Test of Sensus Metering Systems Navicomm Series

To: FCC 47 CFR Part 15, SubPart B and Radio Collocation

Test Report Serial No.: SNUS11-U2 Rev B

TEST REPORT

From

Test of: Sensus Metering Systems Navicomm

To: FCC 47 CFR Part 15, SubPart B and Radio Collocation

Test Report Serial No.: SNUS11-U2 Rev B

This report supersedes: None

Applicant:	Sensus Metering Systems 8609 Six Forks Rd 3rd Floor Raleigh, NC 27615 USA
Product Function:	Remote telemetry device
Copy No: pdf	**Issue Date:** 4th January 2011

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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ACCREDITED
TESTING CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1 ACCREDITATION, LISTINGS & RECOGNITION

1.1 TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

1.2 RECOGNITION

MiCOM Labs, Inc has widely recognized Electrical testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA** countries. Our test reports are widely accepted for global type approvals.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	Listing #: 4143A
Japan	VCCI	-	-	No. 2959
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

**APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing
Phase II – recognition for both product testing and certification
N/A – Not Applicable

1.3 PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard EN ISO/IEC Guide 65. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf


The American Association for Laboratory Accreditation
World Class Accreditation

Accredited Product Certification Body

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence as a

Product Certification Body

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC Guide 65:1996 *General requirements for bodies operating product certification systems*. This accreditation demonstrates technical competence for a defined scope and the operation of a quality management system for a Telecommunications Certification Body (TCB) meeting FCC (U.S.), and IC (Canada) requirements.

Presented this 24th day of June 2010.

President & CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2011

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body

TCB Identifier – US0159

Industry Canada – Certification Body

CAB Identifier – US0159

2 DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft		
Rev A	4th January 2011	Initial Release
Rev B	4th January 2011	Correction of typo.

3 TEST RESULT CERTIFICATE

Applicant:	Sensus Metering Systems 8609 Six Forks Rd 3rd Floor Raleigh NC 27615, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
Product:	Navicomm Series	Telephone:	+1 925 462 0304
Model No.:	NaviComm-GSM/GPRS-G2 NaviComm-GSM/GPRS-F4 NaviComm-FLX-900	Fax:	+1 925 462 0306
S/No's:	N/A - Engineering Samples		
Date(s) Tested:	9/21/2010 - 9/23/2010	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15 Subpart B + radio collocation	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:

ACCREDITED
TESTING CERTIFICATE #2381.01

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4 REFERENCES AND MEASUREMENT UNCERTAINTY

4.1 Normative References

Ref.	Publication	Year	Title
i.	47 CFR Part 15	2009	Code of Federal Regulations, Title 47, Part 15 (47 CFR 15)
ii.	47 CFR Part 22H	2009	PART 22--PUBLIC MOBILE SERVICES
iii.	47 CFR Part 24E	2009	PART 24--PERSONAL COMMUNICATIONS SERVICES
iv.	FCC 47 CFR Part 90	2009	Code of Federal Regulations; Part 90
v.	FCC 47 CFR Part 101	2009	Code of Federal Regulations; Part 101
vi.	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
vii.	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
viii.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
ix.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
x.	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
xi.	A2LA	9TH June 2010	Reference to A2LA Accreditation Status – A2LA Advertising Policy

4.2 Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5 TEST SUMMARY

List of Measurements: The following table represents the list of measurements required under FCC 47 CFR Part 15, SubPart 15.247

Standard Section(s)	Test Description	Condition	Result	Test Report Section
15.205, 15.210	Radiated (Digital) Emissions	Radiated	Compliant	7.1
15.207	AC Wireline Emissions 0.15 – 30 MHz	Conducted	Compliant	7.2
(d), 15.205, 15.209	Transmitter Radiated Spurious Emissions; Colocation F4 radio module	Radiated	Compliant	7.3.1
(d), 15.205, 15.209	Transmitter Radiated Spurious Emissions; Colocation G2 radio module	Radiated	Compliant	7.3.2
(d), 15.205, 15.209	Transmitter Radiated Spurious Emissions; Colocation G2 radio module	Radiated	Compliant	7.3.4

Note 1: Test results reported in this document relate only to the items tested

Note 2: The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria

Note 3: Section 6.8 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix

6 PRODUCT DETAILS AND TEST CONFIGURATIONS

6.1 Test Program Scope

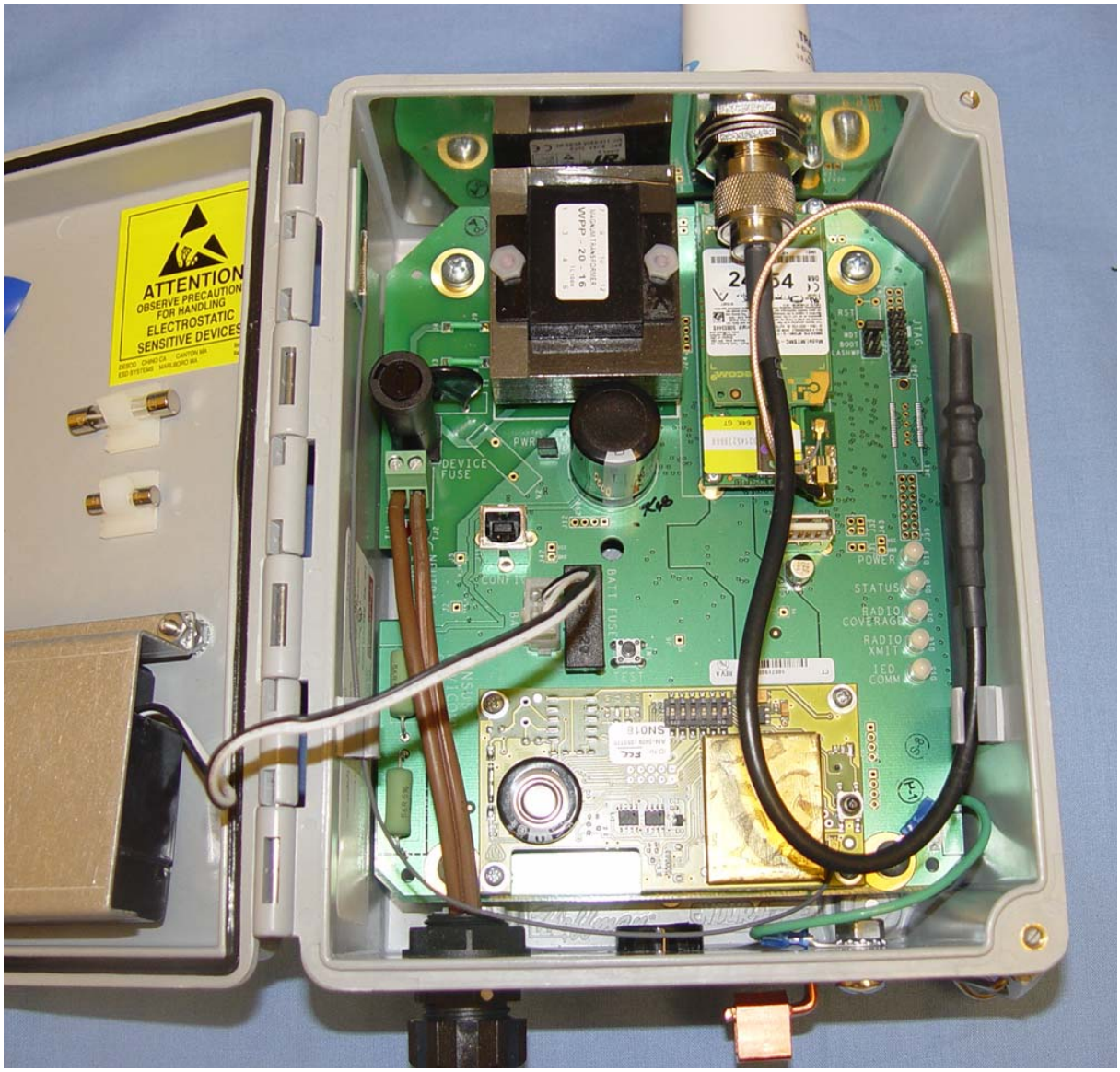
The purpose of this test report is to show compliance of the Sensus Metering Systems Navicomm series of devices with FCC Class B emissions and Radio collocation requirements.

The Navicomm series of devices uses the Horstmann 2.4 GHz Smart Controller FCC ID: YQVHHH002 in colocation with one of the following devices:

MultiTech 900/1800 MHz (G2) device; FCC ID: AU792U09D24824
MultiTech 900/1800 MHz (F4) device; FCC ID: AU792U07A31817
Sensus Model U905458B; Flexnet 900; FCC ID: SDBDAFLX;

APPLICANT: Sensus Metering Systems **PRODUCT:** Navicomm

Internal Photograph of Navicomm showing location of Radio and Antennas.



6.2 EUT Details

Detail	Description
Purpose:	The purpose of this test report is to show compliance of the Sensus Metering Systems Navicomm series of devices with FCC Class B emissions and Radio collocation requirements
Applicant:	Sensus Metering Systems 8609 Six Forks Rd 3rd Floor Raleigh, NC 27615 USA
Manufacturer:	Same as applicant
Test Laboratory:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	SNUS11
Date EUT received:	20th September 2010
Dates of test (from - to):	21st to 23rd September 2010
No of Units Tested:	2
Product Name:	Navicomm
Manufacturers Trade Name:	Sensus
Model No.:	NaviComm-GSM/GPRS-G2 NaviComm-GSM/GPRS-F4 NaviComm-FLX-900
Equipment Primary Function:	Remote Faulted Circuit Indicator
Equipment Secondary Function(s):	N/A
Installation type:	Fixed
Construction/Location for Use:	Outdoor only
Software/Firmware Release:	1.6.697
Hardware Release:	REV A
Test Software Release:	Engineering release
Rated Input Voltage and Current AC:	120VAC +/-10% (108VAC-132VAC), 0.1A
Operating Frequency:	60Hz +/- 0.5%
Rated Input Voltage and Current DC:	No DC option for normal operation
Operating Temperature Range ºC:	-30C to +70C
Long Term Frequency Stability:	20 p.p.m.
Equipment Dimensions:	6" x 4" x 8"
Weight:	5lbs

6.3 External A.C/D.C Power Adaptor

No AC/DC adaptor used with this device.

6.4 Antenna Details

The following is a description of the EUT antennas.

Antenna Type:	Manufacturer	Model	Gain (dBi)	Frequency Range (MHz)
GSM/GPRS Antenna	Laird	TRA821/18503P	3	821/1850
900 Antenna	Laird	TRAB8903NP	3	821/1850
2.4GHz Antenna	Laird	MAP24064 Mini Nano-blade	2.5	2400-2483.5

6.5 Cabling and I/O Ports

The following is a description of the cable and input, output ports available on the EUT.

Type of I/O Ports	Description	Screened (y/n)	Description	Qty	Tested
AC Mains	Connection to public AC power	N	1m-3m	1	Y
RF	N-Type connector for GPRS antenna	Y	< 1m	1	Y

6.6 Equipment Details

The following is a description of EUT and supporting equipment used during the test program.

Type (EUT/Support)	Equipment Description	Manufacturer	Model No.	Serial No (s).
EUT	Remote Faulted Circuit Indicator	Sensus	Navicomm	N/A - Engineering Samples
Radio Module	Horstmann 2.4 GHz Smart Controller FCC ID: YQVHHH002	Horstmann	AN-0409/050710	N/A
Radio Module	MultiTech 900/1800 MHz (F4) device FCC ID: AU792U07A31817	MultiTech	MTSMC-G-F4	N/A
Radio Module	MultiTech 900/1800 MHz (G2) device FCC ID: AU792U09D24824	MultiTech	MTSMC-G2	N/A
Radio Module	Sensus FlexNet 900 MHz remote telemetry radio FCC ID: SDBDAFLX	Sensus	U905458B	N/A

6.7 Test Configurations

Configuation	Radio Module 1	Radio Module 2
Configuration 1	Horstmann 2.4 GHz Smart Controller FCC ID: YQVHHH002	MultiTech 900/1800 MHz (F4) device FCC ID: AU792U07A31817
Configuration 2	Horstmann 2.4 GHz Smart Controller FCC ID: YQVHHH002	MultiTech 900/1800 MHz (G2) device FCC ID: AU792U09D24824
Configuration 2	Horstmann 2.4 GHz Smart Controller FCC ID: YQVHHH002	Sensus 900 MHz remote telemetry radio FCC ID: SDBDAFLX

6.8 Equipment Modifications

No modifications were required.

