Nemko Test Report:	5L0359RUS1
Applicant:	Navini Networks 2240 Campbell Creek Blvd. Suite 110 Richardson, TX 75082
Equipment Under Test: (E.U.T.)	2.5-2.6 LMX E
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:	 Tom Tidwell, Frontline Manager
Date:	29 August, 2005

NVLAP LAB CODE: 100426-0

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Navini Networks

Model No.: 2.5-2.6 LMX E

Serial No.: Prototype

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	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

Section 2. General Equipment Specification

Input Power	120 Vac
Frequency Range	2500.5 to 2685.5 MHz

Type(s) of Modulation:

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

Emission Designator:	2M00F9W (Navini mode) 1M70F9W (802.16e mode)
Output Impedance:	50 ohms
RF Power Output:	30 dBm Average conducted 27 dBm Average conducted at band edges
Duty Cycle:	50% TDD
Selection Of Operating Frequency:	Not selectable by operator
Power Output Adjustment Capability:	Not selectable by operator

Description of EUT

Navini's Wireless Modem is a sleek end-user wireless terminal device used to give the user access to Navini's wireless broadband network.

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 18 August 2005

Test Results: Complies

Measurement Data: See Tables.

RF Power Output – Navini Mode

Freq	Power (dBm)	Power (Watts)
2500.5	27.10	0.513
2600	30.02	1.00
2685.5	27.10	0.513

RF Power Output – 802.16e mode

Freq	Power (dBm)	Power (Watts)
2500.5	26.90	0.490
2600	30.3	1.07
2685.5	27.10	0.531

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 18 August 2005

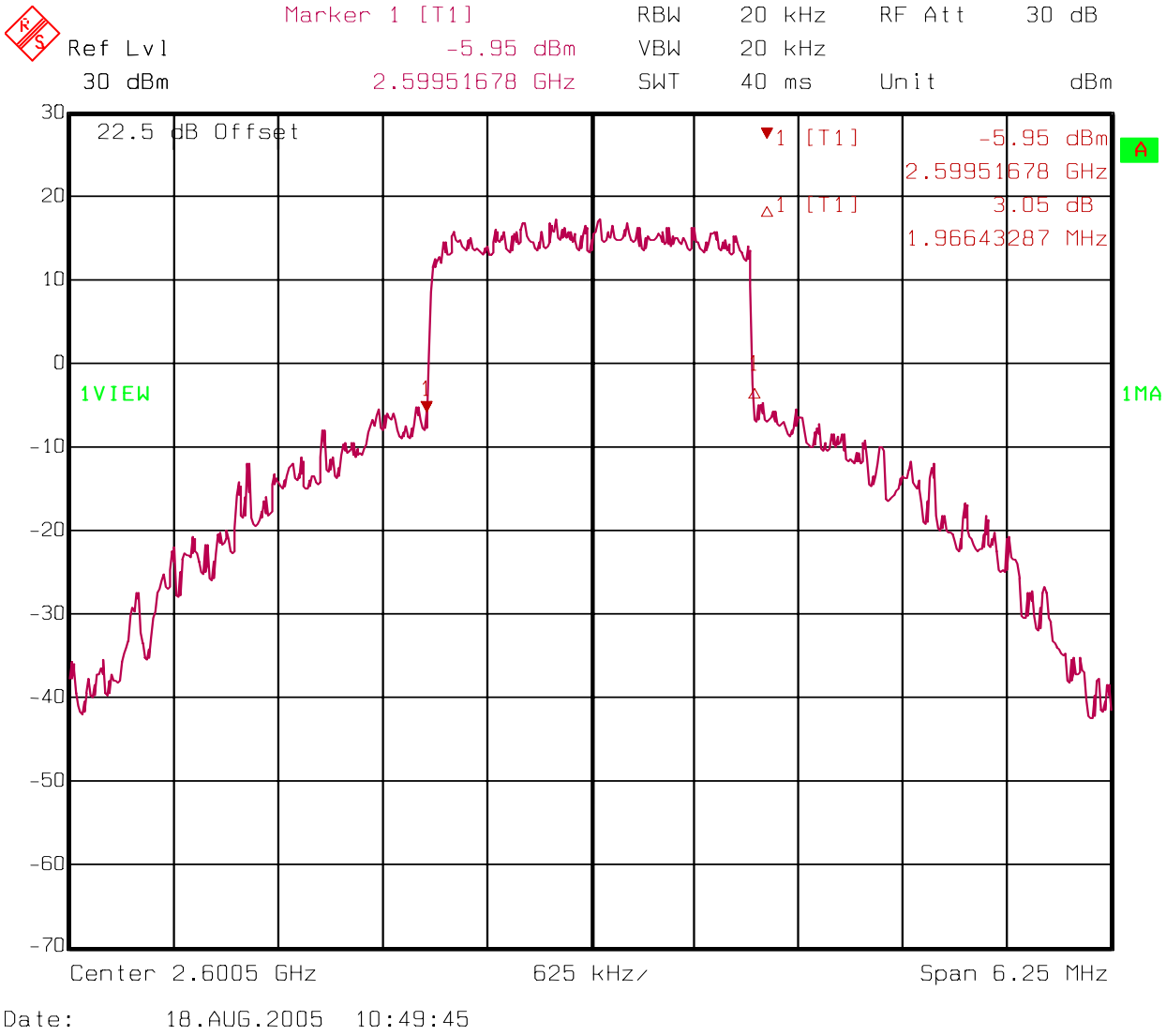
Test Results: Complies

Measurement Data: See attached plots.

Test Equipment Used: 1036-1472-1629

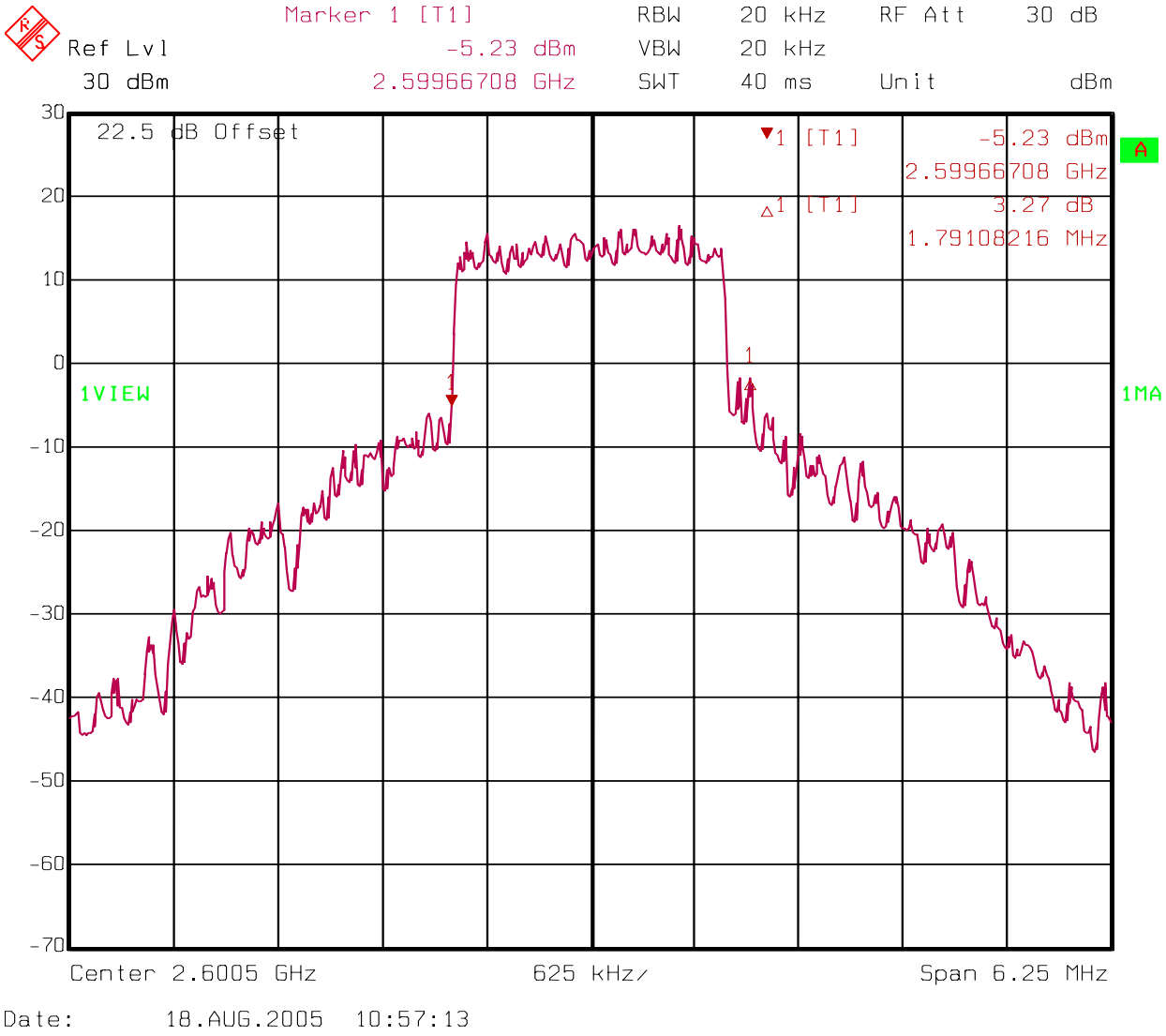
Test Conditions: 22^{O}C 45% RH

Test Data – Occupied Bandwidth



Navini mode

Test Data – Occupied Bandwidth



802.16e mode

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 18 August 2005

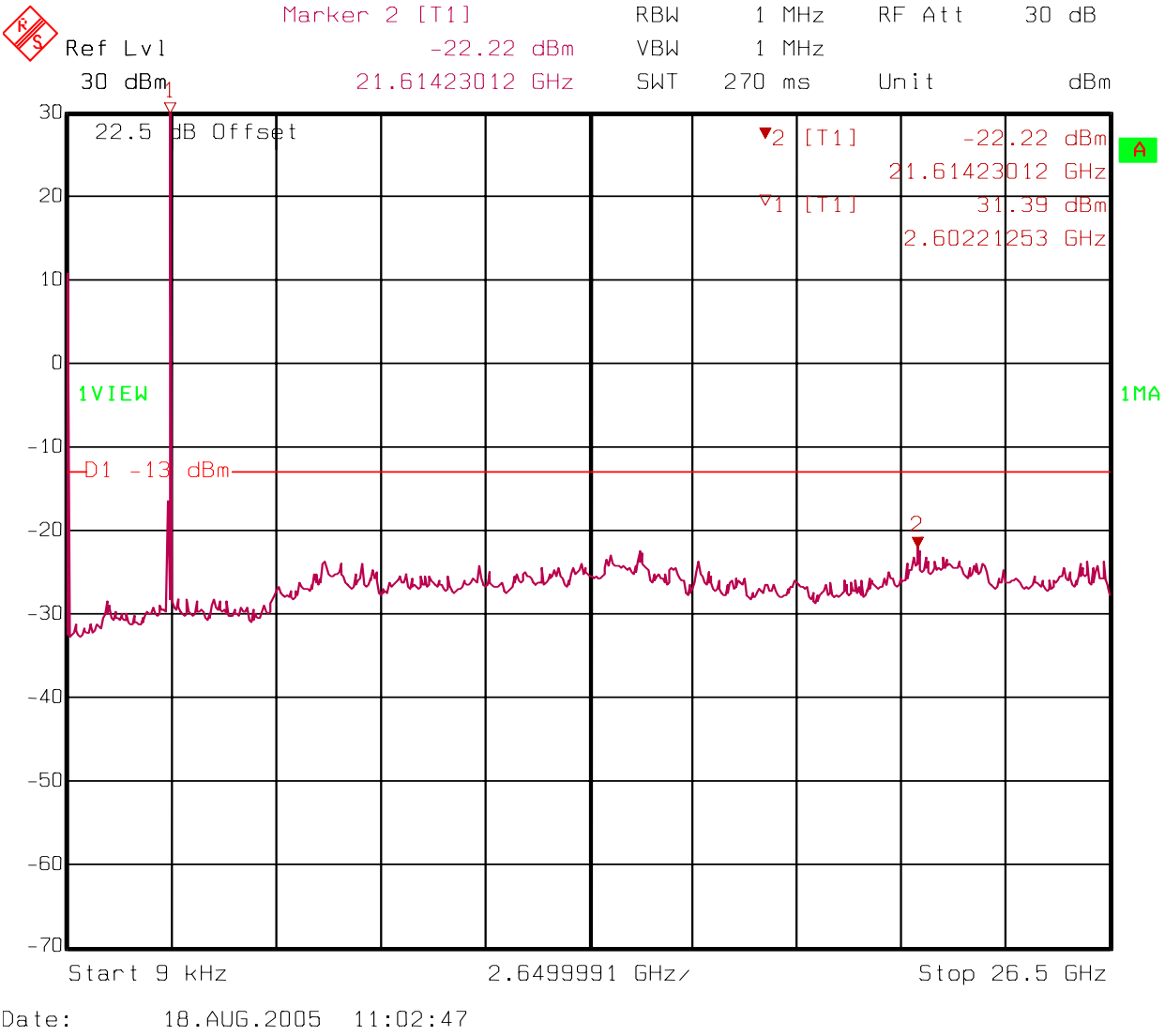
Test Results: Complies

Measurement Data: See attached plots.

