



849 NW State Road 45
Newberry, FL 32669 USA

Ph.: 888.472.2424 or
352.472.5500

Fax: 352.472.2030

Email: info@timcoengr.com

Website: www.timcoenar.com

FCC PART 15.249 & IC RSS-210
UNLICENSED INTENTIONAL RADIATOR
TEST REPORT

Applicant	INVIS-A-BEAM LLC
Address	4707 ENTERPRISE AVE UNIT #2 NAPLES FL 34104 USA
FCC ID	2ABHSPDY100AA
IC Certification Number	12743A-PDY100AA
Model Number	PDY-100-AA
Product Description	RF TRANSMITTER HEAD UNIT A
Date Sample Received	8/27/2015
Final Test Date	9/8/2015
Tested By	Cory Leverett
Approved By	Sid Sanders

Report Number	Version Number	Description	Issue Date
1789UT15TestReport	Rev1	Initial Issue	9/9/2015

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**

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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:

Cory Leverett
Project Manager

Date: 9/9/2015



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GENERAL INFORMATION

EUT Specification

FCC Regulatory Standard	Title 47 CFR Part 2 & 15		
IC Regulatory Standard	RSS-210 (i8) & RSS-GEN (i4)		
FCC ID	2ABHSPDY100AA		
IC	12743A-PDY100AA		
Model	PDY-100-AA		
EUT Description	RF TRANSMITTER HEAD UNIT A		
Operating Frequency	TX: 916.25-917.75 MHz	RX: NA	
EUT Power Source	☐ 110–120Vac/50– 60Hz		
	☐ DC Power		
	☒ Battery Operated Exclusively		
Test Item	☒ Prototype	☐ Pre-Production	☐ Production
Type of Equipment	☒ Fixed	☐ Mobile	☐ Portable
Antenna Connector	None		
Antenna	Integrated PCB Trace Antenna		
Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.		
Test Conditions	Temperature: 24-26°C Relative humidity: 50-65%		
Measurement Standards	IC RSS-GEN Issue 4 FCC CFR 47 Part 15.31 ANSI C63.10-2013 (test methods) ANSI C63.4-2009 (Site Validation)		
Test Exercise	Transmitting under Normal Modulation		

Test Supporting Equipment

Device	Manufacturer	Model	S/N	Supplied By	Use
NA					

TEST RESULTS SUMMARY

Requirement	FCC Rule Part	IC RSS	Result
Fundamental & Harmonic Emissions	15.249 (a)(c)(e)	210 § A2.9	Pass
Occupied Bandwidth	15.215 (c)	GEN § 6.6	Pass
Bandedge Compliance	15.249 (c)(d)(e) 15.209	210 § A2.9(b) GEN § 8.9	Pass
Spurious Emissions	15.249 (c)(d)(e) 15.209	210 § A2.9(b) GEN § 8.9	Pass
AC Power Line Conducted Emissions	15.207	GEN § 8.8	NA(1)
Restricted Band Emissions	15.205	210 § 2.2 GEN § 8.10	Pass
Antenna Requirements	15.203	GEN § 8.3	Pass

Notes:

