Elliott

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August 30, 1999

Chief, Equipment Authorization Branch,
Authorization and Evaluation Division,
Office of Engineering and Technology
FEDERAL COMMUNICATIONS COMMISSION
P.O. Box 358315
Pittsburgh, PA 15251-5315

Gentlemen:

The enclosed documents constitute a formal submittal and application for a Grant of Equipment Authorization pursuant to Subpart C of Part 15 of FCC Rules (CFR 47) regarding intentional radiators. Data within this report demonstrates that the equipment tested complies with the FCC limits for intentional radiators.

Elliott Laboratories, as duly authorized agent prepared this submittal. A copy of the letter of our appointment as agent is enclosed.
If there are any questions or if further information is needed, please contact Elliott Laboratories for assistance.

Sincerely,

Mark Briggs

Mark R. Briggs
Manager, EMC Consulting Services

MRB/dmg
Enclosures: Agent Authorization Letter
Emissions Test Report with Exhibits

File: R33470

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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C Specifications for an Intentional Radiator on the Proxim, Inc. Model: 8931/8930

FCC ID:	IMKRL8ETH
GRANTEE:	Proxim, Inc. 510 DeGuigne Drive Sunnyvale, CA. 94086
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	August 30, 1999
FINAL TEST DATE:	July 2, July 19 and August 17, 1999
AUTHORIZED SIGNATORY:	Mark Briggs Mark R. Briggs Manager, EMC Consulting Services

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SCOPE

An electromagnetic emissions test has been performed on the Proxim, Inc. Spread Spectrum Wireless RangeLAN 802 Ethernet Master model 8931/8930 pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Proxim, Inc. model 8931/8930 and therefore apply only to the tested sample. The sample was selected and prepared by Pete Garcia of Proxim, Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units which are subsequently manufactured.

STATEMENT OF COMPLIANCE

The tested sample of Proxim, Inc. model 8931/8930 complied with the requirements of Subpart C of Part 15 of the FCC Rules for low power intentional radiators.

Maintenance of FCC compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

EMISSION TEST RESULTS

The following emissions tests were performed on the Proxim, Inc. model 8931/8930. The actual test results are contained in an exhibit of this report.

LIMITS OF CONDUCTED INTERFERENCE VOLTAGE

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.207.

The following measurement was extracted from the data recorded during the conducted emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

0.45 – 30MHz, 120V/60Hz, Channel 2

Frequency MHz	Level dBuV	Power Lead	15.207 Limit	15.207 Margin	Detector QP/Ave	Comments
0.4604	35.0	Neutral	48.0	-13.0	QP	

Note: Changing channels had no significant effect on the conducted emissions on the AC Power line from the device.

LIMITS OF ANTENNA CONDUCTED POWER

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247. All out-of-band emissions recorded in any 100 kHz band were more than 20 dB below the highest in-band level. The actual test data and any correction factors are contained an exhibit of this report.

LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247 and 15.209 in the case of emissions falling within the restricted frequency bands specified in Section 15.205.

The following measurement was extracted from the data recorded during the radiated electric field emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

30MHz –26 GHz, Restricted Bands Only Mobile Marck Antenna, Channel 80

Frequency	Level	Pol	15.209		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
12400	42.7	v	46.0	-3.8	Avg	293	1.0	

2483.5 MHz, Restricted Band – Band Edge, Mobile Marck Antenna

Frequency	Level	Pol	15.209		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/Avg	degrees	meters	
2483.5	53.6	v	54.0	-0.4	Avg	293	1.0	See note 1 below

Note 1: Bandwidth corrected from measurement bandwidth of 10kHz using 10Log(1MHz/10kHz)
Note 2: Average readings are corrected by 4dB to allow for duty cycle correction as per previous submittals for Proxim's radios.

LIMITS OF POWER AND BANDWIDTH

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247.

The maximum power output was 25.3 dBm (0.341 Watts) on channel 80 for the model 8931 and 19.83dBm (0.096 Watts) on channel 40 for the model 8930.

The maximum 20 dB bandwidth was 925 kHz. This was measured using a 30kHz resolution bandwidth in accordance with the waiver obtained from the FCC by Proxim.

The actual test data and any correction factors are contained in an exhibit of this report.

MEASUREMENT UNCERTAINTIES

ISO Guide 25 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.2

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Proxim, Inc. model 8931 and 8930 are radio LAN devices that transmit 10Mb/s ethernet data using frequency hopping spreading techniques. The radios are identical except for the maximum output power rating. The 8931 has a maximum nominal output power of 400mW and the 8930 has a maximum output power of 100mW.

Each of the two devices is a wireless transceiver, which is designed to extend the capabilities of a LAN. Under normal operation each device would connect into a LAN (attached to a wired LAN backbone) via the 10Base-T port. A serial port is provided for configuration purposes only and would typically not be connected during normal operation. When testing as a digital device the serial port of each device was connected to an unterminated cable. When testing as a radio, the serial port of each device was connected to PC to allow channel selection and configuration for the various tests.

The sample was received on July 2, 1999 and tested on July 2, July 19 and August 17, 1999. It was configured for all tests as the model 8931. The sample was also configured as an 8930 for measurements of output power in accordance with instructions from Joe Dichoso of the FCC.

The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	FCC ID Number
Proxim / 8930/8931 / Spread Spectrum Wireless RangeLAN802 Ethernet Master	849J0533	IMLRL8ETH

INPUT POWER

The EUT input is rated at 120/240, 50/60 Hz. The EUT contained the following input power components during emissions testing:

Description	Manufacturer	Model
External 120VAC/60Hz to 12VDC at 1 Amp Converter	Proxim	Proxim P/N 4000.0007 P/N AD121A-9P M/N 481210003C0

PRINTED WIRING BOARDS

The EUT contained the following printed wiring boards during emissions testing:

Manufacturer/Description	Assembly #	Rev.	Serial #	Crystals (MHz)
Proxim / Main Board	0149	A	849J0533	20, 40

SUBASSEMBLIES

The EUT contained the following subassembly modules during emissions testing:

Manufacturer/Description	Assembly #	Rev.	Serial Number
Proxim.802 Mini ISA	8400-0150	19	A30407228

ENCLOSURE

The EUT enclosure is primarily constructed di casting of magnesium alloy (AZ91-D). It measures approximately 8.5 cm wide by 14.0 cm deep by 3.0 cm high.

ANTENNA

The EUT can use the following antennas:

Description	Manufacturer	Part Number
9 dBi Fiberglass Antenna w/omni directional Pattern	Mobile Marck	1900-0035
9 dBi HF Antenna w/Linear Polarization & Directional Pattern Patch Antenna	Vertex	1900-0036
5.15 dBi Policarbonate omni directional Antenna	Cushcraft	1900-0040
8.5 dBi Patch Antenna	Huber & Suhner	1900-0043
1 dBi Peak Gain Omni directional Antenna	Centurion	1900-0044

During testing for radiated spurious emissions the following antennas were used:

Description	Manufacturer	Part Number
9 dBi Fiberglass Antenna w/omni directional Pattern	Mobile Marck	1900-0035
9 dBi HF Antenna w/Linear Polarization & Directional Pattern Patch Antenna	Vertex	1900-0036

These represent the highest gain antennas of each antenna type (Omni-Directional or Patch antenna). They were selected in accordance with instructions from the FCC.

The antennas are connect to the device using a reversed polarity TNC female connector thereby complying with the requirements of 15.203. Additionally, warnings are placed in the user-manual warning that modifications to the connector or antenna must not be made.

EMI SUPPRESSION DEVICES

The EUT did not contain EMI suppression devices during emissions testing:

MODIFICATIONS

The EUT required the following modifications in order to comply with the emission specifications:

Prior to the radiated emissions test for the digital device performed on 8/17/99 capacitors were added to the DC power input. This included capacitors from line to ground and line to line. These capacitors would have no effect on the emissions related to the intentional radiator.

SUPPORT EQUIPMENT

Refer to the individual test logs contained in the Appendices for specifics.

EXTERNAL I/O CABLING

Refer to the individual test logs contained in the Appendices for specifics.

TEST SOFTWARE

The EUT contained test software running during testing which continuously exercised the system by transmitting and receiving data through the antenna.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on July 2, July 19 and August 17, 1999 at the Elliott Laboratories Open Area Test Site #1 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde and Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

POWER METER

A power meter and thermister mount are used for all direct output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

ANSI C63.4 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS, SECTION 15.207

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209

Following limits were used for emissions falling in restricted bands:

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. A distance factor, when used for electric field measurements, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1:Test Equipment Calibration Data

3 Pages

Test Equipment List - SVOATS#1

June 25, 1999

Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☐ Elliott Laboratories	FCC / CISPR LISN	LISN-3, OATS	304	12	6/10/99	6/10/2000
☐ EMCO	Biconical Antenna, 30-300 MHz	3110B	363	12	4/19/99	4/19/2000
☐ EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	487	12	3/24/99	3/24/2000
☐ EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	1/15/99	1/15/2000
☑ EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	868	12	9/22/98	9/22/99
☐ Emco	Log Periodic Antenna	3146A	A169	12	2/20/99	2/20/2000
☐ Filtek	High Pass Filter	HP12/1000-5B	955	12	4/17/99	4/17/2000
☐ Filtek	High Pass Filter	HP12/1000-5B	956	12	4/17/99	4/17/2000
☐ Filtek	High Pass Filter	HP12/1000-5B	957	12	4/17/99	4/17/2000
☐ Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	12	1/4/99	1/4/2000
☐ Hewlett Packard	EMC Recever /Analyzer	8595EM	787	12	11/23/98	11/23/99
☐ Hewlett Packard	Microwave Preamplifier,	8449B	263, (F303)	12	5/24/99	5/24/2000
☐ Hewlett Packard	Microwave Preamplifier,	8449B	785	12	11/25/98	11/25/99
☑ Hewlett Packard	Microwave Preamplifier,	8449B	870	12	11/12/98	11/12/99
☐ Hewlett Packard	Power Meter	432A	259, (F304)	12	2/17/99	2/17/2000
☑ Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	12	1/18/99	1/18/2000
☐ Hewlett Packard	Spectrum Analyzer, 9 KHz-6.5 GHz	8595E-041-103-	Metric, 885	12	5/11/99	5/11/2000
☐ Hewlett Packard	Thermistor Mount	478A	652	12	2/17/99	2/17/2000
☐ Inmet Corporation	20 dB Pad, DC-18 GHz, 50Ω	18N-20	859	12	8/27/98	8/27/99
☐ Narda West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	4/23/99	4/23/2000
☑ Narda West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/29/99	4/29/2000
☐ Narda West	High Pass Filter	HPF 180	821	12	8/10/98	8/10/99
☐ Rohde& Schwarz	Pulse Limiter	ESH3 Z2	811	12	12/8/98	12/8/99
☐ Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	5/27/99	5/27/2000
☐ Rohde &Schwarz	Test Receiver, 20-1300MHz	ESVP	213, (F196)	12	5/27/99	5/27/2000
☐ Solar Electronics	Support Equipment LISN,	8012-50-R-24-B	305, (F111)	N/A	3/26/99	3/26/2000

D32830, D33279

File Number: T32568

Date: 7/1/99 - 8/17/99

Engr: Jerry Hill

All calibration of equipment is traceable to a national standard of measurement such as NIST.

Test Equipment List - SVOATS#1

July 15, 1999

	Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☐	Elliott Laboratories	FCC / CISPR LISN	LISN-3, OATS	304	12	6/10/99	6/10/2000
☐	EMCO	Biconical Antenna, 30-300 MHz	3110B	363	12	4/19/99	4/19/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	487	12	3/24/99	3/24/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	1/15/99	1/15/2000
☑	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	868	12	9/22/98	9/22/99
☐	Emco	Log Periodic Antenna	3146A	A169	12	2/20/99	2/20/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	955	12	4/17/99	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	956	12	4/17/99	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	957	12	4/17/99	4/17/2000
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	12	1/4/99	1/4/2000
☐	Hewlett Packard	EMC Recever /Analyzer	8595EM	787	12	11/23/98	11/23/99
☐	Hewlett Packard	Microwave Preamplifier,	8449B	263, (F303)	12	5/24/99	5/24/2000
☑	Hewlett Packard	Microwave Preamplifier,	8449B	785	12	11/25/98	11/25/99
☐	Hewlett Packard	Microwave Preamplifier,	8449B	870	12	11/12/98	11/12/99
☐	Hewlett Packard	Power Meter	432A	259, (F304)	12	2/17/99	2/17/2000
☑	Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	12	1/18/99	1/18/2000
☐	Hewlett Packard	Spectrum Analyzer, 9 KHz-6.5 GHz	8595E-041-103-	Metric, 885	12	5/11/99	5/11/2000
☐	Hewlett Packard	Thermistor Mount	478A	652	12	2/17/99	2/17/2000
☐	Inmet Corporation	20 dB Pad, DC-18 GHz, 50Ω	18N-20	859	12	8/27/98	8/27/99
☐	Narda West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	4/23/99	4/23/2000
☑	Narda West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/29/99	4/29/2000
☐	Narda West	High Pass Filter	HPF 180	821	12	8/10/98	8/10/99
☐	Rohde& Schwarz	Pulse Limiter	ESH3 Z2	811	12	12/8/98	12/8/99
☐	Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	5/27/99	5/27/2000
☐	Rohde &Schwarz	Test Receiver, 20-1300MHz	ESVP	213, (F196)	12	5/27/99	5/27/2000
☐	Solar Electronics	Support Equipment LISN,	8012-50-R-24-B	305, (F111)	N/A	3/26/99	3/26/2000

File Number: T32830

Date: 7/19/99

Engr: Conrad / Jerry

All calibration of equipment is traceable to a national standard of measurement such as NIST.

Test Equipment List - SVOATS#1

August 13, 1999

	Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☑	EMCO	Biconical Antenna, 30-300 MHz	3110B	363	12	4/19/99	4/19/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	487	12	3/24/99	3/24/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	1/15/99	1/15/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	868	12	9/22/98	9/22/99
☑	EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	12	6/25/99	6/25/2000
☐	Filtek	High Pass Filter	HP12/1000-5BA	955	12	4/17/99	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5BA	956	12	4/17/99	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5BA	957	12	4/17/99	4/17/2000
☑	Fischer Custom	LISN, Freq. 0.9 -30 MHz,16 Amp	FCC-LISN-50/2	1079	12	6/11/99	6/11/2000
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	12	1/4/99	1/4/2000
☐	Hewlett Packard	EMC Recever /Analyzer	8595EM	787	12	11/23/98	11/23/99
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263, (F303)	12	8/3/99	8/3/2000
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	11/25/98	11/25/99
☐	Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	12	11/12/98	11/12/99
☐	Hewlett Packard	Power Meter	432A	259, (F304)	12	2/17/99	2/17/2000
☑	Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	12	1/18/99	1/18/2000
☐	Hewlett Packard	Spectrum Analyzer, 9 KHz-6.5 GHz	8595E-041-103-	Metric, 885	12	5/11/99	5/11/2000
☐	Hewlett Packard	Thermistor Mount	478A	652	12	2/17/99	2/17/2000
☐	Inmet Corporation	20 dB Pad, DC-18 GHz, 50Ω	18N-20	859	12	8/27/98	8/27/99
☐	Narda West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	4/23/99	4/23/2000
☐	Narda West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/29/99	4/29/2000
☐	Narda West	High Pass Filter	HPF 180	821	12	8/10/99	8/10/2000
☑	Rohde& Schwarz	Pulse Limiter	ESH3 Z2	811	12	7/10/99	7/10/2000
☑	Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	5/27/99	5/27/2000
☑	Rohde &Schwarz	Test Receiver, 20-1300MHz	ESVP	213, (F196)	12	5/27/99	5/27/2000
☐	Solar Electronics	Support Equipment LISN,	8012-50-R-24-B	305, (F111)	12	3/26/99	3/26/2000

File Number: T33279

Date: 8/17/99

Engr: Ceron Chu

All calibration of equipment is traceable to a national standard of measurement such as NIST.

EXHIBIT 2:Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T 32568 31 Pages
T 32830 14 Pages
T 33279 11 Pages

Client:	Proxim, Inc.	Date:	7/2, 19, 8/17/99	Test Engr:	AA, CC, JH
Product:	RangeLAN802 Model 8931/8930	File:	T32568	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SV #1	Contact:	P. Garcia
Spec:	FCC Part 15.247	Page:	1 of 4	Approved:	
Revision	1.0				

Test Objective

The objective of this test session is to perform final qualification testing the EUT defined below relative to the specification defined above. The results in this test log are taken from the following test data files:

D32568, performed on 7/2/99 by Anil Allamaneni
D32830, performed on 7/19/99 by Jerry Hill
D33279, performed on 8/17/99 by Conrad Chu

Test Summary

Run #1a - Output Power – High Setting (D32568)

PASS The maximum output power was measured on channel 80 to be 25.3 dBm (0.341 Watts).

The output power was measured directly from the antenna port.

Run #1a - Output Power – Low Setting (D32830)

PASS The maximum output power was measured on channel 40 to be 19.83 dBm (0.096 Watts).

The output power was measured directly from the antenna port.

Run #2 - Bandwidth (D32568)

PASS The maximum 20 dB bandwidth for the frequency hopping radio was measured to be 925 kHz.

Run #3 - Occupancy (Frequency Hopping Radios Only) (D32568)

PASS The number of channels was confirmed to be 79. The hopping sequence occupied a single channel for 380 mS every 32 seconds.

Client:	Proxim, Inc.	Date:	7/2, 19, 8/17/99	Test Engr:	AA, CC, JH
Product:	RangeLAN802 Model 8931/8930	File:	T32568	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SV #1	Contact:	P. Garcia
Spec:	FCC Part 15.247	Page:	2 of 4	Approved:	
Revision	1.0				

Run #4 - Conducted Spurious Emissions On The Antenna Port, 30 MHz – 25.5 GHz (D32568, D33279)

PASS The out of band spurious emissions on the antenna port for all three channels were measured to be more than 20dB below the highest in-band signal level.

Equipment Under Test (EUT) General Description

The EUT is a radio LAN device that transmits 10Mb/s ethernet data using frequency hopping spreading techniques. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 120 V, 60 Hz.

Equipment Under Test (EUT)

Manufacturer/Model/Description	Serial Number	FCC ID Number
Proxim / 8930/8931 / Spread Spectrum Wireless RangeLAN802 Ethernet Master	849J0533	IMKRL8ETH

Power Supply and Line Filters

The EUT used the following external AC-DC adapter:

Description	Manufacturer	Model
External 120VAC/60Hz to 12VDC at 1 Amp Converter	Proxim	Proxim P/N 4000.0007 P/N AD121A-9P M/N 481210003C0

Printed Wiring Boards in EUT

The manufacturer provided the following information:

Manufacturer/Description	Assembly #	Rev.	Serial Number	Crystals (MHz)
Proxim, RangeLan 802 Ethernet Adapter	0149	A	849J0533	20, 40

Subassemblies in EUT

Manufacturer/Description	Assembly Number	Rev.	Serial Number
Proxim.802 Mini ISA	8400-0150	19	A30407228

Antenna

The EUT antenna is permanently connected to the device via a reversed polarity coaxial connector. For direct measurements the antenna was removed and replaced with a temporary connector to facilitate connection to a spectrum analyzer.

Description	Manufacturer	Part Number
9 dBi Fiberglass Antenna w/omni directional Pattern	Mobile Marck	1900-0035
9 dBi HF Antenna w/Linear Polarization & Directional Pattern Patch Antenna	Vertex	1900-0036
5.15 dBi Policarbonate omni directional Antenna	Cushcraft	1900-0040
8.5 dBi Patch Antenna	Huber & Suhner	1900-0043
1 dBi Peak Gain Omni directional Antenna	Centurion	1900-0044

EUT Enclosure

The EUT enclosure is primarily constructed di casting of magnesium alloy (AZ91-D). It measures approximately 8.5 cm wide by 14.0 cm deep by 3.0 cm high.

EMI Suppression Devices (filters, gaskets, etc.)

Description	Manufacturer	Part Number
None	-	-

Modifications

No modifications were made to the EUT in order to comply with the requirements:

Client:	Proxim, Inc.	Date:	7/2, 19, 8/17/99	Test Engr:	AA, CC, JH
Product:	RangeLAN802 Model 8931/8930	File:	T32568	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SV #1	Contact:	P. Garcia
Spec:	FCC Part 15.247	Page:	4 of 4	Approved:	
Revision	1.0				

Local Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
Toshiba / Tecra 500CS Model # PA 1221U V / Laptop PC	11679294-3	CJ6UK333

Remote Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
None	-	-

Interface Cabling

Cable Description	Length (m)	From Unit/Port	To Unit/Port
Category 5 UTP (x1)	3.0	EUT / RJ45 Port	Unterminated
Shielded Serial Cable (x1)	2.0	EUT / Serial Port	Laptop PC / Serial Port
Coaxial, Reverse-Polarity TNC (x1)	0.3	EUT / RF Port	Antenna
Unshielded Power Cable (x1)	2.0	EUT / DC Power Input	AC-DC Converter / DC Power Output
Unshielded Power Cord (x1)	2.0	Laptop PC / AC Power Input	120VAC/60Hz

Test Software

The EUT was operating in a continuous transmit mode with no hopping for measurements made with the unit on a single channel. For tests on the channel occupancy the device was configured to transmit a maximum packet length with minimum delay time and with hopping enabled. The local support PC was used to configure the system and monitor if necessary.

