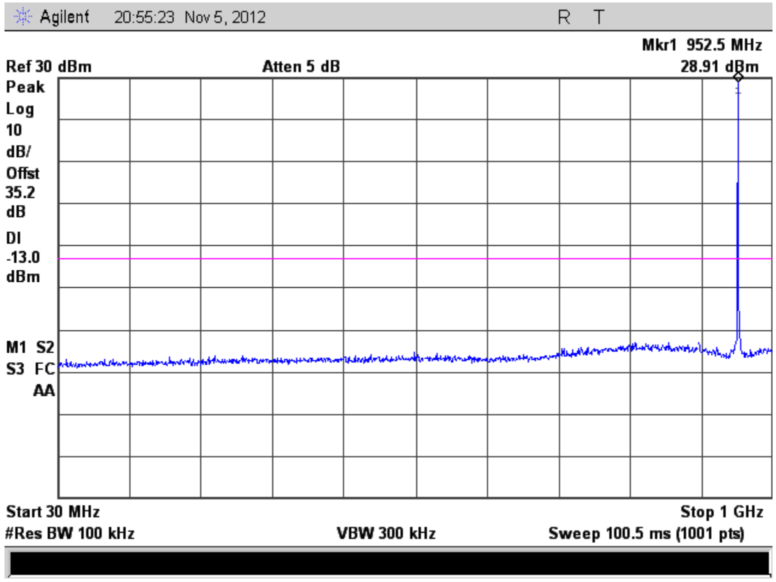


Figure 7.3.2-13: 952.5 MHz – 30MHz to 1GHz

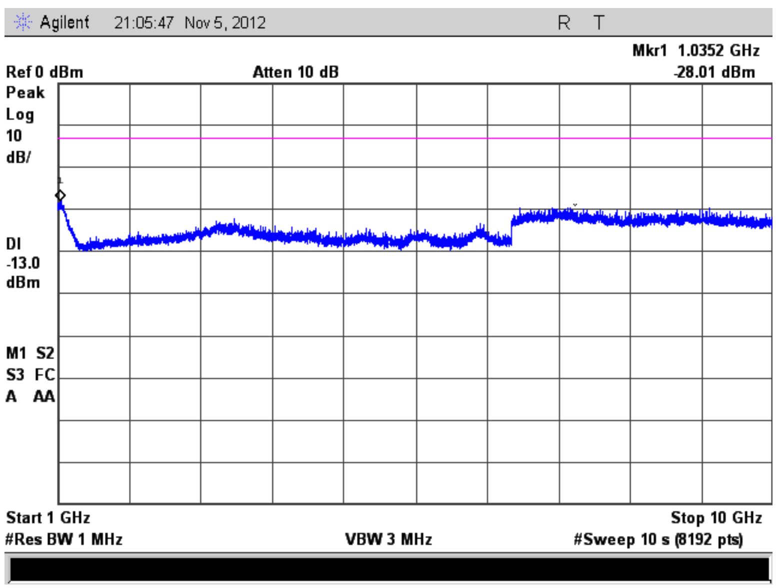


Figure 7.3.2-14: 952.5 MHz – 1GHz to 10GHz

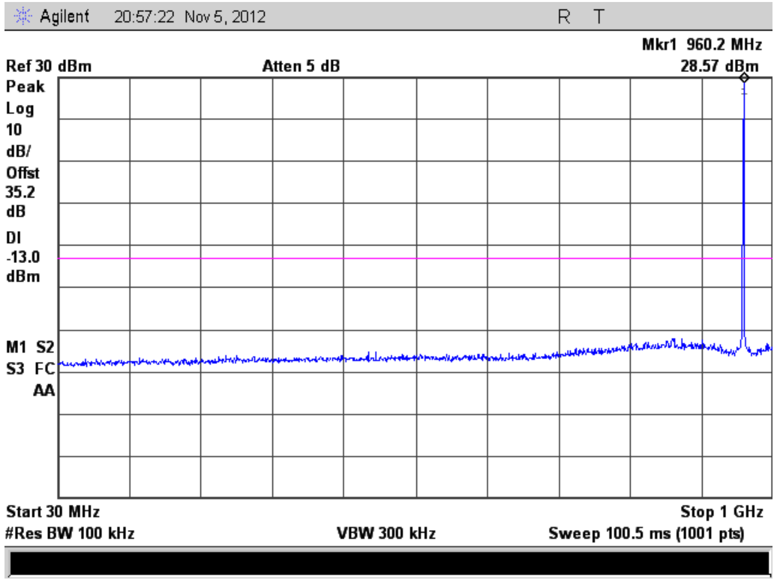


Figure 7.3.2-15: 959.925 MHz – 30MHz to 1GHz

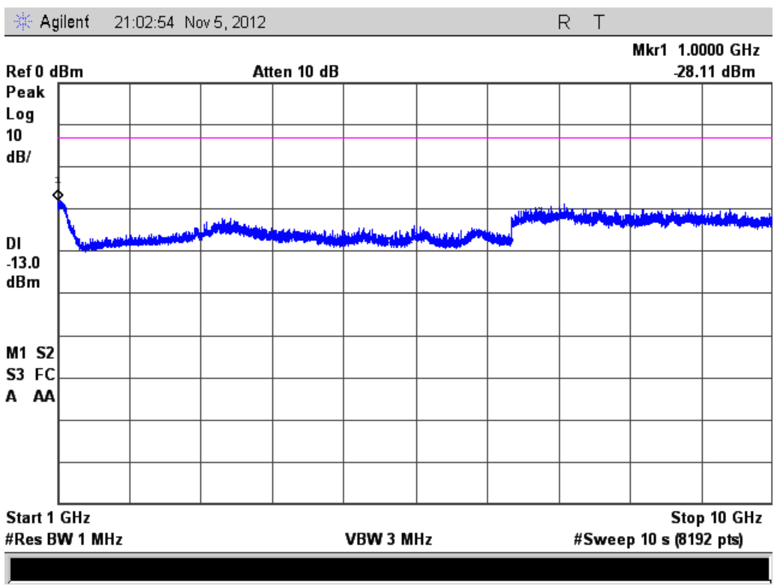


Figure 7.3.2-16: 959.925 MHz – 1GHz to 10GHz

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 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.

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	-55.20	H	-60.92	-13.00	47.92
2704.5	-47.25	H	-43.92	-13.00	30.92
3606	-52.65	H	-45.22	-13.00	32.22
4507.5	-55.65	H	-45.54	-13.00	32.54
5409	-56.15	H	-42.85	-13.00	29.85
6310.5	-57.00	H	-43.51	-13.00	30.51
1803	-47.25	V	-46.62	-13.00	33.62
2704.5	-38.85	V	-32.72	-13.00	19.72
3606	-47.80	V	-36.82	-13.00	23.82
4507.5	-54.40	V	-44.29	-13.00	31.29
5409	-59.70	V	-49.95	-13.00	36.95
6310.5	-56.60	V	-44.01	-13.00	31.01
7212	-57.00	V	-41.73	-13.00	28.73

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	-54.00	H	-55.57	-13.00	42.57
2791.5	-51.55	H	-48.57	-13.00	35.57
3722	-49.05	H	-38.59	-13.00	25.59
4652.5	-55.40	H	-43.01	-13.00	30.01
5583	-55.15	H	-38.83	-13.00	25.83
1861	-48.10	V	-46.52	-13.00	33.52
2791.5	-44.55	V	-38.57	-13.00	25.57
3722	-42.45	V	-29.64	-13.00	16.64
4652.5	-55.95	V	-44.81	-13.00	31.81
5583	-59.20	V	-47.83	-13.00	34.83

