



Nemko Test Report: 5L0613RUS1

Applicant: Nokia, Inc.

Equipment Under Test: 2115i
(E.U.T.)

In Accordance With: **FCC Part 24, Subpart E**
Broadband PCS Subscriber Station

Tested By: Nemko USA Inc.
802 N. Kealy
Lewisville, TX
75057-3136

Authorized By:

A handwritten signature in blue ink, appearing to read 'John F. Smith', is written over a faint, light blue circular background.

Date: 21 December, 2005

NVLAP LAB CODE: 100426-0
Accreditation valid 1/1/05 to 12/31/05



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*EQUIPMENT: 2115i***Test Report No.: 5L0613RUS1**

Section 1. Summary of Test Results

Manufacturer: Nokia, Inc.

Model No.: 2115i

Serial No.: 04408616693

Type: RH-89

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 and FCC Part 24, Subpart E.

☐

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”.](#)

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This report applies only to the items tested.

*EQUIPMENT: 2115i***Test Report No.: 5L0613RUS1**

Summary Of Test Data**Part 24**

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	24.232	Not tested
Occupied Bandwidth	24.238	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	Complies
Field Strength of Spurious Emissions	24.238(a)	Complies
Frequency Stability	24.235	Complies

Footnotes:

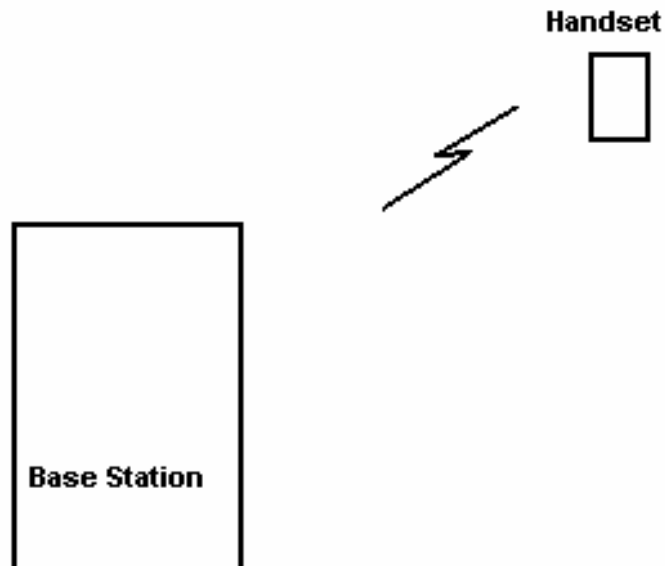
Section 2. General Equipment Specification

Frequency Bands:	1851.25 to 1908.75 MHz		
Type of Modulation and Designator:	CDMA (F9W) ☒	AMPS (F8W) ☐	NADC (DXW) ☐
Necessary Bandwidth:	1.235 MHz		
Emission designator(s):	1M23F9W		
Output Impedance:	50 ohms		

Operational Description

CDMA handset for use in 1900 PCS band

System Diagram



Section 3. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 24.238(a)
TESTED BY: David Light	DATE: 21 December 2005

Test Results: Complies.

The worst-case emission (noise floor) is -24.4 dBm at 3760 MHz.

Measurement Data: Refer to attached data

Orientation of device under test: The device under test was tested on three orthogonal axis in order to determine worst-case orientation. The worst-case orientation was found to be in the upright position.

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Field Strength of Spurious Emissions

Distance: 3 m

Measurement Uncertainty: +/-1.7 dB

Notes:

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Photographs of Test Setup



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Section 4. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 24.235
TESTED BY: David Light	DATE: 20 December 2005

Test Results: Complies.

Measurement Data: Refer to attached data

EQUIPMENT: 2115i

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Test Data – Frequency Stability

<u>Frequency Stability</u>							
Page <u>1</u> of <u>1</u>							
Job No.: 5L0613		Date: 12/19/2005					
Specification: Part 24		Temperature(°C): 22					
Tested By: David Light		Relative Humidity(%) 35					
E.U.T.: _____		CDMA 1900 Handset					
Configuration: _____		Tx					
Sample Number: 1							
<u>Test Equipment Used</u>							
Antenna: _____		Directional Coupler: _____					
Pre-Amp: _____		Cable #1: 1067					
Filter: _____		Cable #2: _____					
Receiver: 8924C							
Attenuator #1 _____							
PCS Extender: 83236B							
Measurement Uncertainty: 1×10^{-17} ppm							
Standard Test Frequency 1880.000000 MHz							
Temp (°C)	Measured Frequency (MHz)	Rho	Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	1879.999996	0.986	3.7	-4	1880.0	0.00	
20	1879.999981	0.987	4.2	-19	1880.0	-0.01	
20	1879.999982	0.986	3.3	-18	1880.0	-0.01	Battery cutoff
50	1879.999994	0.987	3.7	-6	1880.0	0.00	
40	1879.999995	0.986	3.7	-5	1880.0	0.00	
30	1879.999990	0.985	3.7	-10	1880.0	-0.01	
10	1879.999993	0.983	3.7	-7	1880.0	0.00	
0	1879.999994	0.985	3.7	-6	1880.0	0.00	
-10	1879.999989	0.989	3.7	-11	1880.0	-0.01	
-20	1879.999987	0.986	3.7	-13	1880.0	-0.01	
-30					1880.0		
Notes: Handset ceased operation prior to reaching -30 C							

