FCC PART 15, SUBPART C
TEST METHOD: ANSI C63.4-1992

for

AIR I/O

Model: MN900DS

Prepared for

TELXON CORPORATION
8302 NEW TRAILS DRIVE
THE WOODLANDS, TEXAS 77381

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KYLE FUJIMOTO

Approved by: *Scott McCutchan*
SCOTT McCUTCHAN

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DATE: FEBRUARY 14, 1999

	REPORT BODY	APPENDICES				TOTAL
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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

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

Device Tested:	Air I/O Model: MN900DS S/N: N/A
Modifications:	The EUT was modified in order to meet the specifications. Please see the list located in Appendix A.
Manufacturer:	VTech Wireless, Inc. 1 Corporate Park Drive, Suite 100 Irvine, California 92606
Test Dates:	February 2 and 9, 1999
File # For Canada	IC2154-D
Test Specifications:	EMI requirements FCC Title 47, Part 15 Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247
Test Procedure:	ANSI C63.4: 1992
Test Deviations:	The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 450 kHz – 30 MHz	Complies with the **Class B** limits of FCC Title 47, Part 15 Subpart B; and Subpart C, section 15.207
2	Spurious Radiated RF Emissions, 10 kHz – 1000 MHz	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.209(a)
3	Fundamental and Emissions produced by the intentional radiator in non-restricted bands, 10 kHz – 9.3 GHz	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247(c)
4	Emissions produced by the intentional radiator in restricted bands, 10 kHz – 9.3 GHz	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.209(a)
5	6 dB Bandwidth	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (a)(2)
6	Maximum Peak Output Power	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (b)(1)
7	RF Antenna Conducted	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (c)
8	Peak Power Spectral Density Conducted from the Intentional Radiator to the Antenna	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (d)
9	Processing Gain	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (e)

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Air I/O Model: MN900DS. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the Air I/O, referred to as EUT hereafter, are within the specification limits defined by FCC Title 47, Part 15, Subpart C, sections 15.207, 15.209, and 15.247.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Telxon Corporation

Aaron Angle	Vice President Product Development

Compatible Electronics Inc.

Kyle Fujimoto	Test Engineer
Scott McCutchan	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on February 1, 1999

2.5 Disposition of the Test Sample

The test sample was returned to VTech Wireless, Inc. on February 10, 1999.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
FCC Title 47, Part 15 Subpart C.	FCC Rules - Radio frequency devices (including digital devices) – Intentional Radiators.
ANSI C63.4 1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
FCC Title 47, Part 15 Subpart B	FCC Rules - Radio frequency devices (including digital devices) – Unintentional Radiators.

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

Specifics of the EUT and Peripherals Tested

The Air I/O Model: MN900DS (EUT) was installed inside the Toshiba laptop computer and connected to a right angle adjustable antenna that is a ½ wave dipole via its RF output port. The laptop computer was connected to the printer, modem, and AC Adapter via its parallel, serial, and DC IN ports, respectively. The low (channel 1), medium (channel 3), and high (channel 5) channels were tested. The EUT was constantly transmitting and receiving. The EUT was investigated for emissions in both receiving and transmitting modes with the antenna being placed in three different orthogonal axis. The final radiated as well as conducted data was taken when the EUT emissions were at their highest level, which was when the EUT was constantly transmitting and the antenna in its X-axis (parallel with the wooden table). The cables were bundled and routed as shown in the photographs in Appendix A.

4.1.1 Cable Construction and Termination

Cable 1 — This is a 1 foot braid shielded cable connecting the EUT to the ½ wave dipole antenna. It has a metallic MMCX connector at the EUT end and a reverse TNC metallic connector at the antenna end. The shield of the cable was grounded to the chassis via the connectors.

Cable 2 — This is a 5 foot braid and foil shielded cable connecting the printer to the laptop computer. It has a Centronics metallic type connector at the printer end and a D-25 pin metallic connector at the laptop computer end. The cable was bundled to a length of bundled to a length of 1 meter. The shield of the cable was grounded to the chassis via the connectors.

Cable 3 — This is a 6 foot braid and foil shielded cable connecting the modem to the laptop computer. It has a D-25 pin metallic connector at the modem end and a D-9 pin metallic connector at the laptop computer end. The cable was bundled to a length of bundled to a length of 1 meter. The shield of the cable was grounded to the chassis via the connectors.

Cable 4 — This is a 6 foot unshielded cable connecting the EUT to the AC Adapter. It has a 1/8 inch power connector at the EUT end and a two pin power connector at the AC Adapter end.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
AIR I/O (EUT)	VTECH WIRELESS, INC.	MN900DS	N/A	N7R-MN900DS
LAPTOP COMPUTER	TOSHIBA	PA1241U XCD	87142725-1	DoC
MODEM	HAYES	07-00038	A0115003033	BFJ9D907-00038A
PRINTER	CITIZEN	LSP-10	11300-6073	DLK66TLSP-10
AC ADAPTER	TOSHIBA	PA2450U	N/A	N/A

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Spectrum Analyzer	Hewlett Packard	8566B	3638A08784	Nov. 16, 1998	May 16, 1999
Preamplifier	Com Power	PA-102	1017	Jan. 16, 1999	Jan. 16, 2000
Quasi-Peak Adapter	Hewlett Packard	85650A	3303A01688	June 23, 1998	June 23, 1999
RF Attenuator	Com-Power	412-10	N/A	Nov. 20, 1998	Nov. 20, 1999
LISN	Com Power	LI-200	1764	Jan. 3, 1999	Jan. 3, 2000
LISN	Com Power	LI-200	1771	Jan. 3, 1999	Jan. 3, 2000
LISN	Com Power	LI-200	1775	Jan. 3, 1999	Jan. 3, 2000
LISN	Com Power	LI-200	1780	Jan. 3, 1999	Jan. 3, 2000
Biconical Antenna	Com Power	AB-100	1548	Oct. 15, 1998	Oct. 15, 1999
Log Periodic Antenna	Com Power	AL-100	1117	Oct. 15, 1998	Oct. 15, 1999
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Hewlett Packard	D5251A 888	US74458128	N/A	N/A
Printer	Hewlett Packard	C5886A	SG7CM1P090	N/A	N/A
Monitor	Hewlett Packard	D5258A	DK74889705	N/A	N/A
Loop Antenna	Com-Power	AL-130	25309	Feb. 5, 1998	Feb. 5, 1999
Horn Antenna	Antenna Research	DRG-118/A	1053	Dec. 8, 1995	N/A
Microwave Preamplifier	Hewlett Packard	8449B	3008A008766	Jan. 30, 1999	Jan. 30, 2000

5.3 Processing Gain Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Signal Generator	Hewlett Packard	8656B	2530A02271	Jan. 22, 1999	Jan. 22, 2000
Attenuator	Pasternack	PE7036-3	N/A	Prior to Test	Prior to Test
Power Combiner	MCC Mini Circuits	15542	ZFSC-2-2500	Prior to Test	Prior to Test
Laptop Computer	Toshiba	PA124OU VCD	X7345171	N/A	N/A
Laptop Computer	IBM	2635-6EU	78-CT37797/08	N/A	N/A
Accessory AIR I/O	VTech Wireless, Inc.	MN900DS	N/A	N/A	N/A

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and 8.1.2 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Transmitter Power

Transmit power is herein defined as the power delivered to a 50 Ohm load at the antenna port of the T/R switch.

Power	Accuracy
23.0 dBm	+3/-3 dB

7.2 Channel Number and Frequencies

Channel Number	Channel center Frequency (MHz)
1	908.5
2	912.5
3	915.0
4	919.2
5	922.2

7.3 Chipping Rate

The transceiver uses a chipping rate of 2.38 M Chips/second, with a spreading code of 11 chips per bit.

7.4 Spreading Gain

The theoretical spreading gain, is 13.45 dB.

7.5 Antenna Gain

The antenna gain is 2.15 dBi. Please see the antenna exhibit for more information.

7.6 Manufacturer of the Spread Spectrum Chip

The transciever uses a custom ASIC manufactured by LSI Logic. The manufacturers part number is TSSCIII.

7.7 Antenna Requirements per section 15.203

The transceiver module uses an MMCX connector for it's RF input/output connection. The antenna connects to the transceiver module via a short pig tail cable that has an MMCX plug on one end and a reverse-sex TNC on the other. The antenna uses the opposite reverse-sex TNX to connect to the pig tail. No standard RF connectors are used in the equipment.

7.8 Description of Transmitter

The spread spectrum transmitter uses a custom ASIC manufactured by LSI Logic to generate 37.83 MHz, BPSK, DSSS signal. The carrier for this signal is derived from a 75.6589 MHz crystal oscillator. The ASIC contains the pseudo-random code generator, mod 2 adder, and BPSK modulator, and receiver correlator. The user interface is a serial clock and data line that operate at the “over the air” baud rate of 215 Kb/s.

The 37.83 MHz DSCC signal passes through a buffer amplifier and bandpass filter, then to a linear up-converter. The local oscillator for the up-converter is derived from a VCO whose center frequency tunes over the 864 to 890 MHz range. The VCO’s center frequency in maintained by a phaselocked loop synthesizer.

The output of the buffer amplifier passes through a SAW bandpass filter with a center frequency of 915 MHz. A gain-controlled amplifier follows the SAW. This stage is used to set the final output power of the transmitter. A driver amplifier follows the gain controlled amplifier then another SAW bandpass filter. The two SAW filters remove the local oscillator and transmit image frequencies for the output. The driver amplifier excites the output power stage. The output stage increases the transmit power level to maximum of +27 dBm. The output of the power stage drives a two-section lowpass filter and third harmonic trap. The transmit signal then passes through a transmit/receiver switch, and finally to the RF output at the transceiver’s MMCX coax connector.

7.9 Processing Gain

The transceiver uses BPSK modulation with its process gain described by

$$Gp(\text{in dB}) = 10 \text{ Log } (\text{Bandwidth}_{RF}/R_{info})$$

$$= 10 \text{ Log } (2 \text{ x Chip Rate})/(\text{Data Rate})$$

$$= 10 \text{ Log } (2 \text{ x } 2.38\text{MHz})/(215\text{Kb/s})$$

$$= 13.45\text{dB}$$

In demonstrating that the radio has the proper amount of process gain we selected a maximum bit error rate of 1 in 10^{-4}. This bit error rate is the minimum acceptable for the intended application of this product. At this bit error rate the system requires a Peak Signal to RMS Noise ratio of 17.4 dB (*Information Transmission Modulation and Noise*, Mischa Swartz, 1980, Figure 5.5). We used this number for the (S/N)o entry of the Gp equation described in Section Part 15.247 (e),(2), that is:

$$Gp = (S/N)o + Mj + Lsys, \text{ all in dB}$$

A balanced data stream (equal number of 1's and 0's) was sent from a transmitter to the test receiver. The transmitter operated at a data rate of 215,000 bits per second. Each data frame was exactly one second long and contained 215,000 data bits. At the end of each frame a bit error rate was calculated by taking the number of incorrect bits and dividing by 215,000. This resulted in a minimum resolution of about 0.5 in 10^{-5} BER for any single one second frame. The nominal un-jammed signal level at the test receiver's input connector was adjusted to –60dBm. At this level the BER was essentially zero, with no errors observed over many seconds of operation. At 50 KHz increments across the occupied spectrum, the level of the jammer was increased until the BER exceeded 1.0 x 10^{-4}. We noted the jammer level at which the drop in BER occurred and computed Mj.

8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 RF Emissions

8.1.1 Conducted Emissions Test

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak detector was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the spectrum analyzer offset was adjusted accordingly to read the actual data measured. The LISN output was read by the spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The initial test data was taken in manual mode while scanning the frequency ranges of 0.45 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the spectrum analyzer span adjusted to 1 MHz.

The final data was collected under program control by the HP 9000/300 in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave.

<u>Conducted Emissions Data Sheets</u>

8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, and the Hewlett Packard Microwave Amplifier Model: 8449B was used for frequencies above 1 GHz. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps. The quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets. The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
10 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 9.3 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

Radiated Emissions (Spurious and Harmonics) Test (con't)

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data.

Radiated Emissions Data Sheets

8.2 6 dB Bandwidth for Direct Sequence Systems

The 6 dB Bandwidth was taken through an attenuation pad using the spectrum analyzer. The bandwidth was measured using a direct connection from the RF out on the RF board. The resolution bandwidth was 100 kHz, and the video bandwidth 1 MHz.

Test Results:

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (a)(2). The bandwidth is at least 500 kHz. Please see the data sheets located in Appendix D.

6dB Bandwidth Data Sheets

8.3 Peak Output Power

The peak output power was taken through an attenuation pad using the spectrum analyzer. The peak output power was measured using a direct connection from the RF out on the RF board. The resolution bandwidth was 3 MHz, and the video bandwidth 1 MHz.

Test Results:

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (b)(1). The maximum peak output power is less than 1 watt.

Peak Output Power Data Sheets

8.4 Spectral Density Output

The spectral density output was using the spectrum analyzer. The spectral density output power was measured using a direct connection from the RF out on the RF board into the input of the analyzer. The resolution bandwidth was 3 kHz, and the video bandwidth 10 kHz. The highest 2 MHz of the signal was used as the frequency span with the sweep rate being 1 second for every 3 kHz of span.

Test Results:

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (d). The spectral density output does not exceed 8 dBm in any 3 KHz band.

