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FCC PART 15.249 & IC RSS-210 (i8) ANNEX A2.9

UNLICENSED INTENTIONAL RADIATOR

COMBINED TEST REPORT

Applicant	**BUILDING 36 TECHNOLOGIES, LLC**
Address	**35 HIGHLAND CIRCLE SUITE 300 NEEDHAM MA 02494 USA**
FCC ID	2AC3T-B36T10RB
IC Certification Number	12323A-B36T10RB
Model Number	B36-T10 RB
Product Description	THERMOSTAT
FCC Standard Applied	47 CFR §15.249
Industry Canada Standard Applied	RSS-210 Issue 8 Annex A2.9
Date Sample Received	12/5/2014
Date Tested	12/15/2014
Tested By	Cory Leverett
Approved By	Sid Sanders
Report Number	2235AUT14TestReport.docx
Test Results	☒ PASS ☐ FAIL

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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
Engineering Project Manager
Date: 12/15/2014

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GENERAL INFORMATION

EUT Specification

The test results relate only to the items tested.			
Applicable Standards	FCC Part 15.249 & IC RSS-210 (i8), RSS-GEN (i4)		
EUT Description	THERMOSTAT		
FCC ID	2AC3T-B36T10RB		
IC Certification Number	12323A-B36T10RB		
Model Number	B36-T10 RB		
Operating Frequency	TX: 908.4 MHz & 916 MHz	RX: Same	
No. of Channels	2	**Modulations**	QPSK
EUT Power Source	☐ 110–120Vac/50– 60Hz when Charging		
	☐ DC Power		
	☒ Battery Operated Exclusively		
Test Item	☐ Prototype	☐ Pre-Production	☒ Production
Type of Equipment	☒ Fixed	☐ Mobile	☐ Portable
Antenna Connector	FCC Rules require that the antenna connector be unique. There is no antenna connector, it has an integrated PCB antenna		
Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.		
Conditions in the Test laboratory	Temperature: 24-26ºC Relative humidity: 50-65%		
Test Exercise	The sample was programmed through a PC connected to a wireless programming board. Power attenuation setting was 9, the bandwidth (baud rate) tested was 100KHz		
Revision History of EUT	None		

TEST RESULTS SUMMARY

FCC Rules Part No.	Industry Canada Rules	RESULTS – Pass/Fail/NA
15.249 Fundamental Emission	RSS-210 (i8) ANNEX A2.9, RSS-GEN (i4)	Pass
15.249 & 15.209 Harmonics & Spurious	RSS-210 (i8) ANNEX A2.9, RSS-GEN (i4)	Pass
15.205 & 2.202 Occupied Bandwidth	RSS-GEN (i4), 4.6	Pass
15.249 & 15.205 Bandedge Compliance	RSS-GEN (i4), 4.6	Pass
15.207 Power Line Emissions	RSS-GEN (i4), 7.2.4	Not Applicable

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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. 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

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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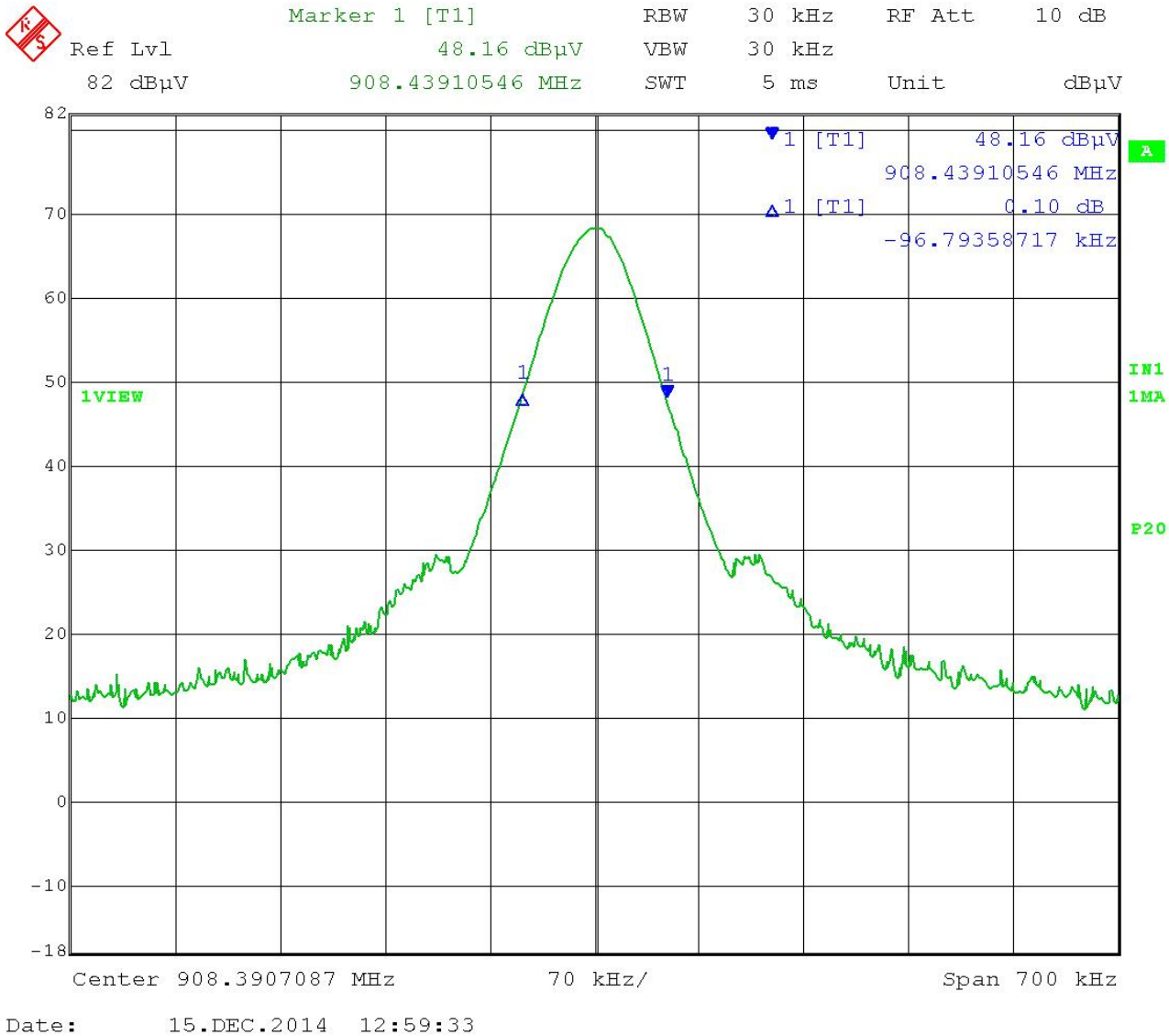
20 dB BANDWIDTH

Rule Part: FCC part 15.205, 2.202 , RSS GEN (i4) 4.6

Requirements: must remain inside band

Test Data: 908.4 MHz Occupied Bandwidth = 96.79 KHz



Date: 15.DEC.2014 12:59:33

Results meet requirements

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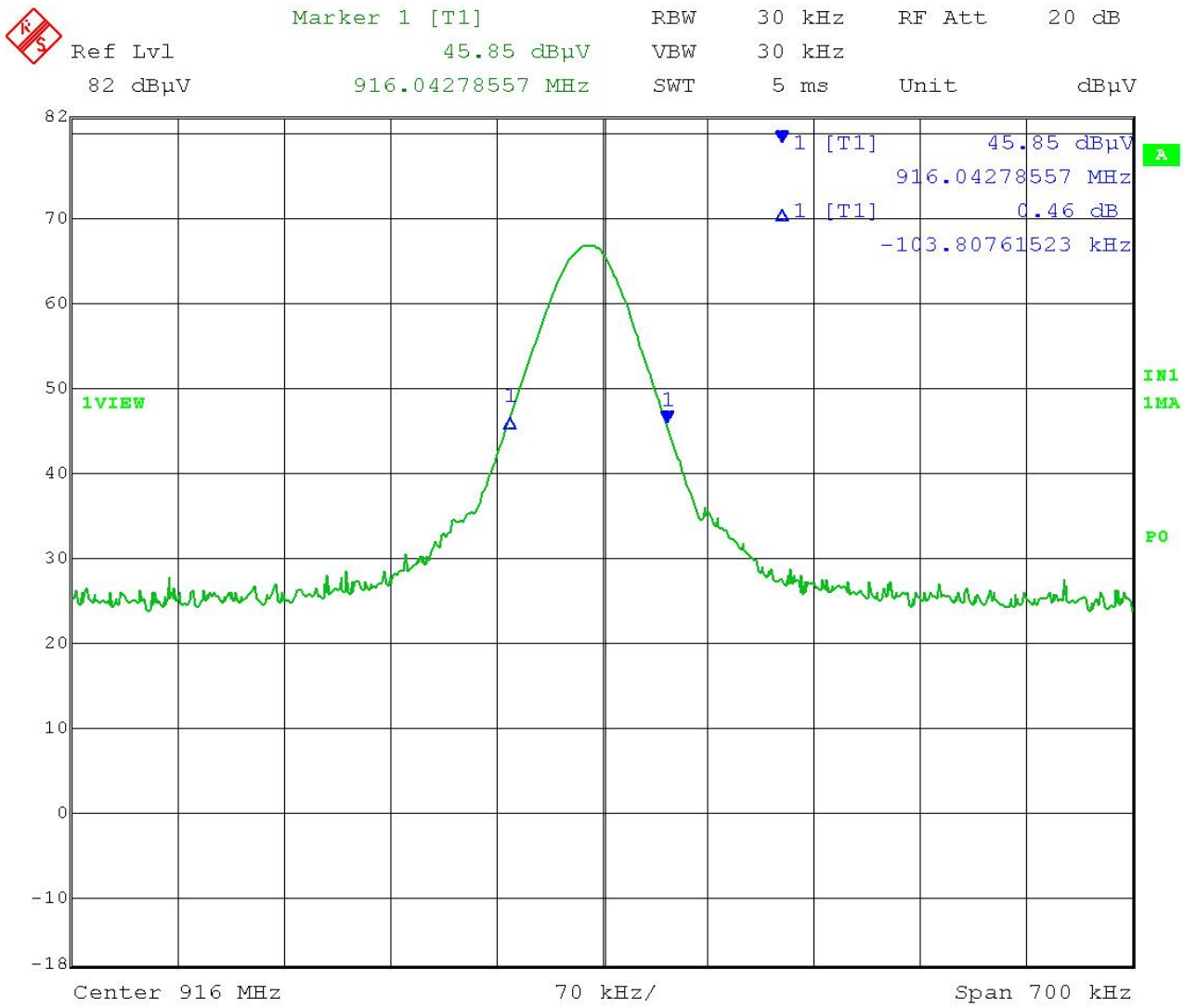
20 dB BANDWIDTH

Test Data: 916 MHz Occupied Bandwidth = 103.8 KHz



Results meet requirements

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RADIATION INTERFERENCE

Rules Part No.: FCC 15.249, 15.209 & IC RSS-210 (i8) ANNEX A2.9, RSS-GEN (i4)

Requirements:

Frequency	Limits
Part 15.209 & RSS-GEN (i4)	
9 to 490 kHz	2400/F (kHz) µV/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) µV/m @ 30 meters
1705 kHz to 30 MHz	29.54 dBµV/m @ 30 meters
30 – 88	40.0 dBµV/m @ 3 meters
80 – 216	43.5 dBµV/m @ 3 meters
216 – 960	46.0 dBµV/m @ 3 meters
Above 960	54.0 dBµV/m @ 3 meters
Part 15.249 & RSS-210 (i8) ANNEX A.2.9	
Fundamental 902 – 928 MHz	94.0 dBµV/m @ 3 meters
Fundamental 2.4 – 2.4835 GHz	94.0 dBµV/m @ 3 meters
Harmonics	54.0 dBµV/m @ 3 meters

Remarks:

The EUT was tested in three orthogonal planes as required. The EUT parallel (flat) on the turntable table was the worst case position and the following table and plots represent the emissions for this position. A test setup photo is provided in this report to document the final worst case position.

Unless otherwise noted in the results, a Peak Detector is Used for measurement's. No emissions were found past the second harmonic of each frequency tested.

RADIATION INTERFERENCE

Test Data: Field Strength table.

Tuned Freq MHz	Emission Freq MHz	Meter Reading dBuV	Detector	RBW KHz	Ant. Polarity	Coax Loss dB	Cor Factor dB/m	FS dBuV/m	Margin dB
908.4	64.74	4.3	Peak	100	H	0.41	6.16	10.89	29.11
908.4	123.34	6.5	Peak	100	V	0.65	11.37	17.54	25.96
908.4	135.27	4.8	Peak	100	V	0.68	14.04	18.51	24.99
908.4	171.72	5.4	Peak	100	V	0.78	15.12	20.32	23.18
908.4	337.87	4.1	Peak	100	H	1.16	13.98	18.26	75.74
908.4	721.04	5.9	Peak	100	V	1.96	21.3	27.14	66.86
908.4	906.21	8.1	Peak	100	H	2.39	23.3	31.76	62.24
908.4	908.4	59.4	Q Peak	120	V	2.39	23.3	83.12	10.88
908.4	908.4	68.1	Q Peak	120	H	2.39	23.3	91.83	2.17
908.4	910.38	8.2	Peak	100	H	2.4	23.3	31.86	62.14
908.4	2,725.0	7.8	Average	1000	H	3.41	32.51	40.72	13.28
916	31.7	9.9	Peak	100	V	0.18	12.64	22.72	17.28
916	66.79	12.4	Peak	100	V	0.42	6.03	18.88	21.12
916	66.79	12.4	Peak	100	V	0.42	6.03	18.88	21.12
916	122.32	6.3	Peak	100	V	0.64	11.16	17.13	26.37
916	183.64	5.6	Peak	100	V	0.81	13.51	18.87	24.63
916	706.61	5.5	Peak	100	H	1.98	21.17	26.69	67.31
916	908.01	7.3	Peak	100	H	2.39	23.3	30.99	63.01
916	912.06	6.8	Peak	100	H	2.4	23.32	30.49	63.51
916	916	55.8	Q Peak	1000	V	2.4	23.36	79.52	14.48
916	916	66.6	Q Peak	1000	H	2.4	23.36	90.35	3.65
916	917.95	7.9	Peak	100	H	2.41	23.38	31.68	62.32
916	920	8.1	Peak	100	H	2.41	23.4	31.88	62.12
916	950.3	5.5	Peak	100	V	2.46	23.7	29.69	16.31
916	2,747.93	9.5	Average	1000	H	3.42	32.52	42.44	11.56

