



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Silent Tech Holdings Pty Ltd

Model: RFM22B

Description: Radio Transceiver Module

FCC ID: 2AFM2-XK420

IC: 20657-XK420

Serial Number: N/A

To

FCC Part 15.247 FHSS

Date of Issue: September 22, 2015

On the behalf of the applicant:

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Attention of:

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Alex Macon
Project Test Engineer

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All results contained herein relate only to the sample tested.



Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	July 20, 2015	Alex Macon	Original Document
2.0	September 22, 2015	Alex Macon	Updated test summary table to include 15.203



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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted in the table below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A



The applicant has been cautioned as to the following

15.21 - Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) - Special Accessories

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.



Standard Test Conditions and Engineering Practices

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2 and the following individual Parts: 15.247 Operation within bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-2009, ANSI C63.10-2009, FCC DA 00-705, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10 to 40C (50 to 104F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temperature (°C)	Humidity (%)	Pressure (mbar)
24.5 – 25.3	32.4 – 48.6	960.1 – 970.1

Measurement results, unless otherwise noted, are worst case measurements.

EUT Description

Model: RFM22B

Description: Radio Transceiver Module

Serial Number: N/A

Additional Information:

The EUT is a Wetness Sensor to be used in a Remote Control Leak Detection System which incorporates a 900 MHz radio with an integral antenna.

EUT Operation during Tests

Two external screws were bridged at the base of the pcb, which simulated wetness and caused the unit to transmit.

15.203: Antenna Requirement:

- The antenna is permanently attached to the EUT
- The antenna uses a unique coupling
- The EUT must be professionally installed
- The antenna requirement does not apply



Accessories: None

Cables: None

Modifications: None



Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.203	Antenna Requirement	Pass	
15.247(b)	Peak Output Power	Pass	
15.247(d)	Conducted Spurious Emissions	N/A	Device incorporates an integral antenna.
15.247(d), 15.209(a), 15.205	Radiated Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Emissions At Band Edges	Pass	
15.247(a)	Occupied Bandwidth	Pass	
15.247(a)	Channel Separation	Pass	
15.247(a)	Dwell Time	Pass	
15.247(a)	Number of Hopping Channels	Pass	
15.207	A/C Powerline Conducted Emissions	N/A	EUT is a DC powered device.
15.215 RSS-210	99% Occupied Bandwidth	Pass	



Peak Output Power

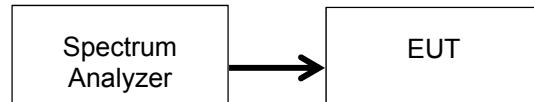
Engineer: Alex Macon

Test Date: 5/19/15

Test Procedure

The EUT was connected directly to a spectrum analyzer. A spectrum analyzer was used to verify that the EUT met the requirements.

Test Setup



Transmitter Peak Output Power

Tuned Frequency (MHz)	Recorded Measurement	Specification Limit	Result
916.9	27.7 mW	1 W	Pass
915.5	29.0 mW	1 W	Pass



