REGULATORY COMPLIANCE TEST REPORT

FCC CFR 47 15.247, RSS-247 Issue 2

Report No.: ALNT93-U2 Rev A

Company: Alien Technology, LLC

Model Name: Nexus Multiplexer System

REGULATORY COMPLIANCE TEST REPORT

Company: Alien Technology, LLC

Model Name: Nexus Multiplexer System

To: FCC CFR 47 Part 15 Subpart C 15.247, RSS-247 Issue 2

Test Report Serial No.: ALNT93-U2 Rev A

This report supersedes: None

Applicant:	Alien Technology, LLC 845 Embedded Way San Jose, 95138 USA
Product Function:	Nexus 8 Port Multiplexer with the ALR-F800 RFID Reader
Issue Date:	12th November 2019

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com

A2LA ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard 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 April 2017*).

Presented this 14th day of May 2018.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.01
Valid to February 29, 2020
Revised November 7, 2019

For the 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 product certification body also meets the *A2LA R322 – Specific Requirements – Notified Body Accreditation Requirements* and *A2LA R308 - Specific Requirements - ISO-IEC 17065 - Telecommunication Certification Body Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 14th day of May 2018

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to February 29, 2020
Revised November 7, 2019

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

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	7th November 2019	Draft report for client review.
Rev A	12th November 2019	Initial Release
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In the above table the latest report revision will replace all earlier versions.

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

3. TEST RESULT CERTIFICATE

Manufacturer:	Alien Technology, LLC 845 Embedded Way San Jose, 95138 USA	**Tested By:**	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model:	ALX-2525, ALX-2530, ALR-F800	**Telephone:**	+1 925 462 0304
Equipment Type:	Nexus 8 Port Multiplexer with the ALR-F800 RFID Reader.	**Fax:**	+1 925 462 0306
S/N's:	ALNT68-1		
Test Date(s):	14th – 24th October 2019	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart C 15.247 **ISED RSS-247 Issue 2**	**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, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. 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	A2LA	August 2018	R105 - Requirement's When Making Reference to A2LA Accreditation Status
III	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
IV	ANSI C63.4	2014	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 32	2015	Electromagnetic compatibility of multimedia equipment - Emission requirements
VI	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
VII	FCC 06-96	Jun 30 2006	Memorandum Opinion and Order
VIII	FCC 47 CFR Part 15.247	2016	Radio Frequency Devices; Subpart C – Intentional Radiators
IX	ICES-003	Issue 6 Jan 2016; Updated April 2019	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement.
X	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
XI	RSS-247 Issue 2	Feb 2017	Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices
XII	RSS-Gen Issue 5	March 2019 Amendment 1	General Requirements for Compliance of Radio Apparatus
XIII	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
XIV	FCC 47 CFR Part 2.1033	2016	FCC requirements and rules regarding photographs and test setup diagrams.

4.2. Test and Uncertainty Procedure

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.

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5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Alien Technology Nexus Multiplexer to FCC CFR 47 Part 15 Subpart C 15.247 (DTS) and Industry Canada RSS-247 Issue 2
Applicant:	Alien Technology, LLC 845 Embedded Way San Jose California 95138 USA
Manufacturer:	As Applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	ALNT93-U2
Date EUT received:	14th October 2019
Standard(s) applied:	FCC CFR 47 Part 15 Subpart C 15.247 ISED RSS 15.247 Issue 2
Dates of test (from - to):	14th – 24th August 2019
No of Units Tested:	1
Product Family Name:	Nexus
Model(s):	ALR-F800, ALX-2525, ALX-2530
Location for use:	Indoor
Declared Frequency Range(s):	902 - 928 MHz;
Type of Modulation:	PR-ASK
Declared Nominal Output Power (dBm):	+30 dBm
Transmit/Receive Operation:	Transceiver
Rated Input Voltage and Current:	AC/ DC adaptor 12V dc 2.5A, DC POE 56Vdc 0.3A Optional for controller: AC/DC adapter 24V dc
Operating Temperature Range:	-20 to +55 ºC
ITU Emission Designator:	67K0A1D
Equipment Dimensions:	ALR-F800: 20.2cm (L) x 19.1cm (W) x 2.8cm (D) ALX-2525: 18.3cm (L) x 11.7cm (W) x 2.8cm (D) ALX-2530: 18.1cm (L) x 10.8cm (W) x 2.9cm (D)
Weight:	ALR-F800: 0.85 kg, ALX-2525: 0.18 kg, ALX-2530: 0.18 kg
Hardware Rev:	19.10.24
Software Rev:	Rev A

5.2. Scope Of Test Program

Alien Technology Nexus Multiplexer

The scope of the test program was to test the Alien Technologies Nexus Multiplexer which consists of the ALR-F800 RFID Reader, ALX-2525 Multiplexer, and ALX-2530 Controller unit for compliance against the following specifications:

FCC CFR 47 Part 15 Subpart C 15.247
Radio Frequency Devices; Subpart C – Intentional Radiators

RSS-247 Issue 2
Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices.

The ALX-2530 Controller has a GPIO connector and is also available as model variant ALX-2535 without the GPIO connector.

The ALX-2530 Controller was tested within the scope of this test program as it represent the worst case model variant in terms of emissions.

System Test and Measurement Configurations

The Nexus Multiplexer system consists of the ALR-F800 RFID Reader, ALX-2525 Multiplexer, and ALX-2530 Controller. The ALR-F800 RFID Reader was previously tested in a stand-alone configuration with results reported in MiCOM Labs test Report ALNT63-U5 Rev A. Conductive RF measurements were spot checked on the ALR-F800 RFID Reader to verify continuing compliance during this test program.

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

Type (EUT/ Support)	Equipment Description	Manufacturer	Model No.	Serial No.
EUT	RFID Reader	Alien Technology	ALR-F800	ALNT68-1
EUT	Multiplexer	Alien Technology	ALX-2525	Prototype
EUT	Controller	Alien Technology	ALX-2530	Prototype
Support	12V AC/DC Power Supply	PhiHong	PSAC30U-120	-
Support	POE Power Supply	Ault	PW180KA4800F01	--
Support	24V AC/DC Power Supply (optional for controller)	Meanwell	MDR-60-24	
Support	Laptop	Dell	--	--

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
external	Alien Technology	ALR-8698	Panel	8.5	-	70	-	902 - 928
external	Alien Technology	ALR-8697	Panel	5.5	-	70	-	902 - 928
external	Times-7	ALR-A1001	Panel	5.5	-	68	-	902 - 928
external	Broadradio	ALR-0501	Panel	3.0	-	105	-	902 - 928

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

5.5. Cabling and I/O Ports

Port Type	Max Cable Length	# Of Ports	Screened	Conn Type	Data Type
USB	15m	1	Y	USB2.0 Type A	Digital
USB	15m	1	Y	USB 2.0 Type B	Digital
RS232	Unknown	1	Y	DB9	Digital
Ethernet	100m	1	N	RJ45	Packet Data
dc Jack	Unknown	1	N	Power Jack	-

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s) (PR-ASK)	Data Rate with Highest Power Tari	Channel Frequency (MHz)		
		Low	Mid	High
PR-ASK	25.00	902.75	915.25	927.25

5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance for radiated emissions:
1. A Fair-Rite Type 61 ferrite (Part No 0461164181) was added to the DC cable at the connector to the ALR-F800 with 3 full turns and to the GPIO cable at the F800 connector. A 1 μF Cap was placed on the GPIO connector interface between 12V and ground to minimize emissions in the 30-1000 MHz range.

5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:
1. NONE

6. TEST SUMMARY

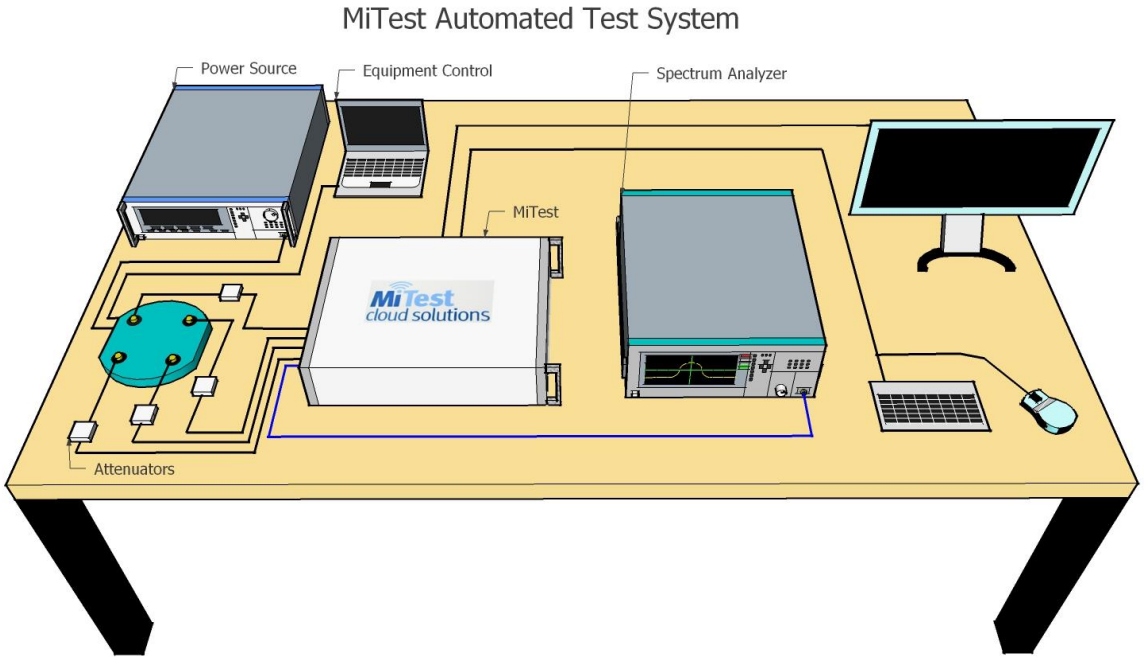
List of Measurements

Test Header	Result	Data Link
Conducted Test Results		
15.247(a)(2) 20 dB & 99% Bandwidth	Complies	View Data
15.247(b), 15.31(e) Conducted Output Power	Complies	View Data
15.247(d) Emissions	Complies	-
(1) Conducted Emissions	Complies	-
(i) Conducted Spurious Emissions	Complies	View Data
(ii) Conducted Band-Edge Emissions	Complies	View Data
Radiated Test Results		
(i) 15.205 Restricted Band Emissions	Complies	View Data
15.209 Emissions below 1 GHz	Complies	View Data
ac Wireline Emissions		
(3) 15.207 ac Wireline Emissions (0.15 – 30 MHz)	Complies	View Data

Note: Per the note in Section 5.2 of this report, the ALR-F800 RFID Reader used in the Nexus Multiplexer System was spot checked conductively to verify continuing compliance during this test program. The conducted data in this report was previously reported in MiCOM Labs test report ALNT63-U5 Rev A which documents the testing of the ALR-F800 RFID Reader.

7. TEST EQUIPMENT CONFIGURATION(S)

7.1. RF Conducted Testing

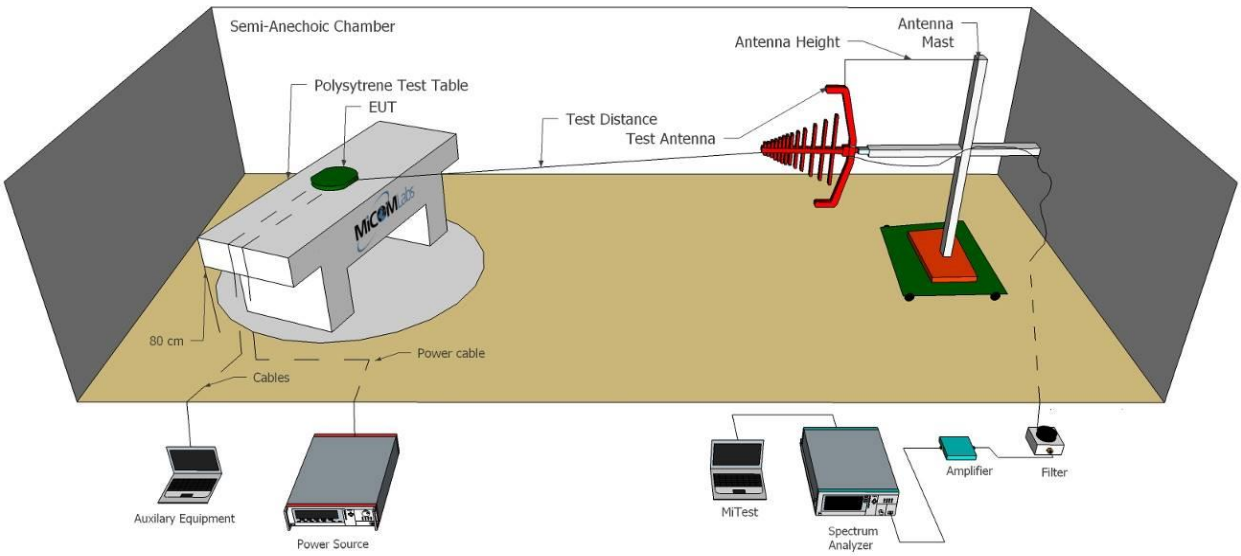


Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
#3 SA	MiTest Box to SA	Fairview Microwave	SCA1814-0101-72	#3 SA	9 Mar 2020
#3P1	EUT to MiTest box port 1	Fairview Microwave	SCA1814-0101-72	#3P1	9 Mar 2020
#3P2	EUT to MiTest box port 2	Fairview Microwave	SCA1814-0101-72	#3P2	9 Mar 2020
#3P3	EUT to MiTest box port 3	Fairview Microwave	SCA1814-0101-72	#3P3	9 Mar 2020
#3P4	EUT to MiTest box port 4	Fairview Microwave	SCA1812-0101-72	#3P4	9 Mar 2020
249	Resistance Thermometer	Thermotronics	GR2105-02	9340 #2	30 Oct 2020
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2020
398	MiTest RF Conducted Test Software	MiCOM	MiTest ATS	Version 4.1	Not Required
405	DC Power Supply 0-60V	Agilent	6654A	MY4001826	Cal when used
408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required

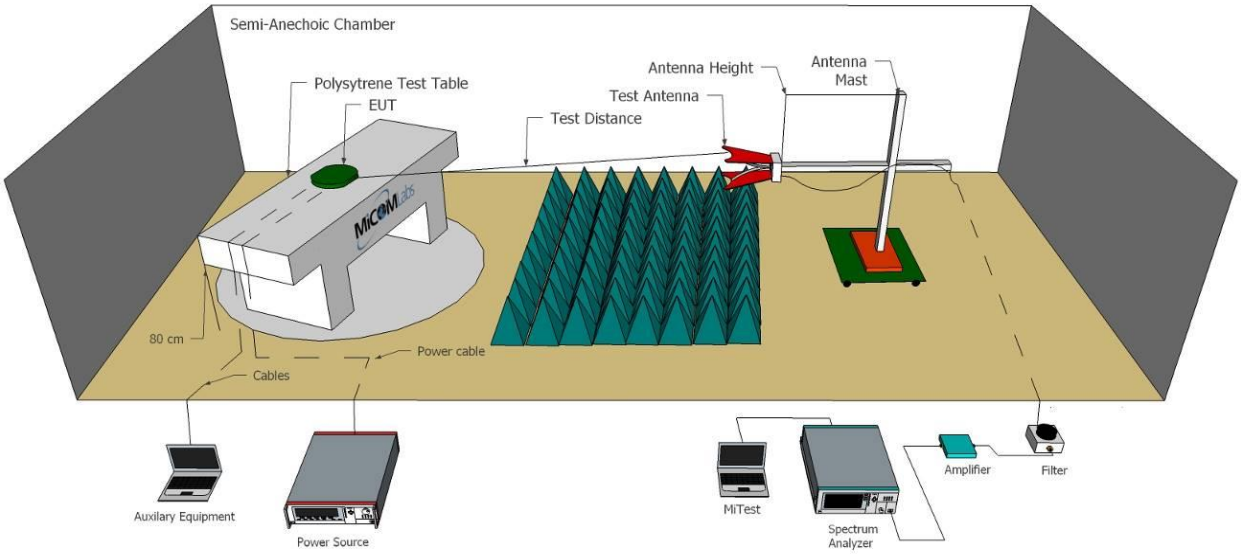
7.2. Radiated Emissions - 3m Chamber

Test Setup for Radiated Emissions for above and below 1 GHz

Radiated Emissions Below 1GHz Test Setup



Radiated Emissions Above 1GHz Test Setup



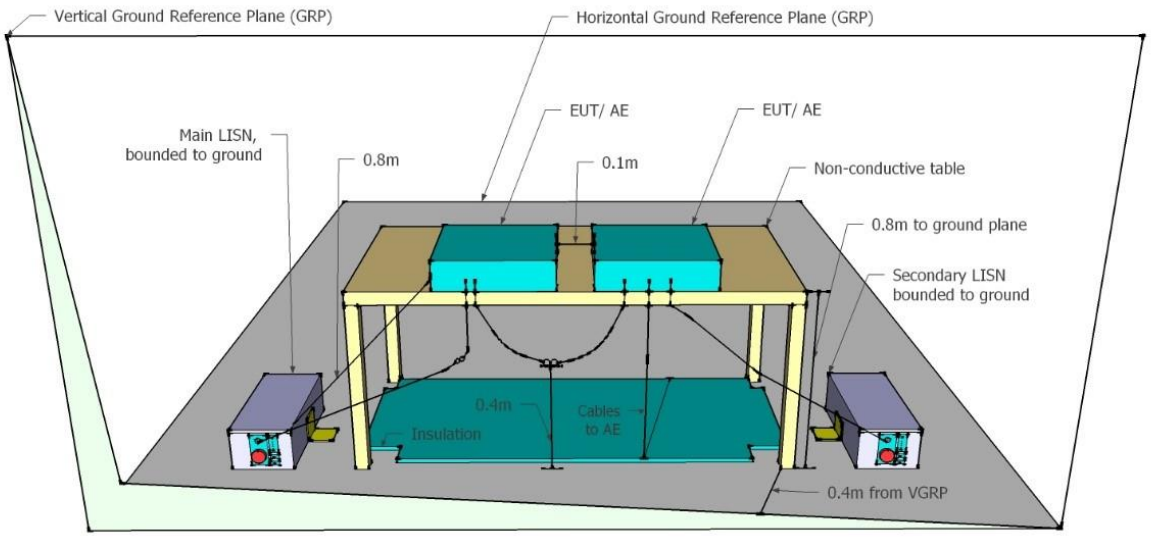
A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	25 Jan 2020
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	4 Apr 2020
346	1.6 TO 10GHz High Pass Filter	EWT	EWT-57-0112	H1	3 Sep 2020
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	21 Nov 2019
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2020
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	6 Sep 2020
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	12 Nov 2019
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	9 Sep 2020
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
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	5 Sep 2020
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	5 Sep 2020
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	9 Sep 2020
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	3 Sep 2020
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	9 Sep 2020
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	9 Sep 2020
510	Barometer/Thermometer	Control Company	68000-49	170871375	20 Dec 2019
518	Cable - Amp to Antenna	SRC Haverhill	157-3051574	518	9 Sep 2020
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used
CC05	Confidence Check	MiCOM	CC05	None	4 Apr 2020

7.3. ac Wireline

The ac Wireline Conducted Emissions test was performed using the conducted test set-up shown in the diagram below.

Test Measurement Set up



Assets Utilized for ac Wireline Emission Testing

A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
184	Pulse Limiter	Rhode & Schwarz	ESH3Z2	357.8810.52	28 Feb 2020
190	LISN (two-line V-network)	Rhode & Schwarz	ESH3Z5	836679/006	18 Oct 2020
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2020
295	Conducted Emissions Chamber Maintenance Check	MiCOM	Conducted Emissions Chamber	295	20 Dec 2019
307	BNC-CABLE	Megaphase	1689 1GVT4	15F50B002	11 Sep 2020
316	Dell desktop computer workstation	Dell	Desktop	WS04	Not Required
372	AC Variable PS	California Instruments	1251P	L06951	Cal when used
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2020
496	MiTest Conducted Emissions test software.	MiCOM	Conducted Emissions Test Software Version 1.0	496	Not Required
510	Barometer/Thermometer	Control Company	68000-49	170871375	20 Dec 2019
CCEMC01	Confidence Check.	MiCOM	CCEMC01	None	28 Feb 2020

8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by MiTest. MiTest is an automated test system developed by MiCOM Labs. MiTest is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.

The MiCOM Labs "MiTest" Automated Test System" (Patent Pending)

9. TEST RESULTS

9.1. 20 dB & 99% Bandwidth

Conducted Test Conditions for 6 dB and 99% Bandwidth			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	20 dB and 99 % Bandwidth	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for 20 dB and 99% Bandwidth Measurement
The bandwidth at 20 dB and 99 % was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

Testing was performed under ambient conditions at nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limits for 20 dB and 99% Bandwidth

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(i) 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.

Equipment Configuration for 20 dB & 99% Bandwidth			
Variant:	PR-ASK	**Duty Cycle (%):**	99.00
Data Rate:	25.00 Tari	**Antenna Gain (dBi):**	3.00
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 20 dB Bandwidth (MHz) Port(s)				20 dB Bandwidth (MHz)		Limit	Lowest Margin
MHz	a	b	c	d	Highest	Lowest	KHz	KHz
902.8	0.054	--	--	--	0.054	0.054	≤500.0	-446.0
915.3	0.058	--	--	--	0.058	0.058	≤500.0	-442.0
927.3	0.051	--	--	--	0.051	0.051	≤500.0	-449.0

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				Maximum 99% Bandwidth (MHz)		
MHz	a	b	c	d			
902.8	0.059	--	--	--	0.059		
915.3	0.059	--	--	--	0.059		
927.3	0.059	--	--	--	0.059		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

9.2. Number of Channels

Conducted Test Conditions for Number Of Channels			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Number of Channels	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

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.

Testing was performed under ambient conditions at nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limit
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; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

Equipment Configuration for Hopping Sequence

Variant:	PR-ASK	**Duty Cycle (%):**	Not Applicable
Data Rate:	25.00 Tari	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:			

Test Measurement Results

Modulation	Frequency Range (MHz)	Number of Hopping Channels	Limit	Total Number of Hops	Results
			No of Hopping Channels		
PR-ASK	900.00 – 912.00	19.0	--	19.0	--
PR-ASK	912.00 – 928.00	31.0	--	31.0	--
PR-ASK	902.00 – 928.00	**Total No. of Hopping Channels:**	≥50	50.0	Pass

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

9.3. Channel Spacing

Conducted Test Conditions for 6 dB and 99% Bandwidth			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Channel Spacing	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

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.

Testing was performed under ambient conditions at nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limit
(1) 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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Equipment Configuration for Channel Separation

Variant:	PR-ASK	**Duty Cycle (%):**	Not Applicable
Data Rate:	25.00 Tari	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:			

Test Measurement Results

Center Frequency	Packet Type	Chan Separation	Limit (20 dB Occ. BW)	Result
MHz		MHz	MHz	
915.255	PR-ASK	0.502	> 0.058	Pass
Traceability to Industry Recognized Test Methodologies				
Measurement Uncertainty:	±2.81 dB (Spectrum/Amplitude), ±0.86 ppm (Frequency)			

Note: click the links in the above matrix to view the graphical image (plot).

