Test of Alien Technology RFID Reader ALR-9680

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

Test Report Serial No.: ALNT65-U2 Rev A

TEST REPORT

FROM

MiCOM Labs

Test of Alien Technology RFID Reader ALR-9680

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

Test Report Serial No.: ALNT65-U2 Rev A

This report supersedes: NONE

Manufacturer: Alien Technology, LLC
845 Embedded Way
San Jose, California 95138
USA

Product Function: 915 MHz RFID Reader

Copy No: pdf **Issue Date:** 17th December 2015

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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Phone: +1 (925) 462-0304
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ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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TABLE OF CONTENTS

1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. Testing Accreditation

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2005. 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

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 28th day of February 2014.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to December 31, 2015
Revised November 18, 2015

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

1.2. Recognition

MiCOM Labs, Inc has widely recognized wireless testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA countries. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2 4143A-3
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

EU MRA – European Union Mutual Recognition Agreement.
NB – Notified Body
APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.
Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing
Phase II – recognition for both product testing and certification

1.3. Product Certification

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

Accredited Product Certification Body

A2LA has accredited

MICOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 28th day of February 2014.

President & CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to December 31, 2015
Revised November 18, 2015

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

United States of America – Telecommunication Certification Body (TCB)
Industry Canada – Certification Body, CAB Identifier – US0159
Europe – Notified Body (NB), NB Identifier - 2280
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft	15th December 2015	Three additional antennas added; 1).. Alien ALR-8697 2).. Alien ALR-8698 3).. Times 7 A5010
Rev A	17th December 2015	Updated release.
This document was originally released as ALNT46-U1, 15th February 2013		
Rev A	15th February 2013	Initial Release

1. TEST RESULT CERTIFICATE

Manufacturer:	Alien Technology, LLC 845 Embedded Way San Jose, California 95138 USA	Tested By:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California, 94566, USA
EUT:	915 MHz RFID Reader	Telephone:	+1 925 462 0304
Model:	ALR-9680	Fax:	+1 925 462 0306
S/N:	MH1200002		
Test Date(s):	11th to 29th January 2013 28th Oct to 14th Dec 2015	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part15.247 & IC RSS-247	EQUIPMENT COMPLIES

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

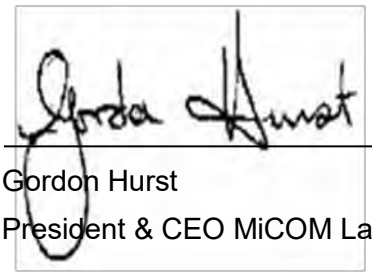
Notes:

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

A2LA ACCREDITED TESTING CERT #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	KDB 662911	2015	Guidance for measurement of output emission of devices that employ single transmitter with multiple outputs or systems with multiple transmitters operating simultaneously in the same frequency band
II	KDB 558074 D01 v03r03	9th June 2015	Guidance for performing compliance measurements on Digital Transmission Systems (DTS) operating under section 15.247.
III	A2LA	June 2015	R105 - Requirement's When Making Reference to A2LA Accreditation Status
IV	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
V	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
VI	CISPR 22	2008	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
VII	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
VIII	FCC 47 CFR Part 15.247	2014	Radio Frequency Devices; Subpart C – Intentional Radiators
IX	ICES-003	Issue 5 2012	Spectrum Management and Telecommunications; Interference-Causing Equipment Standard. Information Technology Equipment (ITE) – Limits and methods of measurement.
X	M 3003	Edition 3 Nov. 2012	Expression of Uncertainty and Confidence in Measurements
XI	RSS-247 Issue 1	May 2015	Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices
XII	RSS-Gen Issue 4	November 2014	General Requirements and Information for the Certification of Radiocommunication Equipment
XIV	FCC 47 CFR Part 2.1033	2014	FCC requirements and rules regarding photographs and test setup diagrams.

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 ALR-9680 to FCC Part 15.247 and Industry Canada RSS-247 Issue 1 regulations
Applicant:	As Manufacturer
Manufacturer:	Alien Technology, LLC 845 Embedded Way San Jose, California 95138 USA
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton, California 94566 USA
Test report reference number:	ALNT65-U2 Rev A
Standard(s) applied:	FCC 47 CFR Part15.247 & IC RSS-247
Date EUT received:	Initial Program: 11th January 2013 Secondary Program: 28th October 2015
Dates of test (from - to):	11th to 29th January 2013 28th October to 14th December 2015
No of Units Tested:	One
Type of Equipment:	915 MHz RFID Reader
Manufacturers Trade Name:	Enterprise Reader
Model:	ALR9680
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:	56K6A1D
Microprocessor(s) Model:	ARM9 Core
Clock/Oscillator(s):	18.4 MHz; 24 MHz; 25 MHz; 32.768 kHz
Frequency Stability:	±10 ppm
EUT Dimensions:	10.5” x 8” x 1.5”
EUT Weight :	2.4 lbs
Primary function of equipment:	Radio Frequency Identification (RFID) Reader

3.2. Scope of Test Program

The scope of the test program was to test the Alien Technology RFID Reader ALR-9680 in the frequency ranges 902 - 928 MHz against FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications for radiated and conducted emissions for intentional radiators. The intentional radiator was tested in a simulated typical installation to demonstrate compliance with the stated standards.

Additional Antennas (December 2015)

Client requested to add an additional three antennas;

i).. ALR-8697

ii).. ALR-8698

iii).. Times 7 A5010

Alien Technology RFID Reader ALR-9680

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	ALR-9680	MH1200002
EUT	100-240Vac/dc Power Supply Unit 24 Vdc,1.25 A	Autec Power Systems	SA06-30S17R	R00074900070
EUT	100-240Vac/dc POE 48 Vdc output	ITE Power Supply	PW180KA4800F01	None
EUT	Laptop	IBM	ThinkPad	None

3.4. Antenna Details

Manufacturer	Model	Type	Frequency	Antenna Gain (dBi)
Alien	ALR-8696-C	Circular	902-928MHz	5.5
Alien	ALR-8697	Circular	902-928MHz	5.5
Alien	ALR-8698	Circular	902-928MHz	8.0
Alien	Times 7 A5010	Circular	902-928MHz	5.3

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. (4x) RF Port (915 MHz)
1. 10/100BT Ethernet
2. dc Supply on single connector +24 Vdc
3. Serial Port (9 pin) Local Maintenance Terminal
4. 5 Pin I/O port.

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

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-247** and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(a)(1) 5.1 (3)	20 dB BW	20 dB BW	Conducted	Complies	5.1.1
15.247(a)(1) 5.1 (3)	Transmitter Channels	Channel Spacing	Conducted	Complies	5.1.2
15.247(a)(1) 5.1 (3)	Transmitter Channels	Number of Channels	Conducted	Complies	5.1.3.1
		Channel Occupancy	Conducted	Complies	5.1.3.2
15.247(b)(2) 5.4 (1)	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) 5.5	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-247** and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(d) **15.205** **15.209** **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) **15.205** **15.209** **A8.5** **2.2** **2.6**	Radiated Emissions below 1 GHz		Radiated	Complies	*5.1.9*
15.207 **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

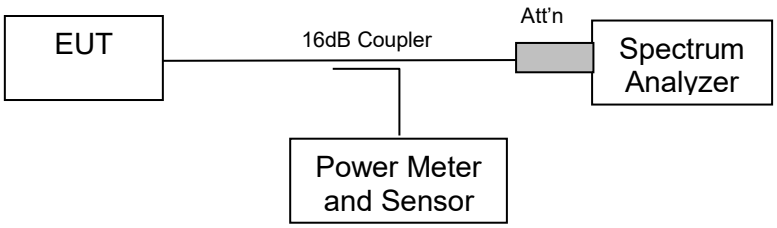
5.1. Device Characteristics

5.1.1. 20 dB Bandwidth

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

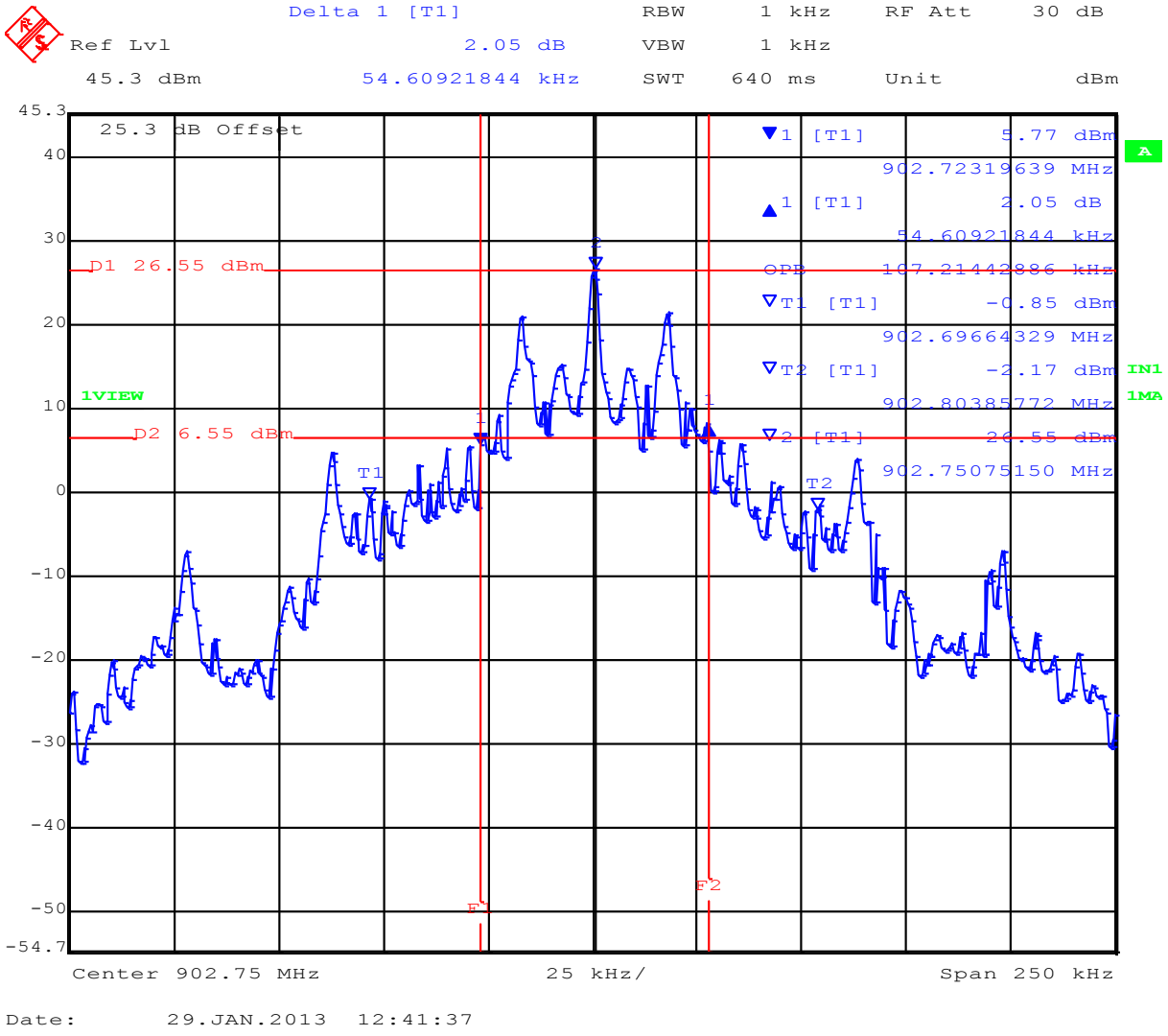
Test Results for 20 dB Bandwidth

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

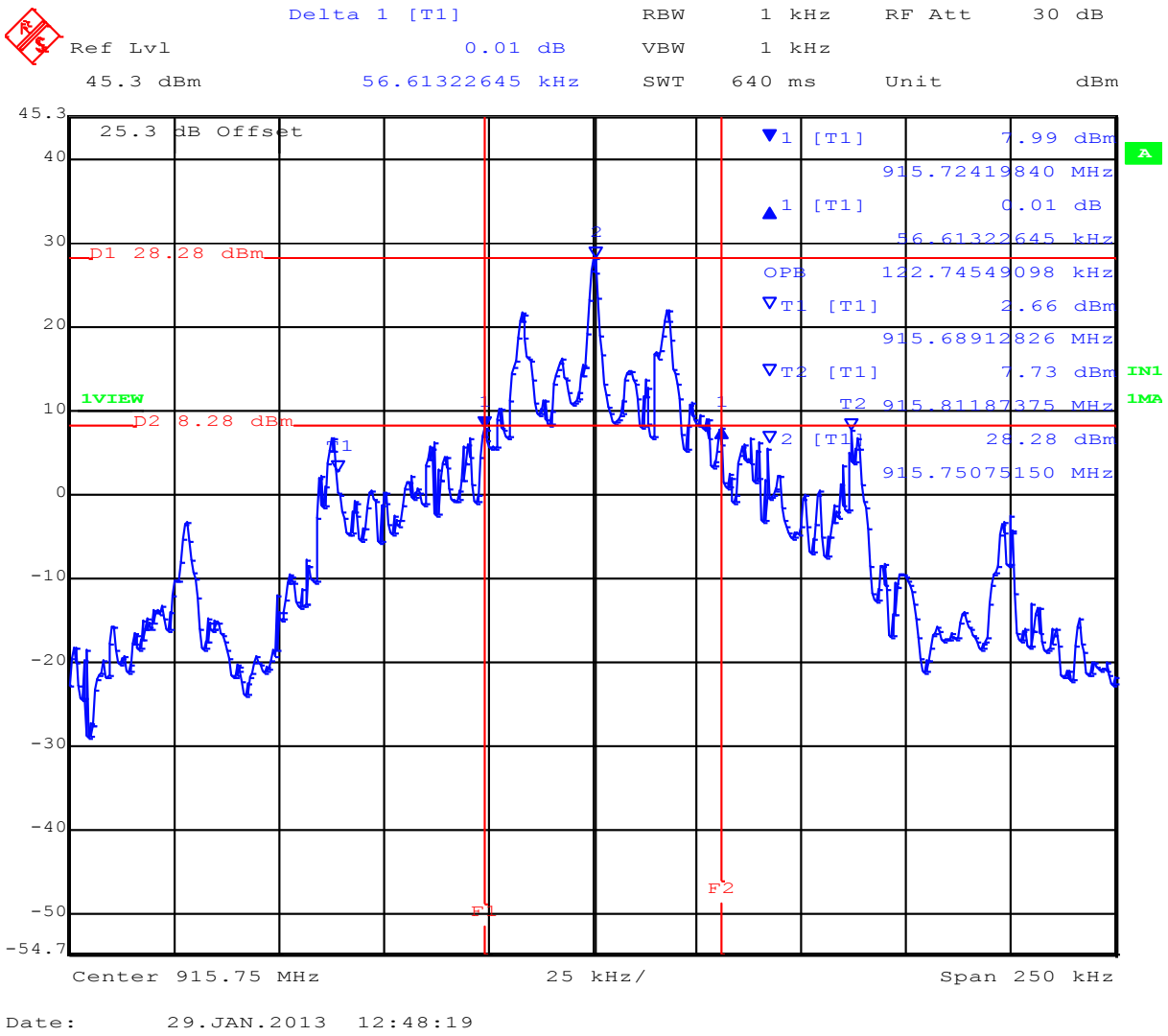
TABLE OF RESULTS

Channel #	Center Frequency (MHz)	20 dB Bandwidth (kHz)	Specification (kHz)
0	902.75	54.6	<500
26	915.75	56.6	
49	927.25	50.6	

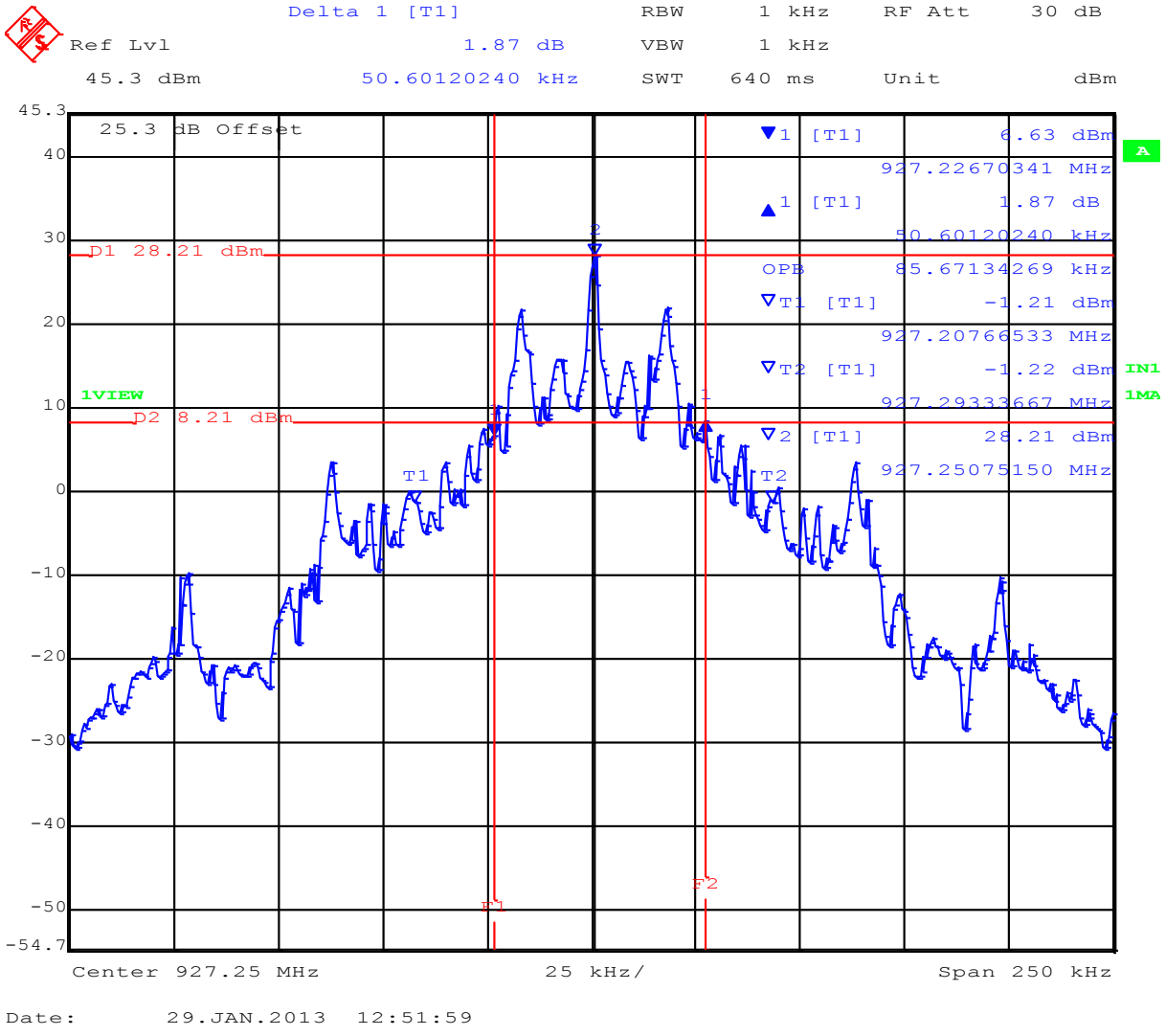
CH 0 902.75 MHz 20 dB Bandwidth



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(c)

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

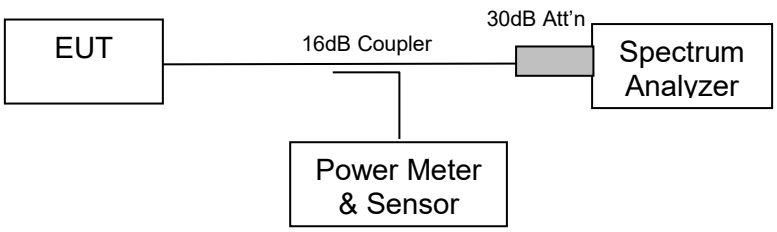
Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117

5.1.2. Transmitter Channels - Channel Spacing

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

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

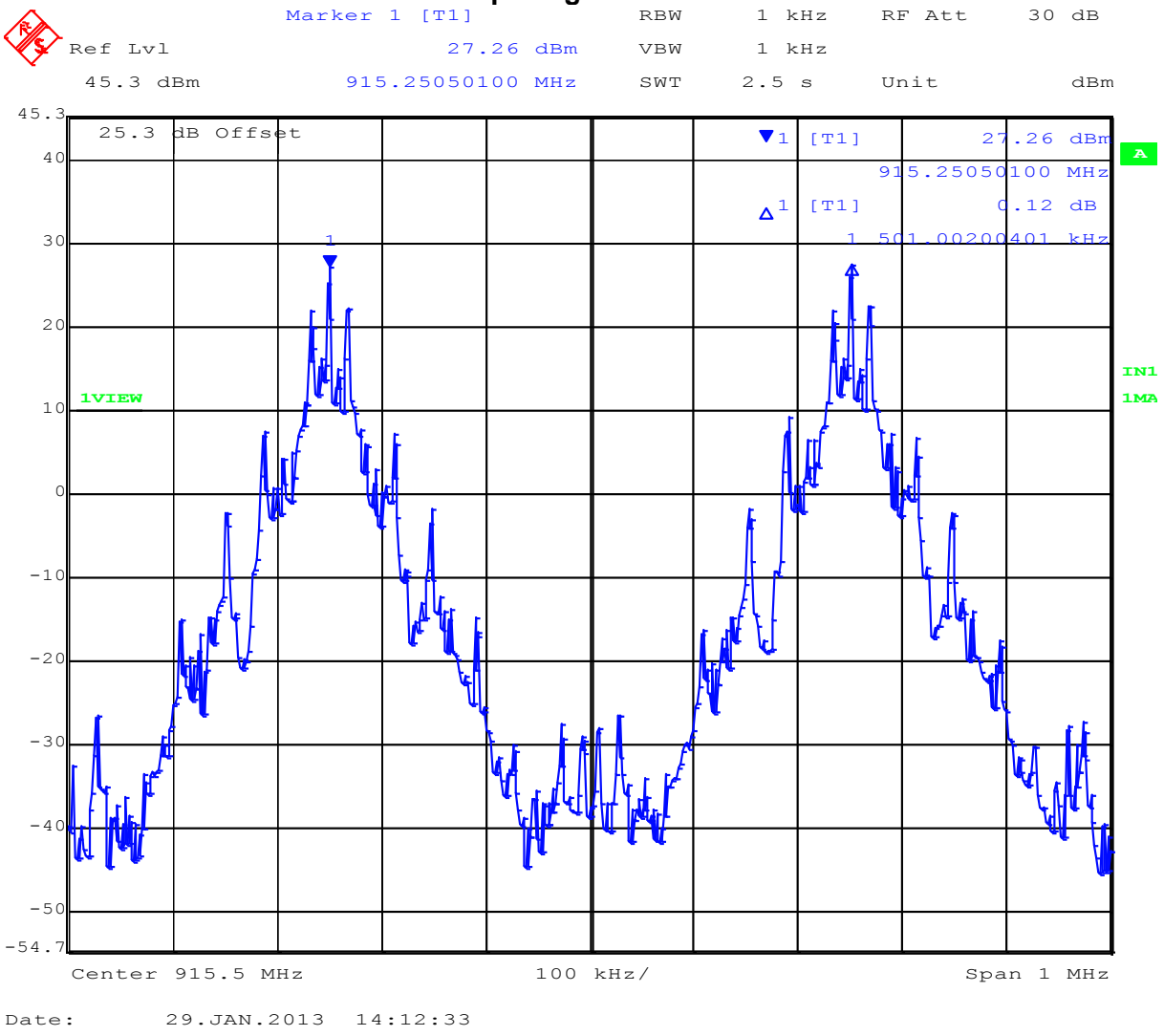
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

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(c)

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.

