Nemko Test Report:	6L0013RUS1
Applicant:	Andrew Corporation
Equipment Under Test: (E.U.T.)	MR903D
In Accordance With:	**FCC Part 24, Subpart D** Narrowband PCS Repeater
Tested By:	Nemko USA Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	 David Light, Senior Wireless Engineer
Date:	09 February 2006

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Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: MR903D

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 24, Subpart D.

☒ 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".

NVLAP LAB CODE: 100426-0

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.132(a)	≤ Rated	Complies
Occupied Bandwidth	24.133	≤ Rated	Complies
Spurious Emissions at Antenna Terminals	24.133	-13 dBm	Complies
Field Strength of Spurious Emissions	24.133	-13 dBm E.I.R.P.	Complies
Frequency Stability	24.135	± 1 ppm	N/A

Footnotes:

The device has no modulation circuitry; therefore this test was not performed.

The device was tested at the maximum input level for all tests

Section 2. General Equipment Specification

Supply Voltage Input: 120 Vac

Frequency Range: **Uplink:** 901-902 MHz

Frequency Range: **Downlink:** 940-941 MHz

Type of Modulation: **Analog**
Designator: **(F8W/F1D)** ☒

Output Impedance: 50 ohms

Gain: 60 dB

RF Output (Rated):

	Output Power per Carrier, dBm			
Technology	**1**	**2**	**4**	**8**
Analog	18	15	12	9

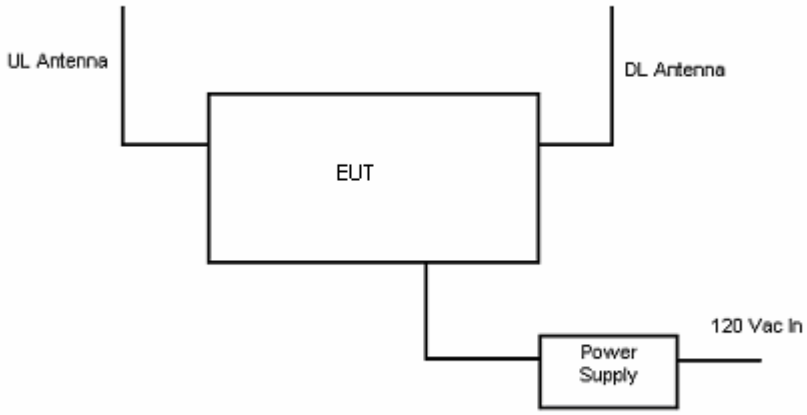
Frequency Translation: **F1-F1** ☒ **F1-F2** ☐ **N/A** ☐

Band Selection: **Software** ☐ **Selector Switch** ☐ **Fullband Coverage** ☒

Description of EUT

The MR903D band selective mini repeater is a bi-directional amplifier used to enhance signals between a mobile and base station in a wireless network.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 24.132
TESTED BY: Kevin Rose	DATE: 17-31 JANUARY 2006:

Test Results: Complies.

Measurement Data:

Test Equipment used: 1036-1470-1478-1629-1659

Modulation	Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Measured/Rated (dB)
Analog uplink low	901.05	18.08	18	.08
Analog uplink mid	901.5	18.05	18	.05
Analog uplink high	902.95	18.17	18	.17
Analog downlink low	940.05	18.11	18	.11
Analog downlink mid	940.5	18.09	18	.09
Analog downlink high	942.95	18.13	18	.13

Measurement uncertainty: +/- 0.7 dB

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 24.131
TESTED BY: Kevin Rose	DATE: 17-31 JANUARY 2006:

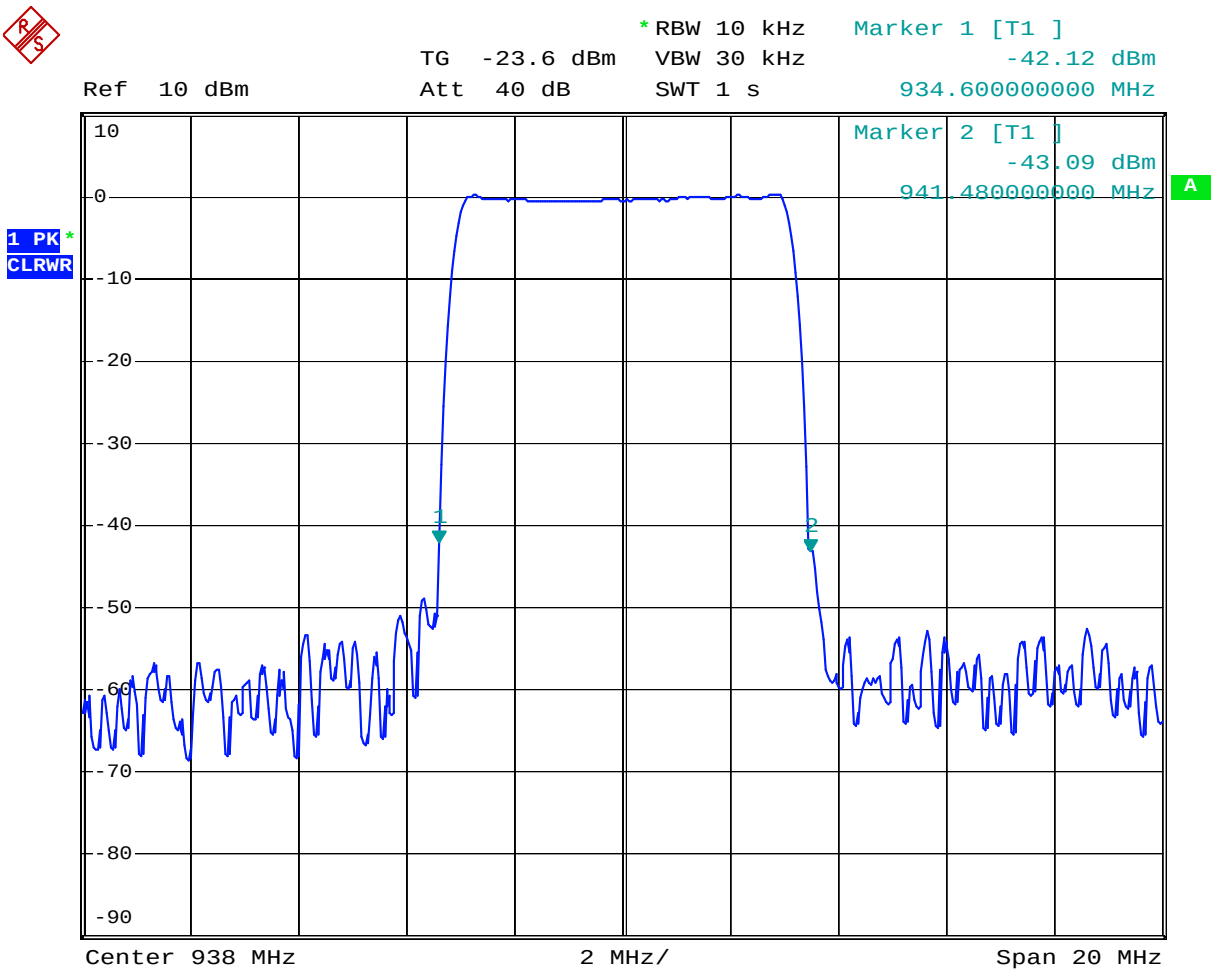
Test Results: Complies.

Test Data: See attached plots.

