

Electromagnetic Compatibility Test Report

Prepared in accordance with

FCC Part 15C, RSS-210 Issue 8 and ANSI C63.10:2013

On

Active RFID Tag

RM433V2

OMNI-ID

1200 Ridgeway Avenue

Rochester, NY 14615

Prepared by:

TUV Rheinland of North America, Inc.

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Manufacturer's statement - attestation

The manufacturer; **Omni-ID**, as the responsible party for the equipment tested, hereby affirms:

- a) That he has reviewed and concurs that the test shown in this report are reflective of the operational characteristics of the device for which certification is sought;
- b) That the device in this test report will be representative of production units;
- c) That all changes (in hardware and software/firmware) to the subject device will be reviewed.
- d) That any changes impacting the attributes, functionality or operational characteristics documented in this report will be communicated to the body responsible for approving (certifying) the subject equipment.

Ed Nabrotzky

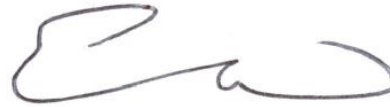
Printed name of official

**1200 Ridgeway Ave
Suite 106
Rochester, NY 14615**

Address

(585) 697-9913

Telephone number



Signature of official

10/05/2015

Date

ed.nabrotzky@omni-id.com

Email address of official

FCC ID: N74-RM433V2



IC: 10336A-RM433V2

Report No.:

31552797.002.doc

Page 3 of 60

Client:	OMNI-ID 1200 Ridgeway Avenue Rochester, NY 14615	Contact: Len Desmond Tel: 585-713-1021 Fax: e-mail len.desmond@omni-id.com		
Identification:	Active RFID Tag	Serial No.:	TS-1	
Test item:	Model RM433V2	Date Test Completed:		10/27/2015
Testing location:	TUV Rheinland of North America 710 Resende Road Webster, NY 14580 U.S.A.		Tel: (585) 645-0125	
Test specification:	Emissions: FCC Part 15.231 Radiated Emissions Std FCC Part 15.209 and RSS - 210 Issue 8, FCC Part 15.231 and RSS - 210 Issue 8, FCC Part 15.231 and RSS - 210 Issue 8			
Test Result:	The above product was found to be Compliant to the above test standard(s)			
tested by: Randall Masline		reviewed by: Cecil Gittens		
<u>11 January 2016</u> Date Name Signature		<u>11 January 2016</u> Date Name Signature		
Other Aspects:	None			
Abbreviations: OK, Pass, Compliant, Complies = passed Fail, Not Compliant, Does Not Comply = failed N/A = not applicable				
			Industry Canada	VCCI
US5253	Testing Cert.# 3331.08		482B-1	BSMI
			A-0203	SL2-IN-E-050R

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1 General Information

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Part 15C, RSS-210 Issue 8 and ANSI C63.10:2013 based on the results of testing performed on 10/27/2015 on the Active RFID Tag, Model Number. RM433V2, manufactured by OMNI-ID. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

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1.3 Summary of Test Results

Applicant	OMNI-ID 1200 Ridgeway Avenue Rochester, NY 14615	Tel	585-713-1021	Contact	Len Desmond
		Fax		e-mail	len.desmond@omni-id.com
Description	Active RFID Tag	Model Number	RM433V2		
Serial Number	TS-1	Test Voltage/Freq.	3 VDC		
Test Date Completed:	10/27/2015	Test Engineer	Randall Masline		
Standards	Description	Severity Level or Limit		Measured	Test Result
FCC Part 15 subpart C Standard	Radio Frequency Devices - Subpart C: Intentional Radiators	See called out parts below		See Below	Complies
RSS-210 Issue 8 Standard	Licence-exempt Radio Apparatus (All Frequency Bands): Category 1 Equipment	See called out parts below		See Below	Complies
FCC Part 15.231	Operation in the band 433.5 434.5 MHz	See Basic Standards Below		See Below	Complies
FCC Part 15.209 and RSS - 210 Issue 8	Radiated Emissions	Class B, 30 - 1000 MHz Spurious up to 6000 Mhz		Limit	Complies
FCC Part 15.231 and RSS - 210 Issue 8	Field Strength of Fundamental and Spurious Emissions	15.231 Limit for 433 MHz is 80.8 dBuV Limit is raised to 116.19 dBuV/m at 433 MHz with Duty Cycle Correction Factor		434.528 MHz Channel 13 Yagi Antenna 94.94 dBuV/m	Complies
FCC Part 15.231 and RSS - 210 Issue 8	Bandwidth	Part 15.231 1082.5 kHz RSS - 210 99% BW		681.30 kHz 576.23 kHz	Complies
FCC Part 15.231(a)	Deactivation of Transmitter	5 Seconds, 433 MHz		Within 5 seconds	Complies

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2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America located at, 710 Resende Road, Webster, NY 14580 is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90575). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

2.1.2 A2LA

This is a program which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Lab code: 3331.08). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 VCCI

VCCI Accredited test lab. Registration numbers A-0203

2.1.4 Industry Canada

(Registration No.: 482B-1) The 10m Semi-Anechoic Chamber has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.4-2013.

2.1.5 BSMI

Registration No.: SL2-IN-E-050R. The BSMI accreditation was obtained by NIST MRA with the BSMI.

2.1.6 Korea

Recognized by Radio Research Agency as an accredited Conformity Assessment Body (CAB) under the terms of Phase I of the APEC TEL.

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2.1.7 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: RAW = Measured level before correction (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V/m}}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dB μ V/m)

$$25 \text{ dB}\mu\text{V/m} + 17.5 \text{ dB} - 20 \text{ dB} + 1.0 \text{ dB} = 23.5 \text{ dB}\mu\text{V/m}$$

2.2 Measurement Uncertainty Emissions

	U_{lab}	U_{cispr}
Radiated Disturbance @ 10m		
30 MHz – 1,000 MHz	4.57 dB	5.2 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	2.62 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.88 dB	4.5 dB

2.3 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

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2.4 Measurement Equipment Used

Equipment	Manufacturer	Model #	Ref.	Serial #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
Radiated Emissions							
Receiver (20Hz-40GHz)	Rohde & Schwarz	ESI(B) 40		100090	8-Jul-15	8-Jul-16	RE
Receiver (20Hz-40GHz)	Rohde & Schwarz	ESU 40		100274	4-Aug-15	4-Aug-16	RE
BiLog	Chase	CBL6111	C017	1169	22-Aug-15	22-Nov-15	RE
Horn(1-18 GHz)	ETS	3117		040361	16-Jan-14	16-Jan-16	RE
Horn(18-26.5 GHz)	ETS	3160-09		1275	16-Jan-14	16-Jan-16	RE
Horn(26.5-40 GHz)	ETS	3160-10		1180	16-Jan-14	16-Jan-16	RE
Loop Antenna	EMCO	6502		8901-2302	10-Mar-15	10-Mar-17	RE
Multimeter	Fluke	83	C437	48162892	3-Aug-15	3-Aug-16	RE
Signal Generator	R&S	SMR 40		1104.0002.40	15-Aug-14	15-Aug-16	RE_S
Horn (1-18 GHz)	EMCO	3115		9812-5635	14-Apr-14	14-Apr-16	RE_S
Horn (18-40 GHz)	Com-Power	AH-840		101083	8-Jul-15	8-Jul-16	RE_S
Environmental Chamber	Tenny			1662			RE
Environmental Chamber	Thermotron			20891			
Meter	Fluke				31-Dec-15	31-Dec-16	
Thermocouple	Fluke	80TK			31-Dec-15	31-Dec-16	
General Laboratory Equipment							
Multimeter	Fluke	87	C405	49050672	3-Aug-15	3-Aug-16	
Multimeter	Fluke	8062A	C452	4715199	3-Aug-15	3-Aug-16	
Pressure/Temperature/RH	Extech	SD700	C480	Q668876	3-Aug-15	3-Aug-16	

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3 Product Information

3.1 Equipment Modifications

No modifications were needed to bring product into compliance.

3.2 Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in appendix A of this report.

Duty Cycle

$T_{on} = 1.7\text{mS}$

$T_{off} = 100\text{ mS}$

So Duty Cycle = $100 * (1.7\text{mS}) / (1.7\text{mS} + 100\text{ mS}) = 1.67\%$

Duty cycle correction factor calculation: FCC 15.35

Each announce packet contains 344 bits of data and the packet transmission time with 200 Kbps data rate is 1.7mS.

Packet time = 1.7mS

Averaging Period = 100mS

Factor = $20 \text{ LOG}(\text{Packet Time} / \text{Averaging Period}) = 20 \text{ LOG}(1.7\text{mS}/100\text{mS})$

Factor = $20 \text{ LOG}(.017) = -35.39\text{ dB}$

3.3 Antennas

The EUT is an Active RFID Tag that operates at 433 MHz, and utilizes four (4) different antennae. A Dipole 1.2 dBi gain, a Monopole 4.65 dBi gain, a Yagi 9.15 dBi gain, and a helical whip -5.6 dBi gain.

Testing was performed on all antennas and the measured data shows the highest emissions.

4 Emissions

4.1 Radiated Emissions

This test measures the electromagnetic levels of spurious signals generated by the EUT that radiated from the EUT and may affect the performance of other nearby electronic equipment.

4.1.1 Over View of Test

Results	Complies (as tested per this report)					Date	10/23/2015	
Standard	FCC Part 15.209 and RSS - 210 Issue 8							
Product Model	RM433V2				Serial#	TS-1		
Configuration	Tested in 10m Semi-Anechoic Chamber							
Test Set-up	Tested in 10m Semi-Anechoic Chamber, placed on turn-table at 3 meters, see test plans for details							
EUT Powered By	3 VDC	Temp	24°C	Humidity	52%	Pressure	1013mbar	
Frequency Range	30 - 1000 MHz @ 3m Spurious emissions to 6000 Mhz							
Perf. Criteria	Class B. (Below Limit)			Perf. Verification		Readings Under Limit		
Mod. to EUT	None			Test Performed By		Randall Masline		

4.1.2 Test Procedure

Radiated FCC emissions tests were performed using the procedures of ANSI C63.10:2013 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration. Further radiated emission tests were performed per the procedures stated in the other emissions standards listed in this report.

The frequency range from 30 - 1000 MHz was investigated for radiated emissions.

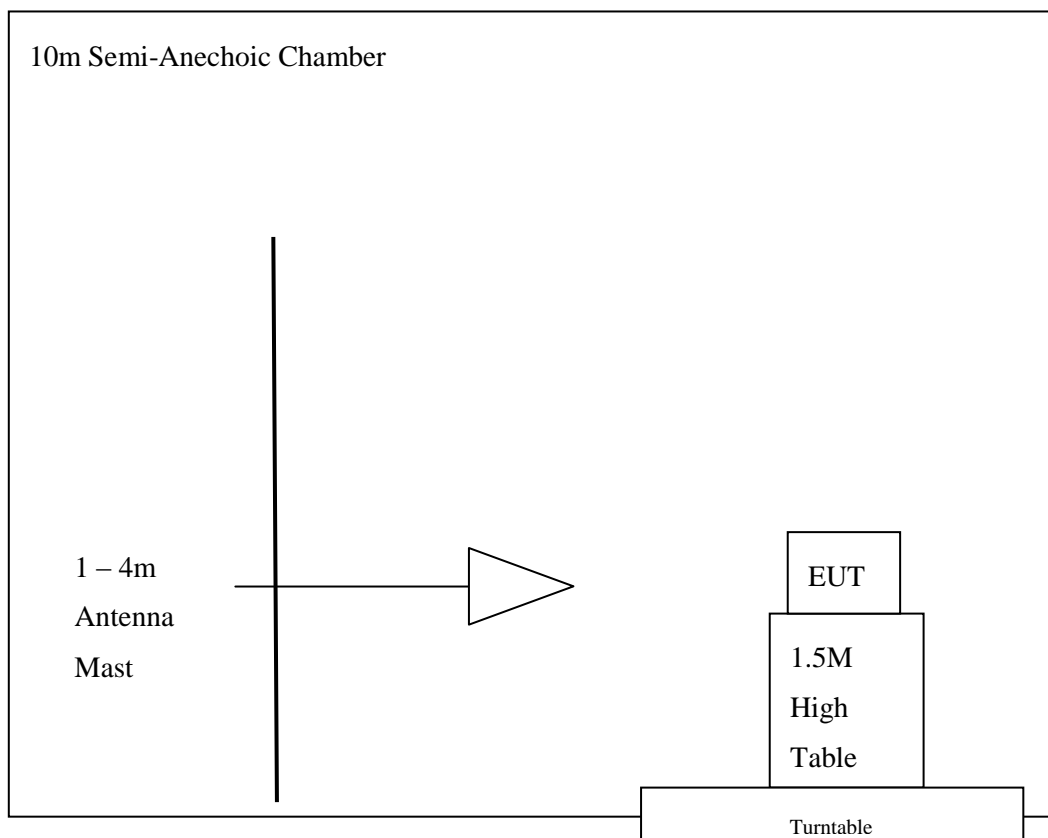
4.1.3 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

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4.1.1 Block Diagram of Test Setup

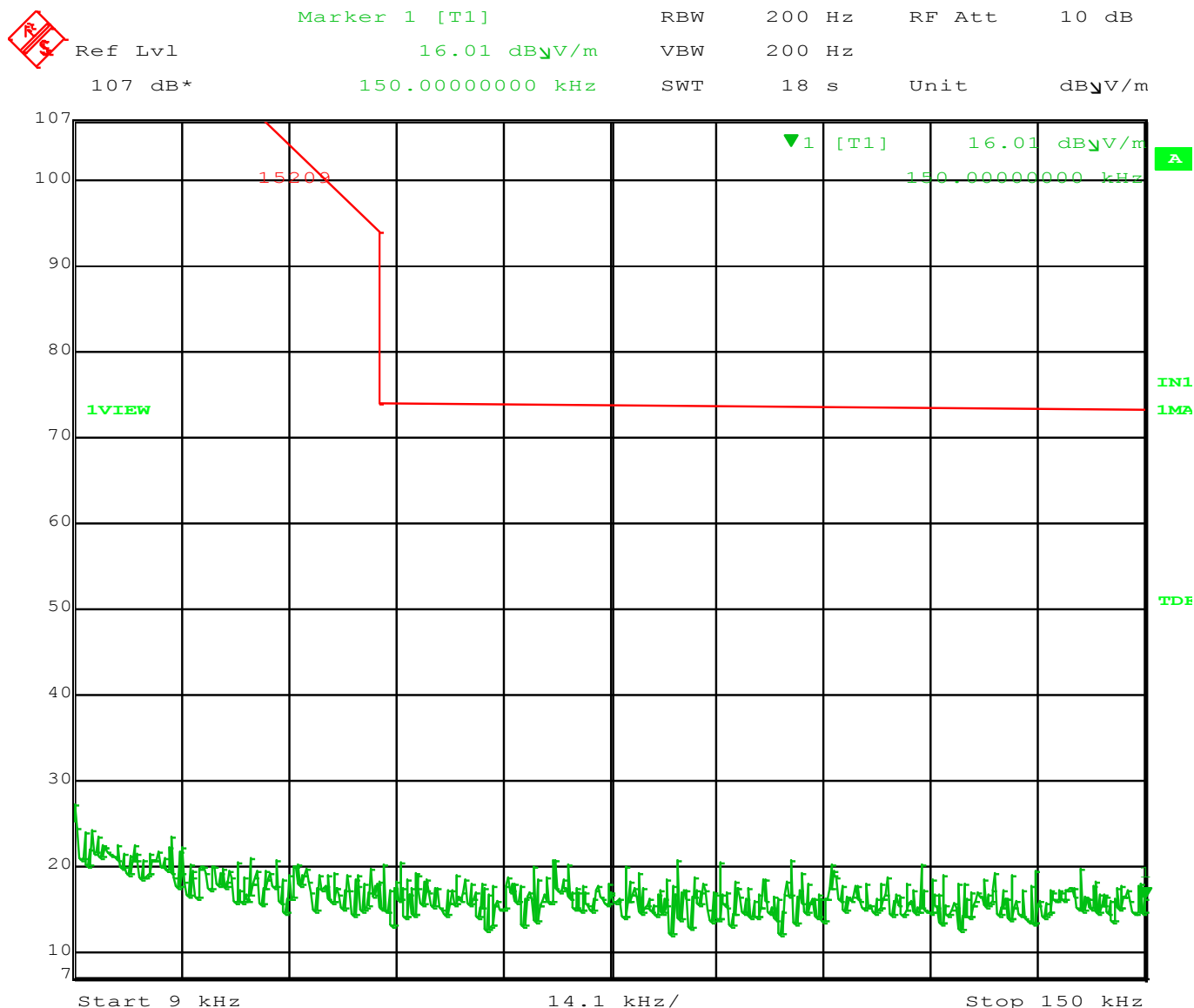
Testing performed at a distance of 3 meters



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4.1.1 Final Graphs

Radiated Emissions were performed using the highest Gain antenna, the 7 dBi Yagi.



