

Electromagnetic Compatibility Test Report

Prepared in accordance with

FCC Part 15 and ANSI C63.10: 2013

On

BROADBAND ETHERNET RADIO

RF-7800W

**Harris RF Communications
221 Jefferson Ridge Parkway
Lynchburg, VA 24501**




Prepared by:

TUV Rheinland of North America, Inc.

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Report No.: 31551684.004 Harris RF-7800W.doc

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Client:	Harris RF Communications 221 Jefferson Ridge Parkway Lynchburg, VA 24501		William Pertner 434-455-9295 wpertner@harris.com		
Identification:	BROADBAND ETHERNET RADIO	Serial No.:	A00451		
Test item:	RF-7800W	Date tested:	7/2/2015		
Testing location:	TUV Rheinland of North America 710 Resende Road Building 199 Webster, NY 14580 U.S.A.		Tel: (585) 645-0125		
Test specification:	Emissions: FCC Part 15, Subpart E, FCC Parts 15.107(c), 15.207(c) FCC Parts 15.407, 15.205, 15.209, 15.215(c) FCC Part 15.407, FCC Part 15.407, FCC Part 15.407, FCC Part 15.407, FCC Parts 15.209(a)				
Test Result	The above product was found to be Compliant to the above test standard(s)				
tested by: Randall E Masline		reviewed by: Cecil Gittens			
16 December 2015 <i>Signature</i>		16 December 2015 <i>Signature</i>			
Other Aspects:	None				
Abbreviations: OK, Pass, Compliant, Complies = passed Fail, Not Compliant, Does Not Comply = failed N/A = not applicable					
			Industry Canada	VCCI	BSMI
US5253	Testing Cert.# 3331.08		482B-1	A-0203	SL2-IN-E-050R

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Revisions

Date mm/dd/yy	Name	Page Number of Change	Describe Change

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Manufacturer's statement - attestation

The manufacturer; Harris Corporation, as the responsible party for the equipment tested, hereby affirms:

- a) That they have 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.

William H. Pertner
Printed name of official

William H Pertner

Signature of official

221 Jefferson Ridge Parkway
Lynchburg, VA 24501
Address

07/22/2015
Date

434-455-9295
Telephone number

william.pertner@harris.com
Email address of official

1 General Information

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Part15C based on the results of testing performed on 7/2/2015 on the BROADBAND ETHERNET RADIO, RF-7800W No. RF-7800W, manufactured by Harris RF Communications 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 RF-7800W 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 EMC 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	Harris RF Communications 221 Jefferson Ridge Parkway Lynchburg, VA 24501	Tel	434-455-9295	Contact	William Pertner
		Fax	434-455-6851	e-mail	wpertner@harris.com
Broadband Ethernet Radio	BROADBAND ETHERNET RADIO	RF-7800W:	RF-7800W		
Serial Number	A00451	Test Voltage/Freq.	Power over Ethernet		
Test Date Completed:	7/2/2015	Test Engineer	Randall E Masline		
Standards	Broadband Ethernet Radio	Severity Level or Limit		Criteria	Test Result
FCC Part 15, Subpart E Standard	Radio Frequency Devices-Subpart C: Intentional Radiators	See called out parts below		See Below	Complies
FCC Part 15.407	Operation within the band 5725 to 5850 MHz	See called out parts below		Below Limit	Complies
FCC Parts 15.407, 15.205, 15.209, 15.215(c)	Out-of-Band Spurious and Harmonic Emissions (EUT in Transmit Mode)	Below the applicable limits		Below Limit	Complies
FCC Parts 15.107(c), 15.207(c)	Conducted Emissions on AC Mains	EUT is operated by POE		Below Limit	Complies
FCC Part 15.407	Band Edge Radiated Emission	Per requirements of the standard		Below Limit	Complies
FCC Part 15.407	Conducted Output Power	Shall not exceed 1.0 Watts		Below Limit	Complies
FCC Part 15.407	Occupied Bandwidth	6 dB ≥ 500 kHz 99% BW		Within Limit	Complies
FCC Part 15.407	Peak Power Spectral Density	≤ 8 dBm in any 3 kHz		Below Limit	Complies
FCC Part 15.31(e)	Voltage Requirements	Output at 0.85% and 1.15% of Nominal Voltage		Below Limit	Complies
FCC Parts 15.209(a)	Radiated Emissions while EUT in Receive Mode	Below limit of section 15.209(a) Class B		Below Limit	Complies
FCC Parts 15.247(i)	RF Exposure	SAR or MPE Requirements		Below Limit	Complies (without testing)
FCC Parts 15.203	Antenna Requirements	Professionally Installed Device			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, Building 199, 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 ILAC/A2LA

This is a program which is administered under the auspices of A2LA. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Certificate Number: 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 C63.4-2009.

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

Per CISPR 16-4-2	Ulab	Ucisp
Radiated Disturbance @ 10m		
30 MHz – 1,000 MHz	4.57 dB	5.2 dB
Radiated Disturbance @ 3m		
1.0 GHz – 6.0 GHz	5.08 dB	5.2 dB
6.0 GHz – 18.0 GHz	5.16 dB	5.5 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

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Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is $\pm 2.98\%$.	Per EN61000-4-2
The estimated combined standard uncertainty for radiated immunity measurements is $\pm 2.0\text{dB}$.	Per EN61000-4-3
The estimated combined standard uncertainty for EFT fast transient immunity measurements is $\pm 5.0\%$.	Per EN61000-4-6
The estimated combined standard uncertainty for surge immunity measurements is $\pm 5.0\%$.	Per EN61000-4-5
The estimated combined standard uncertainty for conducted immunity measurements is $\pm 2.0\text{dB}$.	Per EN61000-4-6
The estimated combined standard uncertainty for power frequency magnetic field immunity measurements is $\pm 2.57\%$.	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for voltage variation and interruption measurements is $\pm 2.48\%$.	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for radiated emissions measurements is $\pm 4.57\text{ dB}$	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for radiated emissions measurements from 1 GHz to 6 GHz is $\pm 4.57\text{dB}$	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for radiated emissions measurements from 6 GHz to 18 GHz is $\pm 4.57\text{dB}$	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for conducted emissions measurements is $\pm 2.62\text{dB}$.	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for harmonic current and flicker measurements is $\pm 11.15\%$.	Per CISPR16-4-2 Method

Expanded measurement uncertainty numbers are shown in the tables above. Compliance criteria are not based on measurement uncertainty.

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2.3 Measurement Equipment Used

Equipment	Manufacturer	Model #	Ref.	Serial #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
Radiated Emissions							
Analyzer w RF Filter Section 85460A	HP	8546A		3325A00134	12-Aug-14	12-Aug-15	RE
Multimeter	Fluke	83	C437	48162892	12-Aug-14	12-Aug-15	RE
BiLog	Chase	CBL6111	C017	1169	22 Aug 13	22 Aug 15	RE
Receiver (20Hz-40GHz)	Rohde & Schwarz	ESI(B) 40		100274	15-Aug-14	15-Aug-15	RE
Horn(1-18 GHz)	ETS	3117		040361	1-16-14	1-16-16	RE
Horn(18-26.5 GHz)	ETS	3160-09		1275	1-16-14	1-16-16	RE
Horn(26.5-40 GHz)	ETS	3160-10		1180	1-16-14	1-16-16	RE
Conducted Emissions							
LISN	Schwarzbeck	8126	C109	189	12-Aug-14	12-Aug-15	CE
Analyzer w RF Filter Section 85460A	HP	8546A		3325A00134	12-Aug-14	12-Aug-15	CE
Multimeter	Fluke	87	C445	59890224	12-Aug-14	12-Aug-15	CE
General Laboratory Equipment							
Multimeter	Fluke	87	C405	49050672	12-Aug-14	12-Aug-15	
Multimeter	Fluke	8062A	C452	4715199	12-Aug-14	12-Aug-15	
Pressure/Temperature/RH	Extech	SD700	C480	Q668876	12-Aug-14	12-Aug-15	

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3 Product Information

3.1 Product Broadband Ethernet Radio

Broadband Ethernet Radio uses the frequency band listed below with the associated bandwidths.

Bandwidth (MHz)	Low (MHz)	Middle (MHz)	High (MHz)
40	5745	5787.5	5830
20	5735	5787.5	5840
10	5730	5787.5	5845
5	5727.5	5787.5	5847.5

3.2 Equipment Modifications

No modifications were needed to bring product into compliance.

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4 Radiated Emissions

4.1 Spurious Emissions Outside the band - FCC 15.407

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either RF conducted or radiated measurements. Conducted antenna port measurements are provided below to show that the EUT meets these requirements at the band edges.

4.1.1 Over View of Test

Results	Complies (as tested per this report)				Date	6/30/2015	
Standard	FCC Parts 15.205, 15.209, 15.215(c), 15.407						
Product	RF-7800W			Serial#	A00451		
Test Set-up	Tested in a 10m semi-anechoic chamber placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane on a turn-table, at 3 m						
EUT Powered By	Power over Ethernet	Temp	76 °F	Humidity	36%	Pressure	1007 mbar
Perf. Criteria	(Below Limit)		Perf. Verification		Readings Under Limit		
Mod. to EUT	None		Test Performed By		Randall E Masline		

4.1.2 Test Procedure

Testing was performed in accordance with 47 CFR Part 15, ANSI C63.10:2009, RSS-GEN Issue 2. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.1.3 Deviations

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

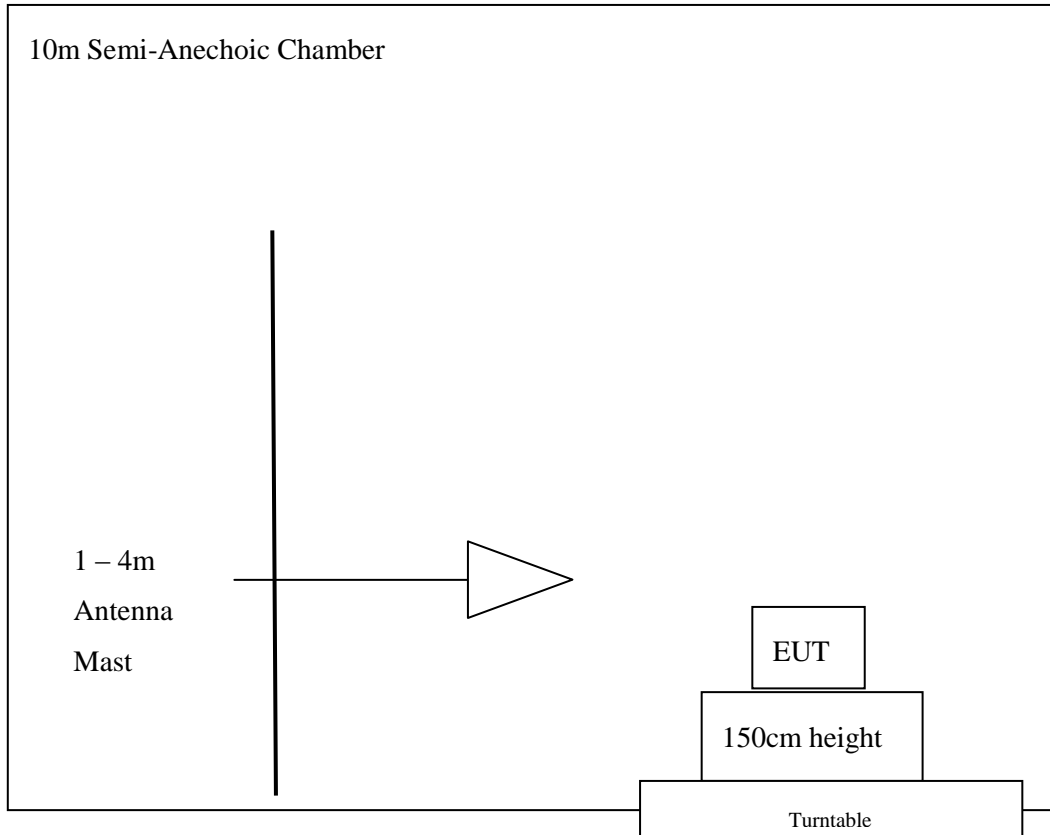
4.1.4 Final Test

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

The worst –case emissions are shown below. All other emissions are on file at TUV Rheinland.

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4.1.1 Test setup



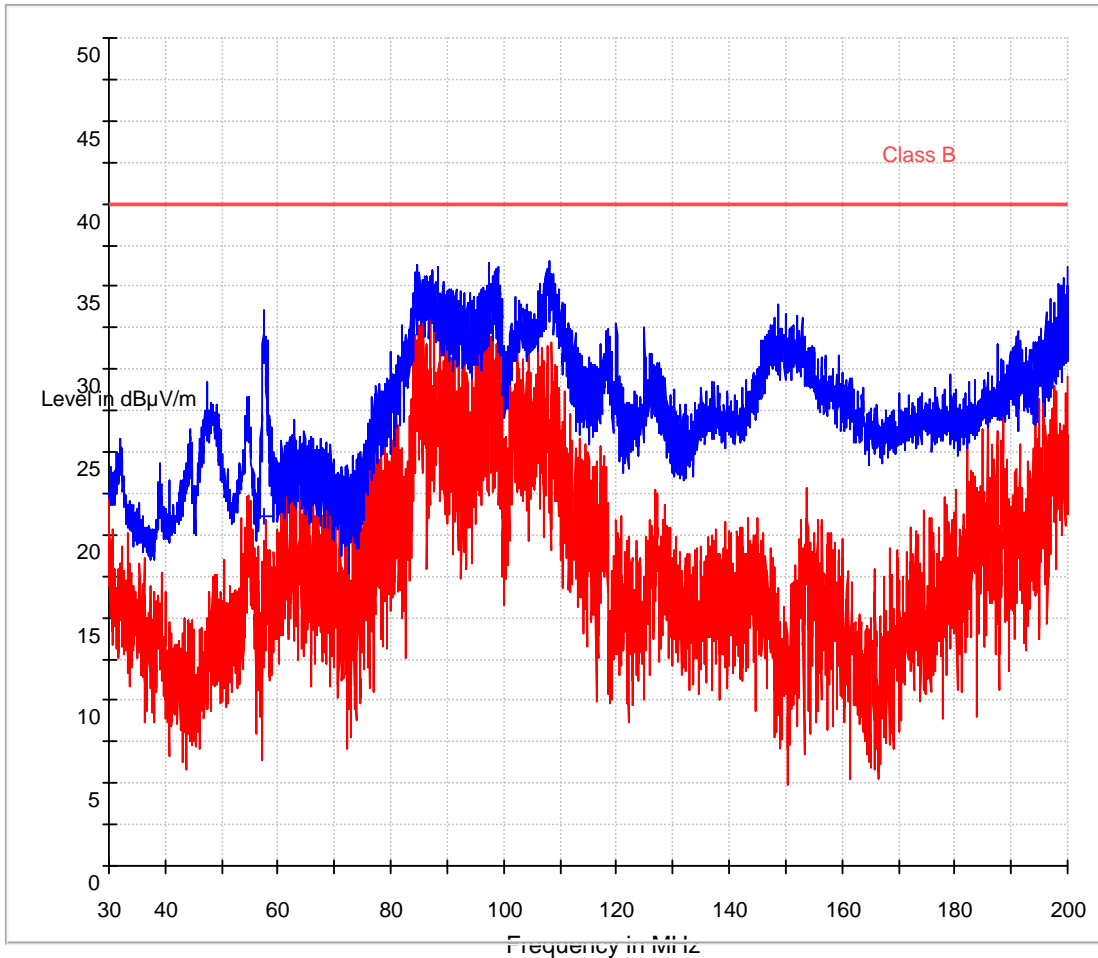
4.1.1 Final Test

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4.1.1.1 Final Radiated Emissions

NOTES:

Radiated Emissions
Horizontal

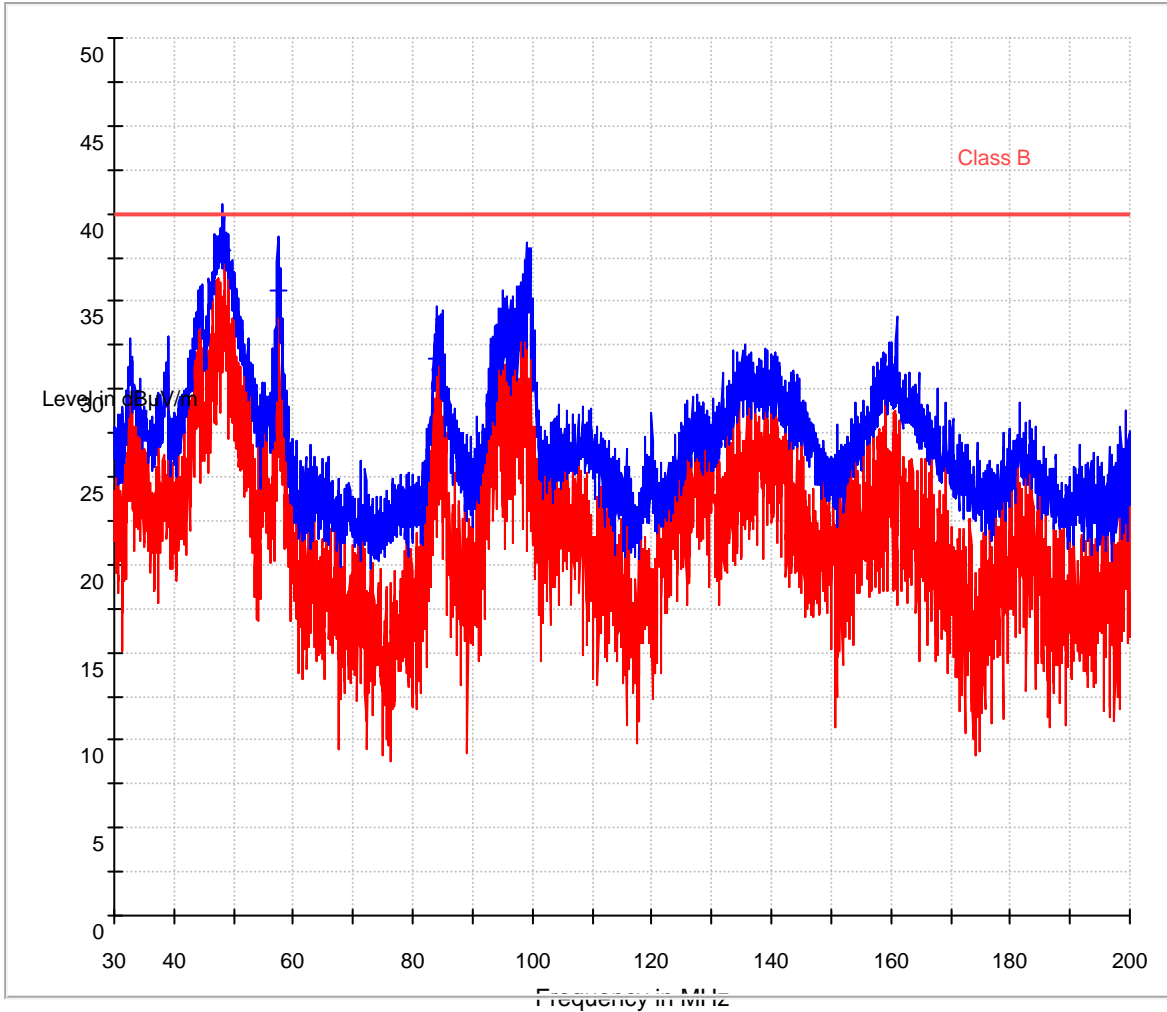


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
57.560000	21.1	100.0	120.000	100.0	H		-2.0	-12.1
97.400000	34.3	100.0	120.000	100.0	H		-2.0	-7.4

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NOTES:

Radiated Emissions
Vertical

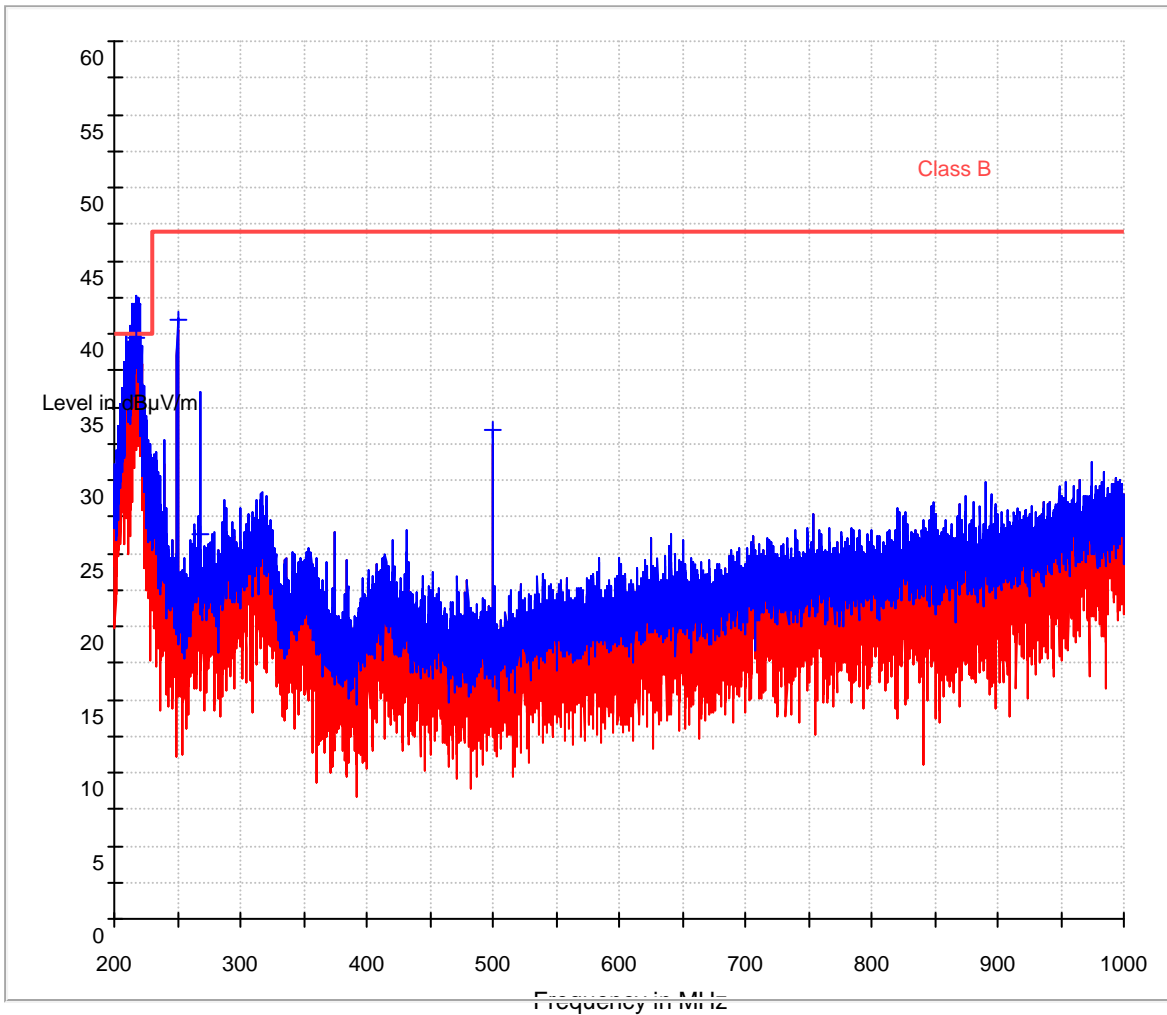


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
48.120000	37.9	100.0	120.000	100.0	V		43.0	-8.5
57.520000	35.6	100.0	120.000	100.0	V		43.0	-12.1
84.080000	31.8	100.0	120.000	100.0	V		43.0	-9.8

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NOTES:

Radiated Emissions Prescan
Horizontal

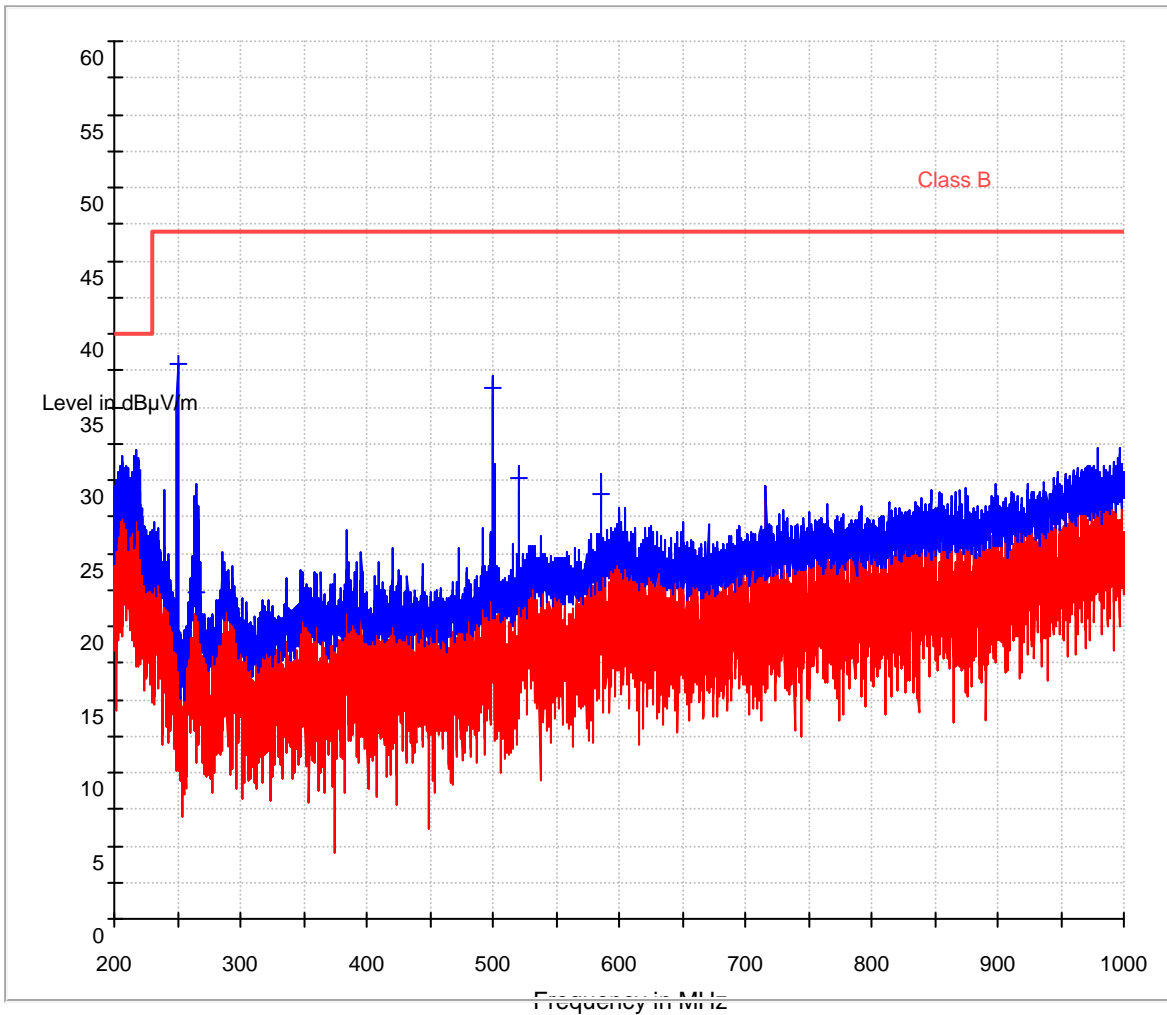


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
217.920000	39.8	100.0	120.000	100.0	H		43.0	-4.9
250.000000	41.0	100.0	120.000	100.0	H		43.0	-2.0
268.240000	26.3	100.0	120.000	100.0	H		43.0	-1.3
500.000000	33.4	100.0	120.000	100.0	H		43.0	5.0