6.9 Deviations from the Test Standard

Testing was performed as detailed in the response to inquiry to FCC (KDB Tracking Number 663683) concerning collocation testing of modules certified to two (2) different FCC parts.

7 Test Results

7.1 Radiated Spurious Emissions – Digital Apparatus

Standard Reference

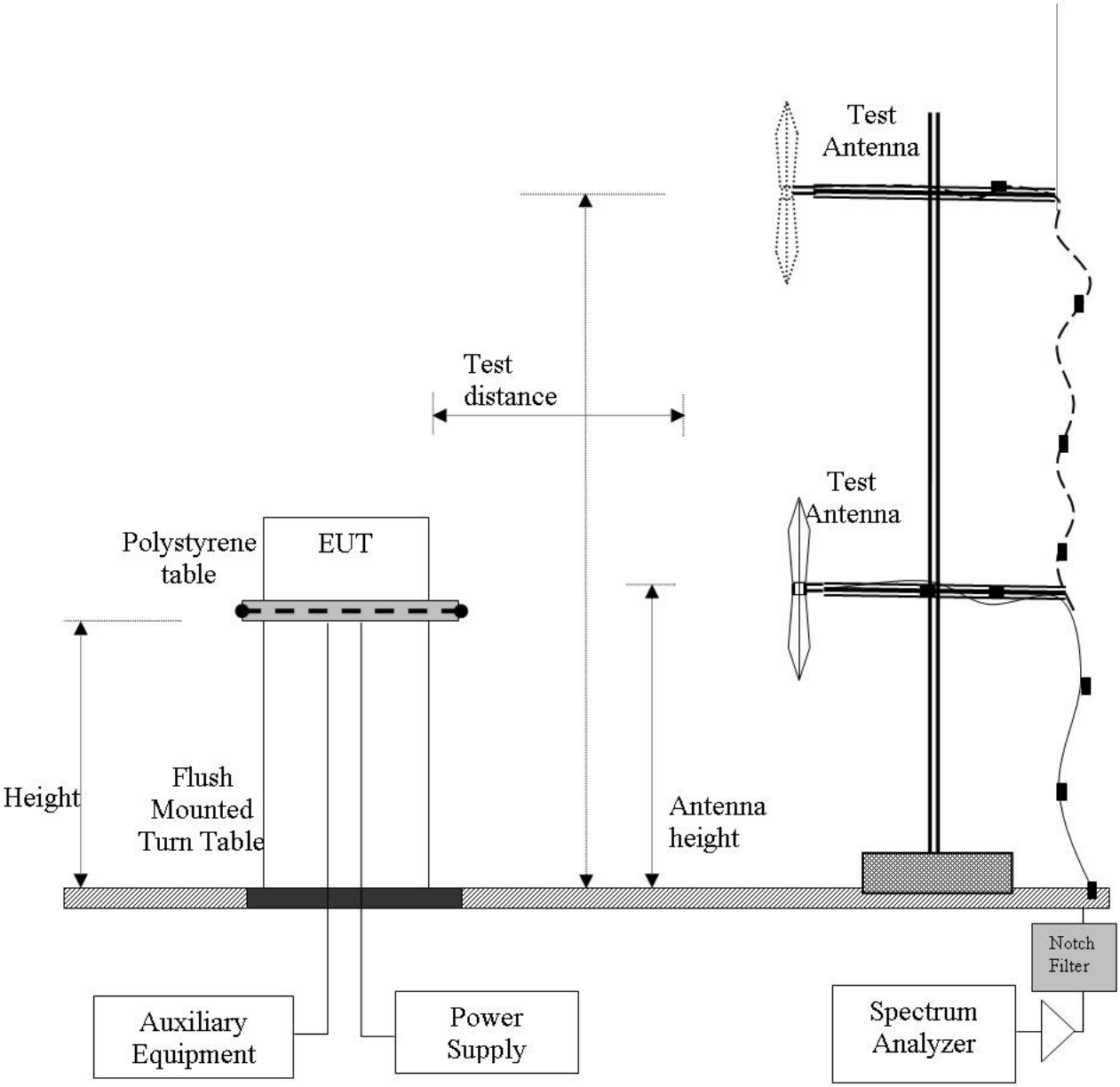
FCC, Part 15 Subpart B §15.109
Industry Canada ICES-003 §5

Test Procedure

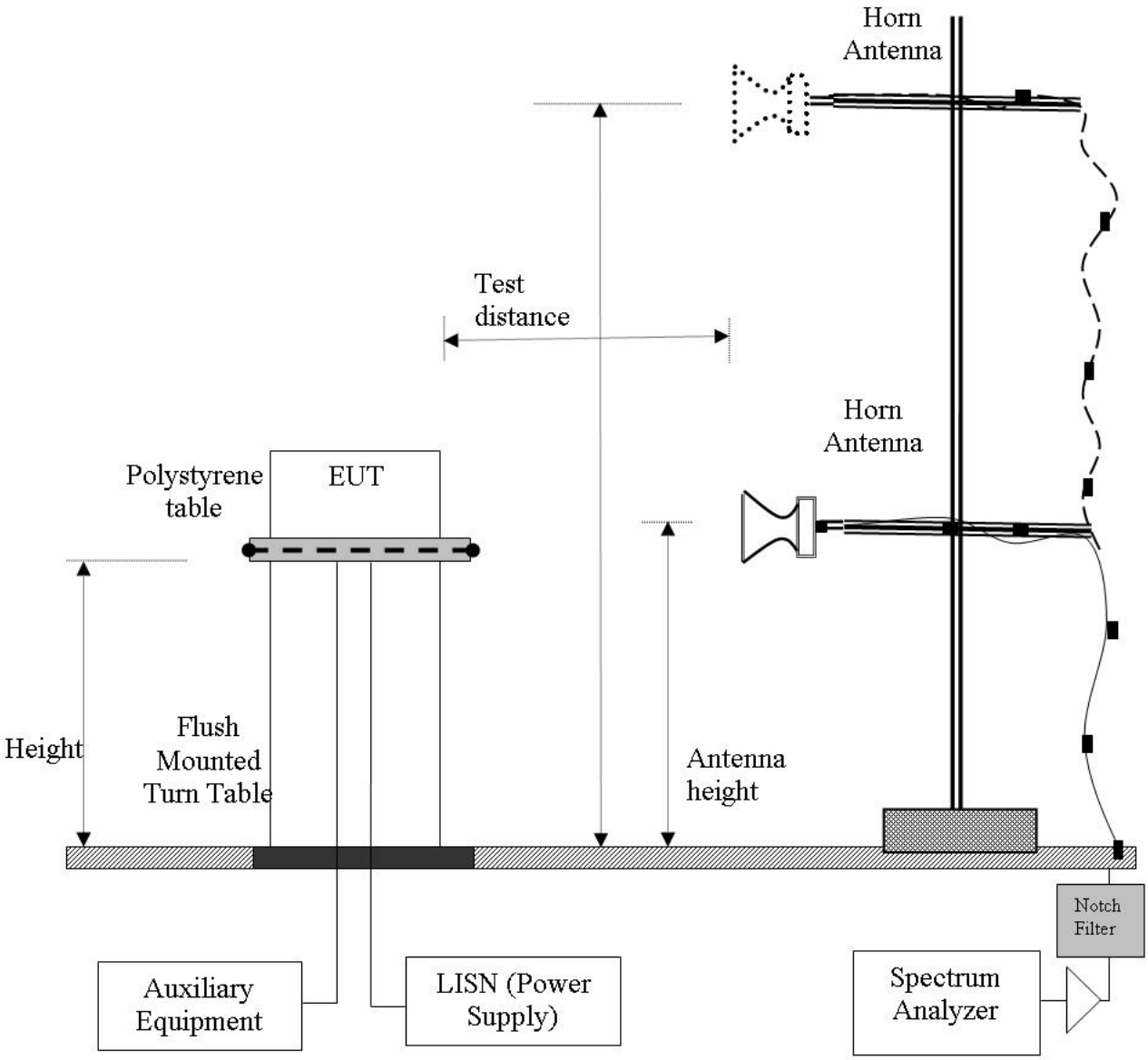
Testing was performed in a 3-meter semi-anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Only the highest emissions relative to the limit are listed.

Test Measurement Set up



Measurement set up for Radiated Emission Test < 1 GHz



Measurement set up for Radiated Emission Test > 1 GHz

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR – FO

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Specification

Radiated Spurious Emissions – Digital Apparatus

FCC, Part 15 Subpart B §15.109
A representative type or model of each digital apparatus shall be tested in accordance with the measurement methods described in FCC Part 15; Subpart A - General and FCC Subpart B – Unintentional Radiators.

Industry Canada ICES-003
A representative type or model of each digital apparatus shall be tested in accordance with the measurement method described in the publication referred to in Section 7.1 [Canadian Standards Association Standard CAN/CSA-CEI/IEC CISPR 22:02, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."].

FCC, Part 15 Subpart B §15.109 Spurious Emissions Limits

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values.

Frequency (MHz)	Field Strength @ 3m (µV/m)	Measurement Distance (meters)	Field Strength (dBµV/m) @ 3m
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

Field Strength of radiated emissions for a Class A digital device are as follows.

Frequency (MHz)	Field Strength @ 10m (µV/m)	Measurement Distance (meters)	Field Strength (dBµV/m) @ 3m
30-88	90	3	49.5
88-216	150	3	54.0
216-960	210	3	57.0
Above 960	300	3	60.0

ICES-003 §5 Spurious Emissions Limits

Class A Digital Device: The field intensity of radio noise emissions that are radiated from a Class A digital apparatus shall not exceed the limits specified in Table 5 of the publication referred to in Section 7.1, within the indicated frequency range.

Frequency range MHz	Quasi-peak limits dB(µV/m) @ 10m	Quasi-peak limits dB(µV/m) @ 3m
30 to 230	40	50.5
230 to 1 000	47	57.5
Note 1	The lower limit shall apply at the transition frequency.	
Note 2	Additional provisions may be required for cases where interference occurs	

Class B Digital Device: The field intensity of radio noise emissions that are radiated from a Class B digital apparatus shall not exceed the limits specified in Table 6 of the publication referred to in Section 7.1, within the indicated frequency range.

Frequency range MHz	Quasi-peak limits dB(µV/m) @ 10m	Quasi-peak limits dB(µV/m) @ 3m
30 to 230	30	40.5
230 to 1 000	37	47.5
Note 1	The lower limit shall apply at the transition frequency.	
Note 2	Additional provisions may be required for cases where interference occurs	

Laboratory Measurement Uncertainty for Spectrum Measurement

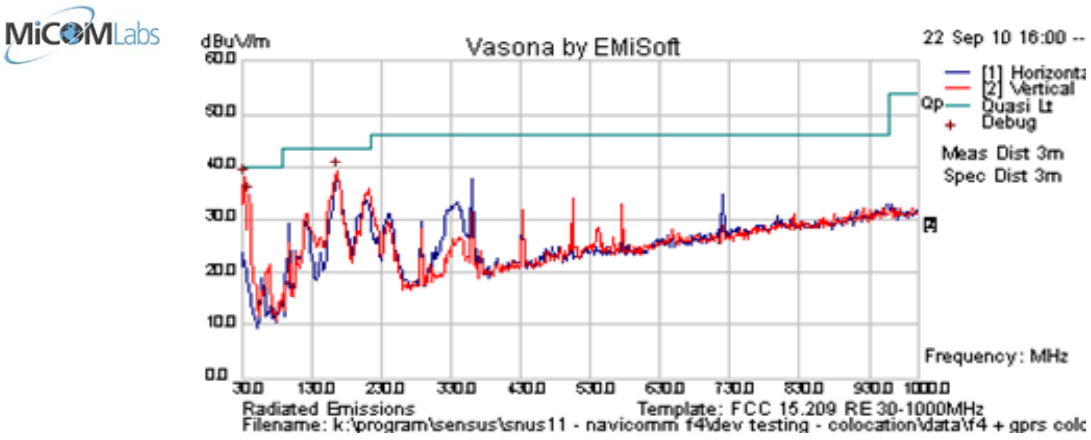
Measurement Uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Work instruction WI-03	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