1. This EUT is battery powered only, no provision is provided to connect to the public AC mains utility

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OCCUPIED BANDWIDTH

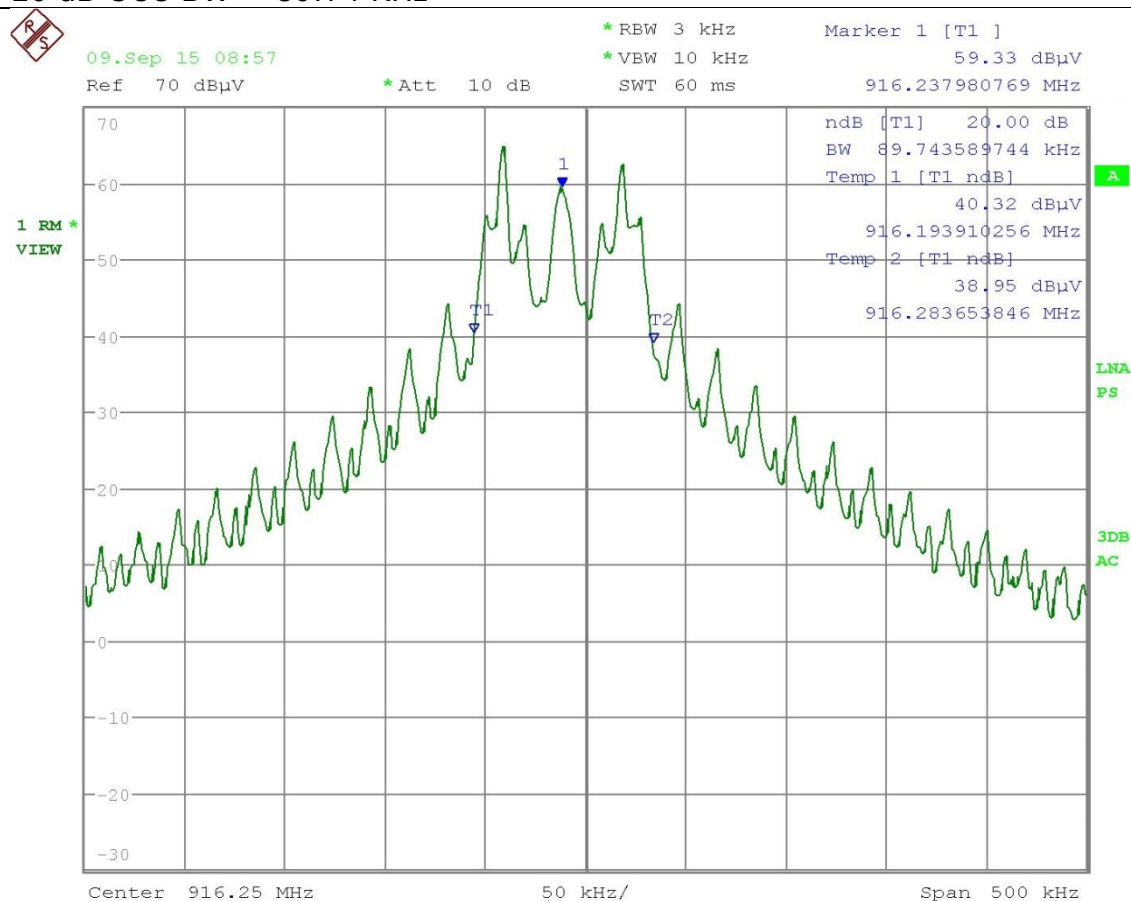
Rules Part No.: FCC 15.215(c) & IC RSS-GEN § 6.6

Requirements: FCC requires that the 20 dB bandwidth of the emission shall be contained within the frequency band