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Section 5. Spurious Emissions – Conducted

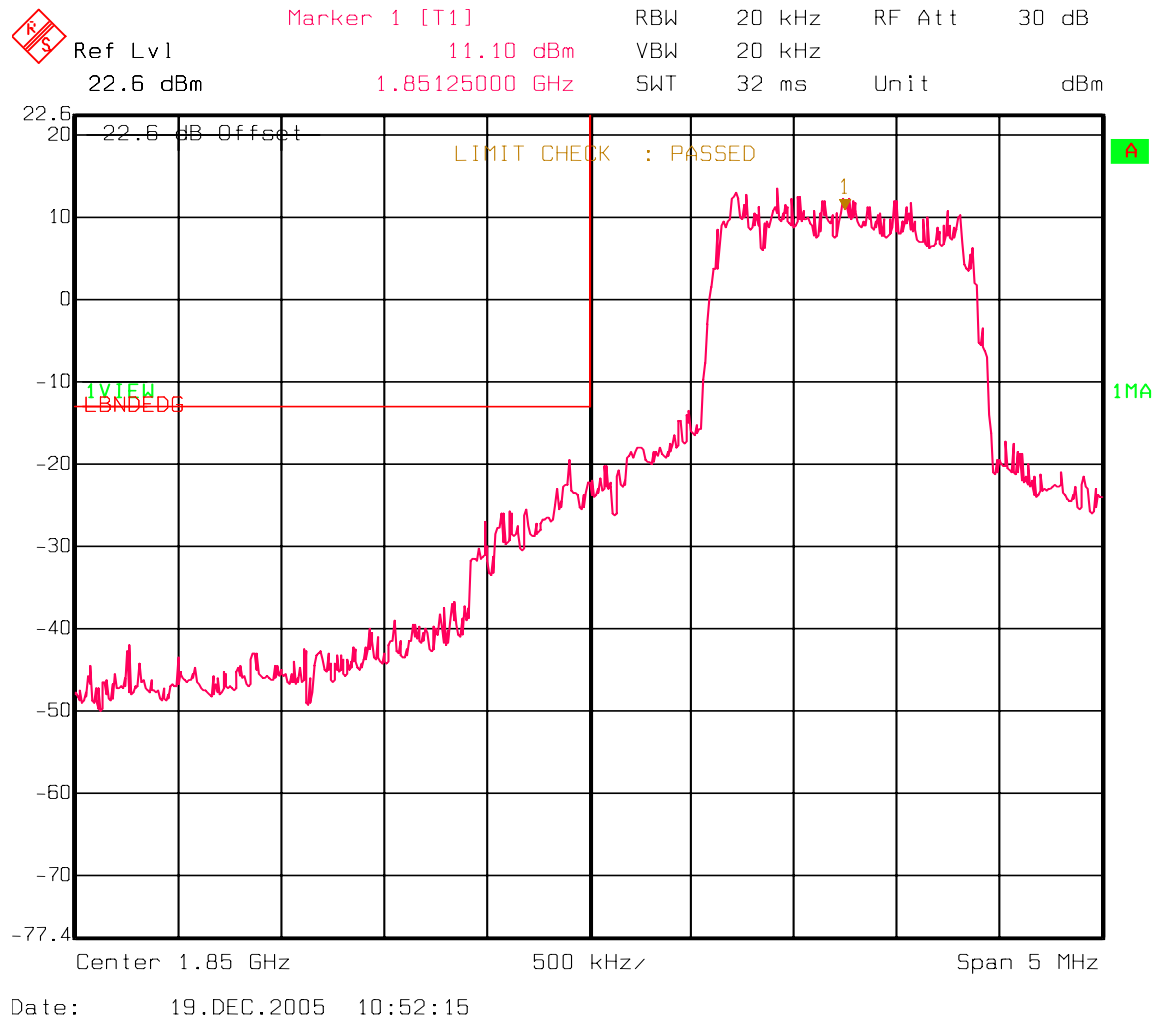
NAME OF TEST: Spurious Emissions - Conducted	PARA. NO.: 24.238(a)
TESTED BY: David Light	DATE: 20 December 2005

Test Results: Complies.

