

BLUETOOTH TRANSMITTER

The test report for the Bluetooth 2.4 GHz Spread Spectrum transmitter follows:

ELITE ELECTRONIC ENGINEERING INC.
1516 CENTRE CIRCLE
DOWNERS GROVE, ILLINOIS 60515-1082

ELITE PROJECT: 31469 DATES TESTED: September 11-13, 2002 and
October 15-17, 2002

TEST PERSONNEL: Richard E. King

TEST 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

ENGINEERING TEST REPORT NO. 31469-01


MEASUREMENTS OF RF EMISSIONS

FROM THE MOTOROLA A830 BLUETOOTH F.H.S.S. TRANSMITTER

FOR: Motorola
Rolling Meadows, Illinois

PURCHASE ORDER NO.: NP540349

Report By:


Richard E. King
EMC Engineer

Approved By:


Raymond J. Klouda
Registered Professional
Engineer of Illinois - 44894

ENGINEERING TEST REPORT NO. 31469-01

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

DESCRIPTION OF TEST ITEM: Bluetooth FHSS Transmitter in a PCS
Cell Phone

MODEL NO. :A830

SERIAL NO.: 76A0023

FCC ID NO. : None given.

MANUFACTURER: Motorola

APPLICABLE

SPECIFICATION: FCC "Code of Federal Regulations", Title 47, Part 15,
Subpart C, Sec. 15.247

TEST PERFORMED BY: ELITE ELECTRONIC ENGINEERING INC.
Downers Grove, Illinois 60515

DATES TESTED: September 11-13 and October 15-17, 2002

PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):

WITNESS: No Motorola personnel were present during the testing.

ELITE ELECTRONIC: Richard E. King

ELITE JOB NO.: 31469

ABSTRACT: The model A830 Bluetooth Transmitter meets the requirements of the FCC "Code of Federal Regulations", Title 47, Part 15, Subpart C, Section 15.247 for bluetooth spread spectrum transmitters. The carrier frequency separation, number of hopping frequencies, time of occupancy (dwell time), 20 dB bandwidth, peak output power, band-edge compliance, and spurious emissions and power spectral density were measured and found to comply with the requirements.

See the test results and data pages for more details.

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MEASUREMENT OF RF EMISSIONS

FROM AN A830 BLUETOOTH FHSS TRANSMITTER

1.0 INTRODUCTION:

1.1 DESCRIPTION OF TEST ITEM: This report presents the results of the RF emissions measurements performed for the model A830 Bluetooth spread spectrum transmitter, (hereinafter referred to as the test item). The tests were performed for Motorola located in Libertyville, Illinois.

The test item is a frequency hopping spread spectrum transceiver (FHSS) used for bluetooth applications. It operates in the frequency band 2400 to 2483.5MHz.

1.2 PURPOSE: The test series was performed to determine if the test item would meet the selected requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for intentional radiators.

1.3 DEVIATIONS, ADDITIONS AND EXCLUSIONS: There were no deviations from the test requirements.

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 (FCC) "Code of Federal Regulations", Title 47, Part 15, dated 1 October 2001

FCC Public Notice, DA 00-705, "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems", Released March 30, 2000

1.5 SUBCONTRACTOR IDENTIFICATION: This series of tests was performed by the Elite Electronic Engineering Inc., of Downers Grove,

Illinois.

2.0 TEST ITEM SETUP AND OPERATION:

For all tests the test item was placed on a 0.8 meter high non-conductive table. The 3.6VDC was supplied to the test item from an HP 6033A power supply. The test item is supplied with an internal antenna.

3.0 TEST SITE AND INSTRUMENTATION:

3.1 TEST SITE: All tests were performed at Elite's facility in Downers Grove, Illinois. All tests were performed in a hybrid anechoic/ferrite tile shielded enclosure.

3.2 TEST INSTRUMENTATION: 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.

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.1 POWER LINE CONDUCTED EMISSIONS:

4.1.1 REQUIREMENT: This requirement does not apply since the test item is battery operated. There are no operation modes where the transmitter can be connected to the AC power public utilities, and therefore, the conducted emissions test is not required.

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 setup 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 was 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: Data page 16 shows the carrier frequency separation. As can be seen from this plot, the separation is 1MHz, which is greater than the 20dB bandwidth (835kHz).

4.3 NUMBER OF HOPPING FREQUENCIES:

4.3.1 REQUIREMENTS: Per section 15.247(a)(1)(ii), frequency hopping systems shall use at least 75 hopping frequencies.

4.3.2 PROCEDURE: 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 \geq to 1% of the span. The peak detector and 'Max-Hold' function was engaged. The span was set wide enough to capture the entire frequency band of operation.

When the trace had stabilized 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: Data page 17 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 of 75.

4.4 TIME OF OCCUPANCY (DWELL TIME):

4.4.1 REQUIREMENTS: Per section 15.247(a)(1)(ii), the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

4.4.2 PROCEDURE: 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 was 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 expanded to capture the average time between hops. When the trace had stabilized after multiple scans, the time between hops was measured. The analyzer's display was plotted using a 'screen dump' utility.

The dwell time in a 30 second period was then calculated from dwell time per hop divided by time between hops then multiplied by 30 seconds. The dwell time in a 30 second period was then divided by the number of frequency hopping channels to give the dwell time of a single frequency hopping channel.

4.4.3 RESULTS: Data pages 18 and 19 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 136.3 usec burst every 19.8 msec's multiplied by a 30 second period. This calculated value is equal to 0.206 seconds which is less than the 0.4 seconds allowed.

4.5 20 dB BANDWIDTH:

4.5.1 REQUIREMENTS: Per section 15.247(a)(1)(ii), the

maximum 20dB bandwidth of the hopping channel is 1MHz.

4.5.2 PROCEDURE: 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 20 through 22 show that the maximum 20 dB bandwidth was 0.835 MHz. The 20 dB bandwidth was less than the 1.0MHz maximum requirement.

4.6 PEAK OUTPUT POWER:

4.6.1 REQUIREMENTS: This requirement applies only to the transmit mode of operation. Per section 15.247(b) the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.6.2 PROCEDURES: Since the antenna was an integrated antenna the equivalent isotropic radiated power (EIRP) was computed from the radiated field strength measurements at 3 meters.

The spectrum analyzer bandwidth was set to 3 MHz which is greater than the 20dB bandwidth of the transmitter. A double ridged waveguide antenna was positioned 3 meters from the test item. The maximum meter reading was recorded for the vertical and horizontal

receiver antenna polarity while rotating the test item through 360 degrees. The EIRP was calculated for the low, middle and high hopping frequencies.

4.6.3 RESULTS: The results are presented on data page 23. The maximum EIRP measured from the transmitter was -1.5 dBm. Therefore, the transmitter meets the De Facto 36 dBm limit. Only one type of antenna is supplied with the test item.

4.7 BAND-EDGE COMPLIANCE:

4.7.1 REQUIREMENTS: 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 PROCEDURE: The same data recorded for the low and high hopping frequencies from the 20 dB bandwidth measurements was used to demonstrate compliance with the 20 dB band-edge requirements.

For the radiated 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.

4.7.3 RESULTS: Data pages 24 and 25 show the band-edge

compliance results using the marker-delta method. As can be seen from this plots, the emissions at the band-edge in the restricted band are within the general limits.

4.8 SPURIOUS EMISSIONS:

4.8.1 REQUIREMENTS: Per section 15.247(c), the spurious emissions in any 100 kHz BW outside the frequency band must be at least 20dB below the highest 100 kHz BW level measured within the band. In addition, the radiated emissions which fall in the restricted bands must meet the general limits of 15.209.

4.8.2 PROCEDURES: Since the test item was supplied with a permanently attached antenna, the spurious emissions compliance was evaluated against the radiated emissions levels for unrestricted bands as well as the restricted bands.

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. Frequency range 18 to 24 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 these measurements, the measurement bandwidths were 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.

4.8.3 RESULTS: The peak preliminary radiated emissions level plots are presented on data pages 26 through 34. These plots show that the spurious emissions were below the general limits.

The ambient level plots with only the external power supply on were also presented on Data Pages 35 and 36 for reference.

The harmonics and any other emissions that fall in the restricted frequency bands were then re-measured manually. This data is shown in the tables on data Pages 37 through 39. The field intensities levels for the harmonics in the restricted band were within the general limit.

A block diagram of the test item orientation position is shown in Figure 1.

4.9 POWER SPECTRAL DENSITY:

4.9.1 REQUIREMENTS: 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. This requirement apply only to inquiry or acquisition mode when direct sequence spread spectrum techniques are used.

4.9.2 PROCEDURE: The test item was setup inside the chamber. The test item was put into inquiry or acquisition mode.

The resolution bandwidth (RBW) was initially set to 3MHz to set the EIRP reference level. Knowing the EIRP peak level, the result of this plot was used to determine the 8dBm limit.

The resolution bandwidth (RBW) was set to 3kHz, the sweep time was set to the span divided by 3kHz (1MHz/3kHz = 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: Data page 40 shows the power spectral density results for the inquiry mode. As can be seen from this plot, the peak power density is less than 8dBm in a 3kHz band during any time interval of continuous transmission.

5.0 CONCLUSION:

The Motorola model A830 Bluetooth transmitter does meet the limits imposed by 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 Inc. certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specification.

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.

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

ENGINEERING TEST REPORT NO. 31469-01

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								
XZG3	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2421A03059	---		N/A	
Equipment Type: AMPLIFIERS								
APH0	POWER AMPLIFIER	HEWLETT PACKARD	11975A	2304A00322	2-8GHZ		NOTE 1	
APK3	PREAMPLIFIER	AGILENT TECHNOL	8449B	3008A01593	1-26.5GHZ	05/09/02	12	05/09/03
Equipment Type: ANTENNAS								
NHGO	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ		NOTE 1	
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	06/25/02	12	06/25/03
NWH0	RIDGED WAVE GUIDE	TENSOR	4105	2081	1-12.4GHZ	08/25/02	12	08/25/03
NW10	RIDGED WAVE GUIDE	AEL	H1498	153	2-18GHZ	08/09/02	12	08/09/03
Equipment Type: CONTROLLERS								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---		N/A	
CDN3	COMPUTER	GATEWAY	PRO700C	0022368722	700MHZ		N/A	
Equipment Type: PRINTERS AND PLOTTERS								
HRE1	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061052	---		N/A	
HRG7	LASERJET 2100	HEWLETT PACKARD	C1470A	USGG109762	---		N/A	
Equipment Type: RECEIVERS								
RAC2	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3638A08770	100HZ-22GHZ	02/21/02	12	02/21/03
RACD	RF PRESELECTOR	HEWLETT PACKARD	85685A	3010A01205	20HZ-2GHZ	02/21/02	12	02/21/03
RAE1	SPECTRUM ANALYZER (DCC-CEM)	HEWLETT PACKARD	85660A	2209A01336	100HZ-22GHZ	02/14/02	12	02/14/03
RAF4	QUASIPeAK ADAPTER	HEWLETT PACKARD	85650A	2043A00320	0.01-1000MHZ	06/13/02	12	06/13/03
RAH0	FREQUENCY MIXER	HEWLETT PACKARD	11970K	2332A00270	18-26GHZ		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.
ETR 31469-01
Radiated Emissions Test Setup Anechoic Ferrite Chamber