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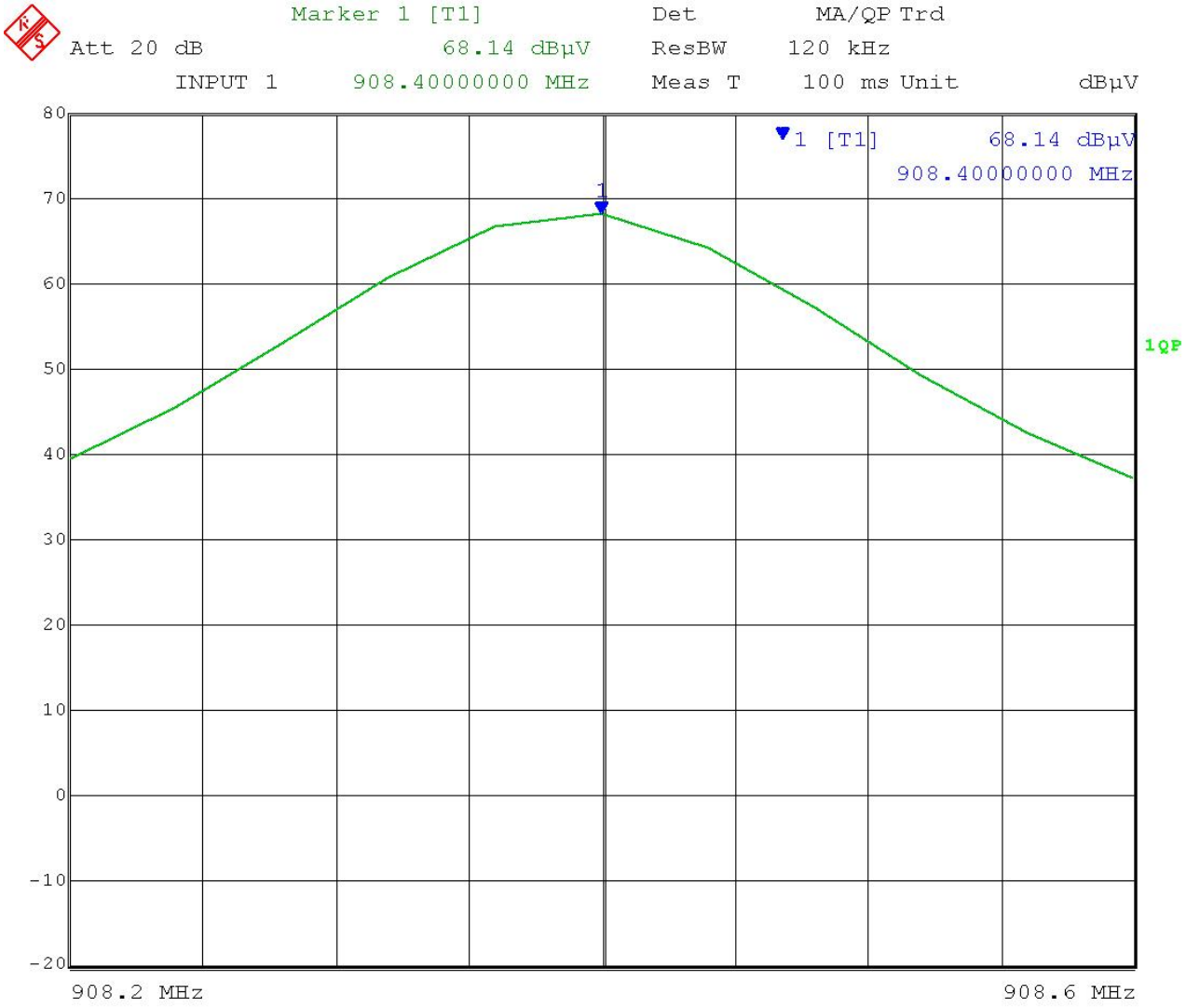
RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz Fundamental Quasi Peak Scan

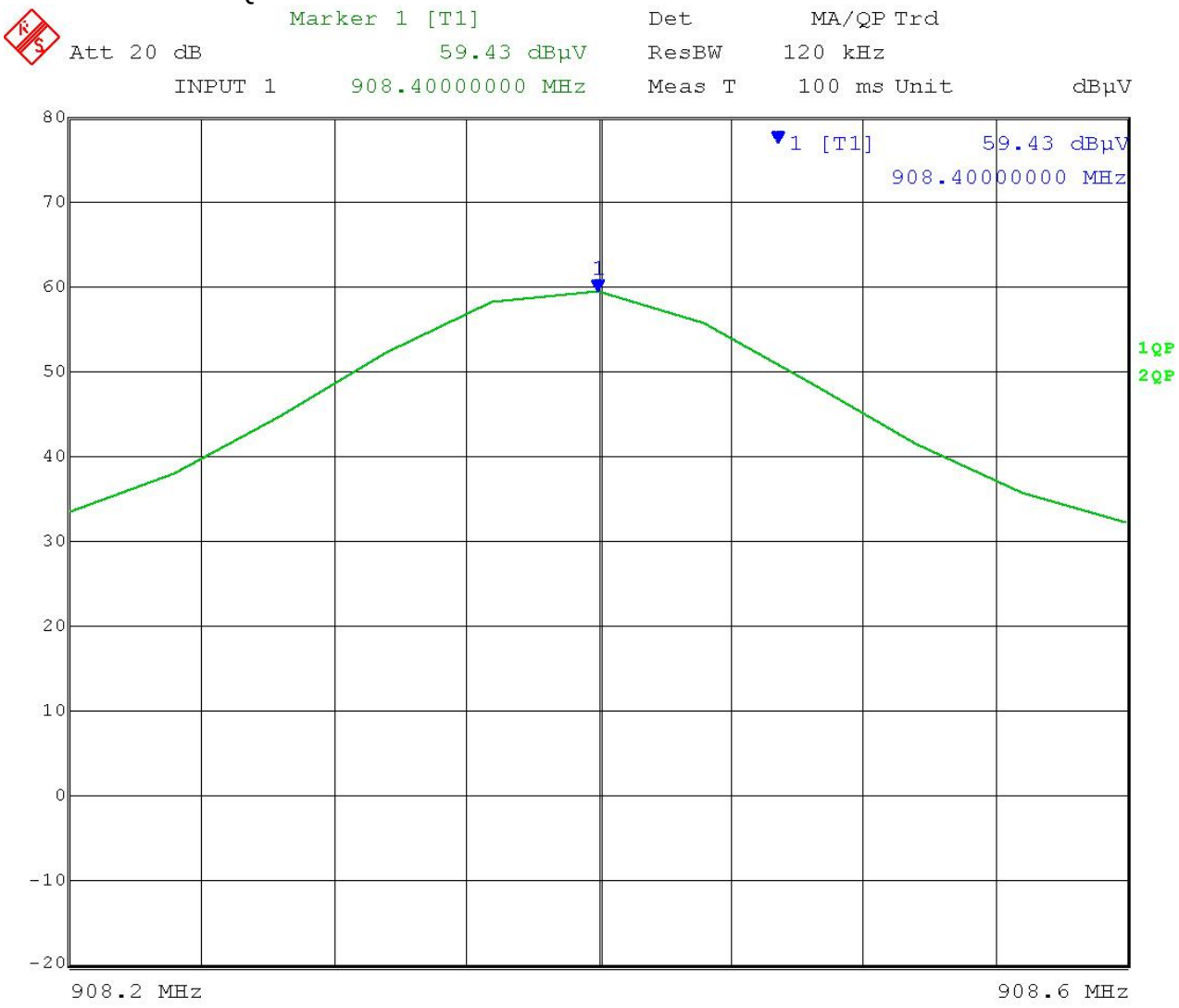


Horizontal

RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz Quasi Peak Scan



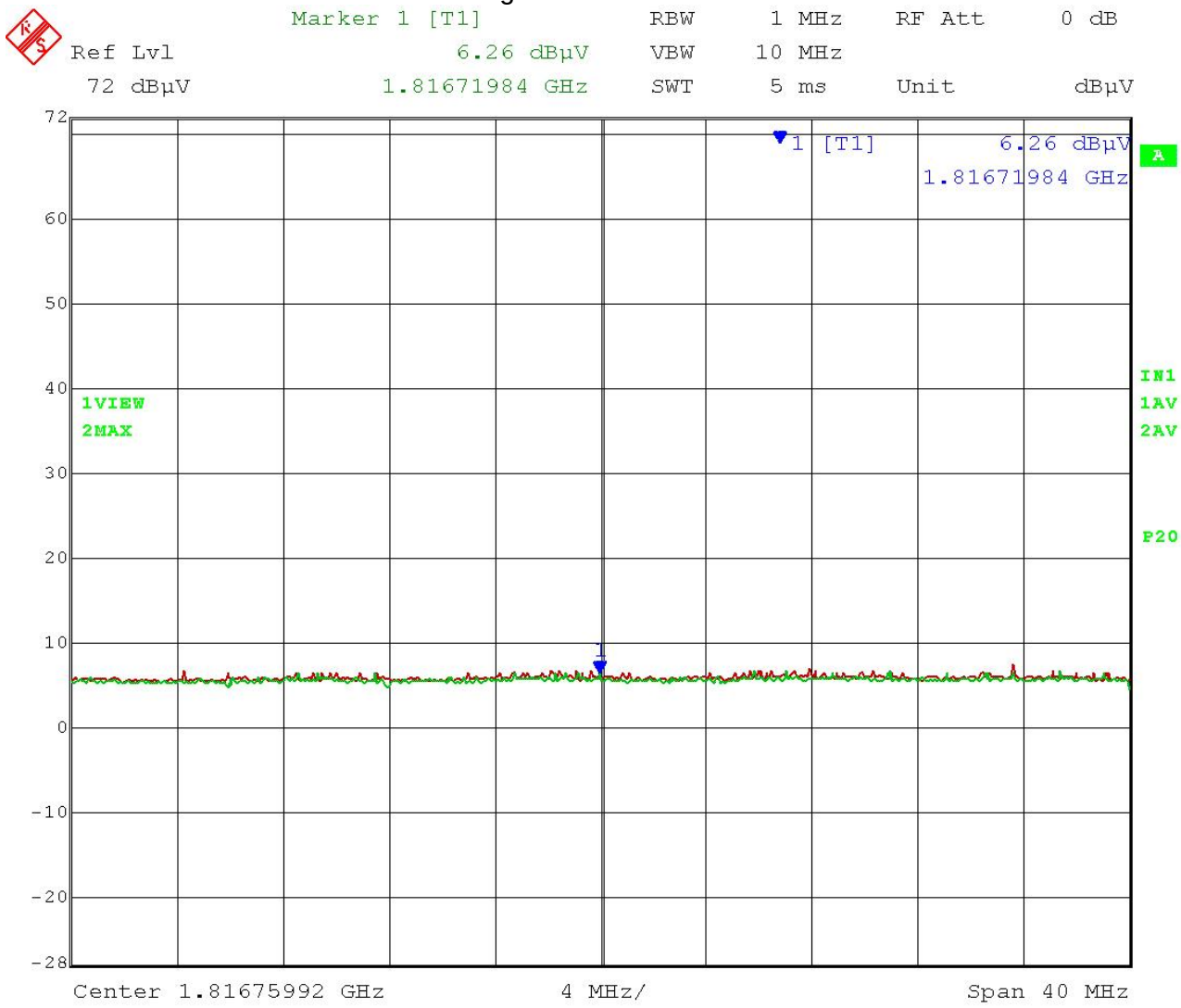
Date: 15.DEC.2014 12:44:27

Vertical

RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz 1st Harmonic Average Scan



