Electromagnetic Compatibility
Test Report

Prepared in accordance with

FCC Parts 2 and 90 (Subpart Y)

On

BROADBAND ETHERNET RADIO

RF-7800W

Harris RF Communications
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

Prepared by:

TUV Rheinland of North America, Inc.

Client:	Harris RF Communications 221 Jefferson Ridge Parkway Lynchburg, VA 24501	Shane Miller 434-455-9530 smille29@harris.com	
Identification:	BROADBAND ETHERNET RADIO	***Serial No.:***	E00047
Test item:	RF-7800W	***Date tested:***	7/9/2013
Testing location:	TUV Rheinland of North America 336 Initiative Drive Rochester, NY 14624 U.S.A.	Tel: (585) 426-5555 Fax: 585-568-8338	
Test specification:	**Emissions:** FCC Part 90, FCC Parts 90.210 FCC Parts 90.210 FCC Part 90.1213 and Section 2.1049, FCC Part 90.1215, FCC Part 90.1215, FCC Parts 90.1217, Part 1.1307 and 1.1310,		
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	
8 August 2013 Randall E Masline ***Signature***		8 August 2013 Cecil Gittens ***Signature***	
Other Aspects:	**None**		

Abbreviations: OK, Pass, Compliant, Complies = passed
Fail, Not Compliant, Does Not Comply = failed
N/A = not applicable

FC	ilac-MRA A2LA ACCREDITED	**Industry Canada**	**VCCI**	**BSMI**
US5253	**Testing Cert.# 3331.04**	**3466C-1**	**A-0037**	**SL2-IN-E-050R**

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Manufacturer's statement - attestation

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

a) That Shane Miller 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.

Shane Miller	
Printed name of official	Signature of official
221 Jefferson Ridge Parkway Lynchburg, VA 24551	2 Aug 13
Address	Date
434-455-9530	smille29@Harris.com
Telephone number	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 Part 90 and Part 2 based on the results of testing performed on 7/9/2013 on the BROADBAND ETHERNET RADIO, RF-7800W Model 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.

1.3 *Summary of Test Results*

Applicant	Harris RF Communications 221 Jefferson Ridge Parkway Lynchburg, VA 24501	**Tel**	434-455-9530	**Contact**	Shane Miller
		Fax	434-455-6819	**e-mail**	smille29@harris.com

Broadband Ethernet Radio	BROADBAND ETHERNET RADIO	**RF-7800W:**	RF-7800W
Serial Number	E00047	**Test Voltage/Freq.**	Power over Ethernet
Test Date Completed:	7/9/2013	**Test Engineer**	Randall E Masline

Standards	Description	Severity Level or Limit	Criteria	Test Result
FCC Part 90 Standard	Regulations Governing licensing and use of frequencies in the 4940-4990 MHz band	See called out parts below	See Below	**Complies**
FCC Part 90.1215		Below the applicable limits	Below Limit	Complies
FCC Parts 90.210	Spurious and Harmonic Emissions (EUT in Transmit Mode)	Below the applicable limits	Below Limit	Complies
FCC Parts 90.210	Conducted Emissions on AC Mains	EUT is operated by POE	Below Limit	Complies
FCC Part 90.1215	Power Limits	Shall not exceed 1.0 Watt	Below Limit	Complies
FCC Part 90.1213 and Section 2.1049	99% Occupied Bandwidth	99% BW	Within Limit	Complies
FCC Part 90.1215	Peak Power Spectrial Denesity	≤ 21 dBm in any 1 MHz	Below Limit	Complies
FCC Part 90.213 and Part 2.1055	Freqency Stability		Below Limit	Complies
FCC Parts 90.1217, Part 1.1307 and 1.1310	RF Exposure	SAR or MPE Requirements	Below Limit	Complies (without testing)

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America located at, 336 Initiative Drive, Rochester, NY 14624-6217 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: 3331.04). 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-0037, R-3673, C-4113, C-4114, C-4115, T-1158, T-1159 G429.

2.1.4 Industry Canada

(Registration No.: 3466C-1) The OATS 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.

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:

Field Strength (dBµV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBµV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

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

Sample radiated emissions calculation @ 30 MHz

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

25 dBµV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBµV/m

2.2 Measurement Uncertainty Emissions

Per CISPR 16-4-2	Ulab	Ucispr
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

Measurement Uncertainty Immunity

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

2.3 Measurement Equipment Used

Equipment	Manufacturer	Model #	Ref.	Serial #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
Radiated Emissions							
Horn	EMCO	3115	C025	9512-4630	20-Jul-12	20-Jul-13	RE
Horn	EMCO	3115	C031	9812-5635	23-Mar 12	23-Mar 14	RE
BiLog	Chase	CBL6111	C041	1170	12-Sept-12	12-Sept-14	RE
Analyzer w RF Filter Section 85460A	HP	8546A		3325A00134	11-Sept-12	11-Sept-13	RE
Receiver (20Hz-40GHz)	Rohde & Schwarz	ESI(B) 40	C320	839283/005	13-Sept-12	13-Sept-13	RE
Multimeter	Fluke	83	C437	48162892	13-Sept-12	13-Sept-13	RE
Amplifier (1-26.5 GHz.)	Agilent	8449B	C438	3008A01842	7-Nov-11	7-Nov-13	RE
Amplifier 1 - 18GHz	Rohde & Schwarz	TS-PR18	C439	122002/001	7-Nov-11	7-Nov-13	RE
Amplifier (18-26.5GHz)	Rohde & Schwarz	TS-PR26	C443	100005	10-Aug- 12	10-Aug- 13	RE
BiLog	Chase	CBL6111B	C448	2081	22-Feb-12	22-Feb-14	RE
Receiver	Agilent	N9038A	C325	MY52130004	1-May-12	1-May 13	RE
Horn(18-26.5 GHz)	EMCO	3160-09	C447	C447	8-Mar-13	8-Mar-15	RE
Pressure/Temperature/RH	Extech	SD700	C482	Q668892	3-Oct-12	3-Oct-13	RE
Temp Chamber	Tenney Eng	T-14 Special		9928	21-Jan-13	21-Jan-14	RE
Conducted Emissions							
LISN	Schwarzbeck	8126	C109	189	13-Sept-12	13-Sept-13	CE
LISN	Schwarzbeck	8121	C111	131	21-Jan-13	21-Jan-14	CE
Analyzer w RF Filter Section 85460A	HP	8546A		3325A00134	11-Sept-12	11-Sept-13	CE
Multimeter	Fluke	87	C405	49050672	13-Sept-12	13-Sept-13	CE
General Laboratory Equipment							
Multimeter	Fluke	87	C445	59890224	13-Sept-12	13-Sept-13	
Multimeter	Fluke	8062A	C452	4715199	13-Sept-12	13-Sept-13	
Pressure/Temperature/RH	Extech	SD700	C481	Q668884	3-Oct-12	3-Oct-13	

3 Product Information

3.1 Product

Broadband Ethernet Radio RF-7800W

3.2 Equipment Modifications

No modifications were needed to bring product into compliance.

3.3 Transmitter Spurious/Harmonic Radiated Emissions Limits @ 90.210(M)

3.3.1 Over View of Test

Results	**Complies** (as tested per this report)				**Date**	7/11/2013	
Standard	FCC Part 90.210 M Mask						
Product	RF-7800W			**Serial#**	E00047		
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.						
EUT Powered By	Power over Ethernet	**Temp**	76 ºF	**Humidity**	36%	**Pressure**	1007 mbar
Perf. Criteria	(Below Limit)		**Perf. Verification**		Readings Under Limit		
Mod. to EUT	None		**Test Performed By**		Randall E Masline		

3.3.2 Test Procedure

(a) The power of emission outside any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.
(b) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

3.3.3 Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Exhibit 7, § 7.1 of this report and its value in dBc is calculated as follows:

1. If the transmitter's antenna is an integral part of the EUT, the ERP is measured using substitution method.
2. If the transmitter's antenna is non-integral and diverse, the lowest ERP of the carrier with 0 dBi antenna gain is used for calculation of the spurious/harmonic emissions in dBc:
3. Lowest ERP of the carrier = EIRP – 2.15 dB = Pc + G - 2.15 dB = xxx dBm (conducted) + 0 dBi – 2.15 dB
4. Spurious /harmonic emissions levels expressed in dBc (dB below carrier) are as follows:

3.3.4 Deviations

There were no deviations from the test methodology listed in the test plan for the Transmitter Spurious/Harmonic radiated emission test.

3.3.5 Final Test

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

3.3.5.1 Near Lowest Frequency (4942.5 MHz)

Fundamental Frequency: 4942.5 MHz

Test Frequency Range: 30 MHz – 40 GHz

All emissions are more than 20 dB below the limit.

3.3.5.2 Near Middle Frequency (4965 MHz)

Fundamental Frequency: 4965 MHz

Test Frequency Range: 30 MHz – 40 GHz

All emissions are more than 20 dB below the limit.

3.3.5.3 Near Highest Frequency (4985 MHz)

Fundamental Frequency: 4985

Test Frequency Range: 30 MHz – 40 GHz

All emissions are more than 20 dB below the limit.

3.3.6 MEASURING THE EIRP OF SPURIOUS/HARMONIC EMISSIONS USING

SUBSTITUTION METHOD:

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency: equal to the signal source

Resolution BW: 10 kHz

Video BW: same

Detector Mode: positive

Average: off

Span: 3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor

E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels obtained in the Section 7.2.1 for ERP/EIRP measurements.

(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):

- ♦ DIPOLE antenna for frequency from 30-1000 MHz or
- ♦ HORN antenna for frequency above 1 GHz }.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.

(f) Use one of the following antenna as a receiving antenna:

- ♦ DIPOLE antenna for frequency from 30-1000 MHz or
- ♦ HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.

(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.

(i) Tune the EMI Receivers to the test frequency.

(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

(k) The transmitter was rotated through 360o about a vertical axis until a higher maximum signal was received.

(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the

transmitter was obtained in the test receiver.

(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1

EIRP = P + G1 = P3 + L2 - L1 + A + G1

ERP = EIRP – 2.15 dB

Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1

Where: P: Actual RF Power fed into the substitution antenna port after corrected.

P1: Power output from the signal generator

P2: Power measured at attenuator A input

P3: Power reading on the Average Power Meter

EIRP: EIRP after correction

ERP: ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)

(p) Repeat step (d) to (o) for different test frequency

(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.

(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

3.4 Emission Mask 90.210(M)

3.4.1 Over View of Test

Results	**Complies** (as tested per this report)					**Date**	7/11/2013
Standard	FCC Part 90.210 M Mask						
Product	RF-7800W			**Serial#**	E00047		
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.						
EUT Powered By	Power over Ethernet	**Temp**	76 ºF	**Humidity**	36%	**Pressure**	1007 mbar
Perf. Criteria	(Below Limit)			**Perf. Verification**	Readings Under Limit		
Mod. to EUT	None			**Test Performed By**	Randall E Masline		

3.4.2 Test Procedure

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

m) Emission Mask M. For high power transmitters (greater that 20 dBm) operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

(1) On any frequency removed from the assigned frequency between 0-45% of the authorized bandwidth (BW): 0 dB.

(2) On any frequency removed from the assigned frequency between 45-50% of the authorized bandwidth: 568 log (% of (BW)/45) dB.

(3) On any frequency removed from the assigned frequency between 50-55% of the authorized bandwidth: 26 + 145 log (% of BW/50) dB.

(4) On any frequency removed from the assigned frequency between 55-100% of the authorized bandwidth: 32 + 31 log (% of (BW)/55) dB.

(5) On any frequency removed from the assigned frequency between 100-150% of the authorized bandwidth: 40 + 57 log (% of (BW)/100) dB.

(6) On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.

(7) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth

3.4.3 Method of Measurements

The Emission masks are measured using EMI receiver (spectrum analyzer) with RBW = 1% of 99% OBW, VBW >= RBW.

