Test of AP0127730, AP0134760

To: FCC 47 CFR Part 90, Subpart Y; IC RSS 111

Test Report Serial No.: RDWN12-U4 Rev A

TEST REPORT

FROM

Test of AP0127730, AP0134760

To FCC 47 CFR Part 90, Subpart Y; IC RSS 111

Test Report Serial No.: RDWN12-U4 Rev A

This report supersedes NONE

Manufacturer: RADWIN Ltd
27 Habarzel Street
Tel Aviv, 69710
Israel

Product Function: 5 GHz 2x2 MIMO RF Module

Copy No: pdf **Issue Date:** 28th November 2012

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
440 Boulder Court, Suite 200
Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
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ACCREDITED
TEST CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

ilac-MRA

A2LA World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 27th day of March 2012.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2013

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

RECOGNITION

MiCOM Labs, Inc has widely recognized Electrical testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA** countries. Our test reports are widely accepted for global type approvals.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

**APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.
Phase I - recognition for product testing
Phase II – recognition for both product testing and certification
N/A – Not Applicable

**EU MRA – European Union Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

**NB – Notified Body

PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard EN ISO/IEC Guide 65. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

United States of America – Telecommunication Certification Body (TCB)
TCB Identifier – US0159

Industry Canada – Certification Body
CAB Identifier – US0159

Europe – Notified Body
Notified Body Identifier - 2280

Japan – Recognized Certification Body (RCB)
RCB Identifier - 210

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	28th November 2012	Initial release.

1. TEST RESULT CERTIFICATE

Manufacturer:	RADWIN Ltd 27 Habarzel Street Tel Aviv, 69710 Israel	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	RF Module operating in the 4.9 – 5.8 GHz bands.	Telephone:	+1 925 462 0304
Model:	AP0127730, AP0134760	Fax:	+1 925 462 0306
S/N's:	Prototype		
Test Date(s):	10th to 18th September 2012	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 90, Subpart Y; IC RSS 111	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

ACCREDITED
TEST CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
(i)	FCC 47 CFR Part 90	2012	Code of Federal Regulations
(ii)	FCC 47 CFR Part 90 Sect 90.210 Sect 90.1215	2012	90.210 Emission Masks (Revised requirements) 90.1215 Power Limits (Revised requirements)
(iii)	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
(iv)	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(v)	M 3003	Edition 2 Dec. 2007	Expression of Uncertainty and Confidence in Measurements
(vi)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(vii)	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(viii)	A2LA	July 2012	Reference to A2LA Accreditation Status – A2LA Advertising Policy

2.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the AP0127730, AP0134760 to FCC Part 90, Subpart Y and Industry Canada RSS-111 regulations.
Applicant:	RADWIN Ltd 27 Habarzel Street Tel Aviv, 69710 Israel
Manufacturer:	As applicant.
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	RDWN12-U4 Rev A
Date EUT received:	10th September 2012
Standard(s) applied:	FCC 47 CFR Part 90, Subpart Y; IC RSS 111
Dates of test (from - to):	10th to 18th September 2012
No of Units Tested:	One
Type of Equipment:	5 GHz 2x2 MIMO RF module.
Manufacturers Trade Name:	RADWIN
Model(s):	AP0127730, AP0134760
Location for use:	Inside outdoor enclosure
Declared Frequency Range(s):	4940 - 4990 MHz
Hardware Rev	Prototype
Software Rev	Prototype
Type of Modulation:	Per 802.11n – BPSK, QPSK, 16QAM, 64QAM, OFDM
Declared Nominal Average Output Power:	5 MHz: 24.57 dBm; 10 MHz: 23.37 dBm; 20 MHz: 24.38 dBm
EUT Modes of Operation:	5 MHz; 10 MHz; 20 MHz.
Transmit/Receive Operation:	Time Division Duplex
System Beam Forming:	AP0127730, AP0134760 has no capability for antenna beam forming
Rated Input Voltage and Current:	POE 55 Vdc 1 A
Operating Temperature Range:	Declared range -35° to +60ºC
ITU Emission Designator:	5 MHz 5M00W7W 10 MHz 10M0W7W 20 MHz 20M0W7W
Equipment Dimensions:	1.9” x 2.0” x 0.3” inches
Weight:	0.042 lb (19g)
Primary function of equipment:	5 GHz 2X2 MIMO RF module.

3.2. Scope of Test Program

AP0127730, AP0134760 RF Testing

The scope of the test program was to test the AP0127730, AP0134760 5 GHz 2x2 MIMO RF module configurations in the frequency range 4940 to 4990 MHz for compliance against FCC 47 CFR Part 90 Subpart Y and Industry Canada RSS-111 specifications.

AP0127730, AP0134760

AP0127730, AP0134760 (Rear)

AP0127730, AP0134760 Label

3.3. Equipment Model(s) and Serial Number(s)

Equipment Type	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	RF module operating in the 4.9-5.8 GHz bands	RADWIN Ltd	AP0127730, AP0134760	None
Support	Laptop PC	DELL	LATITUDE D530	None

3.4. Antenna Details

No antennas were tested as part of this test program. The following is provided for information only.

Antenna Type	Manufacturer	Model Number	Antenna Gain (dBi)
			4940 – 4990 MHz
Dish Dual Pole	RADWIN Ltd.	RW-9721-5158	28
Flat Panel Dual Pole External	RADWIN Ltd.	RW-9622-5001	29
Flat Panel Dual Pole External	RADWIN Ltd.	RW-9612-5001	23
Flat Panel Dual Pole Integrated	RADWIN Ltd.	MT0070760	21
Flat Panel Dual Pole Integrated	RADWIN Ltd.	AM0111760	14
Flat Panel Dual Pole Integrated	RADWIN Ltd.	AM0119960	13
Sector Dual Pole 60 Deg	RADWIN Ltd.	RW-9061-5002	15
Sector Dual Pole 90 Deg	RADWIN Ltd.	RW-9061-5001	14
Sector Dual Pole Integrated 90 Deg	RADWIN Ltd.	MT0125250	13
Sector Dual Pole 120 Deg	RADWIN Ltd.	RW-9061-5004	11
Sector Dual Pole Integrated 120 Deg	RADWIN Ltd.	MT0128930	11
Sector Dual Pole Integrated 95 Deg	RADWIN Ltd.	AM0135060	12

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. 1 x 10/100/1000 Ethernet (includes POE +55 Vdc)

3.6. Test Configurations

Matrix of test configurations

Parameter	Operational Mode	Test Conditions	Bandwidths (MHz)
Occupied BW & Emission Mask	Modulated	Ambient	5, 10, 20
Peak Output power	Modulated	Ambient	5, 10, 20
Peak Power Spectral Density	Modulated	Ambient	5, 10, 20
Frequency Stability	Modulated	Temperature Variations and Voltage Variations	20
Conducted Emissions	Modulated	Ambient	5, 10, 20
Radiated Emissions	Modulated	Ambient	5, 10, 20

Only worst case plots are provided for each test parameter are identified within this report. Plots not included are held on file by the test laboratory and available upon request with client permission.

3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

3.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

3.9. Subcontracted Testing or Third Party Data

1. NONE

4. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 90**, **Subpart Y (except Section 5.1.4)** and **Industry Canada RSS-111**; **Industry Canada RSS-Gen**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
2.1049; 90.210(m) **5.3** **4.6**	26 dB Occupied BW & Emission Mask	Emission mask and bandwidth measurement(s)	Conducted	Complies	5.1.1
2.1046; 90.1215 (a) **5.3 4.8**	Peak Output Power	Modulated Output Power	Conducted	Complies	5.1.2
2.1046; 90.1215 (a) **4.2**	Peak Power Spectral Density	Maximum Spectral Density	Conducted	Complies	5.1.3
Subpart C 90.1217 **5.6**	Maximum Permissible Exposure	Exposure to radio frequency energy levels	Radiated	Complies	5.1.4
2.1055(a)(1); 90.213 **5.2 4.7**	Frequency Stability	Includes temperature and voltage variations	Conducted	Complies	5.1.5
2.1051; 90.210(m) **5.4 4.9**	Conducted Spurious Emissions at Antenna Port	Emissions from the antenna port 30 MHz – 40 GHz	Conducted	Complies	5.1.6
2.1053; 90.210(m) **5.3 4.9**	Radiated Spurious Emissions	Spurious emissions 30 MHz – 40 GHz	Radiated	Complies	5.1.7
4.10 **6**	Radiated Receiver Emissions			Complies	5.1.8

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

5. TEST RESULTS

5.1. Device Characteristics

5.1.1. Occupied Bandwidth and Emission Mask

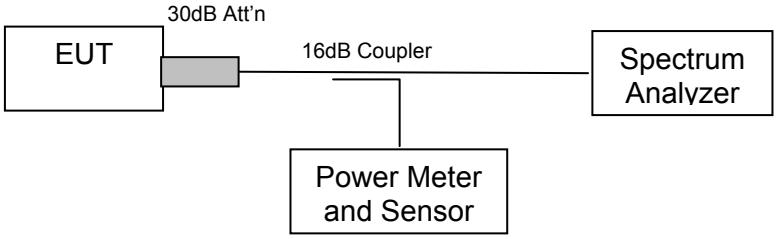
FCC 47 CFR Part 90, Subpart Y; 2.1049; §90.210(m)

Test Procedure

The transmitter terminal of EUT was connected to the input of the spectrum analyzer set to measure the 26 dB occupied bandwidth and emission mask for the radio. The system highest power setting was selected with modulation ON and duty cycle set for 100% i.e. continuous operation at all times.

For emission masks 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.

Test Measurement Set up



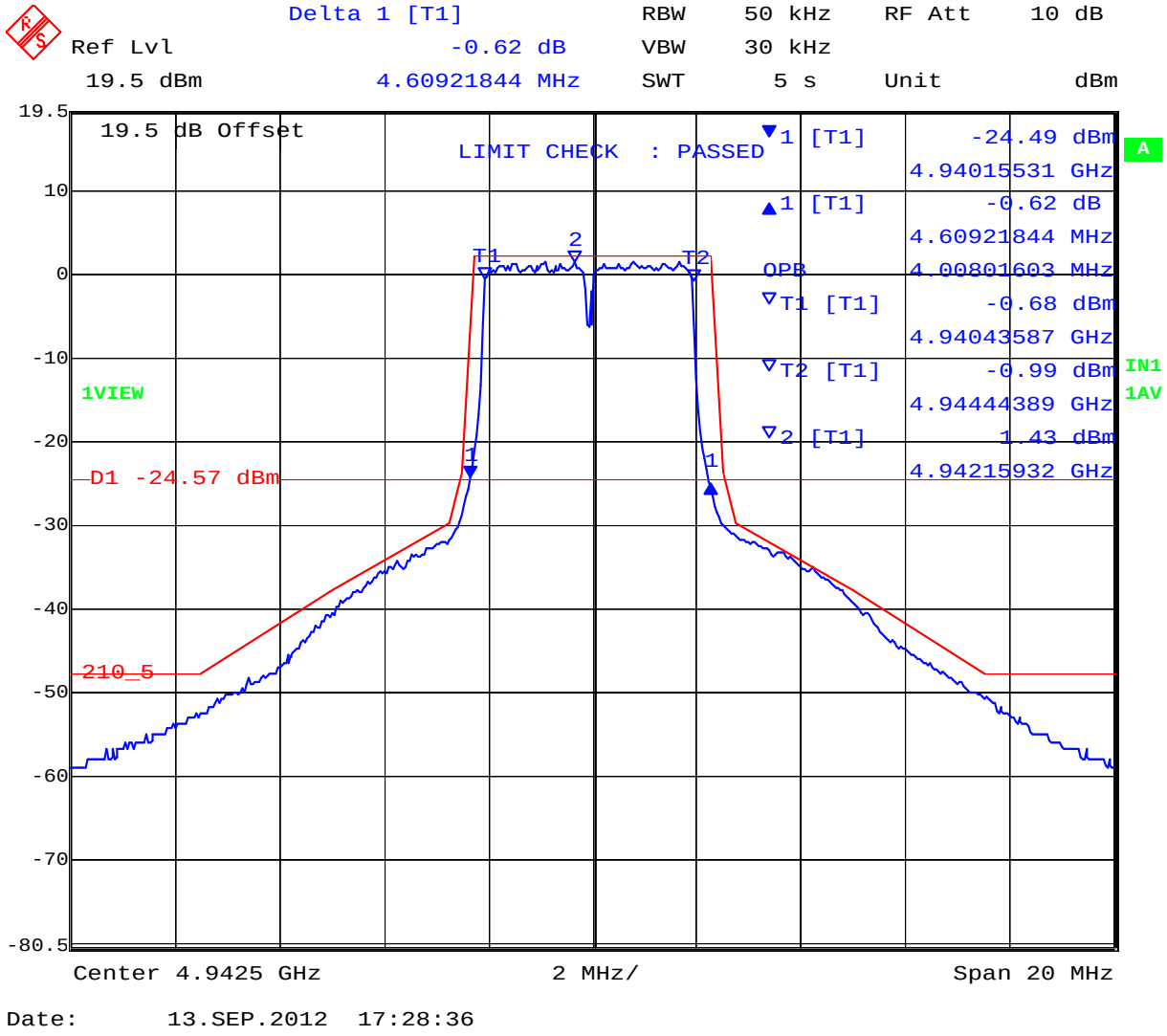
Test set up for Occupied Bandwidth and Emission Mask measurement

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

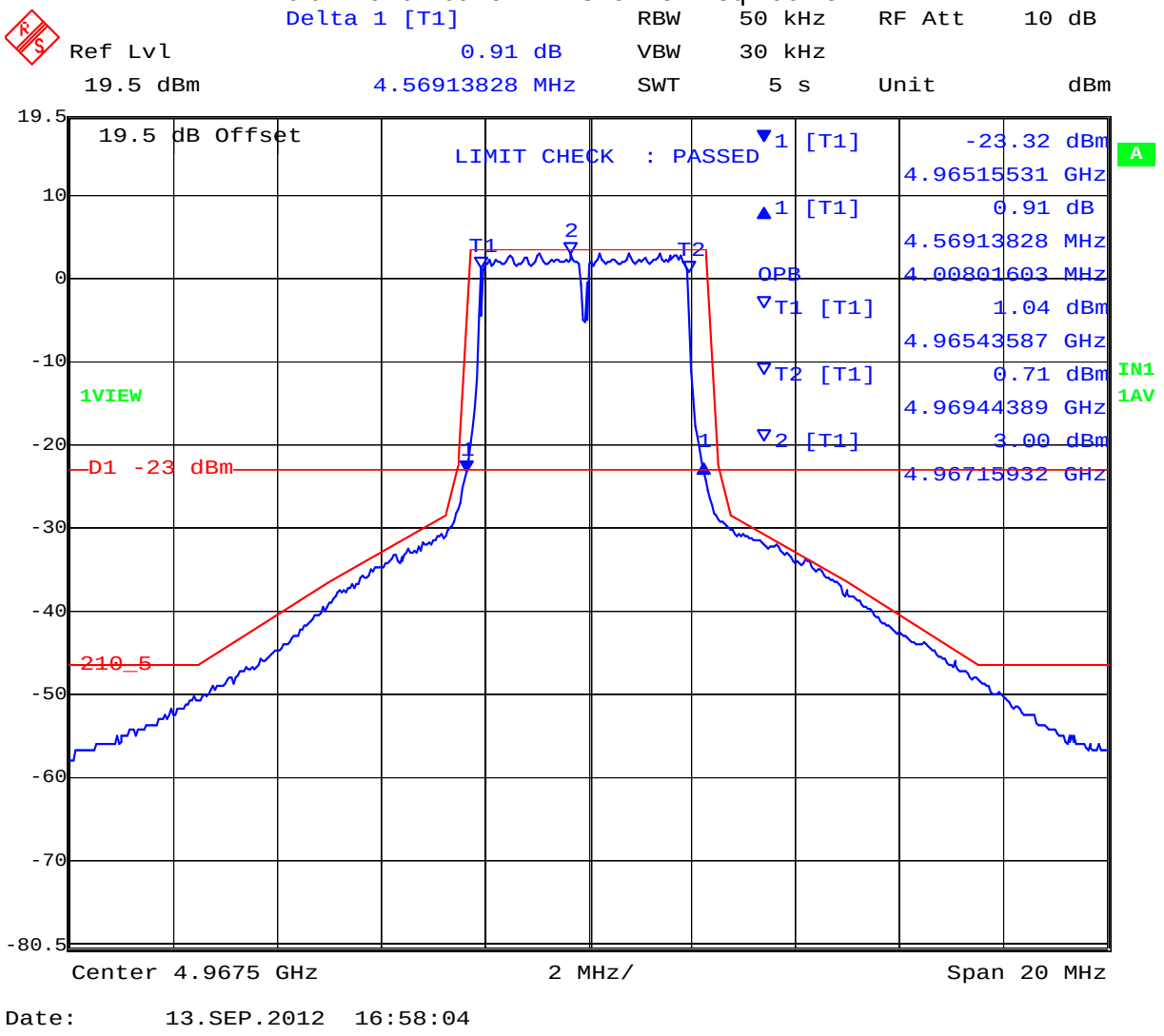
TABLE OF RESULTS – 5 MHz 26 dB Bandwidth(s)

Center Frequency (MHz)	26 dB Bandwidth (MHz)	
	Port A	Port B
4942.5	4.609	4.489
4967.5	4.569	4.569
4987.5	4.449	4.569

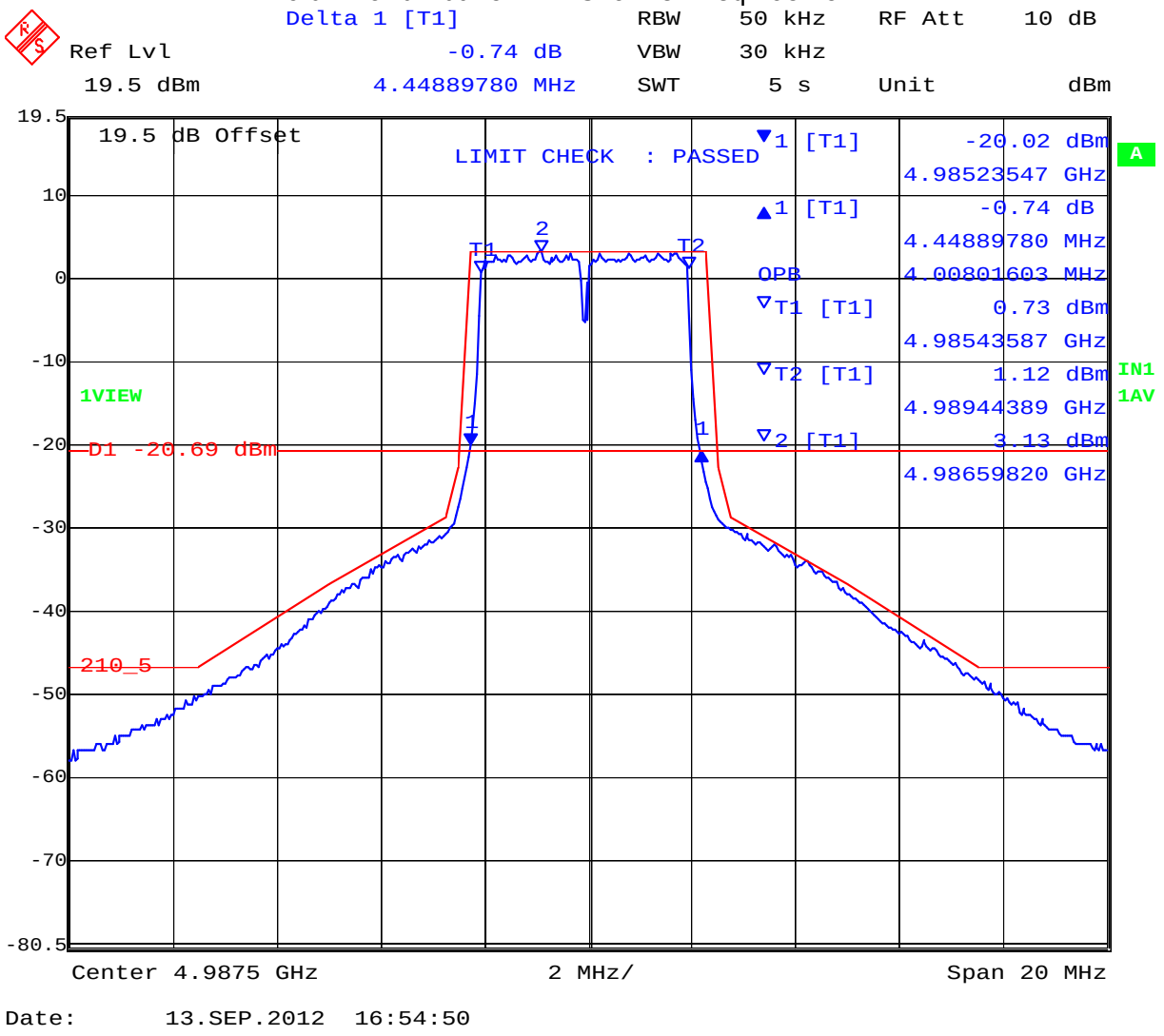
Port A
26 dB Bandwidth 5 MHz Channel Freq 4942.5 MHz



Port A
26 dB Bandwidth 5 MHz Channel Freq 4967.5 MHz

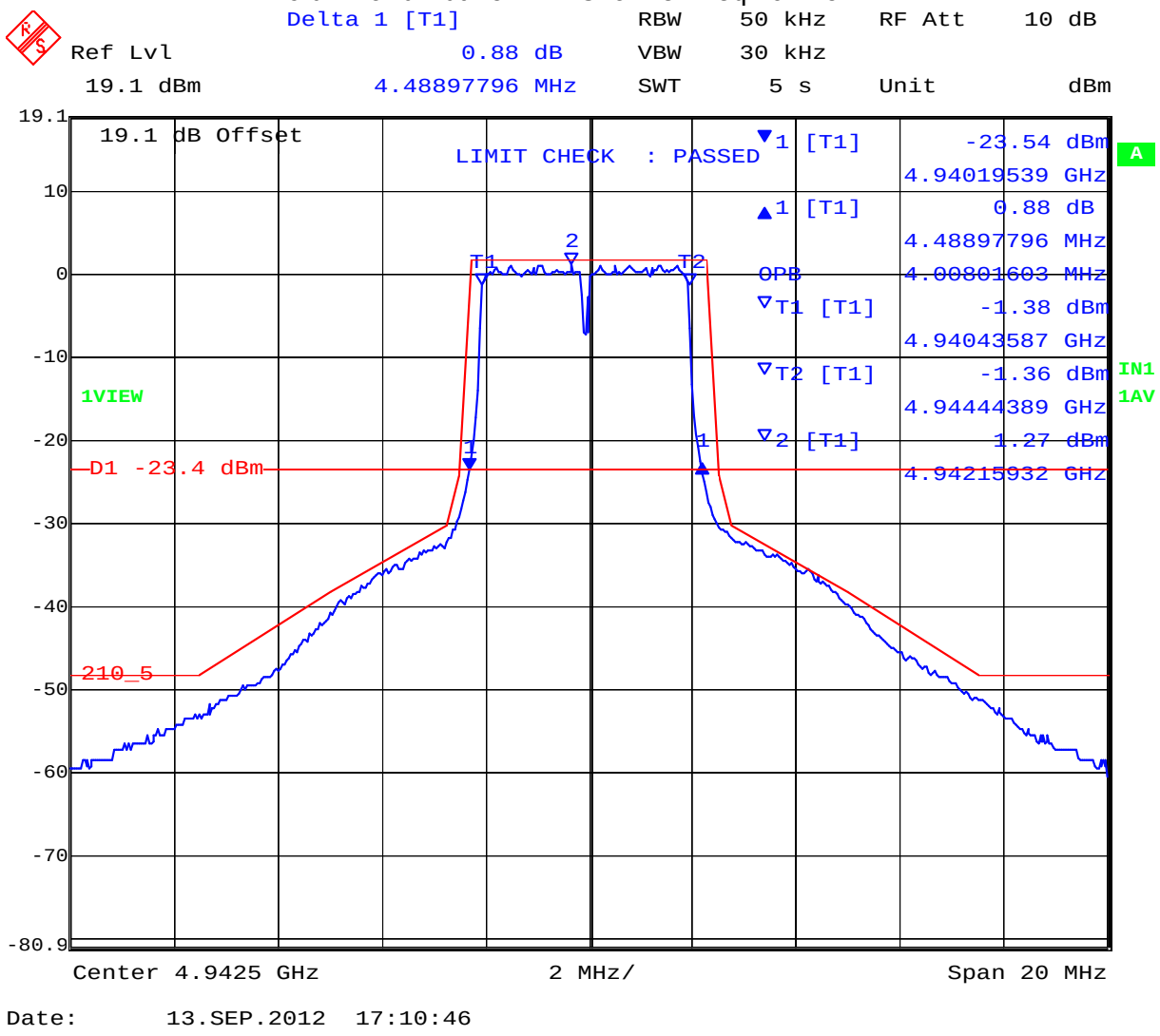


Port A
26 dB Bandwidth 5 MHz Channel Freq 4987.5 MHz

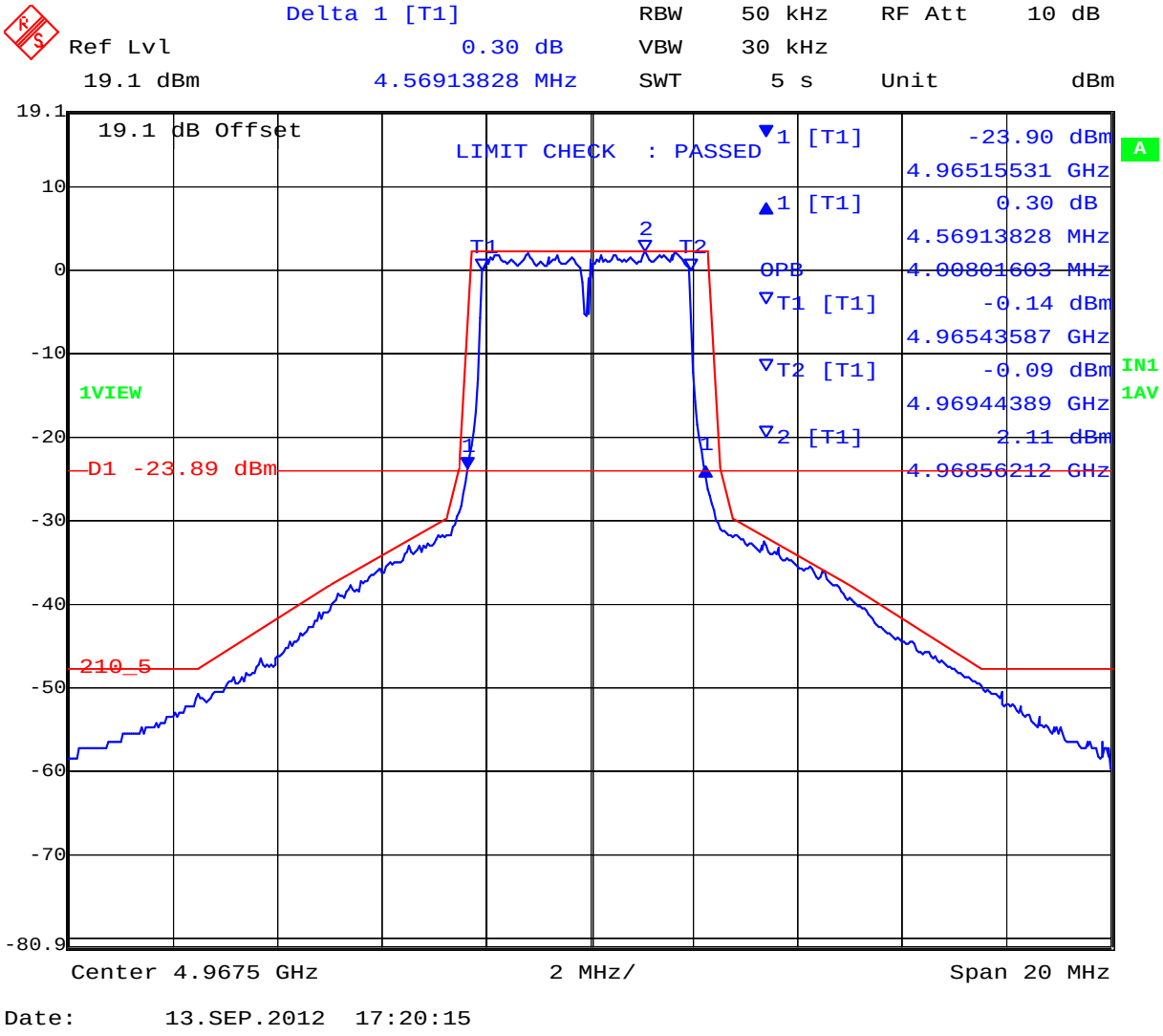


Port B

26 dB Bandwidth 5 MHz Channel Freq 4942.5 MHz



Port B
26 dB Bandwidth 5 MHz Channel Freq 4967.5 MHz



Port B
26 dB Bandwidth 5 MHz Channel Freq 4987.5 MHz

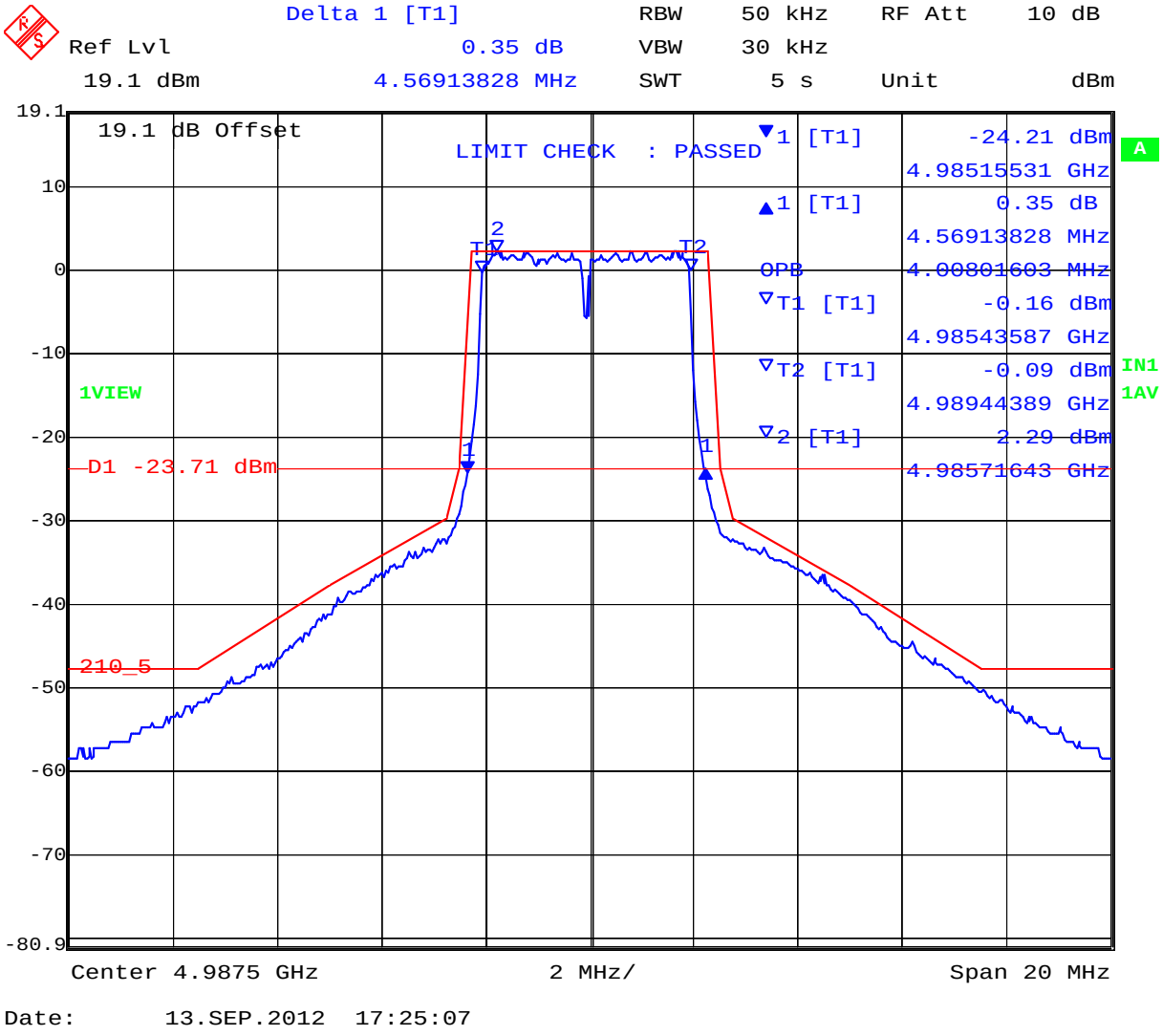
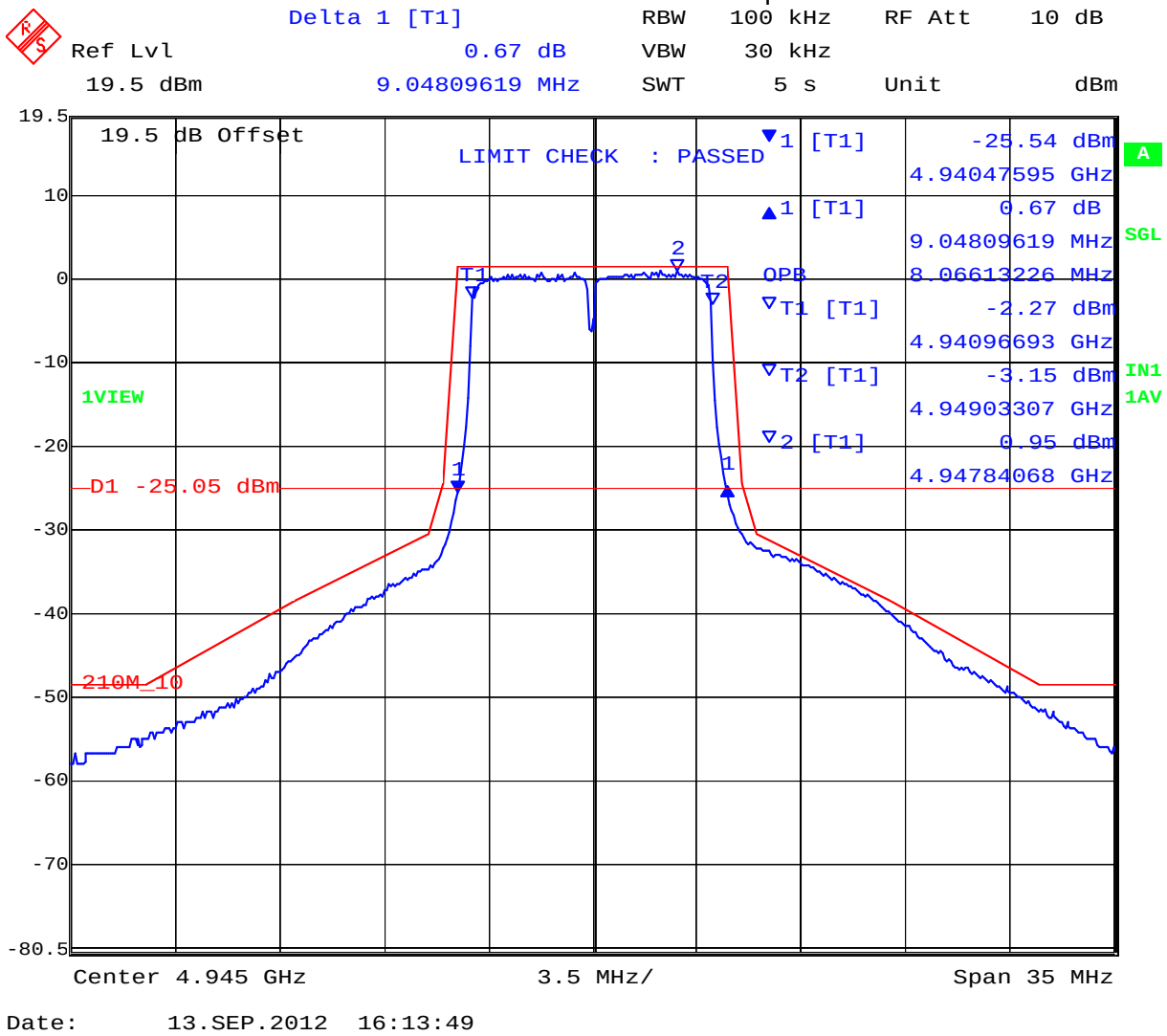