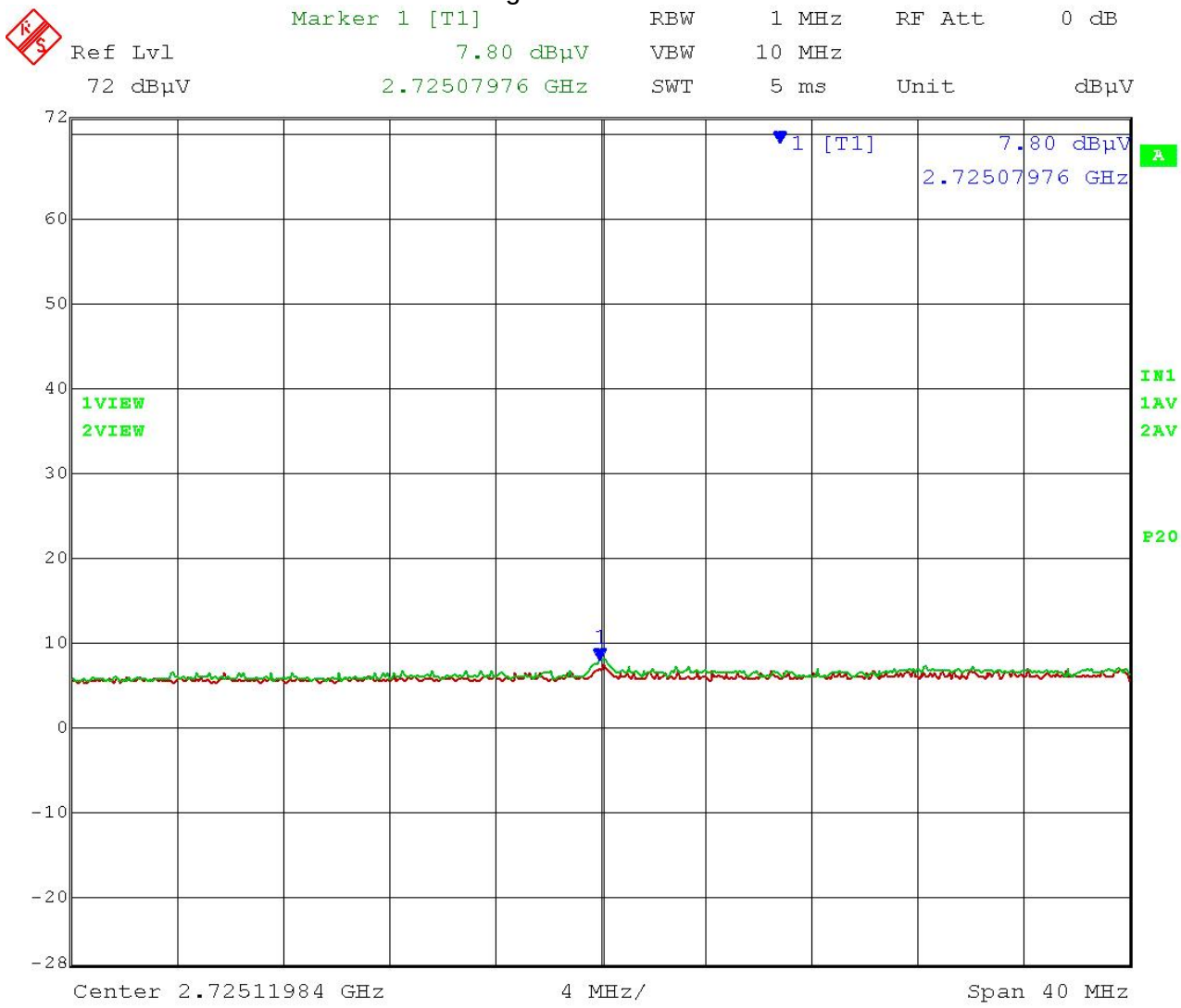
Date: 15.DEC.2014 15:18:25

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz 2nd Harmonic Average Scan



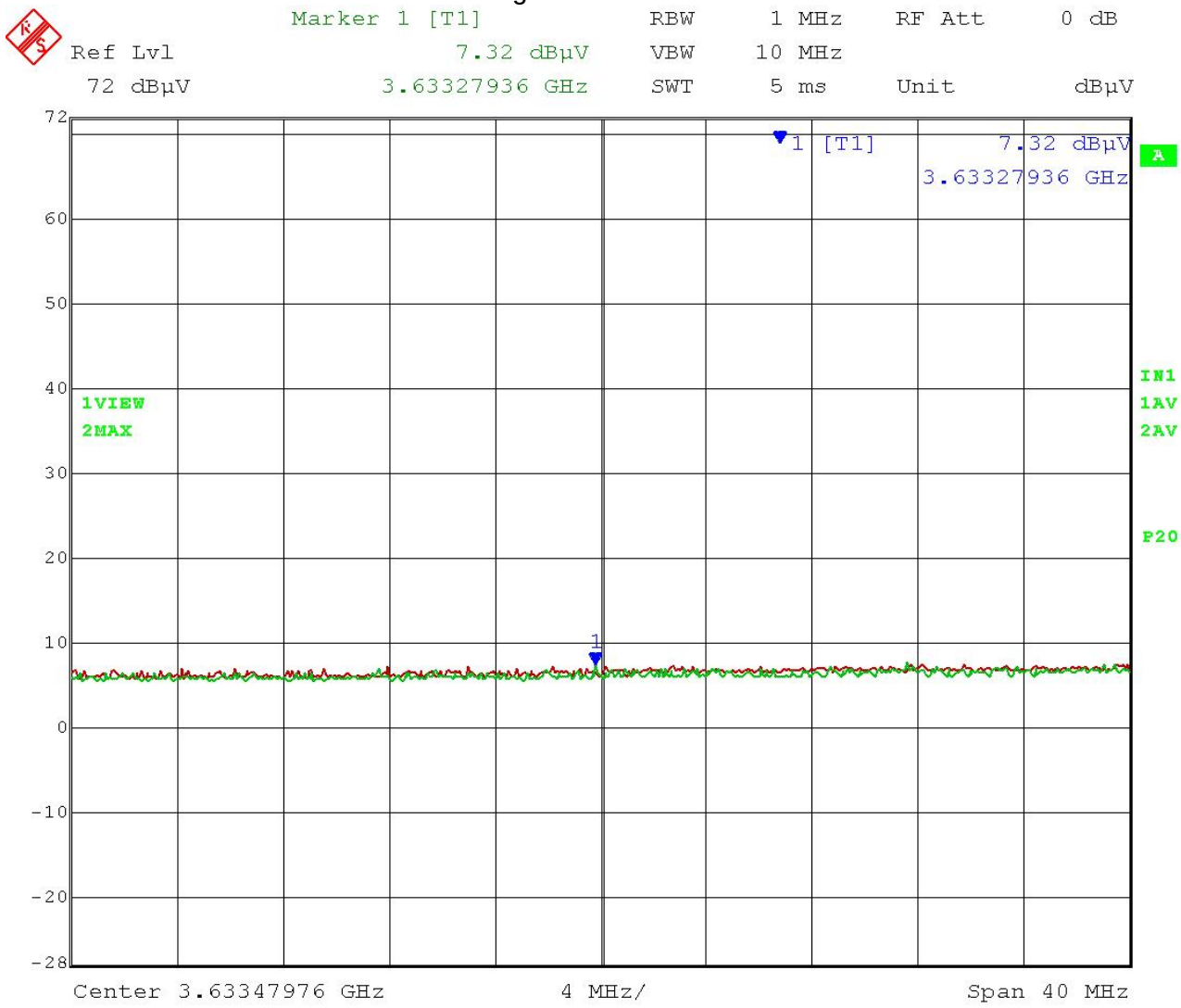
Date: 15.DEC.2014 15:24:44

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz 3rd Harmonic Average Scan



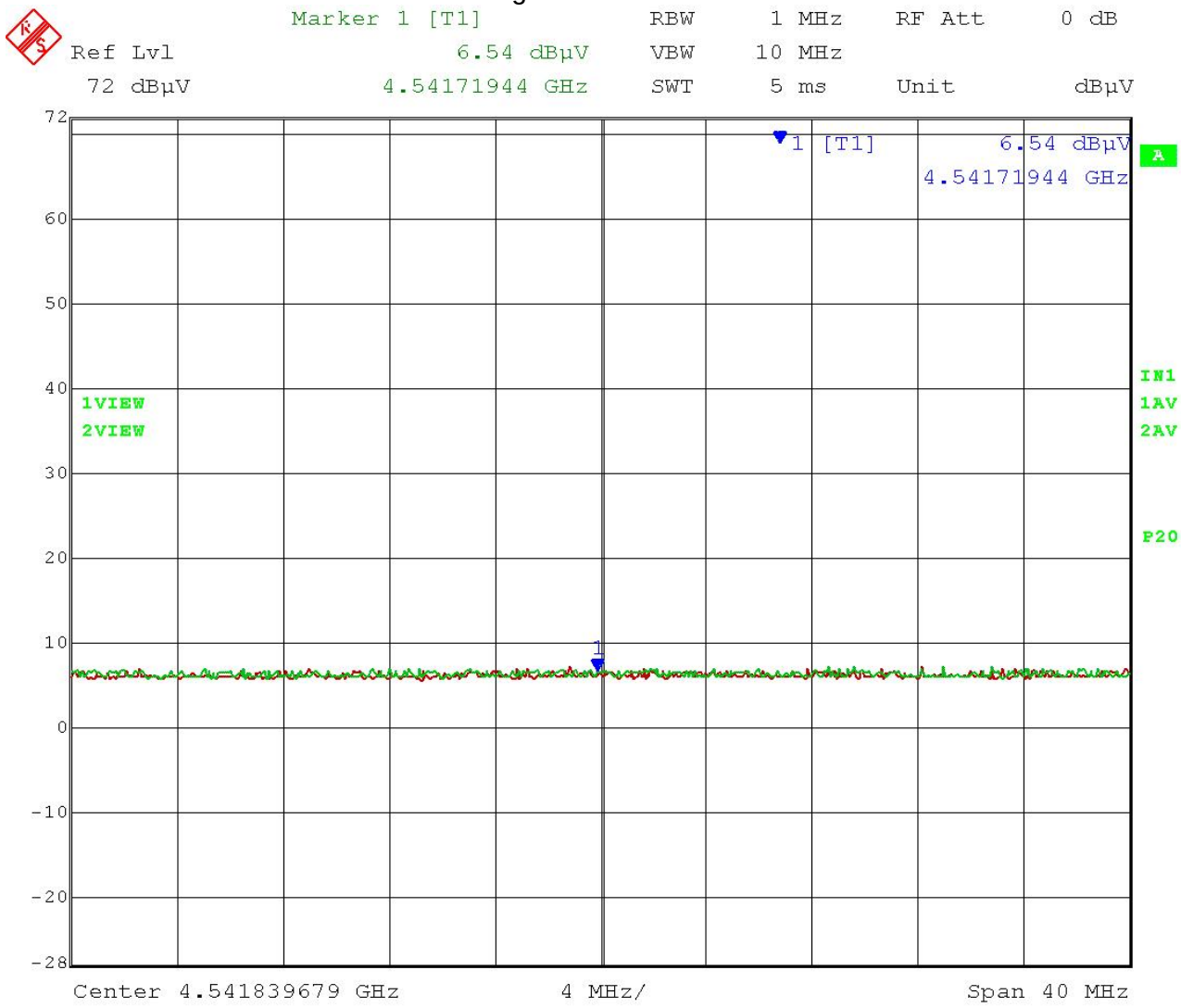
Date: 15.DEC.2014 15:26:23

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz 4th Harmonic Average Scan



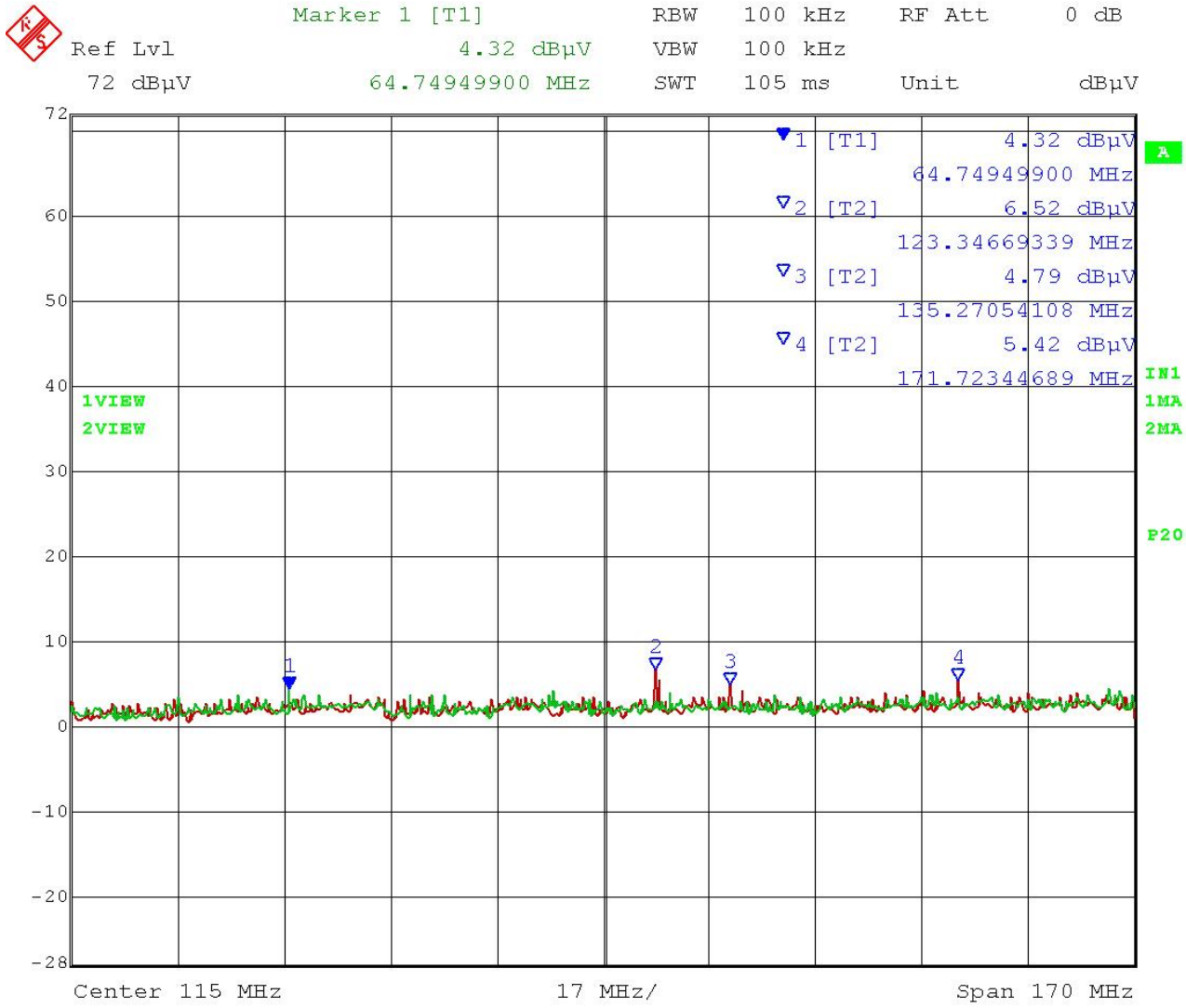
Date: 15.DEC.2014 15:29:01

