



Nemko Test Report: 48929RUS1rev3

Applicant: Nokia, Inc.

Equipment Under Test: 6152
(E.U.T.)

In Accordance With: **FCC Part 22, Subpart H**
Cellular Band Subscriber Services

Tested By: Nemko Dallas Inc.
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Lewisville, TX
75057-3136

Authorized By:

A handwritten signature in blue ink, appearing to read 'Tom Tidwell', is written over a light blue circular background.

Tom Tidwell, Frontline Group Manager

Date: 22 September, 2005

NVLAP LAB CODE: 100426-0



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Section 1. Summary of Test Results

Manufacturer: Nokia, Inc.

Model No.: 6152

Type: B3.1

Serial No.: 033/03785067

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. None.

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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	2.1046	Not Tested
Audio Frequency Response	2.1047	Not Tested
Audio Low Pass Filter Response	2.1047	Not Tested
Modulation Limiting	2.1047	Not Tested
Occupied Bandwidth	2.1049	Complies
Spurious Emissions at Antenna Terminals	2.1051	Complies
Field Strength of Spurious Emissions	2.1053	Complies
Frequency Stability	2.1055	Complies

Footnotes

:

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

.

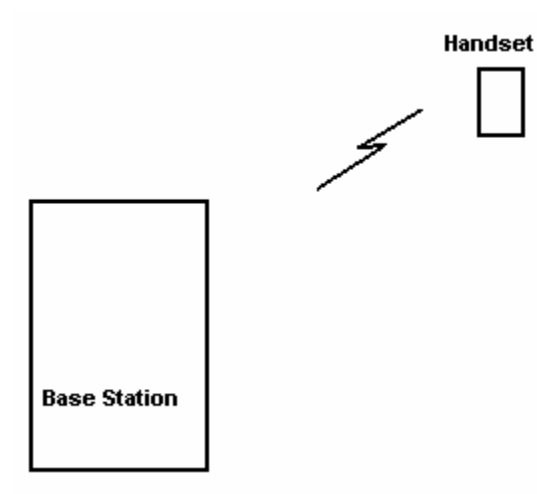
Section 2. General Equipment Specification

Frequency Range:	824.04 to 848.97 MHz
Tunable Bands:	824.04 to 849.97 MHz
Necessary Bandwidth:	1.25 MHz CDMA 40 kHz Analog
Emission Designator:	1M25F9W 40K0F8W / 40K0F1D
Output Impedance:	50 ohms
Operator Selection of Frequency:	Software Controlled
Power Output Adjustment Capability:	Software Controlled

Operational Description

The 6152 is a dual mode CDMA/Analog handset operating in the 800 MHz cellular band.

System Diagram



Section 3. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 8/15/2005

Test Results: [Complies.](#)

Test Data: [See attached plots](#)

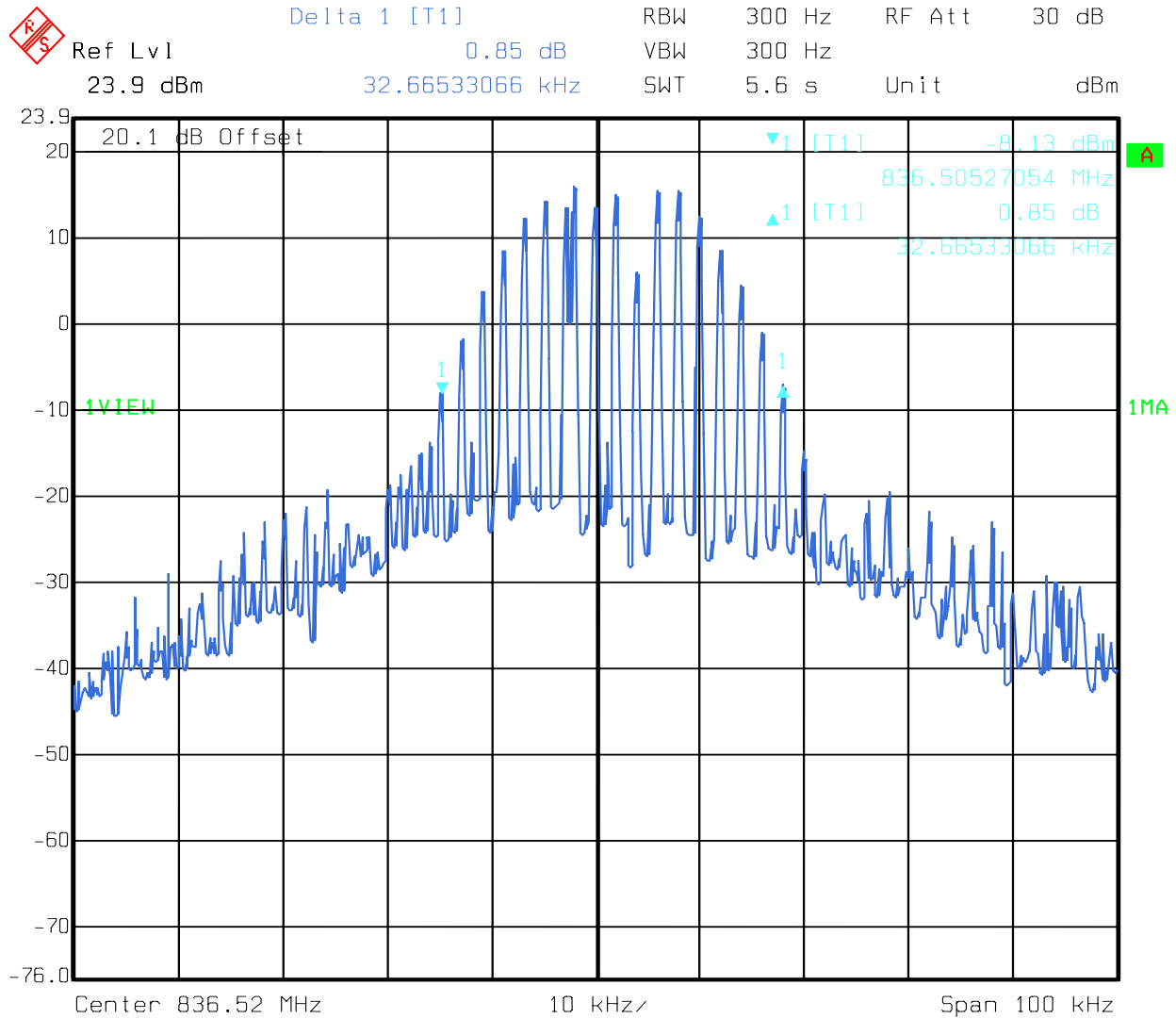
Equipment Used: [1082-1472-1659-1464-1054](#)

Measurement Uncertainty: [+/- 1.6](#) dB

Temperature: [22](#) °C

Relative Humidity: [45](#) %

Test Data – Occupied Bandwidth (Voice & SAT)

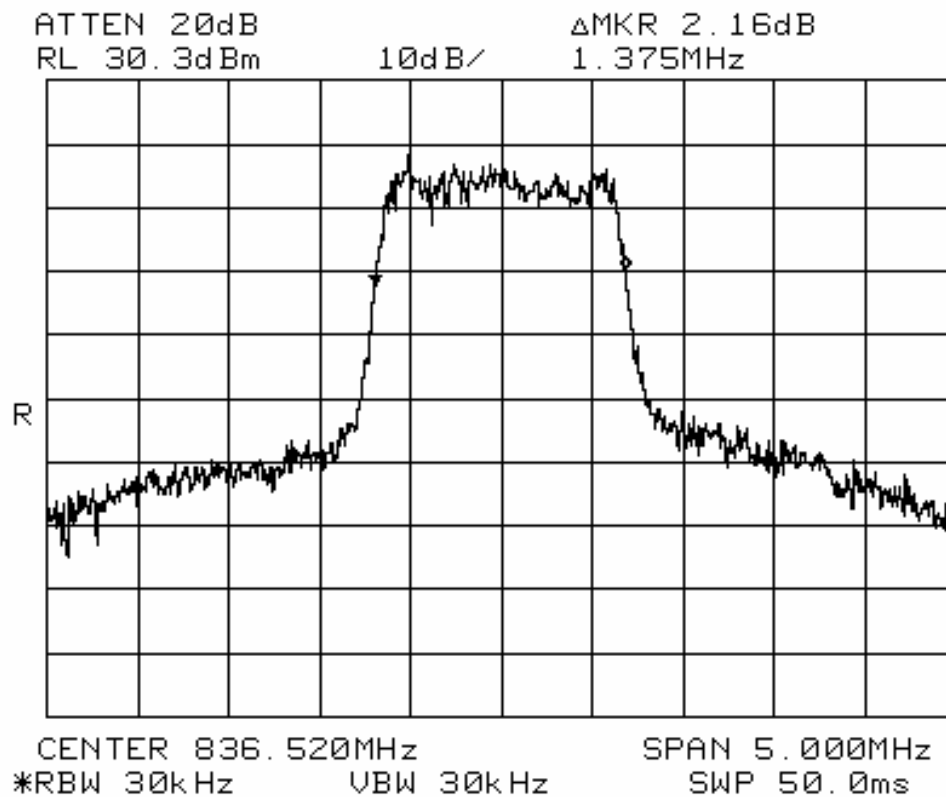


Date: 26.SEP.2005 12:36:37

Channel 384

2 kHz AF + 6 kHz SAT

Test Data – Occupied Bandwidth (CDMA)



Section 4. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 8/15/2005

Test Results: [Complies.](#)

Test Data: [See attached plots](#)