Measurement Data: Refer to attached data

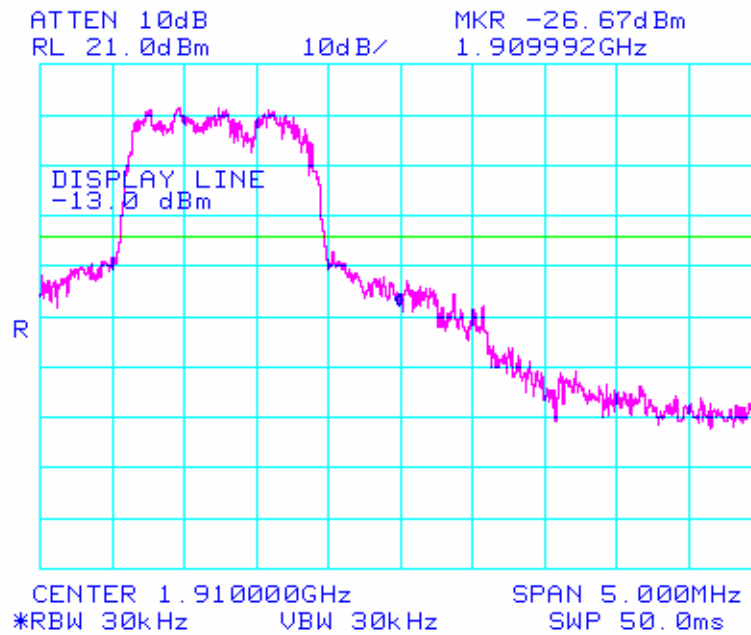
EQUIPMENT: 2115i

Test Report No.: 5L0613RUS1

Test Data – Spurious Emissions – Conducted
Channel 25

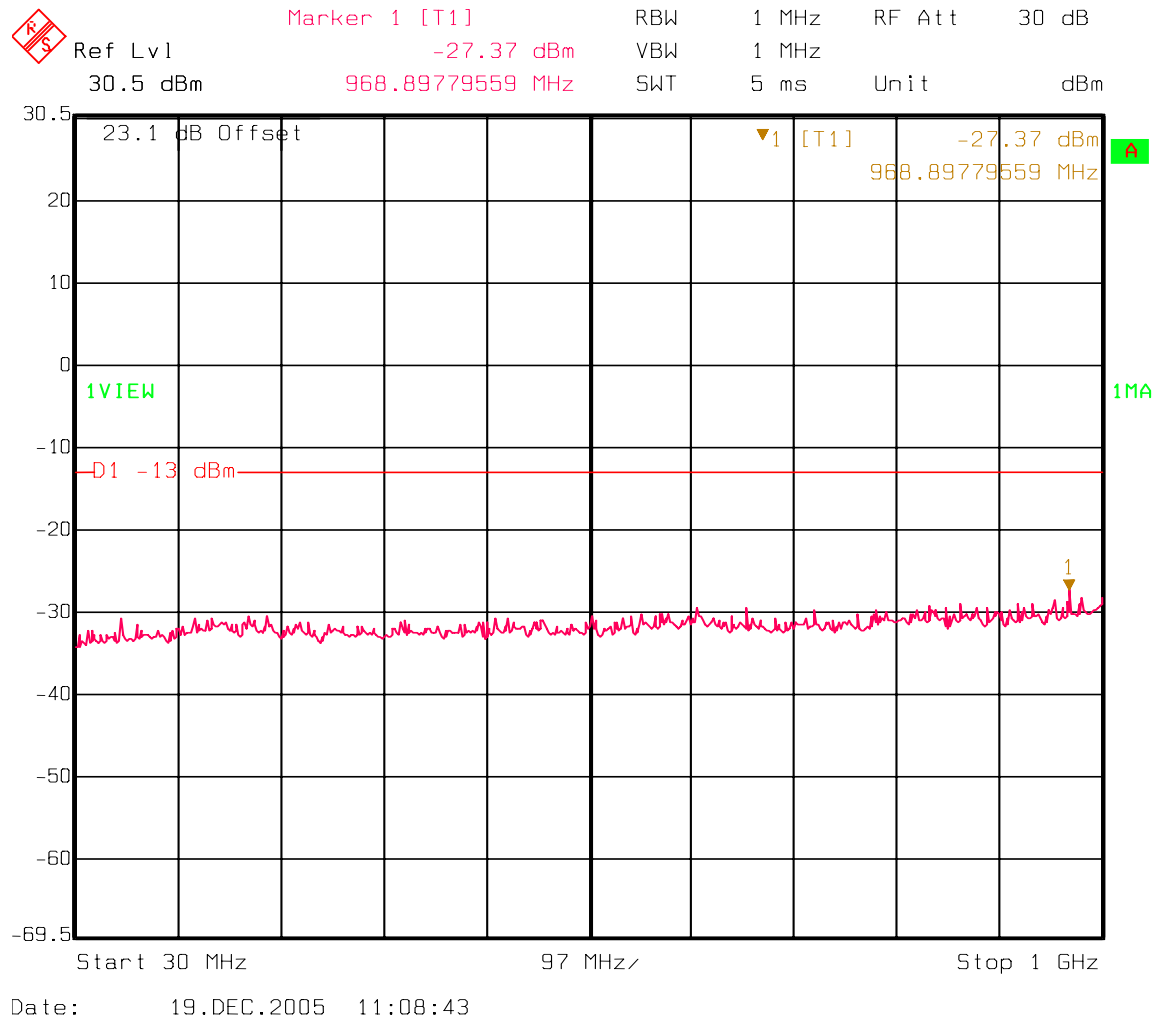
EQUIPMENT: 2115i

Test Report No.: 5L0613RUS1

Test Data – Spurious Emissions – Conducted
Channel 1175