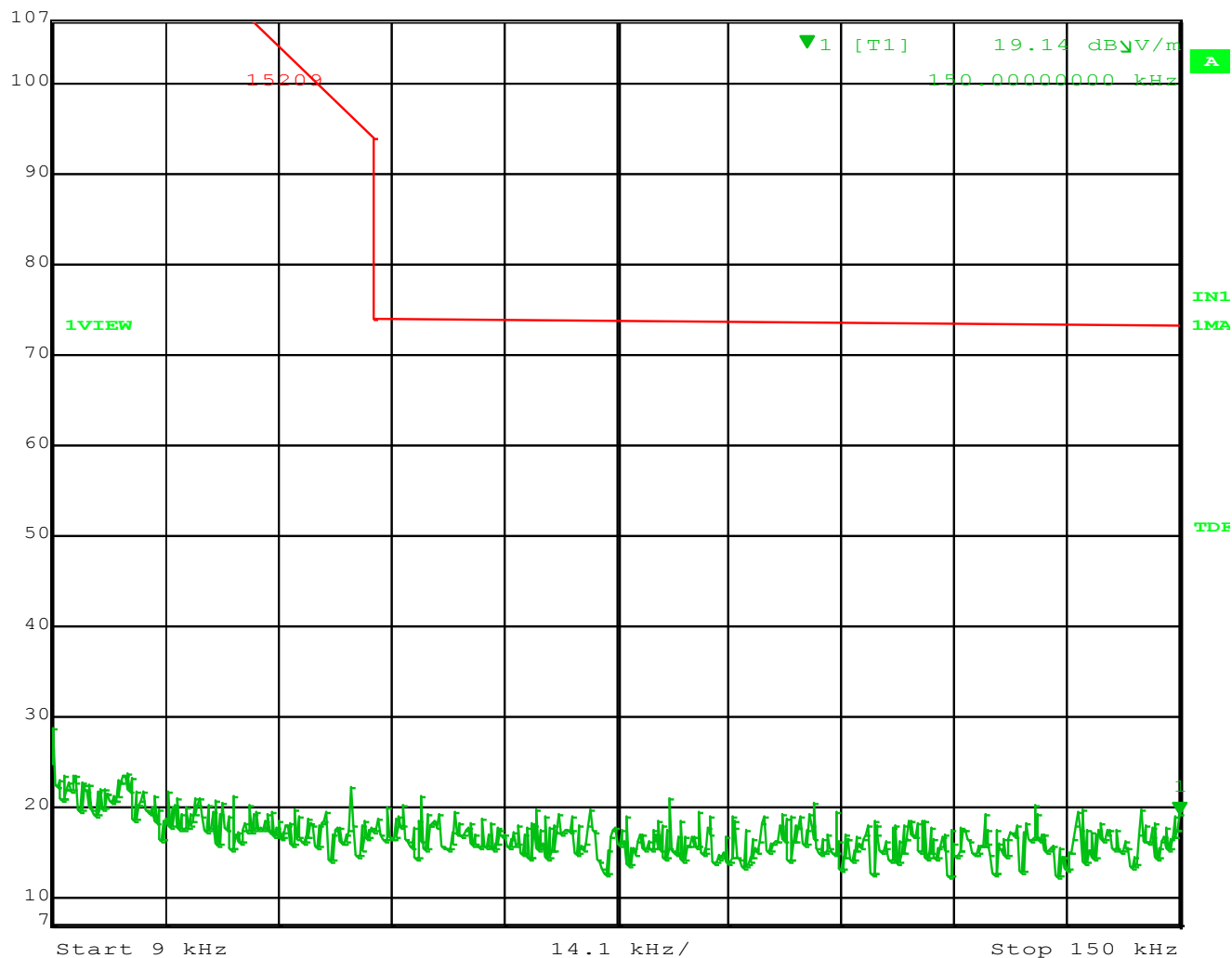
Date: 15.OCT.2015 15:16:18

Figure 1 – Spurious Emissions (Parallel) 9 kHz to 150 kHz

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Marker 1 [T1] RBW 200 Hz RF Att 10 dB
Ref Lvl 19.14 dBµV/m VBW 200 Hz
107 dB* 150.00000000 kHz SWT 18 s Unit dBµV/m



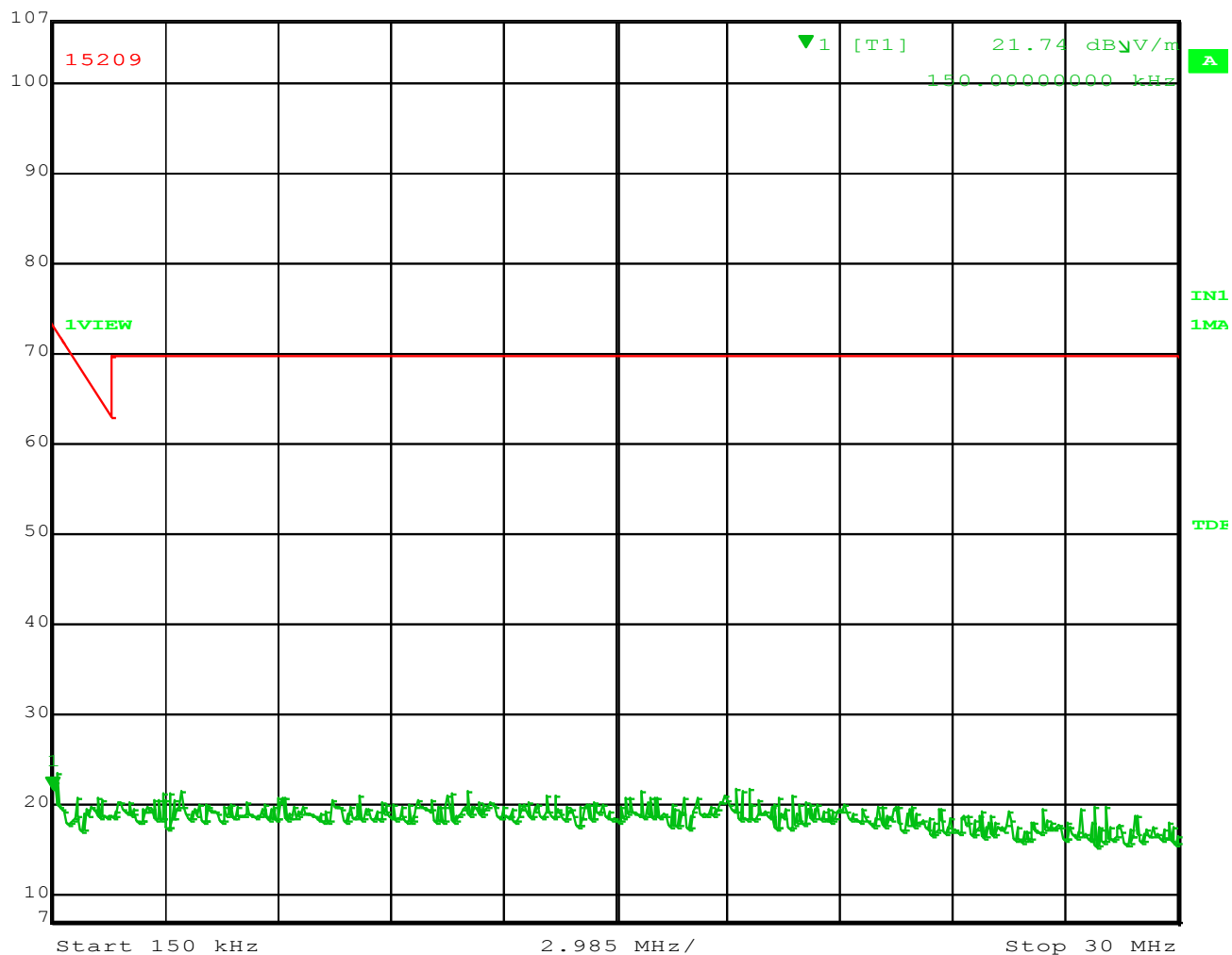
Date: 15.OCT.2015 15:15:30

Figure 2 – Spurious Emissions (Perpendicular) 9 kHz to 150 kHz

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Marker 1 [T1] RBW 10 kHz RF Att 10 dB
Ref Lvl 21.74 dB μ V/m VBW 10 kHz
107 dB* 150.00000000 kHz SWT 760 ms Unit dB μ V/m



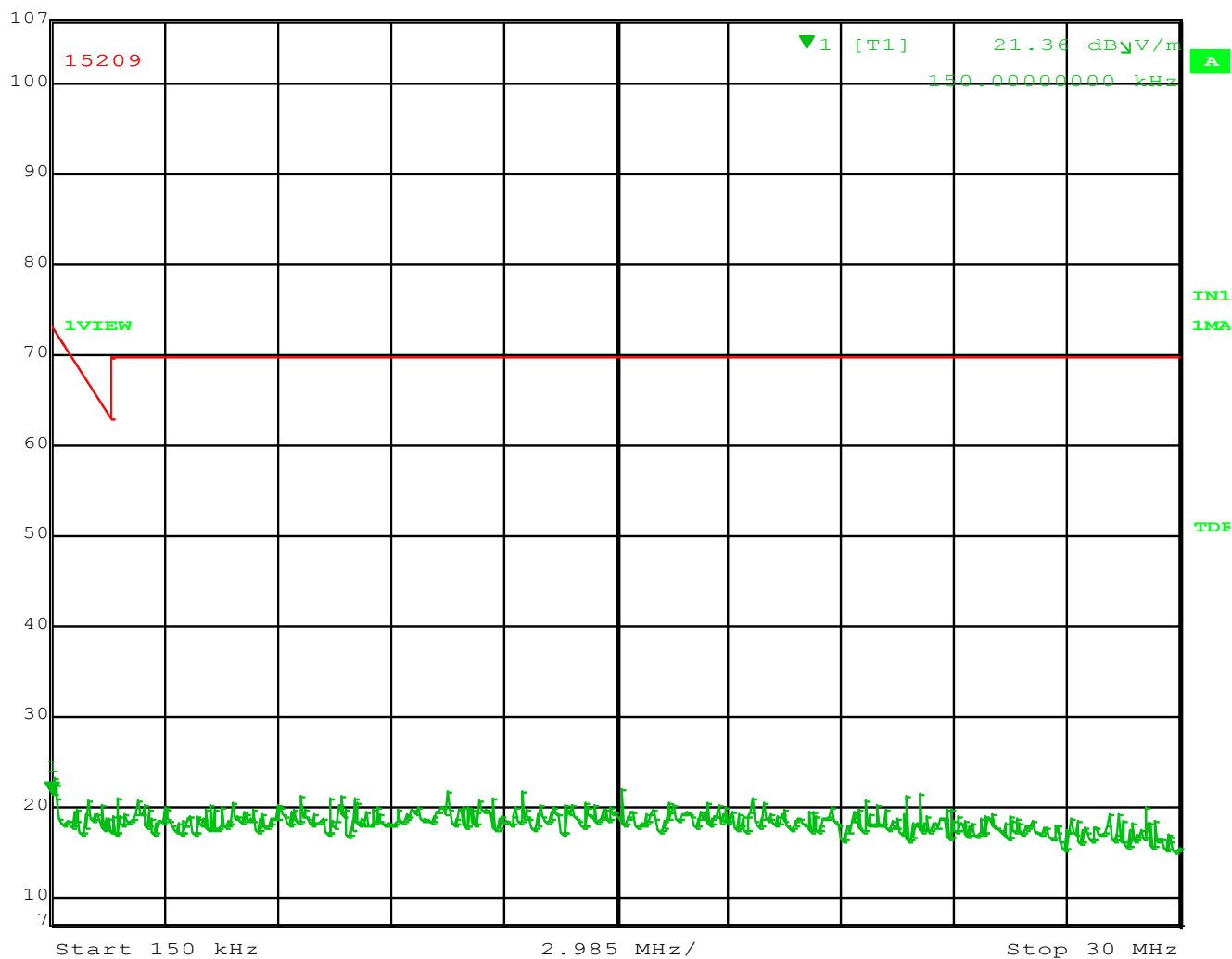
Date: 15.OCT.2015 15:20:16

Figure 3 – Spurious Emissions (Parallel) 150 kHz to 30 MHz

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Marker 1 [T1] RBW 10 kHz RF Att 10 dB
Ref Lvl 21.36 dBV/m VBW 10 kHz
107 dB* 150.00000000 kHz SWT 760 ms Unit dBV/m



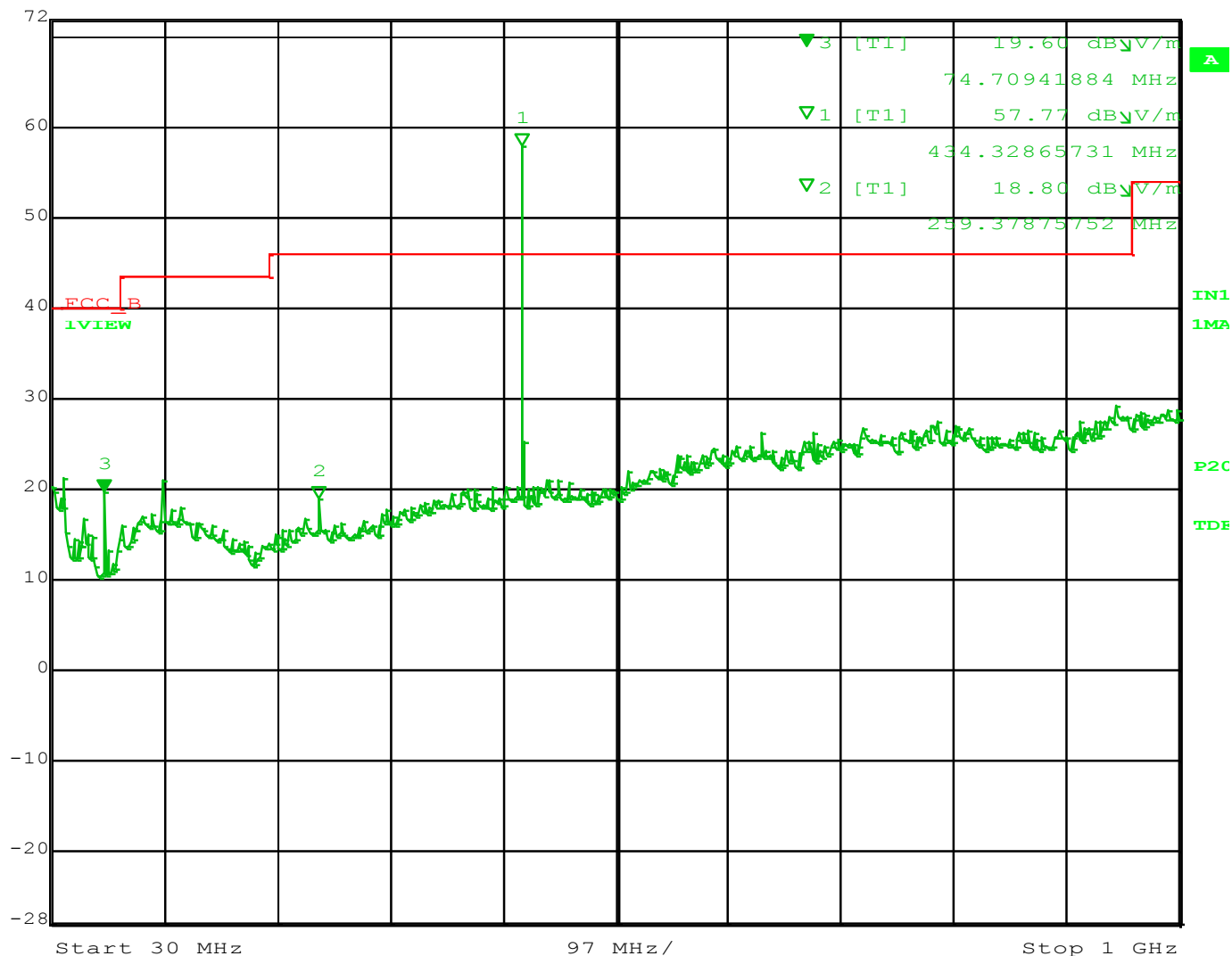
Date: 15.OCT.2015 15:20:43

Figure 4 – Spurious Emissions (Perpendicular) 150 kHz to 30 MHz

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Marker 3 [T1] RBW 100 kHz RF Att 0 dB
 Ref Lvl 19.60 dB μ V/m VBW 300 kHz
 72 dB* 74.70941884 MHz SWT 300 ms Unit dB μ V/m



Date: 22.OCT.2015 11:40:19

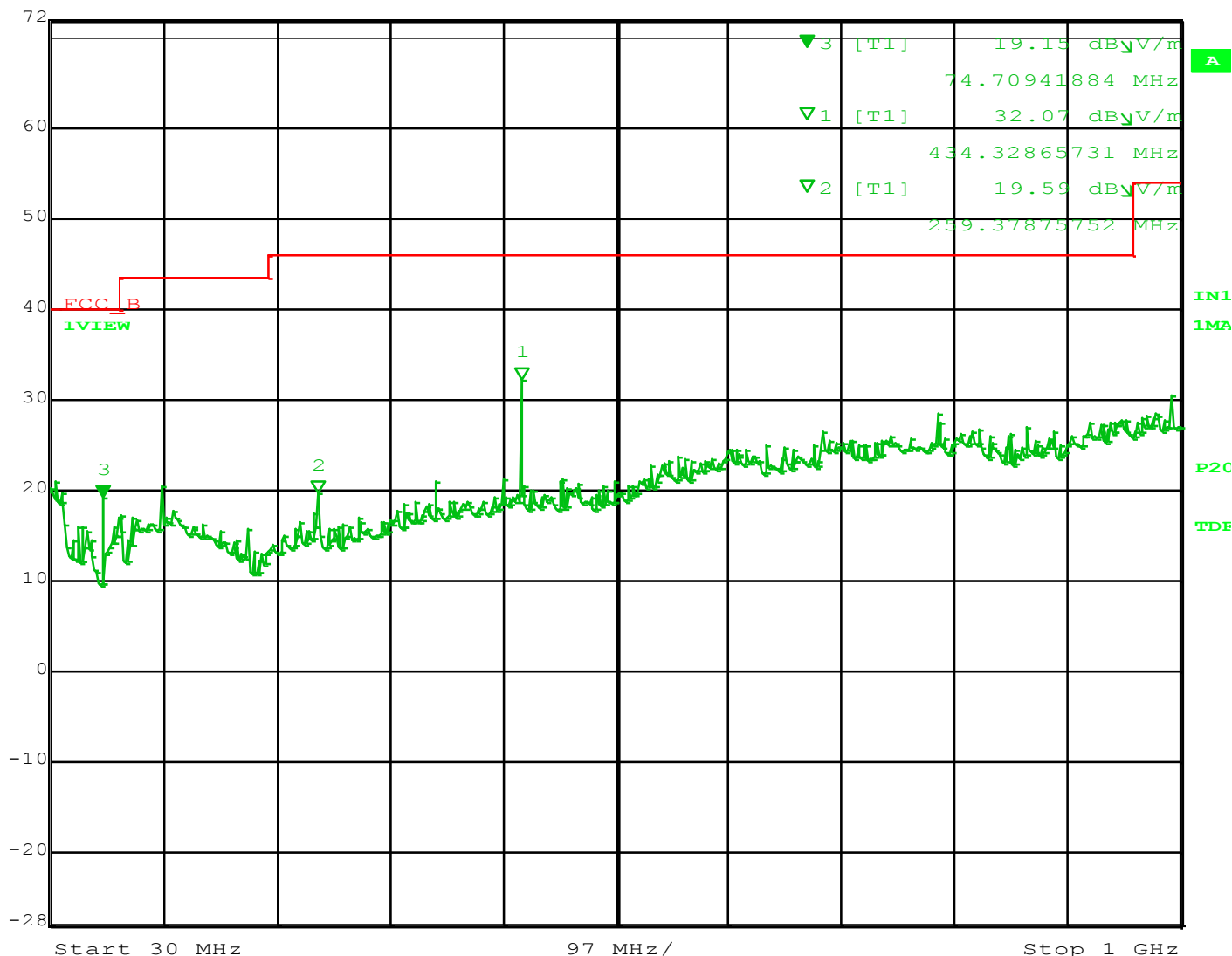
Figure 5 – Channel 13 with YAGI antenna, Horizontal

NOTE: Marker 1 is the Fundamental

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Marker 3 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 19.15 dBV/m VBW 300 kHz
72 dB* 74.70941884 MHz SWT 300 ms Unit dBV/m