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NOTES:

Radiated Emissions Prescan
Vertical

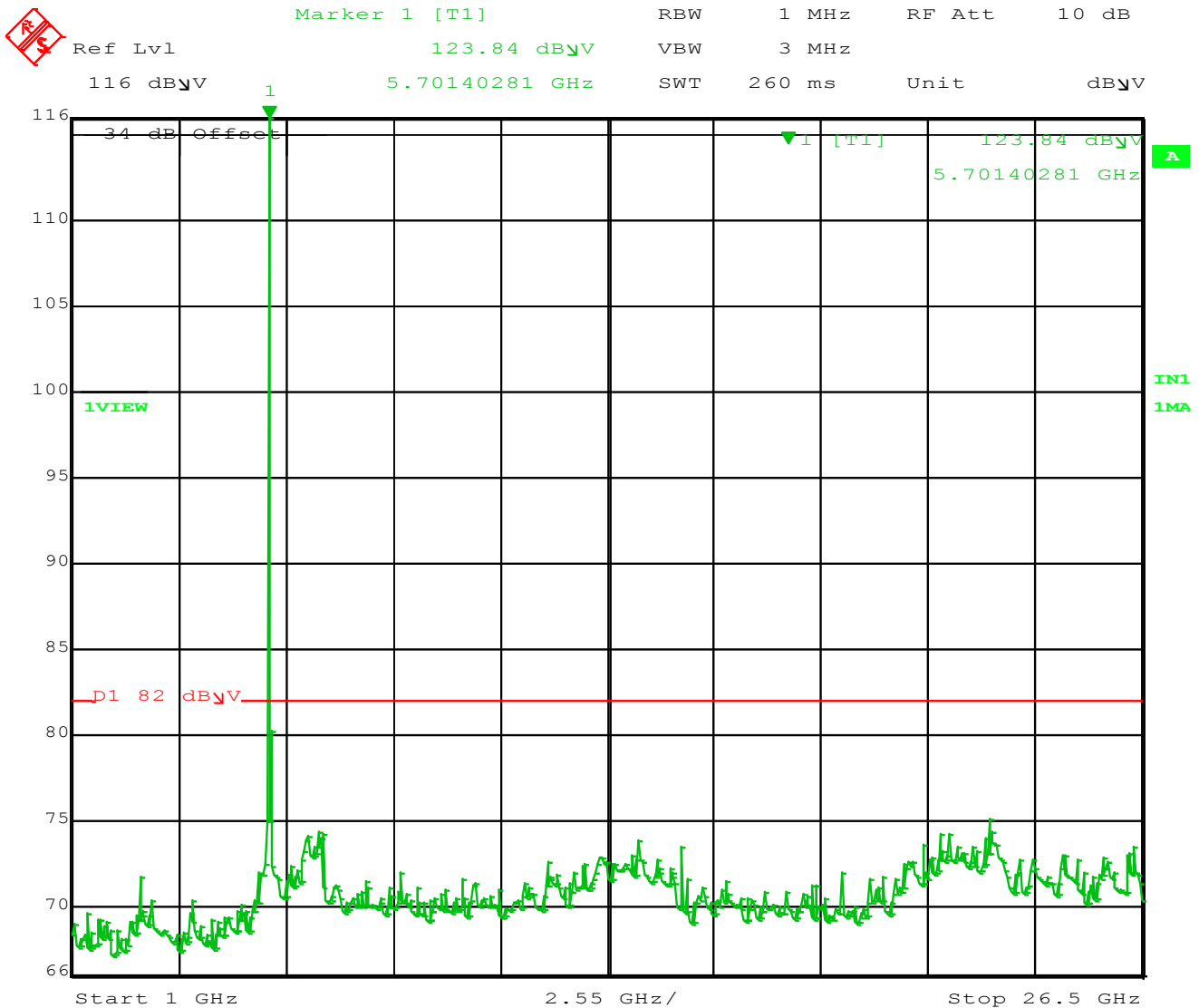


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
250.000000	38.0	100.0	120.000	100.0	V		43.0	-2.0
264.480000	22.3	100.0	120.000	100.0	V		43.0	-1.4
500.000000	36.4	100.0	120.000	100.0	V		43.0	5.0
521.120000	30.1	100.0	120.000	100.0	V		43.0	5.9
586.320000	29.1	100.0	120.000	100.0	V		43.0	7.8

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4.1.2 Emissions Outside the Frequency Band

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either RF conducted or radiated measurements. Conducted antenna port measurements are provided below to show that the EUT meets these requirements at the band edges.

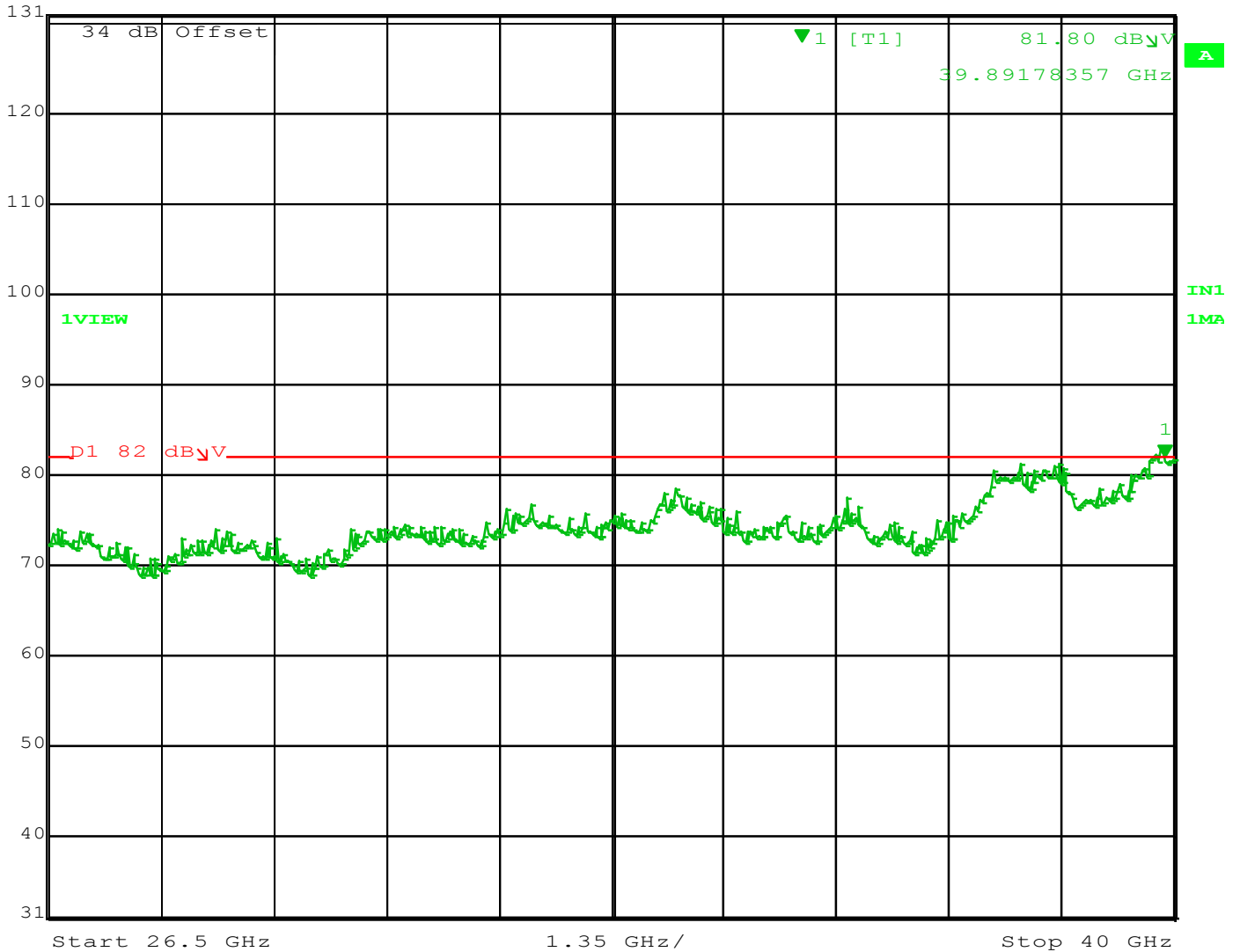


Date: 2.JUL.2015 12:19:43

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Marker 1 [T1]	RBW	1 MHz	RF Att	0 dB
Ref Lvl	81.80 dB μ V	VBW	3 MHz	
131 dB μ V	39.89178357 GHz	SWT	205 ms	Unit dB μ V



Date: 2.JUL.2015 12:22:06

NOTE: Marker 1 is noise floor emissions at 1MHz/3MHz Bandwidths

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4.2 Band Edge

4.2.1 Test Over View

Results	Complies (as tested per this report)				Date	7/2/2015	
Standard	FCC Part 15.407						
Product	RF-7800W			Serial#	A00451		
Test Set-up	Radiated Measurements using 30 dBi Gain Antenna						
EUT Powered By	Power over Ethernet	Temp	76° F	Humidity	46%	Pressure	1002 mbar
Perf. Criteria	(Below Limit)		Perf. Verification		Readings Under Limit		
Mod. to EUT	None		Test Performed By		Randall E Masline		

4.2.2 Test Procedure

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

4.2.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Radiated Immunity test.

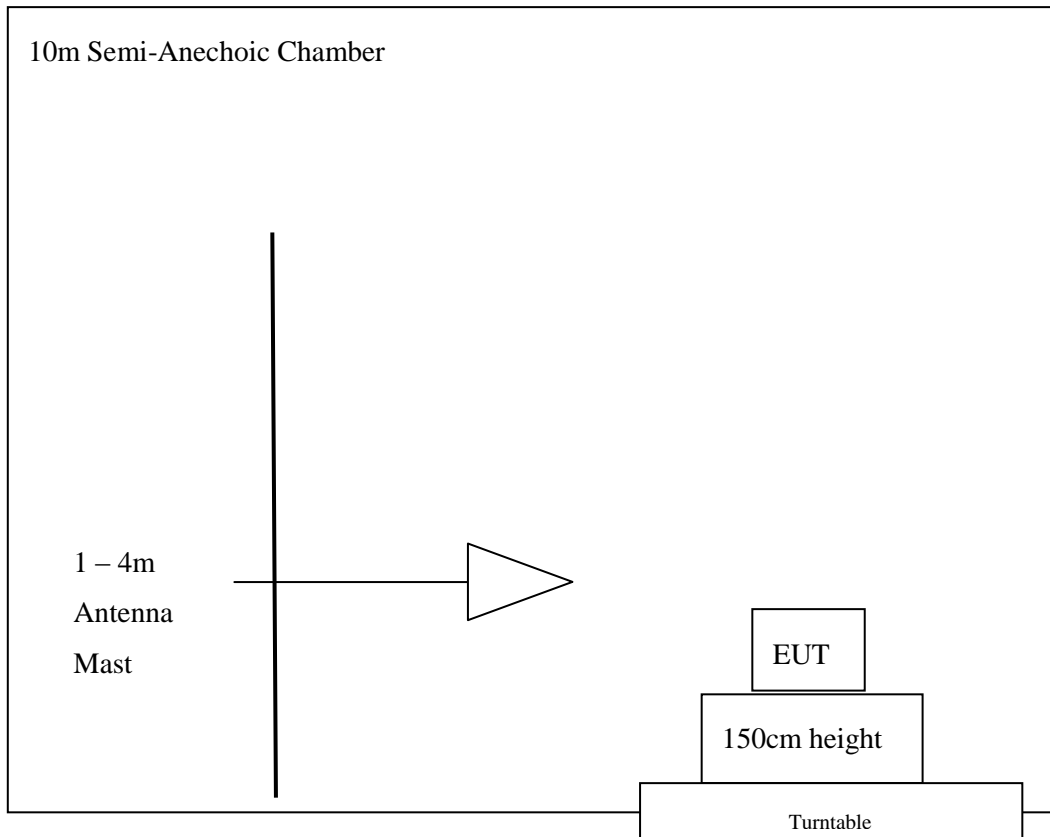
4.2.4 Final Test

The EUT met the performance criteria requirement as specified in the standards.

Measurements were taken radiated using the highest gain 30 dBi Antenna.

NOTE: Radiated Band edge measurements were taken with 30 dBi gain antenna and calculations were performed to ensure that the lower band edge at 5725 MHz met the 72.8 dBuV limit at the band edge and also at 10 MHz away at 68.2 dBuV. Scans are on file at TUV Webster NY

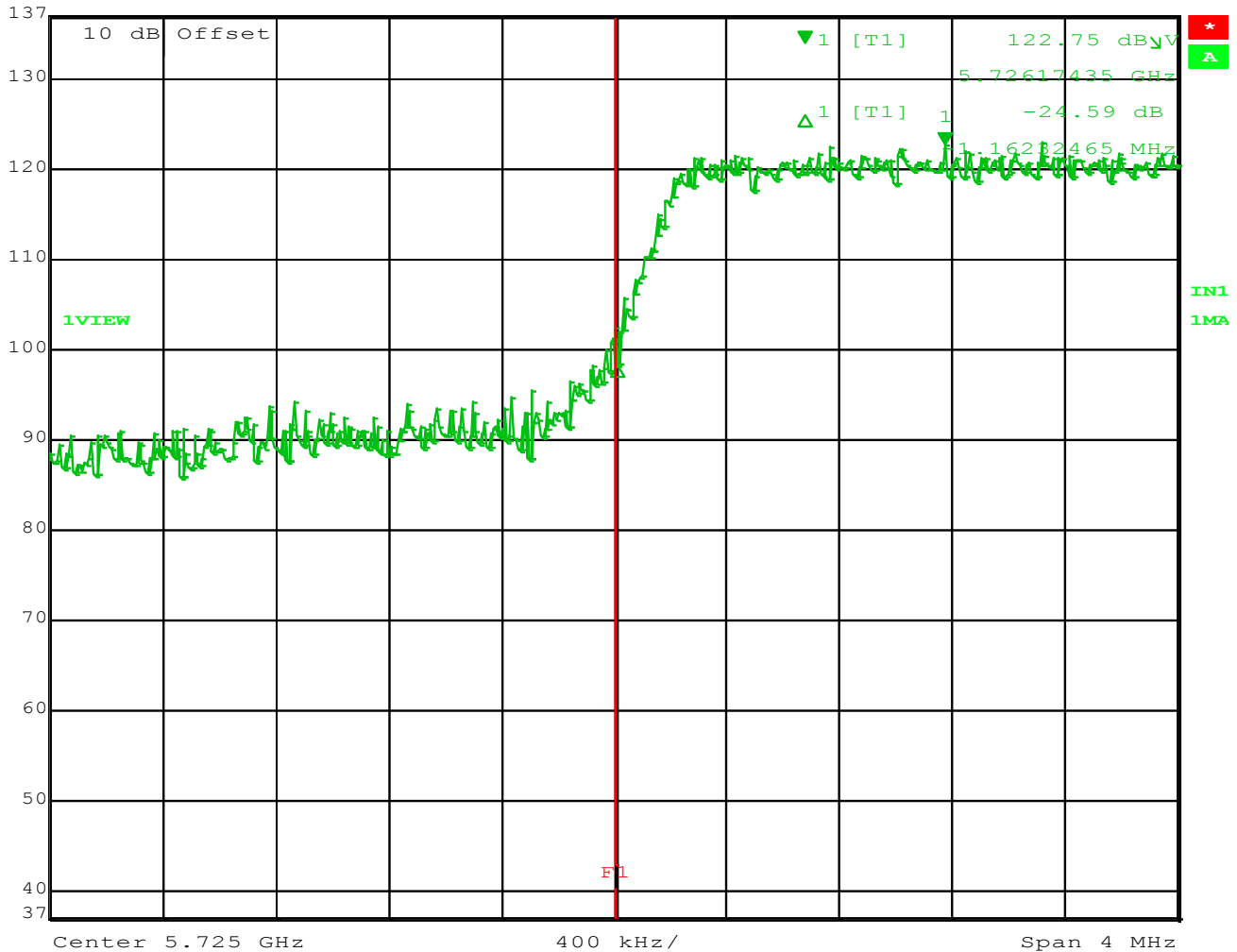
4.2.5 Test setup



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 30 dB
 Ref Lvl 122.75 dBµV VBW 300 kHz
 137 dBµV 5.72617435 GHz SWT 5 ms Unit dBµV



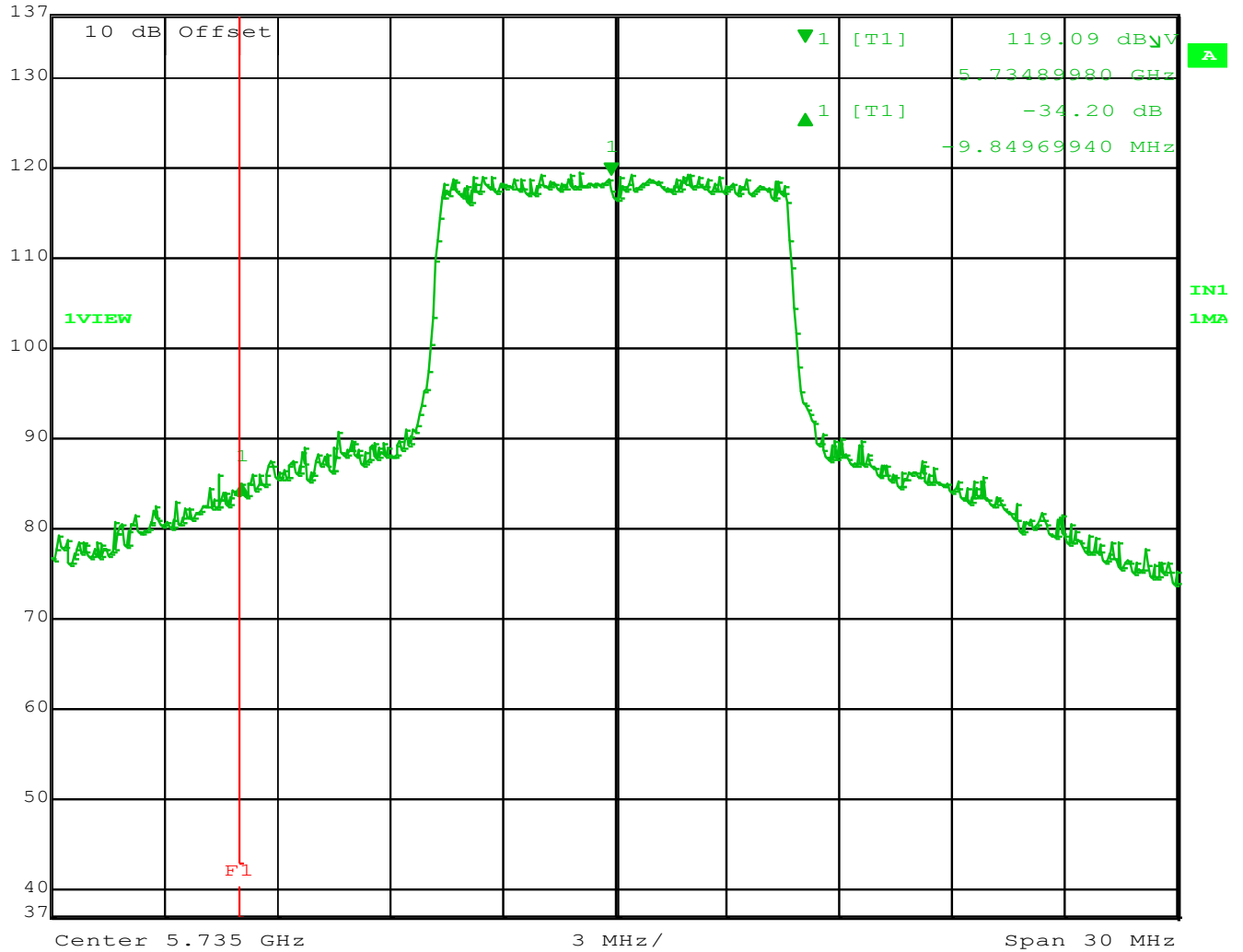
Date: 13.NOV.2015 14:43:49

Notes: Measured using the Peak detector. Band Edge is at 5725 MHz (F1)
 5727.5 MHz at 5 MHz BW

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Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	-34.20 dB	VBW	300 kHz	
137 dB μ V	-9.84969940 MHz	SWT	7.5 ms	Unit dB μ V



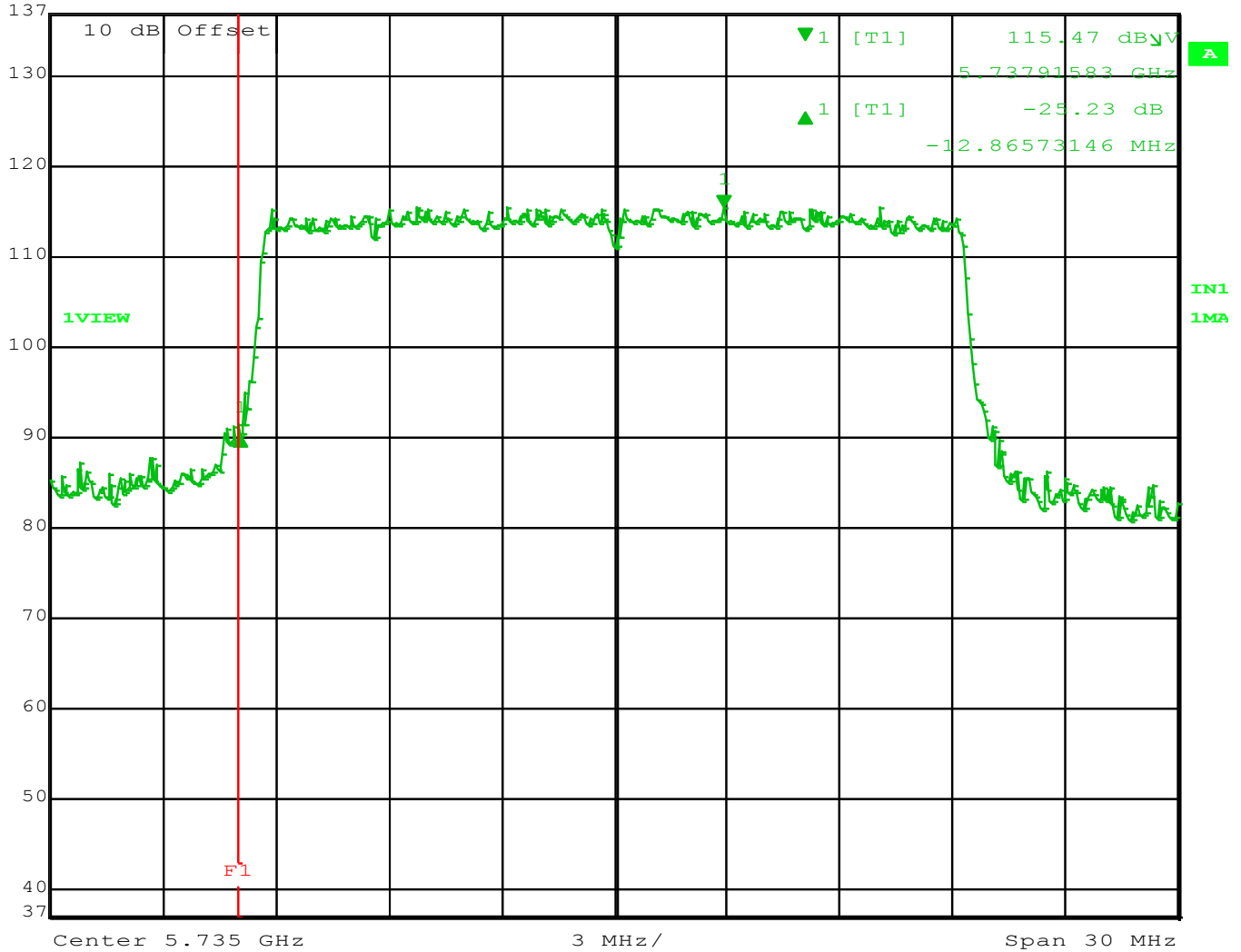
Date: 13.NOV.2015 15:24:17

Notes: Measured using the Peak detector. Band Edge is at 5725 MHz (F1)
5735 MHz using 10 MHz BW

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Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	-25.23 dB	VBW	300 kHz	
137 dB μ V	-12.86573146 MHz	SWT	7.5 ms	Unit dB μ V



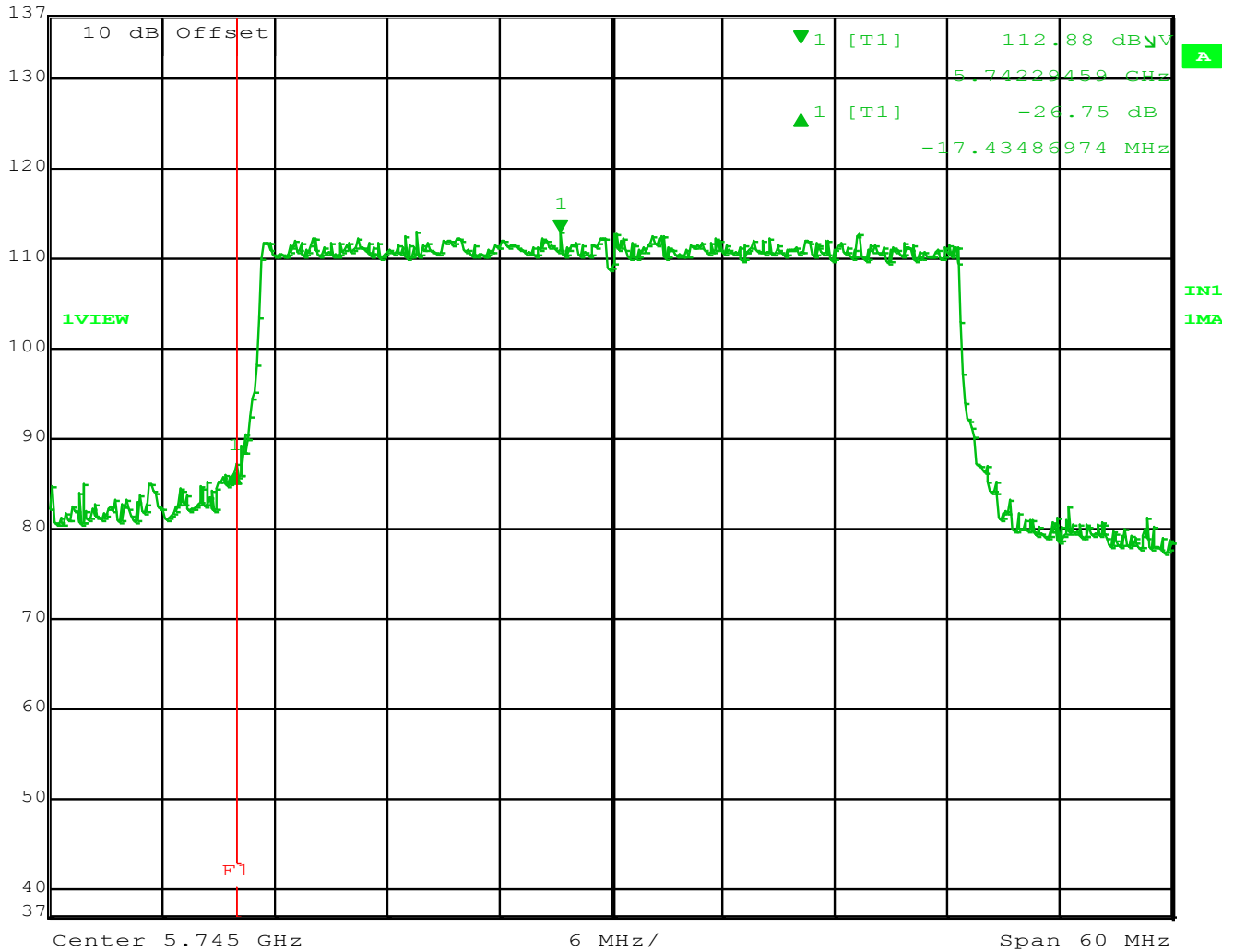
Date: 13.NOV.2015 15:27:20

Notes: Measured using the Peak detector. Band Edge is at 5725 MHz (F1)
5735 MHz using 20 MHz BW