Test Equipment Used: 1036-1472-1629

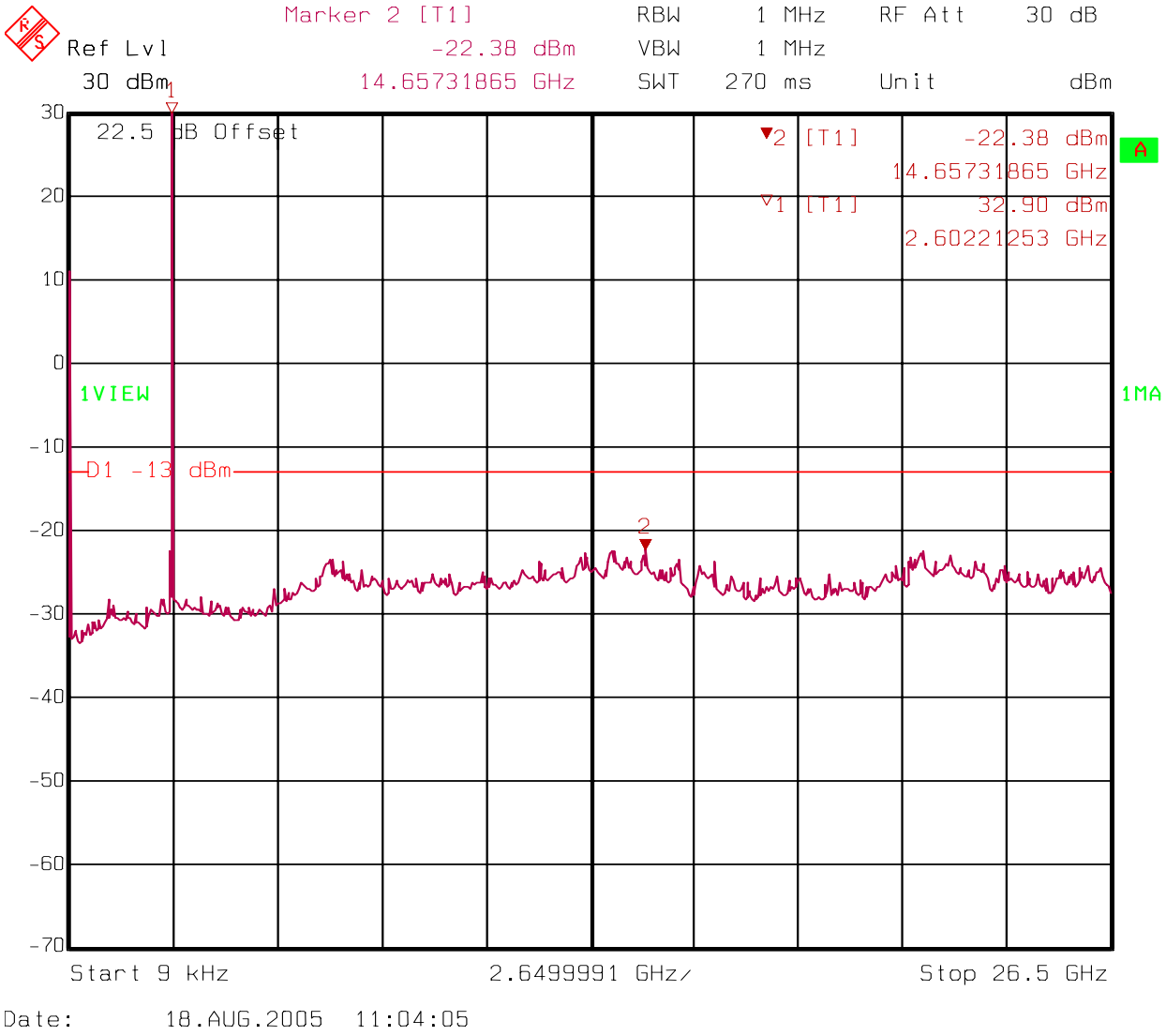
Test Conditions: 22^{O}C 45% RH

Test Data – Spurious Emissions at Antenna Terminals



Navini mode

Test Data – Spurious Emissions at Antenna Terminals



802.16e mode

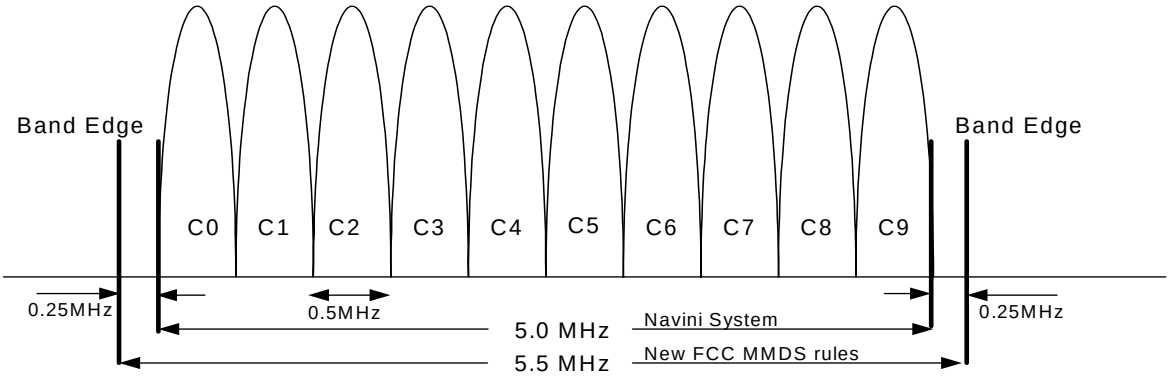
Test Data – Spurious Emissions at Antenna Terminals - Emissions Mask

Explanation of Mask Testing Method

The Navini networks system is comprised of a BTS which occupies 5 MHz of spectrum, a CPE which occupies 2MHz, and a PCMCIA card which occupies 1 MHz. Since the channels are spaced at 5.5MHz that leaves .25 MHz of guard band on both the upper and lower edges of the Channel for the BTS.

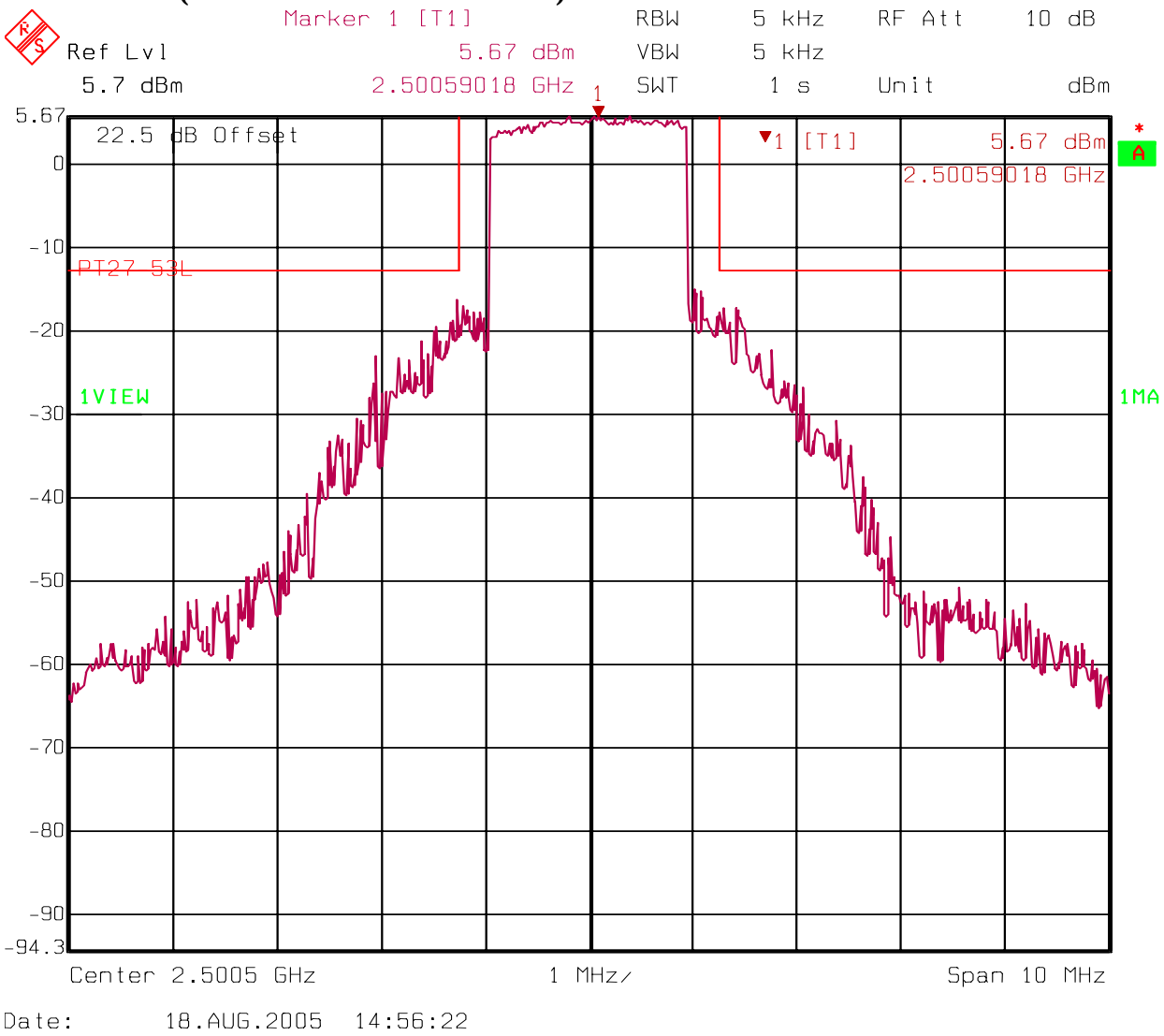
Within the 5 MHz of spectrum which the BTS occupies we have ten 500 KHz carriers (please see figure below). Of these ten carriers the CPE will use only 4 carriers.

When the CPE occupies carriers C0,C1 ,C2 , and C3 or carriers C6, C7, C8, and C9 the power at the antenna port is 27 dBm avg. To show compliance the mask is reduced from 5.5 MHz wide to 2.5 MHz wide. By placing the signal in the center of this mask we are able to show compliance to both the upper and lower edges of the channel. If however the CPE occupies carriers C2, C3, C4, and C5 or carriers C4, C5, C6, and C7 then the power at the antenna port is increased to 30dBm avg. In this case the mask is increased to 4.5 MHz. In doing so we shall show compliance to both the upper and lower edges of the Channel with a 1.25Mhz guard band at both edges.



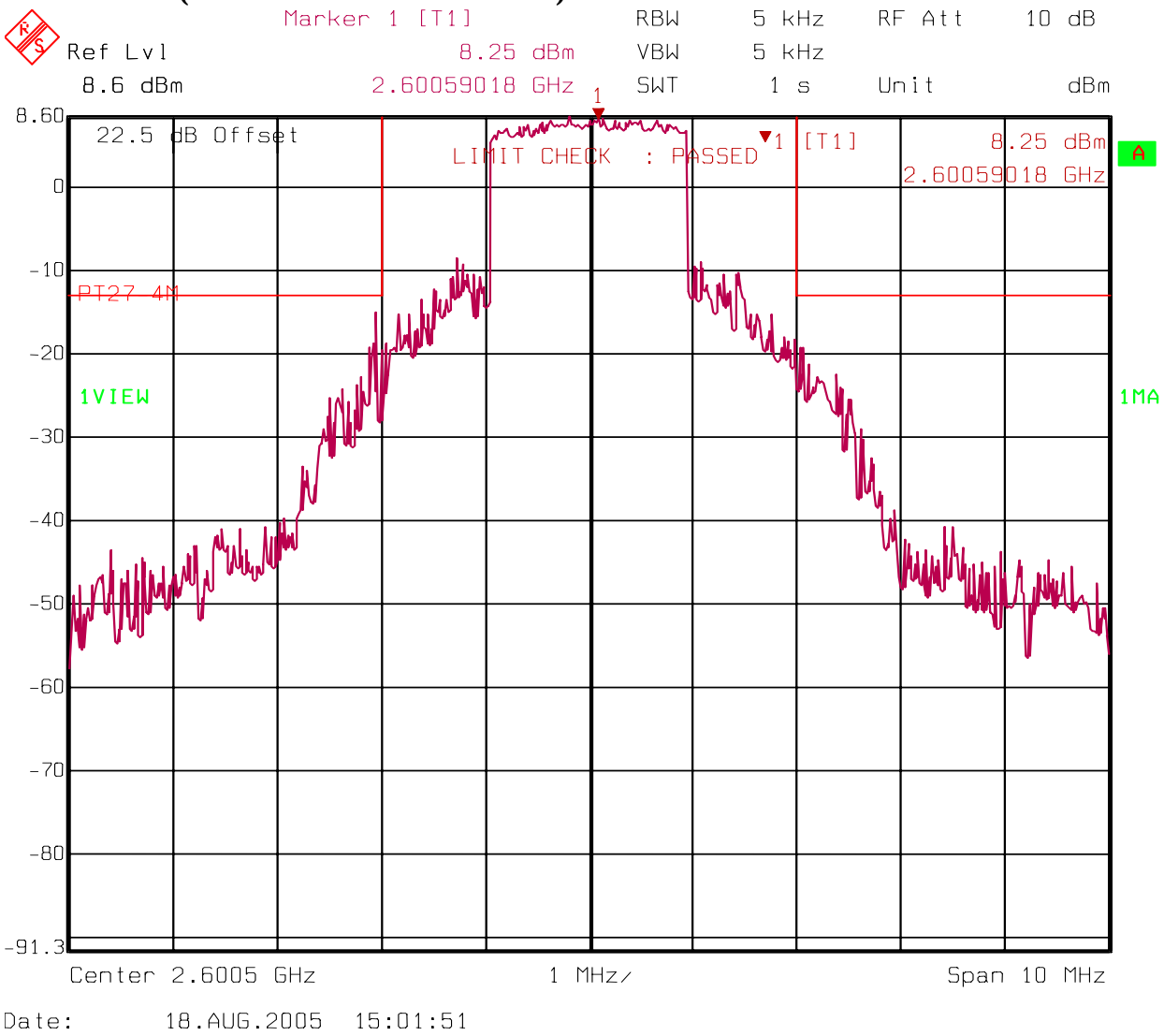
10-Carrier BTS Signal Operating in a 5 MHz Band

Mask Center (Conducted Power at 27 dBm)



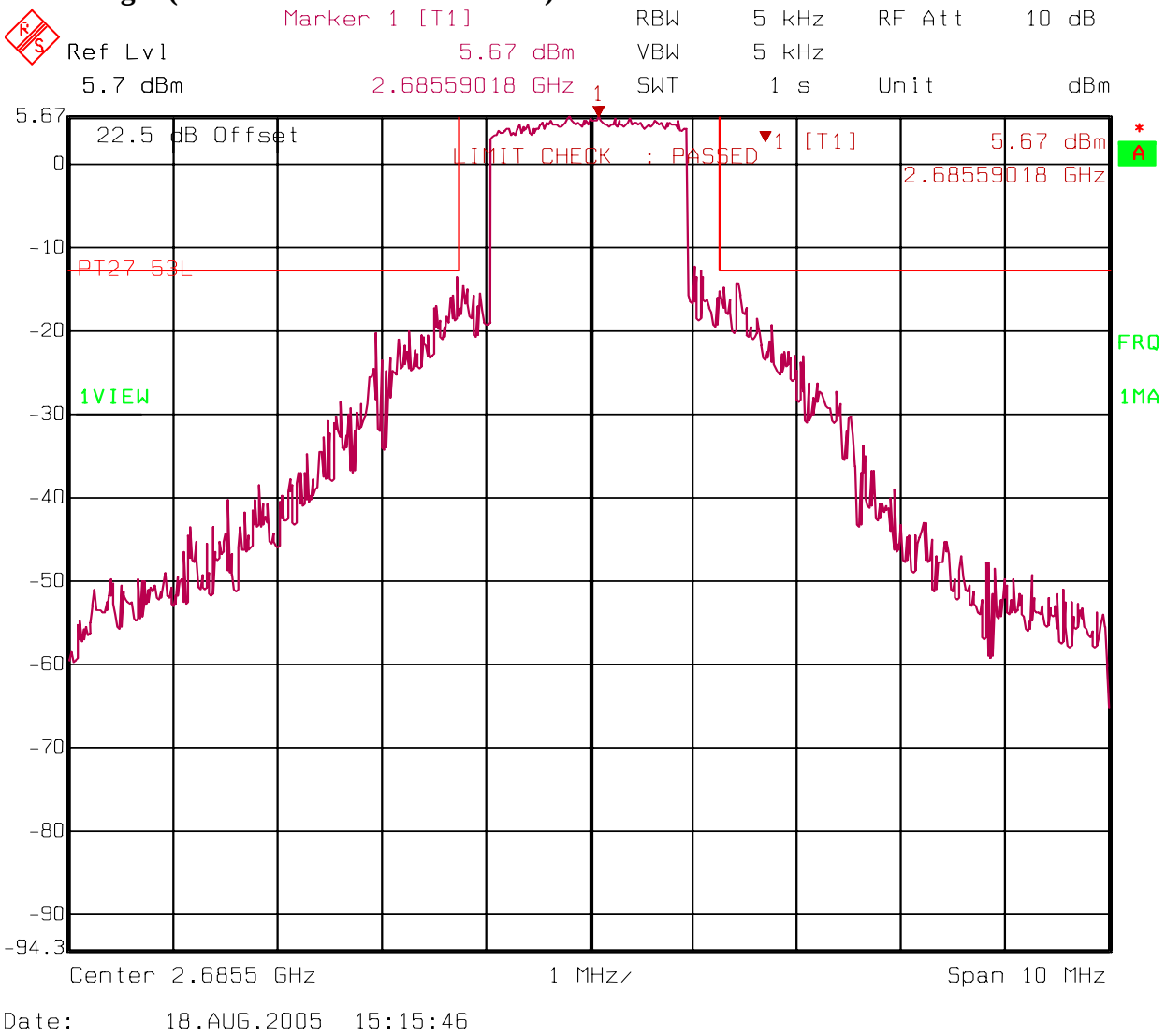
Navini Mode – Low Channel

Mask Center (Conducted Power at 30 dBm)