designated under which the equipment is operated. Industry Canada 99% Bandwidth reporting only

Method of Measurement: ANSI C63.10 § 6.9 Occupied bandwidth tests

Test Data: Low End of Band

20 dB OCC BW = 89.74 KHz



Date: 9.SEP.2015 08:57:10

RESULTS MEET REQUIREMENTS

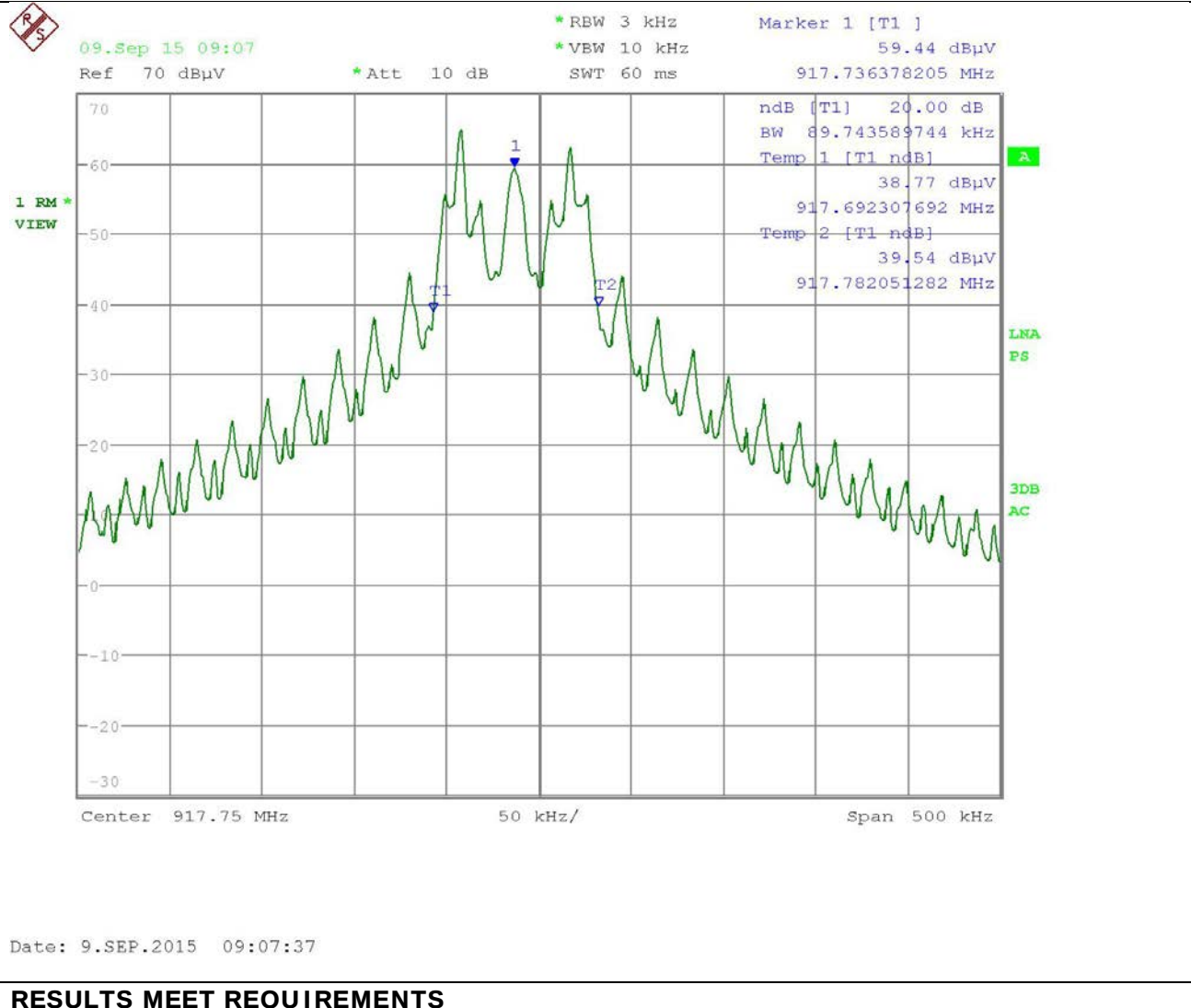
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OCCUPIED BANDWIDTH