7.1.1 Measurement Results for Radiated Spurious Emissions – Digital Apparatus

Test Freq.	N/A	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	25.5
Freq. Range	30 - 1000 MHz	**Rel. Hum.(%)**	34
Power Setting	120V AC 60 Hz	**Press. (mBars)**	1003
Antenna	Laird and Integral 2.4 GHz		
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
34.629	37.5	3.5	-13.1	27.9	Quasi Max	V	104	0	40	-12.1	Pass	
40.922	44.4	3.6	-17.6	30.4	Quasi Max	V	107	290	40	-9.6	Pass	
166.729	51.6	4.6	-18.8	37.3	Quasi Max	V	98	97	43.5	-6.2	Pass	
359.969	47.3	5.5	-15.1	37.6	Quasi Max	H	106	346	46	-8.4	Pass	
431.960	40.3	5.8	-13.8	32.2	Quasi Max	V	114	7	46	-13.8	Pass	
719.943	36.5	6.8	-9.5	33.8	Quasi Max	H	105	170	46	-12.2	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

7.2 Conducted Disturbance at Mains Terminal (150 kHz – 30 MHz)

Standard Reference

FCC, Part 15 Subpart C §15.107
Industry Canada ICES-003 §5.3

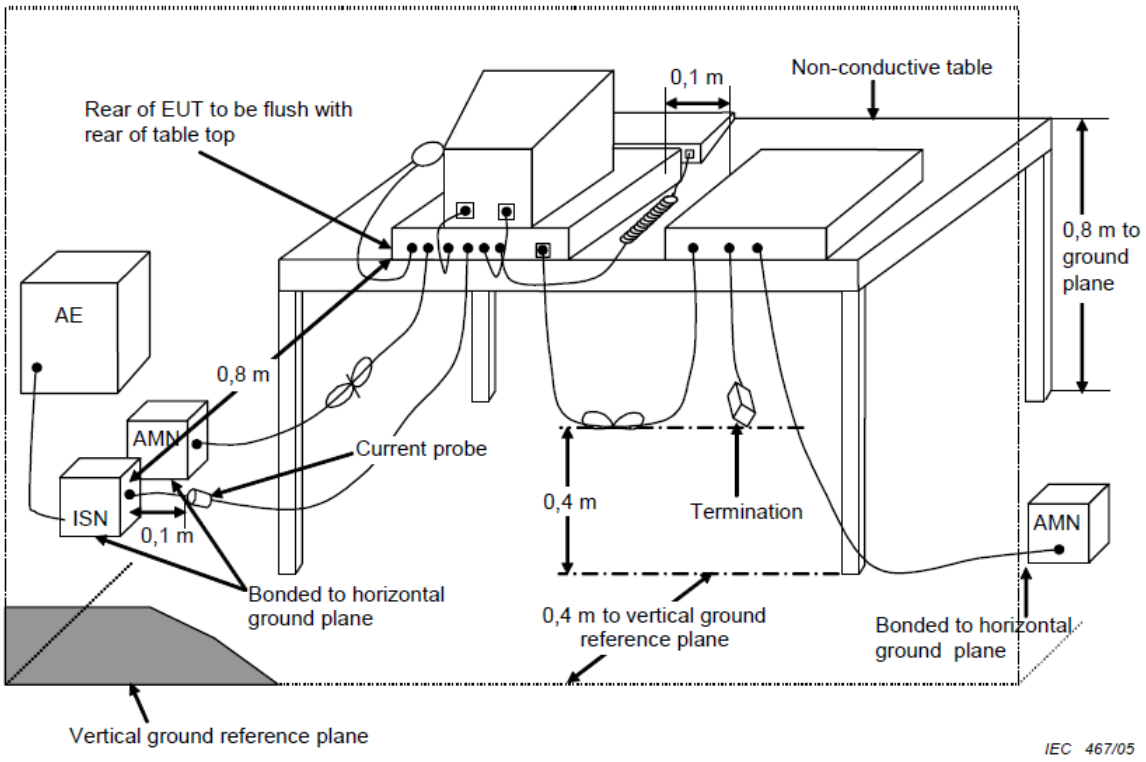
Test Procedure

The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

Test Measurement Set up



Measurement set up for Conducted Disturbance at Mains Terminals

Specification

Conducted Disturbance at Mains Terminal – Digital Apparatus

FCC, Part 15 Subpart B §15.107
(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Industry Canada ICES-003
The voltage of radio noise emissions that are conducted along the power supply lines of a Class A digital apparatus shall not exceed the limits specified in Table 1 of the publication referred to in Section 7.1 [Canadian Standards Association Standard CAN/CSA-CEI/IEC CISPR 22:02, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."], within the indicated frequency range.

The voltage of radio noise emissions that are conducted along the power supply lines of a Class B digital apparatus shall not exceed the limits specified in Table 2 of the publication referred to in Section 7.1 [Canadian Standards Association Standard CAN/CSA-CEI/IEC CISPR 22:02, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."], within the indicated frequency range.

FCC, Part 15 Subpart B §15.107 & Industry Canada ICES-003 Limits

Limits for conducted disturbance at the mains ports of class B ITE

Frequency of emission (MHz)	Quasi-peak dBuV	Average dBuV
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50
Note 1	* Decreases with the logarithm of the frequency	
Note 2	* The lower limit applies at the boundary between frequency ranges	

Limits for conducted disturbance at the mains ports of class A ITE

Frequency of emission (MHz)	Quasi-peak dBuV	Average dBuV
0.15–0.5	79	66
0.5–30	73	60
Note 1	* The lower limit shall apply at the transition frequency.	

Laboratory Measurement Uncertainty for Conducted Emissions

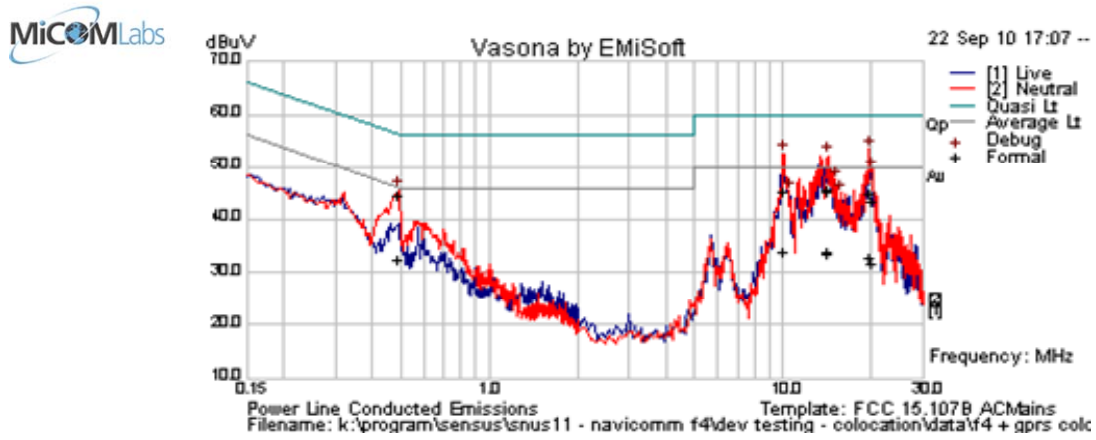
Measurement uncertainty	±2.64 dB

Traceability

Method	Test Equipment Used
Work instruction WI-EMC-01	0158, 0184, 0193, 0190, 0293, 0307

7.2.1 Conducted Disturbance at Mains Terminal (150 kHz – 30 MHz)

Test Freq.	N/A	**Engineer**	SB
Variant	AC Line Emissions	**Temp (ºC)**	25.5
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	34
Power Setting	120V AC 60 Hz	**Press. (mBars)**	1003
Antenna	N/A		
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
19.718	33.7	10.5	0.7	45.0	Quasi Peak	Neutral	60	-15.1	Pass	
10.174	34.7	10.3	0.4	45.4	Quasi Peak	Neutral	60	-14.6	Pass	
14.315	34.6	10.4	0.6	45.6	Quasi Peak	Neutral	60	-14.4	Pass	
0.492	34.7	9.9	0.1	44.7	Quasi Peak	Neutral	56.13	-11.4	Pass	
20.228	32.4	10.5	0.7	43.7	Quasi Peak	Neutral	60	-16.4	Pass	
14.391	34.5	10.4	0.6	45.5	Quasi Peak	Neutral	60	-14.5	Pass	
19.718	21.7	10.5	0.7	32.9	Average	Neutral	50	-17.1	Pass	
10.174	23.1	10.3	0.4	33.7	Average	Neutral	50	-16.3	Pass	
14.315	23.1	10.4	0.6	34.1	Average	Neutral	50	-15.9	Pass	
0.492	22.4	9.9	0.1	32.4	Average	Neutral	46.13	-13.7	Pass	
20.228	20.5	10.5	0.7	31.7	Average	Neutral	50	-18.3	Pass	
14.391	22.5	10.4	0.6	33.5	Average	Neutral	50	-16.5	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

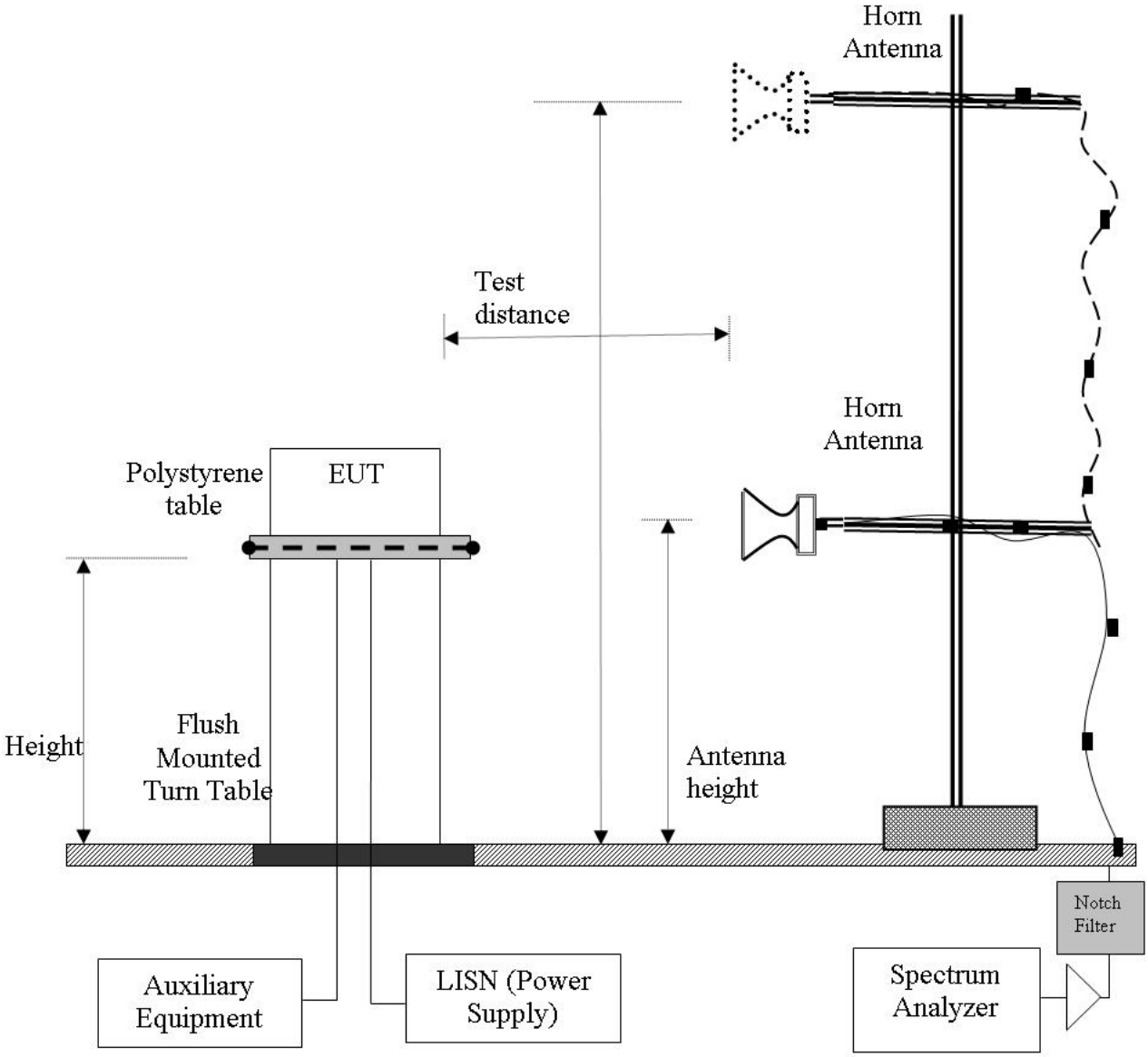
7.3 Radiated Spurious Emissions - Radio Collocation