TABLE OF RESULTS – 10 MHz 26 dB Bandwidth(s)

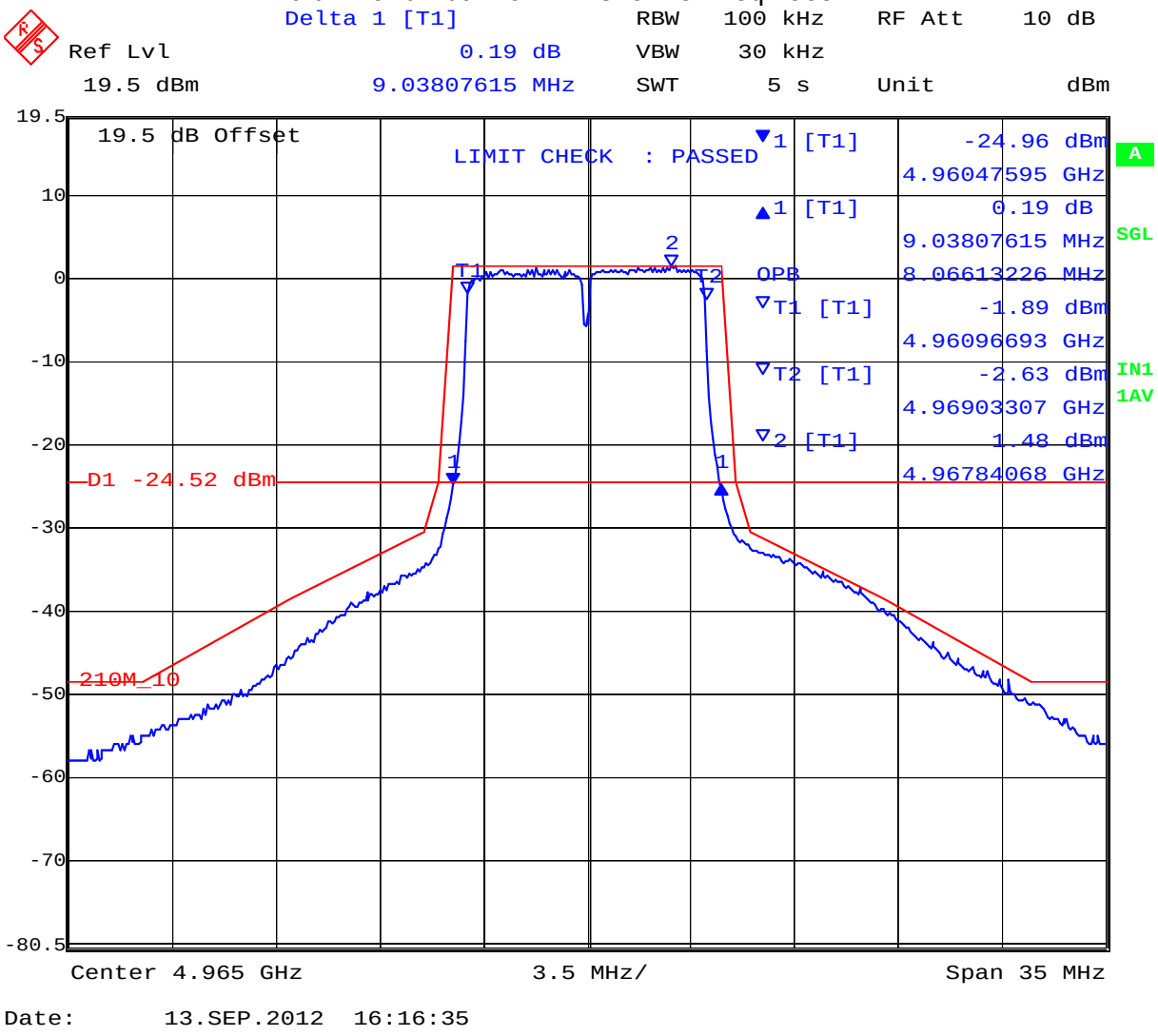
Center Frequency (MHz)	26 dB Bandwidth (MHz)	
	Port A	Port B
4945	9.048	9.053
4965	9.038	9.038
4985	9.033	8.978

Port A
26 dB Bandwidth 10 MHz Channel Freq 4945 MHz

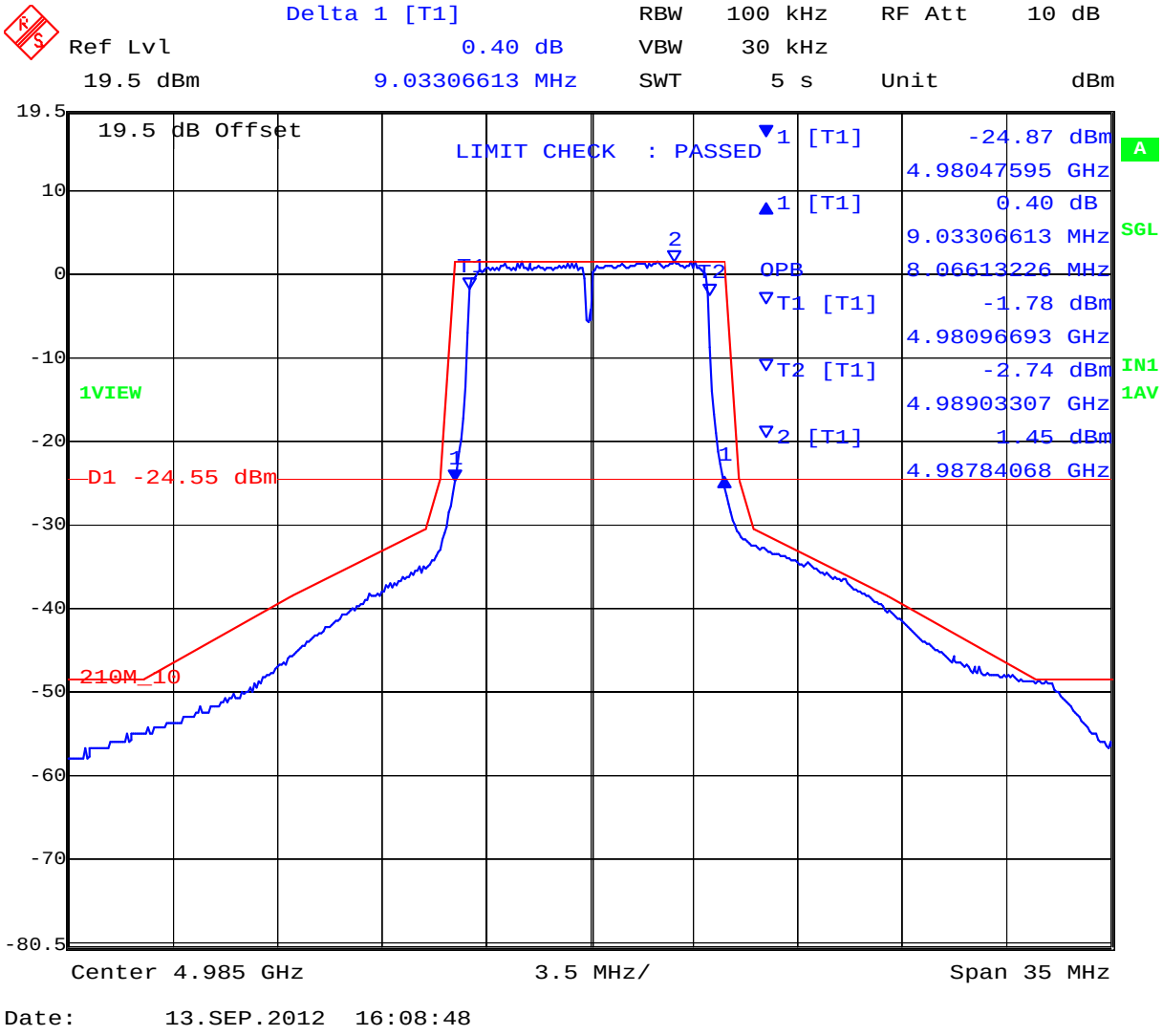


Port A

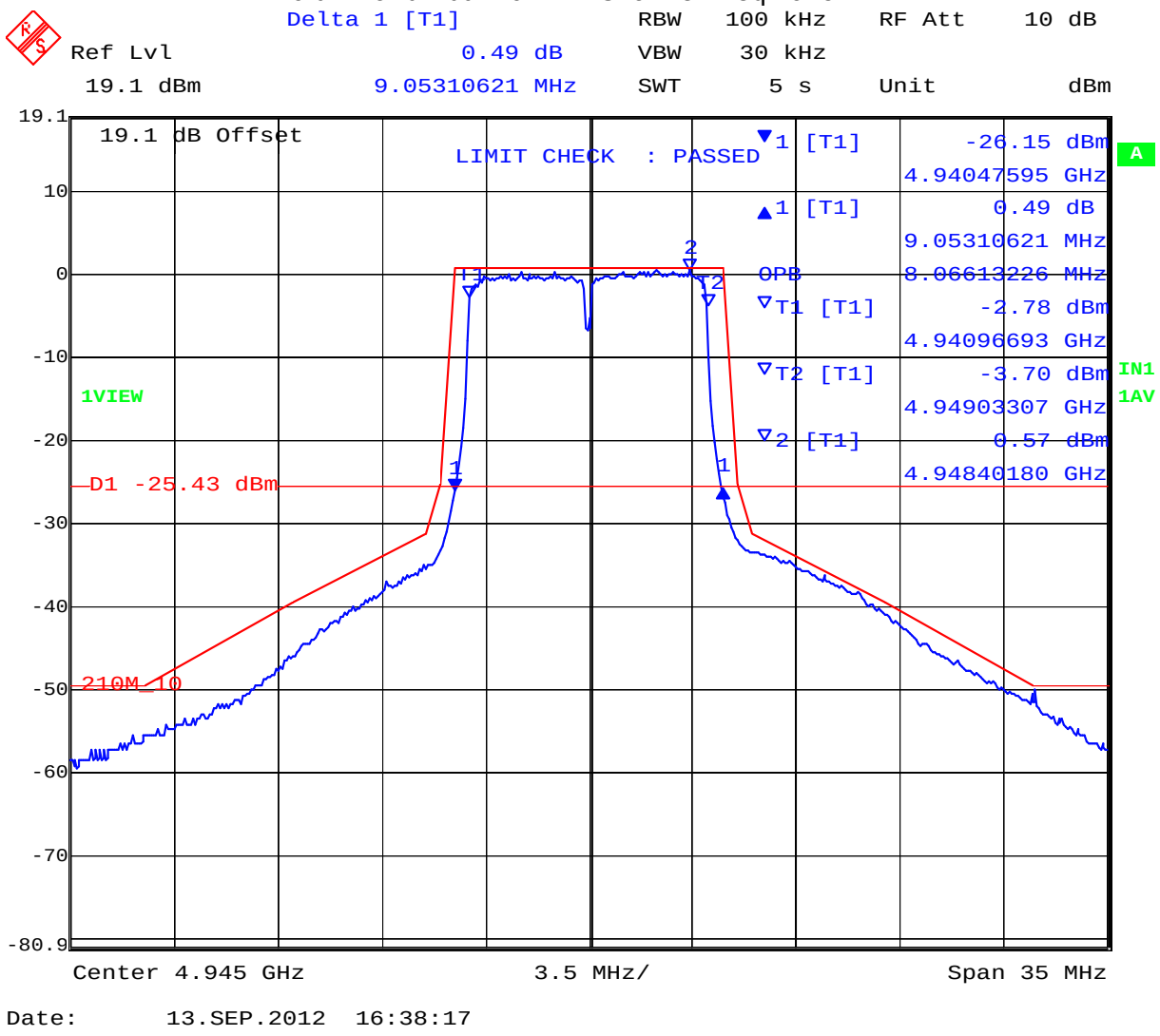
26 dB Bandwidth 10 MHz Channel Freq 4965 MHz



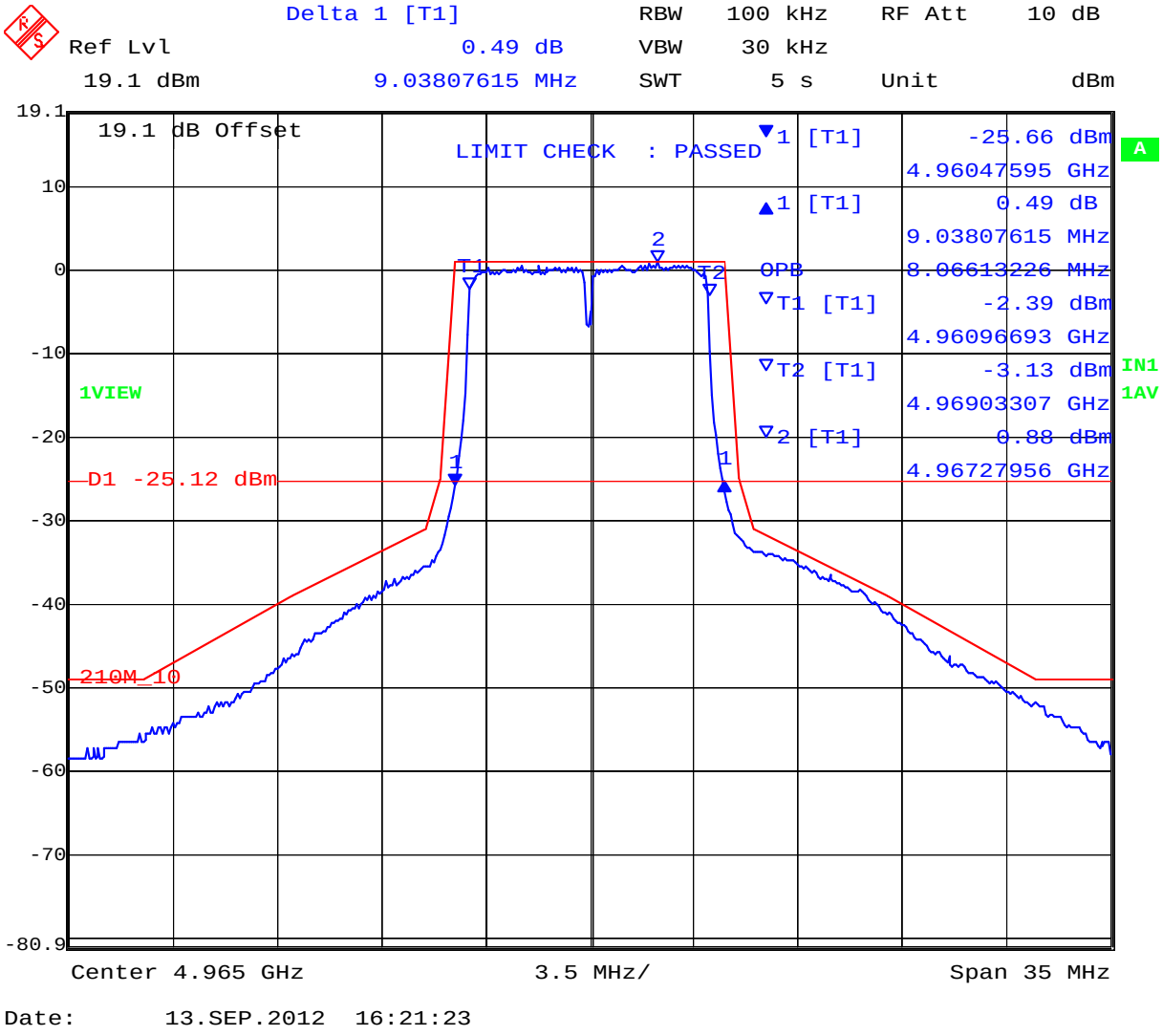
Port A
26 dB Bandwidth 10 MHz Channel Freq 4985 MHz



Port B
26 dB Bandwidth 10 MHz Channel Freq 4945 MHz



Port B
26 dB Bandwidth 10 MHz Channel Freq 4965 MHz



Port B
26 dB Bandwidth 10 MHz Channel Freq 4985 MHz

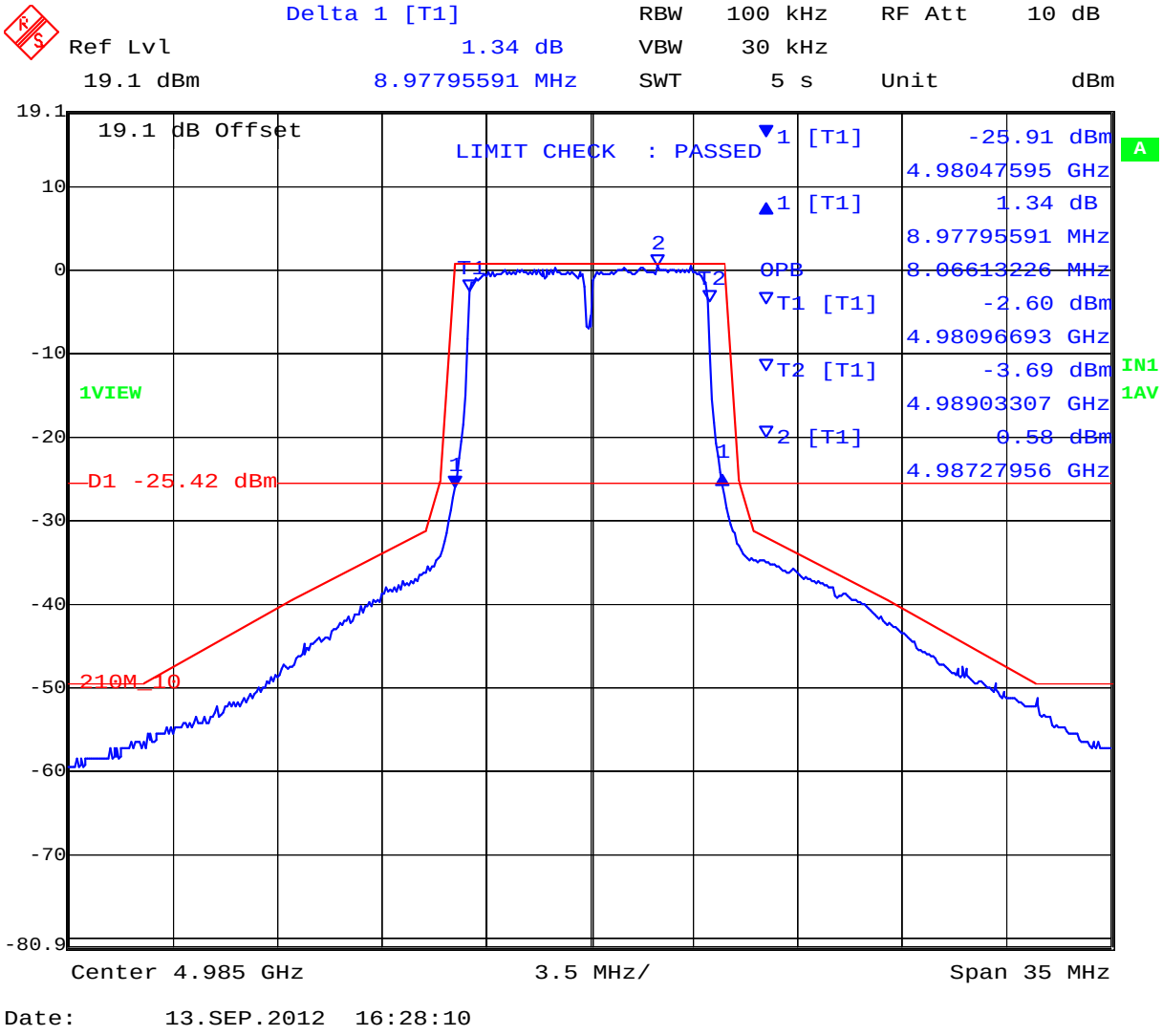
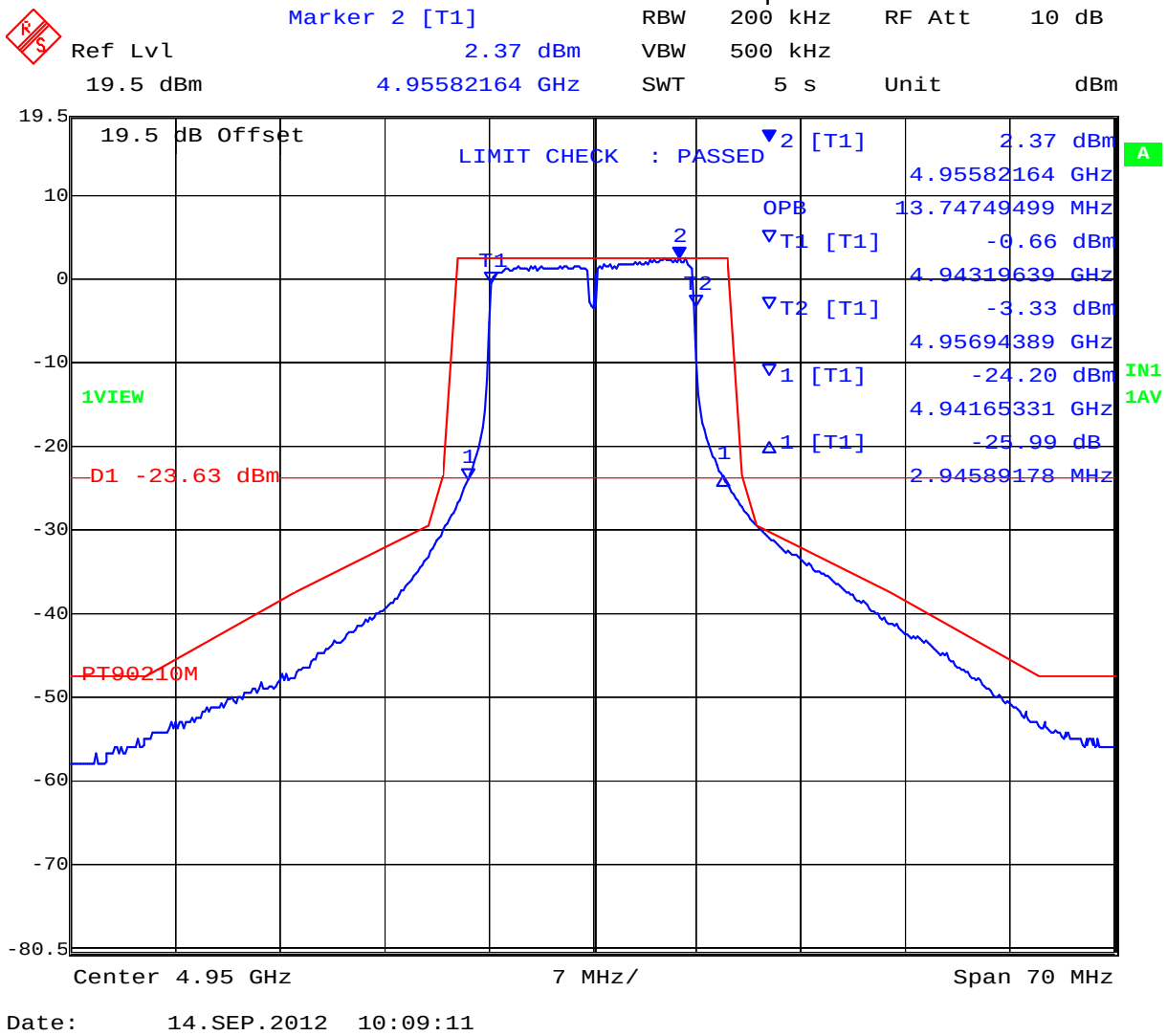


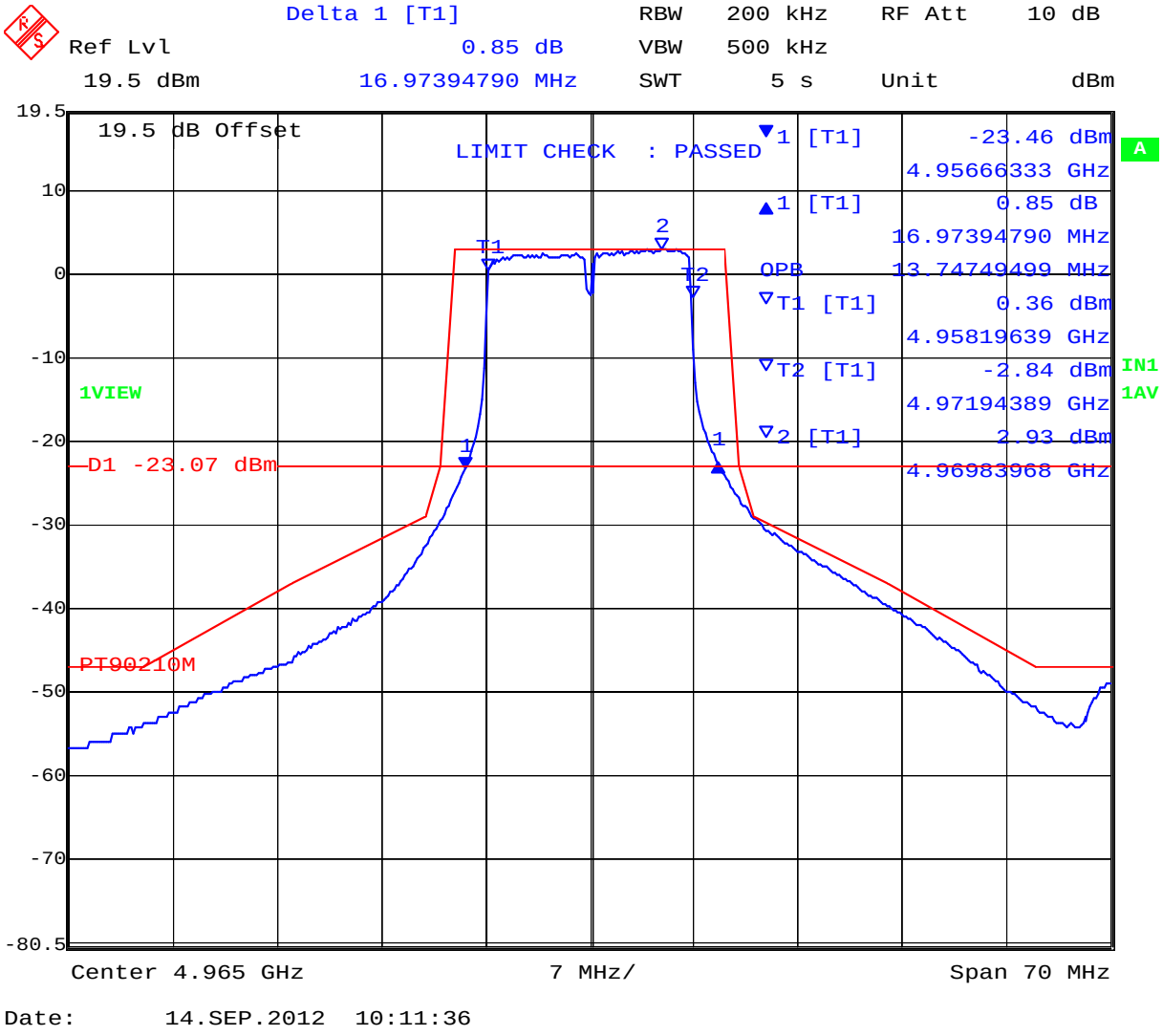
TABLE OF RESULTS – 20 MHz 26 dB Bandwidth(s)

Center Frequency (MHz)	26 dB Bandwidth (MHz)	
	Port A	Port B
4950	16.974	16.834
4965	16.974	16.974
4980	17.114	16.974

