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## **FCC PART 15.249 TEST REPORT UNLICENSED INTENTIONAL RADIATOR**

<b>Applicant</b>	INVIS-A-BEAM LLC
<b>Address</b>	2021 TIMBERLINE DR NAPLES FL 34109-7126 USA
<b>FCC ID</b>	2ABHS00100AA
<b>Model Number</b>	LM-100-AA and LW-100-AA
<b>Product Description</b>	LOT-MASTER
<b>FCC Standard Applied</b>	47 CFR §15.249
<b>Date Sample Received</b>	8/18/2014
<b>Date Tested</b>	8/19/2014
<b>Tested By</b>	S. S. SANDERS
<b>Approved By</b>	Cory Leverett
<b>Report Number</b>	1293AZUT14TestReport.docx
<b>Test Results</b>	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

<p><b>THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.</b></p>
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## GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

## Summary

The device under test does:

- ☒ fulfill the general approval requirements as identified in this test report  
☐ not fulfill the general approval requirements as identified in this test report

## Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.  
849 NW State Road 45  
Newberry, FL 32669



**Authorized Signatory Name:**

**Project Manager:** Sid Sanders

**Date:** 8/19/2014

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APPLICANT: INVIS-A-BEAM LLC  
FCC ID: 2ABHS00100AA  
REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx

## GENERAL INFORMATION

### EUT Specification

The test results relate only to the items tested.			
<b>Applicable Standard</b>	Part 15.249		
<b>EUT Description</b>	LOT-MASTER		
<b>FCC ID</b>	2ABHS00100AA		
<b>Model Number</b>	LM-100-AA and LW-100-AA		
<b>Operating Frequency</b>	TX: 915 MHz	RX: Same	
<b>No. of Channels</b>		<b>Modulations</b>	
<b>EUT Power Source</b>	<input checked="" type="checkbox"/> 110–120Vac/50– 60Hz		
	<input checked="" type="checkbox"/> DC Power		
	<input type="checkbox"/> Battery Operated Exclusively		
<b>Test Item</b>	<input type="checkbox"/> Prototype	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Production
<b>Type of Equipment</b>	<input type="checkbox"/> Fixed	<input checked="" type="checkbox"/> Mobile	<input type="checkbox"/> Portable
<b>Antenna Connector</b>	FCC Rules require that the antenna connector be unique.		
<b>Test Facility</b>	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.		
<b>Conditions in the Test laboratory</b>	Temperature: 26°C Relative humidity: 50%		
<b>Test Exercise</b>	The EUT was placed in continuous transmit mode of operation.		
<b>Revision History of EUT</b>	New		

### Test Supporting Equipment

Supporting Device	Manufacturer	Model / FCC ID	Serial Number
N/A			

### TEST RESULTS SUMMARY

Specification – Rules Part No.	RESULTS – Pass/Fail/NA
FCC Rule 15.249 Fundamental	PASS
FCC Rule 15.249 Harmonics & Spurious	PASS
Bandedge	PASS
Power Line Emissions 15.207	PASS

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## TEST PROCEDURES

**Radiation Interference:** ANSI C63.4-2003 using a spectrum analyzer, a preselector, a quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3 MHz above 1 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worst case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

**Formula Of Conversion Factors:** The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+ CL	= FS
33	20 dBuV	+ 10.36 dB	+ 0.5	= 30.86 dBuV/m @ 3m

**Power Line Conducted Interference:** The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

**Occupied Bandwidth:** A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

**ANSI C63.4-2003 10.1 Measurement Procedures:** The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. Emissions attenuated more than 20 dB below the permissible value are not reported.

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## RADIATION INTERFERENCE

Rules Part No.: 15.249, 15.209

### Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V/m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V/m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V/m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V/m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V/m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V/m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V/m}$ @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB $\mu\text{V/m}$ @ 3 meters
Fundamental 2.4 – 2.4835 GHz	94.0 dB $\mu\text{V/m}$ @ 3 meters
Harmonics	54.0 dB $\mu\text{V/m}$ @ 3 meters

### Test Setup:

Radtstsetup1



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## RADIATION INTERFERENCE

Rules Part No.: 15.249, 15.209

### Test Setup:

**Radtstsetup2**



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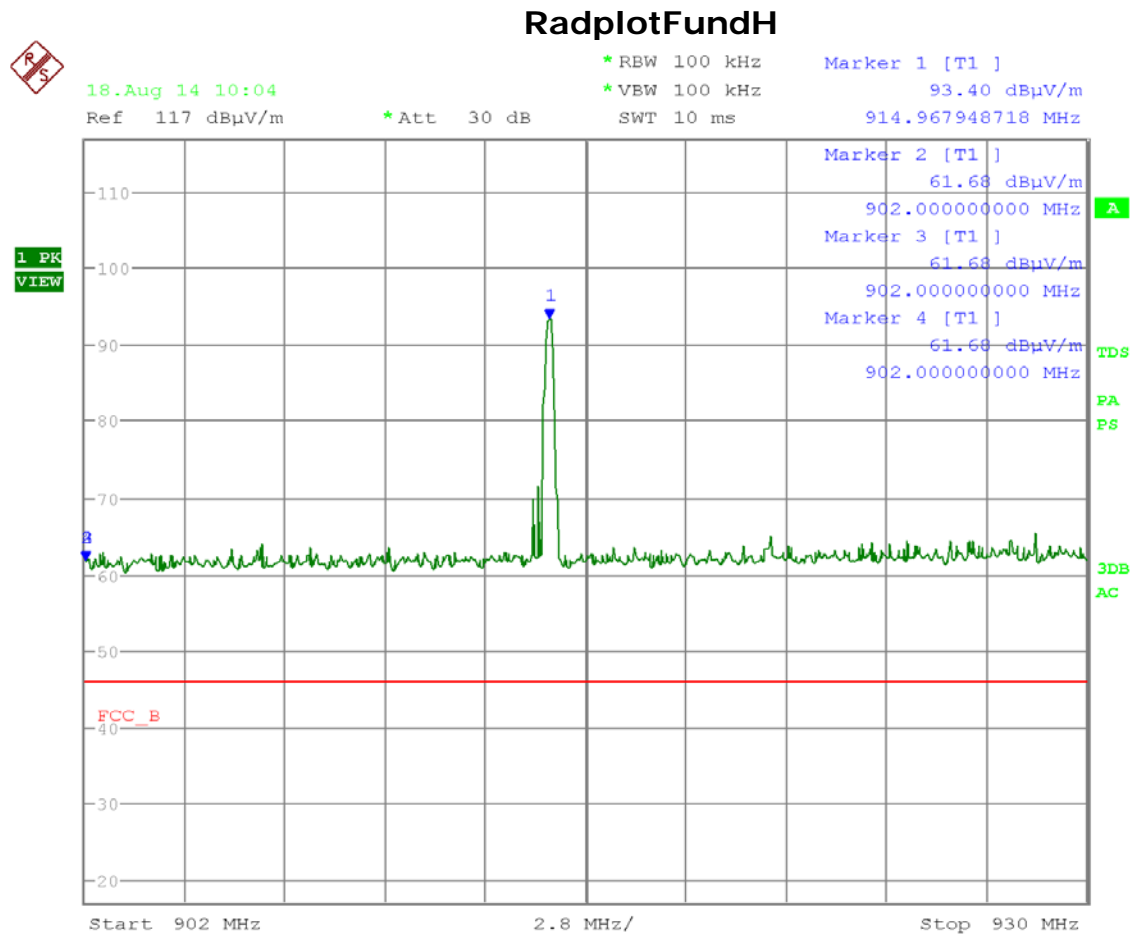
APPLICANT: INVIS-A-BEAM LLC

