9 August, 2001

Chris Gustaf
Trango Systems
9939 Via Pasar
San Diego, CA 92126

Dear Mr. Gustaf,

Enclosed is the report for the Data Transceiver, model M5800SB-SU-EXT. Please check it thoroughly for discrepancies This is an official copy of this report complete with the original Acme Testing staff signatures, which should be retained by you as the official record of testing, as it may be required for future verification of compliance. The FCC regulations require that you, as the "responsible party" keep this data until three (3) years after the last date of manufacture or sale of the equipment. Please be aware that our internal controls require us to keep a historical copy of your report on file for three years only, after which time it will be destroyed.

Thank you for your business. We look forward to working with you when you next require testing services.

Yours Sincerely,

Harry H. Hodes
Principal Engineer
President/CEO

The following are samples of what the FCC expects to see displayed prominently in your users manual and/or on your FCC ID label (more information can be found in the CFR 47):

§ 15.19 Labelling requirements.

The following is a sample of the statement that must appear on the FCC ID Label that will be place on your product:

COMPANY NAME
FCC ID:
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For devices that are so small that a label can not be affixed upon the product the FCC states: "When the device is so small or for such use that it is not practicable to place the statement specified in this section on it, the information required by these paragraphs shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. **However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.**

§ 15.21 Information to user.

> The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

PLEASE NOTE: INFORMATION TO THIS EFFECT MUST APPEAR IN THE MANUAL OR THE FCC WILL DENY YOUR APPLICATION FOR EQUIPMENT AUTHORIZATION!!!!

2002 Valley Highway PO Box 3 Acme WA 98220-0003
phone:888 226-3837 fax: 360 595-2722

REPORT OF MEASUREMENTS
PART 15C (15.247) – INTENTIONAL RADIATOR

DEVICE: DATA TRANSCEIVER

MODEL: M5800SB-SU-EXT

MANUFACTURER: TRANGO SYSTEMS

ADDRESS: 9939 VIA PASAR
SAN DIEGO, CA 92126

WORK ORDER: 01-EMC-032801

1. General

1.1 Document History

REVISION	DATE	COMMENTS
-	21 May 2001	Initial Release, Harry H. Hodes

Note: Acme Testing Co. hereby makes the following statements so as to conform with Chapter 10 (Test Reports) Requirement of ANSI C63.4:1992 "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The units described in this report were received at Acme Testing Co.'s facilities on 01 May & 10 July 2001. Testing was performed on the units described in this report on 01, 02 & 03 May, 10, 15, 18 & 23 July 2001.
- The Test Results reported herein apply only to the Units actually tested, and to substantially identical Units.
- This test report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government, or any other foreign government.

1.2 Purpose

The purpose of this report is to demonstrate compliance of the Trango Systems Model M5800SB-SU-EXT Data Transceiver to the FCC regulations for spread spectrum unlicensed devices operating under Section 15.247 of the Code of Federal Regulations Title 47.

A change was made to the chassis and to the power supply circuitry of the EUT. These changes affect the radiation pattern and the conducted disturbance presented to the power distribution network, but not the functionality of the transceiver's internal circuitry. Based on engineering judgment, new testing was performed to determine the Radiated Harmonic signal strengths and levels of AC Power Line Conducted Emissions. This testing ensured that the changes made to the chassis and power supply did not result in a non-compliance of the EUT. This Test Report includes data that was recorded on 21 May 2001 and that was previously documented in Report Number 2001096. The following sections were included from Report Number 2001096: 6 DB Bandwidth, Power Output, Conducted Spurious Emissions, Process Gain, and Peak Power Spectral Density.

1.3 Manufacturer

Company Name:	Trango Systems
Contact:	Chris Gustaf
Street Address:	9939 Via Pasar
City/State/Zip:	San Diego, CA 92126
Telephone:	858 621-2700
Fax:	858 621-2722
Web:	www.trangosys.com

1.4 Test location

Laboratory:	Test Site #1
Street Address:	2002 Valley Highway
Mailing Address:	PO Box 3
City/State/Zip:	Acme WA 98220-0003
Telephone:	888 226-3837
Fax:	360 595-2722
E-mail:	acmetest@acmetesting.com
Web:	www.acmetesting.com

1.5 Accreditations and Listings

Acme Testing Co.'s test facilities are accredited by A2LA for a specific scope of accreditation which includes the tests detailed herein, under Certificate Numbers: 0829-01 (Acme, WA), and 0829-02 (Plummer, ID). Acme Testing Co.'s test facilities that are used to perform radiated and conducted emissions are currently registered with the Federal Communications Commission under registration numbers: 90420 (Acme, WA), and 96502 (Plummer, ID). In addition, Acme Testing Co.'s test facilities are also registered with the Industry Canada under registration numbers: IC3251 (Acme, WA), and IC3618 (Plummer, ID).

2. Test Results Summary

Summary of Test Results
Data Transceiver, Model M5800SB-SU-EXT

Requirement	CFR Section	Test Result
AC Emissions < 48 dBuV	15.207	PASS
6 dB BW > 500 kHz	15.247(a)	PASS
Max Output Power < 1 W	15.247(a)	PASS
Conducted Spurious >-20 dBc	15.247(c)	PASS
Radiated Spurs < Section 15.209 Limits	15.205(b)	PASS
Power Density < 8dBm in 3 kHz BW	15.247(d)	PASS

The signed original of this report, supplied to the client, represents the only "official" copy. Retention of any additional copies (electronic or non-electronic media) is at Acme Testing's discretion to meet internal requirements only. The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) is factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the referenced standards and all applicable Public Notices received prior to the date of testing. Acme Testing assumes responsibility only for the accuracy and completeness of this data as it pertains to the sample tested.

TEST PERFORMED BY:

_____ _____

Andrew K. Pace — Date of Issuance
EMC Engineer

REVIEWED AND APPROVED BY:

_____ _____

Harry H. Hodes — Date of Issuance
President/CEO
Principal EMC Engineer

3. Description of Equipment and Peripherals

3.1 Equipment Under Test (EUT)

Device:	Data Transceiver
Model Number:	M5800SB-SU-EXT
Serial Number:	None
FCC ID:	None
Power:	120 V/60 Hz
Grounding:	None
Size of EUT:	8 in x 3 in x 13 in

3.2 EUT Peripherals and Support Equipment

Device	Manufacturer	Model Number	FCC ID	Serial Number
Junction Box	Trango Systems	None	None	None
Dish Antenna	Trango Systems	None	None	None
Laptop Computer	IBM Corporation	2626-2E9	ANOKAJIPENCP	78-DFNF5 96/12

3.3 The Mode of Operation During Tests

The transceiver was operated in a test configuration. That is, a laptop computer containing test code was connected to the EUT via a serial cable. Depending on the characteristic being tested, the following setting were modified in software:

1. The transceiver could be set to one of three channels, fc = 5736, 5776, or 5836 MHz;
2. Modulation could be turned on or off;
3. The polarization of the transmitted signal could be set to horizontal or vertical;

With those settings in place, the laptop was then used to turn on the transceiver with whatever setting-changes that had been made in place. If modulation was turned on, the laptop was used to transmit packet data to the EUT serially. This packet data was then transmitted by the EUT in the form of a direct sequence spread spectrum signal on the chosen channel and with the chosen polarization.

3.4 Modifications Required for Emissions Compliance

1. None.

3.5 Description of Interface Cables

EUT/Dish Antenna

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	0.76 m	No

EUT/Dish Antenna

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	0.76 m	No

EUT/Junction Box

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	0.6 m	No

EUT/Laptop Computer

Shielded	Unshielded	Flat	Round	Length	Ferrite
No	Yes	Yes	No	1 m	No

ARRANGEMENT OF INTERFACE CABLES: All interface cables were positioned for worst case maximum emissions within the manner assumed to be a typical operation condition (please reference photographs).

4. Antenna requirement

4.1 Regulation

(47CFR 15.203) An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators, which in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.2 Test Results

The M5800SB-SU-EXT incorporates reverse polarization SMA connectors to comply with this section.

4.3 Photo of Antenna Connector on EUT

5. AC Power Line Conducted Emissions Tests

Test Requirement: 47CFR Part 15 Subpart C Section 15.247

Test Procedure: ANSI C63.4: 1992

Date of Test: 10 July 2001

Laboratory: Test Site #1 (Acme, WA)

5.1 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Line Conduction Test Site: Acme Testing Co., Test Site Number 1, Calibrated: 1 December 2000, Calibration due Date: 1 December 2001

⇒ Line Impedance Stabilization Network: EMCO 3825/2, Serial Number 9002-1601, Calibrated: 2 January 2001, Calibration due Date: 2 January 2002

5.2 Purpose

The purpose of this test was to evaluate the level of conducted noise the EUT imposed on the AC mains.

5.3 Test Procedures

The EUT was placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that was placed above the groundplane. The EUT was connected to a dedicated LISN. The LISN was bonded to the groundplane.

Prescan tests were performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, final conducted measurements were taken. Conducted measurements were made on each current carrying conductor with respect to ground.

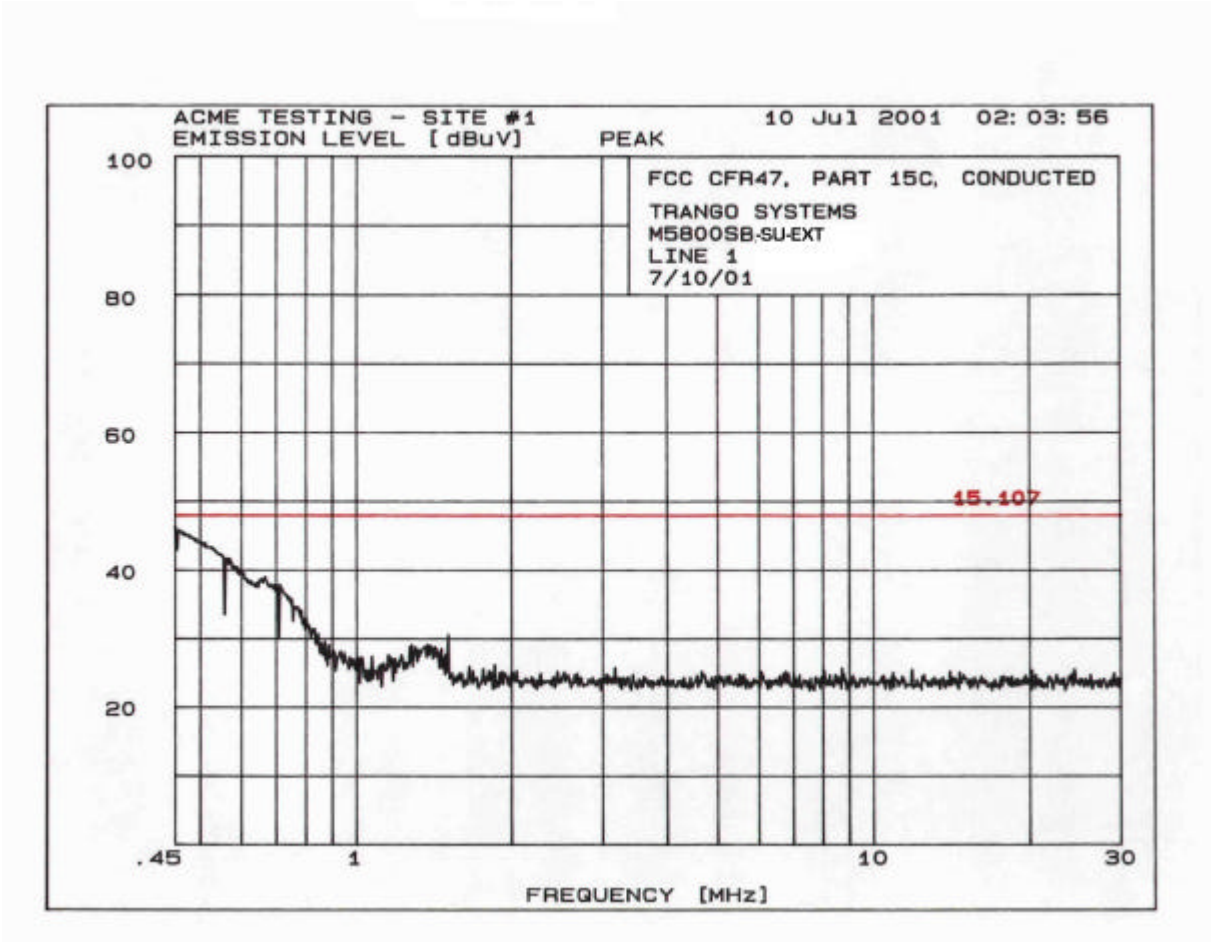
Conducted Emissions Test Characteristics	
Frequency range	0.45 MHz - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1/Line 2