3.4.4 Deviations

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

3.4.5 Final Test

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

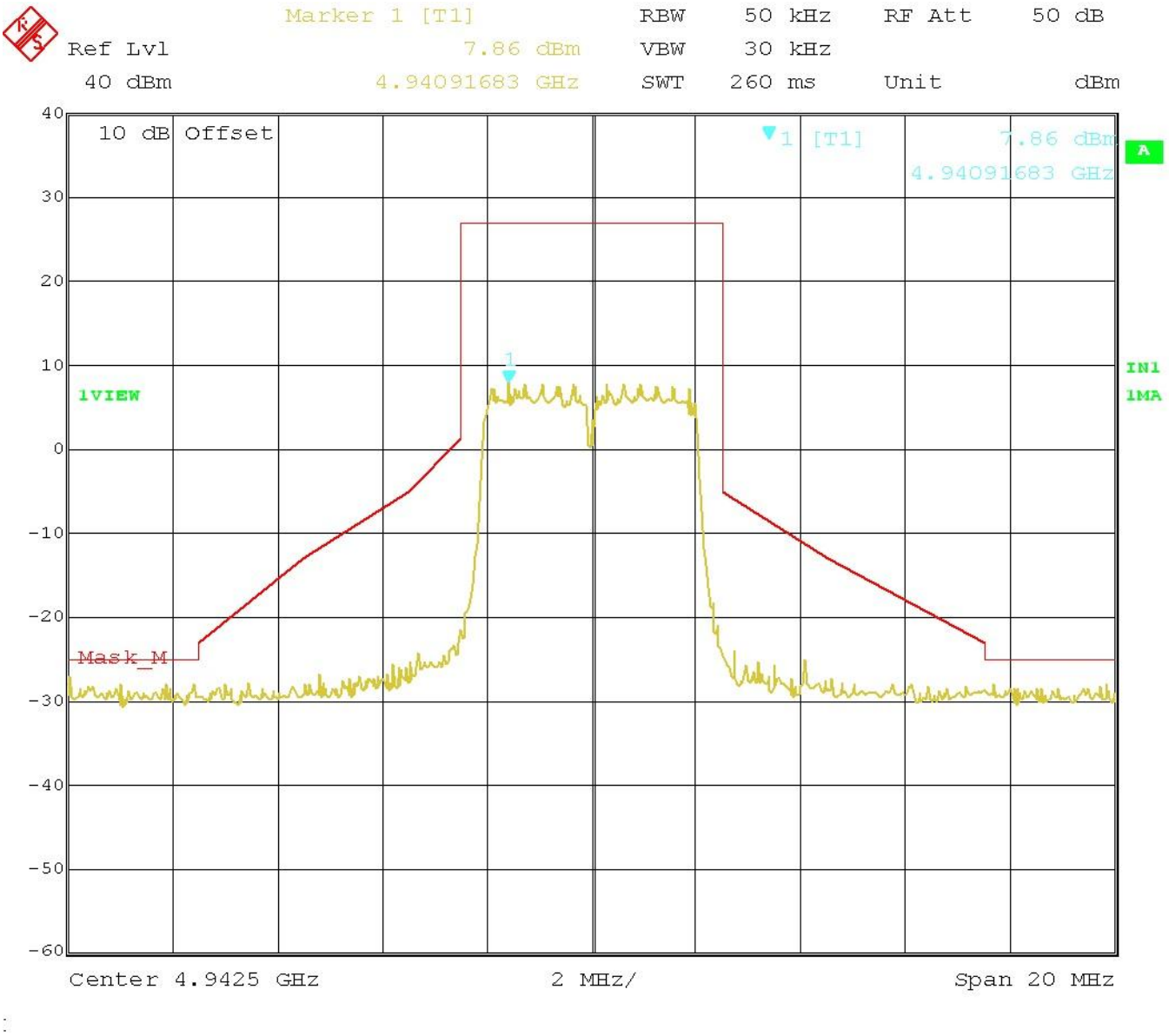


Figure 1 – Center Frequency 4942.5 MHz - 5 MHz Channel Spacing

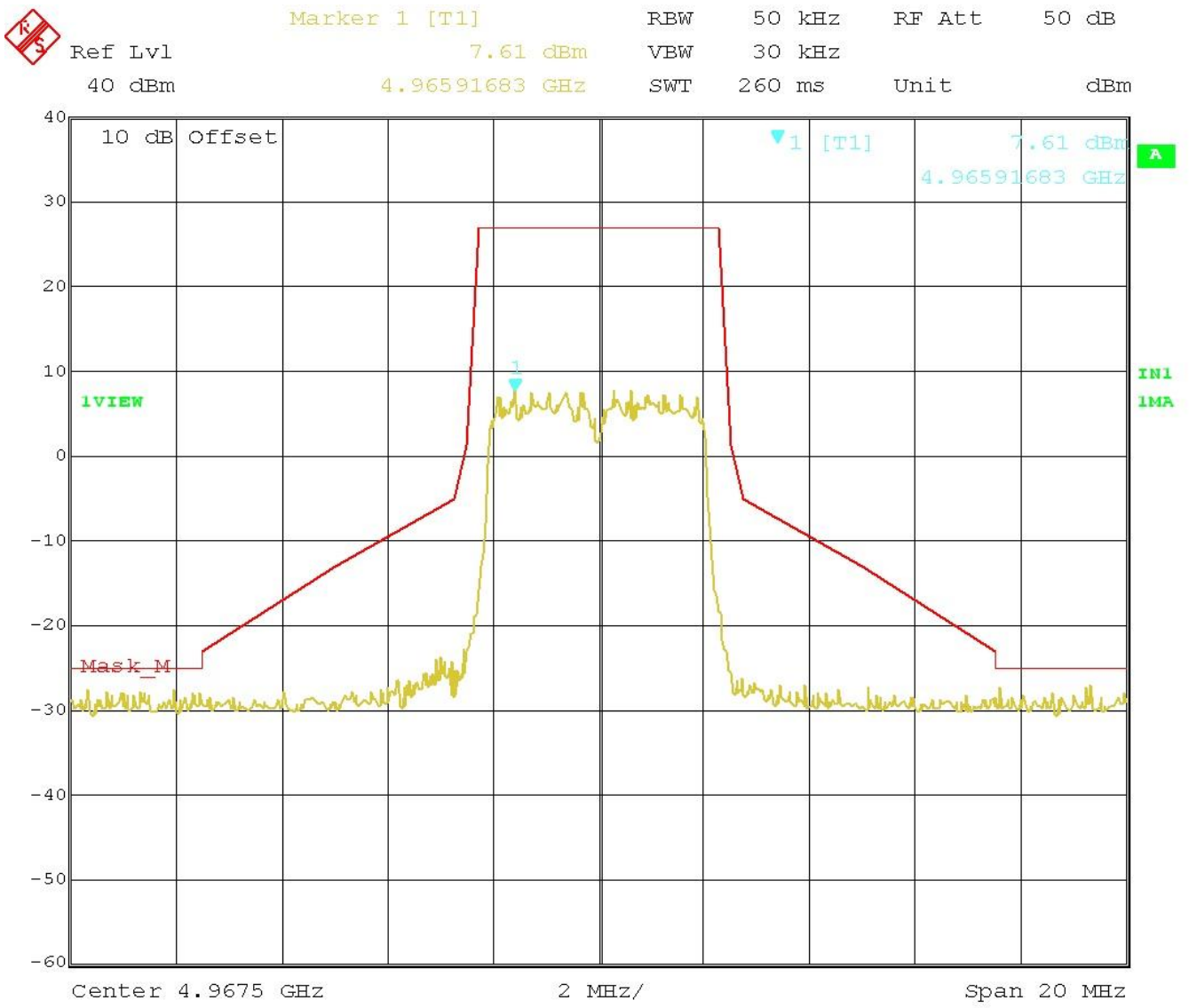


Figure 2 – Center Frequency 4967.5 MHz - 5 MHz Channel Spacing

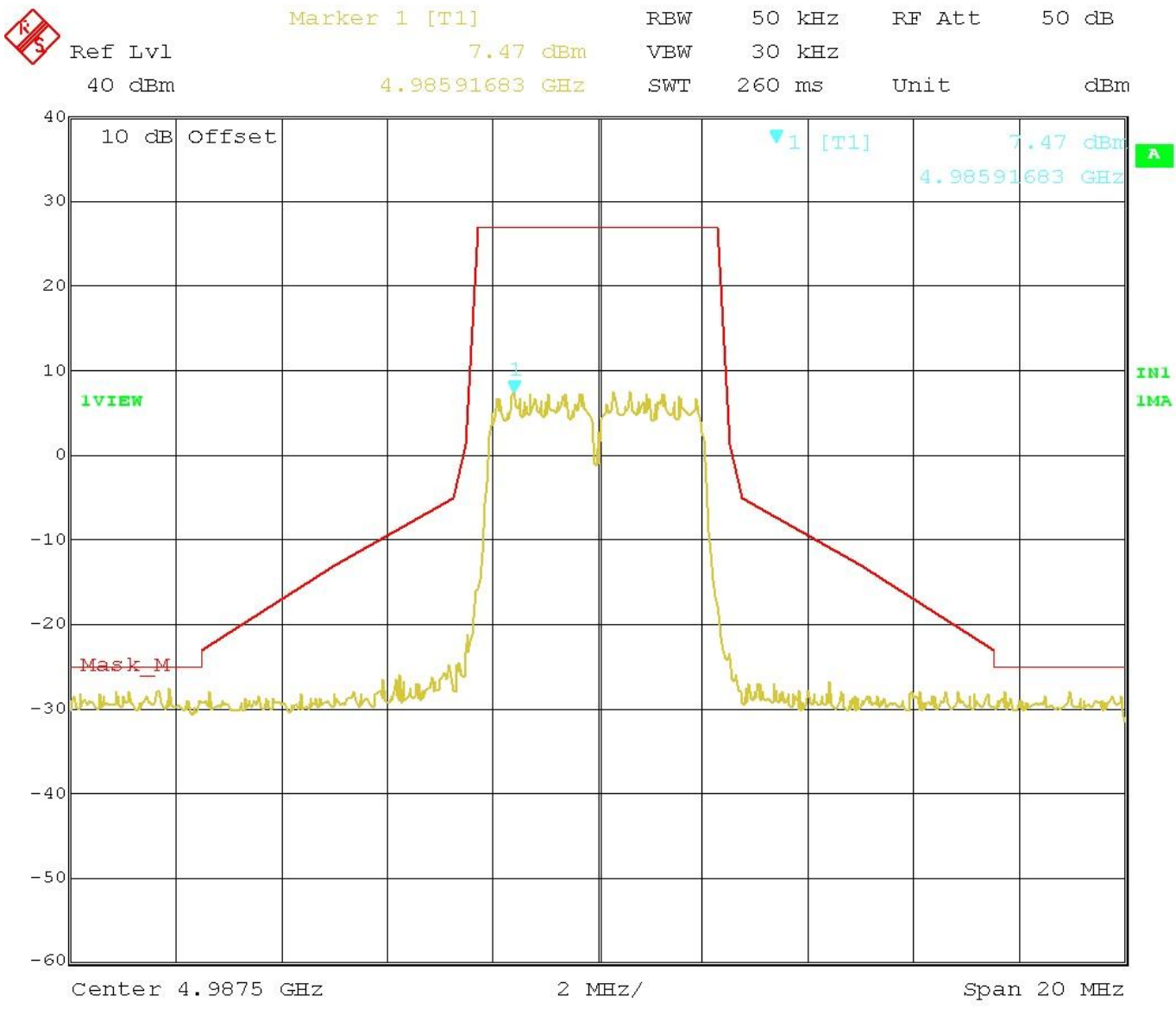


Figure 3 – Center Frequency 4987.5 MHz - 5 MHz Channel Spacing

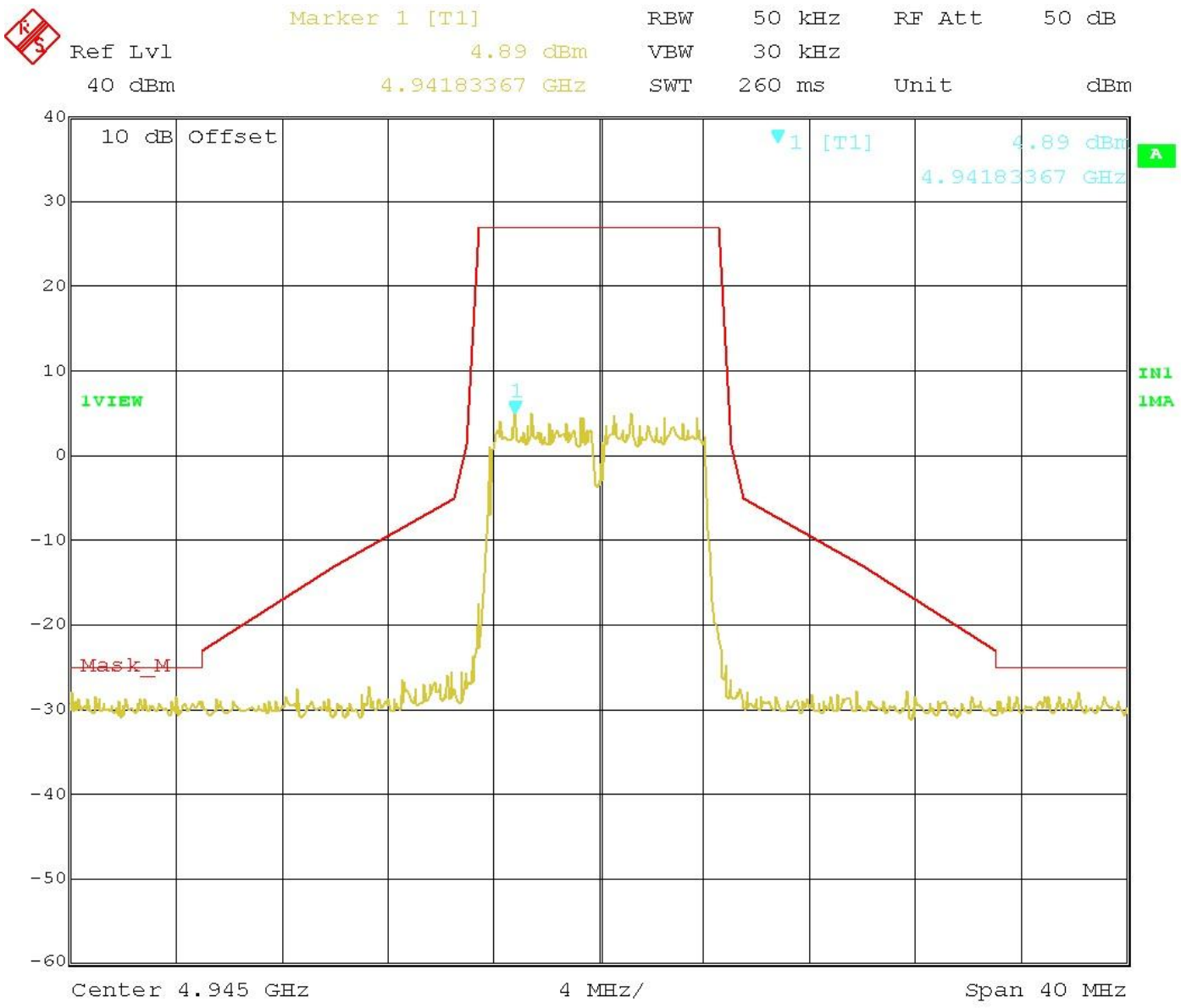


Figure 4 – Center Frequency 4945 MHz - 10 MHz Channel Spacing

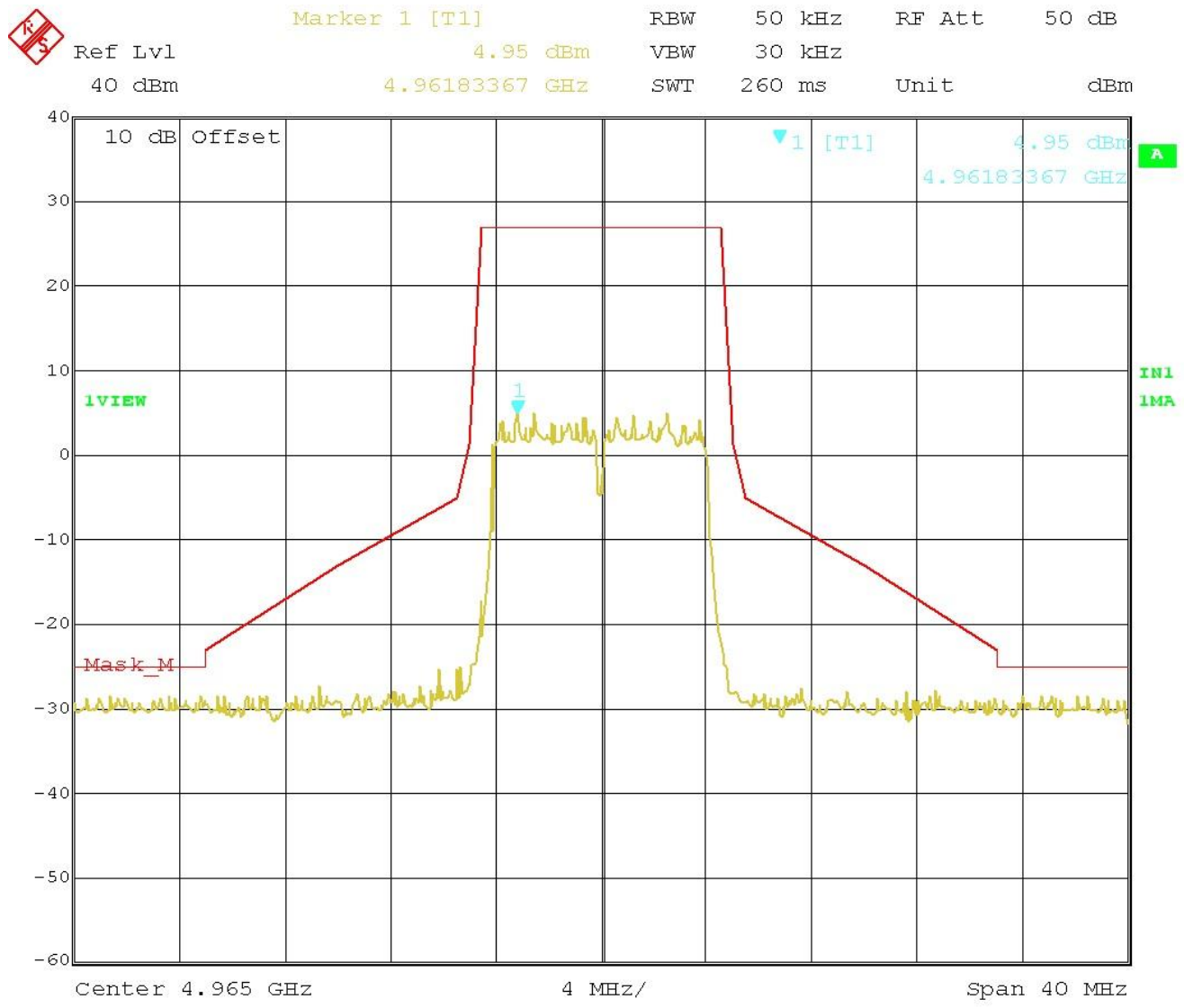


Figure 5 – Center Frequency 4965 MHz - 10 MHz Channel Spacing

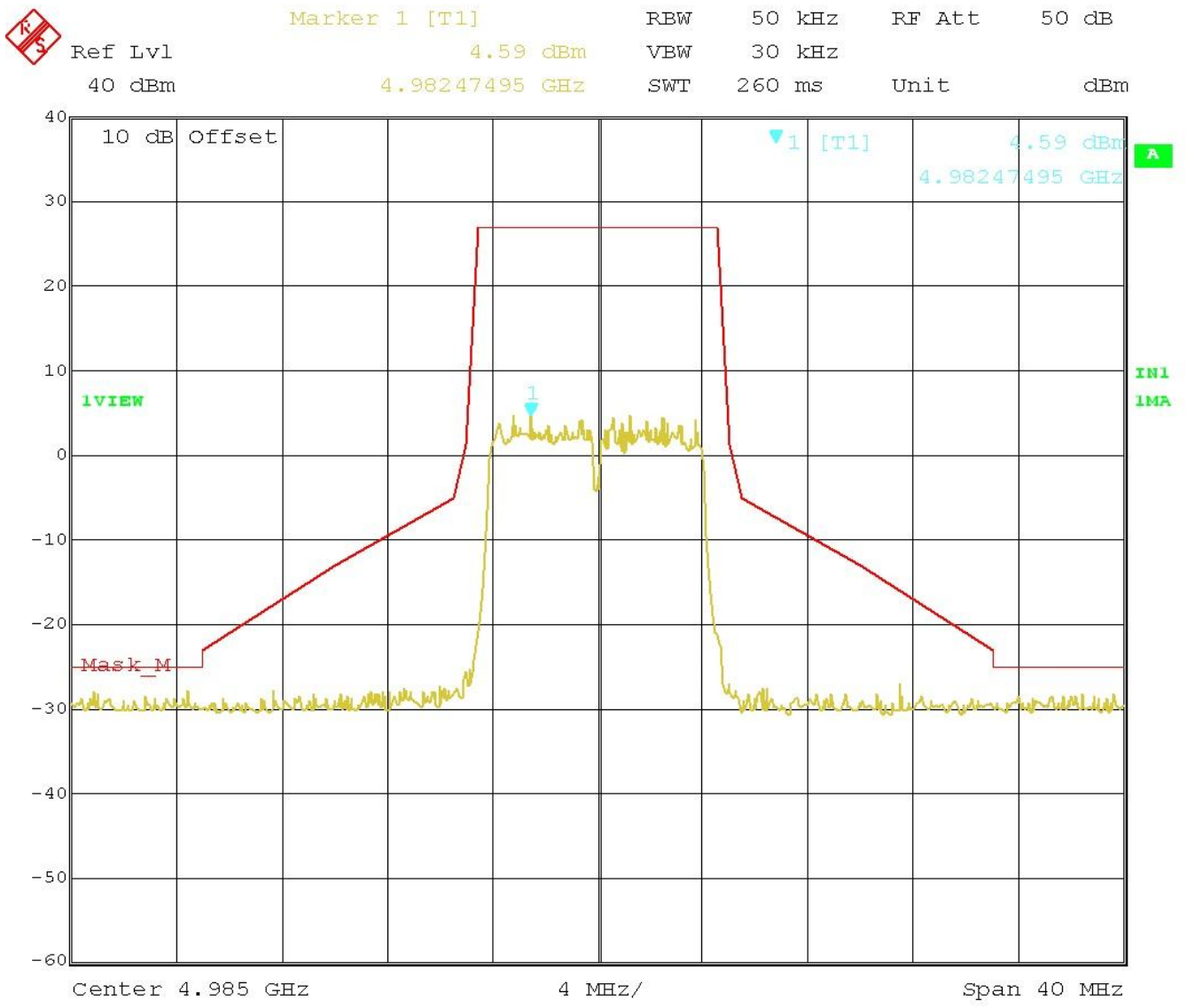


Figure 6 – Center Frequency 4985 MHz - 10 MHz Channel Spacing

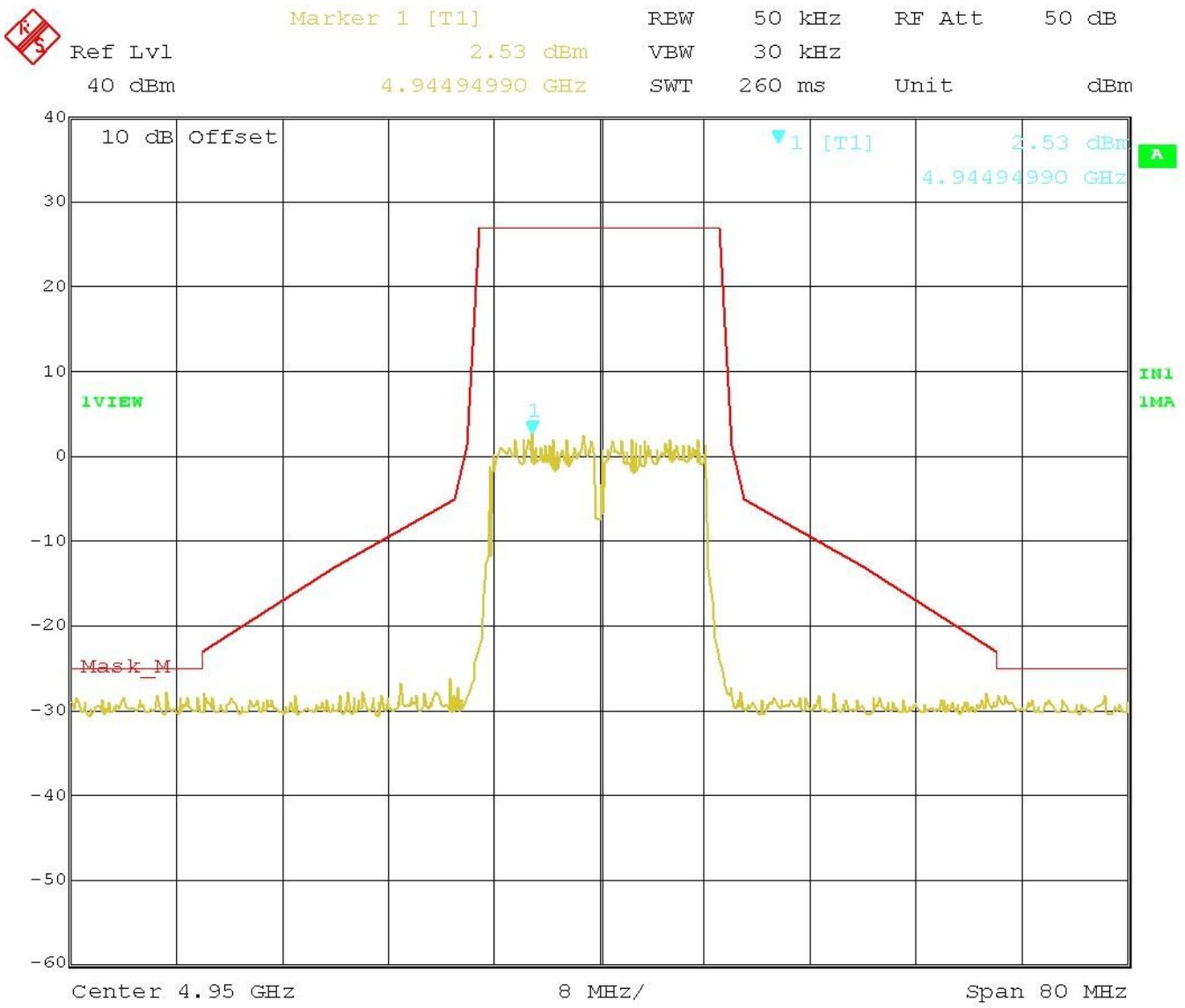


Figure 7 – Center Frequency 4950 MHz - 20 MHz Channel Spacing

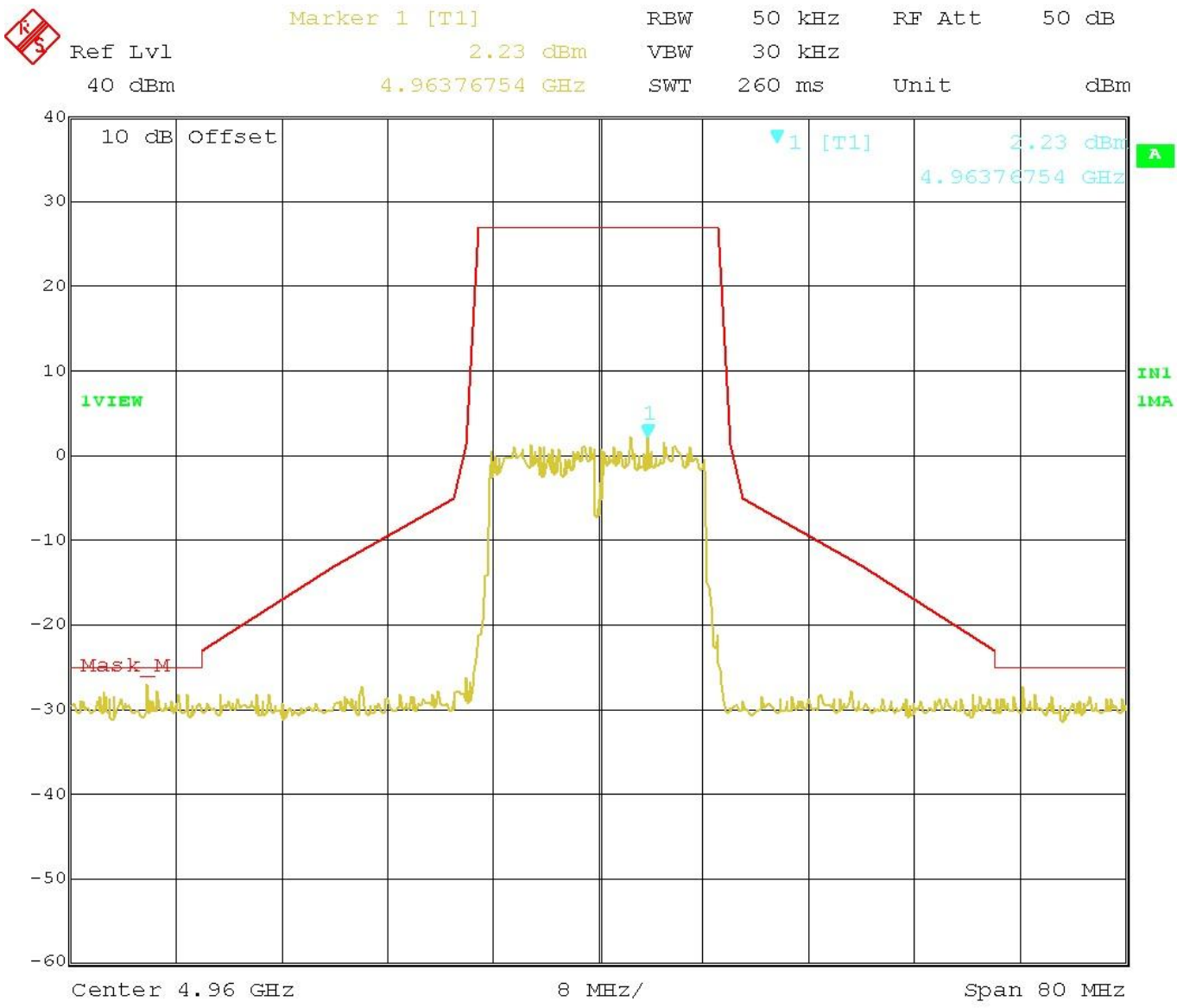


Figure 8 – Center Frequency 4960 MHz - 20 MHz Channel Spacing

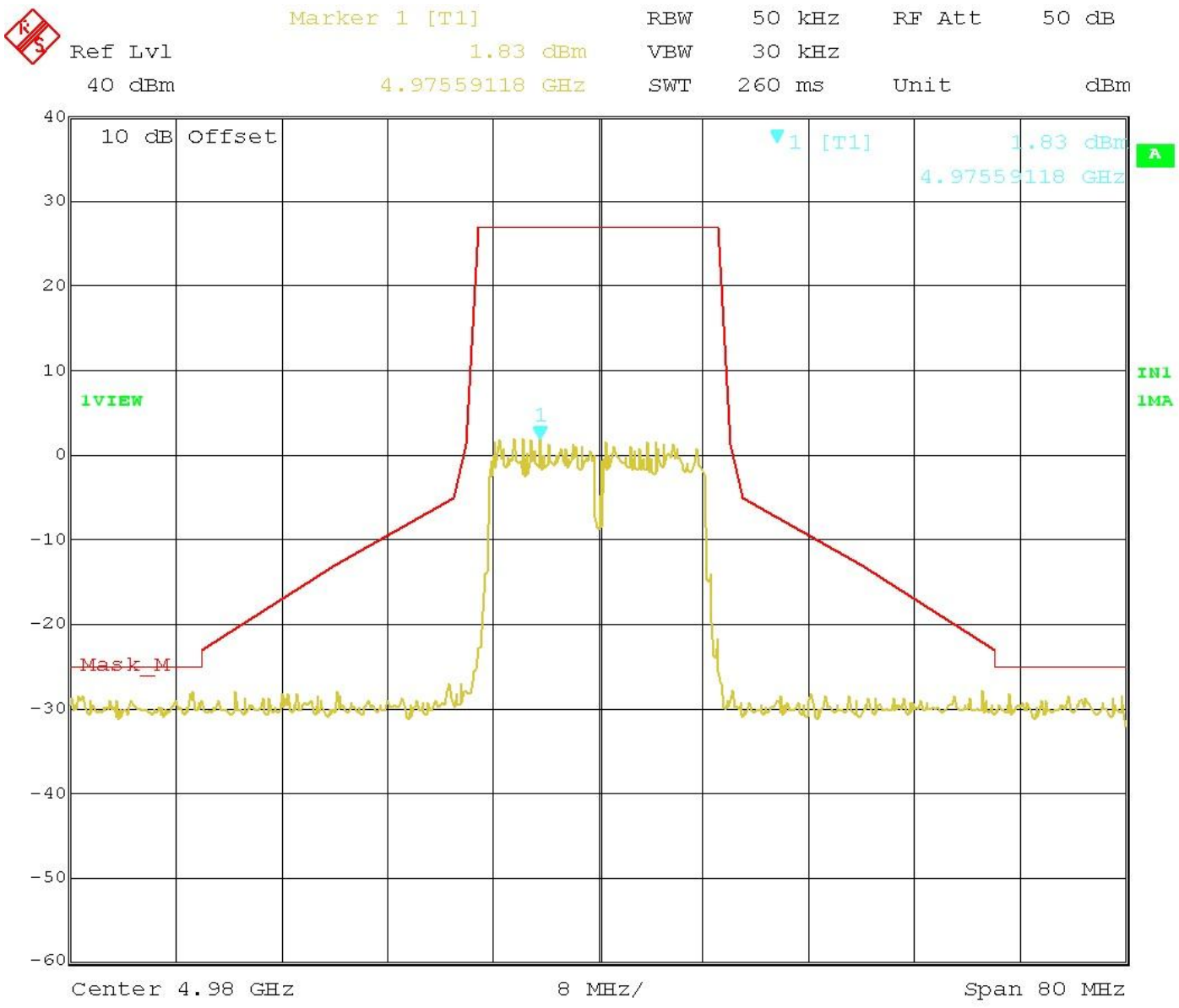


Figure 9 – Center Frequency 4980 MHz - 20 MHz Channel Spacing

3.5 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.

3.5.1 Over View of Test

Results	**Complies** (as tested per this report)				**Date**	7/9/2013	
Standard	FCC Parts 90.210						
Product	RF-7800W			**Serial#**	E00047		
Test Set-up	Tested in shielded room. EUT placed on table, see test plans for details						
EUT Powered By	4120VAC/60Hz	**Temp**	23º 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				

3.5.2 Test Procedure

This device is powered by POE (Power over Ethernet), therefore per FCC Part 15.207(c) this test is required.

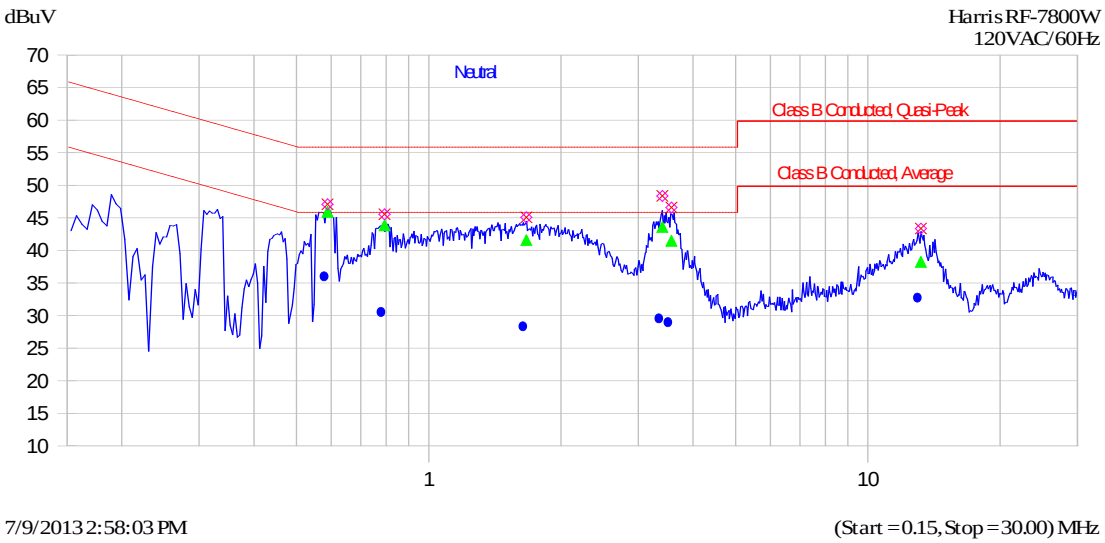
3.5.3 Final Test

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

NOTES:

Conducted Emissions @ 120V/60Hz
Neutral

Neutral



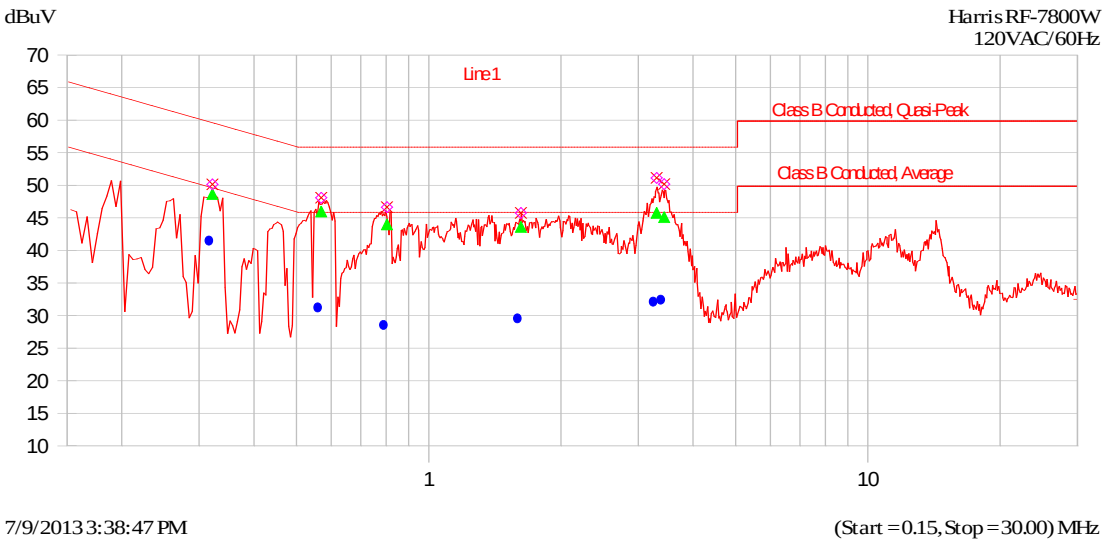
Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Transducer Correction dB	Cable Correction dB
0.583	47.2	46.0	-10.0	35.9	-10.1	0.0	10.3
0.786	45.7	44.0	-12.0	30.4	-15.6	0.0	10.3
1.652	45.2	41.7	-14.3	28.2	-17.8	0.0	10.4
3.373	48.5	43.7	-12.3	29.4	-16.6	0.1	10.5
3.535	46.7	41.6	-14.4	28.9	-17.1	0.1	10.5
13.083	43.5	38.4	-21.6	32.6	-17.4	0.1	11.0

NOTES:

Conducted Emissions @ 120V/60Hz

Line

Line 1



Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Transducer Correction dB	Cable Correction dB
0.319	50.3	48.8	-11.0	41.4	-8.4	0.0	10.2
0.564	48.2	46.1	-9.9	31.1	-14.9	0.0	10.3
0.796	46.8	44.1	-11.9	28.4	-17.6	0.0	10.3
1.607	45.9	43.7	-12.3	29.4	-16.6	0.0	10.4
3.274	51.3	45.9	-10.1	32.0	-14.0	0.1	10.5
3.406	50.3	45.2	-10.8	32.3	-13.7	0.1	10.5

4 Power Limits

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 NVLAP 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 Conducted Output Power, FCC 90.1215

The transmitting power of stations operating in the 4940–4990 MHz band must not exceed the maximum limits in this section. (a) The peak transmit power should not exceed:

Channel bandwidth (MHz)	Low power peak transmitter power (dBm)	High power peak transmitter powe (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

4.1.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	6/27/2013	
Standard	FCC Part 90.1215						
Product	RF-7800W			**Serial#**	E00047		
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		

4.1.2 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.

Test Setup:

4.1.3 Deviations

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

4.1.4 Final Test

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

4.1.5 Peak Power Output Results

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

5 MHz Spacing		8.5 dBi Antenna							
							8.5 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4942.5	18	64 QAM 2/3	12	26.48	27	-0.52	34.98	53	-18.02
4967.5	18	64 QAM 2/3	12	26	27	-1	34.5	53	-18.5
4987.5	18	64 QAM 2/3	12	26.8	27	-0.2	35.3	53	-17.7
4942.5	18	64 QAM 1/2	12	26.86	27	-0.14	35.36	53	-17.64
4967.5	18	64 QAM 1/2	12	26.1	27	-0.9	34.6	53	-18.4
4987.5	18	64 QAM 1/2	12	26.34	27	-0.66	34.84	53	-18.16
4942.5	20	16 QAM 3/4	9	26.15	27	-0.85	34.65	53	-18.35
4967.5	20	16 QAM 3/4	9	26.52	27	-0.48	35.02	53	-17.98
4987.5	20	16 QAM 3/4	9	25.25	27	-1.75	33.75	53	-19.25
4942.5	20	16 QAM 1/2	6	25.12	27	-1.88	33.62	53	-19.38
4967.5	20	16 QAM 1/2	6	26.32	27	-0.68	34.82	53	-18.18
4987.5	20	16 QAM 1/2	6	26.37	27	-0.63	34.87	53	-18.13
4942.5	22	QPSK 3/4	9	26.7	27	-0.3	35.2	53	-17.8
4967.5	22	QPSK 3/4	9	26.7	27	-0.3	35.2	53	-17.8
4987.5	22	QPSK 3/4	9	26.53	27	-0.47	35.03	53	-17.97
4942.5	22	QPSK 1/2	3	26.05	27	-0.95	34.55	53	-18.45
4967.5	22	QPSK 1/2	3	26.8	27	-0.2	35.3	53	-17.7
4987.5	22	QPSK 1/2	3	26.9	27	-0.1	35.4	53	-17.6
4942.5	22	BPSK 1/2	1.5	26.86	27	-0.14	35.36	53	-17.64
4967.5	22	BPSK 1/2	1.5	26.85	27	-0.15	35.35	53	-17.65
4987.5	22	BPSK 1/2	1.5	26.36	27	-0.64	34.86	53	-18.14

Figure 10 – Highest Peak Conducted Power Output for all Modulations with 5 MHz channel spacing with EIRP for a 8.5 dBi Gain antenna

10 MHz Spacing		8.5 dBi Antenna							
							8.5 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4945	18	64 QAM 2/3	27	22.39	30	-7.61	30.89	56	-25.11
4965	18	64 QAM 2/3	27	22.48	30	-7.52	30.98	56	-25.02
4985	18	64 QAM 2/3	27	20.38	30	-9.62	28.88	56	-27.12
4945	18	64 QAM 1/2	24	21.12	30	-8.88	29.62	56	-26.38
4965	18	64 QAM 1/2	24	20.64	30	-9.36	29.14	56	-26.86
4985	18	64 QAM 1/2	24	20.46	30	-9.54	28.96	56	-27.04
4945	20	16 QAM 3/4	18	22.91	30	-7.09	31.41	56	-24.59
4965	20	16 QAM 3/4	18	21.87	30	-8.13	30.37	56	-25.63
4985	20	16 QAM 3/4	18	22.24	30	-7.76	30.74	56	-25.26
4945	20	16 QAM 1/2	12	22.06	30	-7.94	30.56	56	-25.44
4965	20	16 QAM 1/2	12	22.31	30	-7.69	30.81	56	-25.19
4985	20	16 QAM 1/2	12	21.52	30	-8.48	30.02	56	-25.98
4945	22	QPSK 3/4	9	24.41	30	-5.59	32.91	56	-23.09
4965	22	QPSK 3/4	9	24.47	30	-5.53	32.97	56	-23.03
4985	22	QPSK 3/4	9	24.66	30	-5.34	33.16	56	-22.84
4945	22	QPSK 1/2	6	24.87	30	-5.13	33.37	56	-22.63
4965	22	QPSK 1/2	6	24.35	30	-5.65	32.85	56	-23.15
4985	22	QPSK 1/2	6	24.22	30	-5.78	32.72	56	-23.28
4945	22	BPSK 1/2	3	24.92	30	-5.08	33.42	56	-22.58
4965	22	BPSK 1/2	3	24.61	30	-5.39	33.11	56	-22.89
4985	22	BPSK 1/2	3	24.45	30	-5.55	32.95	56	-23.05

Figure 11 – Highest Peak Conducted Power Output for all Modulations with 10 MHz channel spacing with EIRP for a 8.5 dBi Gain antenna

20 MHz Spacing		8.5 dBi Antenna							
							8.5 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4950	18	64 QAM 2/3	27	17.74	33	-15.26	26.24	59	-32.76
4965	18	64 QAM 2/3	27	16.45	33	-16.55	24.95	59	-34.05
4980	18	64 QAM 2/3	27	16.32	33	-16.68	24.82	59	-34.18
4950	18	64 QAM 1/2	48	18.46	33	-14.54	26.96	59	-32.04
4965	18	64 QAM 1/2	48	19.1	33	-13.9	27.6	59	-31.4
4980	18	64 QAM 1/2	48	18.45	33	-14.55	26.95	59	-32.05
4950	20	16 QAM 3/4	36	18.57	33	-14.43	27.07	59	-31.93
4965	20	16 QAM 3/4	36	18.65	33	-14.35	27.15	59	-31.85
4980	20	16 QAM 3/4	36	19.23	33	-13.77	27.73	59	-31.27
4950	20	16 QAM 1/2	24	18.58	33	-14.42	27.08	59	-31.92
4965	20	16 QAM 1/2	24	18.76	33	-14.24	27.26	59	-31.74
4980	20	16 QAM 1/2	24	18.47	33	-14.53	26.97	59	-32.03
4950	22	QPSK 3/4	18	20.9	33	-12.1	29.4	59	-29.6
4965	22	QPSK 3/4	18	20.76	33	-12.24	29.26	59	-29.74
4980	22	QPSK 3/4	18	20.7	33	-12.3	29.2	59	-29.8
4950	22	QPSK 1/2	12	20.82	33	-12.18	29.32	59	-29.68
4965	22	QPSK 1/2	12	20.72	33	-12.28	29.22	59	-29.78
4980	22	QPSK 1/2	12	20.76	33	-12.24	29.26	59	-29.74
4950	22	BPSK 1/2	6	20.53	33	-12.47	29.03	59	-29.97
4965	22	BPSK 1/2	6	20.58	33	-12.42	29.08	59	-29.92
4980	22	BPSK 1/2	6	20.55	33	-12.45	29.05	59	-29.95

Figure 12 – Highest Peak Conducted Power Output for all Modulations with 20 MHz channel spacing with EIRP for a 8.5 dBi Gain antenna

5 MHz Spacing		14 dBi Antenna							
							14 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4942.5	18	64 QAM 2/3	12	26.48	27	-0.52	40.48	53	-12.52
4967.5	18	64 QAM 2/3	12	26	27	-1	40	53	-13
4987.5	18	64 QAM 2/3	12	26.8	27	-0.2	40.8	53	-12.2
4942.5	18	64 QAM 1/2	12	26.86	27	-0.14	40.86	53	-12.14
4967.5	18	64 QAM 1/2	12	26.1	27	-0.9	40.1	53	-12.9
4987.5	18	64 QAM 1/2	12	26.34	27	-0.66	40.34	53	-12.66
4942.5	20	16 QAM 3/4	9	26.15	27	-0.85	40.15	53	-12.85
4967.5	20	16 QAM 3/4	9	26.52	27	-0.48	40.52	53	-12.48
4987.5	20	16 QAM 3/4	9	25.25	27	-1.75	39.25	53	-13.75
4942.5	20	16 QAM 1/2	6	25.12	27	-1.88	39.12	53	-13.88
4967.5	20	16 QAM 1/2	6	26.32	27	-0.68	40.32	53	-12.68
4987.5	20	16 QAM 1/2	6	26.37	27	-0.63	40.37	53	-12.63
4942.5	22	QPSK 3/4	9	26.7	27	-0.3	40.7	53	-12.3
4967.5	22	QPSK 3/4	9	26.7	27	-0.3	40.7	53	-12.3
4987.5	22	QPSK 3/4	9	26.53	27	-0.47	40.53	53	-12.47
4942.5	22	QPSK 1/2	3	26.05	27	-0.95	40.05	53	-12.95
4967.5	22	QPSK 1/2	3	26.8	27	-0.2	40.8	53	-12.2
4987.5	22	QPSK 1/2	3	26.9	27	-0.1	40.9	53	-12.1
4942.5	22	BPSK 1/2	1.5	26.86	27	-0.14	40.86	53	-12.14
4967.5	22	BPSK 1/2	1.5	26.85	27	-0.15	40.85	53	-12.15
4987.5	22	BPSK 1/2	1.5	26.36	27	-0.64	40.36	53	-12.64

