Test of PRISM PASS2

To FCC 47 CFR Part 15.247

Test Report Serial No.: TSIL02-A1 Rev B

TEST REPORT

FROM

MiCOM Labs

Test of PRISM PASS2

To FCC 47 CFR Part 15.247

Test Report Serial No.: TSIL02-A1 Rev B

This report supersedes TSIL02-A1 Rev A

Manufacturer: Alanco Technologies Inc
15575 North 83rd Way, Suite 3
Scottsdale, Arizona 85260
USA

Product Function: Personal Tracking Device

Copy No: pdf **Issue Date:** 18th November '05

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
3922 Valley Avenue, Suite B
Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
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A2LA ACCREDITED
CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION & LISTINGS

MiCOM Labs, Inc. an accredited laboratory complies with the international standard BS 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

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ACCREDITED LABORATORY

A2LA has accredited

MICOM LABS
Pleasanton, CA

for technical competence in the field of

Electrical Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing.

Presented this 14th day of September 2005.

American Association for Laboratory Accreditation
Corporate SEAL 1978 District of Columbia
A2LA

President
For the Accreditation Council
Certificate Number 2381.01
Valid to: November 30, 2007

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

LISTINGS

MiCOM Labs test facilities are listed by the following organizations;

North America

United States of America
Federal Communications Commission (FCC) Listing #: 102167

Canada
Industry Canada (IC) Listing #: 4143

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	15th Nov 2005	
Rev A	16th Nov 2005	First issue.
Rev B	18th Nov 2005	Removed calculation for Maximum Permissible Exposure as this is a portable device and not mobile or fixed

1. TEST RESULT CERTIFICATE

Manufacturer:	Alanco Technologies Inc 15575 North 83rd Way, Suite 3 Scottsdale, Arizona 85260 USA	Tested By:	MiCOM Labs, Inc. 3922 Valley Avenue 'B' Pleasanton California, 94566, USA
EUT:	Personal Tracking Device	Telephone:	+1 925 462 0304
Model:	PRISM PASS2	Fax:	+1 925 462 0306
S/N:	368762		
Test Date(s):	22nd July to 6th Nov 05	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.247	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
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 15.247	2001	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

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 PRISM PASS2 to FCC and Industry Canada regulations
Applicant:	Alanco Technologies Inc 15575 North 83rd Way, Suite 3 Scottsdale, Arizona 85260 USA
Manufacturer:	As Applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 3922 Valley Avenue, Suite "B" Pleasanton, California 94566 USA
Test report reference number:	TSIL02-A1 Rev B
Date EUT received:	1st November 2005
Standard(s) applied:	FCC 47 CFR Part 15.247
Dates of test (from - to):	22nd July – 6th November '05
No of Units Tested:	2 EUT's Conducted testing - pcb with SMA connector Radiated testing - final product with antenna
Type of Equipment:	915 MHz RFID Wristband
Manufacturers Trade Name:	PRISM
Model:	PASS2
Location for use:	Indoor and outdoor
Declared Frequency Range(s):	915 MHz +/- 10 MHz
Type of Modulation:	Direct Sequence Spread Spectrum
Declared Nominal Output Power:	-25 dBm to + 22 dBm
EUT Modes of Operation:	Intermittent transmitter (Single mode of operation)
Transmit/Receive Operation:	Transmit only
Rated Input Voltage and Current:	3.6 Vdc nominal 0.08 mA
Operating Temperature Range:	15 to 35ºC
ITU Emission Designator:	22M1WXDET
Microprocessor(s) Model:	MSP430F167
Clock/Oscillator(s):	32.768 kHz; 800 kHz; 10 MHz; 14.523809 MHz
Frequency Stability:	±12.5 ppm
Equipment Dimensions:	2.4" x 2.2" x 0.875"
Weight:	4 oz
Primary function of equipment:	RFID wristband provides location information to the base station

3.2. Scope of Test Program

The scope of the test program was to test the Technology Systems International Inc PRISM PASS2 915 MHz RFID wristband personal tracking device against the current FCC 47 CFR Part 15.247 requirements.

Technology Systems International Inc PRISM PASS2

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

Type (EUT/ Support)	Equipment Description	Model No.	Serial No.
EUT	PCB with SMA connector	PASS2	N/A
EUT	Final product with integral antenna	PASS2	368762

3.4. Antenna Details

Antenna Type	Gain (dBi)	Manufacturer	Model No.	Serial No.
Integral	2			

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. NONE

3.6. Test Configurations

Matrix of test configurations

EUT	Test Type	Operating Channel	Frequencies (MHz)
Pcb with SMA	Conducted	Single channel	915 MHz
Final product, integral antenna	Radiated	Single channel	915 MHz

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

4. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(a)(2)	6 dB and 99 % Bandwidths	>=500 kHz	Conducted	Complies	5.1.1
15.247(b) **15.31(e)**	Peak Output Power	Shall not exceed 1W	Conducted	Complies	5.1.2
15.247(d)	Peak Power Spectral Density	Shall not be greater than +8 dBm in any 3 kHz band	Conducted	Complies	5.1.3
15.247(b)(5)	Maximum Permissible Exposure	Exposure to radio frequency energy levels	Conducted	Not Applicable - portable device	5.1.4
15.247(c) **15.205(a) / 15.209(a)**	Spurious Emissions (30MHz - 26 GHz)	The radiated emission in any 100 kHz of out-band shall be at least 20 dB below the highest in-band spectral density	Conducted	Complies	5.1.5
5.205(a) / 15.209(a)	Radiated Emissions	Restricted Bands	Radiated	Complies	5.1.6
	Transmitter Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.6.1*
	Radiated Band Edge	Band edge results		Complies	*5.1.6.2*

Section(s)	Test Items	Description	Condition	Result	Test Report Section
5.205(a) / 15.209(a)	Radiated Spurious Emissions	Emissions <1 GHz (30M-1 GHz)	Radiated	Complies	*5.1.6.3*
15.207	AC Wireline Conducted Emissions 150 kHz – 30 MHz	Conducted Emissions device is battery operated	Conducted	Not Applicable	5.1.7

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 highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

