Nemko Test Report:	4L0519RUS1REV2
Applicant:	Navini Networks 2240 Campbell Creek Blvd. Suite 110 Richardson, TX 75082
Equipment Under Test: (E.U.T.)	2500-2686 MHz TTA BTS Sector
In Accordance With:	**FCC PART 27, Subpart M** Broadband Radio Service and Educational Broadband Service
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, Texas 75057-3136
Authorized By:	 Dustin Oaks, Engineer
Date:	1/31/2005

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Navini Networks

Model No.: 2500-2686 MHz TTA BTS Sector

Serial No.: 01

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 27, Subpart M.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. NONE

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC. LIMIT	RESULT
RF Power Output	2.1046	33 dBW + 10log(X/Y) dBW (181.38 Watts)	Complies
Occupied Bandwidth	2.1049	5.5 MHz	Complies
Spurious Emissions @ Antenna Terminals	2.1051	-13 dBm	Complies
Field Strength of Spurious Radiation	2.1053	-13 dBm	Complies
Frequency Stability	2.1055	Must remain within authorized bandwidth	Complies

Footnotes:

X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition

Signal bandwidth = 0.5 MHz therefore, 33 dBW + 10 log (0.5/5.5) = 181.38 Watts

Section 2. General Equipment Specification

Power Supply	24 Vdc
Frequency Range:	2500 to 2686 MHz

Type(s) of Modulation:

F3E (Voice)	F1D	F2D	D7W (QAM)	F9W
☐	☐	☐	☐	☒

Emission Designator:	5M00F9W
Output Impedance:	50 ohms
RF Power Output: (Rated at antenna terminal)	33 dBm
Duty Cycle:	50% TDD
Selection Of Operating Frequency:	Selectable by operator
Power Output Adjustment Capability:	Selectable by operator, up to Maximum

Note:

Description of EUT

Wireless terminal device.

System Diagram

Refer to separate exhibit.

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 1/27/2005

Test Results: Complies

Measurement Data: See Tables.

Test Data – RF Power Output

2500-2599MHz TTA Module

Frequency (MHz)	Average Conducted Power (dBm)
2545	32.95

2600-2686MHz TTA Module

Frequency (MHz)	Average Conducted Power (dBm)
2641	33.03

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 1/27/2005

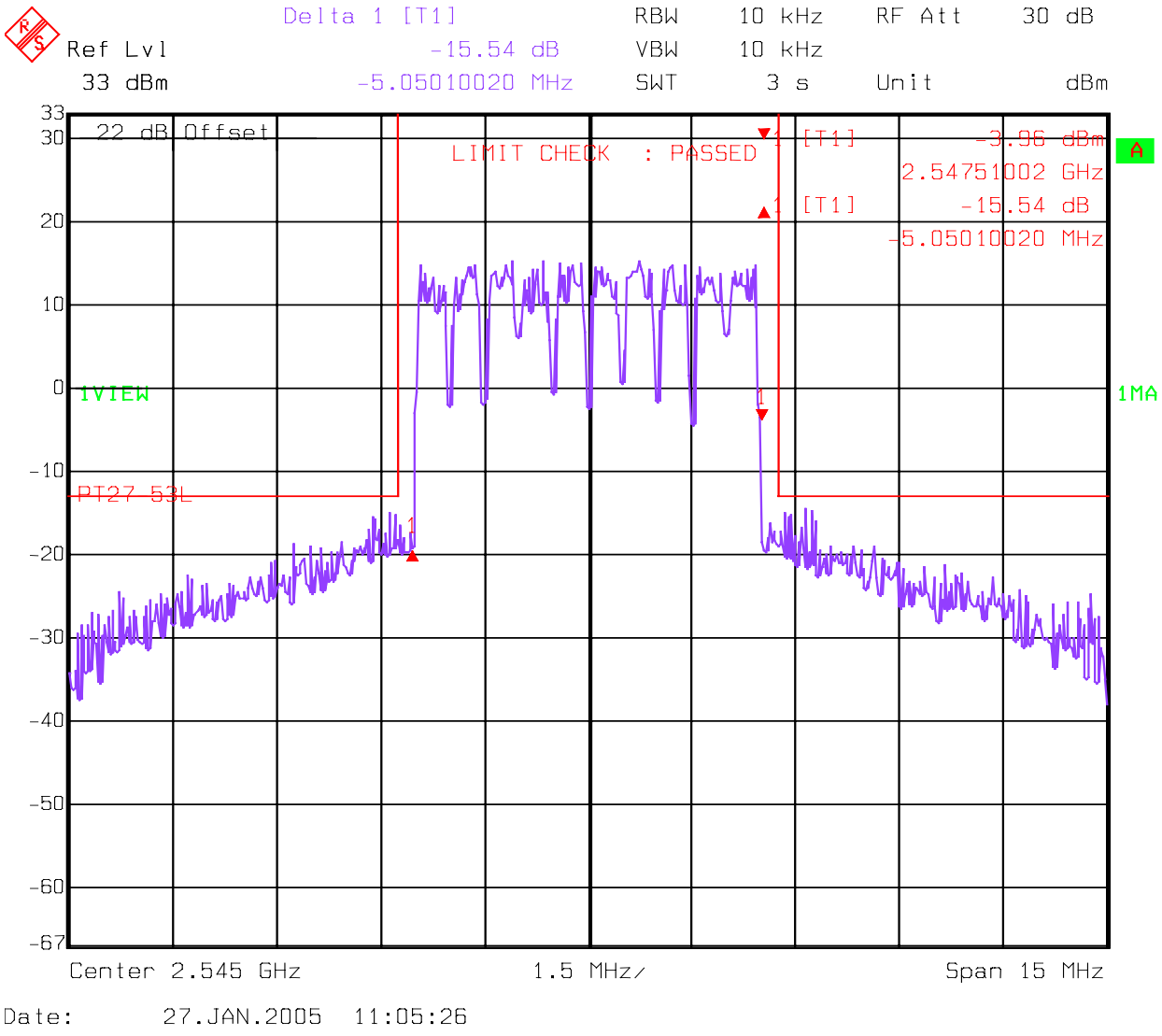
Test Results: Complies

Measurement Data: See attached plots.

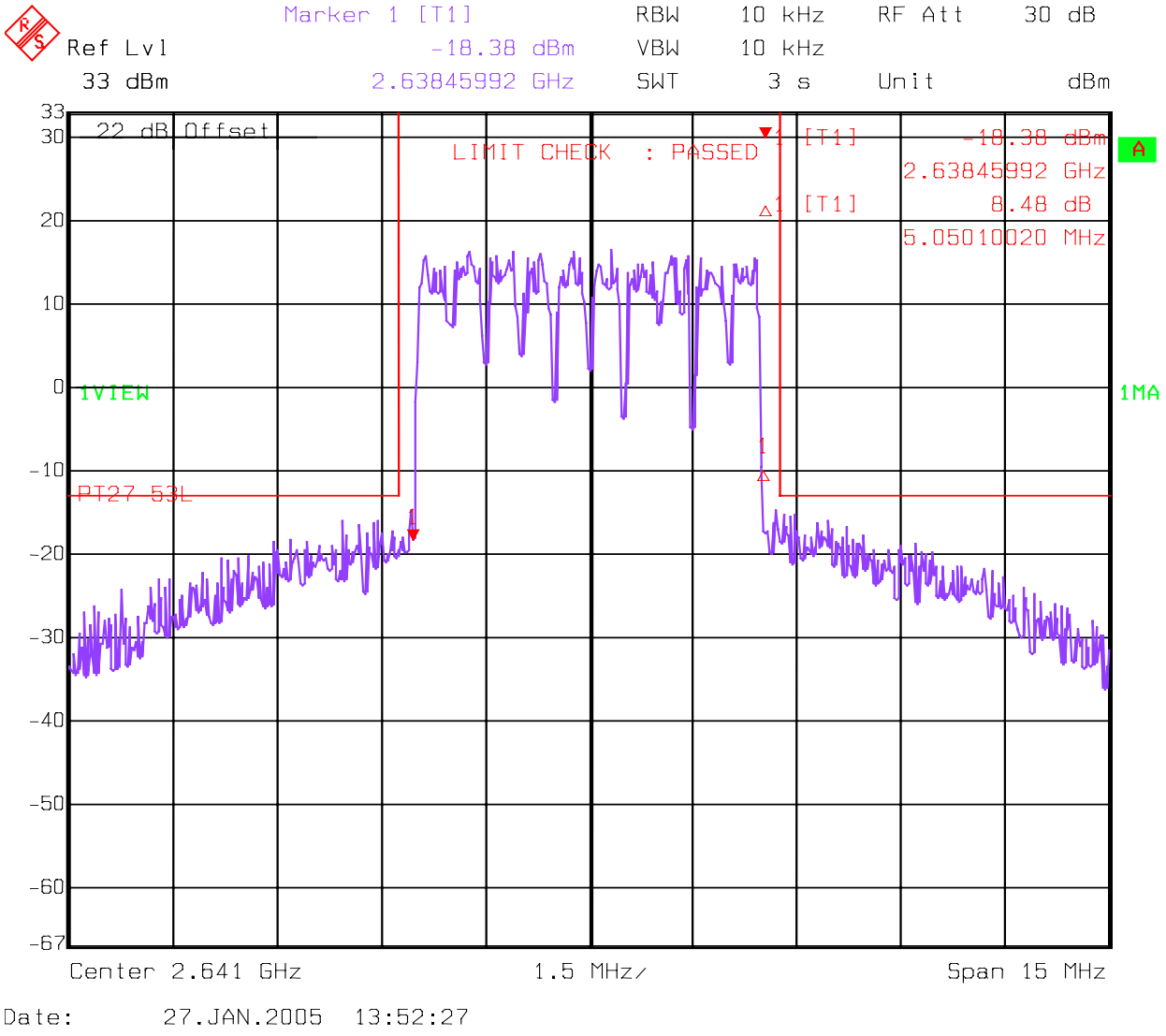
Test Data – Occupied Bandwidth

2500-2600 MHz TTA Module

Center Channel



2600-2700 MHz TTA Module



Section 5. Spurious Emissions at Antenna Terminals

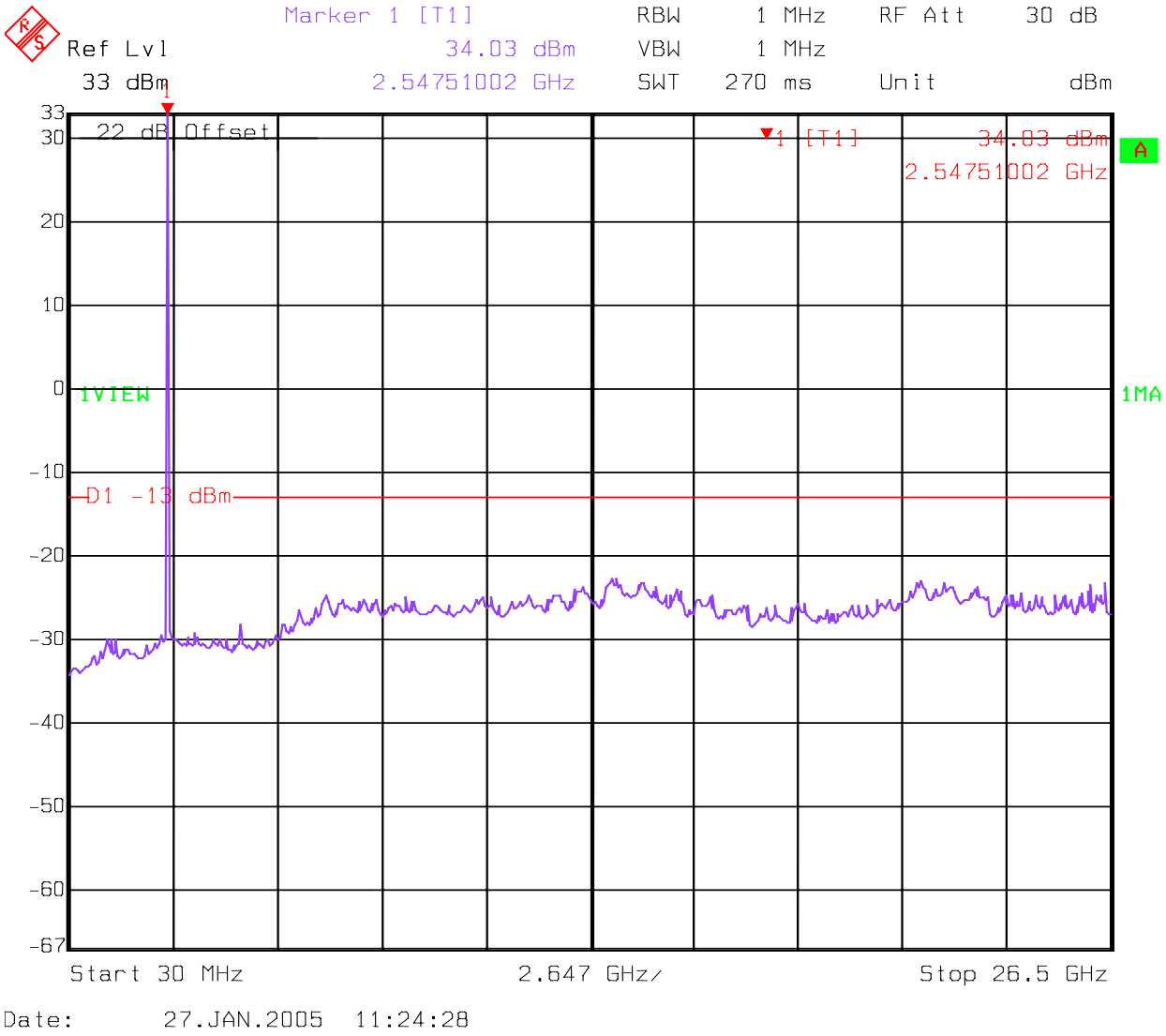
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 1/27/2005