Spectral Density Output Data Sheets

8.5 RF Antenna Conducted Test

The RF antenna conducted test was taken using the spectrum analyzer. The RF antenna conducted test was measured using a direct connection from the RF out on the RF board into the input of the analyzer. The resolution bandwidth was 100 kHz, and the video bandwidth 1 MHz. The spans were wide enough to include all the harmonics and emissions that were produced by the intentional radiator.

Test Results:

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (c). The RF power that is produced by the intentional radiator is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

<u>RF Antenna Conducted Test Data Sheets</u>

8.6 RF Band Edges

The RF band edges were taken at the edges of the ISM spectrum (902 MHz when the EUT was on channel 1 and 928 MHz when the EUT was on channel 5) using the spectrum analyzer. The RF band edges were measured using a direct connection from the RF out on the RF board into the input of the analyzer. The resolution bandwidth was 100 kHz, and the video bandwidth 300 kHz. The marker was placed at 902 MHz (for channel 1) and 928 MHz (for channel 5). This frequency was then checked to see that it was 20 dB below the band that contained the highest level of desired power.

Test Results:

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (c). The RF power at the band edges is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

<u>RF Band Edges Data Sheets</u>

8.7 Processing Gain

The EUT was installed inside the Toshiba laptop with the RF output of the EUT being sent to input #2 of the combiner. A signal generator was used to generate the jamming signal. The jamming signal was then sent to input #1 of the combiner. The combined signal (signal and jammer) was then sent through an attenuator to the receiving DSSS transceiver which was installed inside the IBM laptop. The signal generator was incremented 50 kHz in each direction across the 6 dB bandwidth of the signal. The level of the jammer was increased until the BER on the IBM laptop exceeded 1.0 X 10^{-4}

The signal level and jammer level were measured using a spectrum analyzer AFTER the attenuator and combiner in order to prevent having to take these losses into account. The analyzer was offset 2.1 dB for the loss of the measuring coax cable into the input of the spectrum analyzer.

Note: The signal level was measured with the jamming signal turned off. The jamming level was measured with the signal level turned off.

Processing Gain Data Sheets

9. CONCLUSIONS

The Air I/O Model: MN900DS meets all of the specification limits defined in FCC Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247.

APPENDIX A

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart B and C specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

Modifications:

Please see Modification Letter on the next page.

VTech Group of Companies

To Whom It May Concern:

To successfully meet the spurious radiated emission requirements of FCC Part 15.247 it was necessary to add a 2700 MHz, third harmonic trap, and additional shielding to the test PC card. Several non-RF circuit board traces in the area of the output RF power amplifier were conducting third harmonic energy from the PA's unfiltered output to the area of the final RF output connector. These traces provided a parasitic path around the PA's output lowpass filter. During the test we temporarily relocated the offending circuitry to a different part of the board. In addition we covered the area vacated by the moved circuitry with copper tape, which we connected to circuit ground. For the production circuit boards all of the circuitry associated with this problem has been moved permanently to another area of the pc card away from the PA, and the effected area replaced with a solid ground plane. To provide additional margin for third harmonic spurious output signals, a series resonant trap (1pF in series with 3.3nH) has been added to the circuit board directly at the RF output connector.

The housing for the RF output connector is covered by a shield. However the shield had a notch through which the RF output connector protruded. During testing we bridged the small gap between the shield and the RF output connector with a piece of copper tape. For the production radios, we have changed the shield tooling to create a small tab on the shield that now solders directly to the top of the MMCX RF output connector thereby eliminating the gap.

The above two changes allowed the UUT to pass the radiated spurious emissions.

Thank you,

Terry Flach

Terry Flach

Chief Engineer
VTech Wireless, Inc.

VTech Wireless, Inc.

1 Corporate Park Drive, Suite 100, Irvine, California 92606-5113, U.S.A.
Tel: 949.752.0312 ♦ Fax: 949.752.5014

APPENDIX B

ADDITIONAL MODELS COVERED UNDER THIS REPORT

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST	Air I/O Model: MN900DS S/N: N/A

There were no additional models covered under this report.

APPENDIX C

DIAGRAMS, CHARTS AND PHOTOS

FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

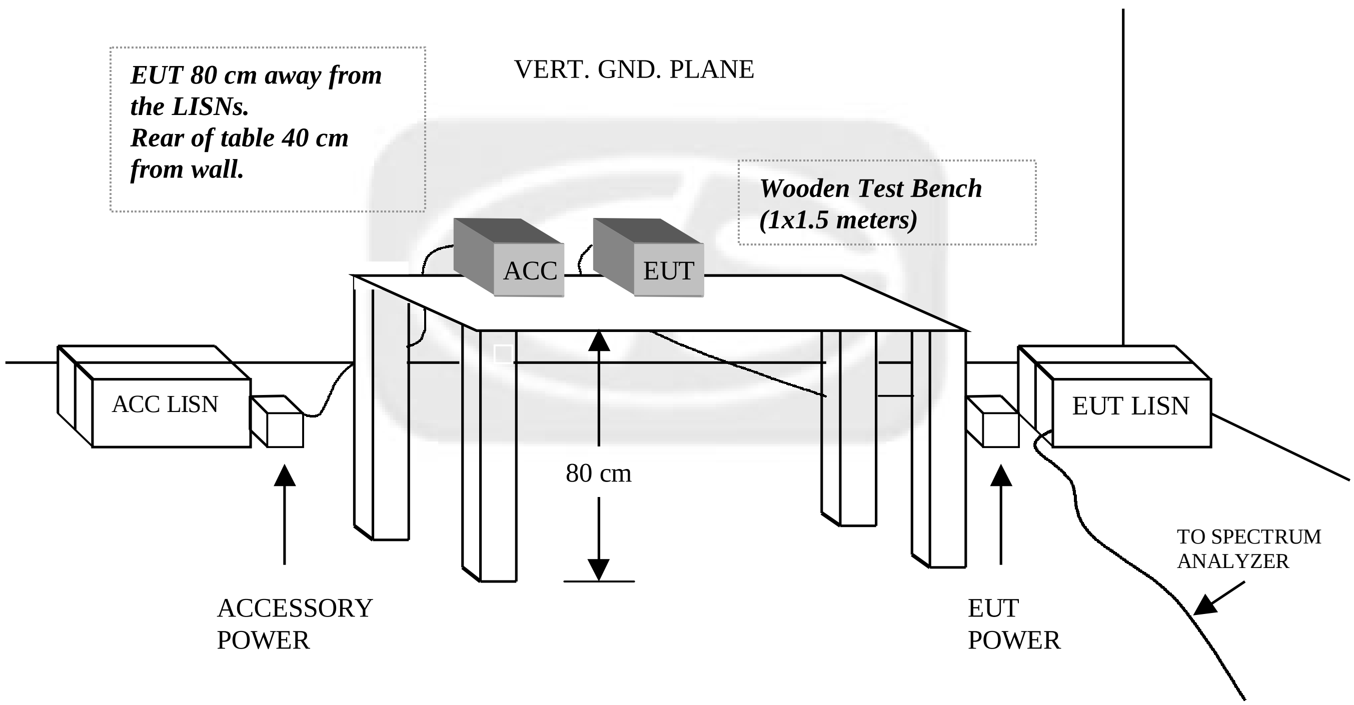
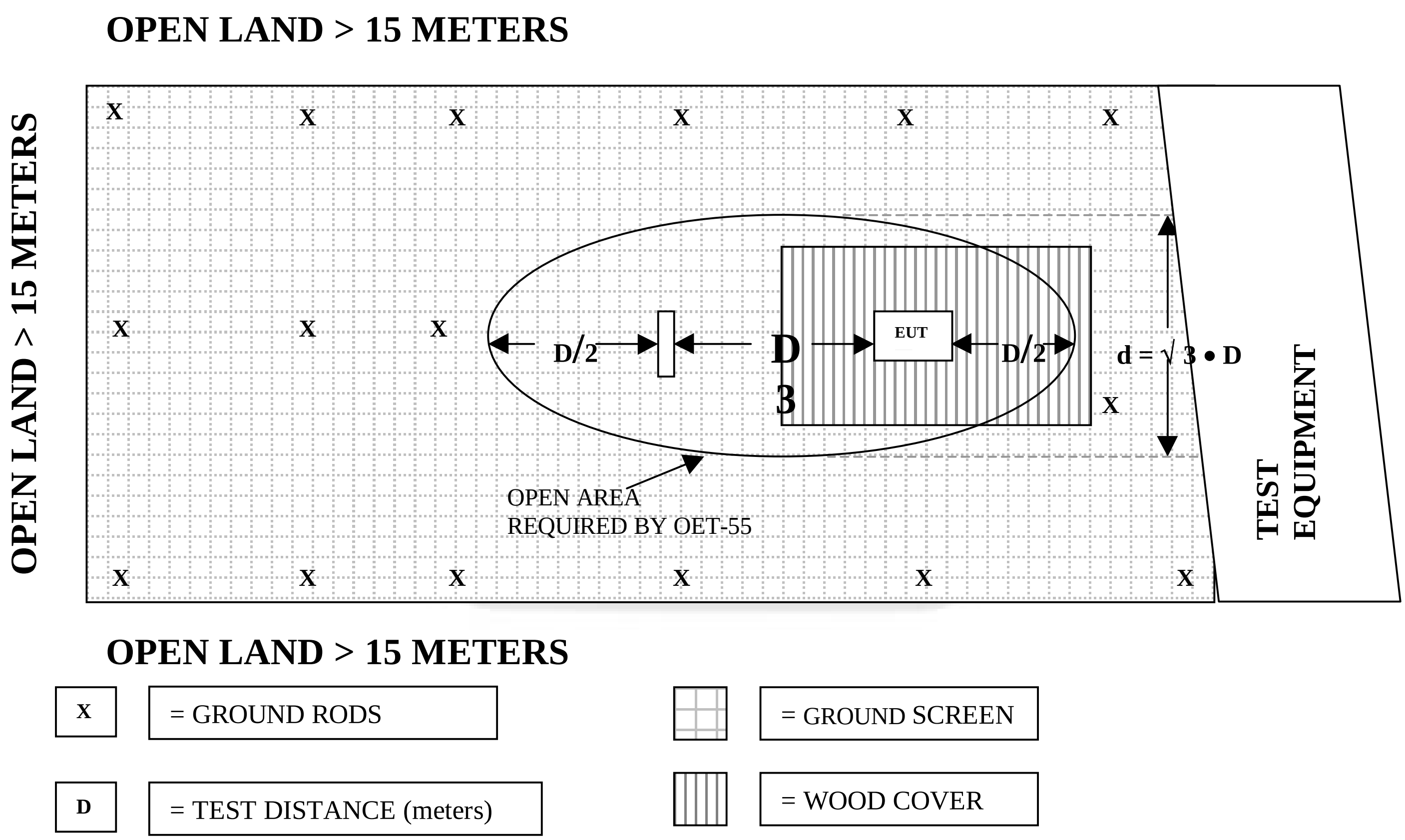


FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE



FRONT VIEW

TELXON CORPORATION
AIR I/O
Model: MN900DS
FCC SUBPART B and C - RADIATED EMISSIONS – 2-2-99

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

TELXON CORPORATION
AIR I/O
Model: MN900DS
FCC SUBPART B and C - RADIATED EMISSIONS – 2-2-99

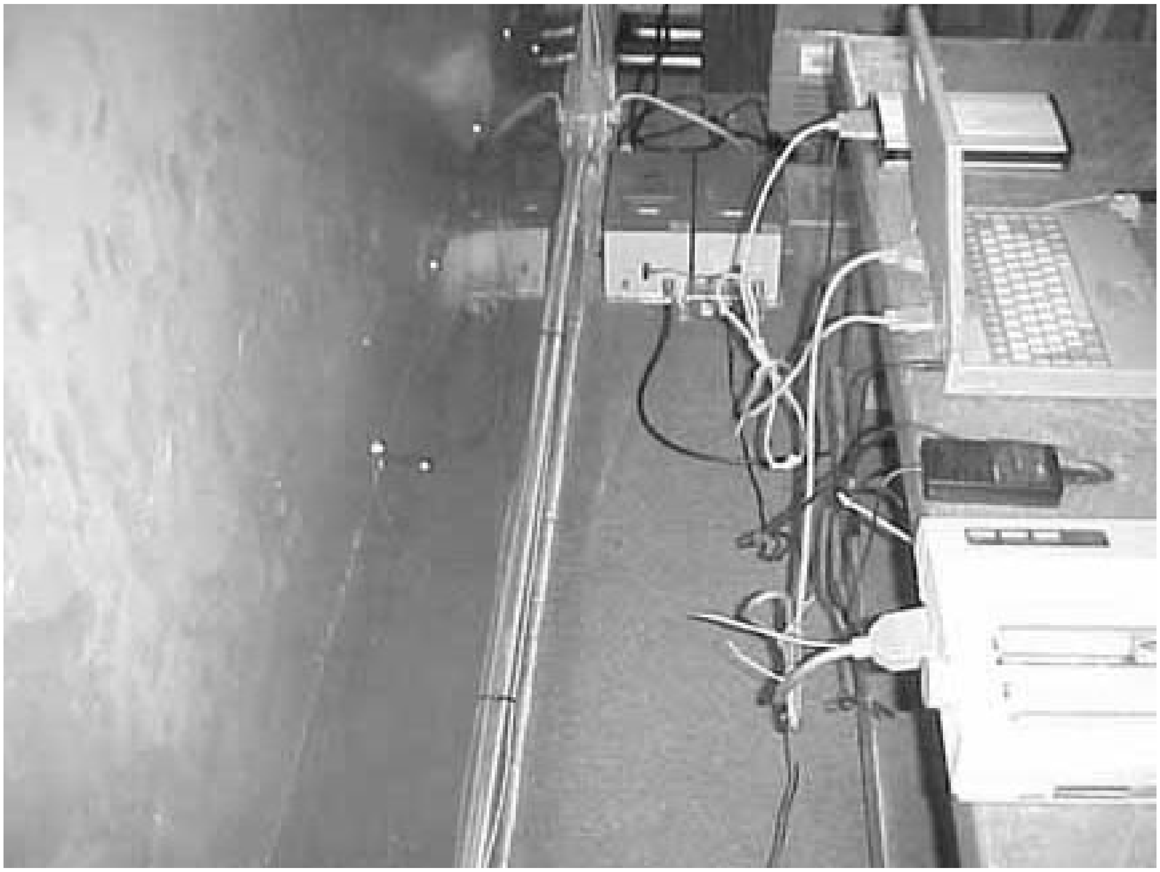
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

