TEST REPORT

Report Number: 3099245ATL-001b

November 13, 2006

Product Designation: SR450

Standard: CFR Title 47 Part 90
RSS-119, Issue 6, March 25, 2000

Tested by:
Intertek Testing Services NA Inc.
1950 Evergreen Blvd., Suite 100
Duluth, GA 30096

Client:
Temco Communications Inc
Silver Palace Honancho 1F, 2-12-26,
Honan, Suginami-Ku, Tokyo, Japan
Contact: Brian Murakami

Tests performed by:

Richard Bianco
EMC Engineer

Report reviewed by:

David J. Schramm
EMC Department Manager

1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatum text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)		
5.0	Transmitter Information for equipment other than that operating under parts 15 and 18 of the rules (Transmitter Info - Licensed)		
6.0	RF Output Power (Conducted) (FCC Part 2.1046 Cond)	07/20/2006	PASS
7.0	Audio Low Pass Filter (Voice Input) (FCC Part 2.1047 alp)	09/27/2006	PASS
8.0	Audio Frequency Response (FCC Part 2.1047 afr)	07/30/2006	PASS
9.0	Modulation Limiting (FCC Part 2.1047 ml)	09/28/2006	PASS
10.0	Occupied Bandwidth (FCC Part 2.1049)	07/25/2006	PASS
11.0	Spurious emissions at antenna terminals (FCC Part 2.1051)	07/25/2006	PASS
12.0	Field strength of spurious radiation (FCC Part 2.1053)	07/28/2006	PASS
13.0	Measurement of frequency stability (Frequency Stability)	07/26/2006	PASS
14.0	Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)	09/28/2006	PASS

3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Sample Number
FM Radio	Temco	SR450	1-3

EUT receive date:	07-18-2006
EUT receive condition:	Good

Description of EUT provided by Client:
The SR450 is a two-way radio communication device that is designed to operate on 15 channels between the frequency range of 446MHz and 512MHz. The transmitter output can be set to 200mW for low power or 2W for high power. It has a high sensitive built-in VOX that detects only human voice sounds and a noise cancellation feature utilizing real time digital processing.

Description of EUT exercising:
The EUT was equipped with a new set of batteries and switched to the on position and places the transceiver in a continuous receive mode of operation. All the stand-by testing was performed in this configuration. For all other testing the transmit button was pressed and the device was placed in a continuous transmit state. When modulation was required to perform a test there was a signal applied to the microphone input port.

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Method:

Record the details of EUTcabling, document the support equipment, and show the interconnections in a block diagram.

Data:

EUT Cabling						
					Connection	
ID	Description	Length	Shielding	Ferrites	From	To
A	AF Connector	1m	No	No	EUT	Microphone/Voiceducer

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Microphone	Temco	RSM220	NA
Voiceducer	Temco	EM7B-05	NA

5.0 Transmitter Information for equipment other than that operating under parts 15 and 18 of the rules (Transmitter Info - Licensed)

Method:

Data:

FCC Rule Part			
2.1033(c)(1)	**Applicant**	Company Name:	Temco Communications Inc.
		Address:	13 Chipping Campden, S. Barrington, Il
		Phone:	847-359-3277
		Fax:	847-359-3743
		Contact Name:	Brian Murakami
		Email:	bmurakami@temcom.net
	Manufacturer	Company Name:	Temco Communications Inc.
		Address:	13 Chipping Campden, S. Barrington, Il
		Phone:	847-359-3277
		Fax:	847-359-3743
		Contact Name:	Brian Murakami
		Email:	bmurakami@temcom.net
2.1033(c)(2)	**Equipment**	FCC ID:	
		EUT Model Number:	SR450
		EUT Serial Number:	Engineering Samples 1-3
2.1033(c)(3)		User Manual	Attach as separate exhibit.
2.1033(c)(4)	Frequency Range		446 to 512 MHz
2.1033(c)(5)	Type(s) of Emission		
2.1033(c)(6)	Range of operating power and means for variation		200mW-2W manual switch
2.1033(c)(7)	Maximum power rating		2W
2.1033(c)(8)	DC voltage and current into final RF stages of device		
2.1033(c)(9)	Tune up procedure		Attach as separate exhibit.
2.1033(c)(10)	Schematics		Attach as separate exhibit.
2.1033(c)(11)	Photographs of ID label and label location		Attach as separate exhibit.
2.1033(c)(12)	Internal and external photographs		Attach as separate exhibit.
2.1033(c)(13)	Detailed description of digital modulation technique		Attach as separate exhibit.
2.1033(c)(14)	Measurement procedure		Referenced in each section of this test
2.1033(c)(15)	Part 97 RF Power Amplifier?		No
2.1033(c)(16)	AM broadcast stereophonic exciter-generator		No
2.1033(c)(17)	Part 25 Certification?		No
2.1033(c)(18)	Software defined radio?		No

6.0 RF Output Power (Conducted) (FCC Part 2.1046 Cond)

Method:

Connect the transmitter output to a calibrated coaxial attenuator. Connect the other end of the attenuator to a power meter. Transmitter output was read off the power meter in dBm.

Performed the test at three frequencies (low, middle, and high channels) and on the highest power levels, which can be setup on the transmitter.

Canada typically requires this test to be repeated at +60° C and at -30° C.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 03 dB	Weinschel Corp	2	200003	07/18/2006	07/18/2007
Attenuator, 20 dB	Weinschel Corp	2	200008	07/18/2006	07/18/2007
Power Meter	Boonton	4232A	200063	10/25/2005	10/25/2006
Power Sensor, Dual Diode, 10kHz to 8GHz, 20 dBm	Boonton	51011-EMC	200064	10/25/2005	10/25/2006

Results: The sample tested was found to Comply.

Photos:

Conducted Carrier Power

6.0 RF Output Power (Conducted) (FCC Part 2.1046 Cond)

Data:

EUT Mode	Frequency MHz	Channel	Measured Power dBm		
			+60°C	+20°C	-30°C
Low Power	445.998	1	22.88	22.97	22.84
	479.002	8	22.76	22.91	22.84
	512.001	15	22.84	22.89	22.74
High Power	445.998	1	32.87	32.94	32.81
	479.001	8	32.8	32.9	32.82
	512.001	15	32.85	32.89	32.64

7.0 Audio Low Pass Filter (Voice Input) (FCC Part 2.1047 alp)

Method:

Guide: ANSI/TIA-603-C 2004

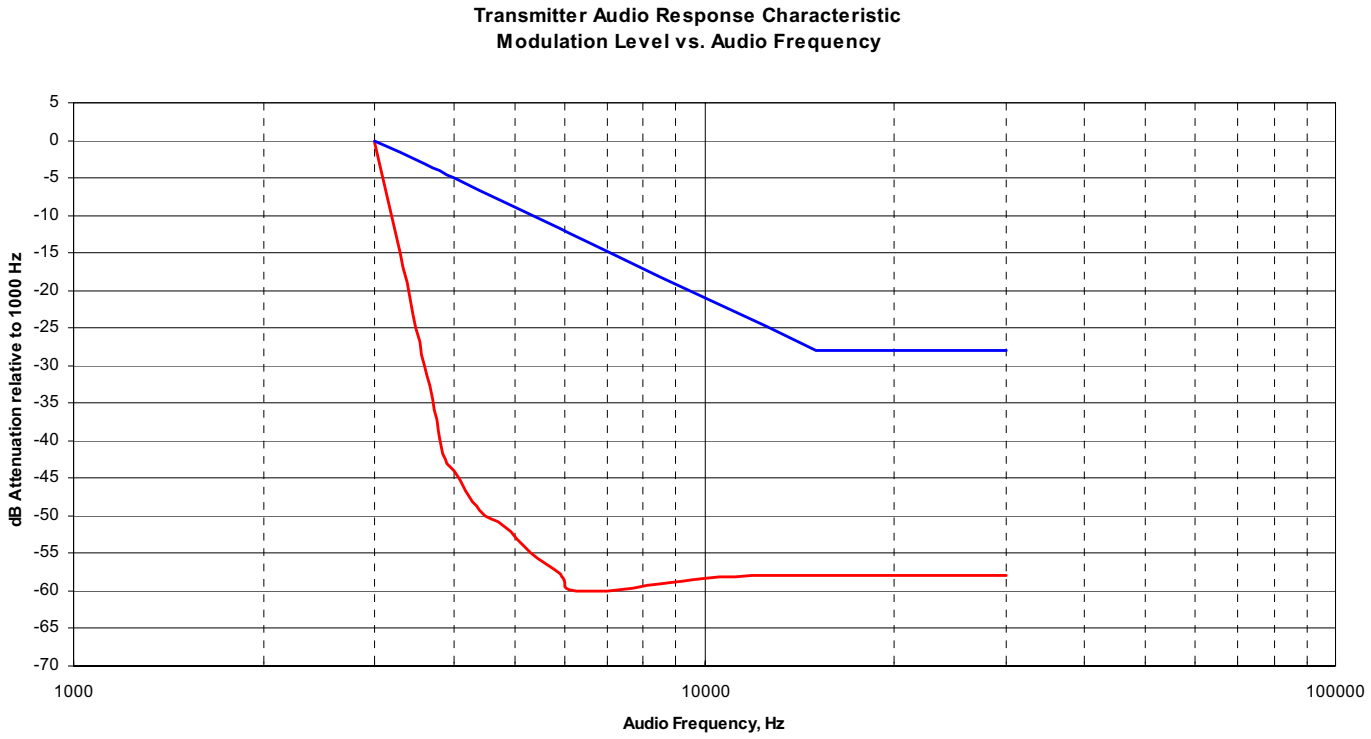
1) Setup the EUT and test equipment such that the audio input is connected at the input to the modulation limiter at the modulation stage.
2) Connect the audio output to the modulated stage.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 10 dB	Weinschel Corp	2	200009	07/18/2006	07/18/2007
Attenuator, 20 dB	Weinschel Corp	2	200008	07/18/2006	07/18/2007
Audio Analyzer	Hewlett Packard	HP8903B	NYM-EMC65	07/17/2006	07/17/2007
Modulation Analyzer	Hewlett Packard	8901A	213050	12/12/2005	12/12/2006
Power Supply	Tektronix	PS2510G	211678	04/17/2006	04/17/2007

Results: The sample tested was found to Comply.

Data:



8.0 Audio Frequency Response (FCC Part 2.1047 afr)

Method:

Guide: ANSI/TIA-603-C 2004

1) Connect the audio signal generator to the input of the post limiter low pass filter and the dB meter to the output of the post limiter low pass filter.
2) Apply a 1000 Hz tone from the audio signal generator and adjust the level per manufacturer's specifications. Record the dB level of the 1000 Hz tone as LEVREF.
3) Set the audio signal generator to the desired test frequency between 3000 Hz and the upper low pass filter limit. Record the dB level at the test frequency as LEVFREQ.
4) Calculate the audio frequency response at the test frequency as:
low pass filter response = LEVFREQ - LEVREF
1) Repeat the above procedure for all the desired test frequencies.

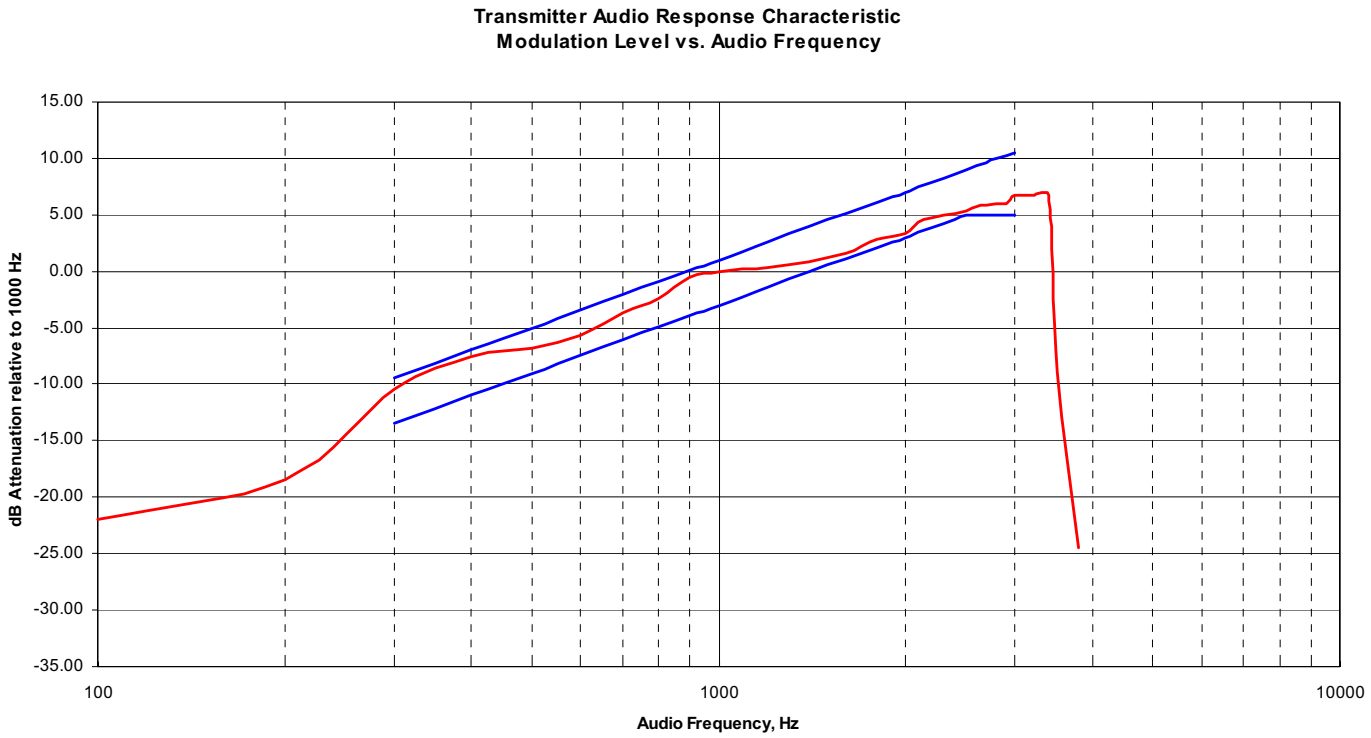
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 10 dB	Weinschel Corp	2	200009	07/18/2006	07/18/2007
Attenuator, 20 dB	Weinschel Corp	2	200008	07/18/2006	07/18/2007
Audio Analyzer	Hewlett Packard	HP8903B	NYM-EMC65	07/17/2006	07/17/2007
Modulation Analyzer	Hewlett Packard	8901A	213050	12/12/2005	12/12/2006
Power Supply	Tektronix	PS2510G	211678	04/17/2006	04/17/2007

Results: The sample tested was found to Comply.