Date: 22.OCT.2015 11:39:39

Figure 6 – Channel 13 with YAGI antenna, Vertical

NOTE: Marker 1 is the Fundamental

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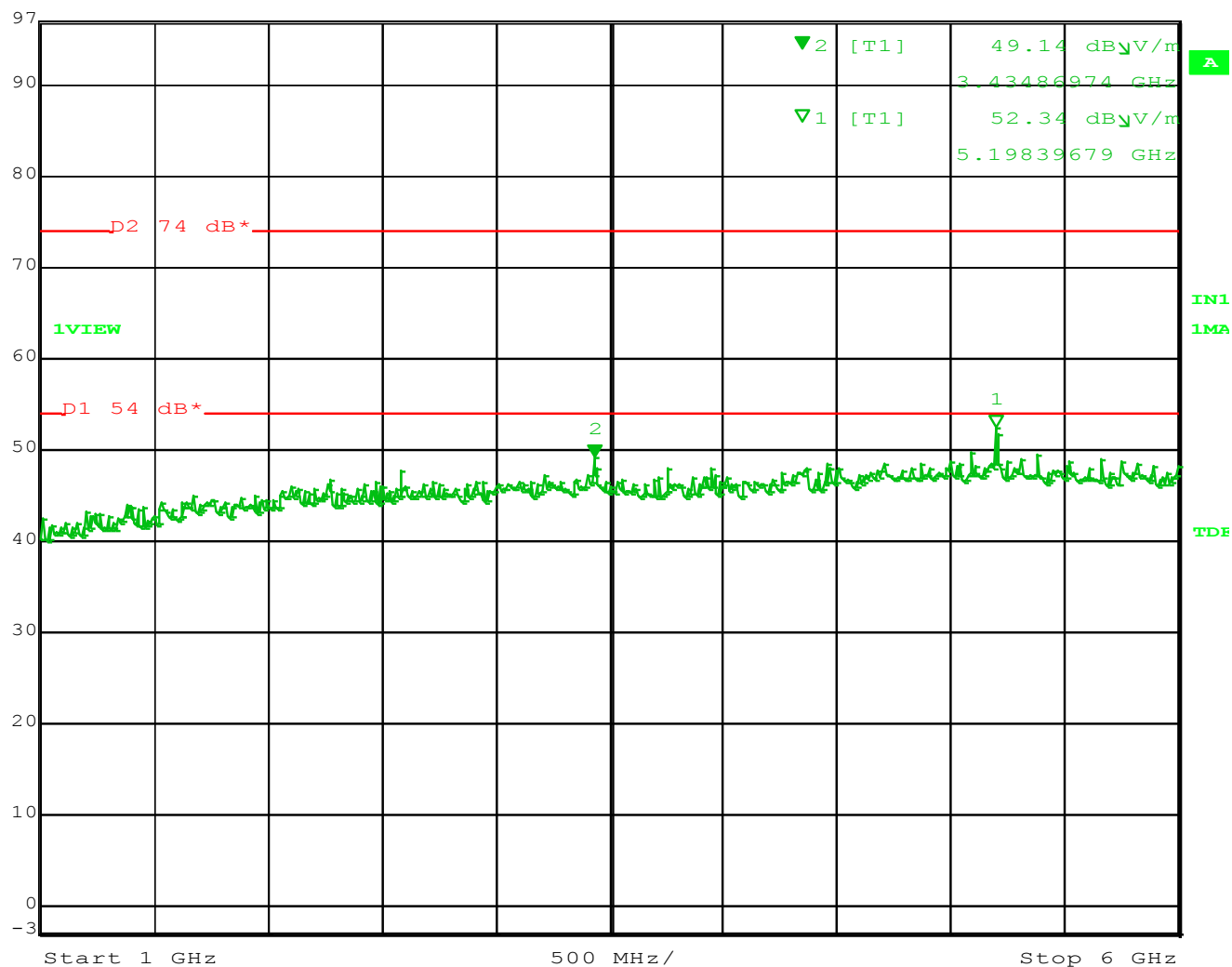
Frequency (MHz)	Antenna Polarity (H–V)	Antenna Height (M)	Peak (dBuV/m)	QP (dBuV/m)	Limit (dBuV/m)	Result
259.3787	H	1.5	18.8	18.2	47	Complies
74.7094	H	1.5	19.6	19.1	40	Complies
259.3787	V	1.5	19.59	19.3	47	Complies
74.7094	V	1.5	19.15	19	47	Complies

Figure 7 – Spurious Measurements 30 -1000 MHz

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Marker 2 [T1] RBW 1 MHz RF Att 0 dB
 Ref Lvl 49.14 dBμV/m VBW 3 MHz
 97 dB* 3.43486974 GHz SWT 12.5 ms Unit dBμV/m



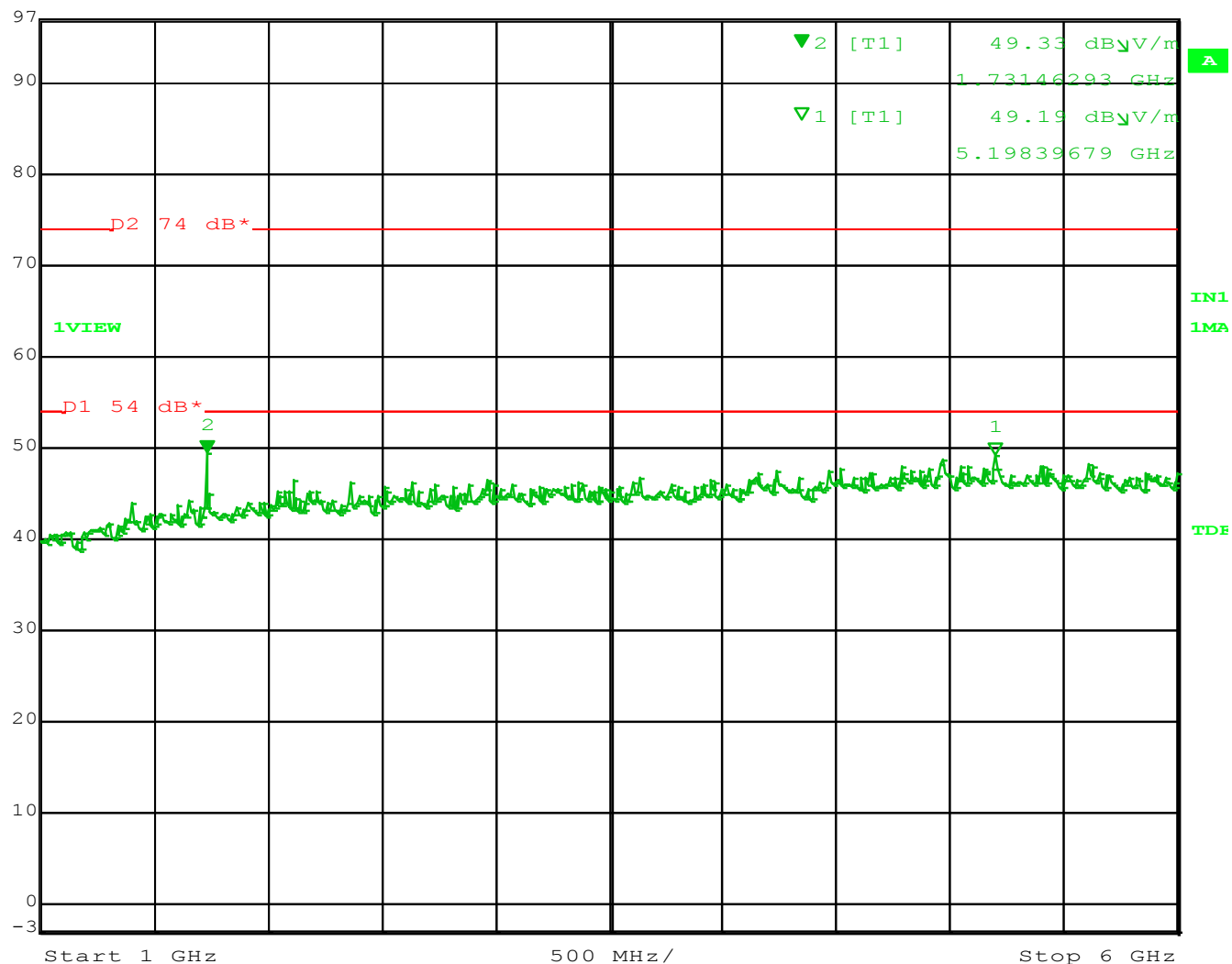
Date: 16.OCT.2015 11:32:52

Figure 8 – Channel 0 Yagi Antenna, Horizontal

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Marker 2 [T1] RBW 1 MHz RF Att 0 dB
Ref Lvl 49.33 dBV/m VBW 3 MHz
97 dB* 1.73146293 GHz SWT 12.5 ms Unit dBV/m



Date: 16.OCT.2015 11:33:31

Figure 9 – Channel 0 Yagi Antenna, Vertical

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Frequency (GHz)	Antenna Polarity (H-V)	Antenna Height (M)	Peak (dBuV/m)	AVG (dBuV/m)	AVG Limit (dBuV/m)	Result
3.434	H	1.5	52.34	19.9	54	Complies
5.198	H	1.5	49.14	47.5	54	Complies
1.731	V	1.5	49.33	45.6	54	Complies
5.198	V	1.5	49.19	48.9	54	Complies

Figure 10 – Spurious Measurements 1000 - 6000 MHz

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4.2 Fundamental Field Strength and Harmonic Emissions

This test evaluates the field strength of the fundamental and field strength of the spurious emissions.

4.2.1 Test Over View

Results	Complies (as tested per this report)					Date	10/16/2015	
Standard	FCC Part 15.231 and RSS - 210 Issue 8							
Product Model	RM433V2				Serial#	TS-1		
Configuration	Tested in 10m Semi-Anechoic Chamber							
Test Set-up	EUT placed on table Tested in 10m Semi-Anechoic Chamber							
EUT Powered By	3 VDC	Temp	21° C	Humidity	48%	Pressure	1021mbar	
Perf. Criteria	15.231 (Below Limit)			Perf. Verification		Readings under Limit		
Mod to EUT	None			Test Performed By		Randall Masline		

4.2.2 Test Procedure

The EUT was placed on a table 3 meters from the antenna and all 3 orthogonal positions were investigated for highest field strength and highest spurious emissions. The fundamental frequency of the EUT is 433 MHz, therefore in addition to the requirements of 15.205 the EUT was tested to meet the following requirements in 15.231(b)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70.....	2,250.....	225
70-130.....	1,250.....	125
130-174.....	\1\ 1,250 to 3,750	\1\ 125 to 375
174-260.....	3,750.....	375
260-470.....	\1\ 3,750 to 12,500.	\1\ 375 to 1,250
Above 470.....	12,500.....	1,250

4.2.3 Deviations

There were no deviations from the test methodology listed in the test plan for the harmonic current emissions test.

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4.2.4 Final Test

All final measurements were below (in compliance) the limits.

4.2.5 Duty cycle correction factor calculation:

Each announce packet contains 344 bits of data and the packet transmission time with 200 Kbps data rate is 1.7mS.

Packet time = 1.7mS

Averaging Period = 100mS

Factor = $20 \text{ LOG}(\text{Packet Time} / \text{Averaging Period}) = 20 \text{ LOG}(1.7\text{mS} / 100\text{mS})$

Factor = $20 \text{ LOG}(.017) = -35.39 \text{ dB}$

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Dipole Antenna:

Freq.	Channel	Polarity	value dBuV/m	Limit (dBuV)	Duty Cycle	Delta From Limit
					Correction Factor	(dBuV)
433.12	0	Horiz	73.72	80.8	35.39	42.47
433.12	0	Vert	60.49	80.8	35.39	55.7
433.84	7	Horiz	68.67	80.8	35.39	47.52
433.84	7	Vert	62.53	80.8	35.39	53.66
434.55	13	Horiz	88.35	80.8	35.39	27.84
434.55	13	Vert	67.56	80.8	35.39	48.63

Monopole Antenna:

Freq.	Channel	Polarity	value dBuV/m	Limit (dBuV)	Duty Cycle	Delta From Limit
					Correction Factor	(dBuV)
433.12	0	Horiz	76.83	80.8	35.39	39.63
433.12	0	Vert	72.16	80.8	35.39	44.03
433.84	7	Horiz	53.48	80.8	35.39	62.71
433.84	7	Vert	59.60	80.8	35.39	56.59
434.55	13	Horiz	90.76	80.8	35.39	25.43
434.55	13	Vert	76.06	80.8	35.39	40.13

Yagi Antenna:

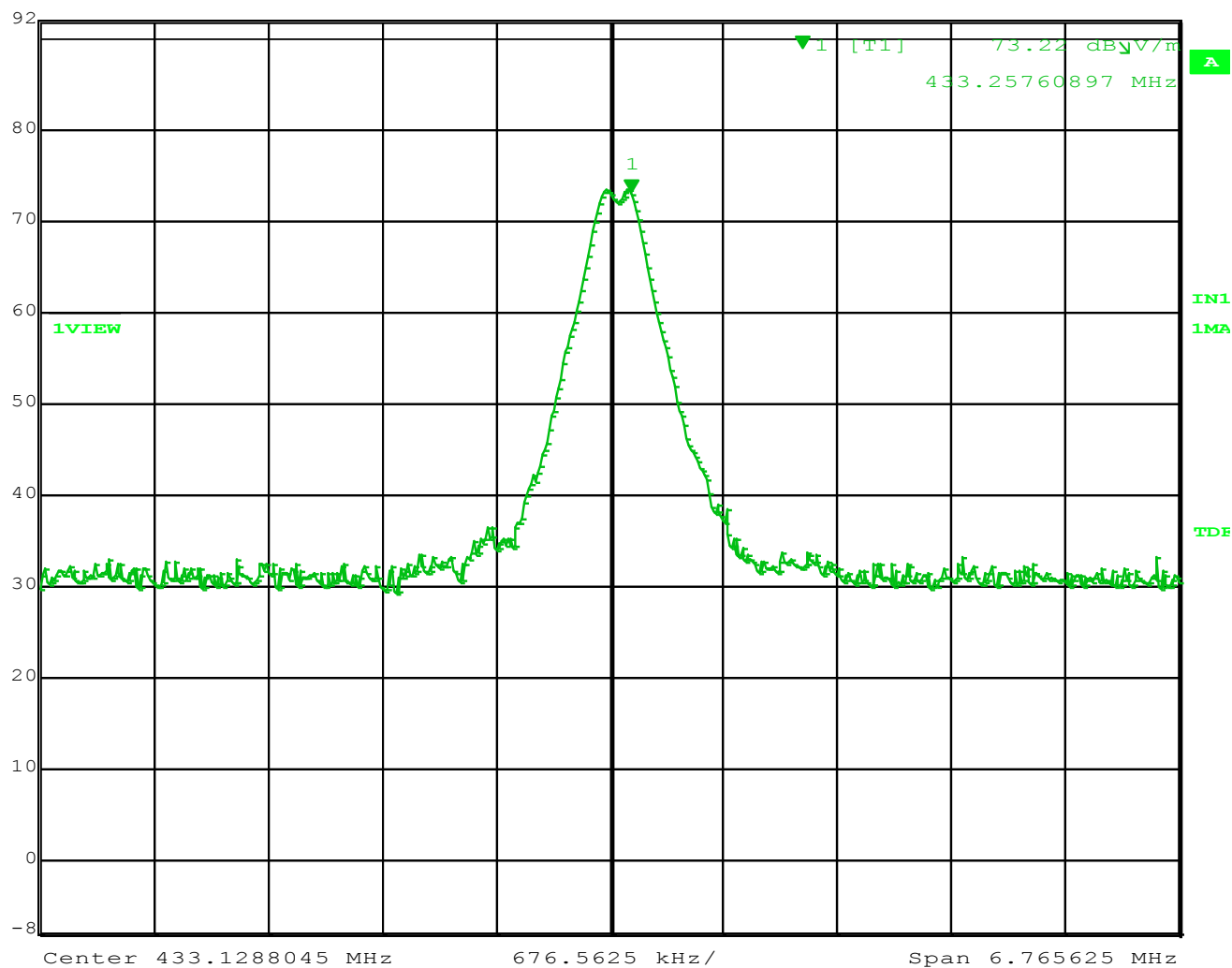
Freq.	Channel	Polarity	value dBuV/m	Limit (dBuV)	Duty Cycle	Delta From Limit
					Correction Factor	(dBuV)
433.12	0	Horiz	83.92	80.8	35.39	32.27
433.12	0	Vert	66.29	80.8	35.39	49.9
433.84	7	Horiz	74.77	80.8	35.39	41.42
433.84	7	Vert	59.04	80.8	35.39	57.15
434.55	13	Horiz	94.49	80.8	35.39	21.7
434.55	13	Vert	78.91	80.8	35.39	37.28

NOTE: ALL Radiated Measurements were taken at 100% Peak value without Duty Cycle Correction Factor

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Marker 1 [T1] RBW 100 kHz RF Att 0 dB
 Ref Lvl 73.22 dB μ V/m VBW 300 kHz
 92 dB* 433.25760897 MHz SWT 5 ms Unit dB μ V/m



Date: 6.OCT.2015 19:46:51

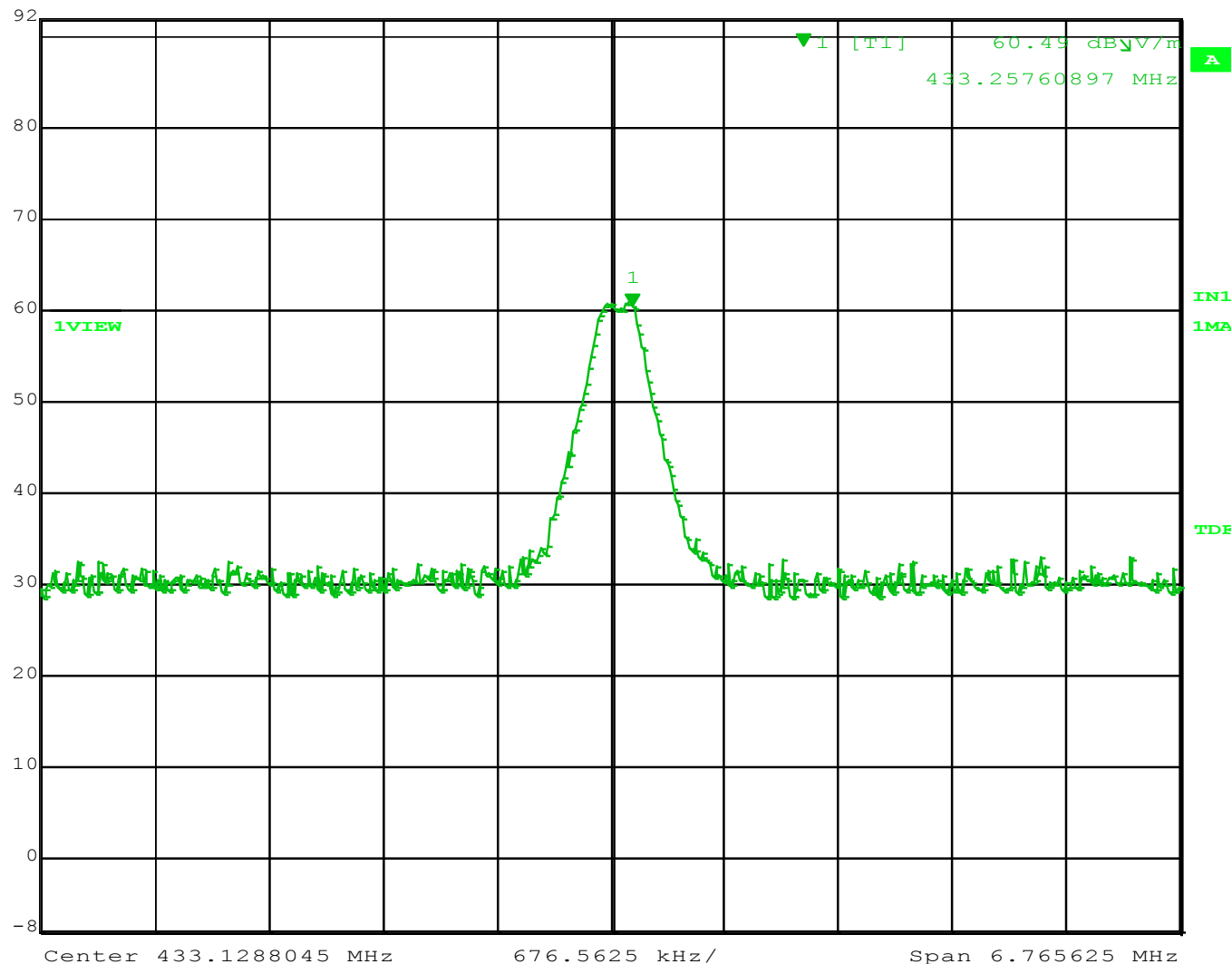
Figure 11 – Field Strength measurement with dipole antenna