5.1.3. Transmitter Channels

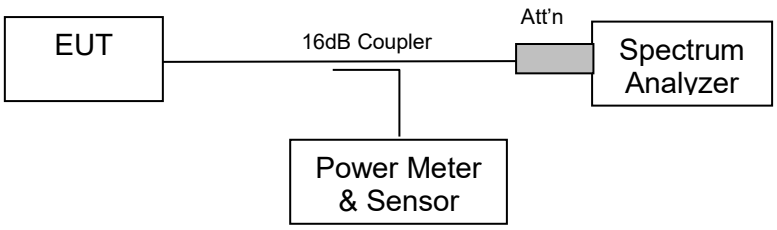
5.1.3.1. Number of Channels

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



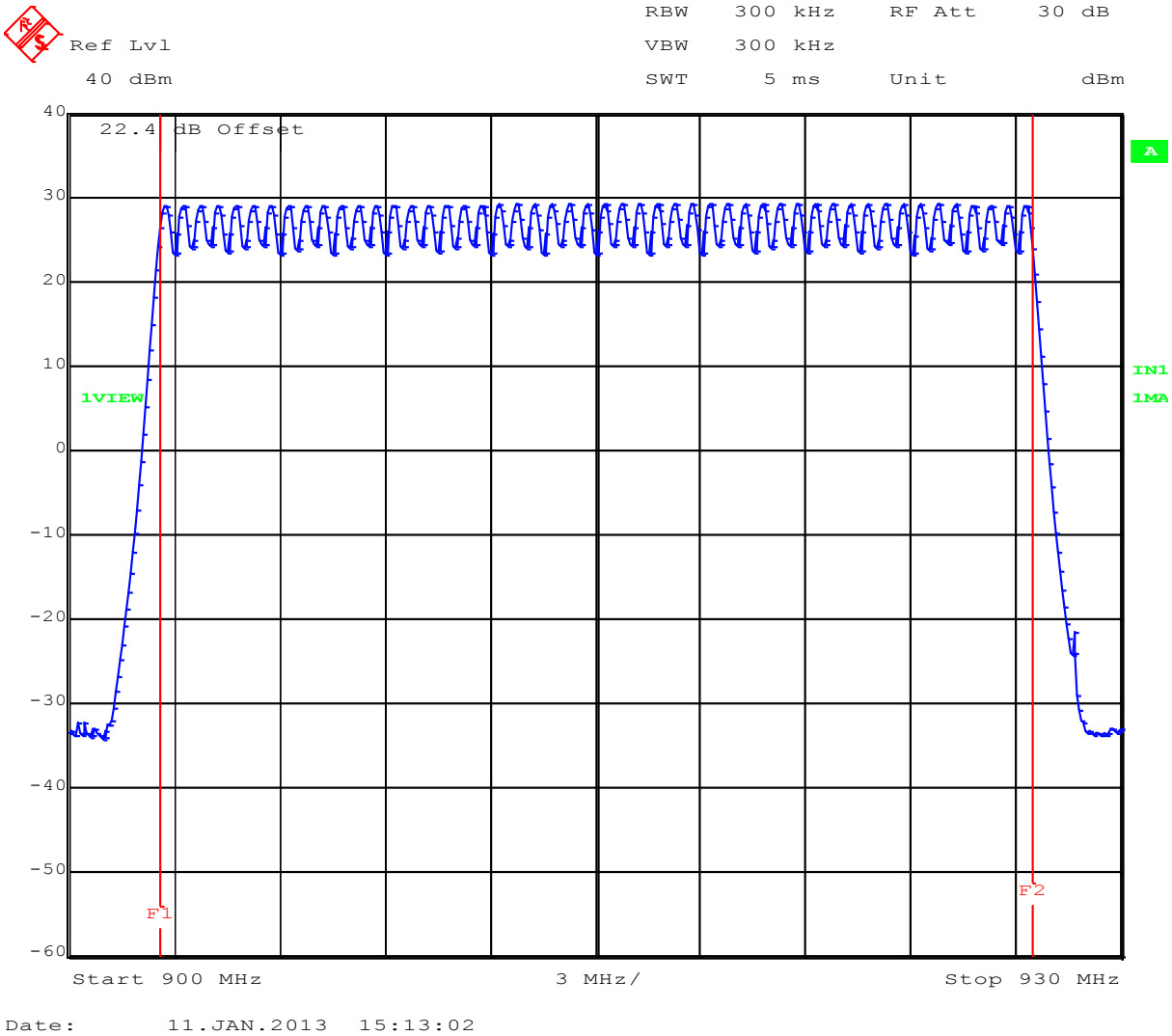
Test set up to measure the number of channels and channel occupancy

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

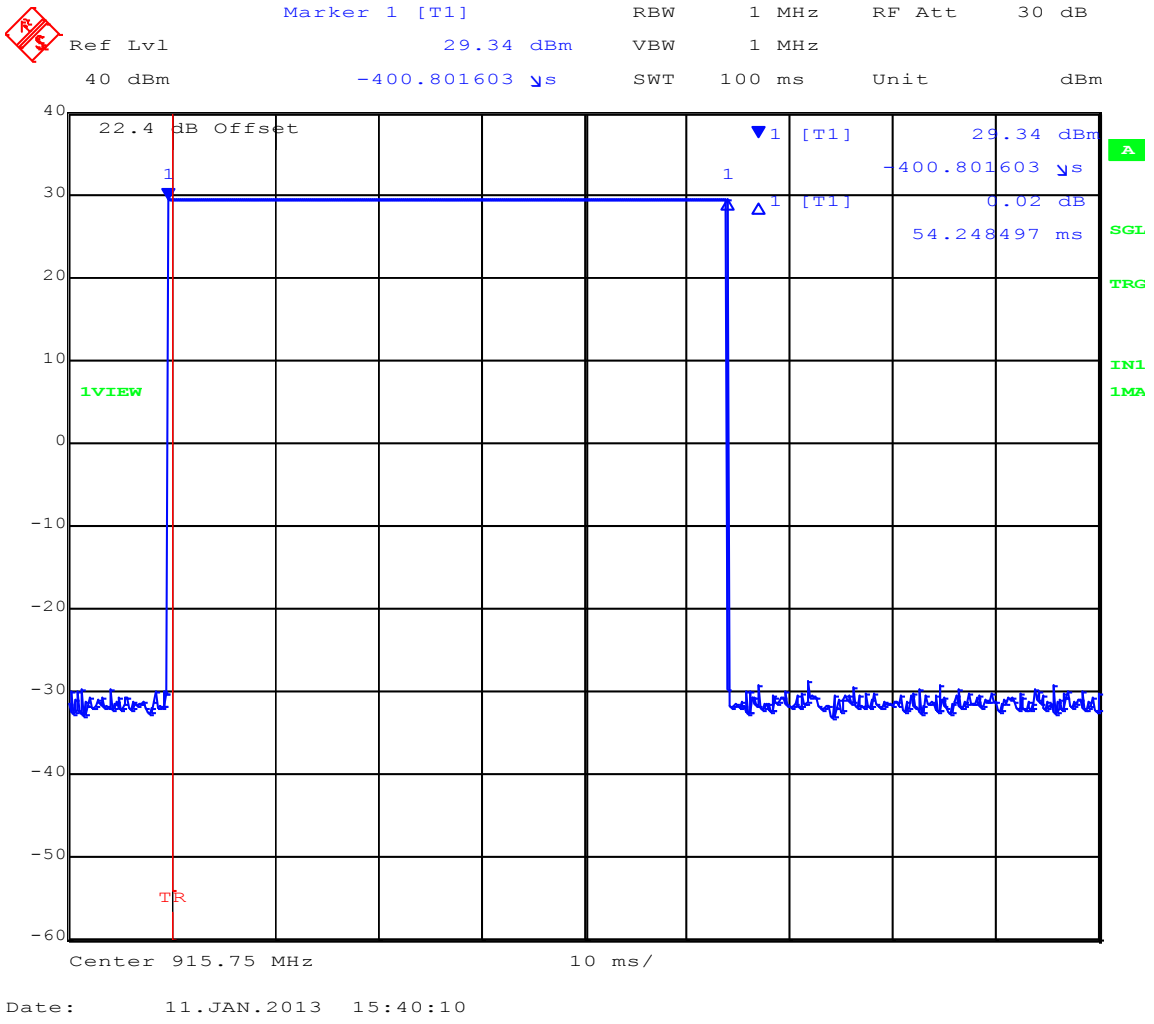
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

Channel Dwell Time

TABLE OF RESULTS

Channel #	Center Frequency (MHz)	Channel Dwell Time (single channel) (mSecs)
26	915.75	54.248

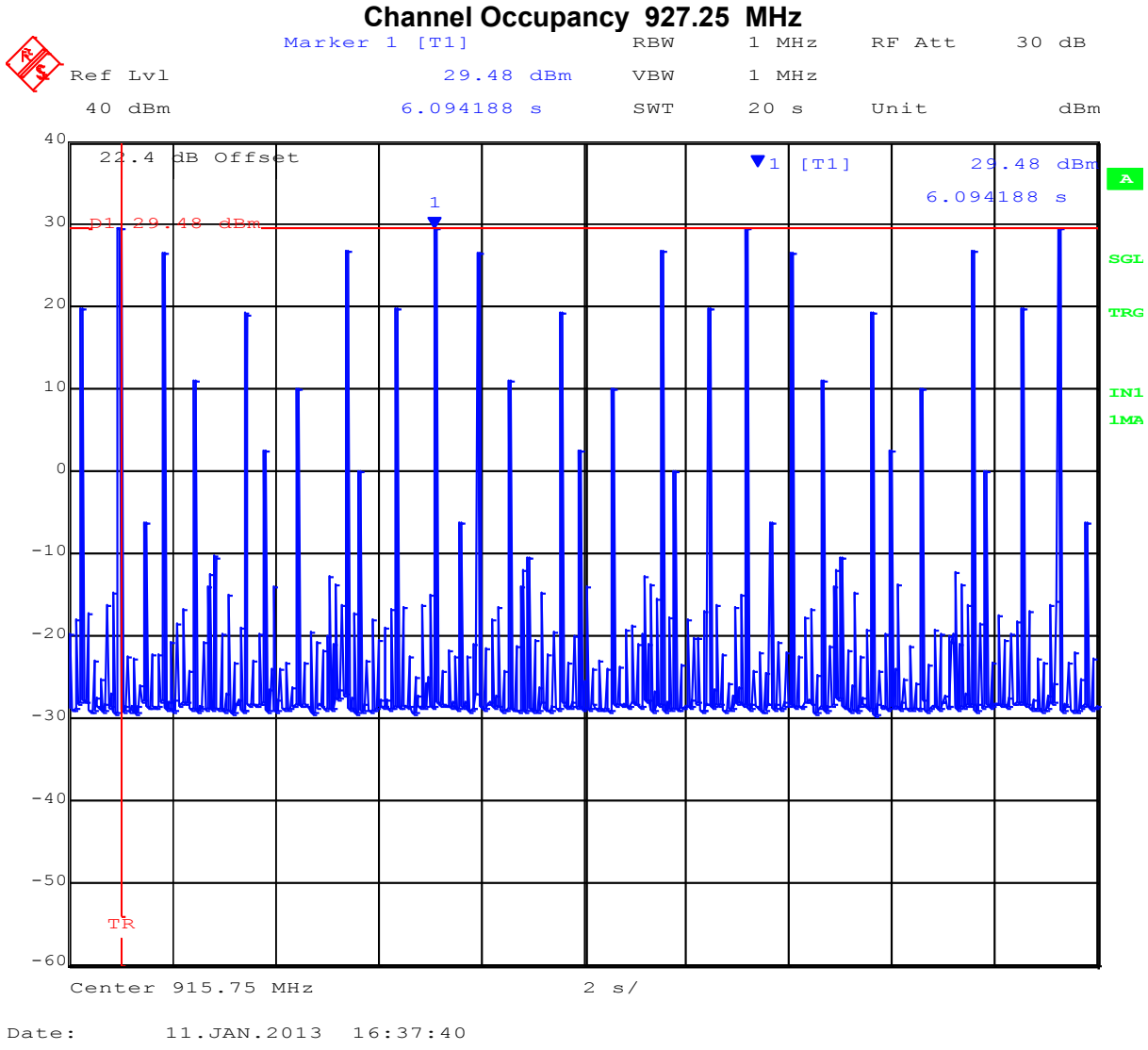
Channel dwell time Ch 26 915.75 MHz



Channel Occupancy

TABLE OF RESULTS

Channel #	Center Frequency (MHz)	Channel Occupancy within 10 Second Period (mSeconds)
26	915.75	20 x 54.248 = 1048.96



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

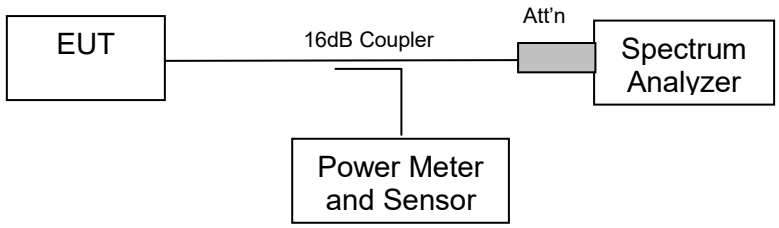
Method	Test Equipment Used
Measurements were made per work instruction WI-02 'Frequency Measurement"	0078, 0134, 0158, 0184, 0193, 0250, 0252 0310, 0312.

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

15.247 (c) Operation with directional antenna gains greater than 6 dBi.
If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Model	Gain (dBi)	Max. Allowable Conducted Peak Power (dBm)	Maximum EIRP (dBm)
ALR-8696-C	5.5	30.0	+36.0
ALR-8697	5.5		
ALR-8698	8.0		
Times 7 A5010	5.3		

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	+28.90
26	915.75	+29.70
49	927.25	+29.54

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 band 902–928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W, and the e.i.r.p. shall not exceed 1 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

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm^2) = EIRP/(4πd^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 0.6 mW/cm^2

Antenna Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance @ 0.6mW/cm^2 Limit(cm)
5.5	3.55	+29.70	933.3	21.0

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 = f/1500 = 0.6 mW / cm^2 from 1.310 Table 1

RSS-Gen §5.6 Category I and Category II equipment shall comply with the applicable requirements of RSS-102.

Laboratory Measurement Uncertainty for Power Measurements

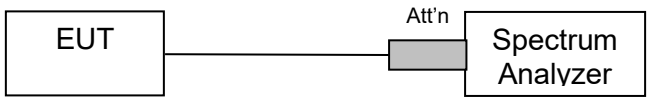
Measurement uncertainty	±1.33 dB

5.1.6. Conducted Spurious Emissions Transmitter

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

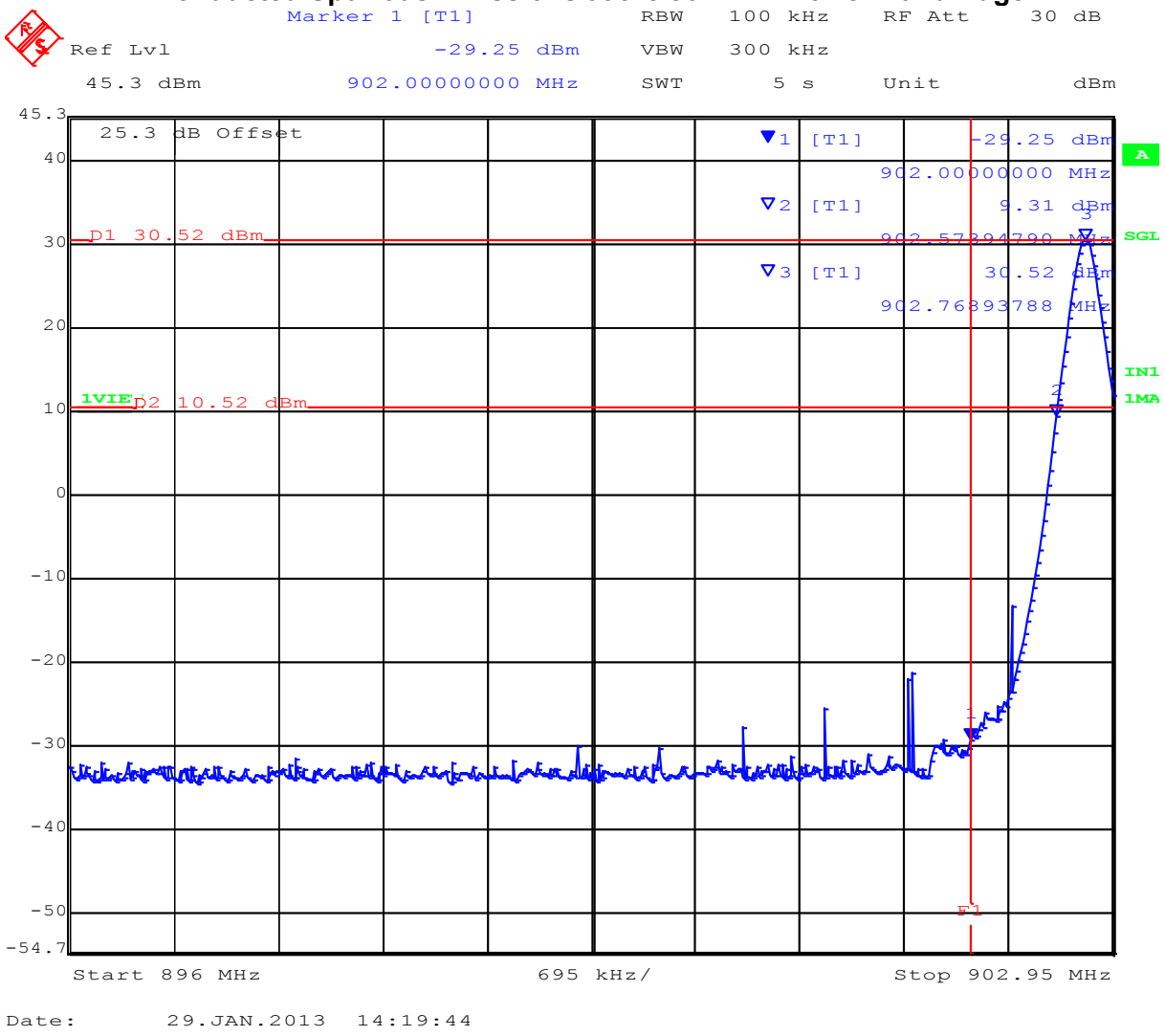
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