FCC ID: 2ABHS00100AA

REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx

## RADIATION INTERFERENCE FUNDAMENTAL HORIZONTAL

Rules Part No.: 15.249, 15.209



Date: 18.AUG.2014 10:04:05

### Results: Meets Requirements

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APPLICANT: INVIS-A-BEAM LLC

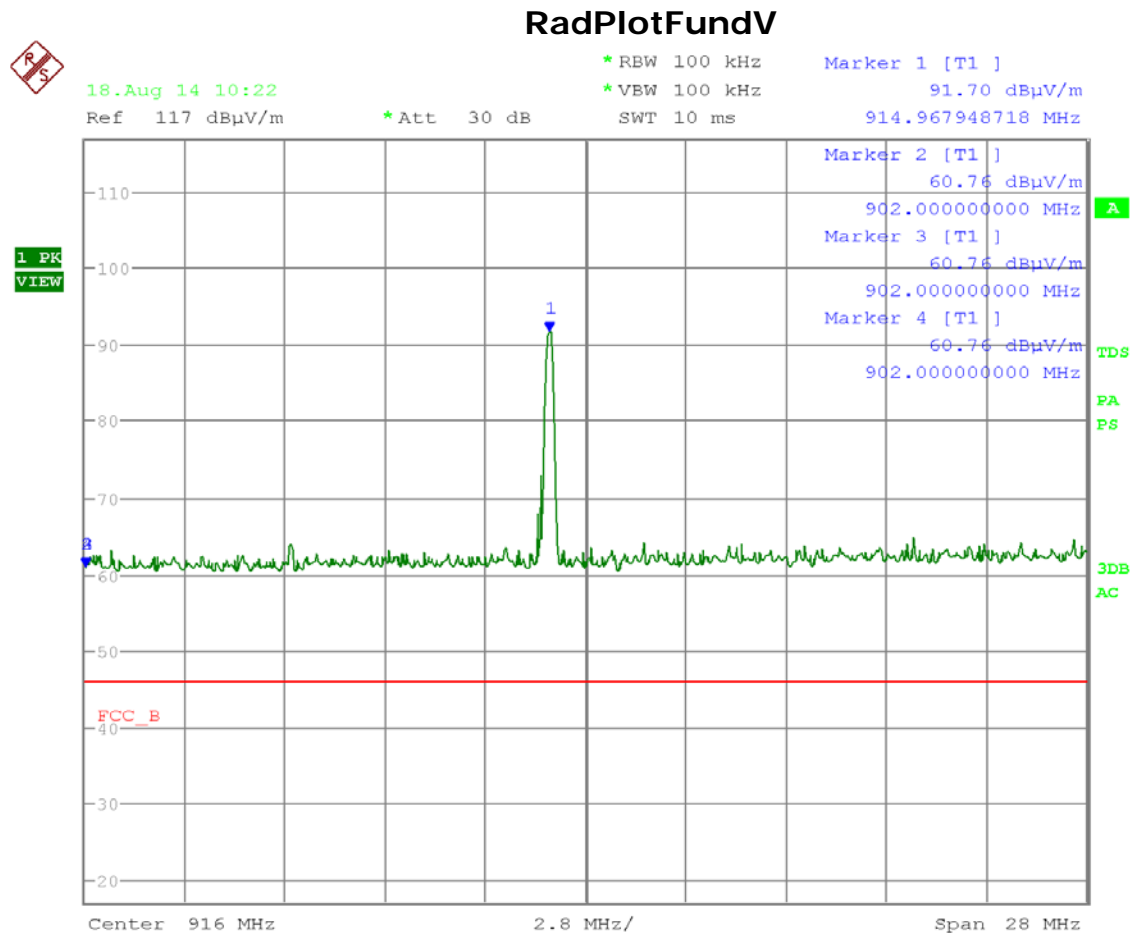
FCC ID: 2ABHS00100AA

REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx



## RADIATION INTERFERENCE FUNDAMENTAL VERTICAL

Rules Part No.: 15.249, 15.209



Date: 18.AUG.2014 10:22:14

**Results: Meets Requirements**

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APPLICANT: INVIS-A-BEAM LLC

FCC ID: 2ABHS00100AA

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# RADIATION INTERFERENCE 30- 200MHZ HORIZONTAL