5.4 Test Results

A summary of the 6 (six) highest amplitude conducted emissions is listed below.

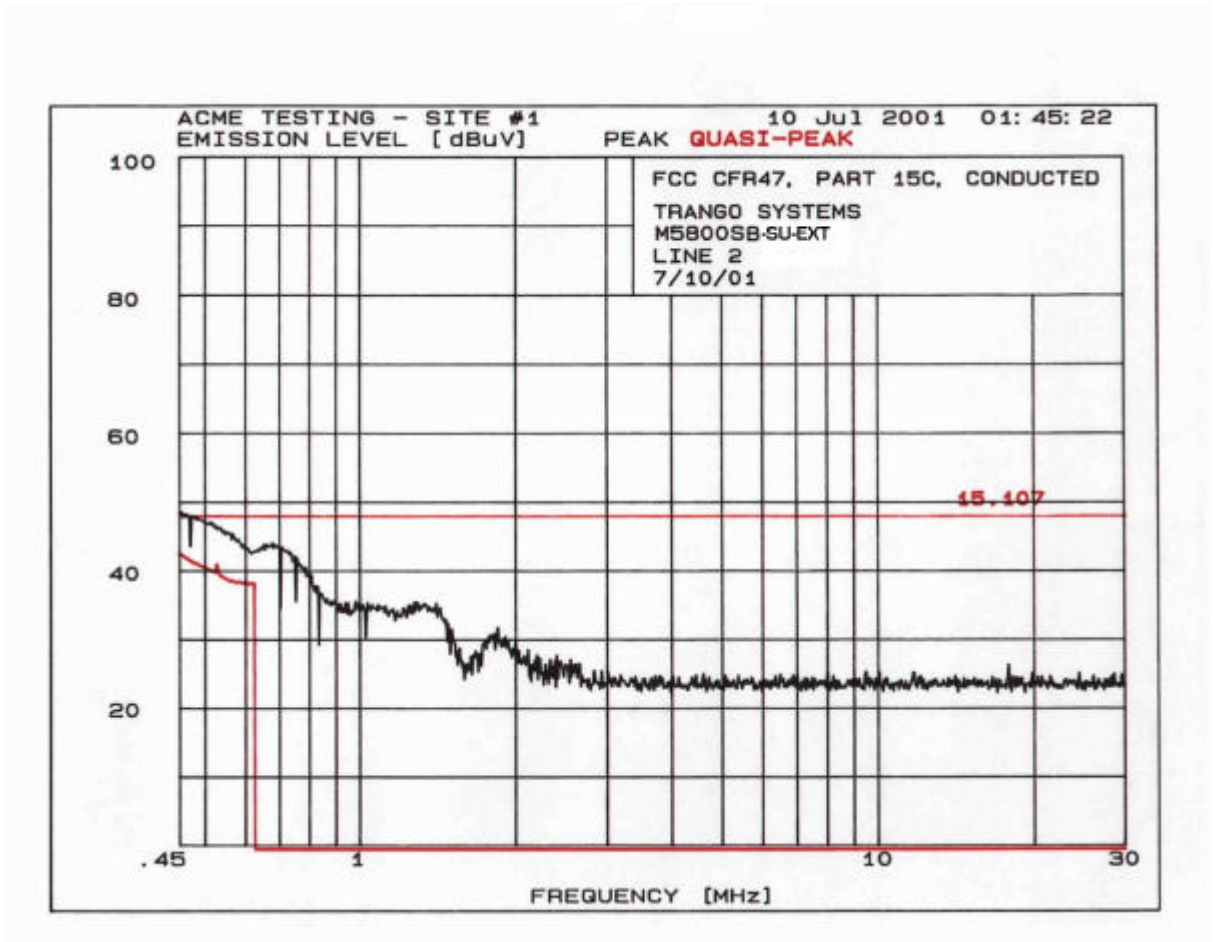
FCC RULES 47CFR PART 15C, SUBPART 15.247,CLASS B
CONDUCTED EMISSIONS (0.45 MHZ TO 30 MHZ) 60 Hz/120 VAC
LINE 1

PEAK #	FREQ. (MHz)	AMPL (dBµV)
1	0.4557	45.8
2	0.5621	41.7
3	0.7139	37.9
4	0.7635	34.7
5	1.513	30.6



FCC RULES 47CFR PART 15C, SUBPART 15.247,CLASS B
CONDUCTED EMISSIONS (0.45 MHZ TO 30 MHZ) 60 Hz/120 VAC
LINE 2

PEAK #	FREQ. (MHz)	AMPL (dBµV)
1	0.4752	48.0
2	0.7079	43.5
3	0.7603	41.9
4	0.8408	36.8
5	1.037	35.3
6	1.279	35.4



6. 6 dB Bandwidth

6.1 Regulation

(47 CFR 15.247(a2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

6.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

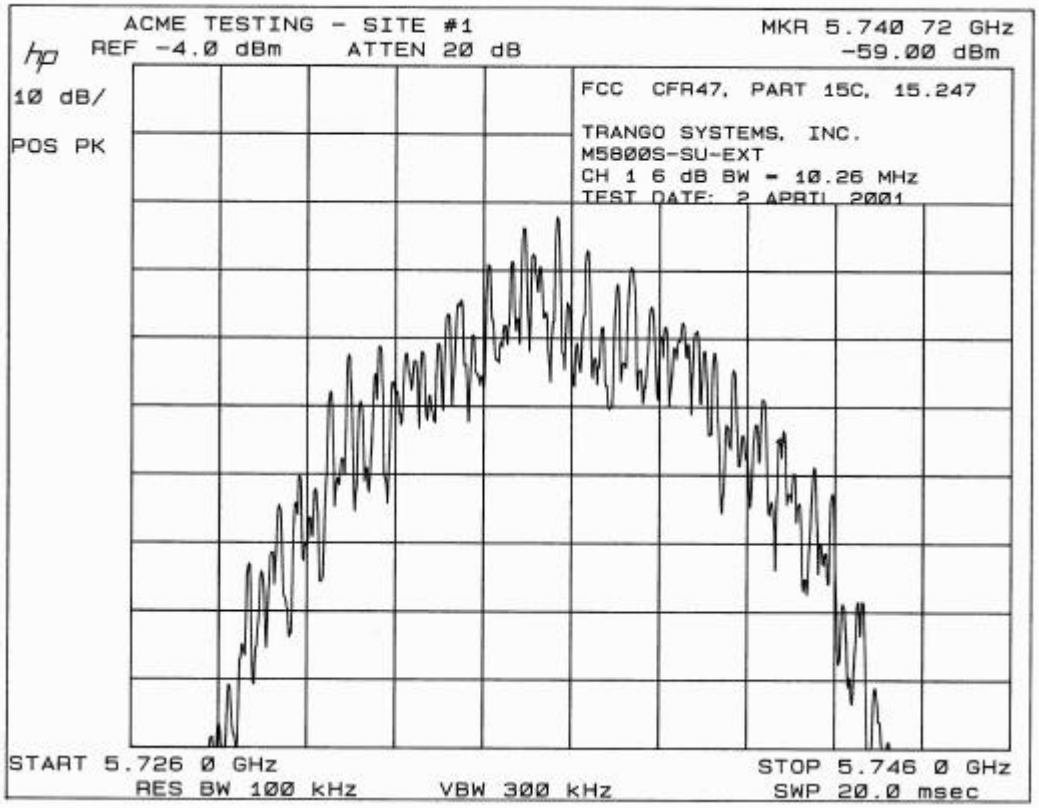
⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

