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

ELITE PROJECT: 31521 DATES TESTED: October 28, 2002 through February 21, 2003

TEST PERSONNEL: Richard E. King EMC Engineer

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. 31521-02

MEASUREMENTS OF RF EMISSIONS

FROM THE MODEL BT0606AL09 IN-VEHICLE BLUETOOTH MODULE

FOR: Motorola
Rolling Meadows, Illinois

Report By: Richard E. King
Richard E. King
EMC Engineer

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

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

DESCRIPTION OF TEST ITEM: Frequency Hopping Spread Spectrum Transmitter

MODEL NO. : BT0606AL09 **SERIAL NO.:** 00E00C496045

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: October 28, 2002 through February 21, 2003

PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):
WITNESS: No Motorola personnel were present during the testing.
ELITE ELECTRONIC: Richard E. King

ELITE JOB NO.: 31521

ABSTRACT: The model BT0606AL09 In-vehicle Bluetooth Module 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, antenna conducted and radiated 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 A IN-VEHICLE BLUETOOTH MODULE TRANSMITTER

1.0 INTRODUCTION:

1.1 **DESCRIPTION OF TEST ITEM:** This report presents the results of the RF emissions measurements performed for the model BT0606AL09 In-Vehicle Bluetooth Module spread spectrum transmitter, (hereinafter referred to as the test item). The tests were performed for Motorola located in Elk Grove Village, Illinois.

The test item is a frequency hopping spread spectrum transceiver used for in vehicle 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 7.0VDC was supplied to the test item from a power supply. The test item is supplied with its external 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 receives 7.0VDC from the vehicle's power supply. There are no operation modes where the transmitter can be connected to the AC power public utilities, and therefore, the conducted emissions test are 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. The output of the test item was connected to the spectrum analyzer through a 20dB pad. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to ≥ 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: Page 16 shows the carrier frequency separation. As can be seen from this plot, the separation is 1.020MHz which is greater than the 20dB bandwidth (925kHz).

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. If the power output is less than 125mW, frequency hopping systems that operate in the 2.4GHz band can use as few as fifteen hopping channels, regardless of hopping channel bandwidth.

4.3.2 PROCEDURE: The test item was setup inside the chamber. The output of the test item was connected to the spectrum analyzer through a 20dB pad. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to ≥ 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: 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.

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. The output of the test item was connected to the spectrum analyzer. 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: 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 330.0 usec burst every 99.5 msec's multiplied by a 30 second period. This calculated value is equal to

0.099 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. The output of the test item was connected to the spectrum analyzer through a 20dB pad. 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 ≥ 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 0.925 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: The output of the test item was connected to the spectrum analyzer. The maximum meter reading was recorded. The peak power output was calculated for the low, middle and high hopping frequencies.

4.6.3 RESULTS: The results are presented on page 23. The maximum antenna conducted output power measured from the transmitter was -0.2 dBm which meets the 30 dBm limit. The maximum EIRP measured from the transmitter was 3.5 dBm which meets the De Facto 36 dBm limit.

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: Pages 24 through 27 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 ANTENNA CONDUCTED EMISSIONS

4.8.1.1 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.

4.8.1.2 PROCEDURES: The measuring equipment was connected to the test item's antenna port. The emissions in the frequency range from 30MHz to 18GHz were observed and plotted separately with the test item transmitting at 2402.0MHz, 2441.0MHz, and 2480.0MHz. Compliance above 18GHz is demonstrated with radiated measurements.

4.8.1.3 RESULTS: The results of the antenna conducted emissions levels were plotted. These plots are presented on pages 28 through 36. These plots show that the spurious emissions were at least 20 dB below the level of the fundamental.

4.8.2 RADIATED SPURIOUS EMISSIONS:

4.8.2.1 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.

4.8.2.2 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. 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.

4.8.2.3 RESULTS: The preliminary emissions levels were plotted. These plots are presented on pages 37 through 45. These plots show that the radiated spurious emissions were at least 20 dB below the level of the fundamental.

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 pages 46 through 48. The field intensities levels for the harmonics in the restricted band were within the 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.

4.9.2 PROCEDURE: The output of the test item was connected to the spectrum analyzer. The test item was put into inquiry mode.

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: Page 49 shows the power spectral density results. 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 In-Vehicle Bluetooth Module 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.

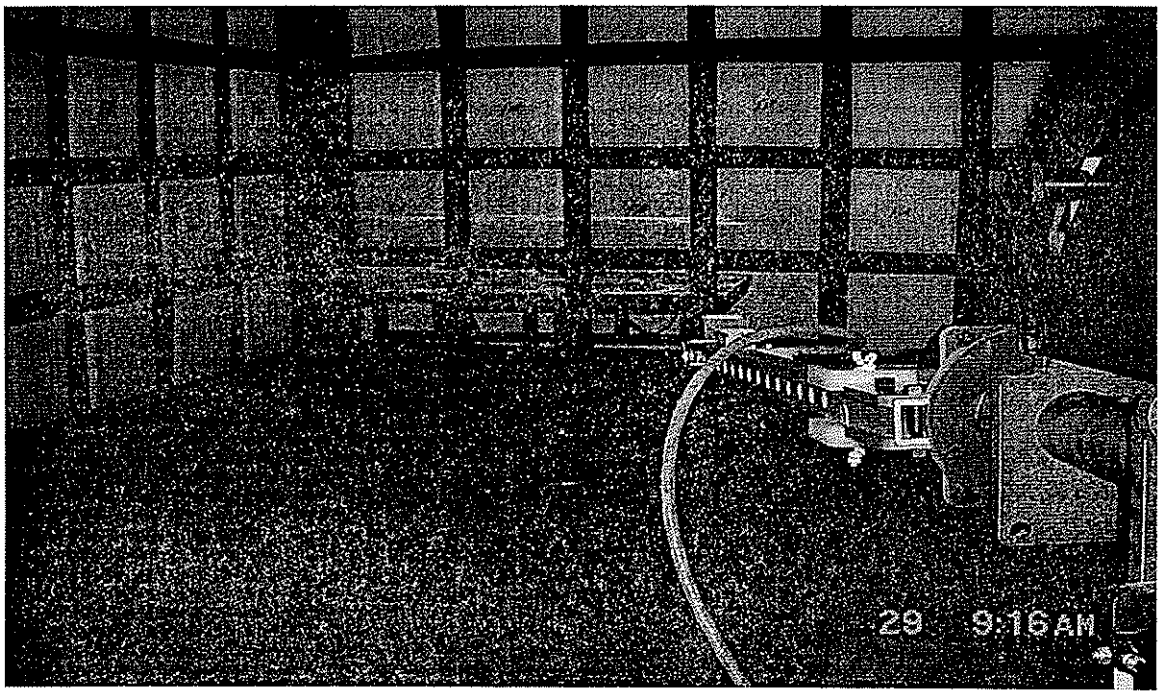
TABLE I: TEST EQUIPMENT LIST

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								
XZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---		N/A	
XPR0	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800	001	4.8-20GHZ	06/22/02	12	06/22/03
Equipment Type: AMPLIFIERS								
APH0	POWER AMPLIFIER	HEWLETT PACKARD	11975A	2304A00322	2-8GHZ		NOTE 1	
APK0	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	02/22/02	12	02/22/03
Equipment Type: ANTENNAS								
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	06/25/02	12	06/25/03
NWI0	RIDGED WAVE GUIDE	AEL	H1498	153	2-18GHZ	08/09/02	12	08/09/03
Equipment Type: ATTENUATORS								
T2D6	20DB, 25W ATTENUATOR - ESD	WEINSCHEL	46-20-43	AY9245	DC-18GHZ	02/04/02	12	02/04/03
Equipment Type: CONTROLLERS								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---		N/A	
CDG1	COMPUTER	HEWLETT PACKARD	D5893T	US91465296	---		N/A	
CDS0	COMPUTER	GATEWAY	MFATXPNT NMZ	0028483109	1.8 GHZ		N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---		N/A	
Equipment Type: METERS								
MAA0	AC AMMETER	WESTON	904	14562	750MA	05/11/02	12	05/11/03
Equipment Type: PRINTERS AND PLOTTERS								
HRE1	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061052	---		N/A	
HRG1	LASERJET 2100XI	HEWLETT PACKARD	C4170A	USCD047809	---		N/A	
HRL0	PRINTER LASERJET 2200D	HEWLETT PACKARD	C7058A	CNGRG86288	---		N/A	
Equipment Type: RECEIVERS								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	01/18/02	12	01/18/03
RACB	RF PRESELECTOR	HEWLETT PACKARD	85685A	3506A01491	20HZ-2GHZ	01/18/02	12	01/18/03
RAE1	SPECTRUM ANALYZER (DCC-CEM	HEWLETT PACKARD	85660A	2209A01336	100HZ-22GHZ	02/14/02	12	02/14/03
RAF3	QUASIPEAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/18/02	12	01/18/03
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.



Radiated Emissions Worst Case Horizontal Polarization

Radiated Emissions Worst Case Vertical Polarization

ELITE ELECTRONIC ENGINEERING Inc.

hp

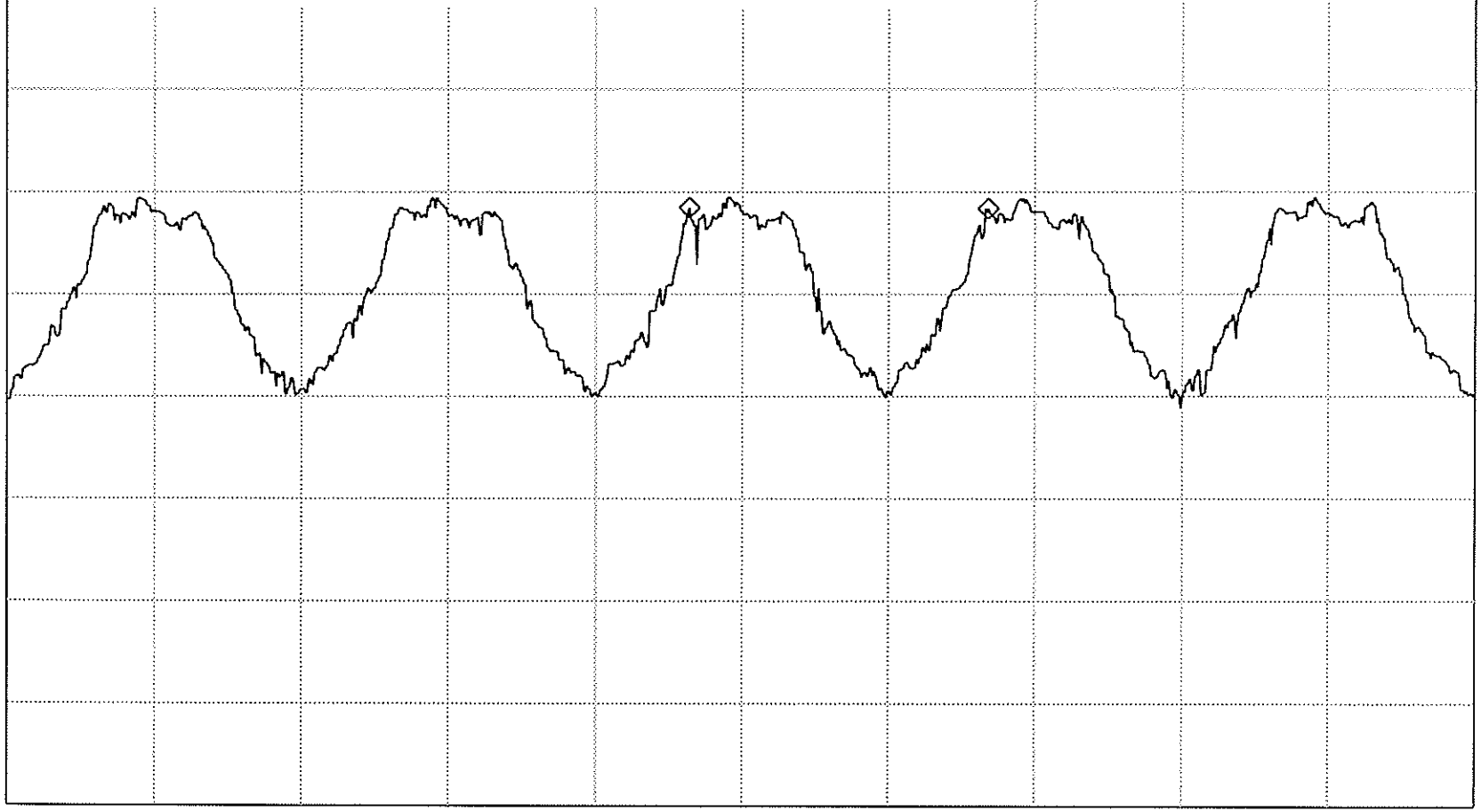
MKR ^ 1.020 MHz

REF 127.0 dBuV ATTEN 30 dB +20dB ext. -0.10 dB

10 dB/

R. KING
31 Oct 2002
10:24:41

MANFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL : 00E00C496045
TEST PERFORMED: FCC 15.247 CARRIER FREQ. SEPERATION
MODE : FREQ. HOPPING ENABLED
NOTES : FULL POWER ANT.



CENTER 2.441 00 GHz SPAN 5.00 MHz
RES BW 100 kHz(i) VBW 1 MHz SWP 20.0 msec

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ELITE ELECTRONIC ENGINEERING Inc.

hp

MKR 2.407 89 GHz

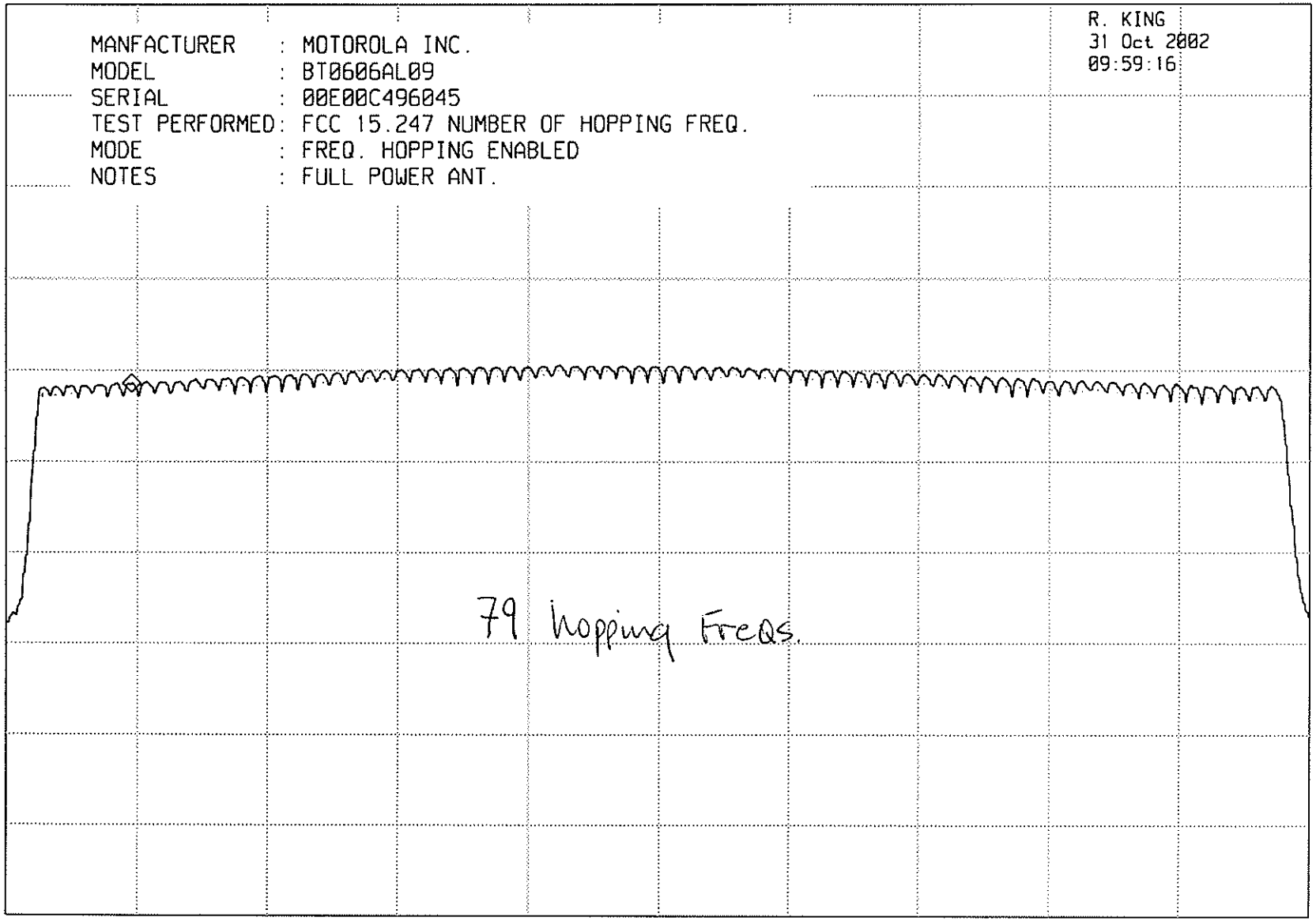
REF 127.0 dBuV ATTEN 30 dB + 20dB ext 85.50 dBuV

10 dB/

OFFSET
-20.0
dB

R. KING
31 Oct 2002
09:59:16

MANFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL : 00E00C496045
TEST PERFORMED: FCC 15.247 NUMBER OF HOPPING FREQ.
MODE : FREQ. HOPPING ENABLED
NOTES : FULL POWER ANT.