FRONT VIEW

TELXON CORPORATION
AIR I/O
Model: MN900DS
FCC SUBPART B and C - CONDUCTED EMISSIONS – 2-2-99

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

114 OLINDA DRIVE, BREA, CALIFORNIA 92823 PHONE: (714) 579-0500 FAX: (714) 579-1850

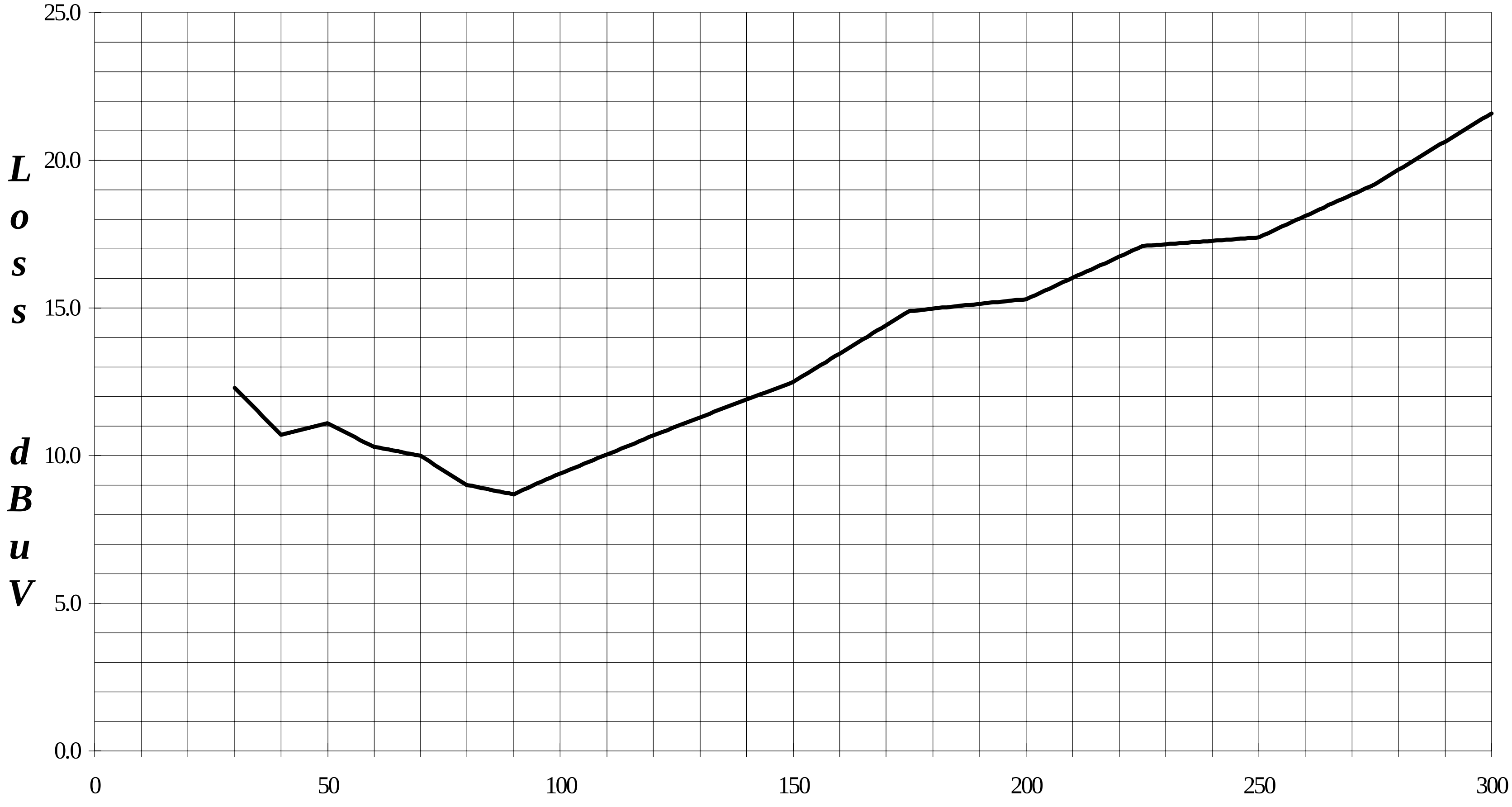


REAR VIEW
TELXON CORPORATION
AIR I/O
Model: MN900DS
FCC SUBPART B and C - CONDUCTED EMISSIONS – 2-2-99

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

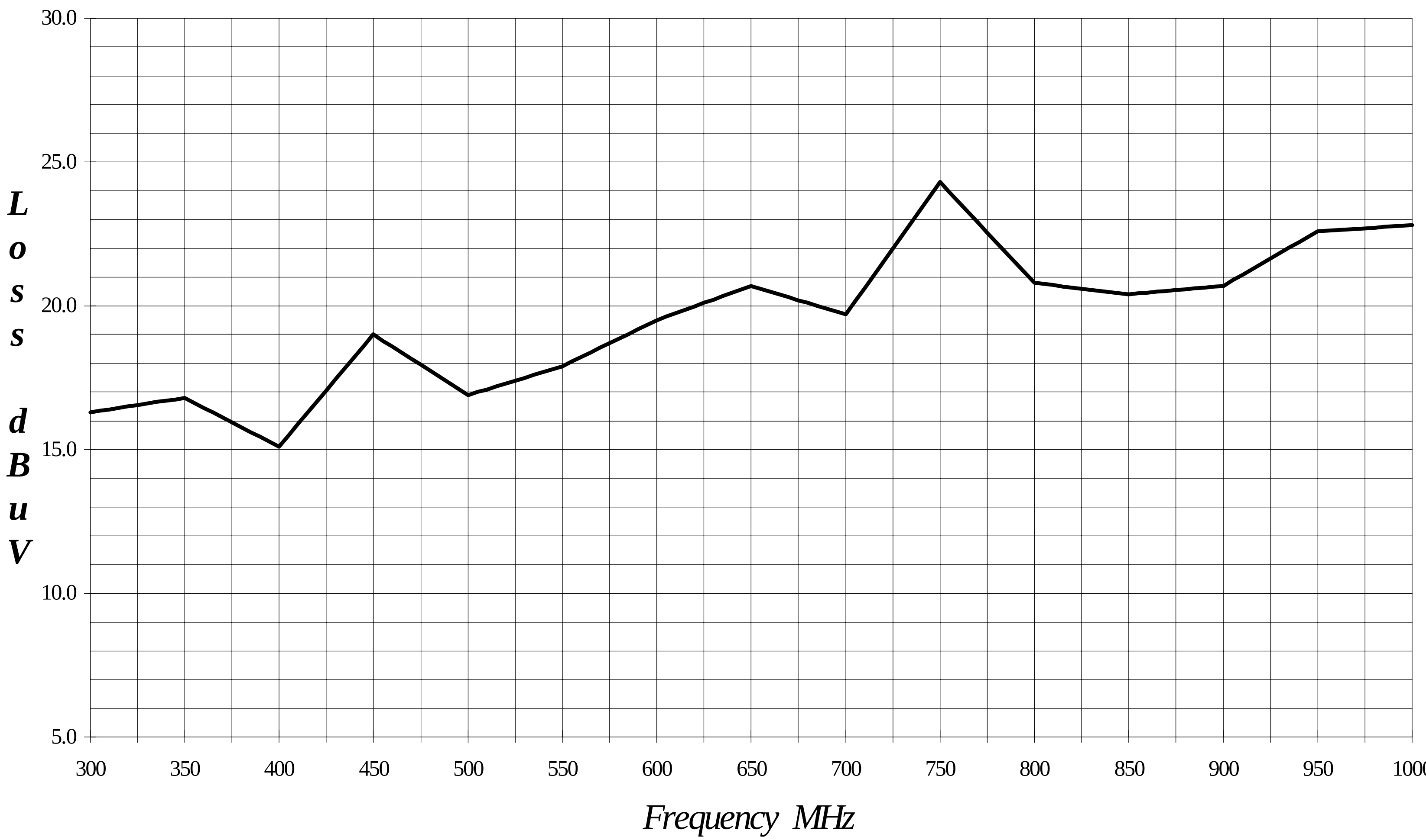
***Cal*: 10/15/98**

LAB "D" BICONICAL ANTENNA AB-100 S/N 01548



***Cal*: 10/15/98**

LAB "D" LOG PERIODIC ANTENNA AL-100 S/N 01117



Lab "D" Effective: 1/16/99 Effective Gain = Preamplifier Gain – Cable Loss

HEWLETT PACKARD 8449B

MICROWAVE PREAMPLIFIER

S/N: 3008A008766

CALIBRATION DATE: JANUARY 30, 1999

FREQUENCY (GHz)	**FACTOR (dB)**	**FREQUENCY (GHz)**	**FACTOR (dB)**
1.0	36.9	9.5	34.3
1.1	36.3	10.0	33.7
1.2	36.4	10.5	34.1
1.3	36.2	11.0	33.7
1.4	36.3	11.5	34.0
1.5	35.7	12.0	33.9
1.6	35.9	12.5	34.4
1.7	35.7	13.0	32.9
1.8	35.6	13.5	31.6
1.9	35.5	14.0	31.8
2.0	35.4	14.5	31.9
2.5	35.6	15.0	32.2
3.0	35.2	15.5	32.8
3.5	35.2	16.0	32.4
4.0	34.3	16.5	32.1
4.5	34.1	17.0	32.3
5.0	34.3	17.5	30.3
5.5	33.0	18.0	31.5
6.0	34.1	18.5	31.2
6.5	34.5	19.0	32.2
7.0	34.3	19.5	32.0
7.5	33.9	20.0	32.0
8.0	34.5	20.5	33.2
8.5	34.5	21.0	30.9
9.0	34.4	22.0	32.1

ANTENNA RESEARCH ASSOCIATES, INC.
11317 Frederick Avenue, Beltsville, MD 20705

E-FIELD ANTENNA FACTOR CALIBRATION

E(dB V/m) = Vo(dB V) + AFE(dB/m)

Model number : DRG-118/A

Frequency GHz	AFE dB/m	Gain dBi
1	22.3	8.0
2	26.7	9.5
3	29.7	10.1
4	29.5	12.8
5	32.3	12.0
6	32.4	13.4
7	36.1	11.0
8	37.4	10.9
9	36.8	12.5
10	39.5	10.7
11	39.6	11.5
12	39.8	12.0
13	39.7	12.8
14	41.8	11.3
15	41.9	11.9
16	38.1	16.3
17	41.0	13.9
18	46.5	8.9

Serial number : 1053
Job number : 96-092
Remarks : 3 meter calibration
Standards : LPD-118/A, TE-1000

Temperature : 72° F
Humidity : 56 %
Traceability : A01887
Date : December 08, 1995

Calibrated By

COMPATIBLE ELECTRONICS

Com-Power Corporation

(714) 587-9800

Antenna Calibration

Antenna Type:	Loop Antenna
Model:	AL-130
Serial Number:	25309
Calibration Date:	2/5/98

Frequency MHz	Magnetic (dB/m)	Electric dB/m
0.01	-40.5	11.0
0.02	-41.6	9.9
0.03	-40.0	11.5
0.04	-40.3	11.2
0.05	-41.6	9.9
0.06	-41.1	10.4
0.07	-41.3	10.2
0.08	-41.6	9.9
0.09	-41.7	9.8
0.1	-41.8	9.7
0.2	-44.0	7.5
0.3	-41.6	9.9
0.4	-41.7	9.8
0.5	-41.7	9.8
0.6	-41.5	10.0
0.7	-41.5	10.0
0.8	-41.6	9.9
0.9	-41.6	9.9
1	-41.1	10.4
2	-40.7	10.8
3	-40.7	10.8
4	-40.9	10.6
5	-40.1	11.4
6	-40.0	11.5
7	-40.3	11.2
8	-39.8	11.7
9	-38.8	12.7
10	-40.8	10.7
12	-41.4	10.1
14	-41.4	10.1
15	-40.9	10.6
16	-40.8	10.7
18	-41.5	10.0
20	-41.5	10.0
25	-41.2	10.3
30	-41.4	10.1

