

Certification Test Report

FCC ID: SDBFLEXGE100
IC: 2220A-FLEXGE100

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

ACS Report Number: 13-2078.W04.1A

Applicant: Sensus Metering Systems, Inc.
Model: 570x

Test Begin Date: May 24, 2013
Test End Date: April 7, 2014

Report Issue Date: July 16, 2014



For The Scope of Accreditation Under Certificate Number AT-1533

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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A handwritten signature in blue ink, appearing to read "Thierry Jean-Charles".

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Reviewed by:

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

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This report contains 21 pages

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1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with the specific test requirements of Part 2 Subpart J, Part 24 Subpart D, 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 Class II Permissive Change.

The purpose of the Class II Permissive Change is to correct the emissions designators of the original filing and to add new modulation format. There are no RF output power or hardware changes on the product.

1.2 Product Description

The Sensus Flexnet model 570x is a printed circuit board module which provides wireless communication capability to the GE KV2c family of electric utility meters. The device mounts into the existing GE meters and acts as the "Third Party AMR Board". The device monitors meter reading and diagnostic information via a C12-21 serial interface to the GE main board. The device communicates via the FlexNet fixed wireless telemetry network to provide electric meter readings and diagnostic data from the meter to the utility provider via radio.

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

Test Sample Serial Numbers: 103X75700148T00312421804
Hardware Revision: X3
Firmware Version: 1.2.3.4

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 evaluated for RF conducted emissions to cover the new modulation. The RF conducted measurements were performed with an SMA connector at the antenna port. The EUT was evaluated for all frequency bands of operation, with the exception of the 896.0375 MHz - 901 MHz and 935 MHz - 940 MHz bands, which do not support the mPass 10k modulation. The spurious emissions at the antenna port are covered under the original certification report which documented the worst case configuration.

1.3.2 In-Band Testing Methodology

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
90	896.0375 – 901.0
90	935.0 – 940.0
101	928.85 - 929.0
101	932.0 - 932.5
101	941.0 - 941.5
101	959.85 - 960.0

The evaluation for the permissive changes applies to all the frequency bands except for the 896.0375 – 901.0 MHz and 935.0 – 940.0 MHz bands. 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	(See Note)	901.9875
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	(See Note)	940.5000
101	941.0 - 941.5		941.4875
101	959.85 – 960.0	Middle	959.9250

Note: The frequencies were selected per the original certification report.

1.4 Emission Designators

The 570x transmitter produces five (5) distinct modulation formats. The emissions designators for the modulation types used by the 570x transmitter are as follows:

EMISSIONS DESIGNATORS:

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

2.0 TEST FACILITIES

2.1 Location

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

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

FCC Test Firm Registration #: 475089
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

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.

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:

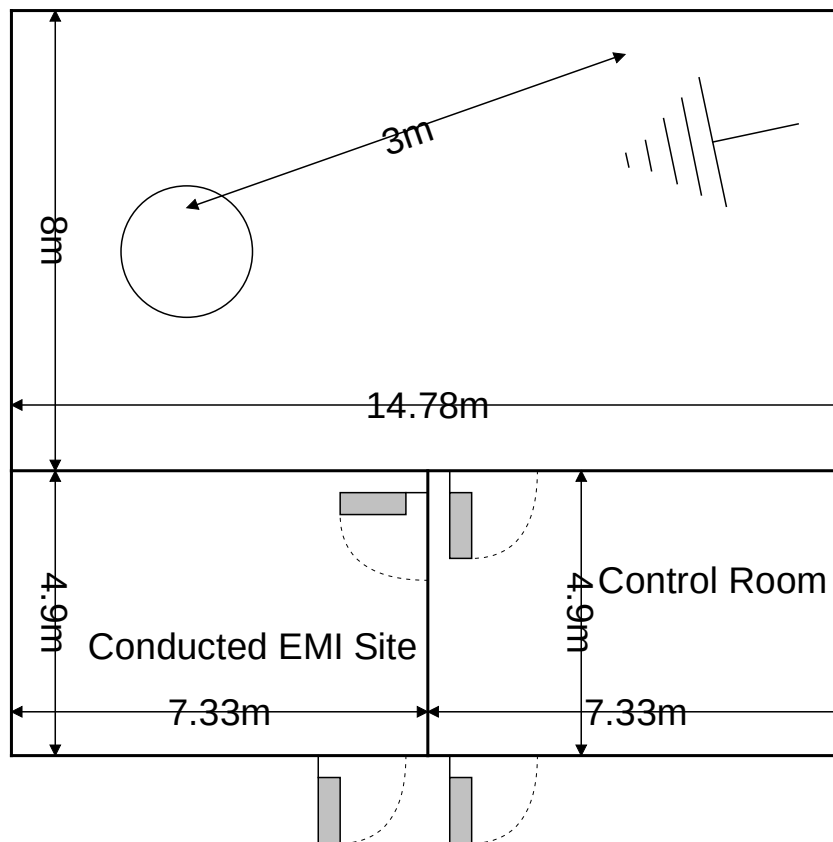


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m³. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω /50 μ H 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:

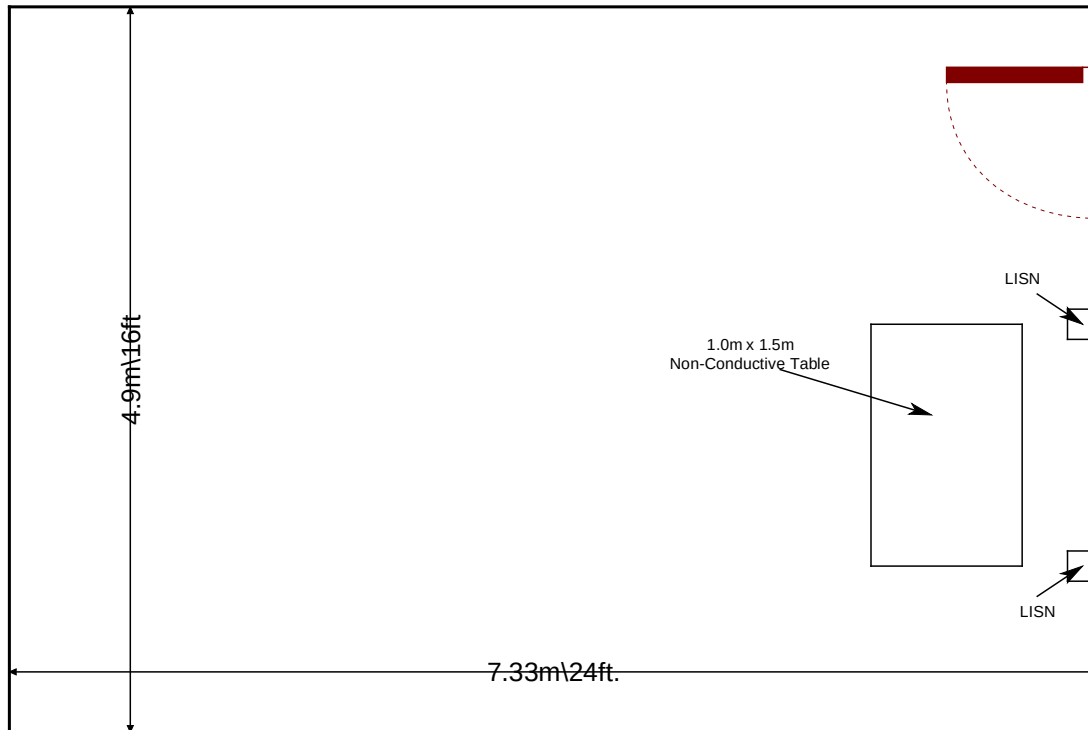


Figure 2.3.2-1: AC Mains Conducted EMI Site

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 - 2014
- 3 - US Code of Federal Regulations (CFR): Title 47, Part 101, Subpart C: Fixed Microwave Services - 2014
- 4 - US Code of Federal Regulations (CFR): Title 47, Part 24, Subpart D: Personal Communications Services – 2014
- 5 – TIA-603-D: Land Mobile FM or PM - Communications Equipment - Measurement and Performance Standards – 2010
- 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
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2012	5/31/2013
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2013	5/31/2014
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/20/2012	12/20/2013
3002	Rohde & Schwarz	ESU40	Receiver	100346	11/5/2013	11/5/2014

Notes:

- The asset information is provided to cover the entire test period. The assets were used during the active cycle of the calibration period.
- Asset 3002 was acquired in the midst of the test cycle.

5.0 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Sensus Metering Systems	570x	103X75700148T00312421804
2	DC Power Supply	Lambda	LPD-422A-FM	A82600

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	20 VDC Power Lead	0.24 m	No	EUT to Power Supply
B	5.5 VDC Power Lead	0.24 m	No	EUT to Power Supply
C	Ground Lead	0.24 m	No	EUT to Power Supply
D	Power Cord	1.5 m	No	Power Supply to AC Mains