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Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	-26.75 dB	VBW	300 kHz	
137 dB μ V	-17.43486974 MHz	SWT	15 ms	Unit dB μ V



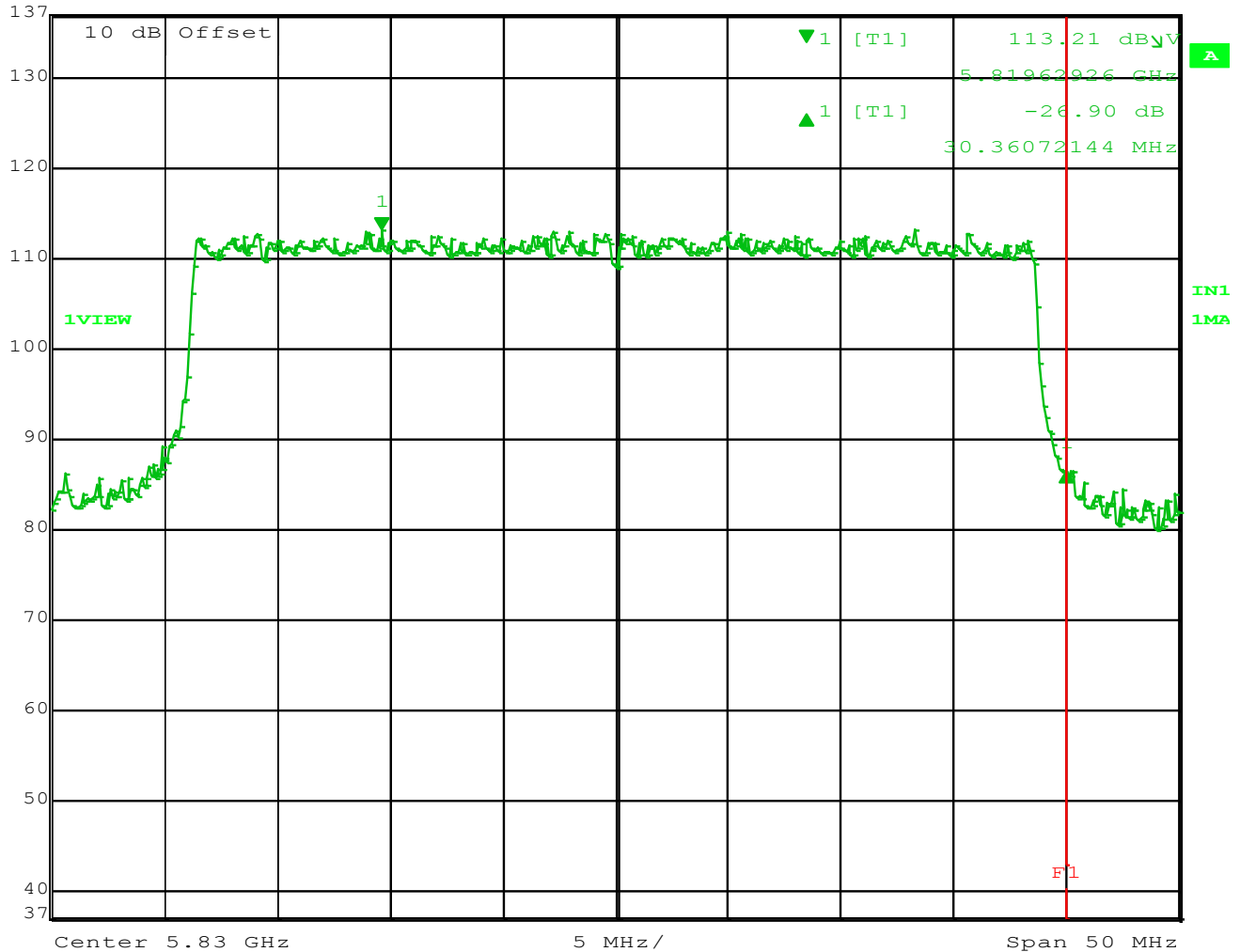
Date: 13.NOV.2015 15:31:55

Notes: Measured using the Peak detector. Band Edge is at 5725 MHz (F1)
5745 MHz using 40 MHz BW

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Ref Lvl	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
137 dB μ V	-26.90 dB	VBW	300 kHz		
	30.36072144 MHz	SWT	12.5 ms	Unit	dB μ V



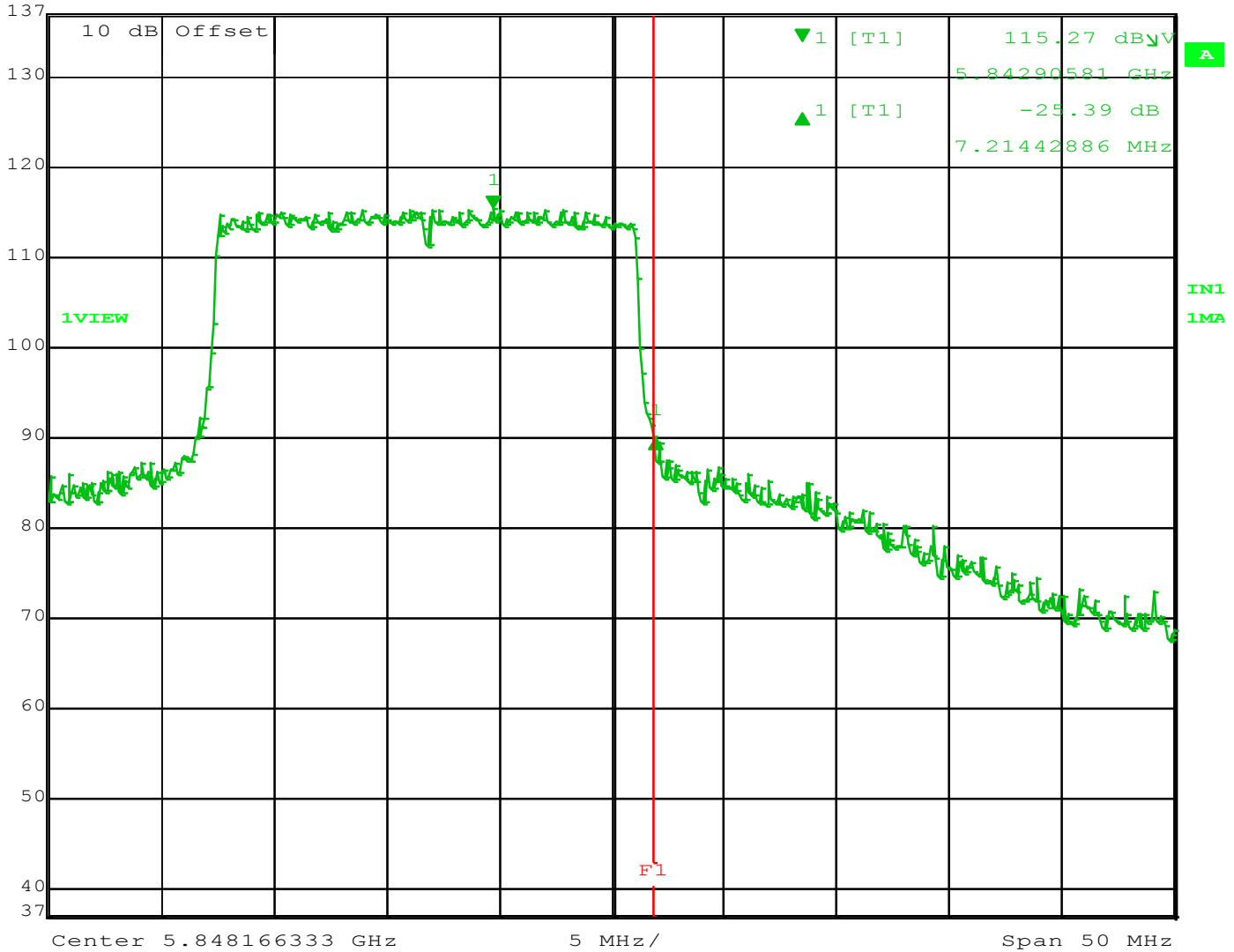
Date: 13.NOV.2015 15:46:18

Notes: Measured using the Peak detector. Band Edge is at 5850 MHz (F1)
5830 MHz using 40 MHz BW

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	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	-25.39 dB	VBW	300 kHz		
137 dBμV	7.21442886 MHz	SWT	12.5 ms	Unit	dBμV



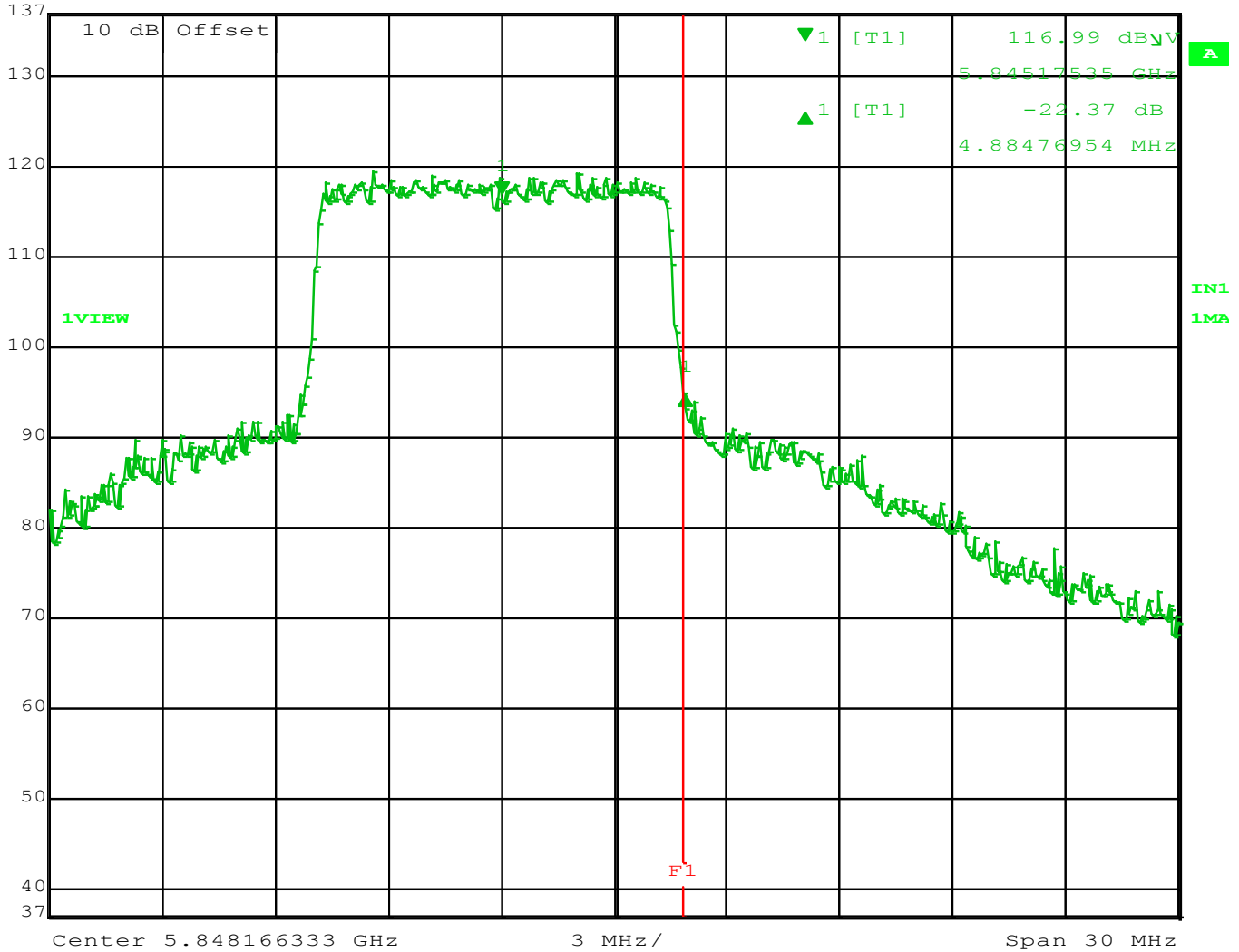
Date: 13.NOV.2015 15:44:43

Notes: Measured using the Peak detector. Band Edge is at 5850 MHz (F1)
5840 MHz using 20 MHz BW

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Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	-22.37 dB	VBW	300 kHz	
137 dB μ V	4.88476954 MHz	SWT	7.5 ms	Unit dB μ V



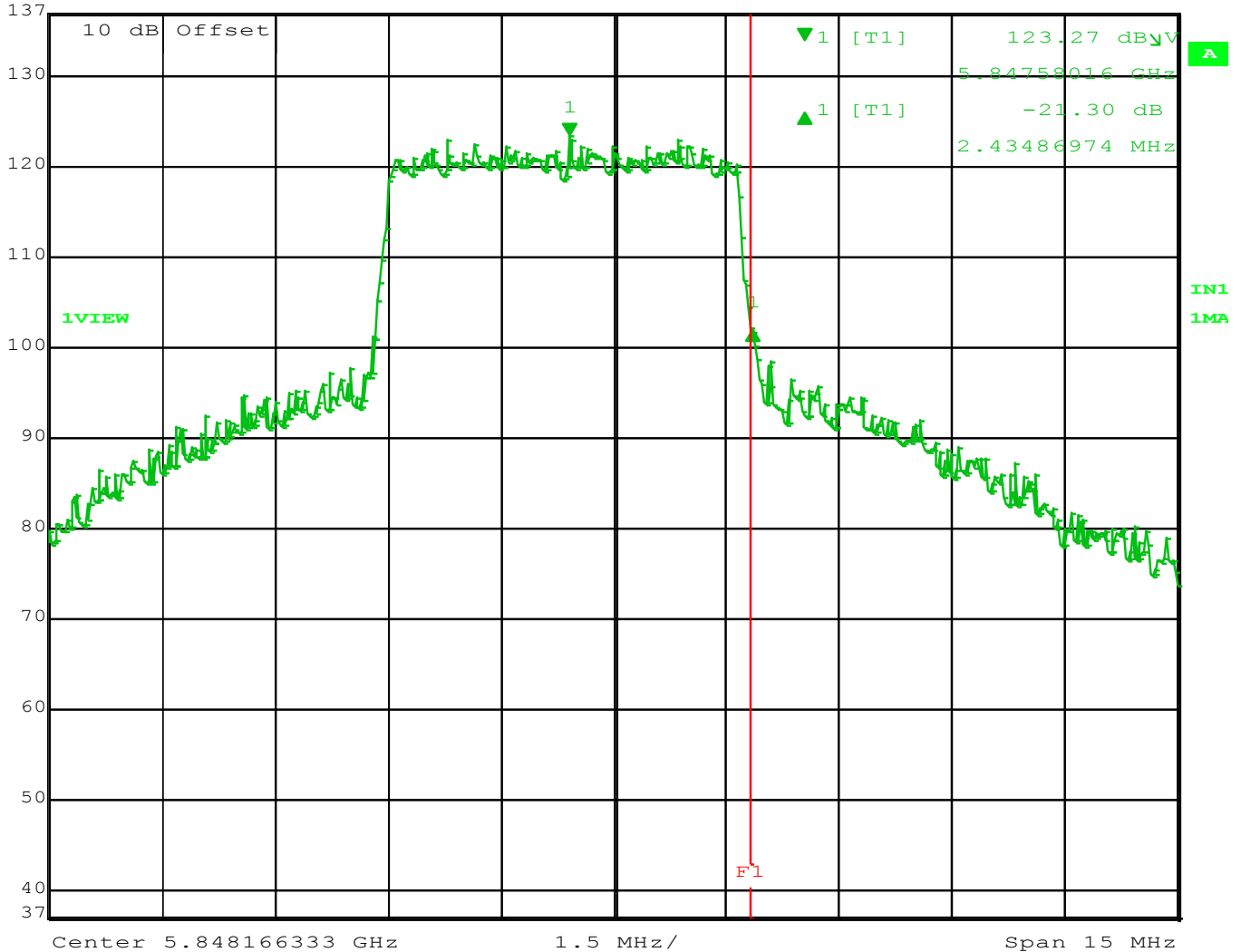
Date: 13.NOV.2015 15:40:50

Notes: Measured using the Peak detector. Band Edge is at 5850 MHz (F1)
5845 MHz using 10 MHz BW

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Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	-21.30 dB	VBW	300 kHz	
137 dB μ V	2.43486974 MHz	SWT	5 ms	Unit dB μ V



Date: 13.NOV.2015 15:37:48

Notes: Measured using the Peak detector. Band Edge is at 5850 MHz (F1)
5847.5 MHz using 5 MHz BW

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Conducted Emissions on AC Mains

This test measures the electromagnet levels of spurious signals generated by the EUT on the AC power line that may affect the performance of other near by electronic equipment.

4.2.6 Over View of Test

Results	Complies (as tested per this report)				Date	7/2/2015	
Standard	FCC Parts 15.107(c), 15.207(c)						
Product	RF-7800W			Serial#	A00451		
Test Set-up	Tested in shielded room. EUT placed on table, see test plans for details						
EUT Powered By	4.5VDC battery	Temp	23° C	Humidity	25%	Pressure	1011 mbar
Frequency Range	150 kHz – 30 MHz						
Perf. Criteria	(Below Limit)		Perf. Verification	Readings Under Limit for L1 & Neutral			
Mod. to EUT	None		Test Performed By	Randall E Masline			

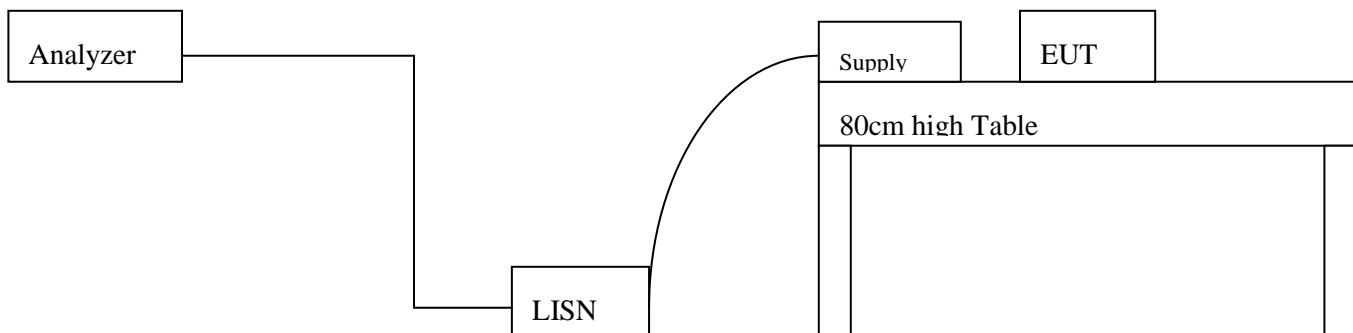
4.2.7 Test Procedure

This device is powered by POE (Power over Ethernet), therefore per FCC Part 15.207(c) this test is required. The EUT is powered via Ethernet using a 120VAC/60Hz power adapter

4.2.8 Final Test

Since the EUT is a powered via POE (Power over Ethernet). Product Complies.

4.2.9 Test setup

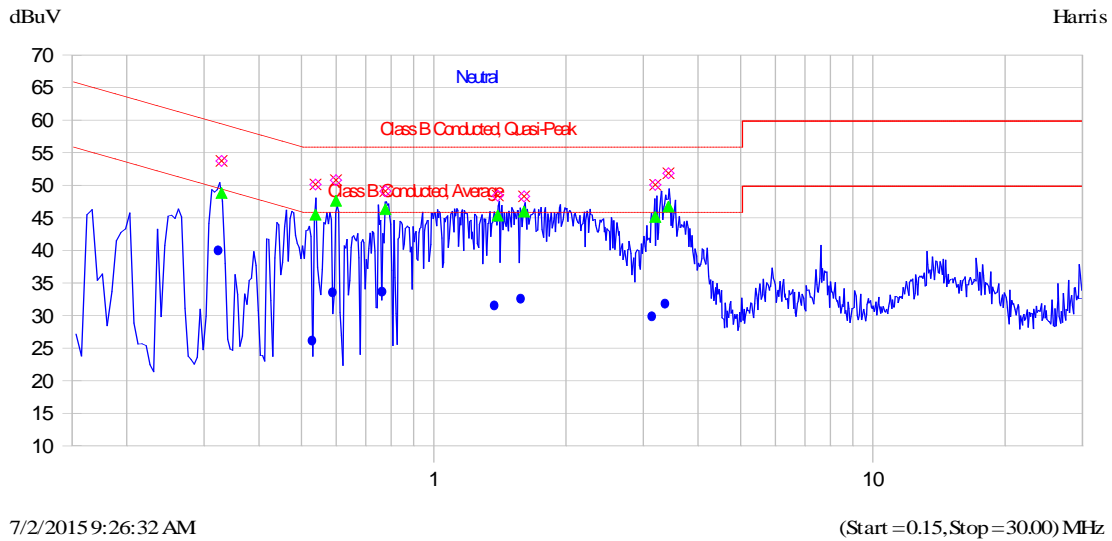


The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself 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.

NOTES:

Conducted Emissions @ 120V/60Hz
Neutral

Neutral



Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP dB	QP-QP Limit	Avg dBuV	Delta Avg-Avg dB	Avg-Avg Limit	Transducer Correction dB	Cable Correction dB
0.326	53.9	48.9	-10.6		39.9	-9.7		0.0	10.3
0.533	50.3	45.6	-10.4		26.0	-20.0		0.0	10.3
0.593	50.9	47.7	-8.3		33.4	-12.6		0.0	10.3
0.769	49.2	46.5	-9.5		33.5	-12.5		0.0	10.3
1.387	48.6	45.5	-10.5		31.4	-14.6		0.0	10.4
1.592	48.4	46.1	-9.9		32.5	-13.5		0.1	10.4
3.166	50.2	45.3	-10.7		29.7	-16.3		0.1	10.6
3.393	52.0	46.9	-9.1		31.7	-14.3		0.1	10.6

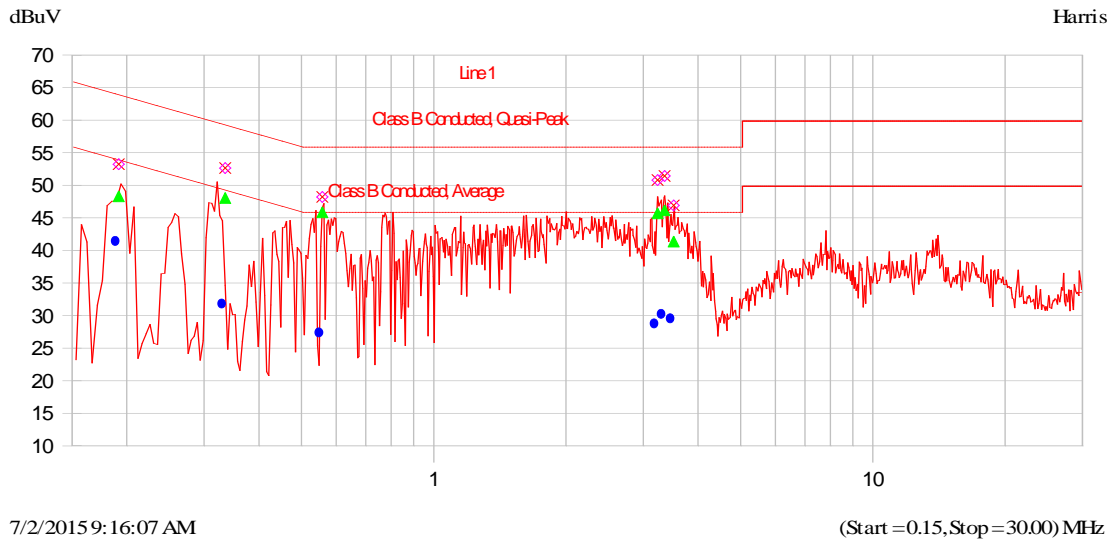
The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself 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.

NOTES:

Conducted Emissions @ 120V/60Hz

Line

Line 1



Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP dB	Limit	Avg dBuV	Delta Avg-Avg dB	Limit	Transducer Correction dB	Cable Correction dB
0.190	53.4	48.4	-15.6		41.3	-12.7		0.0	10.2
0.332	52.8	48.2	-11.2		31.7	-17.7		0.0	10.3
0.552	48.3	46.0	-10.0		27.3	-18.7		0.0	10.3
3.204	50.9	45.8	-10.2		28.7	-17.3		0.1	10.6
3.325	51.6	46.3	-9.7		30.1	-15.9		0.1	10.6
3.488	47.0	41.5	-14.5		29.4	-16.6		0.1	10.6

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5 Antenna Port Conducted Emissions

For conducted tests, the emissions were measured at the antenna port.

Testing was performed in accordance with 47 CFR Part 15, ANSI C63.10:2009, RSP-100 Issue 9. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

5.1 Conducted Output Power, FCC 15.407

5.1.1 For systems using digital modulation 5725–5850 in the MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

5.1.2 Test Over View

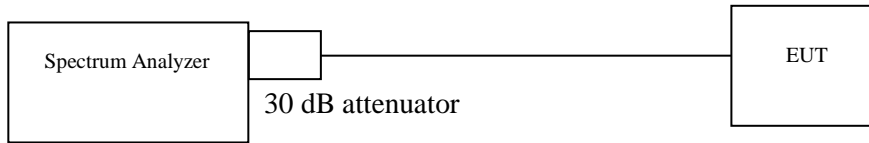
Results	Complies (as tested per this report)				Date	6/27/2015	
Standard	FCC Part 15.407						
Product	RF-7800W			Serial#	A00451		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	Power over Ethernet	Temp	22° C	Humidity	32%	Pressure	1010mbar
Perf. Criteria	(Below Limit)			Perf. Verification	Readings Under Limit		
Mod. to EUT	None			Test Performed By	Randall E Masline		

5.1.3 Test Procedure

The peak output power was measured at the low, mid and high band frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The cable loss and the attenuator was measured and added in the reference level offset in the spectrum analyzer. The spectrum analyzer's resolution bandwidth was greater than the 20dB bandwidth of the modulated carrier and the video bandwidth was equal to the resolution bandwidth.