Test Data: High End of Band

20 dB OCC BW = 89.74 KHz

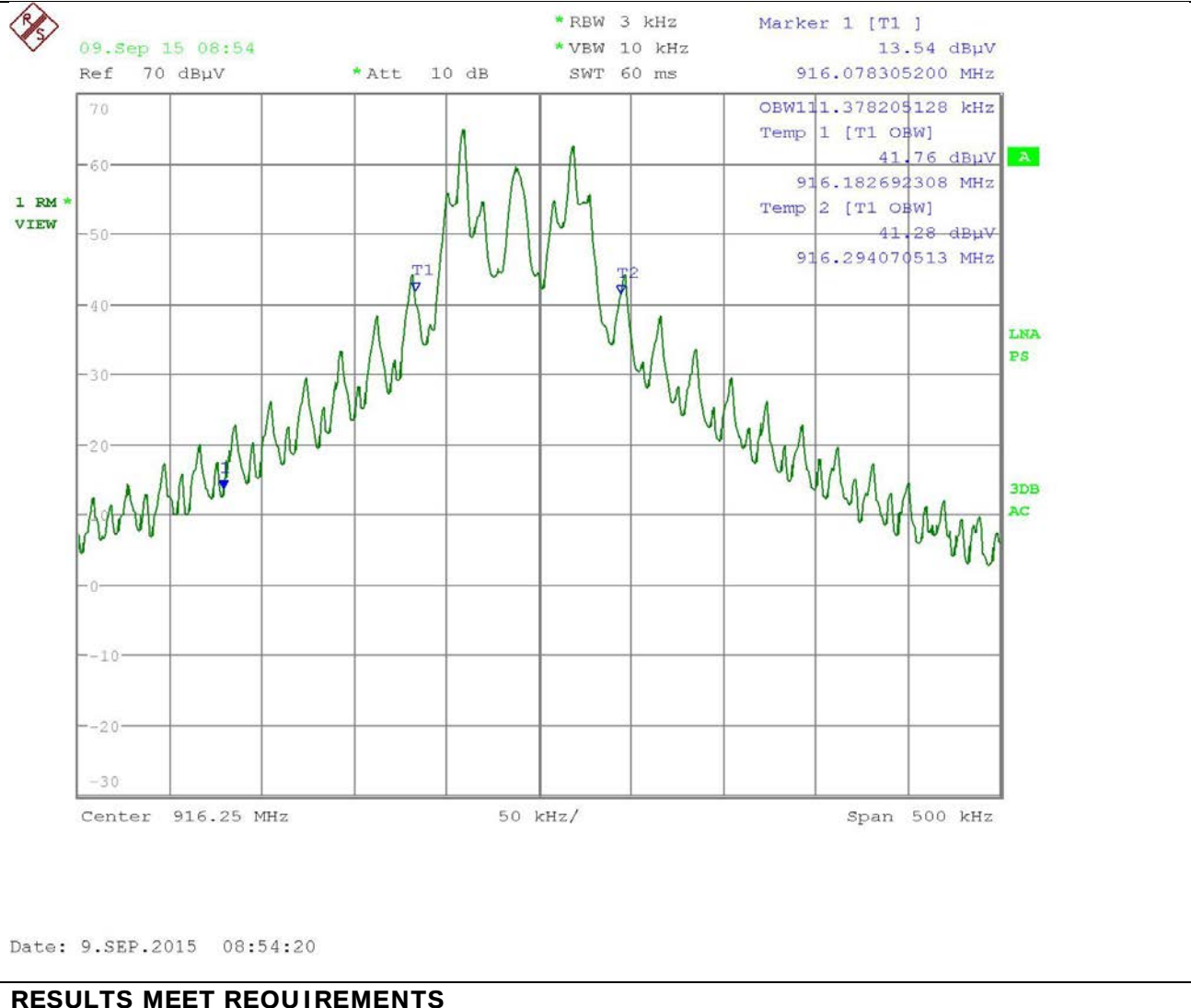


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OCCUPIED BANDWIDTH

Test Data: Low End of Band

99% OCC BW = 111.37 KHz

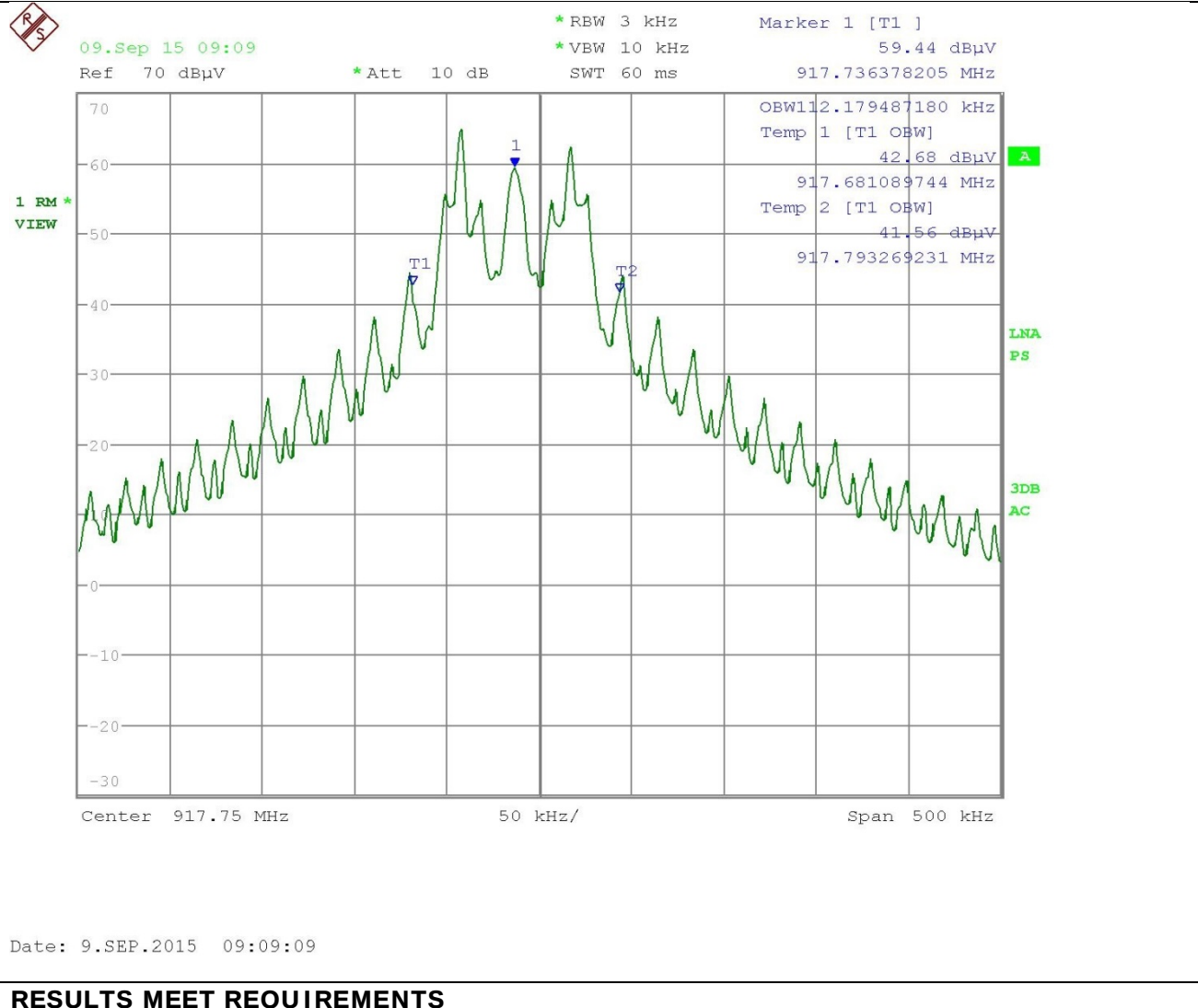


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OCCUPIED BANDWIDTH