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START 2.400 0 GHz
RES BW 1 MHz(i) VBW 3 MHz

STOP 2.483 0 GHz
SWP 20.0 msec

ELITE ELECTRONIC ENGINEERING Inc.

hp

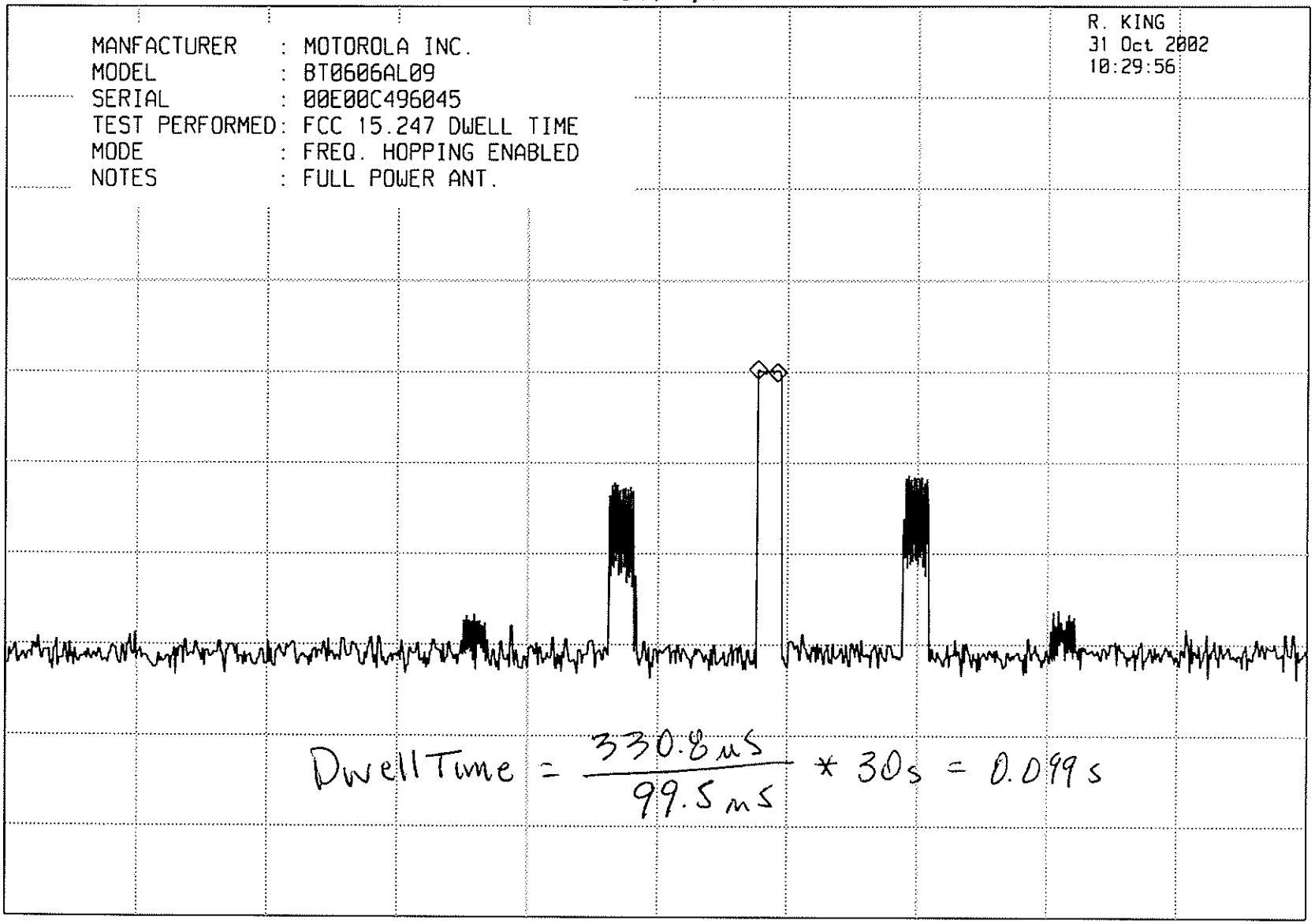
MKR ^ 330.8 usec
-0.30 dB

REF 127.0 dBuV ATTEN 30 dB +20dB ext.

10 dB/

R. KING
31 Oct 2002
10:29:56

MANFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL : 00E00C496045
TEST PERFORMED: FCC 15.247 DWELL TIME
MODE : FREQ. HOPPING ENABLED
NOTES : FULL POWER ANT.



$$\text{Dwell Time} = \frac{330.8\,\mu s}{99.5\,ms} * 30s = 0.099\,s$$

CENTER 2.441 000 000 GHz
RES BW 1 MHz(i) VBW 3 MHz
SPAN 0 Hz
SWP 22.1 msec

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ELITE ELECTRONIC ENGINEERING Inc.

hp

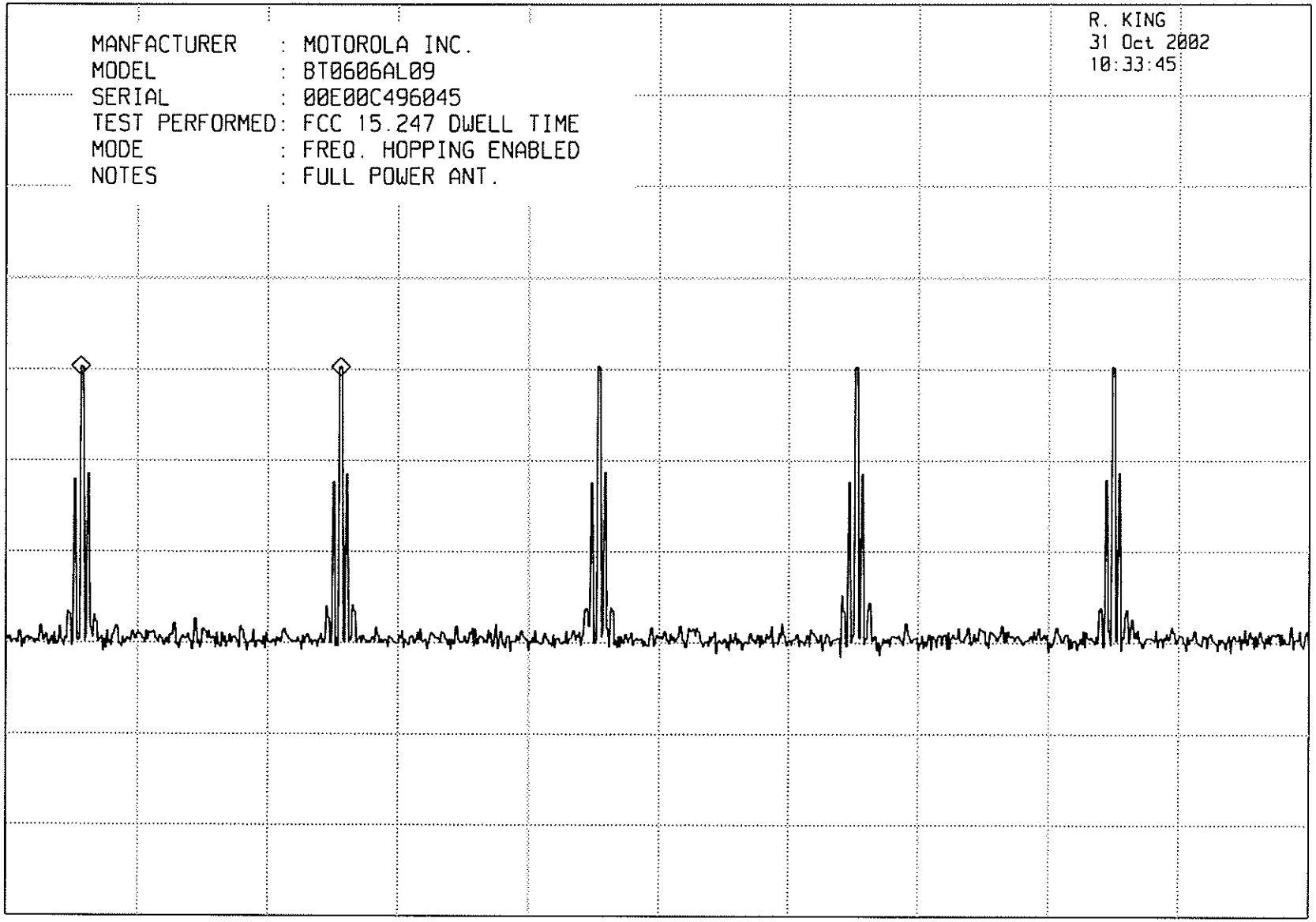
MKR ^ 99.50 msec
-0.10 dB

REF 127.0 dBuV ATTEN 30 dB + 20 dB ext.

10 dB/

R. KING
31 Oct 2002
10:33:45

MANFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL : 00E00C496045
TEST PERFORMED: FCC 15.247 DWELL TIME
MODE : FREQ. HOPPING ENABLED
NOTES : FULL POWER ANT.



ETR 31521-02

CENTER 2.441 000 000 GHz
RES BW 1 MHz(i) VBW 3 MHz

SPAN 0 Hz
SWP 500 msec

ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 127.0 dBuV ATTEN 30 dB +20dB ext.

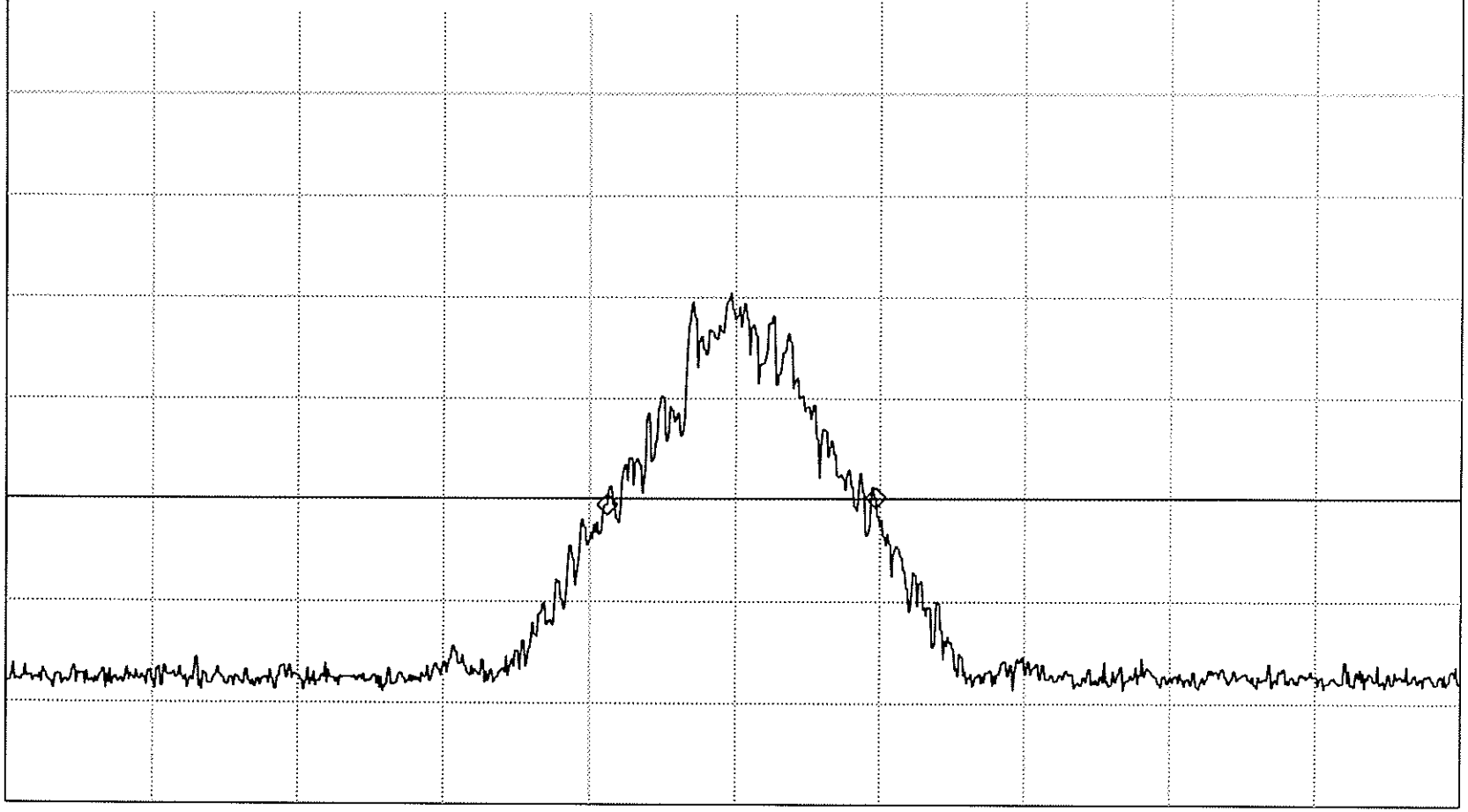
MKR ^ 925 kHz
0.70 dB

10 dB/

MANFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL : 00E00C496045
TEST PERFORMED: FCC 15.247 20 dB BANDWIDTH
MODE : TRANSMIT @ 2402.0MHz
NOTES : FULL POWER ANT.

R. KING
31 Oct 2002
10:39:11

DL
57.1
dBuV



CENTER 2.402 00 GHz
RES BW 10 kHz(i) VBW 100 kHz

SPAN 5.00 MHz
SWP 375 msec

ETR 31521-02

ELITE ELECTRONIC ENGINEERING Inc.

hp

MKR ^ 920 kHz
0.60 dB

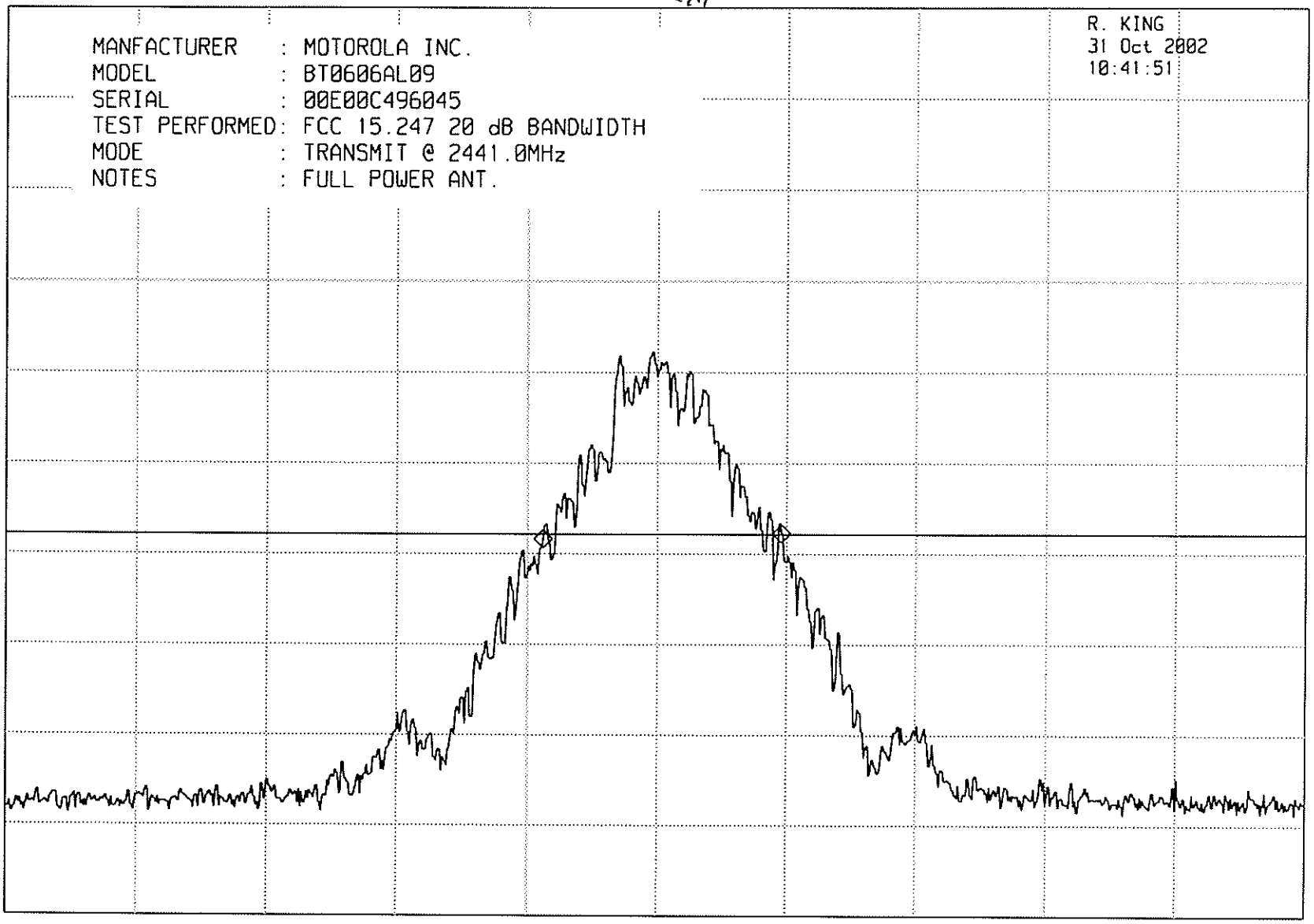
REF 117.0 dBuV ATTEN 20 dB + 20dB ext

10 dB/

R. KING
31 Oct 2002
10:41:51

MANFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL : 00E00C496045
TEST PERFORMED: FCC 15.247 20 dB BANDWIDTH
MODE : TRANSMIT @ 2441.0MHz
NOTES : FULL POWER ANT.

