Test of Alien Technology RFID Reader ALR9900

To: FCC 47 CFR Part15.247 & IC RSS-210

Test Report Serial No.: VAFI01-U1 Rev A

# TEST REPORT

FROM

MiCOM Labs

Test of Alien Technology RFID Reader ALR9900

Class II Permissive Change FCC ID: P65ALR9900

To FCC 47 CFR Part15.247 & IC RSS-210

Test Report Serial No.: VAFI01-U1 Rev A

This report supersedes: None

**Manufacturer:** Alien Technology
18220 Butterfield Blvd
Morgan Hill
California 95037, USA

**Product Function:** 915 MHz RFID Reader

**Copy No:** pdf **Issue Date:** 15th February 2012

**This Test Report is Issued Under the Authority of;**

**MiCOM Labs, Inc.**
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A2LA ACCREDITED
CERTIFICATE #2381.01

**MiCOM Labs is an ISO 17025 Accredited Testing Laboratory**

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## ACCREDITATION, LISTINGS & RECOGNITION

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

ilac-MRA

The American Association for Laboratory Accreditation

World Class Accreditation

*Accredited Laboratory*

A2LA has accredited

**MICOM LABS**

*Pleasanton, CA*

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 26th day of February 2008.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to February 28, 2010
Revised November 17, 2009

*For the 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 #: 4143A

***Japan Registration***

VCCI Membership Number: 2959

- Radiation 3 meter site; Registration No. R-2881
- Line Conducted, Registration Nos. C-3181 & T-1470
- Emissions; Registration Nos. C-3180 & T-1469

# RECOGNITION

**APEC MRA (Asia-Pacific Economic Community Mutual Recognition Agreement)**

**Conformity Assessment Body (CAB) – MiCOM Labs**

Test data generated by MiCOM Labs is accepted in the following countries under the APEC MRA.

| Country | Recognition Body | Phase | CAB Identification No. |
|---|---|---|---|
| Australia | Australian Communications and Media Authority (ACMA) | I | US0159 |
| Hong Kong | Office of the Telecommunication Authority (OFTA) | I | |
| Korea | Ministry of Information and Communication Radio Research Laboratory (RRL) | I | |
| Singapore | Infocomm Development Authority (IDA) | I | |
| Taiwan | National Communications Commission (NCC)<br>Bureau of Standards, Metrology and Inspection (BSMI) | I<br>I | |

# DOCUMENT HISTORY

| Document History | | |
|---|---|---|
| **Revision** | **Date** | **Comments** |
| Draft | | |
| Rev A | 12th January 2010 | Initial Release<br><br>FCC ID: P65ALR9900<br>Product originally certified 5th October 2007, MiCOM Labs Test Report ALNT25-A1, 4th October 2007 |
| Rev B | 15th February 2012 | Tested additional antenna, updated Section 5.1.8.5 Transmitter Radiated Spurious Emissions – Antenna RFID-v9.1 |
| | | |
| | | |

# 1. TEST RESULT CERTIFICATE

| | | | |
|---|---|---|---|
| Manufacturer: | Alien Technology<br>18220 Butterfield Blvd<br>Morgan Hill<br>California 95037, USA | Tested By: | MiCOM Labs, Inc.<br>440 Boulder Court<br>Suite 200<br>Pleasanton<br>California, 94566, USA |
| EUT: | 915 MHz RFID Reader | Telephone: | +1 925 462 0304 |
| Model: | ALR9900 | Fax: | +1 925 462 0306 |
| S/N: | JA0900005 | | |
| Test Date(s): | 16th November 2011 | Website: | www.micomlabs.com |

| STANDARD(S) | TEST RESULTS |
|---|---|
| FCC 47 CFR Part15.247 & IC RSS-210 | 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
TEST 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 | 2007 | Code of Federal Regulations |
| **(ii)** | Industry Canada RSS-210 | Issue 7 June 2007 | Low Power License-Exempt Radiocommunication Devices (All Frequency Bands) |
| **(iii)** | Industry Canada RSS-Gen | Issue 2 June 2007 | General Requirements and Information for the Certification of Radiocommunication Equipment. |
| **(iv)** | 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 |
| **(v)** | CISPR 22/ EN 55022 | 1997 1998 | Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment |
| **(vi)** | M 3003 | Edition 1 Dec. 1997 | Expression of Uncertainty and Confidence in Measurements |
| **(vii)** | LAB34 | Edition 1 Aug 2002 | The expression of uncertainty in EMC Testing |
| **(viii)** | 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 |
| **(ix)** | 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 Alien Technology RFID Reader ALR9900 to FCC Part 15.247 and Industry Canada RSS-210 regulations |
| Applicant: | As Manufacturer |
| Manufacturer: | Alien Technology<br>18220 Butterfield Blvd<br>Morgan Hill<br>California 95037, USA |
| Laboratory performing the tests: | MiCOM Labs, Inc.<br>440 Boulder Court, Suite 200<br>Pleasanton, California 94566 USA |
| Test report reference number: | VAFI01-U1 Rev A |
| Standard(s) applied: | FCC 47 CFR Part15.247 & IC RSS-210 |
| Date EUT received: | 15th December 2009 |
| Dates of test (from - to): | 16th November 2011 |
| No of Units Tested: | One |
| Type of Equipment: | 915 MHz RFID Reader |
| Manufacturers Trade Name: | Enterprise Reader |
| Model: | ALR9900 |
| Location for use: | Indoor |
| Declared Frequency Range(s): | 902 - 928 MHz |
| Type of Modulation: | PR-ASK |
| Declared Nominal Output Power: | +30 dBm |
| EUT Modes of Operation: | FHSS |
| Transmit/Receive Operation: | Transceiver, Simplex |
| Rated Input Voltage and Current: | 115Vac 60 Hz |
| Operating Temperature Range: | 0ºC to +50ºC (client declared range) |
| ITU Emission Designator: | 52K6L1D |
| Microprocessor(s) Model: | Intel Xscale |
| Clock/Oscillator(s): | 20, 3.6864, 25 MHz, 32.768 kHz |
| Frequency Stability: | ±20ppm |
| EUT Dimensions: | 8” x 7” x 1.6” |
| EUT Weight : | 2.21 lbs |
| Primary function of equipment: | Radio Frequency Identification (RFID) Reader |

## 3.2. Scope of Test Program

The scope of the test program was to perform a Class II Permissive Change on the Alien Technology RFID Reader ALR9900 in the frequency ranges 902 - 928 MHz against FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications for radiated emissions for intentional radiators. The intentional radiator was tested in a simulated typical installation to demonstrate compliance with the stated standards.

The Class II Permissive Change was to add a single antenna, see following description;

### Antenna Model Number:

RFID-v9.1 915 MHz

This antenna was designed primarily for use in RFID applications such as soft drink vending machines where a carefully controlled read/write staging area is needed, together with insensitivity to the presence of liquids. Far-Field radiation has been minimized to eliminate interaction with directly adjacent sensors and the presence of Tags not in the desired staging area.

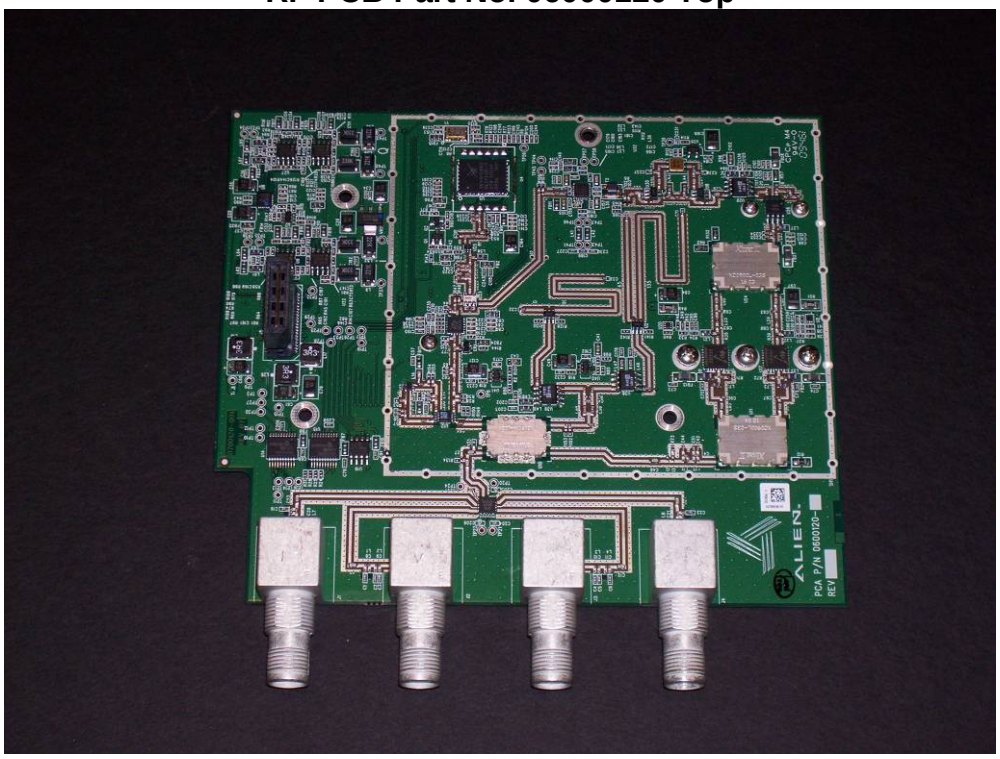
| SPECIFICATIONS | | |
|---|---|---|
| Nominal Impedance | 50 | Ohms |
| Center Frequency | 915 | MHz |
| Frequency Range of Operation | 902 - 928 | MHz |
| SWR Bandwidth (Min) | 26 | MHz |
| SWR (Max, 50 Ohm)[1] | 2:1 | |
| Read Range[2] | 4 | Inches |
| Nominal Gain[3] | -3.55 to 0.55 | dbi |
| Maximum Input Power[4] | 500 | mw |

| Notes |
|---|
| (1) SWR Typically 1.5:1 |
| (2) RFID Tag centered over Antenna |
| (3) Depends on T-Attenuator option selected: 0 to -3dbi |
| (4) Typical Power needed for max read height is 50mw |

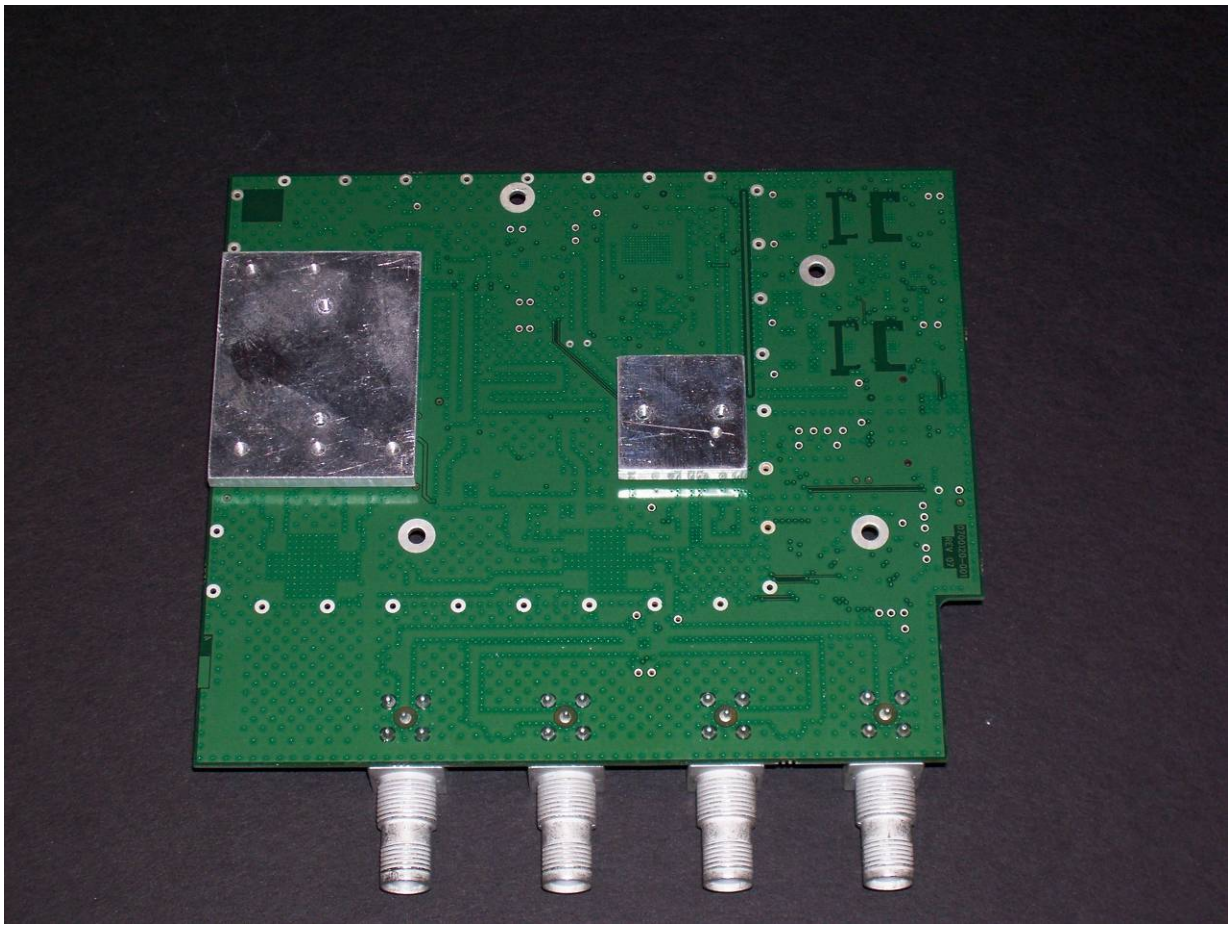
Because of the small size of this radiator compared to wavelength, its far field pattern is almost perfectly isotropic, producing a maximum gain in the pattern of 0.55db. This occurs on a line drawn from the center through the gap in the resonator in the plane of the antenna. The EIRP is therefore .55db maximum over the isotropic reference. The inclusion of the onboard T-Attenuator reduces the EIRP by 1db to 4db, depending on the configuration chosen.

Maximum average power in normal operation is less than 50mw (0.05W). Power output needed from the Reader is 100mw at a 50% duty cycle, and losses in the transmission line, connectors, and antenna dielectric actually reduce that by about 2db, to 32mw. Peak envelope power (PEP) would be 64mw. The power density in normal operation at 12 inches would be 27mw/m2 (0.027W per square meter), or less than 18x10-6/in2 (0.000018W per square inch). Again these levels would be reduced by 1db to 4db depending on the vales chosen for the T-Attenuator.

## RF PCB Part No. 06000120 Top



## RF PCB Part No. 06000120 Underside



## Alien Technology 915 MHz RFID Reader

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

| Type (EUT/ Support) | Equipment Description (Including Brand Name) | Mfr | Model No. | Serial No. |
|---|---|---|---|---|
| EUT | RFID Reader | Alien Technology | ALR9900 | FA0700154 |
| EUT | 115Vac/dc Power Supply Unit<br>10 Vdc,2A<br>6 Vdc,2A<br>-5Vdc/0.5A | Cable Connections, by Rong Horng Electronic Co Ltd | RHL-97575720 2505-6 | D0629G |
| EUT | 100-240Vac/dc PSU<br>9.75 Vdc, 2.5A<br>+5.75Vdc, 3A<br>-5.75 Vdc, 0.3A | XP Power | HUP45-30/#10045-01 | 03485057-0631 |
| EUT | Latitude Laptop | Dell | C600, PP01L | None |

## 3.4. Antenna Details

| Brand | Model | Type | Frequency | Antenna Gain |
|---|---|---|---|---|
| Alien | ALR-9608 | Circular | 902-928MHz | 5.5dBic |
| Alien | ALR-9611/* | Circular | 902-928MHz | 6dBi |
| Laird | S9025PCRTN | Circular | 902-928MHz | 5.5dBi |
| Laird | S9025P R/L | Circular | 902-928MHz | 5.5dBic |
| Laird | S9026X | Circular | 902-928MHz | 6 dBic |
| Laird | S8056RC | Circular | 860-960MHz | 6dBi |
| Laird | S9028PC12NF | Circular | 902-928MHz | 7.5dBic |
| Laird | S9028PCL | Circular | 902-928MHz | 8 dBic |
| Laird | S8658WP R/L | Circular | 865-960MHz | 8.5dBic |
| Laird | S8658WPLE240 RTN | Circular | 865-960MHz | 8.5dBic |
| Laird | DCE8658WPR | Circular | 865-960MHz | 8.5dBic |
| Laird | S8658WPR12N F | Circular | 865-956MHz | 8.5dBi |
| Laird | DCE9028P R/L | Circular | 902-928MHz | 9dBic |
| Mobile Mark | PN10-915/* | Circular | 850-980MHz | 10dBic |
| Mobile Mark | PN12-915/* = EDN 228-221 | Circular | 902-928MHz | 12dBic |
| Mobile Mark | PN12-868/* | Circular | 860-960MHz | 12dBic |
| Mobile Mark | BP6-915/* | Circular | 902-928MHz | 5.5dBic |
| Mobile Mark | PN7-915/* | Circular | 902-928MHz | 7dBic |
| Mobile Mark | PN8-915/* | Circular | 902-928MHz | 8dBi |
| MTI | MT-263007/* | Circular | 902-928MHz | 10dBic |
| MTI | MT-263020/* | Circular | 902-928MHz | 11dBic |
| MTI | MT-241026/* | Circular | 865-956MHz | 2.5dBic |
| MTI | MT-242042/* | Circular | 902-928MHz | 6.5dBic |
| MTI | MT-262013/* | Circular | 902-928MHz | 7.5dBic |
| MTI | MT-262024/* | Circular | 902-928MHz | 7.5dBic |
| MTI | MT-262031/* | Circular | 902-928MHz | 7.5dBic |
| MTI | MT-242043/* | Circular | 865-956MHz | 8.5 dBic |
| MTI | MT-262011/* | Circular | 902-928MHz | 8.5dBic |
| MTI | MT-262006/* | Circular | 902-928MHz | 9dBic |

| | | | | |
|---|---|---|---|---|
| Laird | S9028SLP12NF | Linear | 902-928MHz | 8dBi |
| Laird | (IF 900) CAF 95956 | Linear | 880-960MHz | 3dBi |
| Laird | S9028P12NF | Linear | 902-928MHz | 8dBi |
| Laird | S9028PV | Linear | 902-928MHz | 8dBi |
| Mobile Mark | CVO-915l | Linear | 902-928MHz | 2.5dBi |
| Mobile Mark | CVS-915l | Linear | 902-928MHz | 2.5dBi |
| Mobile Mark | BP6-915 | Linear | 902-928MHz | 5.5dBi |
| MTI | MT-242044/* | Linear | 902-928MHz | 8dBi |
| Laird | S902ANFC | NF | 902-928MHz | 6dBi |
| Laird | S902ANFD | NF | 902-928MHz | 6dBi |
| Mobile Mark | NLM-915 | NF | 860-960MHz | N/A |
| MTI | MT-269508/* | NF | 902-928MHz | N/A |
| Validfill, LLC | RFID-v9.1 915 MHz | NFLS | 902-928MHz | -3.55 to 0.55dBi |

NFLS - Near Field Magnetic Loop Sensor

Tested Antenna

## 3.5. Cabling and I/O Ports

Number and type of I/O ports

1. RF Port (915 MHz)
1. 10/100BT Ethernet
2. dc Supply on single connector +10, +6, -5Vdc
3. Serial Port (9 pin) Local Maintenance Terminal
4. Control input/output

## 3.6. Test Configurations

Test configurations

| Operating Channel | Frequencies (MHz) |
|---|---|
| 0 | 902.75 |
| 26 | 915.75 |
| 49 | 927.25 |

## 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

The following tests were performed by a MiCOM Labs approved test facility;-

1. NONE

# 4. TEST SUMMARY

## List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247**, **Industry Canada RSS-210** and **Industry Canada RSS-Gen.**

| Section(s) | Test Items | Description | Condition | Result | Test Report Section |
|---|---|---|---|---|---|
| **15.247(a)(1)** **A8.1** | 20 dB BW | 20 dB BW | Conducted | Complies | 5.1.1 |
| **15.247(a)(1)** **A8.1** | Transmitter Channels | Channel Spacing | Conducted | Complies | 5.1.2 |
| **15.247(a)(1)** **A8.1** | Transmitter Channels | Number of Channels | Conducted | Complies | 5.1.3.1 |
| | | Channel Occupancy | Conducted | Complies | 5.1.3.2 |
| **15.247(b)(2)** **A8.4** | Output Power | Transmit Power | Conducted | Complies | 5.1.4 |
| **15.247(i)** **5.5** | Maximum Permissible Exposure | Exposure to radio frequency energy levels | Conducted | Complies | 5.1.5 |
| **15.247(d)** **A8.5** | Conducted Spurious Emissions | Band Edge | Conducted | Complies | 5.1.6 |
| | | Spurious Emissions Transmitter (1 to 10 GHz) | Conducted | Complies | |
| **§7.2.3** | | Standby | Conducted | Complies | 5.1.7 |

## List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247**, **Industry Canada RSS-210** and **Industry Canada RSS-Gen.**

| Section(s) | Test Items | Description | Condition | Result | Test Report Section |
|---|---|---|---|---|---|
| **15.247(d)**<br>**15.205**<br>**15.209**<br>**A8.5**<br>**2.2**<br>**2.6**<br>**4.9** | Radiated Emissions above 1 GHz | Transmitter | Radiated | Complies | *5.1.8.1* |
| **4.10** | | Receiver | Radiated | Complies | *5.1.8.2* |
| **15.247(d)**<br>**15.205**<br>**15.209**<br>**A8.5**<br>**2.2**<br>**2.6** | Radiated Emissions below 1 GHz | | Radiated | Complies | *5.1.9* |
| **15.207**<br>**7.2.2** | Conducted | AC Wireline Conducted Emissions | Conducted | Complies | *5.1.10* |

***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

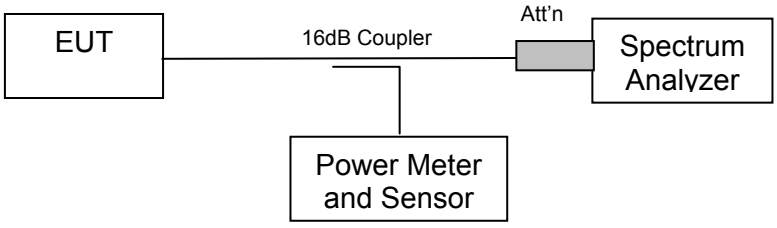
## 5.1. Device Characteristics

### 5.1.1. 20 dB Bandwidth

**FCC, Part 15 Subpart C §15.247(a)(1)**
**Industry Canada RSS-210 §A8.1**

**Test Procedure**
The 20 dB bandwidth is measured with a spectrum analyzer connected to the antenna terminal, while the EUT is operating in transmission mode at the appropriate center frequency and modulation.