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz 30-200 MHz Peak Scan



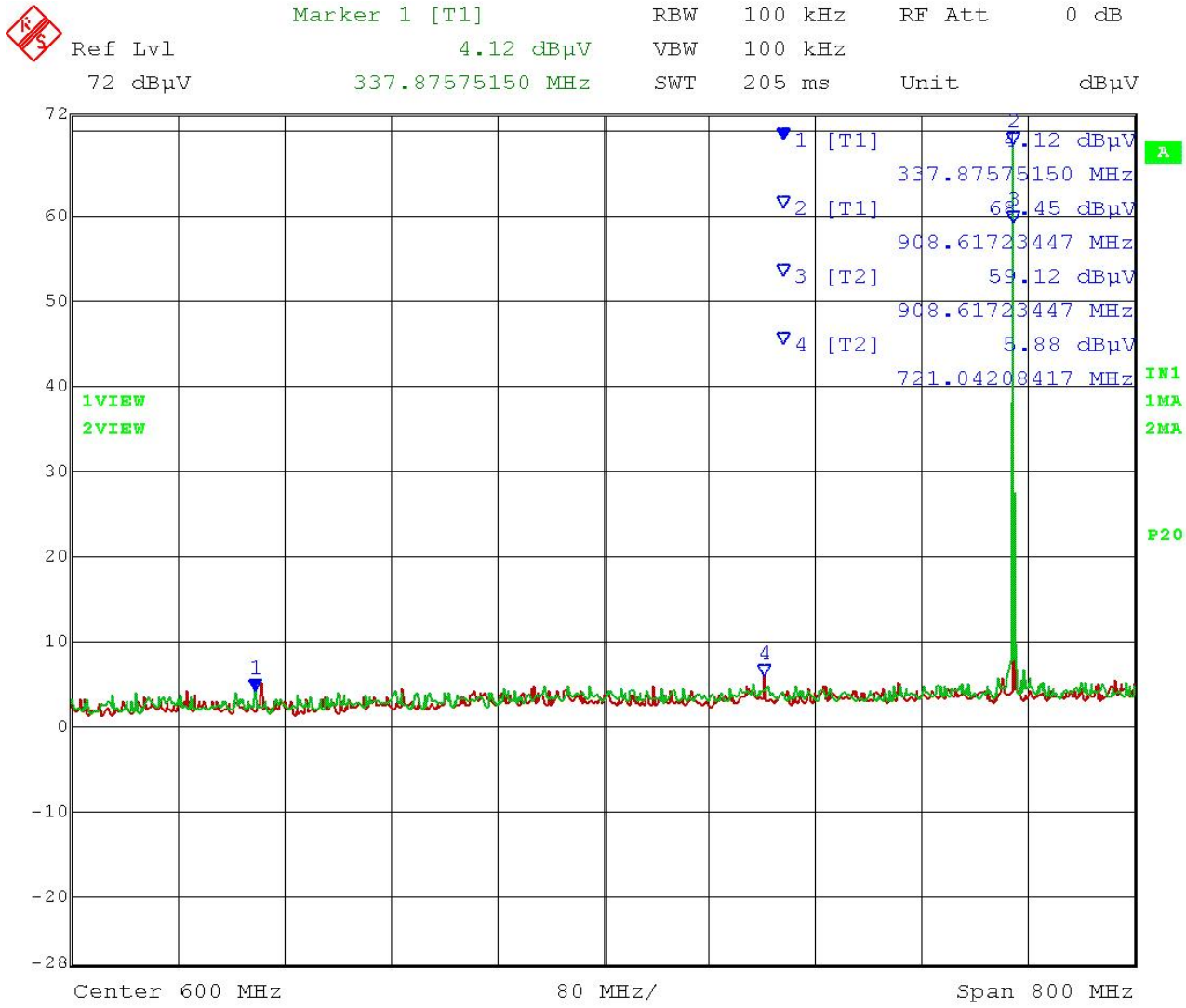
Date: 15.DEC.2014 14:02:01

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz 200-1000 MHz Peak Scan



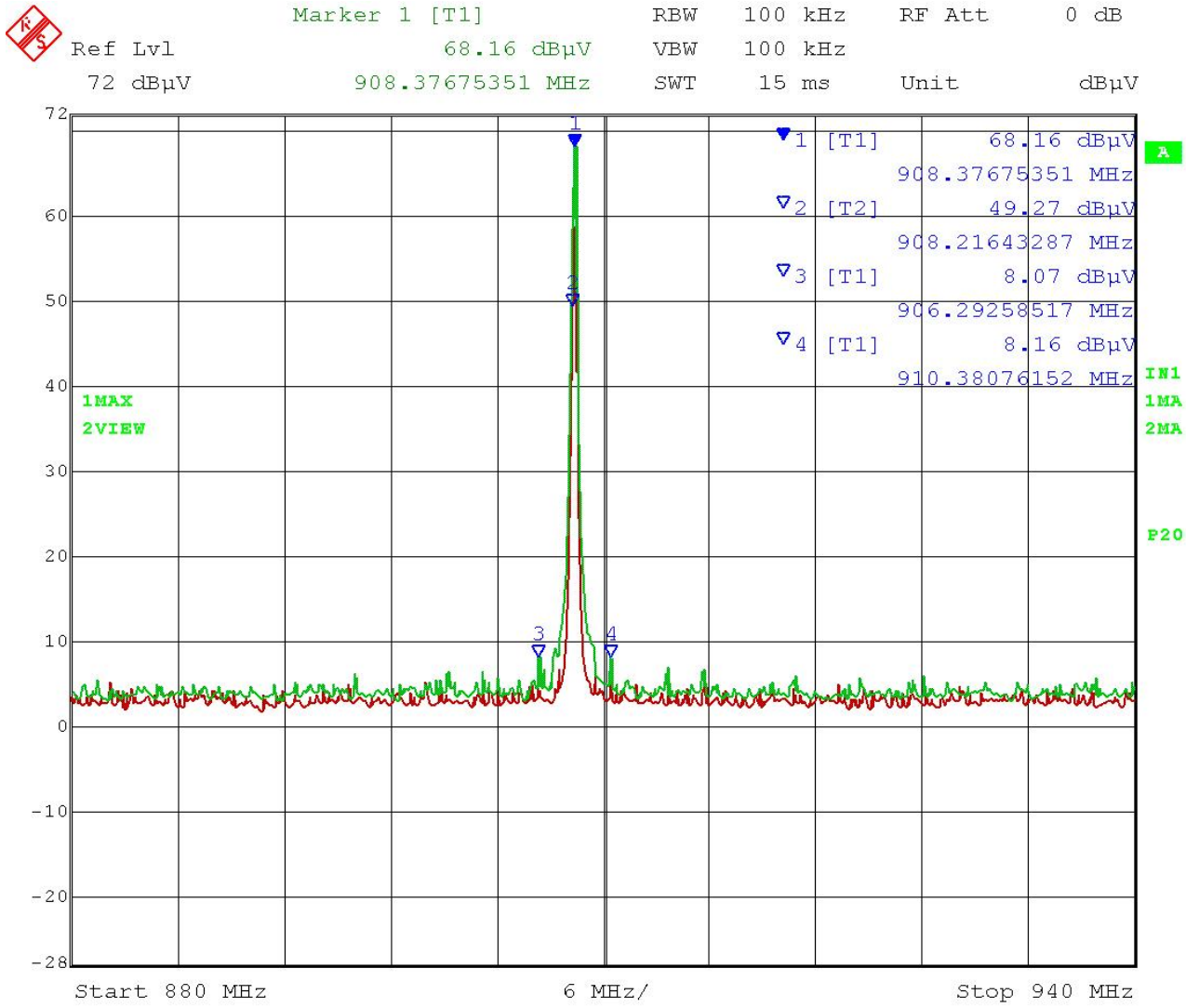
Date: 15.DEC.2014 13:30:45

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 1 908.4 MHz 880-940 MHz Peak Scan



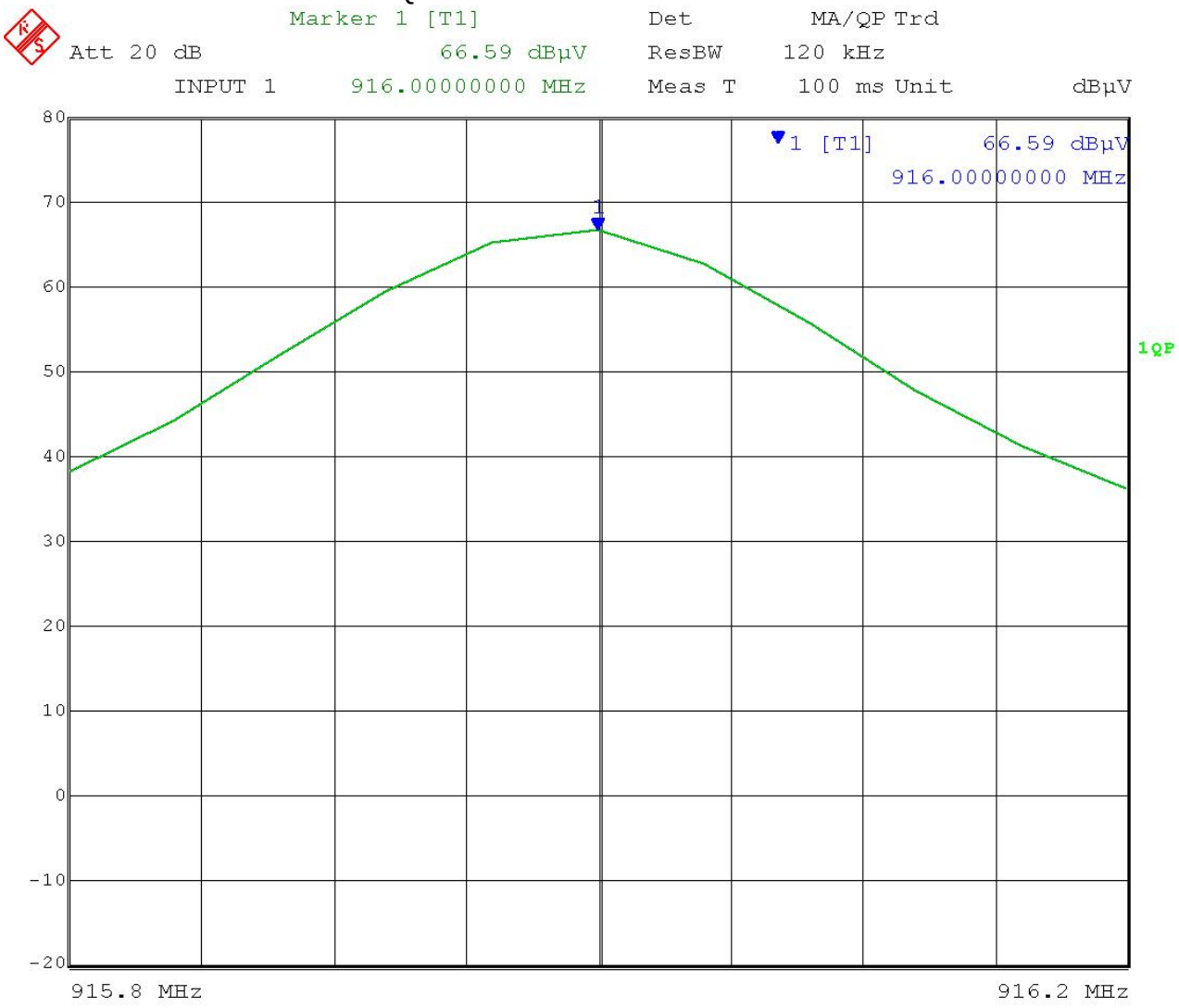
Date: 15.DEC.2014 13:37:58

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz Fundamental Quasi Peak Scan