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Test Setup:



5.1.4 Deviations

There were no deviations from the test methodology listed in the test plan for the Power output test.

5.1.5 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

5.1.6 Antenna gain and power specifications from 15.407 (3)

This system uses fixed point to point antennas with higher gain antennas over 6 dBi and is professionally installed.

(3) For the band [5.725-5.85 GHz](#), the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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5.1.7 Average Power Output



Marker 1 [T1]

RBW 1 MHz RF Att 10 dB

Ref Lvl

8.64 dBm

VBW 3 MHz

30.5 dBm

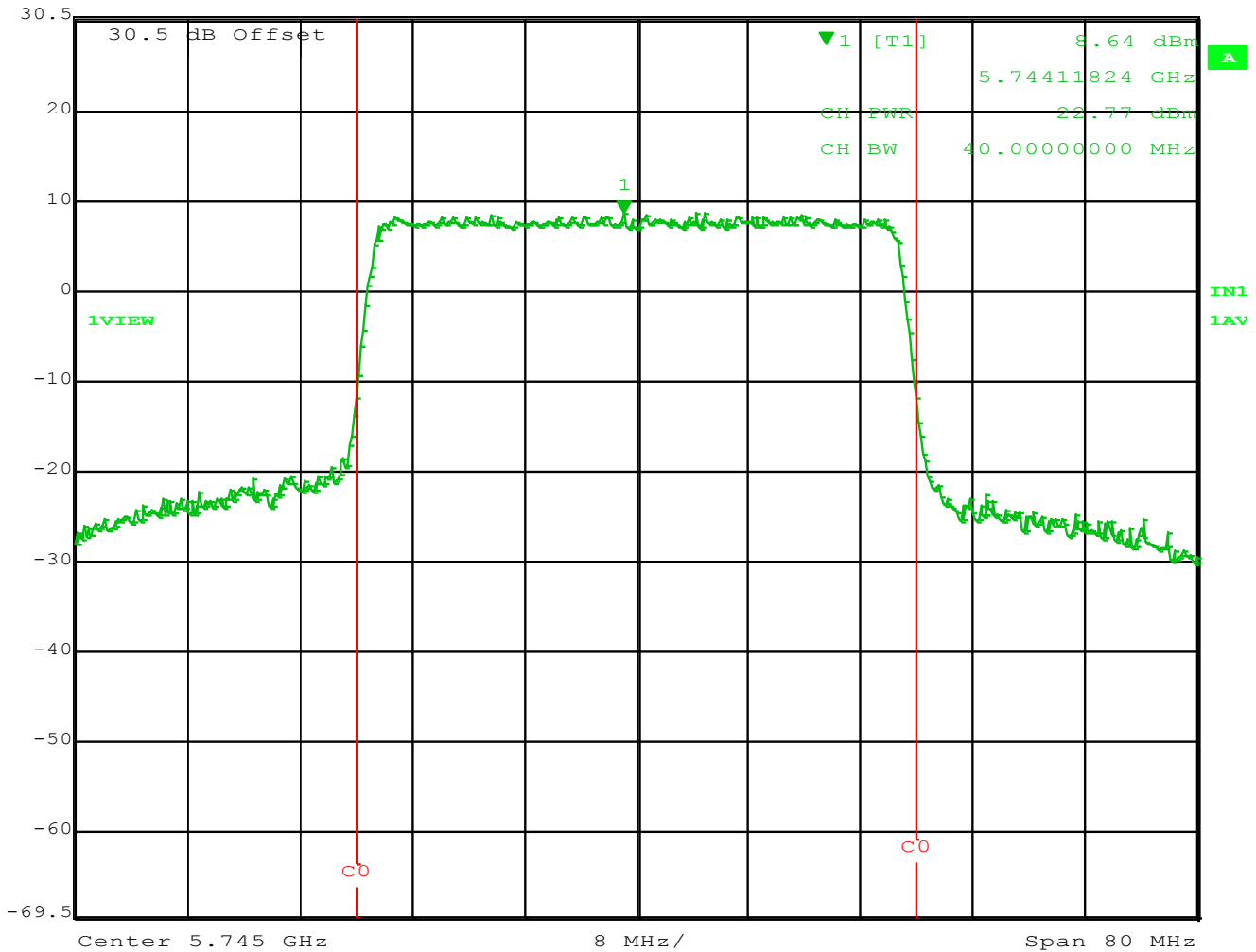
5.74411824 GHz

SWT

5 ms

Unit

dBm



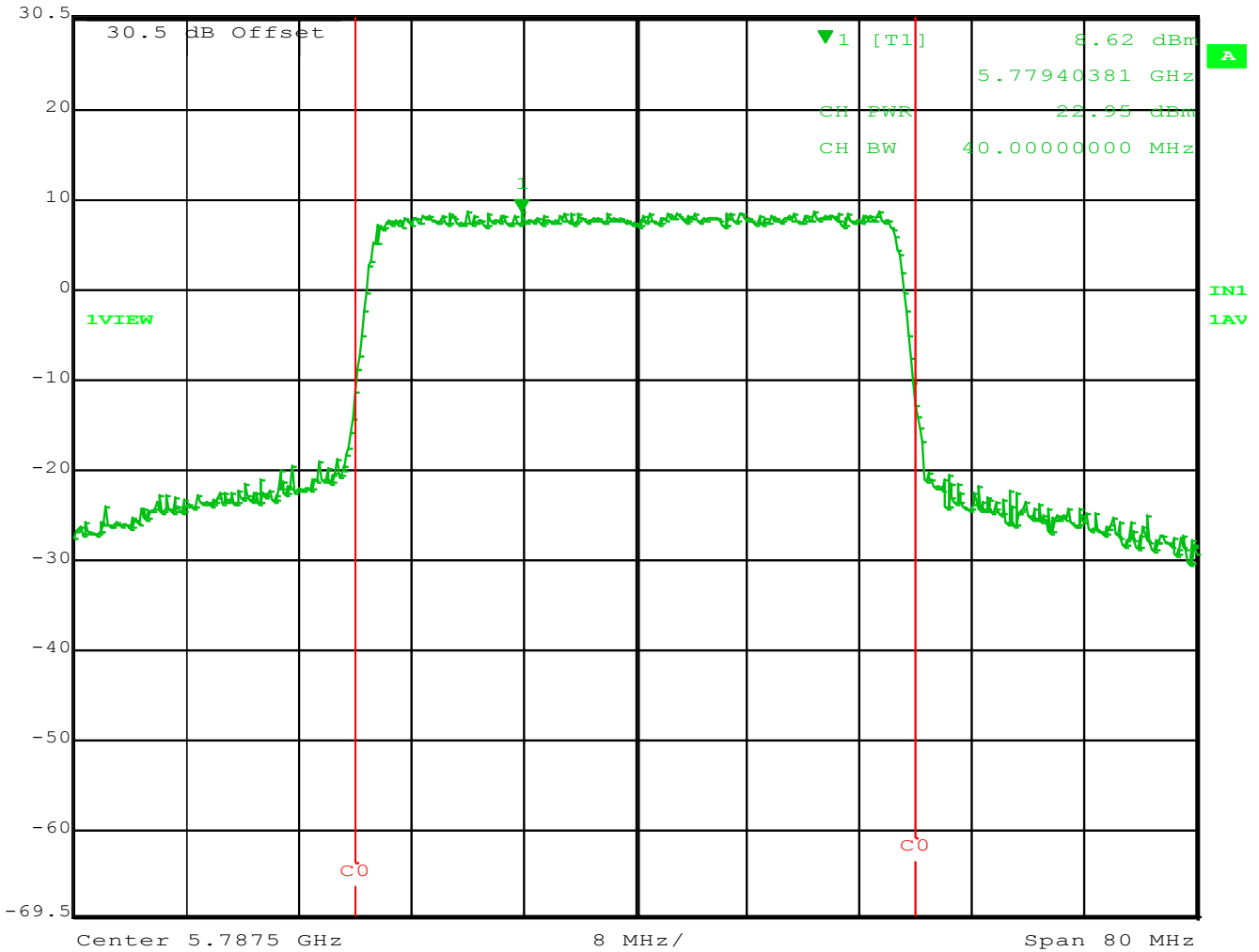
Date: 1.JUL.2015 12:05:49

Figure 1 – Highest Peak Conducted Power Output for Lowest Channel at 5745 MHz using a 40 MHz Bandwidth.

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.



Ref Lvl	30.5 dBm	Marker 1 [T1]	8.62 dBm	RBW	1 MHz	RF Att	10 dB
			5.77940381 GHz	VBW	3 MHz		
				SWT	5 ms	Unit	dBm



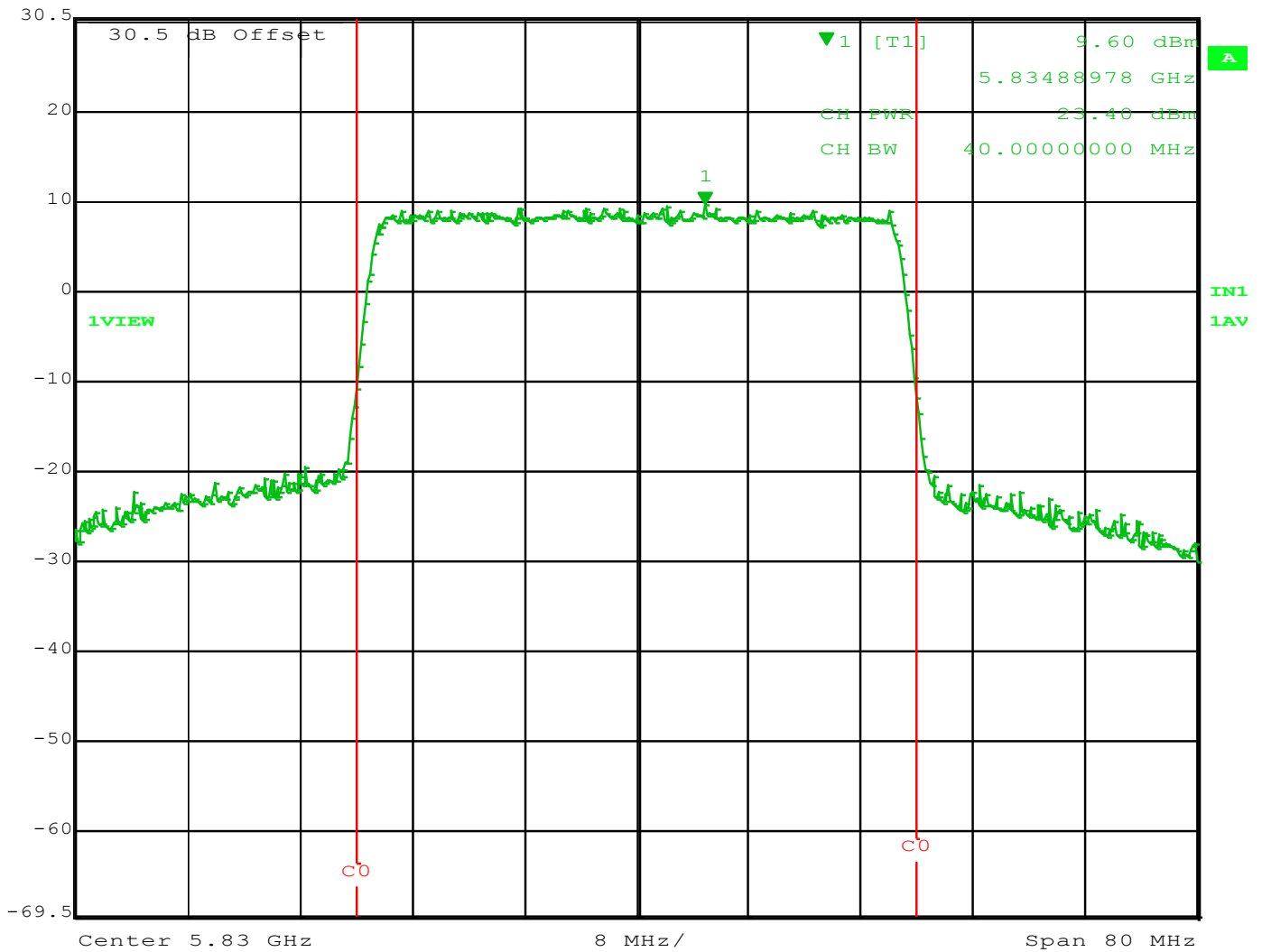
Date: 1.JUL.2015 12:07:14

Figure 2 – Highest Peak Conducted Power Output for Mid Channel at 5787.5 MHz using a 40 MHz Bandwidth.

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Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
Ref Lvl	9.60 dBm	VBW	3 MHz	
30.5 dBm	5.83488978 GHz	SWT	5 ms	Unit dBm



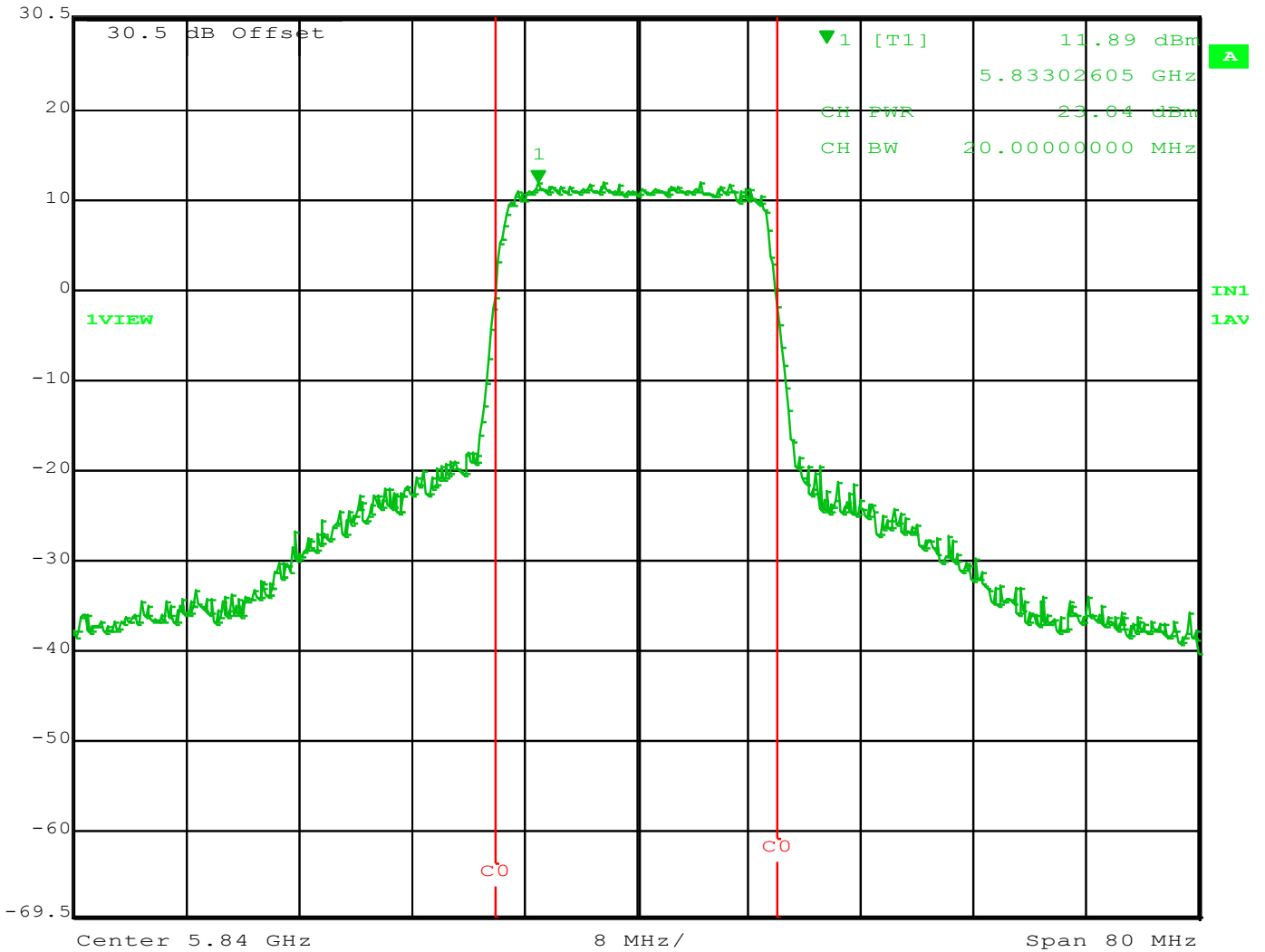
Date: 1.JUL.2015 12:08:17

Figure 3 – Highest Peak Conducted Power Output for Highest Channel at 5830 MHz using a 40 MHz Bandwidth.

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Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
Ref Lvl	11.89 dBm	VBW	3 MHz	
30.5 dBm	5.83302605 GHz	SWT	5 ms	Unit dBm



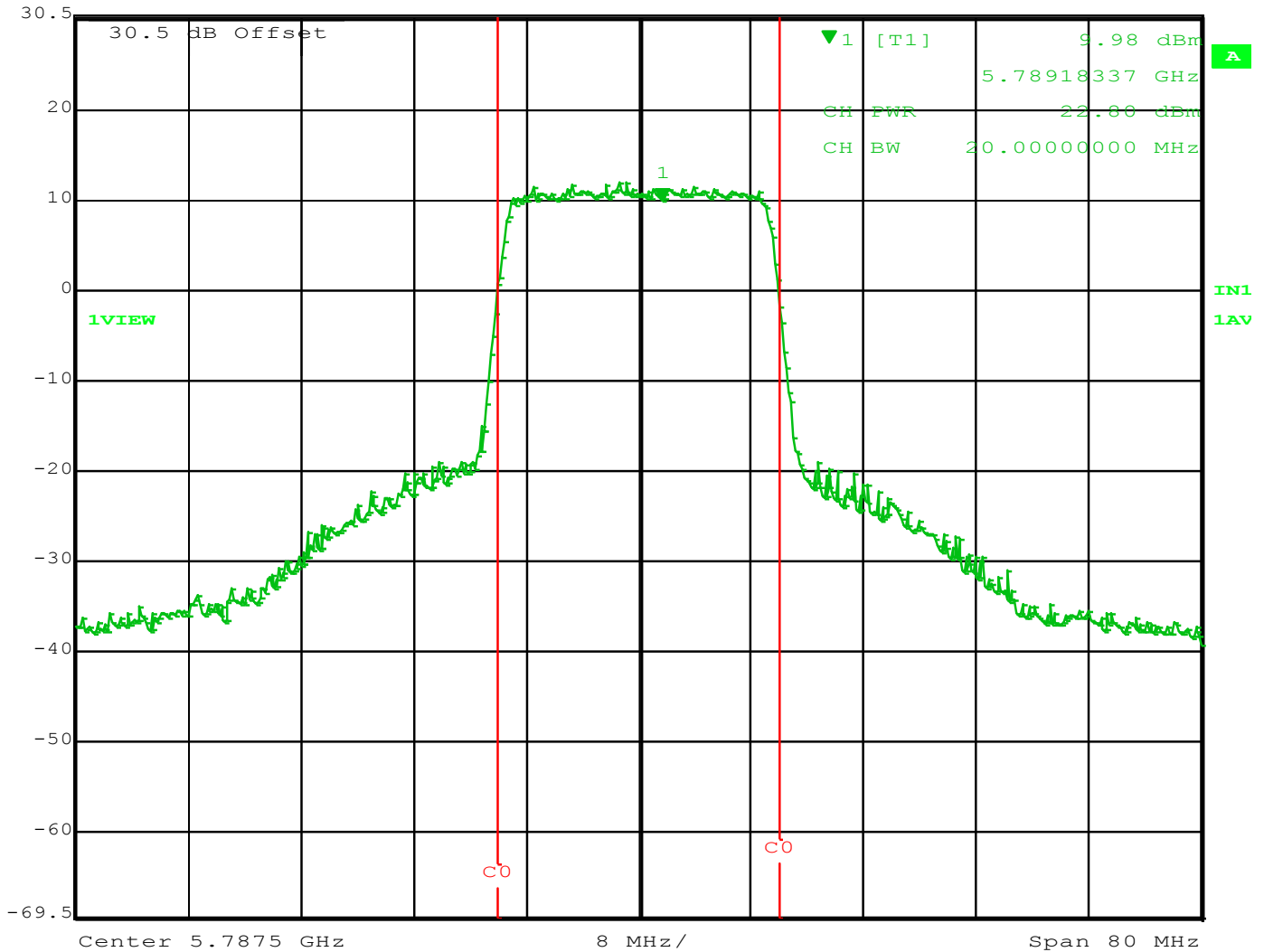
Date: 1.JUL.2015 12:15:45

Figure 4 – Highest Peak Conducted Power Output for Highest Channel at 5840 MHz using a 20 MHz Bandwidth.

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Ref Lvl	30.5 dBm	Marker 1 [T1]	9.98 dBm	RBW	1 MHz	RF Att	10 dB
			5.78918337 GHz	VBW	3 MHz		
				SWT	5 ms	Unit	dBm



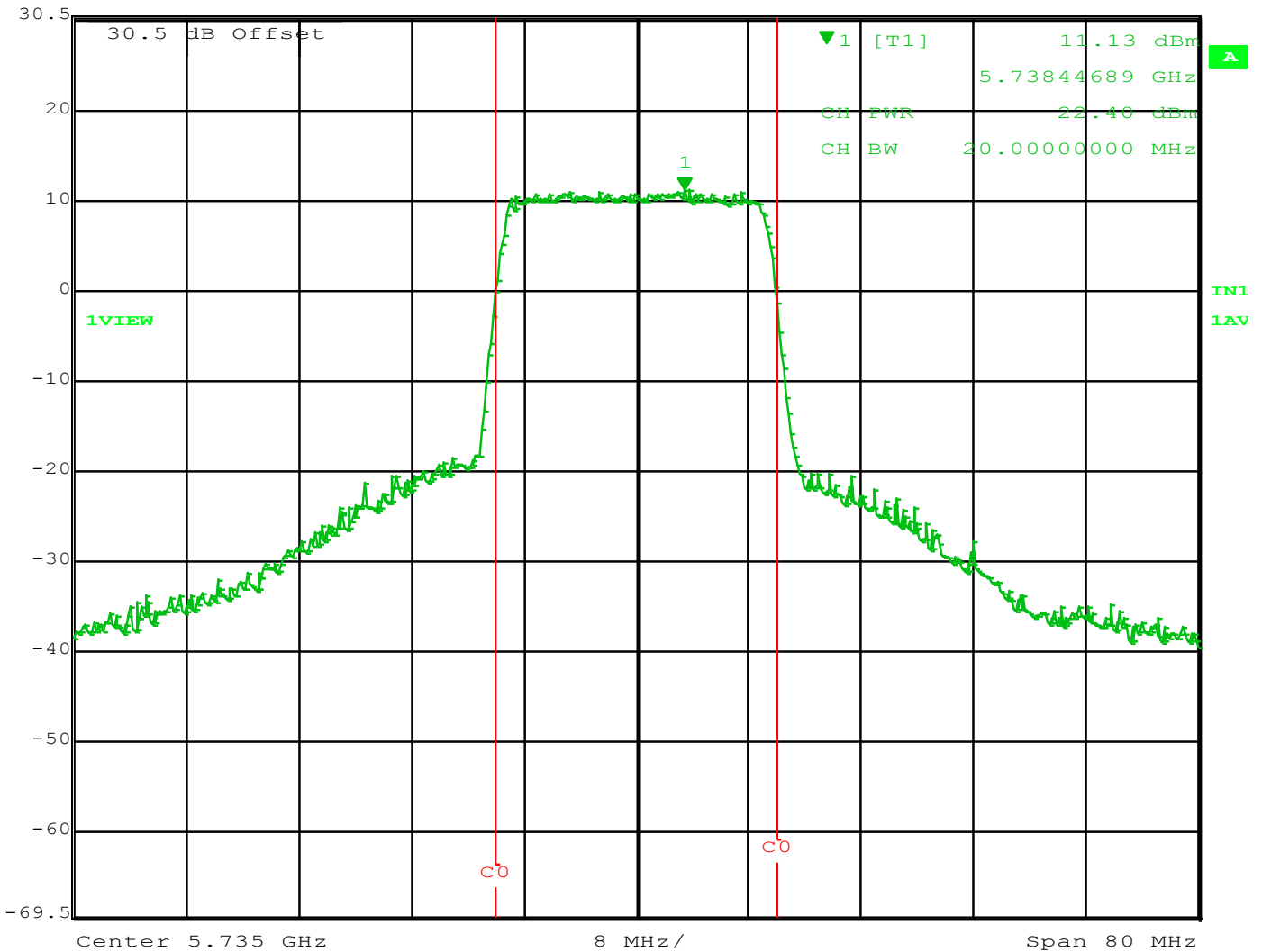
Date: 1.JUL.2015 12:14:15

Figure 5 – Highest Peak Conducted Power Output for Mid Channel at 5787.5 MHz using a 20 MHz Bandwidth.