**Test Measurement Set up**




Measurement set up for 20 dB bandwidth test

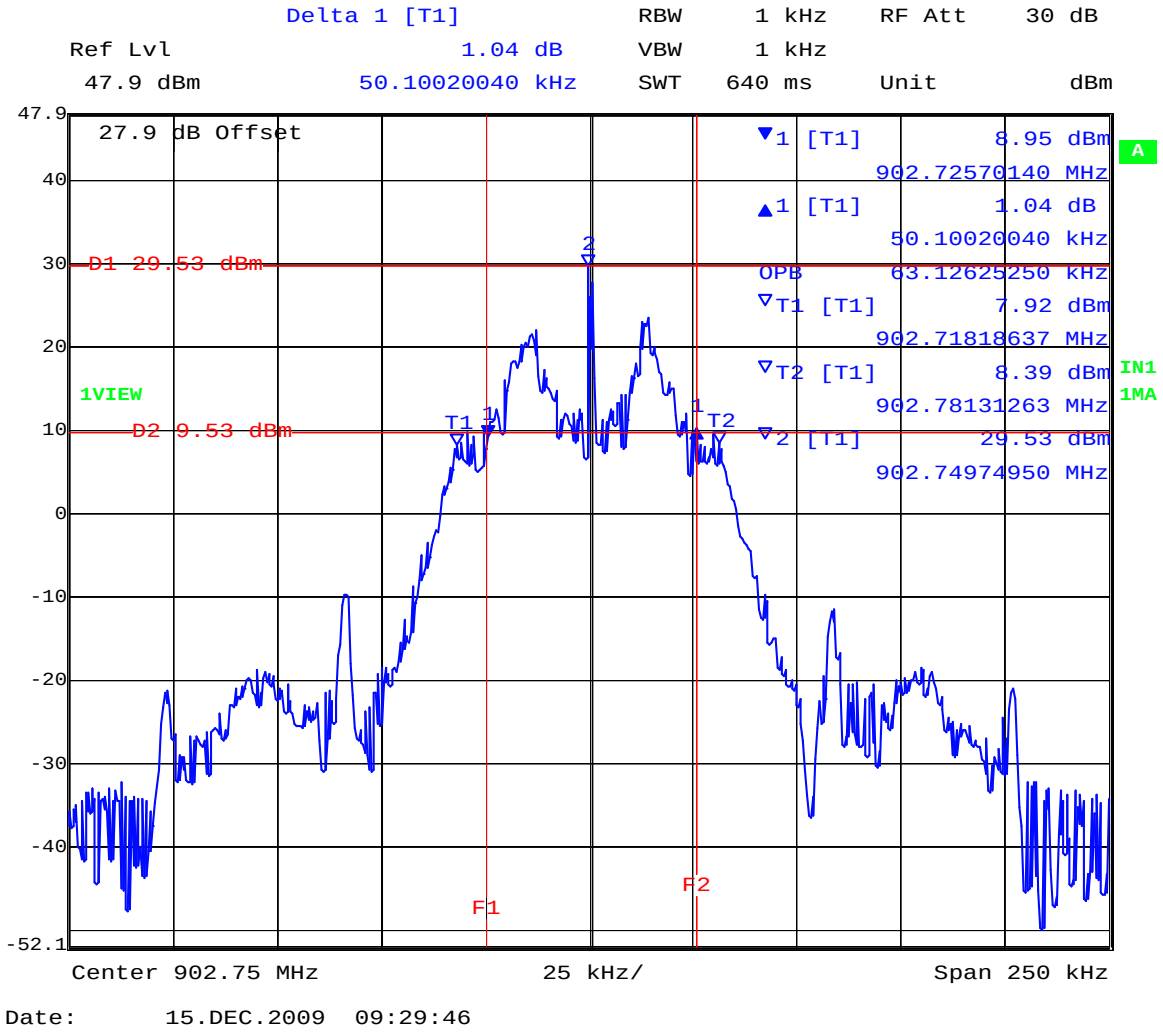
## Test Results for 20 dB Bandwidth

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

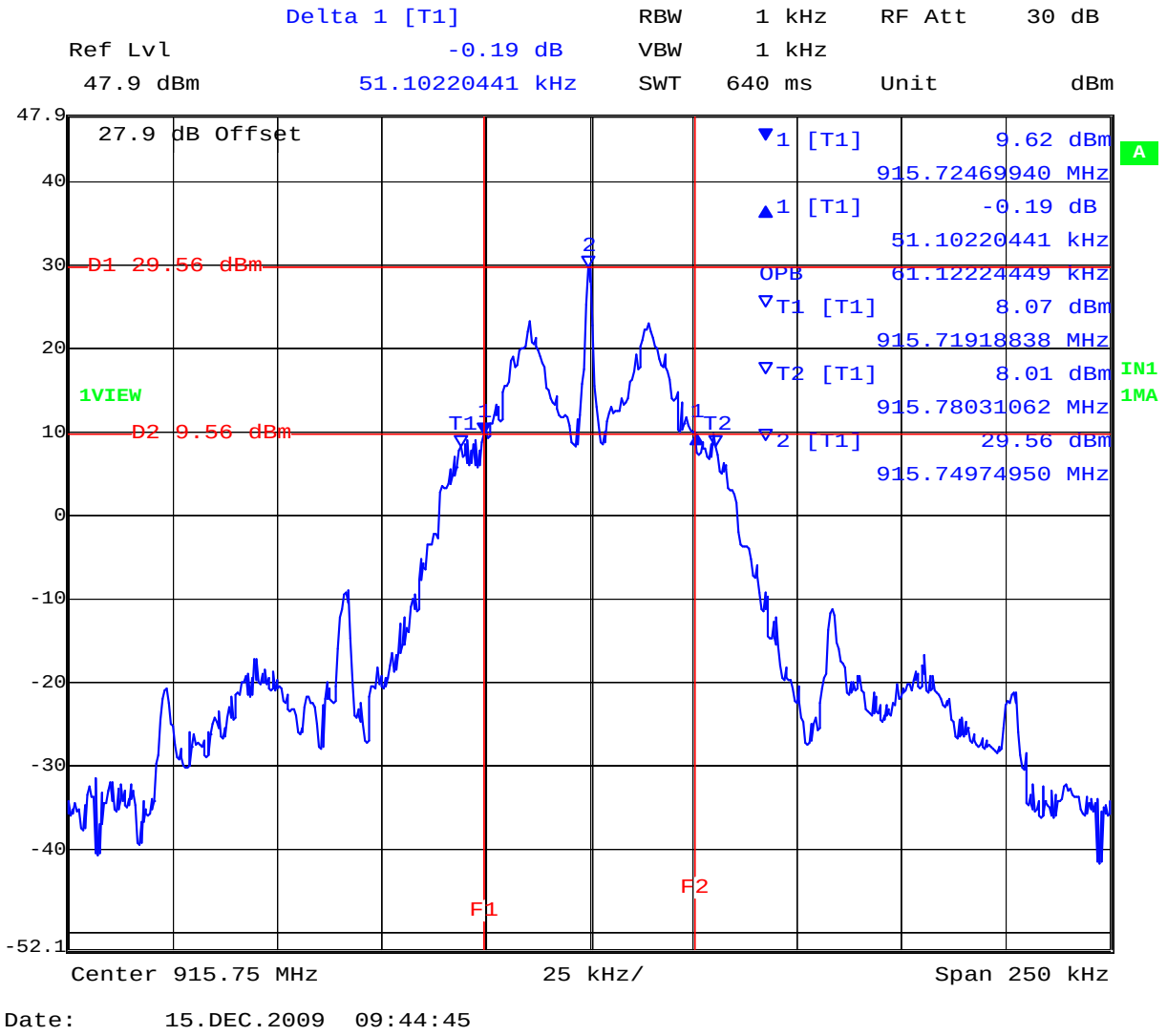
TABLE OF RESULTS

| Channel # | Center Frequency (MHz) | 20 dB Bandwidth (kHz) | Specification (kHz) |
|---|---|---|---|
| 0 | 902.75 | 50.1002 | <500 |
| 26 | 915.75 | 51.1022 | |
| 49 | 927.25 | 53.6072 | |

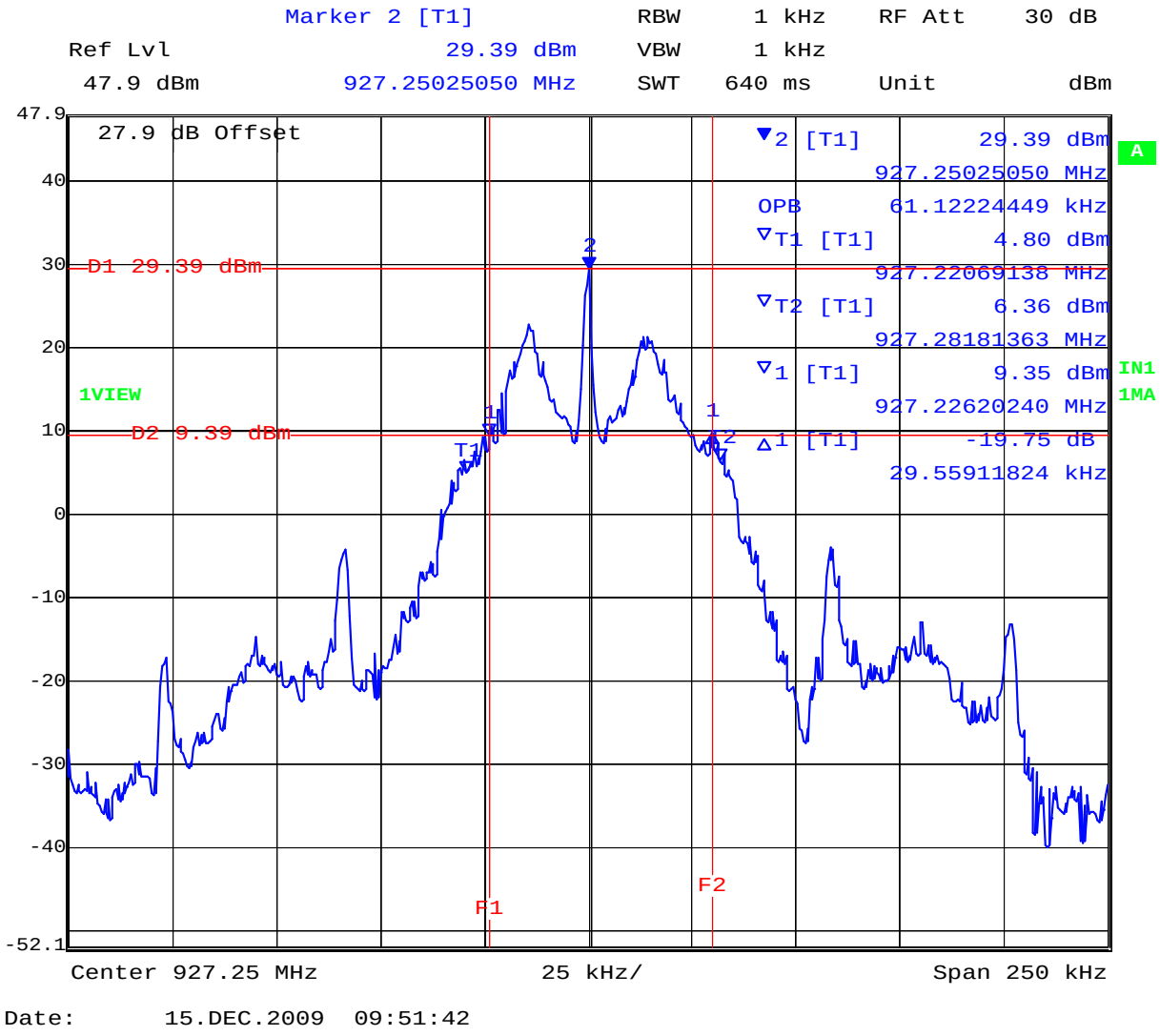
**CH 0 902.75 MHz 20 dB Bandwidth**



## CH 26 915.75 MHz 20 dB Bandwidth



## CH 49 927.25 MHz 20 dB Bandwidth



## Specification

### Limits

**FCC §15.247 (a)(1)**
**Industry Canada RSS-210 §8.1**

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 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, 0070, 0116, 0117 |

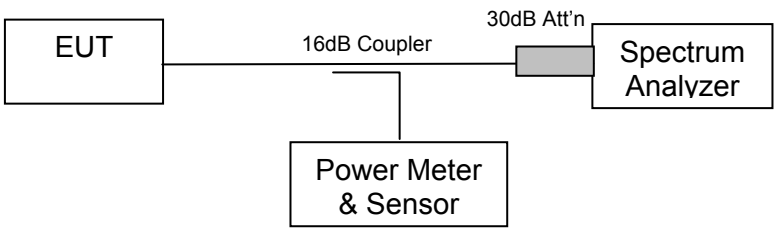
### 5.1.2. Transmitter Channels - Channel Spacing

**FCC, Part 15 Subpart C §15.247(a)(1)**
**Industry Canada RSS-210 §8.1(2)**

**Test Procedure**

The channel spacing is measured with a spectrum analyzer connected to the antenna terminal, while the EUT is operating in transmission mode at the appropriate center frequency and modulation.

**Test Measurement Set up**




Measurement set up for Channel Spacing Test

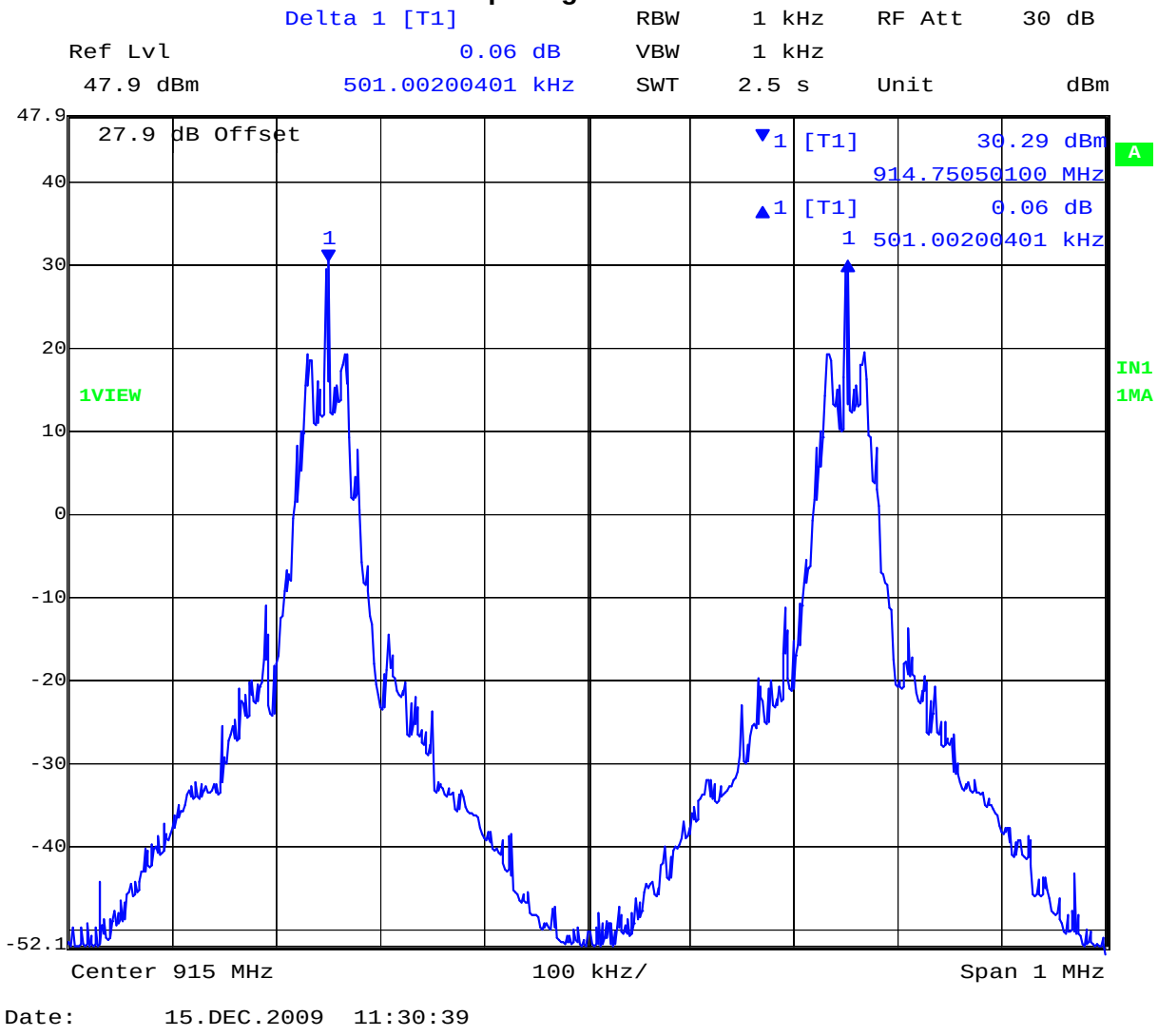
Ambient conditions.
Temperature: 17 to 23 °C  Relative humidity: 31 to 57 %  Pressure: 999 to 1012 mbar

TABLE OF RESULTS

| Channel(s) | Channel Spacing (KHz) | Specification |
|---|---|---|
| 25-26 | 501.002 | Greater than maximum 20 dB Bandwidth |

**Maximum 20 dB bandwidth = 52.6052 kHz**

**Channel Spacing for CH 25 – CH 26**



## Specification for Channel Spacing

### Limits

**FCC §15.247 (a)(1)**
**Industry Canada RSS-210 §A8.1(2)**

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

### Laboratory Uncertainty for Frequency Measurements

| | |
|---|---|
| Measurement uncertainty | ±0.86ppm |

### Traceability

| Method | Test Equipment Used |
|---|---|
| Measurements were made per work instruction WI-02 'Frequency Measurement" | 0078, 0134, 0158, 0184, 0193, 0250, 0252 0310, 0312. |

### 5.1.3. Transmitter Channels

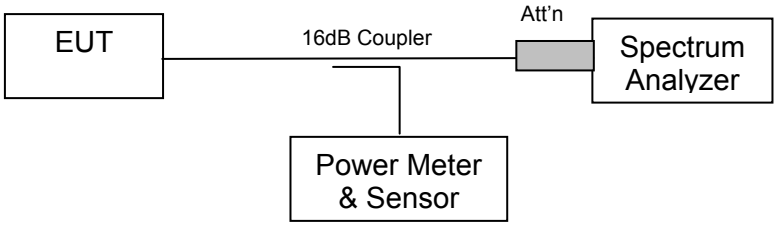
#### 5.1.3.1. Number of Channels

**FCC, Part 15 Subpart C §15.247(a)(1)**
**Industry Canada RSS-210 §A8.1**

**Test Procedure**

The number of channels and channel occupancy is measured with a spectrum analyzer connected to the antenna terminal, while the EUT is operating in transmission mode at the appropriate center frequency and modulation.

**Test Measurement Set up**



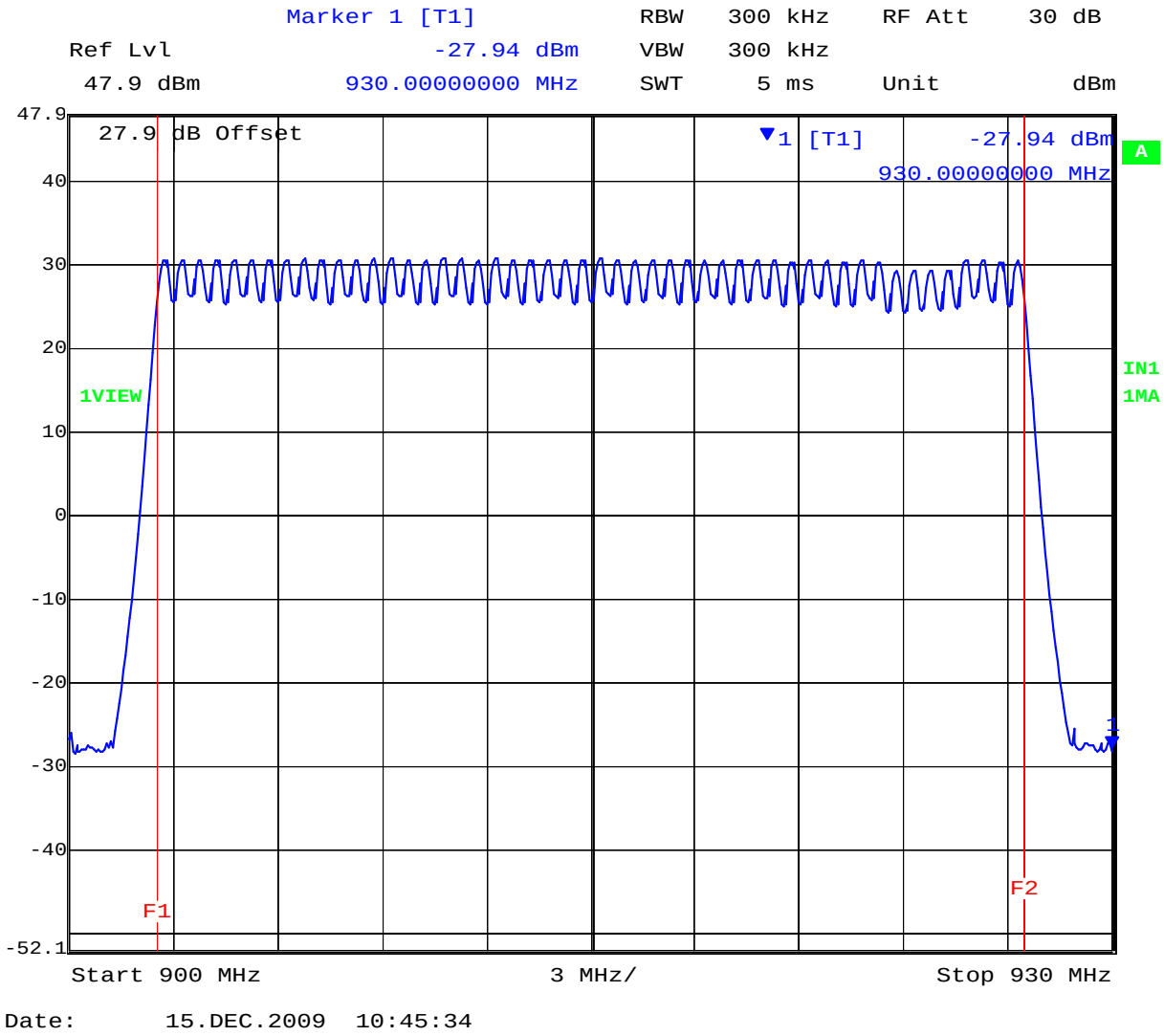

Test set up to measure the number of channels and channel occupancy

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

TABLE OF RESULTS

| Number of Channels | Specification |
|---|---|
| 50 | Minimum of 50 hopping channels |

**Number of Transmission Channels**



### 5.1.3.2. Channel Occupancy

**FCC, Part 15 Subpart C §15.247(a)(1)**
**Industry Canada RSS-210 §A8.1**

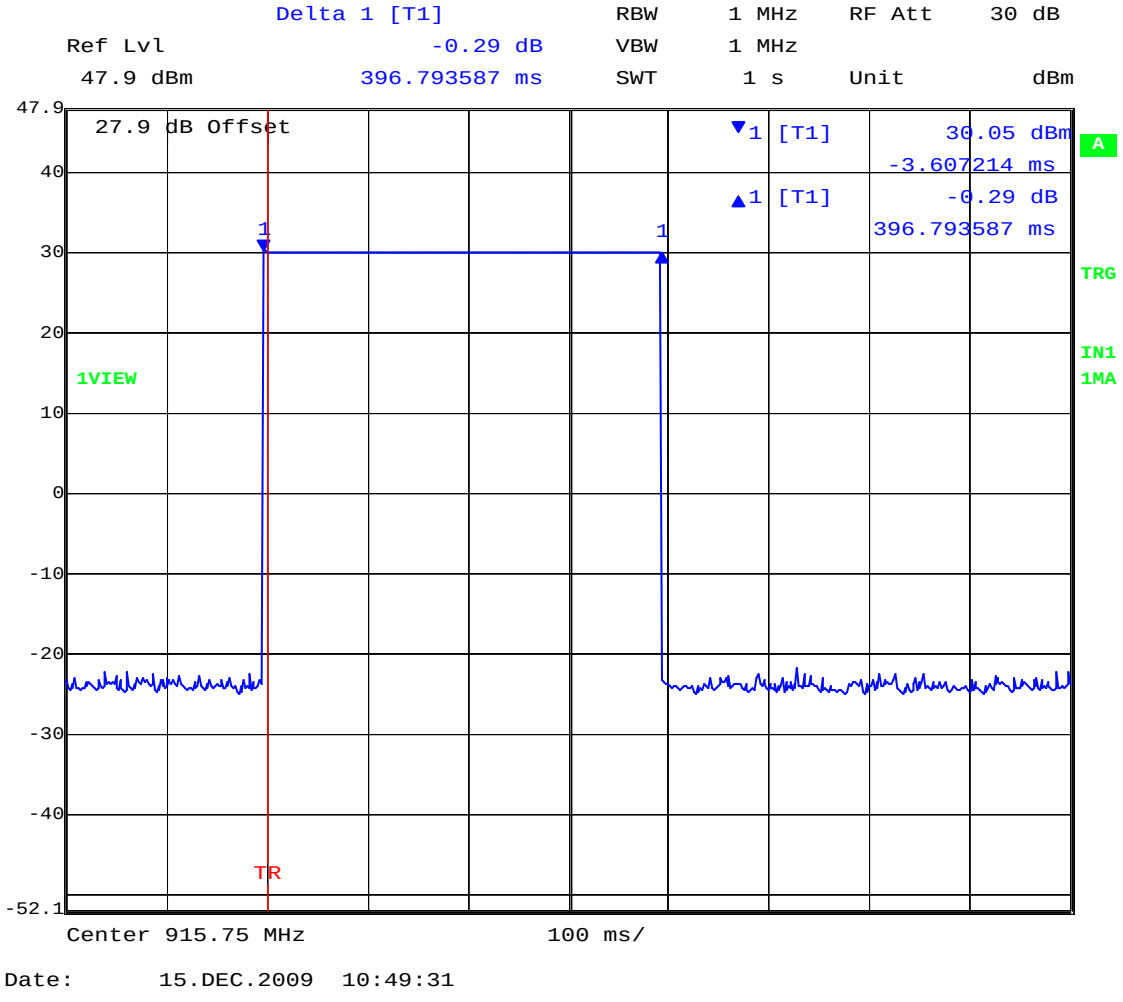
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