Measurement Uncertainty: +/- 1.7 dB

Test Equipment used: 1036-1470-1478-1629-1659

Filter Response Downlink



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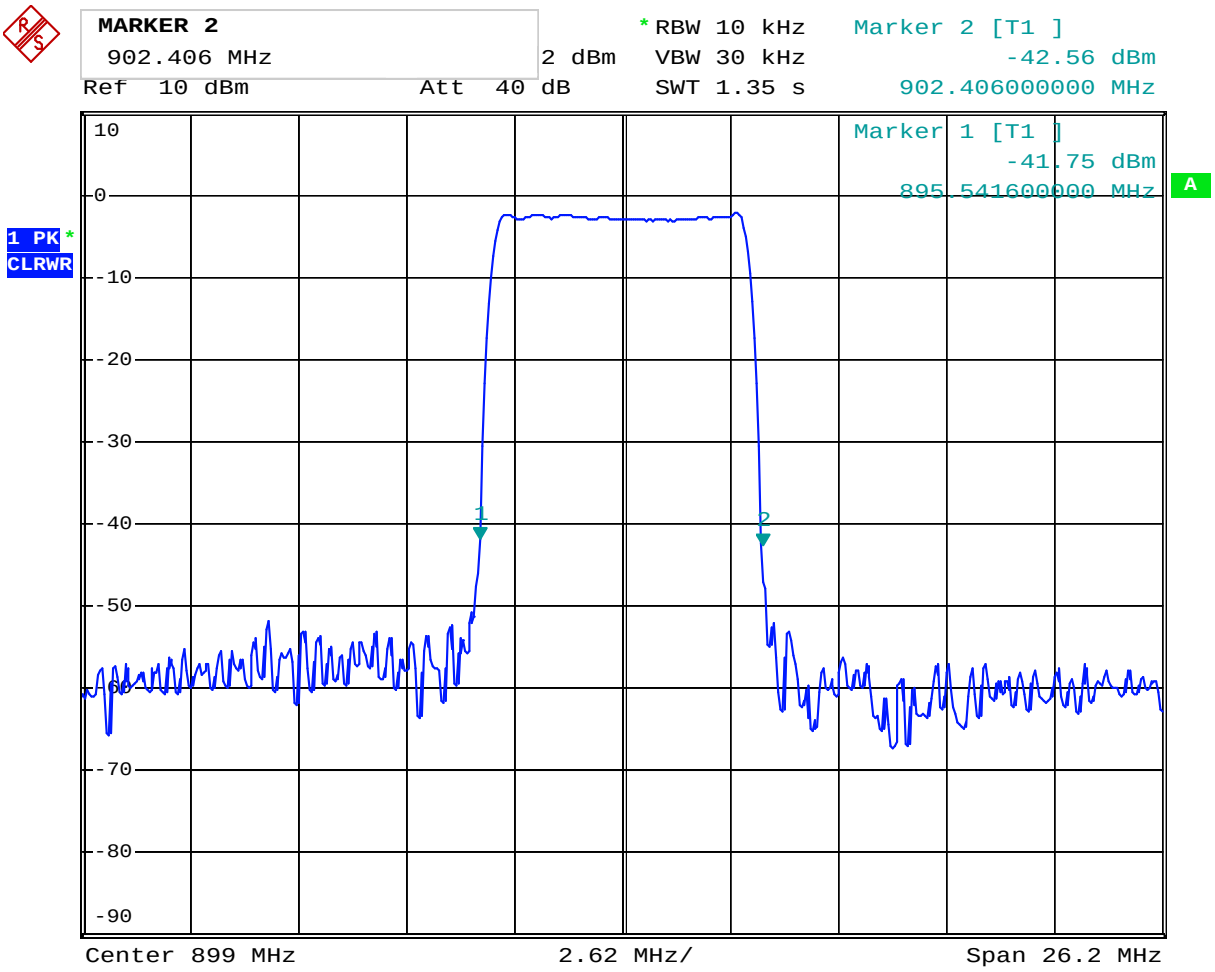
Filter Response Uplink



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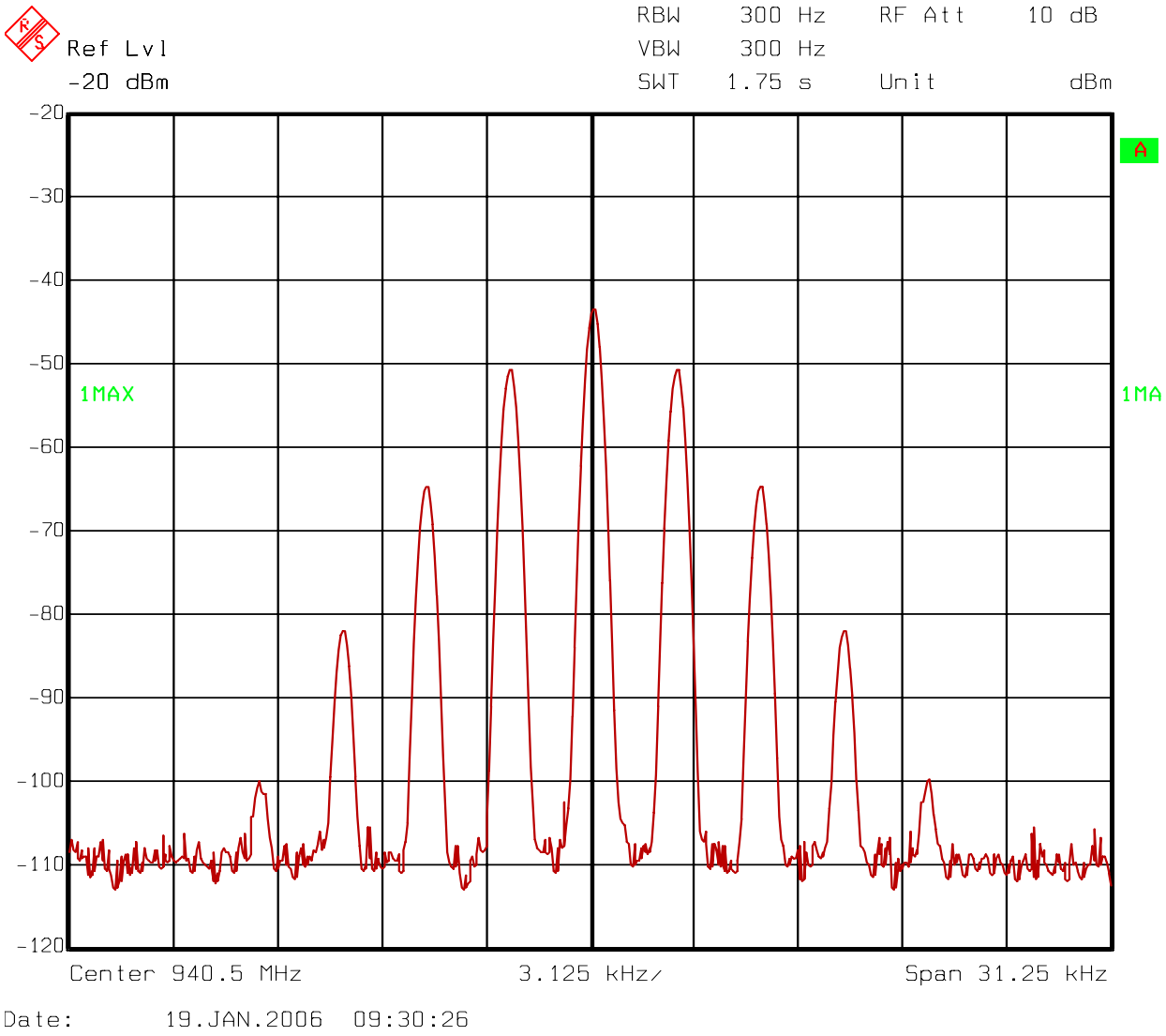
DOWNLINK MID CHANNEL OBW INPUT