Horizontal polarity Channel 0

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 60.49 dBV/m VBW 300 kHz
92 dB* 433.25760897 MHz SWT 5 ms Unit dBV/m



Date: 6.OCT.2015 19:47:29

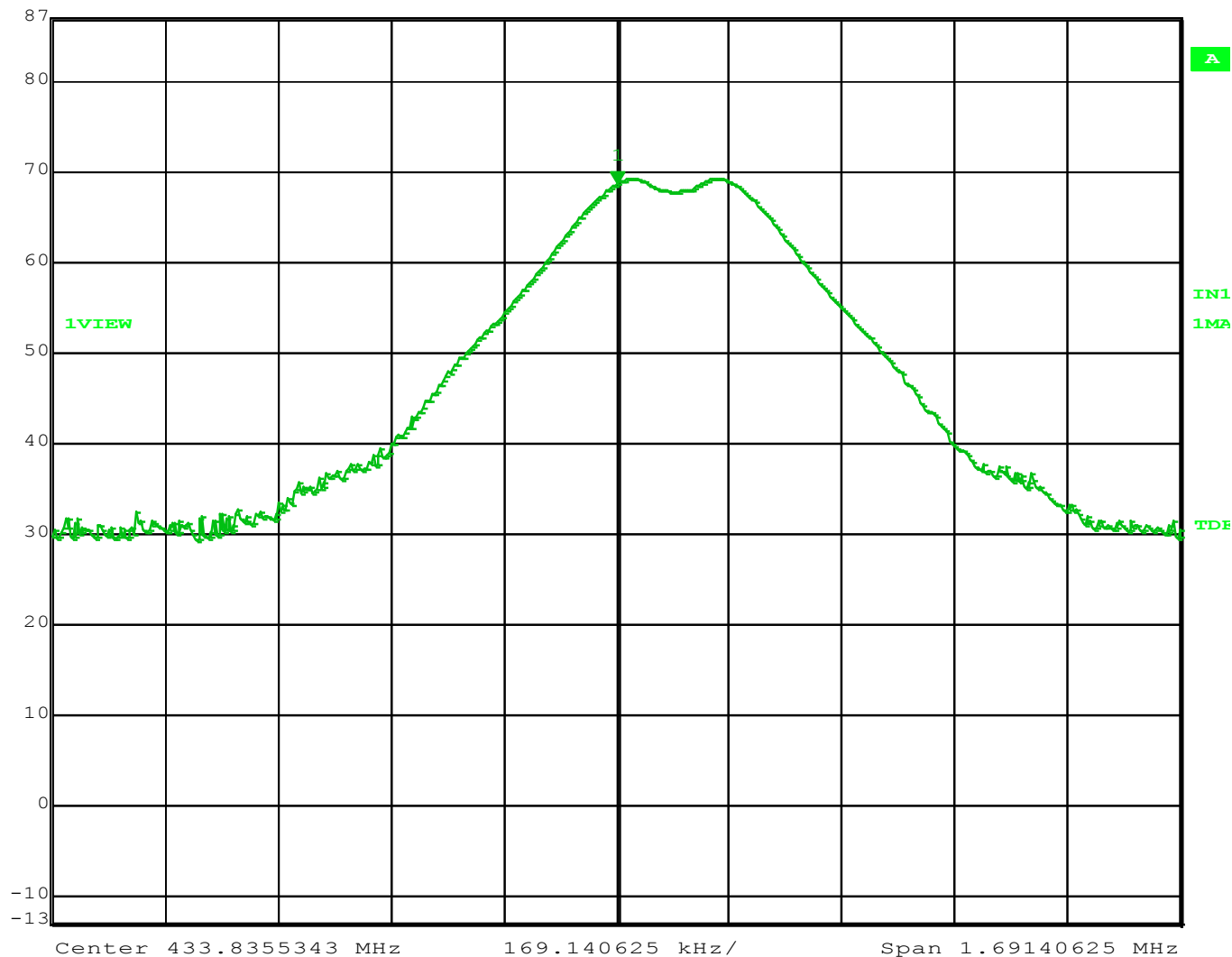
Figure 12 – Field Strength measurement with dipole antenna

Vertical polarity Channel 0

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Marker 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl 68.67 dB μ V/m VBW 300 kHz
87 dB* 433.83553435 MHz SWT 5 ms Unit dB μ V/m



Date: 6.OCT.2015 20:09:55

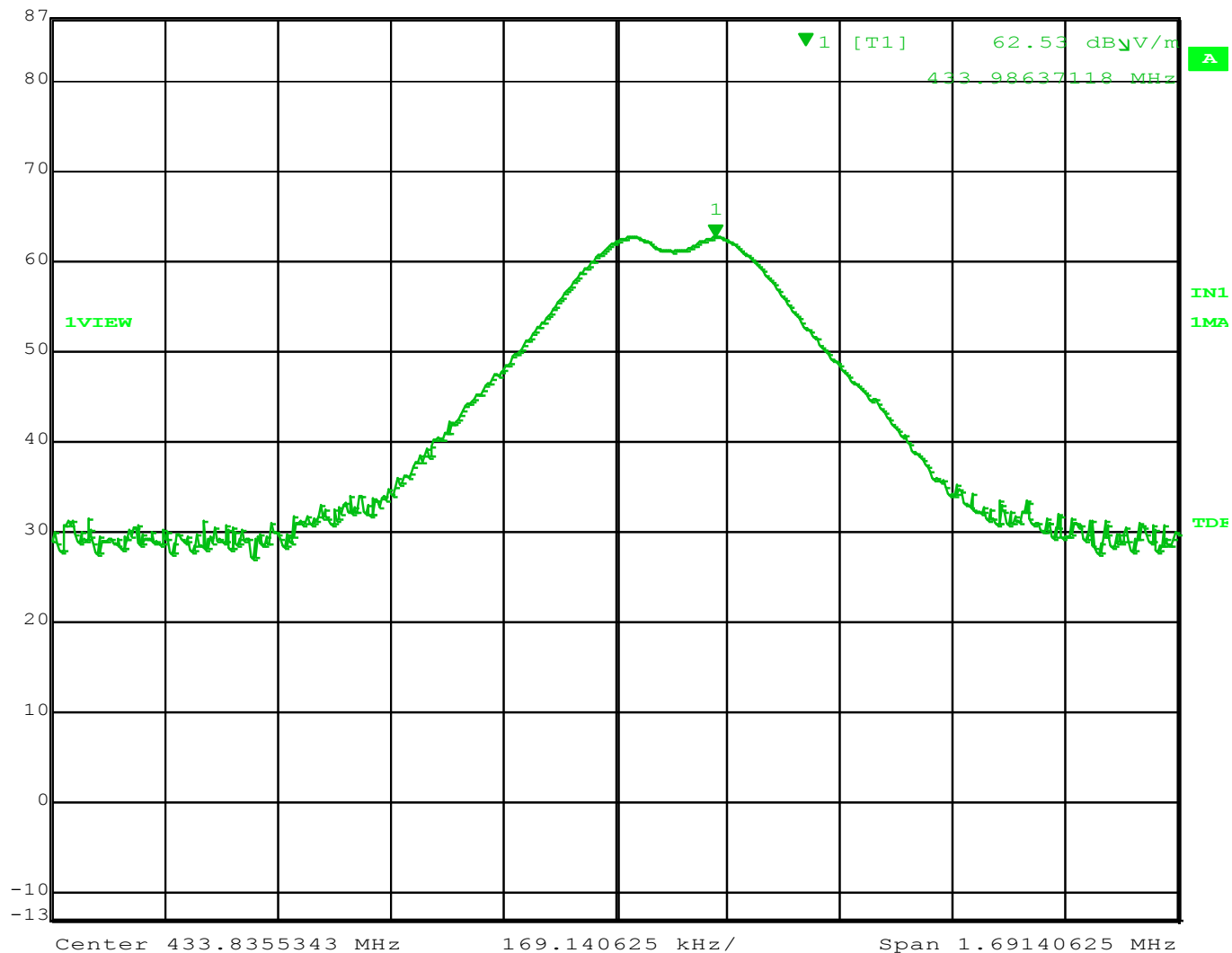
Figure 13 – Field Strength measurement with dipole antenna

Horizontal polarity Channel 7

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Marker 1 [T1] RBW 100 kHz RF Att 10 dB
 Ref Lvl 62.53 dByV/m VBW 300 kHz
 87 dB* 433.98637118 MHz SWT 5 ms Unit dByV/m



Date: 6.OCT.2015 20:18:36

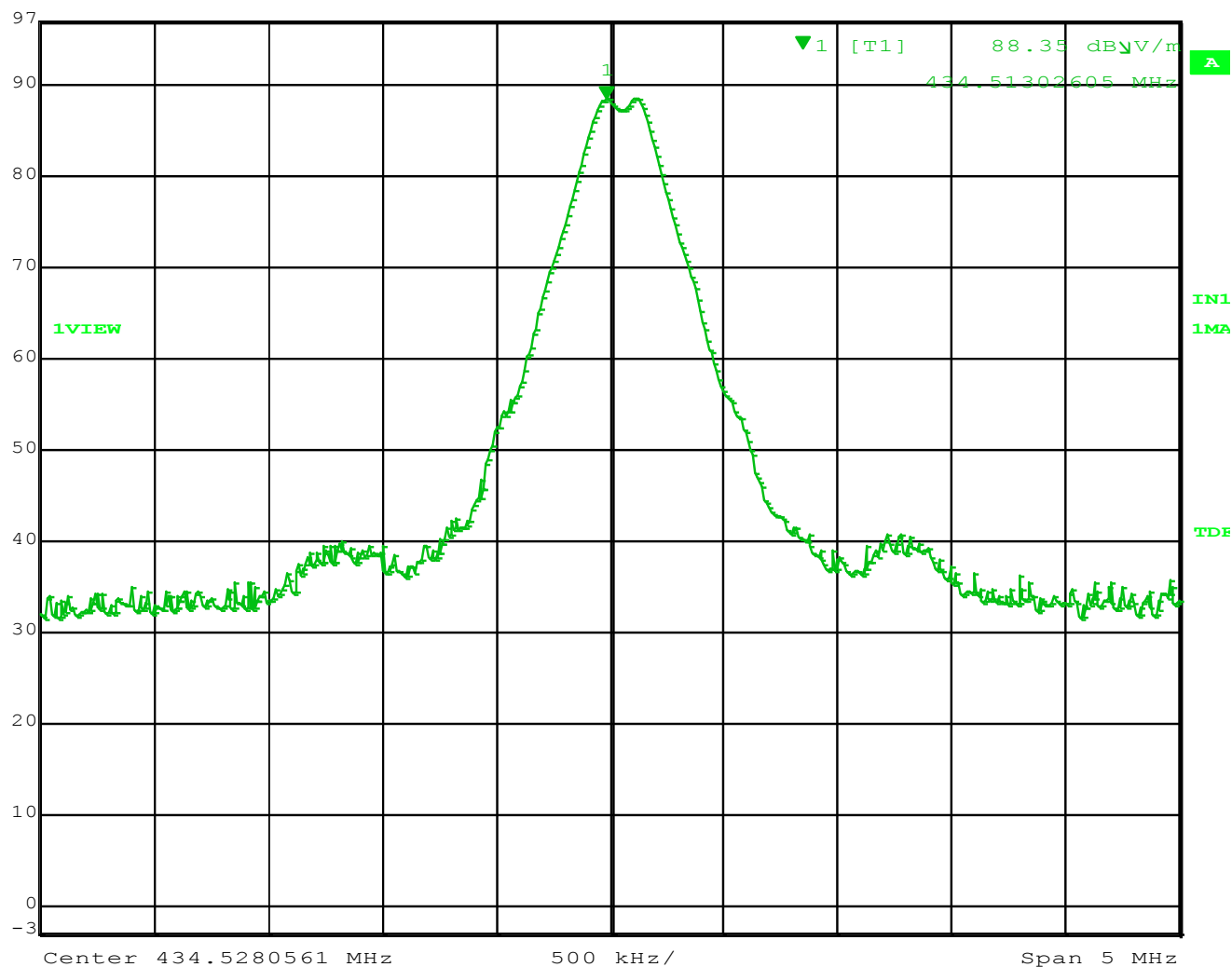
Figure 14 – Field Strength measurement with dipole antenna

Vertical polarity Channel 7

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 88.35 dBV/m VBW 300 kHz
97 dB* 434.51302605 MHz SWT 5 ms Unit dBV/m



Date: 27.OCT.2015 16:51:54

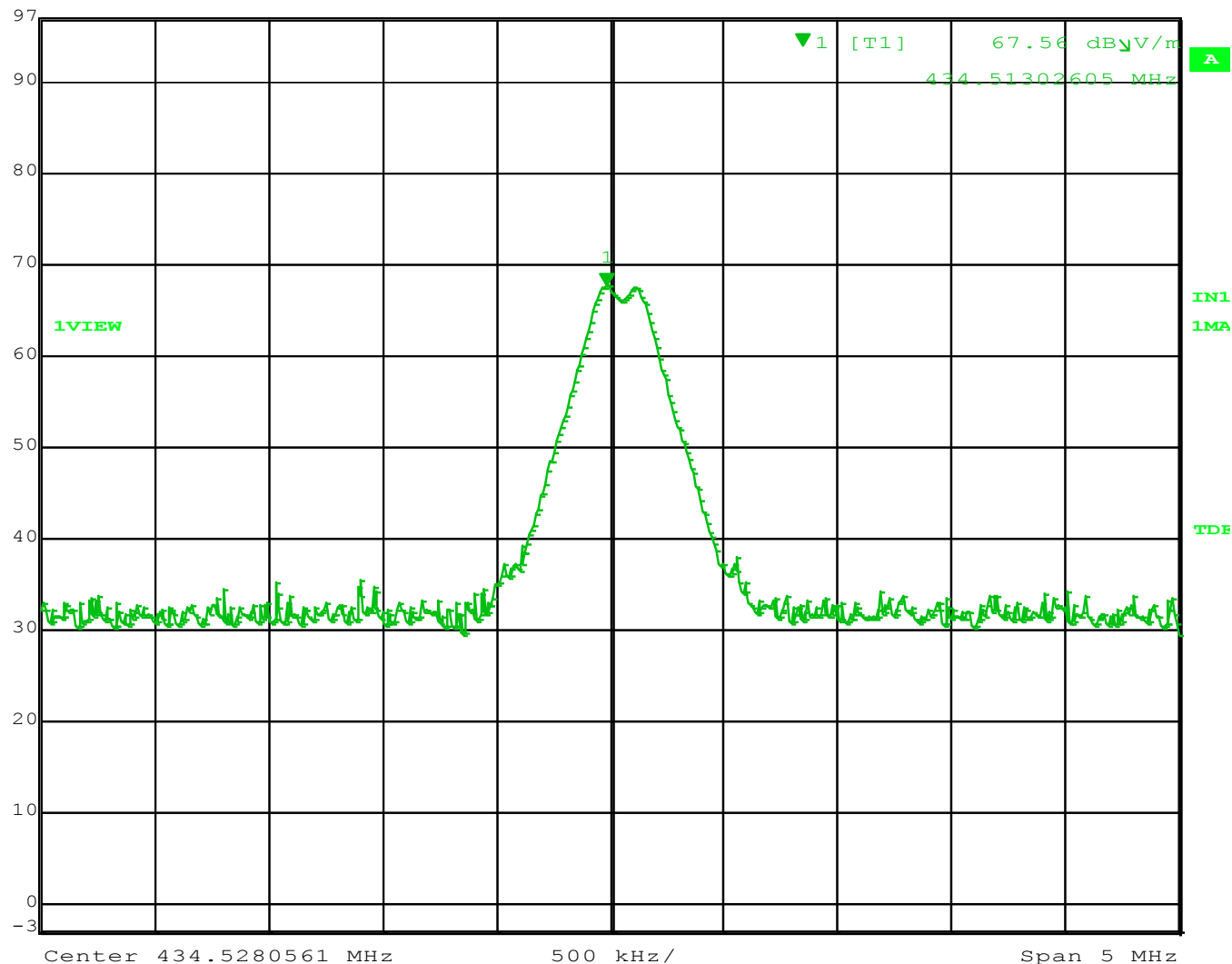
Figure 15 – Field Strength measurement with dipole antenna

Horizontal polarity Channel 13

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 67.56 dByV/m VBW 300 kHz
97 dB* 434.51302605 MHz SWT 5 ms Unit dByV/m



Date: 27.OCT.2015 16:51:22

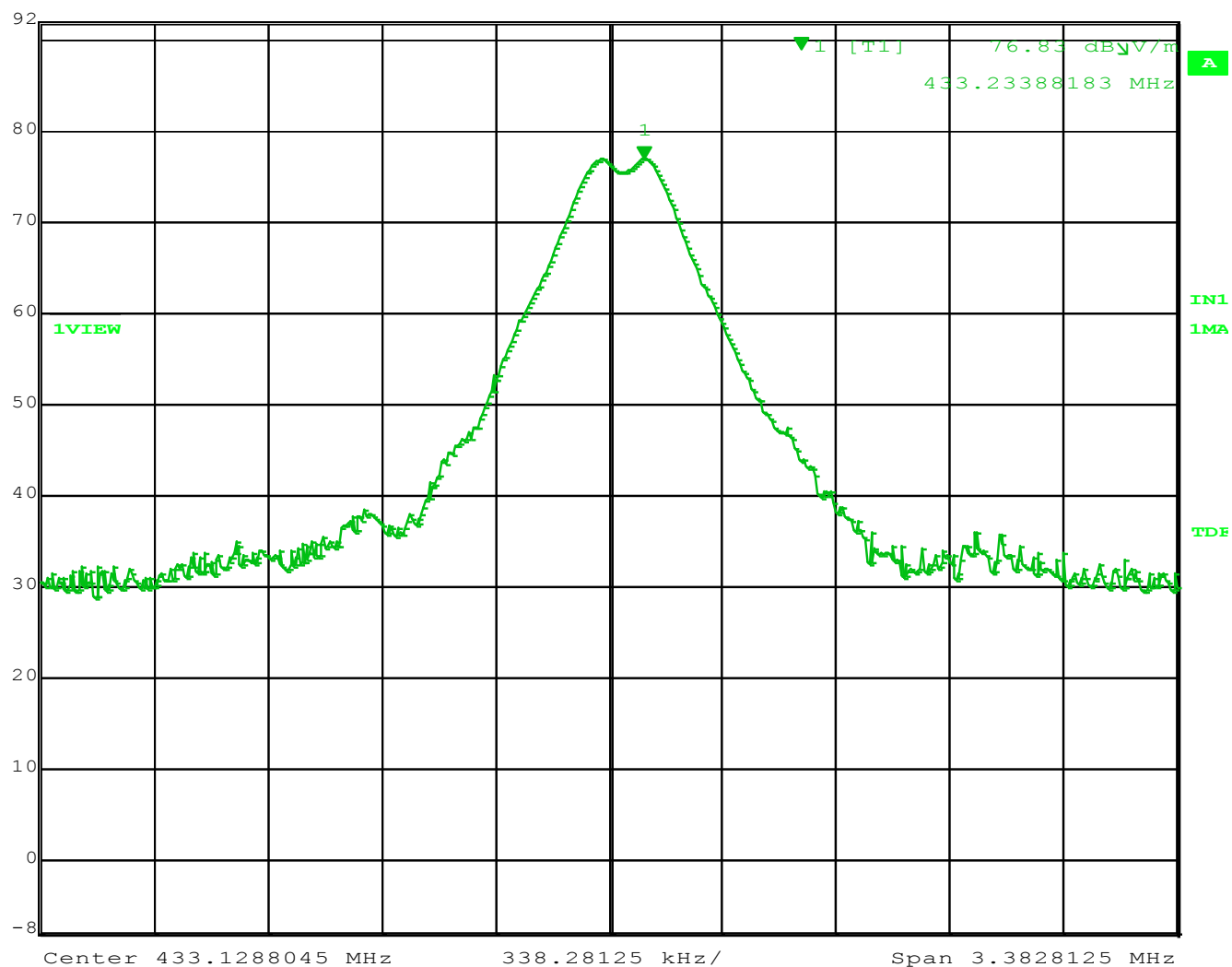
Figure 16 – Field Strength measurement with dipole antenna