8.0 Audio Frequency Response (FCC Part 2.1047 afr)

Data:



9.0 Modulation Limiting (FCC Part 2.1047 ml)

Method:

Guide: ANSI/TIA-603-C 2004

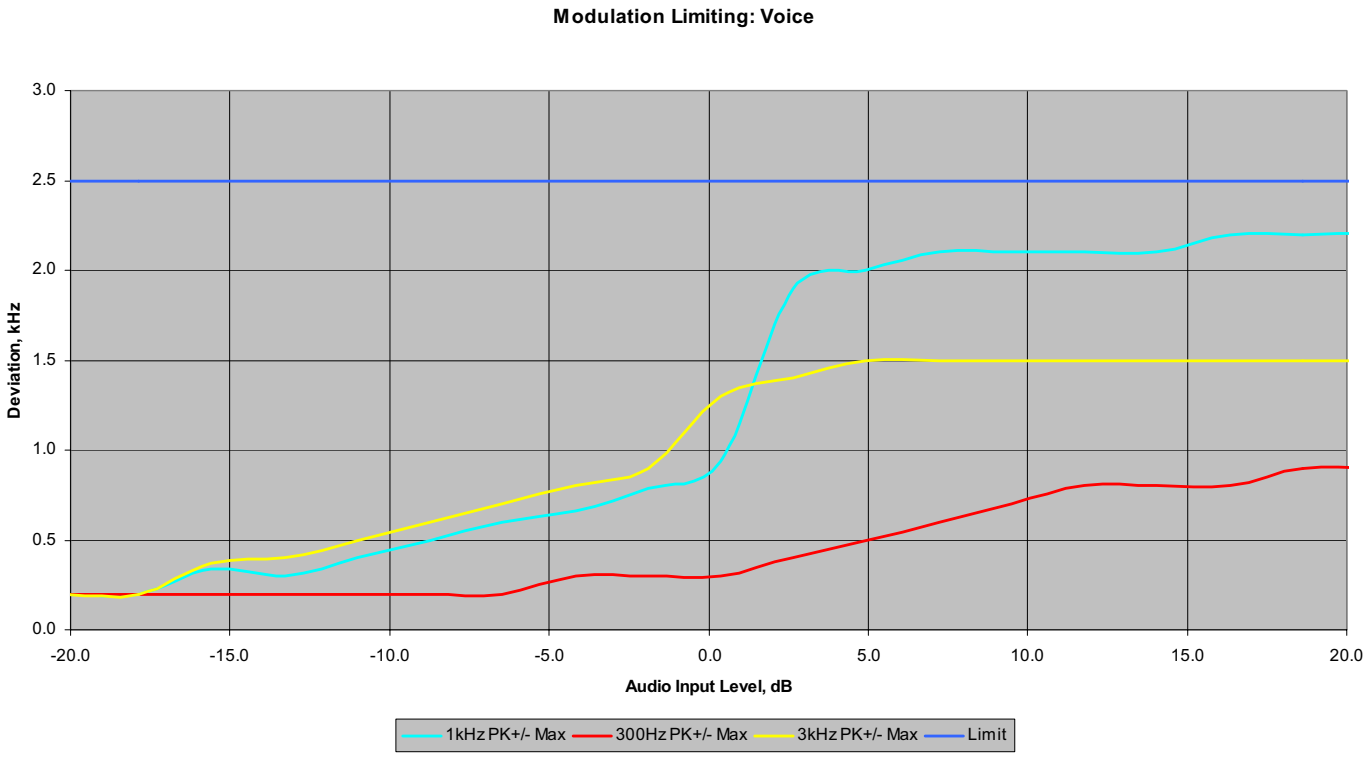
1) Setup the test equipment as follows: Audio source to EUT. EUT to modulation meter through appropriate attenuation.
2) Set the frequency of the audio signal generator to 300Hz and adjust the level from -20 to +20 dB relative to the level required to achieve 60% modulation at 1 kHz.
3) Record the maximum value of plus or minus peak frequency deviation.
4) Repeat the above procedure with frequency 1000Hz and 3000Hz.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Audio Analyzer	Hewlett Packard	HP8903B	NYM-EMC65	07/17/2006	07/17/2007
Modulation Analyzer	Hewlett Packard	8901A	213050	12/12/2005	12/12/2006
Multifunction Synthesizer	Hewlett Packard	8904A	213214	09/19/2006	09/19/2007
Spectrum Analyzer	Hewlett Packard	8595E	213060	03/06/2006	03/06/2007

Results: The sample tested was found to Comply.

Data:



10.0 Occupied Bandwidth (FCC Part 2.1049)

Method:

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Connect the antenna port of the EUT to a spectrum analyzer using a calibrated coaxial cable and attenuator. Set the EUT to transmit at its highest power setting. The 99% bandwidth function of the analyzer was used to automatically generate the occupied bandwidth plots. Repeat for low, mid, and high channels of each band of the EUT.

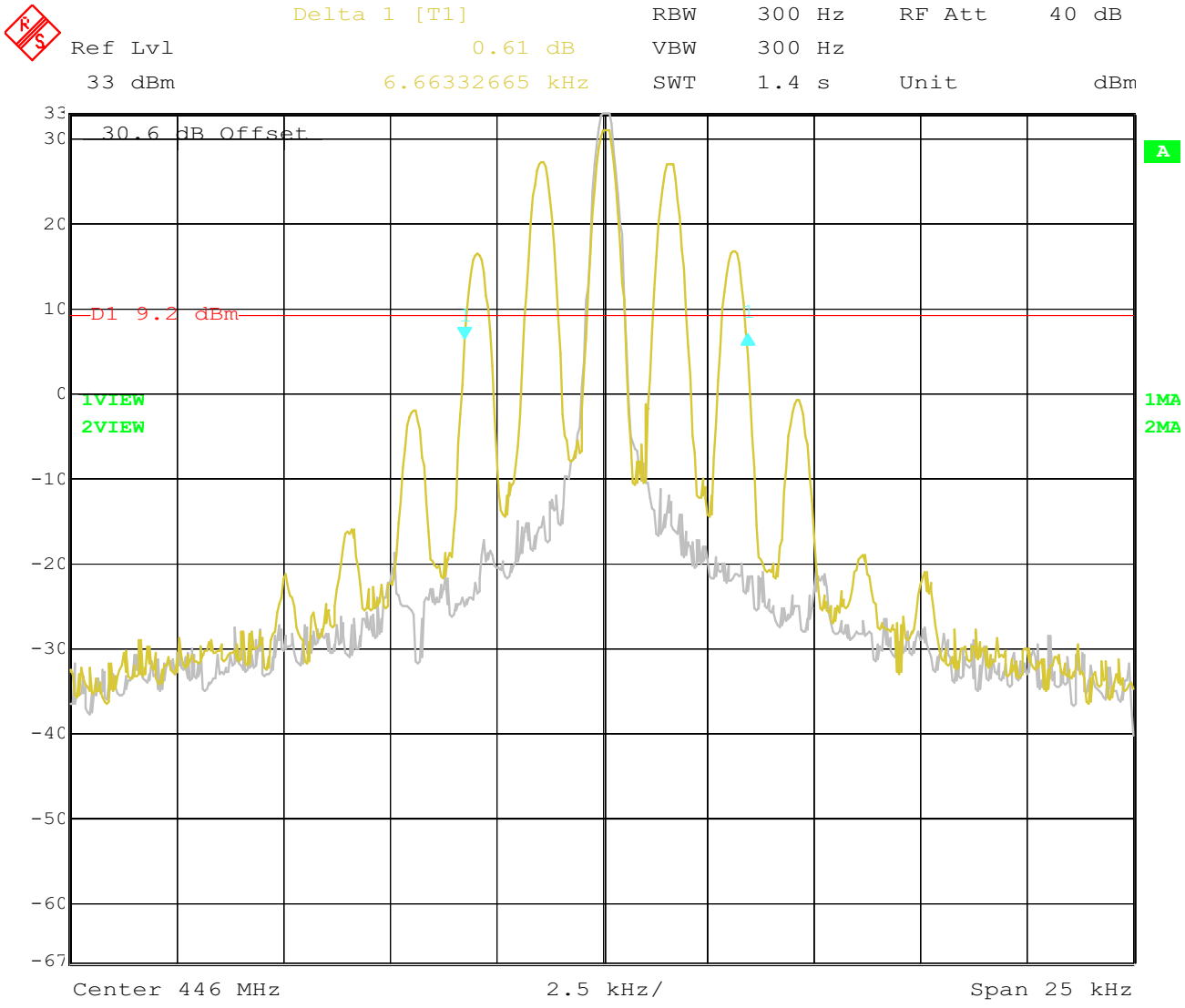
For amplifiers, the output bandwidth shall be less than or equal to the input bandwidth.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 20 dB	Weinschel Corp	2	200008	07/18/2006	07/18/2007
Spectrum Analyzer, 20 Hz to 40 GHz	Rohde & Schwarz	FSEK30	200062	01/12/2006	01/12/2007

Results: The sample tested was found to Comply.

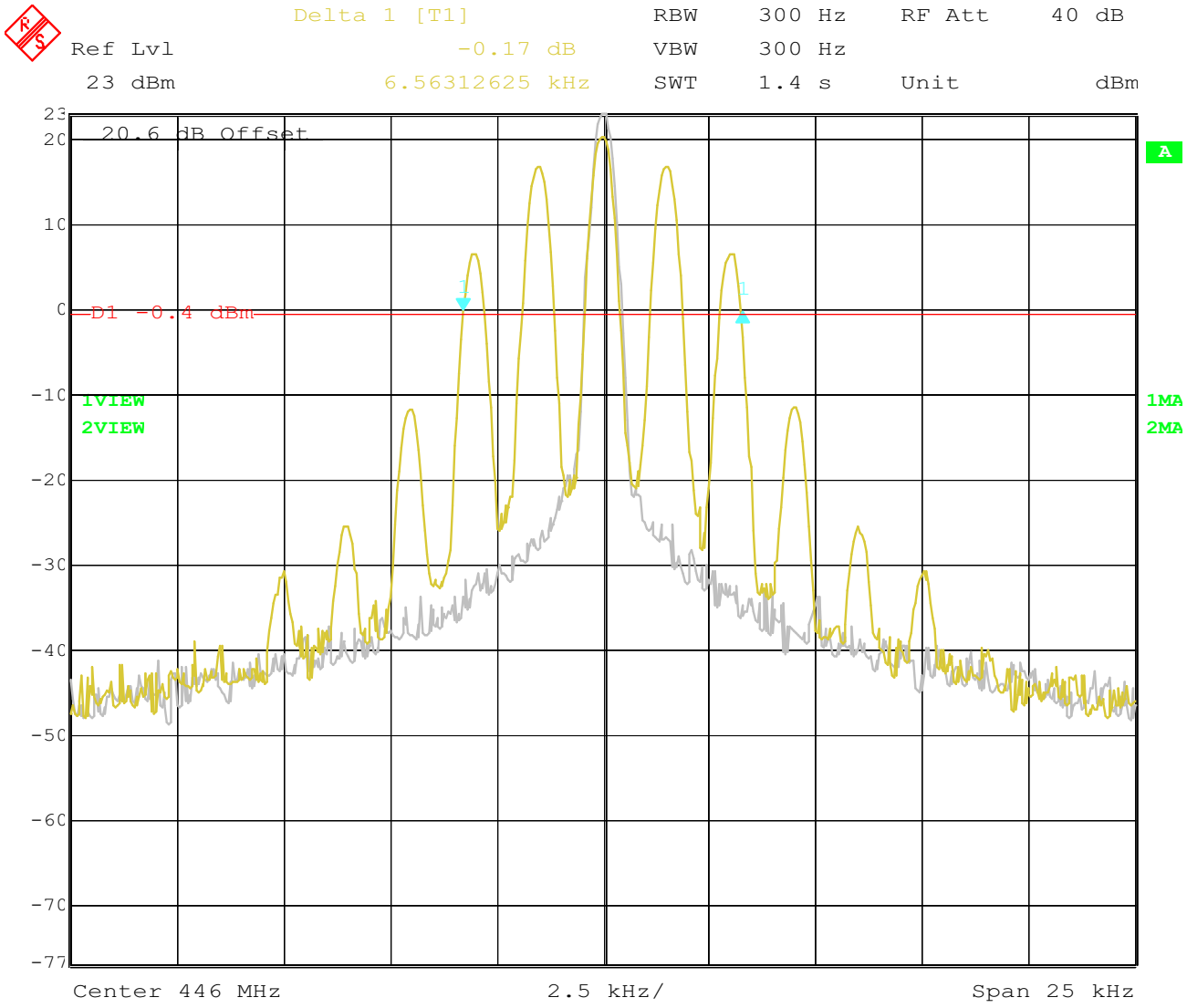
Photos:



Occupied Bandwidth - High Power - 446 MHz

10.0 Occupied Bandwidth (FCC Part 2.1049)

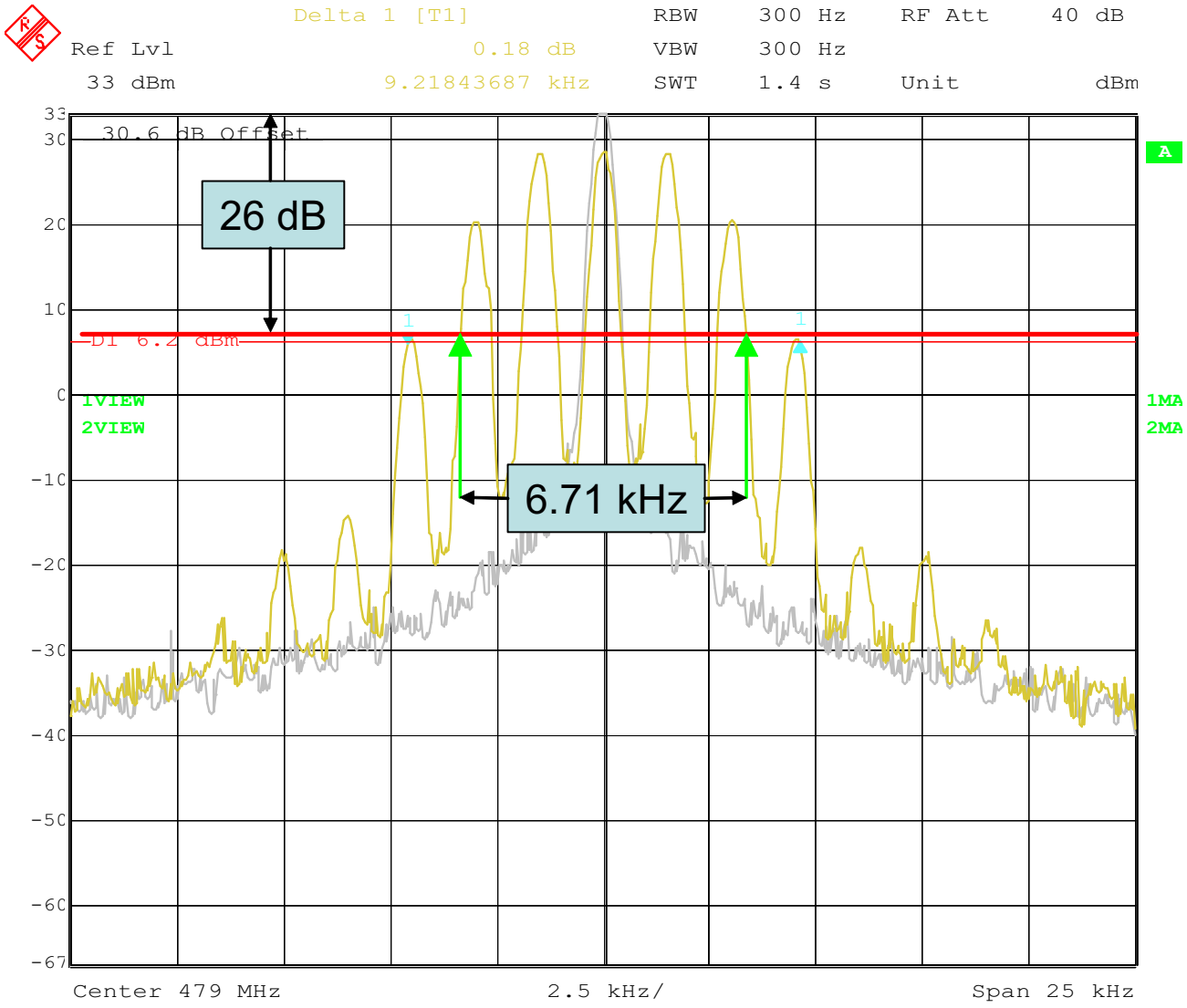
Photos:



Occupied Bandwidth - Low Power - 446 MHz

10.0 Occupied Bandwidth (FCC Part 2.1049)

Photos:

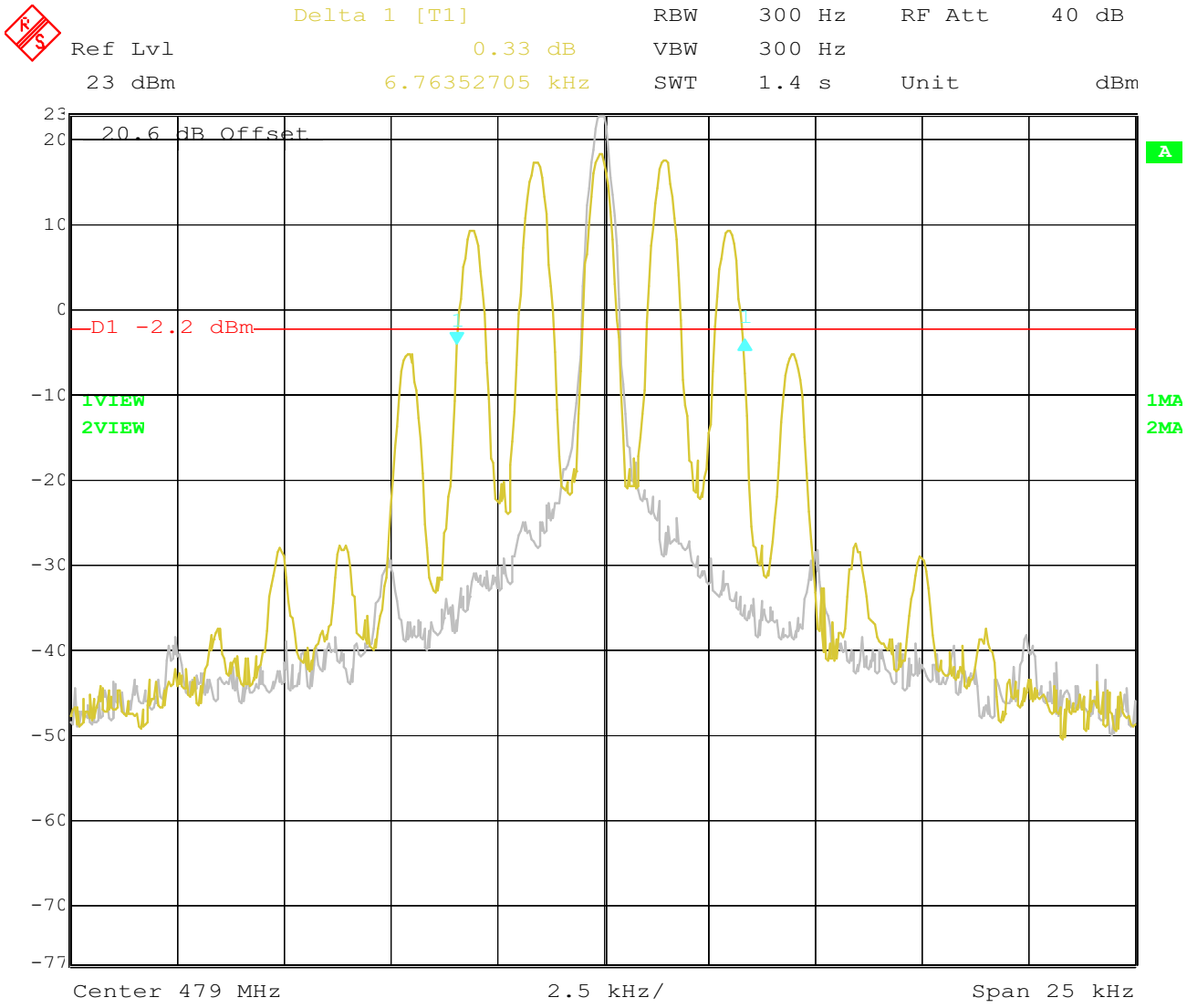


Date: 7.NOV.2006 22:23:14

Occupied Bandwidth - High Power - 479 MHz

10.0 Occupied Bandwidth (FCC Part 2.1049)

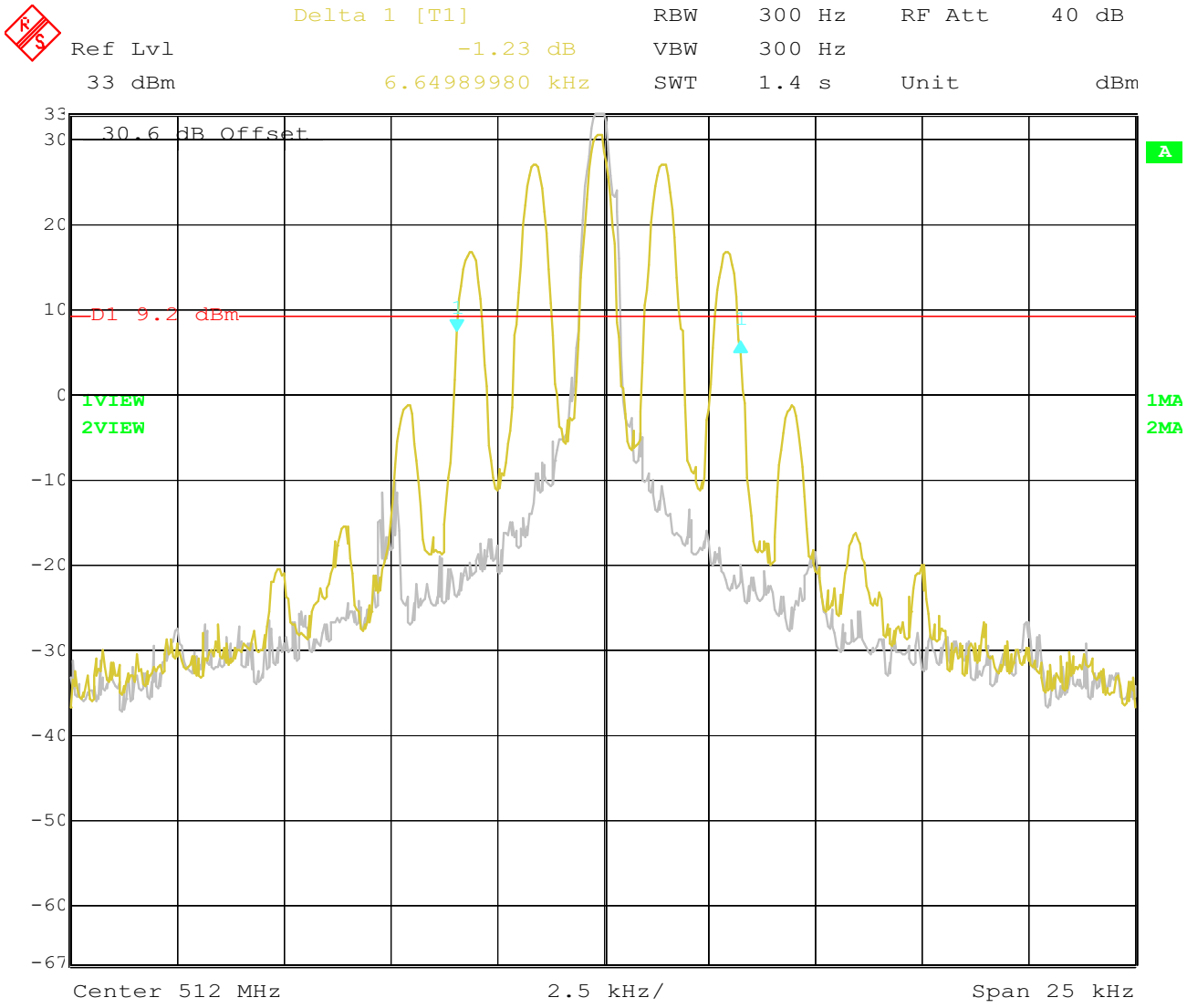
Photos:



Occupied Bandwidth - Low Power - 479 MHz

10.0 Occupied Bandwidth (FCC Part 2.1049)

Photos:

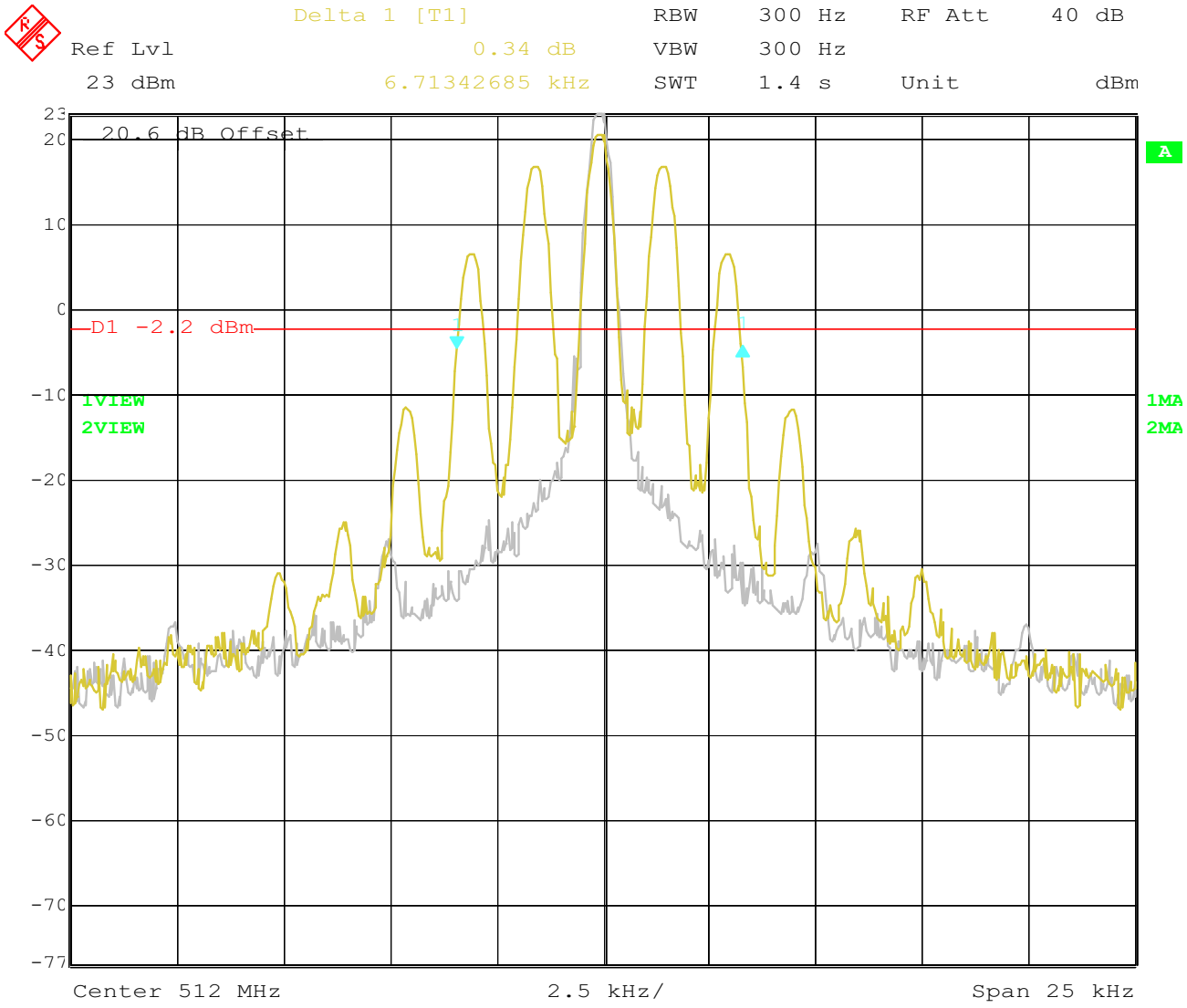


Date: 7.NOV.2006 22:20:32

Occupied Bandwidth - High Power - 512 MHz

10.0 Occupied Bandwidth (FCC Part 2.1049)

Photos:



Occupied Bandwidth - Low Power - 512 MHz

10.0 Occupied Bandwidth (FCC Part 2.1049)

Data:

Mode	Frequency MHz	Resolution Bandwidth (1)	Video Bandwidth	Sweep time Seconds	Measured Bandwidth kHz
High Power	446	300 Hz	300 Hz	1.4	6.66
Low Power	446	300 Hz	300 Hz	1.4	6.56
High Power	479	300 Hz	300 Hz	1.4	6.71
Low Power	479	300 Hz	300 Hz	1.4	6.76
High Power	512	300 Hz	300 Hz	1.4	6.65
Low Power	512	300 Hz	300 Hz	1.4	6.71

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

Method:

FCC §2.1049, FCC §2.1051, §22.917(a), FCC §24.238(a)
Out of Band Emissions: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for the Cellular band and 1 MHz or greater in the PCS band. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

Connect the RF output of the EUT to a spectrum analyzer through appropriate attenuation. Set the EUT to transmit at its maximum power level. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

For Amplifiers, an intermodulation test is also performed. Test all modulations types [TDMA, CDMA, and FM (covers GSM and F1D)].
· CW signal rather than typical signal is acceptable (for FM).
· At maximum drive level, for each modulation: one test with three tones, or two tests (high-, low-band edge) with two tones
· Limit usually is -13dBm conducted.
· Not needed for Single Channel systems.
· Combination of modulation types not needed.