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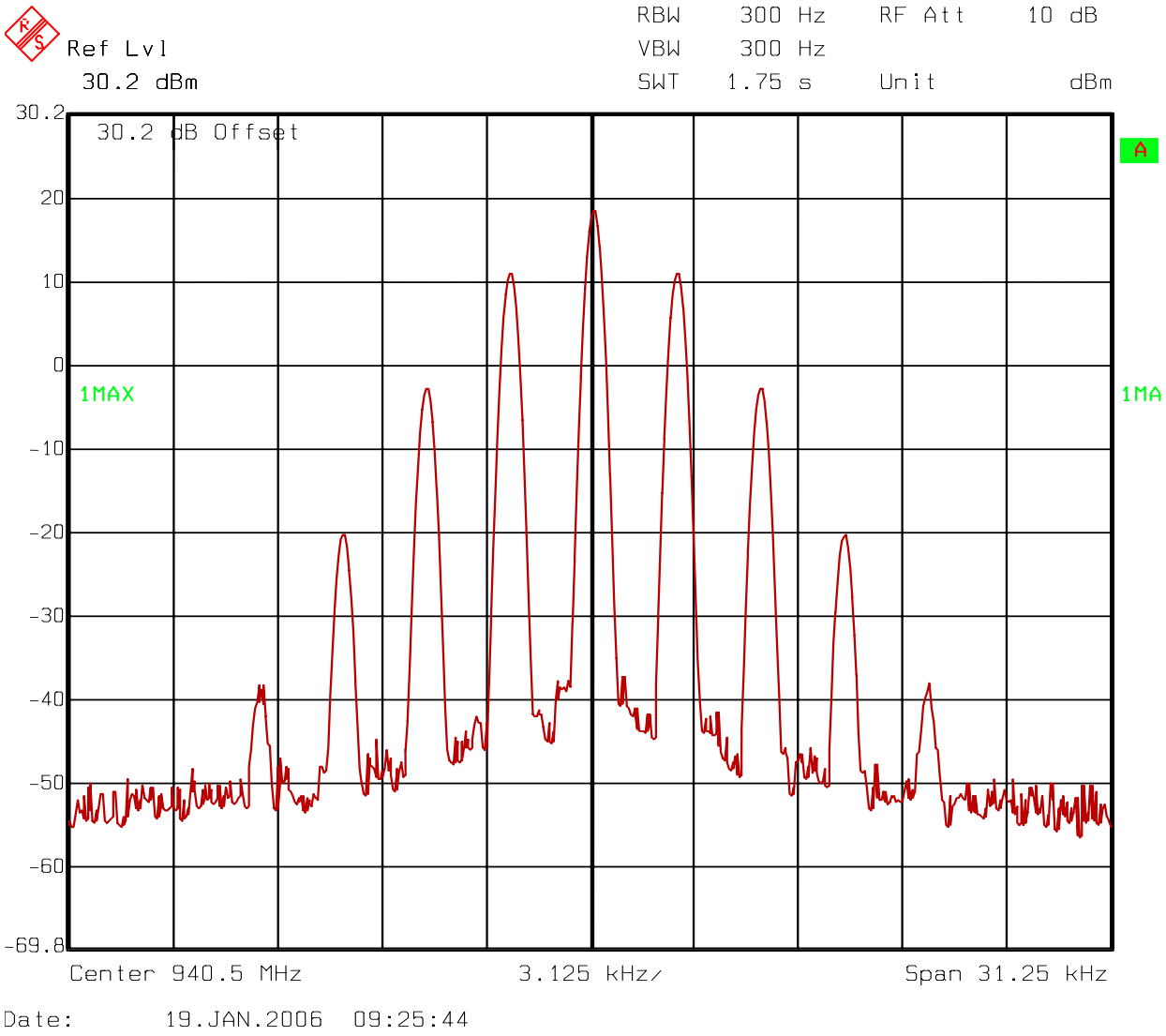
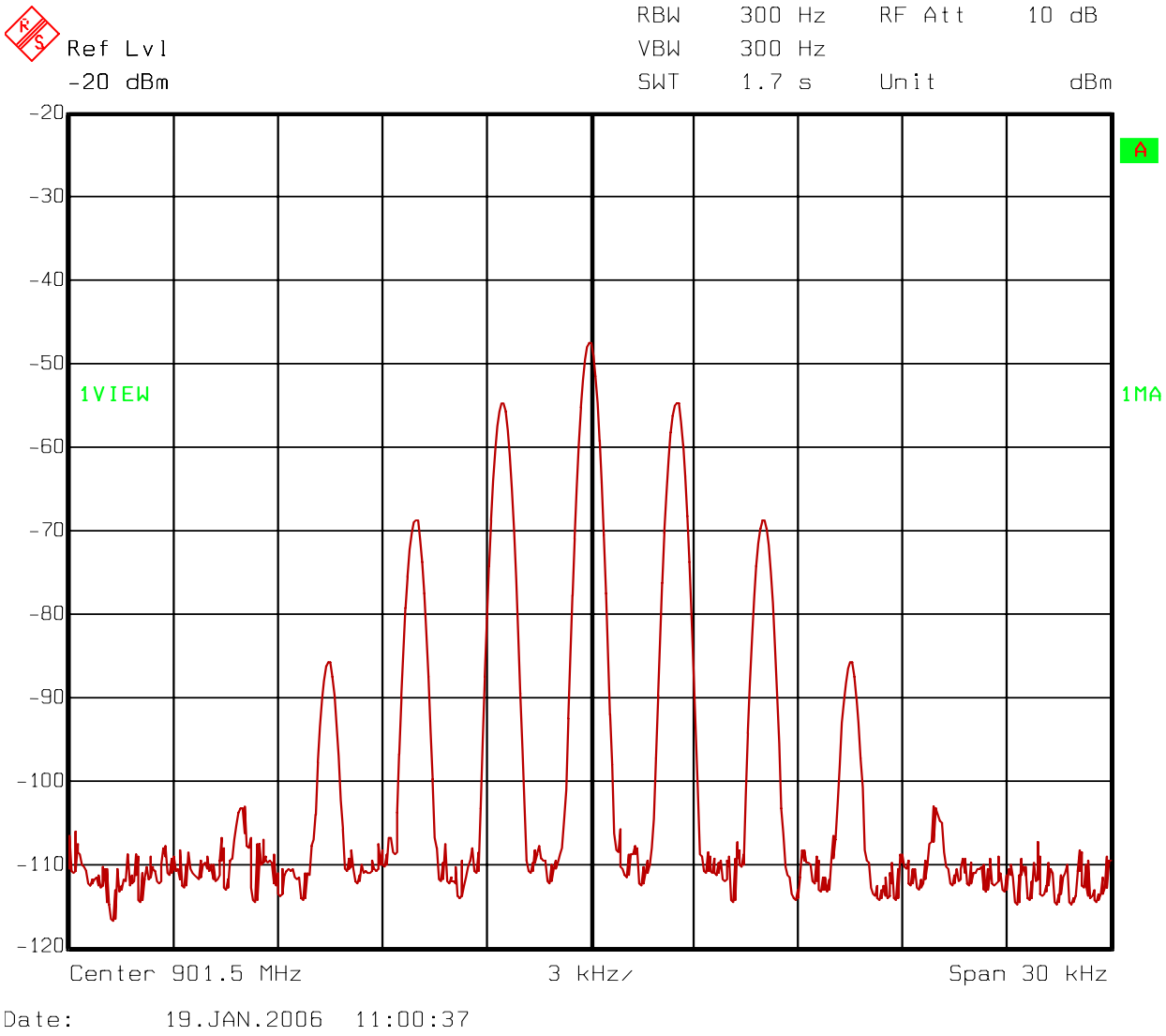
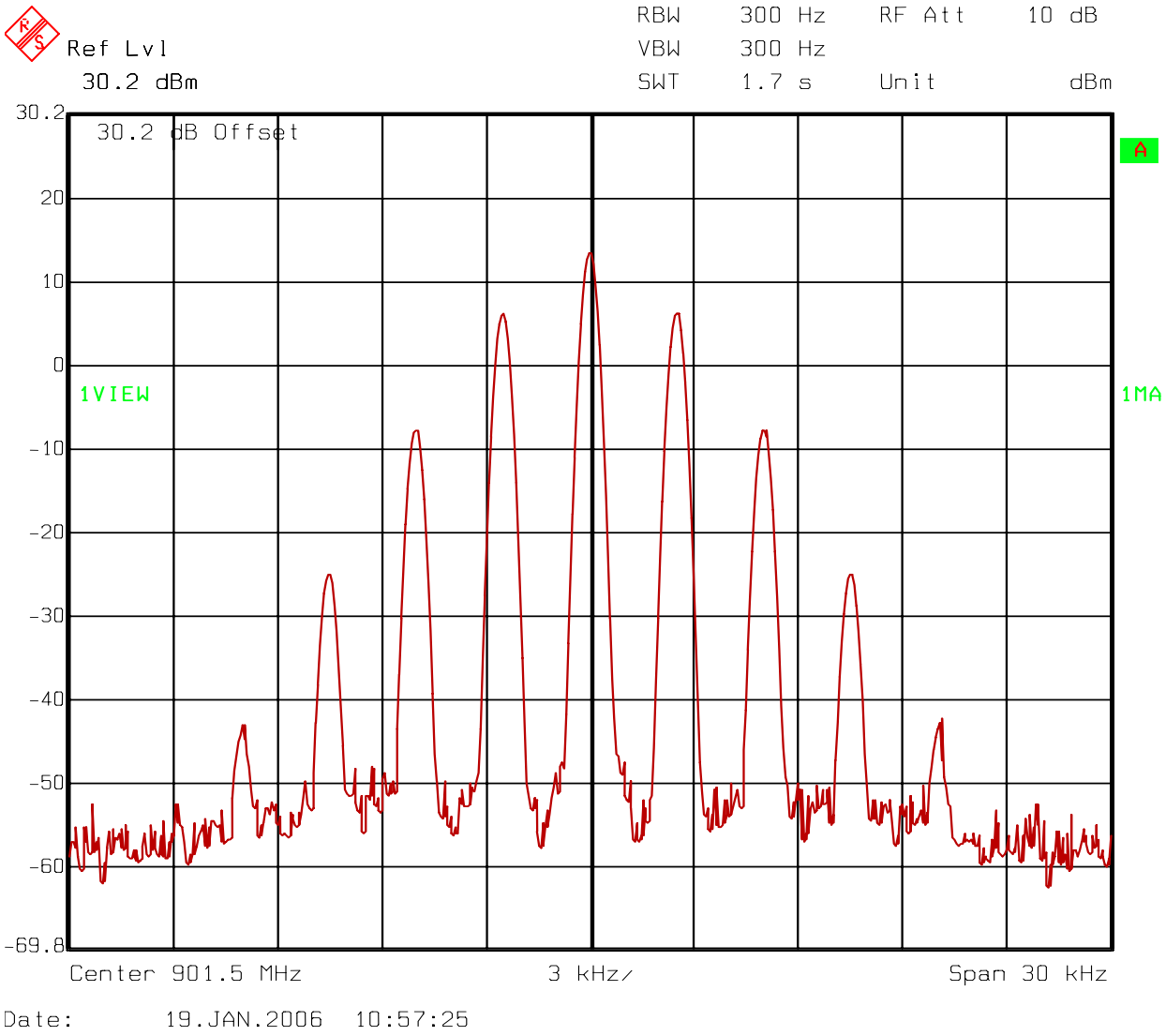