Test Results: Complies

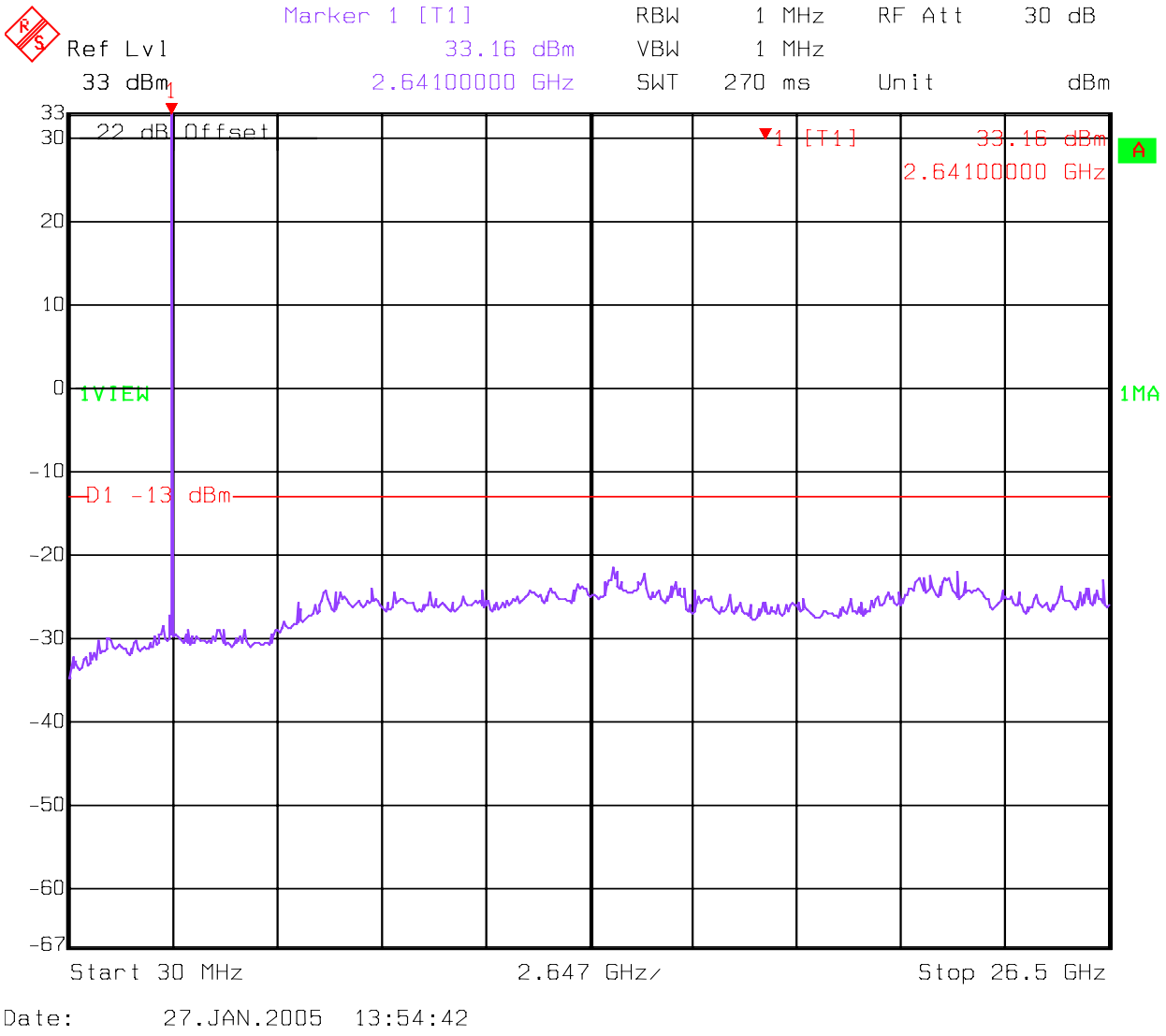
Measurement Data: See attached plots.

Test Data – Spurious Emissions at Antenna Terminals

2500-2600 MHz TTA Module



2600-2700 MHz TTA Module



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 12/2/2004

Test Results: Complies

Measurement Data: See attached table.

Test Data - Radiated Emissions

Nemko Dallas, Inc.

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

E.I.R.P SPURIOUS EMISSIONS

Page 1 of 1 Complete X
Job No.: 4L0519 Date: 12/2/04 Preliminary
Specification: 27.50 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2500-2686 MHz BTS
Configuration: TX 33 dBm into antenna
Sample No: 1
Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Peak VBW: 1 MHz Distance: 3 m

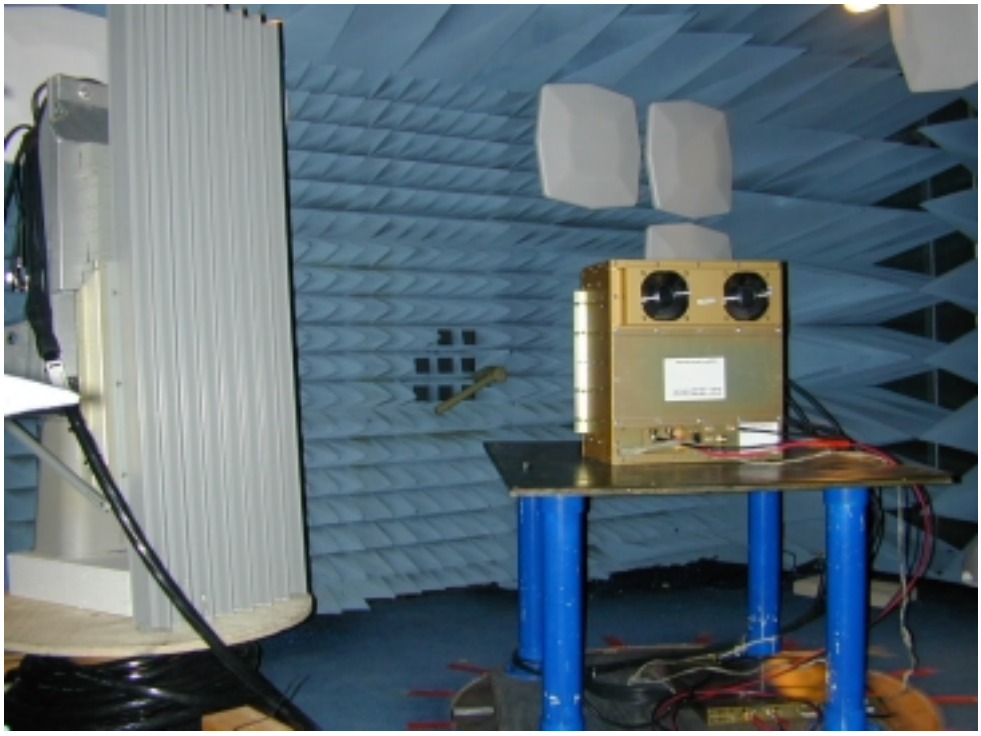
Test Equipment Used

Antenna: 1304 Directional Coupler:
Pre-Amp: 1016 Cable #1: 1484
Filter: 1482 Cable #2: 1485
Receiver: 1464 Cable #3:
Attenuator #1 Cable #4:
Attenuator #2: Mixer:
Additional equipment used:
Measurement Uncertainty: +/-1.7 dB

Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)	Limit (dBm)	EIRP (dBm)	EIRP (mW)	Polarity	Comments
										Tx 2641.25 MHz
5282.5	-55.2	40.6		32.0	11.2	-13.0	-35.4	0.0003	V	
7923.75	-65.8	40.4		34.0	11.6	-13.0	-47.8	0.0000	V	Noise floor
10565	-64.8	40.9		35.3	13.1	-13.0	-46.1	0.0000	V	Noise floor
13206.25	-65.0	44.8		33.5	13.3	-13.0	-40.4	0.0001	V	Noise floor
15847.5	-66.0	43.2		32.7	15.8	-13.0	-39.7	0.0001	V	Noise floor
5282.5	-55.7	36.3		32.0	9.1	-13.0	-42.4	0.0001	H	
7923.75	-65.8	39.8		34.0	9.4	-13.0	-50.6	0.0000	H	Noise floor
10565	-64.8	43.4		35.3	11.0	-13.0	-45.8	0.0000	H	Noise floor
13206.25	-65.0	47.5		33.5	11.2	-13.0	-39.9	0.0001	H	Noise floor
15847.5	-66.0	44.0		32.7	13.6	-13.0	-41.1	0.0001	H	Noise floor
										Tx 2545.25 MHz
5090.5	-58.7	40.6		32.6	11.2	-13.0	-39.5	0.0001	V	
7635.75	-67.0	40.4		32.6	11.6	-13.0	-47.6	0.0000	V	Noise floor
10181	-65.3	41.0		35.5	12.7	-13.0	-47.2	0.0000	V	Noise floor
12726.25	-61.5	44.5		34.7	13.8	-13.0	-37.8	0.0002	V	
15271.5	-67.2	46.5		32.6	13.5	-13.0	-39.8	0.0001	V	Noise floor
17816.75	-67.5	51.0		33.6	10.9	-13.0	-39.3	0.0001	V	Noise floor
5090.5	-56.0	36.3		32.6	9.1	-13.0	-43.3	0.0000	H	
7635.75	-67.0	39.8		32.6	9.4	-13.0	-50.4	0.0000	H	Noise floor
10181	-65.3	42.5		35.5	10.5	-13.0	-47.8	0.0000	H	Noise floor
12726.25	-61.2	47.5		34.7	11.7	-13.0	-36.7	0.0002	H	
15271.5	-67.2	47.1		32.6	11.4	-13.0	-41.3	0.0001	H	Noise floor
17816.75	-67.5	53.6		33.6	8.7	-13.0	-38.8	0.0001	H	Noise floor

The spectrum was searched from 30 MHz to the 10th harmonic of the carrier.

Photos – Radiated Emissions



Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE: 1/28/2005

Test Results: Complies

Measurement Data: See attached plots.