Radiated Spurious Emissions

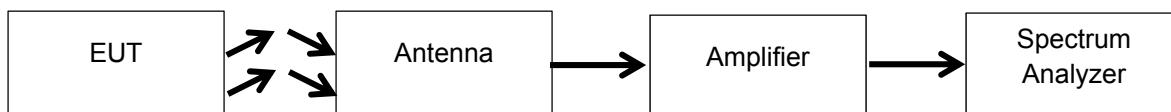
Engineer: Paul Hay

Test Date: 7/21/15

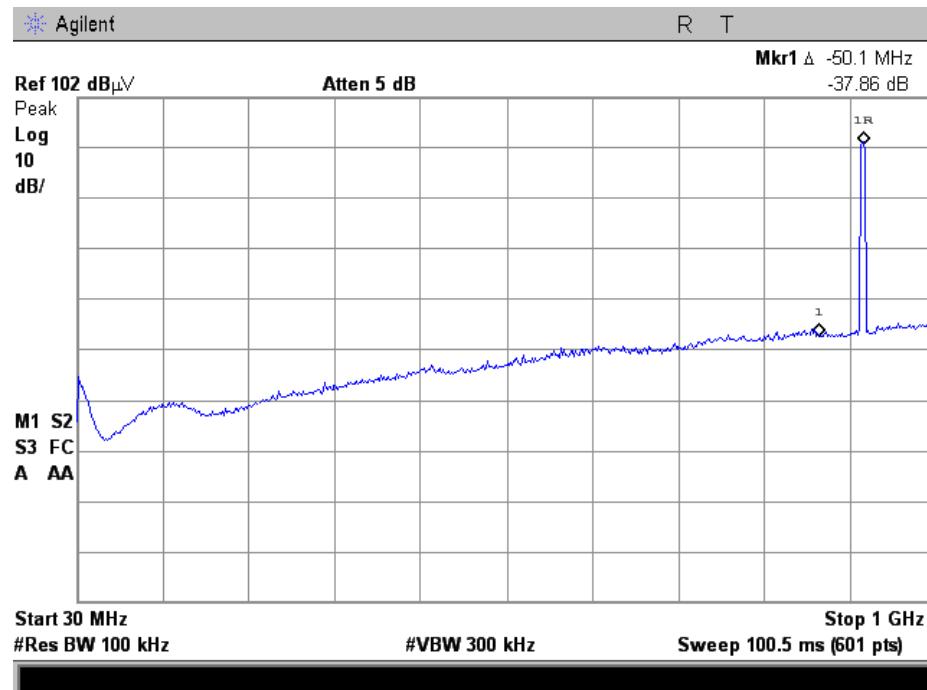
Test Procedure

The EUT was tested in a semi-anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions. The antenna and cable correction factors were summed with the amplifier gain and entered into the spectrum analyzer as an offset to ensure accurate readings. The spectrum for each tuned frequency was examined to the 10th harmonic.

Test Setup



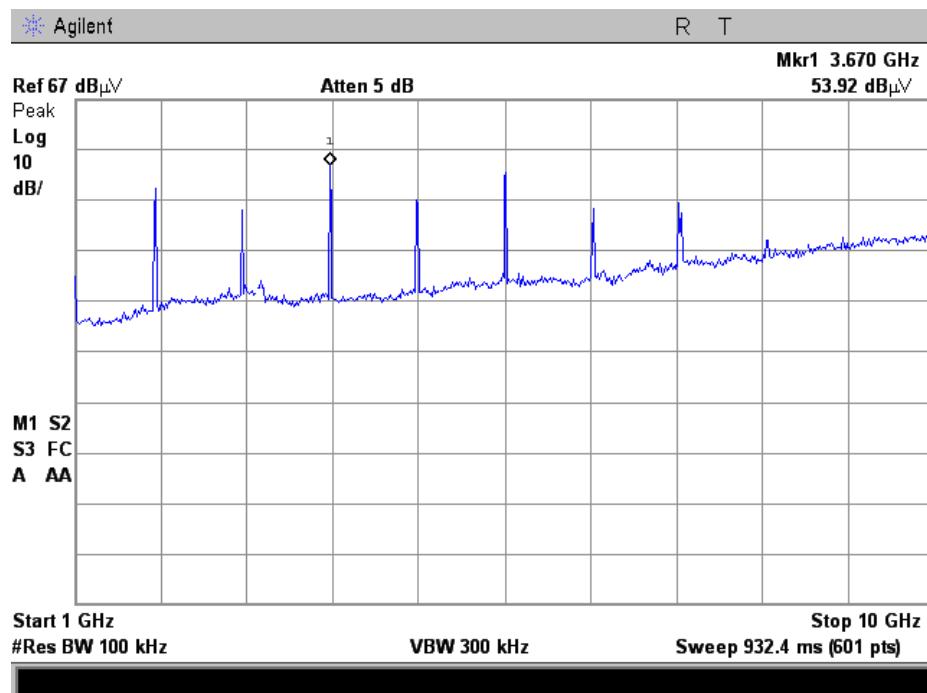
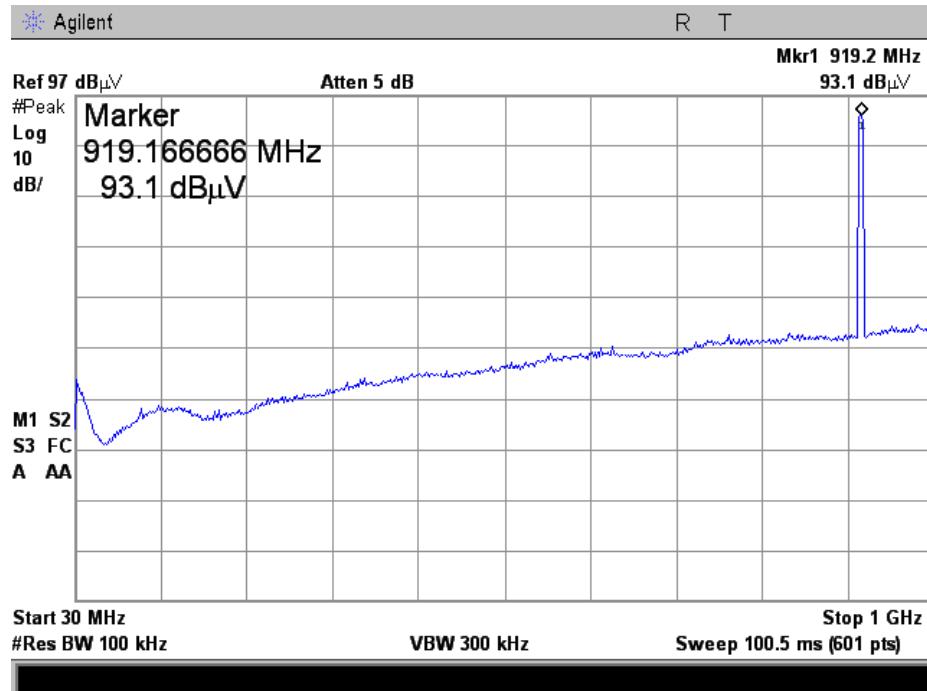
Radiated Spurious Emissions