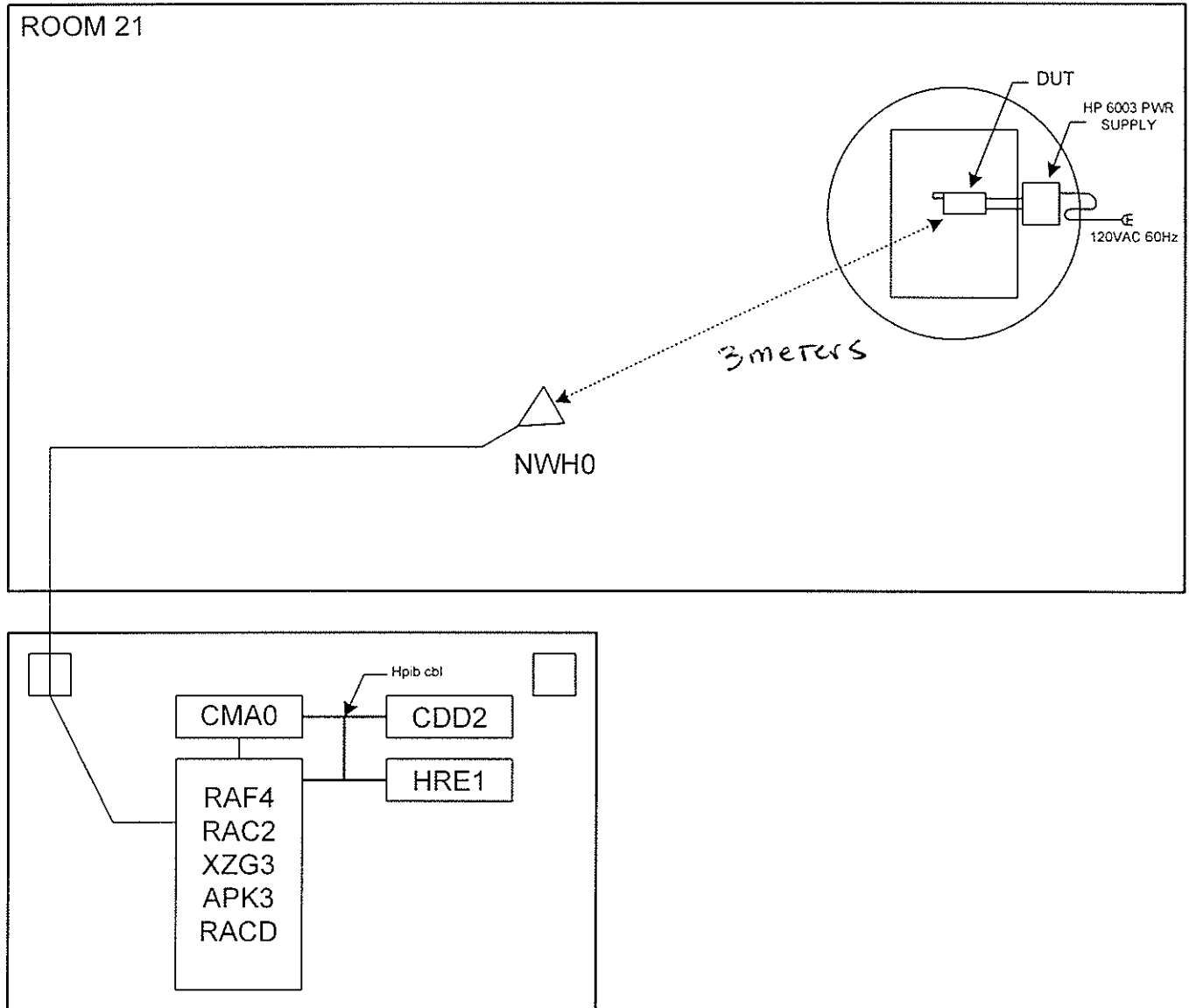
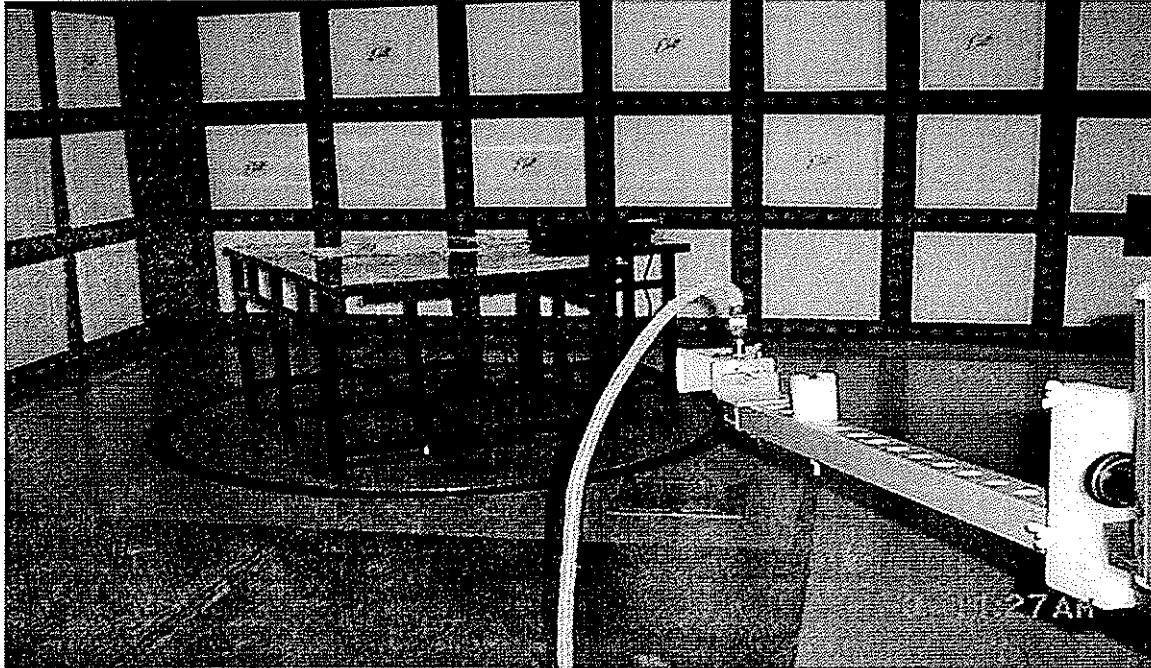
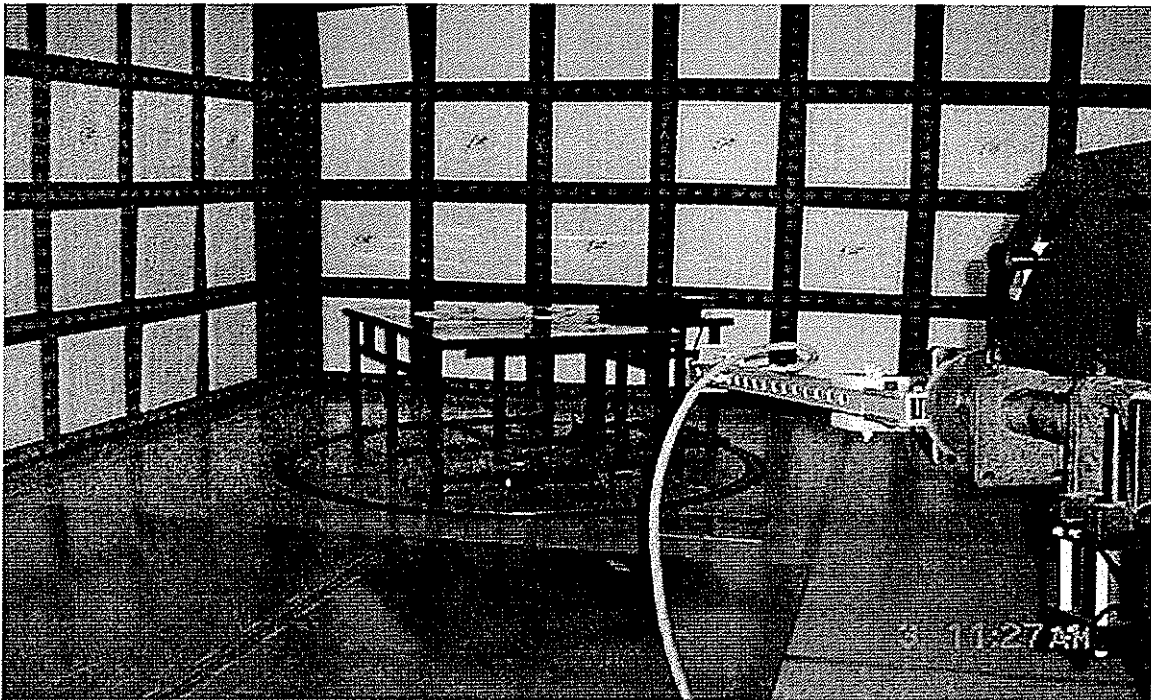


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2



Radiated Emissions Worst Case Horizontal Polarization



Radiated Emissions Worst Case Vertical Polarization

Page ____ of ____.

ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 117.0 dBuV

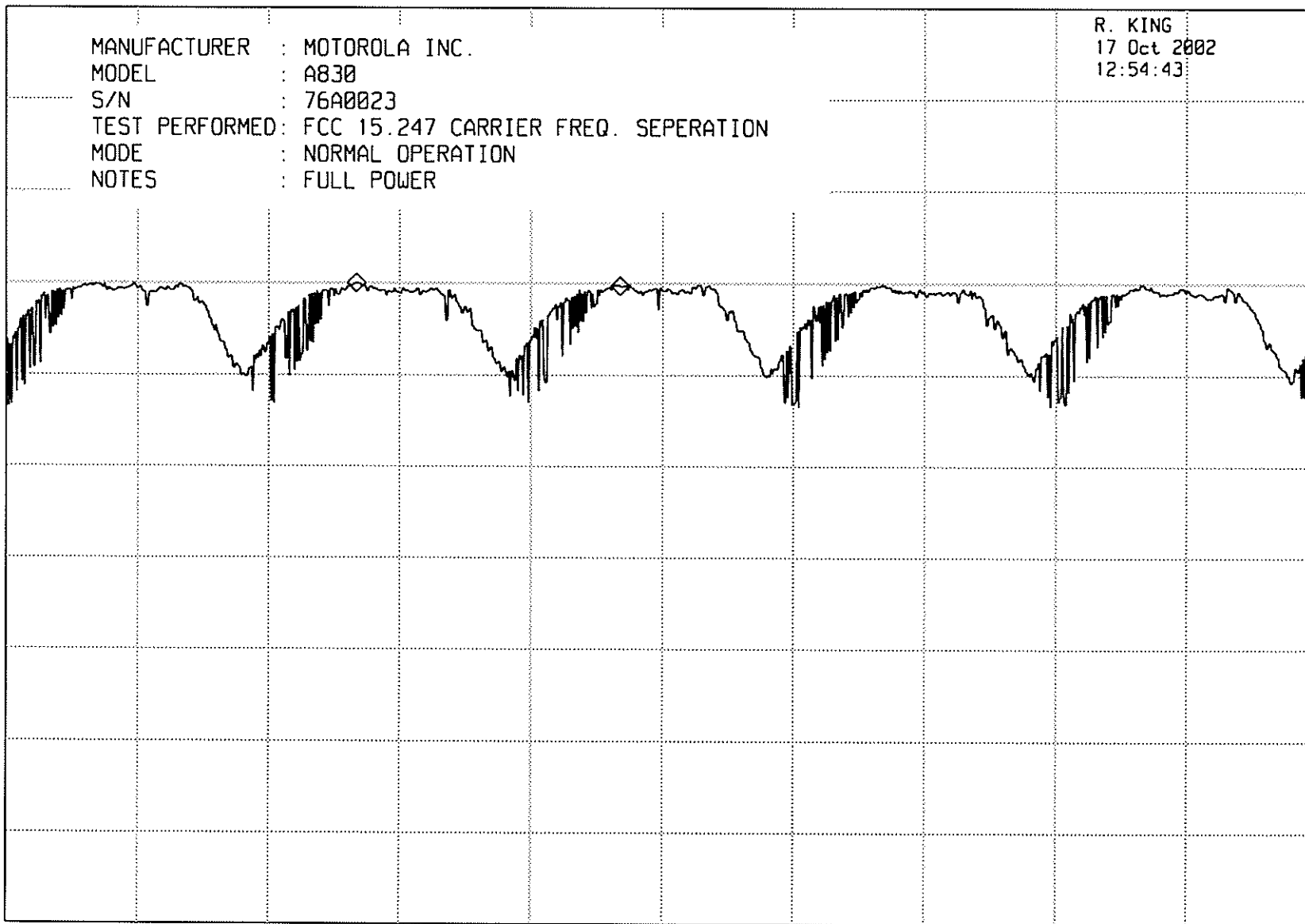
ATTEN 20 dB

MKR ^ 1.005 MHz
-0.30 dB

10 dB/

MANUFACTURER : MOTOROLA INC.
MODEL : A830
S/N : 76A0023
TEST PERFORMED: FCC 15.247 CARRIER FREQ. SEPERATION
MODE : NORMAL OPERATION
NOTES : FULL POWER

R. KING
17 Oct 2002
12:54:43



ETR 31469-01

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CENTER 2.441 00 GHz

RES BW 300 kHz(i)

VBW 3 MHz

SPAN 5.00 MHz

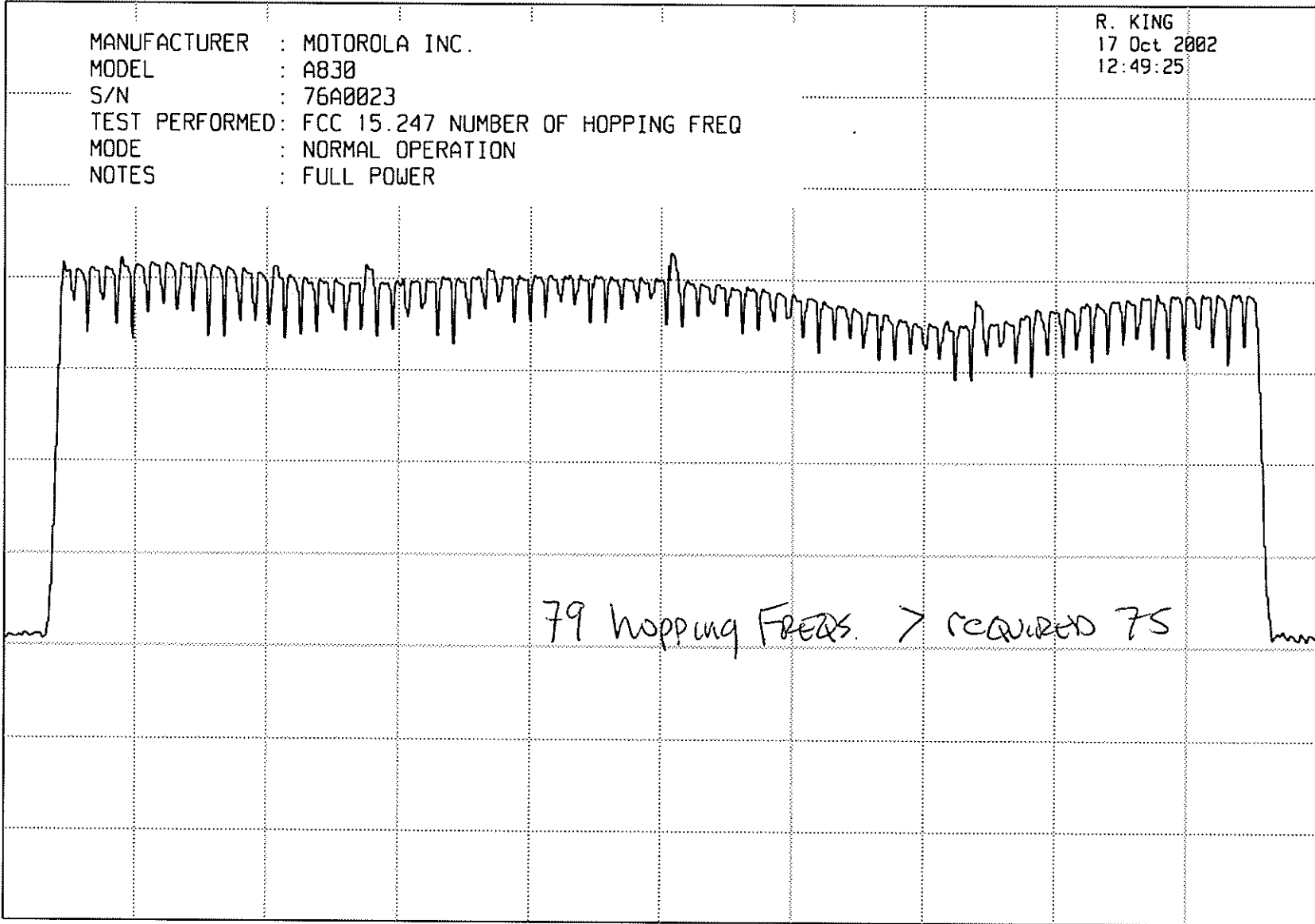
SWP 20.0 msec

ELITE ELECTRONIC ENGINEERING Inc.

hp REF 117.0 dBuV ATTEN 20 dB

MANUFACTURER : MOTOROLA INC.
MODEL : A830
S/N : 76A0023
TEST PERFORMED: FCC 15.247 NUMBER OF HOPPING FREQ
MODE : NORMAL OPERATION
NOTES : FULL POWER

R. KING
17 Oct 2002
12:49:25



ETR 3469-01

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START 2.398 0 GHz

RES BW 300 kHz(i)

VBW 3 MHz

STOP 2.485 0 GHz

SWP 20.0 msec

ELITE ELECTRONIC ENGINEERING Inc.