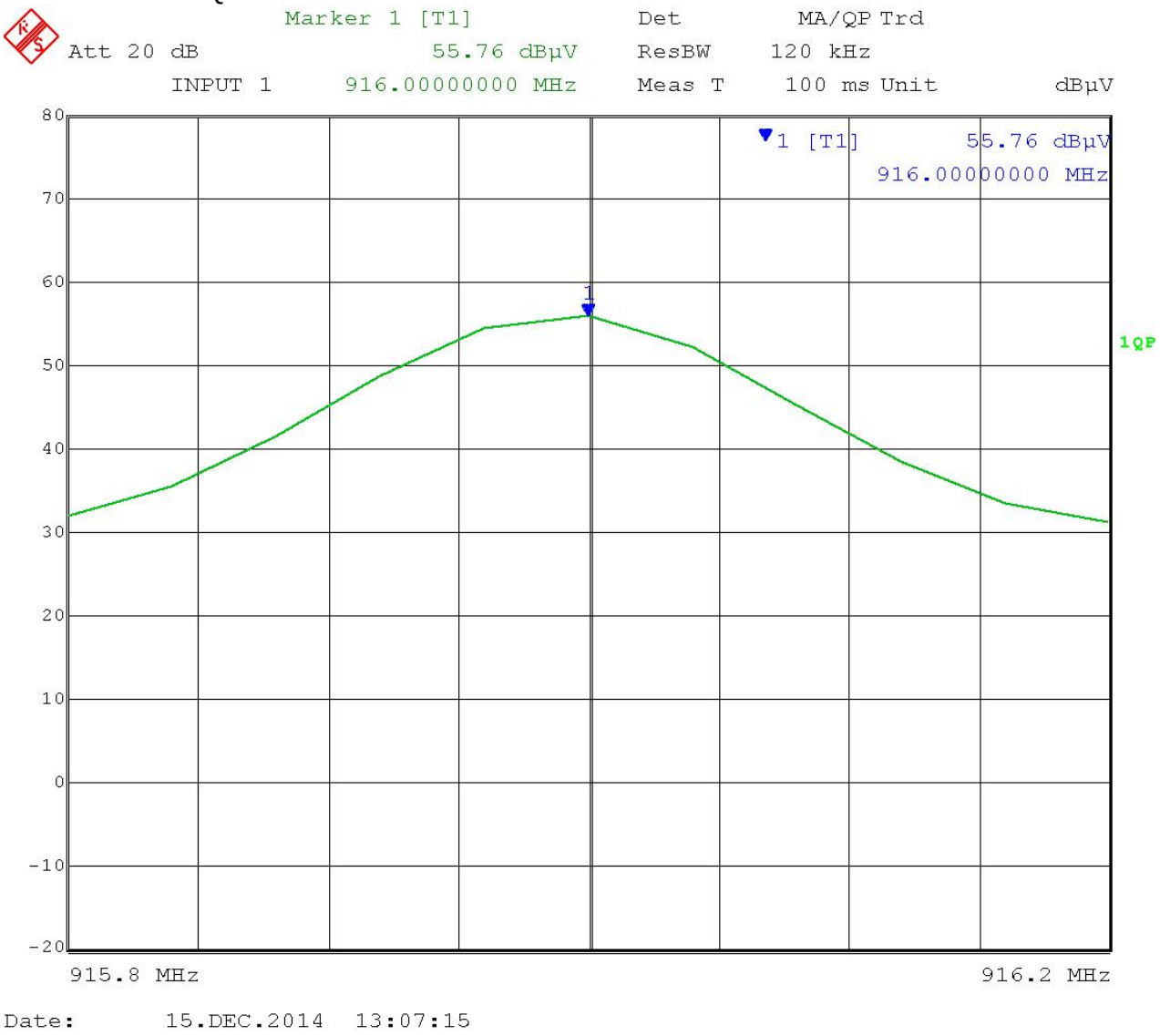


Horizontal

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz Quasi Peak Scan

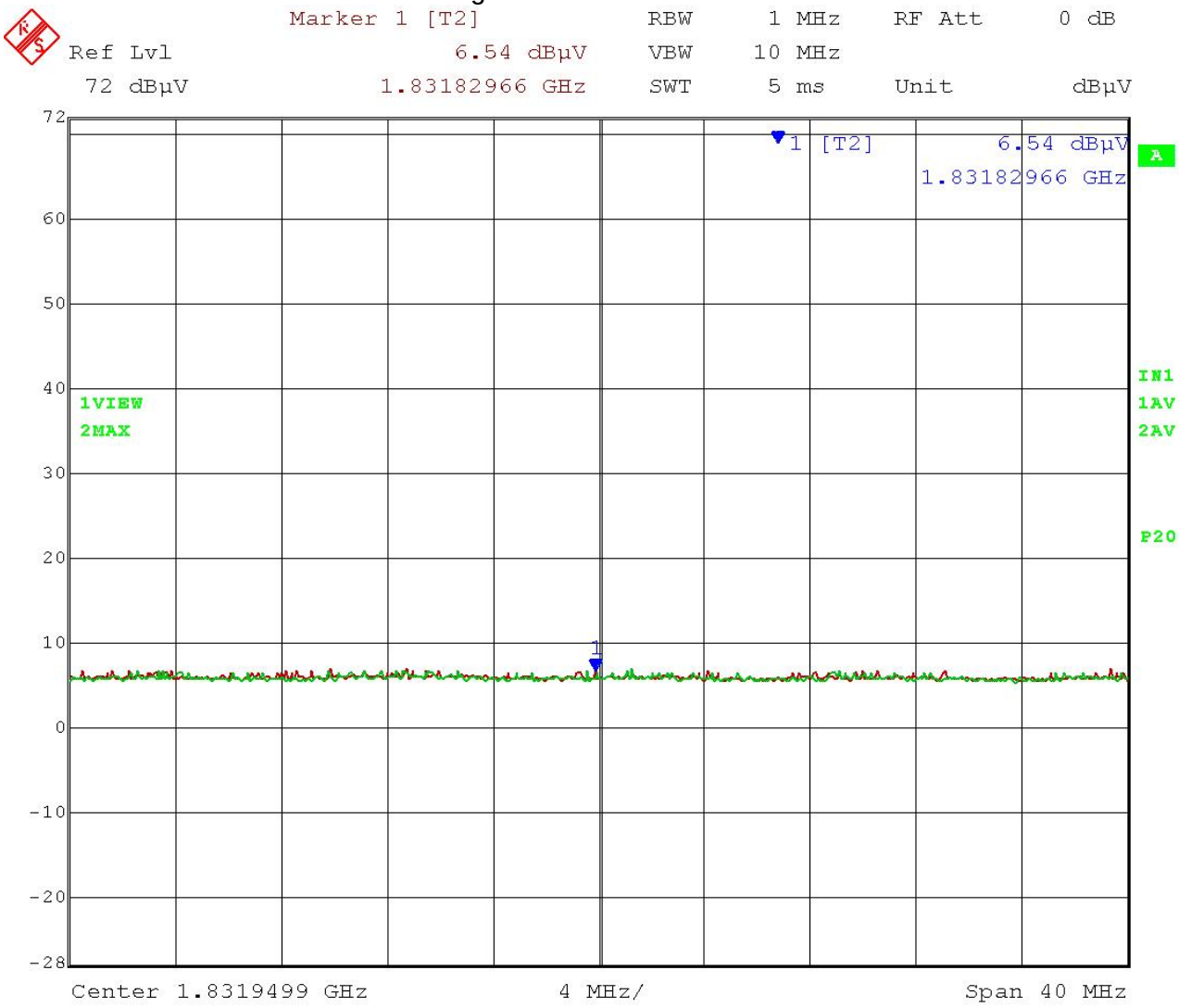


Vertical

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz 1st Harmonic Average



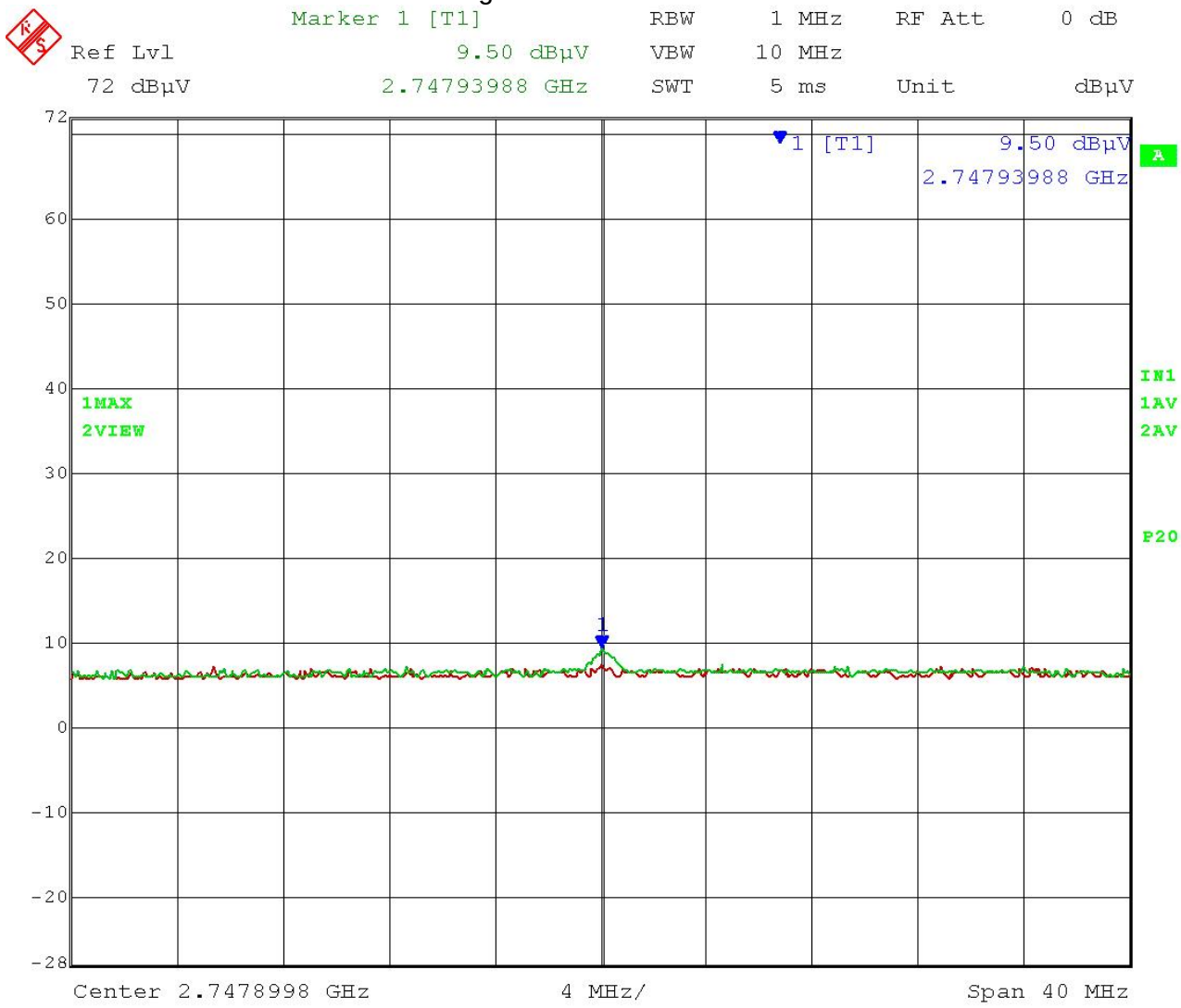
Date: 15.DEC.2014 15:05:35

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz 2nd Harmonic Average Scan

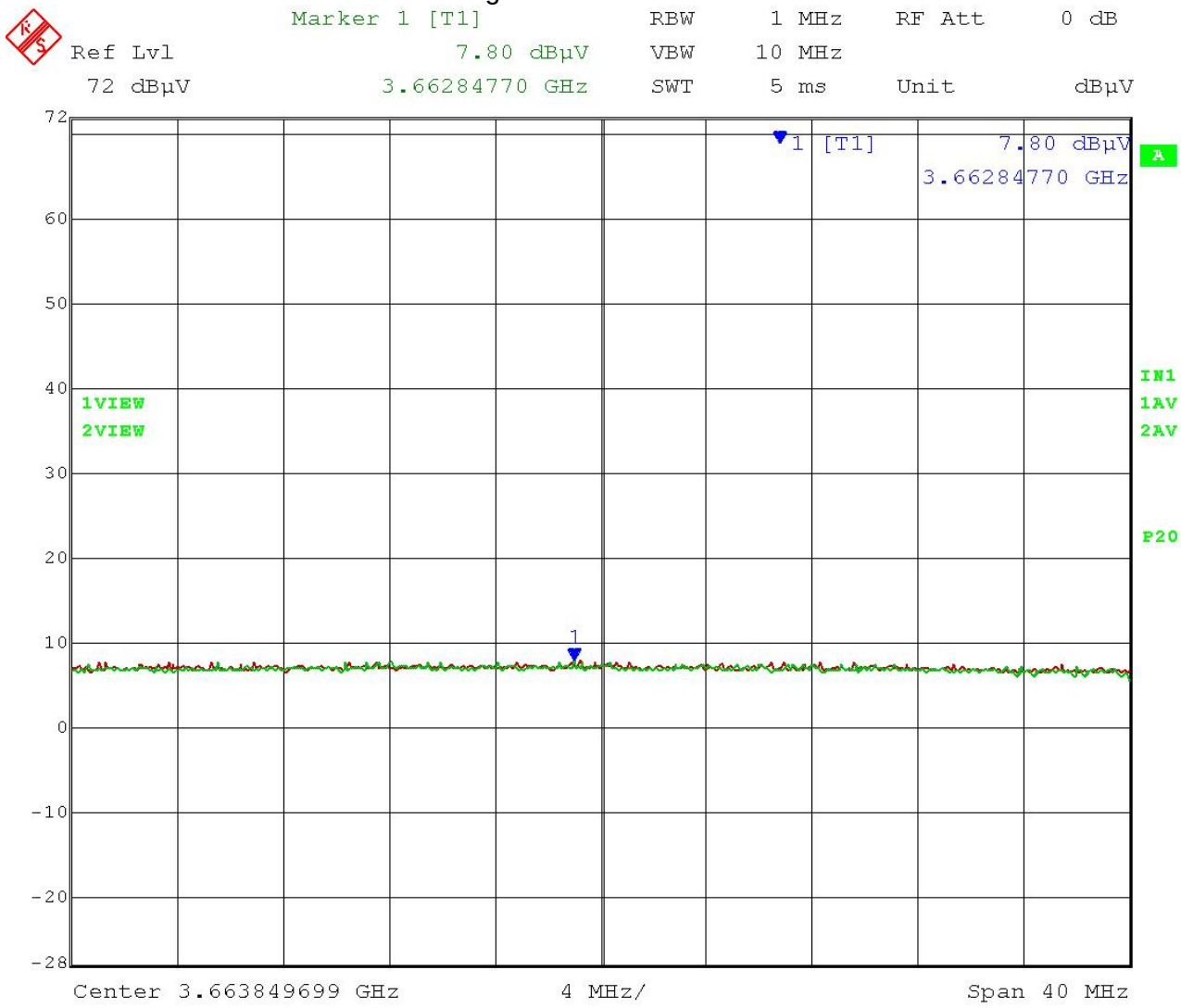


(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz 3rd Harmonic Average Scan