Rules Part No.: 15.249, 15.209

## Rad30200H



07.Aug 14 17:02

Ref 72 dBuV/m

\*Att 0 dB

\*RBW 100 kHz

\*VBW 100 kHz

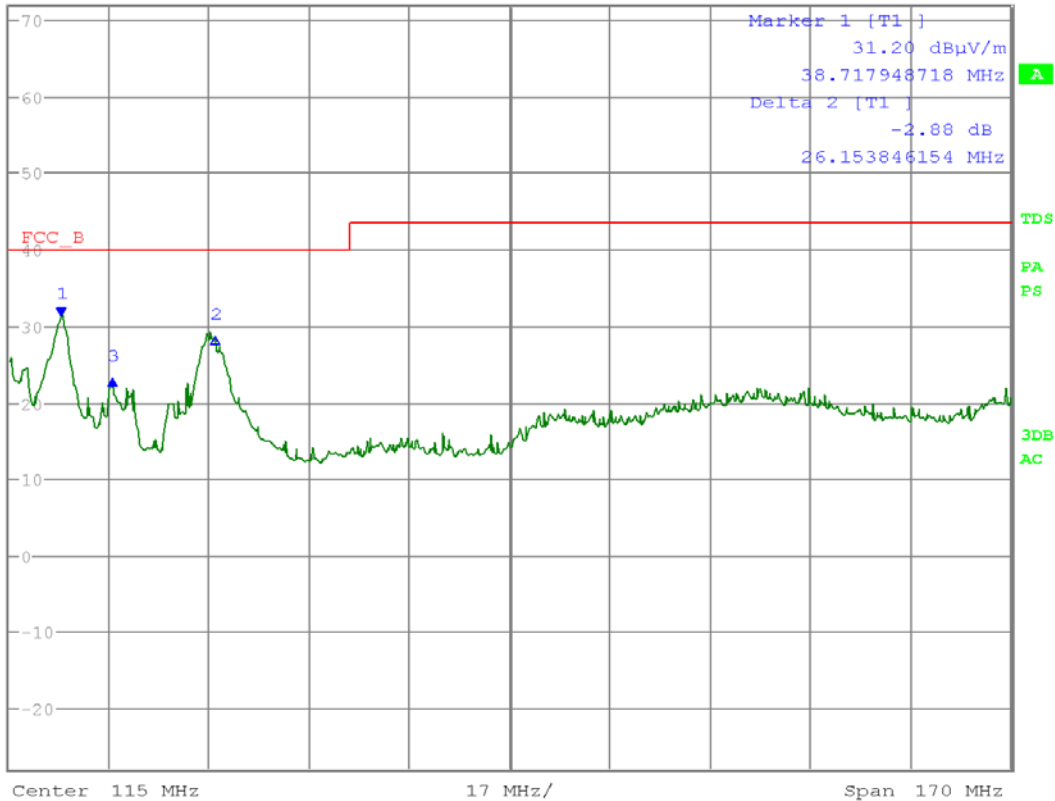
SWT 20 ms

Delta 3 [T1]

