ENGINEERING TEST REPORT ON

2500E/2500U CPE MDS Response Station Transceiver

IN ACCORDANCE WITH:

FCC PART 21, SUBPART K
MULTIPOINT DISTRIBUTION SERVICE

PROJECT NO.: 2L0434RUS1

TESTED FOR:

Navini Networks
2240 Campbell Creek Blvd. Suite 110
Richardson, TX 75082

TESTED BY:

Nemko Dallas, Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

APPROVED BY:

Tom Tidwell, Frontline Manager

DATE: 12/9/2003

This document contains 38 pages.

Table of Contents

Section 1. Summary of Test Results

MODEL NO.: 2500E, 2500U

SERIAL NO.: None

GENERAL:

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 21, Subpart K.

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.	RESULT
Modulation Characteristics		Digitally Modulated Spread Spectrum	N/A
RF Power Output	2.985	33 dBW + 10log(X/6) dBW (21.904)	Complies
Occupied Bandwidth	2.989	Mask (21.101)	Complies
Spurious Emissions at Antenna Terminals	2.991	Mask (-60 dBc) 21.905	Complies
Field Strength of Spurious Radiation	2.993	Mask (-60 dBc) 21.905	Complies
Frequency Stability	2.995	Mask (21.101)	Complies
Powerline Conducted Emissions	15.207	48 dBuV	Complies

Footnotes:

GENERAL EQUIPMENT SPECIFICATION

Power Input: 115 Vac

Frequency Range: 2500 to 2596 MHz

Type of Modulation: Digital

Emission Designator: 2M00F9W

Output Impedance: 50 ohms

RF Power Output (rated): 25 dBm all antennas
28 dBm all antennas when 1 MHz additional guard band is present

Duty Cycle: 50% TDD

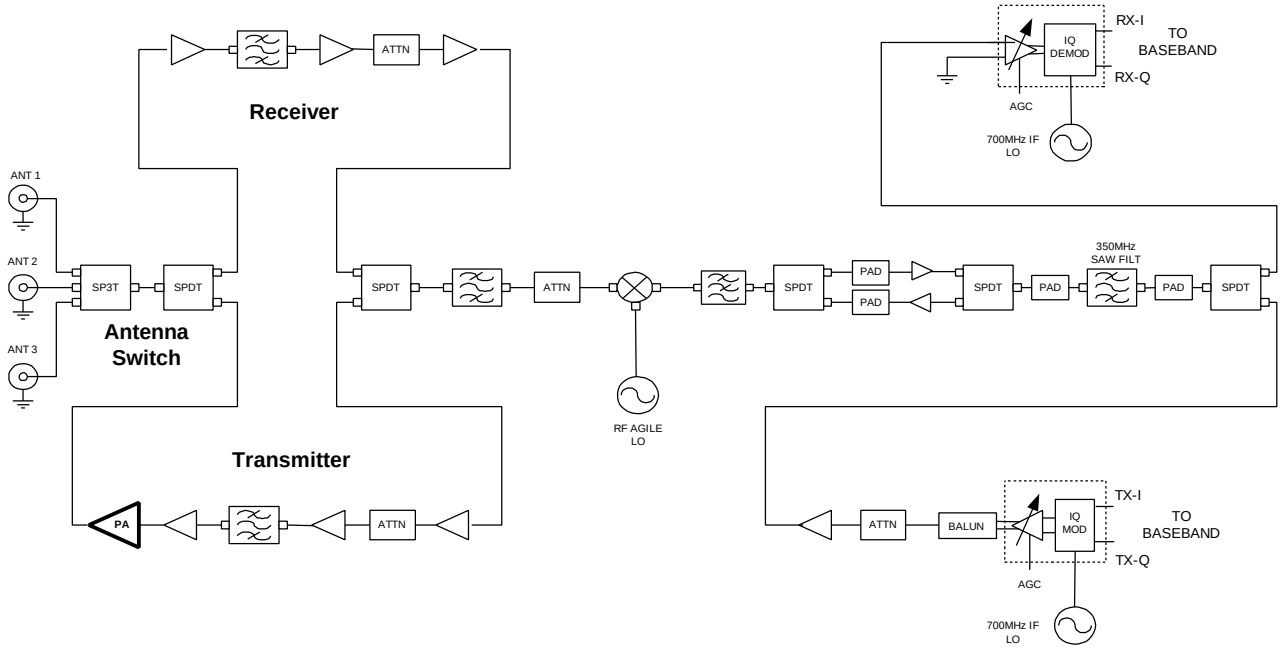
Selection of Operating Frequency: Not selectable by operator

Power Output Adjustment Capability: Not selectable by operator

Description of Operation

The EUT is a CPE (Customer Premise Equipment) transceiver operating in the MMDS band. The transceiver serves as a wireless link between a BTS and a customer site. The EUT uses a multi-antenna system for improved coverage and diversity. **Only one antenna transmits at any time.** The transmitter is digitally modulated and produces a spread spectrum waveform.

System Diagram



Section 2. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 2/20/02

TEST RESULTS: Complies

MEASUREMENT DATA: .

Antenna Port	Measured Output Power (dBm)	Measured Output Power (W)
Broadbeam	25	0.316
Patch	25	0.316

Power was varied +/- 15% with no change in power output.
Temperature: 20 deg Celsius, RH: 50%

Test equipment used:	1036-1629-1477

Section 3. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 9/13/2002

TEST RESULTS: Complies

MEASUREMENT DATA: See attached data sheets

Test Data

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

~~Data Plot~~ **~~Occupied Bandwidth~~**

Page ~~1~~ of ~~1~~

Complete X
Preliminary: ____

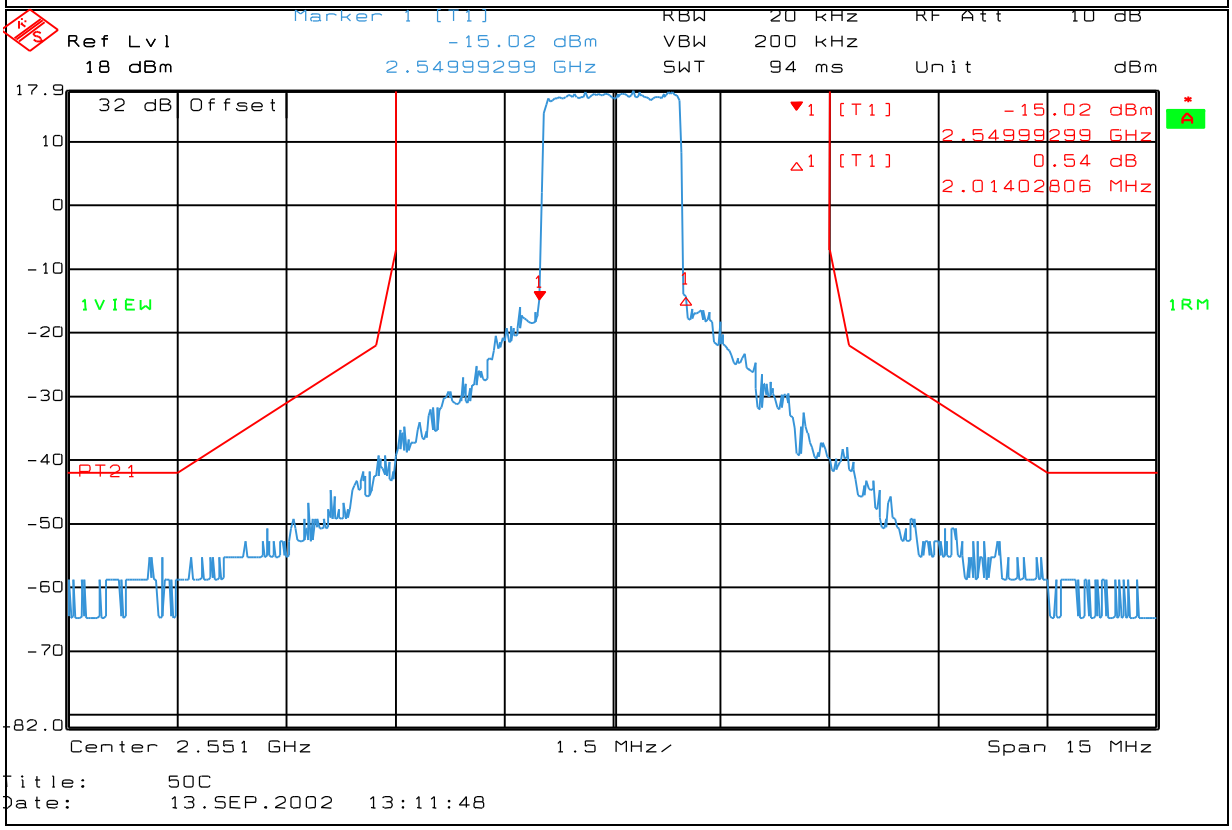
Job No.: 2L0434R
Specification: PT 21
Tested By: David Light
E.U.T.: MMDS CPE
Configuration: Tx full power
Sample Number: 1
Location: Lab 1
Detector Type: Rms

Date: 9/13/2002
Temperature(°C): 24
Relative Humidity(%) 40
RBW: 20 kHz
VBW: 200 kHz
Measurement Distance: NA m

~~Test Equipment Used~~

Antenna: ____
Pre-Amp: ____
Filter: ____
Receiver: 1036
Attenuator #1 ____
Attenuator #2: ____
Additional equipment used: ____
Measurement Uncertainty: +/-1.7 dB

Directional Coupler: ____
Cable #1: ____
Cable #2: ____
Cable #3: ____
Cable #4: ____
Mixer: ____



Section 4. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 9/13/2002

TEST RESULTS: Complies

MEASUREMENT DATA: See attached data sheets.