6.0 EQUIPMENT UNDER TEST SETUP AND BLOCK DIAGRAM

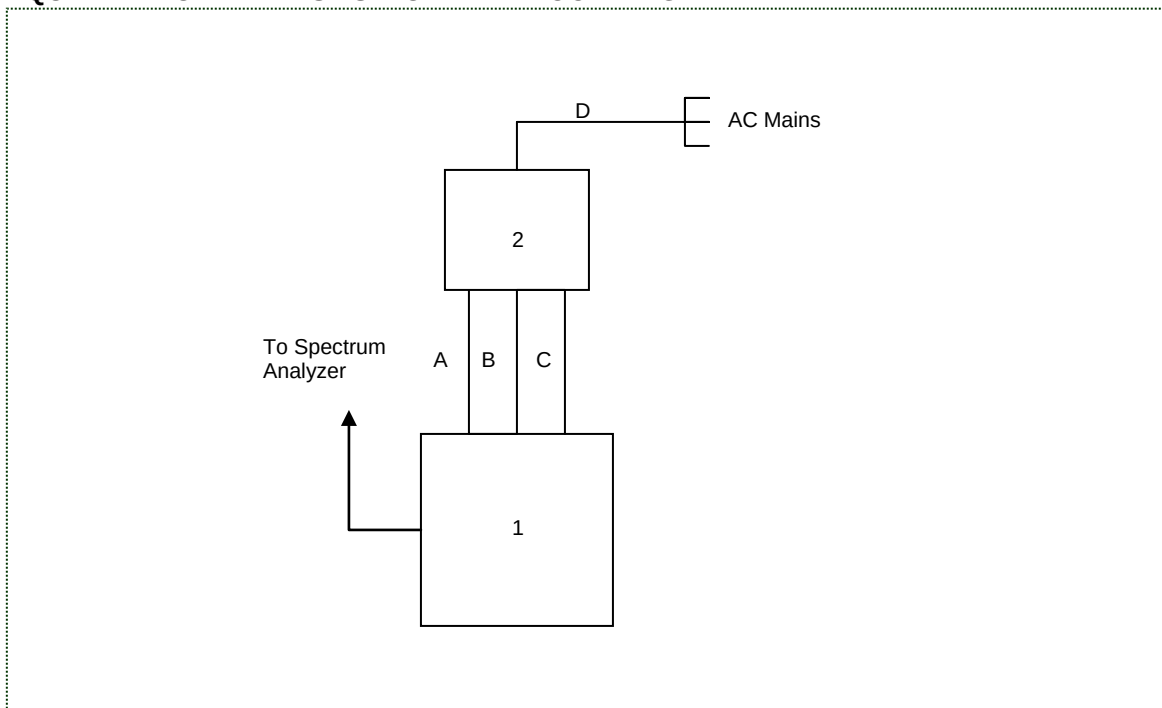


Figure 6-1: EUT Test Setup

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 Summary
RF Power Output	Pass
Occupied Bandwidth (Emissions Limits)	Pass
Spurious Emissions at Antenna Terminals	N/A
Field Strength of Spurious Emissions	N/A

7.1 RF Power Output

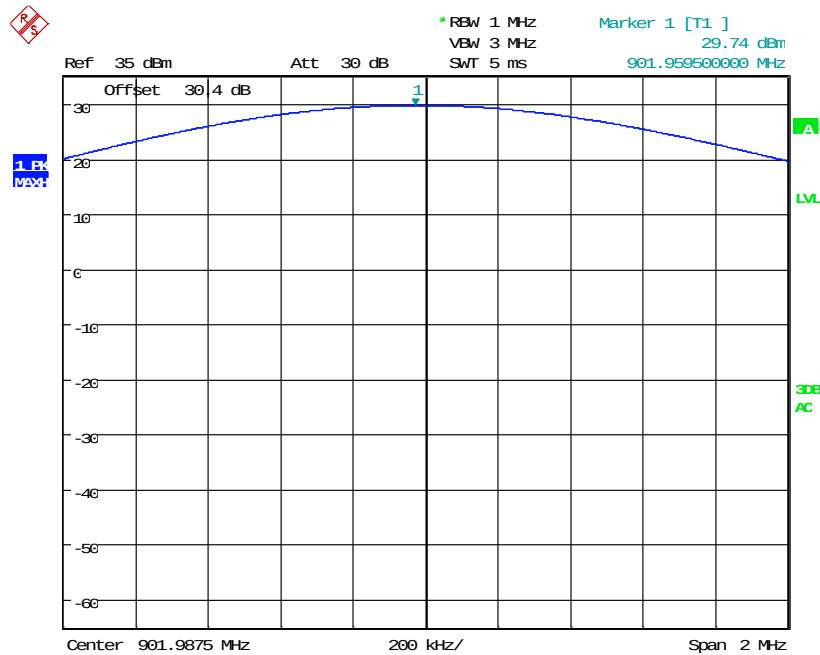
7.1.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through 30 dB of passive attenuation. 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