No other emissions were detectable. All emissions were greater than -20 dBc.

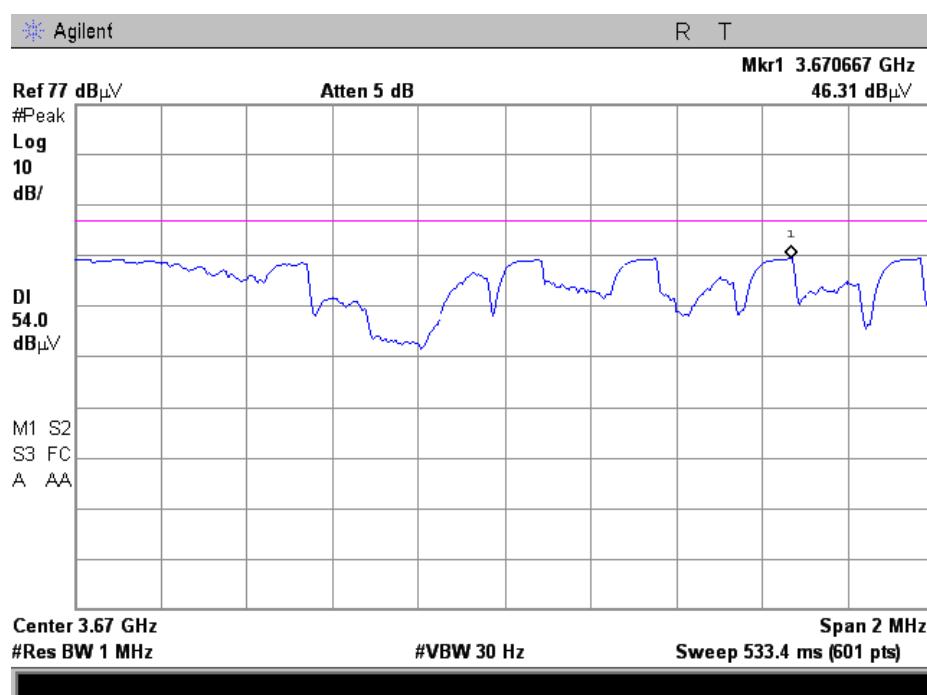
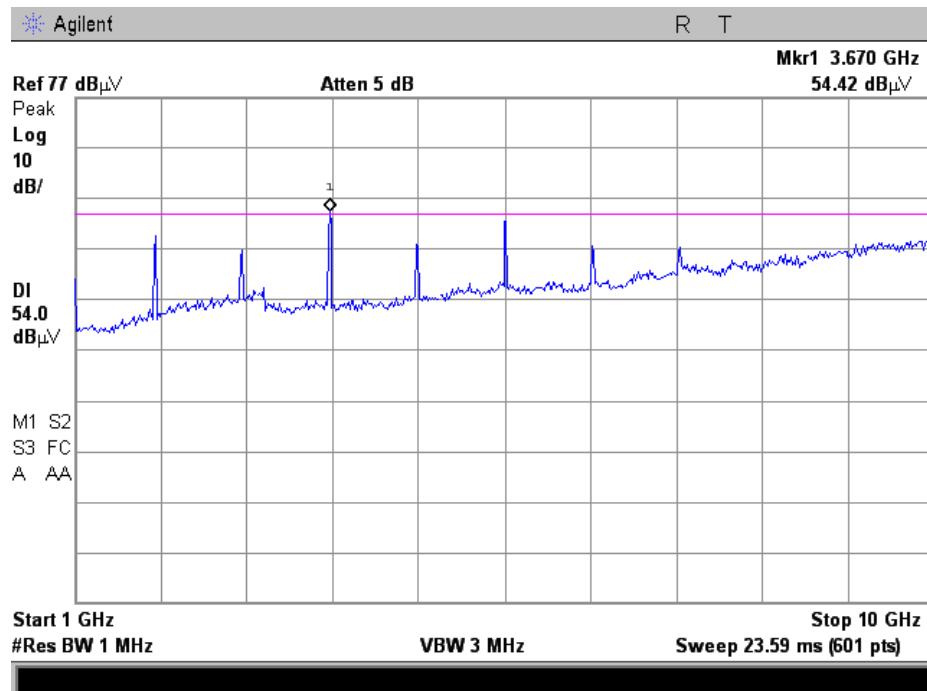


-20dBc requirement



Highest emission is -39.18 dBc

15.209 requirements





Emissions at Band Edges

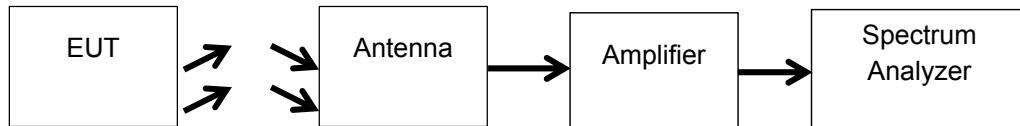
Engineer: Alex Macon

Test Date: 5/19/15

Test Procedure

The EUT was tested in a 3 meter semi-anechoic chamber. A spectrum analyzer was used to verify that the EUT met the requirements for band edge with both peak and average measurements. The cable and transducer correction factors were input into the analyzer as a reference level offset to ensure accurate readings.

Test Setup

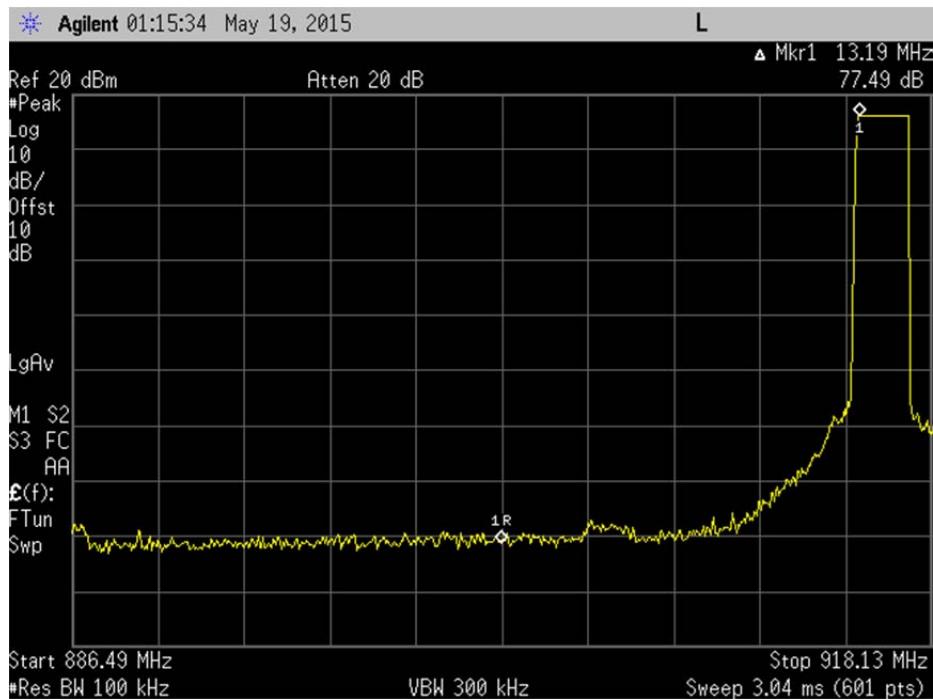


Band Edge Emissions Summary

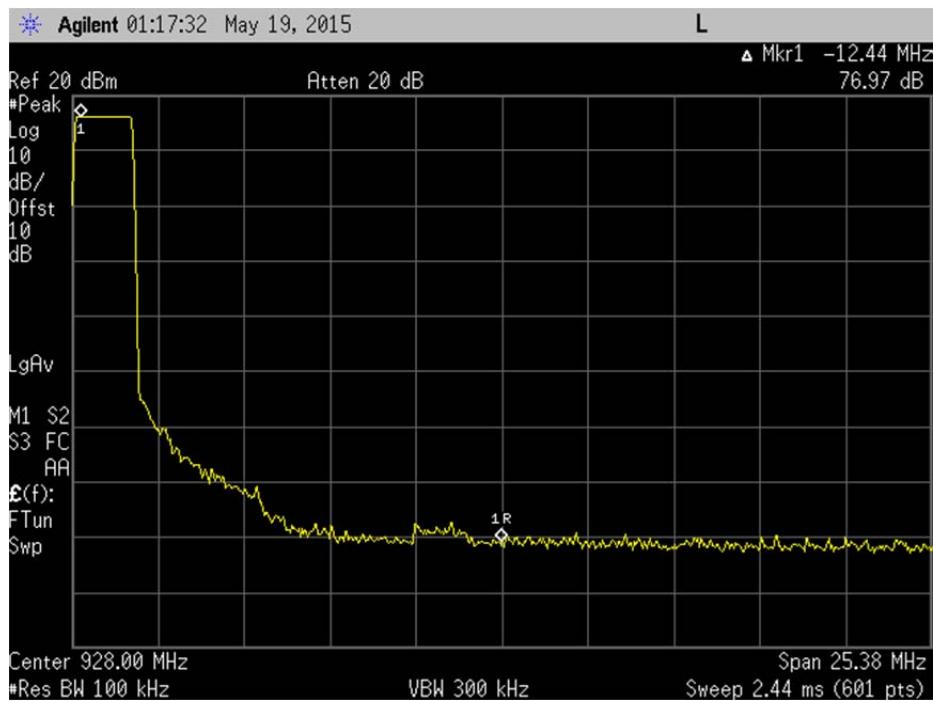
Tuned Frequency (MHz)	Emission Frequency (MHz)	Monitored Level	Detector	Limit	Result
915.5	902.31	-77.49 dBc	Peak	-20 dBc	Pass
916.9	928.0	-76.97 dBc	Peak	-20 dBc	Pass



Band Edge 902 MHz



Band Edge 928 MHz





Occupied Bandwidth

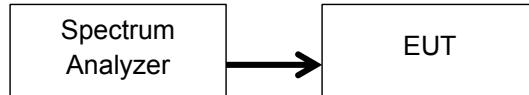
Engineer: Alex Macon

Test Date: 5/19/15

Test Procedure

The EUT was connected directly to a spectrum analyzer. The Span was set wide enough to capture the entire transmitting spectrum and the resolution bandwidth was set to at least 1% of OCBW. The analyzer was set to max hold and when the entire spectrum was captured, the 20dB and 99% bandwidths were measured to verify that the bandwidth met the specification.

Test Setup



20 dB Bandwidth Summary

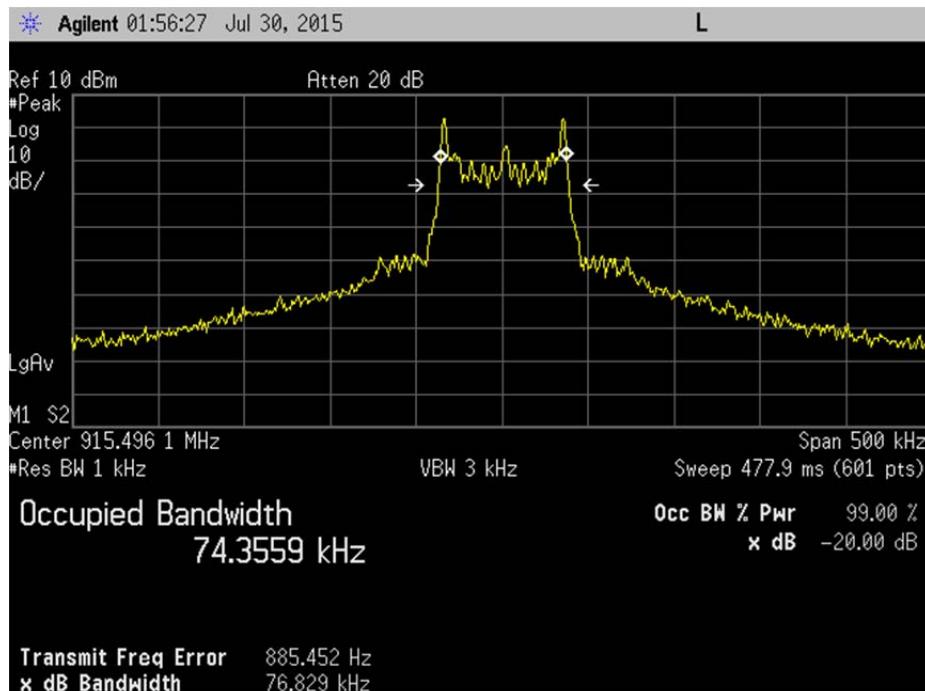
Frequency (MHz)	Recorded Measurement	Specification Limit	Result
915.5	76.83 kHz	80 kHz	Pass
916.9	76.65 kHz	80 kHz	Pass