hp

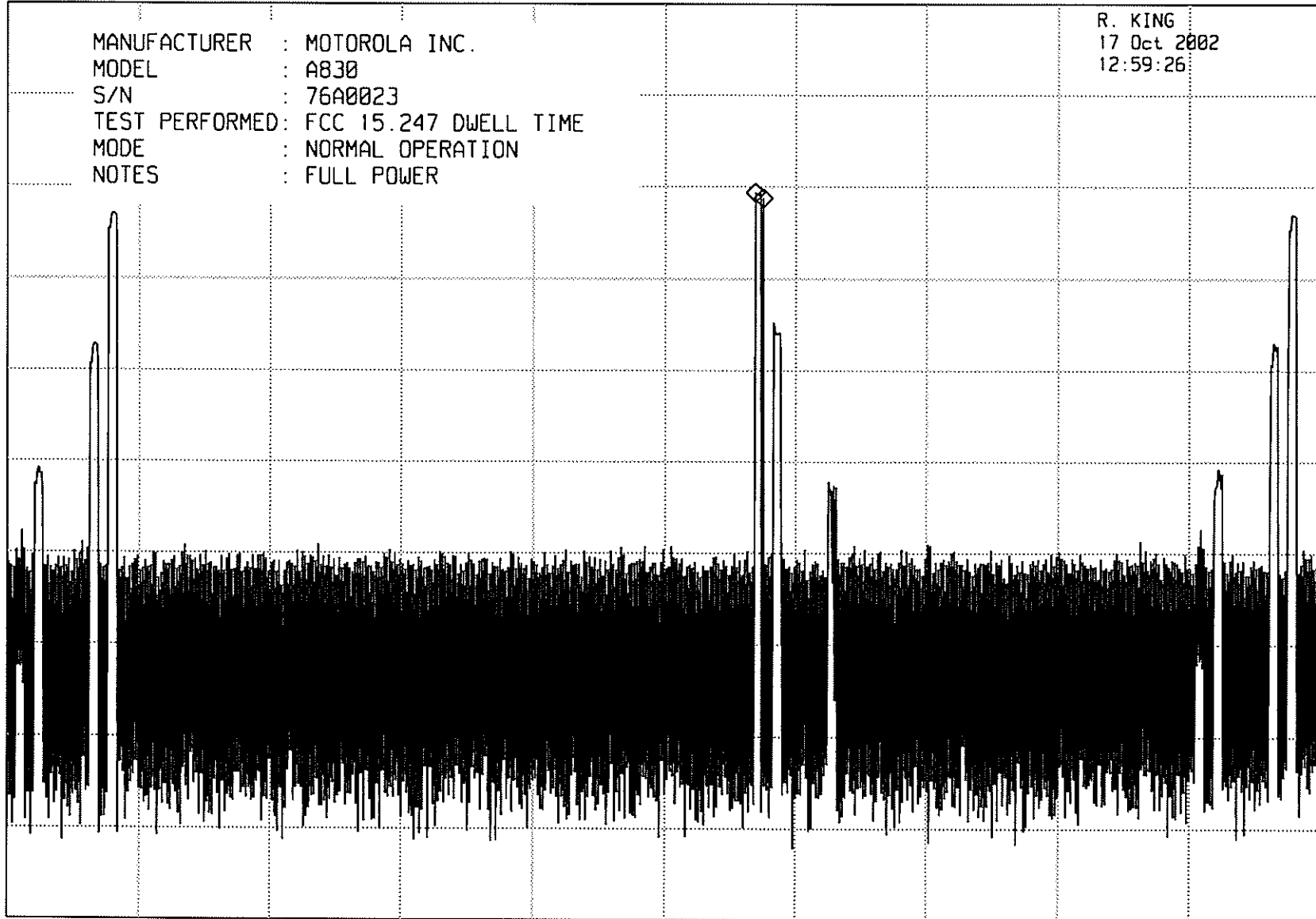
REF 0.0 dBm

ATTEN 10 dB

MKR ^ 132.3 usec

-0.60 dB

10 dB/



ETP 31469-01

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CENTER 2.441 000 000 GHz

RES BW 3 MHz(i)

VBW 3 MHz

SPAN 0 Hz

SWP 22.1 msec

ELITE ELECTRONIC ENGINEERING Inc.

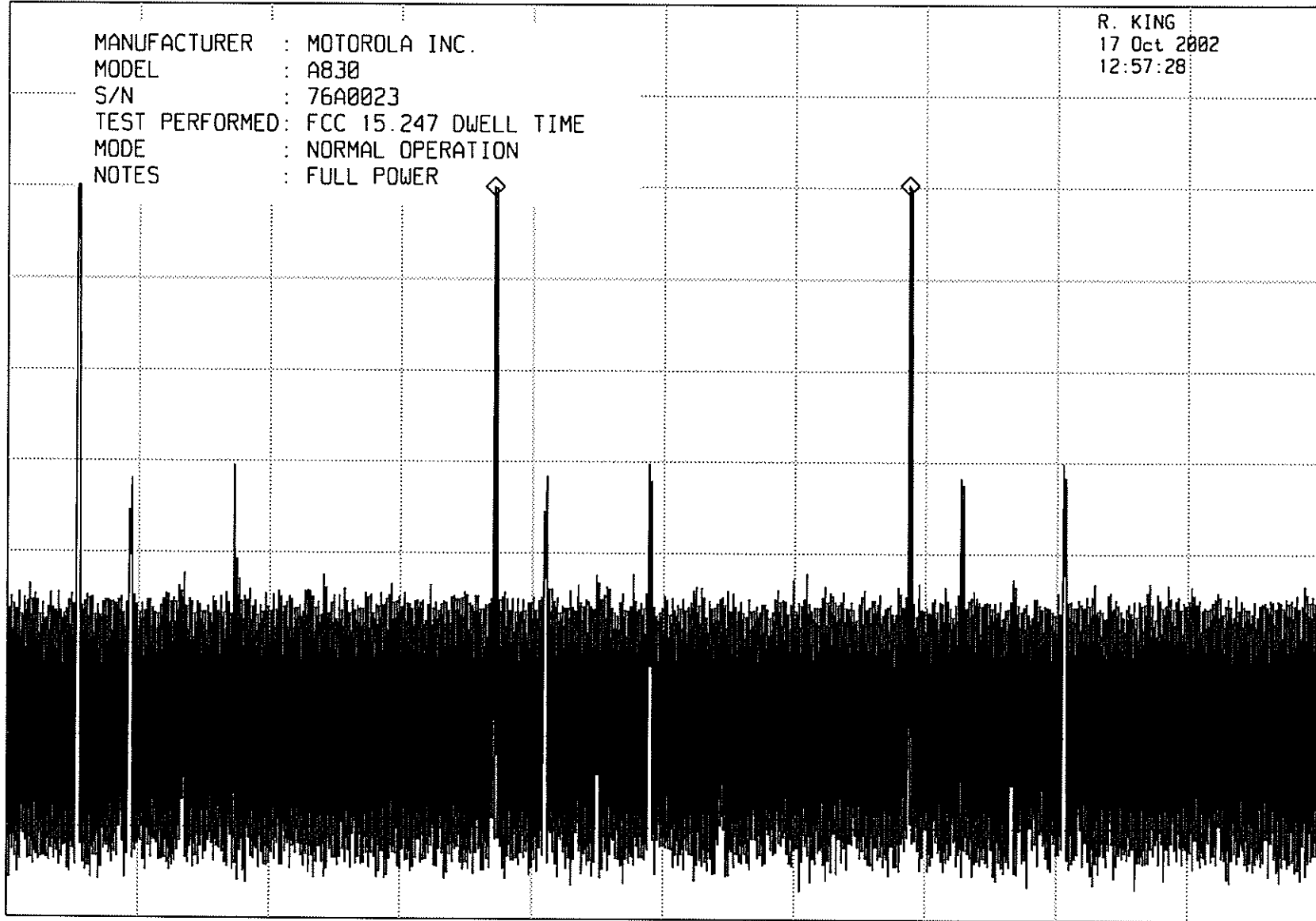
hp REF 107.0 dBuV ATTEN 10 dB

MKR ^-19.8 msec
-0.20 dB

10 dB/

MANUFACTURER : MOTOROLA INC.
MODEL : A830
S/N : 76A0023
TEST PERFORMED: FCC 15.247 DWELL TIME
MODE : NORMAL OPERATION
NOTES : FULL POWER

R. KING
17 Oct 2002
12:57:28



CENTER 2.441 000 000 GHz SPAN 0 Hz
RES BW 1 MHz(i) VBW 3 MHz SWP 62.5 msec

ETR 31469-01

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ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 0.0 dBm

ATTEN 10 dB

MKR ^ 820 kHz

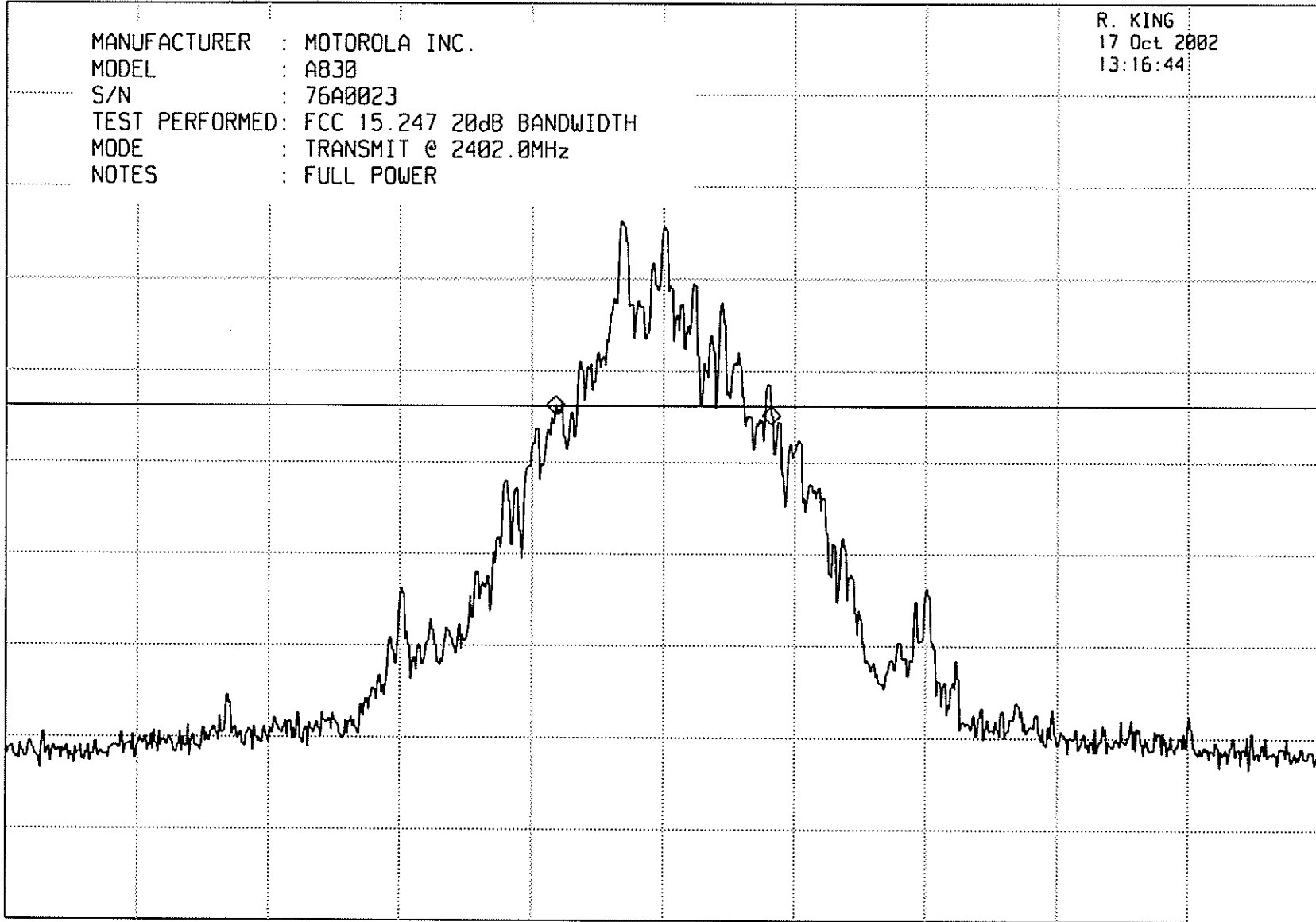
-1.10 dB

10 dB/

MANUFACTURER : MOTOROLA INC.
MODEL : A830
S/N : 76A0023
TEST PERFORMED: FCC 15.247 20dB BANDWIDTH
MODE : TRANSMIT @ 2402.0MHz
NOTES : FULL POWER

R. KING
17 Oct 2002
13:16:44

DL
-43.9
dBm



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CENTER 2.402 00 GHz

RES BW 10 kHz(i)

VBW 100 kHz

SPAN 5.00 MHz

SWP 375 msec

ELITE ELECTRONIC ENGINEERING Inc.

hp REF 0.0 dBm ATTEN 10 dB

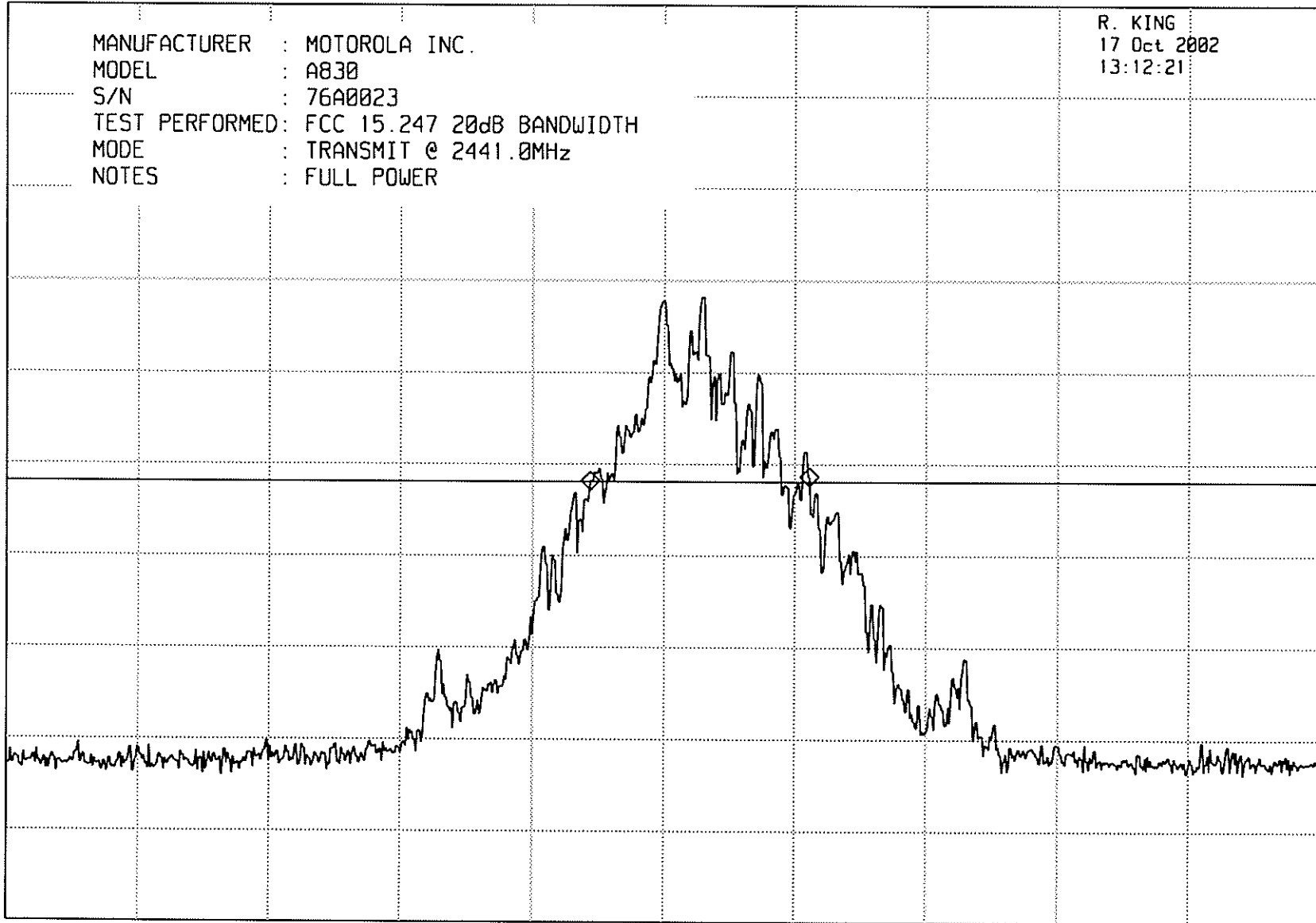
MKR ^ 835 kHz
0.50 dB

10 dB/

DL
-52.0
dBm

MANUFACTURER : MOTOROLA INC.
MODEL : A830
S/N : 76A0023
TEST PERFORMED: FCC 15.247 20dB BANDWIDTH
MODE : TRANSMIT @ 2441.0MHz
NOTES : FULL POWER