5. TEST RESULTS

5.1. Device Characteristics

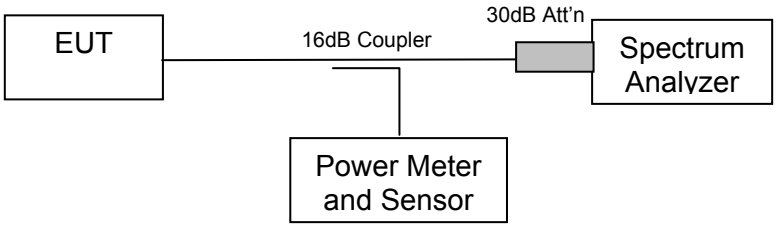
5.1.1. 6 dB and 99 % Bandwidth

FCC, Part 15 Subpart C §15.247(a)(2)

Test Procedure

The bandwidth at 6 dB and 99 % is measured with a spectrum analyser connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency. The spectrum analyzer used a 6 dB resolution bandwidth filter setting to make measurements. Measurements were made while EUT was operating in a pulsed transmission mode

Test Measurement Set up



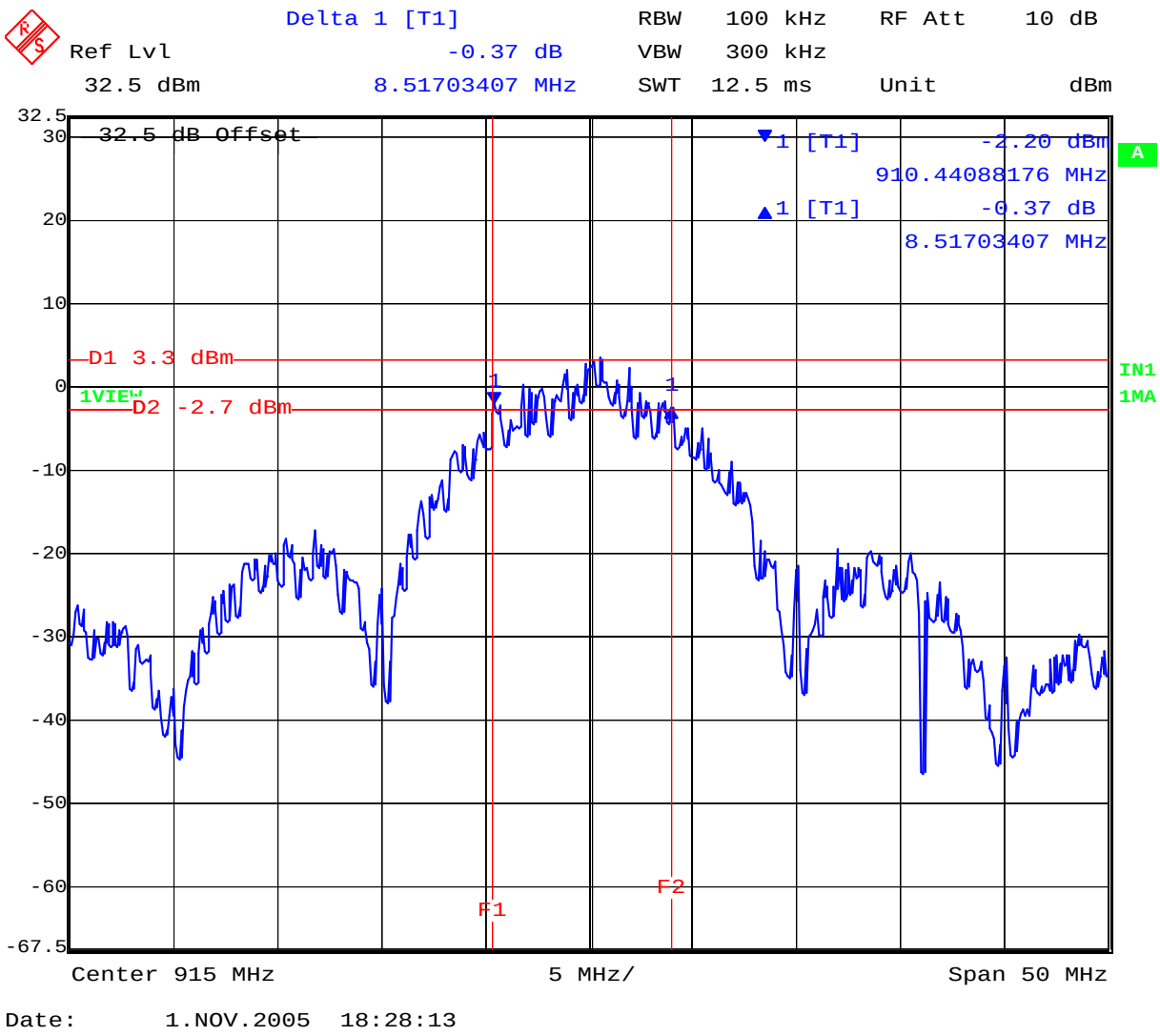
Measurement set up for 6 dB and 99 % bandwidth test

Measurement Results for 6 dB and 99 % Operational Bandwidth(s)

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TABLE OF RESULTS

Center Frequency (MHz)	6 dB Bandwidth (MHz)	99 % BW (MHz)
915	8.5170	22.1443



6 dB Bandwidth Measurement

99% Bandwidth Measurement

Specification

Limits

§15.247 (a)(2) For direct sequence systems the minimum 6 dB bandwidth shall be at least 500 kHz

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	±2.81 dB

Traceability

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

5.1.2. Peak Output Power

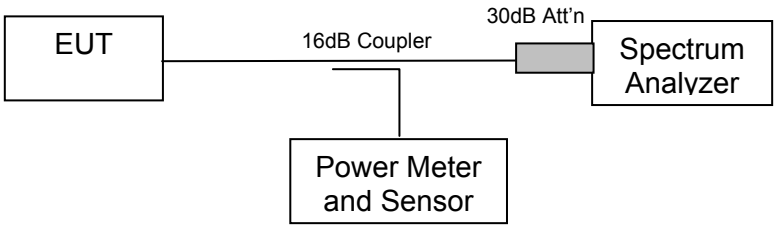
FCC, Part 15 Subpart C §15.247(b)

Test Procedure

Conducted Measurement. The transmitter terminal of EUT was connected to the input of the spectrum analyzer set to measure peak power. The resolution filter bandwidth was set to 6 dB, peak detector selected and the analyzer built-in power function was used to measure peak power over the 99 % bandwidth.