Vertical polarity Channel 13

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 76.83 dBV/m VBW 300 kHz
92 dB* 433.23388183 MHz SWT 5 ms Unit dBV/m



Date: 6.OCT.2015 20:02:25

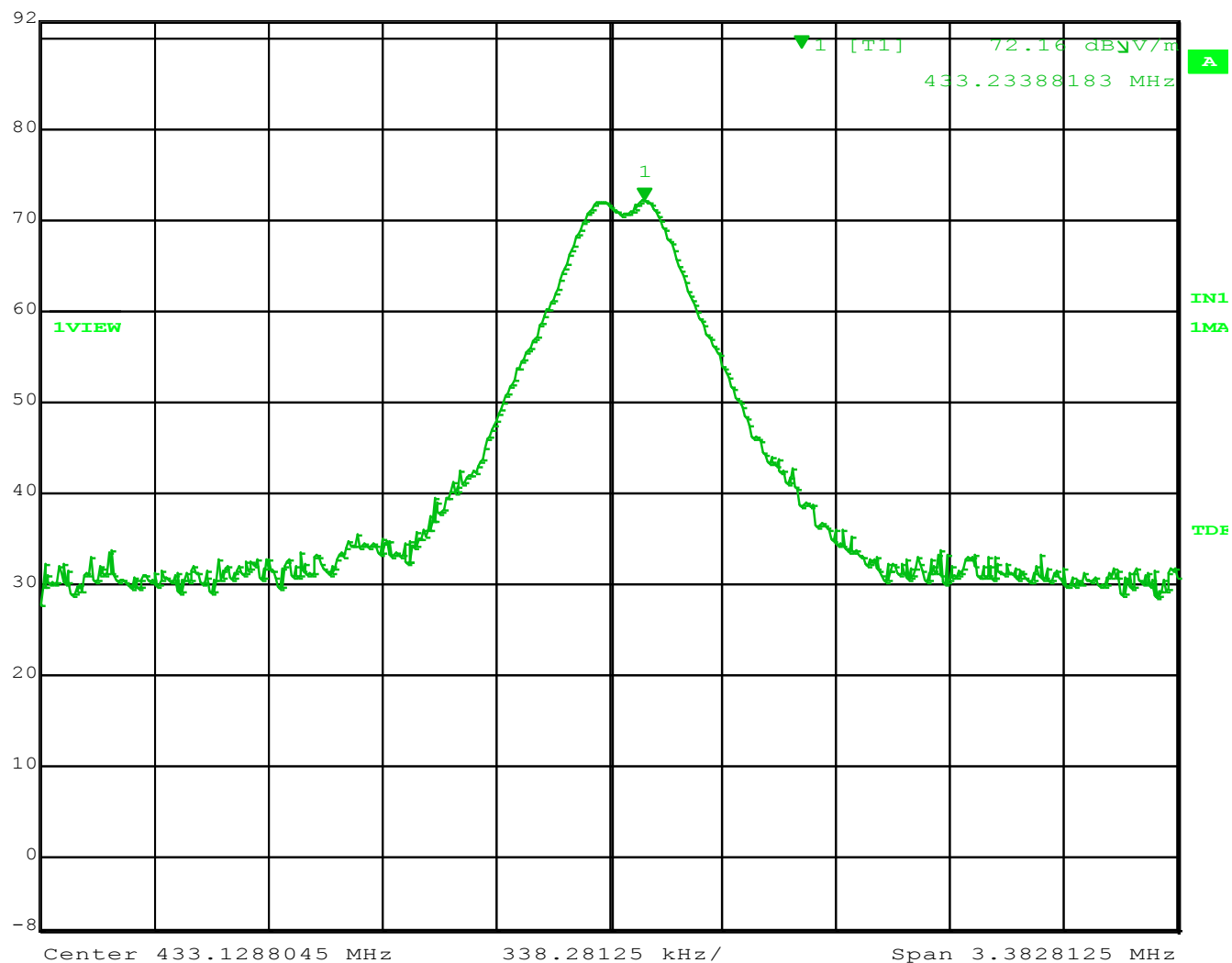
Figure 17 – Field Strength measurement with monopole antenna

Horizontal polarity Channel 0

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
 Ref Lvl 72.16 dBV/m VBW 300 kHz
 92 dB* 433.23388183 MHz SWT 5 ms Unit dBV/m



Date: 6.OCT.2015 20:02:03

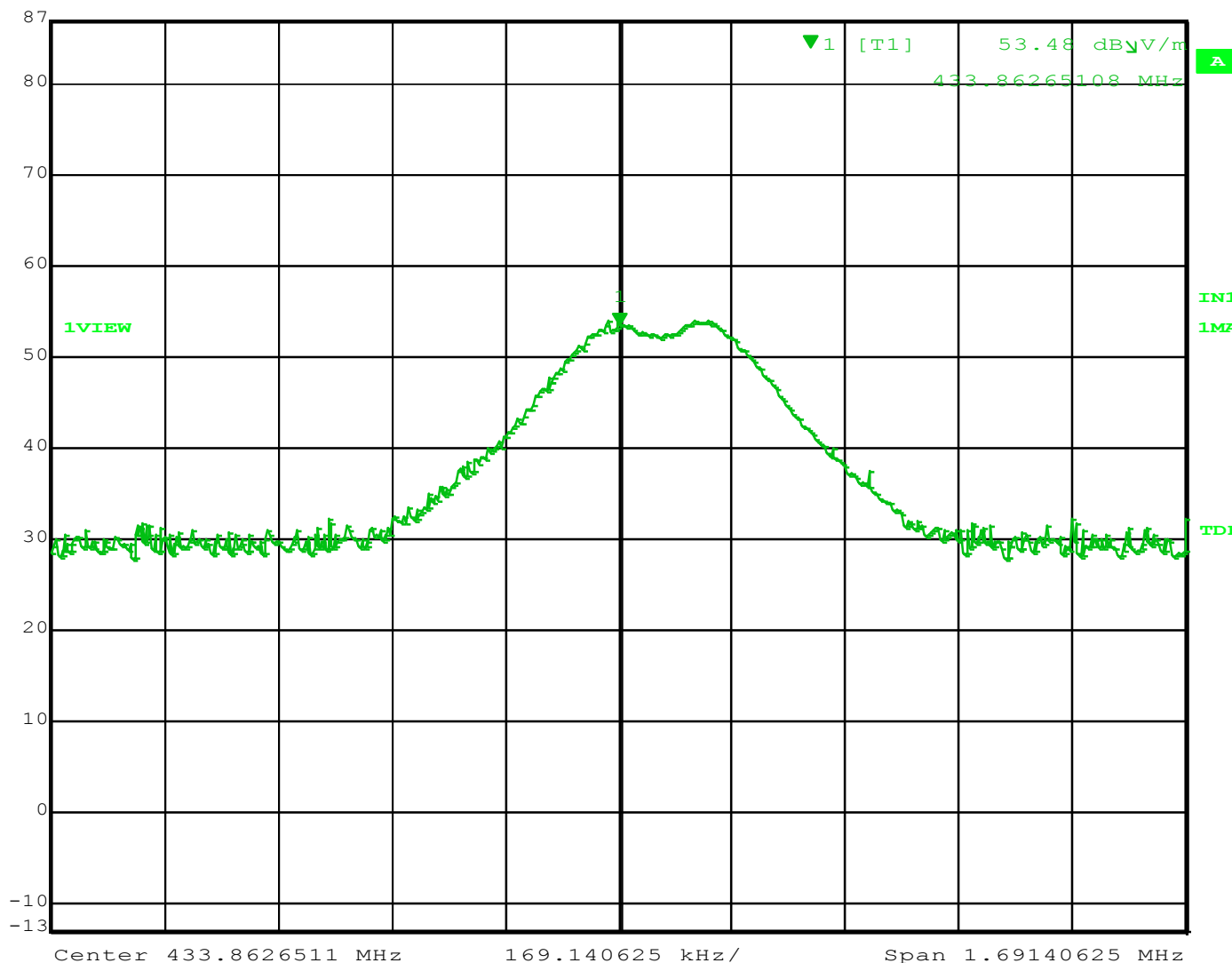
Figure 18 – Field Strength measurement with monopole antenna

Vertical polarity Channel 0

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Marker 1 [T1] RBW 100 kHz RF Att 10 dB
 Ref Lvl 53.48 dB μ V/m VBW 300 kHz
 87 dB* 433.86265108 MHz SWT 5 ms Unit dB μ V/m



Date: 6.OCT.2015 20:50:47

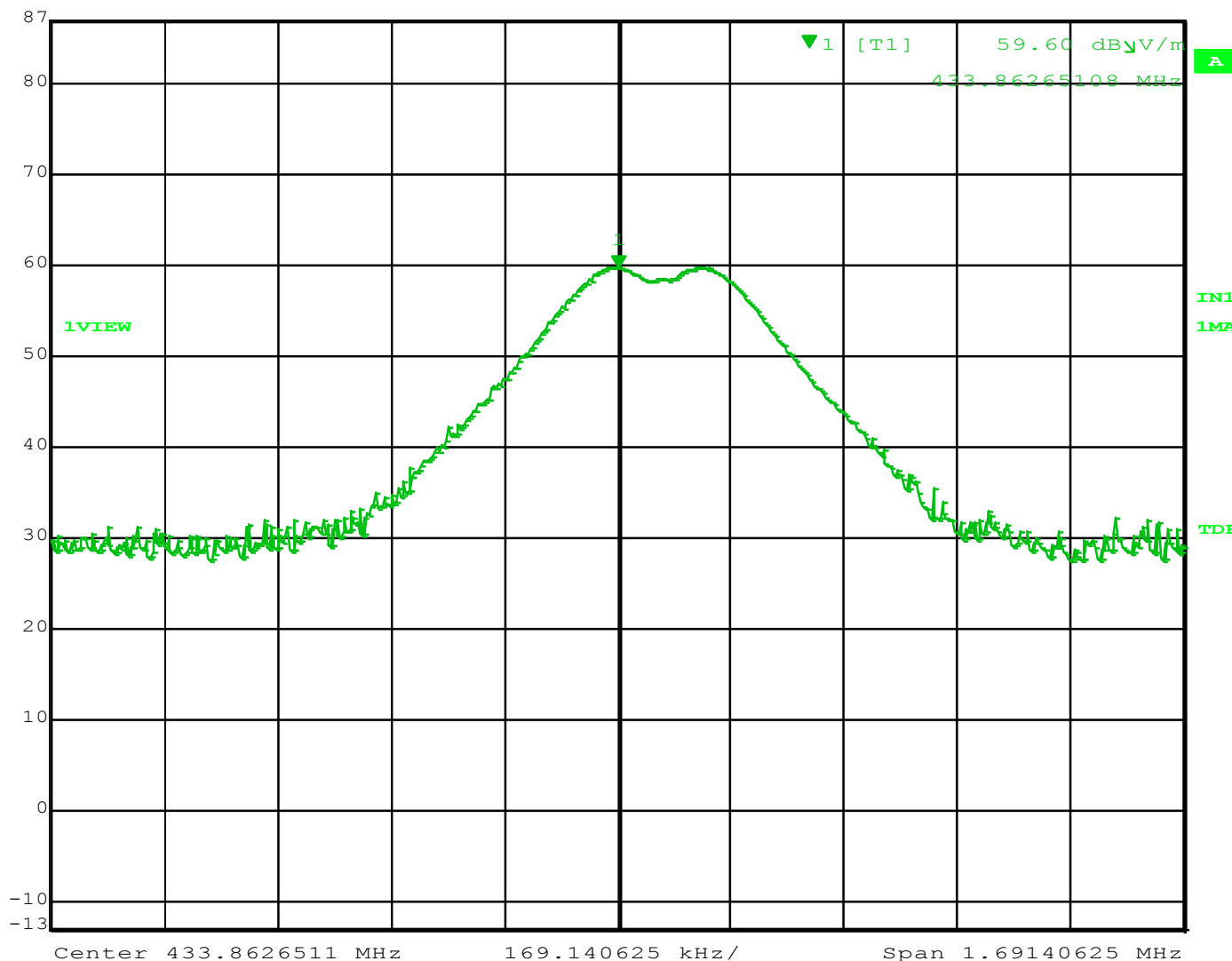
Figure 19 – Field Strength measurement with monopole antenna

Horizontal polarity Channel 7

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl 59.60 dBμV/m VBW 300 kHz
87 dB* 433.86265108 MHz SWT 5 ms Unit dBμV/m



Date: 6.OCT.2015 20:51:14

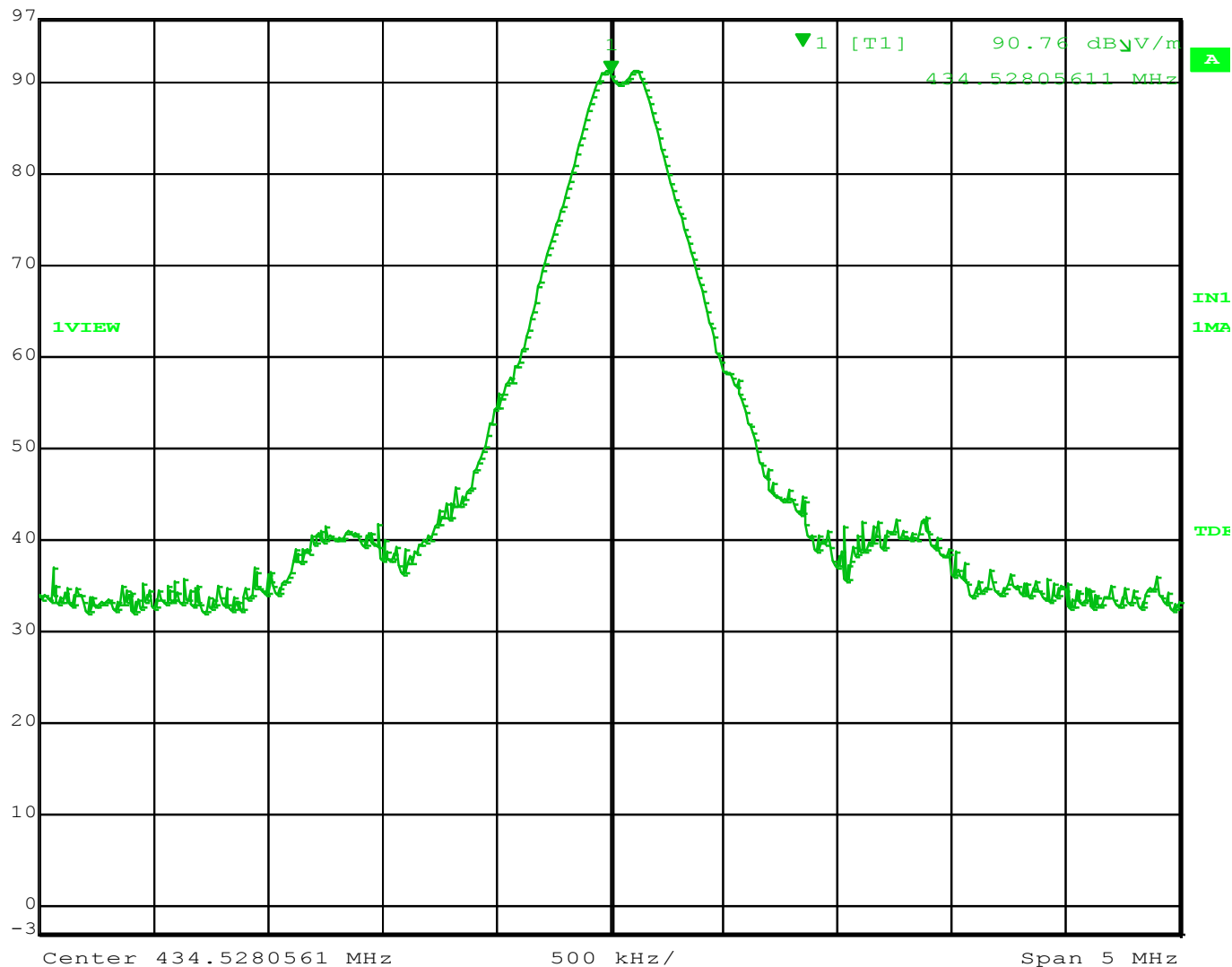
Figure 20 – Field Strength measurement with monopole antenna

Vertical polarity Channel 7

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Ref Lvl	Marker 1 [T1]	RBW	100 kHz	RF Att	0 dB
97 dB*	90.76 dBV/m	VBW	300 kHz		
	434.52805611 MHz	SWT	5 ms	Unit	dBV/m



Date: 27.OCT.2015 16:49:02

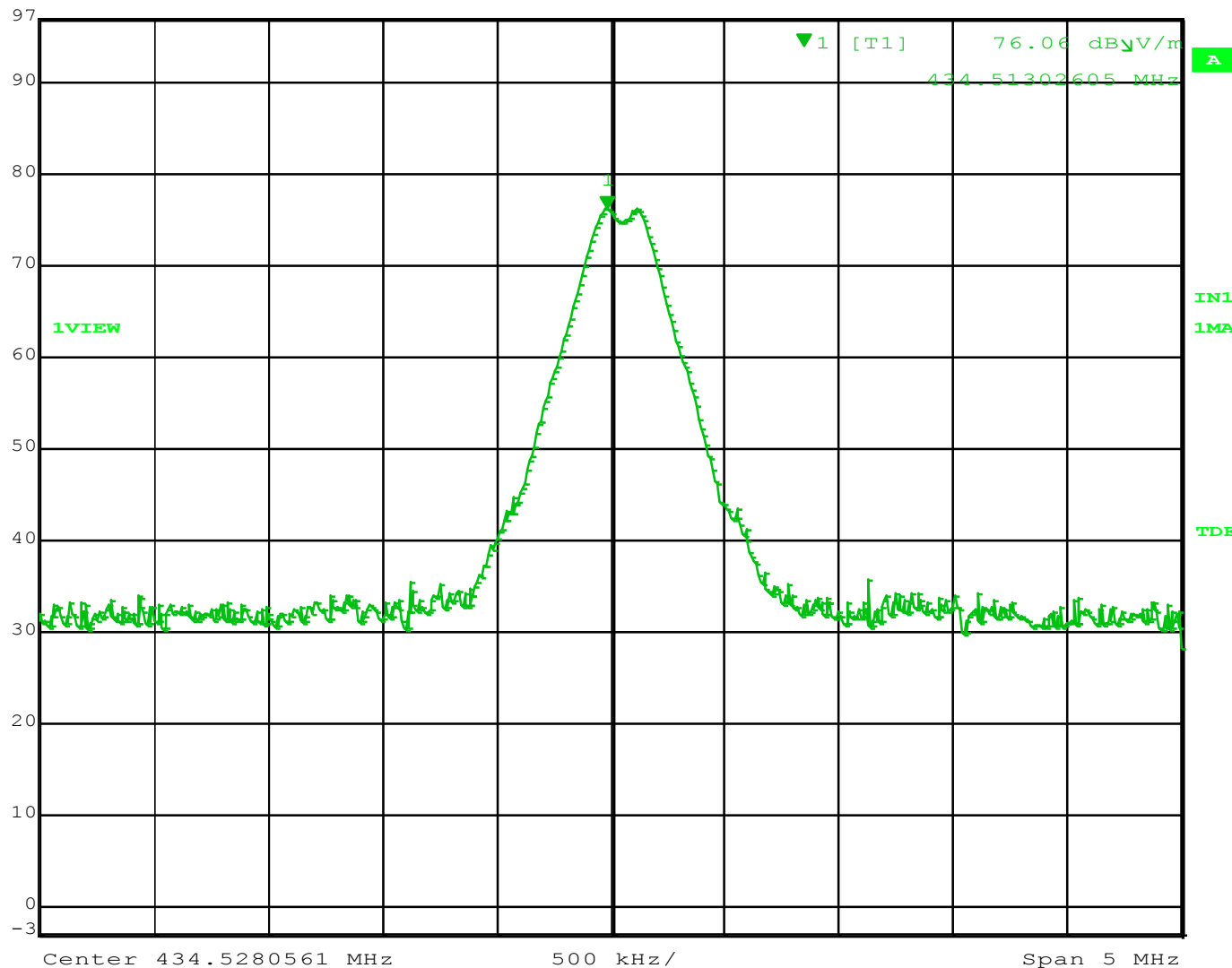
Figure 21 – Field Strength measurement with monopole antenna