Figure 13 – Highest Peak Conducted Power Output for all Modulations with 5 MHz channel spacing with EIRP for a 14 dBi Gain antenna

10 MHz Spacing									
							14 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4945	18	64 QAM 2/3	27	22.39	30	-7.61	36.39	56	-19.61
4965	18	64 QAM 2/3	27	22.48	30	-7.52	36.48	56	-19.52
4985	18	64 QAM 2/3	27	20.38	30	-9.62	34.38	56	-21.62
4945	18	64 QAM 1/2	24	21.12	30	-8.88	35.12	56	-20.88
4965	18	64 QAM 1/2	24	20.64	30	-9.36	34.64	56	-21.36
4985	18	64 QAM 1/2	24	20.46	30	-9.54	34.46	56	-21.54
4945	20	16 QAM 3/4	18	22.91	30	-7.09	36.91	56	-19.09
4965	20	16 QAM 3/4	18	21.87	30	-8.13	35.87	56	-20.13
4985	20	16 QAM 3/4	18	22.24	30	-7.76	36.24	56	-19.76
4945	20	16 QAM 1/2	12	22.06	30	-7.94	36.06	56	-19.94
4965	20	16 QAM 1/2	12	22.31	30	-7.69	36.31	56	-19.69
4985	20	16 QAM 1/2	12	21.52	30	-8.48	35.52	56	-20.48
4945	22	QPSK 3/4	9	24.41	30	-5.59	38.41	56	-17.59
4965	22	QPSK 3/4	9	24.47	30	-5.53	38.47	56	-17.53
4985	22	QPSK 3/4	9	24.66	30	-5.34	38.66	56	-17.34
4945	22	QPSK 1/2	6	24.87	30	-5.13	38.87	56	-17.13
4965	22	QPSK 1/2	6	24.35	30	-5.65	38.35	56	-17.65
4985	22	QPSK 1/2	6	24.22	30	-5.78	38.22	56	-17.78
4945	22	BPSK 1/2	3	24.92	30	-5.08	38.92	56	-17.08
4965	22	BPSK 1/2	3	24.61	30	-5.39	38.61	56	-17.39
4985	22	BPSK 1/2	3	24.45	30	-5.55	38.45	56	-17.55

Figure 14 – – Highest Peak Conducted Power Output for all Modulations with 10 MHz channel spacing with EIRP for a 14 dBi Gain antenna

20 MHz Spacing									
							14 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4950	18	64 QAM 2/3	27	17.74	33	-15.26	31.74	59	-27.26
4965	18	64 QAM 2/3	27	16.45	33	-16.55	30.45	59	-28.55
4980	18	64 QAM 2/3	27	16.32	33	-16.68	30.32	59	-28.68
4950	18	64 QAM 1/2	48	18.46	33	-14.54	32.46	59	-26.54
4965	18	64 QAM 1/2	48	19.1	33	-13.9	33.1	59	-25.9
4980	18	64 QAM 1/2	48	18.45	33	-14.55	32.45	59	-26.55
4950	20	16 QAM 3/4	36	18.57	33	-14.43	32.57	59	-26.43
4965	20	16 QAM 3/4	36	18.65	33	-14.35	32.65	59	-26.35
4980	20	16 QAM 3/4	36	19.23	33	-13.77	33.23	59	-25.77
4950	20	16 QAM 1/2	24	18.58	33	-14.42	32.58	59	-26.42
4965	20	16 QAM 1/2	24	18.76	33	-14.24	32.76	59	-26.24
4980	20	16 QAM 1/2	24	18.47	33	-14.53	32.47	59	-26.53
4950	22	QPSK 3/4	18	20.9	33	-12.1	34.9	59	-24.1
4965	22	QPSK 3/4	18	20.76	33	-12.24	34.76	59	-24.24
4980	22	QPSK 3/4	18	20.7	33	-12.3	34.7	59	-24.3
4950	22	QPSK 1/2	12	20.82	33	-12.18	34.82	59	-24.18
4965	22	QPSK 1/2	12	20.72	33	-12.28	34.72	59	-24.28
4980	22	QPSK 1/2	12	20.76	33	-12.24	34.76	59	-24.24
4950	22	BPSK 1/2	6	20.53	33	-12.47	34.53	59	-24.47
4965	22	BPSK 1/2	6	20.58	33	-12.42	34.58	59	-24.42
4980	22	BPSK 1/2	6	20.55	33	-12.45	34.55	59	-24.45

Figure 15 – – Highest Peak Conducted Power Output for all Modulations with 20 MHz channel spacing with EIRP for a 14 dBi Gain antenna

5 MHz Spacing									
							21 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4942.5	18	64 QAM 2/3	12	26.48	27	-0.52	47.48	53	-5.52
4967.5	18	64 QAM 2/3	12	26	27	-1	47	53	-6
4987.5	18	64 QAM 2/3	12	26.8	27	-0.2	47.8	53	-5.2
4942.5	18	64 QAM 1/2	12	26.86	27	-0.14	47.86	53	-5.14
4967.5	18	64 QAM 1/2	12	26.1	27	-0.9	47.1	53	-5.9
4987.5	18	64 QAM 1/2	12	26.34	27	-0.66	47.34	53	-5.66
4942.5	20	16 QAM 3/4	9	26.15	27	-0.85	47.15	53	-5.85
4967.5	20	16 QAM 3/4	9	26.52	27	-0.48	47.52	53	-5.48
4987.5	20	16 QAM 3/4	9	25.25	27	-1.75	46.25	53	-6.75
4942.5	20	16 QAM 1/2	6	25.12	27	-1.88	46.12	53	-6.88
4967.5	20	16 QAM 1/2	6	26.32	27	-0.68	47.32	53	-5.68
4987.5	20	16 QAM 1/2	6	26.37	27	-0.63	47.37	53	-5.63
4942.5	22	QPSK 3/4	9	26.7	27	-0.3	47.7	53	-5.3
4967.5	22	QPSK 3/4	9	26.7	27	-0.3	47.7	53	-5.3
4987.5	22	QPSK 3/4	9	26.53	27	-0.47	47.53	53	-5.47
4942.5	22	QPSK 1/2	3	26.05	27	-0.95	47.05	53	-5.95
4967.5	22	QPSK 1/2	3	26.8	27	-0.2	47.8	53	-5.2
4987.5	22	QPSK 1/2	3	26.9	27	-0.1	47.9	53	-5.1
4942.5	22	BPSK 1/2	1.5	26.86	27	-0.14	47.86	53	-5.14
4967.5	22	BPSK 1/2	1.5	26.85	27	-0.15	47.85	53	-5.15
4987.5	22	BPSK 1/2	1.5	26.36	27	-0.64	47.36	53	-5.64

Figure 16 – Highest Peak Conducted Power Output for all Modulations with 5 MHz channel spacing with EIRP for a 21 dBi Gain antenna

10 MHz Spacing									
							21 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4945	18	64 QAM 2/3	27	22.39	30	-7.61	43.39	56	-12.61
4965	18	64 QAM 2/3	27	22.48	30	-7.52	43.48	56	-12.52
4985	18	64 QAM 2/3	27	20.38	30	-9.62	41.38	56	-14.62
4945	18	64 QAM 1/2	24	21.12	30	-8.88	42.12	56	-13.88
4965	18	64 QAM 1/2	24	20.64	30	-9.36	41.64	56	-14.36
4985	18	64 QAM 1/2	24	20.46	30	-9.54	41.46	56	-14.54
4945	20	16 QAM 3/4	18	22.91	30	-7.09	43.91	56	-12.09
4965	20	16 QAM 3/4	18	21.87	30	-8.13	42.87	56	-13.13
4985	20	16 QAM 3/4	18	22.24	30	-7.76	43.24	56	-12.76
4945	20	16 QAM 1/2	12	22.06	30	-7.94	43.06	56	-12.94
4965	20	16 QAM 1/2	12	22.31	30	-7.69	43.31	56	-12.69
4985	20	16 QAM 1/2	12	21.52	30	-8.48	42.52	56	-13.48
4945	22	QPSK 3/4	9	24.41	30	-5.59	45.41	56	-10.59
4965	22	QPSK 3/4	9	24.47	30	-5.53	45.47	56	-10.53
4985	22	QPSK 3/4	9	24.66	30	-5.34	45.66	56	-10.34
4945	22	QPSK 1/2	6	24.87	30	-5.13	45.87	56	-10.13
4965	22	QPSK 1/2	6	24.35	30	-5.65	45.35	56	-10.65
4985	22	QPSK 1/2	6	24.22	30	-5.78	45.22	56	-10.78
4945	22	BPSK 1/2	3	24.92	30	-5.08	45.92	56	-10.08
4965	22	BPSK 1/2	3	24.61	30	-5.39	45.61	56	-10.39
4985	22	BPSK 1/2	3	24.45	30	-5.55	45.45	56	-10.55

Figure 17 – – Highest Peak Conducted Power Output for all Modulations with 10 MHz channel spacing with EIRP for a 21 dBi Gain antenna

20 MHz Spacing									
							21 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4950	18	64 QAM 2/3	27	17.74	33	-15.26	38.74	59	-20.26
4965	18	64 QAM 2/3	27	16.45	33	-16.55	37.45	59	-21.55
4980	18	64 QAM 2/3	27	16.32	33	-16.68	37.32	59	-21.68
4950	18	64 QAM 1/2	48	18.46	33	-14.54	39.46	59	-19.54
4965	18	64 QAM 1/2	48	19.1	33	-13.9	40.1	59	-18.9
4980	18	64 QAM 1/2	48	18.45	33	-14.55	39.45	59	-19.55
4950	20	16 QAM 3/4	36	18.57	33	-14.43	39.57	59	-19.43
4965	20	16 QAM 3/4	36	18.65	33	-14.35	39.65	59	-19.35
4980	20	16 QAM 3/4	36	19.23	33	-13.77	40.23	59	-18.77
4950	20	16 QAM 1/2	24	18.58	33	-14.42	39.58	59	-19.42
4965	20	16 QAM 1/2	24	18.76	33	-14.24	39.76	59	-19.24
4980	20	16 QAM 1/2	24	18.47	33	-14.53	39.47	59	-19.53
4950	22	QPSK 3/4	18	20.9	33	-12.1	41.9	59	-17.1
4965	22	QPSK 3/4	18	20.76	33	-12.24	41.76	59	-17.24
4980	22	QPSK 3/4	18	20.7	33	-12.3	41.7	59	-17.3
4950	22	QPSK 1/2	12	20.82	33	-12.18	41.82	59	-17.18
4965	22	QPSK 1/2	12	20.72	33	-12.28	41.72	59	-17.28
4980	22	QPSK 1/2	12	20.76	33	-12.24	41.76	59	-17.24
4950	22	BPSK 1/2	6	20.53	33	-12.47	41.53	59	-17.47
4965	22	BPSK 1/2	6	20.58	33	-12.42	41.58	59	-17.42
4980	22	BPSK 1/2	6	20.55	33	-12.45	41.55	59	-17.45

Figure 18 – – Highest Peak Conducted Power Output for all Modulations with 20 MHz channel spacing with EIRP for a 21 dBi Gain antenna

5 MHz Spacing									
							27.5 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4942.5	18	64 QAM 2/3	12	26.48	27	-0.52	52.48	53	-0.52
4967.5	18	64 QAM 2/3	12	26	27	-1	52	53	-1
4987.5	18	64 QAM 2/3	12	26.8	27	-0.2	52.8	53	-0.2
4942.5	18	64 QAM 1/2	12	26.86	27	-0.14	52.86	53	-0.14
4967.5	18	64 QAM 1/2	12	26.1	27	-0.9	52.1	53	-0.9
4987.5	18	64 QAM 1/2	12	26.34	27	-0.66	52.34	53	-0.66
4942.5	20	16 QAM 3/4	9	26.15	27	-0.85	52.15	53	-0.85
4967.5	20	16 QAM 3/4	9	26.52	27	-0.48	52.52	53	-0.48
4987.5	20	16 QAM 3/4	9	25.25	27	-1.75	51.25	53	-1.75
4942.5	20	16 QAM 1/2	6	25.12	27	-1.88	51.12	53	-1.88
4967.5	20	16 QAM 1/2	6	26.32	27	-0.68	52.32	53	-0.68
4987.5	20	16 QAM 1/2	6	26.37	27	-0.63	52.37	53	-0.63
4942.5	22	QPSK 3/4	9	26.7	27	-0.3	52.7	53	-0.3
4967.5	22	QPSK 3/4	9	26.7	27	-0.3	52.7	53	-0.3
4987.5	22	QPSK 3/4	9	26.53	27	-0.47	52.53	53	-0.47
4942.5	22	QPSK 1/2	3	26.05	27	-0.95	52.05	53	-0.95
4967.5	22	QPSK 1/2	3	26.8	27	-0.2	52.8	53	-0.2
4987.5	22	QPSK 1/2	3	26.9	27	-0.1	52.9	53	-0.1
4942.5	22	BPSK 1/2	1.5	26.86	27	-0.14	52.86	53	-0.14
4967.5	22	BPSK 1/2	1.5	26.85	27	-0.15	52.85	53	-0.15
4987.5	22	BPSK 1/2	1.5	26.36	27	-0.64	52.36	53	-0.64

Figure 19 – Highest Peak Conducted Power Output for all Modulations with 5 MHz channel spacing with EIRP for a 27.5 dBi Gain antenna

10 MHz Spacing									
							26 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4945	18	64 QAM 2/3	27	22.39	30	-7.61	48.39	56	-7.61
4965	18	64 QAM 2/3	27	22.48	30	-7.52	48.48	56	-7.52
4985	18	64 QAM 2/3	27	20.38	30	-9.62	46.38	56	-9.62
4945	18	64 QAM 1/2	24	21.12	30	-8.88	47.12	56	-8.88
4965	18	64 QAM 1/2	24	20.64	30	-9.36	46.64	56	-9.36
4985	18	64 QAM 1/2	24	20.46	30	-9.54	46.46	56	-9.54
4945	20	16 QAM 3/4	18	22.91	30	-7.09	48.91	56	-7.09
4965	20	16 QAM 3/4	18	21.87	30	-8.13	47.87	56	-8.13
4985	20	16 QAM 3/4	18	22.24	30	-7.76	48.24	56	-7.76
4945	20	16 QAM 1/2	12	22.06	30	-7.94	48.06	56	-7.94
4965	20	16 QAM 1/2	12	22.31	30	-7.69	48.31	56	-7.69
4985	20	16 QAM 1/2	12	21.52	30	-8.48	47.52	56	-8.48
4945	22	QPSK 3/4	9	24.41	30	-5.59	50.41	56	-5.59
4965	22	QPSK 3/4	9	24.47	30	-5.53	50.47	56	-5.53
4985	22	QPSK 3/4	9	24.66	30	-5.34	50.66	56	-5.34
4945	22	QPSK 1/2	6	24.87	30	-5.13	50.87	56	-5.13
4965	22	QPSK 1/2	6	24.35	30	-5.65	50.35	56	-5.65
4985	22	QPSK 1/2	6	24.22	30	-5.78	50.22	56	-5.78
4945	22	BPSK 1/2	3	24.92	30	-5.08	50.92	56	-5.08
4965	22	BPSK 1/2	3	24.61	30	-5.39	50.61	56	-5.39
4985	22	BPSK 1/2	3	24.45	30	-5.55	50.45	56	-5.55

Figure 20 – – Highest Peak Conducted Power Output for all Modulations with 10 MHz channel spacing with EIRP for a 27.5 dBi Gain antenna

20 MHz Spacing									
							26 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4950	18	64 QAM 2/3	27	17.74	33	-15.26	43.74	59	-15.26
4965	18	64 QAM 2/3	27	16.45	33	-16.55	42.45	59	-16.55
4980	18	64 QAM 2/3	27	16.32	33	-16.68	42.32	59	-16.68
4950	18	64 QAM 1/2	48	18.46	33	-14.54	44.46	59	-14.54
4965	18	64 QAM 1/2	48	19.1	33	-13.9	45.1	59	-13.9
4980	18	64 QAM 1/2	48	18.45	33	-14.55	44.45	59	-14.55
4950	20	16 QAM 3/4	36	18.57	33	-14.43	44.57	59	-14.43
4965	20	16 QAM 3/4	36	18.65	33	-14.35	44.65	59	-14.35
4980	20	16 QAM 3/4	36	19.23	33	-13.77	45.23	59	-13.77
4950	20	16 QAM 1/2	24	18.58	33	-14.42	44.58	59	-14.42
4965	20	16 QAM 1/2	24	18.76	33	-14.24	44.76	59	-14.24
4980	20	16 QAM 1/2	24	18.47	33	-14.53	44.47	59	-14.53
4950	22	QPSK 3/4	18	20.9	33	-12.1	46.9	59	-12.1
4965	22	QPSK 3/4	18	20.76	33	-12.24	46.76	59	-12.24
4980	22	QPSK 3/4	18	20.7	33	-12.3	46.7	59	-12.3
4950	22	QPSK 1/2	12	20.82	33	-12.18	46.82	59	-12.18
4965	22	QPSK 1/2	12	20.72	33	-12.28	46.72	59	-12.28
4980	22	QPSK 1/2	12	20.76	33	-12.24	46.76	59	-12.24
4950	22	BPSK 1/2	6	20.53	33	-12.47	46.53	59	-12.47
4965	22	BPSK 1/2	6	20.58	33	-12.42	46.58	59	-12.42
4980	22	BPSK 1/2	6	20.55	33	-12.45	46.55	59	-12.45

Figure 21 – – Highest Peak Conducted Power Output for all Modulations with 20 MHz channel spacing with EIRP for a 27.5 dBi Gain antenna

5 MHz Spacing									
							30 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4942.5	17	64 QAM 2/3	12	22.12	27	-4.88	52.12	53	-0.88
4967.5	17	64 QAM 2/3	12	22.2	27	-4.8	52.2	53	-0.8
4987.5	17	64 QAM 2/3	12	21.82	27	-5.18	51.82	53	-1.18
4942.5	17	64 QAM 1/2	12	22.07	27	-4.93	52.07	53	-0.93
4967.5	17	64 QAM 1/2	12	21.9	27	-5.1	51.9	53	-1.1
4987.5	17	64 QAM 1/2	12	21.64	27	-5.36	51.64	53	-1.36
4942.5	19	16 QAM 3/4	9	21.95	27	-5.05	51.95	53	-1.05
4967.5	19	16 QAM 3/4	9	22.37	27	-4.63	52.37	53	-0.63
4987.5	19	16 QAM 3/4	9	21.12	27	-5.88	51.12	53	-1.88
4942.5	19	16 QAM 1/2	6	22.71	27	-4.29	52.71	53	-0.29
4967.5	19	16 QAM 1/2	6	21.3	27	-5.7	51.3	53	-1.7
4987.5	19	16 QAM 1/2	6	22.8	27	-4.2	52.8	53	-0.2
4942.5	21	QPSK 3/4	9	22.37	27	-4.63	52.37	53	-0.63
4967.5	21	QPSK 3/4	9	22.87	27	-4.13	52.87	53	-0.13
4987.5	21	QPSK 3/4	9	22.05	27	-4.95	52.05	53	-0.95
4942.5	21	QPSK 1/2	3	22.47	27	-4.53	52.47	53	-0.53
4967.5	21	QPSK 1/2	3	21.53	27	-5.47	51.53	53	-1.47
4987.5	21	QPSK 1/2	3	21.8	27	-5.2	51.8	53	-1.2
4942.5	21	BPSK 1/2	1.5	22.29	27	-4.71	52.29	53	-0.71
4967.5	21	BPSK 1/2	1.5	22.65	27	-4.35	52.65	53	-0.35
4987.5	21	BPSK 1/2	1.5	22.55	27	-4.45	52.55	53	-0.45

Figure 22 – Highest Peak Conducted Power Output for all Modulations with 5 MHz channel spacing with EIRP for 30 dBi Gain antenna

10 MHz Spacing									
							30 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4945	18	64 QAM 2/3	27	22.39	30	-7.61	52.39	56	-3.61
4965	18	64 QAM 2/3	27	22.48	30	-7.52	52.48	56	-3.52
4985	18	64 QAM 2/3	27	20.38	30	-9.62	50.38	56	-5.62
4945	18	64 QAM 1/2	24	21.12	30	-8.88	51.12	56	-4.88
4965	18	64 QAM 1/2	24	20.64	30	-9.36	50.64	56	-5.36
4985	18	64 QAM 1/2	24	20.46	30	-9.54	50.46	56	-5.54
4945	20	16 QAM 3/4	18	22.91	30	-7.09	52.91	56	-3.09
4965	20	16 QAM 3/4	18	21.87	30	-8.13	51.87	56	-4.13
4985	20	16 QAM 3/4	18	22.24	30	-7.76	52.24	56	-3.76
4945	20	16 QAM 1/2	12	22.06	30	-7.94	52.06	56	-3.94
4965	20	16 QAM 1/2	12	22.31	30	-7.69	52.31	56	-3.69
4985	20	16 QAM 1/2	12	21.52	30	-8.48	51.52	56	-4.48
4945	22	QPSK 3/4	9	24.41	30	-5.59	54.41	56	-1.59
4965	22	QPSK 3/4	9	24.47	30	-5.53	54.47	56	-1.53
4985	22	QPSK 3/4	9	24.66	30	-5.34	54.66	56	-1.34
4945	22	QPSK 1/2	6	24.87	30	-5.13	54.87	56	-1.13
4965	22	QPSK 1/2	6	24.35	30	-5.65	54.35	56	-1.65
4985	22	QPSK 1/2	6	24.22	30	-5.78	54.22	56	-1.78
4945	22	BPSK 1/2	3	24.92	30	-5.08	54.92	56	-1.08
4965	22	BPSK 1/2	3	24.61	30	-5.39	54.61	56	-1.39
4985	22	BPSK 1/2	3	24.45	30	-5.55	54.45	56	-1.55

Figure 23 – – Highest Peak Conducted Power Output for all Modulations with 10 MHz channel spacing with EIRP for 30 dBi Gain antenna

20 MHz Spacing									
							30 dBi Ant		
Frequency	Power	Mod	Data Rate	Peak Pwr	Peak Limit	Margin	EIRP Calc	EIRP Limit	EIRP Margin
4950	18	64 QAM 2/3	27	17.74	33	-15.26	47.74	59	-11.26
4965	18	64 QAM 2/3	27	16.45	33	-16.55	46.45	59	-12.55
4980	18	64 QAM 2/3	27	16.32	33	-16.68	46.32	59	-12.68
4950	18	64 QAM 1/2	48	18.46	33	-14.54	48.46	59	-10.54
4965	18	64 QAM 1/2	48	19.1	33	-13.9	49.1	59	-9.9
4980	18	64 QAM 1/2	48	18.45	33	-14.55	48.45	59	-10.55
4950	20	16 QAM 3/4	36	18.57	33	-14.43	48.57	59	-10.43
4965	20	16 QAM 3/4	36	18.65	33	-14.35	48.65	59	-10.35
4980	20	16 QAM 3/4	36	19.23	33	-13.77	49.23	59	-9.77
4950	20	16 QAM 1/2	24	18.58	33	-14.42	48.58	59	-10.42
4965	20	16 QAM 1/2	24	18.76	33	-14.24	48.76	59	-10.24
4980	20	16 QAM 1/2	24	18.47	33	-14.53	48.47	59	-10.53
4950	22	QPSK 3/4	18	20.9	33	-12.1	50.9	59	-8.1
4965	22	QPSK 3/4	18	20.76	33	-12.24	50.76	59	-8.24
4980	22	QPSK 3/4	18	20.7	33	-12.3	50.7	59	-8.3
4950	22	QPSK 1/2	12	20.82	33	-12.18	50.82	59	-8.18
4965	22	QPSK 1/2	12	20.72	33	-12.28	50.72	59	-8.28
4980	22	QPSK 1/2	12	20.76	33	-12.24	50.76	59	-8.24
4950	22	BPSK 1/2	6	20.53	33	-12.47	50.53	59	-8.47
4965	22	BPSK 1/2	6	20.58	33	-12.42	50.58	59	-8.42
4980	22	BPSK 1/2	6	20.55	33	-12.45	50.55	59	-8.45

Figure 24 – – Highest Peak Conducted Power Output for all Modulations with 20 MHz channel spacing with EIRP for 30 dBi Gain antenna

4.2 Peak Power Spectral Density

4.2.1 Test Over View

High power devices are also limited to a peak power spectral density of 21 dBm per one MHz. High power devices using channel bandwidths other than those listed above are permitted; how- ever, they are limited to a peak power spectral density of 21 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the peak transmit power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point- to-point or point-to-multipoint operation (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the transmitter power or spectral density. Corresponding reduction in the peak transmit power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26dBi.

Results	**Complies** (as tested per this report)					**Date**	6/27/2013
Standard	FCC Part 90.1215						
Product	RF-7800W			**Serial#**	E00047		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	Power over Ethernet	**Temp**	22º C	**Humidity**	32%	**Pressure**	1010mbar
Perf. Criteria	Below Limit (10dBm)			**Perf. Verification**	≤21 dBm in any 1 MHz		
Mod. to EUT	None			**Test Performed By**	Randall E Masline		

4.2.2 Test Procedure

Using the methods of ANSI C63.10:2009.

4.2.3 Deviations

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

4.2.4 Final Test

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

4.2.5 Final Data

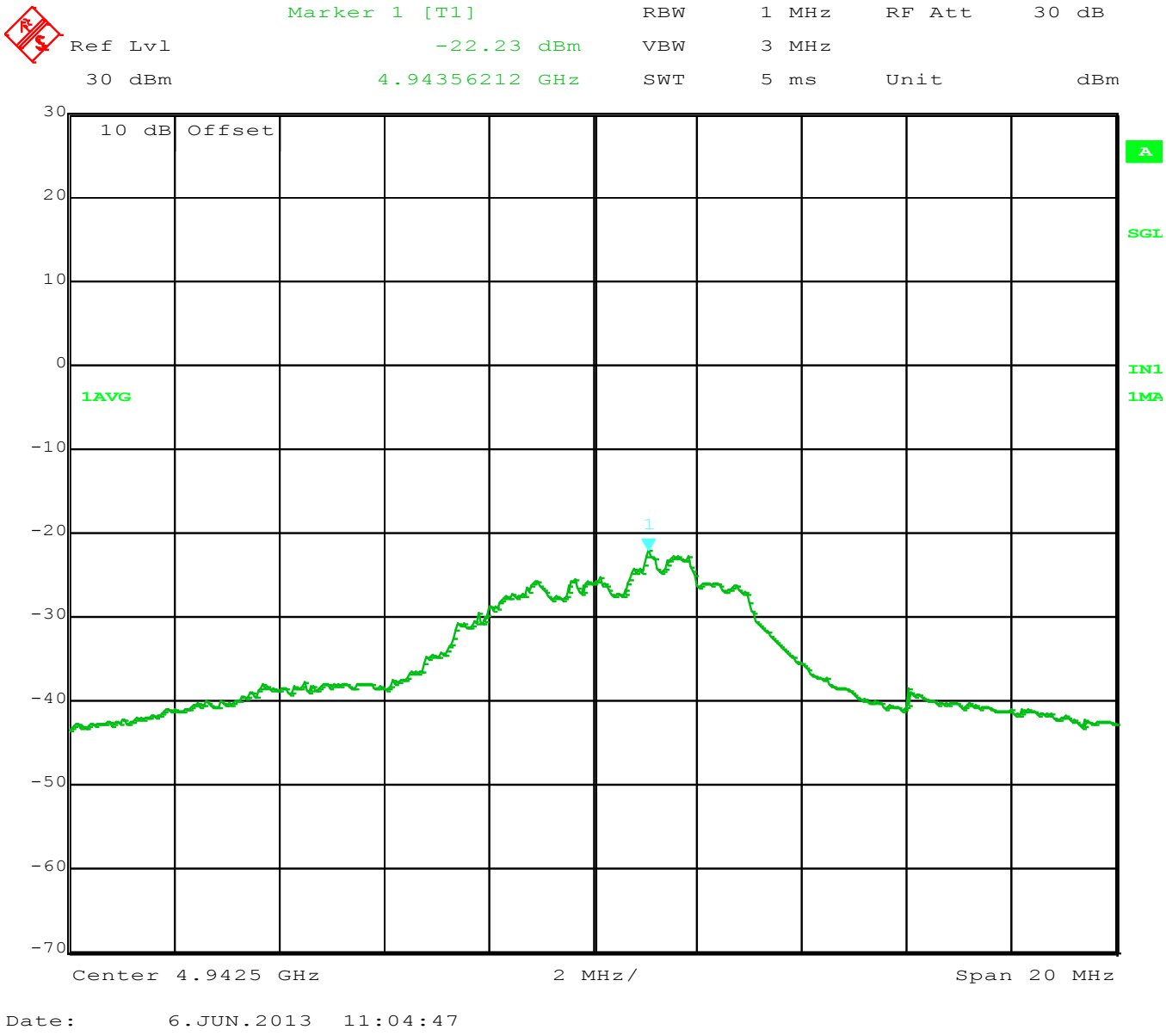


Figure 25: 4942.5 MHz at 5MHz BW

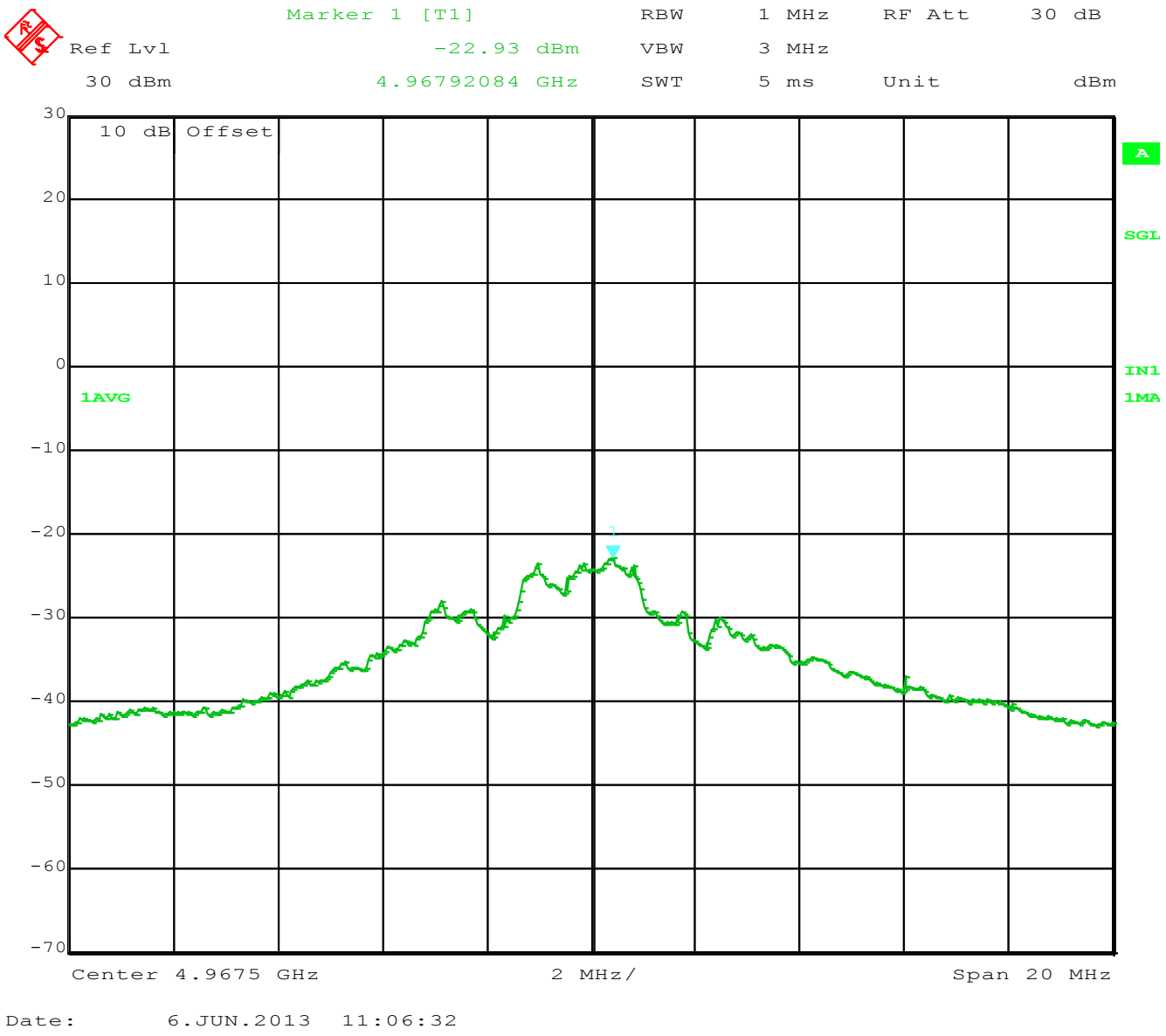


Figure 26: 4967.5 MHz at 5 MHz BW

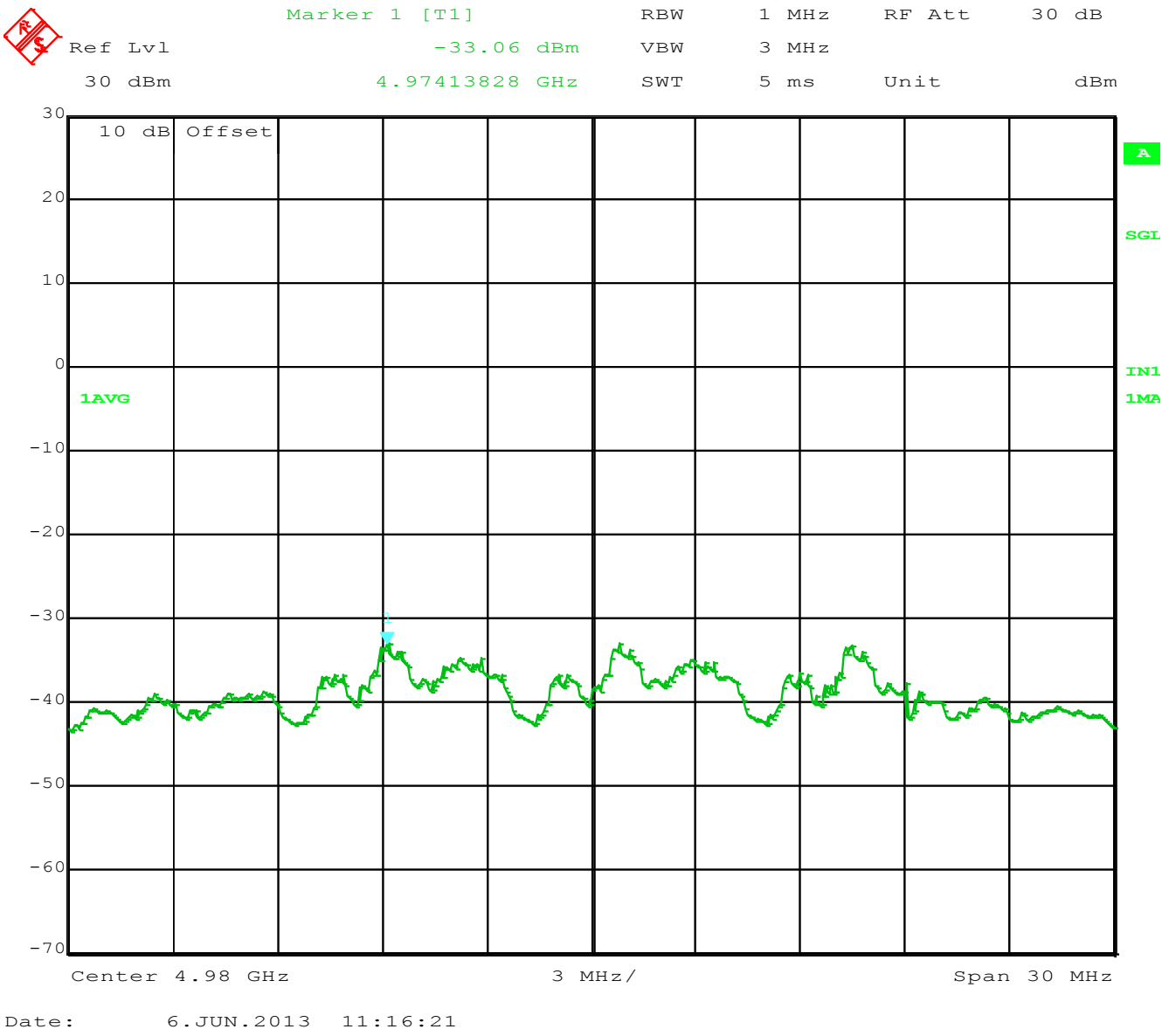


Figure 27: 4987.5 MHz at 5 MHz BW

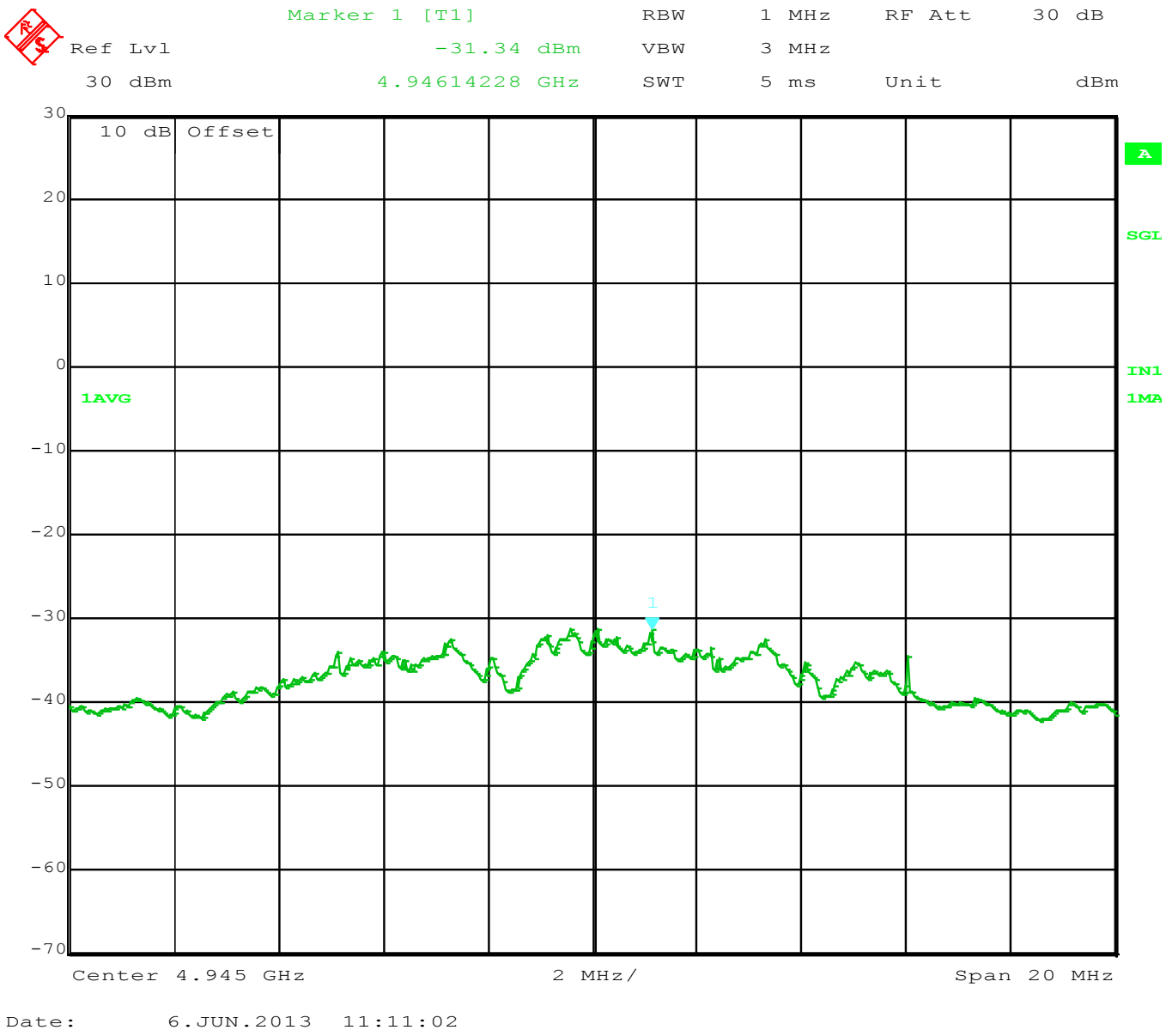


Figure 28: 4945 MHz at 10 MHz BW

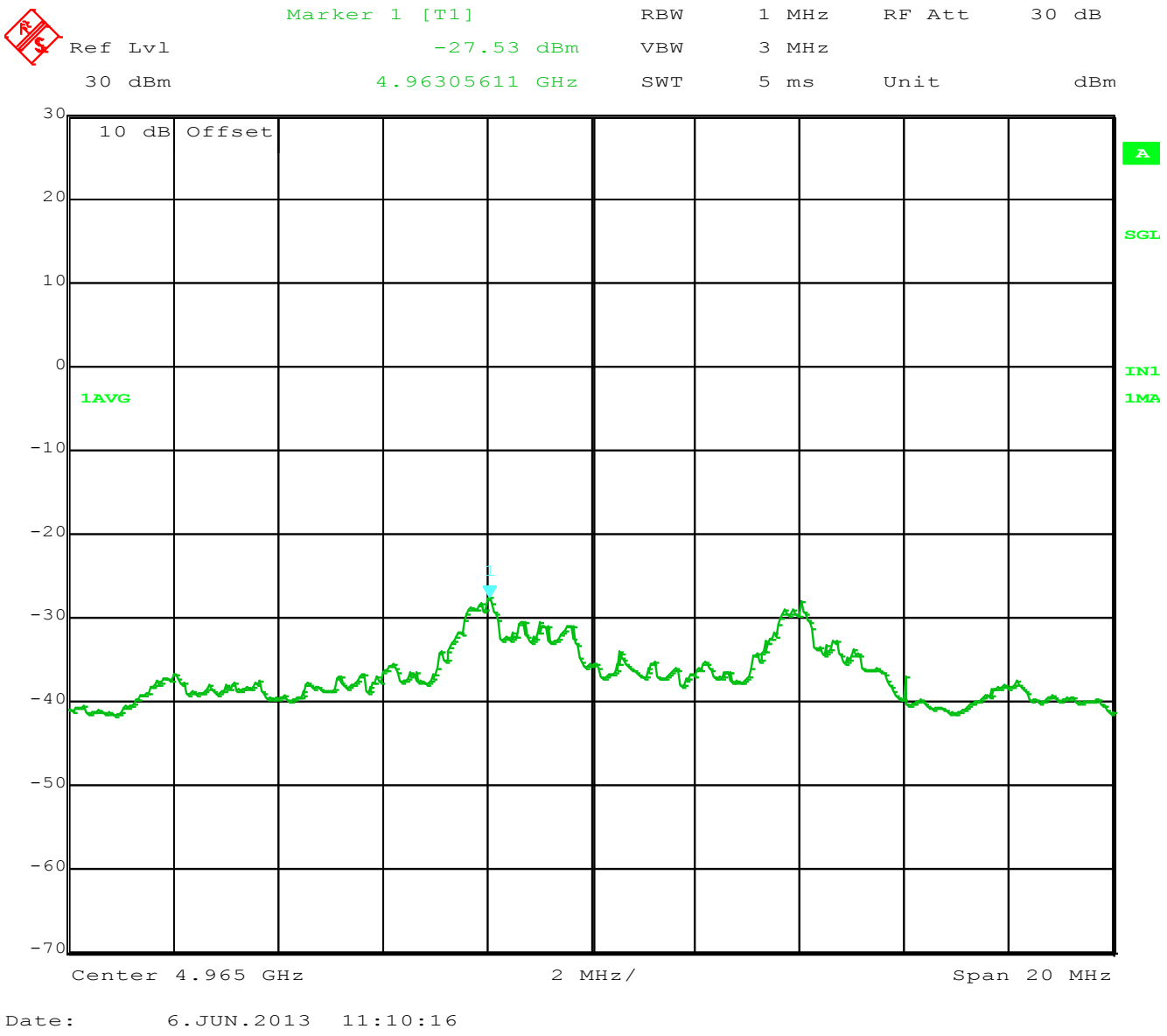


Figure 29: 4965 MHz at 10 MHz BW

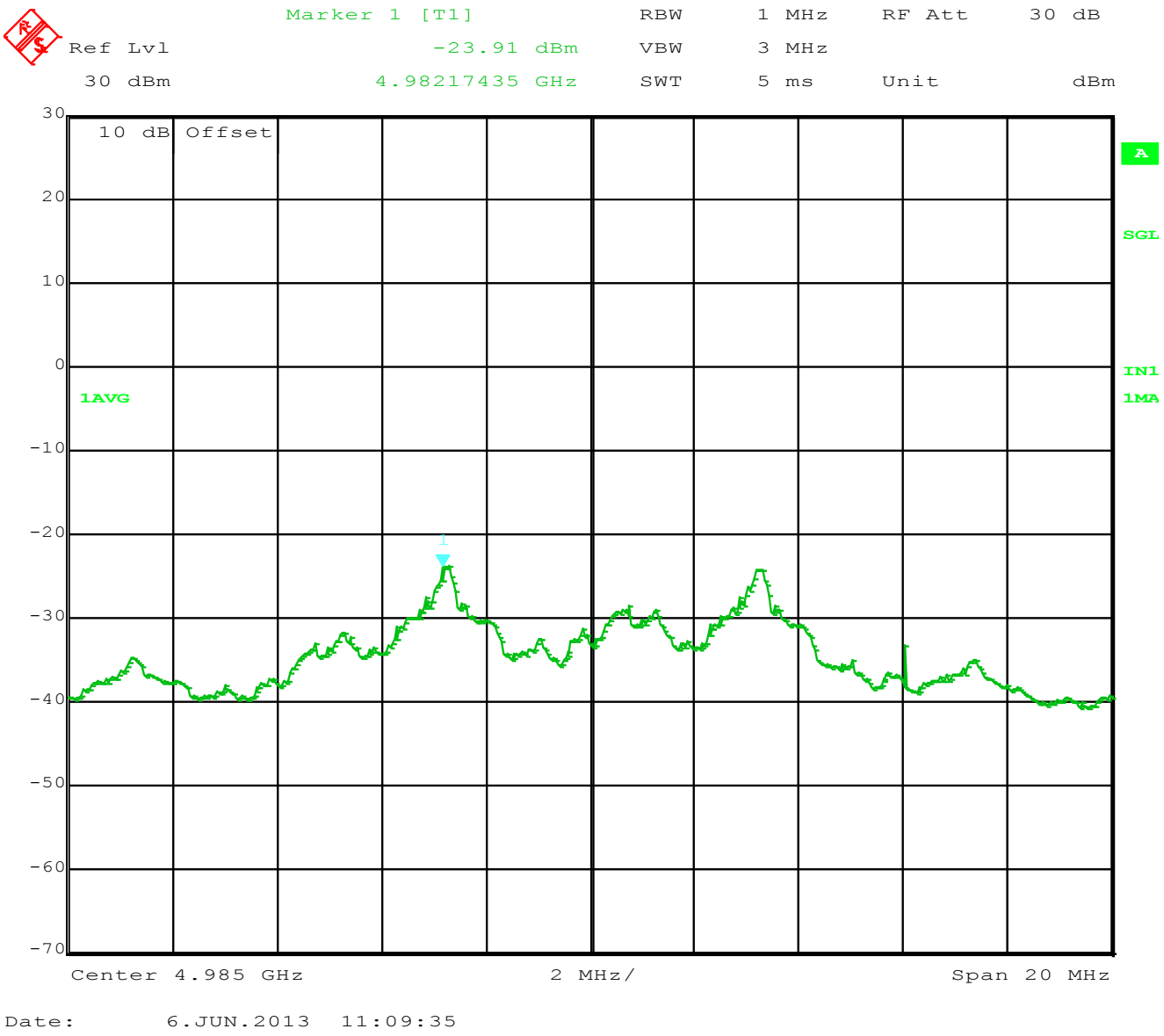


Figure 30: 4985 MHz at 10 MHz BW

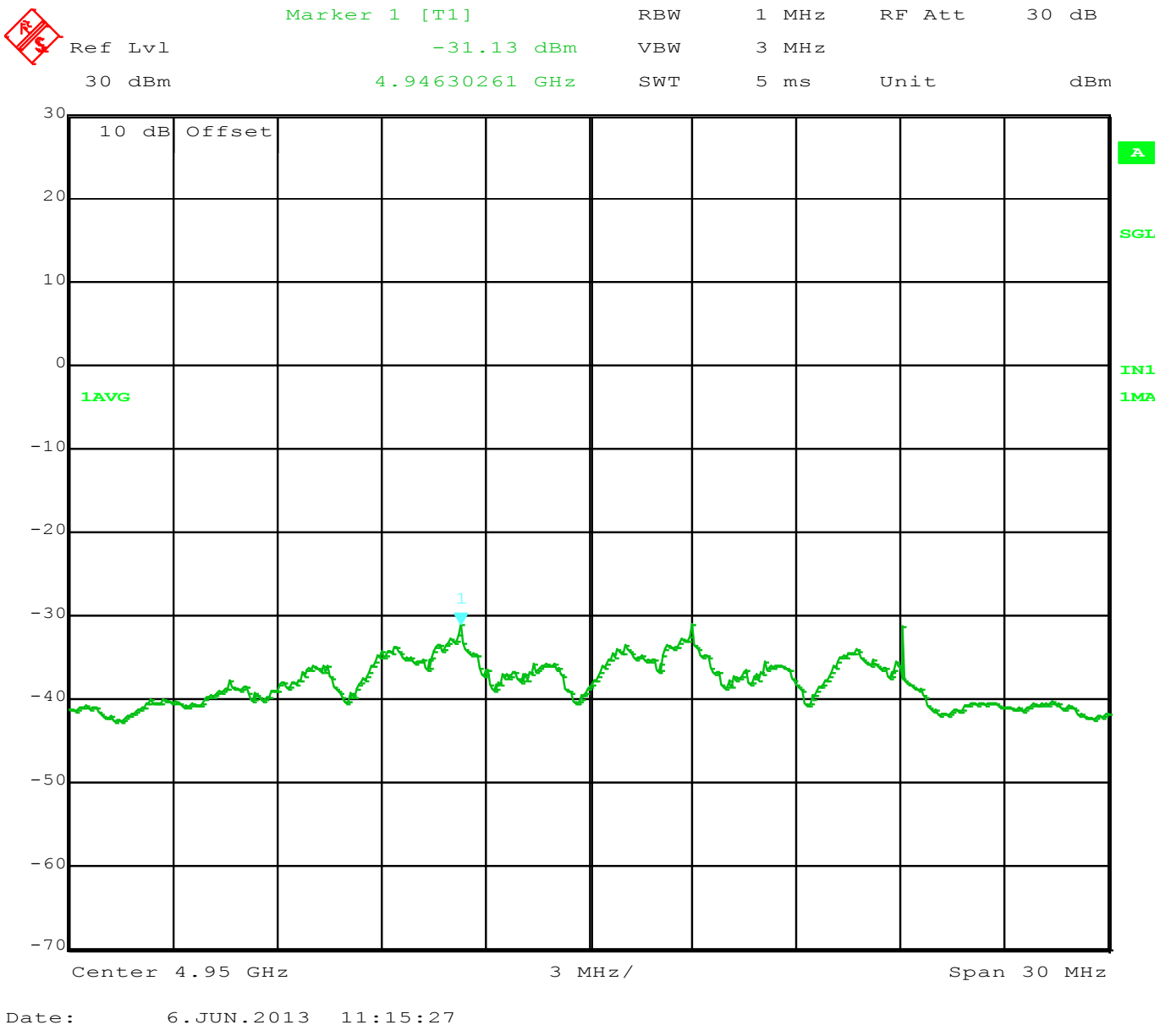


Figure 31: 4950 MHz at 20 MHz BW

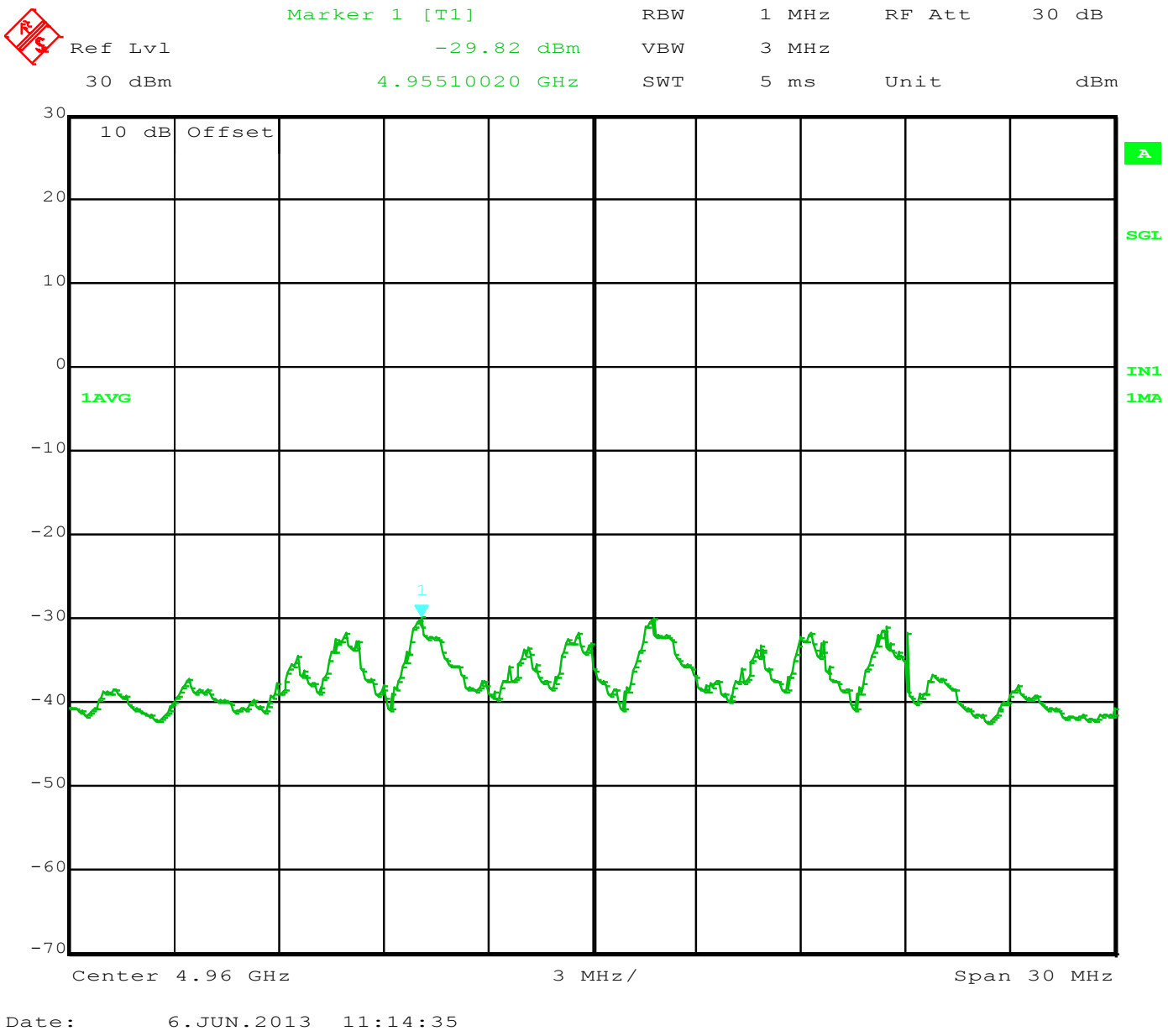


Figure 32: 4960 MHz at 20 MHz BW

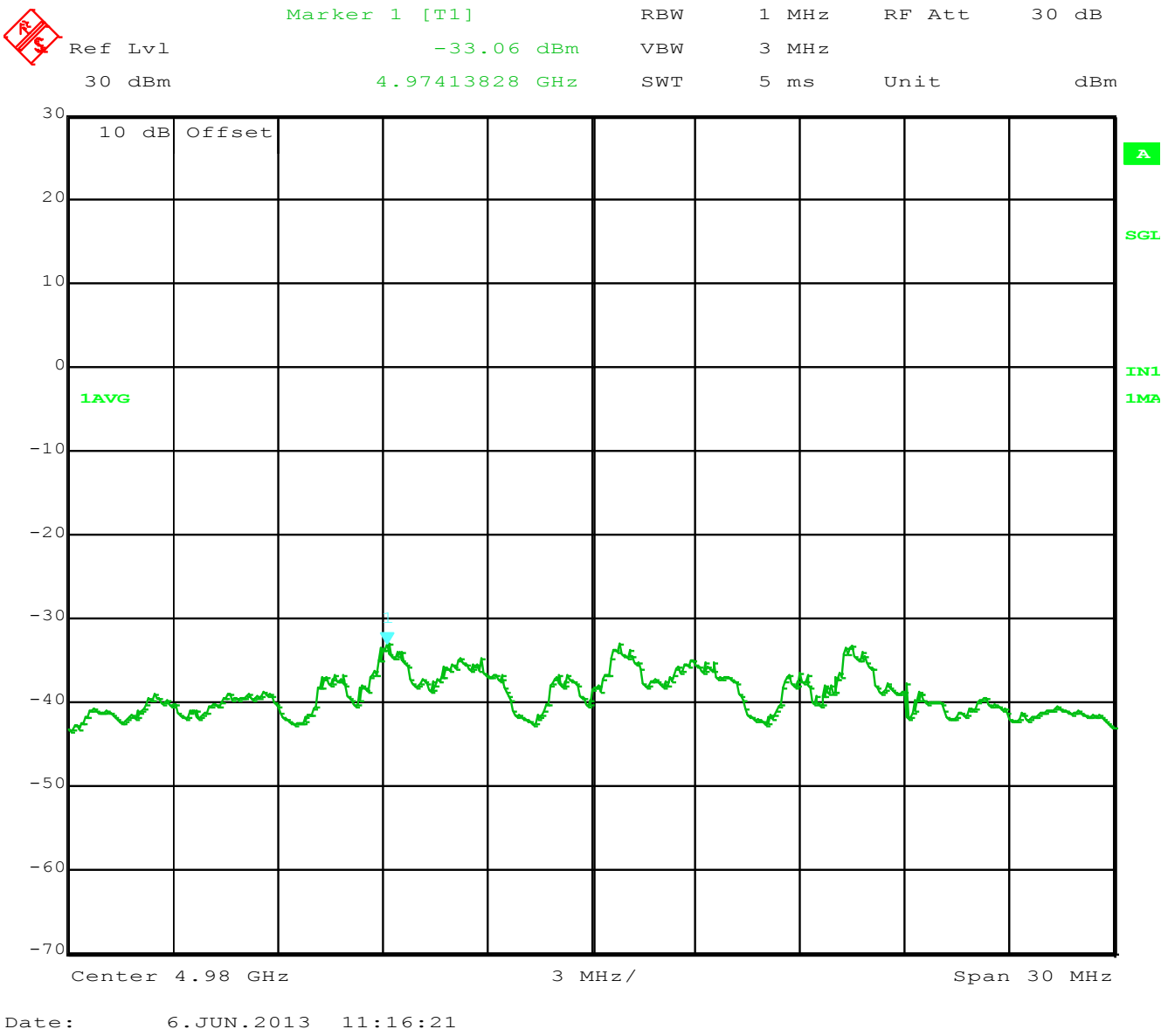


Figure 33: 4980 MHz at 20 MHz BW

4.3 99% Occupied Bandwidth

The following channel center frequencies are permitted to be aggregated for channel bandwidths of 5, 10, 15 or 20 MHz Channel numbers 1 through 5 and 15 through 18 are 1 MHz channels and channels numbers 6 through 14 are 5 MHz channels.

4.3.1 Test Over View

Results	**Complies** (as tested per this report)					**Date**	6/27/2013
Standard	FCC Part 90.1213 & 2.1049						
Product	RF-7800W			**Serial#**	E00047		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	Power over Ethernet	**Temp**	22º F	**Humidity**	32%	**Pressure**	1010 mbar
Perf. Criteria	(Below Limit) No limit Specified			**Perf. Verification**	Readings Under Limit		
Mod. to EUT	None			**Test Performed By**	Randall E Masline		

4.3.2 Test Procedure

The 99% occupied bandwidth is measured using EMI receiver (spectrum analyzer) with RBW = 1% of 99% OBW, VBW >=RBW.

4.3.3 Deviations

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

4.3.4 Final Test

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

4.3.5 Final Data

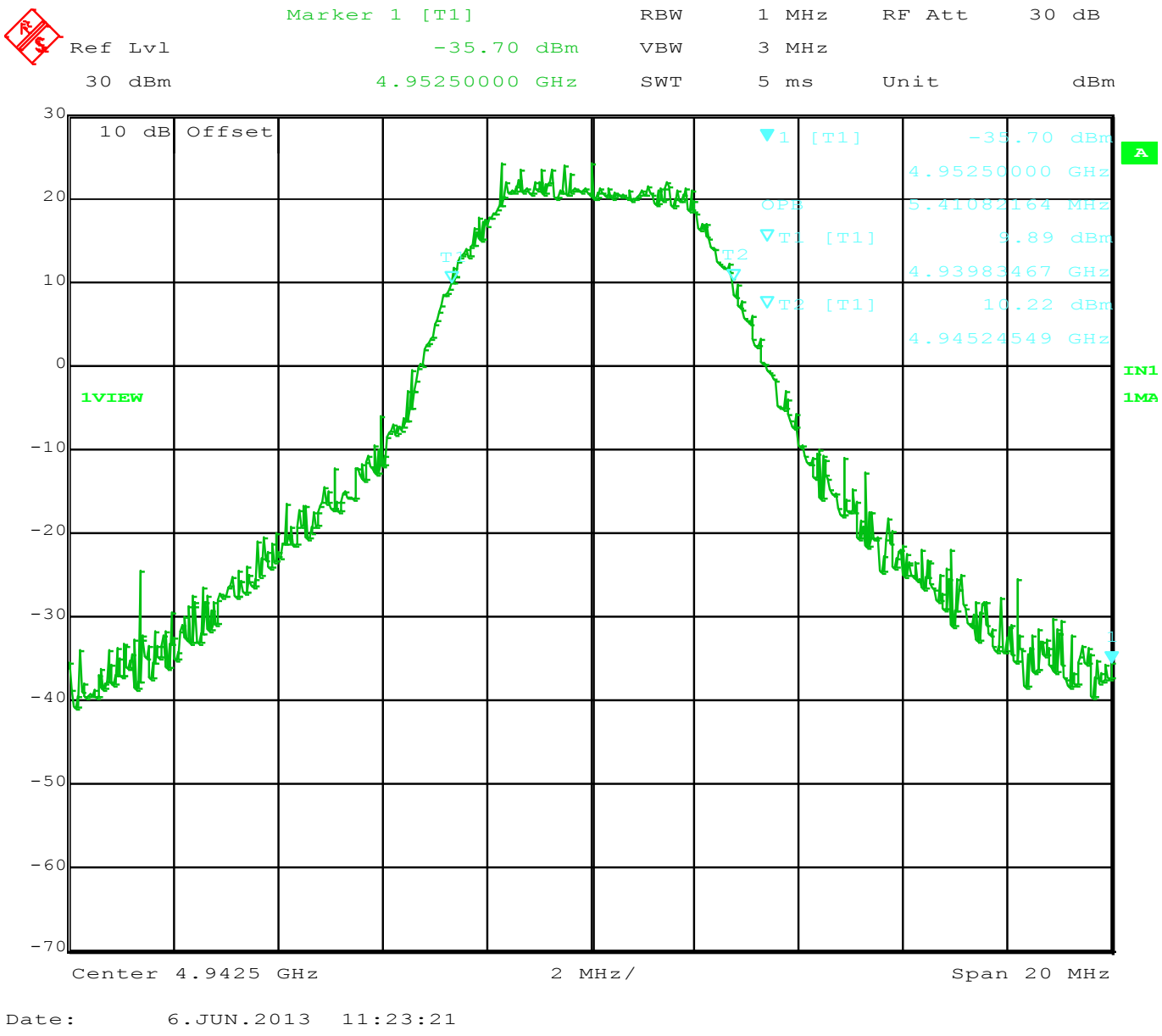


Figure 34: 99% Occupied Bandwidth 4942.5 MHz - 5 MHz Channel

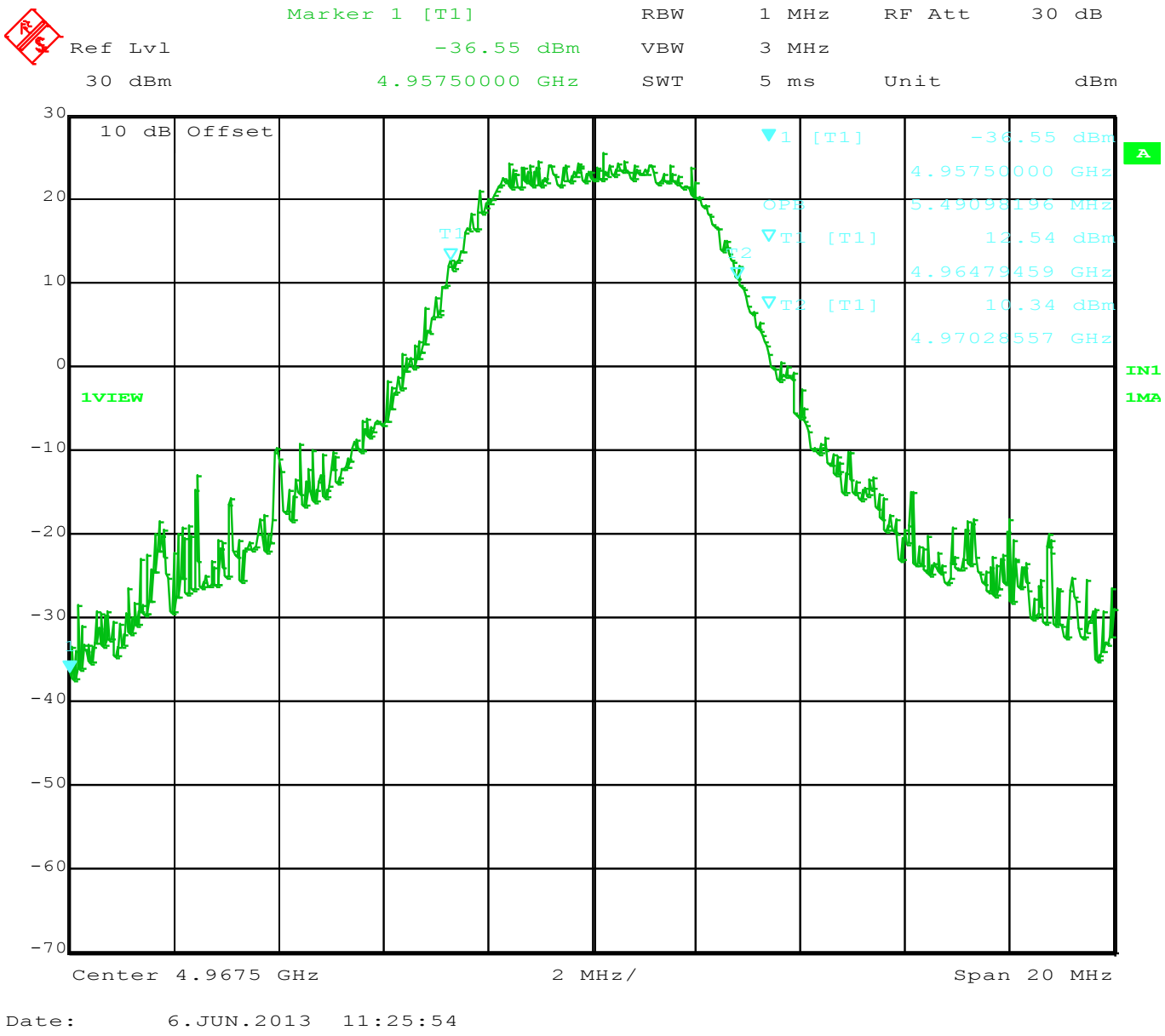


Figure 35: 99% Occupied Bandwidth 4967.5 MHz - 5 MHZ Channel

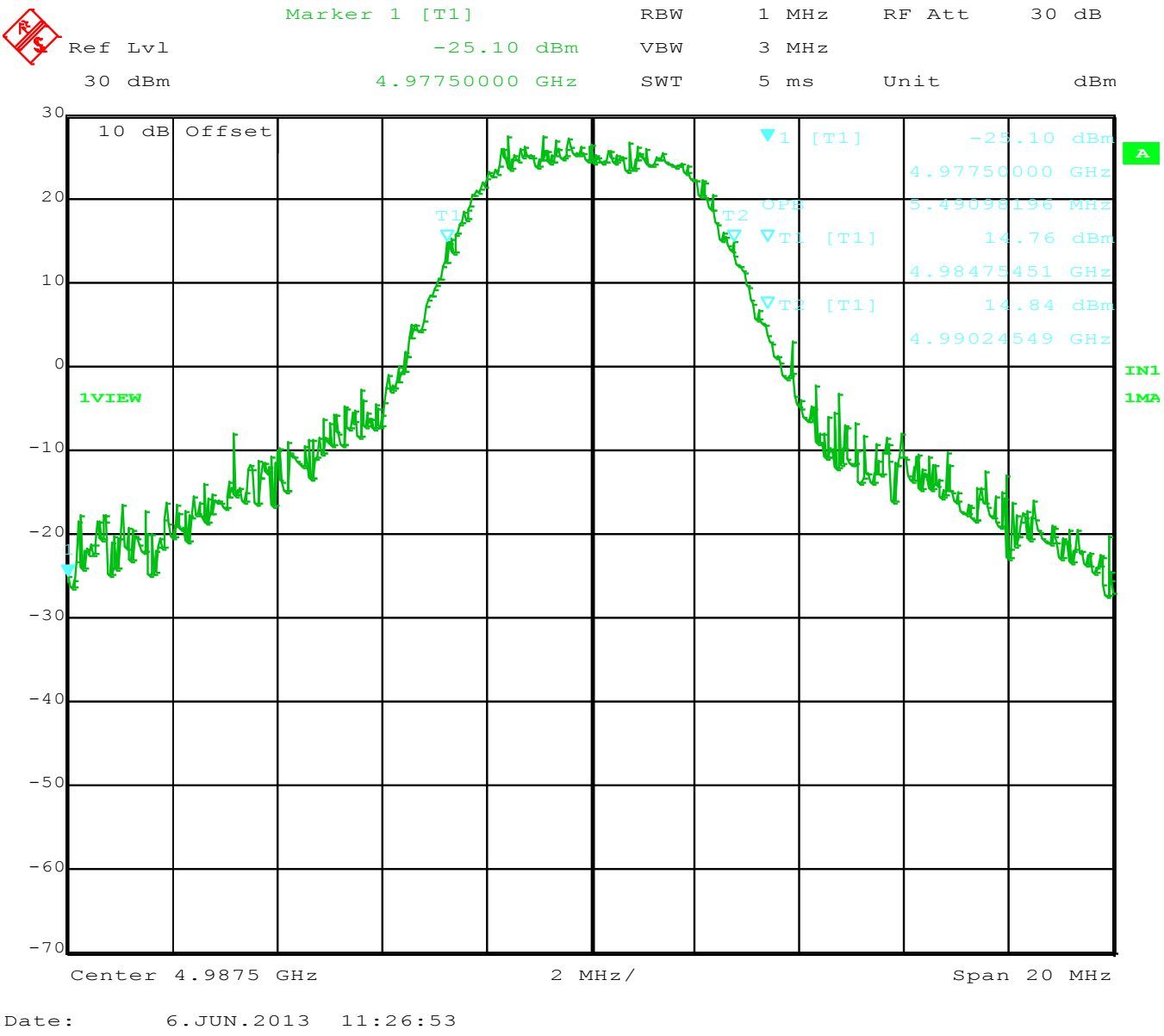


Figure 36: 99% Occupied Bandwidth 4987.5 MHz - 5 MHZ Channel

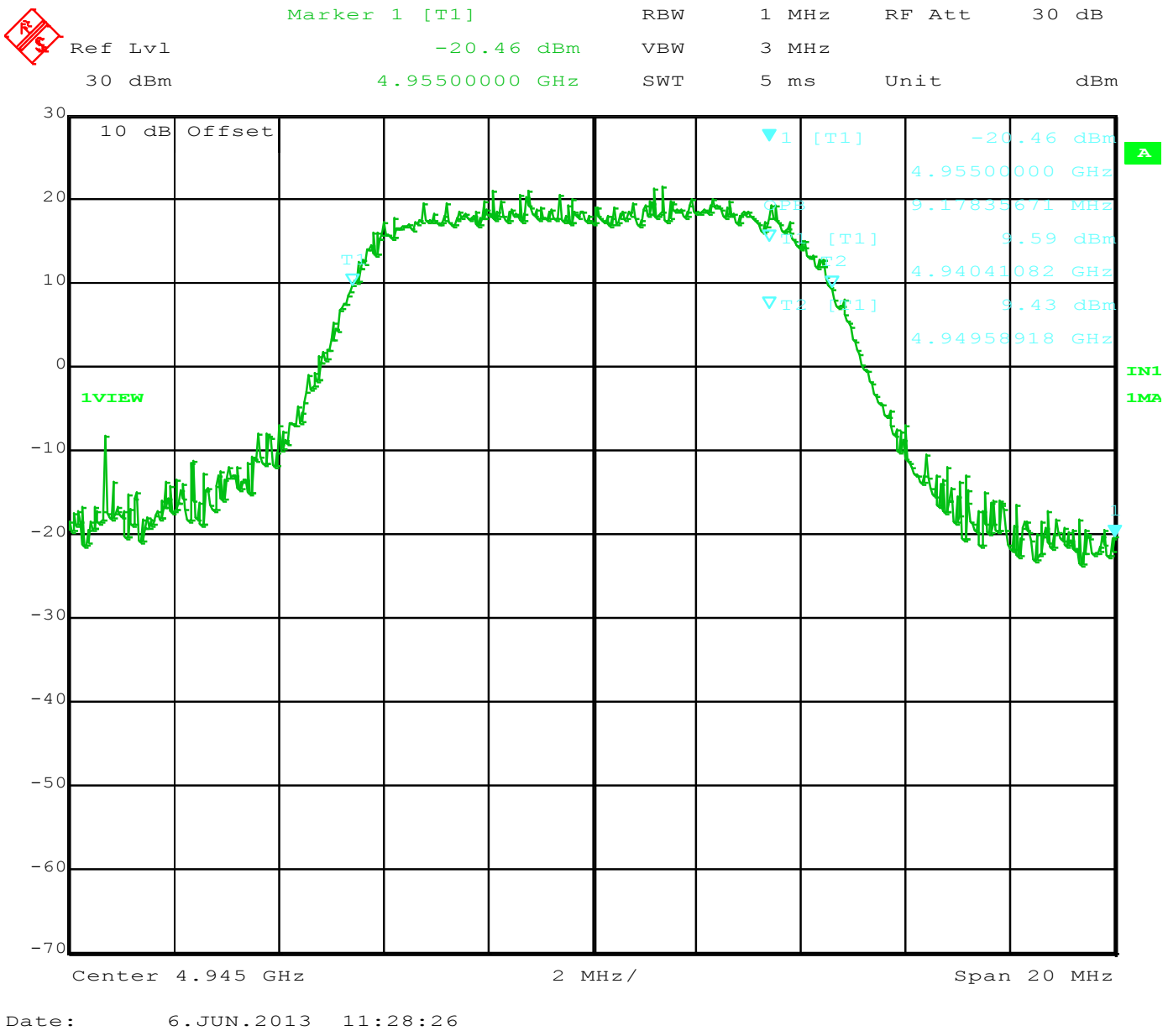


Figure 37: 99% Occupied Bandwidth 4945 MHz - 10 MHZ Channel

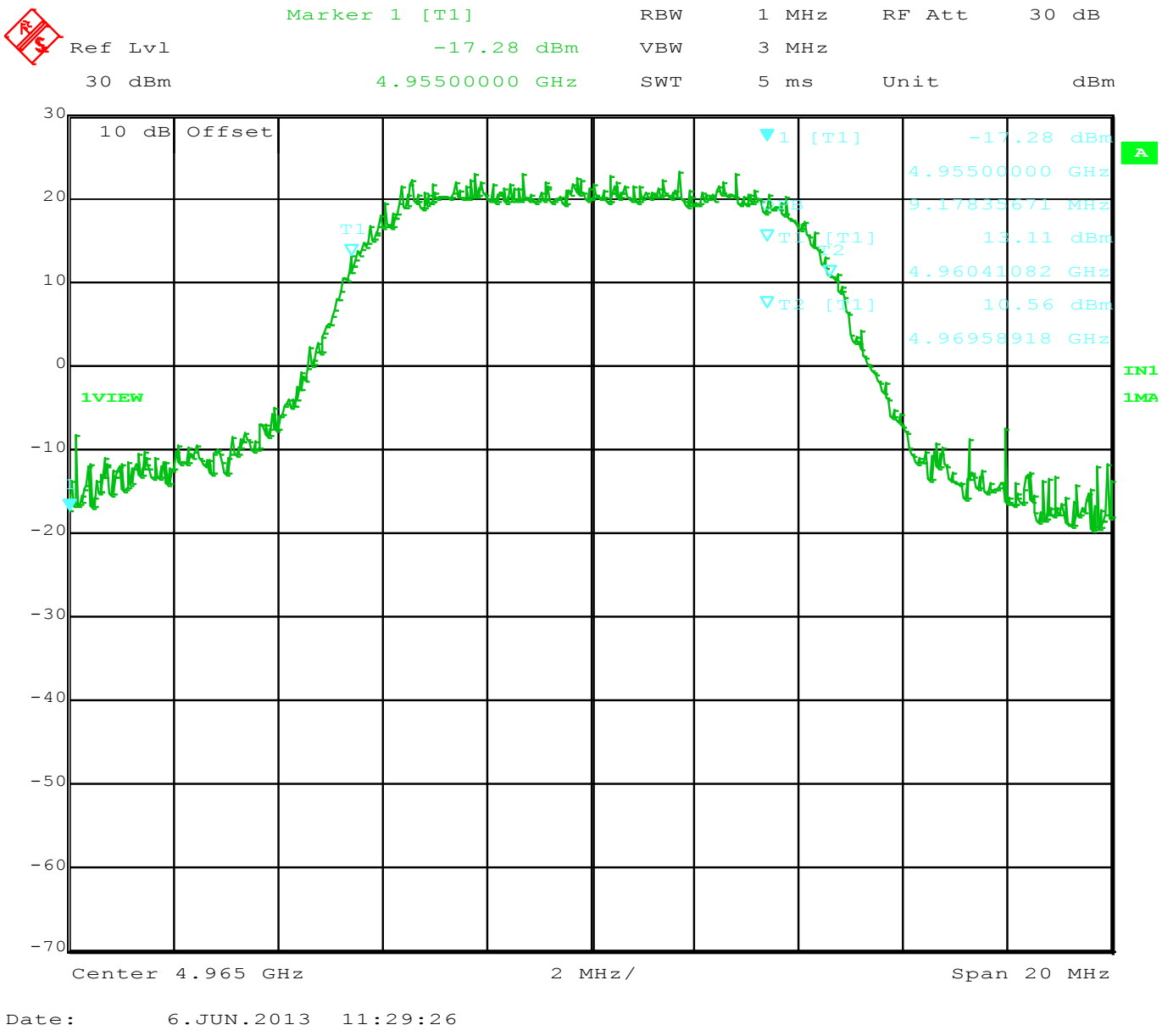


Figure 38: 99% Occupied Bandwidth 4965 MHz - 10 MHz Channel

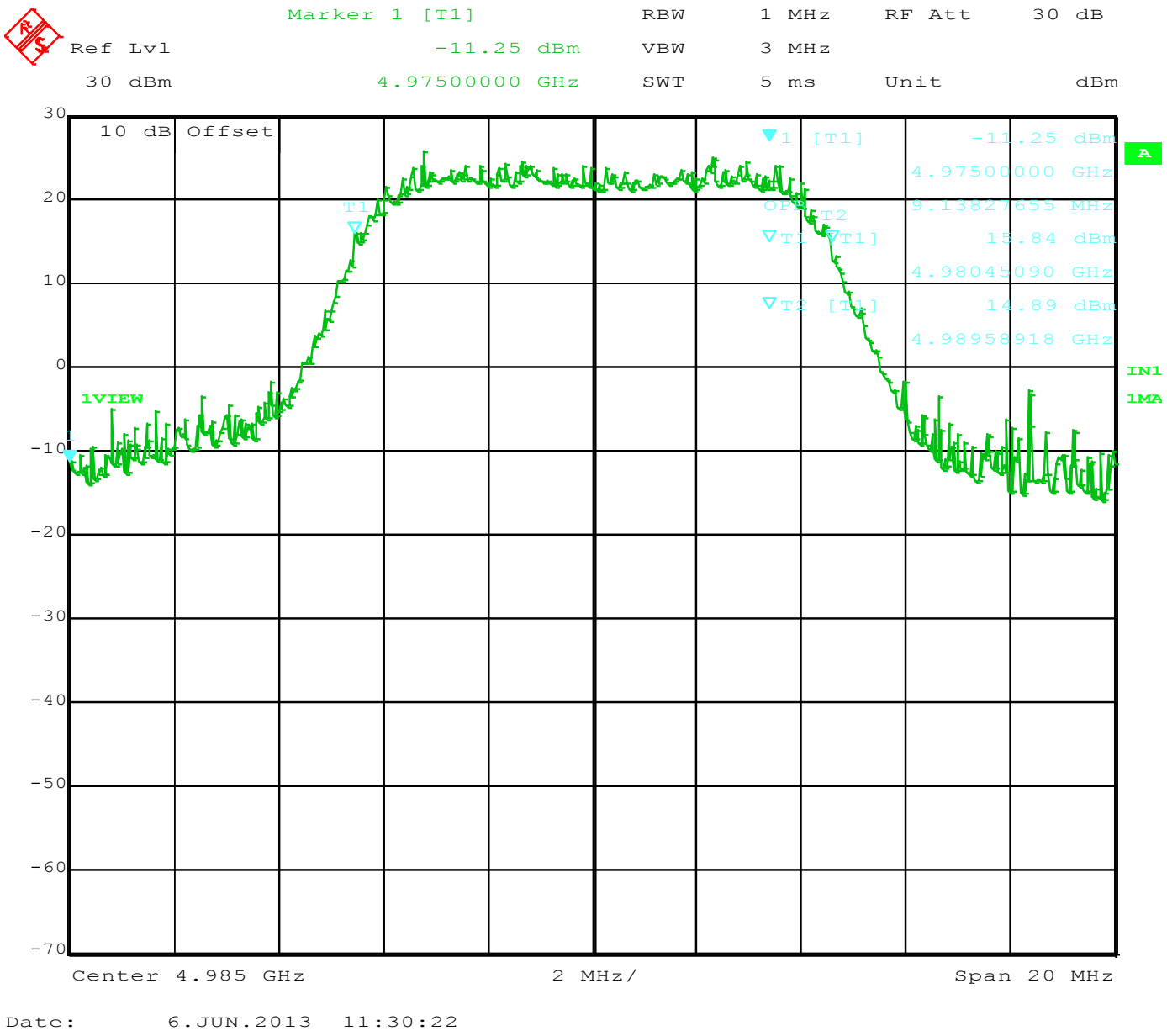


Figure 39: 99% Occupied Bandwidth 4985 MHz - 10 MHz Channel

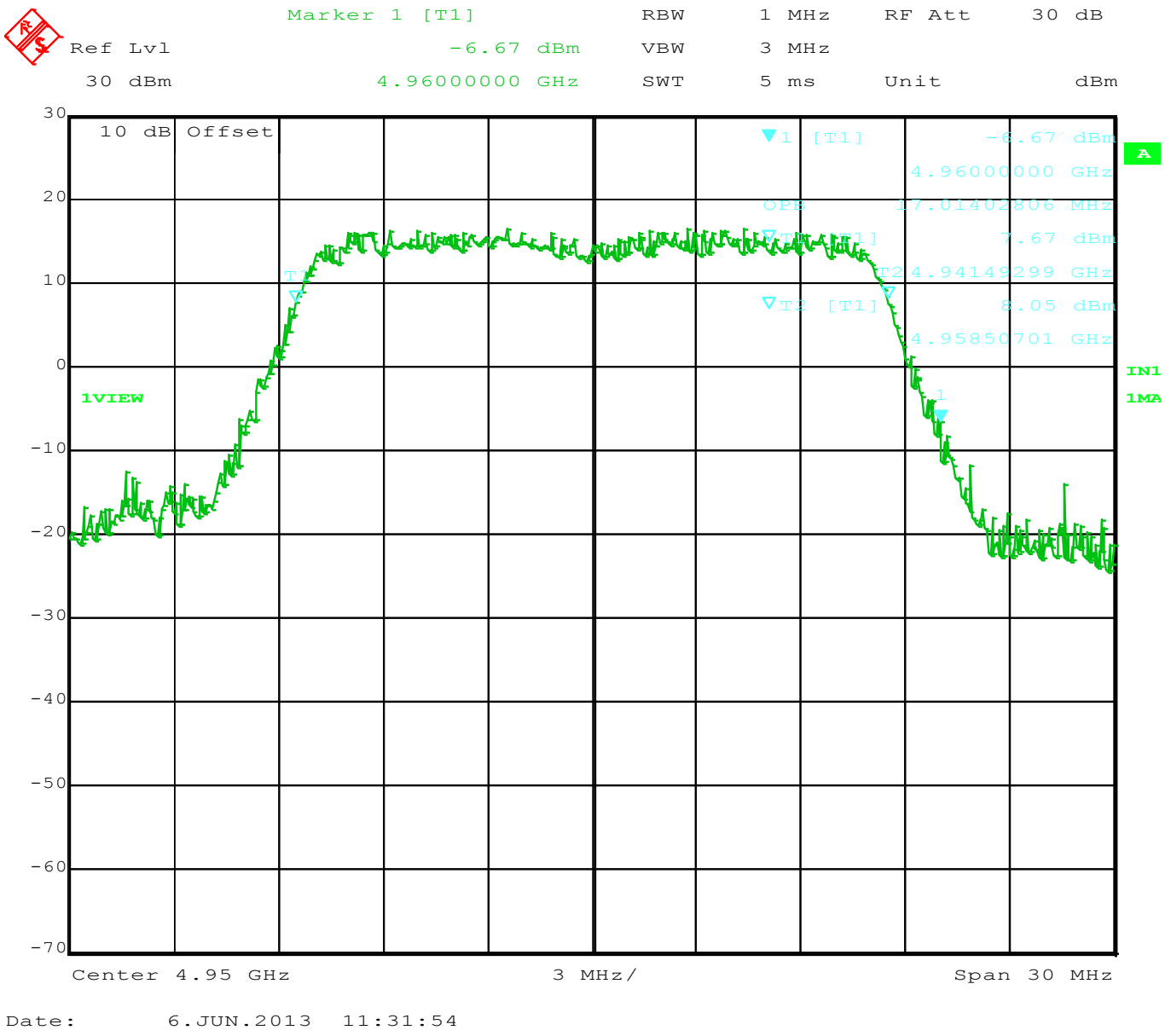


Figure 40: 99% Occupied Bandwidth 4950 MHz - 20 MHz Channel

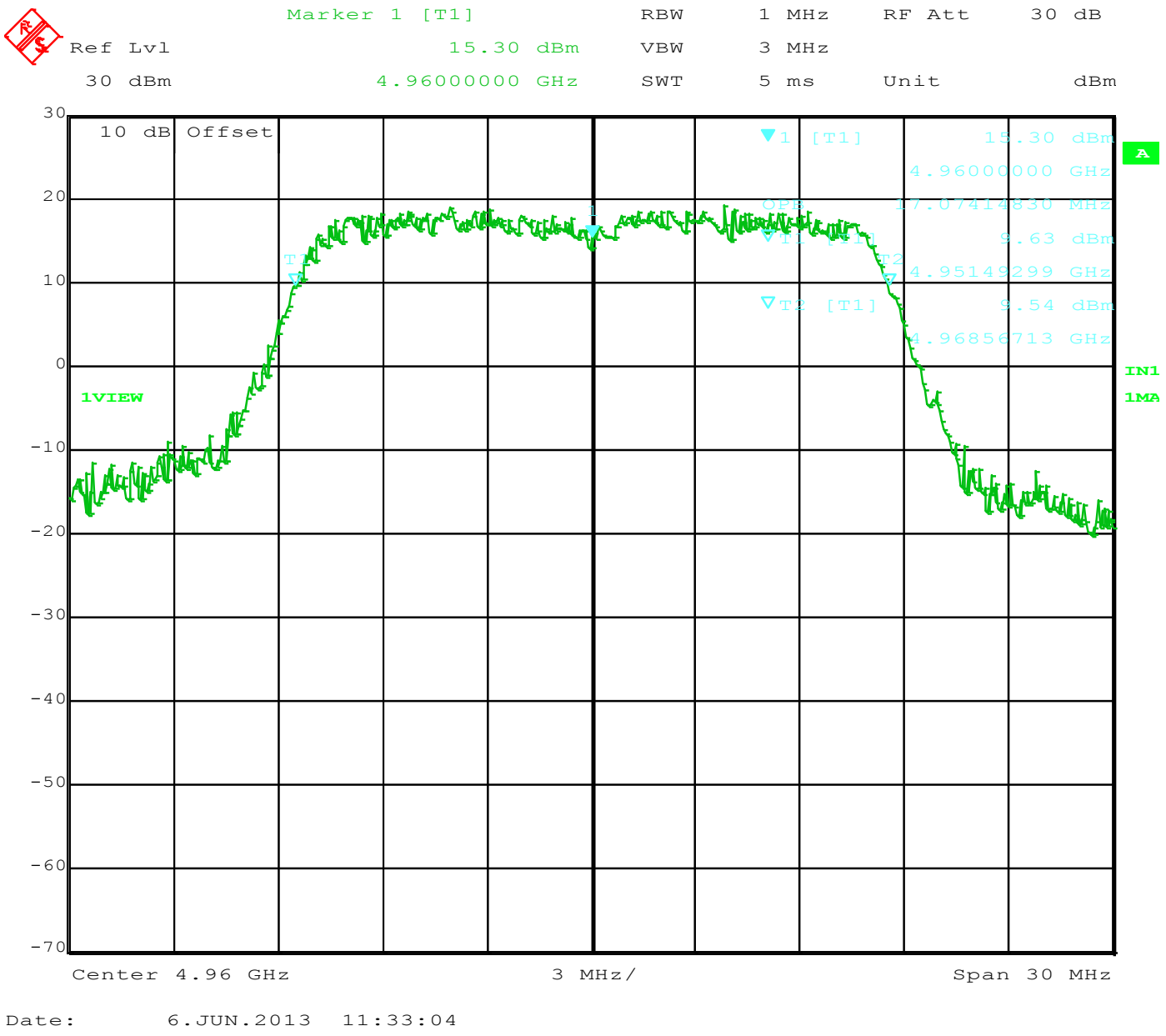


Figure 41: 99% Occupied Bandwidth 4960 MHz - 20 MHz Channel

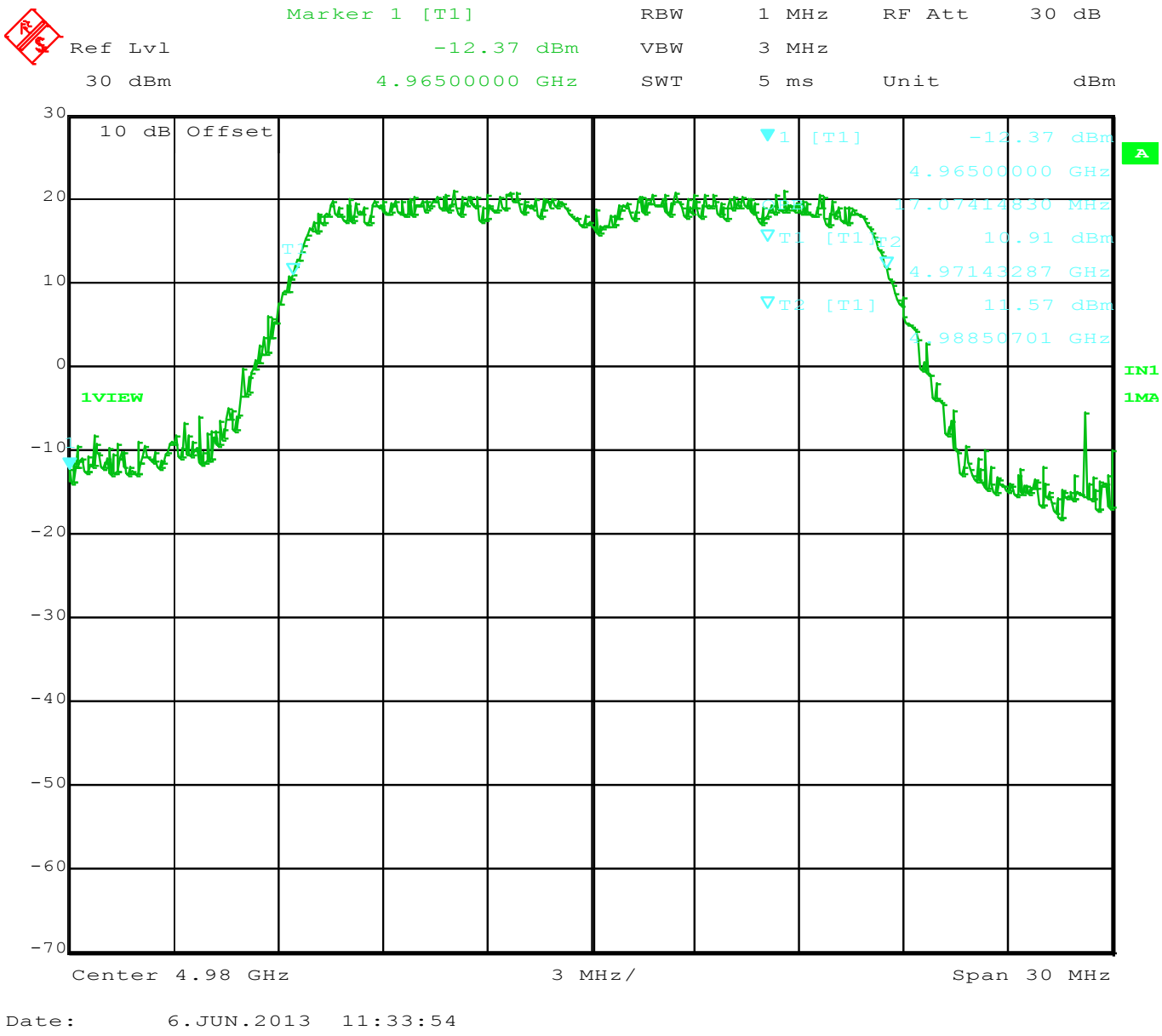


Figure 42: 99% Occupied Bandwidth 4980 MHz - 20 MHz Channel

4.4 Frequency Stability FCC Part 90.213 and 2.1055

4.4.1 Over View of Test

Results	**Complies** (as tested per this report)	**Date**	7/8/2013
Standard	FCC Part 90.213 and Part 2.1055		
Product	RF-7800W	**Serial#**	E00047
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

4.4.2 Test Procedure

(a) The frequency stability shall be measured with variation of ambient temperature as follows: From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).

4.4.3 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.

Center Frequency	4945 MHz
Power Level	18 dBm
Frequency Tolerance Limit	Not Specified
Max Frequency Tolerance Measured	
Input Voltage Rating	100-240VAC

CENTER FREQUENCY & RF POWER OUTPUT VARIATION

Ambient Temperature	Supply Voltage Nominal 120 VAC	Supply Voltage 85% of Nominal 100VAC	Supply Voltage 115% of Nominal 230VAC
(C°)	Hz	Hz	Hz
-40	298050	29850	29850
+20	0	0	0
+60	46500	46500	46500

5 Conducted Emission Limits FCC 90.210 M

(a) The power of emission outside any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation..
(b) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

Results	**Complies** (as tested per this report)					**Date**	5/31/2013
Standard	FCC 90.210 M						
Product	RF-7800W			**Serial#**	E00047		
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**	23º 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		

5.1.1 Test Procedure

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049 and the transmitter was operated in full rated power, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver controls set as RBW = 1 MHz, VBW > RBW and SWEEP TIME = AUTO)..

5.1.2 Deviations

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

5.1.3 Final Test

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

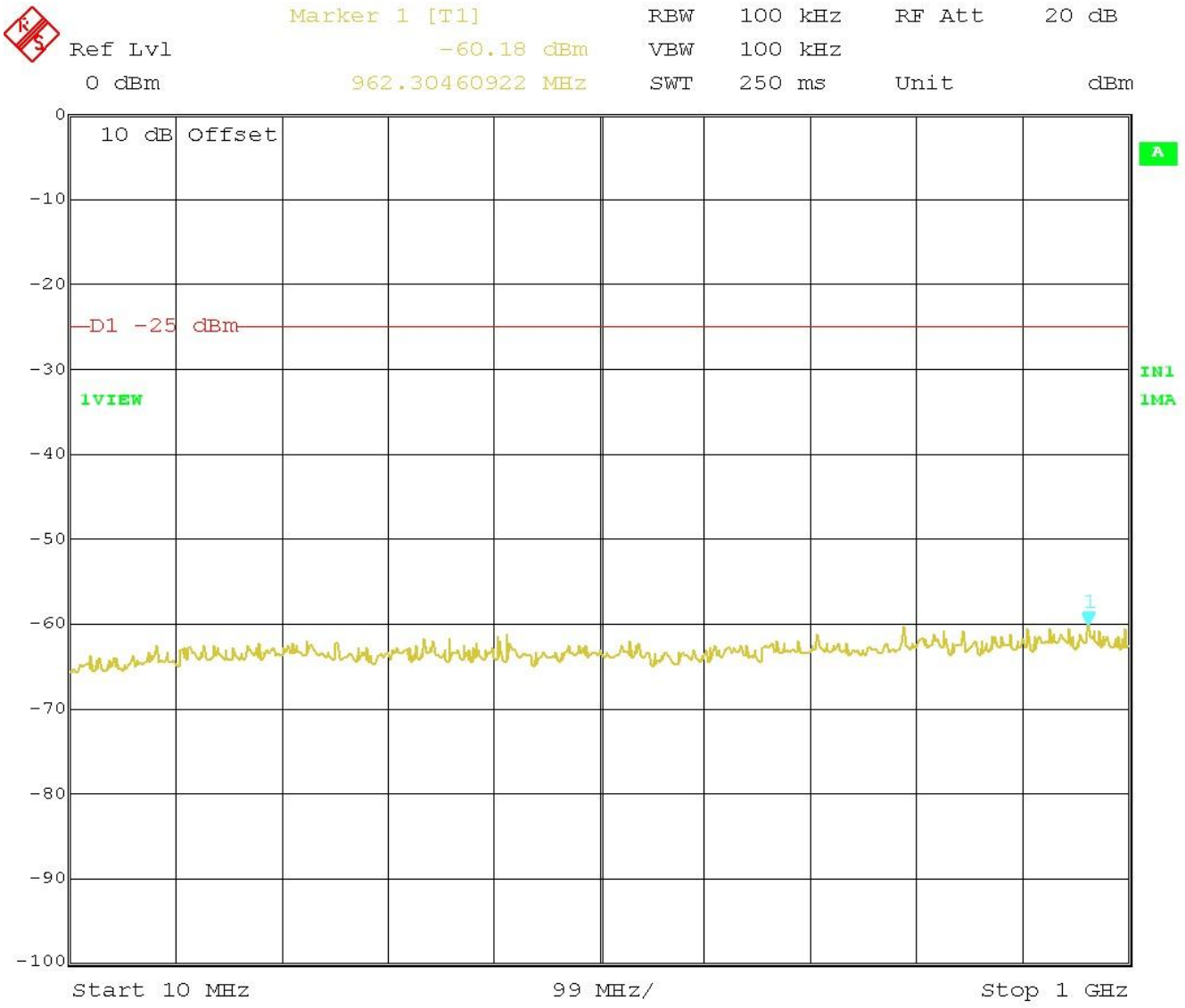


Figure 43 – Spurs 4942.5 MHz – 5 MHz Channel, 10 MHz - 1 GHz

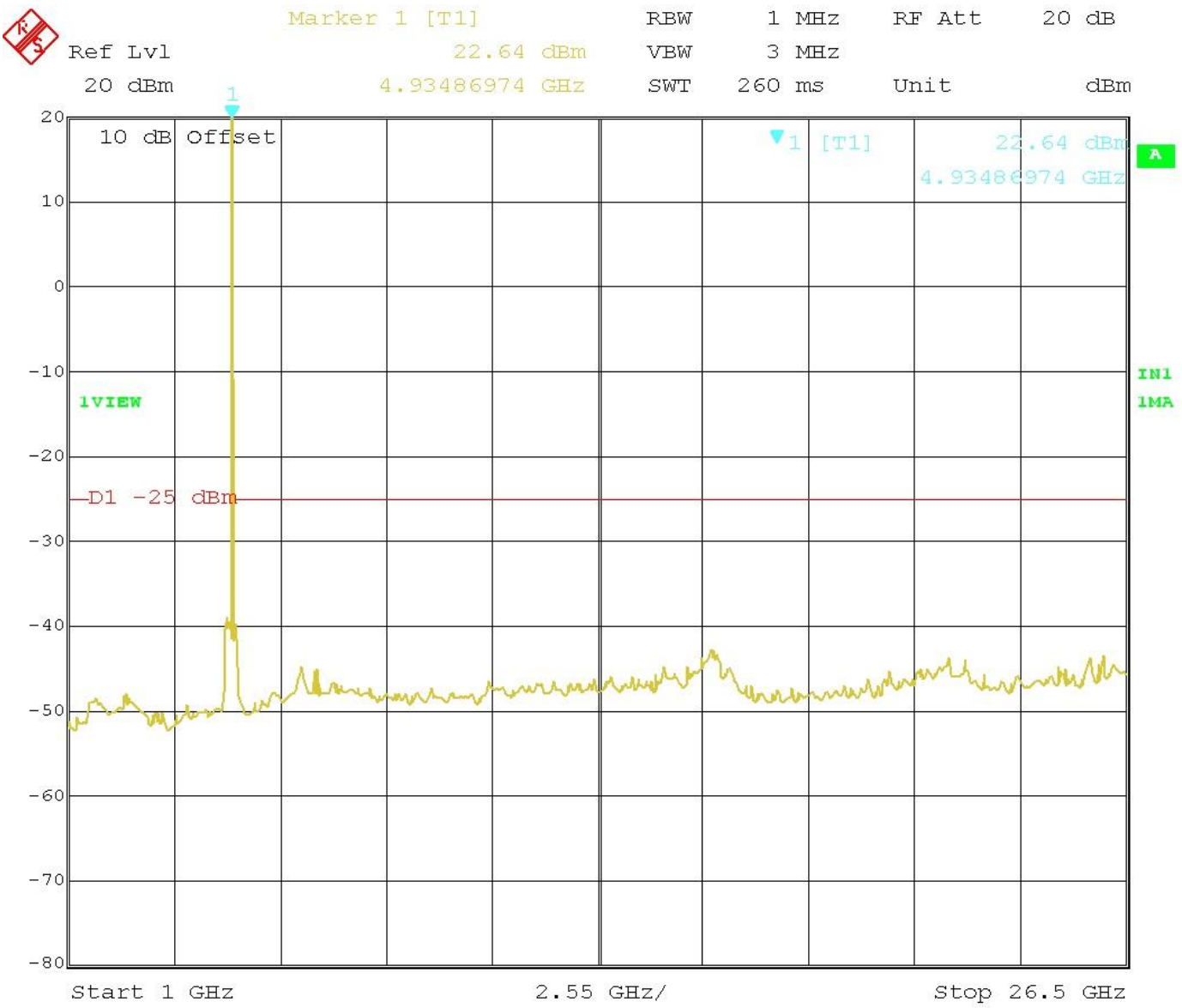


Figure 44 – Spurs 4942.5 MHz – 5 MHz Channel, 1-26.5 GHz

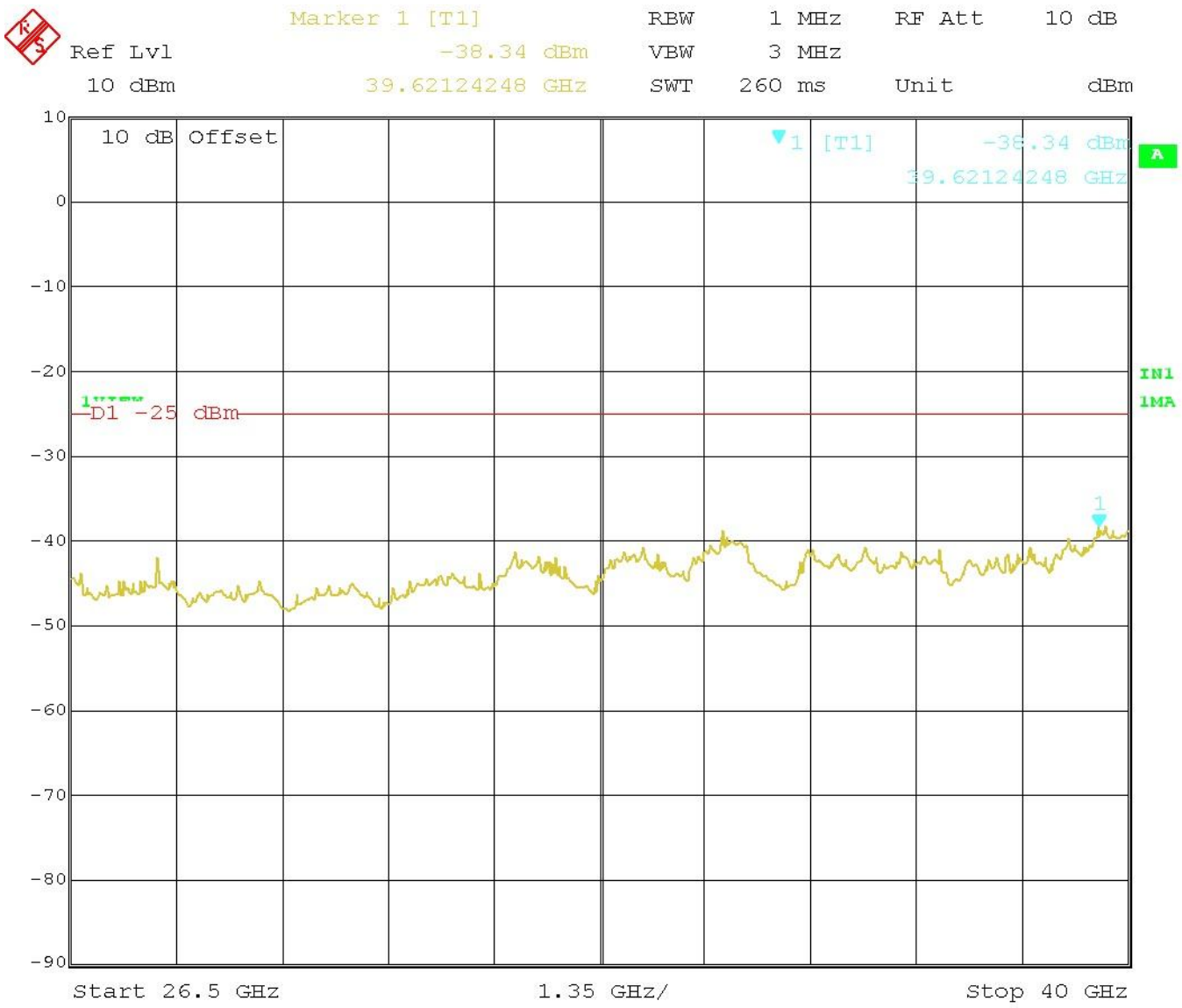


Figure 45 - Spurs 4942.5 MHz – 5 MHz Channel, 26.5 - 40 GHz

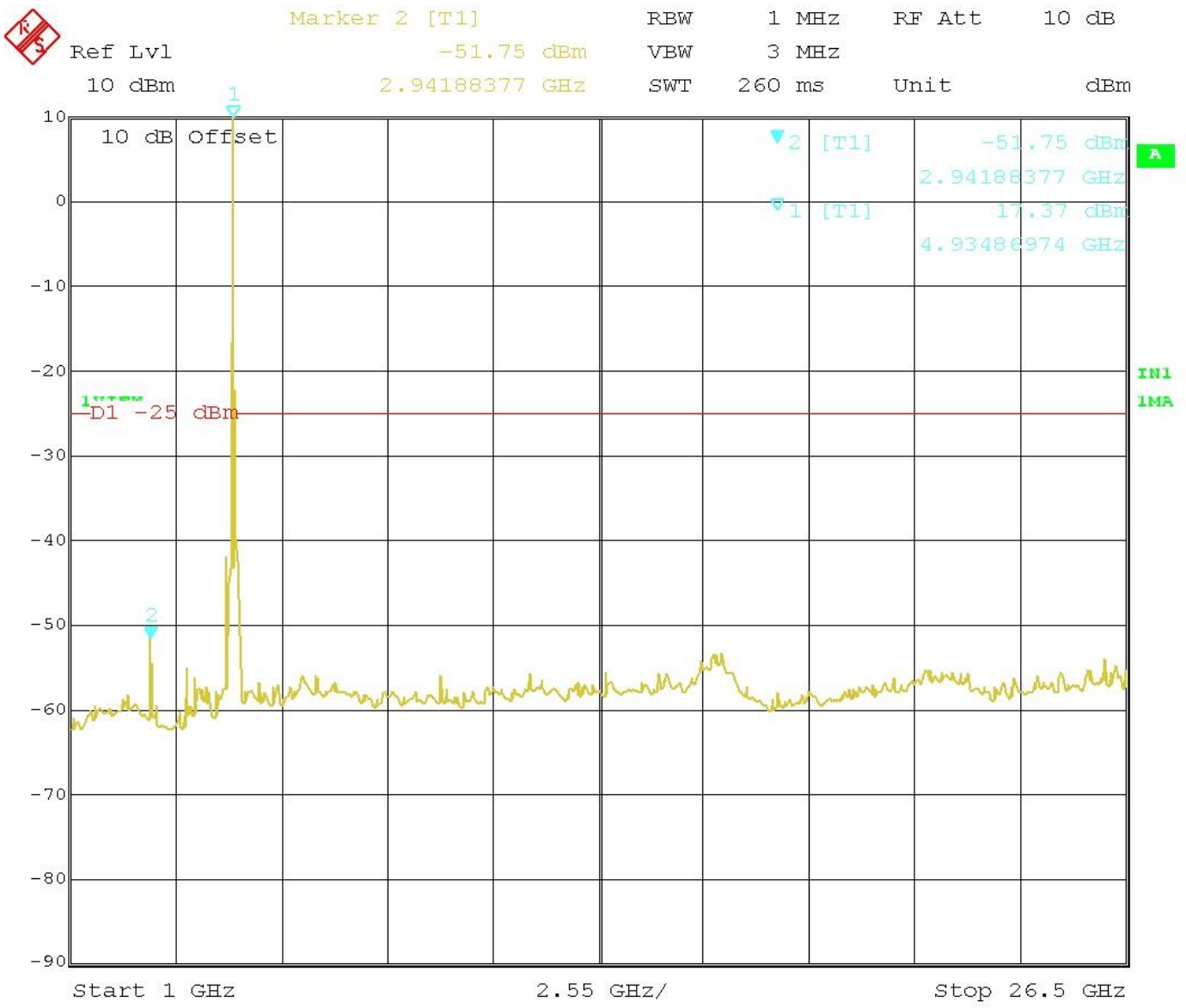


Figure 46 - Spurs 4967.5 MHz – 5 MHz Channel, 1-26.5 GHz

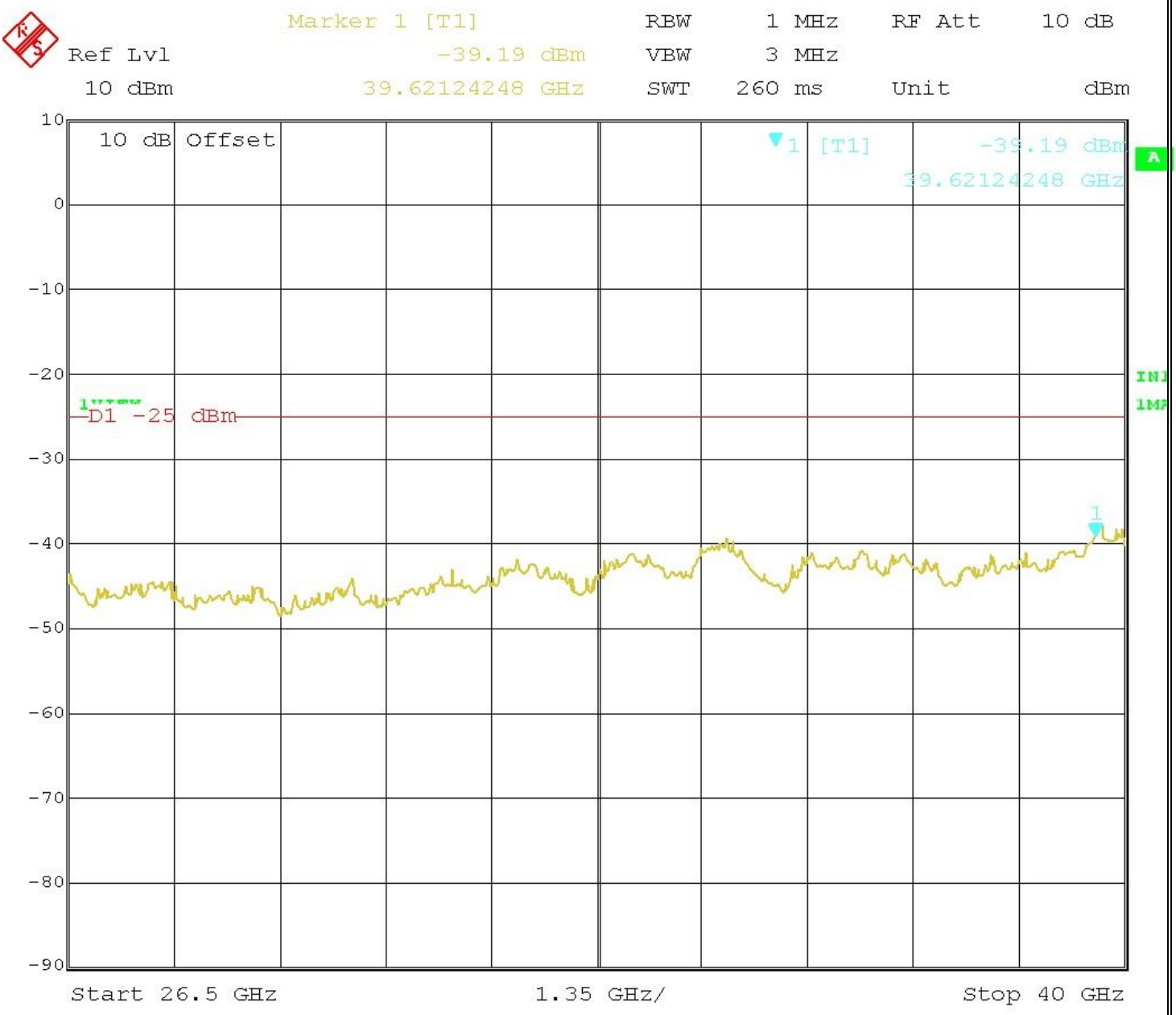


Figure 47 - Spurs 4967.5 MHz – 5 MHz Channel, 26.5 - 40 GHz

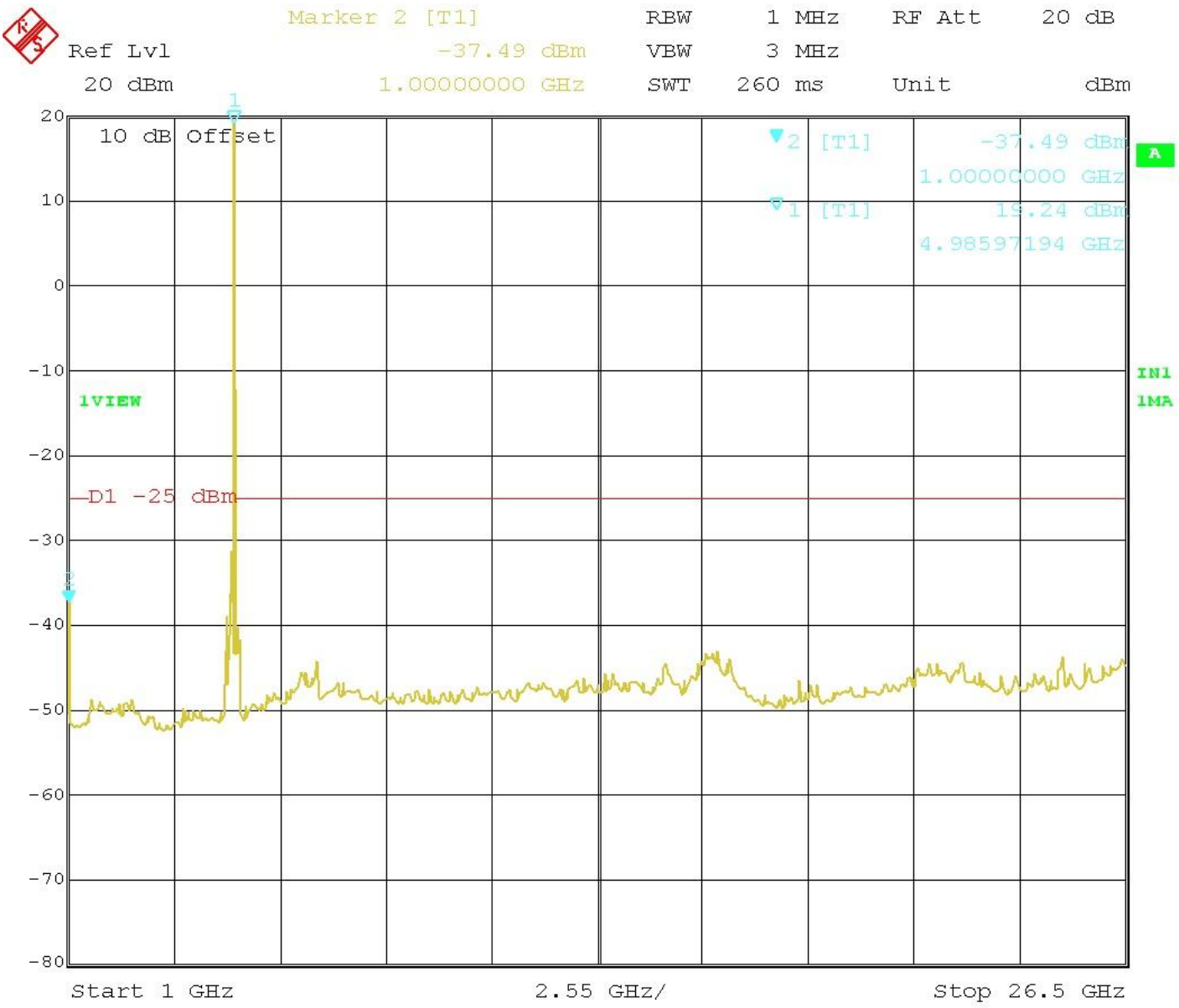


Figure 48 - Spurs 4987.5 MHz – 5 MHz Channel, 1 - 26.5GHz

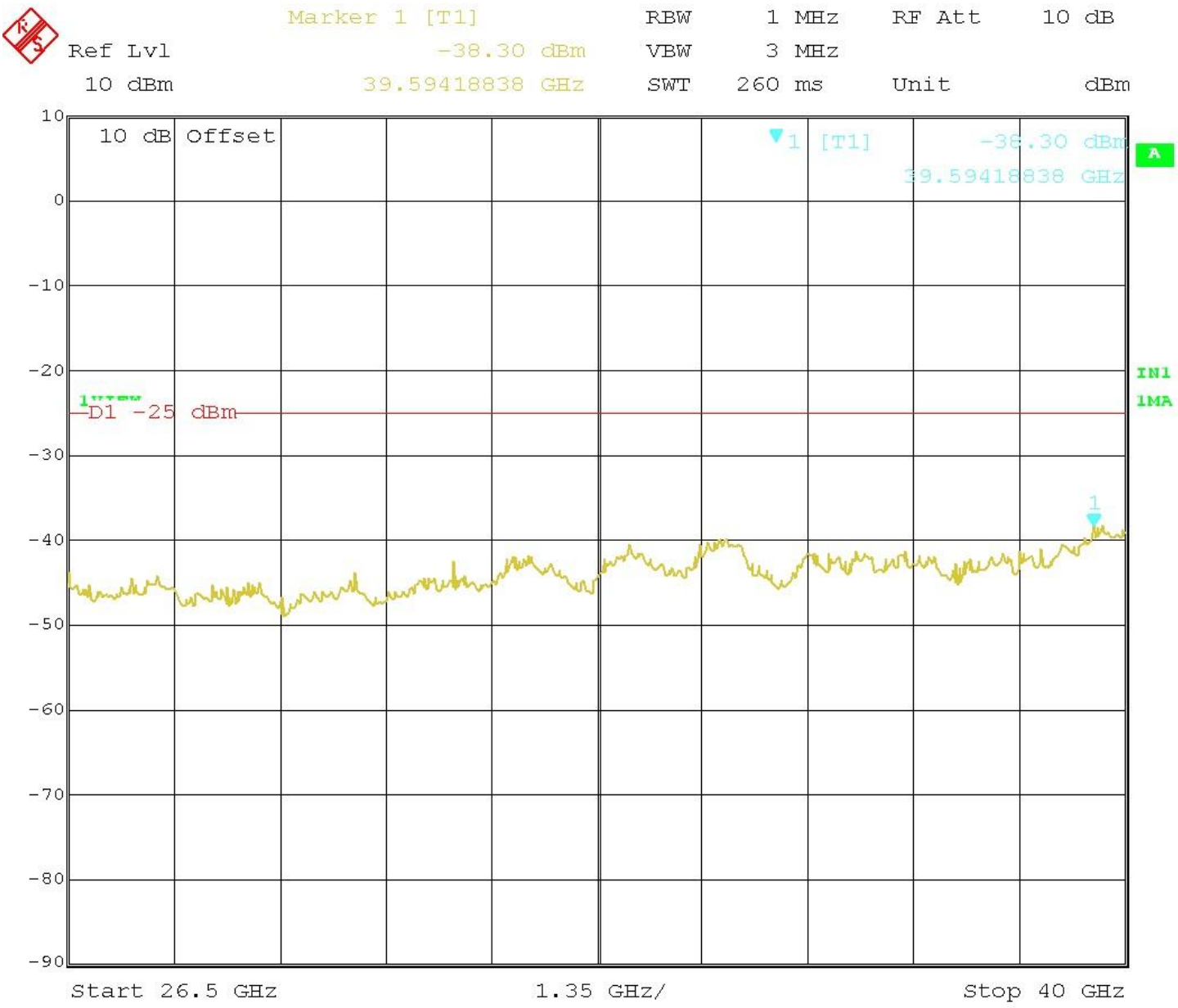


Figure 49 - Spurs 4987.5 MHz – 5 MHz Channel, 26.5 - 40 GHz

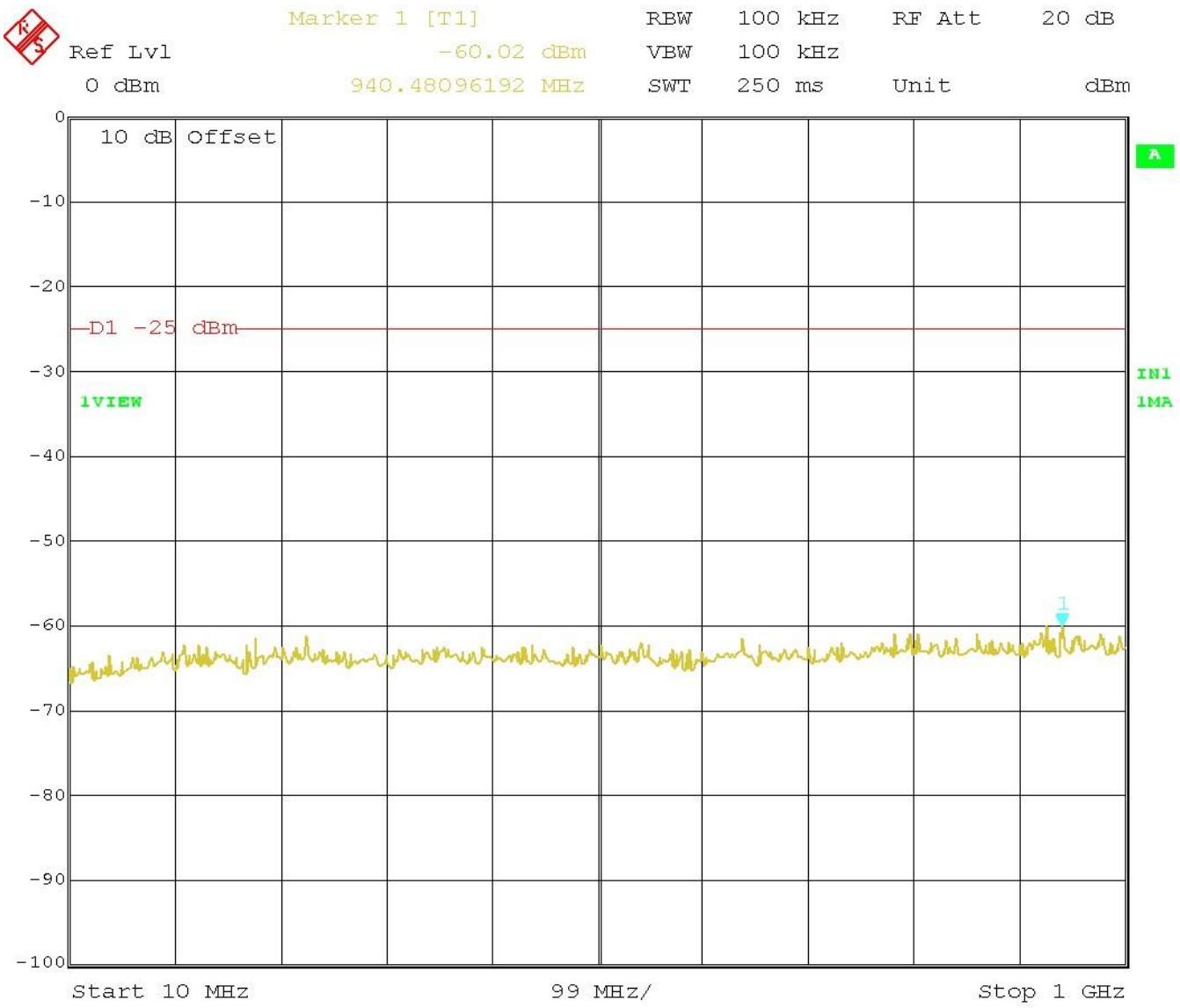


Figure 50 - Spurs 4945 MHz – 10 MHz Channel, 10 MHz - 1 GHz

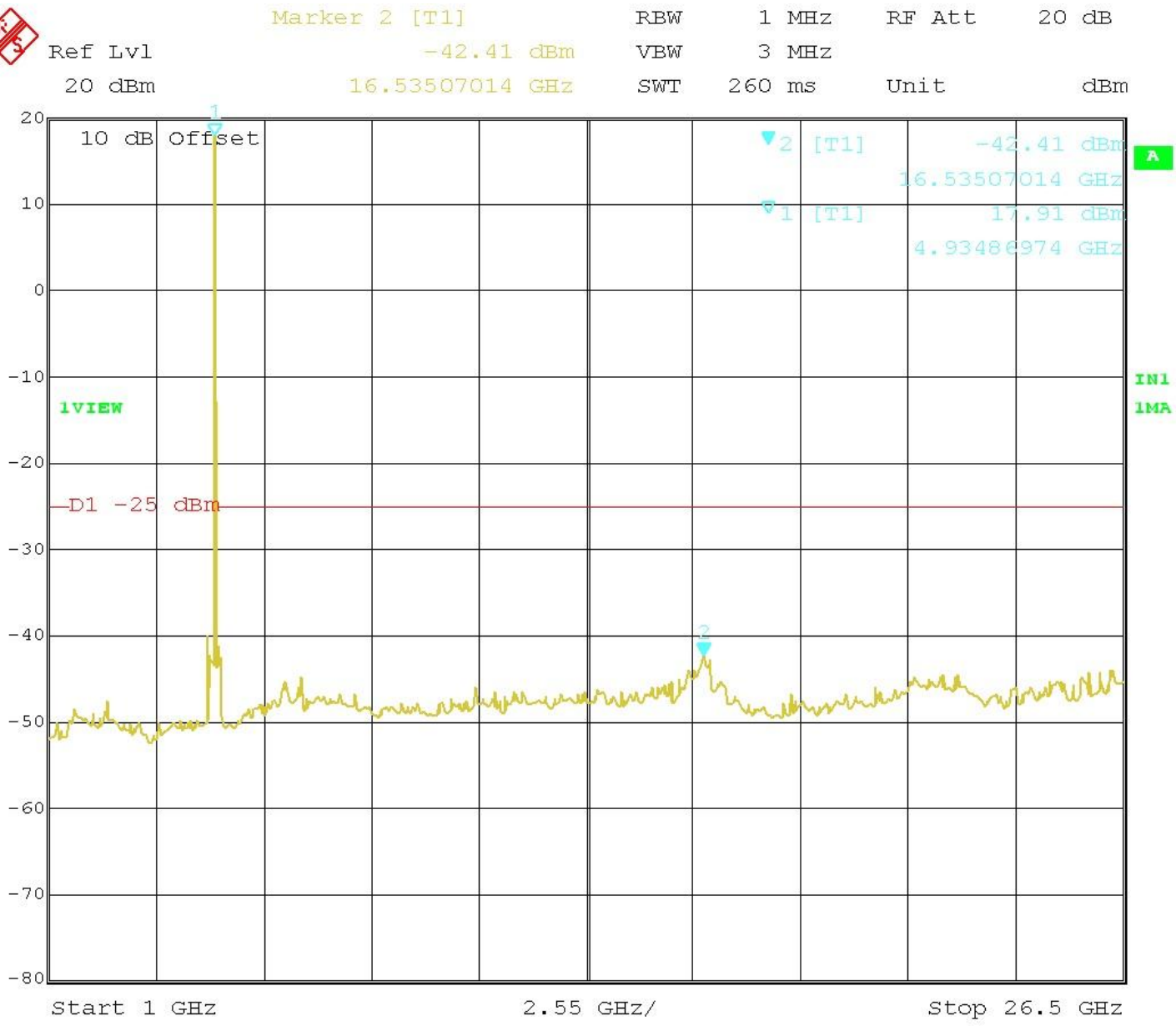


Figure 51 - Spurs 4945 MHz – 10 MHz Channel, 1 - 26.5 GHz

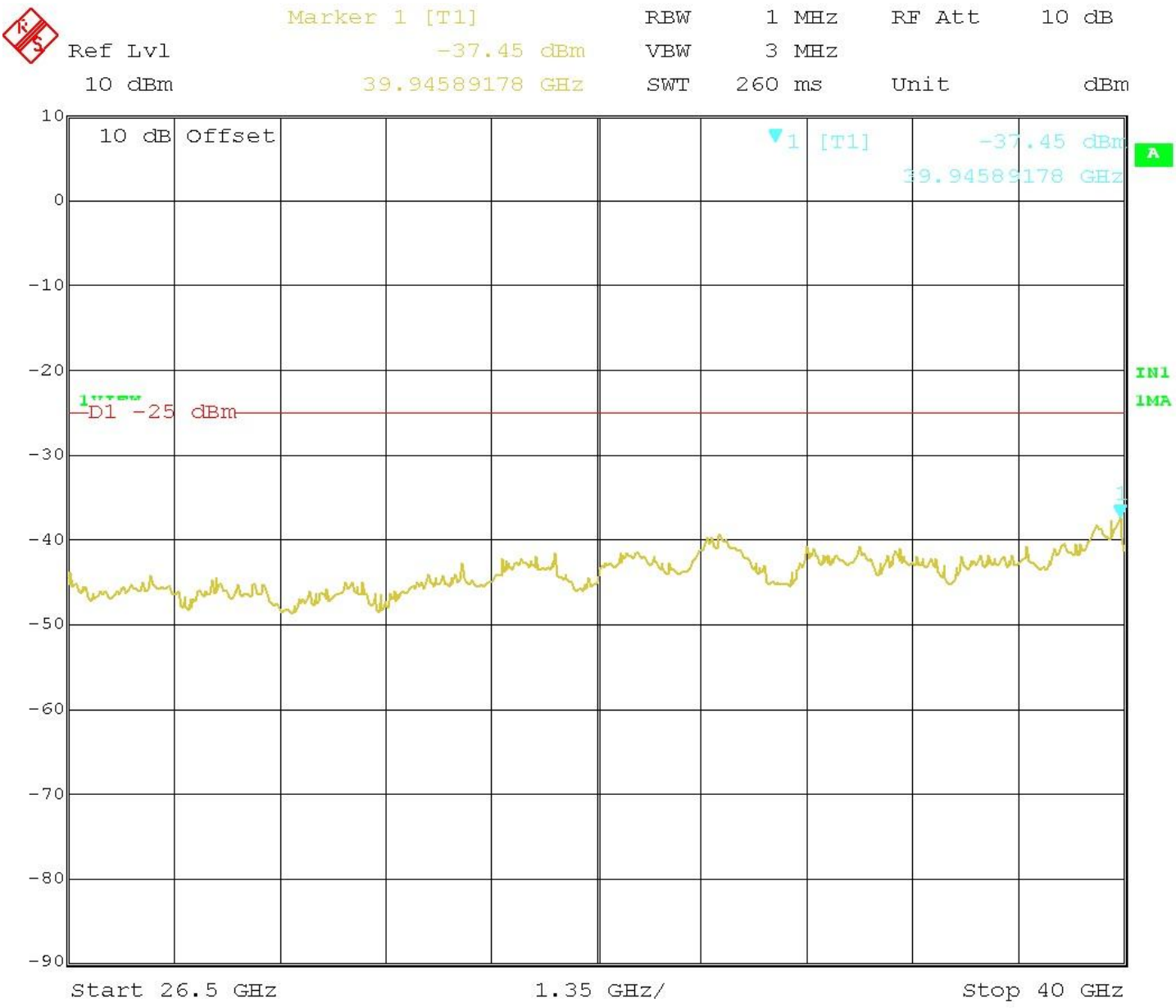


Figure 52 - Spurs 4945 MHz – 10 MHz Channel, 26.5 - 40 GHz

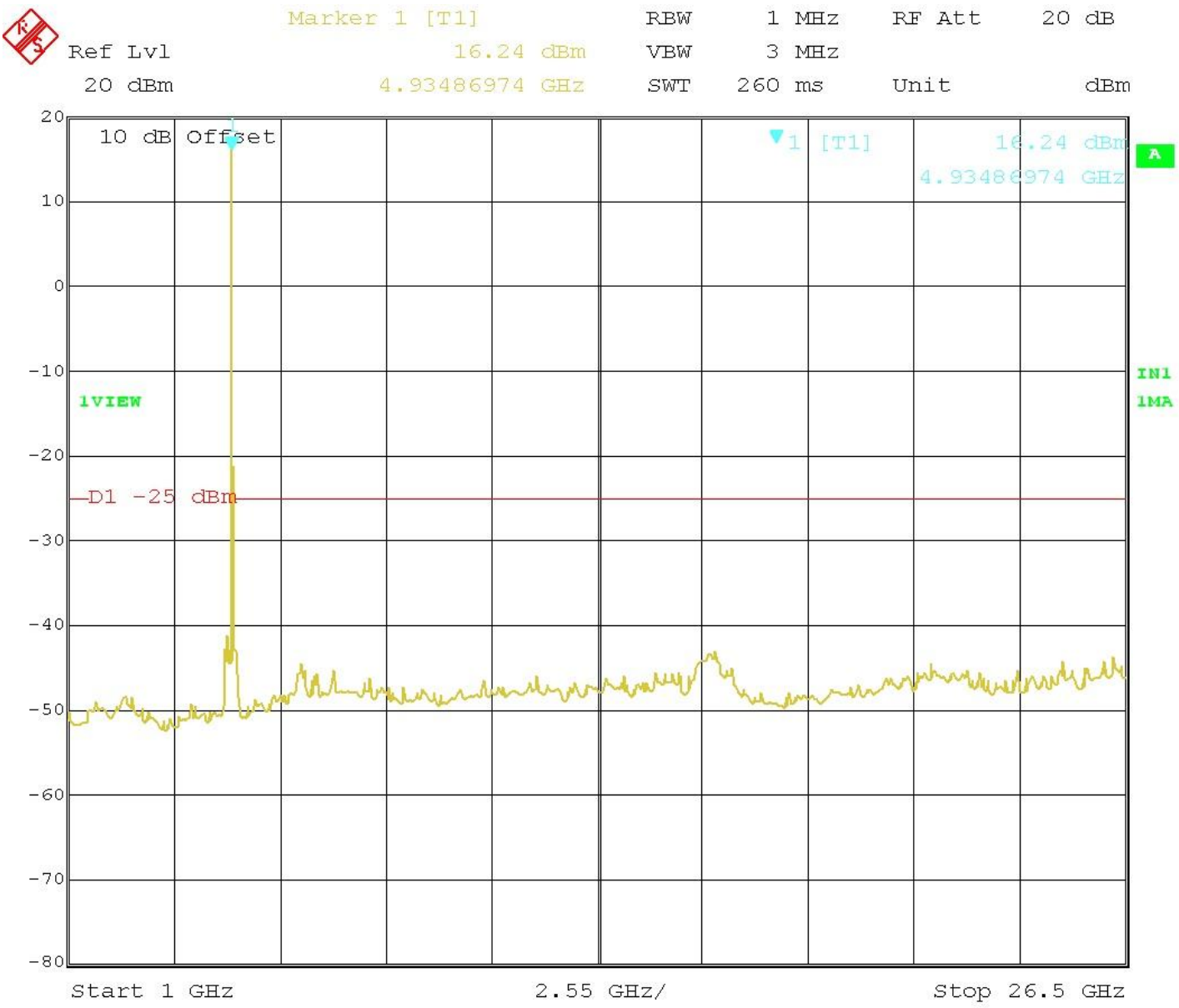


Figure 53 - Spurs 4965 MHz – 10 MHz Channel, 1 - 26.5 GHz

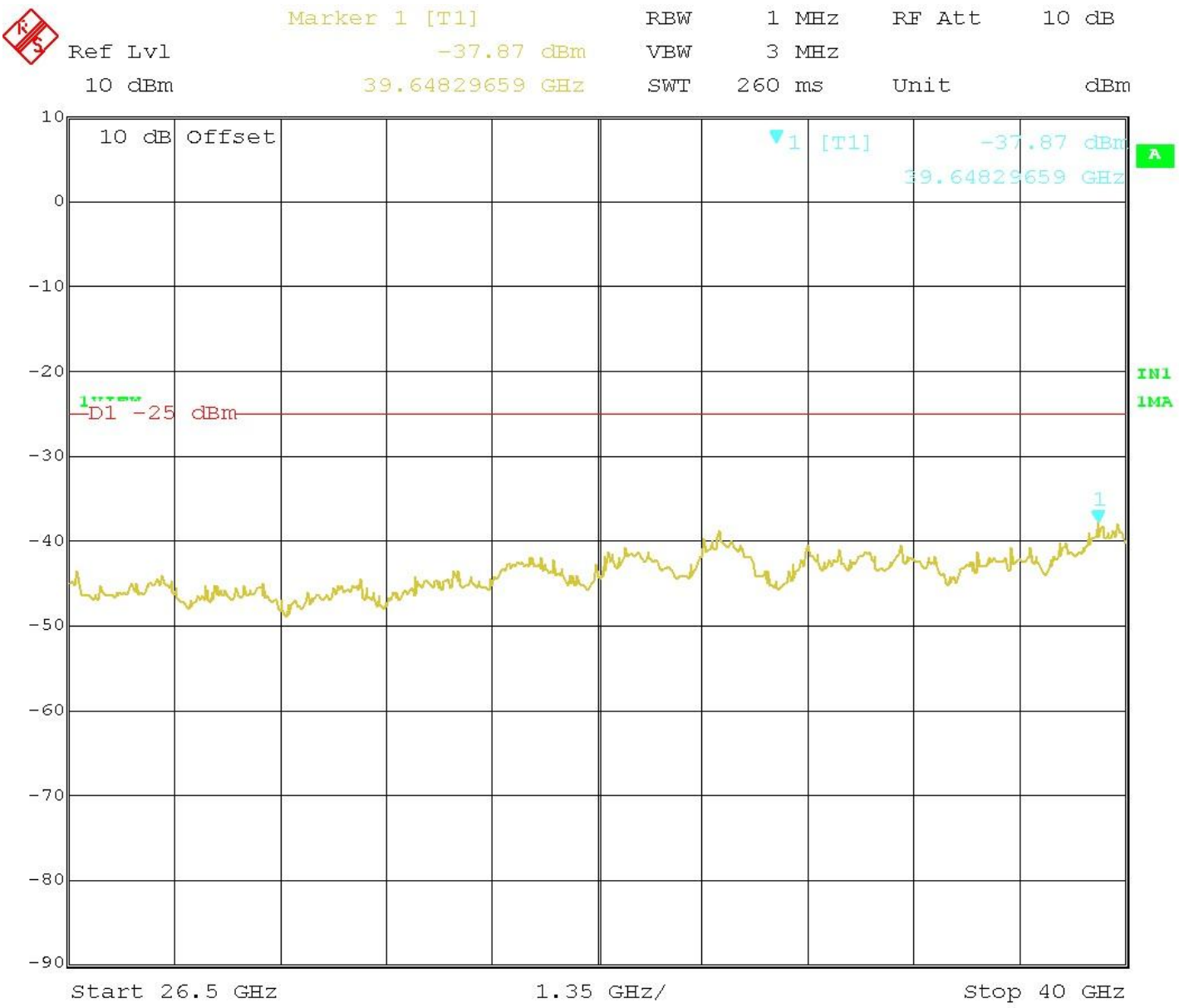


Figure 54 - Spurs 4965 MHz – 10 MHz Channel, 26.5 - 40 GHz

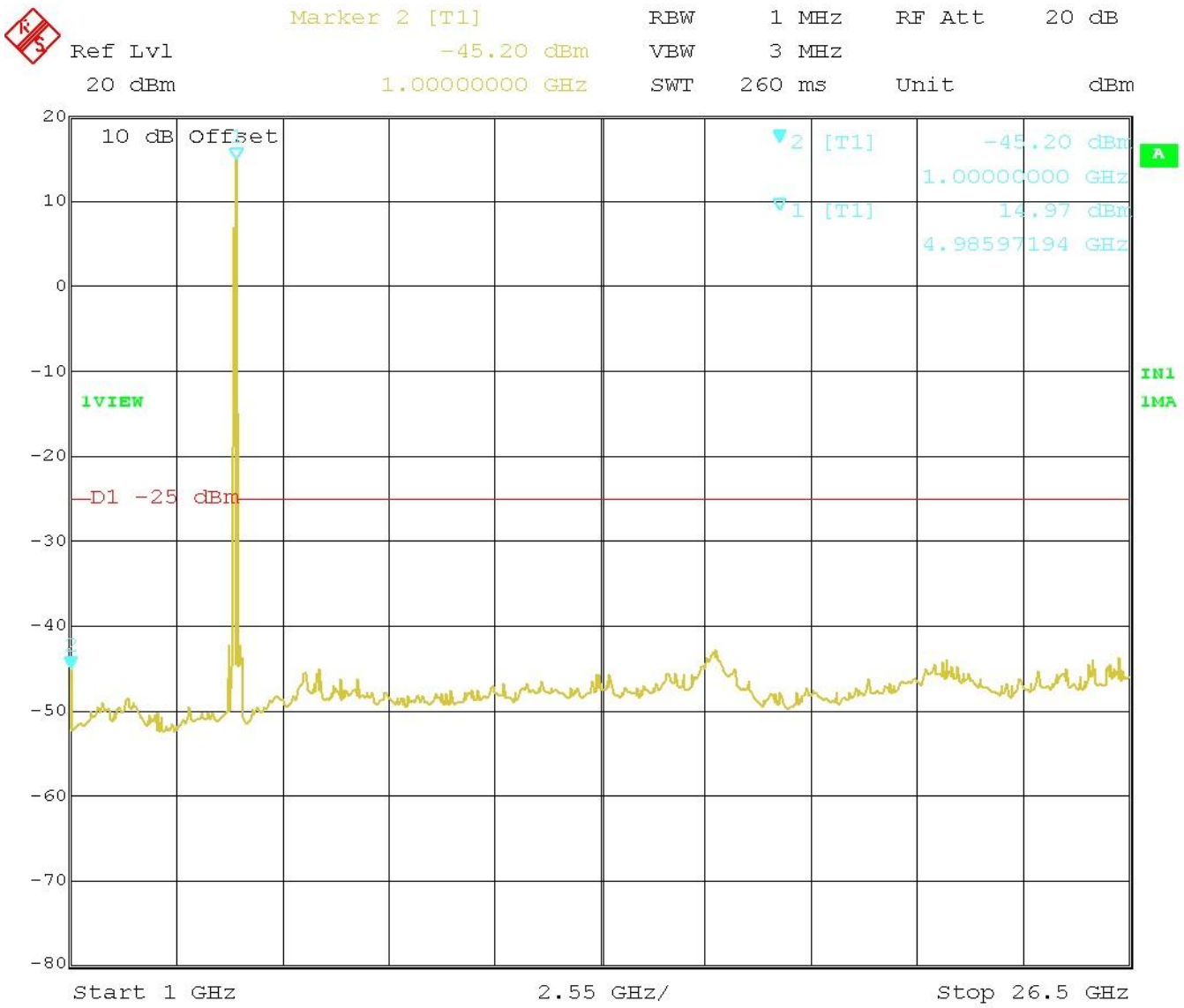


Figure 55 - Spurs 4985 MHz – 10 MHz Channel, 1 - 26.5 GHz

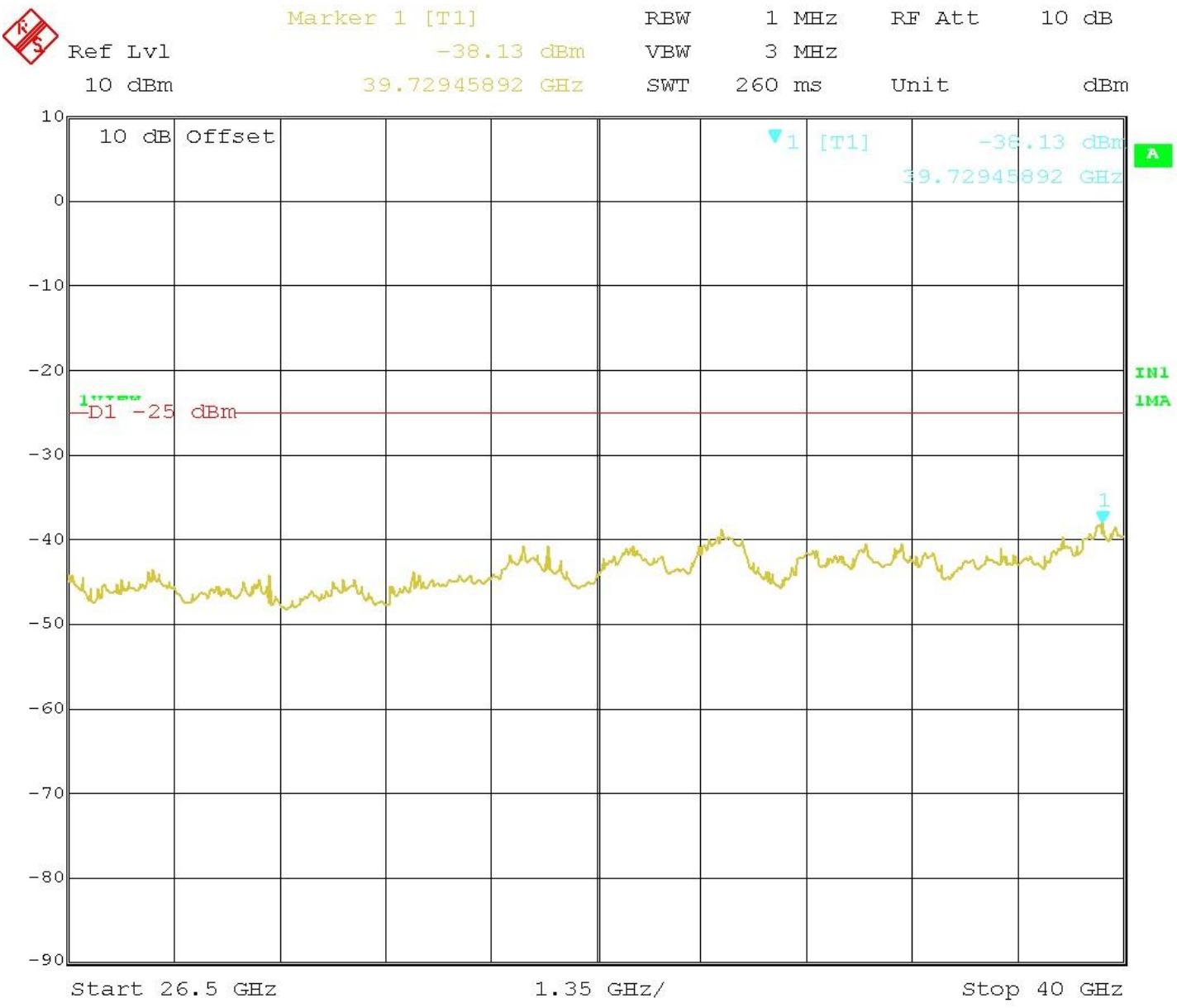


Figure 56 - Spurs 4985 MHz – 10 MHz Channel, 26.5 - 40 GHz

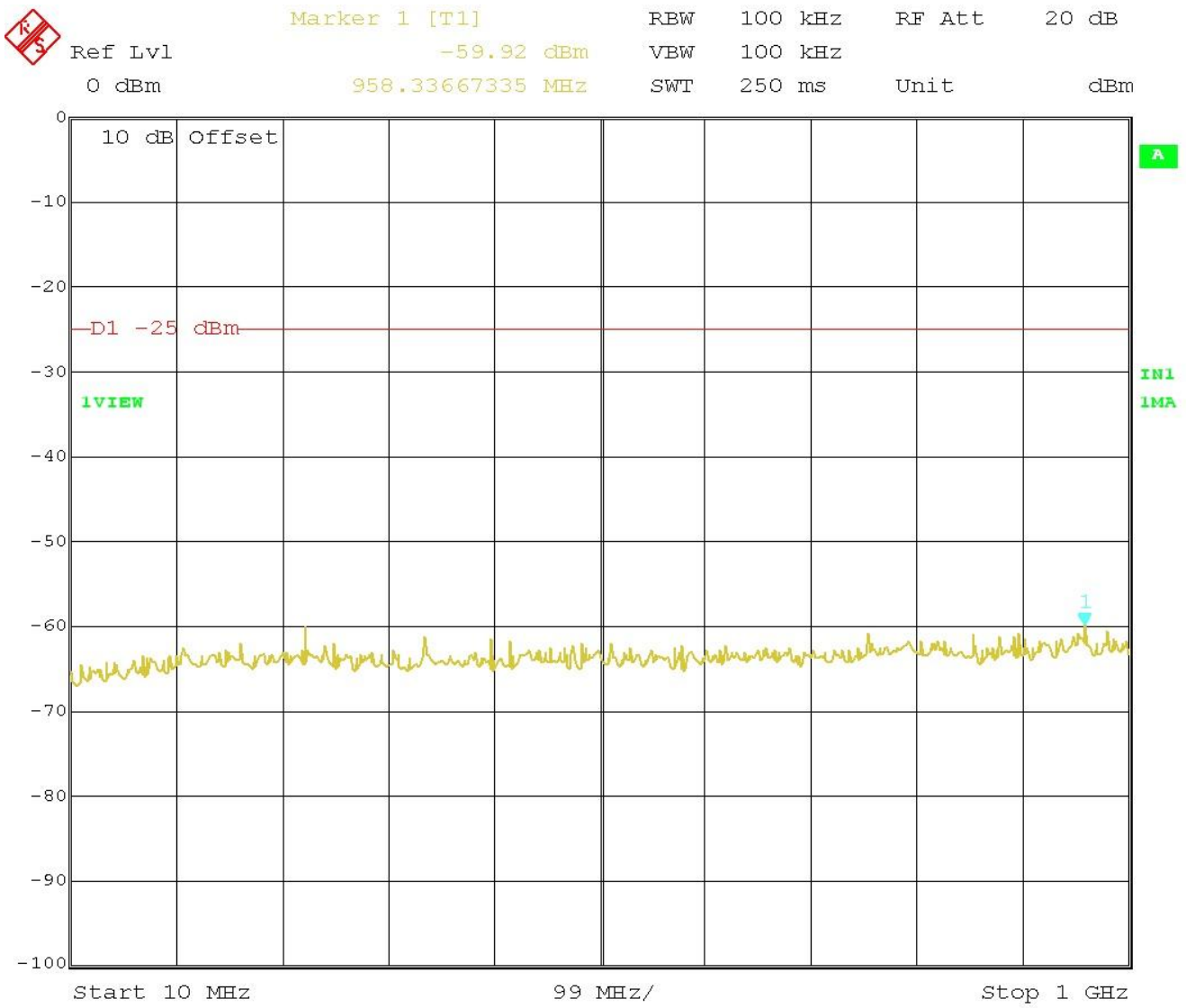


Figure 57 - Spurs 4950 MHz – 20 MHz Channel, 10 MHz - 1 GHz

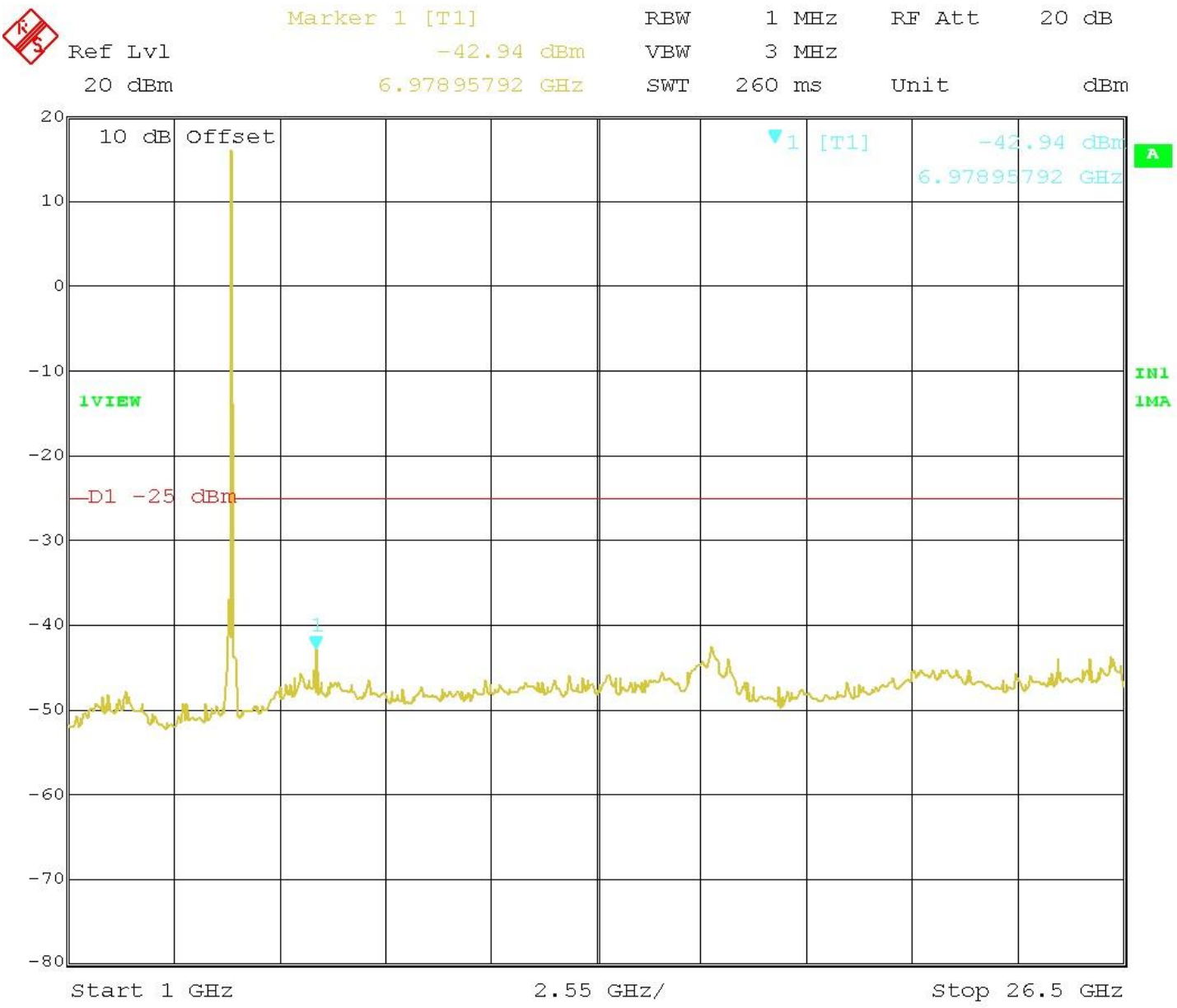


Figure 58 - Spurs 4950 MHz – 20 MHz Channel, 1 - 26.5 GHz

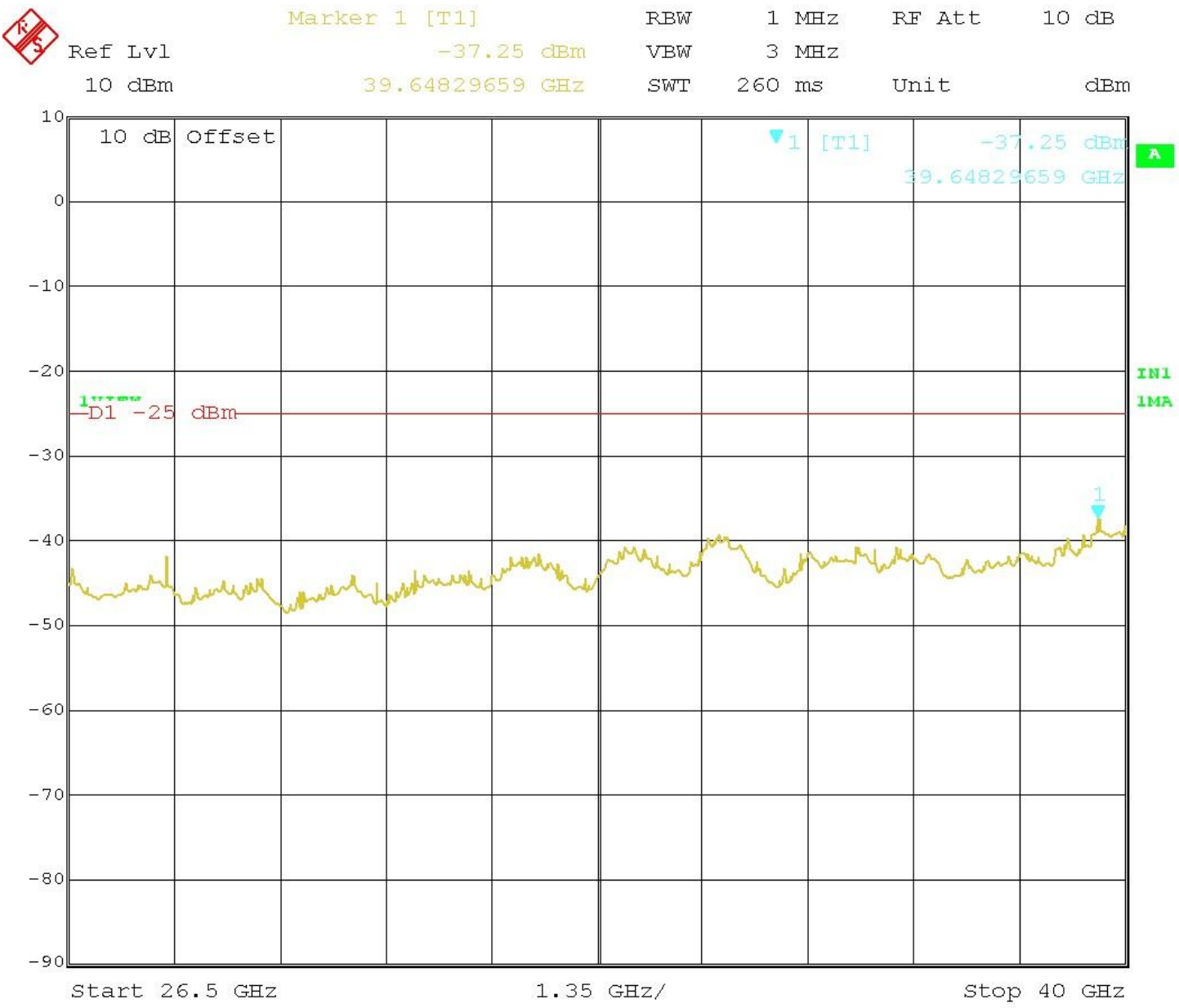


Figure 59 - Spurs 4950 MHz – 20 MHz Channel, 26.5 - 40 GHz

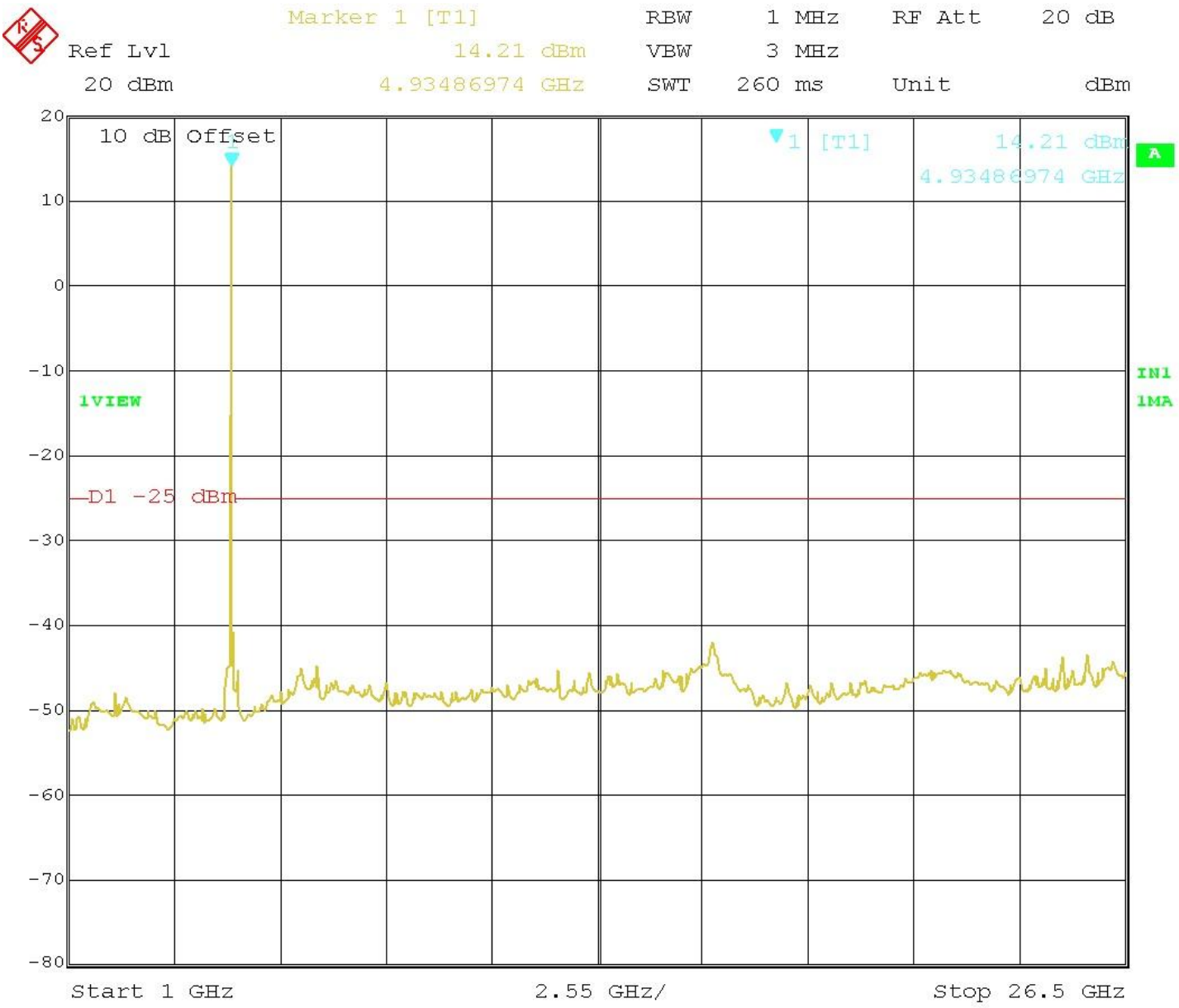


Figure 60 - Spurs 4960 MHz –20 MHz Channel, 1 - 26.5 GHz

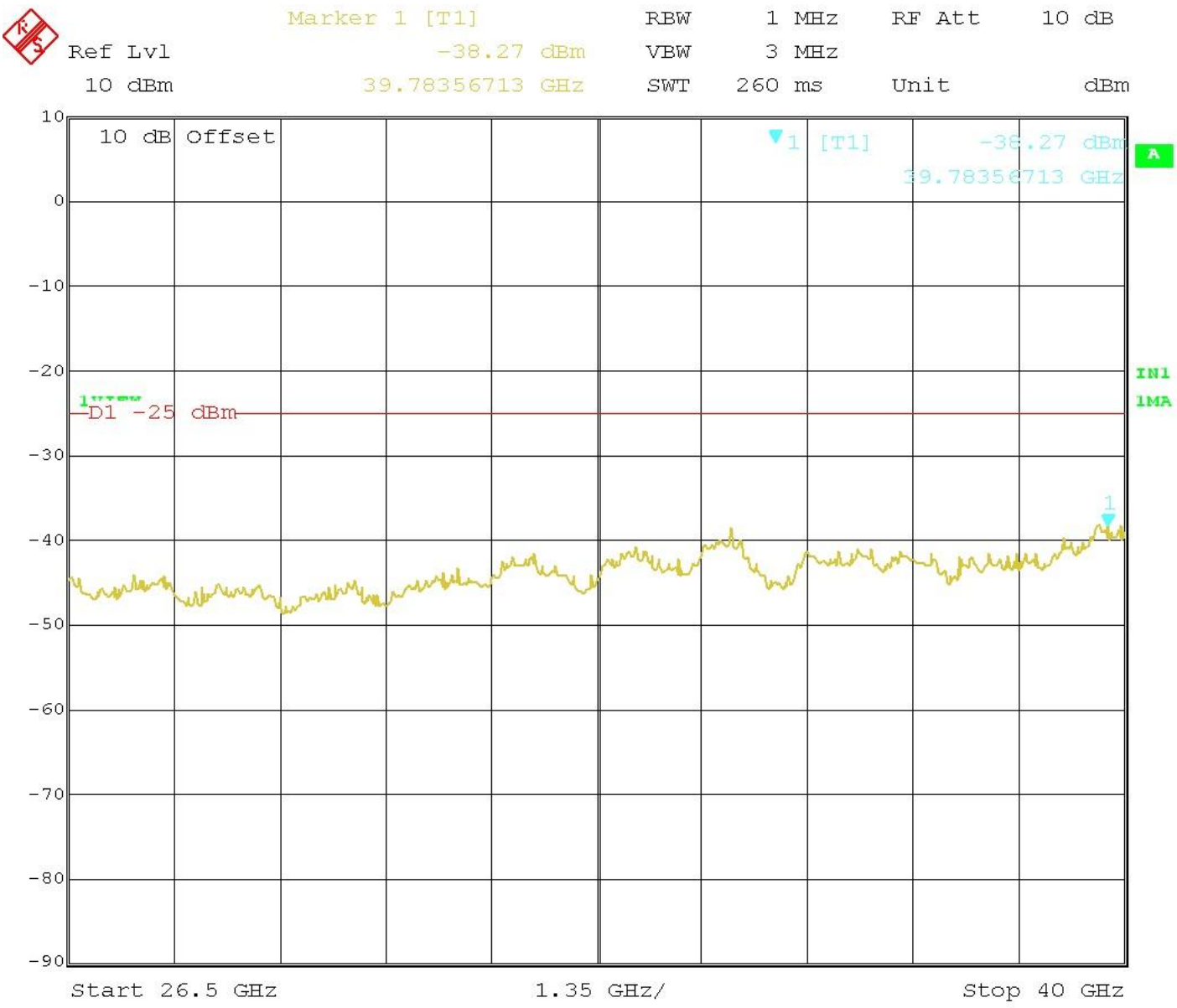


Figure 61 - Spurs 4960 MHz – 20 MHz Channel, 26.5 - 40 GHz

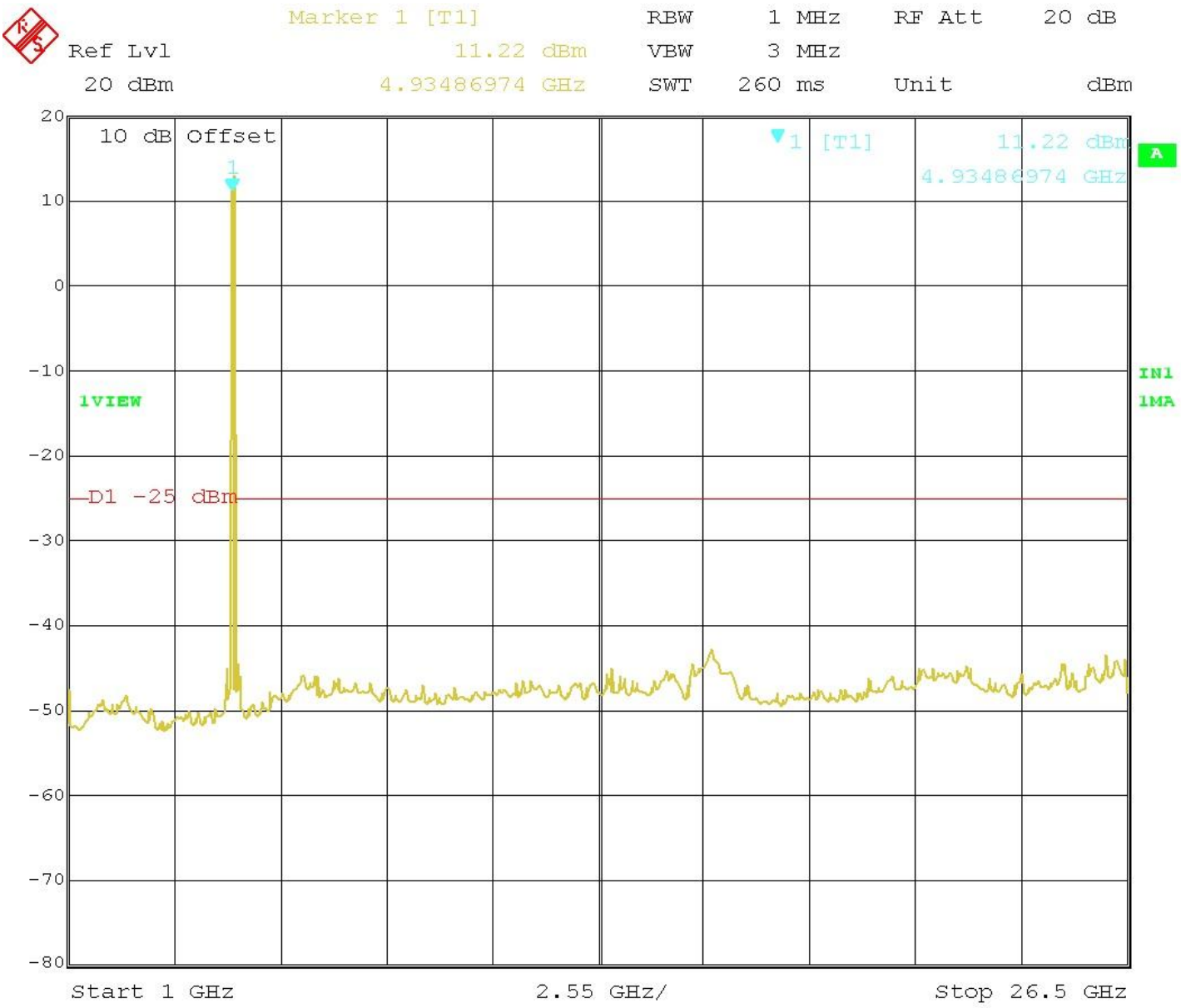


Figure 62 - Spurs 4980 MHz – 20 MHz Channel, 1 - 26.5 GHz

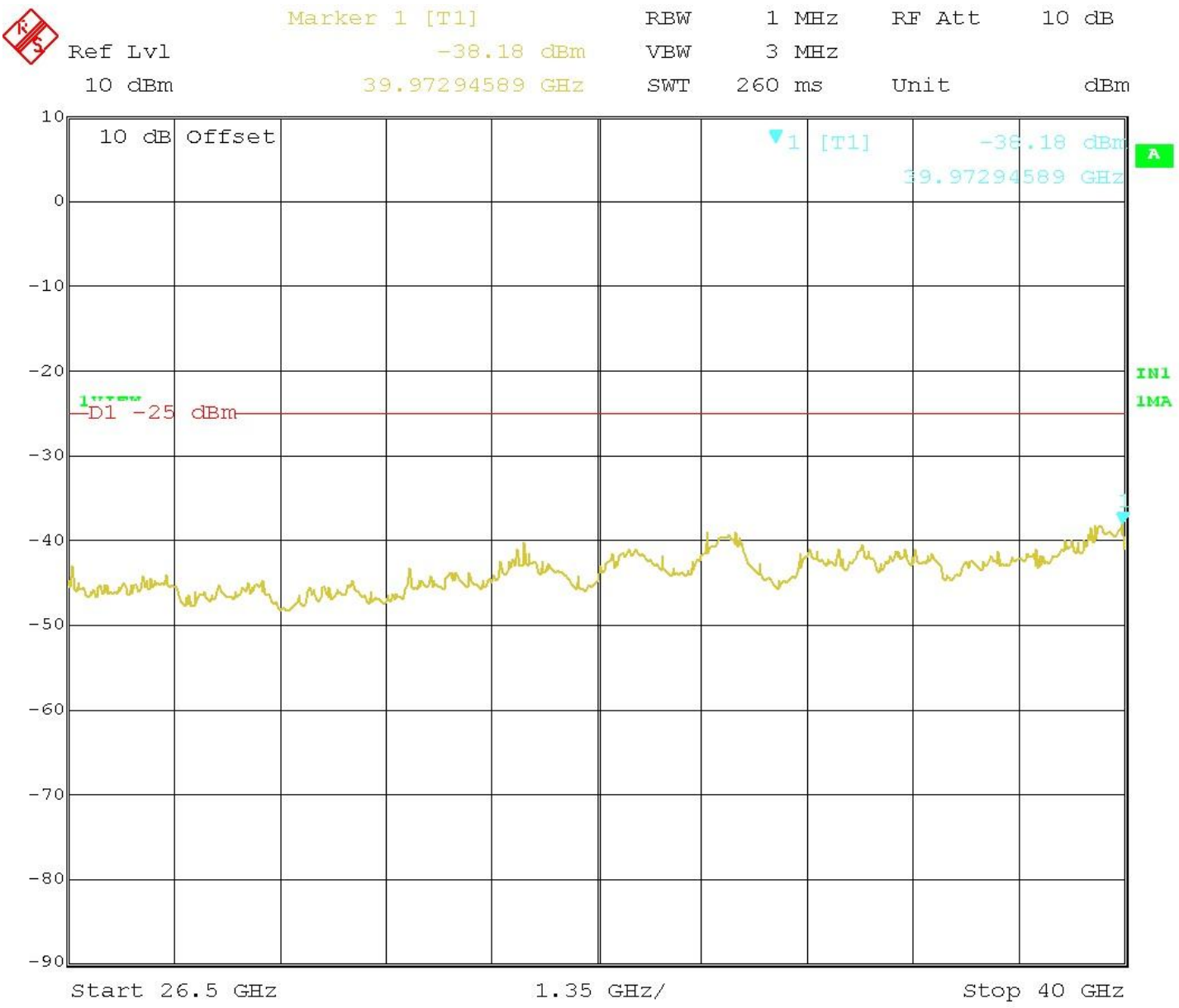


Figure 63 - Spurs 4980 MHz – 20 MHz Channel, 26.5 - 40 GHz

6 RF Exposure

6.1 Exposure Requirements – FCC Parts 90.1217, 1.1307 and 1.1310

FCC 90.1217:- Licensees and manufacturers are subject to the radiofrequency radiation exposure requirements specified in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

FCC 1.1310:- 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).

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)				
1500-100,000	...	...	5	6
(A) Limits for Occupational/Control Exposures				
1500-100,000	...	...	1.0	30
(B) Limits for General Population/Uncontrolled Exposure				

F = Frequency in MHz

6.1.1 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 Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f²)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	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/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30

F = Frequency in MHz

6.1.1.1 Antenna Gain

The maximum Gain measured in Semi-Anechoic Chamber is 8.5 dBi or 7.08 (numeric).

14 dBi or 25.12 (numeric)

21 dBi or 125.89 (numeric)

27.5 dBi or 562.34 (numeric)

30 dBi or 1000 (numeric)

6.1.1.2 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.

8.5 dBi gain Antenna

Frequency (MHz):	5725

Conversions:

Power (dBm):	22.58
Power (mW):	181.134
Power (W):	0.181134

Antenna gain in dBi:	8.50
Linear antenna gain:	7.079

R = distance in cm:	20
R = distance in m:	0.20

FCC:		
Controlled Exposures - Limit (mW/cm^2) =	5	
Uncontrolled Exposures - Limit (mW/cm^2) =	1	
Pd =	0.2551116	mW/cm^2
Controlled Margin to Limit =	4.7449	mW/cm^2
Uncontrolled Margin to Limit =	0.7449	mW/cm^2

14 dBi gain Antenna

Frequency (MHz):	5725

Conversions:

Power (dBm):	22.58
Power (mW):	181.134
Power (W):	0.181134

Antenna gain in dBi:	14.00
Linear antenna gain:	25.119