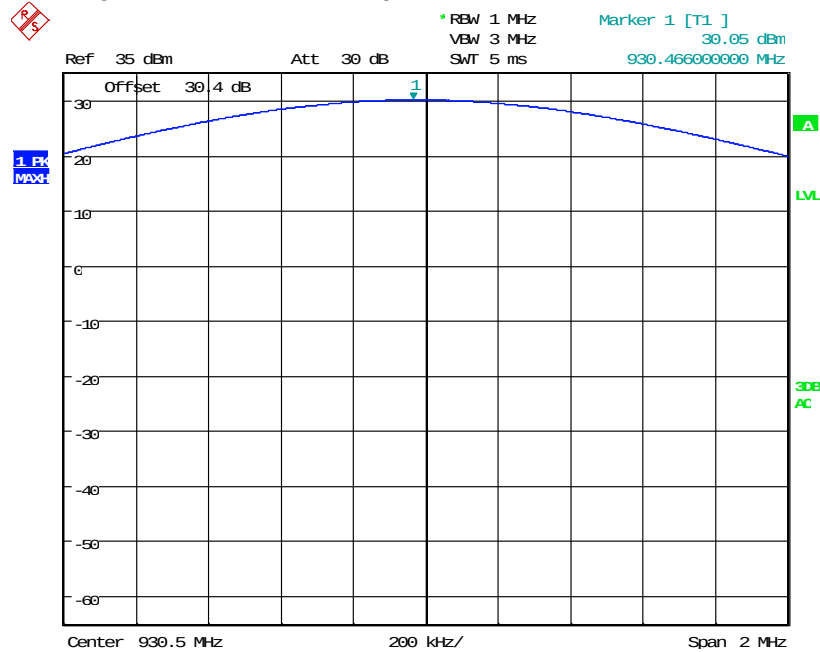
Table 7.1.2-1: Peak Output Power

Frequency (MHz)	FCC Rule Part	Output Power (dBm)	Modulation
901.9875	24D	29.74	mPass 10k
930.5000	24D	30.05	mPass 10k
940.5000	24D	30.08	mPass 10k
928.9250	101	30.07	mPass 10k
932.2500	101	30.01	mPass 10k
941.4875	101	30.42	mPass 10k
959.925	101	30.22	mPass 10k