R. KING
17 Oct 2002
13:12:21



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EMR 31465-01

CENTER 2.440 86 GHz SPAN 5.00 MHz
RES BW 10 kHz(i) UBW 100 kHz SWP 375 msec

ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 0.0 dBm

ATTEN 10 dB

MKR ^ 820 kHz

0.00 dB

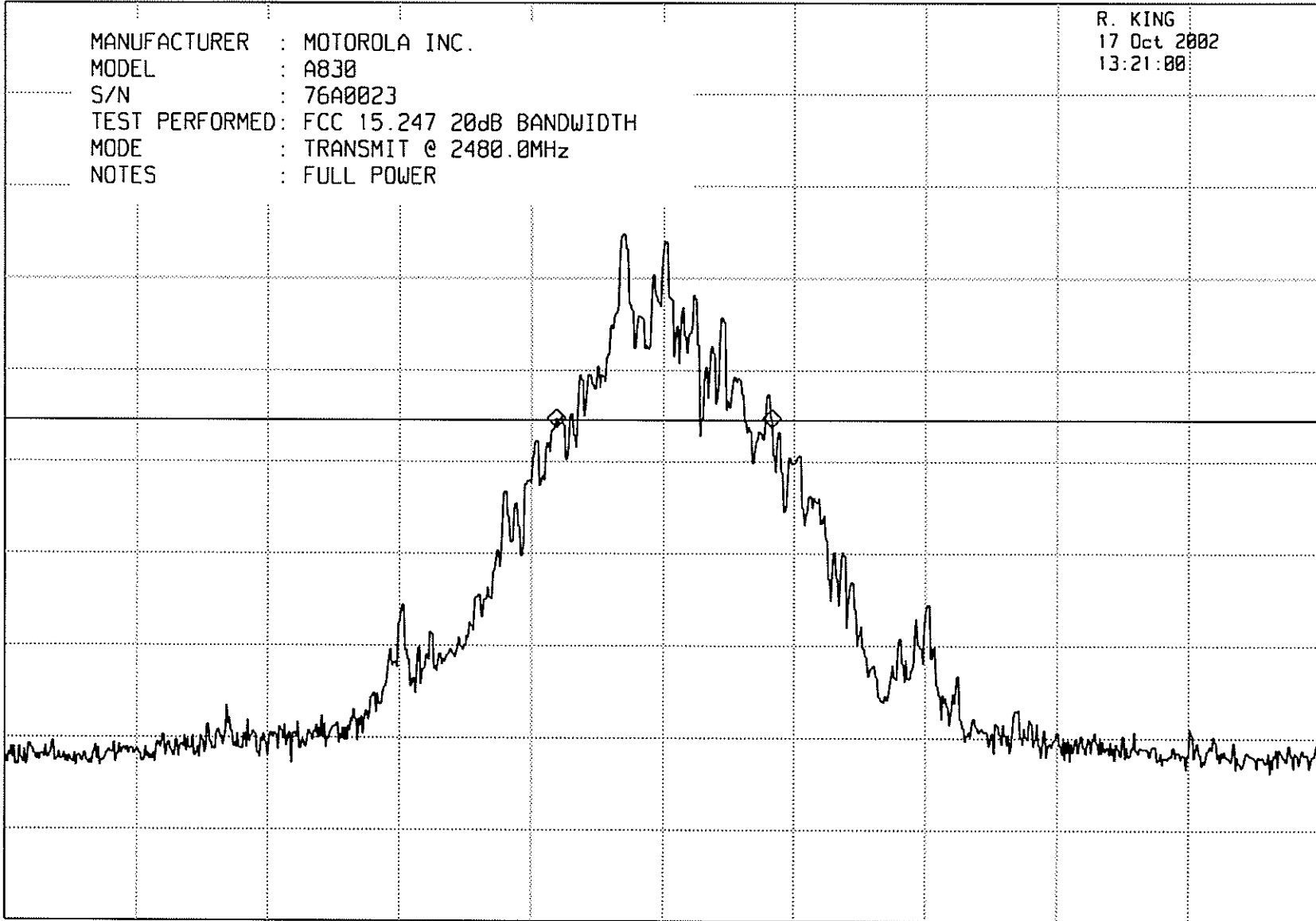
10 dB/

MANUFACTURER : MOTOROLA INC.
MODEL : A830
S/N : 76A0023
TEST PERFORMED: FCC 15.247 20dB BANDWIDTH
MODE : TRANSMIT @ 2480.0MHz
NOTES : FULL POWER

R. KING
17 Oct 2002
13:21:00

DL

-45.5
dBm



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CENTER 2.480 00 GHz

RES BW 10 kHz(i)

VBW 100 kHz

SPAN 5.00 MHz

SWP 375 msec



ETR No. 31469-01
DATA SHEET

PEAK OUTPUT POWER

SPECIFICATION : FCC-15C (15.247)
MANUFACTURER : MOTOROLA
MODEL NO. : A830 BLUETOOTH TRANSMITTER
SERIAL NO. : NONE ASSIGNED
NOTES : TRANSMITTING AT FULL POWER
TEST DATE : October 17, 2002
TEST DISTANCE : 3m

Freq. (MHz)	Ant. Pol.	F.I. (dBuV/m)	Conv. FI to EIRP	EIRP Total (dbm)	EIRP Limit (dBm)
2402.0	H	93.5	-95	-1.5	36
	V	86.2	-95	-8.8	36
2441.0	H	93.3	-95	-1.7	36
	V	84.0	-95	-11.0	36
2480.0	H	89.7	-95	-5.3	36
	V	84.9	-95	-10.1	36

CHECKED BY: Richard King
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ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 107.0 dBuV

ATTEN 10 dB

MKR 2.401 86 GHz

96.40 dBuV

10 dB/

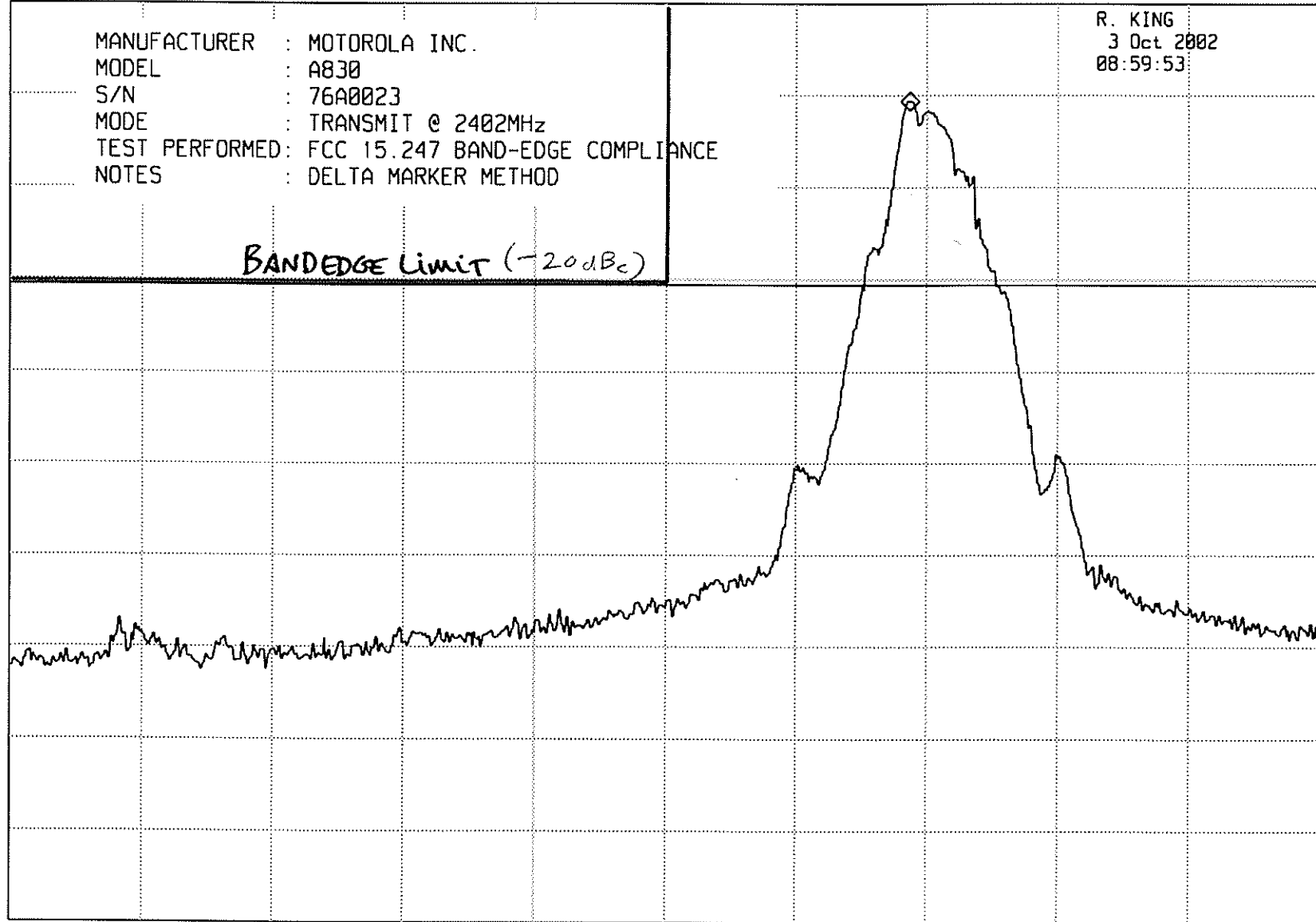
MANUFACTURER : MOTOROLA INC.
MODEL : A830
S/N : 76A0023
MODE : TRANSMIT @ 2402MHz
TEST PERFORMED: FCC 15.247 BAND-EDGE COMPLIANCE
NOTES : DELTA MARKER METHOD

R. KING
3 Oct 2002
08:59:53

DL

76.4 dBuV

BANDEDGE Limit (-20dBc)



ETP 31469-01

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CENTER 2.400 0 GHz

RES BW 100 kHz(i)

UBW 1 MHz

SPAN 10.0 MHz

SWP 20.0 msec

ELITE ELECTRONIC ENGINEERING Inc.

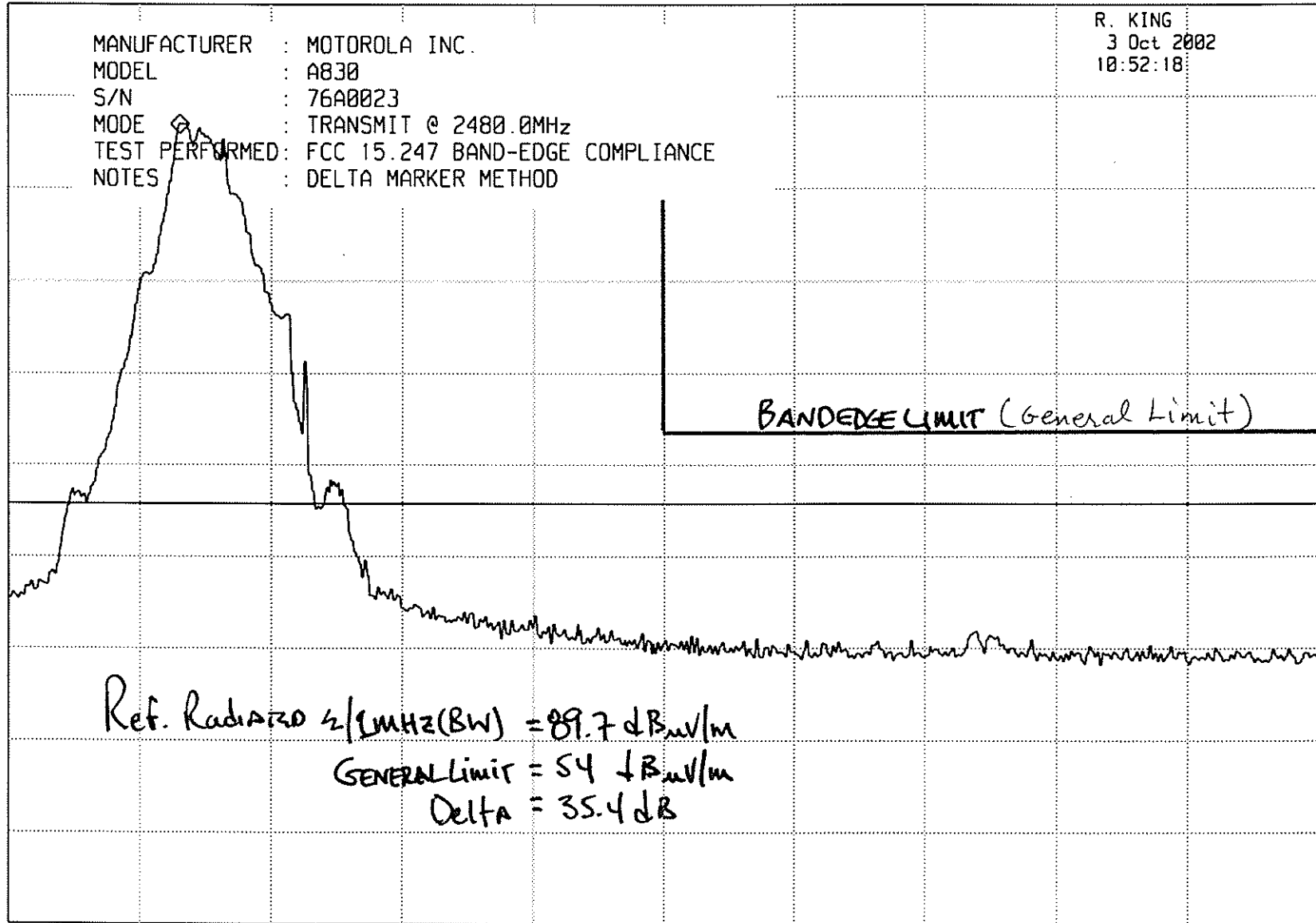
MKR 2.479 80 GHz
94.00 dBuV

hp REF 107.0 dBuV ATTEN 10 dB

10 dB/
OFFSET -20.0 dB
DL 52.7 dBuV

MANUFACTURER : MOTOROLA INC.
MODEL : A830
S/N : 76A0023
MODE : TRANSMIT @ 2480.0MHz
TEST PERFORMED: FCC 15.247 BAND-EDGE COMPLIANCE
NOTES : DELTA MARKER METHOD

R. KING
3 Oct 2002
10:52:18



Ref. Radiated $\frac{1}{\sqrt{1\text{MHz}}}$ (BW) = 89.7 dBuV/m
GENERAL LIMIT = 54 dBuV/m
Delta = 35.4 dB

PTR 31469-01

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CENTER 2.483 5 GHz SPAN 10.0 MHz
RES BW 100 kHz(i) UBW 3 MHz SWP 20.0 msec

ELITE ELECTRONIC ENGINEERING Inc.