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Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
Ref Lvl	11.13 dBm	VBW	3 MHz	
30.5 dBm	5.73844689 GHz	SWT	5 ms	Unit dBm



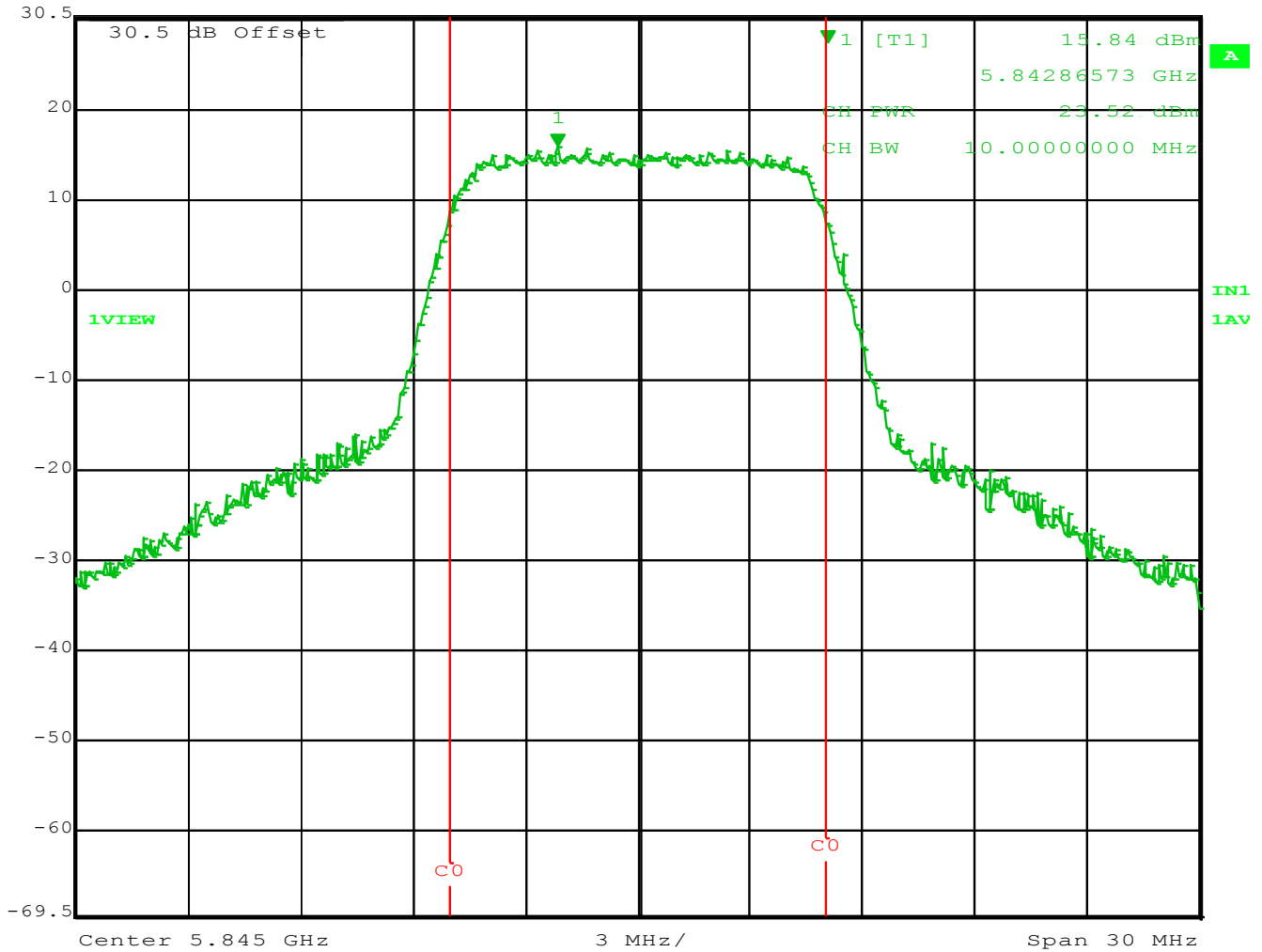
Date: 1.JUL.2015 12:10:23

Figure 6 – Highest Peak Conducted Power Output for Lowest Channel at 5735 MHz using a 20 MHz Bandwidth.

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Marker 1 [T1] RBW 1 MHz RF Att 10 dB
 Ref Lvl 15.84 dBm VBW 3 MHz
 30.5 dBm 5.84286573 GHz SWT 5 ms Unit dBm



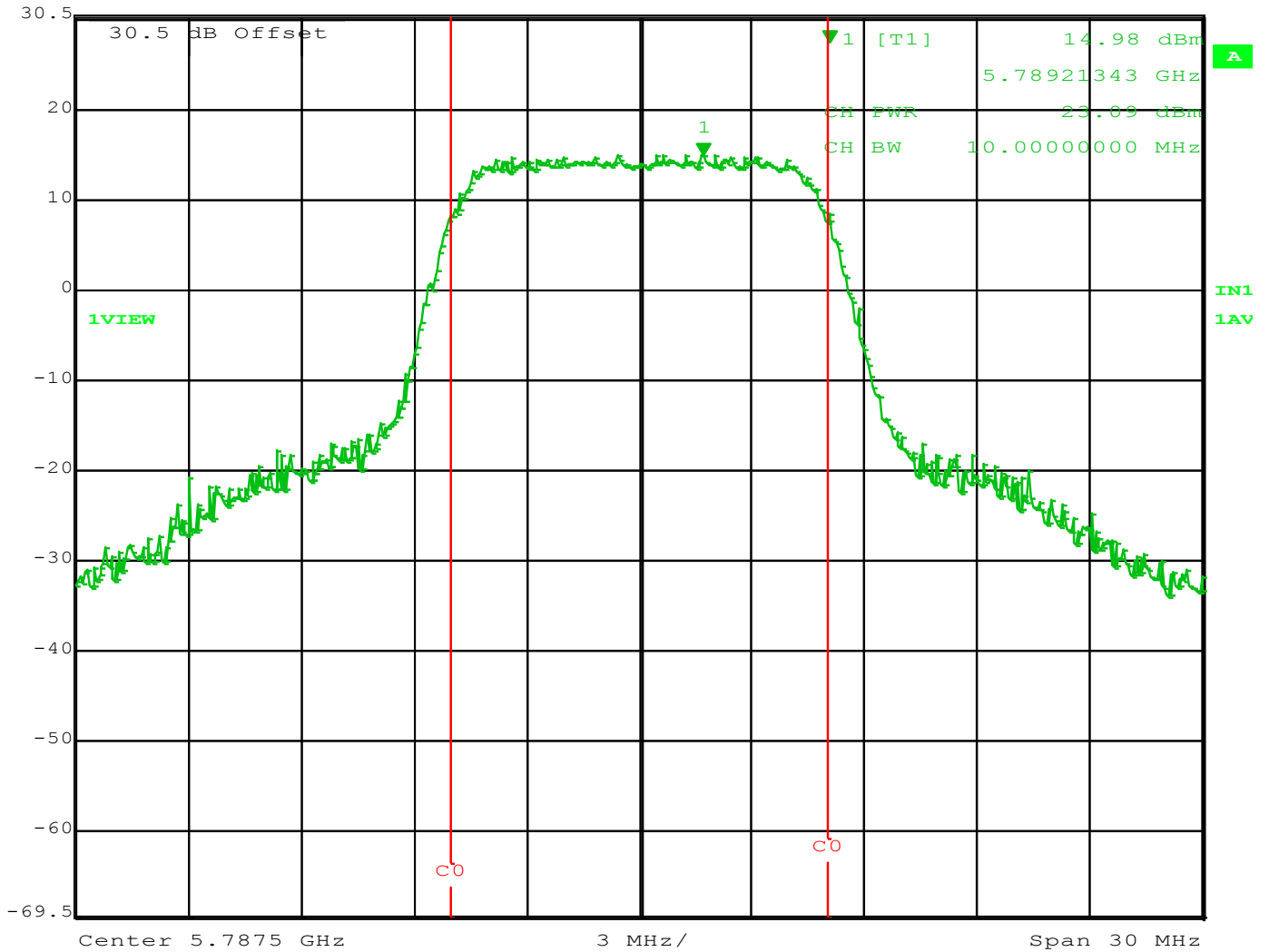
Date: 1.JUL.2015 12:20:17

Figure 7 – Highest Peak Conducted Power Output for Highest Channel at 5845 MHz using a 10 MHz Bandwidth.

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Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
Ref Lvl	14.98 dBm	VBW	3 MHz	
30.5 dBm	5.78921343 GHz	SWT	5 ms	Unit dBm



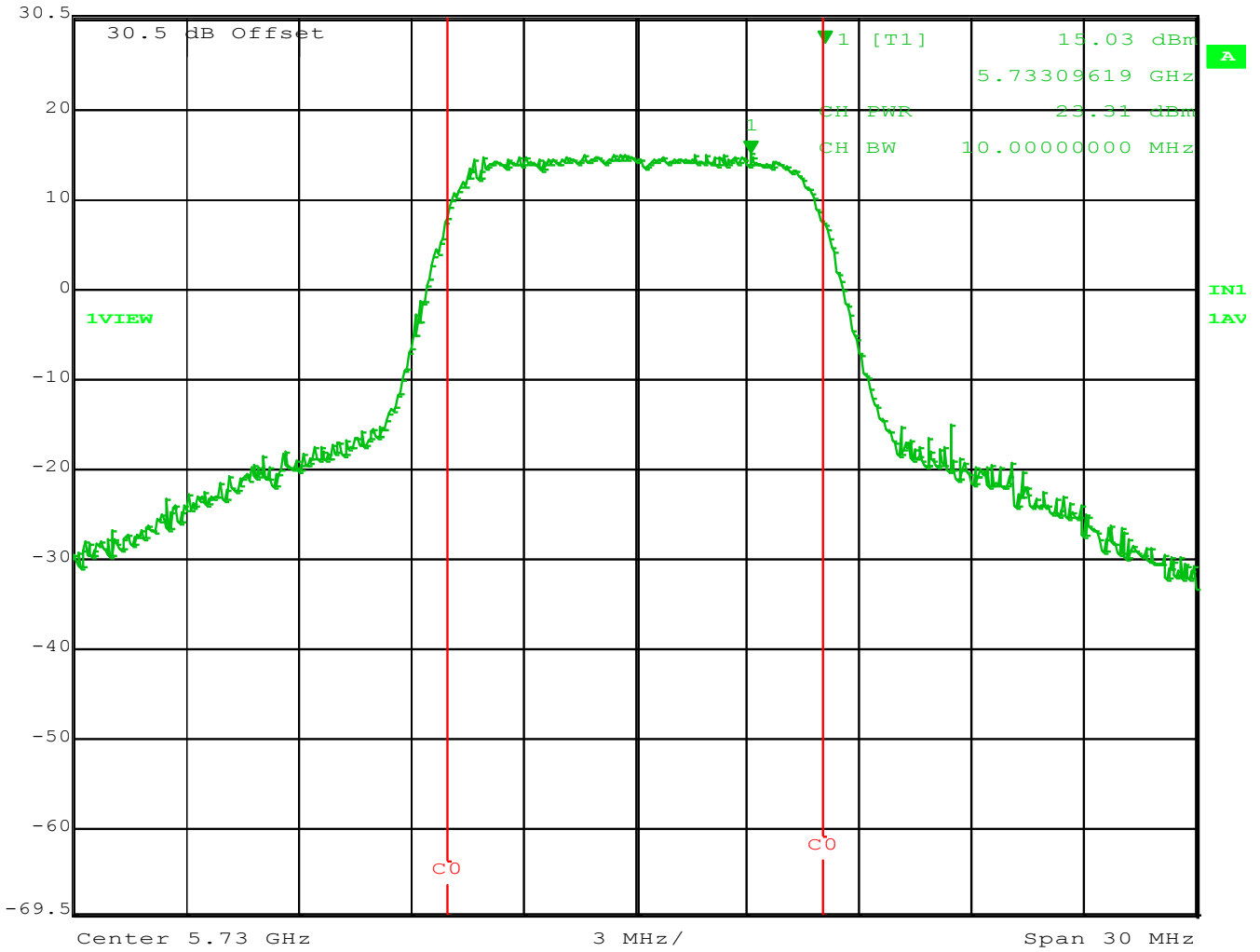
Date: 1.JUL.2015 12:19:17

Figure 8 – Highest Peak Conducted Power Output for Highest Channel at 5787.5 MHz using a 10 MHz Bandwidth.

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Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
Ref Lvl	15.03 dBm	VBW	3 MHz	
30.5 dBm	5.73309619 GHz	SWT	5 ms	Unit dBm



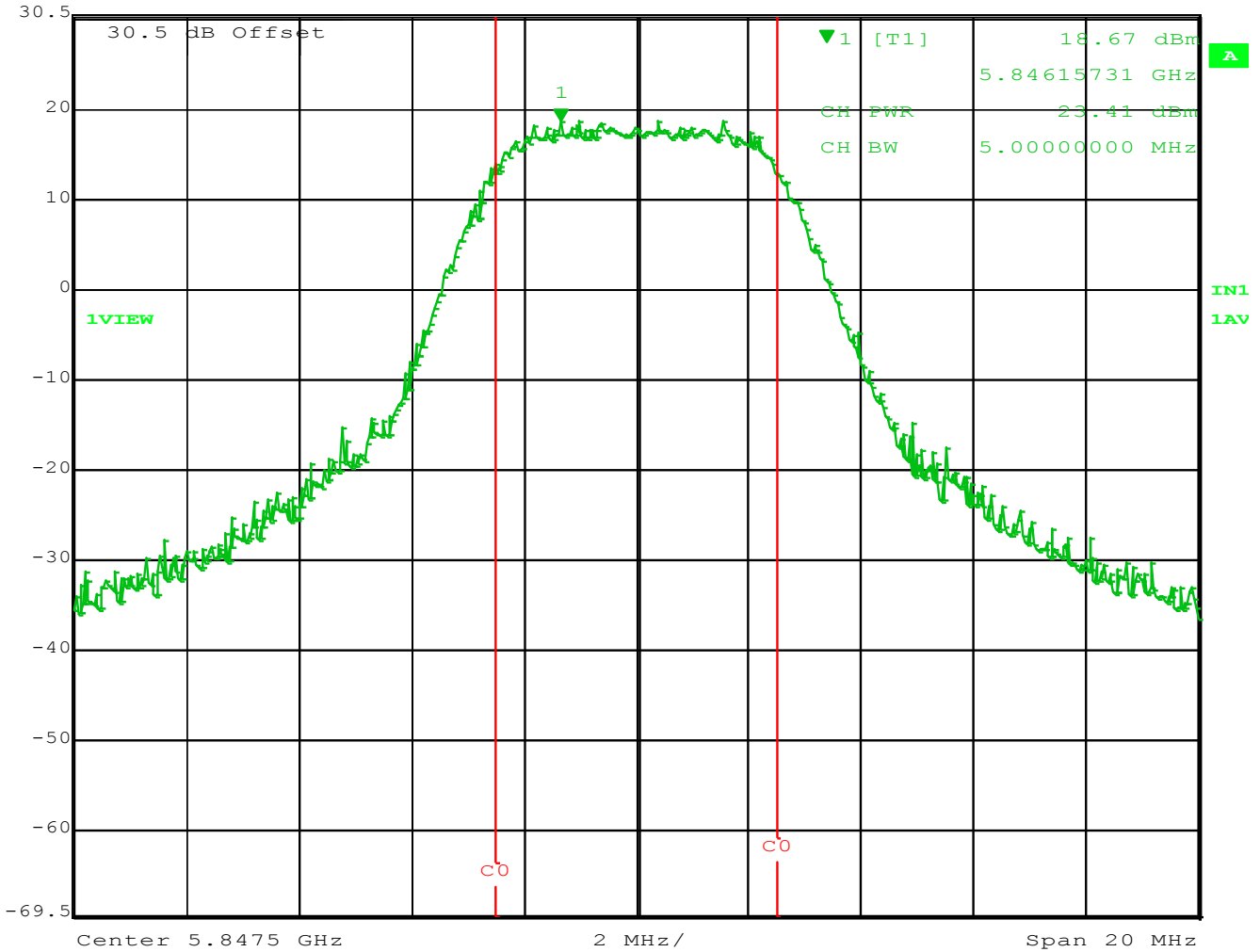
Date: 1.JUL.2015 12:17:59

Figure 9 – Highest Peak Conducted Power Output for Lowest Channel at 5730 MHz using a 10 MHz Bandwidth.

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	1 MHz	RF Att	10 dB
Ref Lvl	18.67 dBm	VBW	3 MHz	
30.5 dBm	5.84615731 GHz	SWT	5 ms	Unit dBm



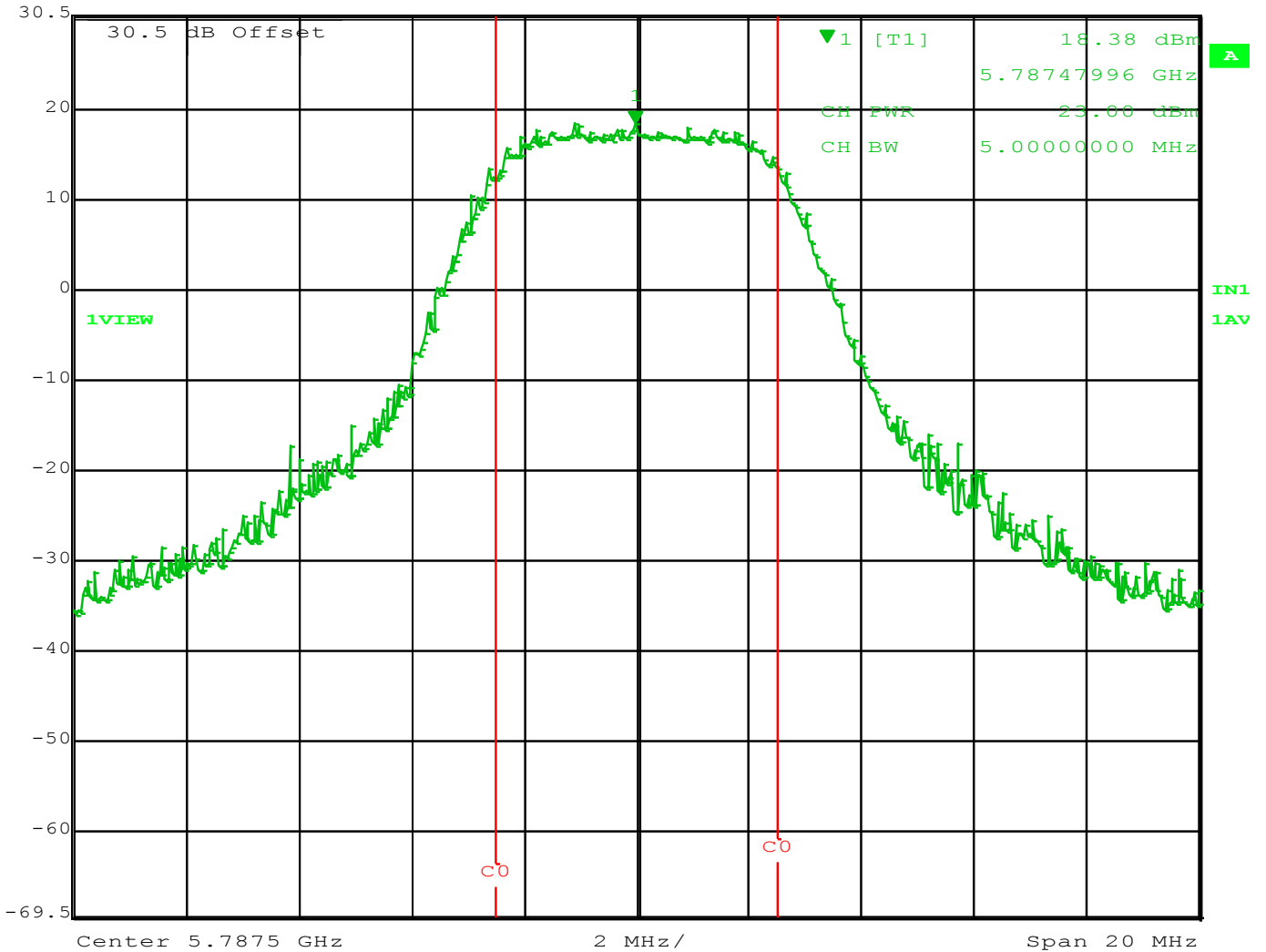
Date: 1.JUL.2015 12:30:01

Figure 10 – Highest Peak Conducted Power Output for Highest Channel at 5847.5 MHz using a 5 MHz Bandwidth.

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Ref Lvl	30.5 dBm	Marker 1 [T1]	18.38 dBm	RBW	1 MHz	RF Att	10 dB
			5.78747996 GHz	VBW	3 MHz		
				SWT	5 ms	Unit	dBm



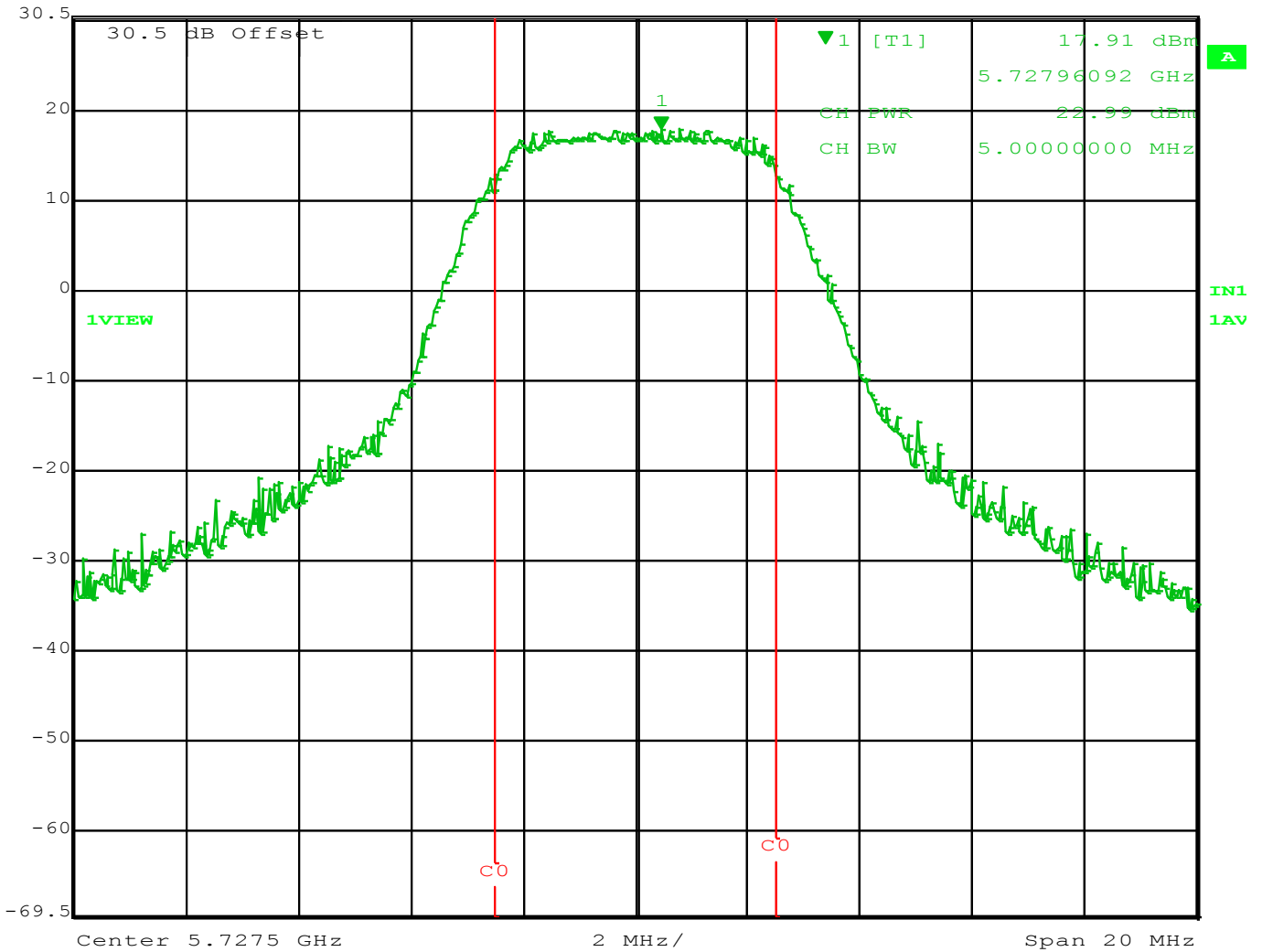
Date: 1.JUL.2015 12:28:04

Figure 11 – Highest Peak Conducted Power Output for Highest Channel at 5787.5 MHz using a 5 MHz Bandwidth.

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Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
Ref Lvl	17.91 dBm	VBW	3 MHz	
30.5 dBm	5.72796092 GHz	SWT	5 ms	Unit dBm



Date: 1.JUL.2015 12:27:00

Figure 12 – Highest Peak Conducted Power Output for Lowest Channel at 5727.5 MHz using a 5 MHz Bandwidth.

Results

As tested, the EUT was found to be compliant to the requirements of the test standard.

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.

5.2 Peak Power Spectral Density

5.2.1 Test Over View

Results	Complies (as tested per this report)				Date	6/27/2015	
Standard	FCC Part 15.247(e) and RSS 210 A8.2(b)						
Product	RF-7800W			Serial#	A00451		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	Power over Ethernet	Temp	22° C	Humidity	32%	Pressure	1010mbar
Perf. Criteria	Below Limit (10dBm)		Perf. Verification		≤8 dBm in any 3 kHz		
Mod. to EUT	None		Test Performed By		Randall E Masline		

5.2.2 Test Procedure

Using the methods of ANSI C63.10:2009, section 6.11.2.3 were used.

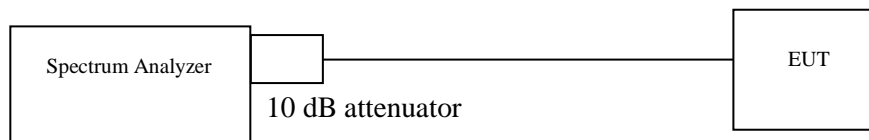
5.2.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Peak Power Spectral Density test.