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	-51.60	H	-51.32	-13.00	38.32
2820.0375	-49.85	H	-45.39	-13.00	32.39
3760.05	-48.80	H	-38.54	-13.00	25.54
4700.0625	-55.70	H	-43.97	-13.00	30.97
5640.075	-52.55	H	-35.68	-13.00	22.68
6580.0875	-56.55	H	-43.08	-13.00	30.08
1880.025	-46.20	V	-44.57	-13.00	31.57
2820.0375	-44.00	V	-37.49	-13.00	24.49
3760.05	-41.80	V	-29.74	-13.00	16.74
4700.0625	-54.85	V	-43.52	-13.00	30.52
5640.075	-57.95	V	-45.53	-13.00	32.53
7520.1	-57.05	V	-42.15	-13.00	29.15

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	-53.40	H	-54.47	-13.00	41.47
2786.775	-52.25	H	-48.07	-13.00	35.07
3715.7	-48.75	H	-37.94	-13.00	24.94
4644.625	-54.90	H	-43.06	-13.00	30.06
5573.55	-54.65	H	-39.08	-13.00	26.08
1857.85	-47.75	V	-46.22	-13.00	33.22
2786.775	-48.25	V	-41.72	-13.00	28.72
3715.7	-42.90	V	-29.74	-13.00	16.74
4644.625	-54.45	V	-42.51	-13.00	29.51
5573.55	-58.65	V	-47.18	-13.00	34.18

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	-51.95	H	-50.42	-13.00	37.42
2796.75	-48.60	H	-43.32	-13.00	30.32
3729	-46.55	H	-36.19	-13.00	23.19
4661.25	-56.75	H	-45.11	-13.00	32.11
5593.5	-55.65	H	-39.43	-13.00	26.43
6525.75	-56.95	H	-41.68	-13.00	28.68
1864.5	-47.35	V	-45.77	-13.00	32.77
2796.75	-39.95	V	-31.92	-13.00	18.92
3729	-40.60	V	-27.19	-13.00	14.19
4661.25	-56.70	V	-46.16	-13.00	33.16
5593.5	-59.70	V	-47.98	-13.00	34.98

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	-51.60	H	-50.42	-13.00	37.42
2824.4625	-50.95	H	-45.84	-13.00	32.84
3765.95	-48.50	H	-38.14	-13.00	25.14
4707.4375	-55.80	H	-45.07	-13.00	32.07
5648.925	-53.15	H	-36.38	-13.00	23.38
6590.4125	-56.60	H	-41.23	-13.00	28.23
1882.975	-46.50	V	-44.22	-13.00	31.22
2824.4625	-45.30	V	-37.84	-13.00	24.84
3765.95	-41.30	V	-28.99	-13.00	15.99
4707.4375	-55.30	V	-44.12	-13.00	31.12
5648.925	-57.20	V	-44.48	-13.00	31.48
7531.9	-56.90	V	-41.65	-13.00	28.65

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	-52.00	H	-51.59	-13.00	38.59
2857.5	-48.95	H	-45.09	-13.00	32.09
3810	-51.40	H	-40.98	-13.00	27.98
4762.5	-55.95	H	-44.02	-13.00	31.02
5715	-55.10	H	-37.97	-13.00	24.97
6667.5	-55.80	H	-39.85	-13.00	26.85
7620	-57.60	H	-41.39	-13.00	28.39
1905	-45.70	V	-43.79	-13.00	30.79
2857.5	-43.90	V	-37.99	-13.00	24.99
3810	-44.30	V	-31.83	-13.00	18.83
4762.5	-56.20	V	-44.57	-13.00	31.57
5715	-60.75	V	-50.12	-13.00	37.12
7620	-56.60	V	-39.84	-13.00	26.84

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	-50.55	H	-48.89	-13.00	35.89
2879.775	-48.50	H	-44.59	-13.00	31.59
3839.7	-51.75	H	-41.18	-13.00	28.18
4799.625	-57.65	H	-47.07	-13.00	34.07
5759.55	-57.45	H	-42.52	-13.00	29.52
6719.475	-55.80	H	-37.32	-13.00	24.32
7679.4	-58.05	H	-43.64	-13.00	30.64
1919.85	-46.65	V	-44.19	-13.00	31.19
2879.775	-43.55	V	-37.29	-13.00	24.29
3839.7	-46.40	V	-33.98	-13.00	20.98
4799.625	-56.45	V	-44.47	-13.00	31.47
5759.55	-60.90	V	-51.87	-13.00	38.87
7679.4	-56.20	V	-38.74	-13.00	25.74