Measurements were made while EUT was operating in a pulsed transmission mode

Test Measurement Set up



Measurement set up for Transmitter Peak Output Power

Antenna Gain - Maximum Allowable Power Level

If transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Type	Antenna No.	Gain (dBi)	Antenna Gain >6dBi (dB)	Max. Allowable Peak Power (dBm)
Not applicable				

Measurement Results for Peak Output Power

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TABLE OF RESULTS

Center Frequency (MHz)	Measurement Bandwidth (MHz)	Peak Power (dBm)
915	22.14	18.28

PEAK POWER EIRP

Max. Peak Power EIRP = max. conducted power + antenna gain (dBi)

Antenna No.	Gain (dBi)	Max. Peak Power EIRP (dBm)
1	2	20.28

Peak Output Power

Specification

Limits

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands: 1watt

§15.247 (b) (4) Except as shown in paragraphs (b)(3)(i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1) or (b)(2) of this section, as appropriate by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0193, 0252, 0313, 0314

5.1.3. Peak Power Spectral Density

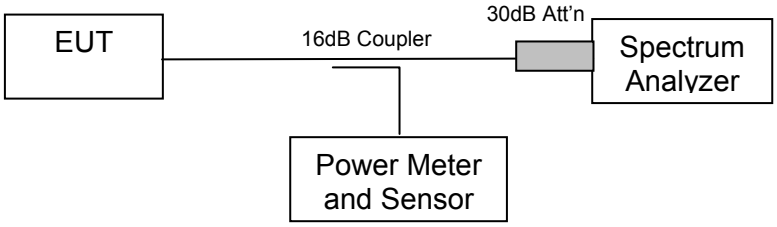
FCC, Part 15 Subpart C §15.247(d)

Test Procedure

The transmitter output was connected to a spectrum analyzer and the maximum level in a 3 kHz bandwidth was measured. A peak value was found over the full emission bandwidth and the frequency span reduced to obtain enhanced resolution. Sweep time => span / 3 kHz with video averaging turned off. The Peak Power Spectral Density is the highest level found across the emission in a 3 kHz resolution bandwidth.

Measurements were made while EUT was operating in a pulsed transmission mode

Test Measurement Set up



Measurement set up for Peak Power Spectral Density

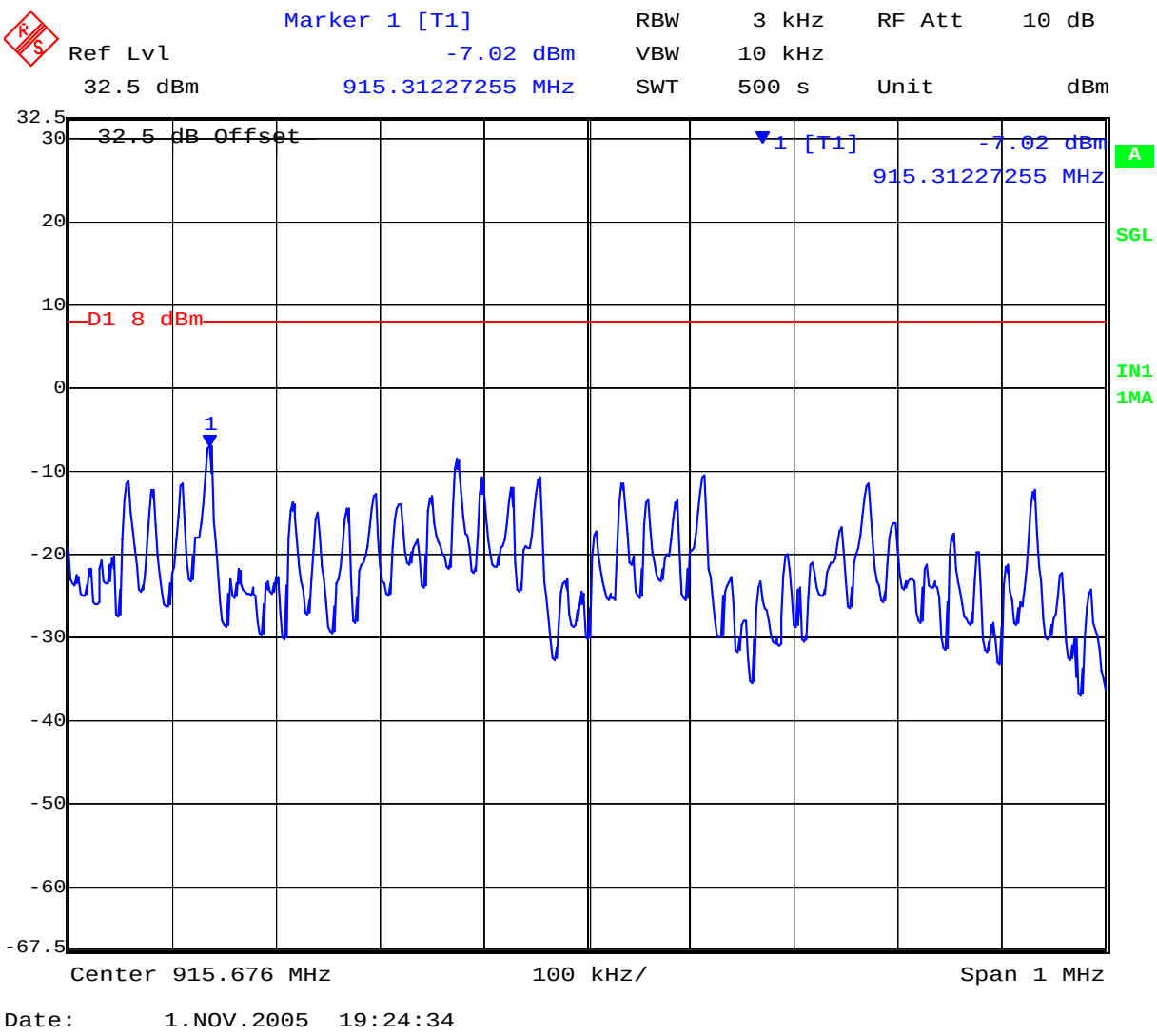
Measurement Results for Peak Power Spectral Density

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

Radio parameters.
Data Rate(s): 10MBit/s

TABLE OF RESULTS

Center Frequency (MHz)	Peak Frequency (MHz)	PPSD (dBm)
915	915.31227255	-7.02



Peak Power Spectral Density (PPSD)

Specification
Peak Power Spectral Density Limits

§15.247 (d) For direct sequence systems the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission

Laboratory Measurement Uncertainty for Spectral Density

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0193, 0252, 0313, 0314

5.1.4. Maximum Permissible Exposure

FCC, Part 15 Subpart C §15.247(b)(5)

Calculations for Maximum Permissible Exposure Levels

Calculation is not applicable for portable type equipment

Specification

Maximum Permissible Exposure Limits

§15.247 (b)(5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency levels in excess of the Commission's guidelines. See §1.1307 (b)(1) of this chapter.

