FCC Certification Test Report

FCC Certification Test Report
for
IntelliSense
C2DLWSH-21-SR

August 24, 2001

Prepared for:

IntelliSense
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Prepared By:

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FCC Certification Test Program

FCC Certification Test Report
for the
IntelliSense
SN921 Direct Sequence Spread Spectrum Transmitter
C2DLWSH-21-SR

August 10, 2001

WLL JOB# 6395

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Abstract

This report has been prepared on behalf of IntelliSense to support the attached Application for Equipment Authorization. The test report and application are submitted for an Intentional Radiator 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 IntelliSense SN921 Direct Sequence Spread Spectrum Transmitter.

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 IntelliSense SN921 Direct Sequence Spread Spectrum Transmitter complies with the limits for an Intentional Radiator device under Part 15.247 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The IntelliSense SN921 Direct Sequence Spread Spectrum Transmitter complies with the specifications for an Intentional Radiator 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:	IntelliSense 625 Coolidge Drive Folsom, CA 95630
Purchase Order Number:	420376
Quotation Number:	59053

1.4 Test Dates

Testing was performed during July 2001.

1.5 Test and Support Personnel

Washington Laboratories, LTD	Greg Snyder
	Santo Lavorata

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

The IntelliSense (C & K Systems, Inc.) Direct Sequence Spread Spectrum Transmitter, SN921-REPEATER Spread Spectrum Transmitter is a 923.58 MHz low power spread spectrum transmitter used for residential security systems. The unit is designed to re-transmit signals that are received from other transmitters within a specific security system to another receiver/control panel. The unit contains a SN930 Spread Spectrum transmitter board with a permanently attached (soldered) antenna, SN921 receiver module, 115 VAC to DC power supply and a 12 Volt battery. The transmitter transmits 7.6 ms "on" pulse followed by a 250ms blank, or "off" pulse.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	IntelliSense
FCC ID Number	C2DLWSH-21-SR
EUT Name:	Direct Sequence Spread Spectrum Transmitter
Model:	SN921-REPEATER
FCC Rule Parts:	§15.247
Frequency Range:	923.58 MHz
Maximum Output Power:	17 dBm
Modulation:	Pulsed
Necessary Bandwidth:	1.2 MHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	1
Power Output Level	Fixed
Antenna Type	Integrated
Oscillators	14.660MHz
Interface Cables:	None (AC Power cord only)
Power Source & Voltage:	115 VAC

2.2 Test Configuration

To complete the test configuration required by the FCC, the SN921-REPEATER Direct Sequence Spread Spectrum Transmitter was tested in all orthogonal planes to cover all possible installations.

2.3 Testing Algorithm

The SN921 was operated continuously by being powered via the 115 VAC and setup to continuously transmit during testing.

Worst-case emission levels are provided in the test results data.

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

FCC Guidance on Measurement for Direct Sequence Spread Spectrum Systems

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 ±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:

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

Equipment	Serial Number	Date Calibrated	Calibration Due
Antenna Research Associates, Inc. Biconical Log Periodic Antenna LPB-2520A (Site 2)	1118	5/15/01	5/15/02
Hewlett-Packard Spectrum Analyzer: HP 8568B (Site 2)	2634A02888	6/29/01	6/29/02
Hewlett-Packard Quasi-Peak Adapter: HP 85650A (Site 2)	2811A01283	6/29/01	6/29/02
Hewlett-Packard RF Preselector: HP 85685A (Site 2)	3221A01395	6/29/01	6/29/02
Hewlett-Packard Spectrum Analyzer: HP 8564E	3643A00657	4/11/01	4/11/02
Hewlett-Packard Preamplifier: HP 8449B	3008A00729	12/07/00	12/07/01
Hewlett-Packard Preamplifier: HP 8449B	3008A00385	9/07/00	9/07/01
Antenna Research Associates, Inc. Horn Antenna DRG-118/A	1010	9/10/99	9/10/01
Solar Electronics LISN 8012-50-R-24-BNC	8379493	8/29/00	8/29/01

4 Test Results

4.1 Duty Cycle Correction

Measurements may be adjusted where pulsed RF is utilized to find the average level associated with a quantity. This calculation is applied to limits for pulsed licensed and unlicensed devices.

On time = $N_1L_1 + N_2L_2 + \ldots + N_{N-1}L_{N-1} + N_NL_N$, where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.

- For Licensed Transmitters basic formula can be stated as 20log[Duty Cycle]
- For Unlicensed Intentional Radiators under 47CFR Part 15, all duty cycle measurements compared to a 100 millisecond period
- i.e. duty cycle = on time/100 milliseconds or period, whichever is less
- Restating the basic formula:
    - Duty cycle = $(N_1L_1 + N_2L_2 + \ldots + N_{N-1}L_{N-1} + N_NL_N)/100$ or T, whichever is less

Where T is the period of the pulse train.

For the SN921 transmitter the unit transmits 7.6 ms "on" pulse followed by a 250ms blank, or "off" pulse. The duty cycle can then be calculated as:

AFd = 7.6 ms on-time/100 ms = 7.6% = -22.38 dB (Maximum 20dB correction used for duty cycle)

4.2 RF Power Output: FCC Part §15.247(b)(1)

The EUT antenna was removed and connected directly into the spectrum analyzer input with a short length of coaxial cable and attenuator. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system.

Table 3. RF Power Output

Frequency	Level	Limit	Pass/Fail
923.58MHz	17 dBm/ 50.1mW	1 Watt	Pass

4.3 Bandwidth: FCC Part §15.247(a)(2)

The EUT antenna was removed and connected directly into the spectrum analyzer input with a short length of coaxial cable. The analyzer resolution bandwidth was set to 100 kHz and the span was set to 10 MHz. The highest peak of the carrier was centered on the analyzer display. An external attenuator was used to confirm that the transmitter

input was not overloading the spectrum analyzer input. The 6dB bandwidth of the modulated carrier was measured and verified to be at least 500kHz. The actual measured 6dB bandwidth is 1.2MHz.

Spectrum analyzer plot of the 6dB bandwidth is located in Figure 1.