Test Procedure

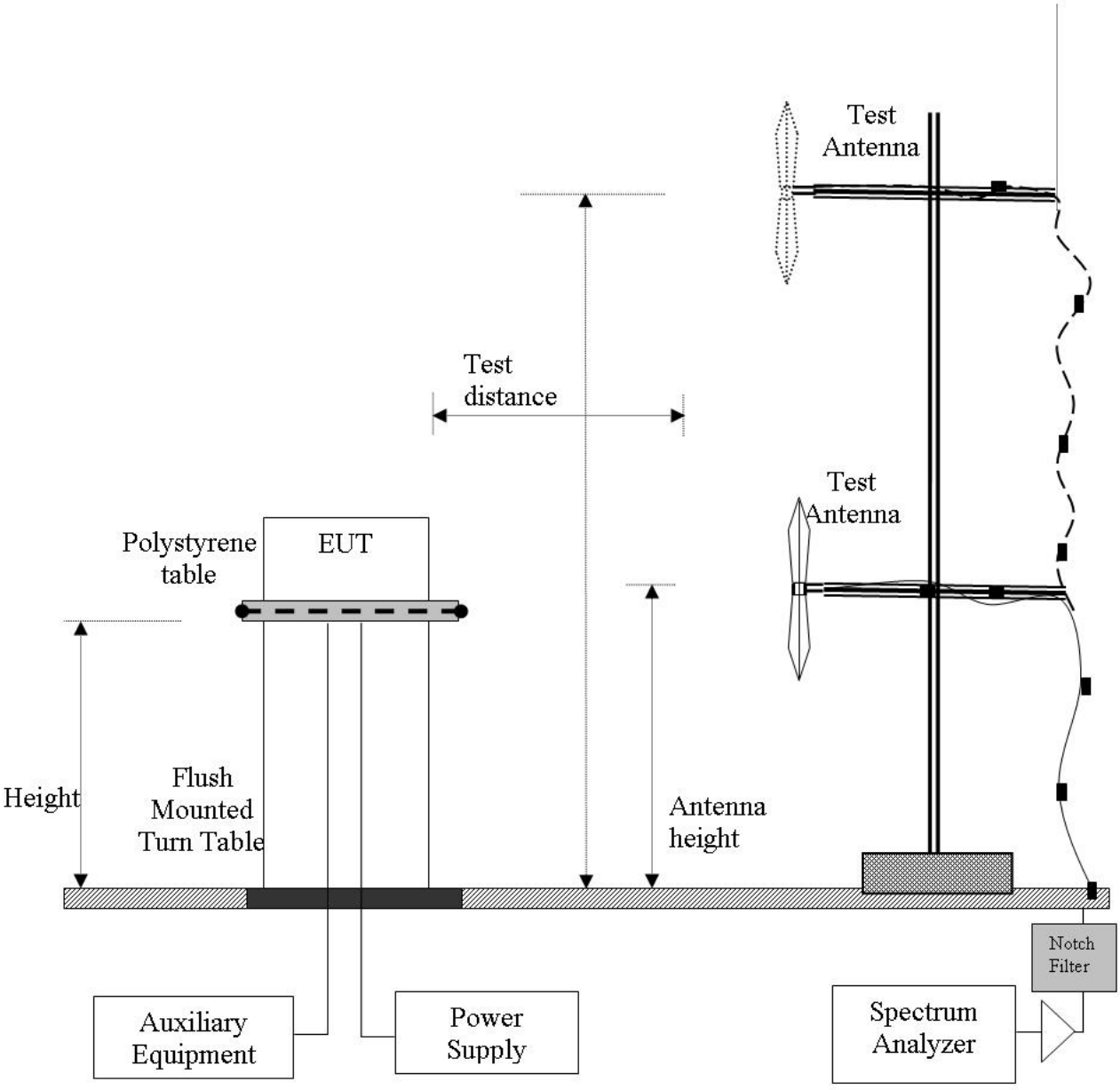
Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Radiated Emission Measurement Setup – Above 1 GHz



Radiated Emission Measurement Setup – Below 1 GHz



Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR – FO

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Specification FCC

Radiated Spurious Emissions

FCC §15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section §15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(a)).

FCC §15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

FCC §15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC §15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

Table 1: FCC 15.209 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Specification IC

Receiver Radiated Spurious Emissions

Industry Canada RSS-Gen §4.10
The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

RSS-Gen §6
If a radiated measurement is made, all spurious emissions shall comply with the limits of *Table 1: RSS-Gen §6 Spurious Emissions Limits.*

Table 1: RSS-Gen §6 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement Uncertainty	+5.6/ -4.5 dB

Traceability:

Method	Test Equipment Used
Work instruction WI-03	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

7.3.1 Measurement Results: F4 Radio Collocation

Testing was performed as detailed in the response to inquiry to FCC (Tracking Number 663683) concerning collocation testing of modules certified to two (2) different FCC parts.

Test Plan:

1) Test the device for spurious emissions with each radio operating independently to the applicable procedures / limits for each module.
2) Test the device for spurious emissions with both radios operating to access any intermodulation / mixing of spurious frequencies.
3) Investigate any new emissions that were not present on independent scans. These emissions should be less than the highest limits of the applicable rule parts for the radios used in the device.
4) Investigate amplitudes of emissions in step 2 to emissions in step 1. Emissions must still meet the limits of the rule part for the certified module.

Response per FCC KDB #663683:

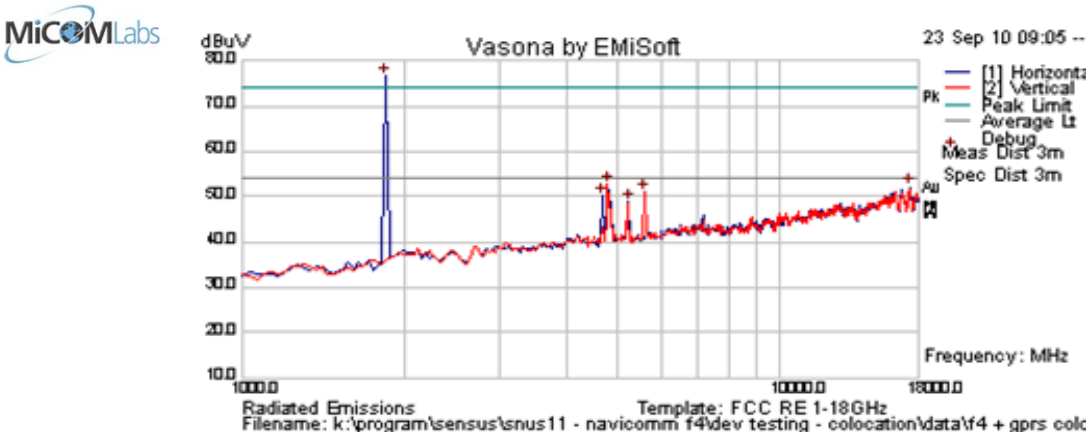
"If you are co-locating 2 certified devices and a motherboard into one enclosure, you must get a completely new certification for these devices co-located within the one enclosure.

The testing is such that you must turn both transmitters on, ie. both certified devices, and test the enclosure the device consisting of 2 certified devices such that they comply with all rule parts associated to each certified device. That is to say rule part 15.209 with both previously certified devices turn on and rule parts Part 22, Part 24, Part 90, Part 101 rules for the other device with both devices turned on."

Test Setup:
2.4GHz and GSM: GSM antenna connection terminated with 50 Ohm cable into Willtek 2201 Prolock. 2.4GHz using internal antenna. Band stop filter in line before preamplifier.

Results Summary:
No additional emissions were witnessed during Collocation testing. All emissions meet the requirements of their respective FCC parts.

Date	Wednesday, September 22, 2010	**Tracker #**	SNUS11
Test Freq.	2400.5 2482.5 (1&2 On); ; GPRS 1900 C	**Engineer**	SB
Variant	F4 GPRS radio w / 2.4GHz radio	**Temp (°C)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Maximum	**Press. (mBars)**	995
Antenna	See below	**Duty Cycle (%)**	99%
Test Notes 1	Both transmitters operating simultaneously; Fundamental attenuated by band stop filter.		
Test Notes 2	GPRS terminated w ith 50 Ohm cable; 802.11 connected to integral antenna		

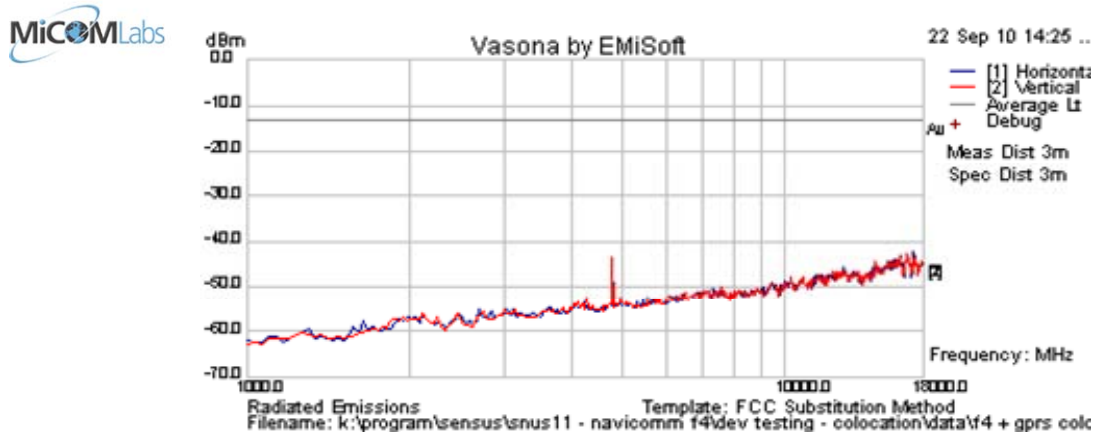


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
4800.992	56.0	4.5	-9.4	51.1	Peak Max	V	126	266	74.0	-22.9	Pass	
17352.274	43.1	8.7	2.0	53.7	Peak Max	H	152	43	74.0	-20.3	Pass	
5599.198	47.3	4.7	-8.6	43.3	Peak Max	V	111	192	74	-30.7	Pass	
4788.707	53.7	4.4	-9.4	48.7	Peak Max	H	103	76	74	-25.3	Pass	
5204.569	48.2	4.6	-9.5	43.3	Peak Max	H	152	129	74	-30.7	Pass	
4800.992	46.9	4.5	-9.4	42.0	Average Max	V	126	266	54	-12.0	Pass	
17352.274	30.0	8.7	2.0	40.7	Average Max	H	152	43	54	-13.3	Pass	
5599.198	34.2	4.7	-8.6	30.3	Average Max	V	111	192	54	-23.7	Pass	
4788.707	35.2	4.4	-9.4	30.2	Average Max	H	103	76	54	-23.8	Pass	
5204.569	34.9	4.6	-9.5	30.0	Average Max	H	152	129	54	-24.0	Pass	
1851.703	86.5	2.7	-12.5	76.6	Peak [Scan]	H	--	--	--	--	n/a	FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

Test Freq.	2400.5 2482.5 (1&2 On); ; GPRS 1900 C	**Engineer**	SB
Variant	F4 GPRS radio w / 2.4GHz radio	**Temp (°C)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Maximum	**Press. (mBars)**	995
Antenna	See below	**Duty Cycle (%)**	99%
Test Notes 1	Only GPRS Operation (-13 dBm limits); Fundamental attenuated by band stop filter.		
Test Notes 2	GPRS terminated w ith 50 Ohm cable; 802.11 connected to integral antenna		

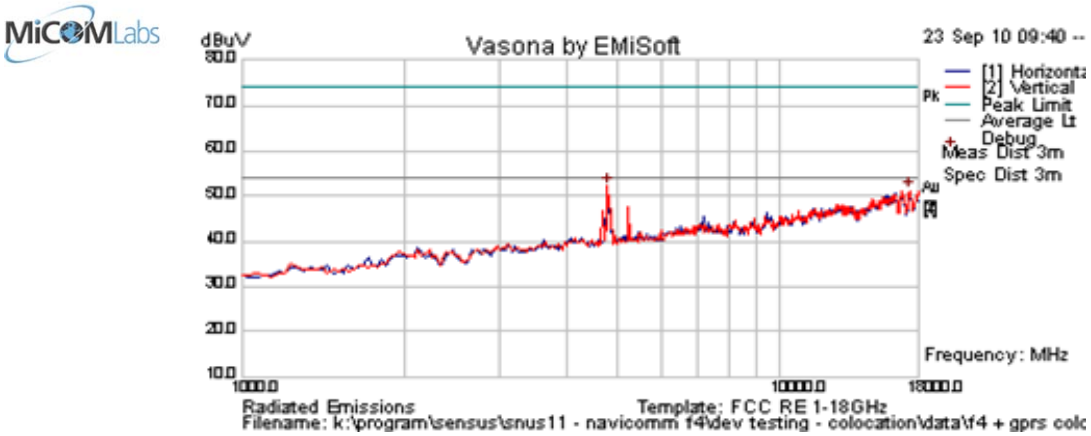


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
No emissions near limit.												