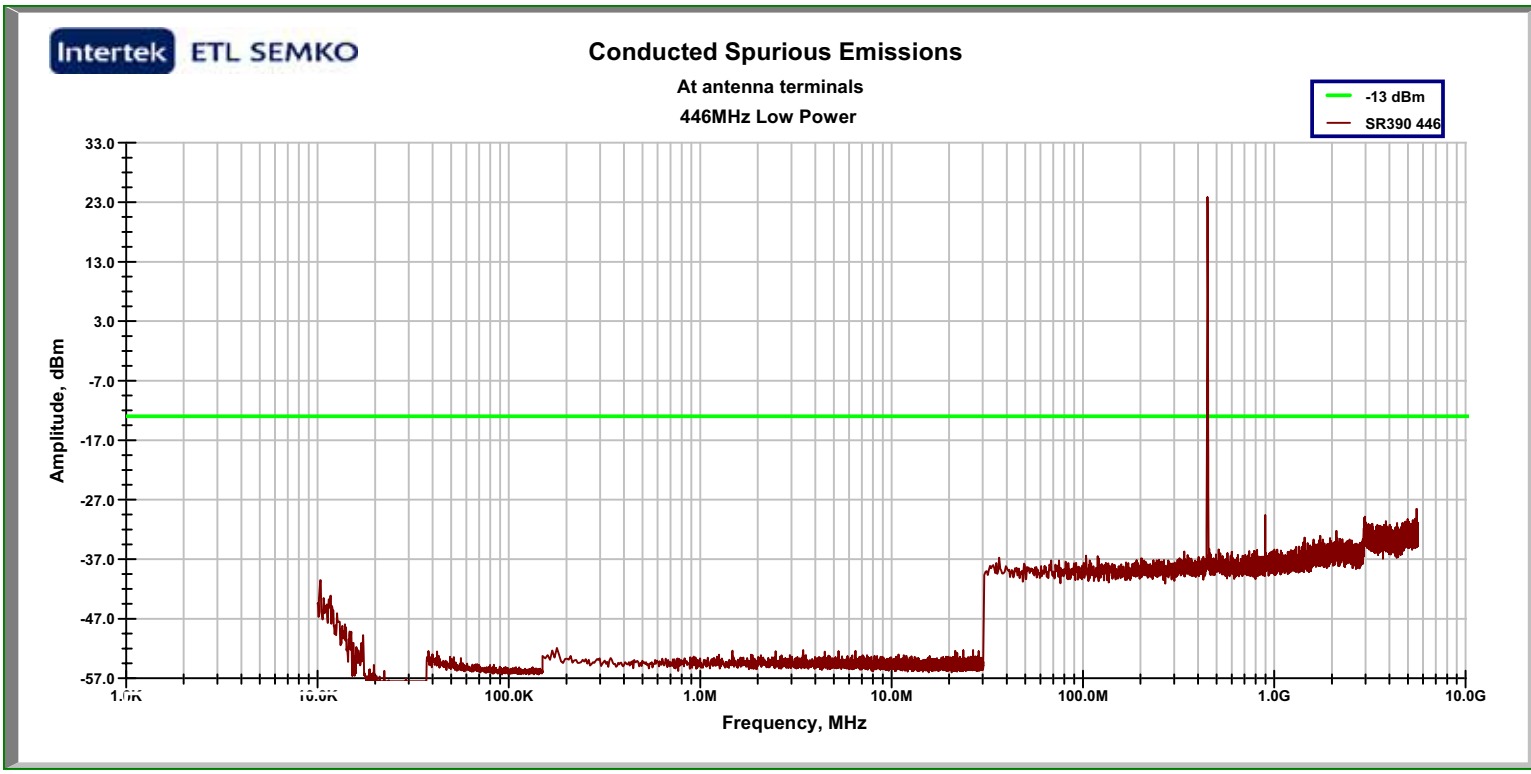
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 03 dB	Weinschel Corp	2	200003	07/18/2006	07/18/2007
Attenuator, 20 dB	Weinschel Corp	2	200008	07/18/2006	07/18/2007
Modulation Analyzer	Hewlett Packard	8901A	213050	12/12/2005	12/12/2006
Spectrum Analyzer	Hewlett Packard	8595E	213060	03/06/2006	03/06/2007

Results: The sample tested was found to Comply.

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

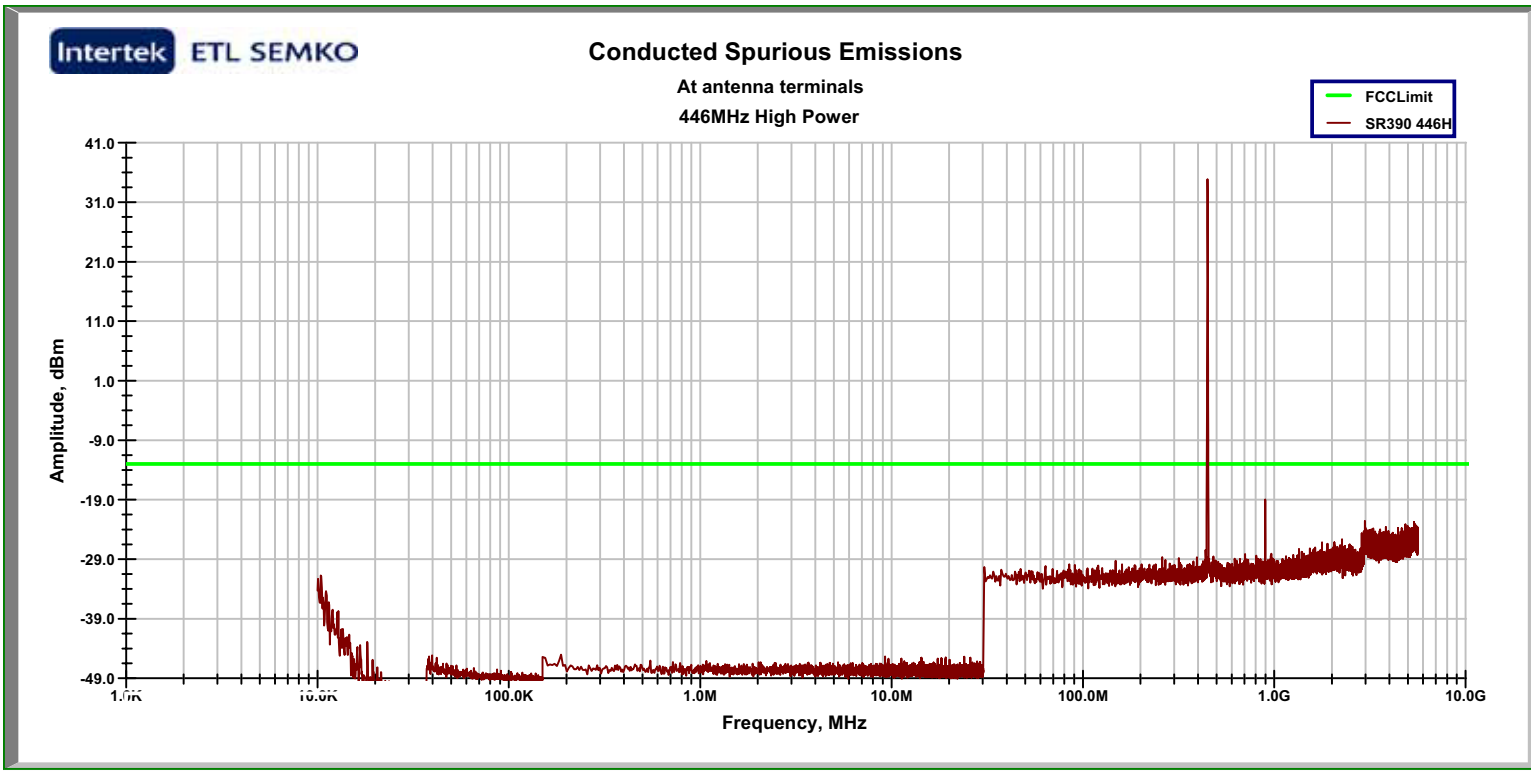
Photos:



Spurious Emissions - Low Channel, Low Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

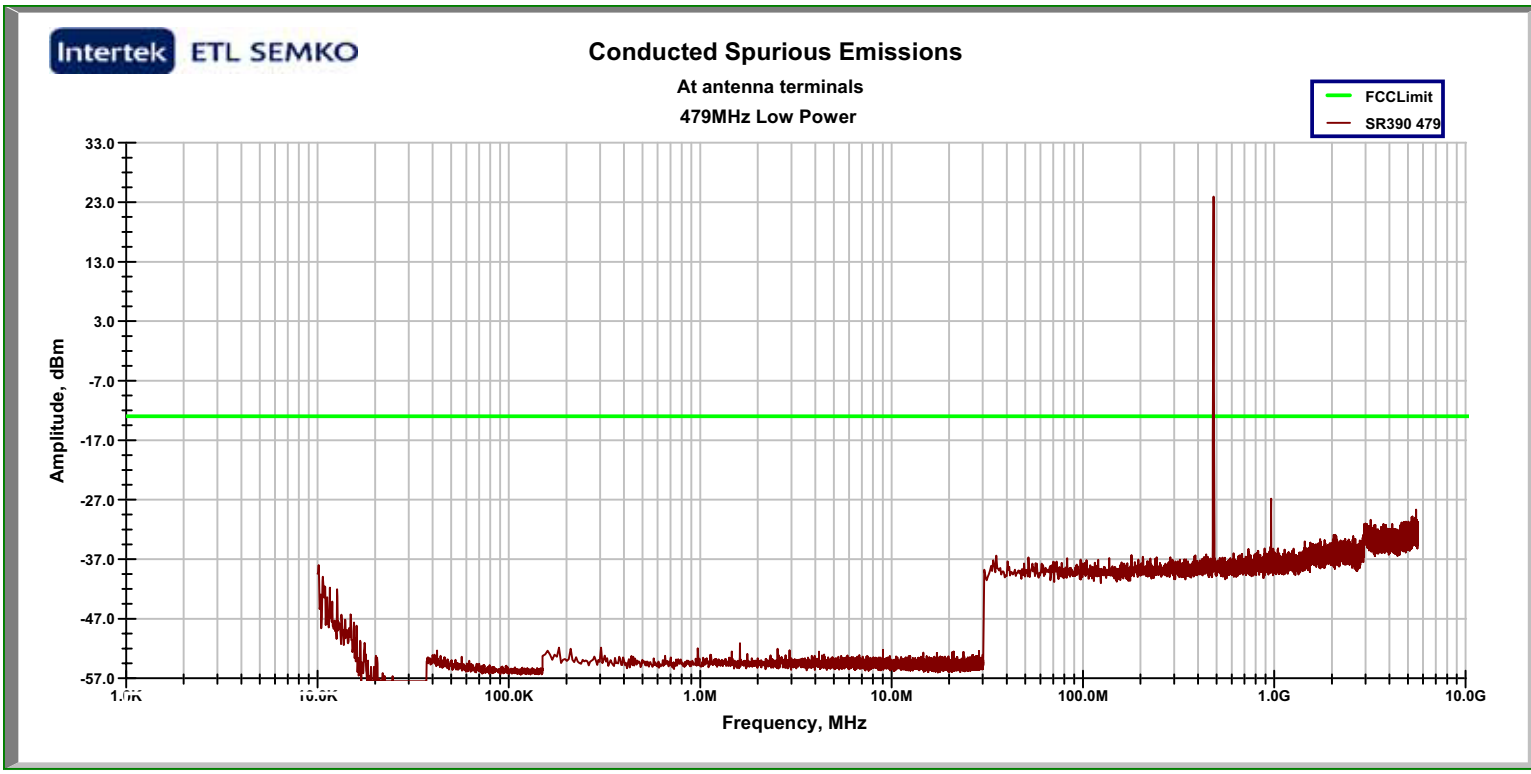
Photos:



Spurious Emissions - Low Channel, High Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

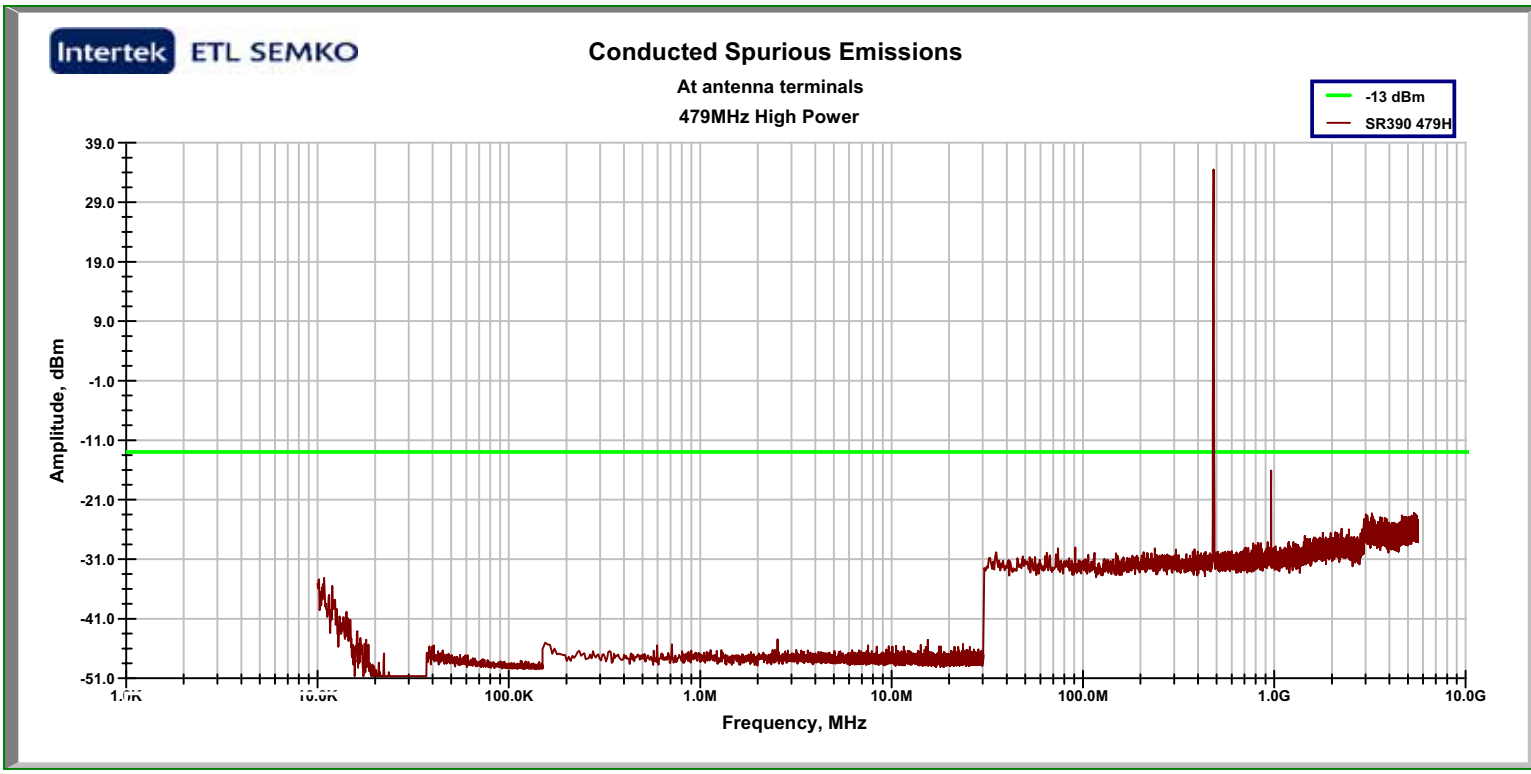
Photos:



Spurious Emissions - Mid Channel, Low Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

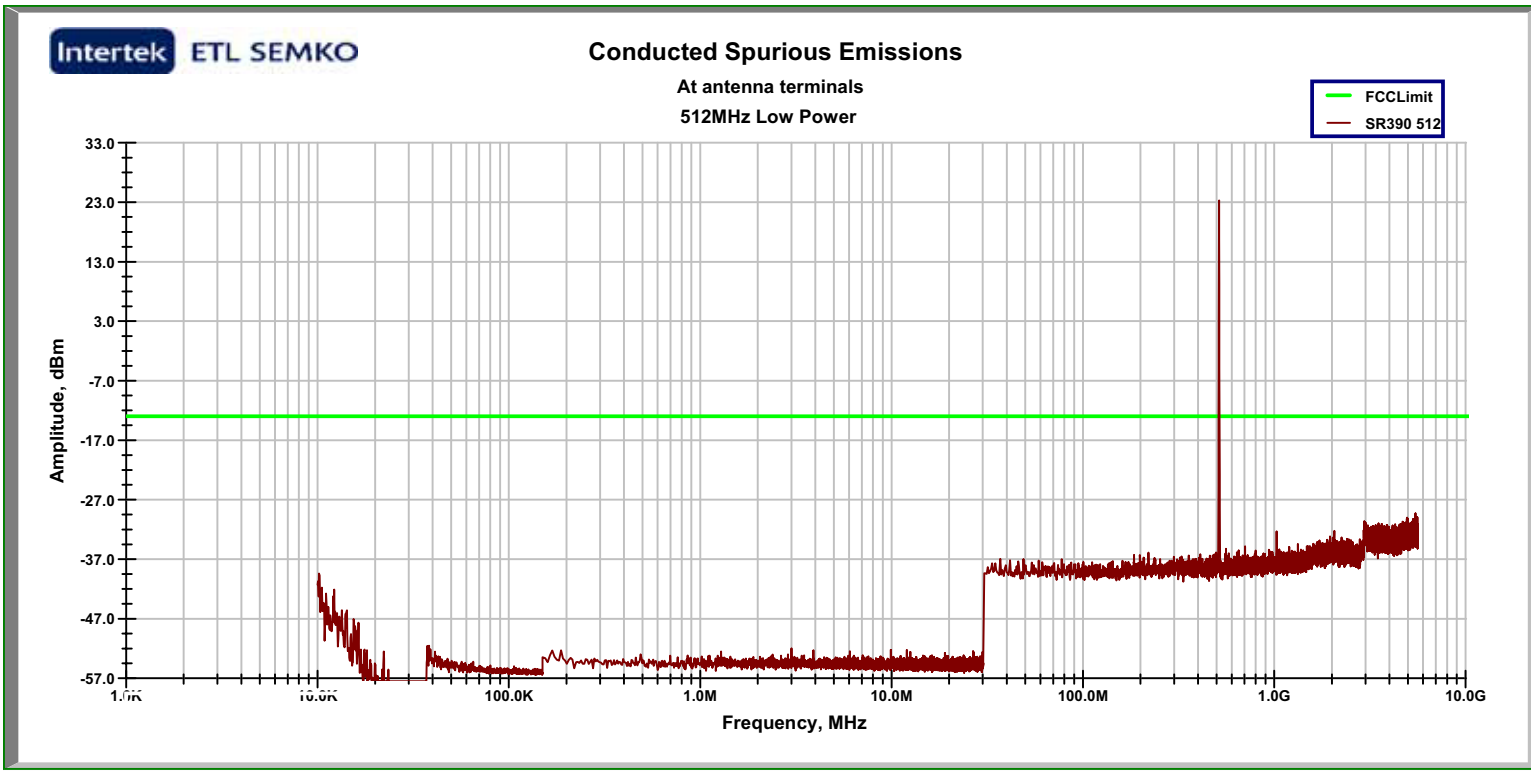
Photos:



Spurious Emissions - Mid Channel, High Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

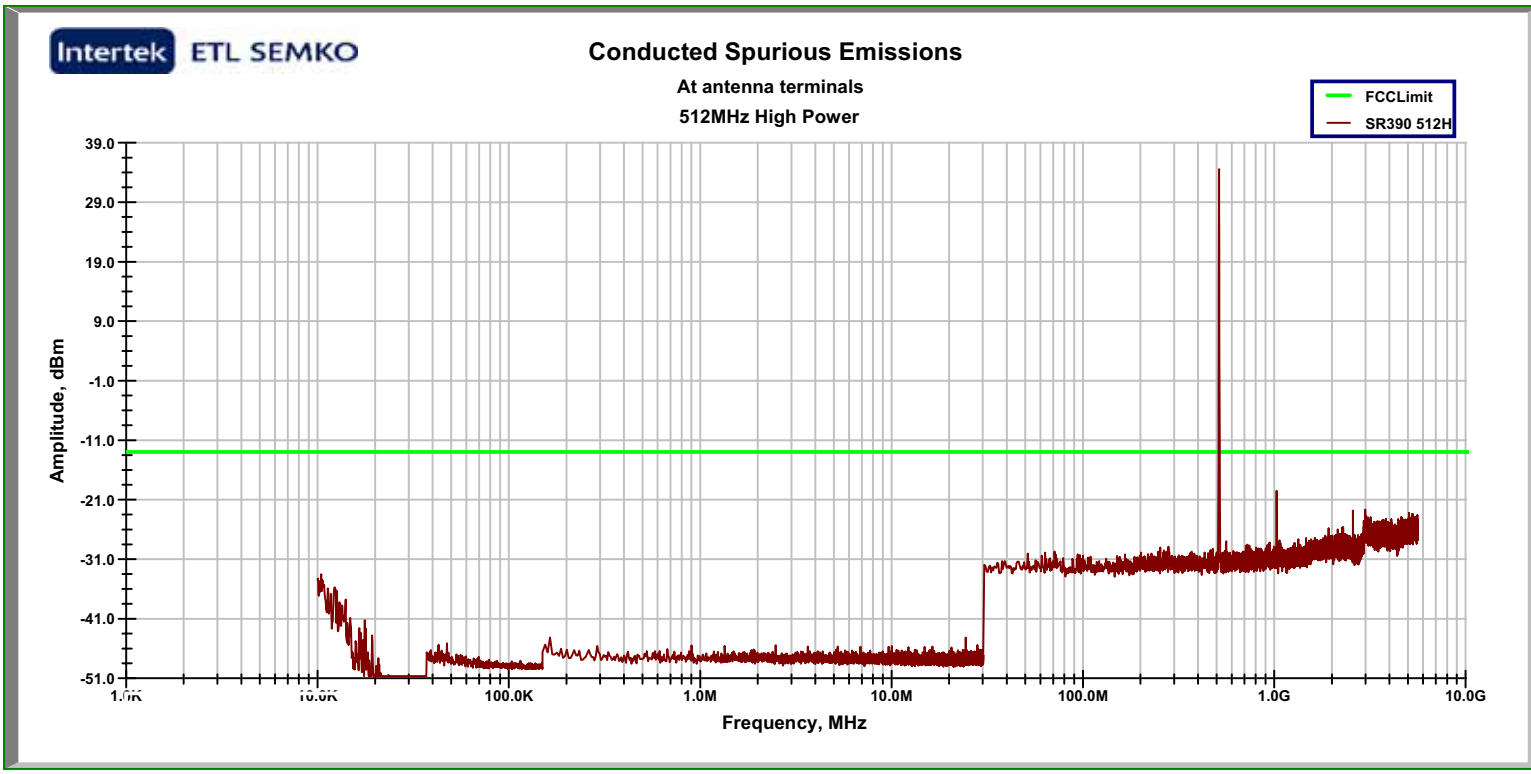
Photos:



Spurious Emissions - High Channel, Low Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

Photos:



Spurious Emissions - High Channel, High Power

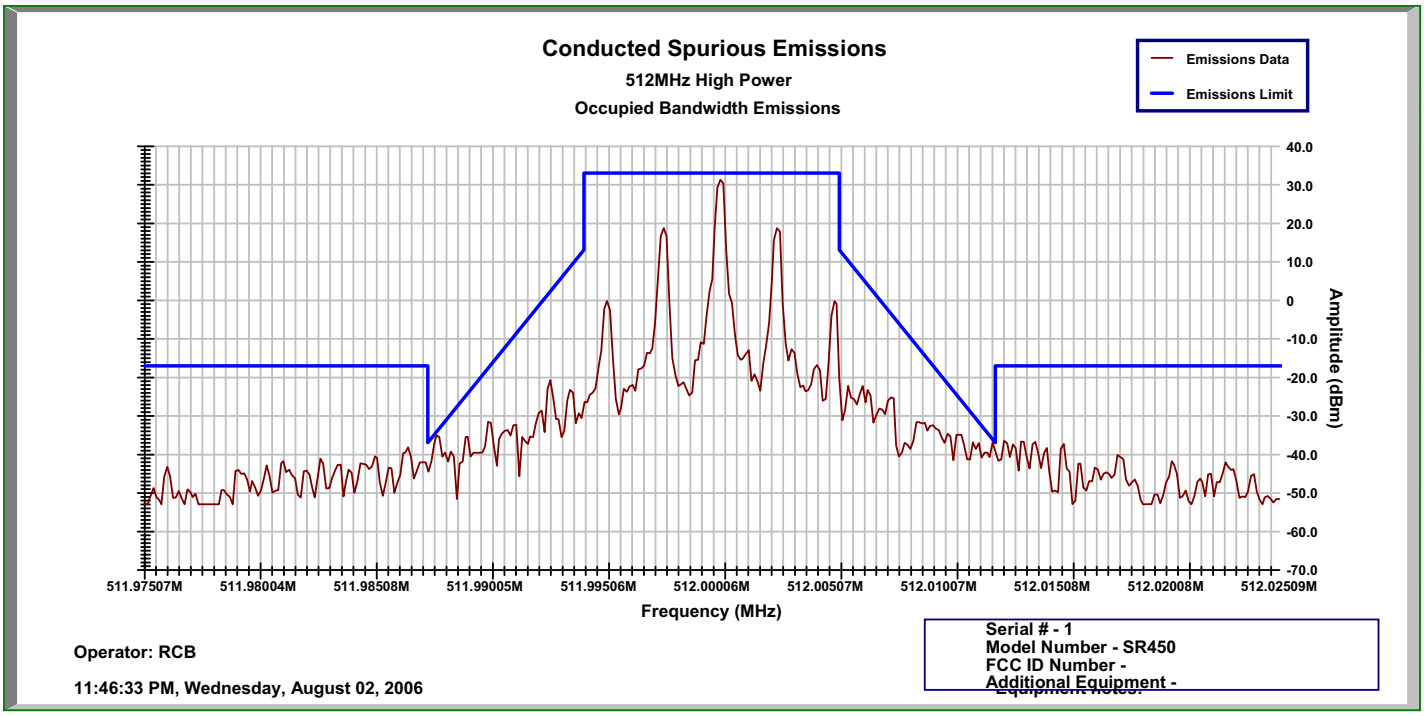
11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

Photos:

Conducted Spurious Emissions

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

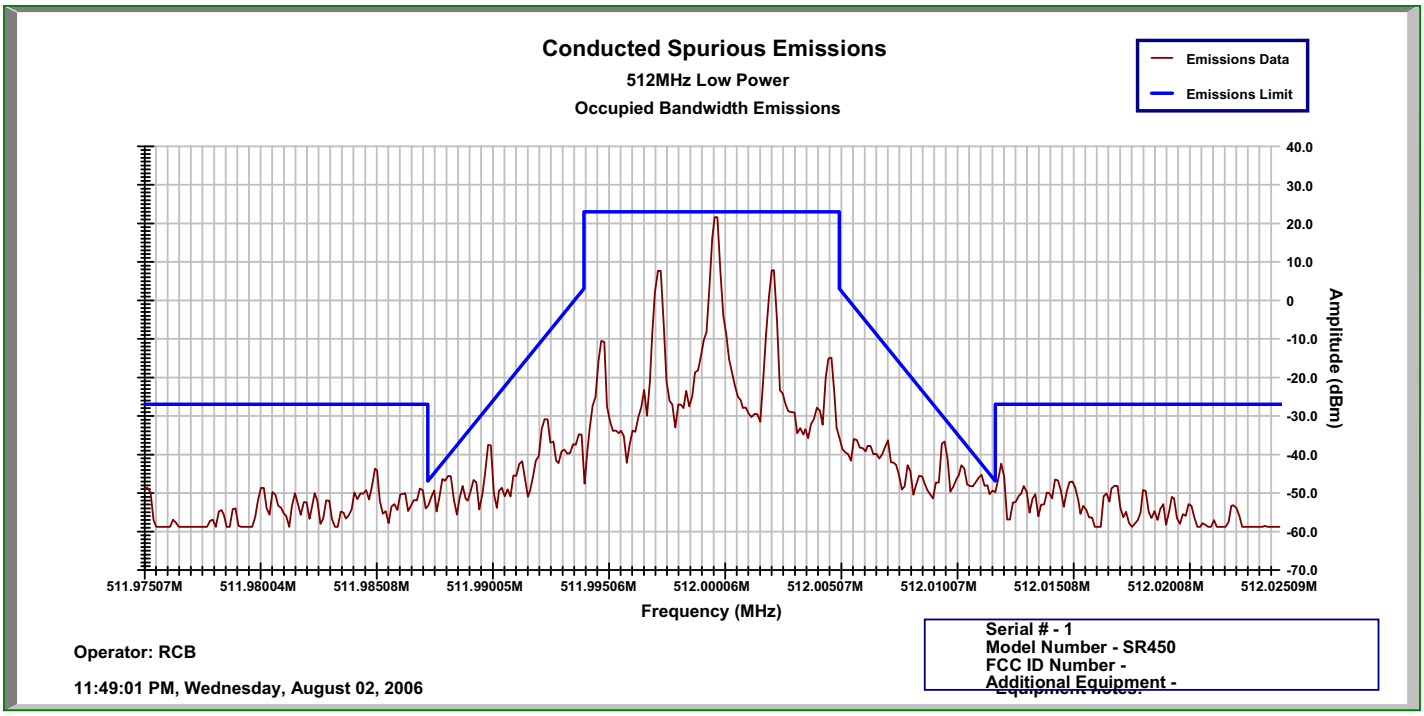
Plots:



Emission Mask - High Channel, High Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

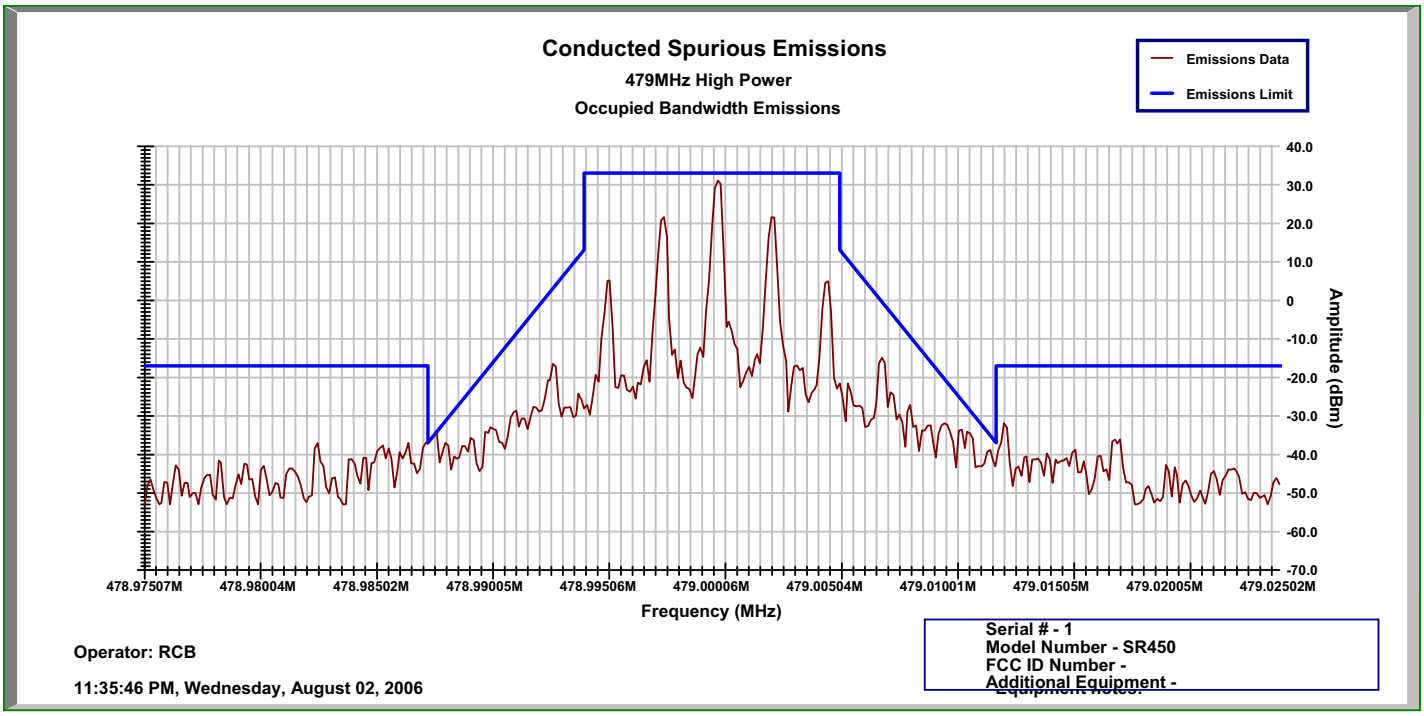
Plots:



Emission Mask - High Channel, Low Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

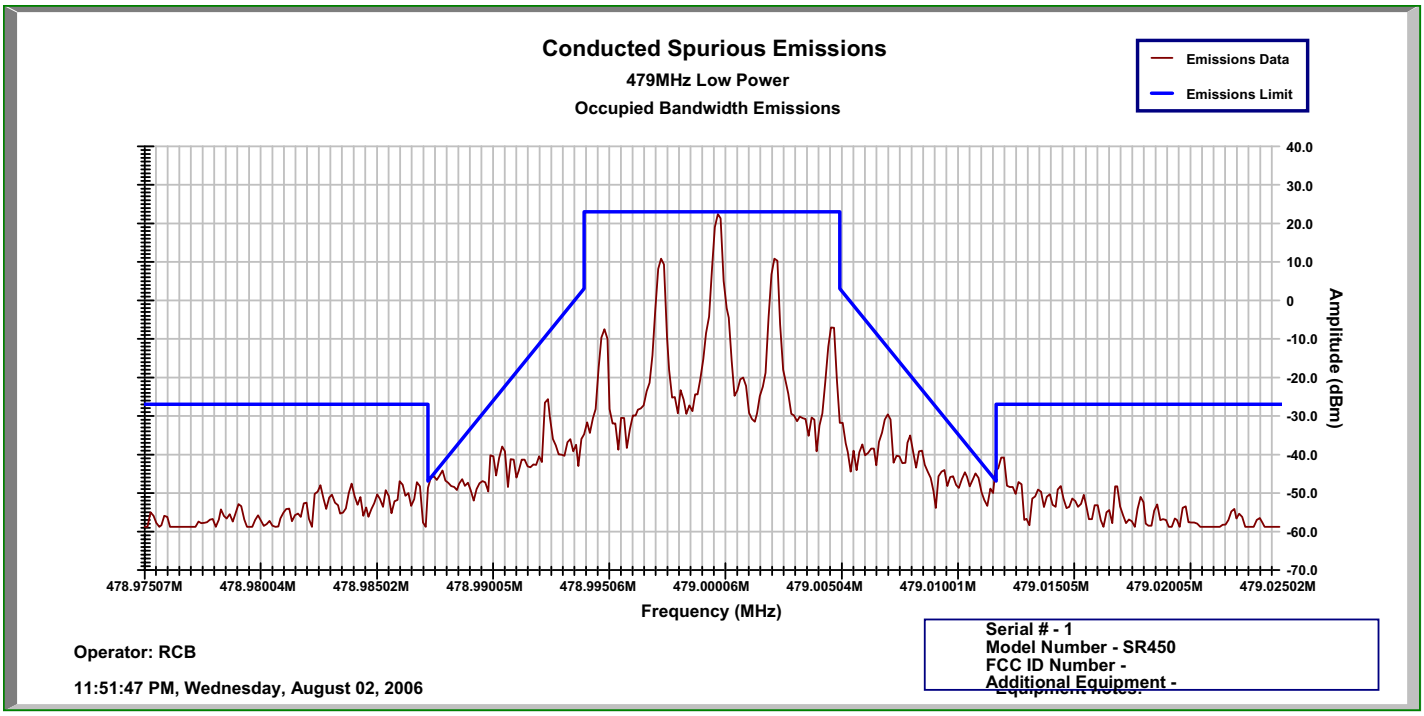
Plots:



Emission Mask - Mid Channel, High Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

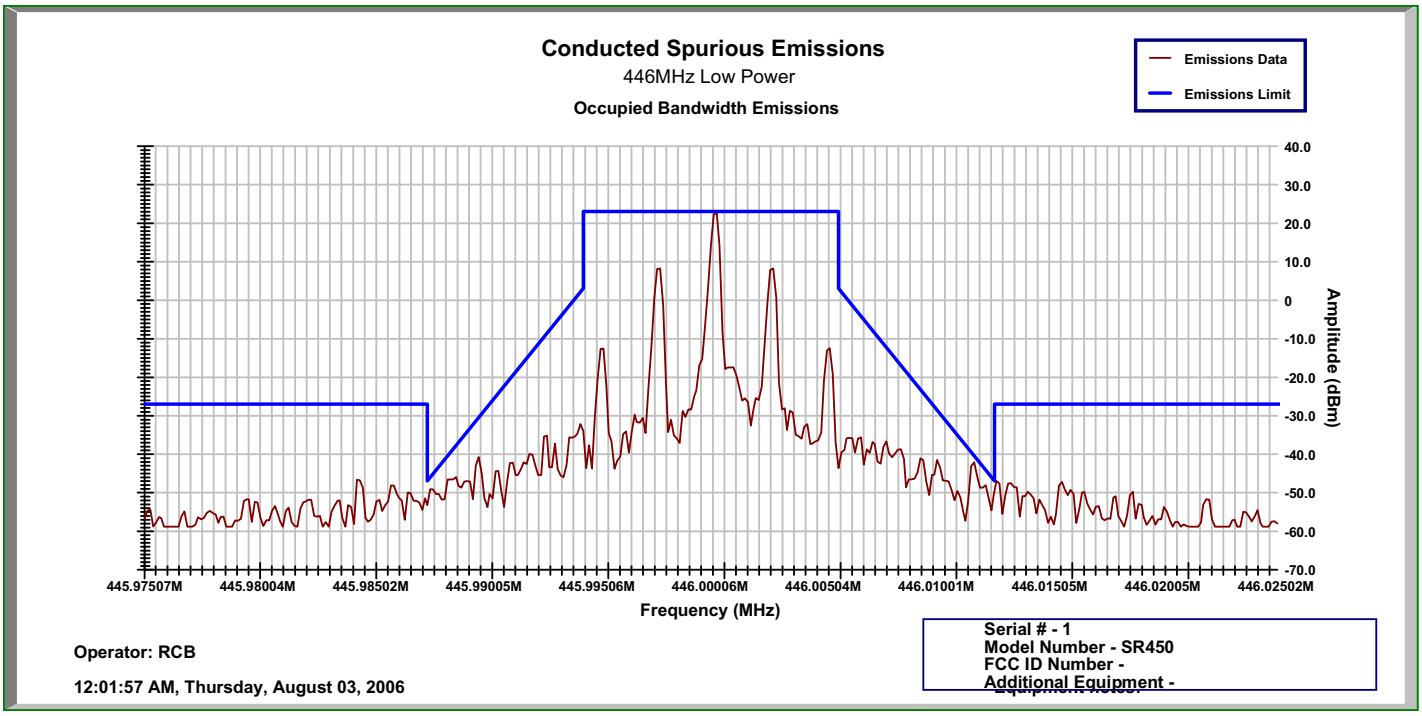
Plots:



Emission Mask - Mid Channel, Low Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

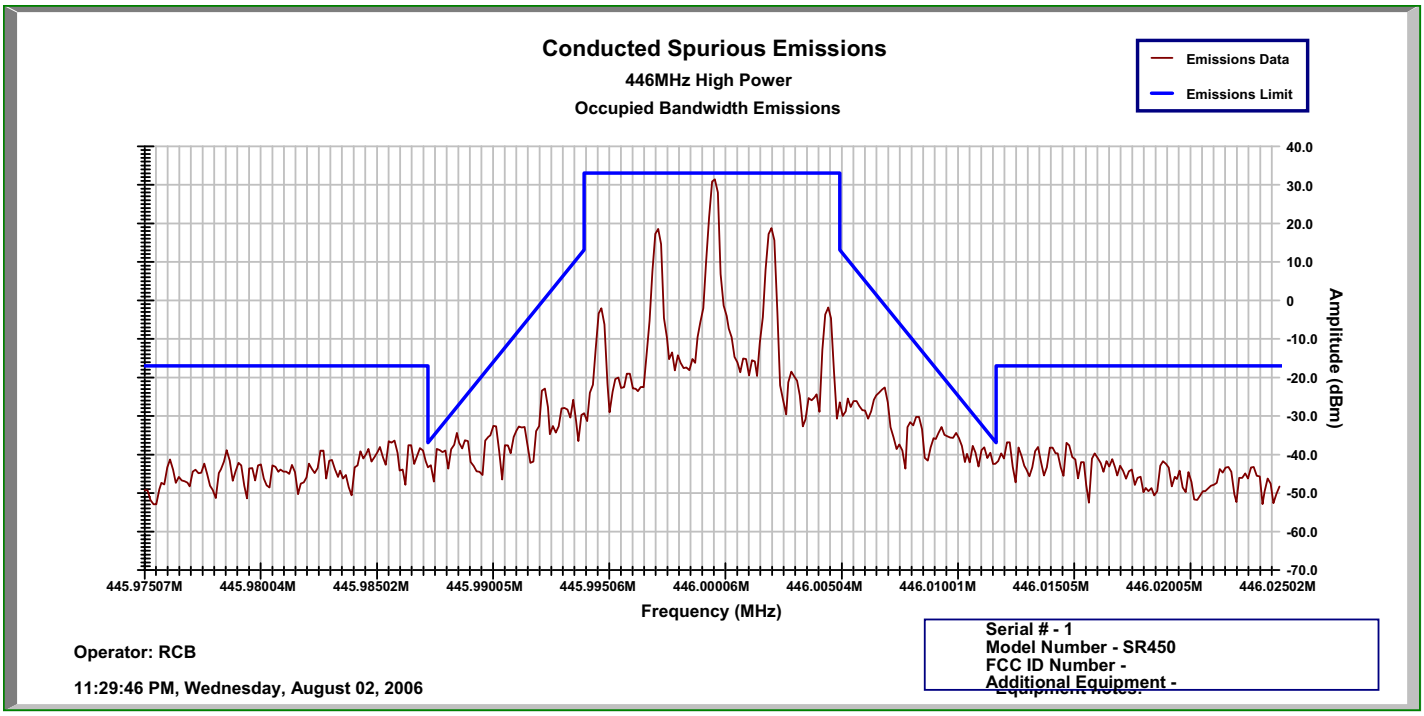
Plots:



Emission Mask - Low Channel, Low Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

Plots:



Emission Mask - Low Channel, High Power

11.0 Spurious emissions at antenna terminals (FCC Part 2.1051)

Data:

Mode	Frequency MHz	RBW/VBW	Peak EUT Emission dBm	Limit dBm	Margin dB
TX 446	892.0026	100 kHz	-23.4	-13	-10.4
TX 479	977.9991	100 kHz	-22.04	-13	-9.04
TX 512	1024.002	100 kHz	-23.4	-13	-10.4

12.0 Field strength of spurious radiation (FCC Part 2.1053)

Method:

Applies to the following Standards:
TIA-603-C (land mobile)
FCC 47 CFR Part 90 (land mobile)
RSS-119 (land mobile/fixed)

PROCEDURE
A) Connect the equipment as illustrated. Place the transmitter to be tested on the turntable in the test site, in its normal operating position. If the transmitter is intended to be hand held, the testing must be repeated with the transmitter in three orthogonal orientations.
B) Attach a non-radiating standard load to the antenna port, using the shortest possible interconnecting shielded cable. For devices with integral, antennas, run the test with the integral antenna operating.
C) Select the larger test distance consistent with the site noise floor; use 10m if possible, 3m if ambient noise requires a shorter distance.
D) Typical spectrum analyzer settings are given below. Refer to the table above, and the specific standard, for correct settings.
1) RBW = 10 kHz below 1 GHz, 1 MHz above 1 GHz.
2) VBW = 300 kHz below 1 GHz, 3 MHz above 1 GHz.
3) Sweep speed sufficiently slow to maintain calibration.
4) detector mode = positive peak.
E) Place the test antenna in its vertical polarization position; use an attenuator with 6 - 10 dB loss (A) as a matching pad between the test antenna and its cable.
F) The spectrum is to be scanned from the lowest RF frequency generated in the equipment to the 10th harmonic of the carrier, excepting the occupied bandwidth. Specific standards may require a different maximum frequency.
G) For each spurious emission detected, raise and lower the test antenna from 1 to 4m with the transmitter facing the test antenna, and record the highest received signal from the transmitter in dBmR. Rotate the turntable through 360 degrees to find the maximum emission value at that frequency.
H) Rotate the test antenna to its horizontal polarization position. Repeat steps g) and h).
I) Replace the transmitter under test with a substitution antenna whose gain above that of a half-wave dipole is known to be G(dBd). Refer to the illustration below.
J) Place the center of the substitution antenna at the same location on the table as the transmitter under test, using vertical polarization for both substitution and test antennas. Connect the substitution antenna to the signal generator, using a cable with known signal loss LC. Use an attenuator with loss S as a matching pad between the substitution antenna and its cable.
K) Raise the test antenna from 1m to 4m to maximize the analyzer display from the substitution antenna. At the maximum display value for each spurious frequency, adjust the signal level dBmT so that the spectrum analyzer displays the maximum signal observed in steps g) - h) above.
L) Calculate the output power of the transmitter in ERP according to:
spurious power in (dBm) = dBmT - LC - S + dBd
M) Repeat steps k) - l) for both antennas horizontally polarized. Record the spurious power separately for the vertical and horizontal polarizations.