Test Data

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

~~Data Plot~~ **~~Spurious Emissions at Antenna Terminals~~**

Page ~~1~~ of ~~2~~ Complete X

Job No.: 2L0436R Date: 9/13/2002 Preliminary: _____

Specification: PT 21 Temperature(°C): 24

Tested By: David Light Relative Humidity(%) 40

E.U.T.: MMDS CPE

Configuration: Tx full power

Sample Number: 1

Location: Lab 1 RBW: 1 MHz Measurement

Detector Type: Peak VBW: 1 MHz Distance: NA m

~~Test Equipment Used~~

Antenna: _____ Directional Coupler: _____

Pre-Amp: _____ Cable #1: _____

Filter: _____ Cable #2: _____

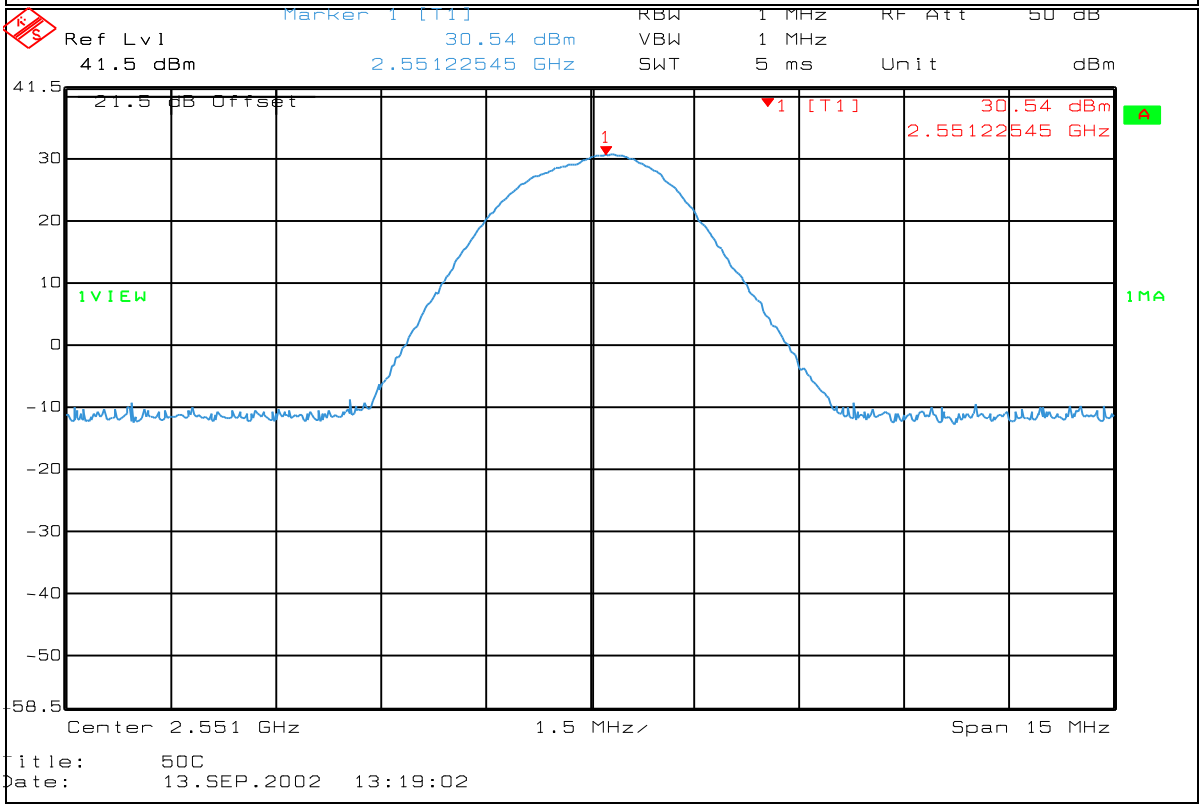
Receiver: 1036 Cable #3: _____

Attenuator #1 _____ Cable #4: _____

Attenuator #2: Mixer: _____

Additional equipment used: _____

Measurement Uncertainty: +/-1.7 dB



Test Data

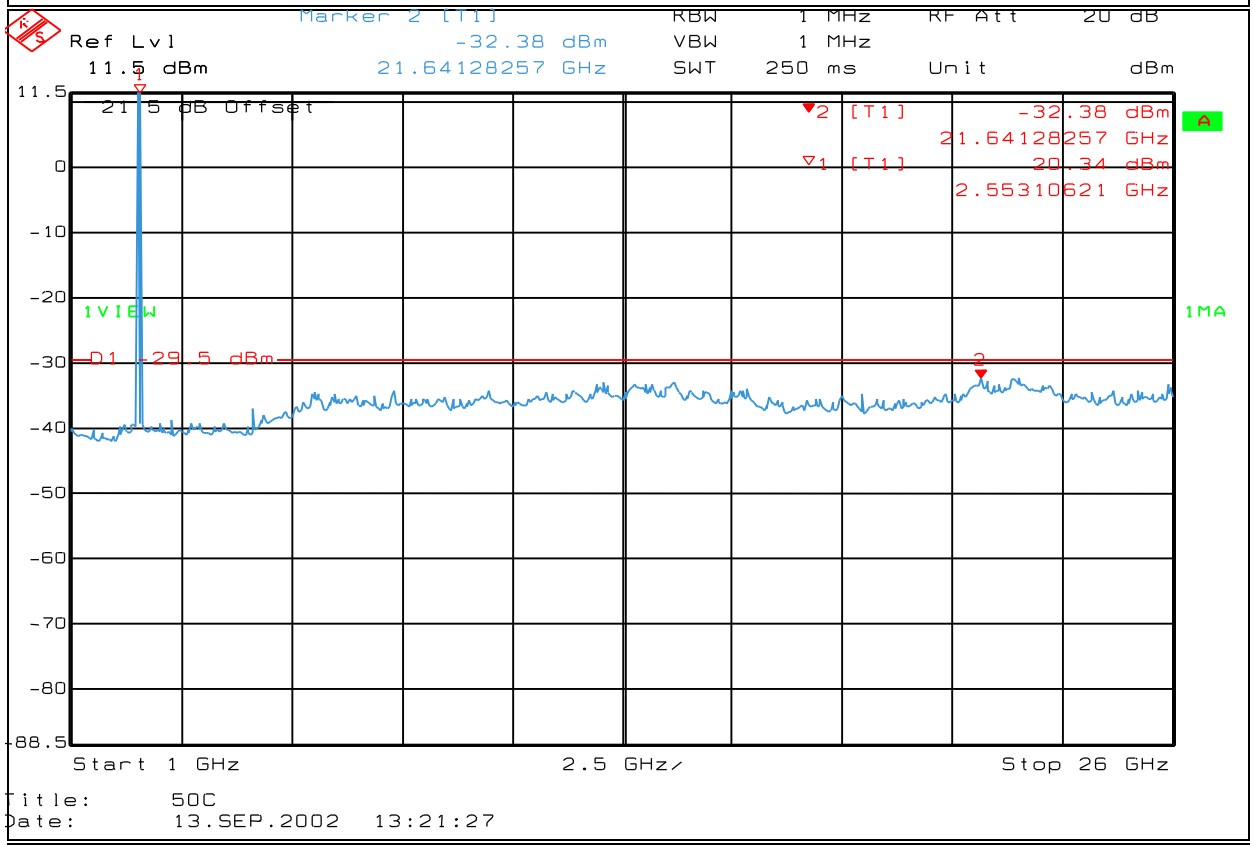
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

~~Data Plot~~ **~~Spurious Emissions at Antenna Terminals~~**

Page ~~2~~ of 2

Job No.: 2L0436R Date: 9/13/2002
Specification: PT 21 Temperature(°C): 24
Tested By: David Light Relative Humidity(%) 40
E.U.T.: MMDS CPE
Configuration: Tx full power



Notes: **Display line = -60 dBc limit (See previous plot)**
Marker 1 indicates carrier - Marker 2 indicates highest emission
Measured to the 10th harmonic of carrier

Section 5. Field Strength of Spurious Radiation

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.993
TESTED BY: David Light	DATE:

TEST RESULTS: Complies

MEASUREMENT DATA: See attached data sheets.

NOTE: This testing was performed using the substitution antenna method as prescribed in EIA/TIA 603-1992, Section 2.2.12. The correction factor on the following tables is the correction factor that results from a calibration of the test site for a given frequency.

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.

Test Data – Field Strength of Spurious Radiation

Dallas Headquarters:
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Lewisville, TX 75057
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Fax: (972) 436-2667

Nemko Dallas, Inc.

ERP Substitution Method

Page 1 of 1 — Complete X — Preliminary

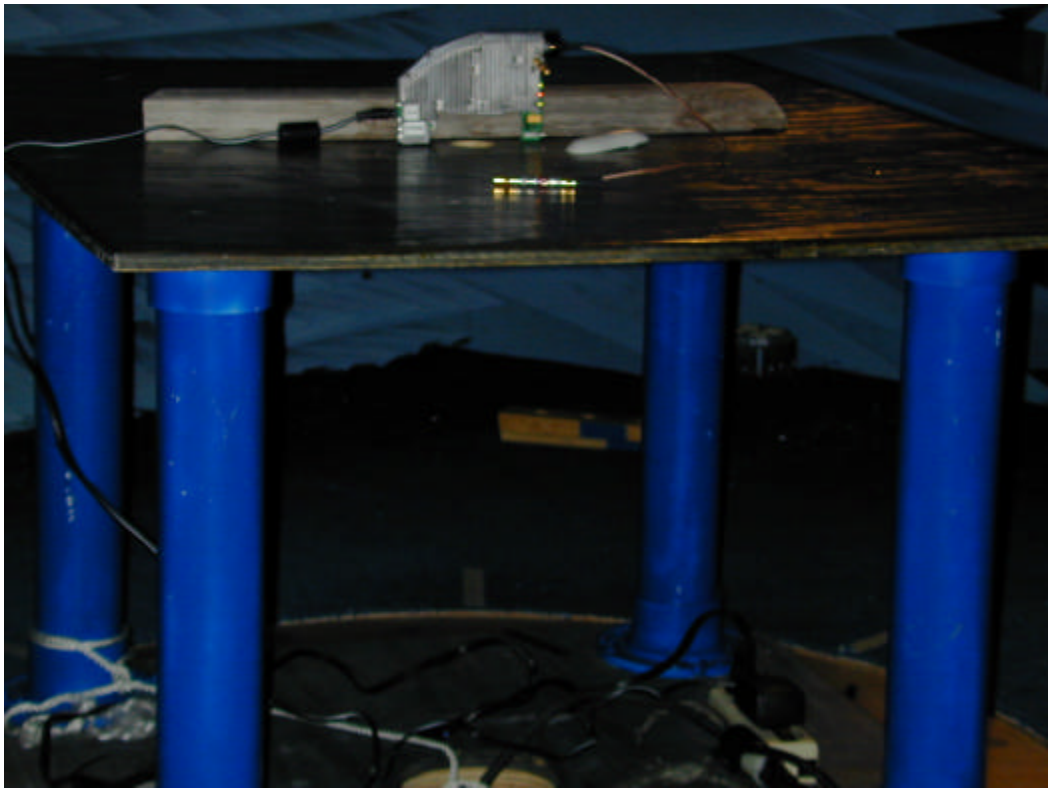
Job No.: 2L0436R — Date: 9/13/2002
Specification: PT 21 — Temperature(°C): 24
Tested By: David Light — Relative Humidity(%) 40
E.U.T.: MMDS CPE
Configuration: TX FULL POWER AT 2.551 GHz
Sample No: 1
Location: AC 1 — RBW: 1 MHz — Measurement Distance: 3 m
Detector Type: Peak — VBW: 1 MHz

Test Equipment Used

Antenna: 1304 — Directional Coupler:
Pre-Amp: 1016 — Cable #1: 1484
Filter: 1482 — Cable #2: 1485
Receiver: 1036 — Cable #3:
Attenuator #1 — Cable #4:
Attenuator #2: — Mixer:
Additional equipment used:
Measurement Uncertainty: +/-3.6 dB

Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)	Limit (dBm)	EIRP (dBm)	EIRP (mW)	Polarity	Comments
2551	-12.0	35.5		0	10.1		33.6	2285.60	V	Carrier measured for
										reference only.
5102	-64.0	41.3		32.7	10.3	-28.5	-45.1	0.0000	V	
7653	-65.3	41.8		32.5	11.3	-28.5	-44.7	0.0000	V	
10204	-62.6	42.0		35.2	12.2	-28.5	-43.6	0.0000	V	
12755	-64.0	44.8		34.2	11.9	-28.5	-41.5	0.0001	V	
5102	-62.3	38.3		32.7	10.3	-28.5	-46.4	0.0000	H	
7653	-65.0	41.5		32.5	11.3	-28.5	-44.7	0.0000	H	
10204	-56.0	44.5		35.2	12.2	-28.5	-34.5	0.0004	H	
12755	-64.0	47.8		34.2	11.9	-28.5	-38.5	0.0001	H	

Notes: **Scanned to the 10th harmonic**



Section 6. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.995
TESTED BY: David Light	DATE: 9/13/2002

TEST RESULTS: Complies.