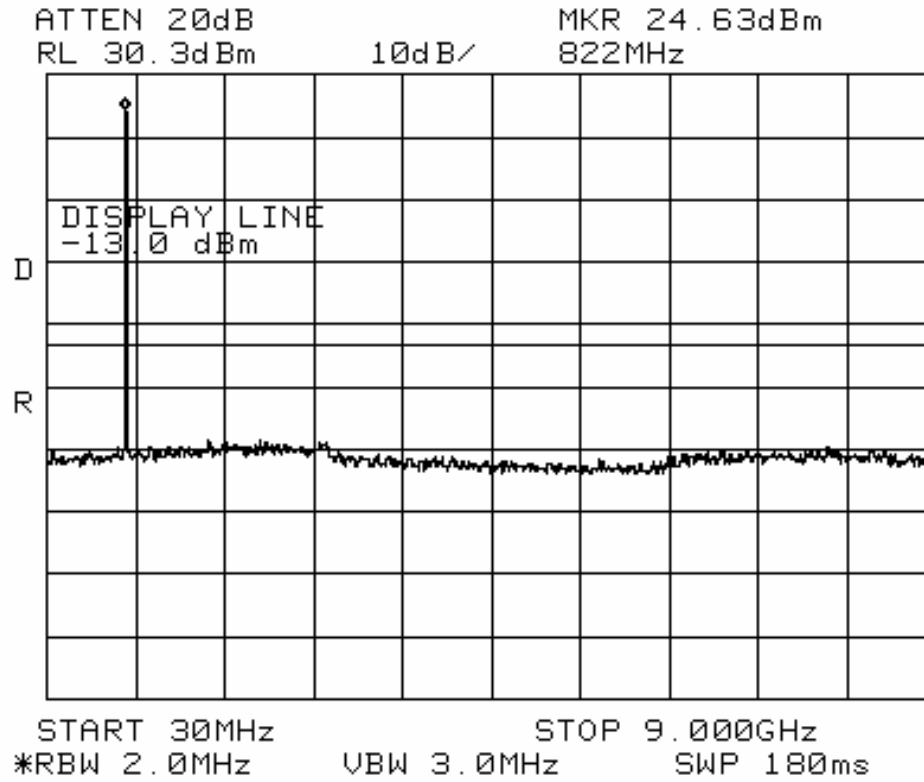
Equipment Used: [1082-1472-1464-1659-1054](#)

Measurement
Uncertainty: [+/- 1.6](#) dB

Temperature: [22](#) °C

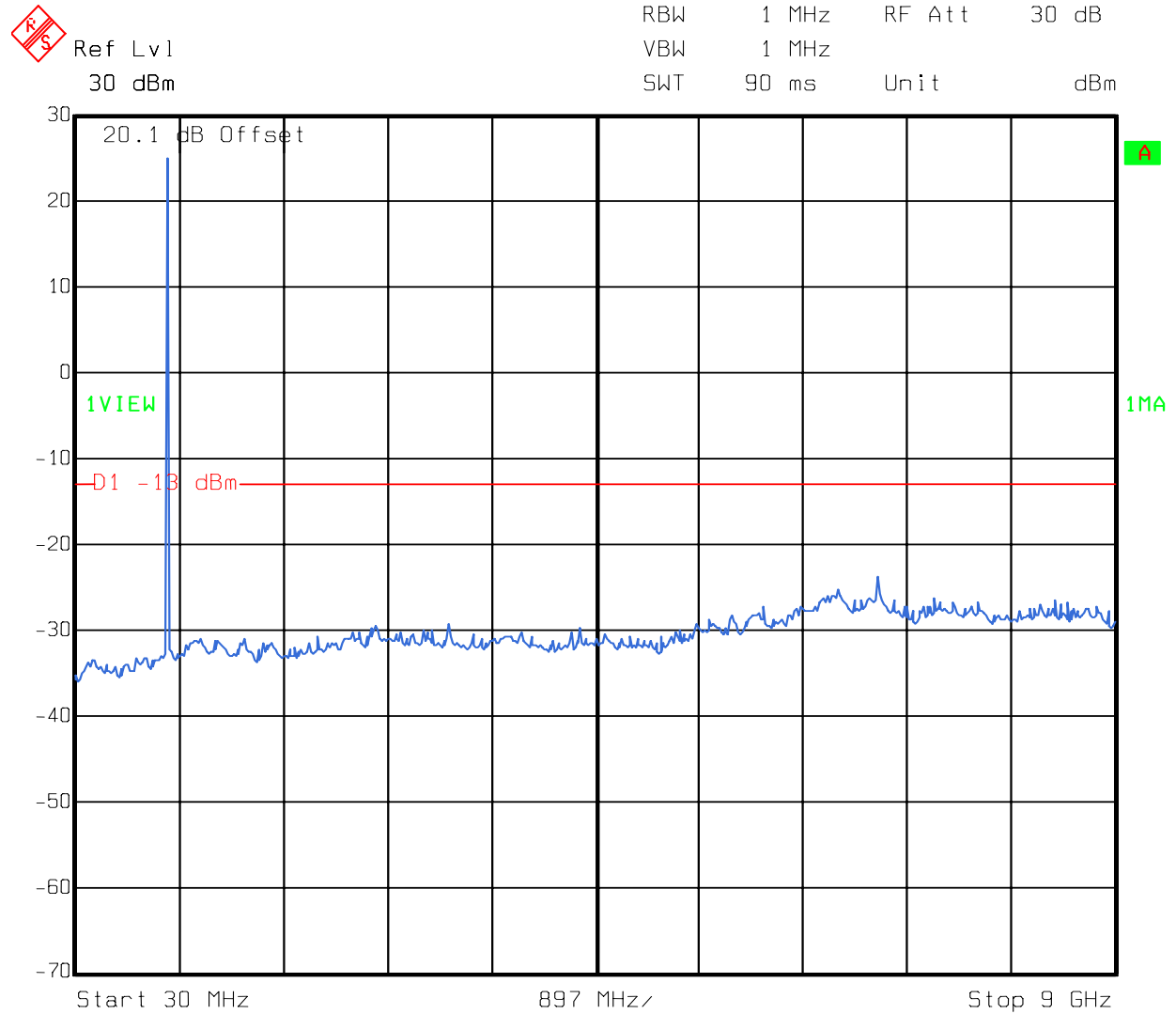
Relative
Humidity: [45](#) %

Test Data – Spurious Emissions (Analog)



Channel 384

Test Data – Spurious Emissions (Analog)



Date: 26.SEP.2005 12:45:26

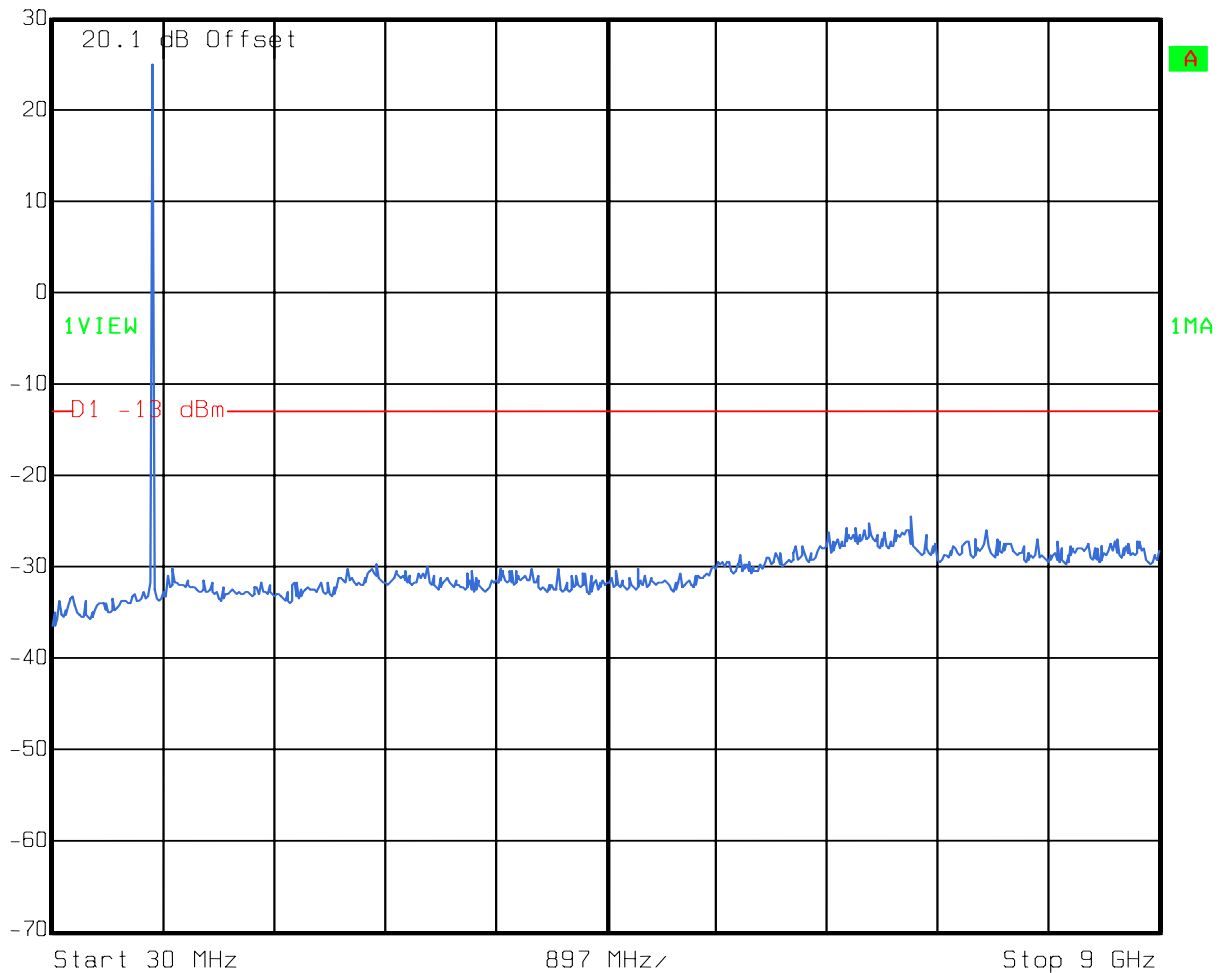
Channel 991

Test Data – Spurious Emissions (Analog)