Trans. Antenna Height	2 meter
Receiving Antenna Height	2 meter

APPENDIX D

DATA SHEETS

CONDUCTED EMISSIONS DATA SHEETS

RETURN TO TEST PROCEDURES

COMPATIBLE ELECTRONICS

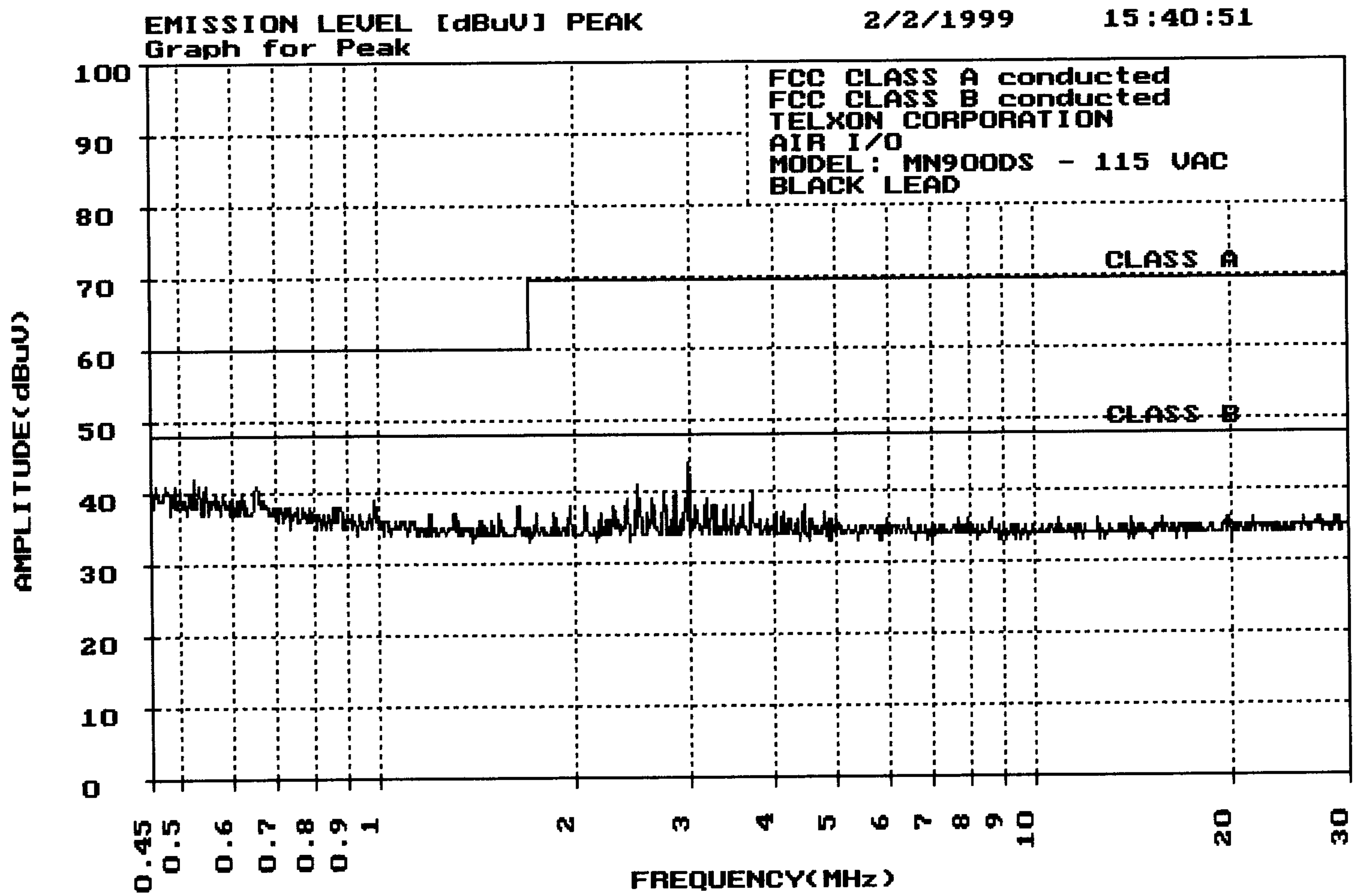
2/2/1999 15:40:51

TELXON CORPORATION
AIR I/O
MODEL: MN900DS - 115 VAC
FCC C - BLACK LEAD
TEST ENGINEER : Kyle Fujimoto
KYLE FUJIMOTO

---

20 highest peaks above -50.00 dB of CLASS B limit line
Peak criteria : 0.50 dB, Curve : Peak

Peak#	Freq(Mhz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	2.968	44.50	48.00	-3.50
2	0.524	42.09	48.00	-5.91
3	2.478	41.80	48.00	-6.20
4	0.489	41.79	48.00	-6.21
5	0.652	41.59	48.00	-6.41
6	0.458	41.59	48.00	-6.41
7	0.546	41.39	48.00	-6.61
8	0.535	41.19	48.00	-6.81
9	0.476	41.19	48.00	-6.81
10	2.729	40.90	48.00	-7.10
11	0.482	40.79	48.00	-7.21
12	0.454	40.79	48.00	-7.21
13	0.498	40.69	48.00	-7.31
14	3.706	40.60	48.00	-7.40
15	2.833	40.60	48.00	-7.40
16	0.581	40.39	48.00	-7.61
17	0.567	40.39	48.00	-7.61
18	0.622	40.19	48.00	-7.81
19	0.517	40.19	48.00	-7.81
20	0.594	39.99	48.00	-8.01



COMPATIBLE ELECTRONICS

COMPATIBLE ELECTRONICS

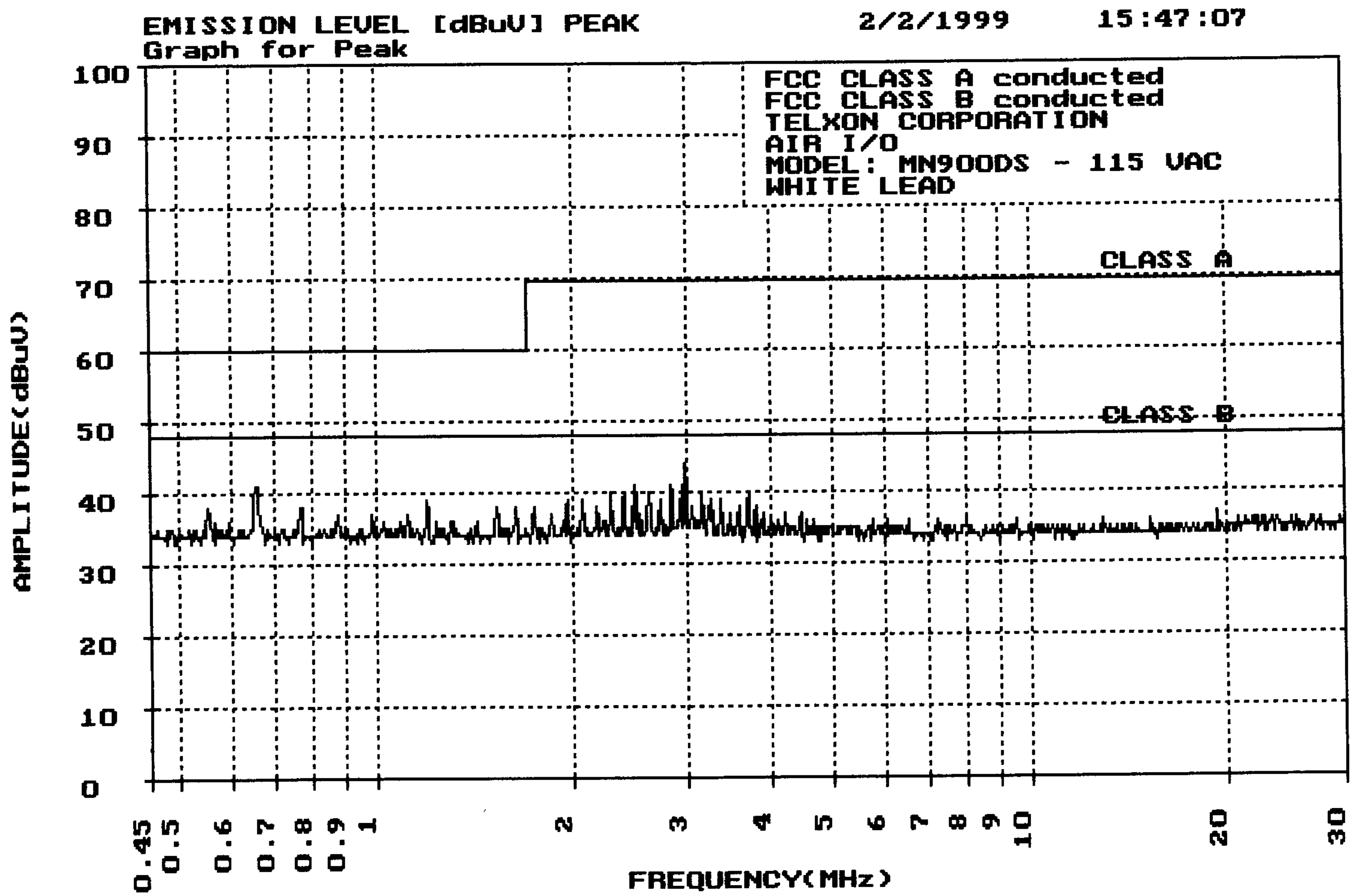
2/2/1999 15:47:07

TELXON CORPORATION
AIR I/O
MODEL: MN900DS - 115 VAC
FCC C - WHITE LEAD
TEST ENGINEER : Kyle Fujimoto
KYLE FUJIMOTO

---

20 highest peaks above -50.00 dB of CLASS B limit line
Peak criteria : 0.50 dB, Curve : Peak

Peak#	Freq(Mhz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	2.968	44.23	48.00	-3.77
2	0.655	41.90	48.00	-6.10
3	2.478	41.62	48.00	-6.38
4	2.821	41.33	48.00	-6.67
5	2.931	41.03	48.00	-6.97
6	2.605	40.83	48.00	-7.17
7	2.395	40.72	48.00	-7.28
8	3.147	40.53	48.00	-7.47
9	2.288	40.22	48.00	-7.78
10	3.706	40.14	48.00	-7.86
11	2.499	40.03	48.00	-7.97
12	3.256	39.93	48.00	-8.07
13	2.068	39.72	48.00	-8.28
14	1.959	39.72	48.00	-8.28
15	2.718	39.63	48.00	-8.37
16	1.198	39.41	48.00	-8.59
17	3.365	39.34	48.00	-8.66
18	3.229	38.63	48.00	-9.37
19	1.740	38.62	48.00	-9.38
20	3.803	38.34	48.00	-9.66



COMPATIBLE ELECTRONICS

RADIATED EMISSIONS DATA SHEETS

RETURN TO TEST PROCEDURES

RADIATED EMISSIONS

COMPANY	TELXON CORPORATION	DATE	2/2/99
EUT	AIR I/O	ANTENNAS	LOG PERIODIC AND HORN
MODEL	MN900DS	POLARIZATION	SEE BELOW
S/N	N/A	TEST DISTANCE	3 METERS
EUT MODE	LOW CHANNEL	LAB	D

Frequency MHz	Peak Reading (dBuV)	Average or Quasi-Peak (dBuV)	Antenna Height (meters)	Azimuth (degrees)	Distance Factor (dB)	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
LOW CHANNEL												
908.50	114.7	108.7	1.0	**180**	0.0	20.8	5.0	37.3	97.2	"--"	"--"	**Vertical Polarization**
1817.00	51.6	45.6	1.0	**90**	0.0	24.5	3.9	35.6	38.4	-38.8	77.2	**Vertical Polarization**
2725.50	56.7	50.7	1.0	**90**	0.0	28.2	5.6	35.6	48.9	-5.1	54.0	**Vertical Polarization**
3634.00	45.8	39.8	1.0	**90**	0.0	29.6	7.0	35.2	41.2	-12.8	54.0	**Vertical Polarization**
4542.50	45.1	39.1	1.0	**90**	0.0	30.9	8.0	34.1	43.9	-10.1	54.0	**Vertical Polarization**
5451.00	37.7	31.7	1.0	**90**	0.0	32.4	9.2	33.0	40.3	-13.7	54.0	**Vertical Polarization**
6359.50	41.7	35.7	1.0	**90**	0.0	34.3	9.8	34.5	45.3	-31.9	77.2	**Vertical Polarization**
7268.00	39.3	33.3	1.0	**90**	0.0	36.8	10.8	33.9	47.0	-7.0	54.0	**Vertical Polarization**
8176.50	43.4	37.4	1.0	**90**	0.0	37.4	11.2	34.5	51.5	-2.5	54.0	**Vertical Polarization**
9085.00	40.0	34.0	1.0	**90**	0.0	36.8	12.1	34.4	48.5	-5.5	54.0	**Vertical Polarization**
LOW CHANNEL												
908.50	114.7	108.7	2.0	**90**	0.0	20.8	5.0	37.3	97.2	"--"	--"	**Horizontal Polarization**
1817.00	51.2	45.2	1.0	**90**	0.0	24.5	3.9	35.6	38.0	-39.2	77.2	**Horizontal Polarization**
2725.50	54.4	48.4	3.0	**180**	0.0	28.2	5.6	35.6	46.6	-7.4	54.0	**Horizontal Polarization**
3634.00	45.8	39.8	2.0	**180**	0.0	29.6	7.0	35.2	41.2	-12.8	54.0	**Horizontal Polarization**
4542.50	43.6	37.6	2.0	**180**	0.0	30.9	8.0	34.1	42.4	-11.6	54.0	**Horizontal Polarization**
5451.00	37.4	31.4	2.0	**270**	0.0	32.4	9.2	33.0	40.0	-14.0	54.0	**Horizontal Polarization**
6359.50	43.2	37.2	2.0	**180**	0.0	34.3	9.8	34.5	46.8	-30.4	77.2	**Horizontal Polarization**
7268.00	39.9	33.9	1.0	**0**	0.0	36.8	10.8	33.9	47.6	-6.4	54.0	**Horizontal Polarization**
8176.50	39.7	33.7	1.0	**90**	0.0	37.4	11.2	34.5	47.8	-6.2	54.0	**Horizontal Polarization**
9085.00	42.1	36.1	1.0	**90**	0.0	36.8	12.1	34.4	50.6	-3.4	54.0	**Horizontal Polarization**