Conducted Band-Edge Results

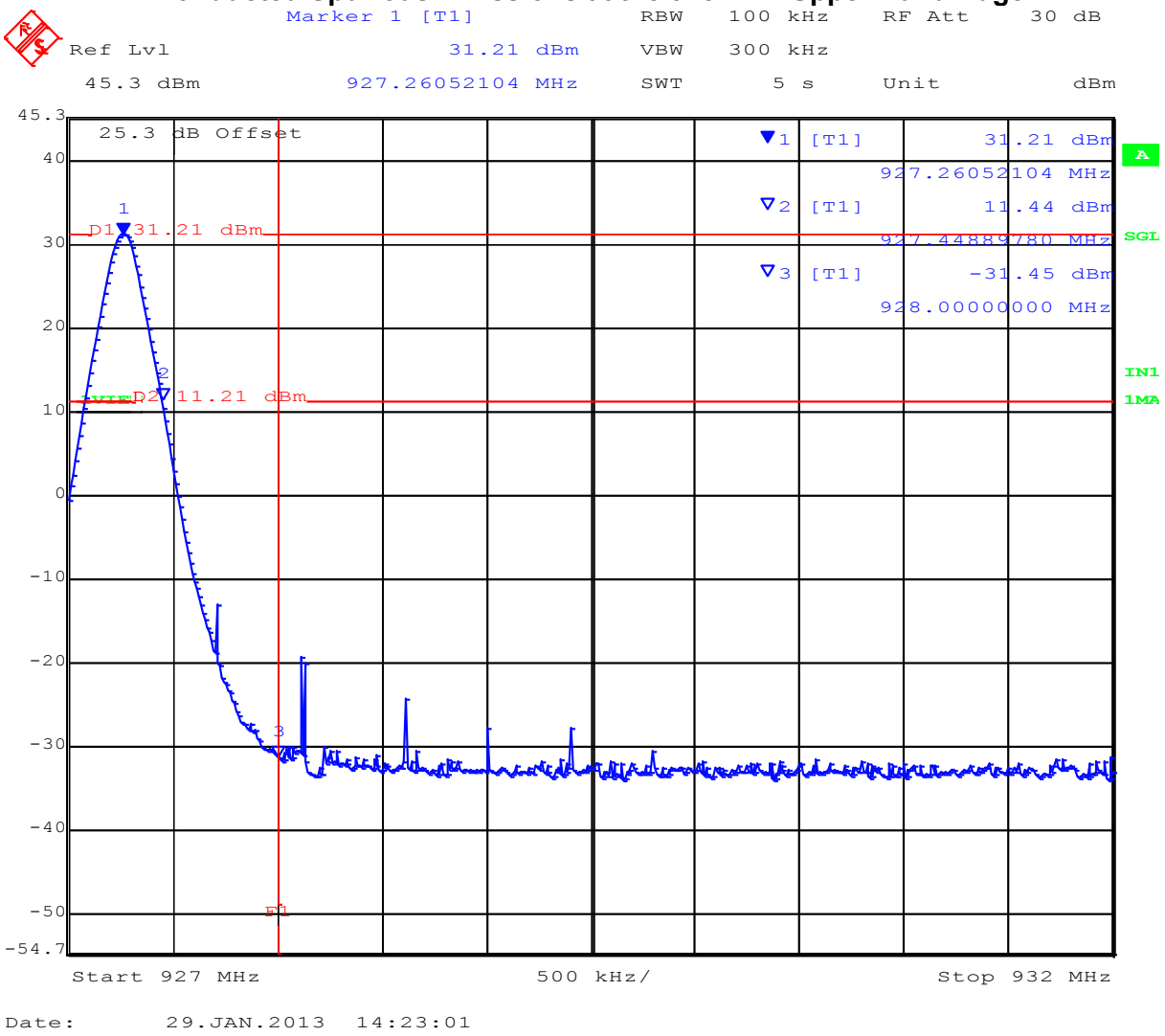
TABLE OF RESULTS –

Channel #	Center Frequency (MHz)	Band-edge Frequency (MHz)	Limit (dBm)	Amplitude @ Band-edge (dBm)	Margin (dB)
0	902.75	902.0	+10.52	-29.25	-39.77
49	927.25	928.0	+11.21	-33.00	-44.21

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

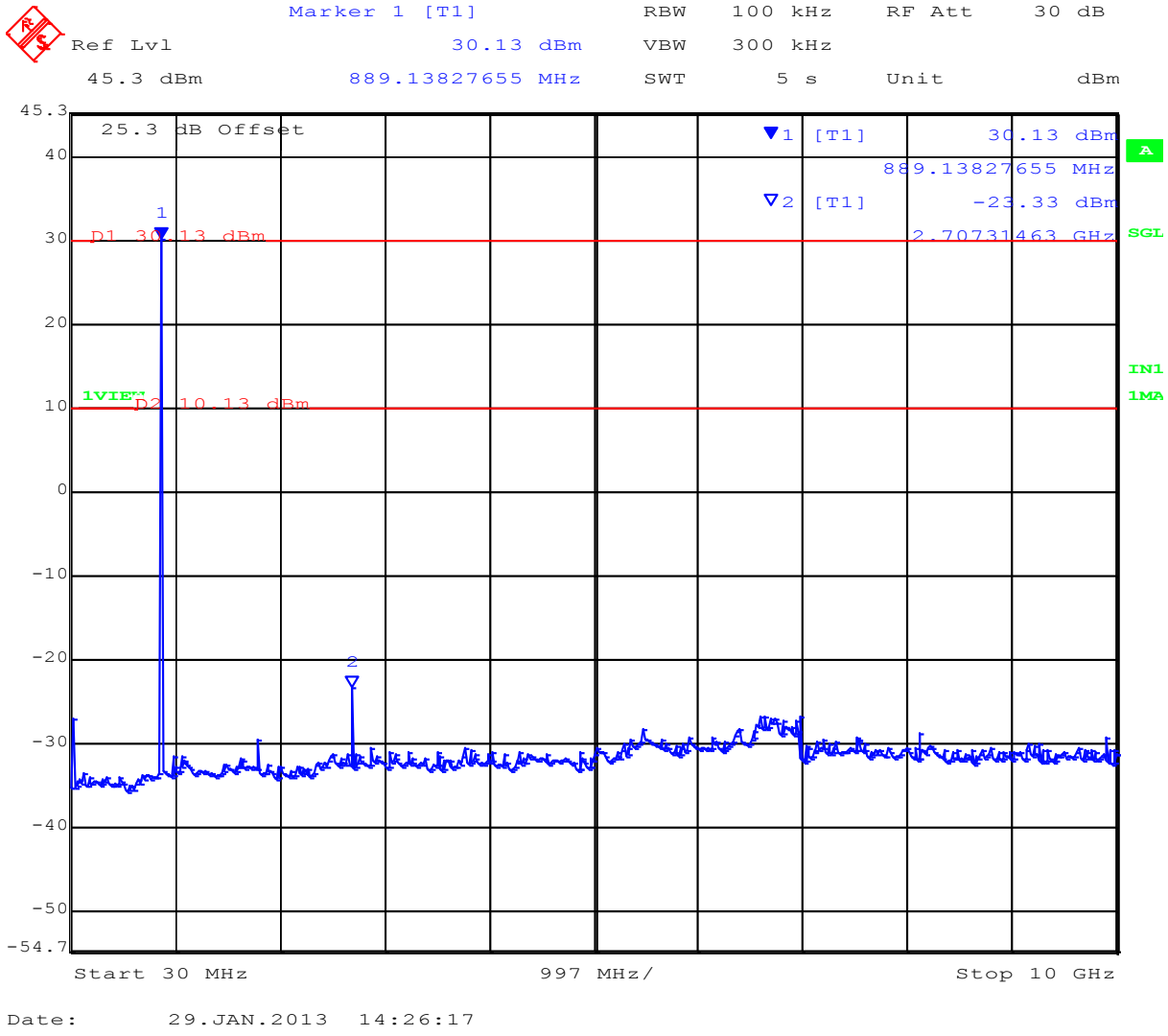
Channel Centre Frequency (MHz)	Start Frequency (MHz)	Stop Frequency (MHz)	Maximum Emission Observed (dBm)	Limit (dBm)	Margin (dB)
902.75	30	10,000	-23.33	+10.13	-33.46
915.75	30	10,000	-26.42	+11.01	-37.43
927.25	30	10,000	-26.55	+10.59	-37.14

The emission breaking the limit line is the carrier.

The emission breaking the limit line is the carrier.

Conducted Transmitter Spurious Emissions

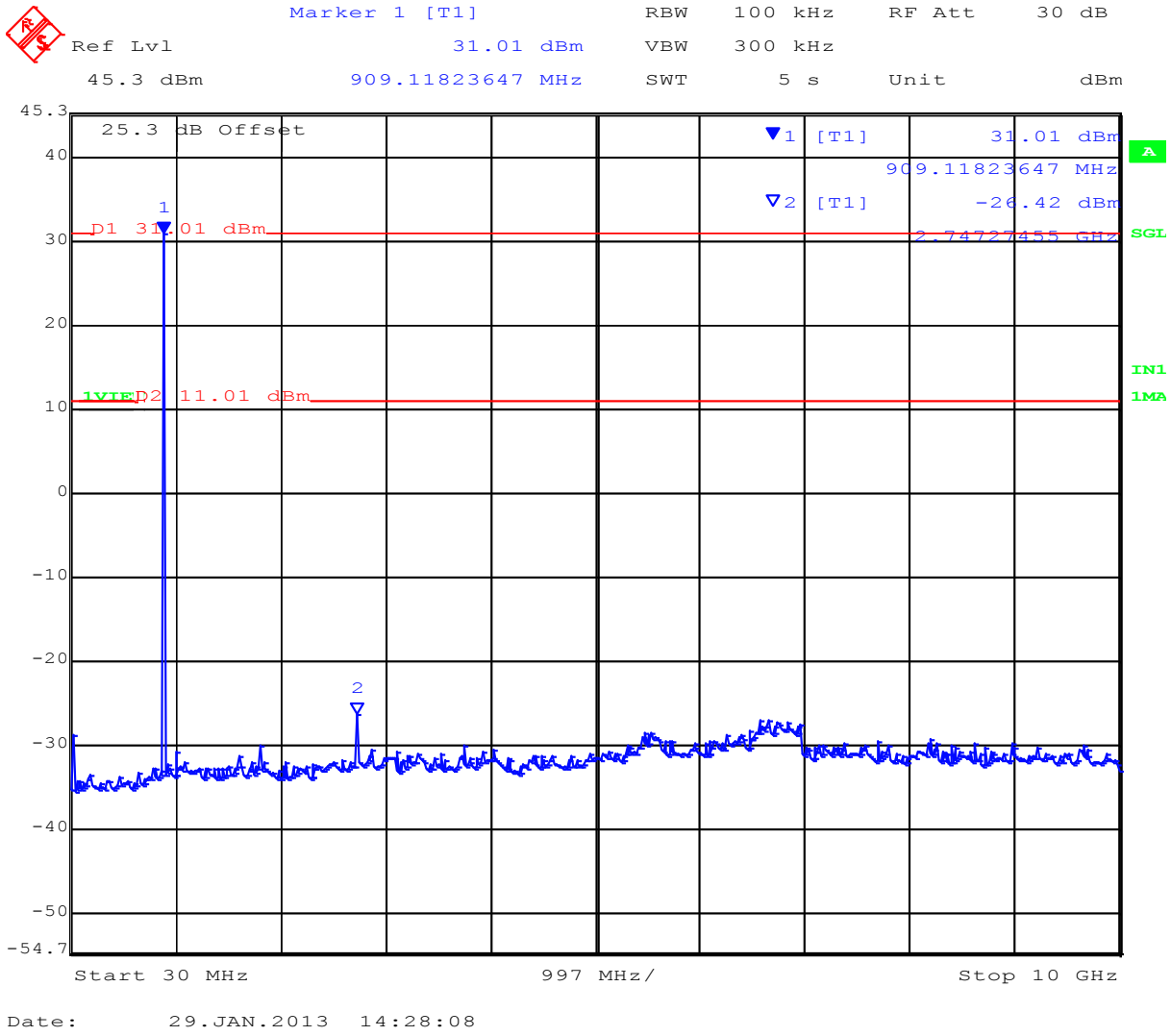
Channel 902.75 MHz - 30 MHz to 10,000 MHz



The emission breaking the limit line is the carrier.

Conducted Transmitter Spurious Emissions

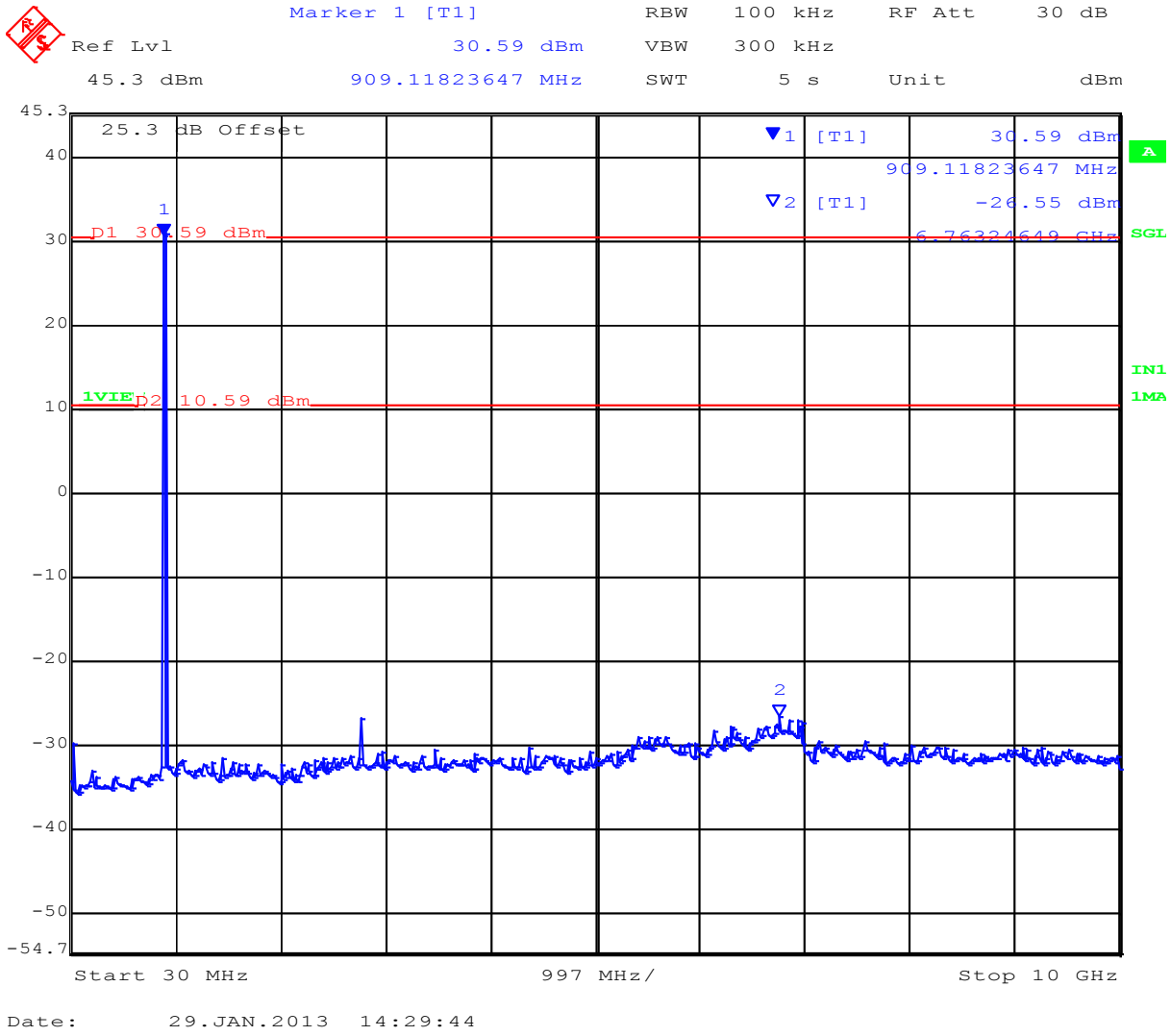
Channel 915.75 MHz - 30 MHz to 10,000 MHz



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.

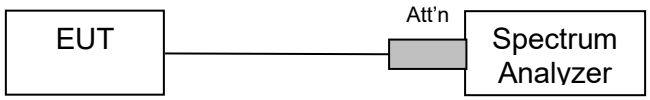
5.1.7. Conducted Spurious Emissions Stand-By

Industry Canada RSS-Gen §6.2

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



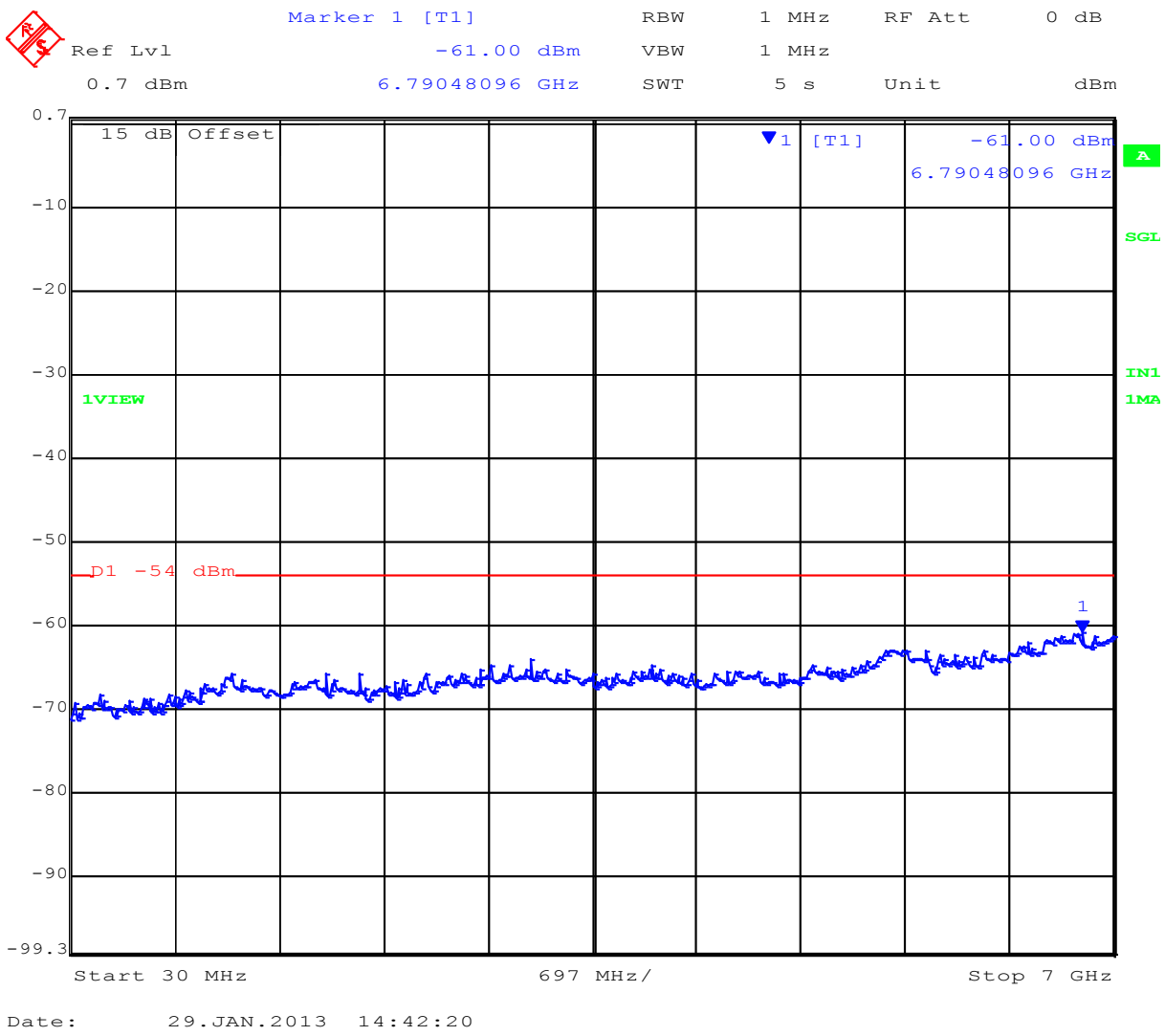
Stand-By spurious emissions test configuration

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 §6.2

If the receiver has a detachable antenna of known impedance, antenna conducted spurious emissions measurement is permitted as an alternative to radiated measurement.

The antenna conducted test shall be performed with the antenna disconnected and the receiver antenna terminals connected to a measuring instrument having equal impedance to that specified for the antenna.

The receiver spurious emissions measured at the antenna terminals by the antenna conducted method shall then comply with the following limits:

Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts in the band 30–1000 MHz, and 5 nanowatts above 1000 MHz.

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.