5.2.4 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

Test Setup:

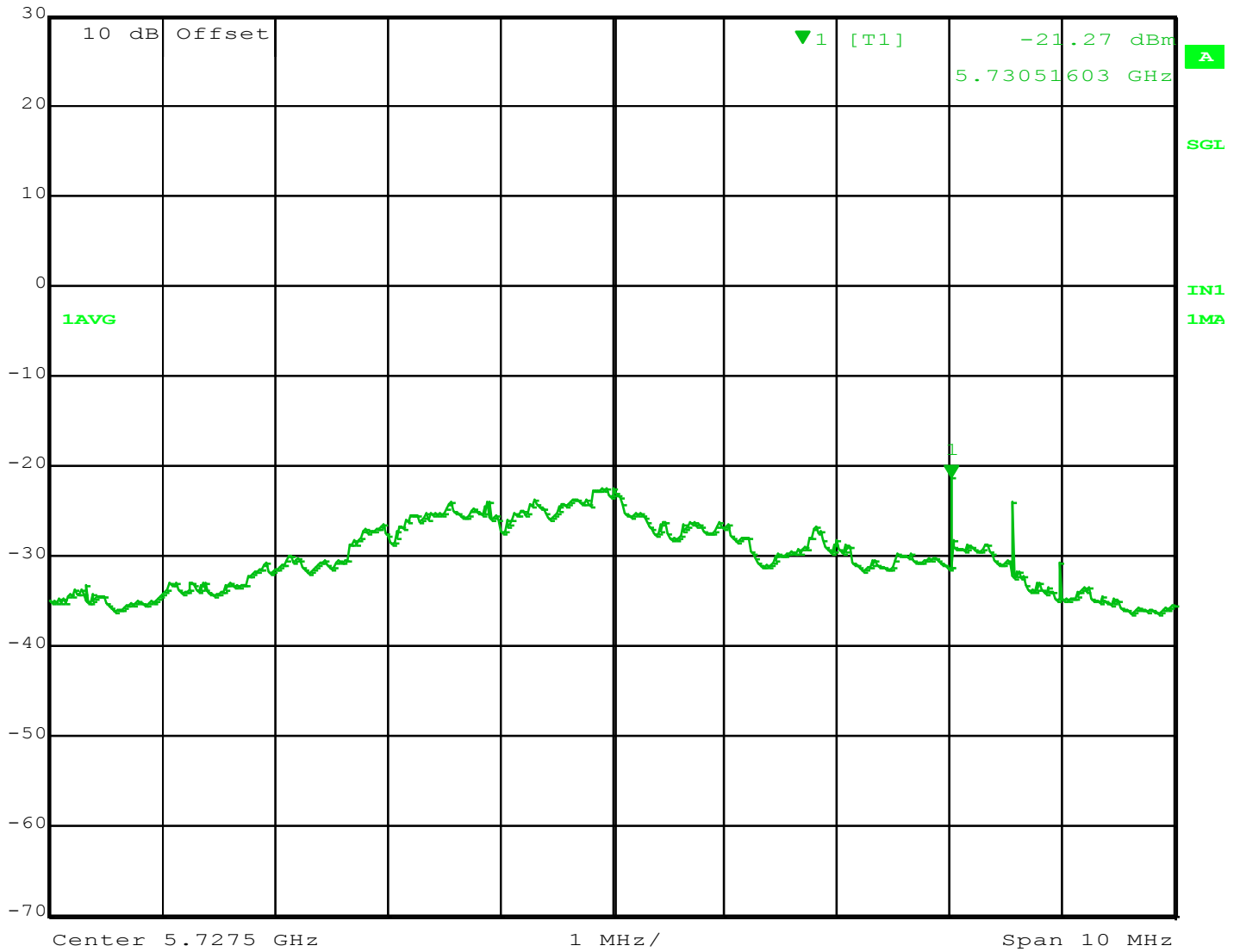


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5.2.5 Final Data



Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
30 dBm	-21.27 dBm	VBW	3 MHz		
	5.73051603 GHz	SWT	5 ms	Unit	dBm



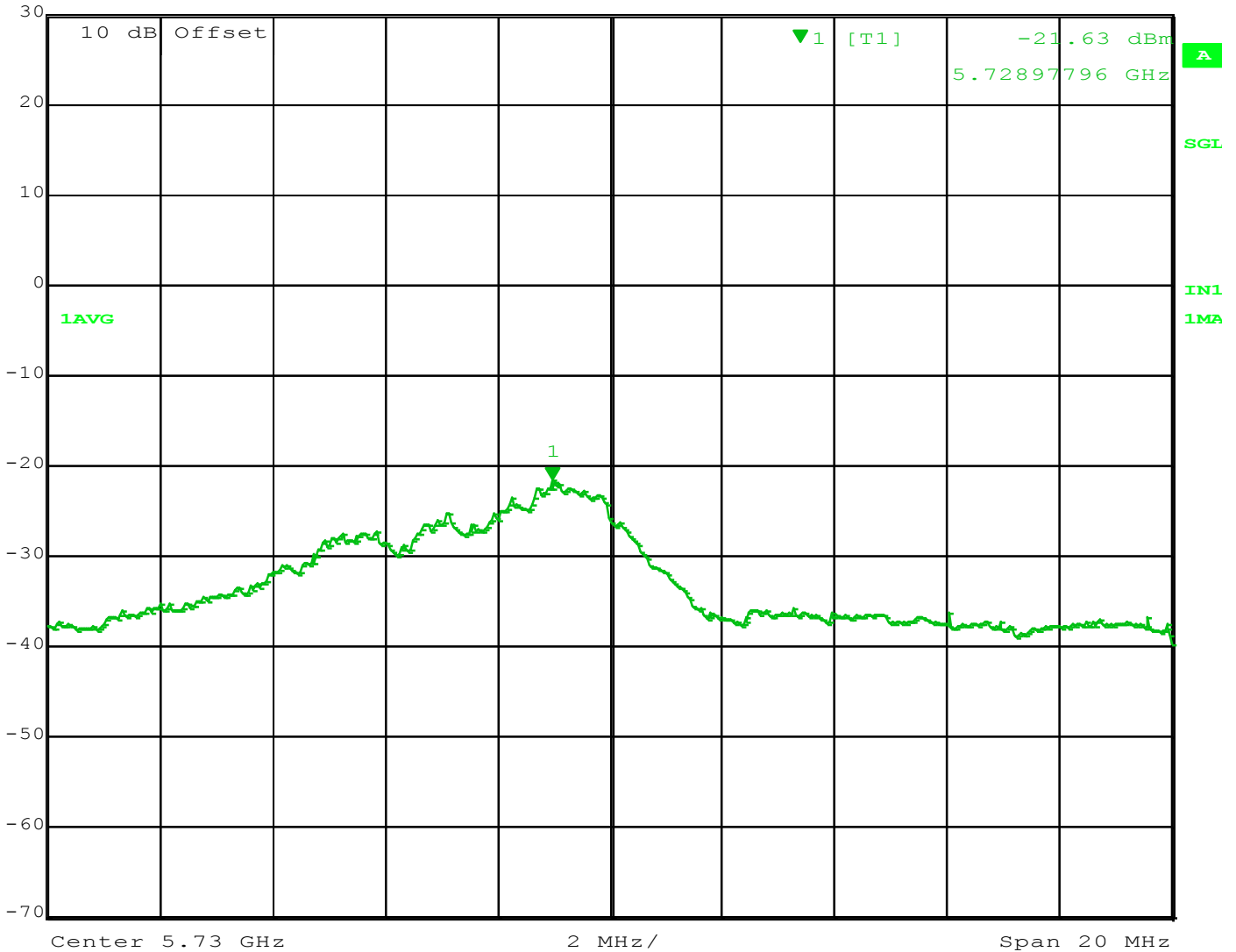
Date: 20.NOV.2015 15:49:56

Figure 13: 5727.5 MHz at 5MHz BW

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Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
Ref Lvl	-21.63 dBm	VBW	3 MHz	
30 dBm	5.72897796 GHz	SWT	5 ms	Unit dBm



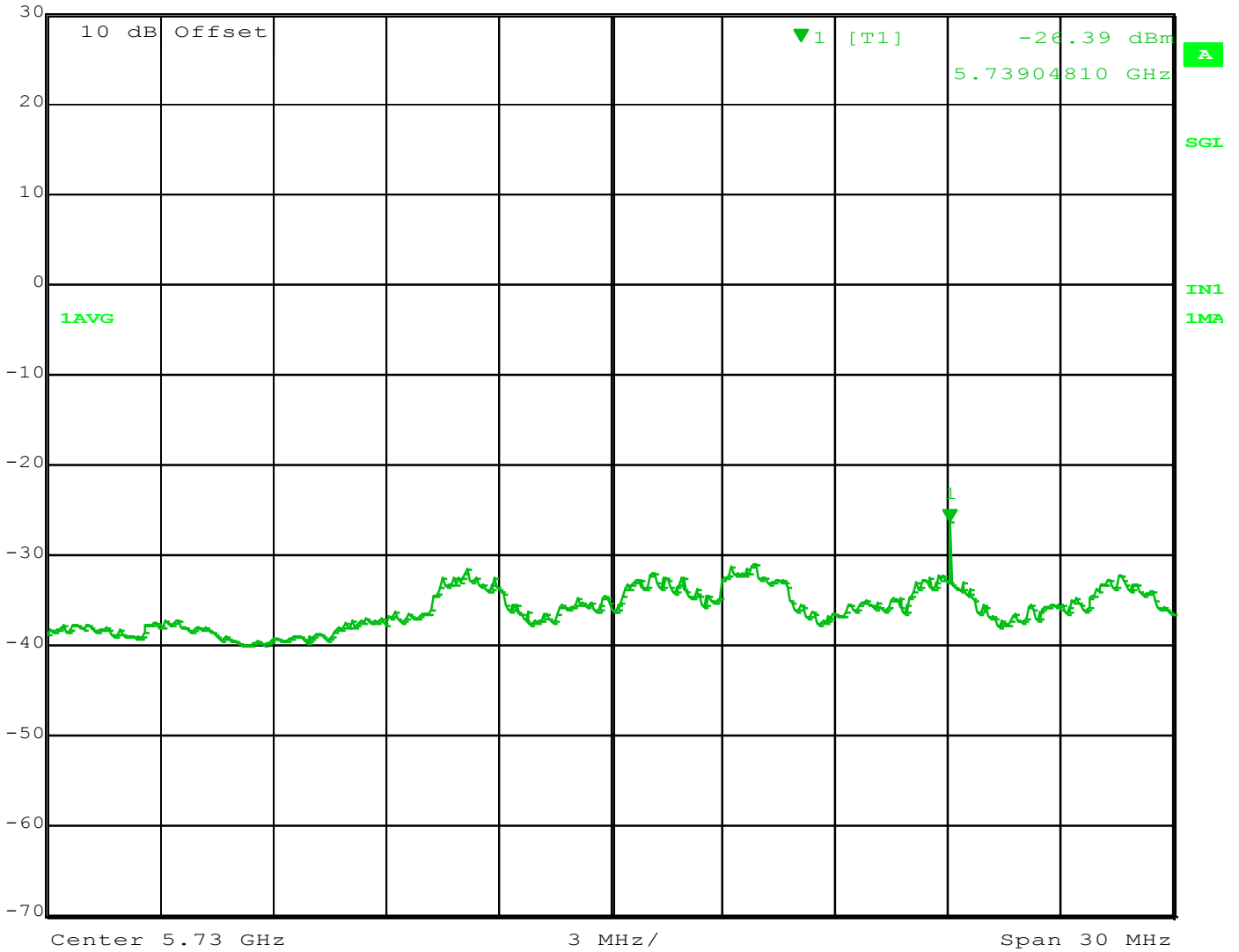
Date: 20.NOV.2015 15:51:00

Figure 14: 5730 MHz at 10 MHz BW

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Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
Ref Lvl	-26.39 dBm	VBW	3 MHz	
30 dBm	5.73904810 GHz	SWT	5 ms	Unit dBm



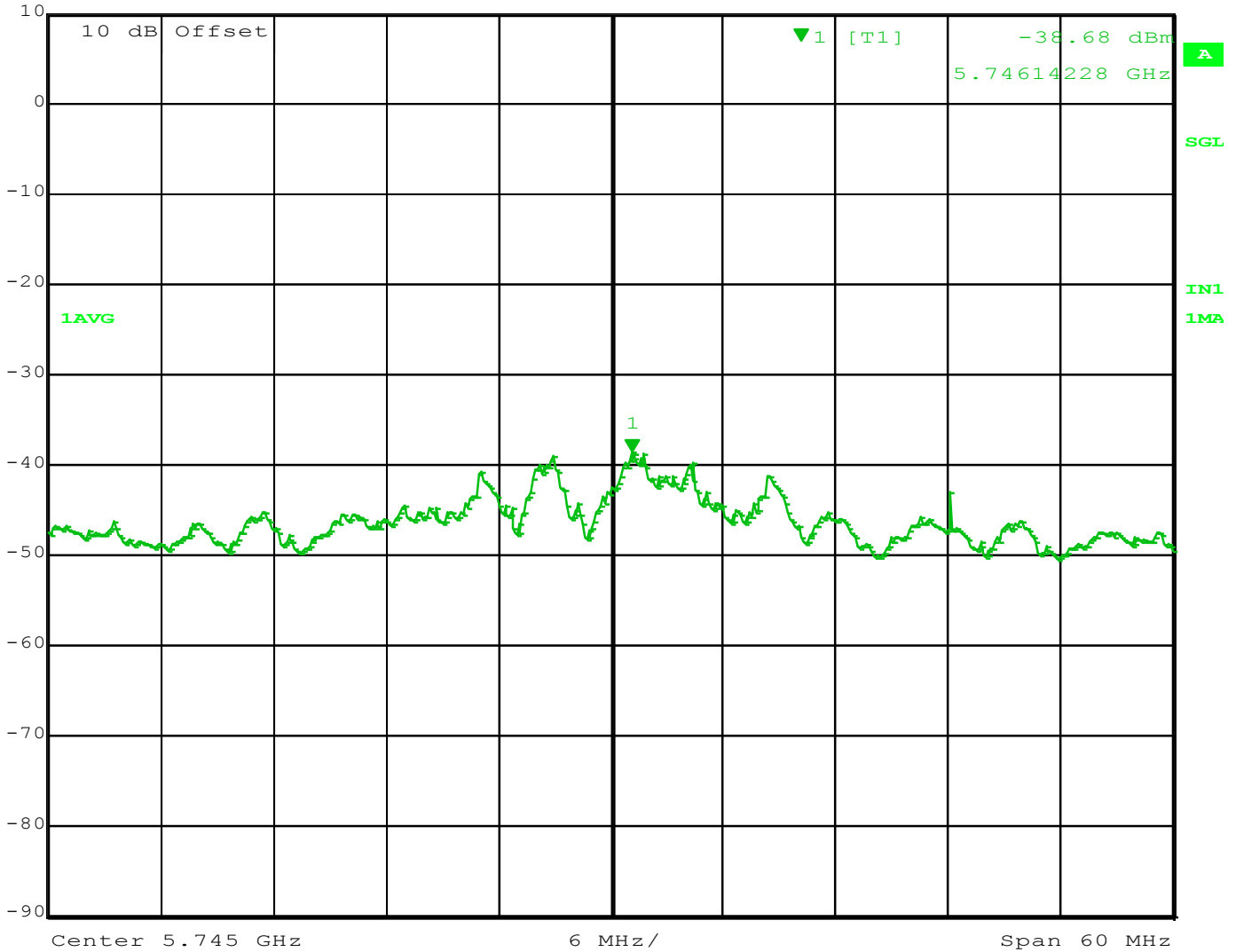
Date: 20.NOV.2015 15:52:37

Figure 15: 5735 MHz at 20 MHz BW

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.



Ref Lvl	10 dBm	Marker 1 [T1]	-38.68 dBm	RBW	1 MHz	RF Att	20 dB
			5.74614228 GHz	VBW	3 MHz		
				SWT	5 ms	Unit	dBm



Date: 20.NOV.2015 15:54:03

Figure 16: 5745 MHz at 40 MHz BW

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.

5.3 Occupied Bandwidth

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.3.1 Test Over View

Results	Complies (as tested per this report)				Date	7/1/2015	
Standard	FCC Part 15.247(a)(2)						
Product	RF-7800W			Serial#	A00451		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	Power over Ethernet	Temp	22° F	Humidity	32%	Pressure	1010 mbar
Perf. Criteria	(Below Limit)		Perf. Verification		Readings Under Limit		
Mod. to EUT	None		Test Performed By		Randall E Masline		

5.3.2 Test Procedure

Minimum allowed 6dB Bandwidth = 500 kHz

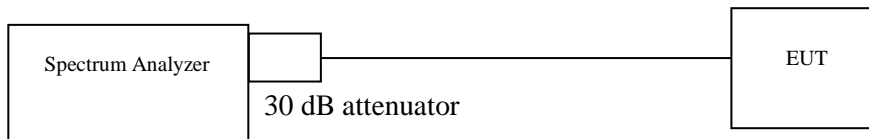
5.3.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Occupied Bandwidth test.

5.3.4 Final Test

The EUT met the performance criteria requirement as specified in the standards.

Test Setup:

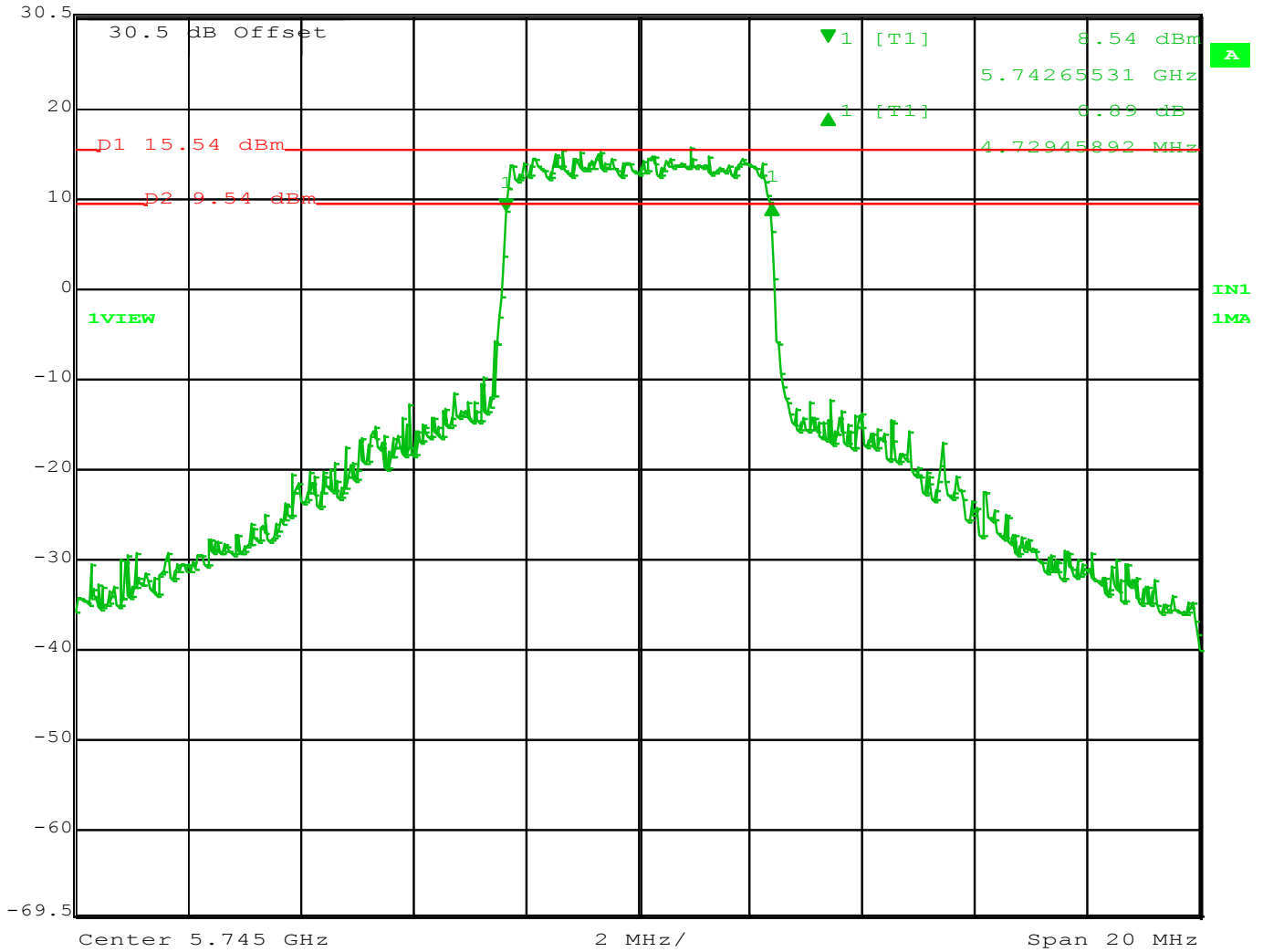


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5.3.5 Final Data



	Delta 1 [T1]	RBW	100 kHz	RF Att	10 dB
Ref Lvl	0.89 dB	VBW	100 kHz		
30.5 dBm	4.72945892 MHz	SWT	5 ms	Unit	dBm



Date: 1.JUL.2015 12:36:07

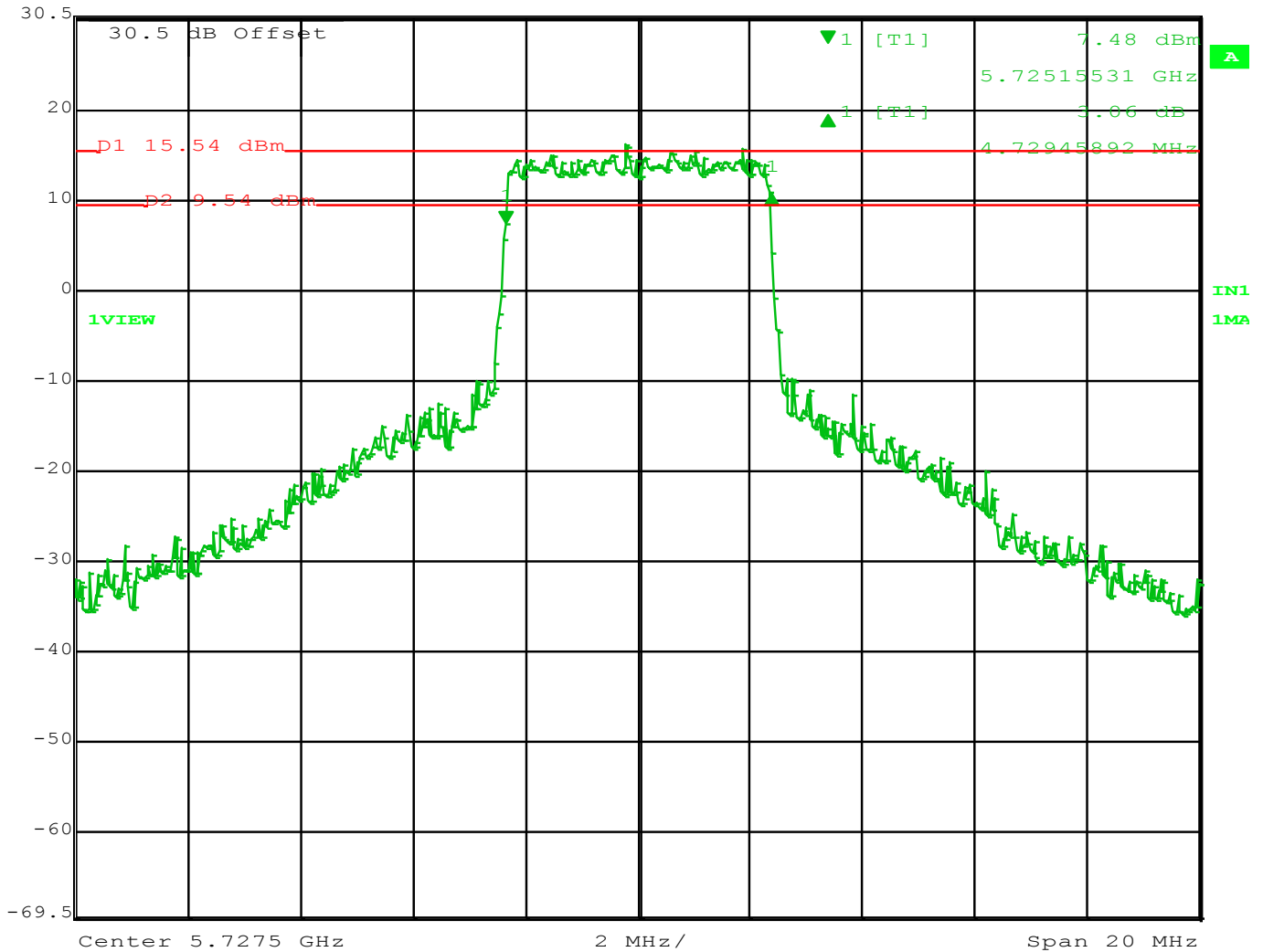
Figure 17: 6dB Occupied Bandwidth 5 MHz Channel at 5745 MHz

6dB Band width is 4.723 MHz which is > 500 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 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	10 dB
Ref Lvl	3.06 dB	VBW	100 kHz	
30.5 dBm	4.72945892 MHz	SWT	5 ms	Unit dBm



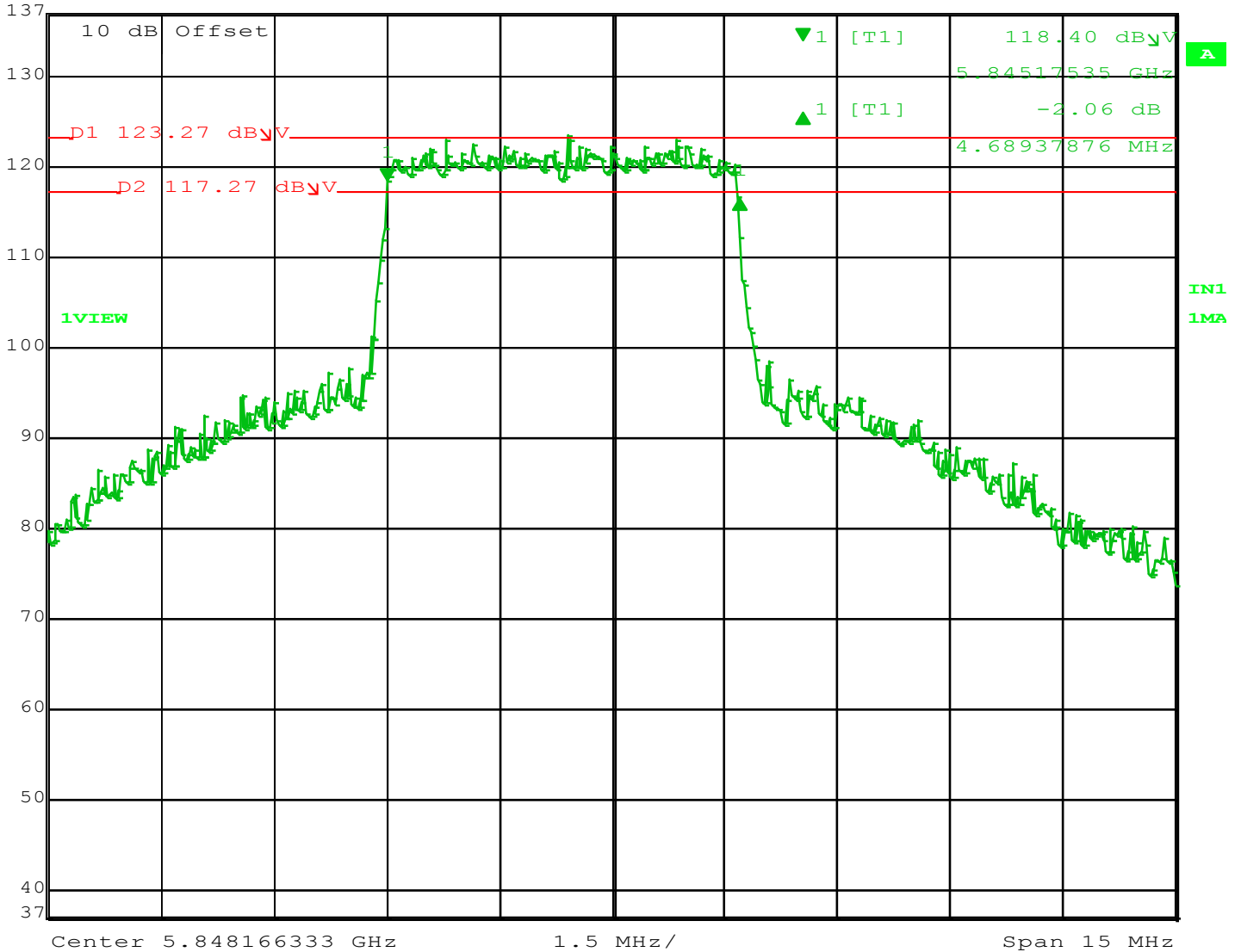
Date: 1.JUL.2015 12:37:40

Figure 18: 6dB Occupied Bandwidth 5 MHz Channel at 5727.5 MHz

6dB Band width is 4.723 MHz which is > 500 kHz

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	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
	Ref Lvl	-2.06 dB	VBW	300 kHz	
	137 dB μ V	4.68937876 MHz	SWT	5 ms	Unit dB μ V