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

9.4. Dwell Time & Channel Occupancy

Conducted Test Conditions for Channel Occupancy			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Dwell Time & Channel Occupancy	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

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.

Testing was performed under ambient conditions at nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limit
(i) 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 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 average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Equipment Configuration for Dwell Time & Channel Occupancy			
Variant:	Not Applicable	**Duty Cycle (%):**	Not Applicable
Data Rate:	Not Applicable	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:			

		Test Measurement Results			
Center Frequency	**Variant Type**	**Dwell Time (Single Channel)**	**Channel Occupancy**	**Channel Occupancy Limit**	**Result**
MHz		**ms**	**ms**	**ms**	
915.25	PR-ASK	42.48	84.96	400.00	Pass

Traceability to Industry Recognized Test Methodologies	
Measurement Uncertainty:	±2.81 dB (Spectrum/Amplitude), ±0.86 ppm (Frequency)

9.5. Conducted Output Power

Conducted Test Conditions for Fundamental Emission Output Power			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Output Power	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (b) & (c)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Fundamental Emission Output Power Measurement
In the case of average power measurements an average power sensor was utilized.

For peak power measurements the spectrum analyzer built-in power function was used to integrate peak power over the 20 dB bandwidth.

Testing was performed under ambient conditions at nominal voltage only. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured, summed (Σ) and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.
Supporting Information
Calculated Power = A + G + Y+ 10 log (1/x) dBm

A = Total Power [10*Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)]
G = Antenna Gain
Y = Beamforming Gain
x = Duty Cycle (average power measurements only)

Limits for Fundamental Emission Output Power
(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following for non-frequency hopping systems:

(3) For systems using digital modulation in the 902-928 MHz and 2400-2483.5 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.
(1) Fixed point-to-point operation:
(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(iii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(2) In addition to the provisions in paragraphs (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:

(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

(B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.

(iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

Equipment Configuration for Average Output Power

Variant:	PR-ASK	**Duty Cycle (%):**	99.00
Data Rate:	25.00 Tari	**Antenna Gain (dBi):**	3.00
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Output Power + DCCF (+0.04 dB) (dBm)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
	Port(s)							
MHz	a	b	c	d	dBm	dBm	dB	
902.8	29.94	--	--	--	29.94	30.00	-0.06	30.00
915.3	29.80	--	--	--	29.80	30.00	-0.20	30.00
927.3	29.72	--	--	--	29.72	30.00	-0.28	30.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

DCCF - Duty Cycle Correction Factor

9.6. Emissions

9.6.1. Conducted Emissions

9.6.1.1. Conducted Spurious Emissions

Conducted Test Conditions for Transmitter Conducted Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Max Unwanted Emission Levels	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (d)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Transmitter Conducted Spurious and Band-Edge Emissions Measurement
Transmitter Conducted Spurious and Band-Edge emissions were measured at a limit of 30 dBc (average detector) or 20 dBc (peak detector) below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Measurements were made while EUT was operating in transmit mode of operation at the appropriate centre frequency closest to the band-edge. Emissions were maximized during the measurement and limits derived from the peak spectral power and drawn on each plot.

Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured separately. Testing was performed under ambient conditions at nominal voltage only.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limits Transmitter Conducted Spurious and Band-Edge Emissions
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Equipment Configuration for Transmitter Conducted Spurious Emissions			
Variant:	PR-ASK	**Duty Cycle (%):**	99.00
Data Rate:	25.00 Tari	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FHSS	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Conducted Spurious Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
902.8	30.0 - 26000.0	-59.023	-50.96	--	--	--	--	--	--
915.3	30.0 - 26000.0	-59.023	-49.59	--	--	--	--	--	--
927.3	30.0 - 26000.0	-58.923	-50.33	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	"<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB"

Note: click the links in the above matrix to view the graphical image (plot).

9.6.1.2. Conducted Band-Edge Emissions

9.6.1.2.1. Conducted Low Band-Edge Emissions

Equipment Configuration for Conducted Low Band-Edge Emissions - Average			
Variant:	PR-ASK	**Duty Cycle (%):**	99.00
Data Rate:	25.00 Tari	**Antenna Gain (dBi):**	3.00
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:			

Test Measurement Results

Channel Frequency:	902.8 MHz					
Band-Edge Frequency:	902.0 MHz					
Test Frequency Range:	850.0 - 904.0 MHz					
Port(s)	**Band-Edge Markers and Limit**			**Revised Limit**		**Margin**
	M1 Amplitude (dBm)	**Plot Limit (dBm)**	**M2 Frequency (MHz)**	**Amplitude (dBm)**	**M2A Frequency (MHz)**	**(MHz)**
a	-45.00	-2.00	902.50	--	--	-0.500

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	"<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB"

Note: click the links in the above matrix to view the graphical image (plot).

9.6.1.2.2. Conducted High Band-Edge Emissions

Equipment Configuration for Conducted High Band-Edge Emissions - Average

Variant:	PR-ASK	**Duty Cycle (%):**	99.00
Data Rate:	25.00 Tari	**Antenna Gain (dBi):**	3.00
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:			

Test Measurement Results

Channel Frequency:	927.3 MHz					
Band-Edge Frequency:	928.0 MHz					
Test Frequency Range:	926.0 - 940.0 MHz					
Port(s)	**Band-Edge Markers and Limit**			**Revised Limit**		**Margin**
	M3 Amplitude (dBm)	**Plot Limit (dBm)**	**M2 Frequency (MHz)**	**Amplitude (dBm)**	**M2A Frequency (MHz)**	**(MHz)**
a	-42.50	-4.00	927.50	--	--	-0.500

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	"<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB"

Note: click the links in the above matrix to view the graphical image (plot).

9.7. Radiated

9.7.1. Restricted Band Emission above 1 GHz

Radiated Test Conditions for Radiated Spurious and Restricted Band Emissions			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Radiated Spurious and Band-Edge Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (d), 15.205, 15.209	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions
Radiated emissions for restricted bands 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 was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.
Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

Operational Modes

Operational mode(s) tested for spurious emissions were the modes which delivered maximum spectral density

Limits for Restricted Bands (15.205, 15.209)
Peak emission: 74 dBuV/m
Average emission: 54 dBuV/m

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

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

Restricted Bands of Operation (15.205)
(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Frequency Band			
MHz	**MHz**	**MHz**	**GHz**
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

(b) Except as provided 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 §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

(1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.

(2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.

(3) Cable locating equipment operated pursuant to §15.213.

(4) Any equipment operated under the provisions of §15.253, 15.255, and 15.256 in the frequency band 75-85 GHz, or §15.257 of this part.

(5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608-614 MHz but are subject to compliance within the other restricted bands.

(6) Transmitters operating under the provisions of subparts D or F of this part.

(7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36-13.41 MHz band only.

(8) Devices operated in the 24.075-24.175 GHz band under §15.245 are exempt from complying with the requirements of this section for the 48.15-48.35 GHz and 72.225-72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b).

(9) Devices operated in the 24.0-24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a).

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).

Traceability

Test Methodology	Measurement Uncertainty
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	+5.6/ -4.5 dB

Antenna ALR-0501

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	902.75	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

1000.00 - 10000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	1805.48	64.49	1.75	-14.50	51.74	Peak (NRB)	Vertical	200	0	--	--	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

Equipment Configuration for TX Spurious & Restricted Band Emissions			
Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	915.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

1000.00 - 10000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	1830.49	60.93	1.76	-14.14	48.55	Peak (NRB)	Vertical	101	34	--	--	Pass
#2	2745.67	55.11	2.16	-11.90	45.37	Max Peak	Vertical	107	207	74.0	-28.6	Pass
#3	2745.67	48.60	2.16	-11.90	38.86	Max Avg	Vertical	107	207	54.0	-15.1	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	927.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

1000.00 - 10000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	1854.58	62.34	1.77	-14.08	50.03	Peak (NRB)	Vertical	177	0	--	--	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

Antenna ALR-8698

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	902.75	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

1000.00 - 10000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	1805.44	68.25	1.75	-14.50	55.50	Peak (NRB)	Horizontal	100	45	--	--	Pass
#2	2708.11	57.51	2.13	-12.15	47.49	Max Peak	Vertical	151	2	74.0	-26.5	Pass
#3	2708.11	53.73	2.13	-12.15	43.71	Max Avg	Vertical	151	2	54.0	-10.3	Pass

Test Notes: EUT powered by AC/DC Adapter, antenna connected thru Mux, Controller powered by 12V GPIO

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	915.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

1000.00 - 10000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	1830.57	61.50	1.76	-14.14	49.12	Peak (NRB)	Horizontal	100	31	--	--	Pass
#2	2745.75	58.63	2.16	-11.90	48.89	Max Peak	Vertical	108	356	74.0	-25.1	Pass
#3	2745.75	54.58	2.16	-11.90	44.84	Max Avg	Vertical	108	356	54.0	-9.2	Pass
#4	5491.49	54.11	3.12	-11.67	45.56	Peak (NRB)	Vertical	100	31	--	--	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	927.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

1000.00 - 10000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	1854.58	62.17	1.77	-14.08	49.86	Peak (NRB)	Horizontal	151	0	--	--	Pass
#2	2781.81	55.52	2.16	-12.01	45.67	Max Peak	Vertical	120	358	74.0	-28.3	Pass
#3	2781.81	50.43	2.16	-12.01	40.58	Max Avg	Vertical	120	358	54.0	-13.4	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

9.7.2. Emissions below 1 GHz

Antenna ALR-0501

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by GPIO. Added Ground. 900 MHz notch in front of amp to prevent overloads. 256 MHz is digital emissions.

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	902.75	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	256.41	54.58	4.75	-16.04	43.29	MaxQP	Horizontal	105	194	46.0	-2.7	Pass
#2	380.81	55.35	5.19	-12.52	48.01	Peak (NRB)	Horizontal	100	15	--	--	Pass
#3	595.24	46.95	5.82	-8.64	44.12	Peak (NRB)	Horizontal	100	353	--	--	Pass
#4	613.25	44.13	5.82	-8.21	41.74	MaxQP	Vertical	126	223	46.0	-4.3	Pass
#5	625.27	48.37	5.82	-8.07	46.12	Peak (NRB)	Vertical	100	360	--	--	Pass
#6	634.31	49.21	5.82	-7.52	47.51	Peak (NRB)	Vertical	100	360	--	--	Pass
#7	724.27	48.92	6.27	-6.86	48.33	Peak (NRB)	Horizontal	100	177	--	--	Pass
#8	790.24	48.13	6.46	-5.98	48.61	Peak (NRB)	Horizontal	100	177	--	--	Pass
#9	856.20	46.60	6.64	-5.42	47.82	Peak (NRB)	Horizontal	100	338	--	--	Pass
#10	880.02	43.91	6.73	-5.19	45.45	Peak (NRB)	Horizontal	100	338	--	--	Pass
#11	902.75	54.88	6.76	-4.93	56.71	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by GPIO. Added Ground. 900 MHz notch in front of amp to prevent overloads. 256 MHz is digital emissions

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	915.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	259.40	56.85	4.76	-15.73	45.88	MaxQP	Horizontal	99	191	46.0	-0.1	Pass
#2	368.80	50.75	5.15	-12.58	43.32	Peak (NRB)	Vertical	100	303	--	--	Pass
#3	374.80	52.77	5.17	-12.65	45.29	Peak (NRB)	Horizontal	100	203	--	--	Pass
#4	584.71	45.74	5.82	-8.70	42.86	Peak (NRB)	Horizontal	100	346	--	--	Pass
#5	611.71	47.67	5.82	-8.25	45.24	MaxQP	Horizontal	132	130	46.0	-0.8	Pass
#6	631.19	49.00	5.82	-7.69	47.13	Peak (NRB)	Vertical	100	203	--	--	Pass
#7	640.30	48.14	5.82	-7.66	46.30	Peak (NRB)	Vertical	100	203	--	--	Pass
#8	724.28	48.62	6.27	-6.86	48.03	Peak (NRB)	Horizontal	100	1	--	--	Pass
#9	764.56	48.43	6.39	-6.29	48.53	Peak (NRB)	Horizontal	100	1	--	--	Pass
#10	793.29	48.61	6.46	-5.98	49.09	Peak (NRB)	Horizontal	100	1	--	--	Pass
#11	814.43	46.35	6.52	-5.54	47.33	Peak (NRB)	Horizontal	100	1	--	--	Pass
#12	915.25	46.58	6.80	-4.66	48.73	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by GPIO. Added Ground. 900 MHz notch in front of amp to prevent overloads. 259 MHz is digital emissions

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	927.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	259.39	56.74	4.76	-15.73	45.77	MaxQP	Horizontal	98	184	46.0	-0.2	Pass
#2	377.83	54.13	5.18	-12.55	46.76	Peak (NRB)	Vertical	100	253	--	--	Pass
#3	385.35	53.90	5.21	-12.57	46.53	Peak (NRB)	Horizontal	100	278	--	--	Pass
#4	595.31	46.99	5.82	-8.64	44.17	Peak (NRB)	Horizontal	100	5	--	--	Pass
#5	611.73	48.11	5.82	-8.25	45.68	MaxQP	Horizontal	131	114	46.0	-0.3	Pass
#6	721.01	47.43	6.25	-6.90	46.78	Peak (NRB)	Horizontal	100	205	--	--	Pass
#7	787.07	46.15	6.45	-5.99	46.61	Peak (NRB)	Horizontal	100	205	--	--	Pass
#8	833.64	45.25	6.58	-5.37	46.45	Peak (NRB)	Horizontal	100	346	--	--	Pass
#9	927.26	54.11	6.82	-4.58	56.35	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by GPIO. Added Ground. 900 MHz notch in front of amp to prevent overloads. 259 MHz is digital emissions

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB, 242 MHz signal is digital

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	902.75	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	59.98	61.95	3.80	-20.97	44.77	Peak (NRB)	Vertical	100	216	--	--	Pass
#2	133.45	51.10	4.23	-14.82	40.51	MaxQP	Vertical	100	276	43.0	-2.5	Pass
#3	155.93	49.01	4.34	-16.02	37.33	Peak (NRB)	Vertical	100	182	--	--	Pass
#4	166.48	46.71	4.39	-16.34	34.76	MaxQP	Vertical	98	276	43.0	-8.2	Pass
#5	196.42	57.15	4.52	-15.84	45.83	Peak (NRB)	Vertical	100	182	--	--	Pass
#6	202.43	53.61	4.54	-15.77	42.39	Peak (NRB)	Horizontal	100	182	--	--	Pass
#7	235.42	67.22	4.67	-16.38	55.51	Peak (NRB)	Horizontal	100	216	--	--	Pass
#8	242.89	64.57	4.71	-16.20	53.08	Digital	Horizontal	128	200	46.0	--	--
#9	515.82	52.17	5.64	-9.99	47.83	Peak (NRB)	Horizontal	100	182	--	--	Pass
#10	595.21	46.59	5.82	-8.64	43.77	Peak (NRB)	Vertical	100	182	--	--	Pass
#11	611.72	46.47	5.82	-8.25	44.04	MaxQP	Horizontal	101	216	46.0	-2.0	Pass
#12	664.25	53.77	5.82	-7.58	52.00	Peak (NRB)	Horizontal	100	182	--	--	Pass
#13	667.19	50.49	5.82	-7.58	48.73	Peak (NRB)	Horizontal	100	216	--	--	Pass
#14	713.66	49.59	6.24	-7.00	48.82	Peak (NRB)	Horizontal	100	182	--	--	Pass
#15	773.67	42.41	6.41	-6.24	42.58	Peak (NRB)	Horizontal	100	182	--	--	Pass
#18	902.76	49.31	6.76	-4.93	51.14	Fundamental	Horizontal	100	268	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB, 242 MHz signal is digital

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	915.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	59.99	61.79	3.80	-20.97	44.62	Peak (NRB)	Vertical	100	216	--	--	Pass
#2	133.45	50.90	4.23	-14.82	40.31	MaxQP	Vertical	100	281	43.0	-2.7	Pass
#3	155.94	54.10	4.34	-16.02	42.43	Peak (NRB)	Vertical	100	141	--	--	Pass
#4	166.42	50.27	4.39	-16.34	38.32	MaxQP	Vertical	100	284	43.0	-4.7	Pass
#5	196.40	54.06	4.52	-15.84	42.74	Peak (NRB)	Vertical	100	305	--	--	Pass
#6	209.89	58.18	4.56	-17.31	45.43	Peak (NRB)	Horizontal	100	286	--	--	Pass
#7	235.38	67.02	4.67	-16.38	55.31	Peak (NRB)	Horizontal	100	216	--	--	Pass
#8	242.88	65.06	4.71	-16.20	53.57	Digital	Horizontal	122	203	46.0	--	--
#9	509.65	48.83	5.61	-10.00	44.44	Peak (NRB)	Horizontal	100	305	--	--	Pass
#10	595.21	52.04	5.82	-8.64	49.22	Peak (NRB)	Vertical	100	164	--	--	Pass
#11	668.74	50.16	5.82	-7.58	48.39	Peak (NRB)	Horizontal	100	216	--	--	Pass
#12	784.17	48.86	6.44	-6.04	49.26	Peak (NRB)	Horizontal	100	264	--	--	Pass
#13	915.26	42.95	6.80	-4.66	45.10	Fundamental	Vertical	100	286	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-0501	**Variant:**	FHSS
Antenna Gain (dBi):	3.00	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	927.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	59.97	62.91	3.80	-20.97	45.74	Peak (NRB)	Vertical	100	270	--	--	Pass
#2	133.44	51.72	4.23	-14.82	41.13	MaxQP	Vertical	98	274	43.0	-1.9	Pass
#3	202.40	58.11	4.54	-15.77	46.89	Peak (NRB)	Horizontal	100	270	--	--	Pass
#4	206.90	57.50	4.55	-17.17	44.88	Peak (NRB)	Horizontal	100	0	--	--	Pass
#5	236.85	60.69	4.68	-16.28	49.09	Peak (NRB)	Horizontal	100	84	--	--	Pass
#6	242.90	65.13	4.71	-16.20	53.64	Digital	Horizontal	119	199	46.0	--	
#7	509.77	50.46	5.61	-10.00	46.07	Peak (NRB)	Horizontal	100	270	--	--	Pass
#8	598.22	50.12	5.82	-8.55	47.39	Peak (NRB)	Horizontal	100	270	--	--	Pass
#9	668.71	53.24	5.82	-7.58	51.47	Peak (NRB)	Horizontal	100	172	--	--	Pass
#10	691.24	48.37	6.17	-7.37	47.17	Peak (NRB)	Horizontal	100	270	--	--	Pass
#11	787.09	47.62	6.45	-5.99	48.08	Peak (NRB)	Horizontal	100	270	--	--	Pass
#12	927.26	51.93	6.82	-4.58	54.17	Fundamental	Horizontal	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

Antenna ALR-8698

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V Added Ground. 900 MHz notch in front of amp to prevent overloads. 262 and 269 are digital emissions

Equipment Configuration for Radiated Digital Emissions

Antenna:	Alien Technology ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	902.75	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	30.00	44.32	3.52	-7.20	40.64	Peak (NRB)	Vertical	100	0	--	--	Pass
#2	262.38	56.95	4.77	-15.35	46.37	Digital	Horizontal	126	153	46.0	--	--
#3	269.88	54.26	4.80	-14.73	44.33	MaxQP	Horizontal	106	157	46.0	-1.7	Pass
#4	374.83	55.00	5.17	-12.65	47.52	Peak (NRB)	Horizontal	100	16	--	--	Pass
#5	526.26	52.33	5.66	-9.56	48.43	Peak (NRB)	Horizontal	100	16	--	--	Pass
#6	535.23	53.01	5.69	-9.34	49.36	Peak (NRB)	Horizontal	100	16	--	--	Pass
#7	767.68	49.68	6.40	-6.25	49.83	Peak (NRB)	Horizontal	100	355	--	--	Pass
#8	779.46	49.76	6.43	-6.09	50.10	Peak (NRB)	Horizontal	100	355	--	--	Pass
#9	880.18	43.38	6.73	-5.19	44.92	Peak (NRB)	Horizontal	100	355	--	--	Pass
#10	902.76	51.55	6.76	-4.93	53.38	Fundamental	Horizontal	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V Added Ground. 900 MHz notch in front of amp to prevent overloads. 262 and 269 are digital emissions

Equipment Configuration for Radiated Digital Emissions

Antenna:	Alien Technology ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	915.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
#1	30.00	44.47	3.52	-7.20	40.79	Peak (NRB)	Vertical	100	0	--	--	Pass
#2	262.37	57.21	4.77	-15.35	46.63	Digital	Horizontal	120	163	46.0	--	--
#3	269.89	54.49	4.80	-14.73	44.56	MaxQP	Horizontal	112	158	46.0	-1.4	Pass
#4	374.07	42.17	5.17	-12.65	34.69	Peak (NRB)	Horizontal	100	359	--	--	Pass
#5	512.74	50.03	5.62	-10.01	45.64	Peak (NRB)	Horizontal	100	359	--	--	Pass
#6	538.25	49.41	5.70	-9.36	45.75	Peak (NRB)	Horizontal	100	359	--	--	Pass
#7	757.04	49.44	6.36	-6.41	49.39	Peak (NRB)	Horizontal	100	10	--	--	Pass
#8	781.11	49.65	6.44	-6.02	50.07	Peak (NRB)	Horizontal	100	10	--	--	Pass
#9	880.26	44.69	6.73	-5.19	46.23	Peak (NRB)	Horizontal	100	10	--	--	Pass
#10	915.25	50.30	6.80	-4.66	52.45	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V Added Ground. 900 MHz notch in front of amp to prevent overloads. 262 and 269 are digital emissions

Equipment Configuration for Radiated Digital Emissions

Antenna:	Alien Technology ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	927.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	30.00	44.89	3.52	-7.20	41.21	Peak (NRB)	Vertical	100	360	--	--	Pass
#2	259.43	55.70	4.76	-15.73	44.73	MaxQP	Horizontal	129	276	46.0	-1.3	Pass
#3	269.91	53.81	4.80	-14.73	43.88	MaxQP	Horizontal	101	146	46.0	-2.1	Pass
#4	374.90	53.35	5.17	-12.65	45.87	Peak (NRB)	Horizontal	100	360	--	--	Pass
#5	532.25	51.49	5.68	-9.41	47.76	Peak (NRB)	Horizontal	100	360	--	--	Pass
#6	565.22	50.08	5.79	-8.88	46.99	Peak (NRB)	Horizontal	100	145	--	--	Pass
#7	764.79	48.51	6.39	-6.29	48.61	Peak (NRB)	Horizontal	100	357	--	--	Pass
#8	784.23	50.73	6.44	-6.04	51.13	Peak (NRB)	Horizontal	100	357	--	--	Pass
#9	880.10	43.08	6.73	-5.19	44.62	Peak (NRB)	Horizontal	100	256	--	--	Pass
#10	927.26	58.65	6.82	-4.58	60.89	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connnected thru Mux to antenna. Controller powered by 12V Added Ground. 900 MHz notch in front of amp to prevent overloads. 262 and 269 are digital emissions

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Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission.