General Test Conditions

During testing, the EUT was connected to 120V/60Hz power input.

Test Data Tables

See attached data

Elliott

Emissions Test Data

Client:	Proxim, Inc.	Date:	7/2/99, 7/19/99, 8/17/99	Test Engr:	Anil / Jerry
Product:	RangeLan 802 Model 8931/8930	File:	D32568	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	P. Garcia
Spec:	FCC 15.247	Distance:	-	Approved:	

Run #1: Output Power Measurements - Direct Measurement

Output Power on high setting. Data taken 7/2/99

Channel	Output Power dBm	Ouput Power Watts	Graph
Low	25.5	0.355	T32568 GPH101
Center	25.33	0.341	T32568 GPH102
High	25.33	0.341	T32568 GPH103

Output Power on Low-power setting. Data taken on 7/19/99

Channel	Output Power dBm	Ouput Power Watts	Graph
Low	19.67	0.093	T32830 GPH101
Center	19.83	0.096	T32830 GPH102
High	19.67	0.093	T32830 GPH103

Above measurements include 0.5dB for cable loss. Level is the measured output power plus the cable loss.

Run #2: Bandwidth Measurements

Measurements made using RBW=30kHz

Channel	Bandwidth kHz	Graph
Low	908	T32568 GPH201
Center	917	T32568 GPH202
High	925	T32568 GPH203

Run #3: Occupancy (Frequency Hopping Radios)

The total number of channels was confirmed to be 79 - refer to plot T32568/303).

The transmission time on a single channel was measured to be 380 mS. The Period between successive transmission on the same channel was measured to be 32 Seconds. (Refer to T32568 GPH304 and 305).

Elliott

Emissions Test Data

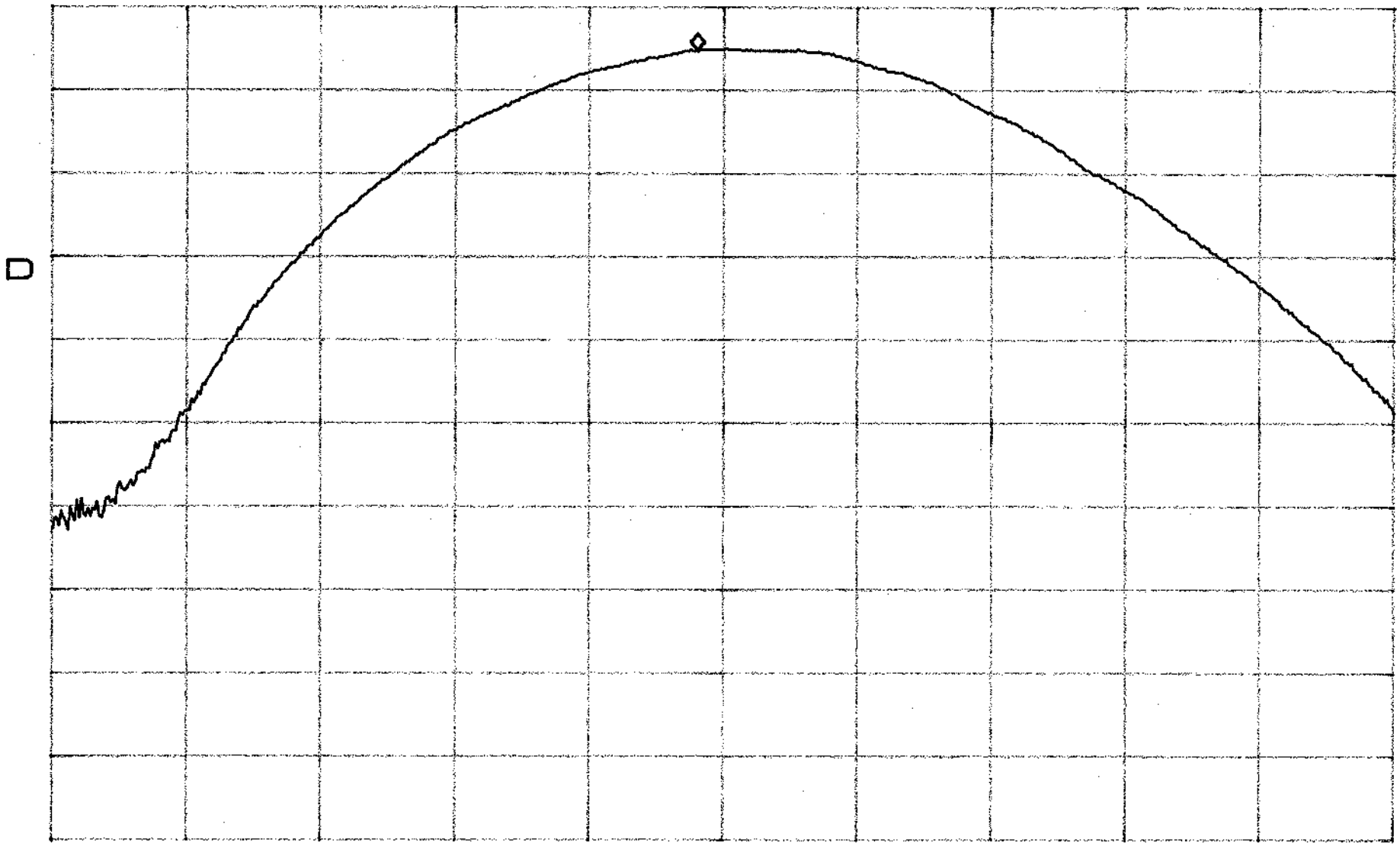
Client:	Proxim, Inc.	Date:	7/2/99, 7/19/99, 8/17/99	Test Engr:	Anil / Jerry
Product:	RangeLan 802 Model 8931/8930	File:	D32568	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	P. Garcia
Spec:	FCC 15.247	Distance:	-	Approved:	

Run #4: Antenna Port Conducted Spurious Emissions Measured in a 100kHz Band.
Data in T23568 taken on 7/2/99, Data in T33279 taken on 8/17/99

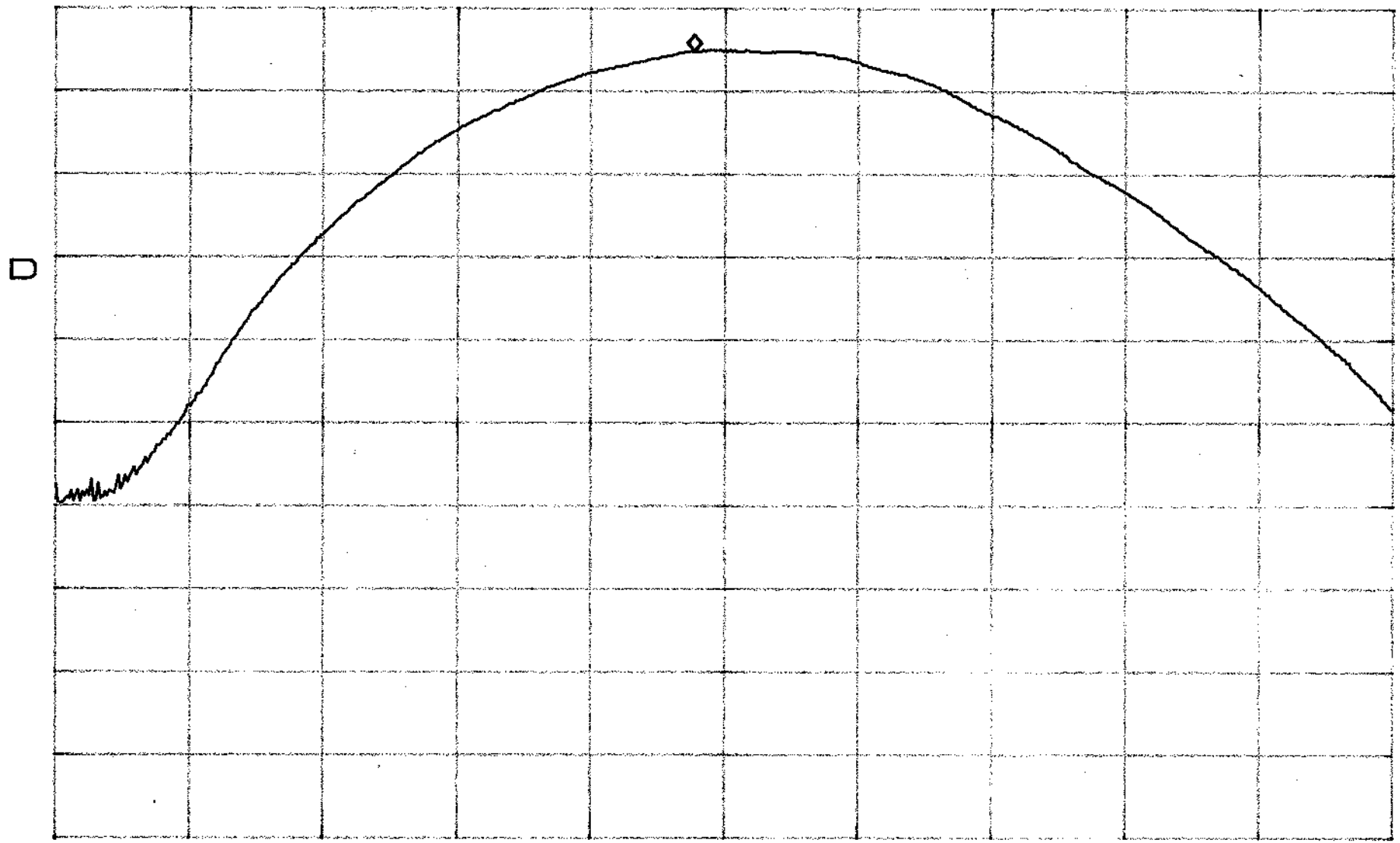
Channel	Frequency Range	Highest out of band level dBc	Graphs
All	2.35 - 2.5 GHz	N/A - Graph shows in-band signal level, EUT hoping on all channels.	T32568 GPH401
Low	30MHz-1GHz, 1-3GHz, 3-10GHz, 10-26.5GHz	>20db	T33279 GPH406-409
Center	30MHz-1GHz, 1-3GHz, 3-10GHz, 10-26.5GHz	>20db	T33279 GPH410-413
High	30 MHz - 2.35 GHz; 2.47 - 2.485 GHz; 2.5 - 10 GHz, 10 - 25 GHz	>20db	T32568 GPH402-405


*ATTEN 40dB
MKR 25.00dBm
RL 30.0dBm
10dB/
2.401800GHz
D
CENTER 2.402000GHz
SPAN 10.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50ms

T32568/001


*ATTEN 40dB
MKR 24.83dBm
RL 30.0dBm
10dB/
2.43980GHz
D
CENTER 2.44000GHz
SPAN 10.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50ms

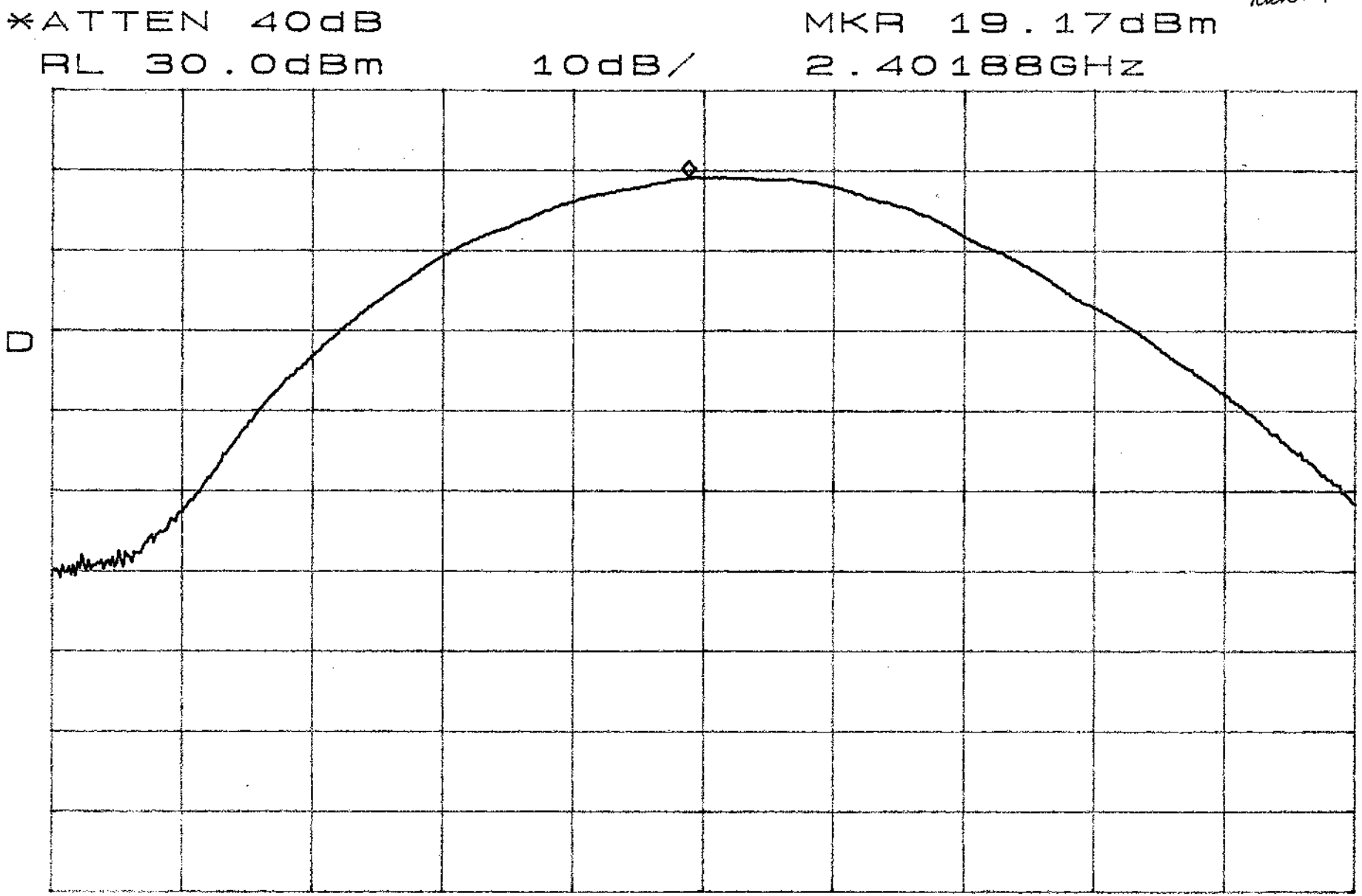
T32568/102


*ATTEN 40dB
MKR 24.83dBm
RL 30.0dBm
10dB/
2.47977GHz
D
CENTER 2.48000GHz
SPAN 10.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50ms

T32568/103

12" SB142 CABLE FROM EUT ANT. OUTPUT TO SPECTRUM ANALYZER INPUT. ALL OTHER CABLES CONNECTED.

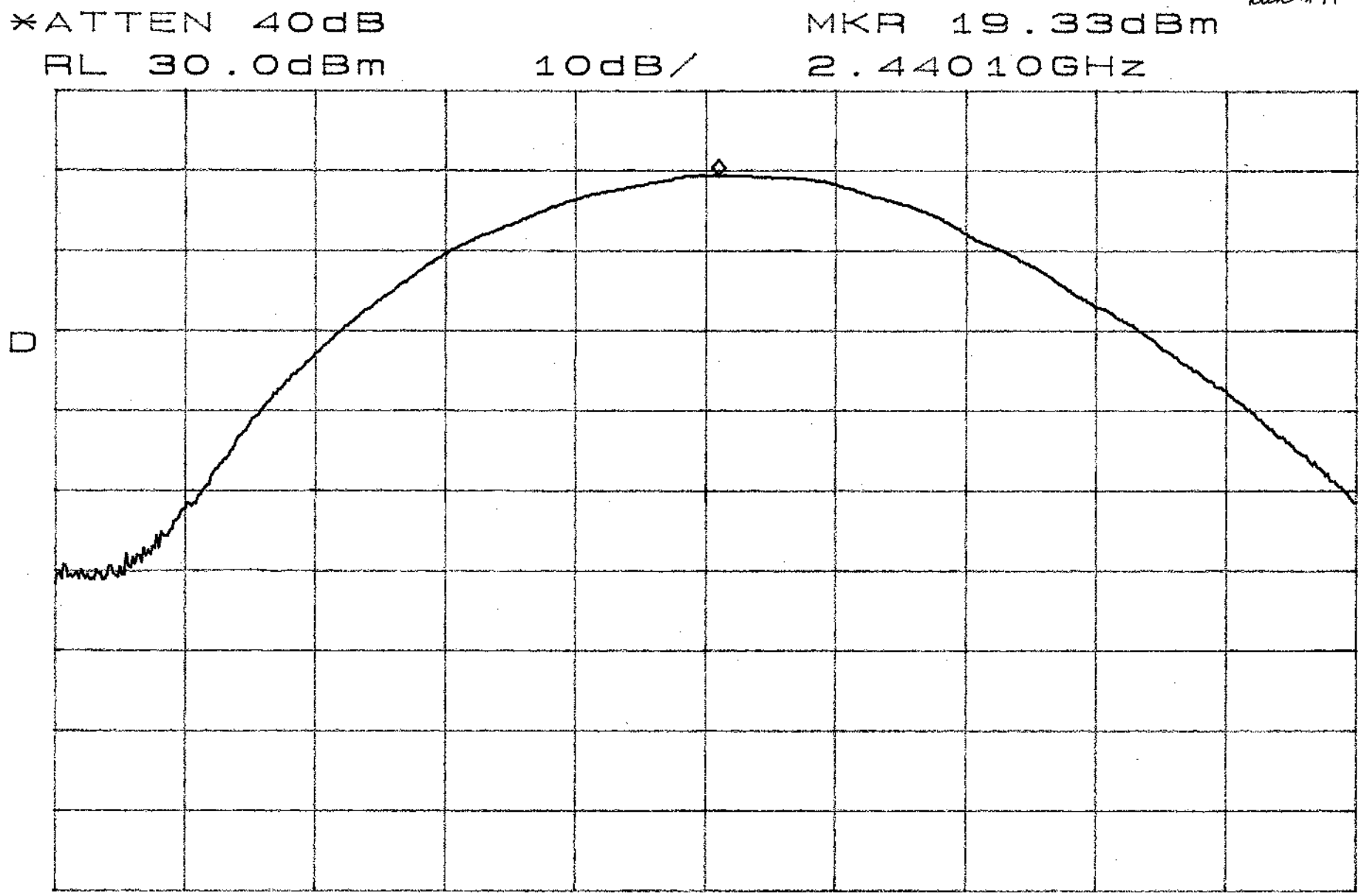
OUTPUT POWER
RADIO LOW POWER MODE
LOW BAND
Run #10



T32830/101

12" SB1472 CABLE FROM EUT ANT. OUTPUT TO SPECTRUM ANALYZER INPUT. ALL OTHER CABLES CONNECTED.

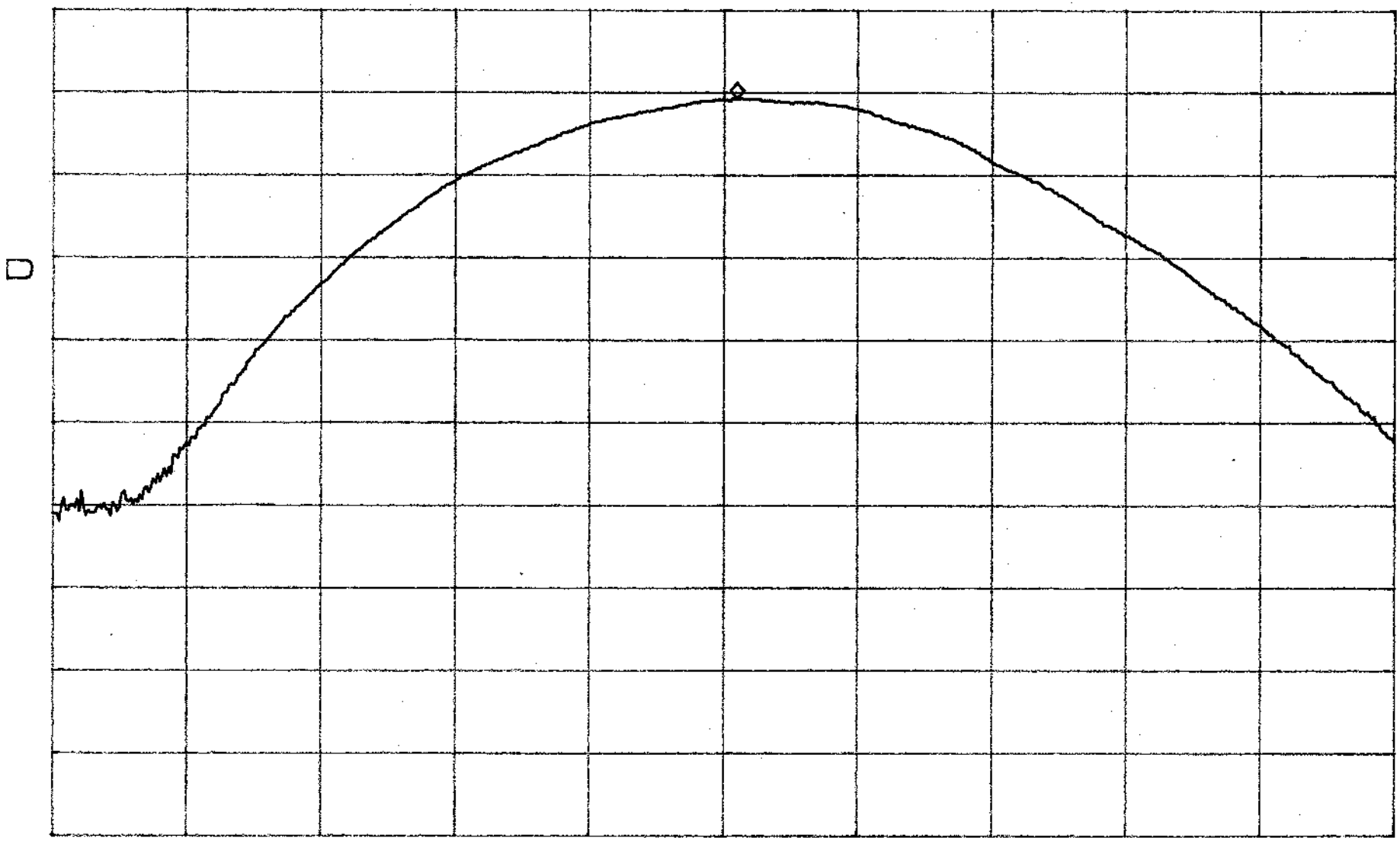
OUTPUT POWER
RADIO LOW POWER MODE
MID BAND
Run #11



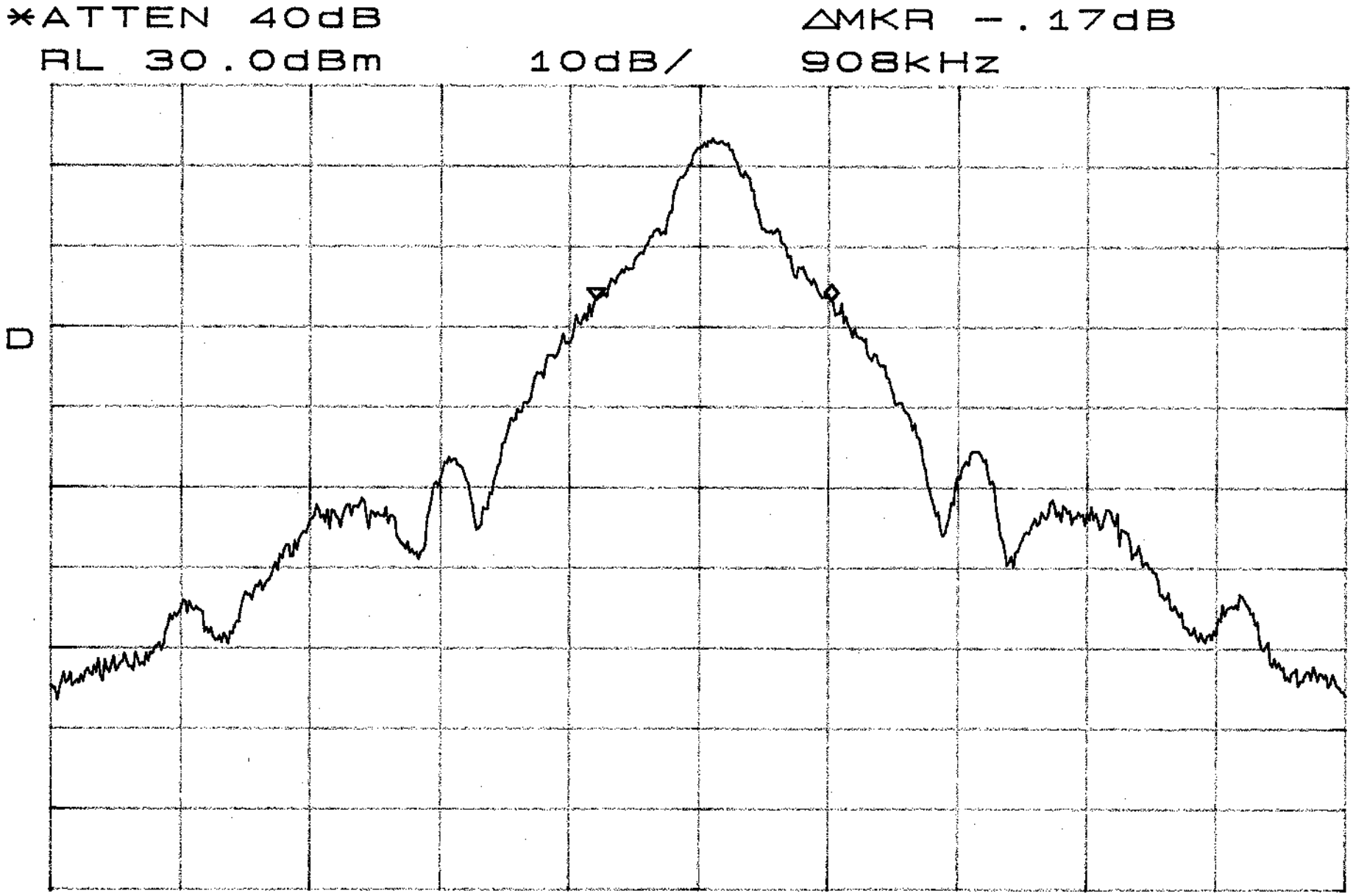
T32830/102

OUTPUT POWER
RADIO LOW POWER MODE
HIGH BAND
Run #12

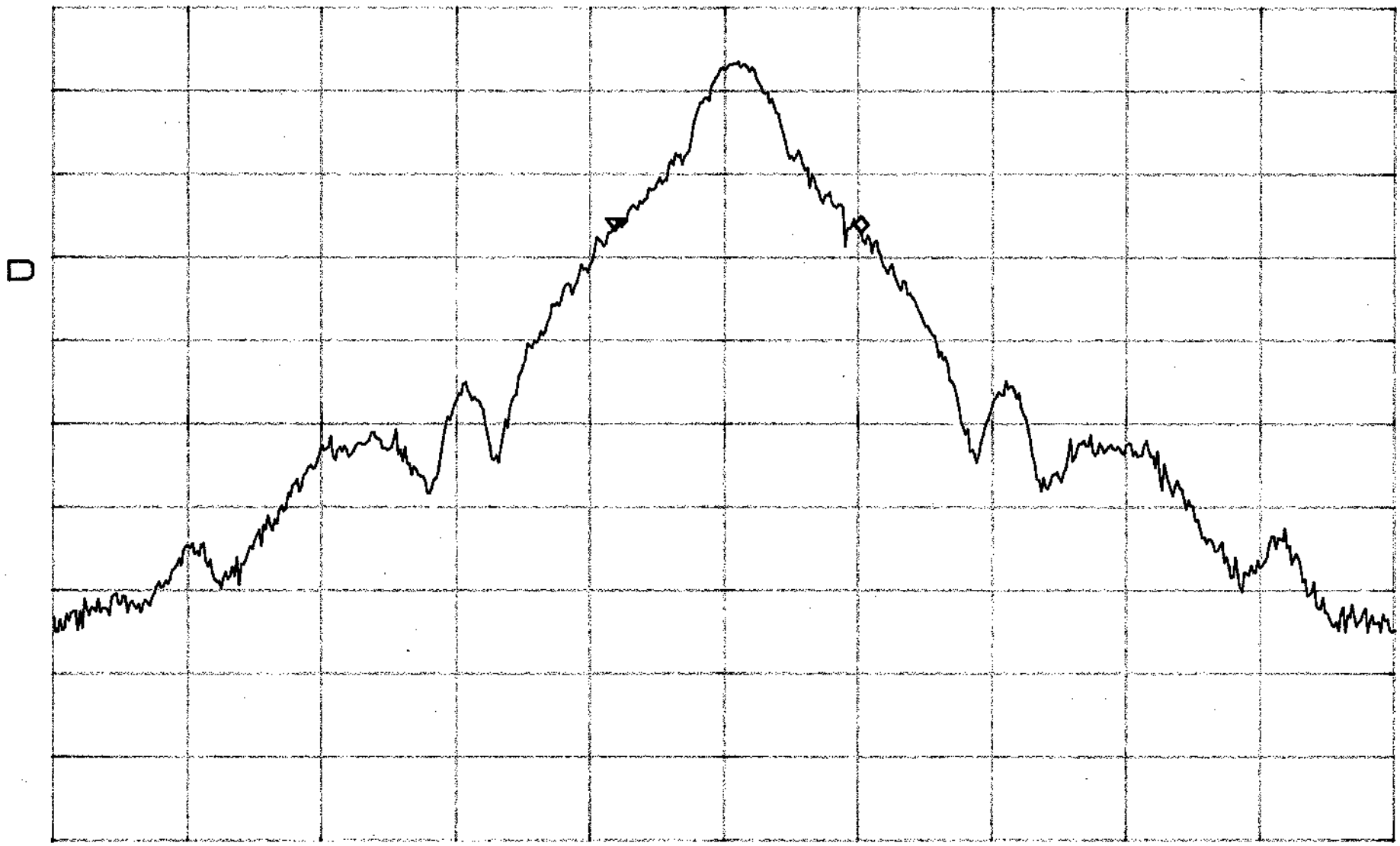
12" SB142 CABLE FROM EUT ANT OUTPUT TO SPECTRUM ANALYZER INPUT. ALL OTHER CABLES CONNECTED



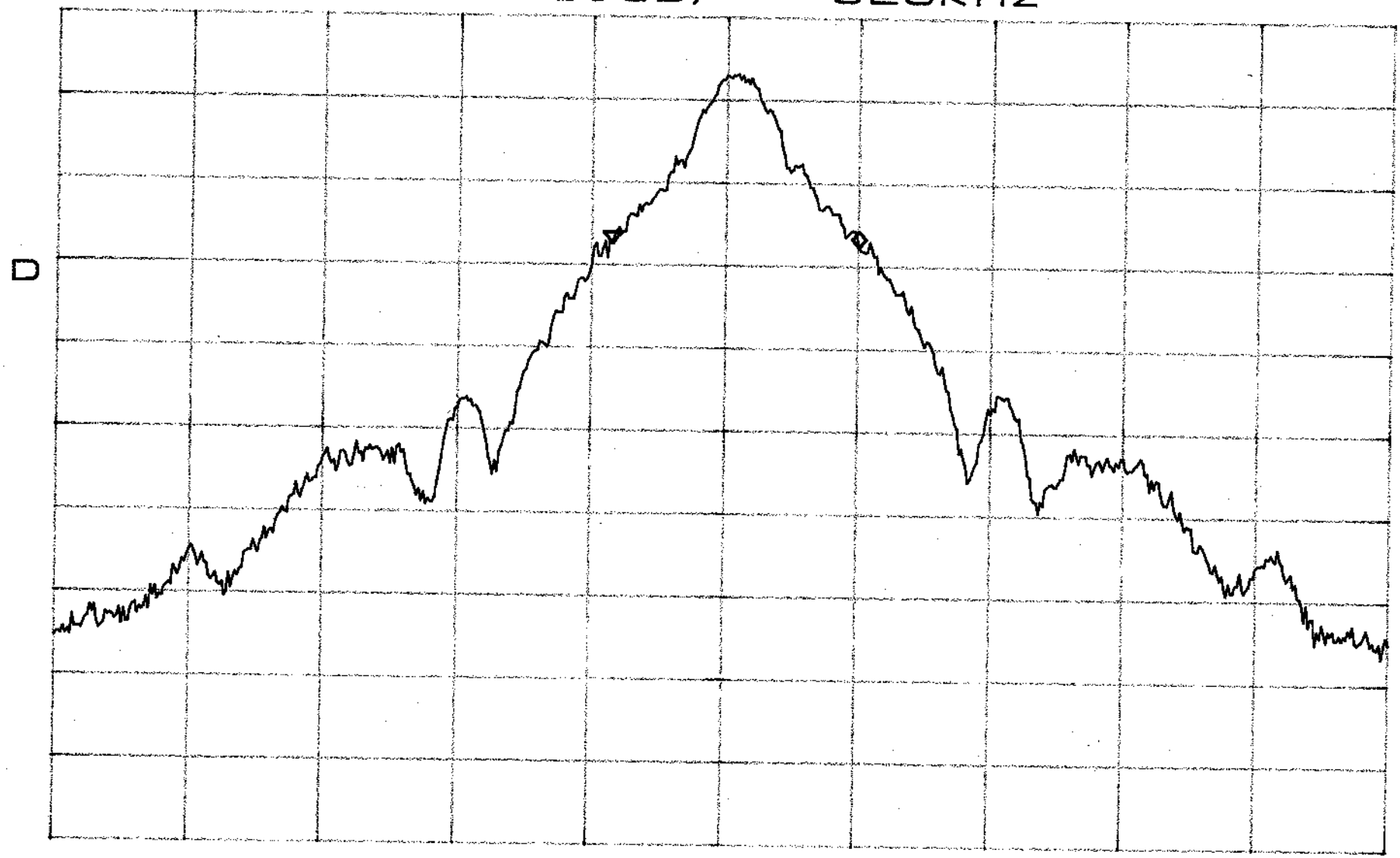
T32830/103


*ATTEN 40dB
ΔMKR -.17dB
RL 30.0dBm
10dB/
908kHz
D
CENTER 2.402000GHz
SPAN 5.000MHz
*RBW 30kHz
*VBW 100kHz
SWP 50ms

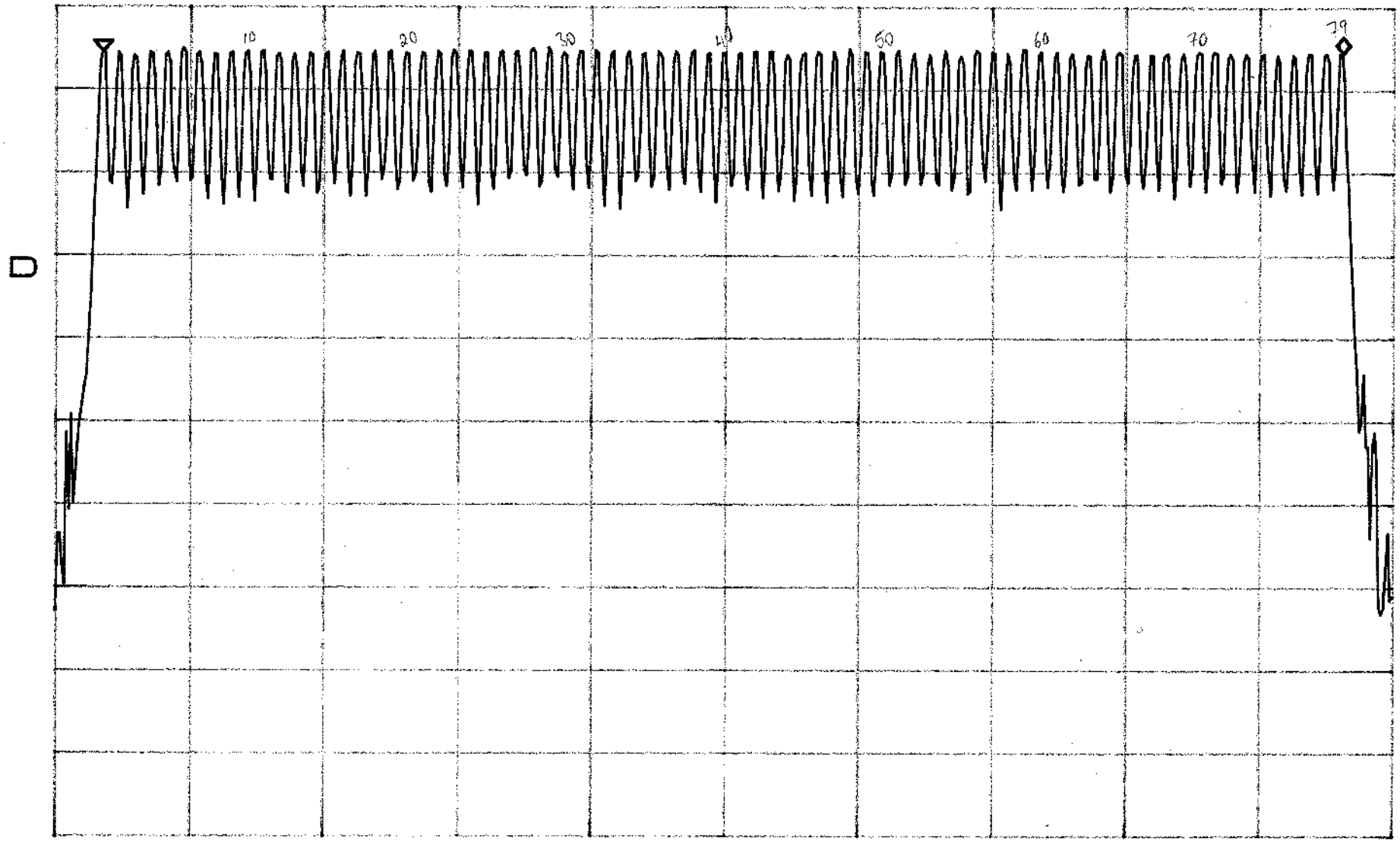
T32568/201


*ATTEN 40dB
ΔMKR -.33dB
RL 30.0dBm
10dB/
917kHz
D
CENTER 2.440000GHz
SPAN 5.000MHz
*RBW 30kHz
*VBW 100kHz
SWP 50ms

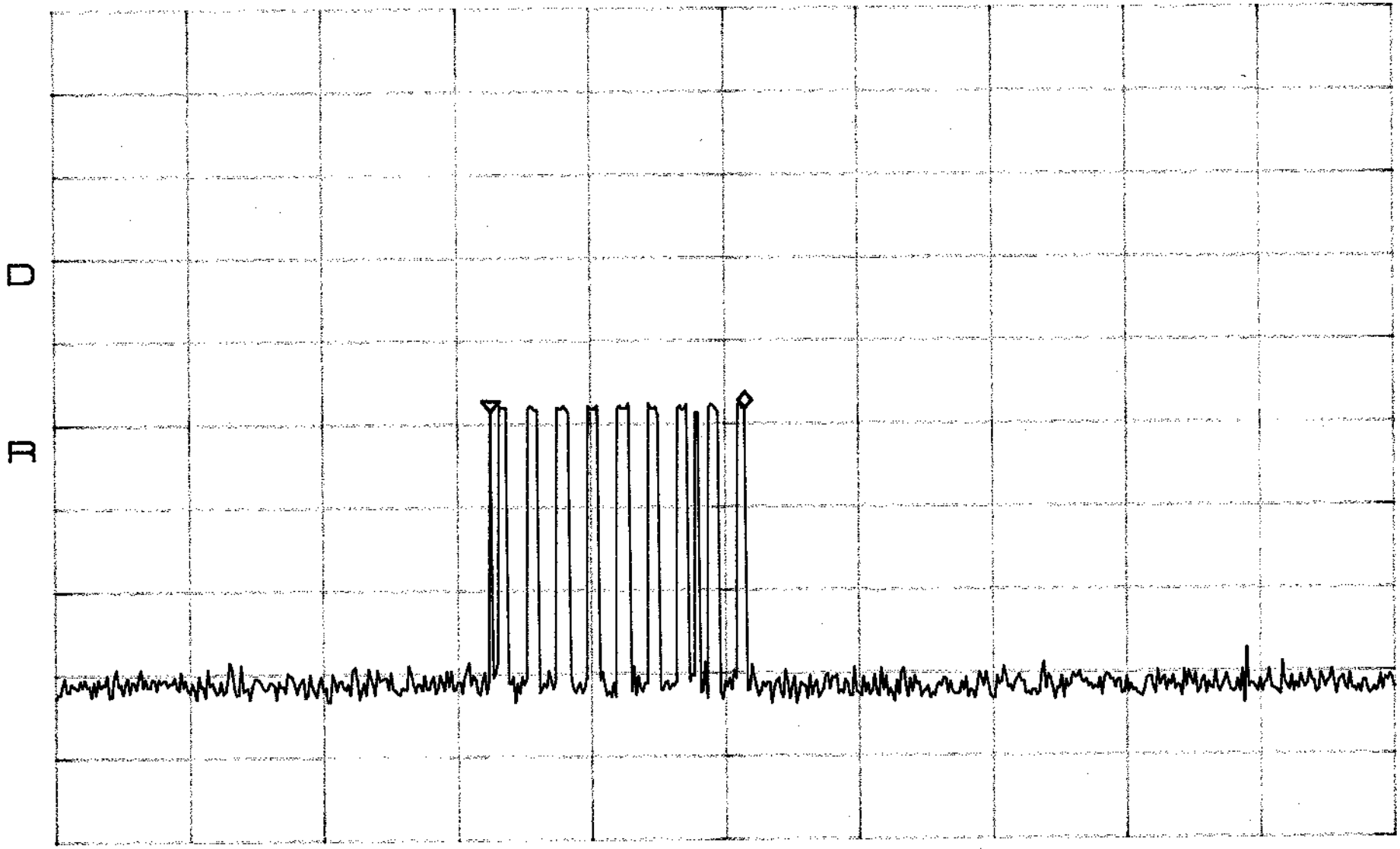
T32568/202


*ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -.34dB
925kHz
D
CENTER 2.480000GHz
SPAN 5.000MHz
*RBW 30kHz
*VBW 100kHz
SWP 50ms

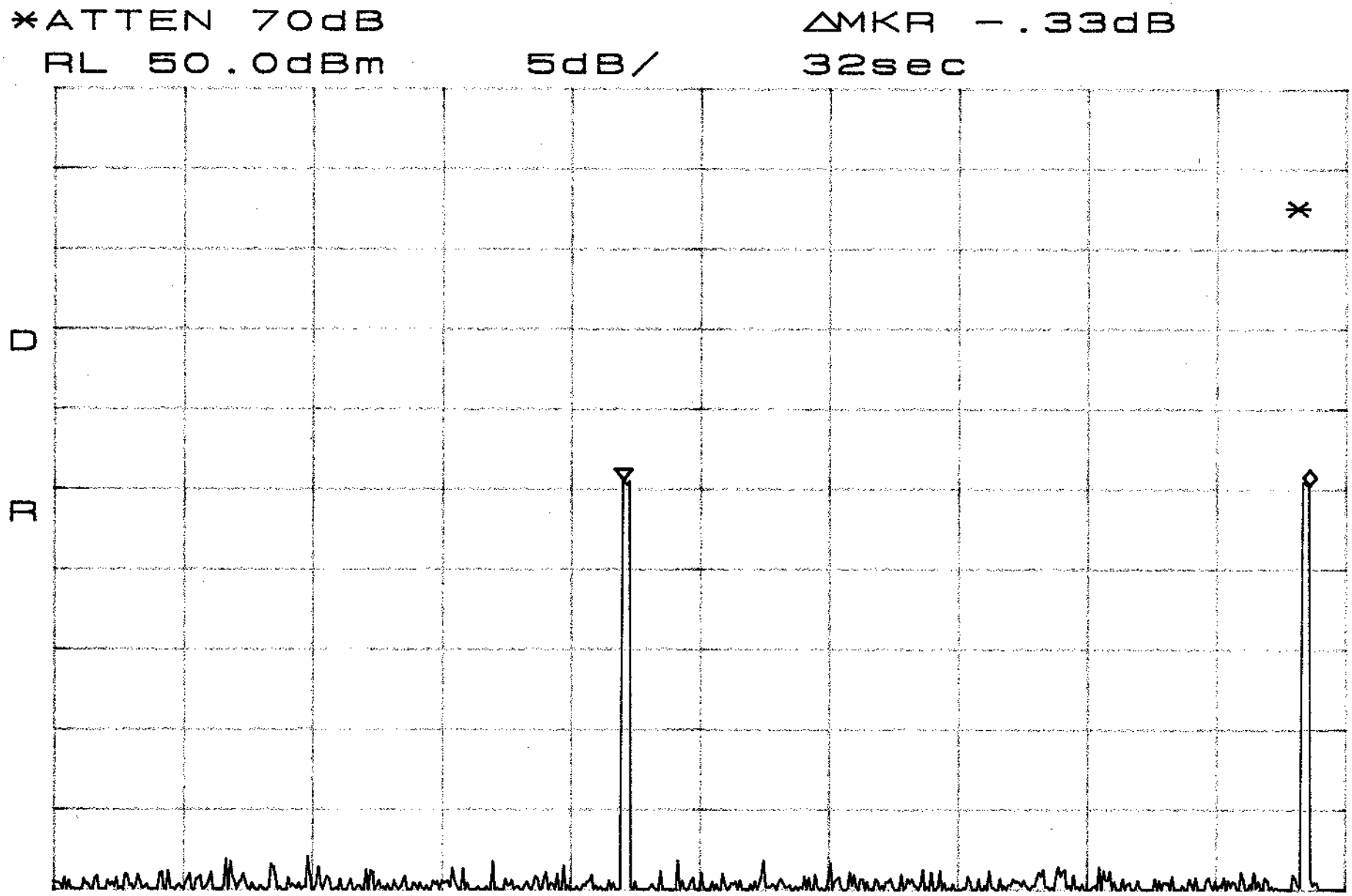
T32568/203


*ATTEN 40dB
ΔMKR 0dB
RL 30.0dBm
10dB/
78.77MHz
D
START 2.39900GHz
STOP 2.48400GHz
*RBW 100KHz
*VBW 100KHz
SWP 50ms

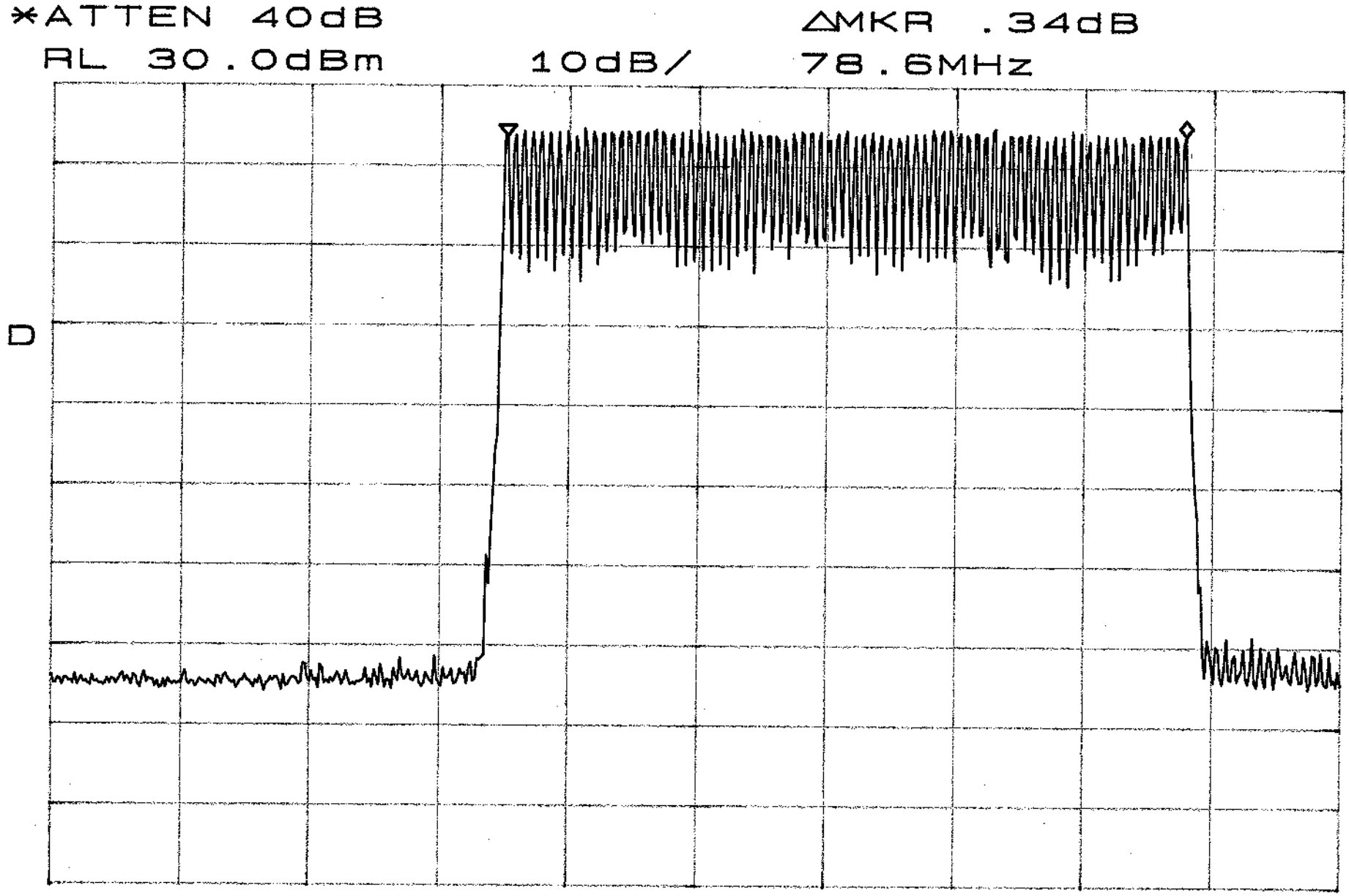
T32568/303


*ATTEN 70dB
RL 50.0dBm
5dB/
ΔMKR .17dB
380ms
D
R
CENTER 2.407000000GHz
SPAN 0Hz
*RBW 300kHz
*VBW 3.0MHz
*SWP 2.0sec

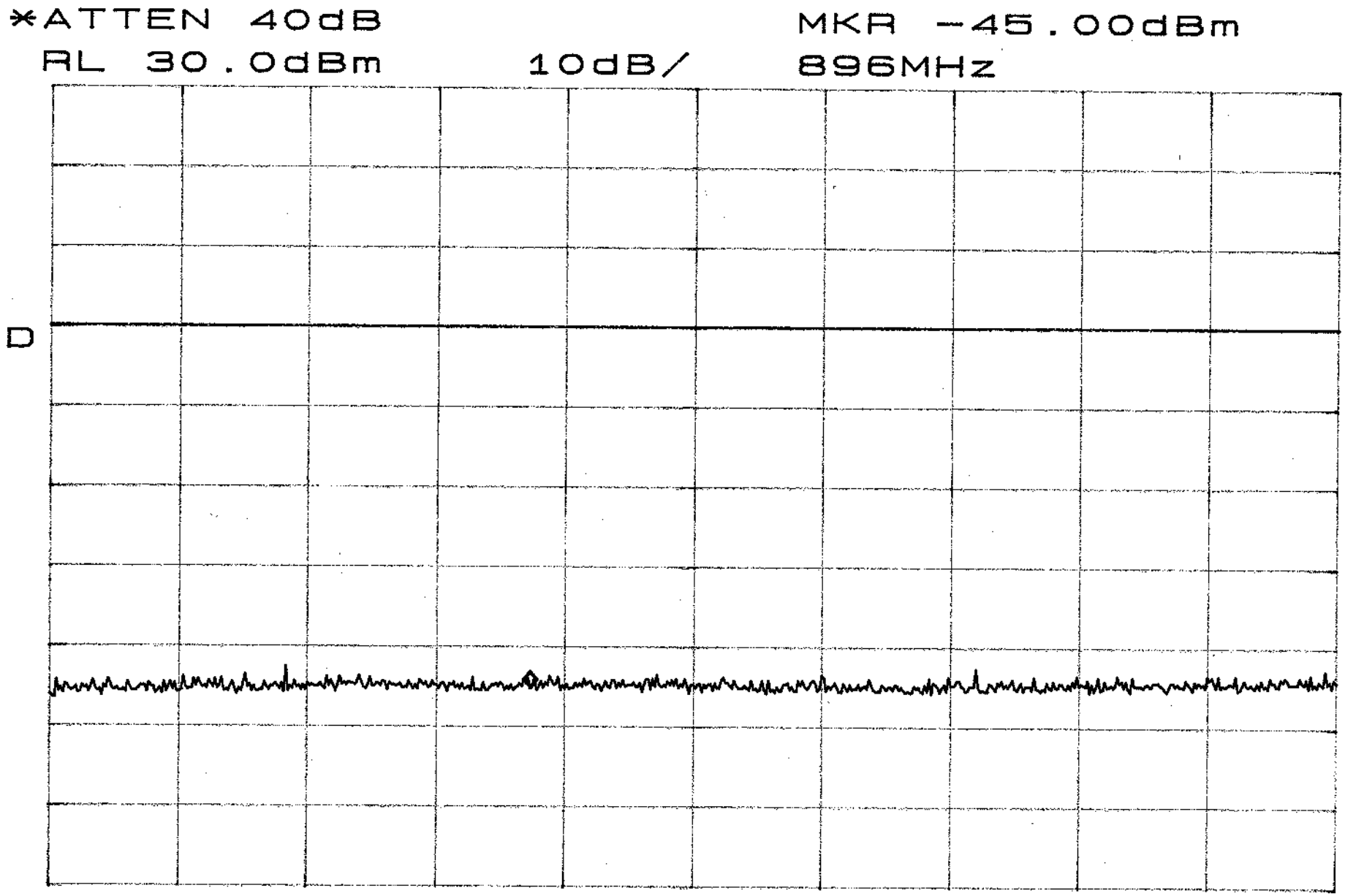
T32568/304


*ATTEN 70dB
ΔMKR −.33dB
RL 50.0dBm
5dB/
32sec
D
R
CENTER 2.407000000GHz
SPAN 0Hz
*RBW 30KHz
*VBW 3.0MHz
*SWP 60sec

T32568/305

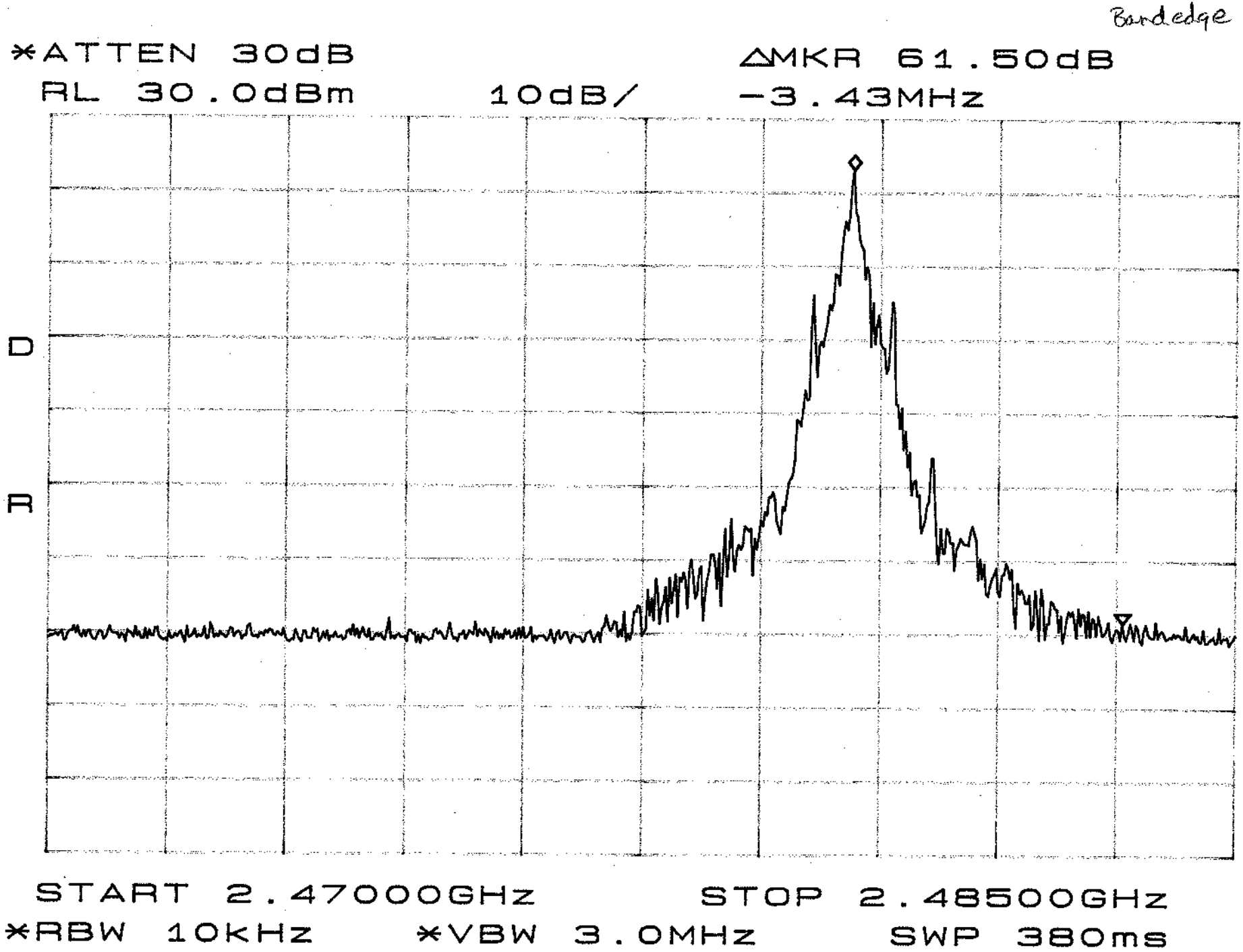

*ATTEN 40dB
ΔMKR .34dB
RL 30.0dBm
10dB/
78.6MHz
D
START 2.3500GHz
STOP 2.4993GHz
*RBW 100KHz
*VBW 100KHz
SWP 50ms

T32568/401

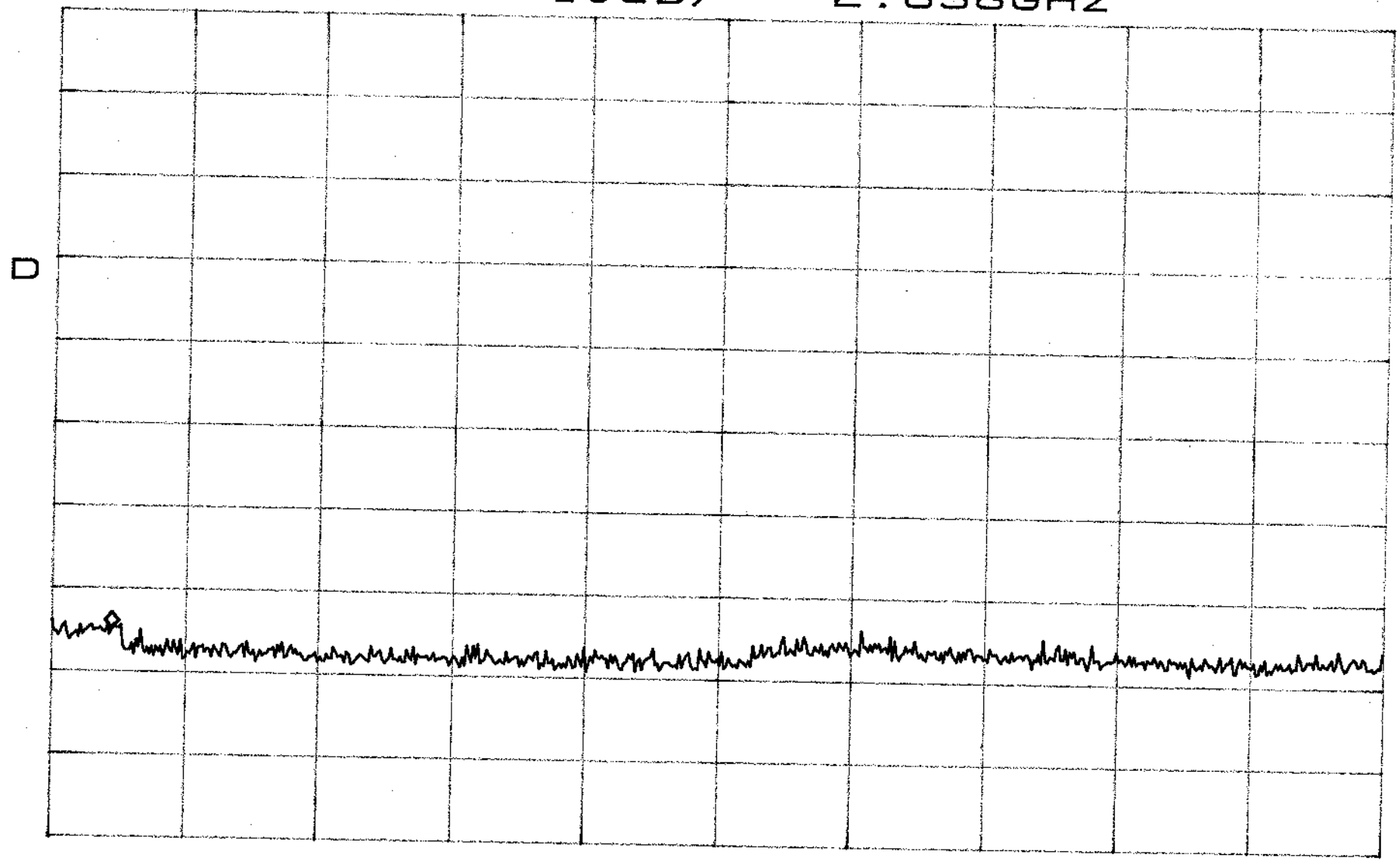

*ATTEN 40dB
MKR -45.00dBm
RL 30.0dBm
10dB/
896MHz
D
START 30MHz
STOP 2.350GHz
*RBW 100kHz
*VBW 100kHz
SWP 580ms

