Test Report

Prepared for: Bird Technologies

Model: DDRXXX

Description: Public Safety Fiber DAS Remote (33dBm)

Serial Number: 10636

FCC ID: V5FDDR002

To

FCC Part 20 (CMRS 90-S)

Date of Issue: November 20, 2015

On the behalf of the applicant: **Bird Technologies**
30303 Aurora Road
Solon, OH 44139

Attention of: **Amy Sanvido, Hardware Engineer**
Ph: (440)519-2179
E-Mail: asanvido@bird-technologies.com

Prepared By
Compliance Testing, LLC
1724 S. Nevada Way
Mesa, AZ 85204
(480) 926-3100 phone / (480) 926-3598 fax
www.compliancetesting.com
Project No: p1580020

Shawn McMillen
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	November 6, 2015	Shawn McMillen	Original Document
2.0	November 11, 2015	Shawn McMillen	Updated Calibration Table and EUT Description
3.0	November 15, 2015	Shawn McMillen	Updated FCC standard on cover page

Table of Contents

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 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 below.

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

Testing Certificate Number: **2152.01**

ilac-MRA

A2LA ACCREDITED
TESTING CERT
#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 the 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.

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, KDB 935210 D05 Indus Booster Basic Measurements v01 and FCC Part 2, Part 20.21, and C63-26D13 where appropriate.

Standard Test Conditions and Engineering Practices

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

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specify 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		
Temp (ºC)	Humidity (%)	Pressure (mbar)
24.7 – 27.9	44.9 – 51.5	963.5 – 970.4

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

EUT Description
Model: DDRXXX
Description: Part 20 CMRA 90-S Booster
Firmware: N/A
Software: N/A
S/N: 10636
Additional Information: N/A

EUT Operation during Tests
Note: the UL is directly connected to a base station and therefore does not radiate.
The EUT was setup in an end to end configuration. Signals were injected into the head end unit and measured from the remote unit.

AGC Threshold
Several tests reference the AGC Threshold level.
The AGC Threshold was measured as follows:

- Connect a signal generator to the input of the EUT.
- Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- Use a CW signal.
- While monitoring the output of the EUT, increase the input level until the output stops increasing or drops a few 10th's of a dB.
- This is the AGC threshold level of the EUT.
- When the procedure calls out to set the RF Input to just below the AGC Threshold, The AGC Threshold is measured using the procedure listed above, and then the RF Input is backed off 0.2 dB below this threshold level.

Frequency (MHz)	Emission Designators
862 - 869	F3E, G1D, G1E, G7W

Accessories: None

Cables: None

Modifications: None

Test Summary Table

Specification	Test Name	Pass, Fail, N/A	Comments
935210 D05	AGC Threshold	Pass	
935210 D05	Out-of-Band Rejection	Pass	
90.219(e)(4)(i)(ii)	Input-Versus-Output Signal Comparison	Pass	
90.219(e)(1)	Mean Output Power and Amplifier gain	Pass	
935210 D05 90.219(e)(3)	Out-Of-Band/Block Emissions Conducted	Pass	
90.219(e)(3)	Spurious Emissions Conducted	Pass	
90.213	Frequency Stability	N/A	Does not have Frequency translation
2.1053	Spurious Emissions Radiated	Pass	

AGC Threshold
Engineer: Shawn McMillen
Test Date: 11/09/2015

Test Procedure

A signal generator was connected to the input of the EUT. A spectrum analyzer was connected to the EUT in order to monitor the output power levels. The Signal Generator was configured to produce the necessary broadband and narrow band signals. The input power level was increase in 1 dB increments until the power no longer increased. The input levels were recorded in the table below.