DL
59.1
dBuV



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CENTER 2.441 00 GHz
RES BW 10 kHz(i) VBW 100 kHz

SPAN 5.00 MHz
SWP 375 msec

ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 117.0 dBuV ATTEN 20 dB +20dB ext.

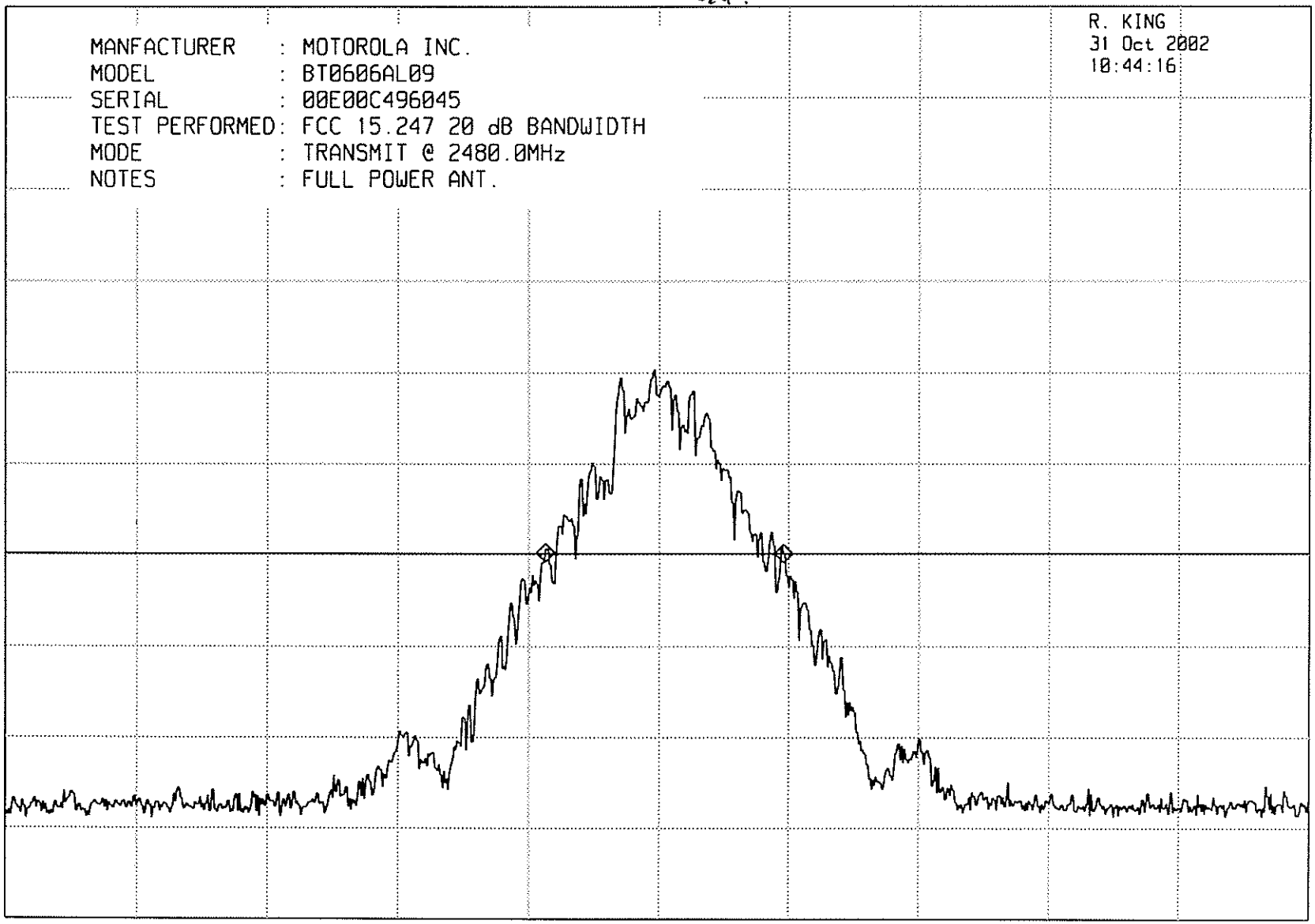
MKR ^ 915 kHz
-0.10 dB

10 dB/

MANFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL : 00E00C496045
TEST PERFORMED: FCC 15.247 20 dB BANDWIDTH
MODE : TRANSMIT @ 2480.0MHz
NOTES : FULL POWER ANT.

R. KING
31 Oct 2002
10:44:16

DL
57.1
dBuV



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CENTER 2.480 00 GHz
RES BW 10 kHz(i) VBW 100 kHz

SPAN 5.00 MHz
SWP 375 msec

PEAK OUTPUT POWER

SPECIFICATION : FCC 15C (15.247)
MANUFACTURER : MOTOROLA INC.
MODEL No. : BT0606AL09
SERIAL No. : 00E00C496045
NOTES : 3MHz BANDWIDTH
TEST DATE : FEBRUARY 21, 2003

ANTENNA CONDUCTED

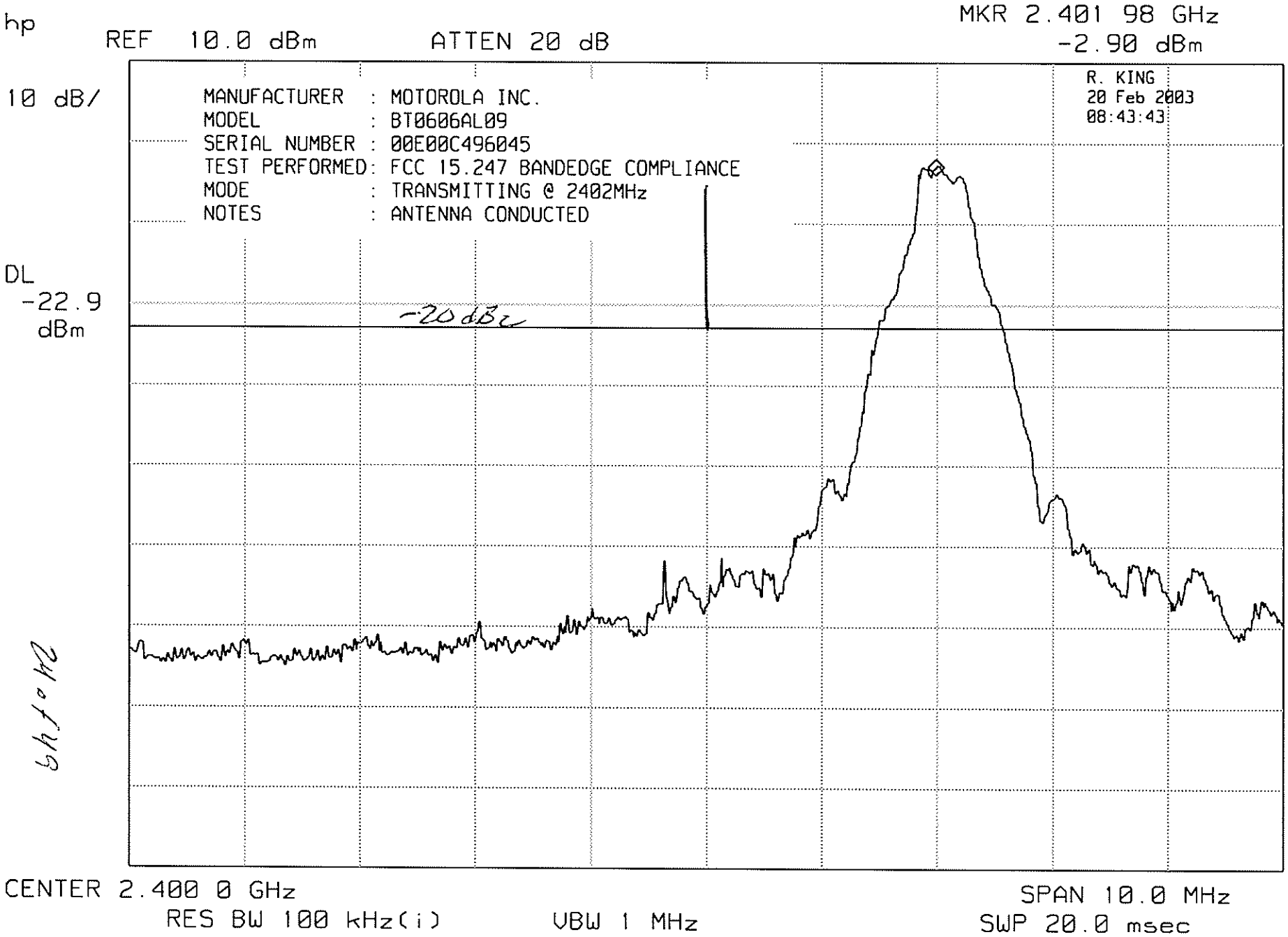
Freq. (MHz)	Mtr. Rdg dBm	Pads dB	Total (dBm)	Limit (dBm)
2402.0	-1.4	0.0	-1.4	30.0
2441.0	-0.3	0.0	-0.3	30.0
2480.0	-0.2	0.0	-0.2	30.0

RADIATED W/EXTERNAL ANTENNA

Freq. (MHz)	Ant. Pol.	F.I. (dBuV/m)	Conv. FI to EIRP	EIRP Total (dBm)	EIRP Limit (dBm)
2402	H	94.5	95	-0.5	36
	V	95.0	95	0.0	36
2441	H	95.4	95	0.4	36
	V	98.4	95	3.4	36
2480	H	94.1	95	-0.9	36
	V	98.5	95	3.5	36

CHECKED BY: Richard E. King
Richard E. King

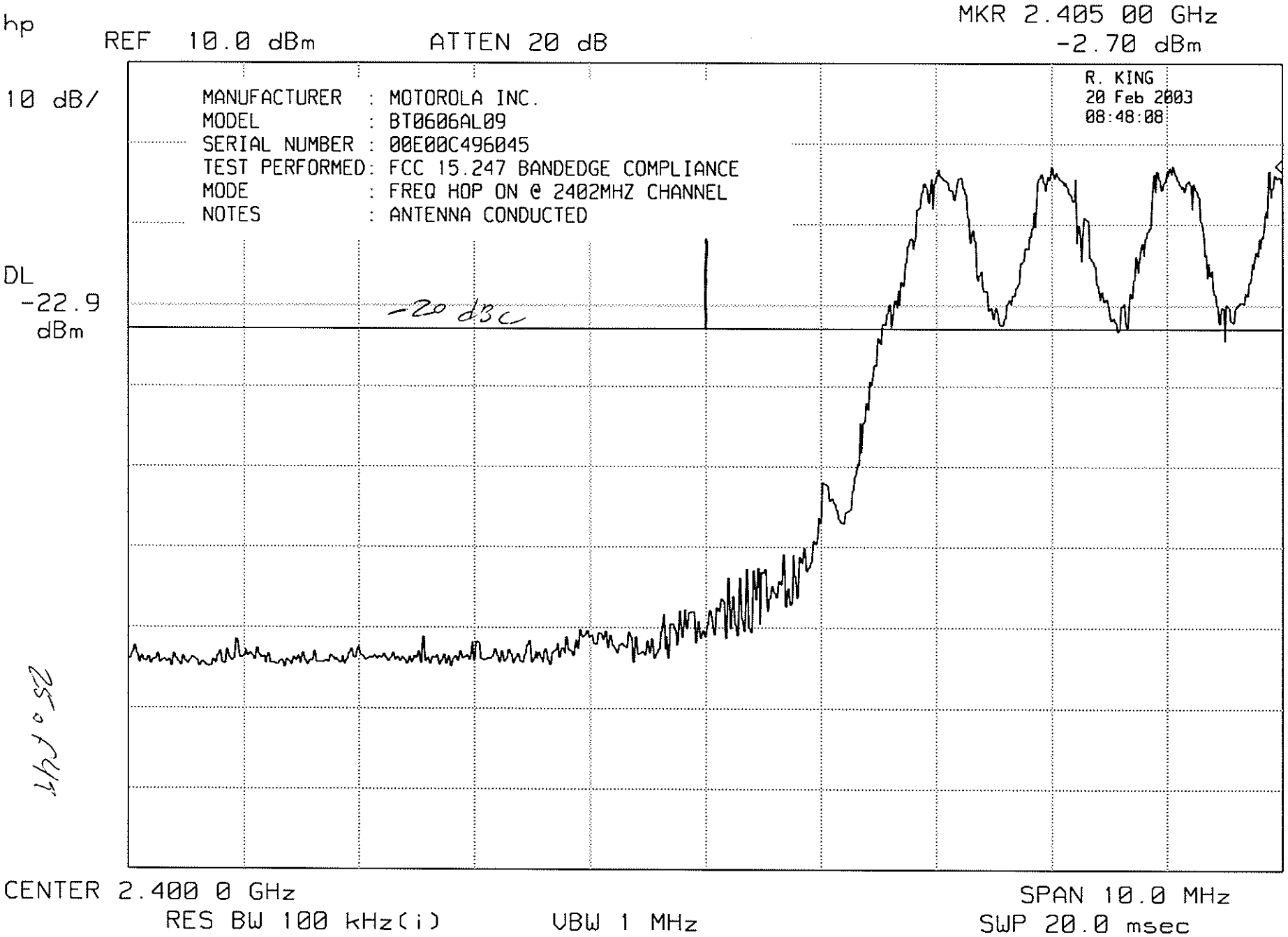
ELITE ELECTRONIC ENGINEERING Inc.



ETR 31521-02

24 of 49

ELITE ELECTRONIC ENGINEERING Inc.



ETR 31521-02

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ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 117.0 dBuV ATTEN 20 dB

MKR 2.479 95 GHz
98.90 dBuV

10 dB/

DL
56.1
dBuV

MANUFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL NUMBER : 00E00C496045
TEST PERFORMED: FCC 15.247 BANDEDGE COMPLIANCE
MODE : MAXIMIZE @ 2480MHz
NOTES : RAD. TO GEN. LIMIT DELTA METHOD

R. KING
20 Feb 2003
16:06:20

98.2dBuV/m
54 general Limit
44.2delta

GENERAL Limit

CENTER 2.483 5 GHz
RES BW 100 kHz(i) VBW 1 MHz

SPAN 10.0 MHz
SWP 20.0 msec

22 of 49

ETR 31521-02

ELITE ELECTRONIC ENGINEERING Inc.