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

*** BELOW 1 GHz, QUASI-PEAK MEASUREMENT IS EMPLOYEED, ABOVE 1 GHz, AVERAGE MEASUREMENT IS EMPLOYED

RADIATED EMISSIONS

COMPANY	TELXON CORPORATION	**DATE**	2/2/99
EUT	AIR I/O	**ANTENNAS**	LOG PERIODIC AND HORN
MODEL	MN900DS	**POLARIZATION**	SEE BELOW
S/N	N/A	**TEST DISTANCE**	3 METERS
EUT MODE	MIDDLE CHANNEL	**LAB**	D

Frequency MHz	Peak Reading (dBuV)	Average or Quasi-Peak (dBuV)	Antenna Height (meters)	Azimuth (degrees)	Distance Factor (dB)	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
MIDDLE CHANNEL												
915.00	114.2	108.2	1.0	**180**	0.0	21.3	5.0	37.1	97.4	"--"	"-"	**Vertical Polarization**
1830.00	50.0	44.0	1.0	**90**	0.0	24.5	3.9	35.6	36.8	-40.6	77.4	**Vertical Polarization**
2745.00	60.5	54.5	1.0	**90**	0.0	28.2	5.6	35.6	52.7	-1.3	54.0	**Vertical Polarization**
3660.00	53.7	47.7	1.0	**90**	0.0	29.6	7.0	35.2	49.1	-4.9	54.0	**Vertical Polarization**
4575.00	45.0	39.0	1.0	**90**	0.0	30.9	8.0	34.1	43.8	-10.2	54.0	**Vertical Polarization**
5490.00	40.1	34.1	1.0	**90**	0.0	32.4	9.2	33.0	42.7	-11.3	54.0	**Vertical Polarization**
6405.00	41.9	35.9	1.0	**90**	0.0	34.3	9.8	34.5	45.5	-31.9	77.4	**Vertical Polarization**
7320.00	43.5	37.5	1.0	**90**	0.0	36.8	10.8	33.9	51.2	-2.8	54.0	**Vertical Polarization**
8235.00	42.7	36.7	1.0	**90**	0.0	37.1	11.5	34.5	50.8	-3.2	54.0	**Vertical Polarization**
9150.00	40.1	34.1	1.0	**90**	0.0	36.8	12.1	34.4	48.6	-5.4	54.0	**Vertical Polarization**
MIDDLE CHANNEL												
915.00	114.0	108.0	1.0	**90**	0.0	21.3	5.0	37.1	97.2	"--"	"--"	**Horizontal Polarization**
1830.00	50.7	44.7	3.0	**90**	0.0	24.5	3.9	35.6	37.5	-39.7	77.2	**Horizontal Polarization**
2745.00	55.7	49.7	3.0	**90**	0.0	28.2	5.6	35.6	47.9	-6.1	54.0	**Horizontal Polarization**
3660.00	45.9	39.9	1.0	**180**	0.0	29.6	7.0	35.2	41.3	-12.7	54.0	**Horizontal Polarization**
4575.00	41.4	35.4	1.0	**270**	0.0	30.9	8.0	34.1	40.2	-13.8	54.0	**Horizontal Polarization**
5490.00	40.5	34.5	1.0	**270**	0.0	32.4	9.2	33.0	43.1	-10.9	54.0	**Horizontal Polarization**
6405.00	40.2	34.2	1.0	**90**	0.0	34.3	9.8	34.5	43.8	-33.4	77.2	**Horizontal Polarization**
7320.00	40.5	34.5	1.0	**90**	0.0	36.8	10.8	33.9	48.2	-5.8	54.0	**Horizontal Polarization**
8235.00	41.1	35.1	1.0	**90**	0.0	37.1	11.5	34.5	49.2	-4.8	54.0	**Horizontal Polarization**
9150.00	40.7	34.7	3.0	**180**	0.0	36.8	12.1	34.4	49.2	-4.8	54.0	**Horizontal Polarization**

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

*** BELOW 1 GHz, QUASI-PEAK MEASUREMENT IS EMPLOYEED, ABOVE 1 GHz, AVERAGE MEASUREMENT IS EMPLOYED

RADIATED EMISSIONS

COMPANY	TELXON CORPORATION	**DATE**	2/2/99
EUT	AIR I/O	**ANTENNAS**	LOG PERIODIC AND HORN
MODEL	MN900DS	**POLARIZATION**	SEE BELOW
S/N	N/A	**TEST DISTANCE**	3 METERS
EUT MODE	HIGH CHANNEL	**LAB**	D

Frequency MHz	Peak Reading (dBuV)	Average or Quasi-Peak (dBuV)	Antenna Height (meters)	Azimuth (degrees)	Distance Factor (dB)	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
HIGH CHANNEL												
922.20	114.4	108.4	3.0	**90**	0.0	21.7	5.0	36.9	98.2	"--"	"--"	**Vertical Polarization**
1844.40	50.6	44.6	1.0	**90**	0.0	24.5	3.9	35.6	37.4	-40.8	78.2	**Vertical Polarization**
2766.60	57.9	51.9	1.0	**90**	0.0	29.7	6.4	35.2	52.8	-1.2	54.0	**Vertical Polarization**
3688.80	48.6	42.6	1.0	**90**	0.0	29.6	7.0	35.2	44.0	-10.0	54.0	**Vertical Polarization**
4611.00	43.6	37.6	1.0	**90**	0.0	30.9	8.0	34.1	42.4	-11.6	54.0	**Vertical Polarization**
5533.20	39.6	33.6	1.0	**90**	0.0	32.4	9.2	33.0	42.2	-11.8	54.0	**Vertical Polarization**
6455.40	42.4	36.4	1.0	**90**	0.0	34.3	9.8	34.5	46.0	-32.2	78.2	**Vertical Polarization**
7377.60	42.8	36.8	1.0	**90**	0.0	36.8	10.8	33.9	50.5	-3.5	54.0	**Vertical Polarization**
8299.80	42.6	36.6	1.0	**90**	0.0	37.1	11.5	34.5	50.7	-3.3	54.0	**Vertical Polarization**
9222.00	40.1	34.1	1.0	**90**	0.0	36.8	12.1	34.4	48.6	-5.4	54.0	**Vertical Polarization**
HIGH CHANNEL												
922.20	114.3	108.3	1.0	**90**	0.0	21.7	5.0	36.9	98.1	"--"	"--"	**Horizontal Polarization**
1844.40	49.1	43.1	2.0	**90**	0.0	24.5	3.9	35.6	35.9	-42.2	78.1	**Horizontal Polarization**
2766.60	55.2	49.2	2.0	**0**	0.0	29.7	6.4	35.2	50.1	-3.9	54.0	**Horizontal Polarization**
3688.80	46.1	40.1	2.0	**0**	0.0	29.6	7.0	35.2	41.5	-12.5	54.0	**Horizontal Polarization**
4611.00	42.6	36.6	2.0	**180**	0.0	30.9	8.0	34.1	41.4	-12.6	54.0	**Horizontal Polarization**
5533.20	42.6	36.6	2.0	**90**	0.0	32.4	9.2	33.0	45.2	-8.8	54.0	**Horizontal Polarization**
6455.40	42.2	36.2	2.0	**90**	0.0	34.3	9.8	34.5	45.8	-32.3	78.1	**Horizontal Polarization**
7377.60	40.3	34.3	2.0	**270**	0.0	36.8	10.8	33.9	48.0	-6.0	54.0	**Horizontal Polarization**
8299.80	42.4	36.4	2.0	**180**	0.0	37.1	11.5	34.5	50.5	-3.5	54.0	**Horizontal Polarization**
9222.00	40.4	34.4	2.0	**90**	0.0	36.8	12.1	34.4	48.9	-5.1	54.0	**Horizontal Polarization**

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

*** BELOW 1 GHz, QUASI-PEAK MEASUREMENT IS EMPLOYEED, ABOVE 1 GHz, AVERAGE MEASUREMENT IS EMPLOYED

Test location: Compatible Electronics
Customer : TELXON CORPORATION Date : 2/ 2/1999
Manufacturer : VTECH WIRELESS Time : 14.15
EUT name : AIR I/O Model: MN900DS
Specification: Fcc_B Test distance: 3.0 mtrs Lab: D
Distance correction factor(20*log(test/spec)) : 0.00
Test Mode : TEMPERATURE 74 DEGREES F.
RELATIVE HUMIDITY 65%
TESTED BY: Kyle Fujimoto
KYLE FUJIMOTO

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	limit = L dBuV/m	Delta R-L dB
1V	32.03	45.80	0.82	11.98	38.60	20.00	40.00	-20.00
2V	48.13	45.20	0.98	11.03	38.60	18.61	40.00	-21.39
3V	75.70	57.00	1.20	9.43	38.60	29.03	40.00	-10.97
4V	95.27	61.20	1.30	9.07	38.51	33.06	43.50	-10.44
5V	96.11	55.30	1.30	9.13	38.52	27.21	43.50	-16.29
6V	99.54	54.40	1.30	9.37	38.59	26.48	43.50	-17.02
7V	127.92	54.10	1.42	11.18	38.76	27.93	43.50	-15.57
8V	132.69	61.70	1.46	11.46	38.71	35.92	43.50	-7.58
9V	140.39	56.90	1.52	11.92	38.62	31.73	43.50	-11.77
10V	145.41	63.10	1.56	12.22	38.56	38.33	43.50	-5.17
11V	151.38	49.10	1.61	12.63	38.49	24.85	43.50	-18.65
12V	189.48	45.50	1.86	15.13	38.63	23.86	43.50	-19.64
13V	199.02	56.10	1.90	15.28	38.78	34.50	43.50	-9.00
14V	227.02	41.00	1.83	17.12	38.31	21.65	46.00	-24.35
15V	298.52	46.20	2.41	21.46	38.49	31.57	46.00	-14.43
16V	331.62	54.00	2.46	16.62	38.56	34.52	46.00	-11.48
17V	340.88	53.70	2.48	16.71	38.58	34.31	46.00	-11.69
18V	364.84	59.50	2.59	16.30	38.48	39.90	46.00	-6.10
19V	431.10	62.20	2.80	17.53	37.95	44.57	46.00	-1.43
20V	431.10	61.53	2.80	17.53	37.95	43.90Qp	46.00	-2.10
21V	441.06	41.40	2.80	18.30	37.87	24.63	46.00	-21.37
22V	576.60	54.90	3.45	18.75	38.17	38.94	46.00	-7.06
23V	795.79	50.20	4.09	21.09	37.52	37.87	46.00	-8.13
24V	870.71	42.90	4.65	20.52	37.46	30.61	46.00	-15.39
25V	946.36	48.90	4.91	22.46	36.57	39.70	46.00	-6.30

Test location: Compatible Electronics
Customer : TELXON CORPORATION
Manufacturer : VTECH WIRELESS
EUT name : AIR I/O
Specification: Fcc_B Test distance: 3.0 mtrs
Distance correction factor(20*log(test/spec)) : 0.00
Test Mode : TEMPERATURE 74 DEGREES F.
RELATIVE HUMIDITY 65%
TESTED BY: Kyle Fujimoto
KYLE FUJIMOTO

Date : 2/ 2/1999
Time : 14.50
Model: MN900DS
Lab: D

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	limit = L dBuV/m	Delta R-L dB
1H	32.05	43.80	0.82	11.97	38.60	17.99	40.00	-22.01
2H	48.06	46.30	0.98	11.02	38.60	19.70	40.00	-20.30
3H	64.06	43.40	1.14	10.18	38.60	16.12	40.00	-23.88
4H	66.42	48.70	1.16	10.11	38.60	21.37	40.00	-18.63
5H	75.69	53.60	1.20	9.43	38.60	25.63	40.00	-14.37
6H	110.99	49.60	1.34	10.10	38.69	22.36	43.50	-21.14
7H	145.46	60.80	1.56	12.23	38.55	36.04	43.50	-7.46
8H	151.39	55.80	1.61	12.63	38.49	31.55	43.50	-11.95
9H	162.65	49.70	1.70	13.71	38.45	26.67	43.50	-16.83
10H	199.00	62.30	1.90	15.28	38.78	40.70	43.50	-2.80
11H	199.00	61.95	1.90	15.28	38.78	40.35Qp	43.50	-3.15
12H	200.53	57.10	1.90	15.34	38.79	35.55	43.50	-7.95
13H	226.99	37.20	1.83	17.12	38.31	17.85	46.00	-28.15
14H	232.20	59.40	1.92	17.19	38.33	40.17	46.00	-5.83
15H	331.63	41.60	2.46	16.62	38.56	22.12	46.00	-23.88
16H	364.79	47.50	2.59	16.30	38.48	27.90	46.00	-18.10
17H	464.25	50.40	2.89	18.40	37.94	33.74	46.00	-12.26
18H	577.15	48.70	3.45	18.77	38.17	32.75	46.00	-13.25

Test location: Compatible Electronics
Customer : TELXON CORPORATION
Manufacturer : VTECH WIRELESS
EUT name : AIR I/O
Specification: Fcc_B Test distance: 3.0 mtrs
Distance correction factor(20*log(test/spec)) : 0.00
Test Mode : RECEIVING MODE ABOVE 1GHz
TEMPERATURE 65 DEGREES F.
RELATIVE HUMIDITY 65%
TESTED BY: Kyle Fujimoto
KYLE FUJIMOTO

Date : 2/ 2/1999
Time : 8.08
Model: MN900DS
Lab: D

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	limit = L dBuV/m	Delta R-L dB
1H	1194.00	52.20	3.20	22.30	36.40	41.30	54.00	-12.70
2V	1194.00	57.50	3.20	22.30	36.40	46.60	54.00	-7.40

COMPATIBLE ELECTRONICS

RADIATED EMISSIONS

COMPANY NAME: TELXON CORPORATION **DATE:** 2-2-99

EUT: AIR I/O **EUT S/N:** N/A

EUT MODEL: MN900 DS **LOCATION:** ■ BREA ☐ SILVERADO ☐ AGOURA

SPECIFICATION: FCC 15.247 **CLASS:** ____ **TEST DISTANCE:** 3M **LAB:** D

ANTENNA: ■ LOOP ☐ BICONICAL ☐ LOG ☐ HORN **POLARIZATION:** ■ VERT ■ HORIZ

■ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT **ENGINEER:** KYLE F.