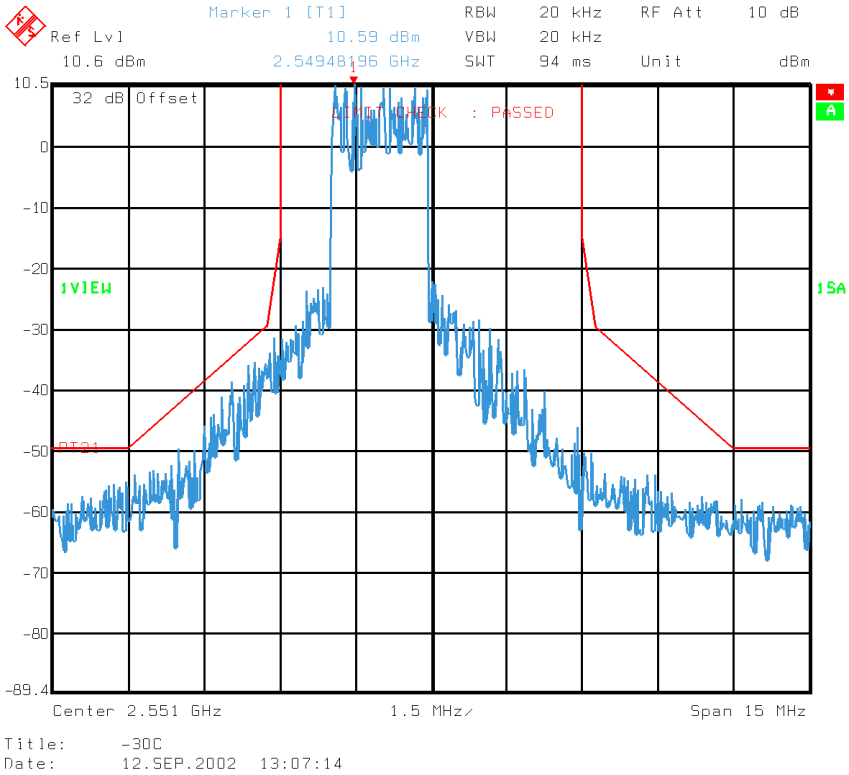
MEASUREMENT DATA: See attached data sheets..

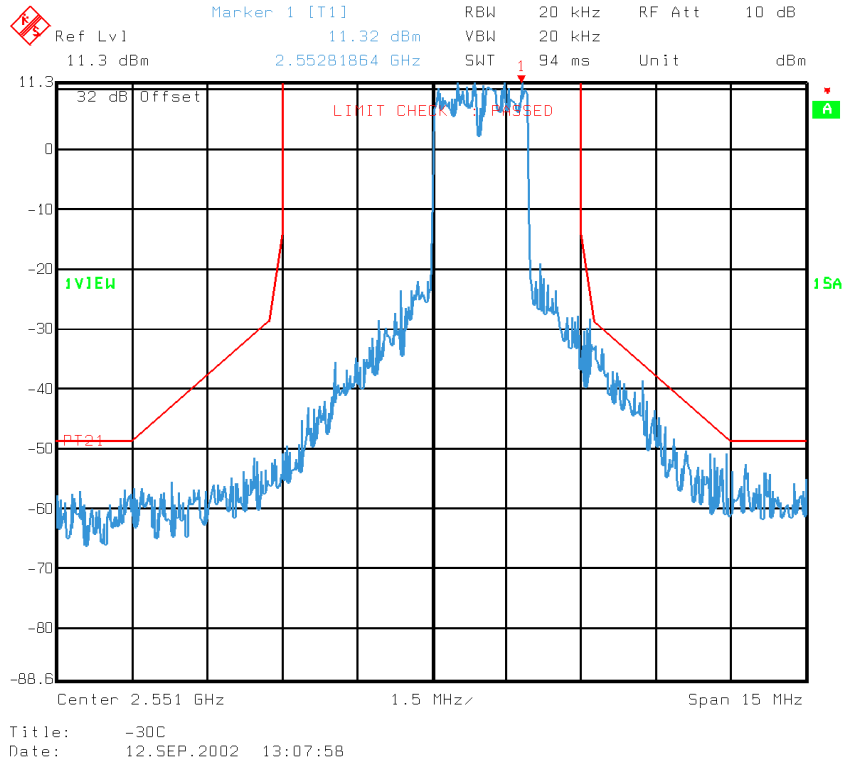
Test equipment used:	1036-1629-1477-278

NOTE: The EUT is an MDS Response Station and is subject to 21.101(a), note 2 below.

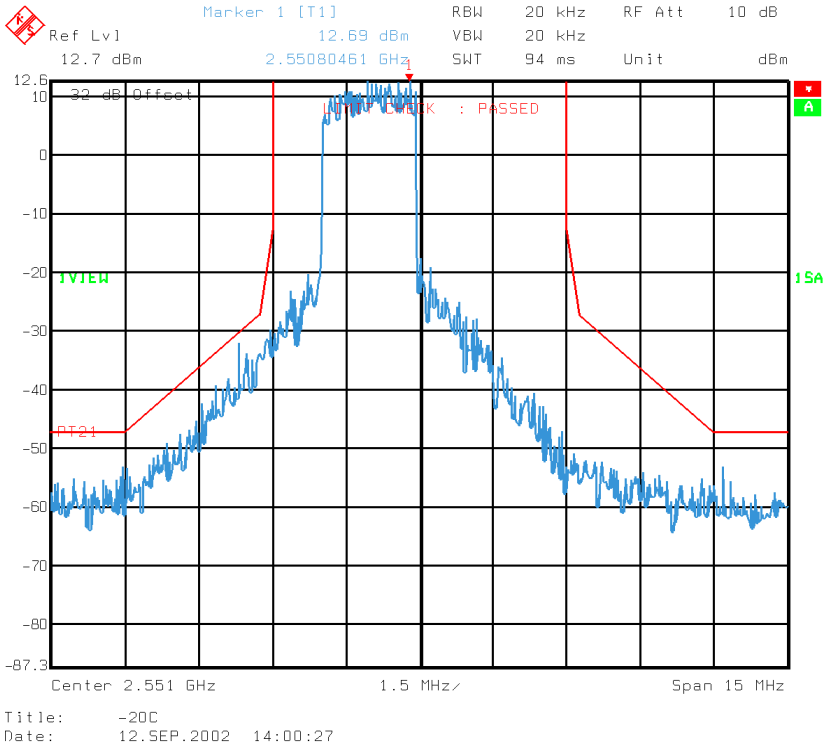
Note 2: Beginning January 21, 2000, the equipment authorized to be used at all MDS main stations, and at all MDS booster stations authorized pursuant to §21.913(b) of this part, shall maintain a frequency tolerance of 0.001**%. MDS booster stations authorized pursuant to §21.913(e) of this part and MDS response stations authorized pursuant to §21.909 of this part shall employ transmitters with sufficient frequency stability to ensure that the emission is, at all times, within the required emission mask.**

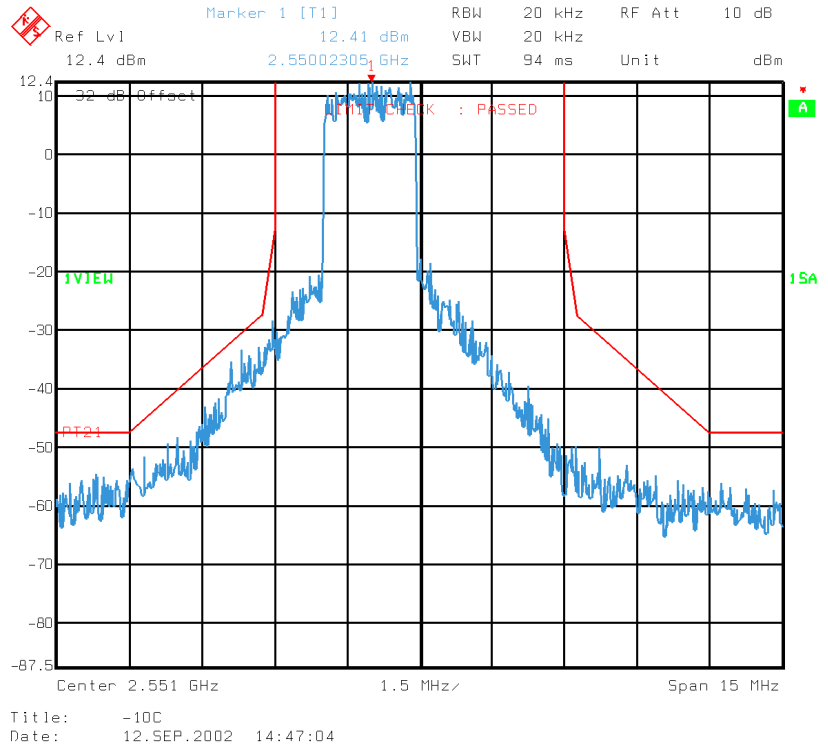
Test Data


Marker 1 [T1]
Ref Lvl
10.6 dBm
10.59 dBm
2.54948196 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
32 dB Offset
LIMIT CHECK : PASSED
1VIEW
1SA
PT21
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.4
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: -30C
Date: 12.SEP.2002 13:07:14