Ref Lvl
30 dBm

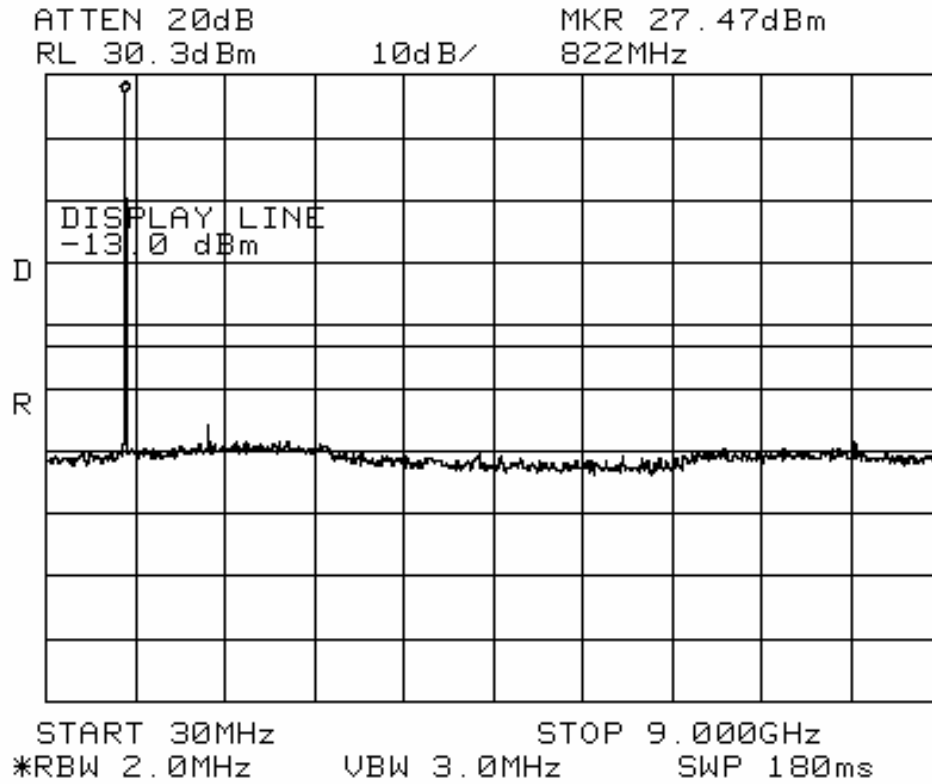
RBW 1 MHz RF Att 30 dB
VBW 1 MHz
SWT 90 ms Unit dBm



Date: 26.SEP.2005 12:46:05

Channel 799

Test Data – Spurious Emissions (CDMA)



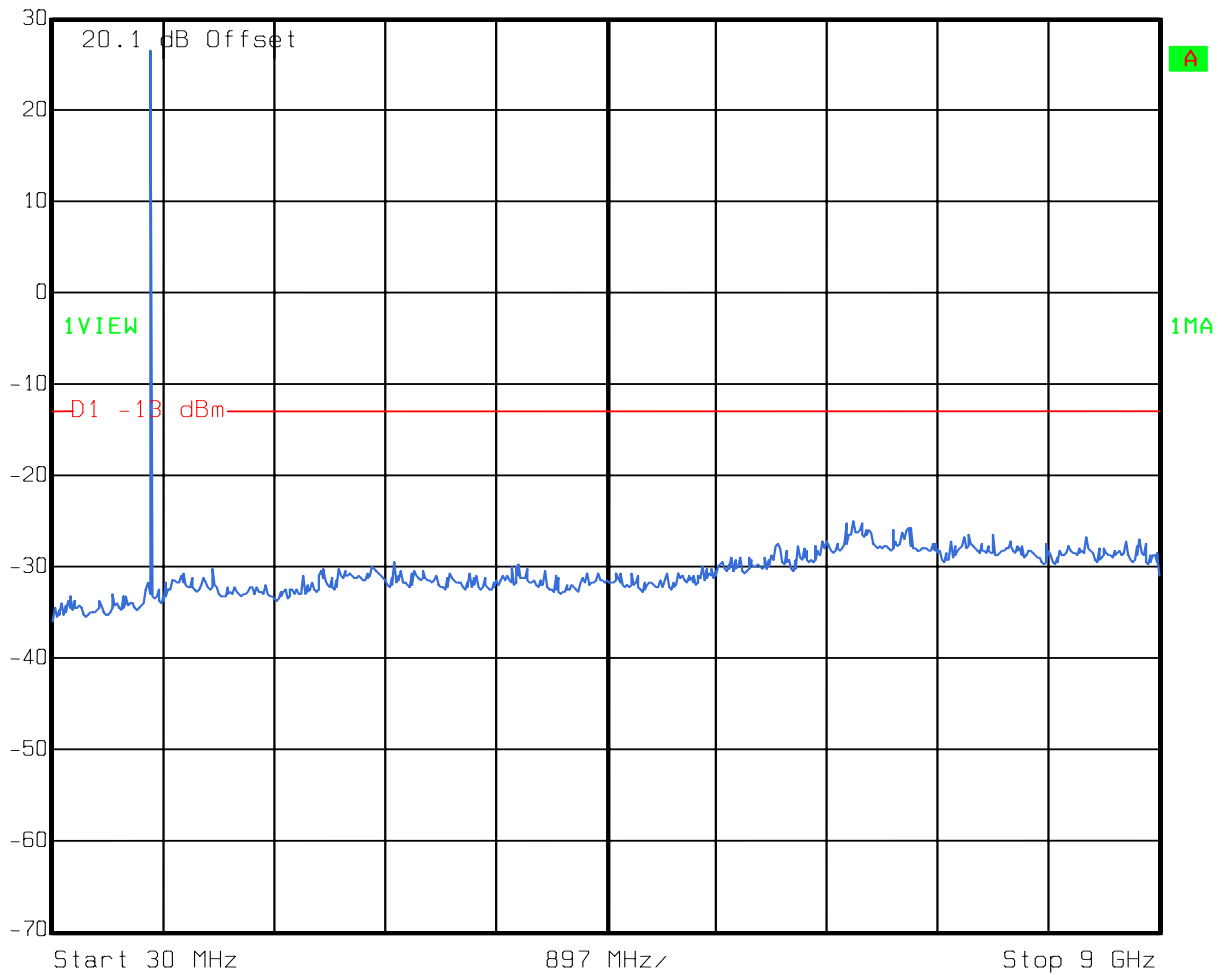
Channel 384

Test Data – Spurious Emissions (CDMA)



Ref Lvl
30 dBm

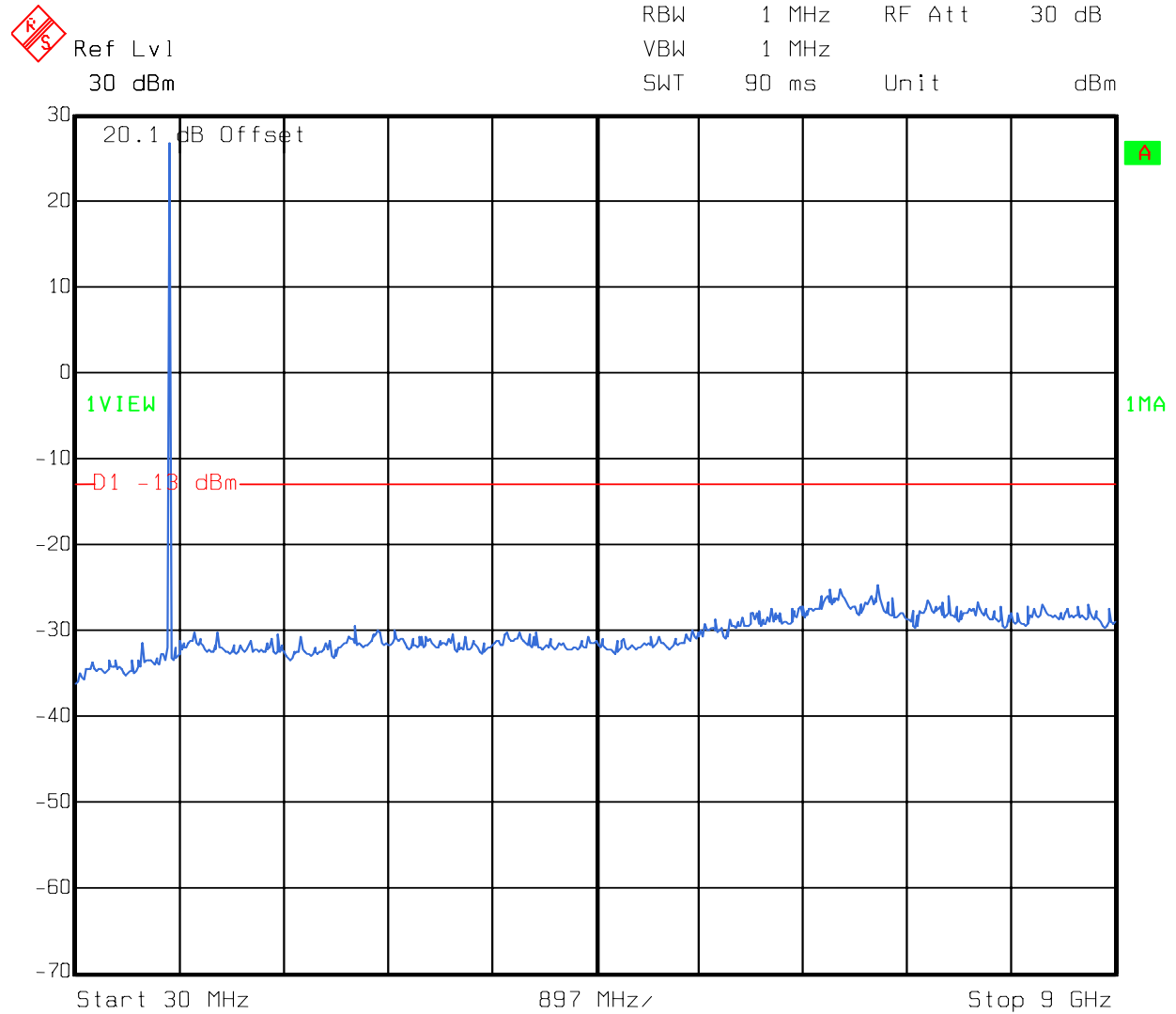
RBW 1 MHz RF Att 30 dB
VBW 1 MHz
SWT 90 ms Unit dBm