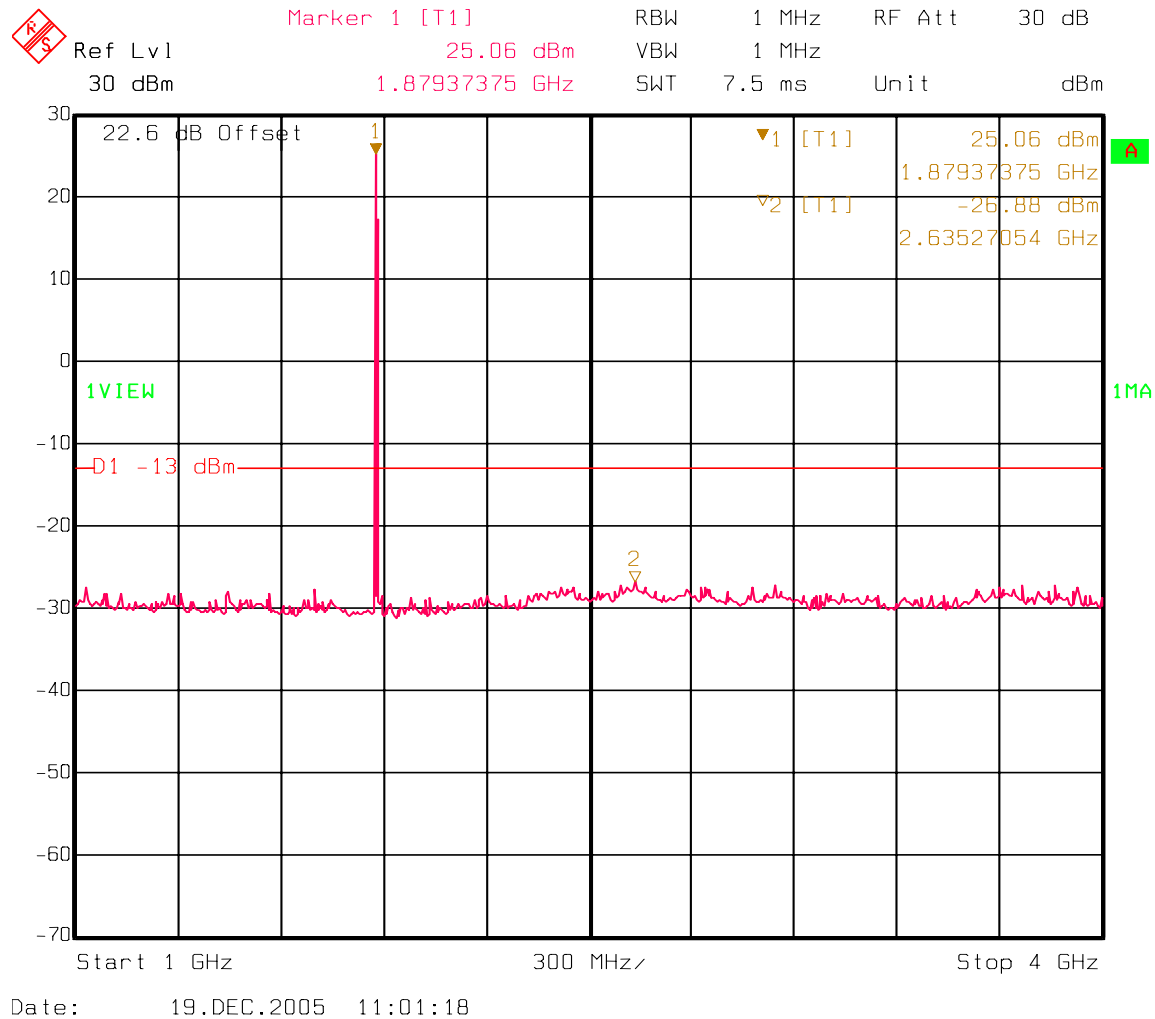
EQUIPMENT: 2115i

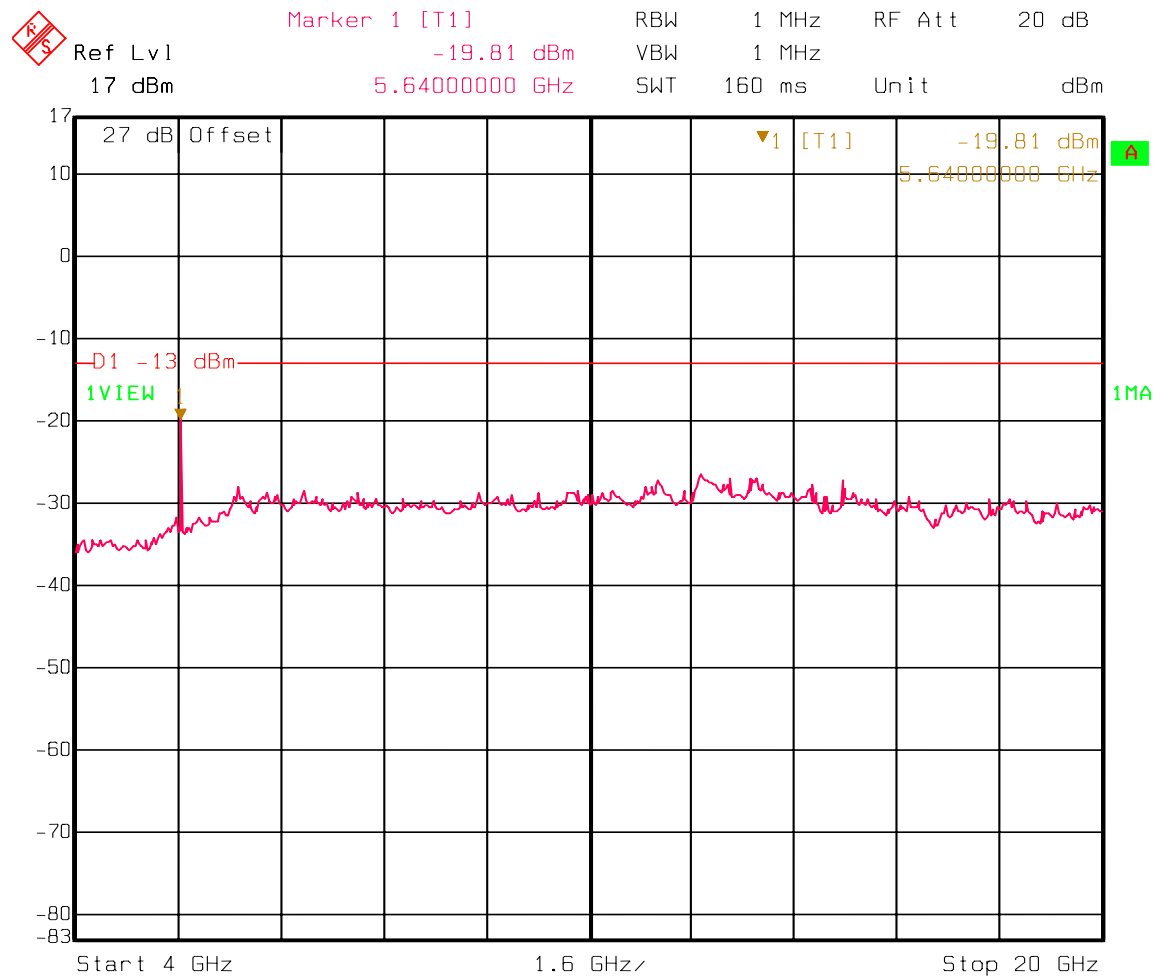
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Test Data – Spurious Emissions – Conducted
Channel 600

EQUIPMENT: 2115i

Test Report No.: 5L0613RUS1

Test Data – Spurious Emissions – Conducted
Channel 600

Test Data – Spurious Emissions – Conducted
Channel 600

Date: 20.DEC.2005 15:01:13

The spectrum was searched on three channels. Data presented is representative of all channels tested.

EQUIPMENT: 2115i

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Section 6. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 20 December 2005

Test Results: Complies.