T32568/402

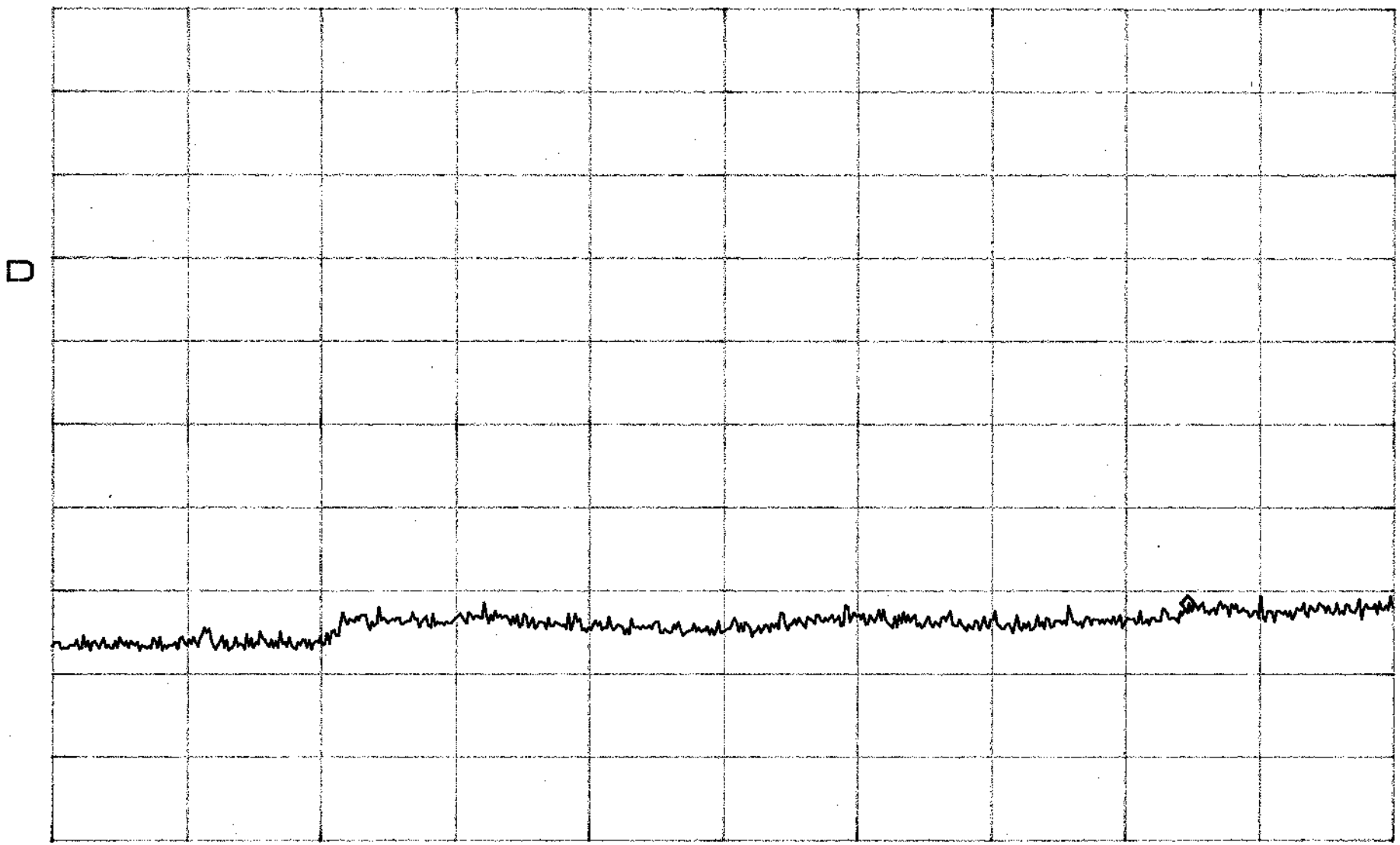
CH 80
Bandedge



T32568/403


*ATTEN 40dB
RL 30.0dBm
10dB/
MKR -44.83dBm
2.838GHz
D
START 2.500GHz
STOP 10.000GHz
*RBW 100kHz
*VBW 100kHz
SWP 1.9sec

T32568/404


*ATTEN 40dB
MKR -42.50dBm
RL 30.0dBm
10dB/
22.70GHz
D
START 10.00GHz
STOP 25.00GHz
*RBW 100kHz
*VBW 100kHz
SWP 3.8sec

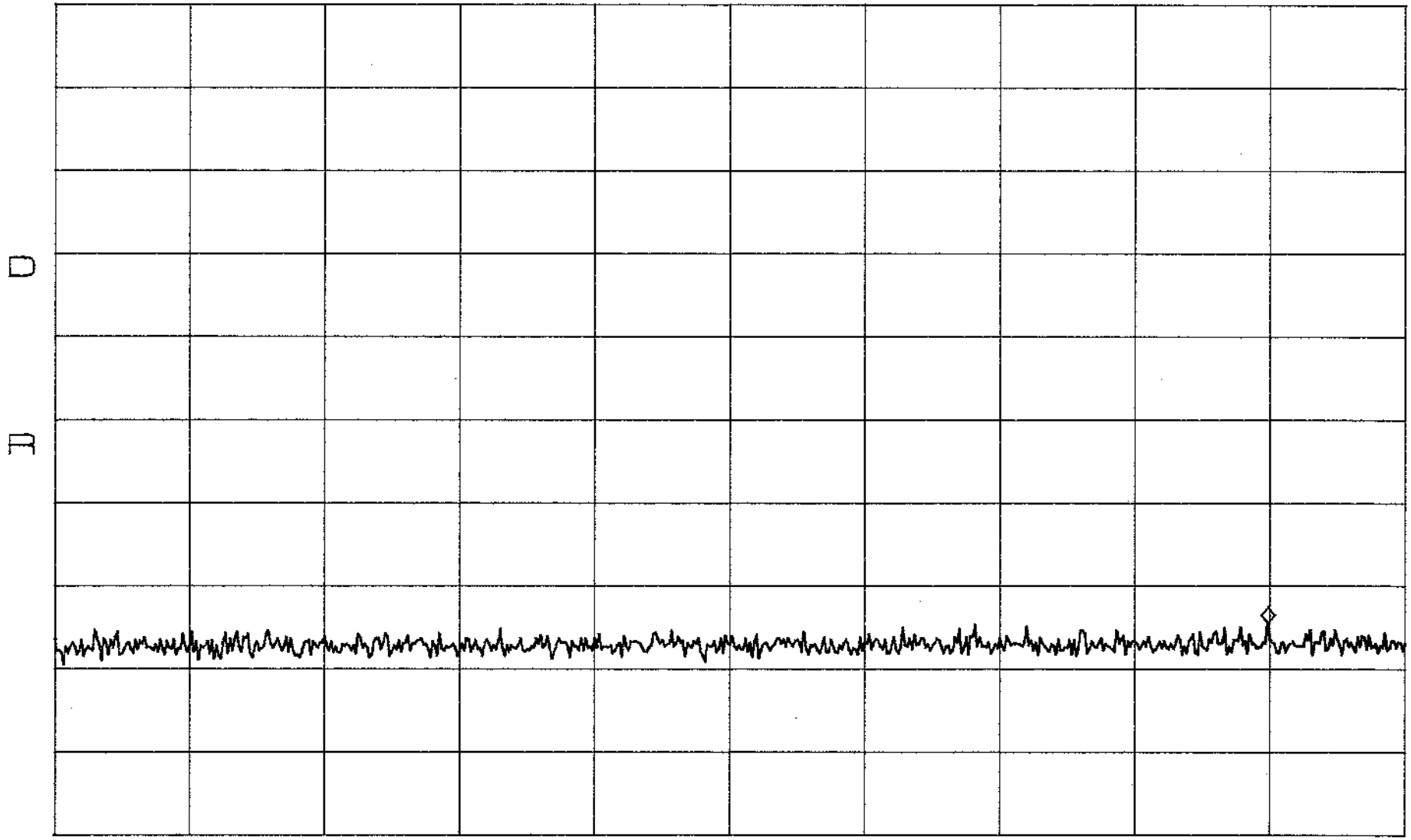
T32568/405

T33279

channel 2

*ATTEN 40dB MKR −44.00dBm

RL 30.5dBm 10dB/ 901.4MHz



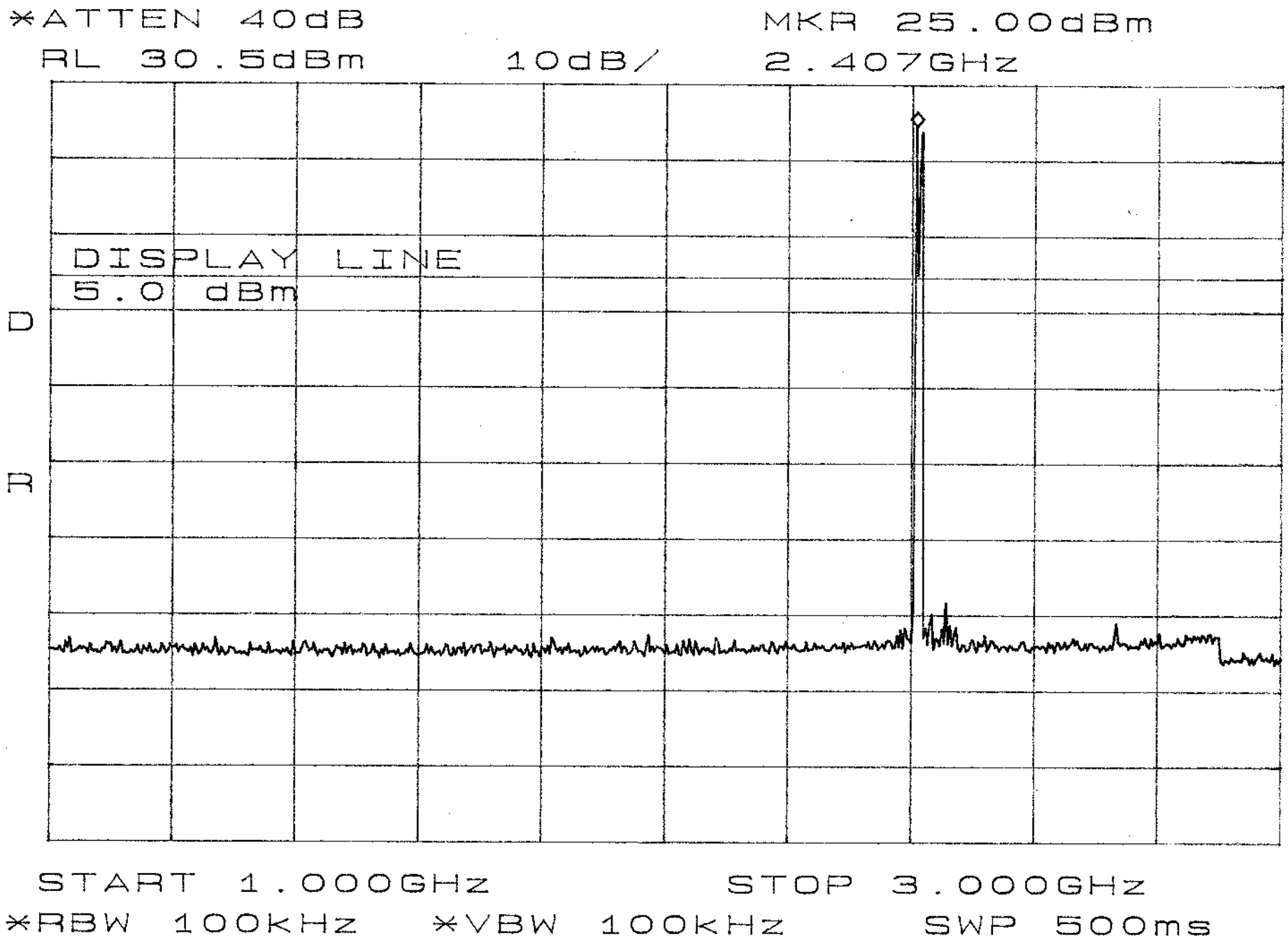
START 30.0MHz STOP 1.0000GHz

*RBW 100kHz *VBW 100kHz SWP 250ms

T33279/406

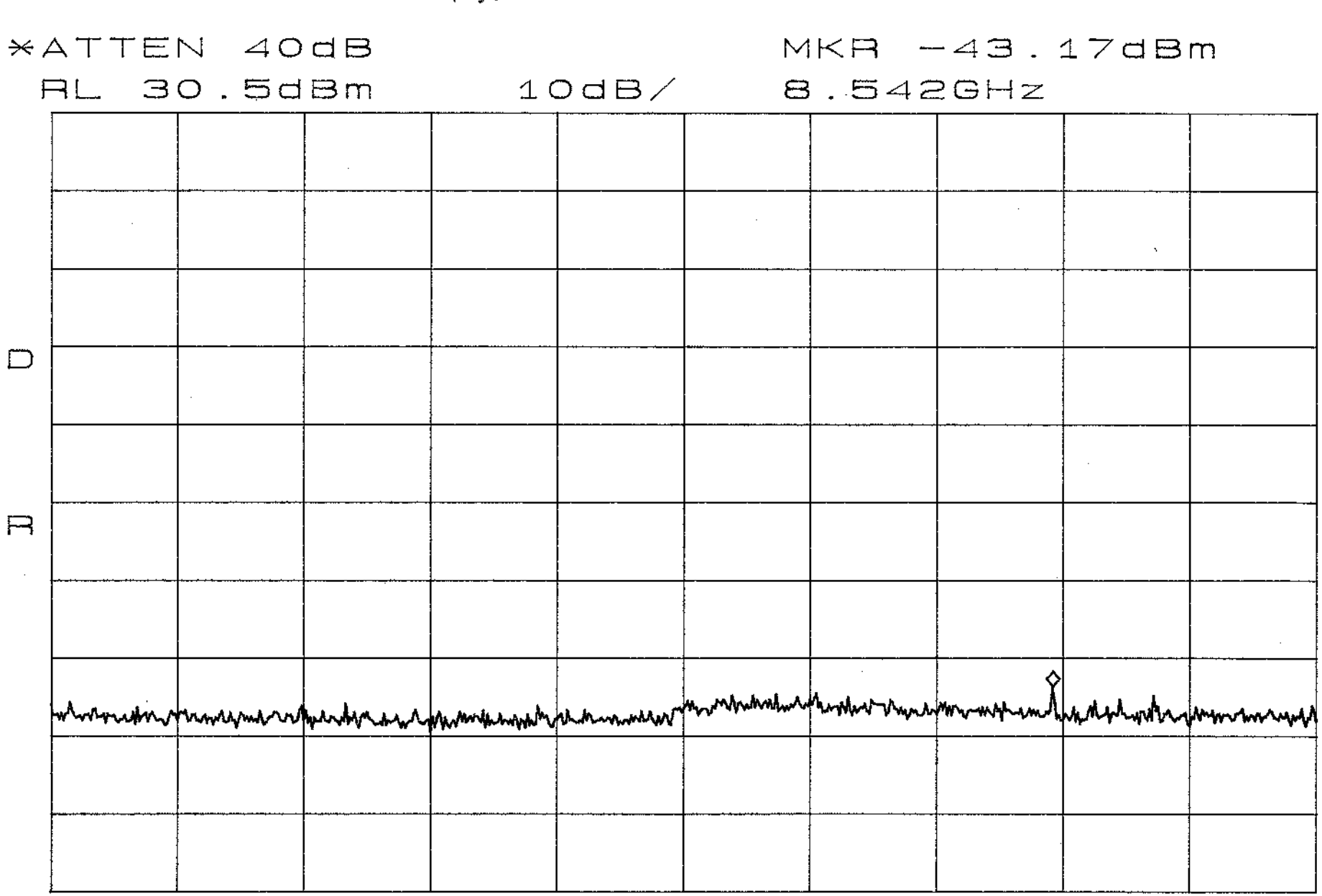
T33279

Channel 2



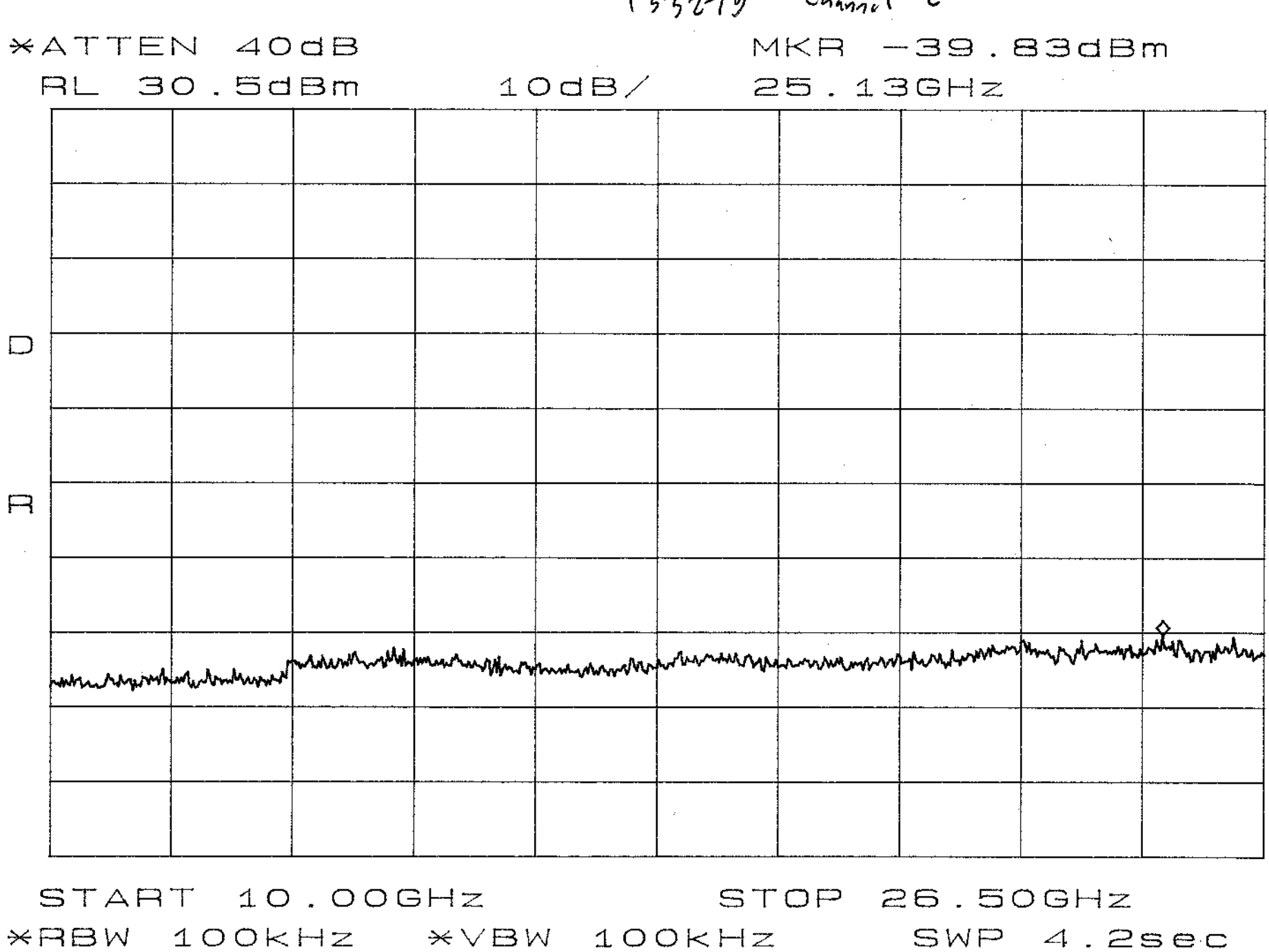
T33279/407

T33279 Channel 2



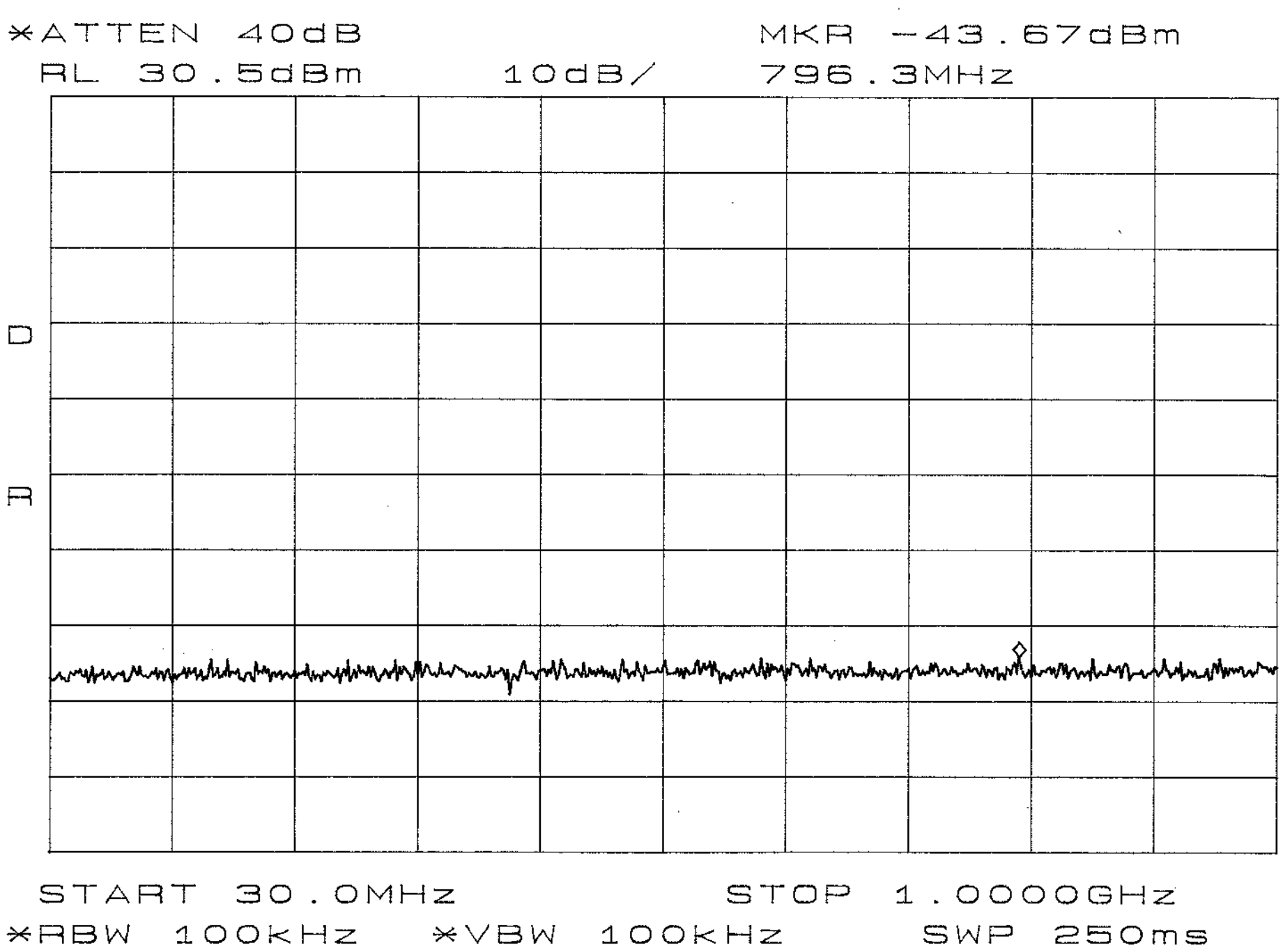
T33279/408

T33279 Channel 2



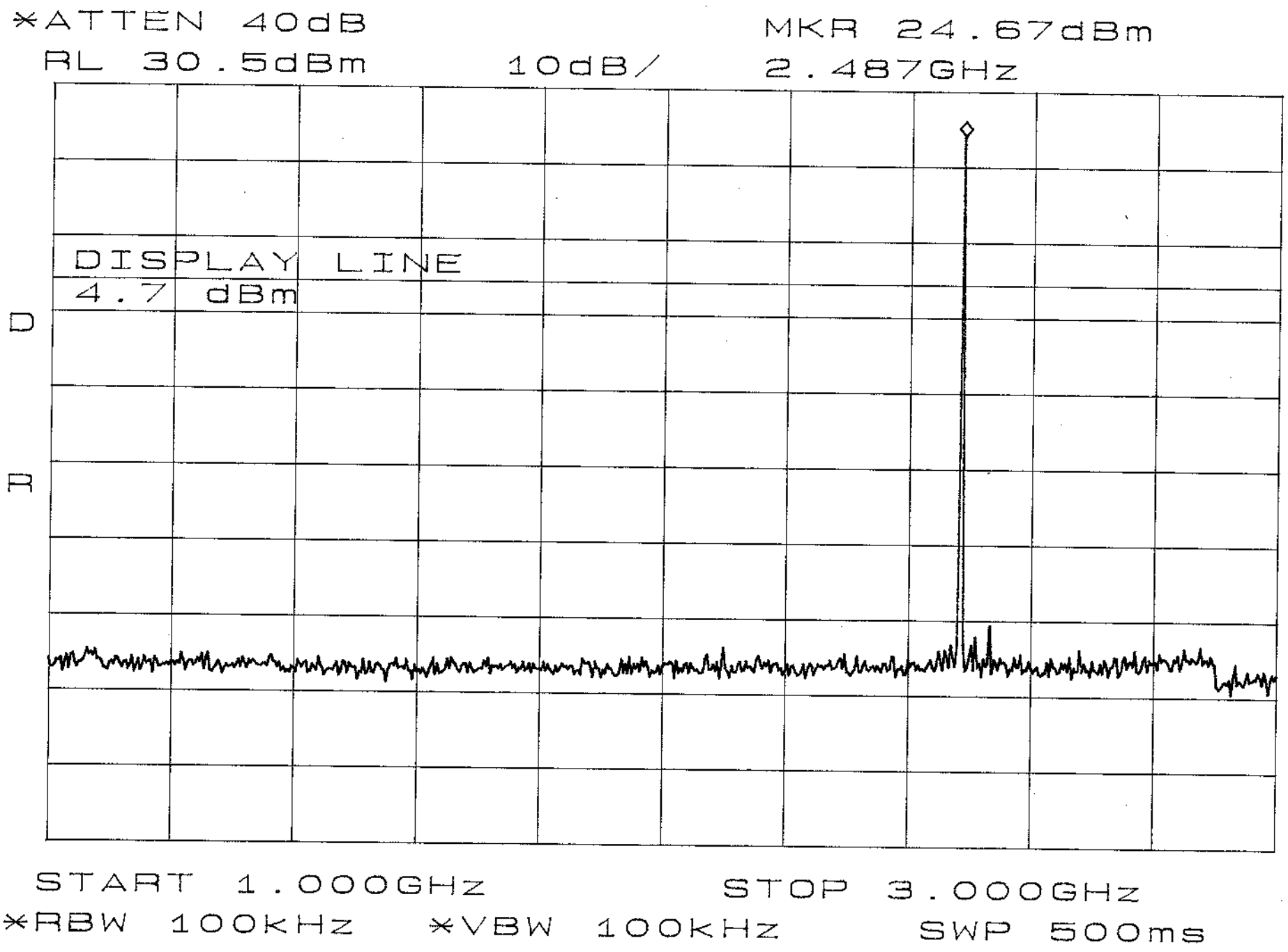
T33279/409

T33279 Channel 40



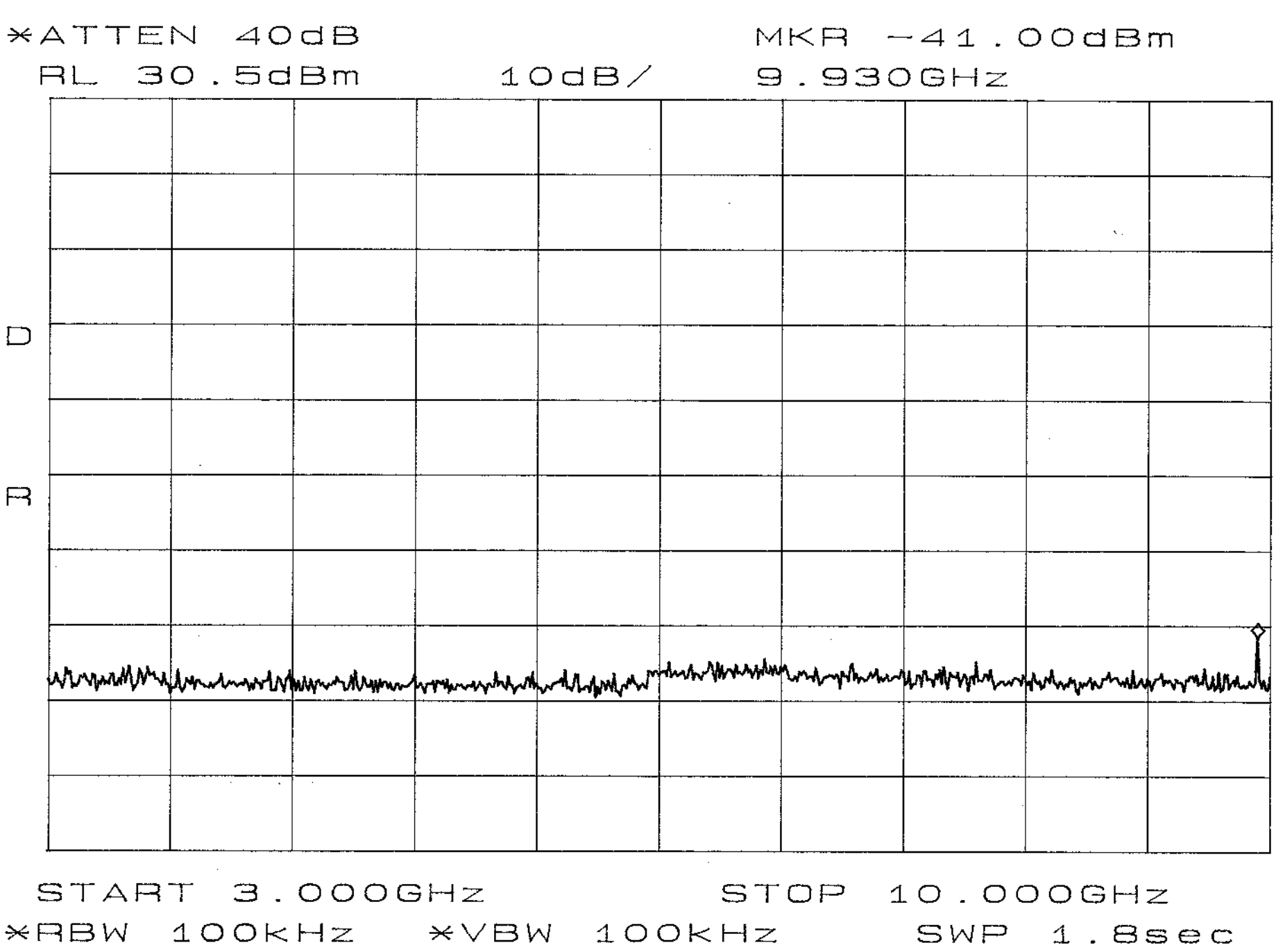
T33279/410

T33279 Channel 80



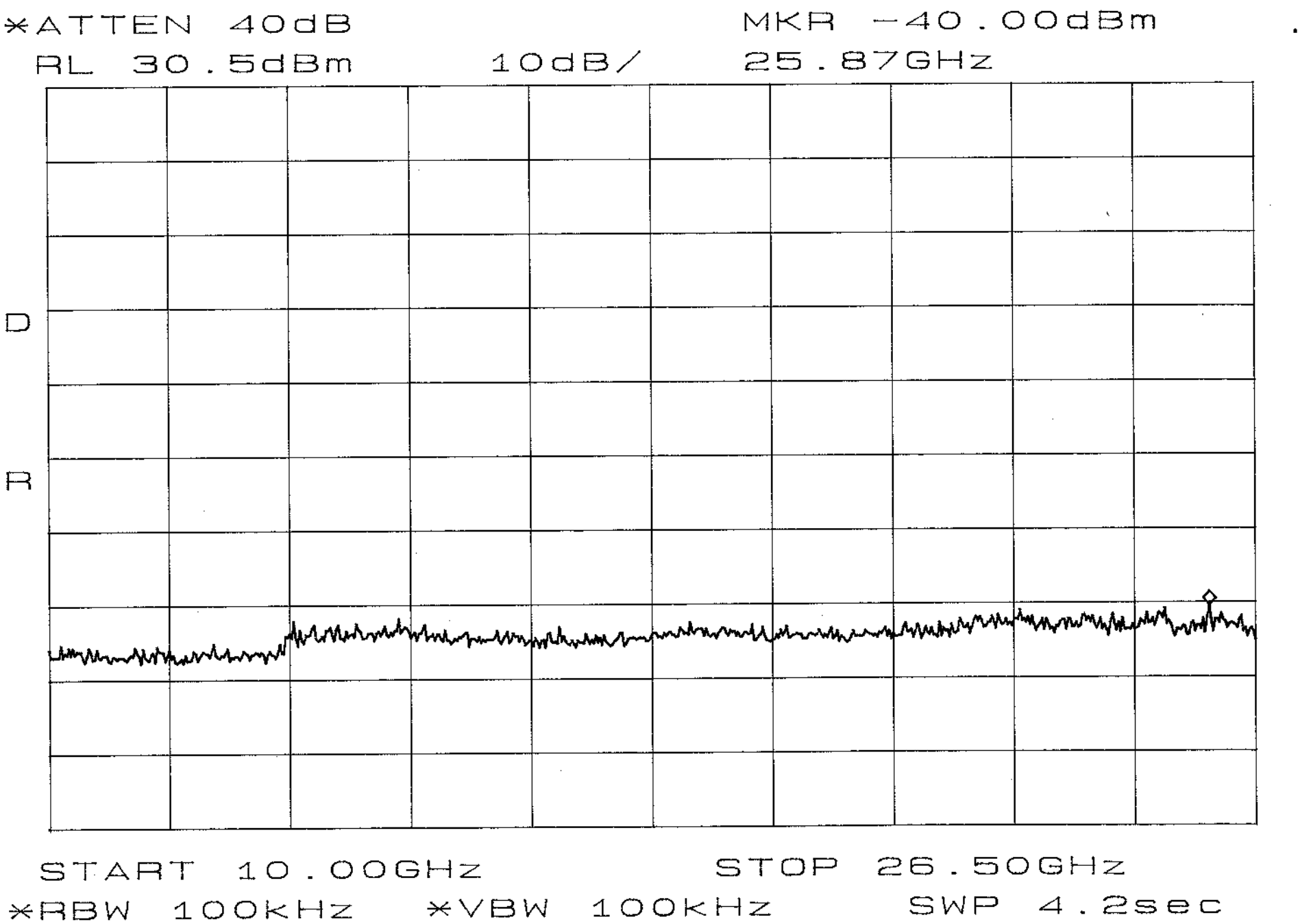
T33279/411

T33279 Channel 80



T33279/412

T33279 Channel 80



T33279/413

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu / Jerry Hi
Product:	RangeLAN802 Model 8931/8930	File:	T32830	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Page:	1 of 5	Approved:	
Revision	1.0				

Ambient Conditions	
Temperature:	21.1 °C
Humidity:	54 % RH

Test Objective

The objective of this test session is to perform final qualification testing the EUT defined below relative to the specification(s) defined above.

Test Summary

Run #1 - Measurement of Fundamental Frequency
Antenna: Centurion 1900-0044, Channel: 80

Results: Information only, limits do not apply

Run #2 - Band-Edge Measurement
Antenna: Centurion 1900-0044, Channel: 80

PASS Results: FCCB -6.9 dB AV @ 2483.500 MHz Horizontal

Note: Measurement made in 10 KHz bandwidth and then corrected using 10 log (1M/10K) to give equivalent level in 1 MHz bandwidth.

Run #3 - Band-Edge Measurement
Antenna: Mobile Marck 1900-0035, Channel: 80

PASS* Results: FCCB -0.4 dB AV @ 2483.500 MHz Vertical

Note: Measurement made in 10 KHz bandwidth and then corrected using 10 log (1M/10K) to give equivalent level in 1 MHz bandwidth.

Run #4 - Measurement of Harmonics, 1.0 – 25.0 GHz
Antenna: Mobile Marck 1900-0035, Channel: 80

PASS Results: FCCB -3.8 dB AV @12400.000 MHz Vertical

Run #5 - Measurement of Harmonics, 1.0 – 25.0 GHz
Antenna: Mobile Marck 1900-0035, Channel: 2

PASS Results: FCCB -5.2 dB AV @14412.000 MHz Vertical

Run #6 - Measurement of Harmonics, 1.0 – 25.0 GHz
Antenna: Mobile Marck 1900-0035, Channel: 40

PASS Results: FCCB -7.4 dB AV @14640.000 MHz Vertical

Run #7 - Band-Edge Measurement
Antenna: Vertex 1900-0036, Channel: 80

PASS Results: FCCB -12.9 dB AV @ 2483.500 MHz Horizontal

Note: Measurement is bandwidth corrected. Correction is based upon the difference between the fundamental level in 1MHz RBW and 1 KHz RBW.

Run #8 - Measurement of Harmonics, 1.0 – 25.0 GHz
Antenna: Vertex 1900-0036, Channel: 2

PASS Results: FCCB -5.0 dB AV @ 7206.000 MHz Vertical

Run #9 Measurement of Harmonics, 1.0 – 25.0 GHz
Antenna: Vertex 1900-0036, Channel: 40

PASS Results: FCCB -6.5 dB AV @ 9760.000 MHz Vertical

Run #10 Measurement of Harmonics, 1.0 – 25.0 GHz
Antenna: Vertex 1900-0036, Channel: 80

PASS Results: FCCB -6.6 dB AV @12400.000 MHz Vertical

Equipment Under Test (EUT) General Description

The EUT is a radio LAN device that transmits 10Mb/s ethernet data using frequency hopping spreading techniques. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 120 V, 60 Hz.

Equipment Under Test (EUT)

Manufacturer/Model/Description	Serial Number	FCC ID Number
Proxim / 8930/8931 / Spread Spectrum Wireless RangeLAN802 Ethernet Master	849J0533	IMKRL8ETH

Power Supply and Line Filters

The EUT used the following external AC-DC adapter:

Description	Manufacturer	Model
External 120VAC/60Hz to 12VDC at 1 Amp Converter	Proxim	Proxim P/N 4000.0007 P/N AD121A-9P M/N 481210003C0

Printed Wiring Boards in EUT

The manufacturer provided the following information:

Manufacturer/Description	Assembly #	Rev.	Serial Number	Crystals (MHz)
Proxim, RangeLan 802 Ethernet Adapter	0149	A	849J0533	20, 40

Subassemblies in EUT

Manufacturer/Description	Assembly Number	Rev.	Serial Number
Proxim.802 Mini ISA	8400-0150	19	A30407228

EUT Enclosure

The EUT enclosure is primarily constructed di casting of magnesium alloy (AZ91-D). It measures approximately 8.5 cm wide by 14.0 cm deep by 3.0 cm high.

EMI Suppression Devices (filters, gaskets, etc.)

Description	Manufacturer	Part Number
None	-	-

Modifications

No modifications were made to the EUT in order to comply with the requirements:

Local Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
Toshiba / Tecra 500CS Model # PA 1221U V / Laptop PC	11679294-3	CJ6UK333

Remote Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
None	-	-

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu / Jerry Hi
Product:	RangeLAN802 Model 8931/8930	File:	T32830	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Page:	5 of 5	Approved:	
Revision	1.0				

Interface Cabling

Cable Description	Length (m)	From Unit/Port	To Unit/Port
Category 5 UTP (x1)	3.0	EUT / RJ45 Port	Unterminated
Shielded Serial Cable (x1)	2.0	EUT / Serial Port	Laptop PC / Serial Port
Coaxial, Reverse-Polarity TNC (x1)	0.3	EUT / RF Port	Antenna
Unshielded Power Cable (x1)	2.0	EUT / DC Power Input	AC-DC Converter / DC Power Output
Unshielded Power Cord (x1)	2.0	Laptop PC / AC Power Input	120VAC/60Hz

Test Software

The EUT was operating in a continuous transmit mode with no hopping. The local-support PC was used to configure the system and monitor if necessary.

General Test Conditions

During radiated testing, the EUT was connected to 120V, 60Hz power input. The EUT and all local support equipment were located on the turntable for radiated testing.

Test Data Tables

See attached data

Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Ambient Conditions
Temperature: 21.1 °C
Humidity: 54 % RH

Run #1: Measurement of Fundamental
Antenna: Centurion 1900-0044 (1.0 dBi omni)
Channel: 80
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with no external preamp
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Conrad Chu

Frequency	Level	Pol	FCC	FCC	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.000	120.2	v	N/A	N/A	Pk	-	-	1.0 MHz RBW
2480.000	115.8	v	N/A	N/A	Pk	-	-	10.0 kHz RBW
2480.000	109.1	v	N/A	N/A	Pk	-	-	1.0 kHz RBW

Run #2: Band-Edge Measurement
Antenna: Centurion 1900-0044 (1.0 dBi omni)
Channel: 80
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with no external preamp
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Conrad Chu

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	71.7	v	74.0	-2.3	Pk	-	-	1.0 MHz RBW
2483.500	64.5	v	74.0	-9.5	Pk	-	-	10.0 kHz RBW, Note 1
2483.500	62.6	v	74.0	-11.4	Pk	-	-	1.0 kHz RBW, Note 2
2483.500	63.0	v	54.0	9.0	Avg	-	-	1.0 MHz RBW
2483.500	47.0	v	54.0	-7.0	Avg	-	-	10.0 kHz RBW, Note 1
2483.500	63.0	h	74.0	-11.0	Pk	-	-	10.0 kHz RBW, Note 1
2483.500	47.1	h	54.0	-6.9	Avg	-	-	10.0 kHz RBW, Note 1

Note 1:	Added 20.0 dB bandwidth correction factor
Note 2:	Added 30.0 dB bandwidth correction factor

Elliott

Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Run #3: Band-Edge Measurement
Antenna: Mobile Marck 1900-0035 (9dBi omni)
Channel: 80
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with no external preamp
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Conrad Chu

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	68.6	v	74.0	-5.4	Pk	-	-	10.0 kHz RBW, Note 1
2483.500	53.6	v	54.0	-0.4	Avg	-	-	10.0 kHz RBW, Note 1
2483.500	68.2	v	74.0	-5.8	Pk	-	-	1.0 kHz RBW, Note 2
2483.500	53.5	v	54.0	-0.5	Avg	-	-	1.0 kHz RBW, Note 2
2483.900	64.5	h	74.0	-9.5	Pk	-	-	10.0 kHz RBW, Note 1
2483.500	47.7	h	54.0	-6.3	Avg	-	-	10.0 kHz RBW, Note 1
2483.700	62.5	h	74.0	-11.5	Pk	-	-	1.0 kHz RBW, Note 2
2483.700	49.4	h	54.0	-4.6	Avg	-	-	1.0 kHz RBW, Note 2

Note 1:	Added 20.0 dB bandwidth correction factor
Note 2:	Added 30.0 dB bandwidth correction factor

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Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Run #4: Measurement of Harmonics, 1.0 - 25.0 GHz, Sorted by Margin
Antenna: Mobile Marck 1900-0035 (9dBi omni)
Channel: 80
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with external preamp
Filter #247 (less than 1dB loss 4.0 - 18.46 GHz) used for measurements below 18.0 GHz
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Conrad Chu

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
12400.000	50.2	v	54.0	-3.8	Avg	-	-	
14880.000	47.7	v	54.0	-6.3	Avg	180	1.2	
12400.000	45.1	h	54.0	-8.9	Avg	-	-	
9920.000	44.8	h	54.0	-9.2	Avg	214	1.5	
9920.000	44.7	v	54.0	-9.3	Avg	180	1.5	
4960.000	41.5	v	54.0	-12.5	Avg	180	2.2	
7440.000	41.3	v	54.0	-12.7	Avg	200	1.0	
12400.000	61.2	v	74.0	-12.8	Pk	-	-	
14880.000	61.2	v	74.0	-12.8	Pk	180	1.2	
7440.000	39.9	h	54.0	-14.1	Avg	260	1.6	
12400.000	58.2	h	74.0	-15.8	Pk	-	-	
4960.000	37.9	h	54.0	-16.1	Avg	-	-	
9920.000	56.1	h	74.0	-17.9	Pk	214	1.5	
9920.000	55.2	v	74.0	-18.8	Pk	180	1.5	
7440.000	53.4	v	74.0	-20.6	Pk	200	1.0	
7440.000	52.4	h	74.0	-21.6	Pk	260	1.6	
4960.000	52.3	v	74.0	-21.7	Pk	180	2.2	
4960.000	50.1	h	74.0	-23.9	Pk	-	-	

Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Run #5: Measurement of Harmonics, 1.0 - 25.0 GHz, Sorted by Margin
Antenna: Mobile Marck 1900-0035 (9dBi omni)
Channel: 2
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with external preamp
Filter #247 (less than 1dB loss 4.0 - 18.46 GHz) used for measurements below 18.0 GHz
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Conrad Chu

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
14412.000	48.8	v	54.0	-5.2	Avg	-	-	
7206.000	46.3	v	54.0	-7.7	Avg	-	-	
12010.000	46.2	v	54.0	-7.8	Avg	-	-	
7206.000	45.4	h	54.0	-8.6	Avg	190	1.2	
14412.000	62.3	v	74.0	-11.7	Pk	-	-	
4804.000	41.7	v	54.0	-12.3	Avg	178	1.6	
9608.000	40.5	v	54.0	-13.5	Avg	100	1.2	
4804.000	39.4	h	54.0	-14.6	Avg	140	1.3	
12010.000	59.1	v	74.0	-14.9	Pk	-	-	
7206.000	56.1	v	74.0	-17.9	Pk	-	-	
9608.000	54.6	v	74.0	-19.4	Pk	100	1.2	
7206.000	54.4	h	74.0	-19.6	Pk	190	1.2	
4804.000	51.8	v	74.0	-22.2	Pk	178	1.6	
4804.000	50.9	h	74.0	-23.1	Pk	140	1.3	

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Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Run #6: Measurement of Harmonics, 1.0 - 25.0 GHz, Sorted by Margin
Antenna: Mobile Marck 1900-0035 (9dBi omni)
Channel: 40
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with external preamp
Filter #247 (less than 1dB loss 4.0 - 18.46 GHz) used for measurements below 18.0 GHz
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Conrad Chu

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
14640.000	46.6	v	54.0	-7.4	Avg	190	1.2	
17080.000	46.1	v	54.0	-7.9	Avg	-	-	
9760.000	45.4	v	54.0	-8.6	Avg	190	1.3	
9760.000	45.1	h	54.0	-8.9	Avg	180	1.1	
12200.000	43.2	v	54.0	-10.8	Avg	200	1.1	
12200.000	42.6	h	54.0	-11.4	Avg	210	1.1	
7320.000	42.0	v	54.0	-12.0	Avg	190	1.3	
14640.000	61.6	v	74.0	-12.4	Pk	190	1.2	
17080.000	60.6	v	74.0	-13.4	Pk	-	-	
4880.000	40.0	v	54.0	-14.0	Avg	140	1.3	
7320.000	37.4	h	54.0	-16.6	Avg	240	1.1	
4880.000	37.1	h	54.0	-16.9	Avg	240	1.1	
9760.000	57.1	v	74.0	-16.9	Pk	190	1.3	
9760.000	57.0	h	74.0	-17.0	Pk	180	1.1	
12200.000	56.8	v	74.0	-17.2	Pk	200	1.1	
12200.000	56.8	h	74.0	-17.2	Pk	210	1.1	
7320.000	53.1	v	74.0	-20.9	Pk	190	1.3	
4880.000	51.3	v	74.0	-22.7	Pk	140	1.3	
7320.000	50.7	h	74.0	-23.3	Pk	240	1.1	
4880.000	50.0	h	74.0	-24.0	Pk	240	1.1	

Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Run #7: Band-Edge Measurement
Antenna: Xertex 1900-0036 (9dBi Patch antenna)
Channel: 80
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with no external preamp
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Conrad Chu

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Meaurements (vertical) of Band-Edge with Different Resolution Bandwidths								
2483.500	84.3	v	74.0	10.3	Pk	-	-	1.0 MHz RBW
2483.500	73.5	v	74.0	-0.5	Pk	-	-	10.0 kHz RBW, Note 1
2483.500	79.8	v	74.0	5.8	Pk	-	-	1.0 kHz RBW, Note 2
2483.500	69.6	v	54.0	15.6	Avg	-	-	1.0 MHz RBW
2483.500	56.0	v	54.0	2.0	Avg	-	-	10.0 kHz RBW, Note 1
2483.500	57.2	v	54.0	3.2	Avg	-	-	1.0 kHz RBW, Note 2
Meaurements (vertical) of Fundamental with Different Resolution Bandwidths								
2480.000	131.1	v	N/A	N/A	Pk	-	-	Fundamental, 1.0 MHz RBW
2480.000	126.6	v	N/A	N/A	Pk	-	-	Fundamental, 10.0 kHz RBW
2480.000	119.5	v	N/A	N/A	Pk	-	-	Fundamental, 1.0 kHz RBW
Final Measurement (vertical) of Band Edge								
(calculated by adding the difference between the 1.0MHz at 1.0 kHz peak measurements of the fundamental to								
the 1.0 kHz bandedge measurement prior to bandwidth correction)								
2483.500	61.4	v	74.0	-12.6	Pk	-	-	Equals 49.8 + 11.6
2483.500	38.8	v	54.0	-15.2	Avg	-	-	Equals 31.2 + 11.6 - 4.0
Meaurements (horizontal) of Band-Edge with 1.0 kHz Resolution Bandwidth								
2483.500	41.6	h	74.0	-32.4	Pk	-	-	1.0 kHz RBW, no BW correction
2483.500	28.4	h	54.0	-25.6	Avg	-	-	1.0 kHz RBW, no BW correction
Meaurements (horizontal) of Fundamental with Different Resolution Bandwidths								
2480.000	123.0	h	N/A	N/A	Pk	-	-	Fundamental, 1.0 MHz RBW
2480.000	110.3	h	N/A	N/A	Pk	-	-	Fundamental, 1.0 kHz RBW
Final Measurement (horizontal) of Band Edge								
(calculated by adding the difference between the 1.0MHz at 1.0 kHz peak measurements of the fundamental to								
the 1.0 kHz bandedge measurement prior to bandwidth correction)								
2483.500	54.3	h	74.0	-19.7	Pk	-	-	Equals 41.6 + 12.7
2483.500	41.1	h	54.0	-12.9	Avg	-	-	Equals 32.4 + 12.7 - 4.0

Note 1:	Added 20.0 dB bandwidth correction factor
Note 2:	Added 30.0 dB bandwidth correction factor

Elliott

Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Run #8: Measurement of Harmonics, 1.0 - 25.0 GHz, Sorted by Margin
Antenna: Xertex 1900-0036 (9dBi Patch antenna)
Channel: 2
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with external preamp
Filter #247 (less than 1dB loss 4.0 - 18.46 GHz) used for measurements below 18.0 GHz
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Jerry Hill

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7206.000	49.0	v	54.0	-5.0	Avg	186	1.0	
7206.000	46.3	h	54.0	-7.7	Avg	198	1.0	
4804.000	42.1	h	54.0	-11.9	Avg	160	1.0	
9608.000	41.3	v	54.0	-12.7	Avg	183	1.0	
4804.000	41.2	v	54.0	-12.8	Avg	156	1.0	
9608.000	41.2	h	54.0	-12.8	Avg	198	1.0	
12010.000	38.0	v	54.0	-16.0	Avg	183	1.0	
12010.000	38.0	h	54.0	-16.0	Avg	178	1.0	noise floor
7206.000	57.3	v	74.0	-16.7	Pk	186	1.0	
7206.000	55.1	h	74.0	-18.9	Pk	198	1.0	
9608.000	55.0	v	74.0	-19.0	Pk	183	1.0	
9608.000	54.4	h	74.0	-19.6	Pk	198	1.0	
12010.000	53.3	h	74.0	-20.7	Pk	178	1.0	noise floor
4804.000	52.0	h	74.0	-22.0	Pk	160	1.0	
4804.000	51.0	v	74.0	-23.0	Pk	156	1.0	
12010.000	49.4	v	74.0	-24.6	Pk	183	1.0	

Elliott

Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Run #9: Measurement of Harmonics, 1.0 - 25.0 GHz, Sorted by Margin
Antenna: Xertex 1900-0036 (9dBi Patch antenna)
Channel: 40
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with external preamp
Filter #247 (less than 1dB loss 4.0 - 18.46 GHz) used for measurements below 18.0 GHz
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Jerry Hill

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
9760.000	47.5	v	54.0	-6.5	Avg	183	1.0	
9760.000	44.3	h	54.0	-9.7	Avg	197	1.0	
12200.000	43.5	v	54.0	-10.5	Avg	180	1.0	
4880.000	43.3	h	54.0	-10.7	Avg	214	1.0	
12200.000	42.9	h	54.0	-11.1	Avg	203	1.0	
4880.000	42.5	v	54.0	-11.5	Avg	180	1.0	
7320.000	39.8	v	54.0	-14.2	Avg	190	1.0	
7320.000	37.4	h	54.0	-16.6	Avg	157	1.0	
9760.000	58.1	v	74.0	-15.9	Pk	183	1.0	
12200.000	57.0	h	74.0	-17.0	Pk	203	1.0	
12200.000	56.8	v	74.0	-17.2	Pk	180	1.0	
9760.000	56.6	h	74.0	-17.4	Pk	197	1.0	
7320.000	52.5	v	74.0	-21.5	Pk	190	1.0	
4880.000	52.2	v	74.0	-21.8	Pk	180	1.0	
4880.000	51.6	h	74.0	-22.4	Pk	214	1.0	
7320.000	49.4	h	74.0	-24.6	Pk	157	1.0	

Elliott

Emissions Test Data

Client:	Proxim, Inc.	Date:	7/19/99	Test Engr:	Conrad Chu/Jerry Hill
Product:	RangeLAN802 Model 8931/8930	File:	D32830	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC Part 15	Distance:	3 m	Approved:	

Run #10: Measurement of Harmonics, 1.0 - 25.0 GHz, Sorted by Margin
Antenna: Xertex 1900-0036 (9dBi Patch antenna)
Channel: 80
Readings taken at 3 meters per FCC requirements
Measurements made using HP analyzer with external preamp
Filter #247 (less than 1dB loss 4.0 - 18.46 GHz) used for measurements below 18.0 GHz
Correction factor of -4.0 dB added for duty cycle to Average Measurements ONLY.
Data taken by Jerry Hill

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
12400.000	47.4	v	54.0	-6.6	Avg	154	1.0	
9920.000	46.6	v	54.0	-7.4	Avg	218	1.0	
12400.000	45.9	h	54.0	-8.1	Avg	154	1.0	
4960.000	42.4	v	54.0	-11.6	Avg	157	1.0	
4960.000	41.3	h	54.0	-12.7	Avg	212	1.0	
9920.000	38.3	h	54.0	-15.7	Avg	218	1.0	
7440.000	36.9	h	54.0	-17.1	Avg	185	1.0	
7440.000	36.6	v	54.0	-17.4	Avg	164	1.0	
12400.000	59.5	v	74.0	-14.5	Pk	189	1.0	
12400.000	58.9	h	74.0	-15.1	Pk	154	1.0	
9920.000	58.7	v	74.0	-15.3	Pk	161	1.0	
9920.000	58.1	h	74.0	-15.9	Pk	218	1.0	
7440.000	52.6	v	74.0	-21.4	Pk	164	1.0	
4960.000	51.5	v	74.0	-22.5	Pk	157	1.0	
4960.000	51.2	h	74.0	-22.8	Pk	212	1.0	
7440.000	51.2	h	74.0	-22.8	Pk	185	1.0	

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EMC Test Log

Client:	Proxim, Inc.	Date:	8/17/99	Test Engr:	Conrad Chu
Product:	RangeLAN802 Model 8931/8930	File:	T33279	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC B	Page:	1 of 5	Approved:	
Revision	1.0				

Ambient Conditions	
Temperature:	22.2 °C
Humidity:	61 % RH

Test Objective

The objective of this test session is to perform final qualification testing the EUT defined below relative to the specification(s) defined above.

Test Summary

Run #1 - Unmaximized Preliminary Radiated Emissions Scan, 30-1000 MHz

Results: FCCB -3.5 dB QP @ 640.000 MHz Vertical

Run #2 - Maximized Radiated Emissions from Run #1

PASS Results: FCCB -3.3 dB QP @ 640.000 MHz Vertical

Run #3 - Conducted Emissions Scan of EUT, 0.45-30.00 MHz, 120V, 60Hz

PASS Results: FCCB -13.0 dB QP @ 0.460 MHz Neutral

Notes: The measurements were made with the EUT operating on Channel 2. It was discovered that the worst-case emissions were on the neutral conductor. Therefore, plots of the neutral conductor were taken with the EUT operating on Channels 40 and 80 to verify that the emissions were also well below the FCCB specification limit.

Run #4 - Conducted Emissions Scan of EUT Antenna Output, 30- 26500 MHz
Per FCC Chapter 15.247 Part C

PASS Data was incorporated into T32568 – Refer to Test-Log T32568 for actual results.

Client:	Proxim, Inc.	Date:	8/17/99	Test Engr:	Conrad Chu
Product:	RangeLAN802 Model 8931/8930	File:	T33279	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC B	Page:	2 of 5	Approved:	
Revision	1.0				

Equipment Under Test (EUT) General Description

The EUT is a radio LAN device that transmits 10Mb/s ethernet data using frequency hopping spreading techniques. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 120 V, 60 Hz.

Equipment Under Test (EUT)

Manufacturer/Model/Description	Serial Number	FCC ID Number
Proxim / 8930/8931 / Spread Spectrum Wireless RangeLAN802 Ethernet Master	849J0533	IMLRL8ETH

Power Supply and Line Filters

The EUT used the following external AC-DC adapter:

Description	Manufacturer	Model
External 120VAC/60Hz to 12VDC at 1 Amp Converter	Proxim	Proxim P/N 4000.0007 P/N AD121A-9P M/N 481210003C0

Printed Wiring Boards in EUT

The manufacturer provided the following information:

Manufacturer/Description	Assembly #	Rev.	Serial Number	Crystals (MHz)
Proxim / Main Board	0149	A	849J0533	20, 40

Subassemblies in EUT

Manufacturer/Description	Assembly Number	Rev.	Serial Number
Proxim.802 Mini ISA	8400-0150	19	A30407228

Client:	Proxim, Inc.	Date:	8/17/99	Test Engr:	Conrad Chu
Product:	RangeLAN802 Model 8931/8930	File:	T33279	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC B	Page:	3 of 5	Approved:	
Revision	1.0				

EUT Enclosure(s)

The EUT enclosure is primarily constructed di casting of magnesium alloy (AZ91-D). It measures approximately 8.5 cm wide by 14.0 cm deep by 3.0 cm high.

EMI Suppression Devices (filters, gaskets, etc.)

Description	Manufacturer	Part Number
None	-	-

Modifications

The following modifications were made to the EUT in order to comply with the requirements:

Prior to the test, capacitors were added to the DC power input. This included capacitors from line to ground and line to line.

Local Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
None	-	-

Remote Support Equipment

Manufacturer/Model/Description	Serial Number	FCC ID Number
None	-	-

Interface Cabling

Cable Description	Length (m)	From Unit/Port	To Unit/Port
Unshielded Twisted Pair (x1)	1.5	EUT / Ethernet Port	Terminated with a resistive load
Shielded Serial DB9 (x1)	3.0	EUT / Ethernet Port	Unterminated
Unshielded Power Cable (x1)	2.0	EUT / DC Power Input	External AC-DC Adapter

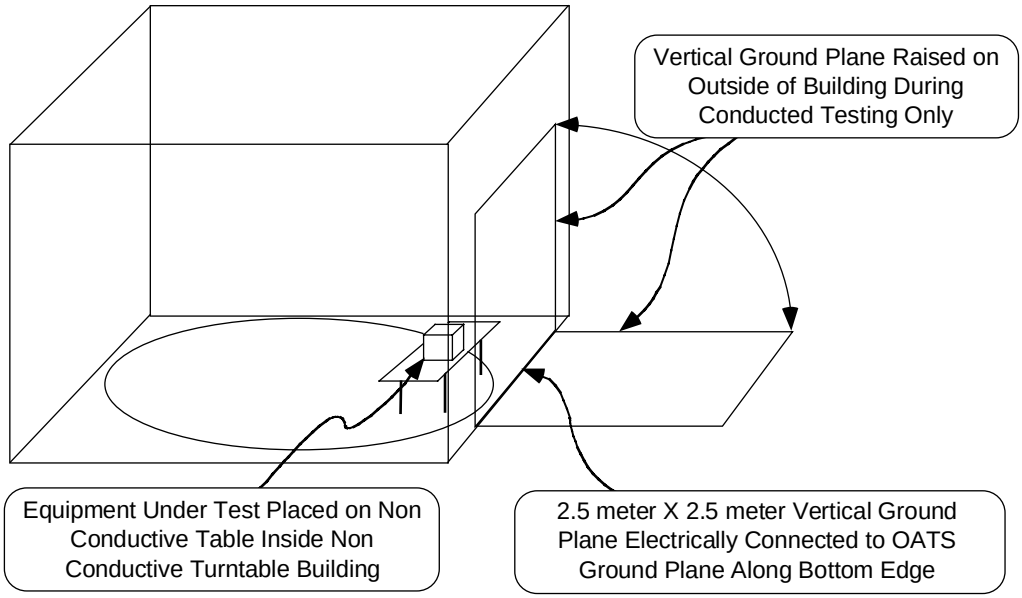
Test Software

The EUT contained test software running during testing which continuously exercised the system by transmitting and receiving data through the antenna.

General Test Conditions

During radiated testing, the EUT was connected to 120V, 60Hz power. The EUT was located on the turntable for radiated testing and conducted testing.