NOTE: For FCC purposes, emissions > 20 dB below the regulatory spurious limit do not have to be determined by the substitution method. The regulatory limit for many licensed transmitters is -13 dBm (50 ?W) or 84.4 dBuV/m at 3m.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

+/- 3.85 dB

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Bilog (20MHz to 2GHz)	Chase	CBL6112B	211386	08/31/2005	08/31/2006
Antenna, Horn, 0.7 - 18 GHz	A.H. Systems	SAS-200/571	213058a	02/27/2006	02/27/2007
Antenna, Horn, 1-18 GHz	EMCO	3115	213061	03/28/2006	03/28/2007
Antenna, Roberts Tunable Dipole (set)	Compliance Design	A100	213157	01/05/2006	01/05/2007
Cable E01 (Formerly PE7000N-N2 or N2)	Pasternack	RG214/U	E01	05/11/2006	05/11/2007
Cable E05 (Formerly HS 1500 N-N)	Huber-Suhner	Sucoflex 104PEA	E05	05/11/2006	05/11/2007
Cable E06 (Formerly HS 1500 N-SMA)	Huber-Suhner	Sucoflex 104PEA	E06 211268	05/11/2006	05/11/2007
Cable E11 (Formerly HS 7000 N-SMA)	Huber-Suhner	Sucoflex 104PEA	E11 211266	05/11/2006	05/11/2007
Cable, 18 GHz, N, 394 inches	Megaphase	G919-NKNK-394	MP3	05/11/2006	05/11/2007
EMI Receiver	Hewlett Packard	8546A	211505	02/13/2006	02/13/2007
EMI Receiver, Preselector section	Hewlett Packard	85460A	211506	02/13/2006	02/13/2007
High Pass Filter, 1 GHz	Filtek	HP12/1000-5AB	213156a	03/06/2006	03/06/2007
Preamplifier, 10 MHz to 2000 MHz, 27 dB gain	Mini-Circuits	ZKL-2	200074	01/24/2006	01/24/2007
Preamplifier, 1-26 GHz	Hewlett Packard	8449B	213191	05/04/2006	05/04/2007
Signal Generator / Sweeper (20 GHz)	Hewlett Packard	83620B	213166	04/12/2006	04/12/2007

12.0 Field strength of spurious radiation (FCC Part 2.1053)

Results: The sample tested was found to Comply.

Photos:

Radiated Spurious Emissions - EUT Front Setup

12.0 Field strength of spurious radiation (FCC Part 2.1053)

Photos:

Radiated Spurious Emissions - EUT Rear Setup

12.0 Field strength of spurious radiation (FCC Part 2.1053)

Photos:

Radiated Spurious Emissions - Substitution Method

12.0 Field strength of spurious radiation (FCC Part 2.1053)

Data:

Client: Temco
Model Number: SR450
Project Number: 3099245
Tested By: RCB
Date: 07-27-2006
Frequency Range (MHz): 1000-5500
Input power: 9Vdc

Receiver: HP 8546A
Antenna: AH Horn SAS200 571
Antenna: Dipole
Cables: E20
Limit: -13dBm
Test Distance (m): 3
Modifications for compliance (y/n): No

A	B	D	E	F	G	H	I
Ant. Pol. (V/H)	Frequency MHz	Net dBm	Limit dBm	Margin dB	Net dBm	Limit dBm	Margin dB
Low Channel, Low Power					Low Channel, High Power		
V	892.000	-33.4	-13.0	-20.4	-31.6	-13.0	-18.6
V	1338.000	-32.7	-13.0	-19.7	-31.5	-13.0	-18.5
V	1784.000	-30.4	-13.0	-17.4	-29.6	-13.0	-16.6
V	2230.000	-31.2	-13.0	-18.2	-30.4	-13.0	-17.4
V	2676.000	-33.1	-13.0	-20.1	-33.1	-13.0	-20.1
V	3122.000	-33.6	-13.0	-20.6	-33.3	-13.0	-20.3
V	3568.000	-29.9	-13.0	-16.9	-29.5	-13.0	-16.5
H	892.000	-32.0	-13.0	-19.0	-30.7	-13.0	-17.7
H	1338.000	-32.3	-13.0	-19.3	-31.2	-13.0	-18.2
H	1784.000	-30.2	-13.0	-17.2	-29.8	-13.0	-16.8
H	2230.000	-32.1	-13.0	-19.1	-33.5	-13.0	-20.5
H	2676.000	-33.9	-13.0	-20.9	-33.2	-13.0	-20.2
H	3122.000	-35.2	-13.0	-22.2	-34.0	-13.0	-21.0
H	3568.000	-32.2	-13.0	-19.2	-31.3	-13.0	-18.3
Mid Channel, Low Power					Mid Channel, High Power		
V	958.000	-33.6	-13.0	-20.6	-30.5	-13.0	-17.5
V	1437.000	-31.7	-13.0	-18.7	-30.2	-13.0	-17.2
V	1916.000	-31.5	-13.0	-18.5	-32.4	-13.0	-19.4
V	2395.000	-32.4	-13.0	-19.4	-31.1	-13.0	-18.1
V	2874.000	-32.5	-13.0	-19.5	-30.2	-13.0	-17.2
V	3353.000	-33.2	-13.0	-20.2	-31.2	-13.0	-18.2
V	3832.000	-29.0	-13.0	-16.0	-27.0	-13.0	-14.0
H	958.000	-33.0	-13.0	-20.0	-30.6	-13.0	-17.6
H	1437.000	-30.7	-13.0	-17.7	-30.8	-13.0	-17.8
H	1916.000	-33.1	-13.0	-20.1	-33.9	-13.0	-20.9
H	2395.000	-33.2	-13.0	-20.2	-31.3	-13.0	-18.3
H	2874.000	-32.7	-13.0	-19.7	-31.0	-13.0	-18.0
H	3353.000	-33.5	-13.0	-20.5	-32.9	-13.0	-19.9
H	3832.000	-29.8	-13.0	-16.8	-28.6	-13.0	-15.6
High Channel, Low Power					High Channel, High Power		
V	1024.000	-31.5	-13.0	-18.5	-29.8	-13.0	-16.8
V	1536.000	-32.5	-13.0	-19.5	-30.8	-13.0	-17.8
V	2048.000	-32.7	-13.0	-19.7	-33.3	-13.0	-20.3
V	2560.000	-32.1	-13.0	-19.1	-30.0	-13.0	-17.0
V	3072.000	-32.1	-13.0	-19.1	-31.7	-13.0	-18.7
V	3584.000	-31.5	-13.0	-18.5	-29.0	-13.0	-16.0
V	4096.000	-29.6	-13.0	-16.6	-28.2	-13.0	-15.2
H	1024.000	-30.9	-13.0	-17.9	-30.3	-13.0	-17.3
H	1536.000	-31.4	-13.0	-18.4	-31.4	-13.0	-18.4
H	2048.000	-33.5	-13.0	-20.5	-32.8	-13.0	-19.8
H	2560.000	-34.6	-13.0	-21.6	-32.4	-13.0	-19.4
H	3072.000	-33.7	-13.0	-20.7	-31.4	-13.0	-18.4
H	3584.000	-32.1	-13.0	-19.1	-29.6	-13.0	-16.6
H	4096.000	-30.9	-13.0	-17.9	-29.2	-13.0	-16.2

13.0 Measurement of frequency stability (Frequency Stability)

Method:

Measure in accordance with Intertek Test Procedure "Procedure Frequency Stability."

Stability with Respect to Ambient Temperature
(1) Place the de-energized EUT in the environmental temperature test chamber. For devices that are normally operated continuously, the EUT may be energized while inside the test chamber. For devices that have oscillator heaters, energize only the heater circuit while the EUT is inside the chamber. Supply the EUT with nominal AC voltage or install a new or fully charged battery in the EUT. An antenna should be connected to the antenna output connector of the EUT if possible. Use of a dummy load could affect the output frequency of the EUT. If the EUT is equipped with or uses an adjustable-length antenna, it should be fully extended.
(2) Turn the EUT on and couple its output to a frequency counter or other frequency-measuring device of sufficient accuracy, considering the frequency tolerance with which the EUT must comply. Tune the EUT to one of the number of the test frequencies. Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
(3) Turn the EUT off and set the environmental chamber to the highest temperature specified by the procuring or regulatory agency. For devices that are normally operated continuously, the EUT may be energized while inside the test chamber. For devices that have oscillator heaters, energize only the heater circuit while the EUT is inside the chamber.
(4) Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and measure the EUT operating frequency at startup, and two, five, and ten minutes after startup. Four measurements in total are made.
(5) If the EUT operates only at one operating frequency, proceed to step 6; otherwise, successively tune the EUT to each of the additional operating frequencies required and repeat step 4.
(6) Set the temperature chamber to the lowest temperature specified by the procuring or regulatory agency. Be sure to allow the environmental chamber temperature to stabilize before performing these measurements.
(7) Repeat Steps 4 and 5
(8) Prepare the final test report in accordance with clause 10 of ANSI C63.4.

Stability with Respect to Input Voltage
(1) This test may be made at ambient room temperature if it is within the range +15° to +25 °C; otherwise, an environmental temperature test chamber set for a temperature of +20 °C shall be used. If possible, connect an antenna to the output terminals of the EUT because use of a dummy load could affect the output frequency of the EUT. If the EUT is equipped with or uses an adjustable-length antenna, it should be fully extended.
(2) Supply the EUT with nominal AC voltage or install a new or fully charged battery in the EUT. Turn on the EUT and couple its output to a frequency counter.
(3) Tune the EUT to any one of the test frequencies. Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Turn the EUT off and place it inside an environmental chamber. Allow sufficient time (approximately 30 min) for the chamber to stabilize at +20 °C before proceeding. Turn the EUT on and measure the EUT operating frequency at startup, and two, five, and ten minutes after startup. Four measurements in total are made.
(4) If measurements on only one operating frequency is required, proceed to step 5; otherwise, successively tune the EUT to each of the additional operating frequencies and repeat step 3.
(5) If the EUT is powered from the AC powerlines, supply it with 85% nominal AC voltage and repeat steps 3 and 4 before proceeding to step 6. If the EUT is battery powered, proceed to step 7.
(6) If the EUT is powered from the AC powerlines, supply it with 115% nominal AC voltage and repeat steps 3 and 4 before proceeding to step 7.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 03 dB	Weinschel Corp	2	200003	07/18/2006	07/18/2007
Attenuator, 20 dB	Weinschel Corp	2	200008	07/18/2006	07/18/2007
Cable, 7m Ferrite (Formerly N8)	Belden	RG-58	E13	05/12/2006	05/12/2007
ENVIRONMENTAL CHAMBER	Thermotron	SM32C	013848	04/17/2006	04/17/2007
Modulation Analyzer	Hewlett Packard	8901A	213050	12/12/2005	12/12/2006
Power Supply	Tektronix	PS2510G	211678	04/17/2006	04/17/2007
Spectrum Analyzer	Hewlett Packard	8595E	213060	03/06/2006	03/06/2007

Results: The sample tested was found to Comply.

13.0 Measurement of frequency stability (Frequency Stability)

Data:

Frequency Stability Measurements Temco SR450
Limit: 2.50ppm = 1180Hz
Worst Case: 0.67ppm = 320Hz

Frequency measurements in 478MHz
Nominal Voltage: 9Vdc

>1 min	Voltage (percentage of nominal)		
Temp. (°C)	85%	100%	115%
60			
50	0.99979	0.99979	0.99979
40		0.99988	
30		0.99996	
20	0.99999	0.99999	0.99999
10		0.99996	
0		0.99992	
-10		0.99987	
-20		0.99981	
-30	0.9997	0.9997	0.9997

Frequency measurements in 478MHz
Nominal Voltage: 9Vdc

2 Min	Voltage (percentage of nominal)		
Temp. (°C)	85%	100%	115%
60			
50	0.99977	0.99977	0.99977
40		0.99985	
30		0.99996	
20	0.99999	0.99999	0.99999
10		0.99996	
0		0.99992	
-10		0.99986	
-20		0.99981	
-30	0.99968	0.99968	0.99968

Frequency measurements in 478MHz
Nominal Voltage: 9Vdc

5 Min	Voltage (percentage of nominal)		
Temp. (°C)	85%	100%	115%
60			
50	0.9997	0.9997	0.9997
40		0.99987	
30		0.99996	
20	0.99999	0.99999	0.99999
10		0.99996	
0		0.99989	
-10		0.99986	
-20		0.99979	
-30	0.99968	0.99968	0.99968

Frequency measurements in 478MHz
Nominal Voltage: 9Vdc

10 Min	Voltage (percentage of nominal)		
Temp. (°C)	85%	100%	115%
60			
50	0.9997	0.9997	0.9997
40		0.99985	
30		0.99996	
20	0.99999	0.99999	0.99999
10		0.99995	
0		0.99988	
-10		0.99986	
-20		0.99979	
-30	0.99968	0.99968	0.99968

14.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

Method:

Measure in accordance with Intertek Test Procedure "TFB-1 Transient frequency behavior" or "TFB-2 Transient frequency behavior."