Limit S = 1mW / cm^2 from 1.310 Table 1

Note: for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

5.1.5. Conducted Spurious Emissions

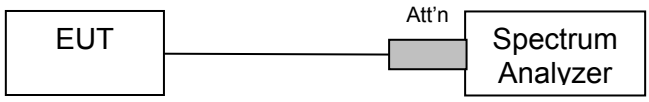
FCC, Part 15 Subpart C §15.247(c)

Test Procedure

Conducted emissions were measured at a limit of 20 dB below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Emissions at the band edge were measured and recorded. Measurements were made while EUT was operating in transmit mode of operation at the appropriate center frequency.

The spectrum analyzer is set to:
RBW=100 kHz, VBW=300 kHz, Span=110 MHz, Sweep = 200 mS

Test Measurement Set up



Band-edge measurement test configuration

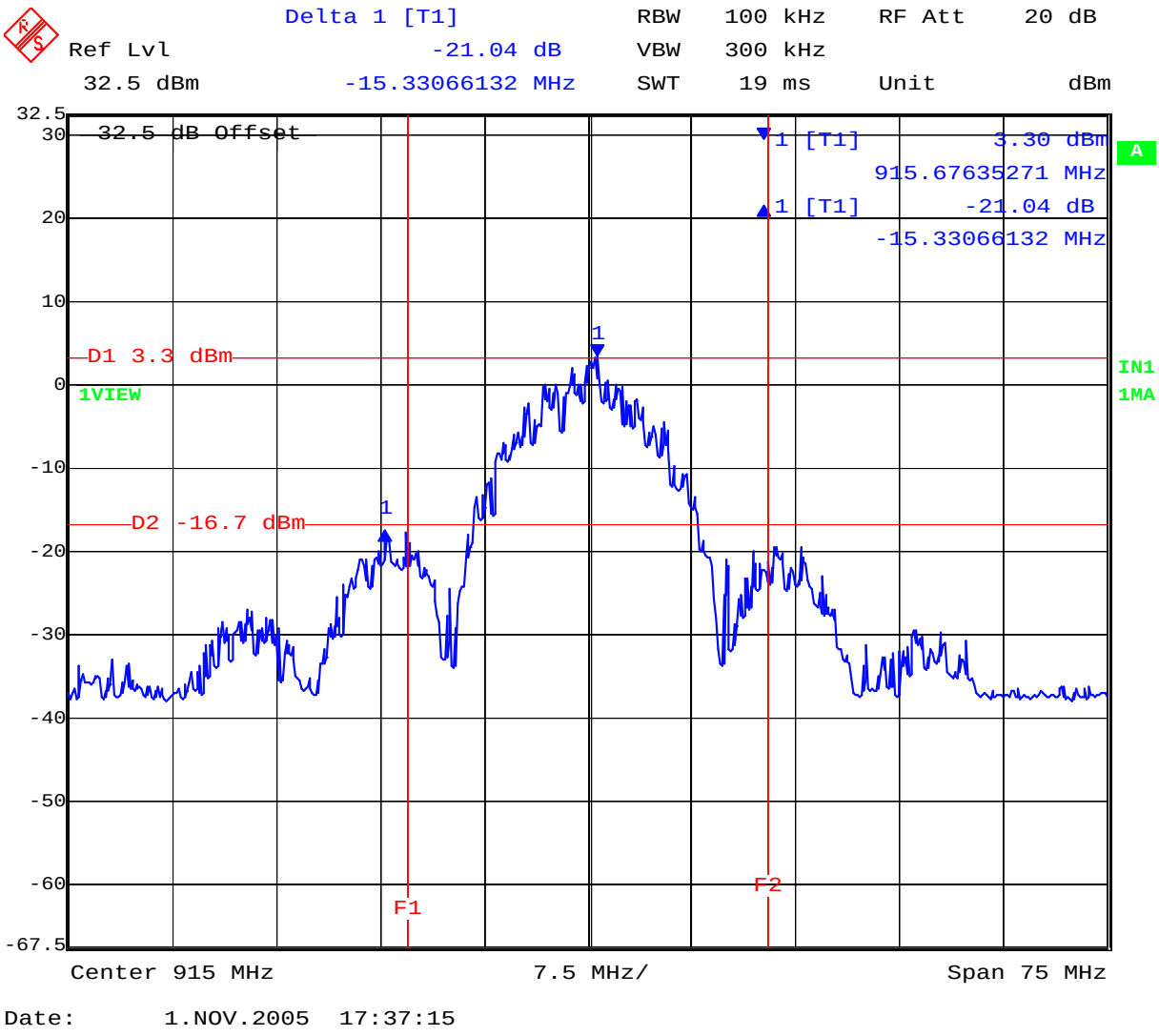
Measurement Results of Conducted Spurious Emissions

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

Conducted Band-Edge Results

TABLE OF RESULTS

Center Frequency (MHz)	Band edge Frequency (MHz)	Limit (20 dB below peak of fundamental) dBm	Amplitude @ Band edge (dBm)	Margin (dB)
915	902	-16.7	-17.74	-1.04
915	928	-16.7	-19.0	-2.3