Measurement Data: Refer to attached data

Ref Lvl 22.6 dBm

Delta 1 [T1] 0.41 dB

RBW 20 kHz

VBW 20 kHz

SWT 32 ms

Unit dBm

22.6

20

10

0

-10

-20

-30

-40

-50

-60

-70

-77.4

1VIEW

1 [T1] 6.52 dBm

1 [T1] 1.85063377 GHz

1 [T1] 0.41 dB

1 [T1] 1.23246493 MHz

Center 1.85125 GHz

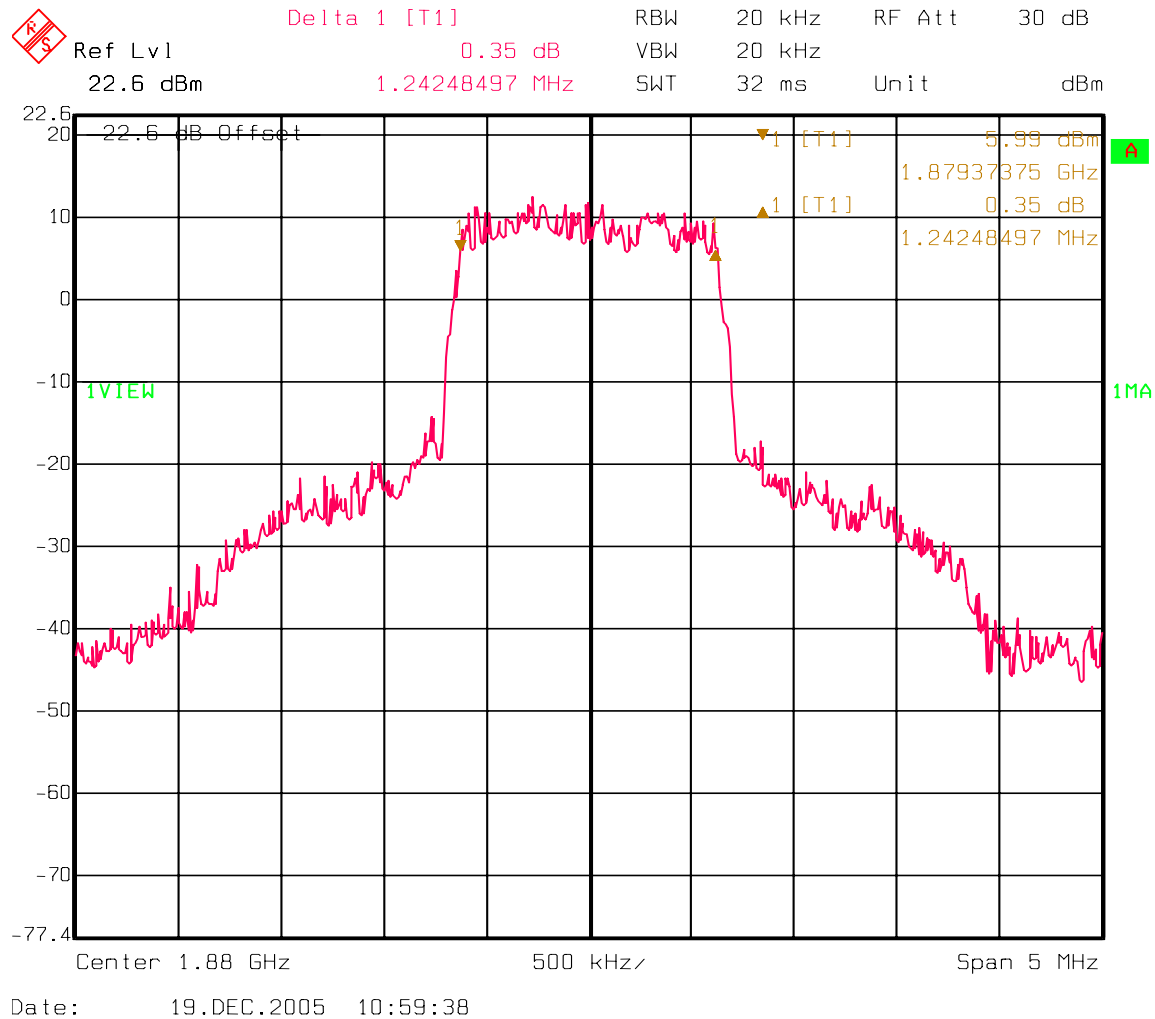
500 kHz

Span 5 MHz

Date: 19.DEC.2005 10:58:31

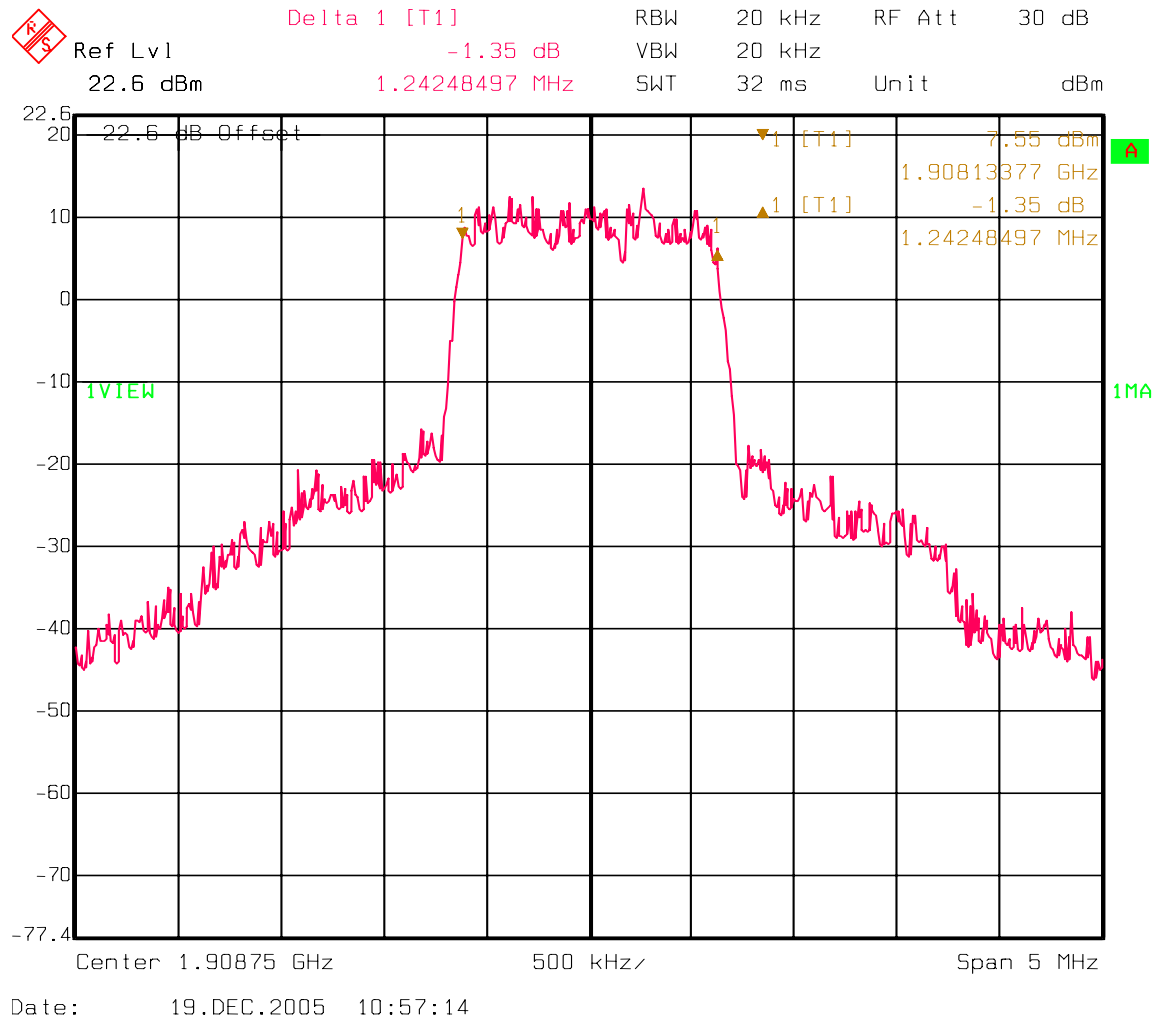
EQUIPMENT: 2115i

Test Report No.: 5L0613RUS1

**Test Data - Occupied Bandwidth
Channel 600**

EQUIPMENT: 2115i

Test Report No.: 5L0613RUS1

**Test Data - Occupied Bandwidth
Channel 1175**

EQUIPMENT: 2115i

Test Report No.: 5L0613RUS1

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1484	Cable	Storm PR90-010-072	N/A	08/26/05	08/26/06
1485	Cable	Storm PR90-010-216	N/A	08/26/05	08/26/06
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
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
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	08/04/05	08/04/06
760	Antenna biconical	Electro Metrics MFC-25	477	08/04/05	08/04/06
1482	Band Pass Filter	K & L 11SH10-4000/T12000-0/0	2	CBU	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
619	THERMOMETER	FLUKE 51	4520028	09/26/05	09/26/06
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	CNR	NA
1067	Blue cable 4m	Storm PR90-010-144	0	08/02/04	08/02/05
	Cellular test set	HP 8924C	US38283285	07/05/05	07/05/07
	PCS Extender	HP	3711JJ04715	07/05/05	07/05/07