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

Test Freq.	2400.5 2482.5 (1&2 On); ; GPRS 1900 C	**Engineer**	SB
Variant	F4 GPRS radio w / 2.4GHz radio	**Temp (°C)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Maximum	**Press. (mBars)**	995
Antenna	See below	**Duty Cycle (%)**	99%
Test Notes 1	Only2.4GHz Operation (-13 dBm limits); Fundamental attenuated by band stop filter.		
Test Notes 2	GPRS terminated w ith 50 Ohm cable; 802.11 connected to integral antenna		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
All emissions measured in simultanious transmission plot.												

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

7.3.2 Measurement Results: G2 Radio Collocation

Testing was performed as detailed in the response to inquiry to FCC (Tracking Number 663683) concerning collocation testing of modules certified to two (2) different FCC parts.

Test Plan:

1) Test the device for spurious emissions with each radio operating independently to the applicable procedures / limits for each module.
2) Test the device for spurious emissions with both radios operating to access any intermodulation / mixing of spurious frequencies.
3) Investigate any new emissions that were not present on independent scans. These emissions should be less than the highest limits of the applicable rule parts for the radios used in the device.
4) Investigate amplitudes of emissions in step 2 to emissions in step 1. Emissions must still meet the limits of the rule part for the certified module.

Response per FCC KDB #663683:

"If you are co-locating 2 certified devices and a motherboard into one enclosure, you must get a completely new certification for these devices co-located within the one enclosure.

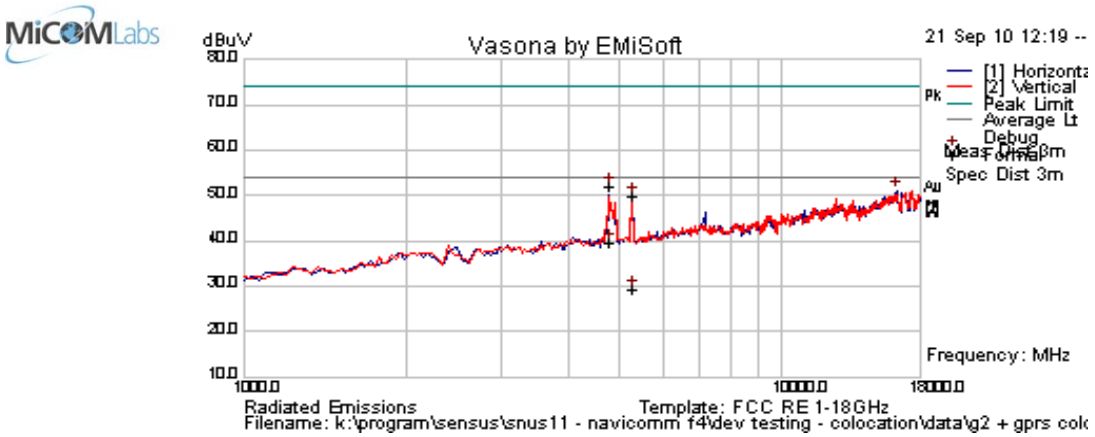
The testing is such that you must turn both transmitters on, ie. both certified devices, and test the enclosure the device consisting of 2 certified devices such that they comply with all rule parts associated to each certified device. That is to say rule part 15.209 with both previously certified devices turn on and rule parts Part 22, Part 24, Part 90, Part 101 rules for the other device with both devices turned on."

Test Setup:
2.4GHz and GSM: GSM antenna connection terminated with 50 Ohm cable into Willtek 2201 Prolock. 2.4GHz using internal antenna. Band stop filter in line before preamplifier.

Results Summary:
No additional emissions were witnessed during Collocation testing. All emissions meet the requirements of their respective FCC parts.

Date	Tuesday, September 21, 2010	**Tracker #**	SNUS11
Lab. Notes	Tx at 2400.5 MHz (sw itches 1&2 Off); 2482.5 MHz (Sw itches 1&2 On);		
Lab. Notes			

Test Freq.	2400.5 2482.5 (1&2 On); ; GPRS 1900 C	**Engineer**	SB
Variant	G2 GPRS radio w / 2.4GHz radio	**Temp (ºC)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Maximum	**Press. (mBars)**	995
Antenna	See below	**Duty Cycle (%)**	99%
Test Notes 1	Both transmitters operating simultaneously. Fundamental attenuated via band stop filter.		
Test Notes 2	GPRS terminated w ith 50 Ohm cable; 802.11 connected to integral antenna		

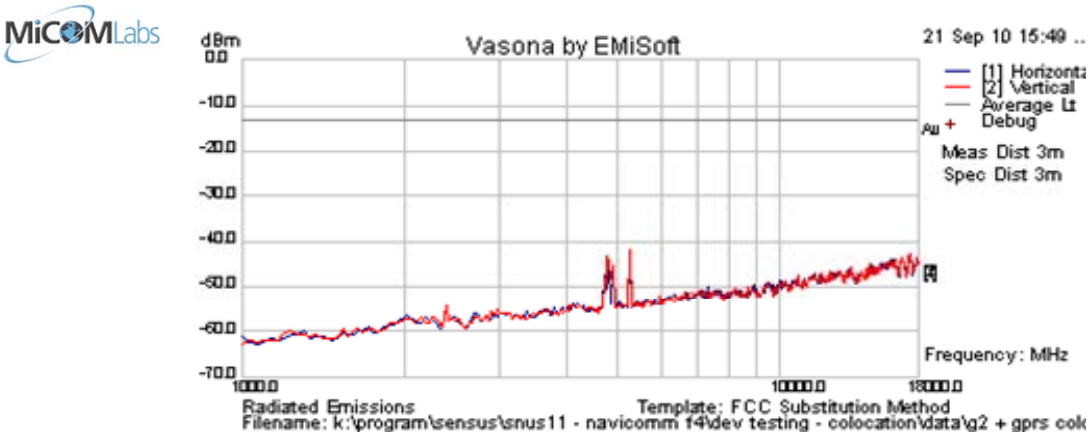


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
4800.721	44.6	4.5	-9.4	39.7	Average	H	98	337	54.0	-14.3	Pass	
4800.721	57.0	4.5	-9.4	52.1	Peak	H	98	337	74.0	-21.9	Pass	
5269.098	34.6	4.6	-9.7	29.5	Average	H	98	337	54	-24.6	Pass	
5269.098	54.8	4.6	-9.7	49.7	Peak	H	98	337	54	-4.3	Pass	Transient

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

Test Freq.	2400.5 2482.5 (1&2 On); ; GPRS 1900 C	**Engineer**	SB
Variant	G2 GPRS radio w / 2.4GHz radio	**Temp (°C)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Maximum	**Press. (mBars)**	995
Antenna	See below	**Duty Cycle (%)**	99%
Test Notes 1	Only GPRS Operation (-13 dBm limits); Fundamental attenuated via band stop filter.		
Test Notes 2	GPRS terminated w ith 50 Ohm cable; 802.11 connected to integral antenna		

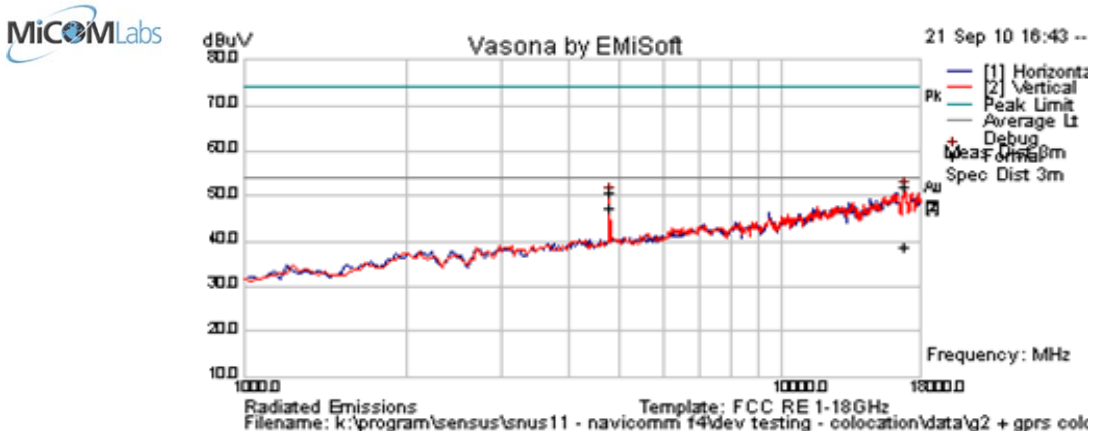


Formally measured emission peaks

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail	Comments
5262.084	-73.1	4.6	3.4	-65.0	Average Max	H	201	229	-13.0	-52.0	Pass	
2402.001	-74.6	3.0	1.9	-69.7	Average Max	H	163	342	-13.0	-56.7	Pass	
4801.017	-64.2	4.5	3.7	-56.1	Average Max	H	137	360	-13	-43.1	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

Test Freq.	2400.5 2482.5 (1&2 On); ; GPRS 1900 C	**Engineer**	SB
Variant	G2 GPRS radio w / 2.4GHz radio	**Temp (°C)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Maximum	**Press. (mBars)**	995
Antenna	See below	**Duty Cycle (%)**	99%
Test Notes 1	2.4GHz only (15.209 Limits); Fundamental attenuated via band stop filter.		
Test Notes 2	GPRS terminated w ith 50 Ohm cable; 802.11 connected to integral antenna		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
16878.247	42.4	8.6	1.1	52.0	Peak Max	V	121	149	74.0	-22.0	Pass	
4800.677	55.7	4.5	-9.4	50.8	Peak Max	H	98	237	74.0	-23.2	Pass	
16878.247	29.3	8.6	1.1	39.0	Average Max	V	121	149	54	-15.0	Pass	
4800.677	52.2	4.5	-9.4	47.3	Average Max	H	98	237	54	-6.7	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

7.3.3 Measurement Results: 900 Radio Collocation

Testing was performed as detailed in the response to inquiry to FCC (Tracking Number 663683) concerning collocation testing of modules certified to two (2) different FCC parts.

Test Plan:

1) Test the device for spurious emissions with each radio operating independently to the applicable procedures / limits for each module.
2) Test the device for spurious emissions with both radios operating to access any intermodulation / mixing of spurious frequencies.
3) Investigate any new emissions that were not present on independent scans. These emissions should be less than the highest limits of the applicable rule parts for the radios used in the device.
4) Investigate amplitudes of emissions in step 2 to emissions in step 1. Emissions must still meet the limits of the rule part for the certified module.

Response per FCC KDB #663683:

"If you are co-locating 2 certified devices and a motherboard into one enclosure, you must get a completely new certification for these devices co-located within the one enclosure.