-8.28 dB

8.717948718 MHz

1 PK  
VIEW



Date: 7.AUG.2014 17:02:44

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APPLICANT: INVIS-A-BEAM LLC

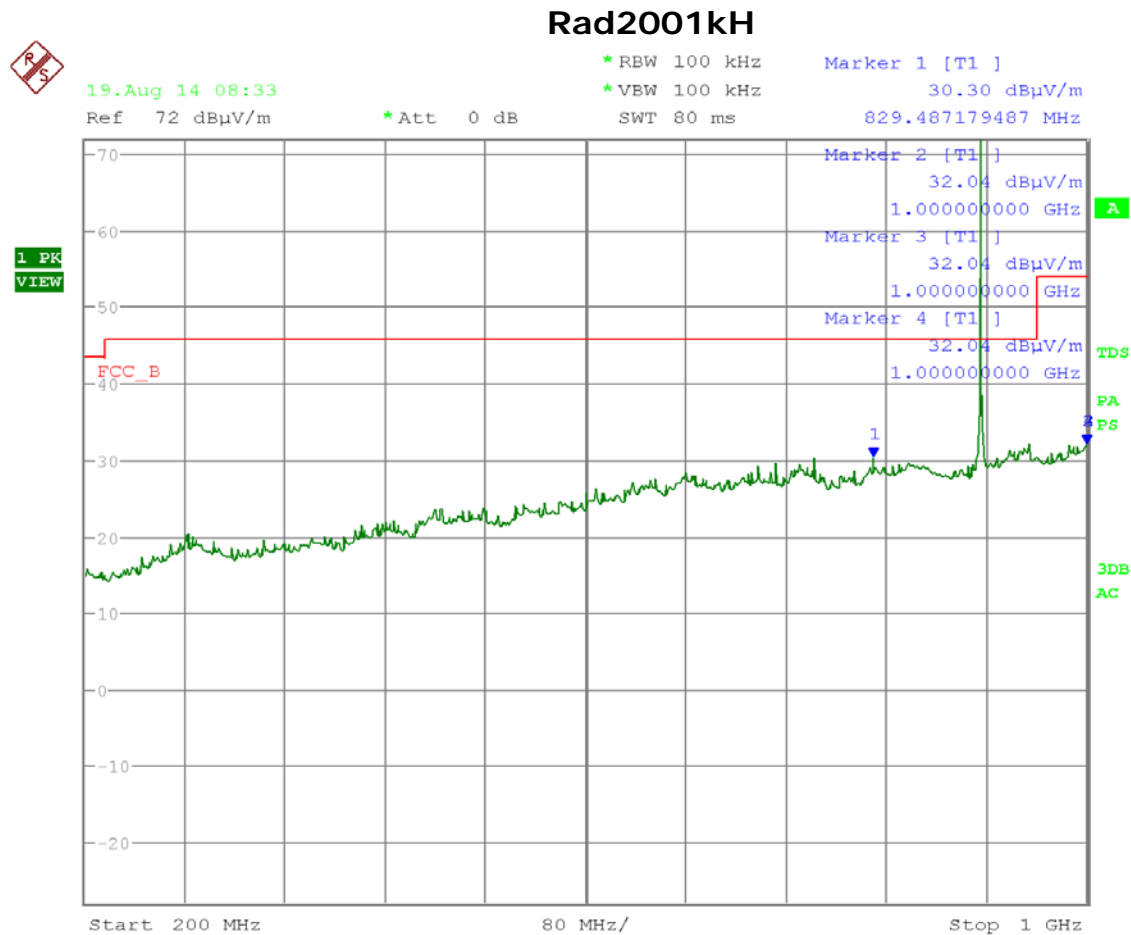
FCC ID: 2ABHS00100AA

REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx



# RADIATION INTERFERENCE 200 1000 MHZ HORIZONTAL

Rules Part No.: 15.249, 15.209



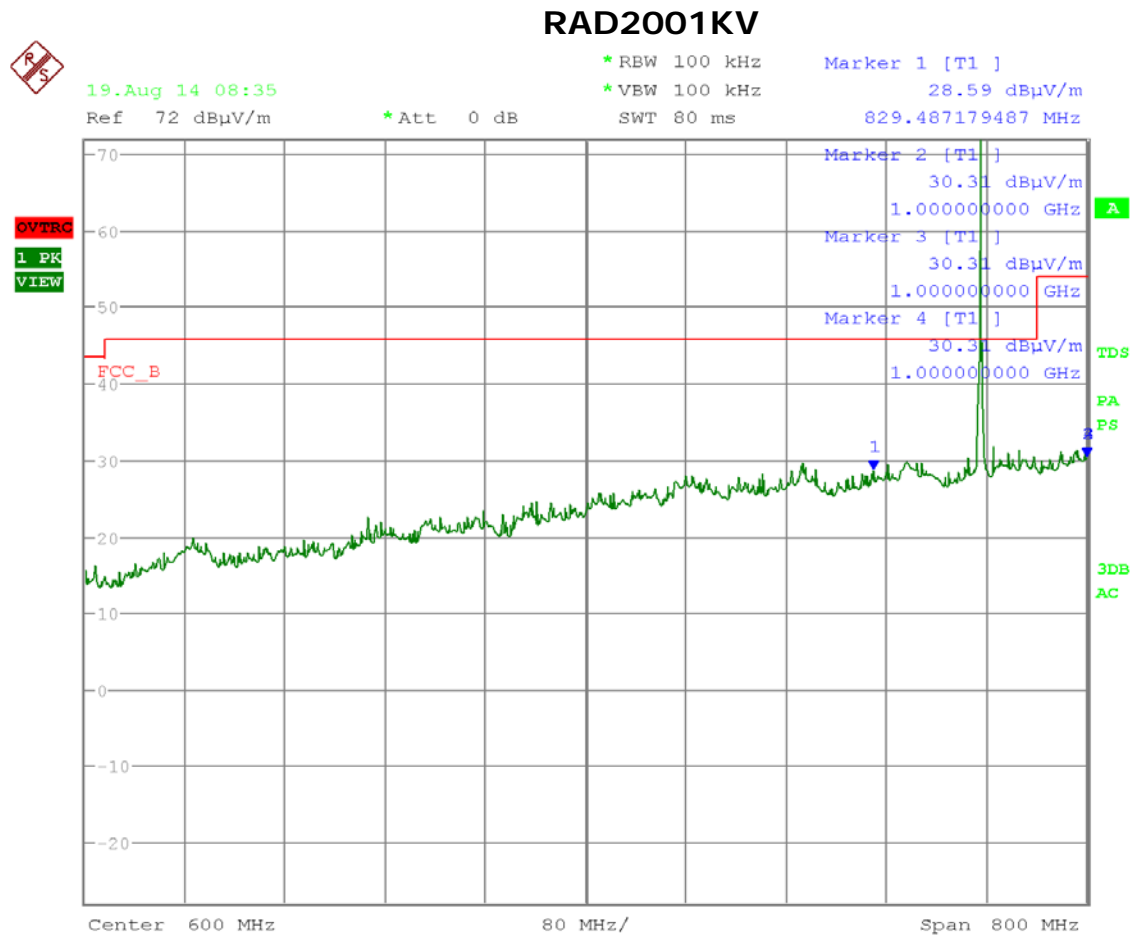
Date: 19.AUG.2014 08:33:53

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# RADIATION INTERFERENCE 200 1000 MHZ VERTICAL

