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Test Report

Prepared for: Bird Technologies Group

Model: 614 Series/470-488MHz

Description: UHF Digital Signal Booster

FCC ID: EZZ61470A

To

FCC Part 1.1310

Date of Issue: May 14, 2015

On the behalf of the applicant:

**Bird Technologies Group
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Attention of:

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**Greg Corbin
Project Test Engineer**

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Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	August 11, 2014	Greg Corbin	Original Document
2.0	September 18, 2014	Mike Graffeo	Corrected antenna gain/loss to -4dBi
3.0	October 29, 2014	Greg Corbin	Corrected report to show power spectral density calculations in place of minimum safe distance
4.0	April 27, 2015	Greg Corbin	Changed exposure environment from Controlled to Uncontrolled and calculated new limits.
5.0	May 12, 2015	Greg Corbin	Added MPE calculations for all modes of operation, including mfr rated power + 20%



ILAC / A2LA

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The tests results contained within this test report all fall within our scope of accreditation, unless below

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Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

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Non-accredited tests contained in this report:

N/A

EUT Description

Model: 614 Series/470-488MHz

Description: UHF Digital Signal Booster

Firmware: R21.D6

S/N: N/A

Additional Information:

The EUT is a Class B industrial UHF digital signal booster operating from 470 – 488 MHz. The downlink operates from 470 – 485 MHz and the uplink operates from 473 – 488 MHz.

Each band has a low power and high power output, configurable in software but not available to the end user, the selection of either low or high power is a factory setting only.

MPE calculations were performed for the downlink at low and high power using an antenna with – 4 dBi gain.

MPE calculations were performed on the uplink at low and high power using an antenna with – 1.28 dBi gain.

MPE calculations were performed at the manufacturer's rated output of +37 dBm +20 % using an antenna with 0 dBi gain.



MPE Evaluation

This is a Fixed device used in an **Uncontrolled** Exposure environment.

Limits Uncontrolled Exposure 47 CFR 1.1310 Table 1, (B)

0.3-1.234 MHz:	Limit [mW/cm ²] = 100
1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
30-300 MHz:	Limit [mW/cm ²] = 0.2
300-1500 MHz:	Limit [mW/cm ²] = f/1500
1500-100,000 MHz	Limit [mW/cm ²] = 1.0

Test Data

Uplink or Downlink Output Power set to manufacturer's (Mfr) rated output power (+37 dBm) + 20 % using an antenna with 0 dBi gain

Test Frequency, MHz	455
Power, Mfr rated, mW (P)	5012
Power, Mfr rated + 20%, mW (P)	6014.4 mw (37.79 dBm)
Antenna Gain Isotropic	0 dBi
Antenna Gain Numeric (G)	1
Distance (R)	20 cm

$S = \frac{P * G}{4\pi r^2}$			
Power Density (S) mw/cm ²	Power mW (P)	Numeric Gain (G)	Distance (r ²) cm
1.197	6014.4	1	20

Power Density (S) = 1.197 mw/cm ²
Limit =(from above table) = 0.303mw/cm ²

With the Uplink output power set to **Mfr rated output power (+37 dBm) + 20 %** using a 0 dBi antenna, the EUT does not meet the power density requirements at 20 cm, so the minimum safe distance was calculated below.

Minimum Safe Distance Evaluation

Test Data

Uplink Output Power set to manufacturer's (Mfr) rated output power (+37 dBm) + 20 % using an antenna with 0 dBi gain

Test Frequency, MHz	455
Power, Mfr rated, mW (P)	5012
Power, Mfr rated + 20%, mW (P)	6014.4 mw (37.79 dBm)
Antenna Gain Isotropic	0 dBi
Antenna Gain Numeric (G)	1
Limit (L)	0.303

$R = \sqrt{(PG/4\pi L)}$			
Distance (R) cm	Power mW (P)	Numeric Gain (G)	Limit (L)
39.8	6014.4	0	0.303

With the Uplink Output Power set to the manufacturer's (Mfr) rated output power (+37 dBm) + 20 % using an antenna with 0 dBi gain , the minimum safe distance is 39.8 cm.



MPE Evaluation

This is a Fixed device used in an **Uncontrolled** Exposure environment.

Limits Uncontrolled Exposure 47 CFR 1.1310 Table 1, (B)

0.3-1.234 MHz:	Limit [mW/cm ²] = 100
1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
30-300 MHz:	Limit [mW/cm ²] = 0.2
300-1500 MHz:	Limit [mW/cm ²] = f/1500
1500-100,000 MHz	Limit [mW/cm ²] = 1.0

Test Data

Downlink high power mode using a - 4.0 dBi antenna

Test Frequency, MHz	470.5
Power, Conducted, mW (P)	3236
Antenna Gain Isotropic	- 4.0 dBi
Antenna Gain Numeric (G)	0.4
Distance (R)	20 cm

$S = \frac{P * G}{4\pi r^2}$			
Power Density (S) mw/cm ²	Power mW (P)	Numeric Gain (G)	Distance (r ²) cm
0.258	3236	0.4	20

Power Density (S) = 0.258 mw/cm ²
Limit =(from above table) = 0.314 mw/cm ²

The EUT power density at 0.258 mw/cm² is below the power density limit of 0.314 mw/cm² in the Downlink high power operating mode using a -4.0 dBi antenna.