Date: 13.NOV.2015 15:38:56

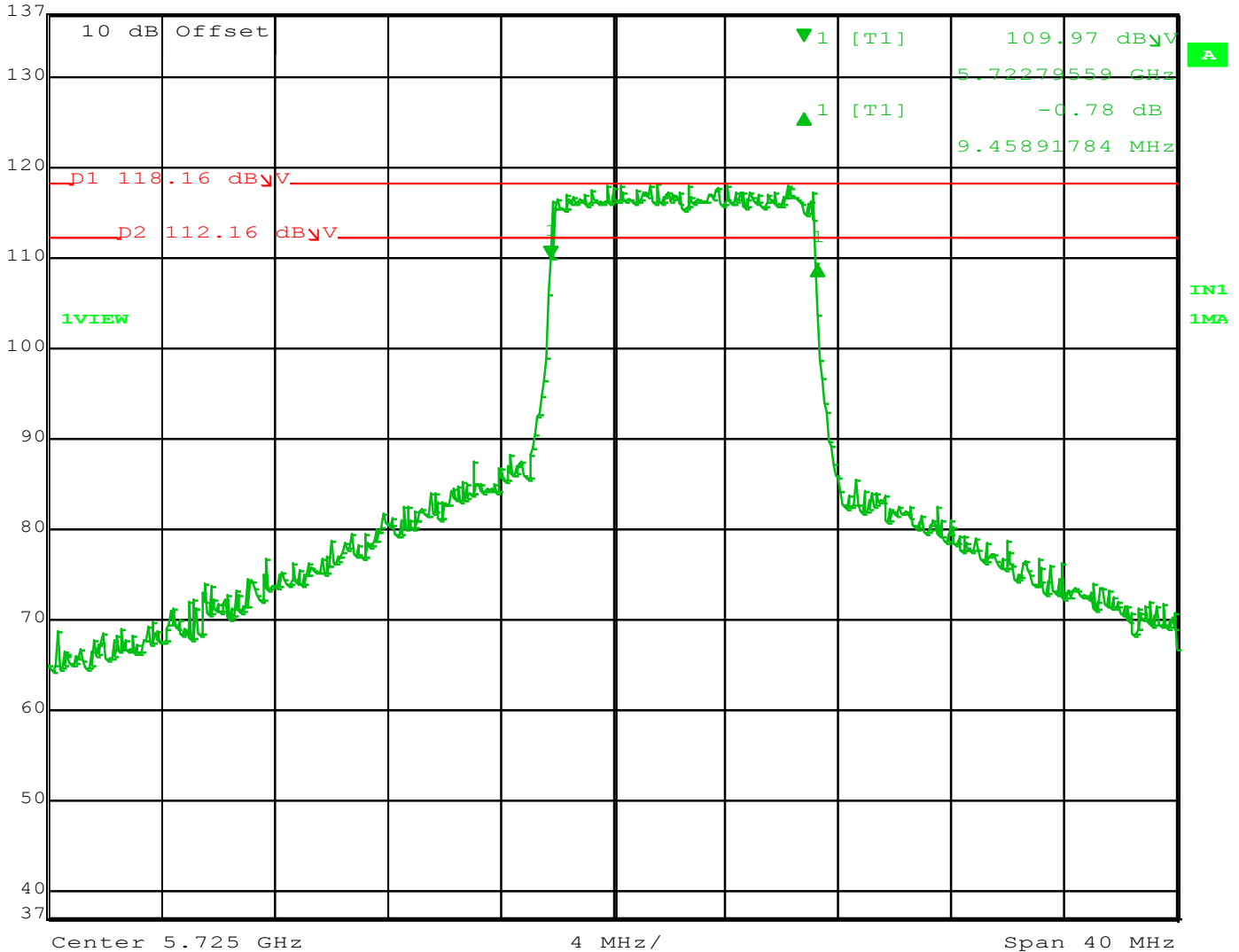
Figure 19: 6dB Occupied Bandwidth 5 MHz Channel at 5847 MHz

6dB Band width is 4.689 MHz which is > 500 kHz

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Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	-0.78 dB	VBW	300 kHz	
137 dB μ V	9.45891784 MHz	SWT	10 ms	Unit dB μ V



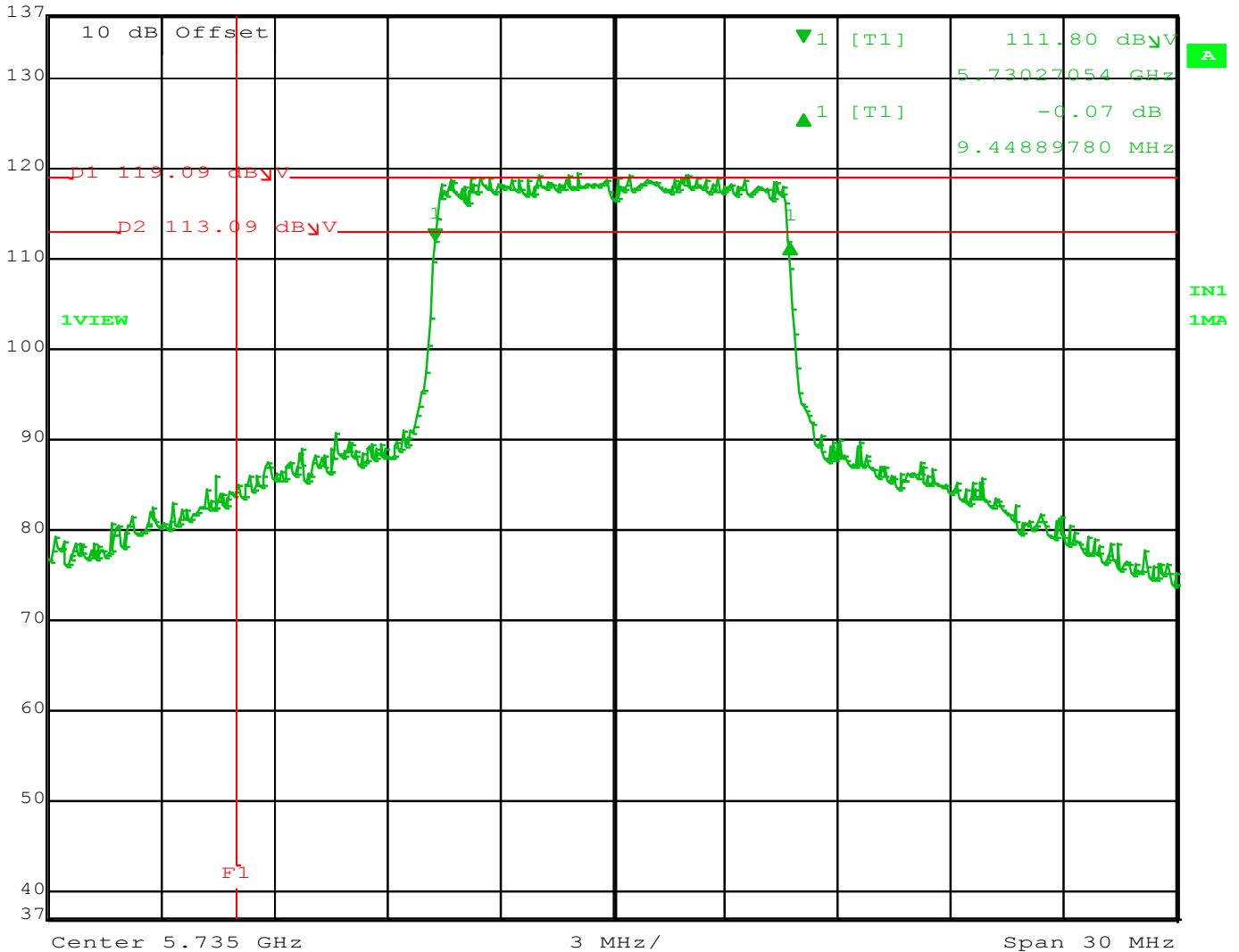
Date: 13.NOV.2015 15:19:15

Figure 20: 6dB Occupied Bandwidth 10 MHz Channel at 5725 MHz
6dB Band width is 9.458 MHz which is > 500 kHz

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Ref Lvl	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
137 dB μ V	-0.07 dB	VBW	300 kHz		
	9.44889780 MHz	SWT	7.5 ms	Unit	dB μ V

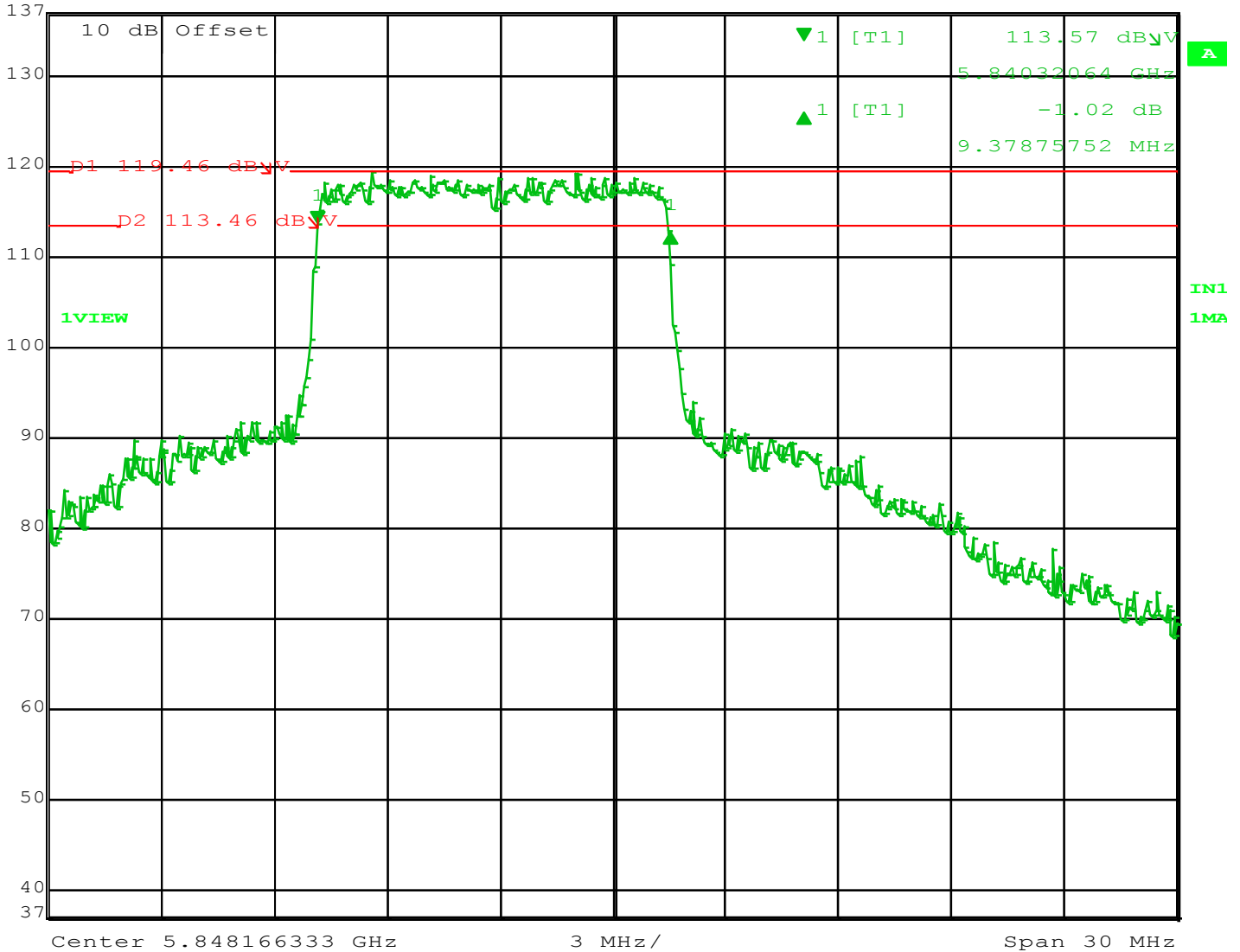


Date: 13.NOV.2015 15:25:36

Figure 21: 6dB Occupied Bandwidth 10 MHz Channel at 5735 MHz
6dB Band width is 9.448 MHz which is > 500 kHz

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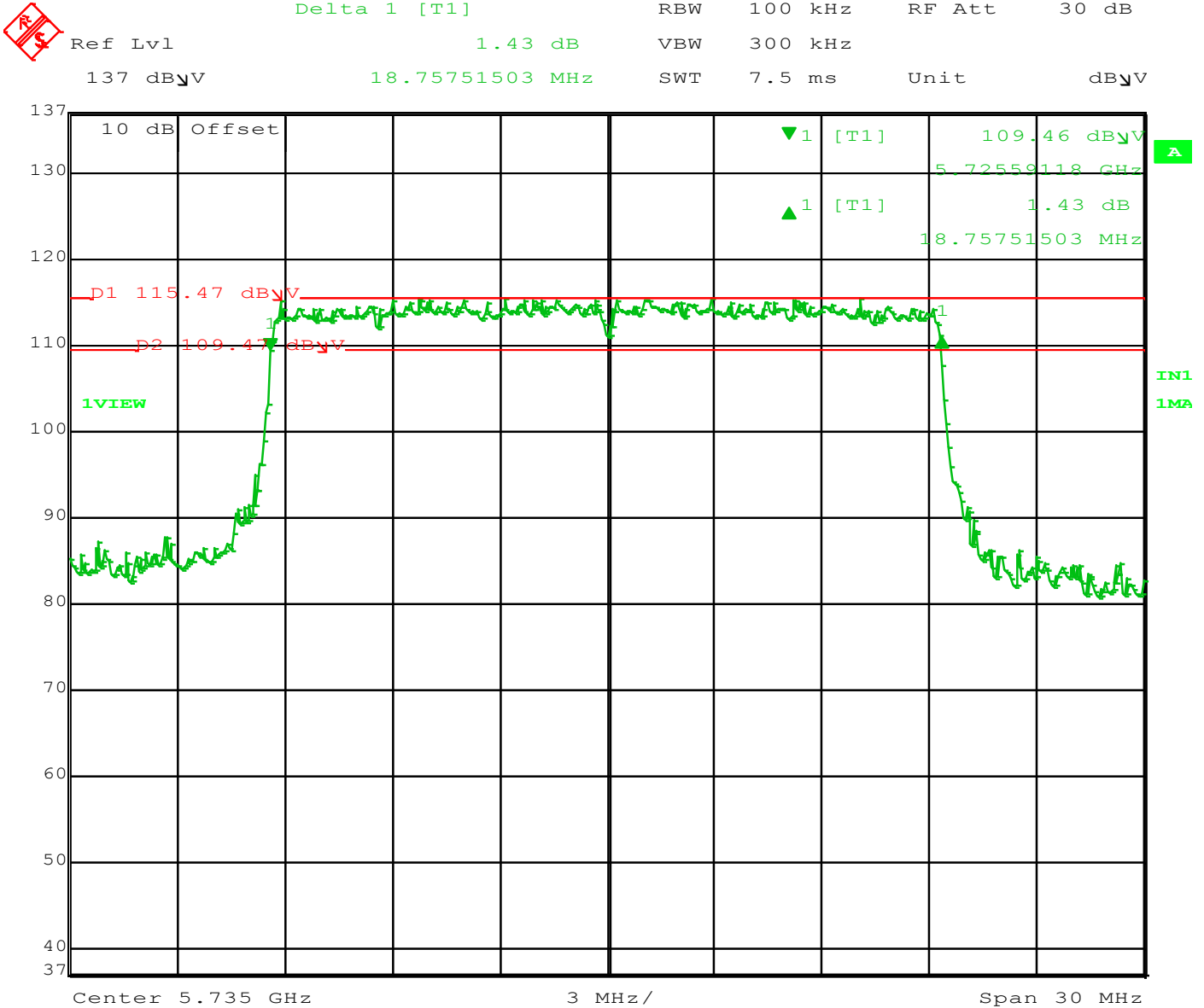
	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
	Ref Lvl	-1.02 dB	VBW	300 kHz	
	137 dBμV	9.37875752 MHz	SWT	7.5 ms	Unit dBμV



Date: 13.NOV.2015 15:42:31

Figure 22: 6dB Occupied Bandwidth 10 MHz Channel at 5845 MHz
6dB Band width is 9.378 MHz which is > 500 kHz

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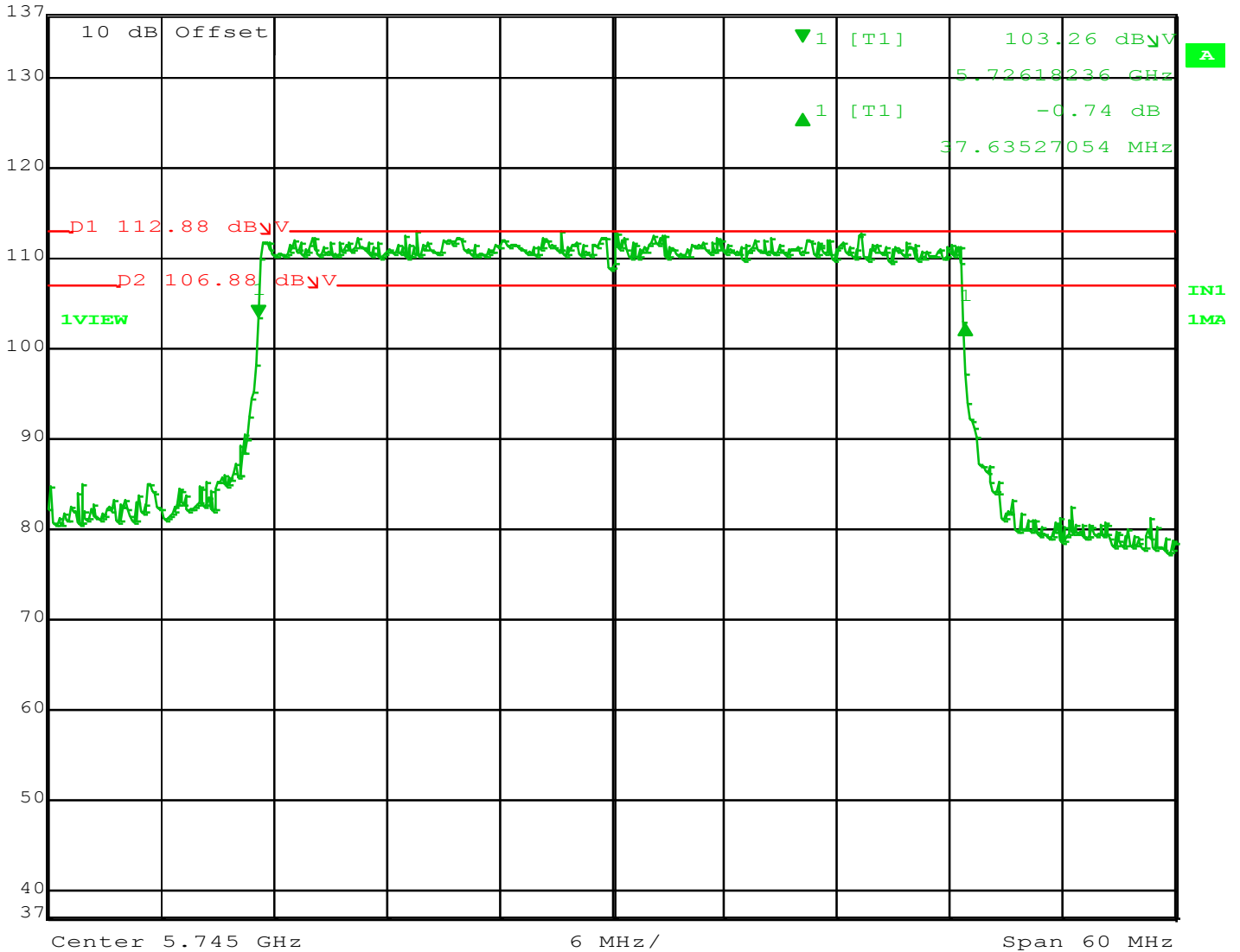
Date: 13.NOV.2015 15:28:40

Figure 23: 6dB Occupied Bandwidth 20 MHz Channel at 5735 MHz

6dB Band width is 18.757 MHz which is > 500 kHz

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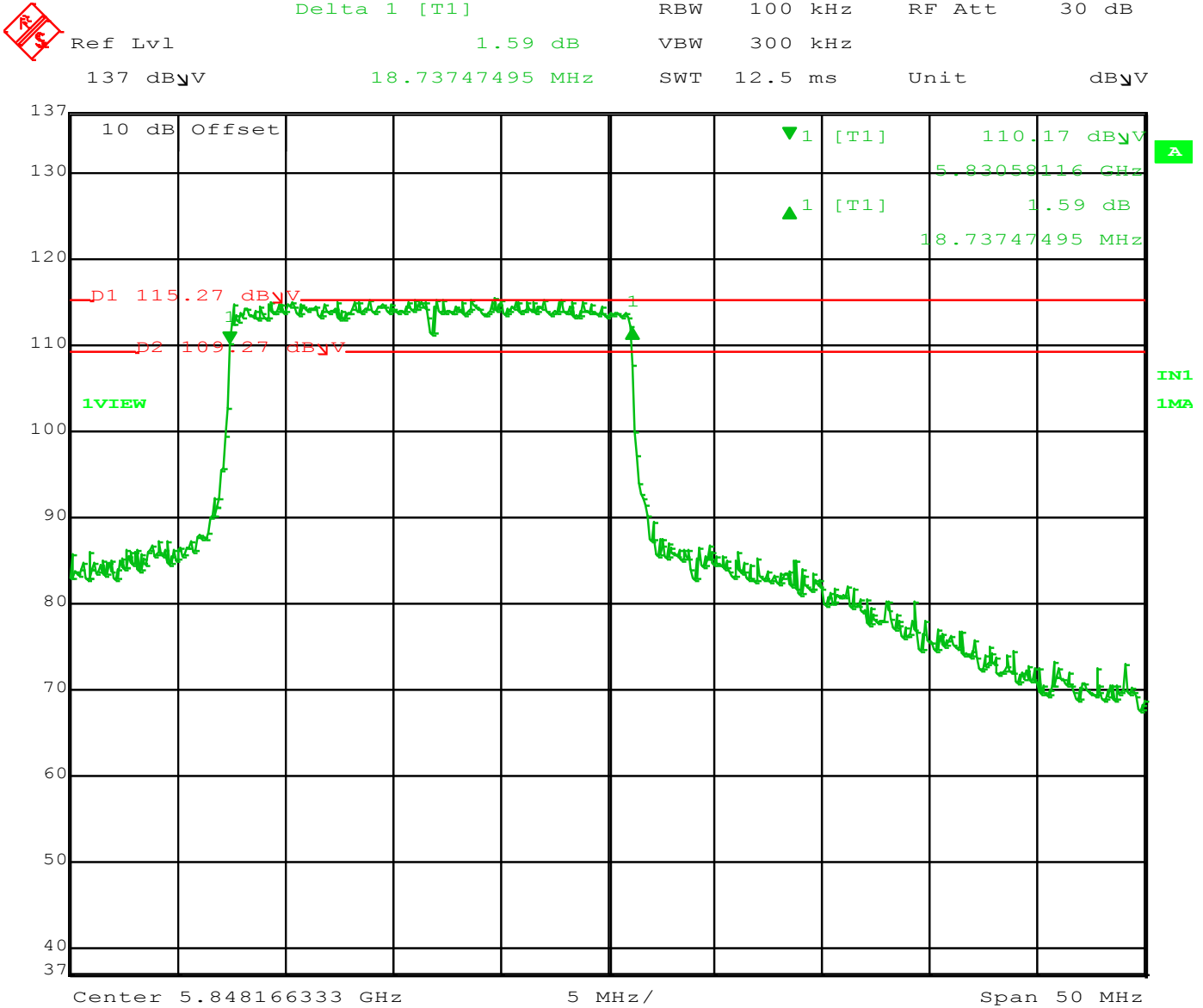
	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
	Ref Lvl	-0.74 dB	VBW	300 kHz	
	137 dB μ V	37.63527054 MHz	SWT	15 ms	Unit



Date: 13.NOV.2015 15:30:58

Figure 24: 6dB Occupied Bandwidth 20 MHz Channel at 5745 MHz
6dB Band width is 37.635 MHz which is > 500 kHz

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Date: 13.NOV.2015 15:43:59

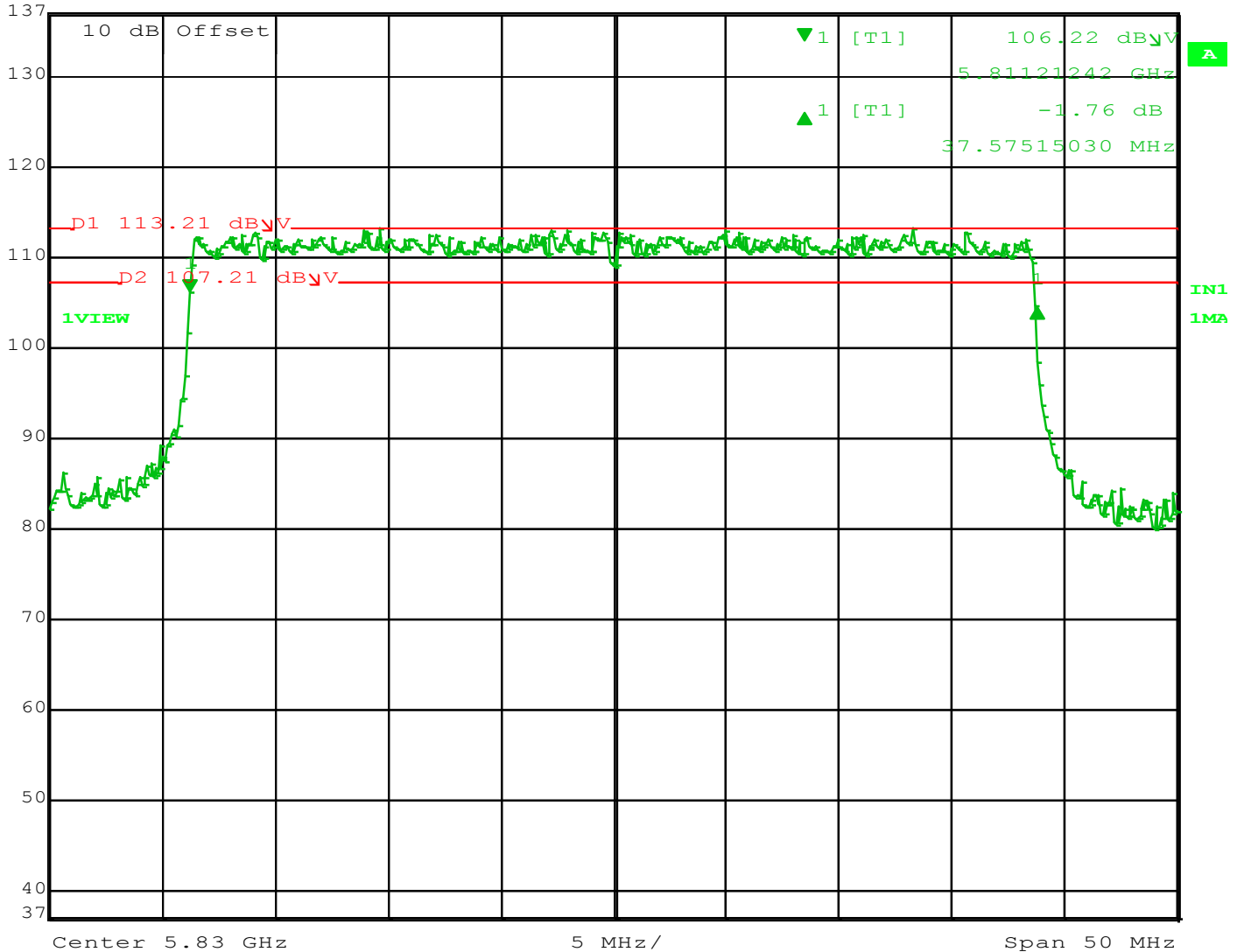
Figure 25: 6dB Occupied Bandwidth 20 MHz Channel at 5840 MHz

6dB Band width is 18.737 MHz which is > 500 kHz

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	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	-1.76 dB	VBW	300 kHz		
137 dB μ V	37.57515030 MHz	SWT	12.5 ms	Unit	dB μ V



Date: 13.NOV.2015 15:47:31

Figure 26: 6dB Occupied Bandwidth 40 MHz Channel at 5840 MHz
6dB Band width is 37.575 MHz which is > 500 kHz

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5.4 Voltage Requirements FCC Part 15.31(e)

FCC Part 15.31 states that for intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4.1 Over View of Test

Results	Complies (as tested per this report)		Date	7/2/2015
Standard	FCC Part 15.31(e)			
Product	RF-7800W	Serial#	A00451	
Test Set-up	Tested in shielded room. EUT placed on table, see test plans for details			
Mod. to EUT	None	Test Performed By	Randall E Masline	

5.4.2 Test Procedure

A variac will be placed in front of the POE (Power over Ethernet) box in order to vary the input AC. The power source test was performed using the $\pm 15\%$ of rated voltage

Manufacturer Rated voltage: VAC, the test will be performed at $\pm 15\%$ of rated voltage.