Rules Part No.: 15.249, 15.209



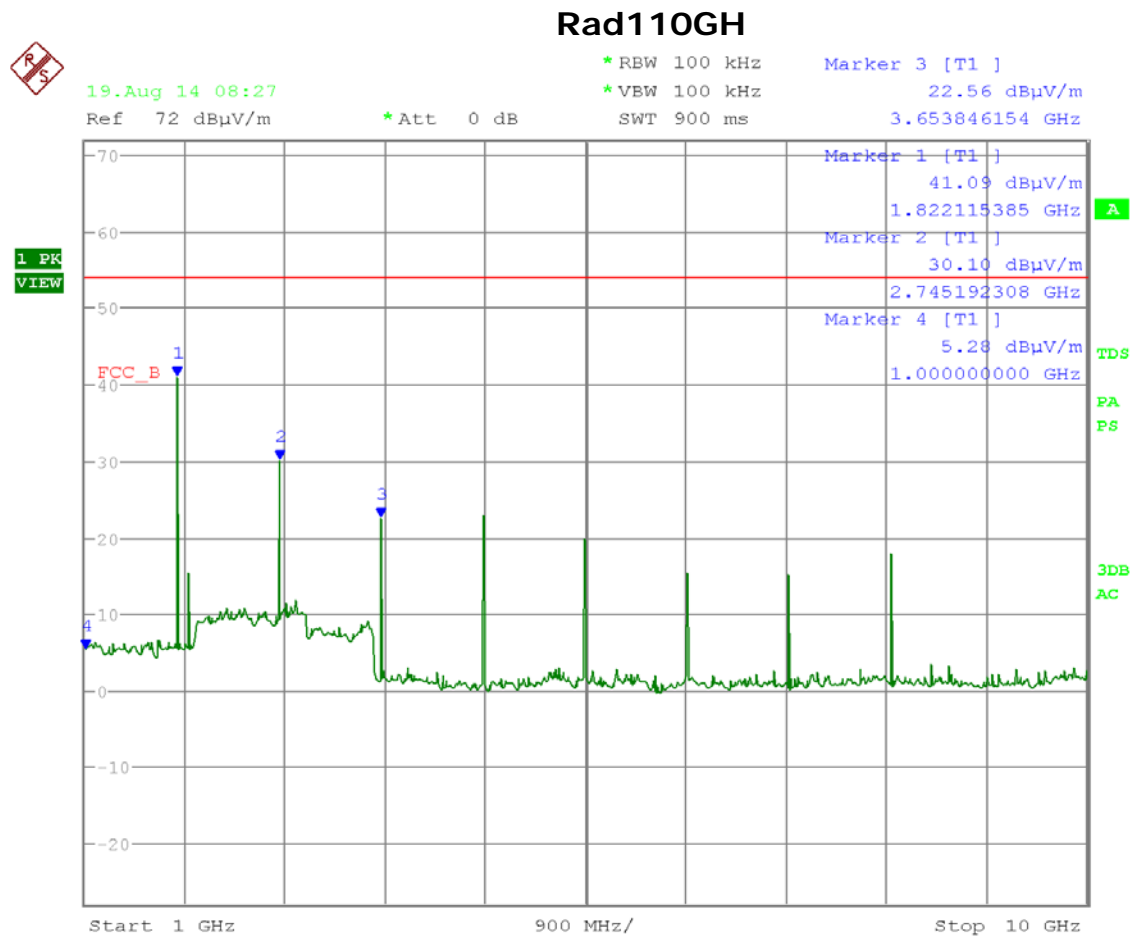
Date: 19.AUG.2014 08:35:02

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APPLICANT: INVIS-A-BEAM LLC  
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 REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx

## RADIATION INTERFERENCE 1 10GHZ HORIZONTAL

Rules Part No.: 15.249, 15.209



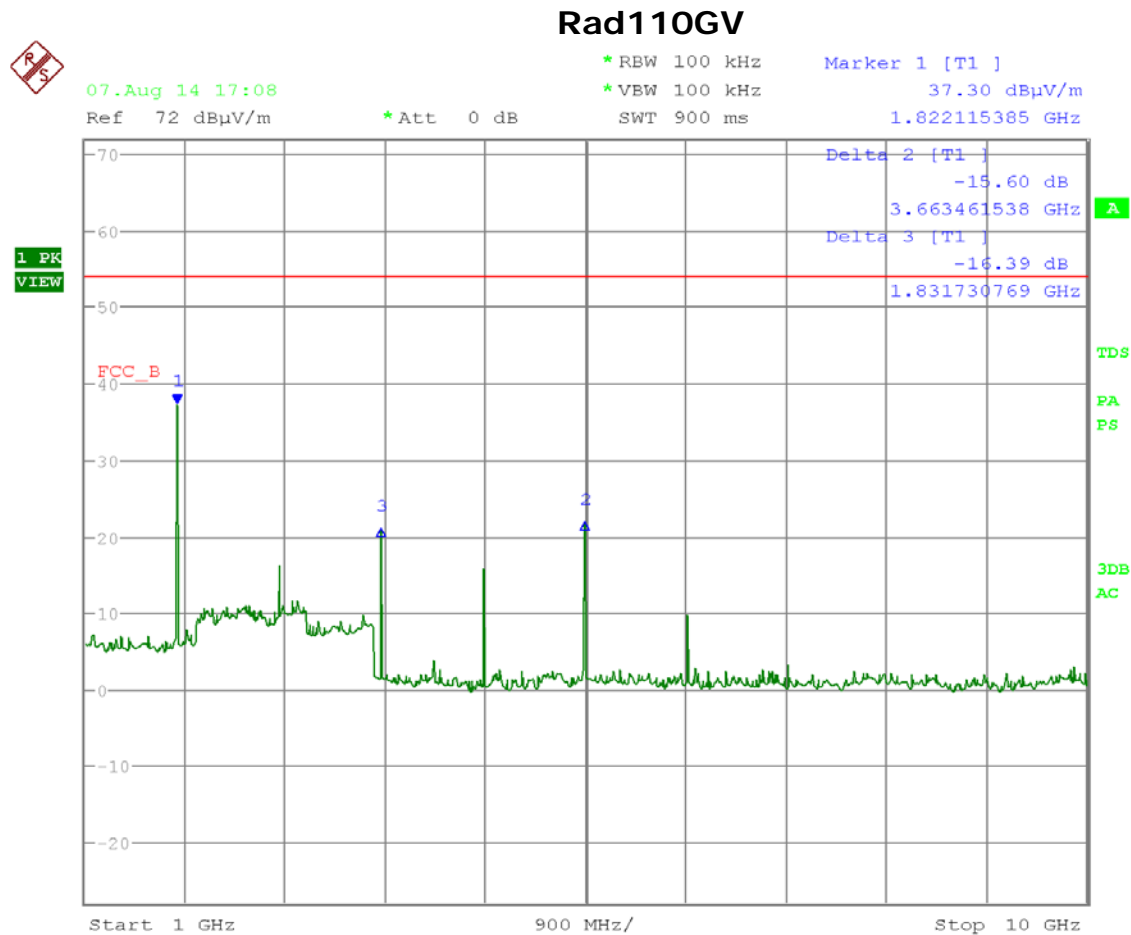
Date: 19.AUG.2014 08:27:32

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 FCC ID: 2ABHS00100AA  
 REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx

# RADIATION INTERFERENCE 1 10GHZ VERTICAL

Rules Part No.: 15.249, 15.209



Date: 7.AUG.2014 17:08:31

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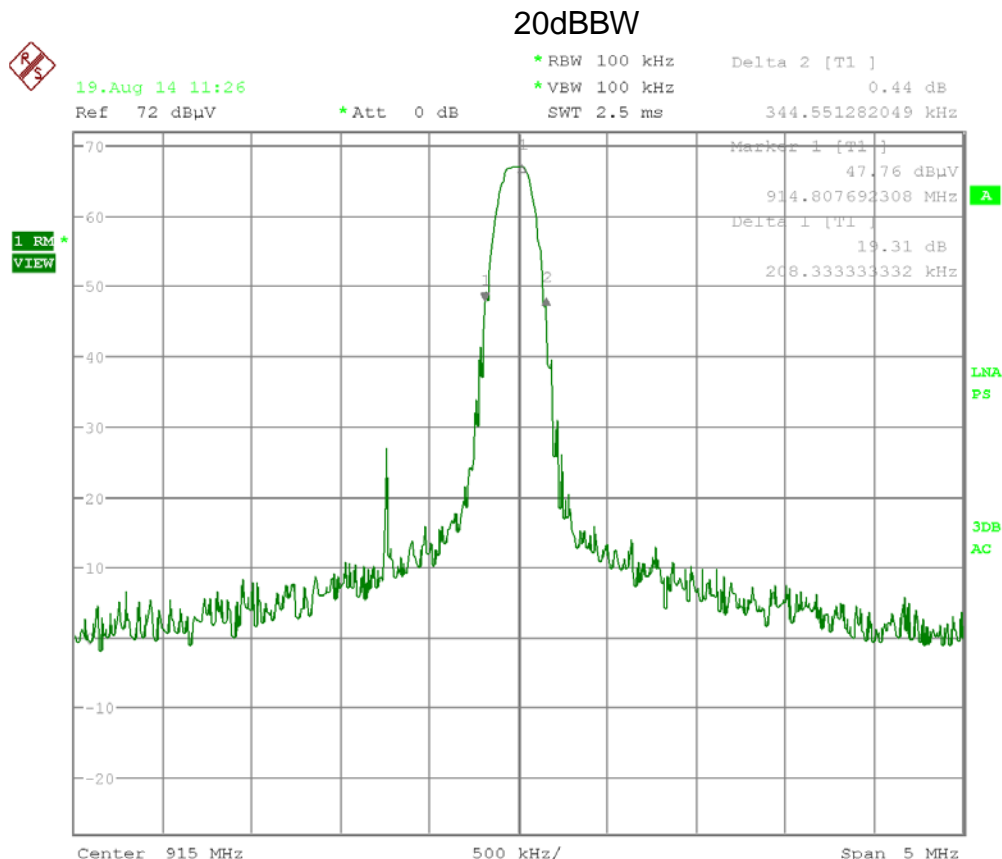
APPLICANT: INVIS-A-BEAM LLC  
 FCC ID: 2ABHS00100AA  
 REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx

## OCCUPIED BANDWIDTH & BANDEDGE:

**Rules Part No.:** 15.249 (d)

**Requirements:** The field strength of any emissions appearing outside the bandedges and up to 10 kHz above and below the band edges shall be attenuated at least 50 dB below the level of the carrier or to the general limits of 15.249.

### Test Data:



Date: 19.AUG.2014 11:26:57

**Results: Meets Requirement**

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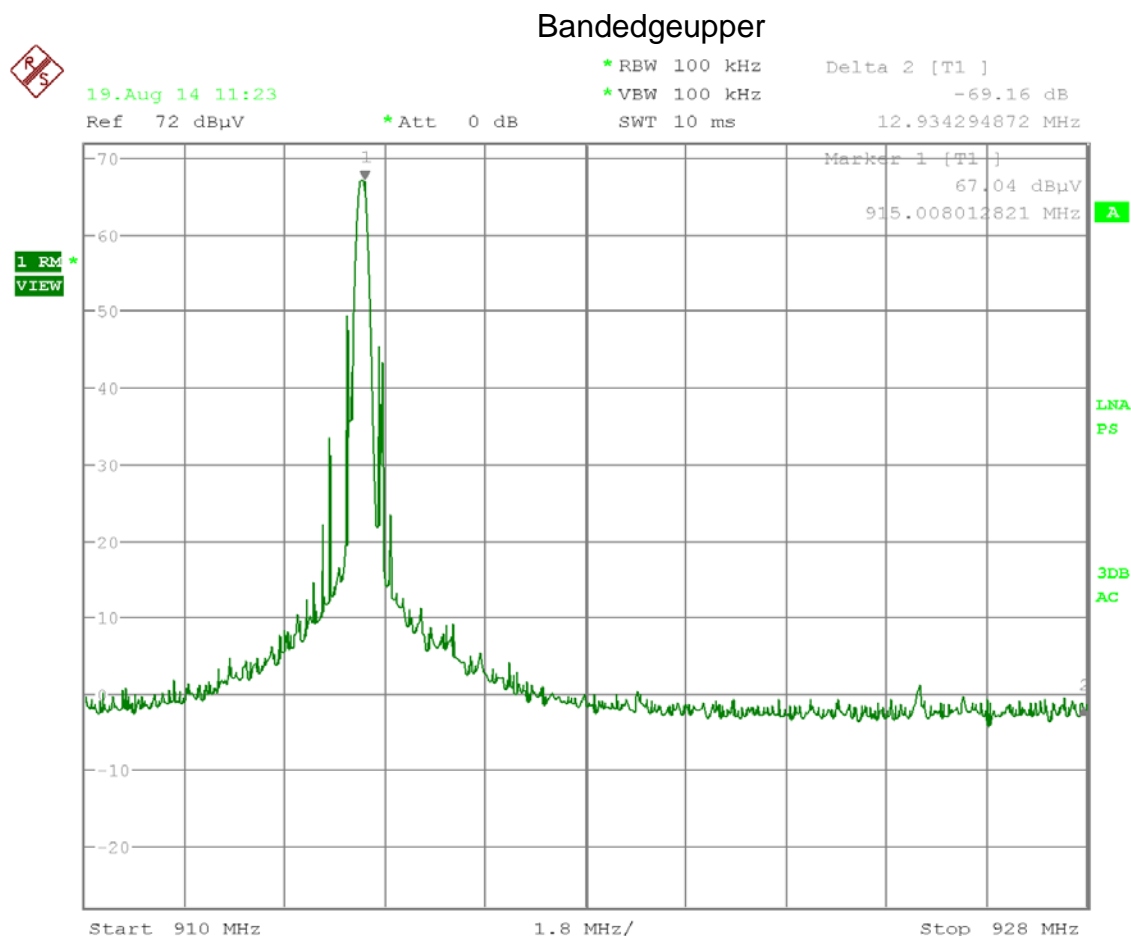
APPLICANT: INVIS-A-BEAM LLC