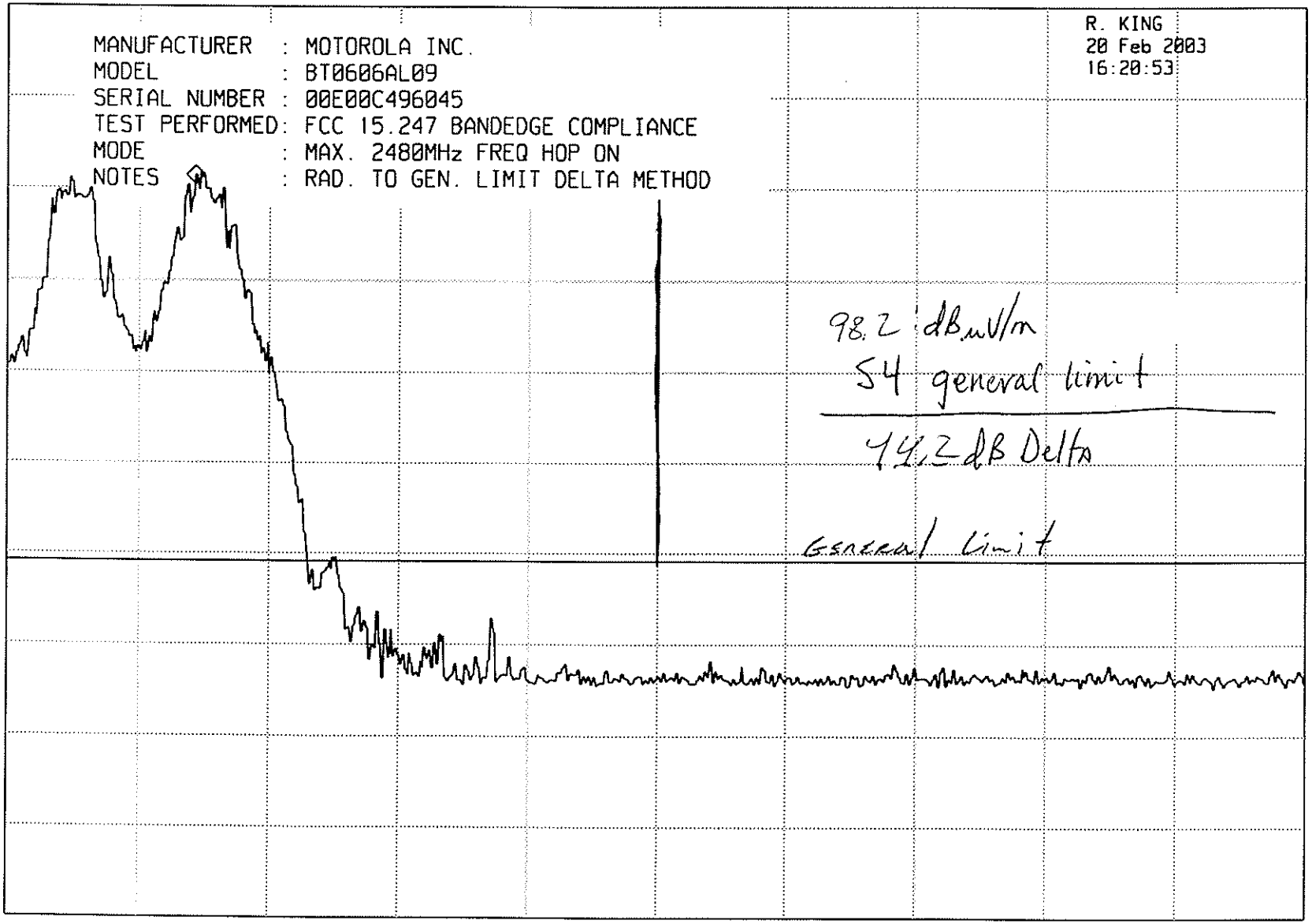
hp

REF 117.0 dBuV ATTEN 20 dB

MKR 2.479 92 GHz
98.50 dBuV

10 dB/

DL
56.1
dBuV



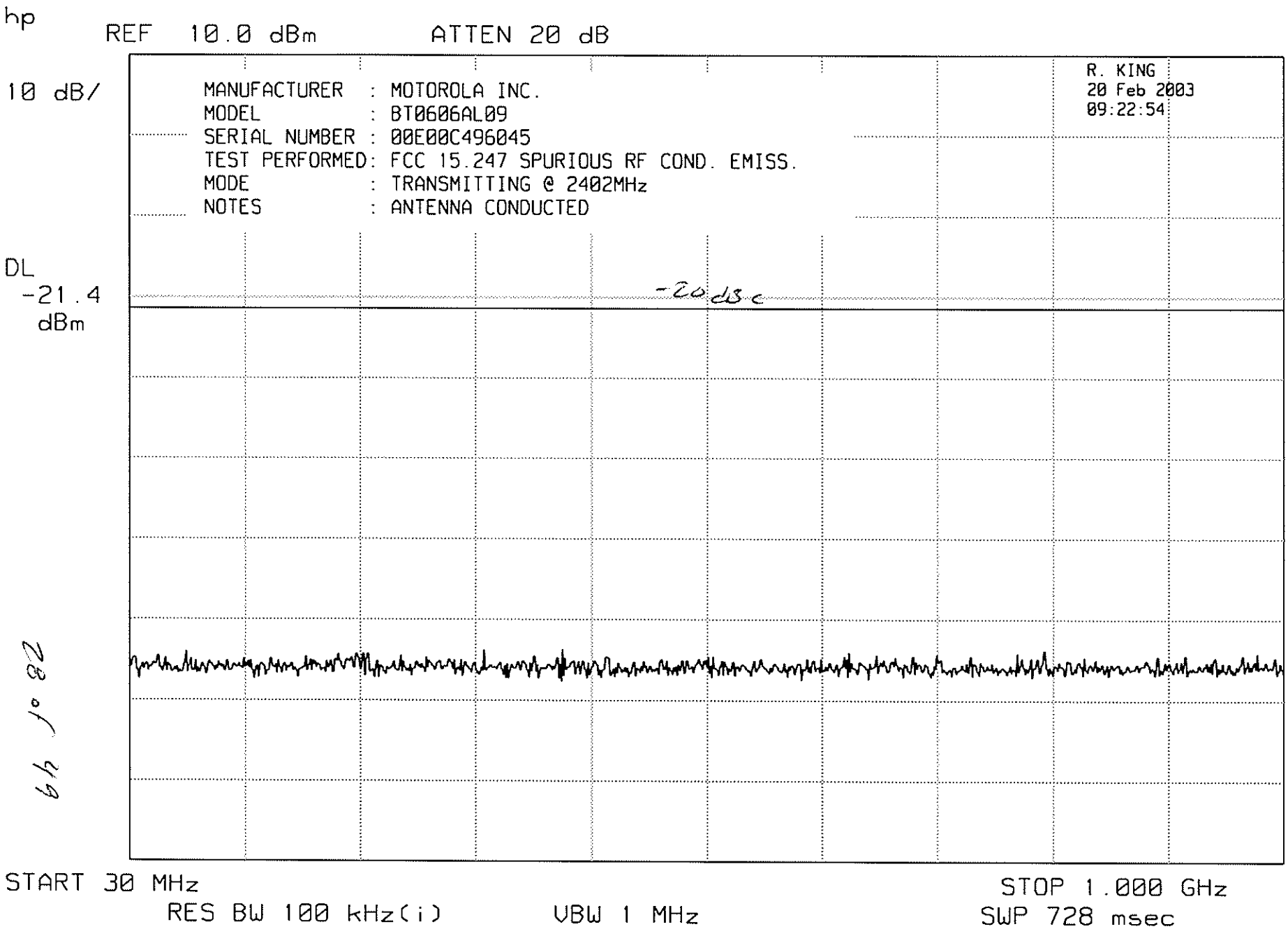
CENTER 2.483 5 GHz
RES BW 100 kHz(i) VBW 1 MHz

SPAN 10.0 MHz
SWP 20.0 msec

27 of 49

ETL 31521-02

ELITE ELECTRONIC ENGINEERING Inc.



ETR 31521-02

ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 10.0 dBm ATTEN 20 dB

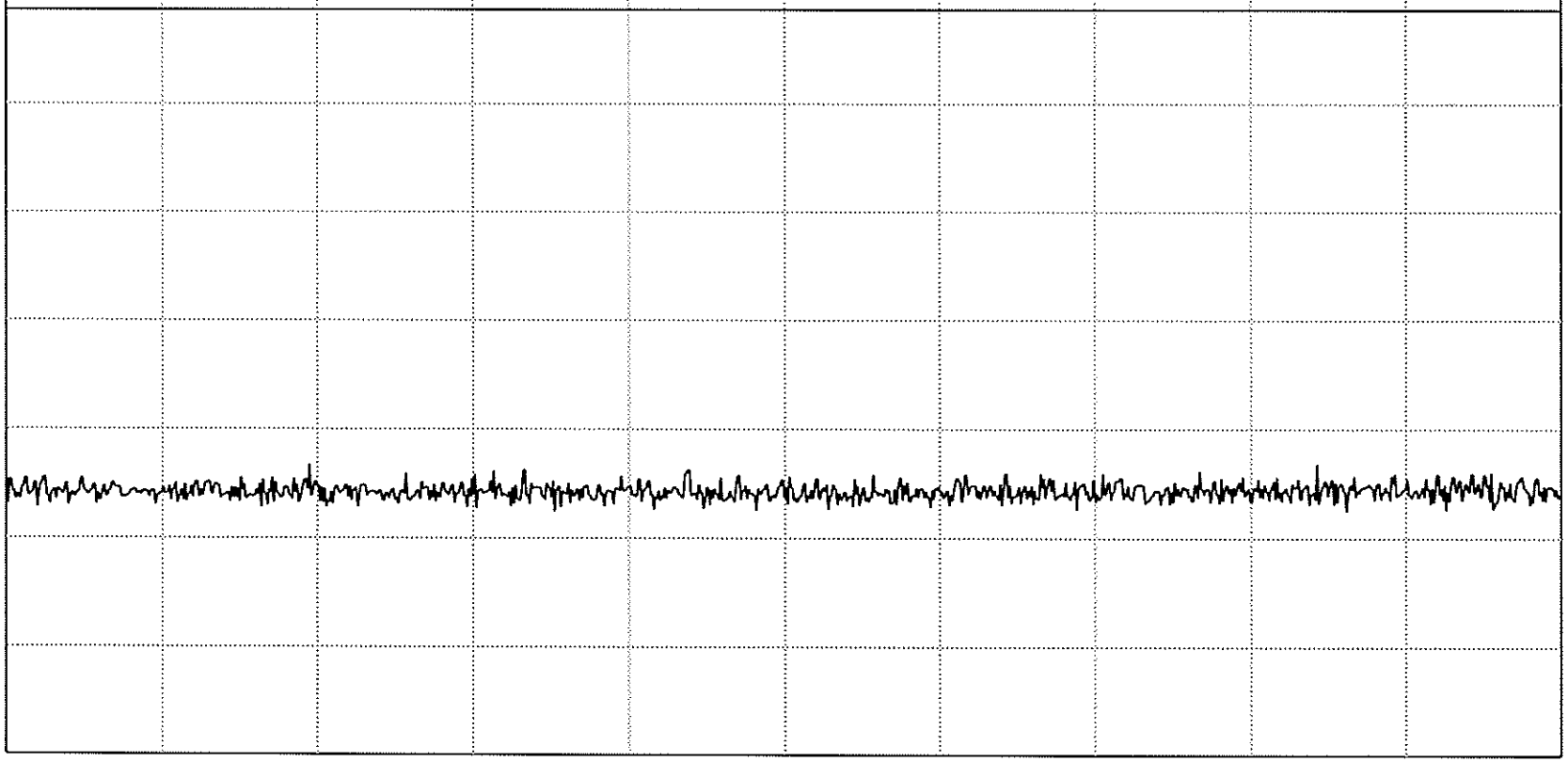
10 dB/

R. KING
20 Feb 2003
09:24:15

MANUFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL NUMBER : 00E00C496045
TEST PERFORMED: FCC 15.247 SPURIOUS RF COND. EMISS.
MODE : TRANSMITTING @ 2402MHz
NOTES : ANTENNA CONDUCTED