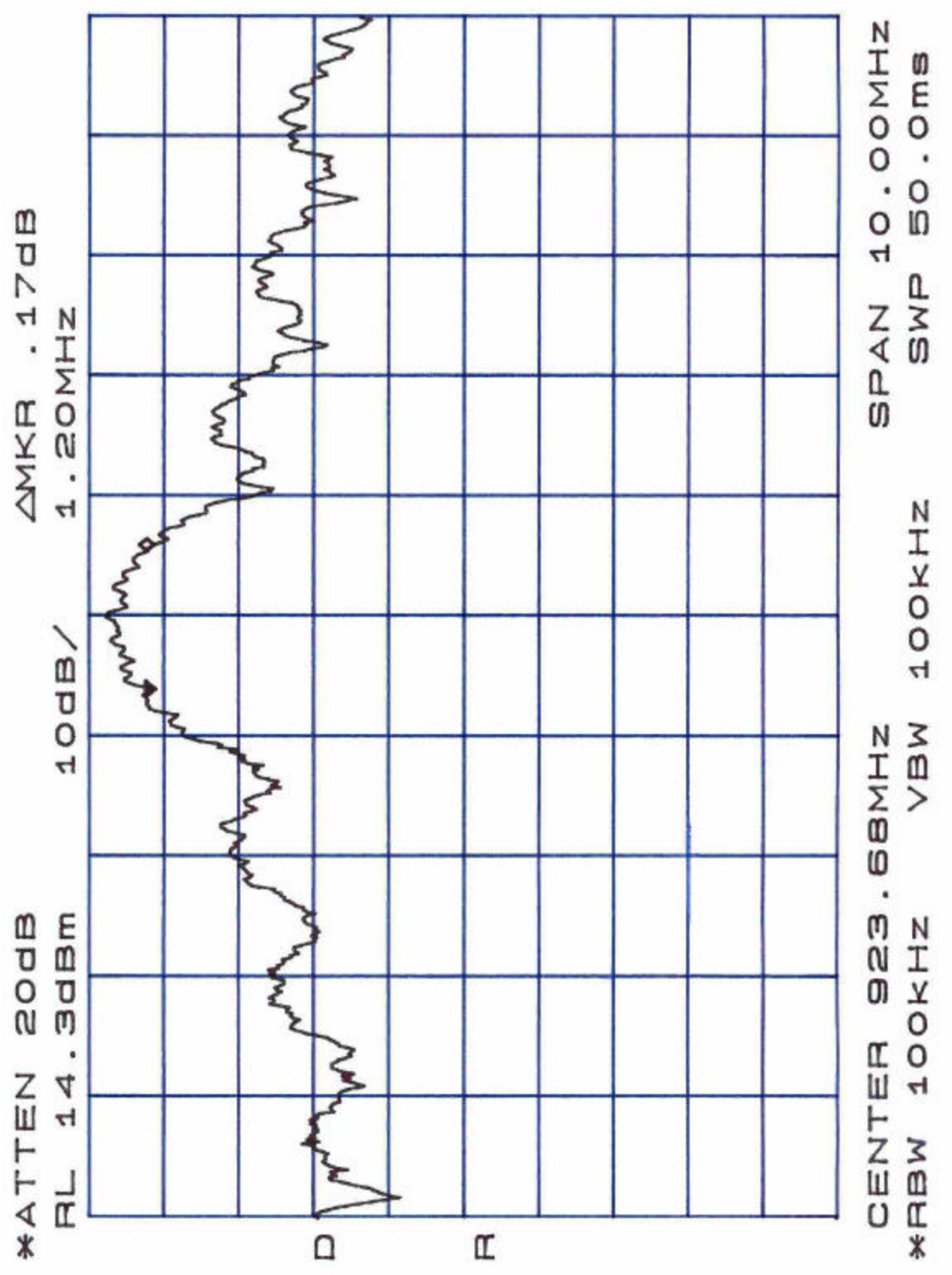

Figure 1. Occupied Bandwidth

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

The EUT antenna was replaced with a short piece of microwave "hard line" coaxial cable and the cable was connected directly into the spectrum analyzer input. The analyzer resolution bandwidth was set to 100 kHz and the video bandwidth was set to 100 kHz. The emissions were scanned up to the tenth harmonic of the carrier. At each frequency, an external attenuator or filter was used to confirm that the transmitter input was not overloading the spectrum analyzer input.

Data are included in the following spectrum analyzer plots. All spurious emissions were verified to be 20dB down from the carrier power in any 100kHz band up to the tenth harmonic.

The peak emission within the 902 to 928 MHz frequency range using a 100 kHz bandwidth was found to be 14.33dBm. All emissions outside the 902 to 928 MHz band were measured and found to be at least 20dBc (-5.67dBm limit).

Spurious Emission plots are shown in Figure 2 through Figure 9.