Test Data: High End of Band

99% OCC BW = 112.17 KHz



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BAND-EDGE

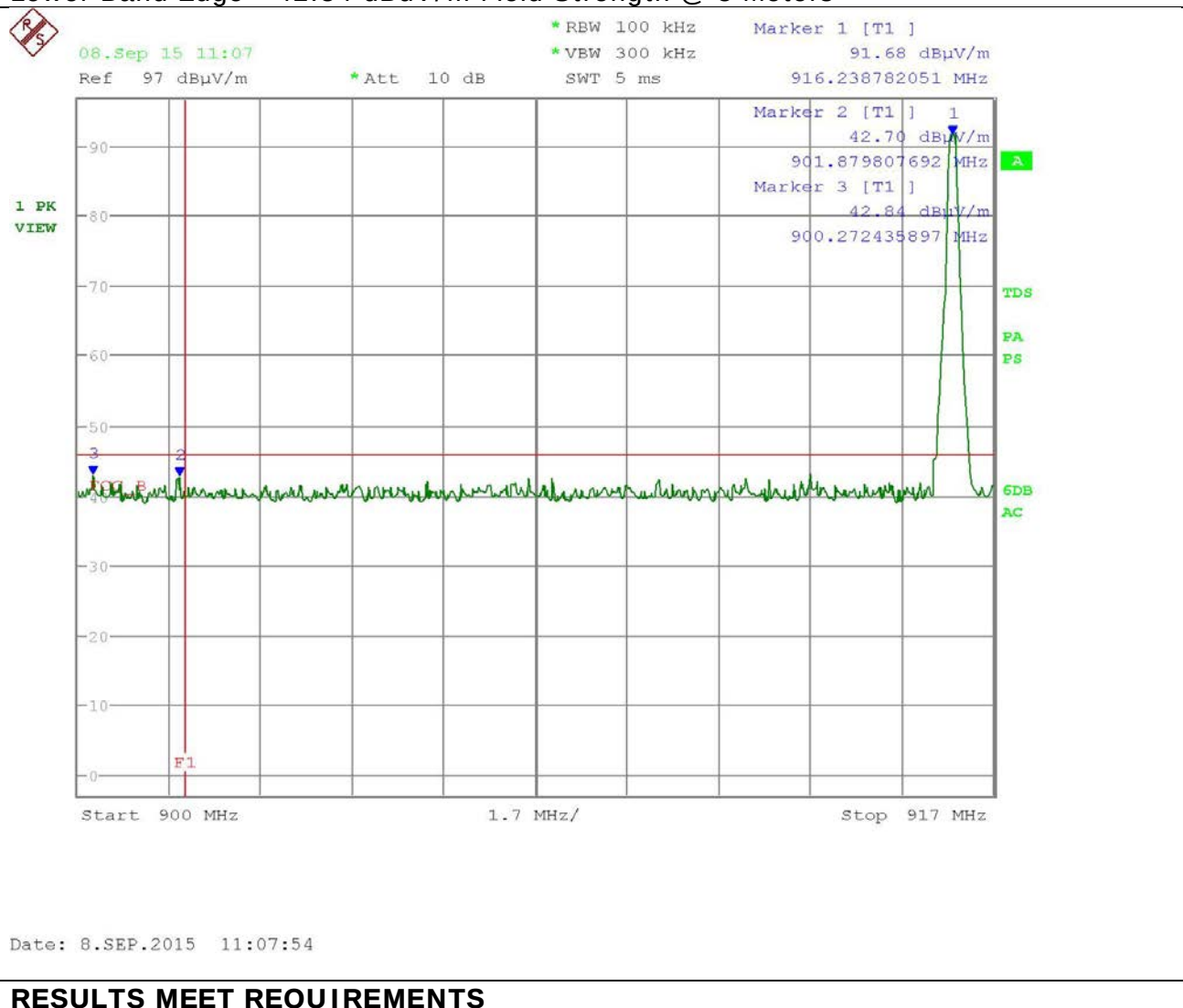
Rules Part No.: FCC 15.249(d) & IC RSS-210 § A2.9(b)

Requirements: The field strength of any emissions appearing outside the band edges 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.