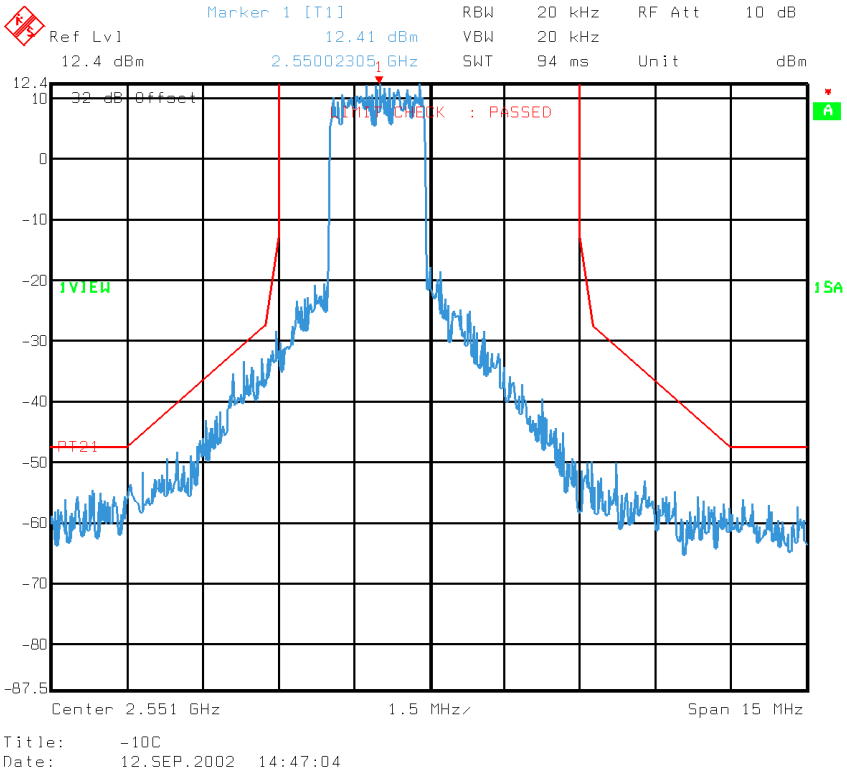

Marker 1 [T1]
Ref Lvl
11.3 dBm
11.32 dBm
2.55281864 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
32 dB Offset
LIMIT CHECK : PASSED
1VIEW
1SA
PT21
11.3
0
-10
-20
-30
-40
-50
-60
-70
-80
-88.6
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: -30C
Date: 12.SEP.2002 13:07:58

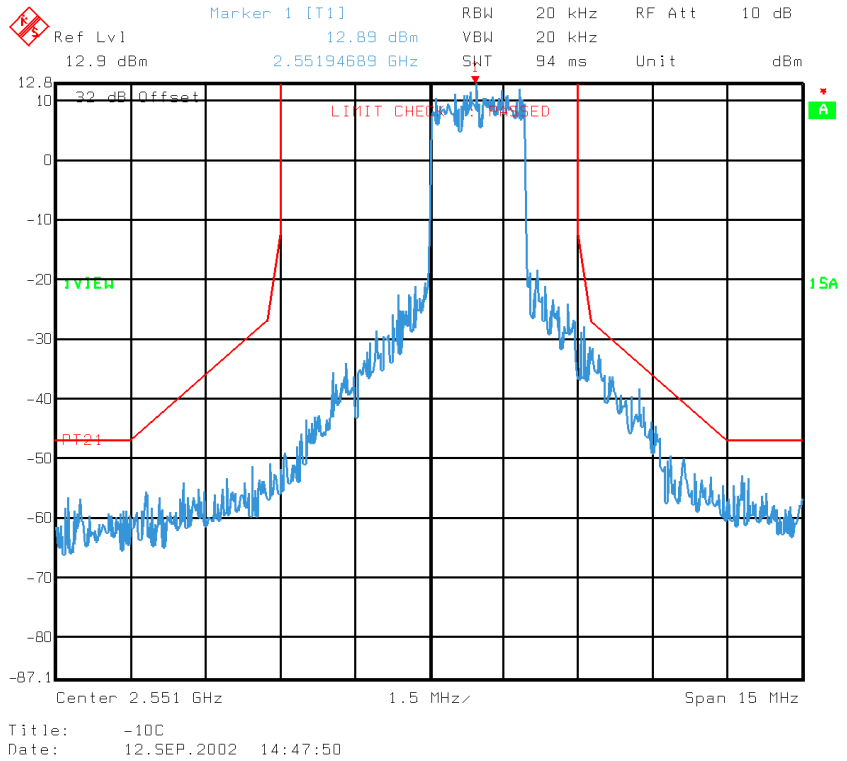
Test Data


Marker 1 [T1]
Ref Lvl
12.7 dBm
12.69 dBm
2.55080461 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
12.6
10
32 dB Offset
LIMIT CHECK : PASSED
0
-10
-20
1VIEW
1SA
-30
-40
PT21
-50
-60
-70
-80
-87.3
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: -20C
Date: 12.SEP.2002 14:00:27

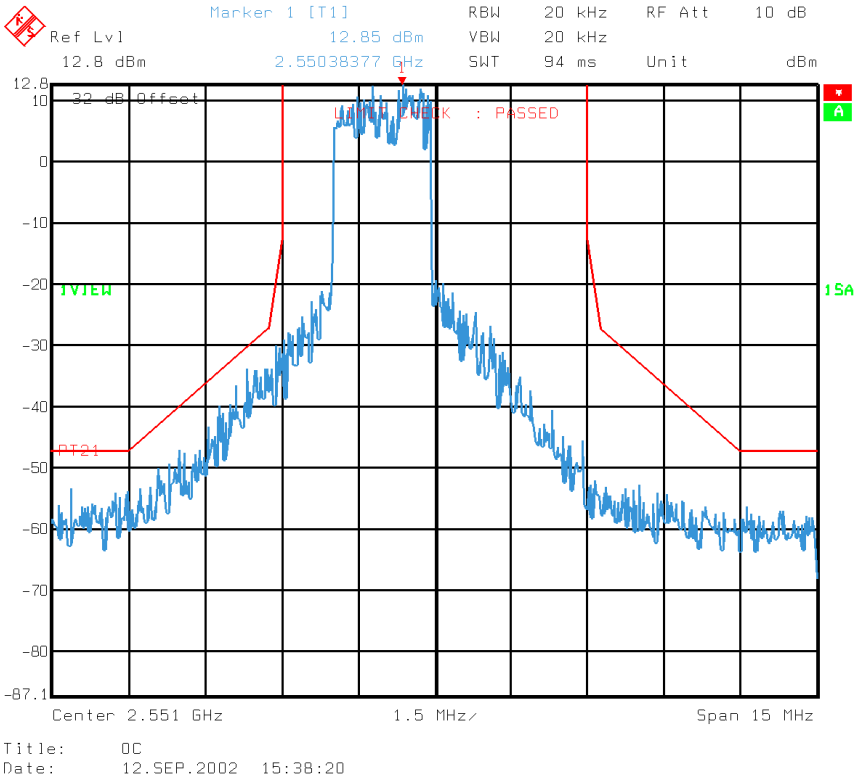

Marker 1 [T1]
Ref Lvl
12.4 dBm
12.41 dBm
2.55002305 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
12.4
10
32 dB Offset
LIMIT CHECK : PASSED
0
-10
-20
1VIEW
1SA
-30
-40
PT21
-50
-60
-70
-80
-87.5
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: -10C
Date: 12.SEP.2002 14:47:04

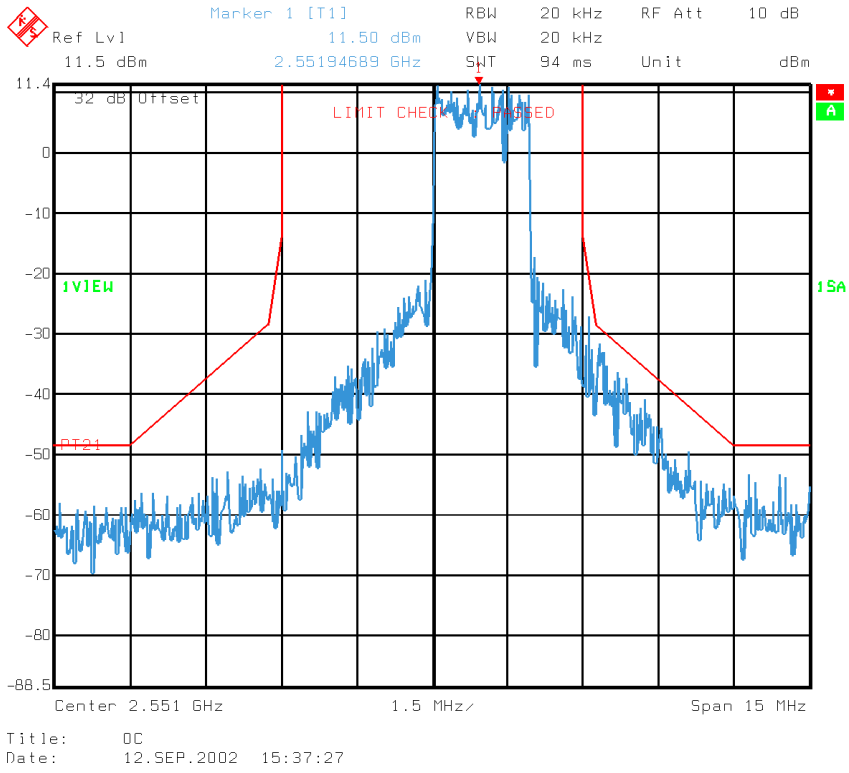
Test Data


Marker 1 [T1]
Ref Lvl
12.4 dBm
12.41 dBm
2.55002305 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
32 dB Offset
LIMIT CHECK : PASSED
1VIEW
1SA
PT21
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: -10C
Date: 12.SEP.2002 14:47:04

