Nemko Test Report:	6L0102RUS1
Applicant:	Communication Components, Inc.
Equipment Under Test: (E.U.T.)	MCPB-850-200
In Accordance With:	**FCC Part 22, Subpart H** Cellular Band Amplifiers
Tested By:	Nemko USA Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	 Kevin Rose Wireless Engineer
Date:	April 3, 2006

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Communication Components, Inc.

Model No.: MCPB-850-200

Serial No.: None

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 22, Subpart H.

☒ 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.
See " Summary of Test Data".

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	22.913(a)	500W ERP	Complies
Occupied Bandwidth	22.917(c)	Input/Output	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	Complies
Frequency Stability	22.355	1.5 ppm	NA

Footnotes :

Measurement uncertainty for each test configuration is expressed to 95% probability.

.

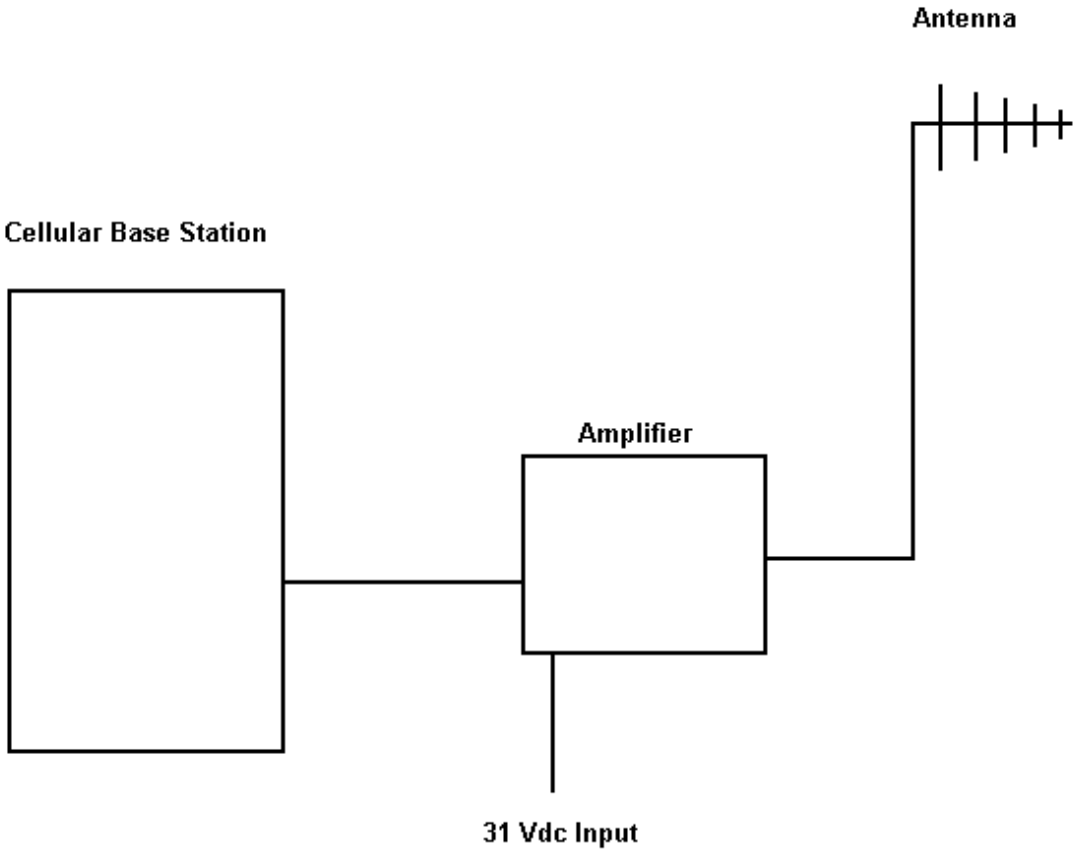
Section 2. General Equipment Specification

Supply Voltage Input:	31 Vdc				
Frequency Range:	869 – 894 MHz				
Type of Modulation and Designator:	**CDMA & WCDMA (F9W)** ☒	**GSM (GXW)** ☒	**NADC (DXW)** ☒	**EDGE (G7W)** ☒	**AMPS (F8W, F1D)** ☒
Output Impedance:	50 ohms				
Rated Output Power:	53 dBm 200 Watts				
RF Output (Rated):	200 Watts composite				
Frequency Translation:	**F1-F1** ☒	**F1-F2** ☐	**N/A** ☐		
Band Selection:	**Software** ☐	**Duplexer Change** ☐	**Fullband Coverage** ☒		

Description of EUT

This is a single directional 200 watt amplifier operating in the 800 MHz cellular band.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 24 March 2006

Test Results: Complies.

Test Data:

	Modulation Type	Per Channel Power Output (dBm)	Composite Power Output (dBm)
	GSM	50.1	53.1
	EDGE	50.0	53.0
	UMTS	49.9	52.9
	CDMA	50.2	53.2
	TDMA	50.1	53.1
	Analog	50.0	53.0

Maximum output power for lowest and highest GSM/EDGE frequencies (869.2 & 893.8 MHz) shall be no greater than 1 watt to comply with bandedge requirements.

Maximum output power for lowest and highest CDMA carriers (ch 1013 and 777) shall be no greater than 200 mW to comply with bandedge requirements.

Equipment Used: 1659-1082-1054-1064-1065

Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 45 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 27 March 2006

Test Results: Complies.

Test Data: See attached plots

Equipment Used: 1659-1082-1054-1064-1065

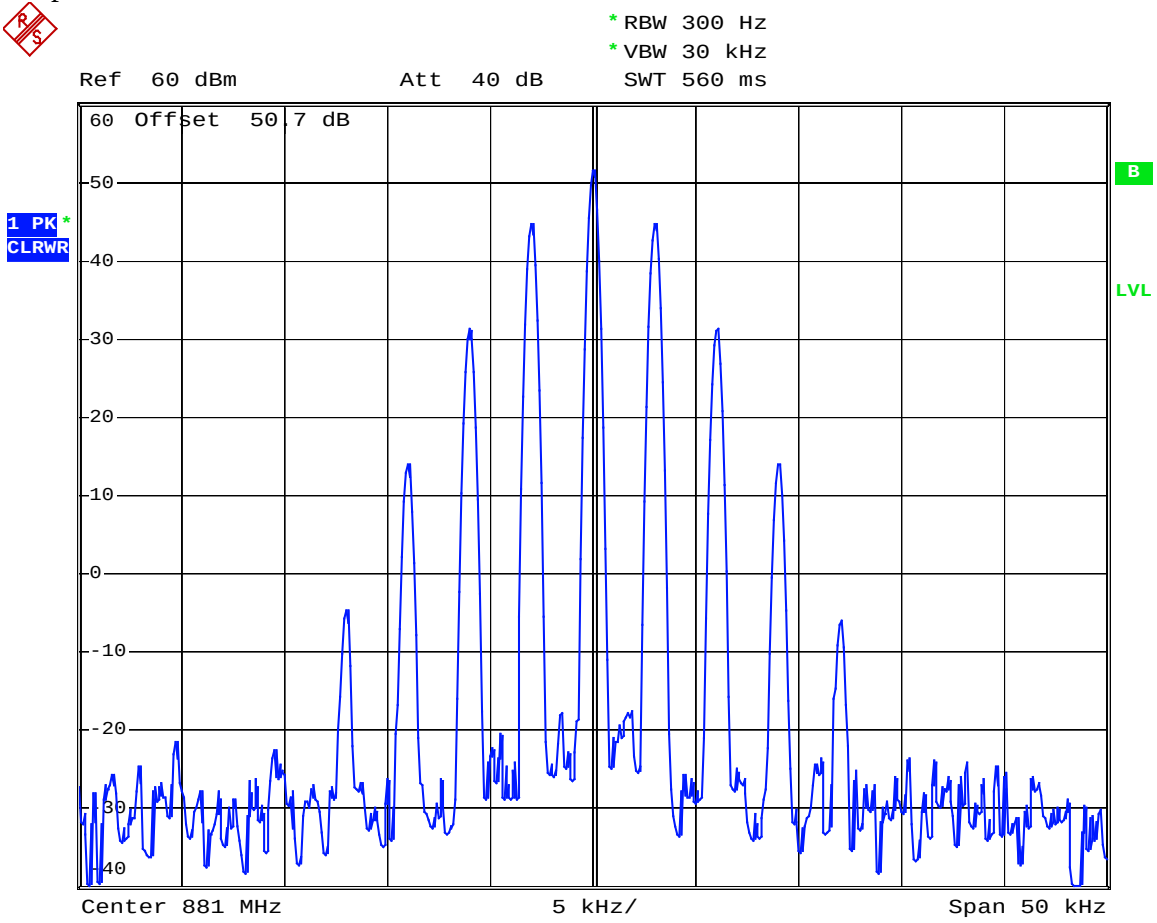
Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 45 %