UPLINK MID CHANNEL OBW INPUT



UPLINK MID CHANNEL OBW OUTPUT



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 24.133
TESTED BY: Kevin Rose	DATE: 17-31 JANUARY 2006:

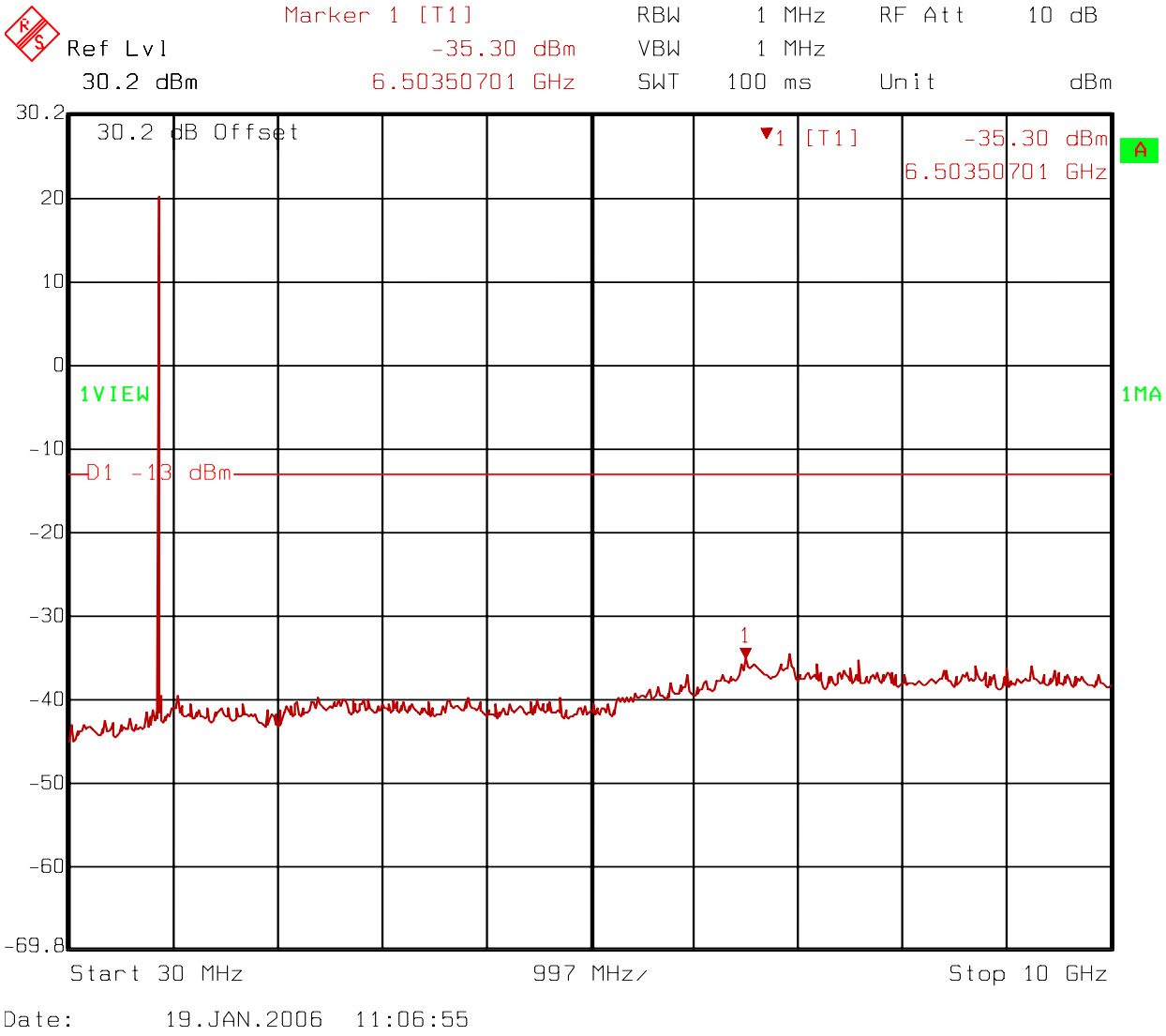
Test Results: Complies.