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	902.75	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	59.98	59.65	3.80	-20.97	42.48	Peak (NRB)	Vertical	100	193	--	--	Pass
#2	130.46	51.46	4.21	-14.63	41.04	MaxQP	Vertical	101	154	43.0	-2.0	Pass
#3	155.95	55.78	4.34	-16.02	44.11	Peak (NRB)	Vertical	100	158	--	--	Pass
#4	209.87	58.75	4.56	-17.31	46.00	Peak (NRB)	Horizontal	100	140	--	--	Pass
#5	235.41	66.99	4.67	-16.38	55.28	Peak (NRB)	Horizontal	100	193	--	--	Pass
#6	242.89	63.83	4.71	-16.20	52.34	MaxQP	Horizontal	127	196	46.0	--	--
#7	361.32	52.92	5.12	-12.69	45.34	Peak (NRB)	Horizontal	100	158	--	--	Pass
#8	502.30	52.10	5.59	-9.99	47.70	Peak (NRB)	Horizontal	100	158	--	--	Pass
#9	667.13	53.79	5.82	-7.58	52.02	Peak (NRB)	Horizontal	100	193	--	--	Pass
#10	701.64	51.33	6.20	-7.23	50.30	Peak (NRB)	Horizontal	100	158	--	--	Pass
#11	880.00	47.76	6.73	-5.19	49.30	Peak (NRB)	Vertical	100	360	--	--	Pass
#12	902.76	68.45	6.76	-4.93	70.28	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	915.25	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	59.99	59.43	3.80	-20.97	42.26	Peak (NRB)	Vertical	100	192	--	--	Pass
#2	130.44	52.69	4.21	-14.63	42.27	MaxQP	Vertical	98	141	43.0	-0.7	Pass
#3	155.94	56.24	4.34	-16.02	44.56	Peak (NRB)	Vertical	100	159	--	--	Pass
#4	196.41	57.51	4.52	-15.84	46.19	Peak (NRB)	Vertical	100	159	--	--	Pass
#5	209.90	60.05	4.56	-17.31	47.30	Peak (NRB)	Horizontal	100	135	--	--	Pass
#6	235.40	66.60	4.67	-16.38	54.89	Peak (NRB)	Horizontal	100	192	--	--	Pass
#7	242.90	63.51	4.71	-16.20	52.02	MaxQP	Horizontal	118	192	46.0	--	--
#8	512.70	53.91	5.62	-10.01	49.52	Peak (NRB)	Horizontal	100	179	--	--	Pass
#9	584.75	49.64	5.82	-8.70	46.76	Peak (NRB)	Vertical	100	179	--	--	Pass
#10	671.70	53.31	5.82	-7.59	51.54	Peak (NRB)	Horizontal	100	192	--	--	Pass
#11	710.79	50.45	6.23	-7.14	49.54	Peak (NRB)	Horizontal	100	179	--	--	Pass
#12	880.03	48.02	6.73	-5.19	49.56	Peak (NRB)	Vertical	100	0	--	--	Pass
#13	915.26	46.34	6.80	-4.66	48.48	Fundamental	Horizontal	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

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Equipment Configuration for TX Spurious & Restricted Band Emissions

Antenna:	ALR-8698	**Variant:**	FHSS
Antenna Gain (dBi):	8.50	**Modulation:**	PR-ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99.00
Channel Frequency (MHz):	927.75	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	61.48	59.60	3.81	-20.98	42.43	Peak (NRB)	Vertical	100	188	--	--	Pass
2	130.48	50.24	4.21	-14.63	39.82	MaxQP	Vertical	100	142	43.0	-3.2	Pass
3	155.90	52.13	4.34	-16.02	40.46	Peak (NRB)	Vertical	100	192	--	--	Pass
4	196.42	57.17	4.52	-15.84	45.85	Peak (NRB)	Vertical	100	192	--	--	Pass
5	209.87	59.71	4.56	-17.31	46.96	Peak (NRB)	Horizontal	100	129	--	--	Pass
6	236.88	66.40	4.68	-16.28	54.80	Peak (NRB)	Horizontal	100	188	--	--	Pass
7	242.91	58.35	4.71	-16.20	46.86	MaxQP	Vertical	137	231	46.0	--	--
8	364.33	54.19	5.13	-12.59	46.73	Peak (NRB)	Horizontal	100	103	--	--	Pass
9	506.77	51.35	5.60	-9.99	46.96	Peak (NRB)	Horizontal	100	169	--	--	Pass
10	595.28	51.50	5.82	-8.64	48.68	Peak (NRB)	Horizontal	100	253	--	--	Pass
11	664.12	53.96	5.82	-7.58	52.20	Peak (NRB)	Horizontal	100	188	--	--	Pass
12	784.00	47.96	6.44	-6.04	48.36	Peak (NRB)	Horizontal	100	163	--	--	Pass
13	880.04	45.98	6.73	-5.19	47.52	Peak (NRB)	Vertical	100	349	--	--	Pass
14	927.25	56.47	6.82	-4.58	58.71	Fundamental	Horizontal	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connnected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

9.7.3. Digital Emissions (0.03 - 1 GHz)

Radiated Test Conditions for Radiated Digital Emissions (0.03 – 1 GHz)			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Digital Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.209	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Digital Emissions (0.03 – 1 GHz)

Testing 30M-1 GHz was performed in a 3-meter anechoic chamber using a CISPR compliant receiver. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. To further maximize emissions the receive antenna was varied between 1 and 4 meters. The emissions are recorded with receiver 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.

Test configuration and setup for Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

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 51.5dBmV; 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 = 36.3dBmV/m

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are done as:

Level (dBmV/m) = 20 * Log (level (mV/m))

40 dBmV/m = 100mV/m
48 dBmV/m = 250mV/m

Limits for Radiated Digital Emissions (0.03 – 1 GHz)

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

Frequency (MHz)	Field Strength		Measurement Distance (m)
	µV/m (microvolts/meter)	dBµV/m (dB microvolts/meter)	
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F(kHz)	--	30
1.705-30.0	30	29.5	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46.0	3
Above 960	500	54.0	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241. (b) In the emission table above, the tighter limit applies at the band edges. (c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. (d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. (e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part. (f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device. (g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

Test Notes: EUT Powered by 12V AC/DC PS. Connected to 4 muxes. all ports connected and term. Device is used in class A environment

Equipment Configuration for Radiated Digital Emissions (Class A)

Antenna:	Not Applicable	**Variant:**	
Antenna Gain (dBi):	Not Applicable	**Modulation:**	
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	
Channel Frequency (MHz):	0.00	**Data Rate:**	
Power Setting:	max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	30.00	40.72	3.52	-7.20	37.04	MaxQP	Horizontal	106	85	49.5	-12.5	Pass
#2	260.90	64.84	4.76	-15.63	53.97	MaxQP	Horizontal	126	145	57.0	-3.0	Pass
#3	263.90	62.69	4.78	-15.27	52.20	MaxQP	Horizontal	117	146	57.0	-4.8	Pass
#4	377.86	54.41	5.18	-12.55	47.04	MaxQP	Horizontal	101	168	57.0	-10.0	Pass
#5	559.24	52.08	5.76	-9.15	48.69	MaxQP	Horizontal	127	122	57.0	-8.3	Pass
#6	787.04	46.65	6.45	-6.00	47.10	MaxQP	Horizontal	101	202	57.0	-9.9	Pass

Test Notes: EUT Powered by 12V AC/DC PS. Connected to 4 muxes. all ports connected and term. Device is used in class A environment

Test Notes: EUT Powered by PoE. Connected to 4 muxes. all ports connected and term. Device is used in class A environment

Equipment Configuration for Radiated Digital Emissions (Class A)

Antenna:	Not Applicable	**Variant:**	
Antenna Gain (dBi):	Not Applicable	**Modulation:**	
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	
Channel Frequency (MHz):	0.00	**Data Rate:**	
Power Setting:	max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	50.47	53.51	3.73	-20.71	36.53	MaxQP	Vertical	101	271	50.0	-13.5	Pass
#2	73.99	56.44	3.91	-20.47	39.88	MaxQP	Vertical	135	210	50.0	-10.1	Pass
#3	77.21	56.39	3.93	-20.63	39.69	MaxQP	Vertical	139	93	50.0	-10.3	Pass
#4	97.60	57.01	4.04	-19.09	41.96	MaxQP	Vertical	108	106	50.0	-8.0	Pass
#5	103.30	55.99	4.07	-17.18	42.88	MaxQP	Vertical	113	105	50.0	-7.1	Pass
#6	106.77	53.38	4.09	-16.45	41.02	MaxQP	Horizontal	185	0	50.0	-9.0	Pass
Test Notes: EUT Powered by PoE. Connected to 4 muxes. all ports connected and term. Device is used in class A environment												

Test Notes: EUT Powered by 12V AC/DC PS and 24V Ext PS on Controller. Connected to 4 muxes. all ports connected and term. Device is used in class A environment

Equipment Configuration for Radiated Digital Emissions (Class A)

Antenna:	Not Applicable	**Variant:**	
Antenna Gain (dBi):	Not Applicable	**Modulation:**	
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	
Channel Frequency (MHz):	0.00	**Data Rate:**	
Power Setting:	max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	72.45	54.40	3.90	-20.49	37.81	MaxQP	Vertical	105	180	49.5	-11.7	Pass
#2	81.16	55.23	3.95	-20.89	38.29	MaxQP	Vertical	117	204	49.5	-11.2	Pass
#3	97.40	57.11	4.04	-19.09	42.06	MaxQP	Vertical	115	145	54.0	-11.9	Pass
#4	104.68	54.83	4.08	-16.77	42.14	MaxQP	Horizontal	184	26	54.0	-11.9	Pass
#5	106.70	53.40	4.09	-16.45	41.04	MaxQP	Horizontal	186	201	54.0	-13.0	Pass
#6	720.00	40.29	6.25	-6.88	39.66	MaxQP	Horizontal	101	228	57.0	-17.3	Pass

Test Notes: EUT Powered by 12V AC/DC PS and 24V Ext PS on Controller. Connected to 4 muxes. all ports connected and term. Device is used in class A environment

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Test Notes: EUT Powered by Poe and 24V Ext PS on Controller. Connected to 4 muxes. all ports connected and term. Device is used in class A environment

Equipment Configuration for Radiated Digital Emissions (Class A)

Antenna:	Not Applicable	**Variant:**	
Antenna Gain (dBi):	Not Applicable	**Modulation:**	
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	
Channel Frequency (MHz):	0.00	**Data Rate:**	
Power Setting:	max	**Tested By:**	JMH

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	72.45	54.40	3.90	-20.49	37.81	MaxQP	Vertical	105	180	49.5	-11.7	Pass
#2	81.16	55.23	3.95	-20.89	38.29	MaxQP	Vertical	117	204	49.5	-11.2	Pass
#3	97.40	57.11	4.04	-19.09	42.06	MaxQP	Vertical	115	145	54.0	-11.9	Pass
#4	104.68	54.83	4.08	-16.77	42.14	MaxQP	Horizontal	184	26	54.0	-11.9	Pass
#5	106.70	53.40	4.09	-16.45	41.04	MaxQP	Horizontal	186	201	54.0	-13.0	Pass
#6	720.00	40.29	6.25	-6.88	39.66	MaxQP	Horizontal	101	228	57.0	-17.3	Pass
Test Notes: EUT Powered by Poe and 24V Ext PS on Controller. Connected to 4 muxes. all ports connected and term. Device is used in class A environment												

9.8. AC Wireline

Test Conditions for ac Wireline Emissions (0.15 – 30 MHz)			
Standard:	FCC CFR 47:15.247	Ambient Temp. (ºC):	20.0 - 24.5
Test Heading:	Conducted (ac Wireline Emissions)	Rel. Humidity (%):	32 - 45
Standard Section(s):	15.207	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for ac Wireline Emissions (0.15 – 30 MHz)
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 configuration and setup for ac Wireline Emission Measurement were per the ac Wireline Test Set-up specified in this document.

Limits for ac Wireline Emissions

(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 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

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

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

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

The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current system containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 µV within the frequency band 535-1705 kHz, as measured using a 50 µH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

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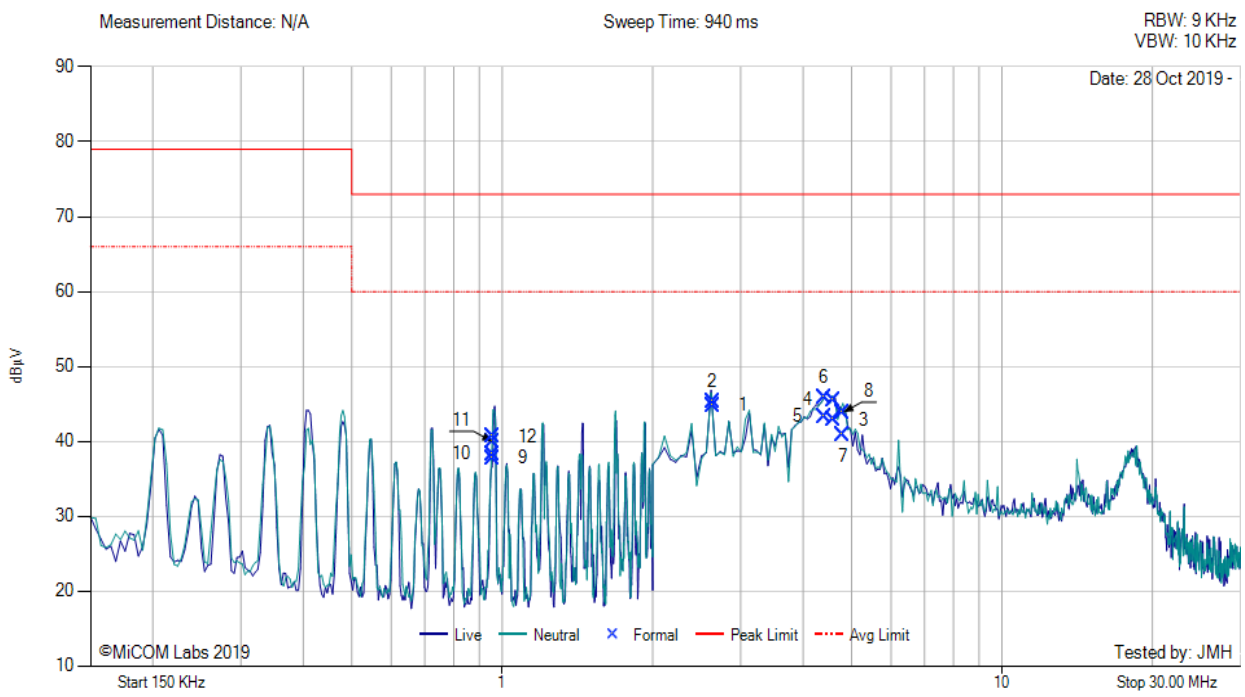
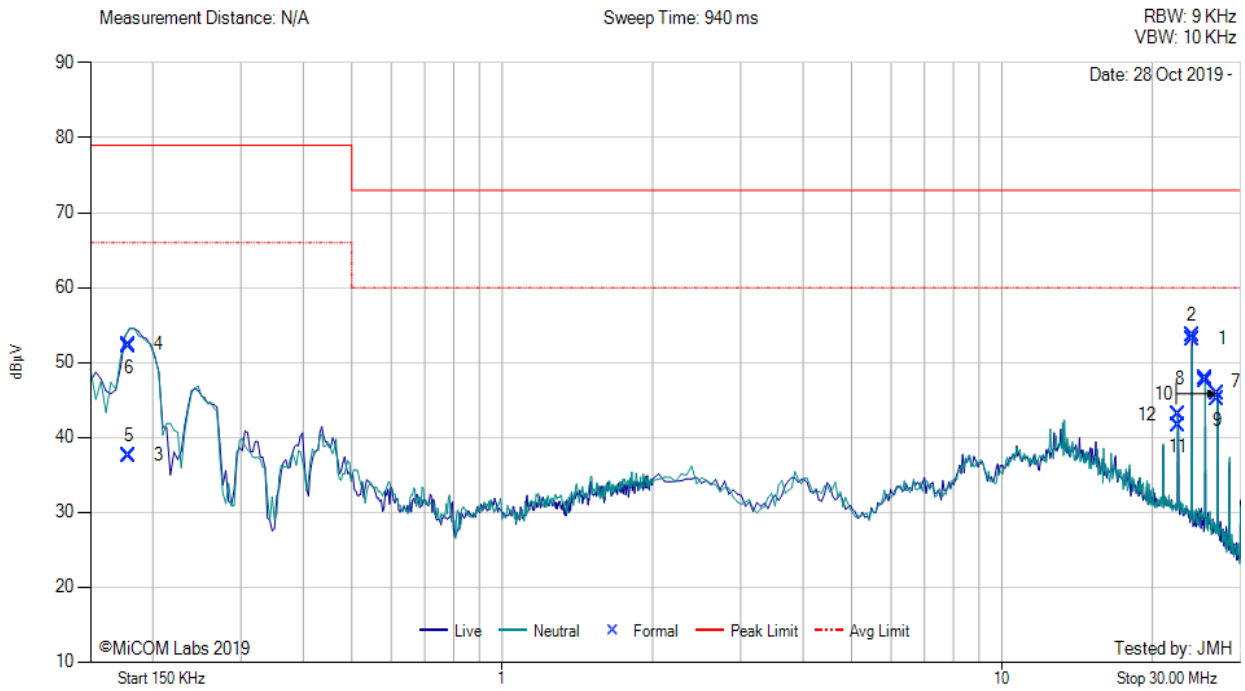
Model:	Nexus Multiplexer	Configuration tested:	PoE Powered
Input power:	$120V_{AC}$/60Hz	Standard:	FCC 15B



Num	Frequency MHz	Raw dBµV	Cable Loss dB	Factor dB	Total Correction dBµV	Corrected Value dBµV	Measurement Type	Line	Limit dBµV/m	Margin dB	Pass /Fail
1	2.635	34.56	0.22	10.01	10.23	44.79	Max Avg	Live	60.0	-15.2	Pass
2	2.635	35.04	0.22	10.01	10.23	45.27	Max Qp	Live	73.0	-27.7	Pass
3	4.608	32.57	0.25	10.07	10.32	42.89	Max Avg	Neutral	60.0	-17.1	Pass
4	4.608	35.25	0.25	10.07	10.32	45.57	Max Qp	Neutral	73.0	-27.4	Pass
5	4.403	33.03	0.25	10.06	10.31	43.34	Max Avg	Live	60.0	-16.7	Pass
6	4.403	35.47	0.25	10.06	10.31	45.78	Max Qp	Live	73.0	-27.2	Pass
7	4.810	30.45	0.26	10.08	10.34	40.79	Max Avg	Neutral	60.0	-19.2	Pass
8	4.810	33.54	0.26	10.08	10.34	43.88	Max Qp	Neutral	73.0	-29.1	Pass
9	0.958	27.76	0.08	9.93	10.01	37.77	Max Avg	Live	60.0	-22.2	Pass
10	0.958	28.31	0.08	9.93	10.01	38.32	Max Qp	Live	73.0	-34.7	Pass
11	0.956	29.96	0.08	9.93	10.01	39.97	Max Avg	Neutral	60.0	-20.0	Pass
12	0.956	30.68	0.08	9.93	10.01	40.69	Max Qp	Neutral	73.0	-32.3	Pass

Test Notes: EUT powered by POE. Controller powered by USB 5V. 120V 60 Hz

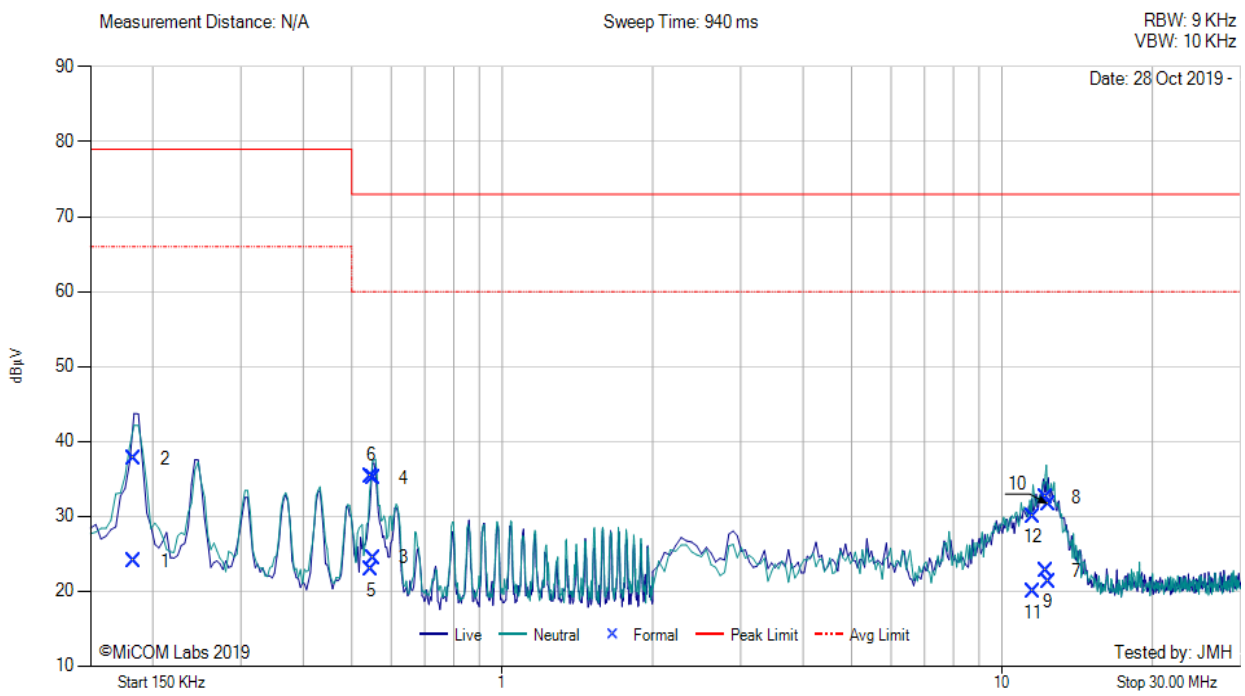
Model:	Nexus Multiplexer	Configuration tested:	12V AC/DC PS Powered
Input power:	120V_{AC}/60Hz	Standard:	FCC 15B



Num	Frequency MHz	Raw dBµV	Cable Loss dB	Factor dB	Total Correction dBµV	Corrected Value dBµV	Measurement Type	Line	Limit dBµV/m	Margin dB	Pass /Fail
1	23.989	41.67	0.64	10.83	11.47	53.14	Max Avg	Live	60.0	-6.9	Pass
2	23.989	42.09	0.64	10.83	11.47	53.56	Max Qp	Live	73.0	-19.4	Pass
3	0.179	27.64	0.06	9.92	9.98	37.62	Max Avg	Neutral	66.0	-28.4	Pass
4	0.179	42.38	0.06	9.92	9.98	52.36	Max Qp	Neutral	79.0	-26.6	Pass
5	0.179	27.52	0.06	9.92	9.98	37.50	Max Avg	Live	66.0	-28.5	Pass
6	0.179	42.16	0.06	9.92	9.98	52.14	Max Qp	Live	79.0	-26.9	Pass
7	25.487	35.96	0.70	10.85	11.55	47.51	Max Avg	Live	60.0	-12.5	Pass
8	25.487	36.31	0.70	10.85	11.55	47.86	Max Qp	Live	73.0	-25.1	Pass
9	26.987	33.50	0.73	10.89	11.62	45.12	Max Avg	Live	60.0	-14.9	Pass
10	26.987	34.22	0.73	10.89	11.62	45.84	Max Qp	Live	73.0	-27.2	Pass
11	22.489	30.06	0.65	10.80	11.45	41.51	Max Avg	Live	60.0	-18.5	Pass
12	22.489	31.54	0.65	10.80	11.45	42.99	Max Qp	Live	73.0	-30.0	Pass

