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Test Report

Prepared for: G-Way Microwave

Models:
GA-V139/152/2/33/80-R6U15
GA-V162/173/2/33/80-R6U15

Description: VHF Bi-Directional Amplifier for land-mobile radio systems.
Used to amplify frequencies within RF shielded buildings.

Serial Numbers: 14081001, 14081002

FCC ID: Q8KVHF2W80

To

FCC Part 1.1310

Date of Issue: December 10, 2014

On the behalf of the applicant:	**G-Way Microwave** **38 Leuning Street** **South Hackensack, NJ 07606**
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Project No: p1480008

Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	September 5, 2014	Greg Corbin	Original Document
2.0	October 28, 2014	Greg Corbin	Added calculations for the Yagi antenna on page 5
3.0	October 29, 2014	Greg Corbin	Corrected report to show power spectral density calculations for the omni-directional antenna; corrected type of device from mobile to fixed on page 6
4.0	December 4, 2014	Greg Corbin	Added the following note to page 4 ****Note: The operating frequencies below 150 MHz are "Not applicable for FCC certification".**

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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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Non-accredited tests contained in this report:

N/A

EUT Description
Models: GA-V139/152/2/33/80-R6U15
GA-V162/173/2/33/80-R6U15
Description: VHF Bi-Directional Amplifier for land-mobile radio systems. Used to amplify frequencies within RF shielded buildings.
Firmware: N/A
Serial Number: 14081001, 14081002

Additional Information:
The EUT is classified as a **Class B** industrial signal booster

Two antennas are specified for use with this system.
- A omnidirectional antenna with 0 dBi gain.
- A yagi antenna with 3.5 dBd (5.65 dBi) gain.

The EUT is a VHF Bi-directional Amplifier that operates from 138 – 174 MHz in both directions. It is used to amplify frequencies within RF shielded buildings for land mobile radio systems.
The system uses modules which have 2 MHz wide bandpass filters with the frequencies selected per the installation requirements.
The system uses the same modules and antennas for the uplink and downlink.
The modules are the same electrically for the uplink and downlink.
The manufacturer supplied 4 modules tuned to the low (139 MHz), mid-lo (151MHz), mid hi (162 MHz), and high (173 MHz) sections of the passband.
2 modules are installed in an enclosure. The 139 MHz and 151 MHz modules were installed in 1 enclosure. The 162 MHz and 173 MHz modules were installed in a 2nd enclosure.
Additional narrowband cavity filters tuned to specific channels or bands within the 2 MHz passband. These narrowband cavity filters were not installed during the tests.
System Power is 120 VAC @ 60 Hz.
The signal booster uses the following frequency bands.
The emission designators listed are representative emission designators used by transmitters whose signal is amplified by this booster.

	Frequency - MHz
Downlink	138 ****** - 174
Uplink	138 ****** - 174

****Note: The operating frequencies below 150 MHz are "Not applicable for FCC certification".**

EUT Operation during Tests

The EUT was tested under normal operating conditions with the front panel attenuators set to 0 dB for all measurements

MPE Evaluation

This is a Fixed device used in Controlled Exposure environment.

Limits Controlled Exposure 47 CFR 1.1310 Table 1, (A)		
	0.3-3.0 MHz:	Limit [mW/cm²] = 100
	3.0-30 MHz:	Limit [mW/cm²] = (900/f²)
	30-300 MHz:	Limit [mW/cm²] = 1.0
	300-1500 MHz:	Limit [mW/cm²] = f/300
	1500-100,000 MHz	Limit [mW/cm²] = 5

Test Data

Test Frequency, MHz	162
Power, Conducted, mW (P)	2089.3
Antenna Gain Isotropic	0 dBi
Antenna Gain Numeric (G)	1
Antenna Type	omnidirectional
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
0.41	2089.3	1	20

Power Density (S) =0.41 mw/cm^2
Limit =(from above table) = 1 mw/cm^2

The amplifier meets the power spectral density requirements at 20 cm with the 0 dBi gain omnidirectional antenna.

Minimum Safe Distance Evaluation

This is a Fixed device used in Controlled Exposure environment.

Limits Controlled Exposure 47 CFR 1.1310 Table 1, (A)		
	0.3-3.0 MHz:	Limit [mW/cm²] = 100
	3.0-30 MHz:	Limit [mW/cm²] = (900/f²)
	30-300 MHz:	Limit [mW/cm²] = 1.0
	300-1500 MHz:	Limit [mW/cm²] = f/300
	1500-100,000 MHz	Limit [mW/cm²] = 5

The Amplifier does not meet the power spectral density requirements at 20 cm with the YAGI antenna, so the minimum safe distance was calculated.

Test Data for Yagi Antenna

Test Frequency, MHz	162
Power, Conducted, mW (P)	2089.3
Antenna Gain Isotropic	5.65 dBi
Antenna Gain Numeric (G)	3.67
Limit (L)	1.0

$R=\sqrt{(PG/4\pi L)}$			
Distance (R) cm	Power mW (P)	Numeric Gain (G)	Limit (L)
24.7	2089.3	3.67	1.0

The minimum safe distance with the YAGI antenna is 24.7 cm.

END OF TEST REPORT