**Channel Dwell Time**

TABLE OF RESULTS

| Channel # | Center Frequency (MHz) | Channel Dwell Time (single channel) (mSecs) |
|---|---|---|
| 26 | 914.75 | 396.79 |

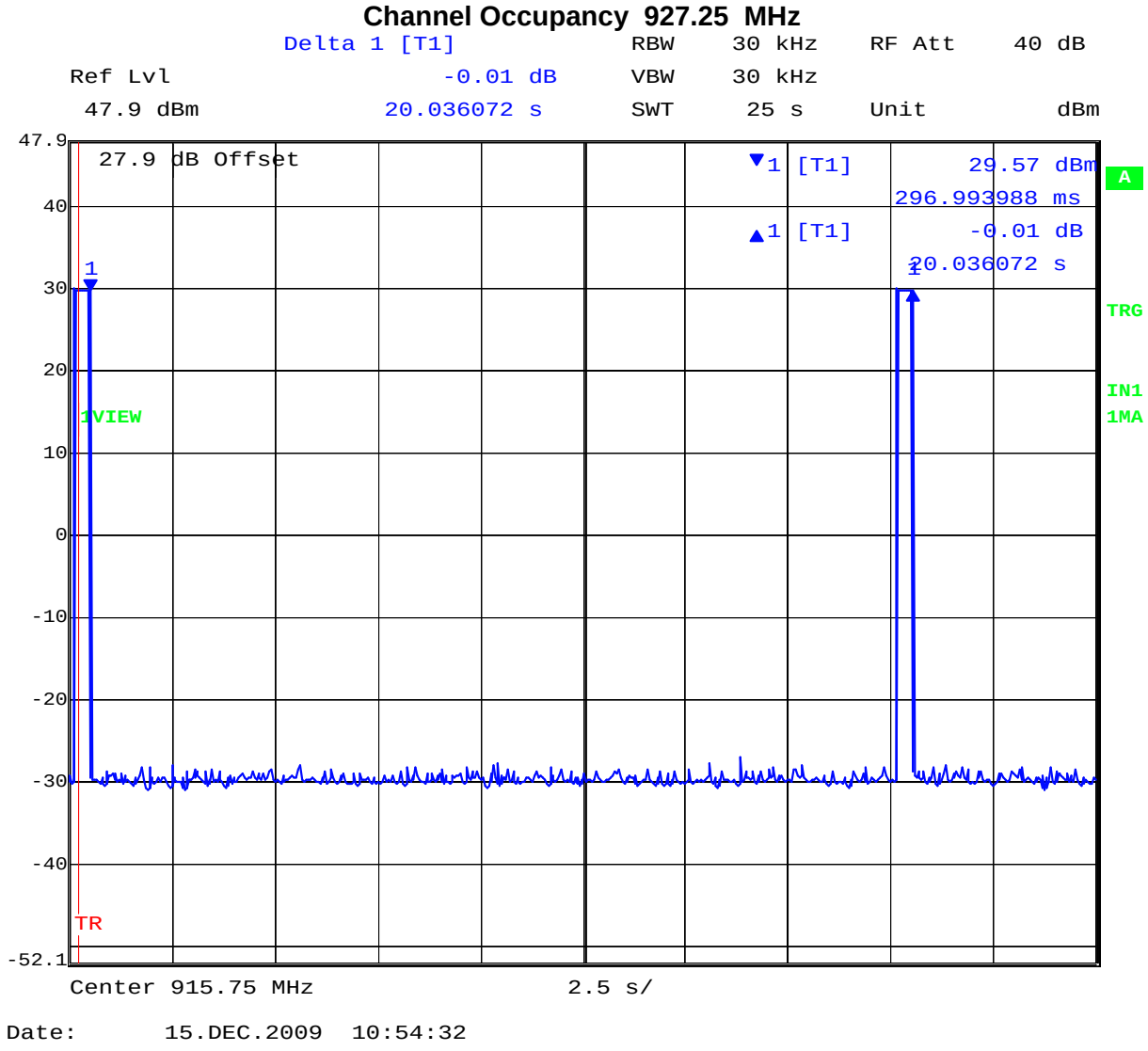
**Channel dwell time Ch 26 915.75 MHz**



## Channel Occupancy

TABLE OF RESULTS

| Channel # | Center Frequency (MHz) | Channel Occupancy within 10 Second Period (mSeconds) |
|---|---|---|
| 26 | 915.75 | 396.79 |



## Specification for Number of Channels and Channel Occupancy

### Limits

**FCC, Part 15 Subpart C §15.247(a)(1)**
**Industry Canada RSS-210 §A8.1**

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

### Laboratory Uncertainty for Frequency Measurements

| | |
|---|---|
| Measurement uncertainty | ±0.86ppm |

### Traceability

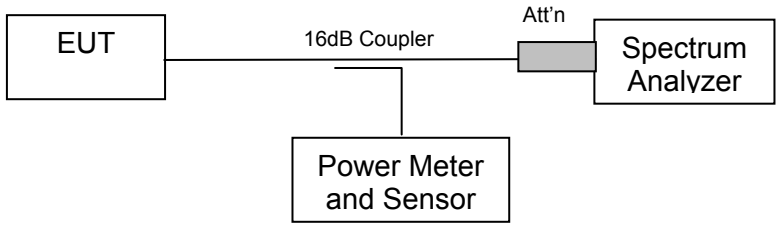
| Method | Test Equipment Used |
|---|---|
| Measurements were made per work instruction WI-02 'Frequency Measurement" | 0078, 0134, 0158, 0184, 0193, 0250, 0252 0310, 0312. |

### 5.1.4. Output Power

**FCC, Part 15 Subpart C §15.247(b)(2)**
**Industry Canada RSS-210 §A8.4**

**Test Procedure**
The transmitter terminal of EUT was set for CW (continuous wave) operation and connected to the input of the power meter which was calibrated to measure power. The value of measured power including antenna cable loss was reported.

**Test Measurement Set up**




Measurement set up for Transmitter Output Power

**Measurement Results for Output Power**

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

TABLE OF RESULTS

| Channel # | Center Frequency (MHz) | Power (dBm) |
|---|---|---|
| 0 | 902.75 | +29.60 |
| 26 | 915.75 | +29.69 |
| 49 | 927.25 | +29.70 |

## Specification

### Limits

**FCC, Part 15 Subpart C §15.247 (b)(2)** The maximum output power of the intentional radiator shall not exceed the following:
(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

**Industry Canada RSS-210 §A8.4**
For frequency hopping systems operating in the 902 - 928 MHz band, the maximum peak conducted power output power is not to succeed 1.0 W if the hopset uses 50 or more hopping channels and 0.25 W if the hopset uses less than 50 hopping channels.

### 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, 0070, 0116, 0117 |

### 5.1.5. Maximum Permissible Exposure

**FCC, Part 15 Subpart C §15.247(i)**
**Industry Canada RSS-Gen §5.5**

**Calculations for Maximum Permissible Exposure Levels**

Power Density = Pd (mW/cm$^2$) = EIRP/(4$\pi$d$^2$)

EIRP = P * G

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

Numeric Gain = 10 ^ (G (dBi)/10)

Because the EUT belongs to the General Population/Uncontrolled Exposure the limit of power density is 1.0 mW/cm$^2$

| Antenna Gain (dBi) | Numeric Gain (numeric) | Peak Output Power (dBm) | Peak Output Power (mW) | Calculated Safe Distance @ 1mW/cm$^2$ Limit(cm) | Minimum Separation Distance (cm) |
|---|---|---|---|---|---|
| 6 | 4.0 | +29.7 | 934 | 17.3 | 20* |

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

**Specification**

**Maximum Permissible Exposure Limits**

**§15.247(i)** 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.

**FCC §1.1310** Limit = 1mW / cm$^2$ from 1.310 Table 1

**RSS-Gen §5.5** Before equipment certification is granted, the applicable requirements of RSS-102 shall be met.

**Laboratory Measurement Uncertainty for Power Measurements**

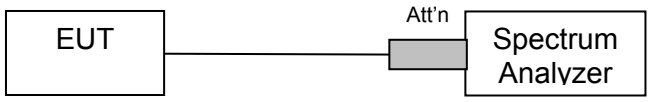
| | |
|---|---|
| Measurement uncertainty | ±1.33 dB |

### 5.1.6. Conducted Spurious Emissions Transmitter

**FCC, Part 15 Subpart C §15.247(d)**
**Industry Canada RSS-210 §A8.5**

**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.

**Test Measurement Set up**




Band-edge measurement test configuration

**Measurement Results of Conducted Spurious Emissions**

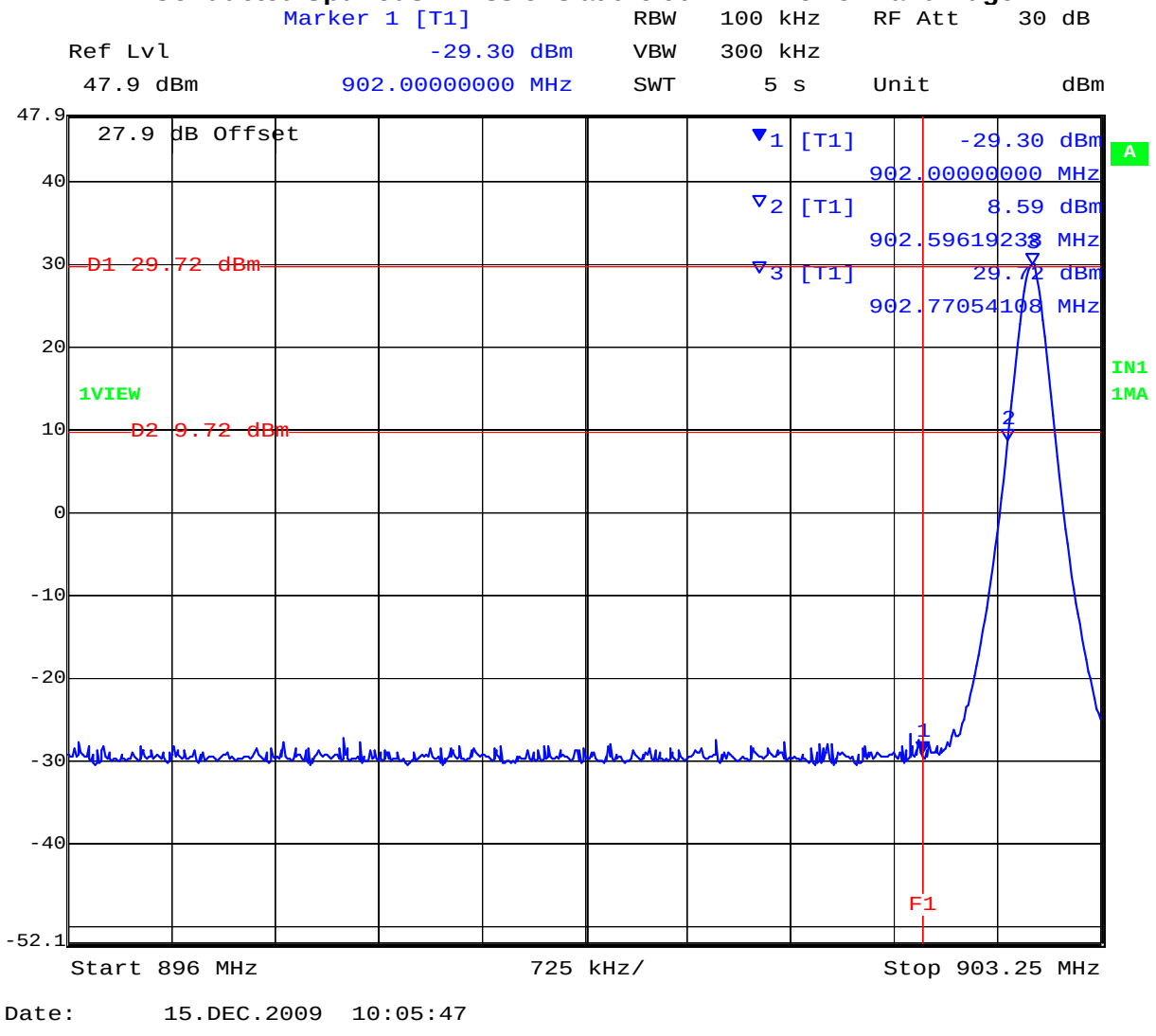
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

## Conducted Band-Edge Results

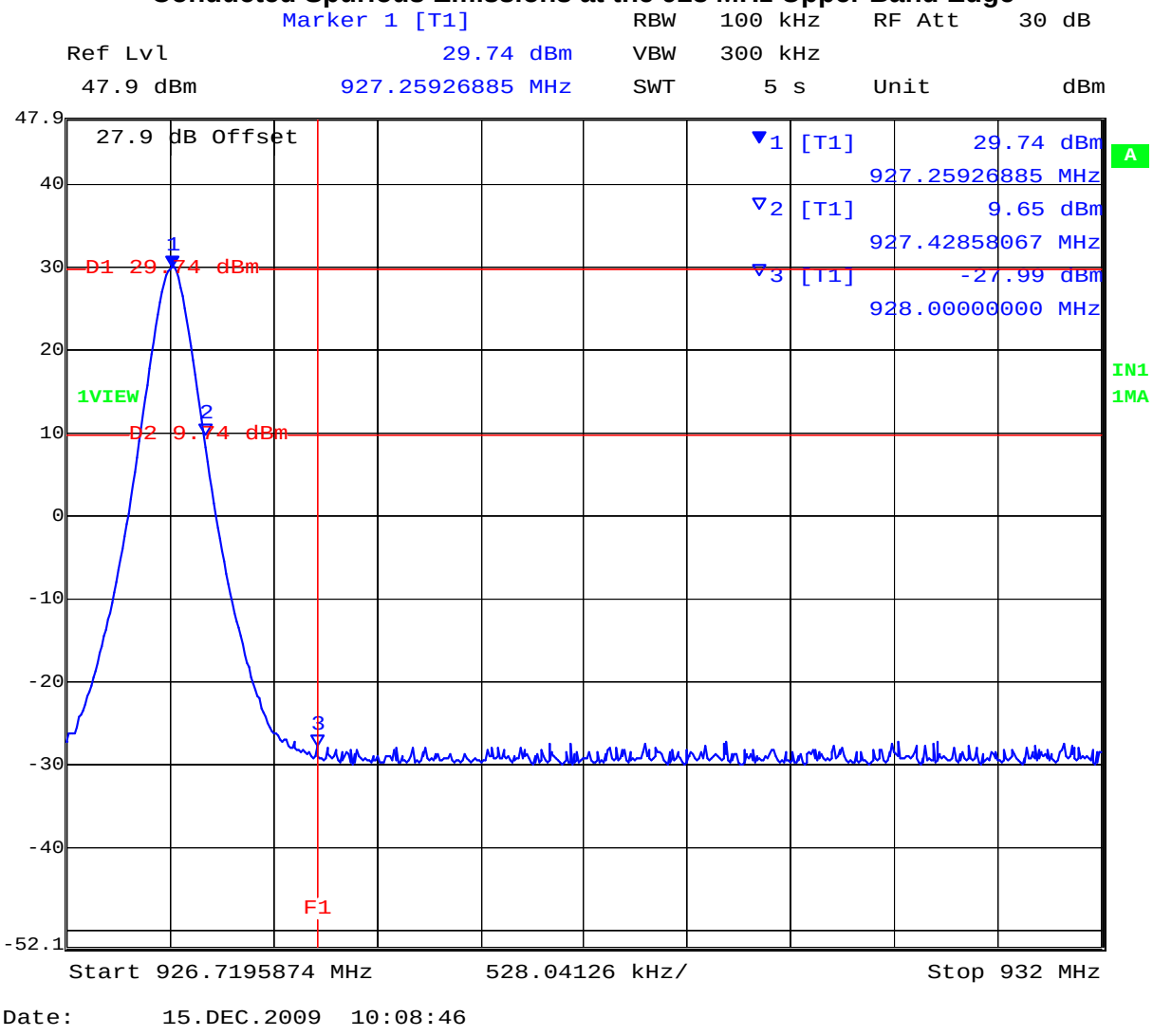
TABLE OF RESULTS – **802.11b**

| Channel # | Center Frequency (MHz) | Band-edge Frequency (MHz) | Limit (dBm) | Amplitude @ Band-edge (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| 0 | 902.75 | 902.0 | +9.72 | -29.30 | -39.02 |
| 49 | 927.25 | 928.0 | +9.74 | -27.99 | -37.73 |

**Conducted Spurious Emissions at the 902 MHz Lower Band Edge**



## Conducted Spurious Emissions at the 928 MHz Upper Band Edge



## Spurious Emissions (1-10 GHz)

Conducted spurious emissions (1-10 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 which were derived from the band-edge measurements provided below are drawn on each plot.

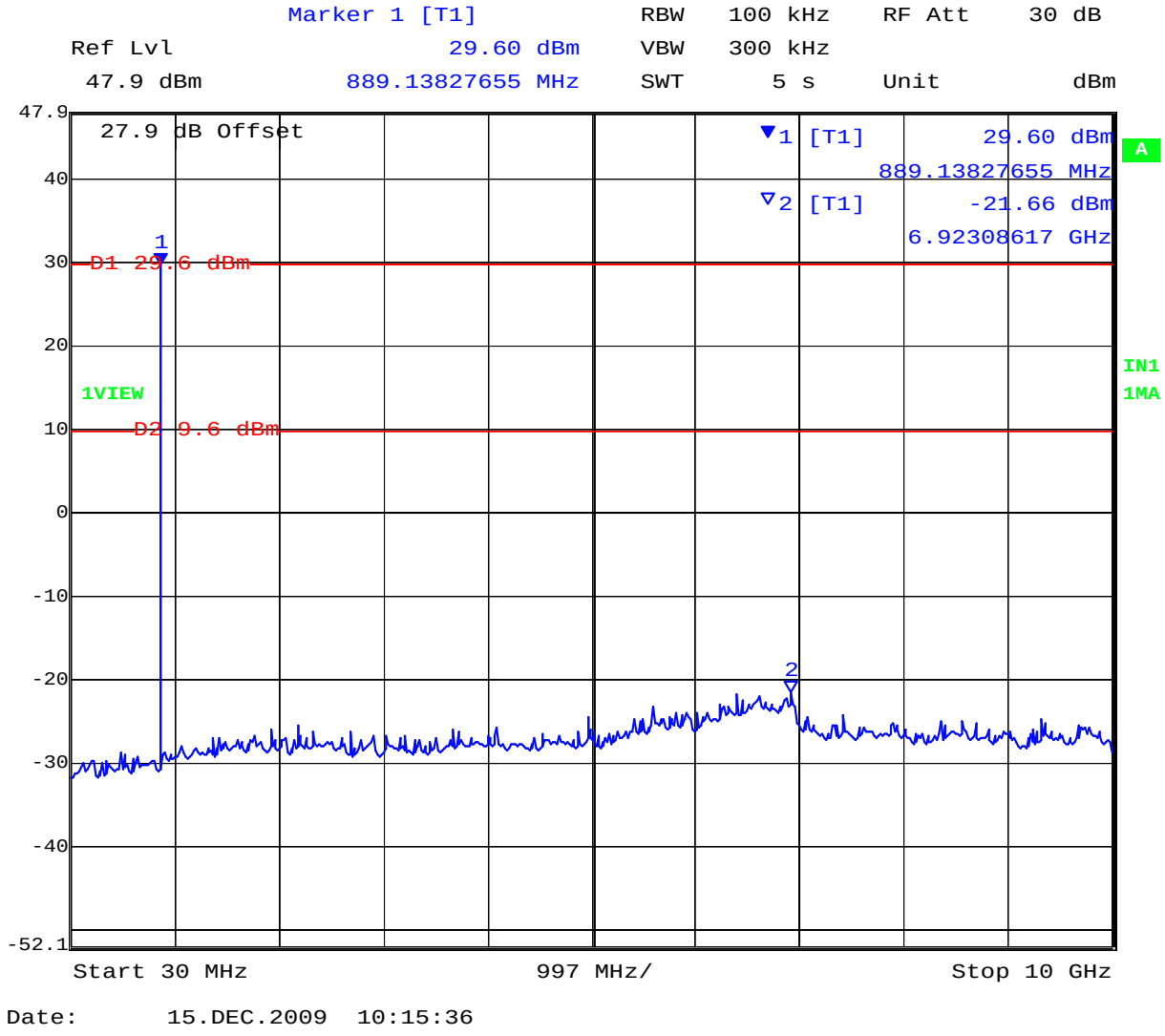
TABLE OF RESULTS

| Channel Centre Frequency (MHz) | Start Frequency (MHz) | Stop Frequency (MHz) | Maximum Emission Observed (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| 902.75 | 30 | 10,000 | -21.66 | +9.60 | -31.26 |

The emission breaking the limit line is the carrier.

## Conducted Transmitter Spurious Emissions

### Channel 902.75 MHz - 30 MHz to 10,000 MHz

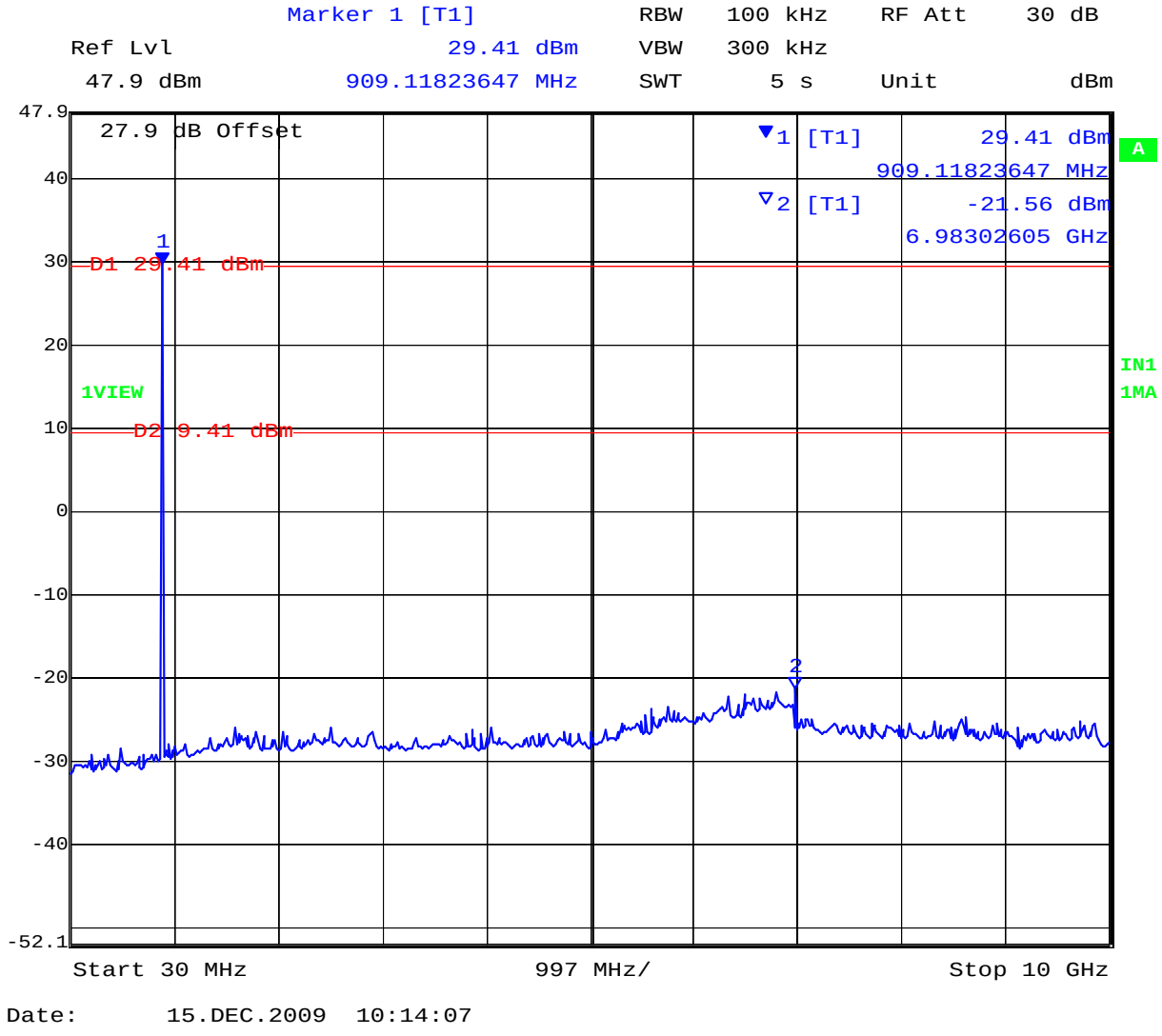


| Channel Centre Frequency (MHz) | Start Frequency (MHz) | Stop Frequency (MHz) | Maximum Emission Observed (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| 915.75 | 30 | 10,000 | -21.56 | +9.41 | -30.97 |

The emission breaking the limit line is the carrier.