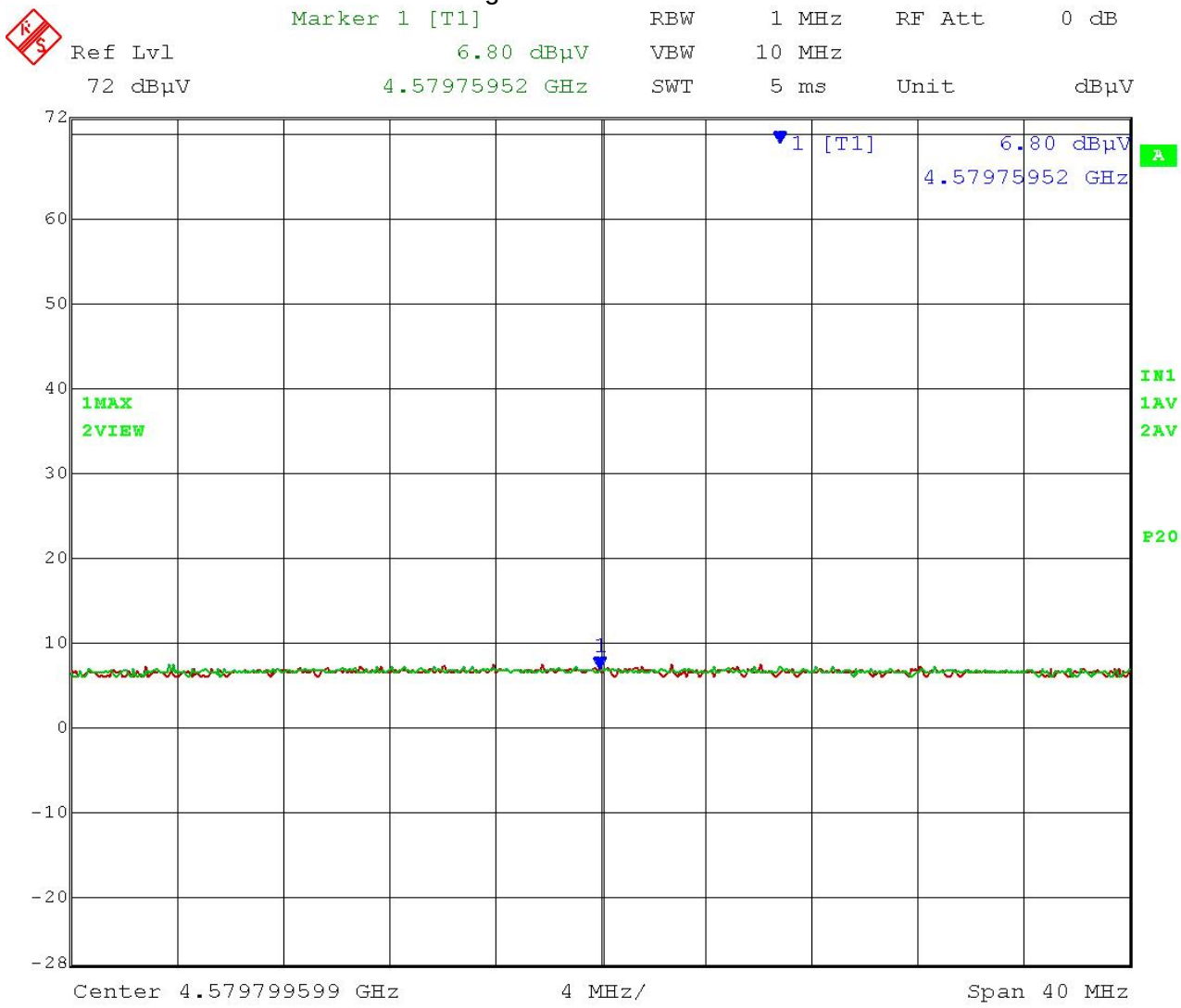
Date: 15.DEC.2014 15:11:01

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz 4th Harmonic Average Scan



Date: 15.DEC.2014 15:14:01

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz 30-200 MHz Peak Scan

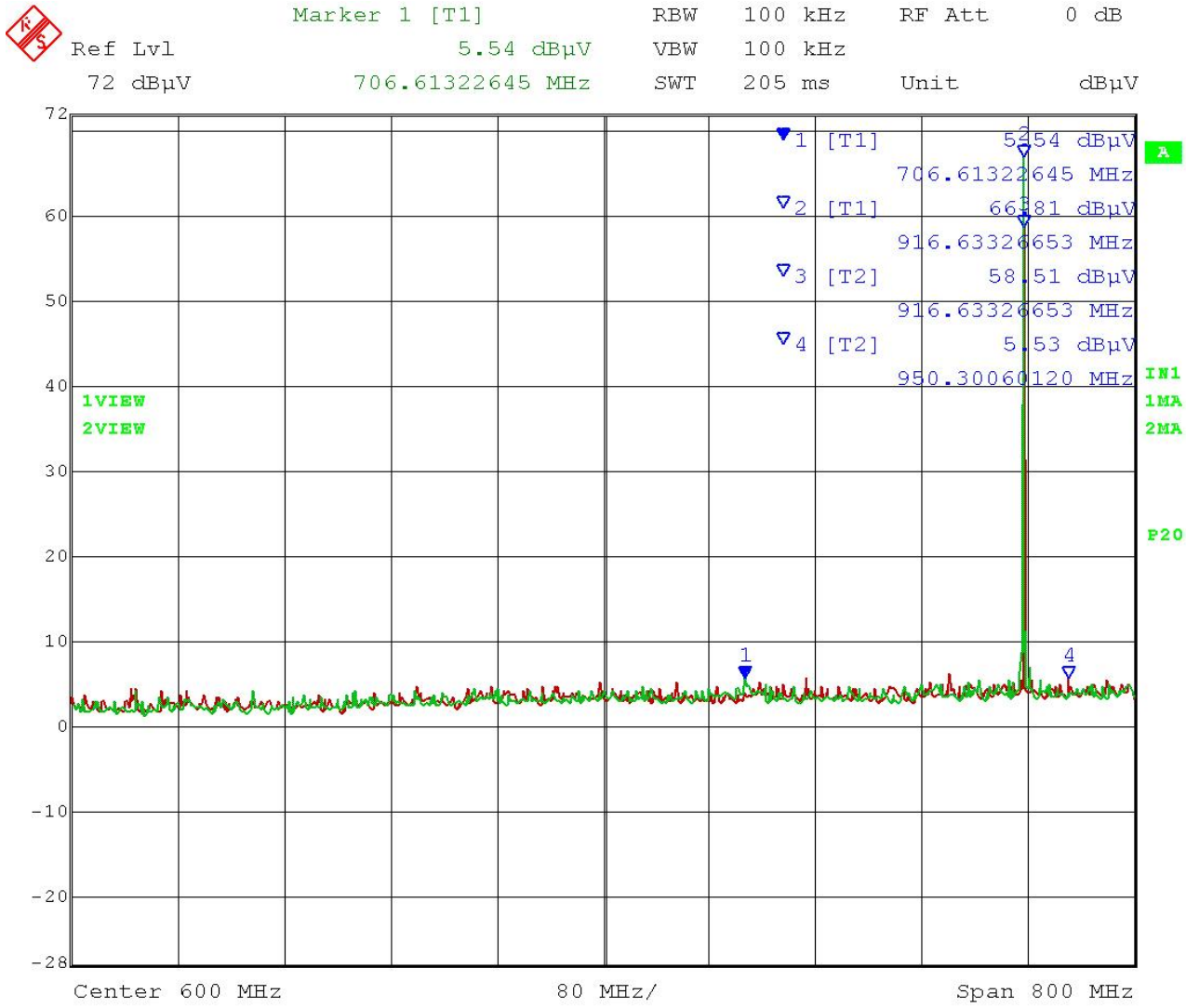
Date: 15.DEC.2014 13:56:04

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz 200-1000 MHz



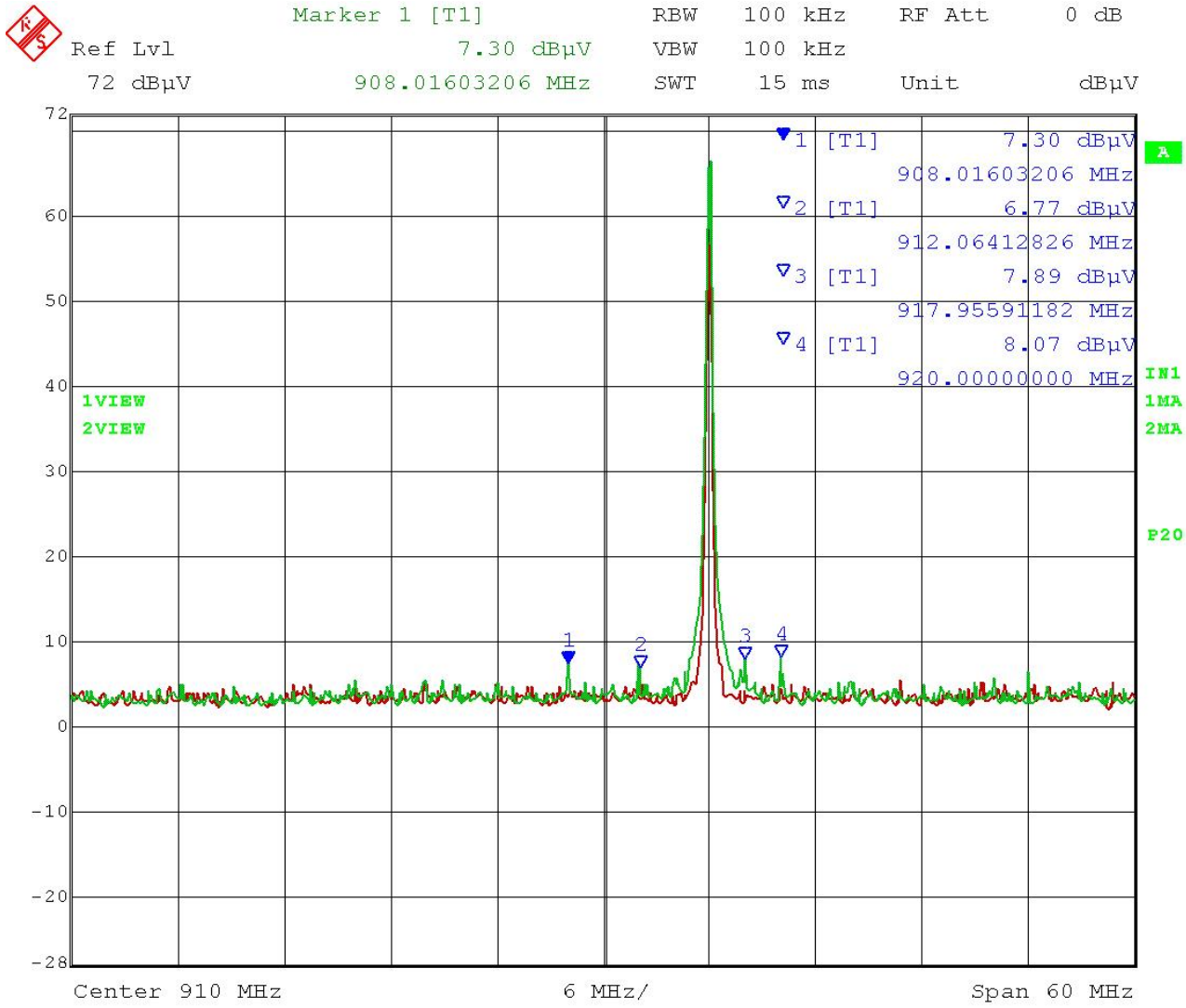
Date: 15.DEC.2014 13:26:55

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

RADIATION INTERFERENCE

Test Data: Plots

CH 2 916 MHz 880-940 MHz Peak Scan



Date: 15.DEC.2014 13:45:57

(Green Trace 1=Horizontal, Red Trace 2 = Vertical)

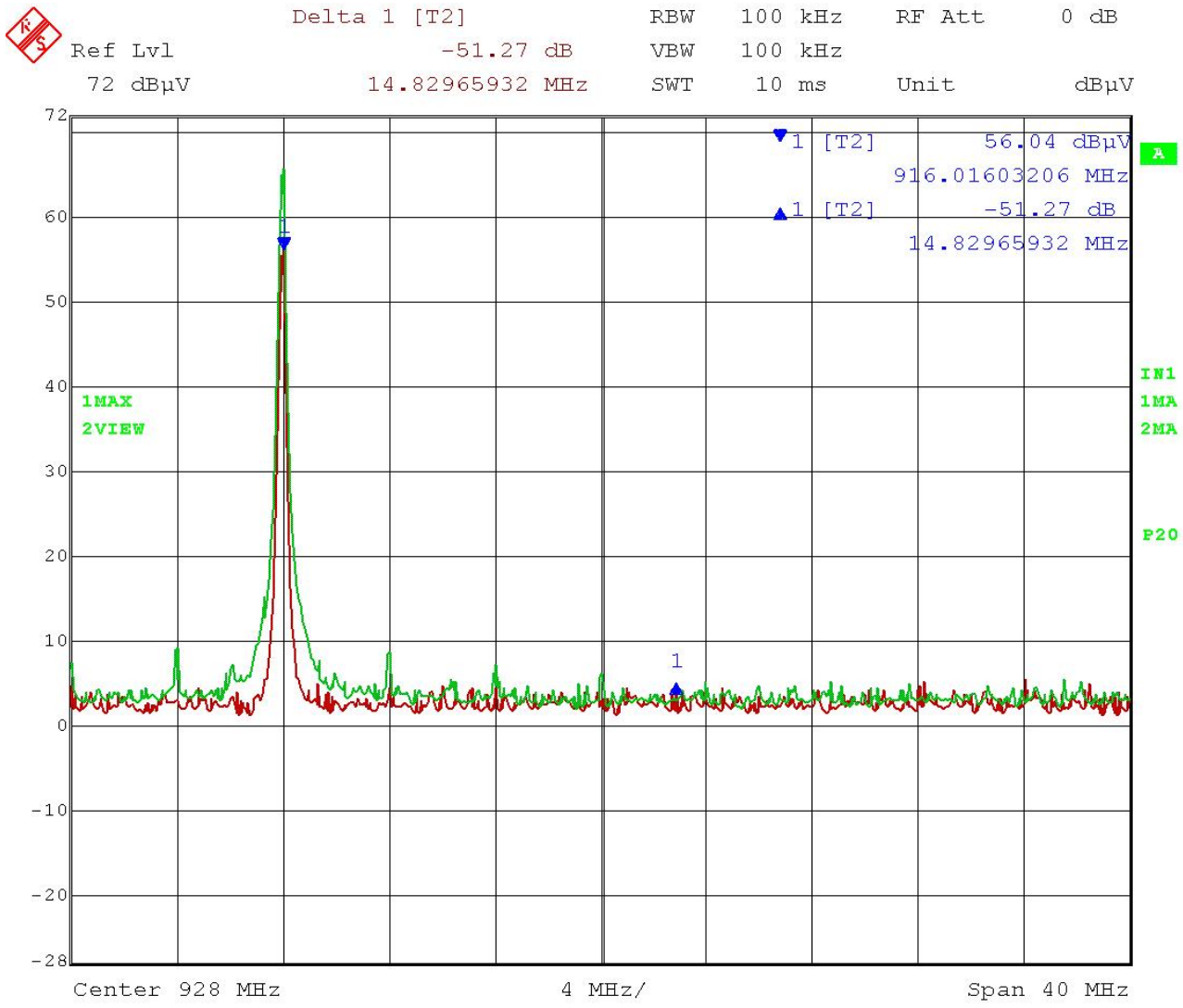
BAND EDGE

Rules Part No.: 15.249 (d), & RSS-GEN (i4), 4.6

Requirements: 50 dBc or in the case of restricted bands 54 dBuV/m. 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: Upper Band Edge

CH 2 916 MHz Vertical



Date: 15.DEC.2014 15:45:58

Vertical Polarity

Results Meet Requirements

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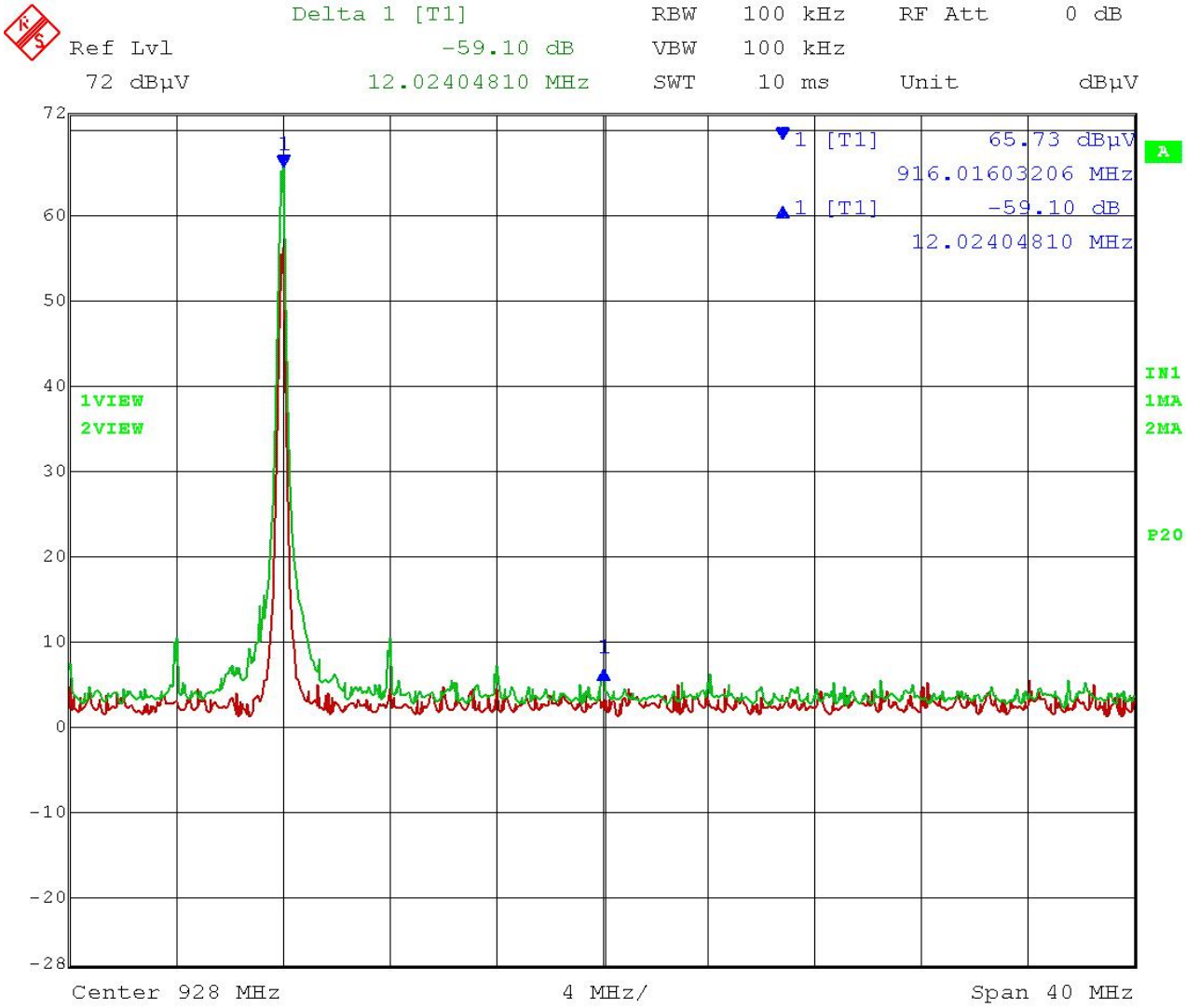
BANDEDGE

