Test of GE MDS Transceiver 4310a

To: FCC 47 CFR Part(s) 90

Test Report Serial No.: GEDE01-U1 Rev A

TEST REPORT

FROM

Test of GE MDS Transceiver 4310a

To FCC 47 CFR Part(s) 90

Test Report Serial No.: GEDE01-U1 Rev A

This report supersedes: NONE

Manufacturer: GE Microwave Data Systems LLC
175 Science Parkway
Rochester, New York 14620
USA

Product Function: Data Transceiver

Copy No: pdf **Issue Date:** 27th November 2012

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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Pleasanton, CA 94566 USA
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www.micomlabs.com

ACCREDITED
TESTING CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

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

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-2
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	210
	VCCI	--	--	No. 2959
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
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

**EU MRA – European Union Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

**NB – Notified Body

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

United States of America – Telecommunication Certification Body (TCB)
TCB Identifier – US0159

Industry Canada – Certification Body
CAB Identifier – US0159

Europe – Notified Body
Notified Body Identifier - 2280

Japan – Recognized Certification Body (RCB)
RCB Identifier - 210

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
A	27th November 2012	Initial Release This report supplements test data provided by the client to complete the Class II Permissive Change

1. TEST RESULT CERTIFICATE

Manufacturer:	GE Microwave Data Systems LLC 175 Science Parkway Rochester, New York 14620 USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	450 MHz Radio Transceiver	Telephone:	+1 925 462 0304
Model:	MDS 4310a	Fax:	+1 925 462 0306
S/N:	601053		
Test Date(s):	12th to 13th November 2012	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part(s) 90 Class II Permissive Change	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.

ACCREDITED
TESTING CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 90	2009	Code of Federal Regulations
(ii)	ANSI C63.4	2003	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
(iii)	CISPR 22/ EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(iv)	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
(v)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(vi)	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
(vii)	A2LA	14th September 2005	Reference to A2LA Accreditation Status – A2LA Advertising Policy
(viii)	FCC (OET)	15th April 2010	Compliance Management Guidance for Wireless Broadband Services Operating in the 3650-3700 MHz Band

2.2. 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.

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the GE MDS Transceiver 4310a to FCC 47 CFR Part(s) 90 regulations.
Applicant:	GE Microwave Data Systems LLC 175 Science Parkway Rochester, New York 14620 USA
Manufacturer:	As Applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	GEDE01-U1 Rev A
Date EUT received:	6th November 2012
Dates of test (from - to):	12th to 13th November 2012
Standard(s) applied:	FCC 47 CFR Part(s) 90
No of Units Tested:	1
Type of Equipment:	450 MHz Data Transceiver
Model:	MDS 4310a
Location for use:	Outdoor use only
Equipment Classification:	Land Mobile Applications
Declared Frequency Range(s):	Transmit: 450 - 470 MHz Receiver: 450 - 470 MHz
Type of Modulation:	4 Level FSK
Operational Bandwidth:	12.5 kHz
Declared Maximum Output Power:	+37.5 dBm
Transmit/Receive Operation:	Simplex
Hardware Release:	2314A12 Rev: Z
FCC ID:	E5M5LL2314
Rated Input Voltage and Current:	Input Nominal: +13.8 Vdc Range: +10.5 – 16.5 Vdc
Operating Temperature Range:	-30ºC to +55ºC
Equipment Dimensions:	2.0" x 5.62” x 7.25”
Weight:	.3.5 lbs
Primary function of equipment:	Data Transceiver

“

3.2. Scope of Test Program

The scope of the test program was to test the GE MDS Transceiver 4310a for compliance against the following standard;-

FCC 47 CFR Part 90, Subpart I requirements.

Applicable Variants
This report contains data with respect to a single modulation;

- 4 Level FSK

3.3. Equipment Model(s) and Serial Number(s)

EUT/ Support	Manufacturer	Equipment Description (Including Brand Name)	Model No.	Serial No.
EUT	GE MDS 4310a	450 MHz MDS Transceiver	MDS 4310a	601053
Support	Remote Maintenance Module	Handheld	--	--

3.4. Antenna Details

Antenna Type	Gain (dBd)	Gain (dBi)	Manufacturer	Manufacturing No.	Serial No.
Omni	5	7.14	PCTEL	ZX2395	--
Yagi	10	12.14	SCALA	CA7-460	--

Note: No antennae were tested as part of this program.

3.5. Cabling and I/O Ports

Number and type of I/O ports

Type of I/O Port	Description	Screened	Length
Antenna Port	N-Type Connector	N/A	
Voltage	2-pin molded Riaconn	y	< 1 Meter
DB25	Local Maintenance Terminal	n	3'
Status LEDS	--	N/A	N/A

3.6. Test Configurations

Test Matrix V's Variants

Parameter	Operational Mode	Test Conditions	Bandwidths (KHz)
Output power	Modulated	Ambient, +13.8 Vdc	12.5, 25.0
Occupied BW			
Frequency Stability	Single Tone (CW)	-30°C to +60°C + Voltage Variation +10.5 – 16.5 Vdc	N/A
Conducted Spurious Emissions	Modulated	Ambient, +13.8 Vdc	N/A
Radiated Spurious Emissions	Modulated	Ambient, +13.8 Vdc	N/A
Digital Emissions	Receiver	Ambient, +13.8 Vdc	N/A
AC Wireline Emissions	Modulated	Not Tested – EUT is dc power	N/A

Test Frequencies

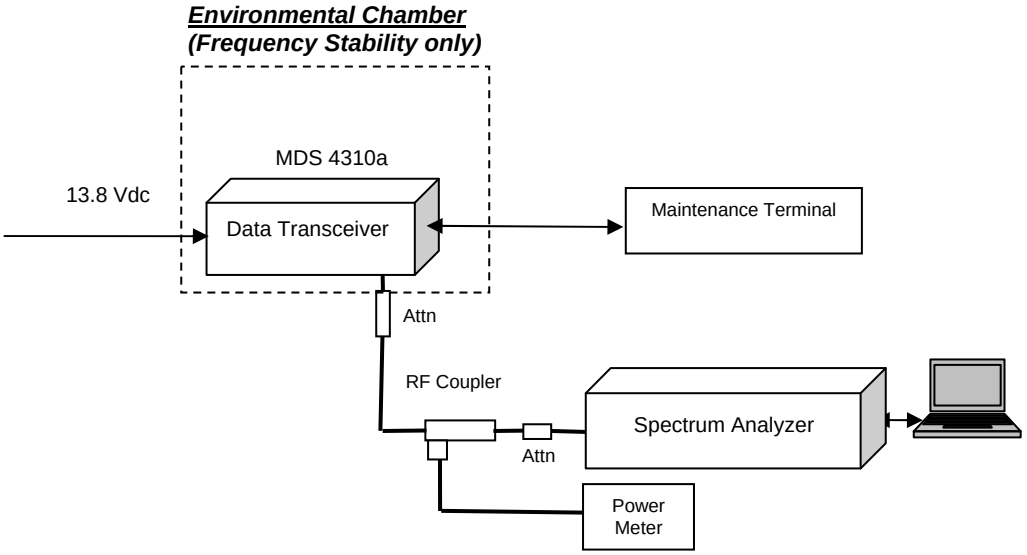
For testing in accordance with 47 CFR 2.1046-2, 1057, FCC OET recommends the following is used to select test frequencies for licensed devices;

Frequency Range of Device	Number of Selected Frequencies	Location in Range of Operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
10 to 100 MHz	3	1 near top, 1 near middle, 1 near bottom

Test Frequency Selection
The EUT is a single frequency device therefore only one frequency was required 450.5 MHz

Test Set-Up

The MDS 4310a conducted testing was implemented using the following test configuration.