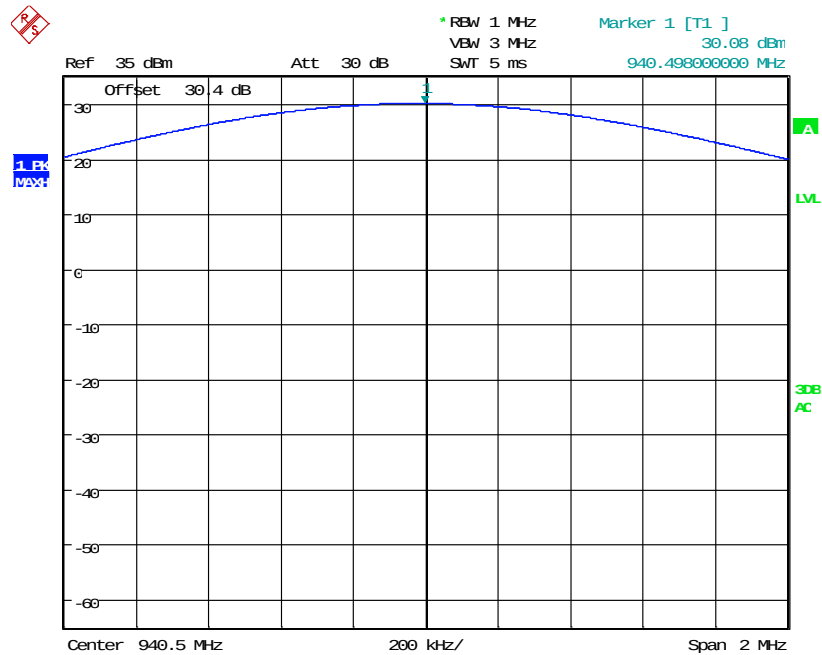
Date: 12.MAR.2014 12:33:13

Figure 7.1.2-1: Peak Output Power – 901.9875 MHz – mPass10k



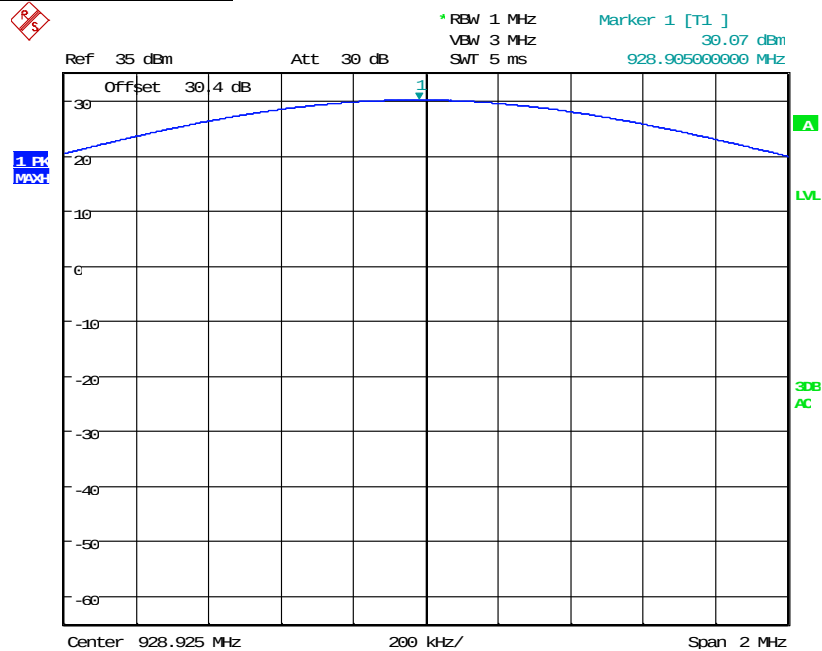
Date: 12.MAR.2014 12:36:11

Figure 7.1.2-2: Peak Output Power – 930.5 MHz – mPass10k



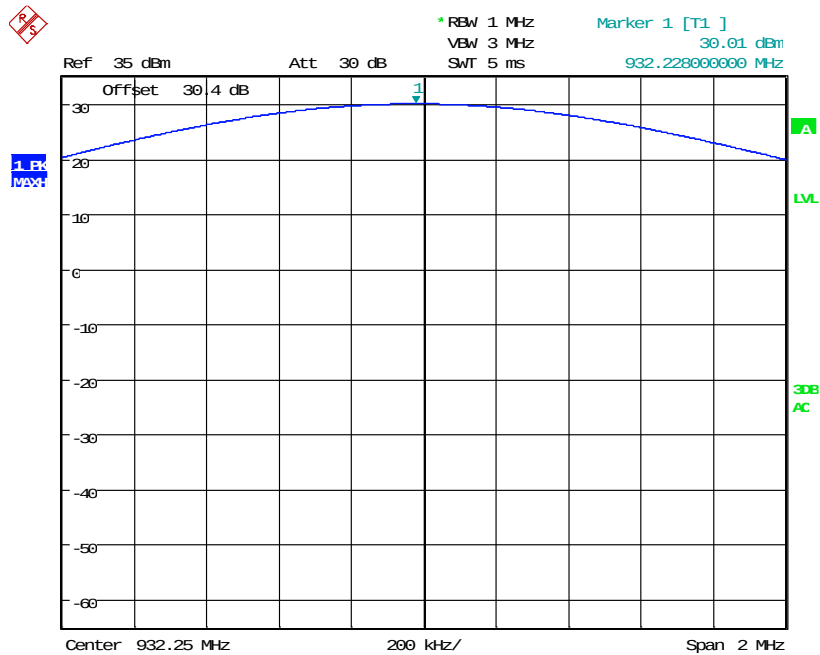
Date: 12.MAR.2014 12:43:02

Figure 7.1.2-3: Peak Output Power – 940.5 MHz – mPass10k

Part 101.113(a) / RSS-119 5.4.1

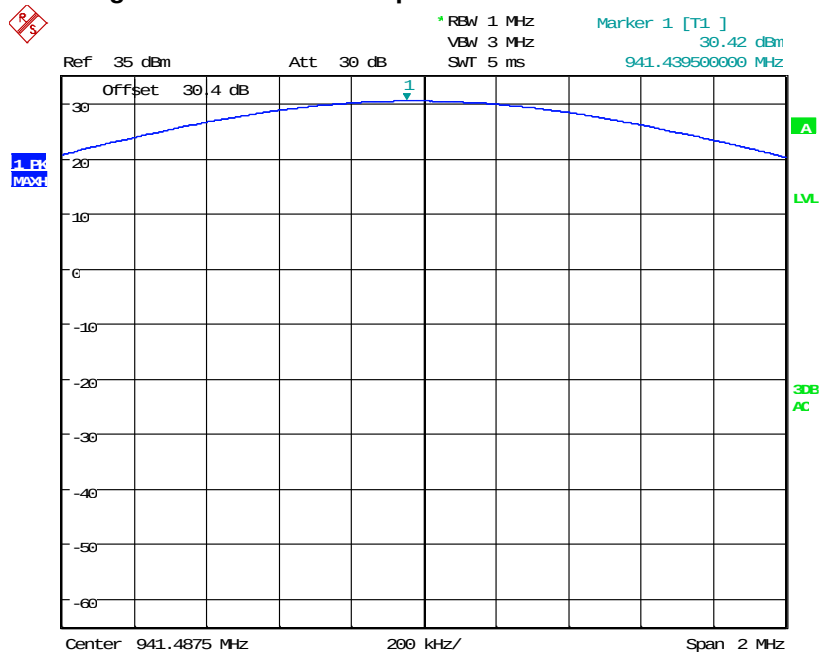
Date: 12.MAR.2014 11:32:20

Figure 7.1.2-4: Peak Output Power – 928.925 MHz – mPass10k