DL
-21.4
dBm

-20dBc

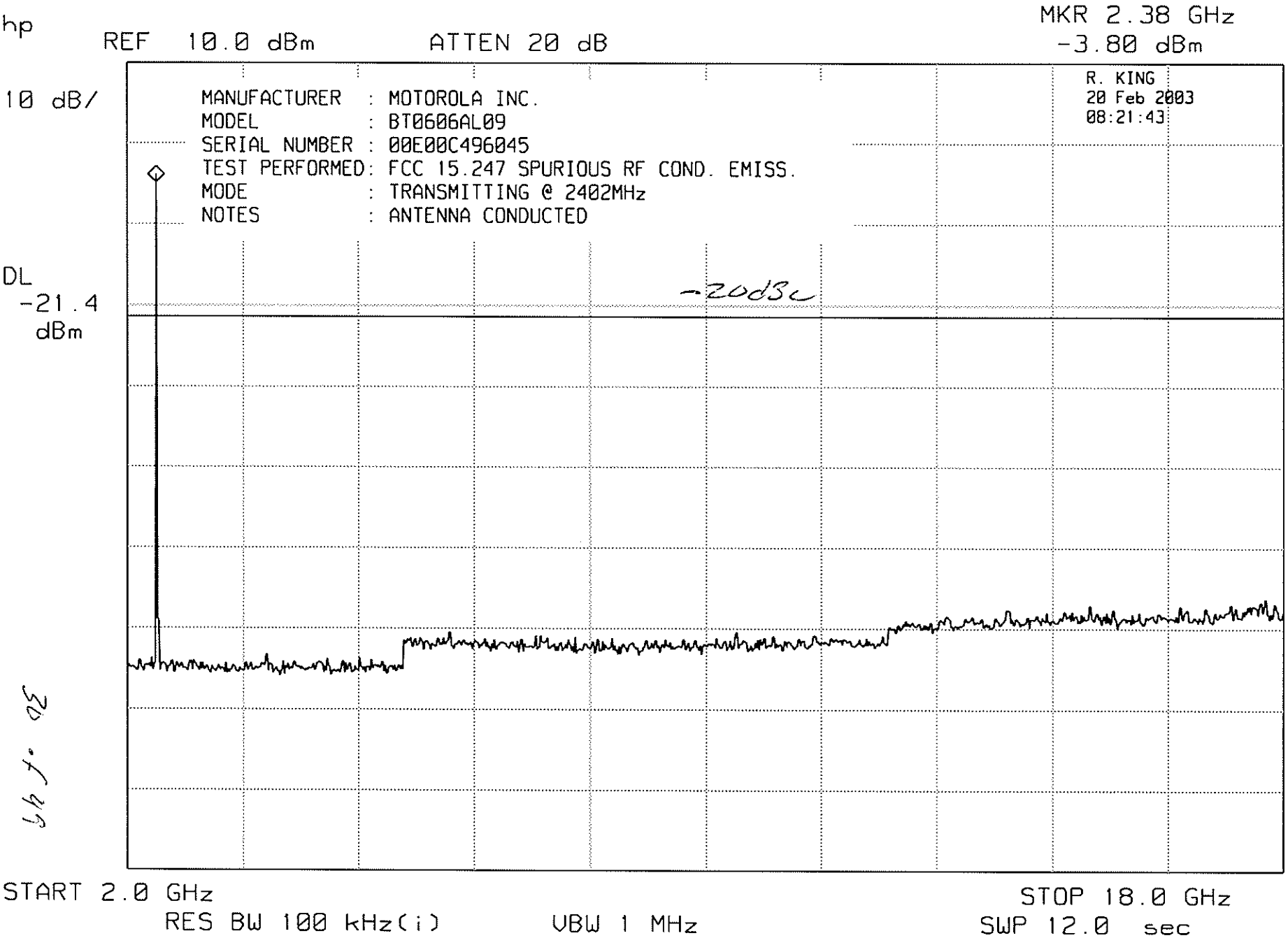


START 1.00 GHz STOP 2.00 GHz
RES BW 100 kHz(i) VBW 1 MHz SWP 750 msec

ETC 3/521-02

29 of 49

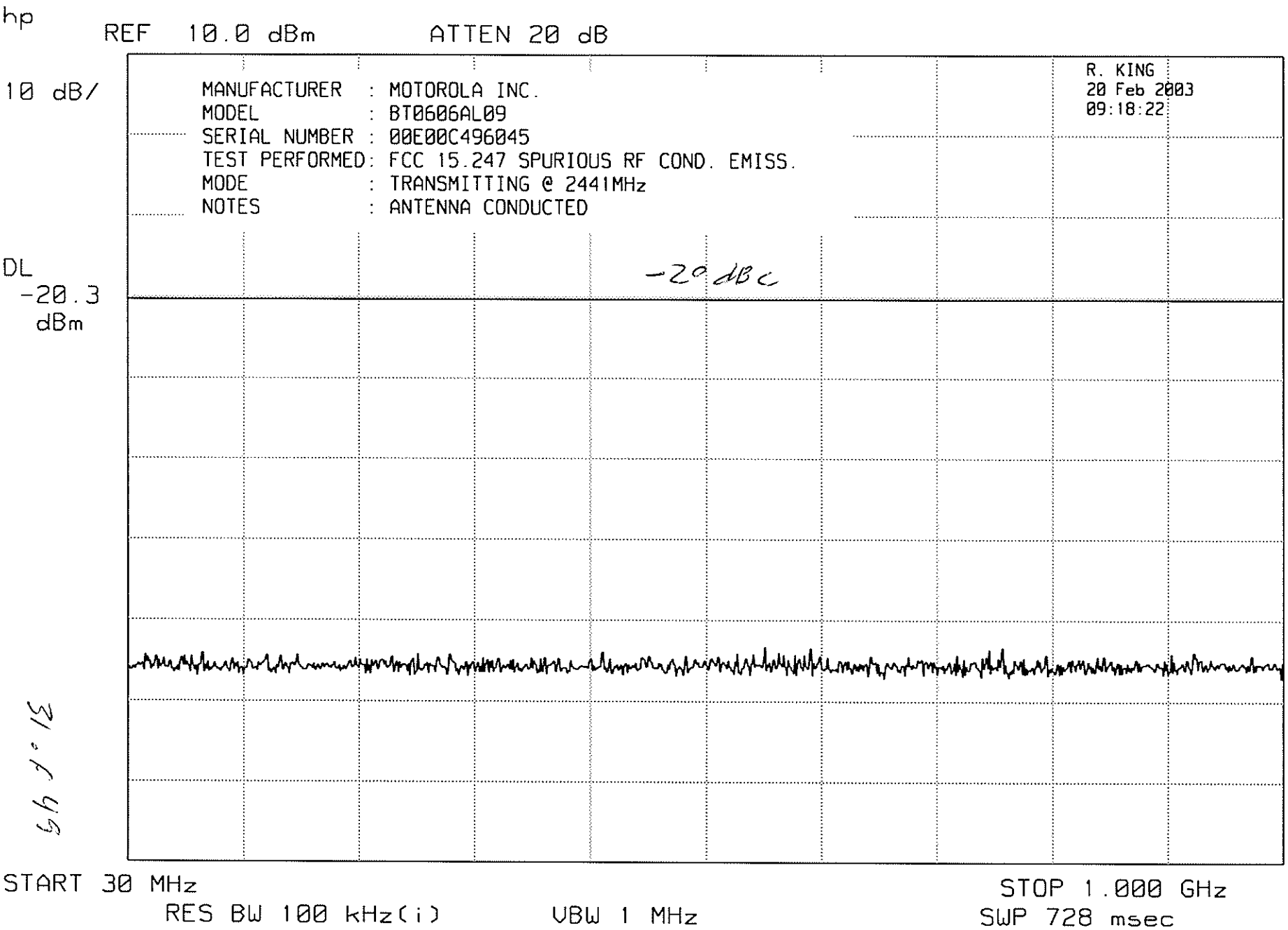
ELITE ELECTRONIC ENGINEERING Inc.



ETR 315-21-02

30 of 49

ELITE ELECTRONIC ENGINEERING Inc.



ETR 31521-02

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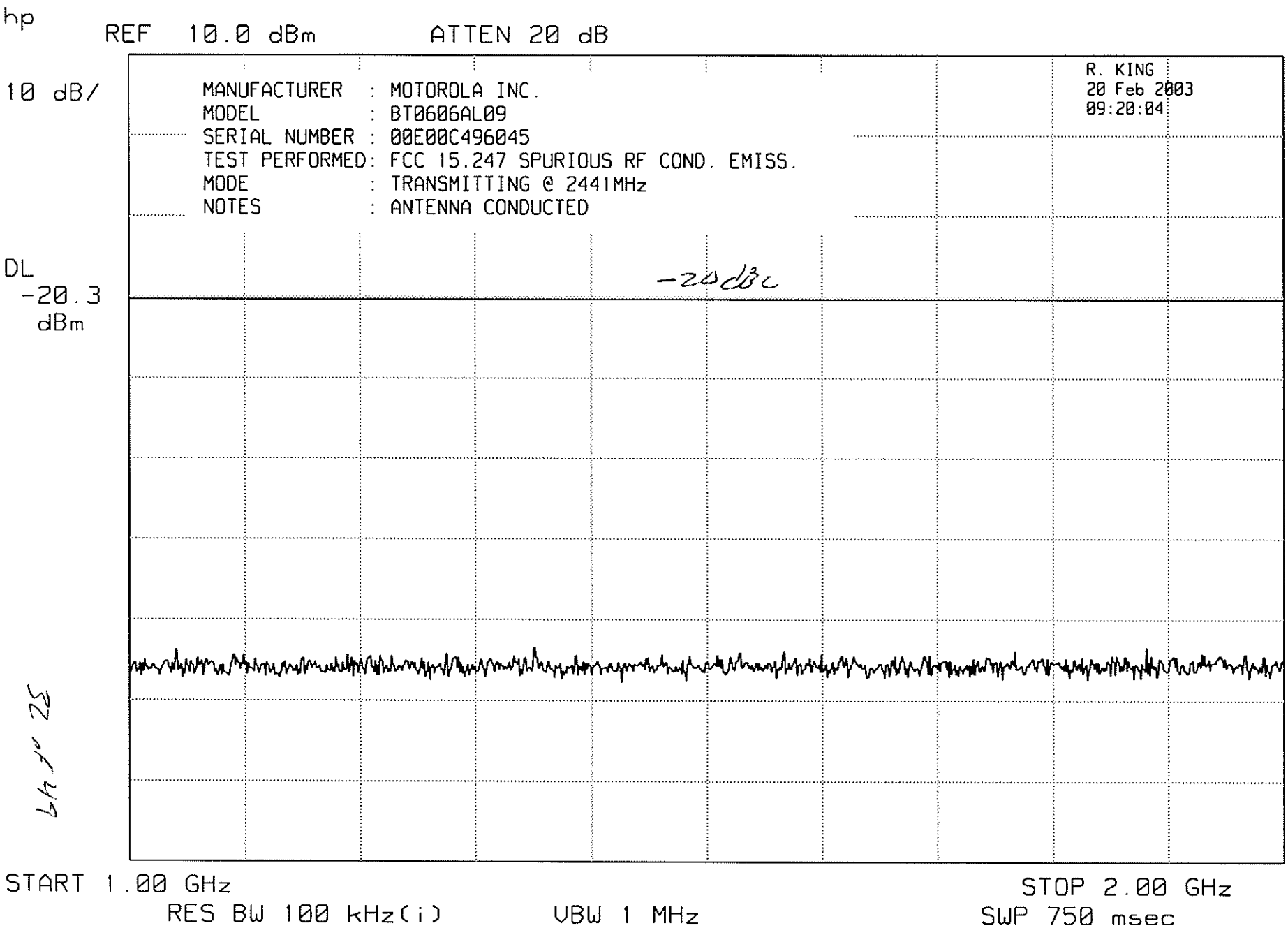
ELITE ELECTRONIC ENGINEERING Inc.



ETR 31521-02

ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 10.0 dBm ATTEN 20 dB

MKR 2.43 GHz
-2.00 dBm

10 dB/

MANUFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL NUMBER : 00E00C496045
TEST PERFORMED: FCC 15.247 SPURIOUS RF COND. EMISS.
MODE : TRANSMITTING @ 2441MHz
NOTES : ANTENNA CONDUCTED

R. KING
20 Feb 2003
08:12:17

DL
-20.3
dBm

-20 dBc

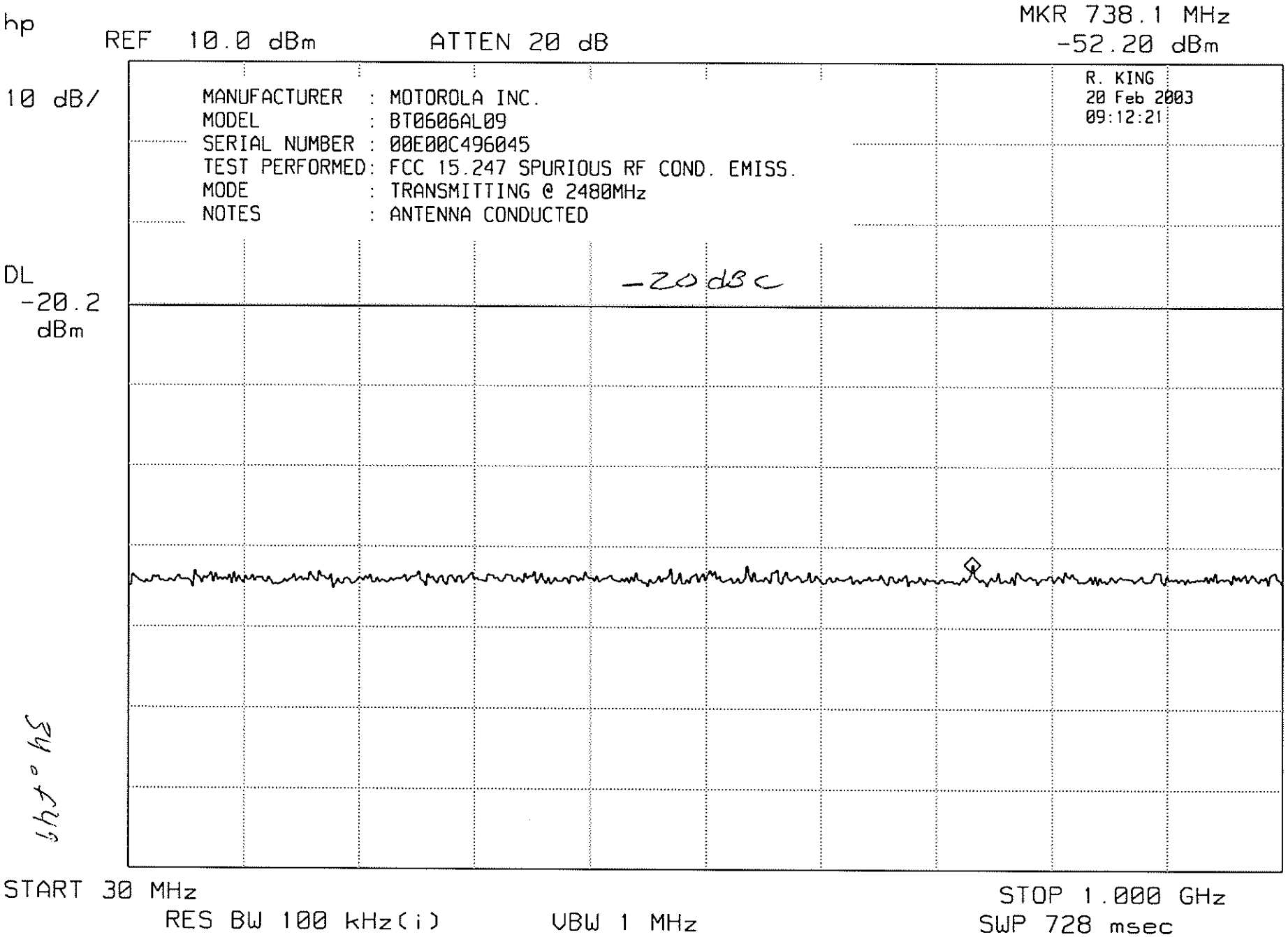
START 2.0 GHz
RES BW 100 kHz(i) VBW 1 MHz

STOP 18.0 GHz
SWP 12.0 sec

FTR 3152-02

33 of 49

ELITE ELECTRONIC ENGINEERING Inc.



ETR 31521-02

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ELITE ELECTRONIC ENGINEERING Inc.

hp

REF 10.0 dBm ATTEN 20 dB

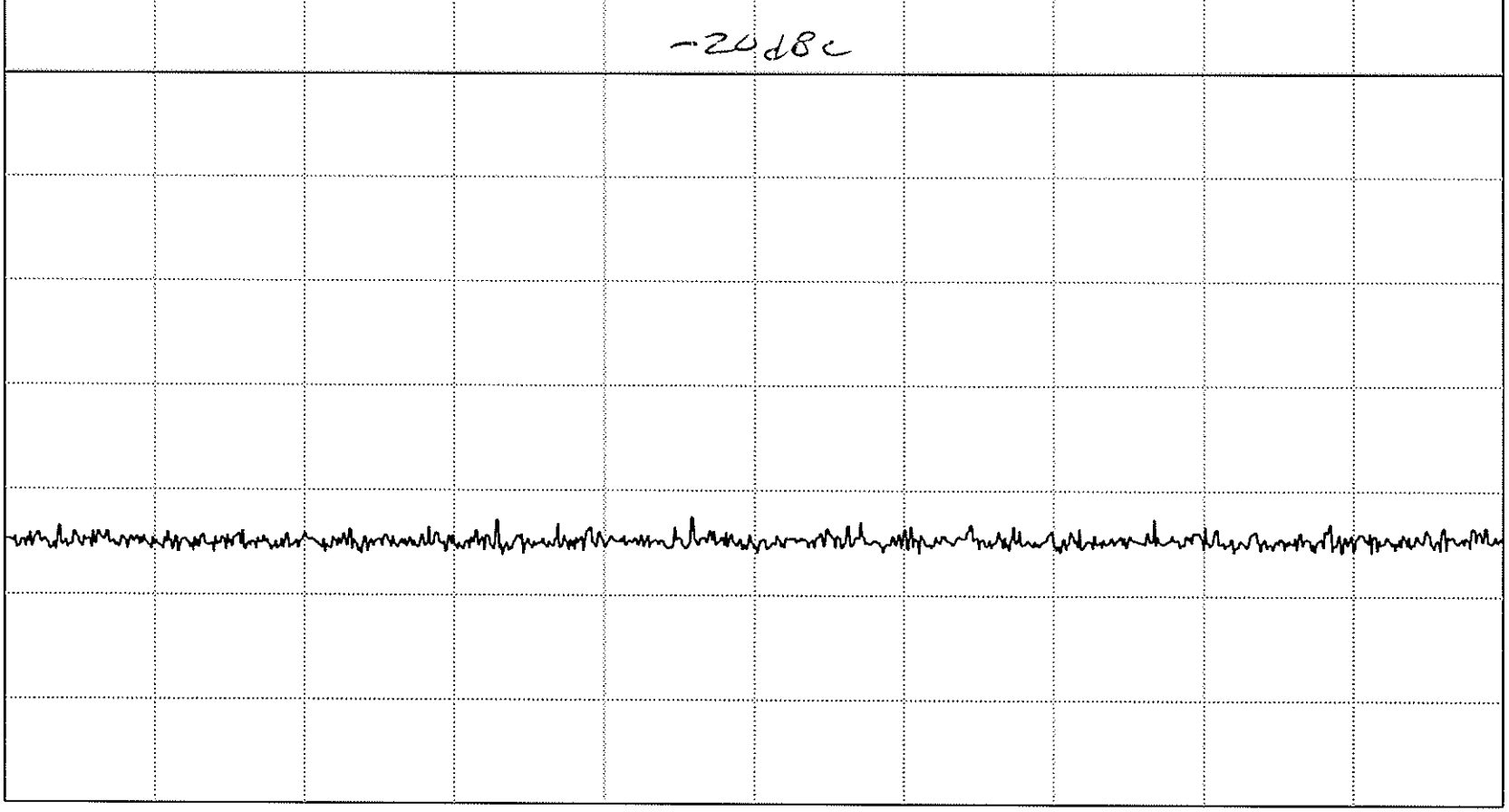
10 dB/

MANUFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL NUMBER : 00E00C496045
TEST PERFORMED: FCC 15.247 SPURIOUS RF COND. EMISS.
MODE : TRANSMITTING @ 2480MHz
NOTES : ANTENNA CONDUCTED