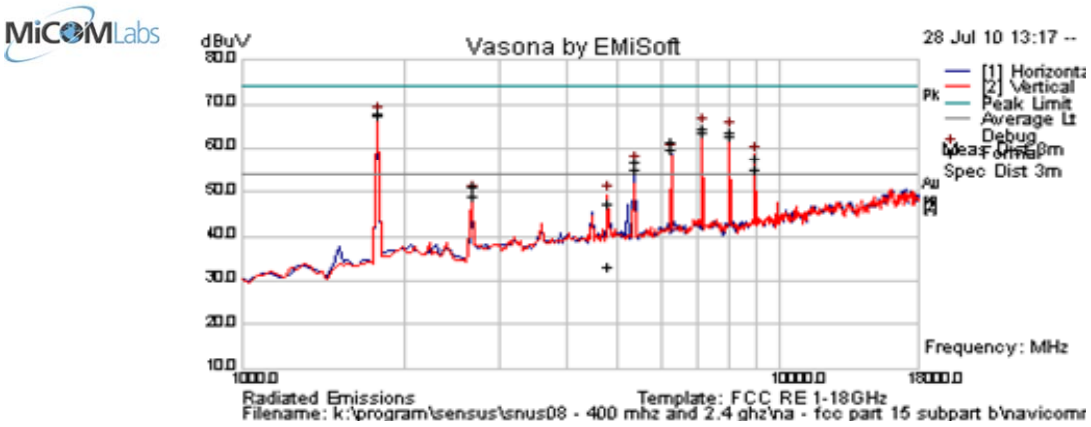
The testing is such that you must turn both transmitters on, ie. both certified devices, and test the enclosure the device consisting of 2 certified devices such that they comply with all rule parts associated to each certified device. That is to say rule part 15.209 with both previously certified devices turn on and rule parts Part 22, Part 24, Part 90, Part 101 rules for the other device with both devices turned on."

Test Setup:
2.4GHz and 900MHz: 900 MHz using external antenna. 2.4GHz using internal antenna. Band-stop filter in place before preamplifier to attenuate fundamental.

Results Summary:
No additional emissions were witnessed during Collocation testing. All emissions meet the requirements of their respective FCC parts.

The first plot below indicates a combination of emissions from both the 900 MHz radio and 2.4 GHz radio. The limits referenced in this plot are only the Part 15.209 limits. The source of the emissions were determined by operating each radio individually. Emissions that appear to be above the 15.209 average limit provided in the initial plot were determined to be from the 900 MHz radio, which requires compliance to FCC Part 90/Part 101, with a limit of -20 dBm.

Test Freq.	900MHz and 2.4GHz Radio	**Engineer**	CSB
Variant	Colocation Testing	**Temp (°C)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	Maximum	**Press. (mBars)**	1007
Antenna	Laird		
Test Notes 1	Both radios transmitting at maximum power with modulation. Emissions limits in plot are		
Test Notes 2	only Part 15 restricted band limits. These do not apply to all emissions in plot.		

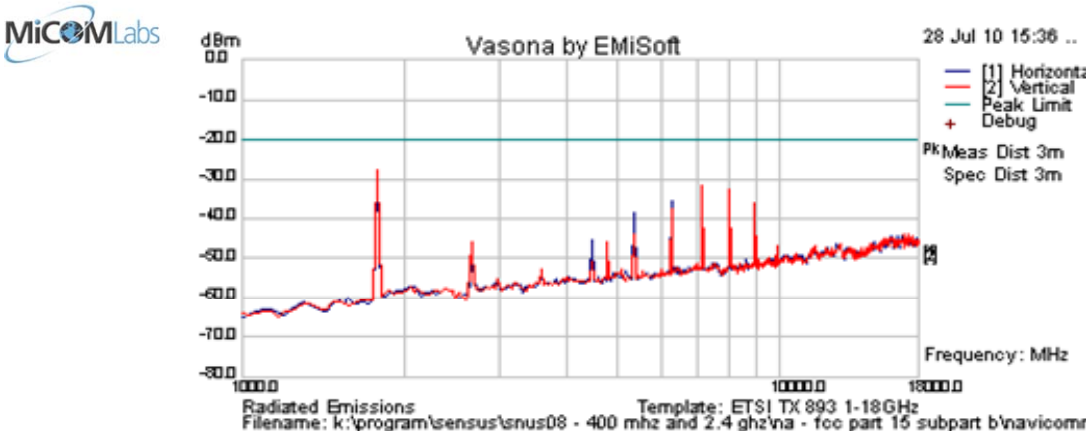


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
1792.002	77.7	2.6	-12.8	67.5	Average Max	V	102	98	54	13.5	N/A	NRB
1792.002	78.0	2.6	-12.8	67.8	Peak Max	V	102	98	74	-6.2	N/A	NRB
2688.039	59.3	3.2	-11.2	51.2	Peak Max	V	104	282	74	-22.8	N/A	NRB
2688.039	56.9	3.2	-11.2	48.9	Average Max	V	104	282	54	-5.1	N/A	NRB
4800.586	52.3	4.4	-9.4	47.4	Peak Max	V	130	77	74	-26.6	N/A	RB
4800.586	38.2	4.4	-9.4	33.3	Average Max	V	130	77	54	-20.7	N/A	RB
5376.065	61.5	4.6	-9.3	56.8	Peak Max	H	99	245	74	-17.2	N/A	RB
5376.065	59.7	4.6	-9.3	55.0	Average Max	H	99	245	54	1.0	N/A	RB
6272.093	63.2	5.0	-6.8	61.4	Peak Max	H	103	219	74	-12.6	N/A	NRB
6272.093	61.5	5.0	-6.8	59.7	Average Max	H	103	219	54	5.7	N/A	NRB
7168.081	63.3	5.4	-5.3	63.5	Average Max	V	109	232	54	9.5	N/A	NRB
7168.081	64.4	5.4	-5.3	64.5	Peak Max	V	109	232	74	-9.5	N/A	NRB
8064.128	62.3	5.6	-4.2	63.7	Peak Max	V	102	228	74	-10.3	N/A	RB
8064.128	61.2	5.6	-4.2	62.6	Average Max	V	102	228	54	8.6	N/A	RB
8960.128	53.0	6.2	-4.1	55.1	Average Max	V	101	246	54	1.1	N/A	NRB
8960.128	55.6	6.2	-4.1	57.7	Peak Max	V	101	246	74	-16.3	N/A	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

Test Freq.	900MHz and 2.4GHz Radio	**Engineer**	CSB
Variant	Colocation Testing	**Temp (°C)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	Maximum	**Press. (mBars)**	1007
Antenna	Laird	**Duty Cycle (%)**	0
Test Notes 1	Flexnet 900 Radio transmitting. Emissions frequencies identicle to combination.		
Test Notes 2	only Part 15 restricted band limits. These do not apply to all emissions in plot.		

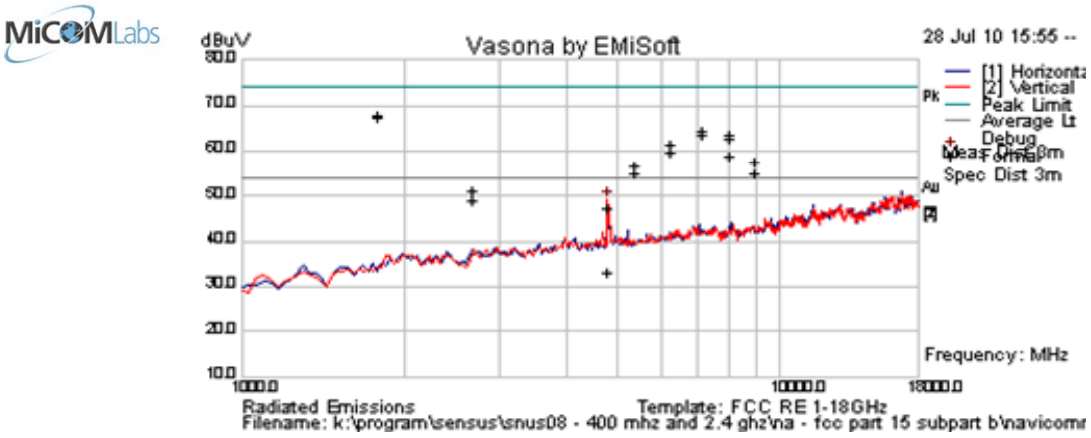


Formally measured emission peaks

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail	Comments
1792.002	-30.7	2.6	0.1	-28.1	Peak [Scan]	V	98	360	-20.0	-8.1	Pass	Flexnet 900
2688.039	-51.5	3.1	1.9	-46.5	Peak [Scan]	V	98	360	-20.0	-26.5	Pass	Flexnet 900
4800.586	-54.2	4.4	3.5	-46.2	Peak [Scan]	V	98	360	-20	-26.2	Pass	Flexnet 900
7168.081	-44.9	5.4	7.7	-31.8	Peak [Scan]	V	98	360	-20	-11.8	Pass	Flexnet 900
8064.128	-47.4	5.6	8.8	-33.0	Peak [Scan]	V	98	360	-20	-13.0	Pass	Flexnet 900
8960.128	-51.4	6.2	9.3	-35.9	Peak [Scan]	V	98	360	-20	-15.9	Pass	Flexnet 900
4475.448	-53.1	4.2	3.2	-45.8	Peak [Scan]	H	98	360	-20	-25.8	Pass	Flexnet 900
5376.065	-47.2	4.6	3.5	-39.1	Peak [Scan]	H	98	360	-20	-19.1	Pass	Flexnet 900
6272.093	-46.8	5.0	6.3	-35.5	Peak [Scan]	H	98	360	-20	-15.5	Pass	Flexnet 900

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

Test Freq.	900MHz and 2.4GHz Radio	**Engineer**	CSB
Variant	Colocation Testing	**Temp (ºC)**	26
Freq. Range	1000 - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	Maximum	**Press. (mBars)**	1007
Antenna	Laird	**Duty Cycle (%)**	0
Test Notes 1	2.4GHz 802.11 radio transmitting.		
Test Notes 2			



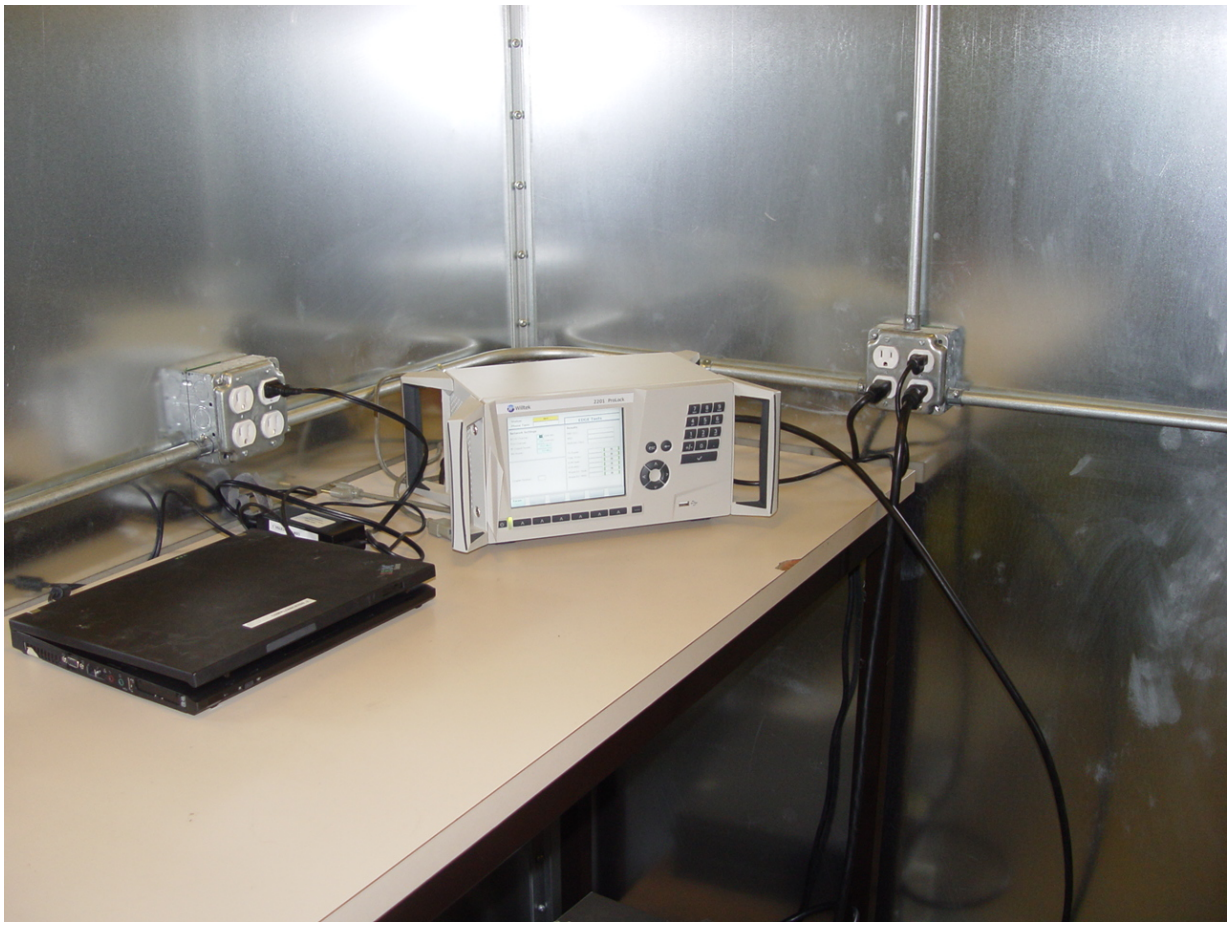
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
4800.681	54.2	4.5	-9.4	49.3	Peak [Scan]	V	100	0	54.0	-4.7	Pass	