**Conducted Transmitter Spurious Emissions**

**Channel 915.75 MHz - 30 MHz to 10,000 MHz**



| Channel Centre Frequency (MHz) | Start Frequency (MHz) | Stop Frequency (MHz) | Maximum Emission Observed (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| 927.25 | 30 | 10,000 | -21.87 | +9.41 | -31.28 |

The emission breaking the limit line is the carrier.

**Conducted Transmitter Spurious Emissions**

**Channel 927.25 MHz - 30 MHz to 10,000 MHz**

## Specification

### Limits Band-Edge

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

**FCC, Part 15 Subpart C §15.247(d)**

**Industry Canada RSS-210 §A.5**

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 a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

### 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' | 0287, 0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117. |

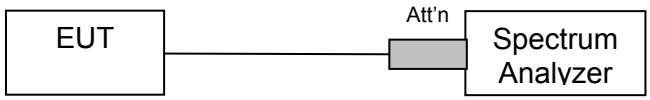
### 5.1.7. Conducted Spurious Emissions Stand-By

**Industry Canada RSS-Gen §7.2.3**

**Test Procedure**

Conducted Stand-By emissions were measured on the device on the mid channel. The EUT was placed in Stand-By mode and emissions were measured 30 MHz – 7 GHz.

**Test Measurement Set up**



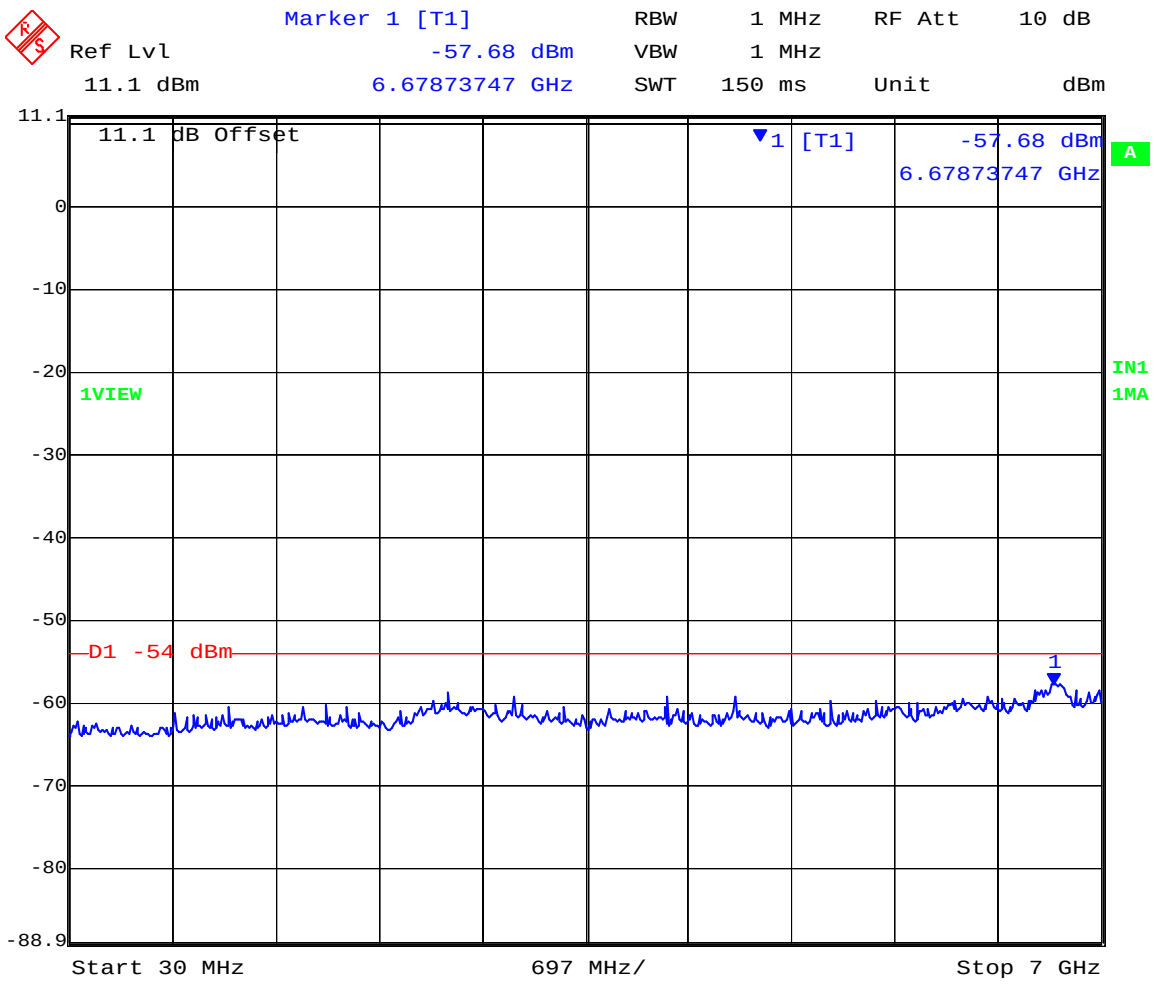

Stand-By spurious emissions test configuration

**Measurement Results of Stand –By Spurious Emissions**

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

## Conducted Stand-By Spurious Emissions 30M - 7 GHz

### Stand-By Conducted Emissions 30 MHz – 7 GHz




No emissions were observed breaking the limit.

**Specification**
Antenna Conducted Measurement
**Industry Canada RSS-Gen §7.2.3**

If the device has a detachable antenna of known antenna impedance, then the antenna conducted method is permitted in lieu of a radiated measurement.
Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts (-57 dBm) in the band 30-1000 MHz, or 5 nanowatts (-53 dBm) above 1 GHz.

**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' | 0287, 0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117. |

### 5.1.8. Radiated Emissions

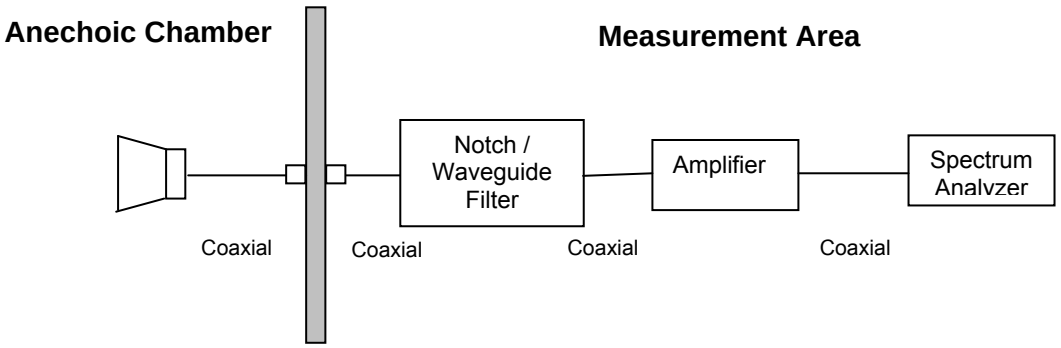
**FCC, Part 15 Subpart C §15.247(d)**
**Industry Canada RSS-210 §A8.5**

**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. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide 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:

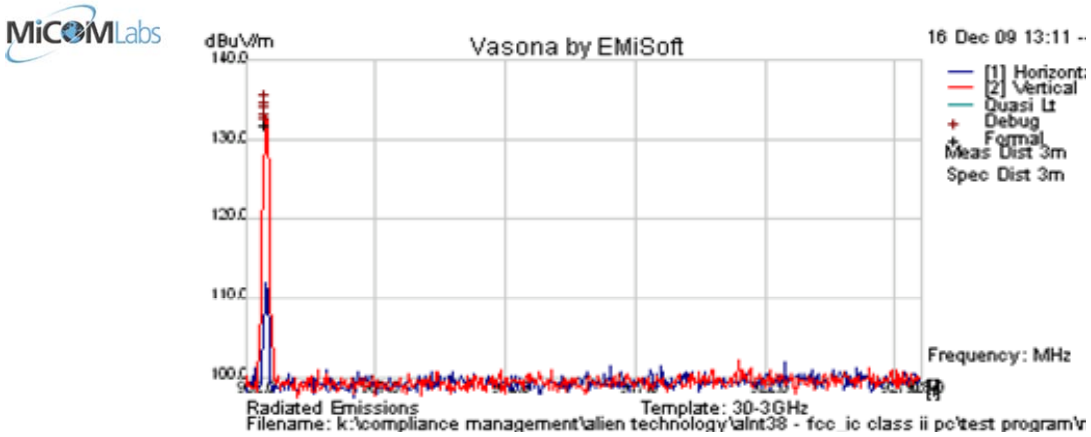
Level (dBμV/m) = 20 * Log (level (μV/m))

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

### 5.1.8.1. Transmitter Peak Emissions – Antenna S9028PV

### Radiated Emissions – Antenna S9028PV; Peak Fundamental Emissions

| | | | |
|---|---|---|---|
| **Test Freq.** | 902.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 902 MHz - 928 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 270 in Transmit Utility (29.8 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | Power level setting reduced to 270 (29.8 dBm), from a nominal of 285 (31.3dBm) | | |
| **Test Notes 2** | | | |

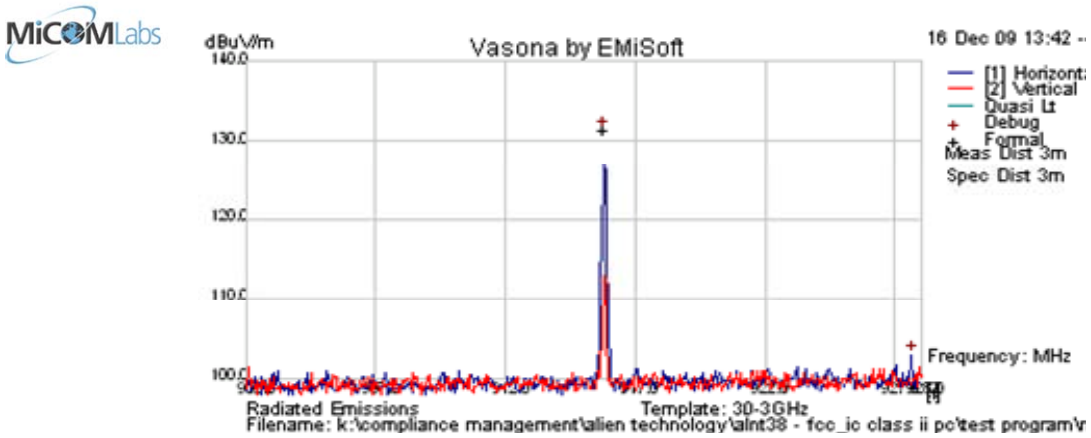



**Formally measured emission peaks**

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 902.764 | 91.7 | 17.3 | 22.8 | 131.8 | Peak | H | 150 | 0 | | | | FUND |

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 902 MHz - 928 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 270 in Transmit Utility (29.7 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | Power level setting reduced to 270 (29.7 dBm), from a nominal of 285 (30.9dBm) | | |
| **Test Notes 2** | | | |

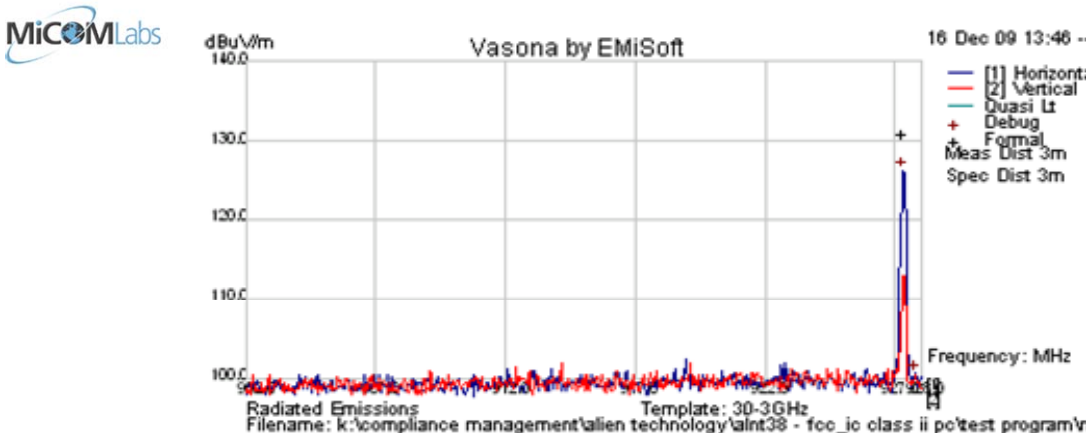



## Formally measured emission peaks

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 915.761 | 91.1 | 17.4 | 22.9 | 131.4 | Peak | H | 147 | 0 | | | | FUND |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

| | | | |
|---|---|---|---|
| **Test Freq.** | 927.25 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 902 MHz - 928 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 270 in Transmit Utility (29.3 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | Power level setting reduced to 270 (29.3 dBm), from a nominal of 285 (30.9dBm) | | |
| **Test Notes 2** | | | |



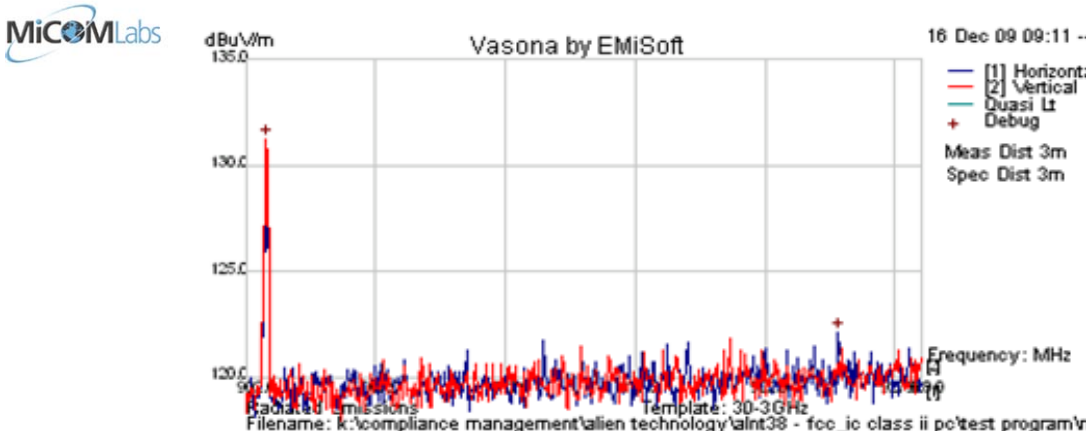

## Formally measured emission peaks

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 927.262 | 90.5 | 17.4 | 23.0 | 130.9 | Peak | H | 148 | 0 | | | | FUND |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

### 5.1.8.2. Transmitter Peak Emissions – Antenna EDN 228-221

| | | | |
|---|---|---|---|
| **Test Freq.** | 902.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 902 MHz - 928 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (29.0 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

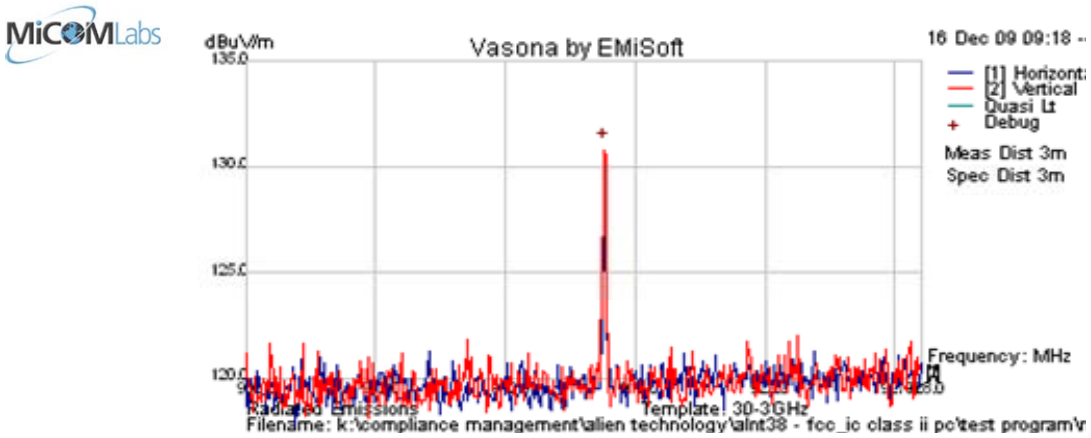



**Formally measured emission peaks**

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 902.752 | 71.2 | 37.3 | 22.8 | 131.3 | Peak | V | 122 | 13 | | | | FUND |

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 902 MHz - 928 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (29.0 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

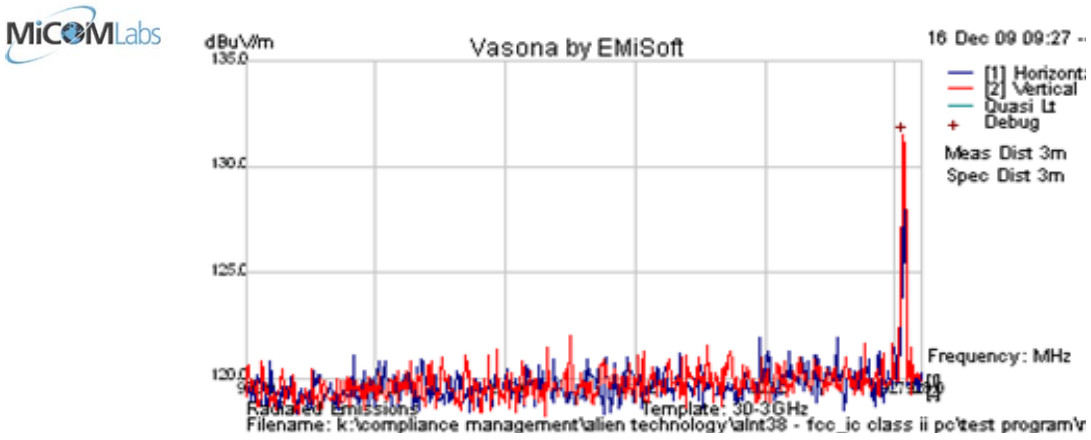



## Formally measured emission peaks

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 915.758 | 70.9 | 37.4 | 22.9 | 131.2 | Peak | V | 105 | 0 | | | | FUND |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |

| | | | |
|---|---|---|---|
| **Test Freq.** | 927.25 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 902 MHz - 928 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (28.43 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |




## Formally measured emission peaks

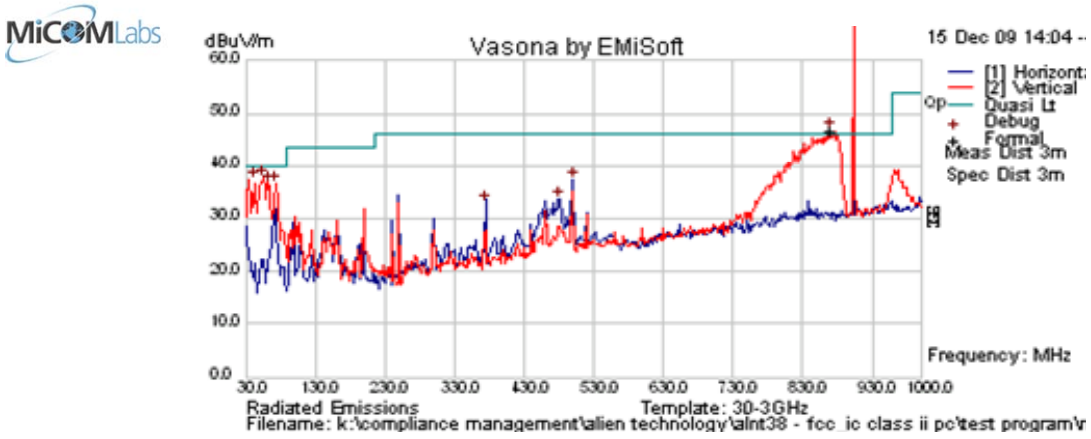
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 927.267 | 70.7 | 37.4 | 23.0 | 131.1 | Peak | V | 109 | 1 | | | | FUND |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

### 5.1.8.3. Transmitter Radiated Spurious Emissions - Antenna S9028PV

### Radiated Spurious Emissions – Antenna S9028PV [30-1000MHz]

| | | | |
|---|---|---|---|
| **Test Freq.** | 902.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (31.3 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

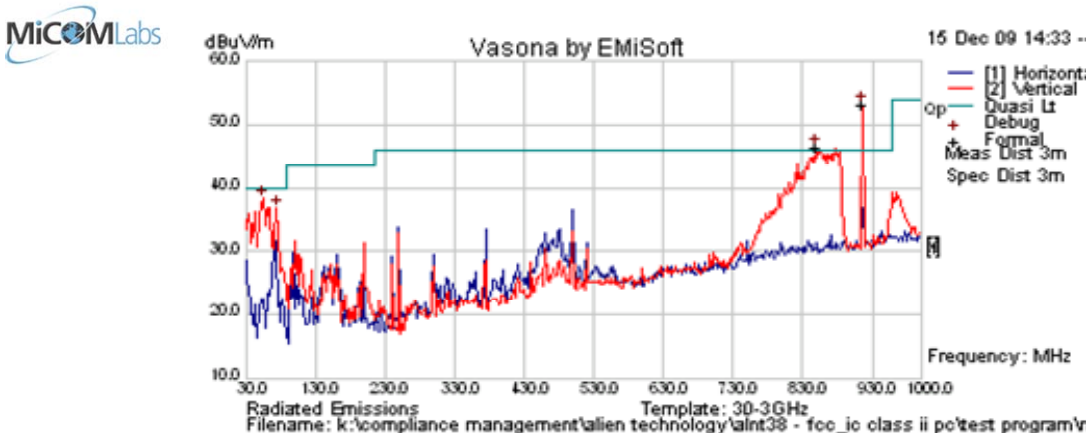



**Formally measured emission peaks**

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 868.669 | 47.1 | 7.2 | -7.6 | 46.7 | Peak | V | 100 | 0 | 111.8 | -65.1 | Pass | TX NRB |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (30.9 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

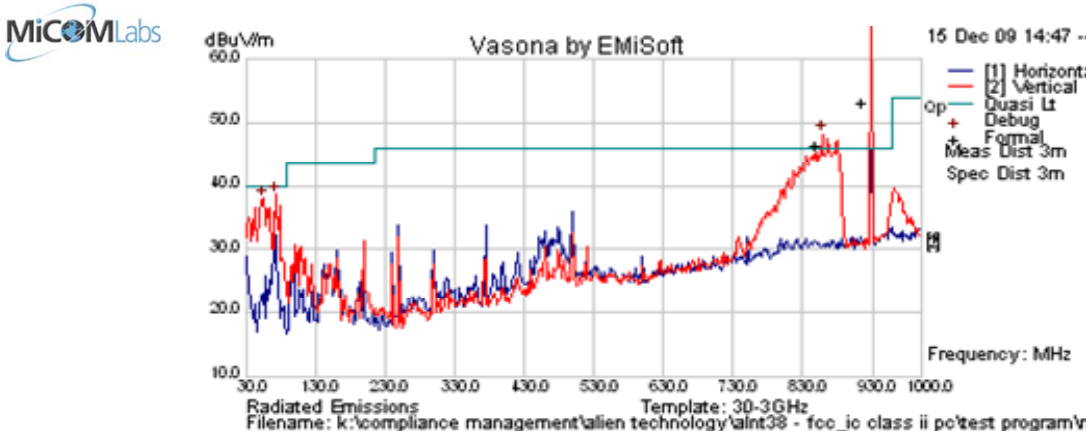



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 848.376754 | 47.1 | 7.2 | -7.8 | 46.5 | Peak [Scan] | V | 100 | 0 | 111.4 | -65.0 | Pass | TX NRB |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 927.25 | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (30.9 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |



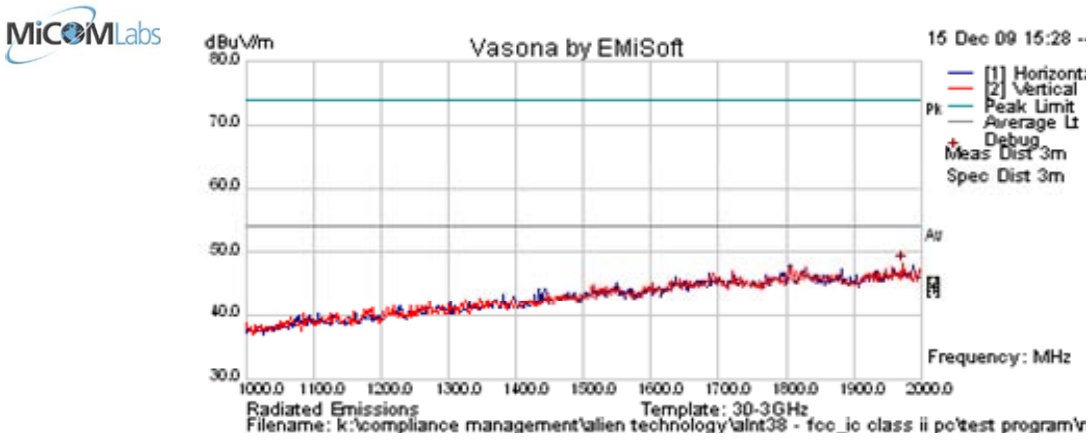

## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 865.214 | 48.7 | 7.2 | -7.7 | 48.2 | Peak [Scan] | V | 100 | 0 | 110.9 | -62.7 | Pass | TX NRB |

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

## Radiated Spurious Emissions – Antenna S9028PV [1000MHz – 2000MHz]

| | | | |
|---|---|---|---|
| **Test Freq.** | 902.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 1000 MHz - 2000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (31.3 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

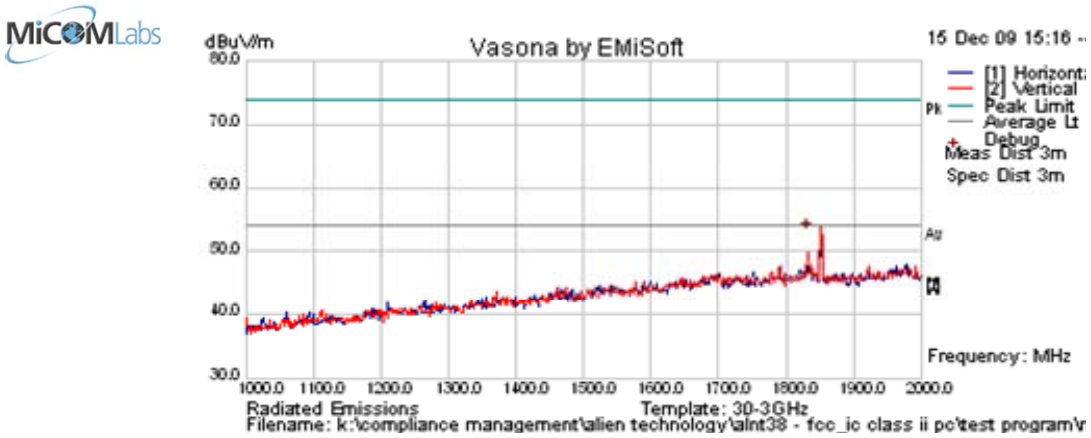



### Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Emissions within 6dB of limit | | | | | | | | | | | | |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 1000 MHz - 2000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (30.9 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

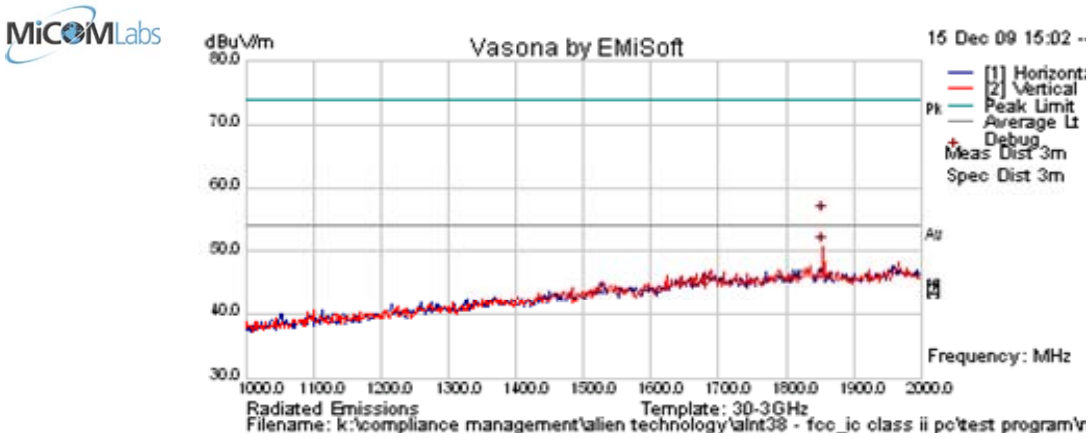



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1831.493 | 43.7 | 9.8 | -0.5 | 53.0 | Peak | V | 129 | 5 | 111.4 | -58.4 | Pass | NRB |
| 1831.493 | 36.1 | 9.8 | -0.5 | 45.4 | Average | V | 129 | 5 | 111.4 | -66.0 | Pass | NRB |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 927.25 | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 1000 MHz - 2000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (30.9 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |



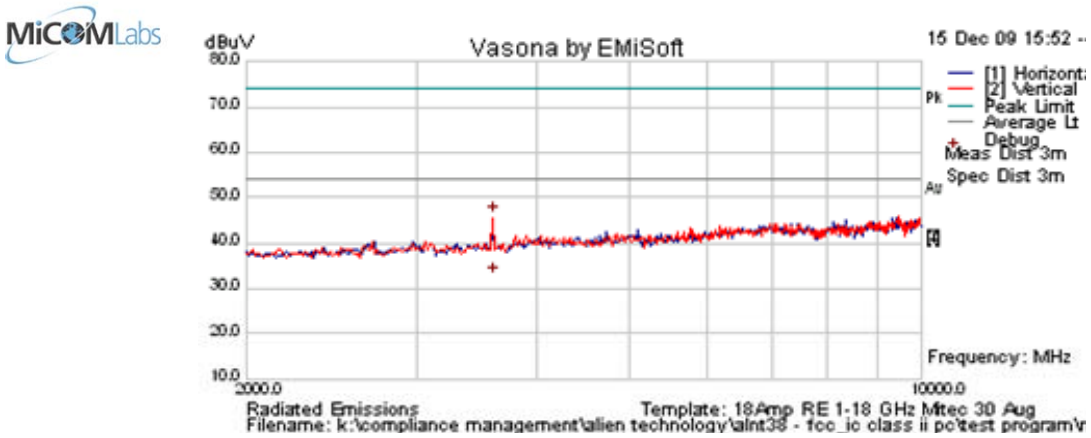

## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1854.489 | 46.5 | 9.9 | -0.6 | 55.9 | Peak | V | 112 | 11 | 110.9 | -55.1 | Pass | NRB |
| 1854.489 | 41.6 | 9.9 | -0.6 | 50.9 | Average | V | 112 | 11 | 110.9 | -60.1 | Pass | NRB |

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

## Radiated Spurious Emissions – Antenna S9028PV [2000MHz – 10000MHz]

| | | | |
|---|---|---|---|
| **Test Freq.** | 902.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 2000 MHz - 10000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (31.3 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

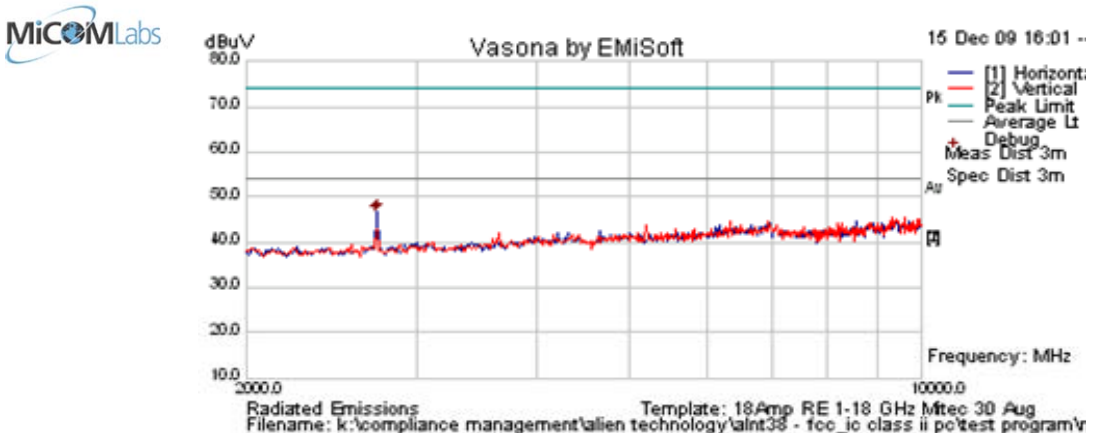



### Formally measured emission peaks

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV | Margin dB | Pass /Fail | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3610.984 | 52.0 | 3.7 | -10.7 | 44.9 | Peak Max | V | 117 | 26 | 74.0 | -29.1 | Pass | RB |
| 3610.984 | 42.7 | 3.7 | -10.7 | 35.6 | Average Max | V | 117 | 26 | 54.0 | -18.4 | Pass | RB |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 2000 MHz - 10000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (30.9 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

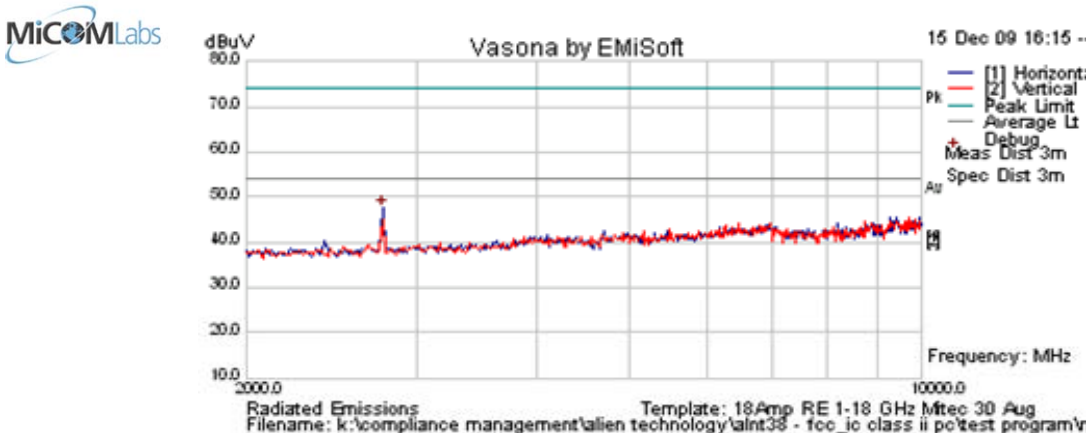



## Formally measured emission peaks

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV | Margin dB | Pass /Fail | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2747.279 | 63.1 | 3.2 | -11.5 | 54.8 | Peak Max | H | 186 | 8 | 74.0 | -19.2 | Pass | RB |
| 2747.279 | 54.1 | 3.2 | -11.5 | 45.7 | Average Max | H | 186 | 8 | 54.0 | -8.3 | Pass | RB |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 927.25 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 2000 MHz - 10000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 285 in Transmit Utility (30.9 dBm) | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |




## Formally measured emission peaks

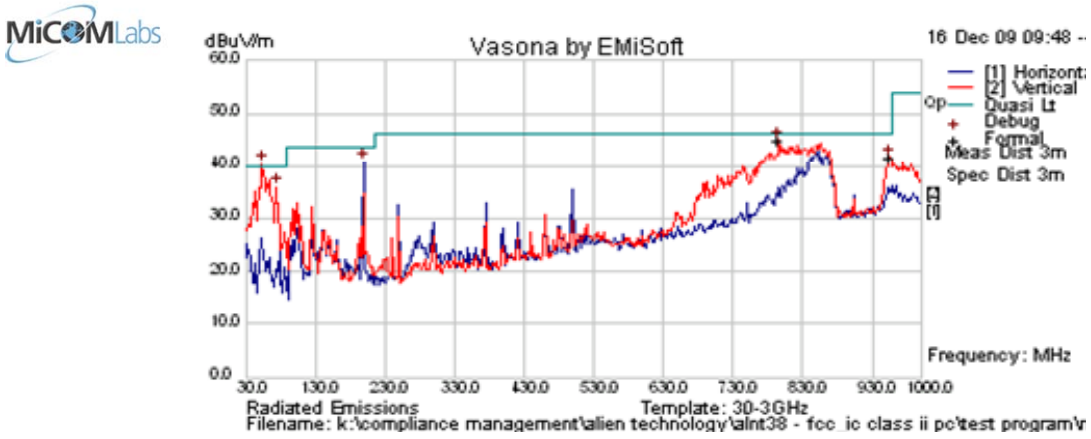
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV | Margin dB | Pass /Fail | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2781.831 | 66.6 | 3.2 | -11.6 | 58.2 | Peak Max | H | 184 | 0 | 74.0 | -15.8 | Pass | RB |
| 2781.831 | 57.6 | 3.2 | -11.6 | 49.2 | Average Max | H | 184 | 0 | 54.0 | -4.8 | Pass | RB |

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

### 5.1.8.4. Transmitter Radiated Spurious Emissions - Antenna EDN 228-221

### Radiated Spurious Emissions – Antenna EDN 228-221 [30-1000MHz]

| | | | |
|---|---|---|---|
| **Test Freq.** | 902.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (29.0 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

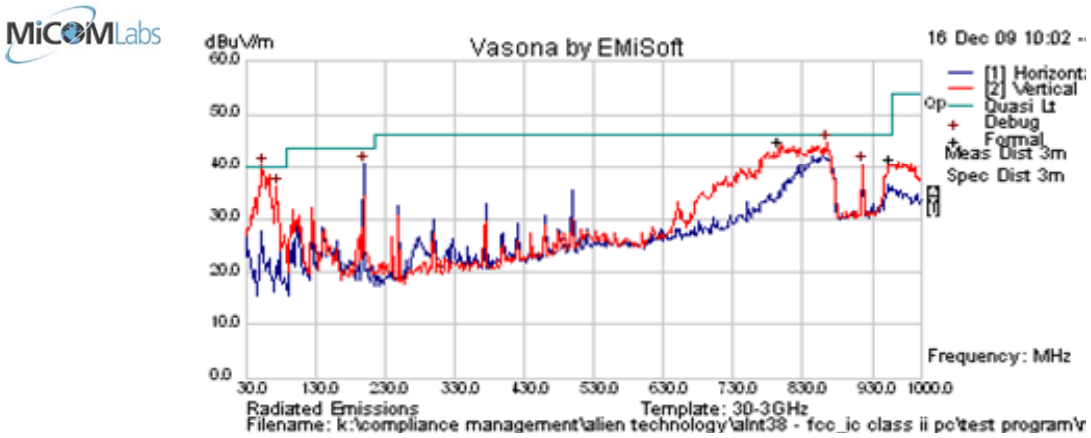



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 795.892 | 46.2 | 7.2 | -8.4 | 45.0 | Peak [Scan] | V | 100 | 0 | 111.3 | -66.3 | Pass | NRB |
| 955.291 | 40.7 | 7.6 | -6.6 | 41.7 | Peak [Scan] | V | 100 | 0 | 111.3 | -69.5 | Pass | NRB |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (29.0 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

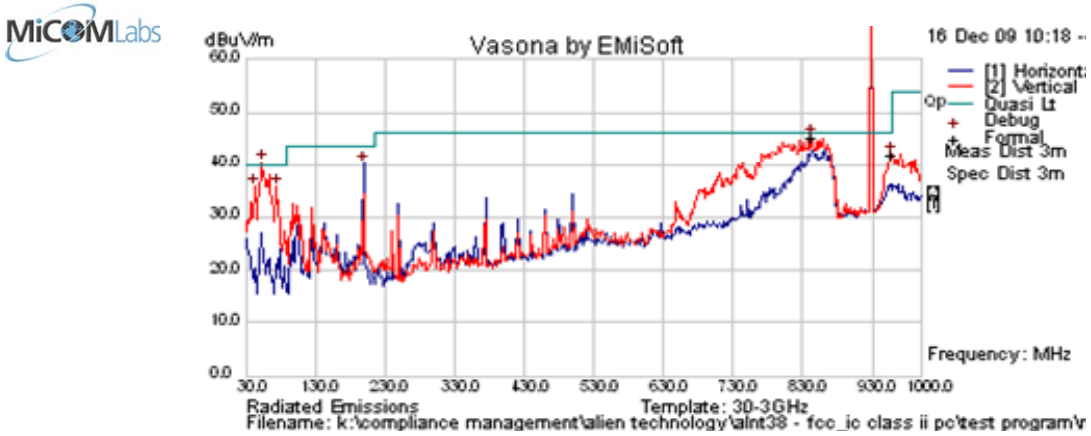



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 863.928 | 45.2 | 7.2 | -7.8 | 44.6 | Peak [Scan] | V | 100 | 0 | 111.2 | -66.6 | Pass | NRB |
| 958.29 | 39.3 | 7.6 | -6.5 | 40.4 | Peak [Scan] | H | 98 | 0 | 111.2 | -70.8 | Pass | NRB |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 927.25 | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (28.43 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |



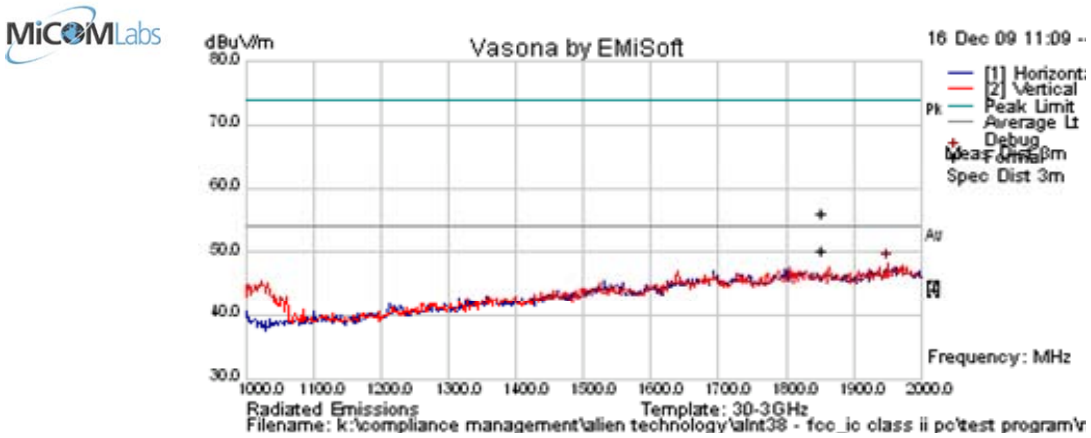

## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 842.545 | 46.0 | 7.2 | -8.0 | 45.2 | Peak [Scan] | V | 100 | 0 | 111.1 | -66.0 | Pass | NRB |
| 958.906 | 40.9 | 7.6 | -6.4 | 42.0 | Peak [Scan] | V | 98 | 0 | 111.1 | -69.1 | Pass | NRB |

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

## Radiated Spurious Emissions – Antenna EDN 228-221 [1000MHz – 2000MHz]

| | | | |
|---|---|---|---|
| **Test Freq.** | 902.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 1000 MHz - 2000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (29.0 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

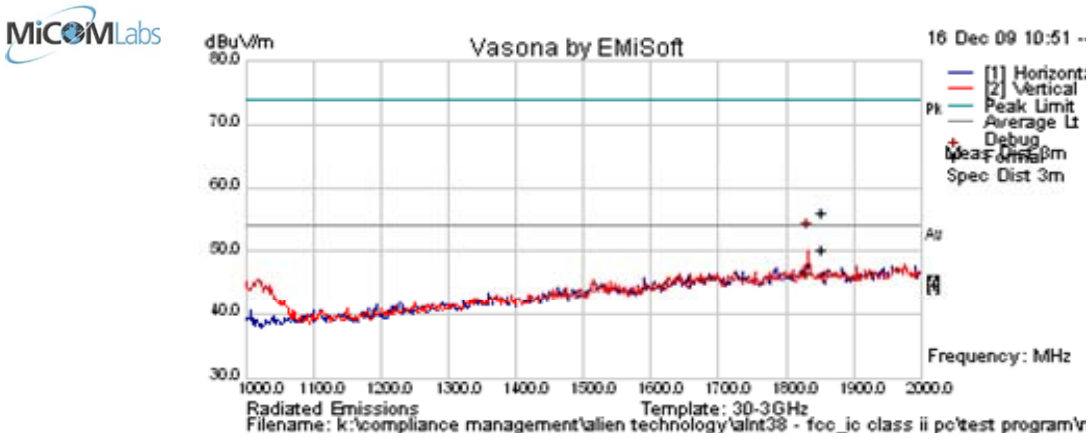



### Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Emissions within 6dB of limit | | | | | | | | | | | | |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 1000 MHz - 2000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (29.0 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

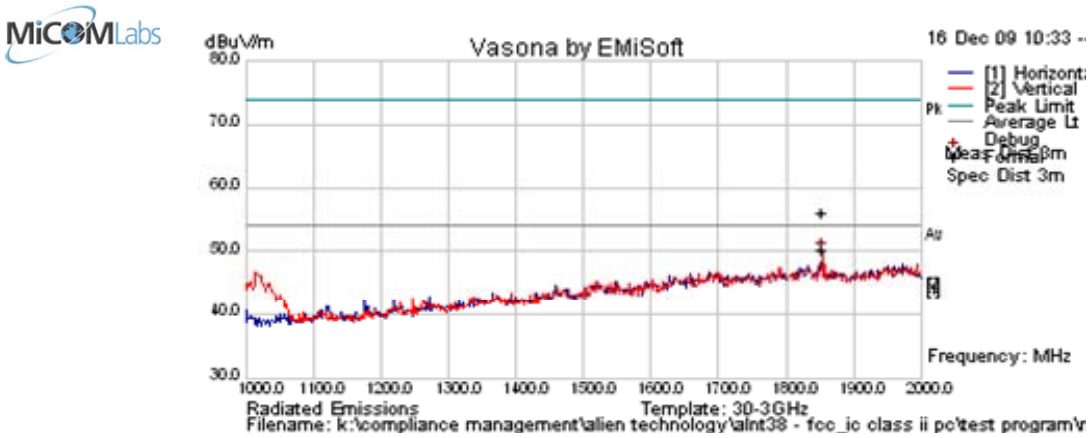



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1831.583 | 43.7 | 9.8 | -0.5 | 53.0 | Peak | V | 155 | 41 | 111.2 | -58.2 | Pass | NRB |
| 1831.583 | 35.8 | 9.8 | -0.5 | 45.1 | Average | V | 155 | 41 | 111.2 | -66.1 | Pass | NRB |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 927.25 | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 1000 MHz - 2000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (28.43 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |



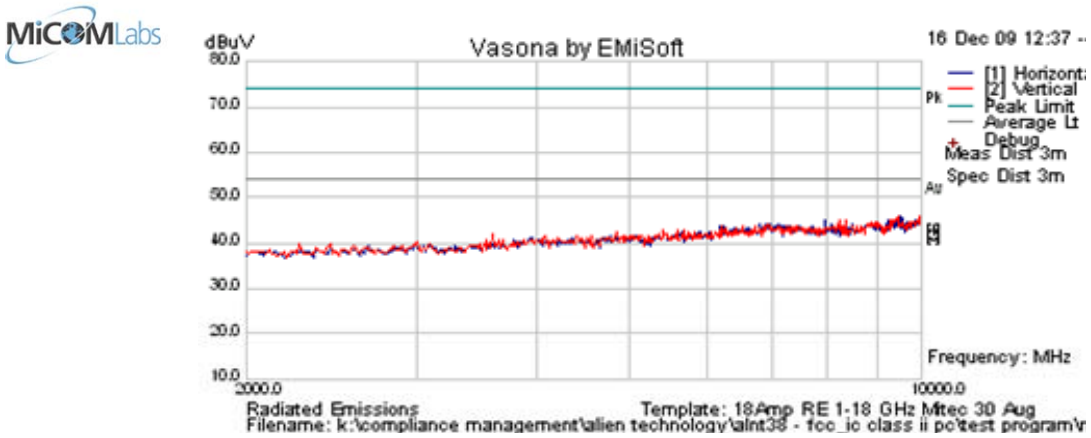

## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1854.549 | 46.7 | 9.9 | -0.6 | 56.0 | Peak | V | 109 | 23 | 111.1 | -55.1 | Pass | NRB |
| 1854.549 | 40.8 | 9.9 | -0.6 | 50.1 | Average | V | 109 | 23 | 111.1 | -61.0 | Pass | NRB |

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

## Radiated Spurious Emissions – Antenna EDN 228-221 [2000MHz – 1000MHz]

| | | | |
|---|---|---|---|
| **Test Freq.** | 902.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 2000 MHz - 10000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (29.0 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

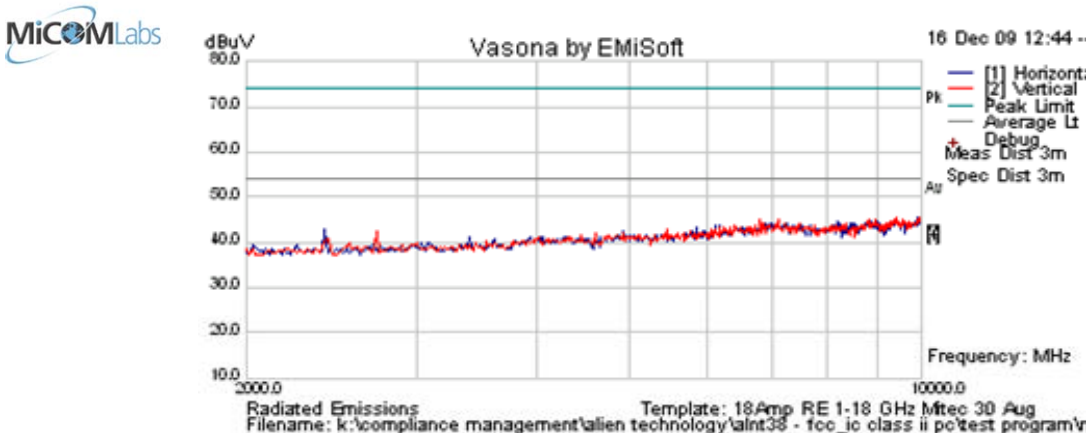



### Formally measured emission peaks

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV | Margin dB | Pass /Fail | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Radio Emissions within 6dB of limit | | | | | | | | | | | | |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 2000 MHz - 10000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (29.0 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | 0 | | |
| **Test Notes 2** | | | |

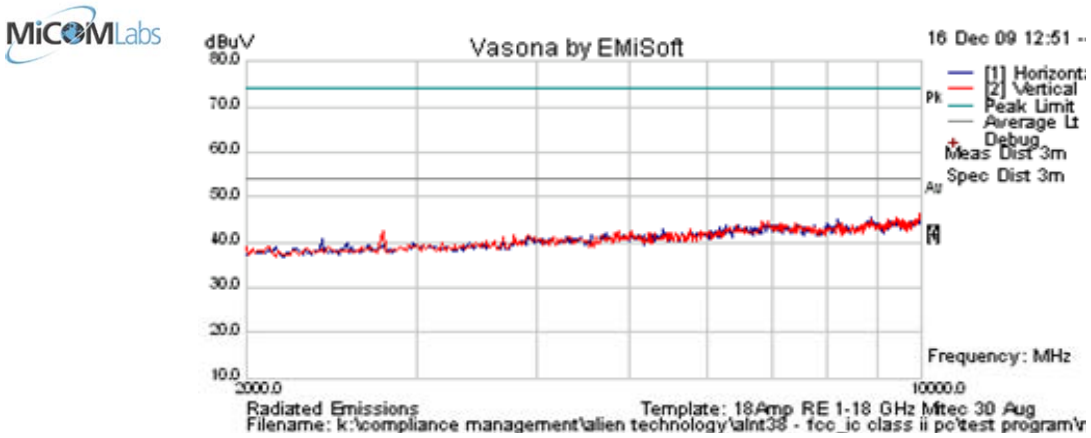



## Formally measured emission peaks

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV | Margin dB | Pass /Fail | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Radio Emissions within 6dB of limit | | | | | | | | | | | | |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | 927.25 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 2000 MHz - 10000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | 260 in Transmit Utility (28.43 dBm) | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | 0 | | |
| **Test Notes 2** | | | |




## Formally measured emission peaks

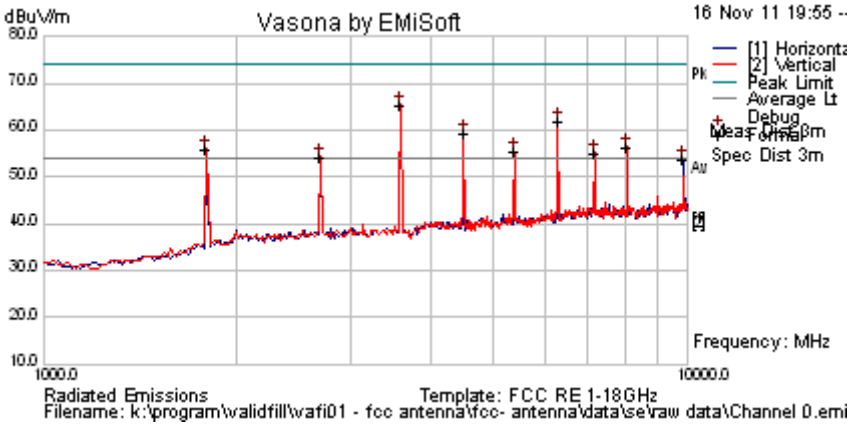
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV | Margin dB | Pass /Fail | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Radio Emissions within 6dB of limit | | | | | | | | | | | | |

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

### 5.1.8.5. Transmitter Radiated Spurious Emissions - Antenna RFID-v9.1 915 MHz Near Field Magnetic Loop Sensor

## Radiated Spurious Emissions – Antenna RFID-v9.1 915 MHz]

| | | | |
|---|---|---|---|
| **Test Freq.** | Channel 0 | **Engineer** | GMH |
| **Variant** | N/A | **Temp (ºC)** | 23.5 |
| **Freq. Range** | 1000 MHz - 10000 MHz | **Rel. Hum.(%)** | 34 |
| **Power Setting** | Maximum | **Press. (mBars)** | 1008 |
| **Antenna** | PCB Antenna | **Duty Cycle (%)** | 100 |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

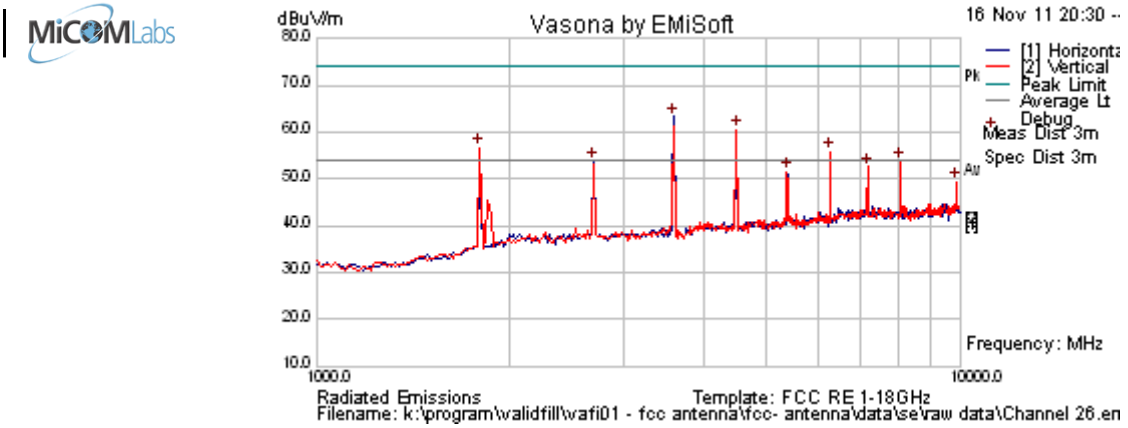



### Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5391.305 | 57.79 | 4.62 | -9.33 | 53.09 | Peak Max | V | 102 | 202 | 74 | -20.91 | Pass | RB |
| 2695.628 | 60.08 | 3.16 | -11.2 | 52 | Peak Max | V | 103 | 270 | 74 | -22 | Pass | RB |
| 5391.305 | 51.08 | 4.62 | -9.33 | 46.37 | Average Max | V | 102 | 202 | 54 | -7.63 | Pass | RB |
| 2695.628 | 53.83 | 3.16 | -11.2 | 45.75 | Average Max | V | 103 | 270 | 54 | -8.25 | Pass | RB |
| 8087.454 | 56.4 | 5.7 | -4.3 | 57.7 | Peak Max | V | 98 | 156 | 74.0 | -16.3 | Pass | RB |
| 8087.454 | 43.2 | 5.7 | -4.3 | 44.6 | Average Max | V | 98 | 156 | 54 | -9.4 | Pass | RB |
| 3597.194 | 73.1 | 3.7 | -11.3 | 65.4 | Peak [Scan] | V | | | | | Pass | NRB |
| 1793.587 | 66.6 | 2.6 | -13.2 | 56.0 | Peak [Scan] | V | | | | | Pass | NRB |
| 6302.60521 | 64.4 | 5.0 | -7.5 | 61.9 | Peak [Scan] | V | | | | | Pass | NRB |
| 7186.373 | 55.5 | 5.4 | -5.7 | 55.2 | Peak [Scan] | V | | | | | Pass | NRB |
| 4498.998 | 65.2 | 4.2 | -10.2 | 59.2 | Peak [Scan] | V | | | | | Pass | NRB |
| 9891.784 | 50.6 | 6.4 | -3.4 | 53.7 | Peak [Scan] | H | | | | | Pass | NRB |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak |

| | | | |
|---|---|---|---|
| **Test Freq.** | Channel 26 | **Engineer** | GMH |
| **Variant** | N/A | **Temp (ºC)** | 23.5 |
| **Freq. Range** | 1000 MHz - 10000 MHz | **Rel. Hum.(%)** | 34 |
| **Power Setting** | Maximum | **Press. (mBars)** | 1008 |
| **Antenna** | PCB Antenna | **Duty Cycle (%)** | 100 |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

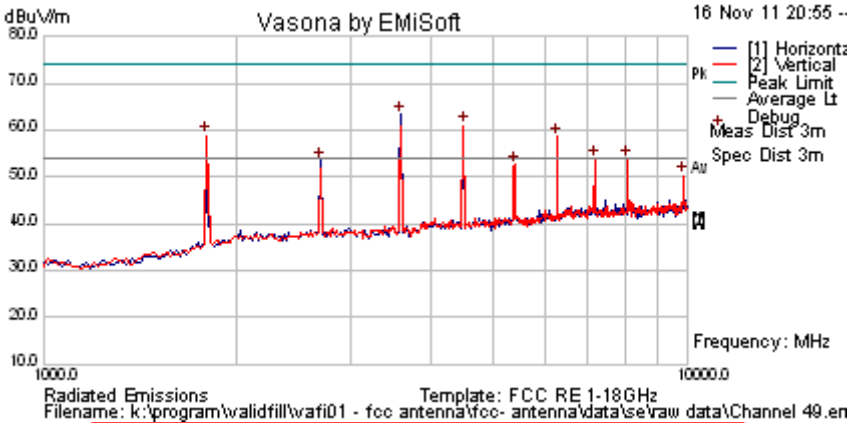



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2707.522 | 63.0 | 3.2 | -11.2 | 54.9 | Peak Max | H | 112 | 361 | 74.0 | -19.1 | Pass | RB |
| 8098.147 | 55.9 | 5.6 | -4.3 | 57.2 | Peak Max | V | 140 | 215 | 74.0 | -16.8 | Pass | RB |
| 5402.666 | 58.7 | 4.6 | -9.3 | 54.0 | Peak Max | V | 166 | 205 | 74 | -20.0 | Pass | RB |
| 2707.522 | 56.8 | 3.2 | -11.2 | 48.7 | Average Max | H | 112 | 361 | 54 | -5.3 | Pass | RB |
| 8098.147 | 42.9 | 5.6 | -4.3 | 44.3 | Average Max | V | 140 | 215 | 54 | -9.7 | Pass | RB |
| 5402.666 | 51.75 | 4.62 | -9.33 | 47.04 | Average Max | V | 166 | 205 | 54 | -6.96 | Pass | RB |
| 3609.444 | 71.0 | 3.7 | -11.3 | 63.4 | Peak [Scan] | H | | | | | Pass | NRB |
| 4511.248 | 66.5 | 4.2 | -10.2 | 60.5 | Peak [Scan] | V | | | | | Pass | NRB |
| 1805.837 | 67.3 | 2.6 | -13.2 | 56.7 | Peak [Scan] | V | | | | | Pass | NRB |
| 6296.819 | 58.3 | 5.0 | -7.5 | 55.8 | Peak [Scan] | V | | | | | Pass | NRB |
| 7198.623 | 53.0 | 5.4 | -5.7 | 52.7 | Peak [Scan] | V | | | | | Pass | NRB |
| 9904.034 | 46.3 | 6.4 | -3.4 | 49.4 | Peak [Scan] | H | | | | | Pass | NRB |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak |

| | | | |
|---|---|---|---|
| **Test Freq.** | Channel 49 | **Engineer** | GMH |
| **Variant** | N/A | **Temp (ºC)** | 23.5 |
| **Freq. Range** | 1000 MHz - 10000 MHz | **Rel. Hum.(%)** | 34 |
| **Power Setting** | Maximum | **Press. (mBars)** | 1008 |
| **Antenna** | PCB Antenna | **Duty Cycle (%)** | 100 |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |



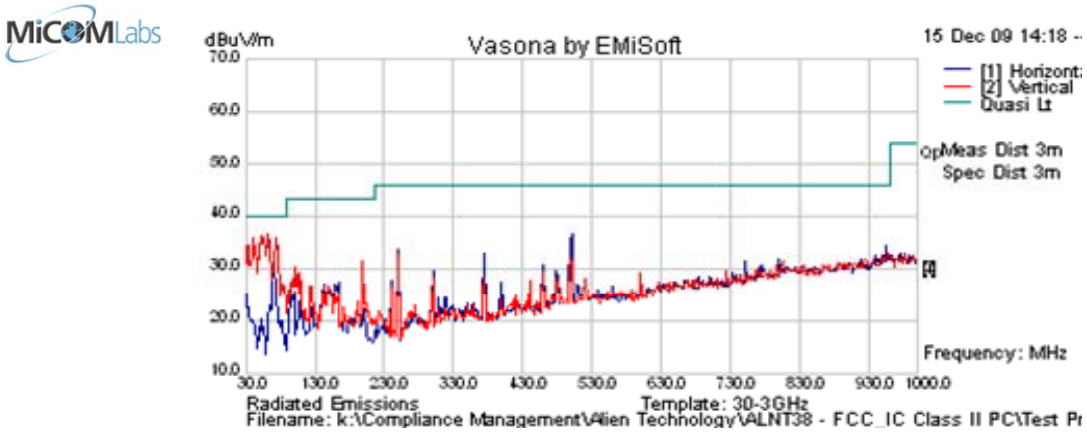

## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8110.021 | 54.6 | 5.6 | -4.3 | 56.0 | Peak Max | V | 141 | 216 | 74.0 | -18.0 | Pass | RB |
| 2719.697 | 64.3 | 3.2 | -11.2 | 56.2 | Peak Max | H | 98 | 142 | 74.0 | -17.8 | Pass | RB |
| 5414.771 | 57.8 | 4.6 | -9.3 | 53.1 | Peak Max | V | 201 | 204 | 74 | -20.9 | Pass | RB |
| 8110.021 | 42.29 | 5.64 | -4.29 | 43.65 | Average Max | V | 141 | 216 | 54 | -10.35 | Pass | RB |
| 2719.697 | 57.96 | 3.16 | -11.2 | 49.88 | Average Max | H | 98 | 142 | 54 | -4.12 | Pass | RB |
| 5414.771 | 50.55 | 4.62 | -9.33 | 45.85 | Average Max | V | 201 | 204 | 54 | -8.15 | Pass | RB |
| 3621.694 | 70.9 | 3.7 | -11.3 | 63.2 | Peak [Scan] | H | | | | | Pass | NRB |
| 4523.498 | 67.0 | 4.2 | -10.2 | 61.0 | Peak [Scan] | V | | | | | Pass | NRB |
| 1818.087 | 69.3 | 2.6 | -13.2 | 58.8 | Peak [Scan] | V | | | | | Pass | NRB |
| 6309.069 | 61.2 | 5.0 | -7.5 | 58.7 | Peak [Scan] | V | | | | | Pass | NRB |
| 7210.873 | 53.9 | 5.4 | -5.7 | 53.6 | Peak [Scan] | V | | | | | Pass | NRB |
| 9916.284 | 47.1 | 6.4 | -3.4 | 50.2 | Peak [Scan] | V | | | | | Pass | NRB |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak |

### 5.1.8.6. Receiver Radiated Spurious Emissions - Antenna S9028PV

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | Rx Mode | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

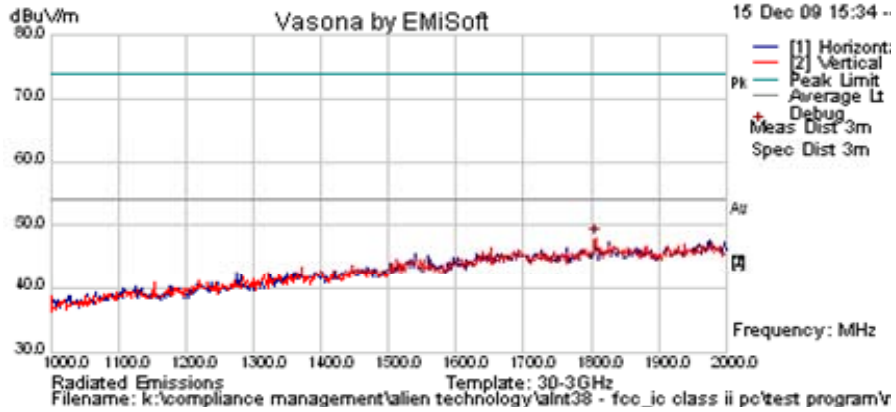



**Formally measured emission peaks**

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Radio Emissions within 6dB of limit | | | | | | | | | | | | |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 1000MHz- 2000MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | Rx Mode | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

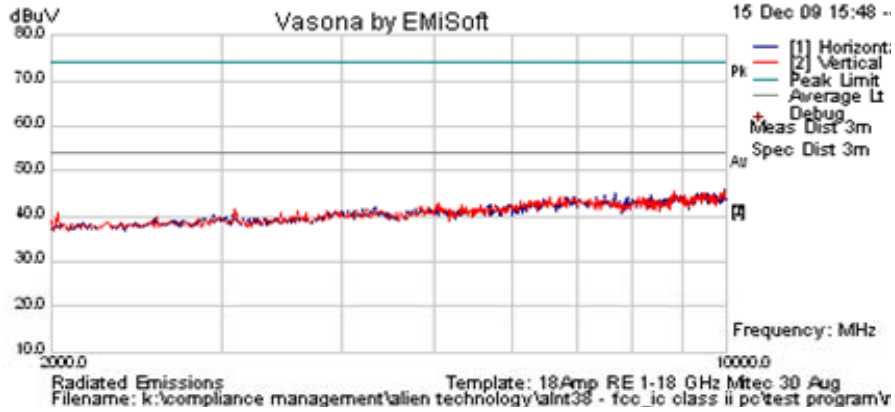



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Emissions within 6dB of limit | | | | | | | | | | | | |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19 |
| **Freq. Range** | 2000MHz-10000MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | Rx Mode | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |



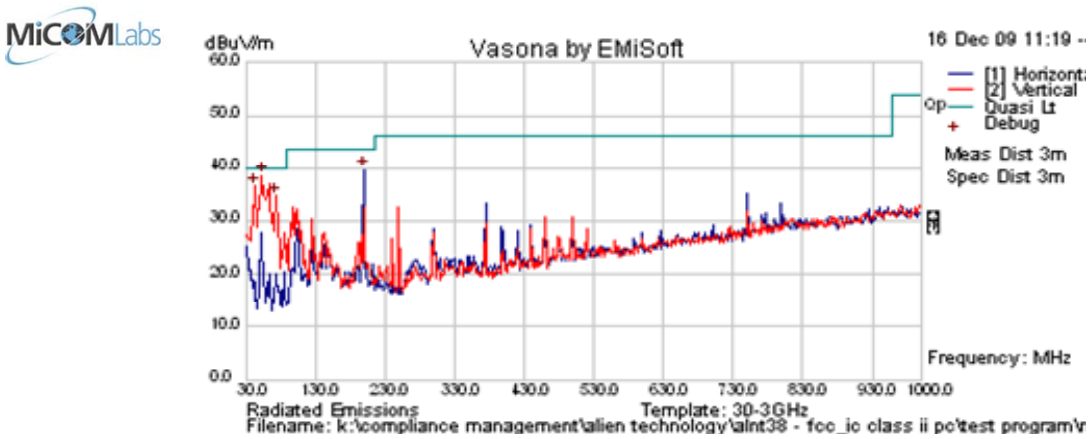

## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Emissions within 6dB of limit | | | | | | | | | | | | |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

### 5.1.8.7. Receiver Radiated Spurious Emissions - Antenna EDN 228-221

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | Rx Mode | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

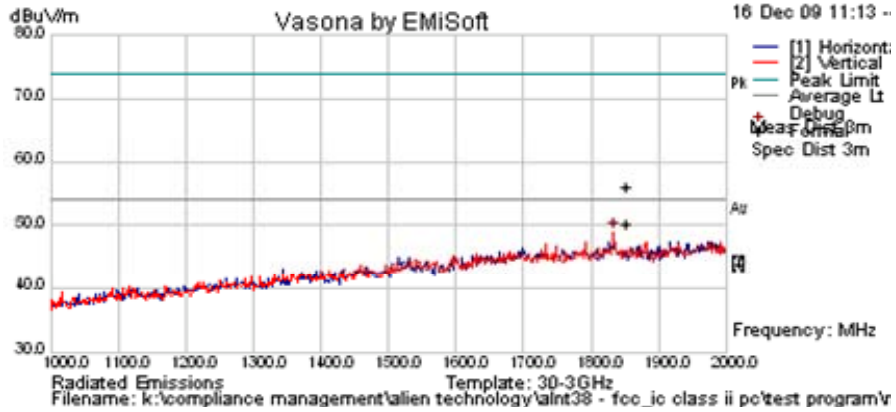



**Formally measured emission peaks**

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Radio Emissions within 6dB of limit | | | | | | | | | | | | |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 1000MHz- 2000MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | Rx Mode | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | | | |
| **Test Notes 2** | | | |

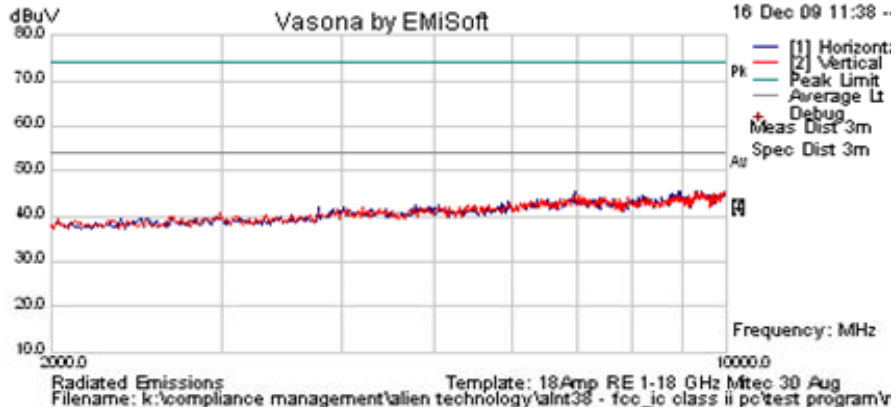



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Radio Emissions within 6dB of limit | | | | | | | | | | | | |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 MHz | **Engineer** | CSB |
| **Variant** | PRASK | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 2000MHz-10000MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | Rx Mode | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | 100% |
| **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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Radio Emissions within 6dB of limit | | | | | | | | | | | | |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

**FCC, Part 15 Subpart C §15.247(d)**
**Industry Canada RSS-210 §A8.5**

**Specification**

**FCC Part 15 Subpart C §15.247(d)**

**Industry Canada §A8.5**

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 a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

**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' | 0287, 0335, 0338, 0158, 0134, 0304, 0311, 0315, 0310, 0312 |

### 5.1.9. Radiated Spurious Emissions – Digital Emissions

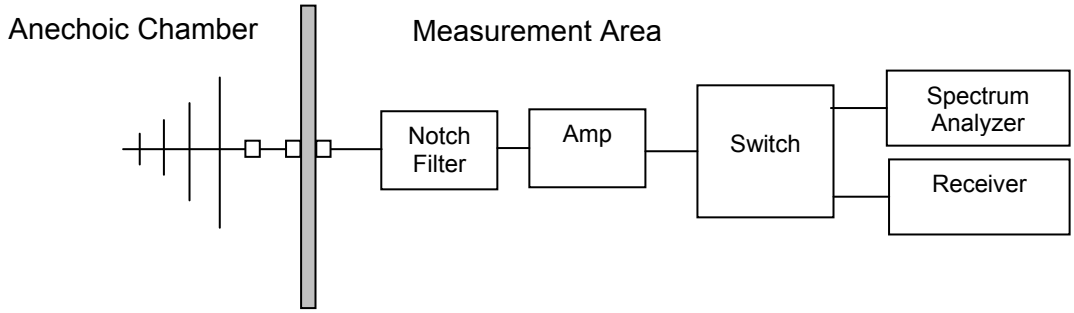
**FCC, Part 15 Subpart C §15.247(d), §15.205, 15.109**

**Test Procedure**

Preliminary radiated emissions were measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarity. The emissions are recorded with a CISPR compliant 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. A photograph of the test set-up in the anechoic chamber in Section 6 Test Set-Up Photographs.