R. KING
20 Feb 2003
09:14:27

DL
-20.2
dBm

-20dBc

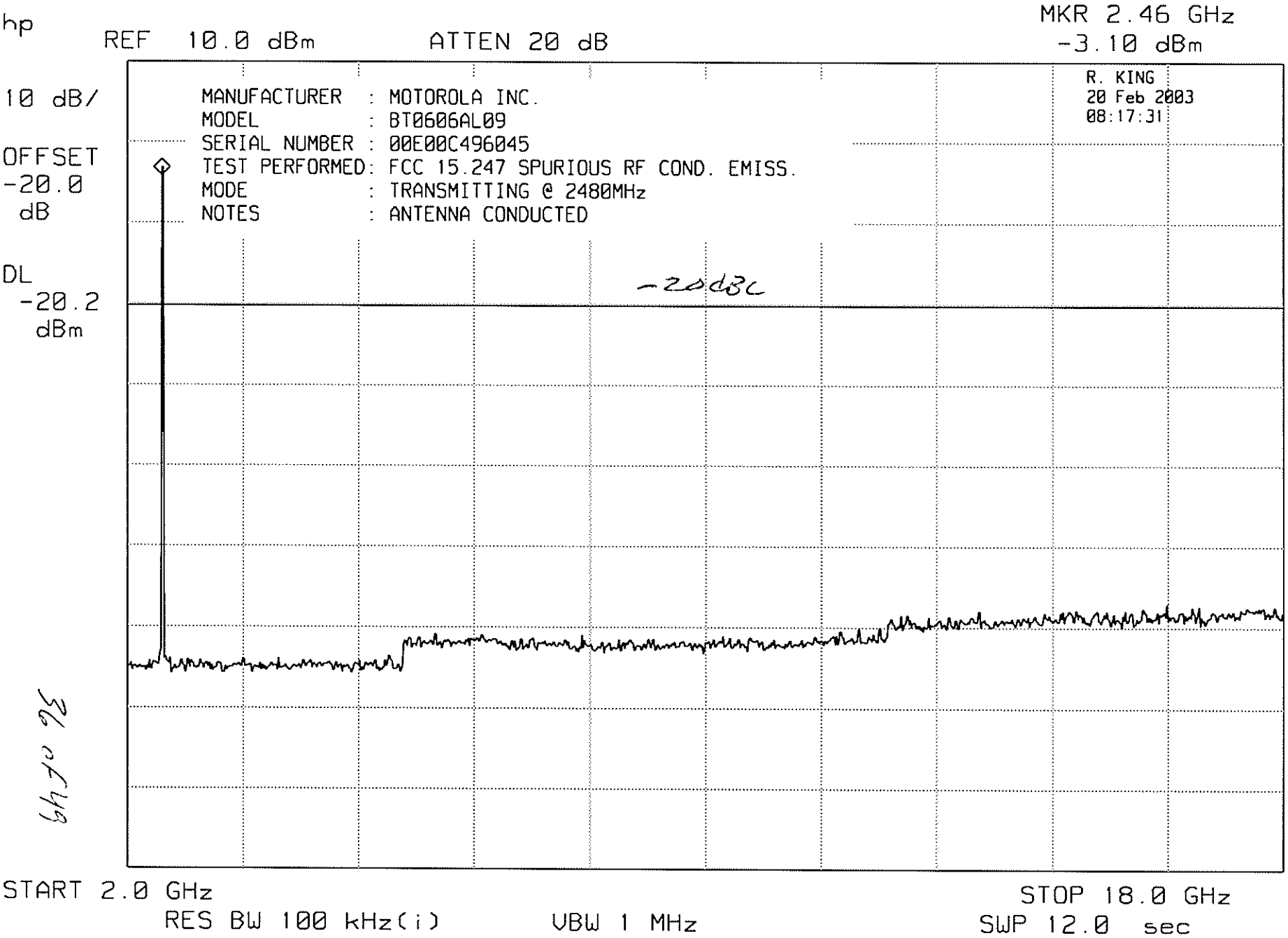


START 1.00 GHz STOP 2.00 GHz
RES BW 100 kHz(i) VBW 1 MHz SWP 750 msec

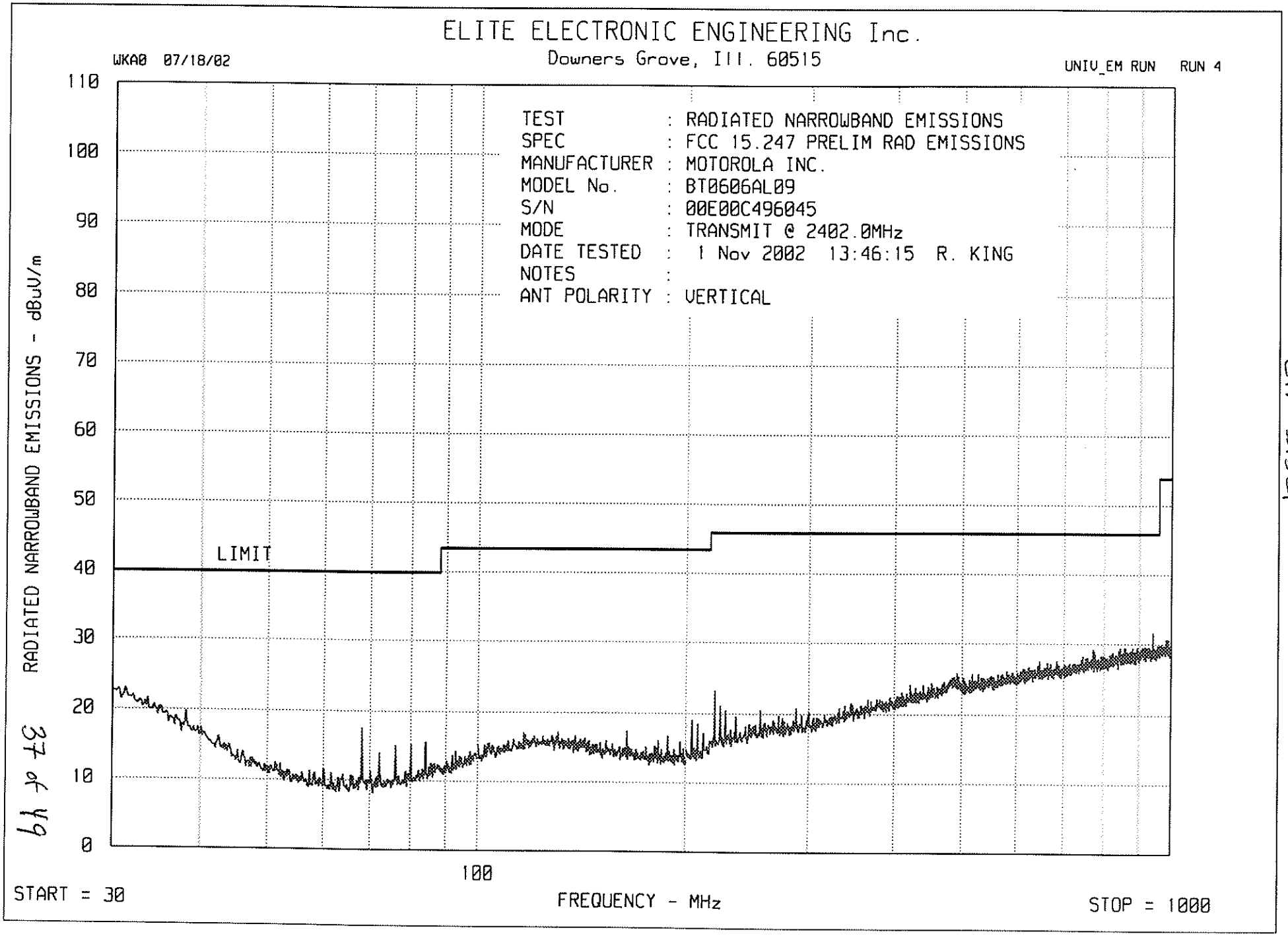
35.49

FTR 3152/-02

ELITE ELECTRONIC ENGINEERING Inc.



FTR 315-21-02


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 07/18/02
UNIV_EM RUN RUN 4
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 15.247 PRELIM RAD EMISSIONS
MANUFACTURER : MOTOROLA INC.
MODEL No. : BT0606AL09
S/N : 00E00C496045
MODE : TRANSMIT @ 2402.0MHz
DATE TESTED : 1 Nov 2002 13:46:15 R. KING
NOTES :
ANT POLARITY : VERTICAL
LIMIT
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
100
START = 30
FREQUENCY - MHz
STOP = 1000

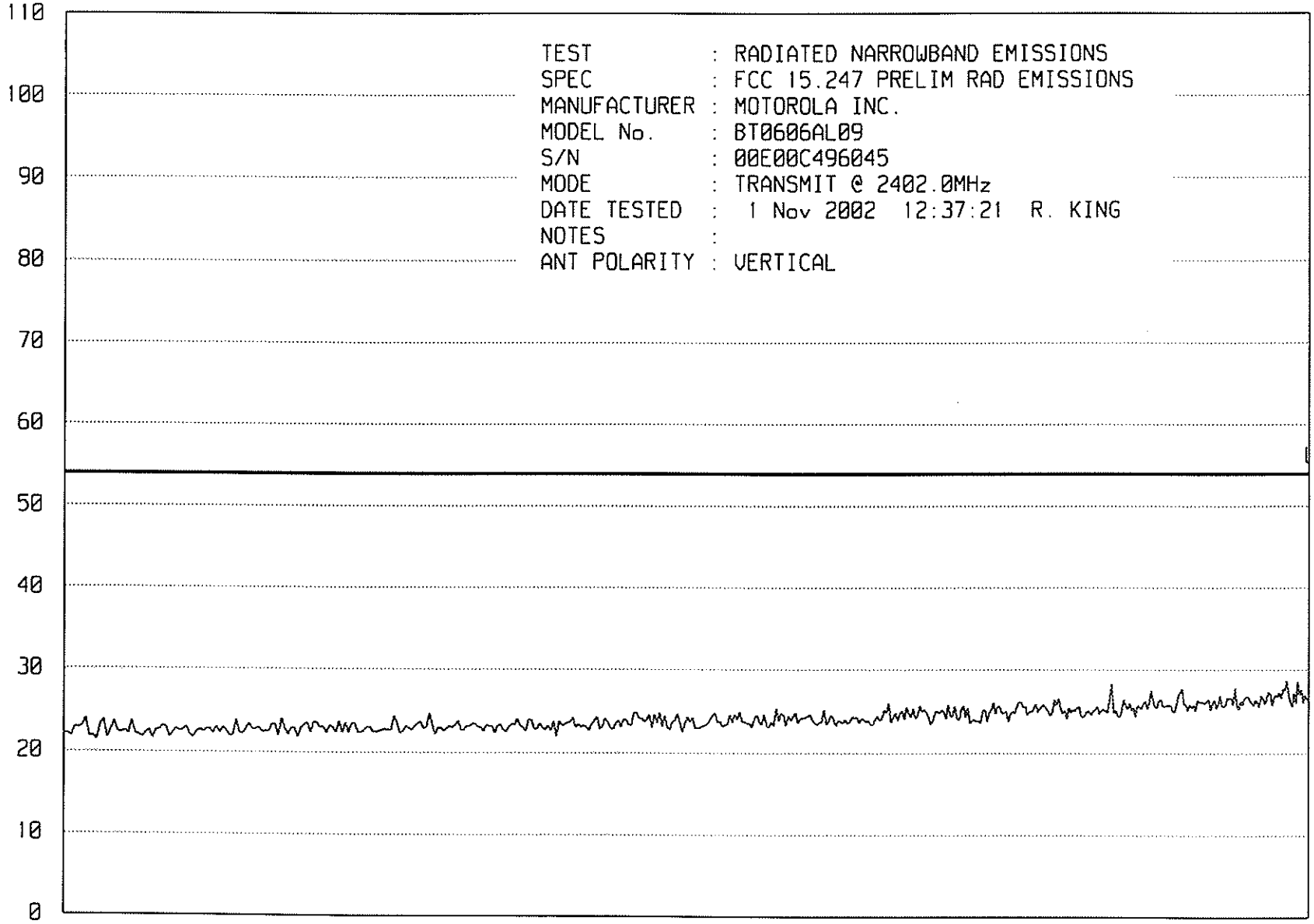
ETR 31521-02

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKA0 07/18/02

UNIV_EM RUN RUN 3



START = 1000

FREQUENCY - MHz

STOP = 2000

ETR 31521-02

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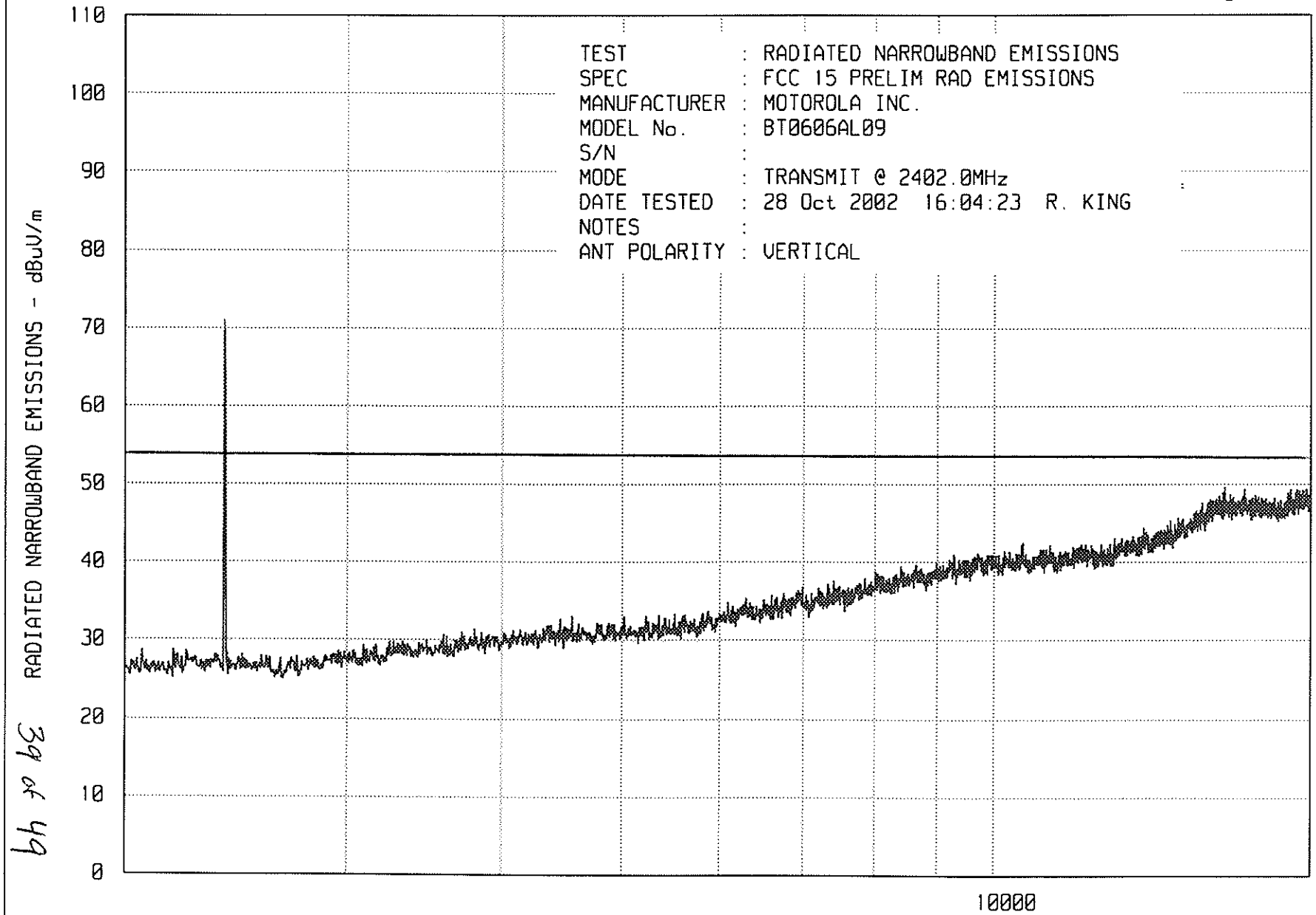
ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKA0 07/18/02