1054	DUAL DIRECTIONAL COUPLER	NARDA 3020A	34366	CBU	N/A
1055	DUAL DIRECTIONAL COUPLER	NARDA 3022	73393	CBU	N/A
1058	DUAL DIRECTIONAL COUPLER	HEWLETT PACKARD 11692D	1212A03366	CBU	N/A

ANNEX A - TEST METHODOLOGIES

*EQUIPMENT: 2115i***Test Report No.: 5L0613RUS1****NAME OF TEST: Occupied Bandwidth****PARA. NO.: 2.1049**

Minimum Standard: Para. No. 24.238(b). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB.

Method Of Measurement:CDMA Per ANSI/J-STD-008

Spectrum analyzer settings:

RBW: 30 kHz

VBW: $\geq$ RBW

Span: 5 MHz

Sweep: Auto

GSM Per ANSI/J-STD-007

RBW: 3 kHz

VBW: $\geq$ RBW

Span: 2 MHz

Sweep: Auto

NADC Per IS-136

RBW: 1 kHz

VBW: $\geq$ RBW

Span: 1 MHz

Sweep: Auto

*EQUIPMENT: 2115i***Test Report No.: 5L0613RUS1****NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.1051**

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA Per ANSI/J-STD-008

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 20 kHz (< 1MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM Per ANSI/J-STD-007

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

NADC Per IS-136

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 1 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

*EQUIPMENT: 2115i***Test Report No.: 5L0613RUS1****NAME OF TEST: Field Strength of Spurious Radiation****PARA. NO.: 2.1053**

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Test Method: TIA/EIA-603-1992

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 a dipole.