Test Notes: EUT powered by 12V AC/DC PS. Controller powered by 12V GPIO. 120V 60 Hz

Model:	ALX-2530 Controller	Configuration tested:	24V AC/DC PS Powered
Input power:	$120V_{AC}$/60Hz	Standard:	FCC 15B



Num	Frequency MHz	Raw dBµV	Cable Loss dB	Factor dB	Total Correction dBµV	Corrected Value dBµV	Measurement Type	Line	Limit dBµV/m	Margin dB	Pass /Fail
1	0.184	14.01	0.06	9.92	9.98	23.99	Max Avg	Live	66.0	-42.0	Pass
2	0.184	27.69	0.06	9.92	9.98	37.67	Max Qp	Live	79.0	-41.3	Pass
3	0.551	14.42	0.10	9.92	10.02	24.44	Max Avg	Neutral	60.0	-35.6	Pass
4	0.551	25.08	0.10	9.92	10.02	35.10	Max Qp	Neutral	73.0	-37.9	Pass
5	0.548	12.88	0.10	9.92	10.02	22.90	Max Avg	Live	60.0	-37.1	Pass
6	0.548	25.38	0.10	9.92	10.02	35.40	Max Qp	Live	73.0	-37.6	Pass
7	12.243	11.91	0.45	10.38	10.83	22.74	Max Avg	Neutral	60.0	-37.3	Pass
8	12.243	21.62	0.45	10.38	10.83	32.45	Max Qp	Neutral	73.0	-40.6	Pass
9	12.368	10.48	0.46	10.36	10.82	21.30	Max Avg	Live	60.0	-38.7	Pass
10	12.368	20.80	0.46	10.36	10.82	31.62	Max Qp	Live	73.0	-41.4	Pass
11	11.531	9.11	0.45	10.31	10.76	19.87	Max Avg	Neutral	60.0	-40.1	Pass
12	11.531	19.25	0.45	10.31	10.76	30.01	Max Qp	Neutral	73.0	-43.0	Pass

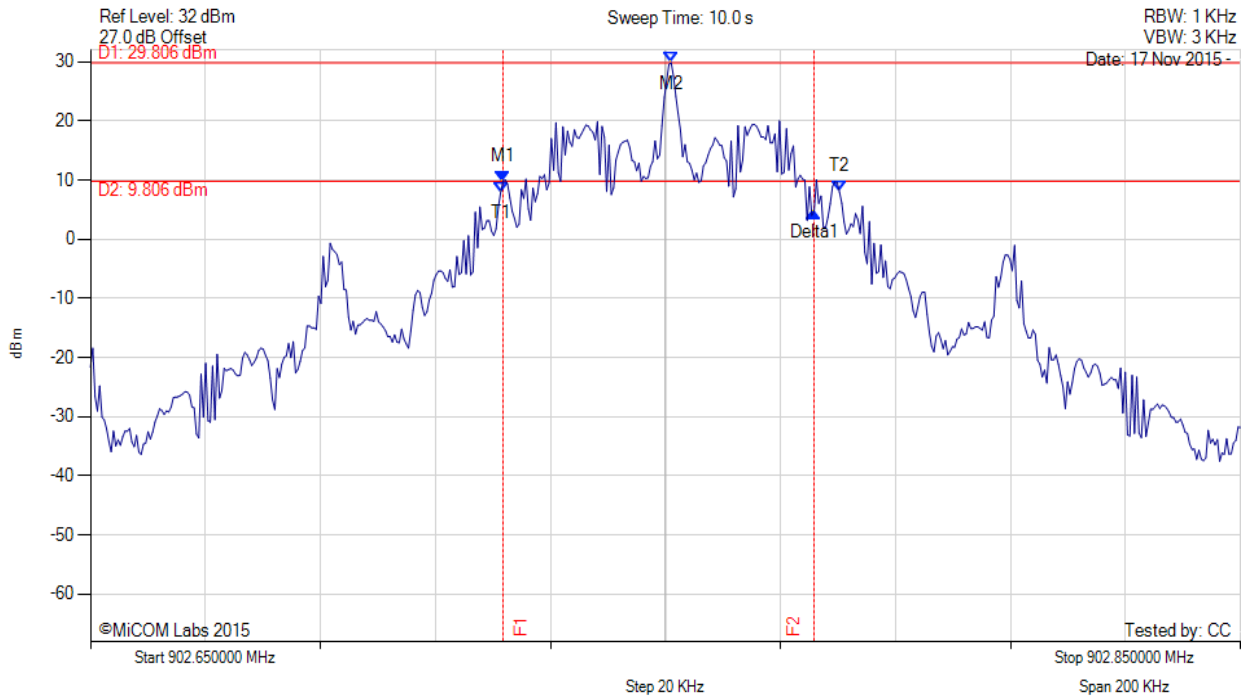
Test Notes: Controller powered by 24V AC/DC PS. 120V 60 Hz

A. APPENDIX - GRAPHICAL IMAGES

A.1. 20 dB & 99% Bandwidth

20 dB & 99% BANDWIDTH

Variant: PR-ASK, Channel: 902.75 MHz, Chain a, Temp: Ambient, Voltage: 56 Vdc

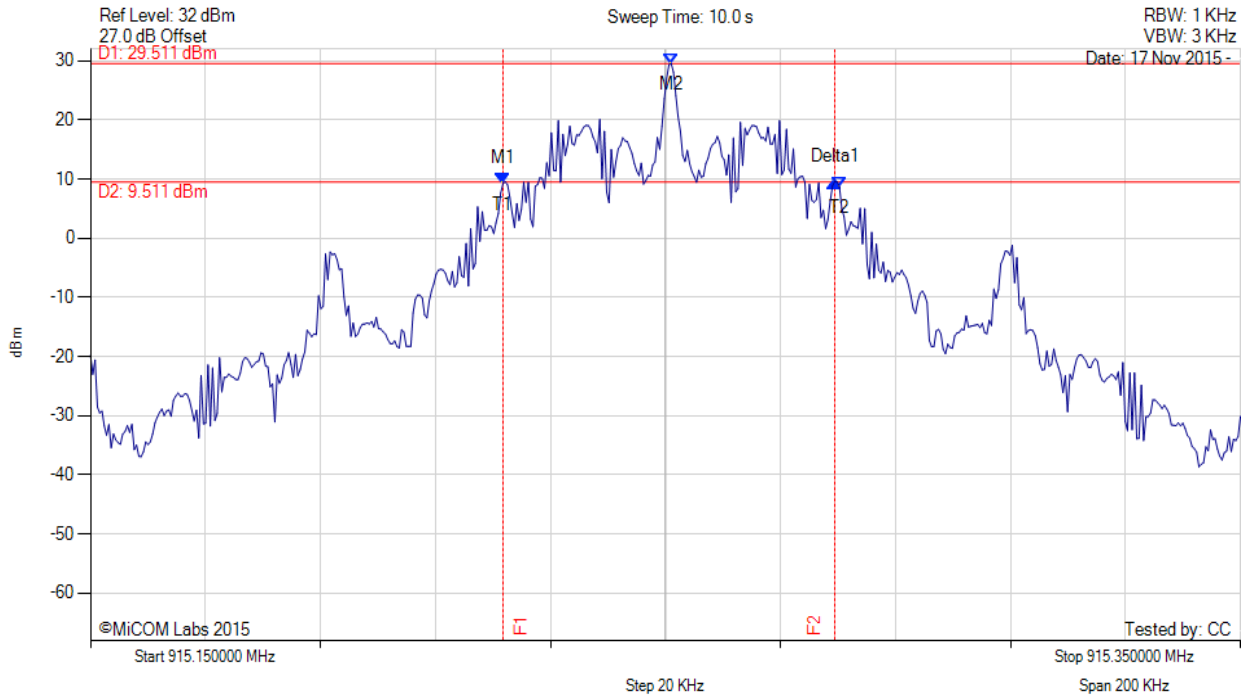


Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAX HOLD	M1 : 902.722 MHz : 9.785 dBm M2 : 902.751 MHz : 29.806 dBm Delta1 : 54 KHz : -5.127 dB T1 : 902.721 MHz : 7.902 dBm T2 : 902.780 MHz : 8.002 dBm OBW : 59 KHz	Measured 6 dB Bandwidth: 0.054 MHz Limit: ≥500.0 kHz Margin: 0.45 MHz

back to matrix

20 dB & 99% BANDWIDTH

Variant: PR-ASK, Channel: 915.25 MHz, Chain a, Temp: Ambient, Voltage: 56 Vdc

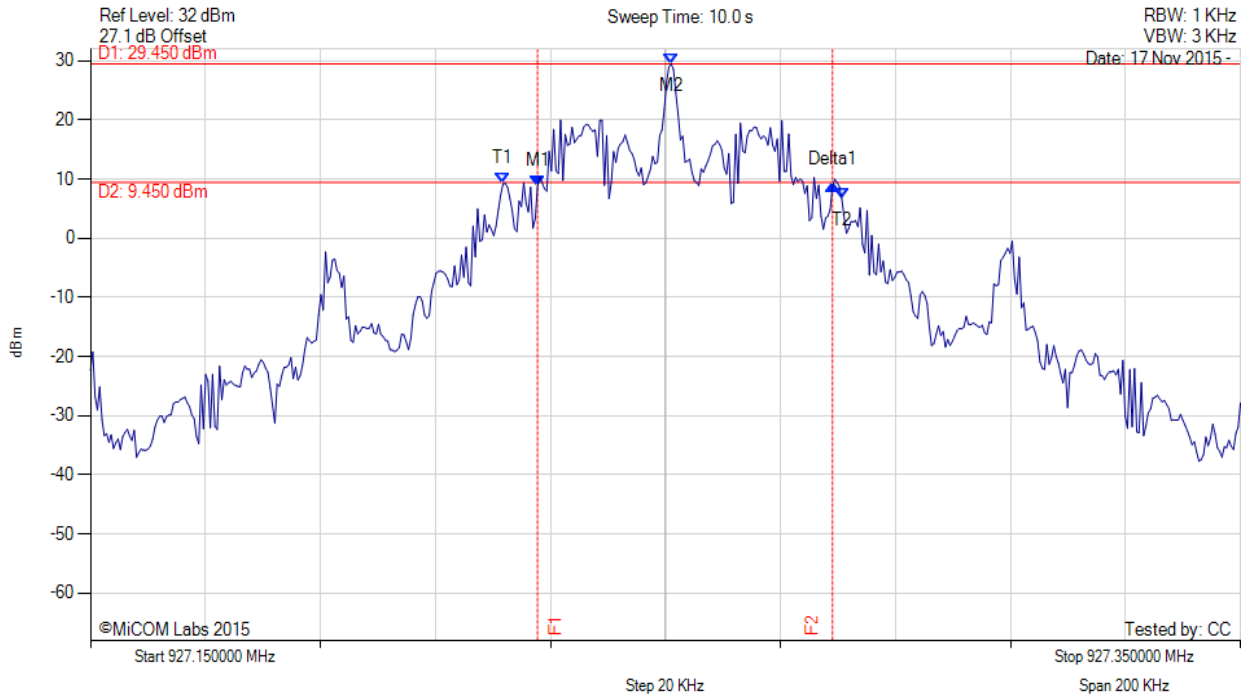


Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAX HOLD	M1 : 915.222 MHz : 9.226 dBm M2 : 915.251 MHz : 29.511 dBm Delta1 : 58 KHz : 0.368 dB T1 : 915.222 MHz : 9.226 dBm T2 : 915.280 MHz : 8.679 dBm OBW : 59 KHz	Measured 6 dB Bandwidth: 0.058 MHz Limit: ≥500.0 kHz Margin: 0.44 MHz

back to matrix

20 dB & 99% BANDWIDTH

Variant: PR-ASK, Channel: 927.25 MHz, Chain a, Temp: Ambient, Voltage: 56 Vdc



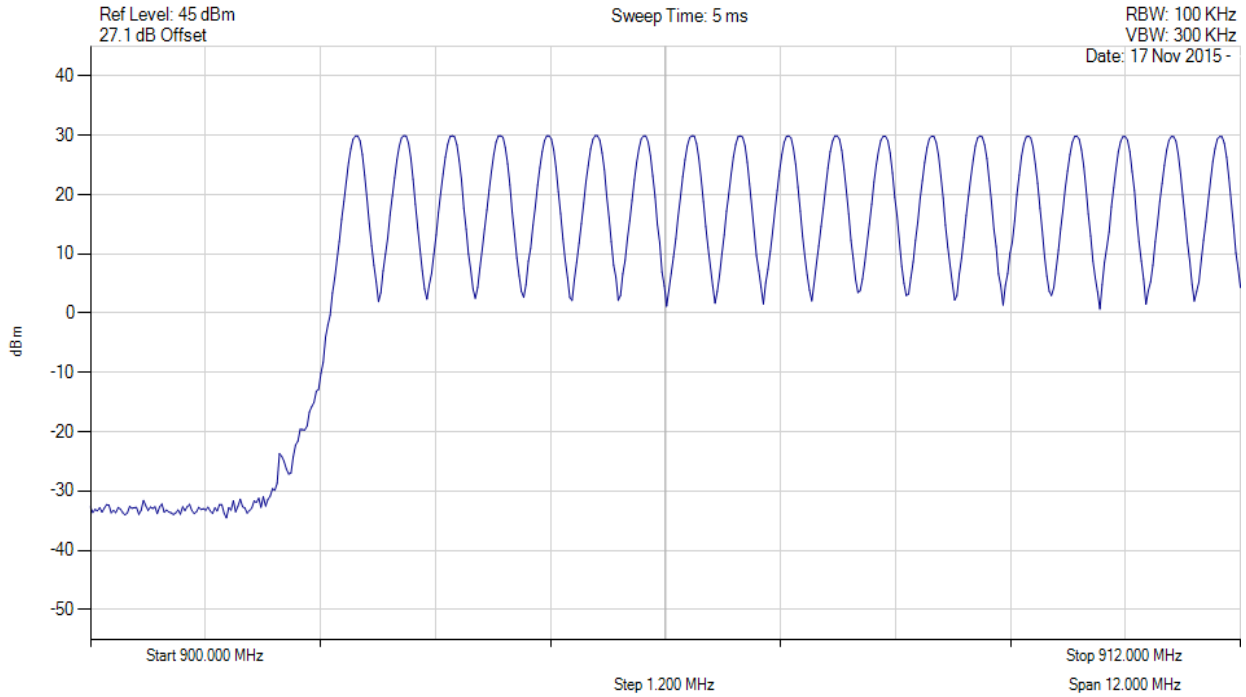
Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAX HOLD	M1 : 927.228 MHz : 8.803 dBm M2 : 927.251 MHz : 29.450 dBm Delta1 : 51 KHz : 0.146 dB T1 : 927.222 MHz : 9.171 dBm T2 : 927.281 MHz : 6.668 dBm OBW : 59 KHz	Measured 6 dB Bandwidth: 0.051 MHz Limit: ≥500.0 kHz Margin: 0.45 MHz

back to matrix

A.2. Number of Channels

Hopping Sequence 902-912 MHz

Variant: PR-ASK, Channel: Hopping, Chain a, Temp: Ambient, Voltage: 56 Vdc

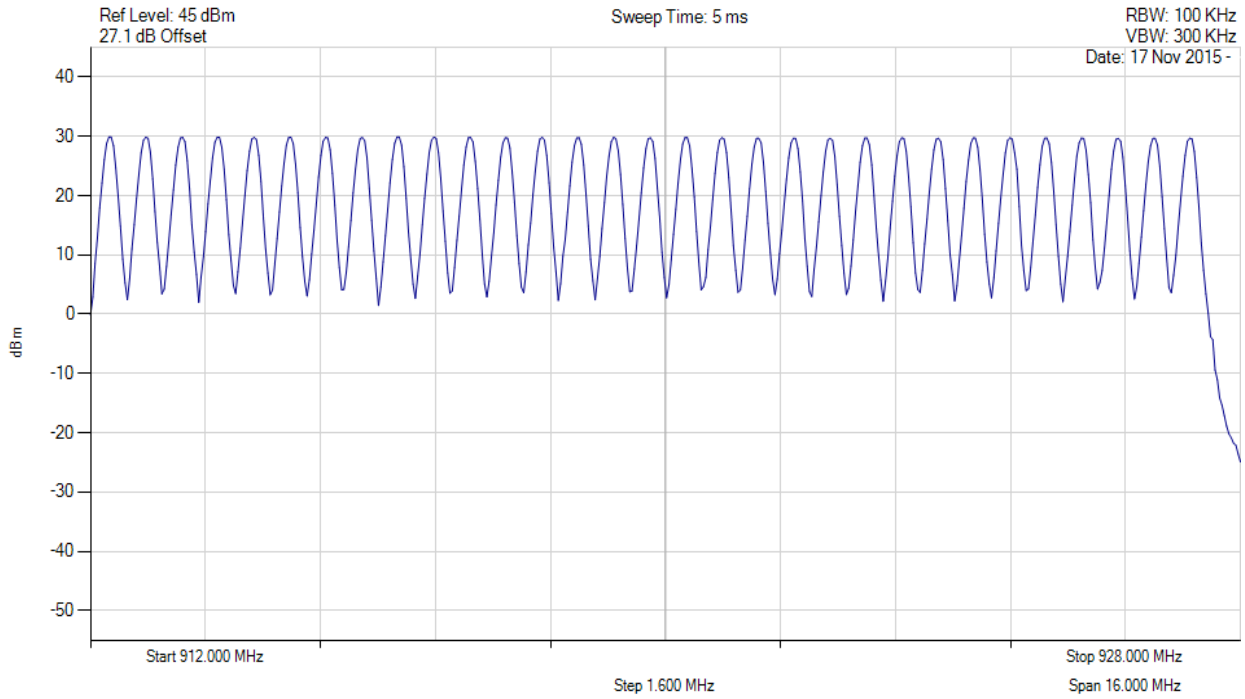


Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW		Channel Frequency: Hopping Number of Hops: 19.0

back to matrix

Hopping Sequence 912-928 MHz

Variant: PR-ASK, Channel: Hopping, Chain a, Temp: Ambient, Voltage: 56 Vdc

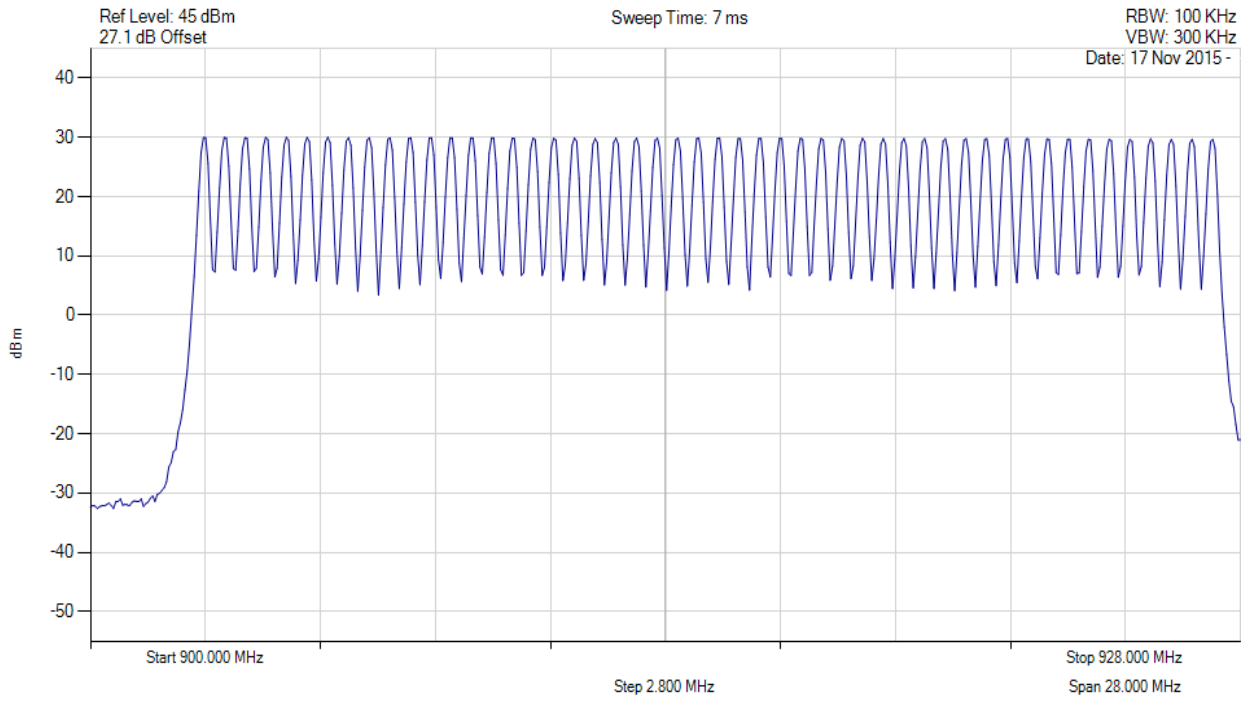


Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW		Channel Frequency: Hopping Number of Hops: 31.0

back to matrix

Hopping Sequence 902-928 MHz

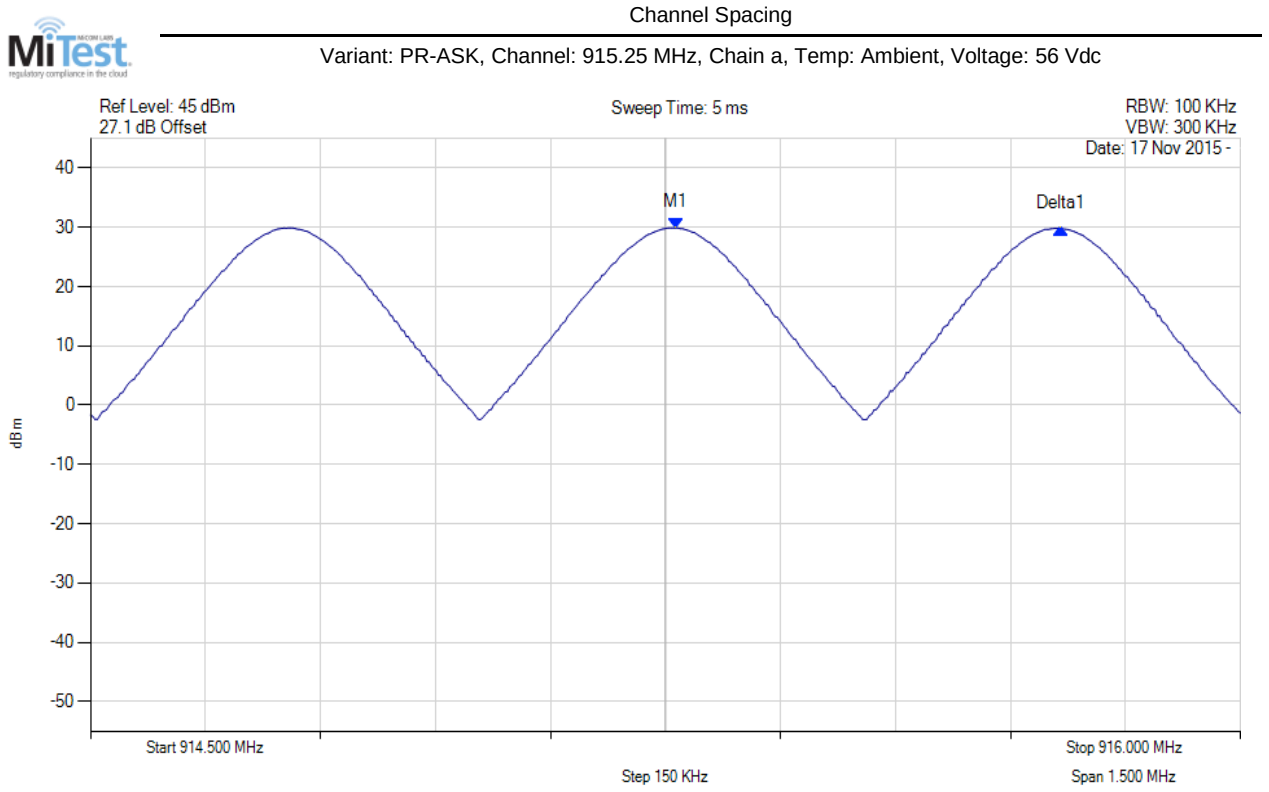
Variant: PR-ASK, Channel: Hopping, Chain a, Temp: Ambient, Voltage: 56 Vdc



Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW		Channel Frequency: Hopping Number of Hops: 50

back to matrix

A.3. Channel Spacing



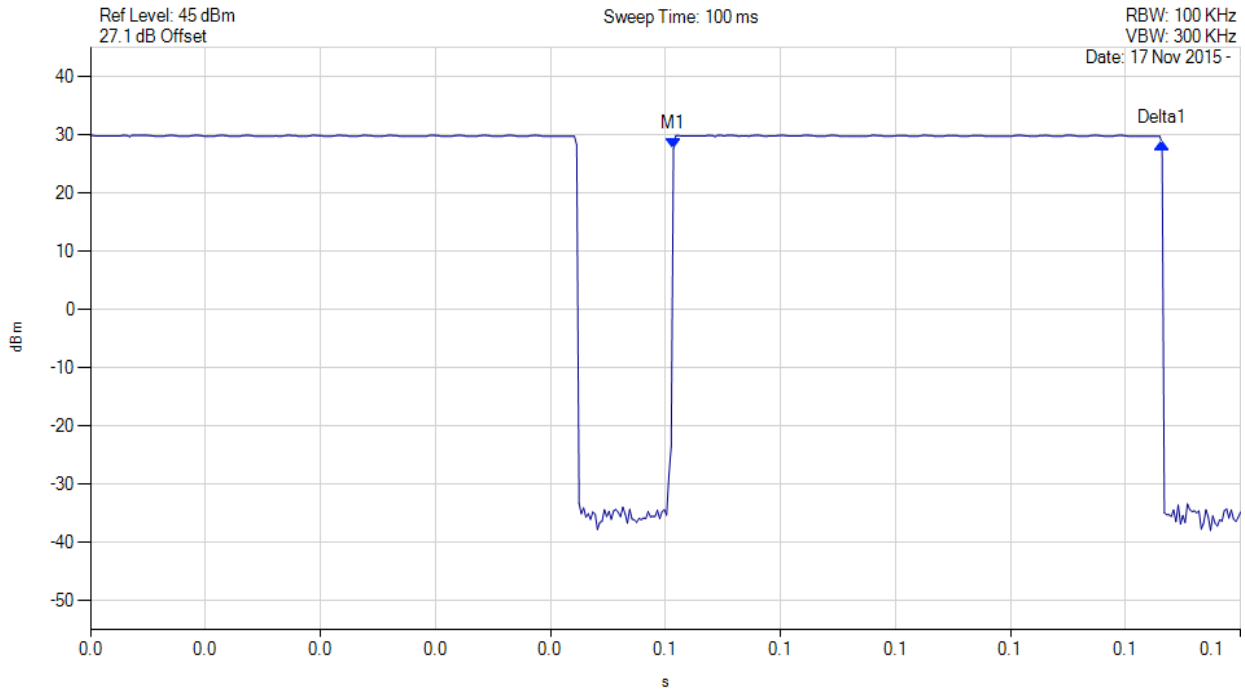
Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAXH	M1 : 915.264 MHz : 29.901 dBm Delta1 : 502 KHz : -0.112 dB	Channel Frequency: 915.25 MHz

back to matrix

A.4. Dwell Time & Channel Occupancy

Dwell Time

Variant: PR-ASK, , Channel: 915.25 MHz, Chain a, Temp: ambient, Voltage: 56 Vdc

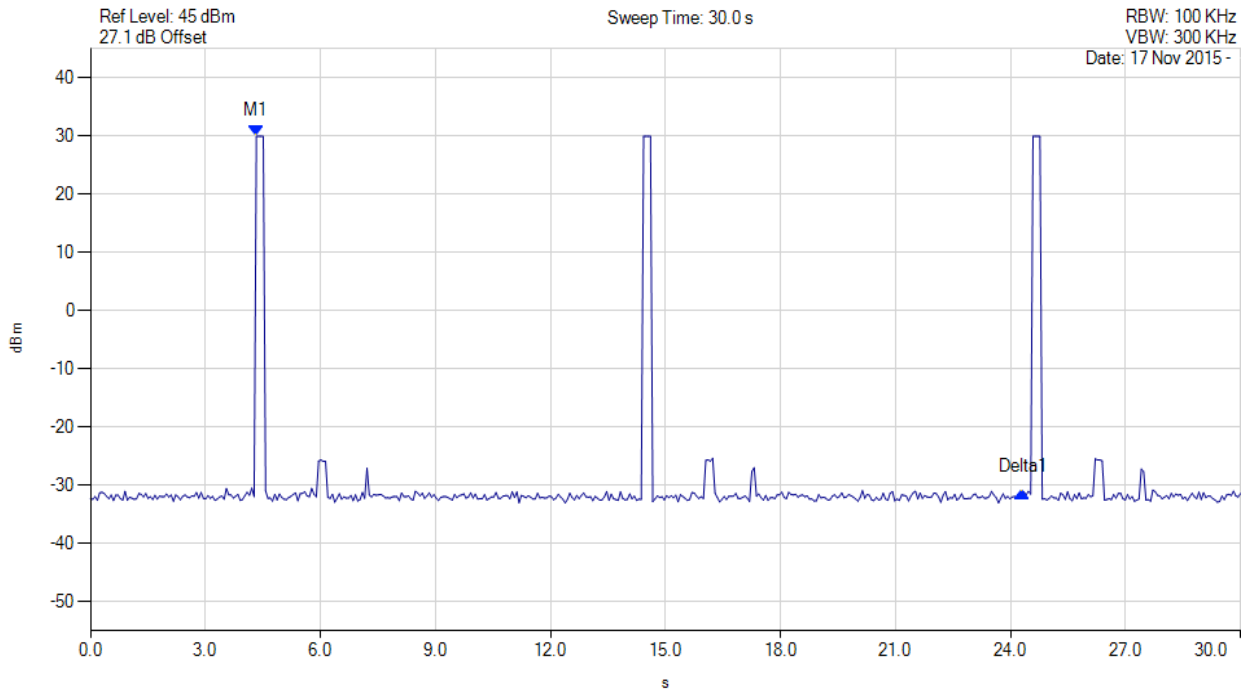


Analyser Setup	Marker:Time:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1(915.25 MHz) : 0.051 s : 27.654 dBm Delta1(915.25 MHz) : 0.042 s : 0.848 dB	Channel Frequency: 915.25 MHz Dwell Time: 0.042 s

back to matrix

Channel Occupancy

Variant: PR-ASK, , Channel: 915.00 MHz, Chain a, Temp: ambient, Voltage: 56 Vdc



Analyser Setup	Marker:Time:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1(915.00 MHz) : 2.164 s : 29.324 dBm Delta1(915.00 MHz) : 20.000 s : -68.944 dB	Channel Frequency: 902.75 MHz Dwell Time: 42ms Occupancy: 84.96 ms Limit: 400ms/20s

back to matrix

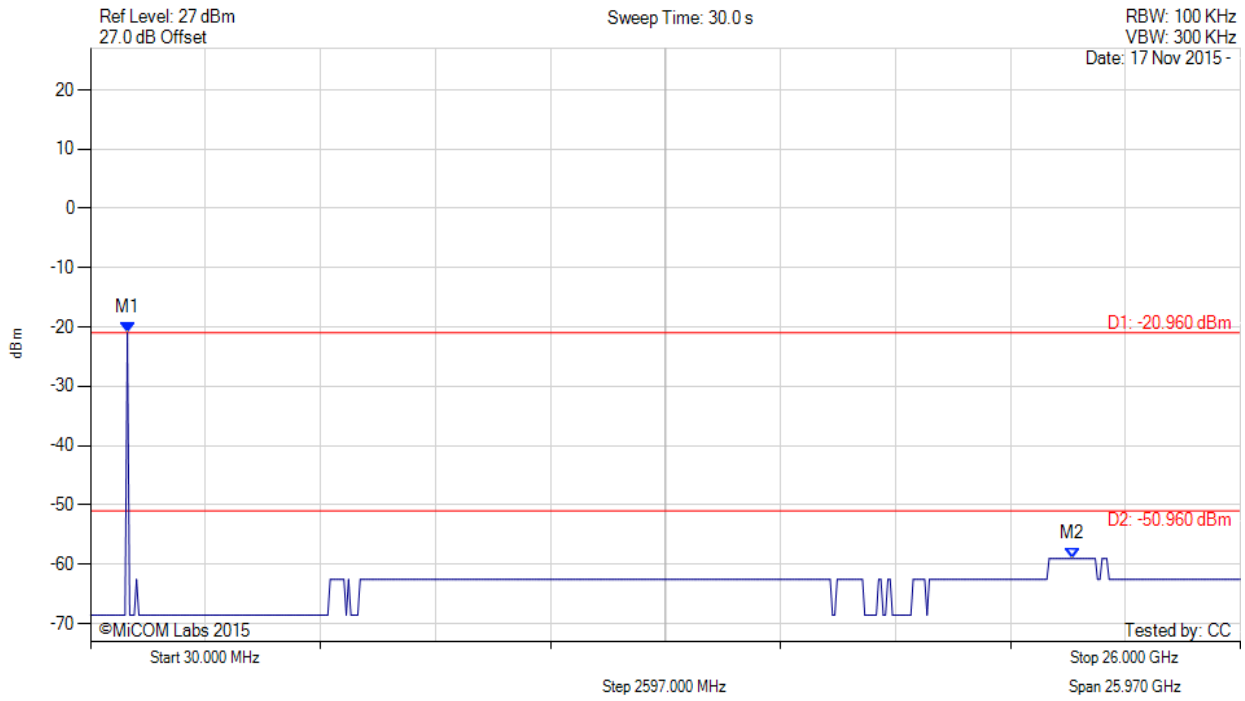
A.5. Emissions

A.5.1. Conducted Emissions

A.5.1.1. Conducted Spurious Emissions

CONDUCTED SPURIOUS EMISSIONS - AVERAGE

Variant: PR-ASK, Channel: 902.75 MHz, Chain a, Temp: Ambient, Voltage: 56 Vdc

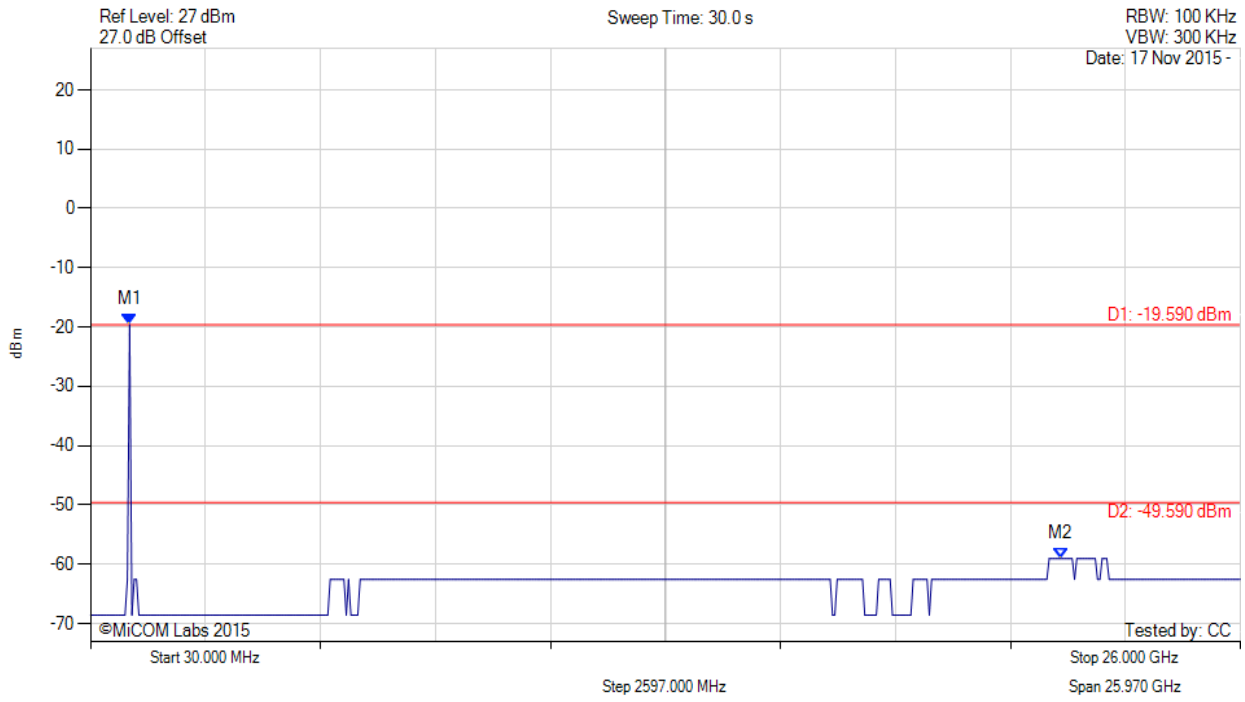


Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = VIEW	M1 : 862.705 MHz : -20.961 dBm M2 : 22.201 GHz : -59.023 dBm	Limit: -50.96 dBm Margin: -8.06 dB

back to matrix

CONDUCTED SPURIOUS EMISSIONS - AVERAGE

Variant: PR-ASK, Channel: 915.25 MHz, Chain a, Temp: Ambient, Voltage: 56 Vdc

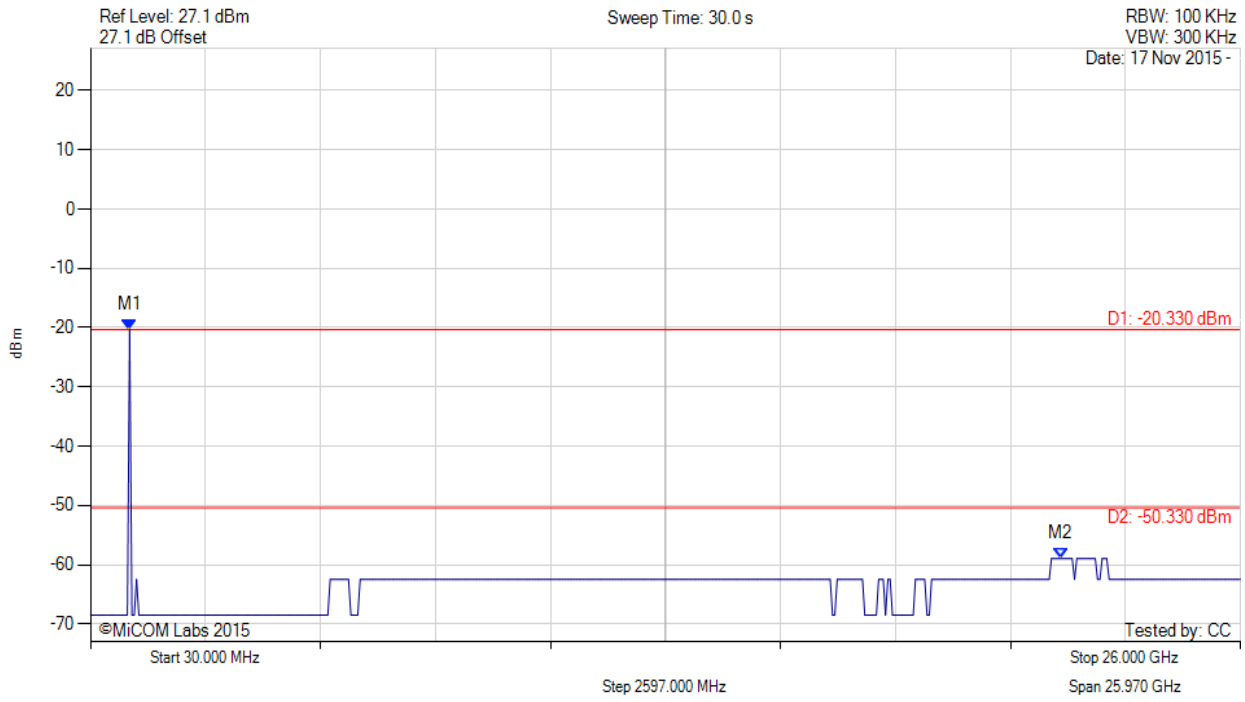


Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = VIEW	M1 : 914.749 MHz : -19.591 dBm M2 : 21.941 GHz : -59.023 dBm	Limit: -49.59 dBm Margin: -9.43 dB

back to matrix

CONDUCTED SPURIOUS EMISSIONS - AVERAGE

Variant: PR-ASK, Channel: 927.25 MHz, Chain a, Temp: Ambient, Voltage: 56 Vdc



Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = VIEW	M1 : 914.749 MHz : -20.335 dBm M2 : 21.941 GHz : -58.923 dBm	Limit: -50.33 dBm Margin: -8.59 dB

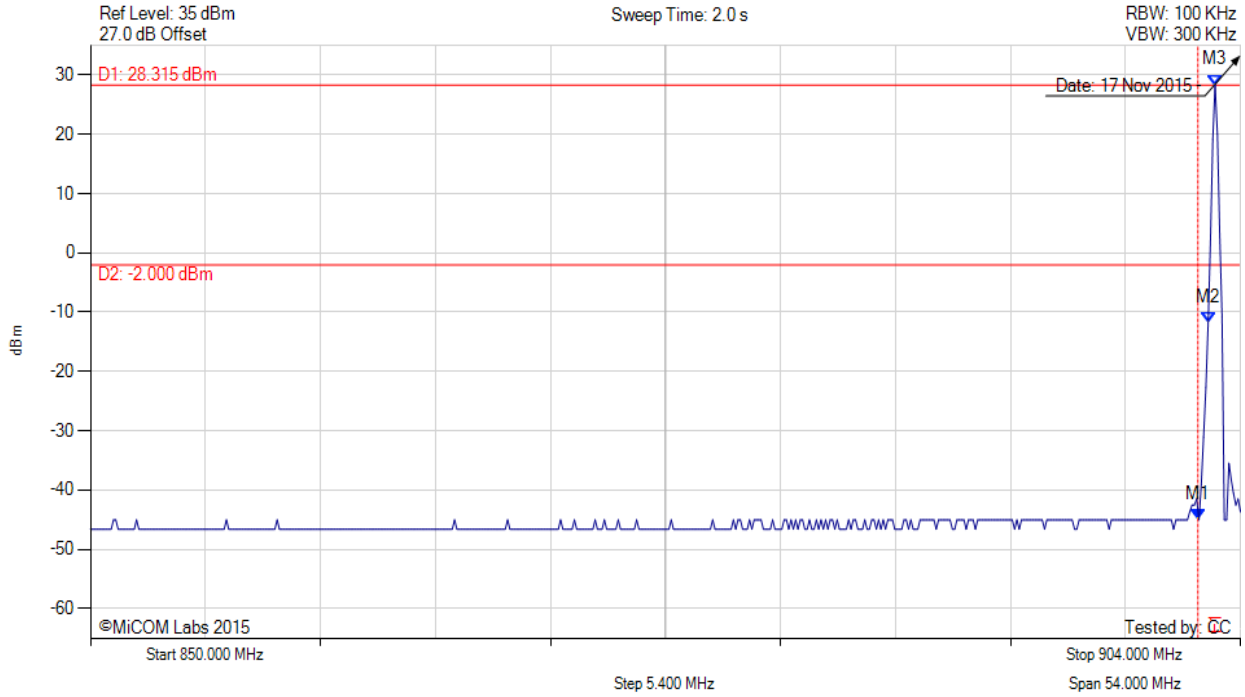
back to matrix

A.5.1.2. Conducted Band-Edge Emissions

A.5.1.2.1. Conducted Low Band-Edge Emissions

CONDUCTED LOW BAND-EDGE EMISSIONS - AVERAGE

Variant: PR-ASK, Channel: 902.75 MHz, Chain a, Temp: Ambient, Voltage: 56 Vdc



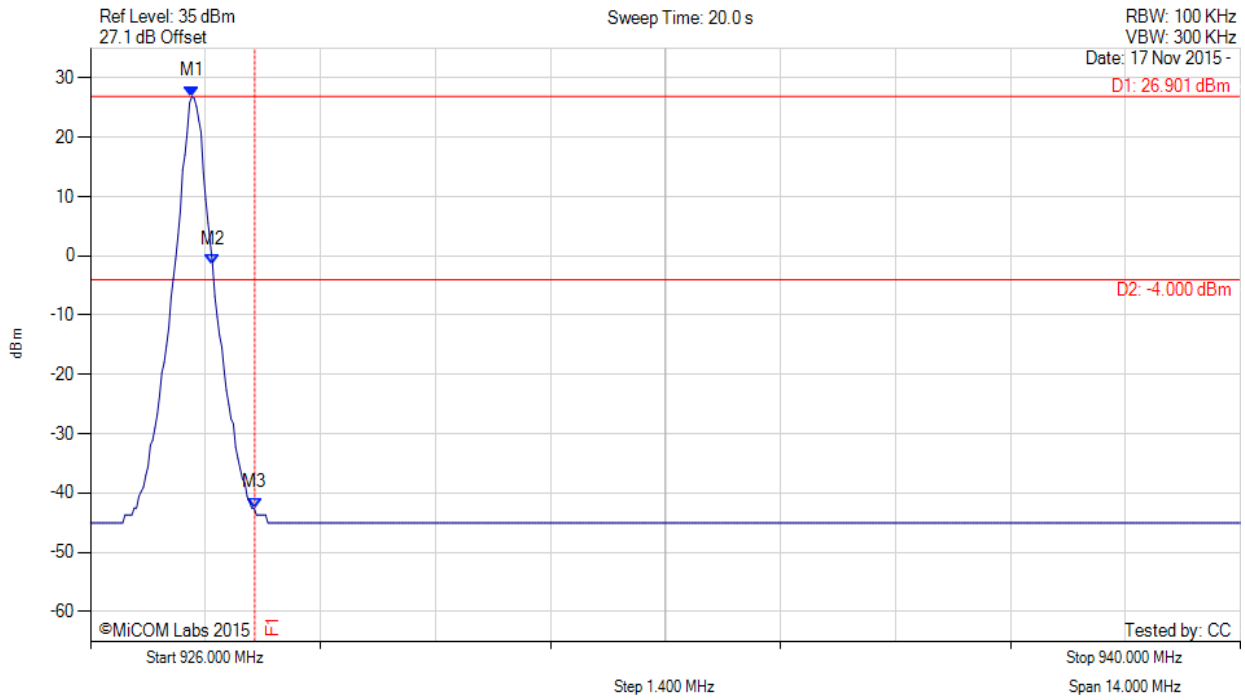
Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -45.002 dBm M2 : 902.485 MHz : -11.716 dBm M3 : 902.810 MHz : 28.315 dBm	Channel Frequency: 902.75 MHz