Test Equipment Used: 1036-1469-1474-1625-283-619

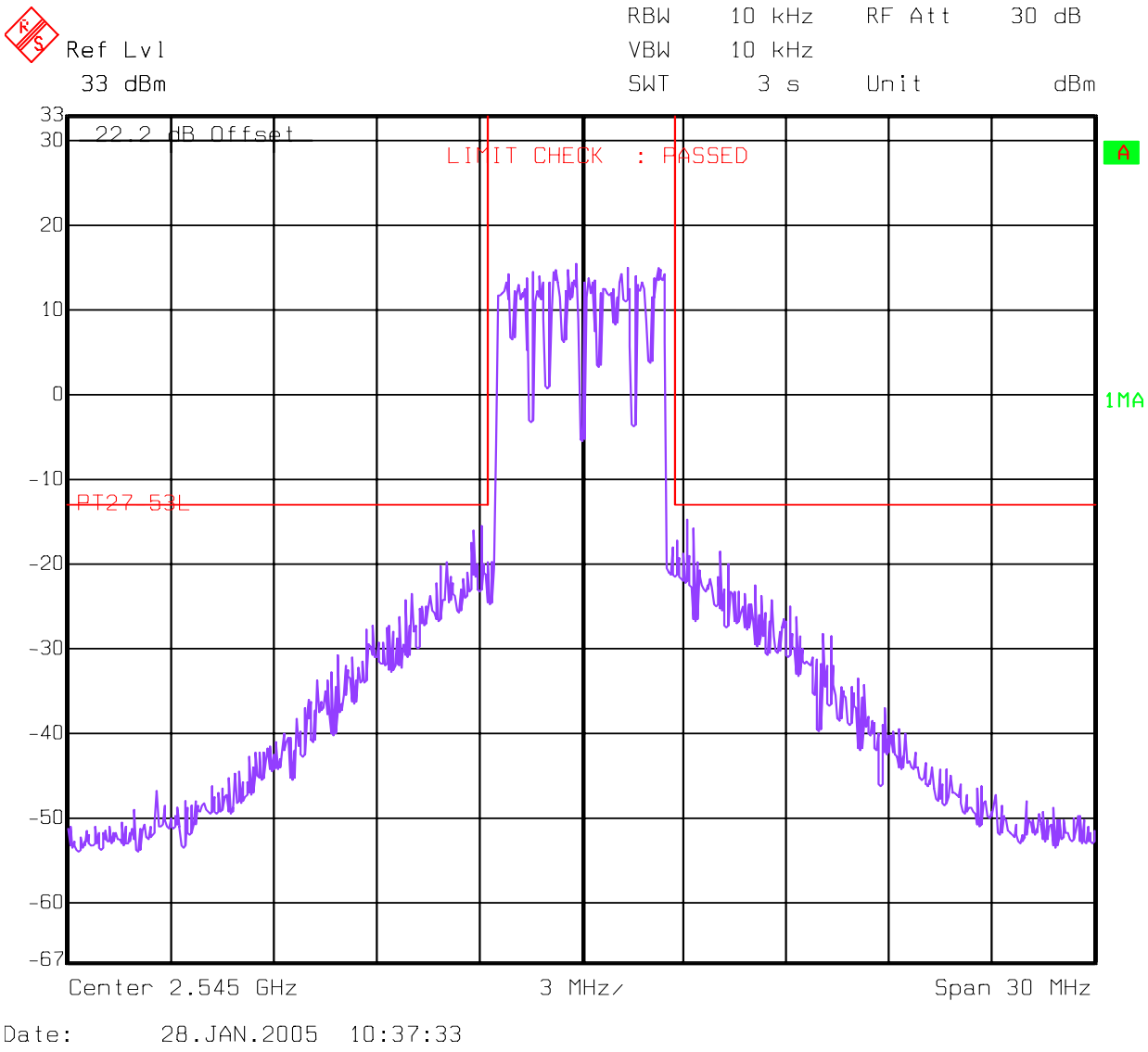
Standard Supply Voltage: 24 Vdc

Environmental Conditions: 20 °Celsius
50 % RH

Test Data – Frequency Stability

2500-2600 MHz Module

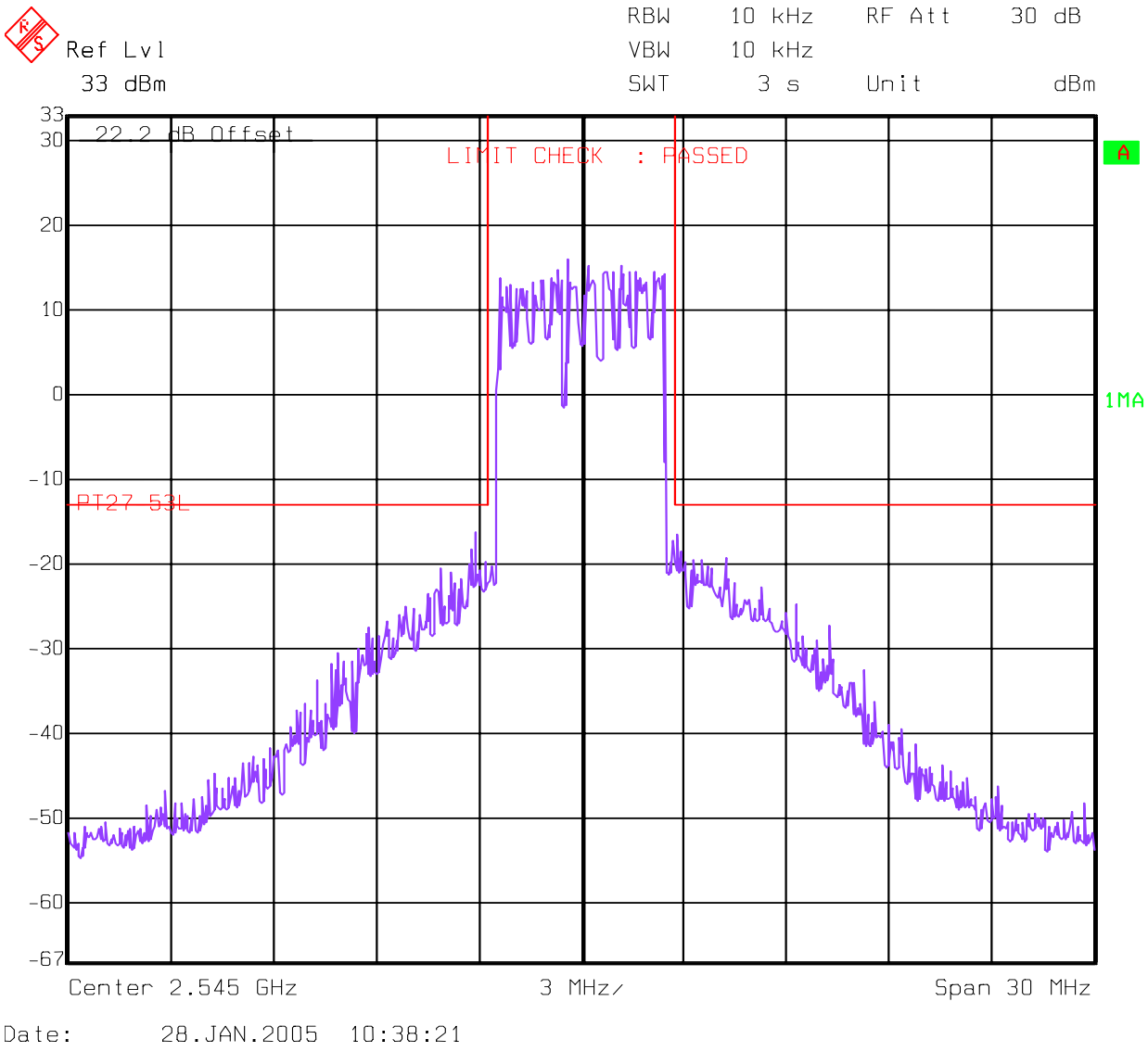
+20 C / 27.6 Vdc



Test Data – Frequency Stability

2500-2600 MHz Module

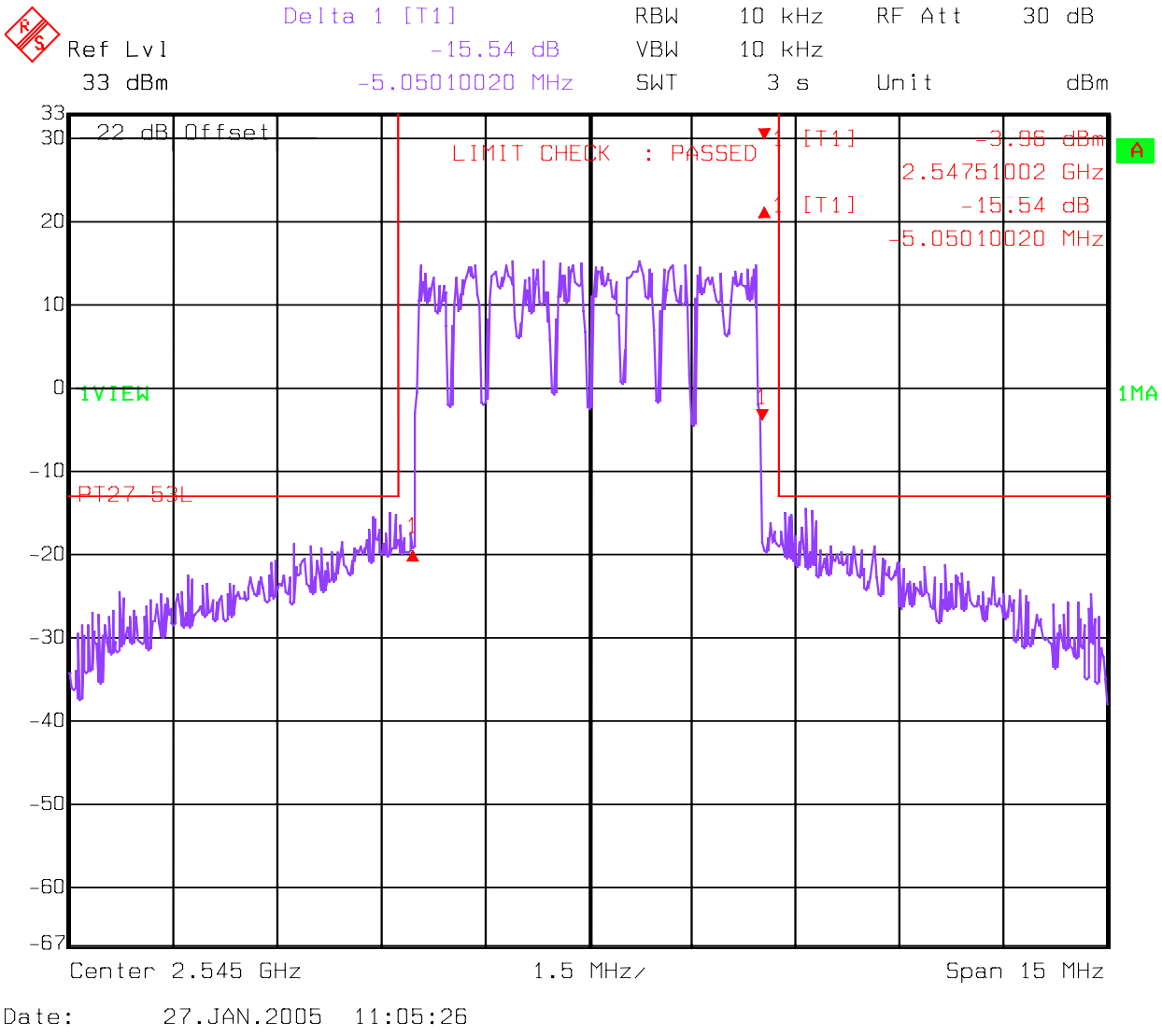
+20 C/ 20.4 Vdc



Test Data – Frequency Stability

2500-2600 MHz Module

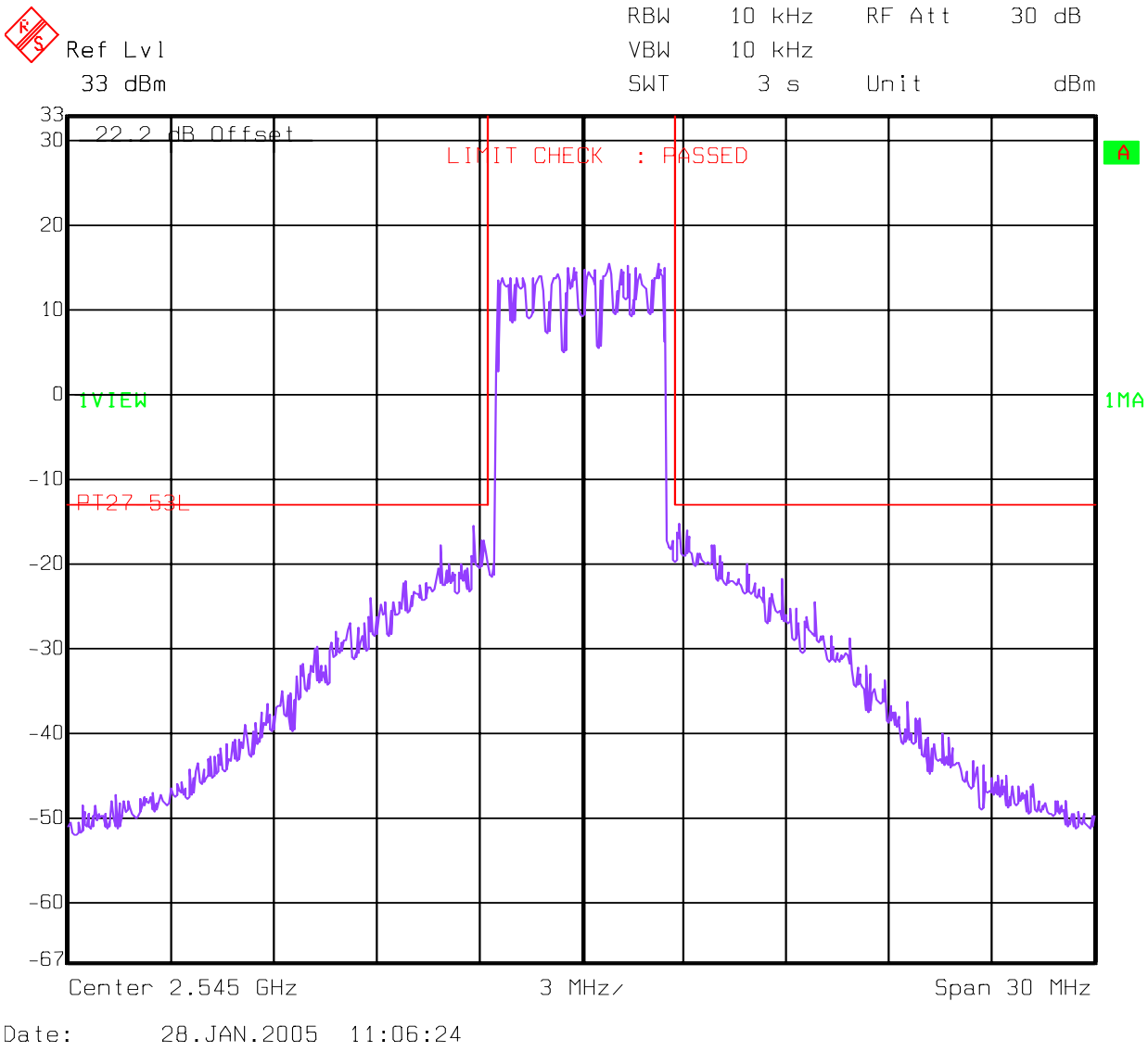
+20 C / 24 Vdc



Test Data – Frequency Stability

2500-2600 MHz Module

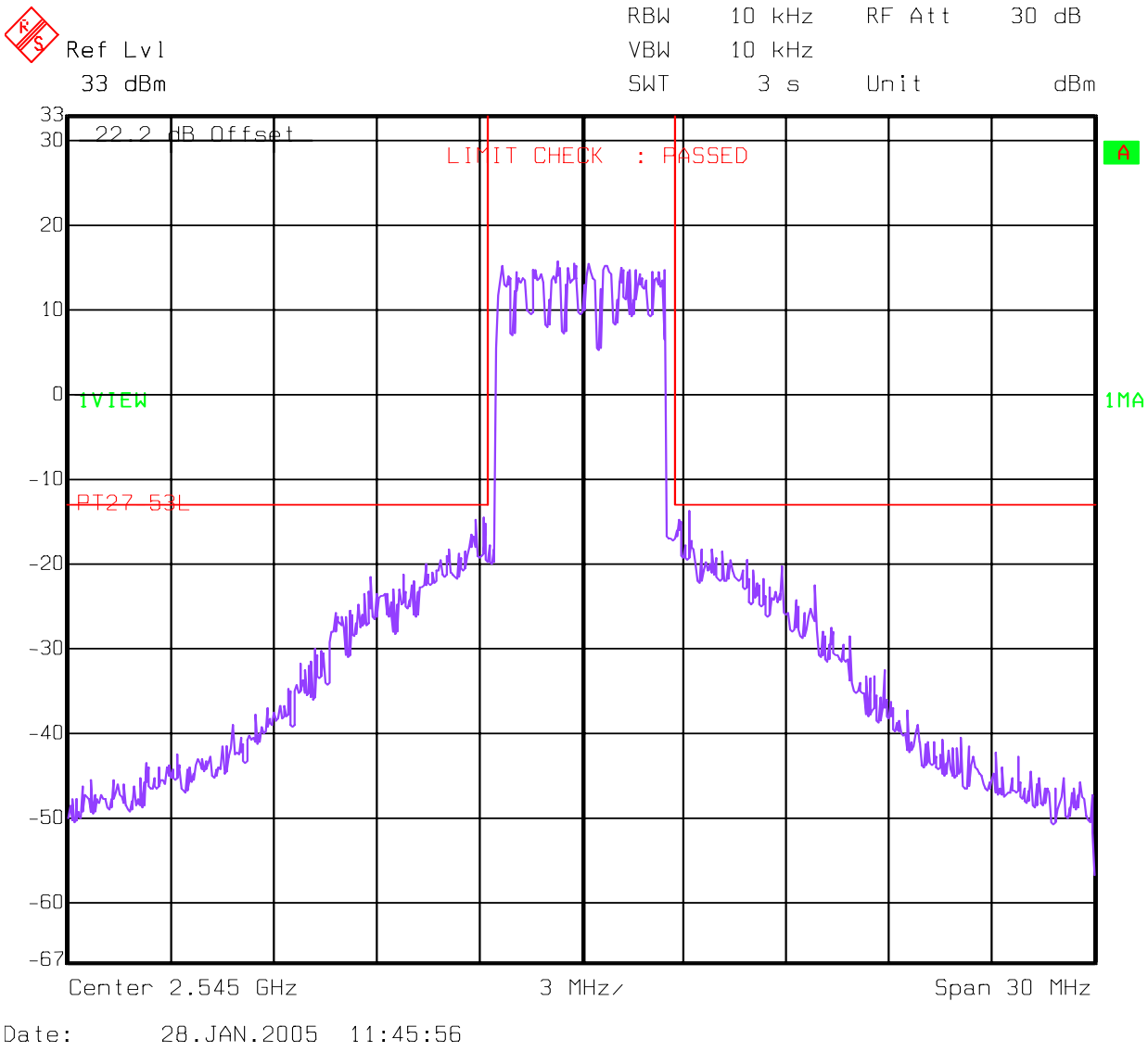