UNIV_EM RUN RUN 1



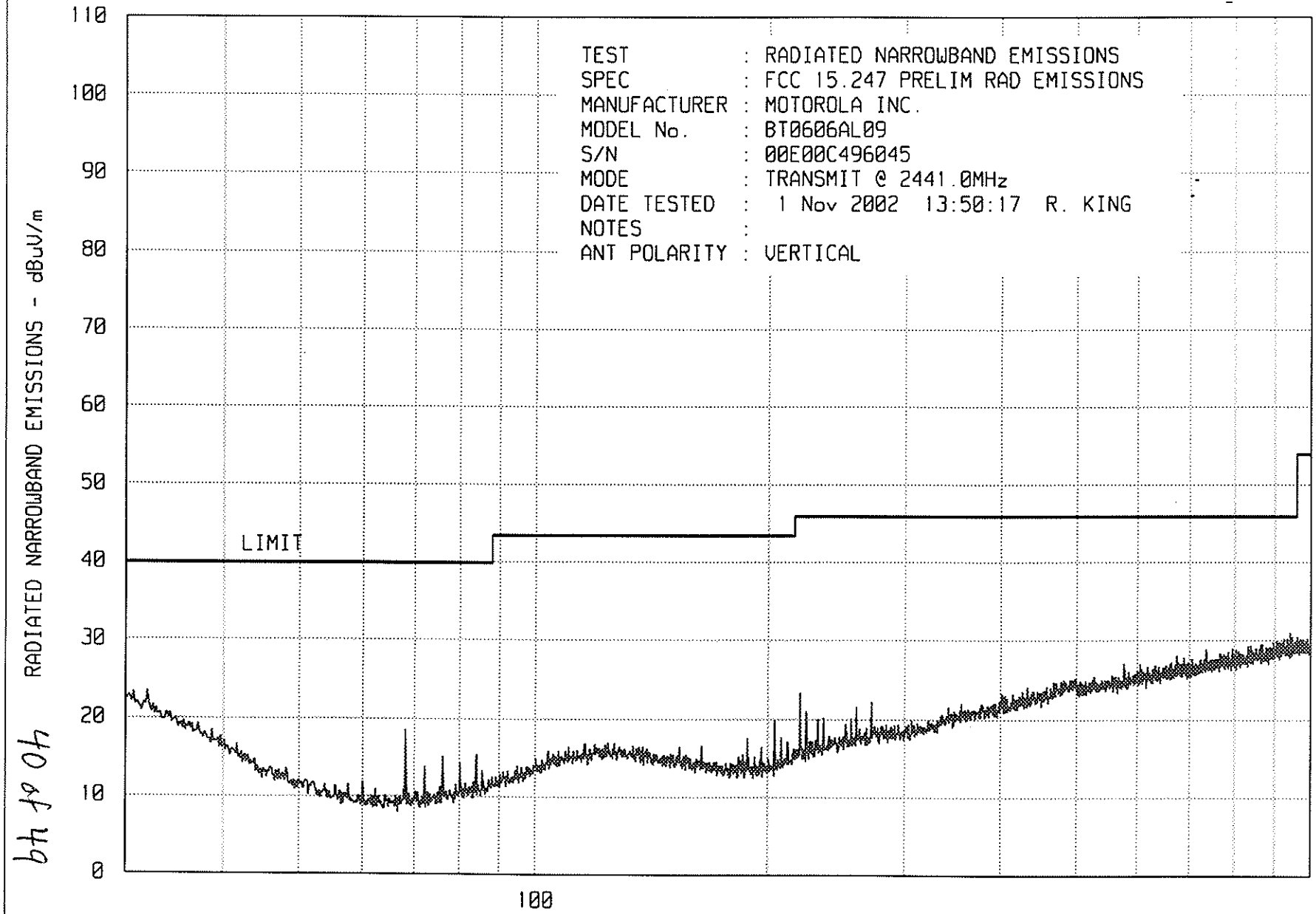
ETR 31521-02

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKA0 07/18/02

UNIV_EM RUN RUN 4



ETR 31521-02

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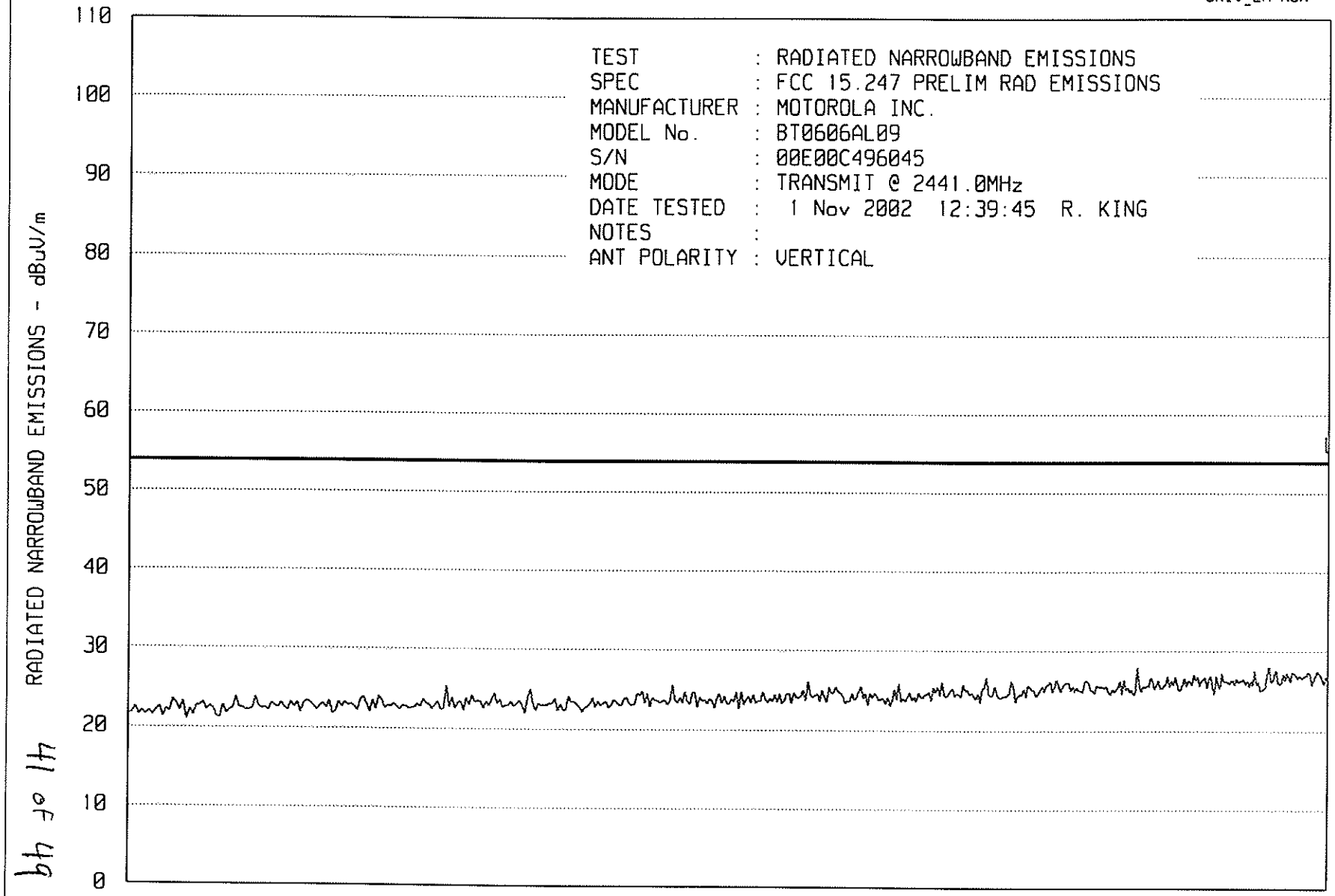
ELITE ELECTRONIC ENGINEERING Inc.

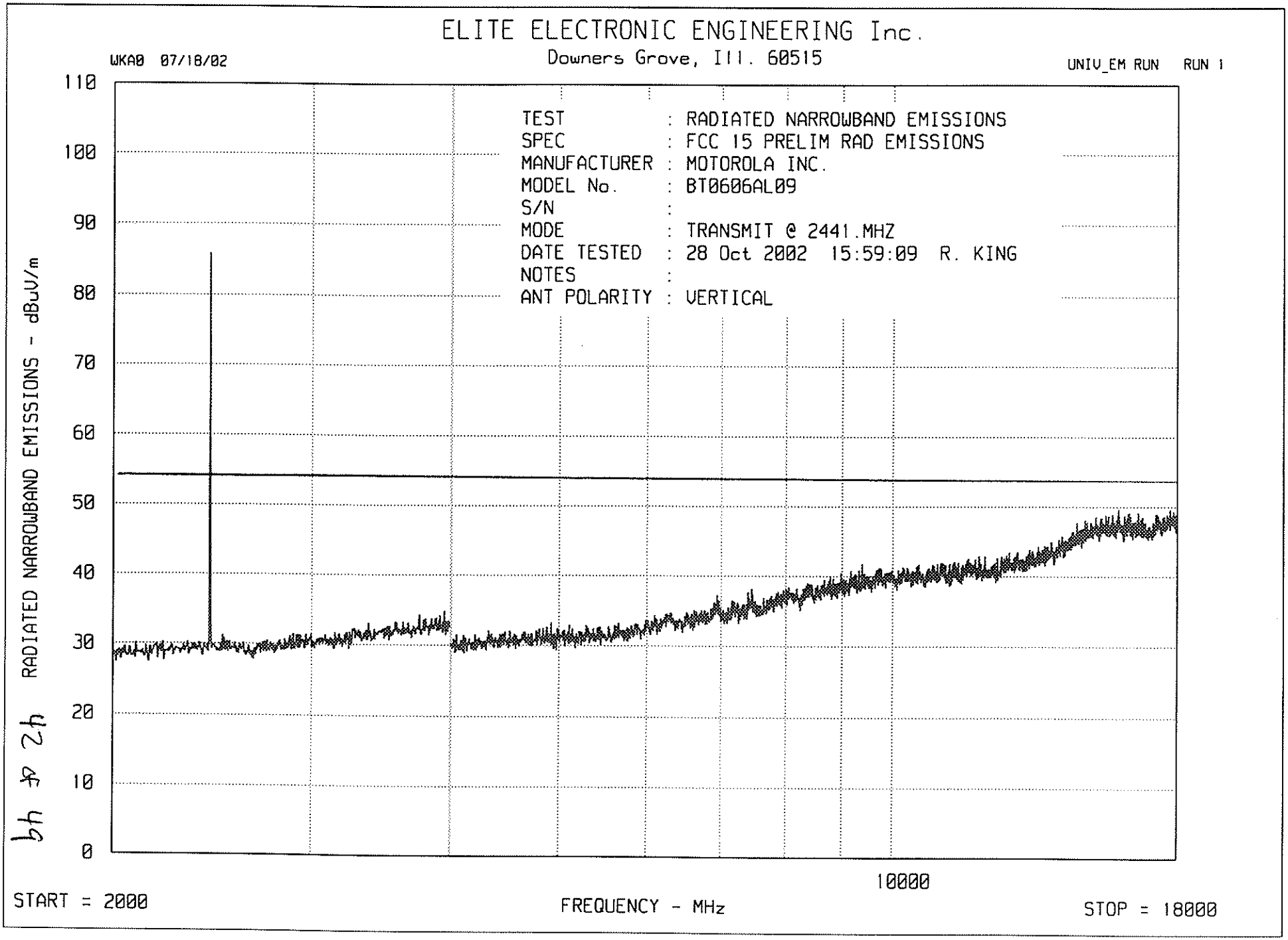
Downers Grove, Ill. 60515

WKA0 07/18/02

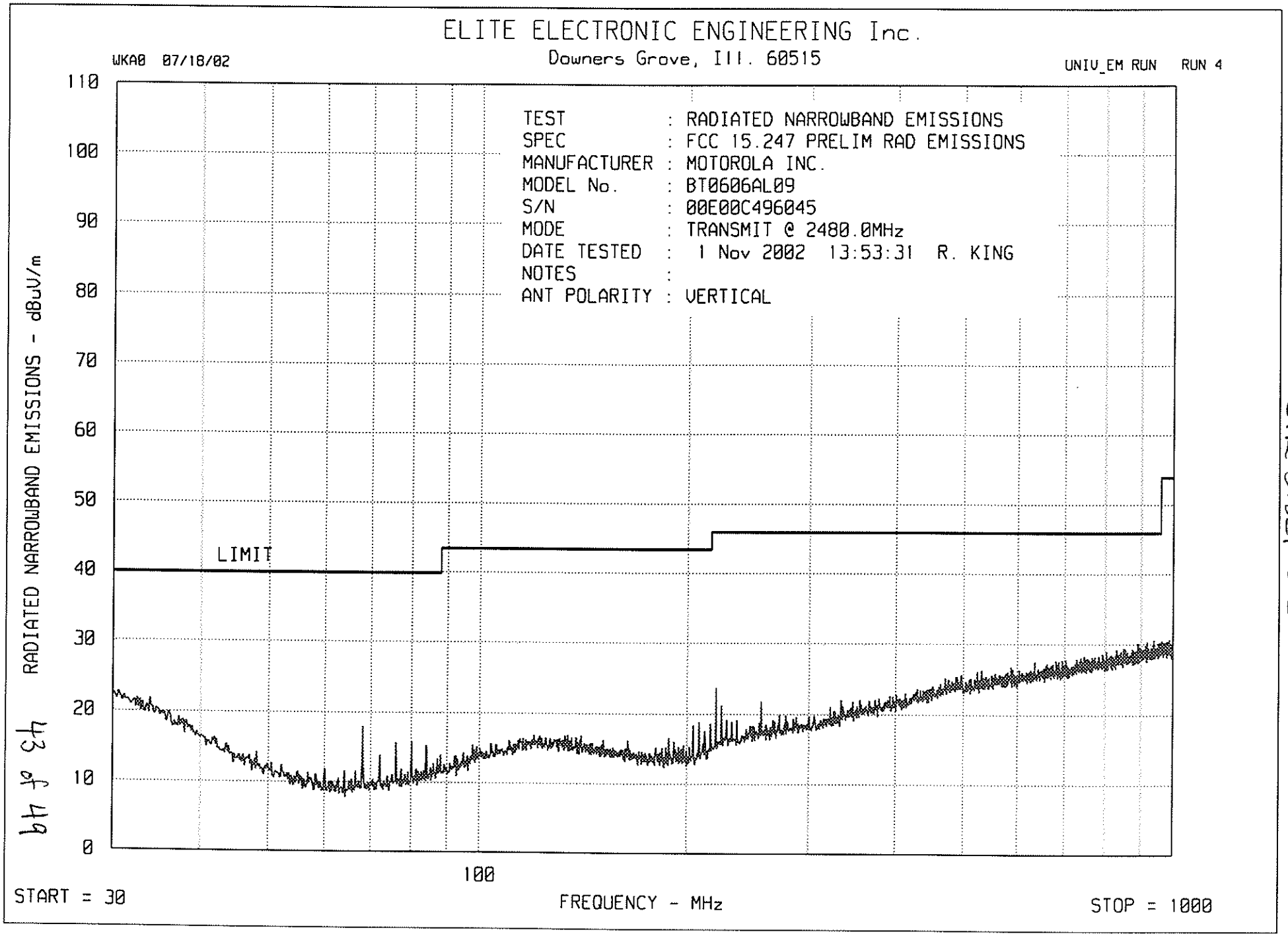
UNIV_EM RUN RUN 3



ETR 31521-02


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA0 07/18/02
UNIV_EM RUN RUN 1
TEST : RADIATED NARROWBAND EMISSIONS
SPEC : FCC 15 PRELIM RAD EMISSIONS
MANUFACTURER : MOTOROLA INC.
MODEL No. : BT0606AL09
S/N :
MODE : TRANSMIT @ 2441.MHZ
DATE TESTED : 28 Oct 2002 15:59:09 R. KING
NOTES :
ANT POLARITY : VERTICAL
RADIATED NARROWBAND EMISSIONS - dBuV/m
110
100
90
80
70
60
50
40
30
20
10
0
10000
START = 2000
FREQUENCY - MHz
STOP = 18000

ETR 31524-02



ETR 31521-012

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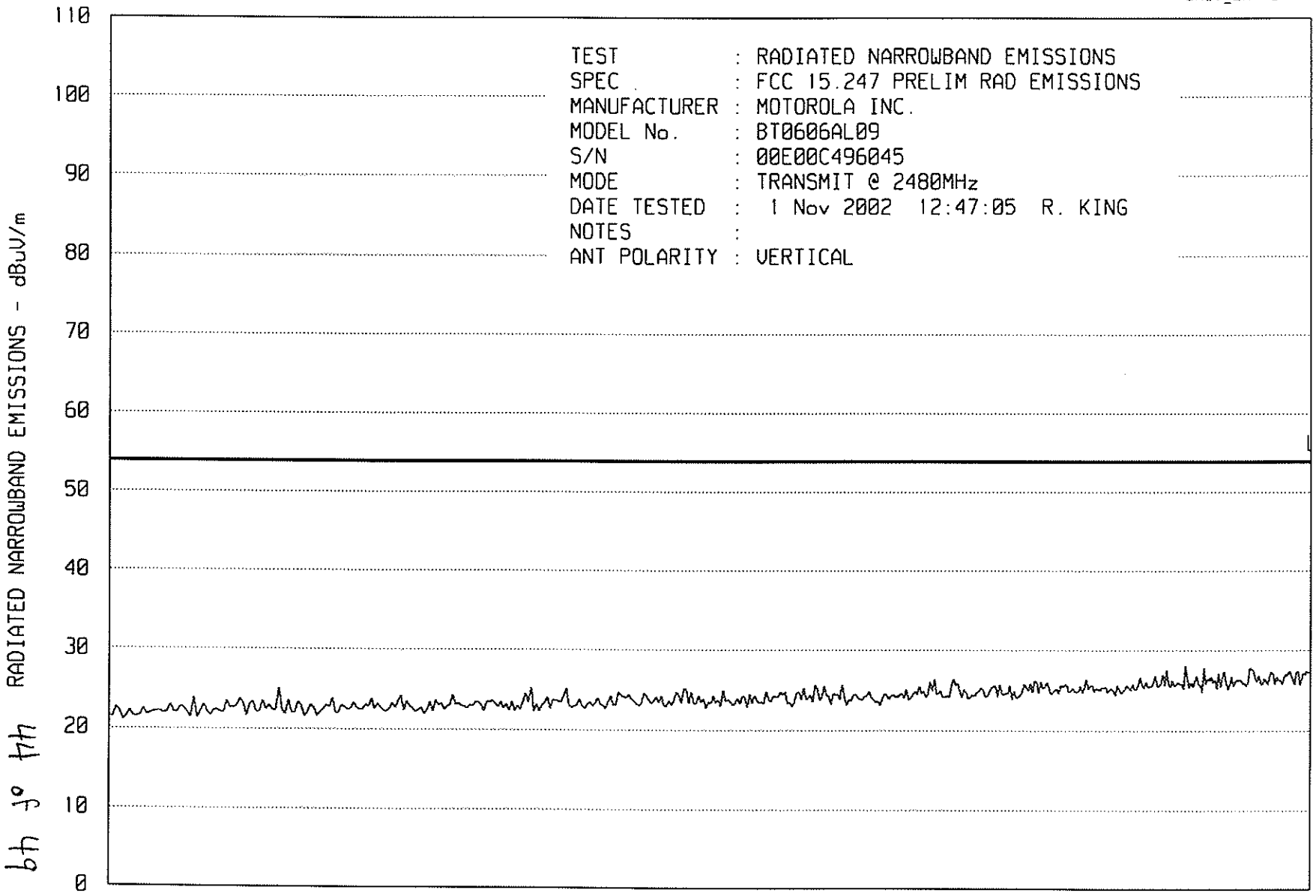
ETR 31521-02