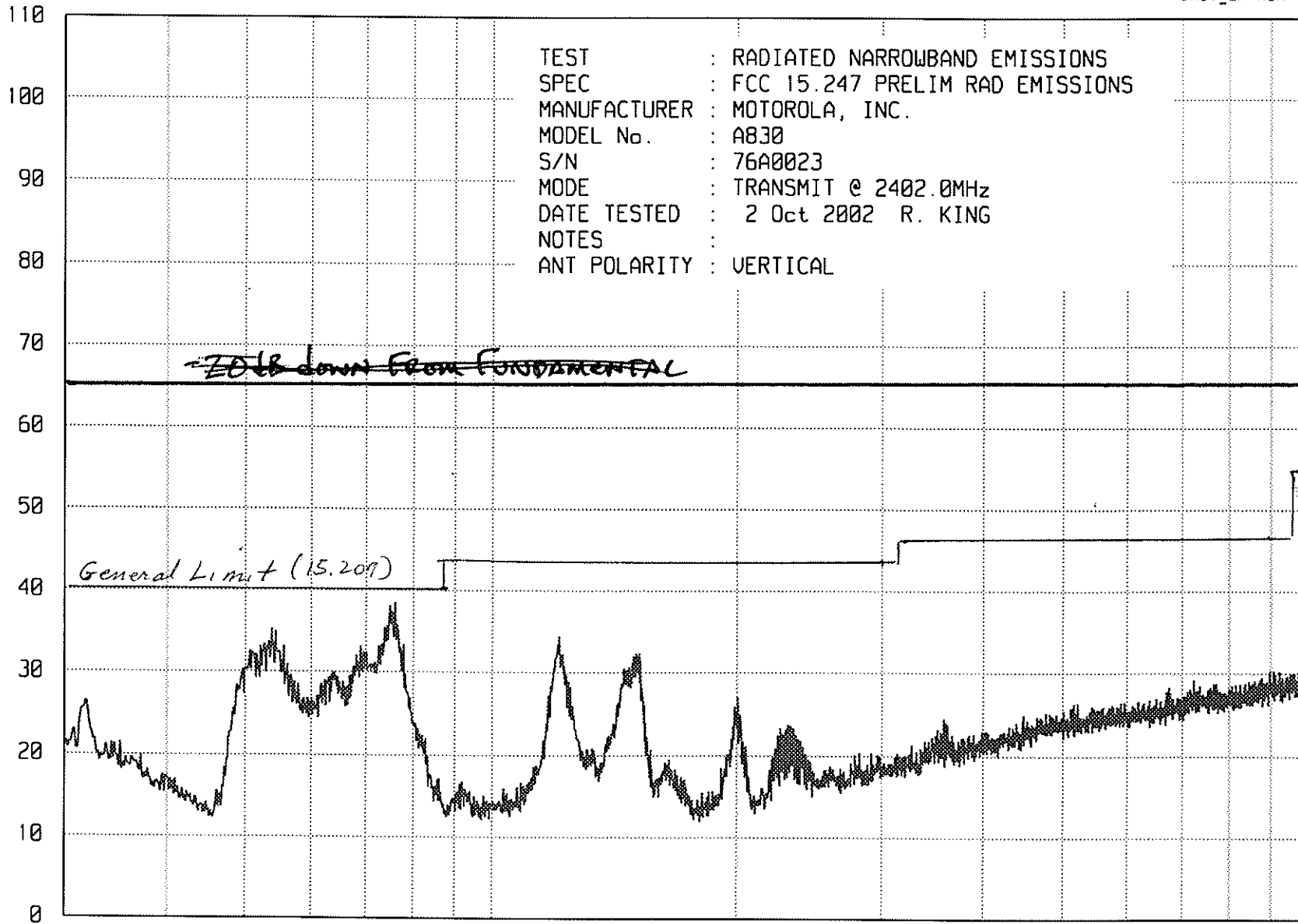
Downers Grove, Ill. 60515

WKA00 06/18/02

UNIV_EM RUN RUN 1

TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 15.247 PRELIM RAD EMISSIONS
MANUFACTURER : MOTOROLA, INC.
MODEL No. : A830
S/N : 76A0023
MODE : TRANSMIT @ 2402.0MHz
DATE TESTED : 2 Oct 2002 R. KING
NOTES :
ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dBµV/m
Page 36 of 40



START = 30

FREQUENCY - MHz

STOP = 1000

ETR 31469-01

ELITE ELECTRONIC ENGINEERING Inc.

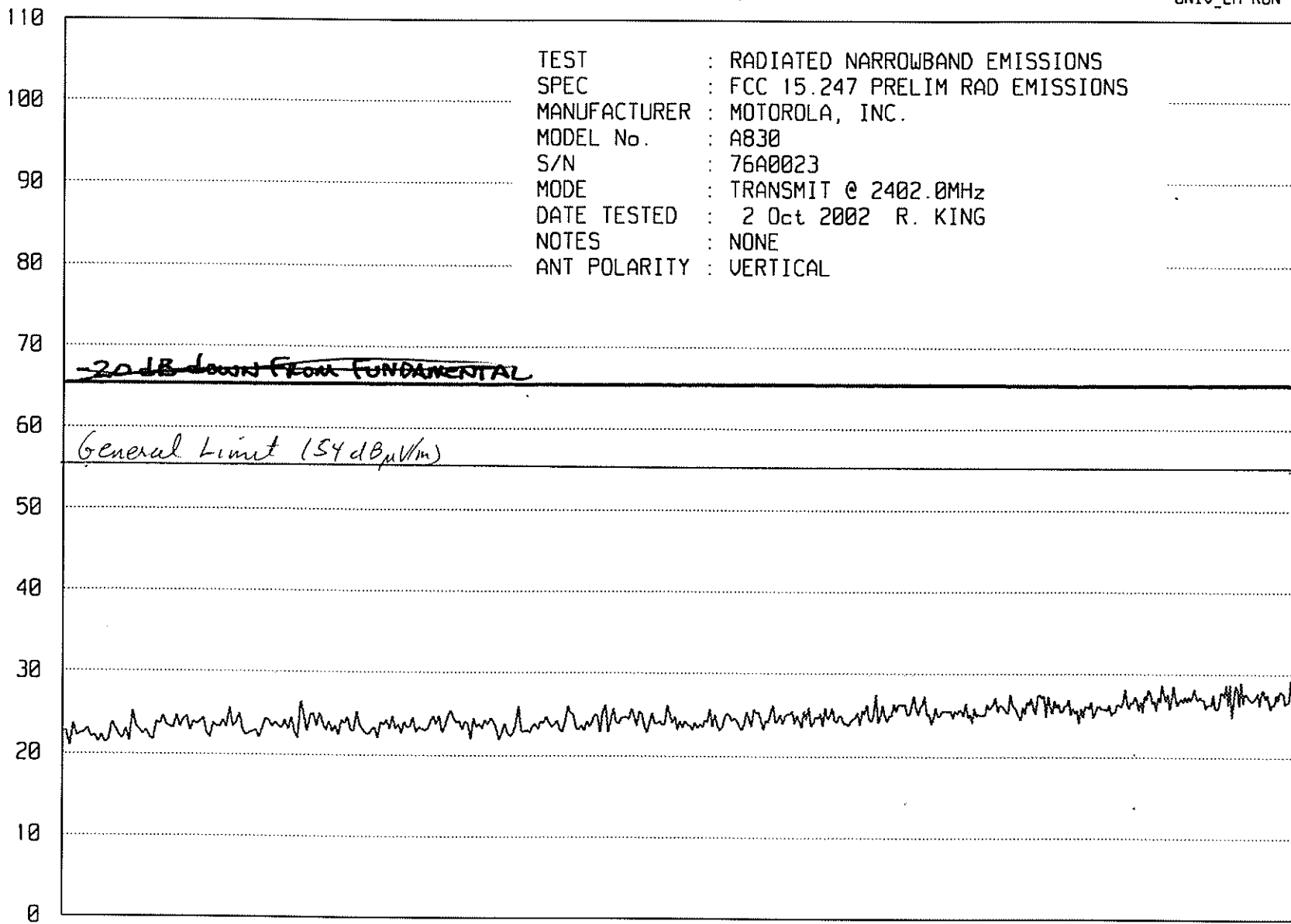
Downers Grove, Ill. 60515

WKAB 06/18/02

UNIU_EM RUN RUN 2

TEST : RADIATED NARROWBAND EMISSIONS
 SPEC : FCC 15.247 PRELIM RAD EMISSIONS
 MANUFACTURER : MOTOROLA, INC.
 MODEL No. : A830
 S/N : 76A0023
 MODE : TRANSMIT @ 2402.0MHz
 DATE TESTED : 2 Oct 2002 R. KING
 NOTES : NONE
 ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dB μ V/m
Page 27 of 40



START = 1000

FREQUENCY - MHz

STOP = 2000

ERR 31469-01

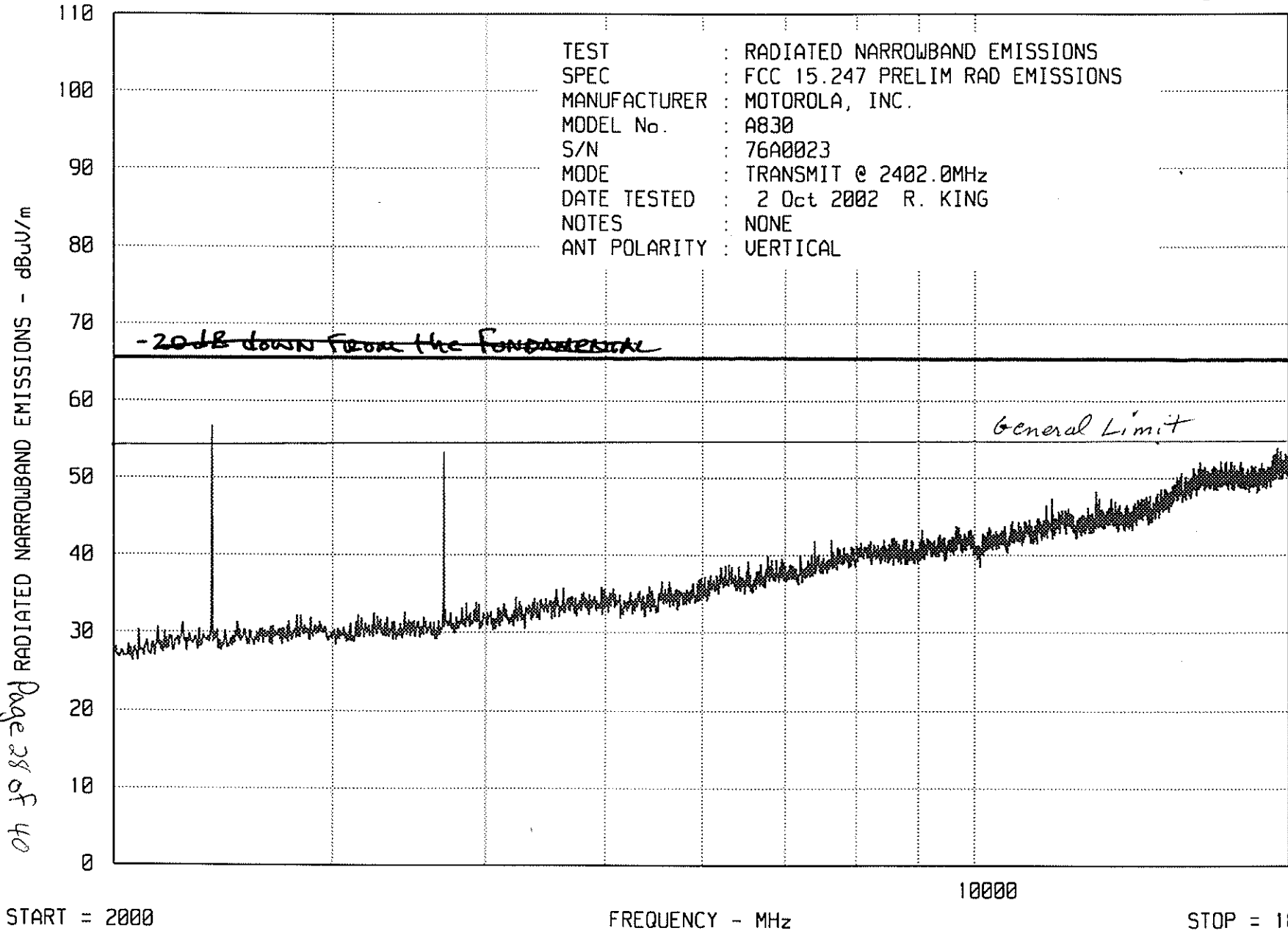
ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKAB 06/18/02

UNIV_EM RUN RUN 3

TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 15.247 PRELIM RAD EMISSIONS
MANUFACTURER : MOTOROLA, INC.
MODEL No. : A830
S/N : 76A0023
MODE : TRANSMIT @ 2402.0MHz
DATE TESTED : 2 Oct 2002 R. KING
NOTES : NONE
ANT POLARITY : VERTICAL