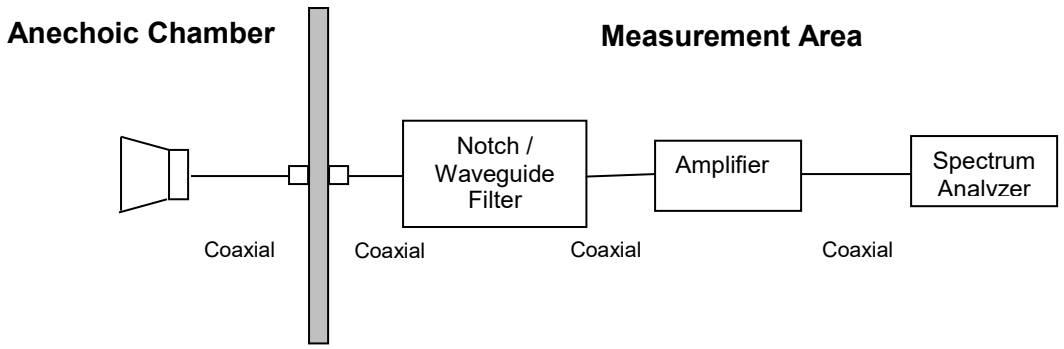
5.1.8. Radiated Emissions

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:

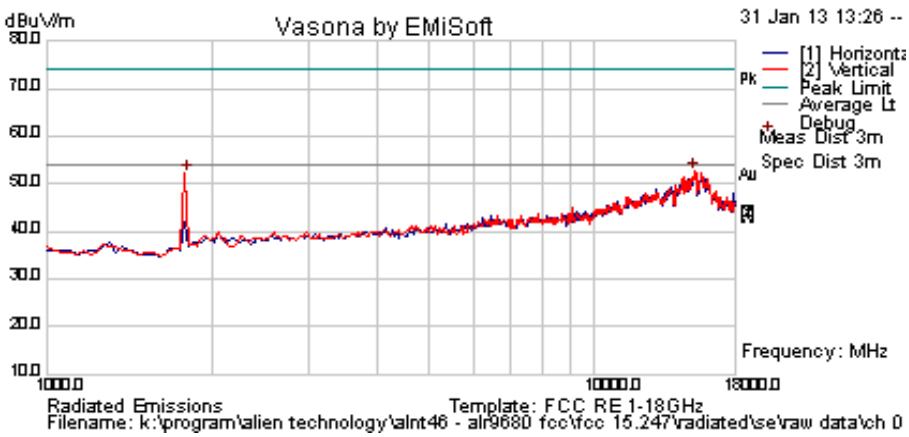
Level (dBμV/m) = 20 * Log (level (μV/m))

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

5.1.8.1. Transmitter Radiated Spurious Emissions

Antenna ALR-8696-C

Test Freq.	CH 0	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	19.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	MAX (29 dBm)	**Press. (mBars)**	1012
Antenna	Port 3 (Directional Panel)		
Test Notes 1	Pant Port 3 gave highest output power and used for all testing for worst case.		
Test Notes 2	POE PSU		

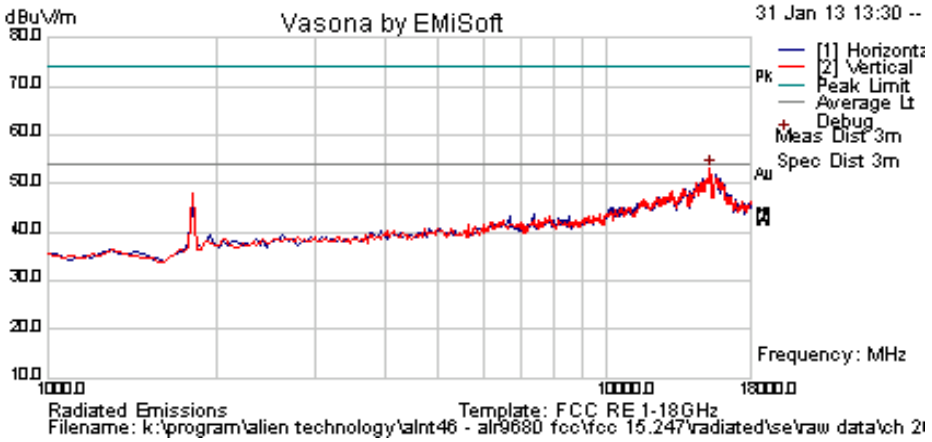


Formally measured emission peaks

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
15206.413	45.8	8.2	-1.5	52.5	Peak [Scan]	H						NRB
1805.541	62.0	2.6	-12.6	52.1	Peak [Scan]	V						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.	CH 26	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	19.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	MAX (29 dBm)	**Press. (mBars)**	1012
Antenna	Port 3 (Directional Panel)	**Duty Cycle (%)**	0
Test Notes 1	Pant Port 3 gave highest output power and used for all testing for worst case.		
Test Notes 2	POE PSU		

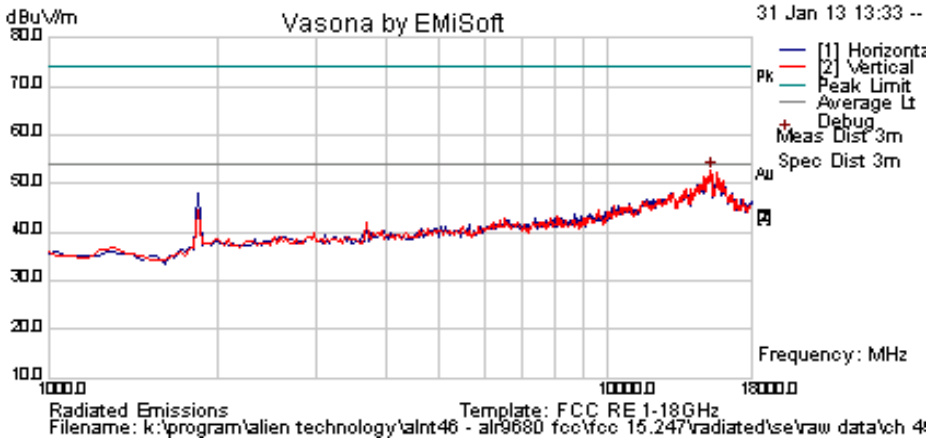


Formally measured emission peaks

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
15206.413	45.8	8.2	-1.5	52.5	Peak [Scan]	H						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.	CH 49	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	19.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	MAX (29 dBm)	**Press. (mBars)**	1012
Antenna	Port 3 (Directional Panel)	**Duty Cycle (%)**	0
Test Notes 1	Pant Port 3 gave highest output power and used for all testing for worst case.		
Test Notes 2	POE PSU		

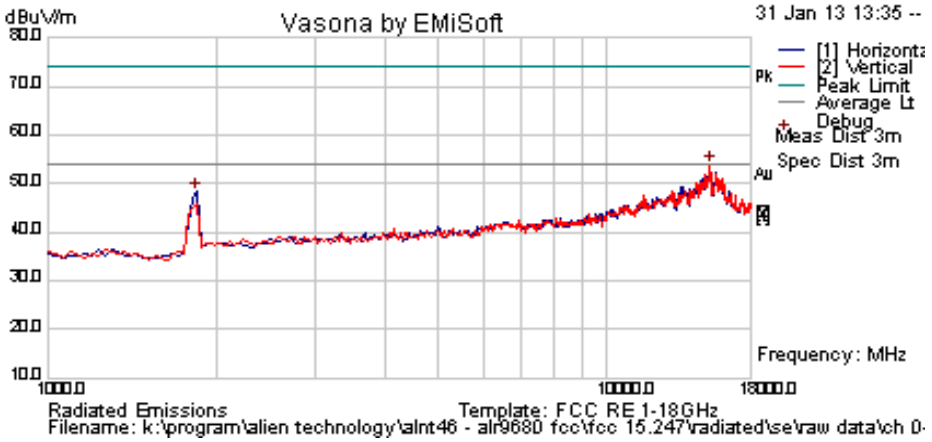


Formally measured emission peaks

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
15206.413	45.8	8.2	-1.5	52.5	Peak [Scan]	H						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.	CH 0-49 (Hopping)	**Engineer**	SB
Variant	FHSS	**Temp (ºC)**	19.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	MAX (29 dBm)	**Press. (mBars)**	1012
Antenna	Port 3 (Directional Panel)		
Test Notes 1	Port 3 gave highest output power and used for all testing for worst case.		
Test Notes 2	POE PSU		

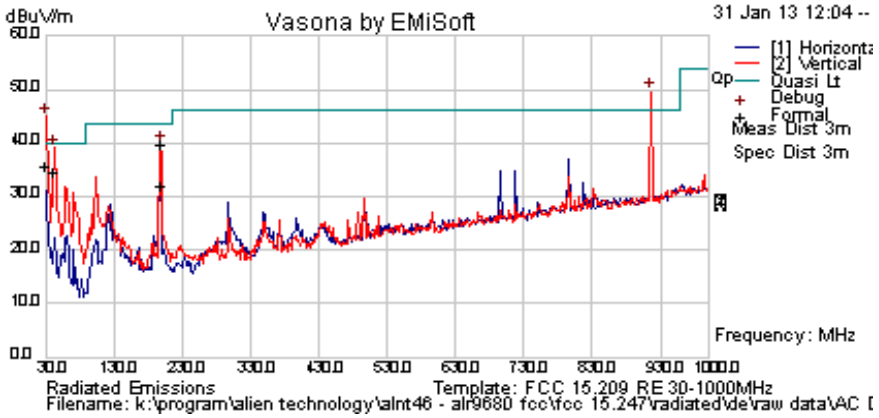


Formally measured emission peaks

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
15274.549	46.9	8.2	-1.2	53.9	Peak [Scan]	V						NRB
1851.703407	58.2	2.7	-12.4	48.4	Peak [Scan]	H						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.	902.75 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	19.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	33
Power Setting	MAX (29 dBm)	**Press. (mBars)**	1012
Antenna	Port 3 (Directional Panel)		
Test Notes 1	Pant Port 3 gave highest output power and used for all testing for worst case.		
Test Notes 2	AC/DC 120VAC (Not supplied or SOLD w/ EUT);PS Autec Power Systems;MDL:SA06-30S17R-U;S/N:R00074900070		

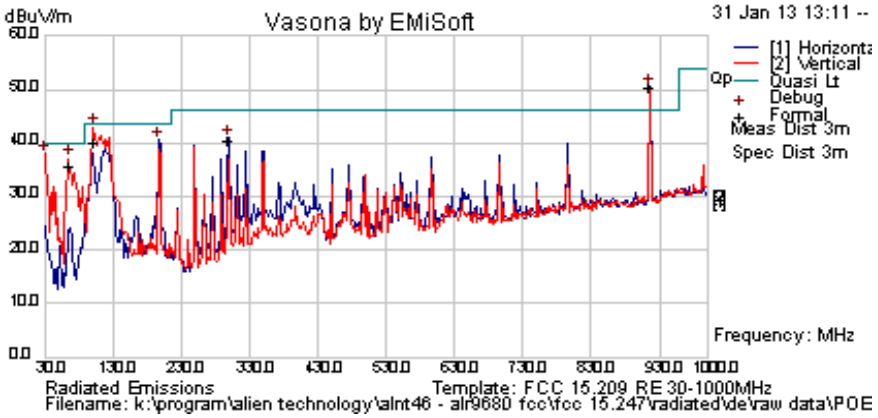


Formally measured emission peaks

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
30.000	41.8	3.5	-9.7	35.6	Quasi Max	V	107	107	40	-4.5	Pass	
42.834	50.5	3.6	-19.5	34.6	Quasi Max	V	103	103	40	-5.4	Pass	
198.664	45.7	4.6	-18.4	31.9	Quasi Max	V	314	314	43.5	-11.6	Pass	
916.413	51.0	7.2	-7.7	50.4	Peak [Scan]	H						FUND

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

Test Freq.	915.75 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	19.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	33
Power Setting	MAX (29 dBm)	**Press. (mBars)**	1012
Antenna	Port 3 (Directional Panel)		
Test Notes 1	Pant Port 3 gave highest output power and used for all testing for worst case.		
Test Notes 2	POE PSU		



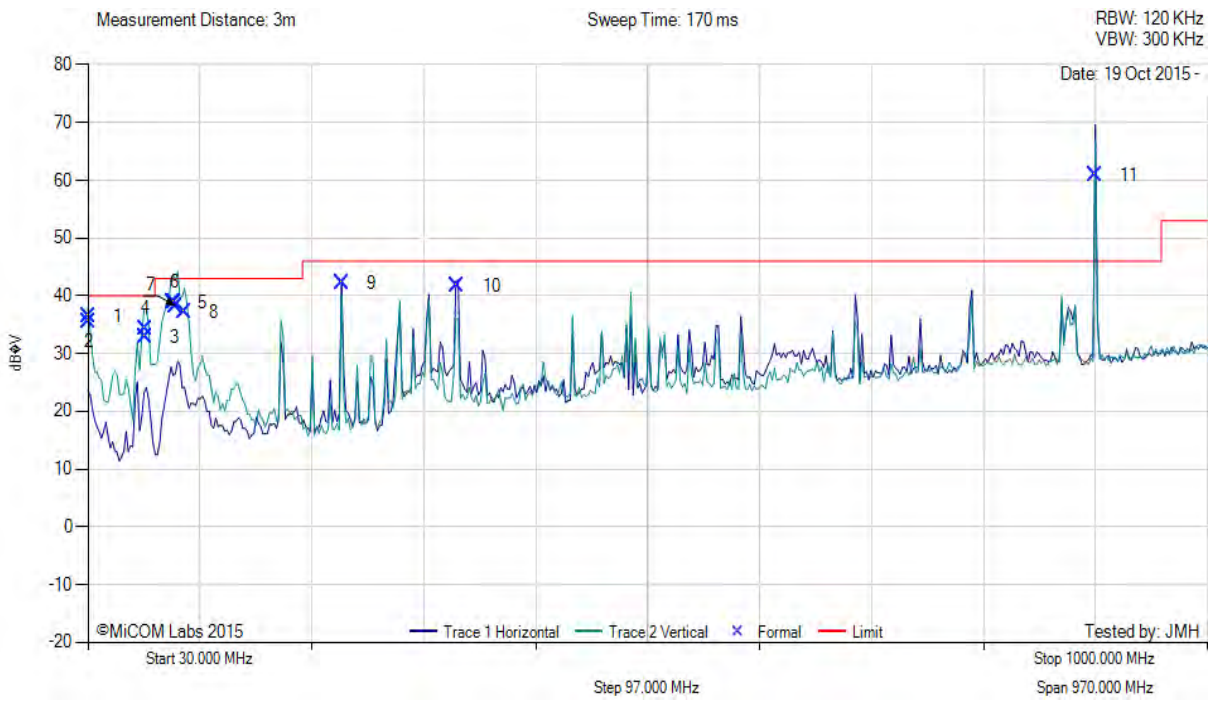
Formally measured emission peaks

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
103.655	56.1	4.1	-20.2	40.0	Quasi Max	V	108	360	43.5	-3.5	Pass	
65.599	55.5	3.8	-23.5	35.8	Quasi Max	V	98	158	40.0	-4.2	Pass	
300.058	52.7	5.1	-17.2	40.6	Quasi Max	H	93	123	46.0	-5.5	Pass	
30.000	41.8	3.5	-9.7	35.6	Quasi Max	V	107	107	40	-4.5	Pass	
198.664	45.7	4.6	-18.4	31.9	Quasi Max	V	314	314	43.5	-11.6	Pass	
916.413	51.0	7.2	-7.7	50.4	Peak [Scan]	H						FUND

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

Antenna ALR-8697

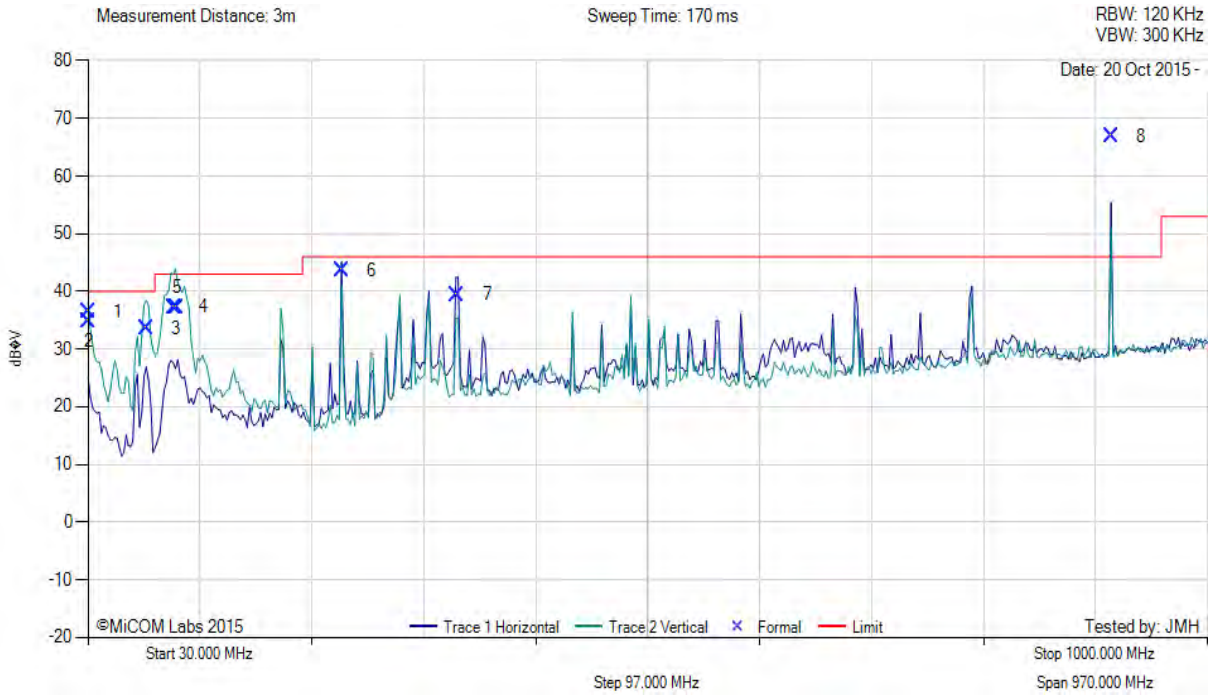
Variant: TX Spur, Test Freq: 902.75 MHz, Antenna: ALR-8697, Power Setting: MAX, Duty Cycle (%): MAx



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.43	42.69	3.42	-9.72	36.39	MaxQP	Vertical	150	285	40.0	-3.6	Pass
2	30.99	42.81	3.43	-10.61	35.63	MaxQP	Vertical	150	276	40.0	-4.4	Pass
3	79.33	52.49	3.77	-23.47	32.79	MaxQP	Vertical	150	357	40.0	-7.2	Pass
4	80.11	53.98	3.77	-23.46	34.29	MaxQP	Vertical	150	354	40.0	-5.7	Pass
5	103.96	55.01	3.90	-20.13	38.78	MaxQP	Vertical	150	9	43.0	-4.2	Pass
6	105.23	54.94	3.91	-19.93	38.92	MaxQP	Vertical	150	1	43.0	-4.1	Pass
7	106.11	53.96	3.91	-19.63	38.24	MaxQP	Vertical	150	7	43.0	-4.8	Pass
8	113.42	51.60	3.95	-18.31	37.24	MaxQP	Vertical	150	215	43.0	-5.8	Pass
9	250.05	56.69	4.53	-19.05	42.17	MaxQP	Horizontal	150	242	46.0	-3.8	Pass
10	350.07	52.56	4.87	-15.73	41.70	MaxQP	Horizontal	150	276	46.0	-4.3	Pass
11	902.81	68.12	3.43	-10.61	60.94	Fundamental	Vertical	100	1	--	--	

Test Notes: Powered by POE PW180KA4800F01, connected to antenna ALR-8698

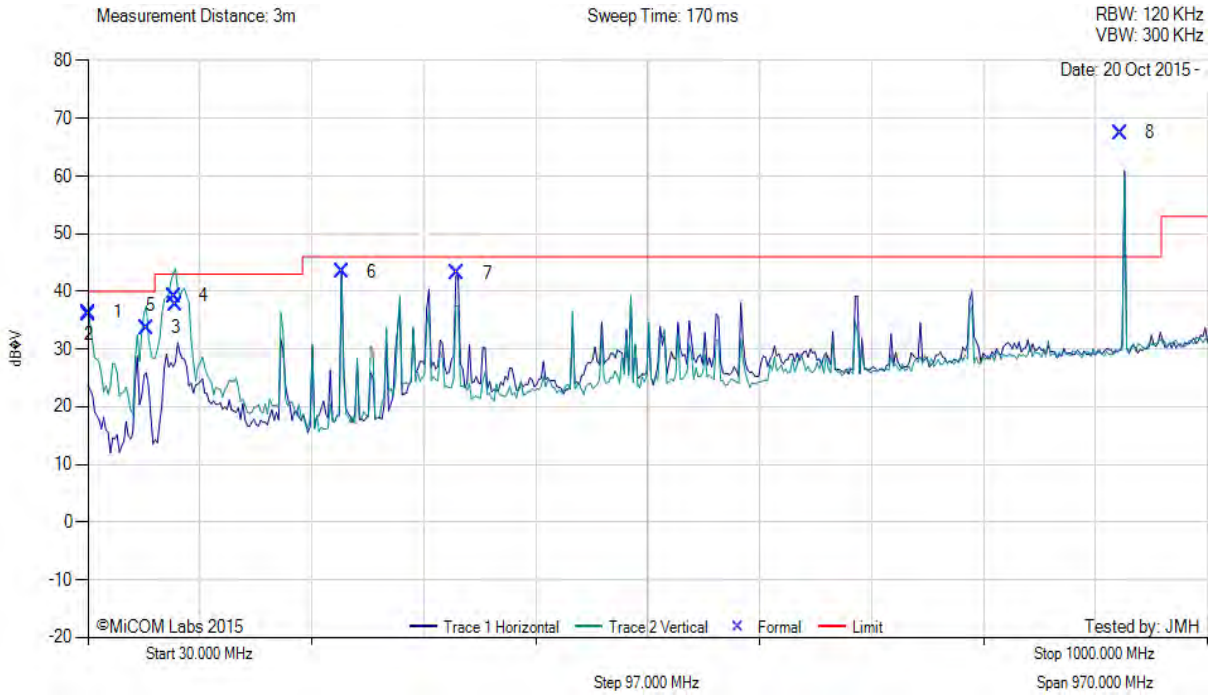
Variant: TX Spur 30-1000, Test Freq: 915.75 MHz, Antenna: ALR-8697, Power Setting: MAX, Duty Cycle (%): MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.40	42.80	3.42	-9.72	36.50	MaxQP	Vertical	150	287	40.0	-3.5	Pass
2	30.97	42.06	3.43	-10.61	34.88	MaxQP	Vertical	150	284	40.0	-5.1	Pass
3	80.82	53.46	3.78	-23.66	33.58	MaxQP	Vertical	150	326	40.0	-6.4	Pass
4	104.89	53.33	3.91	-19.93	37.31	MaxQP	Vertical	150	325	43.0	-5.7	Pass
5	106.86	52.64	3.92	-19.43	37.13	MaxQP	Vertical	150	356	43.0	-5.9	Pass
6	250.04	58.10	4.53	-19.05	43.58	MaxQP	Horizontal	150	237	46.0	-2.4	Pass
7	350.04	50.29	4.87	-15.73	39.43	MaxQP	Horizontal	150	54	46.0	-6.6	Pass
8	916.40	74.12	3.43	-10.61	66.84	Fundamental	Horizontal	100	1	--	--	