Test Data: See attached plots

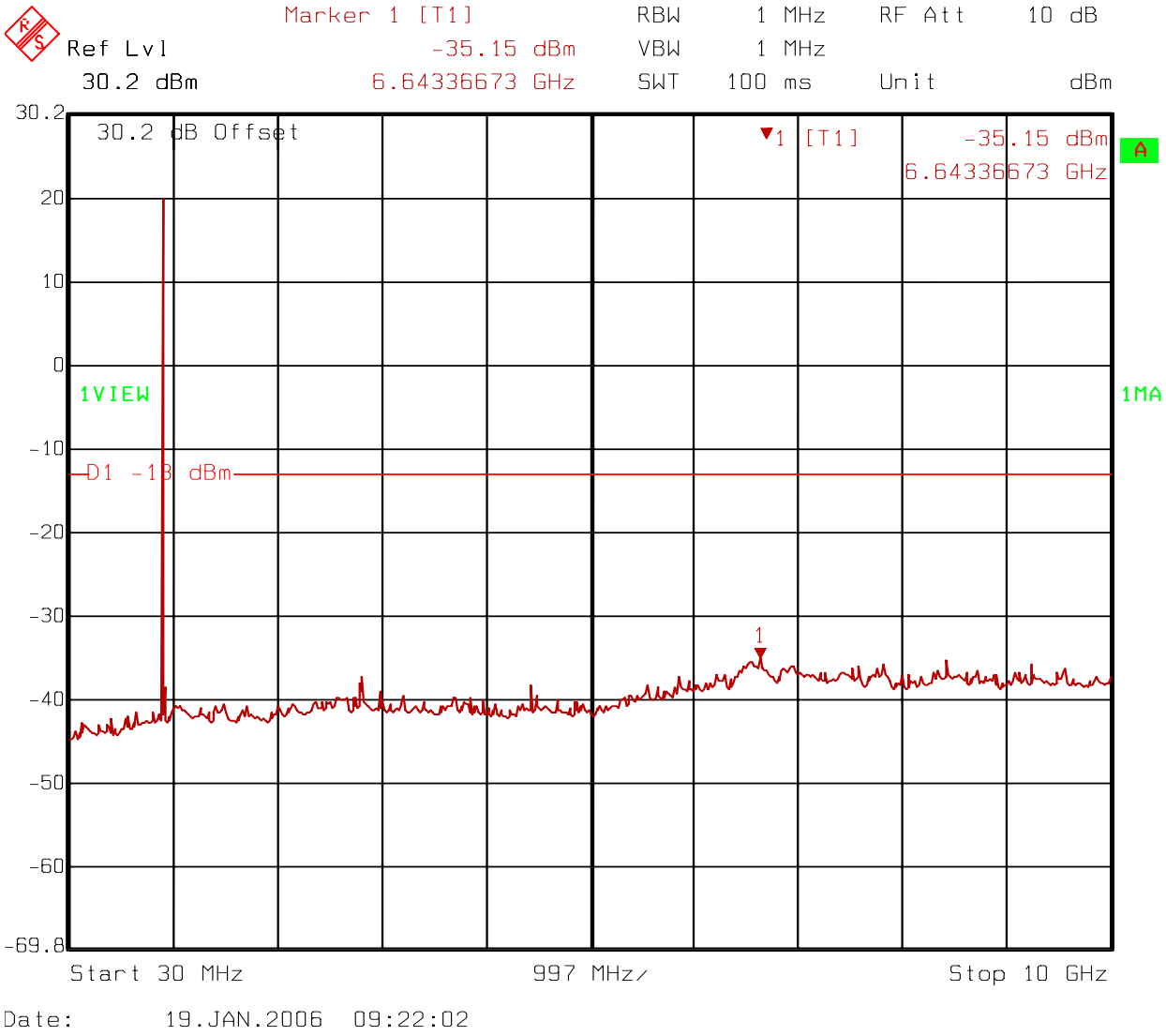
Measurement Uncertainty: +/- 1.7 dB

Test Equipment used: 1036-1470-1478-1629-1659

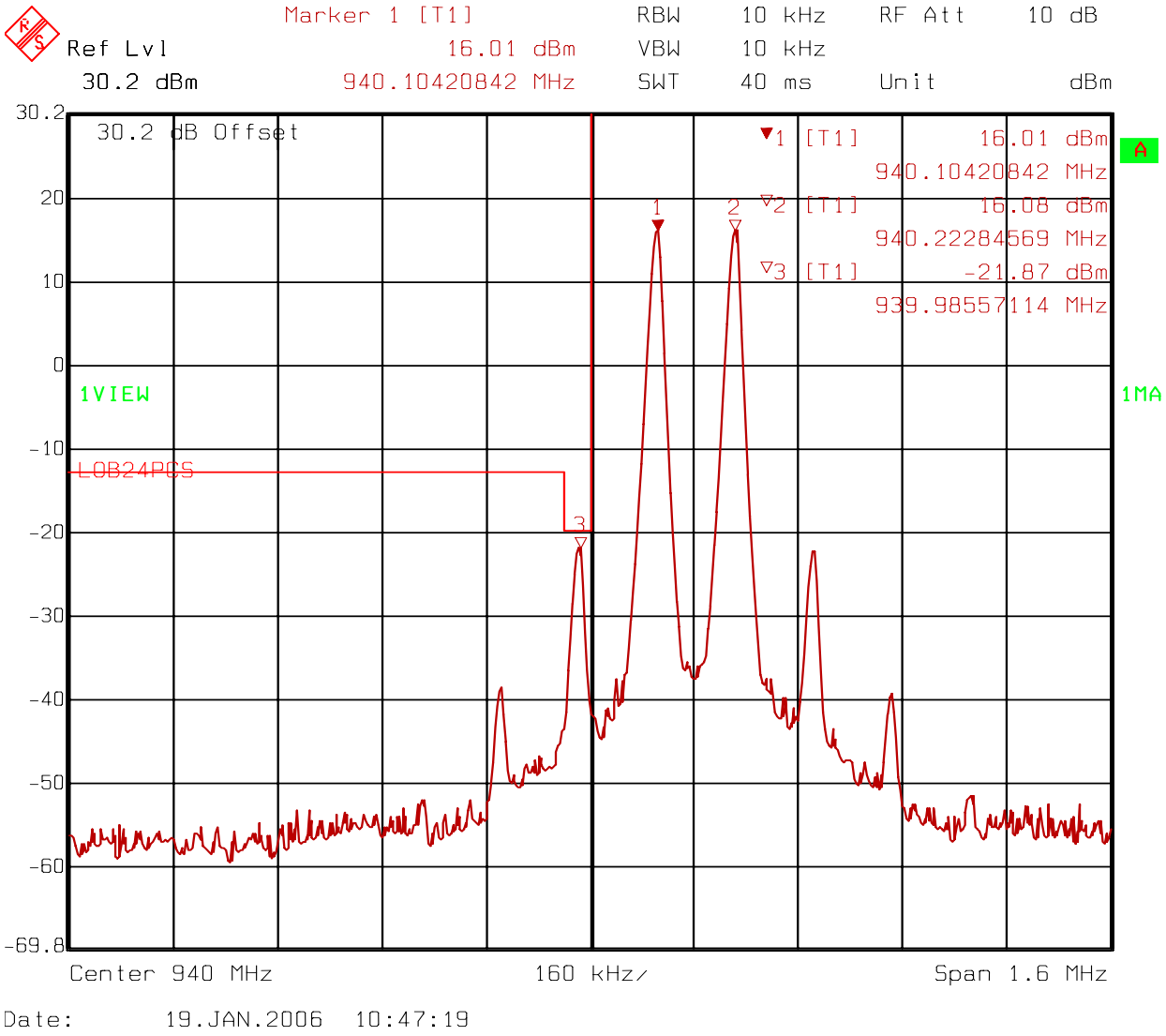
UPLINK MID CHANNEL SPUR



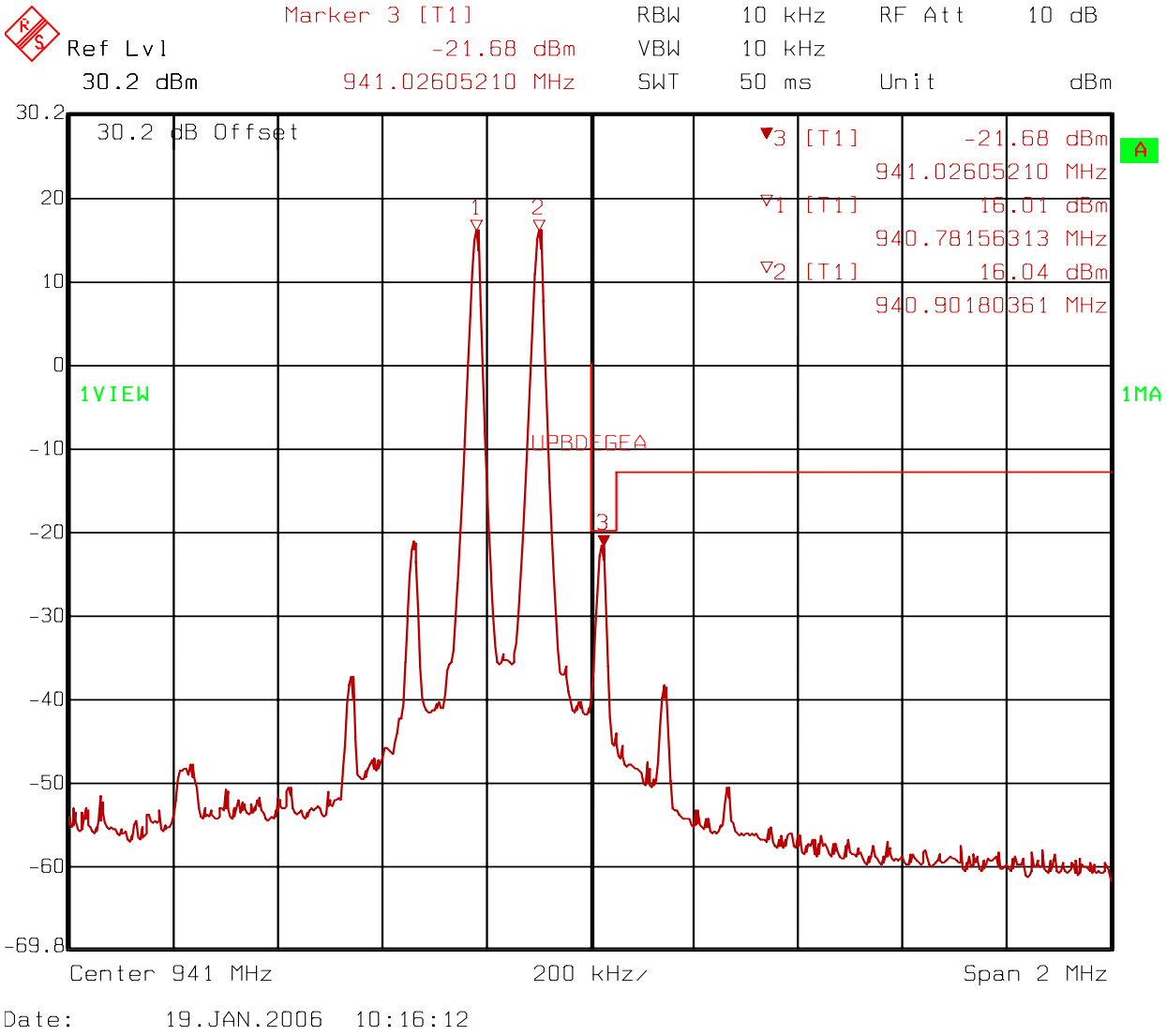
DOWNLINK MID CHANNEL SPUR



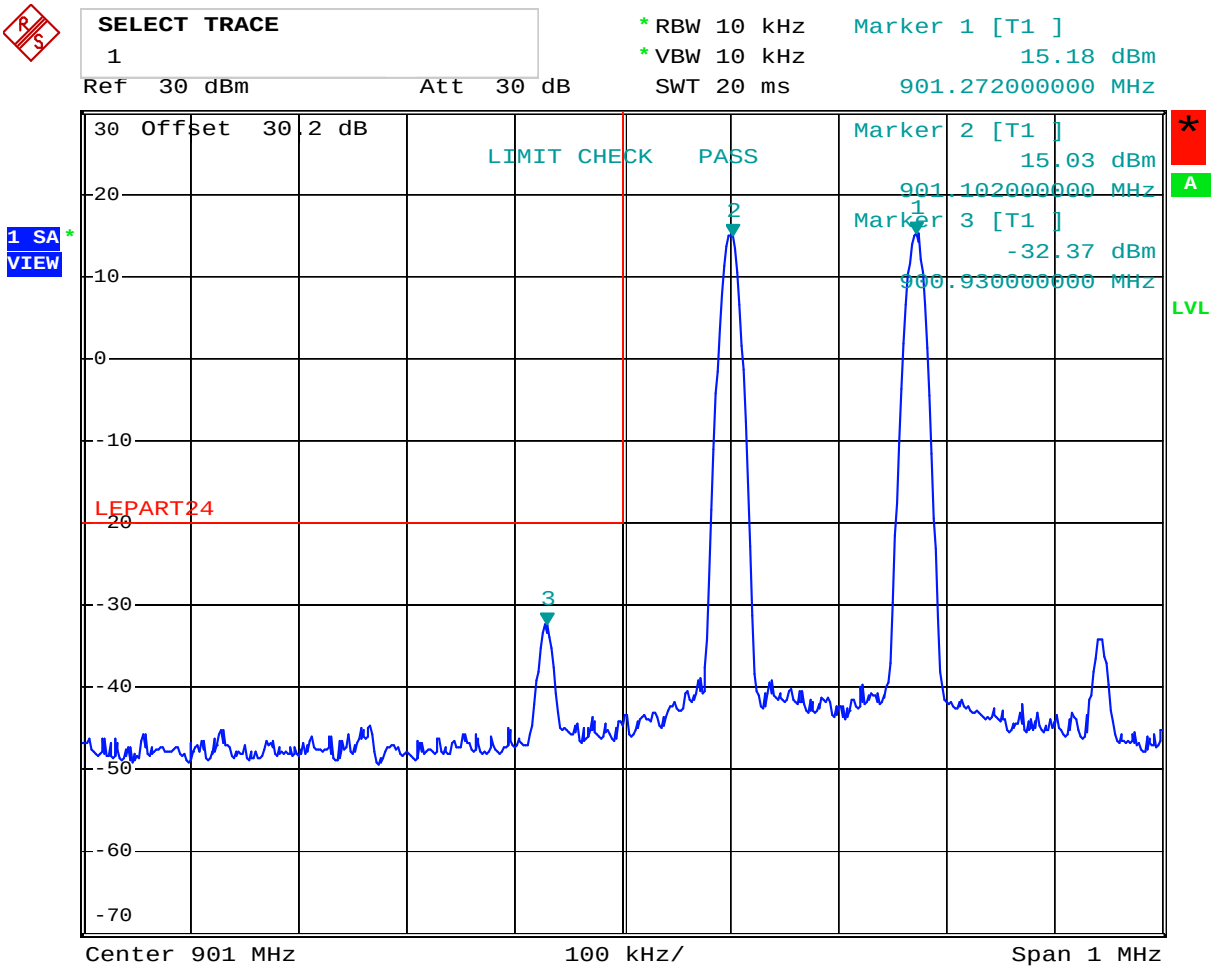
DOWNLINK -20 LIMIT LOWER EDGE INTERMOD



DOWNLINK -20 LIMIT UPPER EDGE INTERMOD

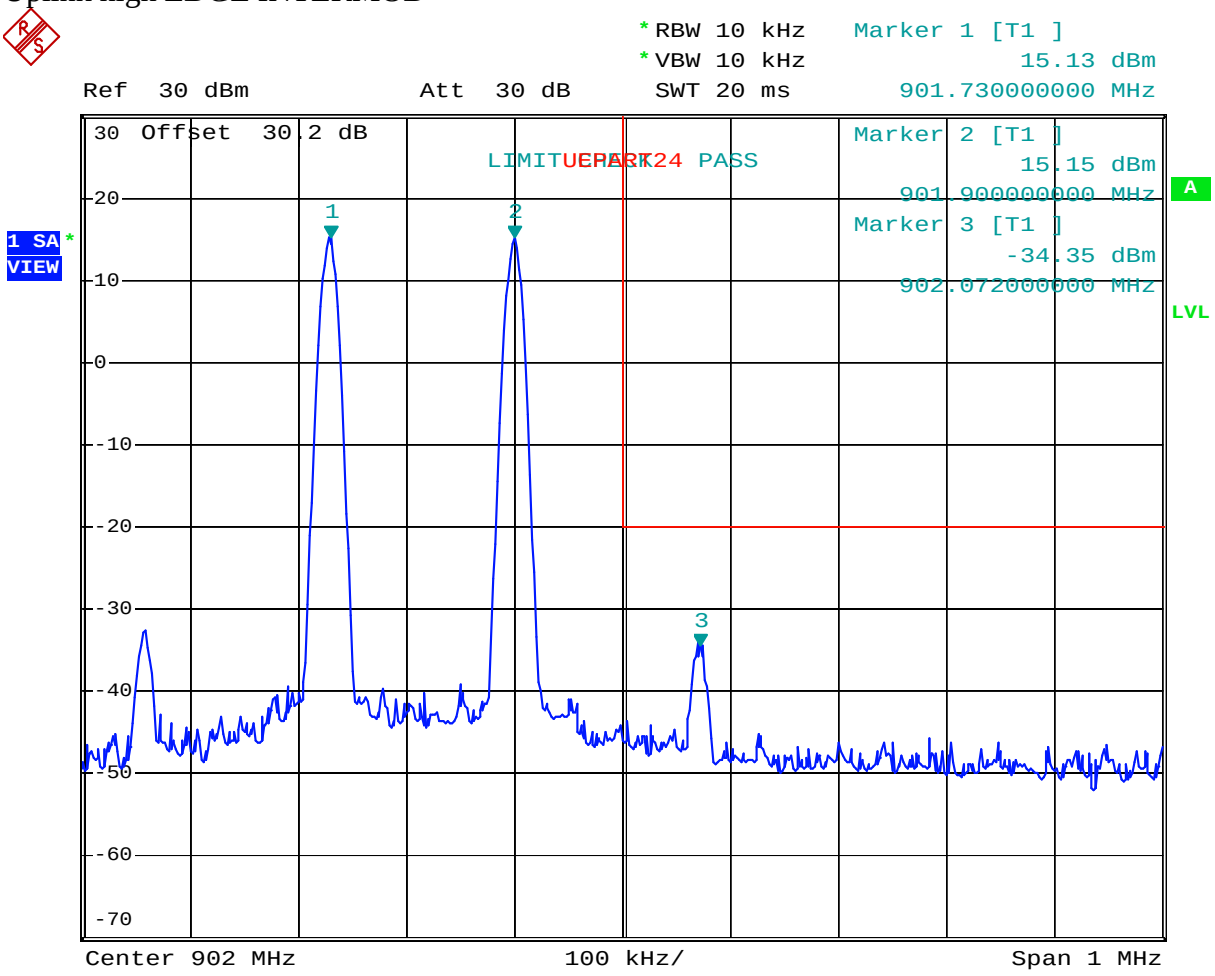


UL LOW EDGE INTERMOD



Date: 10.DEC.2005 11:28:12

Uplink high EDGE INTERMOD



Date: 10.DEC.2005 11:40:59

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 24.133
TESTED BY: Kevin Rose	DATE: 17-31 JANUARY 2006:

Test Results: Complies.

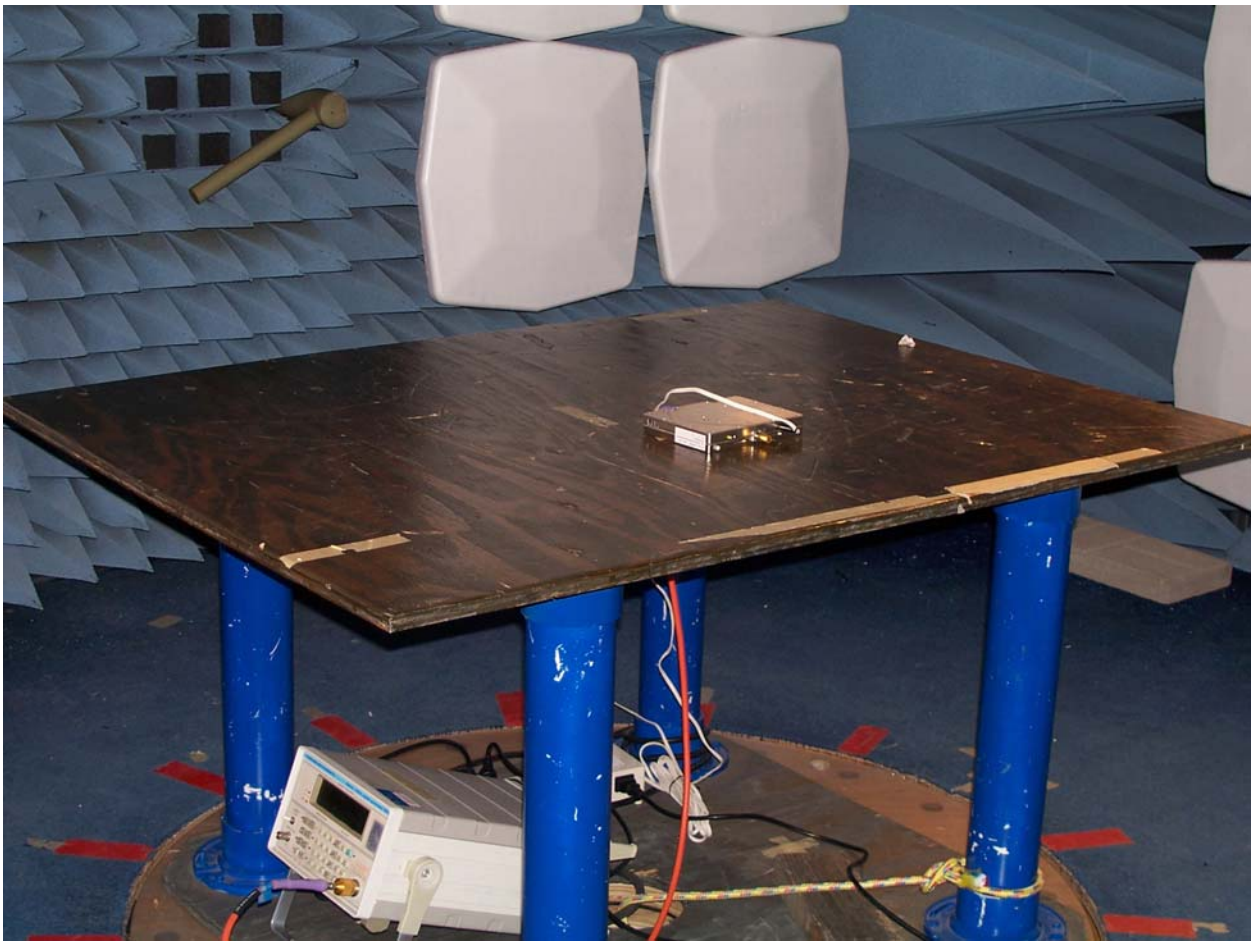