99% Bandwidth Summary

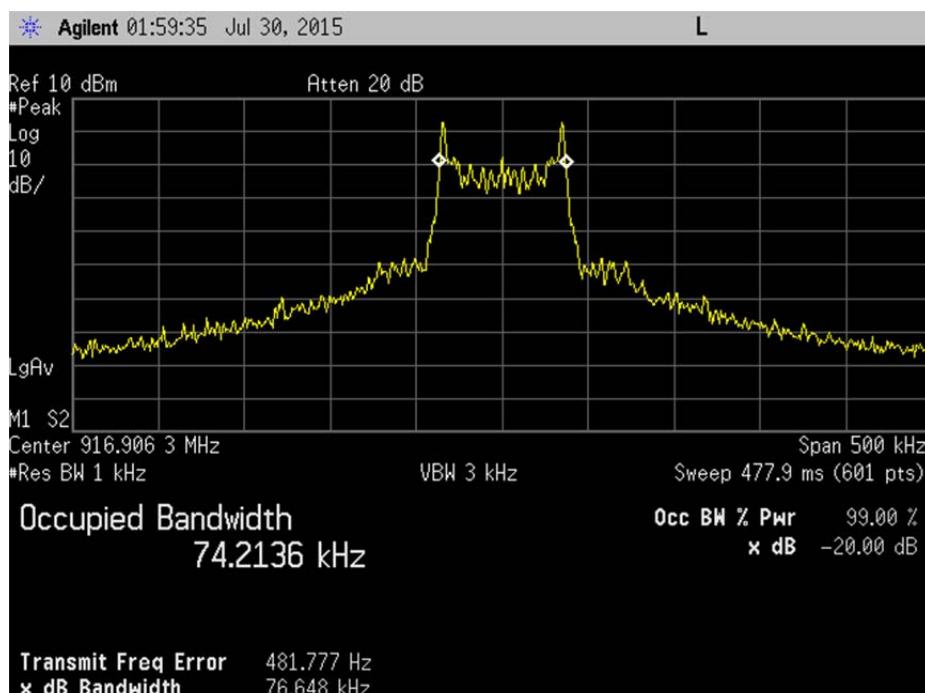
Frequency (MHz)	Recorded Measurement	Result
915.5	74.36 kHz	Pass
916.9	74.21 kHz	Pass