A notch filter with >70 dB of rejection was used to remove the fundamental frequency.

**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

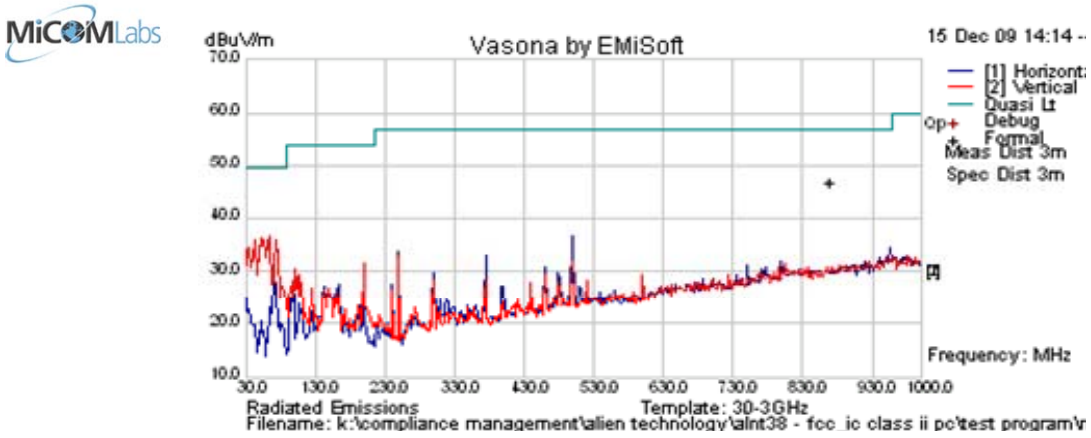
Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

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

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

### 5.1.9.1. Radiated Digital Emissions – Antenna S9028PV; Class A Limit

| | | | |
|---|---|---|---|
| **Test Freq.** | N/A | **Engineer** | CSB |
| **Variant** | Digital Emissions | **Temp (ºC)** | 19 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | N/A | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | Digital Emissions only. Tx on EUT was turned on and off to verify digital and transmitter emissions. | | |
| **Test Notes 2** | Digital emissions values were taken with transmitter on full power for max current draw | | |

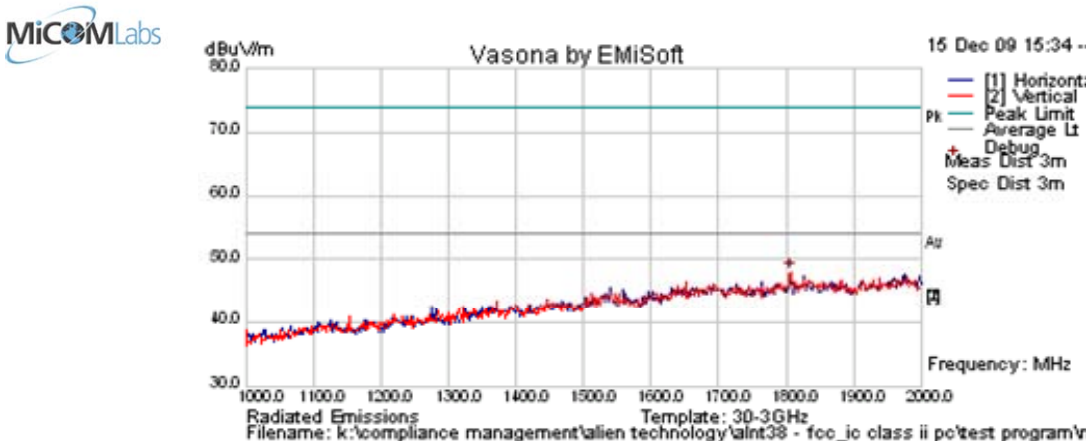



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42.972 | 52.8 | 3.6 | -19.2 | 37.2 | Peak [Scan] | V | 200 | 0 | 49.5 | -12.3 | Pass | DIG |
| 53.567 | 57.5 | 3.8 | -23.6 | 37.7 | Peak [Scan] | V | 100 | 0 | 49.5 | -11.8 | Pass | DIG |
| 63.004 | 56.0 | 3.8 | -23.4 | 36.5 | Peak [Scan] | V | 200 | 0 | 49.5 | -13.0 | Pass | DIG |
| 73.731 | 55.4 | 3.9 | -22.8 | 36.5 | Peak [Scan] | V | 200 | 0 | 49.5 | -13.0 | Pass | DIG |
| 480.005 | 40.2 | 5.9 | -12.5 | 33.6 | Peak [Scan] | V | 98 | 0 | 57 | -23.4 | Pass | DIG |
| 499.985 | 43.7 | 6.0 | -12.6 | 37.2 | Peak [Scan] | V | 98 | 0 | 57 | -19.8 | Pass | DIG |

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

| | | | |
|---|---|---|---|
| **Test Freq.** | N/A | **Engineer** | CSB |
| **Variant** | Digital Emissions | **Temp (ºC)** | 19 |
| **Freq. Range** | 1000-2000MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | N/A | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | Digital Emissions only. Tx on EUT was turned on and off to verify digital and transmitter emissions. | | |
| **Test Notes 2** | Digital emissions values were taken with transmitter on full power for max current draw | | |

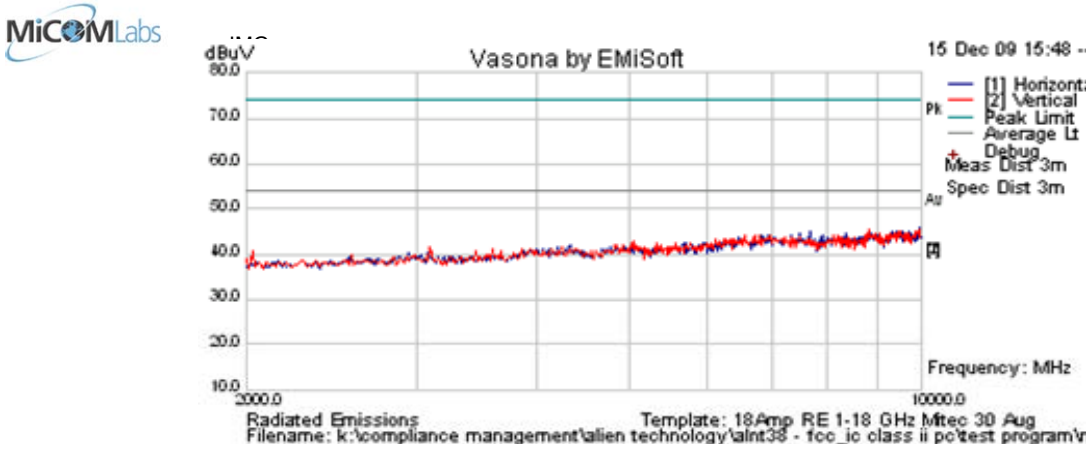



## Formally measured emission peaks

| 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 within 6dB of limit | | | | | | | | | | | | |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

| | | | |
|---|---|---|---|
| **Test Freq.** | N/A | **Engineer** | CSB |
| **Variant** | Digital Emissions | **Temp (ºC)** | 19 |
| **Freq. Range** | 2000MHz - 10000MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | N/A | **Press. (mBars)** | 1009 |
| **Antenna** | S9028PV | **Duty Cycle (%)** | 100% |
| **Test Notes 1** | Digital Emissions only. Tx on EUT was turned on and off to verify digital and transmitter emissions. | | |
| **Test Notes 2** | Digital emissions values were taken with transmitter on full power for max current draw | | |



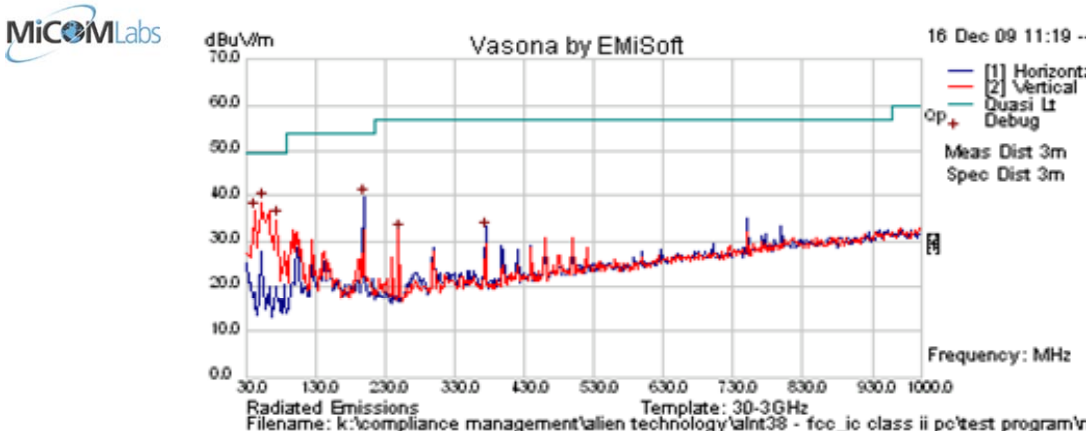

## Formally measured emission peaks

| 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 within 6dB of limit | | | | | | | | | | | | |

| | |
|---|---|
| Legend: | TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission |
| | |

### 5.1.9.2. Radiated Digital Emissions – Antenna EDN 228-221; Class A Limit

| | | | |
|---|---|---|---|
| **Test Freq.** | N/A | **Engineer** | CSB |
| **Variant** | Digital Emissions | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | N/A | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | N/A |
| **Test Notes 1** | Digital Emissions only. Tx on EUT was turned on and off to verify digital and transmitter emissions. | | |
| **Test Notes 2** | Digital emissions values were taken with transmitter on full power for max current draw | | |

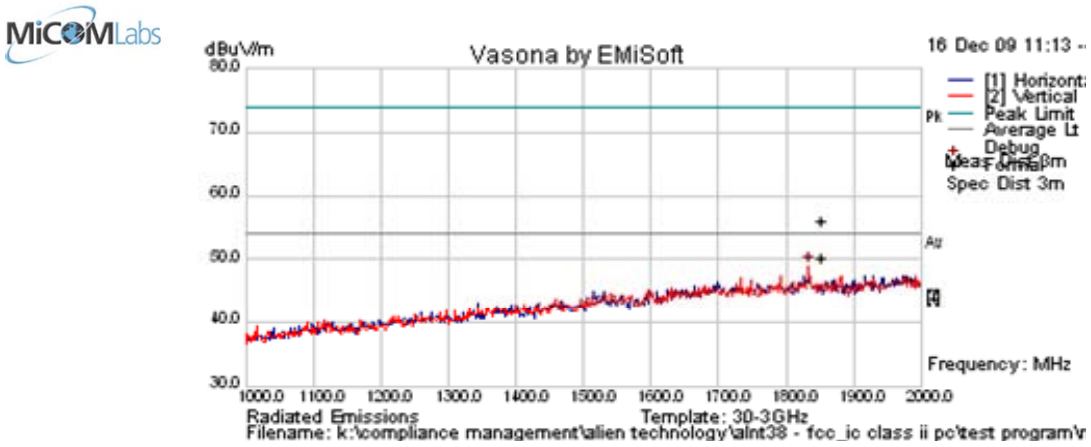



## Formally measured emission peaks

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53.924 | 58.4 | 3.8 | -23.6 | 38.5 | Peak [Scan] | V | 100 | 0 | 49.5 | -11.0 | n/a | |
| 42.962 | 52.1 | 3.6 | -19.1 | 36.6 | Peak [Scan] | V | 100 | 0 | 49.5 | -13.0 | n/a | |
| 199.067 | 52.9 | 4.8 | -17.9 | 39.7 | Peak [Scan] | H | 100 | 0 | 54 | -14.3 | n/a | |
| 74.609 | 53.5 | 3.9 | -22.8 | 34.6 | Peak [Scan] | V | 100 | 0 | 49.5 | -14.9 | n/a | |
| 374.974 | 41.8 | 5.6 | -15.1 | 32.2 | Peak [Scan] | H | 98 | 0 | 57 | -24.8 | n/a | |
| 250.011 | 45.6 | 5.0 | -18.8 | 31.8 | Peak [Scan] | V | 98 | 0 | 57 | -25.2 | n/a | |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | N/A | **Engineer** | CSB |
| **Variant** | Digital Emissions | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 1000-2000MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | N/A | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | N/A |
| **Test Notes 1** | Digital Emissions only. Tx on EUT was turned on and off to verify digital and transmitter emissions. | | |
| **Test Notes 2** | Digital emissions values were taken with transmitter on full power for max current draw | | |

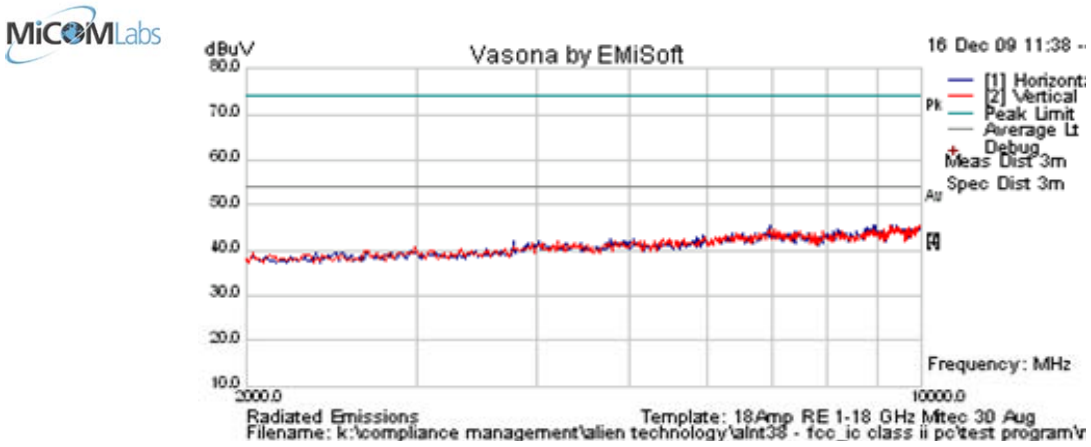



## Formally measured emission peaks

| 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 within 6dB of limit | | | | | | | | | | | | |

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

| | | | |
|---|---|---|---|
| **Test Freq.** | N/A | **Engineer** | CSB |
| **Variant** | Digital Emissions | **Temp (ºC)** | 19.5 |
| **Freq. Range** | 2000MHz - 10000MHz | **Rel. Hum.(%)** | 40 |
| **Power Setting** | N/A | **Press. (mBars)** | 1011 |
| **Antenna** | EDN 228-221 | **Duty Cycle (%)** | N/A |
| **Test Notes 1** | Digital Emissions only. Tx on EUT was turned on and off to verify digital and transmitter emissions. | | |
| **Test Notes 2** | Digital emissions values were taken with transmitter on full power for max current draw | | |



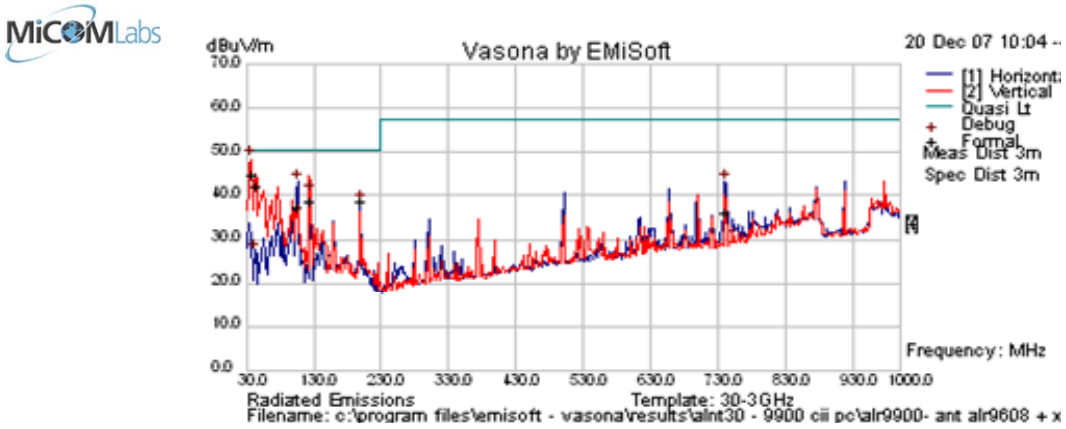

## Formally measured emission peaks

| 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 within 6dB of limit | | | | | | | | | | | | |

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

### 5.1.9.3. Radiated Digital Emissions – XP Power PSU Class A Device

| | | | |
|---|---|---|---|
| **Test Freq.** | 915.75 | **Engineer** | GMH |
| **Variant** | Power Supply Emissions | **Temp (ºC)** | 20.5 |
| **Freq. Range** | 30 MHz - 1000 MHz | **Rel. Hum.(%)** | 33 |
| **Power Setting** | Full Power - 29.8 dBm | **Press. (mBars)** | 105 |
| **Antenna** | N/A | **Duty Cycle (%)** | N/A |
| **Test Notes 1** | Test Data for power supply from previous test report ALNT30-A3 Rev A; | | |
| **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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38.888 | 52.95 | 3.55 | -13.7 | 42.79 | Quasi Max | V | 132 | 74 | 50.5 | -7.71 | Pass | |
| 106.694 | 48.84 | 4.21 | -17.83 | 35.23 | Quasi Max | V | 114 | 246 | 50.5 | -15.27 | Pass | |
| 125.006 | 48.25 | 4.33 | -15.89 | 36.7 | Quasi Max | V | 98 | 156 | 50.5 | -13.8 | Pass | |
| 199.046 | 48.86 | 4.75 | -17.02 | 36.59 | Quasi Max | V | 173 | 196 | 50.5 | -13.91 | Pass | |
| 739.996 | 36.01 | 6.82 | -8.88 | 33.96 | Quasi Max | V | 166 | 171 | 57.5 | -23.54 | Pass | |
| 45.736 | 55.04 | 3.64 | -18.42 | 40.26 | Quasi Max | V | 98 | 360 | 50.5 | -10.24 | Pass | |

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

**§15.109 (b)** The field strength of radiated emissions from a Class A digital device, as determined at a distance of 3 meters, shall not exceed the following:

**§15.109 (b)** Limit Matrix Class A digital device

| Frequency(MHz) | Field Strength (μV/m) | Field Strength (dBμV/m) | Measurement Distance (meters) |
|---|---|---|---|
| 30-88 | 100 | 49.5 | 3 |
| 88-216 | 150 | 54.0 | 3 |
| 216-960 | 200 | 57.0 | 3 |
| Above 960 | 500 | 60.0 | 3 |

### Laboratory Measurement Uncertainty for Radiated Emissions

| | |
|---|---|
| Measurement uncertainty | +5.6/ -4.5 dB |

### Traceability

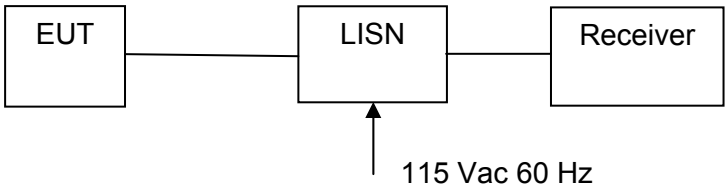
| Method | Test Equipment Used |
|---|---|
| Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions' | 0287, 0335, 0338, 0158, 0134, 0304, 0311, 0315, 0310, 0312, 0341 |

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

**FCC, Part 15 Subpart C §15.207**
**Industry Canada RSS-Gen §7.2.2**

**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.

**Test Measurement Set up**




Measurement set up for AC Wireline Conducted Emissions Test

**Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)**

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

**Radio Parameters:**
Transmitting on Channel 26. 915.25 MHz
Transmit Power +30 dBm
Active antenna port was terminated in a 50Ω termination

TABLE OF RESULTS – Cable Connections PSU

115 Vac 60 Hz

| Freq (MHz) | Line | Peak (dBµV) | QP (dBµV) | QP Limit (dBµV) | QP Margin (dB) | Ave. (dBµV) | Ave. Limit (dBµV) | Ave. Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 1.986 | Live | 43.35 | 41.82 | 56 | -14.18 | 43.45 | 46 | -8.66 |
| 1.800 | Live | 43.32 | 42.29 | 56 | -13.71 | 36.89 | 46 | -9.11 |
| 2.175 | Live | 43.48 | 40.99 | 56 | -13.47 | 34.88 | 46 | -11.12 |
| 5.715 | Live | 49.31 | 43.83 | 60 | -16.17 | 38.05 | 50 | -11.95 |
| 4.657 | Live | 45.37 | 40.30 | 56 | -15.70 | 33.64 | 46 | -12.36 |
| 4.968 | Live | 46.50 | 40.10 | 56 | -15.90 | 32.97 | 46 | -13.03 |