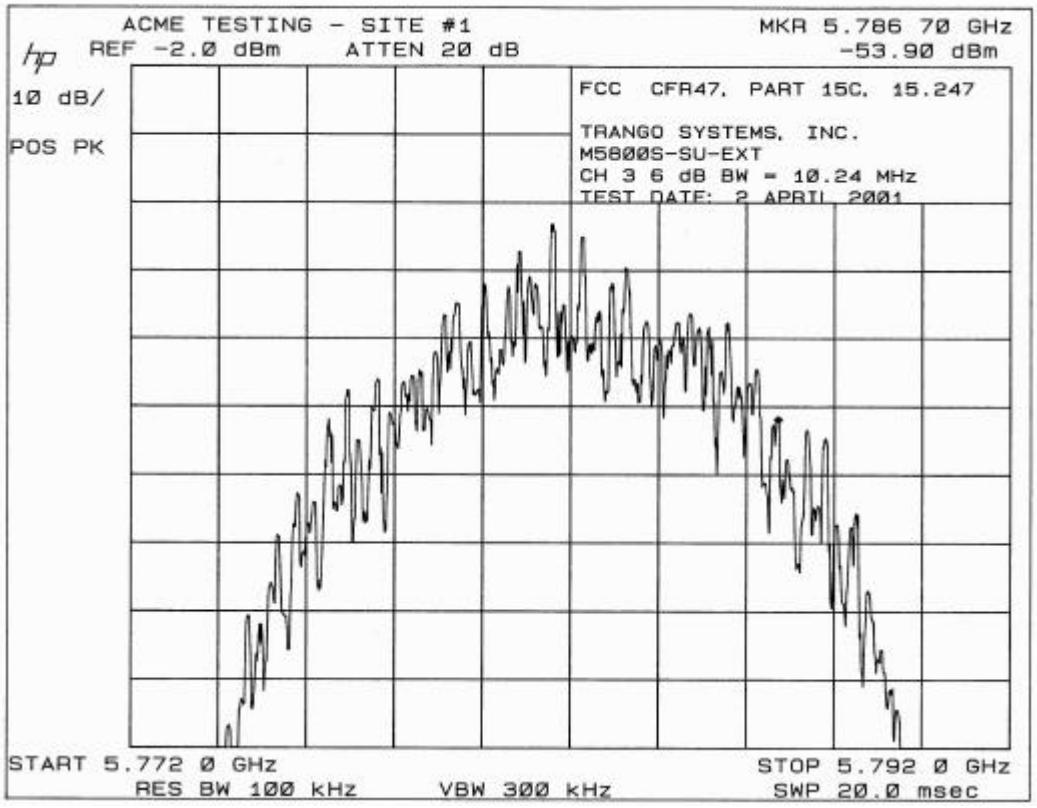
6.3 Test Procedures

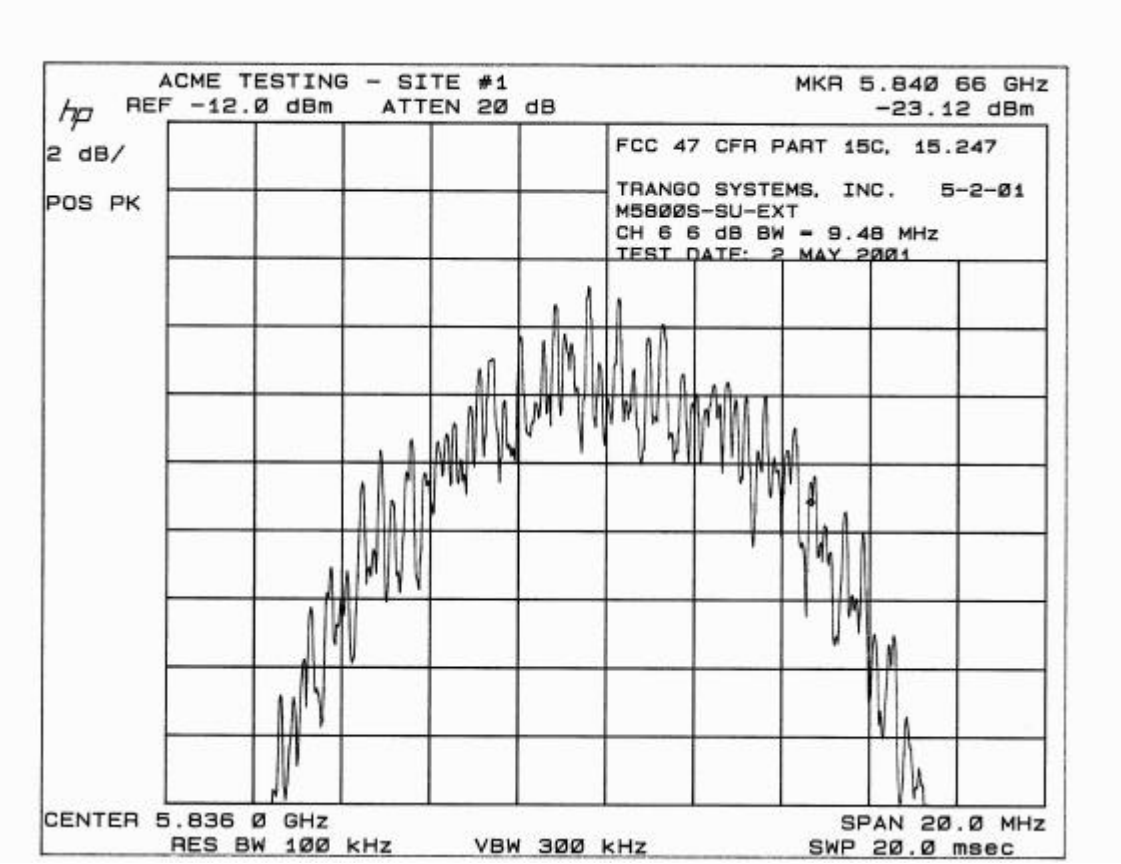
The RF output of the EUT was connected to the RF input port of the RF preselector through a 20 dB pad. The following measurements were made with a RBW = 100 kHz and VBW = 300 KHz.

6.4 Test Results

⇒ The measured 6 dB bandwidth at channel 1 is 10.26 MHz.
⇒ The measured 6 dB bandwidth at channel 3 is 10.24 MHz.
⇒ The measured 6 dB bandwidth at channel 6 is 9.48 MHz.


ACME TESTING - SITE #1
MKR 5.740 72 GHz
REF -4.0 dBm
ATTEN 20 dB
-59.00 dBm
10 dB/
POS PK
FCC CFR47, PART 15C, 15.247
TRANGO SYSTEMS, INC.
M5800S-SU-EXT
CH 1 6 dB BW = 10.26 MHz
TEST DATE: 2 APRIL 2001
START 5.726 0 GHz
STOP 5.746 0 GHz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec


ACME TESTING - SITE #1
MKR 5.786 70 GHz
REF -2.0 dBm
ATTEN 20 dB
-53.90 dBm
10 dB/
POS PK
FCC CFR47, PART 15C, 15.247
TRANGO SYSTEMS, INC.
M5800S-SU-EXT
CH 3 6 dB BW = 10.24 MHz
TEST DATE: 2 APRIL 2001
START 5.772 0 GHz
STOP 5.792 0 GHz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec


ACME TESTING - SITE #1
MKR 5.840 66 GHz
REF -12.0 dBm
ATTEN 20 dB
-23.12 dBm
2 dB/
POS PK
FCC 47 CFR PART 15C, 15.247
TRANGO SYSTEMS, INC. 5-2-01
M5800S-SU-EXT
CH 6 6 dB BW = 9.48 MHz
TEST DATE: 2 MAY 2001
CENTER 5.836 0 GHz
SPAN 20.0 MHz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec

7. Power Output

7.1 Regulation

(47 CFR 15.247(b1)) The maximum peak output power of the intentional radiator shall not exceed the following:
For frequency hopping systems operating in the 2400-2483.5 MHz or 5725-5850 MHz band and for all direct sequence systems: 1 watt.

7.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

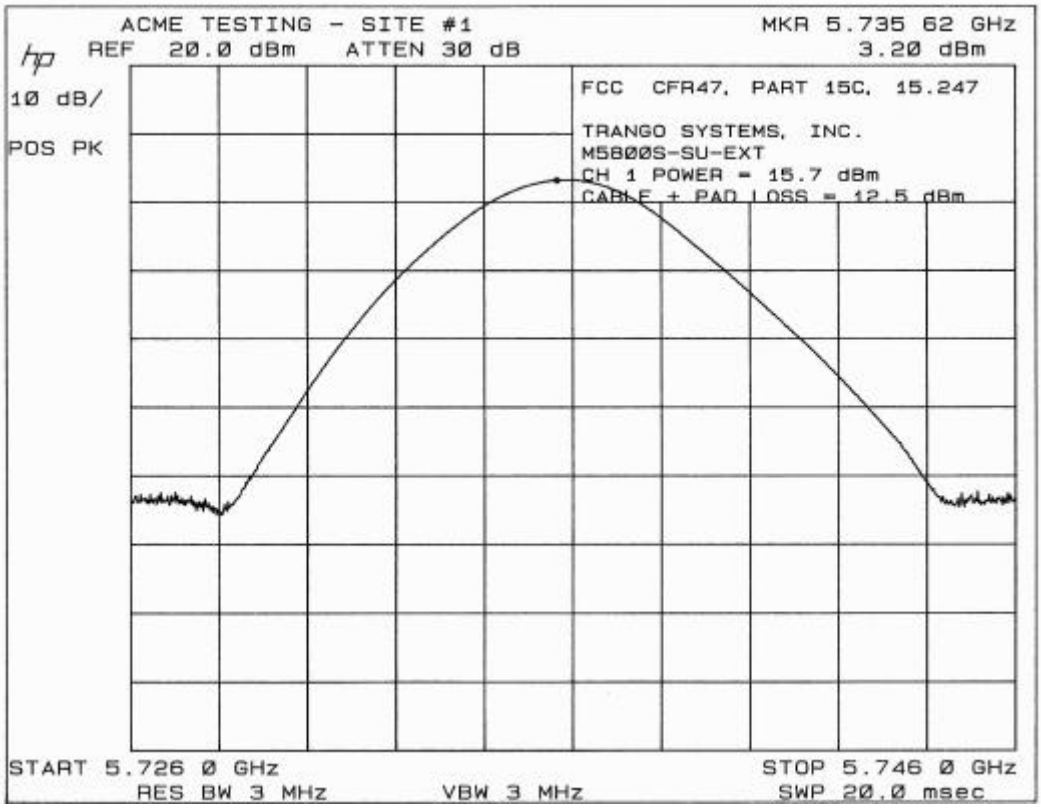
7.3 Test Procedures

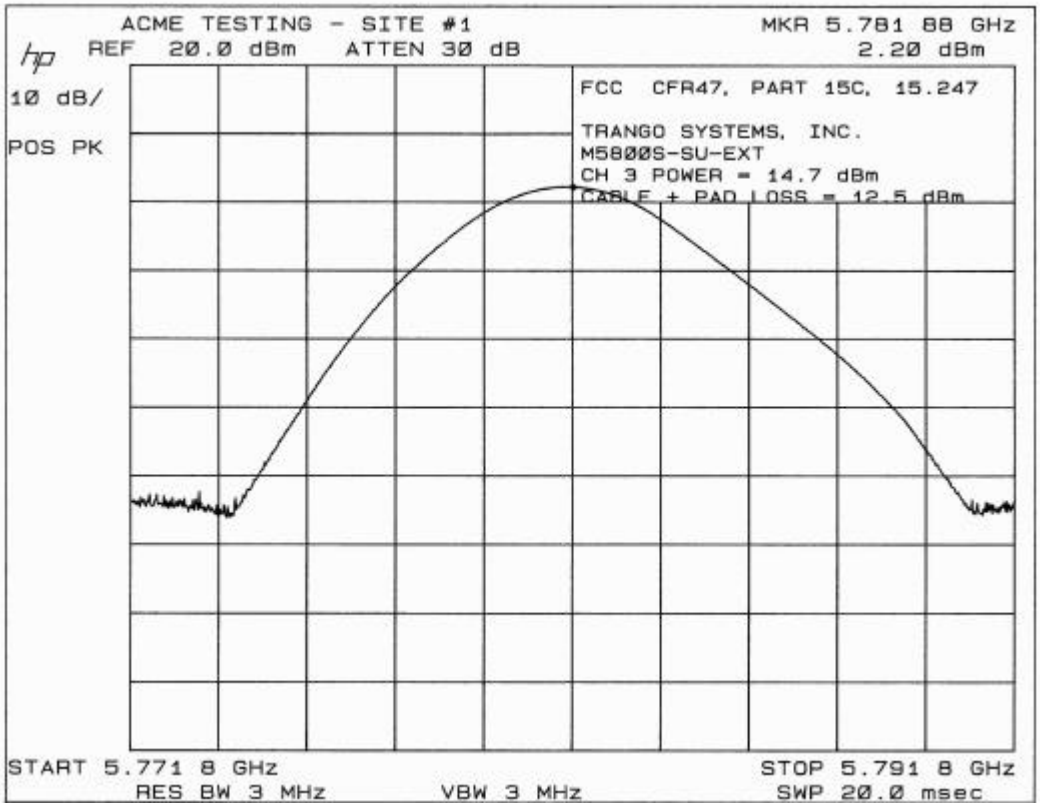
The modulated RF output of the EUT was connected to the RF input port of the RF Preselector. The following measurements were made with a RBW = 3 MHz and VBW = 3 MHz.

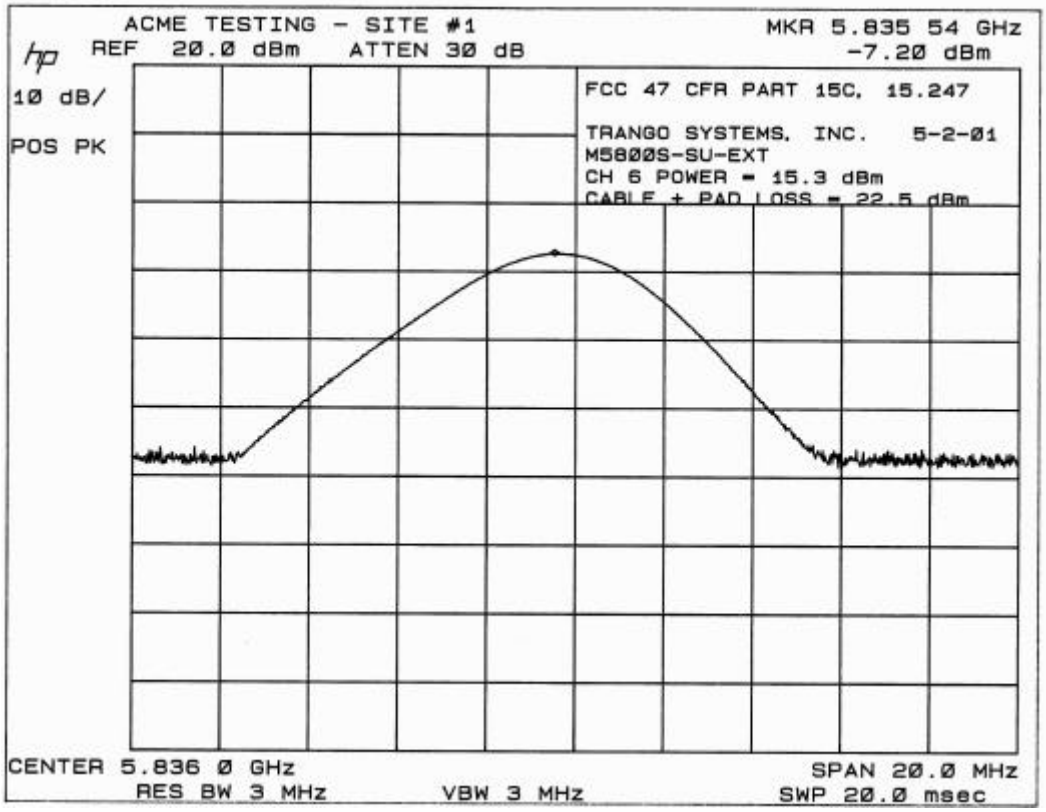
7.4 Test Results

⇒ Measured maximum Peak Envelope Power for channel 1 was 15.7 dBm.
⇒ Measured maximum Peak Envelope Power for channel 3 was 14.7 dBm.
⇒ Measured maximum Peak Envelope Power for channel 6 was 15.3 dBm.

2002 Valley Highway PO Box 3 Acme WA 98220-0003
phone:888 226-3837 fax: 360 595-2722






ACME TESTING - SITE #1
MKR 5.835 54 GHz
REF 20.0 dBm
ATTEN 30 dB
-7.20 dBm
10 dB/
POS PK
FCC 47 CFR PART 15C, 15.247
TRANGO SYSTEMS, INC. 5-2-01
M5800S-SU-EXT
CH 6 POWER = 15.3 dBm
CABLE + PAD LOSS = 22.5 dBm
CENTER 5.836 0 GHz
SPAN 20.0 MHz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

8. Conducted Spurious Emissions

8.1 Regulation

(47 CFR 15.247 I) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

8.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ 2 – 8 GHZ Amplifier: HP 11975A, Serial Number 2304A 00257, Calibrated: 30 March 2001, Calibration due Date: 30 March 2002

⇒ Harmonic Mixer: HP 11970K, Serial Number 3003A 05538, Calibrated: 29 March 2001, Calibration due Date: 30 March 2002

⇒ Harmonic Mixer: HP 11970A, Serial Number 2332A 020123, Calibrated 3 April 2001, Calibration due Date 3 April 2002

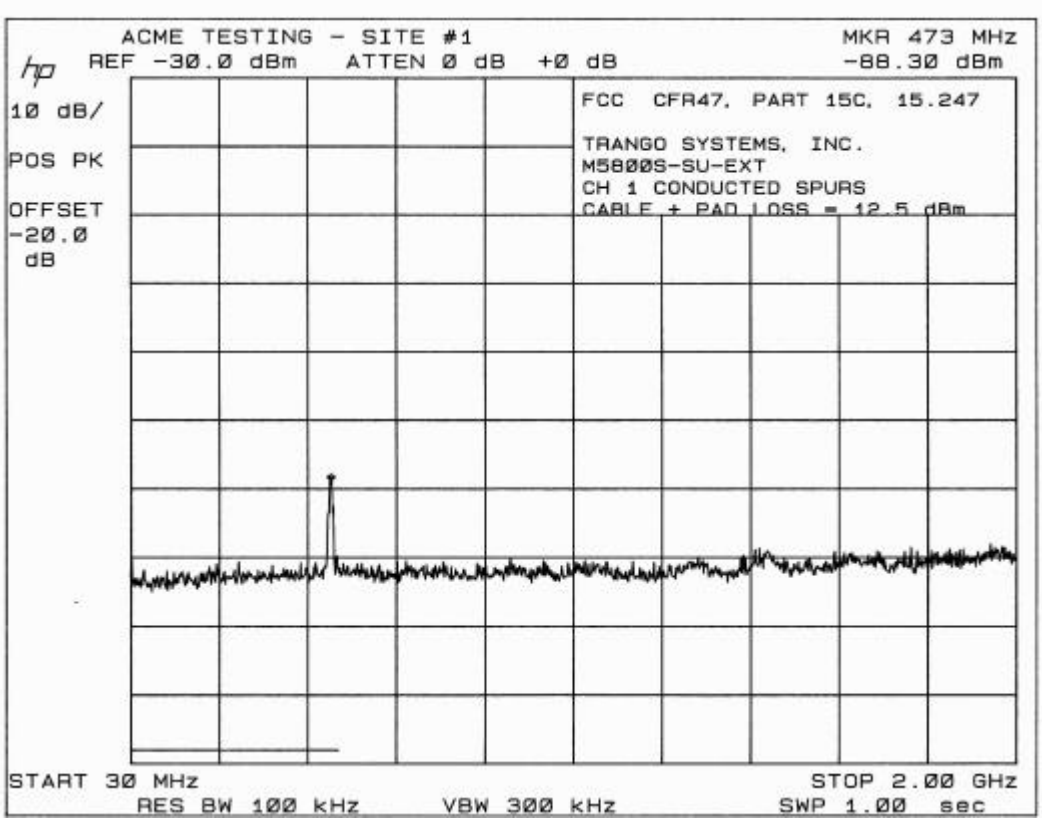
8.3 Test Procedures

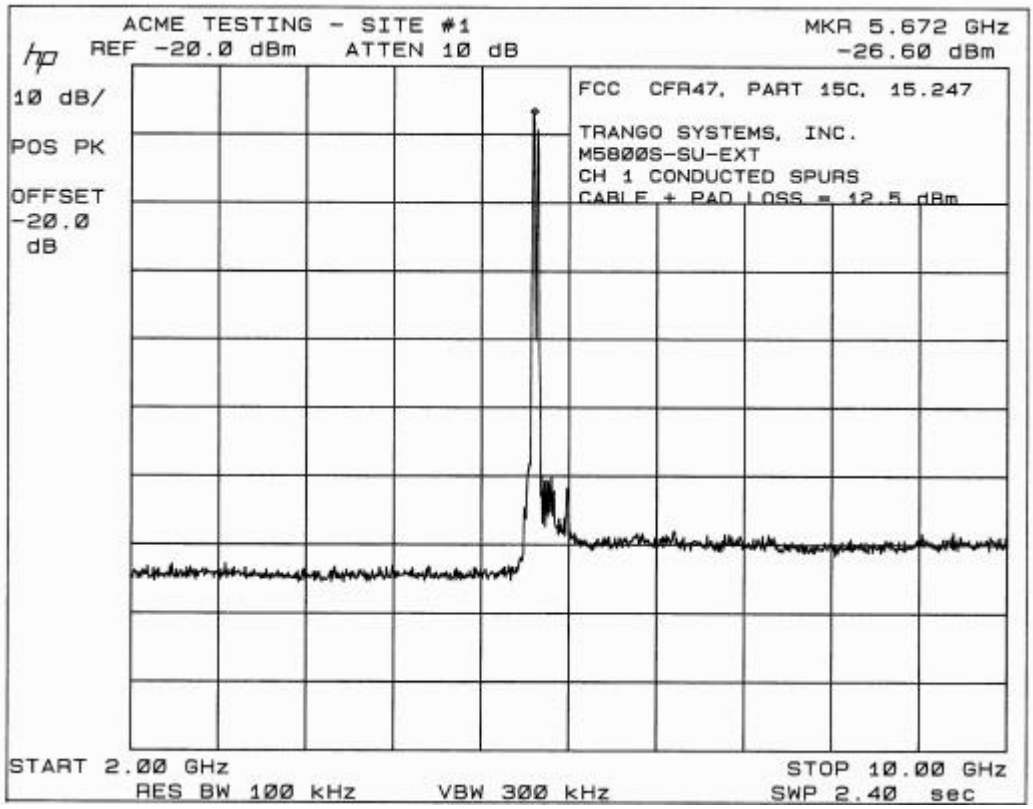
The RF output of the EUT was connected to the RF input port of the RF Preselector. The following measurements were made with a RBW = 100 kHz and VBW = 300 kHz.

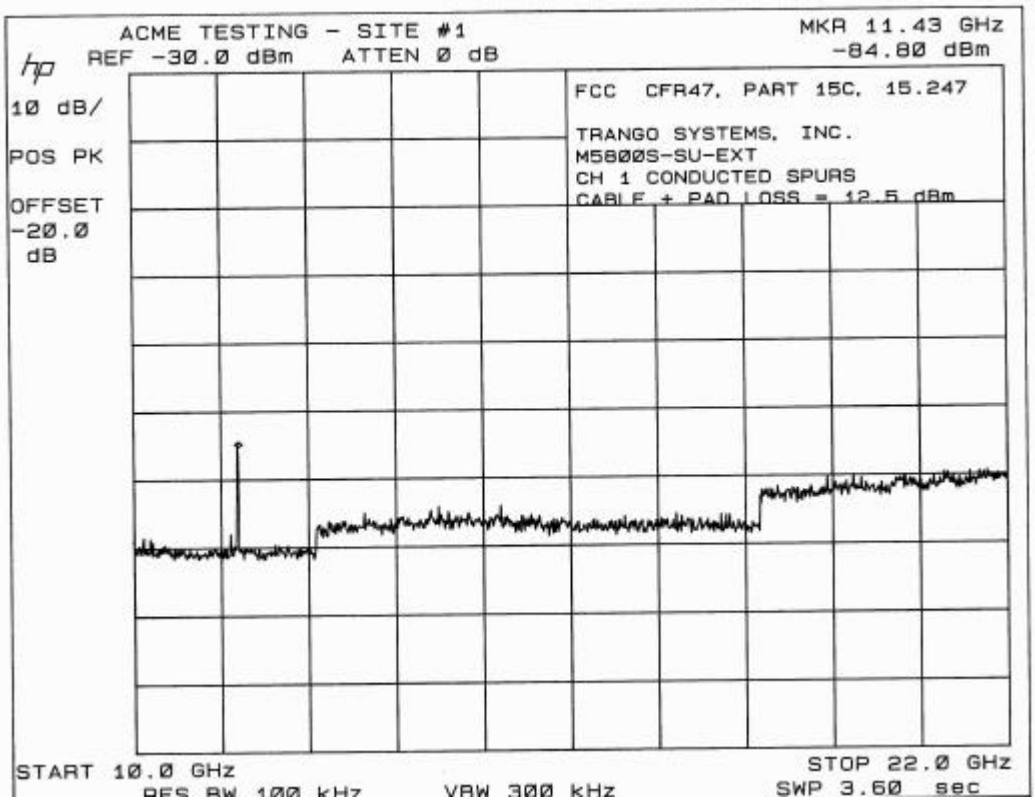
8.4 Test Results

No out of band conducted emissions were detected within 40 dB of the carrier power. The noise floor of the Detection System was –65 dBc from 30 MHz to 2.4 GHz, -60 dBc from 2.4 GHz to 12.5 GHz, -55 dBc from 12.5 GHz to 18 GHz, -50 dBc from 18 GHz to 22 GHz, and –40 dBc from 22 GHz to 24 GHz.

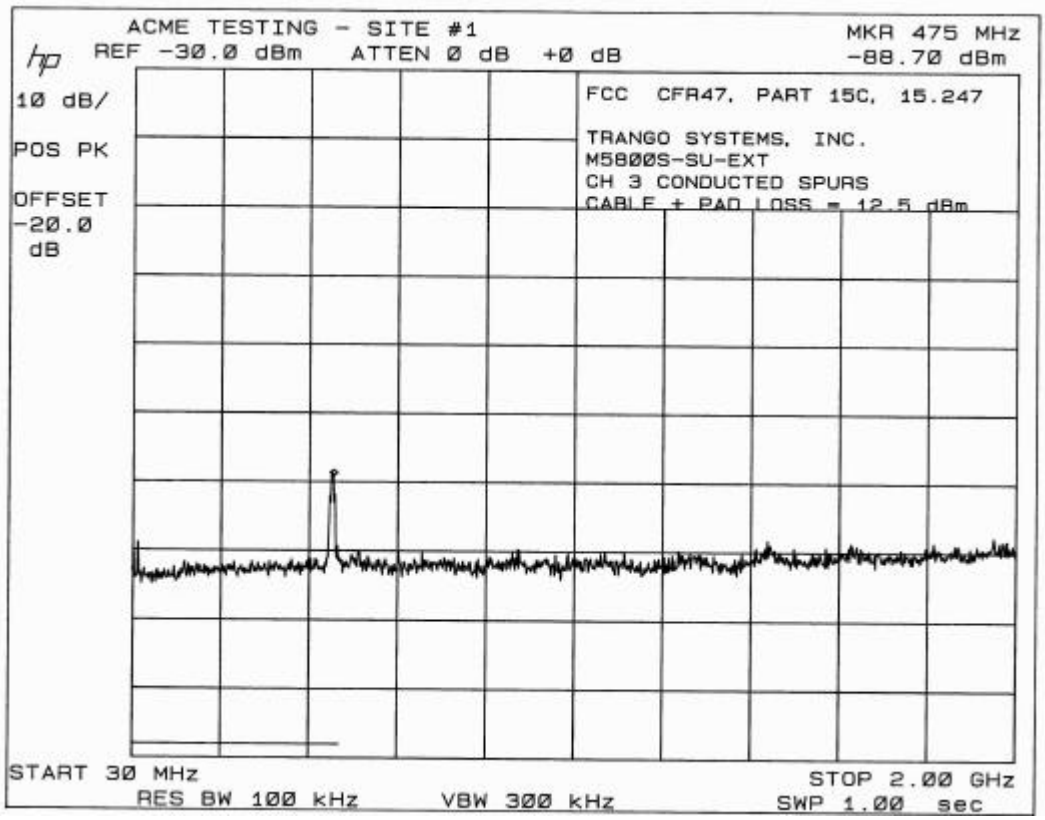
CHANNEL 1 CONDUCTED SPURS

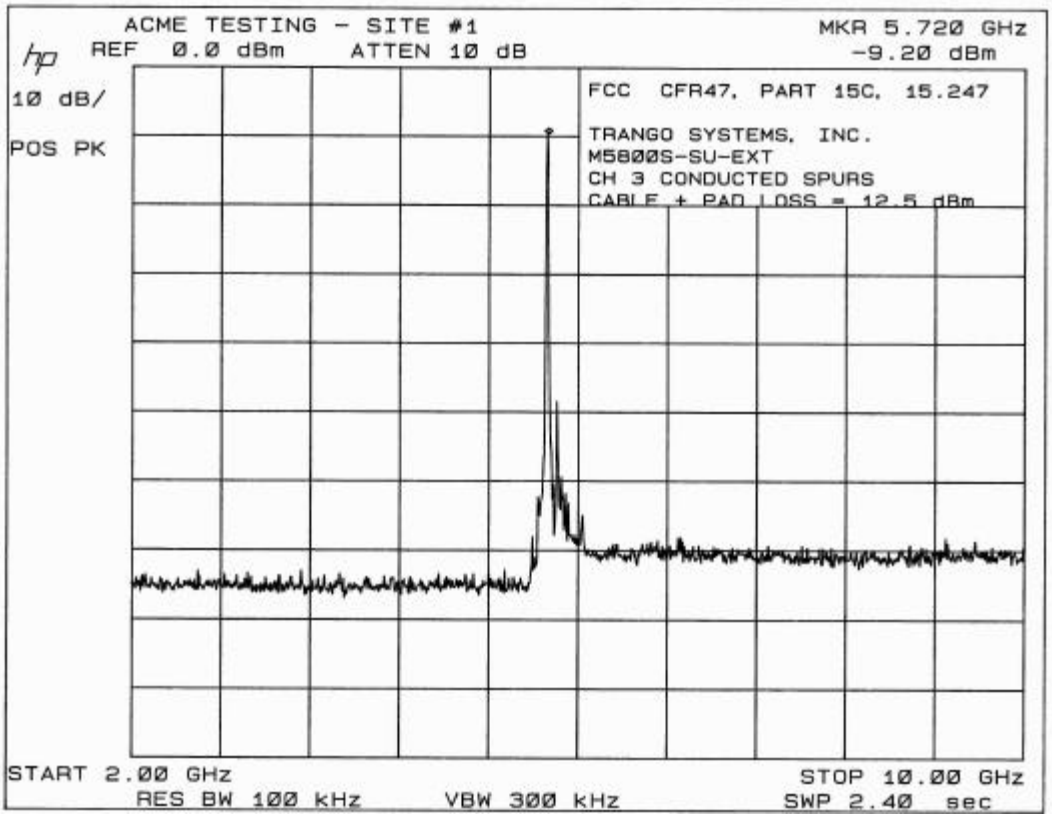


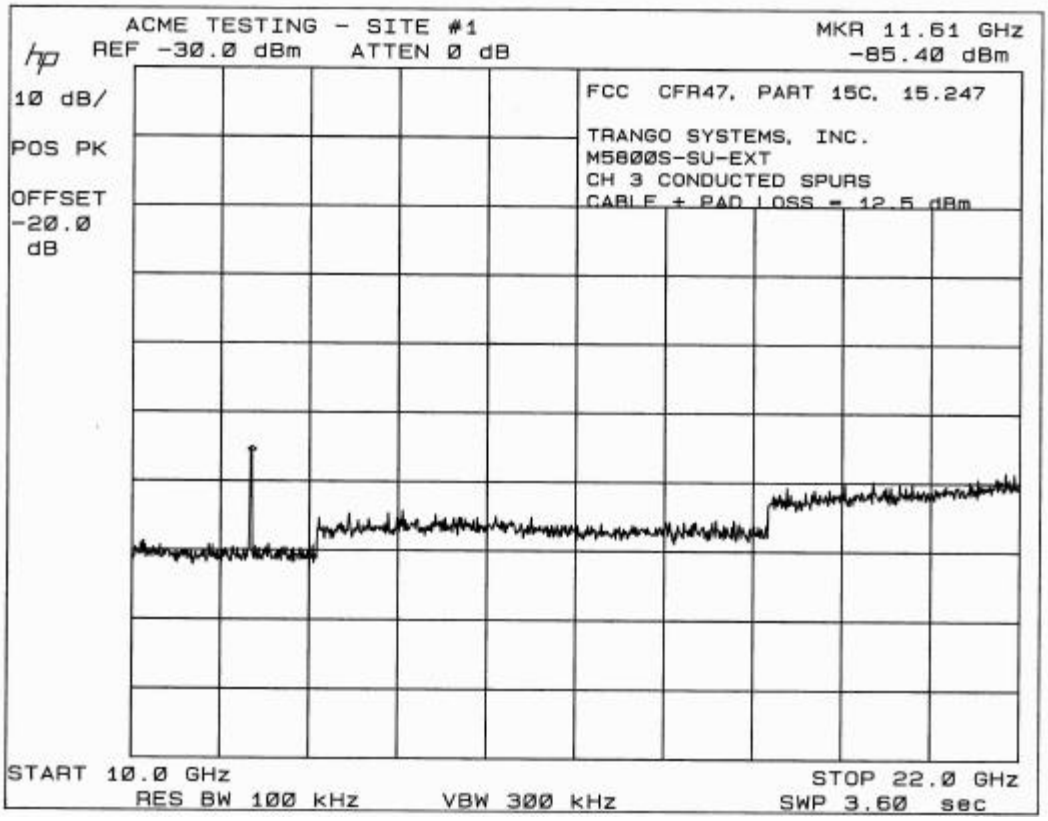



ACME TESTING - SITE #1
REF -30.0 dBm
ATTEN 0 dB
MKR 11.43 GHz
-84.80 dBm
10 dB/
POS PK
OFFSET
-20.0
dB
FCC CFR47, PART 15C, 15.247
TRANGO SYSTEMS, INC.
M5800S-SU-EXT
CH 1 CONDUCTED SPURS
CABLE + PAD LOSS = 12.5 dBm
START 10.0 GHz
STOP 22.0 GHz
VBW 300 kHz
SWP 3.60 sec

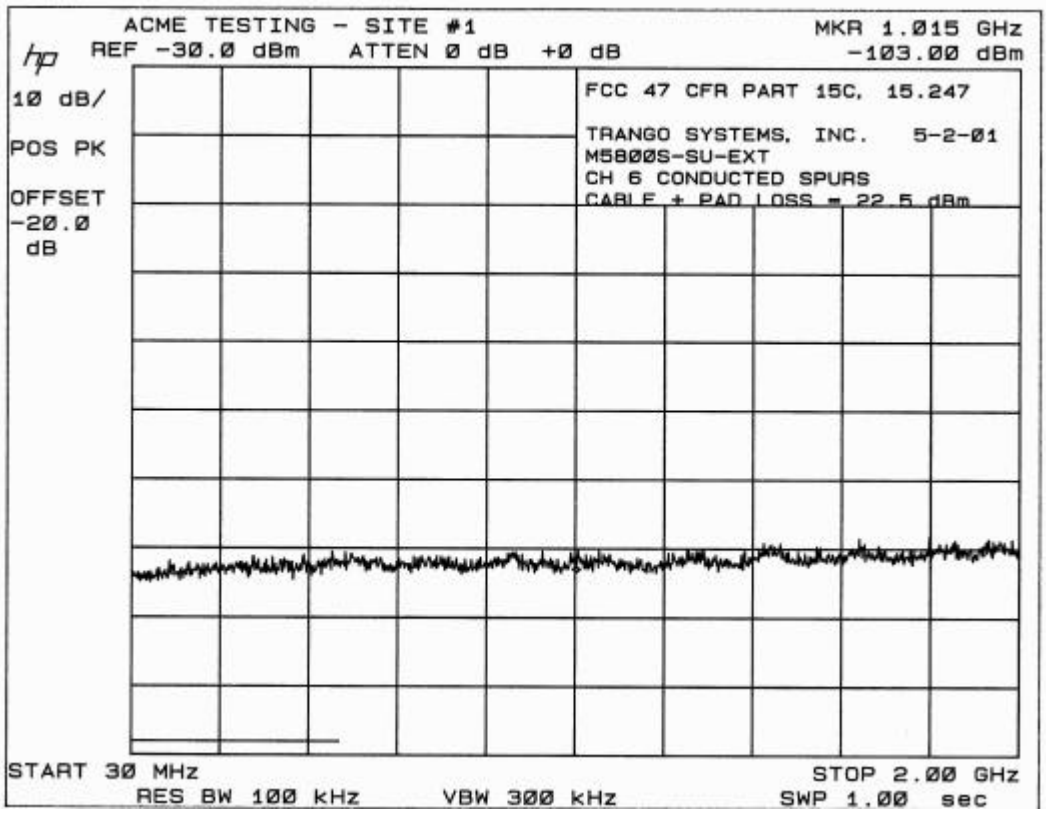
CHANNEL 3 CONDUCTED SPURS

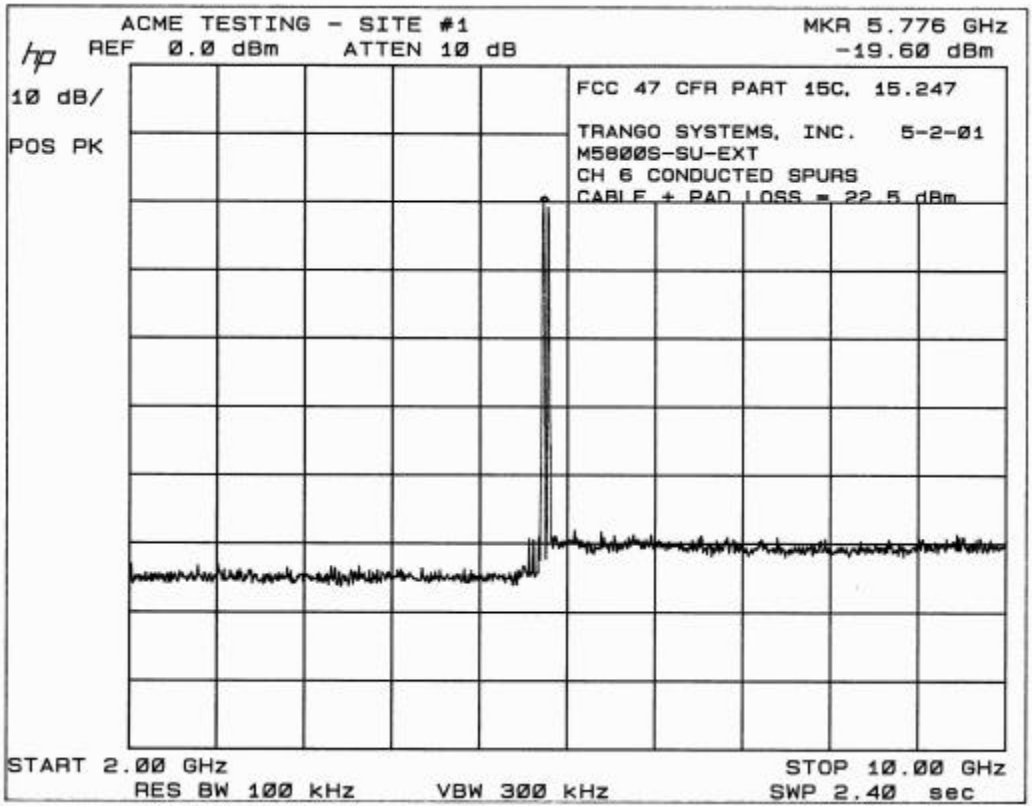


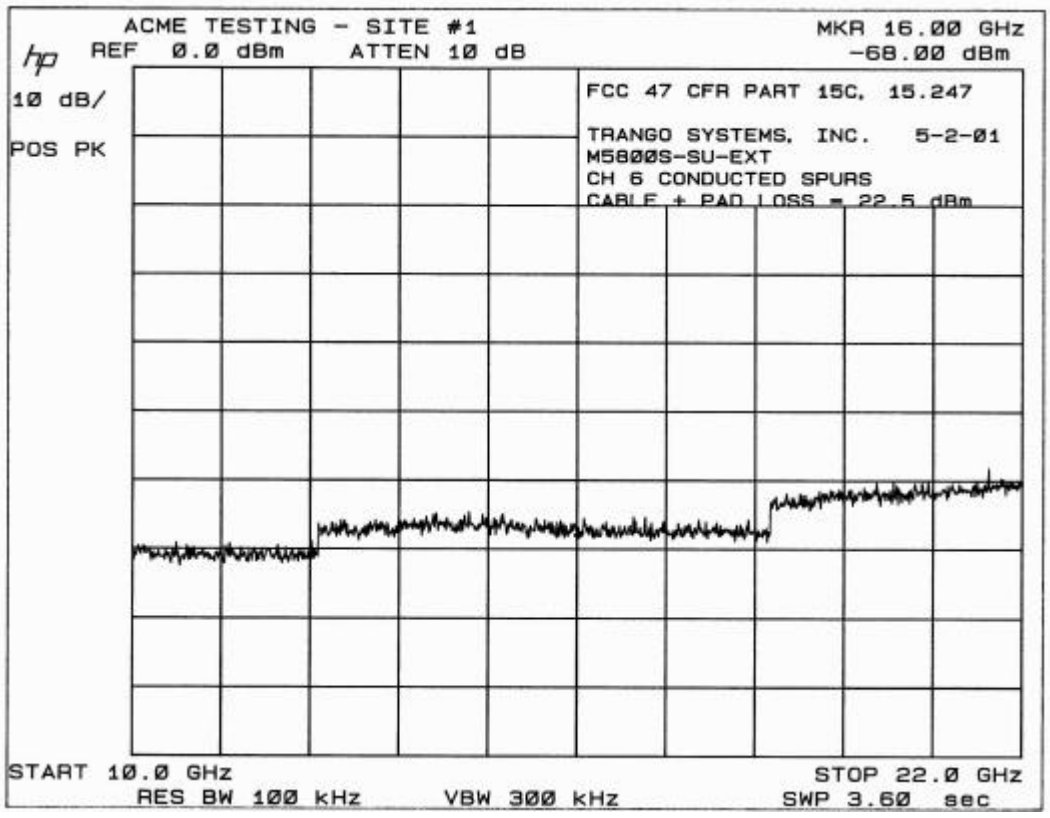



ACME TESTING - SITE #1
REF -30.0 dBm
ATTEN 0 dB
MKR 11.61 GHz
-85.40 dBm
10 dB/
POS PK
OFFSET
-20.0
dB
FCC CFR47, PART 15C, 15.247
TRANGO SYSTEMS, INC.
M5800S-SU-EXT
CH 3 CONDUCTED SPURS
CABLE + PAD LOSS = 12.5 dBm
START 10.0 GHz
STOP 22.0 GHz
RES BW 100 kHz
VBW 300 kHz
SWP 3.60 sec

CHANNEL 6 CONDUCTED SPURS






ACME TESTING - SITE #1
MKR 16.00 GHz
REF 0.0 dBm
ATTEN 10 dB
-68.00 dBm
10 dB/
POS PK
FCC 47 CFR PART 15C, 15.247
TRANGO SYSTEMS, INC. 5-2-01
M5800S-SU-EXT
CH 6 CONDUCTED SPURS
CABLE + PAD LOSS = 22.5 dBm
START 10.0 GHz
STOP 22.0 GHz
RES BW 100 kHz
VBW 300 kHz
SWP 3.60 sec

9. Process Gain

9.1 Regulation

(47 CFR 15.247e) The processing gain of a direct sequence system shall be at least 10 dB. The processing gain represents the improvement to the received signal-to-noise ratio, after filtering to the information bandwidth, from the spreading/dispreading function.

9.2 Test Results

Both the M5800SB-SU-EXT and M5800S-AP-60 systems use the Prism chipset for Modulation/Demodulation/Spreading of the data – The calculations and explanation were written specifically for this chipset by the manufacturer of the chipset, Intersil. At the end is the tabulated test data showing the packet error rate (PER) and the corresponding frequency at which the measurement was made. A total of 340 points were taken, each being recorded for 1 minute. The results of the test show that more than 80% of the packets had a PER of less than 8% satisfying the 15.247e requirement for >10 dB process gain. Since the circuit design and test program is identical on the M5800SB-SU-EXT and M5800S-AP-60 this data can be applied to both applications.

The *intersil PRISM II radio Jamming Margin Test* has been attached to this document for review.

10. Peak Power Spectral Density

10.1 Regulation

(47CFR 15.247) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

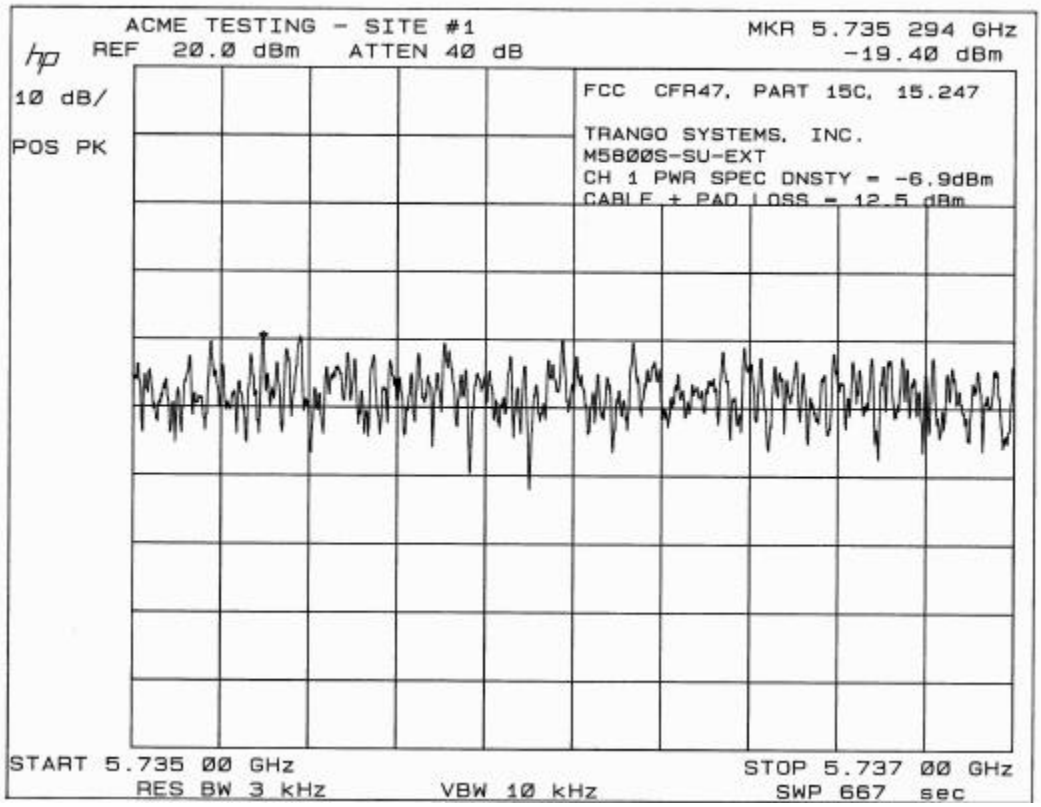
⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

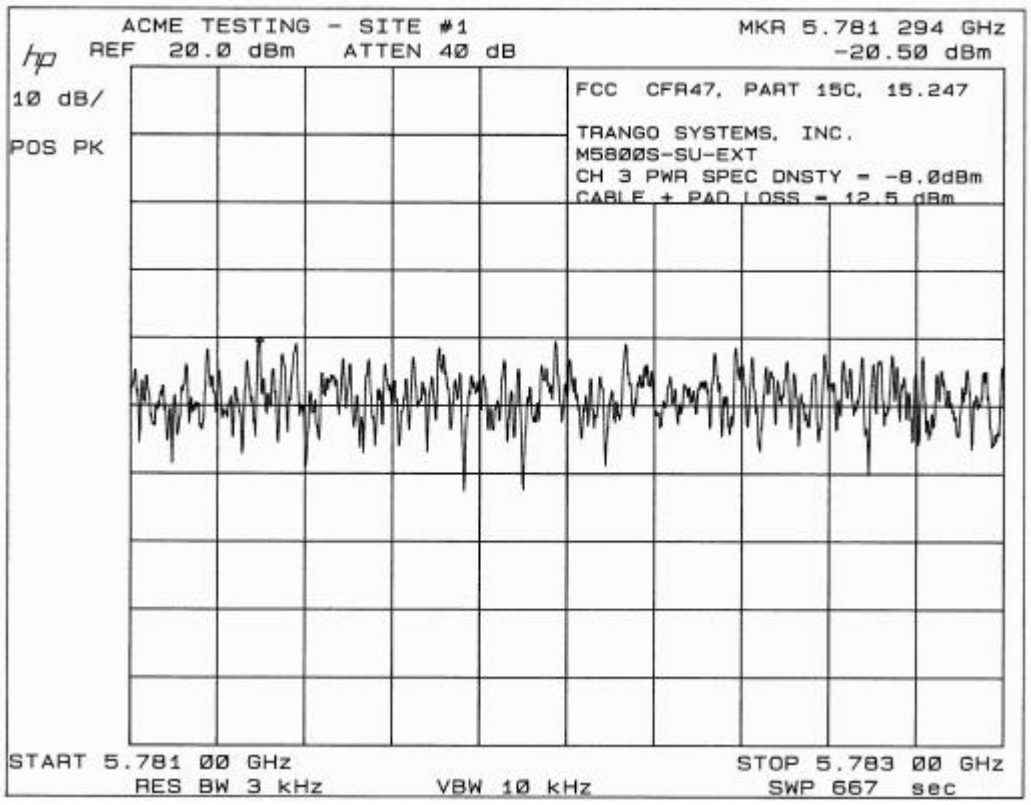
10.3 Test Procedures

The RF output of the EUT was connected to the RF input port of the RF Preselector through a 10 dB pad. The following measurements were made with a RBW = 3 kHz, VBW = 10 kHz and Sweep Time = 666 seconds.

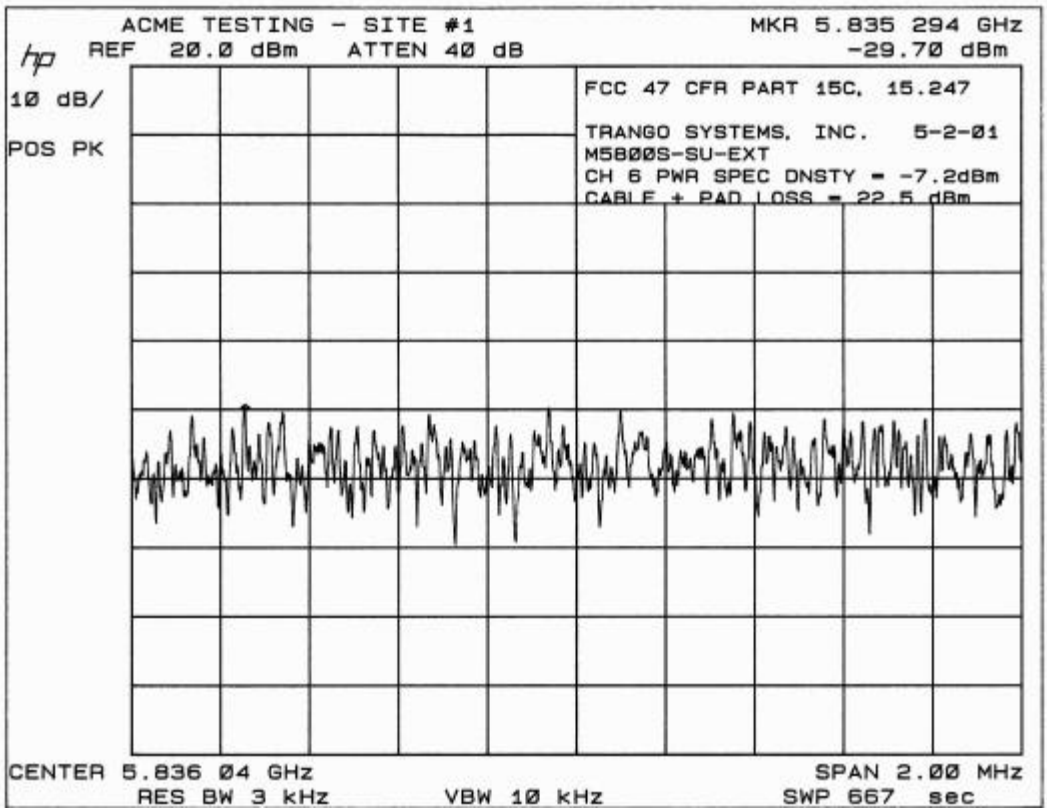
10.4 Test Results

Maximum peak power spectral density of channel 1 is –6.9 dBm.
Maximum peak power spectral density of channel 3 is –8.0 dBm.
Maximum peak power spectral density of channel 6 is –7.2 dBm.


ACME TESTING - SITE #1
MKR 5.735 294 GHz
REF 20.0 dBm ATTEN 40 dB
-19.40 dBm
10 dB/
POS PK
FCC CFR47, PART 15C, 15.247
TRANGO SYSTEMS, INC.
M5800S-SU-EXT
CH 1 PWR SPEC DNSTY = -6.9dBm
CABLE + PAD LOSS = 12.5 dBm
START 5.735 00 GHz
RES BW 3 kHz
VBW 10 kHz
STOP 5.737 00 GHz
SWP 667 sec


ACME TESTING - SITE #1
MKR 5.781 294 GHz
REF 20.0 dBm ATTEN 40 dB
-20.50 dBm
10 dB/
POS PK
FCC CFR47, PART 15C, 15.247
TRANGO SYSTEMS, INC.
M5800S-SU-EXT
CH 3 PWR SPEC DNSTY = -8.0dBm
CABLE + PAD LOSS = 12.5 dBm
START 5.781 00 GHz
RES BW 3 kHz
VBW 10 kHz
STOP 5.783 00 GHz
SWP 667 sec

2002 Valley Highway PO Box 3 Acme WA 98220-0003
phone:888 226-3837 fax: 360 595-2722



11. Radiated Spurious Emissions

11.1 Regulation

(47CFR 15.247 I) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

11.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Open Area Test Site: Acme Testing Co., Test Site Number 1, Calibrated: 1 December 2000, Calibration due Date: 1 December 2001

⇒ EUT Turntable Position Controller: Rothenbuhler Engineering, Custom, No Calibration Required

⇒ Antenna Mast: Compliance Design, Model M100/200, No Calibration Required

⇒ Double Ridge Guide Horn Antenna: EMCO 3115, Serial Number 9807-5534, Calibrated: 5 January 2001, Calibration due Date: 5 January 2002

⇒ 2 – 8 GHZ Amplifier: HP 11975A, Serial Number 2304A 00257, Calibrated: 30 March 2001, Calibration due Date: 30 March 2002

⇒ Harmonic Mixer: HP 11970K, Serial Number 3003A 05538, Calibrated: 29 March 2001, Calibration due Date: 30 March 2002

⇒ Harmonic Mixer: HP 11970A, Serial Number 2332A 020123, Calibrated 3 April 2001, Calibration due Date 3 April 2002

⇒ Pyramidal Horn: EMCO 3160-10, Serial Number 9708-1055, No Calibration Required

⇒ Pyramidal Horn: EMCO 3160-09, Serial Number 9701-1071, No Calibration Required

⇒ Precision Attenuator Set: Weinschel AS-18, Serial Number 665, No Calibration Required

⇒ 1 GHz to 26 GHz Preamplifier: Hewlett Packard HP8449B/H02, Serial Number 2933A00198, Calibrated: 03 May 2001, Calibration Due Date: 03 May 2003

11.3 Test Procedures

The EUT was placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. The EUT was connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.