Nominal Rated Voltage (V_{Nom}):	120	VAC
115% Max Voltage (V_{max}):	138	VAC
85% Minimum Voltage (V_{min}):	102	VAC

5.4.3 Final Test

As tested, the EUT was found to be compliant to the requirements of the test standard.

The output power and frequency did not change or waiver by varying the input voltage to the POE black box.

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.

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6 Emissions in Receive Mode.

6.1 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.

6.1.1 Over View of Test

Results	Complies (as tested per this report)				Date	7/2/2015	
Standard	FCC Parts 15.209(a)						
Product RF-7800W	RF-7800W			Serial#	A00451		
Configuration	See test plan for details						
Test Set-up	Tested at a 10m O.A.T.S. placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane on a turn-table. See test plans for details						
EUT Powered By	Power over Ethernet	Temp	23° C	Humidity	32%	Pressure	1010mbar
Frequency Range	30 MHz to 40 GHz @ 3m						
Perf. Criteria	(Below Limit)			Perf. Verification	Readings Under Limit		
Mod. to EUT	None			Test Performed By	Randall E Masline		

6.1.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.4:2003 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 30 MHz to 13 GHz was investigated for radiated emissions.

Radiated emission testing was performed at a distance of 3 meters in 10m O.A.T.S.

6.1.3 Deviations

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

6.1.4 Final Test

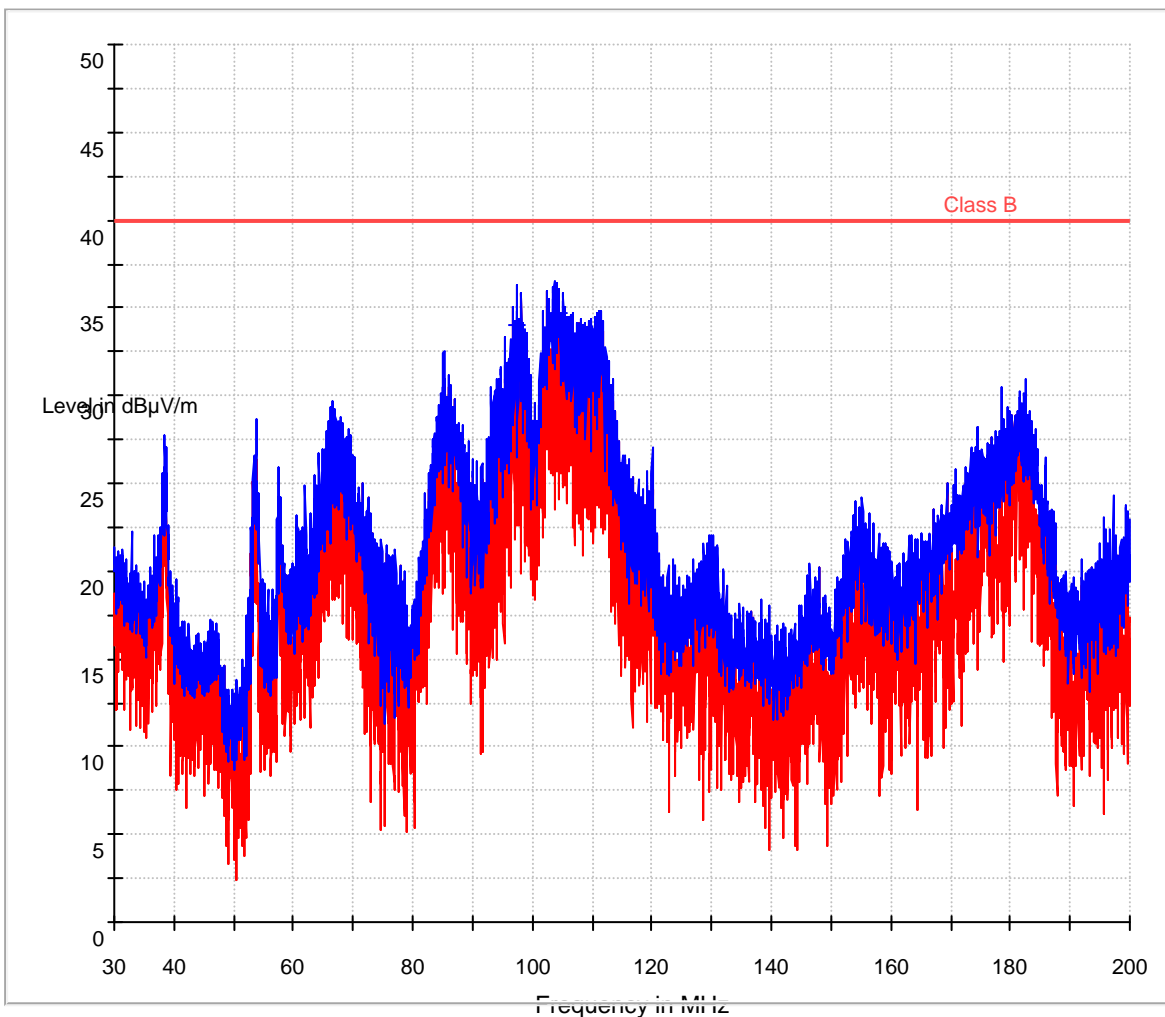
All final radiated emissions measurements were below (in compliance) the limits.

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.

6.1.5 Final Graphs and Tabulated Data

NOTES:

Radiated Emissions
Horizontal

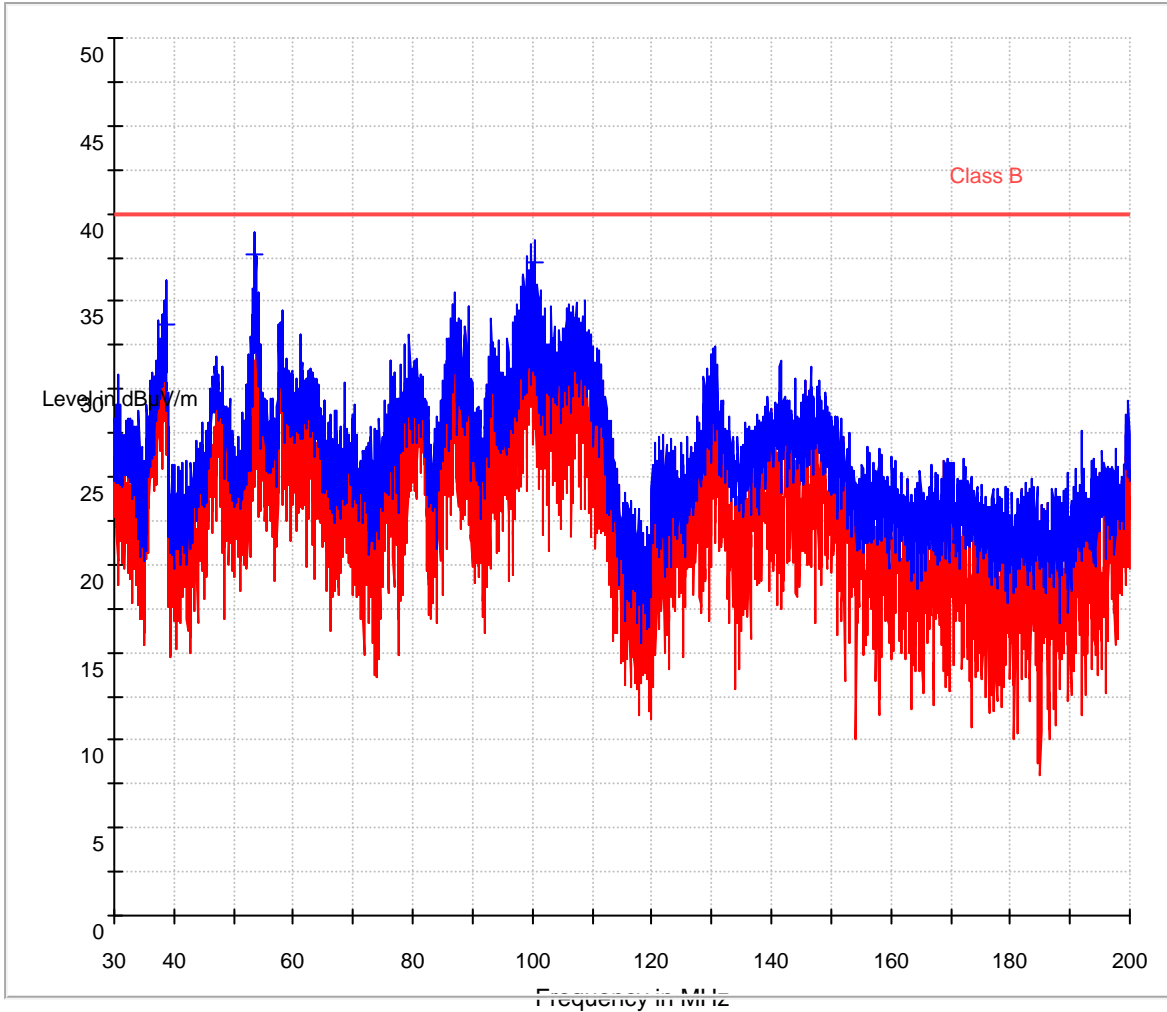


Frequency MHz	QuasiPeak dBuV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
97.440000	34.0	100.0	120.000	100.0	H		28.0	-7.4
104.560000	34.7	100.0	120.000	100.0	H		28.0	-6.3

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NOTES:

Radiated Emissions
Vertical

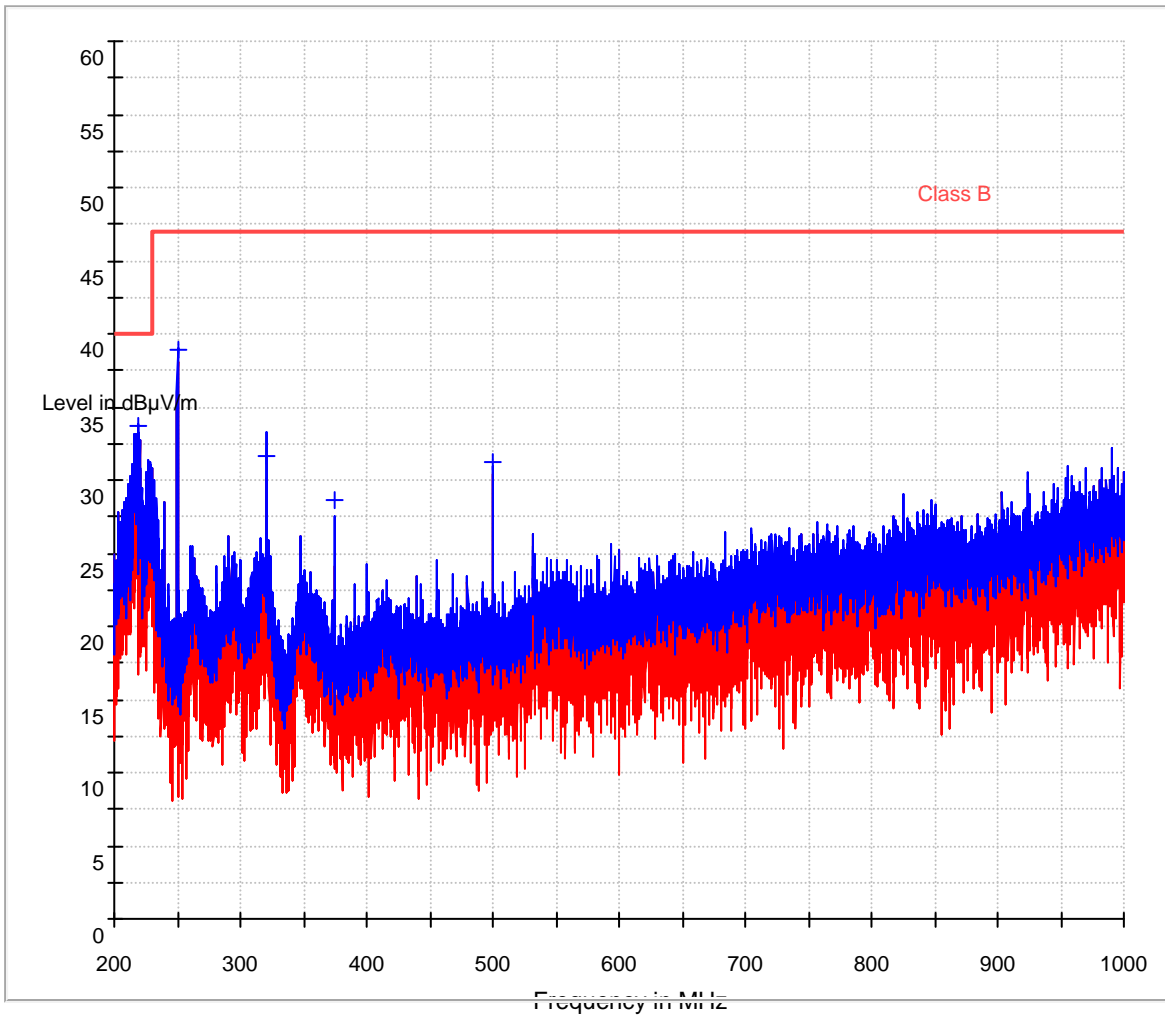


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
38.640000	33.6	100.0	120.000	100.0	V		28.0	-3.7
53.480000	37.6	100.0	120.000	100.0	V		28.0	-10.8
100.520000	37.2	100.0	120.000	100.0	V		28.0	-6.9

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NOTES:

Radiated Emissions
Horizontal

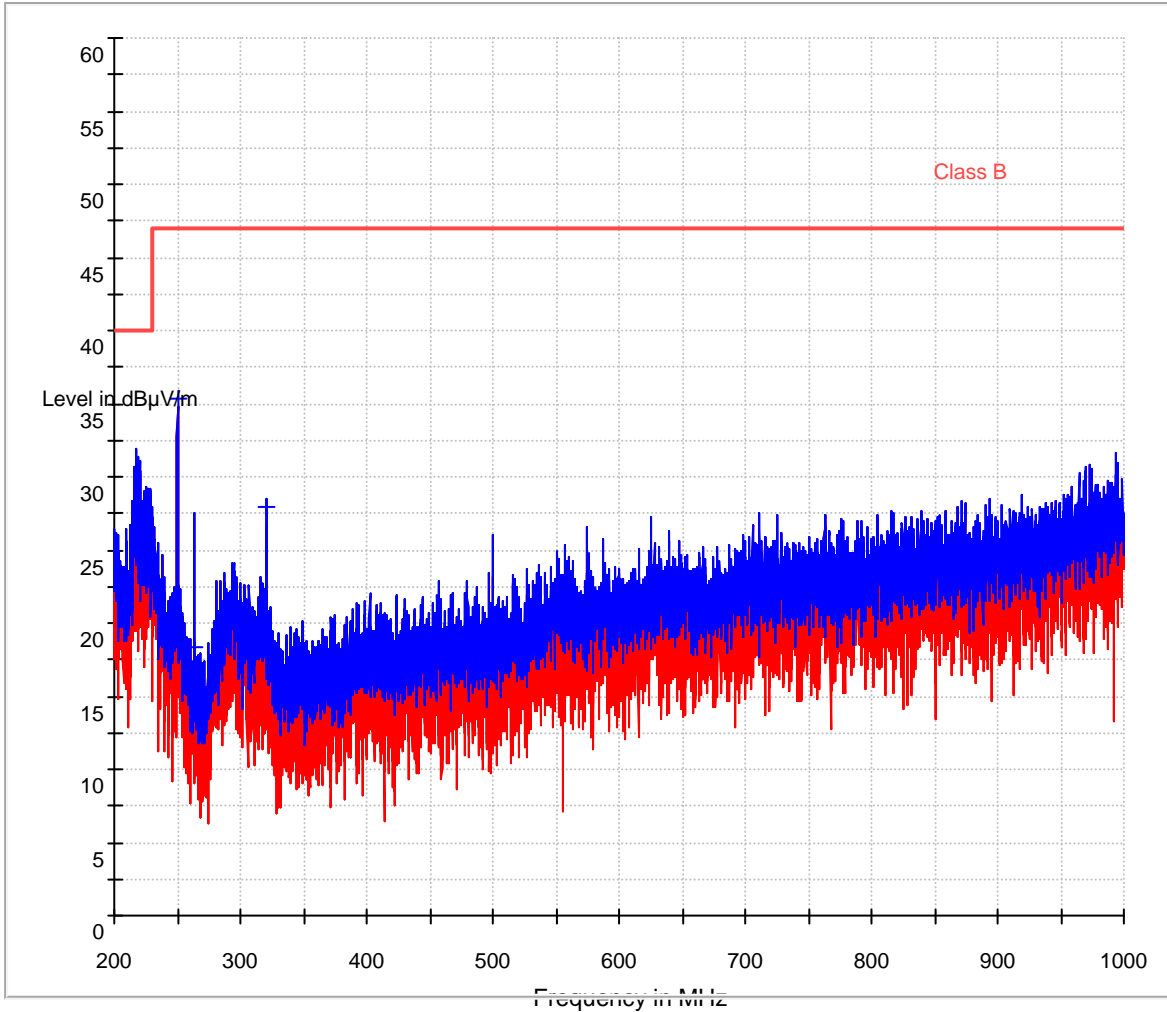


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
218.400000	33.7	100.0	120.000	100.0	H		28.0	-4.9
250.000000	38.9	100.0	120.000	100.0	H		28.0	-2.0
320.000000	31.6	100.0	120.000	100.0	H		28.0	0.4
375.040000	28.6	100.0	120.000	100.0	H		28.0	2.2
500.000000	31.3	100.0	120.000	100.0	H		28.0	5.0

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NOTES:

Radiated Emissions
Vertical



Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
250.000000	35.4	100.0	120.000	100.0	V		28.0	-2.0
264.000000	18.3	100.0	120.000	100.0	V		28.0	-1.4
320.000000	27.9	100.0	120.000	100.0	V		28.0	0.4

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7 RF Exposure

7.1 Exposure Requirements – FCC Parts 2.1091, 15.247(d)

FCC Part 15.247(d) states that SAR evaluation is not required if “Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §1.1307(b)(1) of CFR 47.”

7.1.1 RF Exposure Limit

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

F = Frequency in MHz

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7.1.1.1 Antenna Gain

The maximum Gain measured in Semi-Anechoic Chamber is 8 dBi or 7.08 (numeric).

13.5 dBi or 25.12 (numeric)

21 dBi or 125.89 (numeric)

26 dBi or 398.11 (numeric)

30 dBi or 1000 (numeric)

7.1.1.2 Output Power into Antenna & RF Exposure value at distance >20cm: Mobile

Calculations for this report are based on highest power measurement and all the various antenna gains. Limit for MPE (from FCC part 1.1310 table 1) is 5 mW/cm^2 for professionally installed devices.

The highest output power was 18.67 dBm at 5847.5 MHz using a 5 MHz Bandwidth, that frequency and power will be used for all antenna calculations

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8 dBi Antenna Gain at 5847.5 MHz

Corrected (including cal factors)		
Measurement:	18.67	dBm
The Gain of the antenna:	8.00	dBi
Type of Measurement:	Conducted	Direct measurement at Antenna Port
Impedance:	50.00	Ω
Measuring Distance:	3.00	m
Time weighted Duty Cycle:	100.00	%

The Power Out would be:	0.073620710	Watts
or:	73.62071	mW
or:	73620.71	μW
or:	18.67	dBm

Frequency range from 10 MHz to 40 GHz:

Frequency:	5847.5	MHz
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Power output with DC and antenna Gain (EIRP):

Power (dBm):	26.67
Power (mW):	464.515
Power (W):	0.464515

R = distance in	20	cm
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FCC:

Controlled Exposures - Limit =	5	mW/cm ²
Uncontrolled Exposures - Limit =	1	mW/cm ²
Pd =	0.0924124	mW/cm ²
Controlled Margin to Limit =	4.9076	mW/cm ²
Uncontrolled Margin to Limit =	0.9076	mW/cm ²

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13.5 dBi Gain Antenna at 5847.5 MHz

Corrected (including cal factors)		
Measurement:	18.67	dBm
The Gain of the antenna:	14.00	dBi
Type of Measurement:	Conducted	Direct measurement at Antenna Port
Impedance:	50.00	Ω
Measuring Distance:	3.00	m
Time weighted Duty Cycle:	100.00	%

The Power Out would be:	0.073620710	Watts
or:	73.62071	mW
or:	73620.71	μ W
or:	18.67	dBm

Frequency range from 10 MHz to 40 GHz:

Frequency:	5847.5	MHz
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Power output with DC and antenna Gain (EIRP):

Power (dBm):	32.67
Power (mW):	1849.269
Power (W):	1.849269

R = distance in	20	cm
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FCC:

Controlled Exposures - Limit =	5	mW/cm ²
Uncontrolled Exposures - Limit =	1	mW/cm ²
Pd =	0.3679003	mW/cm ²
Controlled Margin to Limit =	4.6321	mW/cm ²
Uncontrolled Margin to Limit =	0.6321	mW/cm ²

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While using the following antenna a minimum separation distance must be at least 30 cm

21 dBi Gain antenna at 5847.5 MHz

Enter the following highlighted variables:

Corrected (including cal factors) Measurement:	18.67	dBm
The Gain of the antenna:	21.00	dBi
Type of Measurement:	Conducted	Direct measurement at Antenna Port
Impedance:	50.00	Ω
Measuring Distance:	3.00	m
Time weighted Duty Cycle:	100.00	%

The Power Out would be:	0.073620710	Watts
or:	73.62071	mW
or:	73620.71	μ W
or:	18.67	dBm

Frequency range from 10 MHz to 40 GHz:

Frequency:	5847.5	MHz
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Power output with DC and antenna Gain (EIRP):

Power (dBm):	39.67
Power (mW):	9268.298
Power (W):	9.268298

R = distance in	30	cm
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FCC:

Controlled Exposures - Limit =	5	mW/cm ²
Uncontrolled Exposures - Limit =	1	mW/cm ²
Pd =	0.8194975	mW/cm ²
Controlled Margin to Limit =	4.1805	mW/cm ²
Uncontrolled Margin to Limit =	0.1805	mW/cm ²

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While using the following antenna a minimum separation distance must be at least 60 cm

26 dBi Gain Antenna at 5847.5 MHz

Corrected (including cal factors)		
Measurement:	18.67	dBm
The Gain of the antenna:	26.00	dBi
Type of Measurement:	Conducted	Direct measurement at Antenna Port
Impedance:	50.00	Ω
Measuring Distance:	3.00	m
Time weighted Duty Cycle:	100.00	%

The Power Out would be:	0.073620710	Watts
or:	73.62071	mW
or:	73620.71	μ W
or:	18.67	dBm

Frequency range from 10 MHz to 40 GHz:

Frequency:	5847.5	MHz
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Power output with DC and antenna Gain (EIRP):

Power (dBm):	44.67
Power (mW):	29308.932
Power (W):	29.308932

R = distance in	60	cm
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FCC:

Controlled Exposures - Limit =	5	mW/cm ²
Uncontrolled Exposures - Limit =	1	mW/cm ²
Pd =	0.6478696	mW/cm ²
Controlled Margin to Limit =	4.3521	mW/cm ²
Uncontrolled Margin to Limit =	0.3521	mW/cm ²

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While using the following antenna a minimum separation distance must be at least 80 cm

30 dBi Gain Antenna at 5847.5 MHz

Corrected (including cal factors)		
Measurement:	18.67	dBm
The Gain of the antenna:	30.00	dBi
Type of Measurement:	Conducted	Direct measurement at Antenna Port
Impedance:	50.00	Ω
Measuring Distance:	3.00	m
Time weighted Duty Cycle:	100.00	%

The Power Out would be:	0.073620710	Watts
or:	73.62071	mW
or:	73620.71	μ W
or:	18.67	dBm

Frequency range from 10 MHz to 40 GHz:

Frequency:	5847.5	MHz
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Power output with DC and antenna Gain (EIRP):

Power (dBm):	48.67
Power (mW):	73620.710
Power (W):	73.620710

R = distance in	80	cm
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FCC:

Controlled Exposures - Limit =	5	mW/cm ²
Uncontrolled Exposures - Limit =	1	mW/cm ²
Pd =	0.9153984	mW/cm ²
Controlled Margin to Limit =	4.0846	mW/cm ²
Uncontrolled Margin to Limit =	0.0846	mW/cm ²

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Appendix A

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.

Test Plan Summary

Table 1: EMC Test Plan Summary FCC& IC

Test	Test Method ANSI C63.10	Test Parameters (from Standard)
Spurious Emission in Received Mode	CFR47 15.109	Class B
Spurious Emission in Transmitted Mode	CFR47 15.209	Class B
Restricted Bands of Operation	CFR47 15.205	Class B
AC Power Conducted Emission	CFR47 15.207	Class B
Occupied Bandwidth	CFR47 15.247 (a2)	500kHz minimum
Maximum Transmitted Power	CFR47 15.247 (b3)	30dBm w/ 6dBi antenna
Peak Power Spectral Density	CFR47 15.247 (e)	8dBm/ 3kHz.
Band edge Measurement	CFR47 15.247 (d)	20dBr
RF Exposure	CFR47 15.247 (i), 2.1091	General Population

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