Test Data: See attached table.

Measurement Uncertainty: +/- 1.7 dB

Note: Spectrum was search from 30MHz to 10GHz no emissions were detected within 20db of the limit.

Test Equipment used: 1464-791-1484-1485-1481-760-759-993

Photographs of Test Setup
FRONT VIEW



Section 7. Test Equipment List

Nemko ID	Description	Manufacturer / Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ / FSEK30	830844/006	03/22/04	03/23/06
1464	Spectrum analyzer	Hewlett Packard / 8563E	3551A04428	01/15/07	01/15/07
1470	10 db Attenuator DC 18 Ghz	MCL Inc. / BW-S10W2 10db-2WDC	NONE	CBU	N/A
1478	20db Attenuator DC 18 Ghz	MCL Inc. / BW-S20W6	NONE	CBU	N/A
1629	CABLE, 6 ft	MEGAPHASE / 10311 1GVT4	N/A	CBU	N/A
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
1481	Microwave Highpass Filter	K & L / 3DH1-2000/T8000-0/0	4	Cal B4 Use	N/A
1464	Spectrum analyzer	Hewlett Packard / 8563E	3551A04428	01/14/05	01/15/07
1659	Spectrum Analyzer	Rhode & Schwarz / FSP	973353	01/09/06	01/09/07
1629	CABLE, 6 ft	MEGAPHASE / 10311 1GVT4	N/A	N/A	08/26/06
1471	10 db Attenuator DC 18 Ghz	MCL Inc. / BW-S10W2 10db-2WDC	NONE	CBU	N/A
993	Horn antenna	A.H. Systems / SAS-200/571	XXX	08/02/05	08/02/07
1484	Cable 2.0-18.0 Ghz	Storm / PR90-010-072	N/A	09/28/05	09/28/06
1485	Cable 2.0-18.0 Ghz	Storm / PR90-010-216	N/A	09/28/05	09/28/06

ANNEX A - TEST METHODOLOGIES

NAME OF TEST: RF Power Output	**PARA. NO.: 2.985**

Minimum Standard: Para. No.24.132.
(a) Stations transmitting in the 901-902 MHz band are limited to 7 watts e.r.p.