During conducted emissions testing, the EUT was connected to 120V, 60Hz power input as noted. A 2.5 meter X 2.5 meter ground plane was raised to a vertical position 40 cm from the EUT as shown below:



Test Data Tables

See attached data for Run # 1 & 2

Client:	Proxim, Inc.	Date:	8/17/99	Test Engr:	Conrad Chu
Product:	RangeLAN802 Model 8931/8930	File:	T33279	Proj. Eng:	Mark Briggs
Objective:	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCC B	Page:	5 of 5	Approved:	
Revision	1.0				

Test Data Tables

Run #3 - Conducted Emissions, 0.45-30.0 MHz, 120V / 60Hz, Sorted by Margin
Note: EUT operating on Channel 2

Frequency	Level	Power	FCC-B	FCC-B	Detector	Comments
MHz	dBuV	Lead	Limit	Margin	Function	
0.4604	35.0	Neutral	48.0	-13.0	QP	
1.5164	33.7	Neutral	48.0	-14.3	QP	
1.5266	33.3	Line 1	48.0	-14.7	QP	
0.4650	29.1	Line 1	48.0	-18.9	QP	
0.5443	28.0	Neutral	48.0	-20.0	QP	
0.5607	24.2	Line 1	48.0	-23.8	QP	

Run #4 - Conducted Emissions Scan of EUT Antenna Output, 30- 26500 MHz
Per FCC Chapter 15.247 Part C (see attached plots)

Emissions Test Data

Client:	Proxim	Date:	8/17/99	Test Engr:	Conrad Chu
Product:	RangeLAN802	File:	T33279	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCCB	Distance:	3 meters	Approved:	

Ambient Conditions
Temperature: 22.2 °C
Humidity: 61 % RH

Run #1: Preliminary radiated emissions, 30-1000 MHz
Readings taken at 3 meters per FCC requirements
EUT is in a worst-case transmit/receive mode

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
640.000	42.5	v	46.0	-3.5	QP	275	1.0	
40.000	32.2	v	40.0	-7.8	QP	206	1.0	
640.000	37.5	h	46.0	-8.5	QP	183	1.8	some ambient present
840.000	36.0	v	46.0	-10.0	QP	121	1.7	
400.000	36.0	h	46.0	-10.0	QP	220	2.2	signal substitution
672.000	35.6	v	46.0	-10.4	QP	275	1.0	
720.000	34.0	v	46.0	-12.0	QP	233	1.0	
600.000	33.5	h	46.0	-12.5	QP	251	2.3	
920.000	33.2	v	46.0	-12.8	QP	193	2.0	
660.000	33.0	v	46.0	-13.0	QP	138	1.0	signal substitution
680.000	32.7	v	46.0	-13.3	QP	274	1.0	
608.000	32.2	v	46.0	-13.8	QP	266	1.0	some ambient present
480.000	32.0	h	46.0	-14.0	QP	186	1.0	
520.000	31.7	v	46.0	-14.3	QP	246	1.2	
520.000	31.7	h	46.0	-14.3	QP	175	2.3	
580.000	31.0	v	46.0	-15.0	QP	107	1.0	
400.000	30.9	v	46.0	-15.1	QP	353	1.0	
540.000	30.7	v	46.0	-15.3	QP	163	1.0	
700.015	30.7	v	46.0	-15.3	QP	256	1.0	signal substitution
740.000	30.1	v	46.0	-15.9	QP	236	1.0	
280.000	30.0	v	46.0	-16.0	QP	208	1.0	
80.000	23.6	v	40.0	-16.4	QP	160	1.0	
440.000	29.3	h	46.0	-16.7	QP	228	2.4	
160.000	26.5	v	43.5	-17.0	QP	107	1.0	
200.000	26.2	v	43.5	-17.3	QP	139	1.0	signal substitution
600.000	28.6	v	46.0	-17.4	QP	185	1.4	signal substitution
220.000	28.0	v	46.0	-18.0	QP	200	1.0	signal substitution
340.000	28.0	v	46.0	-18.0	QP	153	1.0	
480.000	28.0	v	46.0	-18.0	QP	214	1.2	
1000.000	35.9	v	54.0	-18.1	QP	210	2.0	
240.000	27.5	v	46.0	-18.5	QP	185	1.0	
420.000	27.0	v	46.0	-19.0	QP	183	1.0	
224.000	25.4	v	46.0	-20.6	QP	81	1.0	
260.000	25.3	v	46.0	-20.7	QP	191	1.0	

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Emissions Test Data

Client:	Proxim	Date:	8/17/99	Test Engr:	Conrad Chu
Product:	RangeLAN802	File:	T33279	Proj. Engr:	Mark Briggs
Objective	Final Qualification	Site:	SVOATS #1	Contact:	Pete Garcia
Spec:	FCCB	Distance:	3 meters	Approved:	

Run #1: Continued

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
120.000	22.5	v	43.5	-21.0	QP	79	1.0	
980.000	33.0	v	54.0	-21.0	QP	206	1.9	
40.000	18.0	h	40.0	-22.0	QP	162	3.7	
960.020	30.5	v	54.0	-23.5	QP	199	1.9	signal substitution
200.000	19.2	h	43.5	-24.3	QP	204	4.0	signal substitution
100.000	16.4	v	43.5	-27.1	QP	198	1.0	signal substitution
100.000	8.5	h	43.5	-35.0	QP	250	3.7	signal substitution

Run #2: Maximized readings from run #1

Readings taken at 3 meters per FCC requirements

EUT is in a worst-case transmit/receive mode

Frequency	Level	Pol	FCCB	FCCB	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
640.000	42.7	v	46.0	-3.3	QP	293	1.0	
400.000	39.1	h	46.0	-6.9	QP	200	2.0	
640.000	39.0	h	46.0	-7.0	QP	212	2.1	some ambient present
40.000	32.2	v	40.0	-7.8	QP	206	1.0	
840.000	36.4	v	46.0	-9.6	QP	245	1.0	
672.000	35.6	v	46.0	-10.4	QP	275	1.0	

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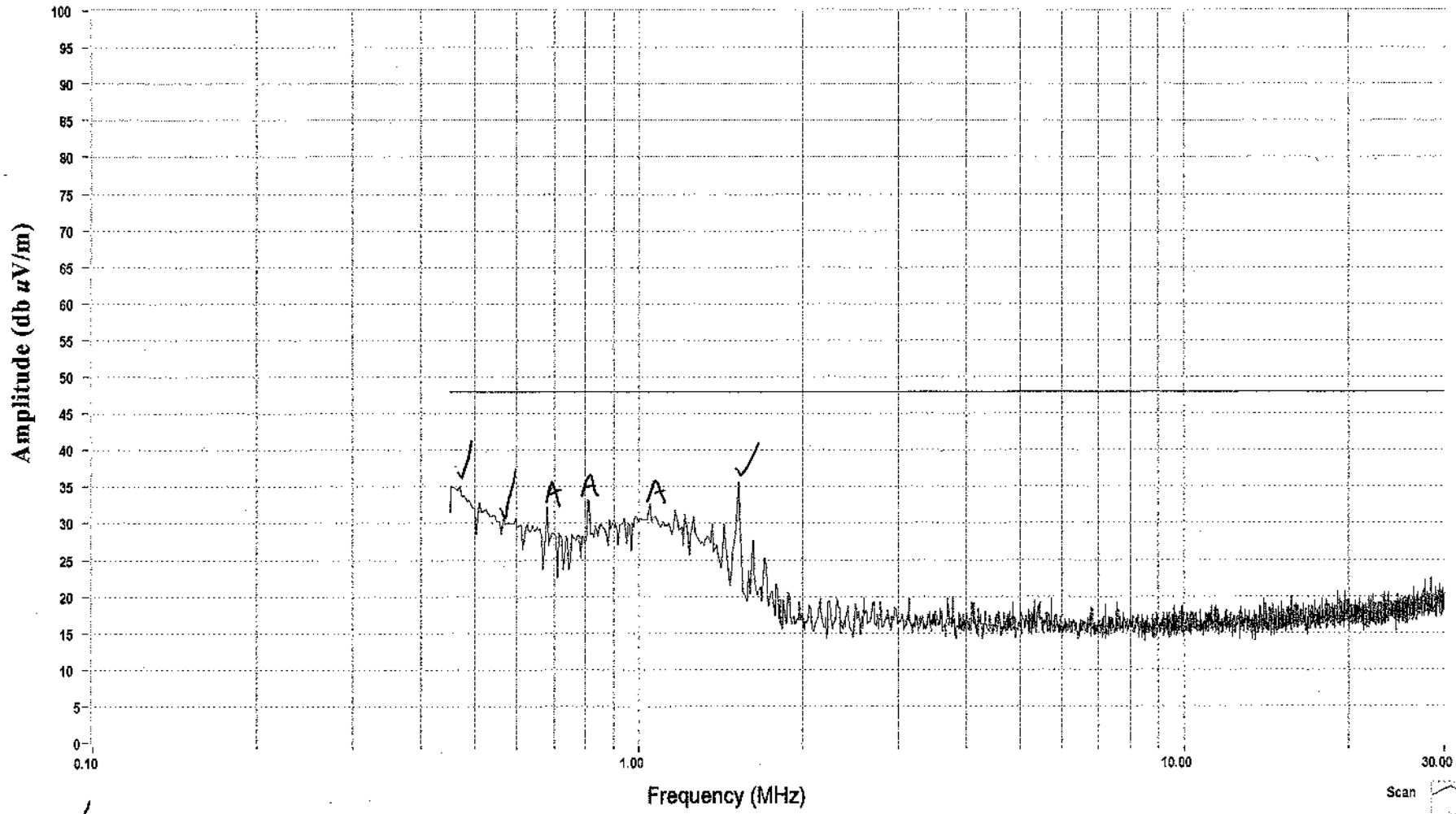
SVOATS #1: Proxim RangeLAN802 Ethernet Master Run3

Channel #2

Wireless LAN Adapter

Spec:
FCC-B

Mains Lead
Line 1



√ = EUT, A = Ambient, T33279

Scan
Peak
Quasi-peak
Average
QuasiPeak Limit
QuasiPeak Limit

8/17/99

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C. C

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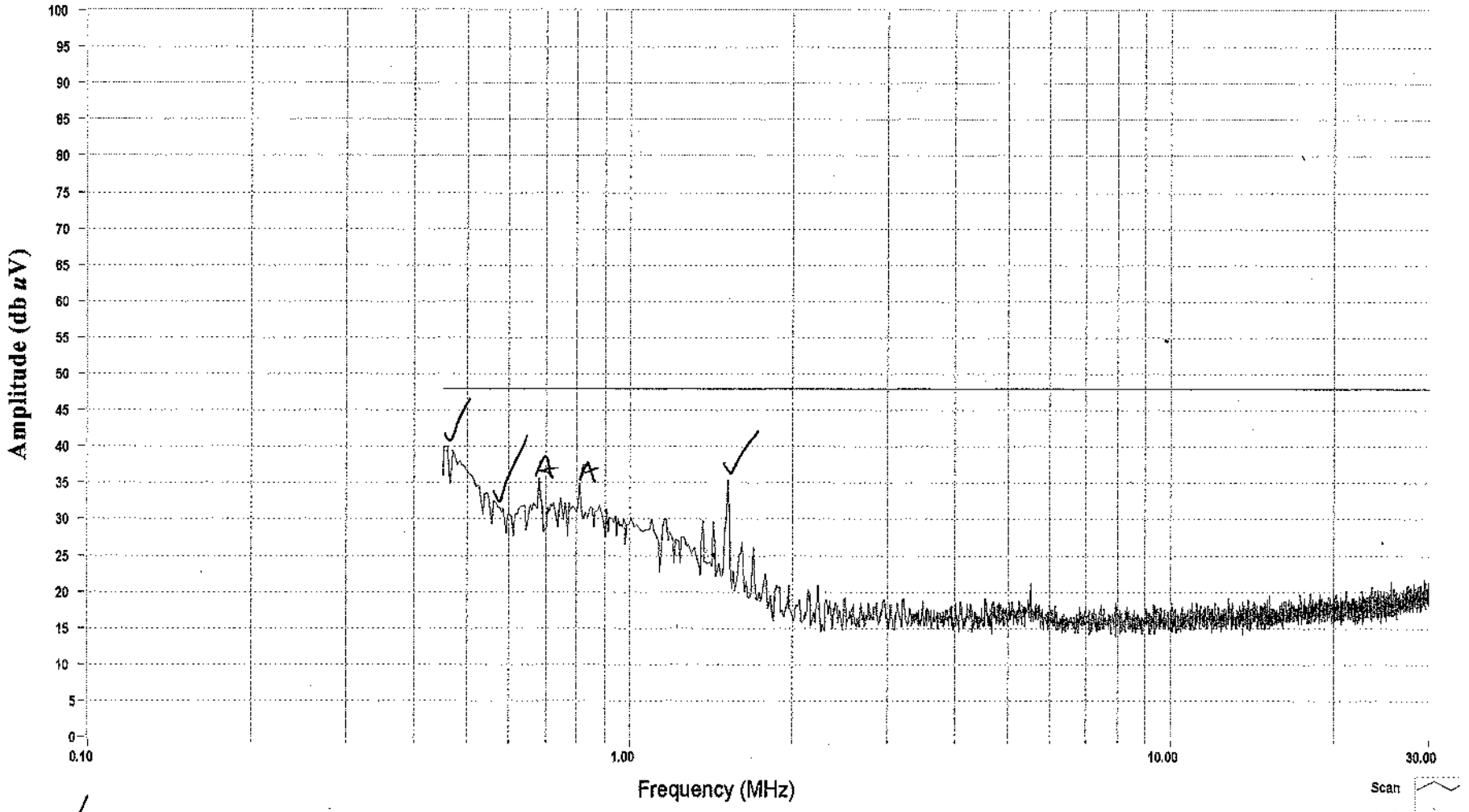
SVOATS #1: Proxim RangeLAN802 Ethernet Master Run 3

Channel #2

Wireless LAN Adapter

Spec: FCC-B

Mains Lead Neutral



√ = EUT, A = Ambient, T33279

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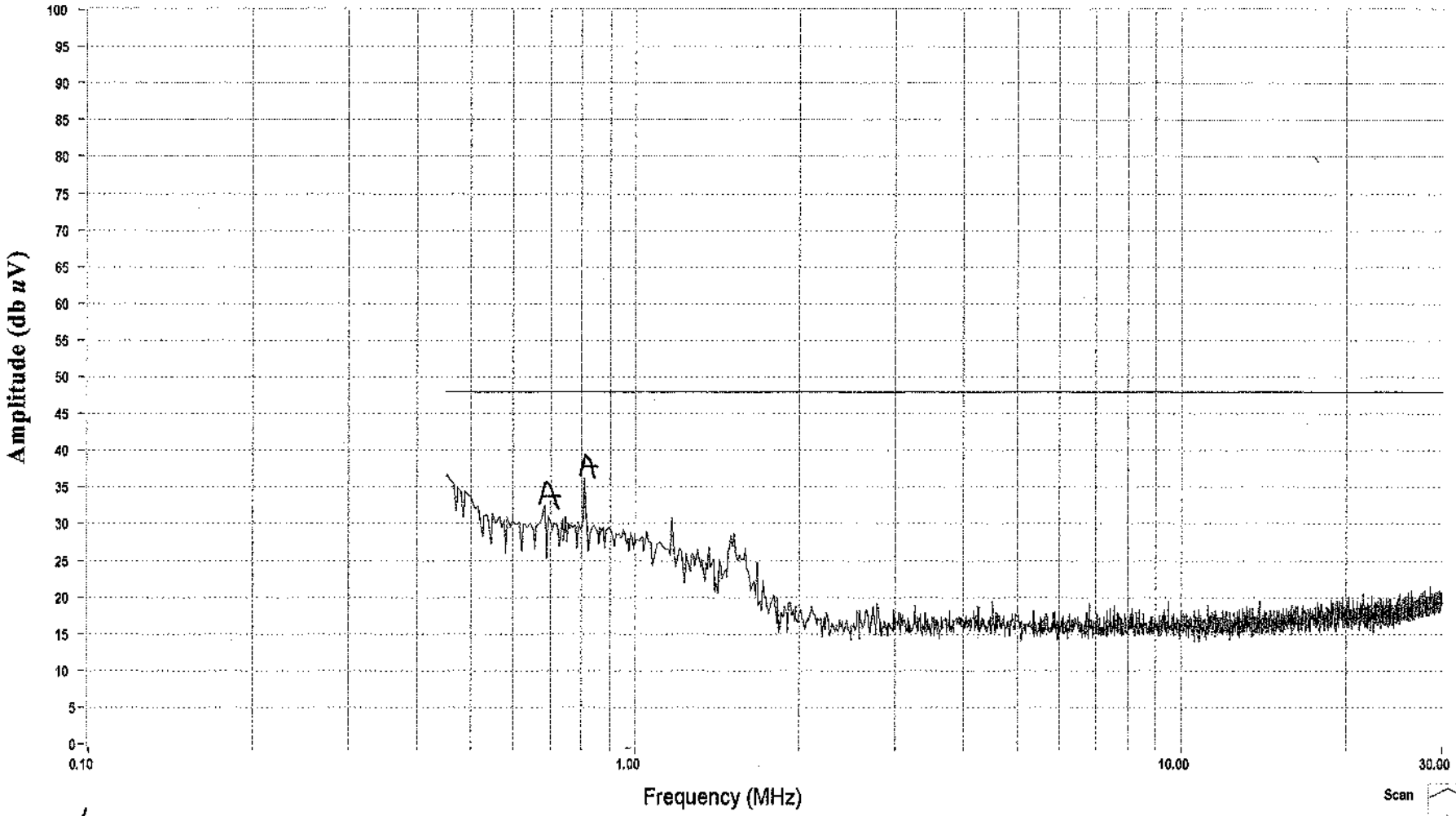
SVOATS #1: Proxim RangeLAN802 Ethernet Master Run 3

Channel #40

Wireless LAN Adapter

Spec:
FCC-B
Mains Lead
Neutral



√= EUT, A = Ambient, T33279

Scan
Peak
Quasi-peak
Average
QuasiPeak Limit
QuasiPeak Limit

8/17/99
Conrad Chu

C. C

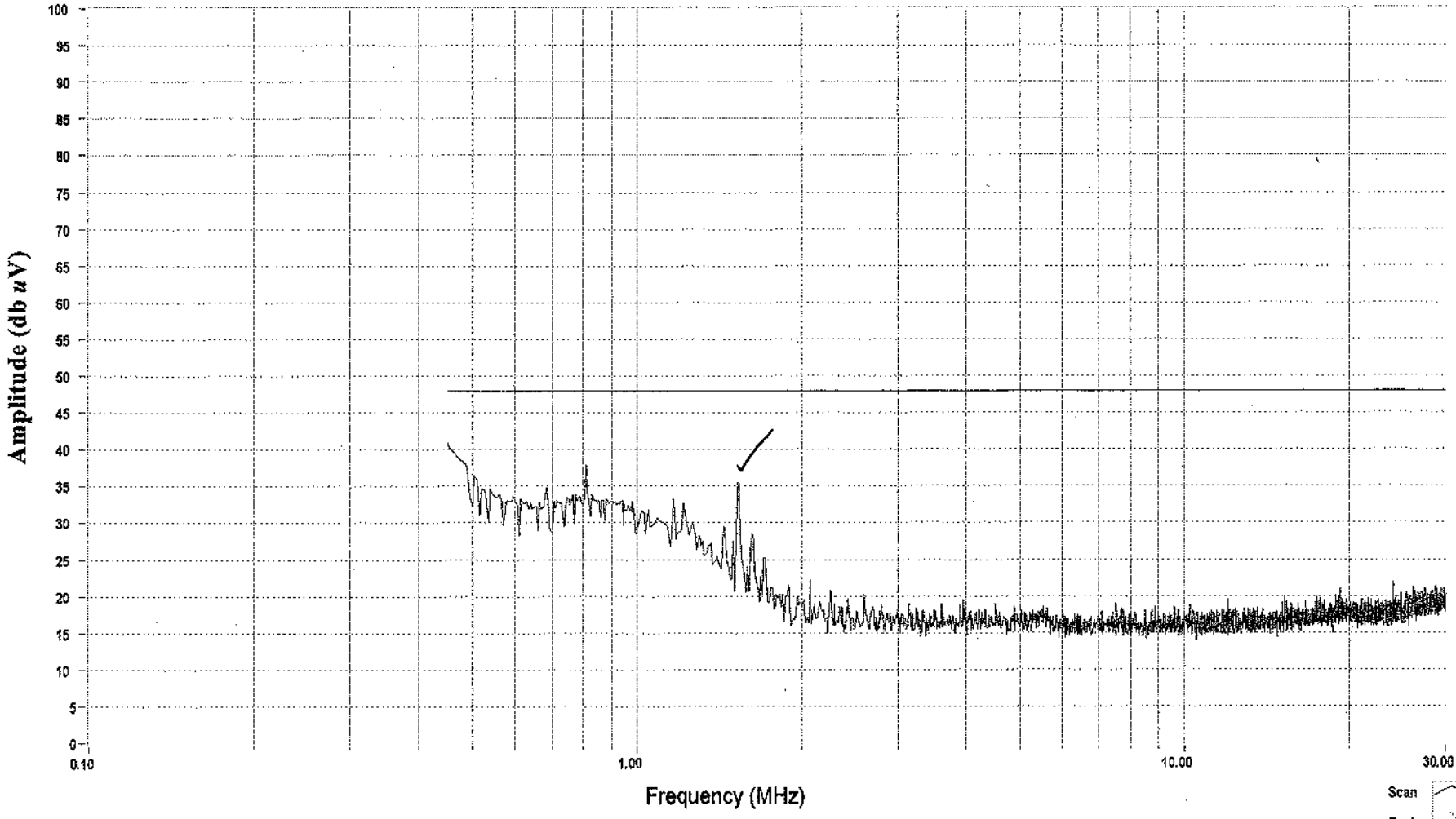
Elliott

SVOATS #1: Proxim RangeLAN802 Ethernet Master Run 3

Channel #80

Wireless LAN Adapter, Channel 80

Spec:
FCC-B
Mains Lead
Neutral



/ = EUT, A = Ambient, T33279

Scan
Peak
Quasi-peak
Average
QuasiPeak Limit
QuasiPeak Limit

8/17/99

Conrad Chu

EXHIBIT 3:Radiated Emissions Test Configuration Photographs

OMNI-DIRECTIONAL ANTENNA

EXHIBIT 3: Radiated Emissions Test Configuration Photographs

OMNI-DIRECTIONAL ANTENNA

EXHIBIT 3: Radiated Emissions Test Configuration Photographs

PATCH ANTENNA

EXHIBIT 3: Radiated Emissions Test Configuration Photographs

PATCH ANTENNA

EXHIBIT 4:Conducted Emissions Test Configuration Photographs

EXHIBIT 4: Conducted Emissions Test Configuration Photographs

EXHIBIT 5:Proposed FCC ID Label & Label Location

2 Pages

EXHIBIT 6: Detailed Photographs of Proxim, Inc. Model 8931/8930 Construction

6 Pages

EXHIBIT 7: Operator's Manual for Proxim, Inc. Model 8931/8930

2 Pages

EXHIBIT 8: Block Diagram of Proxim, Inc. Model 8931/8930

1 Pages

EXHIBIT 9: Schematic Diagrams for Proxim, Inc. Model 8931/8930

10 Pages

EXHIBIT 10: Theory of Operation for Proxim, Inc. Model 8931/8930

8 Pages