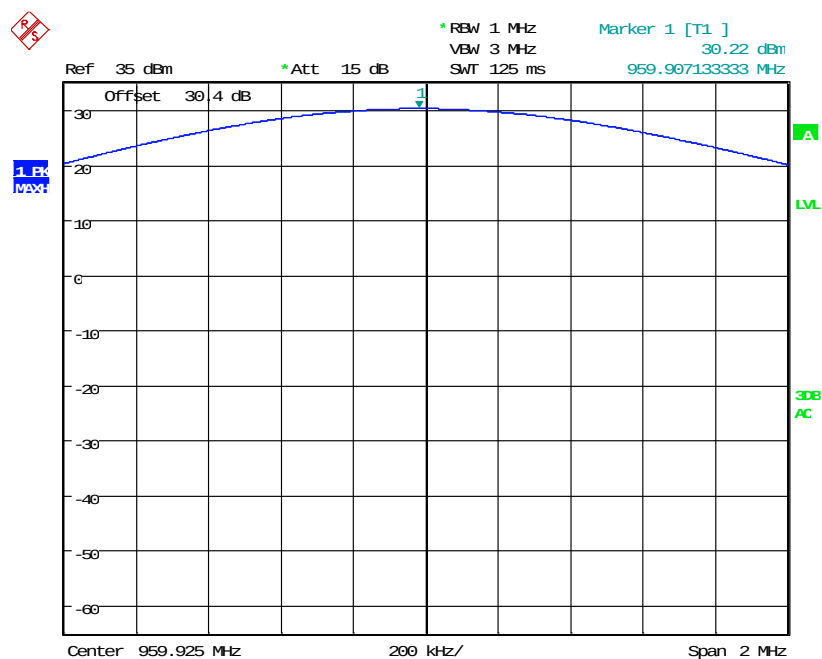
Date: 12.MAR.2014 12:09:37

Figure 7.1.2-5: Peak Output Power – 932.25 MHz – mPass10k



Date: 12.MAR.2014 12:12:02

Figure 7.1.2-6: Peak Output Power – 941.4875 MHz – mPass10k



Date: 7.APR.2014 20:32:32

Figure 7.1.2-7: Peak Output Power – 959.925 MHz – mPass10k

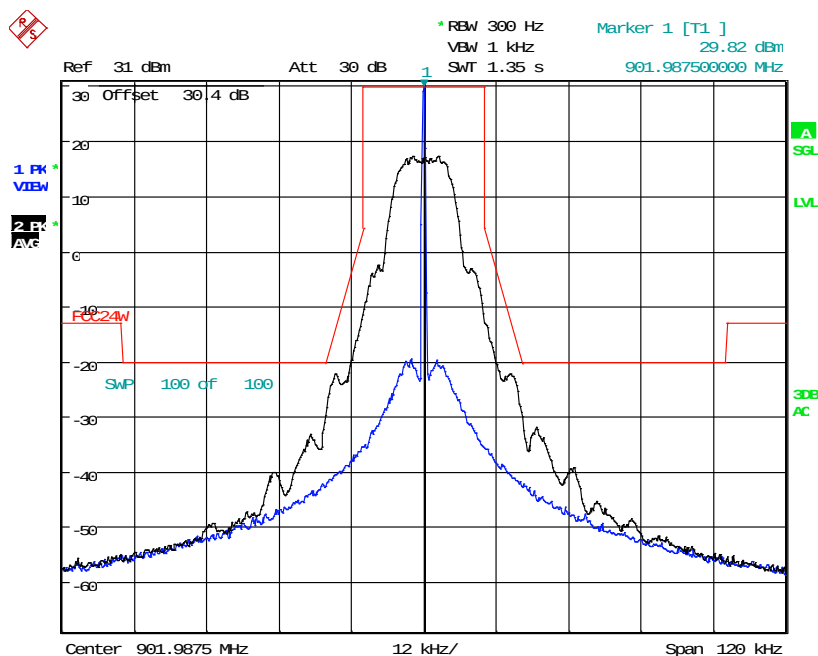
7.2 Occupied Bandwidth (Emission Limits)

7.2.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through 30 dB of passive attenuation. 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.