The EUT meets the power density requirements at 20 cm in the Downlink high power operating mode using a -4.0 dBi antenna



MPE Evaluation

This is a Fixed device used in an **Uncontrolled** Exposure environment.

Limits Uncontrolled Exposure 47 CFR 1.1310 Table 1, (B)

0.3-1.234 MHz:	Limit [mW/cm ²] = 100
1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
30-300 MHz:	Limit [mW/cm ²] = 0.2
300-1500 MHz:	Limit [mW/cm ²] = f/1500
1500-100,000 MHz	Limit [mW/cm ²] = 1.0

Test Data

Downlink low power operating mode using a - 4.0 dBi antenna

Test Frequency, MHz	470.5
Power, Conducted, mW (P)	323.6
Antenna Gain Isotropic	- 4.0 dBi
Antenna Gain Numeric (G)	0.4
Distance (R)	20 cm

$S = \frac{P * G}{4\pi r^2}$			
Power Density (S) mw/cm ²	Power mW (P)	Numeric Gain (G)	Distance (r ²) cm
0.026	323.6	0.4	20

Power Density (S) = 0.026 mw/cm ²
Limit =(from above table) = 0.314 mw/cm ²

The EUT power density at 0.026 mw/cm² is below the power density limit of 0.314 mw/cm² in the Downlink low power operating mode.

The EUT meets the power density requirements at 20 cm in the Downlink low power operating mode.



MPE Evaluation

This is a Fixed device used in an **Uncontrolled** Exposure environment.

Limits Uncontrolled Exposure 47 CFR 1.1310 Table 1, (B)

0.3-1.234 MHz:	Limit [mW/cm ²] = 100
1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
30-300 MHz:	Limit [mW/cm ²] = 0.2
300-1500 MHz:	Limit [mW/cm ²] = f/1500
1500-100,000 MHz	Limit [mW/cm ²] = 1.0

Test Data

Uplink high power mode using a – 1.28 dBi antenna

Test Frequency, MHz	473.5
Power, Conducted, mW (P)	3236
Antenna Gain Isotropic	- 1.28 dBi
Antenna Gain Numeric (G)	0.74
Distance (R)	20 cm

$S = \frac{P * G}{4\pi r^2}$			
Power Density (S) mw/cm ²	Power mW (P)	Numeric Gain (G)	Distance (r ²) cm
0.476	3236	0.74	20

Power Density (S) = 0.476 mw/cm ²
Limit =(from above table) = 0.316 mw/cm ²

In the Uplink high power operating mode, the EUT does not meet the power density requirements at 20 cm, so the minimum safe distance was calculated below.

Minimum Safe Distance Evaluation

Test Data

Uplink high power operating mode using a – 1.28 dBi antenna

Test Frequency, MHz	473.5
Power, Conducted, mW (P)	3626
Antenna Gain Isotropic	- 1.28 dBi
Antenna Gain Numeric (G)	0.74
Limit (L)	0.316

$R = \sqrt{(PG/4\pi L)}$			
Distance (R) cm	Power mW (P)	Numeric Gain (G)	Limit (L)
26.0	3626	0.74	0.316

The minimum safe distance with a – 1.28 dBi antenna is 26.0 cm in the Uplink high power operating mode.



MPE Evaluation

This is a Fixed device used in an **Uncontrolled** Exposure environment.

Limits Uncontrolled Exposure 47 CFR 1.1310 Table 1, (B)

0.3-1.234 MHz:	Limit [mW/cm ²] = 100
1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
30-300 MHz:	Limit [mW/cm ²] = 0.2
300-1500 MHz:	Limit [mW/cm ²] = f/1500
1500-100,000 MHz	Limit [mW/cm ²] = 1.0

Test Data

Uplink low power operating mode using a – 1.28 dBi antenna

Test Frequency, MHz	473.5
Power, Conducted, mW (P)	371.5
Antenna Gain Isotropic	- 1.28 dBi
Antenna Gain Numeric (G)	0.74
Distance (R)	20 cm

$S = \frac{P * G}{4\pi r^2}$			
Power Density (S) mw/cm ²	Power mW (P)	Numeric Gain (G)	Distance (r ²) cm
0.054	371.5	0.74	20

Power Density (S) = 0.054 mw/cm ²
Limit =(from above table) = 0.304 mw/cm ²

The EUT power density at 0.054 mw/cm² is below the power density limit of 0.304 mw/cm² in the uplink low power operating mode.

The EUT meets the power density requirements at 20 cm in the uplink low power operating mode.

END OF TEST REPORT