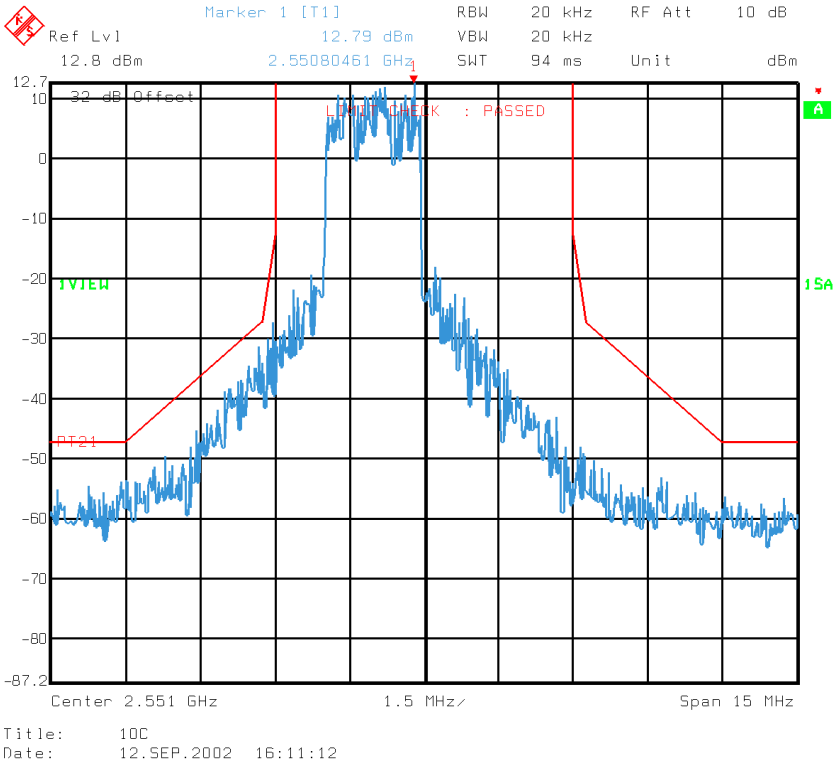

Marker 1 [T1]
Ref Lvl
12.9 dBm
12.89 dBm
2.55194689 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
32 dB Offset
LIMIT CHECK : PASSED
1VIEW
1SA
PT21
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: -10C
Date: 12.SEP.2002 14:47:50

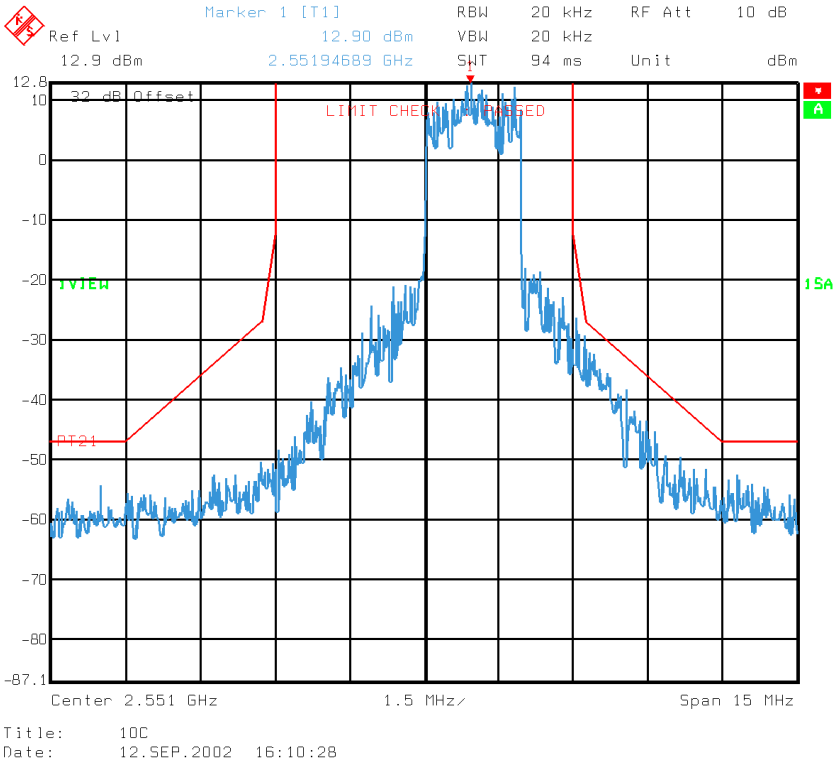
Test Data


Marker 1 [T1]
RBW 20 kHz
RF Att 10 dB
Ref Lvl
12.85 dBm
VBW 20 kHz
12.8 dBm
2.55038377 GHz
SWT 94 ms
Unit dBm
12.8
10
32 dB Offset
LIMIT CHECK : PASSED
0
-10
-20
1VIEW
1SA
-30
-40
PT24
-50
-60
-70
-80
-87.1
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: OC
Date: 12.SEP.2002 15:38:20

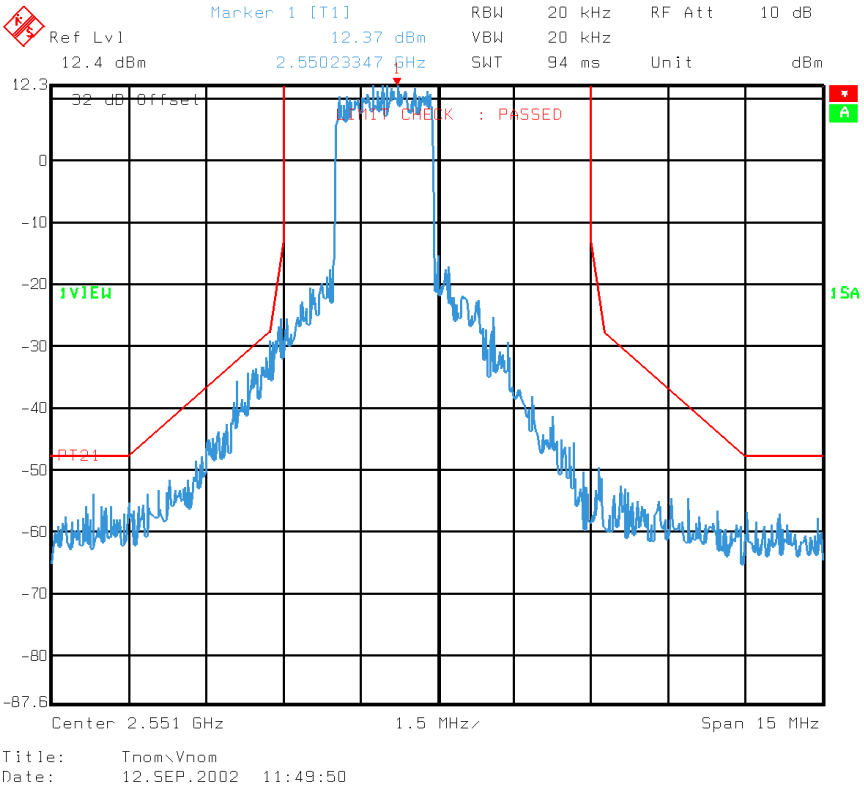

Marker 1 [T1]
RBW 20 kHz
RF Att 10 dB
Ref Lvl
11.50 dBm
VBW 20 kHz
11.5 dBm
2.55194689 GHz
SWT 94 ms
Unit dBm
11.4
32 dB Offset
LIMIT CHECK : PASSED
0
-10
-20
1VIEW
1SA
-30
-40
PT24
-50
-60
-70
-80
-88.5
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: OC
Date: 12.SEP.2002 15:37:27

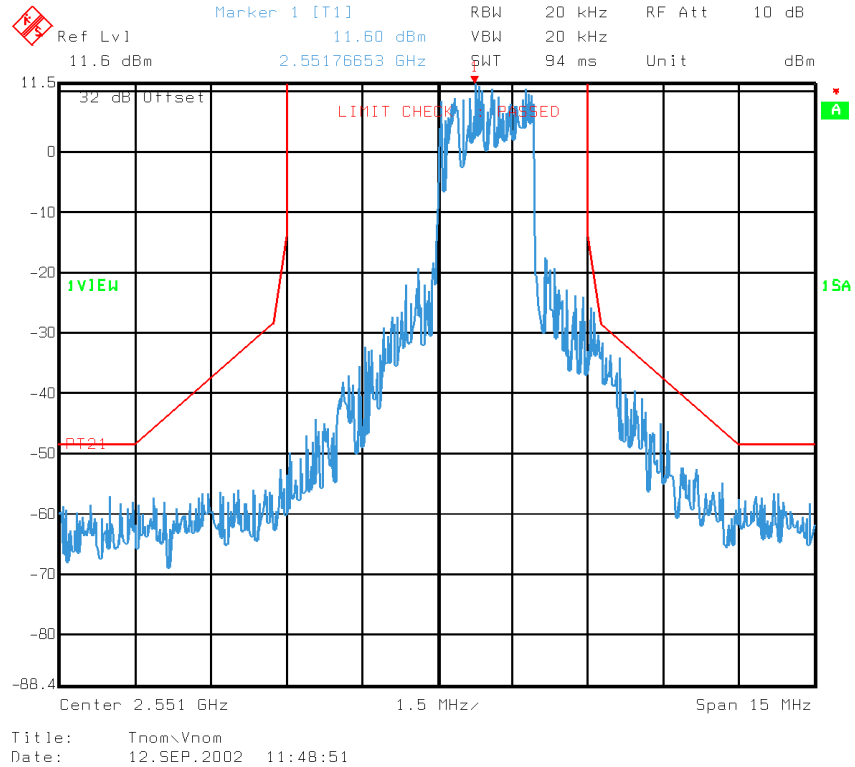
Test Data


Marker 1 [T1]
RBW 20 kHz
RF Att 10 dB
Ref Lvl
12.79 dBm
VBW 20 kHz
12.8 dBm
2.55080461 GHz
SWT 94 ms
Unit dBm
12.7
10
32 dB Offset
LIMIT CHECK : PASSED
A
0
-10
-20
1VIEW
1SA
-30
-40
PT21
-50
-60
-70
-80
-87.2
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: 10C
Date: 12.SEP.2002 16:11:12

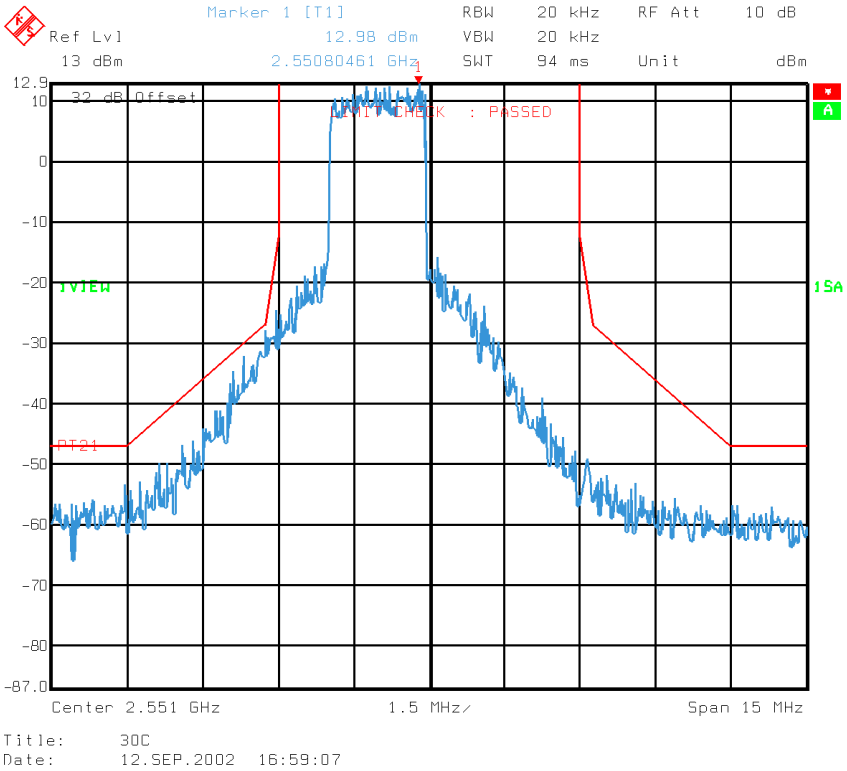

Marker 1 [T1]
RBW 20 kHz
RF Att 10 dB
Ref Lvl
12.90 dBm
VBW 20 kHz
12.9 dBm
2.55194689 GHz
SWT 94 ms
Unit dBm
12.8
10
32 dB Offset
LIMIT CHECK PASSED
A
0
-10
-20
1VIEW
1SA
-30
-40
PT21
-50
-60
-70
-80
-87.1
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: 10C
Date: 12.SEP.2002 16:10:28

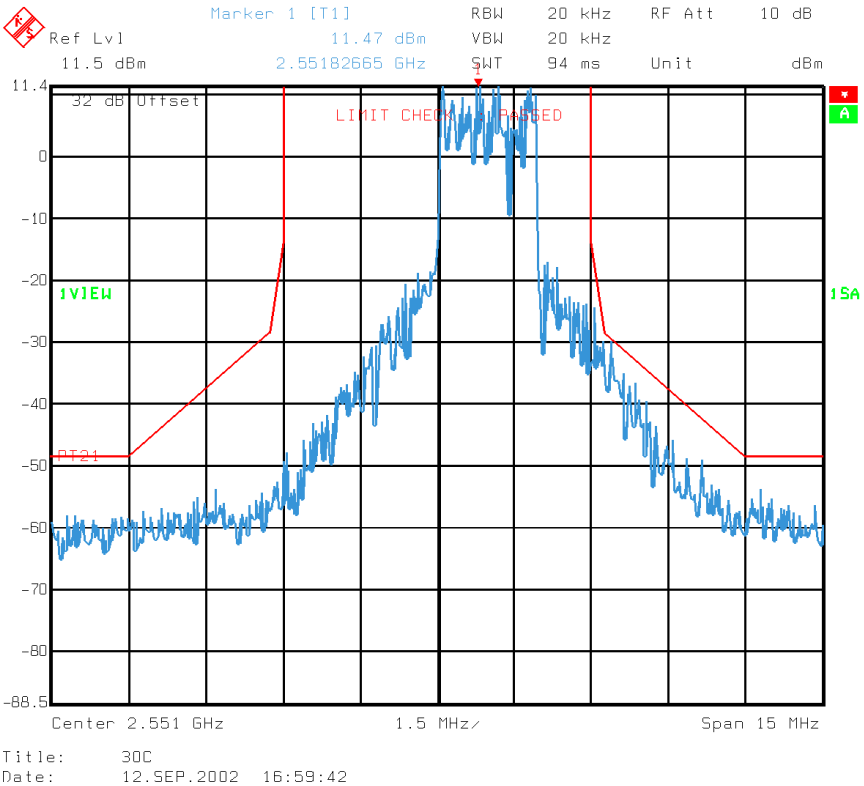
Test Data


Marker 1 [T1]
Ref Lvl
12.4 dBm
12.37 dBm
2.55023347 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
12.3
32 dB Offset
LIMIT CHECK : PASSED
0
-10
-20
-30
-40
-50
-60
-70
-80
-87.6
1VIEW
1SA
PT21
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: Tnom\Vnom
Date: 12.SEP.2002 11:49:50

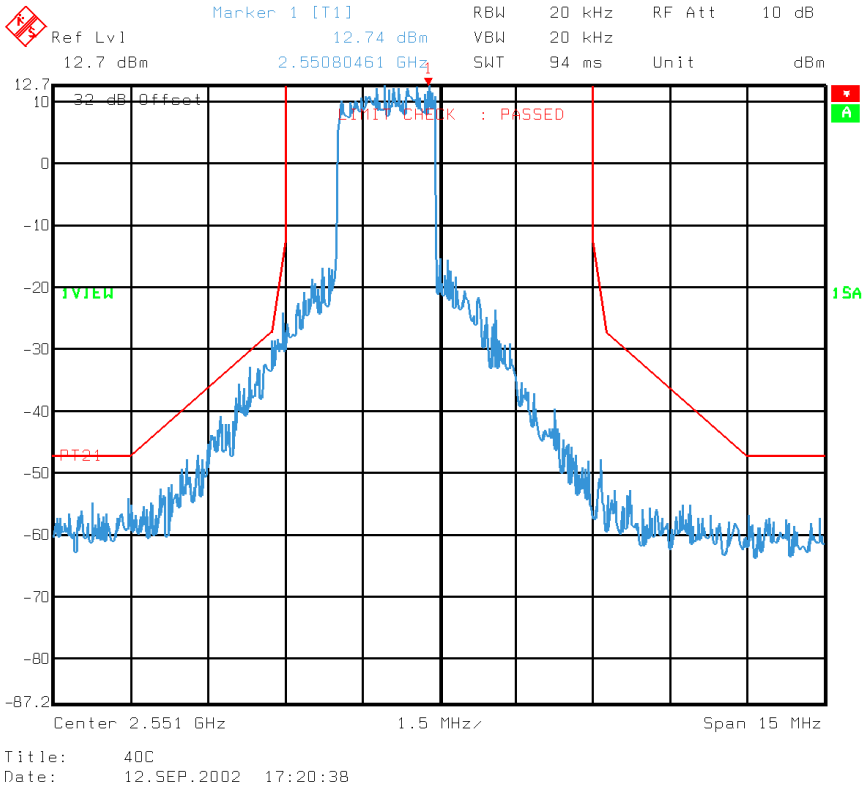

Marker 1 [T1]
Ref Lvl
11.6 dBm
11.60 dBm
2.55176653 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
11.5
32 dB Offset
LIMIT CHECK : PASSED
0
-10
-20
-30
-40
-50
-60
-70
-80
-88.4
1VIEW
1SA
PT21
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: Tnom\Vnom
Date: 12.SEP.2002 11:48:51

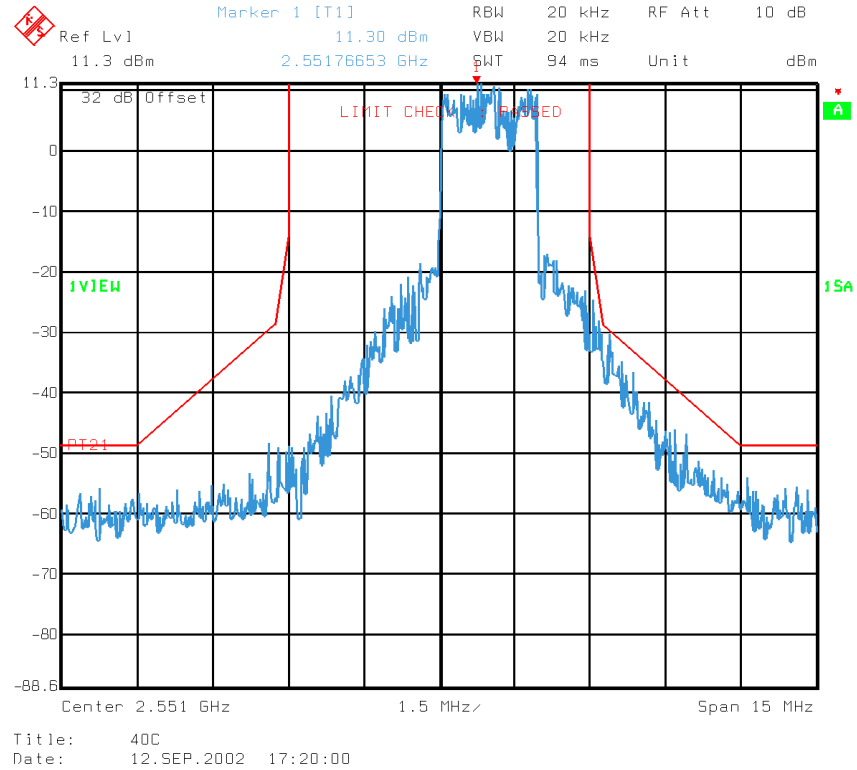
Test Data


Marker 1 [T1]
Ref Lvl
13 dBm
12.98 dBm
2.55080461 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
32 dB Offset
LIMIT CHECK : PASSED
1VIEW
1SA
PT21
12.9
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-87.0
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: 30C
Date: 12.SEP.2002 16:59:07


Marker 1 [T1]
Ref Lvl
11.5 dBm
11.47 dBm
2.55182665 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
32 dB Offset
LIMIT CHECK : PASSED
1VIEW
1SA
PT21
11.4
0
-10
-20
-30
-40
-50
-60
-70
-80
-88.5
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: 30C
Date: 12.SEP.2002 16:59:42

Test Data


Marker 1 [T1]
Ref Lvl
12.7 dBm
12.74 dBm
2.55080461 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
32 dB Offset
LIMIT CHECK : PASSED
1VIEW
1SA
PT21
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: 40C
Date: 12.SEP.2002 17:20:38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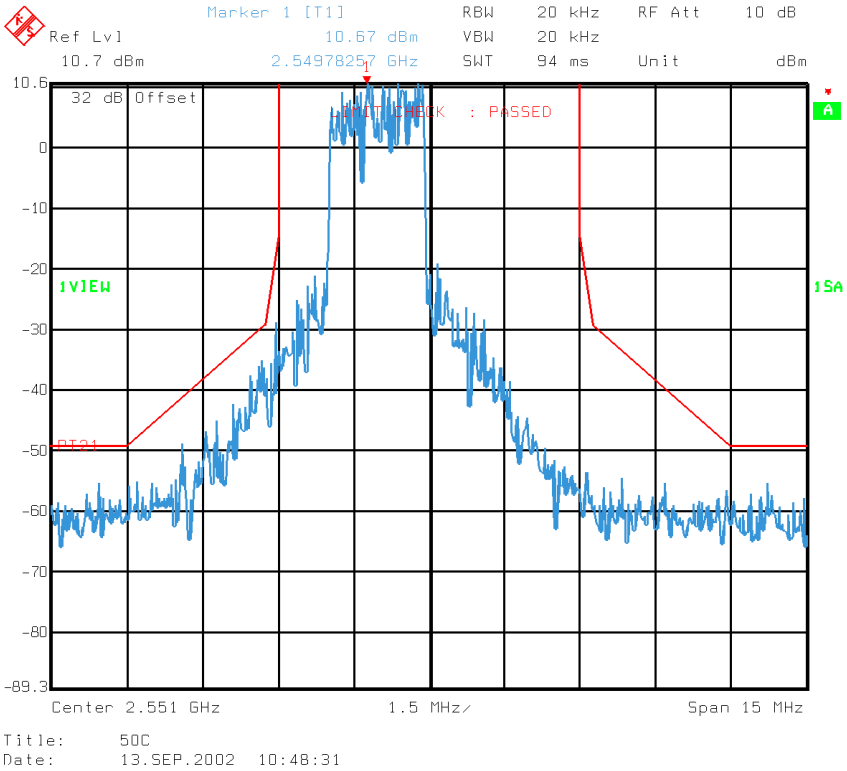
11.30 dBm
2.55176653 GHz
RBW 20 kHz
VBW 20 kHz
SWT 94 ms
RF Att 10 dB
Unit dBm
32 dB Offset
LIMIT CHECK : PASSED
1VIEW
1SA
PT21
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: 40C
Date: 12.SEP.2002 17:20:00