Conducted Test Set-Up

3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

3.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

3.9. Subcontracted Testing or Third Party Data

1. NONE

4. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 90**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
2.1046	Output Power	Modulated Output Power	Conducted	Complies	5.1.1
90.210 (j)	Occupied Bandwidth	Bandwidth	Conducted	Complies	5.1.2
2.1055, 90.213	Frequency Stability	Includes temperature and voltage variations	Conducted	Complies	5.1.3
90.210 (j)	Conducted Spurious Emissions	Emissions from Antenna Port	Conducted	Complies	5.1.4
90.210 (j) **ANSI/TIA-603**	Radiated Spurious Emissions	Spurious emissions	Radiated	Complies	5.1.5

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 3.7 'Equipment Modifications' highlight the equipment modifications that were required to bring the product into compliance with the above matrix*

5. TEST RESULTS

5.1. Device Characteristics

5.1.1. Output Power

FCC 47 CFR Part 90 Subpart 90.210 (j)

Test Procedure
The transmitter output was connected to an average power meter and the Output Power was measured on a modulated carrier under all operational modes.

Output Power was measured under ambient conditions, nominal voltage for all modulations and rule parts for the applicable frequency channels.

Test Set-up is shown in Section 3.6 Test Configuration

Ambient conditions.
Temperature: **17 to 23** °C Relative humidity: **31 to 57** % Pressure: **999 to 1012** mbar

Part 90 Measurement Results

Center Frequency (MHz)	Output Power (dBm) - 4 Level FSK
450.5	+37.46

Laboratory Measurement Uncertainty for Power Measurement

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Output Power'	0070, 0116, 0158, 0193, 0252, 0313, 0314.

5.1.2. Occupied Bandwidth

FCC 47 CFR Part 90 Subpart 90.210 (j)

Test Procedure
The transmitter output was connected to a spectrum analyzer and the Occupied Bandwidth was measured with a modulated and un-modulated carrier.

Occupied Bandwidth was measured under ambient conditions, nominal voltage. The spectrum analyzer RBW and VBW was set for 100/300 Hz which was based on the bandwidth of the output spectrum.

Test Set-up is shown in Section 3.6 Test Configuration

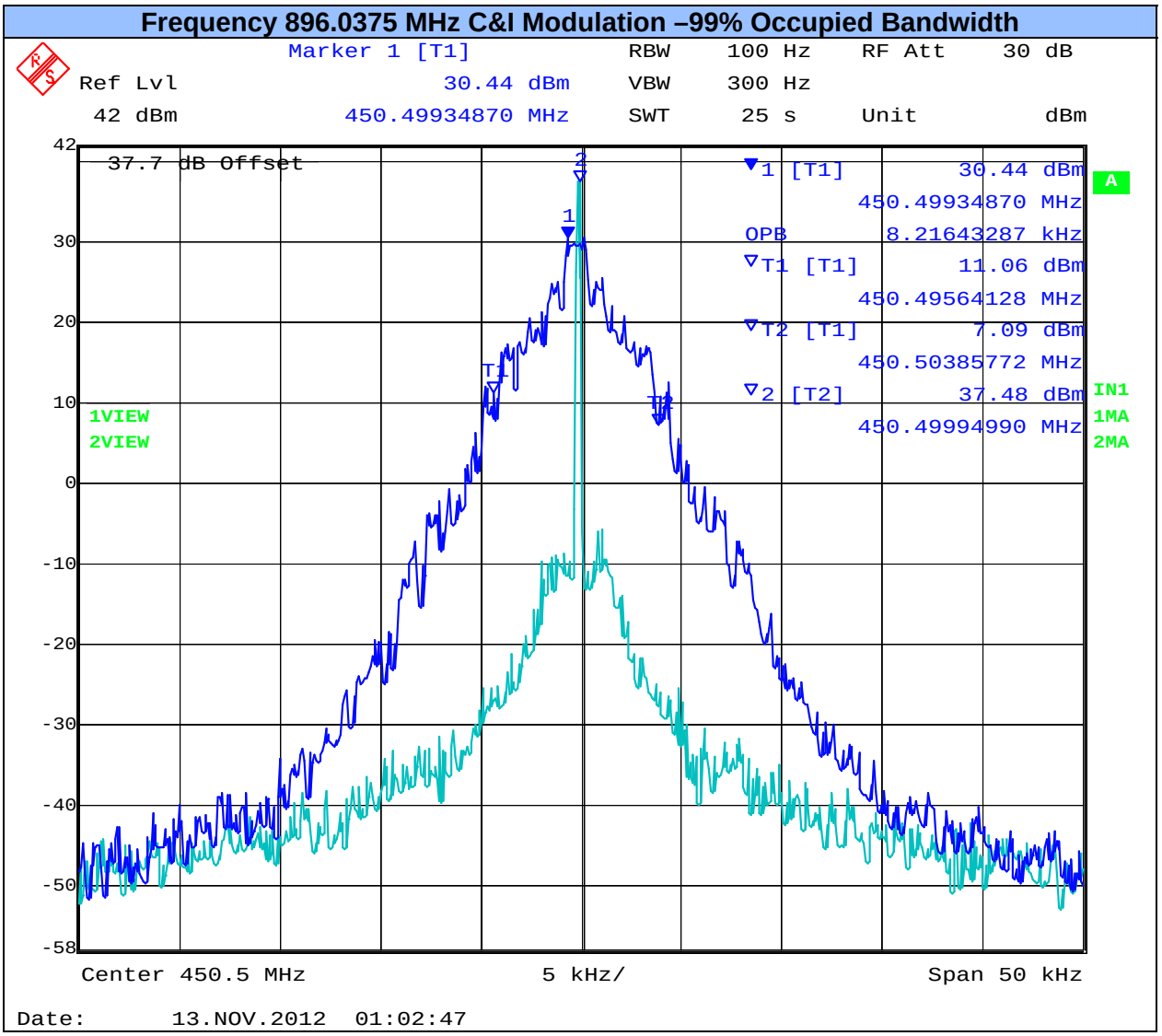
Ambient conditions.
Temperature: **17 to 23** °C Relative humidity: **31 to 57** % Pressure: **999 to 1012** mbar

PART 24 RESULTS

Measurement Results – Occupied Bandwidth + Plot

Center Frequency (MHz)	99% Bandwidth (kHz) - 4 Level FSK
450.5	8.216

Part 90.210 Measurement Results



Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0070, 0116, 0158, 0193, 0252, 0313, 0314.

5.1.3. Frequency Stability; Temperature Variations, and Voltage Variations

FCC 47 CFR Sections 2.1055, 90.213,

Test Procedure
The EUT was placed inside an environmental chamber. The transmitter output was connected to a spectrum analyzer and the frequency stability was measured using a un-modulated (CW) single tone. A thermocouple was used to monitor chamber temperature. The EUT was attached to a variable power supply providing the primary supply voltage.

Frequency stability was measured through the extremes of temperature and voltage on the mid channel of each frequency band. Before measurements were taken at each temperature the equipment waited until thermal balance was obtained.

At +20°C the primary voltage was varied ±15% and measurements were taken at each voltage level.

Test Set-up is shown in Section 3.6 Test Configuration

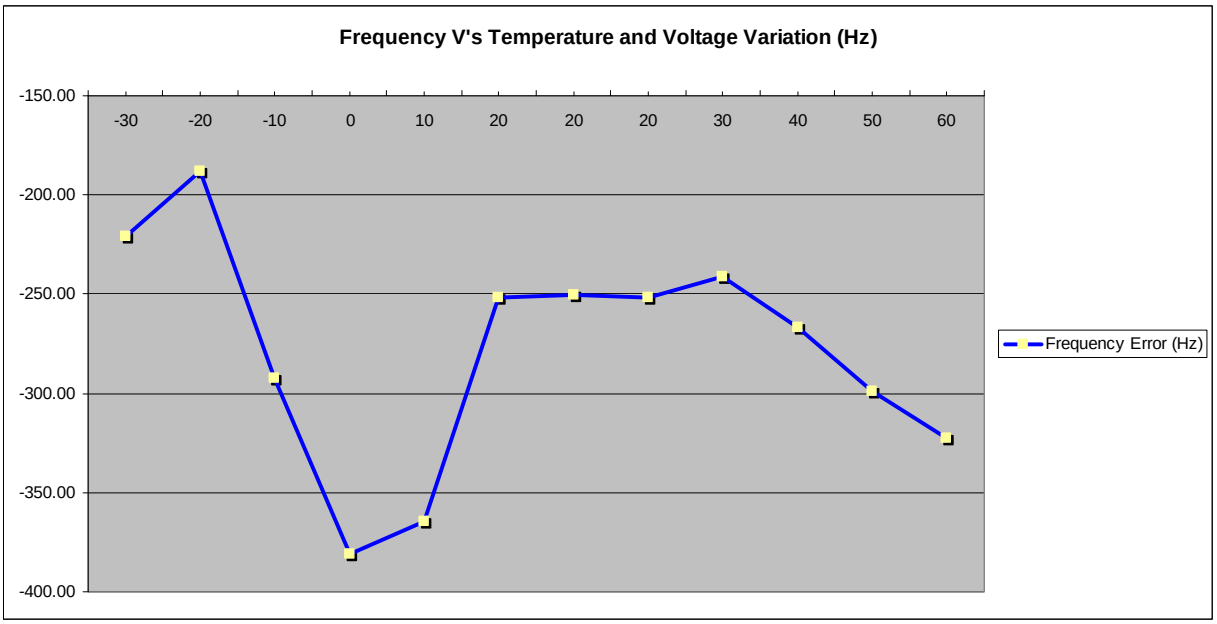
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

TABLE OF RESULTS Frequency Stability – Channel Measured 896.0125 MHz

EUT Classification: Mobile Applications

Voltage	Temperature (°C)	Center Frequency (MHz)	Delta (Hz)	ppm	Limit
13.8 Vdc	-30	450.49977891	-221.09	-0.49	-2.01
	-20	450.49981167	-188.33	-0.42	-2.08
	-10	450.49970757	-292.43	-0.65	-1.85
	+0	450.49961904	-380.96	-0.85	-1.65
	+10	450.49963558	-364.42	-0.81	-1.69
	+20	450.49974811	-251.89	-0.56	-1.94
11.73 Vdc	+20	450.49974971	-250.29	-0.56	-1.94
15.87 Vdc	+20	450.49974831	-251.69	-0.56	-1.94
13.5 Vdc	+30	450.49975853	-241.47	-0.54	-1.96
	+40	450.49973328	-266.72	-0.59	-1.91
	+50	450.49970092	-299.08	-0.66	-1.84
	+60	450.49967737	-322.63	-0.72	-1.78
Maximum Frequency Drift with respect to the nominal frequency		-380.96 Hz to -188.33 Hz -0.85 ppm / -0.42 ppm			

Limit ±2.5 ppm for Fixed and Base Stations



Limits
§ 90.213 (a) Frequency stability

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

MINIMUM FREQUENCY STABILITY [Parts per million (ppm)]

Frequency Range (MHz)	Fixed and Base Stations (ppm)	Mobile Stations (ppm)	
		Over 2 watts output power	2 watts or less output power
421 - 512	±2.5	±1.5	±1.5

Laboratory Uncertainty for Frequency Measurements

Measurement uncertainty (dB)	±0.86ppm

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-02 'Frequency Measurement"	0075, 0156, 0193, 0252, 0313, 0314

5.1.4. Spurious Emissions from Antenna Terminals

FCC 47 CFR Part 90 Subpart 90.210 (j)

Test Procedure
The transmitter output was connected to a spectrum analyzer and the Spurious Emissions were measured using an un-modulated carrier.

Spurious Emissions were measured under ambient conditions, nominal voltage for all rule parts on low and high channels for the particular frequency band.

The limit line was calculated from the attenuation characteristics found within each rule part.

Limit = 43 + 10 * Log (P) where P is in Watts

Limit = -13 dBm

Test Set-up is shown in Section 3.6 Test Configuration

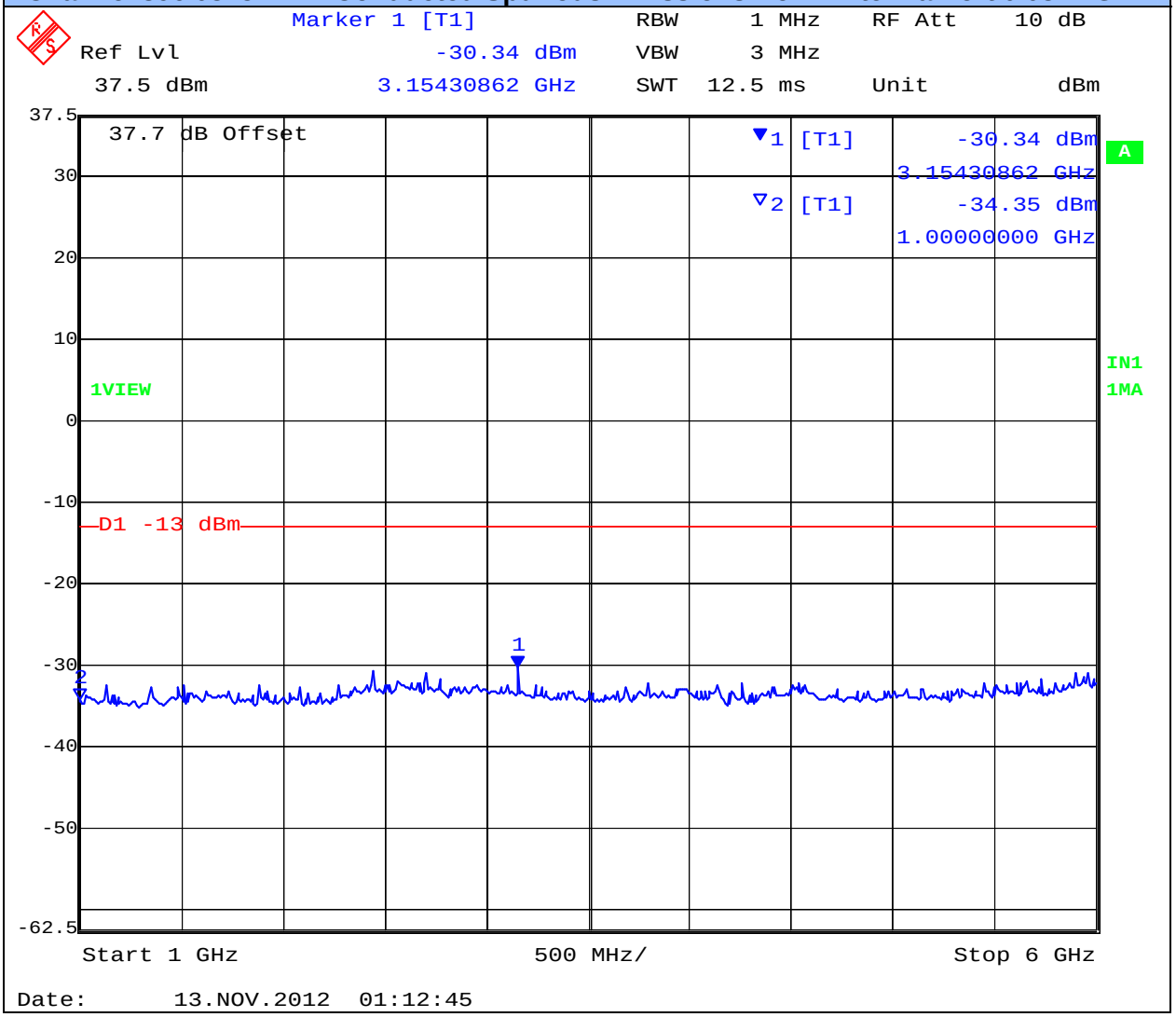
Ambient conditions.
Temperature: **17 to 23** °C Relative humidity: **31 to 57** % Pressure: **999 to 1012** mbar

PART 90 RESULTS

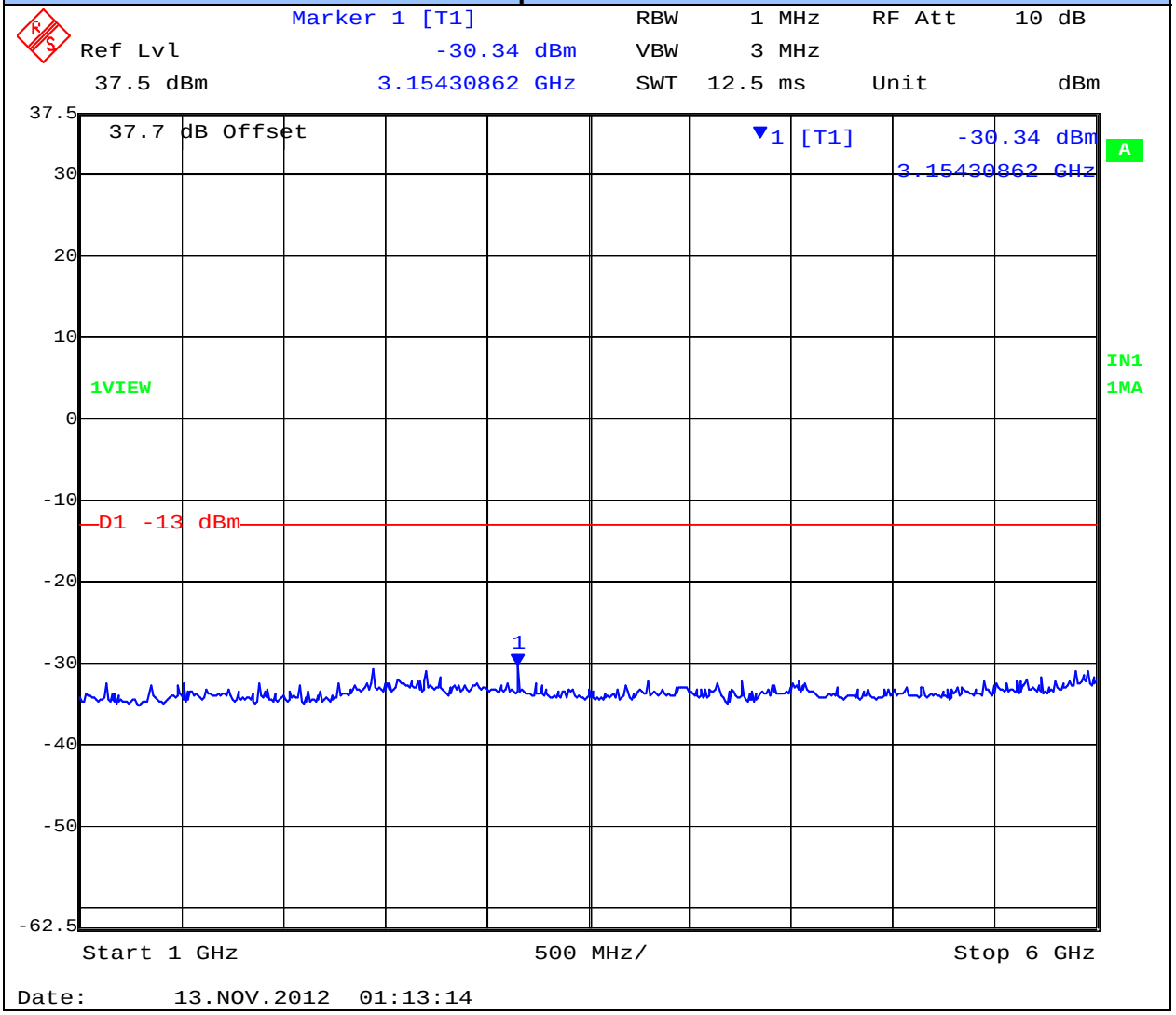
Part 90.210 j Measurement Results – Conducted Spurious Emissions