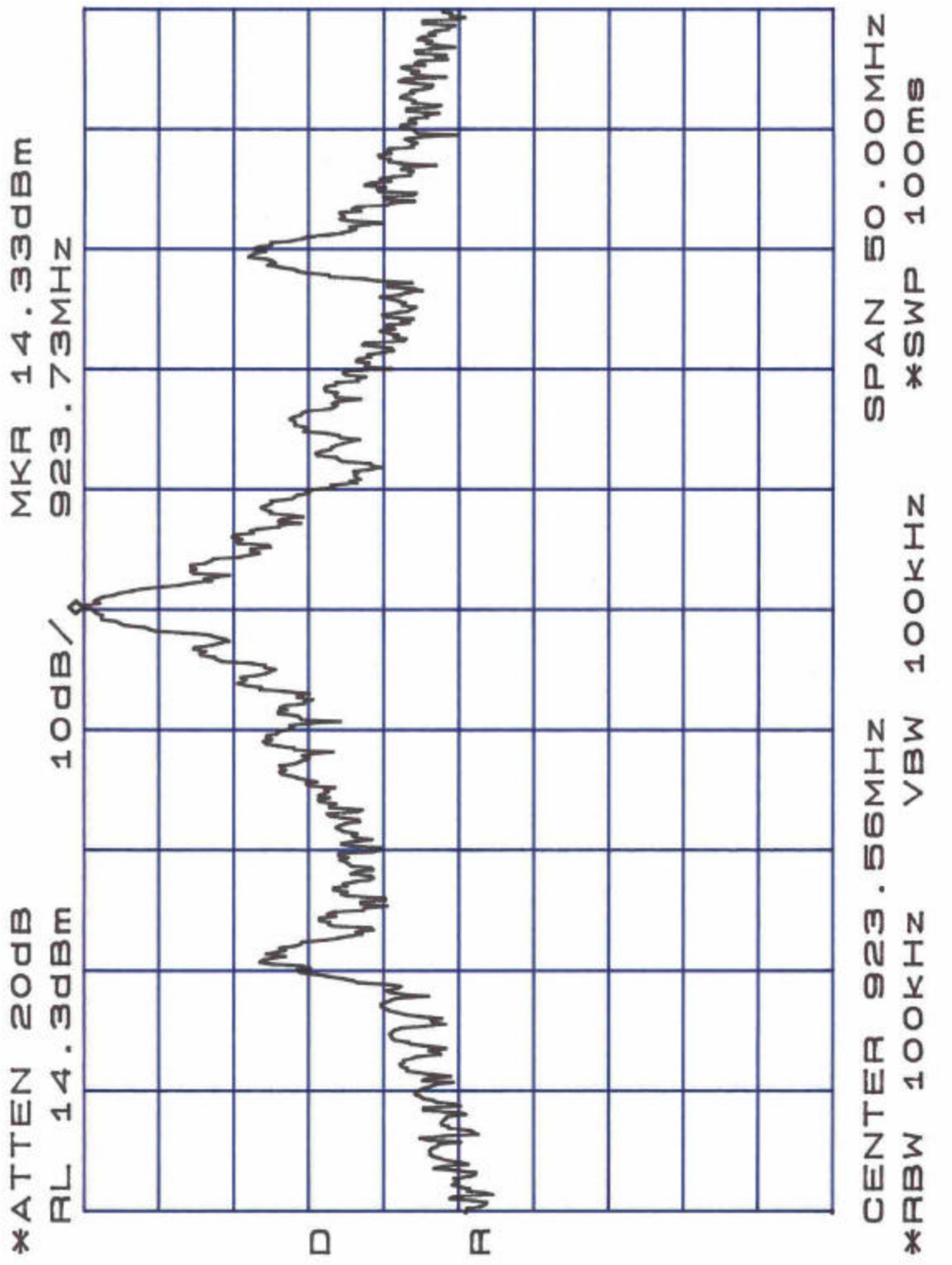

Figure 2. Conducted Spurious Emissions, Peak In-band

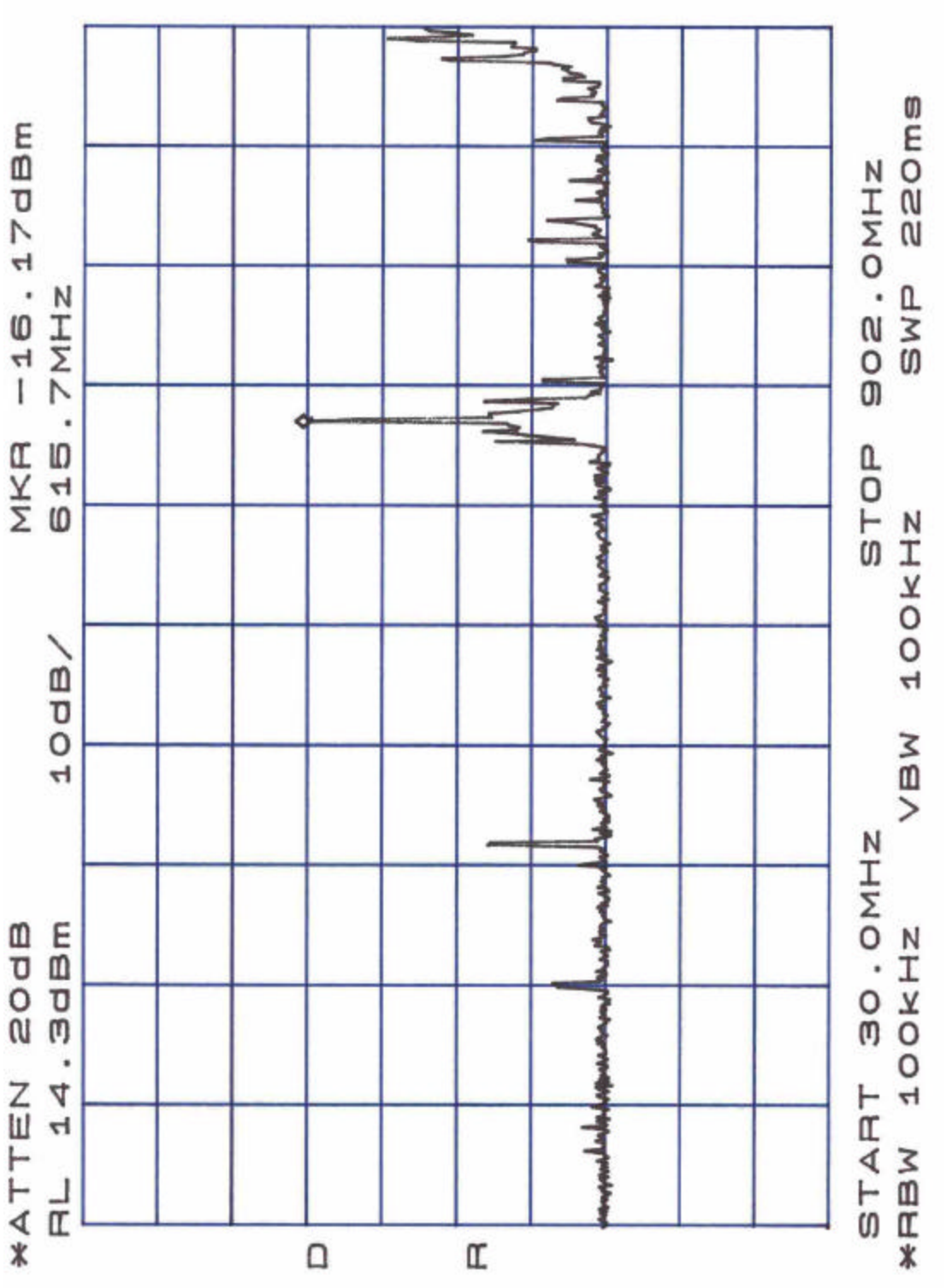

Figure 3. Conducted Spurious Emissions 30 – 902MHz

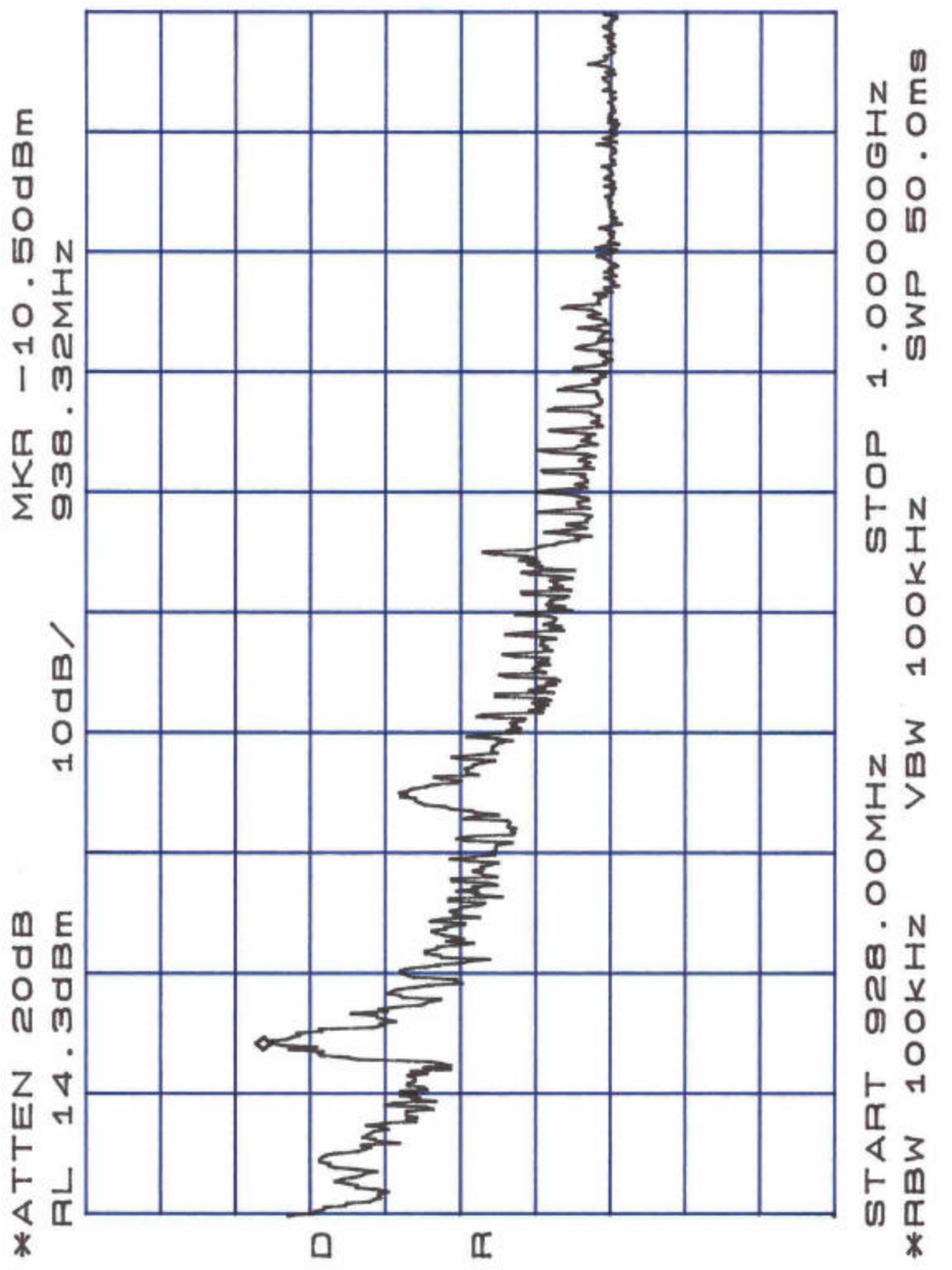

Figure 4. Conducted Spurious Emissions 928 – 1000MHz

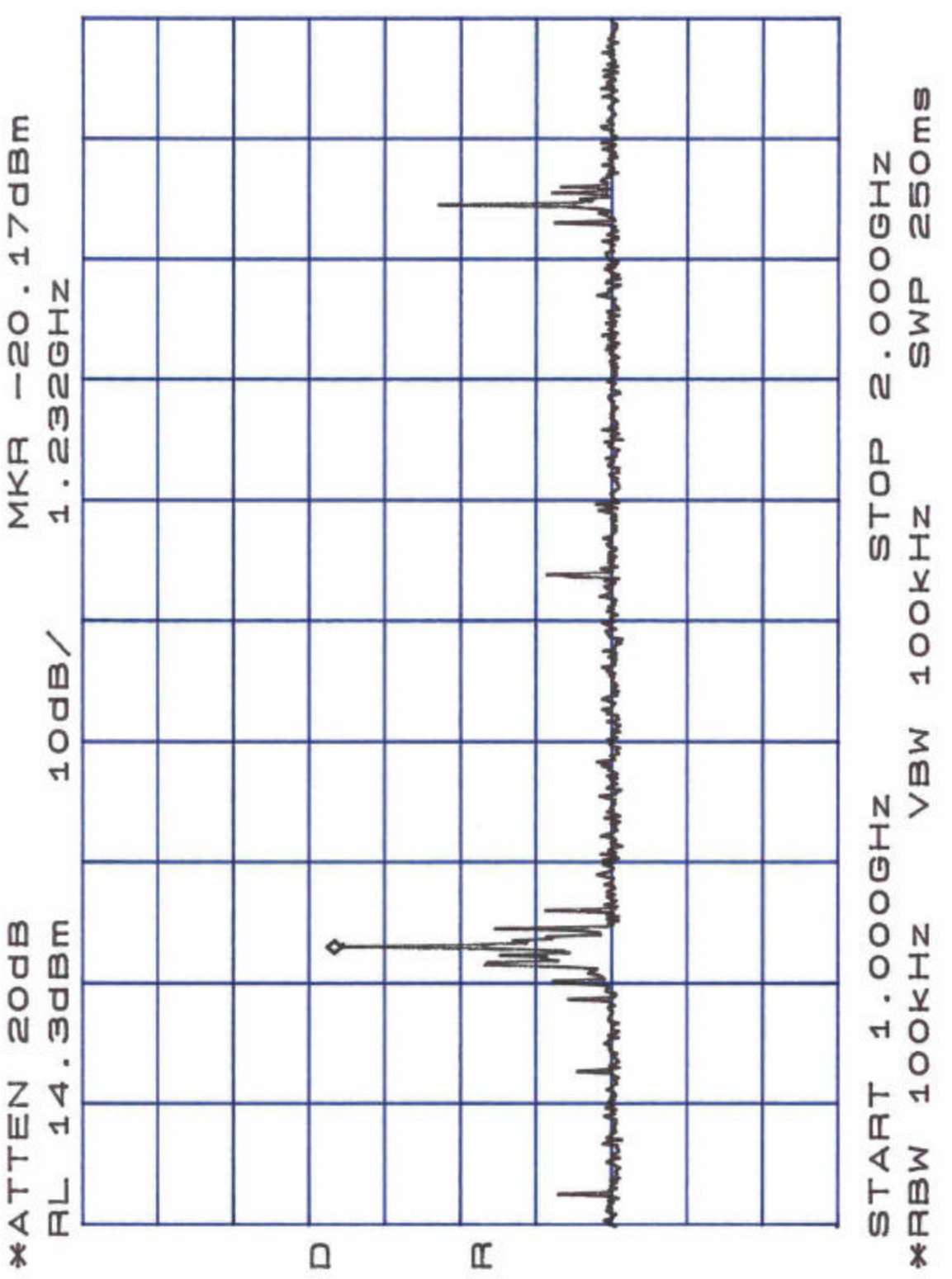

Figure 5. Conducted Spurious Emissions 1000 - 2000MHz