Test Notes: EUT on table powered by POE PW180KA4800F01

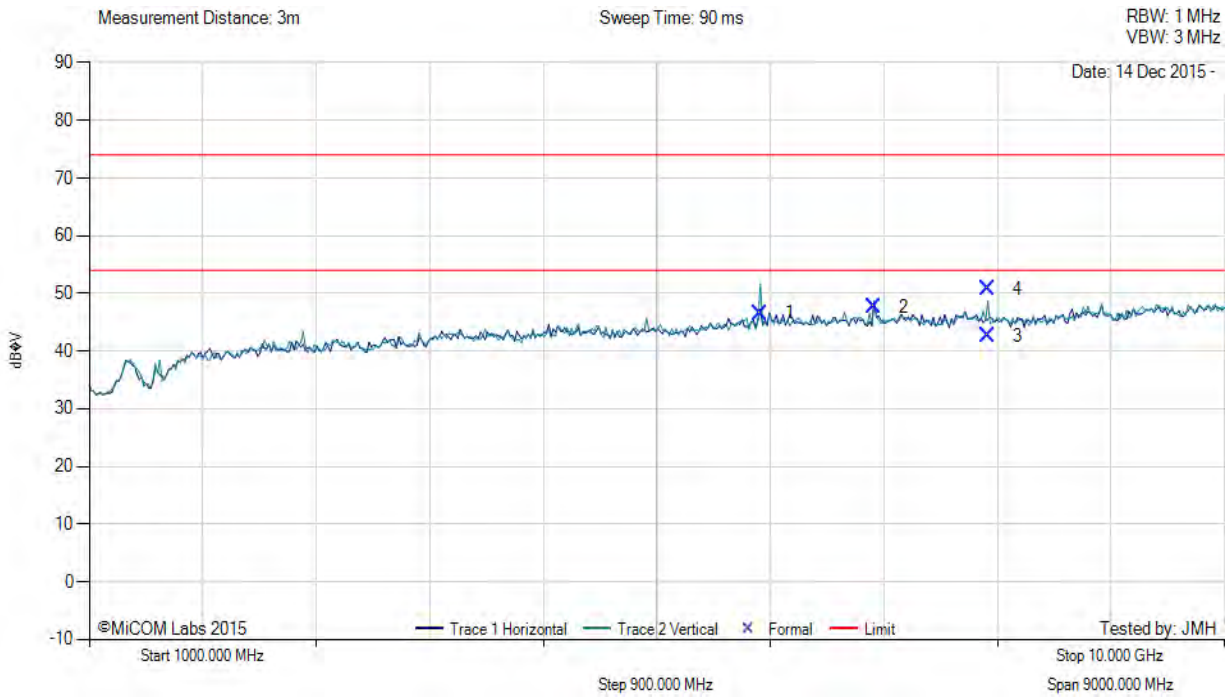
Variant: TX Spur 30-1000, Test Freq: 927.25 MHz, Antenna: ALR-8697, Power Setting: MAX, Duty Cycle (%): MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.39	42.61	3.42	-9.72	36.31	MaxQP	Vertical	100	12	40.0	-3.7	Pass
2	30.98	43.25	3.43	-10.61	36.07	MaxQP	Vertical	100	256	40.0	-3.9	Pass
3	80.62	53.61	3.78	-23.66	33.73	MaxQP	Vertical	100	357	40.0	-6.3	Pass
4	104.60	55.26	3.91	-19.93	39.24	MaxQP	Vertical	116	0	43.0	-3.8	Pass
5	106.09	53.31	3.91	-19.63	37.59	MaxQP	Vertical	125	0	43.0	-5.4	Pass
6	250.03	57.86	4.53	-19.05	43.34	MaxQP	Horizontal	127	251	46.0	-2.7	Pass
7	350.04	53.98	4.87	-15.73	43.12	MaxQP	Horizontal	100	292	46.0	-2.9	Pass
8	924.19	74.72	3.43	-10.61	67.44	Fundamental	Horizontal	100	1	--	--	

Test Notes: EUT on table powered by POE PW180KA4800F01

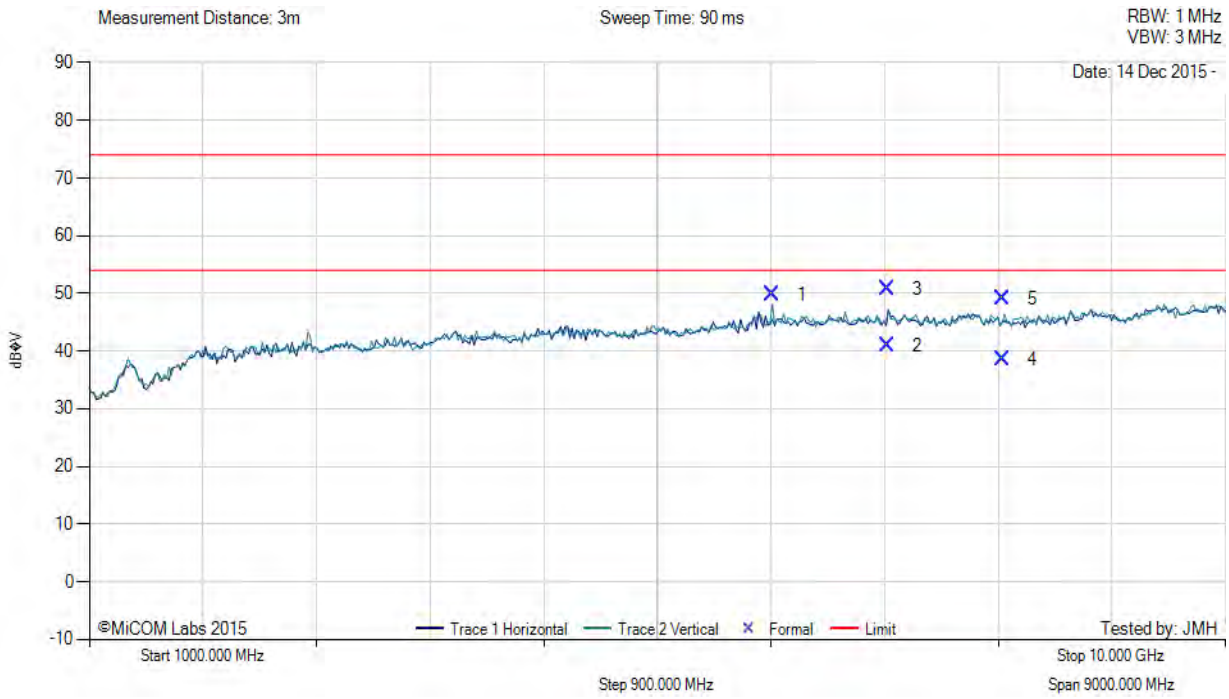
Variant: FHSS, Test Freq: 902.75 MHz, Antenna: 8697, Power Setting: Max



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	6319.24	50.93	3.93	-8.33	46.53	Peak (NRB)	Vertical	101	1	--	--	Pass
2	7222.00	50.72	4.30	-7.35	47.67	Peak (NRB)	Horizontal	101	1	--	--	Pass
3	8124.77	45.22	4.75	-7.31	42.66	Max Avg	Vertical	155	335	54.0	-11.3	Pass
4	8124.77	53.37	4.75	-7.31	50.81	Max Peak	Vertical	155	335	74.0	--	Pass

Test Notes: EUT on 150cm table. powered by POE

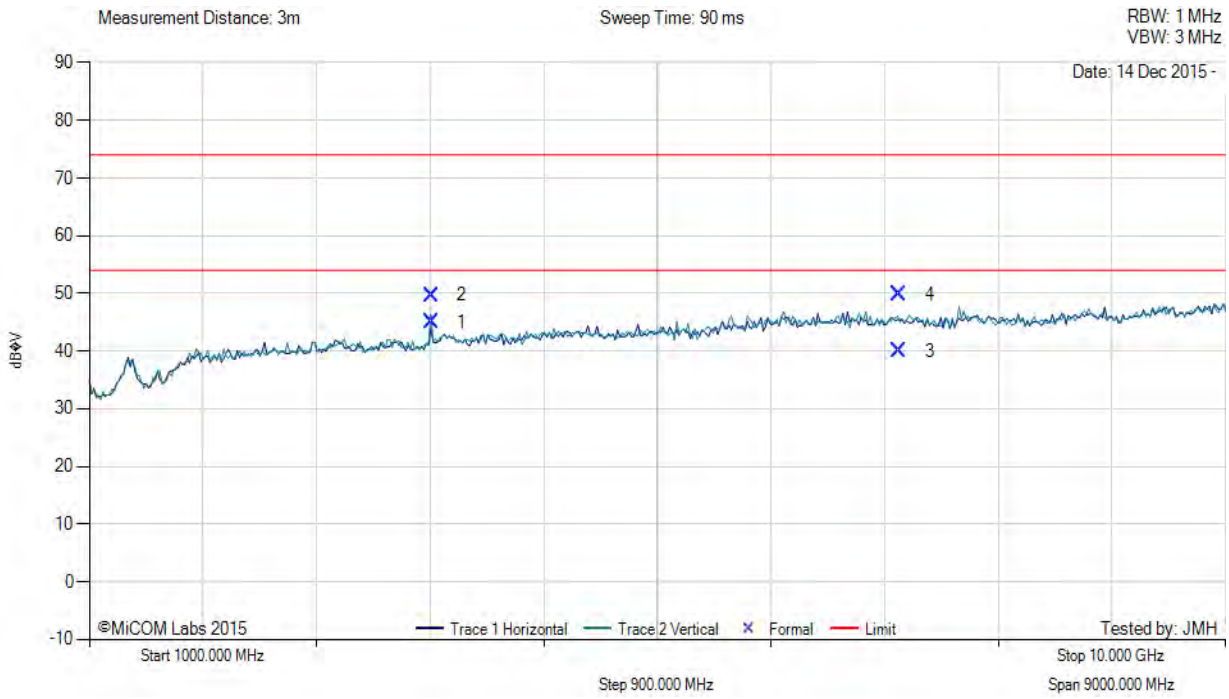
Variant: FHSS, Test Freq: 915.75 MHz, Antenna: 8697, Power Setting: Max



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	6406.80	53.91	3.97	-8.03	49.85	Peak (NRB)	Vertical	151	22	--	--	Pass
2	7322.00	43.96	4.26	-7.26	40.96	Max Avg	Horizontal	115	13	54.0	-13.0	Pass
3	7322.00	53.82	4.26	-7.26	50.82	Max Peak	Horizontal	115	13	74.0	-23.2	Pass
4	8237.27	41.28	4.55	-7.23	38.60	Max Avg	Vertical	124	27	54.0	-15.4	Pass
5	8237.27	51.84	4.55	-7.23	49.16	Max Peak	Vertical	124	27	74.0	-24.8	Pass

Test Notes: EUT on 150cm table powered by POE

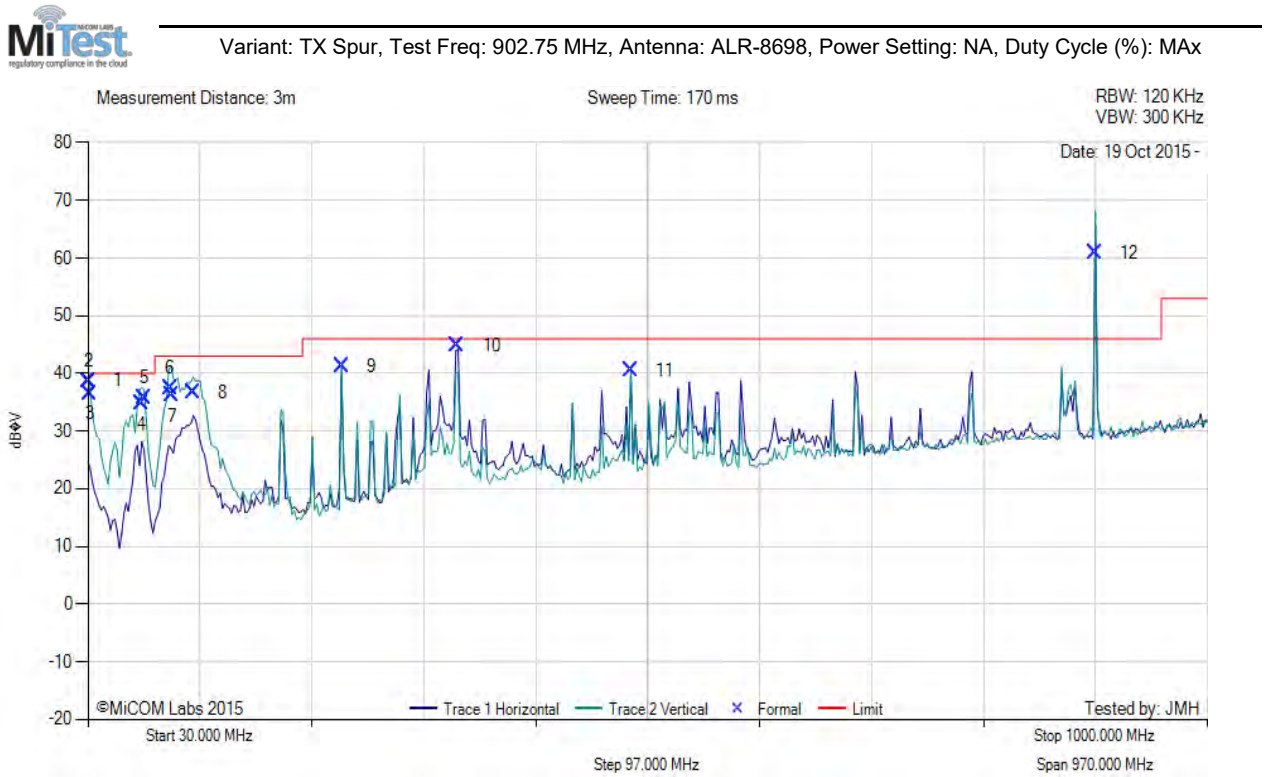
Variant: FHSS, Test Freq: 927.25 MHz, Antenna: 8697, Power Setting: Max



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	3709.04	52.73	3.19	-10.93	44.99	Max Avg	Vertical	173	37	54.0	-9.0	Pass
2	3709.04	57.43	3.19	-10.93	49.69	Max Peak	Vertical	173	37	74.0	-24.3	Pass
3	7417.98	42.81	4.33	-7.14	40.00	Max Avg	Vertical	153	36	54.0	-14.0	Pass
4	7417.98	52.60	4.33	-7.14	49.79	Max Peak	Vertical	153	36	74.0	-24.2	Pass

Test Notes: EUT on 150cm table powered by POE

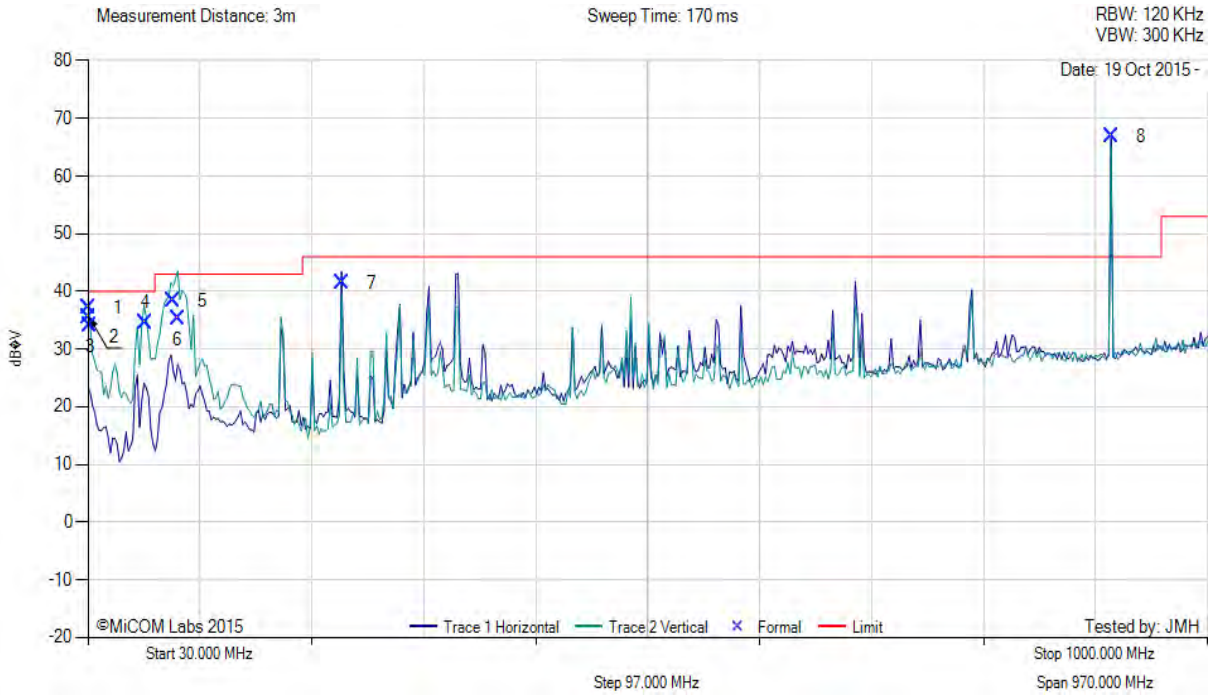
Antenna ALR-8698



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.40	45.06	3.42	-9.72	38.76	MaxQP	Vertical	100	342	40.0	-1.2	Pass
2	30.98	45.84	3.43	-10.61	38.66	MaxQP	Vertical	100	4	40.0	-1.3	Pass
3	31.56	44.34	3.44	-11.21	36.57	MaxQP	Vertical	100	25	40.0	-3.4	Pass
4	76.65	54.21	3.76	-23.26	34.71	MaxQP	Vertical	113	4	40.0	-5.3	Pass
5	78.45	55.40	3.76	-23.37	35.79	MaxQP	Vertical	100	358	40.0	-4.2	Pass
6	101.24	54.47	3.88	-20.94	37.41	MaxQP	Vertical	100	260	43.0	-5.6	Pass
7	103.07	52.73	3.90	-20.42	36.21	MaxQP	Vertical	100	0	43.0	-6.8	Pass
8	121.01	50.10	3.99	-17.39	36.70	MaxQP	Vertical	100	16	43.0	-6.3	Pass
9	250.03	55.69	4.53	-19.05	41.17	MaxQP	Vertical	100	347	46.0	-4.8	Pass
10	350.03	55.63	4.87	-15.73	44.77	MaxQP	Horizontal	100	298	46.0	-1.2	Pass
11	500.06	47.97	5.33	-12.85	40.45	MaxQP	Vertical	110	0	46.0	-5.6	Pass
12	902.81	68.12	3.43	-10.61	60.94	Fundamental	Vertical	100	1	--	--	

Test Notes: Powered by POE PW180KA4800F01, connected to antenna ALR-8698

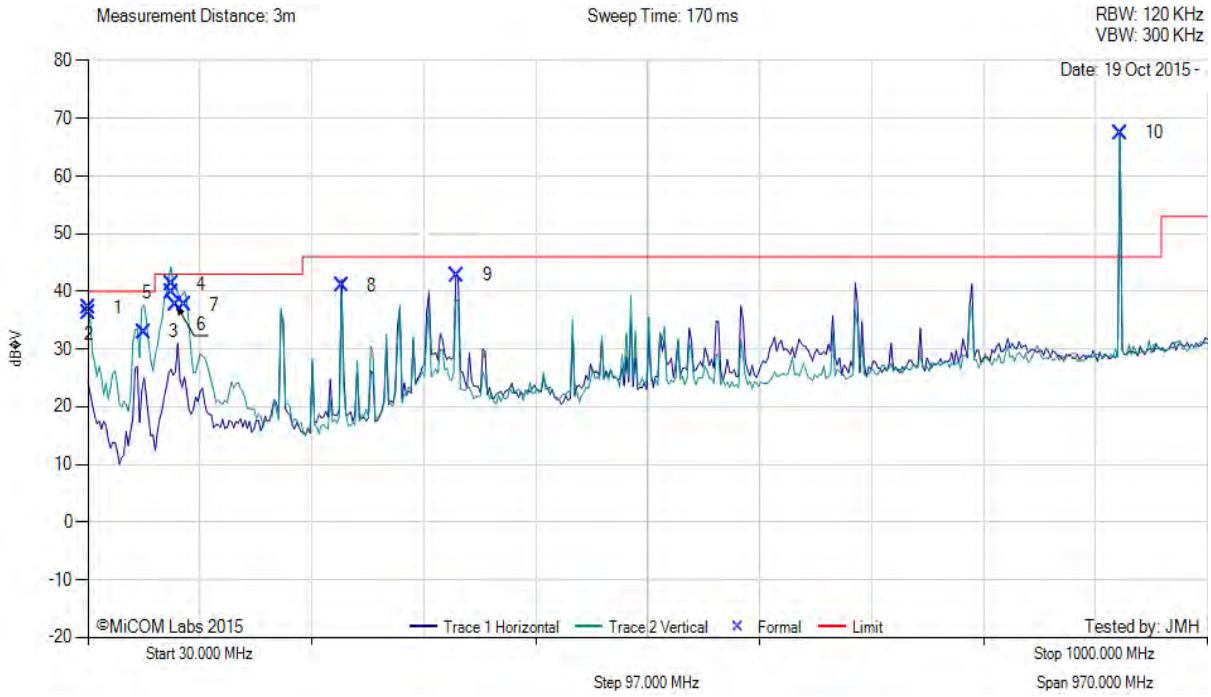
Variant: TX Spur, Test Freq: 915.75 MHz, Antenna: ALR-8698, Power Setting: NA, Duty Cycle (%): MAx