Prescan tests were performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the EUT were maximized by manipulating the system cables, by adjusting the polarization and height of the receive antenna, and by rotating the EUT on the turntable.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz – 40,000 MHz **15.205 RESTRICTED BANDS ONLY**
Test distance	3 m (30 MHz – 26,500 MHz) 10 cm (26,500 MHz – 40,000 MHz)
Test instrumentation resolution bandwidth	120 kHz (30 MHz – 1000 MHz) 1 MHz (1000 MHz – 40,000 MHz)
Receive antenna scan height	1 m – 4 m
Receive antenna polarization	Vertical/Horizontal

11.4 Test Results

VERTICAL

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS	dLIM dB	MODE	POL	SITE HGT cm	AZM deg	CORR FACTOR dB	COMMENTS
1	5737.4	-	120.4	-	PK	V	248	359	3.2	Channel 1
2	5776.1	-	115.3	-	PK	V	247	359	3.3	Channel 2
3	5837.4	-	112.0	-	PK	V	240	359	3.5	Channel 3
4	11471.8	54.0	49.7	-4.3	AVG	V	248	359	9.7	Channel 1
5	11471.9	74.0	69.7	-4.3	PK	V	248	359	9.7	Channel 1
6	11550.9	54.0	52.9	-1.1	AVG	V	247	359	10.1	Channel 2
7	11551.0	74.0	71.3	-2.7	PK	V	247	359	10.1	Channel 2
8	11648.6	54.0	51.1	-2.9	AVG	V	240	359	10.5	Channel 3
9	11671.9	74.0	67.0	-7.0	PK	V	240	359	10.6	Channel 3
10	22944.0	54.0	30.0	-24.0	PK	V	100	1	0	Channel 1
11	23104.0	54.0	30.8	-23.2	PK	V	100	1	0	Channel 2
12	23344.0	54.0	30.4	-23.6	PK	V	100	1	0	Channel 3
13	28686.0	54.0	39.9	-14.1	PK	V	100	1	0	Channel 1
14	28880.0	54.0	39.3	-14.7	PK	V	100	1	0	Channel 2
15	29179.5	54.0	39.7	-14.3	PK	V	100	1	0	Channel 3
16	34416.0	54.0	39.9	-14.1	PK	V	100	1	0	Channel 1
17	34655.8	54.0	39.0	-15.0	PK	V	100	1	0	Channel 2
18	35015.8	54.0	39.3	-14.7	PK	V	100	1	0	Channel 3

HORIZONTAL

No	EMISSION FREQUENCY MHzdBuV/m	SPEC LIMIT dB	MEASUREMENTS ABS cm	dLIM deg	MODE	POL	SITE HGT dB	AZM	CORR FACTOR	COMMENTS
1	5737.5	-	119.8	-	PK	H	267	359	3.2	Channel 1
2	5777.5	-	113.4	-	PK	H	263	359	3.3	Channel 2
3	5837.6	-	111.6	-	PK	H	266	359	3.5	Channel 3
4	11470.6	74.0	73.8	-0.2	PK	H	267	359	9.7	Channel 1
5	11471.0	54.0	52.2	-1.8	AVG	H	267	359	9.7	Channel 1
6	11550.9	54.0	52.3	-1.7	AVG	H	263	359	10.1	Channel 2
7	11551.0	74.0	67.4	-6.6	PK	H	263	359	10.1	Channel 2
8	11671.0	54.0	52.1	-1.9	AVG	H	266	359	10.6	Channel 3
9	11672.7	74.0	67.6	-6.4	PK	H	266	359	10.6	Channel 3
10	22944.0	54.0	30.8	-23.2	PK	H	100	1	0	Channel 1
11	23104.0	54.0	30.4	-23.6	PK	H	100	1	0	Channel 2
12	23344.0	54.0	39.9	-14.1	PK	H	100	1	0	Channel 3
13	28686.0	54.0	39.3	-14.7	PK	H	100	1	0	Channel 1
14	28880.0	54.0	39.7	-14.3	PK	H	100	1	0	Channel 2
15	29179.5	54.0	39.9	-14.1	PK	H	100	1	0	Channel 3
16	34416.0	54.0	39.0	-15.0	PK	H	100	1	0	Channel 1
17	34655.8	54.0	38.3	-14.7	PK	H	100	1	0	Channel 2
18	35015.8	54.0	38.3	-14.7	PK	H	100	1	0	Channel 3

11.5 Test Setup Photographs

12. Annex A.1 Digital Device Conducted Emissions

Test Requirement: 47CFR Part 15 Subpart B Section 15.107

Test Procedure: ANSI C63.4: 1992

Date of Test: 10 July 2001

Laboratory: Test Site #1 (Acme, WA)

12.1 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Line Conduction Test Site: Acme Testing Co., Test Site Number 1, Calibrated: 1 December 2000, Calibration due Date: 1 December 2001

⇒ Line Impedance Stabilization Network: EMCO 3825/2, Serial Number 9002-1601, Calibrated: 2 January 2001, Calibration due Date: 2 January 2002

12.2 Purpose

The purpose of this test was to evaluate the level of conducted noise the EUT imposed on the AC Mains, and to show that the EUT is compliant to the Class B Limits of 47CFR Part 15, Section 15.107.

12.3 Test Procedures

The EUT was placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that was placed above the groundplane. The EUT was connected to a dedicated LISN. The LISN was bonded to the groundplane.

Prescan tests were performed to determine the “worst case” mode of operation. With the EUT operating in “worst case” mode, final conducted measurements were taken. Conducted measurements were made on each current carrying conductor with respect to ground.

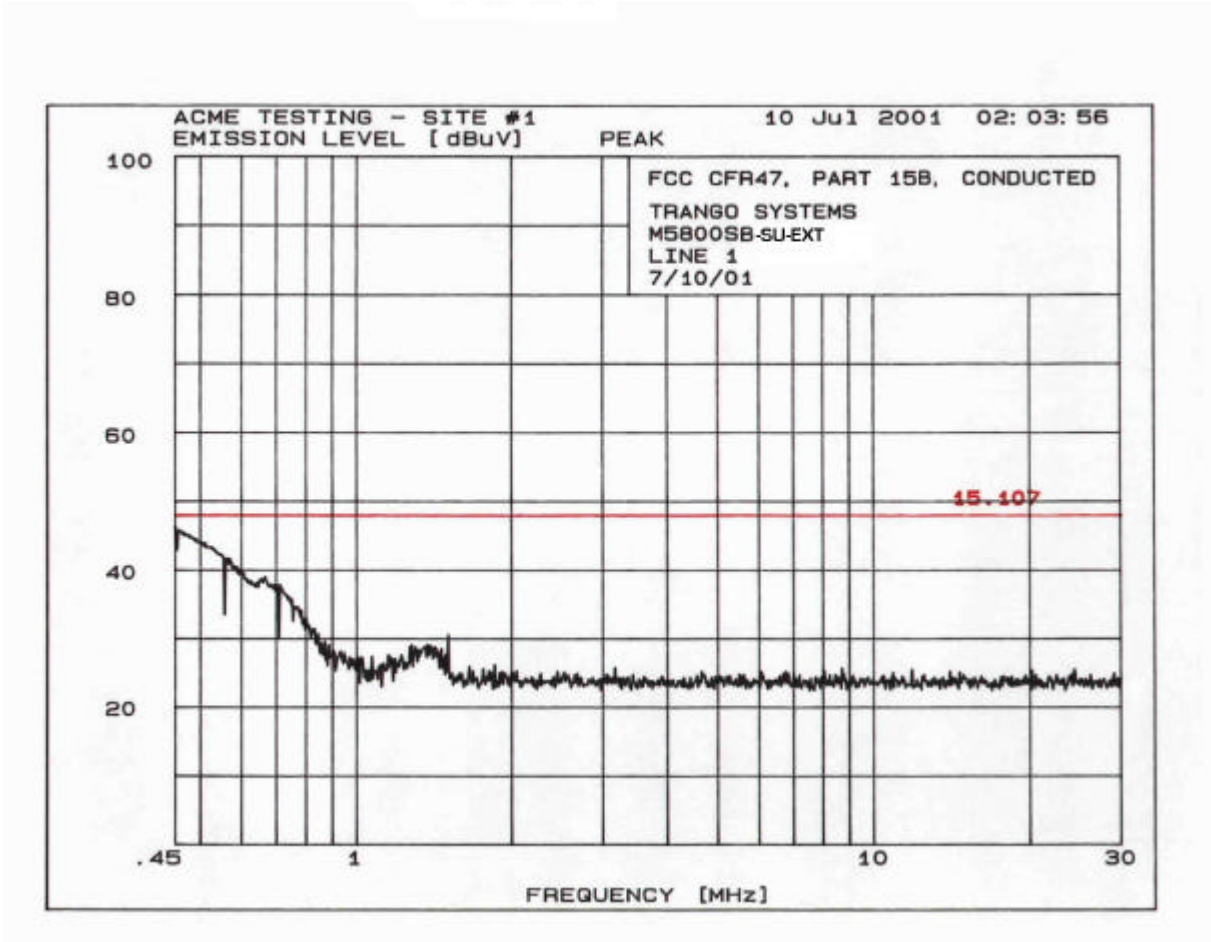
Conducted Emissions Test Characteristics	
Frequency range	0.45 MHz - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1/Line 2

12.4 Test Results

A summary of the 6 (six) highest amplitude conducted emissions is listed below.

FCC RULES 47CFR PART 15B, SUBPART 15.107,CLASS B
CONDUCTED EMISSIONS (0.45 MHZ TO 30 MHZ) 60 Hz/120 VAC
LINE 1

PEAK #	FREQ. (MHz)	AMPL (dBµV)
1	0.4557	45.8
2	0.5621	41.7
3	0.7139	37.9
4	0.7635	34.7
5	1.513	30.6



FCC RULES 47CFR PART 15B, SUBPART 15.107,CLASS B
CONDUCTED EMISSIONS (0.45 MHZ TO 30 MHZ) 60 Hz/120 VAC
LINE 2

PEAK #	FREQ. (MHz)	AMPL (dBµV)
1	0.4752	48.0
2	0.7079	43.5
3	0.7603	41.9
4	0.8408	36.8
5	1.037	35.3
6	1.279	35.4