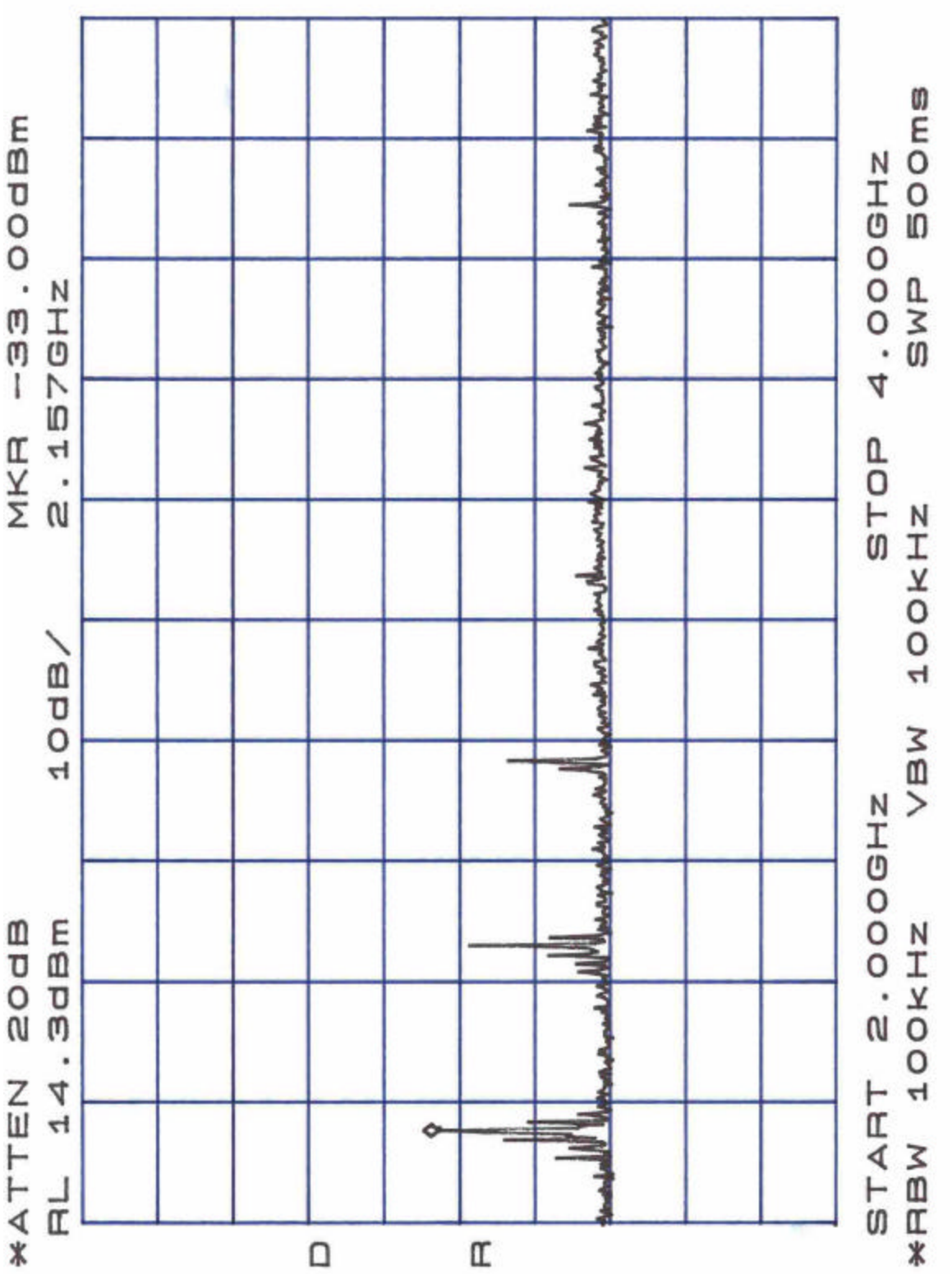

Figure 6. Conducted Spurious Emissions 2000-4000MHz

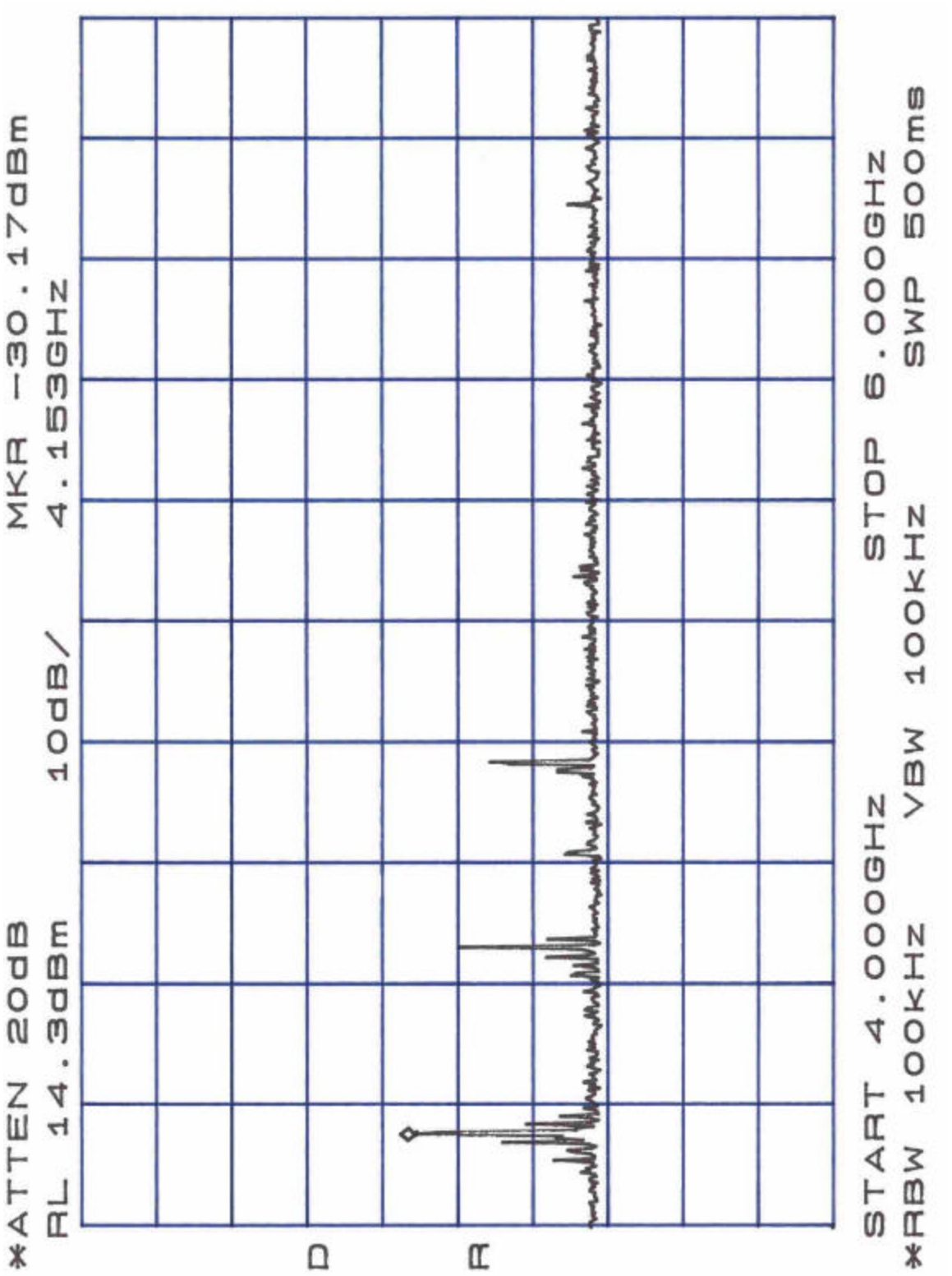

Figure 7. Conducted Spurious Emissions 4000 – 6000MHz

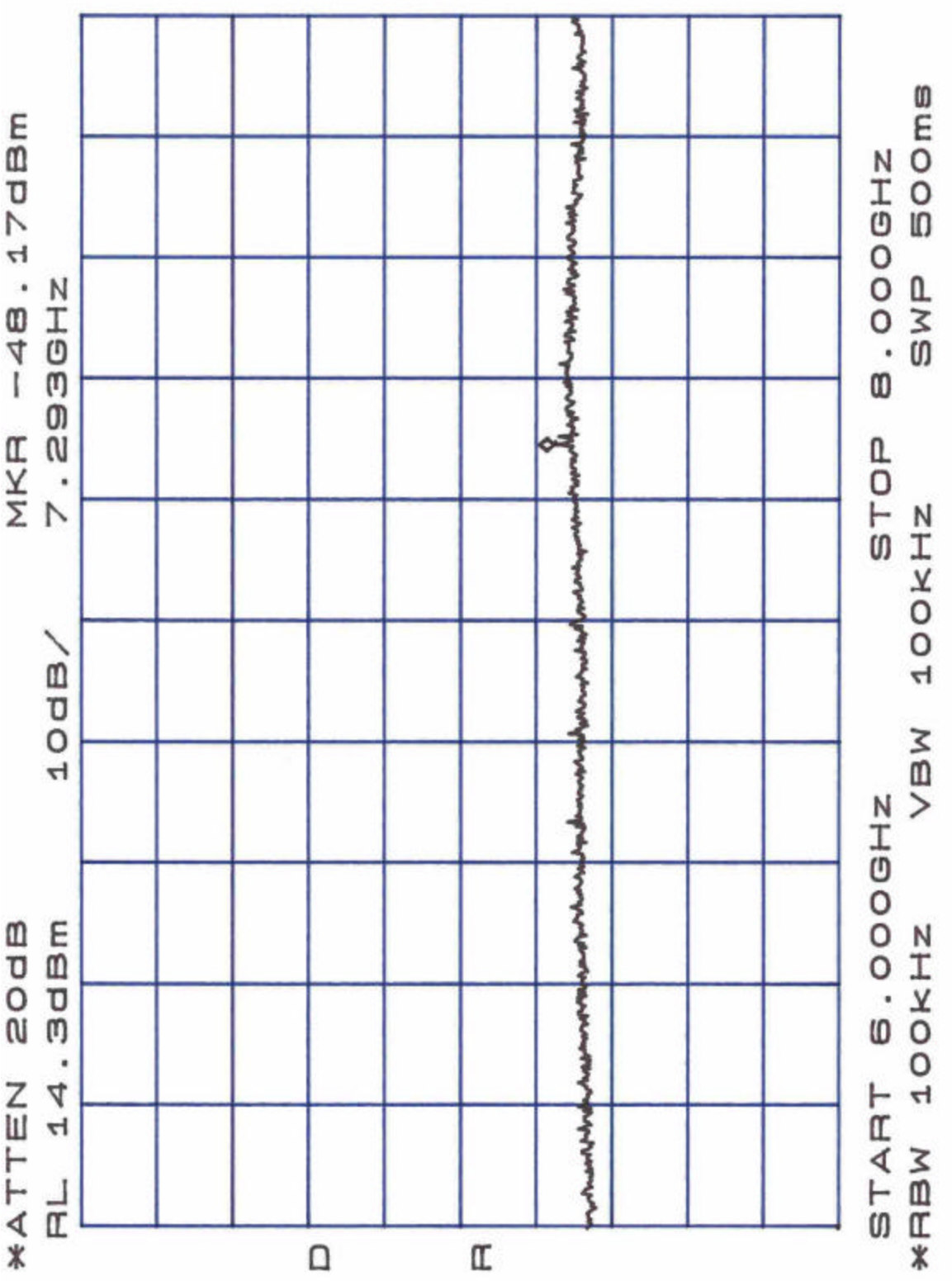

Figure 8. Conducted Spurious Emissions 6000 – 8000MHz

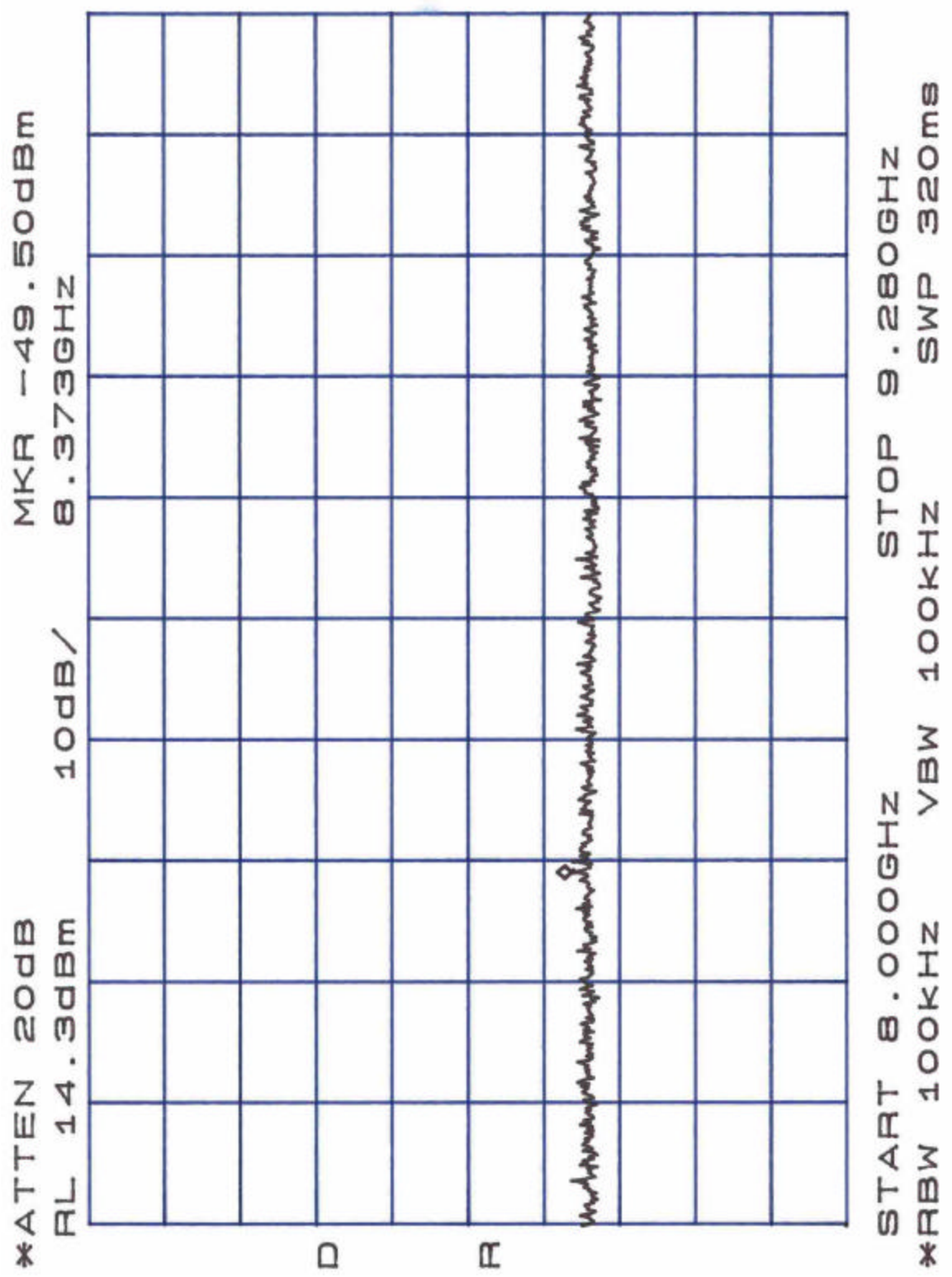

Figure 9. Conducted Spurious Emissions 8000 – 9280MHz

4.5 Power Spectral Density: FCC Part §15.247(d)

In accordance with 15.247(d), the peak power spectral density conducted from the intentional radiator shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

The EUT antenna was removed and connected directly into the spectrum analyzer input with a short length of coaxial cable. The spectrum analyzer was tuned to the center of the carrier frequency and the peak of the emission was located. This emission peak was then zoomed in on for performing the Power Spectral Density measurement. Once the peak emission was detected the analyzer resolution bandwidth was set to 3 kHz with a span of 300kHz and a sweep time of 100 seconds.

The highest peak measurement within the band was –0.83dBm.

Figure 10 is the plot of the Power Spectral Density measurement.