FCC ID: 2ABHS00100AA

REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx



## OCCUPIED BANDWIDTH & BANDEDGE



Date: 19.AUG.2014 11:23:41

**Results: Meets Requirements**

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APPLICANT: INVIS-A-BEAM LLC  
FCC ID: 2ABHS00100AA  
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## POWER LINE CONDUCTED INTERFERENCE

**Rules Part No.:** 15.207

**Requirements:**

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

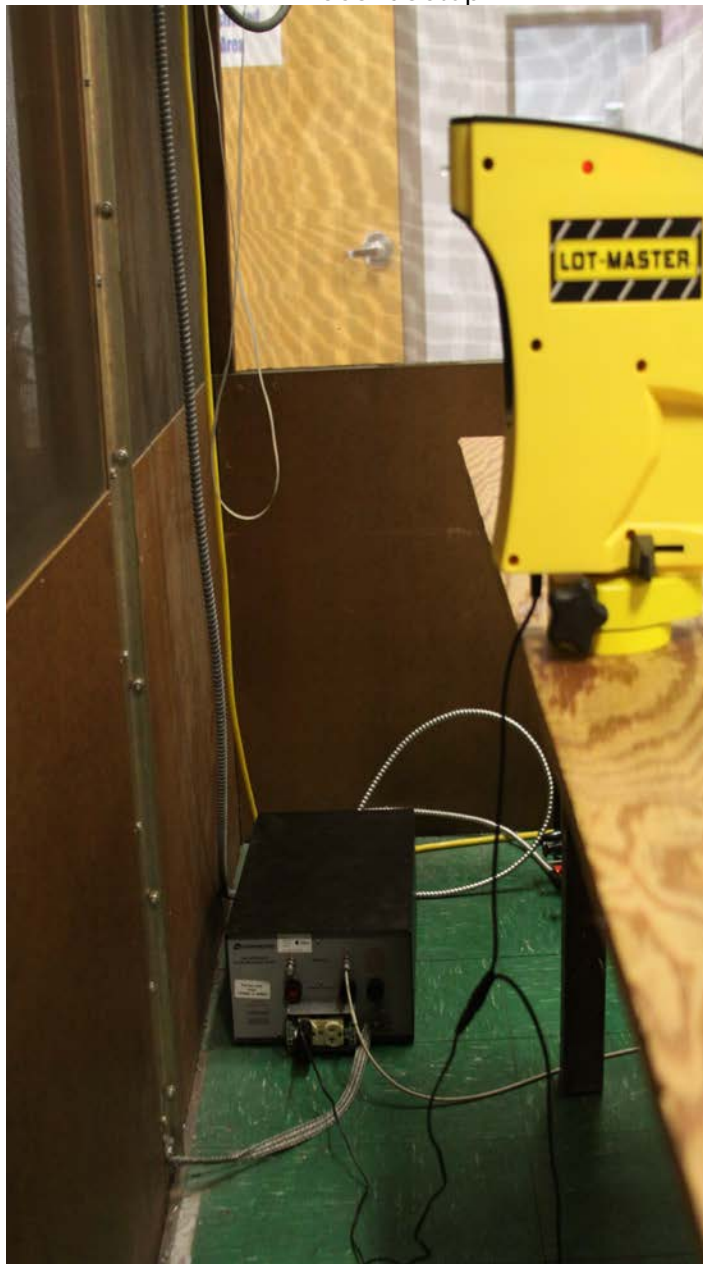
**Test Data:** The attached graphs represent the emissions read for power line conducted for this device. Both lines were observed.