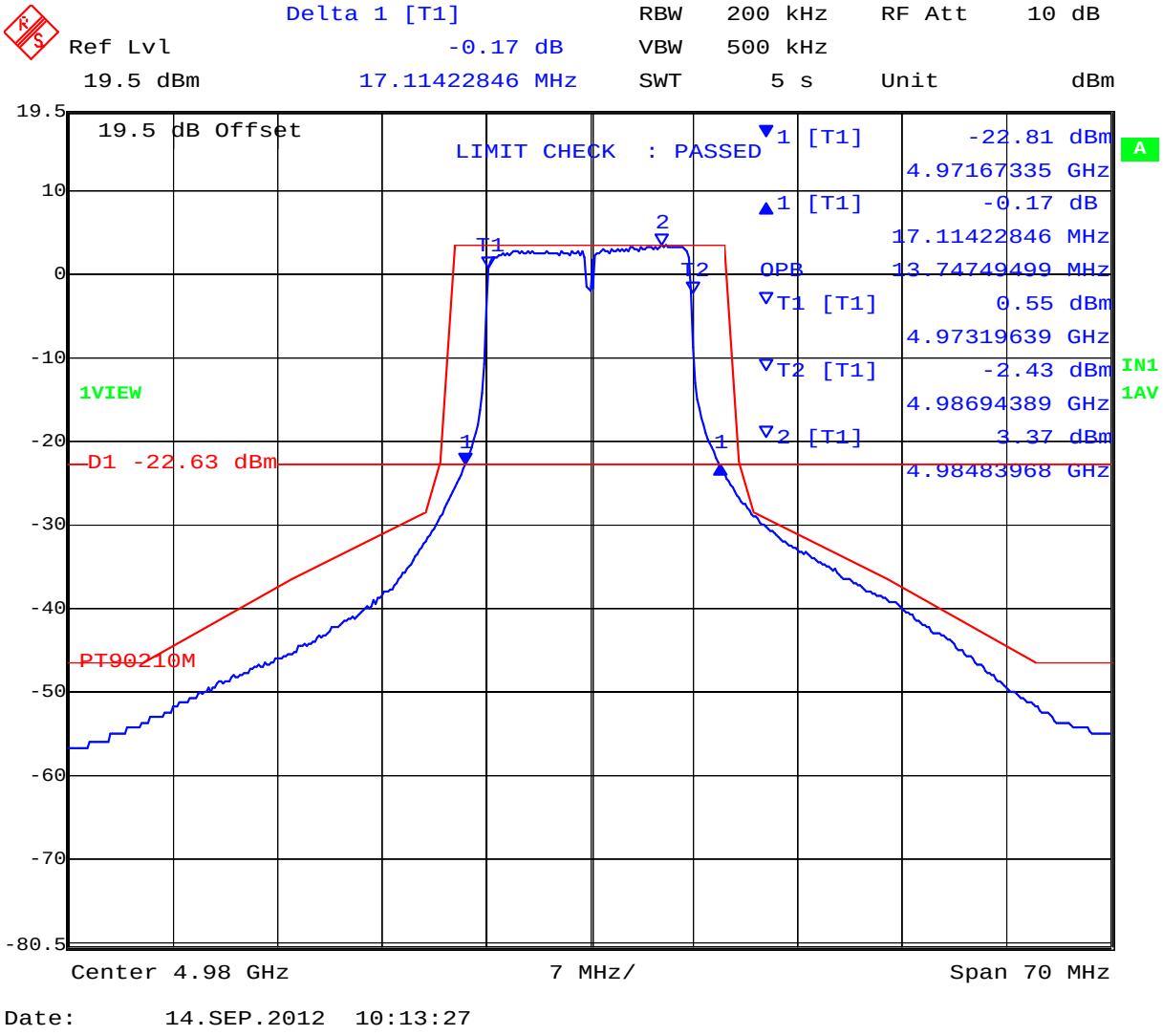
Port A
26 dB Bandwidth 20 MHz Channel Freq 4950 MHz



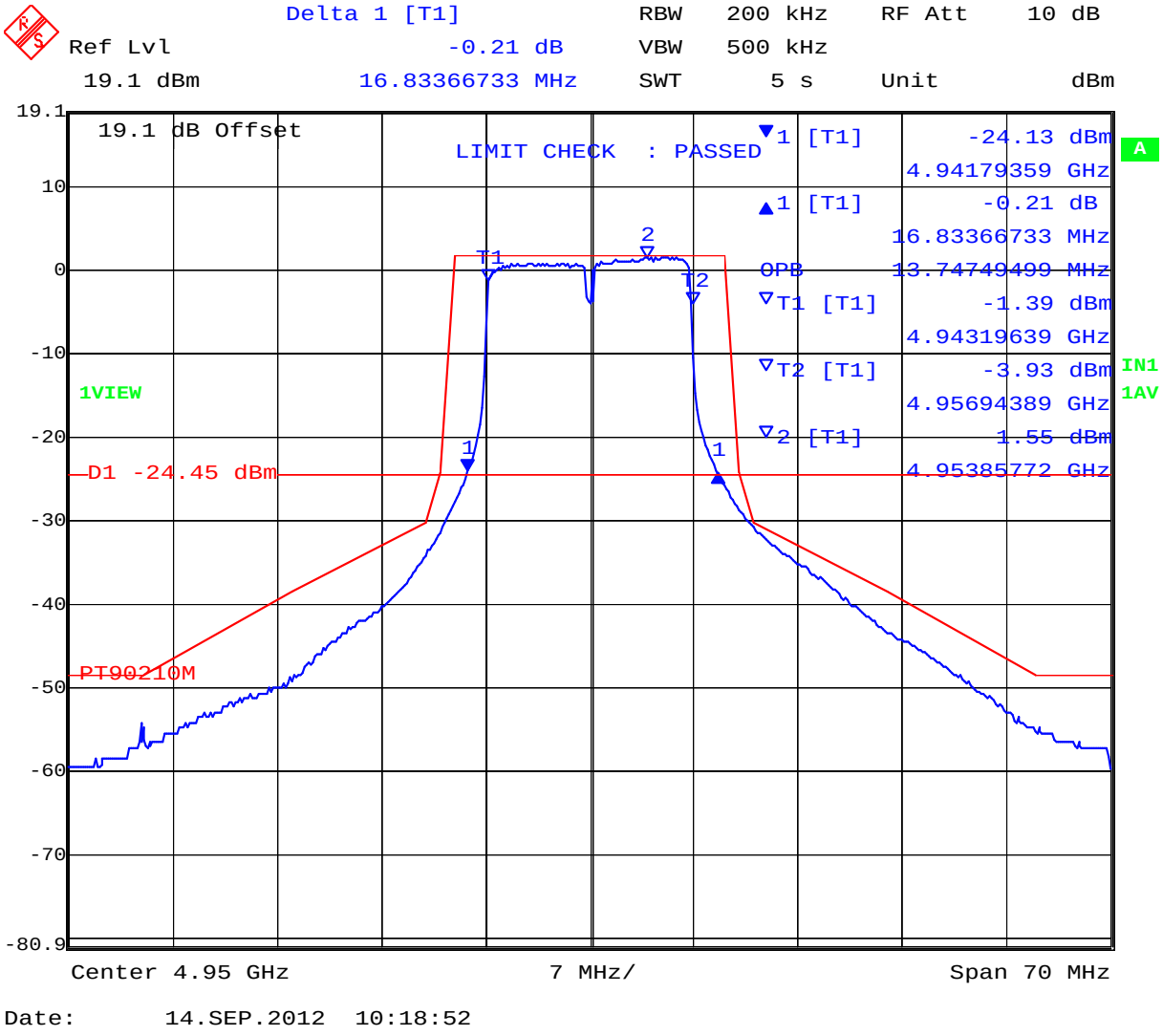
Port A
26 dB Bandwidth 20 MHz Channel Freq 4965 MHz



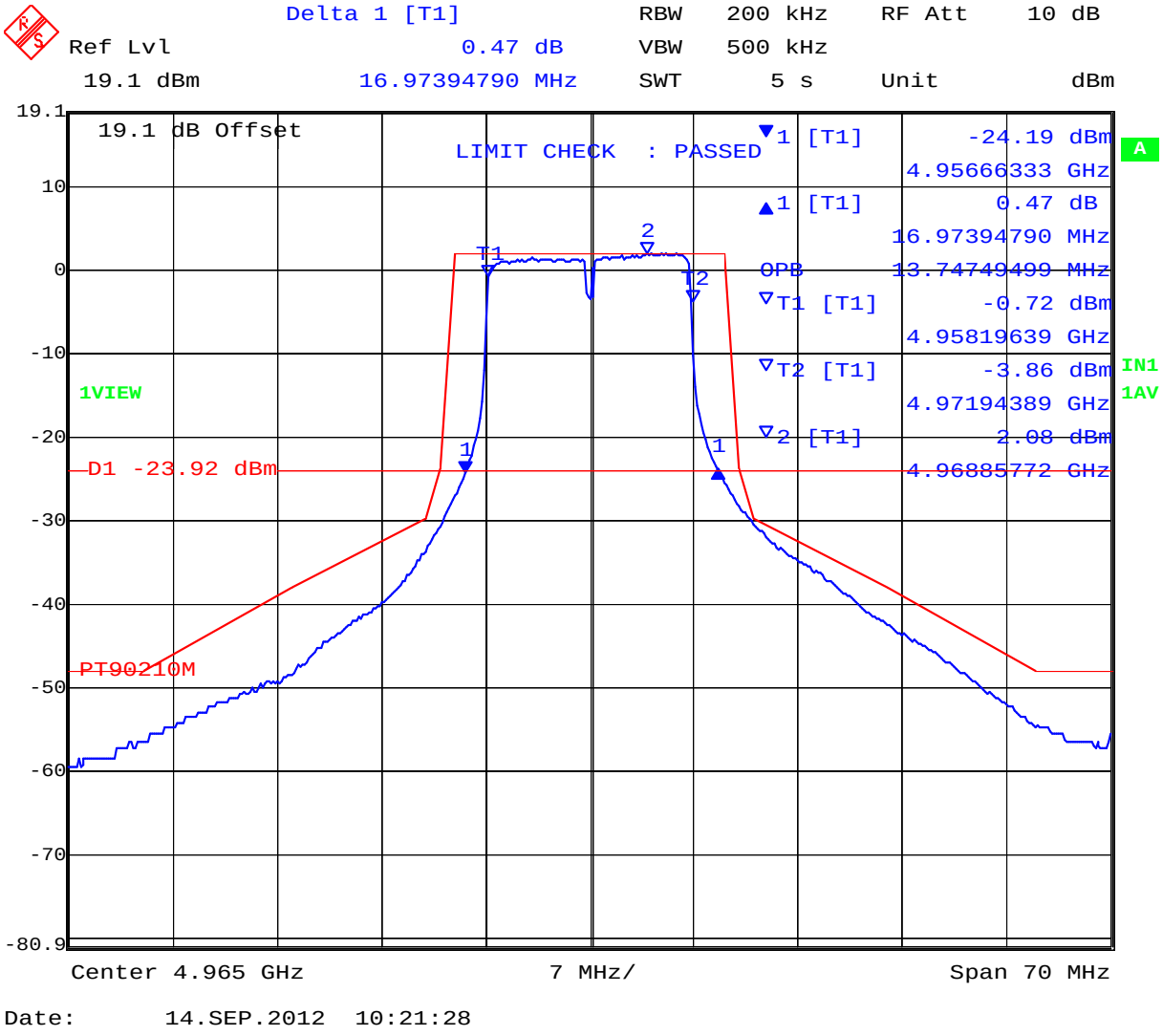
Port A
26 dB Bandwidth 20 MHz Channel Freq 4980 MHz



Port B
26 dB Bandwidth 20 MHz Channel Freq 4950 MHz

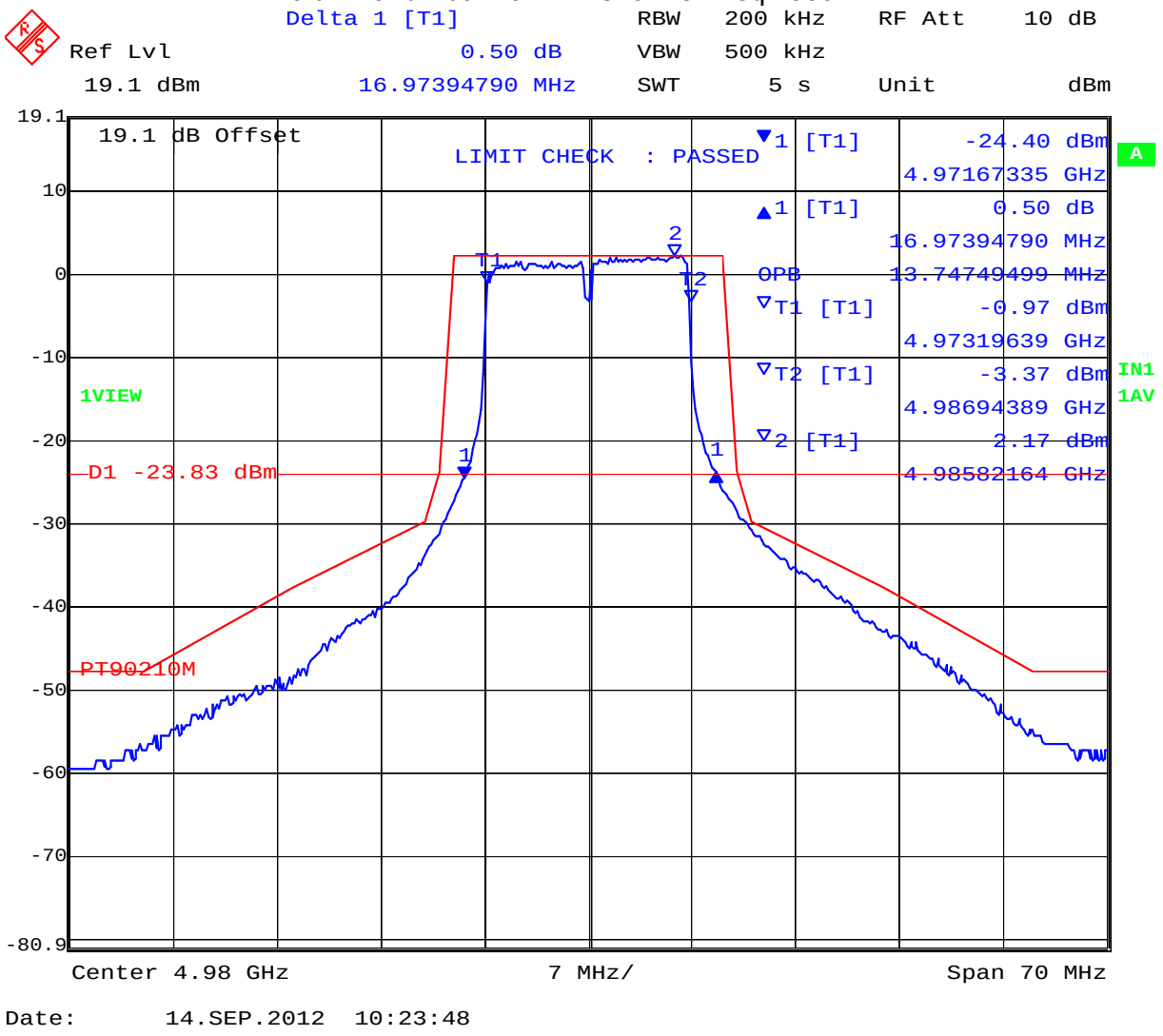


Port B
26 dB Bandwidth 20 MHz Channel Freq 4965 MHz



Port B

26 dB Bandwidth 20 MHz Channel Freq 4980 MHz



Specification Limits
FCC Part §90.210

Limits for Authorized Bandwidth

Frequency Band (MHz) and Related Documents	Spectrum Masks with Audio Filter	Without Audio Filter
4950 – 4990 MHz	L or M	L or M

Reference to the emission masks are provided below

Limits Emission Masks
90.210(L)

Emission Mask L. For low power transmitters (20 dBm or less) 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: 219 log (% of (BW)/45) dB.

(3) On any frequency removed from the assigned frequency between 50-55% of the authorized bandwidth: 10 + 242 log (% of (BW)/50) dB.

(4) On any frequency removed from the assigned frequency between 55-100% of the authorized bandwidth: 20 + 31 log (% of (BW)/55) dB attenuation.

(5) On any frequency removed from the assigned frequency between 100-150% of the authorized bandwidth: 28 + 68 log (% of (BW)/100) dB attenuation.

(6) On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 40 dB.

(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.

Limits Emission Masks (continued)
90.210(M),

(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 between 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.

NOTE TO PARAGRAPH (m): Low power devices may as an option, comply with paragraph (m).

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0070, 0116, 0158, 0193, 0252, 0313, 0314.

5.1.2. Peak Output Power

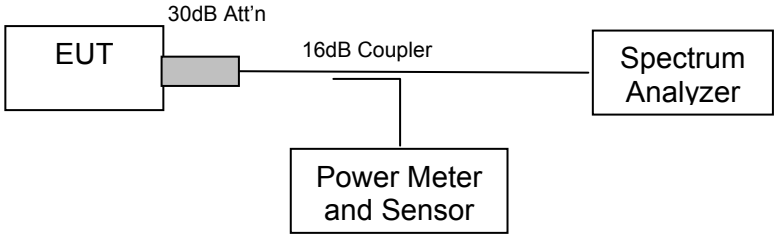
FCC 47 CFR Part 90, Subpart Y; §90.1215

Test Procedure

Average power measurements were measured with the use of an average power head. Peak power measurements were recorded via the spectrum analyzer. The system highest power setting was selected with modulation ON and duty cycle set for 100% i.e. continuous operation at all times.

The 26 dB emission bandwidth (see Section 5.1.1) was used by the spectrum analyzer to measure the peak output power.

Test Measurement Set up



Test set up for modulated output power measurement

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TABLE OF RESULTS – 5 MHZ BANDWIDTH MODULATED CARRIER

Center Frequency (MHz)	Peak Transmitter Power (+dBm)		Total Power (+dBm)
	Port A	Port B	Calculated
4942.5	21.6	20.4	24.1
4967.5	21.8	21.0	24.4
4987.5	21.9	21.2	24.6

TABLE OF RESULTS – 10 MHz Bandwidth Modulated Carrier

Center Frequency (MHz)	Peak Transmitter Power (+dBm)		Total Power (+dBm)
	Port A	Port B	Calculated
4945	20.3	19.8	23.1
4965	20.6	20.1	23.4
4985	20.6	19.6	23.1

TABLE OF RESULTS – 20 MHz Bandwidth Modulated Carrier

Center Frequency (MHz)	Peak Transmitter Power (+dBm)		Total Power (+dBm)
	Port A	Port B	Calculated
4950	21.2	20.3	23.8
4965	21.6	21.1	24.4
4980	21.8	20.9	23.4

Specification Limits

FCC Part §90.1215

Power limits.

The transmitting power of stations operating in the 4940-4990 MHz band must not exceed the maximum limits in this section.

(a)(1) The maximum conducted output power should not exceed:

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

(2) 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; however, they are limited to peak power spectral density of 21 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output 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 and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.

(b) Low power devices are also limited to a peak power spectral density of 8 dBm per one MHz. Low power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output 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.

(c) The maximum conducted output power is measured as a conducted emission over any interval of continuous transmission using instrumentation calibrated in terms of an RMS-equivalent voltage. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true maximum conducted output power measurement conforming to the definitions in this paragraph for the emission in question.

(d) The peak power spectral density is measured as conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of one MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

(e) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Laboratory Measurement Uncertainty for Power Measurement

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Output Power'	0070, 0116, 0158, 0193, 0252, 0313, 0314.

5.1.3. Peak Power Spectral Density (PPSD)

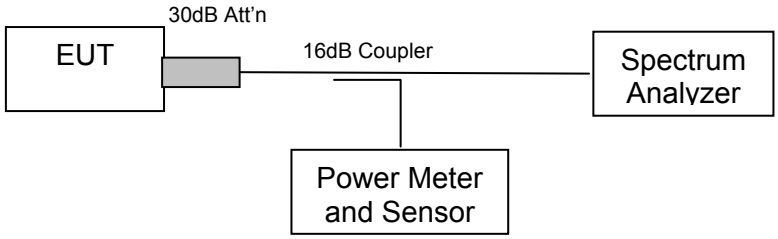
FCC 47 CFR Part 90, Subpart Y; §90.1215

Test Procedure

The test methodology used for this measurement was determined to provide the highest possible PPSD readings.

Peak power spectral density measurements were performed via the spectrum analyzer and plots were recorded. Modulation was ON and the system duty cycle was set for 100% i.e. continuous operation at all times. The system highest power setting was selected with modulation ON and duty cycle set for 100% i.e. continuous operation at all times.

Test Measurement Set up



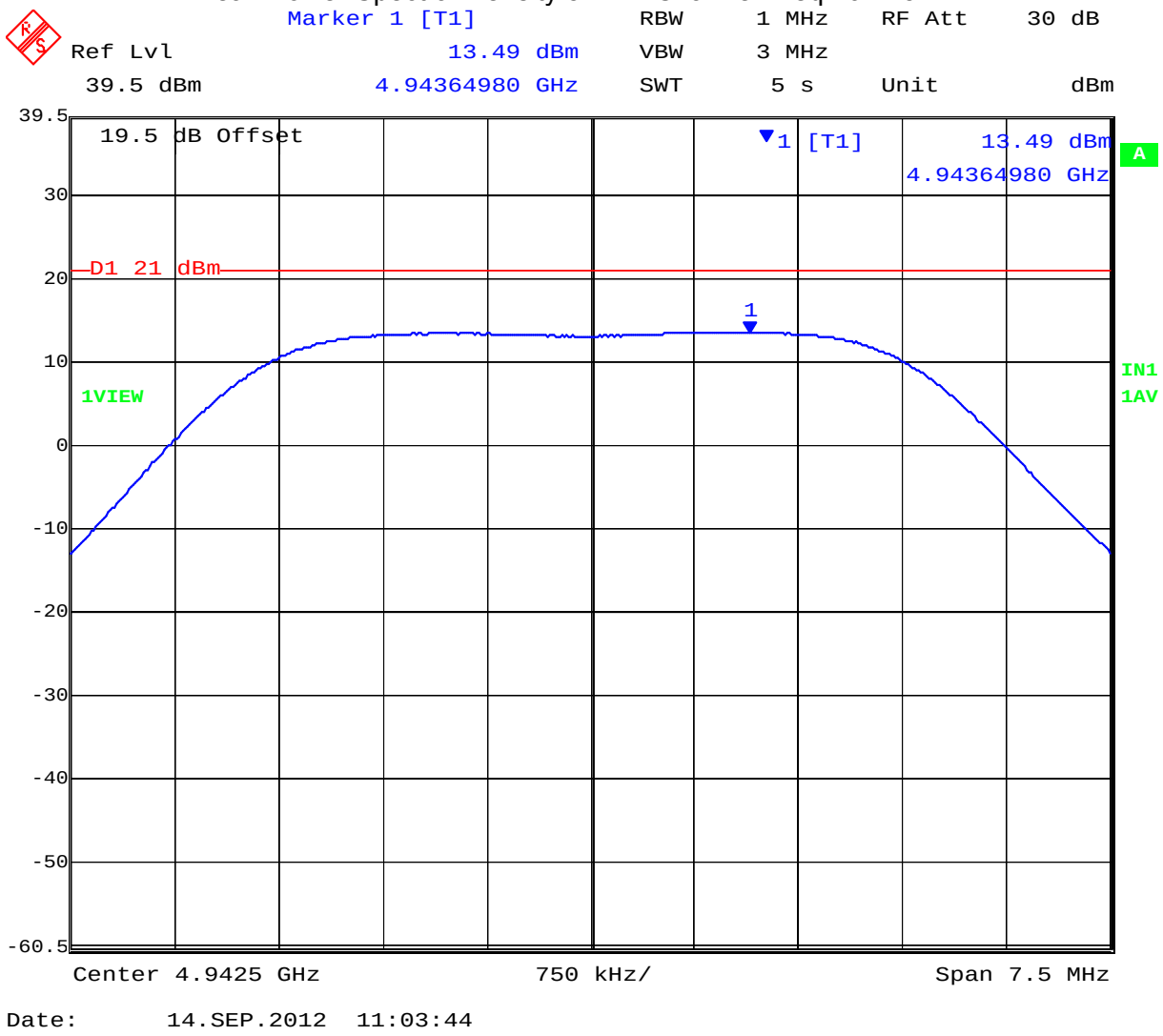
Test set up for Peak Power Spectral Density measurement(s)

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

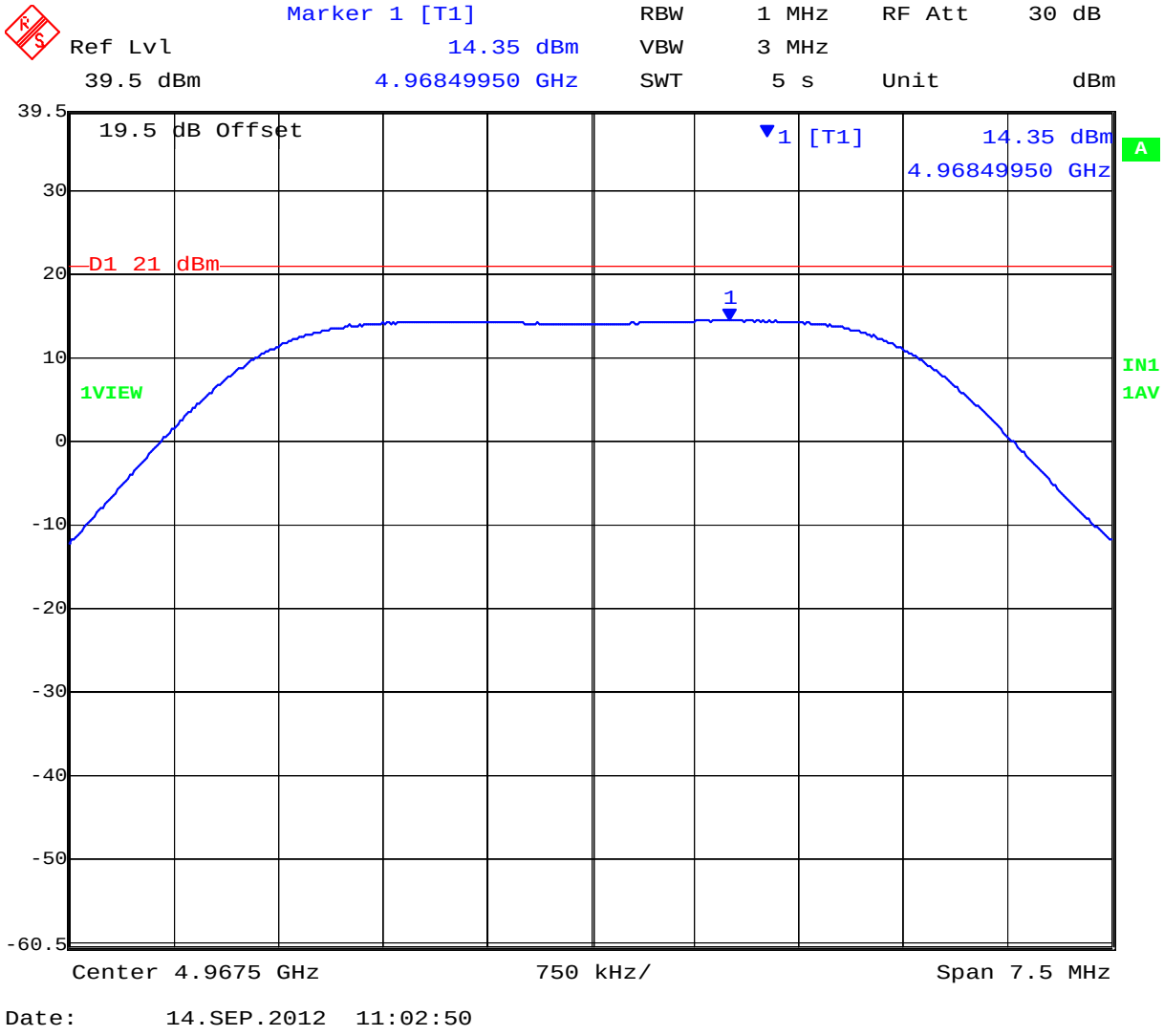
TABLE OF RESULTS – 5 MHz Peak Power Spectral Density

Center Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)		
	Port A	Port B	Total
4942.5	13.49	12.88	16.21
4967.5	14.35	13.44	16.93
4987.5	14.43	13.75	17.11

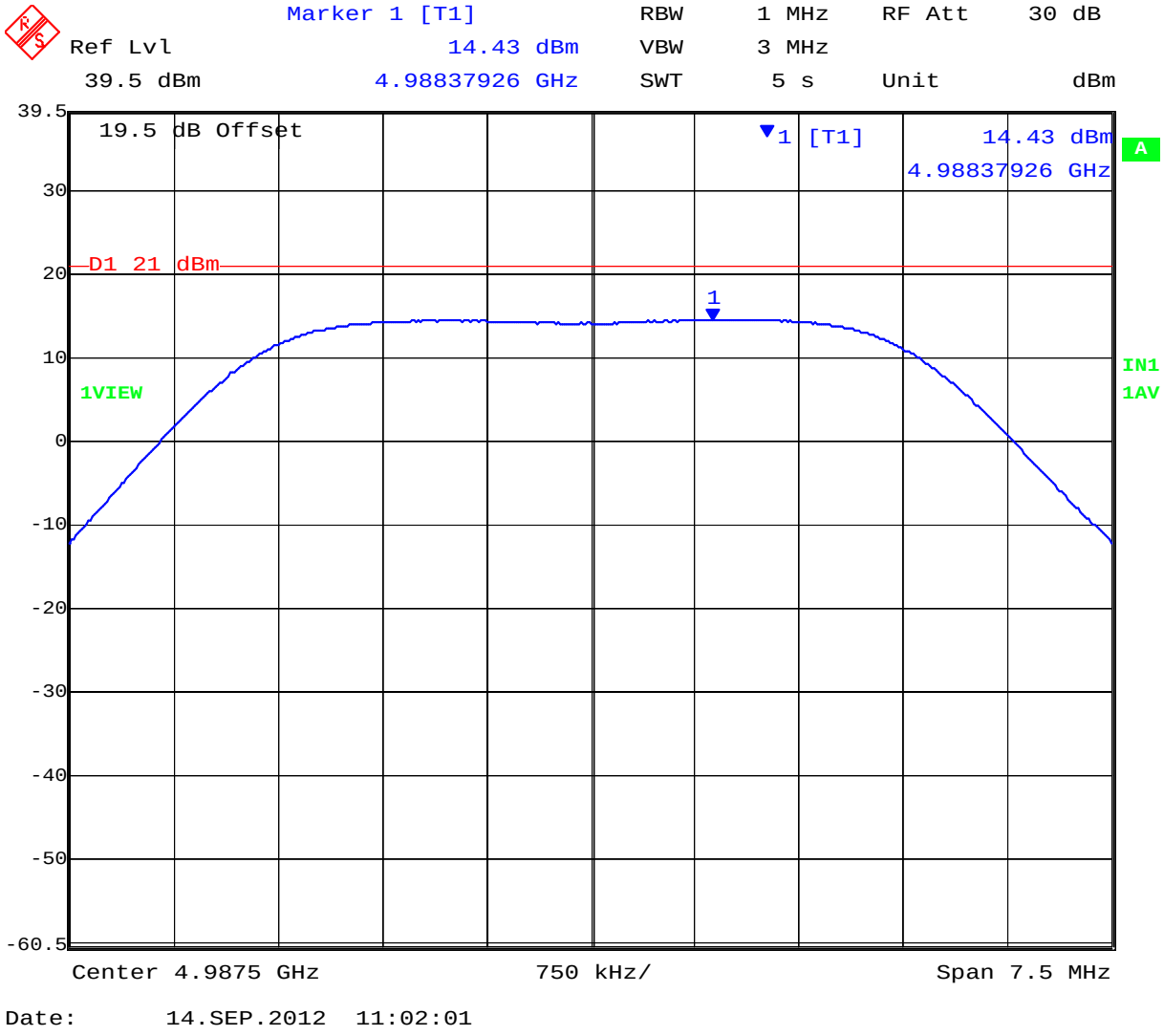
Port A
Peak Power Spectral Density 5 MHz Channel Freq 4942.5 MHz



Port A
Peak Power Spectral Density 5 MHz Channel Freq 4967.5 MHz

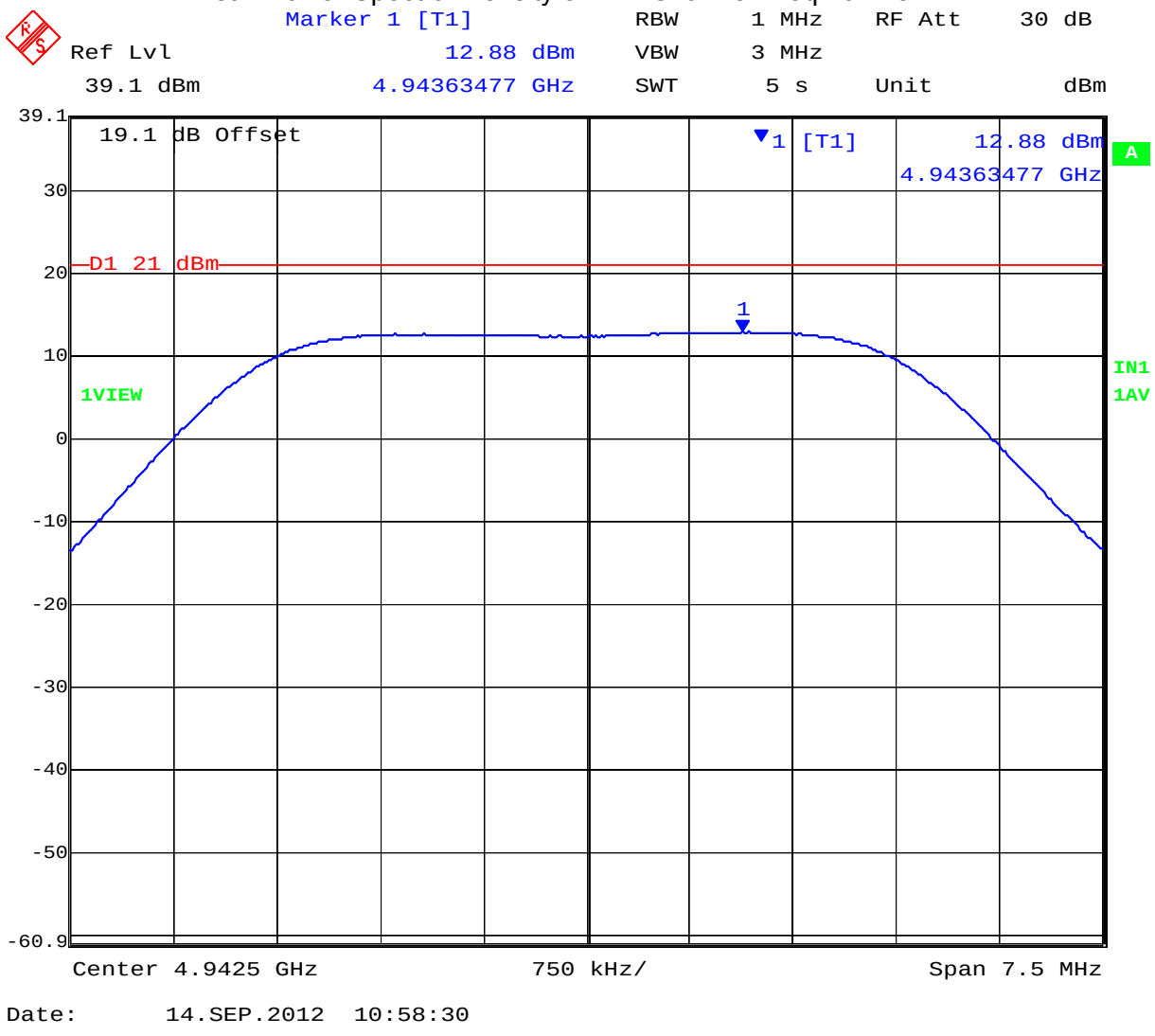


Port A
Peak Power Spectral Density 5 MHz Channel Freq 4987.5 MHz



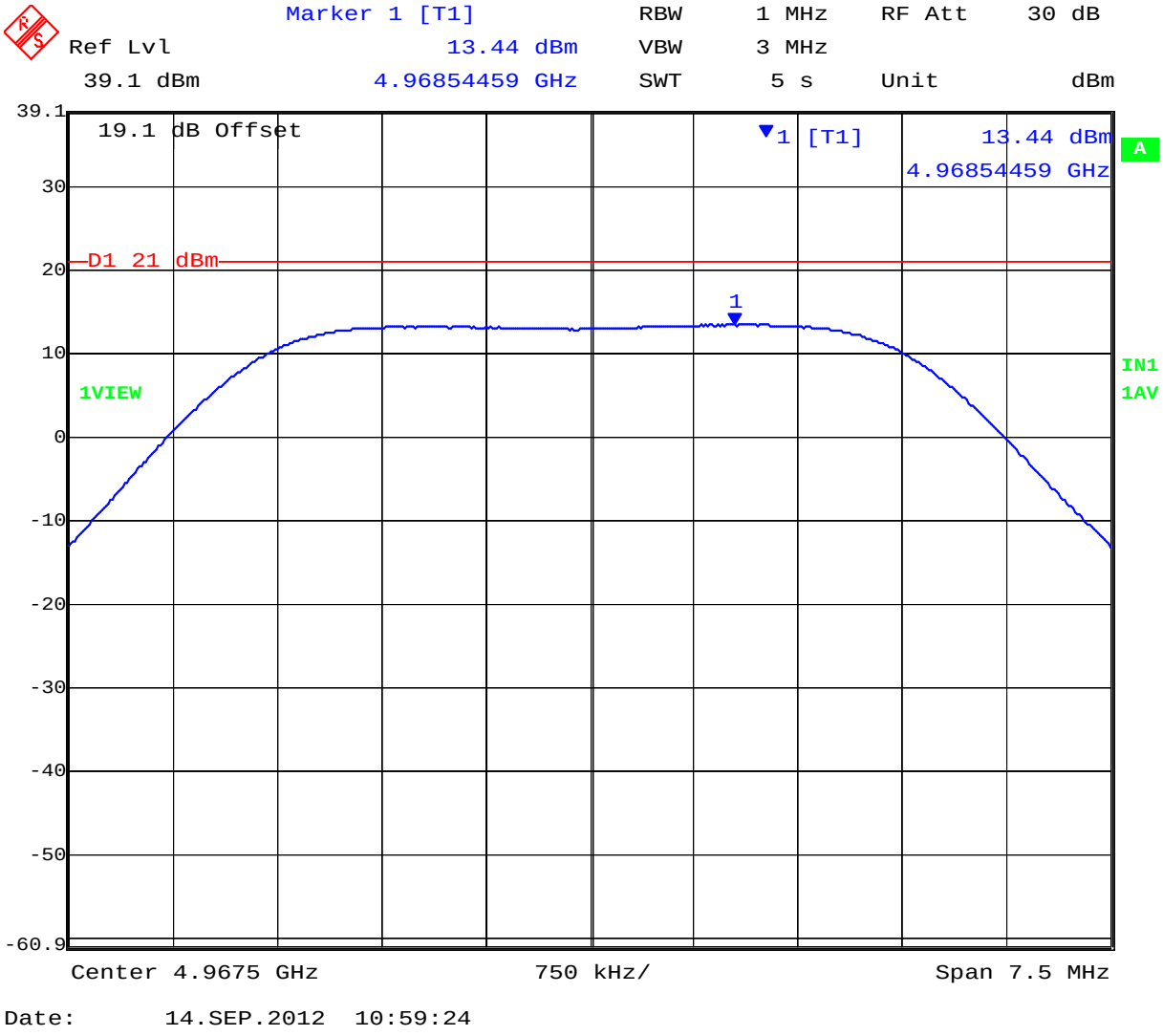
Port B

Peak Power Spectral Density 5 MHz Channel Freq 4942.5 MHz



Port B

Peak Power Spectral Density 5 MHz Channel Freq 4967.5 MHz



Port B

Peak Power Spectral Density 5 MHz Channel Freq 4987.5 MHz

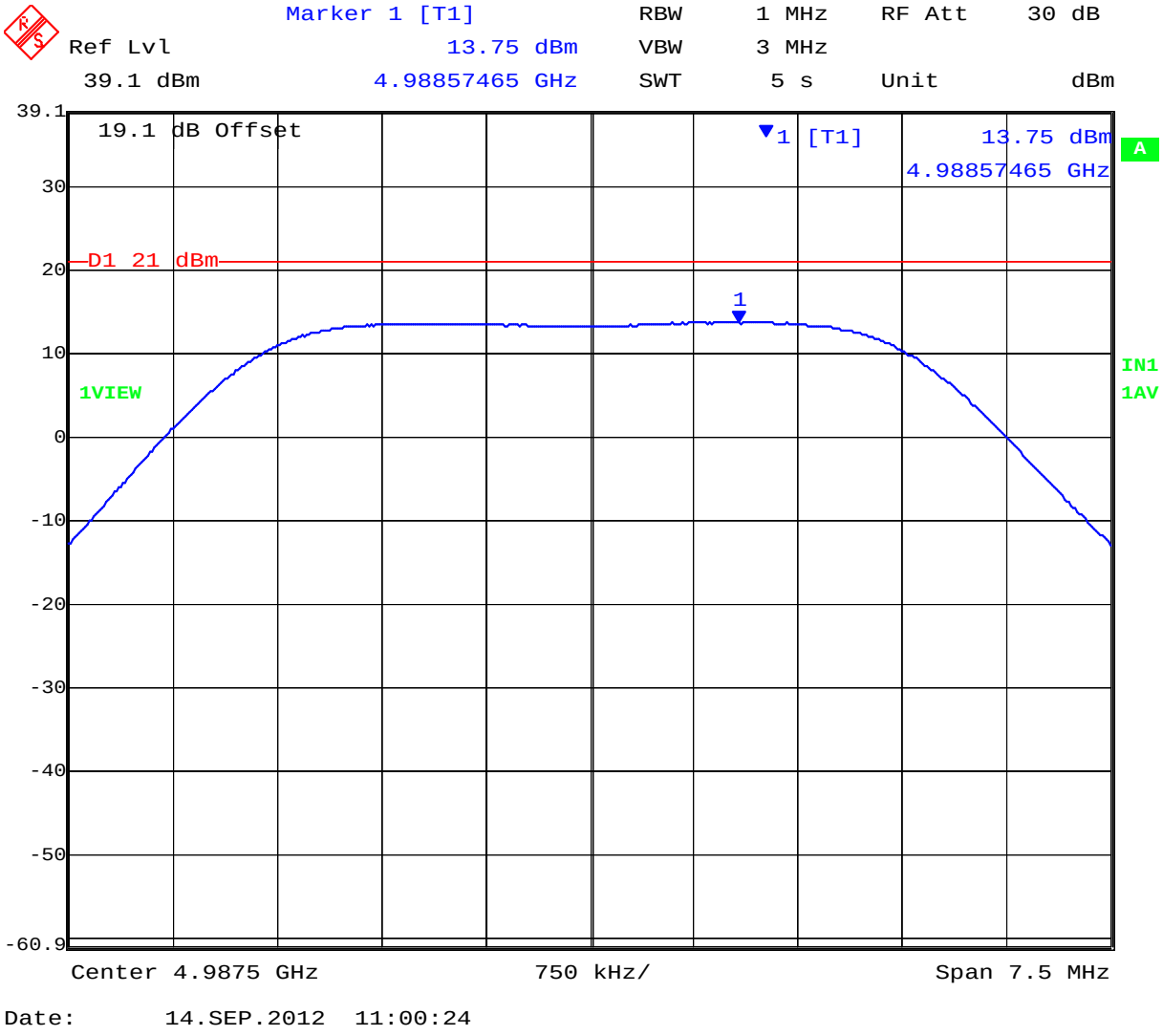
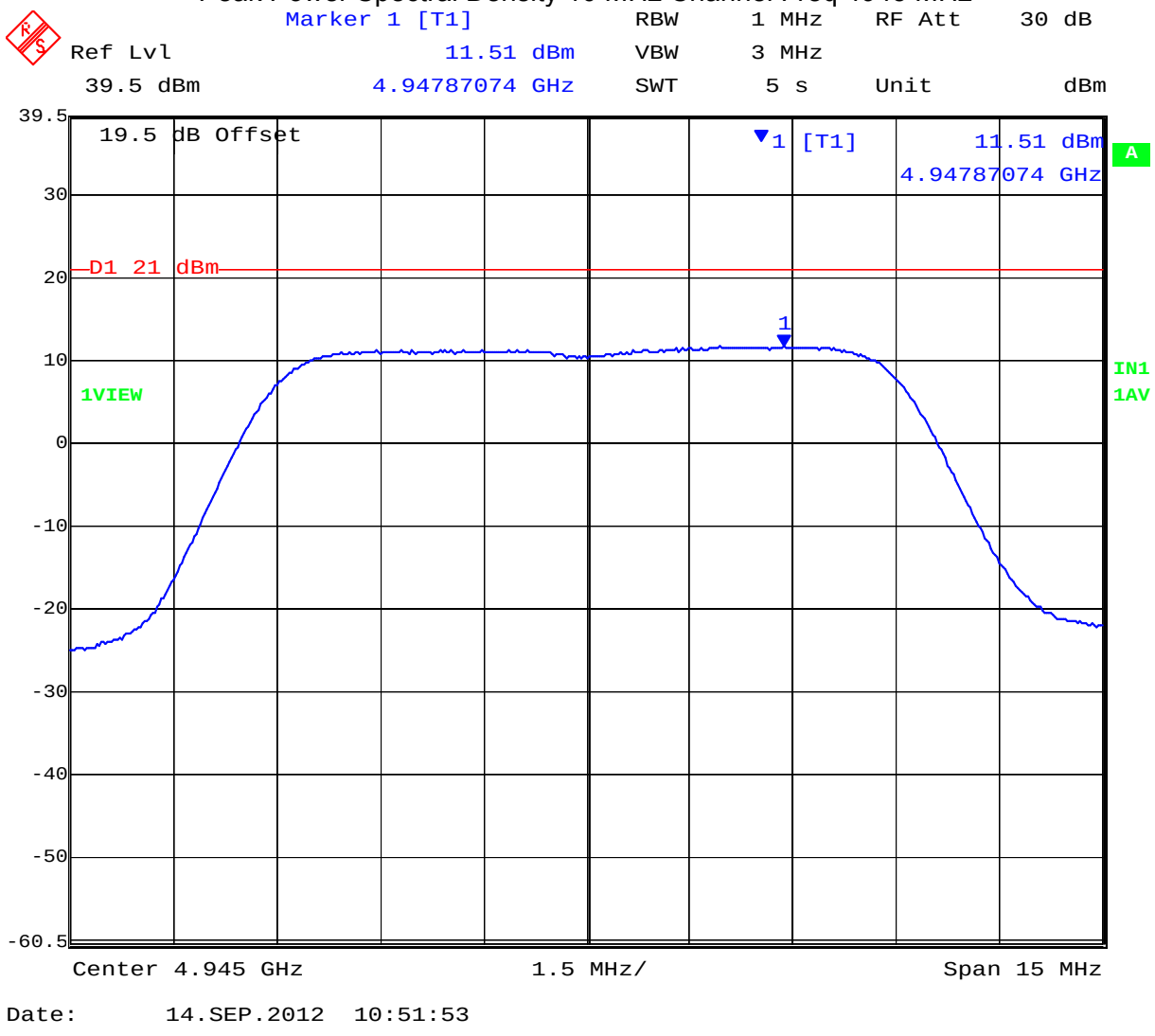


TABLE OF RESULTS – 10 MHz Peak Power Spectral Density(s)

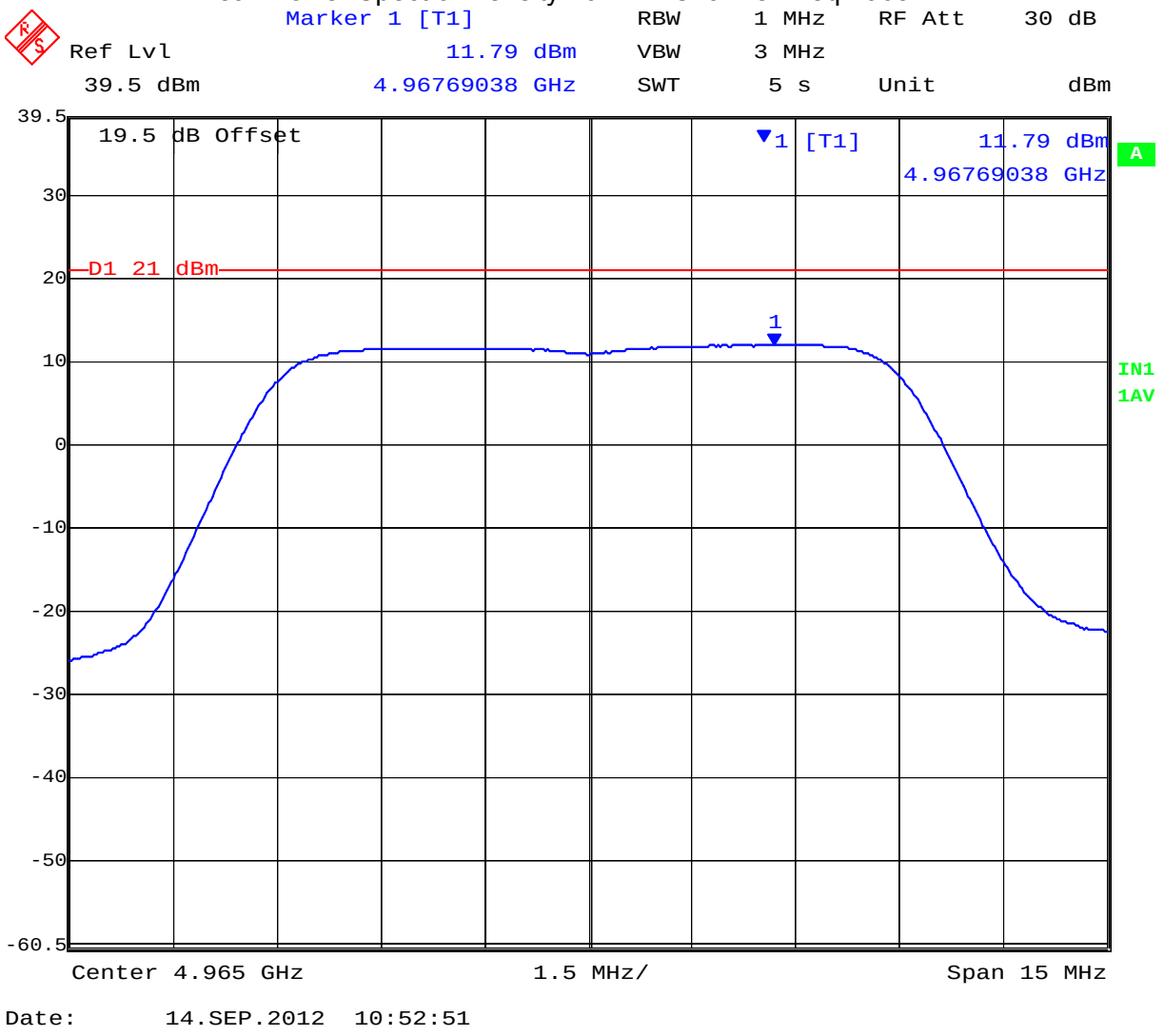
Center Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)		
	Port A	Port B	Total
4945	11.51	10.77	14.17
4965	11.79	10.97	14.41
4985	11.94	11.28	14.63