Test Data – Occupied Bandwidth

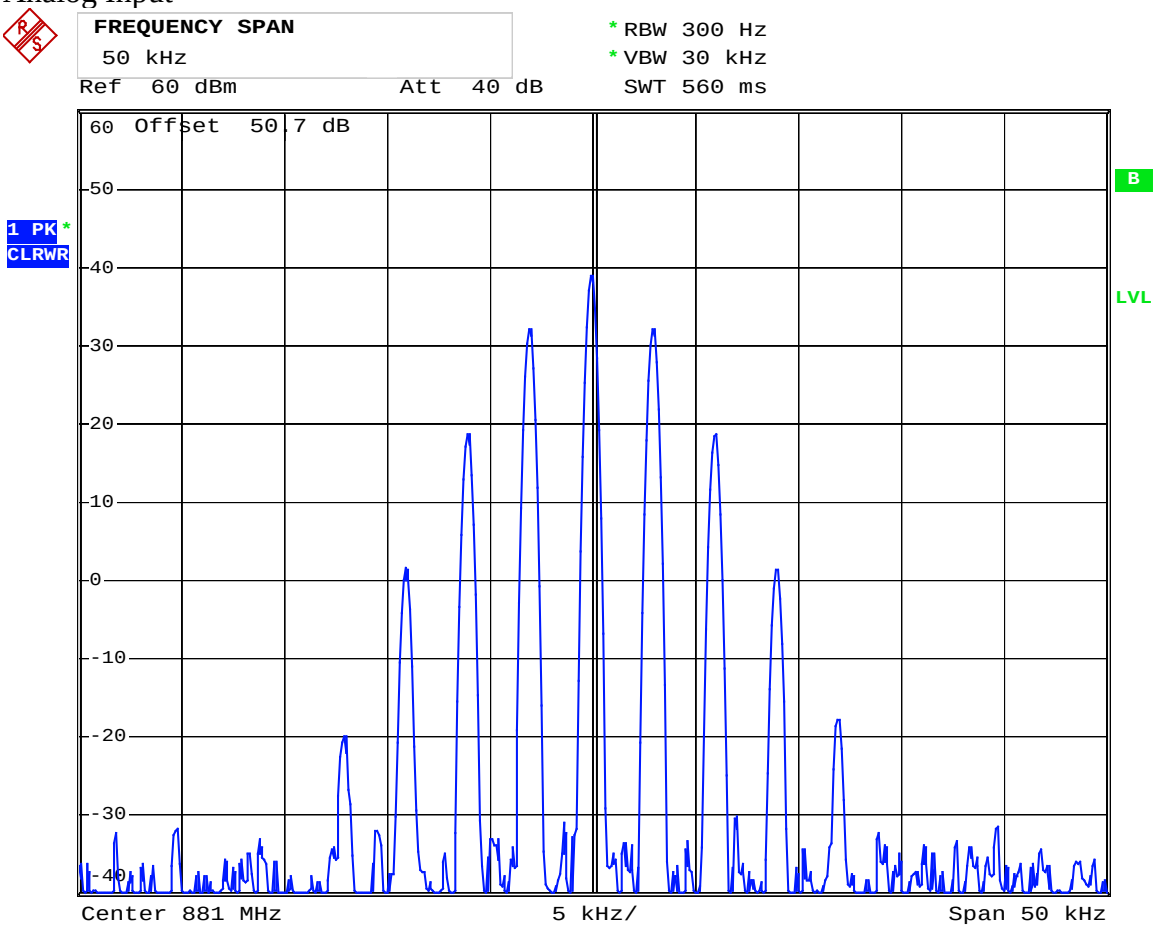
Analog
Output



Date: 27.MAR.2006 09:54:00

Test Data – Occupied Bandwidth

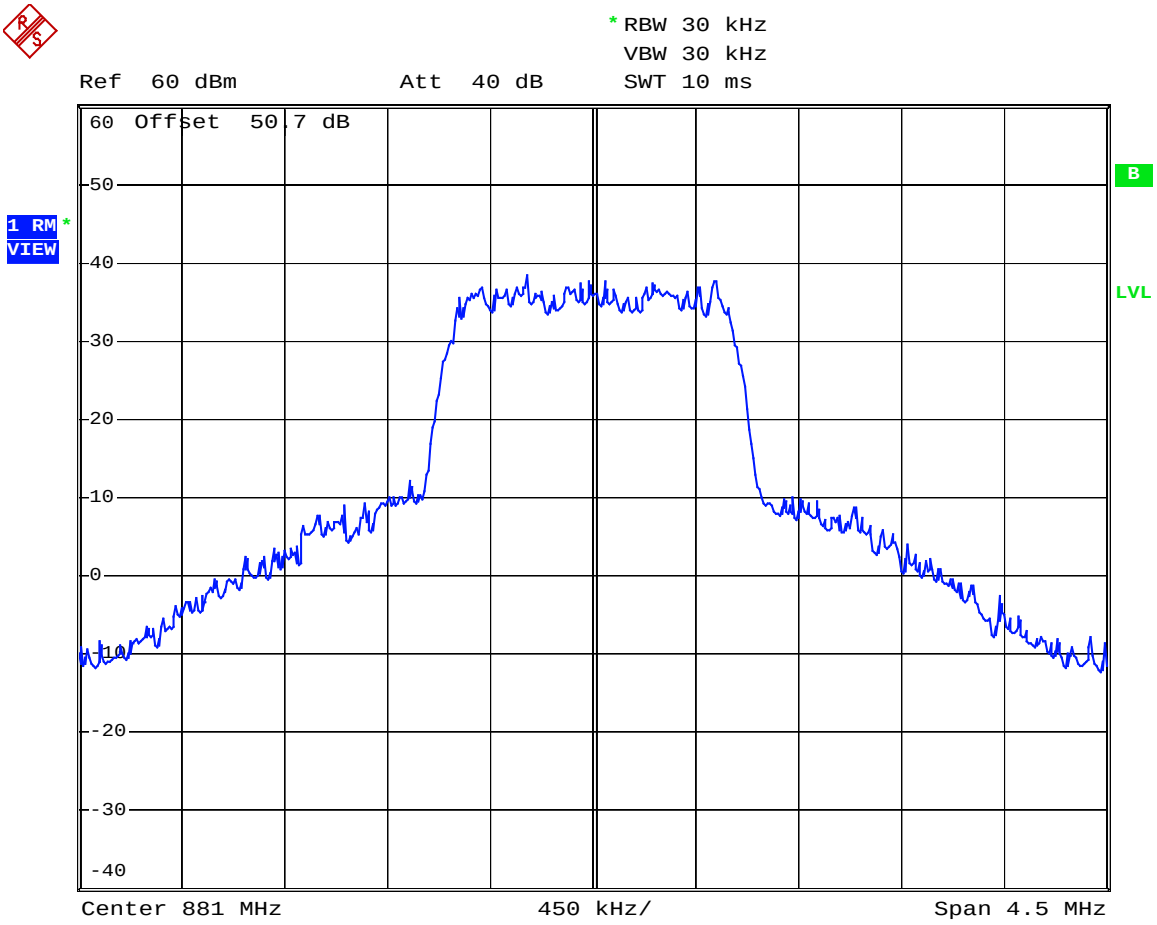
Analog Input



Date: 27.MAR.2006 10:28:03

Test Data – Occupied Bandwidth

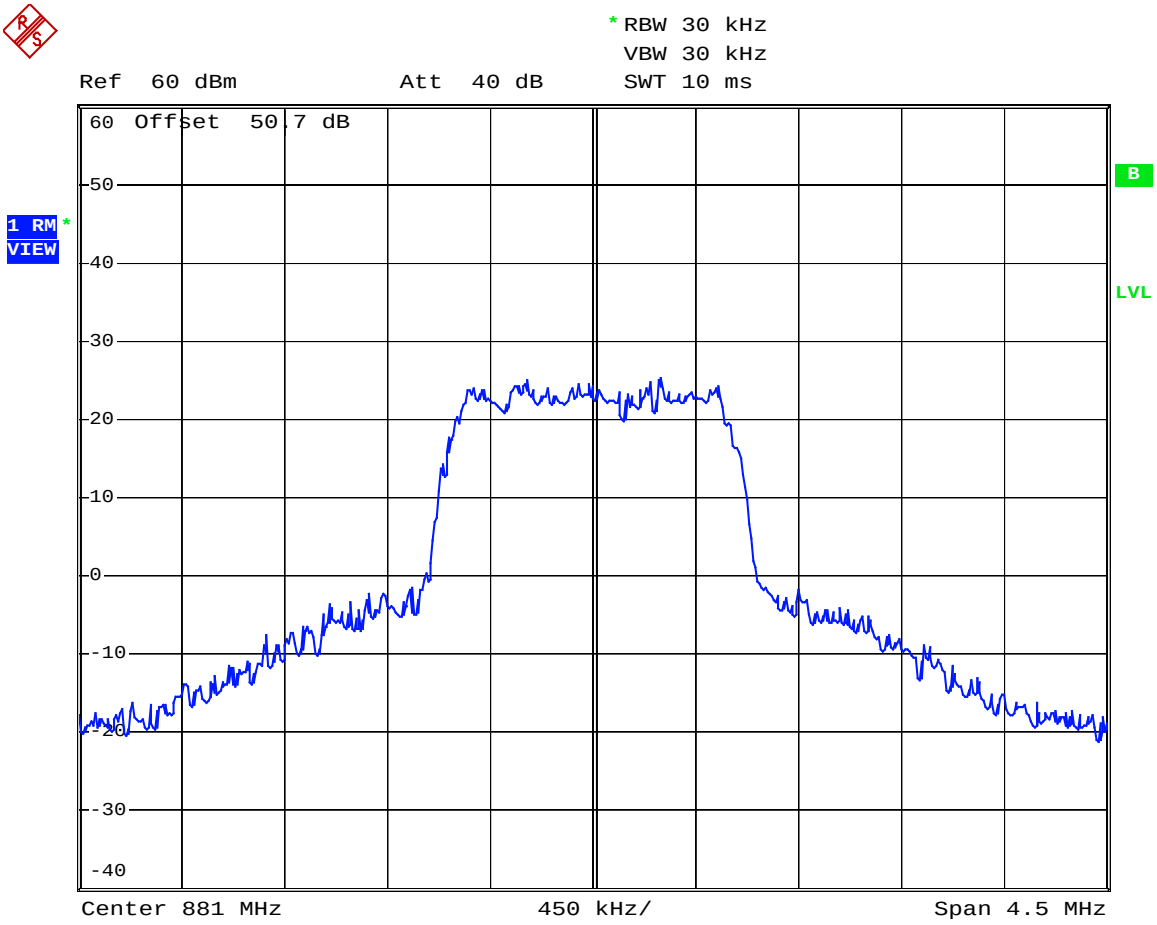
CDMA Output



Date: 27.MAR.2006 10:08:41

Test Data – Occupied Bandwidth

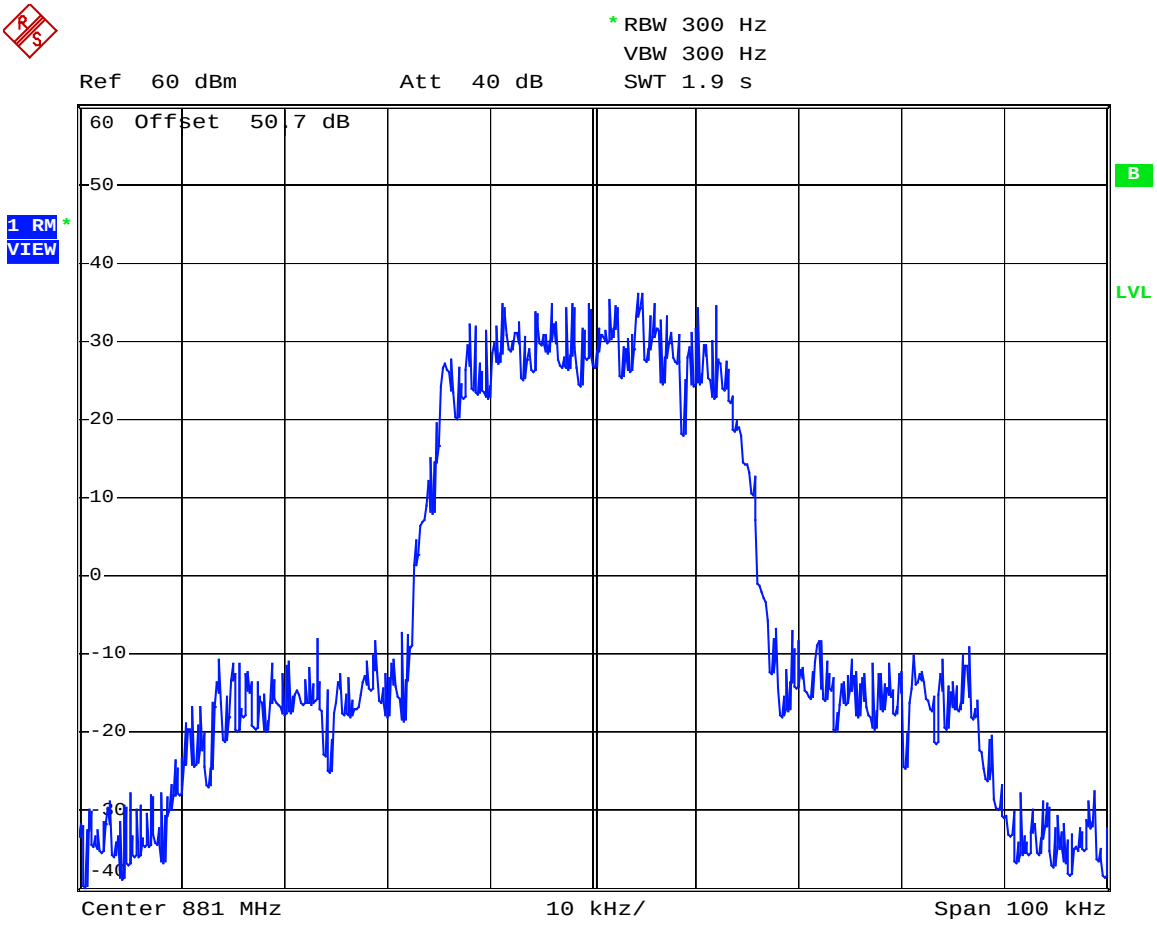
CDMA Input



Date: 27.MAR.2006 10:26:28

Test Data – Occupied Bandwidth

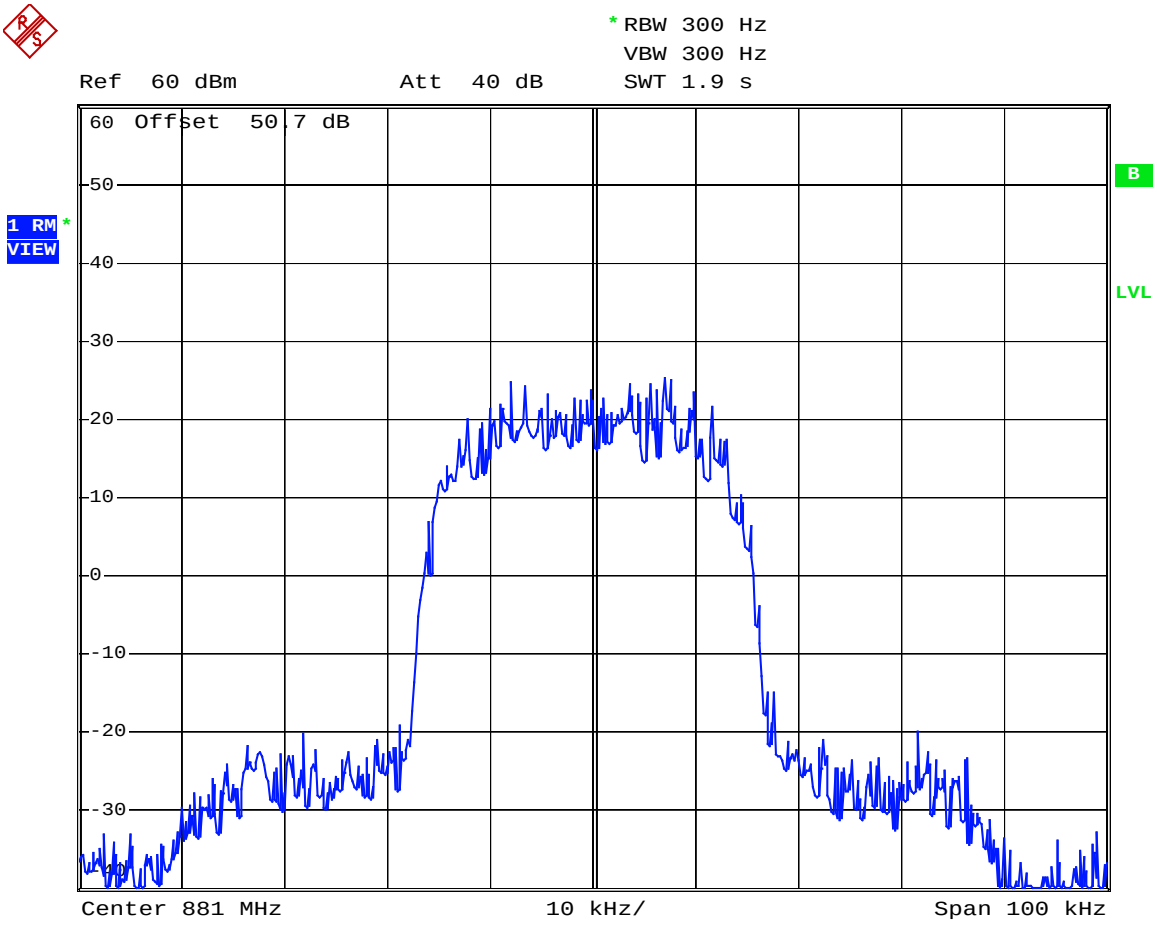
TDMA Output



Date: 27.MAR.2006 10:10:48

Test Data – Occupied Bandwidth

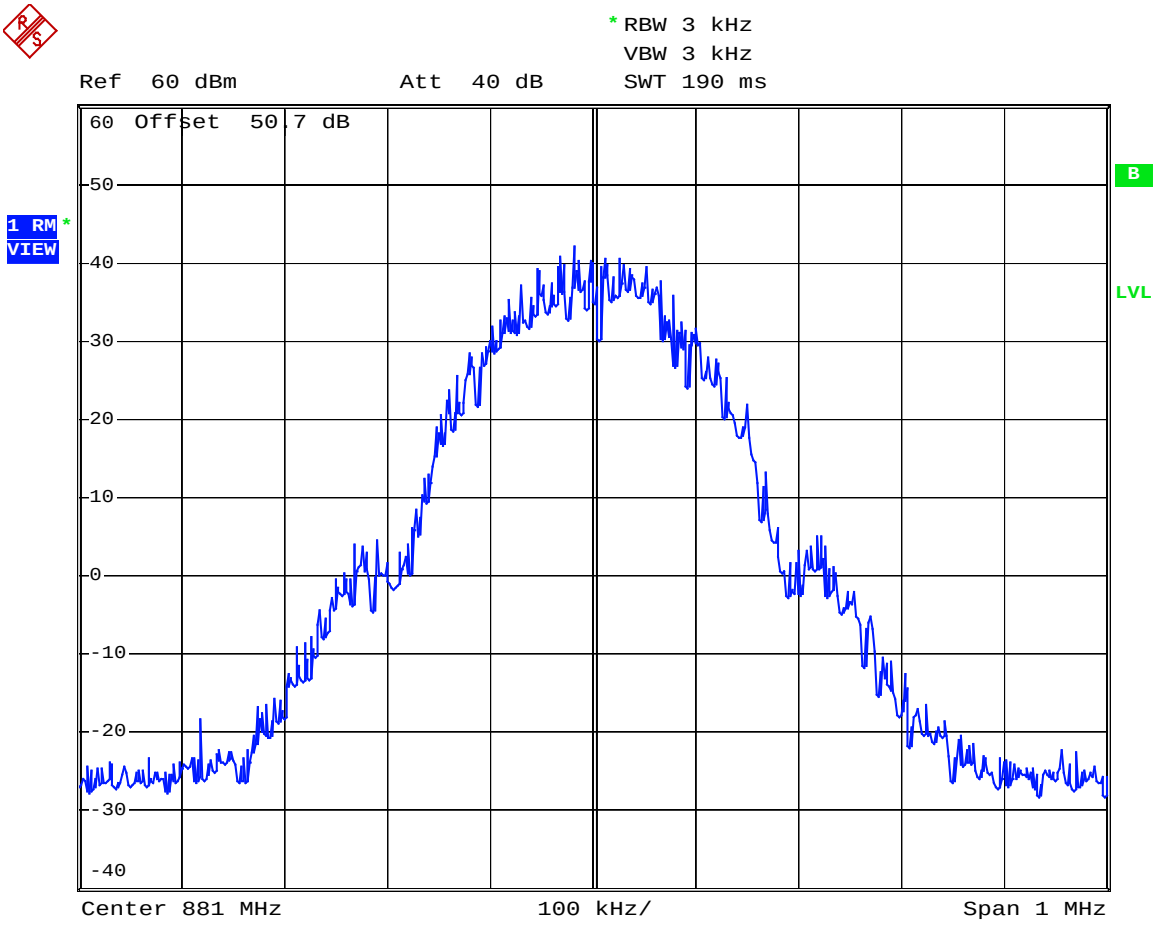
TDMA Input



Date: 27.MAR.2006 10:25:02

Test Data – Occupied Bandwidth

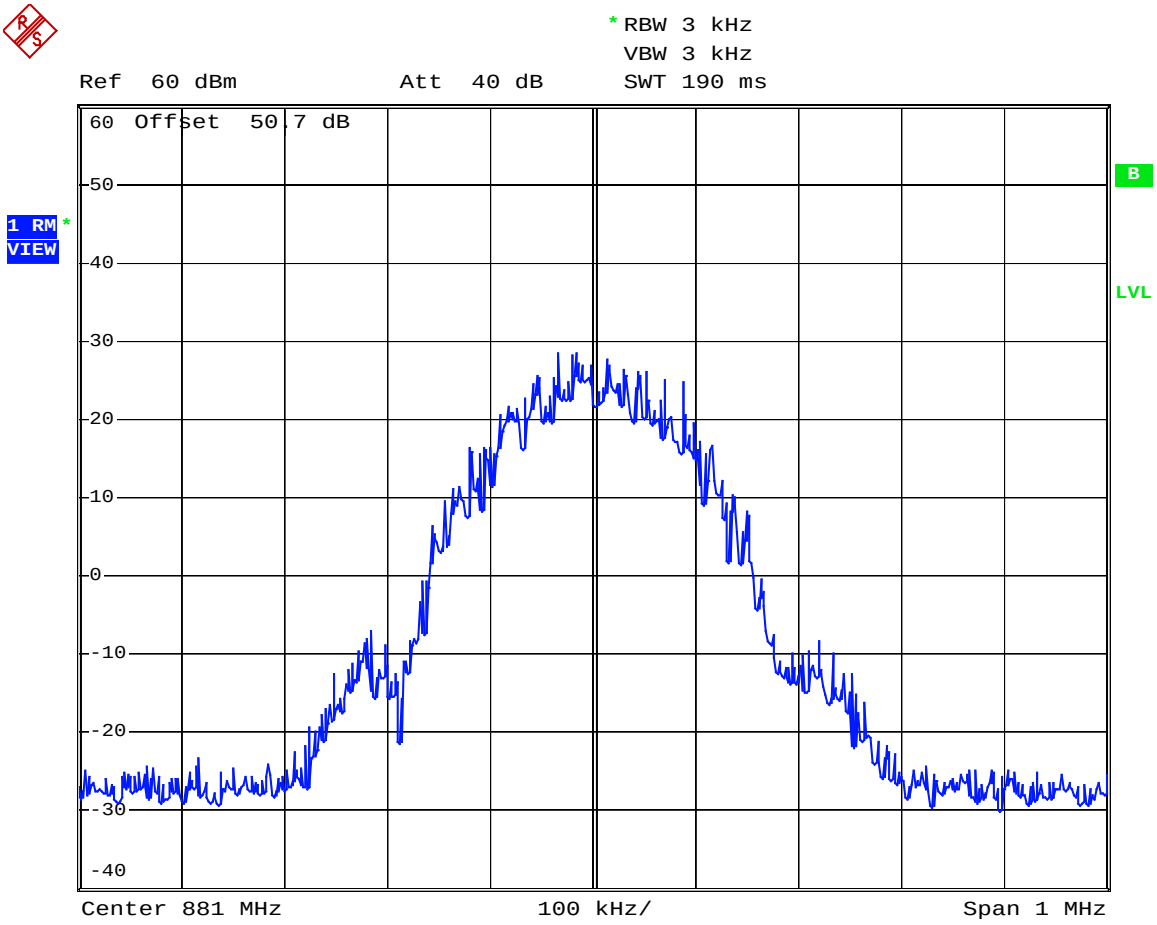
GSM Output



Date: 27.MAR.2006 10:13:07

Test Data – Occupied Bandwidth

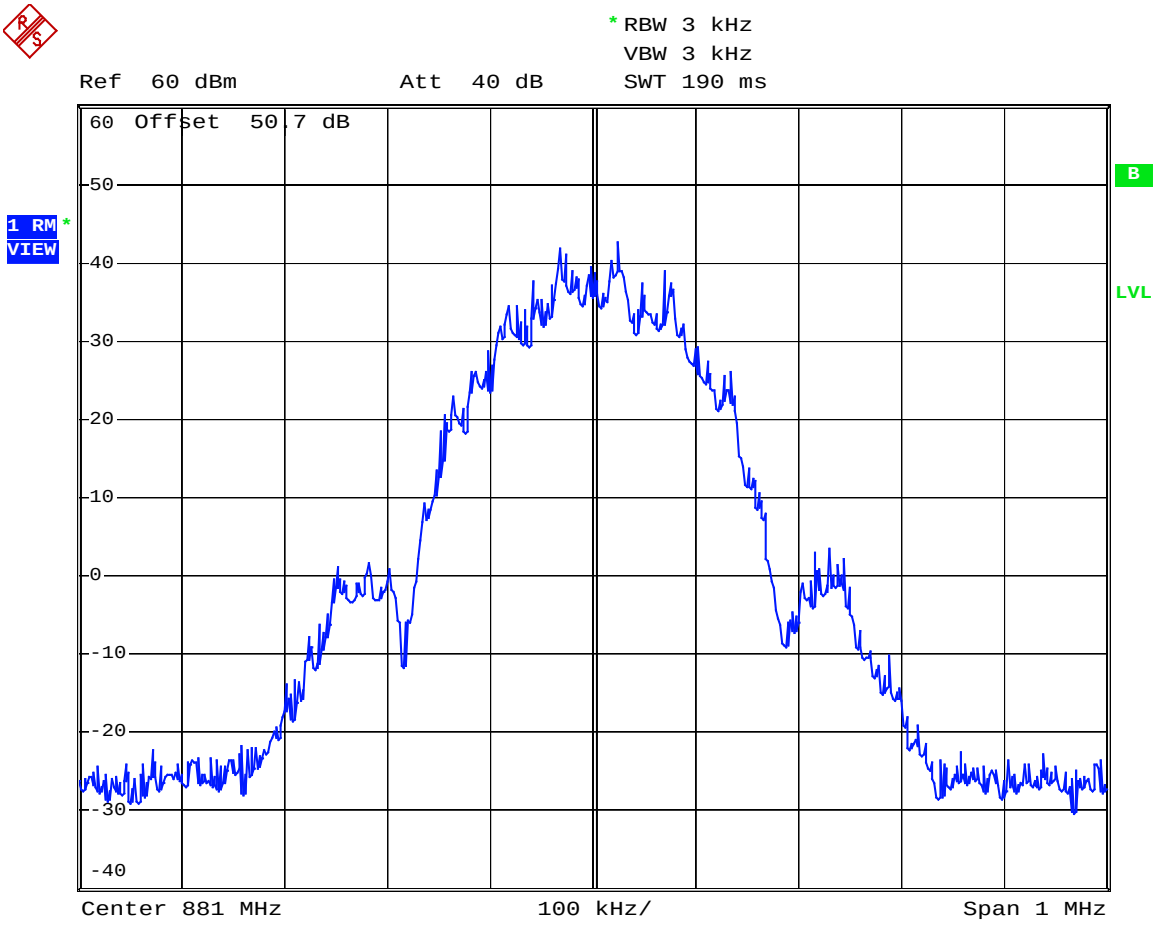
GSM Input



Date: 27.MAR.2006 10:23:40

Test Data – Occupied Bandwidth

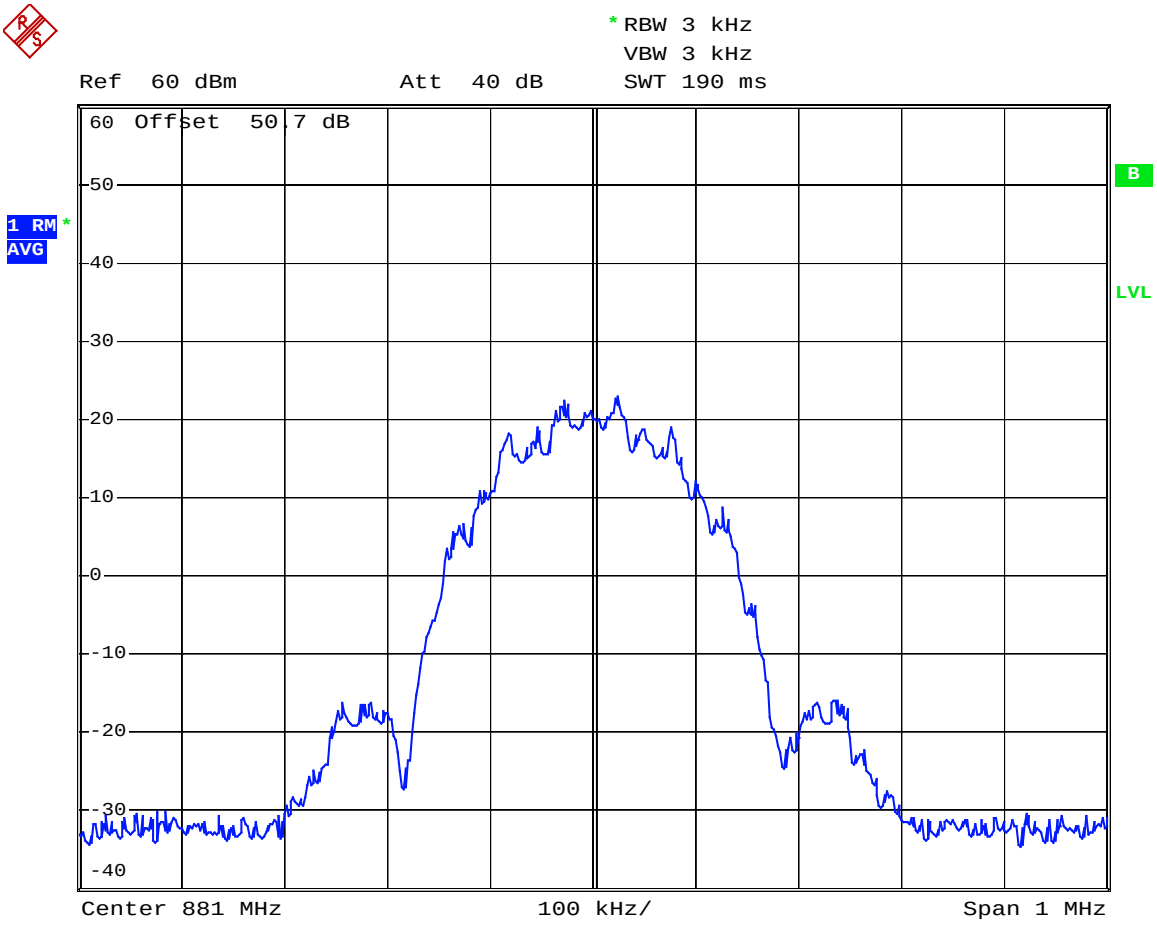
EDGE Output



Date: 27.MAR.2006 10:14:55

Test Data – Occupied Bandwidth

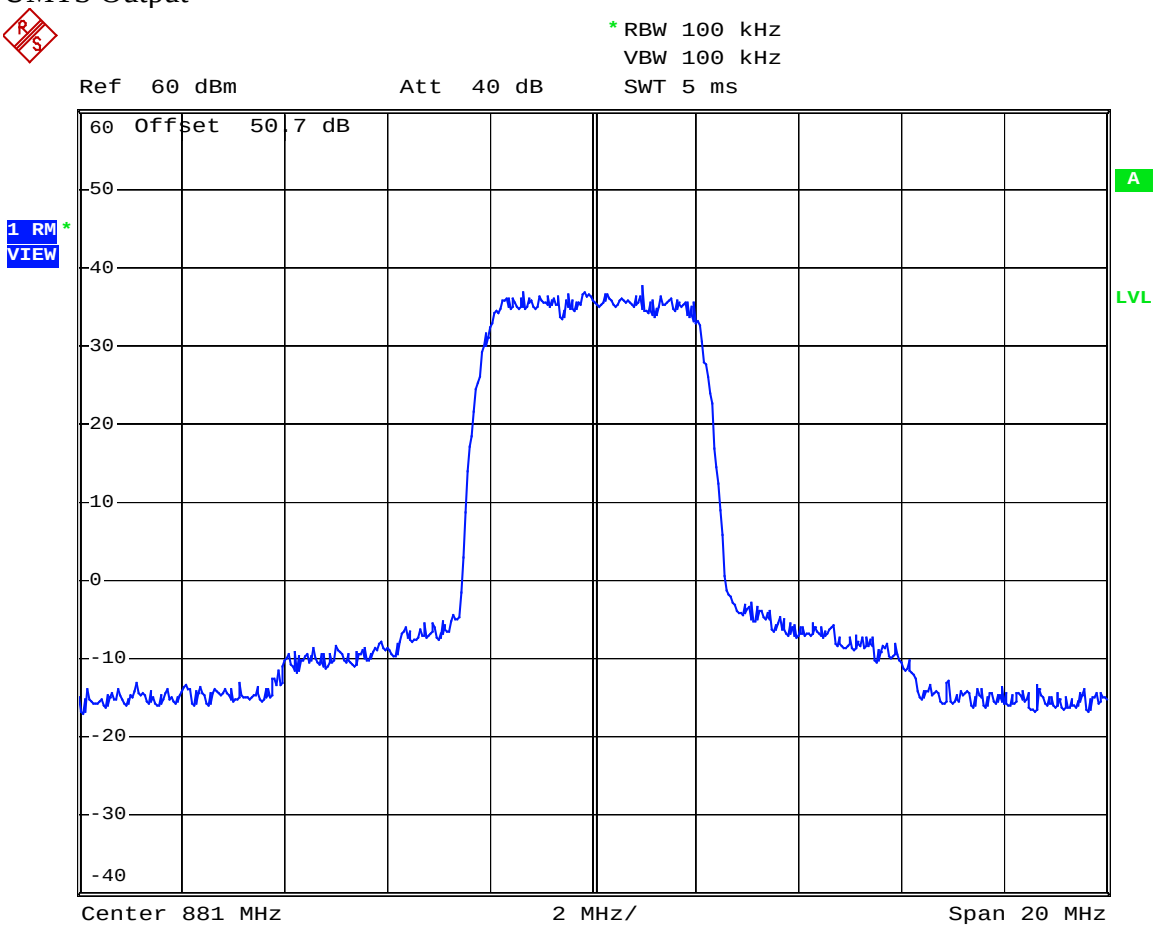
EDGE Input



Date: 27.MAR.2006 10:22:51

Test Data – Occupied Bandwidth

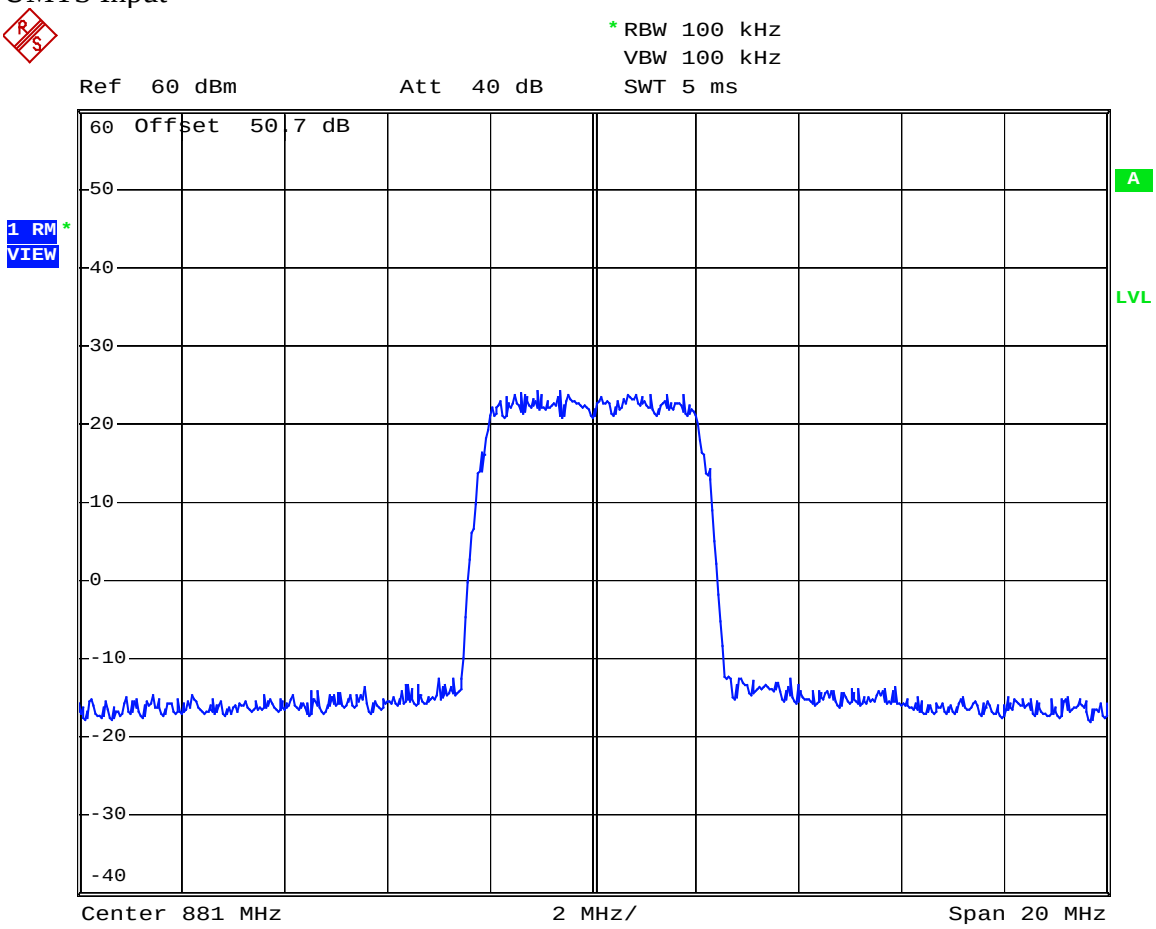
UMTS Output



Date: 29.MAR.2006 11:32:10

Test Data – Occupied Bandwidth

UMTS Input



Date: 29.MAR.2006 11:33:29

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 28 March 2006

Test Results: Complies.