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 -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 measurements were performed at +/- 15% of the 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	901.500410	0.455	100%	3.60
-20 C	901.500397	0.440	100%	3.60
-10 C	901.500144	0.160	100%	3.60
0 C	901.500038	0.042	100%	3.60
10 C	901.500011	0.012	100%	3.60
20 C	901.500018	0.020	100%	3.60
30 C	901.499951	-0.054	100%	3.60
40 C	901.499888	-0.124	100%	3.60
50 C	901.499854	-0.162	100%	3.60
20 C	901.500051	0.057	85%	3.06
20 C	901.500039	0.043	115%	4.14

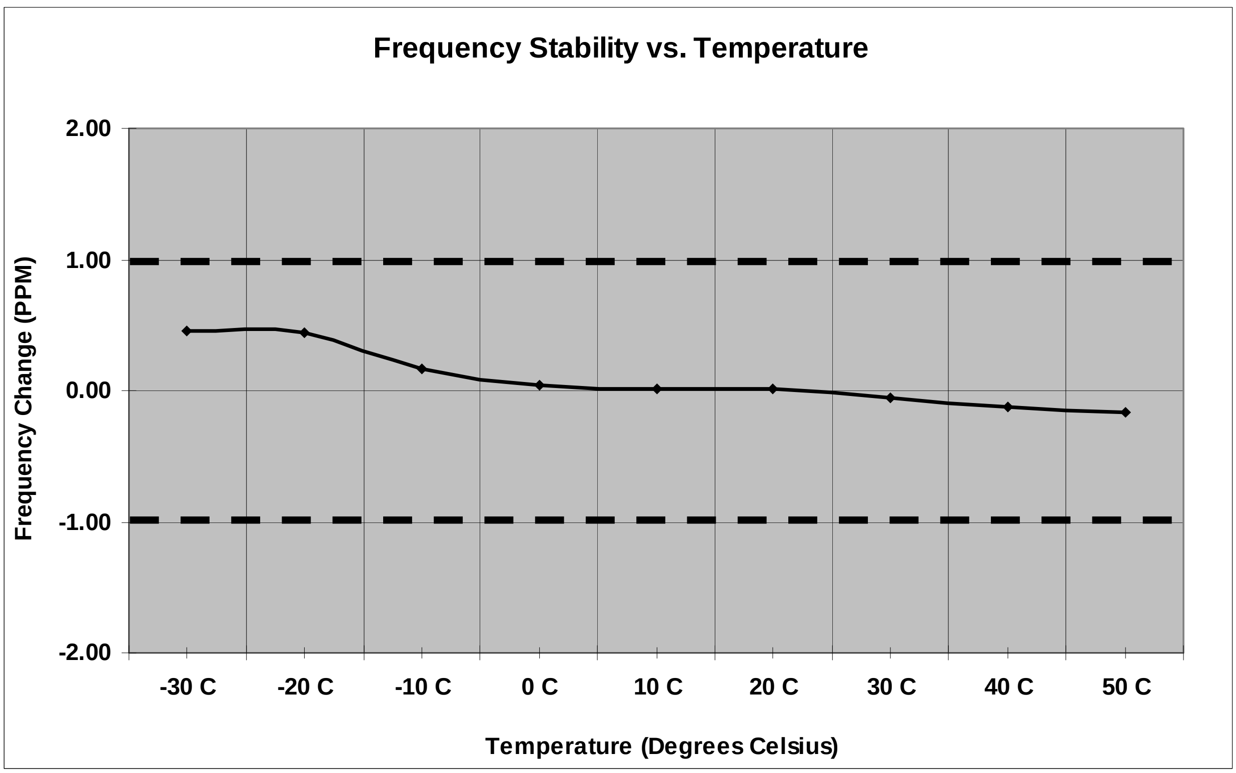


Figure 7.5.2-1: Frequency Stability – 901.5 MHz

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	**930.500461**	**0.495**	100%	3.60
-20 C	**930.500414**	**0.445**	100%	3.60
-10 C	**930.500134**	**0.144**	100%	3.60
0 C	**930.500059**	**0.063**	100%	3.60
10 C	**930.500018**	**0.019**	100%	3.60
20 C	**930.500021**	**0.023**	100%	3.60
30 C	**930.499966**	**-0.037**	100%	3.60
40 C	**930.499871**	**-0.139**	100%	3.60
50 C	**930.499838**	**-0.174**	100%	3.60
20 C	**930.500055**	**0.059**	85%	3.06
20 C	**930.500046**	**0.049**	115%	4.14