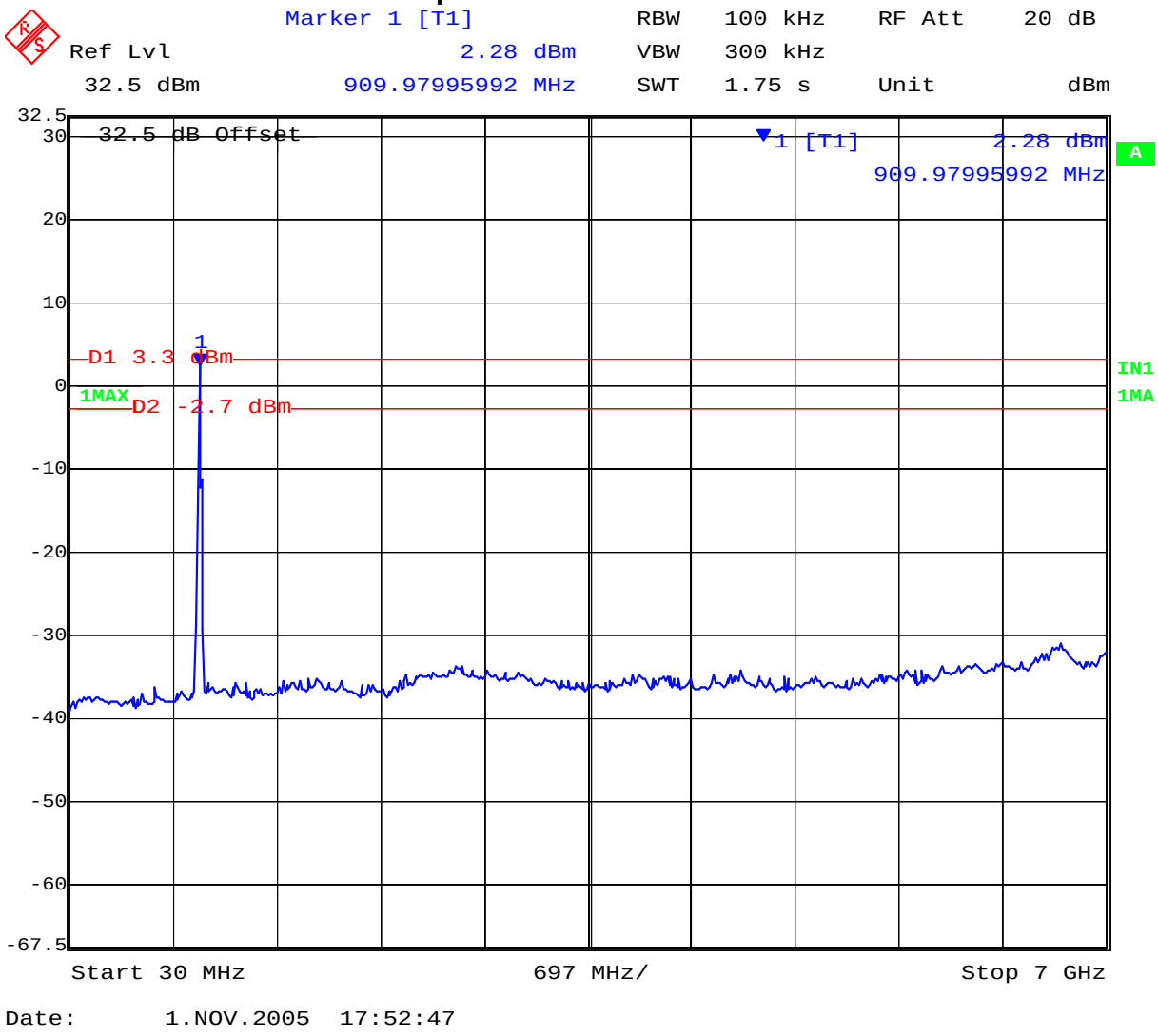
Conducted Band Edge (-20 dBc)

Spurious Emissions (1-26 GHz)

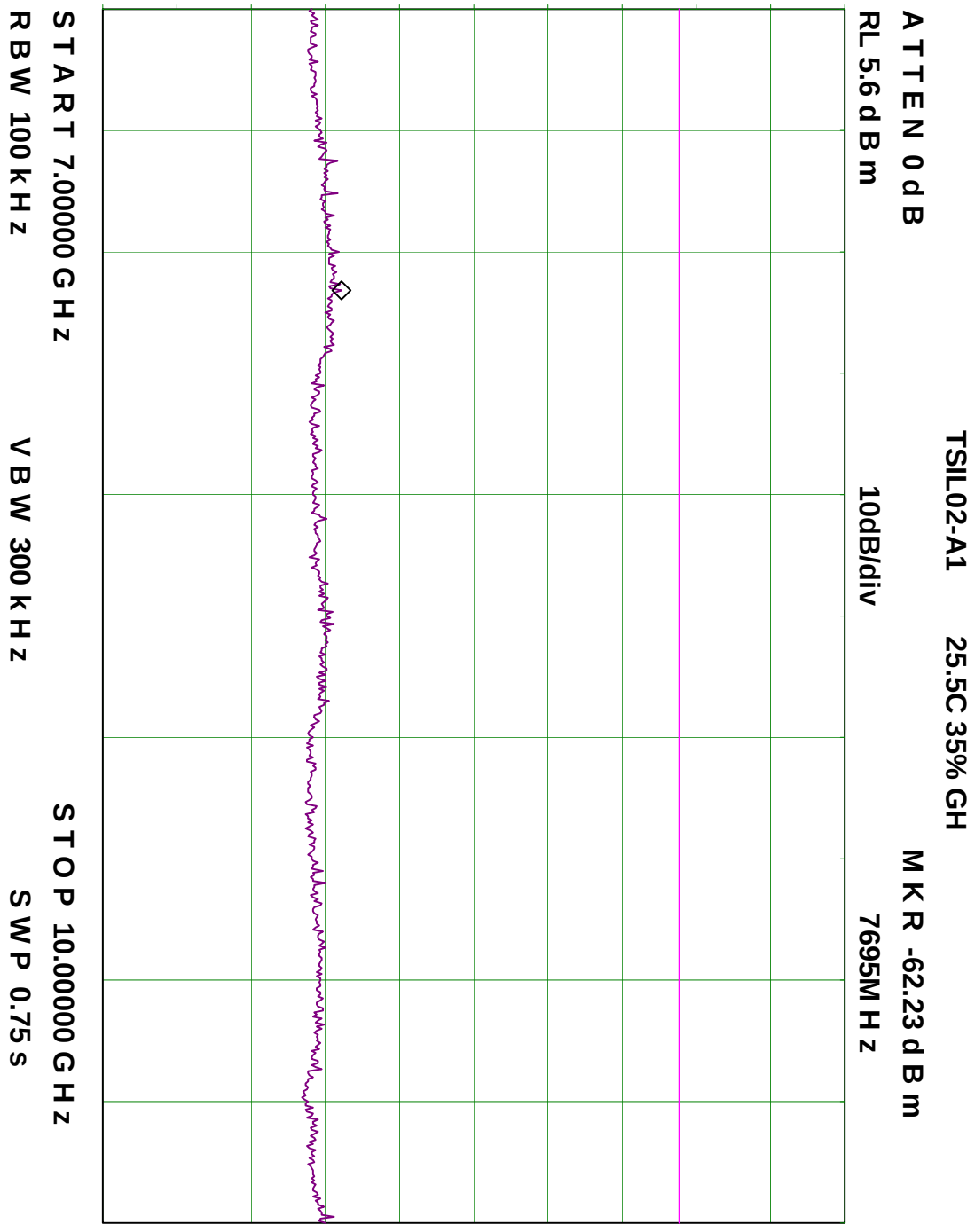
Conducted spurious emissions (1-26 GHz) are provided indicated by the following matrix. Measurements were performed with the transmitter tuned to the channel closest to the band-edge being measured. All emissions were maximized during measurement. Limits were derived from the –20 dBc measurements.