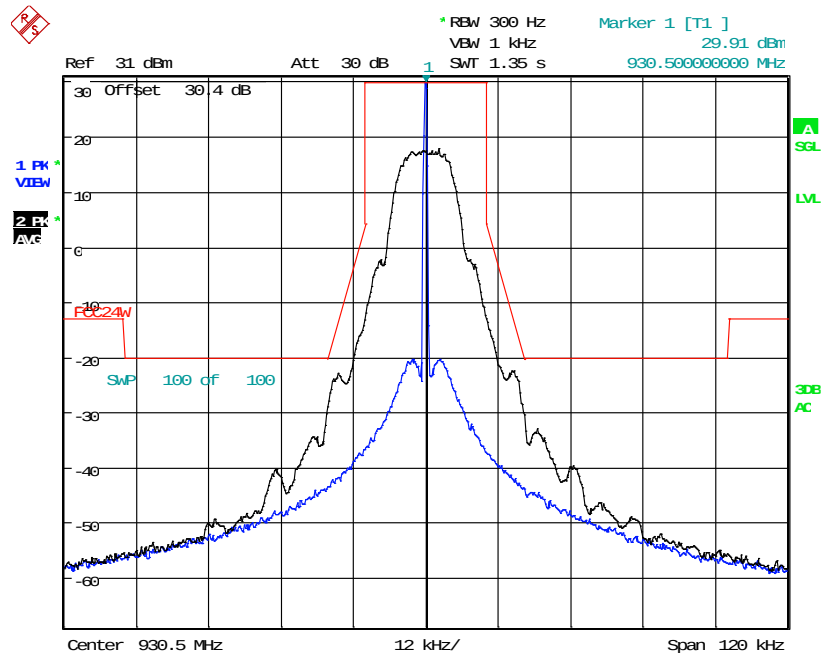
7.2.2 Measurement Results

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



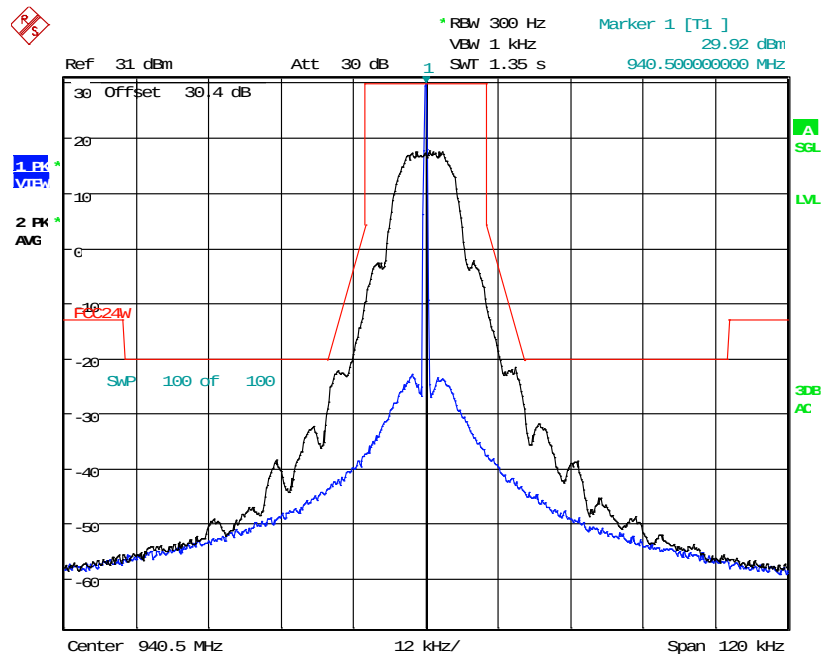
Date: 12.MAR.2014 07:34:06

Figure 7.2.2-1: 901.9875 MHz – mPass 10k



Date: 12.MAR.2014 07:45:32

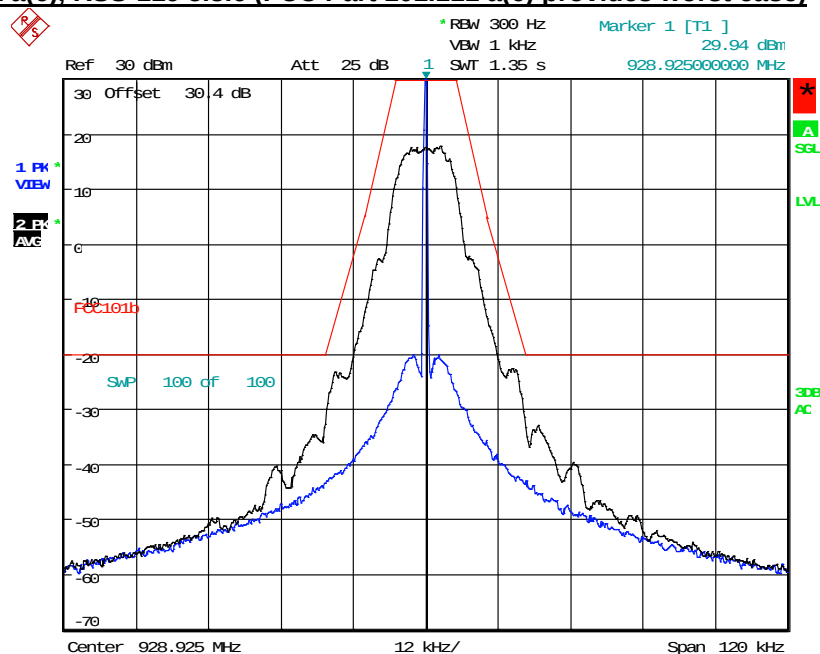
Figure 7.2.2-2: 930.5 MHz – mPass 10k



Date: 12.MAR.2014 07:55:03

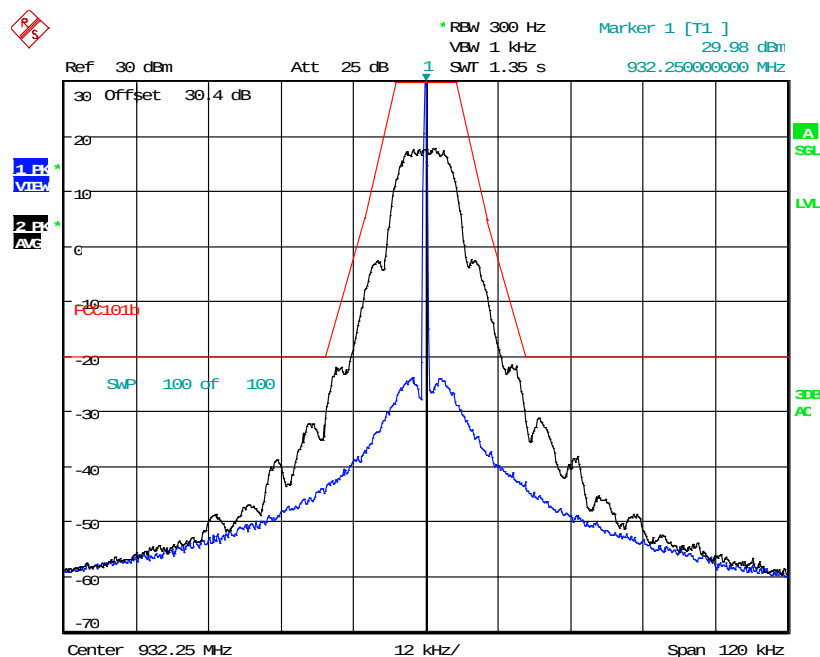
Figure 7.2.2-3: 940.5 MHz – mPass 10k

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



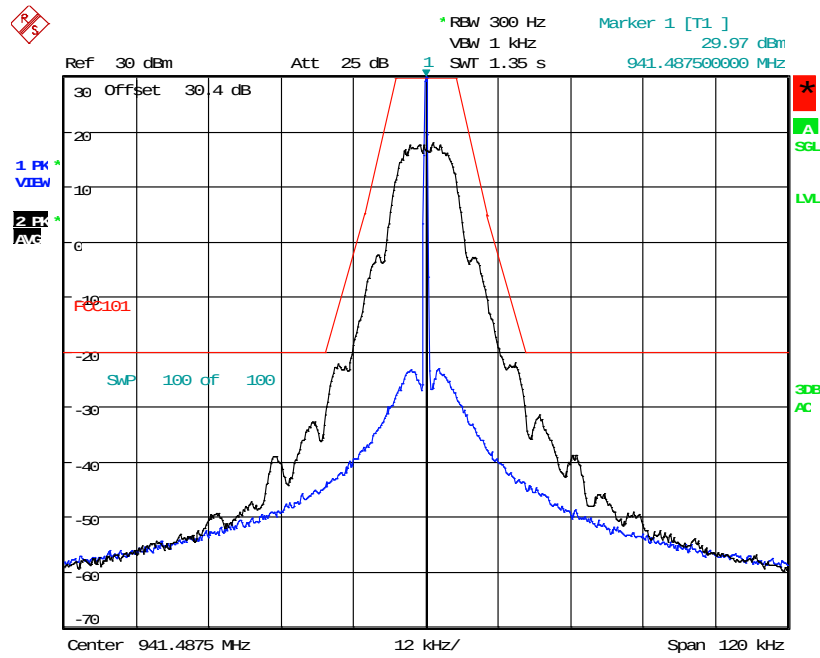
Date: 11.MAR.2014 19:49:20