START = 2000

FREQUENCY - MHz

10000

STOP = 18000

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ETR 31465-01

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKA00 06/18/02

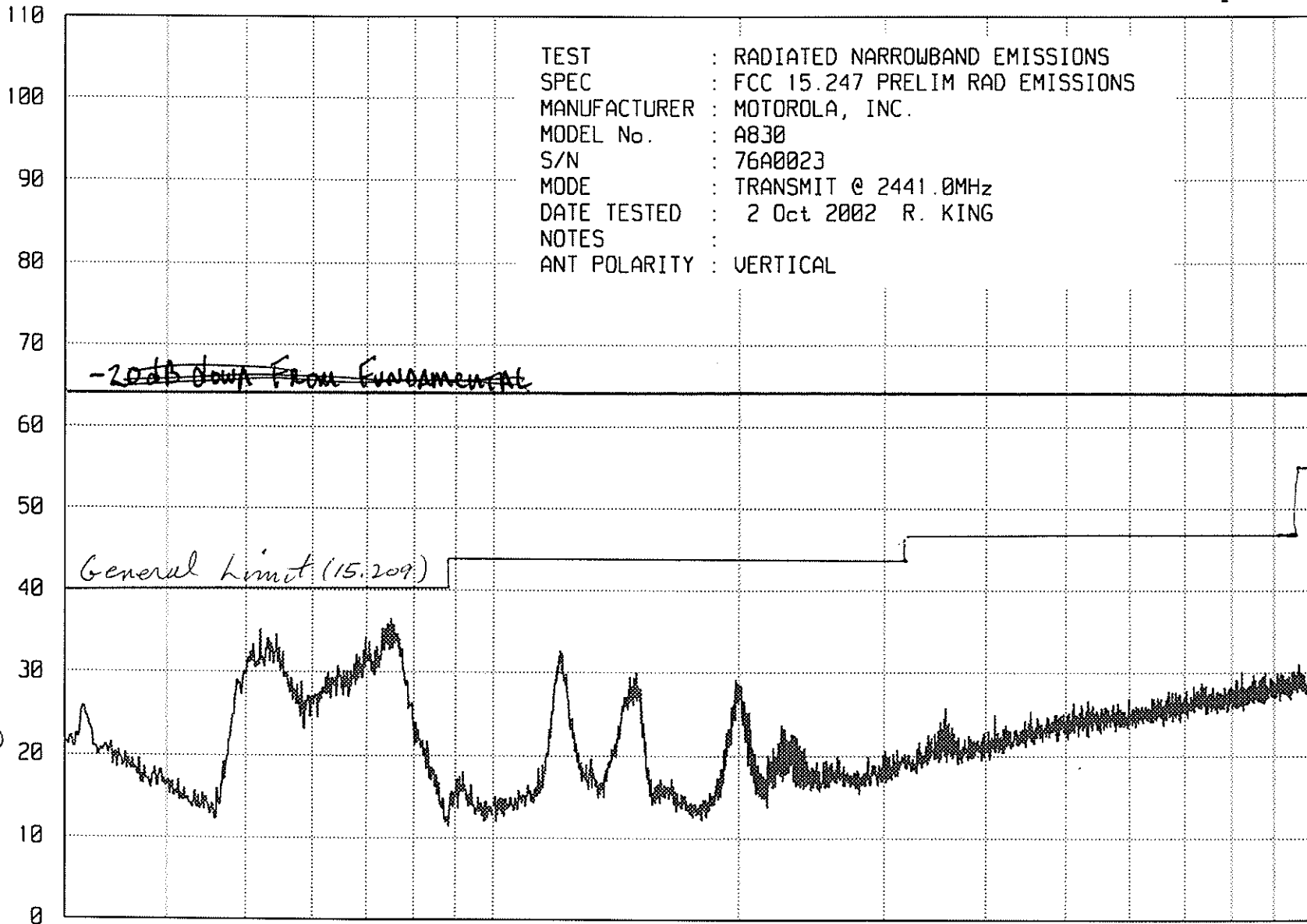
UNIV_EM RUN RUN 1

TEST : RADIATED NARROWBAND EMISSIONS
 SPEC : FCC 15.247 PRELIM RAD EMISSIONS
 MANUFACTURER : MOTOROLA, INC.
 MODEL No. : A830
 S/N : 76A0023
 MODE : TRANSMIT @ 2441.0MHz
 DATE TESTED : 2 Oct 2002 R. KING
 NOTES :
 ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dBµV/m

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EMR 31469-01



START = 30

FREQUENCY - MHz

STOP = 1000

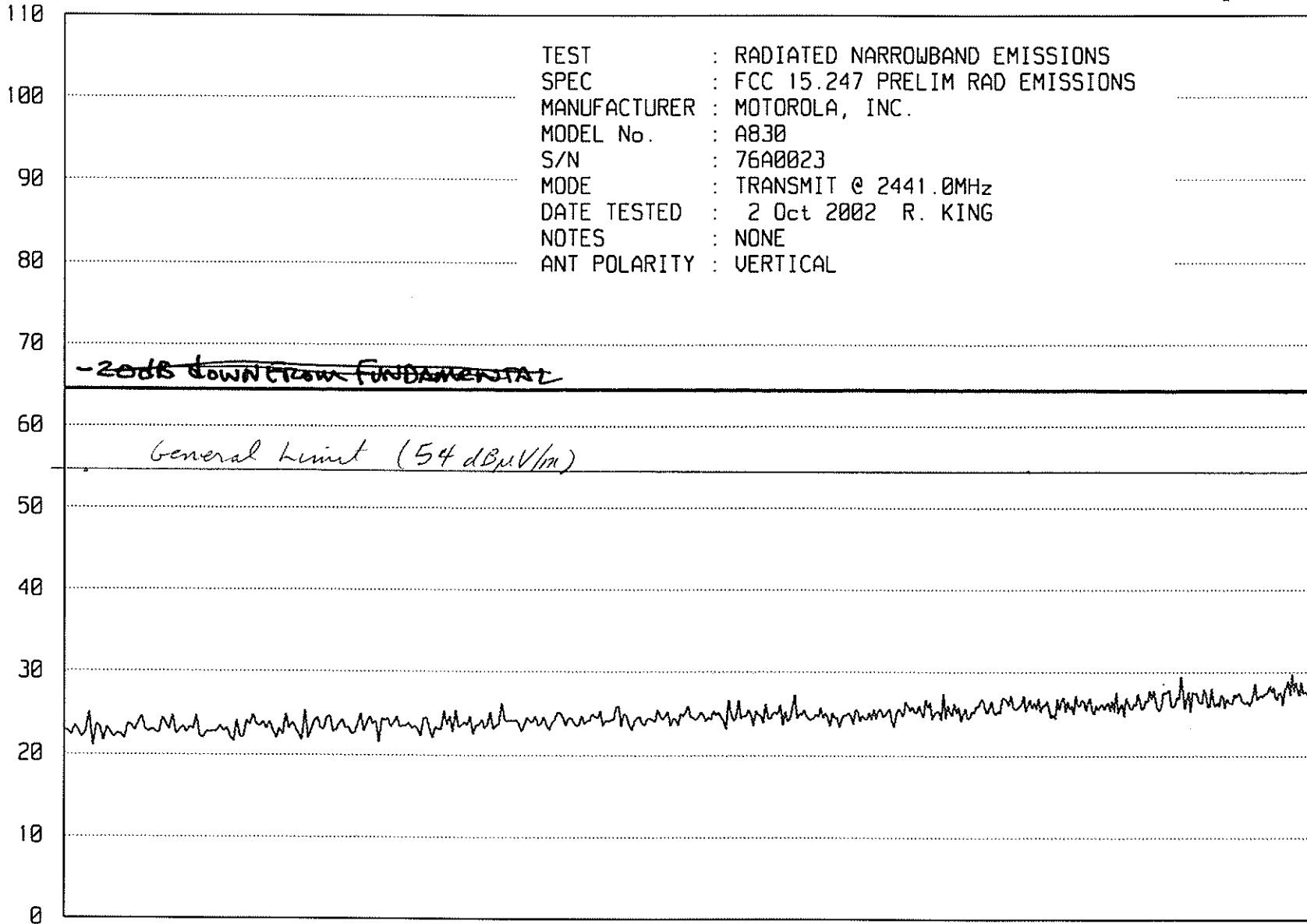
ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKAB 06/18/02

UNIV_EM RUN RUN 2

RADIATED NARROWBAND EMISSIONS - dB μ V/m
Page 30 of 40



TEST : RADIATED NARROWBAND EMISSIONS
 SPEC : FCC 15.247 PRELIM RAD EMISSIONS
 MANUFACTURER : MOTOROLA, INC.
 MODEL No. : A830
 S/N : 76A0023
 MODE : TRANSMIT @ 2441.0MHz
 DATE TESTED : 2 Oct 2002 R. KING
 NOTES : NONE
 ANT POLARITY : VERTICAL

START = 1000

FREQUENCY - MHz

STOP = 2000

ETR 31469-01

ELITE ELECTRONIC ENGINEERING Inc.

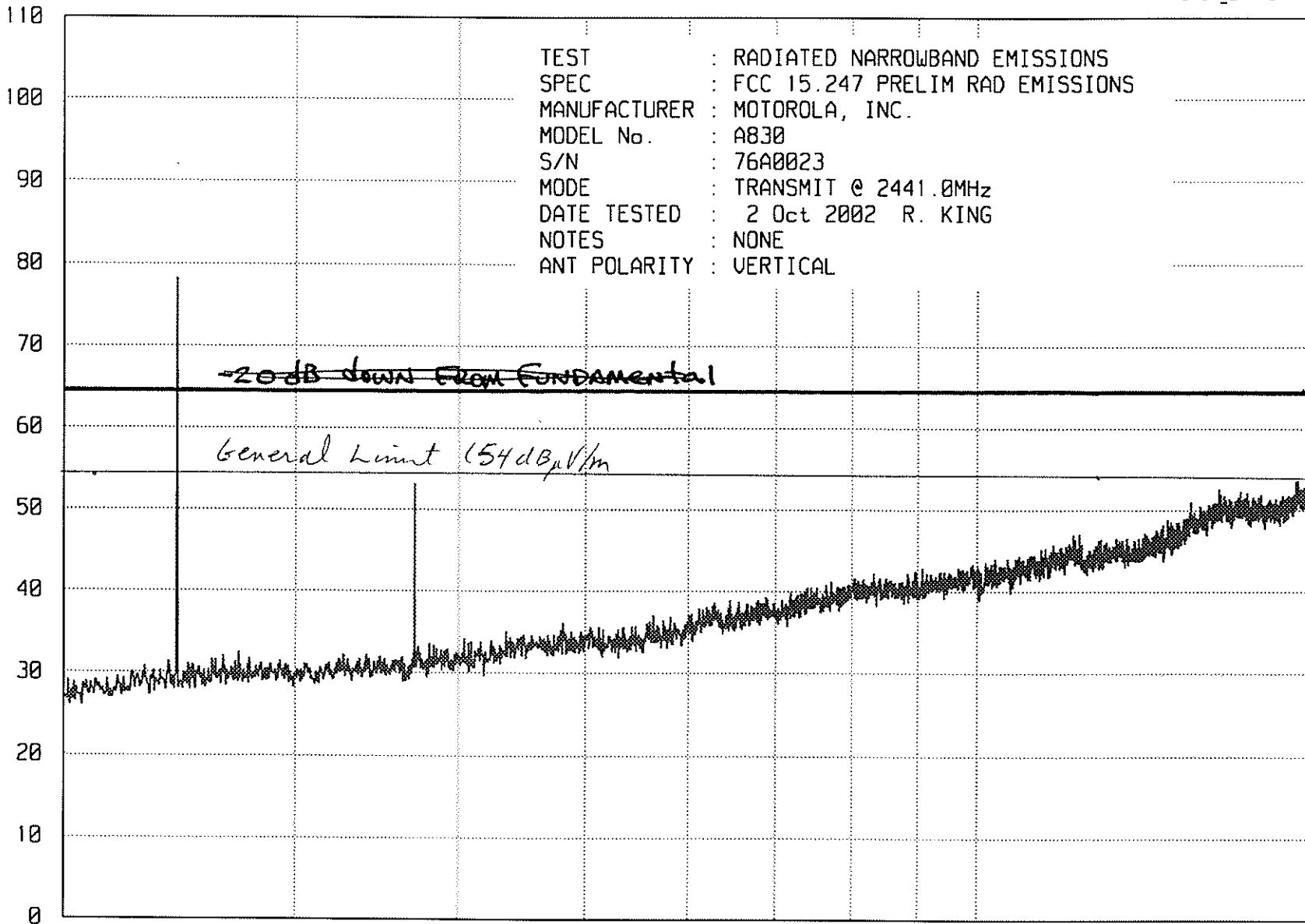
Downers Grove, Ill. 60515

WKAB 06/18/02

UNIV_EM RUN RUN 3

TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 15.247 PRELIM RAD EMISSIONS
MANUFACTURER : MOTOROLA, INC.
MODEL No. : A830
S/N : 76A0023
MODE : TRANSMIT @ 2441.0MHz
DATE TESTED : 2 Oct 2002 R. KING
NOTES : NONE
ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dB μ V/m
Page 31 of 40