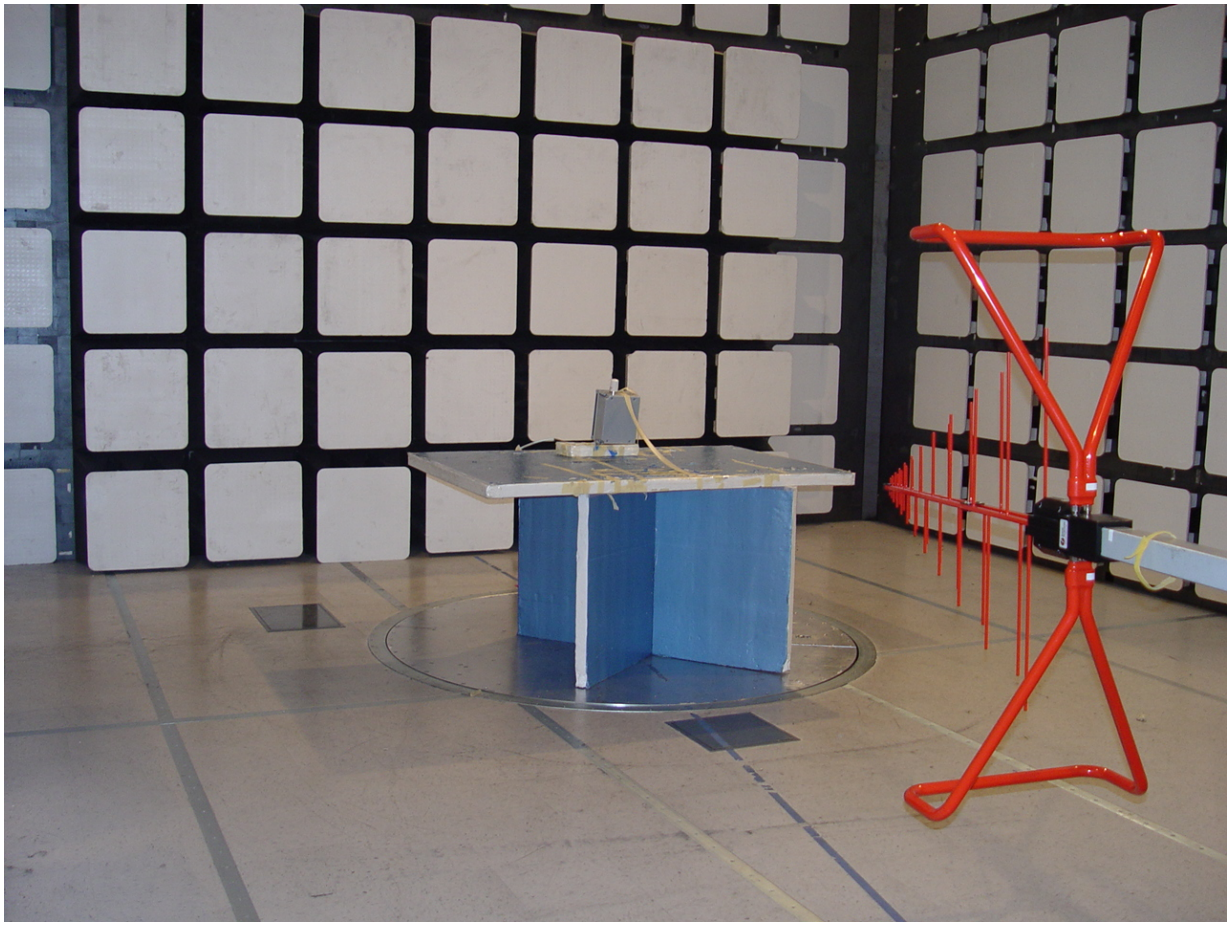
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. RB = Restricted Band.

8 Photographs

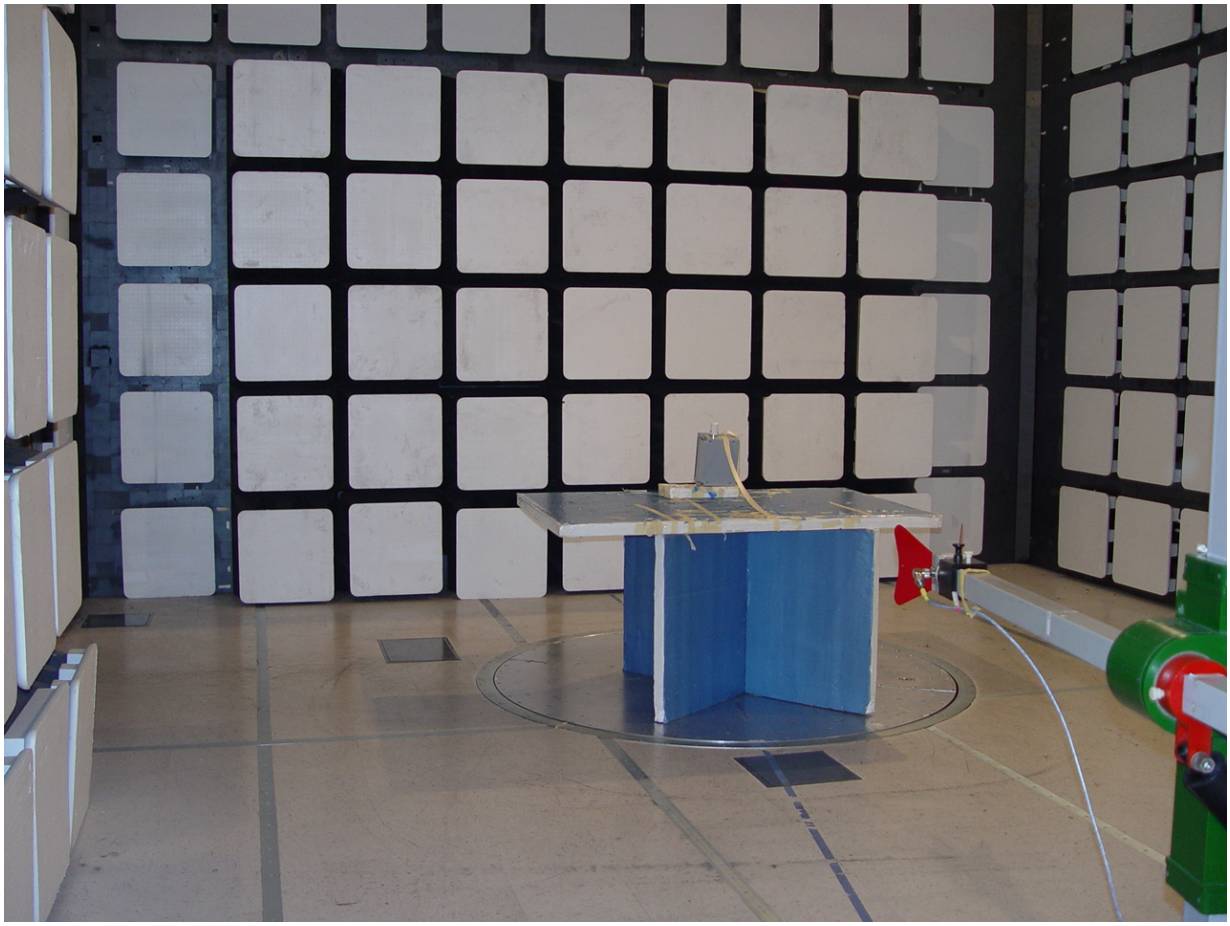
8.1 GPRS base station simulator setup



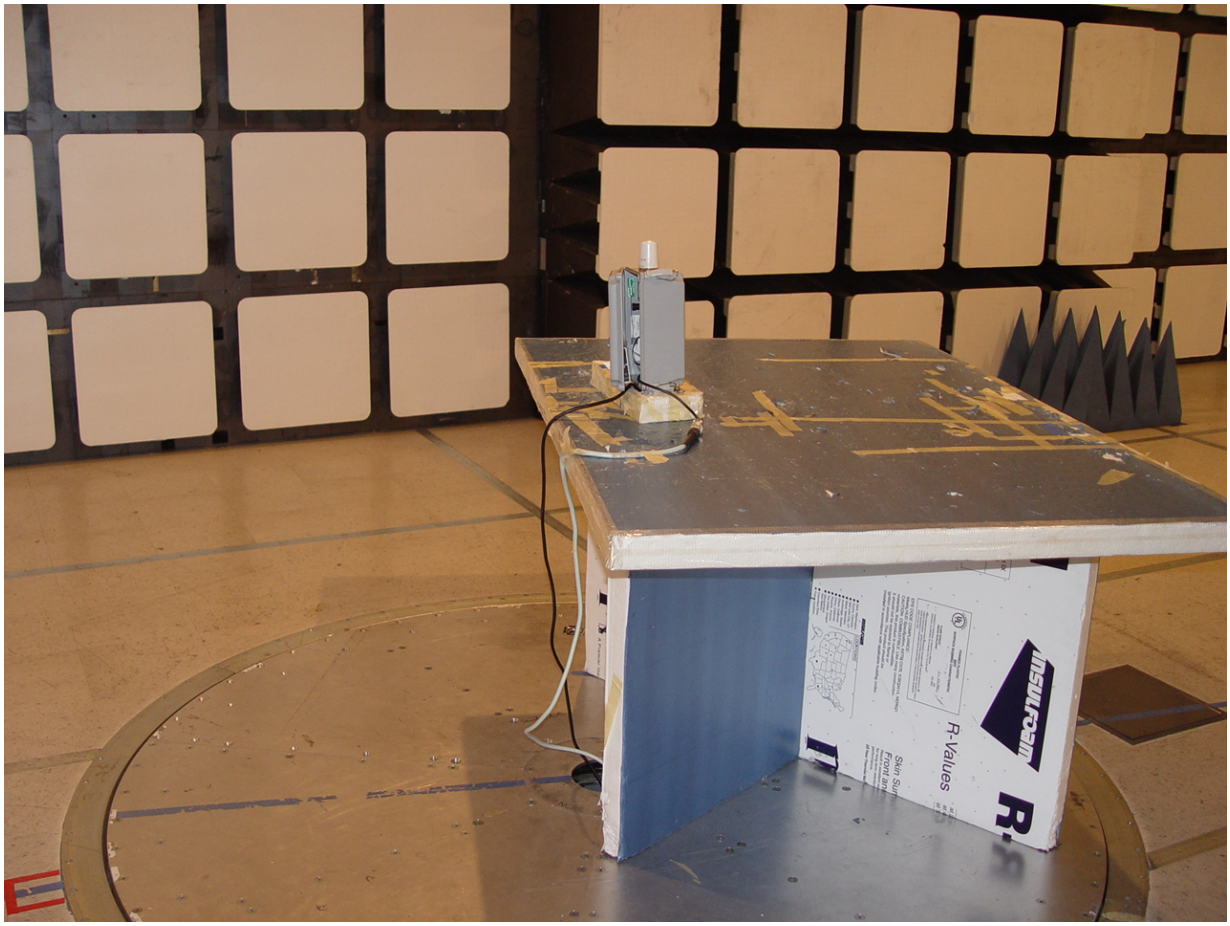
8.2 Navicomm with F4 Radio; Emissions 30 - 1000 MHz