Spectrum Analyzer settings
Power Channel integration
RBW = 1-5% of EBW
Video BW = 3x RBW

Test Setup

Frequency Band (MHz)	Tuned Frequency (MHz)	AGC Threshold (dBm)
862 - 869	865	-45.3

Out-Of-Band Rejection
Engineer: Shawn McMillen
Test Date: 09/23/2015

Test Procedure

The test equipment was set with the following parameters:

Signal Generator:

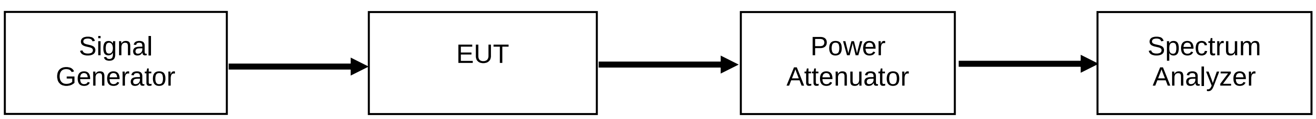
CW Signal
Dwell time = approx. 10 ms
Frequency range = ± 250 % of the passband from the center of the passband.

Spectrum analyzer:

Span ± 250 % of the passband from the center of the passband
Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor
Number of points = SPAN/(RBW/2)
RBW 1 % to 5 % of the passband
VBW to ≥ 3 × RBW
Peak detector with Max Hold

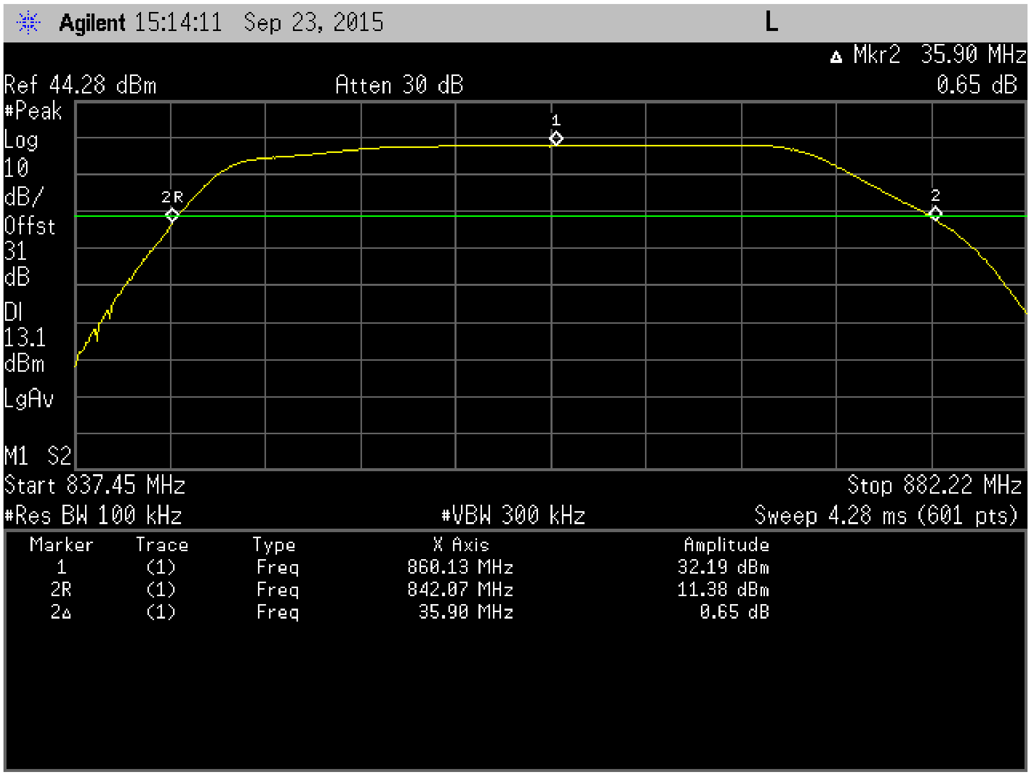
Procedure:
The peak of the frequency response was found and recorded below as f_0.
Two markers we placed at the −20 dB down amplitude point to determine the 20 dB bandwidth. The Band Pass width was recorded below:

Test Setup



Out of Band Rejection Test Data

862-869 MHz



Input-Versus-Output Signal Comparison
Engineer: Shawn McMillen
Test Date: 11/06/2015

Test Procedure

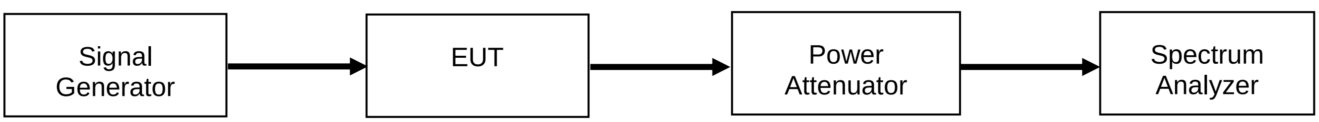
A signal generator was connected to the input of the EUT and was configured to transmit an AWGN signal. The amplitude was set to be just below the AGC threshold level but not more than 0.5 dB.

