FCC Certification Test Report

FCC Certification Test Report
for
ADTRAN, Inc.
FCC ID: HDCTRC4208L1

June 4, 2004

Prepared for:

ADTRAN, Inc.
901 Explorer Blvd
Huntsville, AL 35806

Prepared By:

Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879

FCC Certification Test Report
for the
ADTRAN, Inc.
TRACER
Transceiver 4208L1
FCC ID: HDCTRC4208L1

WLL JOB# 8029

Prepared by: Gregory M. Snyder
Chief EMC Engineer

Reviewed by: Michael Violette
President

Abstract

This report has been prepared on behalf of ADTRAN, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Direct Spread Spectrum Transceiver under Part 15.247 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a ADTRAN, Inc. TRACER DSSS 4208L1.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The ADTRAN, Inc. TRACER DSSS 4208L1 complies with the limits for a Direct Spread Spectrum Transceiver device under Part 15.247 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The ADTRAN, Inc. TRACER DSSS 4208L1 Spread Spectrum System complies with the limits for a Spread Spectrum Transceiver device under Part 15.247 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 2001 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	ADTRAN, Inc. 901 Explorer Blvd Huntsville, AL 35806
Quotation Number:	61468

1.4 Test Dates

Testing was performed from March 9 to May 11, 2004.

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter, Greg Snyder, Ken Gemmell

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
Cm	centimeter
CW	Continuous Wave
DB	decibel
Dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
K	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
M	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
Rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

ADTRAN Part #	Product Name/Description
12804208L1A	Tracer 4208L1 Plan A
12804208L1B	Tracer 4208L1 Plan B

Top Assembly #:	12804208L1A / B
Sub Assembly #(s):	2280003-28, 2280018-11
Circuit Board #(s):	5280003-28, 5280018-11

The 12804208L1 (Tracer 4208L1 Radio) is a digital radio device that accepts eight 1.544 Mb/sec T1 signals and transports them over a wireless carrier. A pair of these radios forms a wireless transport for T1 digital services in the 5.8 GHz Industrial, Scientific, and Medical (ISM) radio band. The 12804208L1 provides the network, antenna, and control/status interface to the customer. The T1 interfaces are network timed. No internal timing is available.

The Tracer 4208L1 operates in the 5748-5823 MHz band using direct sequence spread spectrum transmission. Two Plans are available: “A” and “B”. Each plan has three (3) channels. The channels are determined by internal cable routing on the transmit module during manufacture.

I/O Ports and Cables available on the TRACER 4208L1 Tracer:

Signal/ Port Name	Signal/ Port Type	Cable Type	NOTES
RS232	I/O	Shielded 25 wire	VT100/Modem port
TEST	I/O	Unshielded TP	1/4" stereo jack for I/Q constellation
T1A,B,C,D,E,F,G,H	I/O	Unshielded	100 ohm impedence
ALARM	Control	Unshielded TP	Major and Minor alarm contacts
DC POWER	Power	Unshielded	DC Power input, 21-60 VDC
ANTENNA	I/O	Shielded Coax	Connection to 5.8GHz antenna, 50 ohm
RSSI	I/O	Unshielded wire	Mono jack, Received Signal Strength
TX PWR	I/O	Unshielded wire	Mono jack, Transmitter power level
GND	I/O	Unshielded wire	Mono jack, Circuit ground

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	ADTRAN, Inc.
FCC ID Number	HDCTRC4208L1
EUT Name:	Spread Spectrum Transceiver
Model:	4208L1
FCC Rule Parts:	§15.247
Frequency Range:	5742MHz – 5833MHz
Maximum Output Power:	100 mW
Modulation:	Digital (QPSK)
Bandwidth:	>500kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	2 plans (A and B), 3 channels/band
Power Output Level	Fixed
Antenna Type	Parabolic Dish Radio Waves, Inc. SP2-5.8; 28.5 dBi
Frequency Tolerance:	N/A
Emission Type(s):	N/A
Power Source & Voltage:	48 VDC

The TRACER DSSS 4208L1 contains the following sources:

Frequency (MHz)	Description
51.536	Master clock of digital transmit and receive (XO)
1.544	T1 clock rate for framer (XO)
12	RF reference clock (XO)
280	IF frequency (XO)
5748	RF channel A frequency
5823	RF channel B frequency
1402	RF channel A RX IF
1367	RF channel A TX IF
1422	RF channel B RX IF
1387	RF channel B TX IF

2.2 Test Configuration

The EUT was configured with an external power adapter, loopback connections on Channels A and B, unshielded wires connected to the alarm I/O, and a 50 Ohm coaxial cable connected to the antenna port.

The EUT firmware was set up to provide continuous random data for Direct Sequence modulation to the output connector.

Two plans are available: “A” and “B”. Changing between the plans is accomplished by switching the internal cables. The channels are then programmed within the plan.

An HP Pavilion Laptop PC, Model Number N3350, S/N: TW02810306 was used to set up the EUT. It was removed for the test.

2.3 Testing Algorithm

The EUT was operated continuously by firmware test sequence that provided a modulated RF data stream to the output port.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ±2.3 dB.

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

Total Uncertainty = $(A^2 + B^2 + C^2)^{1/2}/(n-1)$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, total uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2}$ = ±2.3 dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Manufacturer	Model/Type	Function	Identification	Cal. Due
HP	8568B	Spectrum Analyzer	2634A02888	7/07/04
HP	85650A	Quasi-Peak Adapter	3303A01786	7/08/04
HP	HP 8593A	Spectrum Analyzer	3009A00739	6/25/04
HP	8449B	Microwave Preamp	3008A00385	9/29/05
Solar	8012-50-R-24BNC	LISN	8379493	6/30/04
Narda	V638	Horn Antenna	210	7/22/04
ARA	LPB-2520	BiconiLog Antenna	1044	6/20/04
ARA	DRG118/A	Microwave Horn Antenna	1236	4/17/04
HP	85685A	RF Preselector	3221A01395	7/07/04
Tektronix	TDS 220	Oscilloscope	00333	8/18/04
HP	8672A	Generator	00080	3/25/05
Agilent	8474B	Diode Detector	00416	12/19/04
HP	438A	Power Meter	00394	3/10/05

4 Test Results

4.1 RF Power Output

For devices within the scope of FCC §15.247, the peak power conducted from the intentional radiator to the antenna shall not be greater than one watt (30 dBm).

The output from the transmitter was connected to a diode detector and oscilloscope. The peak deflection was measured on the oscilloscope and recorded. A signal generator was then substituted in place of EUT and set to the same frequency as the transmitter. The CW output of the signal generator was increased until the same deflection was noted on the oscilloscope. A power meter was then connected to the output of the signal generator to determine the output power of the signal generator. This level is then recorded as the output power of the EUT at the specified frequency.

The EUT carrier was modulated during this test.

Table 3. RF Power Output

Frequency	Level (dBm)	Level (mW)	Rated (mW)	Limit (W)	Pass/Fail
Plan A (1)	19.73	94	100	1	P
Plan A (2)	19.71	93.5	100	1	P
Plan A (3)	19.84	96.4	100	1	P
Plan B (1)	19.89	97.5	100	1	P
Plan B (2)	19.66	92.5	100	1	P
Plan B (3)	19.64	92	100	1	P

4.2 RF Peak Power Spectral Density

For DSSS devices, 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.

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system.

The carrier was modulated. Plots of the PSD were taken as shown in Figure 1 through Figure 6 below. Table 4 provides a summary of the data.

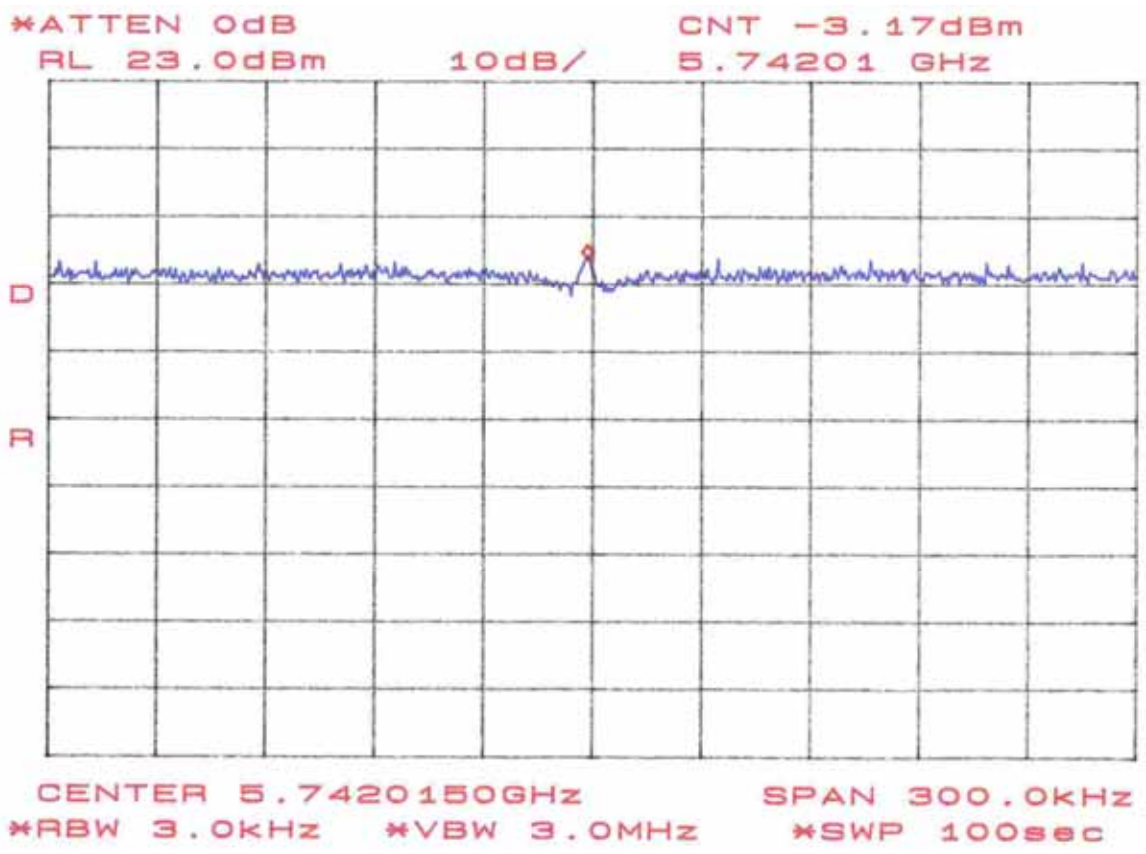

Figure 1. Power Spectral Density Plan A, Band 1

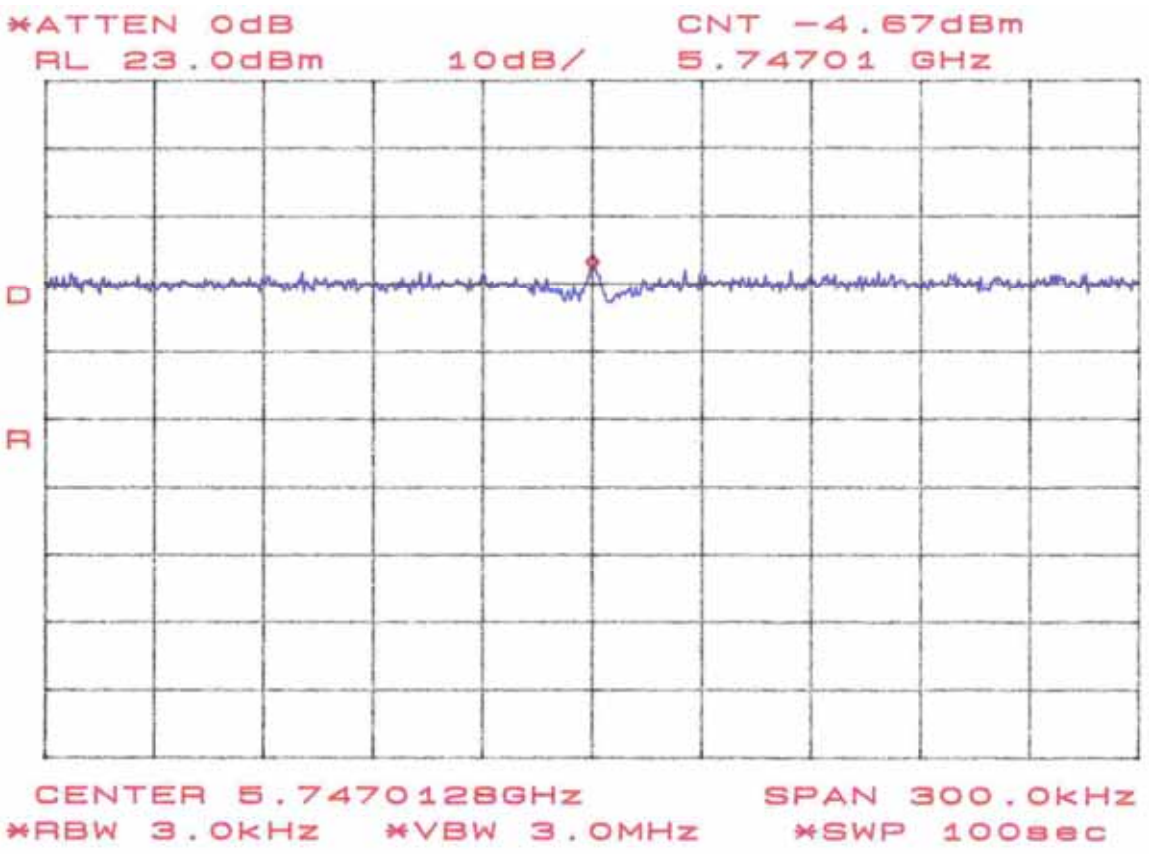

Figure 2. Power Spectral Density Plan A, Band 2

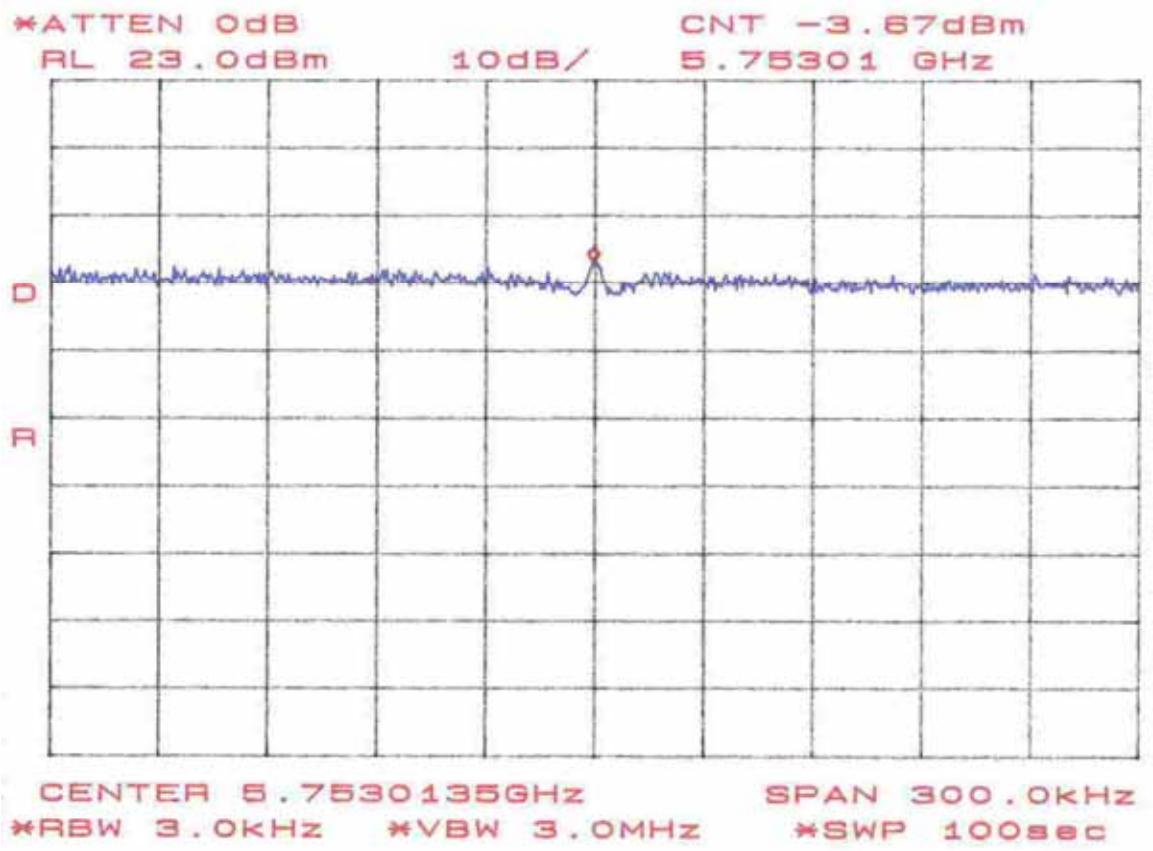

Figure 3. Power Spectral Density Plan A, Band 3

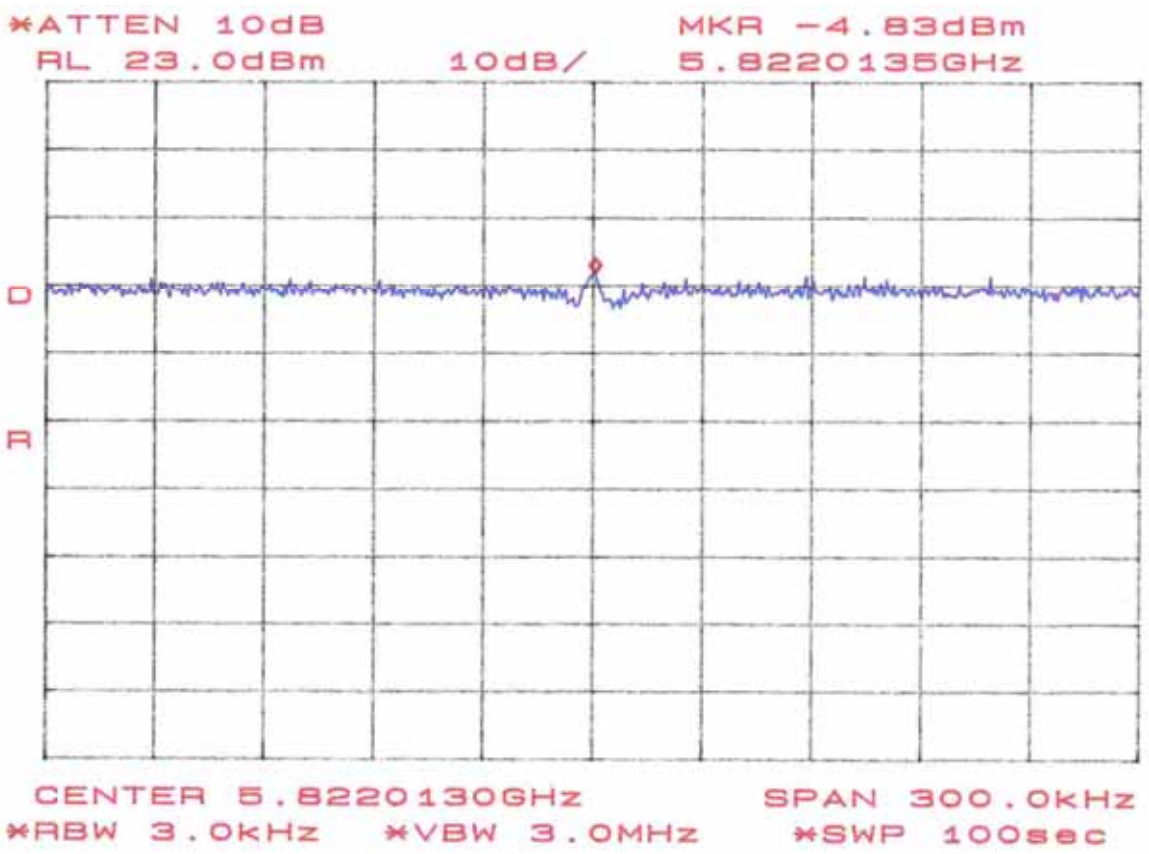

Figure 4. Power Spectral Density Plan B, Band 1

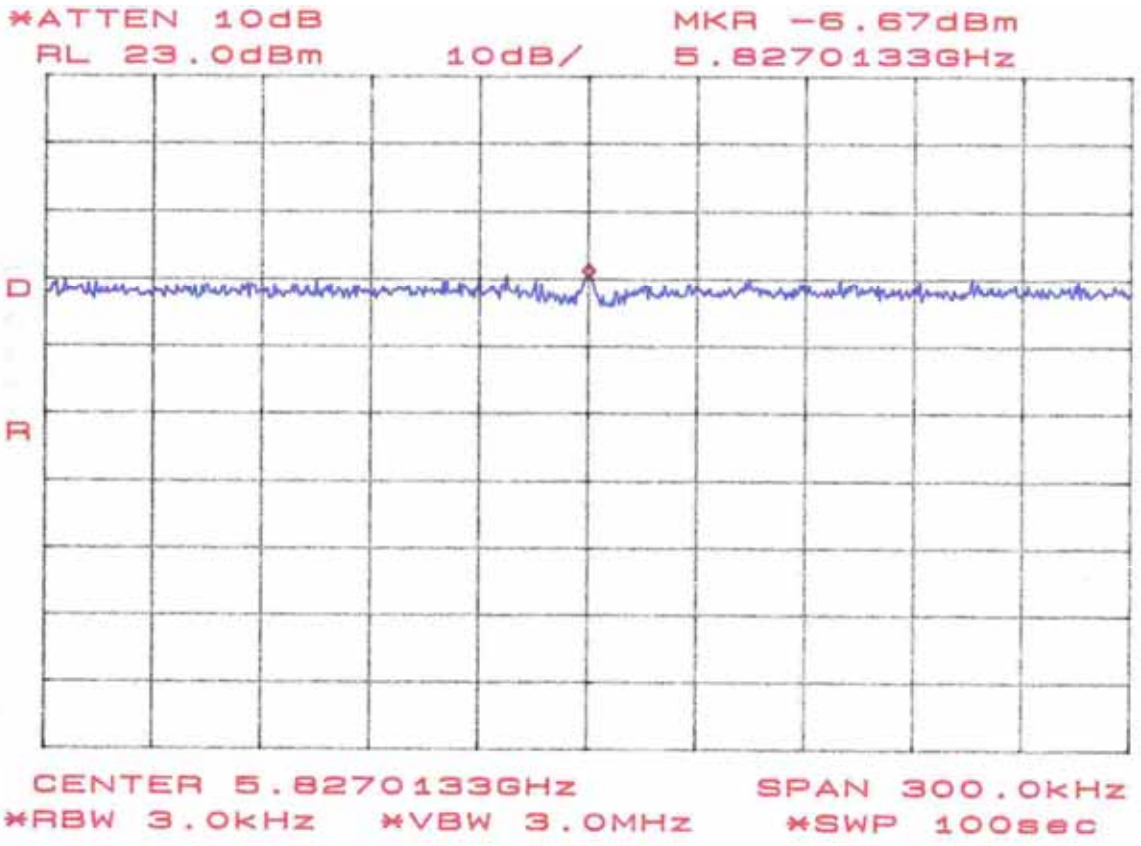

Figure 5. Power Spectral Density Plan B, Band 2

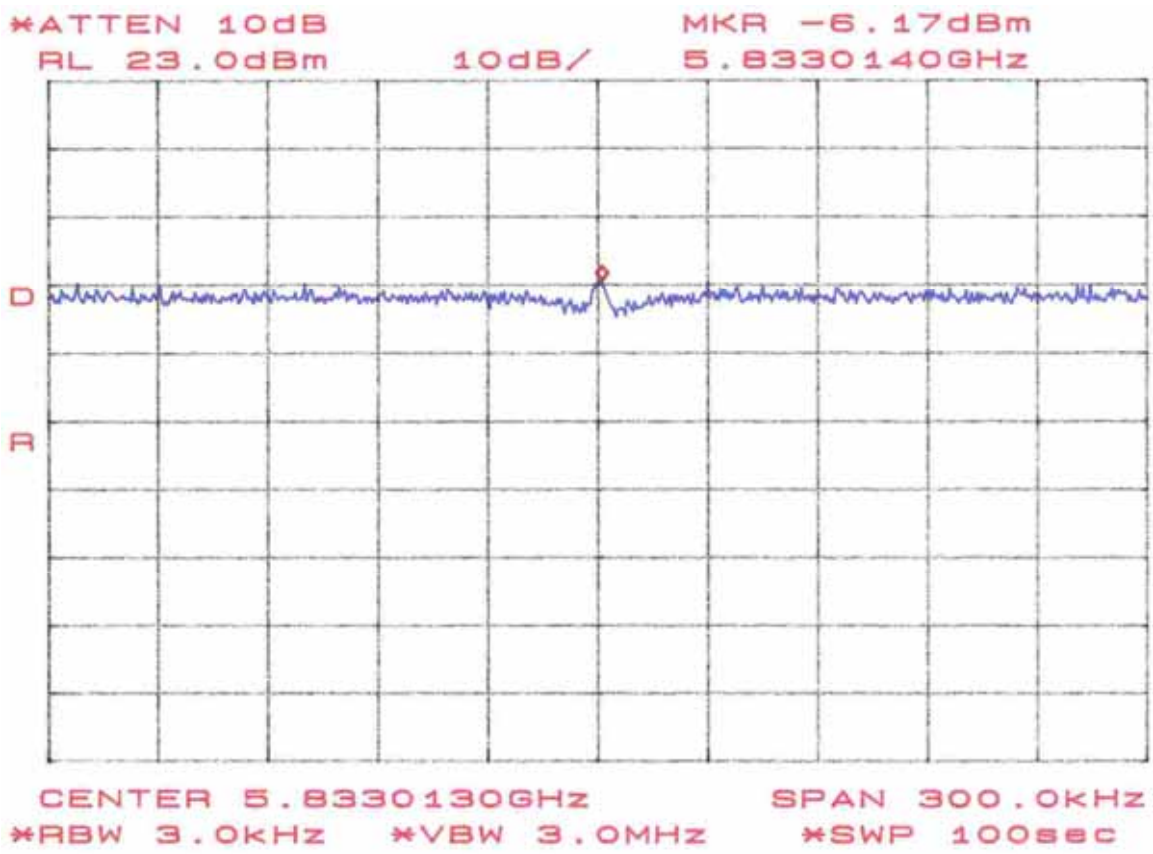

Figure 6. Power Spectral Density Plan B, Band 3

Table 4. RF Power Spectral Density

Frequency	Level (dBm)	Limit (dBm)	Pass/Fail
Plan A (1)	-3.17	8	P
Plan A (2)	-4.67	8	P
Plan A (3)	-3.67	8	P
Plan B (1)	-4.83	8	P
Plan B (2)	-6.77	8	P
Plan B (3)	-6.17	8	P

4.3 Occupied Bandwidth

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

For Direct Sequence Spread Spectrum Systems, FCC Part 15.247 requires that the minimum 6dB bandwidth be at least 500 kHz.

Figure 7. Occupied Bandwidth - Plan A , Band 1

Figure 8. Occupied Bandwidth - Plan A , Band 2

Figure 9. Occupied Bandwidth - Plan A, Band 3

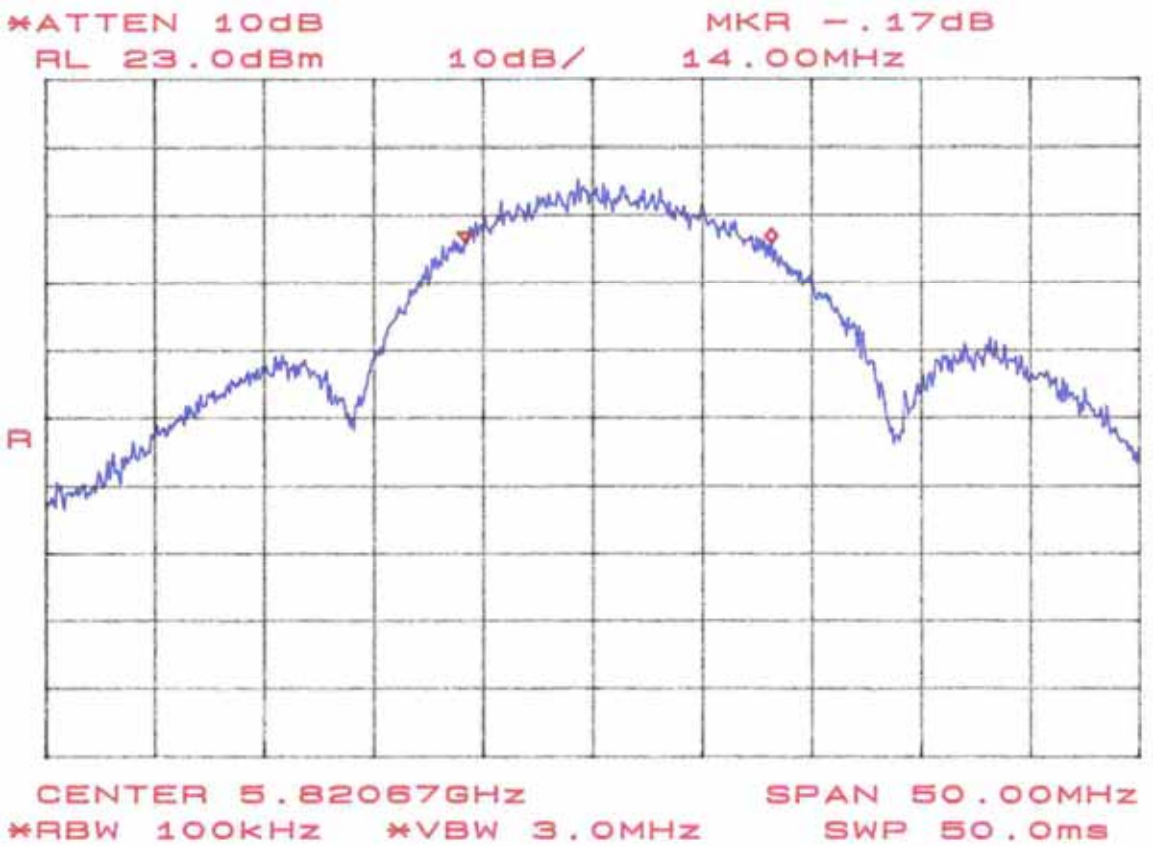

Figure 10. Occupied Bandwidth - Plan B, Band 1

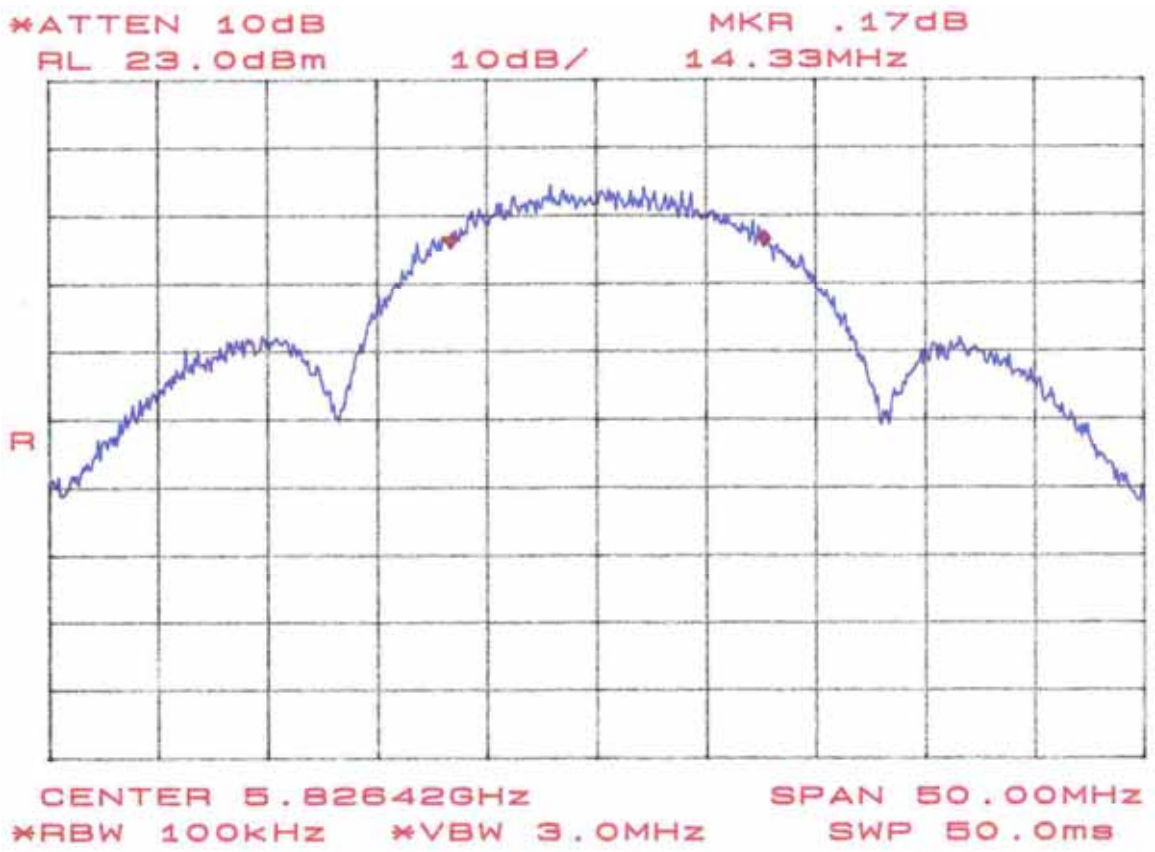

Figure 11. Occupied Bandwidth - Plan B, Band 2

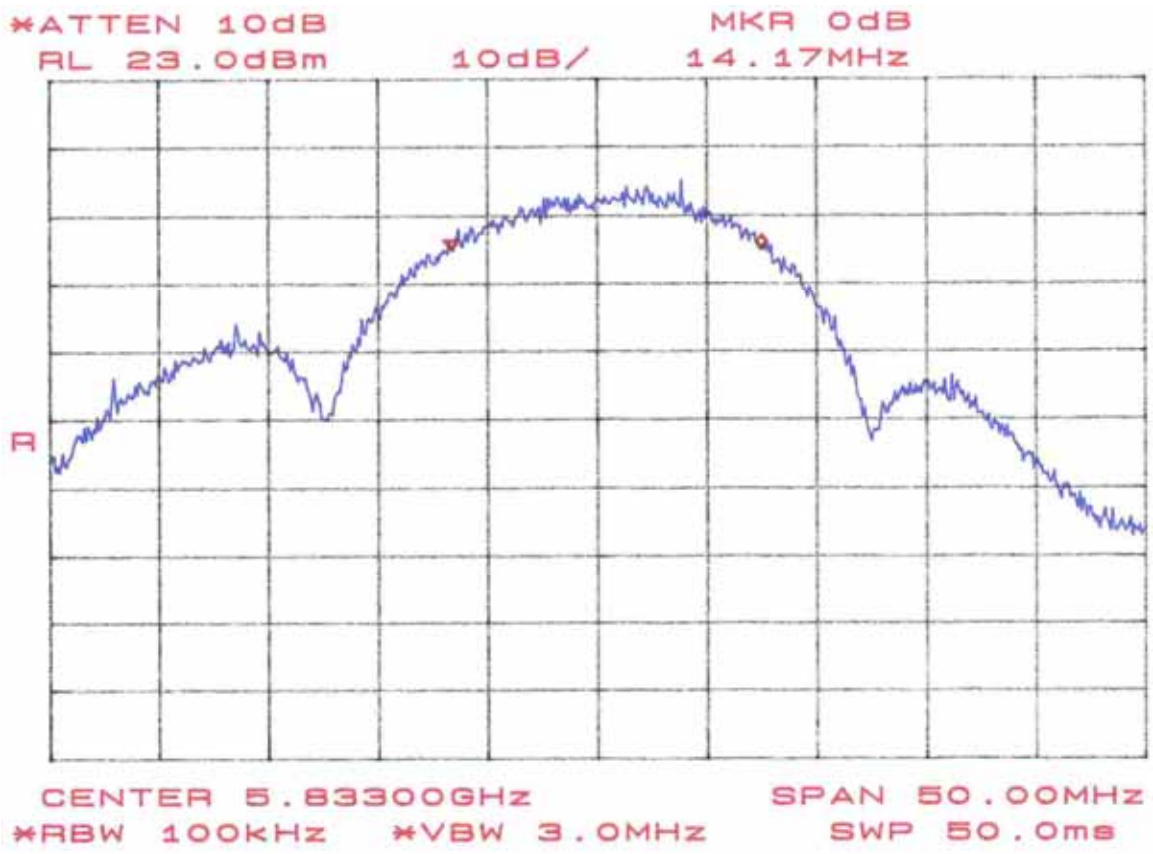

Figure 12. Occupied Bandwidth - Plan B, Band 3

Table 5 provides a summary of the Occupied Bandwidth Results.

Table 5. Occupied Bandwidth Results

Frequency	Bandwidth (MHz)	Limit	Pass/Fail
Plan A (1)	12.17	> 500 kHz	Pass
Plan A (2)	14.58	> 500 kHz	Pass
Plan A (3)	14.17	> 500 kHz	Pass
Plan B (1)	14.0	> 500 kHz	Pass
Plan B (2)	14.33	> 500 kHz	Pass
Plan B (3)	14.17	> 500 kHz	Pass

4.4 Spurious Emissions at Antenna Terminals (FCC Part §15.247(b))

In any 100 kHz band outside the frequency band in which the system is operating, the RF power shall be at least 20dB below that in the 100 kHz bandwidth that contain the highest level of the desired power.

All measurements were performed with a measurement bandwidth of 100kHz. The video bandwidth was set to 3MHz during the testing.

See the plots of conducted emissions plots below.

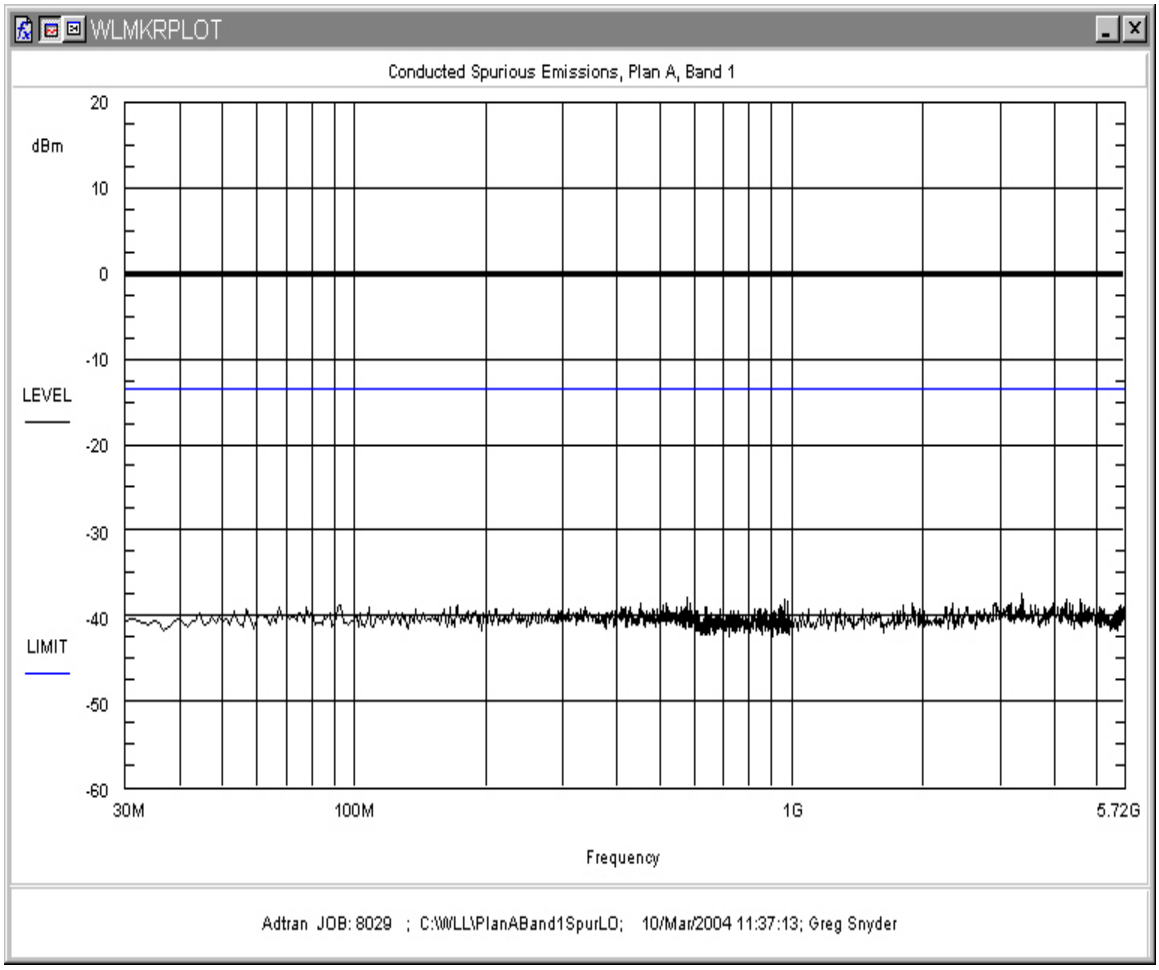

Figure 13. Conducted Spurious Emissions, Plan A Band 1, 30MHz-5.72GHz

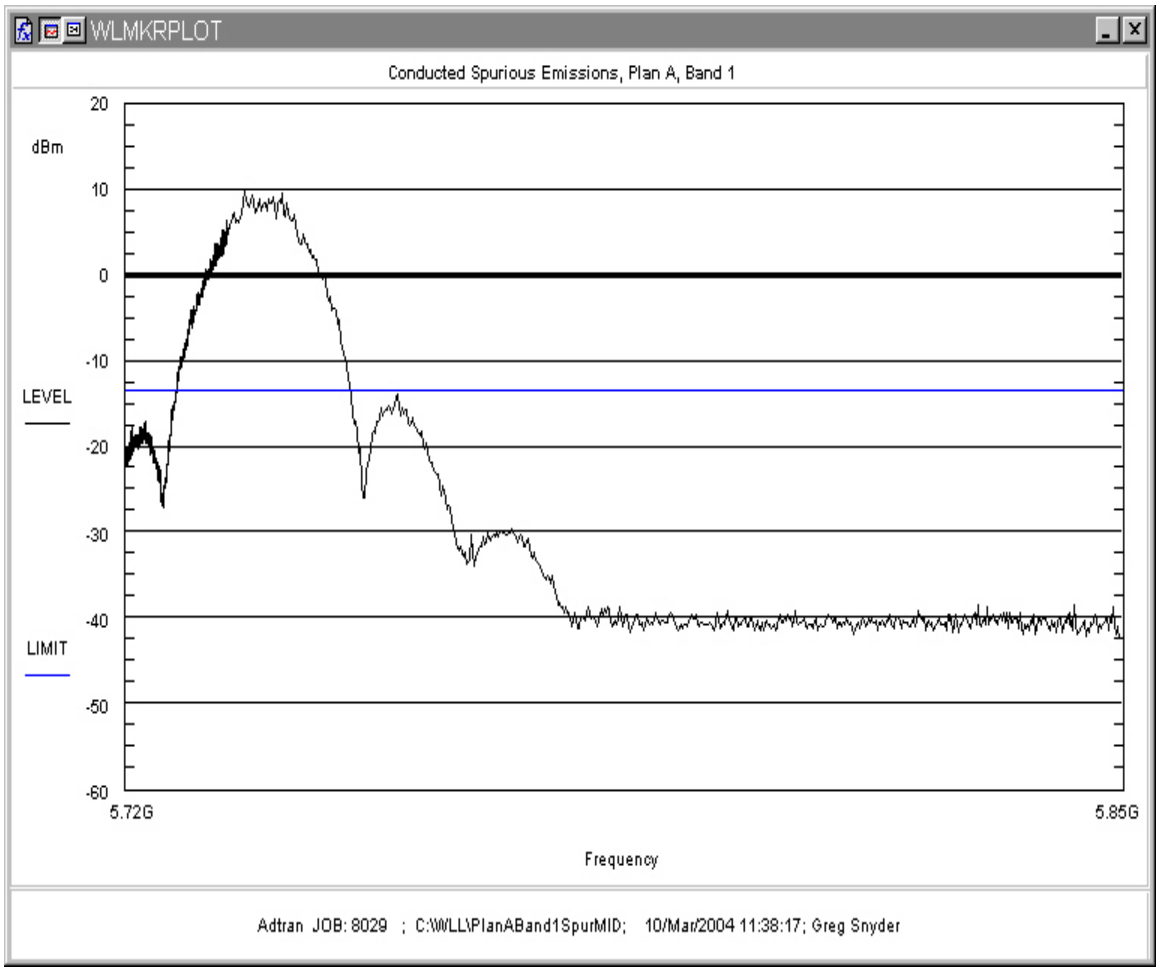

Figure 14. Conducted Spurious Emissions, Plan A Band 1, 5.72GHz-5.85GHz

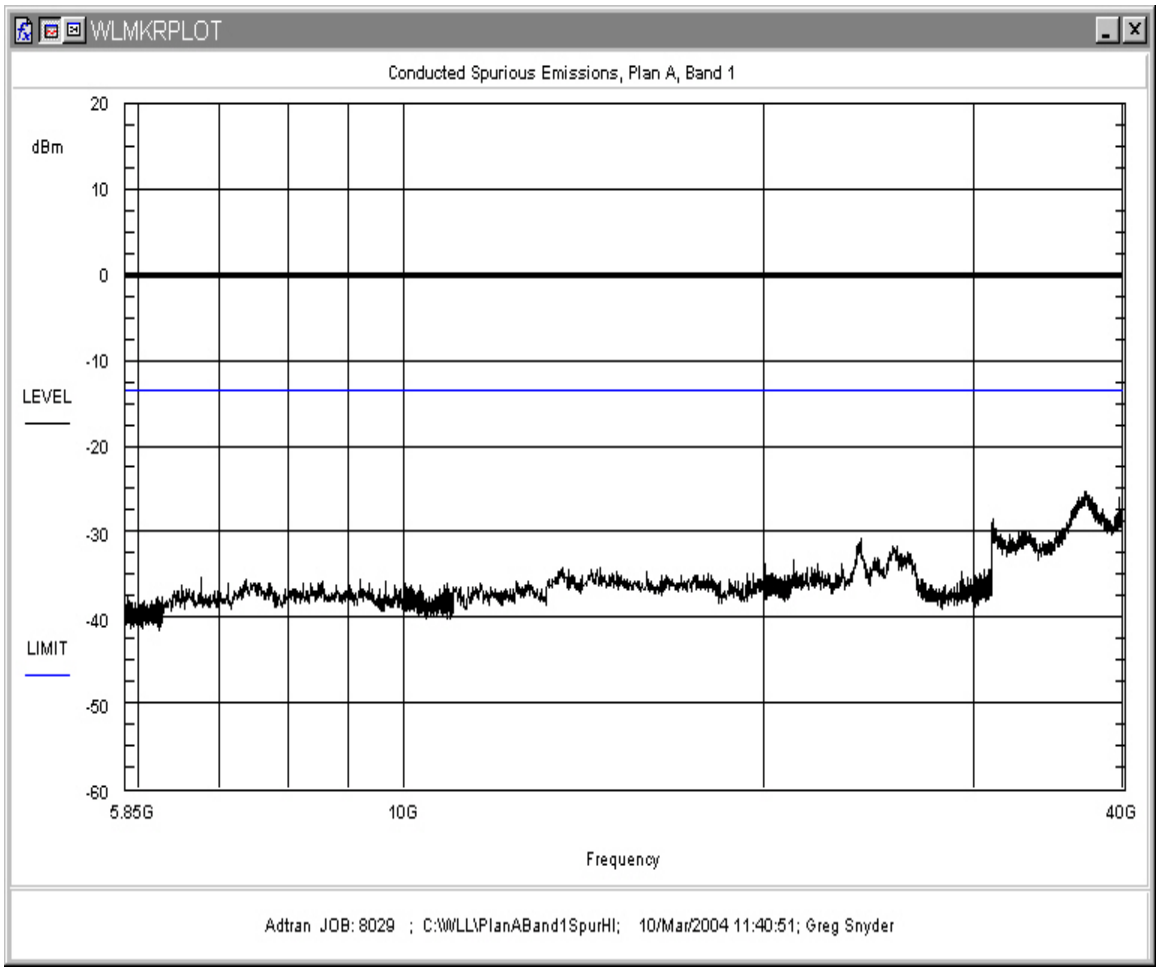

Figure 15. Conducted Spurious Emissions, Plan A Band 1, 5.85GHz-40GHz

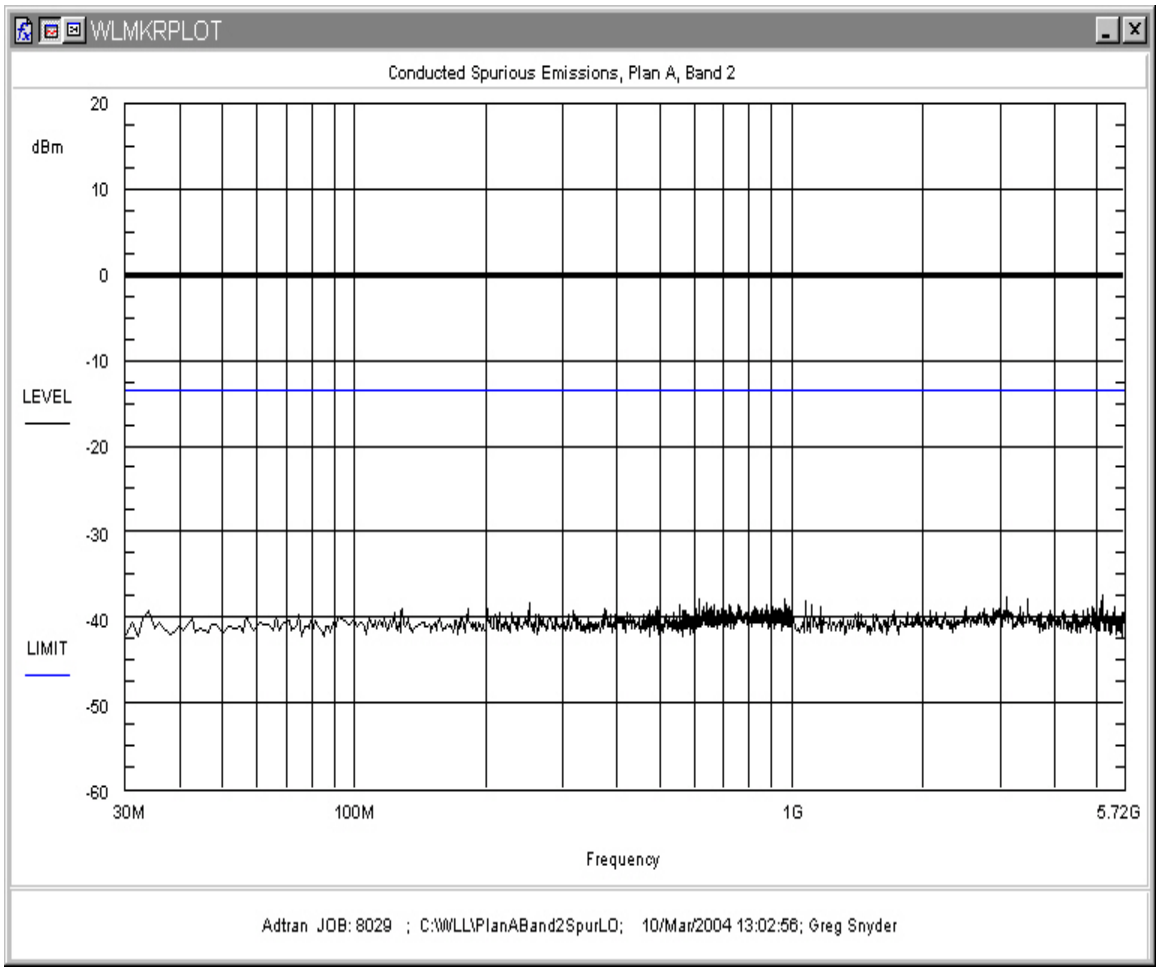

Figure 16. Conducted Spurious Emissions, Plan A Band 2, 30MHz-5.72GHz

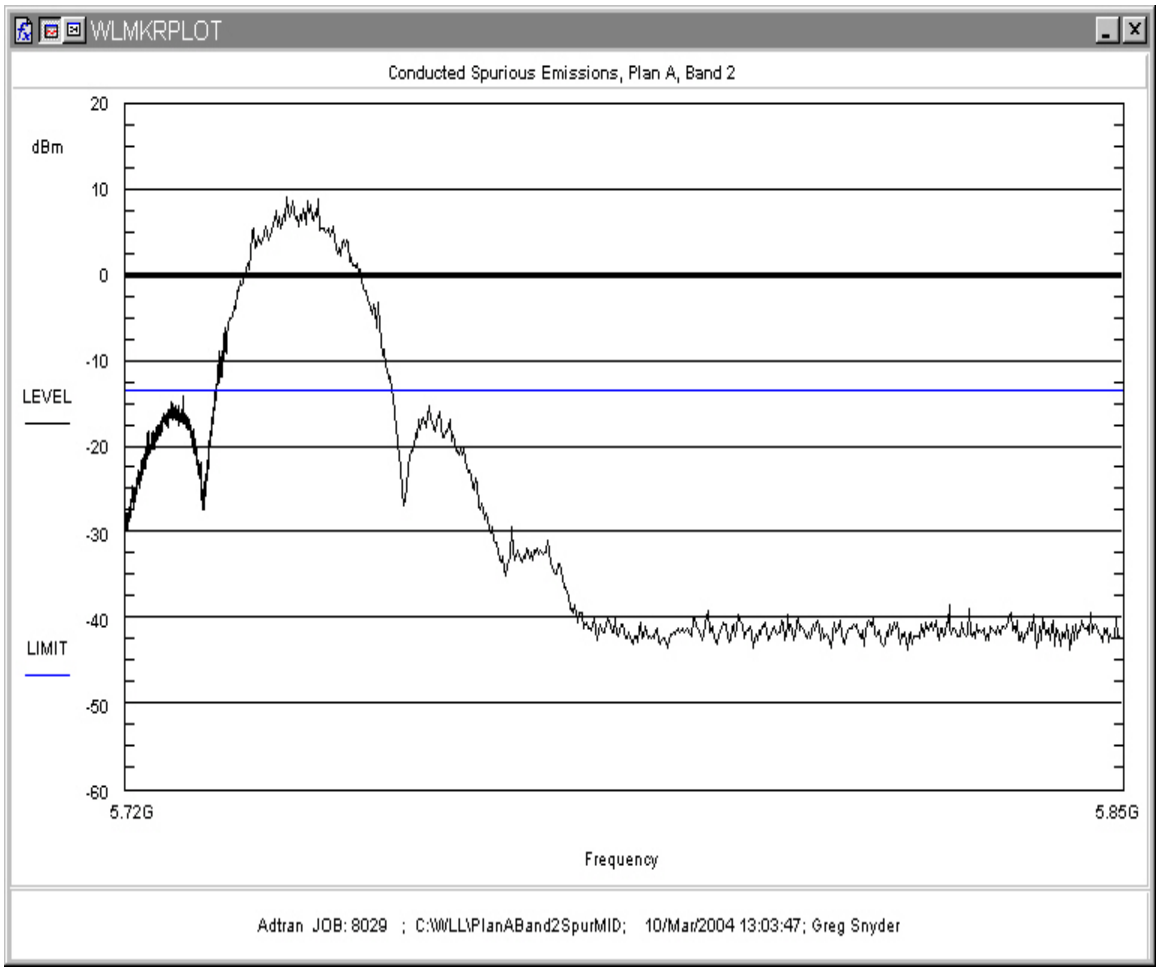

Figure 17. Conducted Spurious Emissions, Plan A Band 2, 5.72G – 5.85GHz

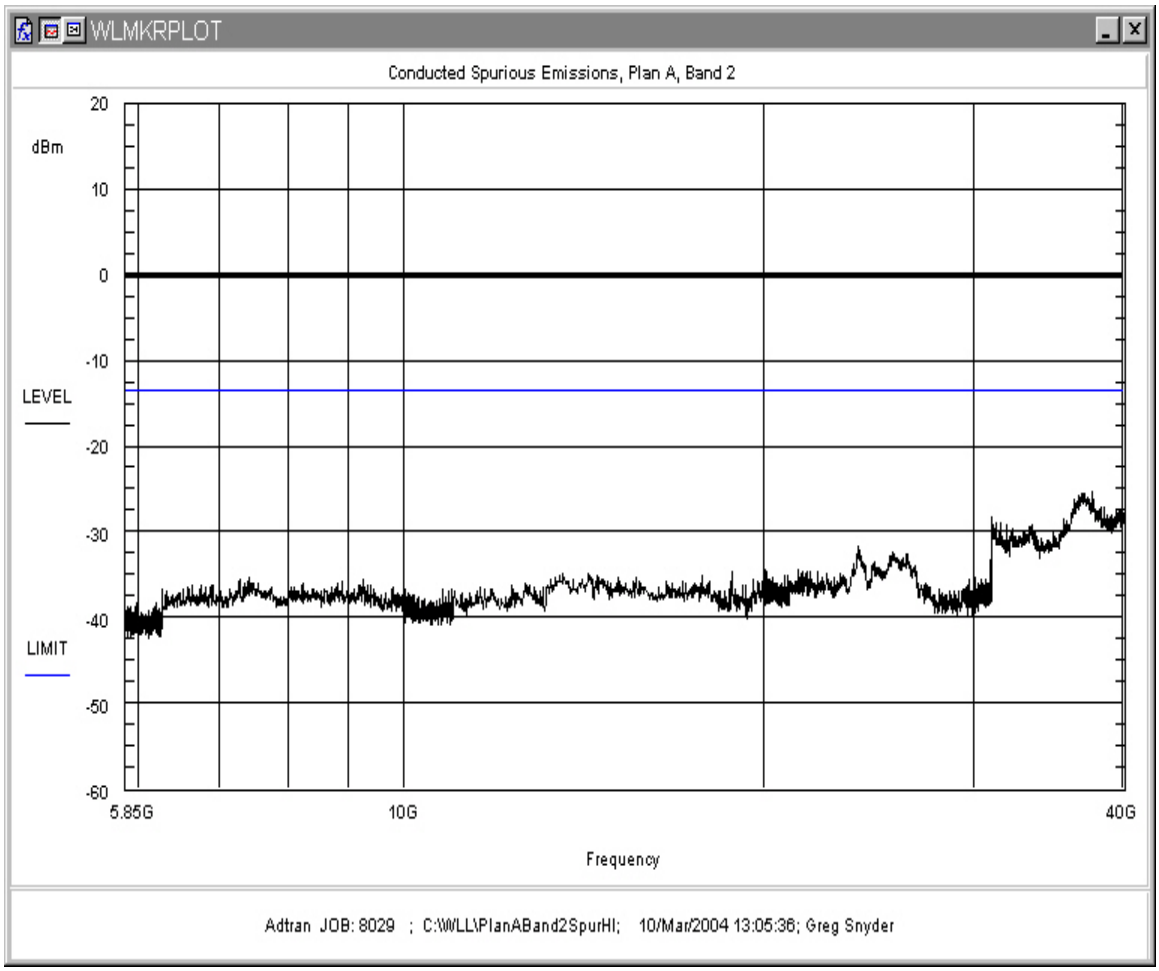

Figure 18. Conducted Spurious Emissions, Plan A Band 2, 5.85GHz – 40GHz

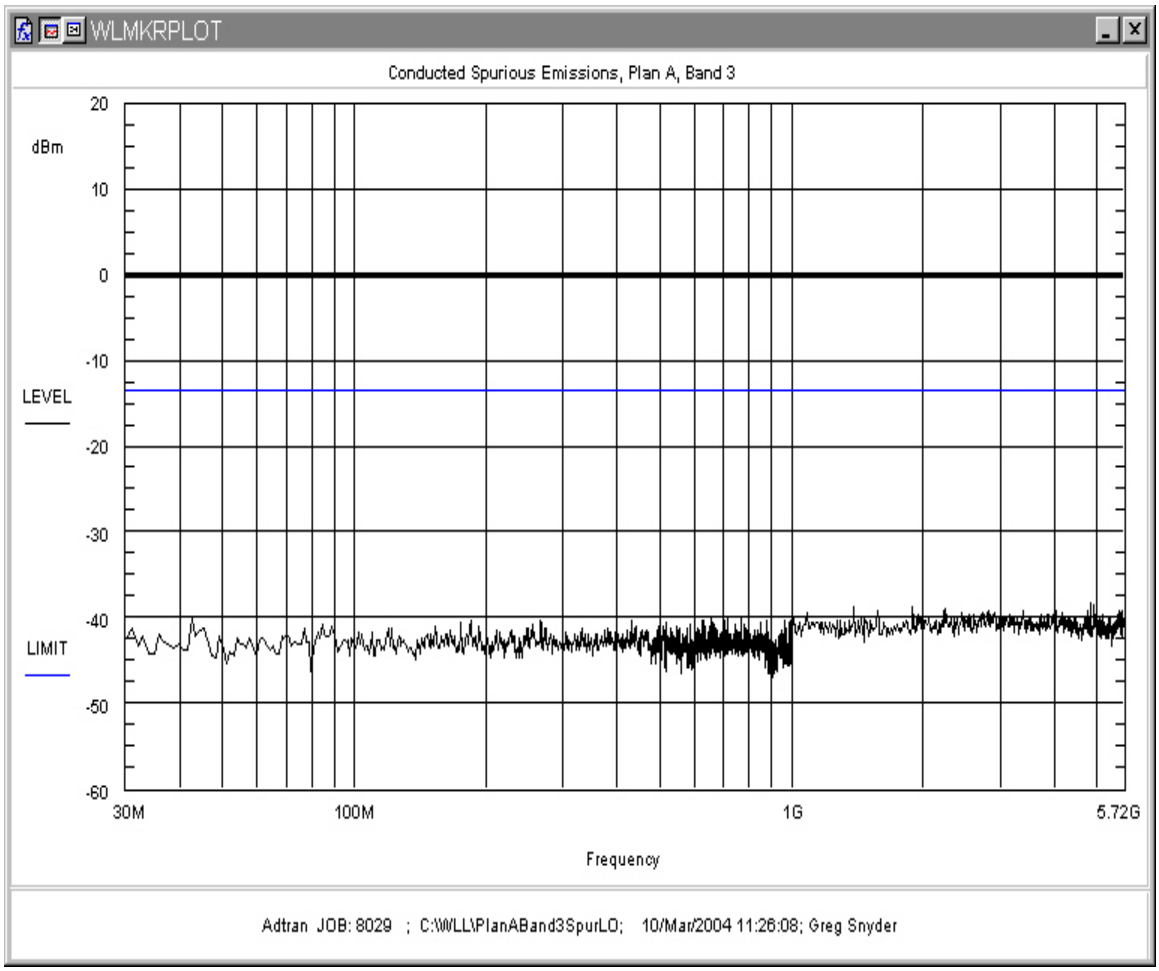

Figure 19. Conducted Spurious Emissions, Plan A Band 3, 30MHz-5.72GHz

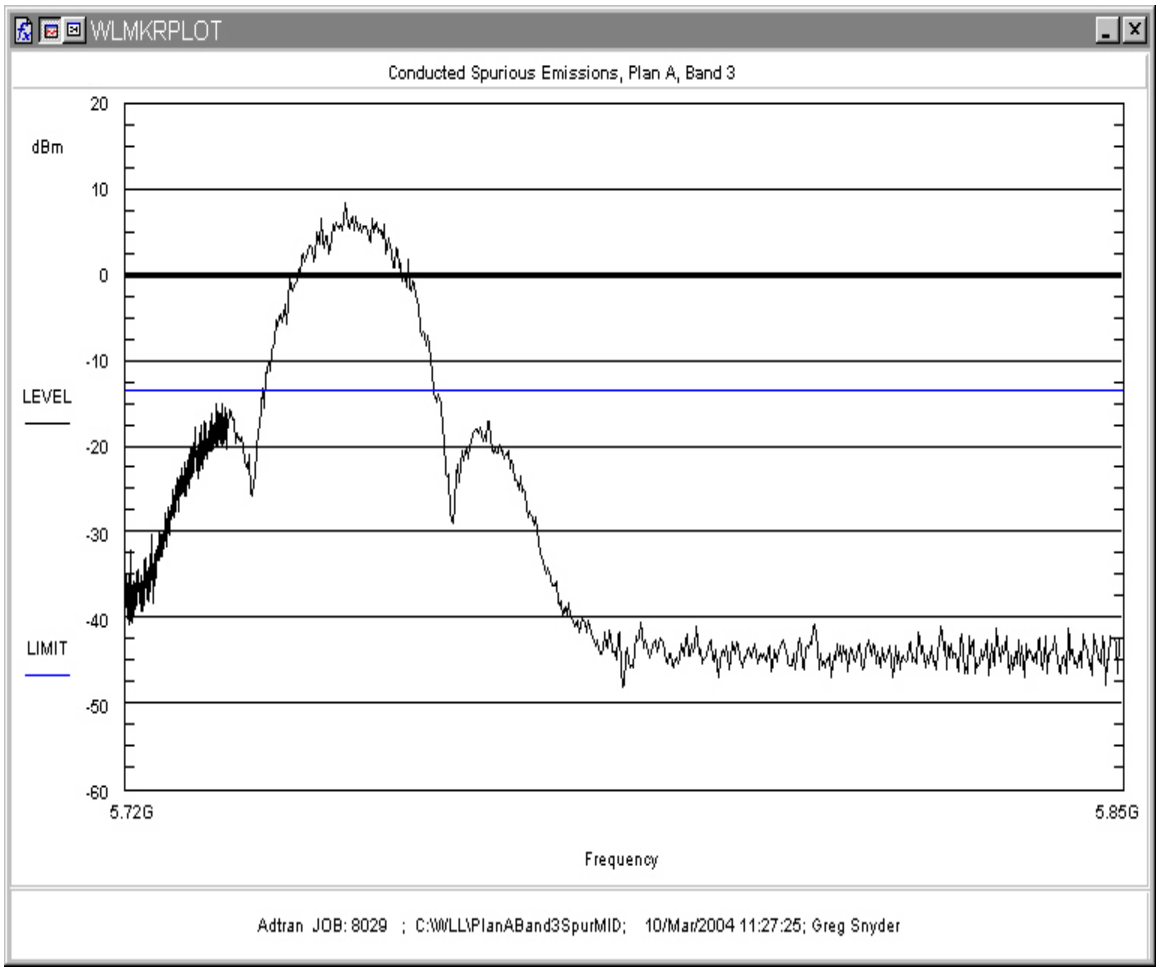

Figure 20. Conducted Spurious Emissions, Plan A Band 3, 5.72GHz-5.85GHz

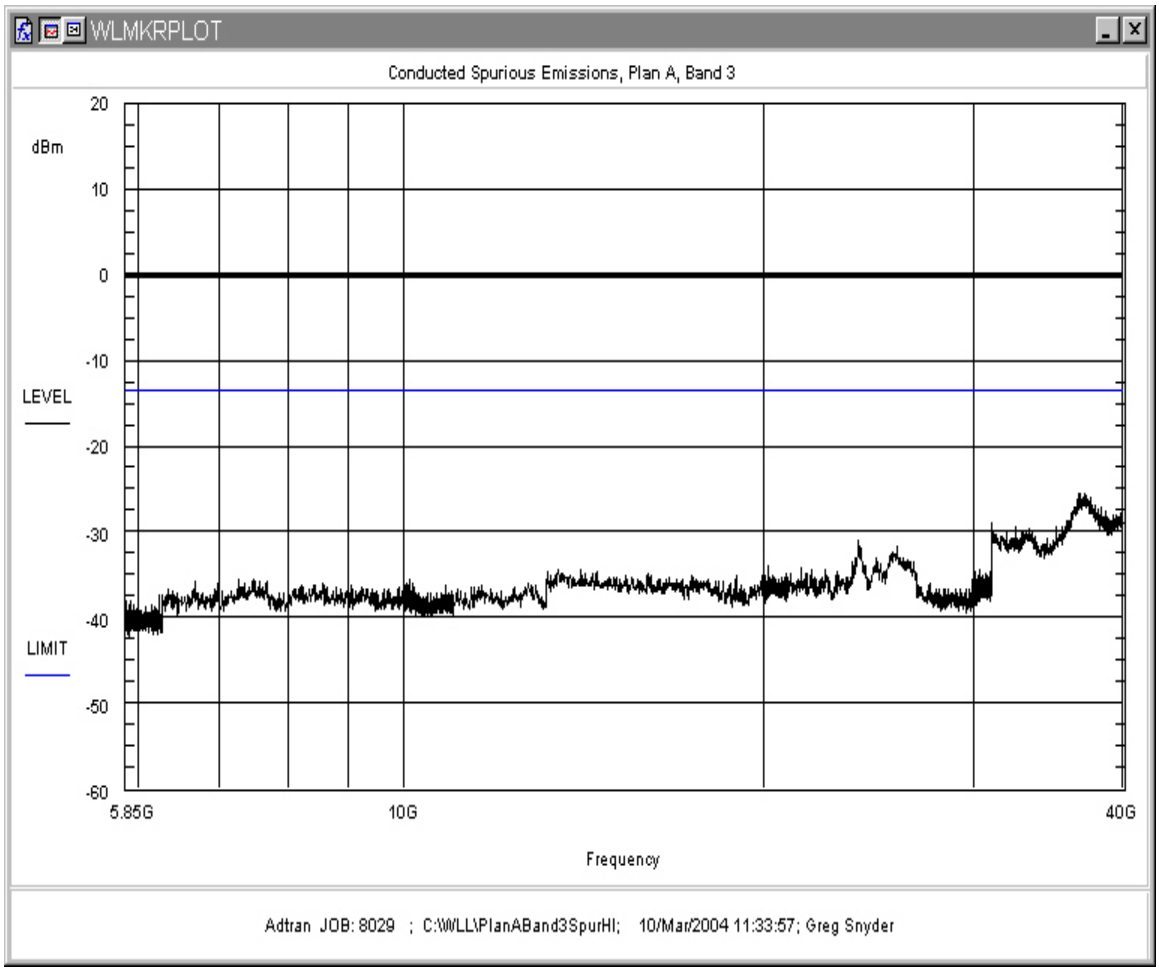

Figure 21. Conducted Spurious Emissions, Plan A Band 3, 5.85GHz-40GHz

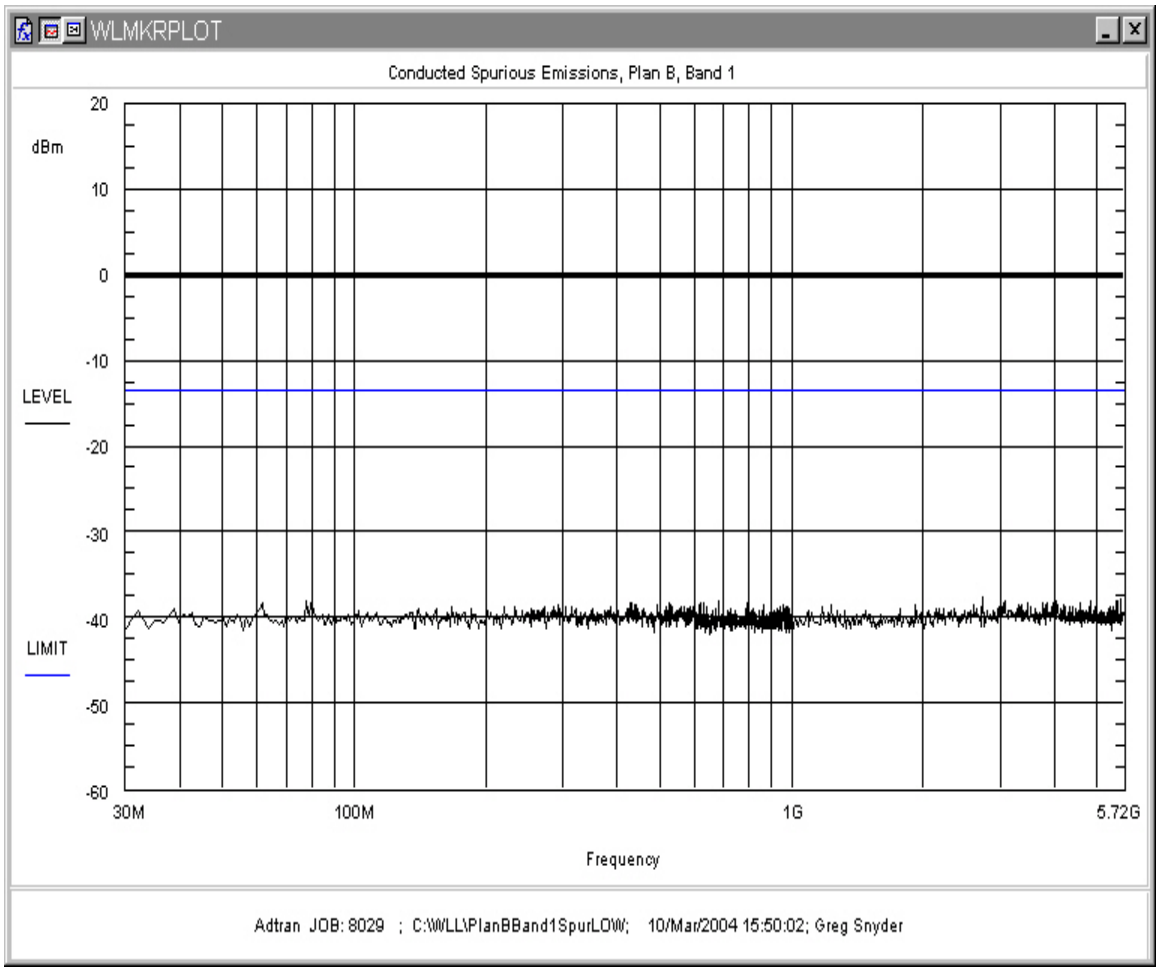

Figure 22. Conducted Spurious Emissions, Plan B Band 1, 30MHz-5.72GHz

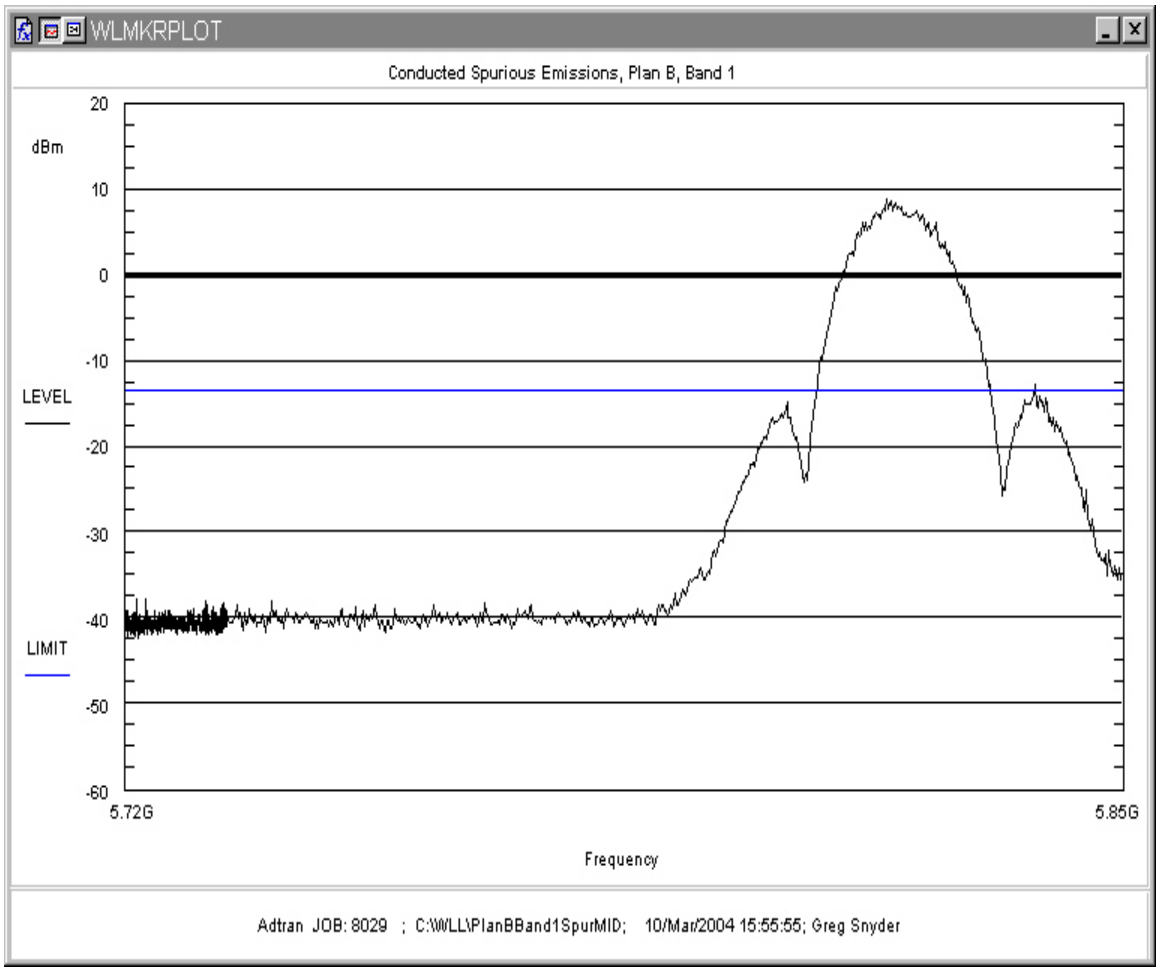

Figure 23. Conducted Spurious Emissions, Plan B Band 1, 5.72GHz-5.85GHz

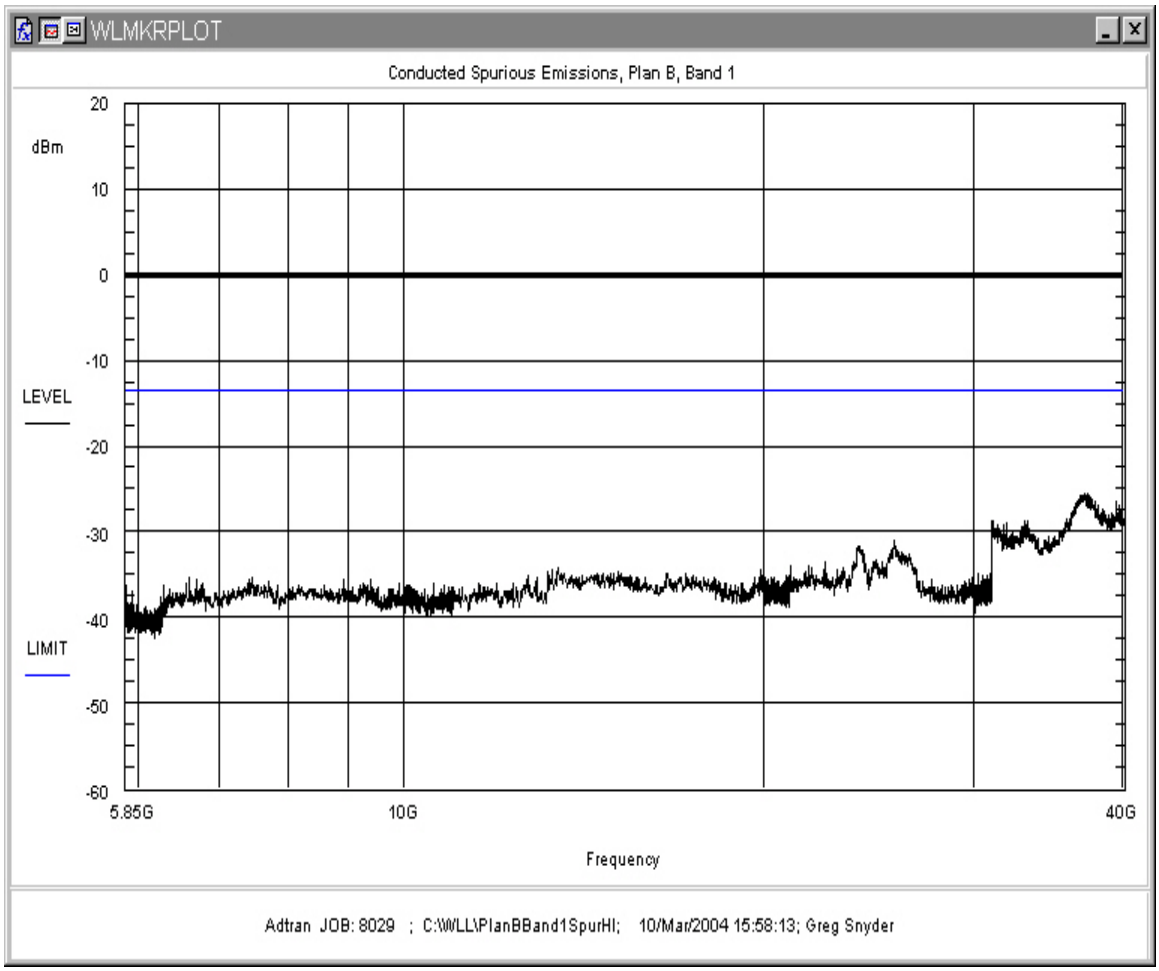

Figure 24. Conducted Spurious Emissions, Plan B Band 1, 5.85GHz-40GHz

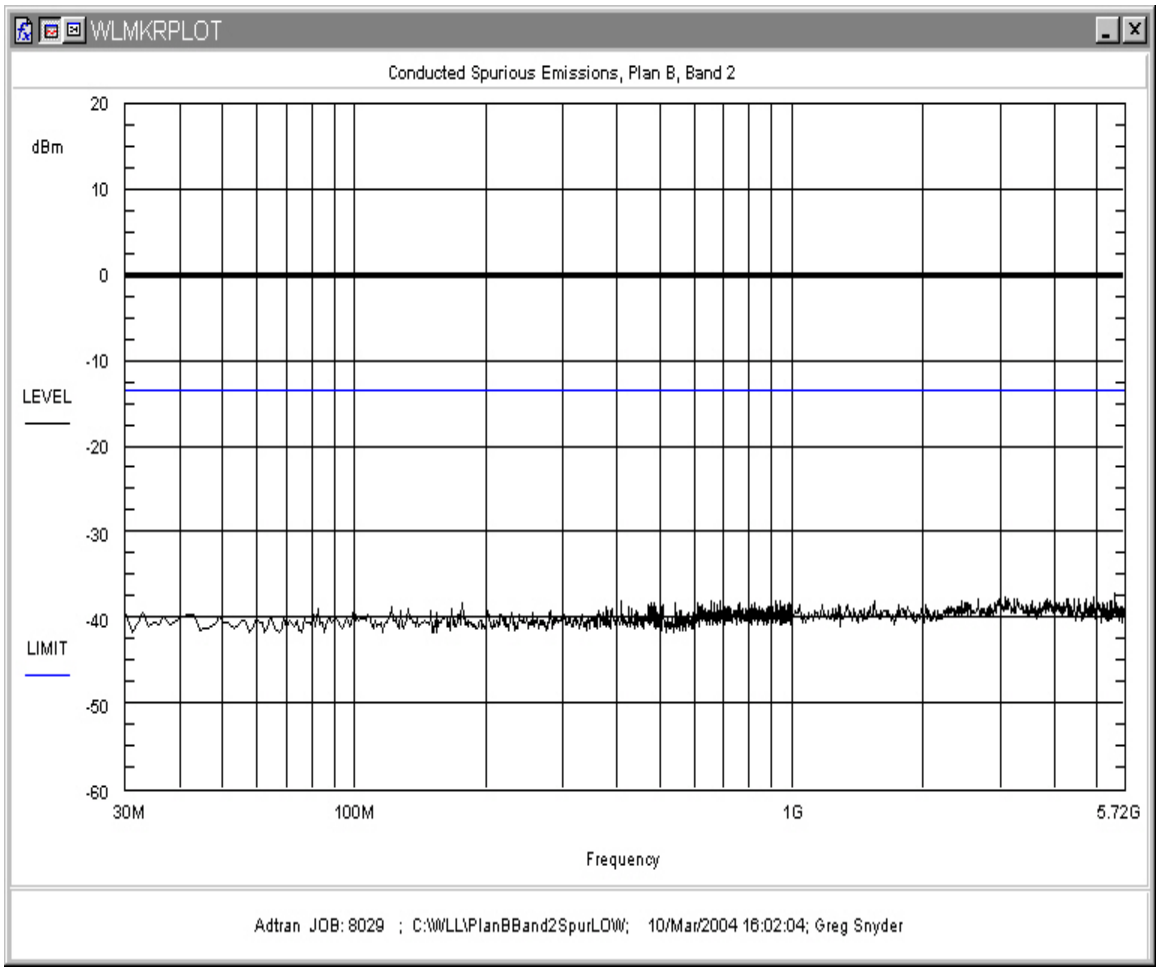

Figure 25. Conducted Spurious Emissions, Plan B Band 2, 30MHz-5.72GHz

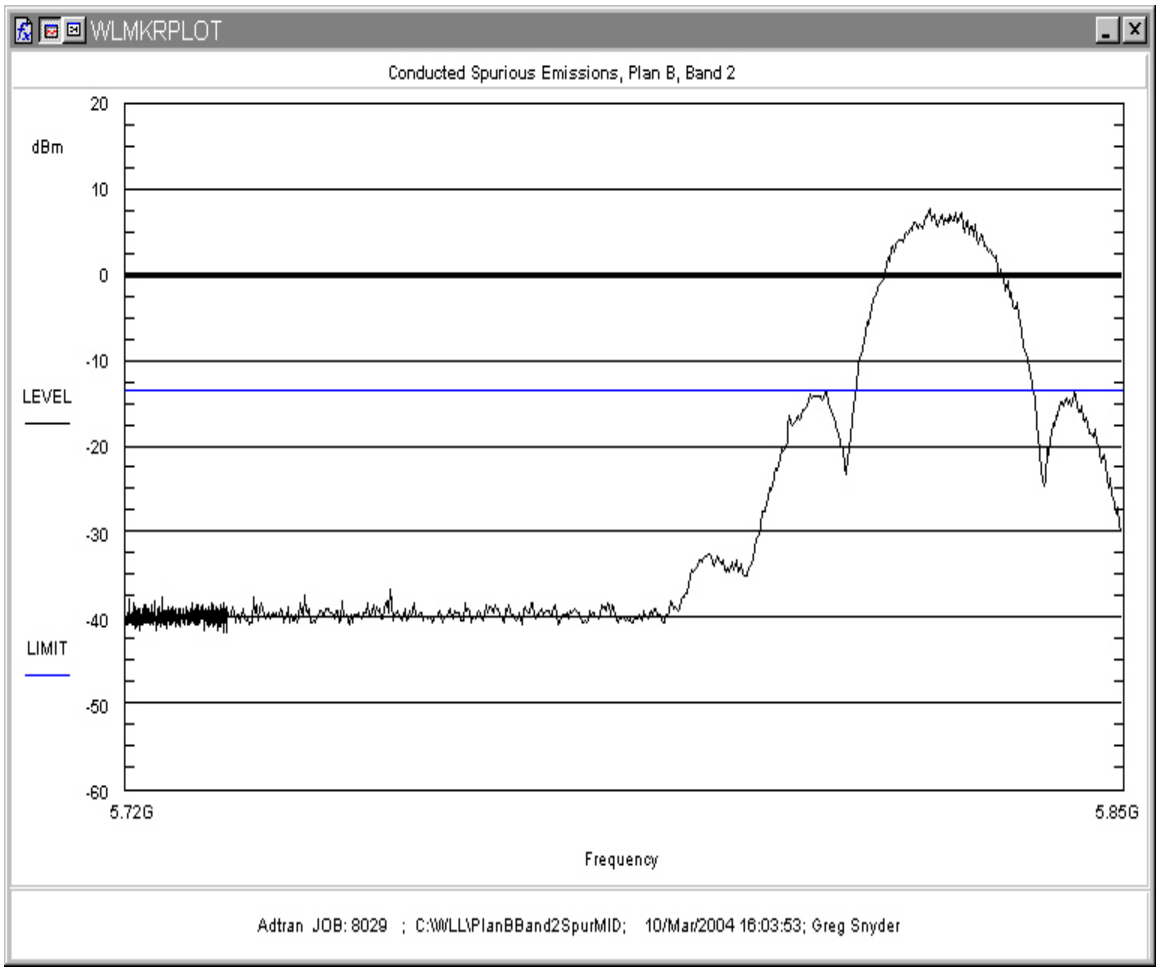

Figure 26. Conducted Spurious Emissions, Plan B Band 2, 5.72GHz-5.85GHz

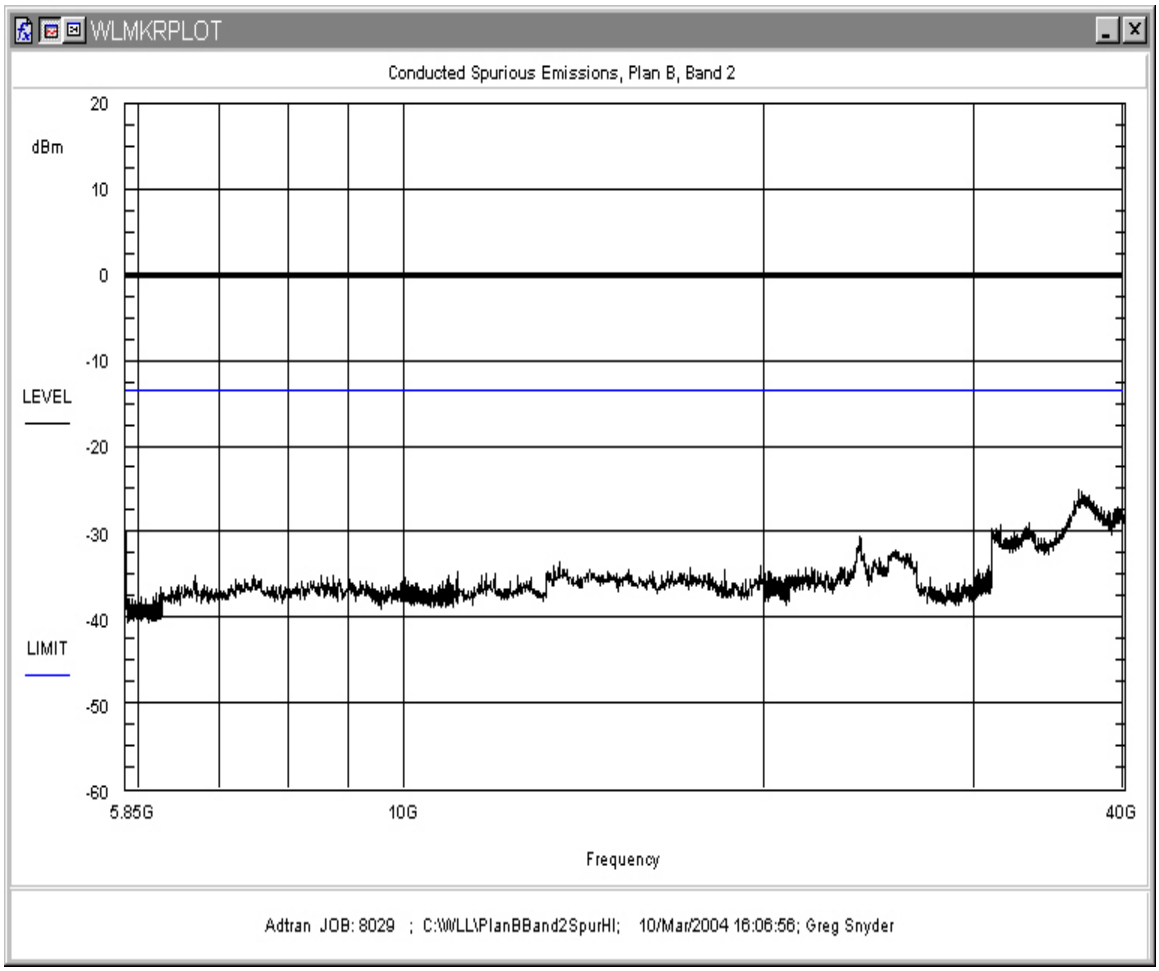

Figure 27. Conducted Spurious Emissions, Plan B Band 2, 5.85GHz-40GHz

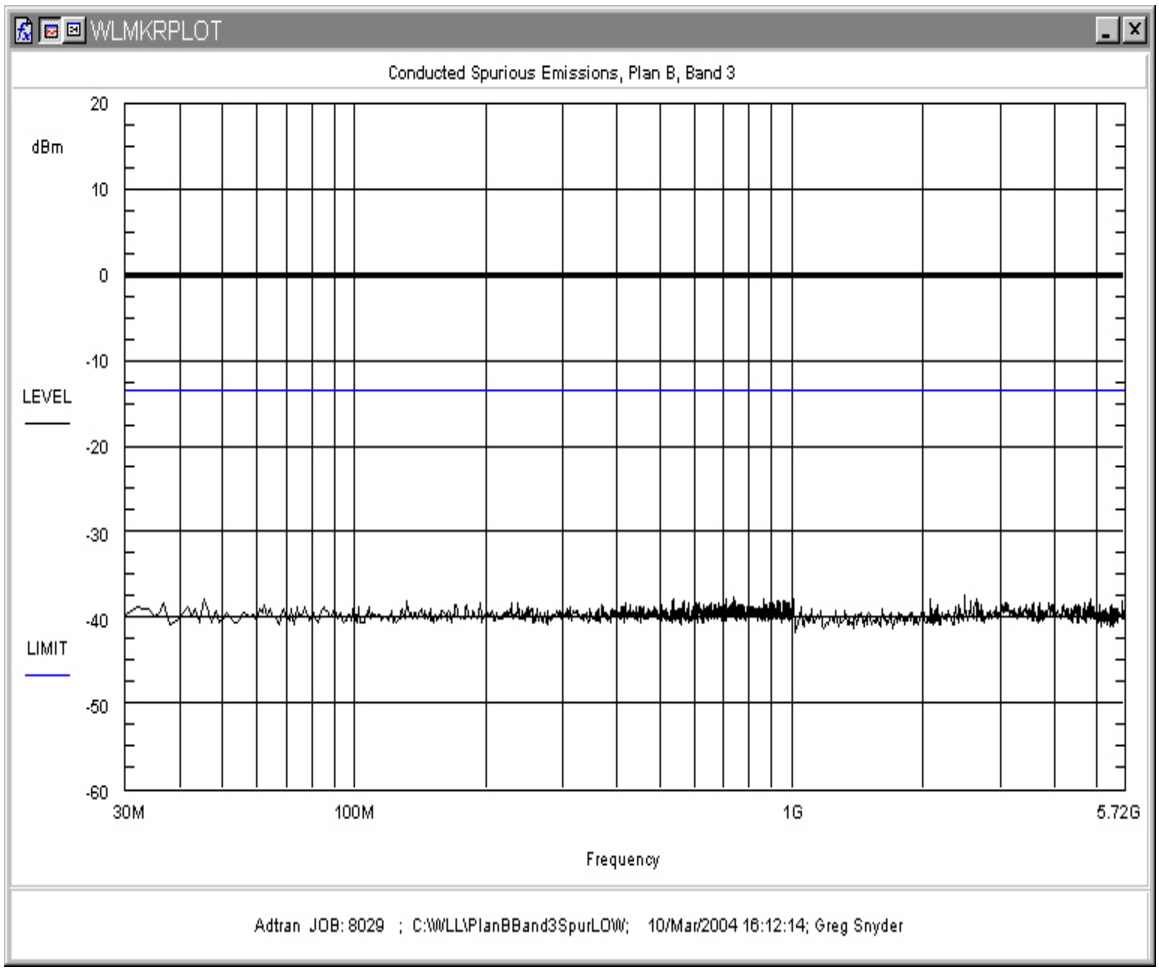

Figure 28. Conducted Spurious Emissions, Plan B Band 3, 30MHz-5.72GHz

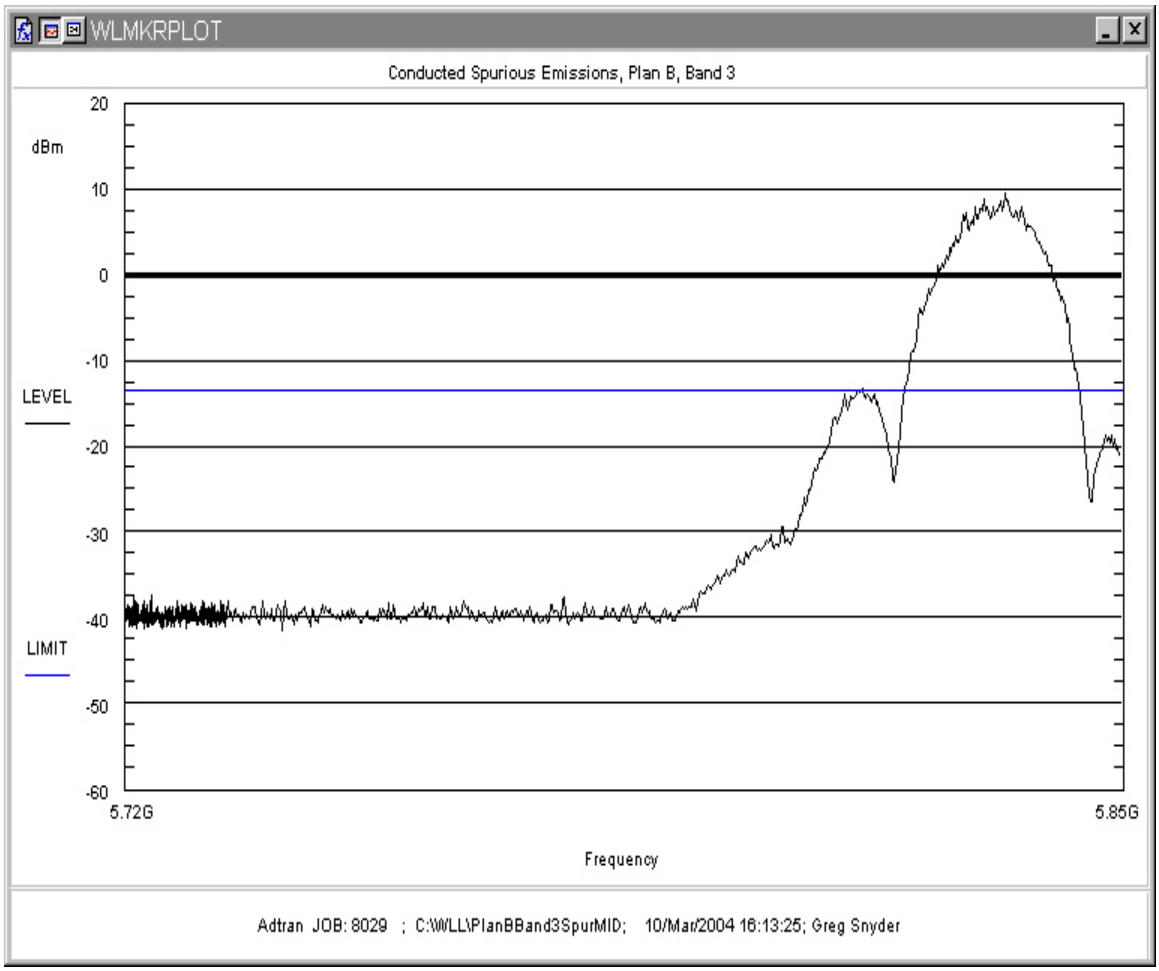

Figure 29. Conducted Spurious Emissions, Plan B Band 3, 5.72GHz-5.85GHz

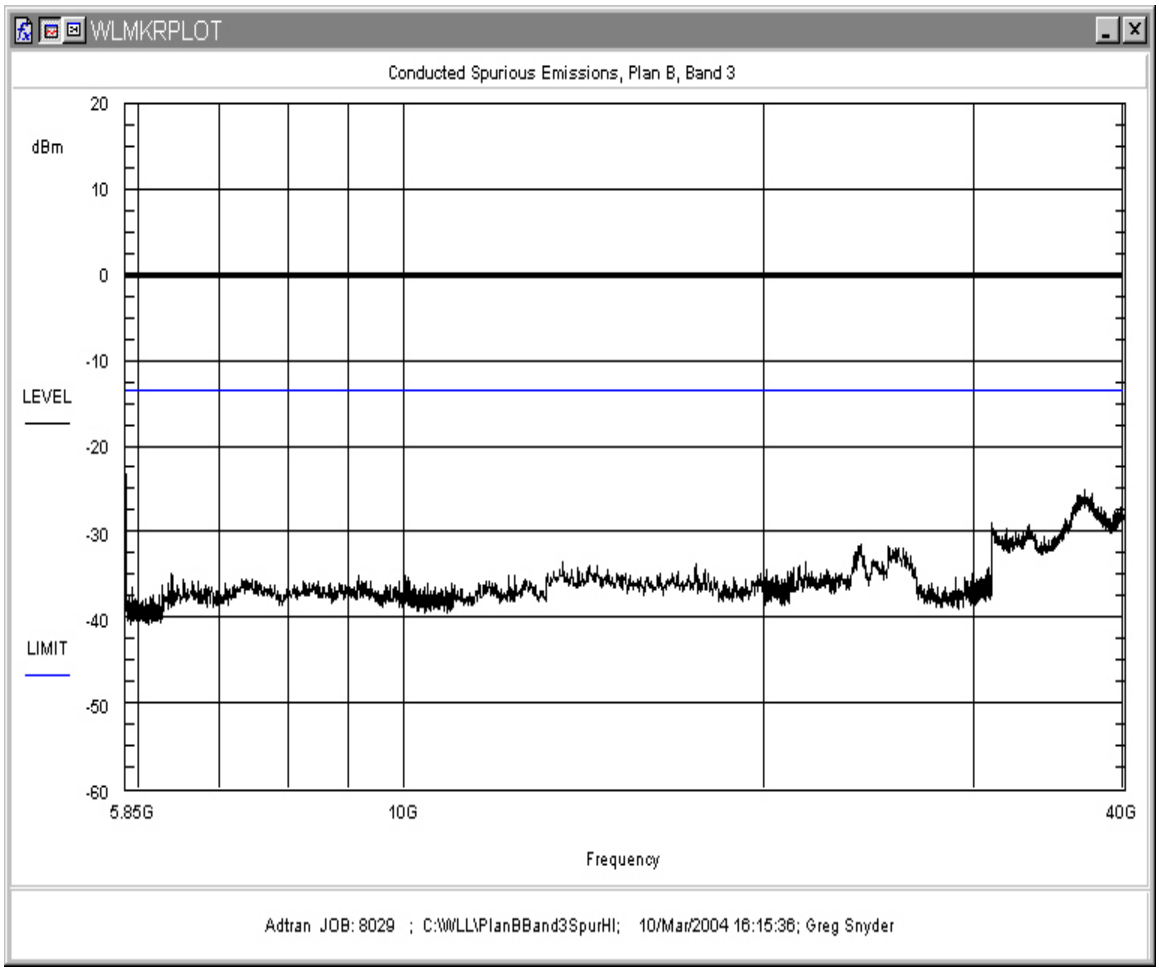

Figure 30. Conducted Spurious Emissions, Plan B Band 3, 5.85GHz-40GHz

4.5 Radiated Spurious Emissions: (FCC Part §15.247(c))

Radiated emissions that fall in the restricted bands must comply with the general emissions limits in 15.209(a).

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>30 kHz
>1000 MHz	1 MHz	<30 Hz (Avg.) 1MHz (Peak)

Harmonic and Spurious emissions that were identified as coming from the EUT were checked in Peak and in Average Mode. It was verified that the peak-to-average ratio did not exceed 20dB.

Peak measurements and average measurements are made. All emissions were determined to have a peak-to-average ratio of less than 20 dB.

4.5.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2001. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The EUT was tested in the following configurations and modes:

Antenna	**Channel**
Dish	A&B

The following is a sample calculation used in the data tables for calculating the final field strength of spurious emissions and comparing these levels to the specified limits.

Sample Calculation:

Spectrum Analyzer Voltage (SA Level):	V dBμV
Antenna Factor (Ant Corr):	AFdB/m
Cable Loss Correction (Cable Corr):	CCdB
Amplifier Gain:	GdB
Electric Field (Corr Level):	EdBμV/m = VdBμV + AFdB/m + CCdB - GdB
To convert to linear units:	EμV/m = antilog (EdBμV/m/20)

Data are supplied in the following tables. Testing was performed to 40GHz. No emissions were detected above 12GHz. All detected emissions are reported in the following tables. Both peak and average measurements are listed.