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.42	43.54	3.42	-9.72	37.24	MaxQP	Vertical	100	343	40.0	-2.8	Pass
2	31.00	42.78	3.43	-10.61	35.60	MaxQP	Vertical	100	320	40.0	-4.4	Pass
3	31.57	41.79	3.44	-11.21	34.02	MaxQP	Vertical	100	342	40.0	-6.0	Pass
4	79.55	54.15	3.77	-23.46	34.46	MaxQP	Vertical	100	359	40.0	-5.5	Pass
5	103.51	54.57	3.90	-20.13	38.34	MaxQP	Vertical	100	1	43.0	-4.7	Pass
6	107.89	50.53	3.92	-19.22	35.23	MaxQP	Vertical	100	230	43.0	-7.8	Pass
7	250.06	56.02	4.53	-19.05	41.50	MaxQP	Horizontal	100	238	46.0	-4.5	Pass
8	916.41	74.12	3.43	-10.61	66.84	Fundamental	Horizontal	100	1	--	--	

Test Notes: Powered by POE PW180KA4800F01, connected to antenna ALR-8698

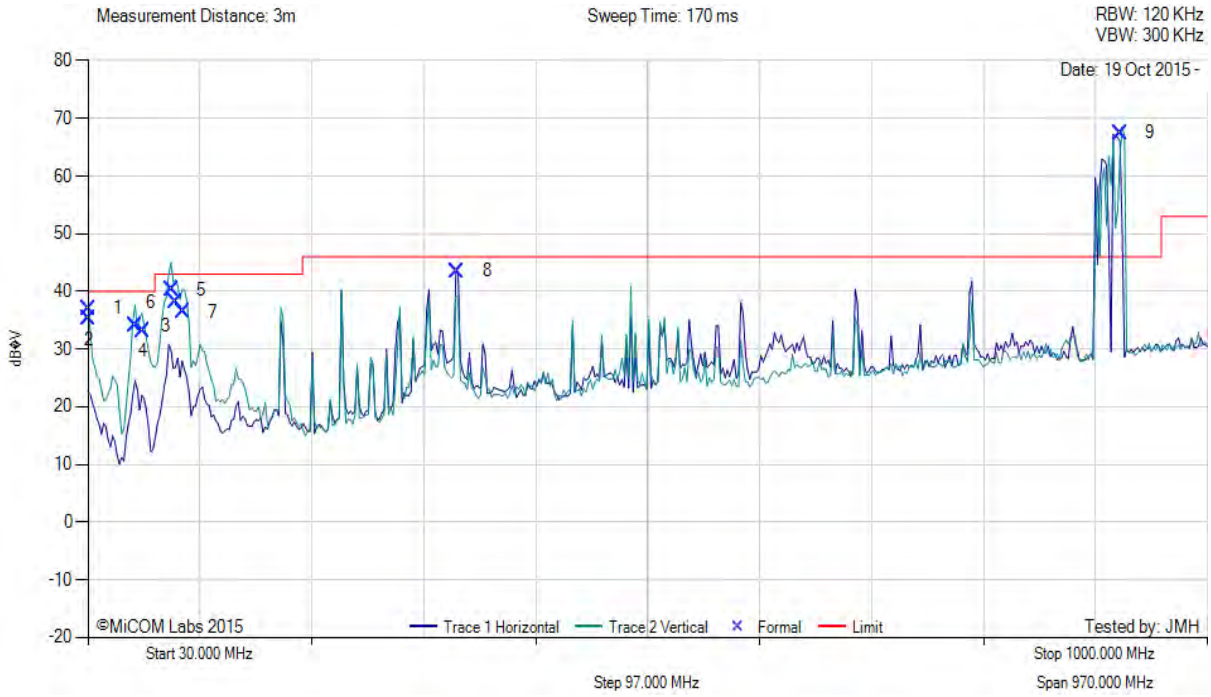
Variant: TX Spur, Test Freq: 927.25MHz, Antenna: ALR-8698, Power Setting: NA, Duty Cycle (%): MAx



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.40	43.40	3.42	-9.72	37.10	MaxQP	Vertical	100	317	40.0	-2.9	Pass
2	30.96	43.44	3.43	-10.61	36.26	MaxQP	Vertical	100	295	40.0	-3.7	Pass
3	78.16	52.57	3.76	-23.37	32.96	MaxQP	Vertical	100	0	40.0	-7.0	Pass
4	102.31	57.97	3.89	-20.63	41.23	MaxQP	Vertical	100	260	43.0	-1.8	Pass
5	103.15	56.40	3.90	-20.42	39.88	MaxQP	Vertical	100	236	43.0	-3.1	Pass
6	106.27	53.47	3.91	-19.63	37.75	MaxQP	Vertical	100	237	43.0	-5.3	Pass
7	113.41	52.04	3.95	-18.31	37.68	MaxQP	Vertical	100	185	43.0	-5.3	Pass
8	250.04	55.50	4.53	-19.05	40.98	MaxQP	Horizontal	100	208	46.0	-5.0	Pass
9	350.06	53.64	4.87	-15.73	42.78	MaxQP	Horizontal	100	299	46.0	-3.2	Pass
10	924.19	74.72	3.43	-10.61	67.44	Fundamental	Horizontal	100	1	--	--	

Test Notes: Powered by POE PW180KA4800F01, connected to antenna ALR-8698

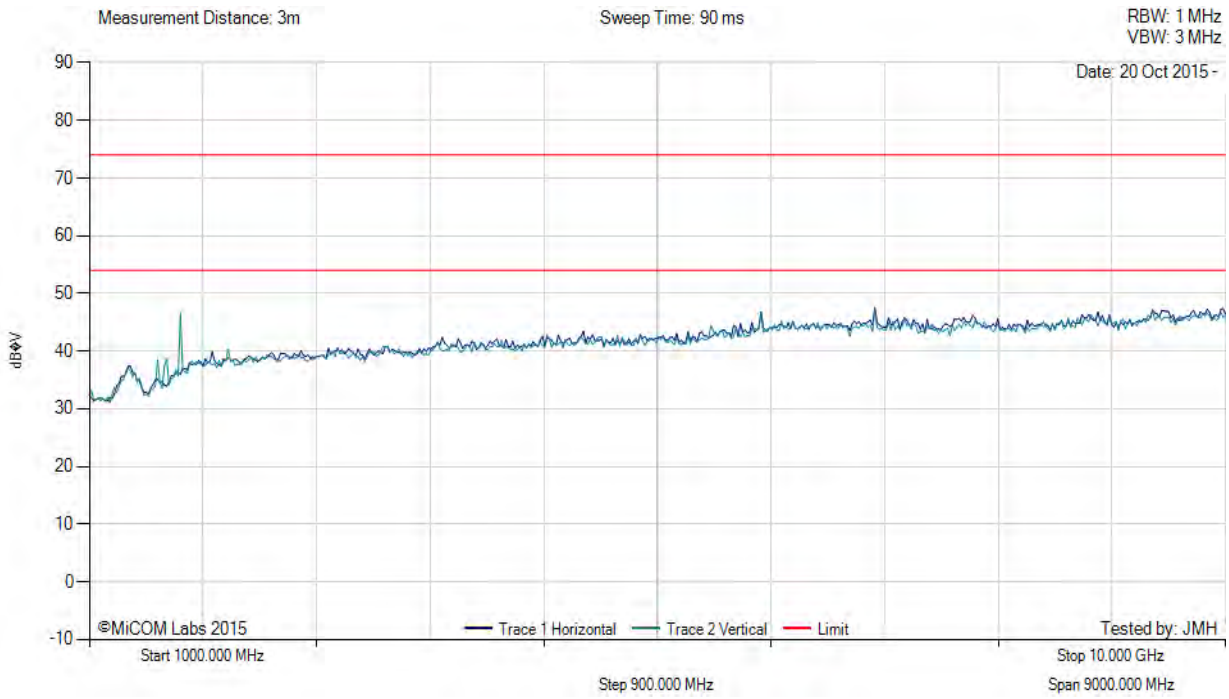
Variant: TX Spur, Test Freq: Hopping, Antenna: ALR-8698, Power Setting: MAX, Duty Cycle (%): MAx



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.40	43.31	3.42	-9.72	37.01	MaxQP	Vertical	150	248	40.0	-3.0	Pass
2	30.98	42.43	3.43	-10.61	35.25	MaxQP	Vertical	150	0	40.0	-4.8	Pass
3	71.39	53.47	3.71	-23.19	33.99	MaxQP	Vertical	150	350	40.0	-6.0	Pass
4	77.48	52.68	3.76	-23.26	33.18	MaxQP	Vertical	150	356	40.0	-6.8	Pass
5	102.73	56.87	3.90	-20.42	40.35	MaxQP	Vertical	150	254	43.0	-2.7	Pass
6	106.28	53.80	3.91	-19.63	38.08	MaxQP	Vertical	150	354	43.0	-4.9	Pass
7	112.11	51.00	3.94	-18.42	36.52	MaxQP	Vertical	150	165	43.0	-6.5	Pass
8	350.04	54.37	4.87	-15.73	43.51	MaxQP	Horizontal	150	299	46.0	-2.5	Pass
9	902-924	74.72	3.43	-10.61	67.44	Fundamental	Horizontal	100	1	--	--	

Test Notes: Powered by POE PW180KA4800F01, connected to antenna ALR-8698

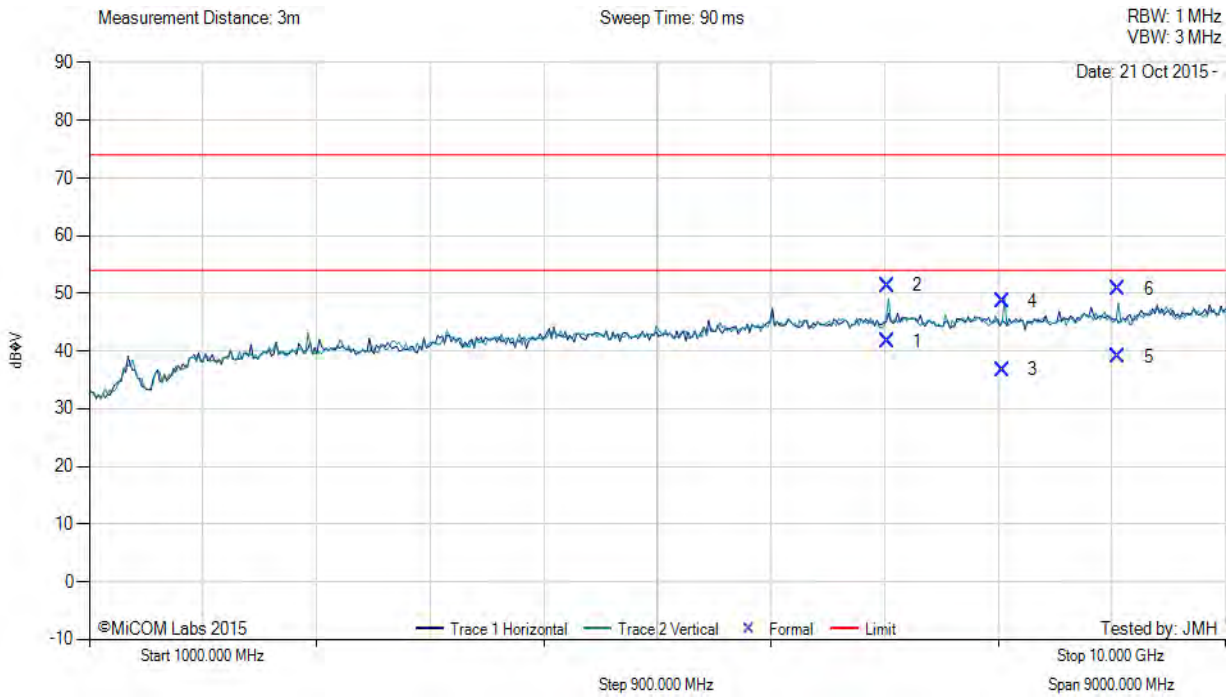
Variant: TX Spur 1-10G, Test Freq: 902.75 MHz, Antenna: ALR-8698, Power Setting: MAX, Duty Cycle (%): MAX



There are no emissions found within 6dB of the limit line.

Test Notes: EUT on table powered by POE PW180KA4800F01

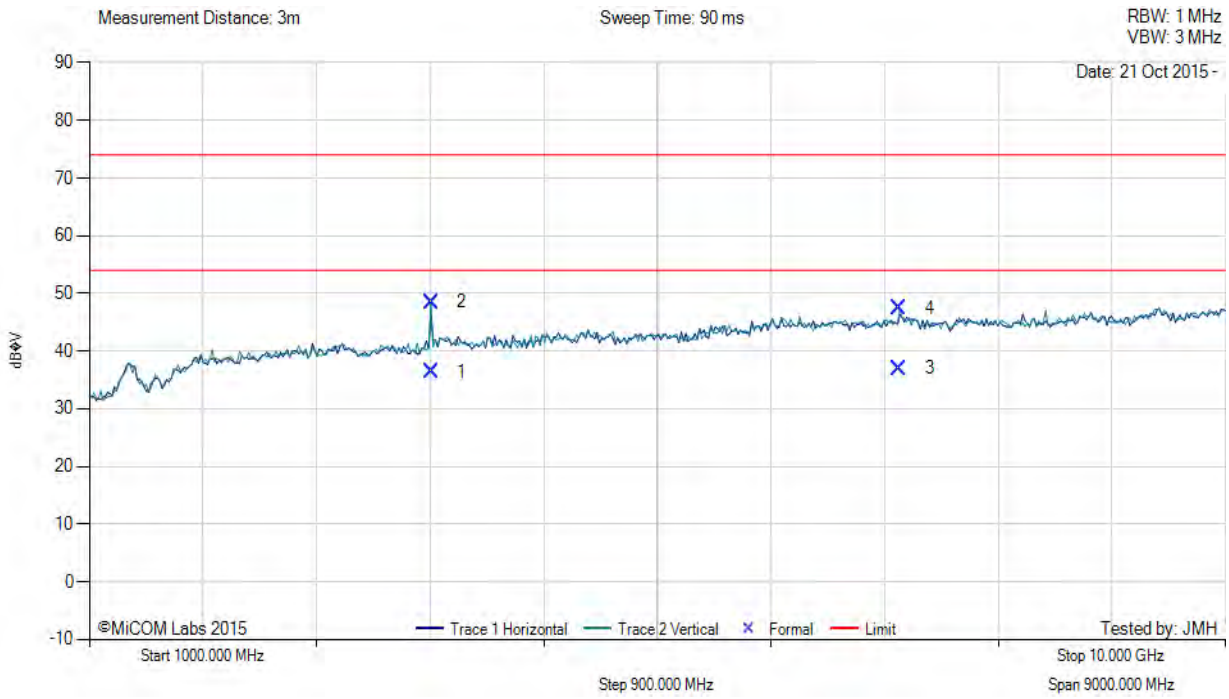
Variant: TX SPur, Test Freq: 915.75 MHz, Antenna: ALR-8698, Power Setting: max, Duty Cycle (%): Max



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	7322.11	44.62	4.26	-7.26	41.62	Max Avg	Vertical	101	350	54.0	-12.4	Pass
2	7322.11	54.37	4.26	-7.26	51.37	Max Peak	Vertical	101	350	74.0	-22.6	Pass
3	8237.30	39.43	4.55	-7.23	36.75	Max Avg	Vertical	110	340	54.0	-17.3	Pass
4	8237.30	51.24	4.55	-7.23	48.56	Max Peak	Vertical	110	340	74.0	-25.4	Pass
5	9152.52	41.13	5.04	-7.21	38.96	Max Avg	Vertical	100	1	54.0	-15.0	Pass
6	9152.52	52.94	5.04	-7.21	50.77	Max Peak	Vertical	100	1	74.0	-23.2	Pass

Test Notes: EUT on table connected to POE PW180KA4800F01

Variant: TX SPur, Test Freq: 927.25 MHz, Antenna: ALR-8698, Power Setting: max, Duty Cycle (%): Max

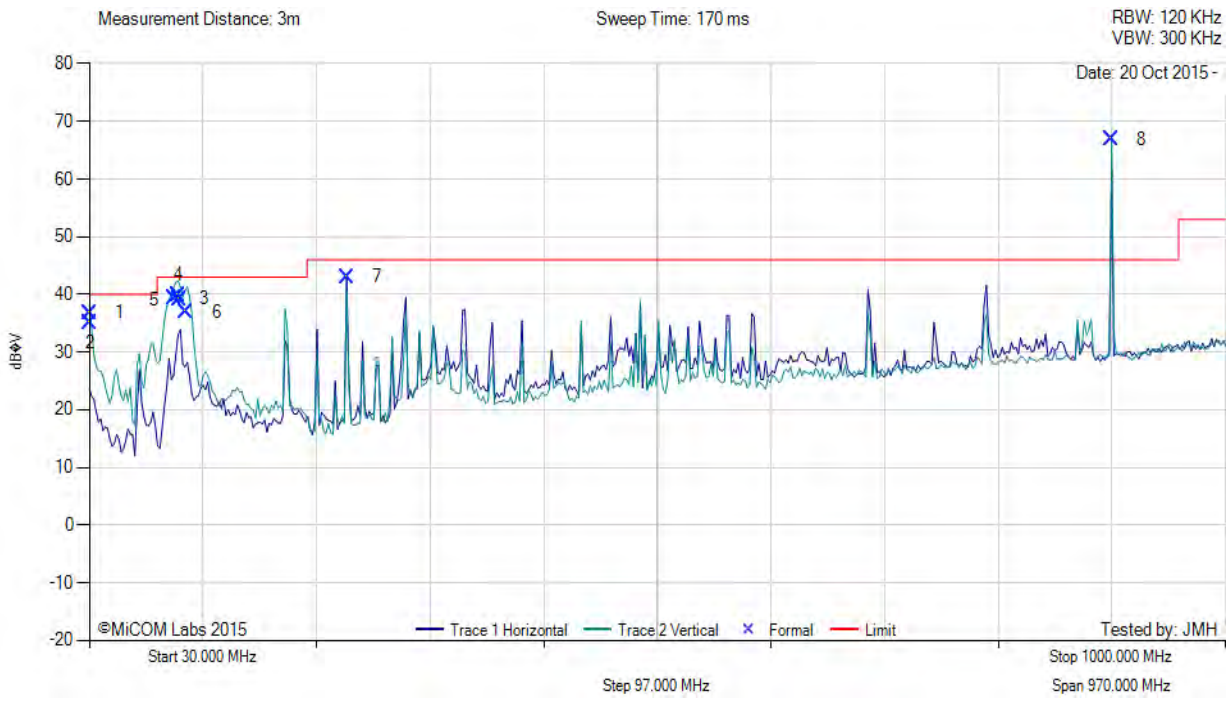


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	3709.06	44.12	3.19	-10.93	36.38	Max Avg	Vertical	111	17	54.0	-17.6	Pass
2	3709.06	56.26	3.19	-10.93	48.52	Max Peak	Vertical	111	17	74.0	-25.5	Pass
3	7418.01	39.84	4.33	-7.14	37.03	Max Avg	Vertical	118	340	54.0	-17.0	Pass
4	7418.01	50.26	4.33	-7.14	47.45	Max Peak	Vertical	151	25	74.0	-26.6	Pass

Test Notes: EUT on table connected to POE PW180KA4800F01

Antenna Times A5010

Variant: TX Spur 30-1000, Test Freq: 902.75 MHz, Antenna: A5010-A-FCC, Power Setting: MAX, Duty Cycle (%): MAX

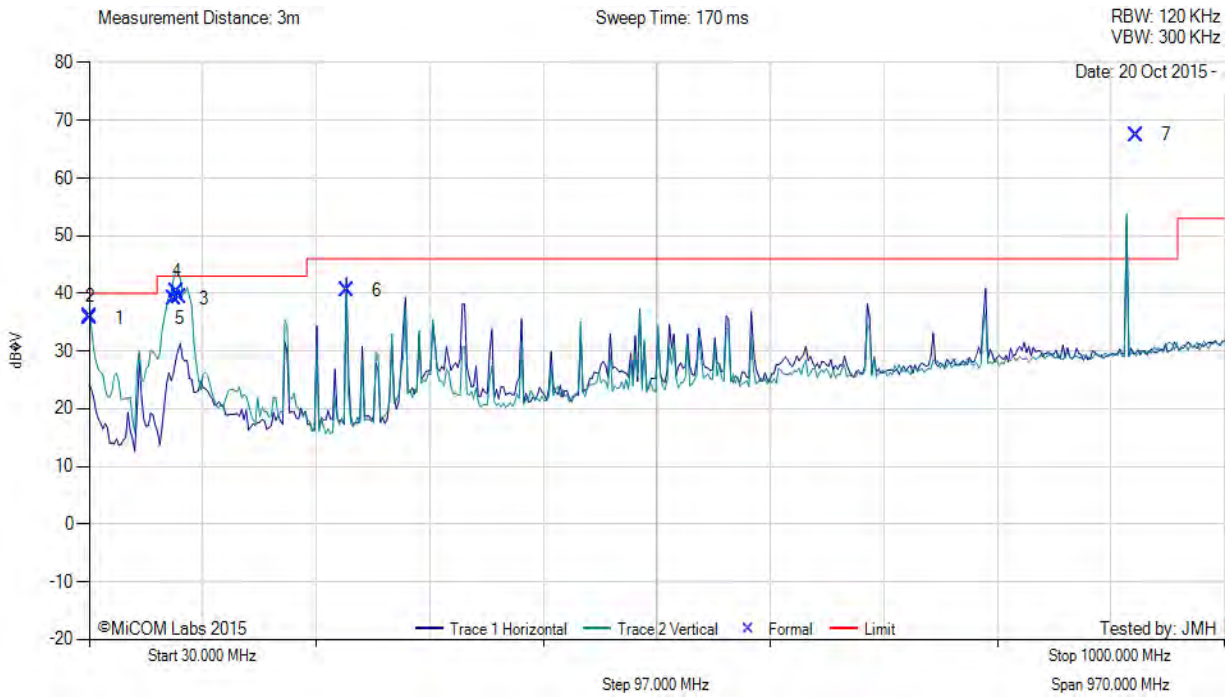


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.40	43.07	3.42	-9.72	36.77	MaxQP	Vertical	108	298	40.0	-3.2	Pass
2	31.00	42.29	3.43	-10.61	35.11	MaxQP	Vertical	100	327	40.0	-4.9	Pass
3	102.92	55.86	3.90	-20.42	39.34	MaxQP	Vertical	100	240	43.0	-3.7	Pass
4	105.86	55.52	3.91	-19.63	39.80	MaxQP	Vertical	100	211	43.0	-3.2	Pass
5	106.73	54.67	3.92	-19.43	39.16	MaxQP	Vertical	100	216	43.0	-3.8	Pass
6	112.94	51.34	3.95	-18.31	36.98	MaxQP	Vertical	100	167	43.0	-6.0	Pass
7	250.04	57.60	4.53	-19.05	43.08	MaxQP	Horizontal	127	116	46.0	-2.9	Pass
8	902.71	74.12	3.43	-10.61	66.94	Fundamental	Vertical	100	1	--	--	