Spectrum analyzer setting:

Span 2 times to 5 times the EBW or alternatively the OBW.
Frequency set to the center frequency of the operational band under test.
RBW to 1% to 5 % of the anticipated OBW
VBW ≥ 3 × RBW
Reference Level 10 log (OBW / RBW) below the reference level
Positive Peak Detector
Max Hold

The -26dB bandwidth was compared between the input and the output of the EUT. All carries applicable to the EUT were investigated. The input level was then increased by 3 dB above and the comparison repeated.

Test Setup



See Annex A

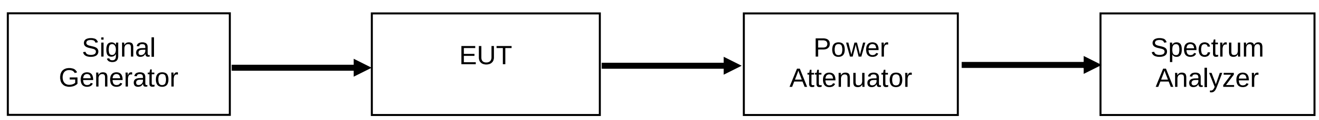
Mean Output and Amplifier Gain
Engineer: Shawn McMillen
Test Date: 11/06/2015

Test Procedure

A signal generator was connected to the input of the EUT. A spectrum analyzer was connected to the EUT in order to monitor the output power levels. The Signal Generator was configured to produce the necessary broadband and narrow band signals. The input power level was increase in 1 dB increments until the power no longer increased. The input and output levels were recorded in the table below. The amplifier gain was determined from the delta between the input and output levels.

Spectrum Analyzer settings
Power Channel integration
RBW = 1-5% of EBW
Video BW = 3x RBW

Test Setup



Frequency Band (MHz)	Modulation	Tuned Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Output Power (dBm) (Pin + 3 dB)
862 - 869	AWGN	865	-45.3	33.3	78.6	33.4
862 - 869	GSM	865	-45.2	33.3	78.7	33.5

Out-Of-Band/Block Emission
Engineer: Shawn McMillen
Test Date: 11/06/2015

Test Procedure

A signal generator connected to the input of the EUT was configured to produce two modulated carriers simultaneously. The center frequencies used were set to the lowest band edge and then to the highest band edge of each applicable band. The input power level was set to just below the AGC threshold but not more than 0.5dB. The composite power was measured using the procedures provided in KDB 971168.

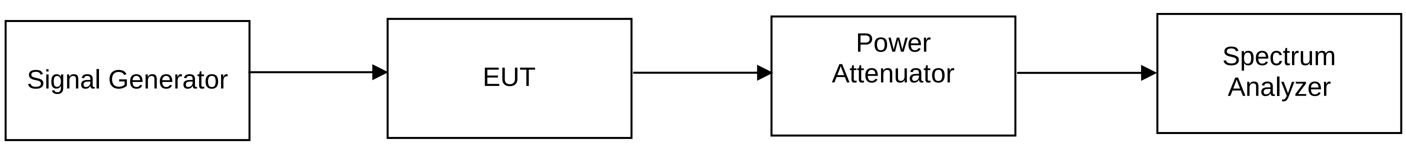
A CDMA test signal was used in place of the AWGN test signal in order to fit 2 carriers in the passband.
The CDMA test frequencies were set at 0.8 and 2.64 MHz from the band edge.
The signal amplitudes were set to equal levels using signal generator offsets.
The signal level inputs were increased until the EUT output stopped increasing.
The input power was recorded.
The lower and upper band edges were recorded per KDB 935210 D05 v01..
The input power was increased 3 dB and the lower and upper band edges were recorded again.