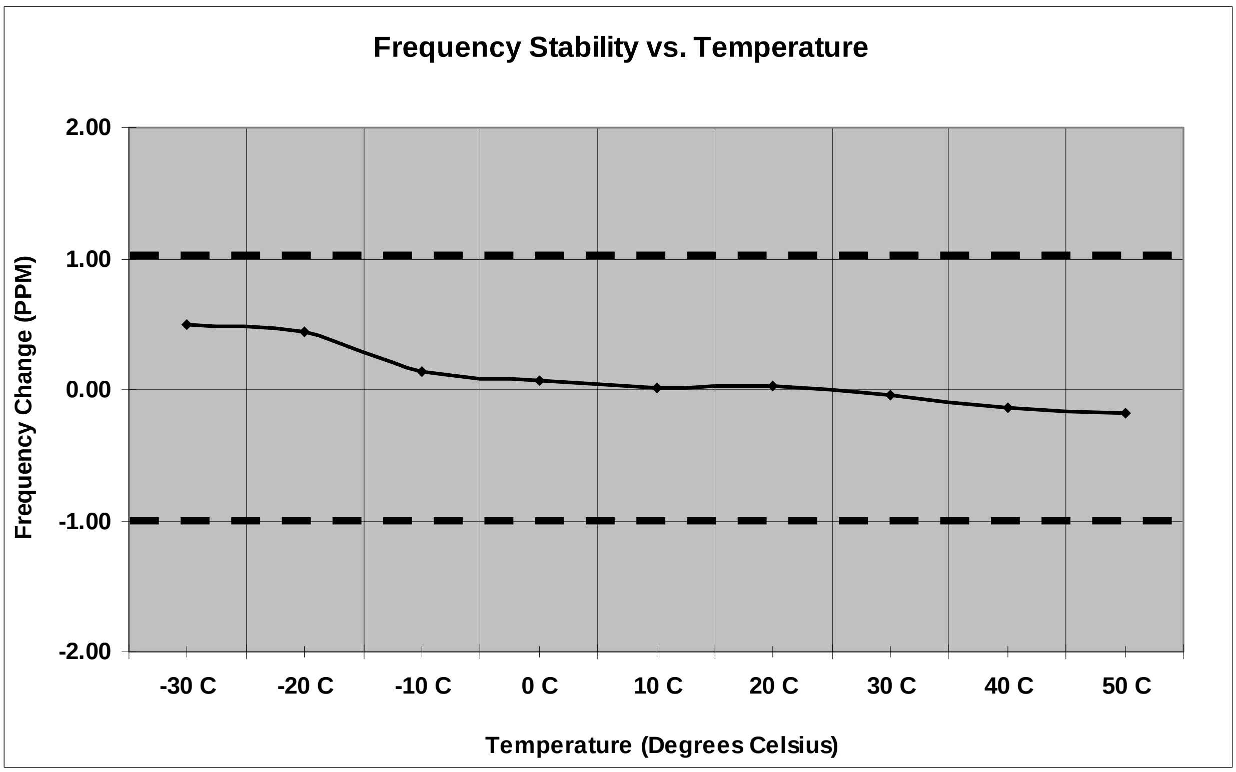


Figure 7.5.2-2: Frequency Stability – 930.5 MHz

Part 101.107, RSS-119 5.3

Frequency Stability

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

Temperature C	Frequency MHz	Frequency Error (PPM)	Voltage (%)	Voltage (VDC)
-30 C	**959.925472**	**0.492**	100%	3.60
-20 C	**959.925426**	**0.444**	100%	3.60
-10 C	**959.925139**	**0.145**	100%	3.60
0 C	**959.925067**	**0.070**	100%	3.60
10 C	**959.925029**	**0.030**	100%	3.60