Test Notes: EUT on table powered by POE PW180KA4800F01

back to matrix

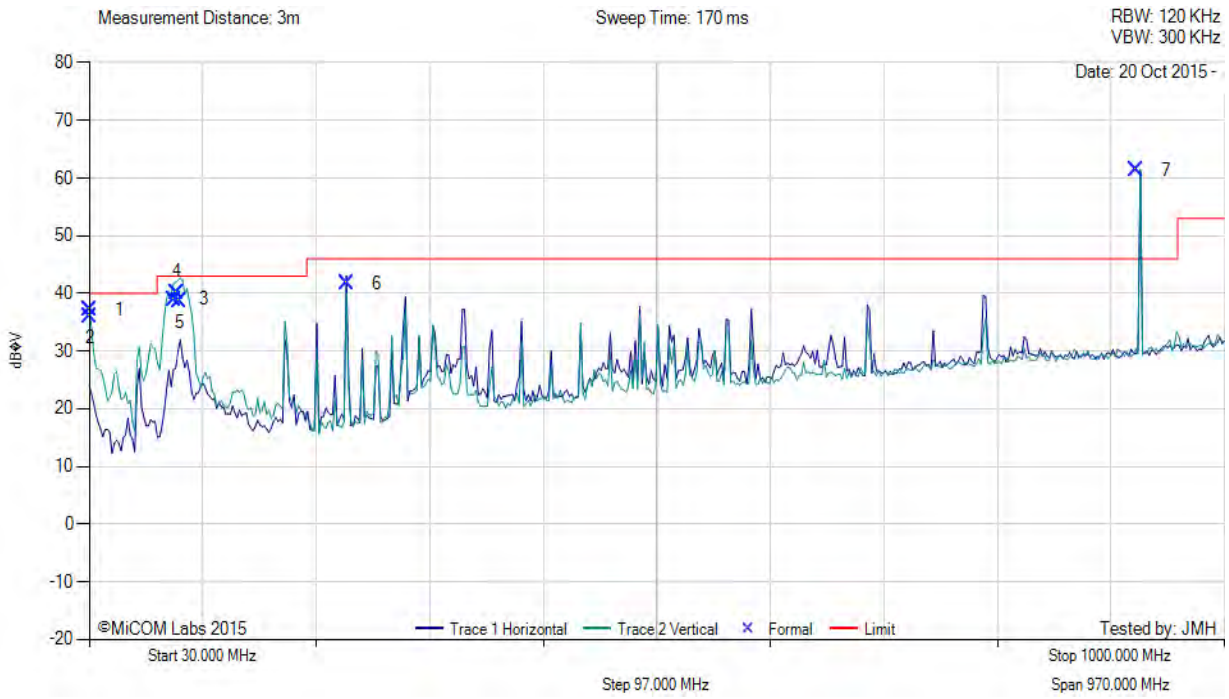
Variant: TX Spur 30-1000, Test Freq: 915.00 MHz, Antenna: A5010-A-FCC, Power Setting: MAX, Duty Cycle (%): MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.39	42.05	3.42	-9.72	35.75	MaxQP	Vertical	100	57	40.0	-4.3	Pass
2	30.98	43.08	3.43	-10.61	35.90	MaxQP	Vertical	100	335	40.0	-4.1	Pass
3	102.66	55.62	3.90	-20.42	39.10	MaxQP	Vertical	100	227	43.0	-3.9	Pass
4	105.01	56.37	3.91	-19.93	40.35	MaxQP	Vertical	100	225	43.0	-2.7	Pass
5	107.21	54.82	3.92	-19.43	39.31	MaxQP	Vertical	100	212	43.0	-3.7	Pass
6	250.03	55.03	4.53	-19.05	40.51	MaxQP	Horizontal	129	268	46.0	-5.5	Pass
7	915.22	74.72	3.43	-10.61	67.44	Fundamental	Horizontal	100	1	--	--	

Test Notes: EUT on table powered by POE PW180KA4800F01

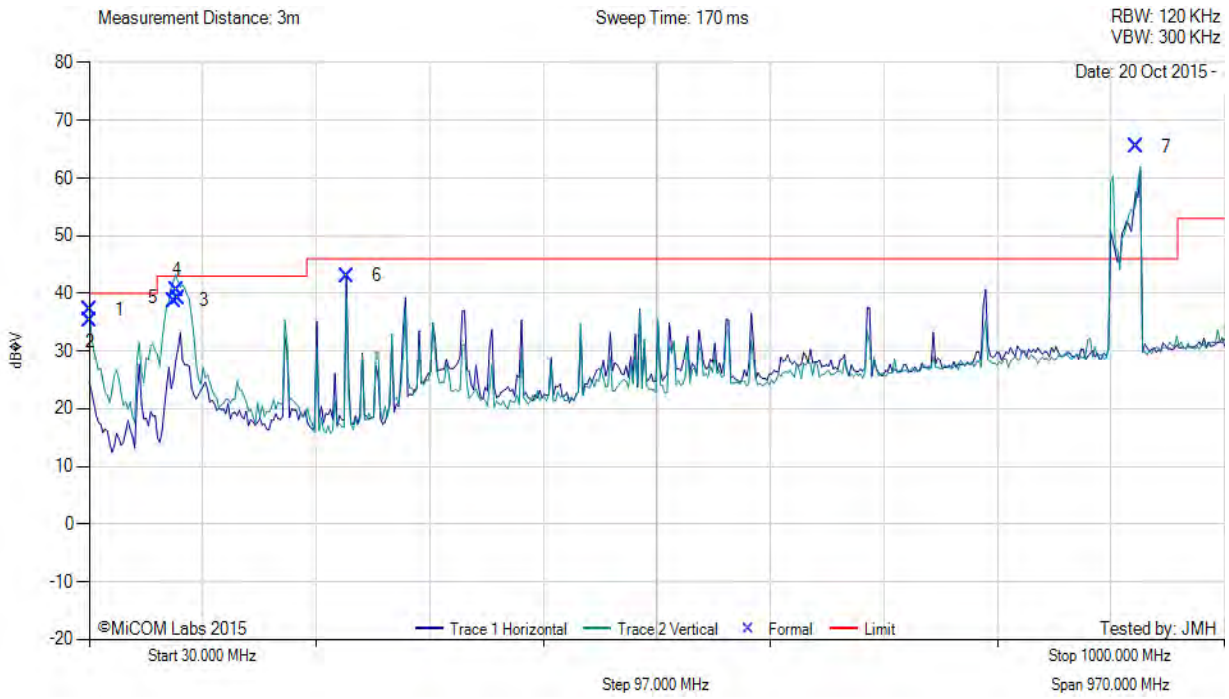
Variant: TX Spur 30-1000, Test Freq: 927.25 MHz, Antenna: A5010-A-FCC, Power Setting: MAX, Duty Cycle (%): MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.38	43.49	3.42	-9.72	37.19	MaxQP	Vertical	100	278	40.0	-2.8	Pass
2	30.98	43.09	3.43	-10.61	35.91	MaxQP	Vertical	100	291	40.0	-4.1	Pass
3	102.45	55.75	3.89	-20.63	39.01	MaxQP	Vertical	100	54	43.0	-4.0	Pass
4	105.14	56.16	3.91	-19.93	40.14	MaxQP	Vertical	100	242	43.0	-2.9	Pass
5	107.52	53.95	3.92	-19.22	38.65	MaxQP	Vertical	113	218	43.0	-4.4	Pass
6	250.03	56.19	4.53	-19.05	41.67	MaxQP	Horizontal	125	268	46.0	-4.3	Pass
7	924.19	68.72	3.43	-10.61	61.44	Fundamental	Horizontal	100	1	--	--	

Test Notes: EUT on table powered by POE PW180KA4800F01

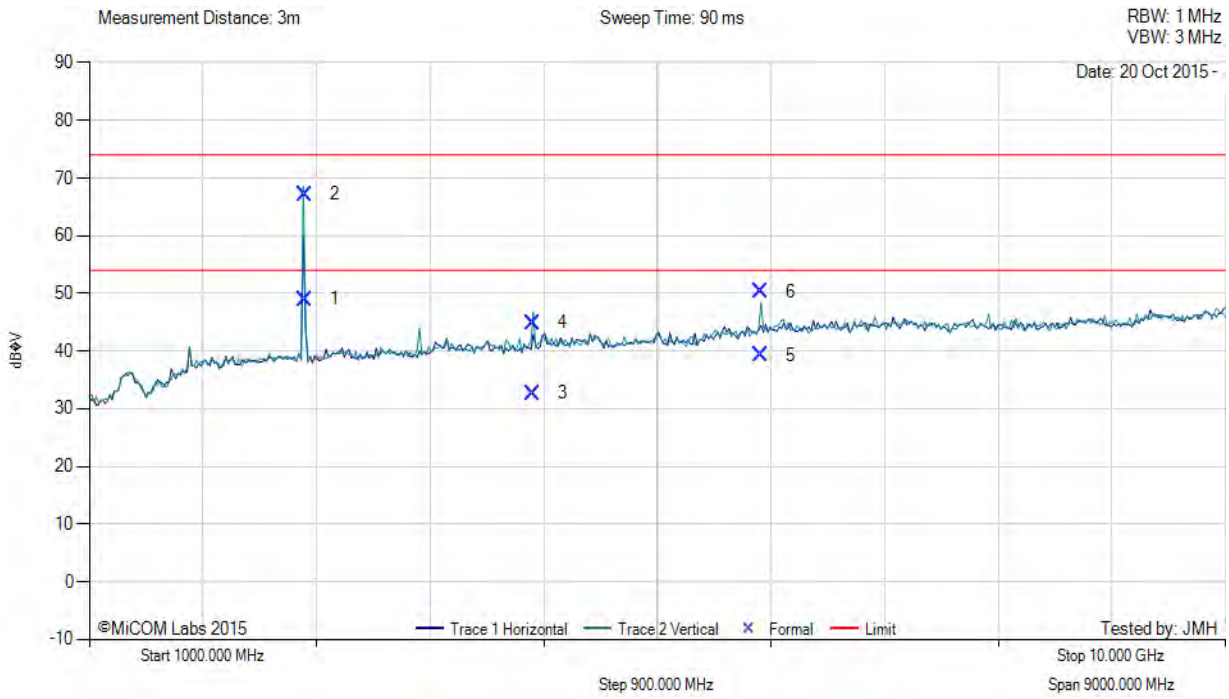
Variant: TX Spur 30-1000, Test Freq 902.75-927.25 MHz, Antenna: A5010-A-FCC, Power Setting: MAX, Duty Cycle (%):MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.40	43.52	3.42	-9.72	37.22	MaxQP	Vertical	100	268	40.0	-2.8	Pass
2	30.98	42.48	3.43	-10.61	35.30	MaxQP	Vertical	100	242	40.0	-4.7	Pass
3	102.49	55.48	3.89	-20.63	38.74	MaxQP	Vertical	100	23	43.0	-4.3	Pass
4	105.14	56.53	3.91	-19.93	40.51	MaxQP	Vertical	100	236	43.0	-2.5	Pass
5	106.21	54.89	3.91	-19.63	39.17	MaxQP	Vertical	106	197	43.0	-3.8	Pass
6	250.02	57.53	4.53	-19.05	43.01	MaxQP	Horizontal	117	266	46.0	-3.0	Pass
7	924.19	72.72	3.43	-10.61	65.44	Fundamental	Horizontal	100	1	--	--	

Test Notes: EUT on table powered by POE PW180KA4800F01

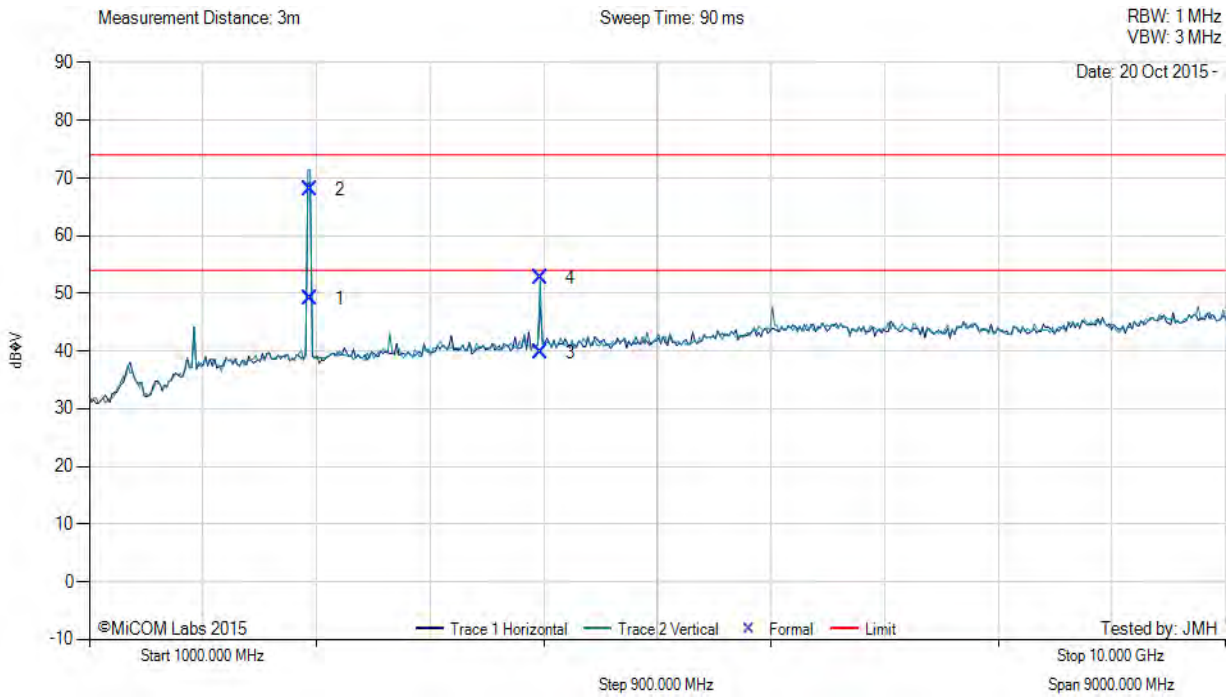
Variant: TX Spur 1-10G, Test Freq: 902.75 MHz, Antenna: A5010-A-FCC, Power Setting: MAX, Duty Cycle (%): MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2708.17	57.51	2.86	-11.37	49.00	Max Avg	Vertical	156	322	54.0	-5.0	Pass
2	2708.17	75.68	2.86	-11.37	67.17	Max Peak	Vertical	156	322	74.0	-6.8	Pass
3	4513.83	40.73	3.54	-11.55	32.72	Max Avg	Vertical	100	346	54.0	-21.3	Pass
4	4513.83	52.88	3.54	-11.55	44.87	Max Peak	Vertical	100	346	74.0	-29.1	Pass
5	6319.26	43.67	3.93	-8.33	39.27	Max Avg	Vertical	107	37	54.0	-14.7	Pass
6	6319.26	54.62	3.93	-8.33	50.22	Max Peak	Vertical	107	37	74.0	-23.8	Pass

Test Notes: EUT on table powered by POE PW180KA4800F01

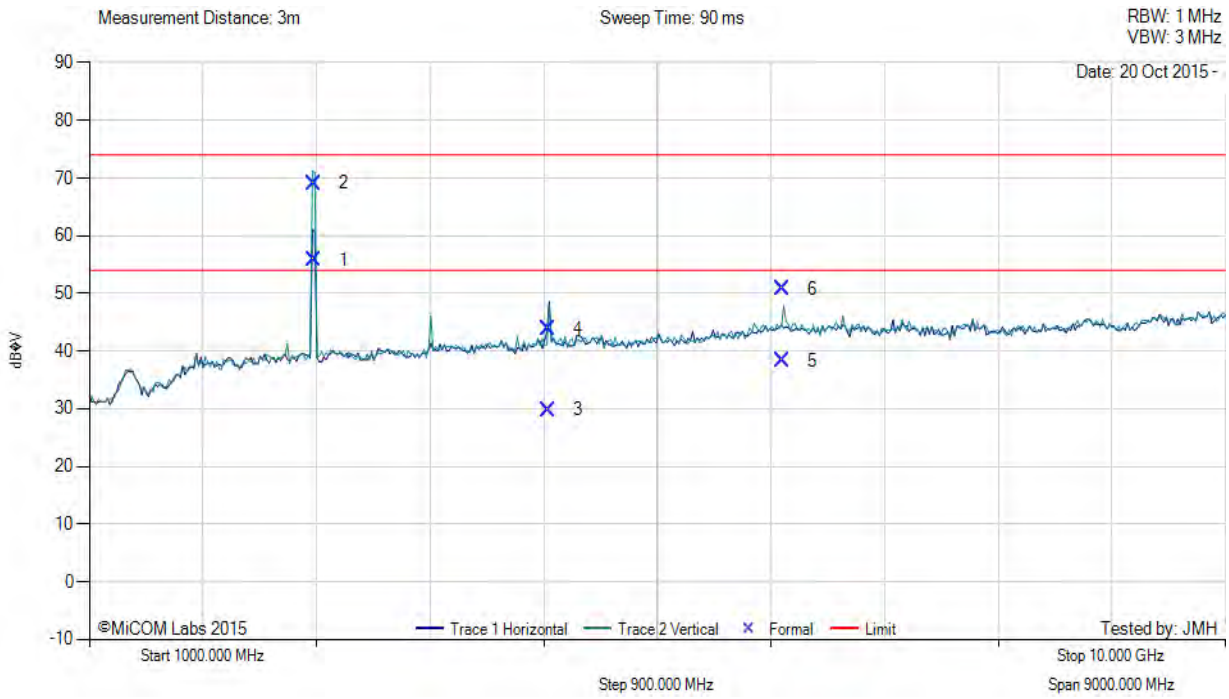
Variant: TX Spur 1-10G, Test Freq: 915.75 MHz, Antenna: A5010-A-FCC, Power Setting: MAX, Duty Cycle (%): MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2745.79	57.62	2.84	-11.35	49.11	Max Avg	Vertical	100	358	54.0	-5.1	Pass
2	2745.79	77.48	2.84	-11.35	68.07	Max Peak	Vertical	100	358	74.0	-5.9	Pass
3	4576.22	47.71	3.48	-11.39	39.80	Max Avg	Vertical	103	325	54.0	-14.2	Pass
4	4576.22	60.64	3.48	-11.39	52.73	Max Peak	Vertical	103	325	74.0	-21.3	Pass