The test was repeated with 2 GSM test signals.

The test was repeated using a single carrier test signal per KDB 935210 D05 v01.

The spectrum analyzer was set with the following parameters
RBW = 1 % of the emission bandwidth
VBW = 3 × RBW
Average power detector
Sweep time = auto-couple
Trace average at least 100 traces in power averaging

Test Setup



Refer to Annex B for Out-Of-Band/Block Emission (Dual Carrier)

Refer to Annex C for Out-Of-Band/Block Emission (Single Carrier)

Radiated Spurious Emissions
Engineer: Shawn McMillen
Test Date: 9/3/2015

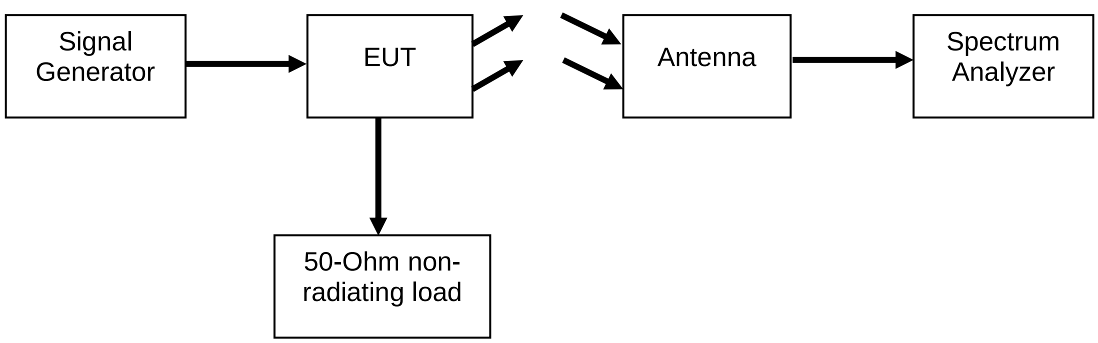
Test Procedure

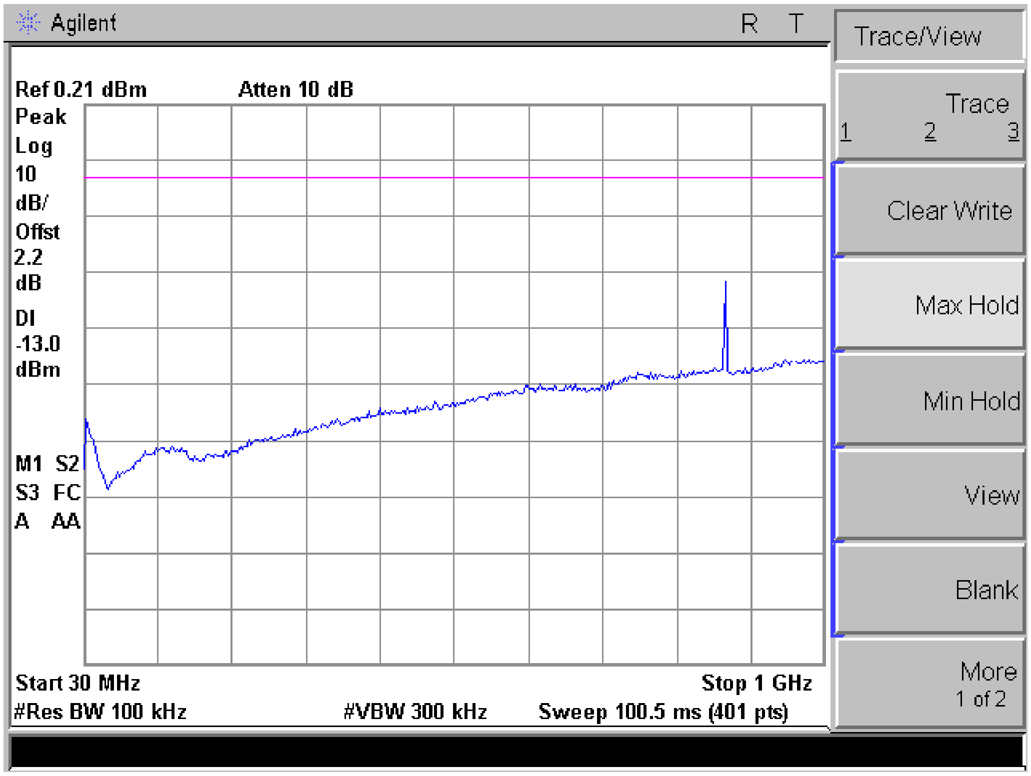
The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized. All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm. A signal generator was used to provide a CW signal. The EUT output was terminated into a 50 Ohm non-radiating load.