Bandwidth 915.5 MHz

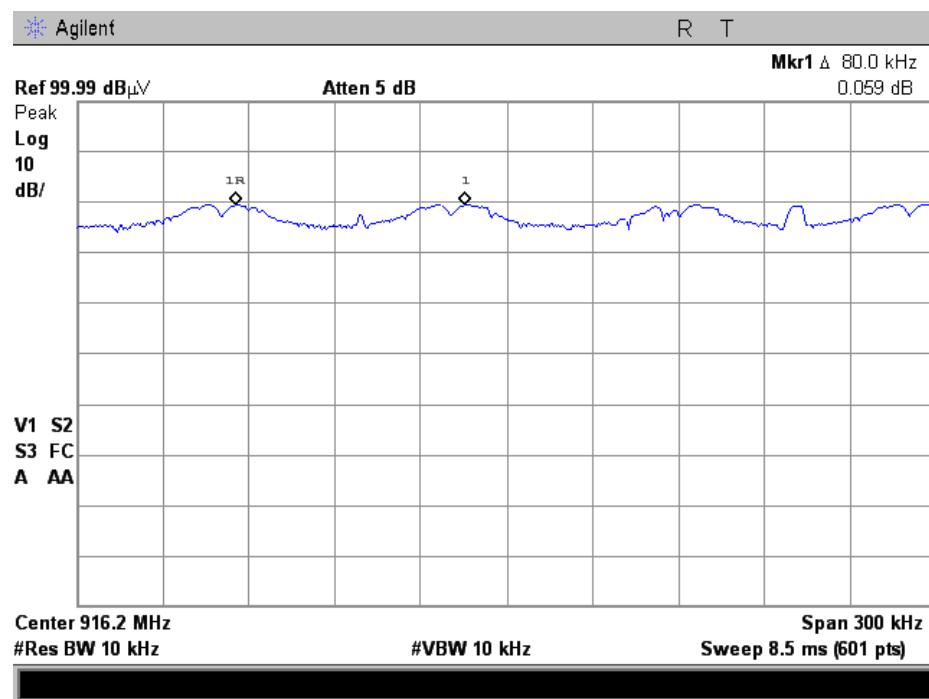


Bandwidth 916.9 MHz





Channel separation plot





Dwell Time

Engineer: Alex Macon

Test Date: 7/15/15

Test Procedure

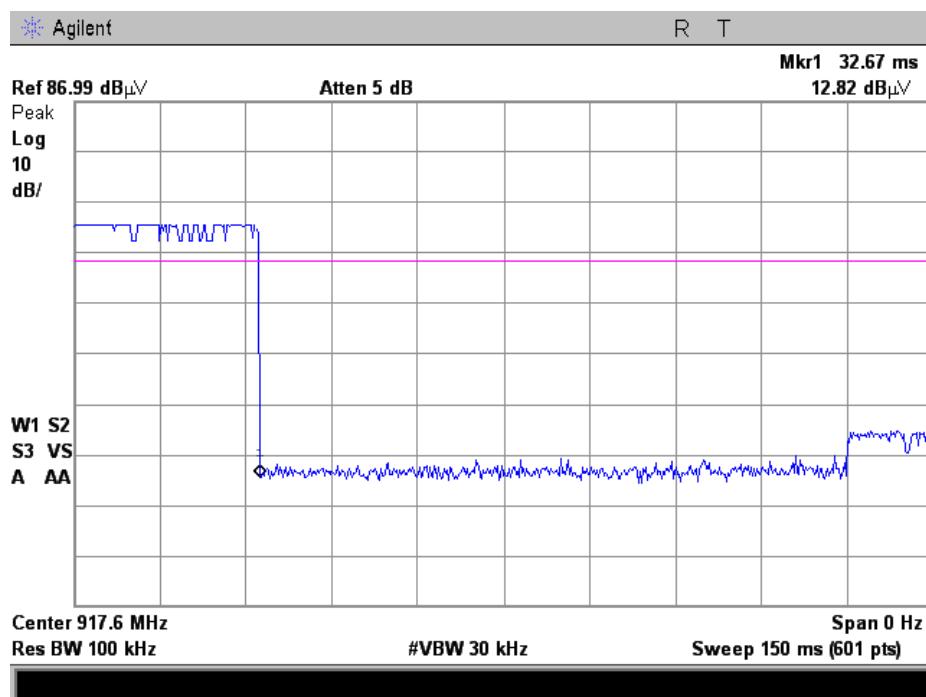
The EUT was tested in a 3 meter semi-anechoic chamber. The EUT was set to hopping mode with the spectrum analyzer set to a 0 Hz span. A single transmission was captured and the dwell time was recorded.

Test Setup



Dwell Time

Due to the infrequent duty of the transmitter in normal operation, it was deemed impractical to measure the dwell time using a spectrum analyzer. The manufacturer has provided a detailed timing document to determine compliance.



This plot is for reference purposes only and is used to validate the manufacturer's timing document.