Start Frequency (MHz)	Stop Frequency (MHz)	Maximum Emission Observed (dBm)	Limit (dBm)	Margin (dB)
30	7,000	-31.00	-16.7	-14.3
7,000	10,000	-63.23	-16.7	-46.53

Conducted Spurious Emissions 30 MHz to 7 GHz



Conducted Spurious Emissions 7 GHz to 10 GHz



Specification

Limits Band-Edge

Lower Limit Band-edge	Upper Limit Band-edge	Limit below highest level of desired power
902 MHz	928 MHz	≥ -20 dBc

§**15.247(c)** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in §**15.209(a)** is not required.

Laboratory Measurement Uncertainty for Conducted Spurious Emissions

Measurement uncertainty	±2.37 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0158, 0193, 0252, 0313, 0314

5.1.6. Radiated Emissions

5.1.6.1. Transmitter Radiated Spurious Emissions (above 1 GHz)

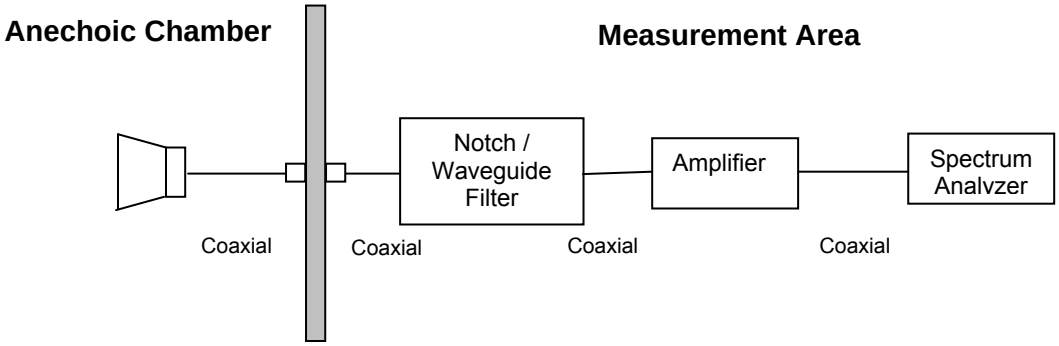
FCC, Part 15 Subpart C §15.247(c)

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities up to the 10th harmonic of the fundamental frequency (10 GHz). The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. A notch filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

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

where: 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

For 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

Measurement Results Transmitter Radiated Spurious Emissions above 1 GHz

Ambient conditions.
Temperature: 19 to 26°C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

Radio parameters.

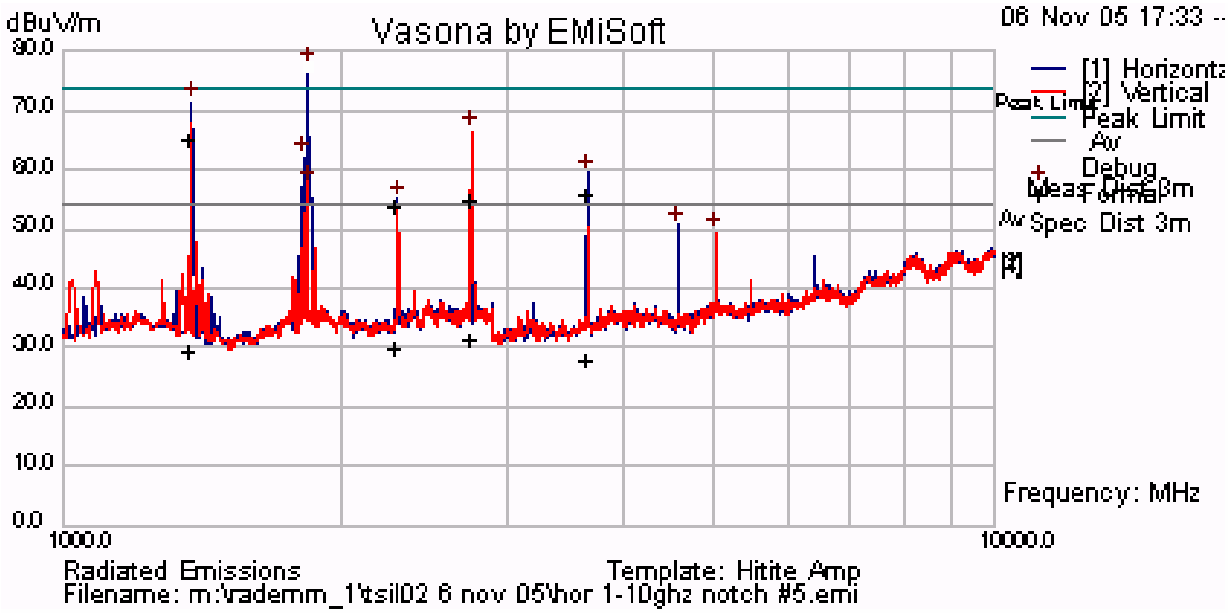
TABLE OF RESULTS – RESTRICTED BAND

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBμV/m)	Correction Factor (dB)	Corrected Field Strength (dBμV/m)	Limit (dBμV/m)	Emission Type	Margin (dB)
1373.32	76	1.93	-6.36	71.56	74.00	Peak	-2.44
2748.55	71.34	2.79	-7.63	66.50	74.00	Peak	-7.50
3660.8	62.17	3.59	-6.27	59.49	74.00	Peak	-14.51
2288.64	61.5	2.49	-8.99	55.00	74.00	Peak	-19.00
1373.32	31.33	1.92	-6.29	26.96	54.00	Average	-27.04
2748.55	34.06	2.79	-7.65	29.20	54.00	Average	-24.80
3660.8	28.48	3.58	-6.31	25.75	54.00	Average	-28.25
2288.64	34.17	2.49	-8.96	27.69	54.00	Average	-26.31