(b) Mobile stations transmitting in the 930-931 MHz and 940-941 MHz bands are limited to 7 watts e.r.p.

(c) Base stations transmitting in the 930-931 MHz and 940-941 MHz bands are limited to 3500 watts e.r.p. per authorized channel and are unlimited in antenna height except as provided in paragraph (d) of this section.

Method Of Measurement: CDMA Per ANSI/J-STD-008
TDMA Per ANSI/J-STD-010
PCS 1900 Per ANSI/J-STD-007

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter or a spectrum analyzer.

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.: 2.989**

Minimum Standard: Para. No. 24.133. 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:

(a) The power of any emission shall be attenuated below the transmitter power (P), as measured in accordance with §24.132(f), in accordance with the following schedule:

(1) For transmitters authorized a bandwidth greater than 10 kHz:

(i) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (fd in kHz) of up to and including 40 kHz: at least 116 Log10 ((fd + 10)/6.1) decibels or 50 plus 10 Log10 (P) decibels or 70 decibels, whichever is the lesser attenuation;

(ii) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 40 kHz: at least 43 + 10 Log10 (P) decibels or 80 decibels, whichever is the lesser attenuation.

(2) For transmitters authorized a bandwidth of 10 kHz:

(i) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (fd in kHz) of up to and including 20 kHz: at least 116 x Log10 ((fd + 5)/3.05) decibels or 50 + 10 x Log10 (P) decibels or 70 decibels, whichever is the lesser attenuation;

(ii) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 20 kHz: at least 43 + 10 Log10 (P) decibels or 80 decibels, whichever is the lesser attenuation.

(b) The measurements of emission power can be expressed in peak or average values provided they are expressed in the same parameters as the transmitter power.

(c) When an emission outside of the authorized bandwidth causes harmful Interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

(d) A minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used when showing compliance with paragraphs (a)(1)(i) & (ii) and (a)(2)(i) & (ii).

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.991

Minimum Standard: Para. No.24.133. 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:

30 Mhz to 1000 MHz:
RBW $\geq$ 100 kHz
VBW $\geq$ RBW
Sweeptime – Auto
Video Averaging – Off
Detector type - Peak

Greater than 1000 MHz
RBW $\geq$ 1 MHz
VBW $\geq$ RBW
Sweeptime – Auto
Video Averaging – Off
Detector type - Peak

NAME OF TEST: Field Strength of Spurious Radiation	**PARA. NO.: 2.993**

Minimum Standard: Para. No.24.133. 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.

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 = 1×10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

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

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 a dipole.

NAME OF TEST: Frequency Stability	**PARA. NO.: 2.995**

Minimum Standard: Para. No. 24.135. The frequency stability shall be ±1%

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

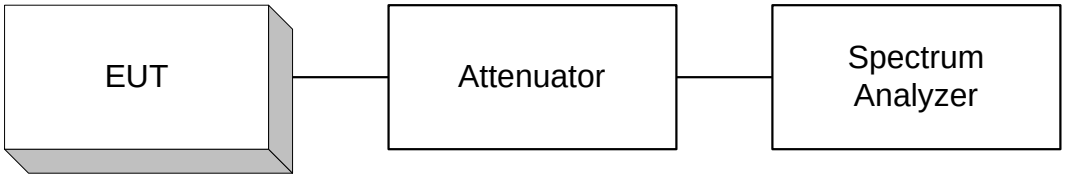
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

Digitally Modulated Signals

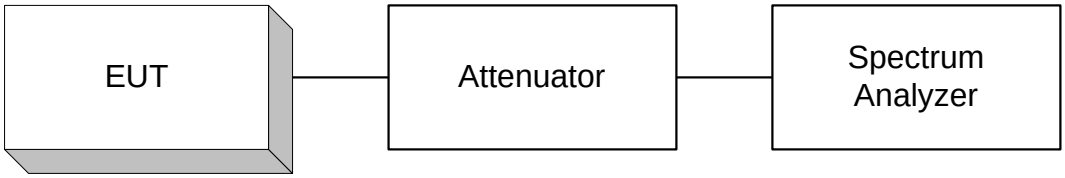
Equipment that produces a digitally modulated carrier is tested using a vector modulation analyzer. Frequency accuracy and rho are measured over the specified environmental extremes.

ANNEX B - TEST DIAGRAMS

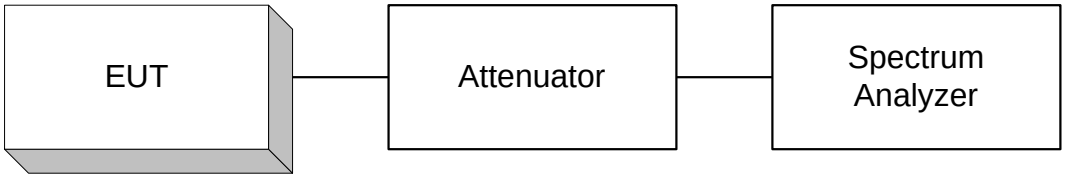
Para. No. 2.1046 - R.F. Power Output



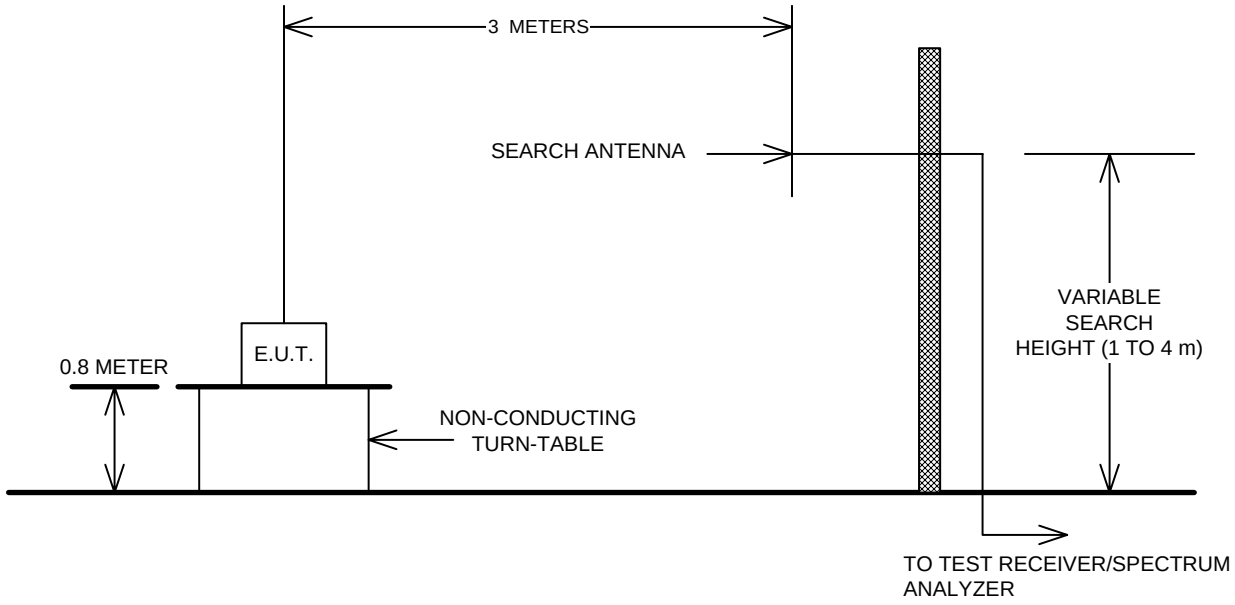
Para. No. 2.1049 - Occupied Bandwidth



Para. No. 2.1051 Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation



Para. No. 2.1055 - Frequency Stability