Test Notes: EUT on table powered by POE PW180KA4800F01

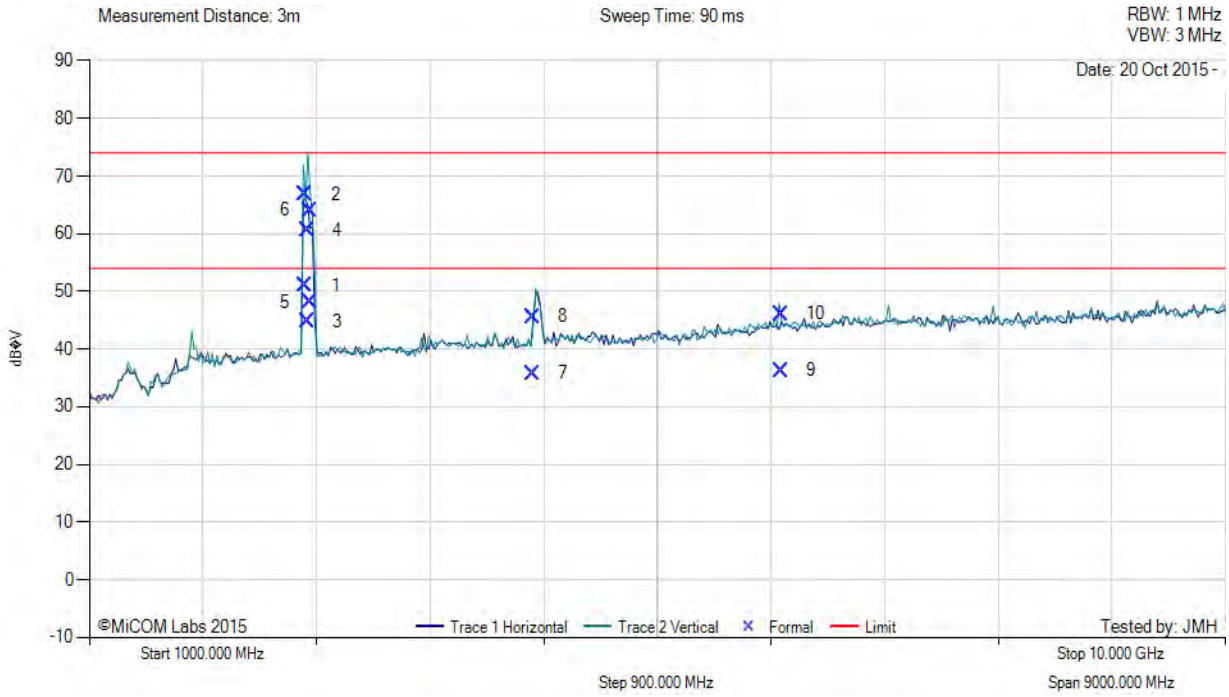
Variant: TX Spur 1-10G, Test Freq: 927.25 MHz, Antenna: A5010-A-FCC, Power Setting: MAX, Duty Cycle (%): MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2781.76	64.20	2.85	-11.33	55.72	Max Avg	Vertical	100	357	54.0	1.7	Fails
2	2781.76	77.56	2.85	-11.33	69.08	Max Peak	Vertical	100	357	74.0	-4.9	Pass
3	4636.12	37.50	3.57	-11.31	29.76	Max Avg	Horizontal	146	357	54.0	24.2	Pass
4	4636.12	51.55	3.57	-11.31	43.81	Max Peak	Horizontal	146	357	74.0	-30.2	Pass
5	6490.75	42.30	4.00	-7.92	38.38	Max Avg	Vertical	102	31	54.0	15.6	Pass
6	6490.75	54.62	4.00	-7.92	50.70	Max Peak	Vertical	102	31	74.0	-23.3	Pass

Test Notes: EUT on table powered by POE PW180KA4800F01

Variant: TX Spur 1 – 10G, Test Freq 902.75-927.25 MHz, Antenna: A5010-A-FCC, Power Setting: MAX, Duty Cycle (%): MAX



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2712.77	59.50	2.84	-11.37	50.97	Max Avg	Vertical	169	49	54.0	-3.0	Pass
2	2712.77	75.28	2.84	-11.37	66.75	Max Peak	Vertical	169	49	74.0	-7.3	Pass
3	2730.77	53.35	2.80	-11.36	44.79	Max Avg	Vertical	178	17	54.0	-9.2	Pass
4	2730.77	69.09	2.80	-11.36	60.53	Max Peak	Vertical	178	17	74.0	-13.5	Pass
5	2747.23	54.71	2.84	-11.35	48.20	Max Avg	Vertical	100	255	54.0	-5.8	Pass
6	2747.23	72.54	2.84	-11.35	64.03	Max Peak	Vertical	100	255	74.0	-10.0	Pass
7	4513.59	43.78	3.54	-11.55	35.77	Max Avg	Vertical	105	357	54.0	-18.2	Pass
8	4513.59	53.62	3.54	-11.55	45.61	Max Peak	Vertical	105	357	74.0	-28.4	Pass
9	6476.82	40.21	3.99	-7.94	36.26	Max Avg	Vertical	128	124	54.0	-17.7	Pass
10	6476.82	50.03	3.99	-7.94	46.08	Max Peak	Vertical	128	124	74.0	-27.9	Pass

Test Notes: EUT on table powered by POE PW180KA4800F01

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

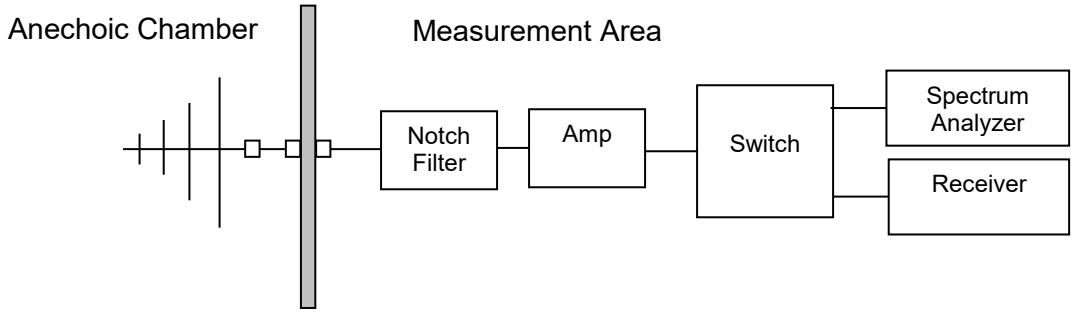
5.1.9. Radiated Spurious Emissions – Digital Emissions (0.03-1 GHz)

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

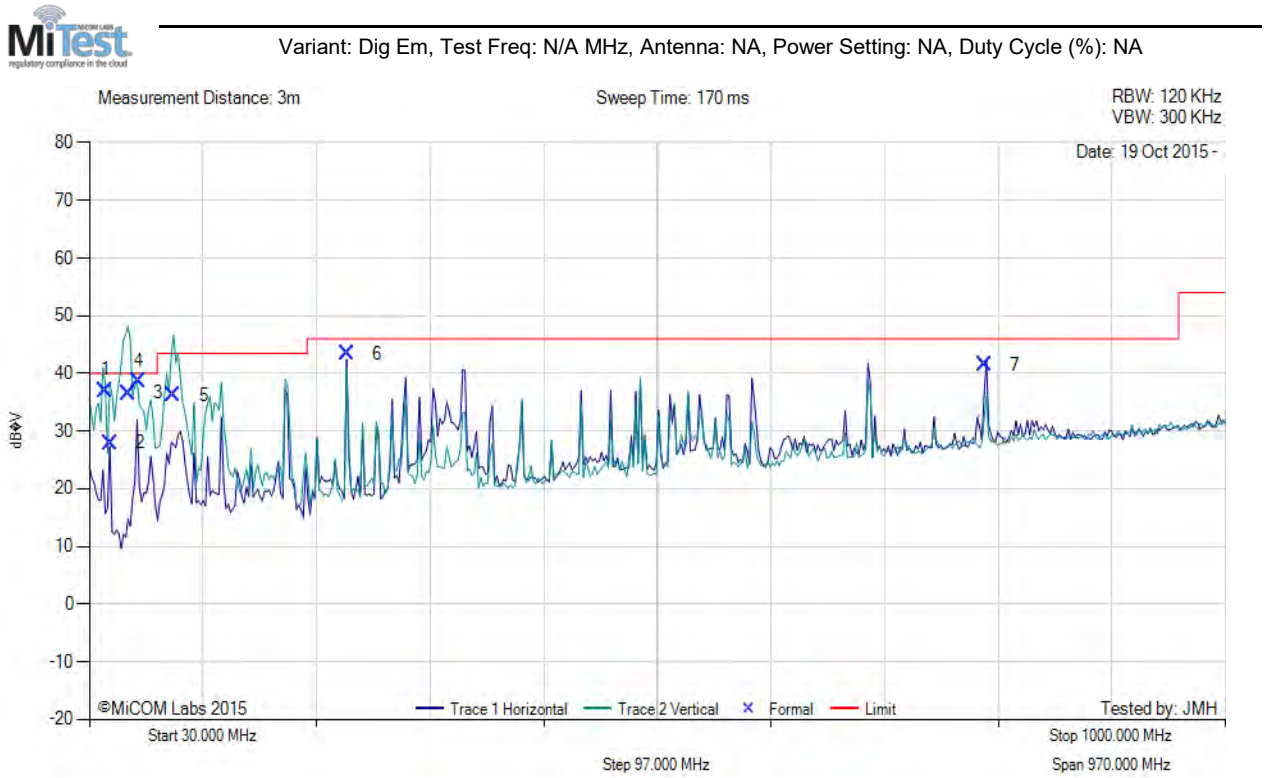
Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

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

Digital Emission Check (19th October 2015)



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	43.51	53.88	3.53	-20.36	37.05	MaxQP	Vertical	100	6	40.0	-3.0	Pass
2	47.98	56.73	3.56	-22.34	27.95	MaxQP	Vertical	189	87	40.0	-2.1	Pass
3	62.90	56.61	3.66	-23.71	36.56	MaxQP	Vertical	122	8	40.0	-3.4	Pass
4	72.02	58.03	3.72	-23.08	38.67	MaxQP	Vertical	119	0	40.0	-1.3	Pass
5	101.87	52.91	3.89	-20.63	36.17	MaxQP	Vertical	105	224	43.5	-7.3	Pass
6	250.02	57.92	4.53	-19.05	43.40	MaxQP	Horizontal	136	240	46.0	-2.6	Pass
7	794.65	44.21	6.07	-8.84	41.44	MaxQP	Horizontal	100	2	46.0	-4.6	Pass

Test Notes: Powered by POE PW180KA4800F01, connected to antenna ALR-8698

Specification

Limits

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

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

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

§15.209 (a) and **RSS-Gen §6.1** Limit Matrix

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

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

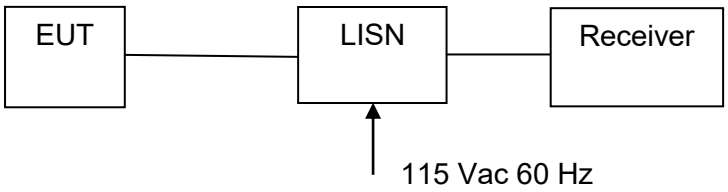
Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0287, 0335, 0338, 0158, 0134, 0304, 0311, 0315, 0310, 0312, 0341

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

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

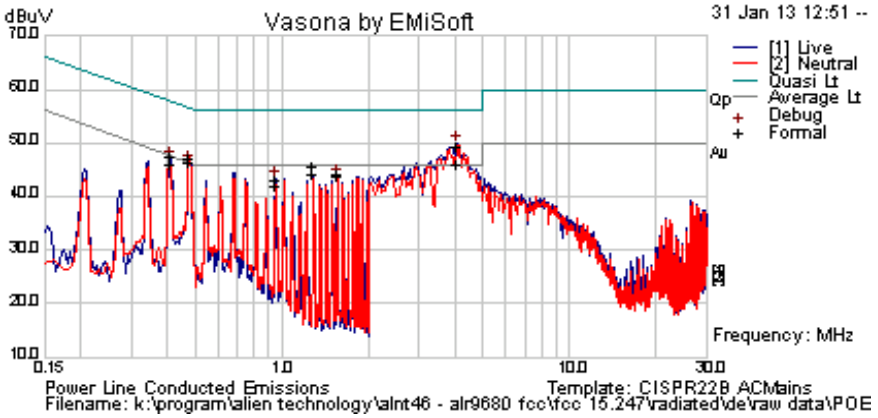
Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

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 - POE

Test Freq.	N/A	**Engineer**	SB
Variant	AC Line Emissions	**Temp (ºC)**	19.5
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	33
Power Setting	MAX (29 dBm)	**Press. (mBars)**	1012
Antenna	Port 3 (Directional Panel)		
Test Notes 1	Pant Port 3 gave highest output power and used for all testing for worst case.		
Test Notes 2	POE PSU		



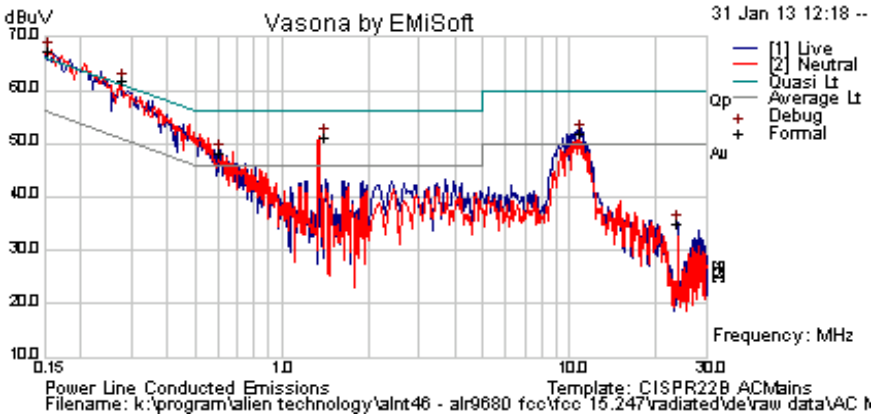
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
4.074	39.0	10.1	0.2	49.3	Quasi Peak	Live	56.0	-6.7	Pass	
0.476	37.2	9.9	0.1	47.2	Quasi Peak	Live	56.4	-9.2	Pass	
0.408	37.5	9.9	0.1	47.4	Quasi Peak	Live	57.7	-10.3	Pass	
1.290	34.0	10.0	0.1	44.1	Quasi Peak	Live	56.0	-11.9	Pass	
1.561	34.1	10.0	0.1	44.2	Quasi Peak	Live	56.0	-11.8	Pass	
0.952	32.1	9.9	0.1	42.1	Quasi Peak	Live	56.0	-13.9	Pass	
4.074	35.3	10.1	0.2	45.6	Average	Live	46.0	-0.5	Pass	
0.476	36.1	9.9	0.1	46.1	Average	Live	46.4	-0.3	Pass	
0.408	36.9	9.9	0.1	46.9	Average	Live	47.7	-0.8	Pass	
1.290	35.5	10.0	0.1	45.5	Average	Live	46.0	-0.5	Pass	
1.561	33.6	10.0	0.1	43.7	Average	Live	46.0	-2.3	Pass	
0.952	32.7	9.9	0.1	42.7	Average	Live	46.0	-3.3	Pass	

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

TABLE OF RESULTS – ac/dc Converter

Test Freq.	N/A	**Engineer**	SB
Variant	AC Line Emissions	**Temp (ºC)**	19.5
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	33
Power Setting	MAX (29 dBm)	**Press. (mBars)**	1012
Antenna	Port 3 (Directional Panel)		
Test Notes 1	Pant Port 3 gave highest output power and used for all testing for worst case.		
Test Notes 2	AC/DC 120VAC (Not supplied or SOLD w/ EUT);PS Autec Power Systems;MDL:SA06-30S17R-U;S/N:R00074900070		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.610	33.8	9.9	0.1	43.8	Quasi Peak	Live	56	-12.2	Pass	
10.917	38.0	10.3	0.4	48.7	Quasi Peak	Live	60	-11.3	Pass	
24.003	23.2	10.6	0.9	34.7	Quasi Peak	Live	60	-25.3	Pass	
0.154	50.8	9.9	0.1	60.8	Quasi Peak	Neutral	65.78	-5.0	Pass	
0.279	43.5	9.9	0.1	53.4	Quasi Peak	Neutral	60.85	-7.4	Pass	
1.419	29.5	10.0	0.1	39.6	Quasi Peak	Neutral	56	-16.4	Pass	
0.610	26.3	9.9	0.1	36.3	Average	Live	46	-9.7	Pass	
10.917	29.4	10.3	0.4	40.2	Average	Live	50	-9.8	Pass	
24.003	19.2	10.6	0.9	30.7	Average	Live	50	-19.3	Pass	
0.154	20.8	9.9	0.1	30.8	Average	Neutral	55.78	-25.0	Pass	
0.279	20.6	9.9	0.1	30.6	Average	Neutral	50.85	-20.3	Pass	
1.419	24.4	10.0	0.1	34.5	Average	Neutral	46	-11.6	Pass	

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

Specification

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 §7.2.4
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

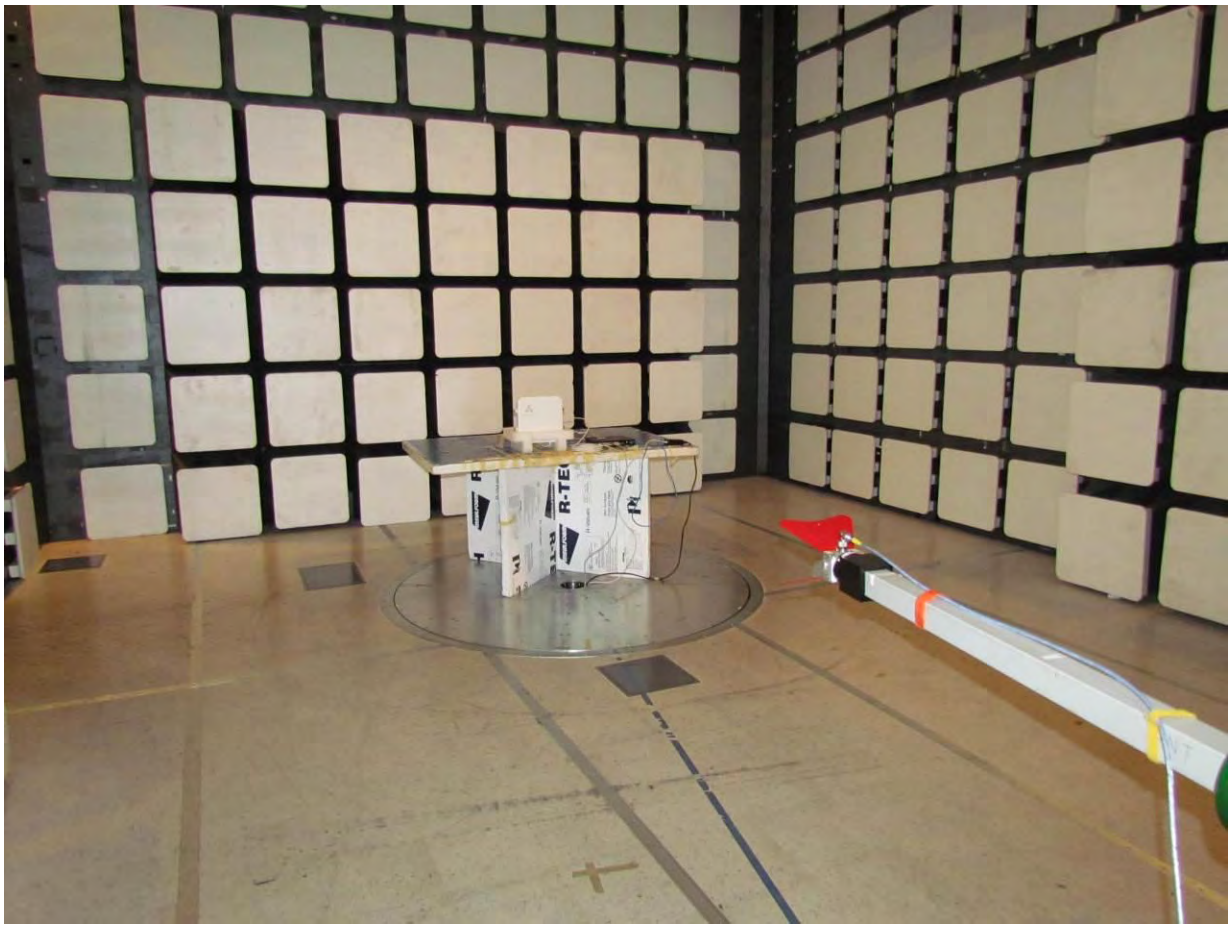
Method	Test Equipment Used
Measurements were made per Sanmina work instruction	0190, 0193

6. PHOTOGRAPHS

6.1. General Measurement Test Set-Up

6.2. Radiated Emissions <1 GHz

6.3. Radiated Emissions >1 GHz



6.4. Cable Connections POE AC Wireline Emissions

7. TEST EQUIPMENT DETAILS

Test Program Details 28th October – 14th December 2015

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	01 Dec 2016
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CY101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	27 Aug 2016
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	15 Aug 2016
341	900MHz Notch Filter	EWT	EWT-14-0199	H1	18 Aug 2016
346	1.6 TO 10GHz High Pass Filter	EWT	EWT-57-0112	H1	18 Aug 2016
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	24 Feb 2016
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	10 Oct 2016
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	28 May 2016
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
447	Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0.73	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	25 Feb 2016
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	25 Feb 2016
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	25 Feb 2016
480	Cable - Bulkhead to Amp	SRC Haverhill	157-157-3050360	480	11 Aug 2016
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-151-3050787	481	11 Aug 2016
482	Cable - Amp to Antenna	SRC Haverhill	157-157-3051574	482	11 Aug 2016

Test Program Details 11th – 29th Jan 2013

Asset #	Instrument	Manufacturer	Part #	Serial #	Calibration Due Date
0070	Power Meter	Hewlett Packard	437B	3125U11552	28th Nov 13
0117	Power Sensor	Hewlett Packard	8487D	3318A00371	15th Nov 13
0223	Power Meter	Hewlett Packard	EPM-442A	US37480256	15th Nov 13
0374	Power Sensor	Hewlett Packard	8485A	3318A19694	29th Nov 13
0376	Power Sensor	Agilent	U2000A	MY51440005	8th Dec 13
0158	Barometer /Thermometer	Control Co.	4196	E2846	8th Dec 13
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007	2nd Dec 13
0287	EMI Receiver	Rhode & Schwartz	ESIB40	100201	16th Nov 13
0338	30 - 3000 MHz Antenna	Sunol	JB3	A052907	8th Nov 13
0335	1-18 GHz Horn Antenna	EMCO	3117	00066580	7th Nov 13
0252	SMA Cable	Megaphase	Sucoflex 104	None	N/A
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001	N/A
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002	N/A
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001	N/A
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001	N/A
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623	N/A
	EMC Test Software	EMISoft	Vasona	5.0051	N/A
	RF Conducted Test Software	National Instruments	Labview	Version 8.2	N/A
	RF Conducted Test Software	MiCOM Labs ATS		Version 1.5	N/A

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