Date: 26.SEP.2005 12:47:31

Channel 1013

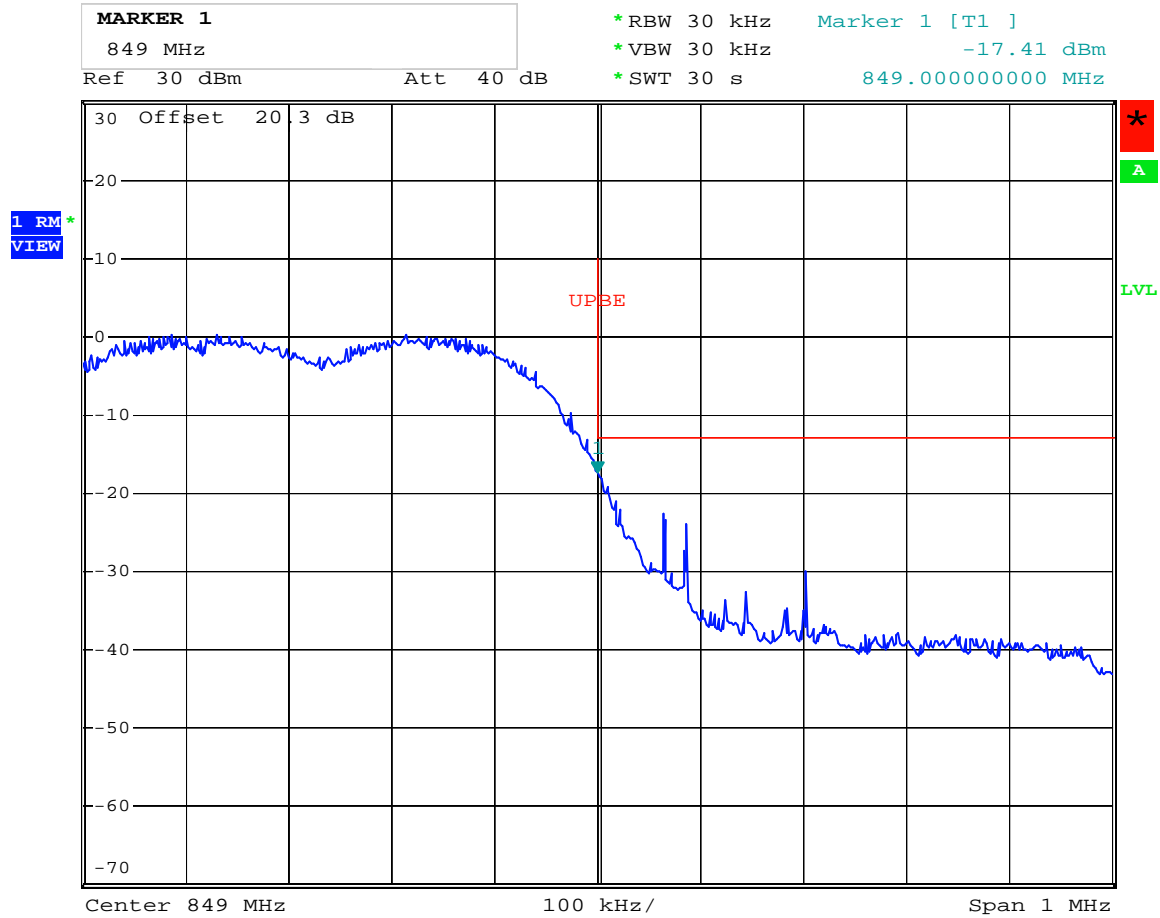
Test Data – Spurious Emissions (CDMA)



Date: 26.SEP.2005 12:48:10

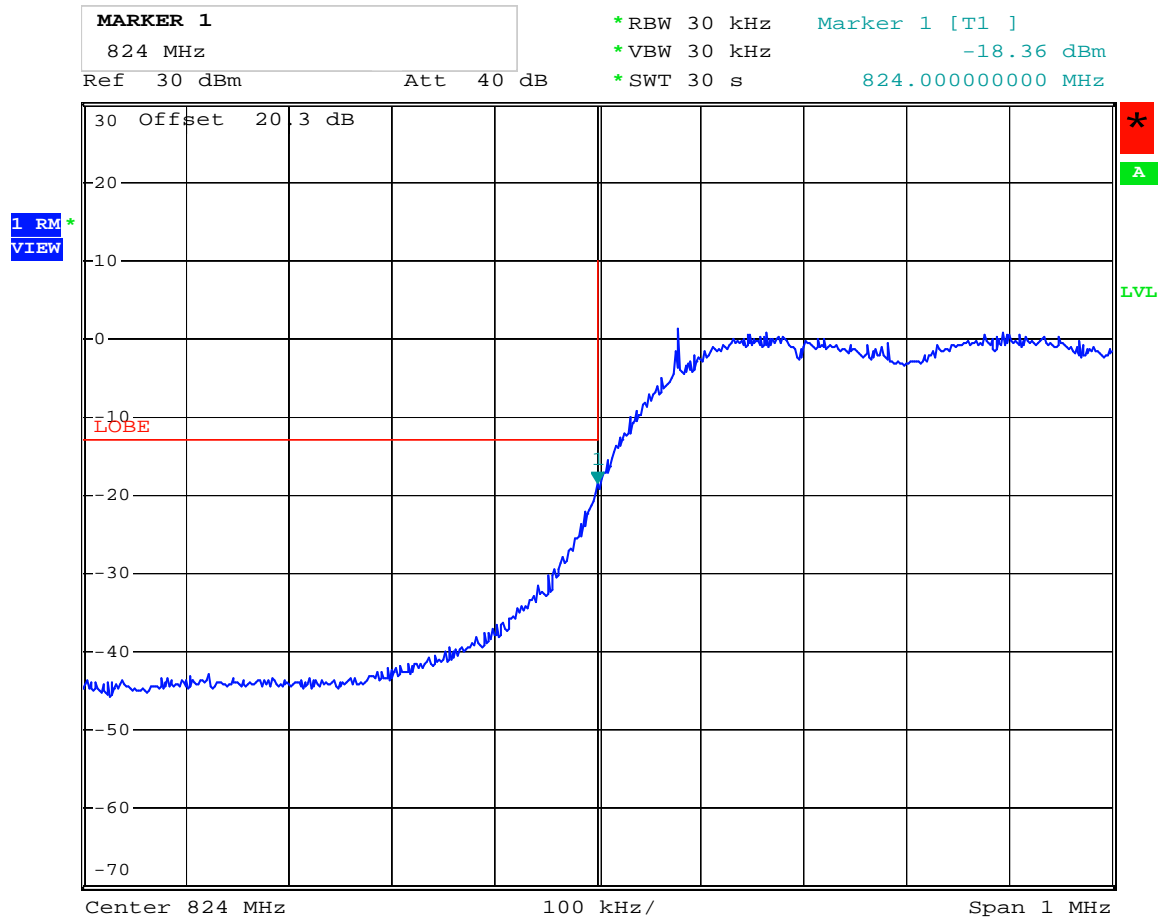
Channel 777

Test Data – Spurious Emissions (CDMA)