**Rules Part No.:** 15.207

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## POWERLINE CONDUCTED EMISSIONS TEST SET UP PHOTO

PwrlineCondSetup

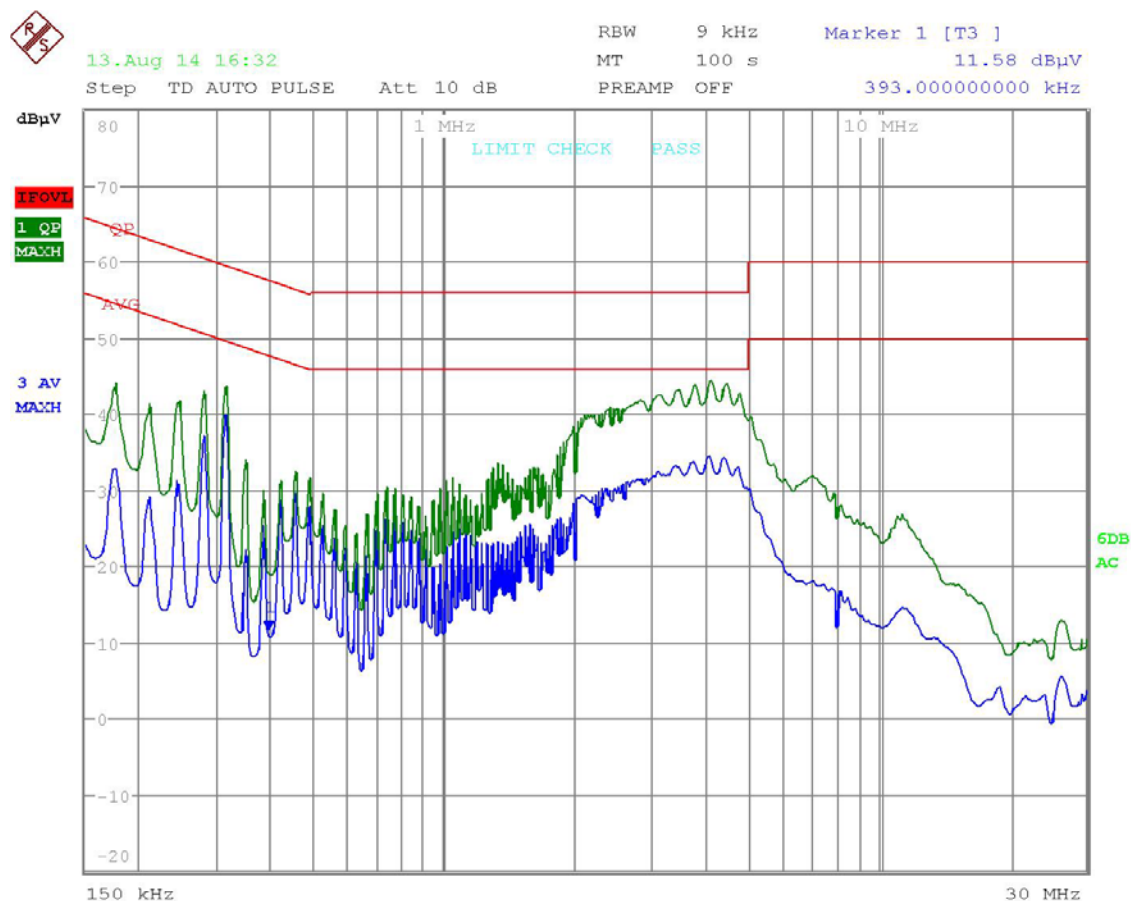


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APPLICANT: INVIS-A-BEAM LLC  
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## POWER LINE CONDUCTED INTERFERENCE PLOT LINE 1

Rules Part No.: 15.207



Date: 13.AUG.2014 16:32:56

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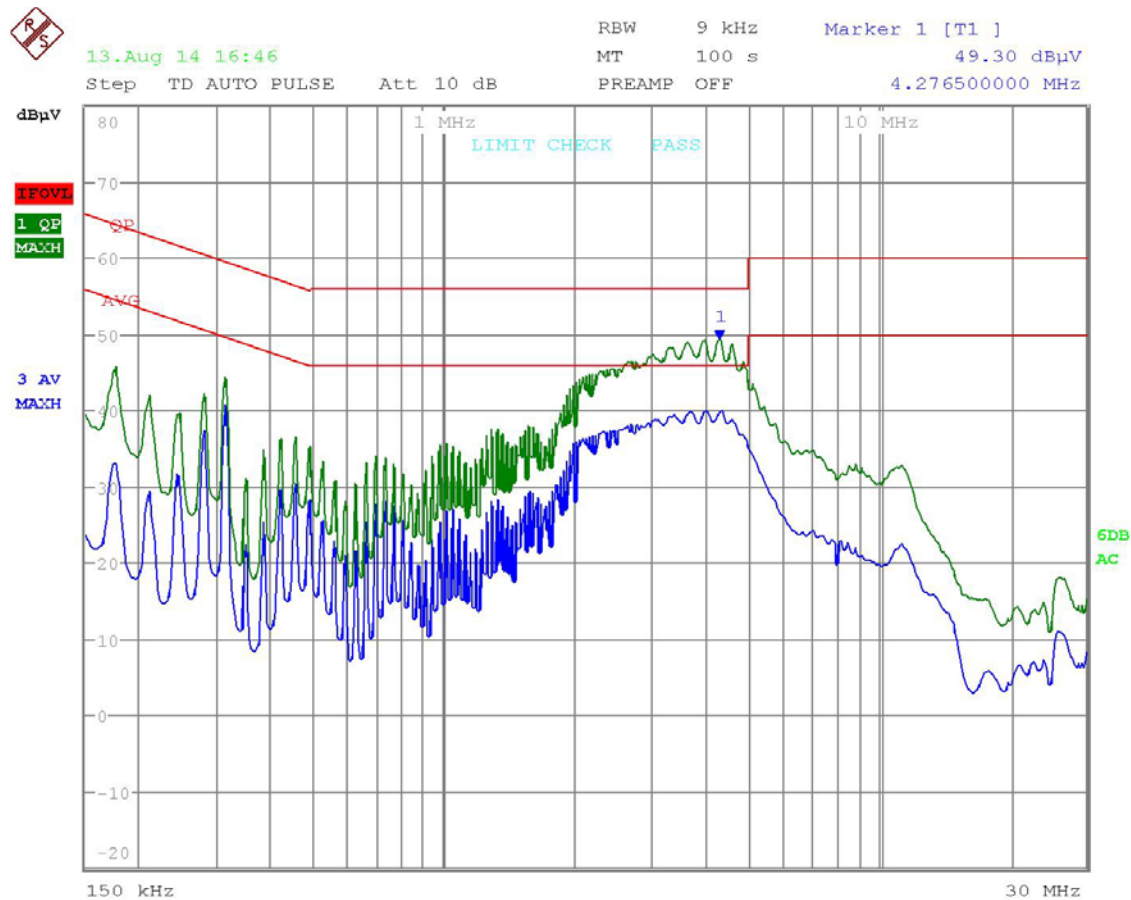
APPLICANT: INVIS-A-BEAM LLC

FCC ID: 2ABHS00100AA

REPORT: I\INVIS\1293AZUT14\1293AZUT14TestReport.docx

## POWER LINE CONDUCTED INTERFERENCE PLOT LINE 2

Rules Part No.: 15.207 Neutral



Date: 13.AUG.2014 16:46:29

**Results: Meets Requirements**

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APPLICANT: INVIS-A-BEAM LLC  
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## EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Shielded Enclosure Screen Room	Timco	Shielded Enclosure	N/A	N/A	N/A
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Coaxial Cable - Chamber 3 cable set	Semiflex	N/A	Chamber 3 cable set	1/26/12	1/26/15
EMI Test Receiver	Rhode & Schwarz	*ESU40	1302.6005.40	3/21/13	3/21/15
Antenna: Biconnical	Eaton	94455-1	1096	5/10/13	5/10/15
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	5/09/13	5/09/15
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	10/05/12	10/05/14
Coaxial Cable #65	General Cable Co.	E9917 RG233/U	Timco #65	6/26/13	6/26/15
LISN	Electro-Metrics	EM-7820	2682	6/5/13	6/5/15

### \*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

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