**AC Wireline - Conducted Emissions (150 kHz – 30 MHz)**
**Cable Connections PSU**

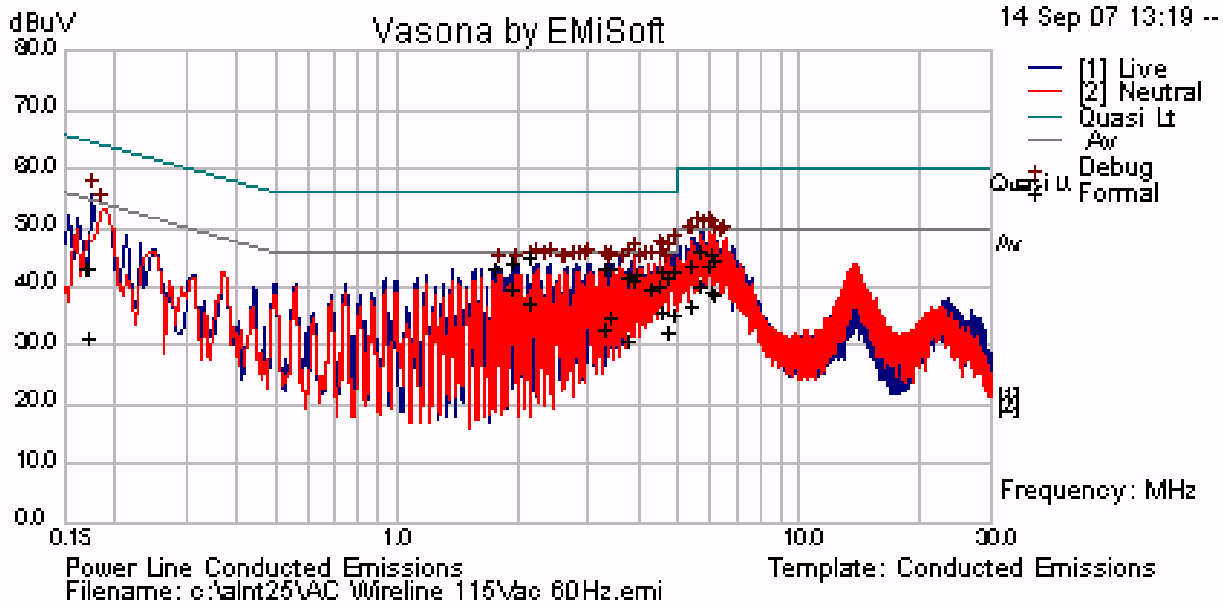
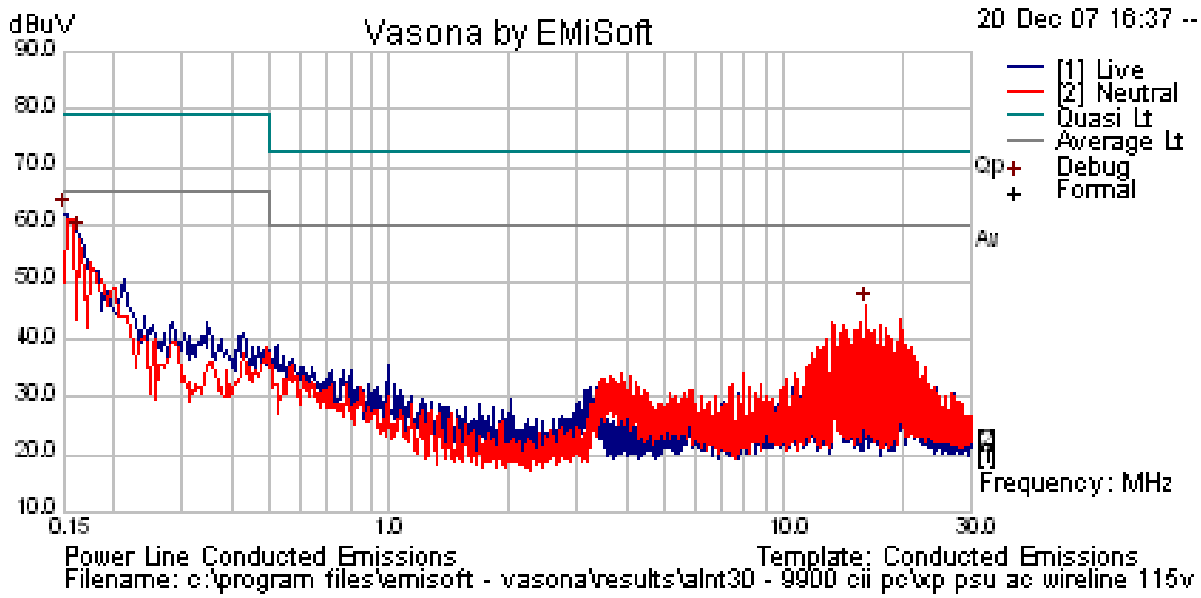


TABLE OF RESULTS – XP Power PSU

115 Vac 60 Hz

| Freq (MHz) | Line | Peak (dBµV) | QP (dBµV) | QP Limit (dBµV) | QP Margin (dB) | Ave. (dBµV) | Ave. Limit (dBµV) | Ave. Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 0.15 | Neut. | 62.04 | 50.59 | 79 | -28.41 | 37.59 | 66 | -28.41 |
| 0.163 | Neut. | 58.50 | 45.98 | 79 | -33.02 | 19.85 | 66 | -46.15 |
| 16.229 | Neut. | 45.93 | 45.94 | 73 | -27.06 | 44.39 | 60 | -15.61 |

**AC Wireline - Conducted Emissions (150 kHz – 30 MHz)**
**XP Power PSU**



## 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.

**RSS-Gen §7.2.2**
The radio frequency voltage that is conducted back into the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The tighter limit applies at the frequency range boundaries.

**§15.207 (a)** and **RSS-Gen §7.2.2** 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

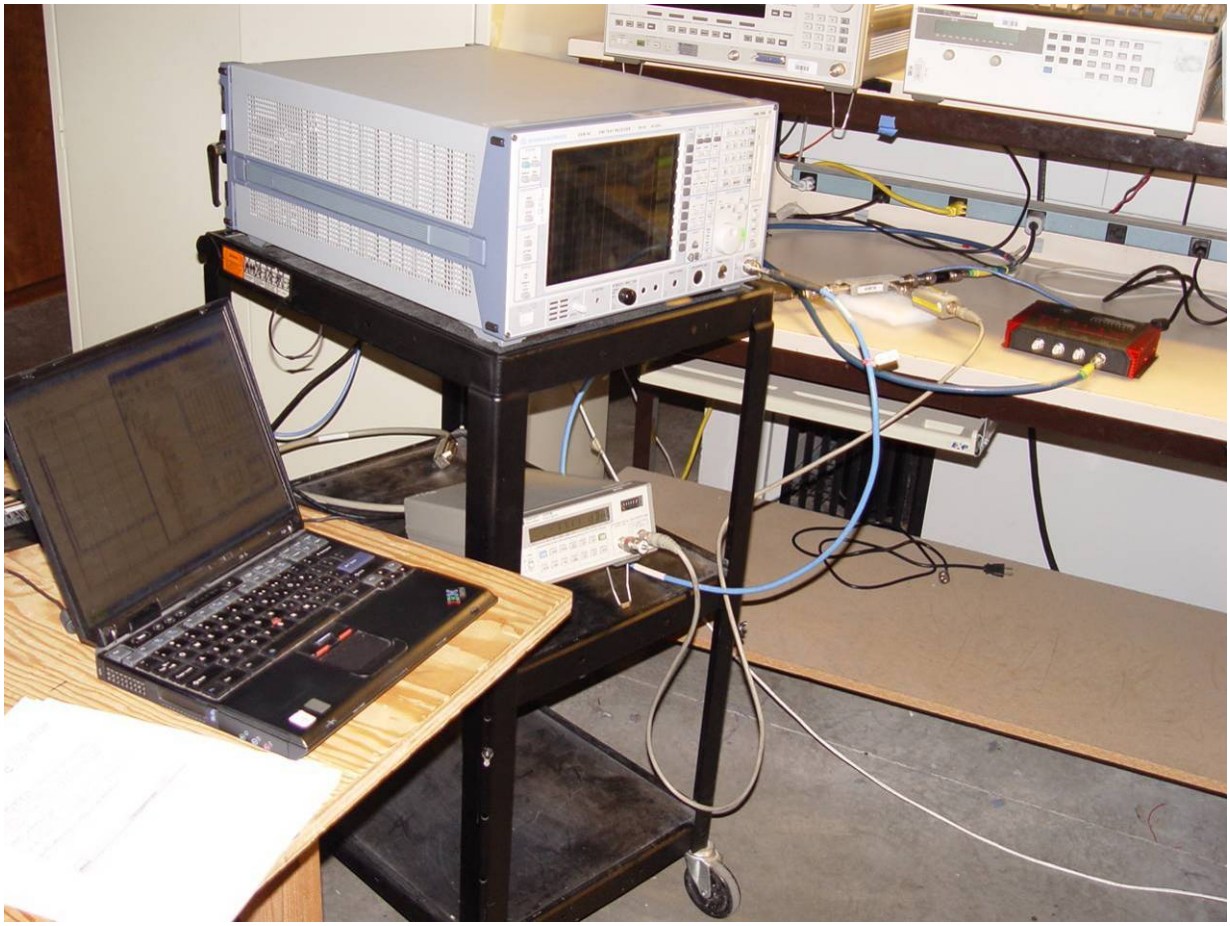
| | |
|---|---|
| Measurement uncertainty | ±2.64 dB |

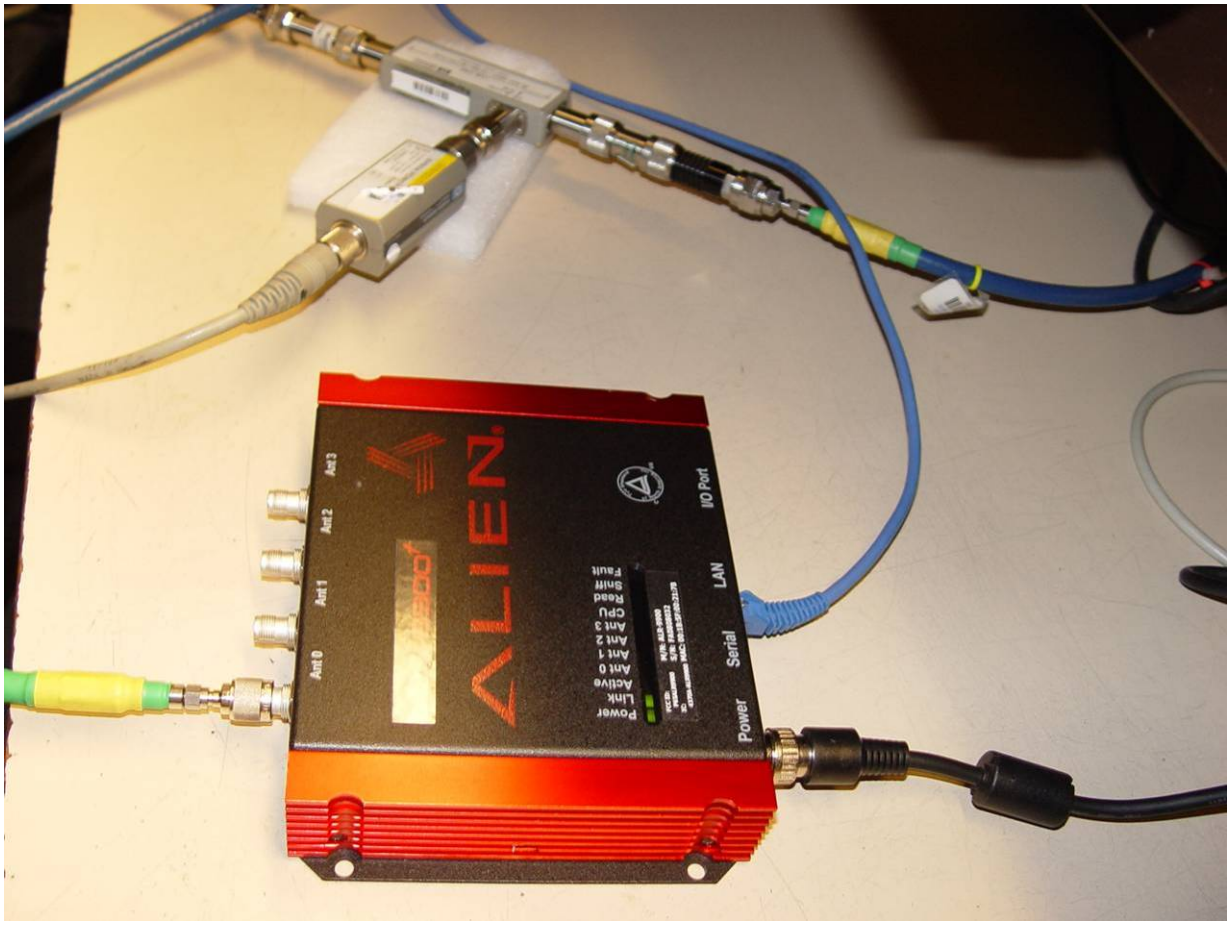
### Traceability

| Method | Test Equipment Used |
|---|---|
| Measurements were made per Sanmina work instruction | 0190, 0193 |

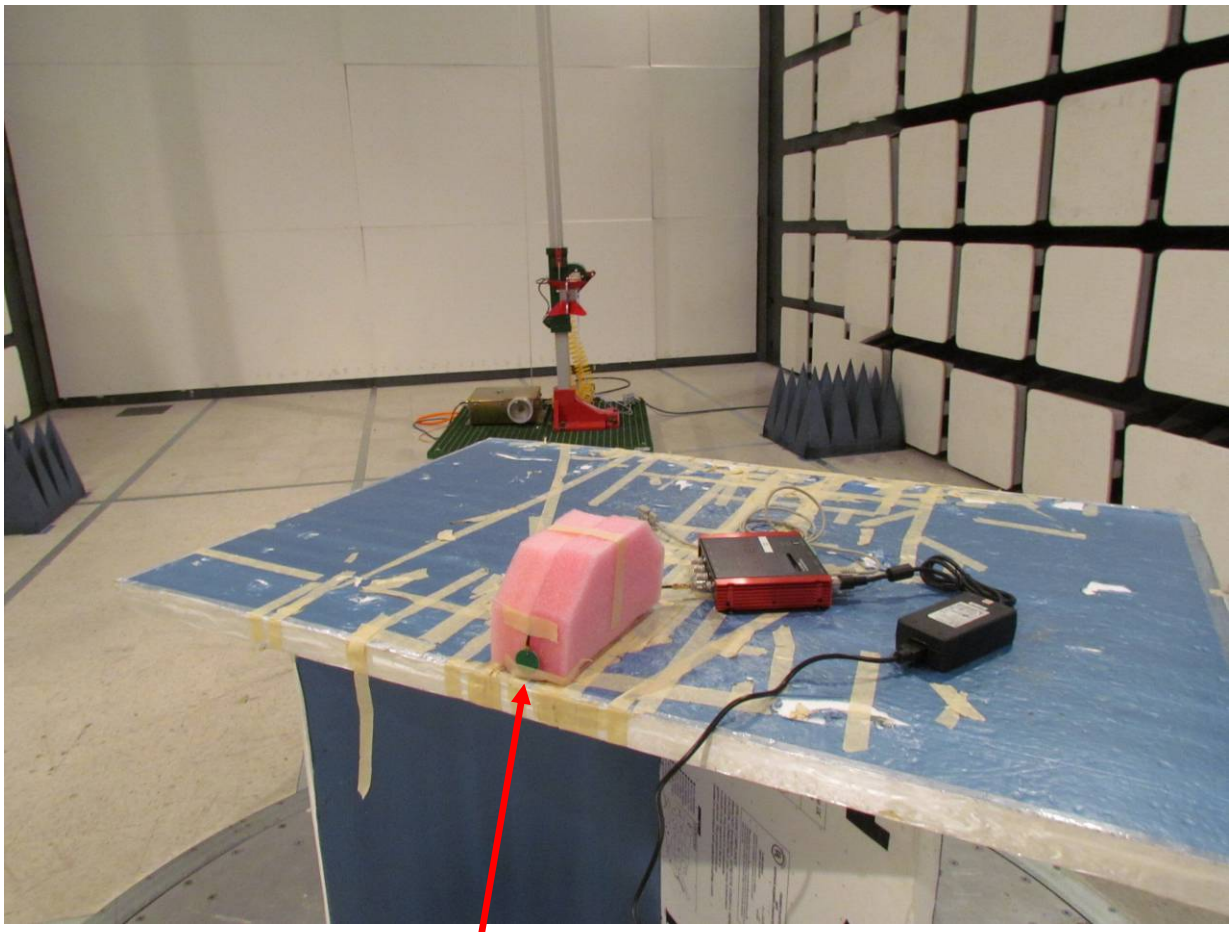
# 6. PHOTOGRAPHS

## 6.1. General Measurement Test Set-Up



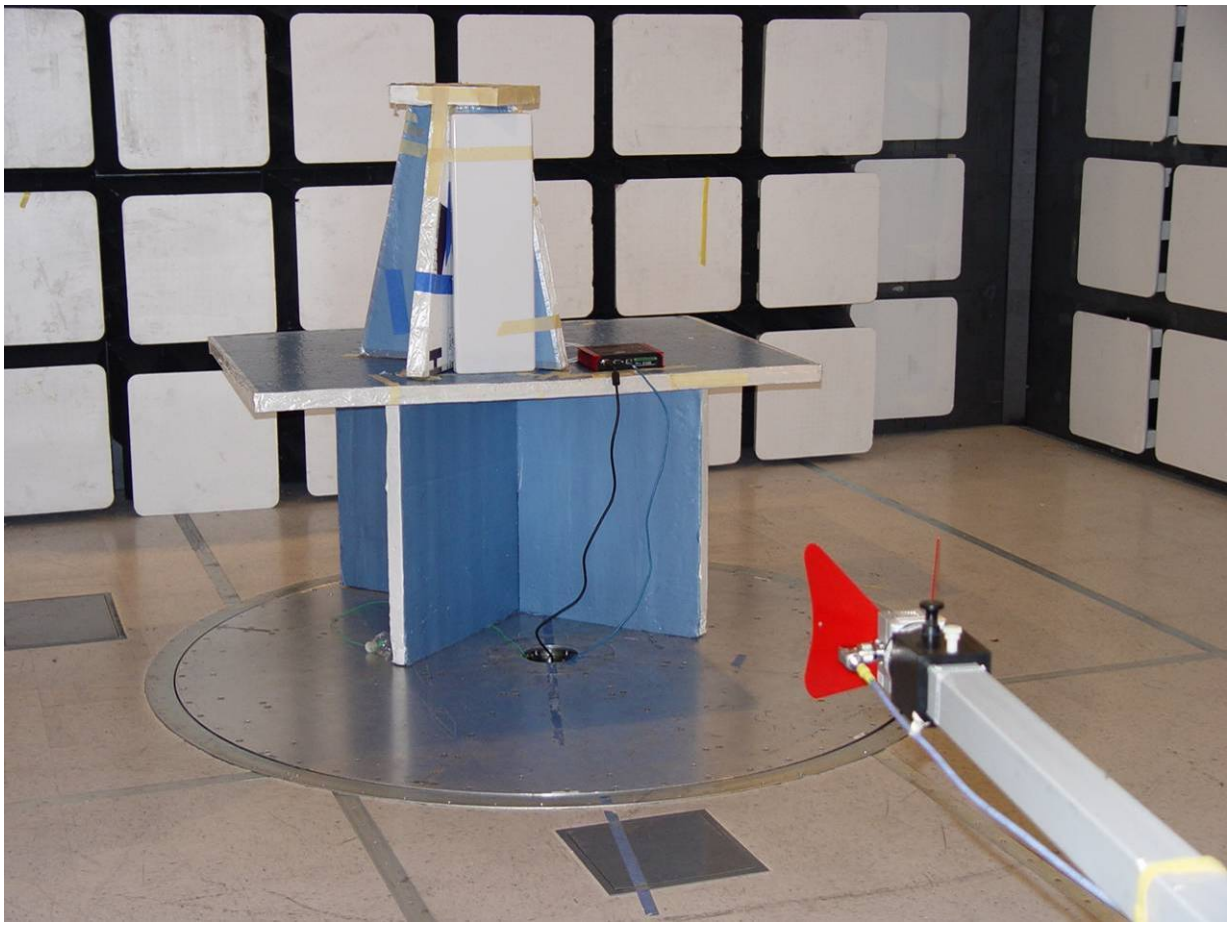


## 6.2. Radiated Emissions >1 GHz



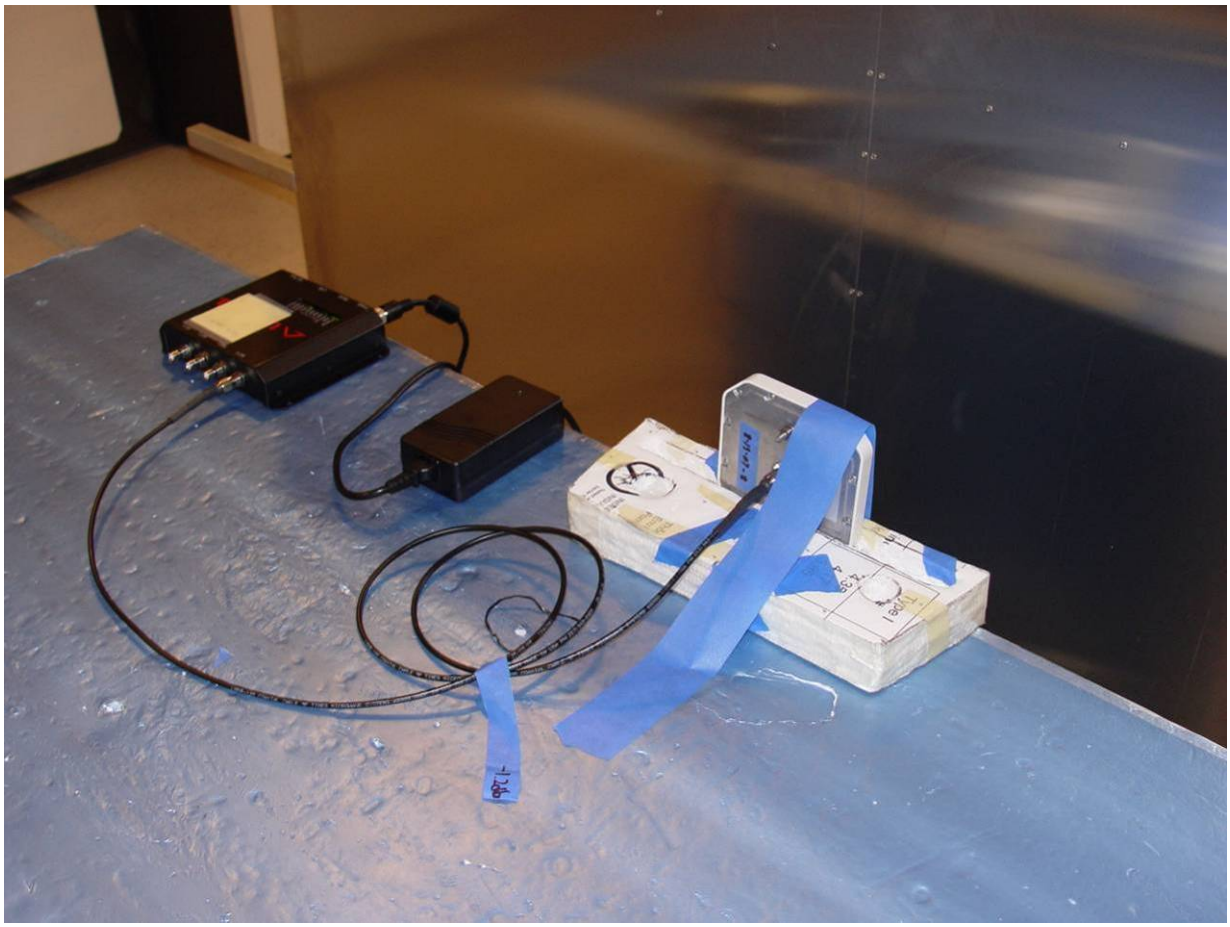
RFID-v9.1 915 MHz
**Near Field Magnetic Loop Sensor Antenna**

## 6.3. Radiated Emissions <1 GHz



## 6.4. Cable Connections PSU AC Wireline Emissions

## 6.5. XP Power PSU AC Wireline Emissions



## 7. TEST EQUIPMENT DETAILS

| Asset # | Instrument | Manufacturer | Part # | Serial # |
|---|---|---|---|---|
| 0070 | Power Meter | Hewlett Packard | 437B | 3125U11552 |
| 0116 | Power Sensor | Hewlett Packard | 8485A | 3318A19694 |
| 0117 | Power Sensor | Hewlett Packard | 8487D | 3318A00371 |
| 0158 | Barometer /Thermometer | Control Co. | 4196 | E2844 |
| 0184 | Pulse Limiter | Rhode & Schwarz | ESH3Z2 | 357.8810.52 |
| 0190 | LISN | Rhode & Schwarz | ESH3Z5 | 836679/006 |
| 0223 | Power Meter | Hewlett Packard | HP EPM-442A | US37480256 |
| 0251 | K-Cable | Megaphase | Sucoflex 104 | Unknown |
| 0252 | K-Cable | Megaphase | Sucoflex 104 | Unknown |
| 0253 | K-Cable | Megaphase | Sucoflex 104 | Unknown |
| 0256 | K-Cable | Megaphase | Sucoflex 104 | Unknown |
| 0271 | Amplifier | 1 to 26.5 GHz | MiCOM | -- |
| 0287 | EMI Receiver | Rhode & Schwarz | ESIB 40 | 100201 |
| 0293 | BNC Cable | Megaphase | 1689 1GVT4 | 15F50B001 |
| 0307 | BNC Cable | Megaphase | 1689 1GVT4 | 15F50B002 |
| 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 |
| 0335 | Horn Antenna | The Electro-Mechanics Company | 3117 | 00066580 |
| 0337 | Amplifier | 30 MHz – 3 GHz | MiCOM | -- |
| 0338 | Antenna (30M-3GHz) | Sunol Sciences | JB3 | A052907 |
| 0341 | 902-928 MHz Notch Filter | EWT | EWT-14-0199 | H1 |
| 0363 | Switch | MiCOM Labs | -- | -- |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