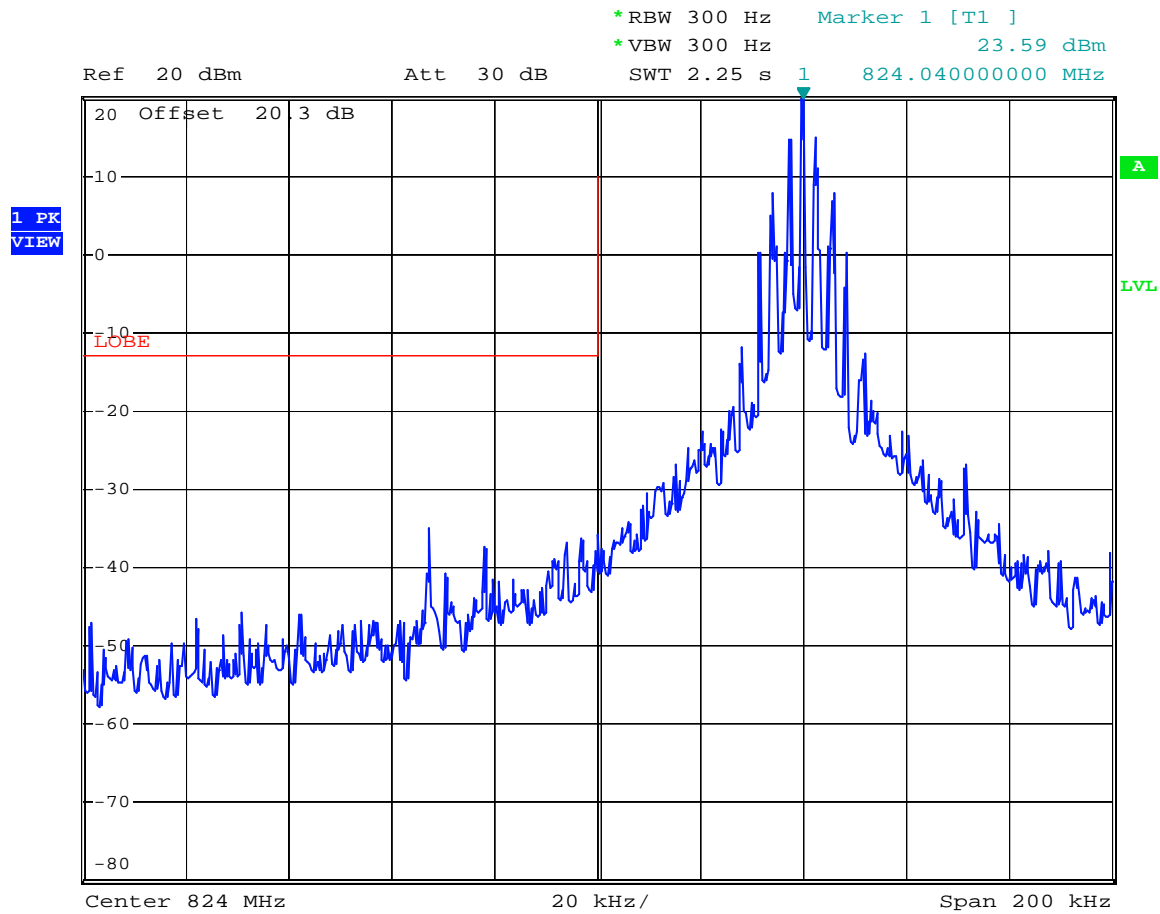
Channel 777

Test Data – Spurious Emissions (CDMA)



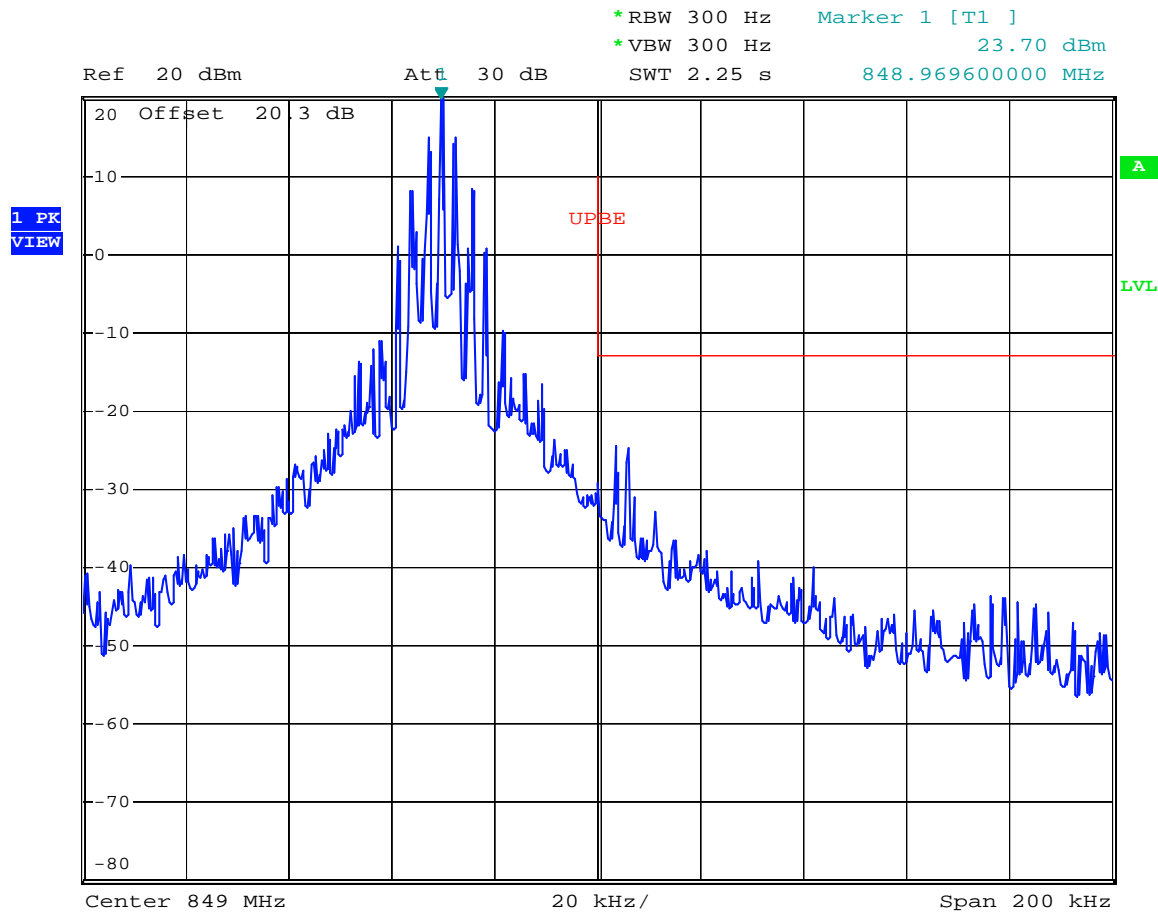
Channel 1013

Test Data – Spurious Emissions (Analog)



Channel 991

Test Data – Spurious Emissions (Analog)

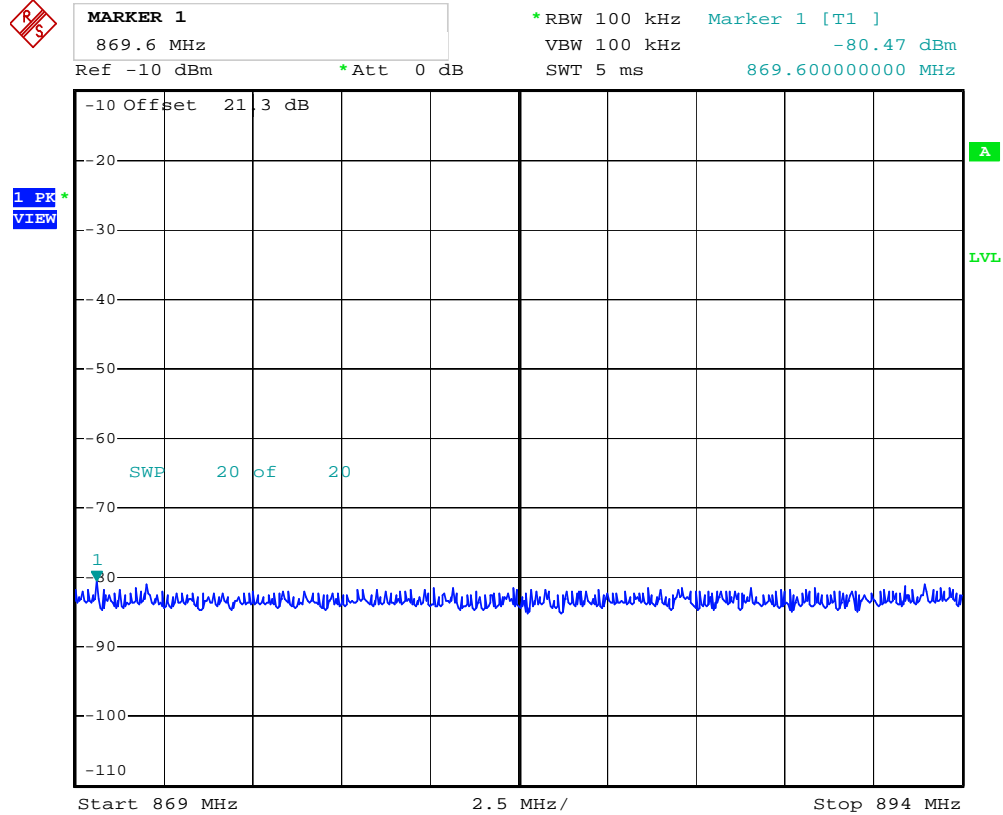


Channel 799

EQUIPMENT: 6152

Spurious Emissions in Rx Band

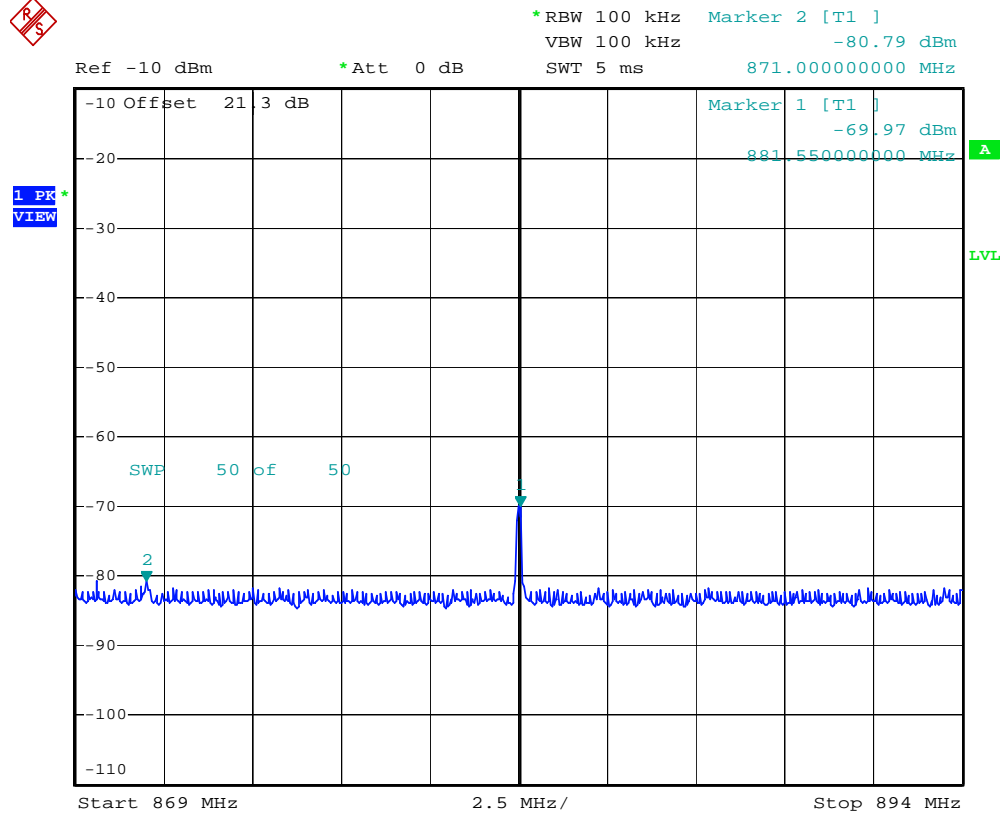
22.917 – CDMA Mode



Channel 384

Spurious Emissions in Rx Band

22.917 –Analog Mode



Channel 384

Marker 1 is from base station simulator

Marker 2 is highest emission

Section 5. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 8/16/2005

Test Results: [Complies.](#)**Test Data:** [See attached table.](#)

The handset was tested on three orthogonal axis'. The upright position pictured was determined to be worse case.