Method of Measurement: ANSI C63.10 § 6.10 Band-edge testing

Test Data: Low End of Band

Lower Band Edge = 42.84 dBuV/m Field Strength @ 3 Meters



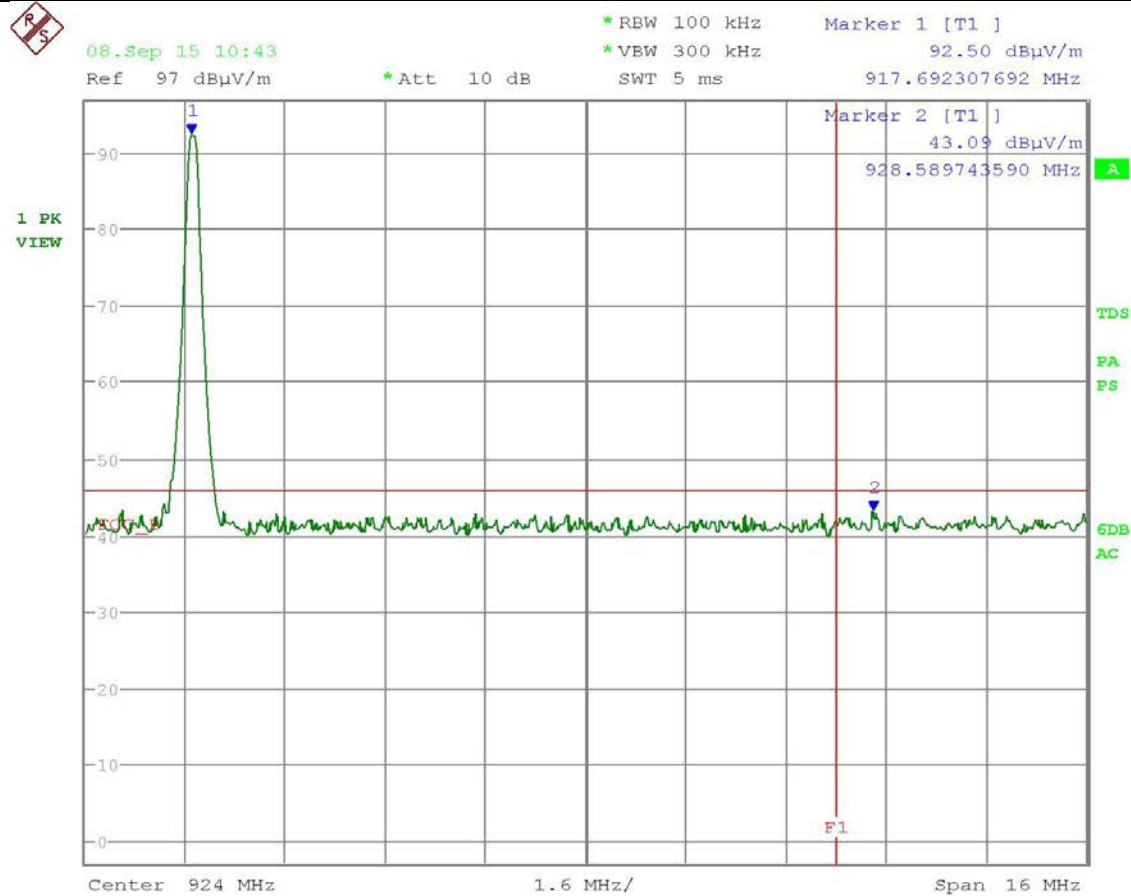
RESULTS MEET REQUIREMENTS

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Test Data: High End of Band

Upper Band Edge = 43.09 dBuV/m Field Strength @ 3 Meters



Date: 8.SEP.2015 10:43:47

RESULTS MEET REQUIREMENTS

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DUTY CYCLE

Rules Part No.: FCC 15.35, & IC RSS-GEN § 6.10

Requirements: When the field strength (or envelope power) is not constant or it is in pulses, and an average detector is specified to be used, the value of field strength or power shall be determined by averaging over one complete pulse train, including blanking intervals within the pulse train, as long as the pulse train does not exceed 0.1 second. In cases where the pulse train exceeds 0.1 second, the average value of field strength or output power shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

Method of Measurement: ANSI C63.10 § 7.5 Procedure for determining the average value of pulsed emissions

Test Data: Calculation of Correction Factor

Worst Case Pulse Train Measured during 100 ms Interval			
Pulse Type	Length of Pulse (ms)	Number of Pulses	On Time (ms)
Long Pulse	4.8	2	9.6
Medium Pulse	0	0	0
Short Pulse	0	0	0
Duty Cycle (%)			9.6
Duty Cycle Correction (dB)			20.35

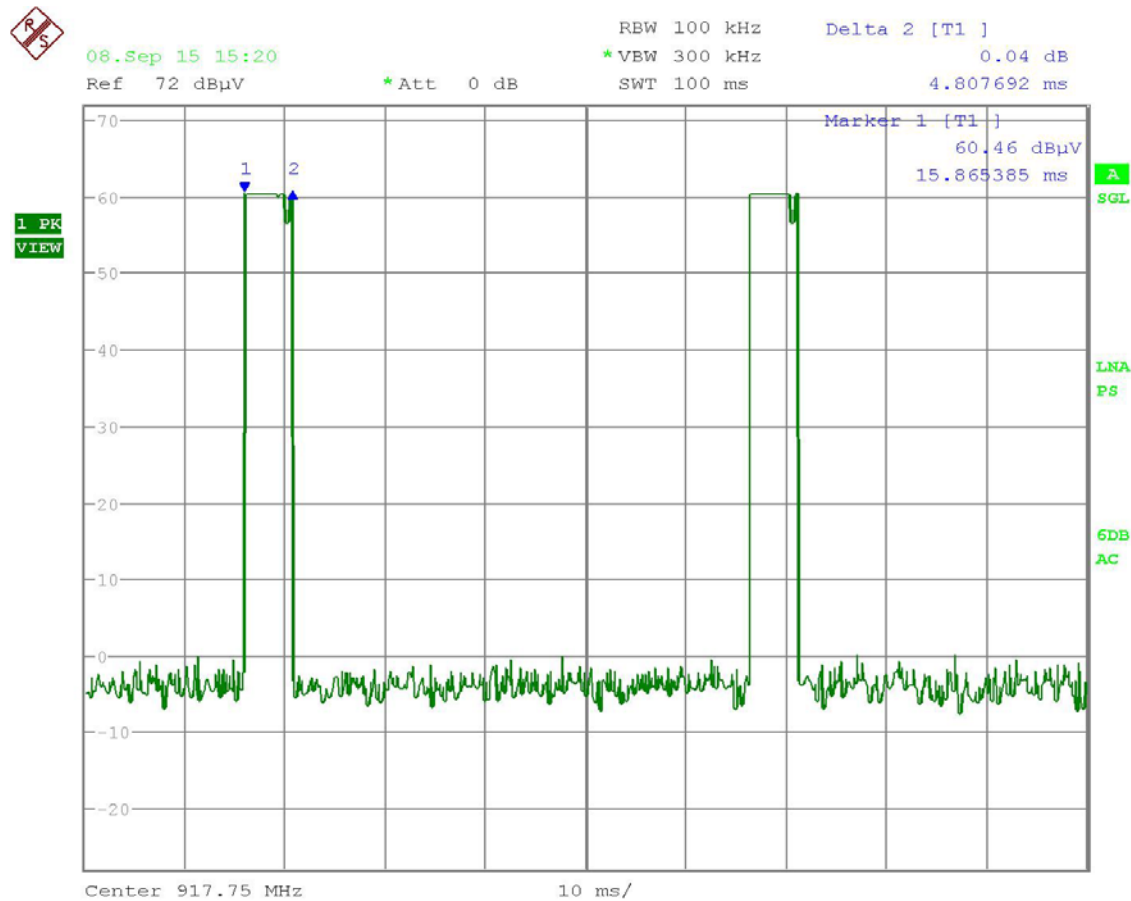
Correction Factor Equation	
$\delta(\text{dB}) = 20\log(\Delta) (10)$	
Where:	δ is the duty cycle correction factor (dB)
	Δ is the duty cycle (dimensionless)

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DUTY CYCLE

Test Data: DUTY CYCLE PLOTS

100 ms PULSE TRAIN



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RADIATION INTERFERENCE

Rules Part No.: FCC 15.249, 15.209 & IC RSS-210 ANNEX A2.9(a)(b), GEN § 8.9

Requirements:

Frequency	Limits
Part 15.209 & RSS-GEN 8.9	
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 & RSS-210 (i8) ANNEX A.2.9	
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

Method of Measurement: ANSI C63.10 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. Emissions were scanned from 30MHz to the tenth harmonic of the fundamental frequency at three places in the band. All emissions greater than 20 dB from the limit are not reported.

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

Test Data: Peak Detector Used for all Measurement's unless otherwise noted in table.

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RADIATION INTERFERENCE

Test Data: Peak Value of Pulsed Emissions from 9 KHz to the tenth harmonic of the fundamental carrier frequency

Tuned Freq MHz	Emission Frequency MHz	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin
916.25	705.15	14.23	H	1.98	21.15	37.36	8.64
916.25	710.73	12.35	H	1.97	21.21	35.53	10.47
916.25	916.25	60.01	V	2.40	23.36	85.77	8.23
916.25	916.25	66.32	H	2.40	23.36	92.08	1.92
916.25	1832.50	37.13	H	2.99	30.23	70.35	3.65
916.25	1832.50	28.21	V	2.99	30.23	61.43	12.57
916.25	2748.62	27.52	H	3.42	32.52	63.46	10.54
916.25	2748.75	24.56	V	3.42	32.52	60.50	13.50
916.25	3665.00	23.33	H	4.20	33.03	60.56	13.44
916.25	3665.00	17.35	V	4.20	33.03	54.58	19.42
916.25	4581.25	19.43	V	4.79	34.08	58.30	15.70
916.25	4581.25	19.63	H	4.79	34.08	58.50	15.50
916.25	5497.50	21.86	H	5.15	34.55	61.56	12.44
916.25	5497.50	21.32	V	5.15	34.55	61.02	12.98
916.25	6413.75	13.54	H	5.42	35.62	54.58	19.42
916.25	6413.75	15.87	V	5.42	35.62	56.91	17.09
916.25	7330.00	13.70	V	5.80	36.01	55.51	18.49
916.25	7330.00	15.54	H	5.80	36.01	57.35	16.65
916.25	8246.25	12.13	H	6.30	35.99	54.42	19.58
916.25	8246.25	12.37	V	6.30	35.99	54.66	19.34
916.25	9162.50	12.04	V	6.65	36.28	54.97	19.03
917.75	705.13	12.63	H	1.98	21.15	35.76	10.24
917.75	710.75	11.44	H	1.97	21.21	34.62	11.38
917.75	917.75	59.61	V	2.41	23.38	85.40	8.60
917.75	917.75	65.98	H	2.41	23.38	91.77	2.23
917.75	1835.41	36.54	H	3.00	30.25	69.79	4.21
917.75	1835.50	28.16	V	3.00	30.25	61.41	12.59
917.75	2753.25	23.96	H	3.43	32.53	59.92	14.08
917.75	2753.25	28.73	V	3.43	32.53	64.69	9.31
917.75	3671.00	19.07	H	4.20	33.03	56.30	17.70
917.75	4588.49	21.77	V	4.79	34.08	60.64	13.36
917.75	4588.75	22.57	H	4.79	34.08	61.44	12.56
917.75	5506.50	22.40	H	5.15	34.56	62.11	11.89
917.75	5506.50	22.21	V	5.15	34.56	61.92	12.08
917.75	6424.25	17.87	H	5.43	35.63	58.93	15.07
917.75	6424.25	17.03	V	5.43	35.63	58.09	15.91
917.75	7342.00	16.59	H	5.81	36.01	58.41	15.59
917.75	7342.00	14.47	V	5.81	36.01	56.29	17.71
917.75	8259.75	13.87	H	6.30	36.00	56.17	17.83
917.75	8259.75	11.99	V	6.30	36.00	54.29	19.71
917.75	9177.50	11.42	V	6.65	36.29	54.36	19.64