START = 2000

FREQUENCY - MHz

10000

STOP = 18000

ETR 31469-01

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKAB 06/18/02

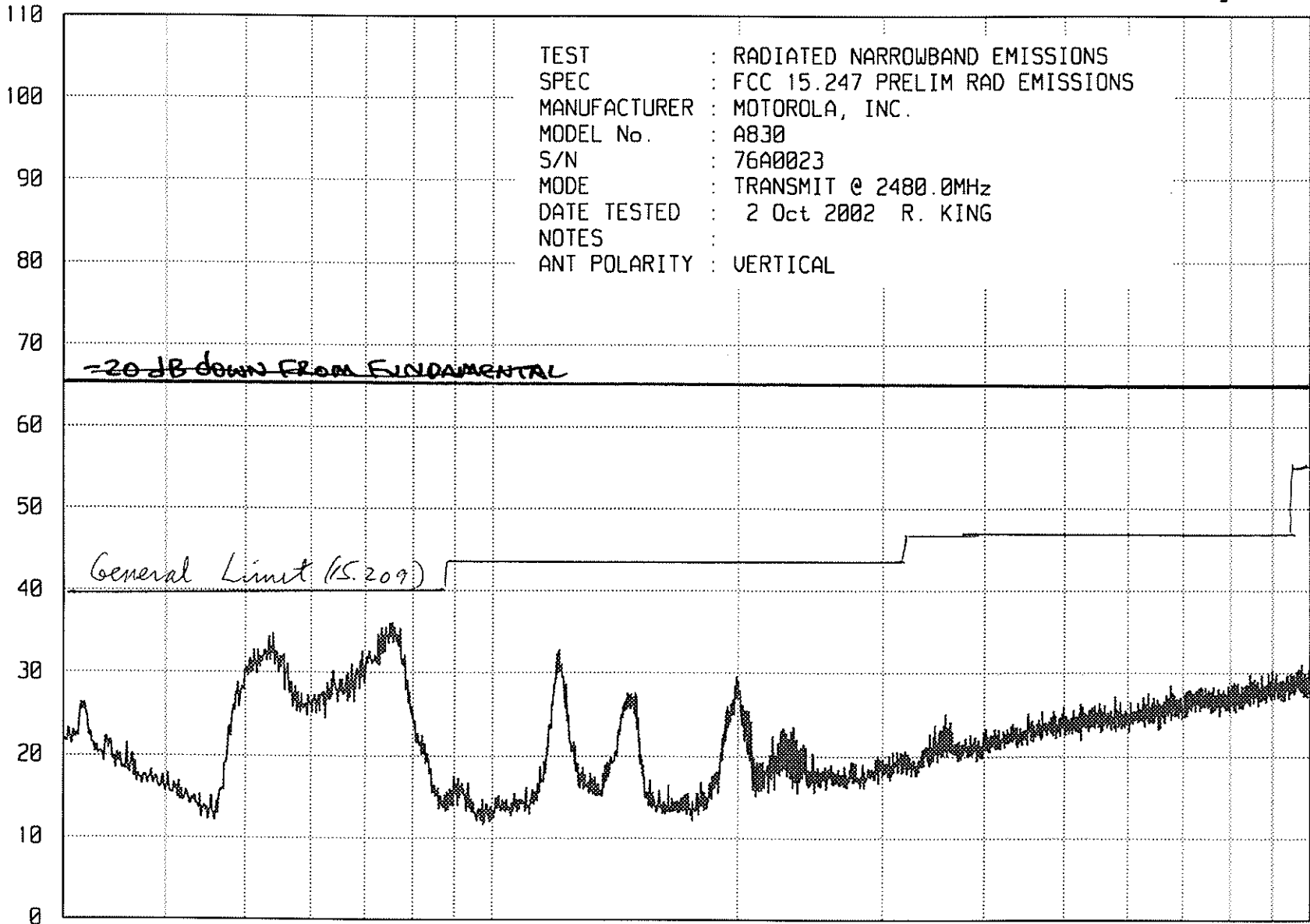
UNIV_EM RUN RUN 1

TEST : RADIATED NARROWBAND EMISSIONS
 SPEC : FCC 15.247 PRELIM RAD EMISSIONS
 MANUFACTURER : MOTOROLA, INC.
 MODEL No. : A830
 S/N : 76A0023
 MODE : TRANSMIT @ 2480.0MHz
 DATE TESTED : 2 Oct 2002 R. KING
 NOTES :
 ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dBuV/m

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ETR 31469-01



START = 30

FREQUENCY - MHz

STOP = 1000

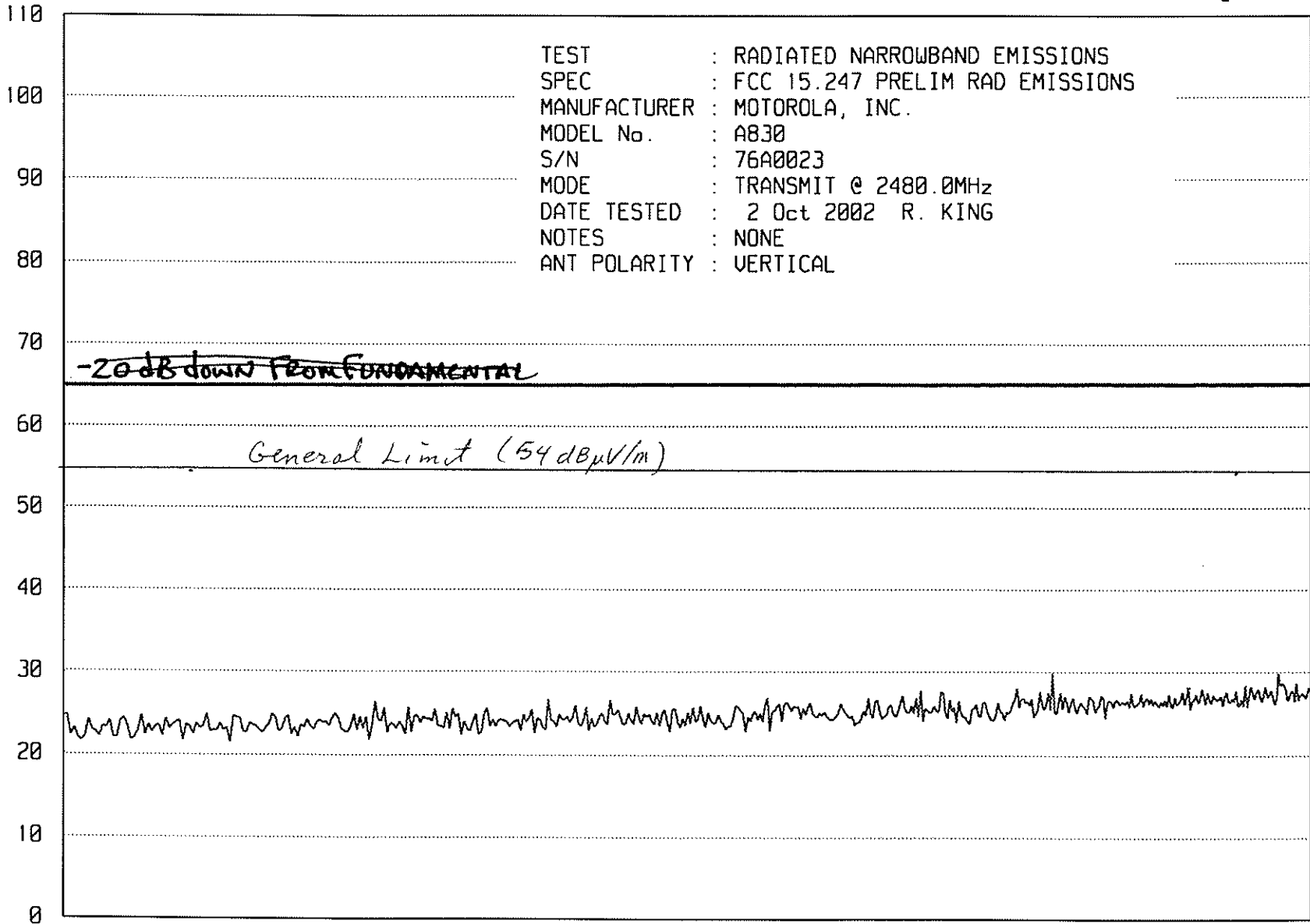
ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKA00 06/18/02

UNIU_EM RUN RUN 2

RADIATED NARROWBAND EMISSIONS - dB μ V/m
Page 33 of 40



ETR 31469.01

START = 1000

FREQUENCY - MHz

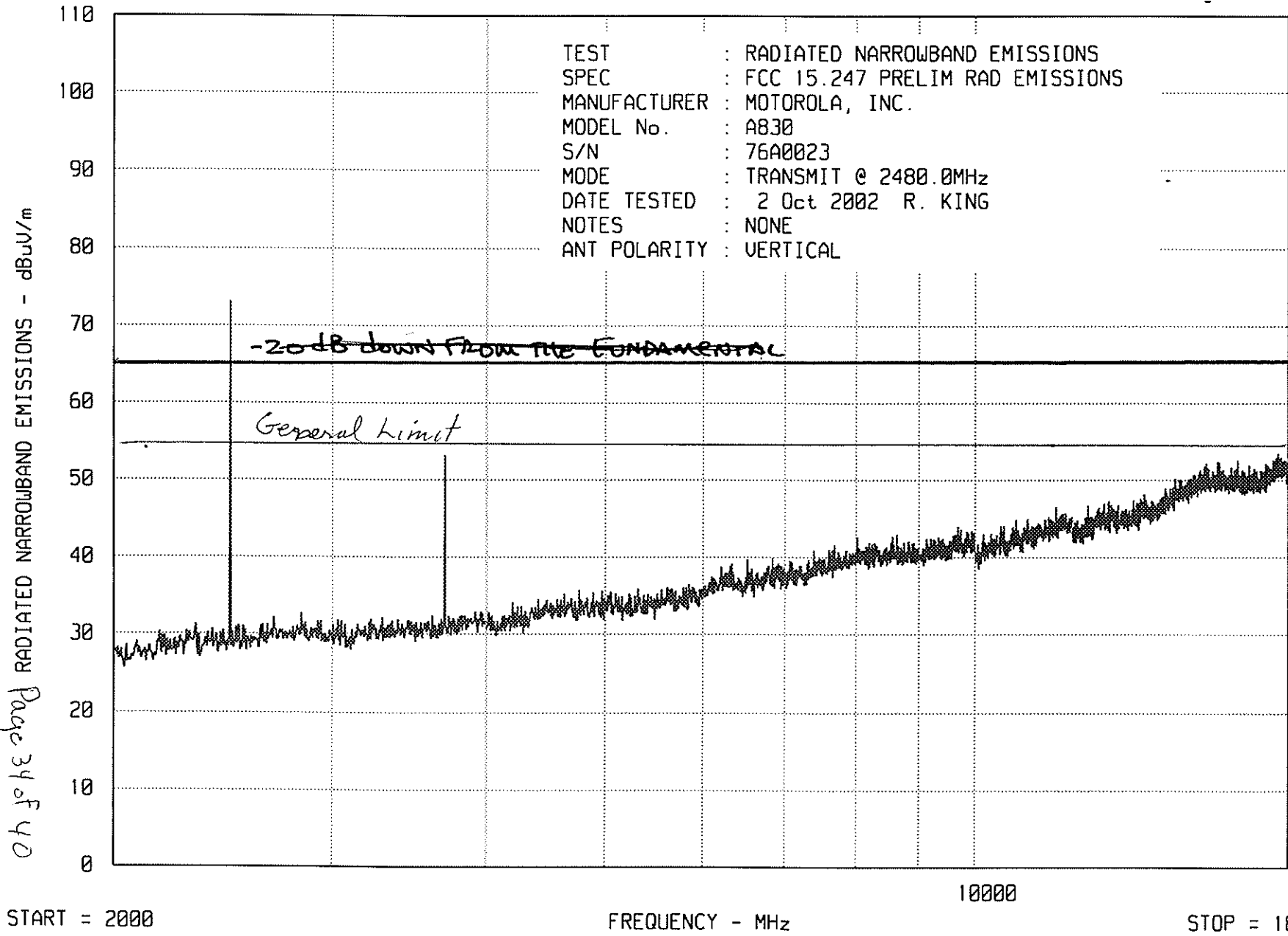
STOP = 2000

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKAB 06/18/02

UNIV_EM RUN RUN 3



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EMR 31469-01

ELITE ELECTRONIC ENGINEERING Inc.

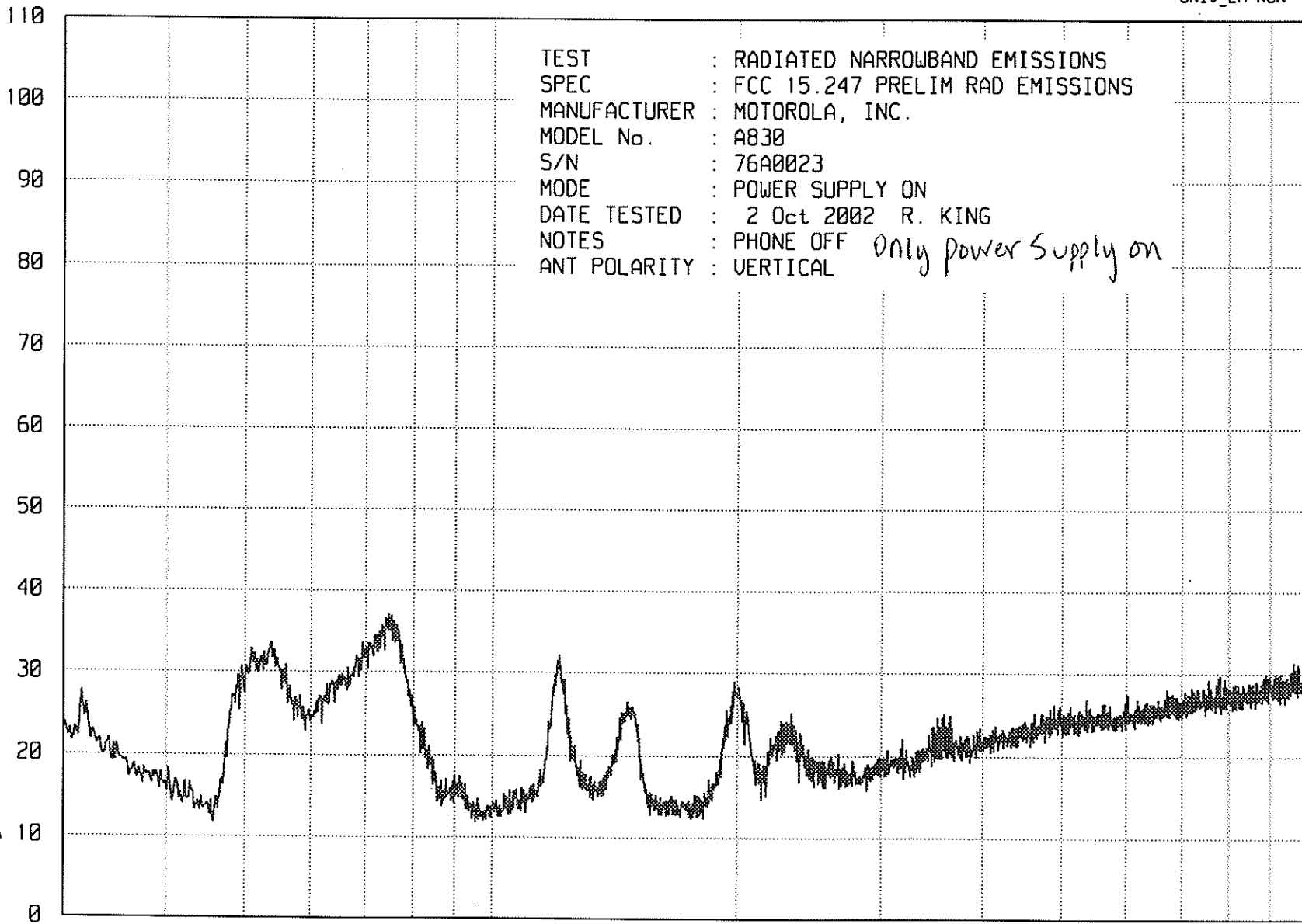
Downers Grove, Ill. 60515

WKAB 06/18/02

UNIV_EM RUN RUN 1

TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 15.247 PRELIM RAD EMISSIONS
MANUFACTURER : MOTOROLA, INC.
MODEL No. : A830
S/N : 76A0023
MODE : POWER SUPPLY ON
DATE TESTED : 2 Oct 2002 R. KING
NOTES : PHONE OFF *Only power supply on*
ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dB μ V/m
Page 35 of 40



START = 30

FREQUENCY - MHz

STOP = 1000

ETR 31469-01

ELITE ELECTRONIC ENGINEERING Inc.