Horizontal polarity Channel 13

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 76.06 dBV/m VBW 300 kHz
97 dB* 434.51302605 MHz SWT 5 ms Unit dBV/m



Date: 27.OCT.2015 16:49:37

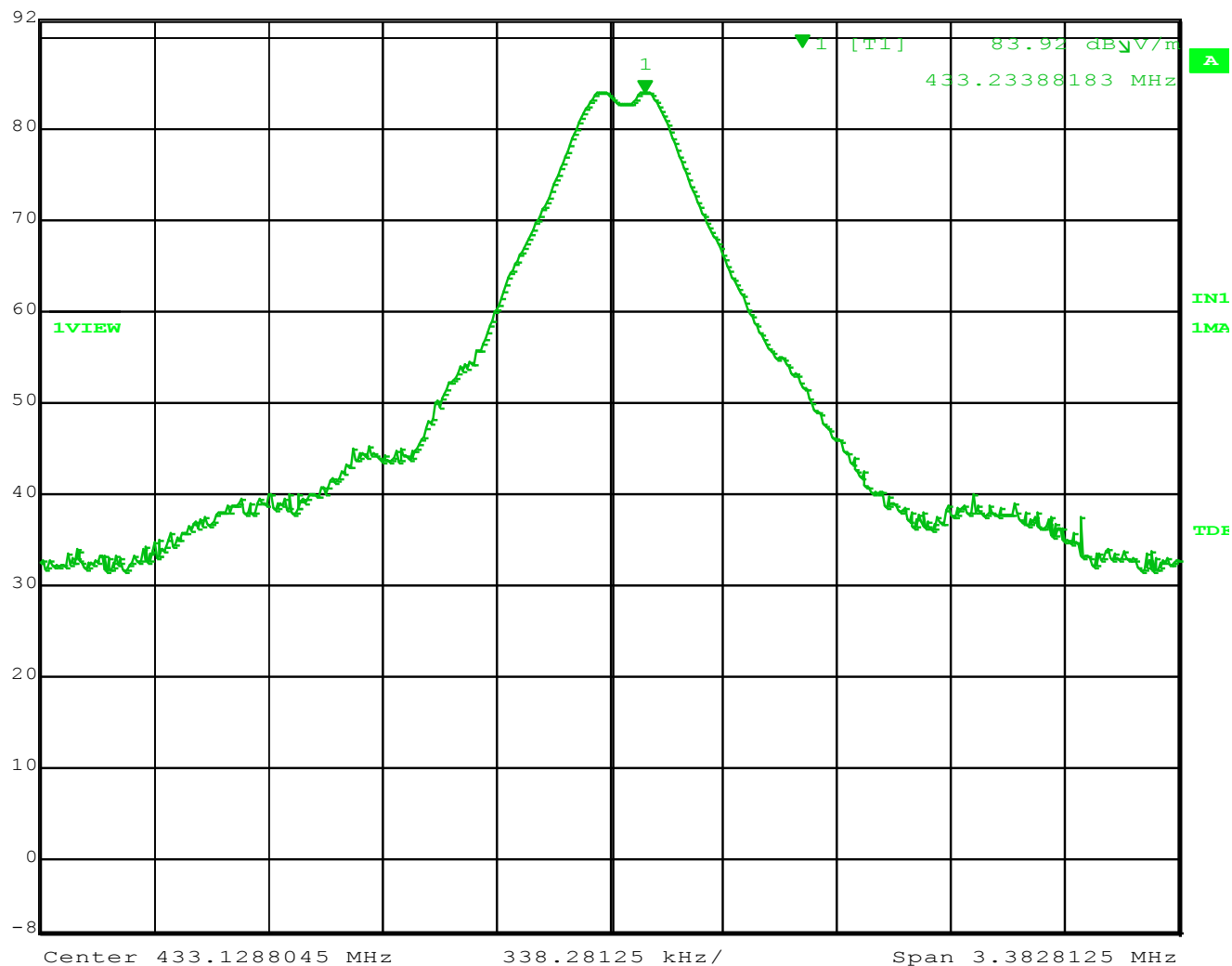
Figure 22 – Field Strength measurement with monopole antenna

Vertical polarity Channel 13

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 83.92 dBµV/m VBW 300 kHz
92 dB* 433.23388183 MHz SWT 5 ms Unit dBµV/m



Date: 6.OCT.2015 19:57:19

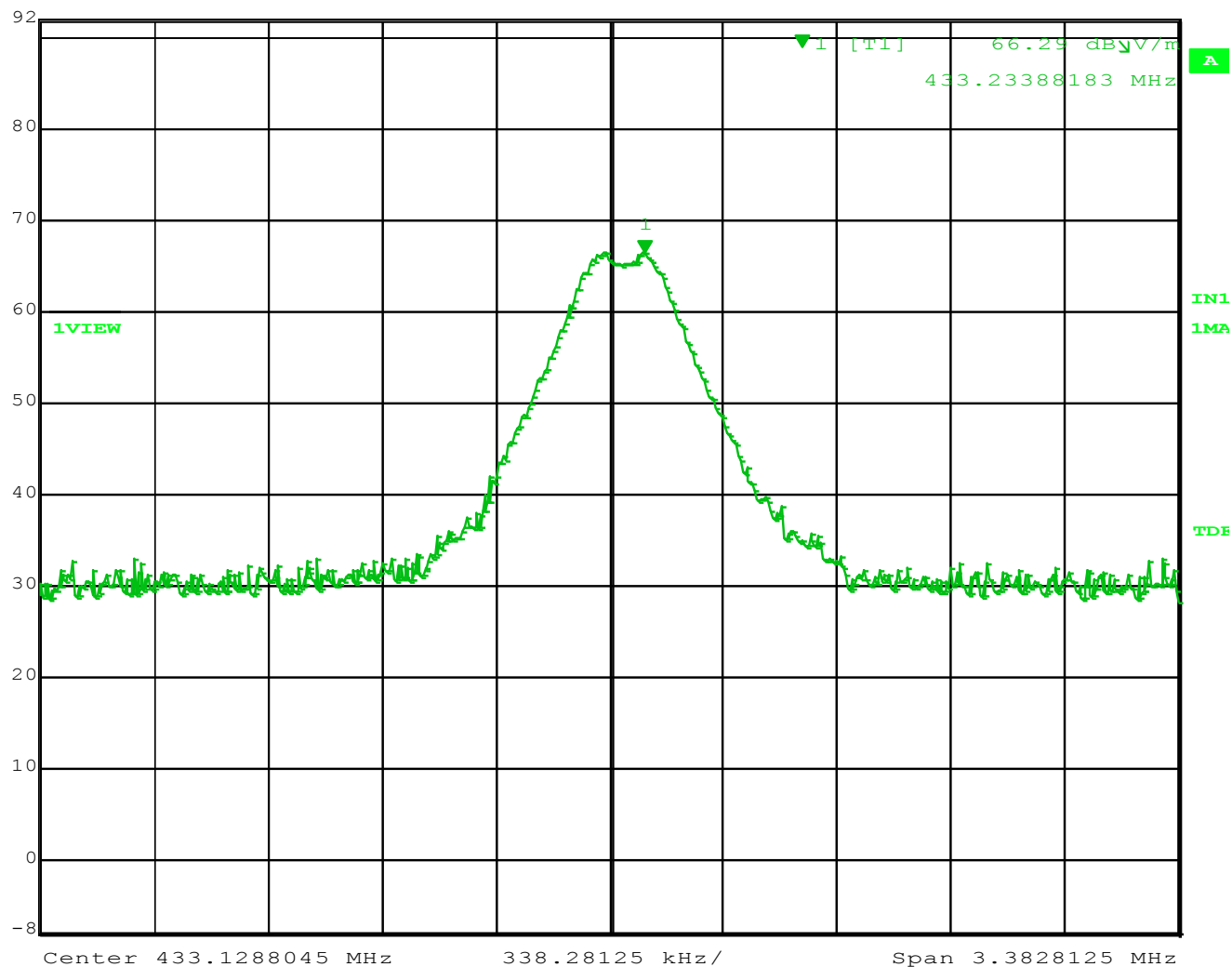
Figure 23 – Field Strength measurement with Yagi antenna

Horizontal polarity Channel 0

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 66.29 dBV/m VBW 300 kHz
92 dB* 433.23388183 MHz SWT 5 ms Unit dBV/m



Date: 6.OCT.2015 19:58:01

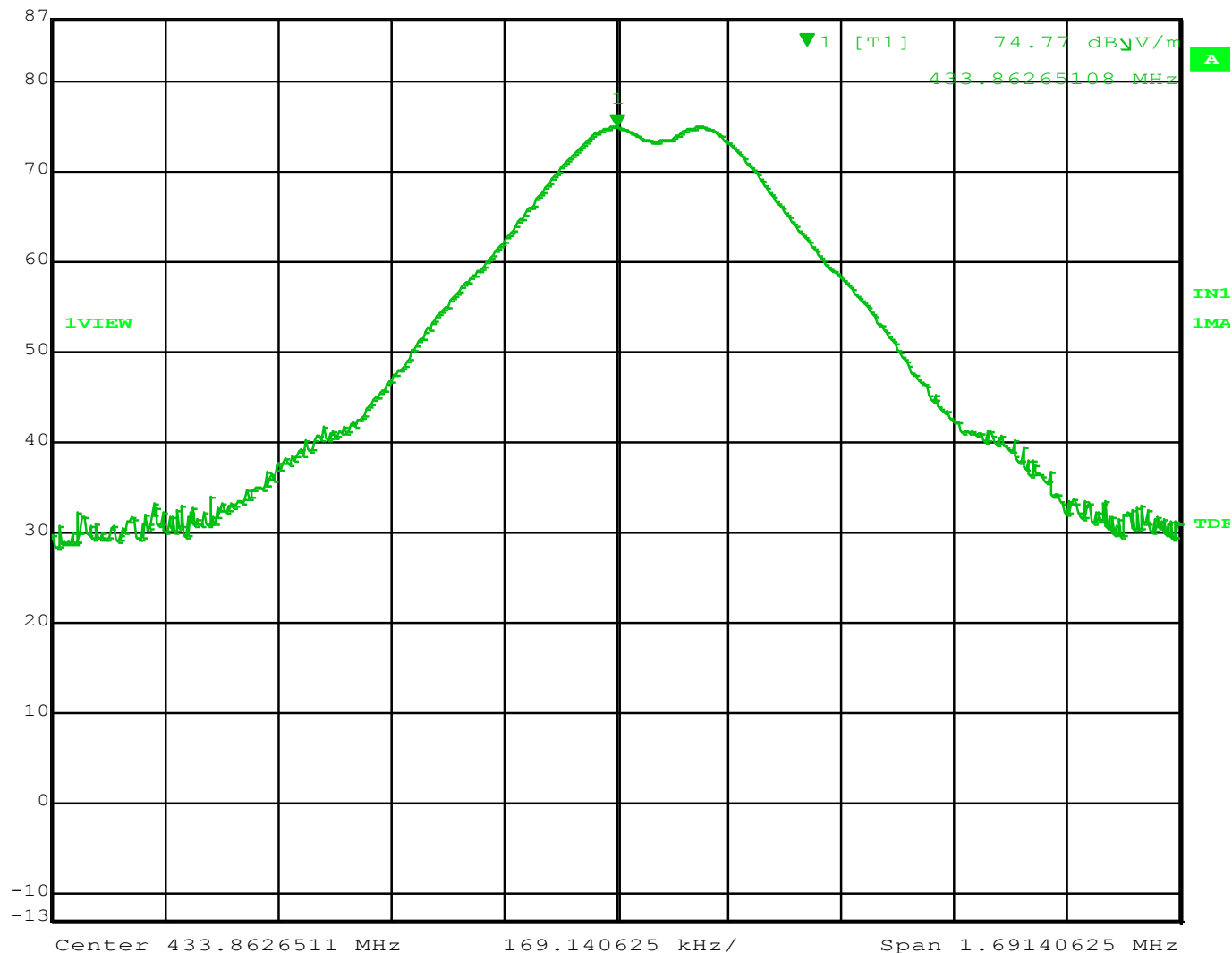
Figure 24 – Field Strength measurement with Yagi antenna

Vertical polarity Channel 0

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 10 dB
74.77 dB μ V/m VBW 300 kHz
87 dB* 433.86265108 MHz SWT 5 ms Unit dB μ V/m



Date: 6.OCT.2015 20:52:28

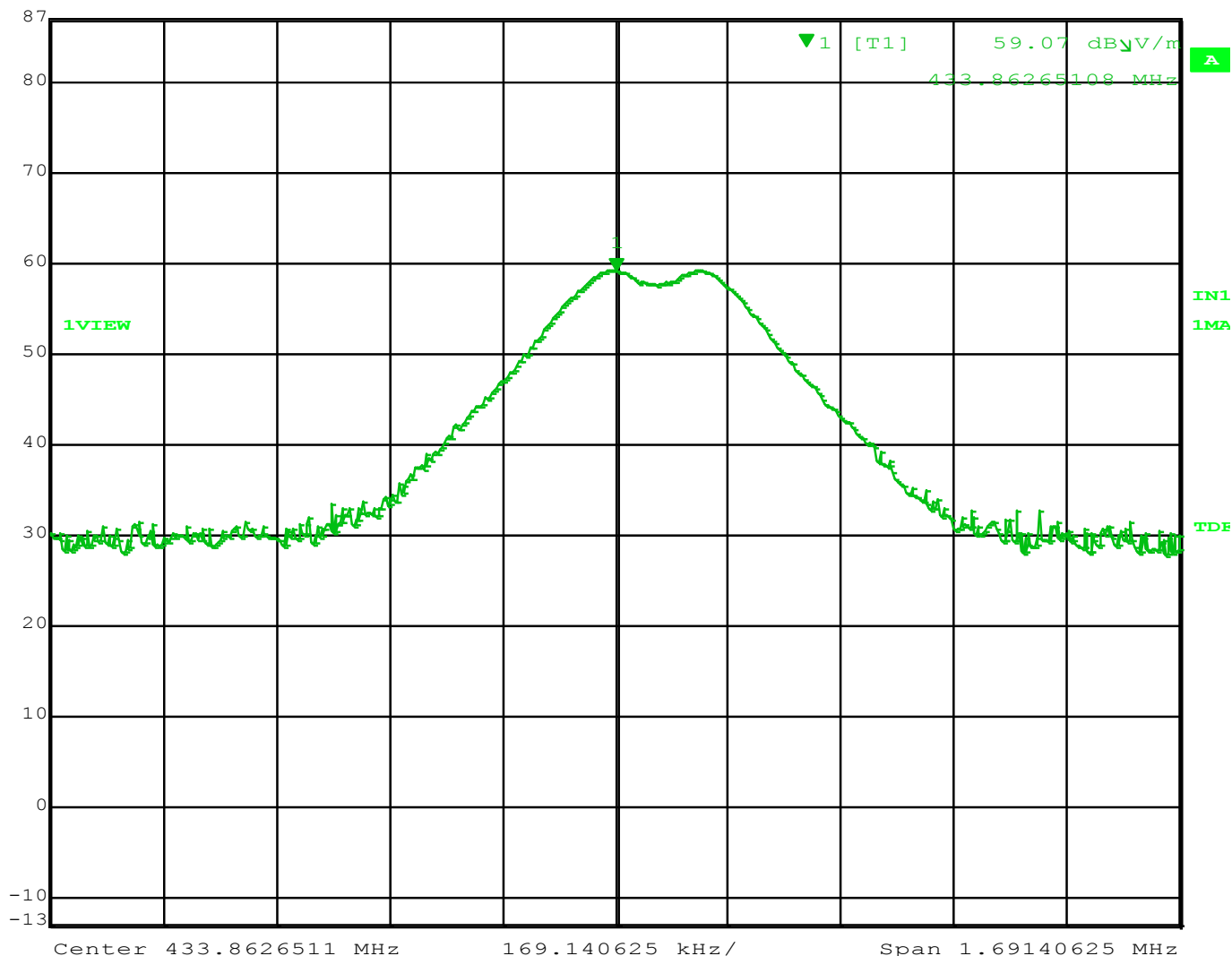
Figure 25 – Field Strength measurement with Yagi antenna

Horizontal polarity Channel 7

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl 59.07 dB μ V/m VBW 300 kHz
87 dB* 433.86265108 MHz SWT 5 ms Unit dB μ V/m