Number of Hopping Channels

Engineer: Alex Macon

Test Date: 6/23/15

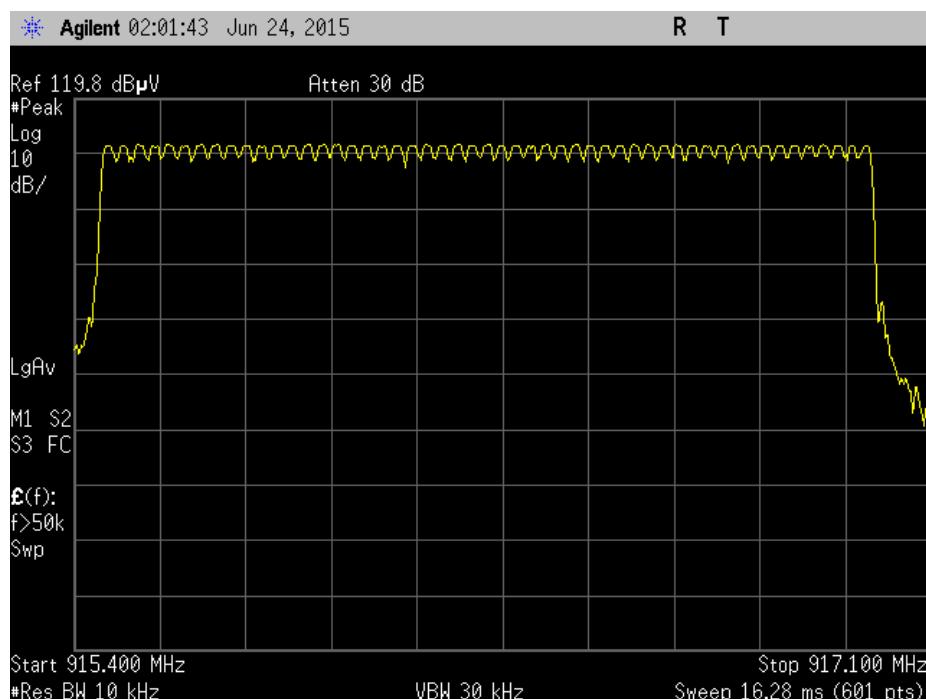
Test Procedure

The EUT was connected directly to a spectrum analyzer. The Span was set to the specified band end points. The EUT was then set to operate in hopping mode. The MAX HOLD function of the spectrum analyzer was utilized to verify the number of hopping channels.

Test Setup



Number of Hopping Channels



52 hopping channels were plotted.



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	EMCO	3115	i00103	1/20/15	1/20/17
Horn Antenna, Amplified	ARA	DRG-118/A	i00271	5/8/14	5/8/16
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	4/1/15	4/1/16
Voltmeter	Fluke	87III	i00319	2/20/15	2/20/16
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	10/8/13	10/8/15
EMI Analyzer	Agilent	E7405A	i00379	2/5/15	2/5/16
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	11/26/13	11/26/15
Spectrum Analyzer 3Hz-13.2GHz	Agilent	E4445A	i00471	5/4/15	5/4/16

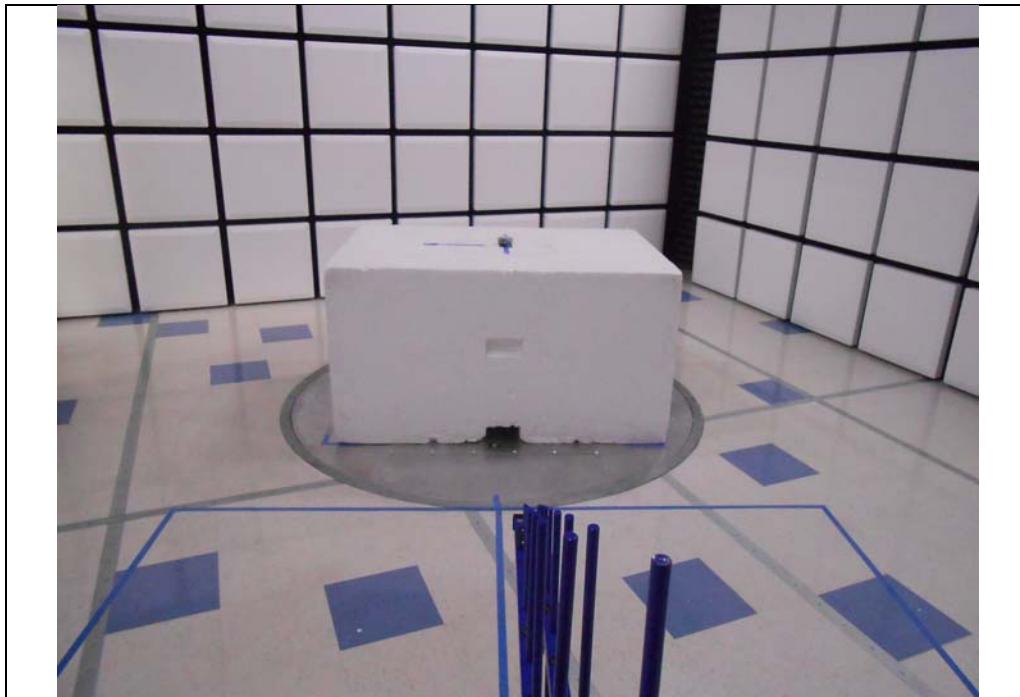
In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT



Test Setup Photos
FCC ID: 2AFM2-XK420
IC: 20657-XK420

RF Radiated #1



RF Radiated #2