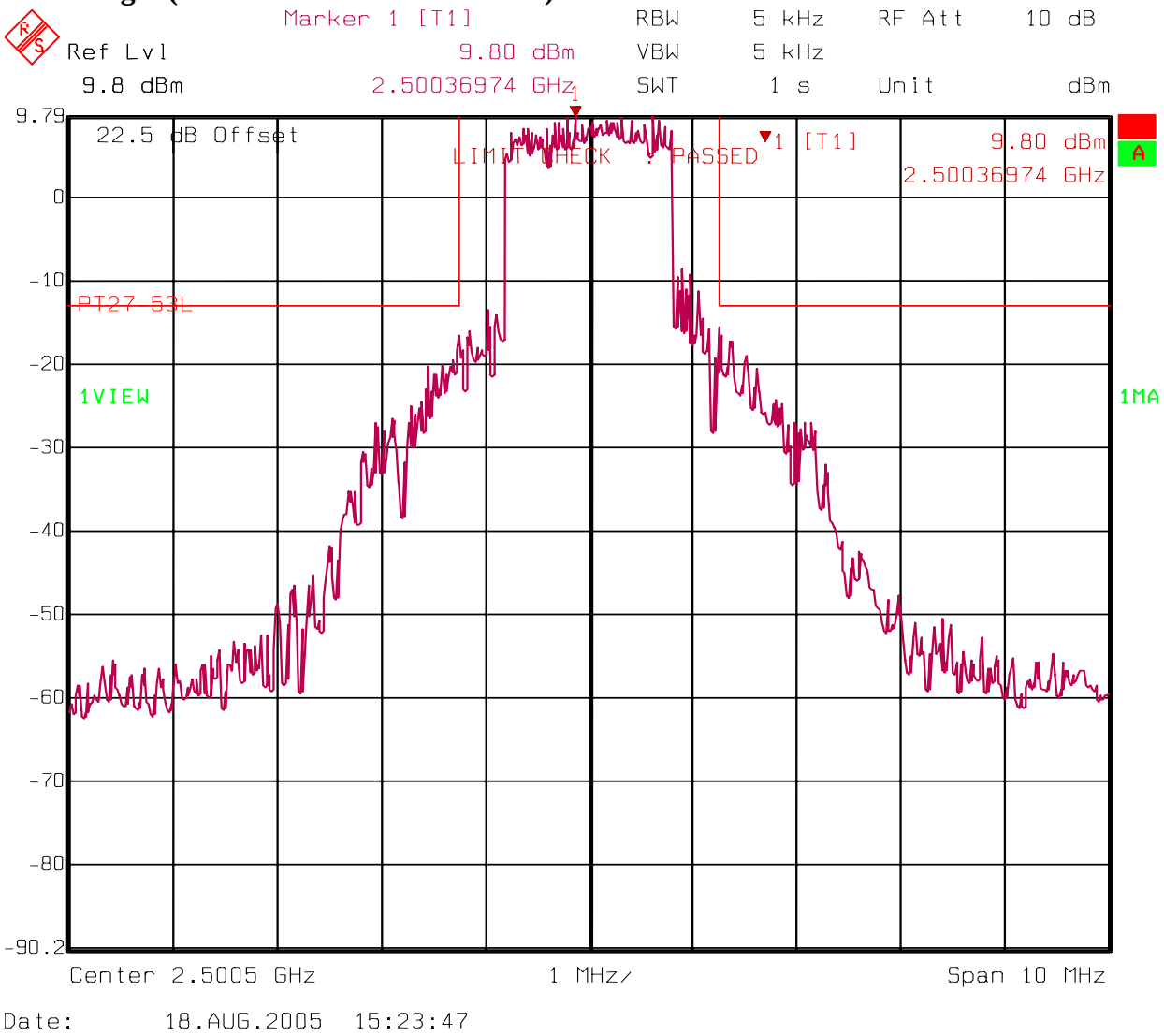
Navini mode – Mid Channel

Mask Edges (Conducted Power at 27 dBm)



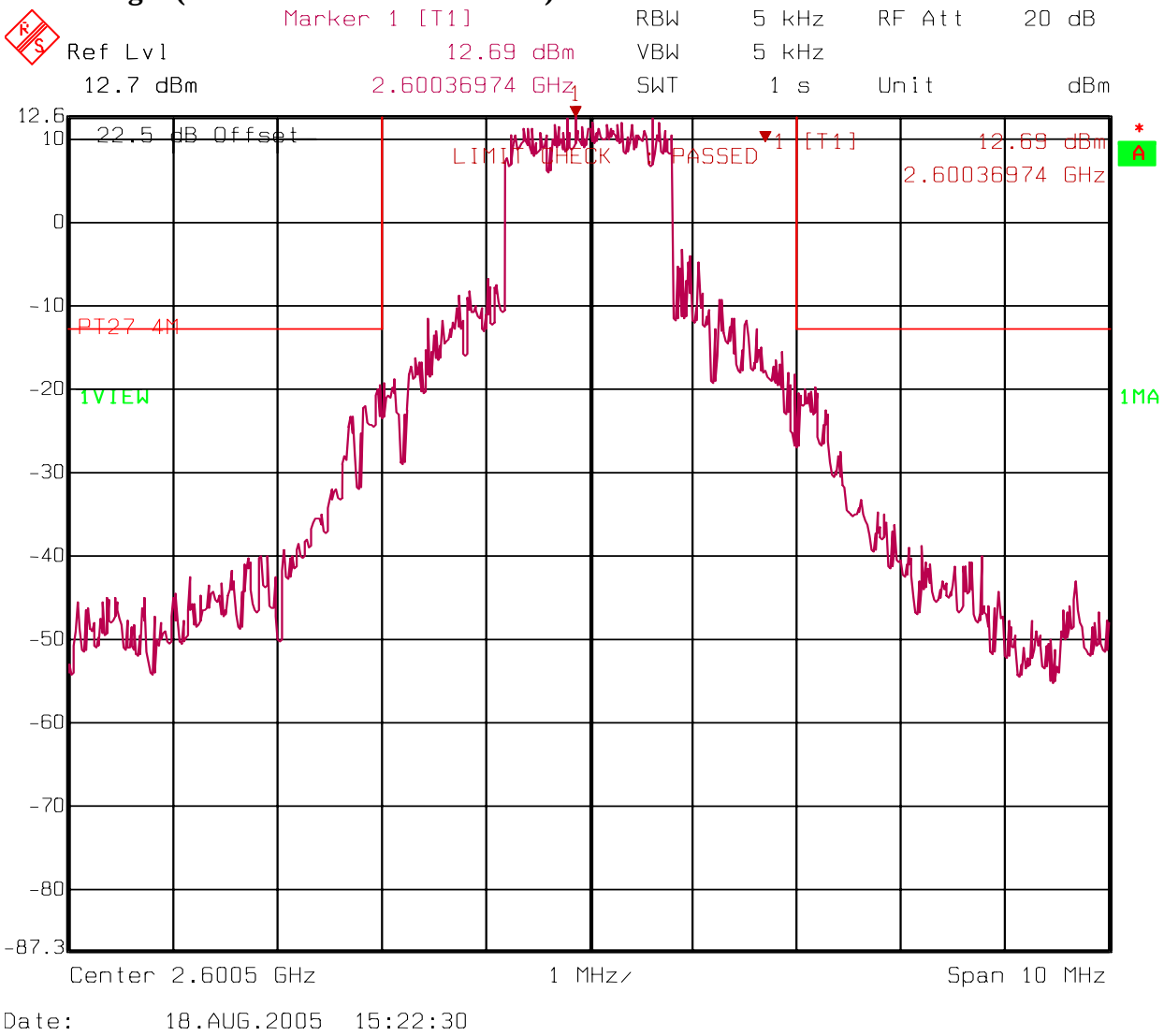
Navini mode – High Channel

Mask Edges (Conducted Power at 27 dBm)



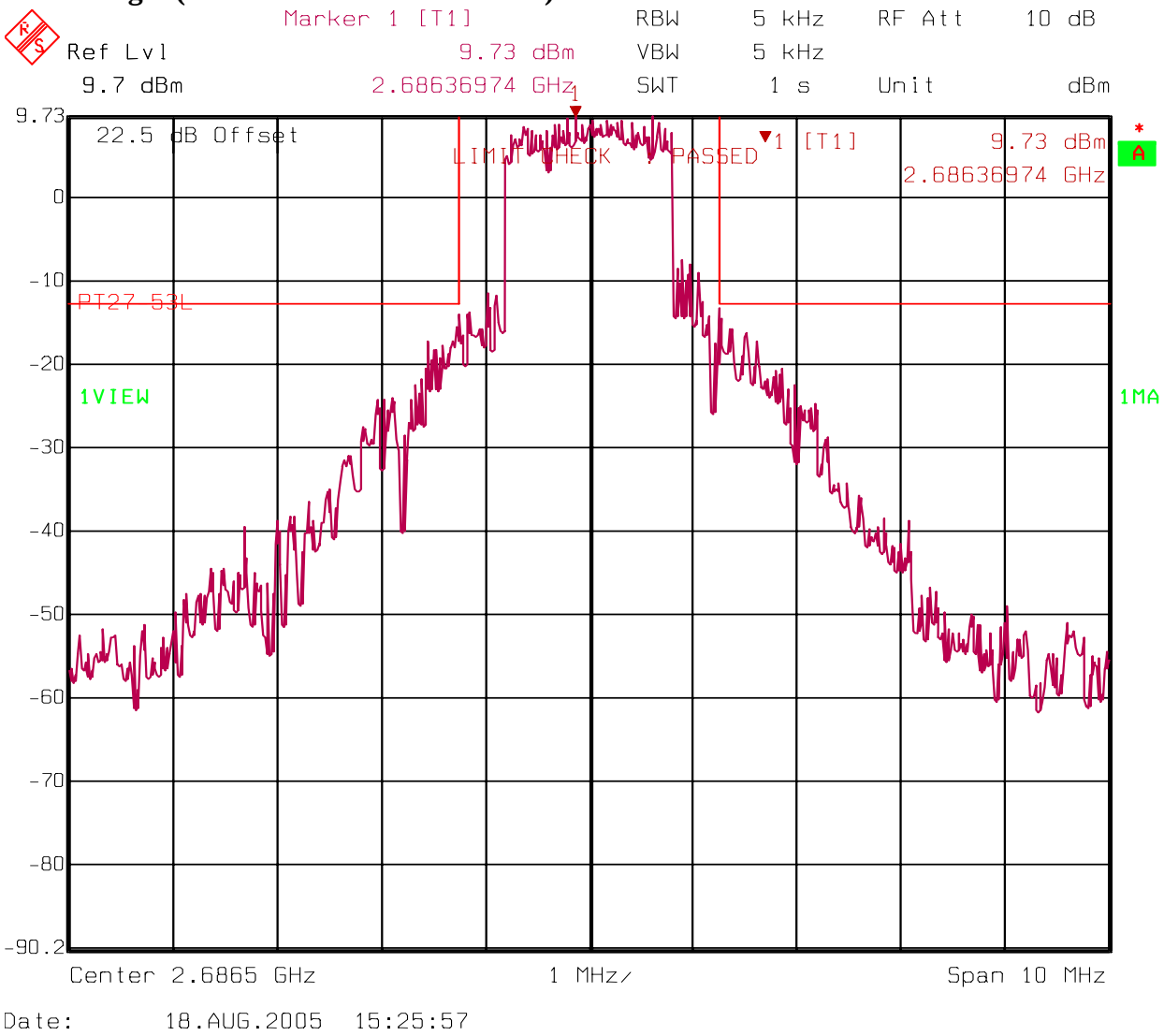
802.16e mode – Low Channel

Mask Edges (Conducted Power at 30dBm)



802.16e mode – Mid Channel

Mask Edges (Conducted Power at 27dBm)



802.16e mode – High channel

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 19 August 2005

Test Results: Complies

Measurement Data: See attached table.

Test Data - Radiated Emissions

EIRP Substitution Method

Page 1 of 1 Complete x
Job 5L0359 Date 7/20/05 Preliminary
Specification: Part Temperature(°C): 22
Tested David Light Relative Humidity(%) 50
E.U.T. 2.6 Ghz LCD CPE
Configuration: Tx at full power
Sample No: 1
Location AC 3 RBW: 1 MHz Measurement
Detector Peak VBW: 1 MHz Distance: 3 m

Test Equipment

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

Frequency (MHz	Meter Reading (dBm	Correction Factor (dB		Pre-Amp Gai (dB	Substitutio Antenna (dBi		EIRP (dBm	EIRP (mW	Polarity	Comments
										Tx 2600
										802.16e
										Upright
5200	-54.0	41.3		32	10.3		-34.4	0.0004	V	
7800	-65.8	41.8		32.8	11.3		-45.5	0.0000	V	
10400	-51.5	42.0		35.3	12.2		-32.6	0.0005	V	
5200	-54.0	38.3		32	10.3		-37.4	0.0002	H	
7800	-64.5	41.5		32.8	11.3		-44.5	0.0000	H	
10400	-54.0	44.5		35.3	12.2		-32.6	0.0005	H	
										Patch
5200	-48.6	41.3		32	10.3		-29.0	0.0013	V	
7800	-62.0	41.8		32.8	11.3		-41.7	0.0001	V	
10400	-52.5	42.0		35.3	12.2		-33.6	0.0004	V	
5200	-51.8	38.3		32	10.3		-35.2	0.0003	H	
7800	-62.3	41.5		32.8	11.3		-42.3	0.0001	H	
										Tx 2600
										Navini
										Upright
5200	-53.5	41.3		32	10.3		-33.9	0.0004	V	
7800	-63.3	41.8		32.8	11.3		-43.0	0.0001	V	
10400	-50.0	42.0		35.3	12.2		-31.1	0.0008	V	
5200	-55.3	38.3		32	10.3		-38.7	0.0001	H	
7800	-63.0	41.5		32.8	11.3		-43.0	0.0001	H	
10400	-52.0	44.5		35.3	12.2		-30.6	0.0009	H	
										Patch
5200	-49.3	41.3		32	10.3		-29.7	0.0011	V	
7800	-62.0	41.8		32.8	11.3		-41.7	0.0001	V	
10400	-51.6	42.0		35.3	12.2		-32.7	0.0005	V	
5200	-51.0	38.3		32	10.3		-34.4	0.0004	H	
7800	-61.5	41.5		32.8	11.3		-41.5	0.0001	H	
10400	-54.0	44.5		35.3	12.2		-32.6	0.0005	H	

Notes **The spectrum was searched from 30 MHz to the 10th harmonic of carrier**
All emissions are reported.

Photos – Radiated Emissions

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE: 19 August 2005

Test Results: Complies

Measurement Data: See attached plots.