Test Data: See attached plots

Equipment Used: 1659-1464-1082-1058-1054-1055-1064-1065

Measurement Uncertainty: +/- 1.6 dB

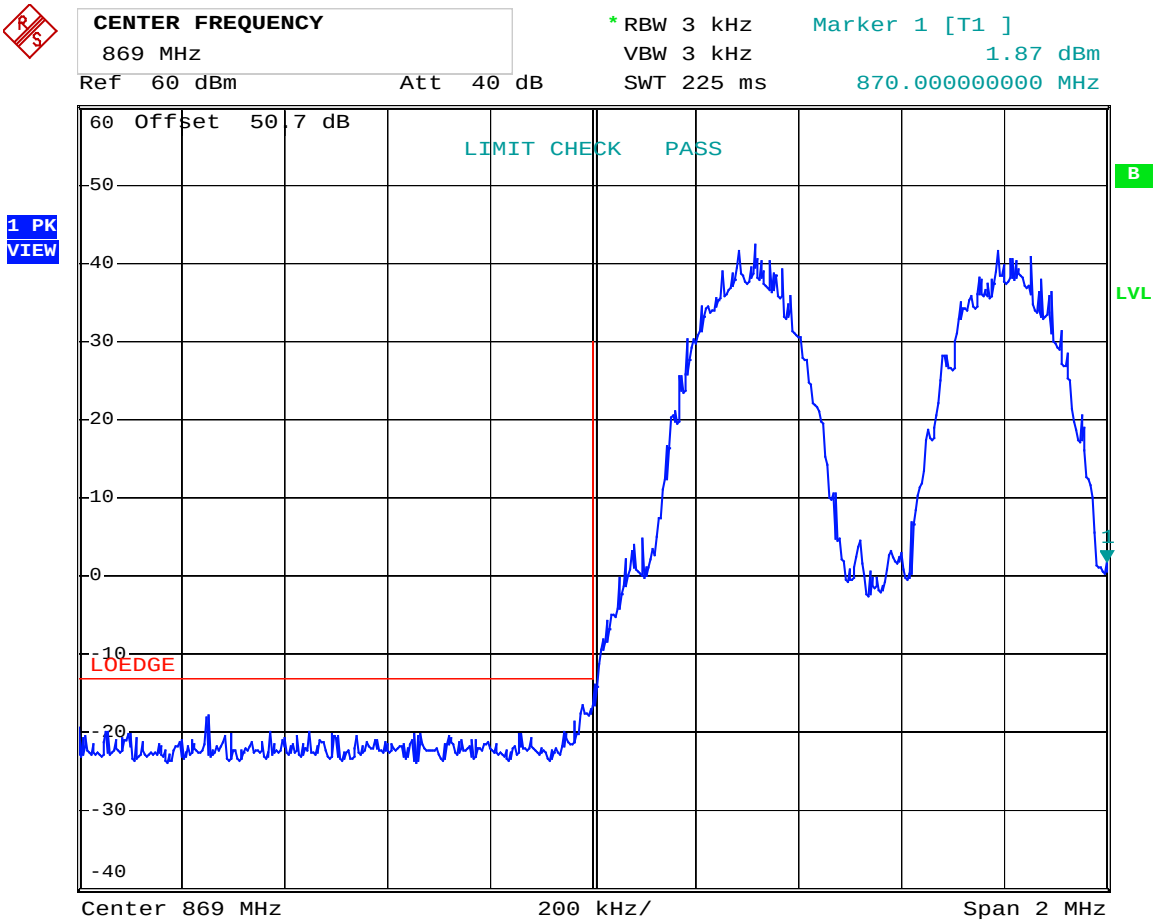
Temperature: 22 °C

Relative Humidity: 45 %

Note: The amplifier was tested on three channels. Data presented is representative of noise floor readings on all channels..

Test Data – Spurious Emissions at Antenna Terminals

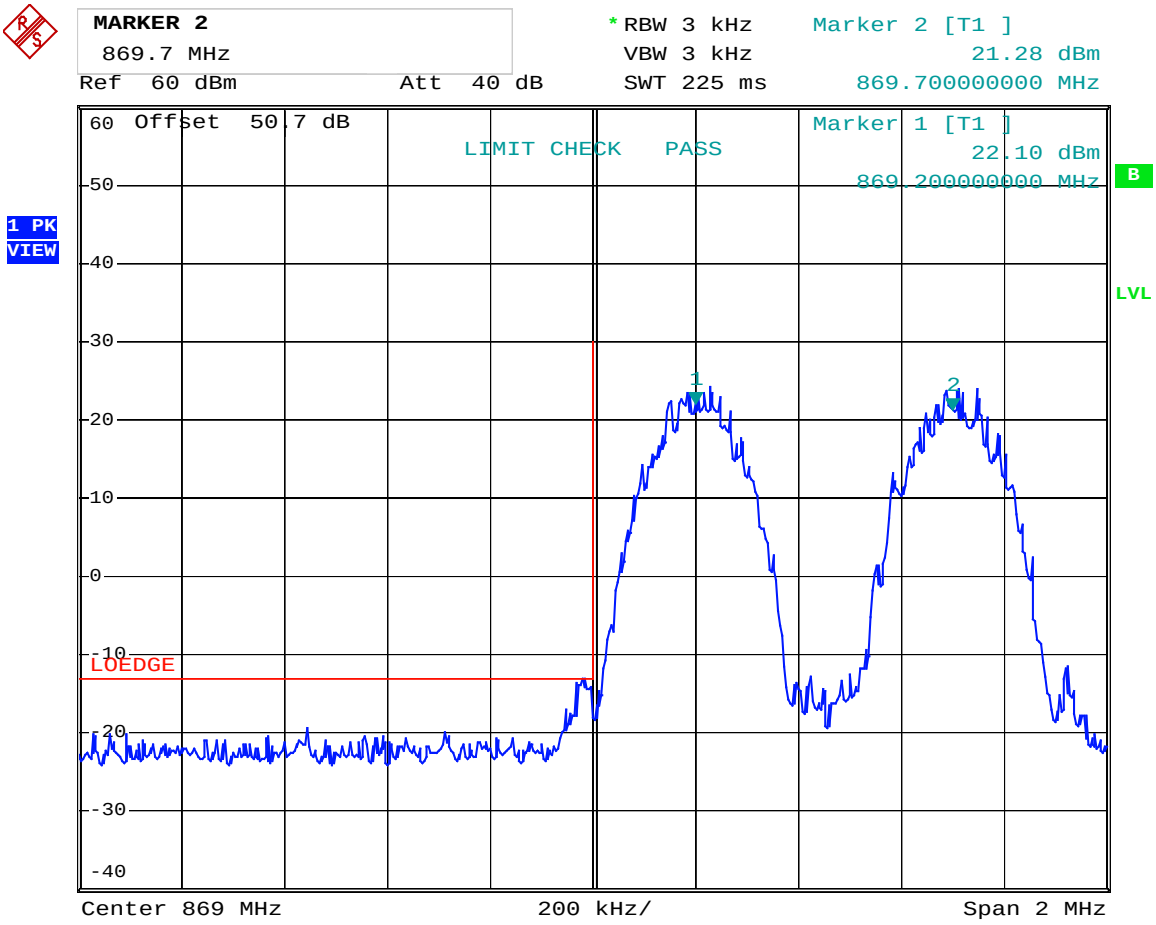
GSM LOWER BANDEDGE
869.3 AND 869.8 MHz
100 WATTS EACH



Date: 31.JAN.2006 12:26:31

Test Data – Spurious Emissions at Antenna Terminals

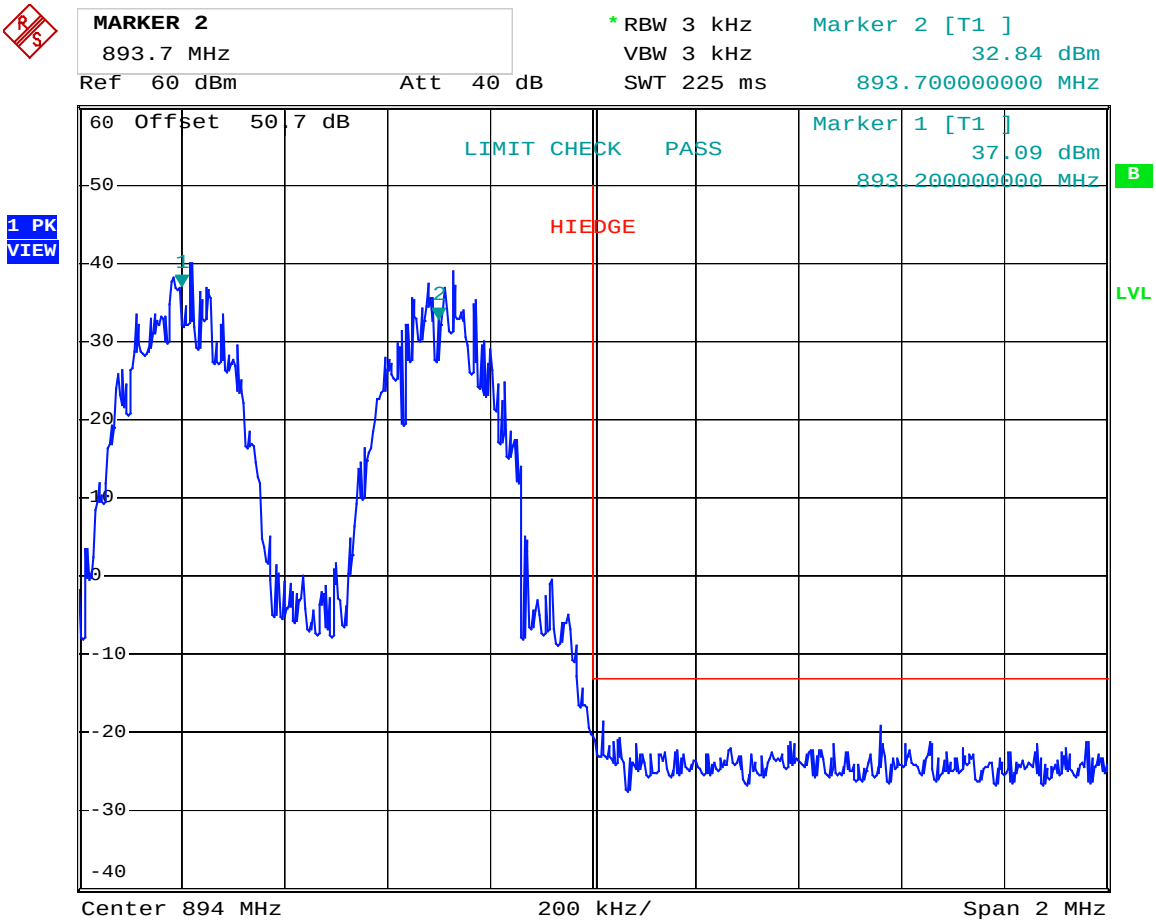
GSM LOWER BANDEDGE
869.2 AND 869.7 MHz
1 WATT EACH



Date: 31.JAN.2006 12:29:25

Test Data – Spurious Emissions at Antenna Terminals

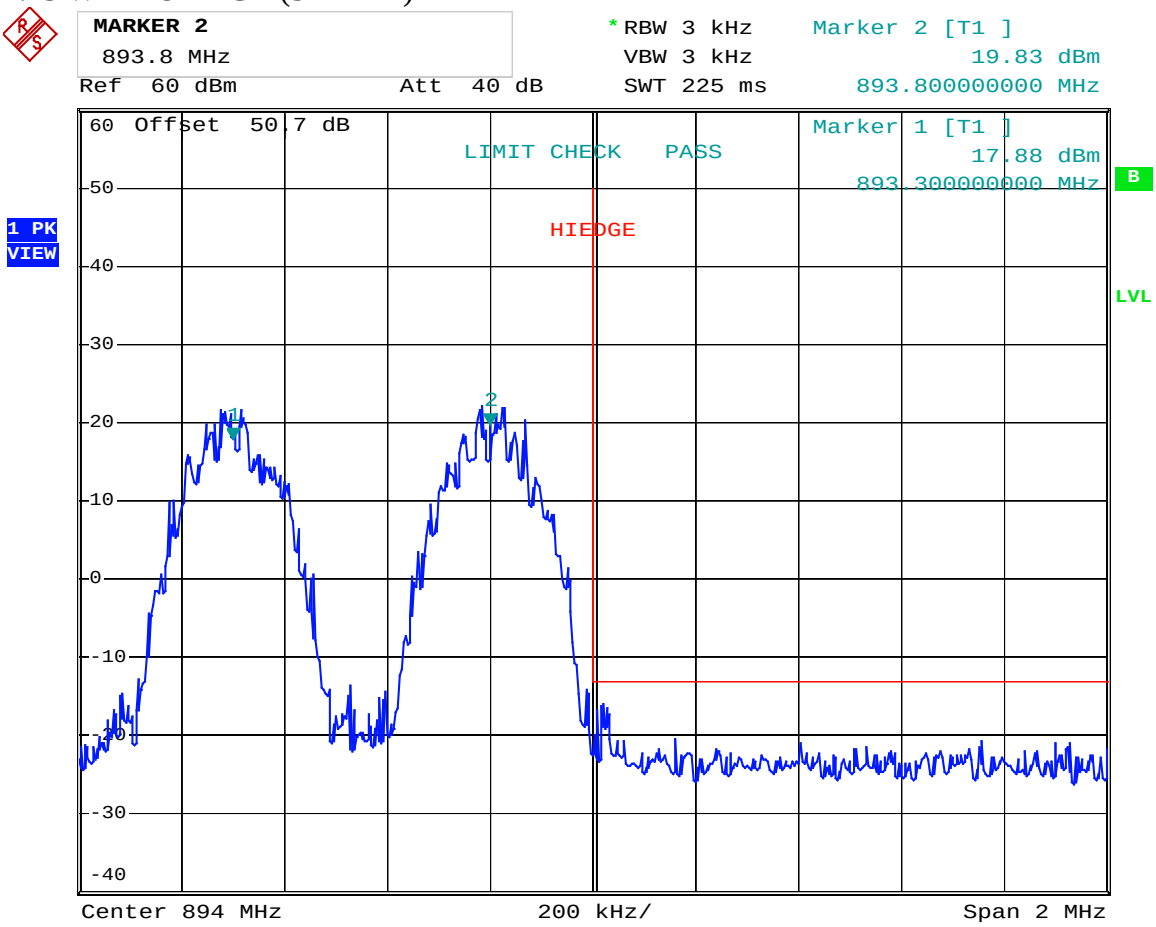
GSM UPPER BANDEDGE
893.2 AND 893.7 MHz
100 WATTS EACH



Date: 27.MAR.2006 11:38:48

Test Data – Spurious Emissions at Antenna Terminals

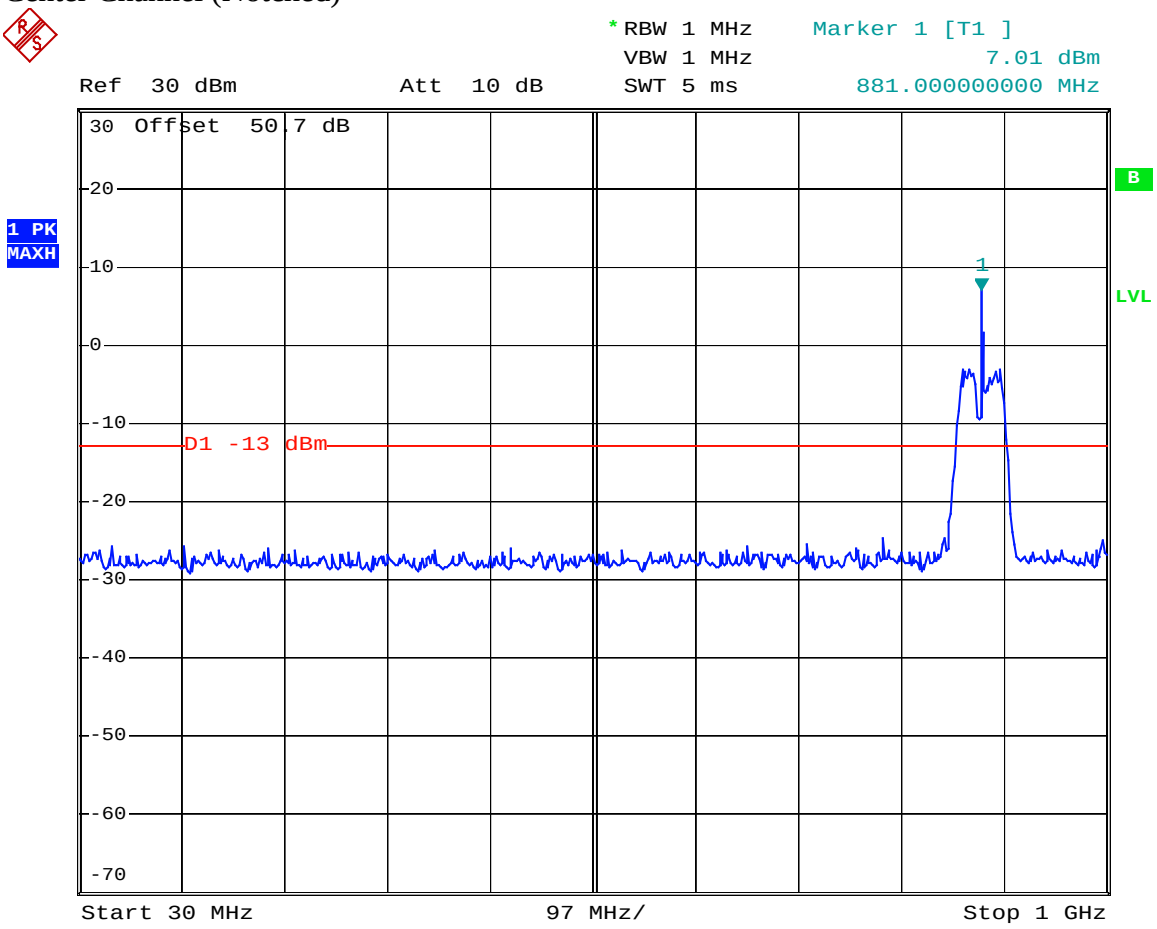
GSM UPPER BANDEDGE
893.3 AND 893.8 MHz
1.25 WATTS EACH (31 DBM)



Date: 27.MAR.2006 11:44:15

Test Data – Spurious Emissions at Antenna Terminals

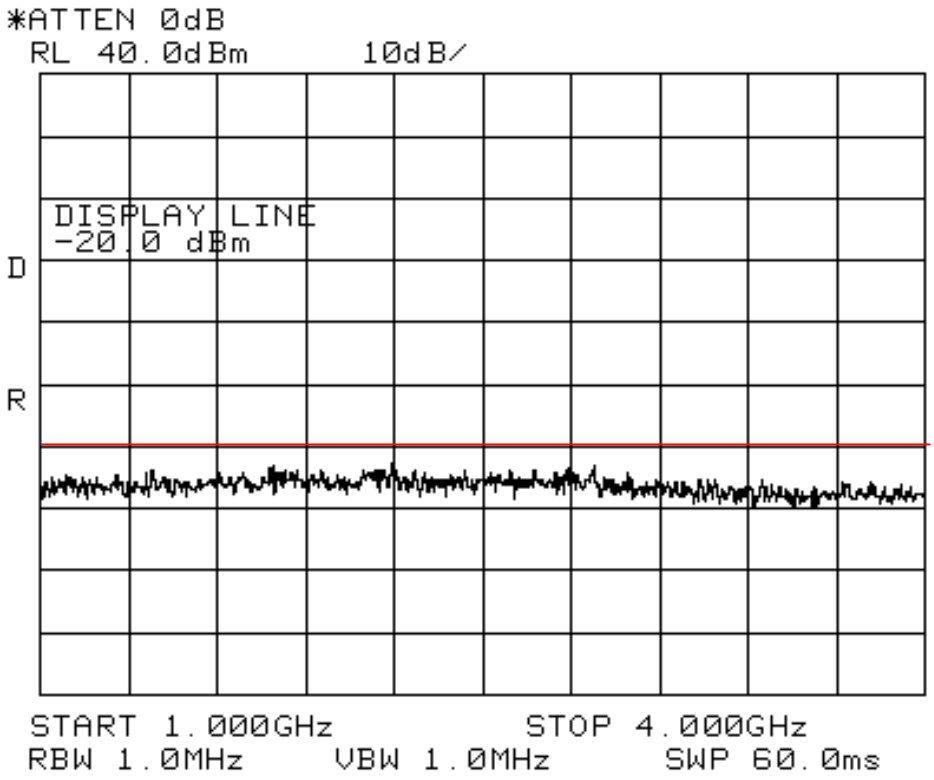
GSM
Center Channel (Notched)