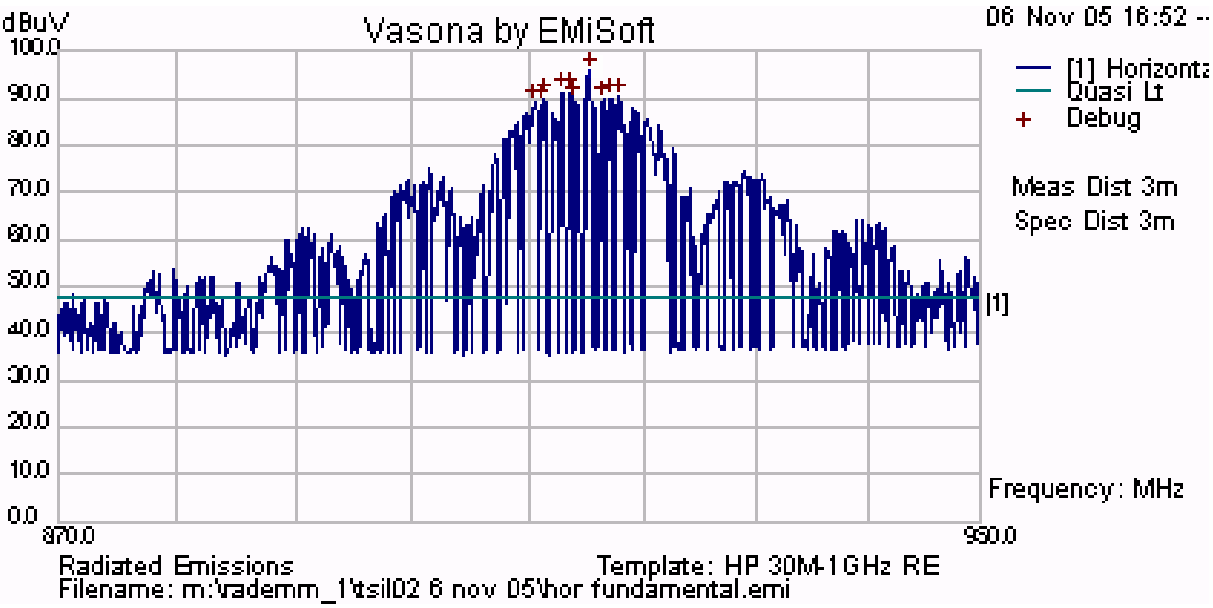
TABLE OF RESULTS – NON-RESTRICTED BAND

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBμV/m)	Correction Factor (dB)	Corrected Field Strength (dBμV/m)	Fund. (dBμV/m)	Limit –20dBc (dBμV/m)	Margin (dB)
1836.72	H	80.6	-4.78	75.82	96.77	76.77	-0.95

Peak fundamental emission 96.77 dBμV/m, see peak emission plot on following page.
Non-restricted band limit was derived at -20dBc from the peak radiated emission 76.77 dBμV/m.



Transmitter Radiated Emissions ≥ 1 GHz



Transmitter Fundamental Emission – Peak emission 96.77 dBµV/m

5.1.6.2. Radiated Band-Edge – Restricted Bands

Closest restricted bands 614 MHz and 960 MHz are tested in the Radiated Emissions (30M – 1GHz) Section 5.1.6.3

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.

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, 0310, 0312

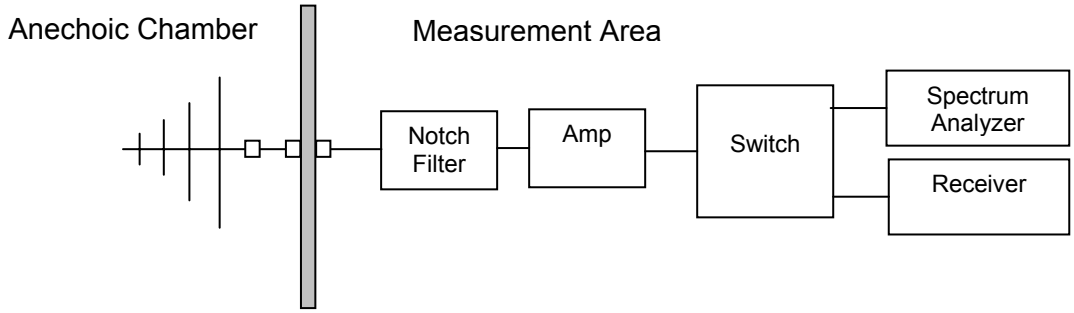
5.1.6.3. Radiated Spurious Emissions (30M-1 GHz)

FCC, Part 15 Subpart C §15.247(c)/ §15.209

Test Procedure

Testing 30M-1 GHz was subcontracted to the company identified in Section 3.9 Subcontracted Testing. Preliminary radiated emissions are 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))

