



Measurement of RF Interference from a Model KC11 Bluetooth Module Transmitter

For : KC Wirefree, LLC
11811 N. Tatum Blvd., #3031
Phoenix, AZ 85028

Date Received: November 17, 2005

Date Tested : November 21 through December 13, 2005

Test Personnel: Richard E. King

Specification : FCC "Code of Federal Regulations" Title 47, Part 15,
Subpart C, Section 15.247 for Frequency Hopping
Spread Spectrum Intentional Radiators Operating within
the 2400-2483.5MHz band.

Richard E. King

Test Report By :
Richard E. King

Raymond J. Klouda

Approved By :
Raymond J. Klouda
Registered Professional Engineer of
Illinois - 44894



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**THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE
WRITTEN APPROVAL OF ELITE ELECTRONIC ENGINEERING INCORPORATED.**

Measurement of RF Interference from a Model KC11 Bluetooth Module Transmitter

1.0 INTRODUCTION:

1.1 Description of Test Item - This document represents the results of the series of radio interference measurements performed on a Bluetooth Module, Model No. KC11, Serial No. 170, (hereinafter referred to as the test item). The test item is a frequency hopping spread spectrum transceiver used in vehicle bluetooth applications. It transmits in the 2400.0MHz to 2483.5MHz band and uses an internal antenna. The test item was manufactured and submitted for testing by KC Wire Free located in Phoenix, AZ.

1.2 Purpose - The test series was performed to determine if the test item meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-2003.

1.3 Deviations, Additions and Exclusions - There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4 Applicable Documents - The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, dated 1 October 2005
- FCC Public Notice, DA 00-705, "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems", Released March 30, 2000
- ANSI C63.4-2003, "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"

1.5 Subcontractor Identification - This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

1.6 Laboratory Conditions - The temperature at the time of the test was 21°C and the relative humidity was 28%.

2.0 TEST ITEM SET-UP AND OPERATION:

The test item is a Bluetooth Module, model KC11. A block diagram of the test item set-up is shown as Figure 1.

2.1 Power Input - The test item obtained 6 VDC power through two leads from a CUI, Inc. model DV-6250 Class 2 Transformer. The transformer received 120V 60Hz power through lowpass powerline filters on the wall of the shielded enclosure. The leads from the transformer to the test item were approximately 1 meter long.

2.2 Grounding - Since only two wires were used to provide the input power, the test item was ungrounded during the tests.

2.3 Support Equipment - There was no support equipment submitted with the test item.

2.4 Interconnect Cables - The following interconnect cables were submitted with the test item:

Item	Description
RS232 Cable	Used for programming only - Unterminated for all tests

2.5 Operational Mode - The test item and all support equipment was placed on an 80cm high non-conductive stand. The test item and all support equipment were energized.

Since the test item utilizes Bluetooth modulation, it operates as a frequency hopping spread spectrum (FHSS) transmitter most of the time. In FHSS mode, the frequency hopping was enabled and disabled as required for the test. With the hopping disabled, the test item was set to transmit at frequencies of 2402MHz, 2441MHz or 2480MHz.

Another function of Bluetooth modulation is Inquiry Mode. When inquiring, the test item operates as a direct sequence spread spectrum transmitter. The Inquiry mode was used for the spectral density measurements.

3.0 TEST EQUIPMENT:

3.1 Test Equipment List - A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

3.2 Calibration Traceability - Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.1 Powerline Conducted Emissions

4.1.1 Requirements – All radio frequency voltages on the power lines of an intentional radiator shall be below the values shown below when using a quasi-peak detector:

CONDUCTED LIMITS FOR INTENTIONAL RADIATORS

Frequency MHz	RFI Voltage dBuV(QP)	RFI Voltage dBuV(Average)
0.15-0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5-5	56	46
5-30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: If the levels measured using the QP detector meet both the QP and the Average limits, the test item is considered to have met both requirements and measurements do not need to be performed using the Average detector.

4.1.2 Procedures - The interference on each power lead was measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. The meter terminal of the LISN not under test was terminated with 50 ohms. Measurements were first made over the entire frequency range from 150kHz through 30MHz with a peak detector and the results were automatically plotted. The data thus obtained was then searched by the computer for the highest levels. Quasi-peak measurements were automatically performed at the frequencies selected from the highest peak measurements, and the results printed.

4.1.3 Results - The conducted emissions comply with the specification limit. The plots of the peak preliminary conducted voltage levels on each power line are presented on pages 15 and 16. The conducted limit is shown as a reference. The final quasi-peak results are presented on pages 17 and 18. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 2.

4.2 Carrier Frequency Separation

4.2.1 Requirements - Per section 15.247 (a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the

hopping channel, whichever is greater.

4.2.2 Procedures - The test item was set up inside the chamber. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to $\geq$ to 1% of the span. The peak detector and 'Max-Hold' function were engaged. The span was set wide enough to capture the peaks of at least two adjacent channels.

When the trace had stabilized after multiple scans, the marker-delta function was used to determine the separation between the peaks of the adjacent channels. The analyzer's display was plotted using a 'screen dump' utility.

4.2.3 Results - Page 19 shows the carrier frequency separation. As can be seen from this plot, the separation is 992 kHz which is greater than the 20dB bandwidth (952 kHz).

4.3 Number of Hopping Frequencies

4.3.1 Requirements - Per section 15.247(a)(1)(iii), for frequency hopping systems operating in the 2400-2483.5MHz band, the frequency hopping systems shall use at least 15 non-overlapping channels.

4.3.2 Procedures - The test item was set up inside the chamber. The output of the test item was connected to the spectrum analyzer through a 30dB pad. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to $\geq$ to 1% of the span. The peak detector and 'Max-Hold' function were engaged. The span was set wide enough to capture the entire frequency band of operation.

The test item's signal was allowed to stabilize after multiple scans. The number of hopping frequencies was counted. The analyzer's display was plotted using a 'screen dump' utility.

4.3.3 Results - Page 20 shows the number of hopping frequencies. As can be seen from this plot, the number of frequencies is 79, which is greater than the minimum required.

4.4 Time of Occupancy

4.4.1 Requirement - Per section 15.247(a)(1)(iii), for frequency hopping systems operating in the 2400-2483.5MHz band, the average time of occupancy shall not be greater than 0.4 seconds within a 0.4 second period multiplied by the number of hopping channels employed.

4.4.2 Procedures - The test item was setup inside the chamber. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to 1 MHz. The peak detector and 'Max-Hold' function were engaged. With the span set to 0Hz, the sweep time was adjusted to capture a single event in order to measure the dwell time per hop. Then, the sweep time was increased to a 0.4 second period multiplied by the number of hopping channels. The number of hops was counted. The analyzer's display was plotted using a 'screen dump' utility.

The dwell time was then calculated from dwell time per hop multiplied by the number of hops.

4.4.3 Results - Pages 21 and 22 show the plots for the time of occupancy (dwell time). As can be seen from the plots, the time of occupancy can be determined by a 2.8mSec pulse multiplied by 98 hops. This calculated value is equal to 0.274 seconds which is less than the 0.4 seconds maximum allowed.

4.5 20dB Bandwidth

4.5.1 Requirement - Per section 15.247(a)(1)(iii), for frequency hopping systems operating in the 2400-2483.5MHz band, the 20dB bandwidth shall be measured for determination of the carrier frequency separation limits.

4.5.2 Procedures - The test item was setup inside the chamber. With the hopping function disabled, the test item was allowed to transmit continuously. The frequency hopping channel was set separately to low, middle, and high hopping channels. The resolution bandwidth (RBW) was set to $\geq$ to 1% of the 20 dB BW.

The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

4.5.3 Results - The plots on pages 23 through 25 show that the maximum 20 dB bandwidth was 951.9 kHz.

4.6 Peak Output Power

4.6.1 Requirement - Per section 15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5MHz band and employing at least 75 hopping channels. The peak output power shall not be greater than 1 watt.

Per section 15.247(4), the peak output power from an intentional radiator if the transmitting antenna(s) have a directional gain greater than 6dBi shall be reduced below by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.6.2 Procedures - The test item was placed on the non-conductive stand and set to transmit. A broadband measuring antenna was placed at a test distance of 3 meters from the test item.

The test item was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The peak power output was measured for the low, middle and high hopping frequencies.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, another double ridged waveguide antenna was then set in place of test item and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss, as required. The peak power output was calculated for the low, middle and high hopping frequencies.

4.6.3 Results - The results are presented on page 26. The maximum EIRP measured from the transmitter was 4.3dBm which meets the 36dBm defacto limit.

4.7 Bandedge Compliance

4.7.1 Requirement - Per section 15.247(c), the emissions at the band-edges must be at least 20dB below the highest level measured within the band. In addition, the radiated emissions which fall in the restricted band beginning at 2483.5 MHz, must meet the general limits of 15.209

4.7.2 Procedures - The test item was setup inside the chamber. With the hopping function disabled, the test item was allowed to transmit continuously. The frequency hopping channel was set separately to low and high hopping channels. The resolution bandwidth (RBW) was set to 100 kHz.

The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility. The measurement was repeated with the frequency hopping function enabled.

For the emissions which fall in the restricted band the "marker-delta" method described in Public Notice DA 00-705 was used. Initially radiated measurements were performed at the fundamentals of the highest hopping frequencies using 1 MHz bandwidth. For the measurements the "delta" required to meet the general limit was calculated.

Next, the band-edge emissions were plotted using peak detector and 100 kHz bandwidth. The "delta" limit was applied to this plot to determine compliance at the band-edge.

The test item was placed on the non-conductive stand and set to transmit. A broadband measuring antenna was placed at a test distance of 3 meters from the test item. The test item was maximized for worst case emissions (or maximum output power) at the measuring antenna. The

maximum meter reading was recorded.

4.7.3 Results - Pages 27 through 30 show the radiated band-edge compliance results using the marker-delta method. As can be seen from these plots, the emissions at the band-edge and in the restricted band are within the general limits.

4.8 Spurious Emissions

4.8.1 Radiated Spurious Emissions

4.8.1.1 Requirement – Per section 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the test item is operating, the spurious emissions shall be at least 20dB down from the highest level of power, either conducted or radiated. In addition, the radiated emissions which fall in the restricted bands must meet the general limits of 15.209.

4.8.1.2 Procedures – The radiated tests were performed in a 32ft. x 20ft. x 18ft. hybrid absorber lined semi-anechoic test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. The floor of the chamber is used as the ground plane. The chamber complies with ANSI 63.4 and CISPR 16 requirements for site attenuation.

Preliminary radiated measurements are performed to determine the frequencies where the significant emissions might be found. With the test item at one set position and the measurement antenna at a set height (i.e. without maximizing), the radiated emissions were measured using peak detection with 100 kHz BW. This data was then automatically plotted up through 18 GHz. The frequency range from 18 to 25 GHz was checked manually but not plotted.

Next, the harmonic or spurious emissions falling in the restricted bands were measured up through the 10th harmonic. For the measurements above 1GHz, the measurement bandwidth was set to 1 MHz RBW. The analyzer was set to **linear mode** with 10 Hz VBW in order to simulate an average detector. A pre-amplifier was used to increase the receiver sensitivity.

4.8.1.3 Results - The preliminary emission measurements taken with 100 kHz BW indicated that the radiated spurious emissions were below the 20dBc limit. The plots up to 18 GHz are presented on pages 31 through 42. A highpass filter with 2.4 GHz cutoff frequency was used when measuring above 2GHz to prevent overloading the preamplifier.

The harmonics and any other emissions that fall in the restricted frequency bands were within the general limit. This data is shown in the tables on pages 43 through 45.

4.9 Spectral Density

4.9.1 Requirement - Per section 15.247(d), the peak power spectral density from the intentional radiator shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.9.2 Procedures - The test item was put into inquiry mode. The test item was placed on the non-conductive stand and set to transmit. A broadband measuring antenna was placed at a test distance of 3 meters from the test item. The test item was maximized for worst case emissions (or maximum output power) at the measuring antenna.

With the resolution bandwidth (RBW) was set to 3 kHz, the sweep time was set to the span divided by 3kHz (i.e. $1\text{MHz}/3\text{kHz} = 333$ seconds). The peak detector and 'Max-Hold' function was engaged. The analyzer's display was plotted using a 'screen dump' utility.

4.9.3 Results - Page 46 shows the power spectral density results. As can be seen from this plot, the peak power density is less than 8dBm in a 3 kHz band during any time interval of continuous transmission.

5.0 CONCLUSIONS:

It was determined that the KC Wire Free Bluetooth Module, Model No. KC11, Serial No. 170, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for Bluetooth spread spectrum transmitters.

6.0 CERTIFICATION:

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

7.0 ENDORSEMENT DISCLAIMER:

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.



TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC.								Page: 1
Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: ACCESSORIES, MISCELLANEOUS								
XPR0	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/	001	4.8-20GHZ	07/27/05	12	07/27/06
XZG2	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2223A01751	---		N/A	
Equipment Type: AMPLIFIERS								
APK2	PREAMPLIFIER	AGILENT TECHNOL	8449B	3008A01595	1-26.5GHZ	02/11/05	12	02/11/06
Equipment Type: ANTENNAS								
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	08/15/05	12	08/15/06
NWH0	RIDGED WAVE GUIDE	TENSOR	4105	2081	1-12.4GHZ	10/01/05	12	10/01/06
NWI1	RIDGED WAVE GUIDE	AEL	H1498	154	2-18GHZ	10/01/05	12	10/01/06
NWN0	DOUBLE RIDGED GUIDE ANTENN	ETS-LINDGREN	3116	00026778	18 TO 40 GHZ	09/06/05	12	09/06/06
Equipment Type: RECEIVERS								
RACE	RF PRESELECTOR W/ RECEIVER	HEWLETT PACKARD	85685A	3010A01194	20HZ-2GHZ	08/26/05	12	08/26/06
RAF1	QUASISPEAK ADAPTER	HEWLETT PACKARD	85650A	2043A00271	0.01-1000MHZ	02/07/05	12	02/07/06
RAG0	FREQUENCY MIXER	HEWLETT PACKARD	11517A	---	12-40GHZ		N/A	

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable

Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or



modulation prior to the test or monitored by a calibrated instrument.



ELITE ELECTRONIC ENGINEERING INC.
Radiated Emissions Test Setup Anechoic Ferrite Chamber

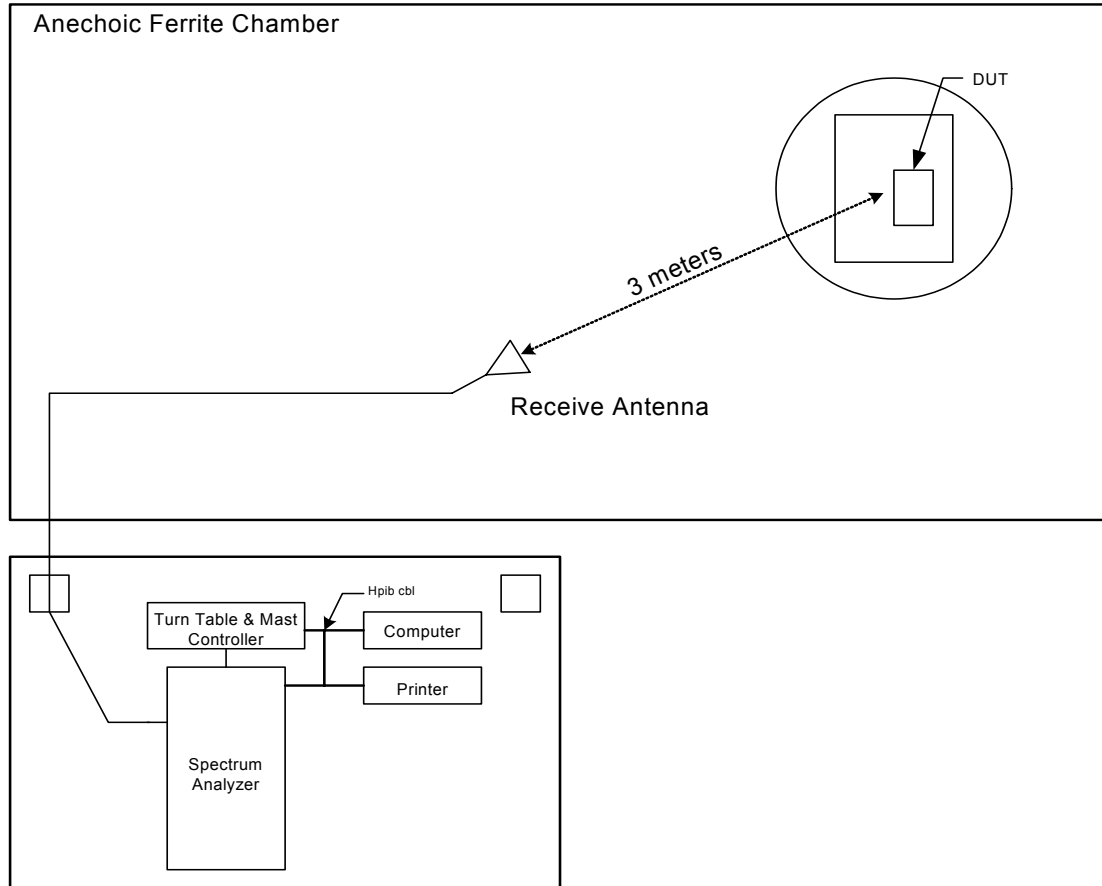
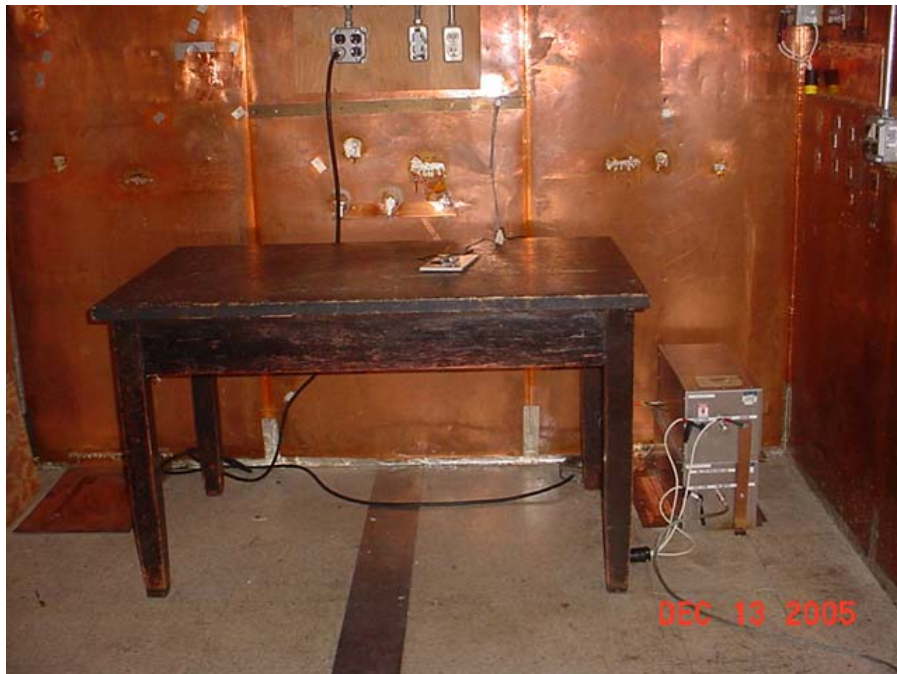


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2



Powerline Conducted Emissions 150kHz – 30MHz

Figure 3



Radiated Emissions – Vertical Polarization



Radiated Emissions – Horizontal Polarization

8566

ELITE ELECTRONIC ENGINEERING Inc.
Dawners Grove, Ill. 60515

PRELIMINARY LINE CONDUCTED EMISSIONS

EN 55022

THIS IS A PLOT OF PEAK VALUES

MANUFACTURER: KC WIRE FREE

MODEL No. : KC11

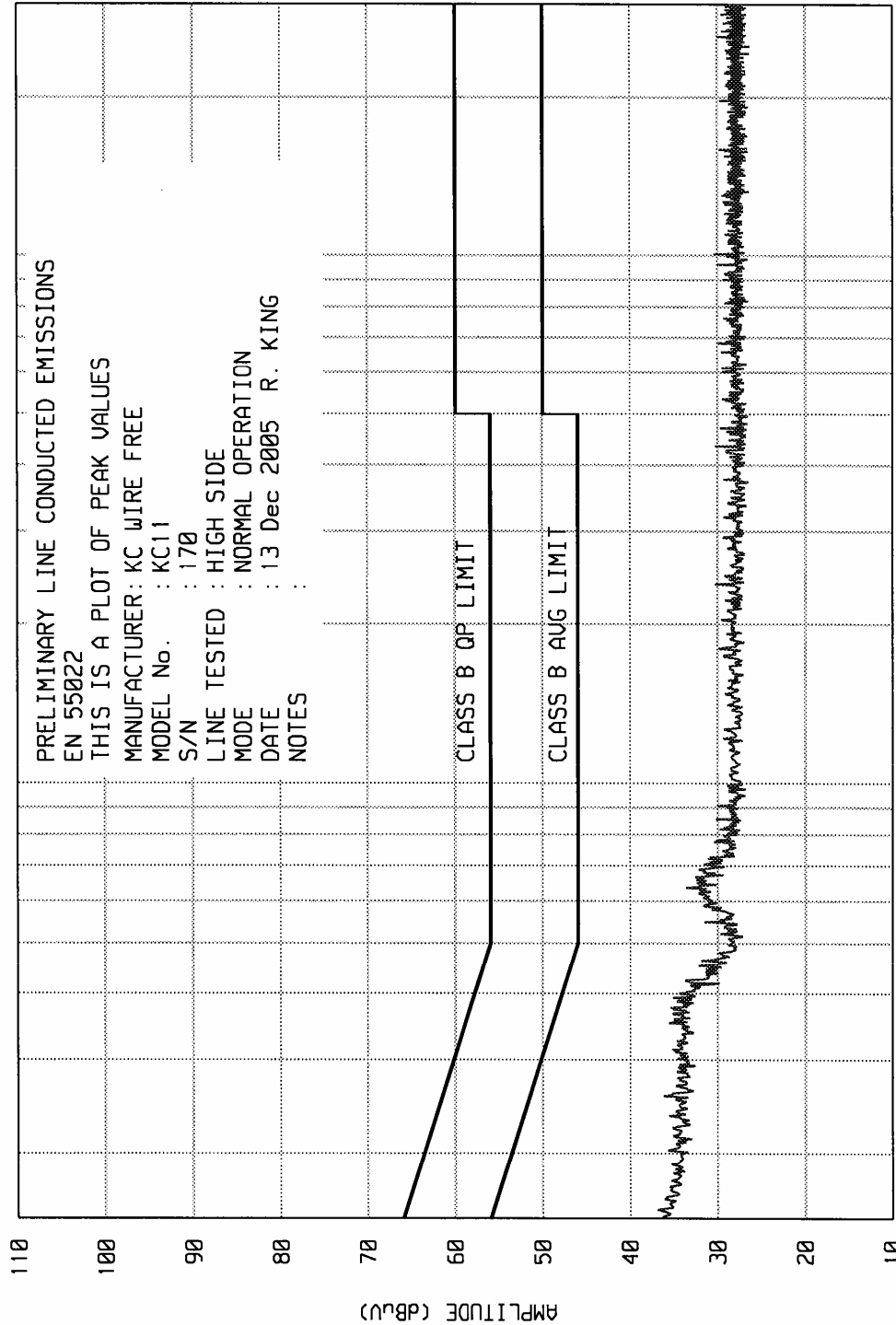
S/N : 170

LINE TESTED : HIGH SIDE

MODE : NORMAL OPERATION

DATE : 13 Dec 2005 R. KING

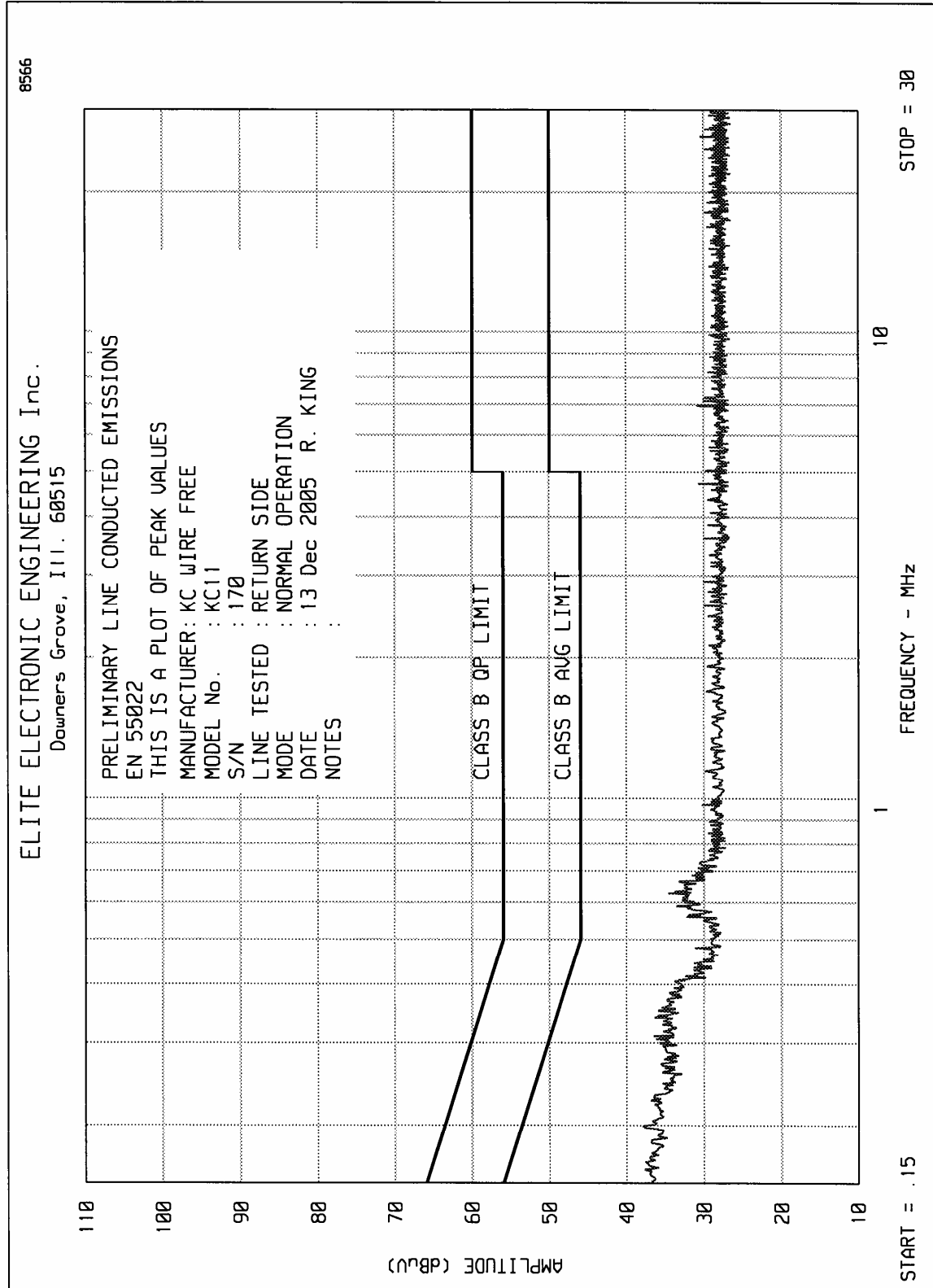
NOTES :



START = .15

FREQUENCY - MHz

STOP = 30



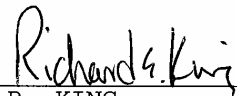


ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : KC WIRE FREE
MODEL : KC11
S/N : 170
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : HIGH SIDE
MODE : NORMAL OPERATION
DATE : 13 Dec 2005
NOTES :
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. dBuV	QP LIMIT dBuV	AVG RDG dBuV	AVG LIMIT dBuV	NOTES
.323	25.8	59.6		49.6	
.624	25.9	56.0		46.0	
.626	25.7	56.0		46.0	
.852	25.5	56.0		46.0	
1.792	25.4	56.0		46.0	
3.156	25.5	56.0		46.0	
5.048	24.3	60.0		50.0	
6.803	24.3	60.0		50.0	
9.584	24.3	60.0		50.0	
12.994	24.3	60.0		50.0	
15.887	24.3	60.0		50.0	
18.724	24.3	60.0		50.0	
21.731	24.3	60.0		50.0	
24.821	24.3	60.0		50.0	
26.673	24.5	60.0		50.0	

CHECKED BY:


R. KING

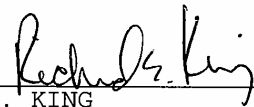


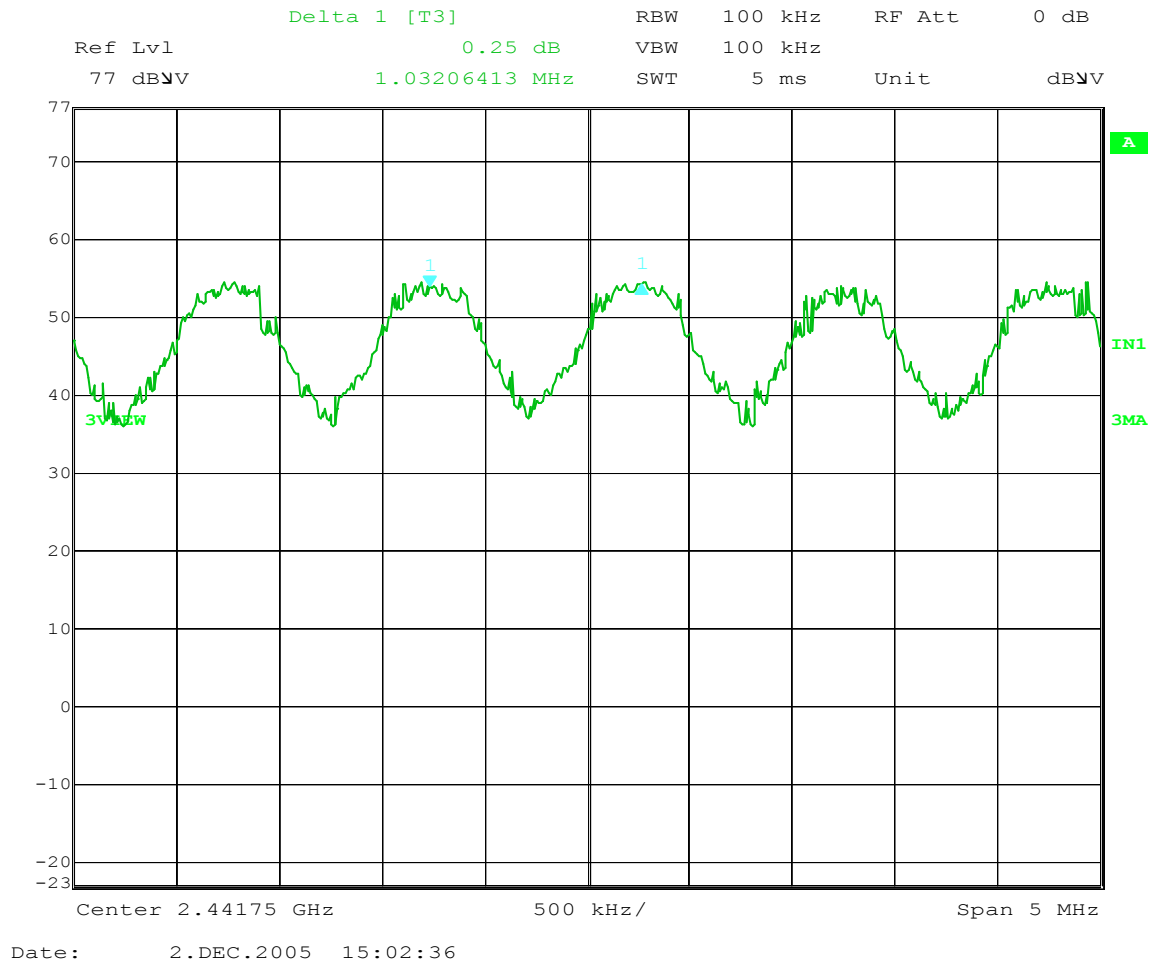
ETR No.
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : KC WIRE FREE
MODEL : KC11
S/N : 170
SPECIFICATION : EN 55022, CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : RETURN SIDE
MODE : NORMAL OPERATION
DATE : 13 Dec 2005
NOTES :
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

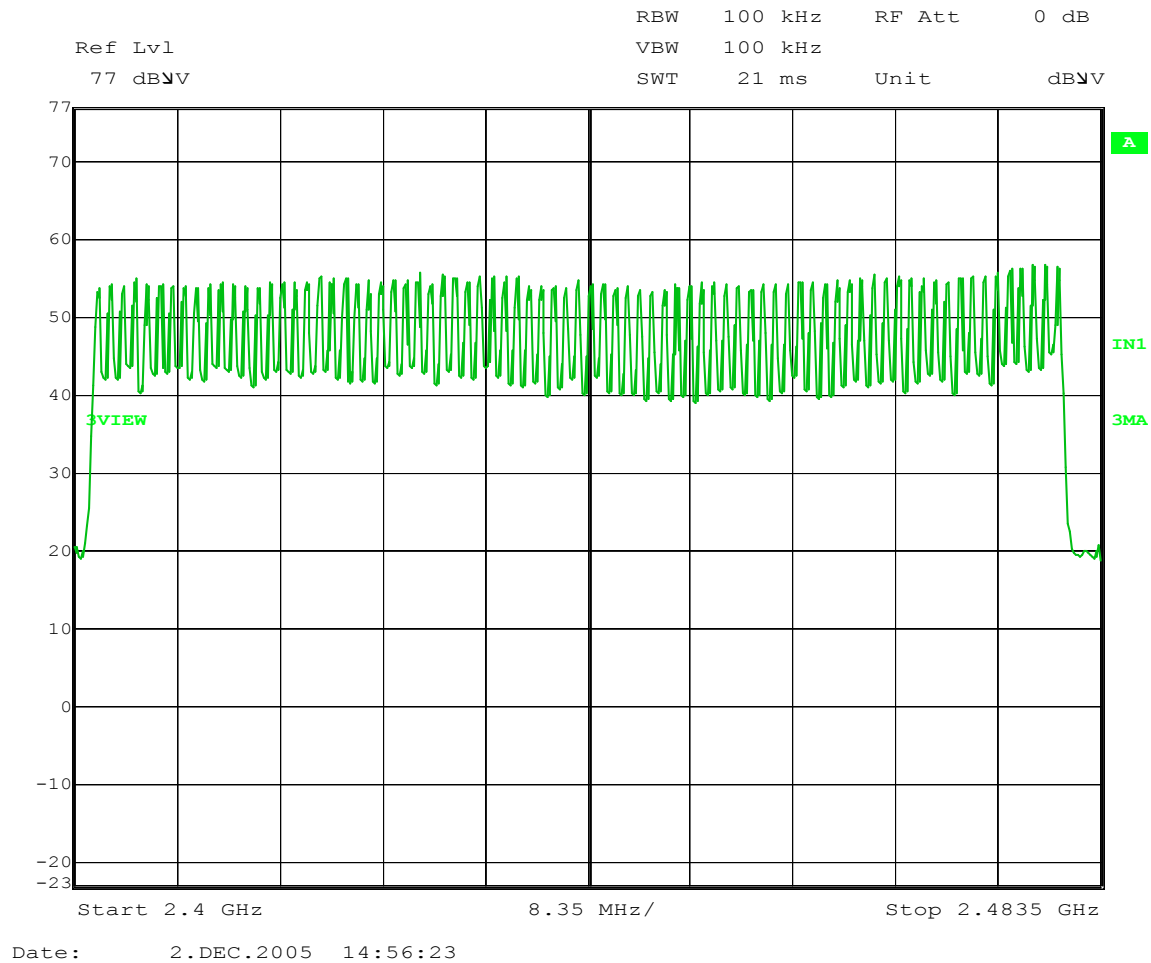
FREQUENCY MHz	METER RDG. dBuV	QP LIMIT dBuV	AVG RDG dBuV	AVG LIMIT dBuV	NOTES
.309	25.9	60.0		50.0	
.590	25.7	56.0		46.0	
.621	25.9	56.0		46.0	
.967	25.9	56.0		46.0	
1.747	25.4	56.0		46.0	
3.601	25.5	56.0		46.0	
4.997	24.3	56.0		46.0	
6.918	24.1	60.0		50.0	
9.803	24.3	60.0		50.0	
12.575	24.3	60.0		50.0	
15.102	24.3	60.0		50.0	
19.010	24.3	60.0		50.0	
21.653	24.6	60.0		50.0	
24.907	24.3	60.0		50.0	
27.267	24.3	60.0		50.0	

CHECKED BY:


R. KING

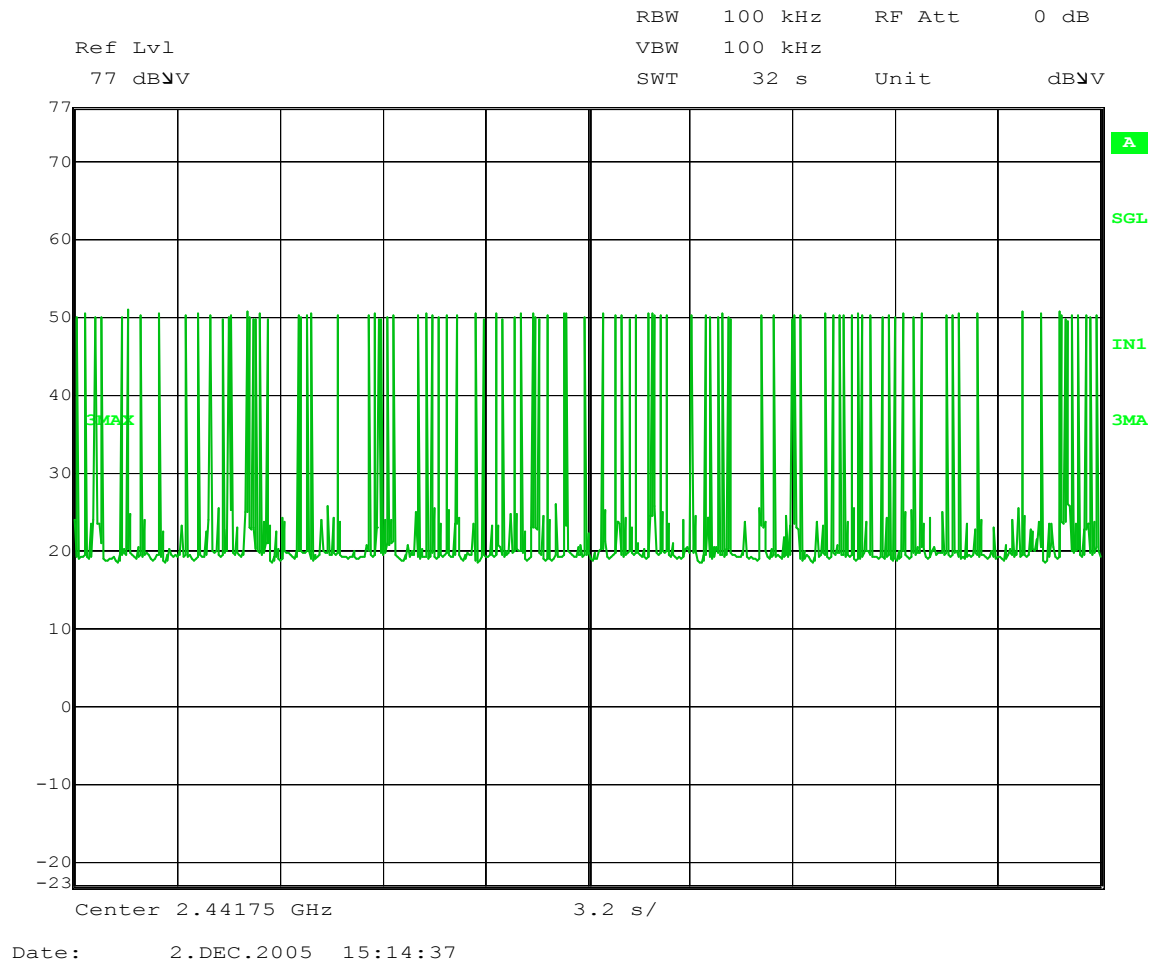


MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 CARRIER FREQUENCY SEPERATION
MODE : FREQUENCY HOPPING ENABLED



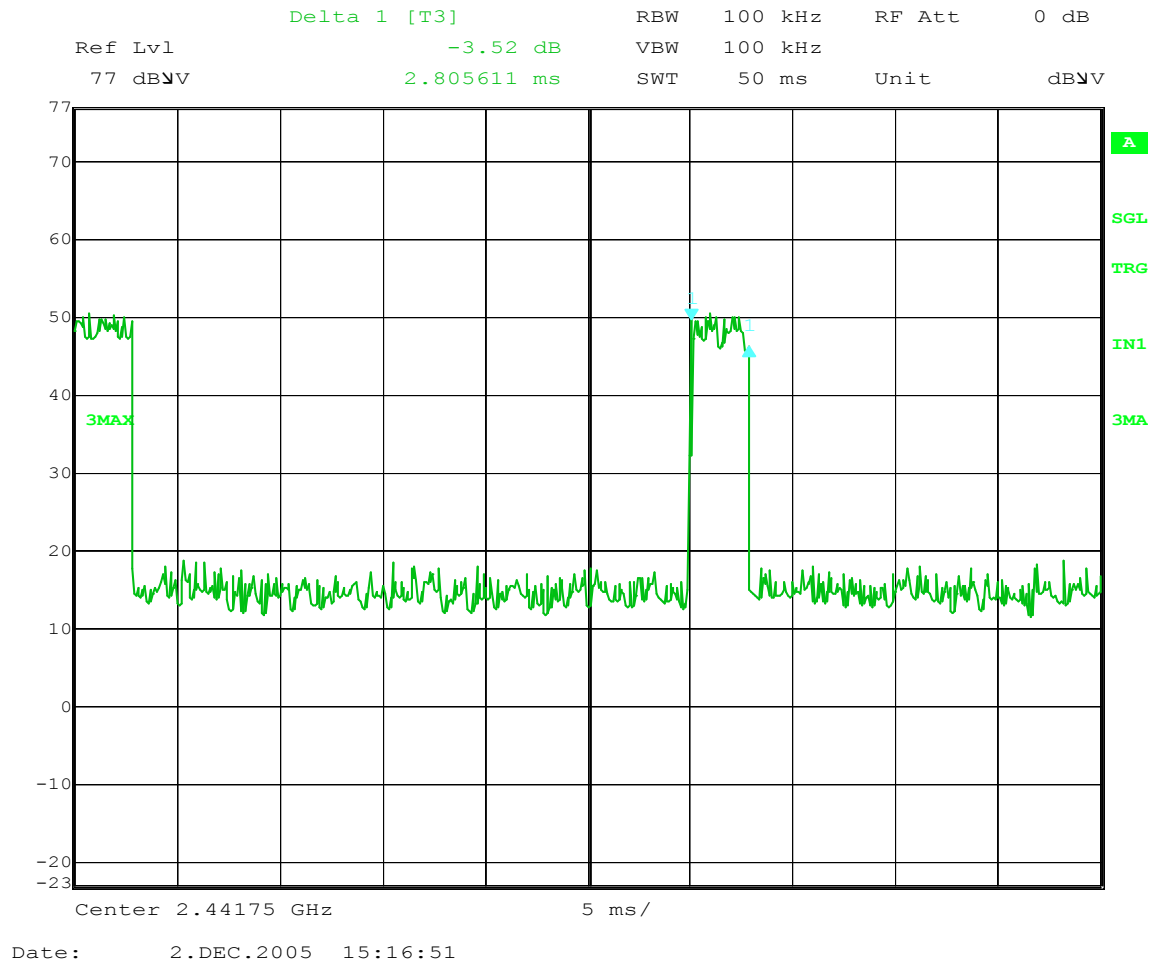
Number of Hopping Frequencies = 79

MANUFACTURER : KC WIRE FREE
 MODEL NO. : KC11
 SERIAL NO. : 170
 TEST PERFORMED : FCC 15.247 NUMBER OF HOPPING FREQUENCIES
 MODE : FREQUENCY HOPPING ENABLED



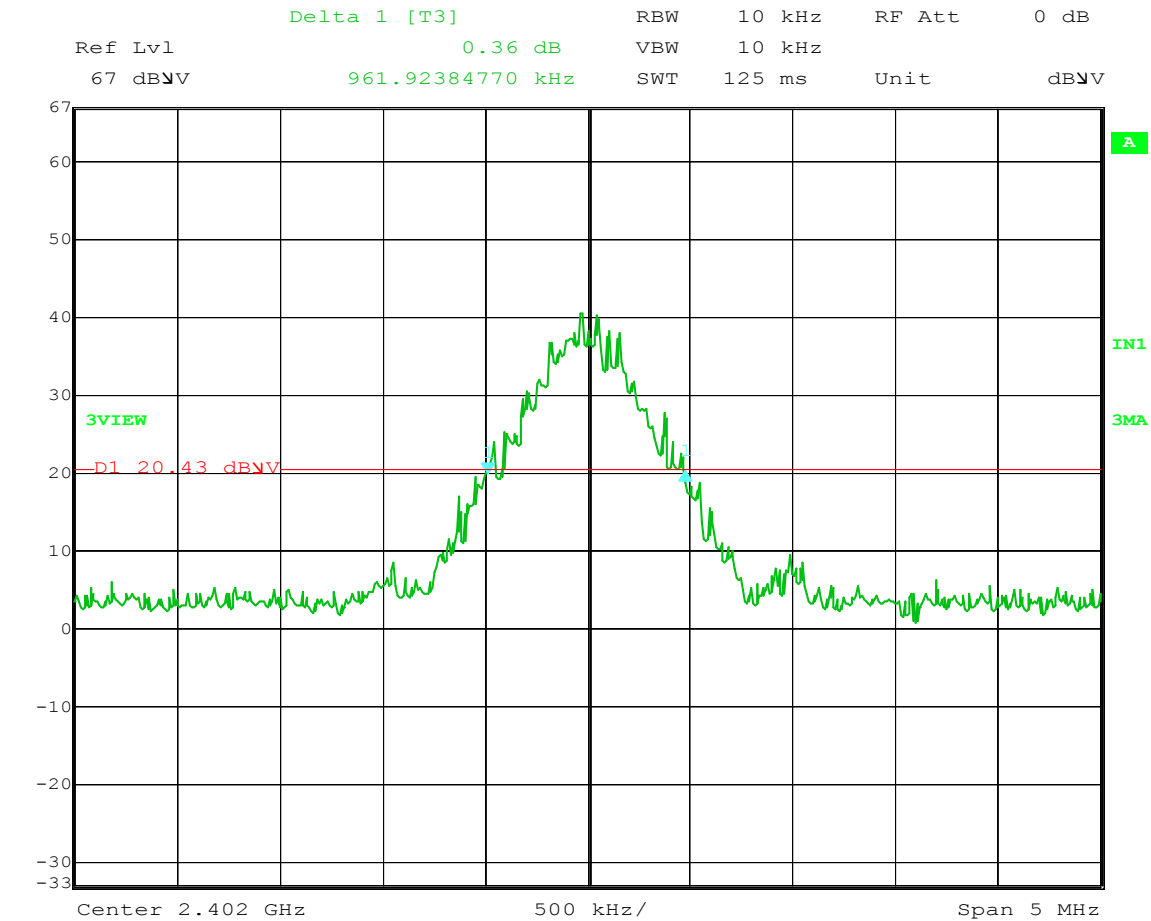
Number of pulses in a 32 second window = 98

MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 DWELL TIME
MODE : FREQUENCY HOPPING ENABLED



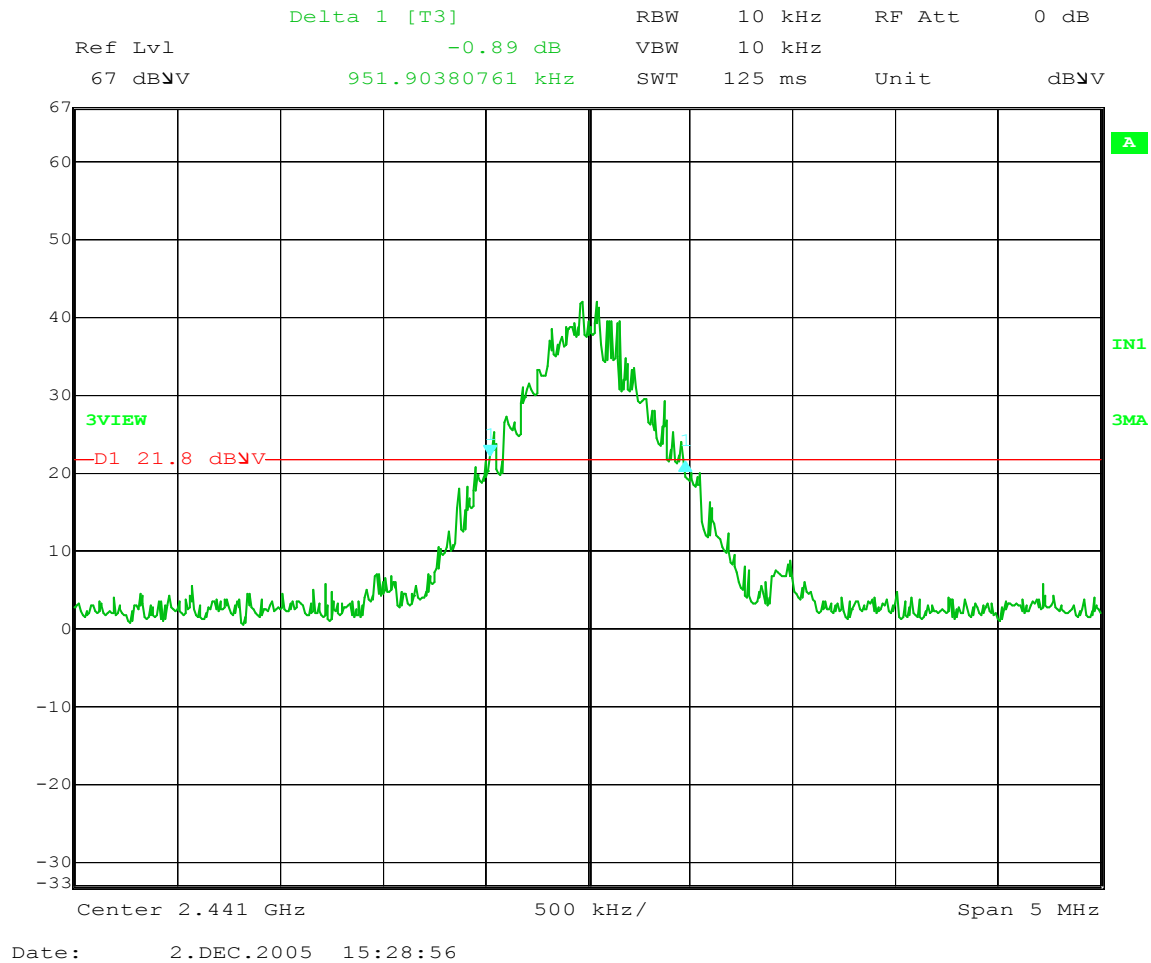
$$\begin{aligned}\text{Dwell Time} &= (\# \text{ of pulses}) * (\text{pulse width}) \\ &= 98 * 2.8\text{mSec} = 0.274 \text{ Seconds}\end{aligned}$$

MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 DWELL TIME
MODE : FREQUENCY HOPPING ENABLED

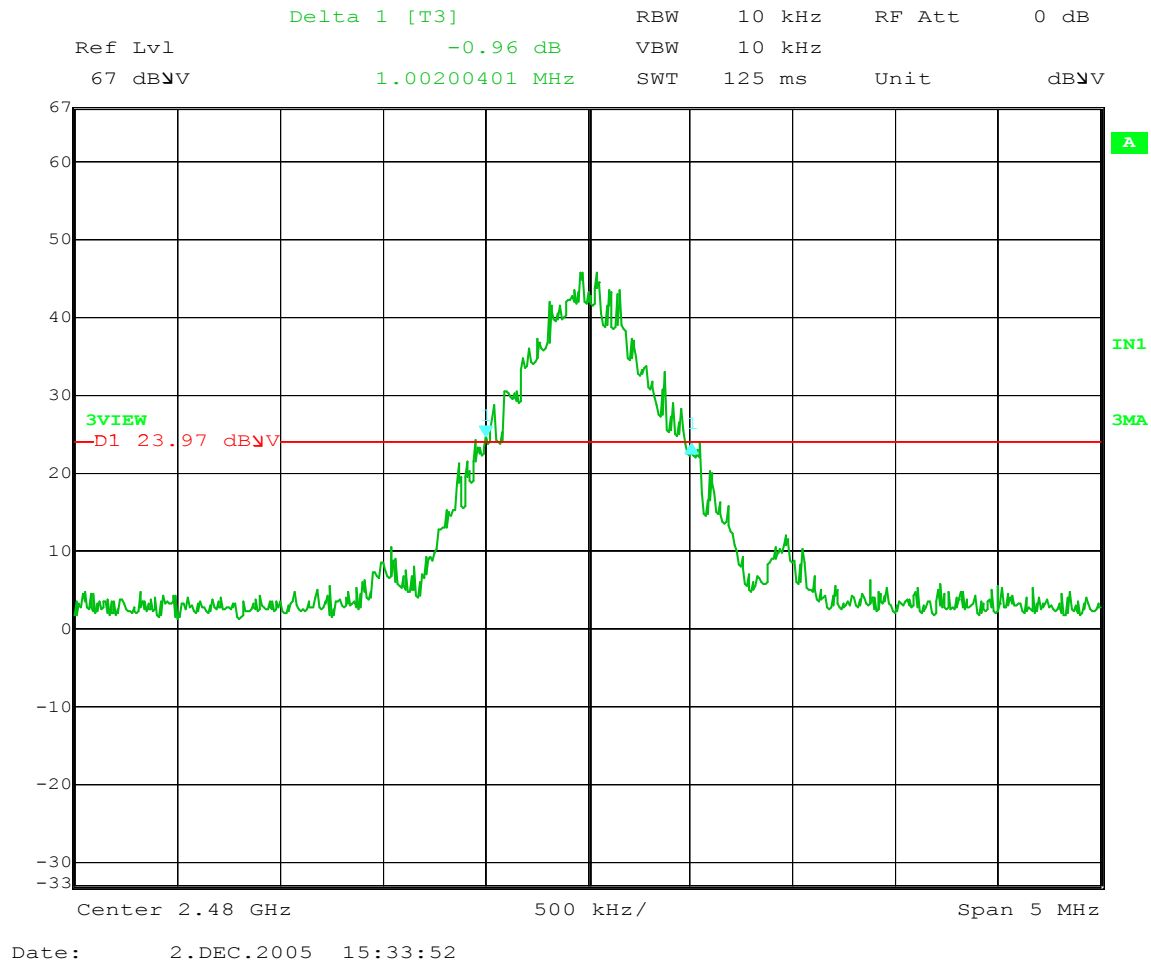


Date: 2.DEC.2005 15:25:24

MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 20dB BANDWIDTH
MODE : TRANSMIT @ 2.402GHz, MAXIMUM DATA RATE



MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 20dB BANDWIDTH
MODE : TRANSMIT @ 2.441GHz, MAXIMUM DATA RATE



MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 20dB BANDWIDTH
MODE : TRANSMIT @ 2.480GHz, MAXIMUM DATA RATE



Data Sheet

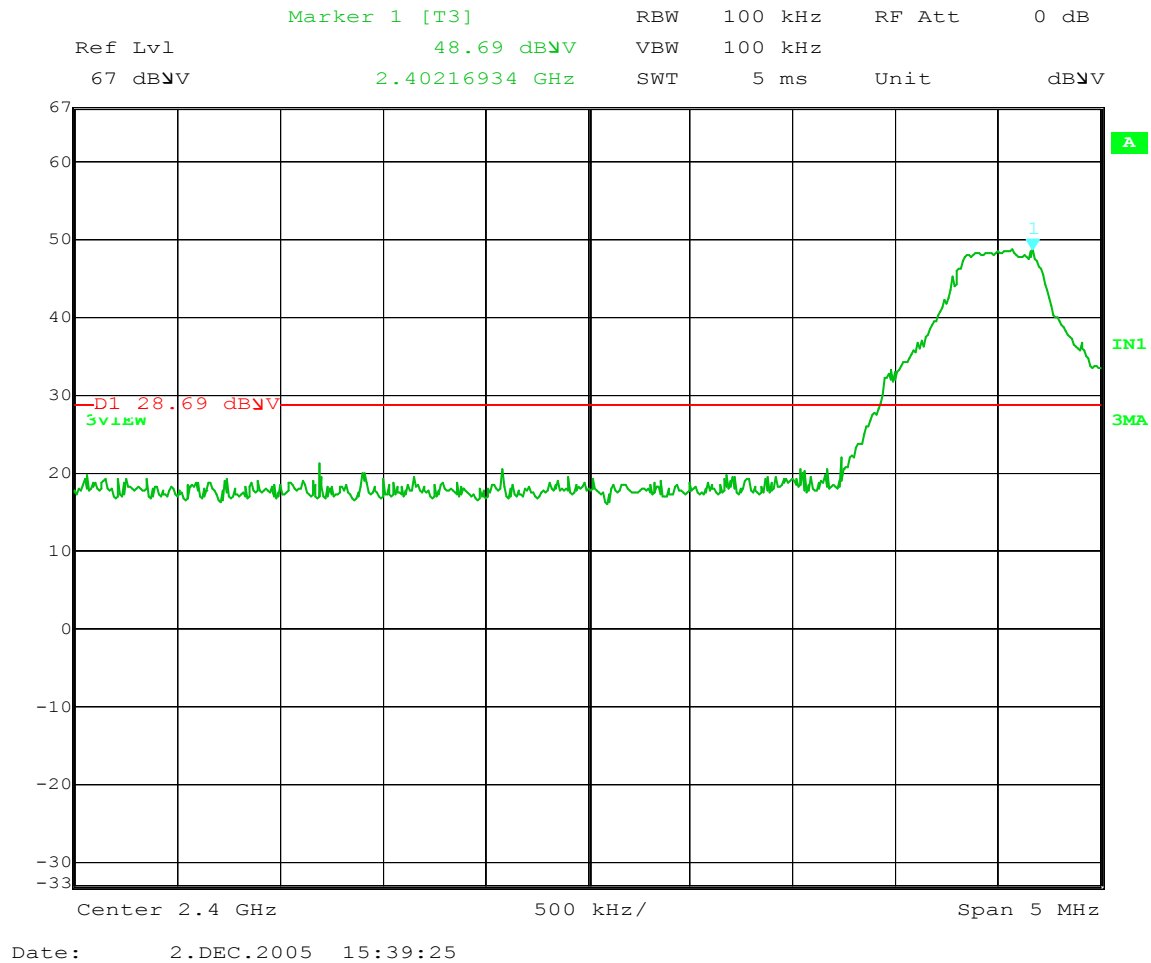
MANUFACTURER : KC Wire Free
MODEL : KC11
S/N : 170
SPECIFICATION : FCC Part 15, Subpart C, Section 15.247
Peak Output Power – Radiated Measurement
DATE : December 12, 2005
NOTES :
: TEST DISTANCE IS 3 METERS

FREQ. (MHz)	AN T POL	SPECTRUM ANALYZER RDG(dBuV)	MATCHED SIGNAL GENERATOR RDG (dBm)	CABLE LOSS (dB)	ANTENN A GAIN (dB)	EIRP TOTAL (dBm)
2402	V	90.6	-2.0	2.8	6.8	-6.0
	H	98.4	5.0	2.8	6.8	1.0
2441	V	92.4	0.2	2.8	6.8	-3.8
	H	99.3	5.8	2.8	6.8	1.8
2480	V	93.0	1.0	2.8	6.9	-3.1
	H	103.4	8.4	2.8	6.9	4.3

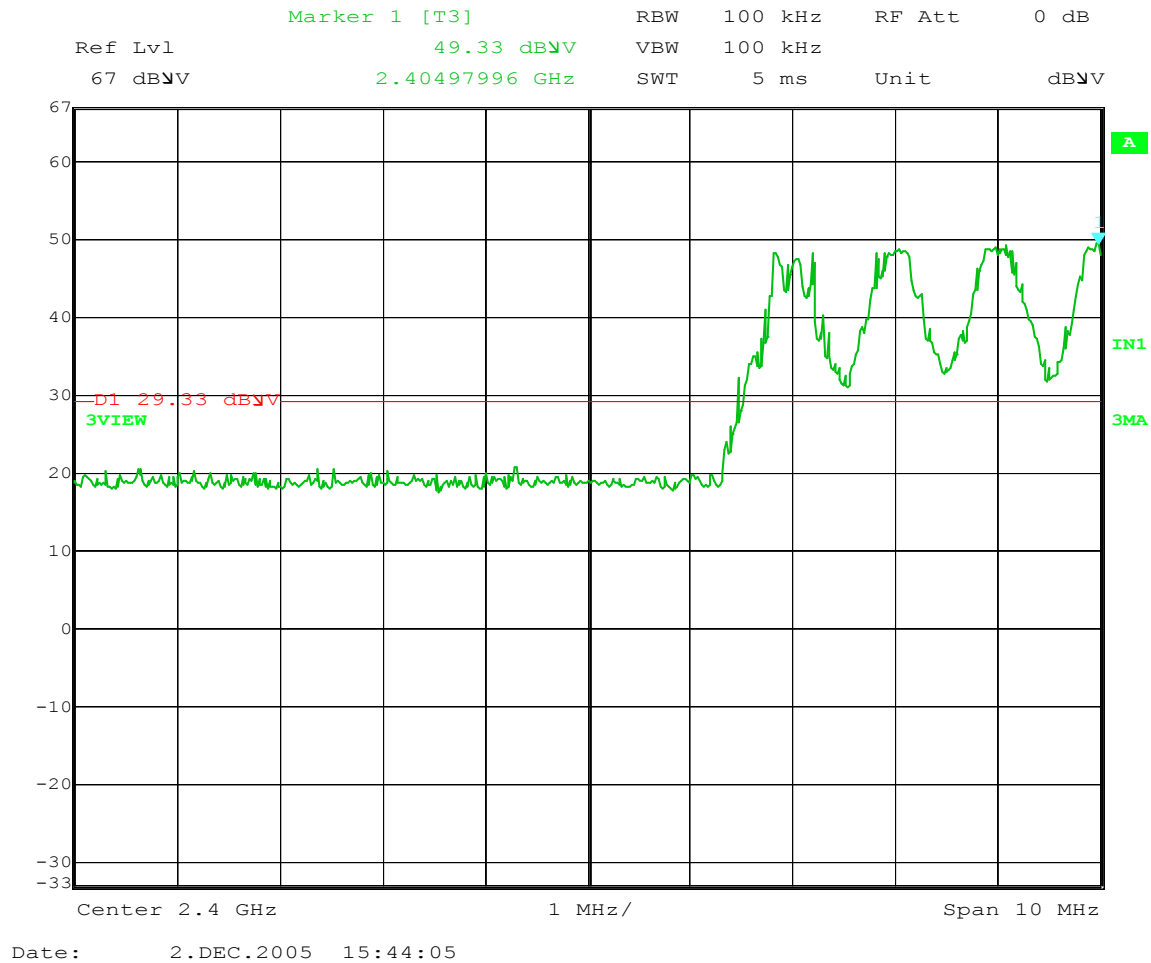
EIRP = S.G. RDG + Cable Loss – Antenna Gain

RICHARD E. KING

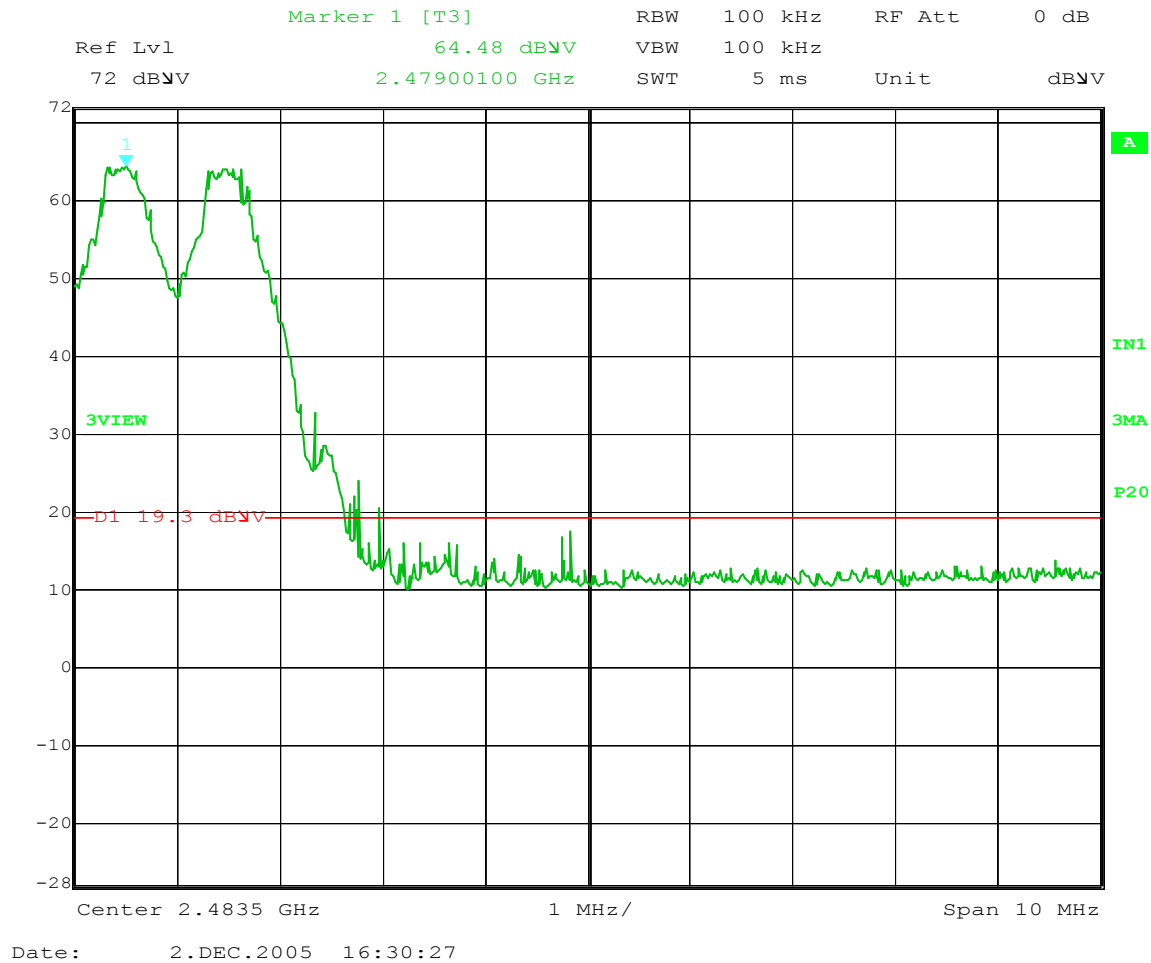
CHECKED BY: _____



MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 BANDEDGE COMPLIANCE
MODE : TRANSMIT @ 2.402GHz, MAXIMUM DATA RATE

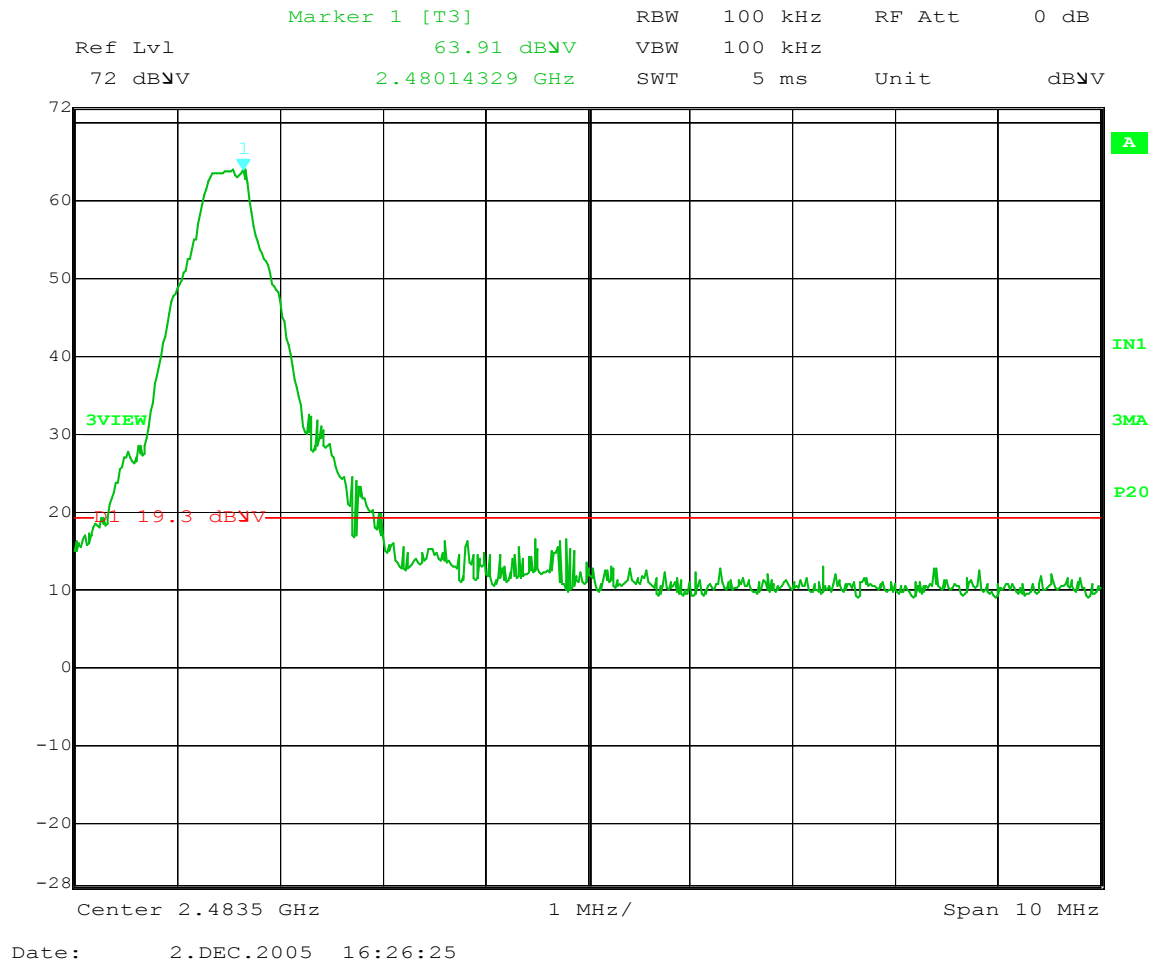


MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 BANDEDGE COMPLIANCE
MODE : FREQUENCY HOPPING ENABLED



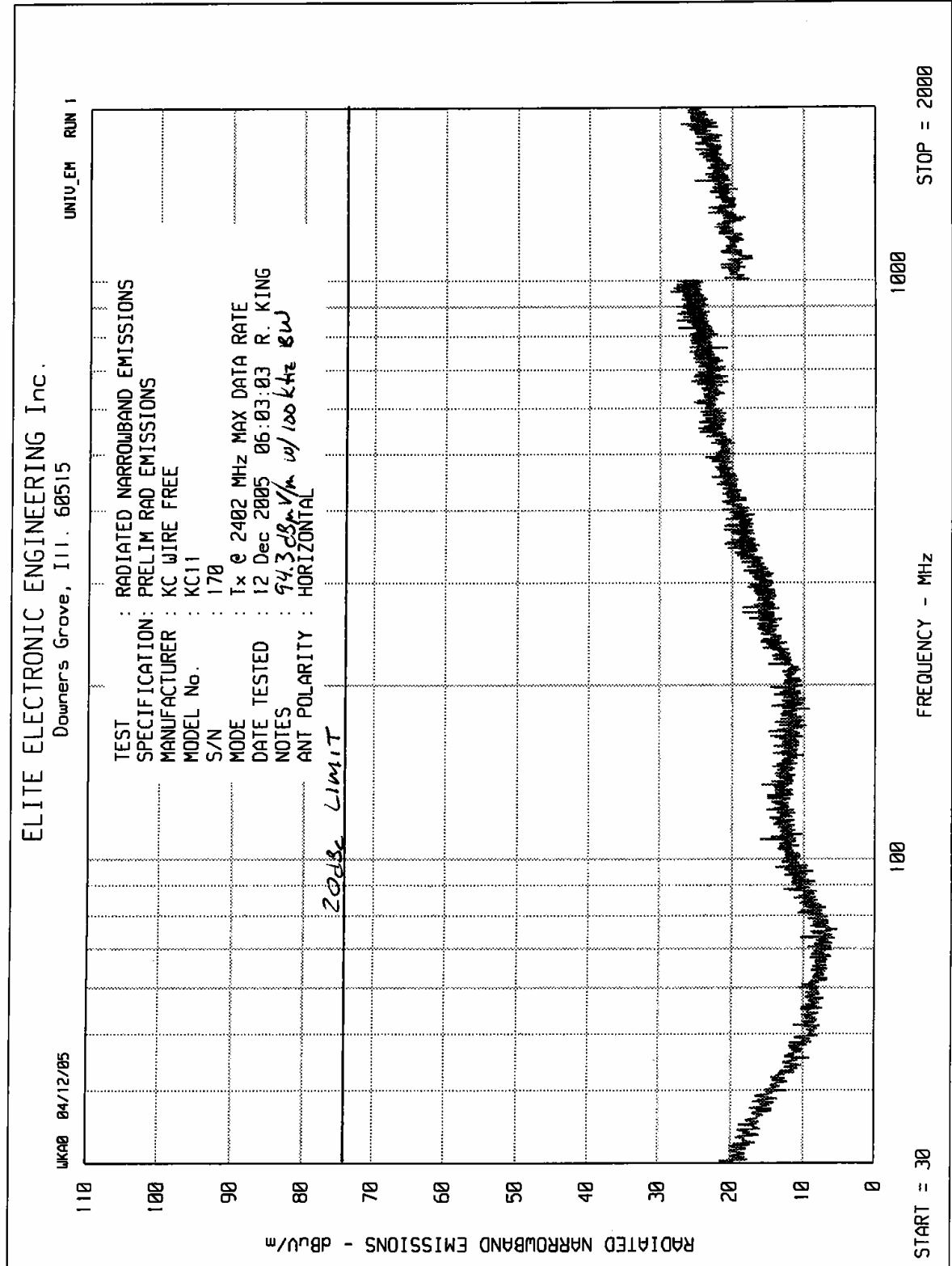
Marker Delta Method: $98.7\text{dBuV/m} - 54.0\text{dBuV/m} = 44.7\text{ dB down}$

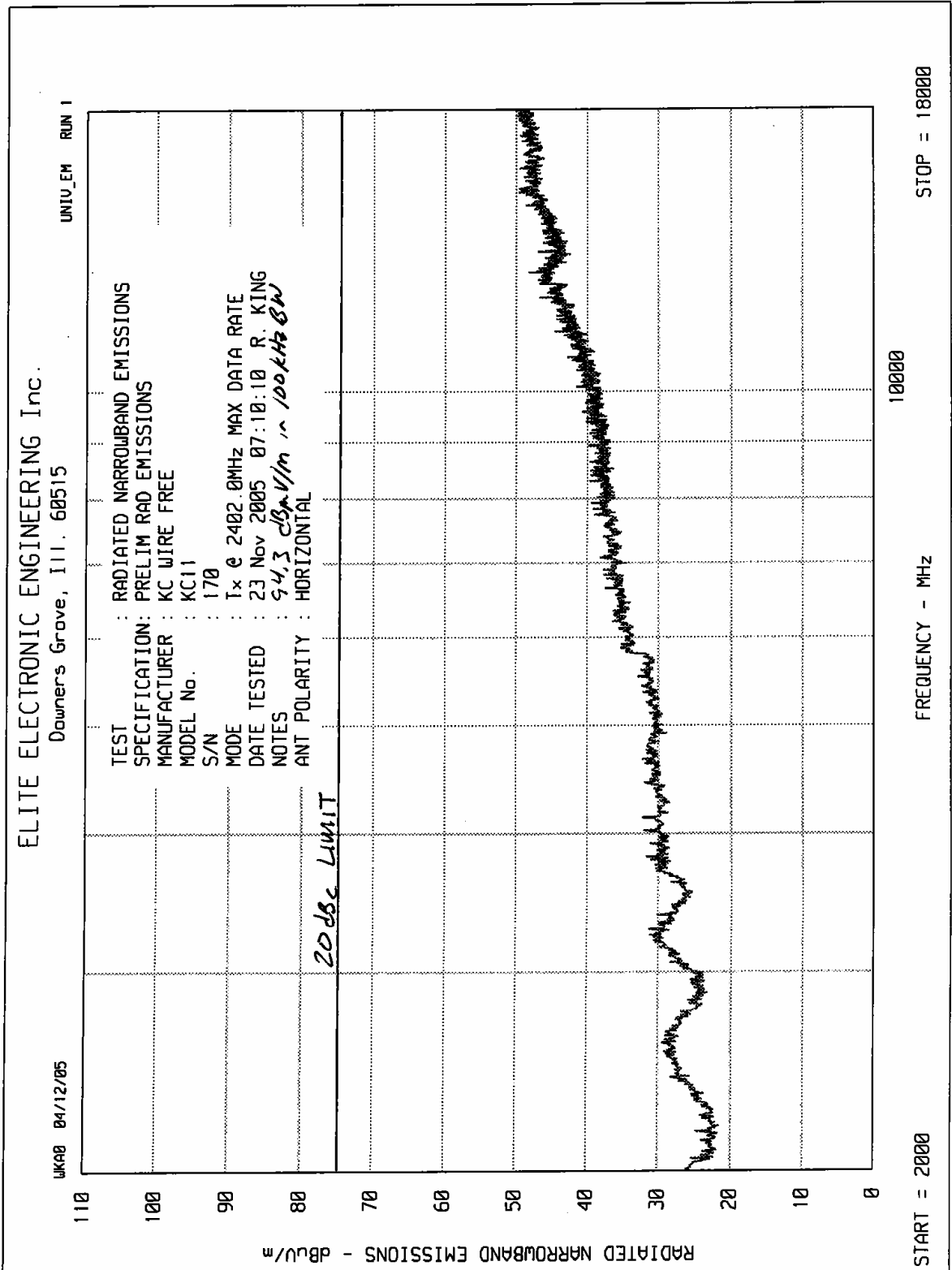
MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 BANDEDGE COMPLIANCE
MODE : FREQUENCY HOPPING ENABLED

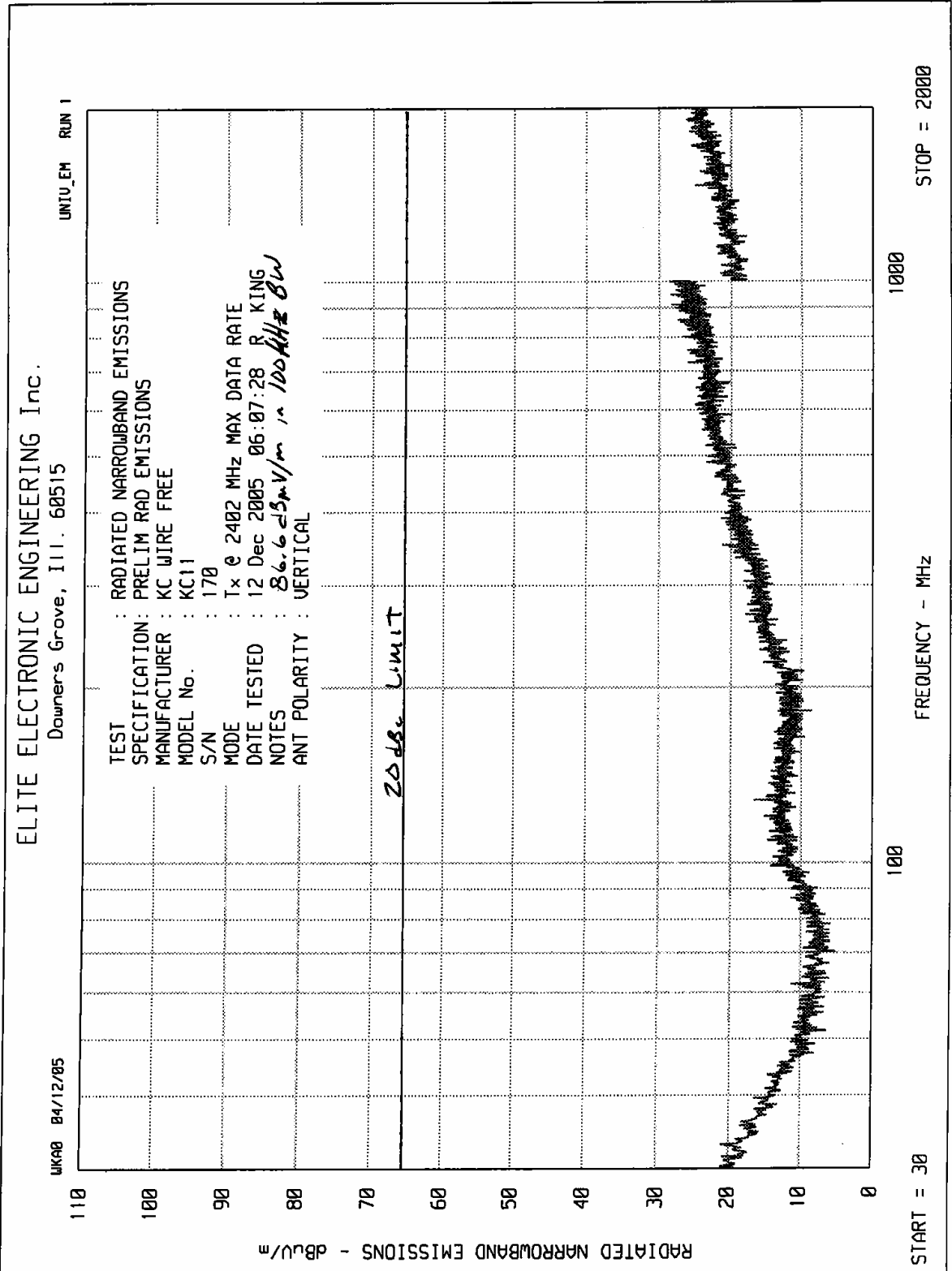


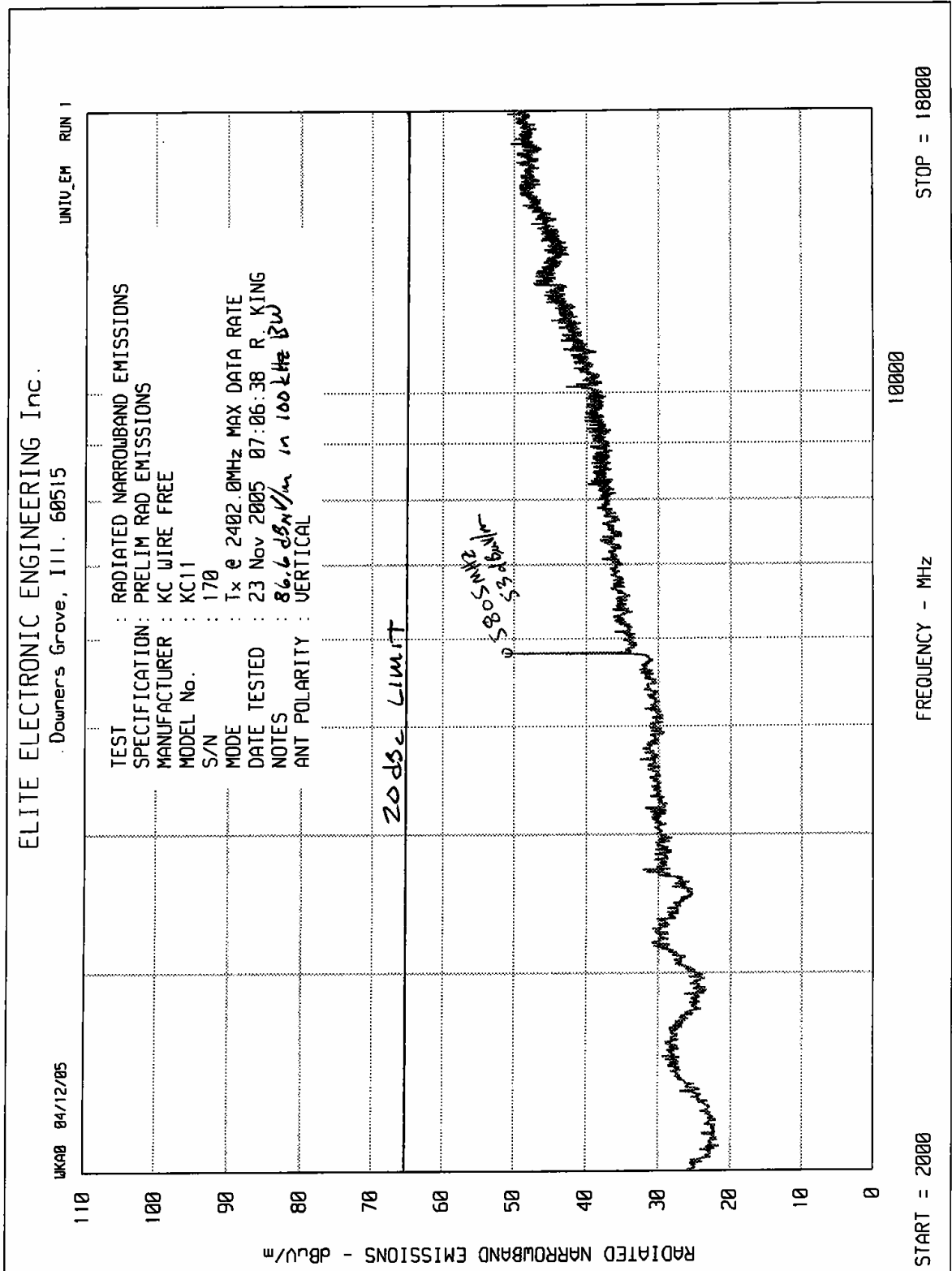
Marker Delta Method: $98.7\text{dB}\mu\text{V}/\text{m} - 54.0\text{dB}\mu\text{V}/\text{m} = 44.7\text{ dB down}$

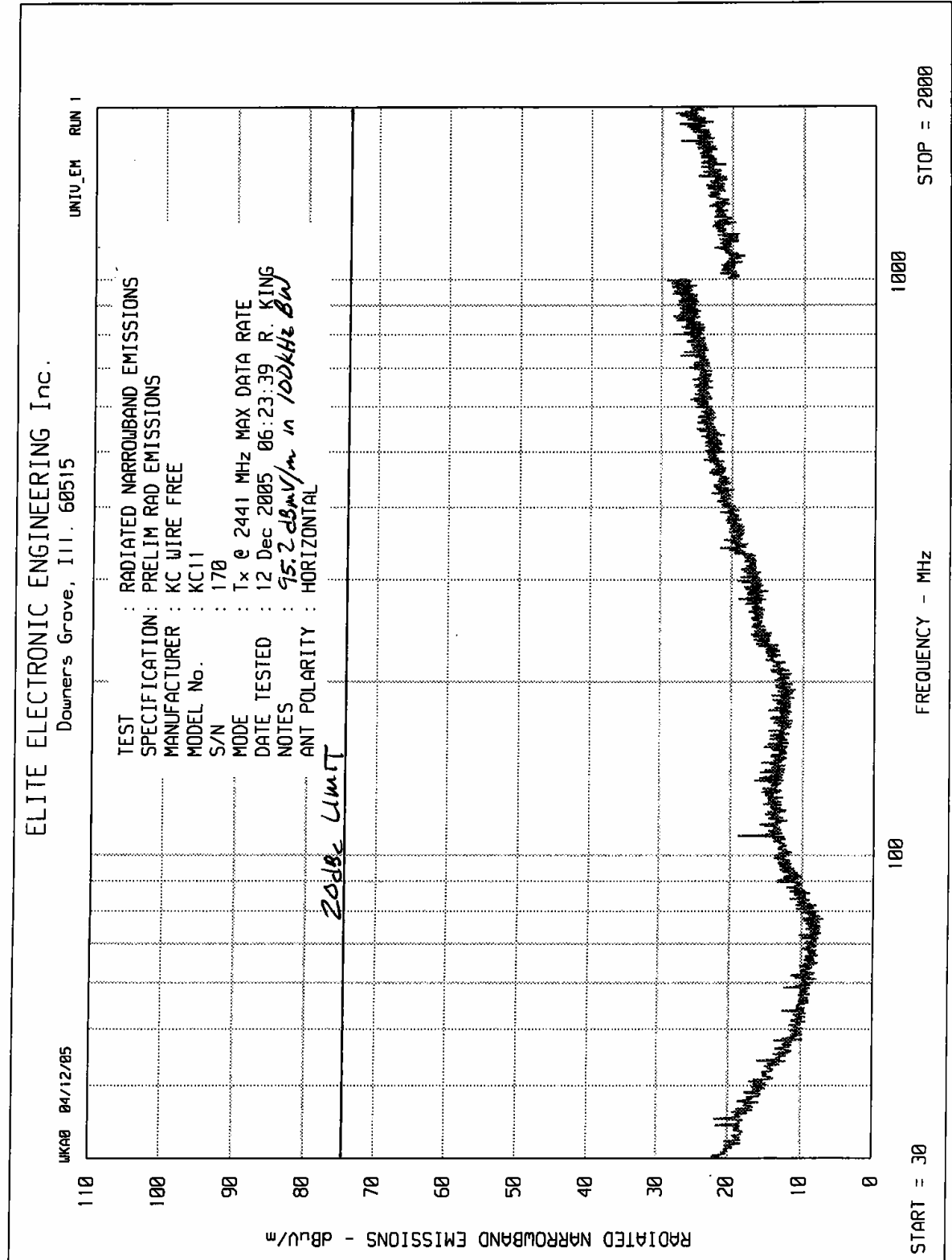
MANUFACTURER : KC WIRE FREE
 MODEL NO. : KC11
 SERIAL NO. : 170
 TEST PERFORMED : FCC 15.247 BANDEDGE COMPLIANCE
 MODE : TRANSMIT @ 2.480GHz, MAXIMUM DATA RATE

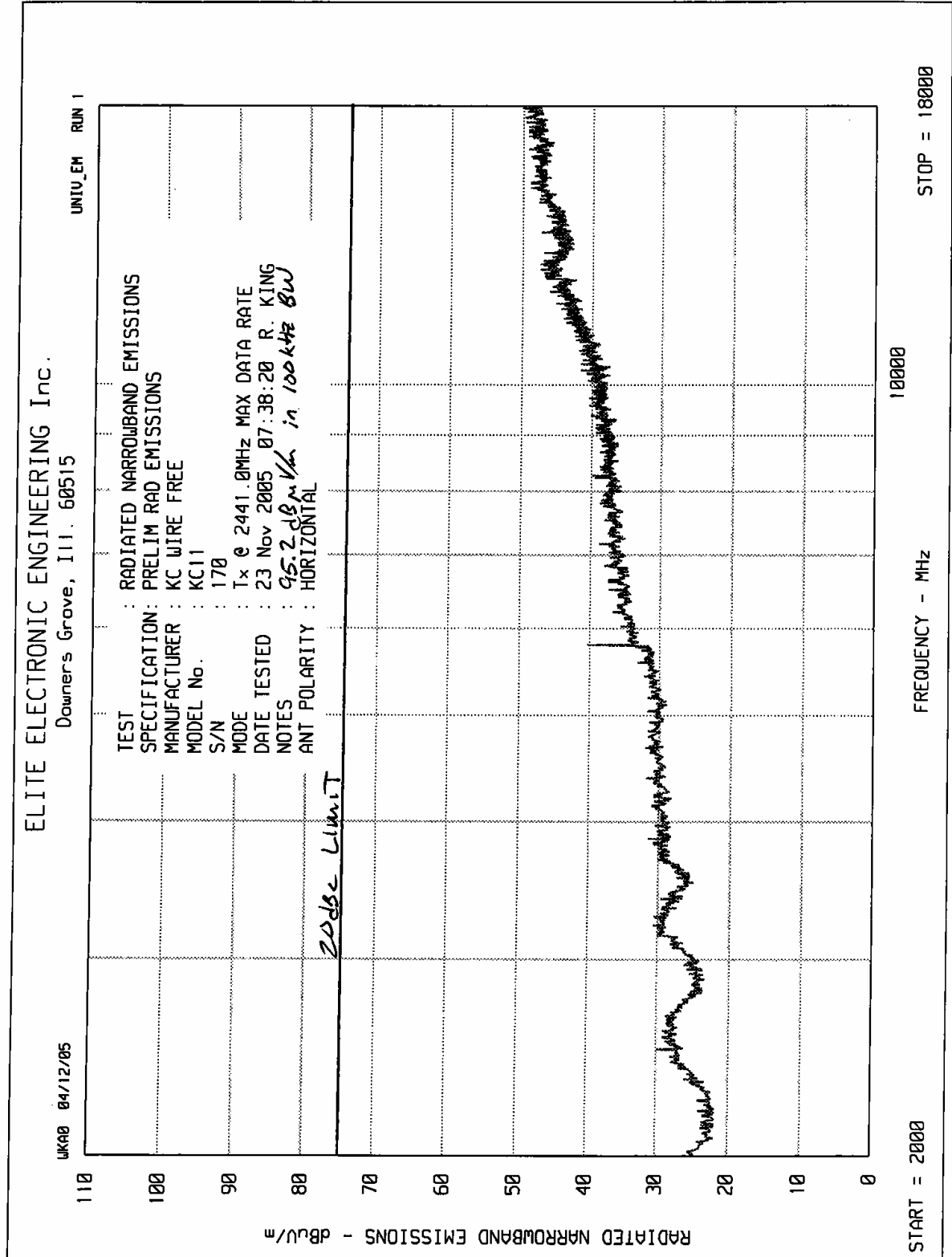


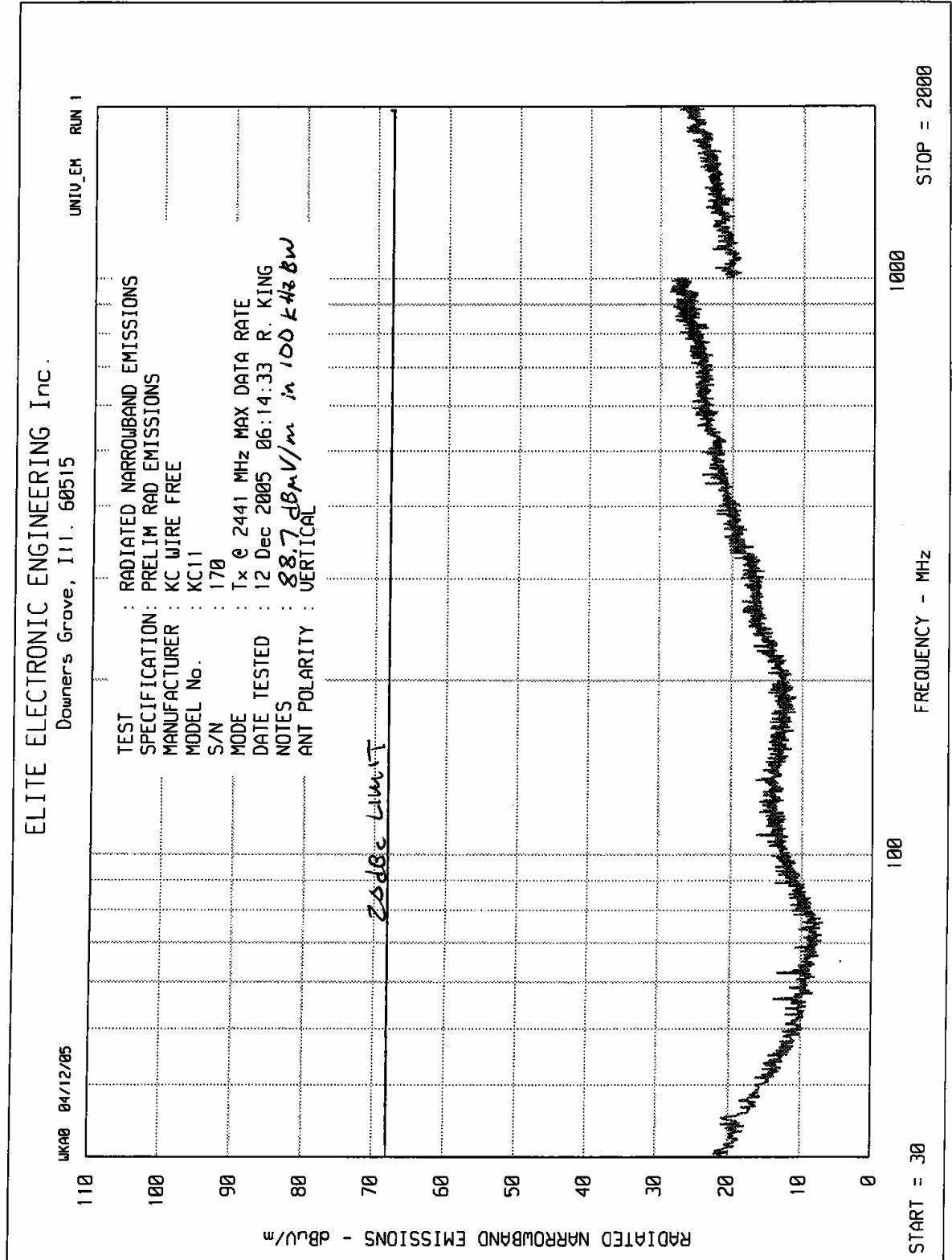


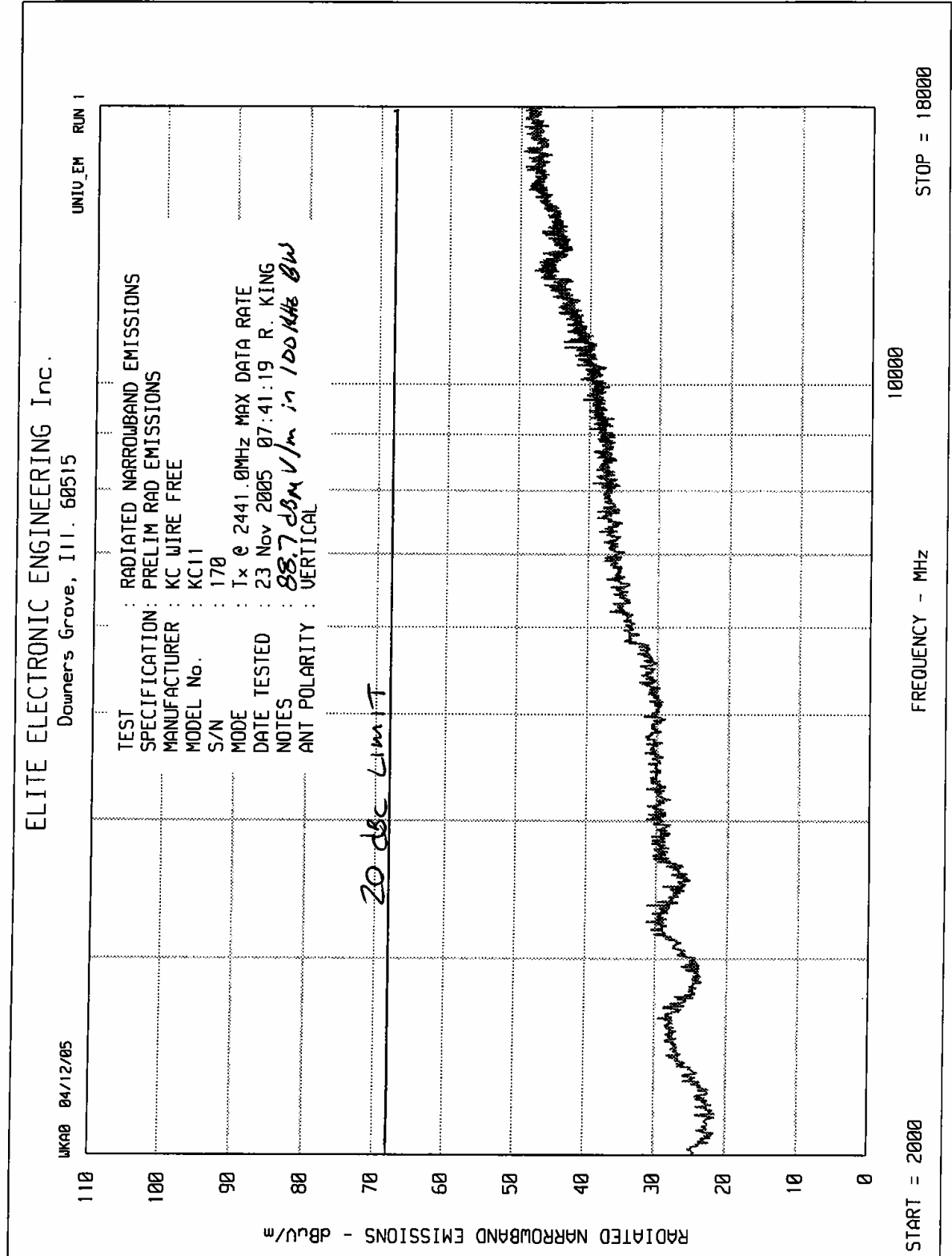


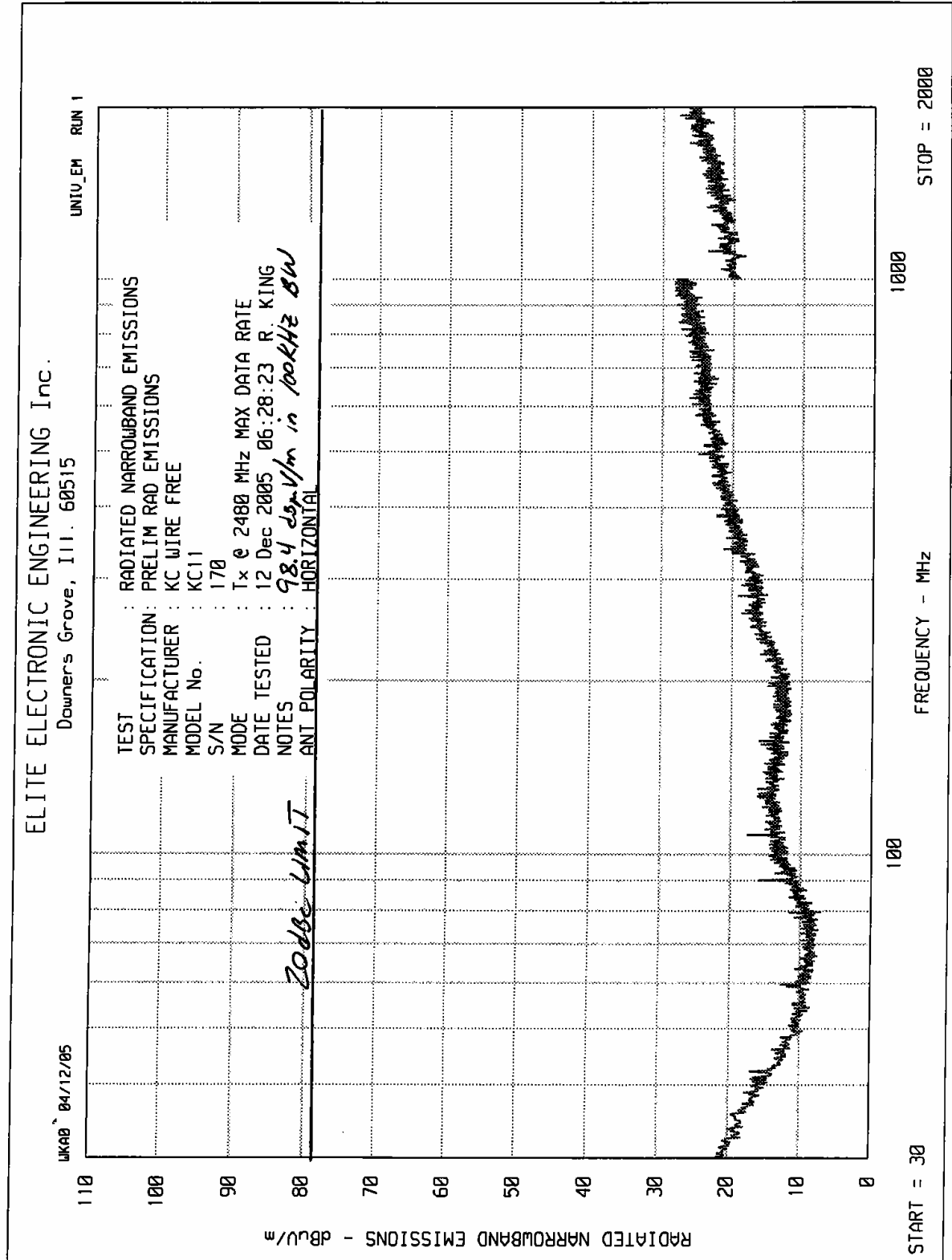


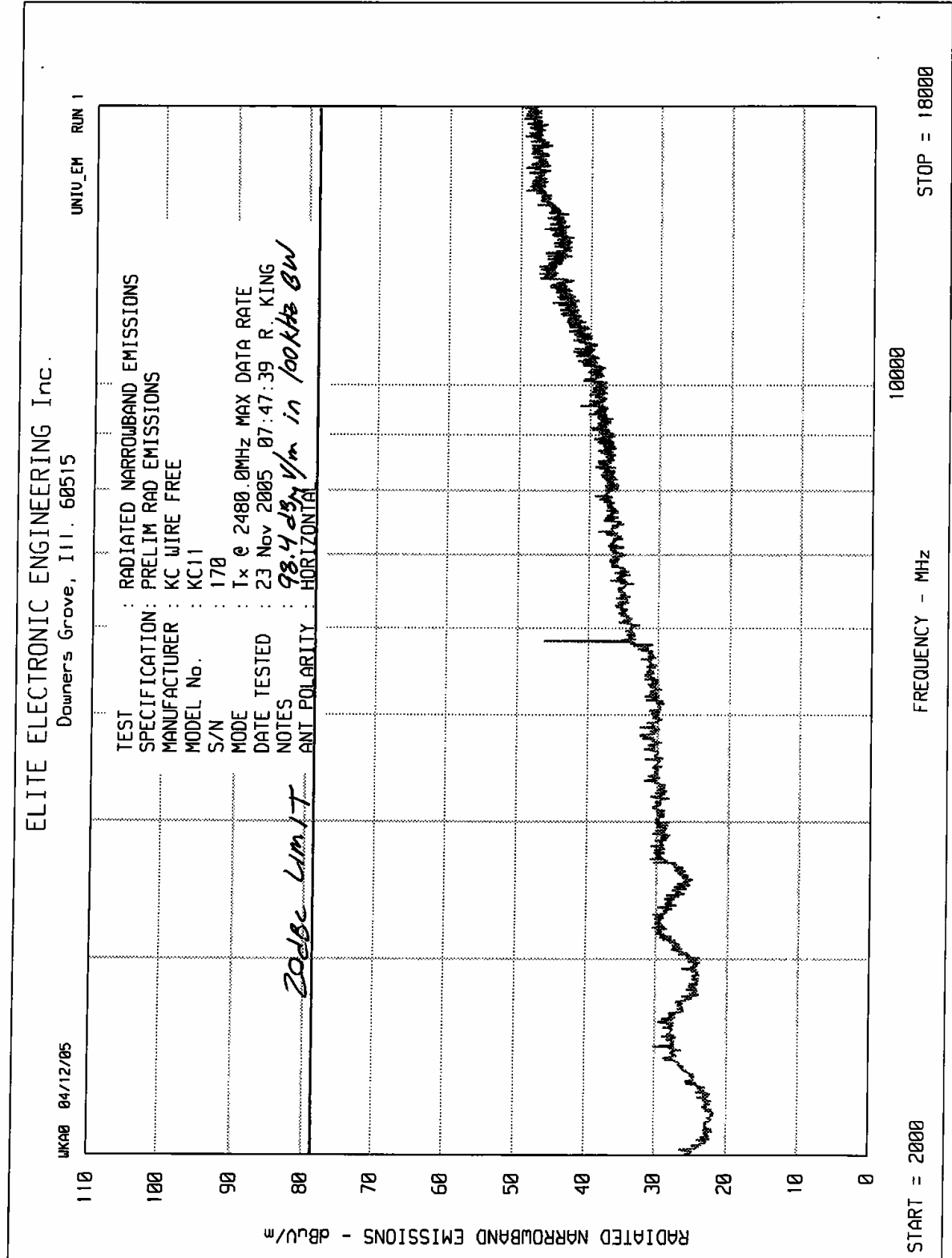


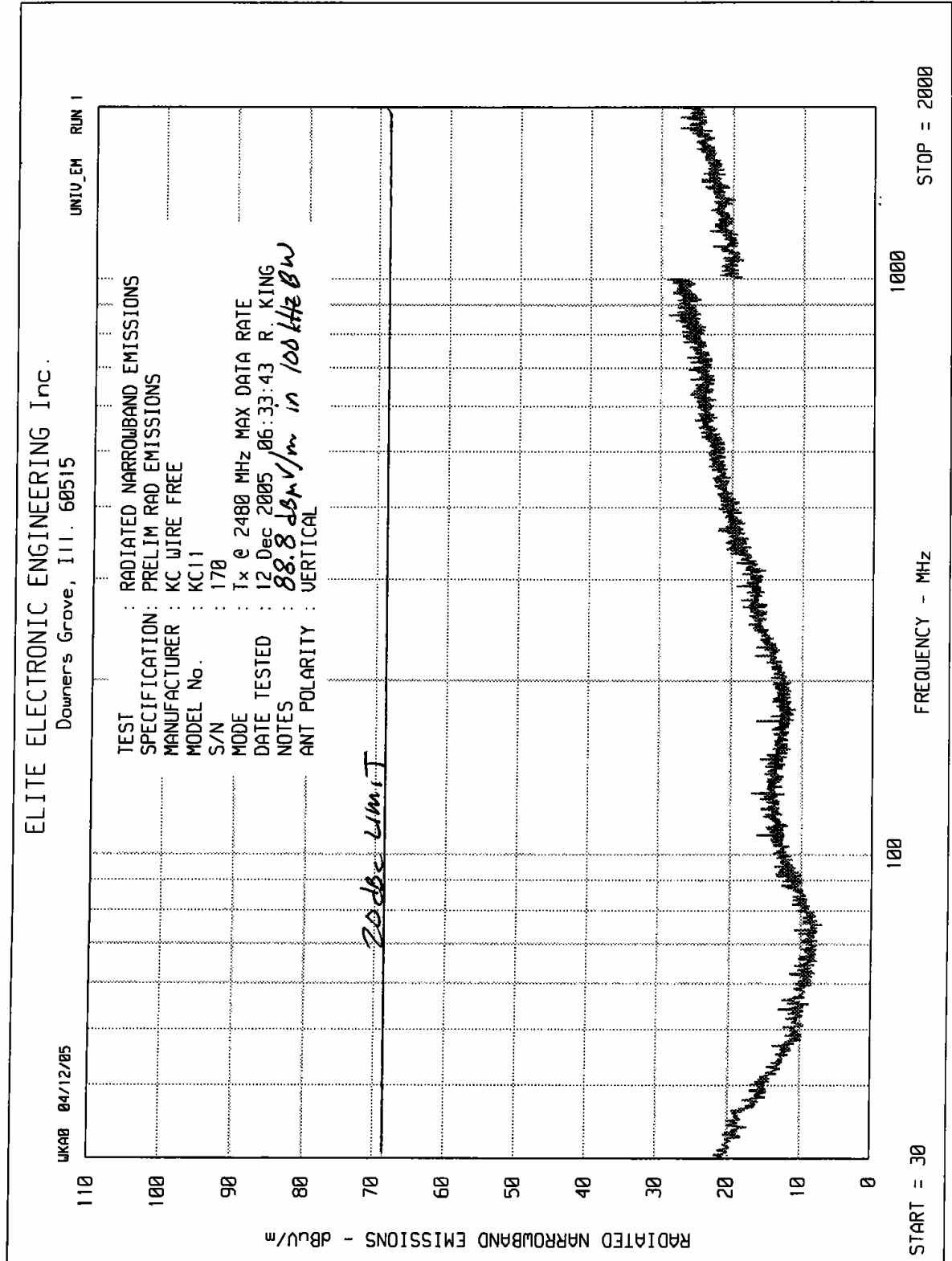


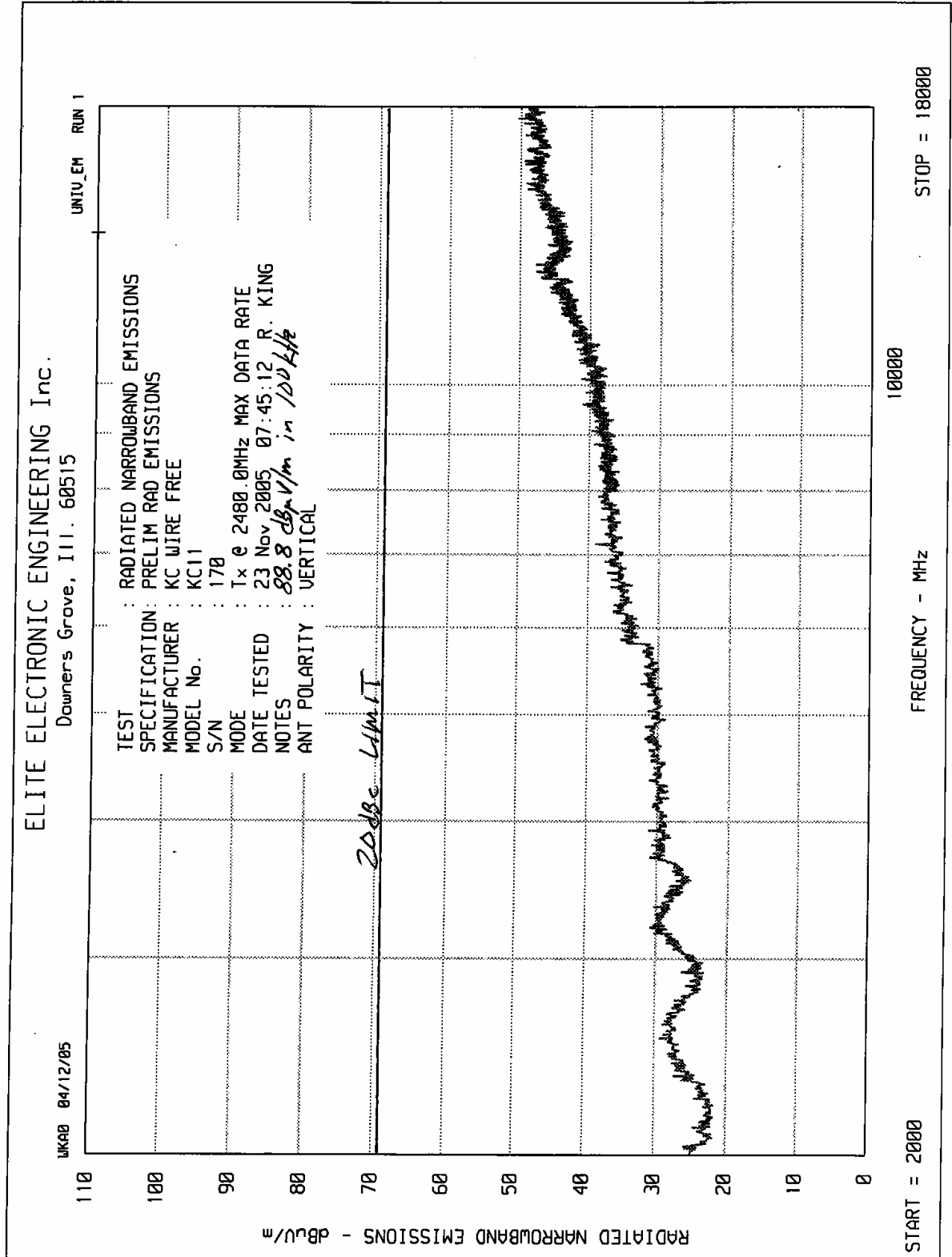














Data Sheet

MANUFACTURER : KC Wire Free
MODEL : KC11
S/N : 170
SPECIFICATION : FCC Part 15, Subpart C, Section 15.247
Radiated Spurious Emissions Measurement
DATE : December 12, 2005
NOTES : Transmitting at 2402MHz
: TEST DISTANCE IS 3 METERS

FREQ. MHz	ANT. POL.	MTR. RDG. dBuV	AMBIENT	B.W. RBW/VBW Hz	ANT FACT. dB	CBL LOSS dB	PRE. AMP. dB	TOTAL dBuV/m	TOTAL uV/m	15.209 Limit dBuV/m
2402.0	H	98.4		3M/3M	29.3	3.5	-34.5	96.7	68497.1	
	V	90.6		3M/3M	29.3	3.5	-34.5	88.9	27904.4	
4804.0	H	28.2	AMB	1M/10	34.8	4.9	-34.5	33.5	47.1	500.0
	V	28.2	AMB	1M/10	34.8	4.9	-34.5	33.5	47.1	500.0
12010.0	H	28.3	AMB	1M/10	41.4	2.0	-34.8	36.9	70.0	500.0
	V	28.2	AMB	1M/10	41.4	2.0	-34.8	36.8	69.2	500.0
19216.0	H	10.2	AMB	1M/10	40.3			50.5	335.0	500.0
	V	10.5	AMB	1M/10	40.3			50.8	346.7	500.0

Checked BY : Richard E. King

Richard E. King



Data Sheet

MANUFACTURER : KC Wire Free
MODEL : KC11
S/N : 170
SPECIFICATION : FCC Part 15, Subpart C, Section 15.247
Radiated Spurious Emissions Measurement
DATE : December 12 , 2005
NOTES : Transmitting at 2441MHz
: TEST DISTANCE IS 3 METERS

FREQ. MHz	ANT. POL.	MTR. RDG. dBuV	AMBIENT	B.W. RBW/VBW Hz	ANT FACT. dB	CBL LOSS dB	PRE. AMP. dB	TOTAL dBuV/m	TOTAL uV/m	15.209 Limit dBuV/m
2441.0	H	99.2		3M/3M	31.8	3.5	-34.5	97.6	76225.6	
	V	92.4		3M/3M	31.8	3.5	-34.5	90.8	34841.8	
4882.0	H	28.2	AMB	1M/10	35.2	5.0	-34.5	33.7	48.5	500.0
	V	28.2	AMB	1M/10	35.2	5.0	-34.5	33.7	48.5	500.0
7323.0	H	27.6	AMB	1M/10	38.0	6.7	-34.6	37.9	79.0	500.0
	V	27.8	AMB	1M/10	38.0	6.7	-34.6	38.1	80.6	500.0
12205.0	H	27.9	AMB	1M/10	41.4	2.0	-34.8	36.5	66.8	500.0
	V	27.6	AMB	1M/10	41.4	2.0	-34.8	36.2	64.6	500.0
19528.0	H	10.1	AMB	1M/10	40.3			50.4	331.1	500.0
	V	10.1	AMB	1M/10	40.3			50.4	331.1	500.0

Checked BY : RICHARD E. King

Richard E. King



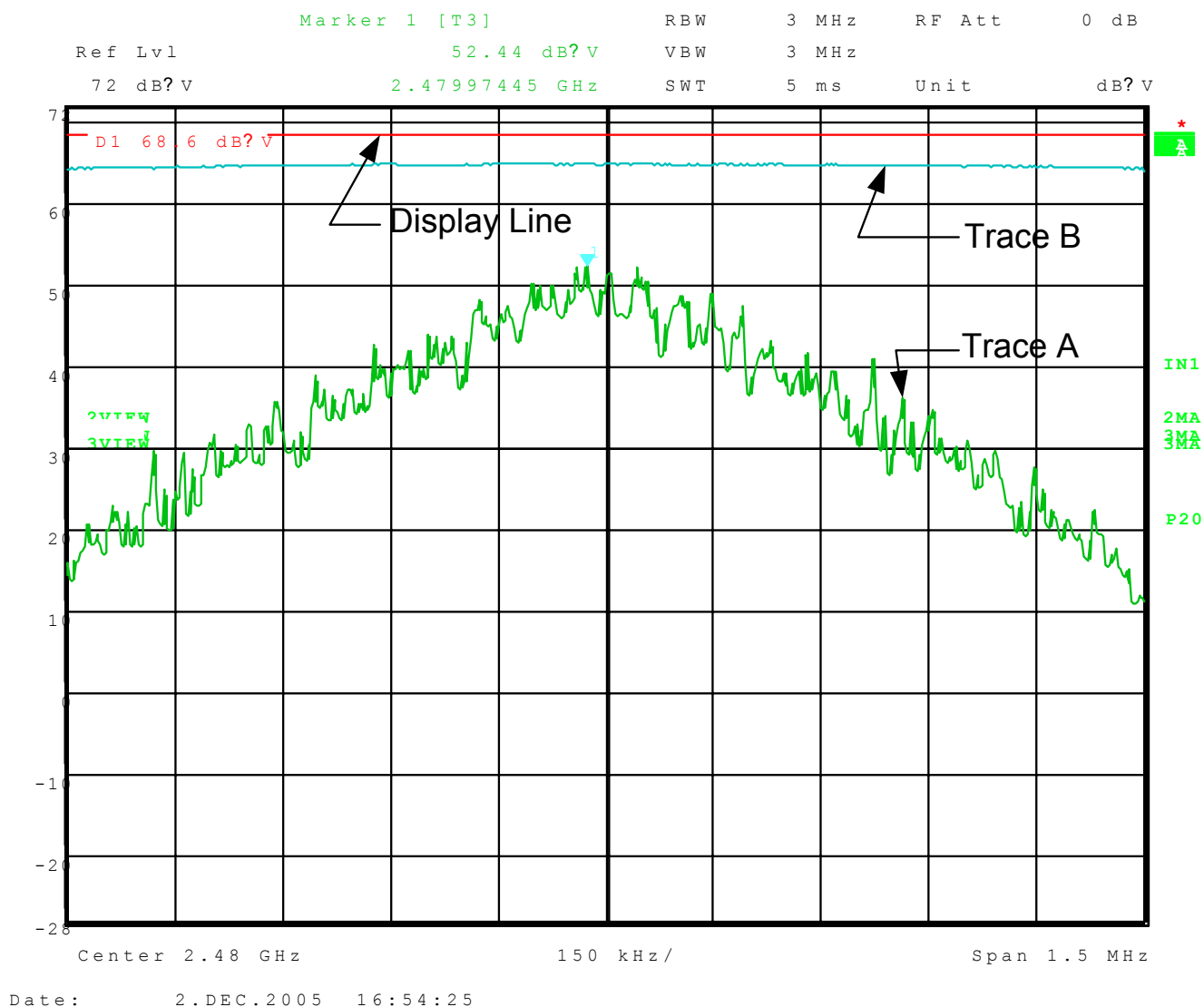
Data Sheet

MANUFACTURER : KC Wire Free
MODEL : KC11
S/N : 170
SPECIFICATION : FCC Part 15, Subpart C, Section 15.247
Radiated Spurious Emissions Measurement
DATE : December 12, 2005
NOTES : Transmitting at 2480MHz
: TEST DISTANCE IS 3 METERS

FREQ. MHz	ANT. POL.	MTR. RDG. dBuV	AMBIENT	B.W. RBW/VBW Hz	ANT FACT. dB	CBL LOSS dB	PRE. AMP. dB	TOTAL dBuV/m	TOTAL uV/m	15.209 Limit dBuV/m
2480.0	H	103.4		3M/3M	29.5	3.5	-34.5	102.0	125437.6	
	V	93.0		3M/3M	29.5	3.5	-34.5	91.6	37881.6	
4960.0	H	23.6	AMB	1M/10	35.2	5.0	-34.5	29.3	29.2	500.0
	V	25.7	AMB	1M/10	35.2	5.0	-34.5	31.4	37.2	500.0
7440.0	H	25.2	AMB	1M/10	38.5	6.7	-34.6	35.8	61.9	500.0
	V	24.8	AMB	1M/10	38.5	6.7	-34.6	35.4	59.1	500.0
12400.0	H	25.5	AMB	1M/10	41.4	2.0	-34.8	34.1	50.7	500.0
	V	25.6	AMB	1M/10	41.4	2.0	-34.8	34.2	51.3	500.0
19840.0	H	10.1	AMB	1M/10	40.3			50.4	331.1	500.0
	V	10.2	AMB	1M/10	40.3			50.5	335.0	500.0
22320.0	H	10.5	AMB	1M/10	40.4			50.9	350.8	500.0
	V	10.5	AMB	1M/10	40.4			50.9	350.8	500.0

Checked BY : RICHARD E. KING

Richard E. King



MANUFACTURER : KC WIRE FREE
MODEL NO. : KC11 W/KC121
SERIAL NO. : 170
TEST PERFORMED : FCC 15.247 POWER SPECTRAL DENSITY
MODE : INQUIRY MODE
NOTES : DISPLAY LINE REPRESENTS +8dBm LIMIT
: TRACE A REPRESENTS MAXIMUM OUTPUT IN A 3kHz BW
: TRACE B REPRESENTS REFERENCE MAXIMUM OUTPUT IN
: 3MHz BW (4.3dBm)