Test Equipment Used: 1659-1529-1472-283-619

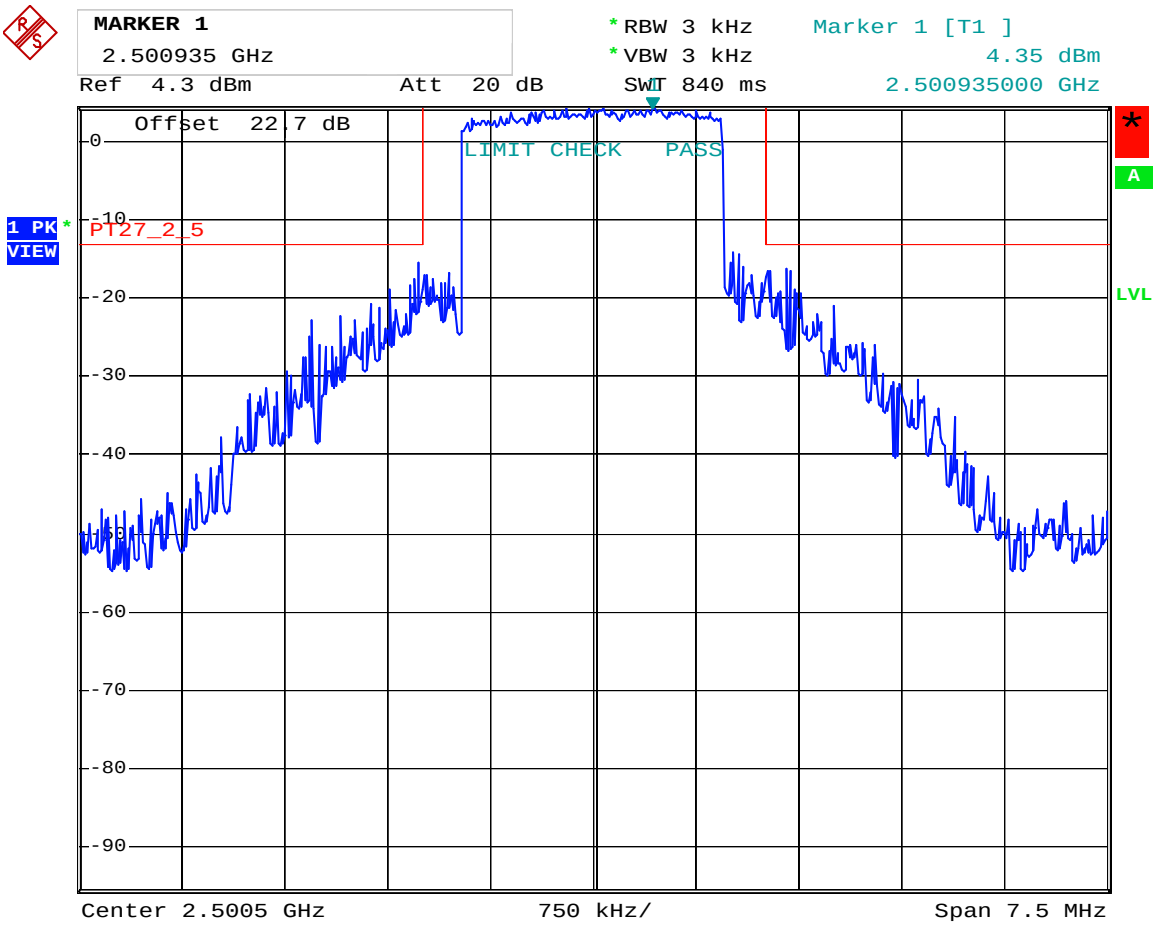
Standard Supply Voltage: 120 Vac

Environmental Conditions: 20 °Celsius
50 % RH

Note: The EUT ceased operation below -20^{0}C

Test Data – Frequency Stability (Navini mode)

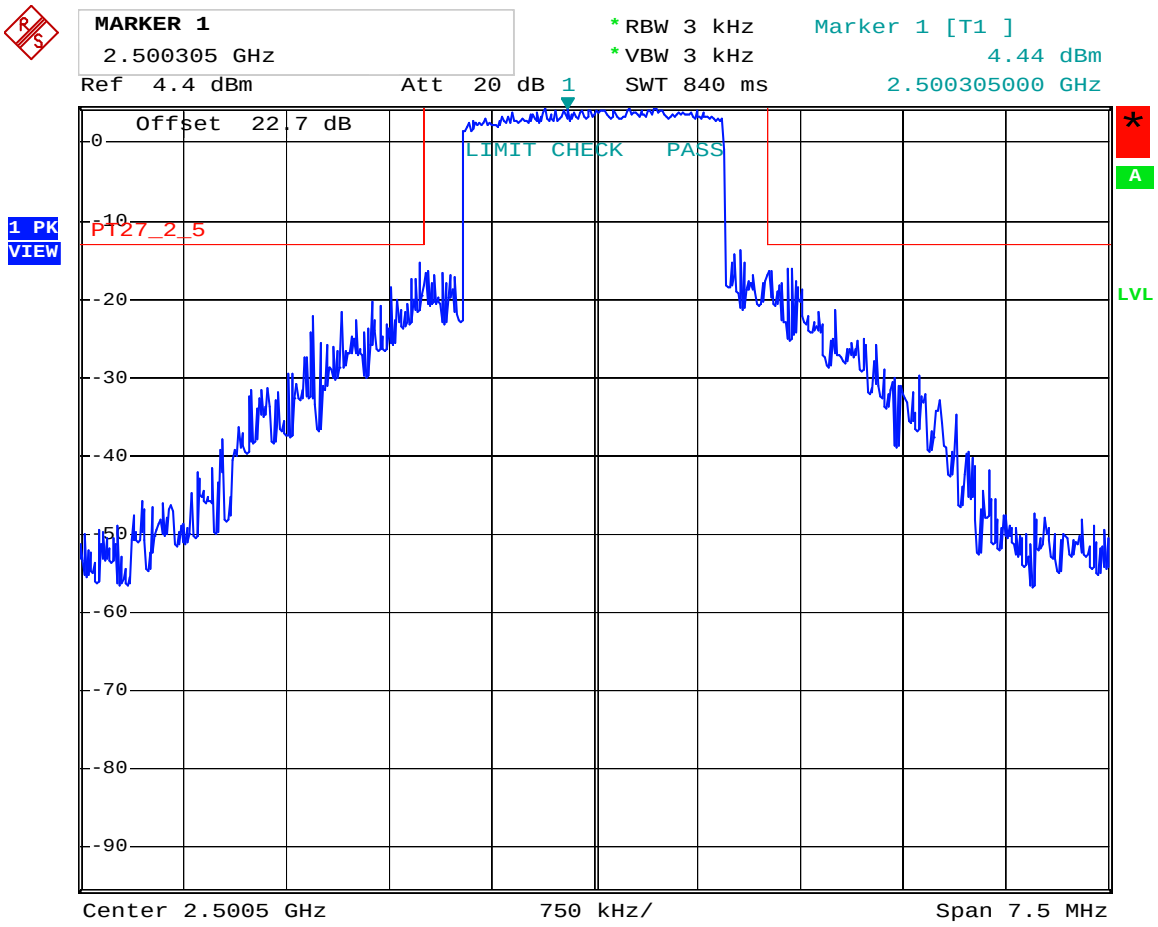
+20 C / 102 Vac



Date: 19.AUG.2005 11:04:01

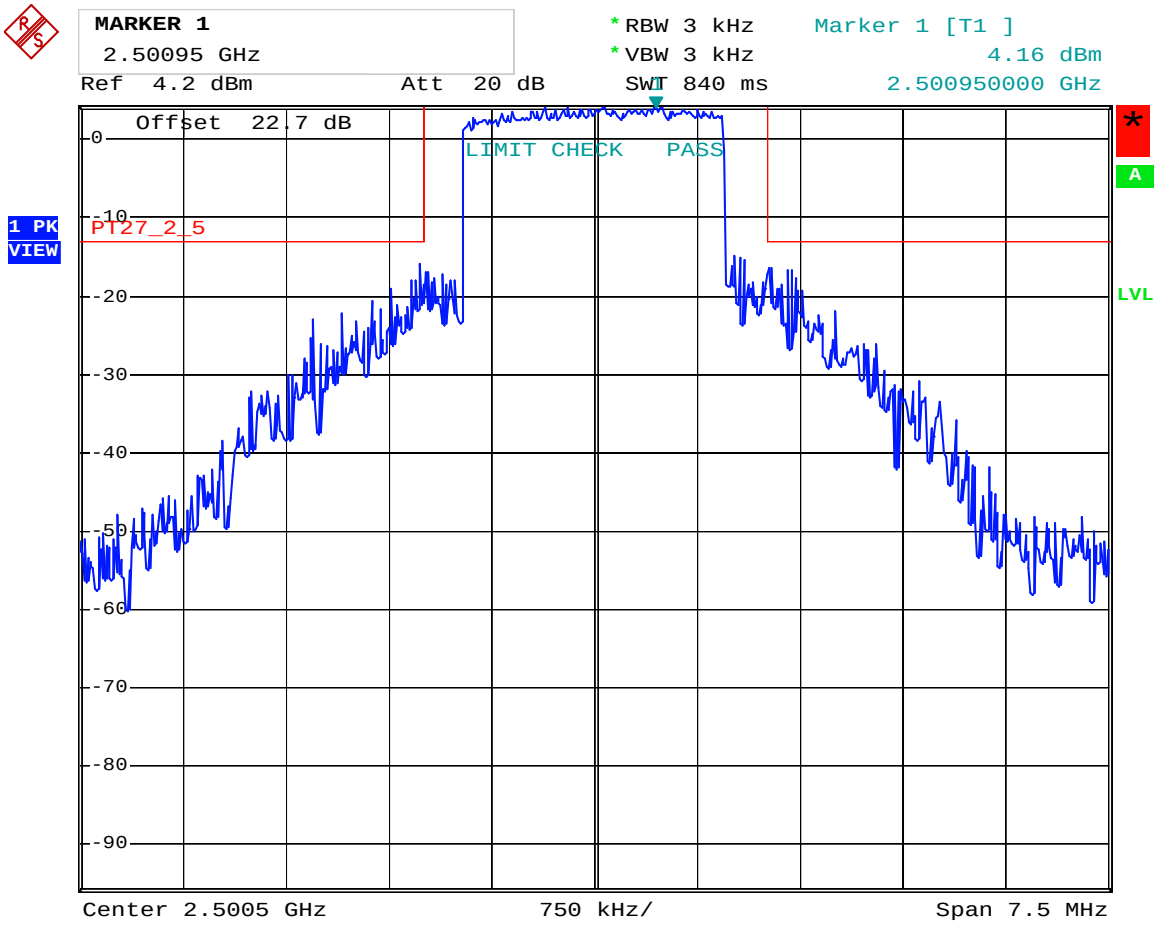
Test Data – Frequency Stability (Navini mode)

+20 C/ 138 Vac



Test Data – Frequency Stability (Navini mode)

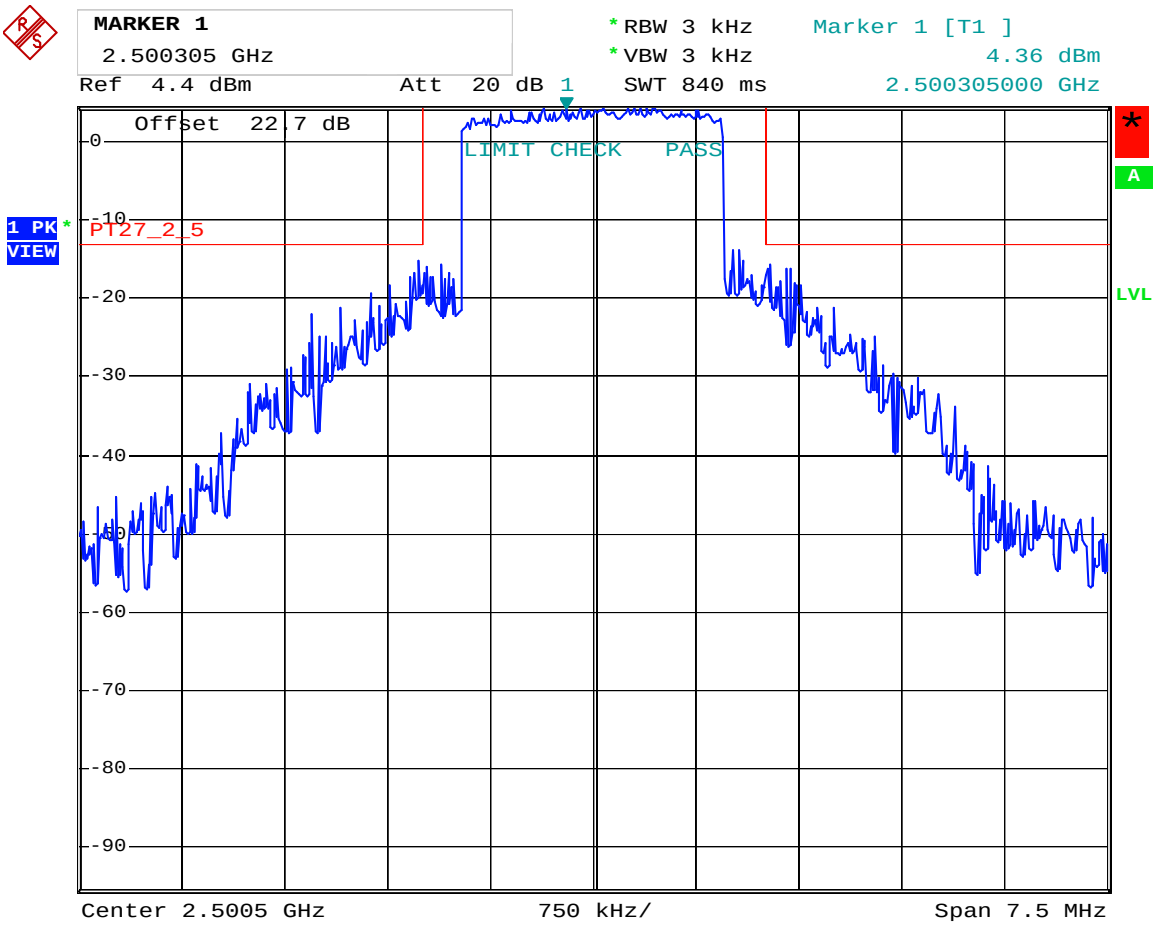
+20 C / 120 Vac



Date: 19.AUG.2005 11:06:15

Test Data – Frequency Stability (Navini mode)

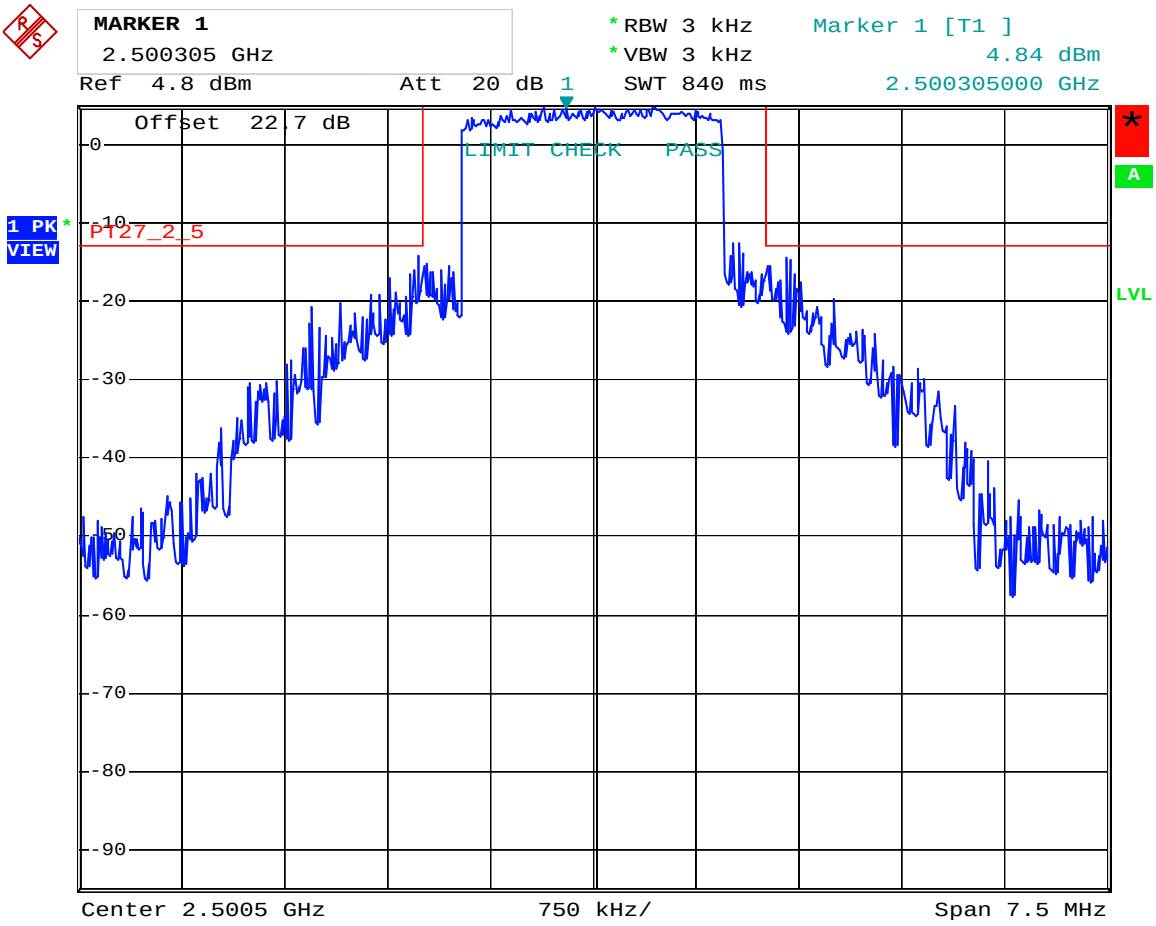
+50 C



Date: 19.AUG.2005 12:00:31

Test Data – Frequency Stability (Navini mode)

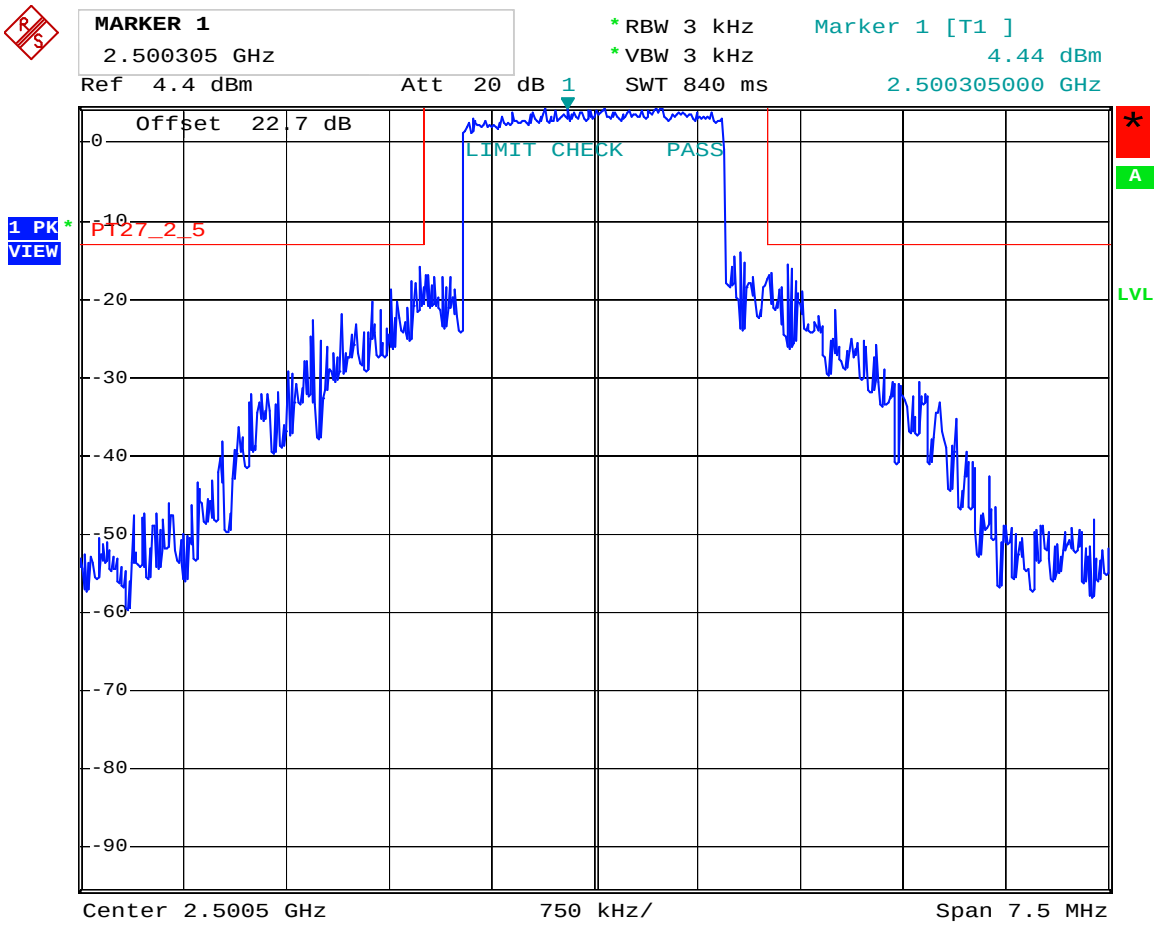
+40 C



Date: 19.AUG.2005 12:39:39

Test Data – Frequency Stability (Navini mode)

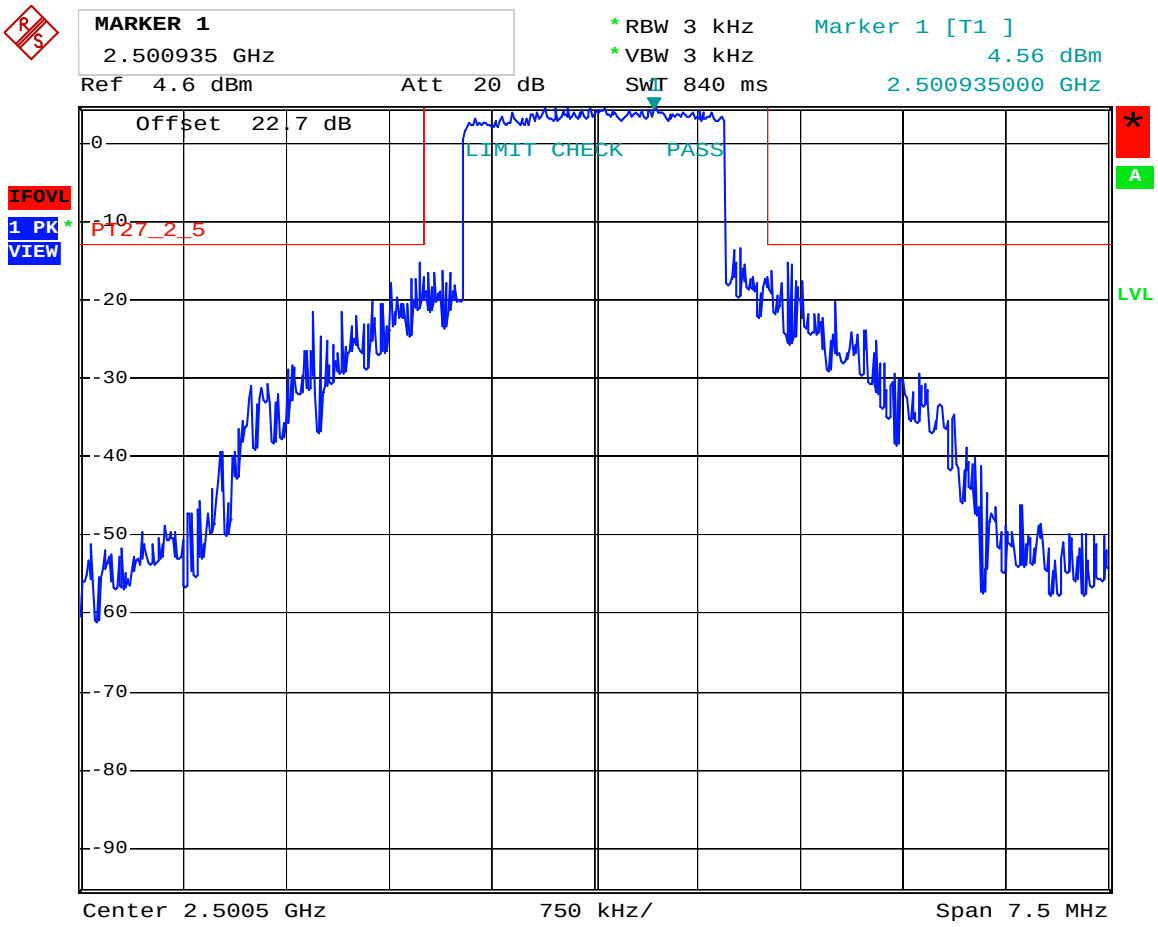
+30 C



Date: 19.AUG.2005 13:25:31

Test Data – Frequency Stability (Navini mode)

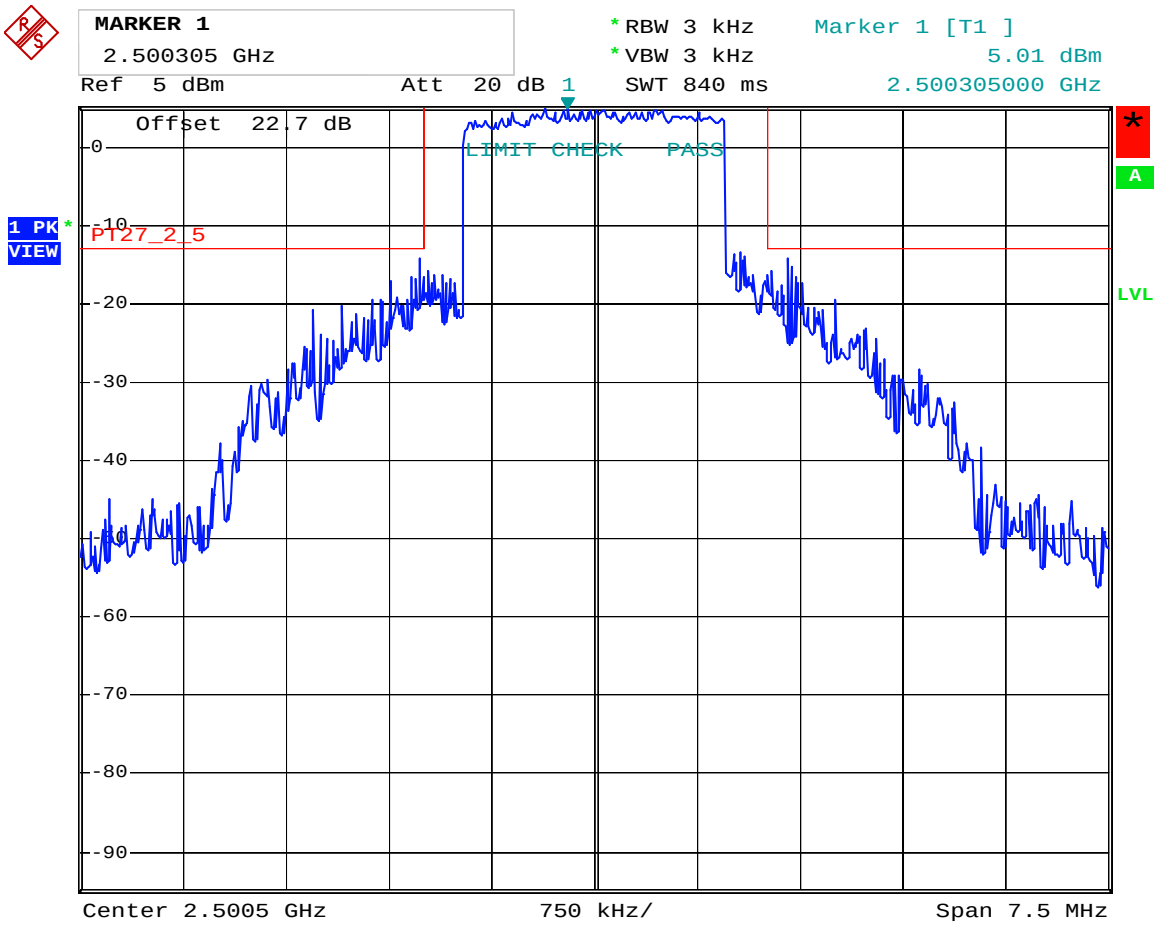
10 C



Date: 19.AUG.2005 14:37:40

Test Data – Frequency Stability (Navini mode)

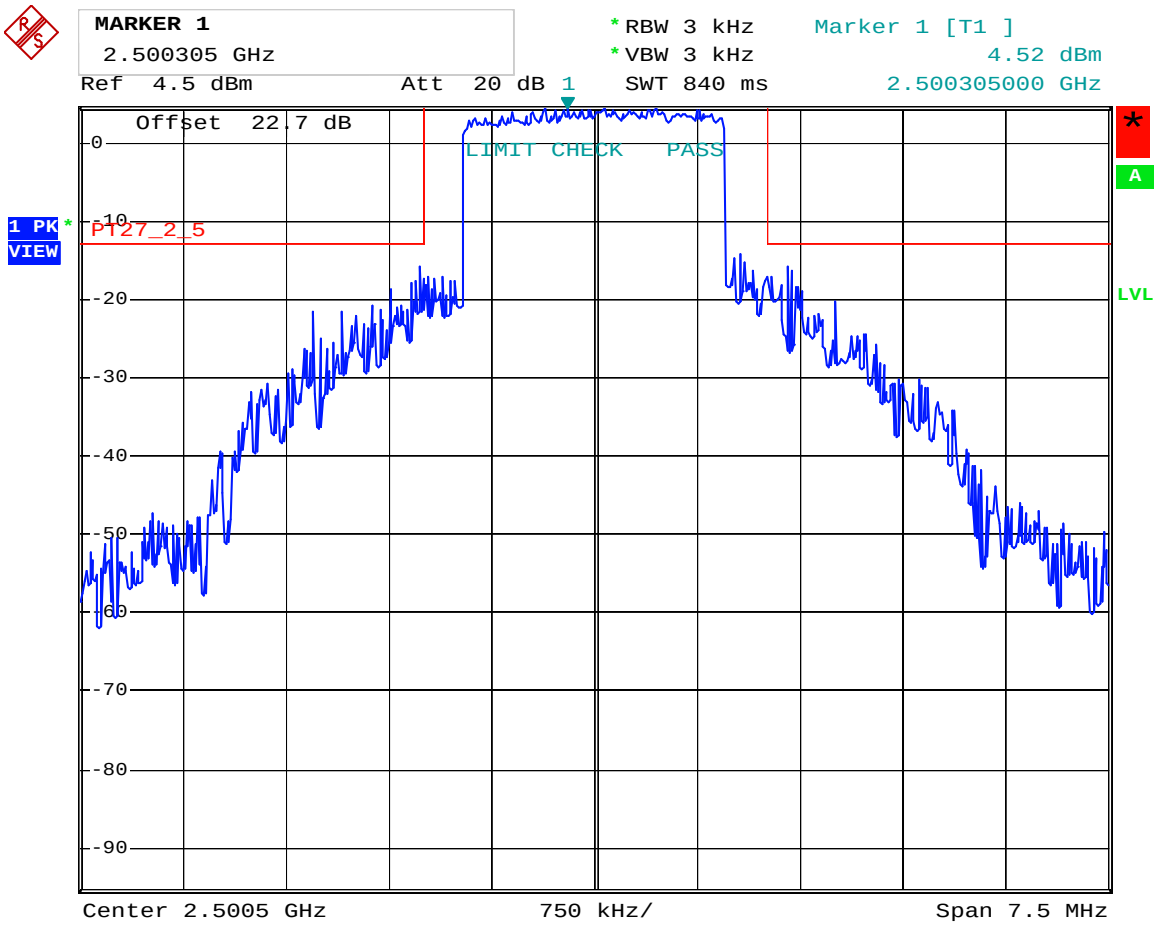
0 C



Date: 19.AUG.2005 15:21:25

Test Data – Frequency Stability (Navini mode)

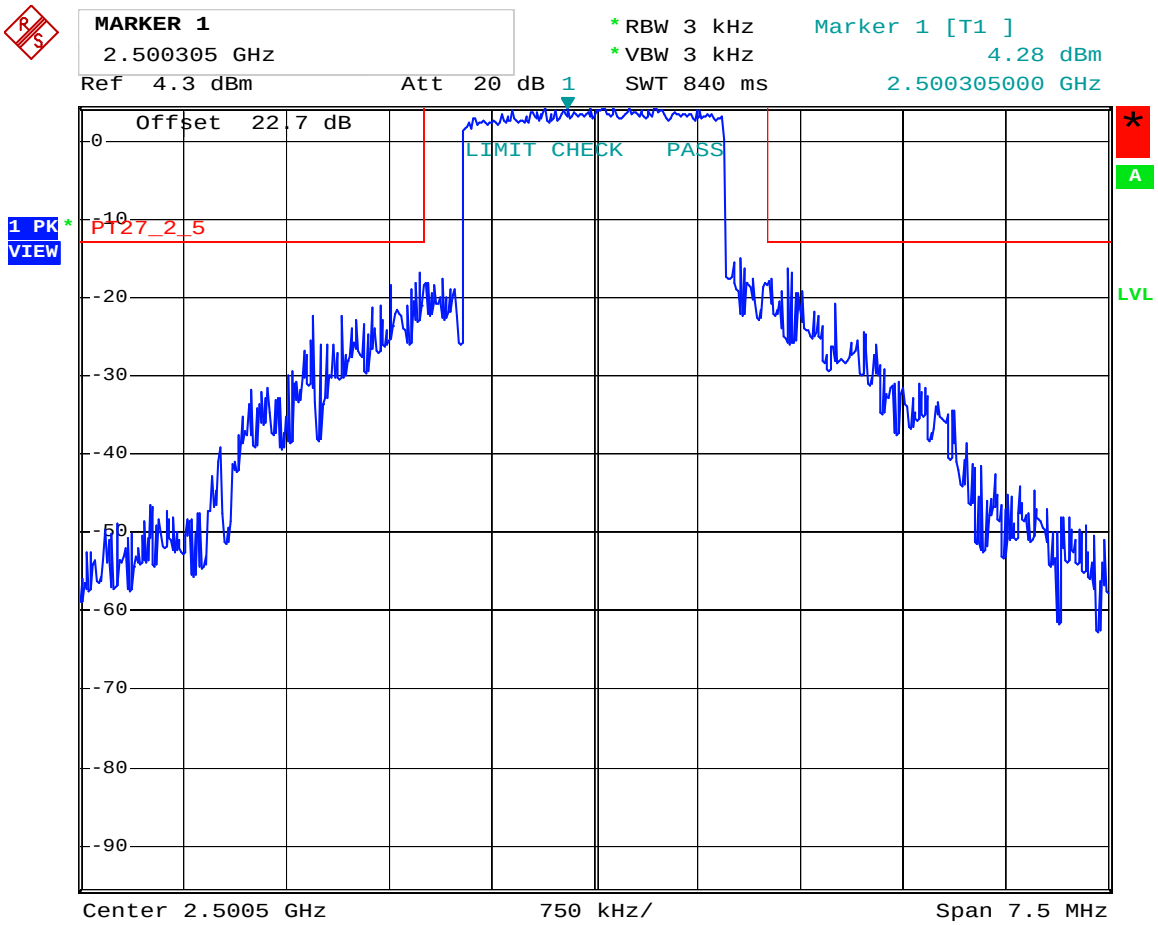
-10 C



Date: 19.AUG.2005 16:01:55

Test Data – Frequency Stability (Navini mode)

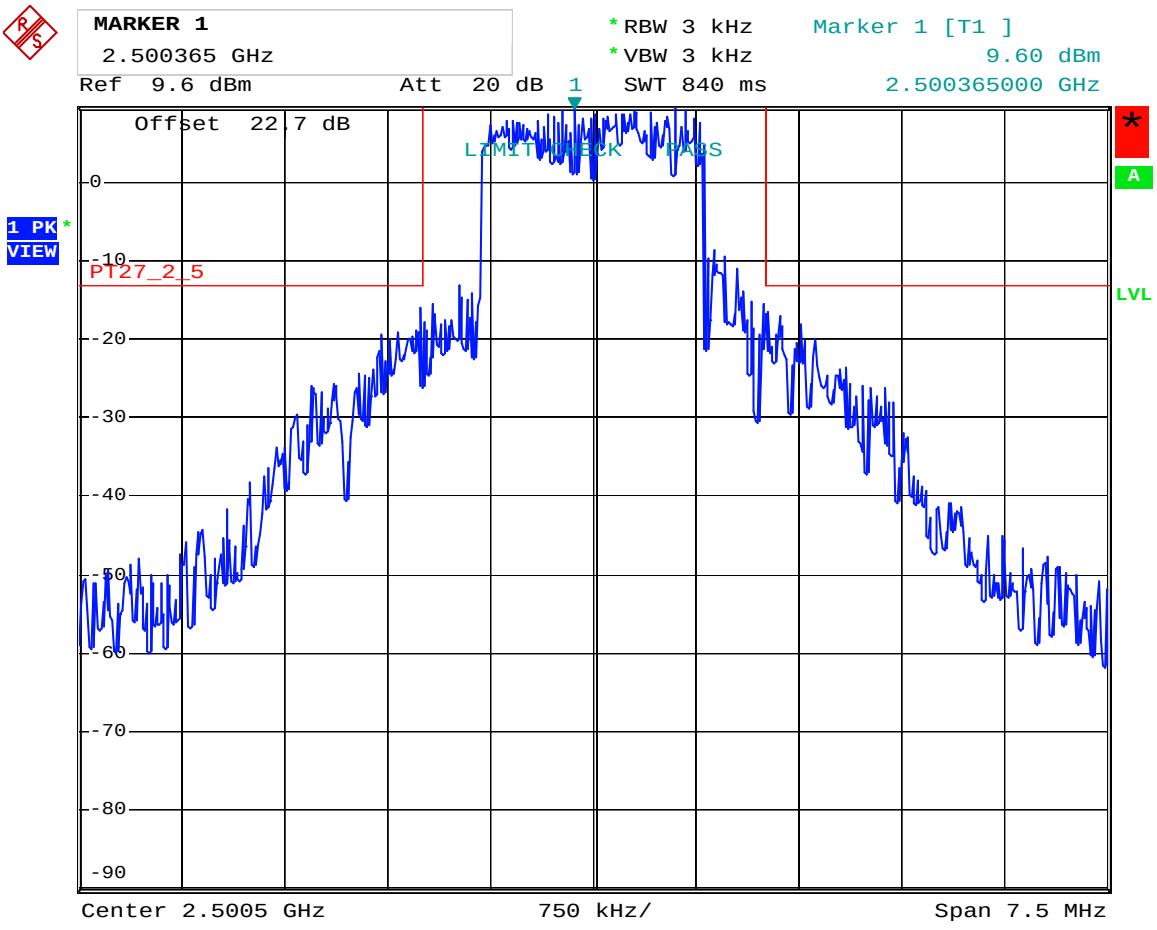
-20 C



Note: The CPE ceased operation at -20^{O}C

Test Data – Frequency Stability (802.16e mode)

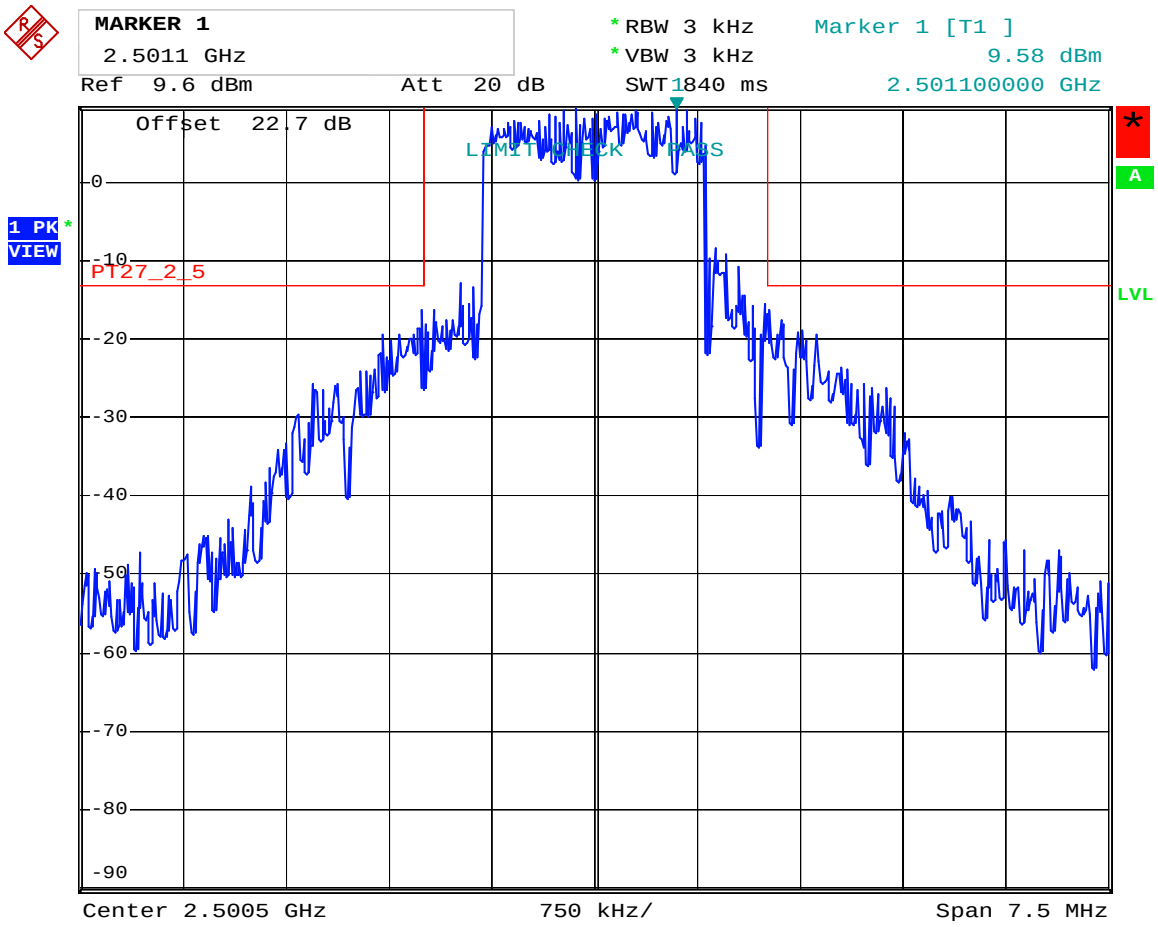
+20 C / 120 Vac



Date: 19.AUG.2005 11:07:52

Test Data – Frequency Stability (802.16e mode)

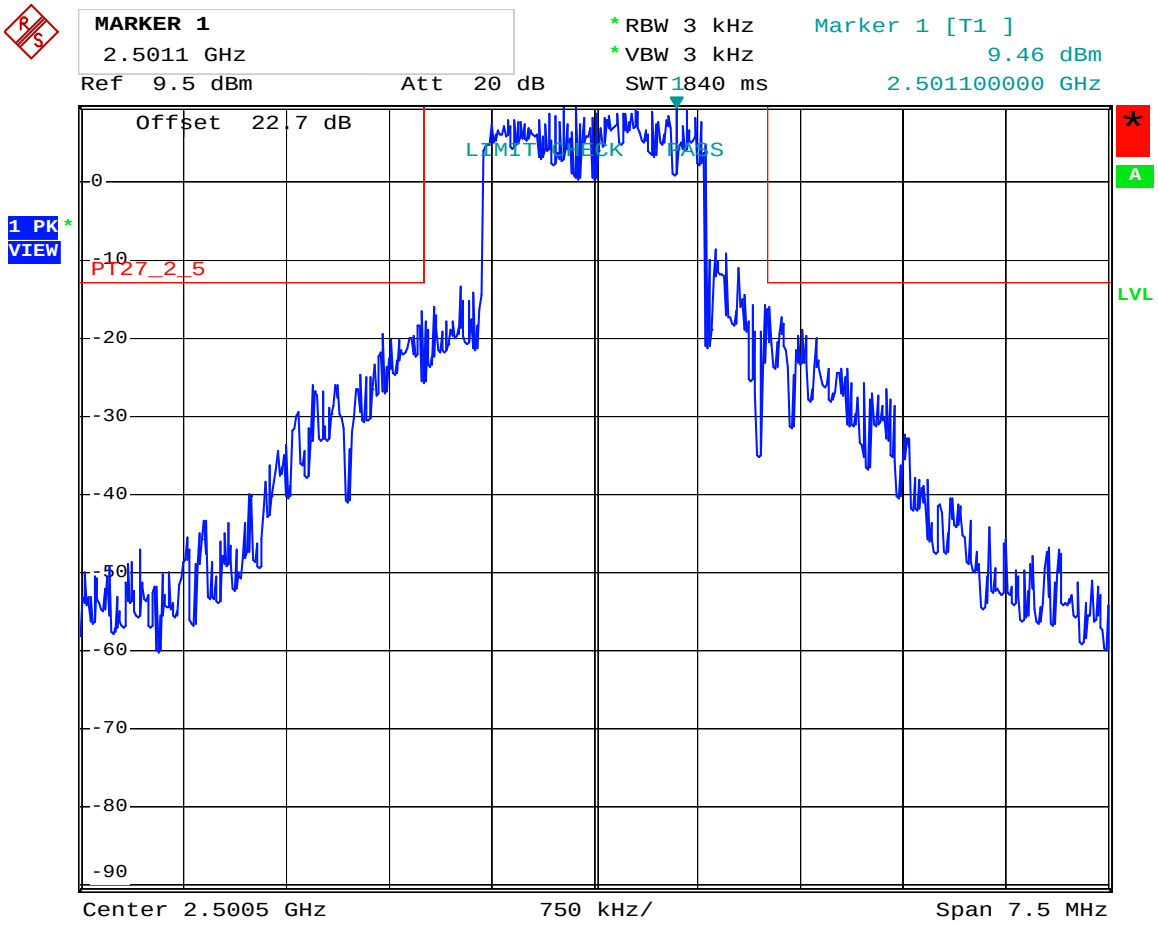
+20 C/ 138 Vac



Date: 19.AUG.2005 11:08:42

Test Data – Frequency Stability (802.16e mode)

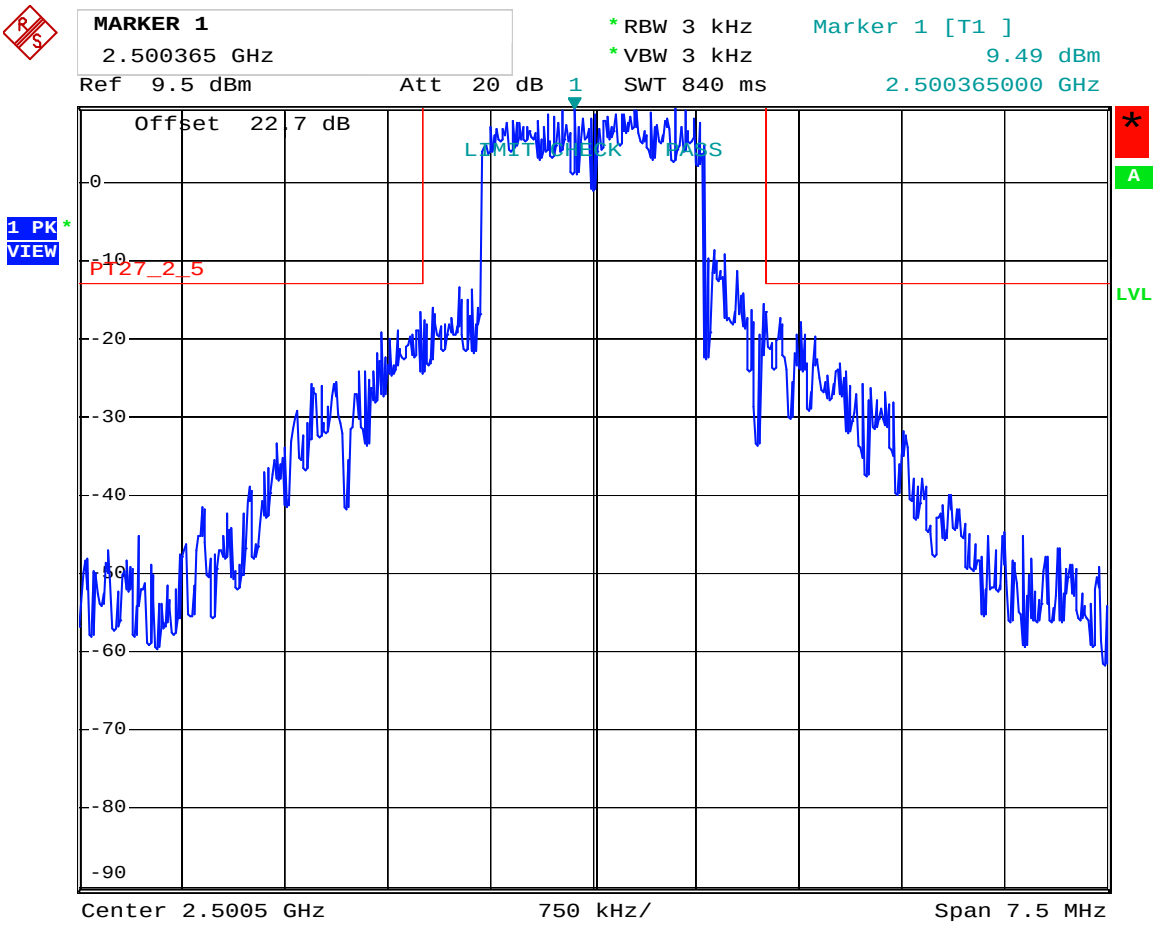
+20 C / 102 Vac



Date: 19.AUG.2005 11:09:41

Test Data – Frequency Stability (802.16e mode)