The RBW was set to 100 kHz for measurements below 1 GHz and 1 MHz for measurements above 1 GHz.
The VBW was set to 3 times the RBW.

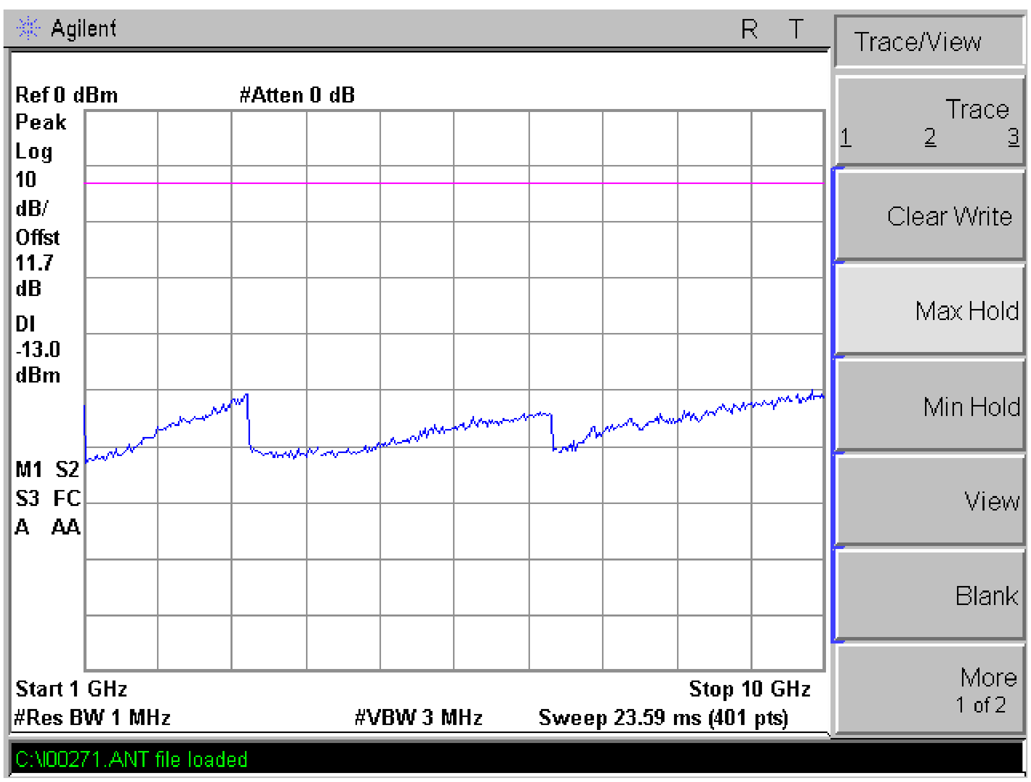
The following formula was used for calculating the limits:
Radiated Spurious Emissions Limit = P1 – (43+ 10Log(P2)) = -13dBm

Test Setup





869MHz 30-1000MHz



869MHz 1-10GHz

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	EMCO	3115	i00103	01/20/15	01/20/16
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	10/19/15	10/19/16
EMI Analyzer	Agilent	E7405A	i00379	2/5/15	2/5/16
Signal Generator	Agilent	E4438C	i00457	9/26/14	9/26/16
Signal Generator	Agilent	E4438C	i00348	09/01/14	09/01/16
Spectrum Analyzer	Agilent	E4445A	i00471	3/20/15	12/1/16
Spectrum Analyzer	Agilent	E4407B	i00331	6/13/14	6/13/16
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	11/26/13	11/26/15

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