Applies to the following Standards:
TIA-603-C (land mobile)
FCC 47 CFR Part 90 (land mobile)
RSS-119 (land mobile and fixed)

PROCEDURE
A) Connect the equipment as illustrated.
B) Connect the test receiver FM output (rear panel) to the vertical input channel of the storage oscilloscope. Connect the output of the RF peak detector to the external trigger on the storage oscilloscope. Connect the output of the RF combiner to the RF power meter.
C) Set the test receiver to measure FM deviation with the audio bandwidth set at < 50 Hz to >15,000 Hz, and tune the RF frequency to the transmitter assigned frequency.
D) Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at +/- 25 kHz deviation (using the test receiver to adjust the deviation) and set its output level to 100 dBm.
E) Key the transmitter.
F) Supply sufficient attenuation via the RF attenuator to provide an input level to the test receiver that is 40 dB below (or - 10 dBm) the test receiver maximum allowed input power (30 dBm) when the transmitter is operating at its rated power level. Note this power level on the RF power meter.
G) Unkey the transmitter.
G) Adjust the RF level of the signal generator to provide RF power into the RF power meter equal to the level noted in step f). This signal generator RF level shall be maintained throughout the rest of the measurement.
I) Disconnect the RF power meter and connect the output of the RF combiner
network to the input of the test receiver.
J) Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjust the display to continuously view the 1000 Hz tone from the FM output. Adjust the vertical amplitude control of the oscilloscope to display the 1000 Hz at +/- 4 divisions, vertically centered on the display.
K) Adjust the oscilloscope so it will trigger on an increasing magnitude from the RF peak detector at l division from the left side of the display, when the transmitter is turned on. Set the controls to store the display.
L) Reduce the attenuation of the RF attenuator so the input to the RF peak detector and the RF combiner is increased by 30 dB when the transmitter is turned on.
M) Key the transmitter and observe the stored display. The signal at the FM output, due to the change in the ratio of power between the signal generator input power and the transmitter output power will, because of the capture effect of the test receiver, produce a change in display: For the first part of the sweep it will show the 1 kHz test signal. Then once the receiver's demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the l kHz test signal is completely suppressed (including any capture time due to phasing) is considered to be ton. The trace should be maintained within the allowed divisions during the period t1 and t2. Refer to the standard requirements in section 4.0 of this procedure, and to the sample following.
N) During the time from the end of t2 to the beginning of t3 the frequency difference should not exceed the limits in section 4.0 of this procedure. The allowed limit is equal to the transmitter frequency times its regulatory frequency tolerance times ? 4 display divisions divided by 25 kHz. For example, at a transmitter assigned frequency of 500 MHz and a frequency tolerance of 5 ppm, this would be 500 MHz times 5 ppm times ?4 divisions divided by 25 kHz. This equals ± 0.4 divisions in this example. Greater vertical sensitivity may he required to view this accurately.
O) Key the transmitter and observe the stored display. The trace should be maintained within the allowed divisions after the end of t2 and remain within it until the end of the trace.
P) To test the transient frequency behavior during the period t3, the transmitter shall be keyed.
Q) Adjust the oscilloscope trigger controls so it will trigger on a decreasing magnitude from the RF peak detector, at 1 division from the right side of the display, when the transmitter is turned off. Set the controls to store the display. The moment when the 1 kHz test signal starts to rise is considered to provide toff.
R) The transmitter shall he unkeyed.
S) Observe the display. The trace should remain within the allowed divisions during the period t3. Refer to the sample following.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

+/- 5.17%

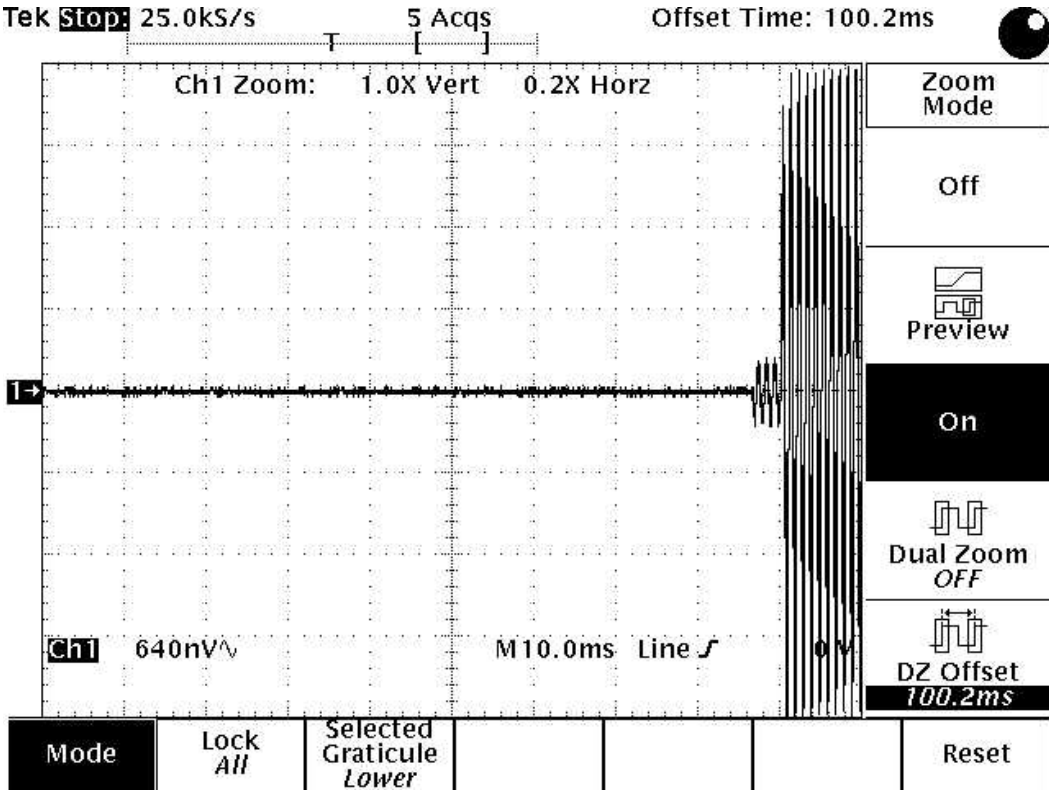
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Digital Real-Time Oscilloscope	Tektronix	TDS680C	213288	06/21/2006	06/21/2007
Modulation Analyzer	Hewlett Packard	8901A	213050	12/12/2005	12/12/2006
Power Splitter, 50-Ohm, DC to 2000 MHz	Mini-Circuits	2FRSC-2050	213157a	10/29/2005	10/29/2006
Signal Generator	Hewlett Packard	8656B	LEX-1016	03/27/2006	03/27/2007

Results: The sample tested was found to Comply.

14.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

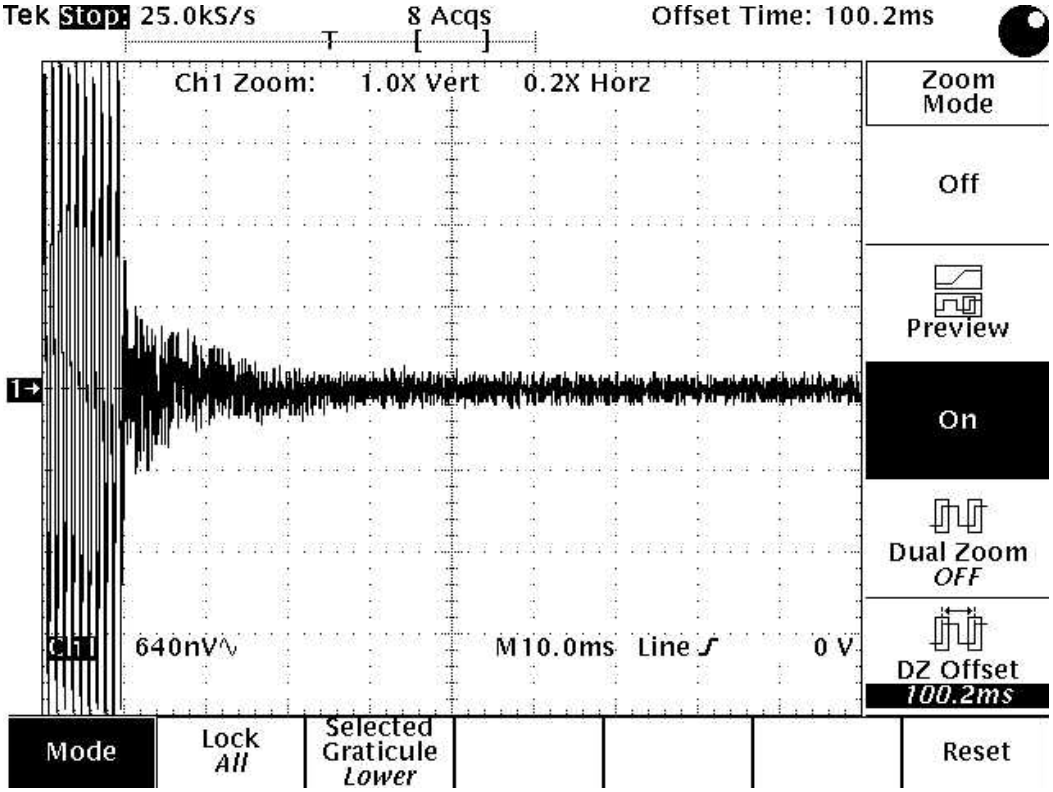
Plots:



Turn Off Transient in High Power

14.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

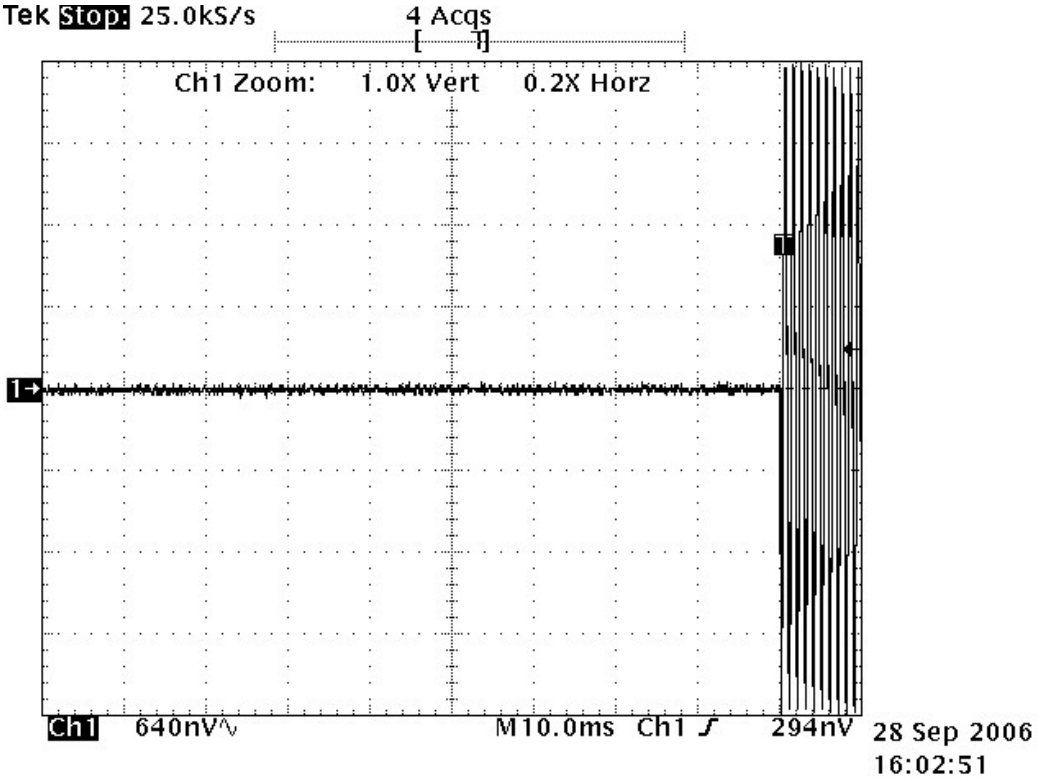
Plots:



Turn On Transient in High Power

14.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

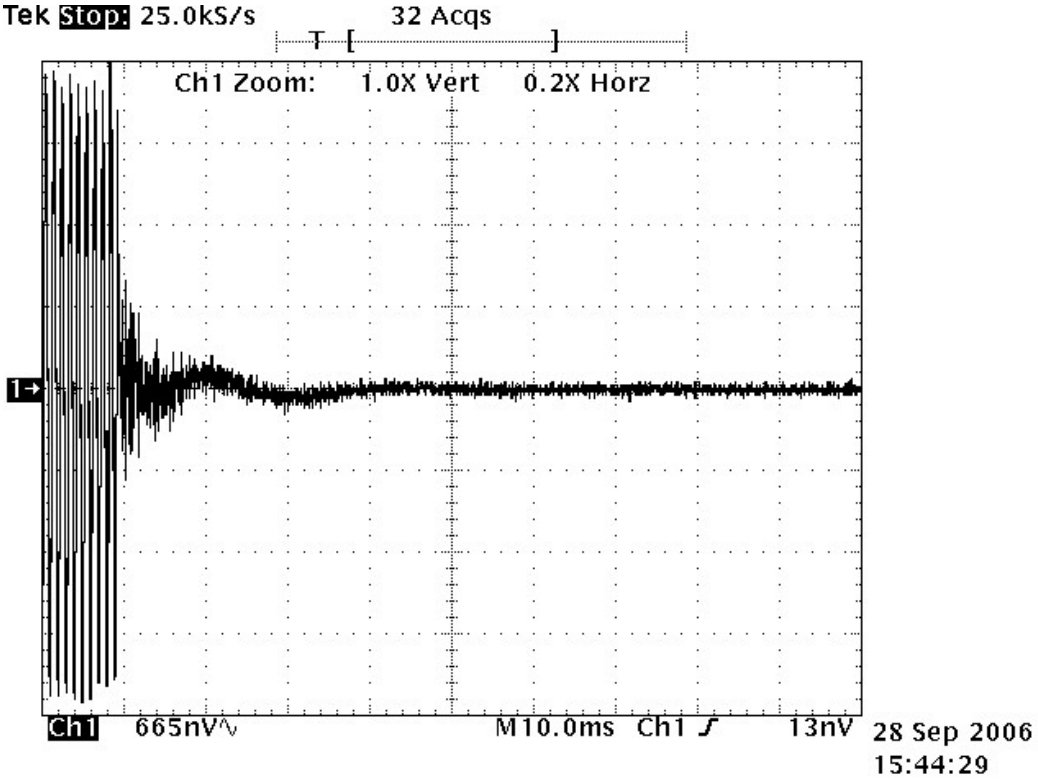
Plots:



Turn Off Transient in Low Power

14.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

Plots:



Turn On Transient in Low Power

14.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

Data: