



**FCC Certification Test Report**  
**for**  
**ADTRAN, Inc.**  
**Tracer 4205**  
**FCC ID: HDCTRC4205**

**January 30, 2003**

Prepared for:

**ADTRAN, Inc.**  
**901 Explorer Blvd**  
**Huntsville, AL 35806**

Prepared By:

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**FCC Certification Test Report**  
**for the**  
**ADTRAN, Inc.**  
**TRACER 4205**

WLL JOB# 7368

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## **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 Digitally Modulated Transmitter 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 an ADTRAN, Inc. TRACER 4205 Transceiver.

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 4205 Transceiver complies with the requirements for a Digitally Modulated Transmitter 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 4205 System complies with the requirements for a Digitally Modulated Transmitter 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 1992 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
Purchase Order Number:	416542
Quotation Number:	60182-A

### **1.4 Test Dates**

Testing was performed from January 6 to January 8, 2003.

### **1.5 Test and Support Personnel**

Washington Laboratories, LTD	Ken Gemmell
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## 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
LISN	Line Impedance Simulation Network
M	Mega - prefix for $10^6$ multiplier
m	Meter
$\mu$	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

The 12804205L1 (Tracer 4205 DS3 Radio) is a digital radio device that accepts a single 44.736 Mb/s DS3 signal and transports it over a wireless carrier. A pair of these radios form a wireless transport for DS3 digital services in the 5.8 GHz ISM radio band. The 12804205L1 provides the network, antenna a control/status interface to the customer. The DS3 interface is network-timed.

A single coaxial cable connects the Tracer 4205 to the antenna.

The Tracer 4205 operates in the 5725-5850 MHz band using digital modulation.

I/O Ports and Cables available on the TRACER 4205 DS3 Radio:

Signal/Port Name	Signal/Port Type	Cable Type	NOTES
DS3 IN	I/O	Shielded Coax	75 Ohm impedance (RG59)
DS3 OUT	I/O	Shielded Coax	75 Ohm impedance (RG59)
RS232	I/O	Shielded 25 Wire	
ALARM	CONTROL	Unshielded TP	Alarm contacts – no active power or signal
ANTENNA	I/O	Shielded Coax	50 Ohm impedance, 5.8GHz signal only
MANAGEMENT	I/O	Shielded TP	Unused in this product version (no SNMP)

The TRACER 4205 contains the sources in Table 2.

**Table 1. Assembly Information**

Item	Number
Top Assembly:	12804205L1A and B
Subassemblies:	2280030-2, 2280018-5
Circuit Boards:	5280030-2, 5280018-5
Schematics:	2280030-2, 2280018-5

### 2.2 Test Configuration

Tracer 4205 DS3 Plan A w/o SNMP, P/N:12804205L1A

Tracer 4205 DS3 Plan B w/o SNMP, P/N: 12804205L1B



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.

### 2.3 Testing Algorithm

The TRACER 4205 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

Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-93)

### 2.6 Measurement Uncertainty

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

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is  $\pm 2.3$  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:

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

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 =  $0.5 (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$  dB.

### 3 Test Results

#### 3.1 Peak 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 diode detector substitution method for measuring peak power was used since the spectrum analyzer used for testing does not have a measurement bandwidth greater than the 6dB bandwidth of the EUT.

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 2. RF Output Power Conducted**

<b>RF Channel</b>	<b>Measured Power (dBm)</b>	<b>FCC Limit (dBm)</b>
Channel A: 5747 MHz	19.92	30
Channel B: 5827 MHz	19.07	30

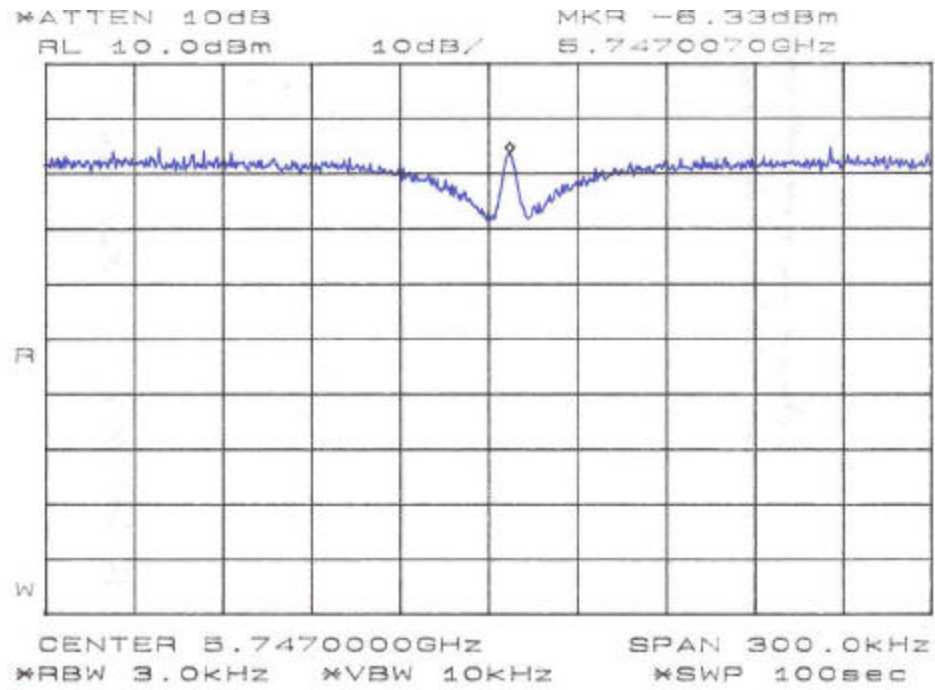
#### 3.2 Power Spectral Density

For Digitally Modulated devices under Part 15.247, 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.

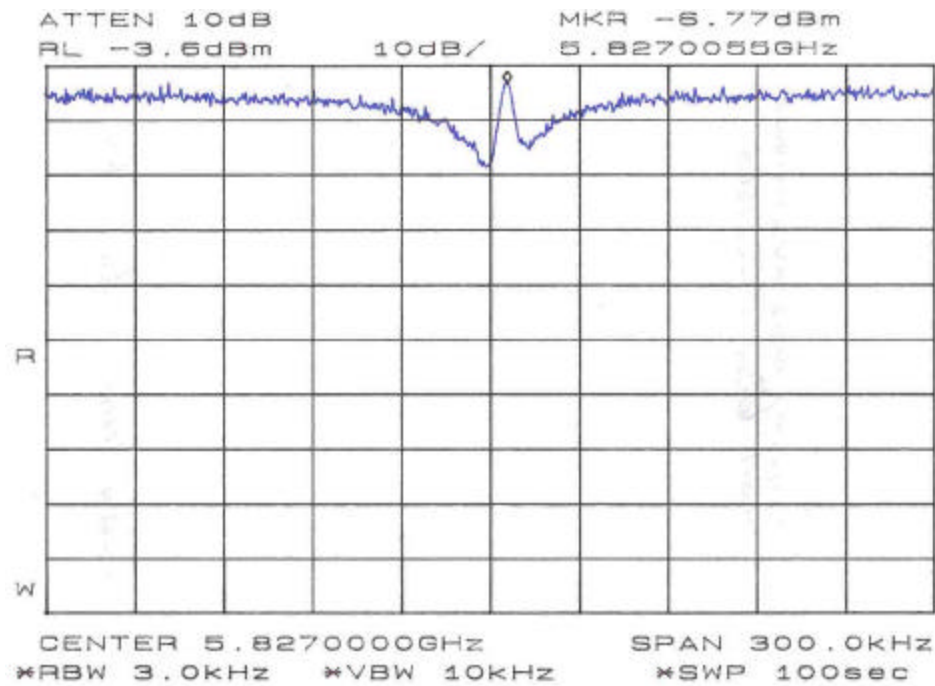
The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system.

The carrier was modulated internally via firmware that provided loop-back data to the rear-panel T1 connectors.

Plots of the Power Spectral Density are shown in Figure 1 and Figure 2. Table 3 lists the results of the Power Spectral Density testing.



**Figure 1: Power Spectral Density, Channel A**



**Figure 2: Power Spectral Density, Channel B**

**Table 3. Power Spectral Density**

<b>Frequency</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Pass/Fail</b>
Channel A 5747 MHz	-6.33	8	Pass
Channel B 5827 MHz	-6.77	8	Pass

### **3.3 Occupied Bandwidth**

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

For Digitally Modulated Systems, FCC Part 15.247 requires that the minimum 6 dB bandwidth be at least 500 kHz.

Table 4 provides a summary of the Occupied Bandwidth Results. Figure 3 and Figure 4 are plots of the Occupied Bandwidths.

**Table 4. Occupied Bandwidth Results**

<b>Frequency</b>	<b>Bandwidth</b>	<b>Limit</b>	<b>Pass/Fail</b>
Channel A: 5747 MHz	22.83 MHz	> 500 kHz	Pass
Channel B: 5827 MHz	21.5 MHz	> 500 kHz	Pass

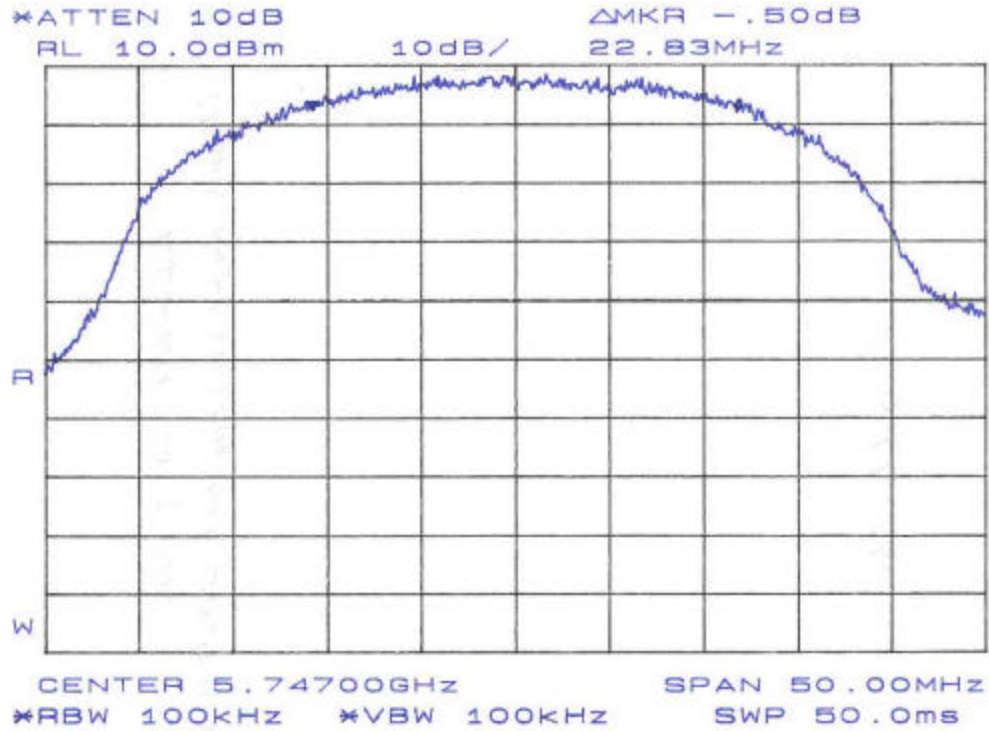


Figure 3. Occupied Bandwidth Channel A

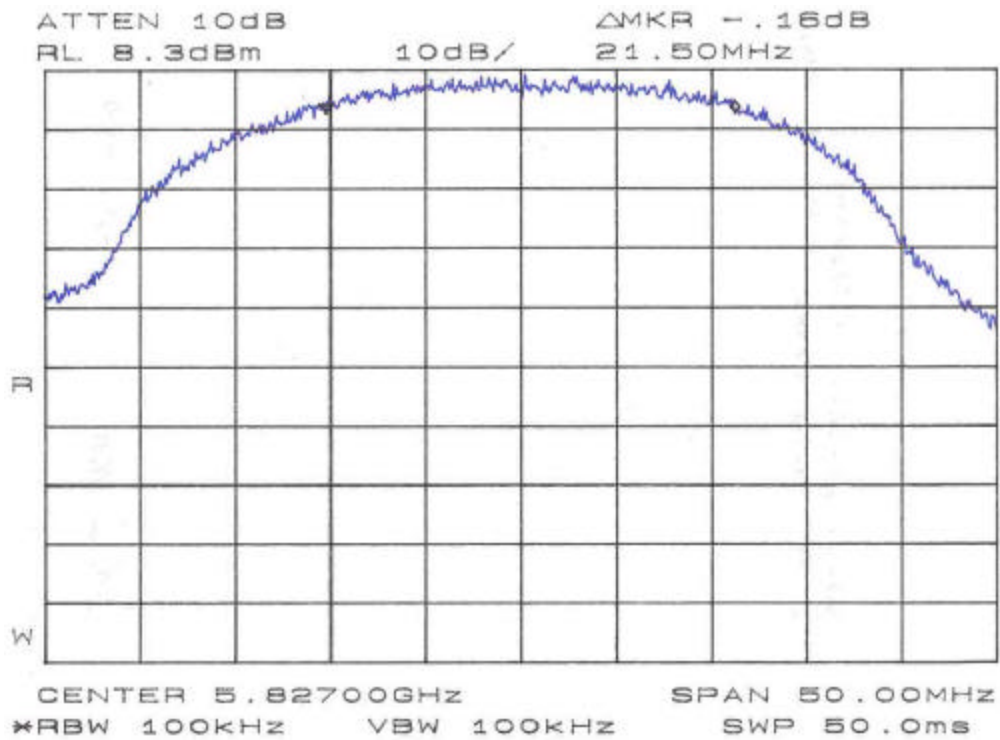


Figure 4. Occupied Bandwidth Channel B

### 3.4 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.

**Table 5: Conducted Spurious Emissions Limits**

<b>Frequency</b>	<b>Highest Power in 100kHz Band (dBm)</b>	<b>Limit (20dBc) (dBm)</b>
Channel A 5747 MHz	9.5	-10.5
Channel B 5827 MHz	8.5	-11.5

Figure 5 through Figure 20 are plots of the conducted spurious emissions as measured at the antenna terminal. Band edge plots are included for Channel A and Channel B as these are the frequencies which fall closest to the frequency band of 15.247.

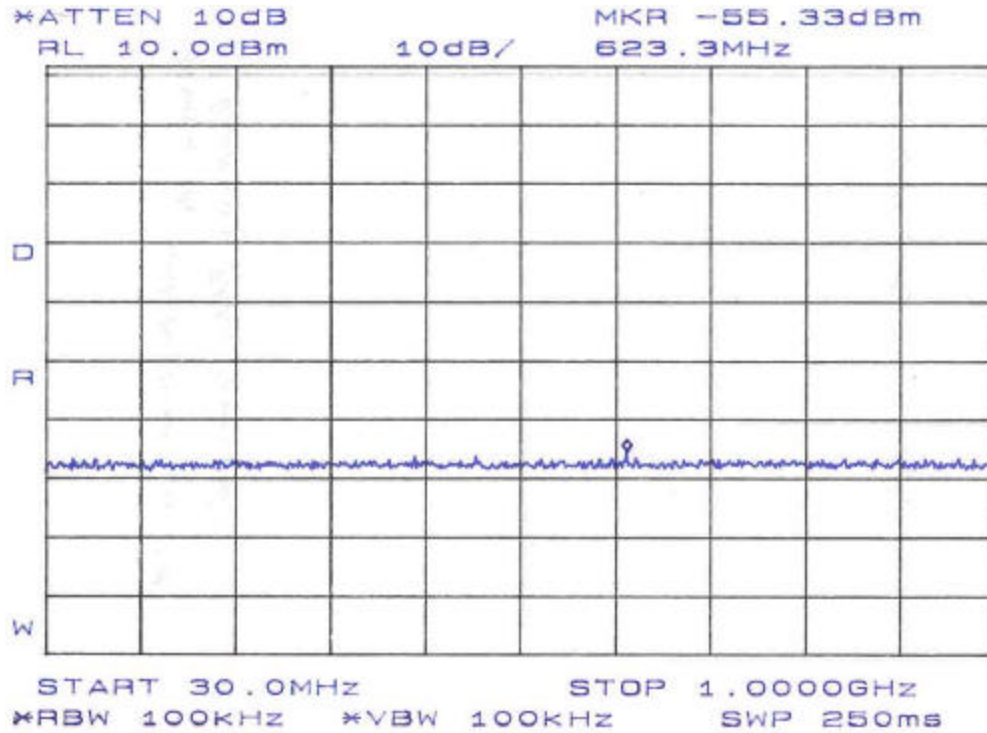


Figure 5. Conducted Spurious Emissions, Channel A, 30M – 1.0GHz

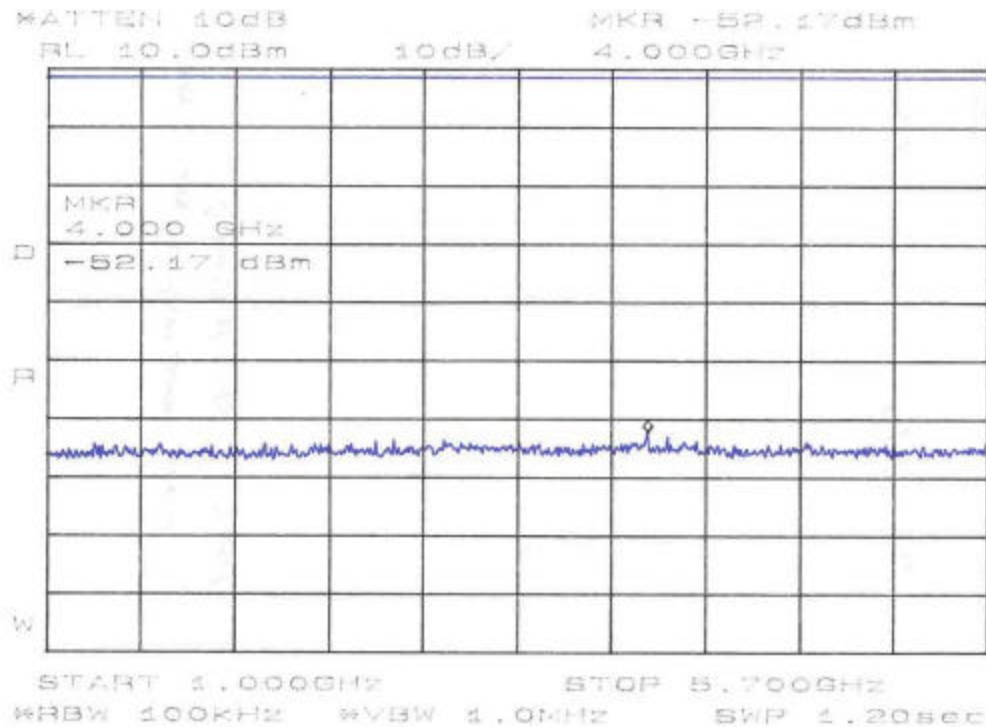
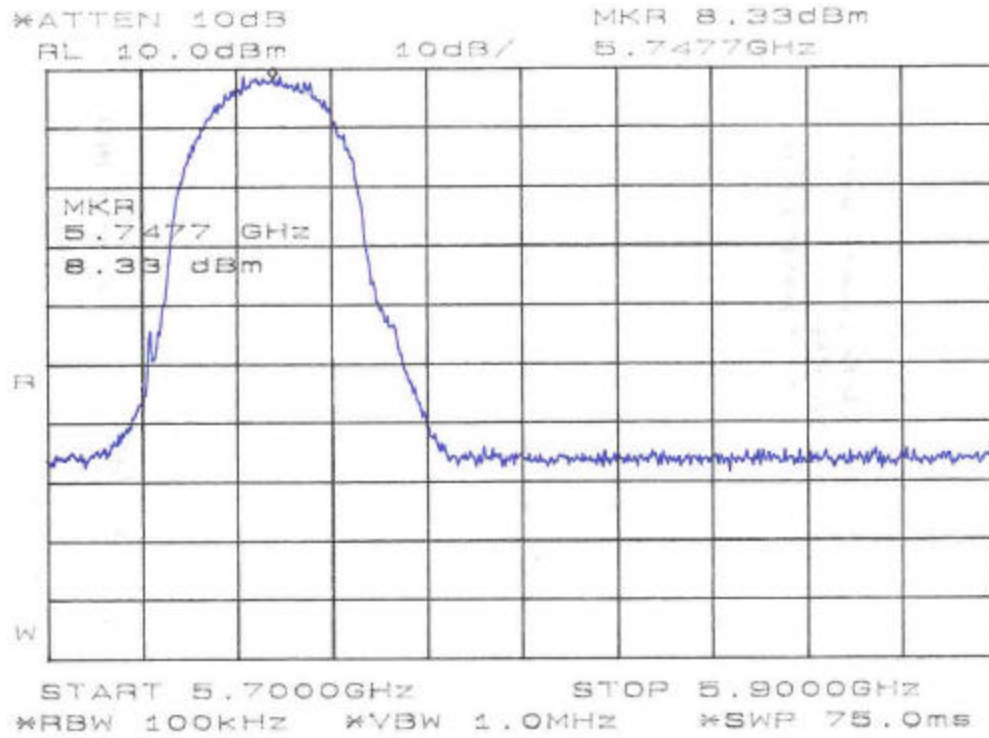
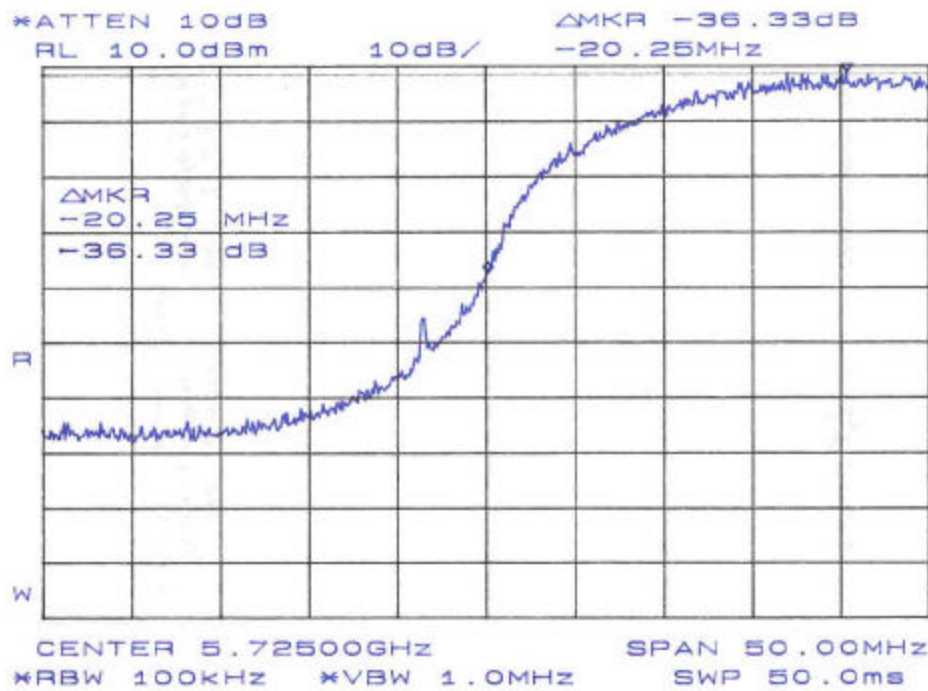


Figure 6. Conducted Spurious Emissions, Channel A, 1GHz – 5.7GHz



**Figure 7. Conducted Spurious Emissions, Channel A, 5.7GHz - 5.9GHz**



**Figure 8. Conducted Spurious Emissions - Band Edge Plot - Channel A**



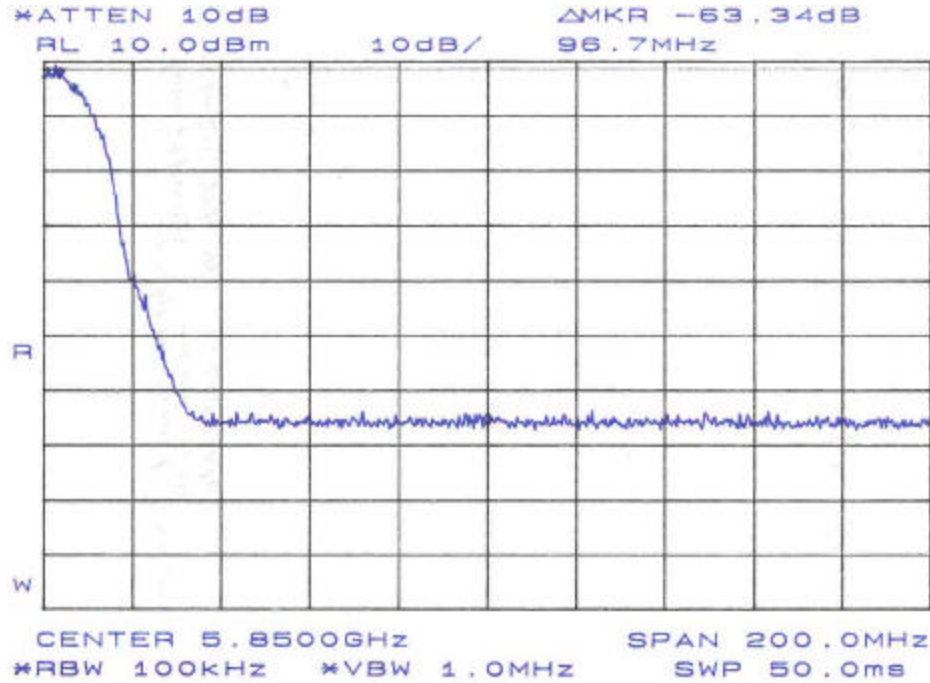


Figure 9. Conducted Spurious Emissions - Band Edge Plot – Channel A

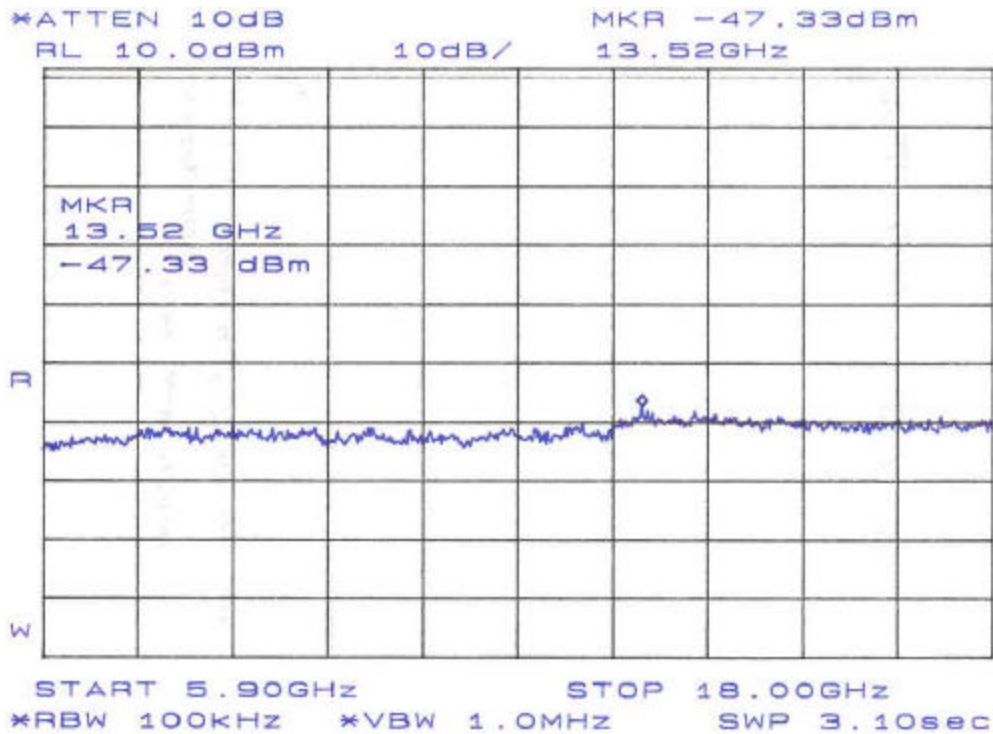


Figure 10. Conducted Spurious Emissions, Channel A, 5.9GHz - 18GHz

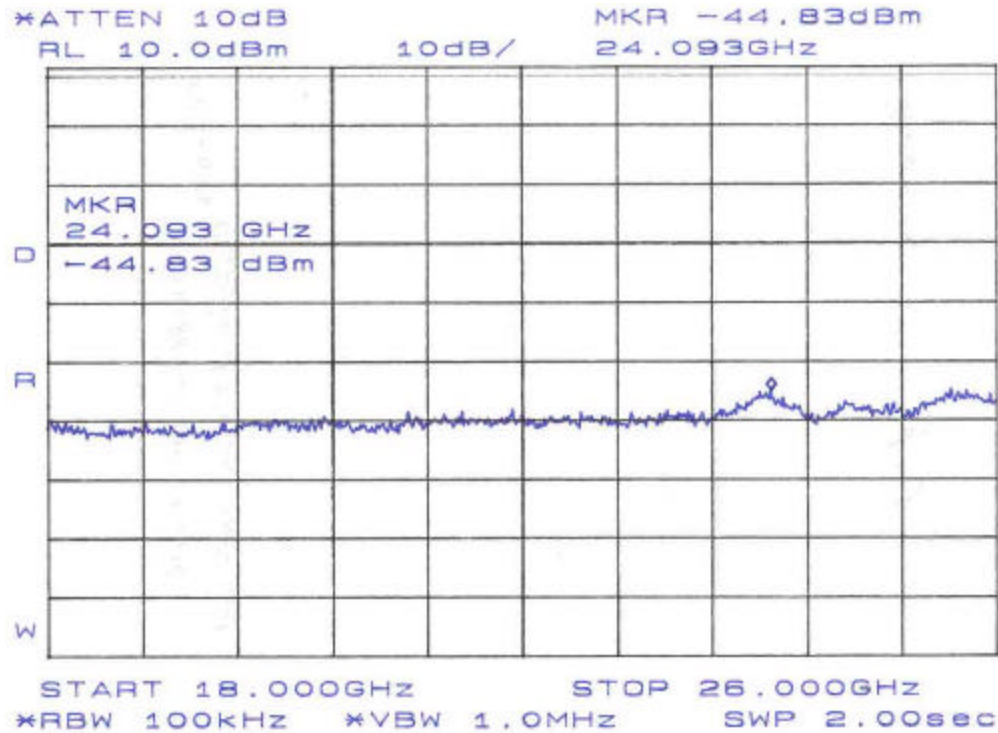


Figure 11. Conducted Spurious Emissions, Channel A, 18GHz - 26GHz

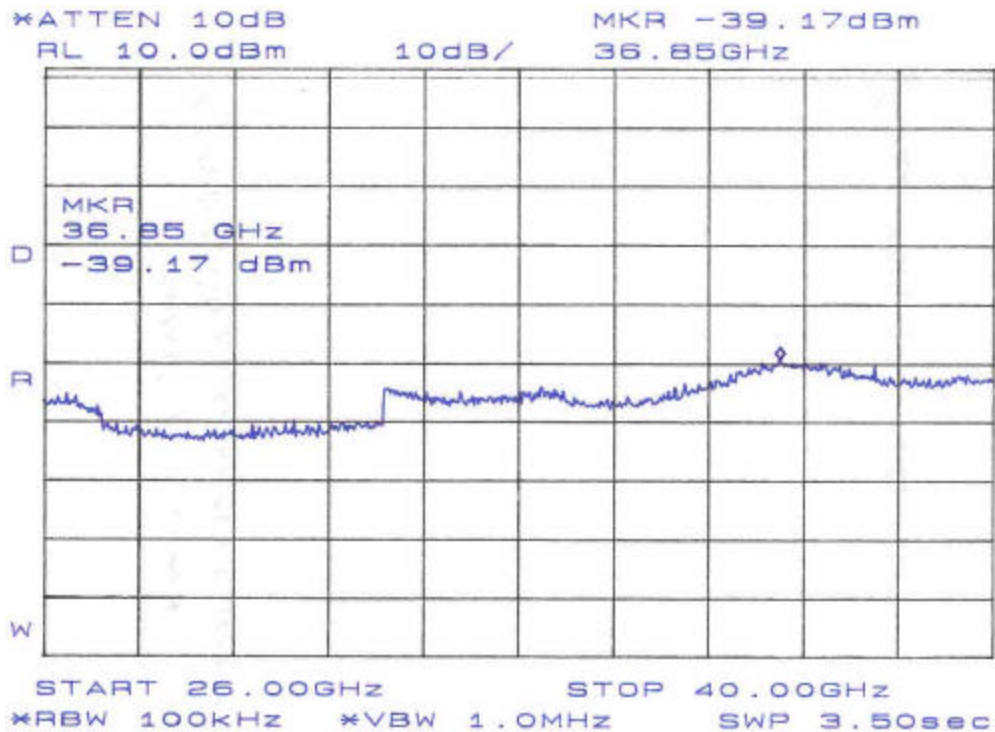


Figure 12. Conducted Spurious Emissions, Channel A, 26GHz - 40GHz

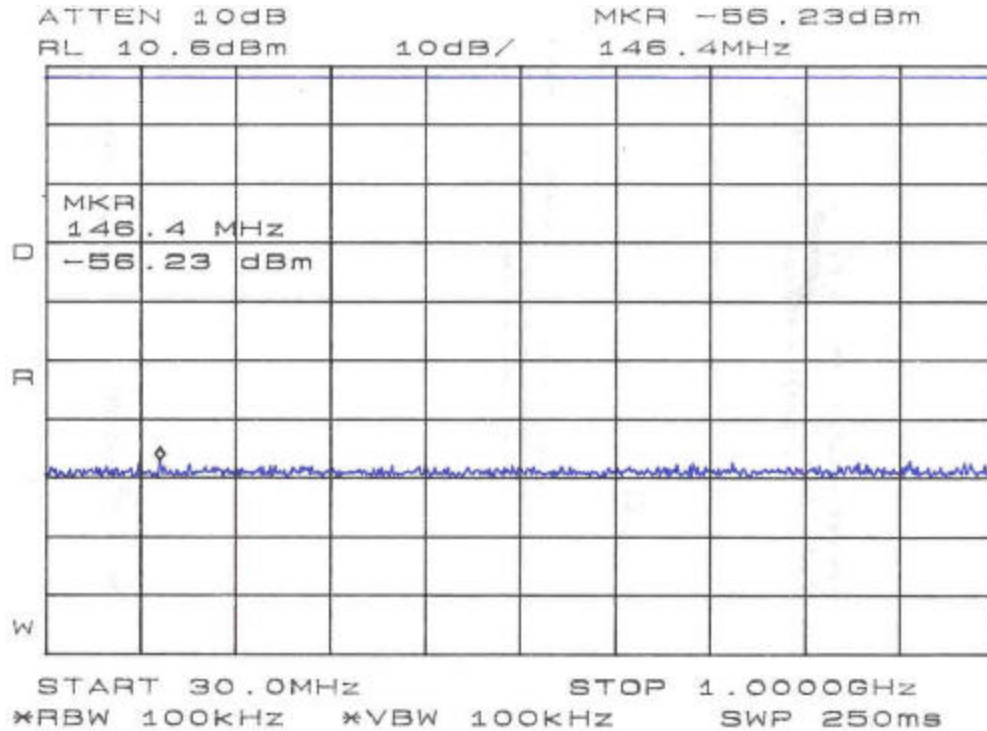


Figure 13. Conducted Spurious Emissions, Channel B, 30MHz – 1GHz

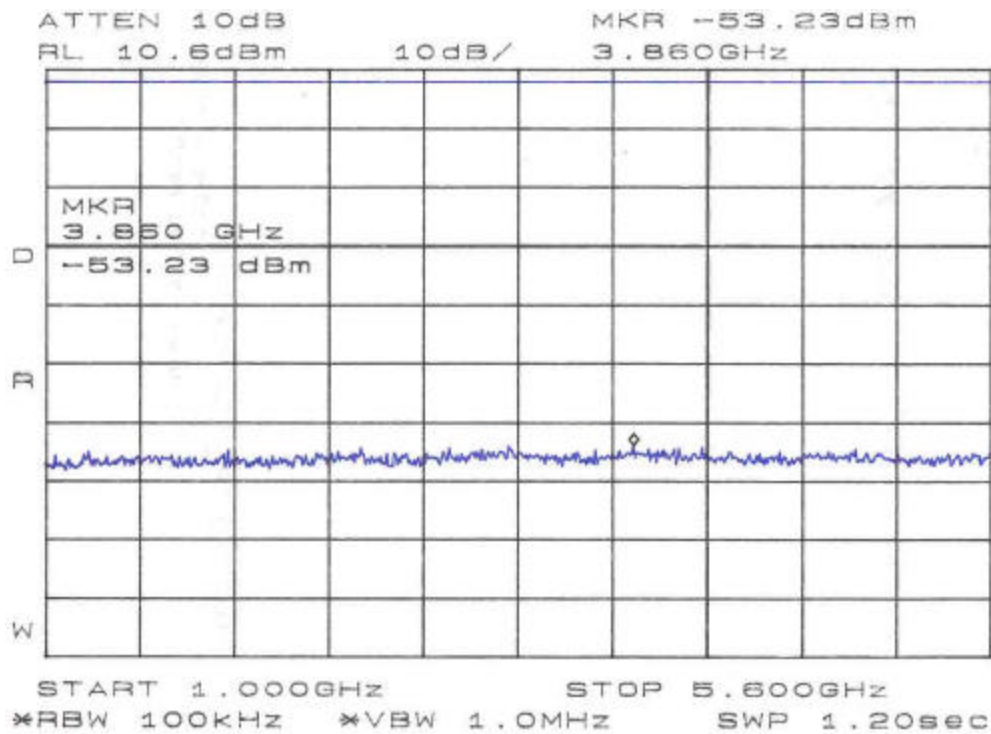
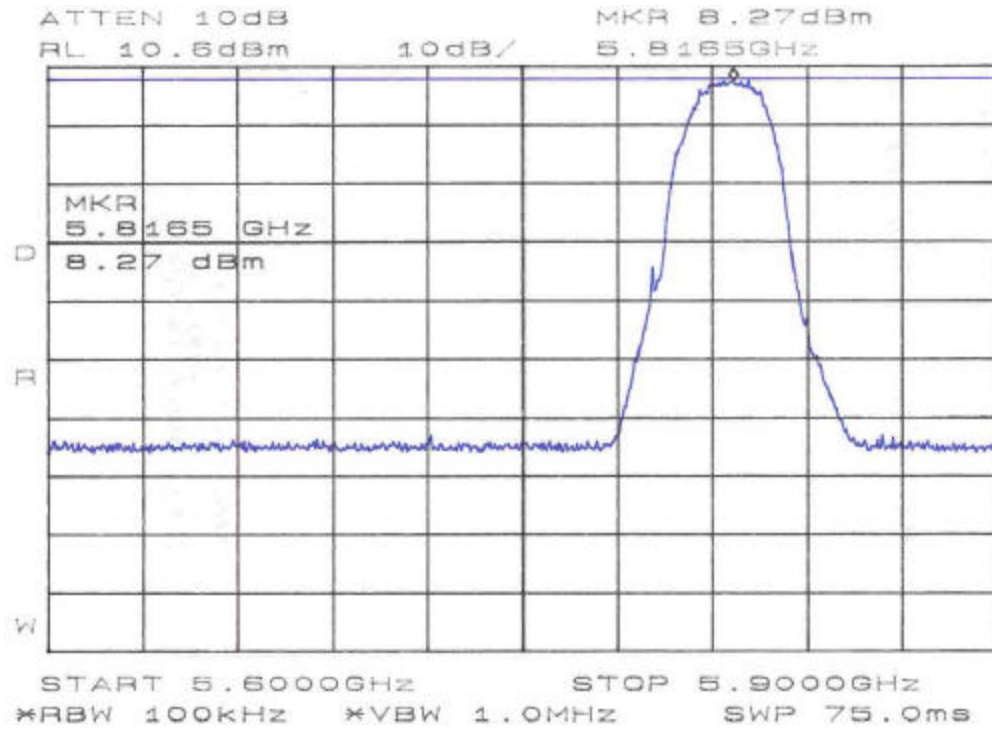
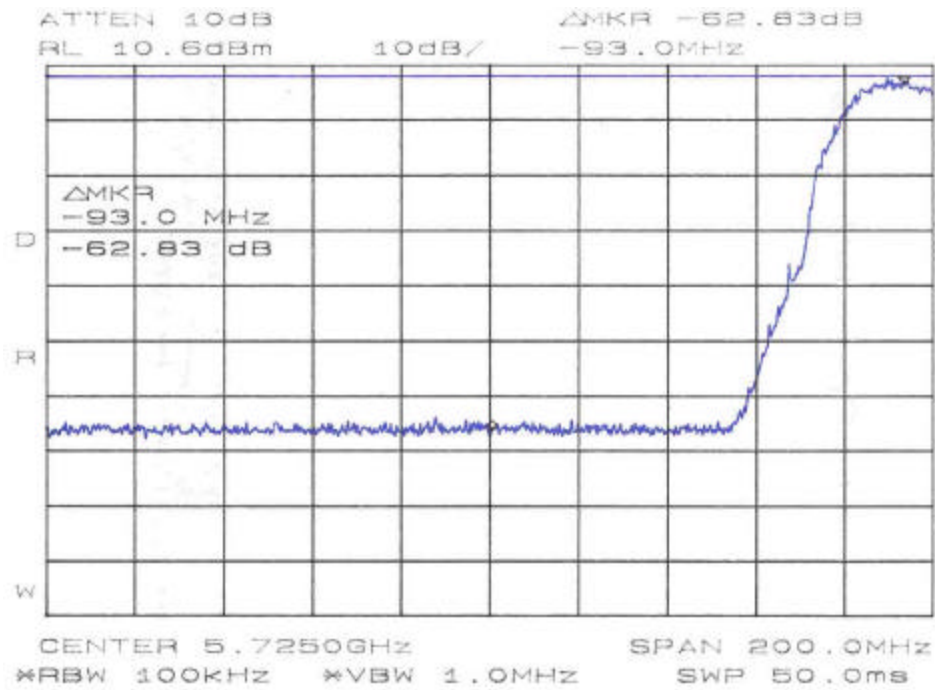


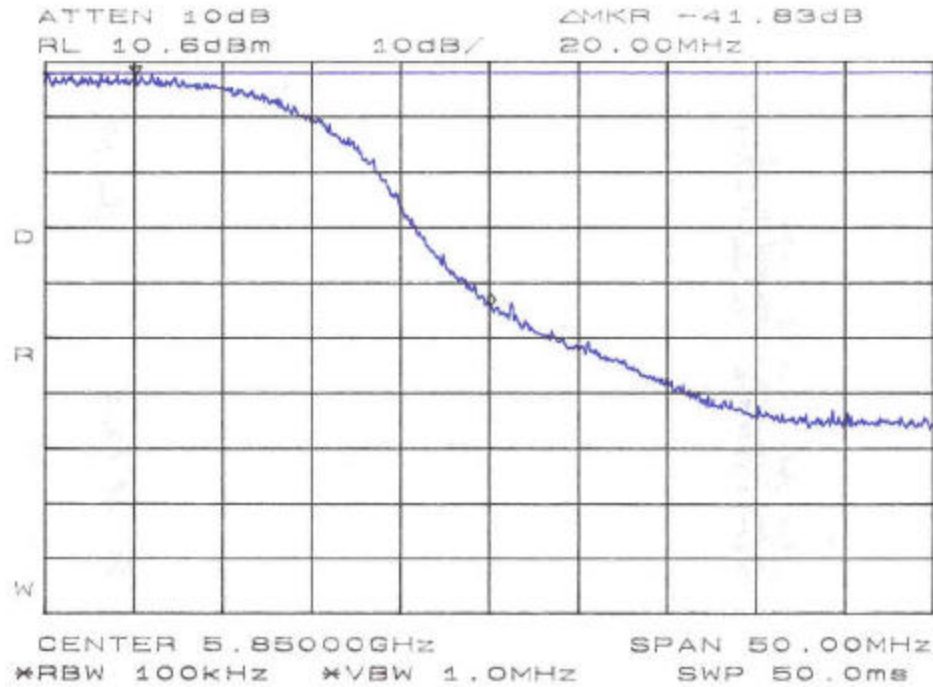
Figure 14. Conducted Spurious Emissions, Channel B, 1GHz – 5.6GHz



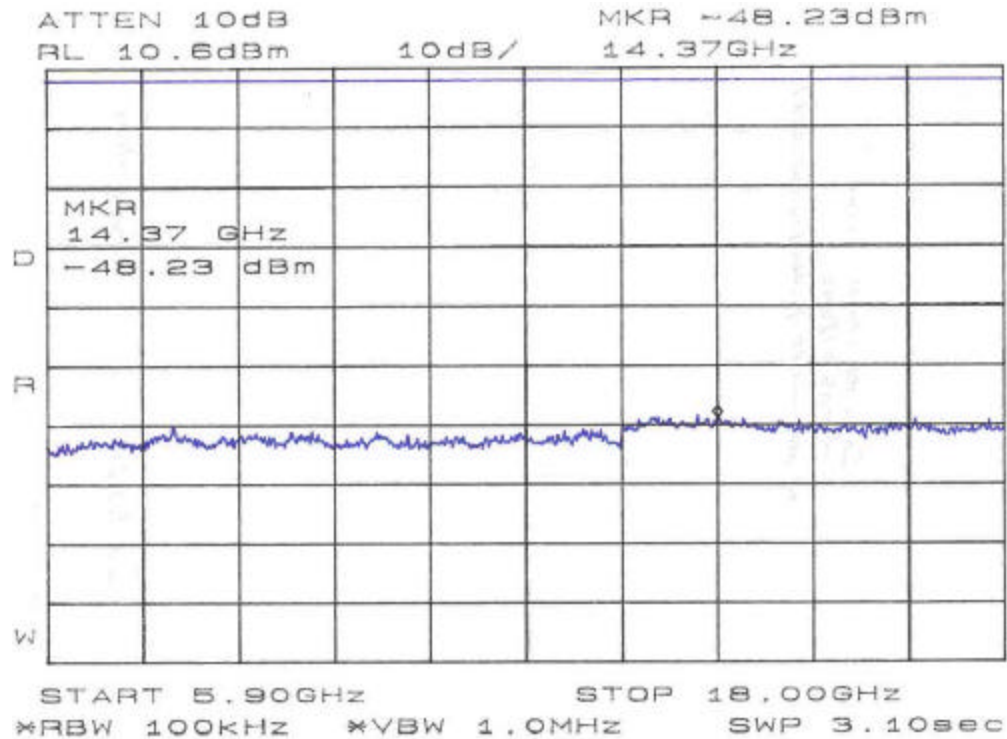
**Figure 15. Conducted Spurious Emissions, Channel B, 5.6GHz – 5.9GHz**



**Figure 16. Conducted Spurious Emissions - Band Edge Plot – Channel B**

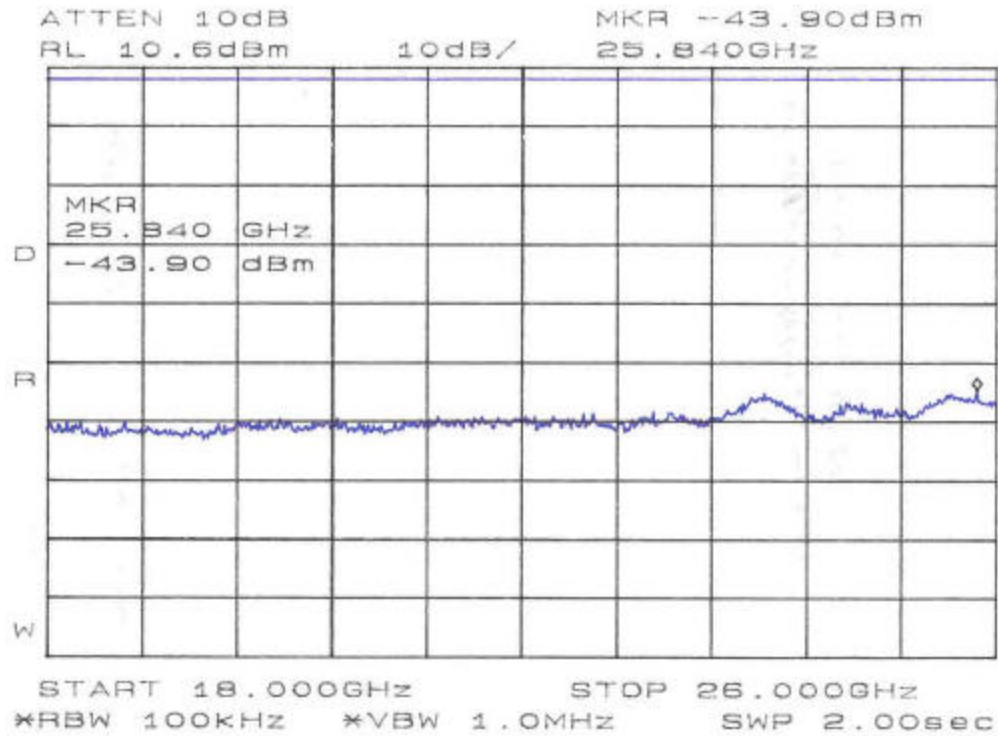


**Figure 17. Conducted Spurious Emissions - Band Edge Plot – Channel B**

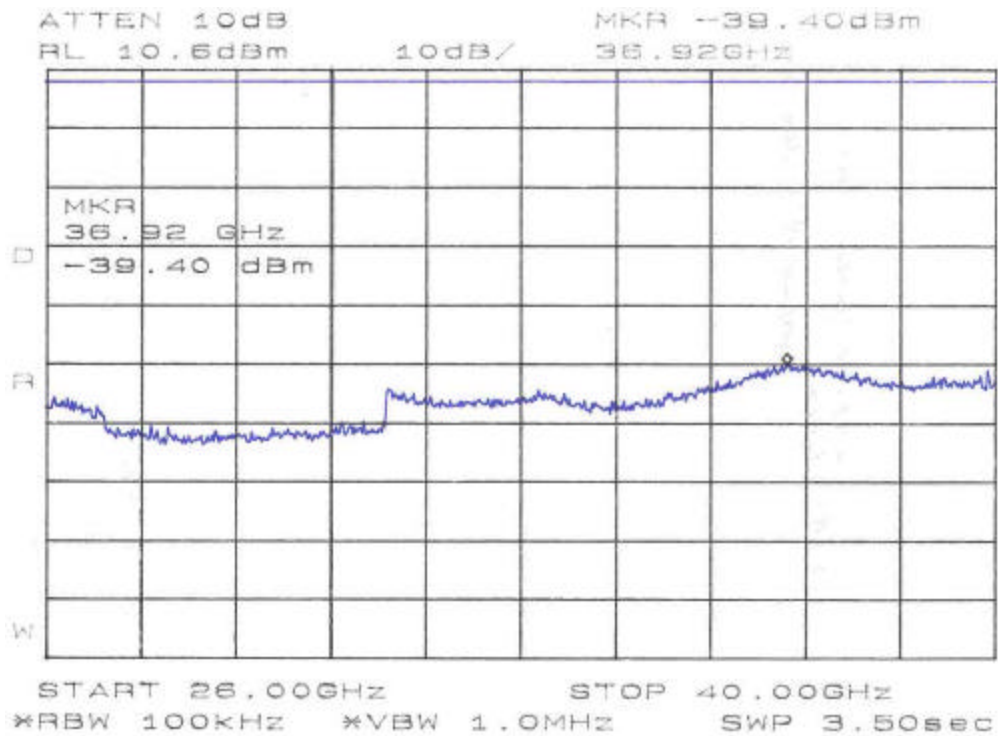


**Figure 18. Conducted Spurious Emissions, Channel B, 5.9GHz - 18GHz**





**Figure 19. Conducted Spurious Emissions, Channel B, 18MHz – 26GHz**



**Figure 20. Conducted Spurious Emissions, Channel B, 26GHz - 40GHz**

### 3.5 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	1MHz
>1000 MHz	1 MHz	10 Hz (1MHz for 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 for the restricted bands.

### 3.5.1 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 C63.4-1992. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

Note that measurements were taken at a closer distance above 18 GHz because of sensitivity restrictions on the measurement system.

The EUT was tested in the following configurations and modes:

Antenna	Channel
Dish	A&B

Emissions were scanned up to 40GHz.

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)

**Table 6: Radiated Emission Test Data-Dish Antenna—Channel A**

CLIENT:	Adtran	DATE:	1/8/03
TESTER:	Ken Gemmell	JOB #:	7368
<b><u>EUT Information:</u></b>		<b><u>Test Requirements:</u></b>	
EUT:	Tracer 4205	TEST STANDARD:	FCC Part 15
CONFIGURATION:	with 28.5dbi ant	DISTANCE:	3m
CLOCKS:	45 Mhz,44.736MHz,51.429Mhz, 25.714Mhz,12Mhz,280Mhz,1386.75 Mhz		
CLASS:	B		
<b><u>Test Equipment/Limit:</u></b>			
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m		

From 18-26 GHz antenna asset 00210 used (at 1.0 meter scan) no amp  
From 26-40 GHz antenna asset 00209 used (at 0.5 meter scan) no amp

**Peak Measurements:**

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
1366.75	V	270.0	1.0	56.8	26.6	2.2	34.2	51.4	371.5	5000	-22.6
2733.74	V	90.0	1.0	53.8	30.3	2.9	34.4	52.6	426.6	5000	-21.4
2843.50	V	135.0	1.0	49.8	30.5	2.8	34.4	48.7	272.3	5000	-25.3
4265.24	V	190.0	1.0	47.3	32.1	3.3	34.3	48.4	263.0	5000	-25.6
8200.50	V	180.0	1.0	48.6	38.5	4.9	34.2	57.8	776.2	5000	-16.2
11494.00	V	0.0	1.0	31	40.9	5	34.0	42.9	139.6	5000	-31.1
1366.75	H	90.0	1.0	57	26.6	2.2	34.2	51.6	380.2	5000	-22.4
2733.74	H	135.0	1.0	53.8	30.3	2.9	34.4	52.6	426.6	5000	-21.4
2843.50	H	125.0	1.0	52.1	30.5	2.8	34.4	51.0	354.8	5000	-23.0
4265.24	H	160.0	1.0	47.2	32.1	3.3	34.3	48.3	260.0	5000	-25.7
8200.50	H	90.0	1.0	48.3	38.5	4.9	34.2	57.5	749.9	5000	-16.5
11494.00	H	0.0	1.0	35.2	40.9	5	34.0	47.0	223.9	5000	-27.0

Note: No emissions detected above 11.494GHz.



Table 6: Radiated Emission Test Data-Dish Antenna—Channel A (continued)

Average Measurements:

Freq.	Pol.	Azimuth	Ant. Hght	SA Level (Avg)	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin	Notes
(MHz)	H/V	Degree	(m)	(dBuV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(uV/m)	(uV/m)	dB	
156.84	V	180.0	1.0	13.0	8.7	2.7	0.0	24.4	16.6	150.0	-19.1	QP
257.46	V	225.0	1.0	15.2	12.4	3.5	0.0	31.1	36.0	200.0	-14.9	QP
1073.90	V	135.0	1.0	42.9	25.1	1.3	34.4	35.0	56.4	500.0	-18.9	
1366.75	V	180.0	1.0	53.9	26.6	2.2	34.2	48.4	264.4	500.0	-5.5	
2733.74	V	180.0	1.0	50.6	30.3	2.9	34.4	49.3	293.1	500.0	-4.6	
2843.50	V	135.0	1.0	48.0	30.5	2.8	34.4	46.9	221.3	500	-7.1	
4100.25	V	90.0	1.0	43.2	31.8	3.0	34.6	43.4	147.6	500.0	-10.6	
4265.24	V	190.0	1.0	46.3	32.1	3.3	34.6	47.7	241.8	500.0	-6.3	
8200.50	V	90.0	1.0	38.9	38.5	4.9	34.2	48.1	254.1	500	-5.9	
11494.00	V	0.0	1.0	23.8	40.9	5.0	34.0	35.6	60.6	500.0	-18.3	
156.84	H	180.0	4.0	14.5	8.7	2.7	0.0	25.9	19.8	150.0	-17.6	QP
257.46	H	225.0	4.0	14.6	12.4	3.5	0.0	30.5	33.6	200.0	-15.5	QP
1073.90	H	180.0	1.0	42.8	25.1	1.3	34.4	34.8	55.0	500	-19.2	
1366.75	H	180.0	1.0	51.8	26.6	2.2	34.2	46.4	208.9	500	-7.6	
2733.74	H	135.0	1.0	50.6	30.3	2.9	34.4	49.4	295.1	500	-4.6	
2843.50	H	125.0	1.0	49.6	30.5	2.8	34.4	48.5	266.1	500	-5.5	
4100.25	H	180.0	1.0	41.3	31.8	3	34.6	41.5	118.9	500	-12.5	
4265.24	H	165.0	1.0	42.8	32.1	3.3	34.6	43.6	151.4	500	-10.4	
8200.50	H	90.0	1.0	38.2	38.5	4.9	34.2	47.4	234.4	500	-6.6	
11494.00	H	0.0	1.0	22.5	40.9	5	34.0	34.4	52.5	500	-19.6	

Note: No emissions detected above 11.494GHz.

**Table 7: Radiated Emission Test Data-Dish Antenna—Channel B**

CLIENT:	Adtran	DATE:	1/7/03
TESTER:	Ken Gemmell	JOB #:	7368
<b><u>EUT Information:</u></b>		<b><u>Test Requirements:</u></b>	
EUT:	Tracer 4205	TEST STANDARD:	FCC Part 15
CONFIGURATION:	with 28.5dbi ant	DISTANCE:	3m
CLOCKS:	45 Mhz,44.736MHz,51.429Mhz, 25.714Mhz,12Mhz,280Mhz,1386.75 Mhz		
CLASS:	B		
<b><u>Test Equipment/Limit:</u></b>			
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m		

From18-26 GHz antenna asset 00210 used (at 1.0 meter scan) No amp  
From26-40 GHz antenna asset 00209 used (at 0.5 meter scan) No amp

### Peak Measurements

Frequency	Polarity	Azimuth	Ant. Hght	SA Level (Peak)	Ant. Corr.	Cable Corr.	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Degree	(m)	(dBuV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(uV/m)	(uV/m)	dB
1073.90	V	135.0	1.0	52.5	25.1	2.2	36.4	43.4	147.9	5000	-30.6
1386.92	V	90.0	1.0	55.5	26.7	2.3	36.0	48.5	266.1	5000	-25.5
1401.75	V	165.0	1.0	43.3	26.7	2.2	35.9	36.3	65.3	5000	-37.7
2773.49	V	135.0	1.0	46.7	30.4	3.2	35.7	44.6	169.8	5000	-29.4
2803.49	V	165.0	1.0	47.2	30.4	2.9	35.7	44.8	173.8	5000	-29.2
4160.24	V	180.0	1.0	41.0	31.9	3.1	36.2	39.8	97.7	5000	-34.2
8320.50	V	135.0	1.0	46.7	38.6	5.3	36.1	54.5	530.9	5000	-19.5
11654.00	V	0.0	1.0	35.5	41.0	5.0	35.0	46.5	211.3	5000	-27.5
1073.90	H	180.0	1.0	52.2	25.1	1.3	36.4	42.2	128.8	5001	-31.8
1386.92	H	90.0	1.0	56.5	26.7	2.2	36.0	49.4	295.1	5002	-24.6
1401.75	H	135.0	1.0	39.8	26.7	2.2	35.9	32.8	43.7	5003	-41.2
2773.49	H	135.0	1.0	43.4	30.4	2.9	35.7	41.0	112.2	5004	-33.0
2803.49	H	165.0	1.0	44.7	30.4	2.9	35.7	42.3	130.3	5005	-31.7
4160.24	H	165.0	1.0	41.8	31.9	3.1	36.2	40.6	107.2	5006	-33.4
8320.50	H	90.0	1.0	44.7	38.6	4.9	36.1	52.1	402.7	5007	-21.9
11654.00	H	0.0	1.0	31.5	41.0	5.0	35.0	42.5	133.4	5008	-31.5

Note: No emissions detected above 11.654GHz.

Table 7: Radiated Emission Test Data-Dish Antenna—Channel B (continued)

Average Measurements:

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Avg.) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB	Notes
110.94	V	180.0	1.0	11.5	10.1	2.3	0.0	23.9	15.7	150.0	-19.6	QP
156.84	V	180.0	1.0	13.8	8.7	2.7	0.0	25.2	18.2	150.0	-18.3	QP
257.46	V	90.0	1.0	17.8	12.4	3.5	0.0	33.7	48.6	200.0	-12.3	QP
1073.90	V	180.0	1.0	45.3	25.1	2.2	36.4	36.2	64.6	500	-17.8	
1386.92	V	90.0	1.0	55.0	26.7	2.3	36.0	48.0	251.2	500	-6.0	
1401.75	V	165.0	1.0	37.4	26.7	2.2	35.9	30.4	33.1	500	-23.6	
2773.49	V	180.0	1.0	41.2	30.4	3.2	35.7	39.1	90.2	500	-14.9	
4160.24	V	180.0	1.0	35.8	31.9	3.1	36.2	34.6	53.7	500	-19.4	
8320.50	V	180.0	1.0	42.0	38.6	5.3	36.1	49.8	309.0	500	-4.2	
11654.00	V	0.0	1.0	23.9	41.0	5.0	35.0	34.9	55.6	500	-19.1	amb
110.94	H	180.0	4.0	11.5	10.1	2.3	0.0	23.9	15.7	150.0	-19.6	QP
156.84	H	180.0	1.0	13.6	8.7	2.7	0.0	25.0	17.8	150.0	-18.5	QP
257.46	H	225.0	4.0	17.4	12.4	3.5	0.0	33.3	46.4	200.0	-12.7	QP
1073.90	H	180.0	1.0	45.5	25.1	1.3	36.4	35.5	59.6	500	-18.5	
1386.92	H	135.0	1.0	54.6	26.7	2.2	36.0	47.5	237.1	500	-6.5	
1401.75	H	165.0	1.0	33.2	26.7	2.2	35.9	26.2	20.4	500	-27.8	
2773.49	H	135.0	1.0	42.0	30.4	2.9	35.7	39.6	95.5	500	-14.4	
4160.24	H	165.0	1.0	37.3	31.9	3.1	36.2	36.1	63.8	500	-17.9	
8320.50	H	90.0	1.0	41.7	38.6	4.9	36.1	49.1	285.1	500	-4.9	
11654.00	H	0.0	1.0	23.2	41.0	5.0	35.0	34.2	51.3	500	-19.8	amb

Note: No emissions detected above 11.654GHz.

### **3.6 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  $\Omega$ /50  $\mu$ H 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 50  $\Omega$  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 was measured. The detector function was set to quasi-peak or peak, 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.

Data is recorded in Table 8.

**Table 8: Conducted Emissions Test Data Sheet**

CLIENT:	Adtran	DATE:	1/8/03
TEST STANDARD:	FCC Part 15	MODEL:	Tracer 4205
JOB #:	7368	CLASS:	FCC_B
TESTER:	Ken Gemmell	Plan B	
TEST VOLTAGE:	120 VAC		

LINE 1 - NEUTRAL

Frequency MHz	Level QP dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Limit AVG dBuV	Margin AVG dB
0.16	59.3	65.5	-6.2	39.2	55.5	-16.3
0.66	38.8	56.0	-17.2	38.8	46.0	-7.2
1.93	37.6	56.0	-18.4	37.6	46.0	-8.4
2.68	38.2	56.0	-17.8	38.2	46.0	-7.8
17.11	38.6	60.0	-21.4	38.6	50.0	-11.4
26.25	31.8	60.0	-28.2	31.8	50.0	-18.2

LINE 2 - PHASE

Frequency MHz	Level QP dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Limit AVG dBuV	Margin AVG dB
0.16	59.3	65.5	-6.2	40.1	55.5	-15.4
0.66	38.5	56.0	-17.5	38.5	46.0	-7.5
1.93	38.1	56.0	-17.9	38.1	46.0	-7.9
2.68	37.8	56.0	-18.2	37.8	46.0	-8.2
17.11	37.9	60.0	-22.1	37.9	50.0	-12.1
26.25	32.5	60.0	-27.5	32.5	50.0	-17.5

## 4 Test Equipment

Table 9 shows a list of the test equipment used for measurements along with the calibration information.

**Table 9: Test Equipment List**

Manufacturer & Model	Description	Serial Number	Property Number	Calibration Due Date
Antenna Research Associates DRG-118/A	Horn Antenna	1236	00425	8/29/03
Antenna Research Associates LPB-2520	Biconilog Antenna	1044	00007	6/19/03
Hewlett Packard 11970W	Harmonic Mixer	2521A01455	00055	8/27/03
Hewlett Packard 11970U	Harmonic Mixer	3003A01626	00083	7/30/03
Hewlett Packard 11970V Harmonic Mixer	Harmonic Mixer	2521A01269	00054	9/10/03
Hewlett Packard 8449B	Pre-Amplifier	3008A00729	00066	1/31/03
Hewlett Packard 8449B	Pre-Amplifier	3008A00385	00312	9/26/03
Hewlett Packard 8564E	Spectrum Analyzer	3643A00657	00067	4/18/03
Hewlett Packard 85650A	Q.P. Adapter	2811A01283	00068	7/02/03
Hewlett Packard 85685A	RF Preselector	3221A01395	00071	5/17/03
Hewlett Packard 8568B	Spectrum Analyzer	2928A04750	00072	7/02/03
Hewlett-Packard 8672A	Synth. Signal Generator	2311A03131	00080	2/20/03
Hewlett Packard 8672A-K22	Frequency Extension Unit	2311A00221	00257	2/20/03
Tektronix TDS 220	Oscilloscope	B025304	00333	8/20/03
Agilent Technologies 8474B	Crystal Detector	2905A04196	00416	12/19/03
Boonton 4230	Power Meter	27103	00260	6/27/03
Boonton 51011-EMC	Power Meter Sensor	30419	00259	6/27/03