Table 6: Radiated Emission Test Data - Plan A, Band 1

CLIENT:	Adtran	DATE:	3/9/04
TESTER:	Ken Gemmell	JOB #:	8029
EUT Information:		**Test Requirements:**	
EUT:	Tracer 4208 8T1	TEST STANDARD:	FCC Part 15
CONFIGURATION:	@ 5742 MHz Plan 1 Band A	DISTANCE:	3m
CLOCKS:	1.544, 12, 51.536, 280 MHz	CLASS:	B
Test Equipment/Limit:			
ANTENNA:	A_00004	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_HF	AMPLIFIER (dB)	A_00312

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) dBµV	Ant. Corr. dB/m	Cable Corr. dB	Amp Gain dB	Corr. Level dBµV/m	Corr. Level µV/m	Limit µV/m	Margin dB
PK											
1133.63	H	200.0	1.0	49.4	25.2	1.5	34.3	41.8	123.2	5000.0	-32.2
1365.48	H	220.0	1.0	52.6	26.1	2.1	34.2	46.6	214.4	5000.0	-27.4
1418.88	H	165.0	1.0	49.3	26.3	2.3	34.2	43.7	153.0	5000.0	-30.3
2837.60	H	180.0	1.0	48.8	29.7	2.8	34.5	46.9	220.4	5000.0	-27.1
4096.48	H	180.0	1.0	52.3	31.3	3.0	34.6	52.0	396.8	5000.0	-22.0
11484.00	H	0.0	1.0	48.8	39.7	5.0	32.8	60.7	1088.4	5000.0	-13.2 **a**
PK											
1133.63	V	190.0	1.0	53.0	25.2	1.5	34.3	45.4	186.0	5000.0	-28.6
1365.48	V	160.0	1.0	51.7	26.1	2.1	34.2	45.8	194.9	5000.0	-28.2
1418.88	V	190.0	1.0	52.8	26.3	2.3	34.2	47.2	228.9	5000.0	-26.8
2837.60	V	180.0	1.0	48.7	29.7	2.8	34.5	46.8	218.4	5000.0	-27.2
4096.48	V	180.0	1.0	55.5	31.3	3.0	34.6	55.2	574.9	5000.0	-18.8
11484.00	V	0.0	1.0	45.7	39.7	5.0	32.8	57.6	758.2	5000.0	-16.4 **a**
AVG											
1133.40	H	200.0	1.0	43.8	25.2	1.5	34.3	36.2	64.6	500.0	-17.8
1365.48	H	220.0	1.0	44.6	26.1	2.1	34.2	38.7	85.9	500.0	-15.3
1418.88	H	165.0	1.0	40.2	26.3	2.3	34.2	34.6	53.6	500.0	-19.4
2837.60	H	180.0	1.0	44.9	29.7	2.8	34.5	43.0	141.7	500.0	-11.0
4096.48	H	180.0	1.0	50.5	31.3	3.0	34.6	50.1	320.3	500.0	-3.9
11484.00	H	0.0	1.0	36.2	39.7	5.0	32.8	48.1	255.1	500.0	-5.9 **a**
AVG											
1133.63	V	190.0	1.0	44.2	25.2	1.5	34.3	36.6	67.3	500.0	-17.4
1365.48	V	160.0	1.0	47.5	26.1	2.1	34.2	41.6	119.6	500.0	-12.4
1418.88	V	190.0	1.0	43.4	26.3	2.3	34.2	37.8	77.6	500.0	-16.2
2837.60	V	180.0	1.0	40.9	29.7	2.8	34.5	38.9	88.5	500.0	-15.0
4096.48	V	180.0	1.0	52.3	31.3	3.0	34.6	52.0	396.4	500.0	-2.0
11484.00	V	0.0	1.0	39.1	39.7	5.0	32.8	51.0	356.3	500.0	-2.9 **a**

a = ambient reading

Table 7: Radiated Emission Test Data - Plan A, Band 3

CLIENT:	Adtran	DATE:	3/9/04
TESTER:	Ken Gemmell	JOB #:	8029
EUT Information:		**Test Requirements:**	
EUT:	Tracer 4208 8T1	TEST STANDARD:	FCC Part 15
CONFIGURATION:	@ 5753 MHz Plan 3 Band A	DISTANCE:	3m
CLOCKS:	1.544, 12, 51.536, 280 MHz	CLASS:	B
Test Equipment/Limit:			
ANTENNA:	A_00004	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_HF	AMPLIFIER (dB)	A_00312

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght M	SA Level dBµV	Ant. Corr. dB/m	Cable Corr. dB	Amp Gain dB	Corr. Level dBµV/m	Corr. Level µV/m	Limit µV/m	Margin dB
Peak											
1133.40	H	0.0	1.0	50.0	25.2	1.5	34.3	42.4	131.9	5000.0	-31.6
1368.20	H	290.0	1.0	46.0	26.1	2.2	34.2	40.1	100.8	5000.0	-33.9
1423.27	H	260.0	1.0	45.5	26.3	2.3	34.2	39.9	99.1	5000.0	-34.1
2846.48	H	180.0	1.0	45.8	29.7	2.8	34.5	43.9	157.2	5000.0	-30.0
4104.75	H	165.0	1.0	44.8	31.3	3.0	34.6	44.5	168.3	5000.0	-29.5
11506.00	H	0.0	1.0	43.9	39.7	5.0	32.7	55.9	622.0	5000.0	-18.1 **a**
PK											
1133.40	V	180.0	1.0	48.2	25.2	1.5	34.3	40.6	107.2	5000.0	-33.4
1368.20	V	100.0	1.0	46.2	26.1	2.2	34.2	40.3	103.2	5000.0	-33.7
1423.27	V	125.0	1.0	45.0	26.3	2.3	34.2	39.4	93.6	5000.0	-34.6
2846.48	V	180.0	1.0	46.4	29.7	2.8	34.5	44.5	168.5	5000.0	-29.4
4104.75	V	180.0	1.0	43.9	31.3	3.0	34.6	43.6	151.8	5000.0	-30.4
11506.00	V	0.0	1.0	43.1	39.7	5.0	32.7	55.1	567.3	5000.0	-18.9 **a**
Avg											
1133.40	H	0.0	1.0	44.7	25.2	1.5	34.3	37.1	71.4	500.0	-16.9
1368.20	H	290.0	1.0	34.2	26.1	2.2	34.2	28.2	25.8	500.0	-25.7
1423.27	H	260.0	1.0	33.8	26.3	2.3	34.2	28.3	25.9	500.0	-25.7
2846.48	H	180.0	1.0	35.3	29.7	2.8	34.5	33.4	46.6	500.0	-20.6
4104.75	H	165.0	1.0	43.8	31.3	3.0	34.6	43.5	149.5	500.0	-10.5
11506.00	H	0.0	1.0	35.2	39.7	5.0	32.7	47.2	228.5	500.0	-6.8 **a**
Avg											
1133.40	V	180.0	1.0	46.0	25.2	1.5	34.3	38.4	83.0	500.0	-15.6
1368.20	V	100.0	1.0	32.4	26.1	2.2	34.2	26.4	21.0	500.0	-27.5
1423.27	V	125.0	1.0	35.6	26.3	2.3	34.2	30.1	31.8	500.0	-23.9
2846.48	V	180.0	1.0	36.1	29.7	2.8	34.5	34.2	51.1	500.0	-19.8
4104.75	V	180.0	1.0	45.2	31.3	3.0	34.6	44.9	175.7	500.0	-9.1
11506.00	V	0.0	1.0	33.7	39.7	5.0	32.7	45.7	192.2	500.0	-8.3 **a**

a = ambient reading

Table 8: Radiated Emission Test Data - Plan B, Band 1

CLIENT:	Adtran	DATE:	3/9/04
TESTER:	Ken Gemmell	JOB #:	8029
EUT Information:		**Test Requirements:**	
EUT:	Tracer 4208 8T1	TEST STANDARD:	FCC Part 15
CONFIGURATION:	@ 5822 MHz Plan 1 Band B	DISTANCE:	3m
CLOCKS:	1.544, 12, 51.536, 280 MHz	CLASS:	B
Test Equipment/Limit:			
ANTENNA:	A_00004	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_HF	AMPLIFIER:	A_00312

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level dBµV	Ant. Corr. dB/m	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level dBµV/m	Corr. Level µV/m	Limit µV/m	Margin dB
PK											
1133.93	H	180.0	1.0	52.6	25.2	1.5	34.3	45.0	177.5	5000.0	-29.0
1383.88	H	180.0	1.0	49.4	26.2	2.2	34.2	43.5	150.4	5000.0	-30.4
2801.10	H	180.0	1.0	47.2	29.7	2.9	34.5	45.3	183.9	5000.0	-28.7
4151.26	H	180.0	1.0	46.5	31.4	3.1	34.6	46.4	208.7	5000.0	-27.6
11644.00	H	0.0	1.0	47.5	39.8	5.0	32.6	59.8	973.8	5000.0	-14.2
PK											
1133.93	V	180.0	1.0	51.4	25.2	1.5	34.3	43.8	154.6	5000.0	-30.2
1383.88	V	180.0	1.0	48.1	26.2	2.2	34.2	42.2	129.5	5000.0	-31.7
2801.10	V	180.0	1.0	44.1	29.7	2.9	34.5	42.1	127.7	5000.0	-31.9
4151.26	V	180.0	1.0	44.7	31.4	3.1	34.6	44.6	169.2	5000.0	-29.4
11644.00	V	0.0	1.0	49.3	39.8	5.0	32.6	61.5	1192.6	5000.0	-12.4
Avg											
1133.93	H	180.0	1.0	40.7	25.2	1.5	34.3	33.1	45.0	500.0	-20.9
1383.88	H	180.0	1.0	36.0	26.2	2.2	34.2	30.2	32.4	500.0	-23.8
2801.10	H	180.0	1.0	34.6	29.7	2.9	34.5	32.7	43.0	500.0	-21.3
4151.26	H	180.0	1.0	34.4	31.4	3.1	34.6	34.3	51.6	500.0	-19.7
11644.00	H	0.0	1.0	31.5	39.8	5.0	32.6	43.7	153.6	500.0	-10.2
Avg											
1133.93	V	180.0	1.0	42.4	25.2	1.5	34.3	34.8	55.1	500.0	-19.2
1383.88	V	180.0	1.0	35.9	26.2	2.2	34.2	30.0	31.7	500.0	-24.0
2801.10	V	180.0	1.0	36.8	29.7	2.9	34.5	34.9	55.3	500.0	-19.1
4151.26	V	180.0	1.0	34.4	31.4	3.1	34.6	34.2	51.5	500.0	-19.7
11644.00	V	0.0	1.0	31.8	39.8	5.0	32.6	44.0	158.5	500.0	-10.0

Table 9: Radiated Emission Test Data - Plan B, Band 3

CLIENT:	Adtran	DATE:	3/9/04
TESTER:	Ken Gemmell	JOB #:	8029
EUT Information:		**Test Requirements:**	
EUT:	Tracer 4208 8T1	TEST STANDARD:	FCC Part 15
CONFIGURATION:	@ 5833 MHz Plan 3 Band B	DISTANCE:	3m
CLOCKS:	1.544, 12, 51.536, 280 MHz	CLASS:	B
Test Equipment/Limit:			
ANTENNA:	A_00004	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_HF	AMPLIFIER:	A_00312

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level dBµV	Ant. Corr. dB/m	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level dBµV/m	Corr. Level µV/m	Limit (µV/m)	Margin dB
PK											
1133.87	H	170.0	1.0	50.2	25.2	1.5	34.3	42.6	134.6	5000.0	-31.4
1388.30	H	245.0	1.0	47.3	26.2	2.2	34.2	41.5	119.3	5000.0	-32.4
2806.97	H	270.0	1.0	43.5	29.7	2.9	34.5	41.6	119.7	5000.0	-32.4
4161.26	H	180.0	1.0	42.8	31.4	3.1	34.6	42.7	137.0	5000.0	-31.2
11666.00	H	0.0	1.0	40.0	39.8	5.0	32.6	52.3	410.7	5000.0	-21.7
PK											
1133.87	V	170.0	1.0	49.7	25.2	1.5	34.3	42.1	127.1	5000.0	-31.9
1388.30	V	190.0	1.0	44.3	26.2	2.2	34.2	38.5	84.4	5000.0	-35.4
2806.97	V	270.0	1.0	45.2	29.7	2.9	34.5	43.3	145.6	5000.0	-30.7
4161.26	V	180.0	1.0	31.0	31.4	3.1	34.6	30.9	35.1	5000.0	-43.1
11666.00	V	0.0	1.0	39.0	39.8	5.0	32.6	51.3	366.0	5000.0	-22.7
Avg											
1133.93	H	170.0	1.0	42.7	25.2	1.5	34.3	35.1	56.8	500.0	-18.9
1383.88	H	245.0	1.0	33.7	26.2	2.2	34.2	27.8	24.7	500.0	-26.1
2801.10	H	270.0	1.0	32.3	29.7	2.9	34.5	30.4	33.1	500.0	-23.6
4161.26	H	180.0	1.0	34.7	31.4	3.1	34.6	34.6	53.6	500.0	-19.4
11666.00	H	0.0	1.0	28.3	39.8	5.0	32.6	40.6	107.1	500.0	-13.4
Avg											
1133.93	V	170.0	1.0	42.7	25.2	1.5	34.3	35.1	56.8	500.0	-18.9
1383.88	V	190.0	1.0	35.2	26.2	2.2	34.2	29.3	29.3	500.0	-24.6
2801.10	V	270.0	1.0	35.5	29.7	2.9	34.5	33.6	47.7	500.0	-20.4
4161.26	V	270.0	1.0	34.3	31.4	3.1	34.6	34.2	51.5	500.0	-19.7
11666.00	V	0.0	1.0	28.4	39.8	5.0	32.6	40.7	108.5	500.0	-13.3

4.6 AC Powerline Conducted Emissions: (FCC Part §15.207)

The EUT was placed on an 80 cm high 1 x 1.5 m non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω/50 μH Line Impedance Stabilization Network bonded to a 3 x 2 meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power and data cables were moved about to obtain maximum emissions.

The 50Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 150 kHz to 30 MHz were measured. The detector function was set to quasi-peak, peak, or average as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth for peak measurements.

Data is recorded in the following table.

Table 10: Conducted Emissions Test Data; 15.207

CLIENT:	Adtran	DATE:	3/9/04
TESTER:	Ken Gemmell	JOB #:	8029
EUT:	Tracer 4208 8T1	TEST STANDARD:	FCC Class B
CONFIGURATION:	Transmitter @ 5833MHz Plan 3 Band B		
CLASS:	CIS22_B	VOLTAGE:	120VAC

LINE 1 - NEUTRAL

Frequency MHz	Level QP dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Limit AVG dBuV	Margin AVG dB
0.220	38.6	62.8	-24.2	38.6	52.8	-14.2
0.307	37.6	60.1	-22.5	37.6	50.1	-12.5
1.010	36.4	56.0	-19.6	36.4	46.0	-9.6
12.717	46.4	60.0	-13.6	40.8	50.0	-9.2
13.390	48.1	60.0	-11.9	42.6	50.0	-7.4
13.476	51.6	60.0	-8.4	46.4	50.0	-3.6
16.425	44.2	60.0	-15.8	39.4	50.0	-10.6
28.469	29.8	60.0	-30.2	29.8	50.0	-20.2

LINE 2 - PHASE

Frequency MHz	Level QP dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Limit AVG dBuV	Margin AVG dB
0.220	35.9	62.8	-26.9	35.9	52.8	-16.9
0.307	37.0	60.1	-23.1	37.0	50.1	-13.1
1.010	37.0	56.0	-19.0	37.0	46.0	-9.0
12.717	44.2	60.0	-15.8	37.8	50.0	-12.2
13.390	45.6	60.0	-14.4	43.2	50.0	-6.8
13.476	44.2	60.0	-15.8	42.5	50.0	-7.5
16.420	41.3	60.0	-18.7	41.3	50.0	-8.7
28.460	33.2	60.0	-26.8	33.2	50.0	-16.8