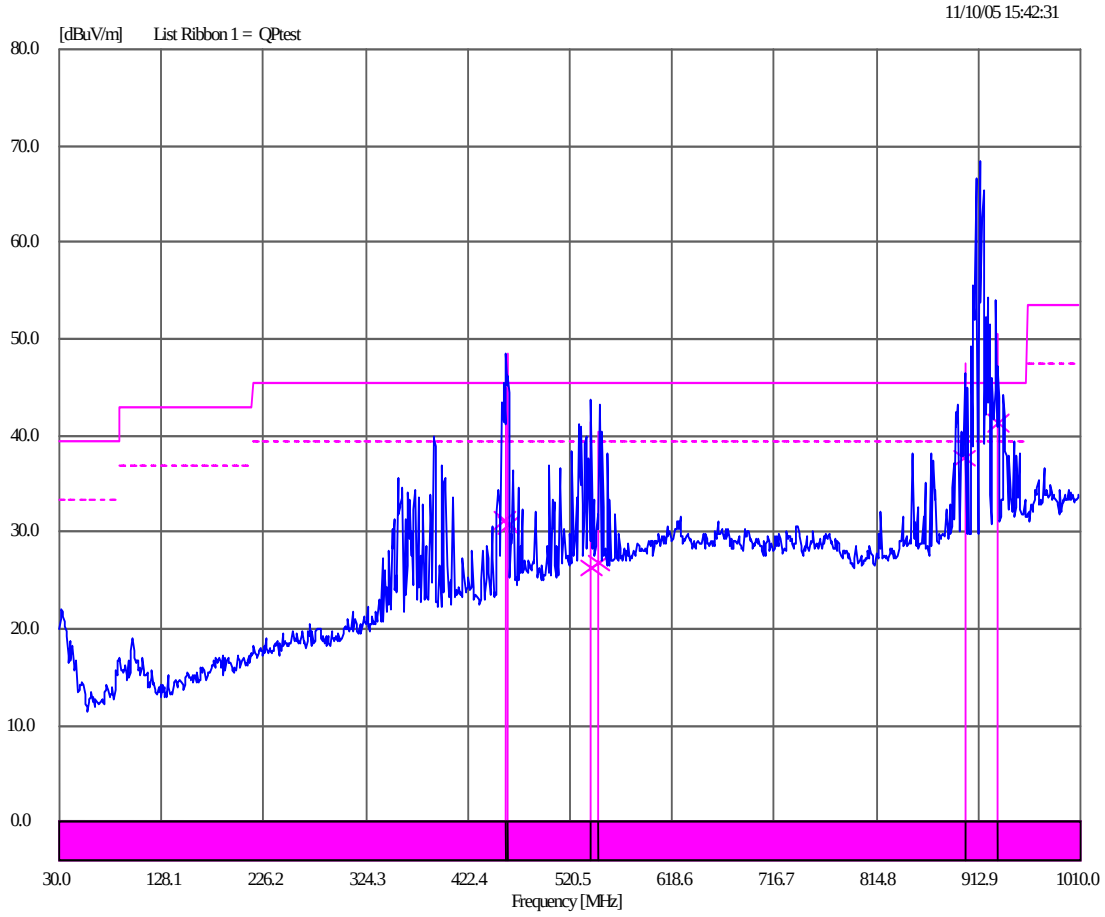
40 dBμV/m = 100μV/m
48 dBμV/m = 250μV/m

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

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TABLE OF RESULTS

Freq. (MHz)	Peak (dBuV/m)	QP (dBuV/m)	QP Lmt (dBuV/m)	QP Margin (dB)	Angle (deg)	Height (cm)	Polarity
458.669389	45.38	31.68	46	-14.32	121	187	Horz
461.211784	48.91	31.19	46	-14.81	1	155	Horz
540.430639	41.89	26.79	46	-19.21	331	137	Horz
548.464526	40.91	27.28	46	-18.72	11	195	Horz
899.905502	47.9	38.19	46	-7.81	107	318	Vert
931.508628	51.06	41.79	46	-4.21	152	101	Horz



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.

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 Sanmina work instruction	8546A HP Receiver and RF Filter, HP Pre-amp, Antenna EMCO Biconilog

5.1.7. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

FCC, Part 15 Subpart C §15.207

The EUT is battery operated, no requirement to test AC Wireline Emissions

Specification

Limit

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. 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.

§15.207 (a) Limit Matrix

The lower limit applies at the boundary between frequency ranges

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

Laboratory Measurement Uncertainty for Conducted Emissions

Measurement uncertainty	±2.64 dB

Traceability

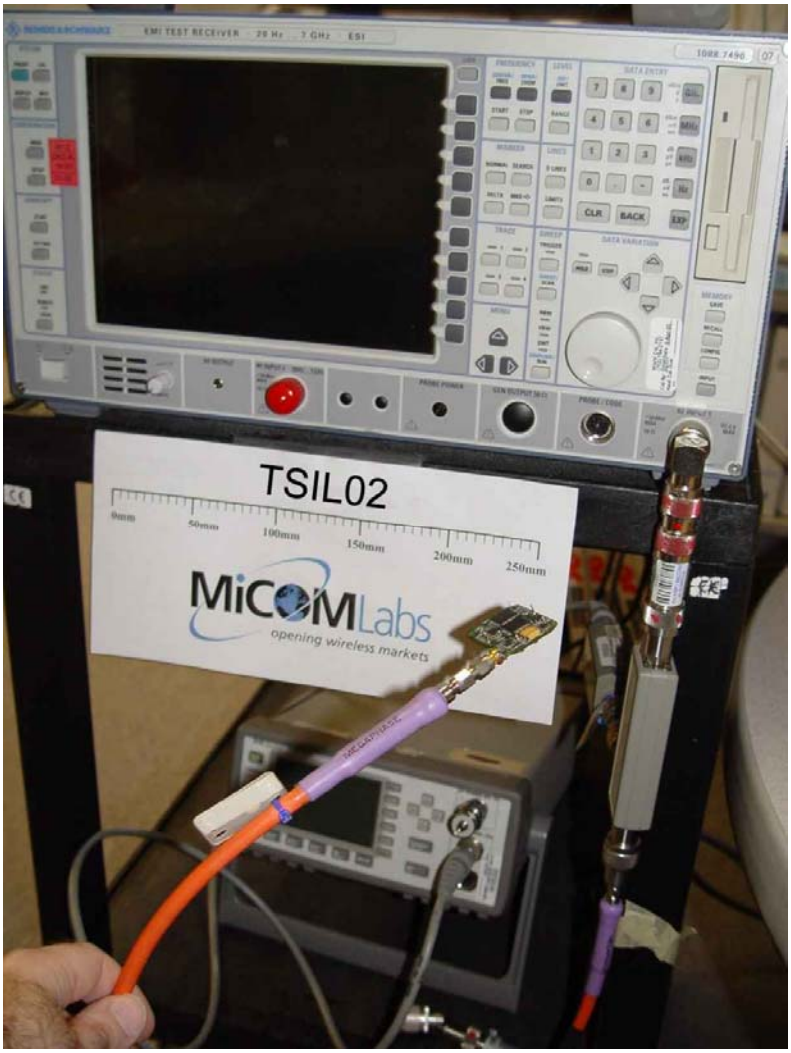
Method	Test Equipment Used
Measurements were made per work instruction WI-EMC-01 'Measurement of Conducted Emissions'	0158, 0184, 0193, 0190, 0293, 0307

6. PHOTOGRAPHS

6.1. Radiated Emissions (30 MHz-1 GHz)

6.2. Spurious Emissions >1 GHz

6.3. General Measurement Test Set-Up



7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #
0088	Spectrum Analyzer	Hewlett Packard	8564E	3410A00141
0104	1-18GHz Horn Antenna	The Electro-Mechanics Company	3115	9205-3882
0134	Amplifier	Com Power	PA 122	181910
0158	Barometer /Thermometer	Control Co.	4196	E2844
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007
0252	SMA Cable	Megaphase	Sucoflex 104	Unknown
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	1623
0314	30dB N-Type Attenuator	NARDA	32319	--

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