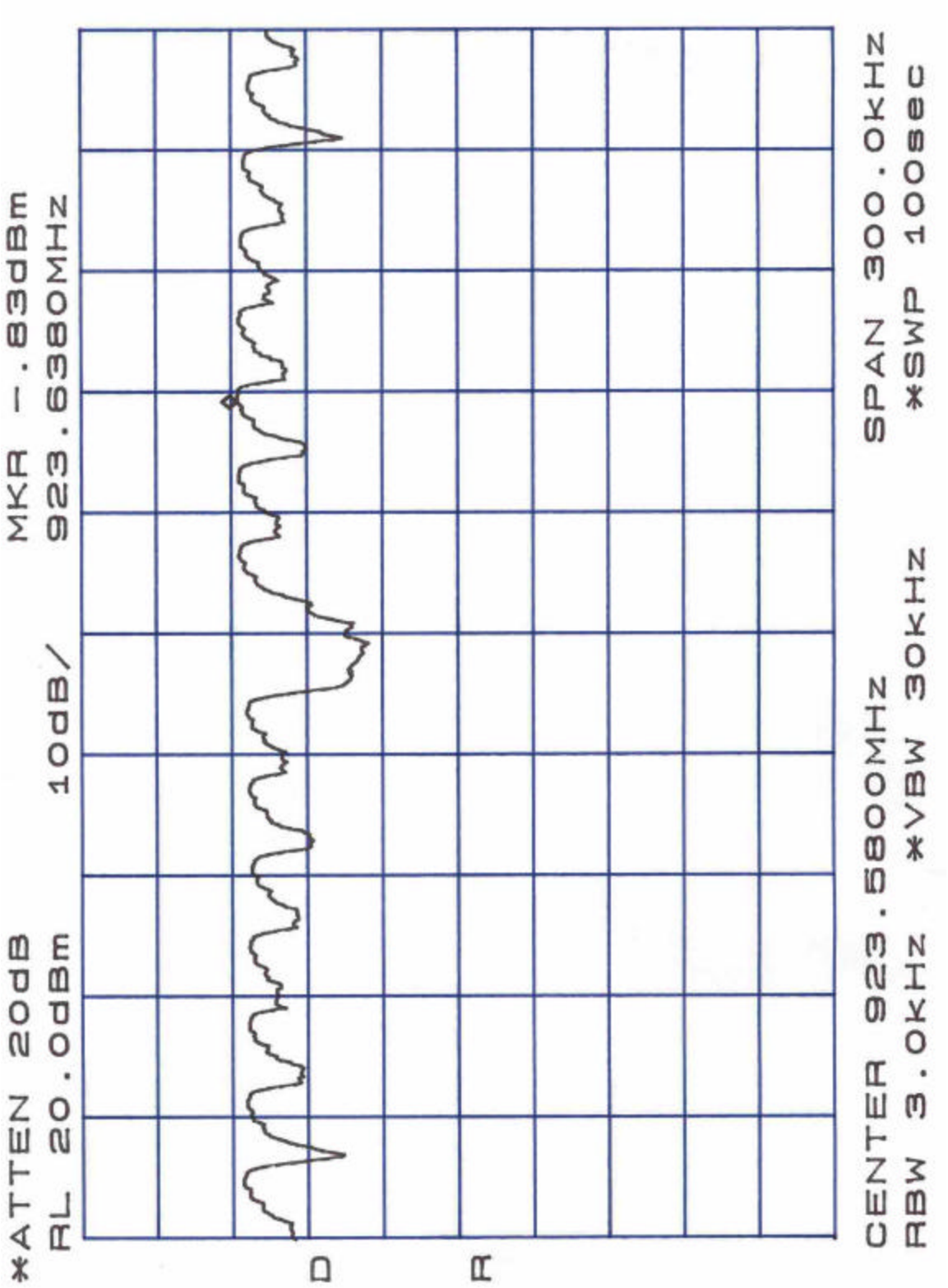

Figure 10. Power Spectral Density

4.6 Radiated Spurious Emissions; Restricted Bands: FCC Part §15.205

Radiated emissions testing was performed on all emissions that fall in the restricted bands as listed in Part 15.205.

4.6.1 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.

Table 4: Radiated Emission Test Data

FCC 15.247(c) 3M Radiated Emissions Data

Restricted Band Spurious Emissions

CLIENT: Intellisense
MODEL NO: SN921-REPEATER
TYPE/PART: Spread Spectrum TX
DATE: 7/5/2001
BY: Greg Snyder
JOB #: 6395
Tx FREQUENCY: 923.58 Mhz

ORIENTATION: X = Flat (Ant. @90 degree)

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (QP) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
278.50	V	0.00	1.0	12.3	15.4	27.7	24.2	200.0	-18.3
278.50	H	0.00	1.0	23.0	15.4	38.4	82.9	200.0	-7.6
322.53	V	180.00	1.0	7.3	16.7	24.0	15.9	200.0	-22.0
322.53	H	180.00	1.0	18.2	16.7	34.9	55.6	200.0	-11.1
608.00	V	270.00	1.0	10.20	23.6	33.8	49.2	200.0	-12.2
923.56	H	202.00	1.0	1.0	28.5	29.5	29.7	200.0	-16.6
960.21	V	135.00	1.3	13.40	29.0	42.4	132.6	500.0	-11.5
960.21	H	202.00	1.0	15.7	29.0	44.7	172.7	500.0	-9.2
967.54	V	90.00	1.0	11.00	29.2	40.2	101.9	500.0	-13.8
967.54	H	225.00	1.0	15.4	29.2	44.6	169.1	500.0	-9.4
982.20	V	67.50	1.0	9.20	29.4	38.6	85.0	500.0	-15.4
982.24	H	225.00	1.0	12.8	29.4	42.2	128.7	500.0	-11.8

Restricted Bands Above 1GHz

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (PEAK) dBuV	Afd dB	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB	
1216.80	V	135.00	1.0	68.50	-20.0	-10.9	37.6	75.6	500.0	-16.4	
1216.80	H	135.00	1.0	63.0	-20.0	-10.9	32.1	40.2	500.0	-21.9	
1231.44	V	135.00	1.0	81.30	-20.0	-10.8	50.5	334.5	500.0	-3.5	
1231.44	H	135.00	1.0	76.3	-20.0	-10.8	45.5	188.1	500.0	-8.5	
1539.30	V	90.00	1.0	60.50	-20.0	-8.7	31.8	39.0	500.0	-22.2	
1539.30	H	180.00	1.0	59.8	-20.0	-8.7	31.2	36.1	500.0	-22.8	
2500.00	H	225.00	1.0	48.5	-20.0	-5.2	23.3	14.6	500.0	-30.7	
2770.83	V	112.50	1.0	62.83	-20.0	-4.8	38.0	79.7	500.0	-16.0	
2770.83	H	225.00	1.0	56.2	-20.0	-4.8	31.4	37.1	500.0	-22.6	
3694.44	V	180.00	1.0	56.70	-20.0	-3.6	33.1	45.1	500.0	-20.9	
3694.44	H	135.00	1.0	50.8	-20.0	-3.6	27.2	22.9	500.0	-26.8	
4603.62	V	0.00	1.0	45.50	-20.0	-2.7	22.8	13.8	500.0	-31.2	nf
4603.62	H	225.00	1.0	46.8	-20.0	-2.7	24.1	16.0	500.0	-29.9	nf
4618.05	V	180.00	1.0	47.20	-20.0	-2.7	24.5	16.8	500.0	-29.5	
4618.05	H	225.00	1.0	48.8	-20.0	-2.7	26.1	20.2	500.0	-27.9	
4926.80	V	180.00	1.0	51.20	-20.0	-2.4	28.8	27.4	500.0	-25.2	
4926.80	H	135.00	1.0	53.7	-20.0	-2.4	31.3	36.6	500.0	-22.7	
5406.00	V	0.00	1.0	45.40	-20.0	-2.0	23.4	14.7	500.0	-30.6	nf
5406.00	H	0.00	1.0	45.4	-20.0	-2.0	23.4	14.7	500.0	-30.6	
7388.64	V	0.00	1.0	45.50	-20.0	2.2	27.7	24.3	500.0	-26.3	nf
7388.64	H	180.00	1.0	46.0	-20.0	2.2	28.2	25.7	500.0	-25.8	nf
8312.22	V	0.00	1.0	45.20	-20.0	2.2	27.4	23.4	500.0	-26.6	nf
8312.22	H	0.00	1.0	45.6	-20.0	2.2	27.8	24.5	500.0	-26.2	nf
9236.40	V	0.00	1.0	46.20	-20.0	2.7	28.9	27.8	500.0	-25.1	nf
9236.40	H	180.00	1.0	46.0	-20.0	2.7	28.7	27.2	500.0	-25.3	nf

nf: Noise floor

ORIENTATION: Y = Standing Up/Vertical Mount

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (QP) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
278.50	H	180.00	1.0	14.4	15.4	29.8	30.8	200.0	-16.2
322.53	H	180.00	1.0	14.2	16.7	30.9	35.1	200.0	-15.1
960.21	H	247.50	1.5	11.5	29.0	40.5	106.5	500.0	-13.4
960.26	V	270.00	1.0	16.70	29.0	45.7	193.8	500.0	-8.2
967.54	H	45.00	2.0	8.0	29.2	37.2	72.1	500.0	-16.8
967.54	V	225.00	1.0	18.70	29.2	47.9	247.3	500.0	-6.1
982.20	V	225.00	1.0	15.30	29.4	44.7	171.6	500.0	-9.3
982.24	H	247.50	1.5	10.0	29.4	39.4	93.2	500.0	-14.6