Port A
Peak Power Spectral Density 10 MHz Channel Freq 4945 MHz

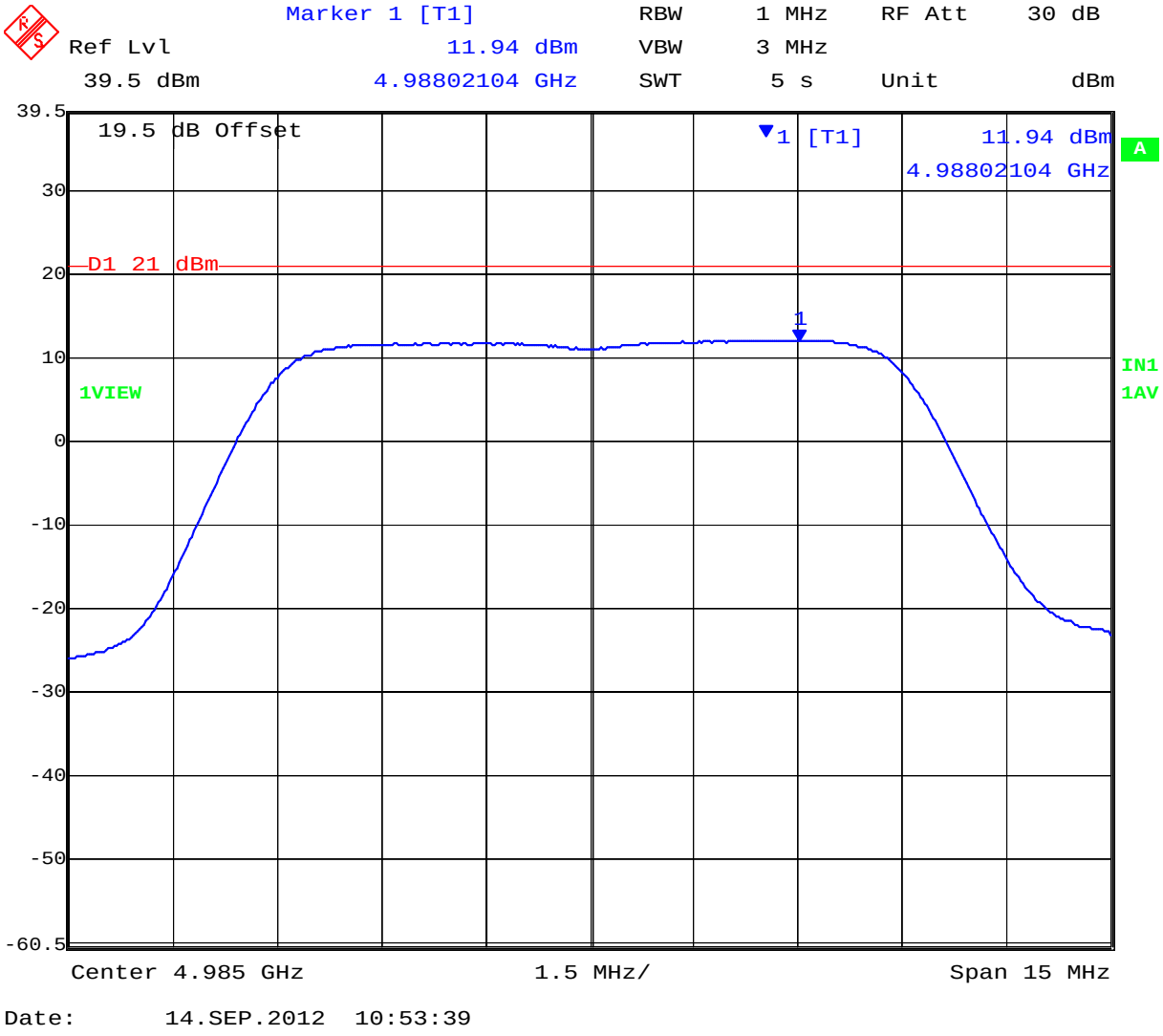


Port A

Peak Power Spectral Density 10 MHz Channel Freq 4965 MHz

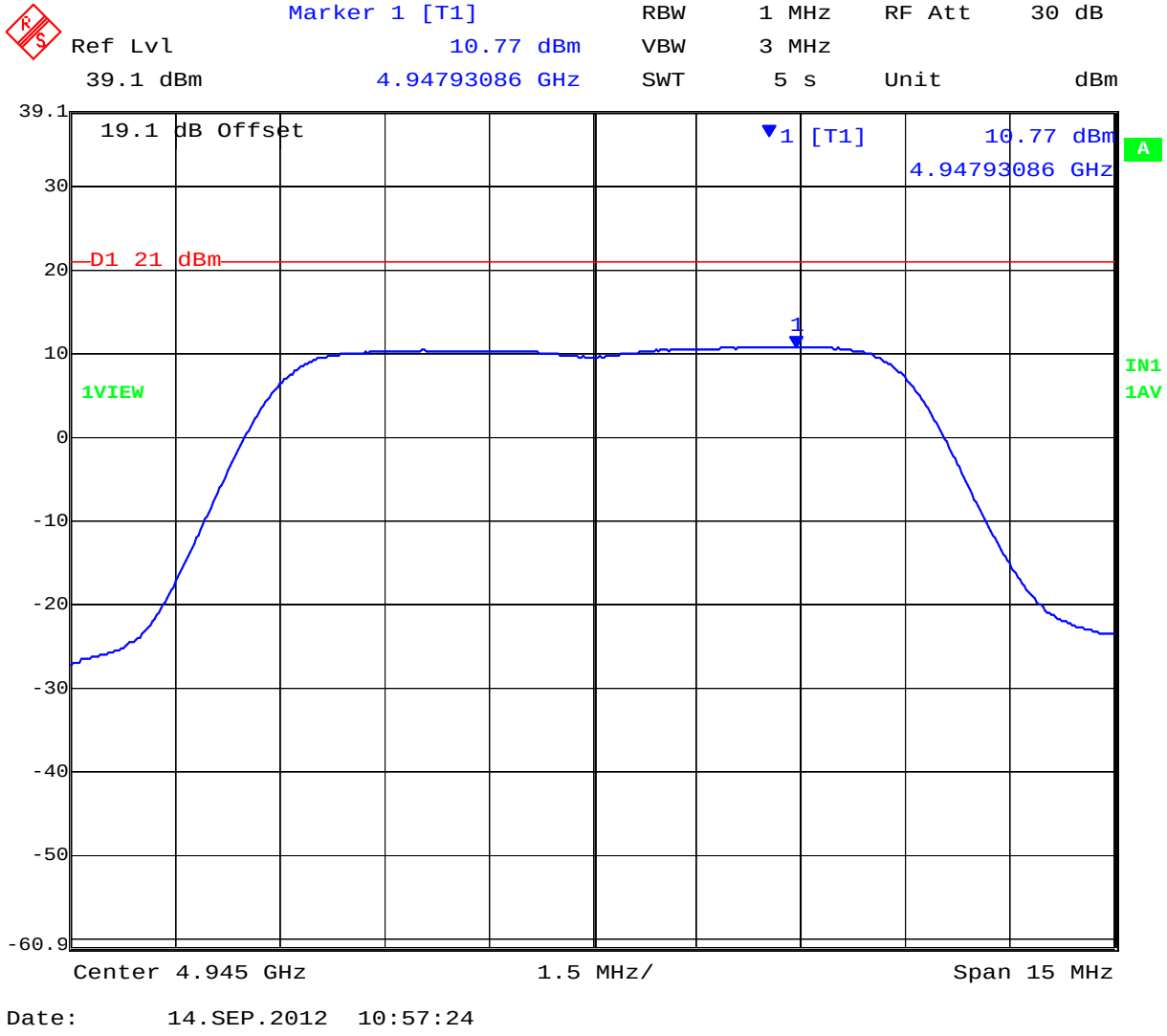


Port A
Peak Power Spectral Density 10 MHz Channel Freq 4985 MHz



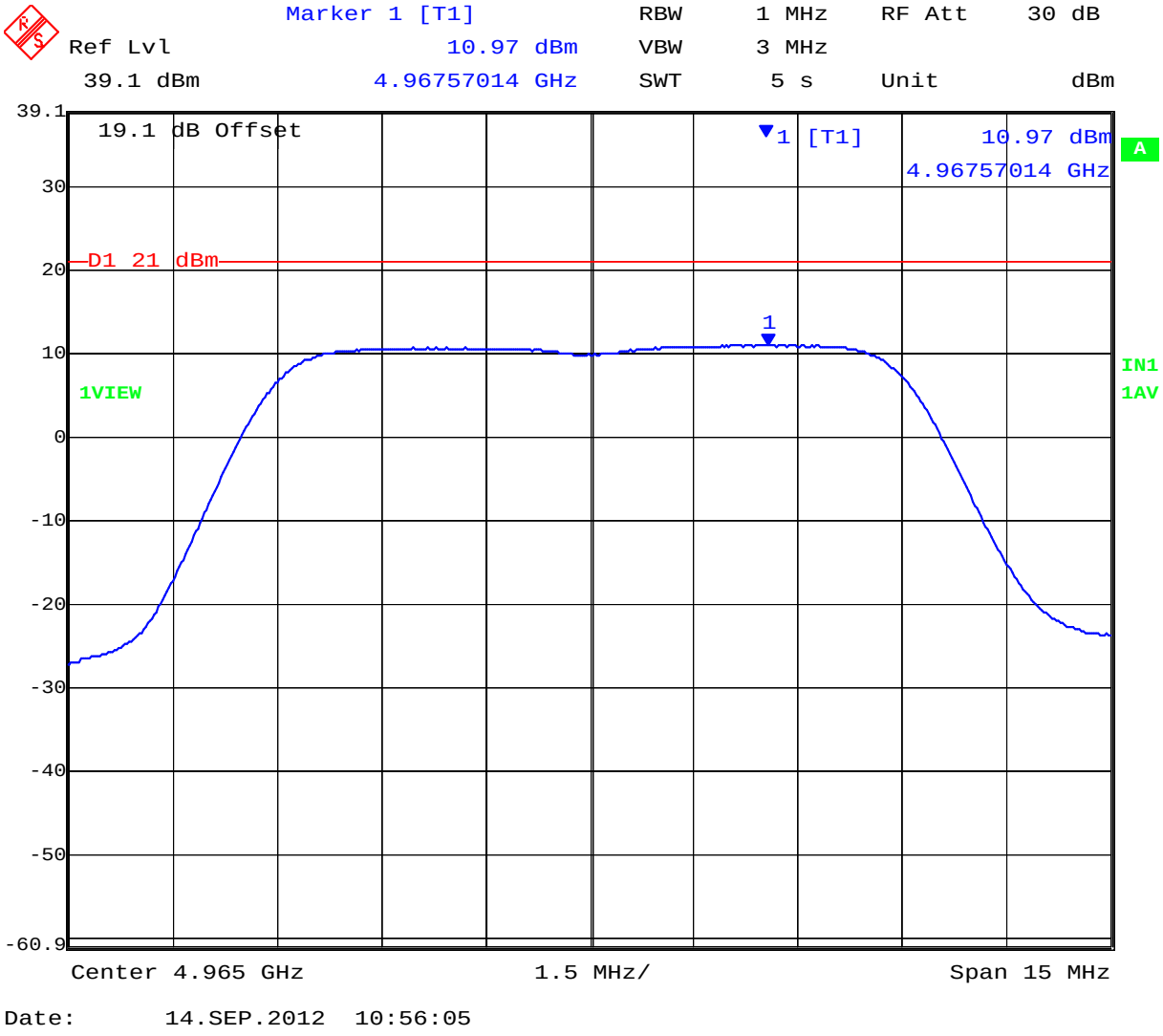
Port B

Peak Power Spectral Density 10 MHz Channel Freq 4945 MHz



Port B

Peak Power Spectral Density 10 MHz Channel Freq 4965 MHz



Port B

Peak Power Spectral Density 10 MHz Channel Freq 4985 MHz

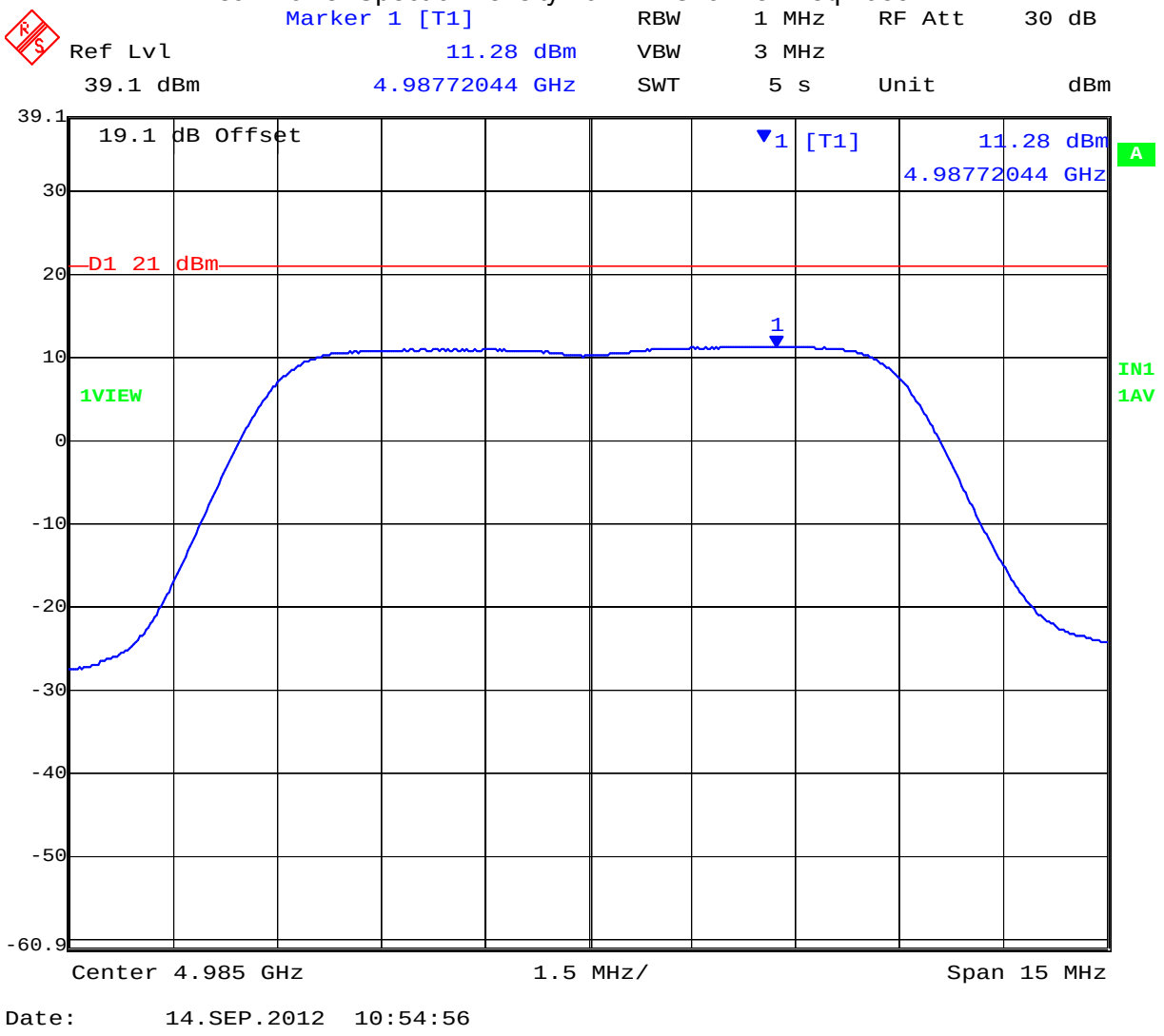
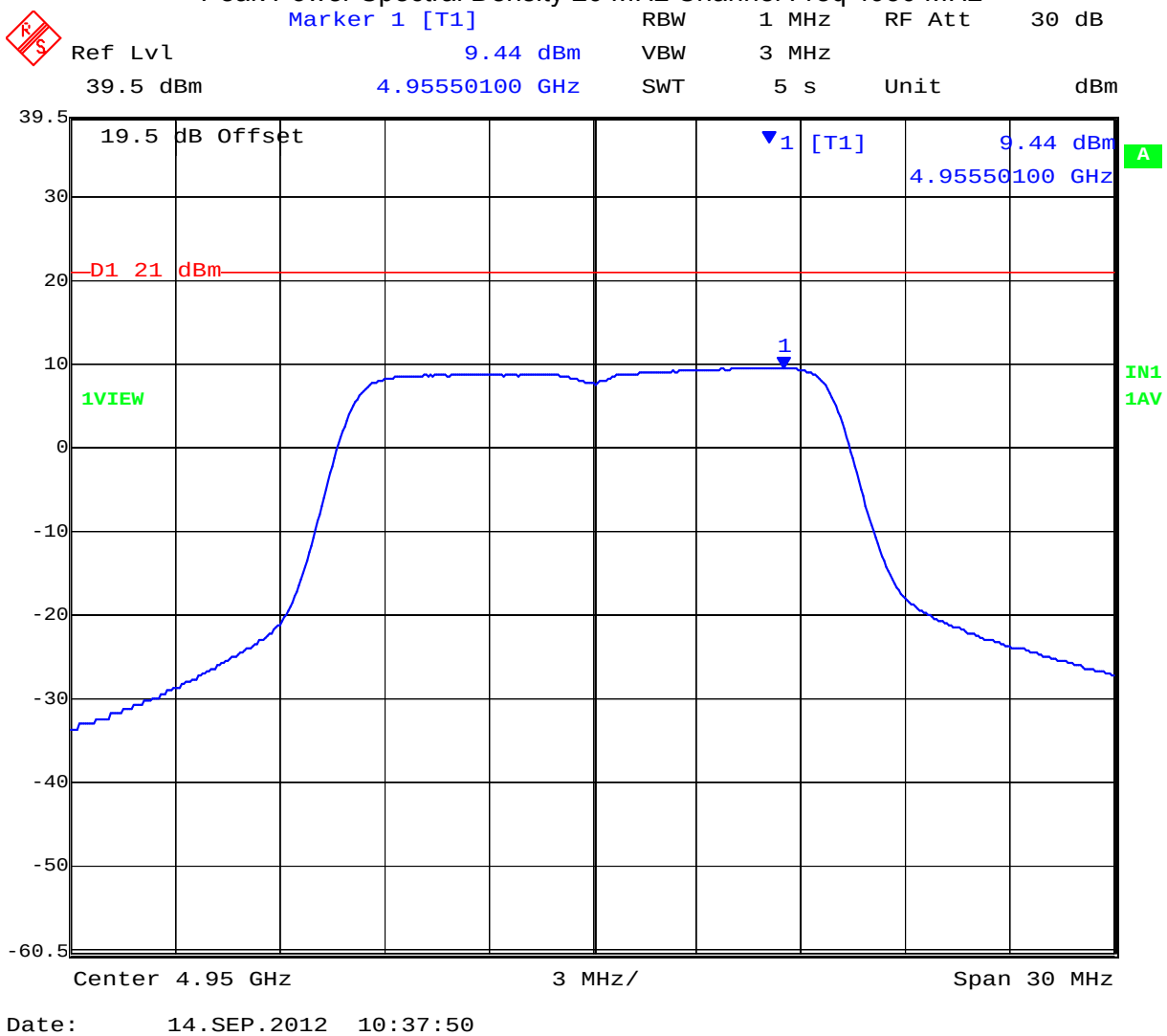


TABLE OF RESULTS – 20 MHz Peak Power Spectral Density(s)

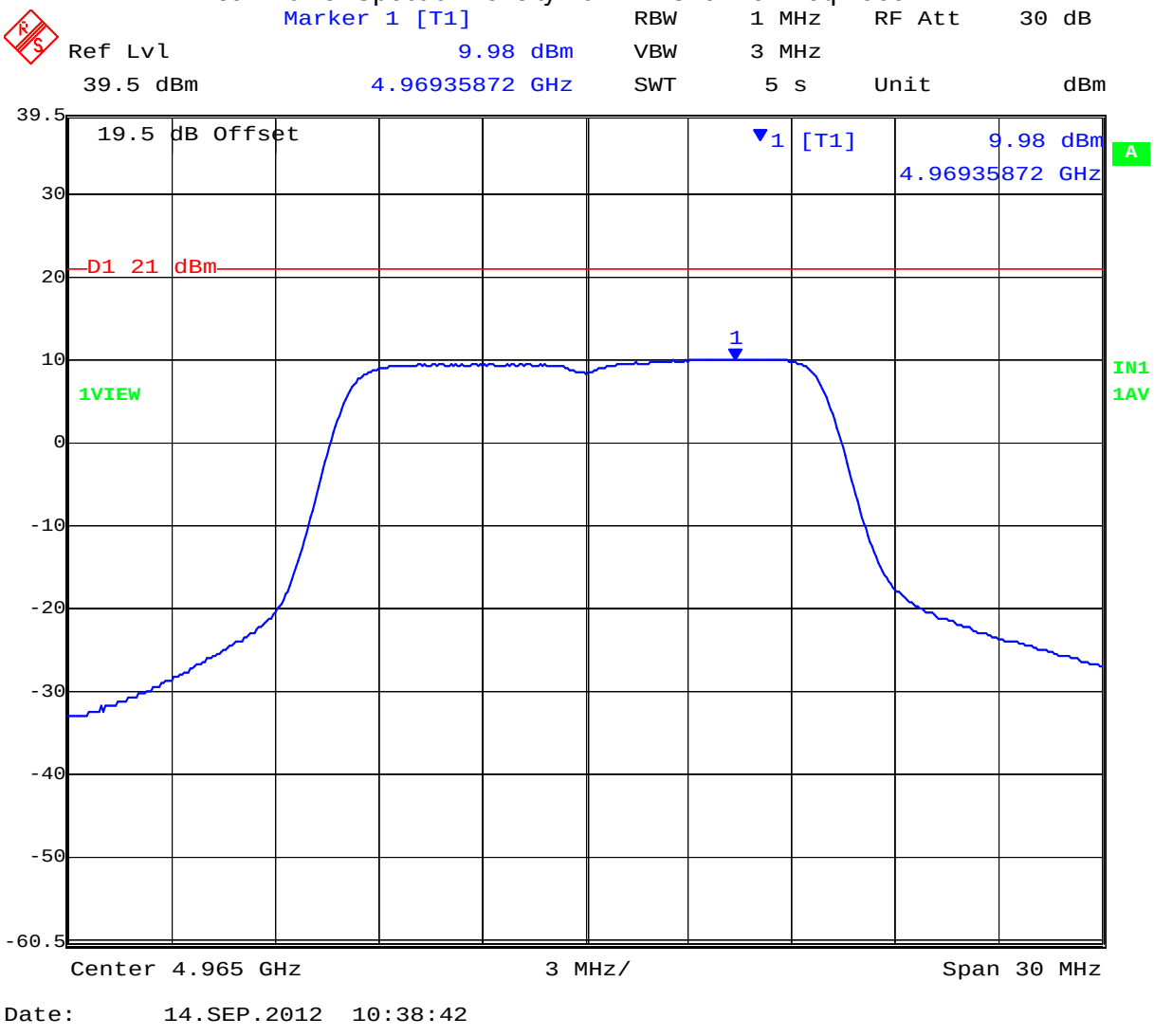
Center Frequency (MHz)	Peak Power Spectral Density (dBm/MHz)		
	Port A	Port B	Total
4950	9.44	8.71	12.10
4965	9.98	9.15	12.60
4980	10.30	9.21	12.80

Port A
Peak Power Spectral Density 20 MHz Channel Freq 4950 MHz

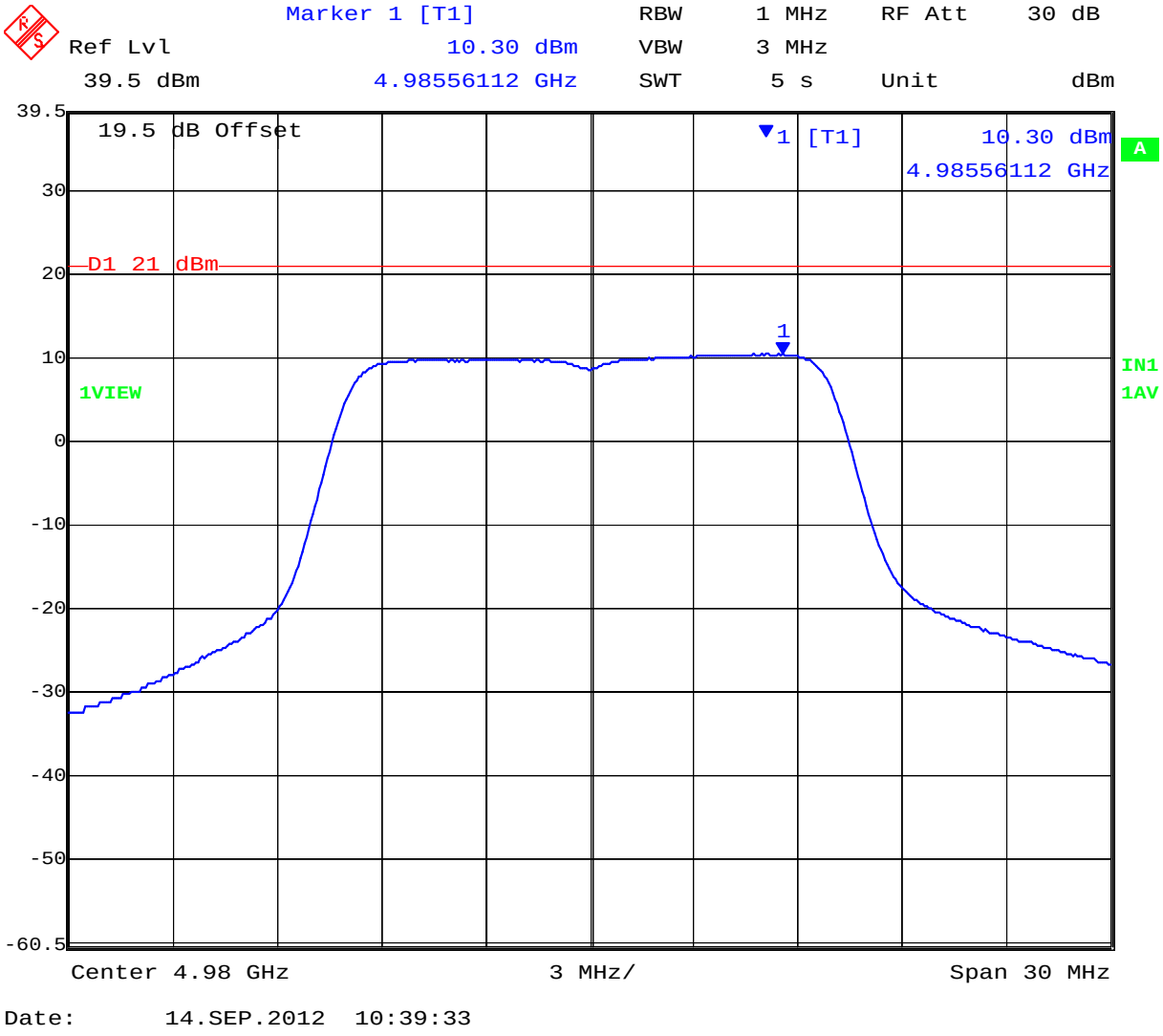


Port A

Peak Power Spectral Density 20 MHz Channel Freq 4965 MHz

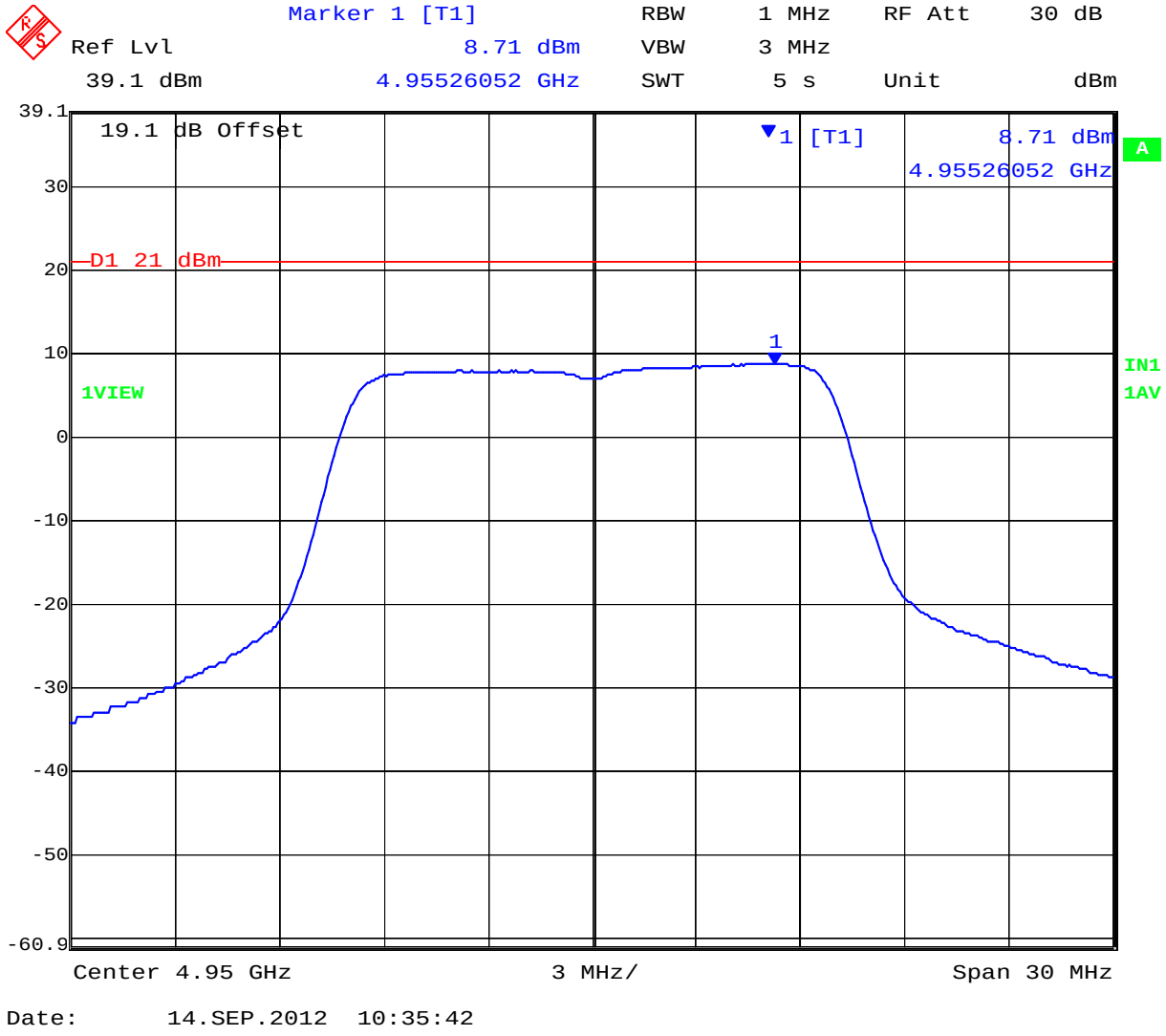


Port A
Peak Power Spectral Density 20 MHz Channel Freq 4980 MHz



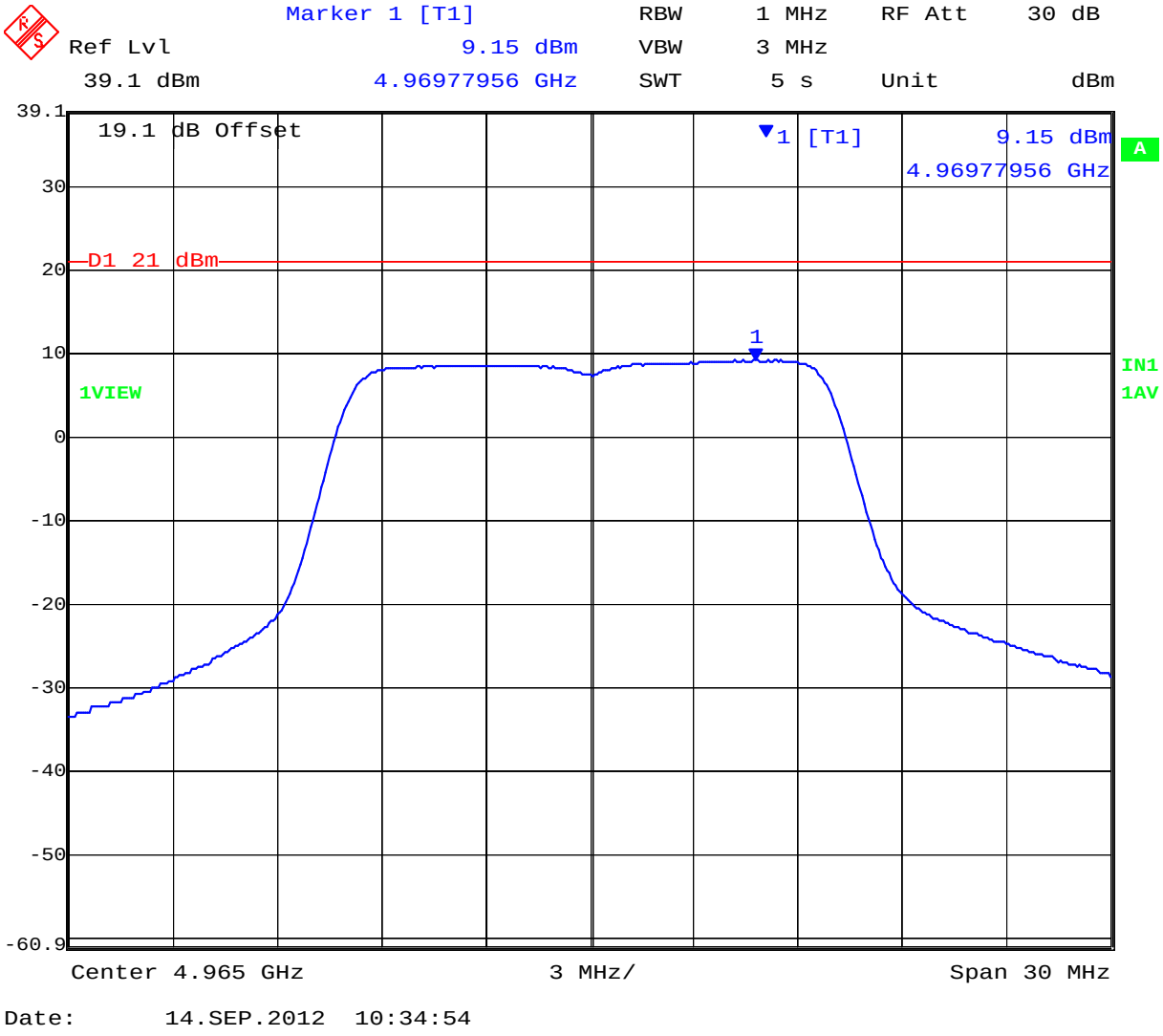
Port B

Peak Power Spectral Density 20 MHz Channel Freq 4950 MHz



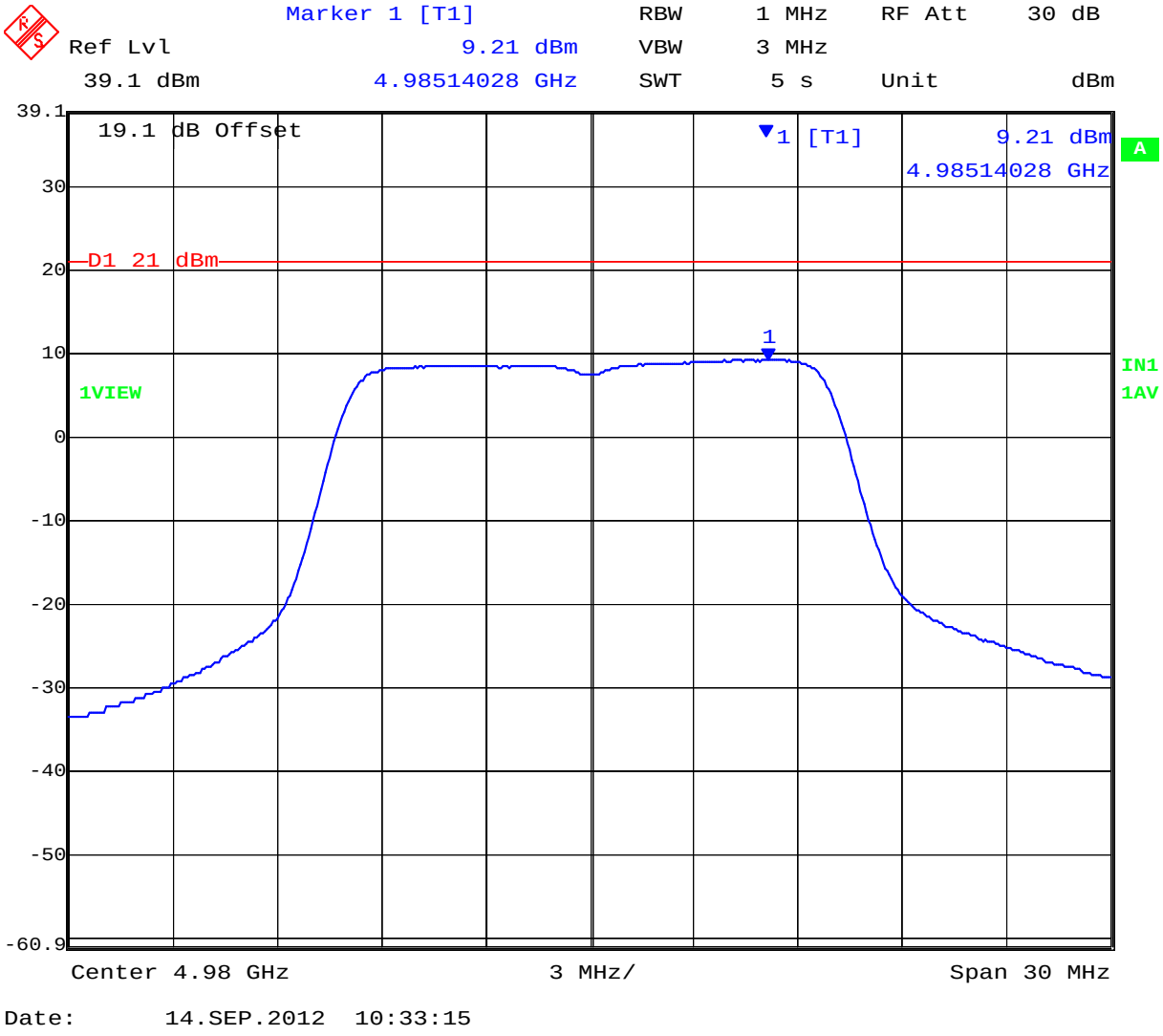
Port B

Peak Power Spectral Density 20 MHz Channel Freq 4965 MHz



Port B

Peak Power Spectral Density 20 MHz Channel Freq 4980 MHz



Specification Limits
FCC Part §90.1215

Refer to the Power Limits Specification in Section 5.1.2 of this report.

Laboratory Measurement Uncertainty for Power Measurement

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Output Power'	0070, 0116, 0158, 0193, 0252, 0313, 0314.

5.1.4. Maximum Permissible Exposure

FCC, Part 90 Subpart C §90.1217
Industry Canada RSS-Gen §5.6

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm^2) = $EIRP/(4\pi d^2)$
EIRP = P * G
P = Peak output power (mW)
G = Antenna numeric gain (numeric)
d = Separation distance (cm)
Numeric Gain = 10 ^ (G (dBi)/10)

Because the EUT belongs to the General Population/Uncontrolled Exposure the limit of power density is 1.0 mW/cm^2

Note: for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

Specification
Maximum Permissible Exposure Limits

§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** Limit = 1mW / cm^2 from 1.310 Table 1 **RSS-Gen §5.6** Category I and Category II equipment shall comply with the applicable requirements of RSS-102.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33dB

4940 – 4990 MHz

Antenna Model	Type	Ant Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance @ 1mW/cm^2 Limit(cm)	Power Density @ 20cm (mW/cm^2)
MT0128930	Sector Dual Pole Integrated 120 Deg	11	13	24.6	288.40	17.00	0.72
RW-9061-5004	Sector Dual Pole 120 Deg	11	13	24.6	288.40	17.00	0.72
AM0135060	Sector Dual Pole Integrated 95 Deg	12	16	24.6	288.40	19.07	0.91
RW-9061-5001	Sector Dual Pole 90 Deg	14	25	24.6	288.40	24.01	1.44
RW-9061-5002	Sector Dual Pole 60 Deg	15.5	35	24.6	288.40	28.54	2.04
MT0125250	Sector Dual Pole Integrated 90 Deg	13	20	24.6	288.40	21.40	1.14
AM0119960	Flat Panel Dual Pole Integrated	16	40	24.6	288.40	30.23	2.28
AM0111760	Flat Panel Dual Pole Integrated	16	40	24.6	288.40	30.23	2.28
RW-9612-5001	Flat Panel Dual Pole External	23	200	24.6	288.40	67.67	11.45
MT0070760	Flat Panel Dual Pole Integrated	23.5	224	24.6	288.40	71.68	12.84
RW-9622-5001	Flat Panel Dual Pole External	29	794	21.6	144.54	95.59	22.84
RW-9721-5158	Dual Pole Dish	28	631	22.6	181.97	95.59	22.84
RW-9732-4958	Dual Pole Dish	32	1585	18.6	72.44	95.59	22.84

5.1.5. Frequency Stability; Temperature Variations, and Voltage Variations

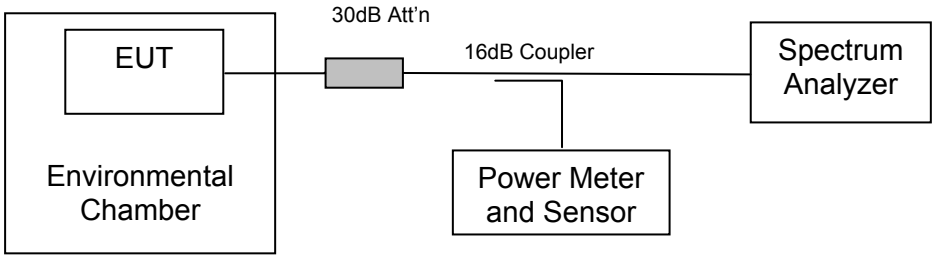
FCC 47 CFR Part 90, Subpart Y; §90.213

Test Procedure

The transmitter output was connected to a spectrum analyzer and the frequency stability was measured in modulated mode. Frequency stability was measured through the extremes of temperature on the mid channel only. Before measurements were taken at each temperature the equipment waited until thermal balance was obtained.

As the system utilized a common clock circuit only the 20 MHz bandwidth variant was measured over the range of temperature.