NOTES:

Frequency (GHz)	Peak Reading (dBuV)	Average Reading (dBuV)	Antenna Height (meters)	Azimuth (degrees)	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	* Corrected Reading (dBuV)	Delta ** (dB)	Spec Limit (dBuV)
			NO EMISSIONS FOUND							
			BETWEEN 10kHz - 30 MHz							
			IN EITHER POLARIZATION							

* **CORRECTED READING** = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

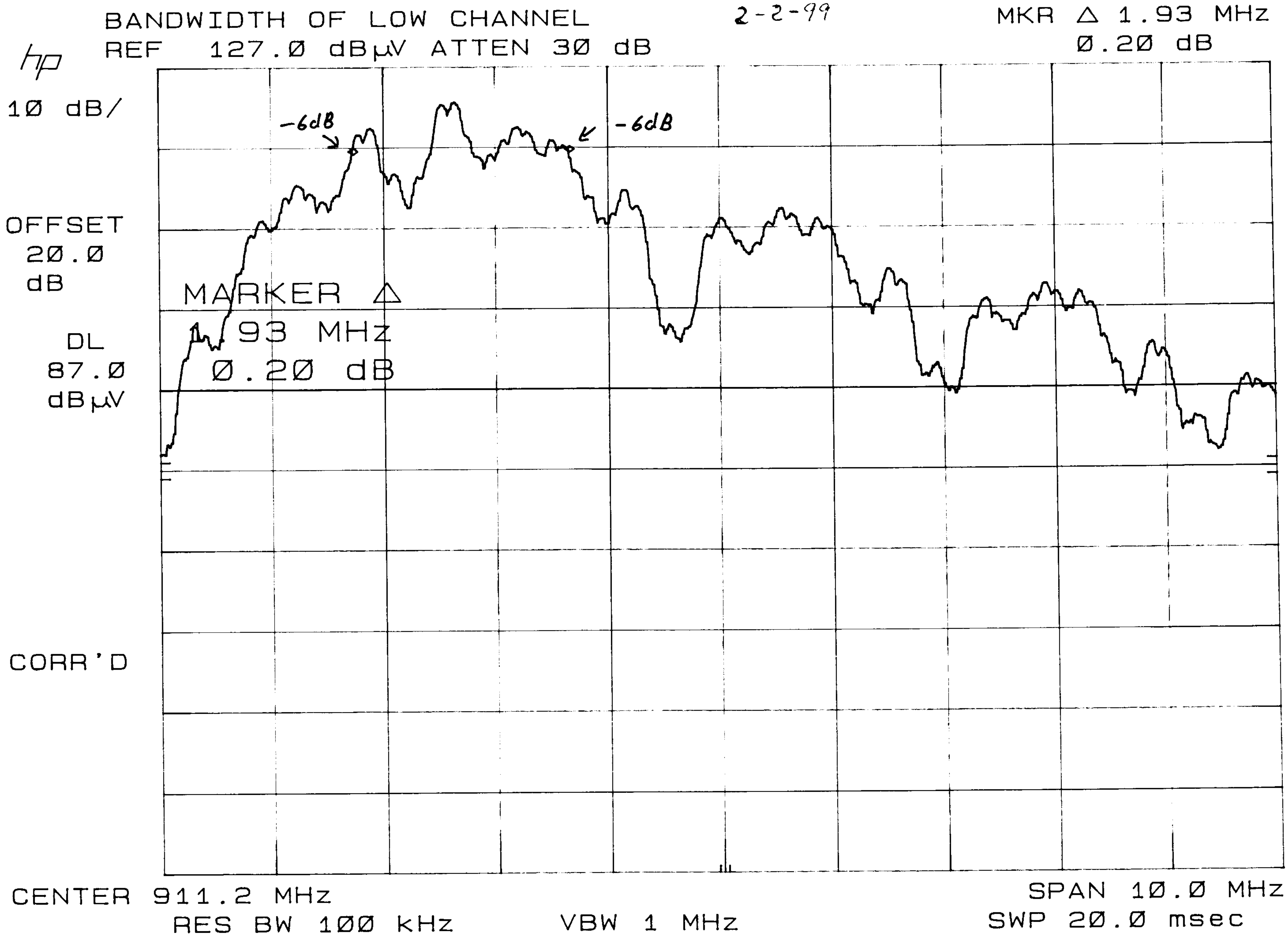
** **DELTA** = CORRECTED READING - SPECIFICATION LIMIT

BREA (714) 579-0500 SILVERADO (714) 589-0700 AGOURA (818) 597-0600

6 dB BANDWIDTH DATA SHEETS

RETURN TO TEST PROCEDURES

114 OLINDA DRIVE, BREA, CALIFORNIA 92823 PHONE: (714) 579-0500 FAX: (714) 579-1850



BANDWIDTH OF LOW CHANNEL
2-2-99
MKR △ 1.93 MHz
Ø.2Ø dB
REF 127.Ø dBµV ATTEN 3Ø dB
hp
1Ø dB/
-6dB
-6dB
OFFSET
2Ø.Ø
dB
MARKER △
1.93 MHz
Ø.2Ø dB
DL
87.Ø
dBµV
CORR'D
CENTER 911.2 MHz
RES BW 1ØØ kHz
VBW 1 MHz
SPAN 1Ø.Ø MHz
SWP 2Ø.Ø msec