Test Data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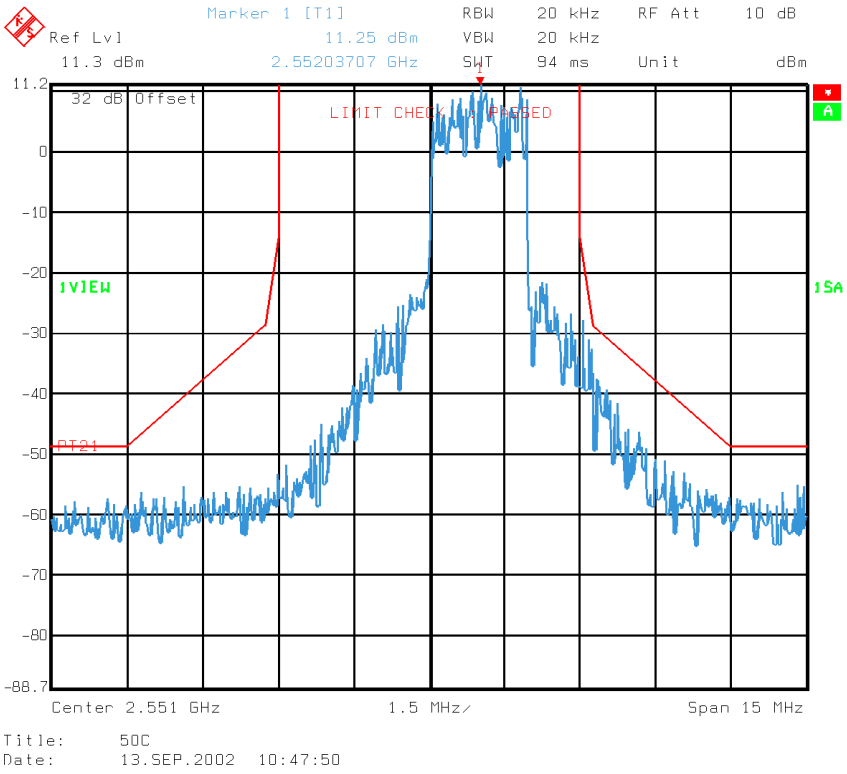
RF Att 10 dB
Ref Lvl
10.67 dBm
VBW 20 kHz
10.7 dBm
2.54978257 GHz
SWT 94 ms
Unit dBm
10.6
32 dB Offset
LIMIT CHECK : PASSED
A
0
-10
-20
1VIEW
1SA
-30
-40
PT21
-50
-60
-70
-80
-89.3
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: 50C
Date: 13.SEP.2002 10:48:31


Marker 1 [T1]
RBW 20 kHz
RF Att 10 dB
Ref Lvl
11.25 dBm
VBW 20 kHz
11.3 dBm
2.55203707 GHz
SWT 94 ms
Unit dBm
11.2
32 dB Offset
LIMIT CHECK : PASSED
A
0
-10
-20
1VIEW
1SA
-30
-40
PT21
-50
-60
-70
-80
-88.7
Center 2.551 GHz
1.5 MHz/
Span 15 MHz
Title: 50C
Date: 13.SEP.2002 10:47:50

Section 7. Test Details

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

MINIMUM STANDARD:
EIRP limitations.

(a) The maximum EIRP of a main or booster station shall not exceed 33 dBW + 10log(X/6) dBW, where X is the actual bandwidth if other than 6 MHz, except as provided in paragraph (b) of this section.

(b)(i) If a main or booster station sectorizes or otherwise uses one or more transmitting antennas with a non-omnidirectional horizontal plane radiation pattern, the maximum EIRP in a given direction shall be determined by the following formula:

EIRP = 33 dBW + 10 log(X/6) dBW + 10 log(360/beamwidth) dBW, where X is the channel width in MHz and 10 log(360/beamwidth) £ 6 dB.
(ii) Beamwidth is the total horizontal plane beamwidth of the individual transmitting antenna for the station or any sector measured at the half-power points.

(c) An increase in station EIRP, above currently-authorized or previously-proposed values, to the maximum values provided in paragraphs (a) and (b) of this section may be authorized, if the requested increase would not cause harmful interference to any authorized or previously-proposed, cochannel or adjacent channel station entitled to interference protection under the Commission's rules, or if an applicant demonstrates that:

(1) A station that must be protected from interference could compensate for interference by increasing its EIRP; and

(2) The interfered-with station may increase its own EIRP consistent with the rules and without causing harmful interference to any cochannel or adjacent channel main or booster station protected service area, response station hub or BTA/PSA, for which consent for the increased interference has not been obtained; and

(3) The applicant requesting authorization of an EIRP increase agrees to pay all expenses associated with the increase in EIRP by the interfered-with station.

(d) For television transmission if the authorized bandwidth is 4.0 MHz or more for the visual and accompanying aural signal, the peak power of the accompanying aural signal must not exceed 10 percent of the peak visual power

of the transmitter. The Commission may order a reduction in aural signal power to diminish the potential for harmful interference.

(e) For main, booster and response stations utilizing digital emissions with non-uniform power spectral density (e.g. unfiltered QPSK), the power measured within any 100 kHz resolution bandwidth within the 6 MHz channel occupied by the non-uniform emission cannot exceed the power permitted within any 100 kHz resolution bandwidth within the 6 MHz channel if it were occupied by an emission with uniform power spectral density, i.e., if the maximum permissible power of a station utilizing a perfectly uniform power spectral density across a 6 MHz channel were 2000 watts EIRP, this would result in a maximum permissible power flux density for the station of 2000/60 = 33.3 watts EIRP per 100 kHz bandwidth. If a non-uniform emission were substituted at the station, station power would still be limited to a maximum of 33.3 watts EIRP within any 100 kHz segment of the 6 MHz channel, irrespective of the fact that this would result in a total 6 MHz channel power of less than 2000 watts EIRP.

NAME OF TEST:	Occupied Bandwidth	PARA. NO.: 2.989

MINIMUM STANDARD:

(a) The maximum out-of-band power of an MDS station transmitter or booster transmitting on a single 6 MHz channel with an EIRP in excess of -9 dBW employing analog modulation shall be attenuated at the channel edges by at least 38 dB relative to the peak visual carrier, then linearly sloping from that level to at least 60 dB of attenuation at 1 MHz below the lower band edge and 0.5 MHz above the upper band edge, and attenuated at least 60 dB at all other frequencies. The maximum out-of-band power of an MDS station transmitter or booster transmitting on a single 6 MHz channel or a portion thereof with an EIRP in excess of -9 dBW (or, when subchannels are used, the appropriately adjusted value based upon the ratio of the channel-to-subchannel bandwidths) employing digital modulation shall be attenuated at the 6 MHz channel edges at least 25 dB relative to the licensed average 6 MHz channel power level, then attenuated along a linear slope to at least 40 dB at 250 kHz beyond the nearest channel edge, then attenuated along a linear slope from that level to at least 60 dB at 3 MHz above the upper and below the lower licensed channel edges, and attenuated at least 60 dB at all other frequencies. Notwithstanding the foregoing, in situations where an MDS station or booster station transmits, or where adjacent channel licensees jointly transmit, a single signal over more than one contiguous 6 MHz channel utilizing digital modulation with an EIRP in excess of -9 dBW (or, when subchannels or superchannels are used, the appropriately adjusted value based upon the ratio of 6 MHz to the subchannel or superchannel bandwidth), the maximum out-of-band power shall be attenuated at the channel edges of those combined channels at least 25 dB relative to the power level of each channel, then attenuated along a linear slope from that level to at least 40 dB at 250 kHz above or below the channel edges of those combined channels, then attenuated along a linear slope from that level to at least 60 dB at 3 MHz above the upper and below the lower edges of those combined channels, and attenuated at least 60 dB at all other frequencies. However, should harmful interference occur as a result of emissions outside the assigned channel, additional attenuation may be required. A transmitter licensed prior to November 1, 1991, that remains at the station site initially licensed, and does not comply with this paragraph, may continue to be used for its life if it does not cause harmful interference to the operation of any other licensee. Any non-conforming transmitter replaced after November 1, 1991, must be replaced by a transmitter meeting the requirements of this paragraph.

(b) A booster transmitting on multiple contiguous or non-contiguous channels carrying separate signals (a “broadband” booster) with an EIRP in excess of -9 dBW per 6 MHz channel and employing analog, digital or a combination of these modulations shall have the following characteristics:

(1) For broadband boosters operating in the frequency range of 2.150-2.160/2 GHz, the maximum out-of-band power shall be attenuated at the upper and lower channel edges

forming the band edges by at least 25 dB relative to the licensed analog peak visual carrier or digital average power level (or, when subchannels are used, the appropriately adjusted value based on upon the ratio of the channel-to-subchannel bandwidths), then linearly sloping from that level to at least 40 dB of attenuation at 0.25 MHz above and below the band edges, then linearly sloping from that level to at least 60 dB of attenuation at 3.0 MHz above and below the band edges, and attenuated at least 60 dB at all other frequencies.

(2) For broadband boosters operating in the frequency range of 2.500-2.690 GHz, the maximum out-of-band power shall be attenuated at the upper and lower channel edges forming the band edges by at least 25 dB relative to the licensed analog peak visual carrier or digital average power level (or, when subchannels are used, the appropriately adjusted value based on upon the ratio of the channel-to-subchannel bandwidths), then linearly sloping from that level to at least 40 dB of attenuation at 0.25 MHz above and below the band edges, then linearly sloping from that level to at least 50 dB of attenuation at 3.0 MHz above and below the band edges, then linearly sloping from that level to at least 60 dB of attenuation at 20 MHz above and below the band edges, and attenuated at least 60 dB at all other frequencies.

(3) Within unoccupied channels in the frequency range of 2.500-2.690 GHz, the maximum out-of-band power shall be attenuated at the upper and lower channel edges of an unoccupied channel by at least 25 dB relative to the licensed analog peak visual carrier power level or digital average power level of the occupied channels (or, when subchannels or 125 kHz channels are used, the appropriately adjusted value based upon the ratio of the channel-to-subchannel bandwidths), then linearly sloping from that level to at least 40 dB of attenuation at 0.25 MHz above and below the occupied channel edges, then linearly sloping from that level to at least 50 dB of attenuation at 3.0 MHz above and below the occupied channel edges, and attenuated at least 50 dB at all other unoccupied frequencies.

(c) Boosters operating with an EIRP less than -9 dBW per 6 MHz channel shall have no particular out-of-band power attenuation requirement, except that if they cause harmful interference, their operation shall be terminated within 2 hours of notification by the Commission until the interference can be cured.

(d) The maximum out-of-band power of an MDS response station using all or part of a 6 MHz channel, employing digital modulation and transmitting with an EIRP greater than -6 dBW per 6 MHz channel shall be attenuated (as measured in accordance with paragraph (e) of this section) at the 6 MHz channel edges at least 25 dB relative to the average 6 MHz channel power level, then attenuated along a linear slope to at least 40 dB at 250 kHz beyond the nearest channel edge, then attenuated along a linear slope from that level to at least 60 dB at 3 MHz above the upper and below the lower licensed channel edges, and attenuated at least 60 dB at all other frequencies. The maximum out-of-band power of an MDS response station using all or part of a 6 MHz channel, employing digital modulation and transmitting with an EIRP no greater than -6 dBW per 6 MHz channel shall be attenuated (as measured in accordance with paragraph (e) of this section) at the channel edges at least 25 dB relative to the average 6 MHz channel transmitter output power level (P), then attenuated along a linear slope to at least 40 dB or 33+10log(P) dB, whichever is the lesser attenuation, at 250 kHz beyond the nearest channel edge, then attenuated along a linear slope from that level to at

least 60 dB or 43+10log(P) dB, whichever is the lesser attenuation, at 3 MHz above the upper and below the lower licensed channel edges, and attenuated at least 60 dB or 43+10log(P) dB, whichever is the lesser attenuation, at all other frequencies. Where MDS response stations with digital modulation utilize all or part of more than one contiguous 6 MHz channel to form a larger channel (e.g., a channel of width 12 MHz), the above-specified attenuations shall be applied only at the upper and lower edges of the overall combined channel. Notwithstanding these provisions, should harmful interference occur as a result of emissions outside the assigned channel(s), additional attenuation may be required by the Commission.

(e) In measuring compliance with the out-of-band emissions limitations, the licensee shall employ one of two methods in each instance: (1) absolute power measurement of the average signal power with one instrument, with measurement of the spectral attenuation on a separate instrument; or (2) relative measurement of both the average power and the spectral attenuation on a single instrument. The formula for absolute power measurements is to be used when the average signal power is found using a separate instrument, such as a power meter; the formula gives the amount by which the measured power value is to be attenuated to find the absolute power value to be used on the spectrum analyzer or equivalent instrument at the spectral point of concern. The formula for relative power measurements is to be used when the average signal power is found using the same instrument as used to measure the attenuation at the specified spectral points, and allows different resolution bandwidths to be applied to the two parts of the measurement; the formula gives the required amplitude separation (in dB) between the flat top of the (digital) signal and the point of concern.

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

MINIMUM STANDARD:

-60 dBc – Refer to previous section "Occupied Bandwidth"

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

MINIMUM STANDARD:

-60 dBc. Refer to previous section "Occupied Bandwidth

TEST METHOD:

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: .

§21.101 Frequency tolerance.

(a) The carrier frequency of each transmitter authorized in these services shall be maintained within the following percentage of the reference frequency except as otherwise provided in paragraph (b) of this section or in the applicable subpart of this part (unless otherwise specified in the instrument of station authorization the reference frequency shall be deemed to be the assigned frequency):

Frequency tolerance (percent)

Frequency range (MHz)	Frequency tolerance for fixed stations (percent)
2,150 to 2,162 Note1 Note2	0.001
2,596 to 2,680 Note1	0.005

(b) As an additional requirement in any band where the Commission makes assignments according to a specified channel plan, provisions shall be made to prevent the emission included within the occupied bandwidth from radiating outside the assigned channel at a level greater than that specified in §21.106.

Note 1: Beginning August 9, 1975, this tolerance will govern the marketing of equipment pursuant to §§2.803 and 2.805 of this chapter and the issuance of all authorizations for new radio equipment. Until that date new equipment may be authorized with a frequency tolerance of 0.03 percent in the frequency range 2,200 to 10,500 MHz and equipment so authorized may continue to be used for its life provided that it does not cause interference to the operation of any other licensee. Equipment authorized in the frequency range 2,450 to 10,500 MHz prior to June 23, 1969, at a tolerance of 0.05 percent may continue to be used until February 1, 1976 provided it does not cause interference to the operation of any other licensee.

Note 2: Beginning January 21, 2000, the equipment authorized to be used at all MDS main stations, and at all MDS booster stations authorized pursuant to §21.913(b) of this part, shall maintain a frequency tolerance of 0.001**%. MDS booster stations authorized pursuant to §21.913(e) of this part and MDS response stations authorized pursuant to §21.909 of this part shall employ transmitters with sufficient frequency stability to ensure that the emission is, at all times, within the required emission mask.**

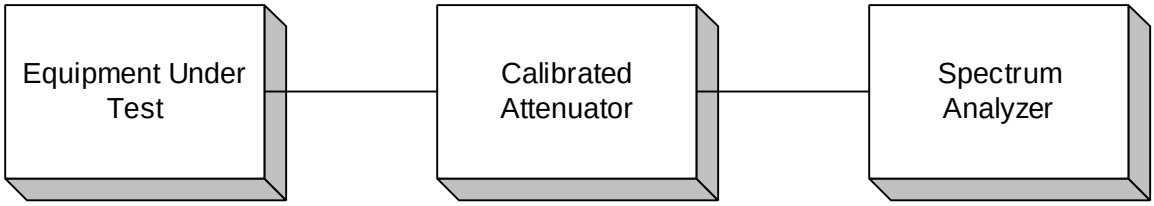
Section 8. Test Equipment

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
1036*	SPECTRUM ANALYZER	ROHDE & FSEK30	830844/006	12/18/01
1304*	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01
1464*	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU
1477	20db Attenuator	MCL Inc. BW-	NONE	CBU
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/15/02
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/15/02
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	01/10/02

Items marked with asterisk (*) have two year cal cycle.

Section 9. Test Diagrams

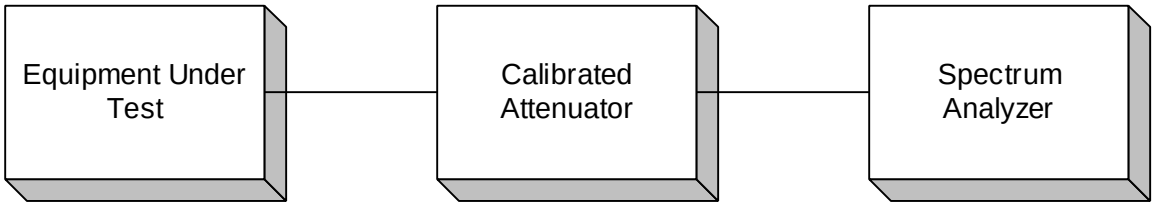
PARA. NO. 2.985 RF POWER OUTPUT



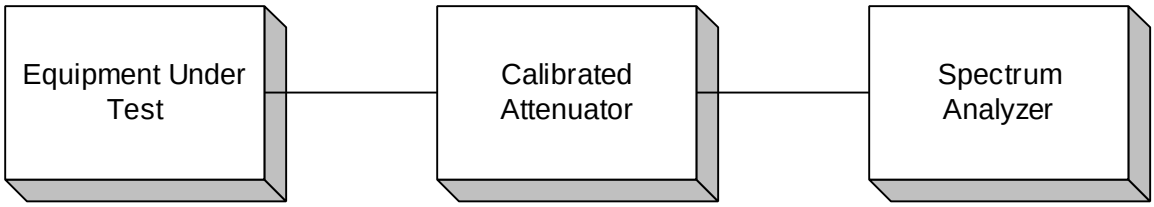
Method Of Measurement:

The peak power at antenna terminals is measured using an in-line power meter or spectrum analyzer. Power output is measured with the maximum rated input level.

PARA. NO. 2.989 OCCUPIED BANDWIDTH



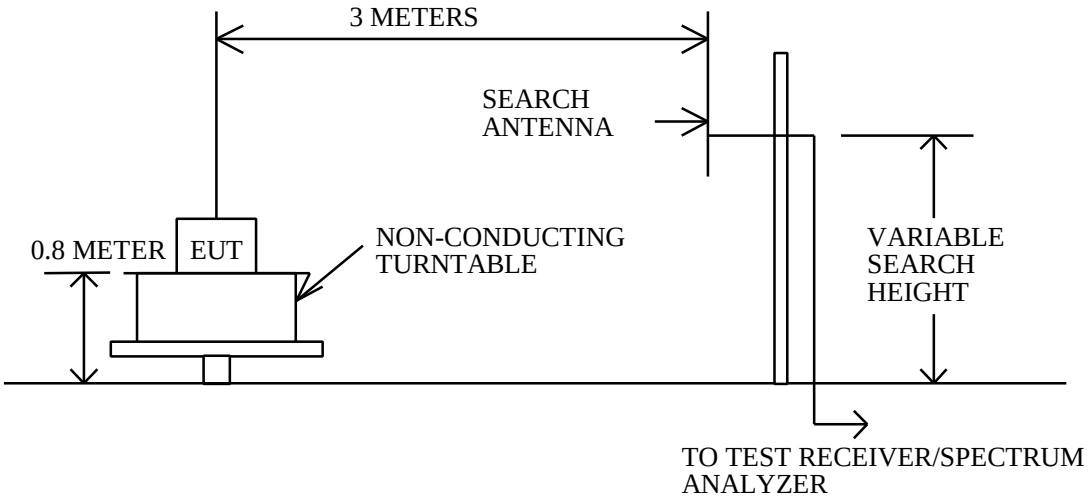
PARA. NO. 2.991 SPURIOUS EMISSIONS AT ANTENNA TERMINALS



Method Of Measurement:

The peak power at antenna terminals is measured using an in-line power meter or spectrum analyzer. Power output is measured with the maximum rated input level.

PARA. NO. 2.993 FIELD STRENGTH OF SPURIOUS RADIATION



PARA. NO. 2.995 FREQUENCY STABILITY