back to matrix

A.5.1.2.2. Conducted High Band-Edge Emissions

CONDUCTED HIGH BAND-EDGE EMISSIONS - AVERAGE

Variant: PR-ASK, Channel: 927.25 MHz, Chain a, Temp: Ambient, Voltage: 56 Vdc

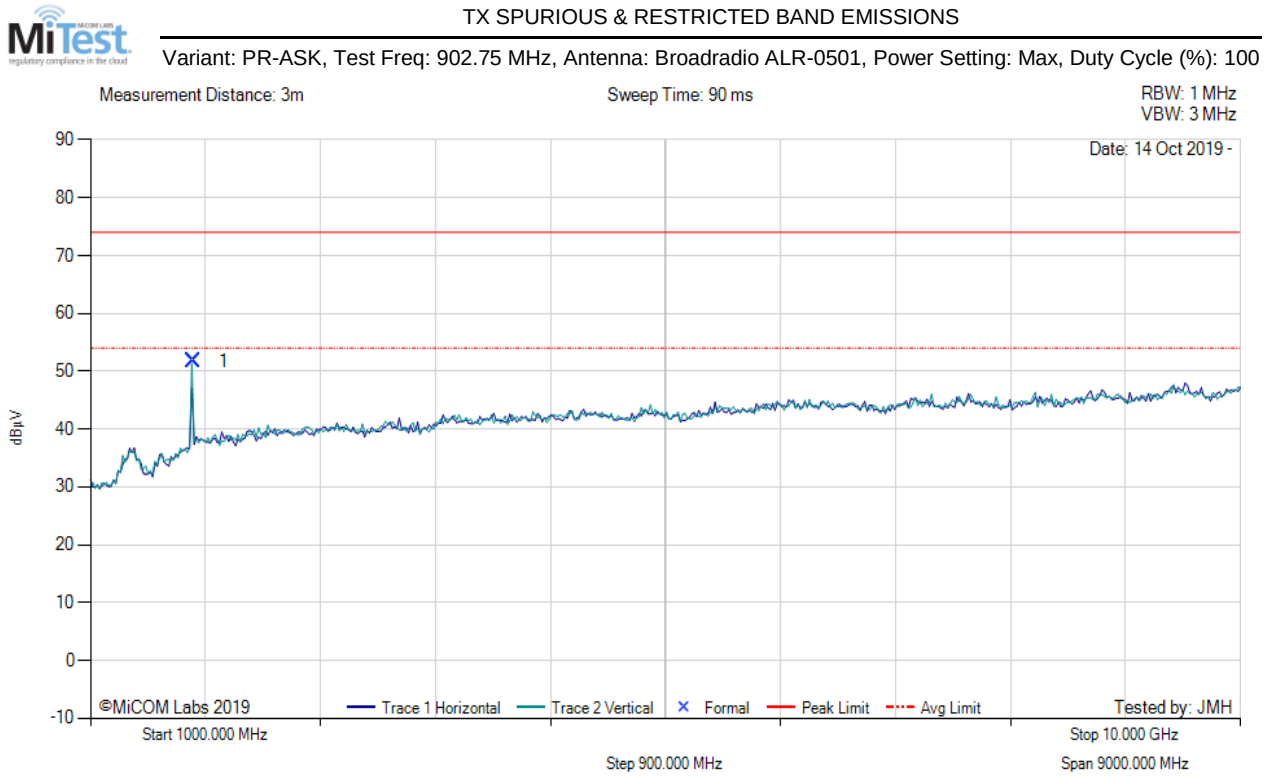


Analyser Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.234 MHz : 26.901 dBm M2 : 927.487 MHz : -1.519 dBm M3 : 928.000 MHz : -42.504 dBm	Channel Frequency: 927.25 MHz

back to matrix

A.5.1.3. Radiated Spurious Emissions

Antenna ALR-0501



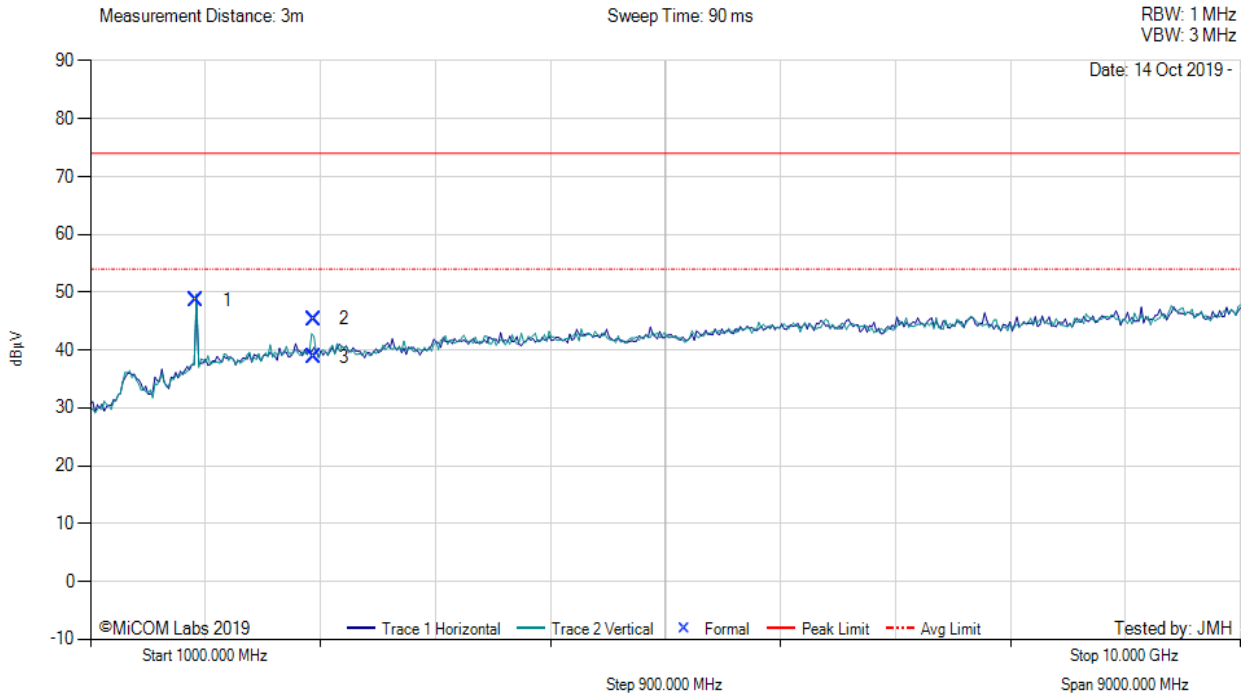
1000.00 - 10000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1805.48	64.49	1.75	-14.50	51.74	Peak (NRB)	Vertical	200	0	--	--	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: PR-ASK, Test Freq: 915.25 MHz, Antenna: Broadradio ALR-0501, Power Setting: Max, Duty Cycle (%): 100



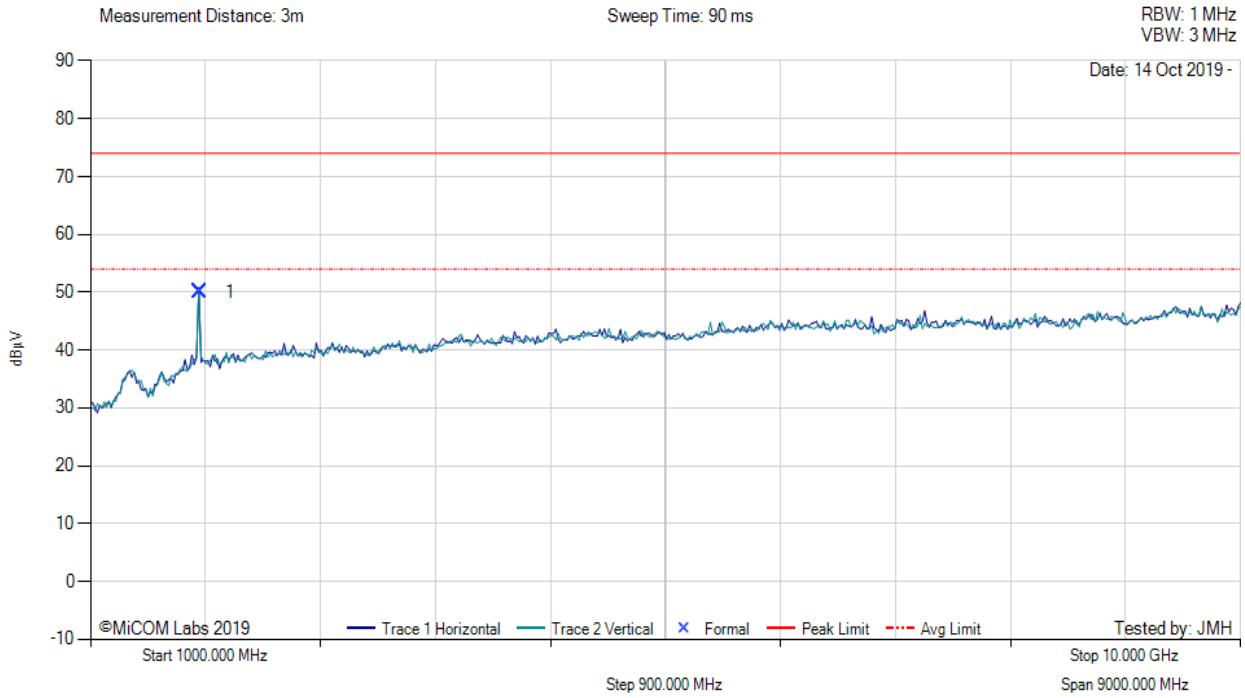
1000.00 - 10000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1830.49	60.93	1.76	-14.14	48.55	Peak (NRB)	Vertical	101	34	--	--	Pass
2	2745.67	55.11	2.16	-11.90	45.37	Max Peak	Vertical	107	207	74.0	-28.6	Pass
3	2745.67	48.60	2.16	-11.90	38.86	Max Avg	Vertical	107	207	54.0	-15.1	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: PR-ASK, Test Freq: 927.25 MHz, Antenna: Broadradio ALR-0501, Power Setting: Max, Duty Cycle (%): 100



1000.00 - 10000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1854.58	62.34	1.77	-14.08	50.03	Peak (NRB)	Vertical	177	0	--	--	Pass

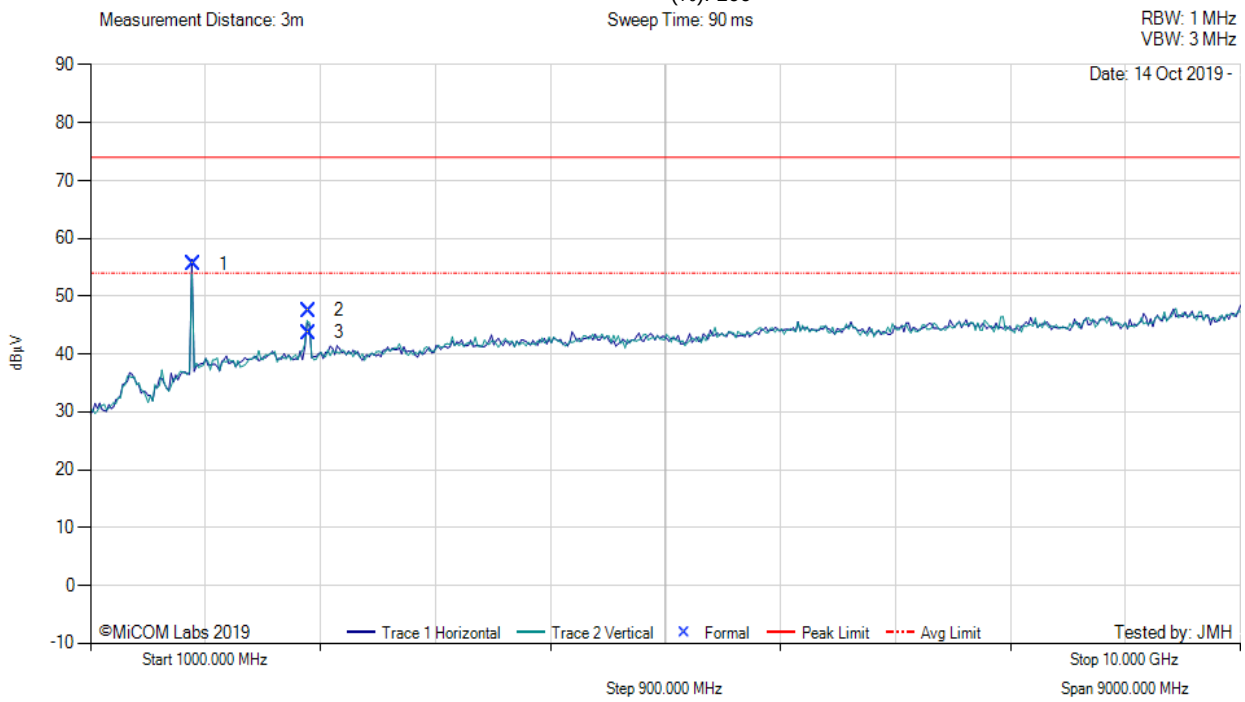
Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

back to matrix

Antenna ALR-8698

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: PR-ASK, Test Freq: 902.75 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100



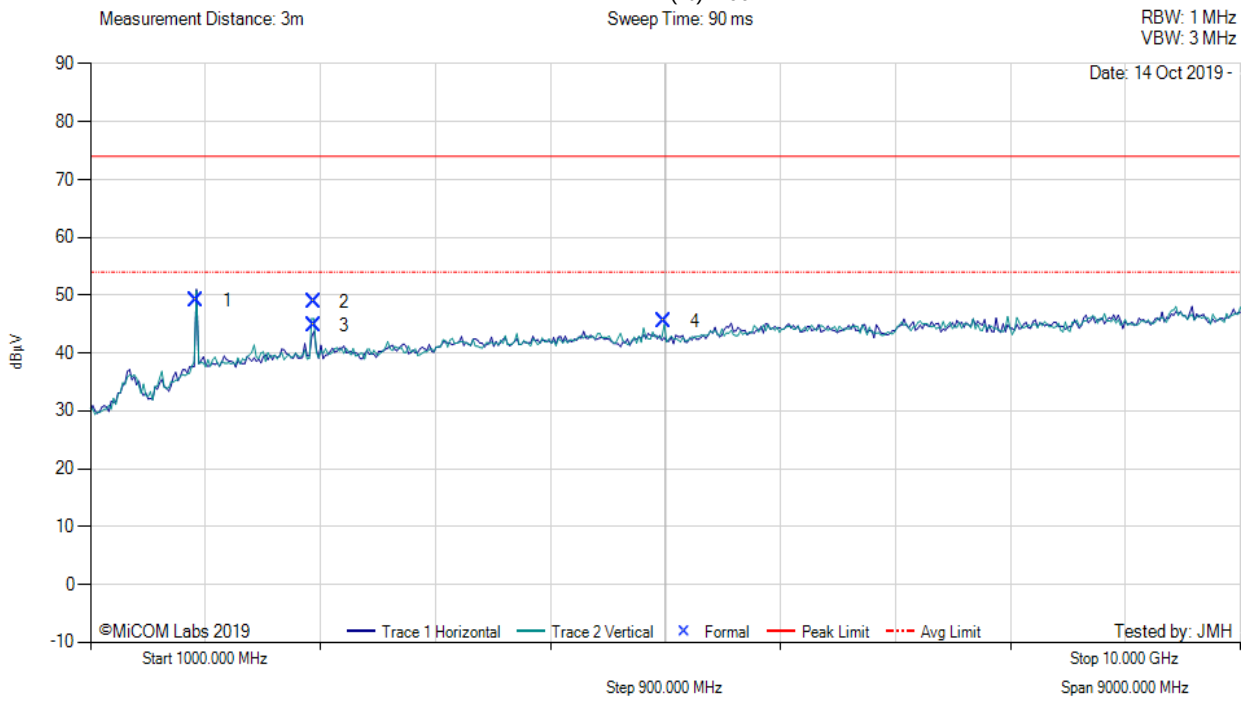
1000.00 - 10000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1805.44	68.25	1.75	-14.50	55.50	Peak (NRB)	Horizontal	100	45	--	--	Pass
2	2708.11	57.51	2.13	-12.15	47.49	Max Peak	Vertical	151	2	74.0	-26.5	Pass
3	2708.11	53.73	2.13	-12.15	43.71	Max Avg	Vertical	151	2	54.0	-10.3	Pass

Test Notes: EUT powered by AC/DC Adapter, antenna connected thru Mux, Controller powered by 12V GPIO

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: PR-ASK, Test Freq: 915.25 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100



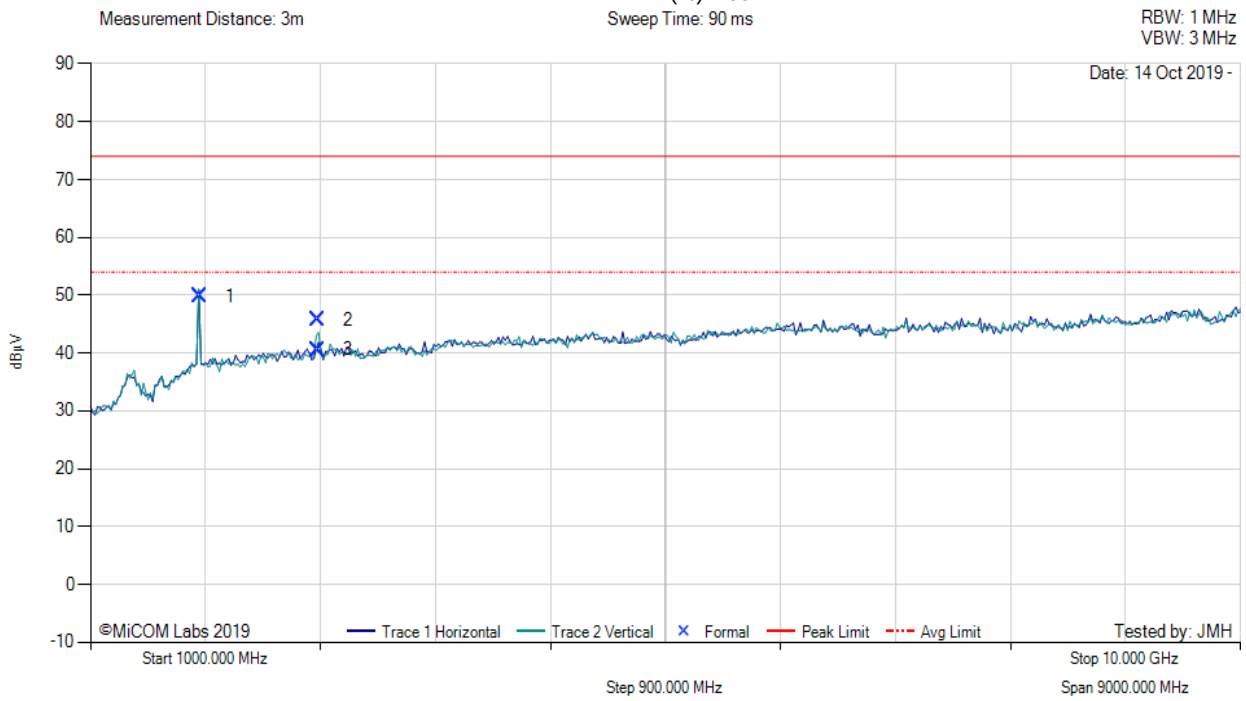
1000.00 - 10000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1830.57	61.50	1.76	-14.14	49.12	Peak (NRB)	Horizontal	100	31	--	--	Pass
2	2745.75	58.63	2.16	-11.90	48.89	Max Peak	Vertical	108	356	74.0	-25.1	Pass
3	2745.75	54.58	2.16	-11.90	44.84	Max Avg	Vertical	108	356	54.0	-9.2	Pass
4	5491.49	54.11	3.12	-11.67	45.56	Peak (NRB)	Vertical	100	31	--	--	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

back to matrix

TX SPURIOUS & RESTRICTED BAND EMISSIONS

Variant: PR-ASK, Test Freq: 927.25 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100



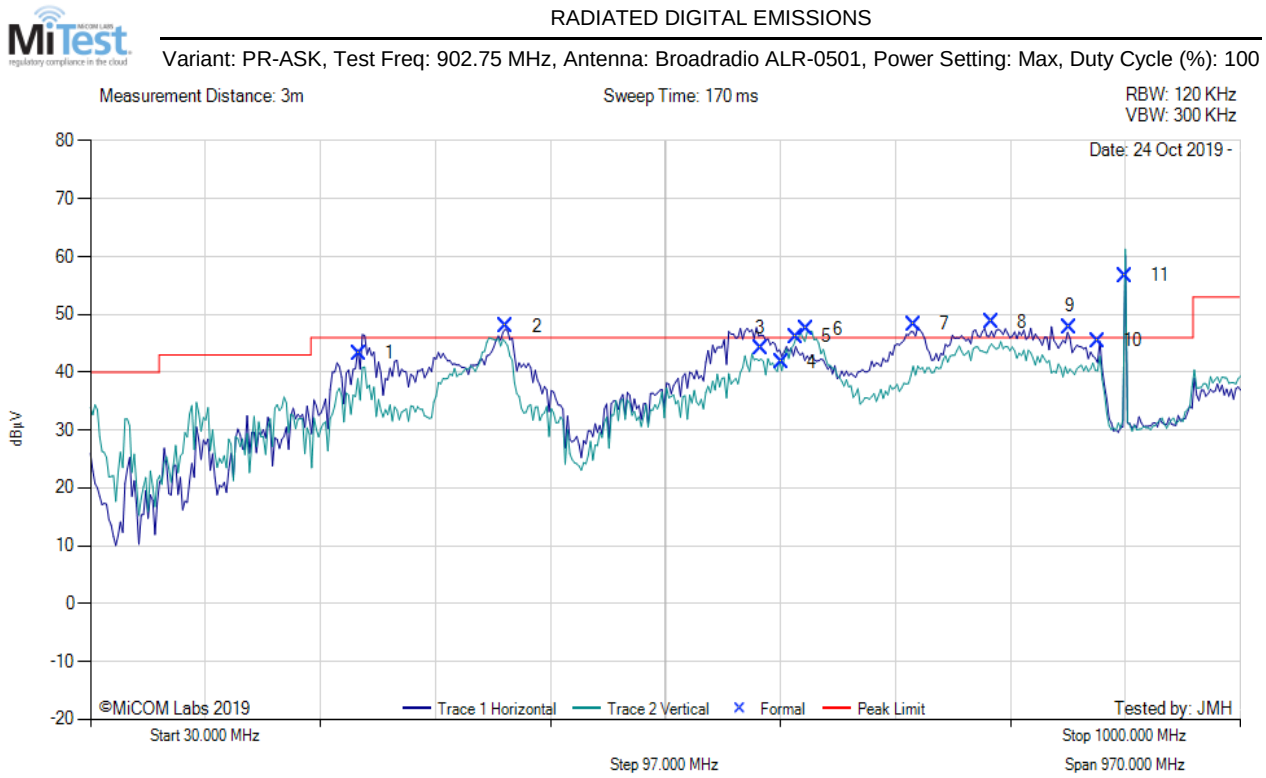
1000.00 - 10000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1854.58	62.17	1.77	-14.08	49.86	Peak (NRB)	Horizontal	151	0	--	--	Pass
2	2781.81	55.52	2.16	-12.01	45.67	Max Peak	Vertical	120	358	74.0	-28.3	Pass
3	2781.81	50.43	2.16	-12.01	40.58	Max Avg	Vertical	120	358	54.0	-13.4	Pass