**Measurement
Uncertainty:** ± 1.7 dB**Temperature:** [20](#) °C**Relative
Humidity:** [50](#) %

Test Data – Spurious Emissions (Analog)

ERP

Page 1 of 1

Complete X

Job No.: 48929

Date: 8/16/2005

Preliminary

Specification: PT22

Temperature(°C): 20

Tested By: David Light

Relative Humidity(%) 50

E.U.T.: Dual mode 800 MHz Handset

Configuration: TX

Sample No: 1

Location: AC 3

RBW: 100 kHz

Measurement

Detector Type: Peak

VBW: 100 kHz

Distance: 3 m

Test Equipment Used

Antenna: 1304

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 (dBd)	Limit (dBm)	ERP (dBm)	ERP (mW)	Polarity	Comments
										Tx 836.52 MHz
										Upright position
										(Worst case)
1673.04	-77.0	32.7		0	6.4	-13	-38.0	0.0002	H	
2509.56	-54.0	34.6		32	8.0	-13	-43.4	0.0000	H	
3346.08	-59.0	35.8		32.6	8.1	-13	-47.7	0.0000	H	
4182.6	-67.0	35.2		33.2	7.9	-13	-57.1	0.0000	H	
5019.12	-70.0	36.3		32.7	9.1	-13	-57.4	0.0000	H	
5855.64	-70.5	36.0		31.6	9.1	-13	-57.0	0.0000	H	
6692.16	-73.0	37.8		31.5	10.1	-13	-56.5	0.0000	H	
8365.2	-72.0	42.2		33	9.7	-13	-53.1	0.0000	H	
1673.04	-68.8	29.9		0	6.4	-13	-32.6	0.0005	V	
2509.56	-51.0	35.6		32	8.0	-13	-39.5	0.0001	V	
3346.08	-63.0	37.1		32.6	8.1	-13	-50.4	0.0000	V	
4182.6	-67.0	42.8		33.2	7.9	-13	-49.5	0.0000	V	
5019.12	-70.0	40.6		32.7	9.1	-13	-53.0	0.0000	V	
6692.16	-74.0	38.3		31.5	10.1	-13	-57.1	0.0000	V	

Notes: Searched spectrum from 30 MHZ to 9 GHz.
Analog mode

The handset was tested on channels 799, 384 and 991. The measurements reported are indicative of noise floor readings found on all three channels.

Test Data – Spurious Emissions (CDMA)

ERP										
Page <u>1</u> of <u>1</u>		Job No.: <u>48929</u>		Date: <u>8/16/2005</u>		Complete <u>X</u>		Preliminary <u> </u>		
Specification: <u>PT22</u>		Temperature(°C): <u>20</u>		Tested By: <u>David Light</u>		Relative Humidity(%) <u>50</u>				
E.U.T.: <u>Dual mode 800 MHz Handset</u>										
Configuration: <u>TX</u>										
Sample No: <u>1</u>										
Location: <u>AC 3</u>				RBW: <u>1 MHz</u>		Measurement				
Detector Type: <u>Peak</u>				VBW: <u>1 MHz</u>		Distance: <u>3</u> m				
Test Equipment Used										
Antenna: <u>1304</u>				Directional Coupler: <u> </u>						
Pre-Amp: <u>1016</u>				Cable #1: <u>1484</u>						
Filter: <u>1481</u>				Cable #2: <u>1485</u>						
Receiver: <u>1464</u>				Cable #3: <u> </u>						
Attenuator #1: <u> </u>				Cable #4: <u> </u>						
Attenuator #2: <u> </u>				Mixer: <u> </u>						
Additional equipment used: <u> </u>										
Measurement Uncertainty: <u>+/-1.7 dB</u>										
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	Limit (dBm)	ERP (dBm)	ERP (mW)	Polarity	Comments
										Tx 836.52 MHz
										Upright position
										(Worst case)
2509.56	-55.0	34.6		32	8.0		-44.4	0.0000	H	
1673.04	-70.0	29.9		0	6.4		-33.8	0.0004	V	
2509.56	-58.3	35.6		32	8.0		-46.8	0.0000	V	
Notes: Searched spectrum from 30 MHz to 9 GHz. CDMA mode										

The handset was tested on channels 777, 384 and 1013. The measurements reported are indicative of noise floor readings found on all three channels. No emissions were detected above the noise floor.

Setup Photos – Spurious Emissions



Section 6. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE: 8/17/2005

Test Results: [Complies.](#)

Test Data: [See attached table.](#)

Measurement
Uncertainty: [+/- 1 x 10⁻⁷](#) ppm

Temperature: [23](#) °C

Relative
Humidity: [55](#) %

Test Data – Frequency Stability Analog

<u>Frequency Stability</u>							
Page <u>1</u> of <u>1</u>							
Job No.: 48929		Date: 8/17/2005					
Specification: Part 22		Temperature(°C): 23					
Tested By: David Light		Relative Humidity(%) 55					
E.U.T.: 800 MHZ Handset							
Configuration: Tx at center channel - ANALOG mode							
Sample Number: 1							
<u>Test Equipment Used</u>							
Antenna: _____		Directional Coupler: _____					
Pre-Amp: _____		Cable #1: 1083					
Filter: _____		Cable #2: _____					
Receiver: 8924C							
Chamber 283							
Thermometer 619							
Measurement							
Uncertainty: 1×10^{-17} ppm		Standard Test Frequency 836.520000 MHz					
Temp (°C)	Measured Frequency (MHz)	Rho	Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	836.519850	NA	3.7	-150	2091.3	-0.2	
20	836.519843	NA	4.3	-157	2091.3	-0.2	
20	836.519850	NA	2.9	-150	2091.3	-0.2	Battery cutoff
50	836.519810	NA	3.7	-190	2091.3	-0.2	
40	836.519857	NA	3.7	-143	2091.3	-0.2	
30	836.519818	NA	3.7	-182	2091.3	-0.2	
10	836.519815	NA	3.7	-185	2091.3	-0.2	
0	836.519840	NA	3.7	-160	2091.3	-0.2	
-10	836.519840	NA	3.7	-160	2091.3	-0.2	
-20	836.519833	NA	3.7	-167	2091.3	-0.2	
-30	836.519870	NA	3.7	-130	2091.3	-0.2	
Notes:							

Test Data – Frequency Stability CDMA

<u>Frequency Stability</u>							
Page <u>1</u> of <u>1</u>							
Job No.: 48929		Date: 8/17/2005					
Specification: Part 22		Temperature(°C): 23					
Tested By: David Light		Relative Humidity(%) 55					
E.U.T.:		800 MHZ Handset					
Configuration:		Tx at center channel - CDMA mode					
Sample Number: 1							
<u>Test Equipment Used</u>							
Antenna:		Directional Coupler:					
Pre-Amp:		Cable #1: 1083					
Filter:		Cable #2:					
Receiver: 8924C							
Chamber 283							
Thermometer 619							
Measurement Uncertainty: 1×10^{-17} ppm							
Standard Test Frequency <u>836.520000</u> MHz							
Temp (°C)	Measured Frequency (MHz)	Rho	Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	836.520003	0.996	3.7	3	2091.3	0.0	
20	836.520006	0.996	4.3	6	2091.3	0.0	
20	836.520003	0.995	2.9	3	2091.3	0.0	Battery cutoff
50	836.519990	0.995	3.7	-10	2091.3	0.0	
40	836.519997	0.995	3.7	-3	2091.3	0.0	
30	836.519992	0.996	3.7	-8	2091.3	0.0	
10	836.520004	0.995	3.7	4	2091.3	0.0	
0	836.520002	0.996	3.7	2	2091.3	0.0	
-10	836.519987	0.995	3.7	-13	2091.3	0.0	
-20	836.520004	0.996	3.7	4	2091.3	0.0	
-30	836.520008	0.995	3.7	8	2091.3	0.0	
Notes:							

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
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	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	08/02/04	08/02/05
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
Nokia	Cell Site Simulator	HP 8924C	US38283285	07/18/05	07/18/07
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	09/16/04	09/16/05
619	THERMOMETER	FLUKE 51	4520028	09/16/04	09/16/05

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 (Voice & SAT)

PARA. NO.: 2.1049

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

- (i) On any frequency removed from the carrier frequency by more than 12 kHz but not more than 20 kHz:

at least $117 \log (f_d/12)$

- (ii) On any frequency removed from the carrier frequency by more than 20 kHz, up to the first multiple of the carrier frequency:

at least $100 \log (f_d/11)$ dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: \geq RBW

Span: 100 kHz

Sweep: Auto

Input Signal Characteristics (F3E/F3D):

RF level: Maximum recommended by manufacturer

AF1 frequency: 6 kHz

AF1 level: sufficient to produce 2 kHz deviation

AF2 frequency: 2.5 kHz

AF2 level: sufficient to produce 12 kHz deviation.