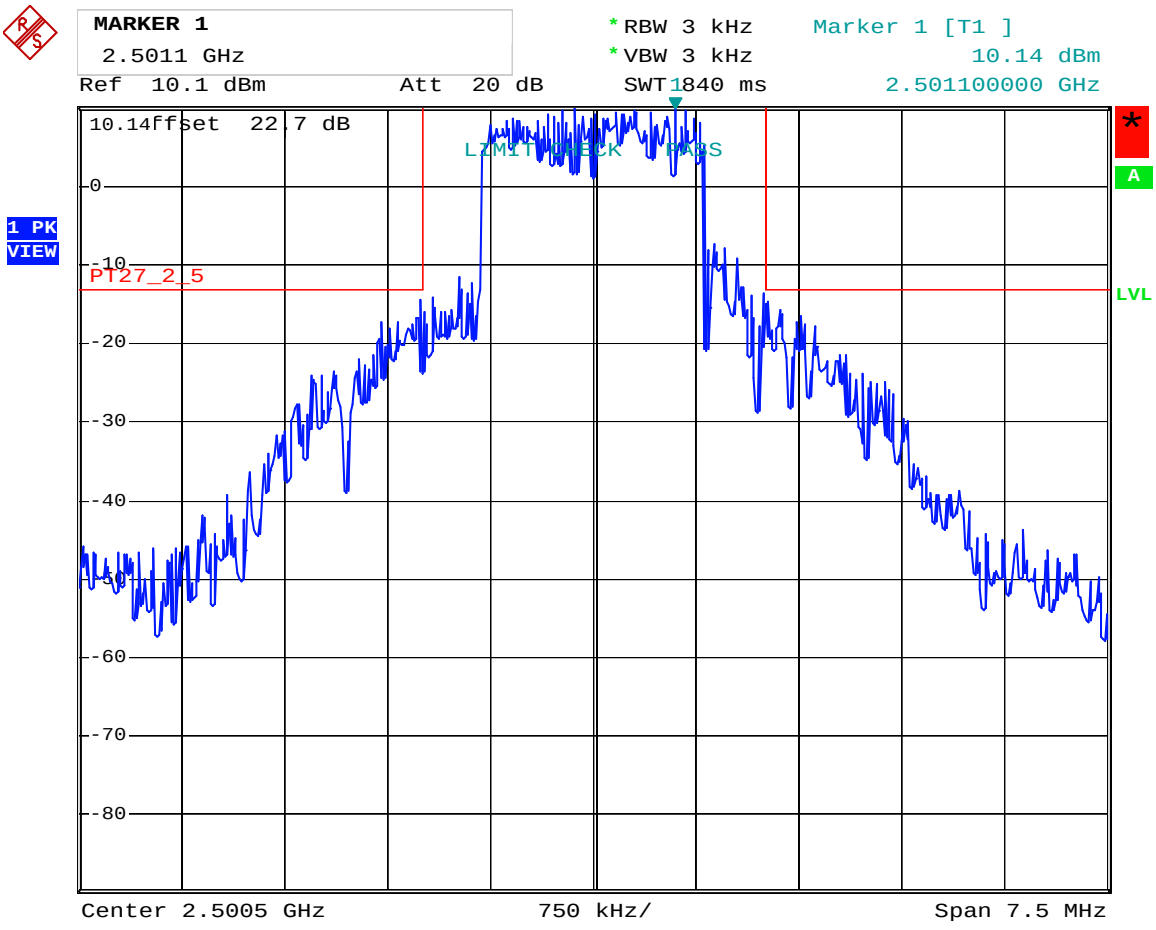
+50 C



Date: 19.AUG.2005 11:59:27

Test Data – Frequency Stability (802.16e mode)

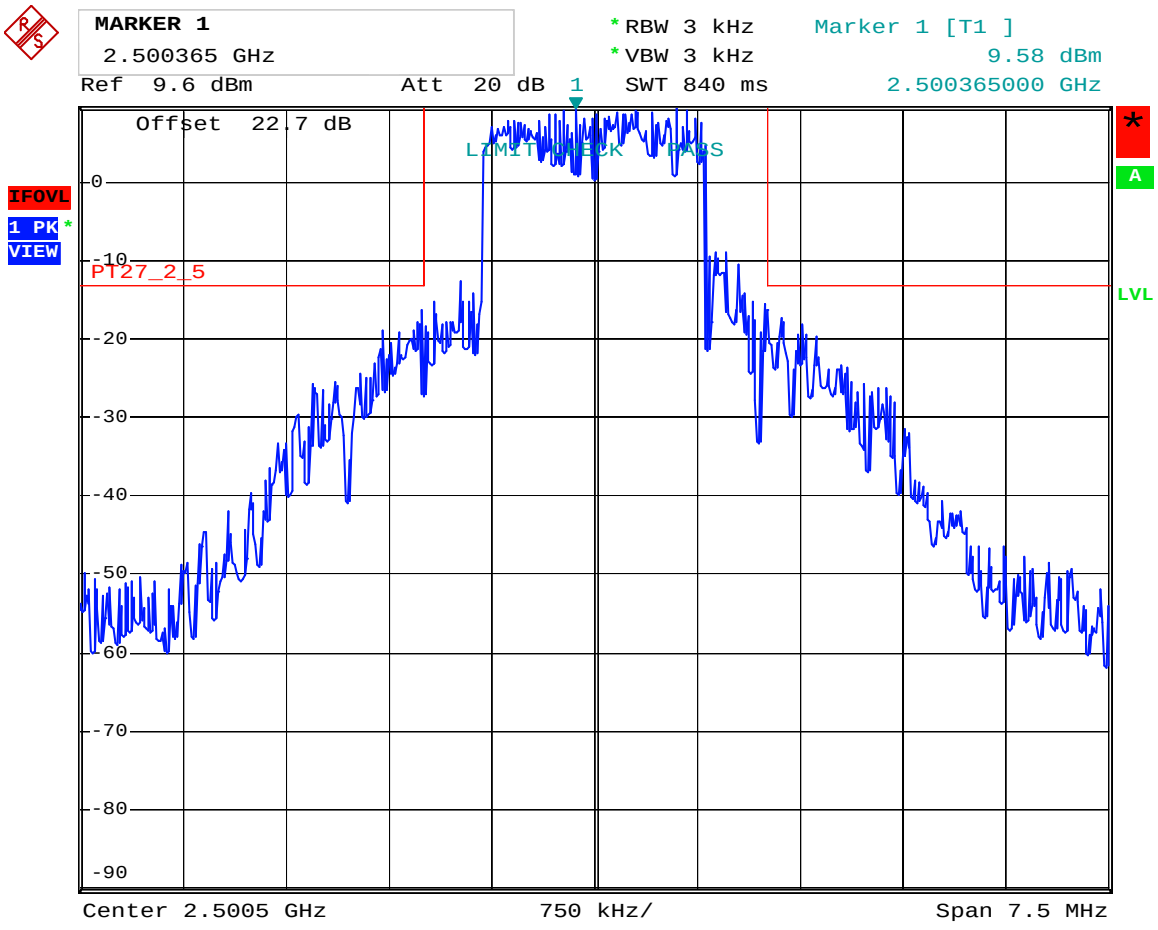
+40 C



Date: 19.AUG.2005 12:40:35

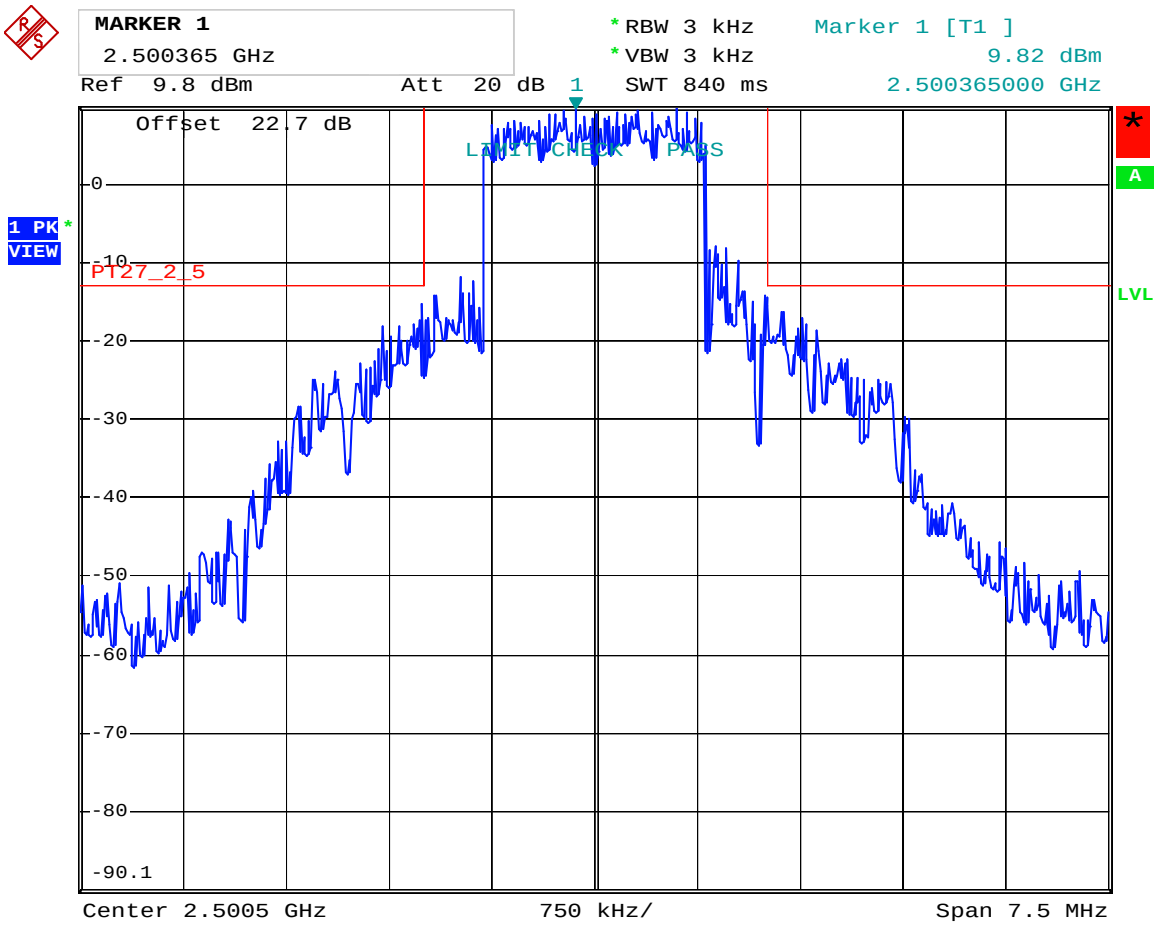
Test Data – Frequency Stability (802.16e mode)

+30 C



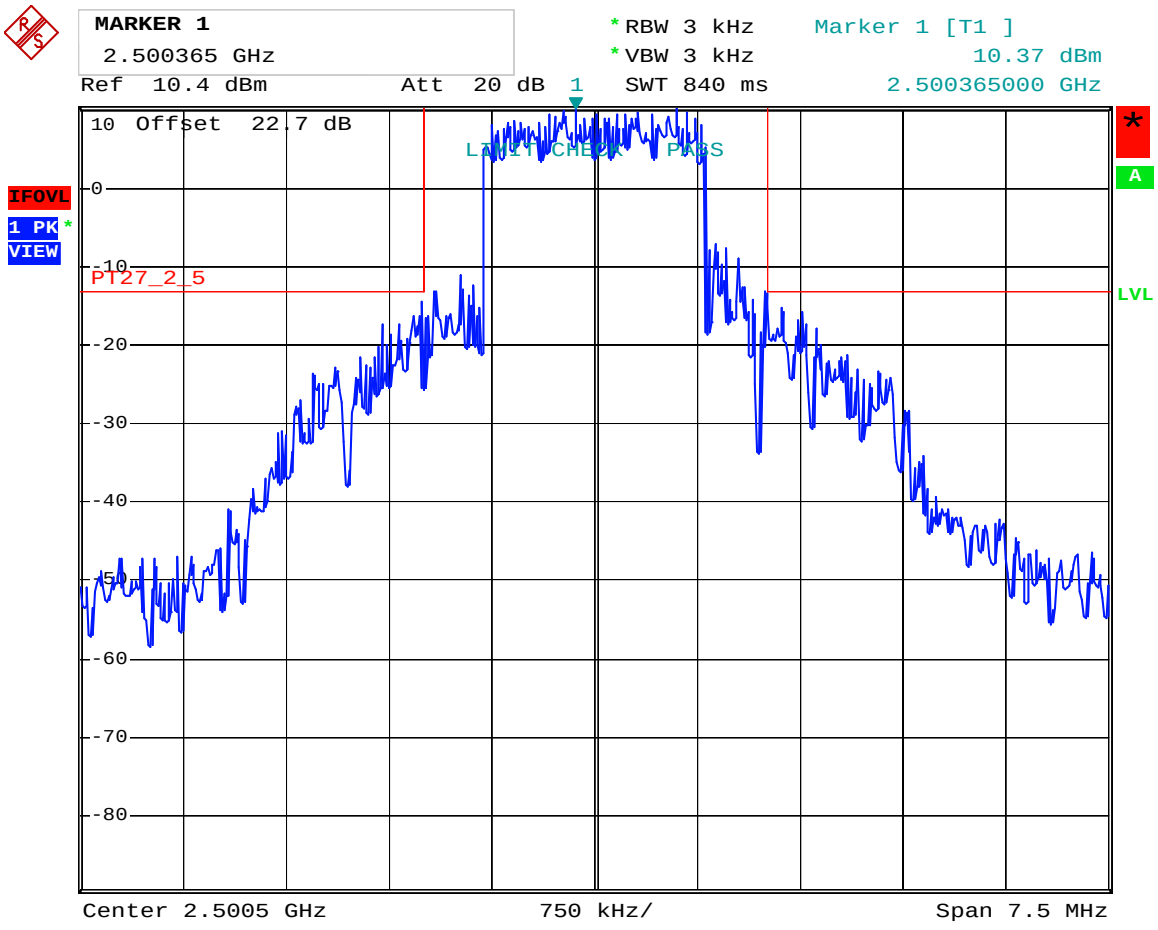
Test Data – Frequency Stability (802.16e mode)