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RADIATION INTERFERENCE

Test Data: Average Value of Pulsed Emissions > 1GHz, See Duty Cycle section of this report for calculation of correction factor.

Tuned Freq MHz	Emission Frequency MHz	Meter Reading dBu V	Duty Cycle dB	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin
916.25	1832.50	37.13	20.00	H	2.99	30.23	50.35	3.65
916.25	1832.50	28.21	20.00	V	2.99	30.23	41.43	12.57
916.25	2748.62	27.52	20.00	H	3.42	32.52	43.46	10.54
916.25	2748.75	24.56	20.00	V	3.42	32.52	40.50	13.50
916.25	3665.00	23.33	20.00	H	4.20	33.03	40.56	13.44
916.25	3665.00	17.35	20.00	V	4.20	33.03	34.58	19.42
916.25	4581.25	19.43	20.00	V	4.79	34.08	38.30	15.70
916.25	4581.25	19.63	20.00	H	4.79	34.08	38.50	15.50
916.25	5497.50	21.86	20.00	H	5.15	34.55	41.56	12.44
916.25	5497.50	21.32	20.00	V	5.15	34.55	41.02	12.98
916.25	6413.75	13.54	20.00	H	5.42	35.62	34.58	19.42
916.25	6413.75	15.87	20.00	V	5.42	35.62	36.91	17.09
916.25	7330.00	13.70	20.00	V	5.80	36.01	35.51	18.49
916.25	7330.00	15.54	20.00	H	5.80	36.01	37.35	16.65
916.25	8246.25	12.13	20.00	H	6.30	35.99	34.42	19.58
916.25	8246.25	12.37	20.00	V	6.30	35.99	34.66	19.34
916.25	9162.50	12.04	20.00	V	6.65	36.28	34.97	19.03
917.75	1835.41	36.54	20.00	H	3.00	30.25	49.79	4.21
917.75	1835.50	28.16	20.00	V	3.00	30.25	41.41	12.59
917.75	2753.25	23.96	20.00	H	3.43	32.53	39.92	14.08
917.75	2753.25	28.73	20.00	V	3.43	32.53	44.69	9.31
917.75	3671.00	19.07	20.00	H	4.20	33.03	36.30	17.70
917.75	4588.49	21.77	20.00	V	4.79	34.08	40.64	13.36
917.75	4588.75	22.57	20.00	H	4.79	34.08	41.44	12.56
917.75	5506.50	22.40	20.00	H	5.15	34.56	42.11	11.89
917.75	5506.50	22.21	20.00	V	5.15	34.56	41.92	12.08
917.75	6424.25	17.87	20.00	H	5.43	35.63	38.93	15.07
917.75	6424.25	17.03	20.00	V	5.43	35.63	38.09	15.91
917.75	7342.00	16.59	20.00	H	5.81	36.01	38.41	15.59
917.75	7342.00	14.47	20.00	V	5.81	36.01	36.29	17.71
917.75	8259.75	13.87	20.00	H	6.30	36.00	36.17	17.83
917.75	8259.75	11.99	20.00	V	6.30	36.00	34.29	19.71
917.75	9177.50	11.42	20.00	V	6.65	36.29	34.36	19.64

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EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconnical Chamber	Eaton Chamber	94455-1	1057	06/14/13	12/14/15
Antenna: Log-Periodic Chamber	Eaton	96005	1243	05/31/13	11/30/15
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	07/09/15	07/09/17
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Anennat: Double-Ridged Horn/ETS Horn 1	ETS-Lindgren Chamber	3117	00035923	06/13/14	06/13/16
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	03/11/14	03/11/16

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

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