



EMC Test Services
1250 Peterson Drive, Wheeling, Illinois 60090, USA

Report No. 9371

TEST SPECIFICATION:

FCC "Rules and Regulations", Part 15, Subpart C
Sections 15.231 (a-d), 15.207 & 15.205

Intentional Radiators

Periodic operation in the band 40.6 – 40.77 MHz & above 70 MHz

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

Formal Name: Remote Control TX3G2

Kind of Equipment: Low Power Transmitter

Test Configuration: Stand Alone

Transmitter FCC ID: KNF-TX3G2

Model Number: TX3G2

Serial Number: NA

Dates of Test: October 11, 2001

Test Conducted For: Iowa Export Import

512 Tuttle Street

Des Moines, Iowa 50309

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Brian J. Mattson
General Manager



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request.**

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1.0 SUMMARY OF TEST REPORT

It was found that the Remote Control TX3G2 S/N NA **"meets"** the radio interference emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Sections 15.231 (a-d), 15.207 and 15.205 for Intentional Radiators operating in the 433.92 MHz Frequency Band with periodic operation.

This report contains the following number of pages.

Text, Data Summary & Charts: 44 pages

NOTE:

The conducted emissions test was not required because the EUT is powered from a DC power source. It does not have a line cord to plug into the A.C. power line.

2.0 INTRODUCTION

On October 11, 2001, a series of radio frequency interference measurements were performed on Low Power Transmitter, S/N NA. The tests were performed according to the procedures of FCC as stated in MP-1 "FCC Methods of Measurement for determining Compliance of Radio Control and Security Alarm Devices and Associated Receivers". Tests were performed by personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Sections 15.231 (a-d), 15.207 and 15.205 for Intentional Radiators operating in the 433.92 MHz Frequency Band with periodic operation.

4.0 TEST SET-UP

All conducted emission tests were performed in a shield enclosure or lab at D.L.S. Electronic Systems, Inc. The conducted tests were performed with the test item placed on a non-conductive table located in the Test Room. The power line supplied was connected to a dual line impedance stabilization network located on the floor, a ground plane. The networks were constructed per the requirements of the American National Standards Institute, ANSI C63.4-1992, Section 4, (Figure2). The only ground supplied to the unit was through the third wire of the standard power cord when supplied.

All radiated emission tests were performed at D.L.S. Electronic Systems, Inc. The radiated tests were made with the test item placed on a non-conductive turntable located in the Test Room with the receive antenna placed three meters from the device under test. The equipment under test was set up according to ANSI C63.4-1992, Section 8, (Figures 9c and 9d).

5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All preliminary data below 1000 MHz was automatically plotted using the Peak or CISPR Detector Functions. This information was then used to determine the frequencies of maximum emissions. Manual measurements were performed on these frequencies using a peak detector function of the Receiver with the bandwidths specified by the FCC. Above 1000 MHz final data was taken using the Peak Detector.

Below 1000 MHz final data was taken using the fixed tuned receiver. Plots were made using the Peak Detector, with manual measurements made on the frequencies of interest, using the Peak, CISPR, and Average Detector Functions of the receiver. When average measurements were made using the fixed tuned receiver, the average was taken of a linear IF signal as specified by FCC and ANSI C63.4-1992.

The fundamental frequency was measured using the Average Detector and the CISPR Detector was used for measuring the Harmonics as stated in Section 15.209. From 10 kHz to 30 MHz a bandwidth of 9 kHz was used. From 30 MHz to 1000 MHz a bandwidth of 120 kHz was used and above 1000 MHz, a bandwidth of 1 MHz was used to ensure proper measurement of the narrowband signal.

A list of the equipment used can be found in Table 1. All equipment was calibrated per the instruction manuals supplied by the manufacturer.



6.0 CONDUCTED EMISSION MEASUREMENTS

The conducted emissions were measured over the frequency range from .45 MHz to 30 MHz in accordance with the power line measurements. As specified in ANSI C63.4-1992, since the device is operated from the public utility lines, the 120 vac 60 Hz power leads, high and low sides, were measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. All signals were then recorded. The allowed levels for Intentional Radiators cannot exceed 250 uV (47.96 dBuV) at any frequency between 450 kHz and 30 MHz, as stated in Section 15.207a.

NOTE:

The conducted emissions test was not required because the EUT is powered from a DC power source. It does not have a line cord to plug into the A.C. power line.



CONDUCTED DATA TAKEN DURING TESTING

PART 15.207

NOTE:

The conducted emissions test was not required because the EUT is powered from a DC power source. It does not have a line cord to plug into the A.C. power line.



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CONDUCTED GRAPHS TAKEN DURING TESTING

PART 15.207

NOTE:

The conducted emissions test was not required because the EUT is powered from a DC power source. It does not have a line cord to plug into the A.C. power line.

7.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS

The allowed radiated emissions for transmitters of this type can not exceed the following field strength limits at a distance of three meters as shown in Section 15.231b. The limits are shown in the following table.

Fundamental Frequency in MHz	Field Strength of Fundamental (uV/m at 3m)	Field Strength of Harmonics (uV/m at 3m)
40.66 to 40.70	2250 (67.04 dBuV)	225 (47.04 dBuV)
70 to 130	1250 (61.94 dBuV)	125 (41.94 dBuV)
130 to 174	1250 (61.94 dBuV) to 3750 (71.48 dBuV)	125 (41.94 dBuV) to 375 (51.48 dBuV)
174 to 260	3750 (71.48 dBuV)	375 (51.48 dBuV)
260 to 470	3750 (71.48 dBuV) to 12500 (81.84 dBuV)	375 (51.48 dBuV) to 1250 (61.94 dBuV)
470 and above	12500 (81.84 dBuV)	1250 (61.94 dBuV)

NOTE:

As stated in 15.35b the 20 dB peak-to-average limit is applicable to all devices measured using an average detector.

For pulsed operation, the switches were set to generate their maximum “on” time, and measurements were made with the peak detector. As stated in Docket 86-422, the duty cycle of the pulse is determined from the total “on” time for the worst case condition during 100 msec. Using the percentage of the total “on” time over a 100 msec period, the total absolute average value was determined.

7.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS (CON'T)

Preliminary radiation measurements were performed at a three meter test distance with the limits adjusted linearly when required. The frequency range from 9 kHz to over 960 MHz, depending upon the fundamental frequency as stated in Part 15.33a, was automatically scanned and plotted at various angles.

Measurements for the Remote Control TX3G2 were made up to 5000 MHz, in accordance with Section 15.33a for Intentional Radiators with a fundamental frequency of 433.92 MHz. For intentional radiators, the frequency range to be investigated is determined by the lowest radio frequency generated by the device without going below 9 kHz, up to at least the tenth harmonic of the highest fundamental frequency or 1000 MHz, whichever is lower.

At those frequencies where significant signals were detected, measurements were made at an open field test site, located at Genoa City, Wisconsin, FCC file number 31040/SIT, to determine the actual radiation levels.

All signals in the frequency range of 30 MHz to 200 MHz were measured with a Biconical Antenna or Tuned Dipoles as the pickup device. From 200 MHz to 1000 MHz, a Log Periodic or Tuned Dipoles were used, and above 1000 MHz a Double Ridge Horn Antenna was used. During the test, below 1000 MHz the equipment was rotated and the antenna was raised and lowered from 1 meter to 4 meters to find the maximum level. In order to find maximum emissions, the cables were moved through all the positions the equipment would be expected to experience in the field. Tests were made in both the horizontal and vertical planes of polarization with the Loop (rotated 360° around its vertical axis), Biconical and Log Periodic. The table was rotated to find the maximum emissions. Above 1000 MHz the antenna was set one meter off the ground plane and three meters from the test item. The table was rotated to find the maximum emissions.

When the equipment is out of limit at 3 meters, and the signals from the equipment at 30 meters cannot be recorded due to the background, a representative sample of these frequencies was measured at various distances such as 4, 5, 6, 8, 15 meters and the greatest distance that can be measured to demonstrate graphically that the emissions are dropping off and will be under the limit at the specified distance.



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RADIATED SPREADSHEETS FOR THE FUNDAMENTAL AND SPURIOUS EMISSION MEASUREMENTS

PART 15.231



SUMMARY DATA SHEET OF **RADIATED EMISSIONS <1000 MHz**

TEST DATE:----- October 11, 2001
MANUFACTURER:----- Iowa Export Import
MODEL NO:----- TX3G2
S/N:----- NA
CONFIGURATION:----- **NA**
DCCF:----- 5.20

TEST SPECIFICATION: FCC "RULES AND REGULATION", PART 15
SUBPART C / SECTION 15.231

TEST EQUIPMENT: Receiver ---- ESI-40 ----- SN 837808/005
Antennas ---- BIA-25 ----- SN 4891
LPA-25 ----- SN 1114

TYPE OF TEST: **VERTICAL** MEASURED **AT 3 METERS**

THE FOLLOWING ARE SIGNIFICANT RADIATED LEVELS FOUND:

FREQ IN MHz.	METER READING dBuV	PRE-AMP + CABLE dB	ANTENNA FACTOR dB	TOTAL - DCCF dBuV	LIMIT dB	MARGIN dB
433.85	94.12	-30.25	16.55	75.22	80.82	5.60
867.71	54.09	-30.74	22.71	40.86	60.82	19.96



SUMMARY DATA SHEET OF **RADIATED EMISSIONS <1000 MHz**

TEST DATE:----- October 11, 2001
MANUFACTURER:----- Iowa Export Import
MODEL NO:----- TX3G2
S/N:----- NA
CONFIGURATION:----- **NA**
DCCF:----- 5.20

TEST SPECIFICATION: FCC "RULES AND REGULATION", PART 15
SUBPART C / SECTION 15.231

TEST EQUIPMENT: Receiver ---- ESI-40 ----- SN 837808/005
Antennas ---- BIA-25 ----- SN 4891
LPA-25 ----- SN 1114

TYPE OF TEST: **HORIZONTAL** MEASURED **AT 3 METERS**

THE FOLLOWING ARE SIGNIFICANT RADIATED LEVELS FOUND:

FREQ IN MHz.	METER READING dBuV	PRE-AMP + CABLE dB	ANTENNA FACTOR dB	TOTAL - DCCF dBuV	LIMIT dB	MARGIN dB
433.85	92.58	-30.25	16.55	73.68	80.82	7.14
867.71	52.52	-30.74	22.71	39.29	60.82	21.53



SUMMARY DATA SHEET OF **RADIATED EMISSIONS >1000 MHz**

TEST DATE:----- October 11, 2001
MANUFACTURER:----- Iowa Export Import
MODEL NO:----- TX3G2
S/N:----- NA
CONFIGURATION:----- **NA**
DCCF:----- 7.94

TEST SPECIFICATION: FCC "RULES AND REGULATION", PART 15
SUBPART C / SECTION 15.231

******LOW POWER AUXILIARY STATIONS******

TEST EQUIPMENT: Spectrum Analyzer ----- HP 8566B
Quasi Peak Adapter ----- HP 85650A

TYPE OF TEST: RADIATED EMISSIONS USING **VERTICAL** POLARIZATION

THE FOLLOWING ARE SIGNIFICANT RADIATED LEVELS FOUND:

FREQ IN MHz.	METER READING dBuV	ANTENNA PLUS CABLE	PRE-AMP GAIN dB	TOTAL- DCCF dBuV	ANTENNA DISTANCE IN METERS	LIMIT dBuV	MARGIN dB
1301.50	68.24	27.21	-41.31	48.94	3	54.00	5.06
1735.40	65.39	29.13	-40.87	48.45	3	60.82	12.37
2169.20	65.09	30.98	-41.37	49.50	3	60.82	11.32
2603.10	59.99	32.37	-41.39	45.77	3	60.82	15.05
3036.90	56.93	33.48	-41.71	43.50	3	60.82	17.32
3470.90	57.32	34.40	-41.14	45.38	3	60.82	15.44
3904.70	59.33	35.96	-40.28	49.81	3	54.00	4.19
4338.50	57.05	35.90	-39.94	47.81	3	54.00	6.19
4772.40	55.39	36.63	-39.82	47.00	3	54.00	7.00



SUMMARY DATA SHEET OF **RADIATED EMISSIONS >1000 MHz**

TEST DATE:----- October 11, 2001
MANUFACTURER:----- Iowa Export Import
MODEL NO:----- TX3G2
S/N:----- NA
CONFIGURATION:----- **NA**
DCCF:----- 7.94

TEST SPECIFICATION: FCC "RULES AND REGULATION", PART 15
SUBPART C / SECTION 15.231

******LOW POWER AUXILIARY STATIONS******

TEST EQUIPMENT: Spectrum Analyzer ----- HP 8566B
Quasi Peak Adapter ----- HP 85650A

TYPE OF TEST: RADIATED EMISSIONS USING **HORIZONTAL** POLARIZATION

THE FOLLOWING ARE SIGNIFICANT RADIATED LEVELS FOUND:

FREQ IN MHz.	METER READING dBuV	ANTENNA PLUS CABLE	PRE-AMP GAIN dB	TOTAL- DCCF dBuV	ANTENNA DISTANCE IN METERS	LIMIT dBuV	MARGIN dB
1301.50	65.52	27.21	-41.31	46.22	3	54.00	7.78
1735.40	64.00	29.13	-40.87	47.06	3	60.82	13.76
2169.20	62.39	30.98	-41.37	46.80	3	60.82	14.02
2603.10	57.71	32.37	-41.39	43.49	3	60.82	17.33
3036.90	60.57	33.48	-41.71	47.14	3	60.82	13.68
3470.90	56.50	34.40	-41.14	44.56	3	60.82	16.26
3904.70	60.13	35.96	-40.28	50.61	3	54.00	3.39
4338.50	54.15	35.90	-39.94	44.91	3	54.00	9.09
4772.40	52.75	36.63	-39.82	44.36	3	54.00	9.64



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RADIATED DATA TAKEN FOR THE

FUNDAMENTAL AND SPRURIOUS

EMISSION MEASUREMENTS

PART 15.231

EDIT PEAK LIST (Final Measurement Results)			
Trace1: ---	Trace2: ---		
Trace3: ---	Trace4: ---		
TRACE	FREQUENCY	LEVEL dBV/m	DELTA LIMIT dB

Title: Radiated Emissions 30 to 200 MHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Vertical
 Date: 11.OCT.2001 16:54:01

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)			
Trace1: ---		Trace2: ---	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Max Peak	433.8500 MHz	80.42 -5.2	5.60
2 Average	433.8500 MHz	72.65	

Title: Radiated Emissions 200 to 500 MHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Vertical
 Date: 11.OCT.2001 16:09:31

Duty Cycle correction factor = 5.2dB

Fundamental limit = 80.82 dBμV/m at 3 meters

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)			
Trace1: ---		Trace2: ---	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
2 Average	867.7100 MHz	37.48	
1 Max Peak	867.7100 MHz	46.06 - 5.2	19.96

Title: Radiated Emissions 500 to 1000 MHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Vertical
 Date: 11.OCT.2001 15:49:27

Duty Cycle correction factor = 5.2 dB
 Limit = 60.82 dBμV/m at 3 meters

FINAL
Genoa

EDIT PEAK LIST (Final Measurement Results)			
Trace1: ---		Trace2: ---	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
2 Average	1.3015 GHz	44.91	
1 Max Peak	* 1.3015 GHz	54.14 - 5.2	5.06
2 Average	1.7354 GHz	42.67	
1 Max Peak	1.7354 GHz	53.65 - 5.2	12.37

Title: Radiated Emissions 1 to 2 GHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Vertical (3 meter test distance)
 Date: 11.OCT.2001 14:53:58

Duty Cycle correction factor = 5.2 dB
 Limit = 60.82 dBµV/m @ 3 meters
 * Restricted Band limit = 54 dBµV/m @ 3 meters

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EDIT PEAK LIST (Final Measurement Results)				
Trace1: ---		Trace2: ---		
Trace3: ---		Trace4: ---		
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB	
2 Average	2.1692 GHz	45.13		
1 Max Peak	2.1692 GHz	54.70	-5.2	11.32
2 Average	2.6031 GHz	39.29		
1 Max Peak	2.6031 GHz	50.97	-5.2	15.05
2 Average	3.0369 GHz	37.62		
1 Max Peak	3.0369 GHz	48.70	-5.2	17.32
2 Average	3.4709 GHz	38.22		
1 Max Peak	3.4709 GHz	50.58	-5.2	15.44
2 Average	3.9047 GHz	44.13		
1 Max Peak	* 3.9047 GHz	55.01	-5.2	4.19
2 Average	4.3385 GHz	42.62		
1 Max Peak	* 4.3385 GHz	53.01	-5.2	6.19
2 Average	4.7724 GHz	41.47		
1 Max Peak	* 4.7724 GHz	52.20	-5.2	7.00

Title: Radiated Emissions 2 GHz to 5 GHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Vertical (3 meter test distance)
 Date: 11.OCT.2001 13:32:01

Duty Cycle correction factor = 5.2 dB

Limit = 60.82 dBµV/m at 3 meters

*Restricted Band limit = 54 dBµV/m at 3 meters

FINAL
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EDIT PEAK LIST (Final Measurement Results)			
Trace1: ---		Trace2: ---	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dB μ V/m	DELTA LIMIT dB
1 Max Peak	433.8500 MHz	78.88 -5.2	7.14
2 Average	433.8500 MHz	70.94	

Title: Radiated Emissions 200 to 500 MHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Horizontal
 Date: 11.OCT.2001 16:15:01

Duty Cycle correction factor = 5.2 dB

Fundamental limit = 80.82 dB μ V/m at 3 meters

FINAL
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EDIT PEAK LIST (Final Measurement Results)			
Trace1: ---		Trace2: ---	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
2 Average	867.7100 MHz	36.09	
1 Max Peak	867.7100 MHz	44.49 -5.2	21.53

Title: Radiated Emissions 500 to 1000 MHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Horizontal
 Date: 11.OCT.2001 15:41:49

Duty Cycle correction factor = 5.2 dB

Limit = 60.82 dBμV/m at 3 meters

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EDIT PEAK LIST (Final Measurement Results)			
Trace1: ---		Trace2: ---	
Trace3: ---		Trace4: ---	
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
2 Average	1.3015 GHz	42.22	
1 Max Peak	* 1.3015 GHz	51.42 - 5.2	7.78
2 Average	1.7354 GHz	43.40	
1 Max Peak	1.7354 GHz	52.26 - 5.2	13.76

Title: Radiated Emissions 1 to 2 GHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Horizontal (3 meter test distance)
 Date: 11.OCT.2001 14:43:49

Duty Cycle correction factor = 5.2 dB

Limit = 60.82 dBμV/m at 3 meters

* Restricted Band limit = 54 dBμV/m at 3 meters

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EDIT PEAK LIST (Final Measurement Results)				
Trace1: ---		Trace2: ---		
Trace3: ---		Trace4: ---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB	
2 Average	2.1692 GHz	38.85		
1 Max Peak	2.1692 GHz	52.00 -5.2	14.02	
2 Average	2.6031 GHz	35.54		
1 Max Peak	2.6031 GHz	48.69 -5.2	17.33	
2 Average	3.0369 GHz	34.95		
1 Max Peak	3.0369 GHz	52.34 -5.2	13.68	
2 Average	3.4709 GHz	39.32		
1 Max Peak	3.4709 GHz	49.76 -5.2	16.26	
2 Average	3.9047 GHz	44.86		
1 Max Peak	* 3.9047 GHz	55.81 -5.2	3.39	
2 Average	4.3385 GHz	38.09		
1 Max Peak	* 4.3385 GHz	50.11 -5.2	9.09	
2 Average	4.7724 GHz	38.61		
1 Max Peak	* 4.7724 GHz	49.56 -5.2	9.64	

Title: Radiated Emissions 2 GHz to 5 GHz
 Comment A: Iowa Export Import
 TX3G2
 Comment B: Horizontal (3 meter test distance)
 Date: 11.OCT.2001 14:20:32

Duty Cycle correction factor = 5.2 dB
 Limit = 60.82 dBμV/m at 3 meters
 * Restricted Band limit = 54 dBμV/m at 3 meters

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8.0 PULSED OPERATION (Duty Cycle Correction Factor)

The radiated emission measurements made at D.L.S. Electronic Systems, Inc., for the Remote Control TX3G2, Model Number TX3G2, are shown by the graphs on the following pages. The actual total “on time” during the 100 msec is 54.91 msec with a total “off time” of 45.09 msec resulting in a **5.19 Duty Cycle Correction Factor**.

FCC Part 15, Section 15.231b, states that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission, but in no case less than 10 seconds.

To find the actual total “on time” during the 100 msec period, the data word is multiplied by the number of data words per 100 msec, yielding actual on time. Taking this number and dividing it by the 100 msec period gives us the Duty Cycle. We then take the Log of Duty Cycle and multiply it by 20. This gives us the Duty Cycle Correction Factor.

The following method was used to determine the Duty Cycle Correction Factor:

Total on time during 100 msec.

$0.4008016 \text{ msec/pulse on time} * 37 \text{ pulses} = 14.83 \text{ msec (data word on time)}$

$1.002004 \text{ msec/pulse on time} * 40 \text{ pulses} = 40.08 \text{ msec (data word on time)}$

$14.83 \text{ msec (data on time)} + 40.08 \text{ msec (data on time)} = 54.91 \text{ msec total “on time”}$

$54.91 \text{ msec (total “on time”) } / 100 \text{ msec} = 0.55 \text{ Duty Cycle}$

$20 * \text{LOG}_{10} 0.55 = \textbf{5.19 dB Duty Cycle Correction Factor}$

NOTE:

As stated in Section 6.5, a maximum of 20 dB can be used.

See the following pages for the graphs of the actual measurements that were made:



PULSED OPERATION GRAPHS TAKEN DURING TESTING

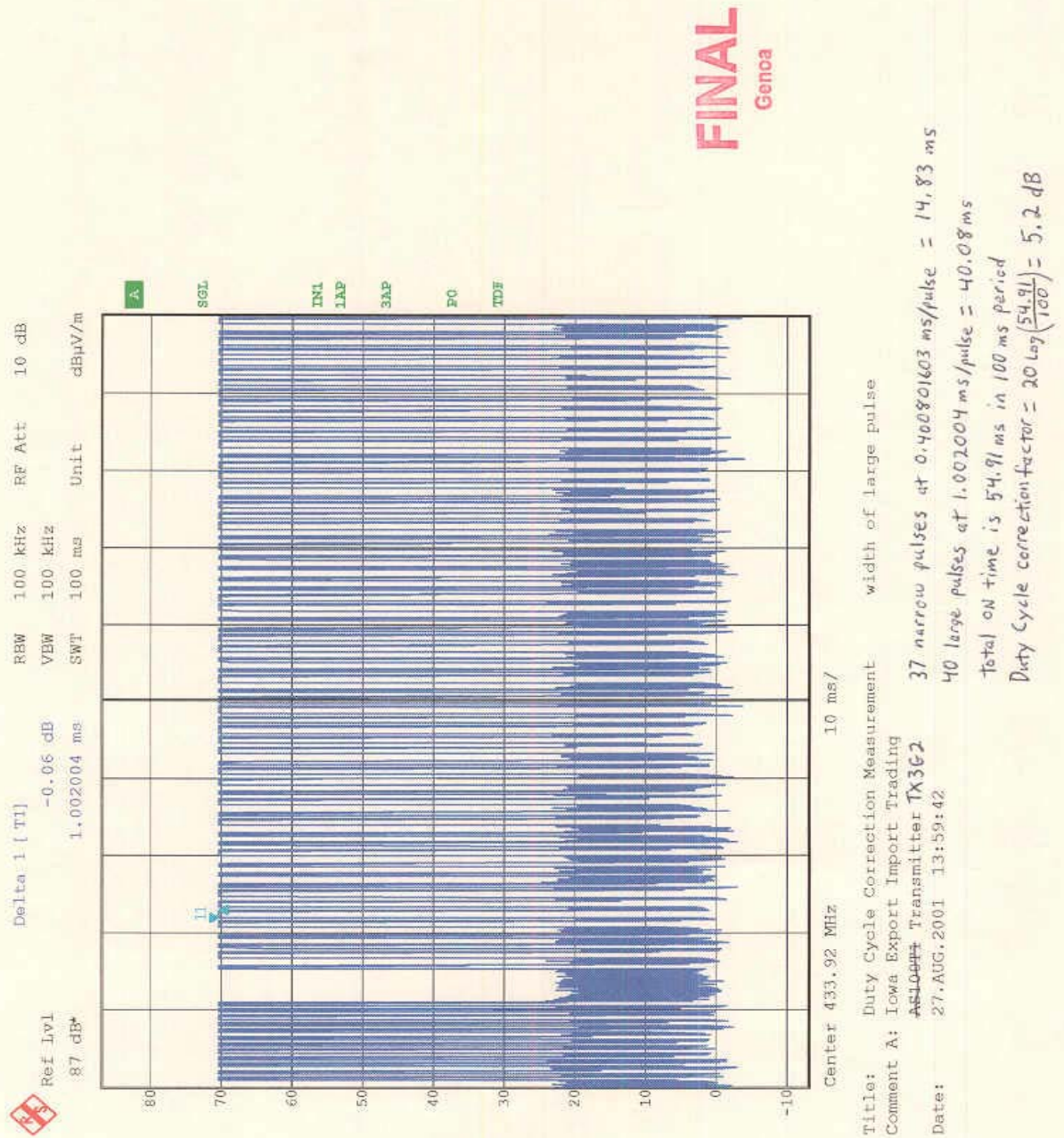
PART 15.231

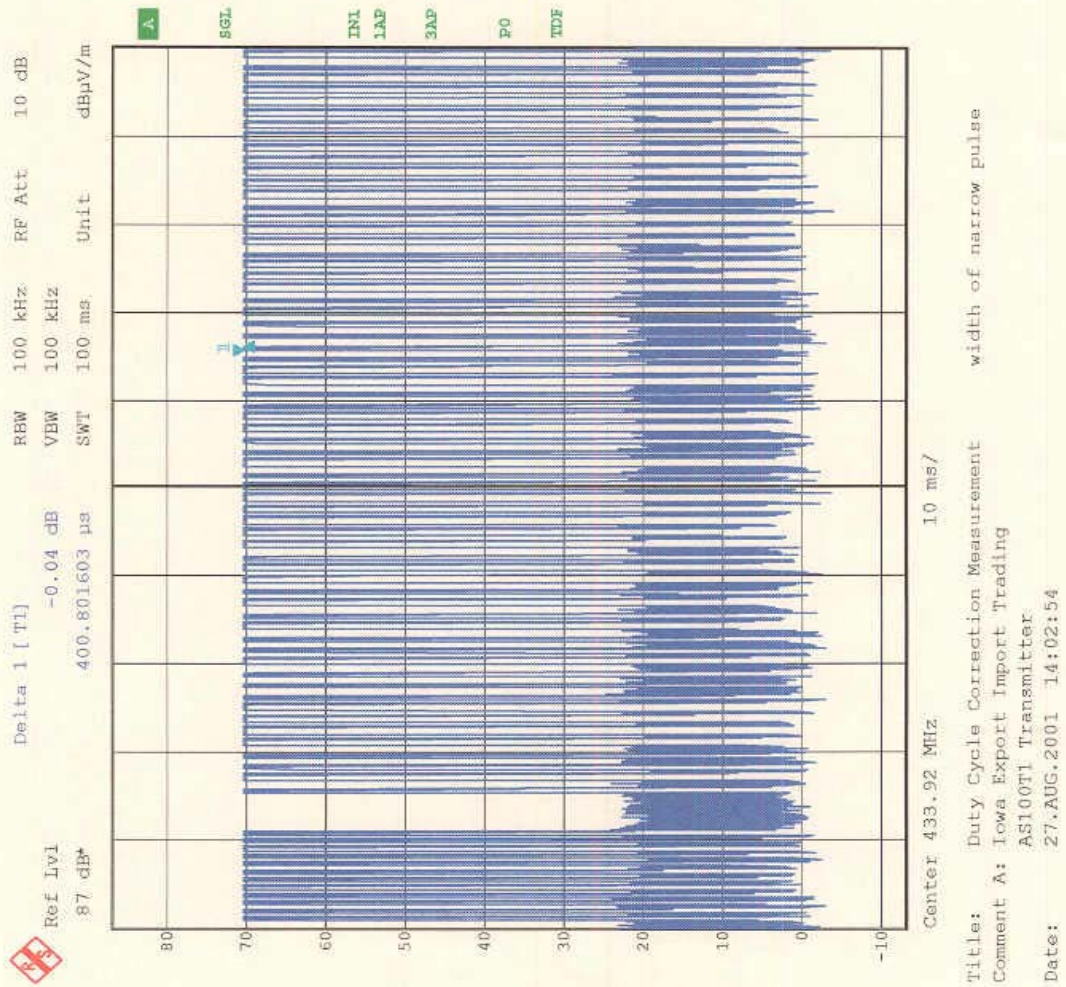
GRAPHS TAKEN OF THE PULSE TRAIN SHOWING THE FOLLOWING:

1. NUMBER OF BITS PER DATA WORD
2. NUMBER OF PULSES PER 100 MSEC
3. OFF TIME BETWEEN DATA WORDS
4. DATA WORD ON TIME

NOTE:

The Duty Cycle Correction Factor does not need to be determined because the measurements made using the Peak detector are under the 15.231b limit.







9.0 BANDWIDTHS

The bandwidth of the transmitter shall be confined to the following specifications as specified in Section 15.231c & d:

40.66 to 40.7 MHz	$\pm .01\%$ within the band edges
70.00 to 900 MHz	.25% of the center frequency
Above 900 MHz	.50% of the center frequency

The bandwidth is determined at the points 20 dB down from the modulated carrier.

As shown by the graph on the following page, the bandwidth for the Remote Control TX3G2 was measured at **57.787**, which meets the above specification. With a fundamental frequency of **433.92** MHz, the FCC Bandwidth limit is **1.0848** MHz when multiplying the fundamental by **.25%**.



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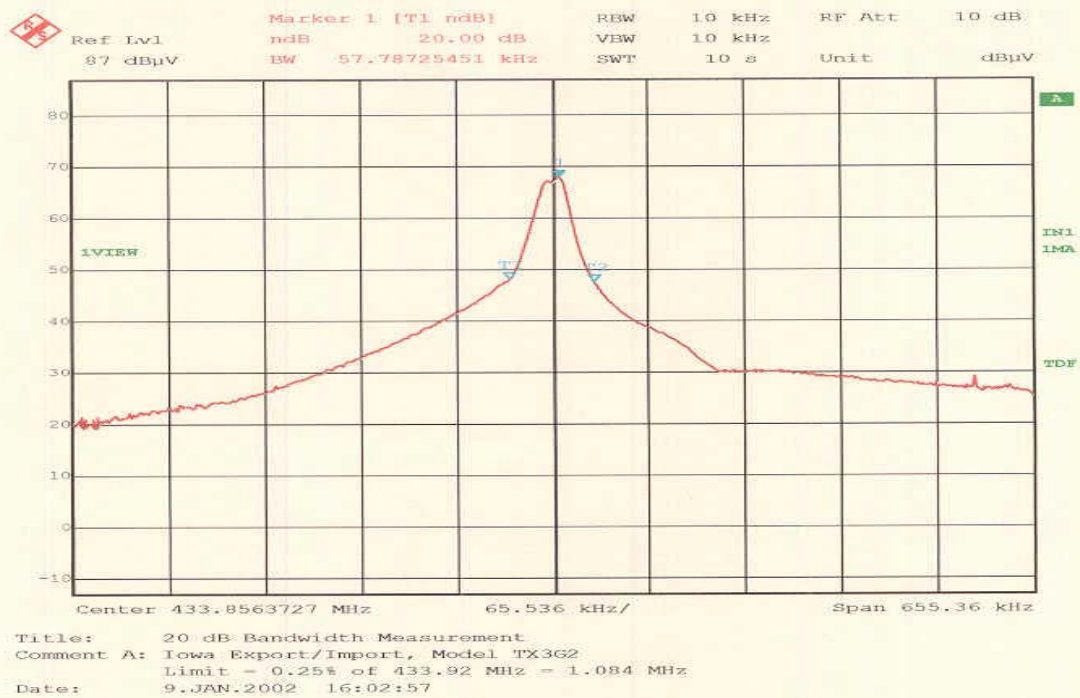
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GRAPHS TAKEN OF THE

FUNDAMENTAL FREQUENCY

AND

BANDWIDTH



10.0 RESTRICTED BANDS

As stated in Section 15.205a, the fundamental emission from the Remote Control TX3G2 shall not fall within any of the bands listed below:

Frequency in MHz	Frequency in MHz	Frequency in MHz	Frequency in GHz
.0900 to .1100	162.0125 to 167.17	2310.0 to 2390	9.30 to 9.50
.4900 to .5100	167.7200 to 173.20	2483.5 to 2500	10.60 to 12.70
2.1735 to 2.1905	240.000 to 285.00	2655.0 to 2900	13.25 to 13.40
8.362 to 8.3660	322.200 to 335.40	3260.0 to 3267	14.47 to 14.50
13.36 to 13.410	399.900 to 410.00	3332.0 to 3339	15.35 to 16.20
25.50 to 25.670	608.000 to 614.00	3345.8 to 3358	17.70 to 21.40
37.50 to 38.250	960.000 to 1240.00	3600.0 to 4400	22.01 to 23.13
73.00 to 75.500	1300.000 to 1427.00	4500.0 to 5250	23.60 to 24.00
108.00 to 121.94	1435.000 to 1626.50	5350.0 to 5450	31.20 to 31.80
123.00 to 138.00	1660.000 to 1710.00	7250.0 to 7750	36.43 to 36.50
149.90 to 150.00	1718.800 to 1722.20	8025.0 to 8500	ABOVE 38.60
156.70 to 156.90	2200.000 to 2300.00	9000.0 to 9200	

NOTE:

The noise floor within the Restricted Bands for the EMC Receiver and HP Spectrum Analyzer typically lies 20 dB below the limit.



EMC Test Services
1250 Peterson Drive, Wheeling, Illinois 60090, USA

Report No. 9371

11.0 PHOTO INFORMATION AND TEST SET-UP

The test set-up can be seen on the accompanying photo page.

Item 0 Remote Control TX3G2
FCC ID#: KNF-TX3G2
Model No: TX3G2; SN: NA



EMC Test Services
1250 Peterson Drive, Wheeling, Illinois 60090, USA

Report No. 9371

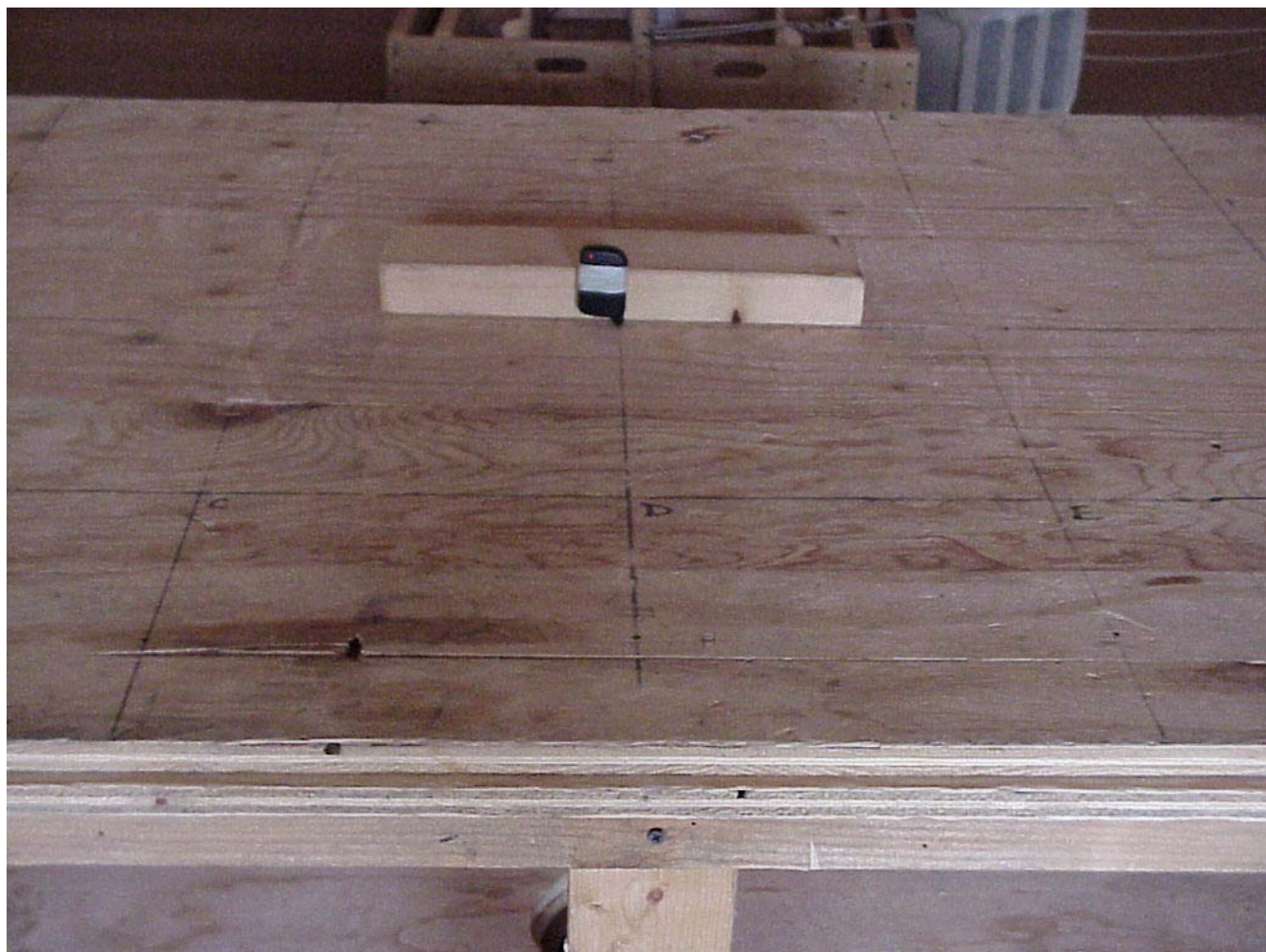
12.0 CONDUCTED PHOTOS TAKEN DURING TESTING.

The equipment under test is battery operated and will not at any time be plugged into the Public Utility lines, therefore the conducted test was not performed.

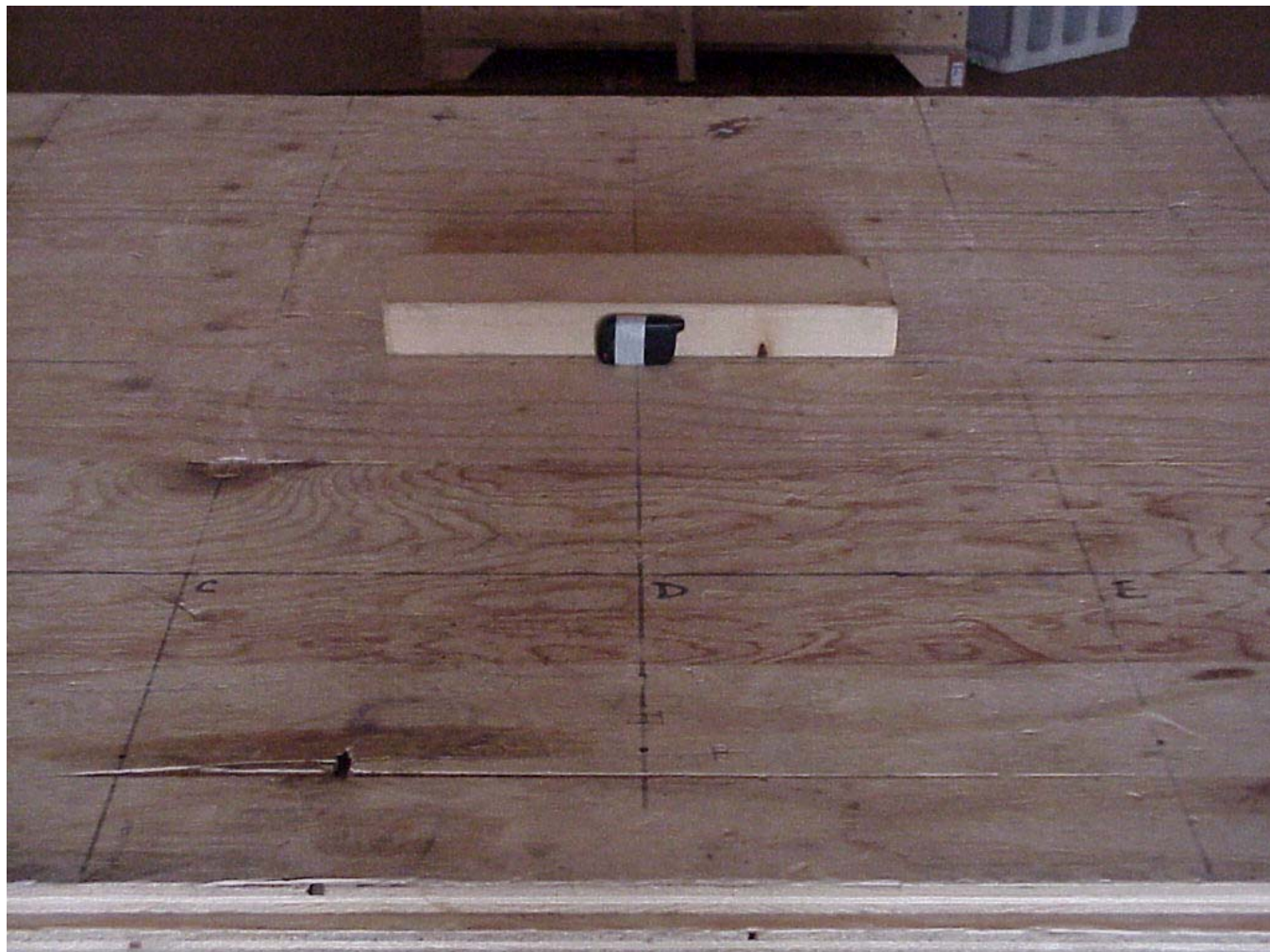
12.0 RADIATED PHOTOS TAKEN DURING TESTING



12.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



12.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)





13.0 CHANGE INFORMATION

The following changes were implemented during the testing and must be incorporated into the production units to ensure compliance.

Change 1. There were no changes made at D.L.S. Electronic Systems, Inc.

The responsibility of implementing the changes listed in this report is accepted or I certify that no changes were made

by _____
Signature Title

for _____
Company Name Date



14.0 RESULTS OF TESTS

The emission test results can be seen on pages at the end of this report. Data sheets indicating the open field radiated measurements can also be found with this report. Those points on the radiated charts shown with a yellow mark are background frequencies that were verified during the test.

15.0 CONCLUSION

It was found that the Remote Control TX3G2, Model Number TX3G2, S/N NA **"meets"** the radio interference emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Sections 15.231 (a-b), 15.207 and 15.205 for Intentional Radiators operating in the 433.92 MHz Frequency Band.

NOTE:

The conducted emissions test was not required because the EUT is powered from an DC power source. It does not have a line cord to plug into the A.C. power line.

TABLE 1 - EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Spectrum Analyzer	Hewlett/ Packard	8566B	2240A 002041	100 Hz – 22 GHz	10/02
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A 00121	10 kHz – 1 GHz	10/02
Spectrum Analyzer	Hewlett/ Packard	8566B	2421A 00452	100 Hz – 22 GHz	2/02
Quasi-Peak Adapter	Hewlett/ Packard	85650A	2043A 00450	10 kHz – 1 GHz	2/02
Spectrum Analyzer	Hewlett/ Packard	8591A	3009A 00700	9 kHz – 1.8 GHz	3/02
Receiver	Electrometrics	EMC-25	772	10 kHz – 1 GHz	10/02
Meter Module	Electrometrics	CRM-25	162	10 kHz – 1 GHz	10/02
Receiver	Electrometrics	EMC-25	804	10 kHz – 1 GHz	10/02
Meter Module	Electrometrics	CRM-25	138	10 kHz – 1 GHz	10/02
Receiver	Electrometrics	EMC-30	44168	10 kHz – 1 GHz	9/02
Receiver	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	11/01
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	12/01
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	12/01
Antenna	EMCO	3104C	0005- 4891	20 MHz – 200 MHz	4/02
Antenna	Electrometrics	LPA-25	1114	200 MHz – 1 GHz	4/02
Antenna	EMCO	3104C	0005- 4892	20 MHz – 200 MHz	4/02

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.

TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Antenna	Electrometrics	3146	1205	200 MHz – 1 GHz	4/02
Antenna	EMCO	3104C	9701-4785	20 MHz – 200 MHz	4/02
Antenna	EMCO	3146	9702-4895	200 MHz – 1 GHz	4/02
Antenna	EMCO	3115	2479	1 GHz – 18 GHz	8/02
Antenna	EMCO	3115	9903-5731	1 GHz – 18 GHz	4/02
Antenna	Rohde & Schwarz	HUF-Z1	829381-001	20 MHz – 1 GHz	2/02
Antenna	Rohde & Schwarz	HUF-Z1	829381-005	20 MHz – 1 GHz	8/02
LISN	Solar	8012-50-R-24-BNC	8305116	10 MHz – 30 MHz	8/02
LISN	Solar	8012-50-R-24-BNC	814548	10 MHz – 30 MHz	8/02
LISN	Solar	9252-50-R-24-BNC	961019	10 MHz – 30 MHz	12/01
LISN	Solar	9252-50-R-24-BNC	971612	10 MHz – 30 MHz	10/02
LISN	Solar	9252-50-R-24-BNC	92710620 Hz – 40 GHz	10 MHz – 30 MHz	10/02

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.