10 C



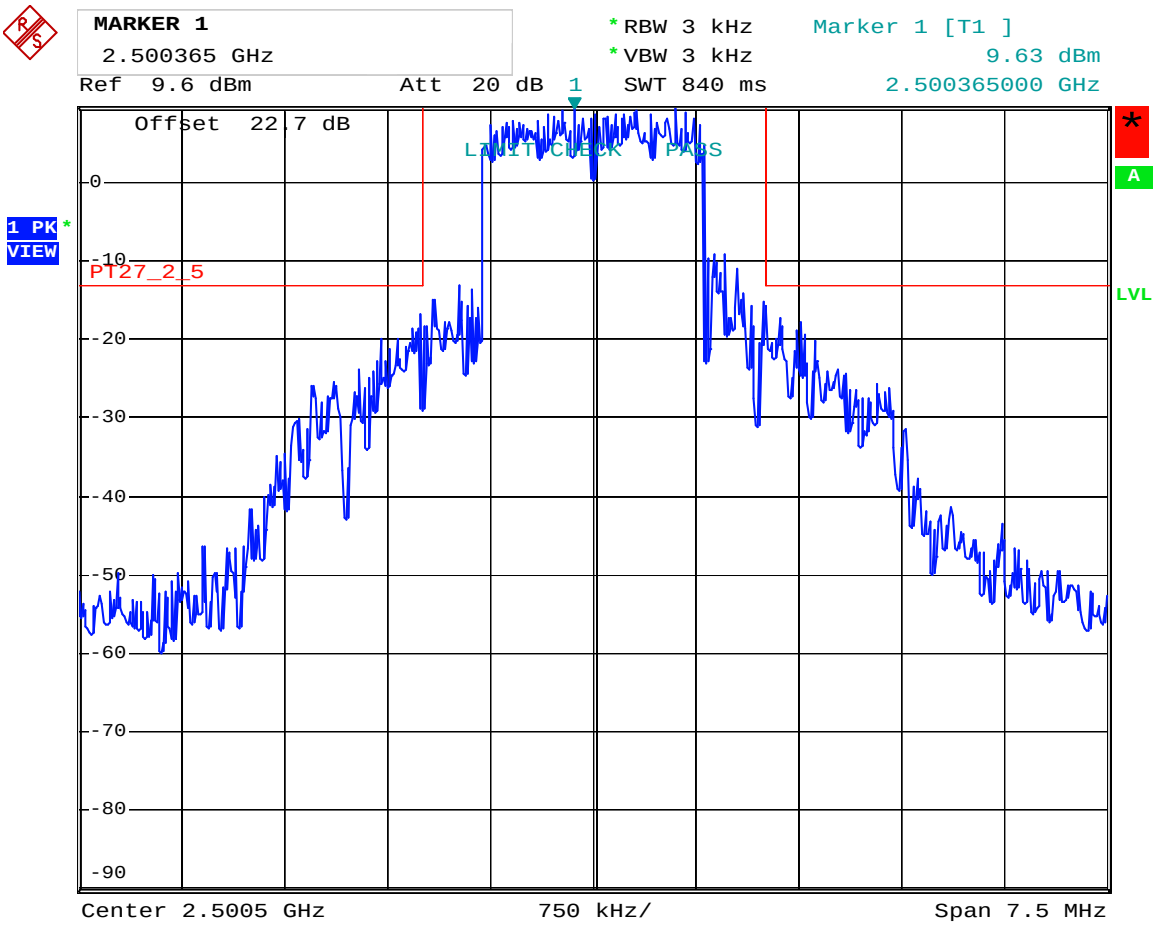
Test Data – Frequency Stability (802.16e mode)

0 C



Test Data – Frequency Stability (802.16e mode)

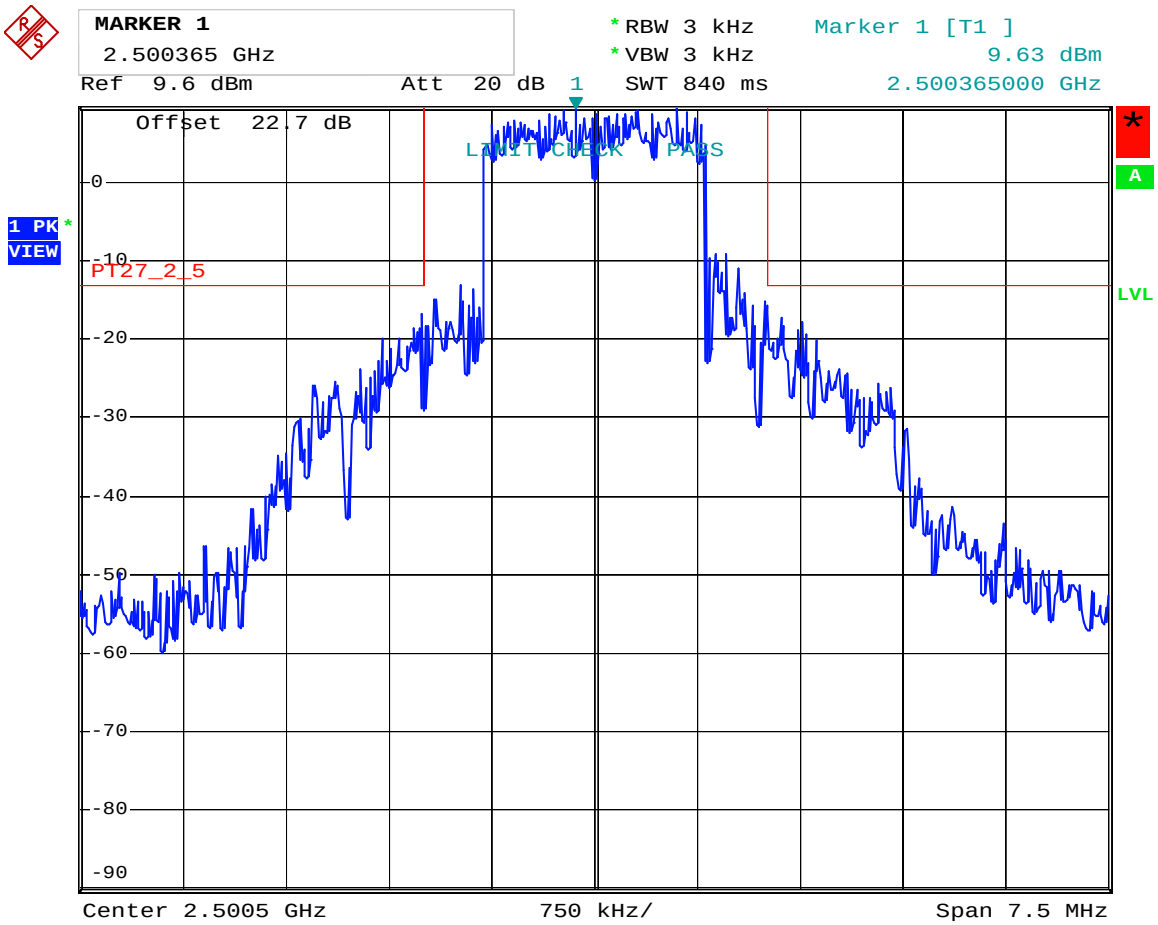
-10 C



Date: 19.AUG.2005 16:02:59

Test Data – Frequency Stability (802.16e mode)

-20 C



Date: 19.AUG.2005 16:02:59

Note: The CPE ceased operation at -20°C

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
2072	Power Meter	HP E4418B	GB39401848	03/12/05	03/12/06
2071	Power Sensor	Agilent E9304A	MY41495174	3/12/05	3/12/06
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
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	08/26/04	08/26/05
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
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	CNR	NA
619	THERMOMETER	FLUKE 51	4520028	09/16/04	09/16/05
1529	CABLE 4M 2.0-18.0 Ghz	Storm PR90-010-144	00-07-002	07/29/04	07/28/05
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1482	Band Pass Filter	K & L 11SH10-4000/T12000-0/0	2	Cal On Use	N/A

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 an isotropic.. 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 eirp 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:

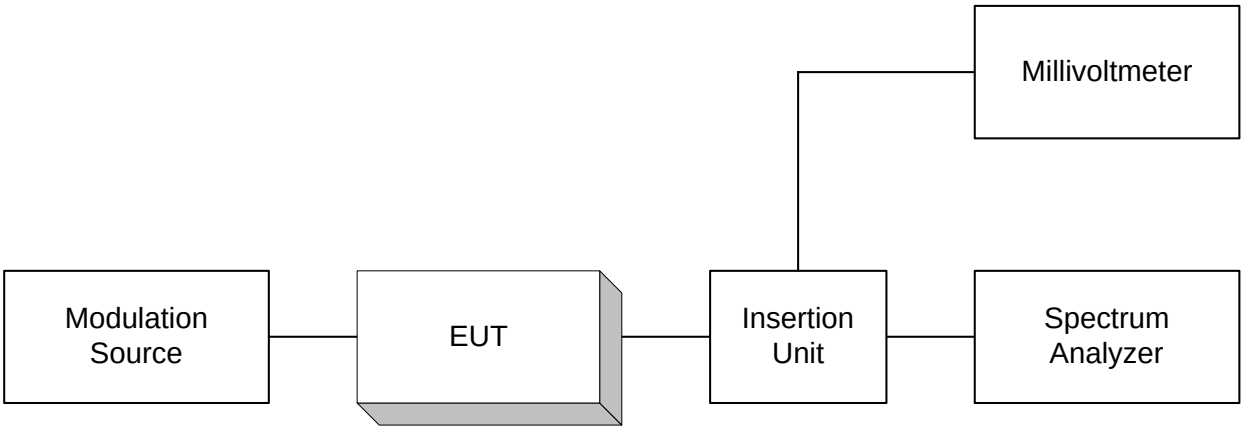
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the 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:

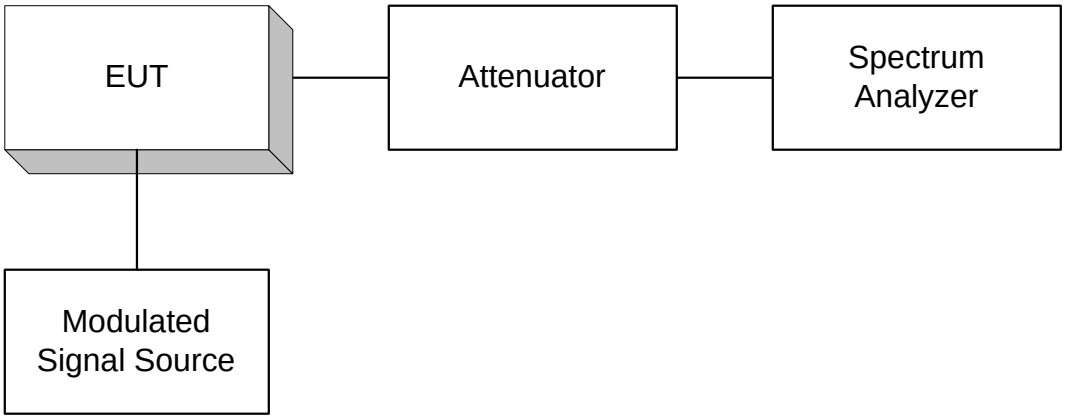
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

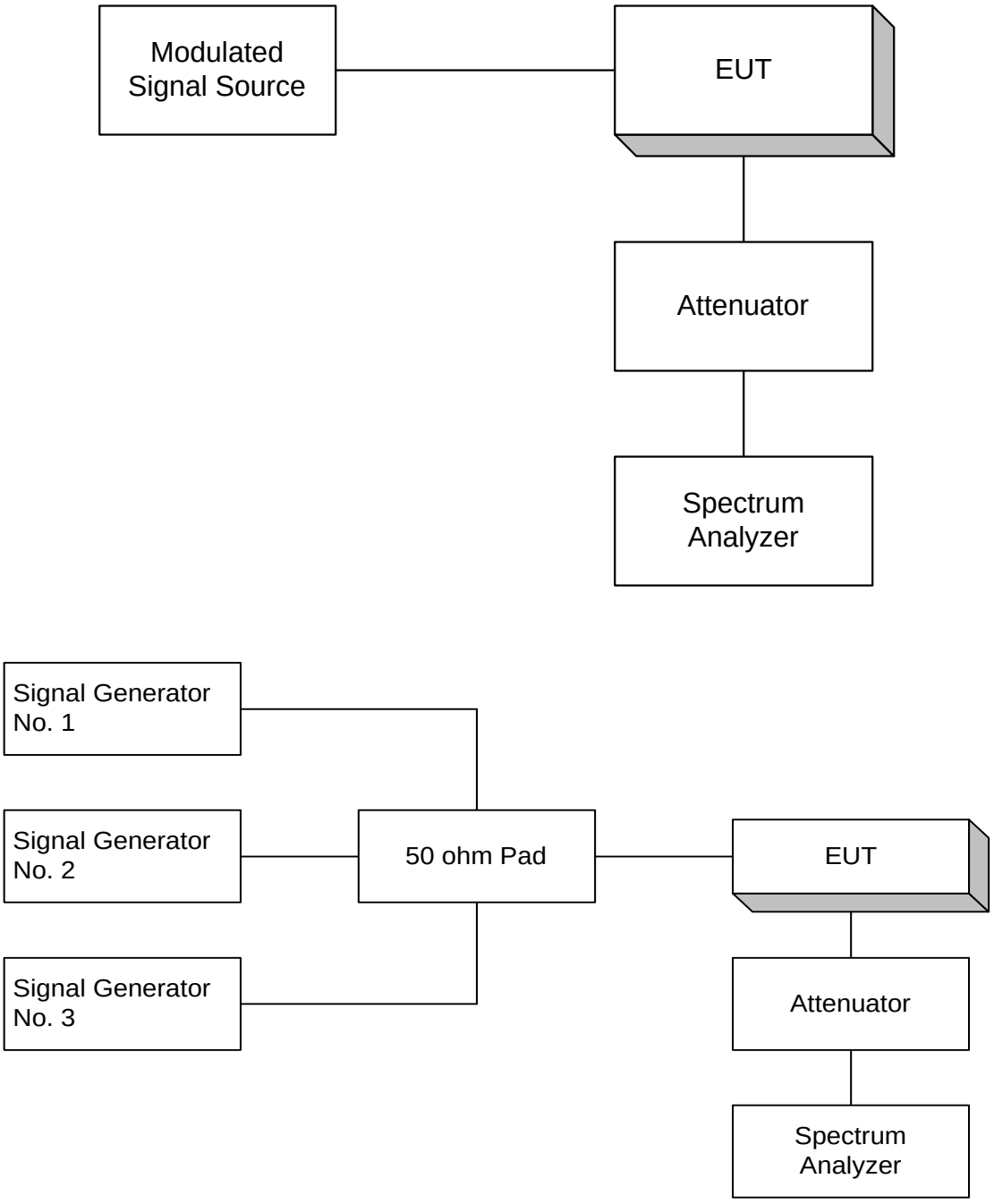
Para. No. 2.1046 - R.F. Power Output



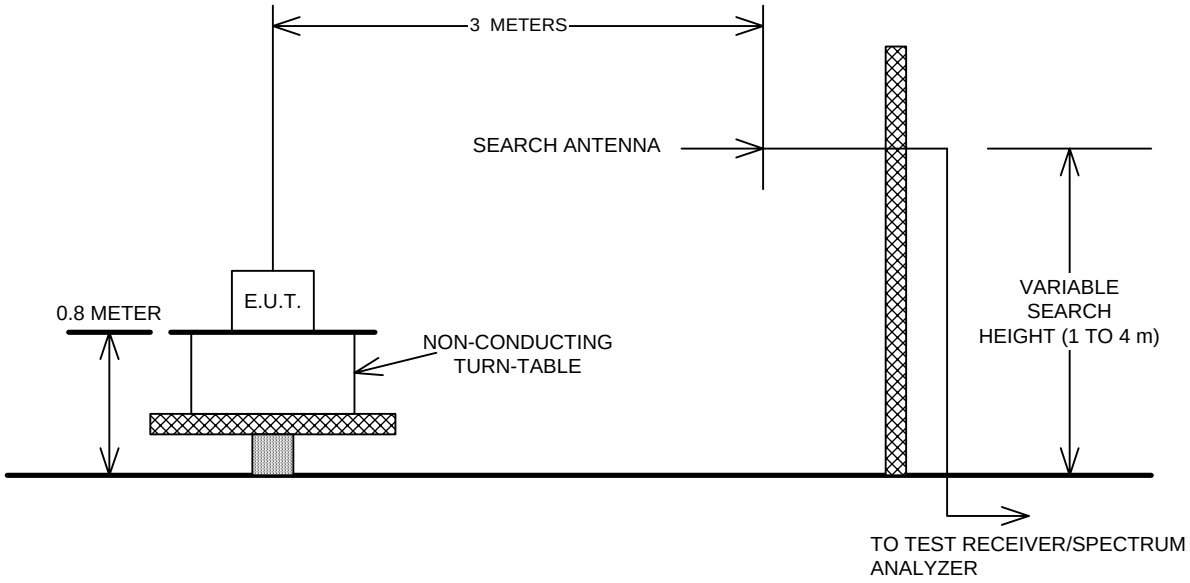
Para. No. 2.1049 - Occupied Bandwidth



Para. No. 2.1051 - Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Radiation



Para. No. 2.1055 - Frequency Stability