Restricted Bands Above 1GHz

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (PEAK) dBuV	Afd dB	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB	
1216.80	V	22.00	1.0	72.30	-20.0	-10.9	41.4	117.1	500.0	-12.6	
1216.80	H	90.00	1.0	62.20	-20.0	-10.9	37.1	71.4	500.0	-16.9	
1231.44	V	22.00	1.0	81.20	-20.0	-10.8	50.4	330.7	500.0	-3.6	
1231.44	H	90.00	1.0	78.50	-20.0	-10.8	47.7	242.4	500.0	-6.3	
1539.30	V	0.00	1.0	54.60	-20.0	-8.7	25.9	19.8	500.0	-28.1	
1539.30	H	157.50	1.0	61.20	-20.0	-8.7	32.5	42.3	500.0	-21.5	
2770.83	V	180.00	1.0	62.20	-20.0	-4.8	37.4	74.1	500.0	-16.6	
2770.83	H	135.00	1.0	68.30	-20.0	-4.8	43.5	149.5	500.0	-10.5	
3694.44	V	225.00	1.0	59.80	-20.0	-3.6	36.2	64.4	500.0	-17.8	
3694.44	H	315.00	1.0	56.00	-20.0	-3.6	32.4	41.6	500.0	-21.6	
4603.62	V	180.00	1.0	44.80	-20.0	-2.7	22.1	12.7	500.0	-31.9	nf
4603.62	H	315.00	1.0	46.00	-20.0	-2.7	23.3	14.6	500.0	-30.7	nf
4618.05	V	157.50	1.0	49.70	-20.0	-2.7	27.0	22.4	500.0	-27.0	
4618.05	H	135.00	1.0	48.40	-20.0	-2.7	25.7	19.3	500.0	-28.3	
4925.80	V	180.00	1.0	50.70	-20.0	-2.4	28.3	25.9	500.0	-25.7	

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (PEAK) dBuV	Afd dB	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB	
4926.80	H	135.00	1.0	50.50	-20.0	-2.4	28.1	25.3	500.0	-25.9	
5541.36	V	180.00	1.0	42.70	-20.0	-1.9	20.8	10.9	500.0	-33.2	nf
5541.36	H	315.00	1.0	45.80	-20.0	-1.9	23.9	15.6	500.0	-30.1	nf
7388.64	V	90.00	1.0	45.00	-20.0	2.2	27.2	22.9	500.0	-26.8	nf
7388.64	H	202.50	1.0	47.0	-20.0	2.2	29.2	28.8	500.0	-24.8	nf
8312.22	V	0.00	1.0	46.50	-20.0	2.2	28.7	27.2	500.0	-25.3	nf
8312.22	H	0.00	1.0	46.6	-20.0	2.2	28.8	27.5	500.0	-25.2	nf
9236.40	V	0.00	1.0	46.60	-20.0	2.5	29.1	28.5	500.0	-24.9	nf
9236.40	H	0.00	1.0	45.80	-20.0	2.5	28.3	26.0	500.0	-25.7	nf

nf: Noise floor

ORIENTATION: Z = Antenna Parallel to Rx Antenna

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (QP) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
278.50	V	0.00	1.0	7.6	15.4	23.0	14.1	200.0	-23.0
322.53	V	180.00	1.0	6.3	16.7	23.0	14.1	200.0	-23.0
960.21	V	45.00	1.3	12.30	29.0	41.3	116.8	500.0	-12.6
960.21	H	315.00	1.0	16.8	29.0	45.8	196.1	500.0	-8.1
967.54	V	225.00	1.3	11.50	29.2	40.7	107.9	500.0	-13.3
967.54	H	315.00	1.5	12.0	29.2	41.2	114.3	500.0	-12.8
982.20	V	225.00	2.3	13.70	29.4	43.1	142.7	500.0	-10.9
982.24	H	135.00	1.8	12.2	29.4	41.6	120.1	500.0	-12.4

Restricted Bands Above 1GHz

Frequency	Polarity	Azimuth	Antenna Height	SA Level (PEAK)	Afd	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	m	dBuV	dB	dB/m	dBuV/m	uV/m	uV/m	dB	
1216.80	V	315.00	1.0	68.00	-20.0	-10.9	37.1	71.4	500.0	-16.9	
1216.80	H	90.00	1.0	62.30	-20.0	-10.9	31.4	37.0	500.0	-22.6	
1231.44	V	45.00	1.0	81.30	-20.0	-10.8	50.5	334.5	500.0	-3.5	
1231.44	H	90.00	1.0	76.80	-20.0	-10.8	46.0	199.3	500.0	-8.0	
1539.30	V	315.00	1.0	60.00	-20.0	-8.7	31.3	36.8	500.0	-22.7	
1539.30	H	315.00	1.0	56.50	-20.0	-8.7	27.8	24.6	500.0	-26.2	
2770.83	V	270.00	1.0	63.30	-20.0	-4.8	38.5	84.1	500.0	-15.5	
2770.83	H	0.00	1.0	61.50	-20.0	-4.8	36.7	68.4	500.0	-17.3	
3694.44	V	315.00	1.0	52.80	-20.0	-3.6	29.2	28.8	500.0	-24.8	
3694.44	H	225.00	1.0	56.20	-20.0	-3.6	32.6	42.6	500.0	-21.4	
4603.62	V	315.00	1.0	45.60	-20.0	-2.7	22.9	13.9	500.0	-31.1	nf
4603.62	H	338.00	1.0	45.30	-20.0	-2.7	22.6	13.5	500.0	-31.4	nf
4618.05	V	270.00	1.0	48.00	-20.0	-2.7	25.3	18.4	500.0	-28.7	
4618.05	H	180.00	1.0	46.80	-20.0	-2.7	24.1	16.0	500.0	-29.9	
4926.80	V	90.00	1.0	46.30	-20.0	-2.4	23.9	15.6	500.0	-30.1	
4926.80	H	0.00	1.0	49.30	-20.0	-2.4	26.9	22.1	500.0	-27.1	.
5541.36	V	248.00	1.0	46.70	-20.0	-1.9	24.8	17.3	500.0	-29.2	
5541.36	H	180.00	1.0	45.30	-20.0	-1.9	23.4	14.7	500.0	-30.6	nf
7388.64	V	0.00	1.0	46.50	-20.0	2.2	28.7	27.2	500.0	-25.3	nf
7388.64	H	180.00	1.0	47.0	-20.0	2.2	29.2	28.8	500.0	-24.8	nf
8312.22	V	0.00	1.0	46.20	-20.0	2.2	28.4	26.3	500.0	-25.6	nf
8312.22	H	0.00	1.0	46.8	-20.0	2.2	29.0	28.2	500.0	-25.0	nf
9236.40	V	0.00	1.0	46.30	-20.0	2.5	28.8	27.5	500.0	-25.2	nf
9236.40	H	0.00	1.0	45.80	-20.0	2.5	28.3	26.0	500.0	-25.7	nf

nf: Noise floor

4.7 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 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 450 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 5.

Table 5: Conducted Emissions Test Data; 15.207

CLIENT: Intellisense
MODEL NO: SN921-REPEATER
TYPE/PART: Spread Spectrum TX
DATE: 7/5/2001
BY: Greg Snyder
JOB #: 6395
Tx FREQUENCY: 923.58 Mhz

LINE 1 - NEUTRAL

Frequency MHz	Voltage (PEAK) dBuV	Voltage uV	FCC Limit uV	Margin dB
0.58	38.6	85.1	250	-9.4
0.67	36.5	66.8	250	-11.5
0.98	37.4	74.1	250	-10.6
1.24	29.8	30.9	250	-18.2
8.77	30.5	33.5	250	-17.5
23.80	28.4	26.3	250	-19.6

LINE 2 - PHASE

Frequency MHz	Voltage (PEAK) dBuV	Voltage uV	FCC Limit uV	Margin dB
0.58	36.7	68.4	250	-11.3
0.68	35.8	61.7	250	-12.2
1.02	38.4	83.2	250	-9.6
1.55	31.4	37.2	250	-16.6
9.30	30.0	31.6	250	-18.0
22.90	29.7	30.5	250	-18.3