Test Data: Upper Bandedge

CH 2 916 MHz Horizontal



Date: 15.DEC.2014 15:46:44

Horizontal Polarity

Results Meet Requirements

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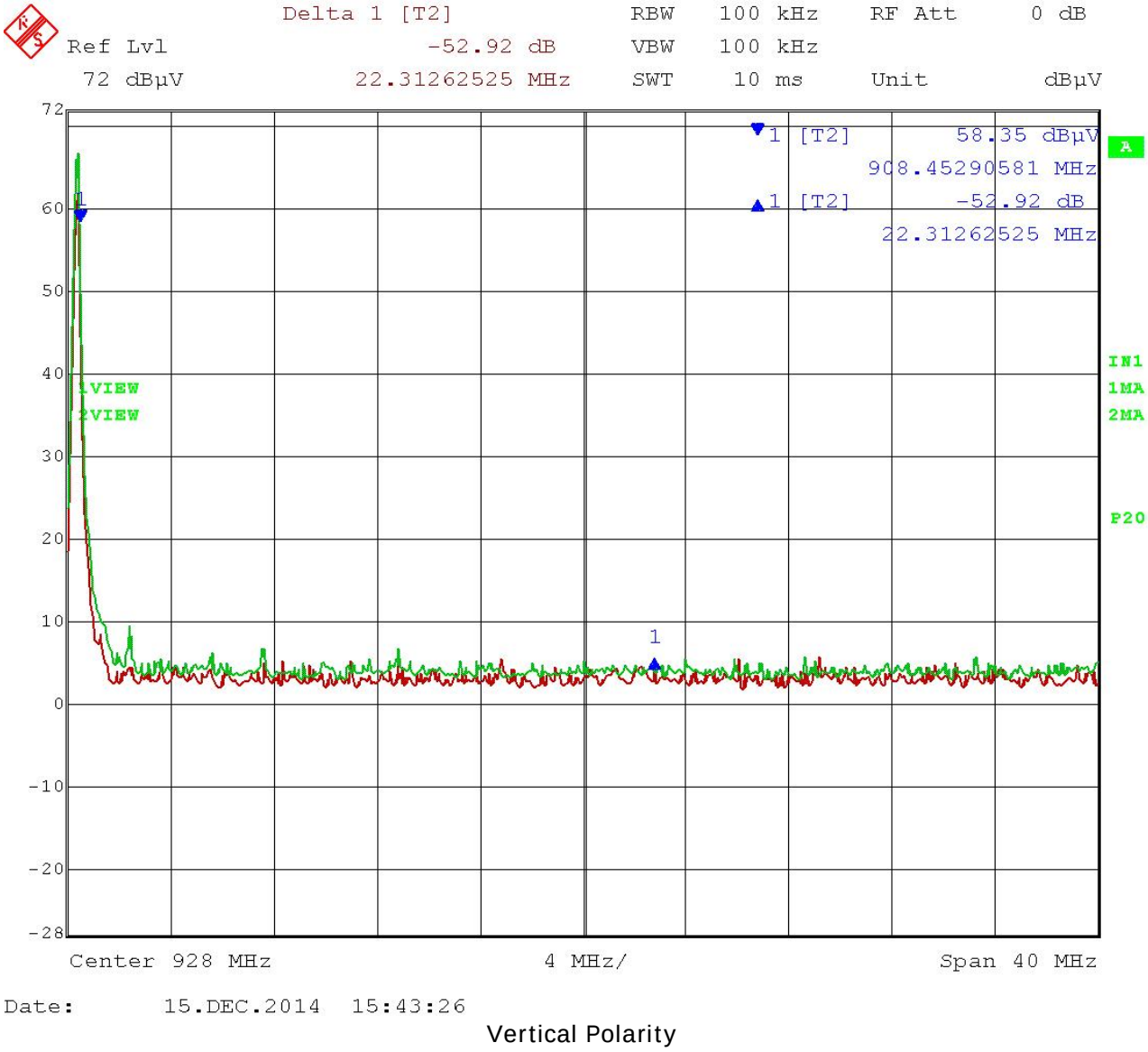
BANDEDGE

Test Data: Upper Bandedge

CH 1 908.4 MHz Vertical



Vertical Polarity

Results Meet Requirements

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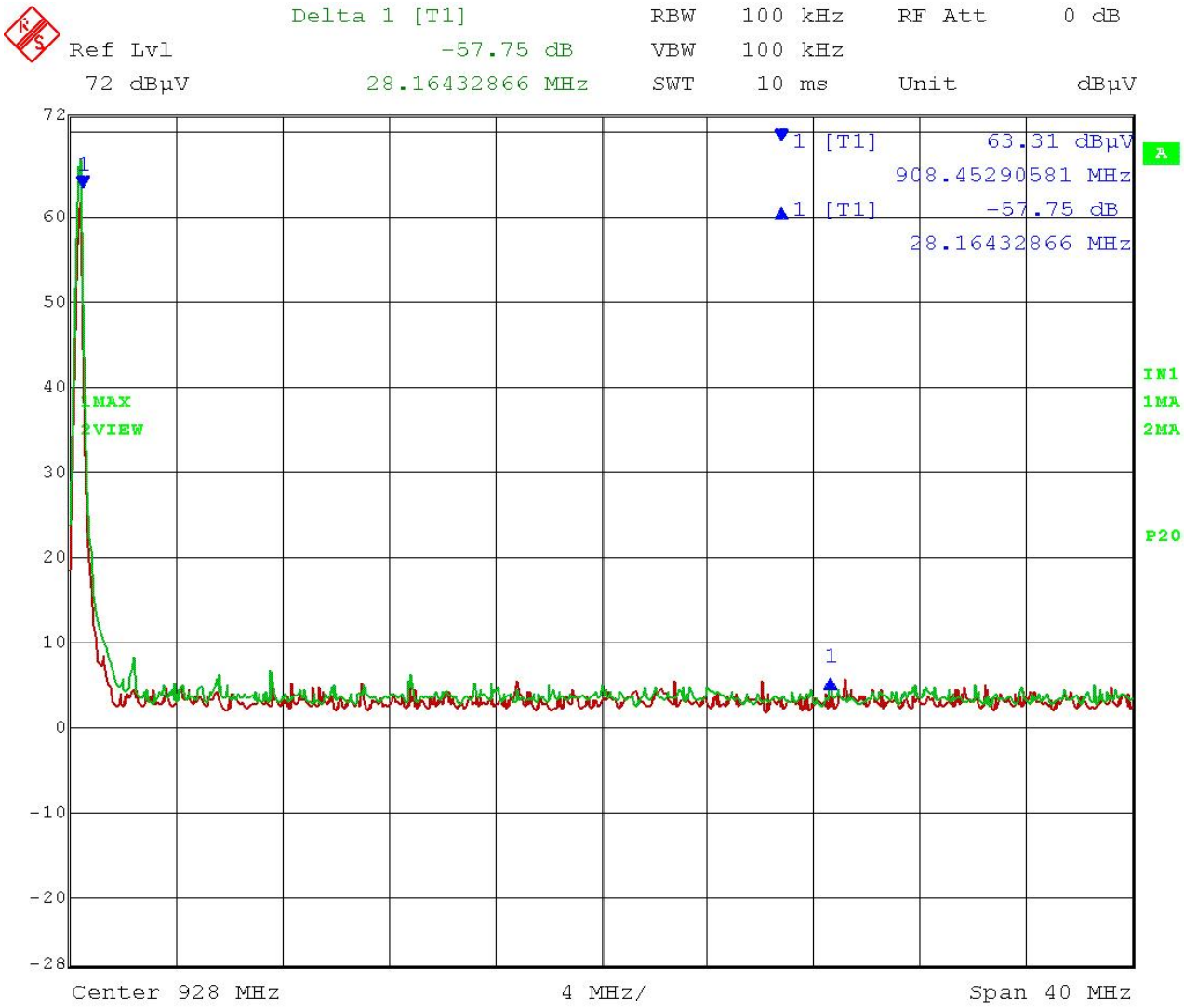
BANDEDGE

Test Data: Upper Bandedge

CH 1 908.4 MHz Horizontal



Date: 15.DEC.2014 15:41:27

Horizontal Polarity

Results Meet Requirements

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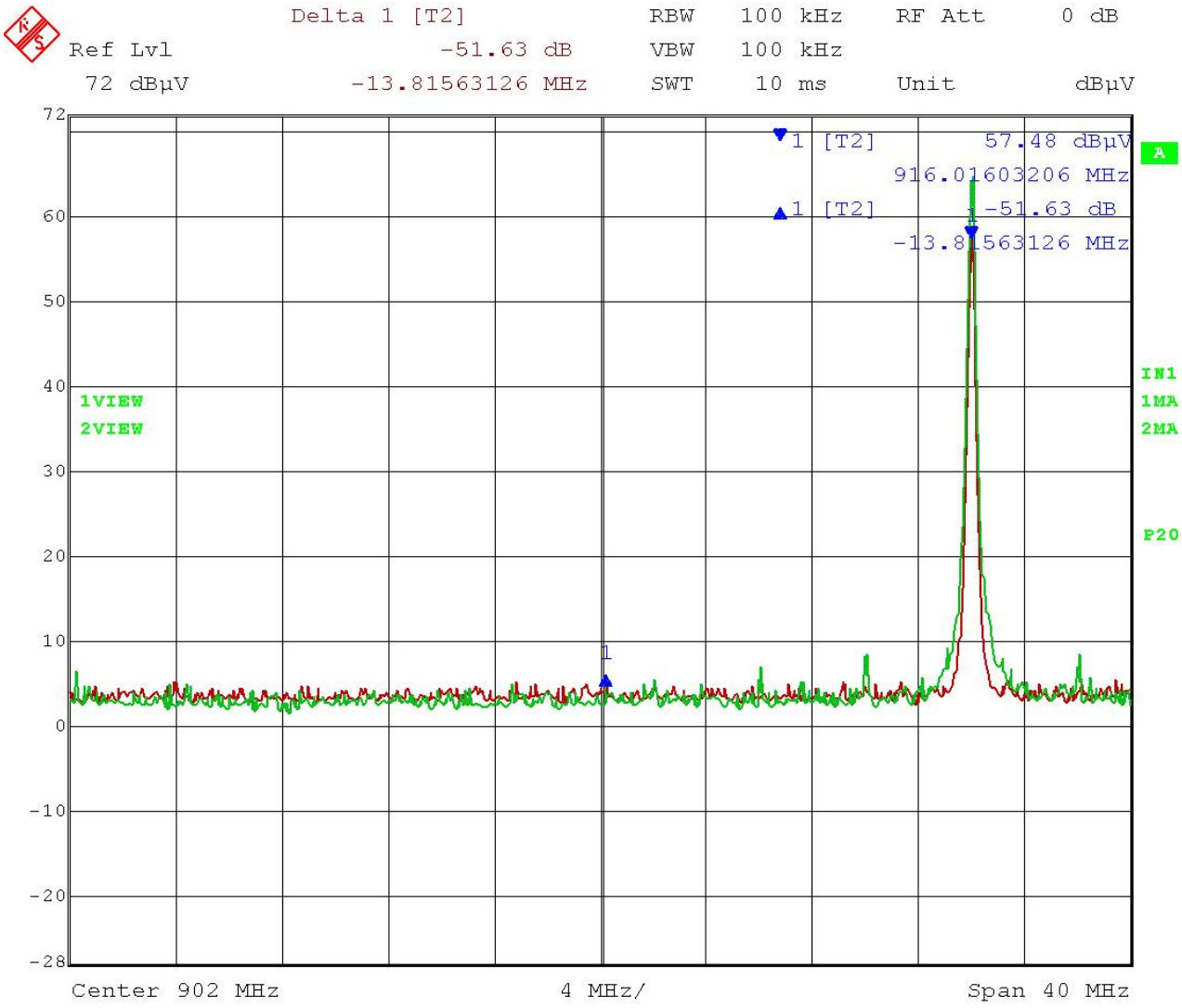
BANDEDGE