BANDWIDTH OF MIDDLE CHANNEL

2-2-99

REF 127.Ø dBµV ATTEN 3Ø dB

MKR △ 1.83 MHz
Ø.ØØ dB

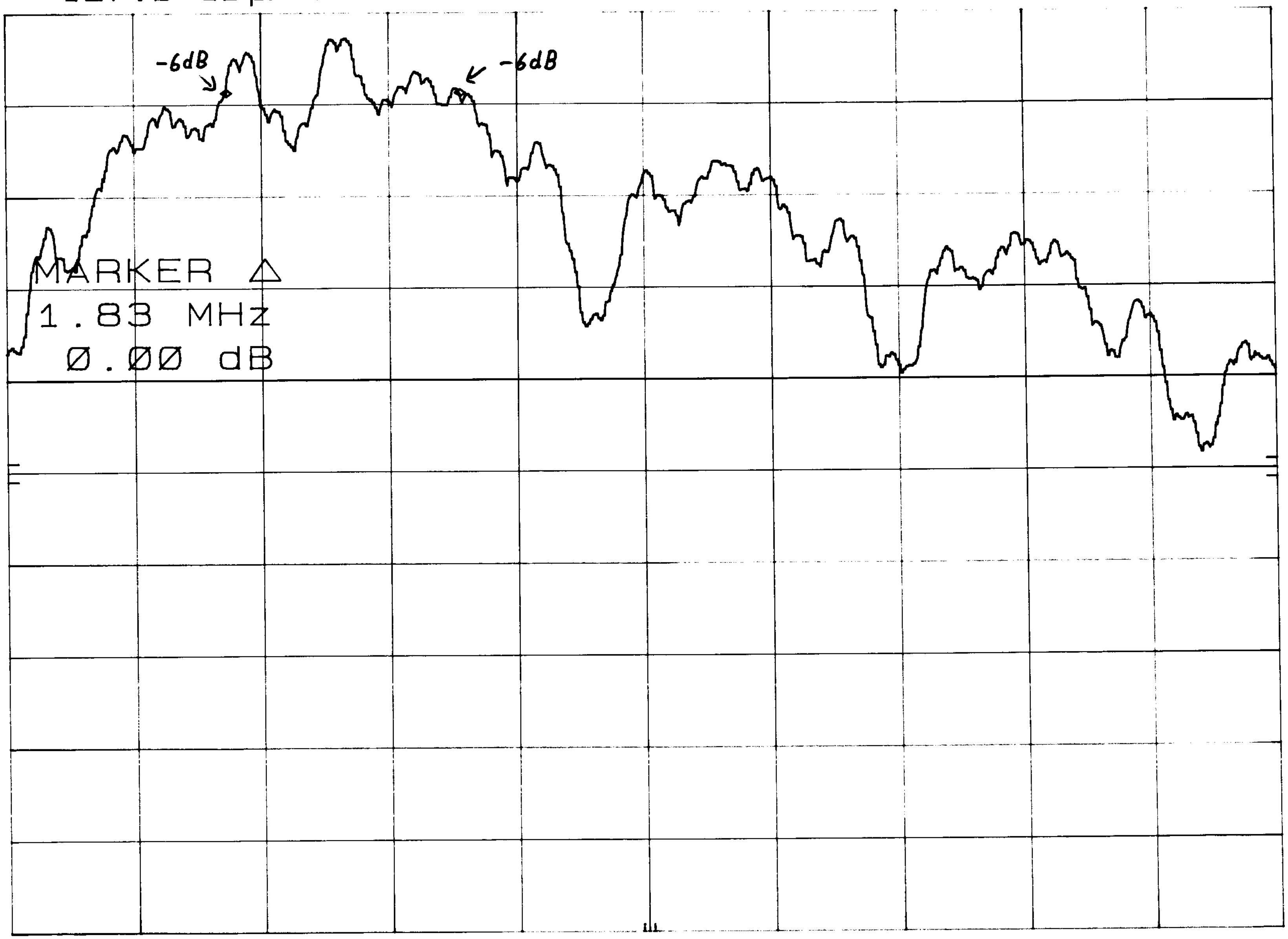
hp

1Ø dB/

OFFSET
2Ø.Ø
dB

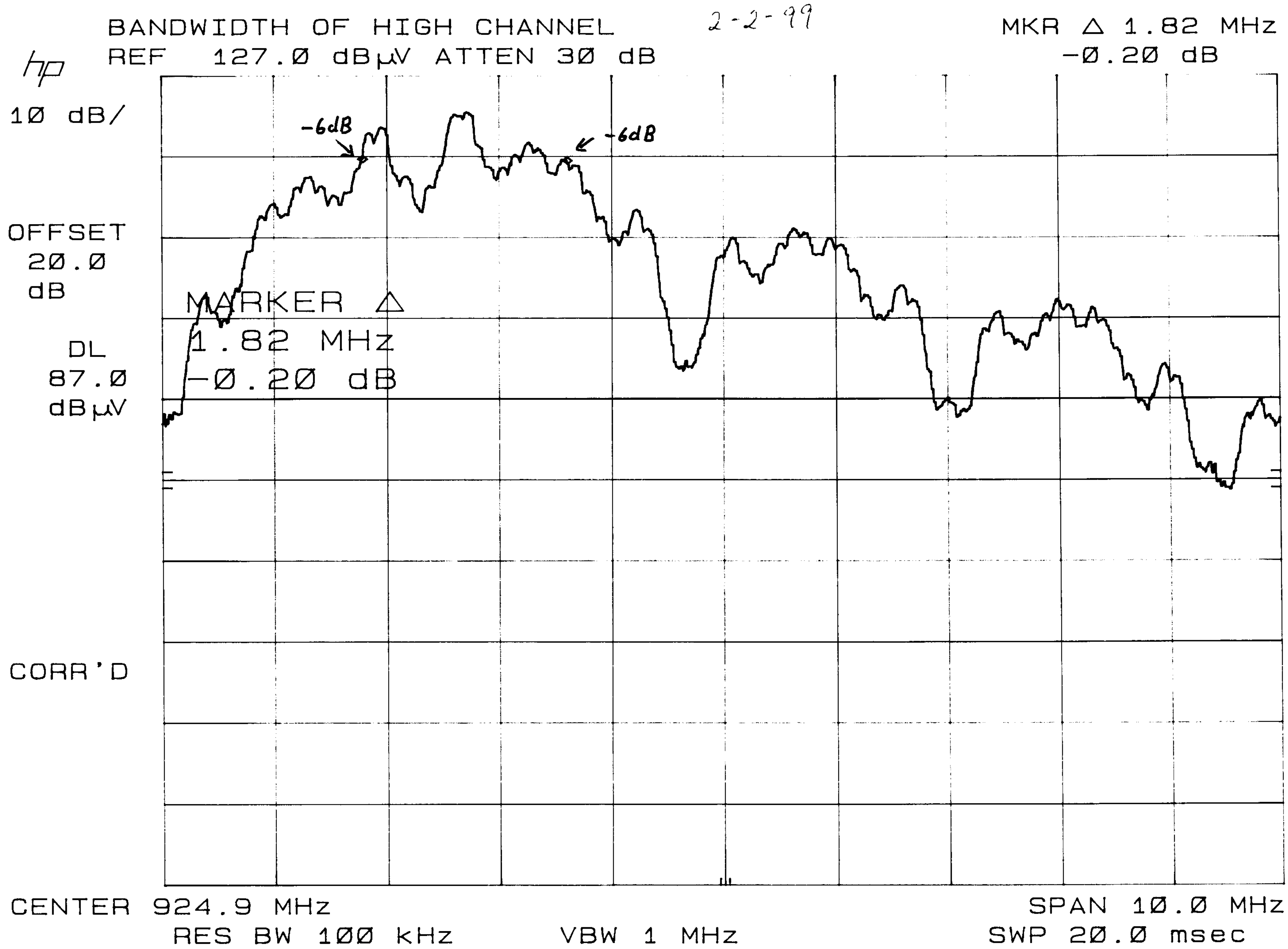
DL
87.Ø
dBµV

CORR'D



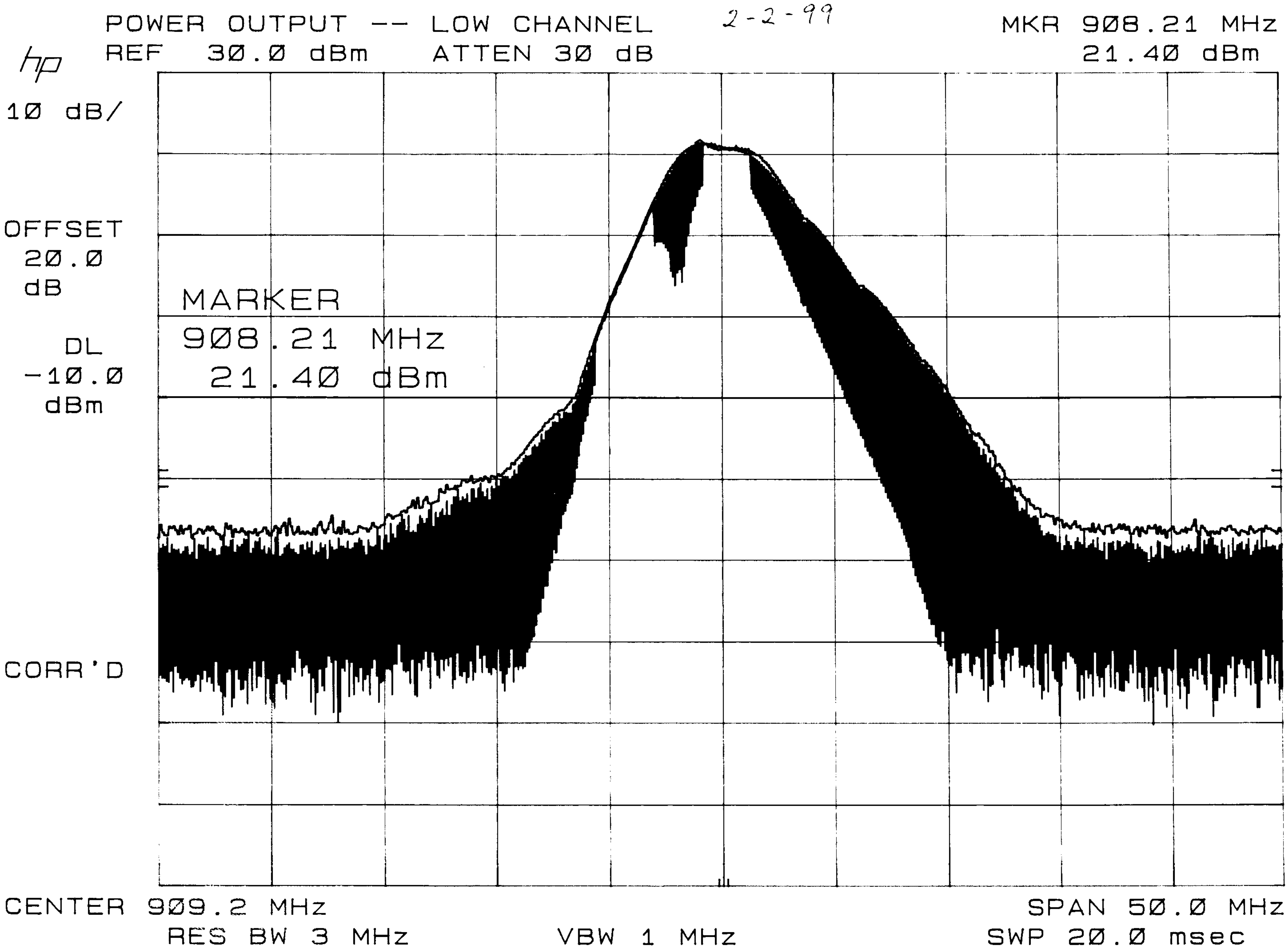
CENTER 917.7 MHz
RES BW 1ØØ kHz
VBW 1 MHz

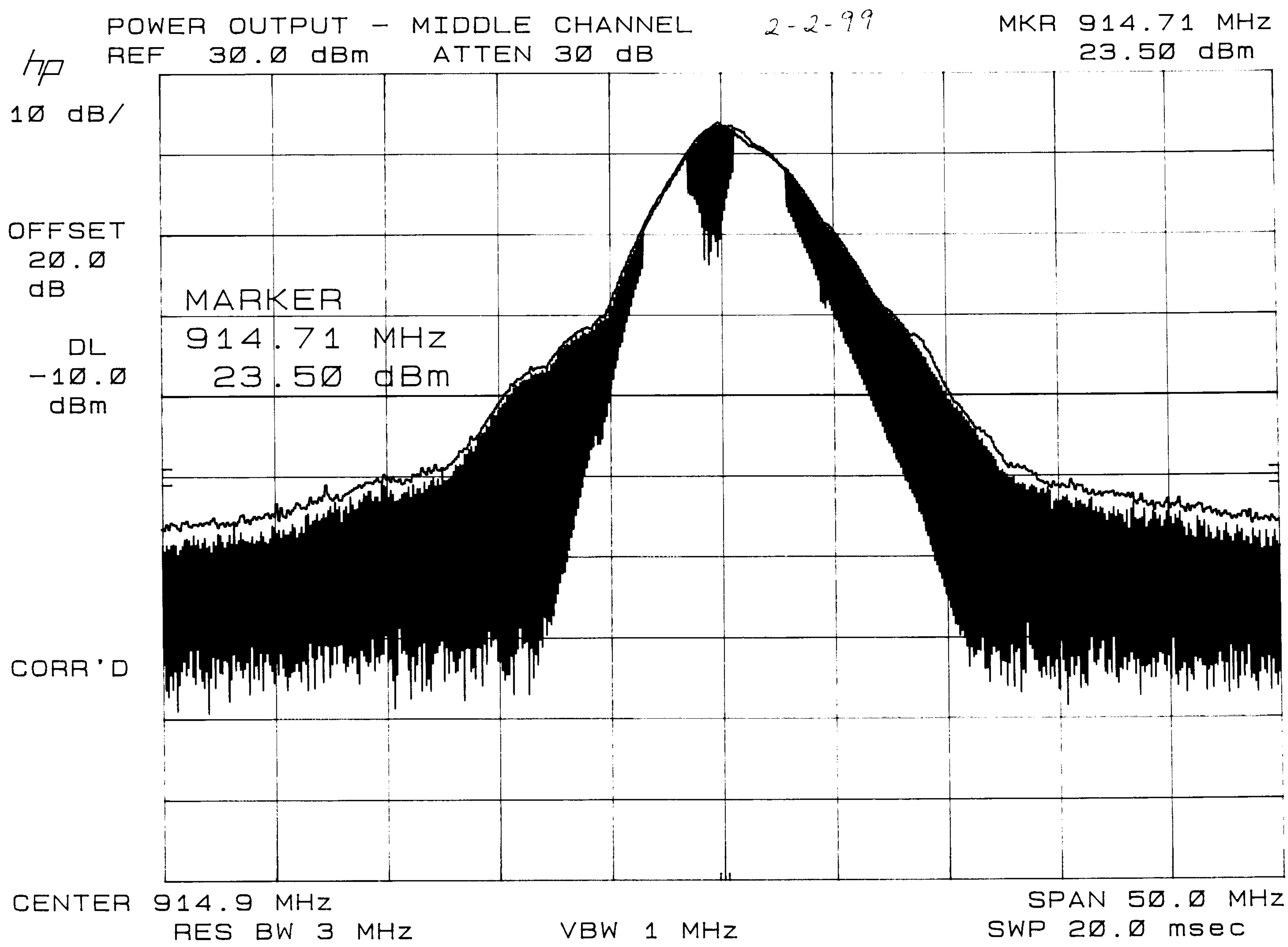
SPAN 1Ø.Ø MHz
SWP 2Ø.Ø msec

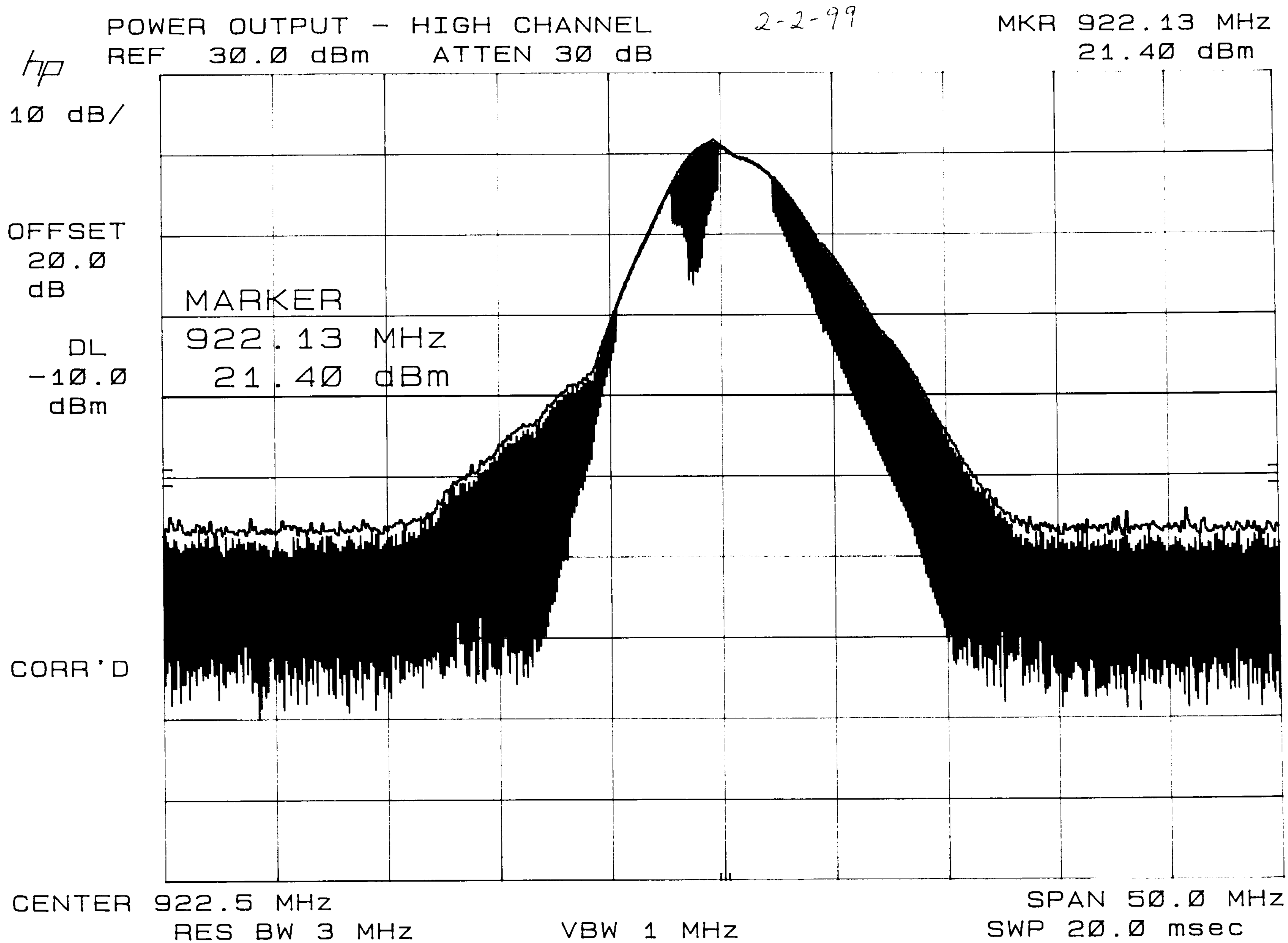

BANDWIDTH OF HIGH CHANNEL
2-2-99
MKR △ 1.82 MHz
-Ø.2Ø dB
REF 127.Ø dBµV ATTEN 3Ø dB
hp
1Ø dB/
-6dB
-6dB
OFFSET
2Ø.Ø
dB
MARKER △
1.82 MHz
-Ø.2Ø dB
DL
87.Ø
dBµV
CORR'D
CENTER 924.9 MHz
RES BW 1ØØ kHz
VBW 1 MHz
SPAN 1Ø.Ø MHz
SWP 2Ø.Ø msec