Channel Centre Frequency (MHz)	Start Frequency (MHz)	Stop Frequency (MHz)	Maximum Emission Observed (dBm)	Limit (dBm)	Margin (dB)
450.5	30	1,000	-30.34	-13	-13.34
	1,000	6,000	-34.35		-17.34

Channel 896.0375 MHz–Conducted Spurious Emissions from Antenna Port 0.03–1 GHz



Channel 896.0375 MHz–Conducted Spurious Emissions from Antenna Port 1– 6 GHz



Laboratory Measurement Uncertainty for Power Measurement

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Output Power'	0070, 0116, 0158, 0193, 0252, 0313, 0314.

5.1.5. Radiated Spurious Emissions

5.1.5.1. Transmitter Radiated Emissions above 1 GHz

FCC 47 CFR Part 90 Subpart 90.210 (j)
ANSI/TIA-603

Test Procedure
Test was performed on a CW (continuous) carrier at the maximum allowed output power at the appropriate center frequency. Substitution was performed on any emissions observed within 6 dB of the limit.

ANSI/TIA-603 was used in order to prove compliance

The measurement equipment was set to measure in peak hold mode. The emissions were measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode.

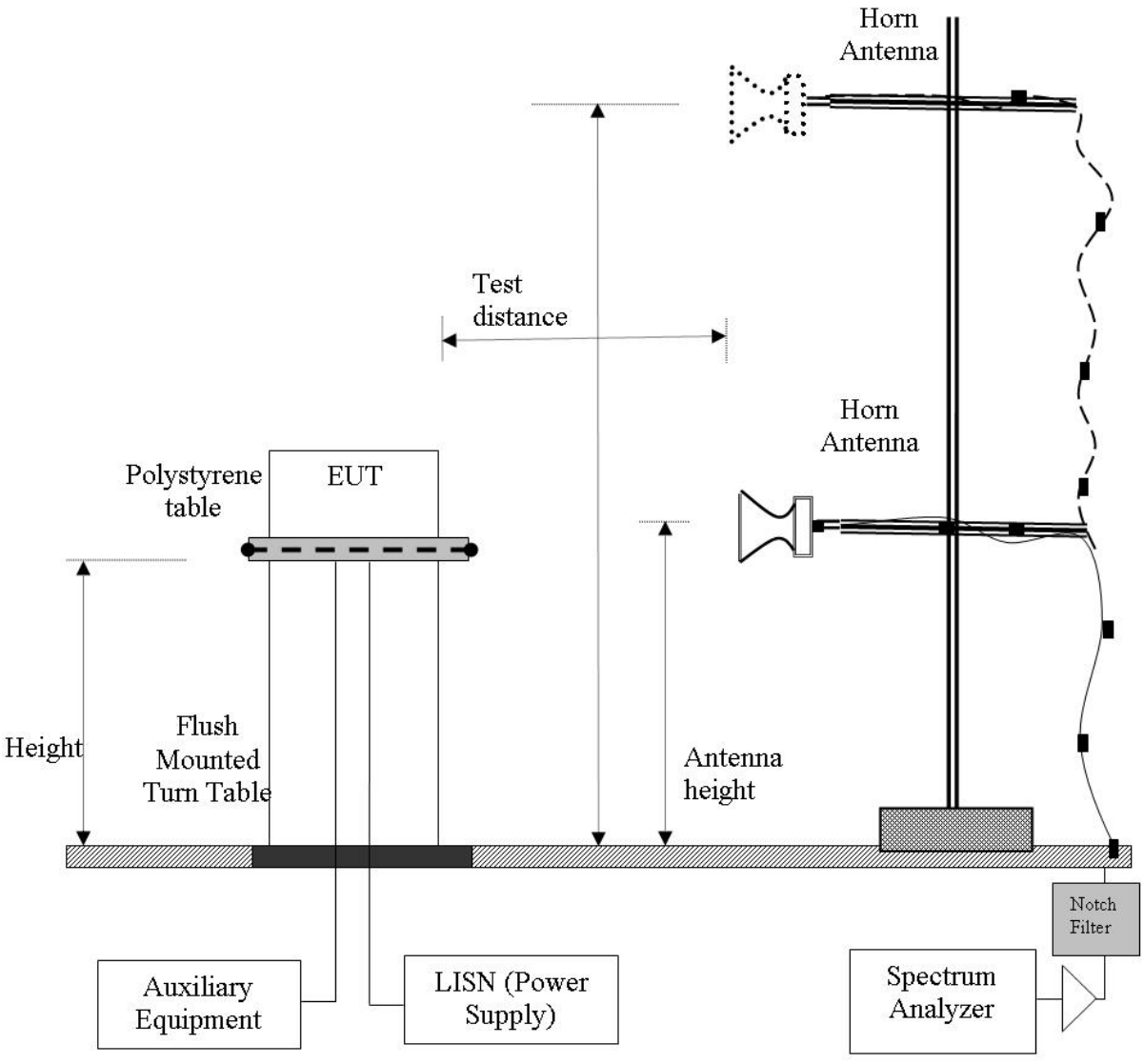
The highest emissions relative to the limit are listed for each frequency band measured.

Limit
The worst case limit for all applicable CFR Parts were applied during radiated testing.

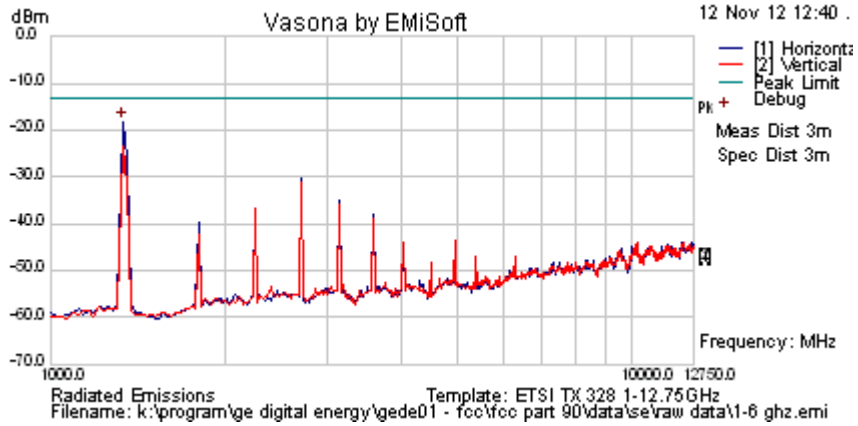
12.5 kHz Channel Spacing: Emission Mask D
On any frequency removed from the carrier frequency by a displacement frequency of than 12.5 kHz: At least 43 + 10 Log_{10} (P). Limit = -13 dBm

Radiated Spurious Emission Test Set-up > 1 GHz

The following tests were performed using the conducted test set-up shown in the diagram below.



Test Freq.	550.5 MHz	**Engineer**	GMH
Variant	Spurious Emissions above 1 GHz	**Temp (ºC)**	20
Freq. Range	1 - 6 GHz	**Rel. Hum.(%)**	32
Power Setting	+37.5 dBm	**Press. (mBars)**	32
Antenna	Port terminated with 50 Ohm load	**Duty Cycle (%)**	1013
Test Notes 1	MDS 4310a Data Transceiver: M/N 4310RA1D15L410A: S/N 601053: FCC ID E5M5LL2314		
Test Notes 2	13.8 Vdc supplied via "The Beast": Test configuration board connected to DB25 Serial Port		



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
1329.659	-20.9	2.3	-0.6	-19.2	Peak [Scan]	H	150	0	-13.0	-6.2	Pass	
2695.55	-35.2	3.2	1.3	-30.7	Peak [Scan]	H	150	0	-13.0	-17.7	Pass	
2248.347	-41.5	2.9	1.7	-36.9	Peak [Scan]	H	150	0	-13.0	-23.9	Pass	
3142.486	-40.8	3.5	1.9	-35.4	Peak [Scan]	H	150	0	-13.0	-22.4	Pass	
1800.413	-43.3	2.6	0.8	-39.9	Peak [Scan]	H	150	0	-13.0	-26.9	Pass	
3590.500	-43.8	3.7	1.9	-38.3	Peak [Scan]	H	150	0	-13.0	-25.3	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	ETSI 328 Measurement Type: 30 kHz RBW, 30 kHz VBW, 1 S sweep time, Peak Detector, Averaging Off

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0104, 0158, 0134, 0310, 0312, Dipole.

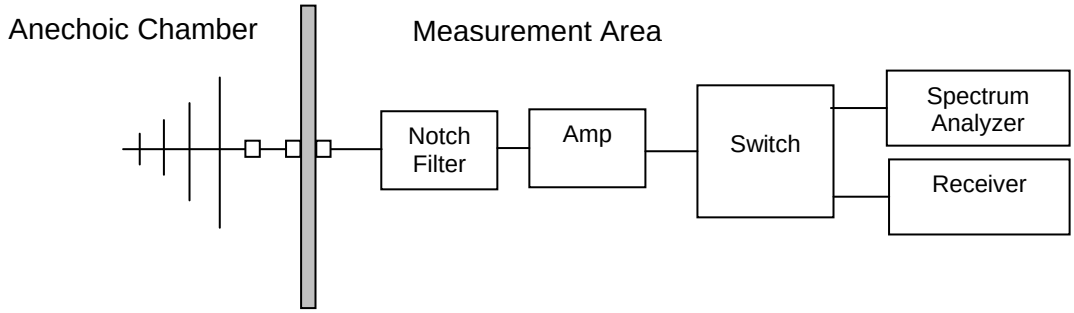
5.1.5.2. Transmitter Radiated Spurious Emissions (30M-1 GHz)

FCC, Part 15 Subpart C §15.205/ §15.209

Test Procedure

Preliminary radiated emissions were measured in the anechoic chamber at a 10-meter distance on every azimuth in both horizontal and vertical polarity. The emissions are recorded with a spectrum analyzer in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed. The anechoic chamber test set-up is identified in Section 6 Test Set-Up Photographs.

Test Measurement Set up



Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

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

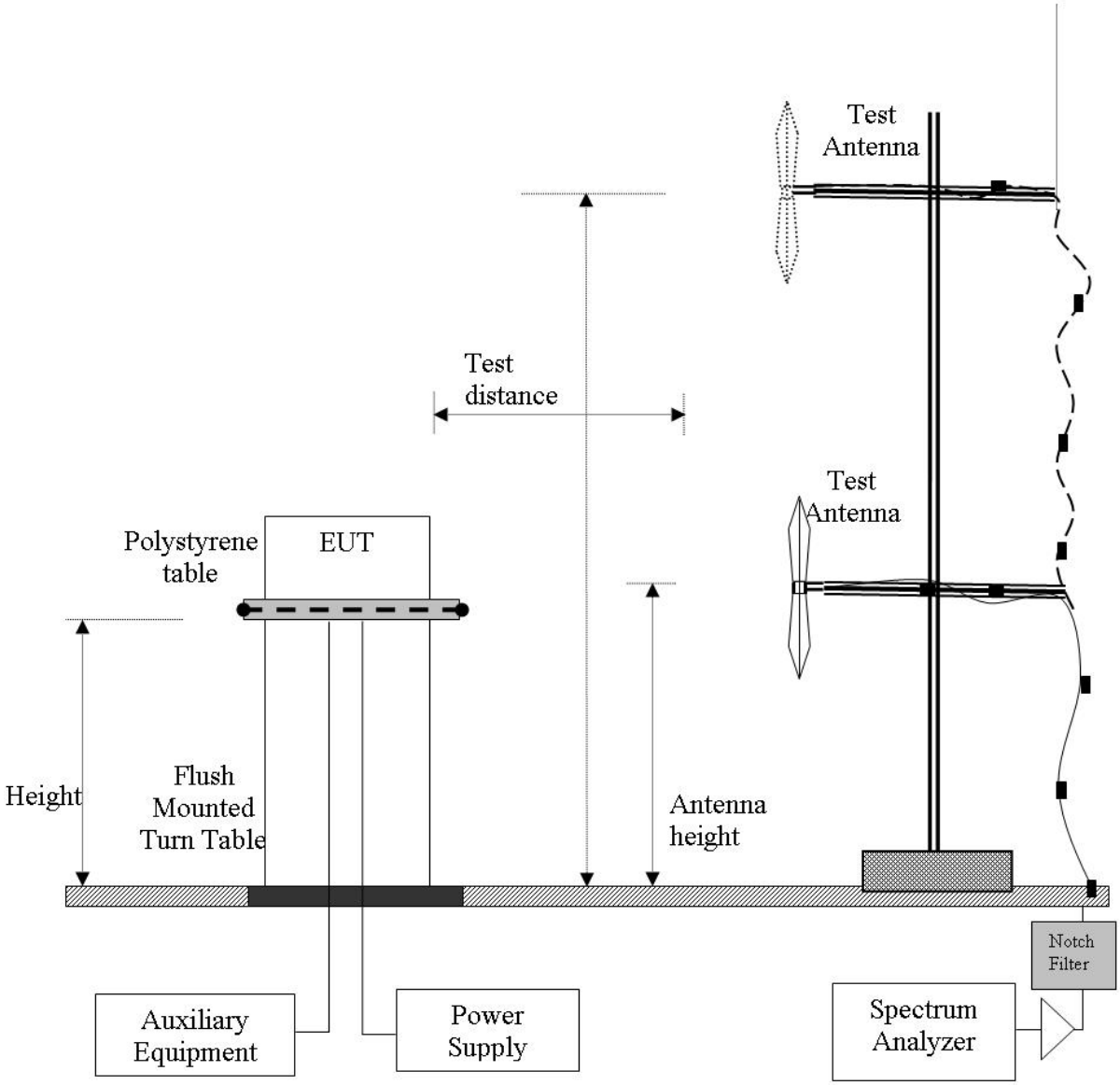
FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBμV/m

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

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

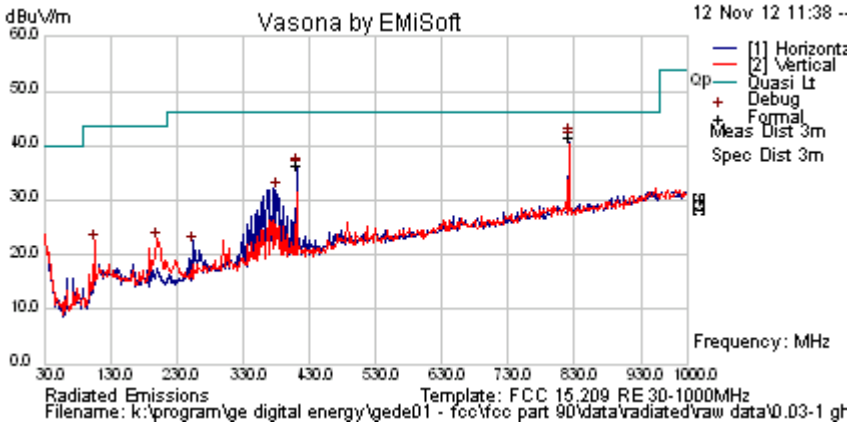
40 dBμV/m = 100μV/m
48 dBμV/m = 250μV/m

Digital Emission Measurement Setup – Below 1 GHz



Measurement Results for Spurious Emissions (30 MHz – 1 GHz)

Test Freq.	450.5 MHz (Receive Mode)	**Engineer**	GMH
Variant	Digital Emissions	**Temp (ºC)**	18.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	32
Power Setting	+37 dBm	**Press. (mBars)**	1015
Antenna	Port terminated with 50 Ohm load		
Test Notes 1	MDS 4310a Data Transceiver: M/N 4310RA1D15L410A: S/N 601053: FCC ID E5M5LL2314		
Test Notes 2	13.8 Vdc supplied via "The Beast": Unterminated 3' screened cable on Communication Port		



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
821.017	43.1	6.9	-8.5	41.5	Quasi Max	H	98	299	46.0	-4.5	Pass	
410.518	45.1	5.5	-14.4	36.2	Quasi Max	H	98	94	46.0	-9.8	Pass	
105.964	37.6	4.1	-19.6	22.1	Peak [Scan]	V	98	94	43.5	-21.4	Pass	
380.075	41.7	5.4	-15.3	31.8	Peak [Scan]	H	98	94	46.0	-14.2	Pass	
200.120	36.0	4.6	-18.3	22.3	Peak [Scan]	V	98	94	43.5	-21.2	Pass	
253.368	35.9	4.9	-19.0	21.8	Peak [Scan]	H	98	94	46	-24.2	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

Specification

Limits

§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.

§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.

§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.

§15.209 (a) Limit Matrix

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 Radiated Emissions

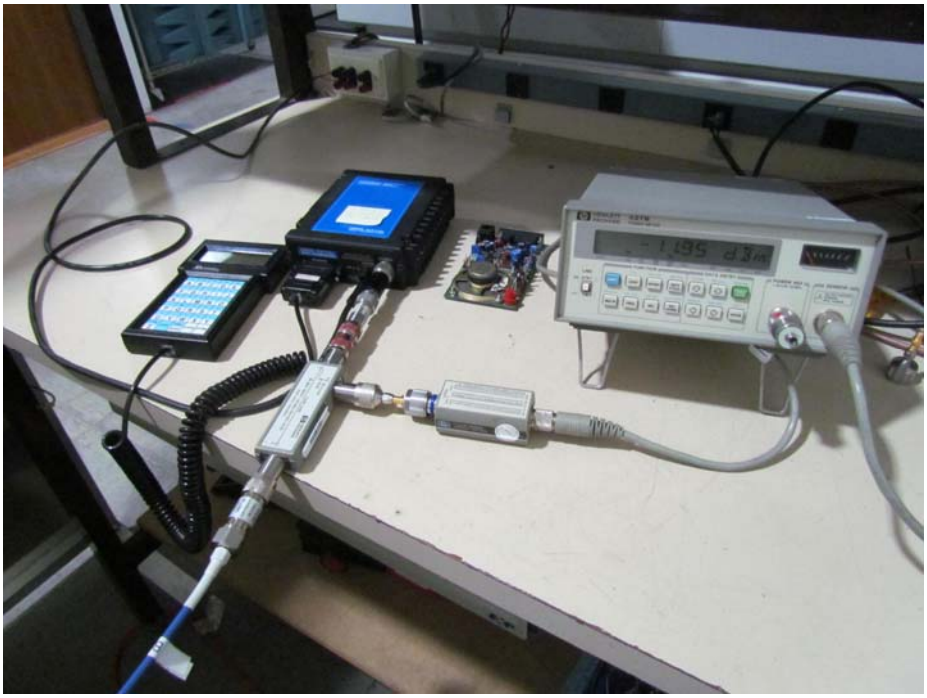
Measurement uncertainty	+5.6/ -4.5 dB

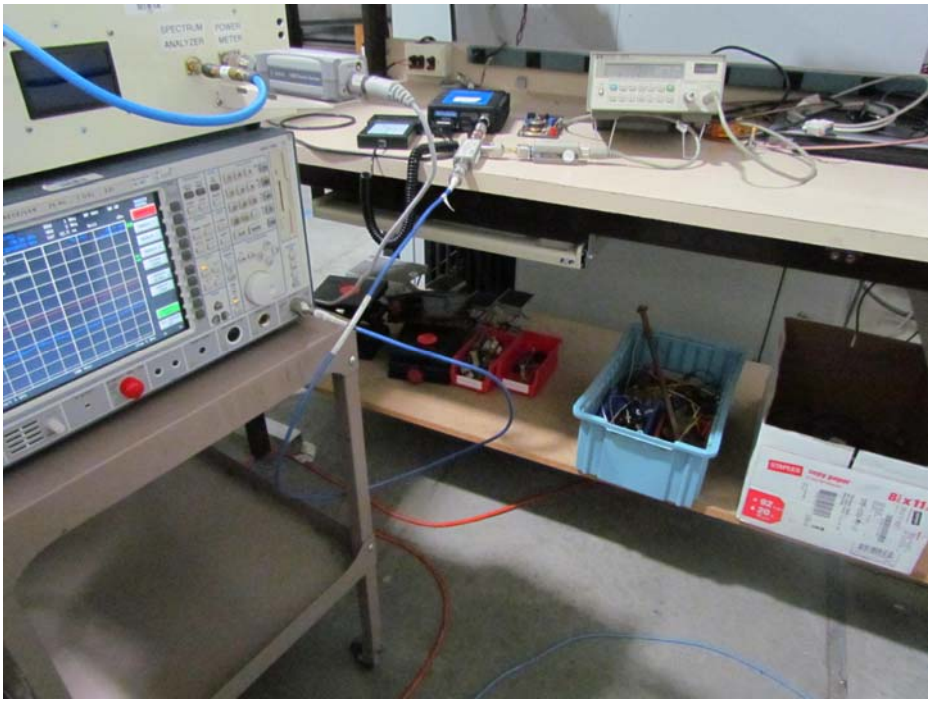
Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

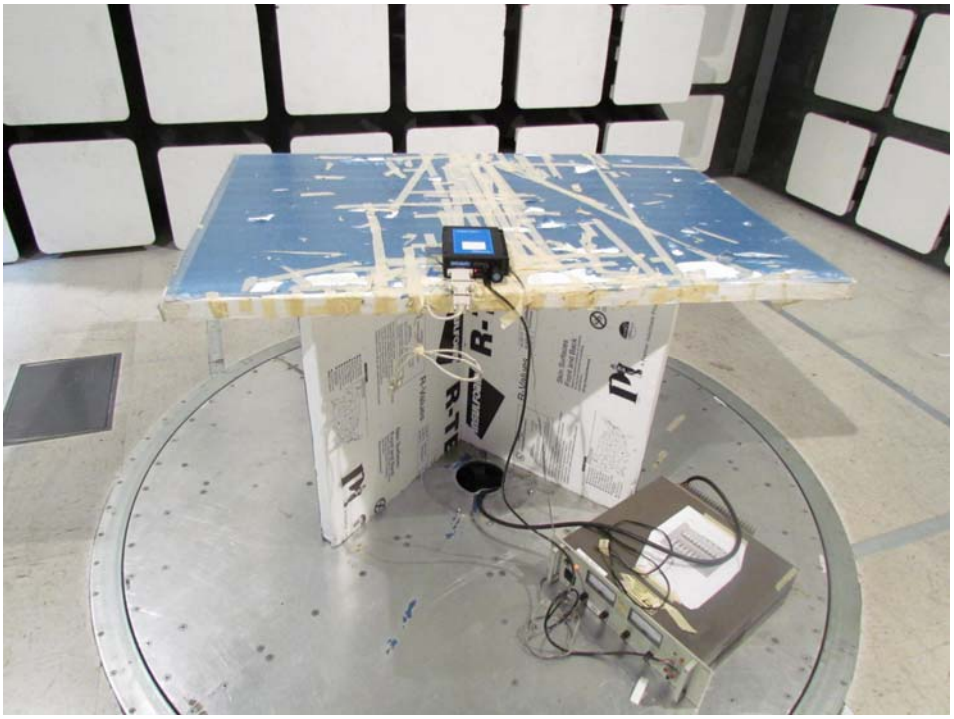
6. TEST SET-UP PHOTOGRAPHS

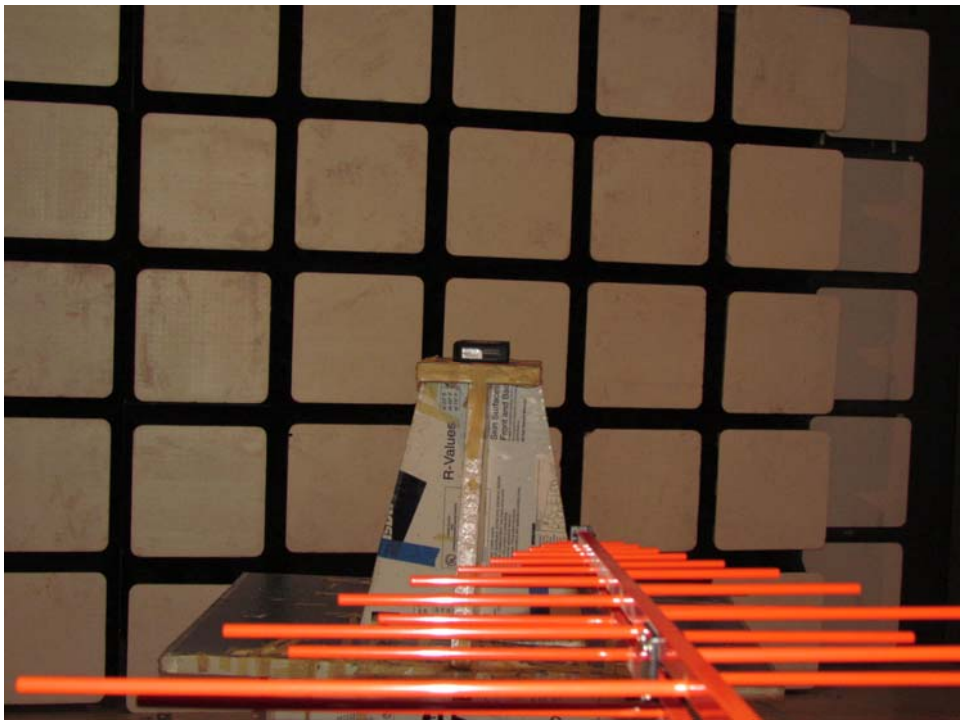
6.1. General Measurement Test Set-Up





6.2. Radiated Emissions below 1 GHz





6.3. Radiated Digital Emissions above 1 GHz

7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #	Calibration Due Date
0070	Power Meter	Hewlett Packard	437B	3125U11552	28th Nov 12
0374	Power Sensor	Hewlett Packard	8485A	3318A19694	29th Nov 12
0158	Barometer /Thermometer	Control Co.	4196	E2846	8th Dec 12
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007	2nd Dec 12
0193	EMI Receiver	Rhode & Schwartz	ESIB40	100201	16th Nov 12
0338	30 - 3000 MHz Antenna	Sunol	JB3	A052907	8th Nov 13
0335	1-18 GHz Horn Antenna	EMCO	3117	00066580	7th Nov 13
0252	SMA Cable	Megaphase	Sucoflex 104	None	N/A
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001	N/A
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002	N/A
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001	N/A
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001	N/A
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623	N/A

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