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V GPIO

back to matrix

A.5.1.4. Radiated Emissions Below 1 Ghz

Antenna ALR-0501



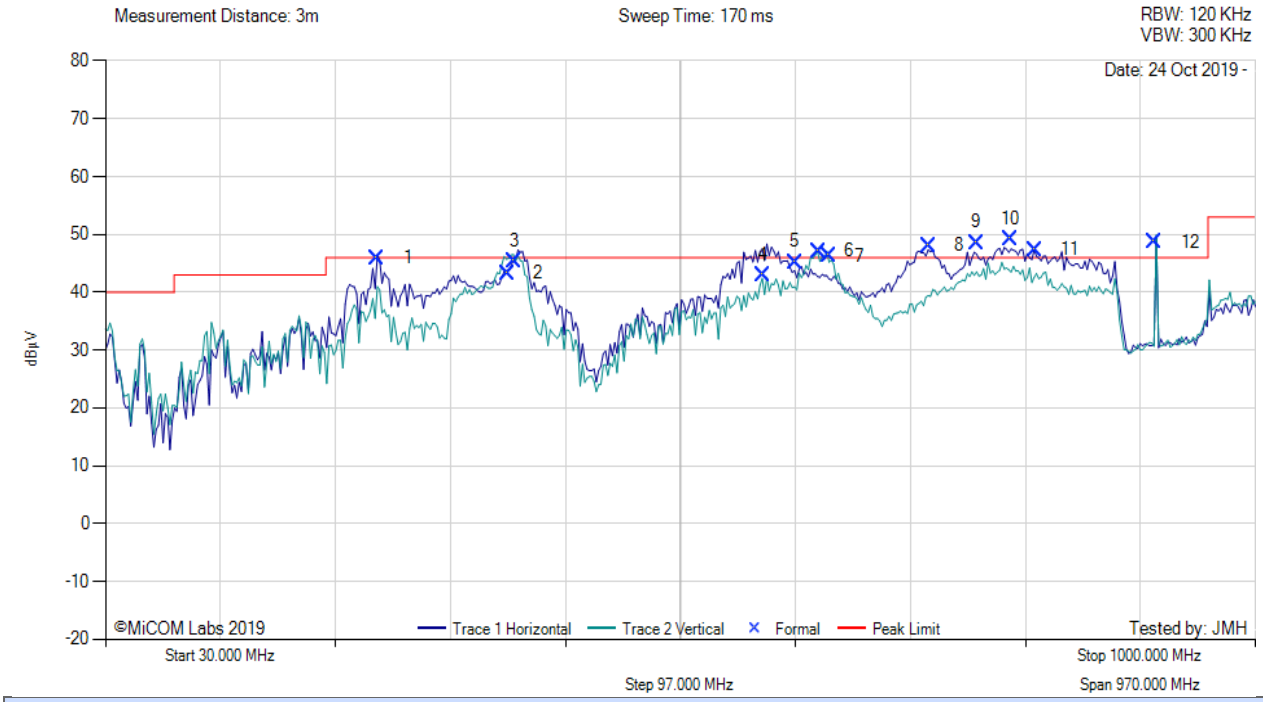
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	256.41	54.58	4.75	-16.04	43.29	MaxQP	Horizontal	105	194	46.0	-2.7	Pass
2	380.81	55.35	5.19	-12.52	48.01	Peak (NRB)	Horizontal	100	15	--	--	Pass
3	595.24	46.95	5.82	-8.64	44.12	Peak (NRB)	Horizontal	100	353	--	--	Pass
4	613.25	44.13	5.82	-8.21	41.74	MaxQP	Vertical	126	223	46.0	-4.3	Pass
5	625.27	48.37	5.82	-8.07	46.12	Peak (NRB)	Vertical	100	360	--	--	Pass
6	634.31	49.21	5.82	-7.52	47.51	Peak (NRB)	Vertical	100	360	--	--	Pass
7	724.27	48.92	6.27	-6.86	48.33	Peak (NRB)	Horizontal	100	177	--	--	Pass
8	790.24	48.13	6.46	-5.98	48.61	Peak (NRB)	Horizontal	100	177	--	--	Pass
9	856.20	46.60	6.64	-5.42	47.82	Peak (NRB)	Horizontal	100	338	--	--	Pass
10	880.02	43.91	6.73	-5.19	45.45	Peak (NRB)	Horizontal	100	338	--	--	Pass
11	902.75	54.88	6.76	-4.93	56.71	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by GPIO. Added Ground. 900 MHz notch in front of amp to prevent overloads. 256 MHz is digital emissions

back to matrix

RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 915.25 MHz, Antenna: Broadradio ALR-0501, Power Setting: Max, Duty Cycle (%): 100



30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	259.40	56.85	4.76	-15.73	45.88	MaxQP	Horizontal	99	191	46.0	-0.1	Pass
2	368.80	50.75	5.15	-12.58	43.32	Peak (NRB)	Vertical	100	303	--	--	Pass
3	374.80	52.77	5.17	-12.65	45.29	Peak (NRB)	Horizontal	100	203	--	--	Pass
4	584.71	45.74	5.82	-8.70	42.86	Peak (NRB)	Horizontal	100	346	--	--	Pass
5	611.71	47.67	5.82	-8.25	45.24	MaxQP	Horizontal	132	130	46.0	-0.8	Pass
6	631.19	49.00	5.82	-7.69	47.13	Peak (NRB)	Vertical	100	203	--	--	Pass
7	640.30	48.14	5.82	-7.66	46.30	Peak (NRB)	Vertical	100	203	--	--	Pass
8	724.28	48.62	6.27	-6.86	48.03	Peak (NRB)	Horizontal	100	1	--	--	Pass
9	764.56	48.43	6.39	-6.29	48.53	Peak (NRB)	Horizontal	100	1	--	--	Pass
10	793.29	48.61	6.46	-5.98	49.09	Peak (NRB)	Horizontal	100	1	--	--	Pass
11	814.43	46.35	6.52	-5.54	47.33	Peak (NRB)	Horizontal	100	1	--	--	Pass
12	915.25	46.58	6.80	-4.66	48.73	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by GPIO. Added Ground. 900 MHz notch in front of amp to prevent overloads. 259 MHz is digital emissions

back to matrix

RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 927.25 MHz, Antenna: Broadradio ALR-0501, Power Setting: Max, Duty Cycle (%): 100

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	259.39	56.74	4.76	-15.73	45.77	MaxQP	Horizontal	98	184	46.0	-0.2	Pass
2	377.83	54.13	5.18	-12.55	46.76	Peak (NRB)	Vertical	100	253	--	--	Pass
3	385.35	53.90	5.21	-12.57	46.53	Peak (NRB)	Horizontal	100	278	--	--	Pass
4	595.31	46.99	5.82	-8.64	44.17	Peak (NRB)	Horizontal	100	5	--	--	Pass
5	611.73	48.11	5.82	-8.25	45.68	MaxQP	Horizontal	131	114	46.0	-0.3	Pass
6	721.01	47.43	6.25	-6.90	46.78	Peak (NRB)	Horizontal	100	205	--	--	Pass
7	787.07	46.15	6.45	-5.99	46.61	Peak (NRB)	Horizontal	100	205	--	--	Pass
8	833.64	45.25	6.58	-5.37	46.45	Peak (NRB)	Horizontal	100	346	--	--	Pass
9	927.26	54.11	6.82	-4.58	56.35	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by GPIO. Added Ground. 900 MHz notch in front of amp to prevent overloads. 259 MHz is digital emissions

back to matrix

RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 902.75 MHz, Antenna: Broadradio ALR-0501, Power Setting: Max, Duty Cycle (%): 100

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	59.98	61.95	3.80	-20.97	44.77	Peak (NRB)	Vertical	100	216	--	--	Pass
2	133.45	51.10	4.23	-14.82	40.51	MaxQP	Vertical	100	276	43.0	-2.5	Pass
3	155.93	49.01	4.34	-16.02	37.33	Peak (NRB)	Vertical	100	182	--	--	Pass
4	166.48	46.71	4.39	-16.34	34.76	MaxQP	Vertical	98	276	43.0	-8.2	Pass
5	196.42	57.15	4.52	-15.84	45.83	Peak (NRB)	Vertical	100	182	--	--	Pass
6	202.43	53.61	4.54	-15.77	42.39	Peak (NRB)	Horizontal	100	182	--	--	Pass
7	235.42	67.22	4.67	-16.38	55.51	Peak (NRB)	Horizontal	100	216	--	--	Pass
8	242.89	64.57	4.71	-16.20	53.08	Digital	Horizontal	128	200	46.0	--	--
9	515.82	52.17	5.64	-9.99	47.83	Peak (NRB)	Horizontal	100	182	--	--	Pass
10	595.21	46.59	5.82	-8.64	43.77	Peak (NRB)	Vertical	100	182	--	--	Pass
11	611.72	46.47	5.82	-8.25	44.04	MaxQP	Horizontal	101	216	46.0	-2.0	Pass
12	664.25	53.77	5.82	-7.58	52.00	Peak (NRB)	Horizontal	100	182	--	--	Pass
13	667.19	50.49	5.82	-7.58	48.73	Peak (NRB)	Horizontal	100	216	--	--	Pass
14	713.66	49.59	6.24	-7.00	48.82	Peak (NRB)	Horizontal	100	182	--	--	Pass
15	773.67	42.41	6.41	-6.24	42.58	Peak (NRB)	Horizontal	100	182	--	--	Pass
18	902.76	49.31	6.76	-4.93	51.14	Fundamental	Horizontal	100	268	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB, 242 MHz signal is digital

RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 915.25 MHz, Antenna: Broadradio ALR-0501, Power Setting: Max, Duty Cycle (%): 100

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	59.99	61.79	3.80	-20.97	44.62	Peak (NRB)	Vertical	100	216	--	--	Pass
2	133.45	50.90	4.23	-14.82	40.31	MaxQP	Vertical	100	281	43.0	-2.7	Pass
3	155.94	54.10	4.34	-16.02	42.43	Peak (NRB)	Vertical	100	141	--	--	Pass
4	166.42	50.27	4.39	-16.34	38.32	MaxQP	Vertical	100	284	43.0	-4.7	Pass
5	196.40	54.06	4.52	-15.84	42.74	Peak (NRB)	Vertical	100	305	--	--	Pass
6	209.89	58.18	4.56	-17.31	45.43	Peak (NRB)	Horizontal	100	286	--	--	Pass
7	235.38	67.02	4.67	-16.38	55.31	Peak (NRB)	Horizontal	100	216	--	--	Pass
8	242.88	65.06	4.71	-16.20	53.57	Digital	Horizontal	122	203	46.0	--	--
9	509.65	48.83	5.61	-10.00	44.44	Peak (NRB)	Horizontal	100	305	--	--	Pass
10	595.21	52.04	5.82	-8.64	49.22	Peak (NRB)	Vertical	100	164	--	--	Pass
11	668.74	50.16	5.82	-7.58	48.39	Peak (NRB)	Horizontal	100	216	--	--	Pass
12	784.17	48.86	6.44	-6.04	49.26	Peak (NRB)	Horizontal	100	264	--	--	Pass
13	915.26	42.95	6.80	-4.66	45.10	Fundamental	Vertical	100	286	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

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RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 927.25 MHz, Antenna: Broadradio ALR-0501, Power Setting: Max, Duty Cycle (%): 100

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	59.97	62.91	3.80	-20.97	45.74	Peak (NRB)	Vertical	100	270	--	--	Pass
2	133.44	51.72	4.23	-14.82	41.13	MaxQP	Vertical	98	274	43.0	-1.9	Pass
3	202.40	58.11	4.54	-15.77	46.89	Peak (NRB)	Horizontal	100	270	--	--	Pass
4	206.90	57.50	4.55	-17.17	44.88	Peak (NRB)	Horizontal	100	0	--	--	Pass
5	236.85	60.69	4.68	-16.28	49.09	Peak (NRB)	Horizontal	100	84	--	--	Pass
6	242.90	65.13	4.71	-16.20	53.64	Digital	Horizontal	119	199	46.0	--	
7	509.77	50.46	5.61	-10.00	46.07	Peak (NRB)	Horizontal	100	270	--	--	Pass
8	598.22	50.12	5.82	-8.55	47.39	Peak (NRB)	Horizontal	100	270	--	--	Pass
9	668.71	53.24	5.82	-7.58	51.47	Peak (NRB)	Horizontal	100	172	--	--	Pass
10	691.24	48.37	6.17	-7.37	47.17	Peak (NRB)	Horizontal	100	270	--	--	Pass
11	787.09	47.62	6.45	-5.99	48.08	Peak (NRB)	Horizontal	100	270	--	--	Pass
12	927.26	51.93	6.82	-4.58	54.17	Fundamental	Horizontal	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

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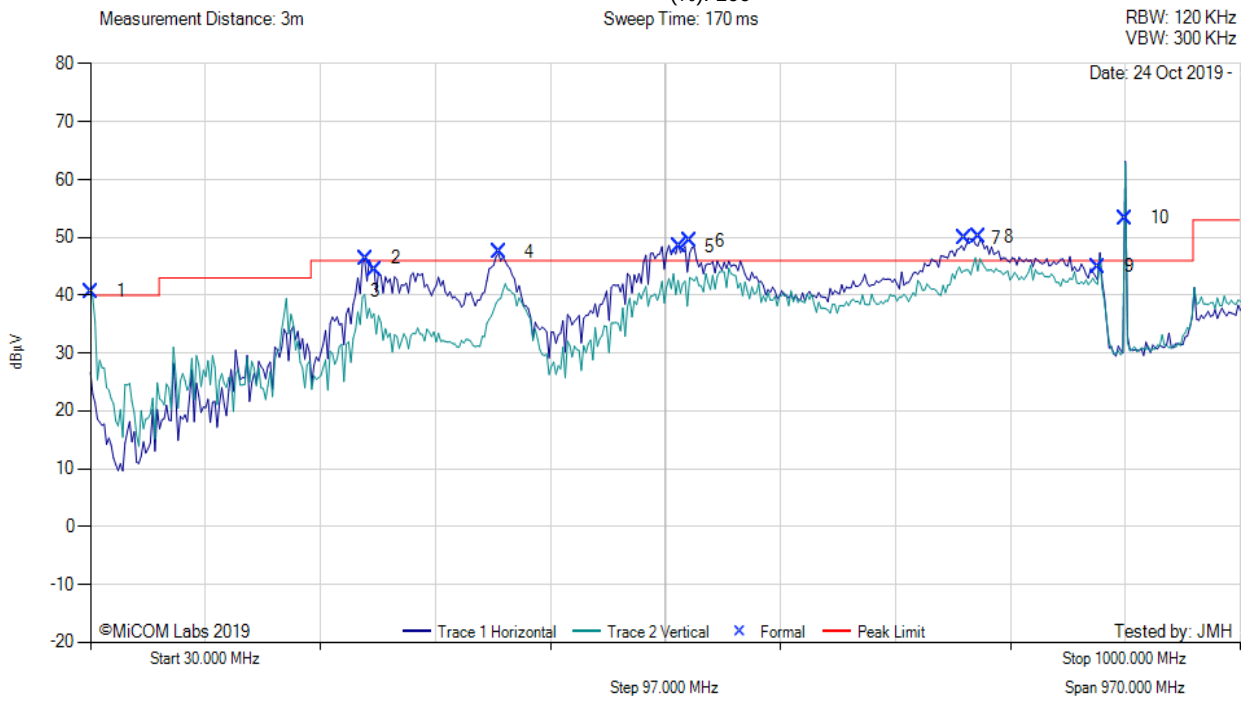
Antenna ALR-8698

RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 902.75 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100



30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	30.00	44.32	3.52	-7.20	40.64	Peak (NRB)	Vertical	100	0	--	--	Pass
2	262.38	56.95	4.77	-15.35	46.37	MaxQP	Horizontal	126	153	46.0	--	--
3	269.88	54.26	4.80	-14.73	44.33	MaxQP	Horizontal	106	157	46.0	-1.7	Pass
4	374.83	55.00	5.17	-12.65	47.52	Peak (NRB)	Horizontal	100	16	--	--	Pass
5	526.26	52.33	5.66	-9.56	48.43	Peak (NRB)	Horizontal	100	16	--	--	Pass
6	535.23	53.01	5.69	-9.34	49.36	Peak (NRB)	Horizontal	100	16	--	--	Pass
7	767.68	49.68	6.40	-6.25	49.83	Peak (NRB)	Horizontal	100	355	--	--	Pass
8	779.46	49.76	6.43	-6.09	50.10	Peak (NRB)	Horizontal	100	355	--	--	Pass
9	880.18	43.38	6.73	-5.19	44.92	Peak (NRB)	Horizontal	100	355	--	--	Pass
10	902.76	51.55	6.76	-4.93	53.38	Fundamental	Horizontal	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connnected thru Mux to antenna. Controller powered by 12V Added Ground. 900 MHz notch in front of amp to prevent overloads. 262 and 269 are digital emissions

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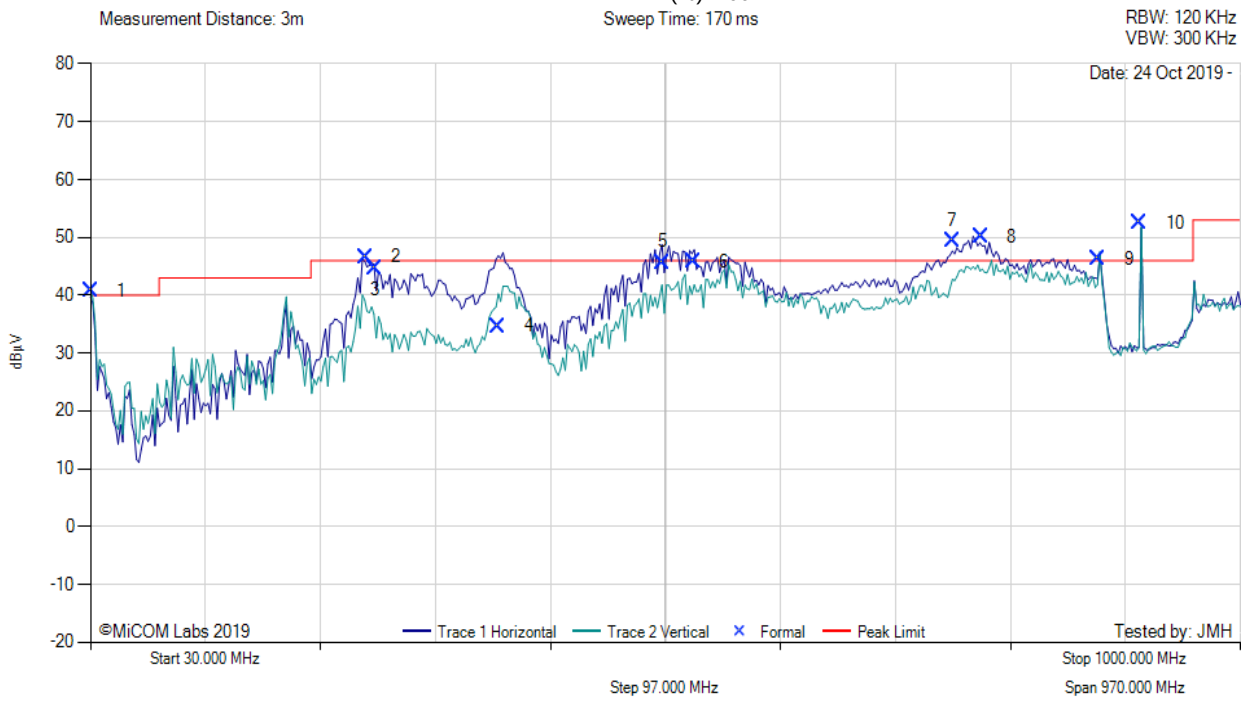
RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 915.25 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100



30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	30.00	44.47	3.52	-7.20	40.79	Peak (NRB)	Vertical	100	0	--	--	Pass
2	262.37	57.21	4.77	-15.35	46.63	Digital	Horizontal	120	163	46.0	--	--
3	269.89	54.49	4.80	-14.73	44.56	MaxQP	Horizontal	112	158	46.0	-1.4	Pass
4	374.07	42.17	5.17	-12.65	34.69	Peak (NRB)	Horizontal	100	359	--	--	Pass
5	512.74	50.03	5.62	-10.01	45.64	Peak (NRB)	Horizontal	100	359	--	--	Pass
6	538.25	49.41	5.70	-9.36	45.75	Peak (NRB)	Horizontal	100	359	--	--	Pass
7	757.04	49.44	6.36	-6.41	49.39	Peak (NRB)	Horizontal	100	10	--	--	Pass
8	781.11	49.65	6.44	-6.02	50.07	Peak (NRB)	Horizontal	100	10	--	--	Pass
9	880.26	44.69	6.73	-5.19	46.23	Peak (NRB)	Horizontal	100	10	--	--	Pass
10	915.25	50.30	6.80	-4.66	52.45	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 12V. Added Ground. 900 MHz notch in front of amp to prevent overloads. 262 and 269 MHz are digital emissions