20 C	**959.925014**	**0.015**	100%	3.60
30 C	**959.924945**	**-0.057**	100%	3.60
40 C	**959.924864**	**-0.142**	100%	3.60
50 C	**959.924841**	**-0.166**	100%	3.60
20 C	**959.925033**	**0.034**	85%	3.06
20 C	**959.925050**	**0.052**	115%	4.14

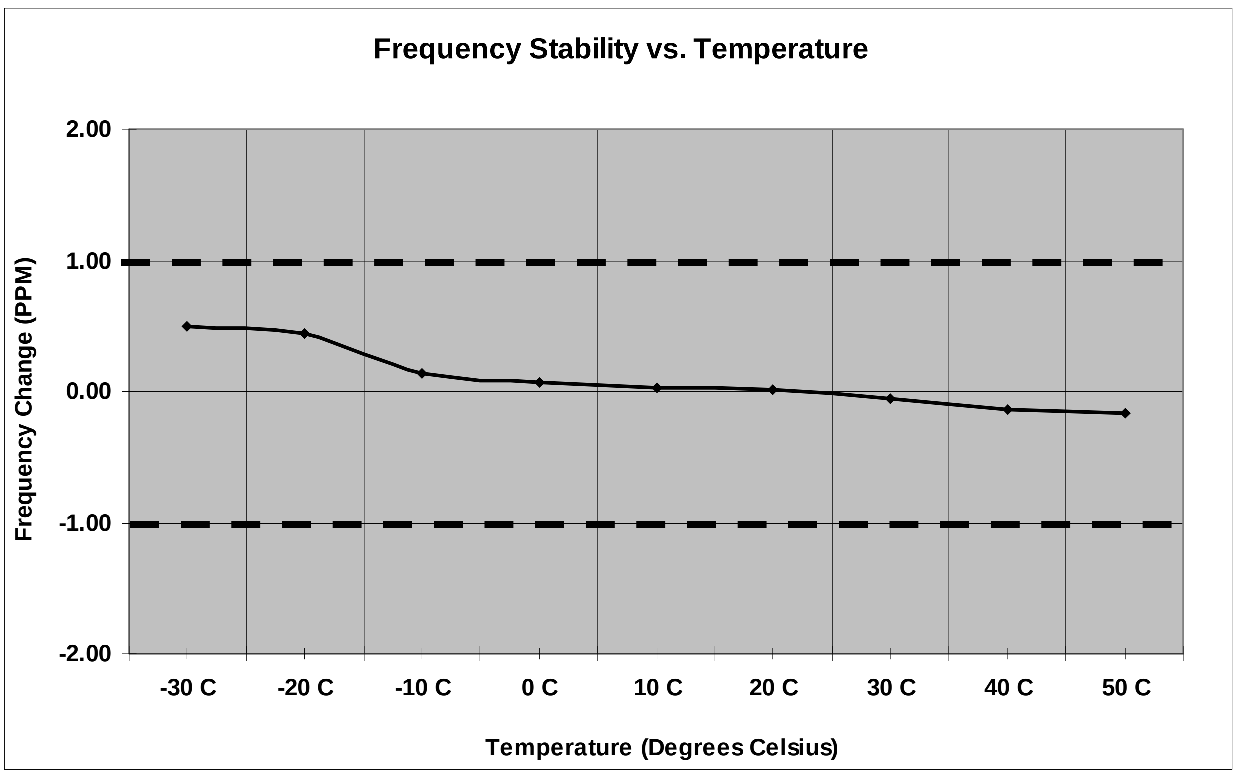


Figure 7.5.2-3: Frequency Stability – 959.925 MHz

8.0 CONCLUSION

In the opinion of ACS, Inc. the model SLC20, 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 where applicable.

End Report