Date: 6.OCT.2015 20:52:05

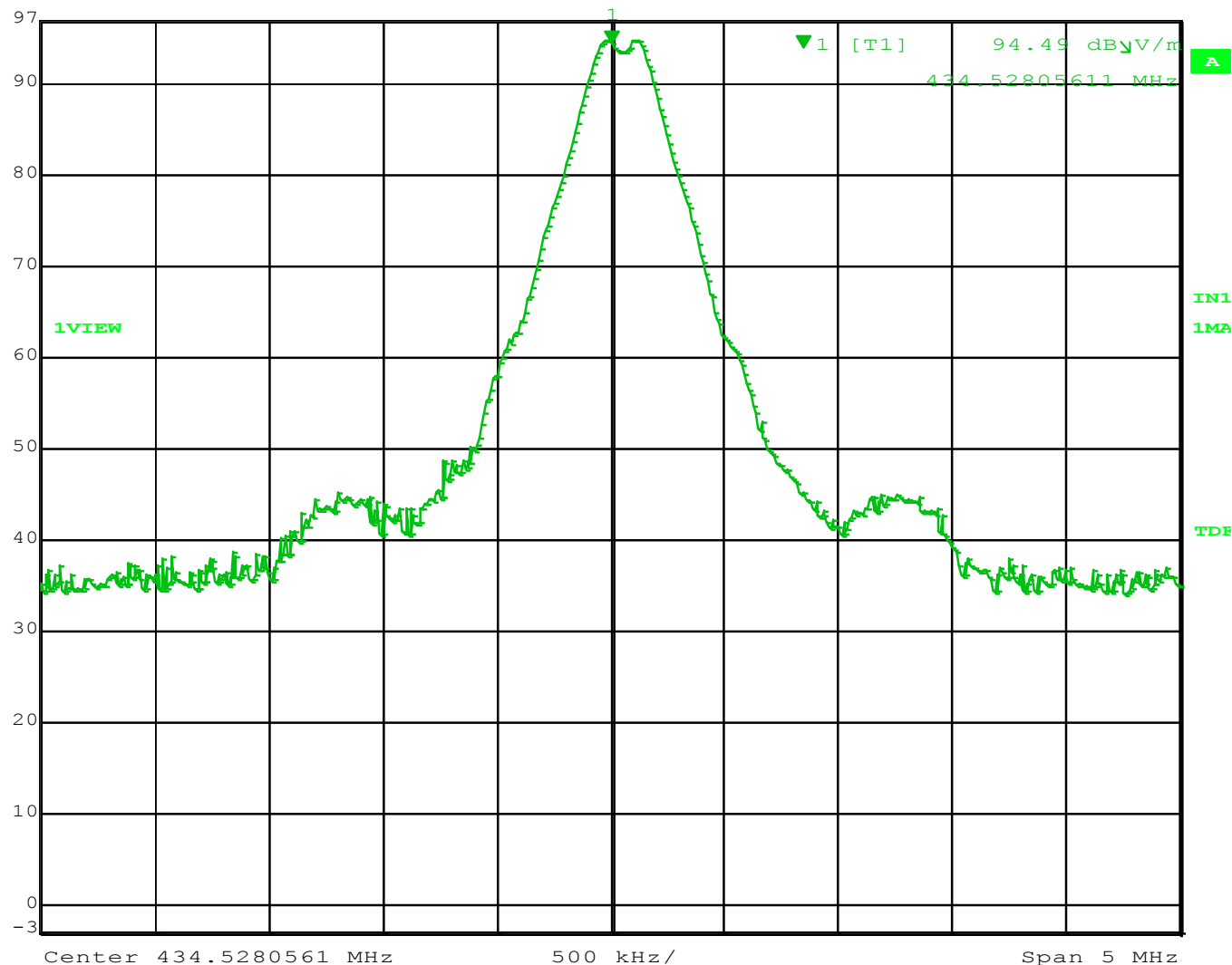
Figure 26 – Field Strength measurement with Yagi antenna

Vertical polarity Channel 7

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Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 94.49 dBV/m VBW 300 kHz
97 dB* 434.52805611 MHz SWT 5 ms Unit dBV/m



Date: 27.OCT.2015 16:46:52

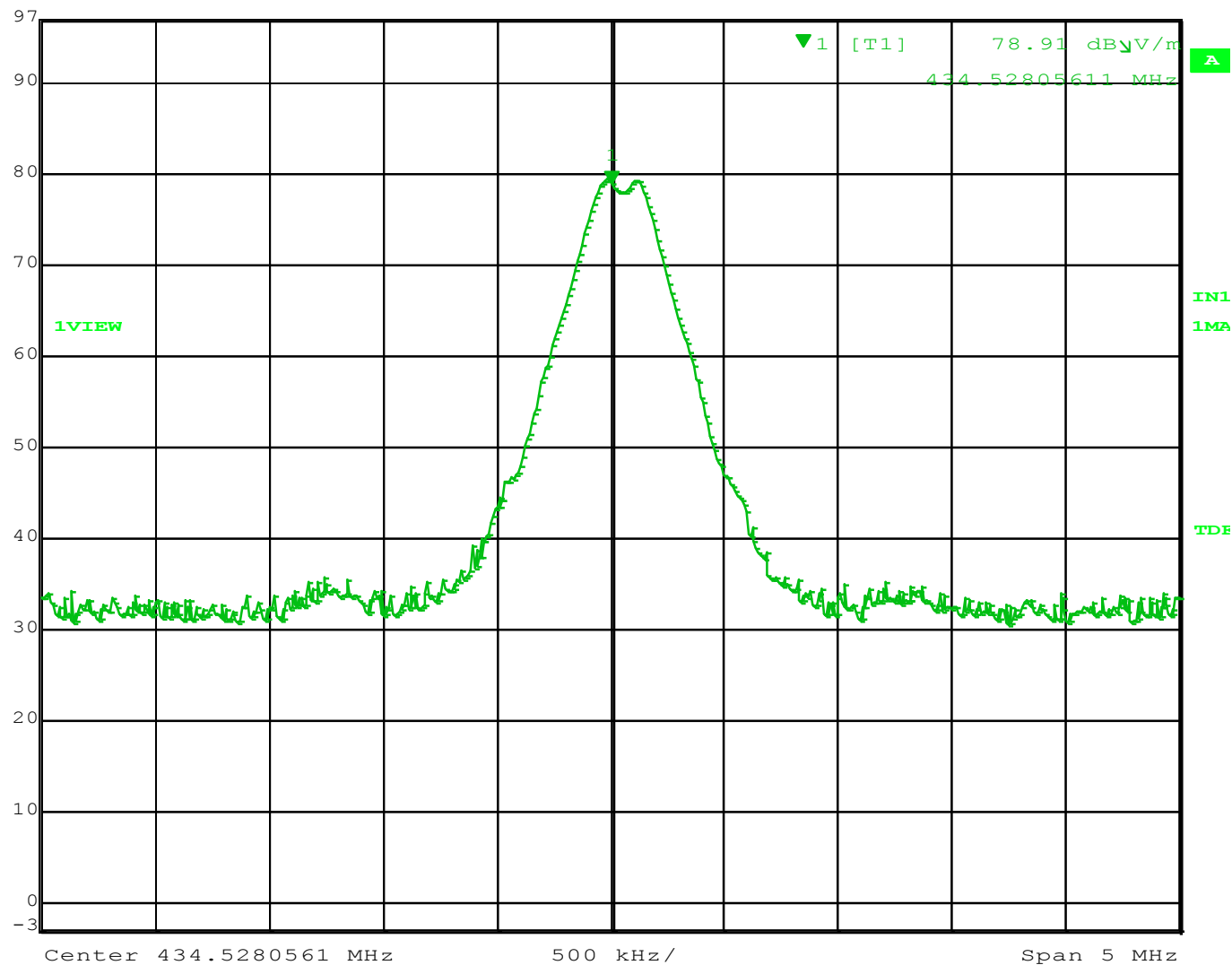
Figure 27 – Field Strength measurement with Yagi antenna

Horizontal polarity Channel 13

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Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 78.91 dBV/m VBW 300 kHz
97 dB* 434.52805611 MHz SWT 5 ms Unit dBV/m

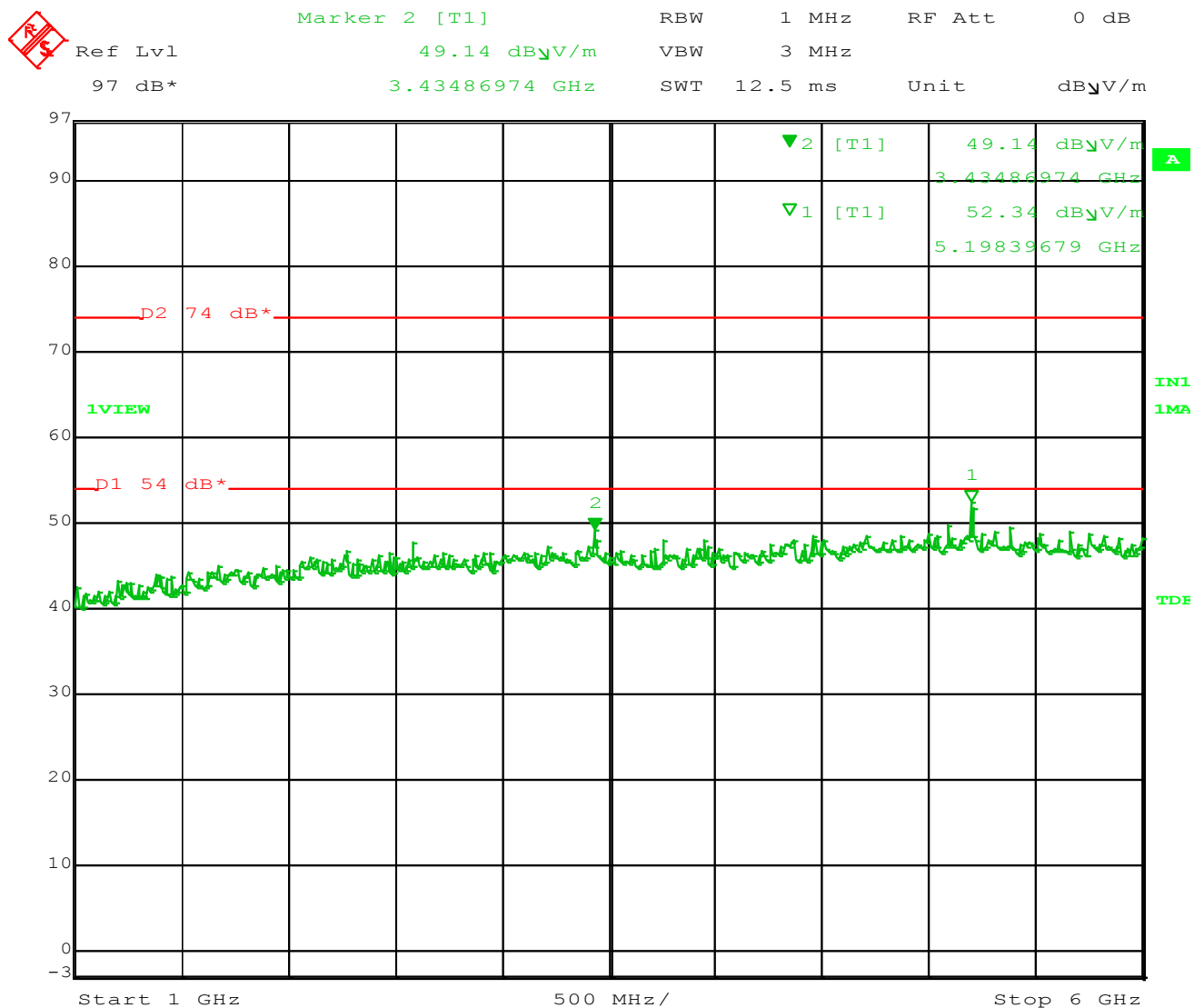


Date: 27.OCT.2015 16:47:43

Figure 28 – Field Strength measurement with Yagi antenna

Vertical polarity Channel 13

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



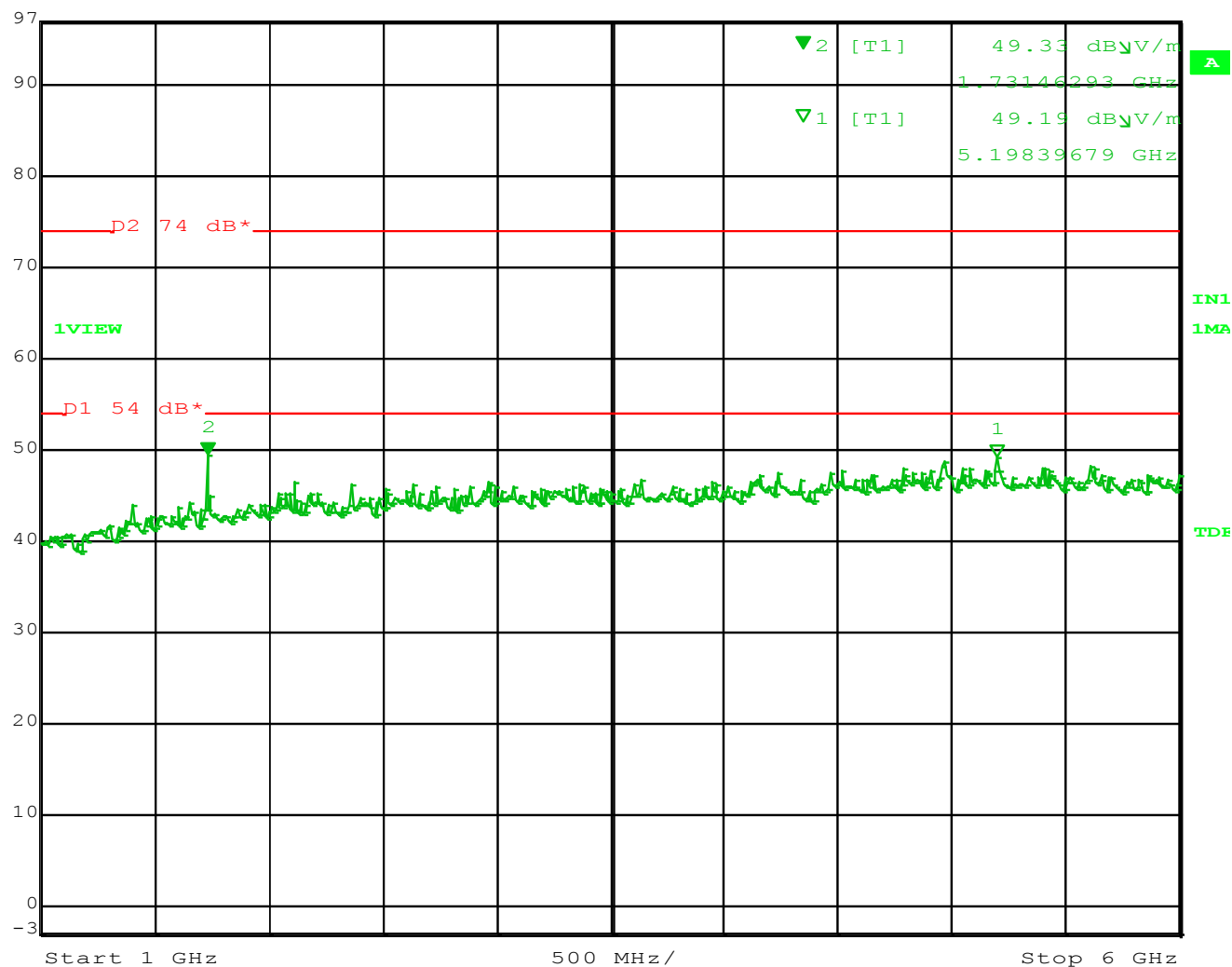
Date: 16.OCT.2015 11:32:52

Figure 29 – Spurious Emissions (Horizontal) 1 to 6 GHz Channel 0

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 2 [T1] RBW 1 MHz RF Att 0 dB
Ref Lvl 49.33 dBV/m VBW 3 MHz
97 dB* 1.73146293 GHz SWT 12.5 ms Unit dBV/m



Date: 16.OCT.2015 11:33:31

Figure 30 – Spurious Emissions (Vertical) 1 to 6 GHz Channel 0

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.

Frequency (GHz)	Antenna Polarity (H-V)	Antenna Height (M)	Peak (dBuV/m)	AVG (dBuV/m)	AVG Limit (dBuV/m)	Result
3.434	H	1.5	52.34	19.9	54	Complies
5.198	H	1.5	49.14	47.5	54	Complies
1.731	V	1.5	49.33	45.6	54	Complies
5.198	V	1.5	49.19	48.9	54	Complies

Figure 31 – Spurious Measurements 1000 - 6000 MHz

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.

4.3 Bandwidth

This test measures the Bandwidth of the fundamental emission.

4.3.1 Test Over View

Results	Complies (as tested per this report)					Date	10/23/2015	
Standard	FCC Part 15.231 and RSS - 210 Issue 8							
Product Model	RM433V2				Serial#	TS-1		
Configuration	Tested in 10m Semi-Anechoic Chamber							
Test Set-up	EUT placed on table							
EUT Powered By	3 VDC	Temp	21° C	Humidity	48%	Pressure	1021mbar	
Perf. Criteria	Part 15.231 (Below Limit)		Perf. Verification		Readings under Limit			
Mod to EUT	None		Test Performed By		Randall Masline			

4.3.2 Test Procedure

Bandwidth measurements were made according to FCC part 15.31 and FCC part 15.231(c). For Industry Canada the bandwidth measurements were made in accordance with RSS – 210 Issue 8

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

The Fundamental Frequency is 433 MHz therefore 0.25% of 433 MHz is 1082.5 Mhz

4.3.3 Deviations

There were no deviations from the test methodology.

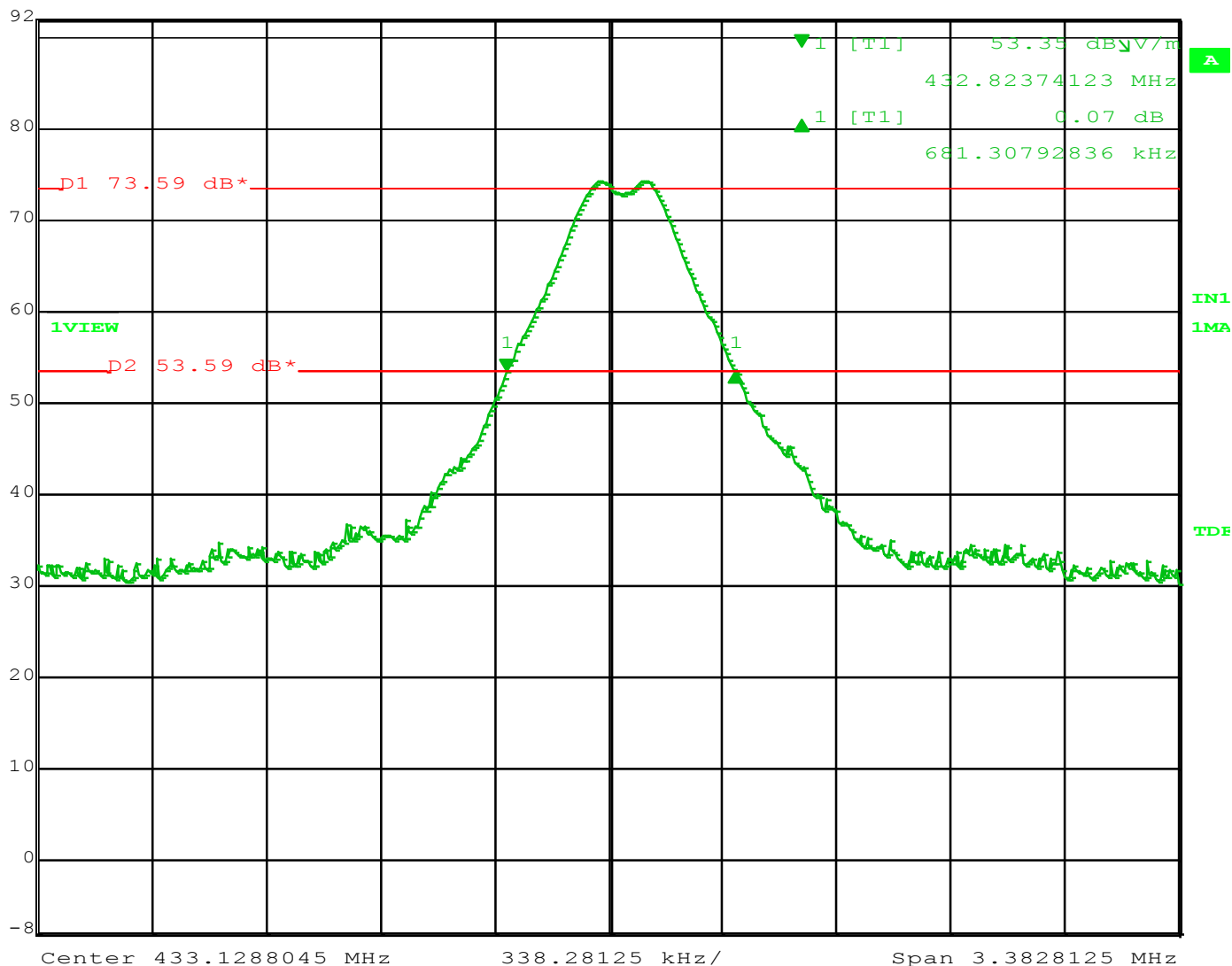
4.3.4 Final Test

All final measurements were within (in compliance) the limits.