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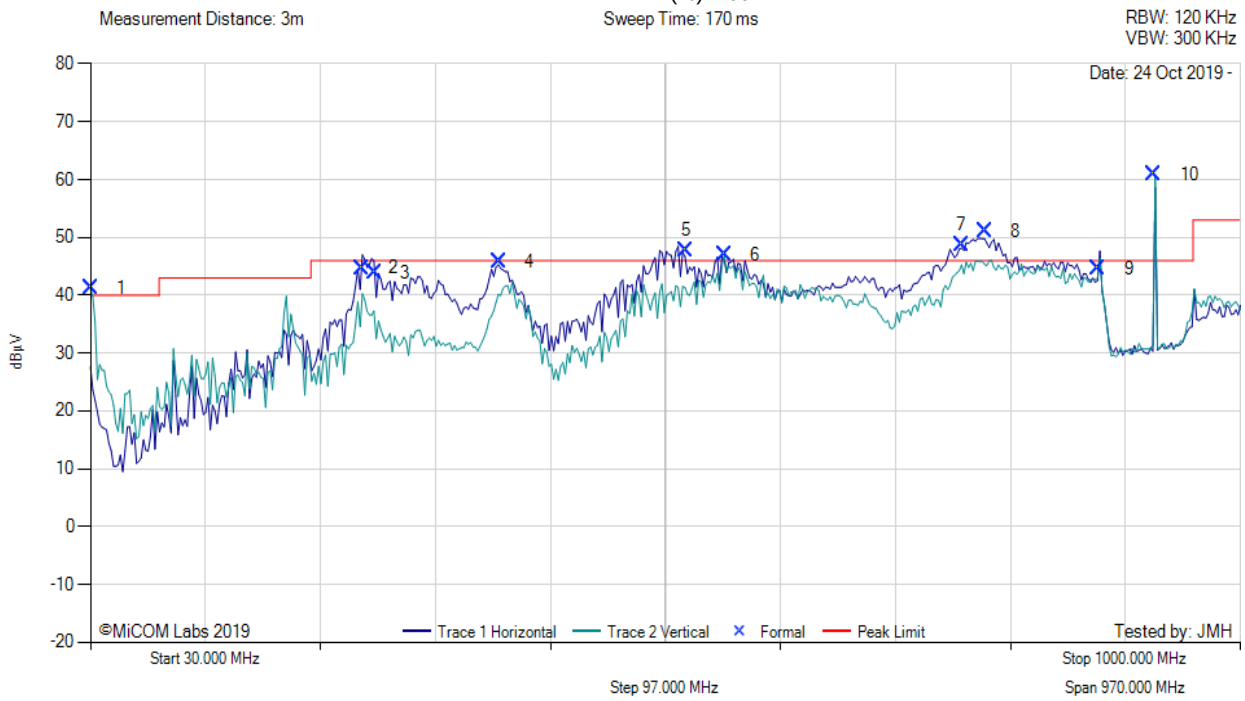
RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 927.25 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100



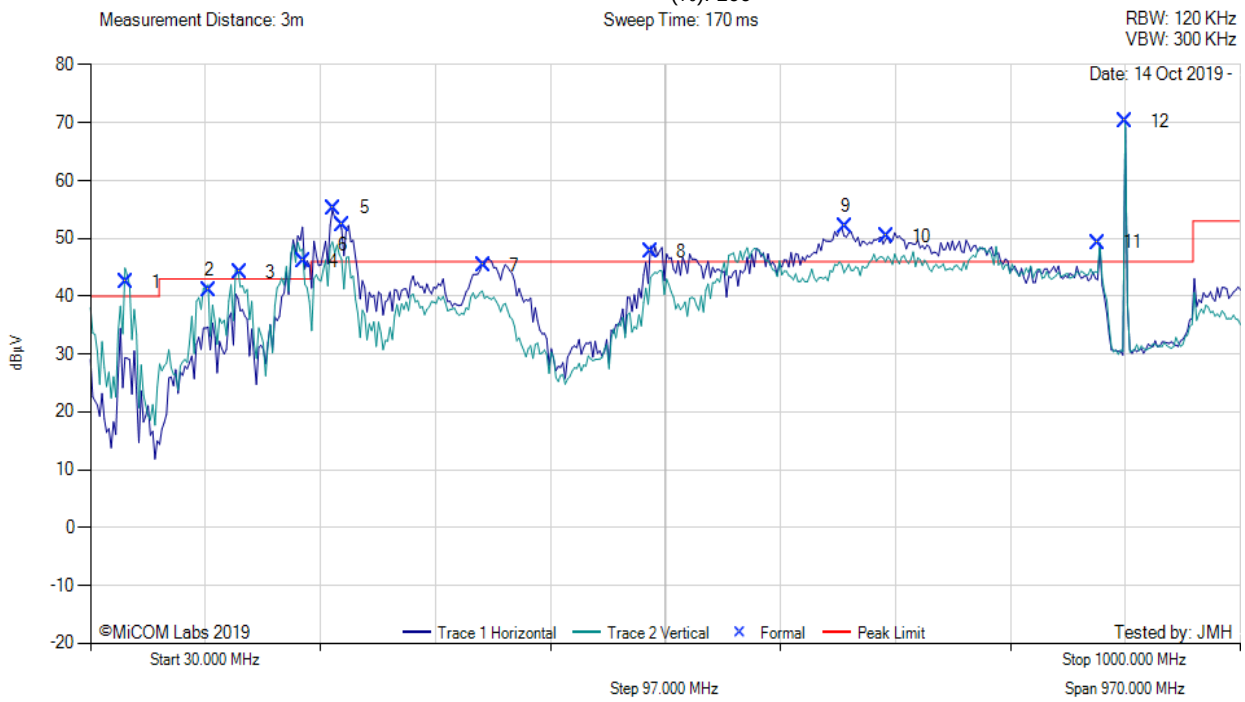
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	30.00	44.89	3.52	-7.20	41.21	Peak (NRB)	Vertical	100	360	--	--	Pass
2	259.43	55.70	4.76	-15.73	44.73	MaxQP	Horizontal	129	276	46.0	-1.3	Pass
3	269.91	53.81	4.80	-14.73	43.88	MaxQP	Horizontal	101	146	46.0	-2.1	Pass
4	374.90	53.35	5.17	-12.65	45.87	Peak (NRB)	Horizontal	100	360	--	--	Pass
5	532.25	51.49	5.68	-9.41	47.76	Peak (NRB)	Horizontal	100	360	--	--	Pass
6	565.22	50.08	5.79	-8.88	46.99	Peak (NRB)	Horizontal	100	145	--	--	Pass
7	764.79	48.51	6.39	-6.29	48.61	Peak (NRB)	Horizontal	100	357	--	--	Pass
8	784.23	50.73	6.44	-6.04	51.13	Peak (NRB)	Horizontal	100	357	--	--	Pass
9	880.10	43.08	6.73	-5.19	44.62	Peak (NRB)	Horizontal	100	256	--	--	Pass
10	927.26	58.65	6.82	-4.58	60.89	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connnected thru Mux to antenna. Controller powered by 12V Added Ground. 900 MHz notch in front of amp to prevent overloads. 259 and 269 MHz are digital emissions

back to matrix

RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 902.75 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100



30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	59.98	59.65	3.80	-20.97	42.48	Peak (NRB)	Vertical	100	193	--	--	Pass
2	130.46	51.46	4.21	-14.63	41.04	MaxQP	Vertical	101	154	43.0	-2.0	Pass
3	155.95	55.78	4.34	-16.02	44.11	Peak (NRB)	Vertical	100	158	--	--	Pass
4	209.87	58.75	4.56	-17.31	46.00	Peak (NRB)	Horizontal	100	140	--	--	Pass
5	235.41	66.99	4.67	-16.38	55.28	Peak (NRB)	Horizontal	100	193	--	--	Pass
6	242.89	63.83	4.71	-16.20	52.34	MaxQP	Horizontal	127	196	46.0	--	--
7	361.32	52.92	5.12	-12.69	45.34	Peak (NRB)	Horizontal	100	158	--	--	Pass
8	502.30	52.10	5.59	-9.99	47.70	Peak (NRB)	Horizontal	100	158	--	--	Pass
9	667.13	53.79	5.82	-7.58	52.02	Peak (NRB)	Horizontal	100	193	--	--	Pass
10	701.64	51.33	6.20	-7.23	50.30	Peak (NRB)	Horizontal	100	158	--	--	Pass
11	880.00	47.76	6.73	-5.19	49.30	Peak (NRB)	Vertical	100	360	--	--	Pass
12	902.76	68.45	6.76	-4.93	70.28	Fundamental	Vertical	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

back to matrix

RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 915.25 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	59.99	59.43	3.80	-20.97	42.26	Peak (NRB)	Vertical	100	192	--	--	Pass
2	130.44	52.69	4.21	-14.63	42.27	MaxQP	Vertical	98	141	43.0	-0.7	Pass
3	155.94	56.24	4.34	-16.02	44.56	Peak (NRB)	Vertical	100	159	--	--	Pass
4	196.41	57.51	4.52	-15.84	46.19	Peak (NRB)	Vertical	100	159	--	--	Pass
5	209.90	60.05	4.56	-17.31	47.30	Peak (NRB)	Horizontal	100	135	--	--	Pass
6	235.40	66.60	4.67	-16.38	54.89	Peak (NRB)	Horizontal	100	192	--	--	Pass
7	242.90	63.51	4.71	-16.20	52.02	MaxQP	Horizontal	118	192	46.0	--	--
8	512.70	53.91	5.62	-10.01	49.52	Peak (NRB)	Horizontal	100	179	--	--	Pass
9	584.75	49.64	5.82	-8.70	46.76	Peak (NRB)	Vertical	100	179	--	--	Pass
10	671.70	53.31	5.82	-7.59	51.54	Peak (NRB)	Horizontal	100	192	--	--	Pass
11	710.79	50.45	6.23	-7.14	49.54	Peak (NRB)	Horizontal	100	179	--	--	Pass
12	880.03	48.02	6.73	-5.19	49.56	Peak (NRB)	Vertical	100	0	--	--	Pass
13	915.26	46.34	6.80	-4.66	48.48	Fundamental	Horizontal	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

back to matrix

RADIATED DIGITAL EMISSIONS

Variant: PR-ASK, Test Freq: 927.25 MHz, Antenna: Alien Technology ALR-8698, Power Setting: Max, Duty Cycle (%): 100

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	61.48	59.60	3.81	-20.98	42.43	Peak (NRB)	Vertical	100	188	--	--	Pass
2	130.48	50.24	4.21	-14.63	39.82	MaxQP	Vertical	100	142	43.0	-3.2	Pass
3	155.90	52.13	4.34	-16.02	40.46	Peak (NRB)	Vertical	100	192	--	--	Pass
4	196.42	57.17	4.52	-15.84	45.85	Peak (NRB)	Vertical	100	192	--	--	Pass
5	209.87	59.71	4.56	-17.31	46.96	Peak (NRB)	Horizontal	100	129	--	--	Pass
6	236.88	66.40	4.68	-16.28	54.80	Peak (NRB)	Horizontal	100	188	--	--	Pass
7	242.91	58.35	4.71	-16.20	46.86	MaxQP	Vertical	137	231	46.0	--	--
8	364.33	54.19	5.13	-12.59	46.73	Peak (NRB)	Horizontal	100	103	--	--	Pass
9	506.77	51.35	5.60	-9.99	46.96	Peak (NRB)	Horizontal	100	169	--	--	Pass
10	595.28	51.50	5.82	-8.64	48.68	Peak (NRB)	Horizontal	100	253	--	--	Pass
11	664.12	53.96	5.82	-7.58	52.20	Peak (NRB)	Horizontal	100	188	--	--	Pass
12	784.00	47.96	6.44	-6.04	48.36	Peak (NRB)	Horizontal	100	163	--	--	Pass
13	880.04	45.98	6.73	-5.19	47.52	Peak (NRB)	Vertical	100	349	--	--	Pass
14	927.25	56.47	6.82	-4.58	58.71	Fundamental	Horizontal	100	0	--	--	

Test Notes: EUT powered by AC/DC PS, connnected thru Mux to antenna. Controller powered by 5V USB. 242 MHz is digital emission

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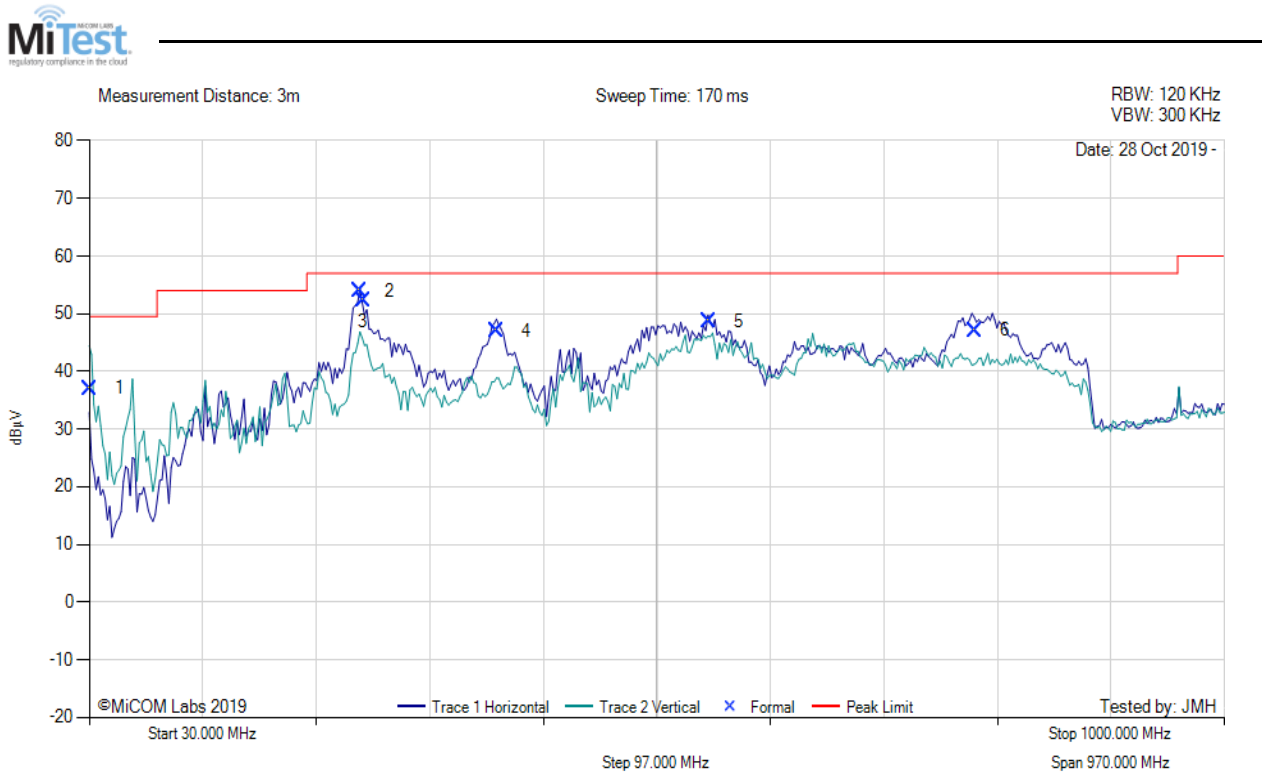
A.5.2. Digital Emissions (0.03 - 1 GHz)



30.00 - 1000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.00	40.72	3.52	-7.20	37.04	MaxQP	Horizontal	106	85	49.5	-12.5	Pass
2	260.90	64.84	4.76	-15.63	53.97	MaxQP	Horizontal	126	145	57.0	-3.0	Pass
3	263.90	62.69	4.78	-15.27	52.20	MaxQP	Horizontal	117	146	57.0	-4.8	Pass
4	377.86	54.41	5.18	-12.55	47.04	MaxQP	Horizontal	101	168	57.0	-10.0	Pass
5	559.24	52.08	5.76	-9.15	48.69	MaxQP	Horizontal	127	122	57.0	-8.3	Pass
6	787.04	46.65	6.45	-6.00	47.10	MaxQP	Horizontal	101	202	57.0	-9.9	Pass

Test Notes: EUT Powered by 12V AC/DC PS. Connected to 4 muxes. all ports connected and term.

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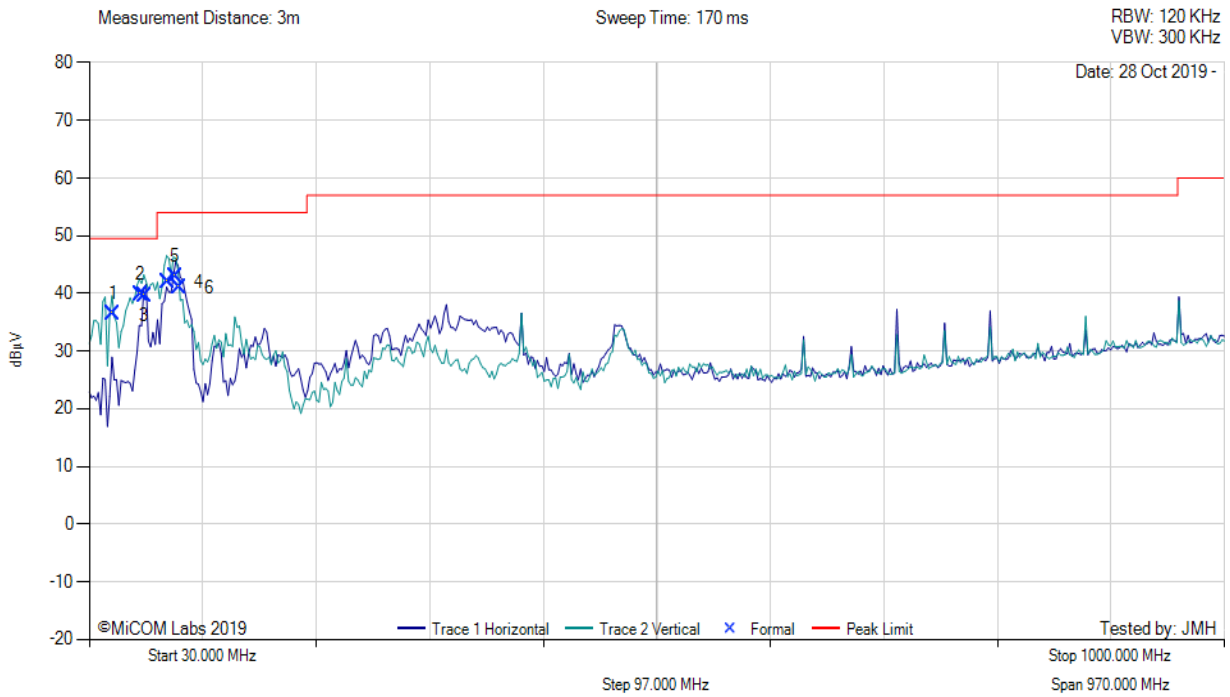

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	50.47	53.51	3.73	-20.71	36.53	MaxQP	Vertical	101	271	50.0	-13.5	Pass
2	73.99	56.44	3.91	-20.47	39.88	MaxQP	Vertical	135	210	50.0	-10.1	Pass
3	77.21	56.39	3.93	-20.63	39.69	MaxQP	Vertical	139	93	50.0	-10.3	Pass
4	97.60	57.01	4.04	-19.09	41.96	MaxQP	Vertical	108	106	50.0	-8.0	Pass
5	103.30	55.99	4.07	-17.18	42.88	MaxQP	Vertical	113	105	50.0	-7.1	Pass
6	106.77	53.38	4.09	-16.45	41.02	MaxQP	Horizontal	185	0	50.0	-9.0	Pass

Test Notes: EUT Powered by Poe. Connected to 4 muxes. all ports connected and term.

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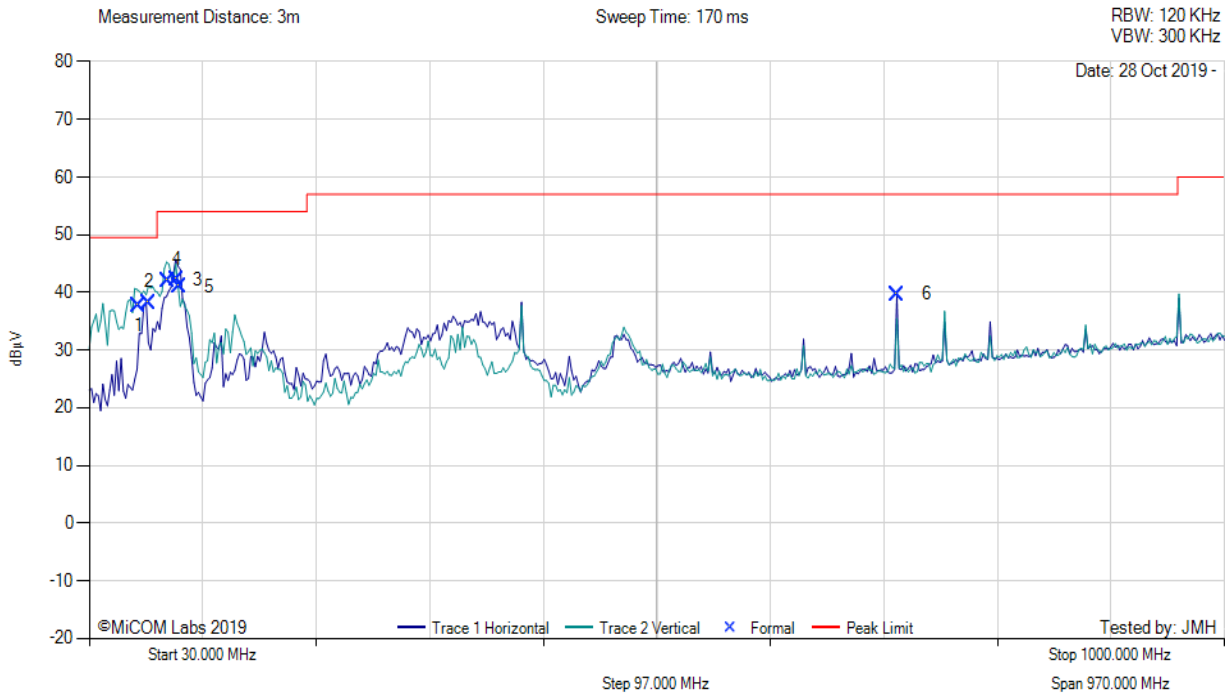
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	72.45	54.40	3.90	-20.49	37.81	MaxQP	Vertical	105	180	49.5	-11.7	Pass
2	81.16	55.23	3.95	-20.89	38.29	MaxQP	Vertical	117	204	49.5	-11.2	Pass
3	97.40	57.11	4.04	-19.09	42.06	MaxQP	Vertical	115	145	54.0	-11.9	Pass
4	104.68	54.83	4.08	-16.77	42.14	MaxQP	Horizontal	184	26	54.0	-11.9	Pass
5	106.70	53.40	4.09	-16.45	41.04	MaxQP	Horizontal	186	201	54.0	-13.0	Pass
6	720.00	40.29	6.25	-6.88	39.66	MaxQP	Horizontal	101	228	57.0	-17.3	Pass

Test Notes: EUT Powered by 12V AC/DC PS and 24V Ext PS on Controller. Connected to 4 muxes. all ports connected and term. Device is used in class A environment

back to matrix



30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	72.45	54.40	3.90	-20.49	37.81	MaxQP	Vertical	105	180	49.5	-11.7	Pass
2	81.16	55.23	3.95	-20.89	38.29	MaxQP	Vertical	117	204	49.5	-11.2	Pass
3	97.40	57.11	4.04	-19.09	42.06	MaxQP	Vertical	115	145	54.0	-11.9	Pass
4	104.68	54.83	4.08	-16.77	42.14	MaxQP	Horizontal	184	26	54.0	-11.9	Pass
5	106.70	53.40	4.09	-16.45	41.04	MaxQP	Horizontal	186	201	54.0	-13.0	Pass
6	720.00	40.29	6.25	-6.88	39.66	MaxQP	Horizontal	101	228	57.0	-17.3	Pass

Test Notes: EUT Powered by Poe and 24V Ext PS on Controller. Connected to 4 muxes. all ports connected and term. Device is used in class A environment

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575 Boulder Court
Pleasanton, California 94566, USA
Tel: +1 (925) 462 0304
Fax: +1 (925) 462 0306
www.micomlabs.com