Figure 7.2.2-4: 928.925 MHz – mPass 10k



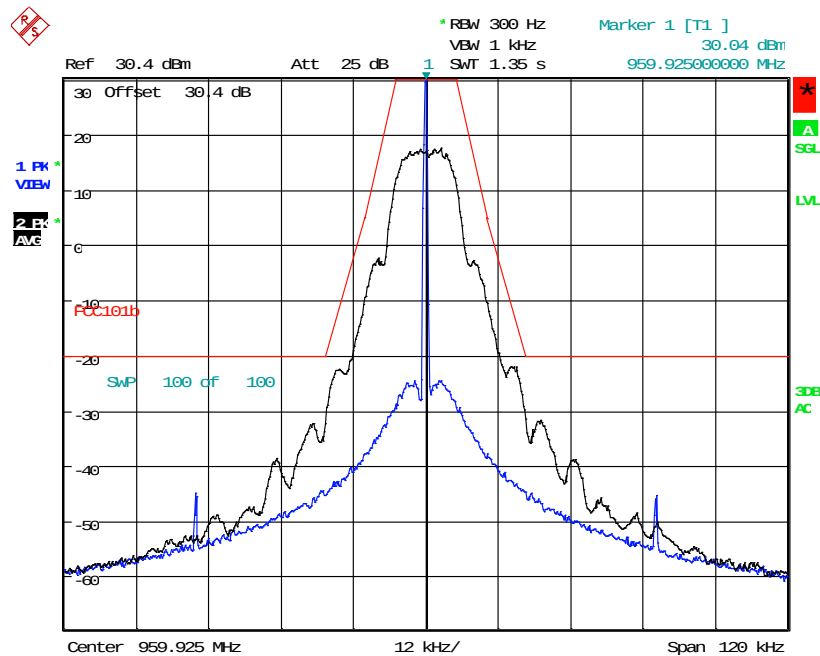
Date: 11.MAR.2014 19:59:50

Figure 7.2.2-5: 932.25 MHz – mPass 10k



Date: 11.MAR.2014 19:25:19

Figure 7.2.2-6: 941.4875 MHz – mPass 10k



Date: 11.MAR.2014 20:28:08

Figure 7.2.2-7: 959.925 MHz – mPass 10k

8.0 CONCLUSION

In the opinion of ACS, Inc. the model 570x, manufactured by Sensus Metering Systems, Inc., meets the requirements of FCC Part 24 D and FCC Part 101 as well as Industry Canada RSS-119 and RSS-134 for the test methods reported in this document.

End Report