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WKA0 07/18/02

UNIV_EM RUN RUN 3



START = 1000

FREQUENCY - MHz

STOP = 2000

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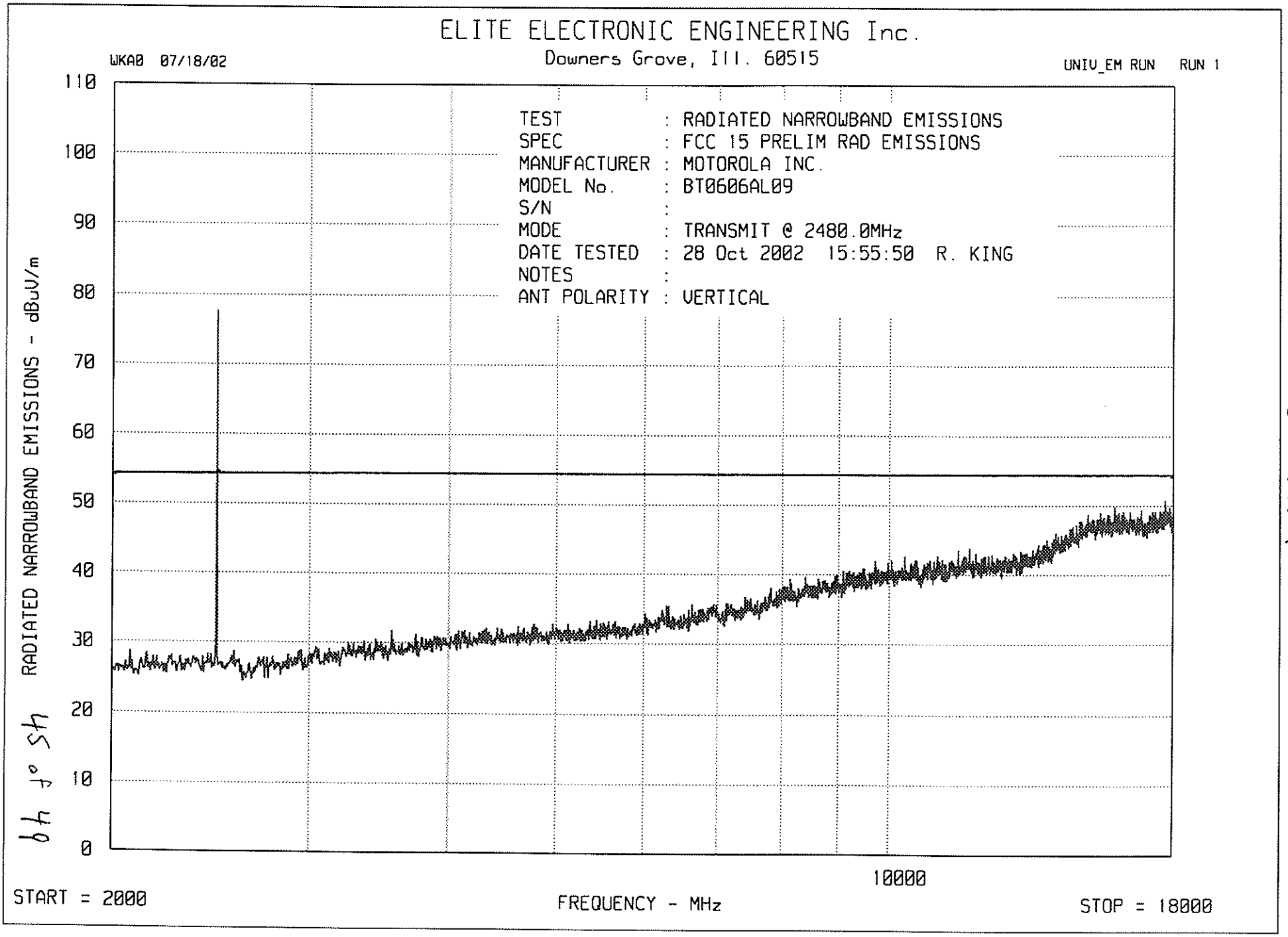

ETR 31521-02

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ETR No. 31521-02
DATA SHEET

MANUFACTURER : MOTORLOLA INC.
MODEL No. : BT0606AL09
SERIAL No. : 00E00C496045
SPECIFICATION : FCC-15C Spurious Radiated Emissions
DATE : FEBRUARY 21, 2003
NOTES :
: TEST DISTANCE IS 3 METERS

FREQ MHz	ANT POL	MTR RDG dBuV		BW(Hz)	ANT FAC	CABLE LOSS	PRE AMP	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV
2402.0	H	95.9		1M/3M	30.9	3.2	-35.9	94.1	50933.1	
	V	96.4		1M/3M	30.9	3.2	-35.9	94.6	53951.1	
2402.0	H	93.9		100k/1M	30.9	3.2	-35.9	92.1	40457.6	
	V	94.4		100k/1M	30.9	3.2	-35.9	92.6	42854.9	
4804.0	H	30.2	AMB	1M/10	33.8	5.8	-35.1	34.7	54.1	500.0
	V	30.1	AMB	1M/10	33.8	5.8	-35.1	34.6	53.5	500.0
12010.0	H	32.9	AMB	1M/10	41.6	8.6	-35.4	47.7	243.8	500.0
	V	32.8	AMB	1M/10	41.6	8.6	-35.4	47.6	239.9	500.0
19216.0	H	12.4	AMB	1M/10	40.3	0.0	0.0	52.7	431.5	500.0
	V	12.5	AMB	1M/10	40.3	0.0	0.0	52.8	436.5	500.0
21618.0	H	8.0	AMB	100k/1M	40.4	0.0	0.0	48.4	263.0	4285.5
	V	8.0	AMB	100k/1M	40.4	0.0	0.0	48.4	263.0	4285.5
24020.0	H	8.0	AMB	100k/1M	40.6	0.0	0.0	48.6	269.2	4285.5
	V	8.0	AMB	100k/1M	40.6	0.0	0.0	48.6	269.2	4285.5

* - Peak level < 20dB above average in all cases.
* - Modulation on but not hopping.

CHECKED BY: Richard E. King
Richard E. King

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ETR No. 31521-02
DATA SHEET

MANUFACTURER : MOTORLOLA INC.
MODEL No. : BT0606AL09
SERIAL No. : 00E00C496045
SPECIFICATION : FCC-15C Spurious Radiated Emissions
DATE : FEBRUARY 21, 2003
NOTES :
: TEST DISTANCE IS 3 METERS

FREQ MHz	ANT POL	MTR RDG dBuV		BW(Hz)	ANT FAC	CABLE LOSS	PRE AMP	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV
2441.0	H	96.8		1M/3M	30.9	3.2	-35.9	95.0	56493.7	
	V	99.8		1M/3M	30.9	3.2	-35.9	98.0	79799.5	
2441.0	H	94.8		100k/1M	30.9	3.2	-35.9	93.0	44874.5	
	V	97.8		100k/1M	30.9	3.2	-35.9	96.0	63387.0	
4882.0	H	30.2	AMB	1M/10	33.8	5.8	-35.1	34.7	54.1	500.0
	V	30.1	AMB	1M/10	33.8	5.8	-35.1	34.6	53.5	500.0
7323.0	H	32.6	AMB	1M/10	38.0	6.8	-35.3	42.1	127.4	500.0
	V	32.6	AMB	1M/10	38.0	6.8	-35.3	42.1	127.4	500.0
12205.0	H	32.7	AMB	1M/10	41.6	8.6	-34.9	48.0	252.3	500.0
	V	32.6	AMB	1M/10	41.6	8.6	-34.9	47.9	248.3	500.0
19528.0	H	12.8	AMB	1M/10	40.3	0.0	0.0	53.1	449.8	500.0
	V	12.8	AMB	1M/10	40.3	0.0	0.0	53.1	453.9	500.0
21969.0	H	8.0	AMB	100k/1M	40.4	0.0	0.0	48.4	263.0	6338.7
	V	8.0	AMB	100k/1M	40.4	0.0	0.0	48.4	263.0	6338.7
24410.0	H	8.0	AMB	100k/1M	40.6	0.0	0.0	48.6	269.2	6338.7
	V	8.0	AMB	100k/1M	40.6	0.0	0.0	48.6	269.2	6338.7

* - Peak level < 20dB above average in all cases.
* - Modulation on but not hopping.

CHECKED BY: Richard E. King
Richard E. King

ETR No. 31521-02
DATA SHEET

MANUFACTURER : MOTORLOLA INC.
MODEL No. : BT0606AL09
SERIAL No. : 00E00C496045
SPECIFICATION : FCC-15C Spurious Radiated Emissions
DATE : FEBRUARY 21, 2003
NOTES :
: TEST DISTANCE IS 3 METERS

FREQ MHz	ANT POL	MTR RDG dBuV		BW(Hz)	ANT FAC	CABLE LOSS	PRE AMP	TOTAL dBuV/m	TOTAL uV/m	LIMIT uV
2480.0	H	95.7		1M/3M	30.9	3.2	-35.9	93.9	49773.7	
	V	100.0		1M/3M	30.9	3.2	-35.9	98.2	81658.2	
2480.0	H	93.7		100k/1M	30.9	3.2	-35.9	91.9	39536.7	
	V	98.0		100k/1M	30.9	3.2	-35.9	96.2	64863.4	
4960.0	H	29.8	AMB	1M/10	33.8	5.8	-35.1	34.3	51.6	500.0
	V	30.0	AMB	1M/10	33.8	5.8	-35.1	34.5	52.8	500.0
7440.0	H	33.0	AMB	1M/10	38.0	6.8	-34.4	43.4	147.9	500.0
	V	33.4	AMB	1M/10	38.0	6.8	-34.4	43.8	154.9	500.0
12400.0	H	32.5	AMB	1M/10	41.6	8.6	-34.2	48.5	267.3	500.0
	V	32.6	AMB	1M/10	41.6	8.6	-34.2	48.6	269.2	500.0
19840.0	H	12.5	AMB	1M/10	40.3	0.0	0.0	52.8	436.5	500.0
	V	12.4	AMB	1M/10	40.3	0.0	0.0	52.7	431.5	500.0
22320.0	H	12.2	AMB	1M/10	40.4	0.0	0.0	52.6	425.6	500.0
	V	12.4	AMB	1M/10	40.4	0.0	0.0	52.8	434.0	500.0
24800.0	H	8.0	AMB	100k/1M	40.6	0.0	0.0	48.6	269.2	6486.3
	V	8.0	AMB	100k/1M	40.6	0.0	0.0	48.6	269.2	6486.3

* - Peak level < 20dB above average in all cases.
* - Modulation on but not hopping.

CHECKED BY: Richard E. King
Richard E. King

ELITE ELECTRONIC ENGINEERING Inc.

hp

MKR 2.441 010 GHz

REF 10.0 dBm ATTEN 20 dB -15.00 dBm

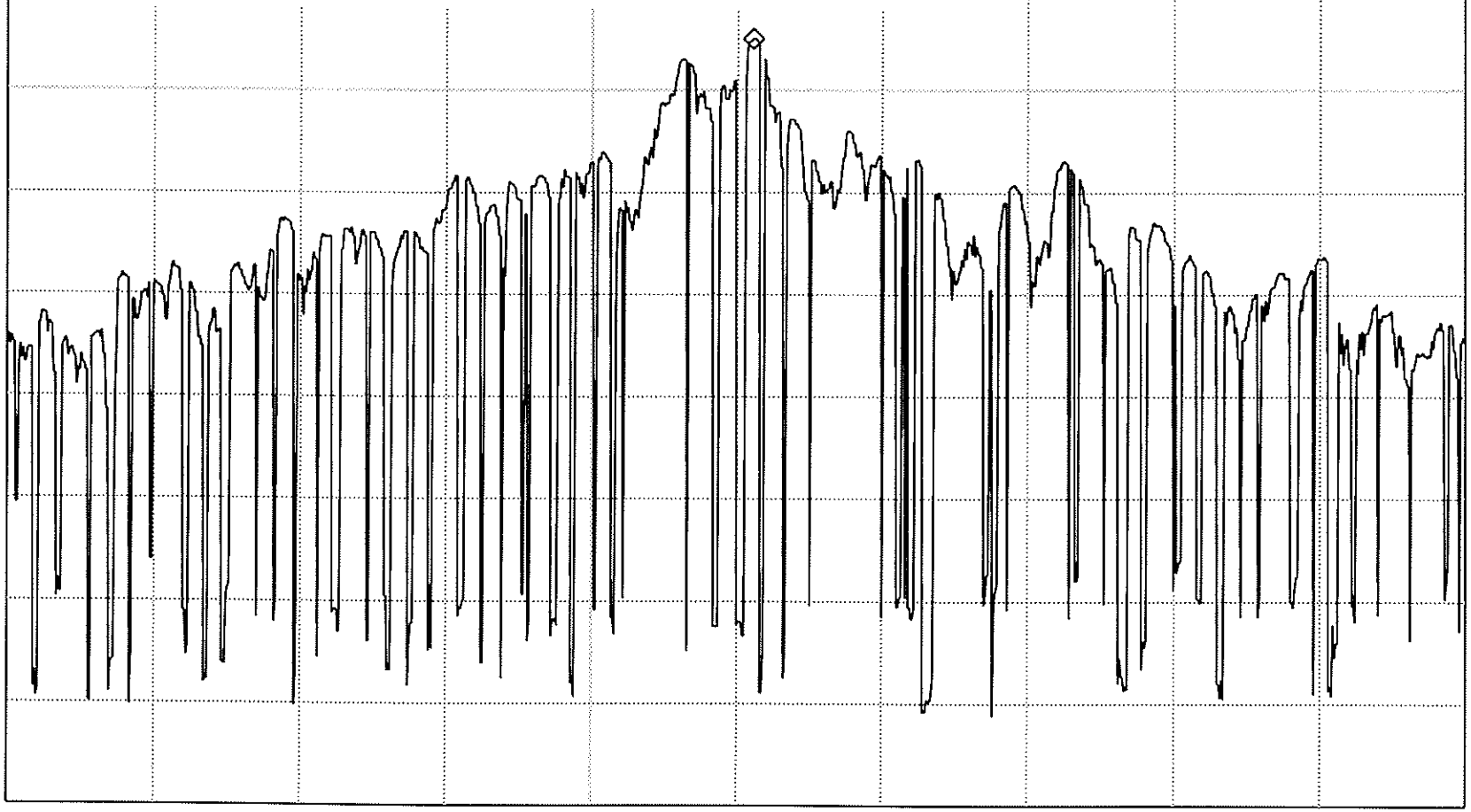
10 dB/

R. KING
21 Feb 2003
15:46:42

MANUFACTURER : MOTOROLA INC.
MODEL : BT0606AL09
SERIAL NUMBER : 00E00C496045
TEST PERFORMED: FCC 15.247 POWER SPECTRAL DENSITY
MODE : INQUIRY
NOTES : ANTENNA CONDUCTED

8 dBm LIMIT

DL
8.0
dBm



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CENTER 2.441 00 GHz SPAN 1.00 MHz

RES BW 3 kHz(i) VBW 30 kHz SWP 333 sec