*EQUIPMENT: 2115i***Test Report No.: 5L0613RUS1****NAME OF TEST: Frequency Stability****PARA. NO.: 2.1055**

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement: CDMA Per ANSI/J-STD-008
TDMA Per ANSI/J-STD-007
NADC Per IS-136

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. 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

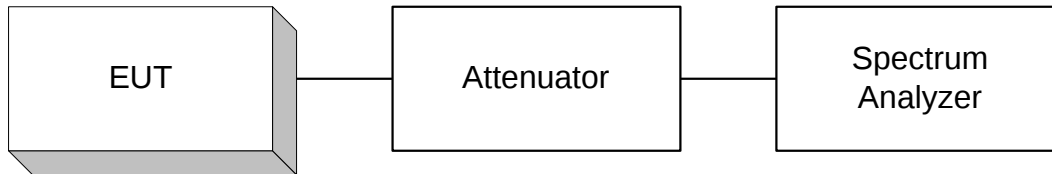
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

Digitally Modulated Signals

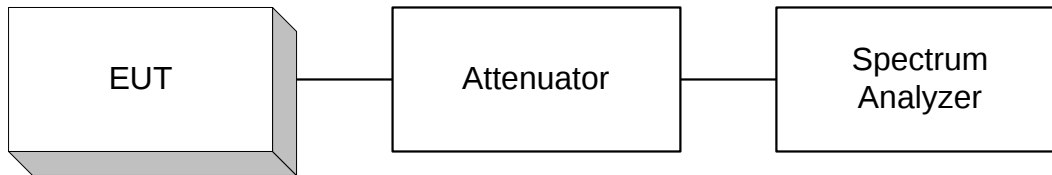
Equipment that produces a digitally modulated carrier is tested using a vector modulation analyzer. Frequency accuracy and rho are measured over the specified environmental extremes.

ANNEX B - TEST DIAGRAMS

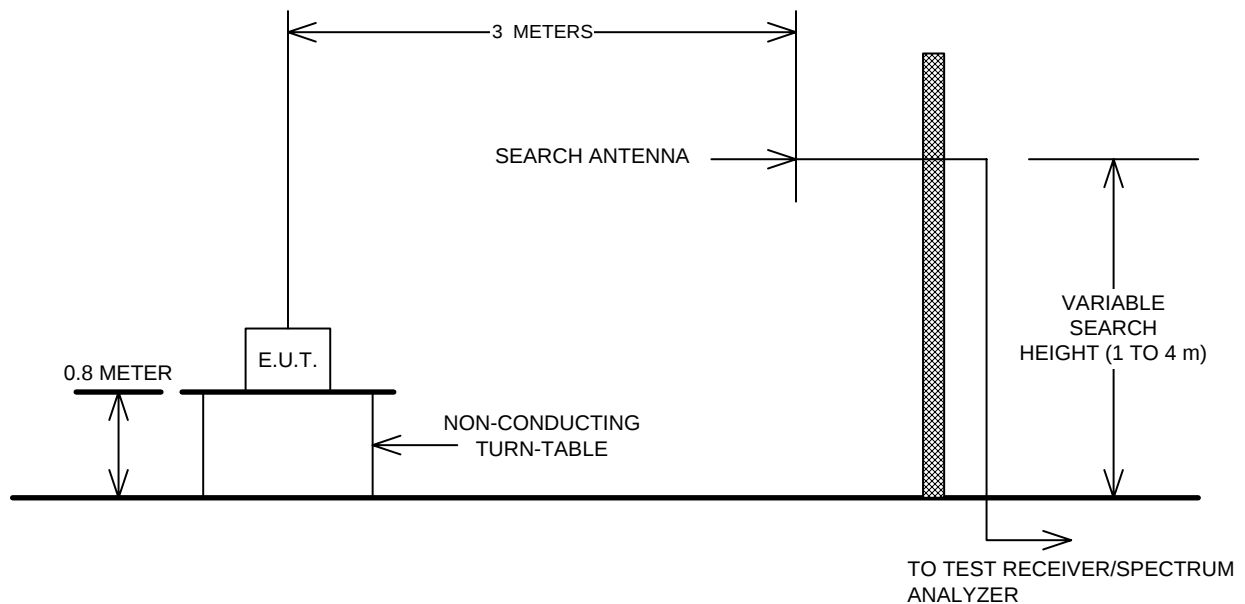
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