Test Data: Lower Bandedge

CH 2 916 MHz Vertical



Vertical Polarity

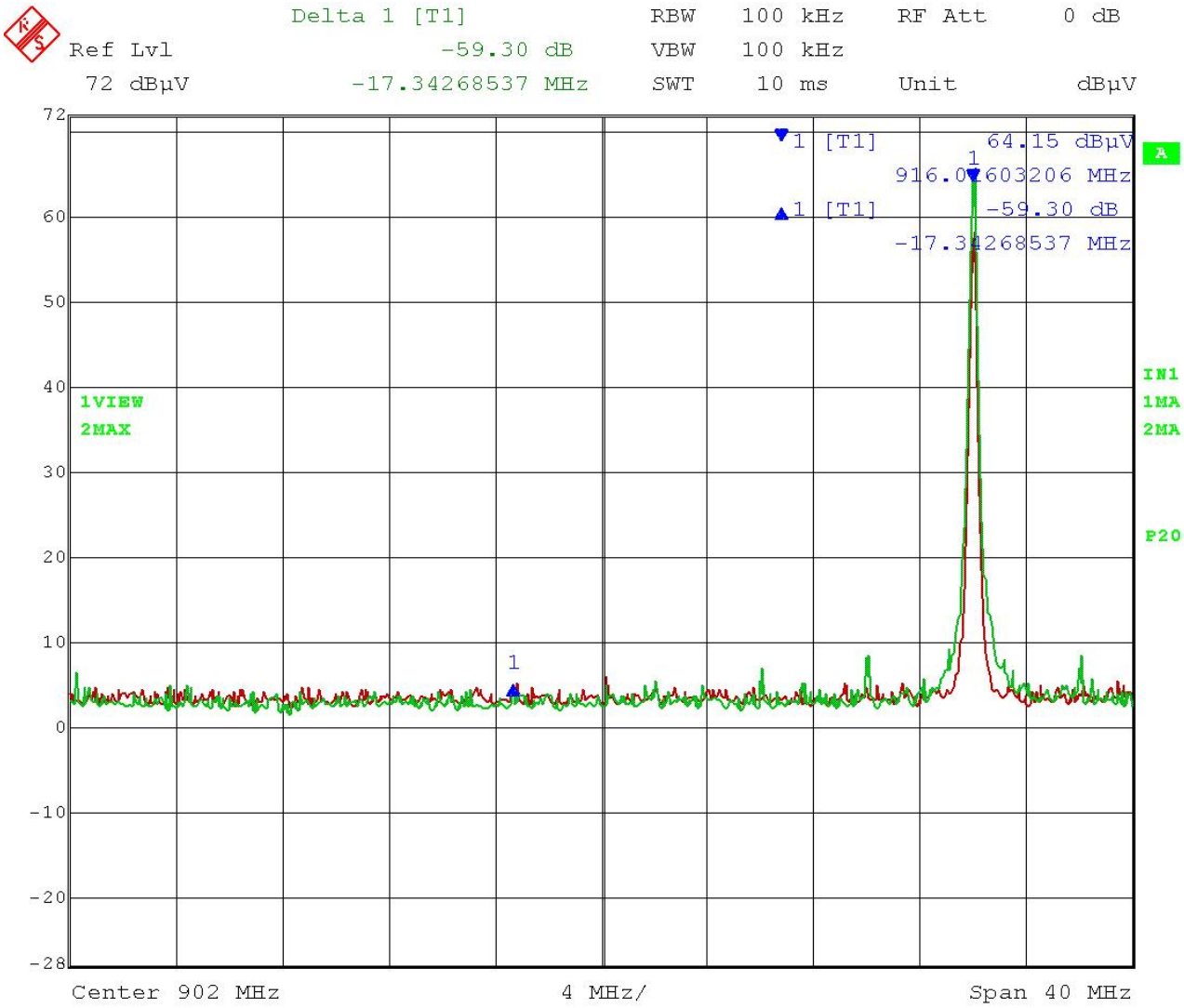
Results Meet Requirements

Table of Contents

BANDEDGE

Test Data: Lower Bandedge

CH 2 916 MHz Horizontal



Horizontal Polarity

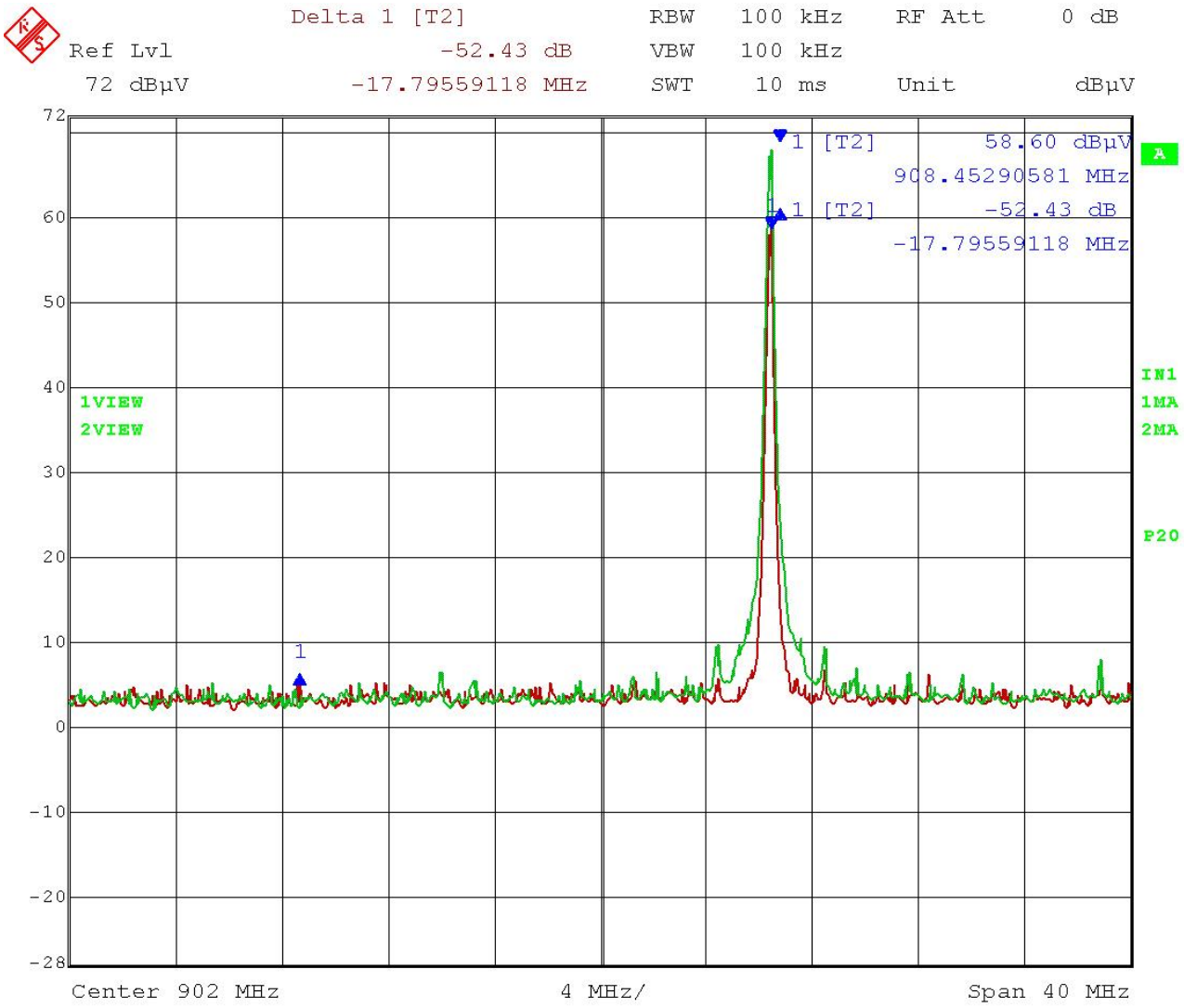
Results Meet Requirements

Table of Contents

BANDEDGE

Test Data: Lower Bandedge

CH 1 908.4 MHz Vertical



Vertical Polarity

Results Meet Requirements

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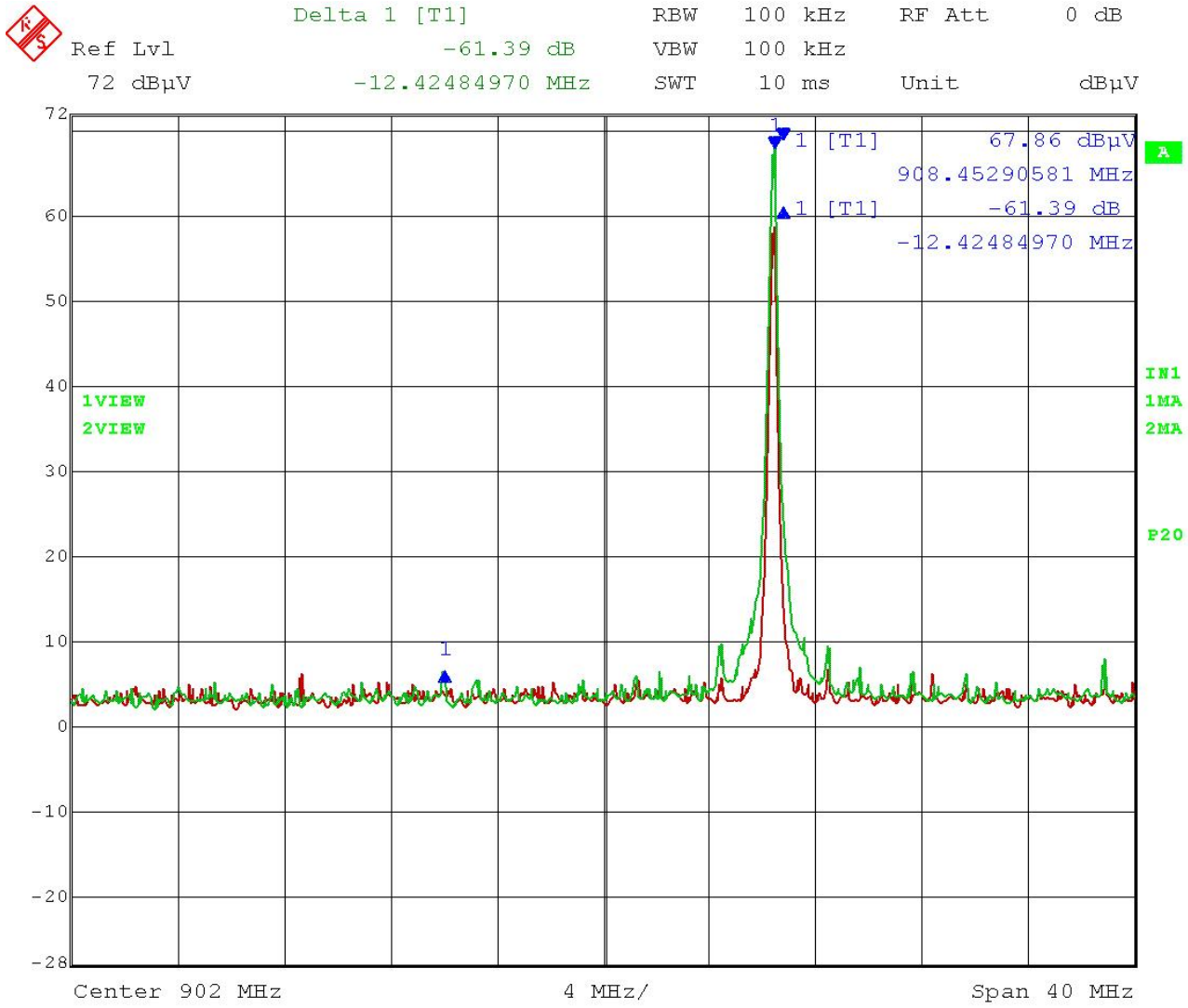
BANDEDGE

Test Data: Lower Bandedge

CH 1 908.4 MHz Horizontal



Date: 15.DEC.2014 15:37:34

Horizontal Polarity

Results Meet Requirements

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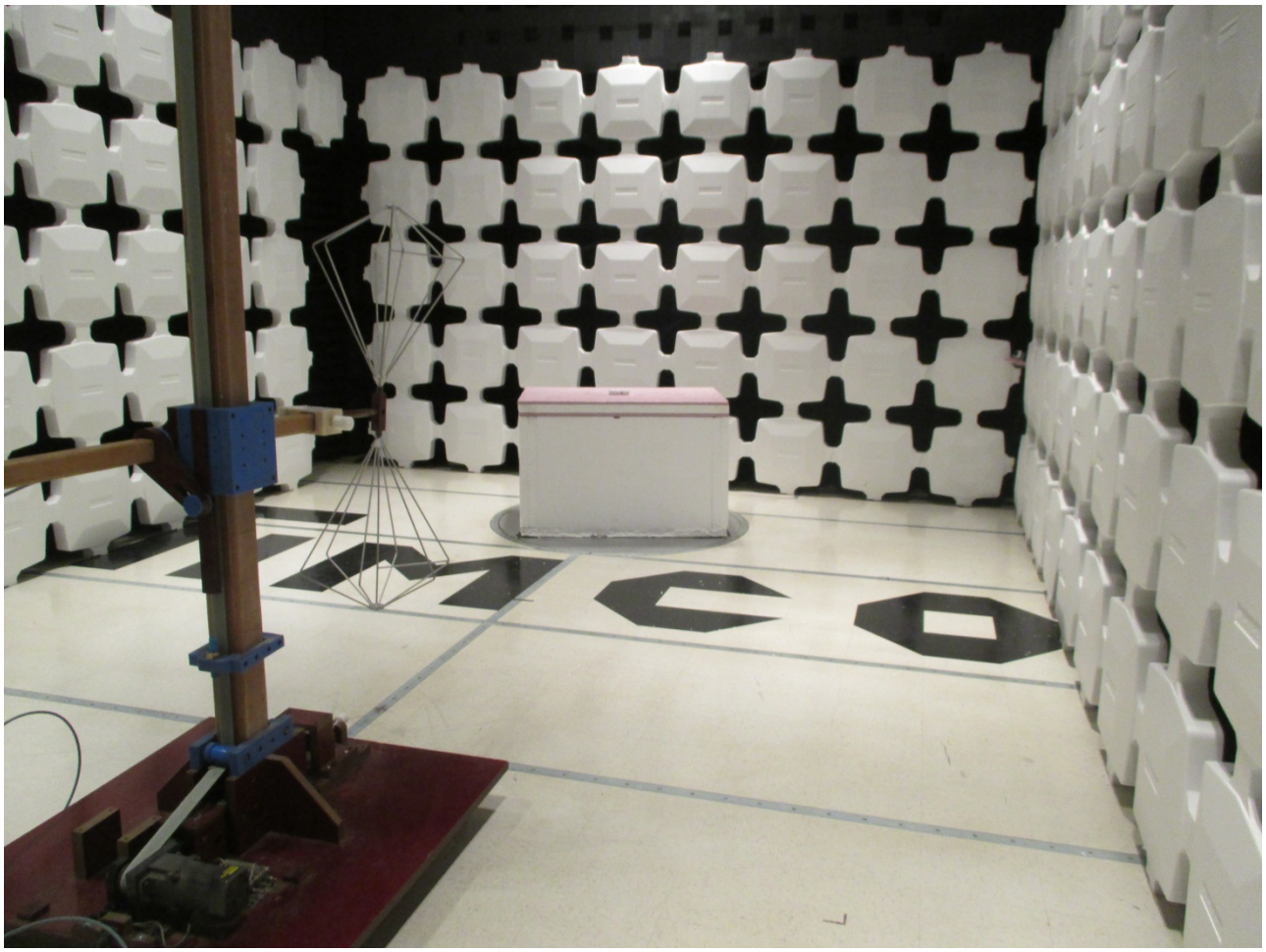
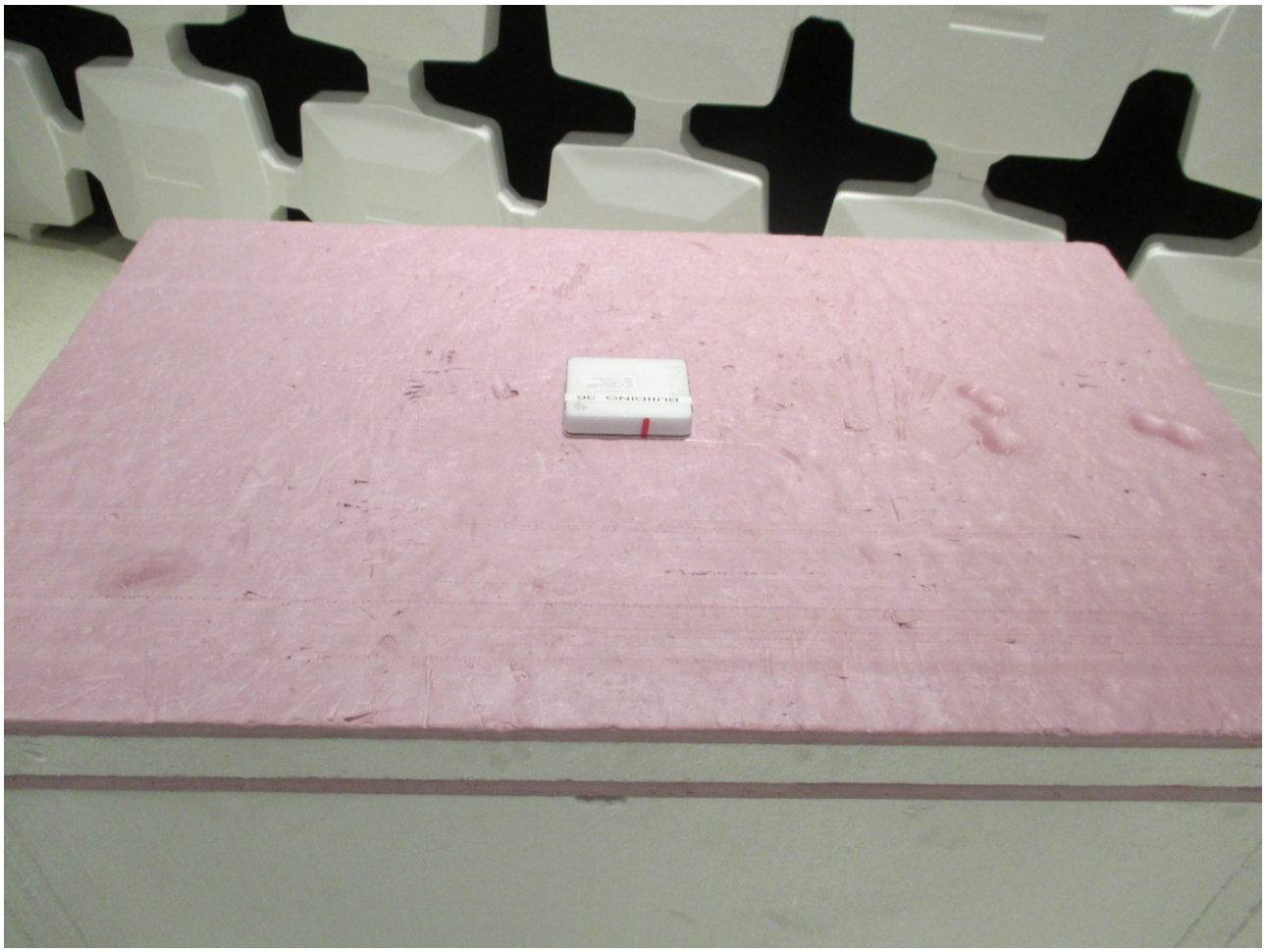
EUT SETUP PHOTOS

Radiated Setup



EUT SETUP PHOTOS

Final EUT Setup



EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconnical Chamber	Eaton Chamber	94455-1	1057	06/14/13	06/14/15
Antenna: Log-Periodic Chamber	Eaton	96005	1243	05/31/13	05/31/15
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Antenna: Double-Ridged Horn/ETS Horn 1	ETS-Lindgren Chamber	3117	00035923	06/13/14	06/13/16
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/12/14	08/12/16
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	03/11/14	03/11/16

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