NAME OF TEST: Occupied Bandwidth (WB Data)

PARA. NO.: 2.1049

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: \geq RBW

Span: 200 kHz

Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz, random bit sequence

AF1 level: sufficient to produce 8 kHz deviation

NAME OF TEST: Occupied Bandwidth (ST)

PARA. NO.: 2.1049

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: \geq RBW

Span: 200 kHz

Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz tone

AF1 level: sufficient to produce 8 kHz deviation

NAME OF TEST: Occupied Bandwidth (Digital Modulation) PARA. NO.: 2.1049

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

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: CDMA (30 kHz), GSM (30 kHz), NADC (1 kHz) and CDPD (1 kHz)

VBW: \geq 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: \geq 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.

Test Method:

The maximum field strength of the spurious emission is measured at a distance of 3 meters. The device under test is then replaced with a substitution antenna of known gain with respect to a $\frac{1}{4}$ wave dipole antenna. A calibrated signal source is used to feed the substitution antenna. The rf level to the substitution antenna is adjusted to repeat the previously measured field strength. The rf input level to the substitution antenna is the effective radiated power of the spurious emission after any correction for substitution antenna gain against a $\frac{1}{4}$ wave dipole.

The spectrum is searched to 10 GHz.

NAME OF TEST: Frequency Stability**PARA. NO.: 2.1055**

Minimum Standard: Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

Table C-1

Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile \leq 3 W
821 to 896	1.5	2.5	2.5

Method Of Measurement:Frequency Stability With Voltage Variation:

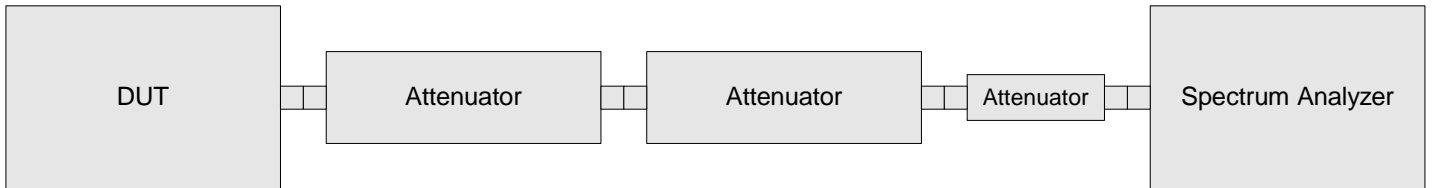
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref. in of the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

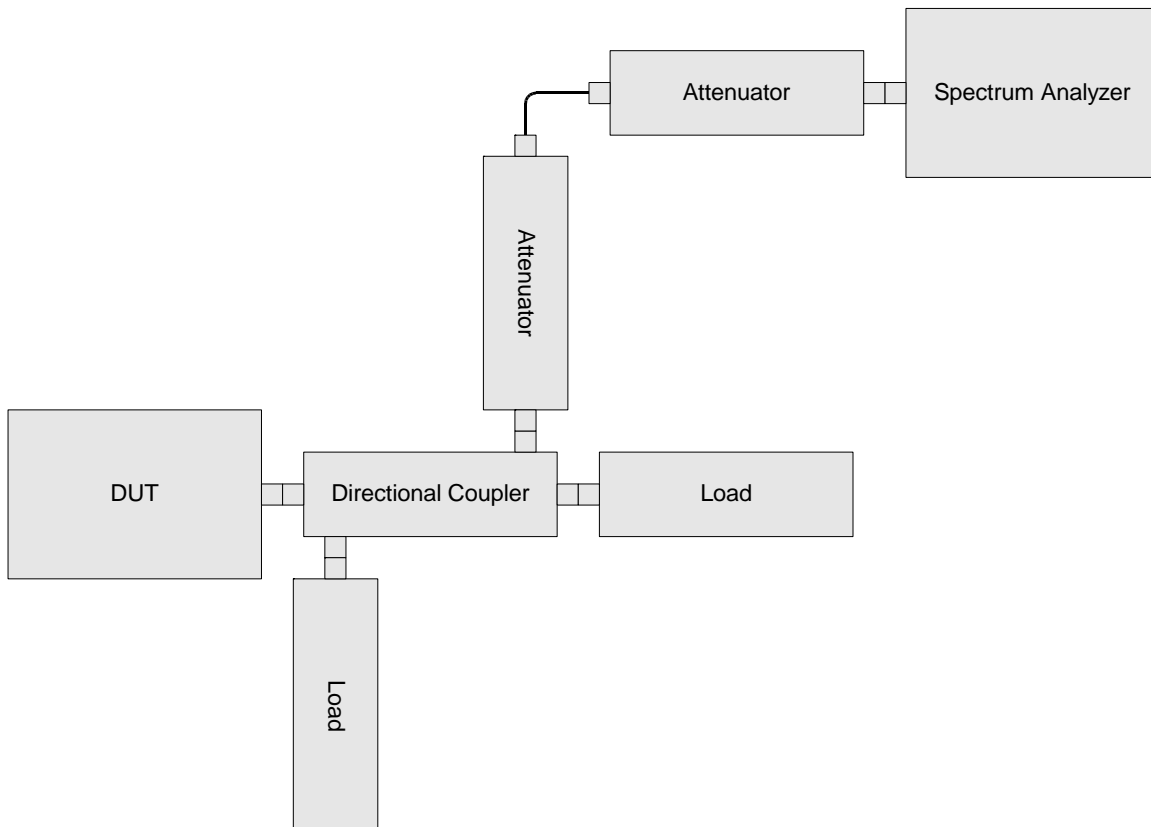
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

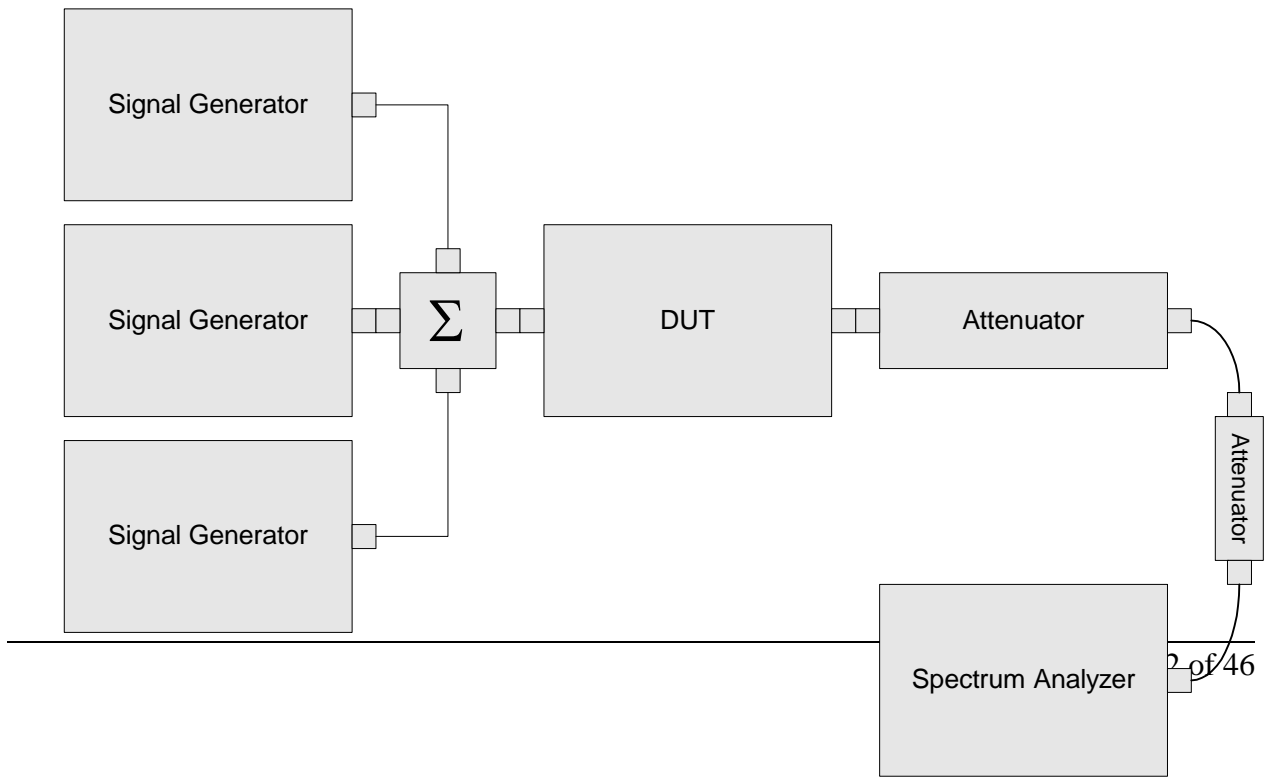
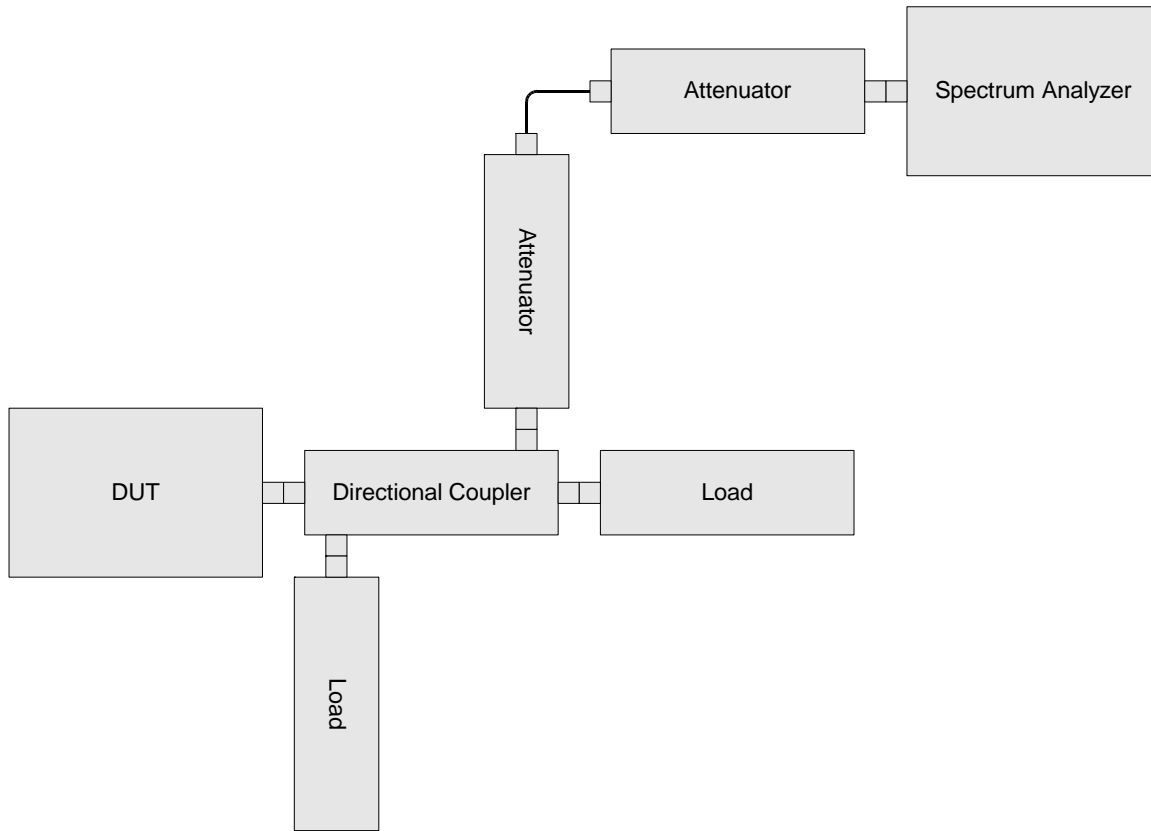
Para. No. 2.1046 - R.F. Power Output