Test Measurement Set up



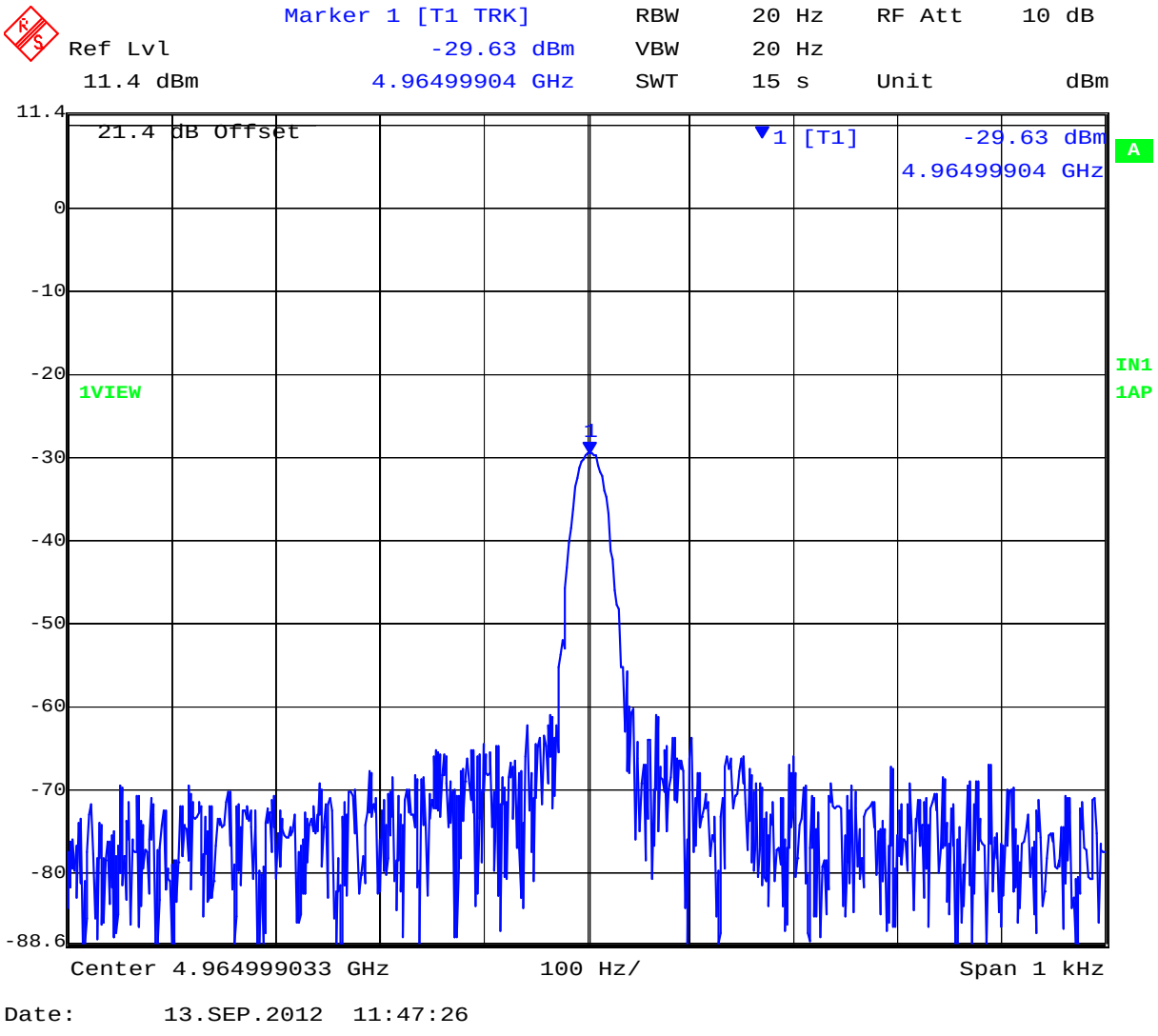
Measurement set up for Frequency Stability

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

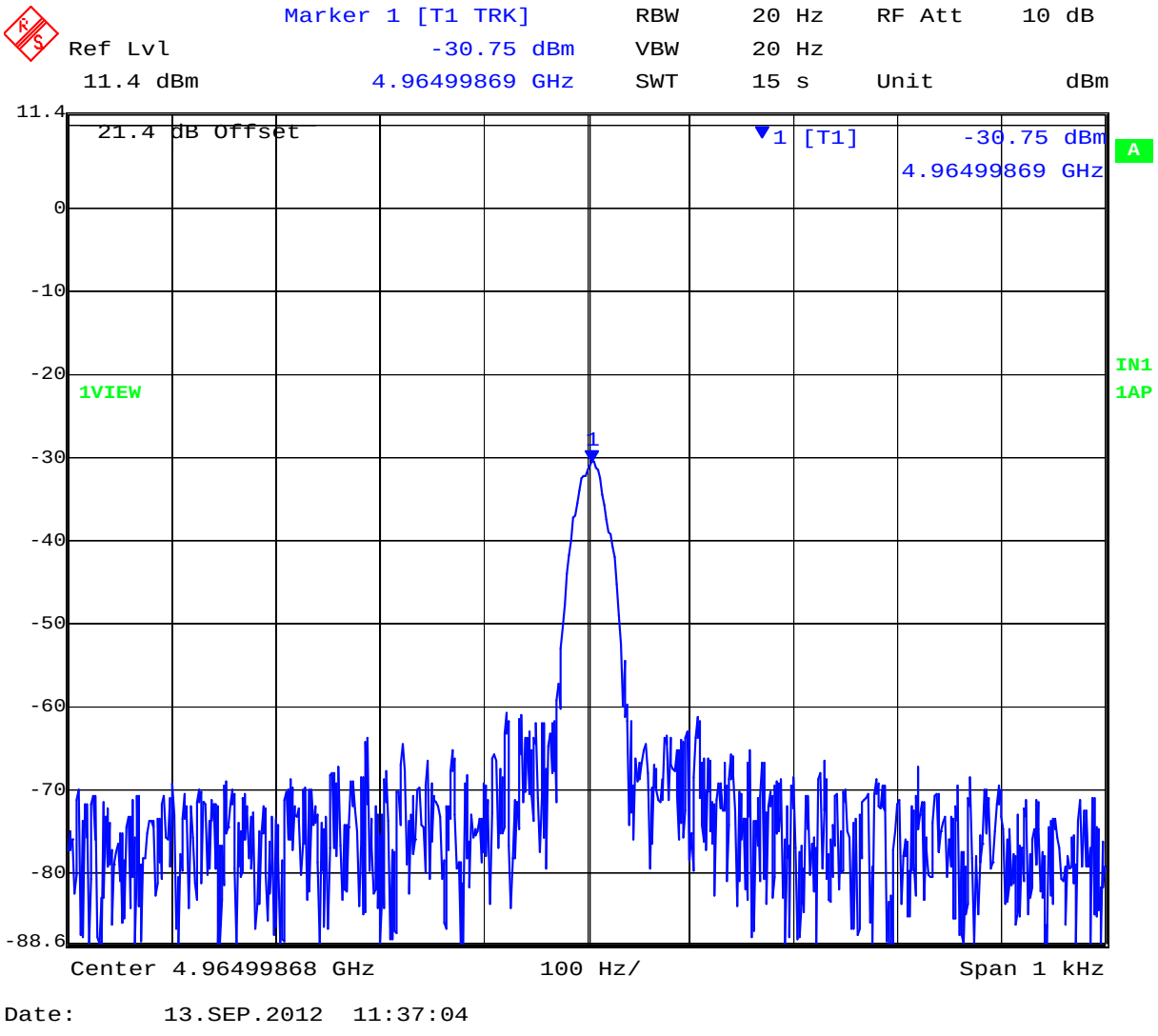
TABLE OF RESULTS Frequency Stability;-

Voltage (dc)	Temperature	Measured Frequency (MHz) Channel 4965 MHz	Delta (kHz)	Drift (ppm)
55	60	4964.99904	-0.960	-0.19
	55	4964.99869	-1.310	-0.26
	45	4964.99826	-1.740	-0.35
	35	4965.00082	0.823	0.17
	25	4965.0025	2.500	0.50
	15	4965.00263	2.630	0.53
	5	4965.0027	2.700	0.54
	-5	4965.00343	3.431	0.69
	-25	4965.00397	3.965	0.80
	-35	4965.00462	4.618	0.93
Maximum Frequency Drift		-1.740 kHz / +4.618 kHz -0.35ppm / +0.93 ppm		

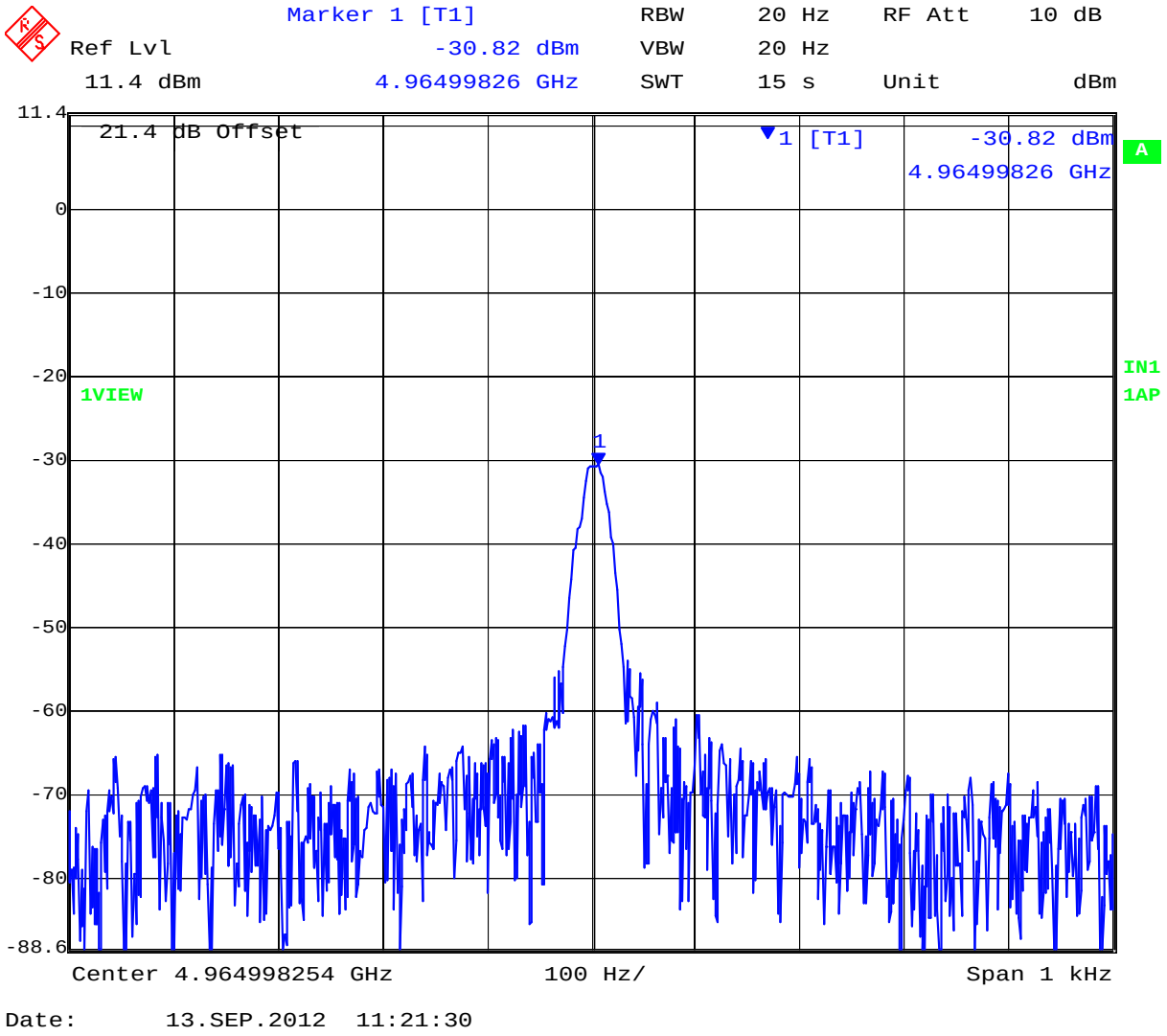
Frequency Stability 4965 MHz 55 Vdc +60°C



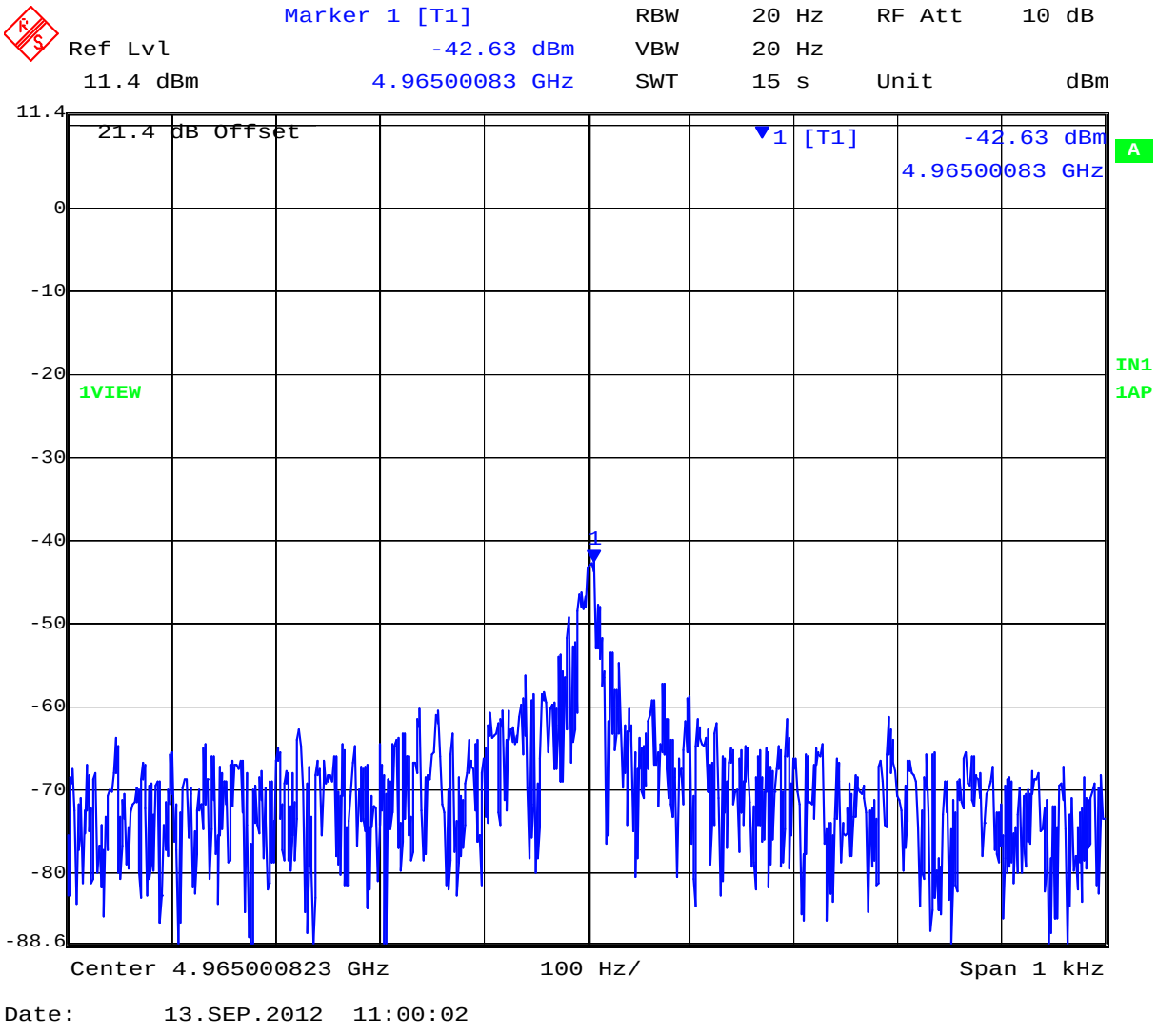
Frequency Stability 4965 MHz 55 Vdc +55°C



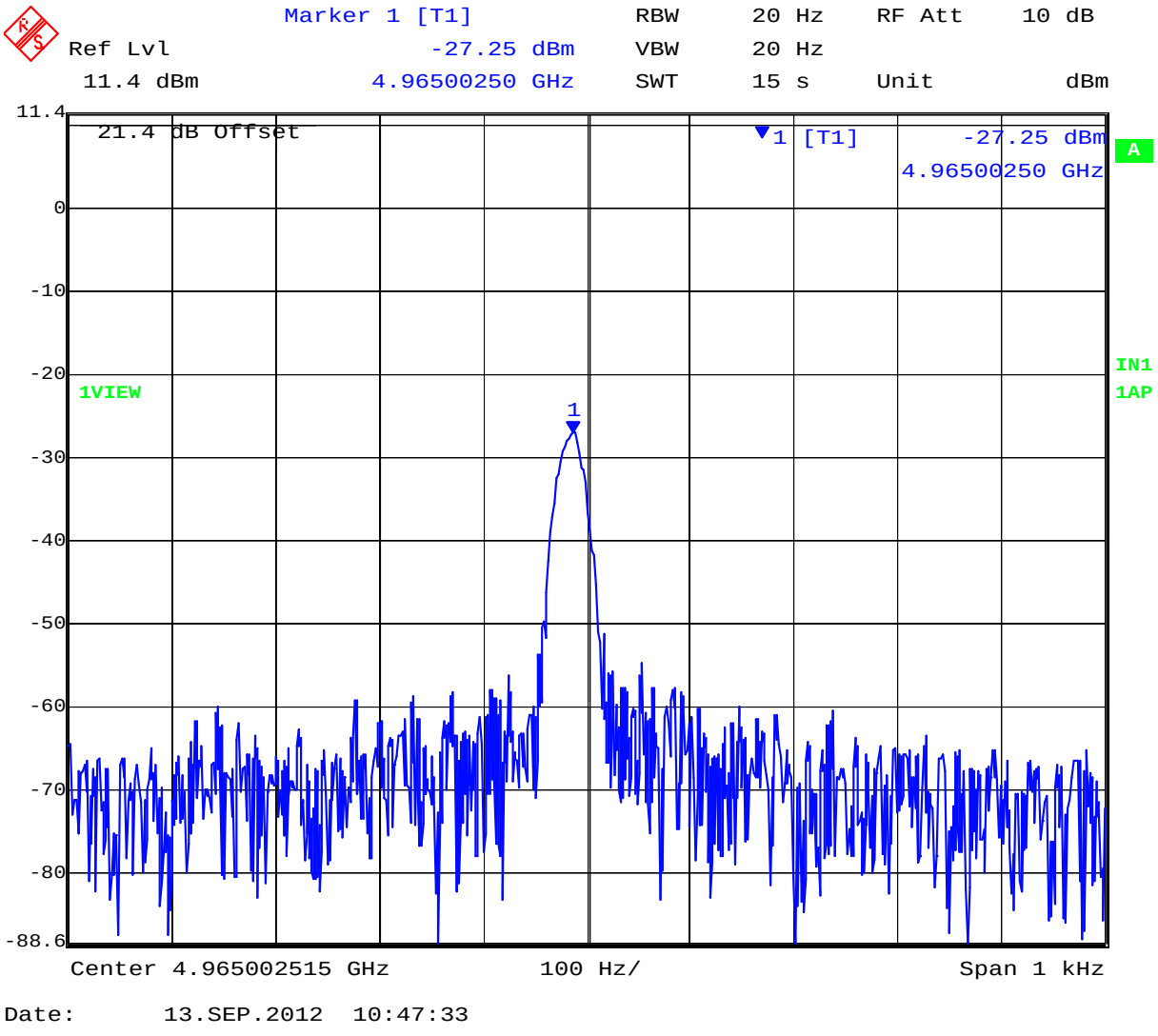
Frequency Stability 4965 MHz 55 Vdc +45°C



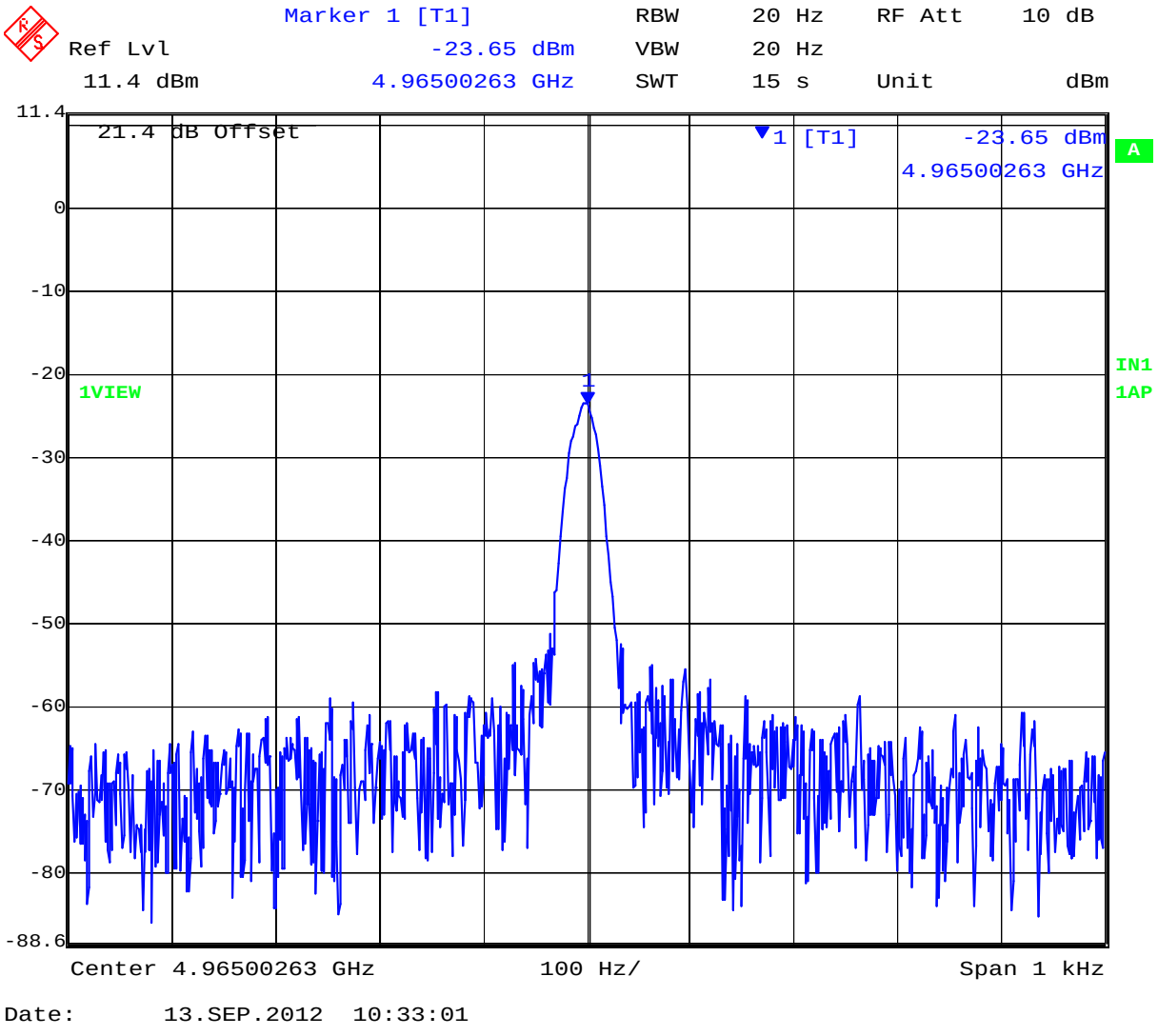
Frequency Stability 4965 MHz 55 Vdc +35°C



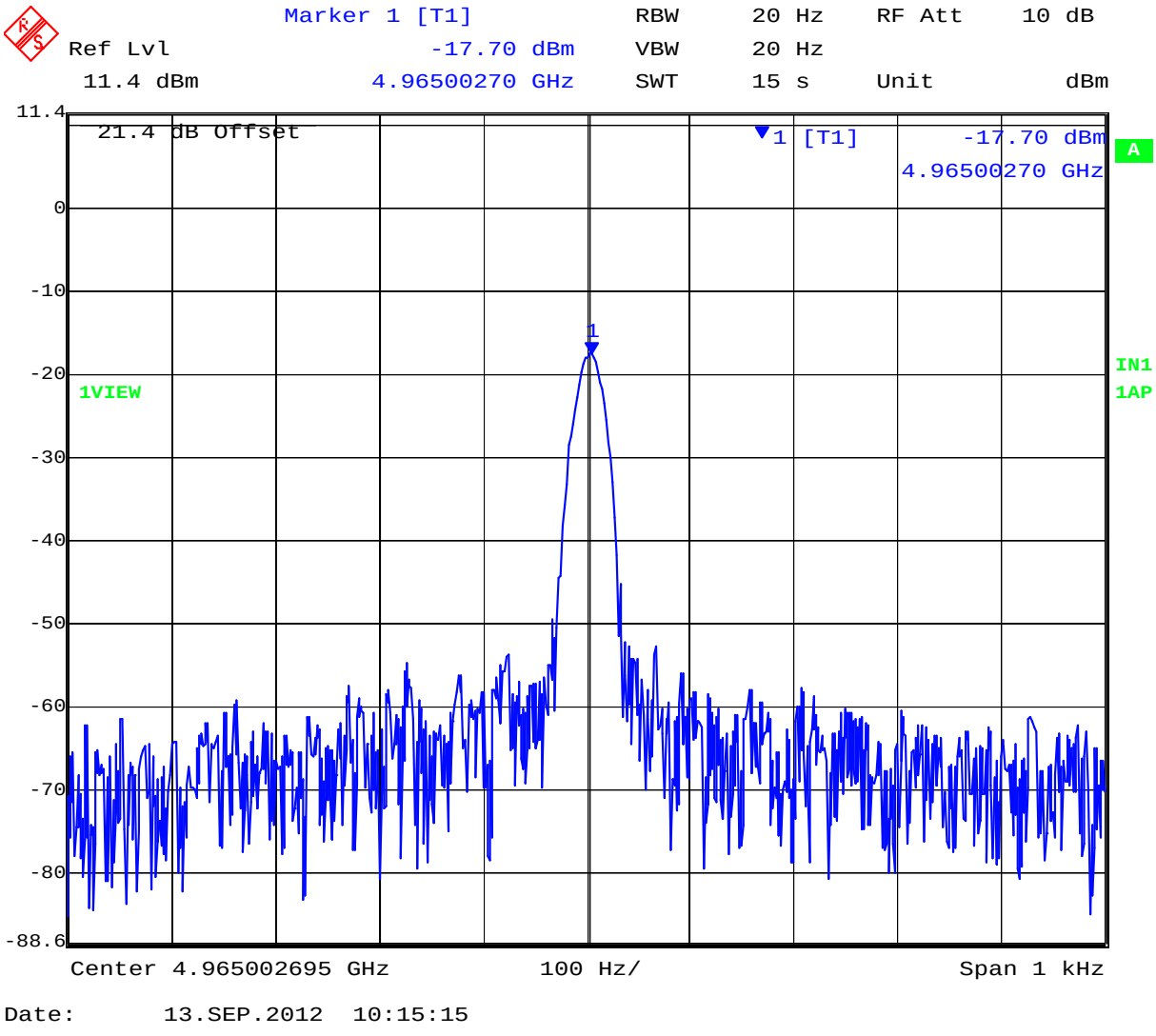
Frequency Stability 4965 MHz 55 Vdc +25°C



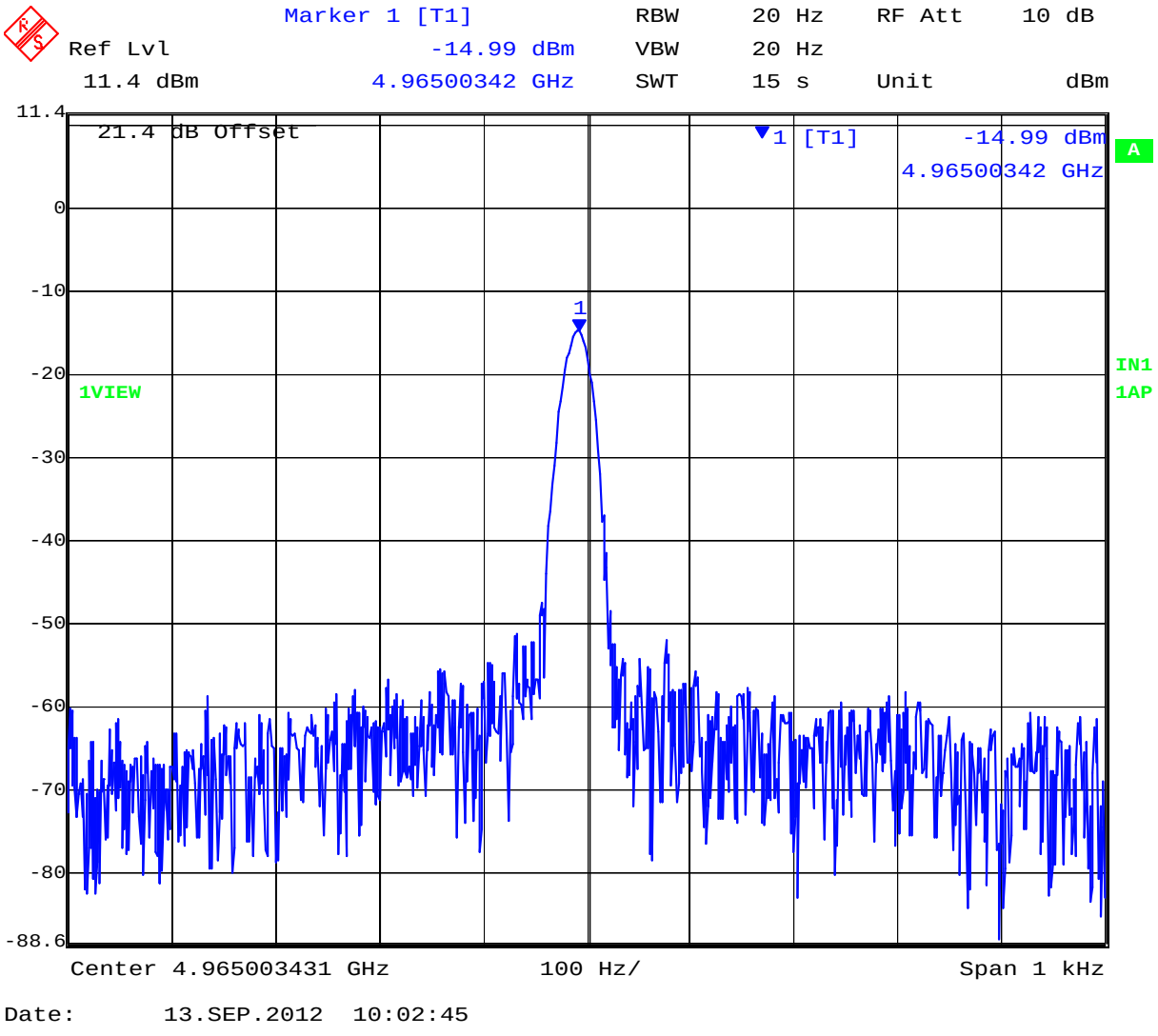
Frequency Stability 4965 MHz 55 Vdc +15°C



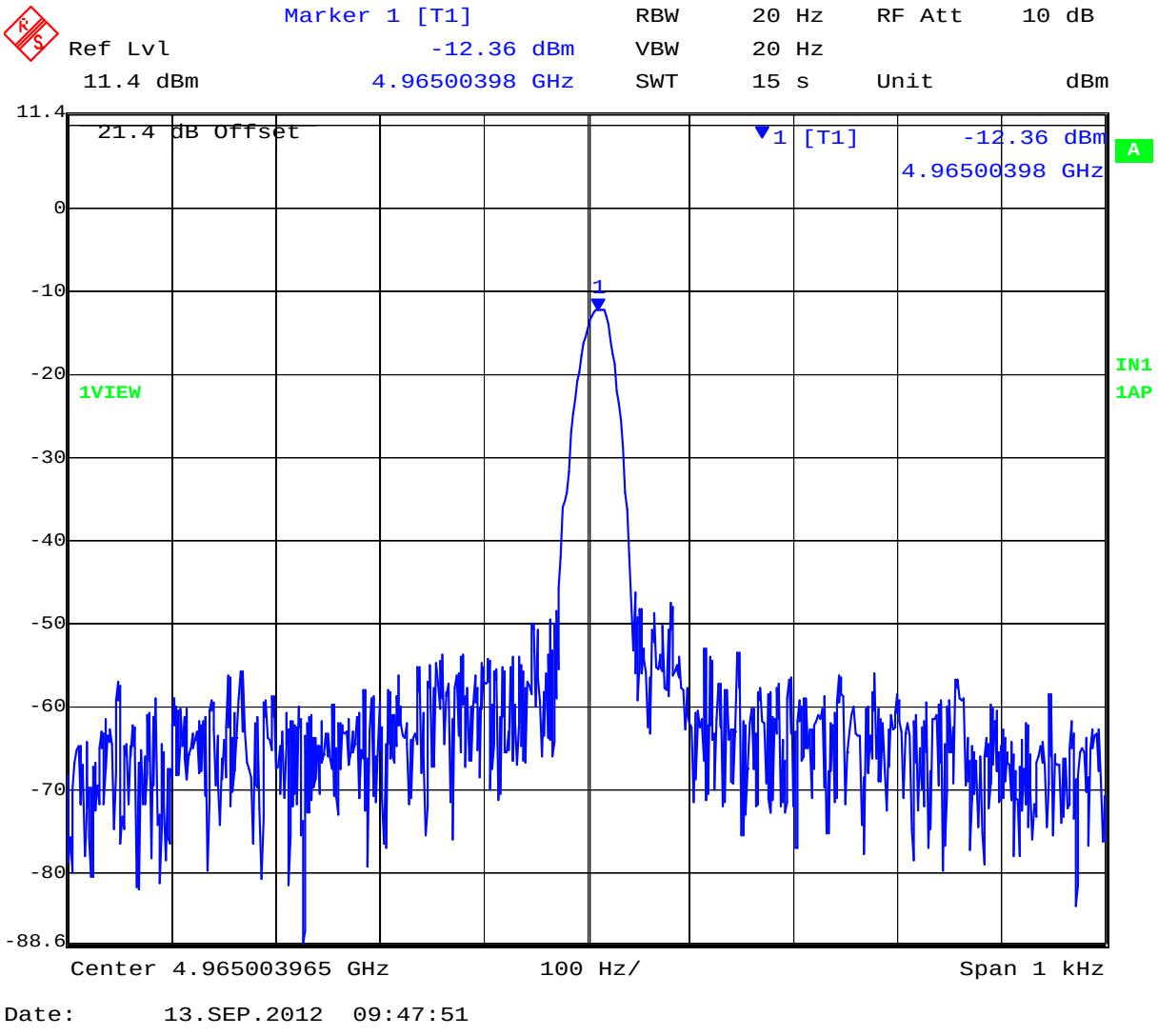
Frequency Stability 4965 MHz 55 Vdc +5°C



Frequency Stability 4965 MHz 55 Vdc -5°C



Frequency Stability 4965 MHz 55 Vdc -25°C



Frequency Stability 4965 MHz 55 Vdc -35°C

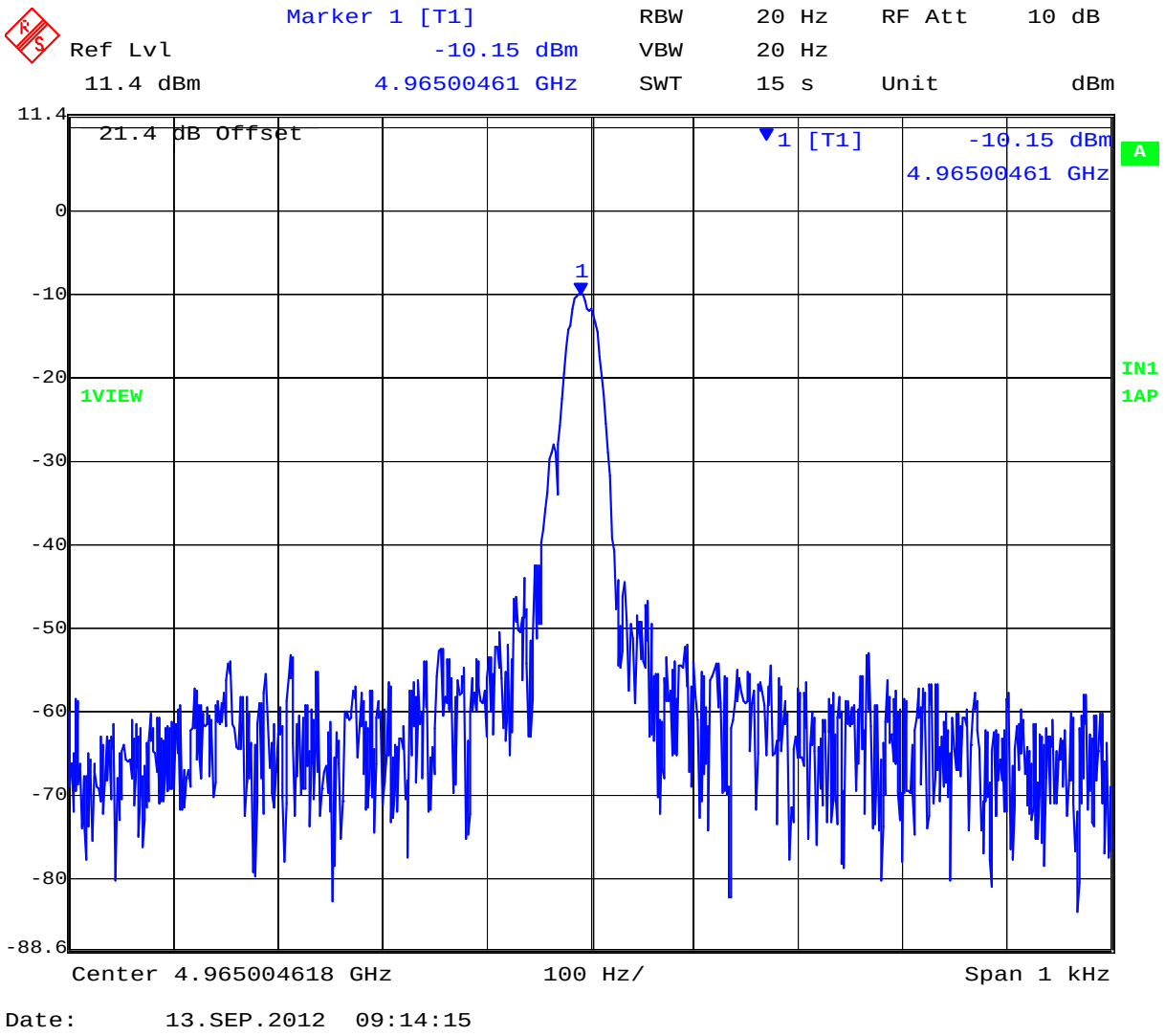


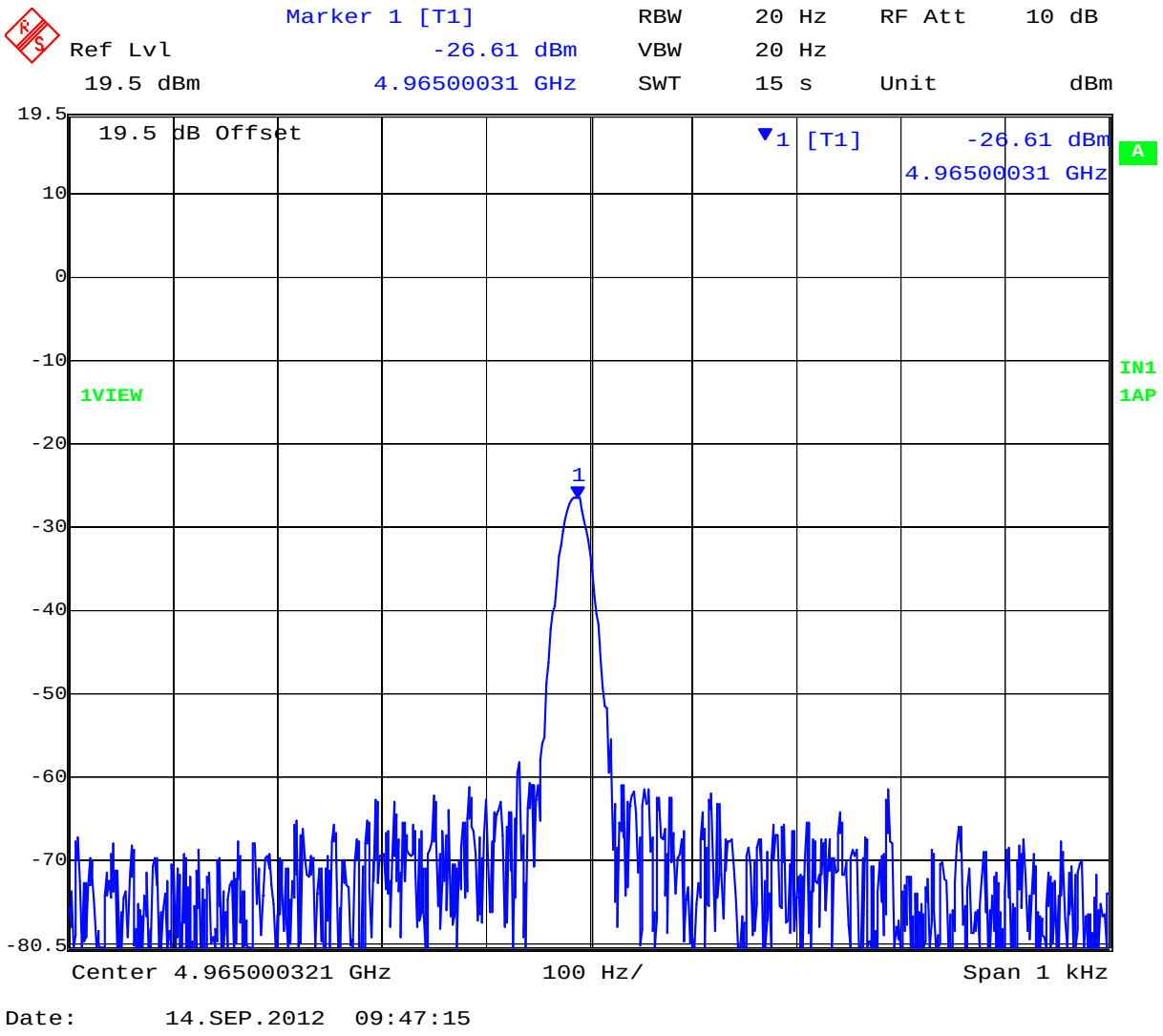
TABLE OF RESULTS Frequency Stability;-

Voltage Variations at Ambient

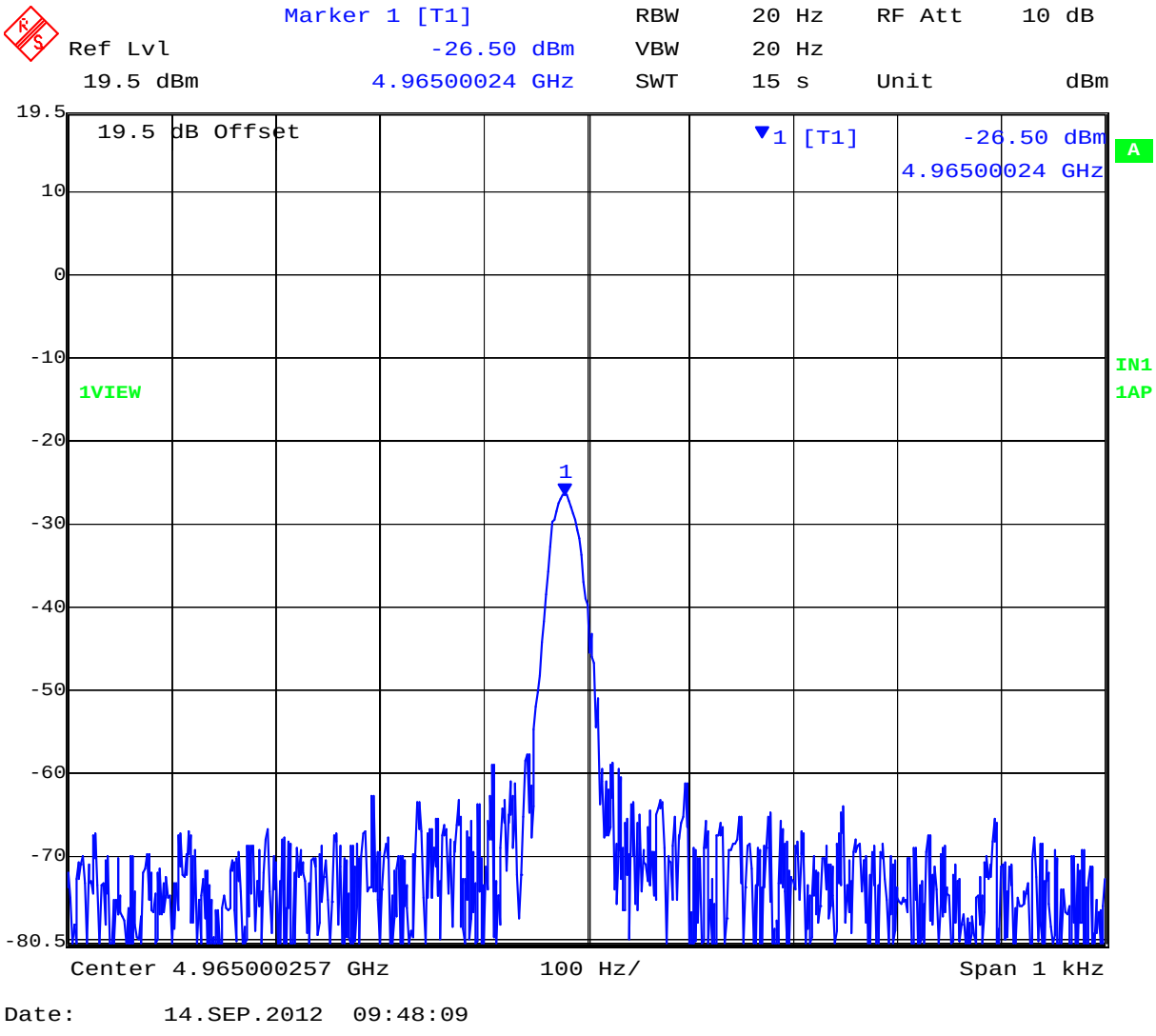
Temperature	Voltage (Vac, 60 Hz)	FREQUENCY (MHz)
		Channel 4965 MHz
Ambient	+43.2	4965.00024
	+55.0	4965.00031
	+59.0	4965.00018
Maximum Frequency Drift		-0.00 / +0.31 kHz

Frequency stability did not change with voltage variation per the voltages identified in the above table.

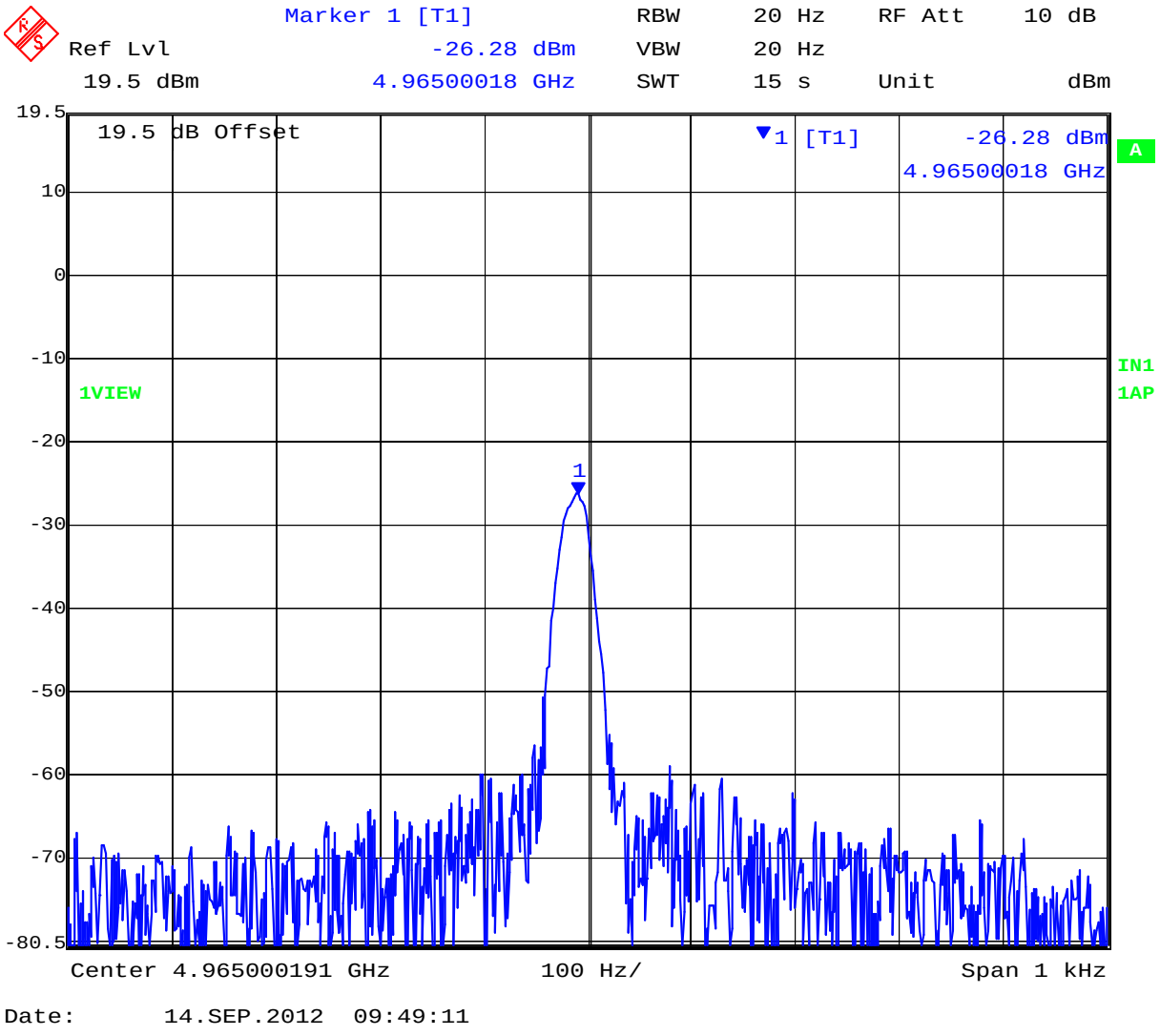
Frequency Stability 4965 MHz 55.0 Vdc +23°C



Frequency Stability 4965 MHz 43.2 Vdc +23°C



Frequency Stability 4965 MHz 59.0 Vdc +23°C



Specification Limits – Frequency stability

FCC Part §90.213

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Minimum Frequency Stability

[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	[1,2,3] 100	100	200
25-50	20	20	50
72-76	5		50
150-174	[5,11] 5	[6] 5	[4,6] 50
216-220	1.0		1.0
220-222 [12]	0.1	1.5	1.5
421-512	[7,11,14] 2.5	[8] 5	[8] 5
806-809	[14] 1.0	1.5	1.5
809-824	[14] 1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	[14] 0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928 [13]	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	[9] 300	300	300
Above 2450 [10]			

[10] Except for DSRCS equipment in the 5850-5925 MHz band, frequency stability is to be specified in the station authorization. Frequency stability for DSRCS equipment in the 5850-5925 MHz band is specified in subpart M of this part.

Manufacturers Specification for Frequency Stability

As no apparent frequency stability limits were provided the manufacturer's specification was used ±20 ppm.

Laboratory Measurement Uncertainty for Frequency Stability

Measurement uncertainty	±0.866 ppm

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-02 'Frequency Measurement'	0070, 0116, 0158, 0193, 0252, 0313, 0314.

5.1.6. Spurious Emissions at Antenna Terminals - Transmitter

FCC 47 CFR Part 90, Subpart Y; §90.210(m)

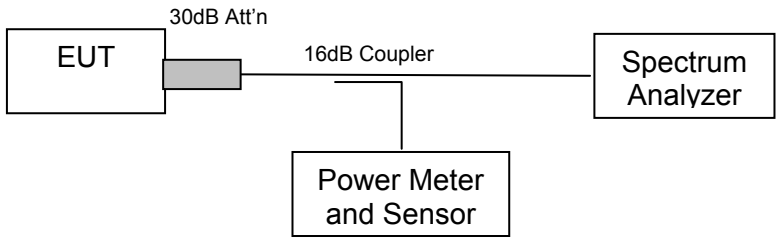
Test Procedure
Transmitter conducted spurious emissions were measured for each bandwidth. Measurement were made while EUT was operating in a modulated transmit mode of operation, at the appropriate center frequency, 100% duty cycle and maximum power at all times. Conducted spurious emissions were measured to 40 GHz.

Conducted spurious emissions' testing was performed only in the configuration with the highest spectral density.

From FCC Part 90.210 (m)
On any frequency removed from the assigned frequency between above 150 % of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.

(P watts)

Test Measurement Set up



Conducted spurious emission test configuration

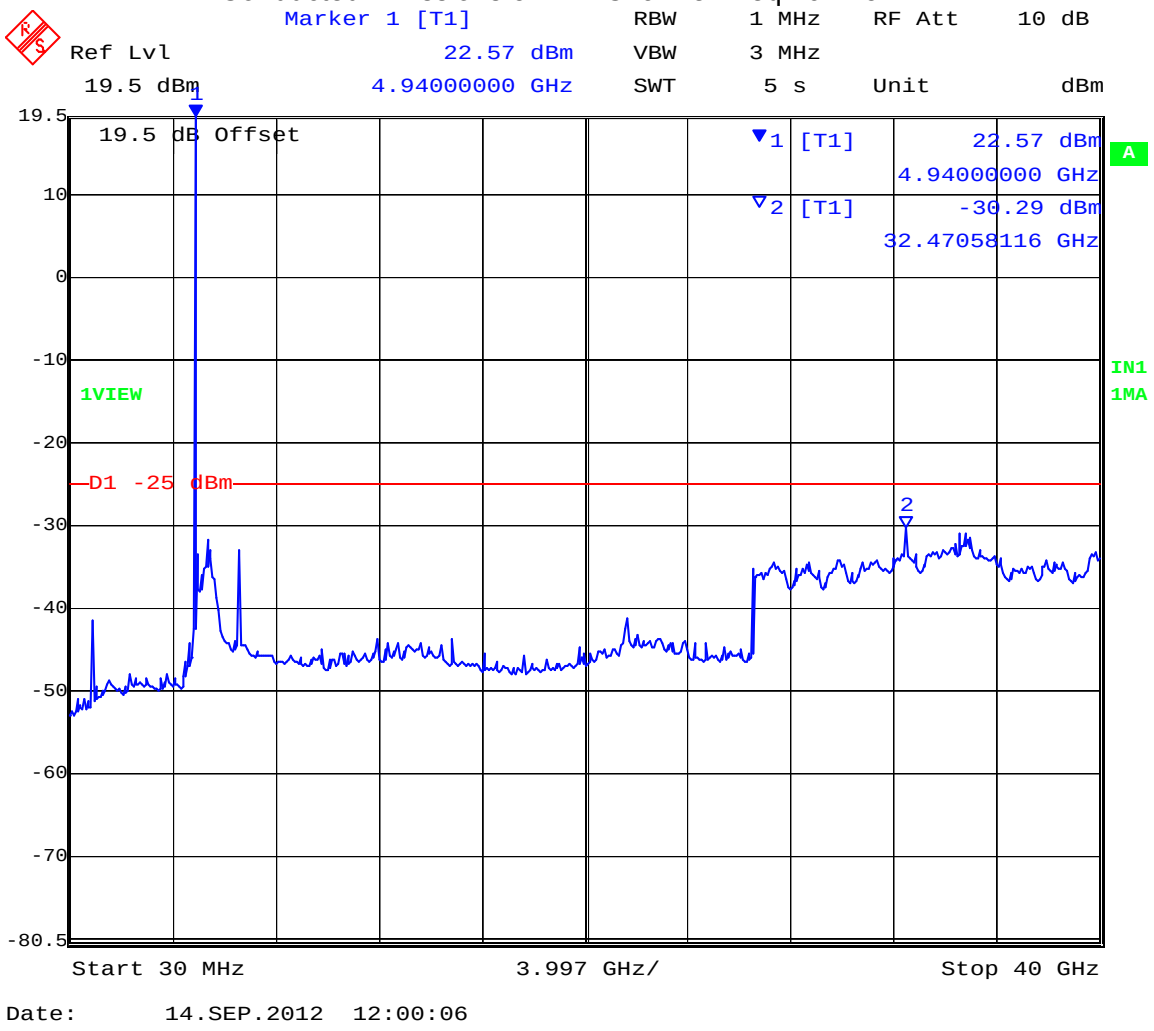
Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57 % Pressure: 999 to 1009 mbar

TABLE OF RESULTS – 5 MHz Bandwidth

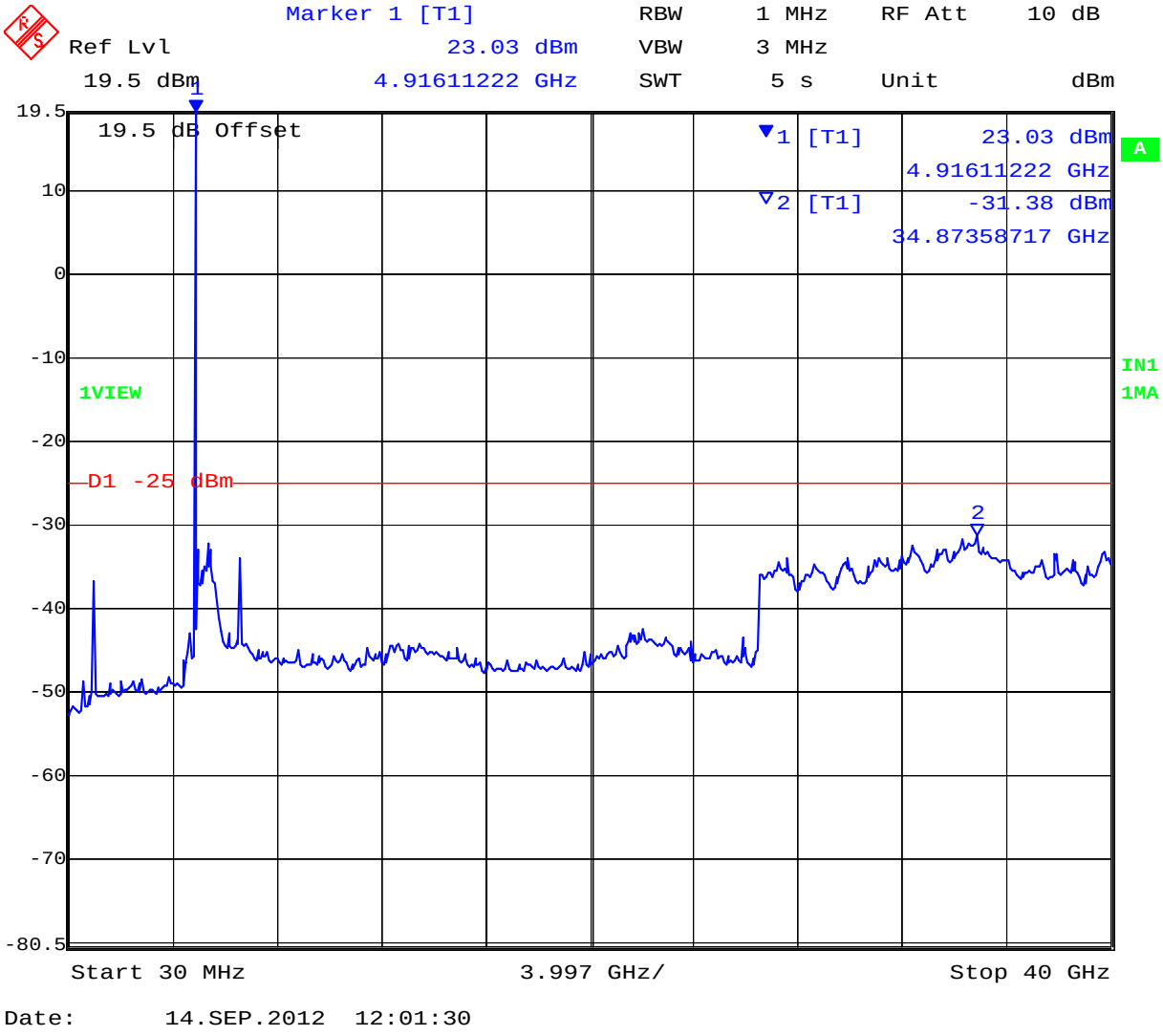
PORT A Limit: -25 dBm

	Frequency (MHz)				
Channel (MHz)	**Start (MHz)**	**Stop (MHz)**	**Freq of Maximum Emission (MHz)**	**Emission Amplitude (dBm)**	**Margin (dB)**
4942.5	30	40,000	32,470.58	-30.29	-5.29
4967.5	30	40,000	34,873.59	-31.38	-6.38
4987.5	30	40,000	34,873.59	-31.25	-6.25

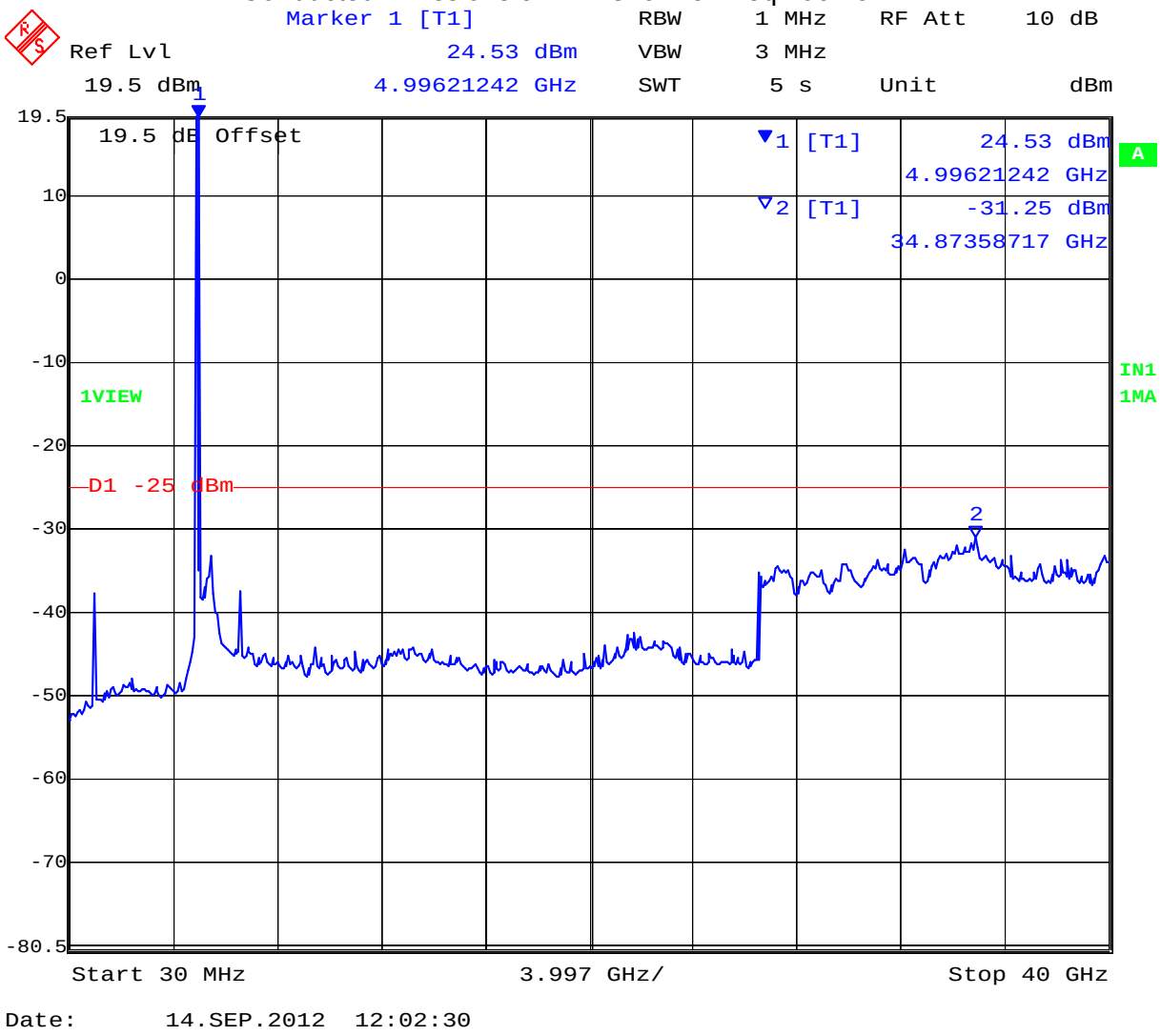
Port A
Conducted Emissions 5 MHz Channel Freq 4942.5 MHz



Port A
Conducted Emissions 5 MHz Channel Freq 4967.5 MHz



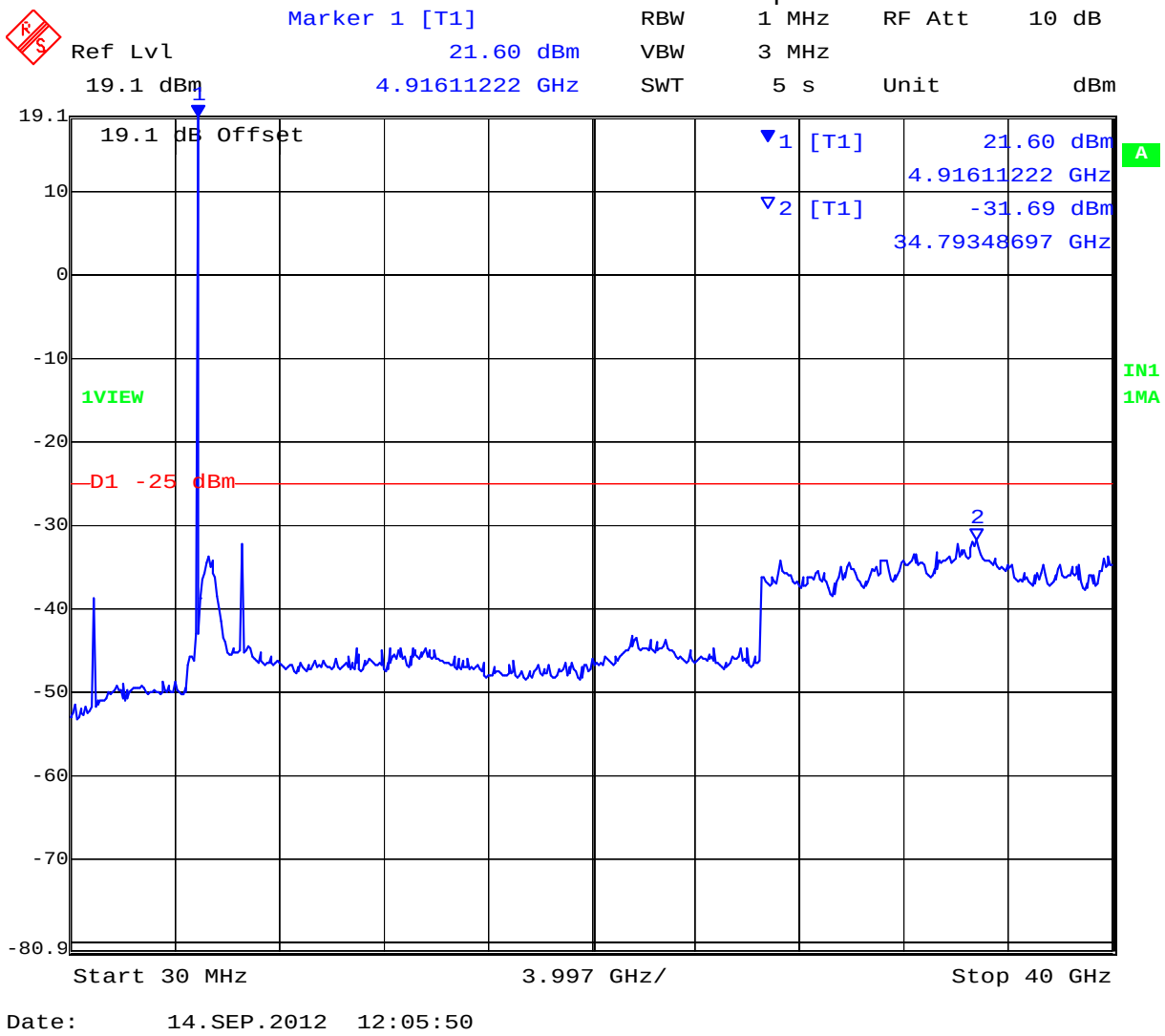
Port A
Conducted Emissions 5 MHz Channel Freq 4987.5 MHz



PORT B Limit: -25 dBm

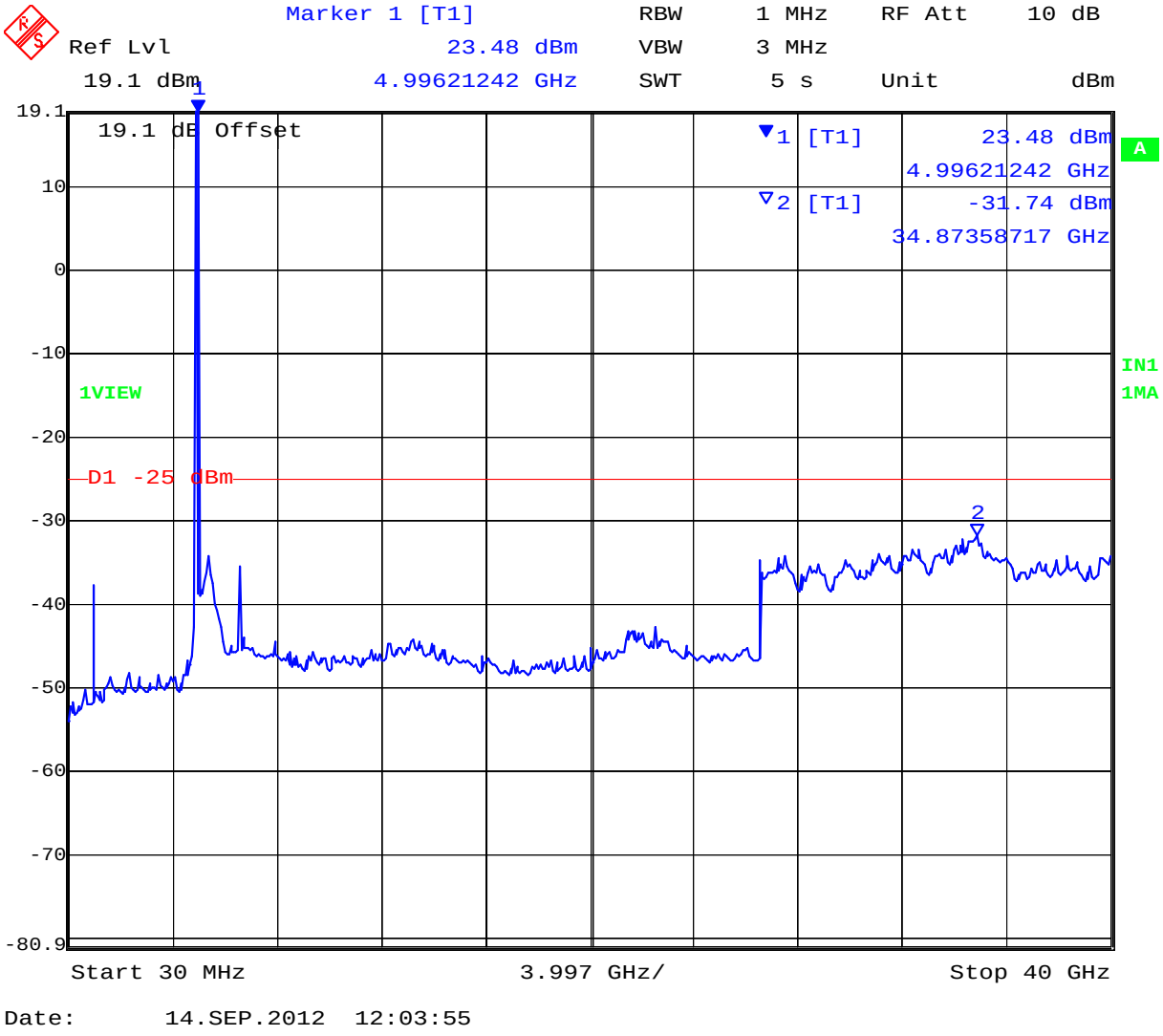
	Frequency (MHz)				
Channel (MHz)	**Start (MHz)**	**Stop (MHz)**	**Freq of Maximum Emission (MHz)**	**Emission Amplitude (dBm)**	**Margin (dB)**
4942.5	30	40,000	34,793.49	-31.69	-6.69
4967.5	30	40,000	34,633.29	-32.19	-6.19
4987.5	30	40,000	34,873.59	-31.74	-6.74

Port B
Conducted Emissions 5 MHz Channel Freq 4942.5 MHz



Port B
Conducted Emissions 5 MHz Channel Freq 4967.5 MHz

Port B
Conducted Emissions 5 MHz Channel Freq 4987.5 MHz



Specification Limits

Conducted Spurious Emission at Antenna Terminals – Transmitter Limits FCC Part §90.210

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

Laboratory Measurement Uncertainty for Conducted Spurious Emissions

Measurement uncertainty	±2.37 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0070, 0116, 0158, 0088, 0252, 0313, 0314

5.1.7. Radiated Spurious Emissions

FCC 47 CFR Part 90, §90.210(m)

Test Procedure
Measurements were made while EUT was operating in a modulated transmit mode of operation, at the appropriate center frequency, 100% duty cycle and maximum power at all times. Radiated spurious emissions were measured to 40 GHz. Substitution was performed on any emissions observed. The antenna port was attenuated with 50 dB attenuation plus a 50 Ω terminator.

The measurement equipment was set to measure in peak hold mode. The emissions were measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode.

The highest emissions relative to the limit are listed for each frequency spanned.

Measurements below 1 GHz utilized 100 KHz RBW, measurements above 1 GHz were performed using a minimum RBW of 1 MHz.

From FCC Part 90.210 (m)
On any frequency removed from the assigned frequency between above 150 % of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.

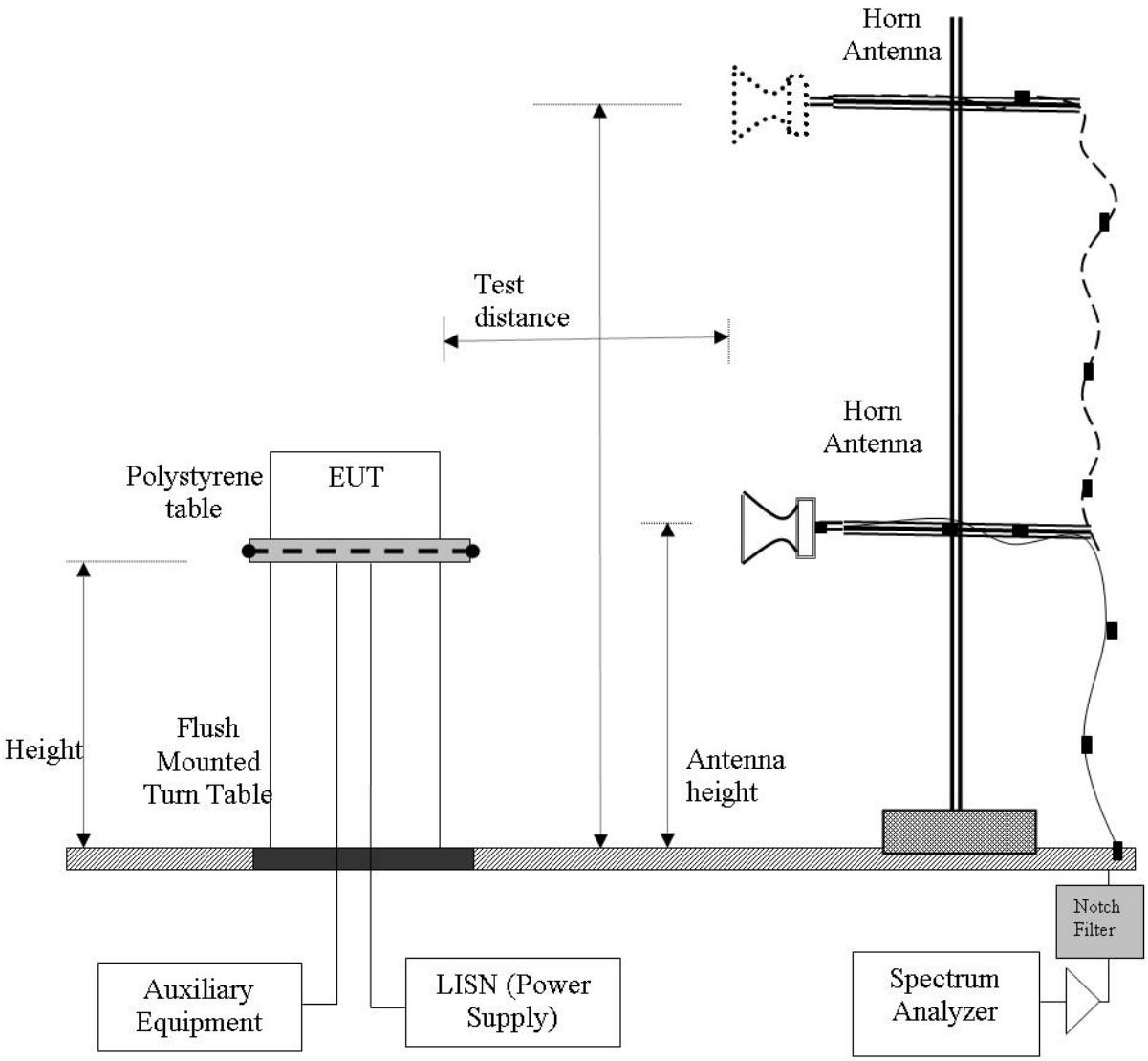
Radiated emissions' testing was performed only in the configuration with the highest spectral density.

Attenuation
55 + 10 log (P) dB for 5 MHz bandwidth = 49.1 dB attenuation (P is in Watts)

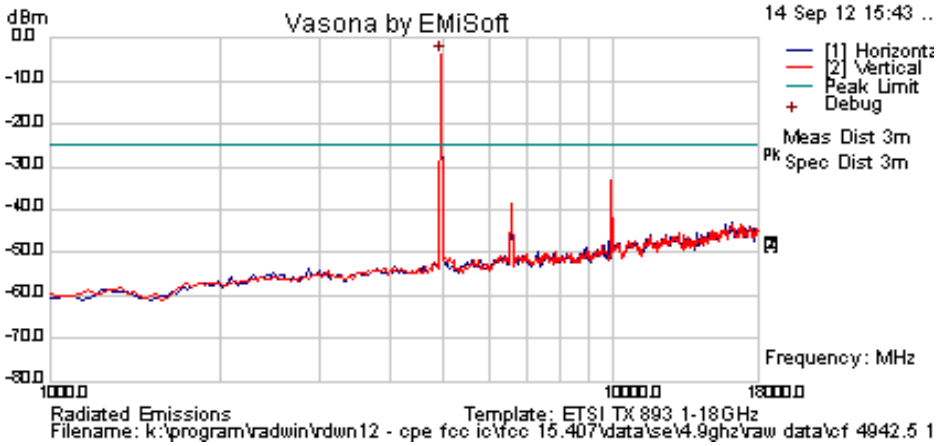
Therefore maximum attenuation for any channel spacing is = 49.1 dB

5 MHz bandwidth limit: +24.1 – 49.1 = -25 dBm

Radiated Emission Measurement Setup – Above 1 GHz



Test Freq.	4942.5 MHz	**Engineer**	SB
Variant	MCS15	**Temp (ºC)**	24
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	27	**Press. (mBars)**	1008
Antenna	50 ohm termination	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



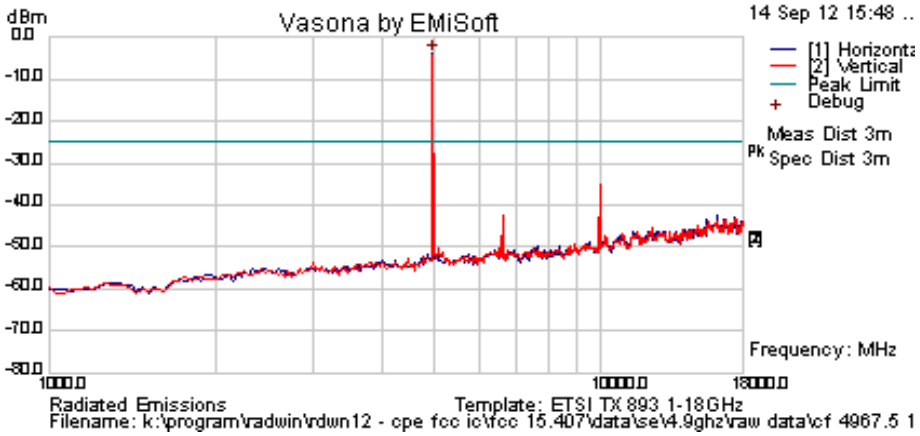
Formally measured emission peaks

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail	Comments
4917.836	-12.5	4.6	4.0	-4.0	Peak [Scan]	V	100	0				FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	ETSI 328 Measurement Type: 30 kHz RBW, 30 kHz VBW, 1 S sweep time, Peak Detector, Averaging Off

The emission breaking the limit line is the transmitter fundamental.

Test Freq.	4967.5 MHz	**Engineer**	SB
Variant	MCS15	**Temp (ºC)**	24
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	28	**Press. (mBars)**	1008
Antenna	50 ohm termination	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



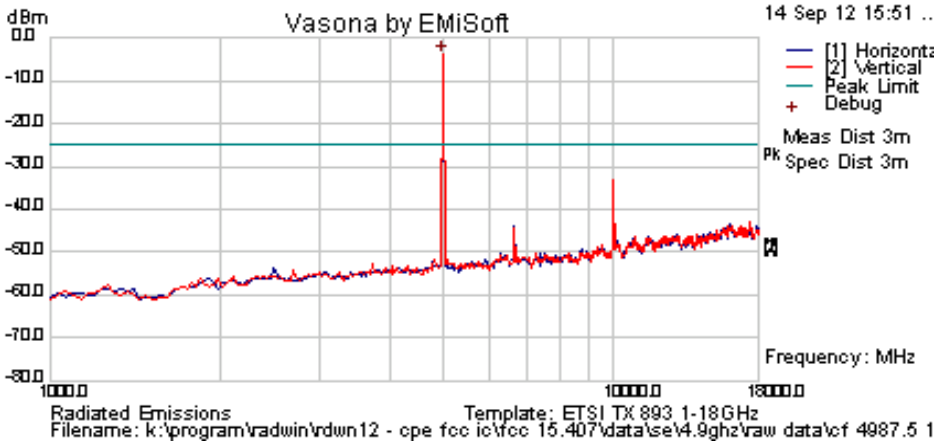
Formally measured emission peaks

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail	Comments
4951.904	-12.4	4.6	3.9	-3.9	Peak [Scan]	H	100	0				FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	ETSI 328 Measurement Type: 30 kHz RBW, 30 kHz VBW, 1 S sweep time, Peak Detector, Averaging Off

The emission breaking the limit line is the transmitter fundamental.

Test Freq.	4987.5 MHz	**Engineer**	SB
Variant	MCS15	**Temp (ºC)**	24
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	28	**Press. (mBars)**	1008
Antenna	50 ohm termination	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail	Comments
4985.972	-12.3	4.6	3.9	-3.8	Peak [Scan]	V	100	0				FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	ETSI 328 Measurement Type: 30 kHz RBW, 30 kHz VBW, 1 S sweep time, Peak Detector, Averaging Off

The emission breaking the limit line is the transmitter fundamental.

Radiated Spurious Emission Limits;

Transmitter Limits
Limits FCC Part §90.210 (m)

Emission Mask M
(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.

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0104, 0158, 0134, 0310, 0312, Dipole.

5.1.8. Receiver Radiated Spurious Emissions (above 1 GHz)

Industry Canada RSS-Gen §4.10, §6

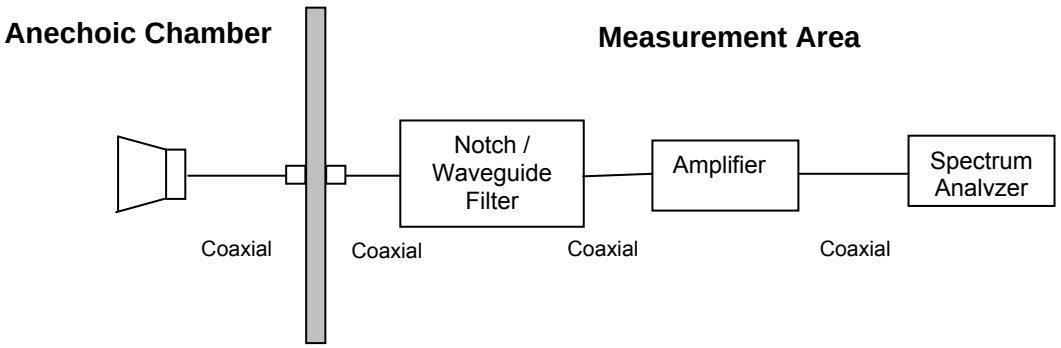
Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

All Sectors of the EUT were tested simultaneously

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Specification

Radiated Receiver Spurious Emissions

RSS-Gen §4.10 the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g.. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.

For emissions below 1000 MHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization as required, with an equal or greater measurement bandwidth relative to the applicable CISPR quasi-peak bandwidth.

Above 1000 MHz, measurements shall be performed using an average detector with a minimum resolution bandwidth of 1 MHz.

RSS-Gen §6 Receiver Spurious Radiated Limits
Spurious emissions from receivers shall not exceed the radiated limits shown in the table below:

RSS-Gen Spurious Emissions Limits

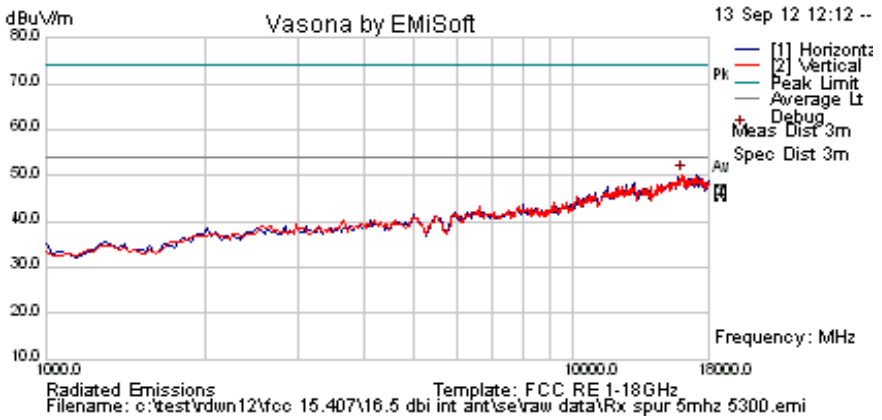
Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Traceability:

Test Equipment Used
0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

Receiver Radiated Spurious Emissions above 1 GHz

Test Freq.	4945 MHz	**Engineer**	JMH
Variant	Receive in Test Utility	**Temp (ºC)**	25
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Not Applicable in Receive Mode	**Press. (mBars)**	1006
Antenna	16.5 dBi Int Flat Panel		
Test Notes 1			
Test Notes 2			

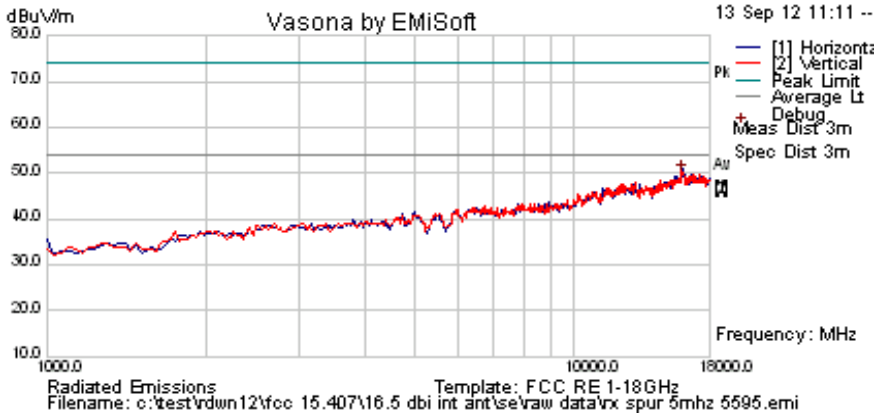


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
16058.116	41.0	9.0	0.3	50.3	Peak [Scan]	V	100	0	54	-3.7	Pass	Noise

Legend:	RB = Restricted Band; NRB = Non-Restricted Band; FUND = Fundamental Freq.
	BE = Emission in Restricted Band Nearest Transmission Band Edge;

Test Freq.	4985 MHz	**Engineer**	JMH
Variant	Receive in Test Utility	**Temp (ºC)**	25
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Not Applicable in Receive Mode	**Press. (mBars)**	1006
Antenna	16.5 dBi Int Flat Panel		
Test Notes 1			
Test Notes 2			



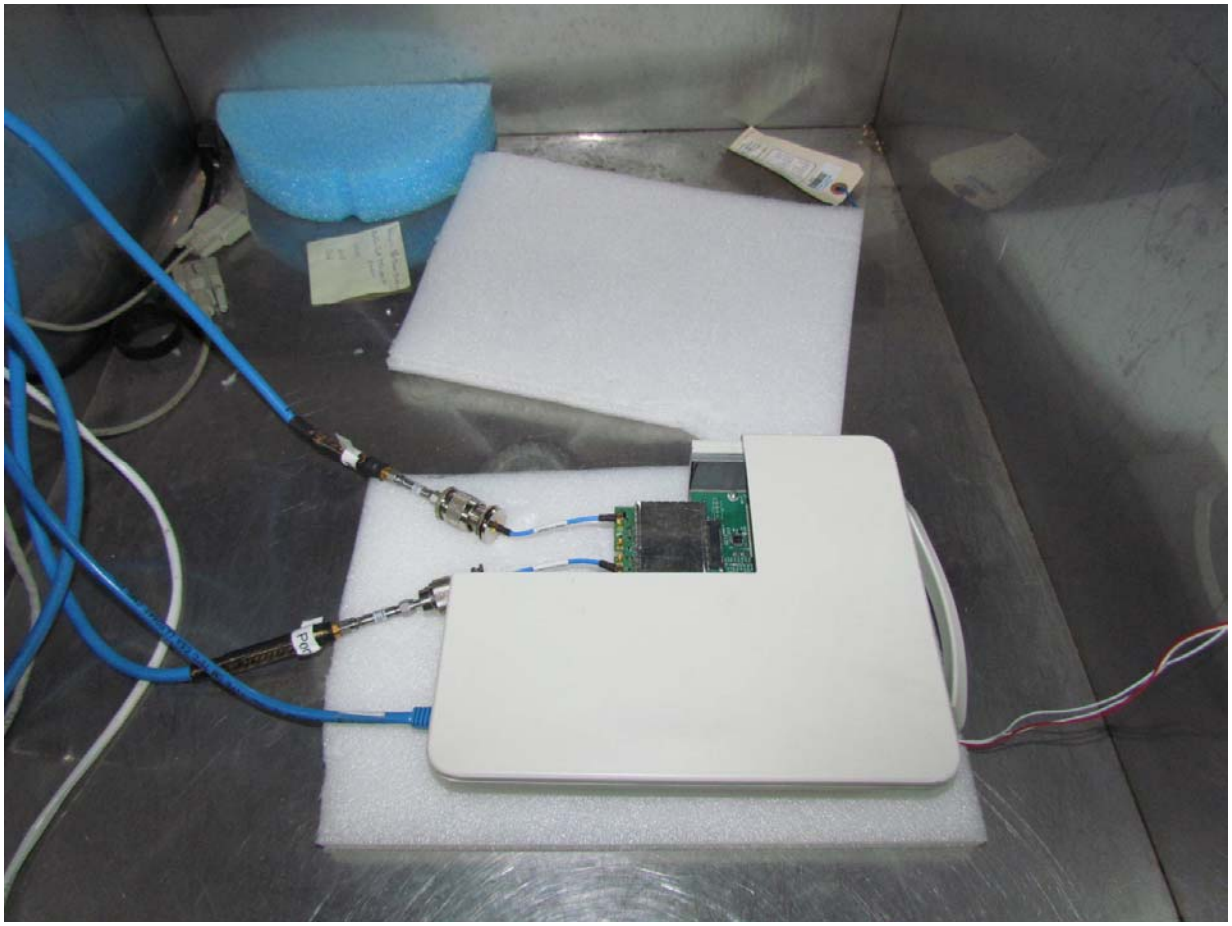
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
16057.918	40.57	9	0.27	49.84	Peak [Scan]	H	116	200	54	-4.16	Pass	Noise

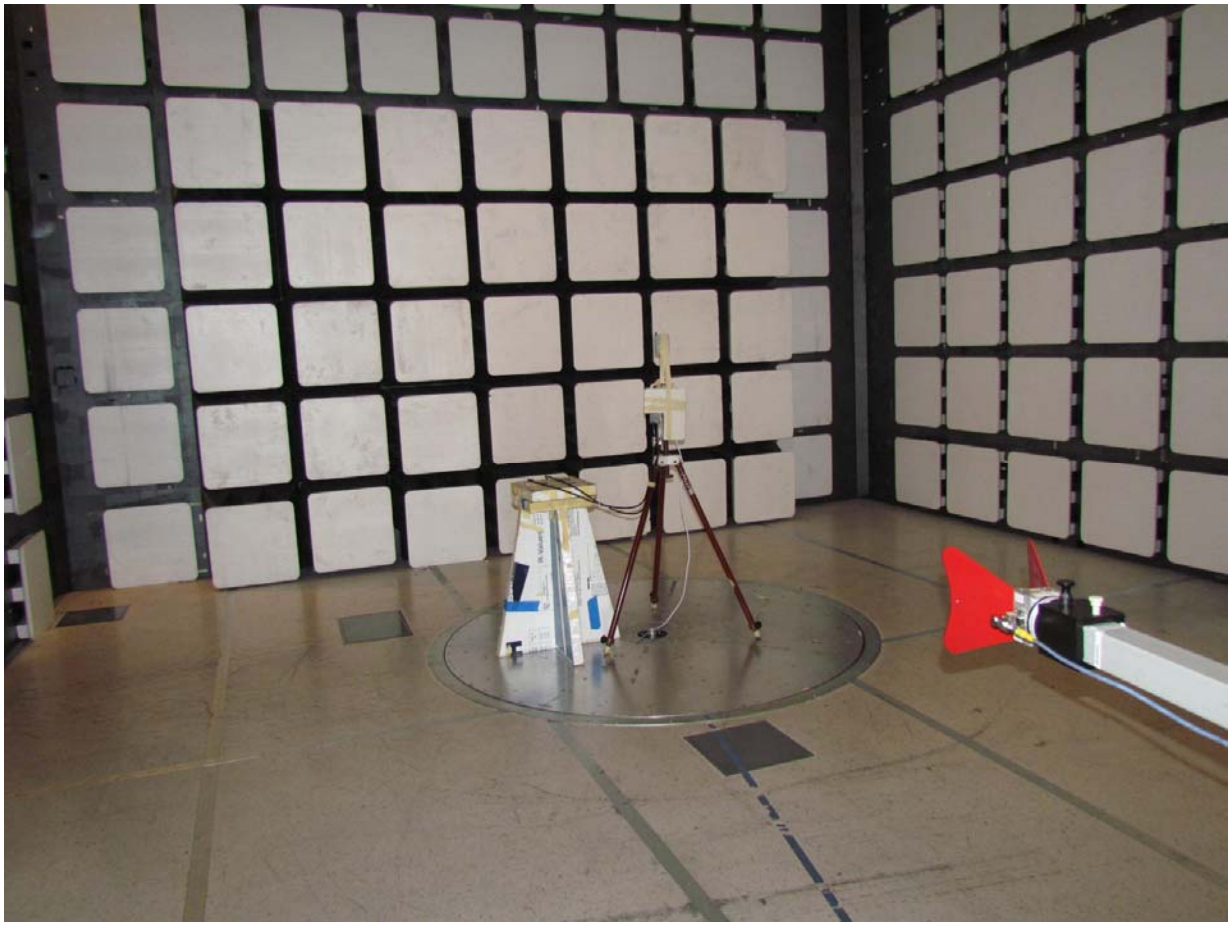
Legend:	RB = Restricted Band; NRB = Non-Restricted Band; FUND = Fundamental Freq.
	BE = Emission in Restricted Band Nearest Transmission Band Edge;

6. TEST SET-UP PHOTOGRAPHS

6.1. Conducted Measurement Test Set-Up



6.2. Radiated Spurious Emissions



7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #	Calibration Due Date
0070	Power Meter	Hewlett Packard	437B	3125U11552	28th Nov 12
0117	Power Sensor	Hewlett Packard	8487D	3318A00371	15th Nov 12
0223	Power Meter	Hewlett Packard	EPM-442A	US37480256	15th Nov 12
0374	Power Sensor	Hewlett Packard	8485A	3318A19694	29th Nov 12
0158	Barometer /Thermometer	Control Co.	4196	E2846	8th Dec 12
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007	2nd Dec 12
0287	EMI Receiver	Rhode & Schwartz	ESIB40	100201	16th Nov 12
0338	30 - 3000 MHz Antenna	Sunol	JB3	A052907	8th Nov 13
0335	1-18 GHz Horn Antenna	EMCO	3117	00066580	7th Nov 13
0252	SMA Cable	Megaphase	Sucoflex 104	None	N/A
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001	N/A
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002	N/A
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001	N/A
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001	N/A
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623	N/A
	EMC Test Software	EMISoft	Vasona	5.0051	N/A

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