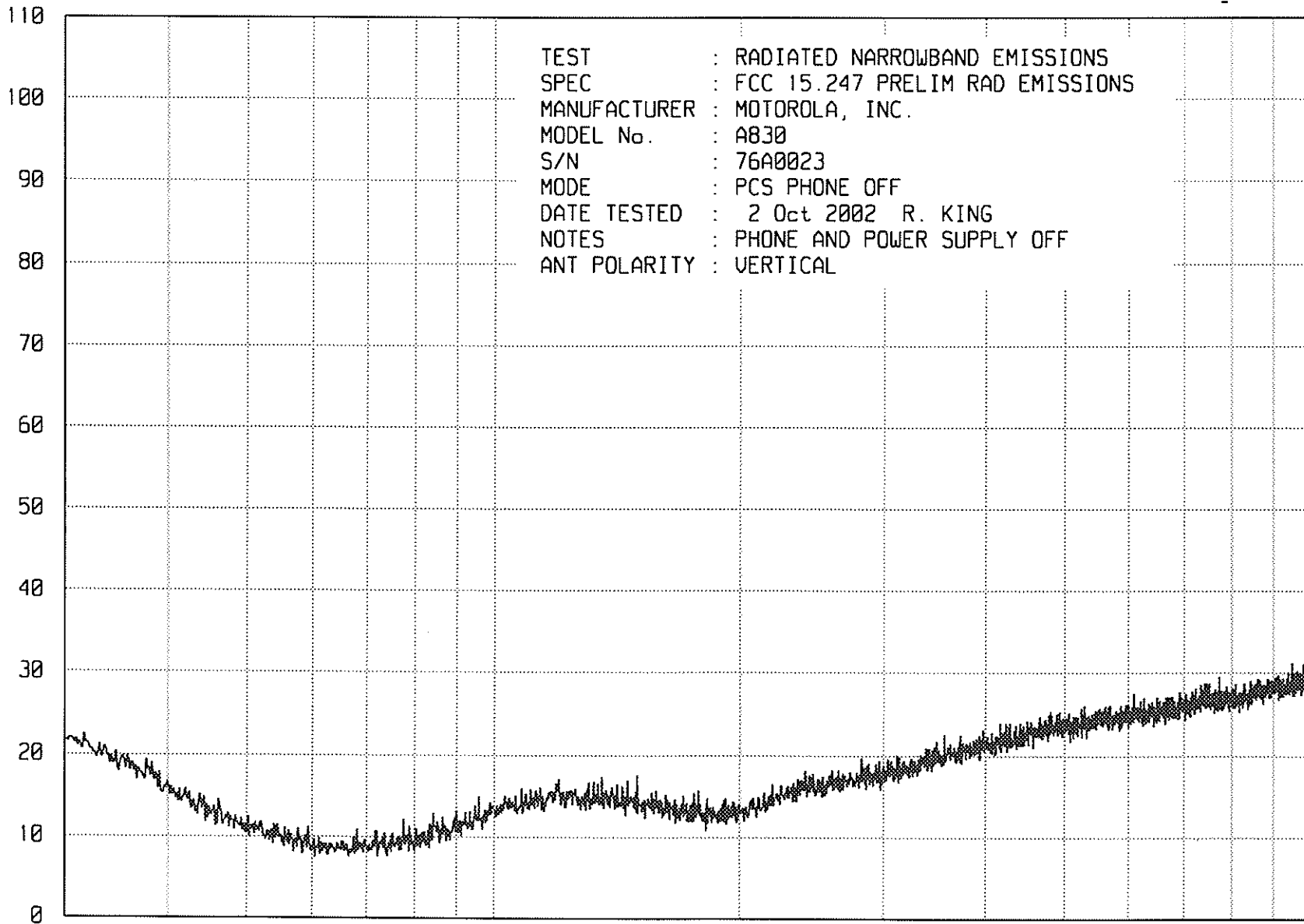
Downers Grove, Ill. 60515

UNI_VEM RUN RUN 1

WKA00 06/18/02

TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 15.247 PRELIM RAD EMISSIONS
MANUFACTURER : MOTOROLA, INC.
MODEL No. : A830
S/N : 76A0023
MODE : PCS PHONE OFF
DATE TESTED : 2 Oct 2002 R. KING
NOTES : PHONE AND POWER SUPPLY OFF
ANT POLARITY : VERTICAL

RADIATED NARROWBAND EMISSIONS - dB μ V/m
Page 36 of 40



START = 30

FREQUENCY - MHz

STOP = 1000

ENR 31469-01



ETR No. 31469-01
DATA SHEET

RADIATED EMISSION MEASUREMENTS IN A 3m ANECHOIC ROOM

SPECIFICATION : FCC-15C (15.247)
 MANUFACTURER : MOTOROLA
 MODEL NO. : A830 BLUETOOTH TRANSMITTER
 SERIAL NO. : NONE ASSIGNED
 NOTES : TRANSMIT AT LOW CHANNEL 2.402GHz
 TEST DATE : October 17, 2002
 TEST DISTANCE : 3m

FREQ	ANT	MTR		ANT	CABLE	PRE	TOTAL	TOTAL	LIMIT	
MHz	POL	RDG		FAC	LOSS	AMP	dBuV/m	uV/m	uV	
		dBuV	BW							
2402.0	H	96.4		1M/3M	28.8	3.3	-35.0	93.5	47315.1	
	V	89.1		1M/3M	28.8	3.3	-35.0	86.2	20417.4	
2402.0	H	81.3		1M/10	28.8	3.3	-35.0	78.4	8317.6	
	V	74.5		1M/10	28.8	3.3	-35.0	71.6	3801.9	
4804.0	H	33.4		1M/10	33.8	4.8	-35.0	37.0	70.8	500.0
	V	33.2		1M/10	33.8	4.8	-35.0	36.8	69.2	500.0
12010.0	H	34.0	AMB	1M/10	40.4	8.6	-35.0	48.0	251.2	500.0
	V	34.1	AMB	1M/10	40.4	8.6	-35.0	48.1	254.1	500.0
19216.0	H	11.3	AMB	1M/10	40.3	0.0	0.0	51.6	380.2	500.0
	V	11.5	AMB	1M/10	40.3	0.0	0.0	51.8	389.0	500.0

CHECKED BY: Richard S. King



ETR No. 31469-01
DATA SHEET

RADIATED EMISSION MEASUREMENTS IN A 3m ANECHOIC ROOM
 SPECIFICATION : FCC-15C (15.247)
 MANUFACTURER : MOTOROLA
 MODEL NO. : A830 BLUETOOTH TRANSMITTER
 SERIAL NO. : NONE ASSIGNED
 NOTES : TRANSMIT AT LOW CHANNEL 2.441GHz
 TEST DATE : October 17, 2002
 TEST DISTANCE : 3m

FREQ	ANT	MTR		ANT	CABLE	PRE	TOTAL	TOTAL	LIMIT	
MHz	POL	RDG		FAC	LOSS	AMP	dBuV/m	uV/m	uV	
		dBuV	BW							
2441.0	H	97.6		1M/3M	28.9	3.4	-36.6	93.3	45972.7	
	V	88.3		1M/3M	28.9	3.4	-36.6	84.0	15758.0	
2441.0	H	63.7		1M/10	28.9	3.4	-36.6	59.4	927.9	
	V	37.1		1M/10	28.9	3.4	-36.6	32.8	43.4	
4882.0	H	33.7		1M/10	34.1	4.9	-36.6	36.1	63.7	500.0
	V	33.4		1M/10	34.1	4.9	-36.6	35.8	61.7	500.0
7323.0	H	33.2	AMB	1M/10	37.2	6.8	-36.6	40.6	107.2	500.0
	V	33.1	AMB	1M/10	37.2	6.8	-36.6	40.5	105.9	500.0
12205.0	H	33.7	AMB	1M/10	40.8	8.6	-36.6	46.5	211.3	500.0
	V	33.9	AMB	1M/10	40.8	8.6	-36.6	46.7	216.3	500.0
19528.0	H	11.6	AMB	1M/10	40.3	0.0	0.0	51.9	393.6	500.0
	V	11.4	AMB	1M/10	40.3	0.0	0.0	51.7	384.6	500.0

CHECKED BY: Richard E. King



ETR No. 31469-01
DATA SHEET

RADIATED EMISSION MEASUREMENTS IN A 3m ANECHOIC ROOM

SPECIFICATION : FCC-15C (15.247)
 MANUFACTURER : MOTOROLA
 MODEL NO. : A830 BLUETOOTH TRANSMITTER
 SERIAL NO. : NONE ASSIGNED
 NOTES : TRANSMIT AT LOW CHANNEL 2.480GHz
 TEST DATE : October 17, 2002
 TEST DISTANCE : 3m

FREQ	ANT	MTR		ANT	CABLE	PRE	TOTAL	TOTAL	LIMIT	
MHz	POL	RDG	BW	FAC	LOSS	AMP	dBuV/m	uV/m	uV	
		dBuV								
2480.0	H	94.1		1M/3M	29.0	3.3	-36.6	89.8	31045.6	
	V	89.2		1M/3M	29.0	3.3	-36.6	84.9	17660.4	
2480.0	H	71.4		1M/10	29.0	3.3	-36.6	67.1	2275.1	
	V	74.7		1M/10	29.0	3.3	-36.6	70.4	3326.6	
4960.0	H	33.2		1M/10	34.2	5.0	-36.6	35.8	61.7	500.0
	V	32.5		1M/10	34.2	5.0	-36.6	35.1	56.9	500.0
7440.0	H	33.5	AMB	1M/10	37.4	6.9	-36.6	41.2	114.8	500.0
	V	33.6	AMB	1M/10	37.4	6.9	-36.6	41.3	116.1	500.0
12400.0	H	34.1	AMB	1M/10	41.1	8.7	-36.6	47.3	231.7	500.0
	V	34.1	AMB	1M/10	41.1	8.7	-36.6	47.3	230.4	500.0
19840.0	H	11.5	AMB	1M/10	40.3	0.0	0.0	51.8	389.0	500.0
	V	11.4	AMB	1M/10	40.3	0.0	0.0	51.7	384.6	500.0
22320.0	H	11.8	AMB	1M/10	40.4	0.0	0.0	52.2	407.4	500.0
	V	11.3	AMB	1M/10	40.4	0.0	0.0	51.7	384.6	500.0

CHECKED BY: Richard E. King

ELITE ELECTRONIC ENGINEERING Inc.

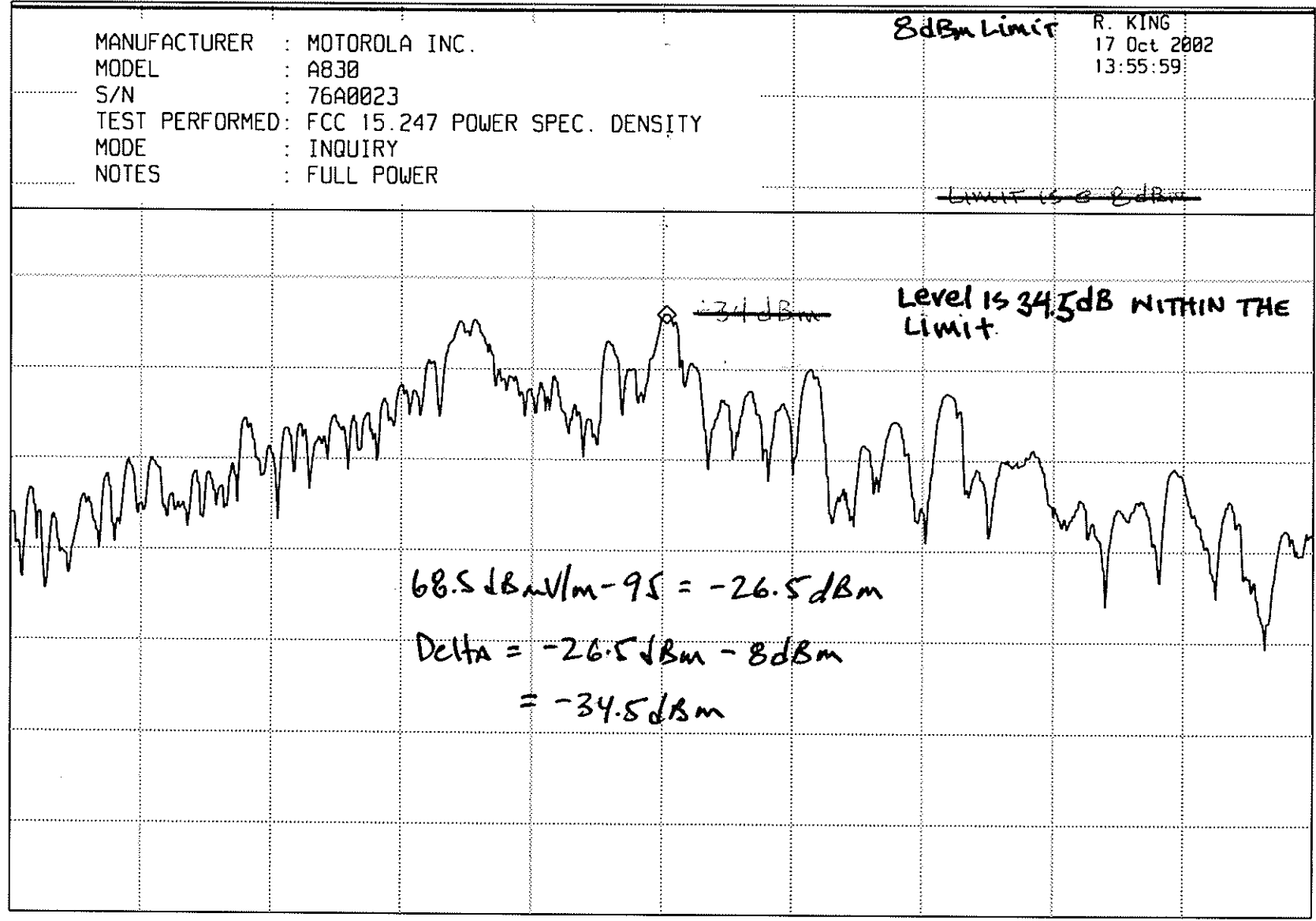
MKR 2.441 002 GHz
73.00 dBuV

REF 107.0 dBuV ATTEN 10 dB

hp
10 dB/

DL
84.3 dBuV

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ETR 3469-01

CENTER 2.441 00 GHz SPAN 1.00 MHz
 RES BW 3 kHz(i) VBW 30 kHz SWP 333 sec