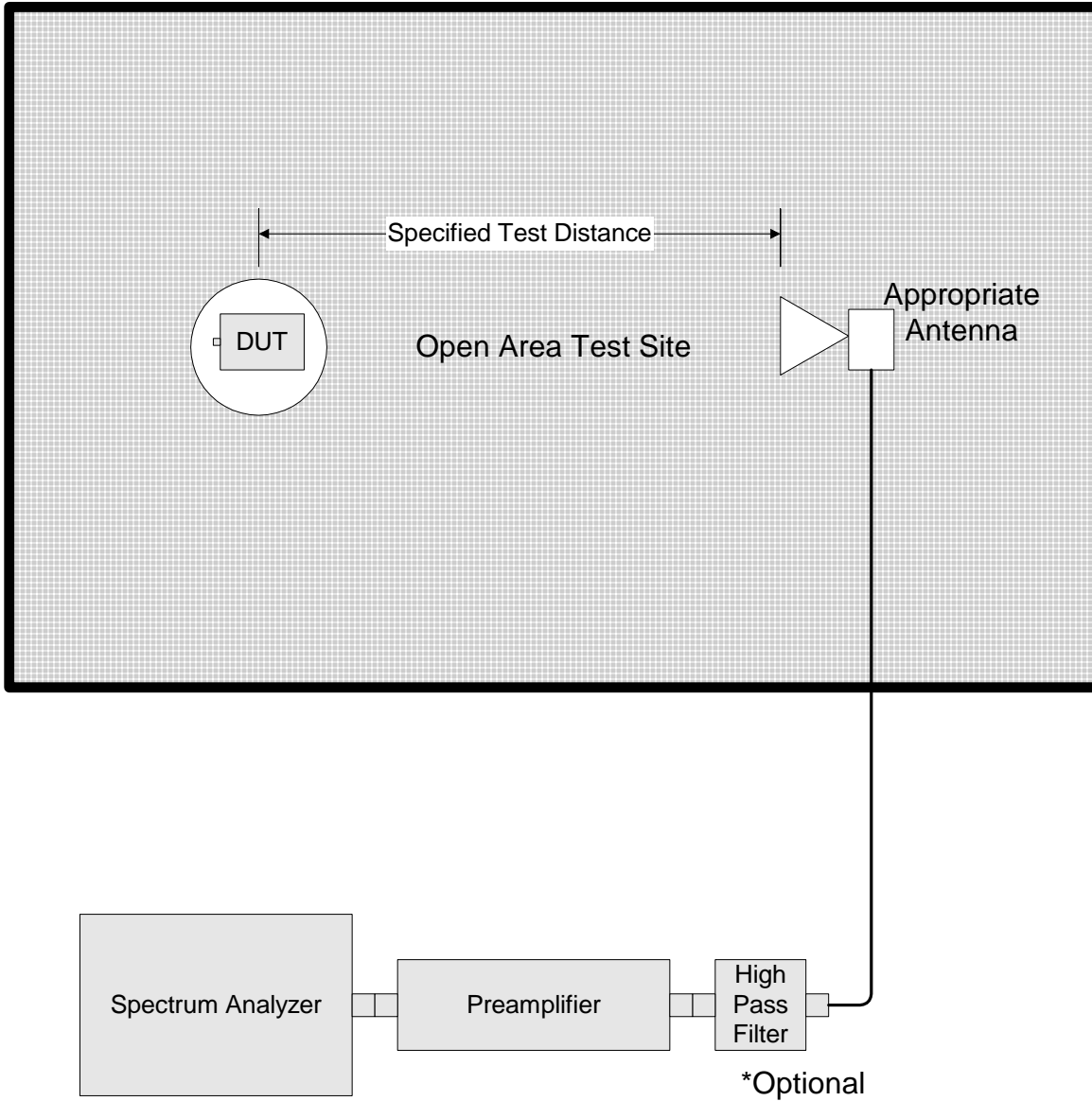
Para. No. 2.1049 - Occupied Bandwidth

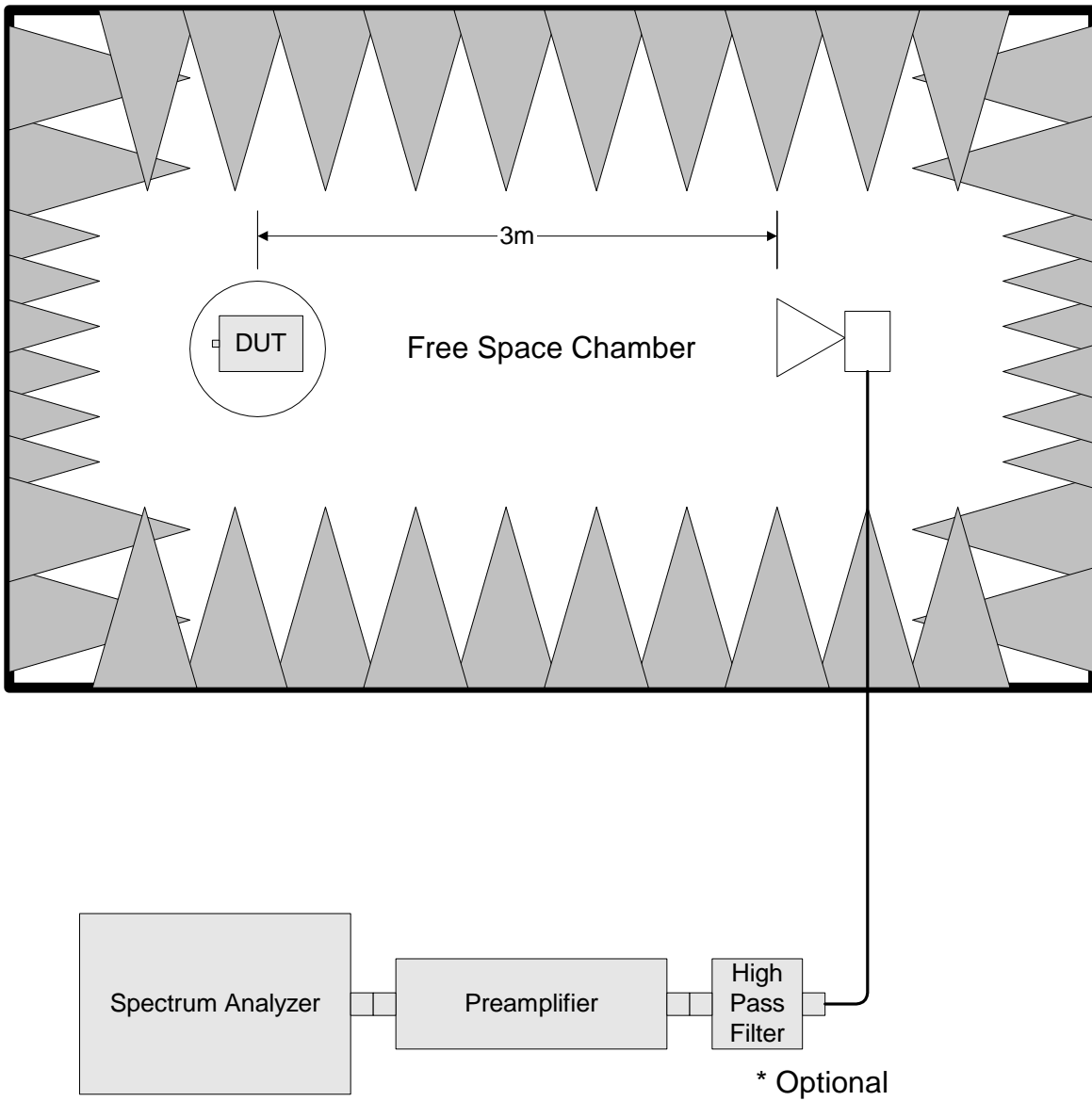


Para. No. 2.1051 Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation





Para. No. 2.1055 - Frequency Stability