Date: 27.MAR.2006 14:26:39

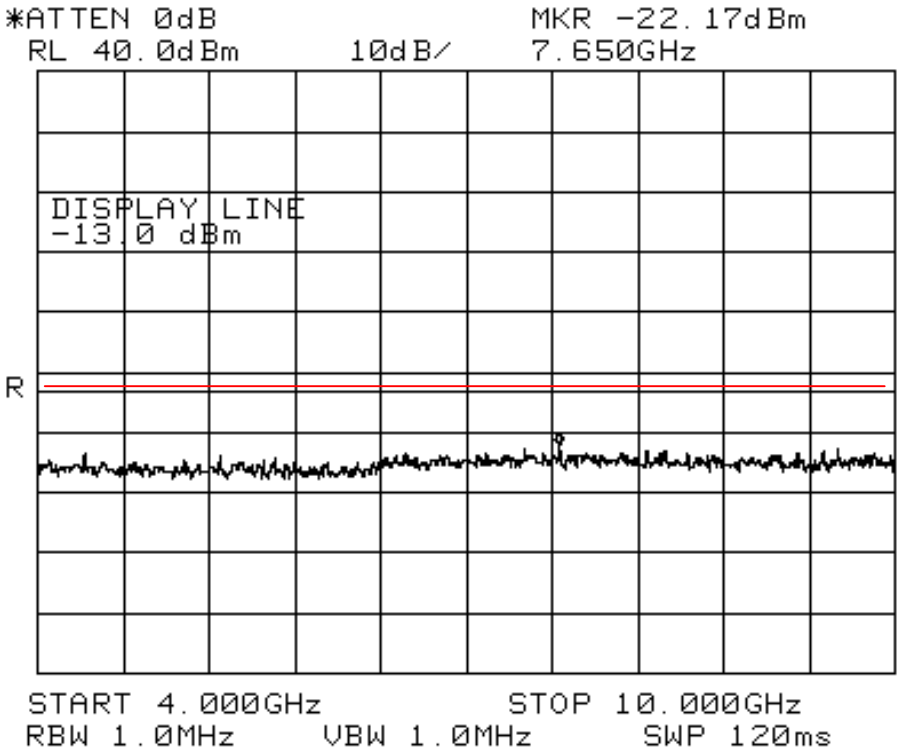
Test Data – Spurious Emissions at Antenna Terminals

GSM



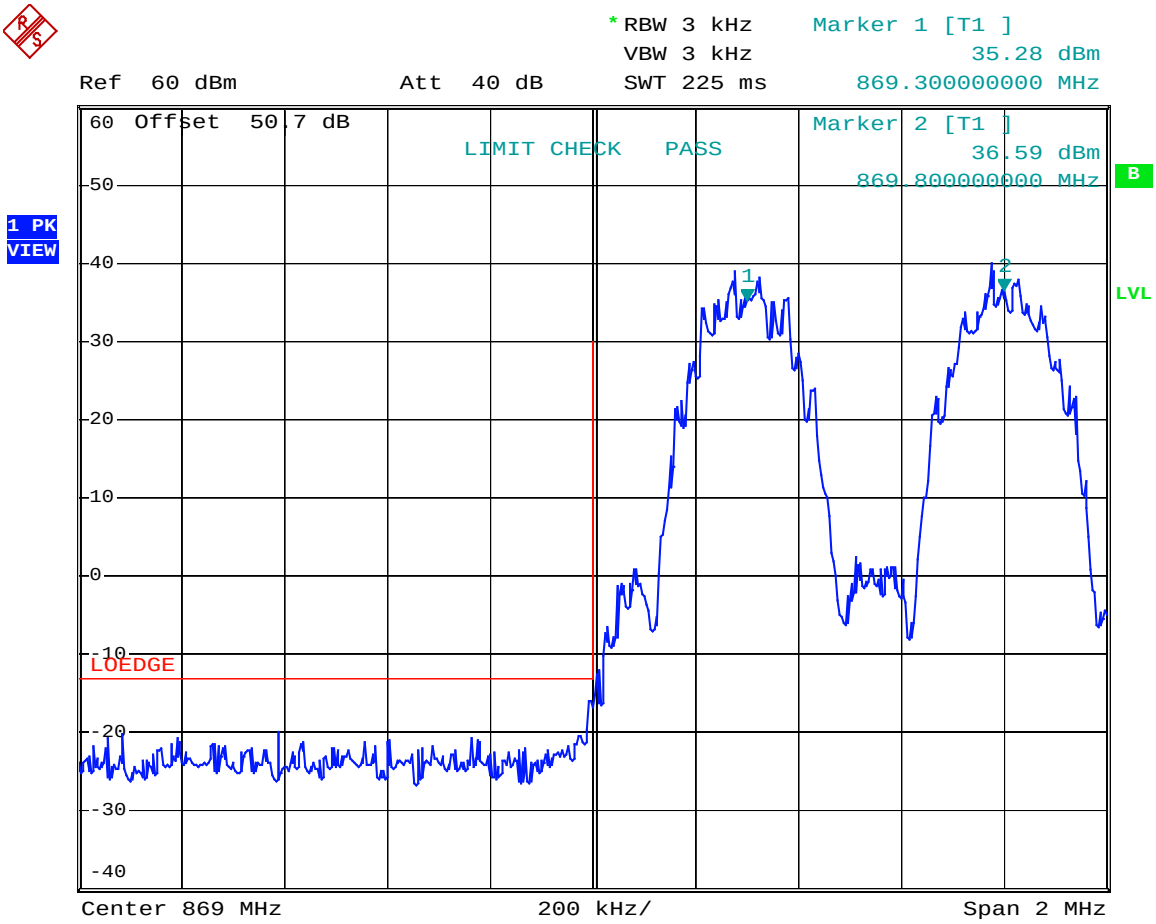
Test Data – Spurious Emissions at Antenna Terminals

GSM



Test Data – Spurious Emissions at Antenna Terminals

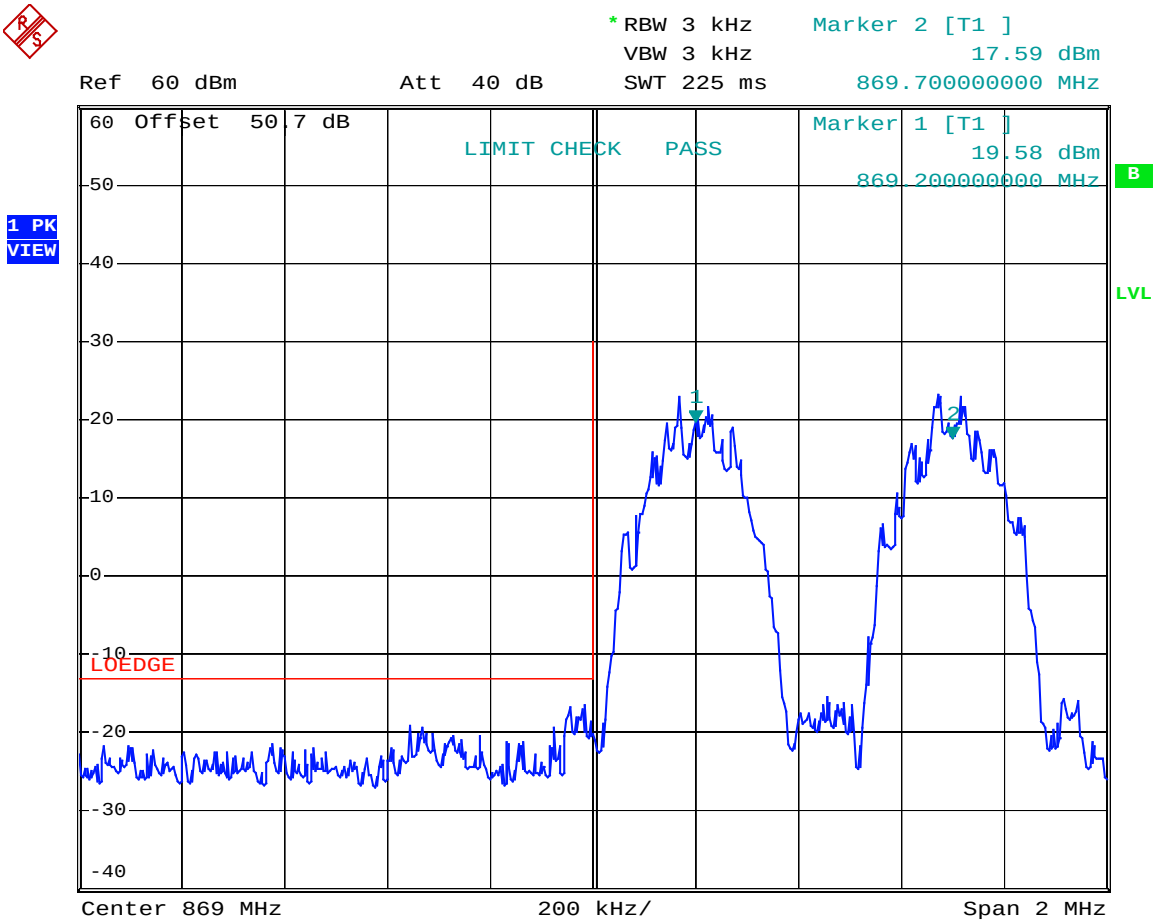
EDGE LOWER BANDEDGE
869.3 AND 869.8 MHz
100 WATTS EACH



Date: 24.MAR.2006 10:58:01

Test Data – Spurious Emissions at Antenna Terminals

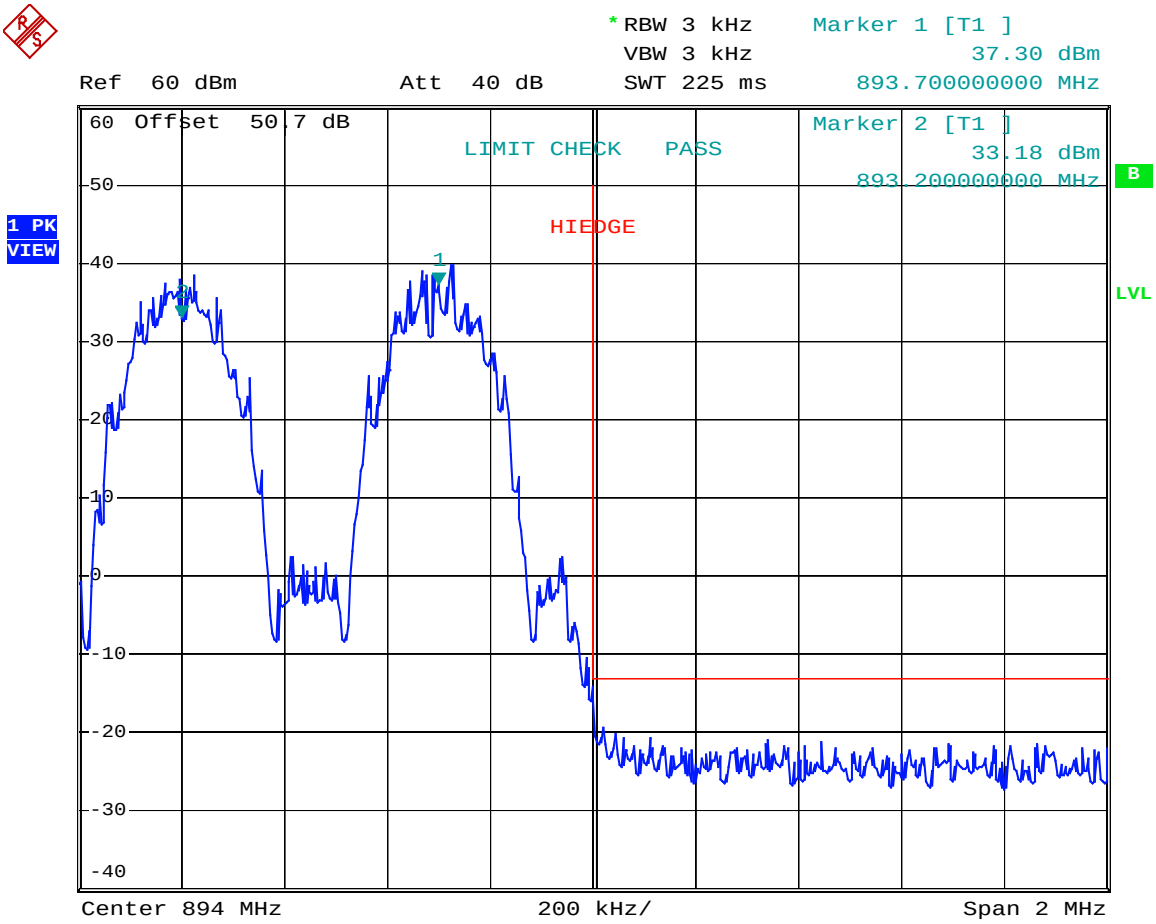
EDGE LOWER BANDEDGE
869.2 AND 869.7 MHz
1 WATTS EACH



Date: 31.JAN.2006 12:35:48

Test Data – Spurious Emissions at Antenna Terminals

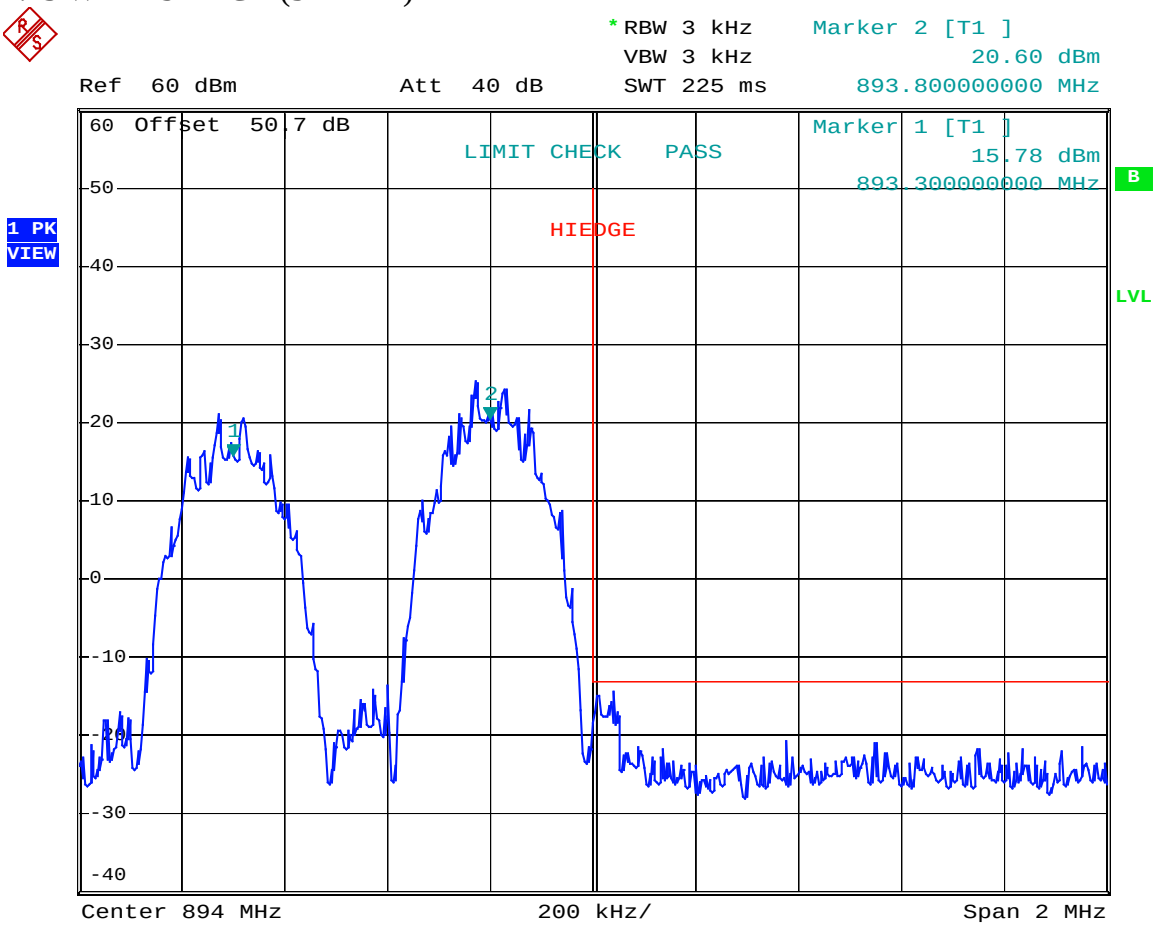
EDGE UPPER BANDEDGE
893.2 AND 893.7 MHz
100 WATTS EACH



Date: 27.MAR.2006 11:48:37

Test Data – Spurious Emissions at Antenna Terminals

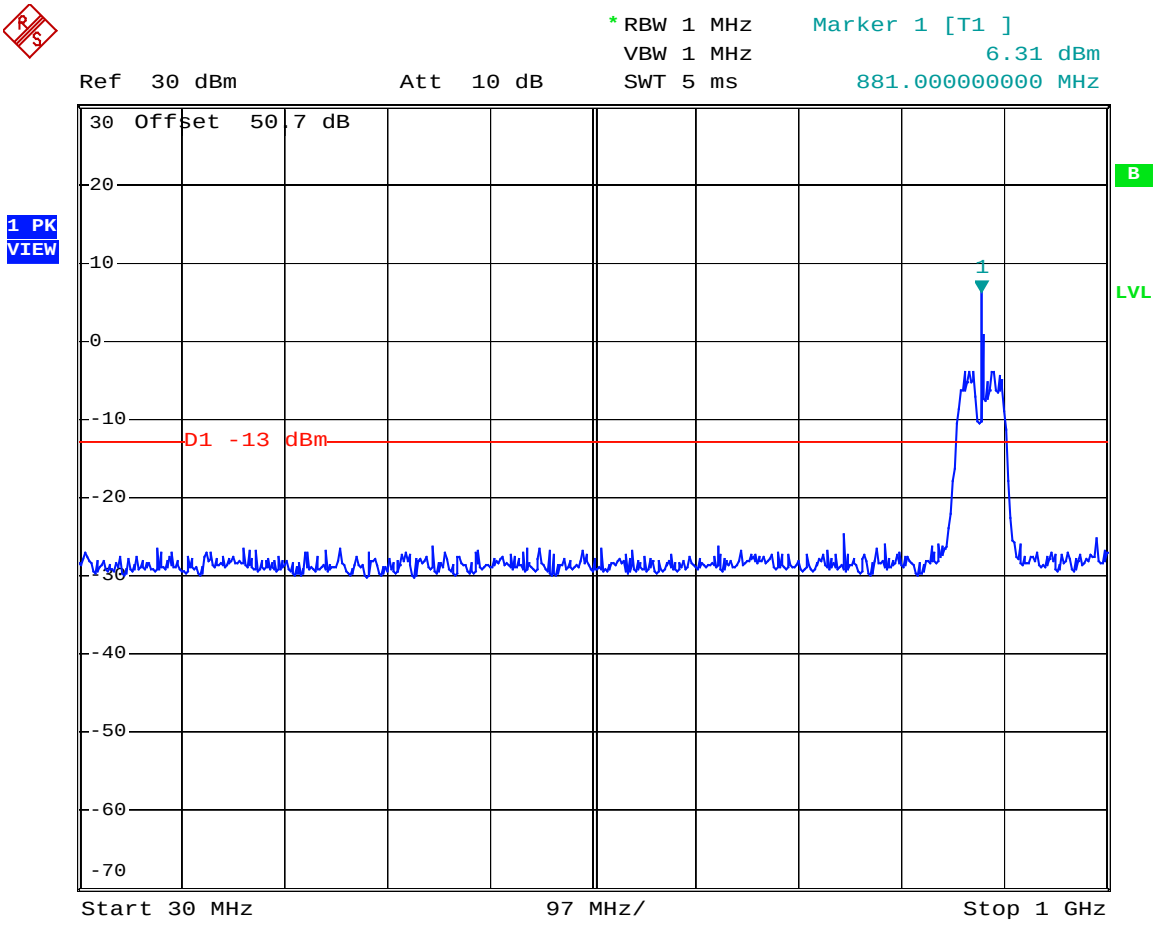
EDGE UPPER BANDEDGE
893.3 AND 893.8 MHz
1.25 WATTS EACH (31 DBM)



Date: 27.MAR.2006 11:46:45

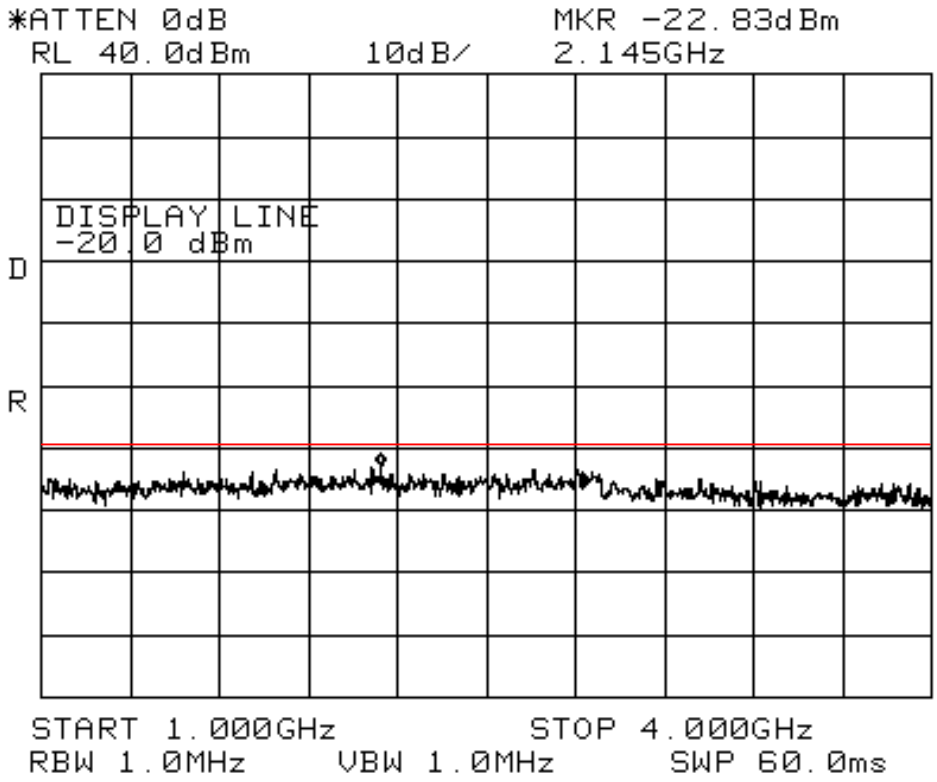
Test Data – Spurious Emissions at Antenna Terminals

EDGE



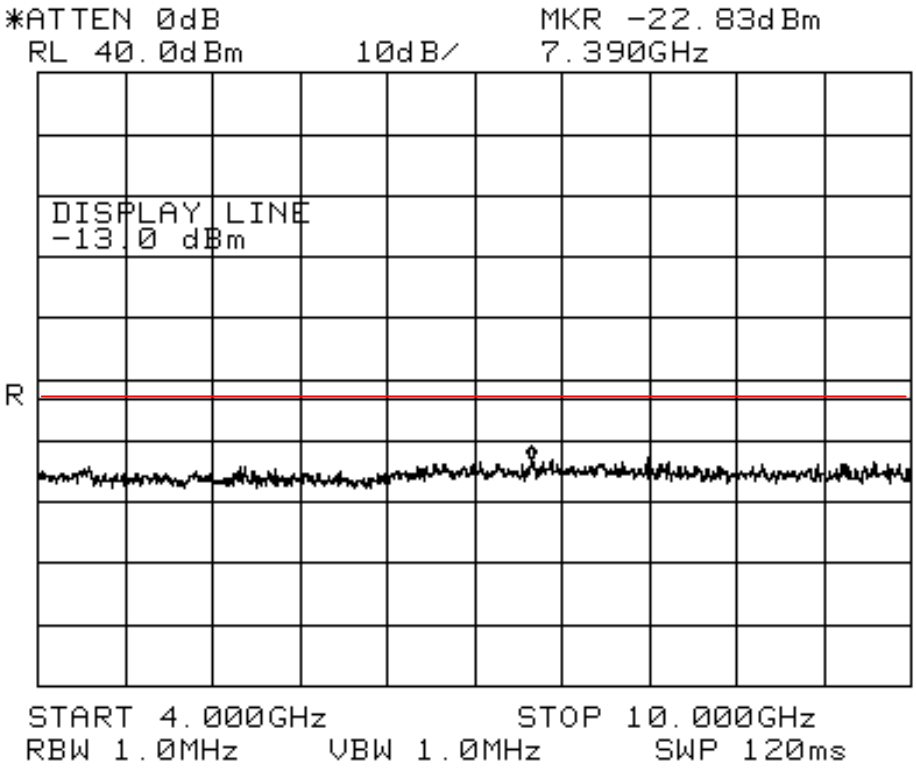
Test Data – Spurious Emissions at Antenna Terminals

EDGE



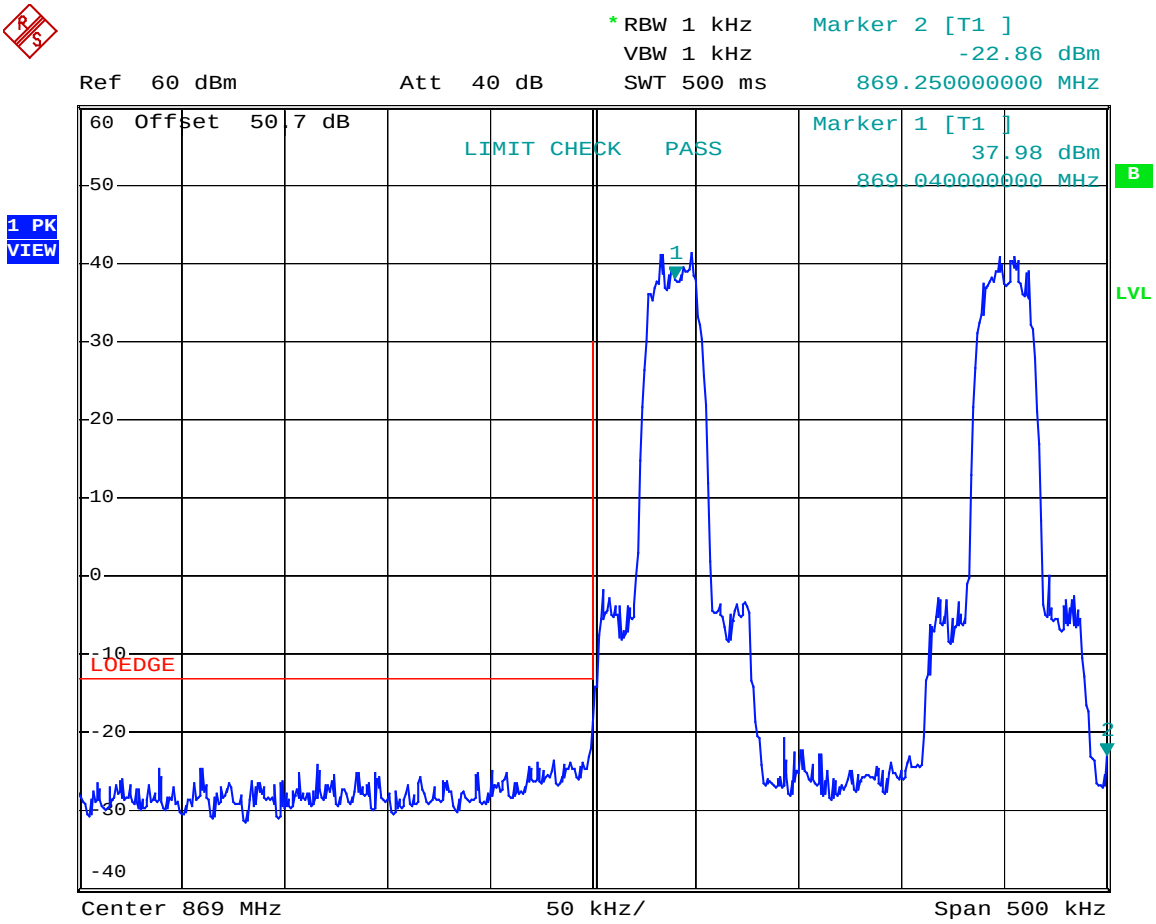
Test Data – Spurious Emissions at Antenna Terminals

EDGE



Test Data – Spurious Emissions at Antenna Terminals

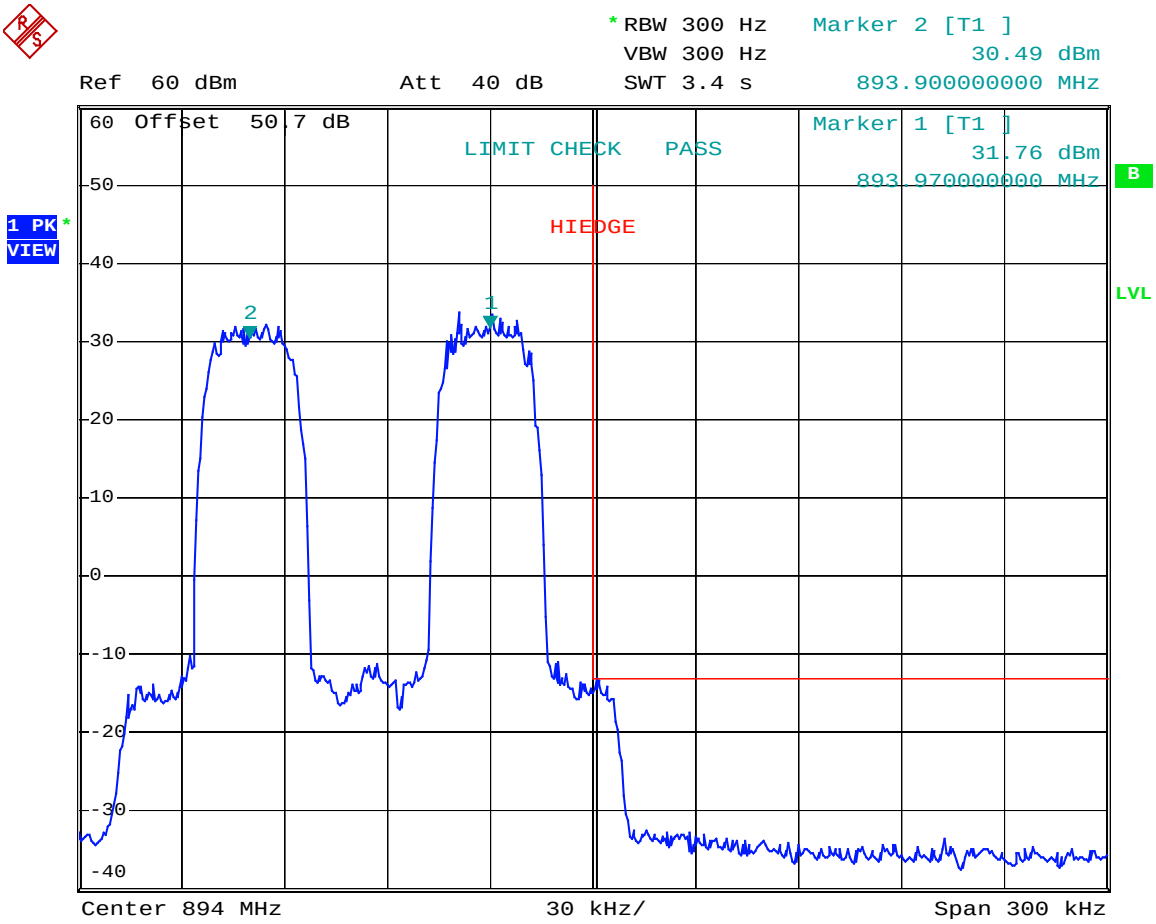
TDMA LOWER BANDEDGE
869.04 AND 869.20 MHz
100 WATTS EACH



Date: 24.MAR.2006 11:02:45

Test Data – Spurious Emissions at Antenna Terminals

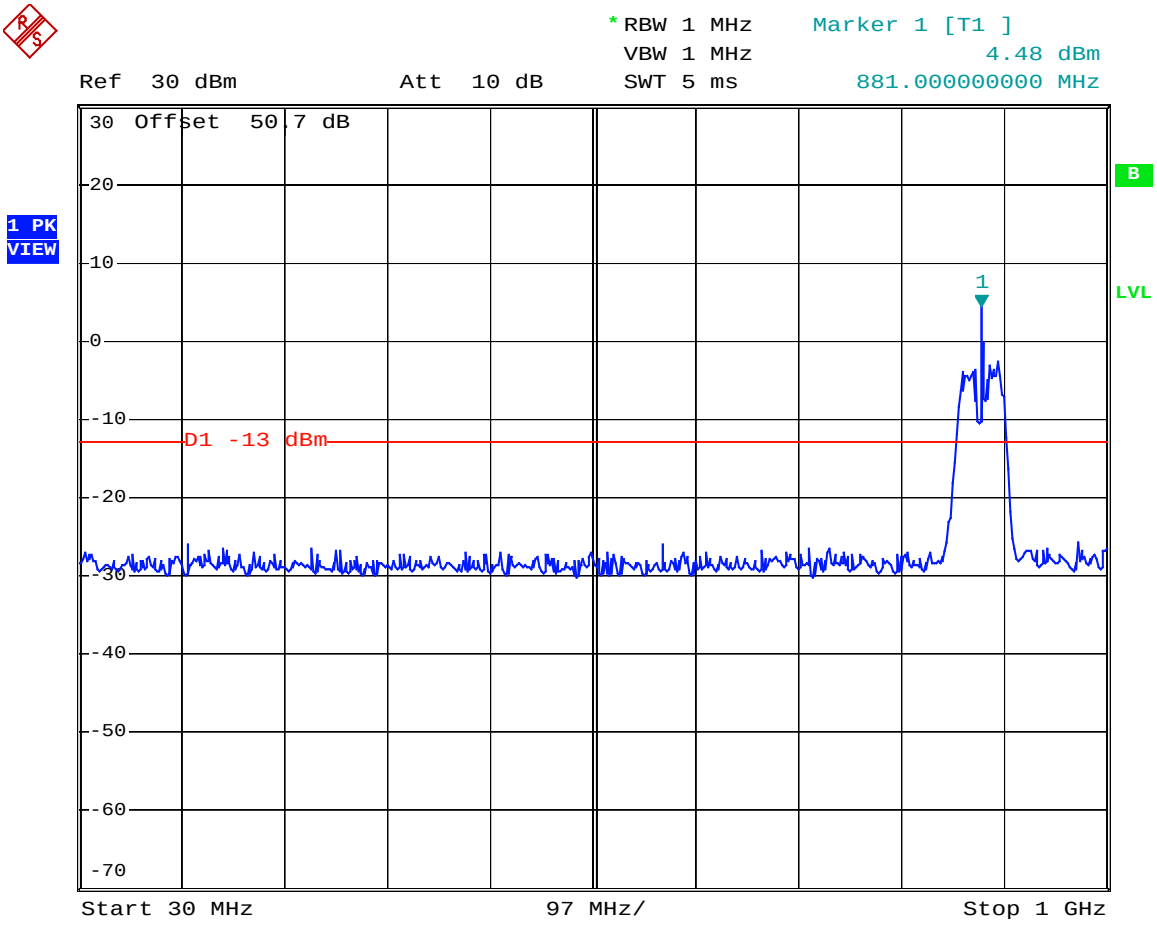
TDMA LOWER BANDEDGE
893.9 AND 893.97 MHz
100 WATTS EACH



Date: 27.MAR.2006 12:03:05

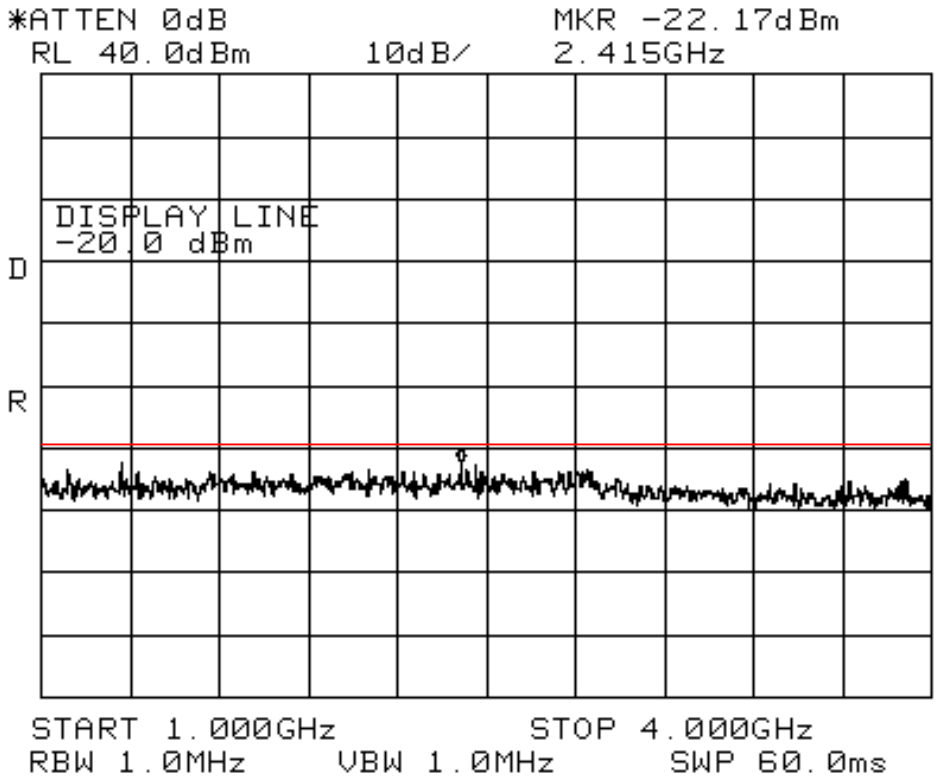
Test Data – Spurious Emissions at Antenna Terminals

TDMA



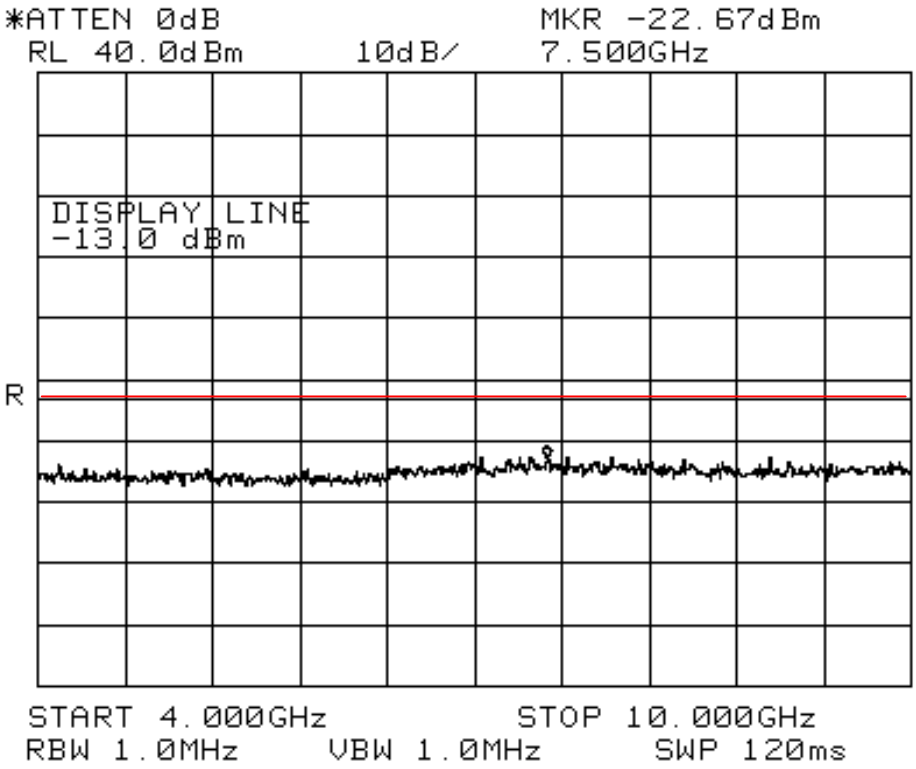
Test Data – Spurious Emissions at Antenna Terminals

TDMA



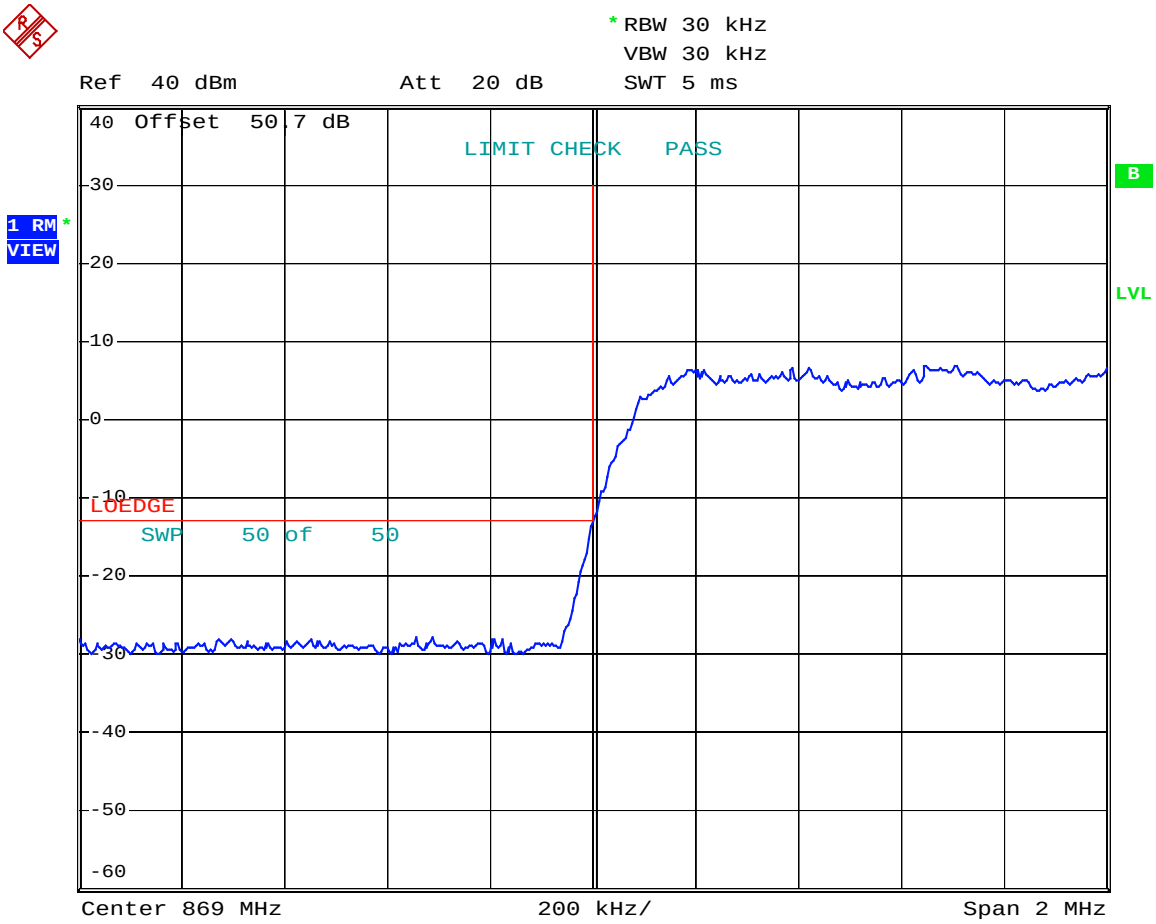
Test Data – Spurious Emissions at Antenna Terminals

TDMA



Test Data – Spurious Emissions at Antenna Terminals

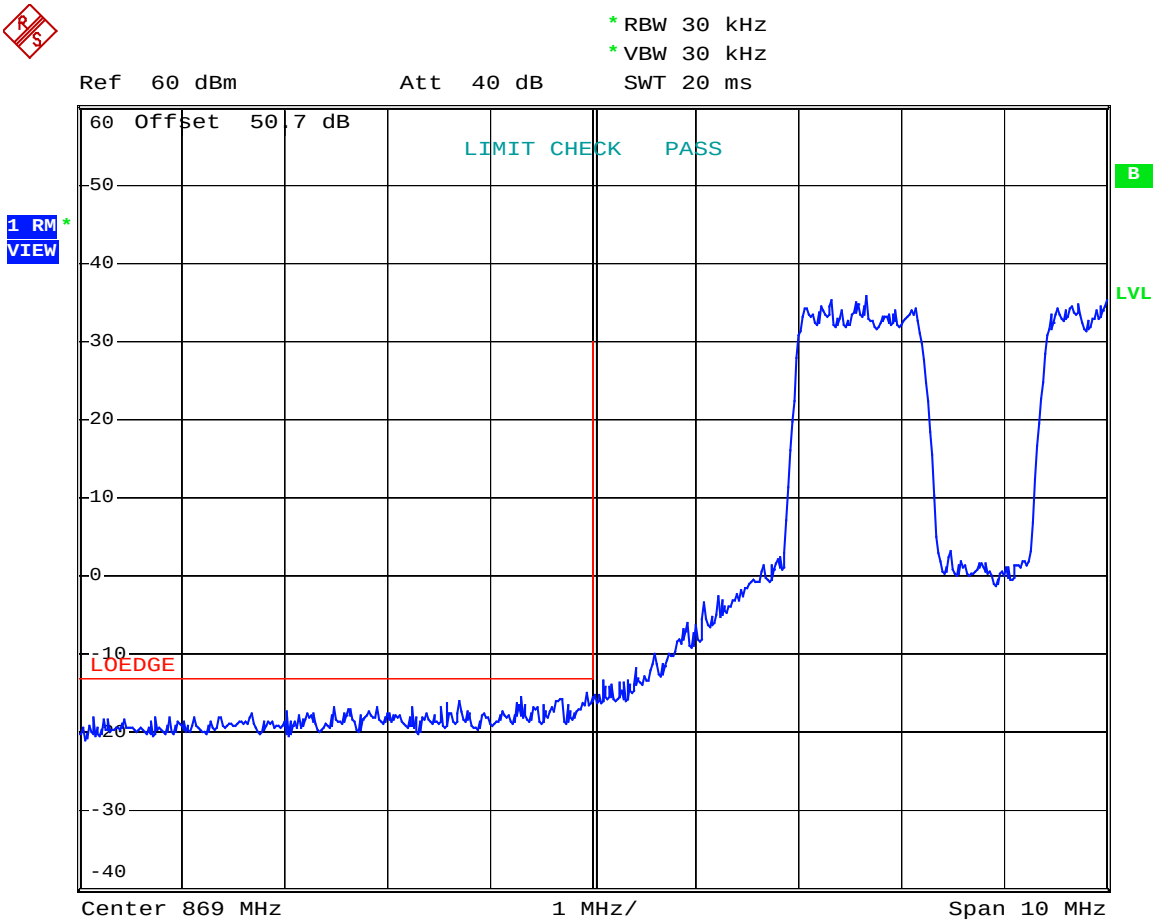
CDMA LOWER BANDEDGE
869.7 MHz (LOWEST CHANNEL)
200 mW SINGLE CARRIER



Date: 24.MAR.2006 11:14:36

Test Data – Spurious Emissions at Antenna Terminals

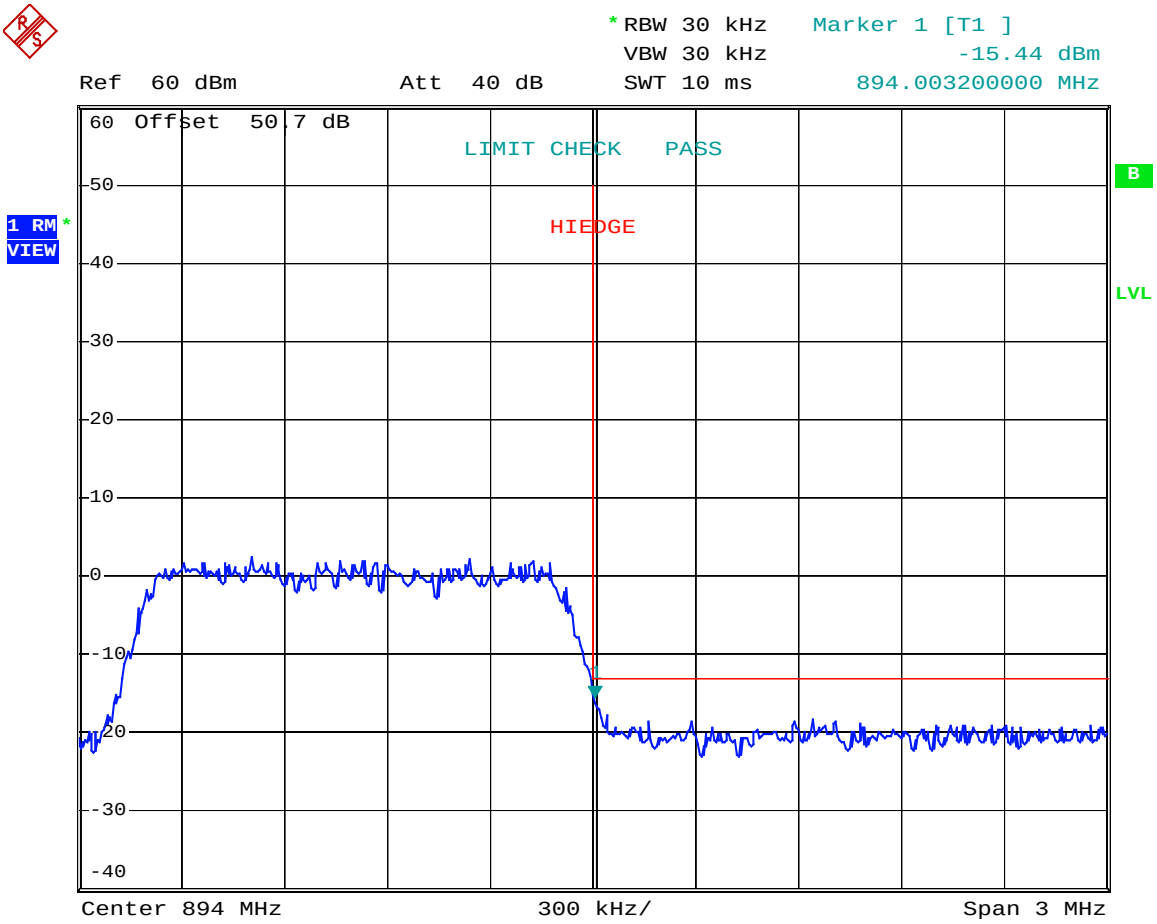
CDMA LOWER BANDEDGE
IM FREQUENCIES 871.6 & 874 MHz
TWO 100 WATT CARRIERS



Date: 27.MAR.2006 09:36:34

Test Data – Spurious Emissions at Antenna Terminals

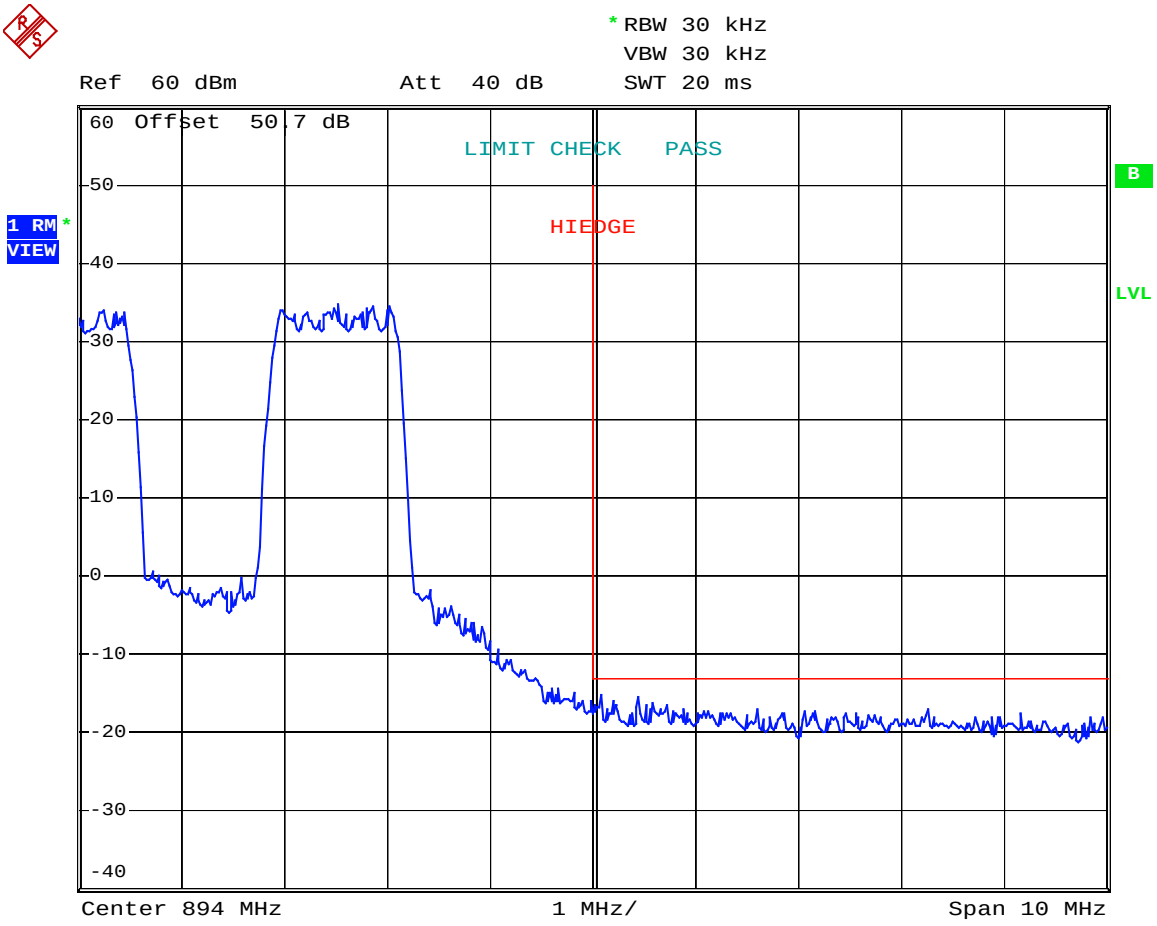
CDMA UPPER BANDEDGE
893.31 MHz (HIGHEST CHANNEL)
80 mW SINGLE CARRIER



Date: 27.MAR.2006 12:08:08

Test Data – Spurious Emissions at Antenna Terminals

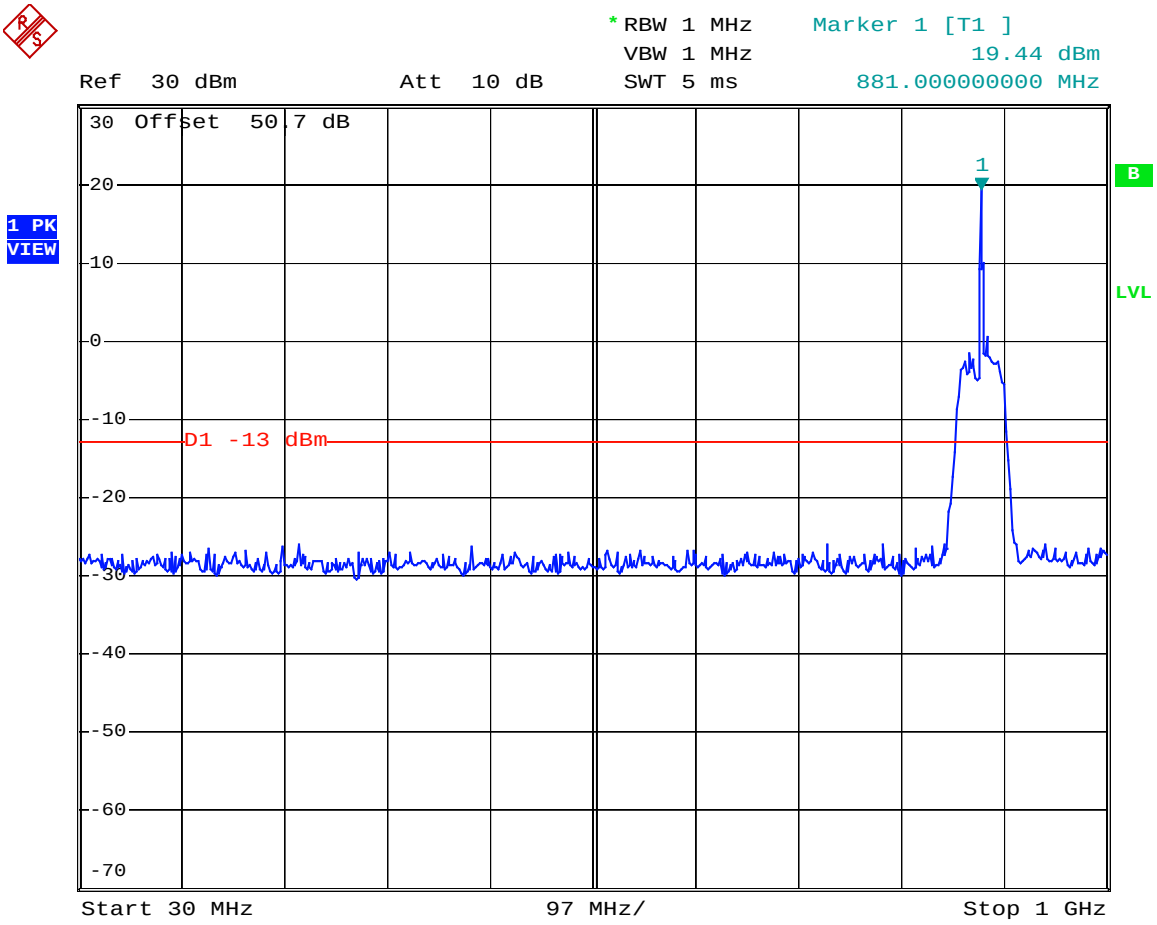
CDMA UPPER BANDEDGE
IM FREQUENCIES 888.9 & 891.5 MHz
TWO 100 WATT CARRIERS



Date: 27.MAR.2006 12:18:50

Test Data – Spurious Emissions at Antenna Terminals

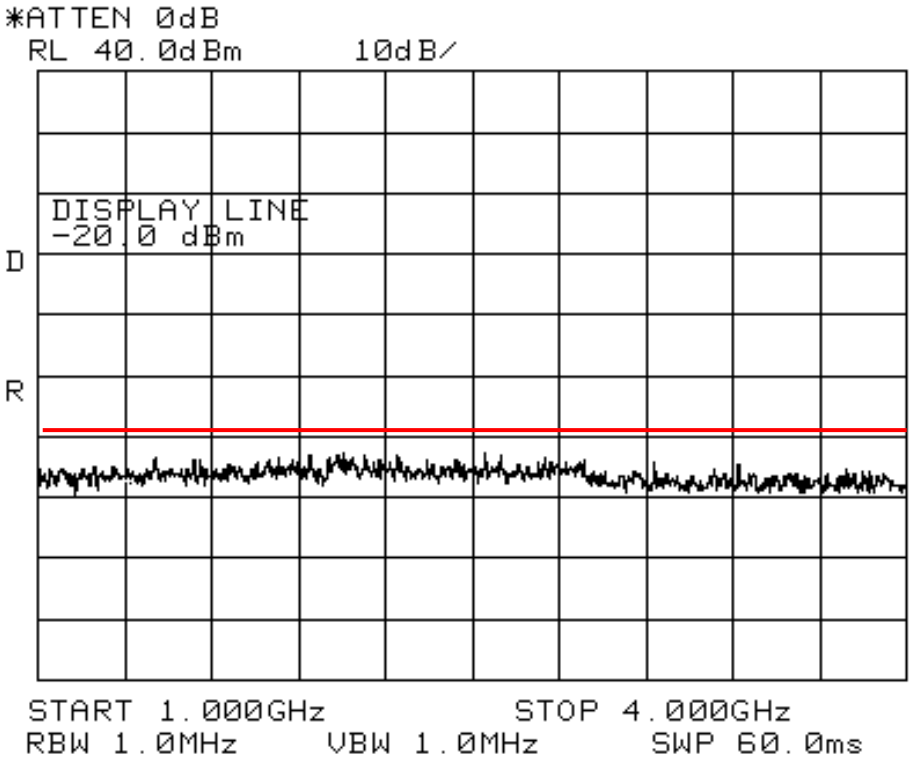
CDMA



Date: 27.MAR.2006 14:30:05

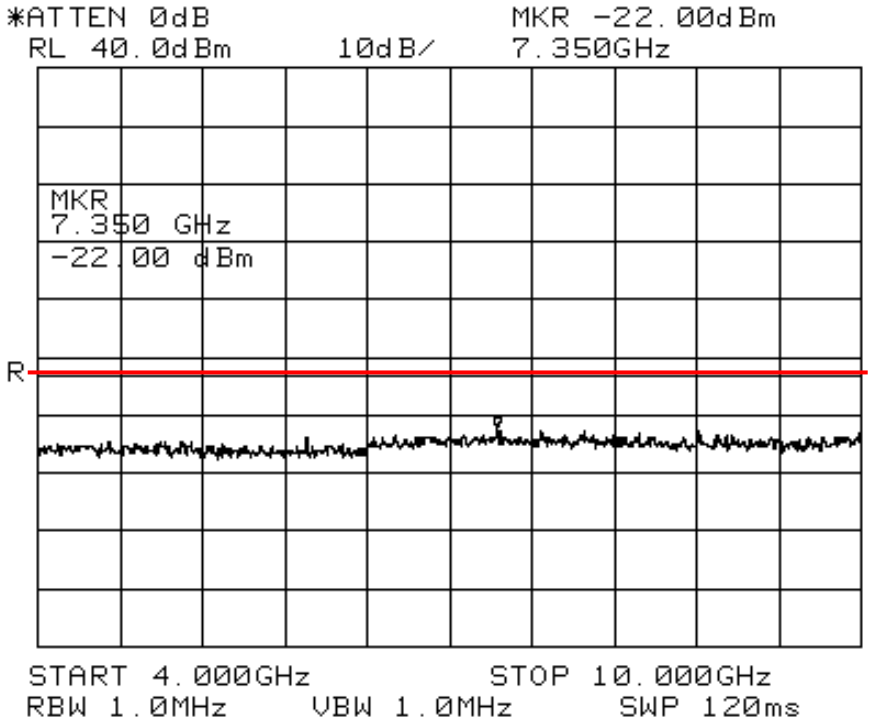
Test Data – Spurious Emissions at Antenna Terminals

CDMA



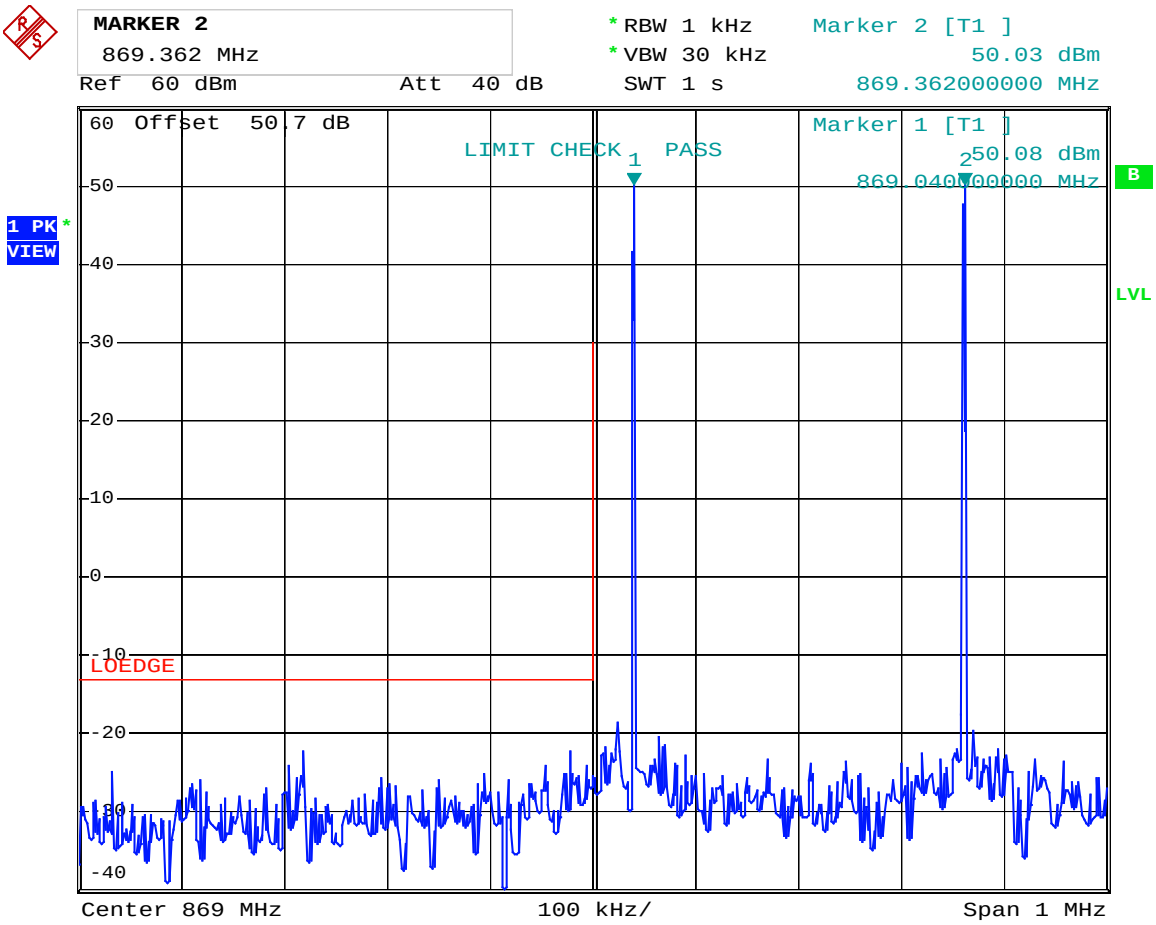
Test Data – Spurious Emissions at Antenna Terminals

CDMA



Test Data – Spurious Emissions at Antenna Terminals

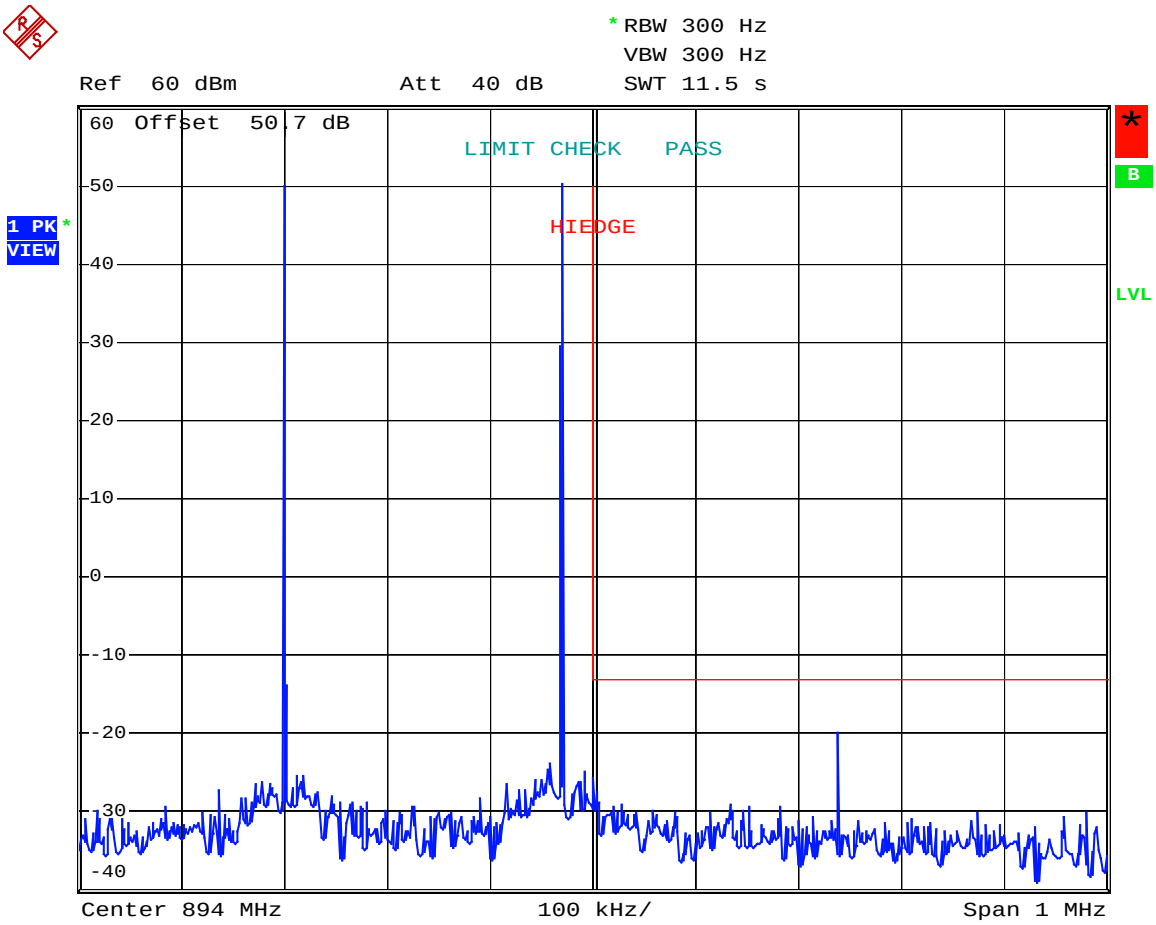
Analog
2 CARRIERS AT 100 WATTS EACH



Date: 27.MAR.2006 09:47:23

Test Data – Spurious Emissions at Antenna Terminals

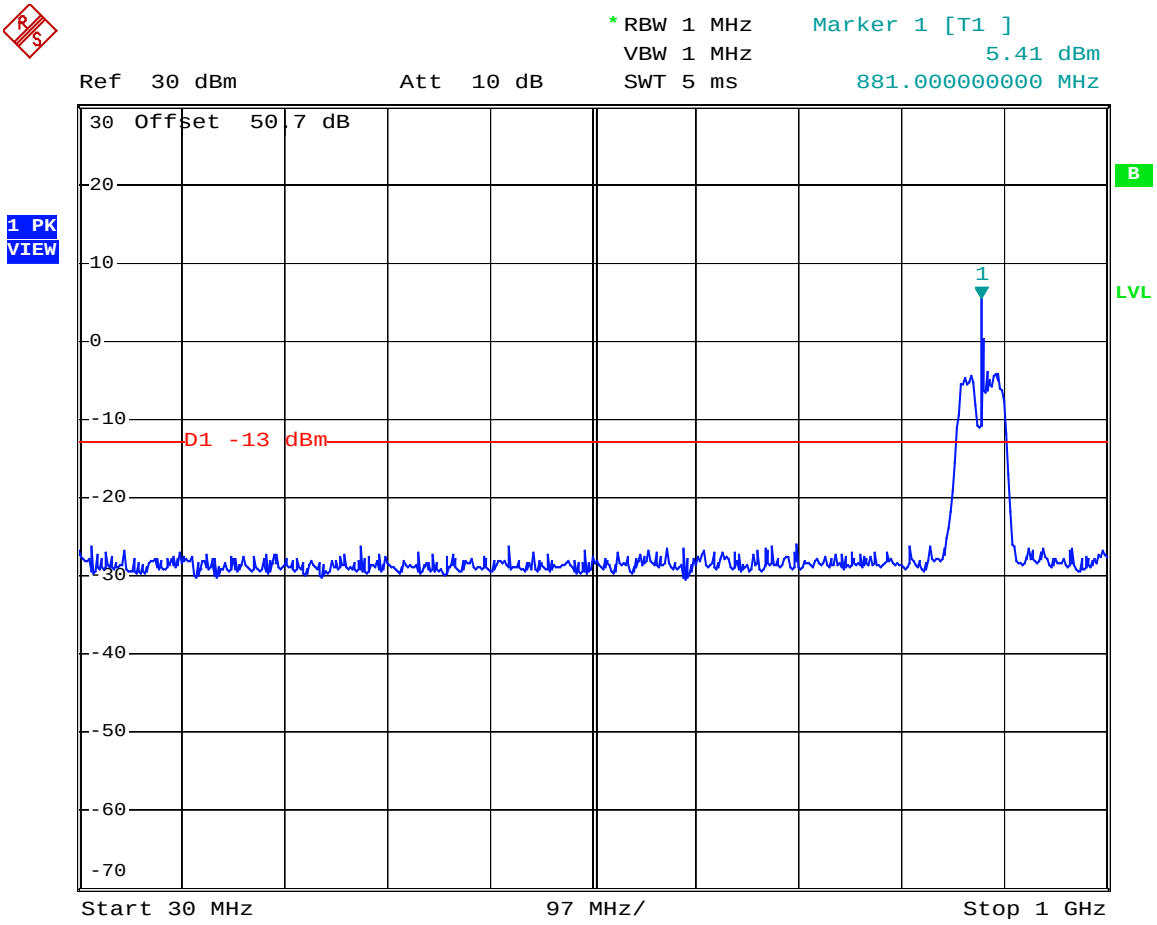
Analog
2 CARRIERS AT 100 WATTS EACH



Date: 27.MAR.2006 12:21:11

Test Data – Spurious Emissions at Antenna Terminals

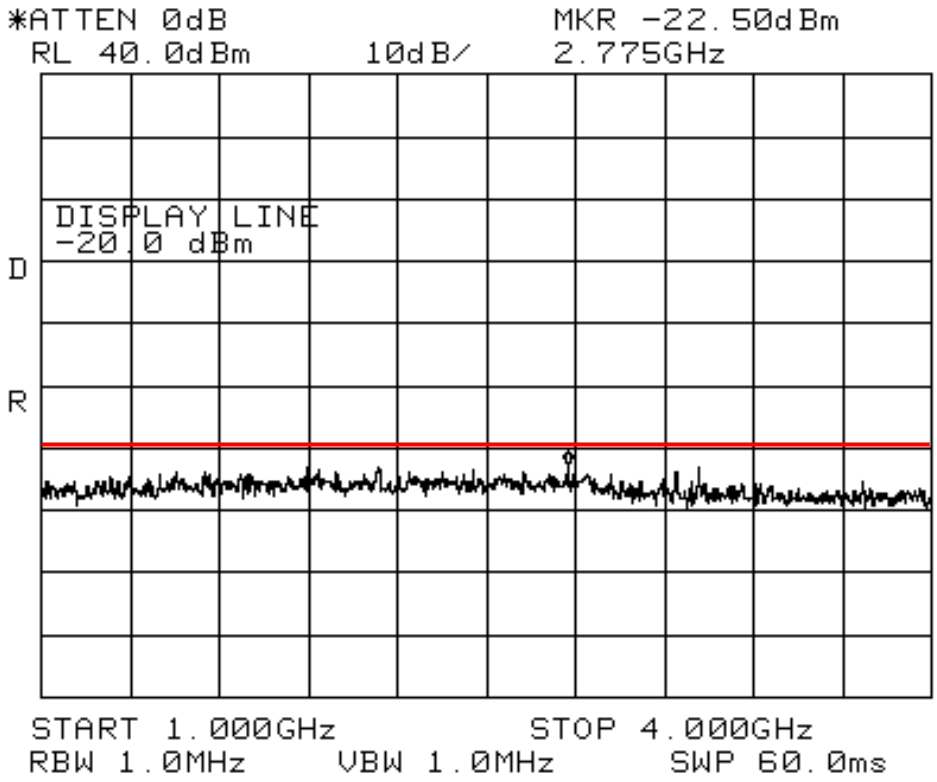
Analog



Date: 27.MAR.2006 14:30:28

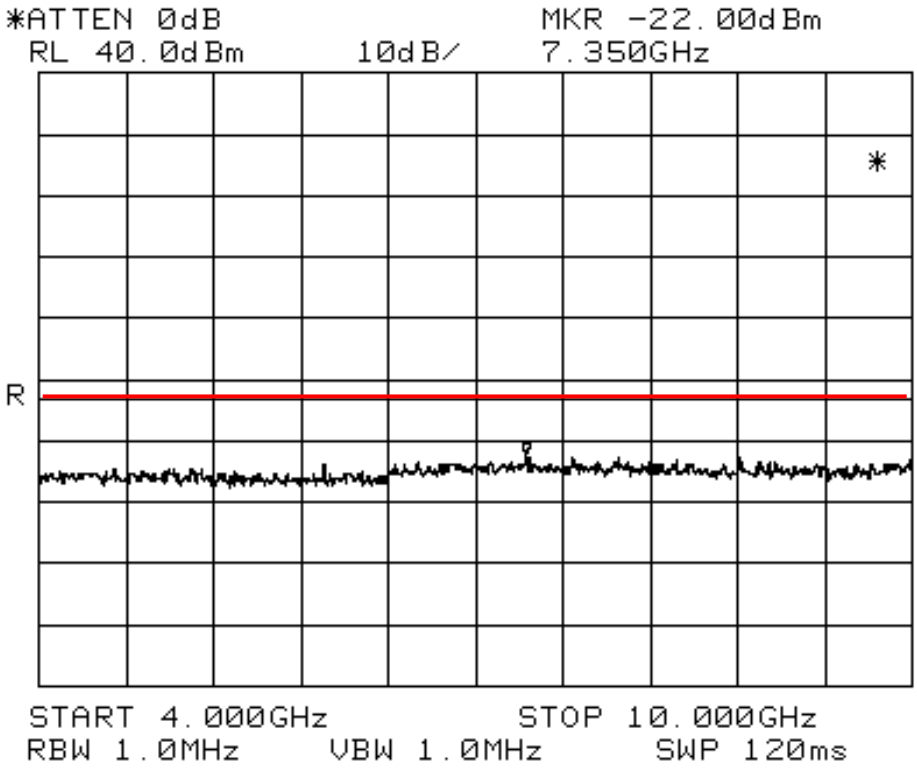
Test Data – Spurious Emissions at Antenna Terminals

Analog



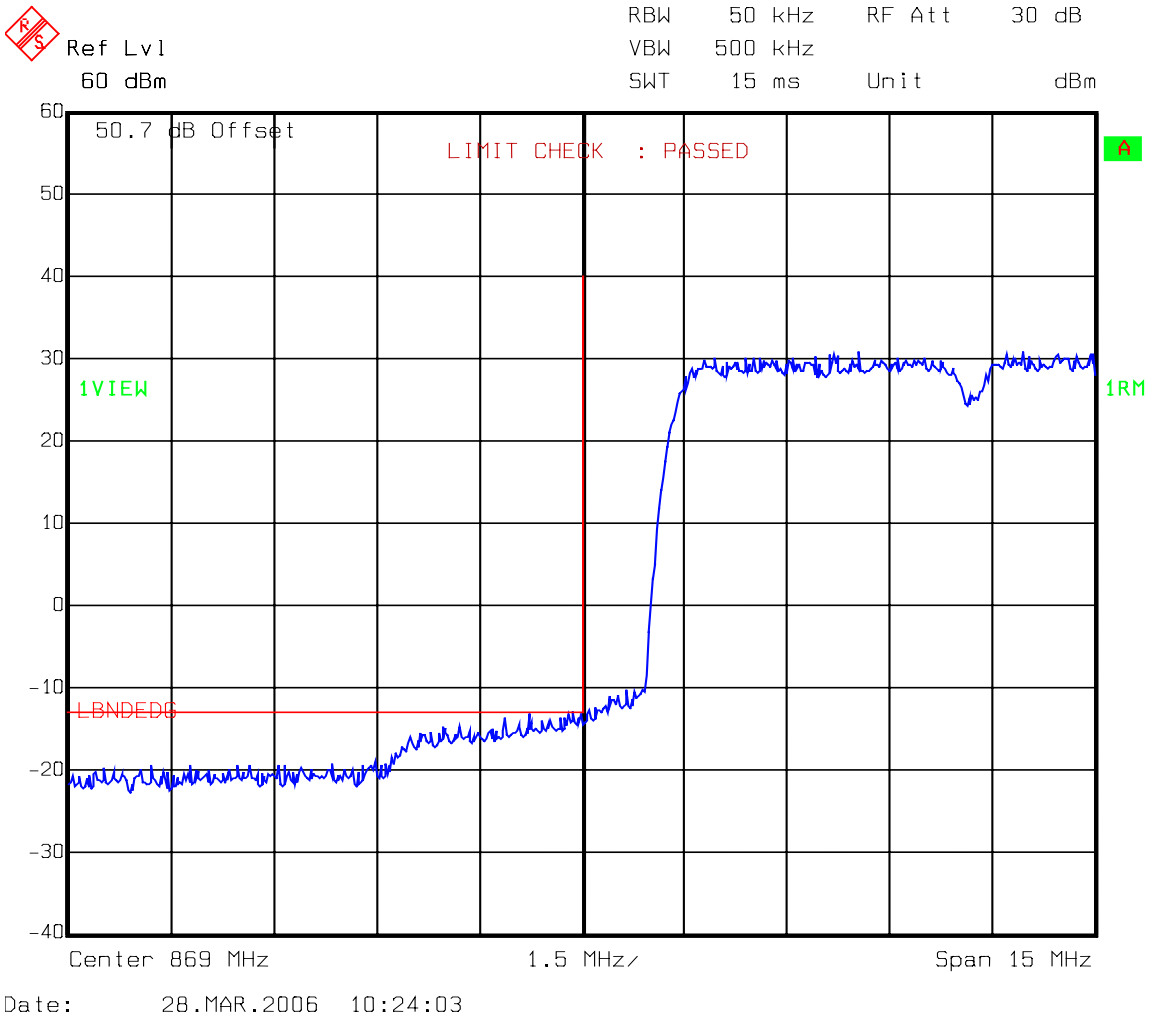
Test Data – Spurious Emissions at Antenna Terminals

Analog

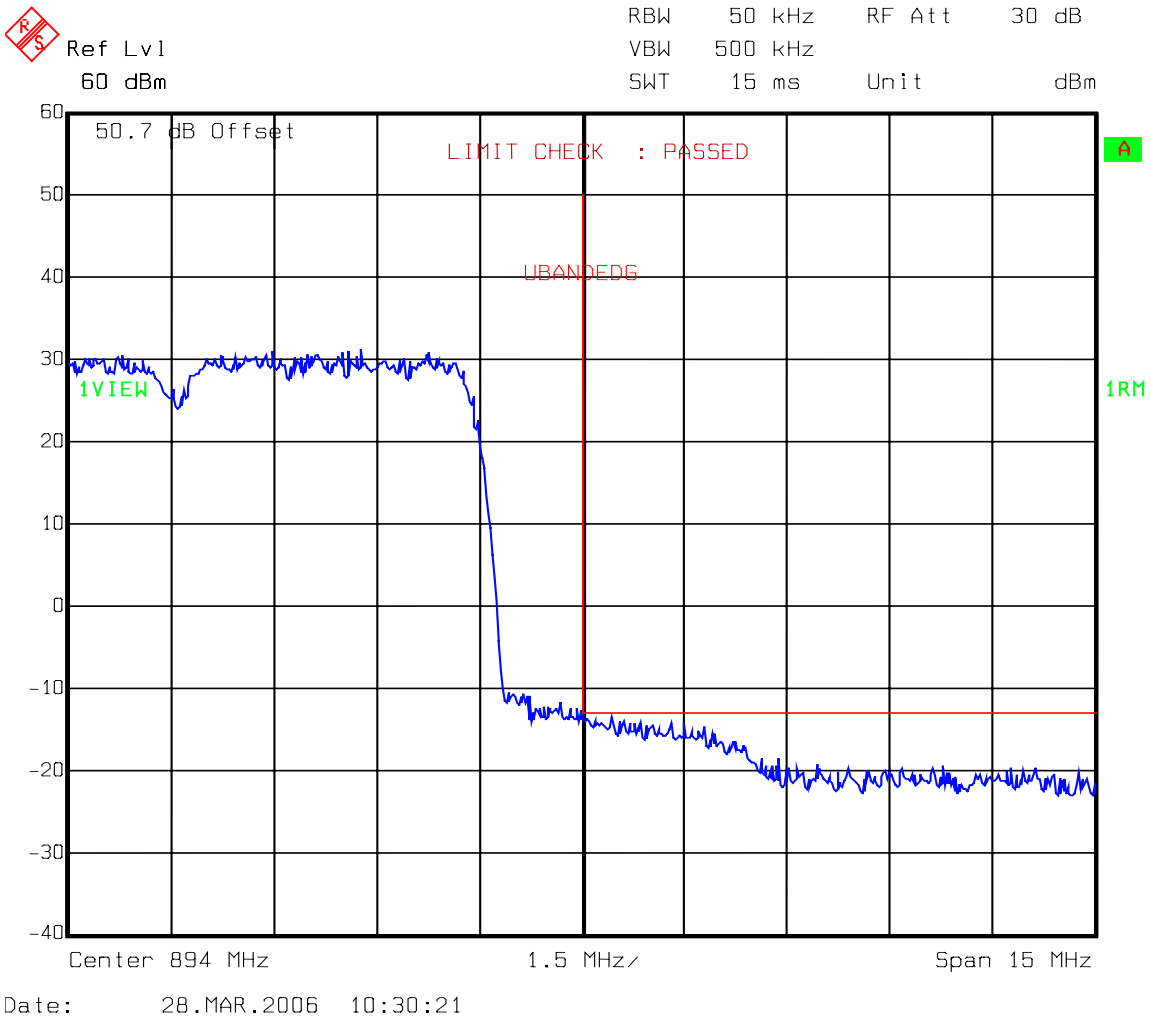


Test Data – Spurious Emissions at Antenna Terminals

UMTS

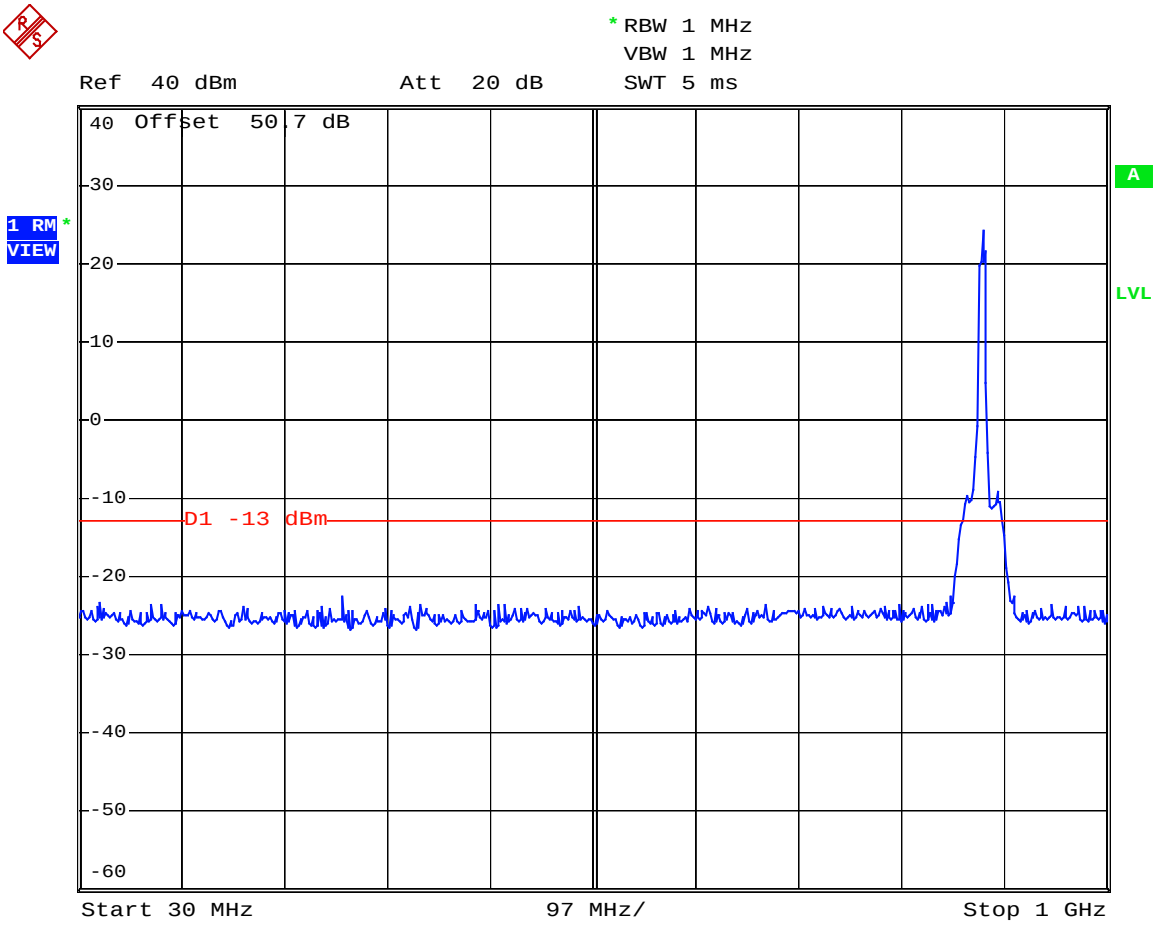


Test Data – Spurious Emissions at Antenna Terminals



Test Data – Spurious Emissions at Antenna Terminals

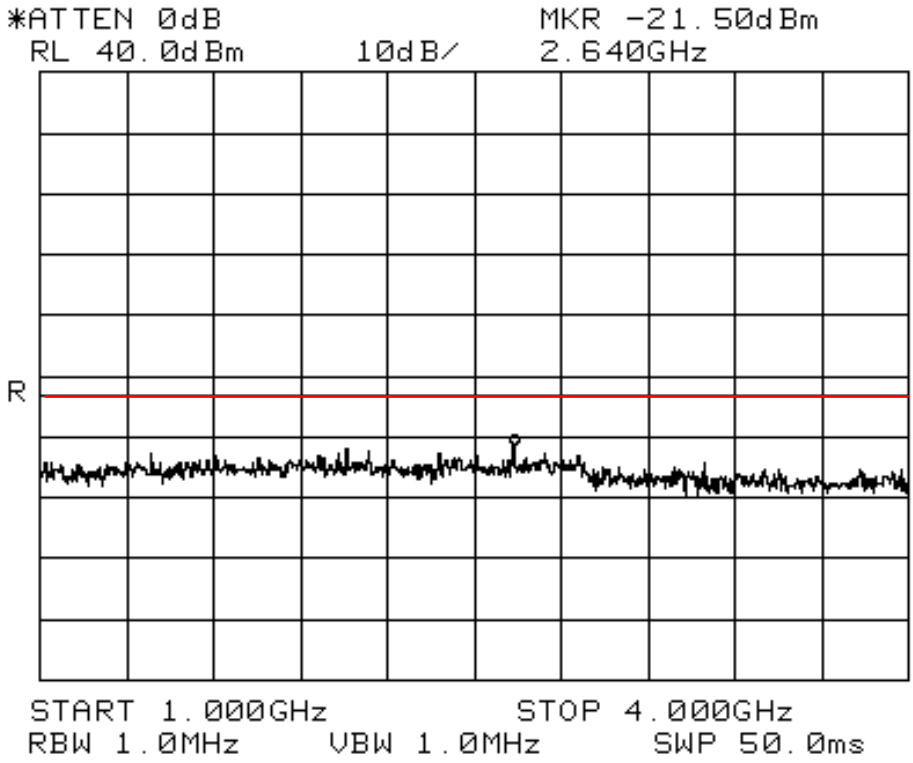
UMTS



Date: 29.MAR.2006 11:37:12

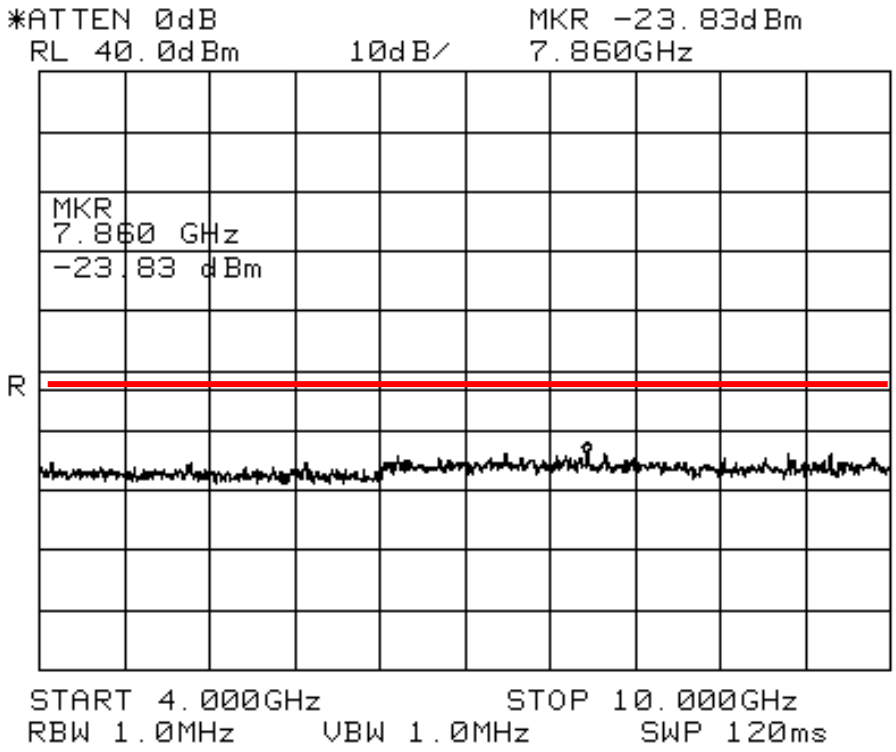
Test Data – Spurious Emissions at Antenna Terminals

UMTS



Test Data – Spurious Emissions at Antenna Terminals

UMTS



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 30 March 2006

Test Results: Complies.

Test Data: See attached table.

Equipment Used: 1464-1484-1485-1016-993-759-760-791

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 45 %

Test Data – Field Strength of Spurious Emissions

Field Strength of Spurious Emissions

Page 1 of 1 Complete X
Job No.: 6L0102 Date: 3/30/06 Preliminary
Specification: Part 2 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 45
E.U.T.: MCPB-850-200
Configuration: Tx full power at mid band
Sample No: 1
Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Peak VBW: 1 MHz Distance: 3 m

Test Equipment Used

Antenna: 993 Directional Coupler:
Pre-Amp: 1016 Cable #1: 1484
Filter: 1481 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)		EIRP (dBm)	EIRP (mW)	Polarity	Comments
1762	-31.0	31.1		31.8	8.4		-23.3	0.0047	V	
2643	-34.5	36.9		32.8	9.3		-21.1	0.0078	V	
3524	-37.0	42.5		32.7	10.2		-17.1	0.0197	V	
4405	-50.0	45.8		31.5	10.1		-25.6	0.0027	V	
5286	-64.0	42.0		32.3	10.7		-43.6	0.0000	V	
6167	-63.5	40.2		31.1	11.3		-43.1	0.0000	V	
7048	-67.0	40.8		31.6	11.7		-46.2	0.0000	V	
7929	-69.0	41.6		34	11.2		-50.2	0.0000	V	
8810	-66.0	41.2		34	11.8		-47.1	0.0000	V	
1762	-28.0	33.5		31.8	8.4		-17.9	0.0163	H	
2643	-39.0	33.6		32.8	9.3		-28.9	0.0013	H	
3524	-41.0	33.9		32.7	10.2		-29.7	0.0011	H	
4405	-48.0	34.9		31.5	10.1		-34.5	0.0004	H	
5286	-64.0	38.1		32.3	10.7		-47.5	0.0000	H	
6167	-66.0	37.4		31.1	11.3		-48.4	0.0000	H	
7048	-66.0	39.4		31.6	11.7		-46.6	0.0000	H	
7929	-69.0	40.4		34	11.2		-51.4	0.0000	H	
8810	-65.0	41.4		34	11.8		-45.9	0.0000	H	

Notes: **Searched spectrum from 30 MHz to 9 GHz**

Photos – Field Strength of Spurious Emissions

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1659	Spectrum Analyzer	Rhode & Schwarz FSP	973353	01/10/06	01/10/07
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/29/04	03/29/06
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1058	DUAL DIRECTIONAL COUPLER	HEWLETT PACKARD 11692D	1212A03366	CBU	N/A
1054	DUAL DIRECTIONAL COUPLER	NARDA 3020A	34366	CBU	N/A
1055	DUAL DIRECTIONAL COUPLER	NARDA 3022	73393	CBU	N/A
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	CBU	N/A
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	CBU	N/A
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/01/05	08/02/07
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	11/12/05	11/12/06
791	PREAMP, 25dB	ICC LNA25	398	11/12/05	11/12/06
760	Antenna biconical	Electro Metrics MFC-25	477	08/04/05	08/04/06
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	08/04/05	08/04/06

ANNEX A - TEST DETAILS

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

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

Method Of Measurement:

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

Integral Antenna:
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**

Minimum Standard: Not defined by FCC. Input vs. Output.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: CDMA (30 kHz), GSM (3 kHz), NADC (1 kHz) and CDPD (1 kHz)
VBW: ≥ RBW
Span: As required
Sweep: Auto

Input Signal Characteristics:
RF level: Maximum recommended by manufacturer

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

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: 30 kHz (AMPS). As required for digital modulations.
VBW: ≥ RBW
Start Frequency: 0 MHz
Stop Frequency: 10 GHz
Sweep: Auto

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

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.

Calculation Of Field Strength Limit:

An example of attenuation requirement of 43 + 10 Log P is equivalent to -13 dBm (5×10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$GP/4\pi R^2 = E^2/120\pi$

For emissions ≤ 1 GHz:

G = 1.64 (Dipole Gain)
P = 10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R}$$

$$\mathrm{E} = \frac{\sqrt{30 \times 1.64 \times 5 \times 10^{-5}}}{3} = 0.016533 \text{ V / m} = 84.4 \text{ dB}\mu\text{V / m}$$

For emissions > 1 GHz:

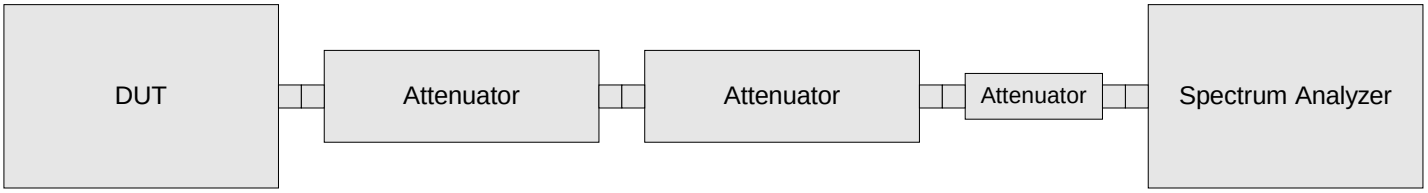
G = 1 (Isotropic Gain)
P = 1 x 10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = 84.4 - 20Log\sqrt{1.64} = 82.3dB\mu V \ / \ m@3m$$

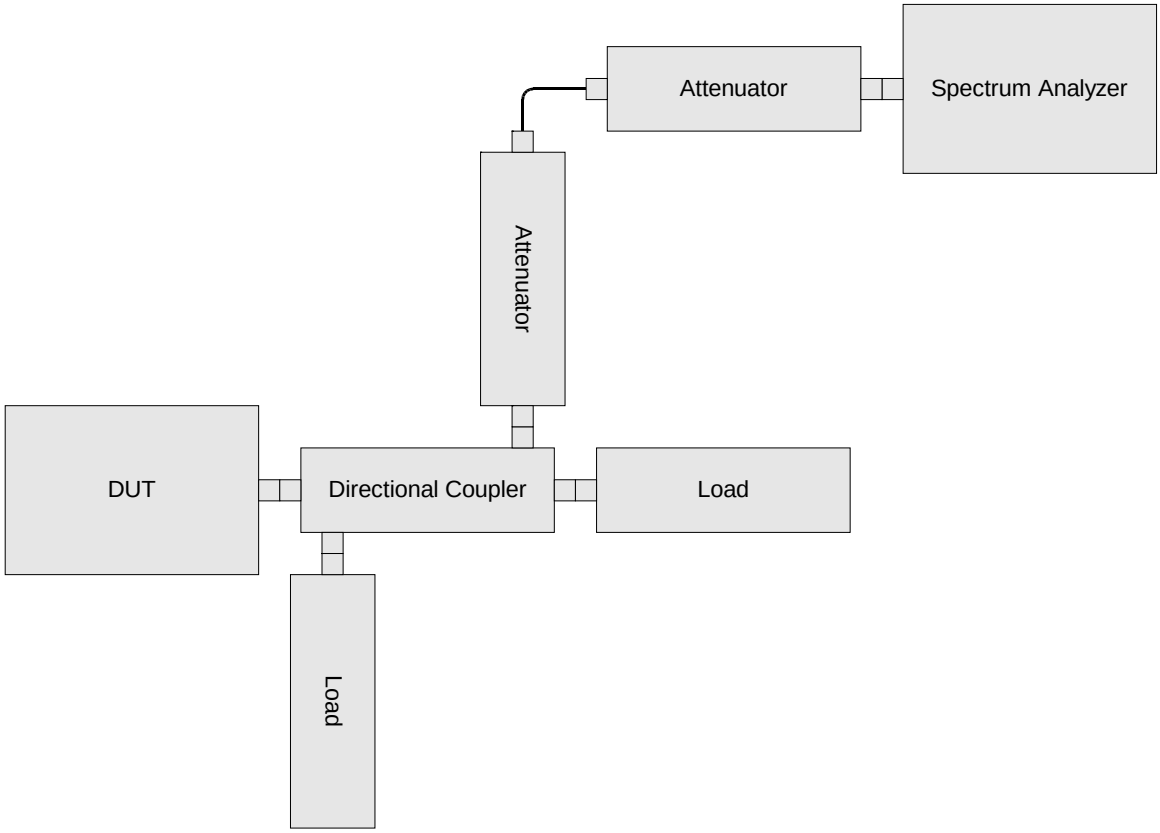
The spectrum is searched to 10 GHz.

ANNEX B - TEST DIAGRAMS

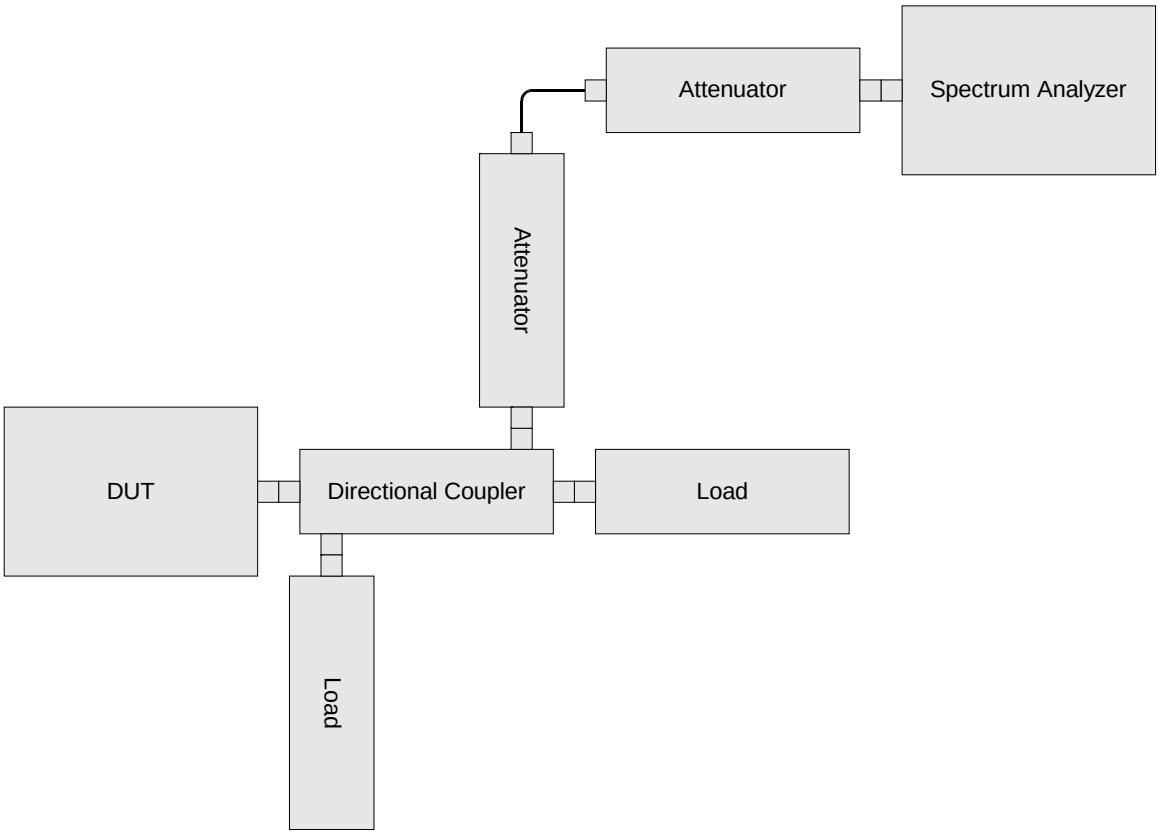
Para. No. 2.1046 - R.F. Power Output

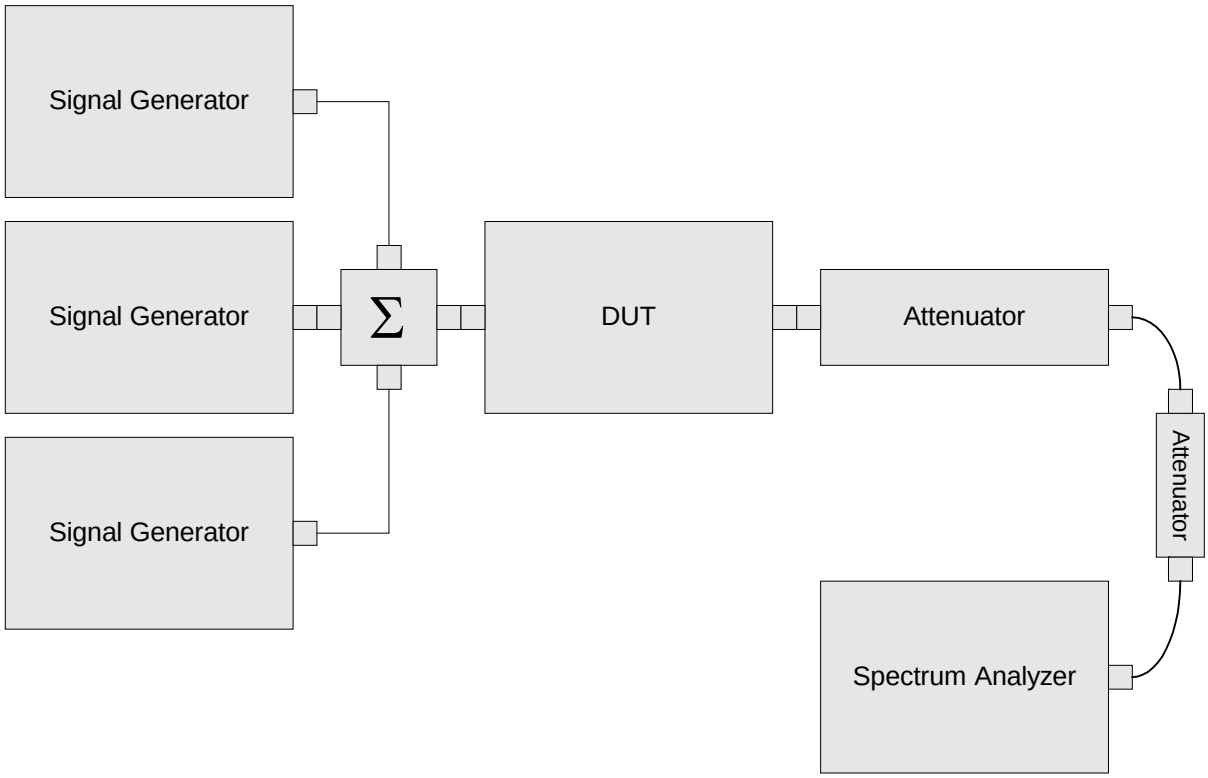


Para. No. 2.1049 - Occupied Bandwidth

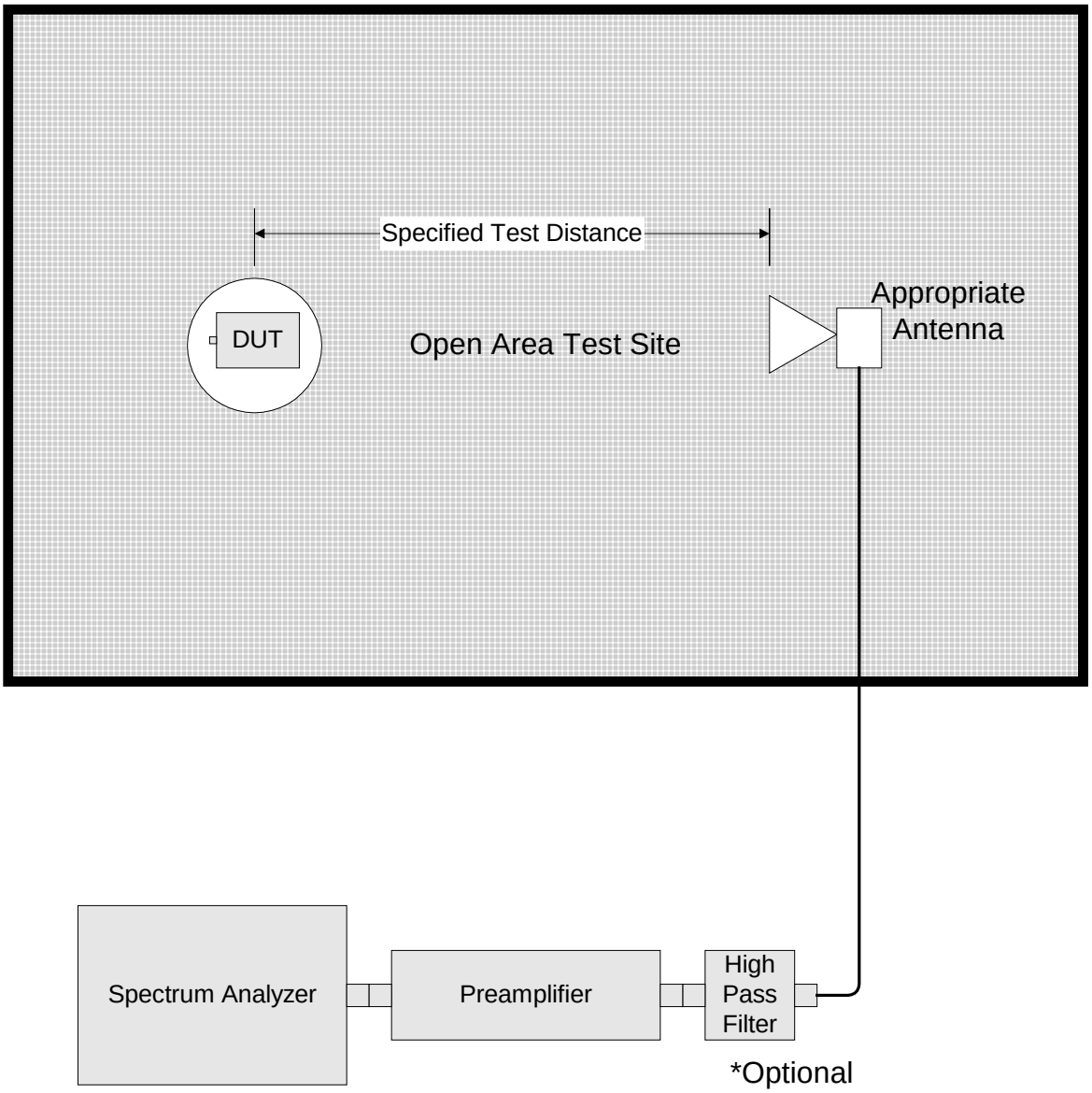


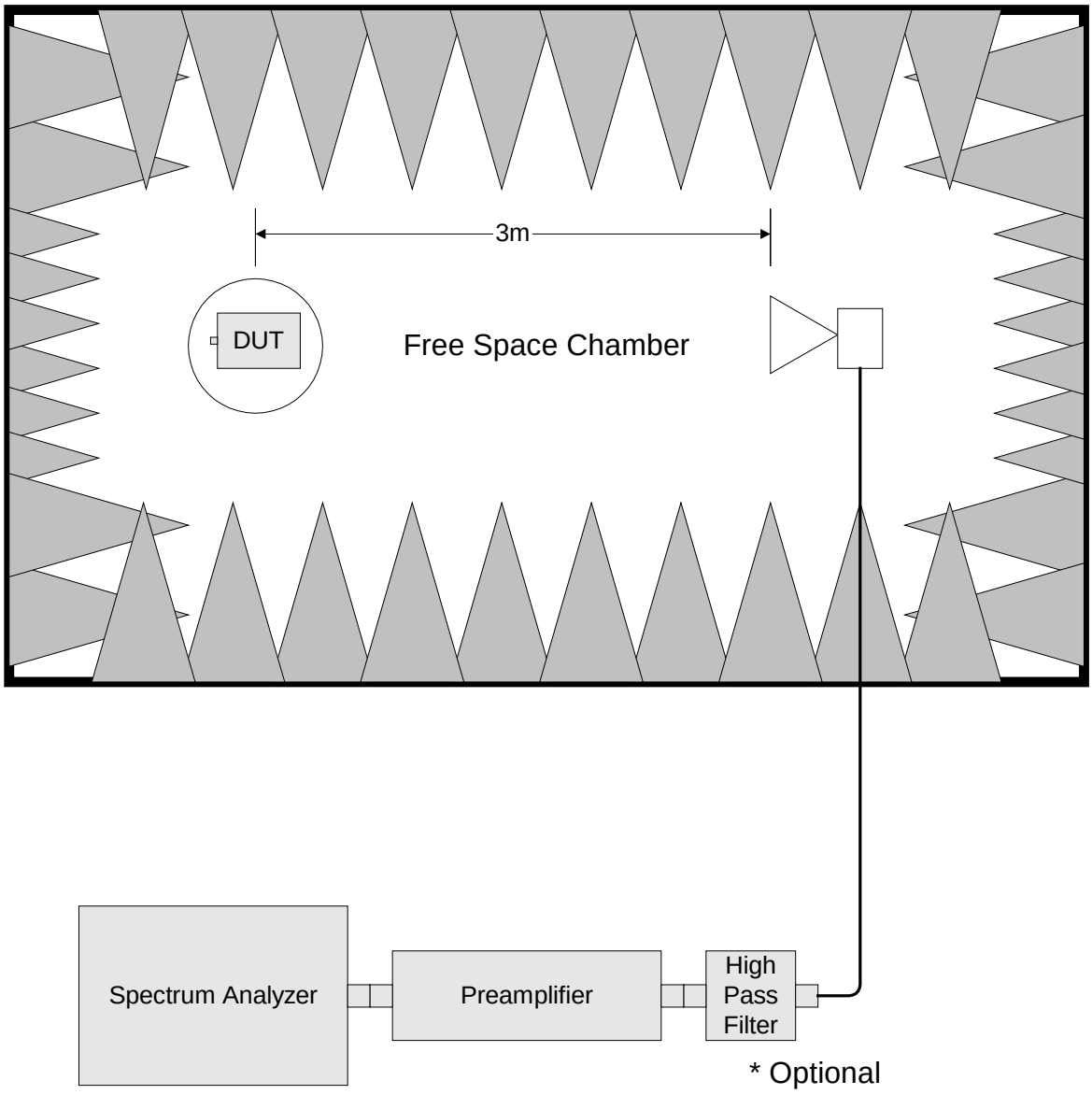
Para. No. 2.1051 Spurious Emissions at Antenna Terminals




Signal Generator
Signal Generator
Signal Generator
∑
DUT
Attenuator
Attenuator
Spectrum Analyzer

Para. No. 2.1053 - Field Strength of Spurious Radiation




3m
DUT
Free Space Chamber
Spectrum Analyzer
Preamplifier
High Pass Filter
* Optional