R = distance in cm:	20
R = distance in m:	0.20

FCC:

Controlled Exposures - Limit (mW/cm^2) =	5	
Uncontrolled Exposures - Limit (mW/cm^2) =	1	
Pd =	0.9051700	mW/cm^2
Controlled Margin to Limit =	4.0948	mW/cm^2
Uncontrolled Margin to Limit =	0.0948	mW/cm^2

21 dBi gain Antenna

Frequency (MHz):	5725

Conversions:

Power (dBm):	22.58
Power (mW):	181.134
Power (W):	0.181134

Antenna gain in dBi:	21.00
Linear antenna gain:	125.893

R = distance in cm:	20
R = distance in m:	0.20

FCC:		
Controlled Exposures - Limit (mW/cm^2) =	5	
Uncontrolled Exposures - Limit (mW/cm^2) =	1	
Pd =	4.5365964	mW/cm^2
Controlled Margin to Limit =	0.4634	mW/cm^2
Uncontrolled Margin to Limit =	-3.5366	mW/cm^2

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

27.5 dBi gain antenna

Frequency (MHz):	5725

Conversions:

Power (dBm):	22.58
Power (mW):	181.134
Power (W):	0.181134

Antenna gain in dBi:	27.50
Linear antenna gain:	562.341

R = distance in cm:	50
R = distance in m:	0.50

FCC:		
Controlled Exposures - Limit (mW/cm^2) =	5	
Uncontrolled Exposures - Limit (mW/cm^2) =	1	
Pd =	3.2422771	mW/cm^2
Controlled Margin to Limit =	1.7577	mW/cm^2
Uncontrolled Margin to Limit =	-2.2423	mW/cm^2

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

30 dBi gain antenna

Frequency (MHz):	5725

Conversions:

Power (dBm):	22.58
Power (mW):	181.134
Power (W):	0.181134

Antenna gain in dBi:	30.00
Linear antenna gain:	1000.000

R = distance in cm:	60
R = distance in m:	0.60

FCC:		
Controlled Exposures - Limit (mW/cm^2) =	5	
Uncontrolled Exposures - Limit (mW/cm^2) =	1	
Pd =	4.0039407	mW/cm^2
Controlled Margin to Limit =	0.9961	mW/cm^2
Uncontrolled Margin to Limit =	-3.0039	mW/cm^2

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

6.1.2 Sample Calculation

The Friis transmission formula: $Pd = (Pout*G) / (4*\pi*R^2)$

Where;

Pd = power density in mW/cm_2
Pout = output power to antenna in mW
G = gain of antenna in linear scale
$\pi \approx 3.1416$
R = distance between observation point and center of the radiator in cm