+50 C



Test Data – Frequency Stability

2500-2600 MHz Module

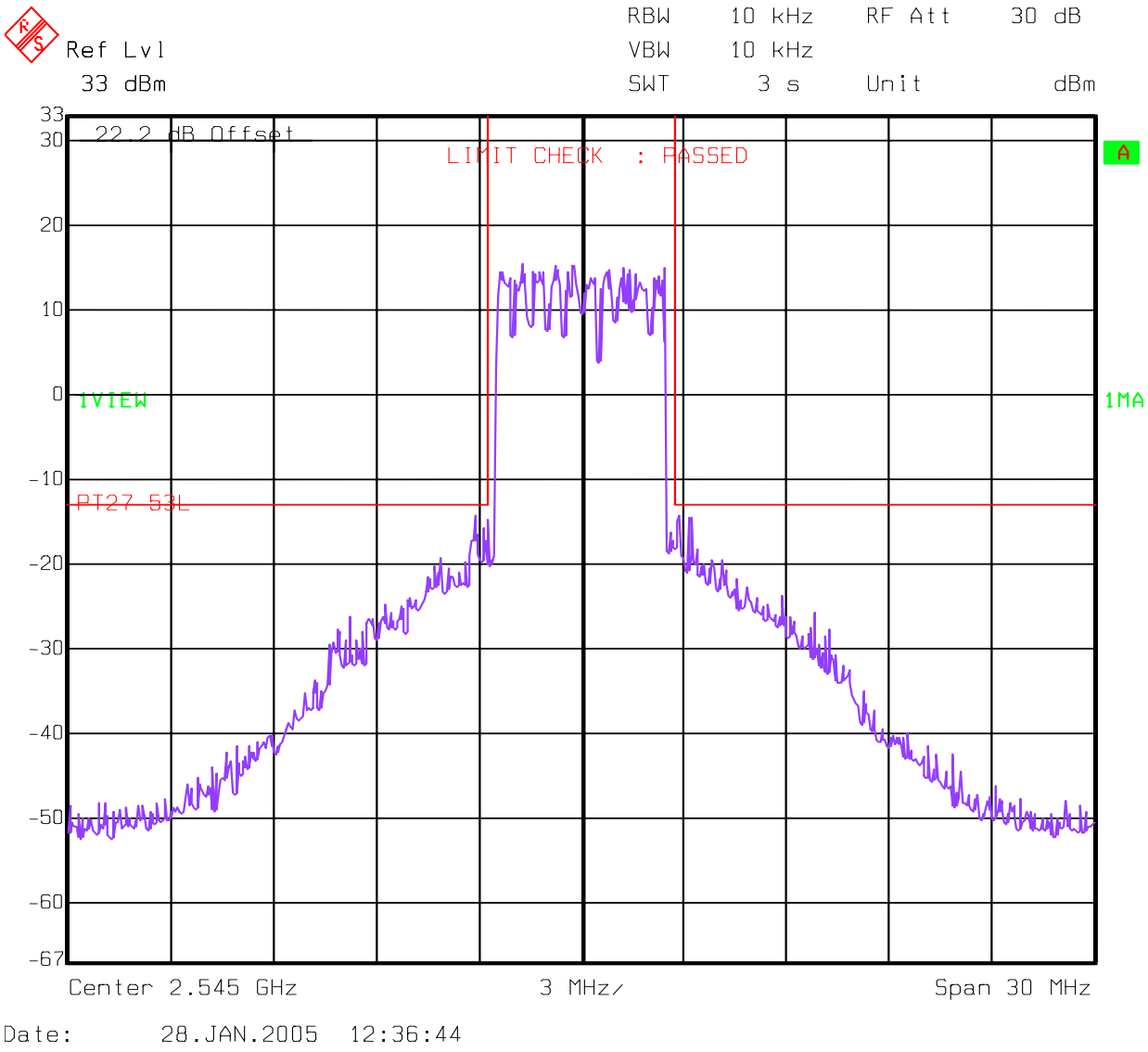
+40 C



Test Data – Frequency Stability

2500-2600 MHz Module

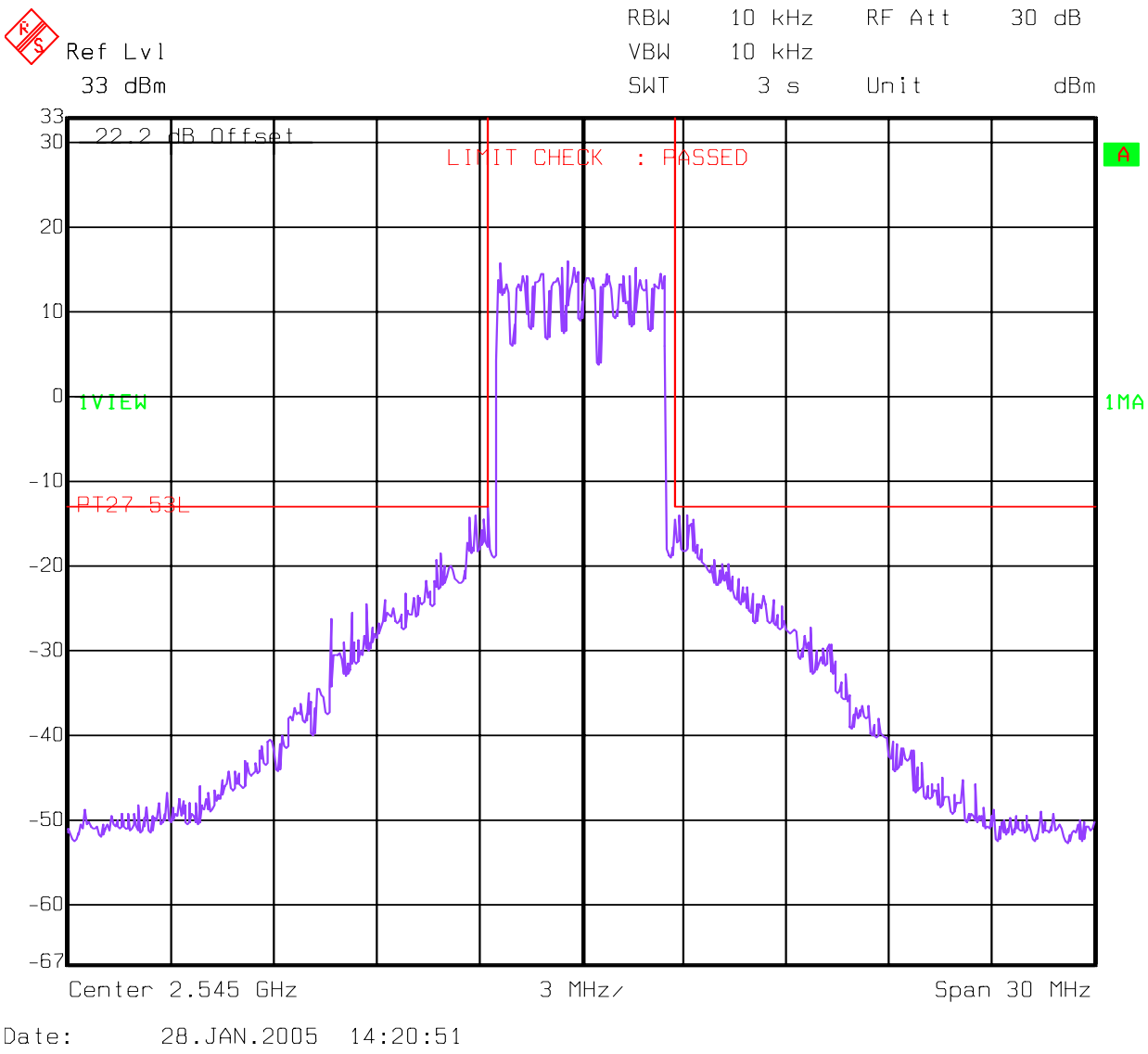
+30 C



Test Data – Frequency Stability

2500-2600 MHz Module

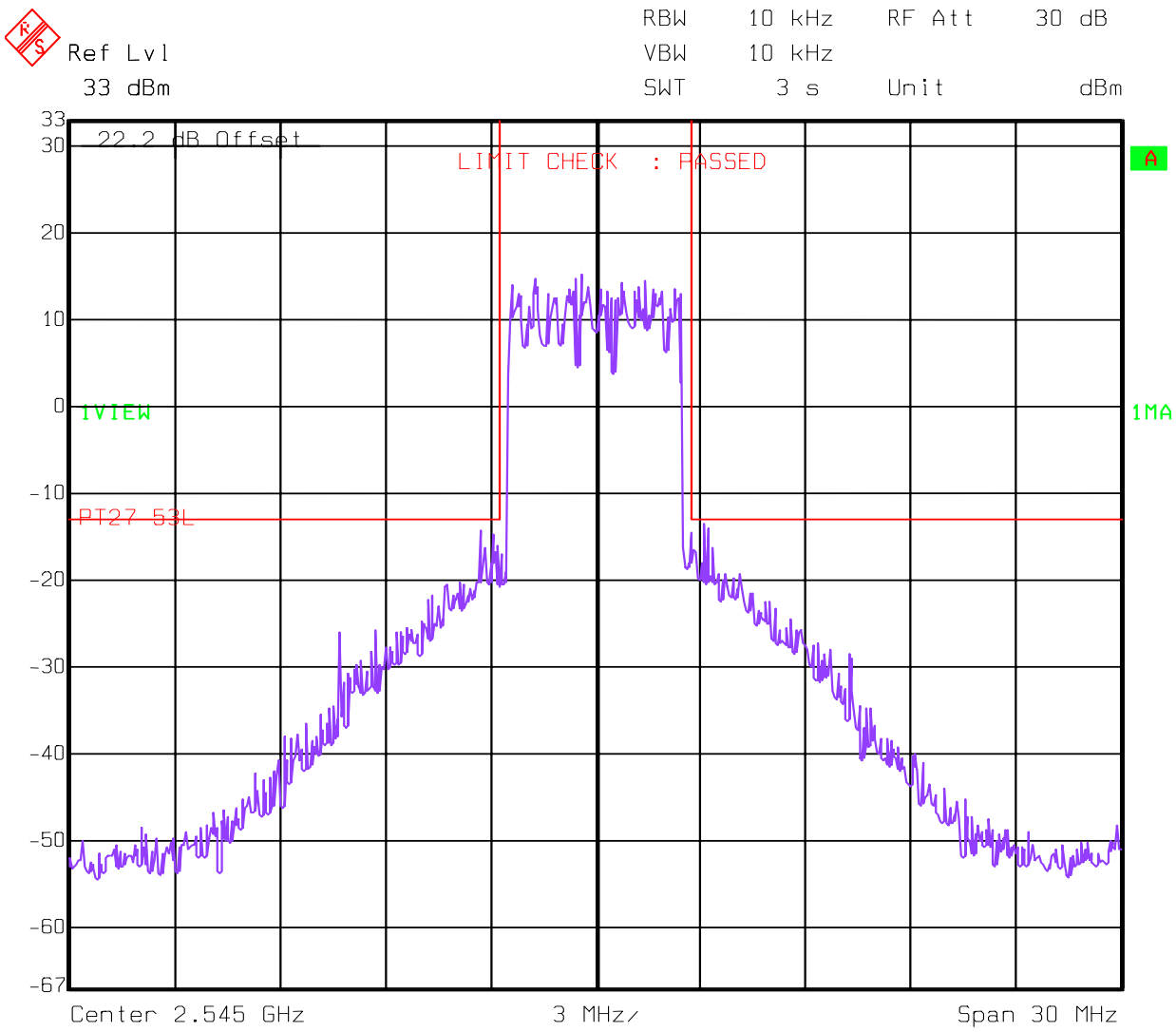
10 C



Test Data – Frequency Stability

2500-2600 MHz Module

0 C

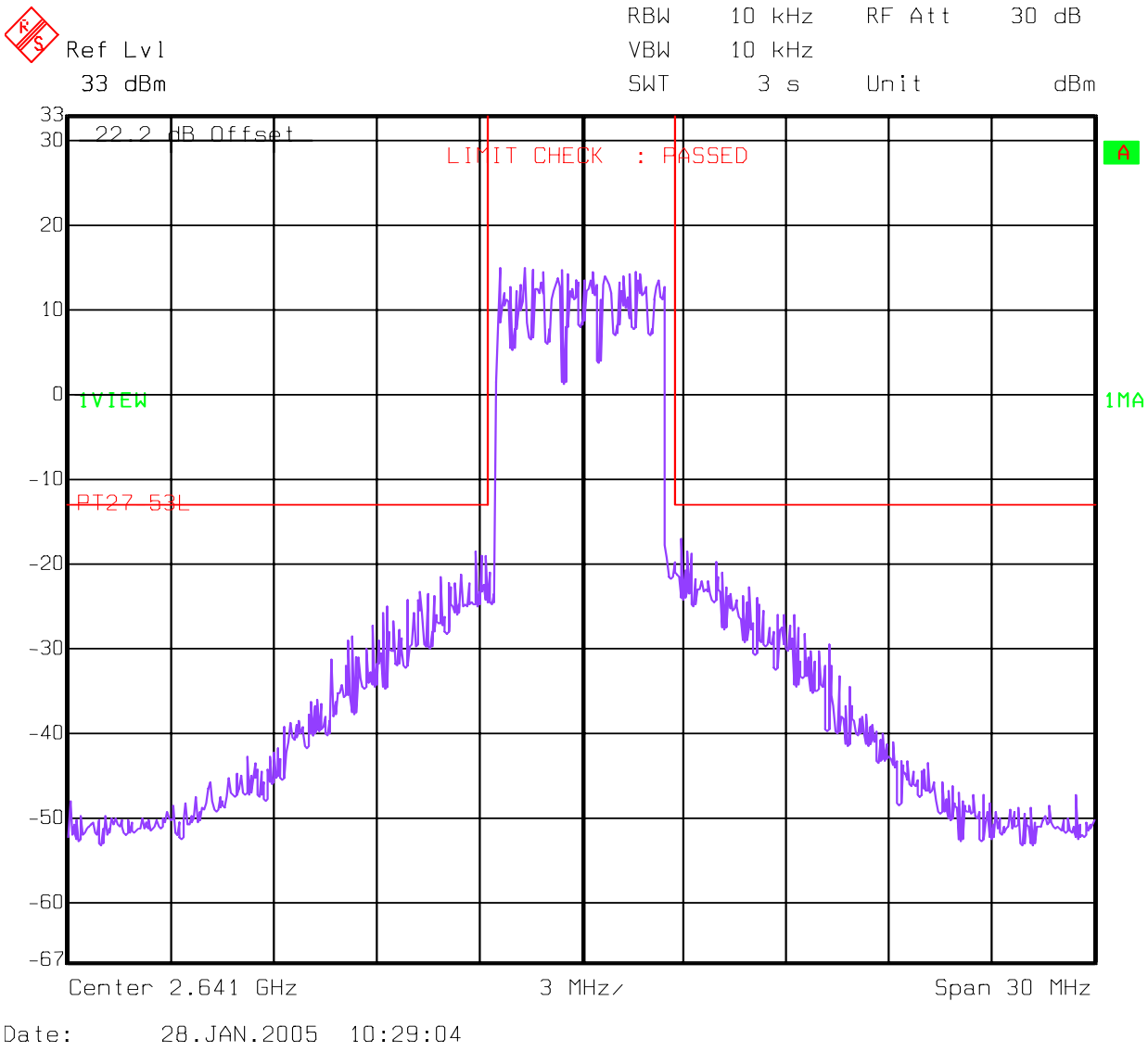


Note: The BTS ceases operation at 0°C

Test Data – Frequency Stability

2600-2700 MHz Module

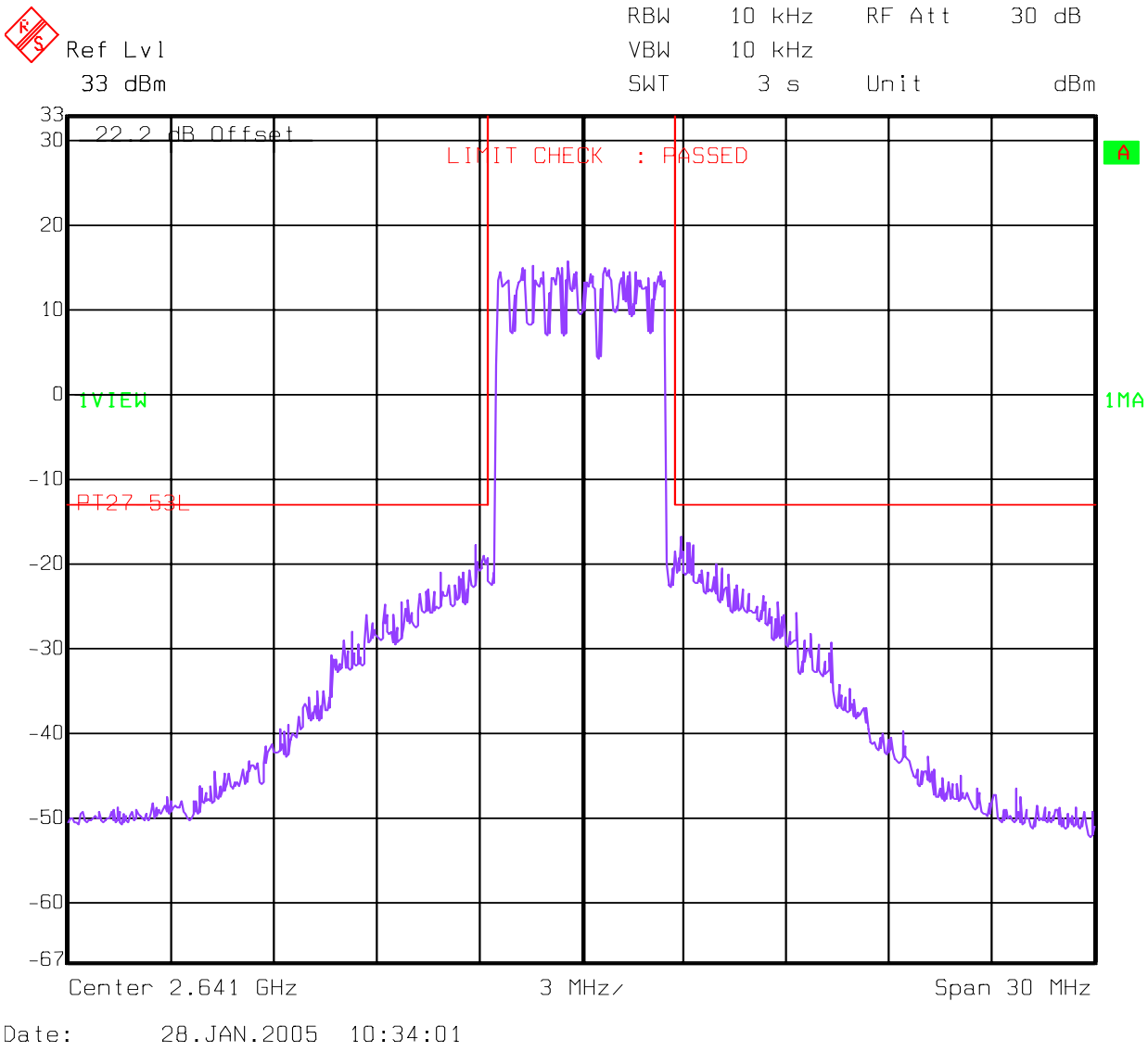
+20 C / 27.6 Vdc



Test Data – Frequency Stability

2600-2700 MHz Module

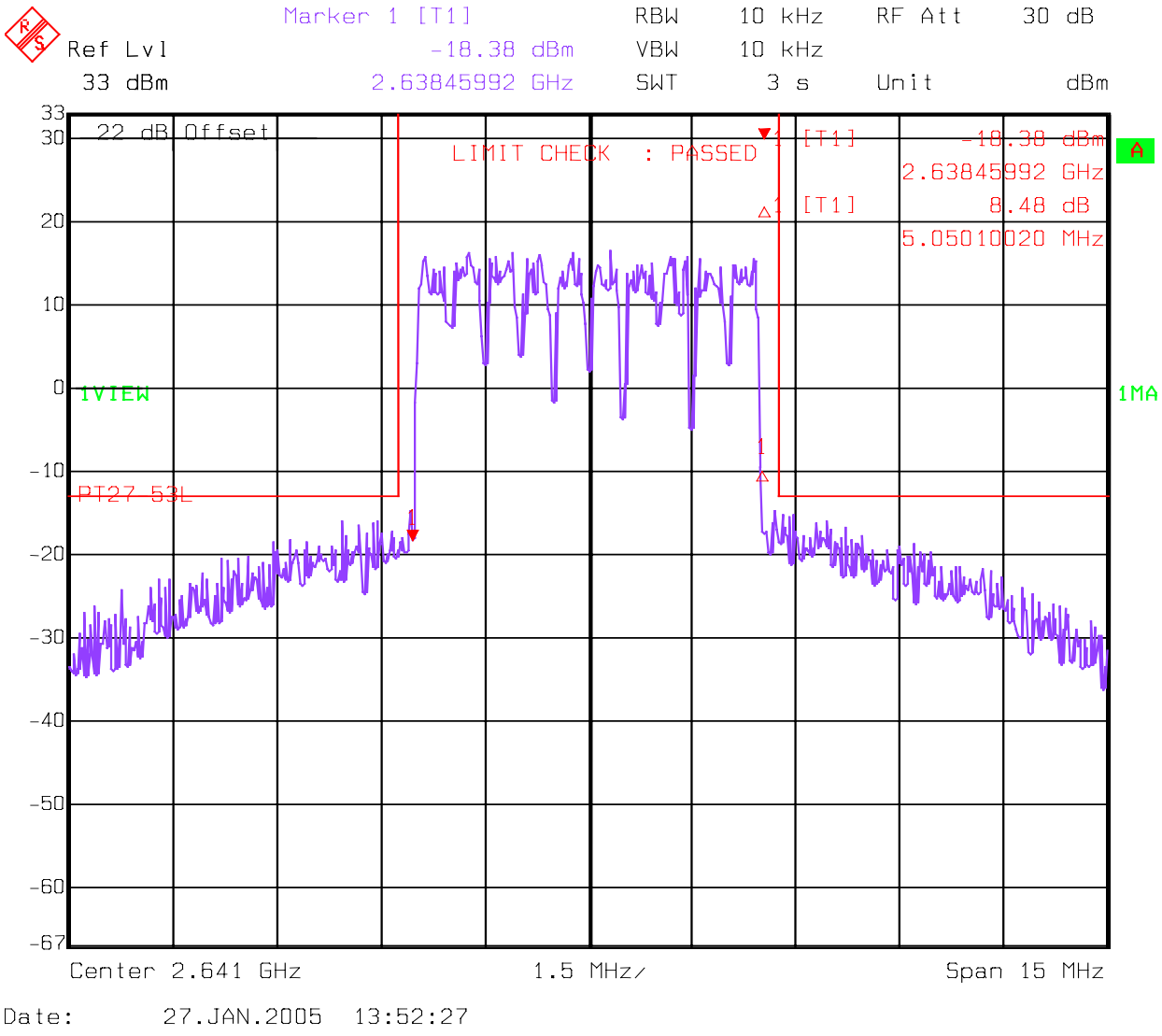
+20 C / 20.4 Vdc



Test Data – Frequency Stability

2600-2700 MHz Module

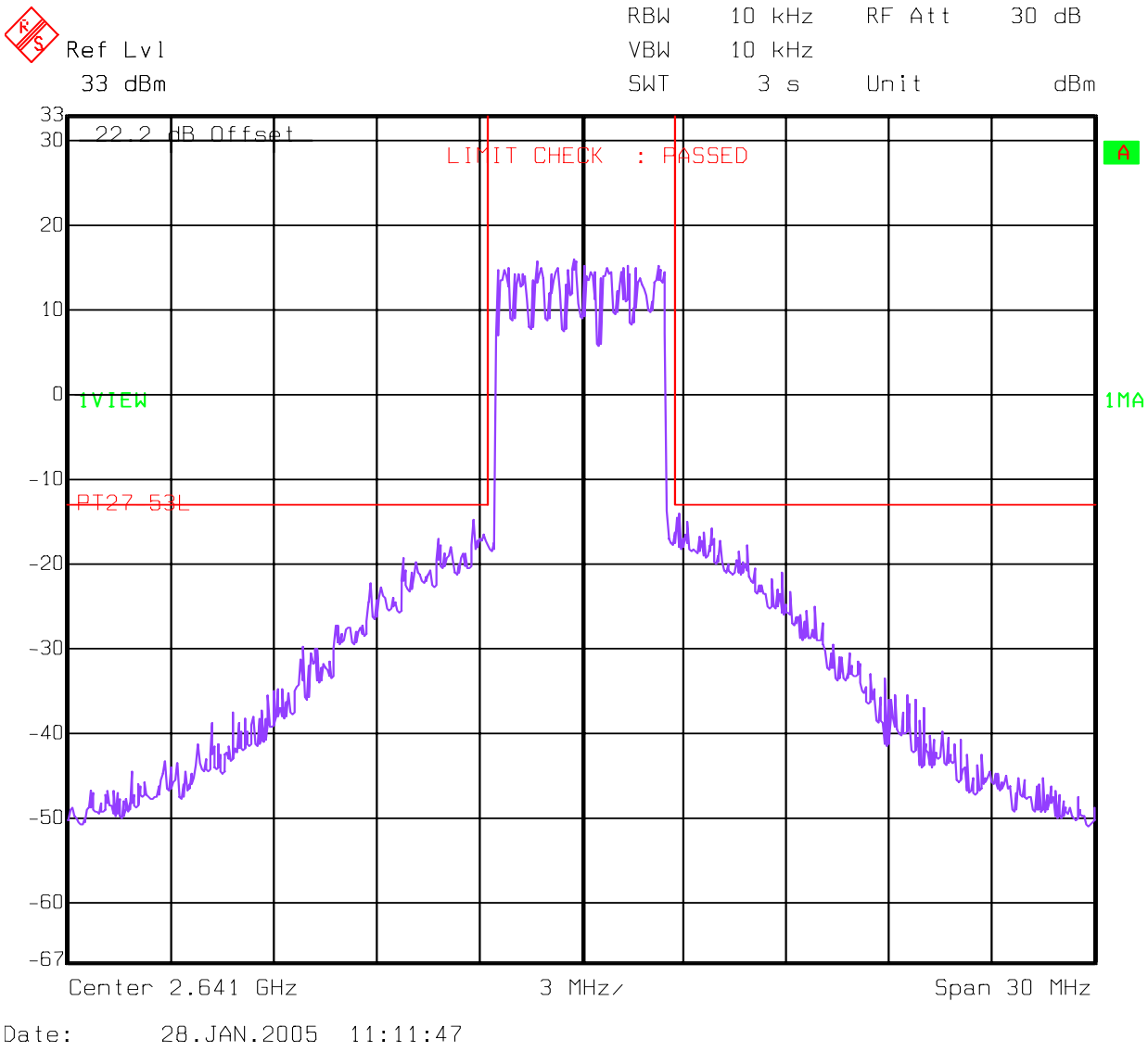
20 C / 24 Vdc



Test Data – Frequency Stability

2600-2700 MHz Module

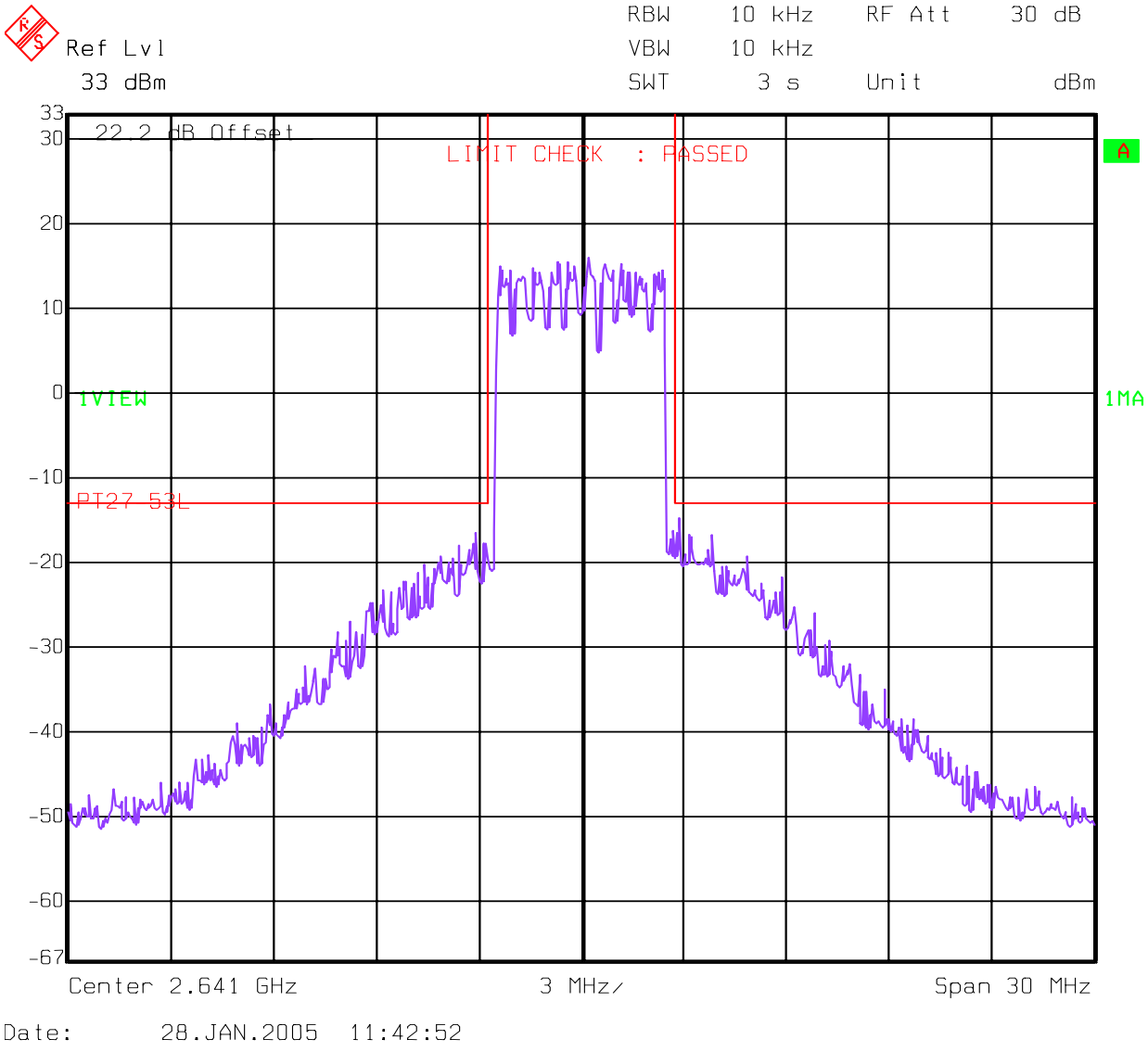
+50 C



Test Data – Frequency Stability

2600-2700 MHz Module

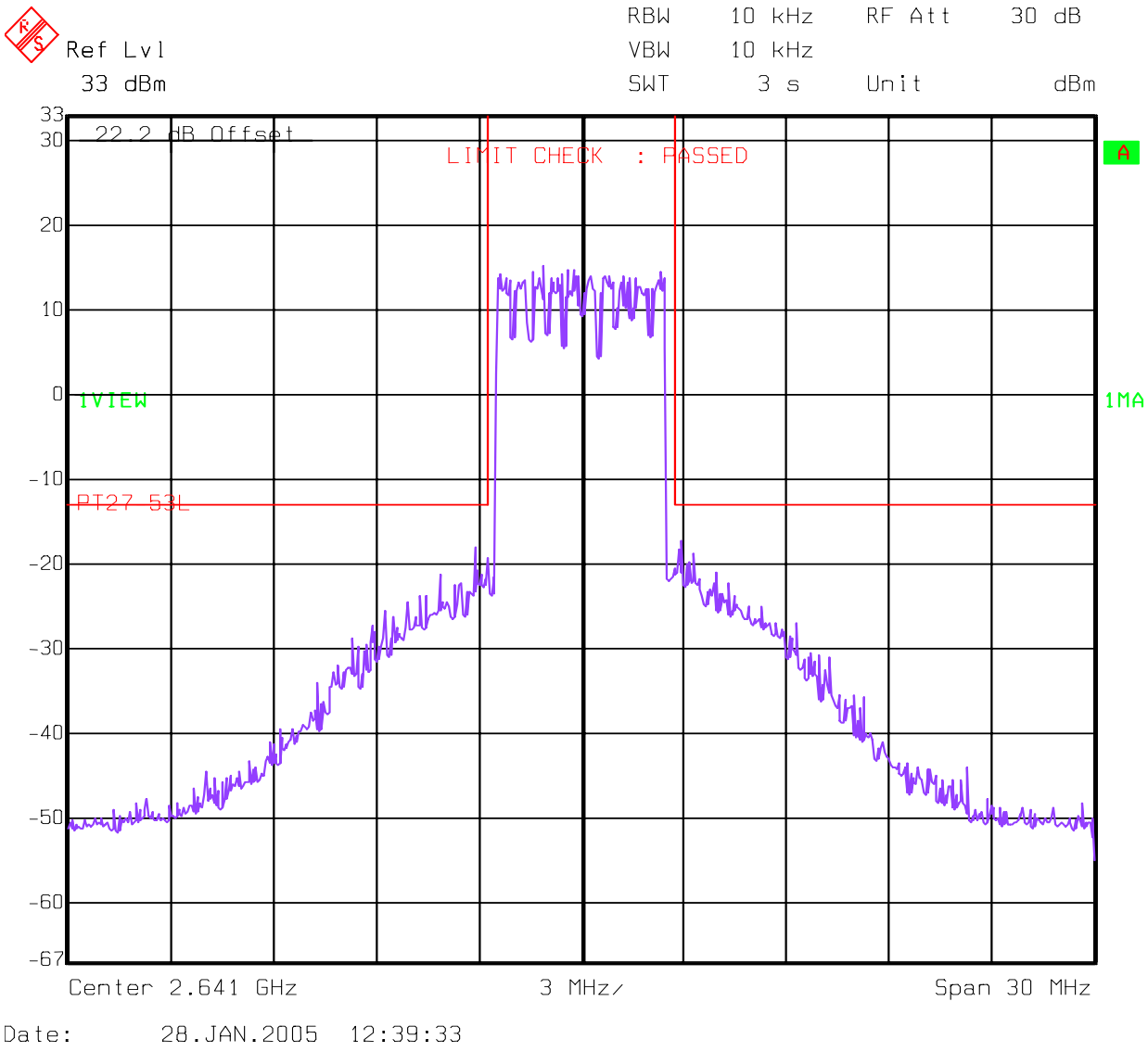
+40 C



Test Data – Frequency Stability

2600-2700 MHz Module

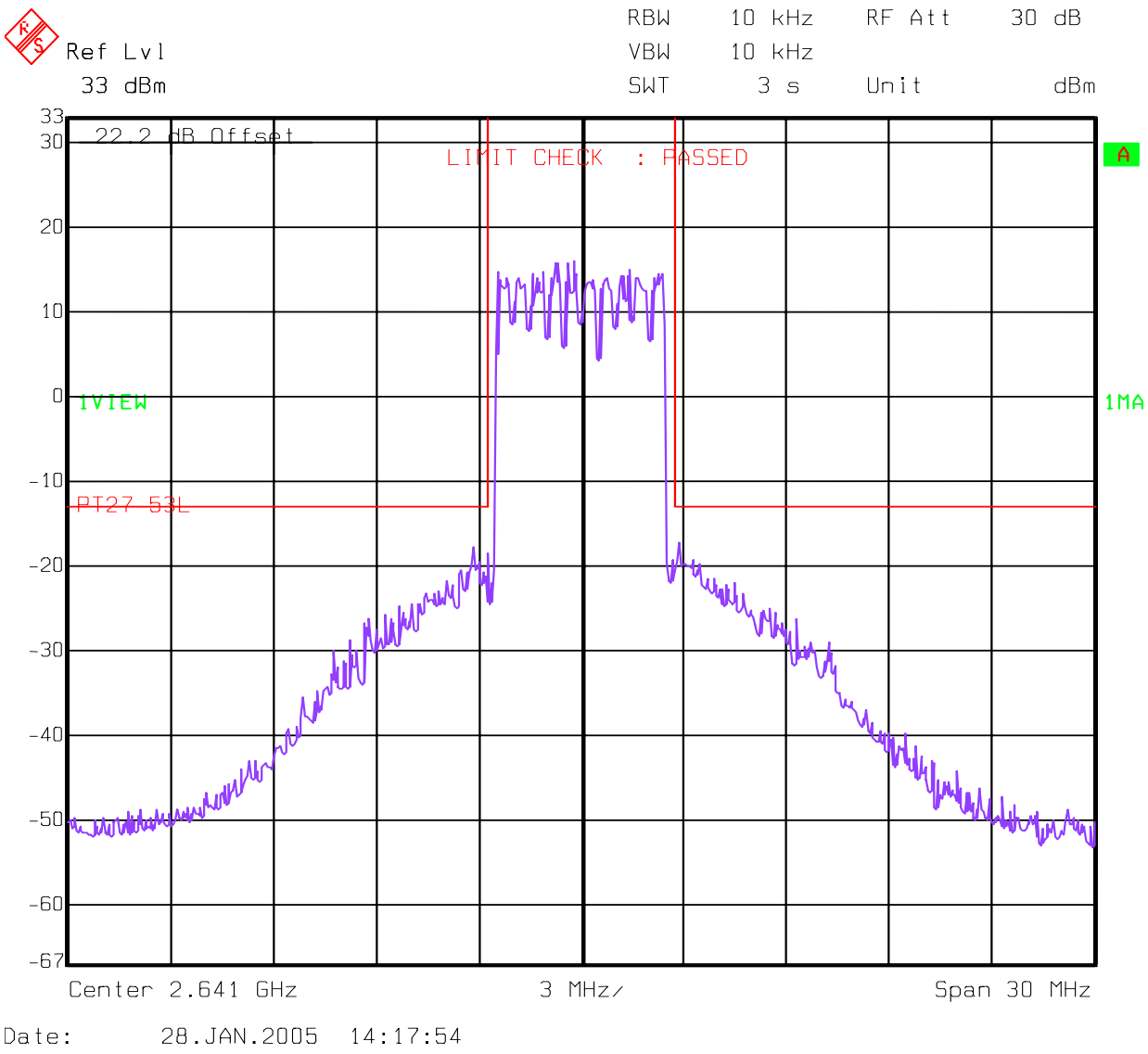
+30 C



Test Data – Frequency Stability

2600-2700 MHz Module

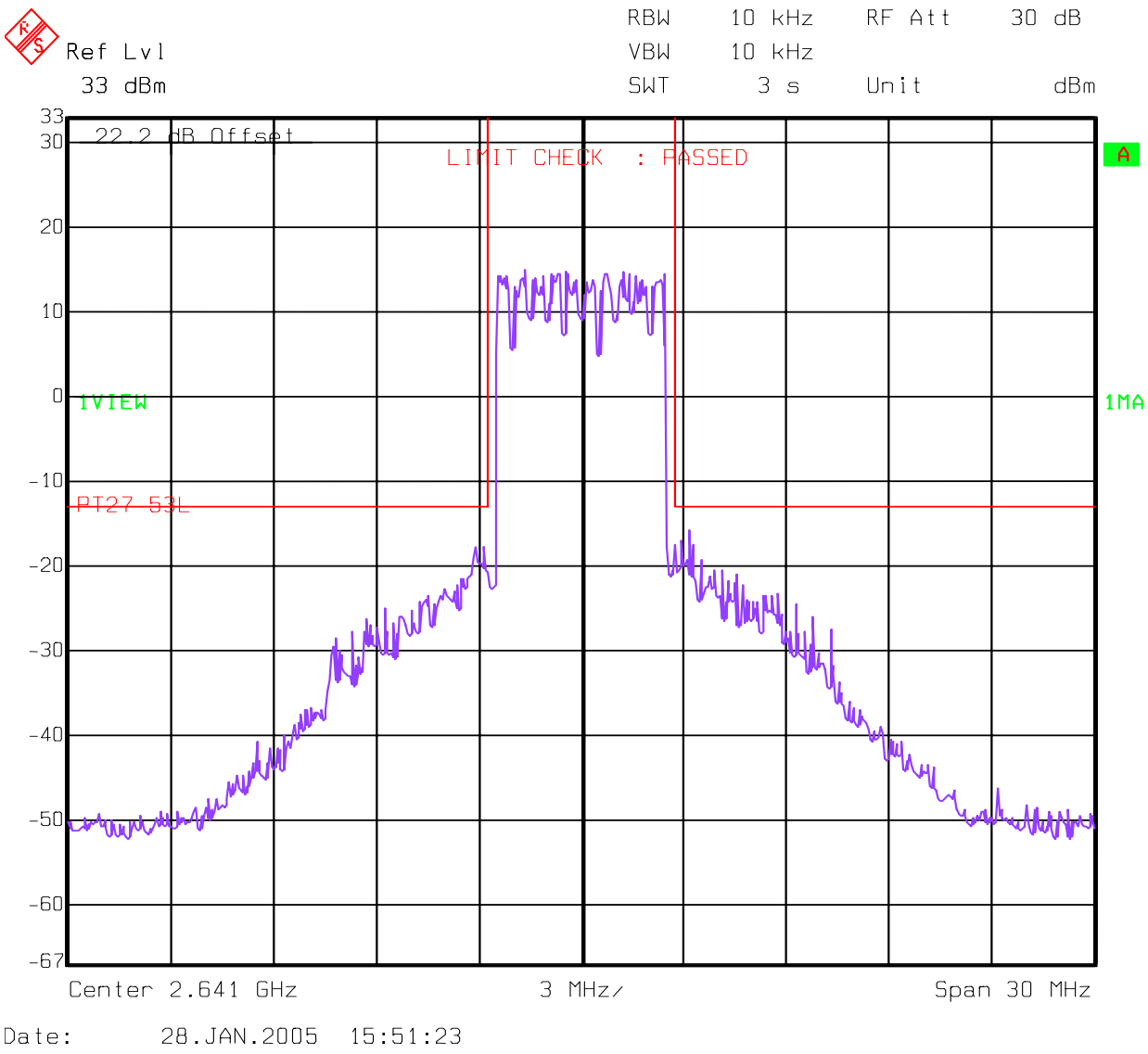
10 C



Test Data – Frequency Stability

2600-2700 MHz Module

0 C



Note: The BTS ceases operation at 0°C

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
619	THERMOMETER	FLUKE 51	4520028	09/16/04	09/16/05
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	04/22/03	04/21/04
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1474	20db Attenuator DC 18 Ghz	MCL Inc. BW-S20W2	NONE	CBU	N/A
1625	CABLE, 18 ft	MEGAPHASE 10311 1GVT4	N/A	08/02/04	08/02/05
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	11/12/04	11/12/05
1482	Band Pass Filter	K & L 11SH10-4000/T12000-0/0	2	Cal B4 Use	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	07/30/04	07/31/06
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	08/26/04	08/26/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	08/02/04	08/02/05
2071	Power Sensor	Agilent E9304A	MY41495174	03/12/04	03/12/05
2072	Power Meter	HP E4418B	GB39401848	03/12/04	03/12/05
760	Antenna biconical	Electro Metrics MFC-25	477	06/22/04	06/22/05
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	07/23/04	07/23/05
791	PREAMP, 25dB	ICC LNA25	398	11/12/04	11/12/05
1983	CABLE	KTL Site A OATS	N/A	03/11/04	03/11/05

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output	**PARA. NO.: 2.1046**

Method Of Measurement:

Antenna Conducted:
The peak power at antenna terminals is measured using a Spectrum Analyzer or Power Meter. Power output is measured with the maximum rated input level.

E.I.R.P.:
If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts
E = the maximum measured field strength in V/m
R = the measurement range (3 meters)
G = the numeric gain of the transmit antenna in relation to an isotropic radiator

NAME OF TEST: Occupied Bandwidth	**PARA. NO.: 2.1049**

Method Of Measurement:

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1% of the bandwidth of the transmitted signal. The resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform.

The appropriate bandwidth mask is applied to the output waveform to verify compliance.

NAME OF TEST: Spurious Emission at Antenna Terminals	**PARA. NO.: 2.1051**

Antenna Conducted:

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of 1 MHz for emissions above 1 GHz. Below 1 GHz the resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform.

The appropriate limit line is applied to the output waveform to verify compliance.

NAME OF TEST: Field Strength of Spurious Radiation PARA. NO.: 2.1053

Test Method: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic.

NAME OF TEST: Frequency Stability 2.1055

Method Of Measurement:

Frequency Stability With Voltage Variation:

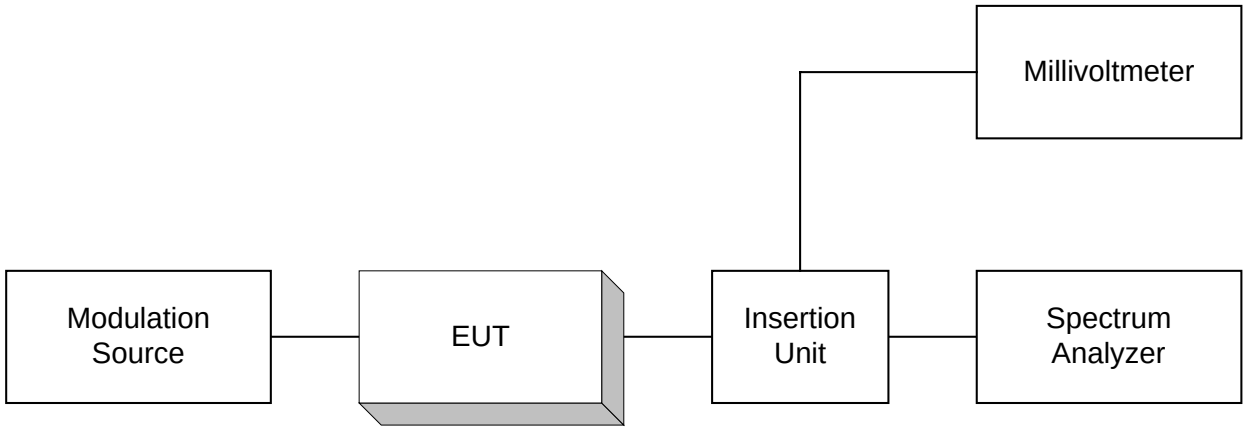
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation:

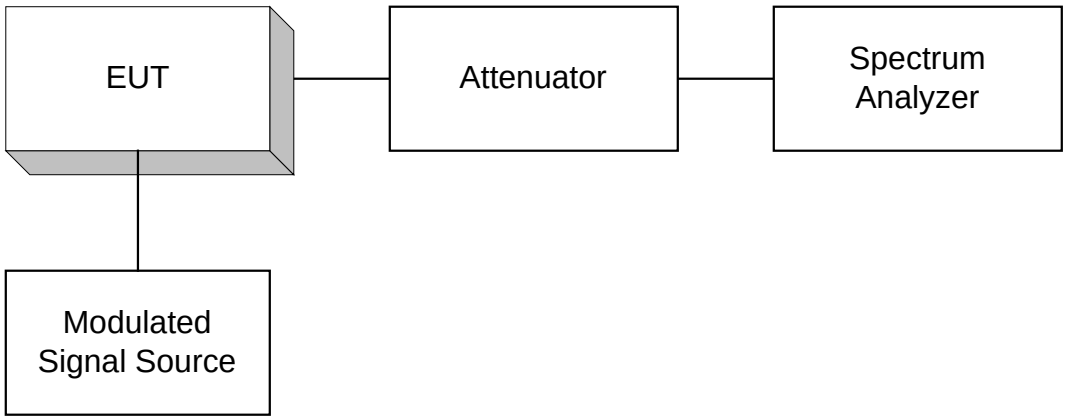
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

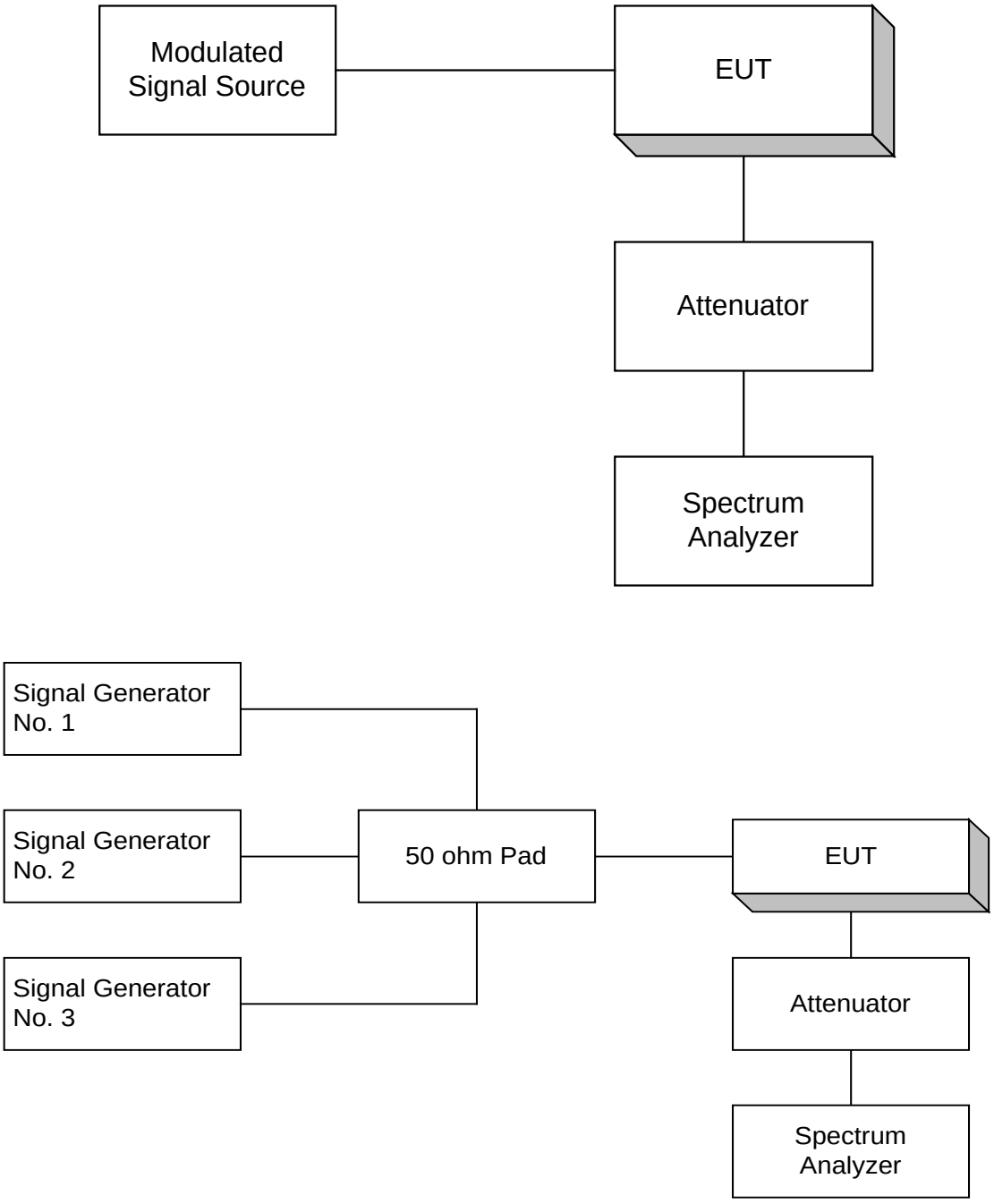
Para. No. 2.1046 - R.F. Power Output



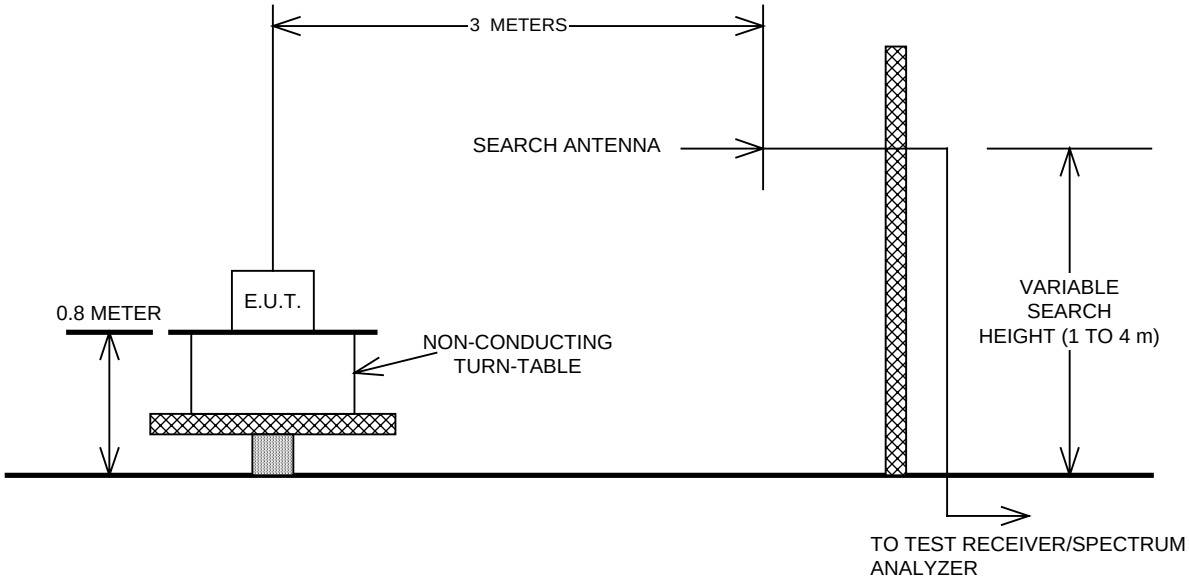
Para. No. 2.1049 - Occupied Bandwidth



Para. No. 2.1051 - Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Radiation



Para. No. 2.1055 - Frequency Stability