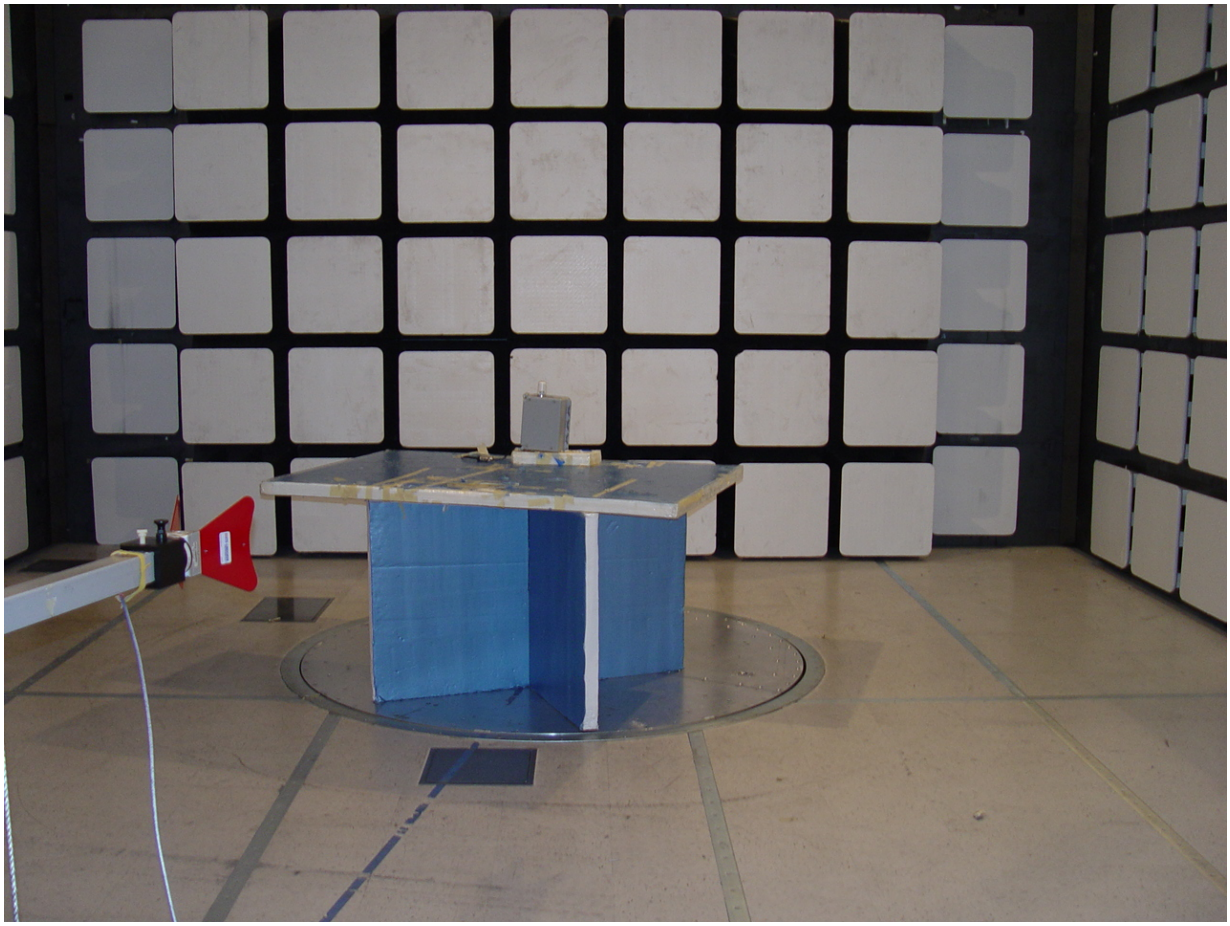
8.3 Navicomm with F4 Radio; Emissions above 1 GHz



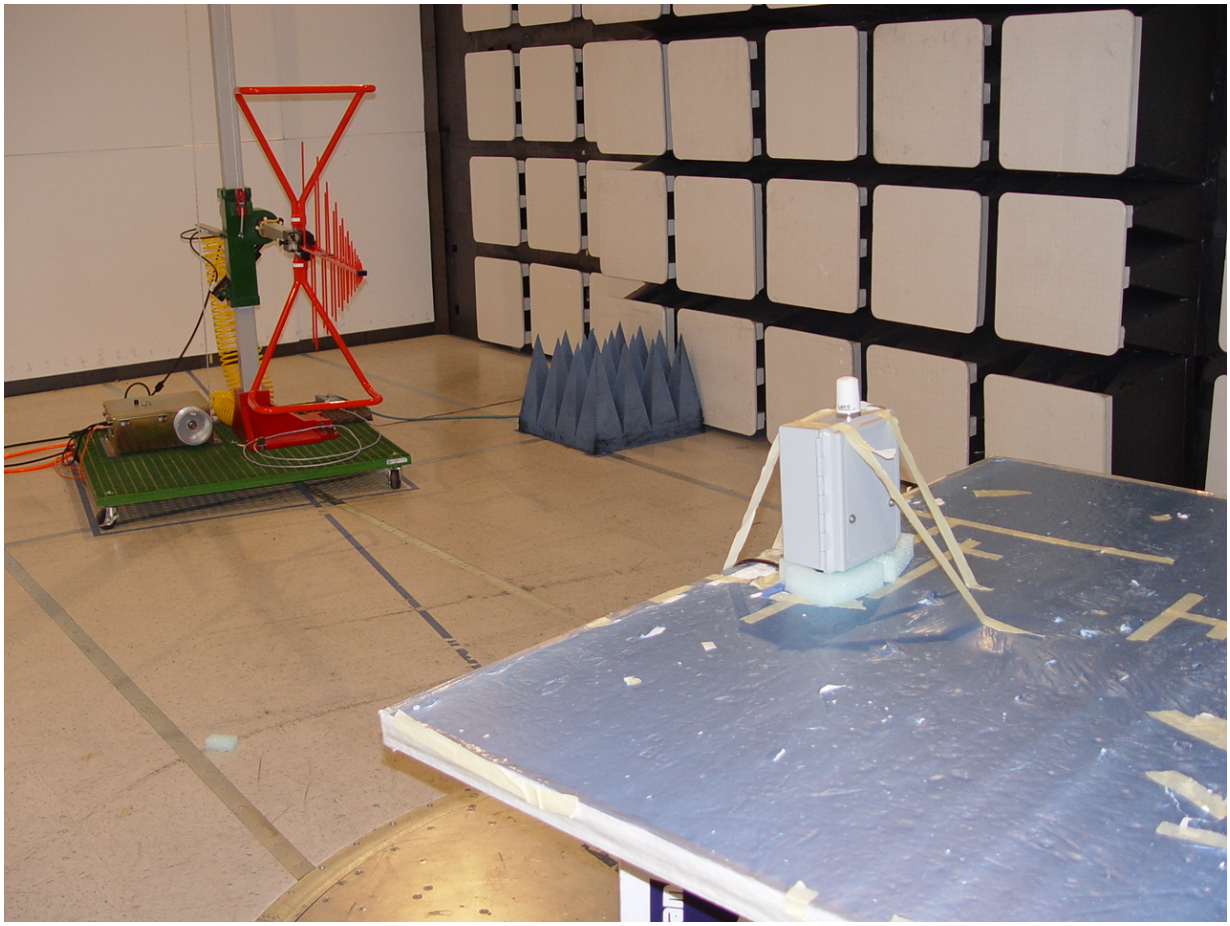
8.4 Navicomm with G2 Radio; Emissions 30 - 1000 MHz



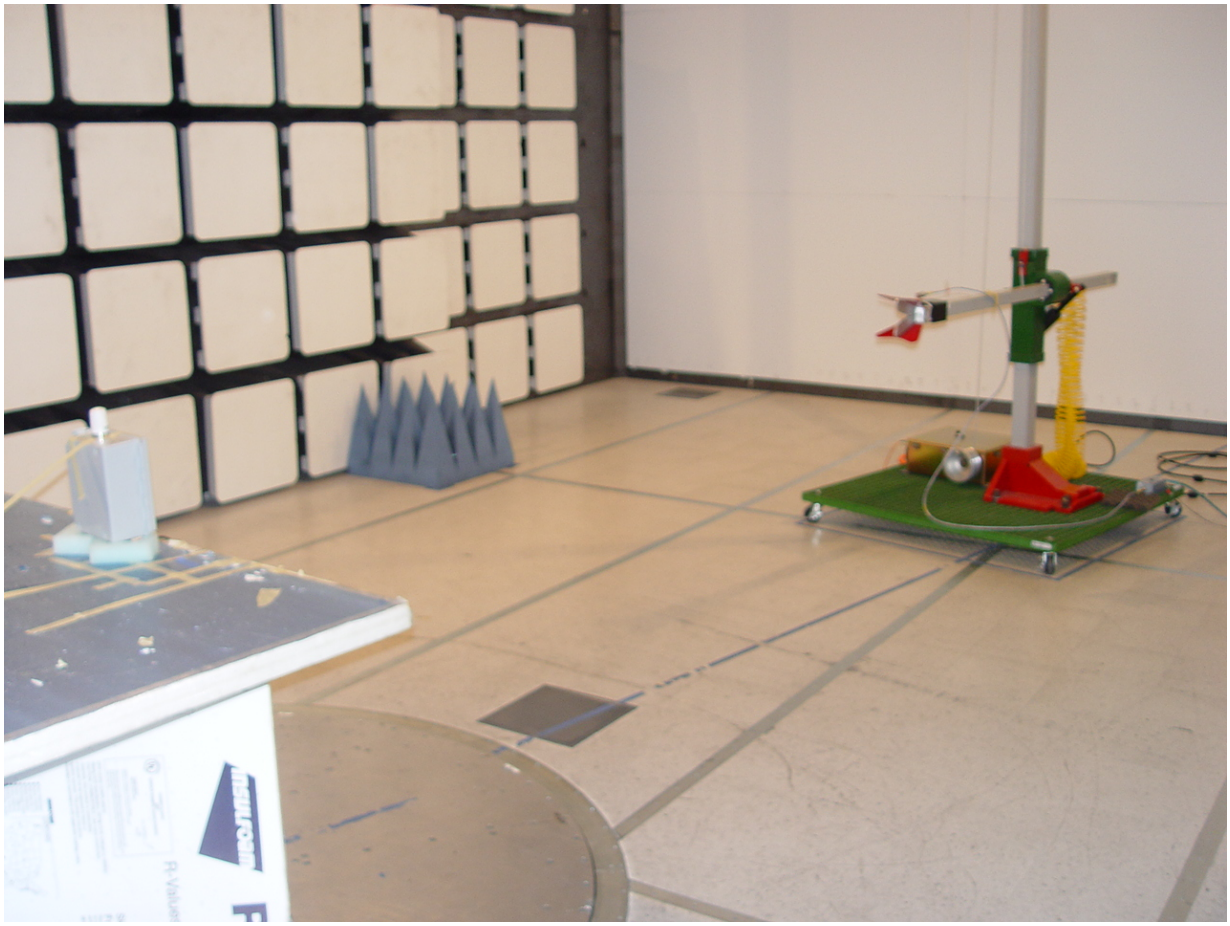
8.5 Navicomm with G2 Radio; Emissions above 1 GHz



8.6 Navicomm with 900MHz Radio; Emissions 30 - 1000 MHz



8.7 Navicomm with 900 MHz Radio; Emissions 30 - 1000 MHz



8.8 Navicomm emissions on AC Line

9 TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Model #	Serial #
0072	Signal Generator	Hewlett Packard	HP 83640A	2927A00105
0075	Environmental Chamber	Thermatron	SE-300-2-2	27946
0338	Antenna (30M-3GHz)	Sunol Sciences	JB3	A052907
0083	Coupler	Hewlett Packard	HP 87301D	3116A00389
0287	EMI Receiver	Rhode & Schwartz	ESIB 40	100201
0098	Oscilloscope	Hewlett Packard	54810A	US38100105
0335	Horn Antenna	The Electro-Mechanics Company	3117	00066580
0116	Power Sensor	Hewlett Packard	8485A	3318A19694
0117	Power Sensor	Hewlett Packard	8487D	3318A00371
0134	Amplifier	ComPower	PA-122	181910
0158	Barometer /Thermometer	Control Co.	4196	E2844
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007
0223	Power Meter	Hewlett Packard	HP EPM-442A	US37480256
0252	K-Cable	Megaphase	Sucoflex 104	Unknown
0253	K-Cable	Megaphase	Sucoflex 104	Unknown
0256	K-Cable	Megaphase	Sucoflex 104	Unknown
0251	K-Cable	Megaphase	Sucoflex 104	Unknown
0305	20M-2GHz Amplifier	ML	ML001	001
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001
0313	Coupler	Hewlett Packard	86205A	3140A01285
0314	30 dB N-Type Attenuator	ARRA	N944-30	1623
Dipole	20MHz-1GHz Dipole Antennas	EMCO	3121C	9009-505

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