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



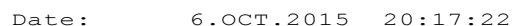
Delta 1 [T1] RBW 100 kHz RF Att 0 dB
 Ref Lvl 0.07 dB VBW 300 kHz
 92 dB* 681.30792836 kHz SWT 5 ms Unit dBV/m



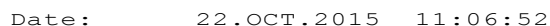
Date: 6.OCT.2015 19:49:12

Figure 32 – 20 dB Bandwidth of channel 0 is 681.30 kHz

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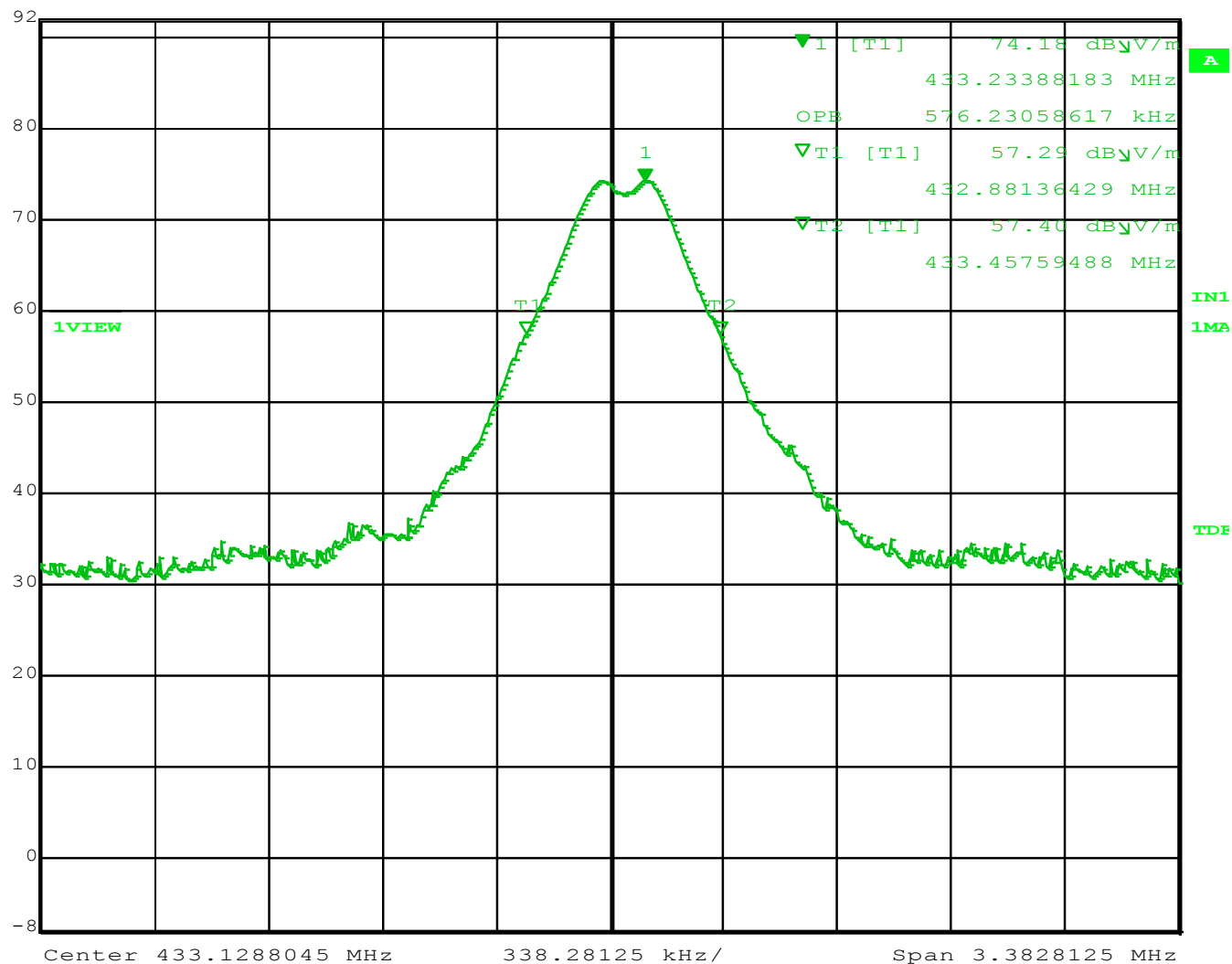
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Marker 1 [T1] RBW 100 kHz RF Att 0 dB
Ref Lvl 74.18 dB μ V/m VBW 300 kHz
92 dB* 433.23388183 MHz SWT 5 ms Unit dB μ V/m



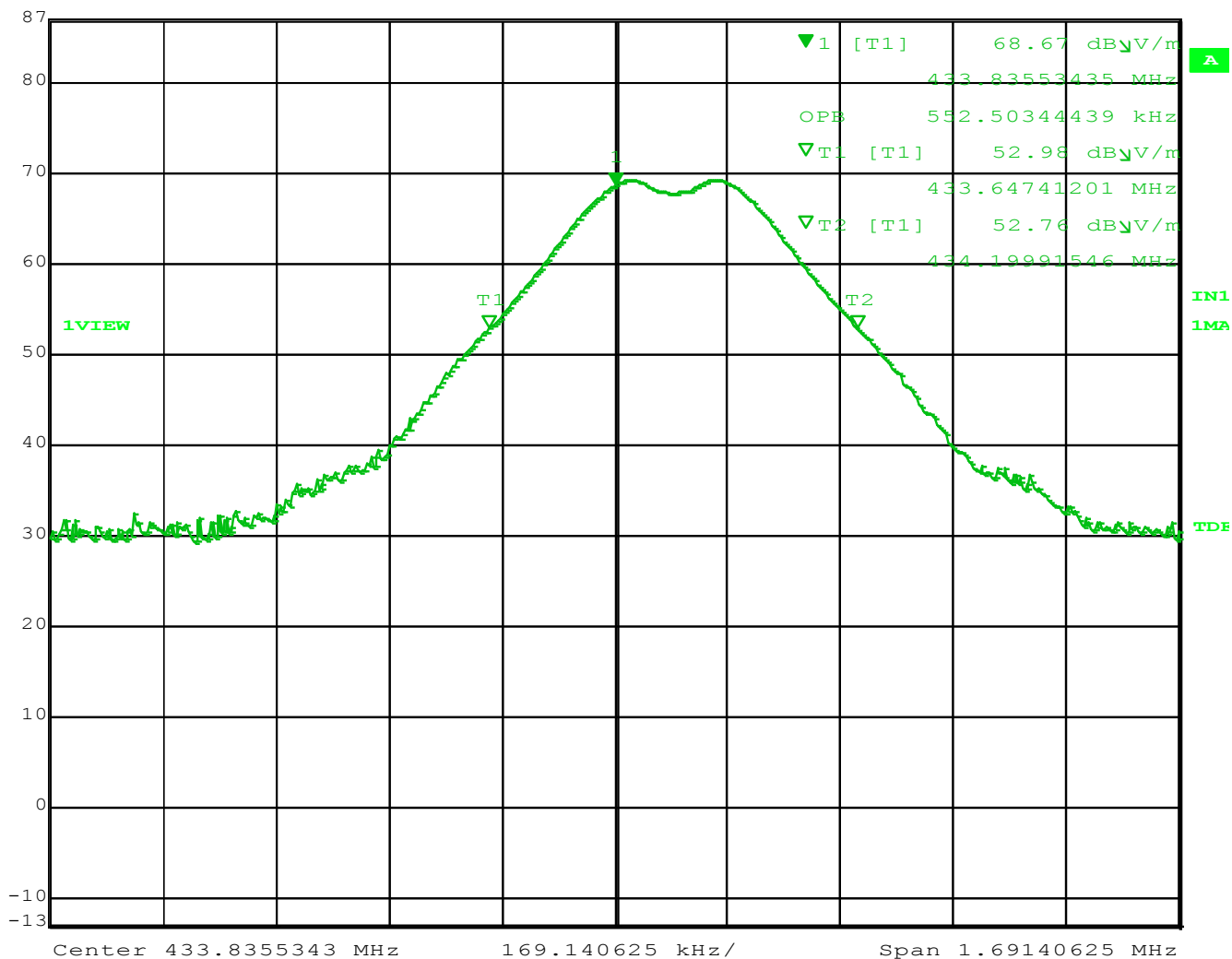
Date: 6.OCT.2015 19:50:17

Figure 35 – 99% BW of channel 0 is 576.23 kHz

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Marker 1 [T1]	RBW	100 kHz	RF Att	10 dB
Ref Lvl	68.67 dBμV/m	VBW	300 kHz	
87 dB*	433.83553435 MHz	SWT	5 ms	Unit dBμV/m



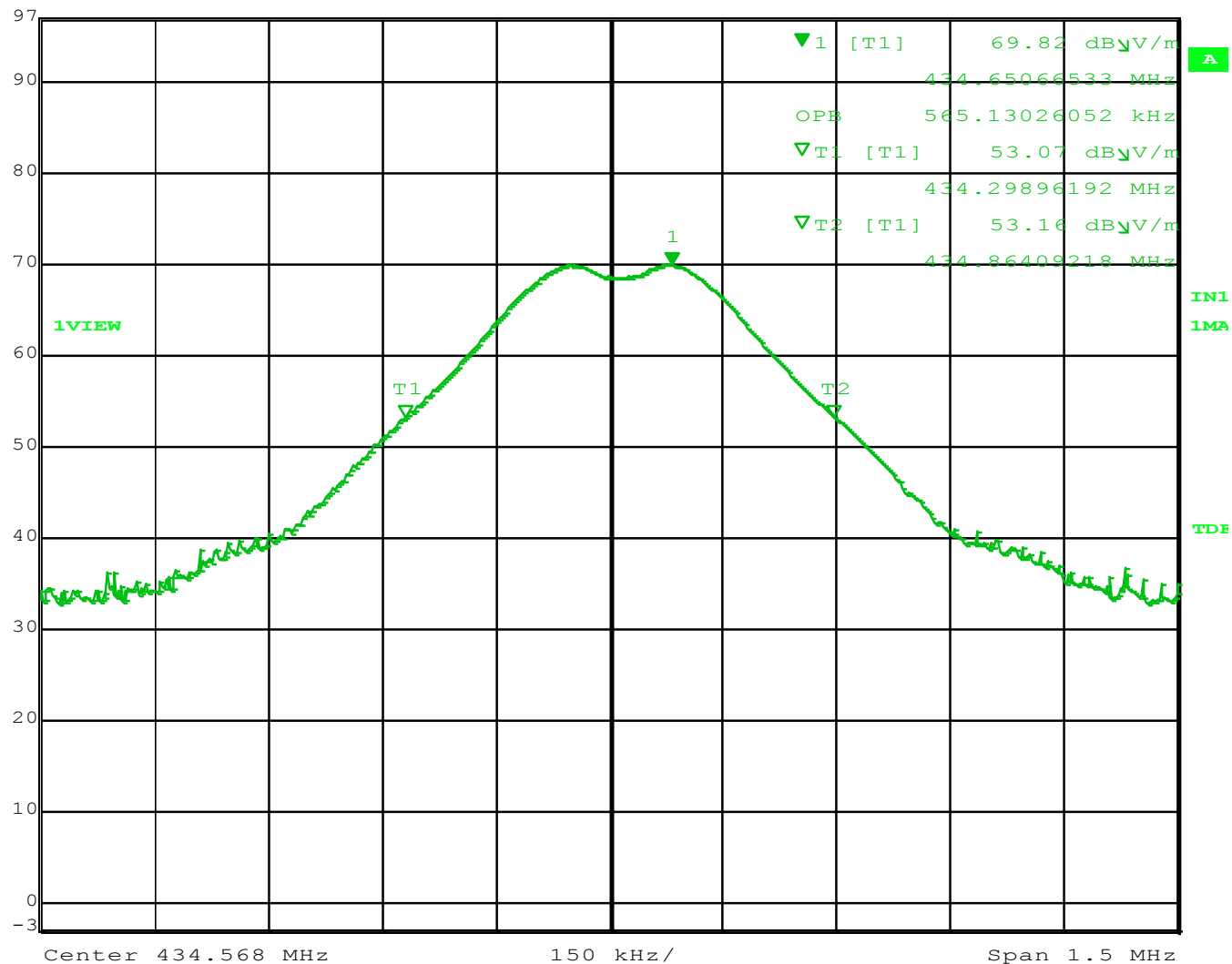
Date: 6.OCT.2015 20:16:15

Figure 36 – 99% BW of channel 7 is 552.50 kHz

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB
 Ref Lvl 69.82 dByV/m VBW 300 kHz
 97 dB* 434.65066533 MHz SWT 5 ms Unit dByV/m



Date: 22.OCT.2015 11:08:08

Figure 37 – 99% BW of channel 13 is 565.130 kHz

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4.4 Deactivation of Transmitter

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

4.4.1 Over View of Test

Results	Complies (as tested per this report)					Date	10/19/2015	
Standard	FCC Part 15.231(a)							
Product Model	RM433V2				Serial#	TS-1		
Configuration	See test plan for details							
Test Set-up	EUT placed on table see test plans for details							
EUT Powered By	3.0 VDC Battery	Temp	22° C	Humidity	37%	Pressure	1004mbar	
Frequency Range	433 MHz							
Perf. Criteria	5 Seconds (Below Limit)		Perf. Verification					
Mod. to EUT	None		Test Performed By		Randall Masline			

4.4.2 Test Procedure

Testing was performed by sweeping the fundamental frequency for 30 seconds and manually operating the transmitter. The EUT does employ a manual switch – in normal operation of the device the active tag transmits once every 6 hours for a duration of 1.7ms for each transmission.

4.4.3 Deviations

There were no deviations from the test methodology listed in the test plan for the conducted emission test.

4.4.4 Final Test

All final measurements were below (in compliance) the limits.

NOTE: Units sent in for testing were set for continuous transmission, testing could not performed, therefore a manufacturer attestation is being used to show compliance with this section.

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October 30, 2015

Federal Communications Commission
7435 Oakland Mills Road
Columbia, MD 21046

Re: FCC ID: N74-RM433V2 deactivation provision in CFR 47 Part 15.231

To Whom It May Concern:

The N74-RM433V2 radio module only transmits in response to trigger messages from Omni-ID RFID tags. These transmissions are short, less than 100mS long, and cease after the message is transmitted. The radio module will not transmit again until it receives another trigger message from an RFID tag. As such the radio module complies with the provisions in part 15.231 paragraph a sub-part 2.

Sincerely,



Ed Nabrotzky
Omni-Id
1200 Ridgeway Ave
Suite 106
Rochester, NY 14615

Omni-ID Corporate Headquarters: 1200 Ridgeway Avenue Rochester, NY 14615 585-713-1000 www.Omni-ID.com

Figure 38 – Attestation of deactivation

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5 MPE Evaluation

Model RM433V2 – Channel 13 with Highest gain Antenna, 9.15 dBi YAGI

Radiated Value in dBuV has Duty Cycle Correction factors applied, highest measured value was 94.49 dBuV – Correction factor of 35.39 dB = 59.1 dBuV.

Corrected (including calibration factors) Measurement:	59.10	dBμV
The Gain of the antenna:	9.15	dBi
Type of Measurement:	Radiated	Calculated using the Friis Equations
Impedance:	50.00	Ω
Measuring Distance:	3.00	m
Time weighted Duty Cycle:	100.00	%

Frequency:	433	MHz
------------	-----	-----

Power output with DC and antenna Gain (EIRP):

Power (dBm):	-36.13
Power (mW):	0.000
Power (W):	0.000000

R = distance in	20	cm
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5.1.1 FCC Evaluation

FCC:		
Controlled Exposures - Limit =	1.443333333	mW/cm ²
Uncontrolled Exposures - Limit =	0.288666667	mW/cm ²
Pd =	0.0000000	mW/cm ²
Controlled Margin to Limit =	1.4433	mW/cm ²
Uncontrolled Margin to Limit =	0.2887	mW/cm ²

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5.1.2 Industry Canada Evaluation RSS-102 Issue 5

Radiated Value in dBuV has Duty Cycle Correction factors applied, highest measured value was 94.49 dBuV – Correction factor of 35.39 dB = 59.1 dBuV.

Corrected (including calibration factors) Measurement:	59.10	dBμV
The Gain of the antenna:	9.15	dBi
Type of Measurement:	Radiated	Calculated using the Friis Equations
Impedance:	50.00	Ω
Measuring Distance:	3.00	m
Time weighted Duty Cycle:	100.00	%

Frequency:	433	MHz
------------	-----	-----

Power output with DC and antenna Gain
(EIRP):

Power (dBm):	-36.13
Power (mW):	0.000
Power (W):	0.000000

R = distance in	20	cm
-----------------	----	----

IC:		
Controlled Exposures to Limit =	13.4319849	W/m ²
Uncontrolled Exposures Limit =	1.659248092	W/m ²
Pd =	0.000000	W/m ²
Controlled Margin to Limit =	13.4320	W/m ²
Uncontrolled Margin to Limit =	1.6592	W/m ²

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Appendix A

6 Test Plan

This test report is intended to follow this test plan outlined here in unless other wise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

6.1 General Information

Client	OMNI-ID
Address 1	21200 Ridgeway Avenue
Address 2	Rochester, NY 14615
Contact Person	Len Desmond
Telephone	585-713-1021
Fax	
e-mail	len.desmond@omni-id.com

6.2 Model(s) Name

RM433V2

6.3 Type of Product

Active RFID Tag

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6.4 Equipment Under Test (EUT) Description

The RM433V2 is an active RFID tag that operates at 433 MHz

6.5 Modifications

No modifications were necessary to meet the requirements.

6.6 Product Environment

<input checked="" type="checkbox"/>	Residential	<input type="checkbox"/>	Hospital
<input checked="" type="checkbox"/>	Light Industrial	<input type="checkbox"/>	Small Clinic
<input type="checkbox"/>	Industrial	<input type="checkbox"/>	Doctor's office
<input type="checkbox"/>	Other		

*Check all that apply

6.7 Countries

<input checked="" type="checkbox"/>	USA
<input checked="" type="checkbox"/>	Canada

*Check all that apply

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6.8 General Product Information

Size	H	2cm	W	7.5cm	L	11.5cm
Weight	<1kg		Fork-Lift Needed		No	
Notes						

6.9 EUT Electrical Powered Information

6.9.1 Electrical Power Type

<input type="checkbox"/>	AC	<input type="checkbox"/>	DC	<input checked="" type="checkbox"/>	Batteries	<input type="checkbox"/>	Host -
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6.9.2 Electrical Power Information

Name	Type	Voltage		Frequency	Current	Notes
		min	max			
3.0 VDC Battery		1.5	3.5	DC		
Notes						

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