PEAK OUTPUT POWER DATA SHEETS

RETURN TO TEST PROCEDURES


POWER OUTPUT -- LOW CHANNEL
2-2-99
MKR 908.21 MHz
21.40 dBm
hp
REF 30.0 dBm ATTEN 30 dB
10 dB/
OFFSET
20.0
dB
DL
-10.0
dBm
MARKER
908.21 MHz
21.40 dBm
CORR'D
CENTER 909.2 MHz
SPAN 50.0 MHz
RES BW 3 MHz
VBW 1 MHz
SWP 20.0 msec

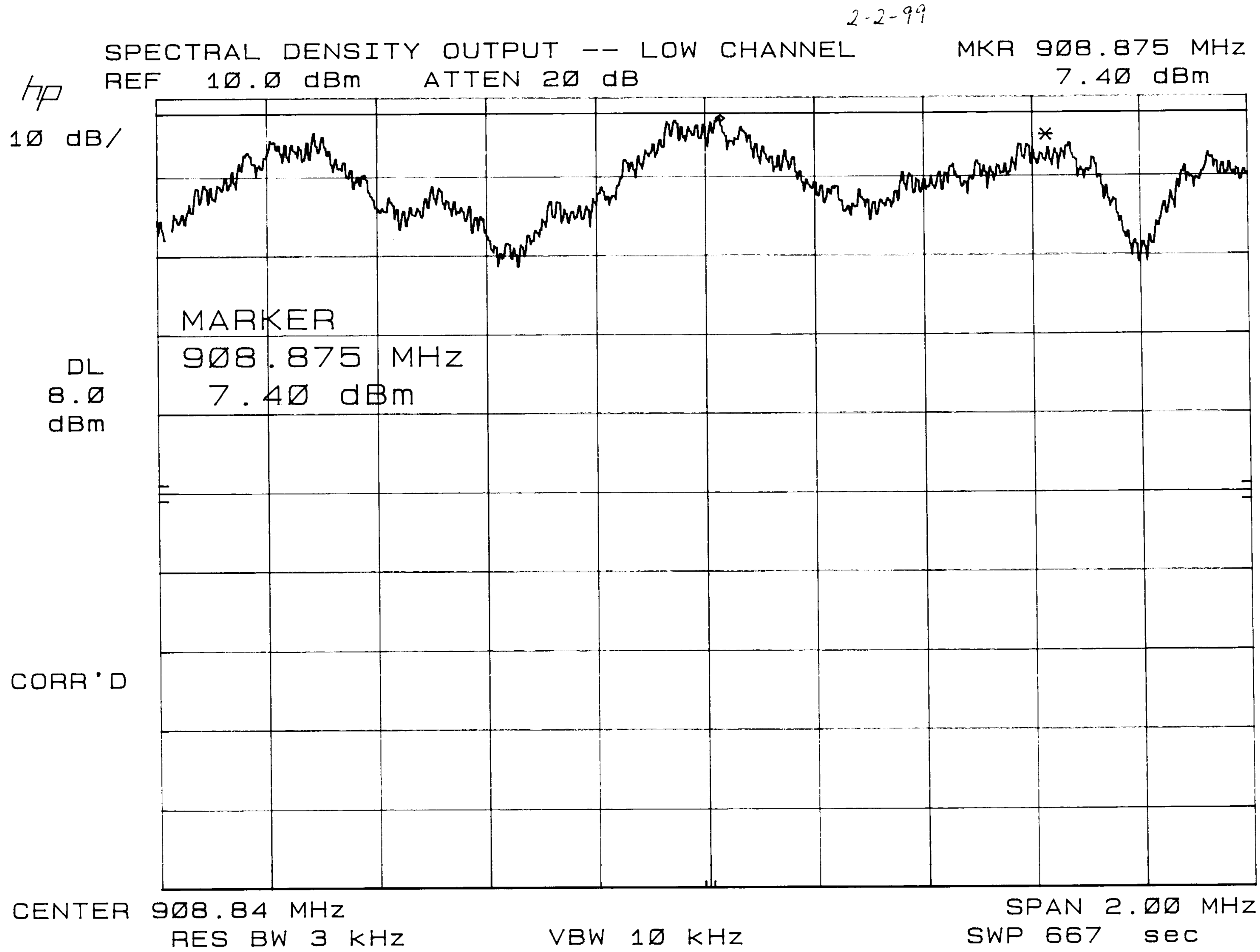

POWER OUTPUT - MIDDLE CHANNEL
2-2-99
MKR 914.71 MHz
23.50 dBm
REF 30.0 dBm ATTEN 30 dB
hp
10 dB/
OFFSET
20.0
dB
MARKER
914.71 MHz
23.50 dBm
DL
-10.0
dBm
CORR'D
CENTER 914.9 MHz
RES BW 3 MHz
VBW 1 MHz
SPAN 50.0 MHz
SWP 20.0 msec



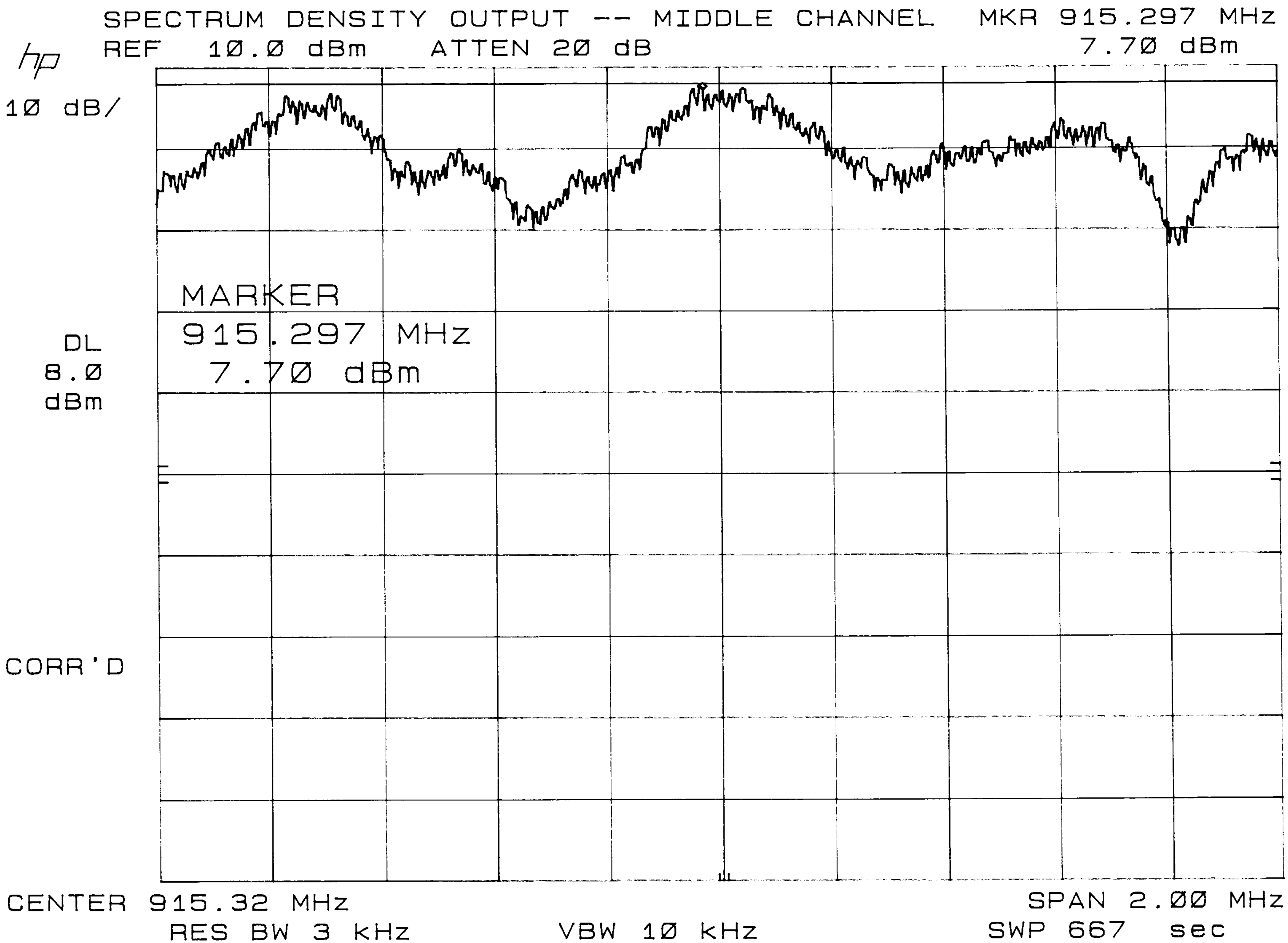
POWER OUTPUT - HIGH CHANNEL
2-2-99
MKR 922.13 MHz
21.40 dBm
REF 30.0 dBm ATTEN 30 dB
hp
10 dB/
OFFSET
20.0
dB
DL
-10.0
dBm
MARKER
922.13 MHz
21.40 dBm
CORR'D
CENTER 922.5 MHz
SPAN 50.0 MHz
RES BW 3 MHz
VBW 1 MHz
SWP 20.0 msec

SPECTRAL DENSITY OUTPUT DATA SHEETS

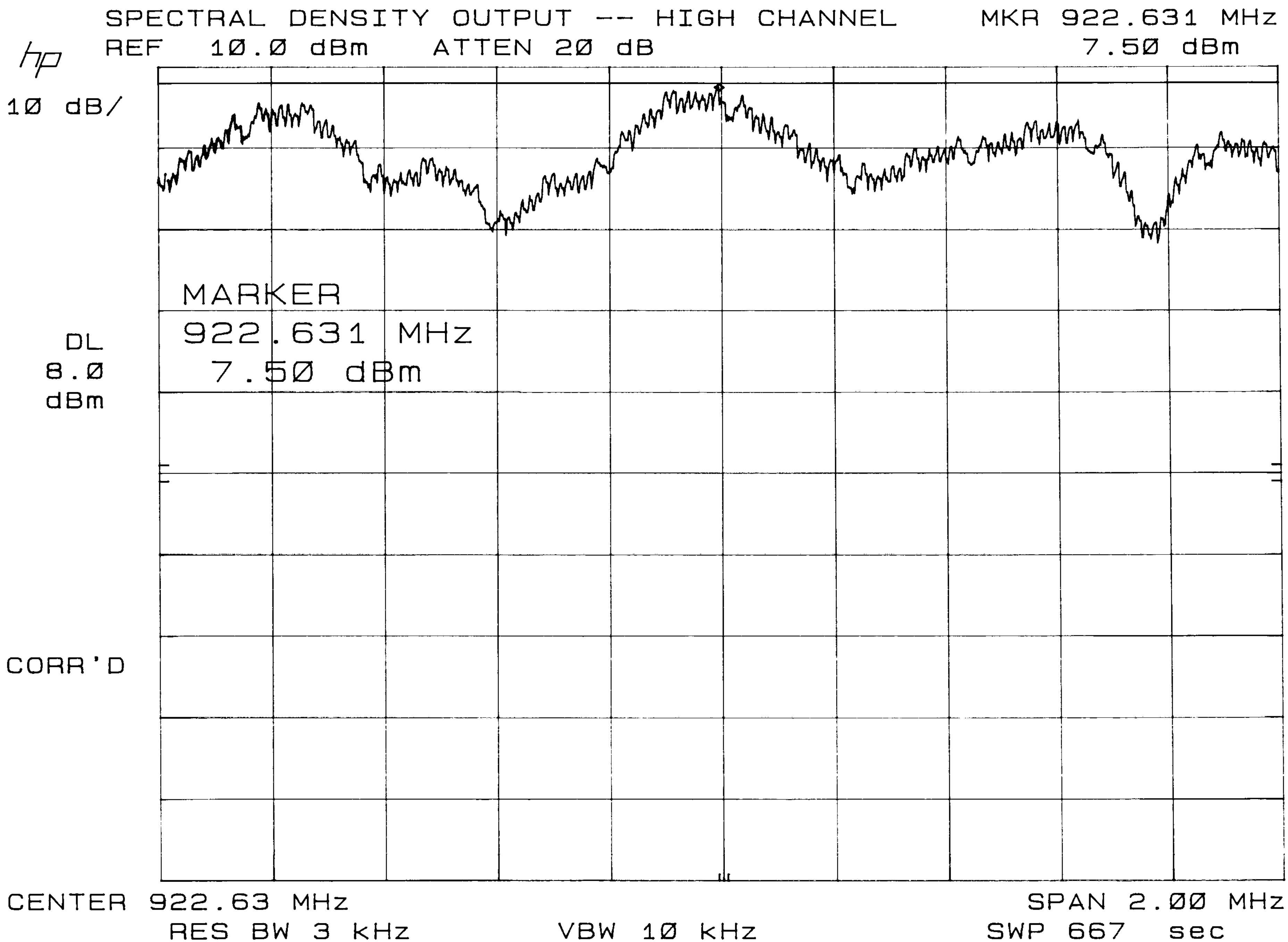
RETURN TO TEST PROCEDURES


2-2-99
SPECTRAL DENSITY OUTPUT -- LOW CHANNEL
MKR 908.875 MHz
7.40 dBm
REF 10.0 dBm ATTEN 20 dB
hp
10 dB/
MARKER
908.875 MHz
7.40 dBm
DL
8.0
dBm
CORR'D
CENTER 908.84 MHz
RES BW 3 kHz
VBW 10 kHz
SPAN 2.00 MHz
SWP 667 sec

2-2-99


SPECTRUM DENSITY OUTPUT -- MIDDLE CHANNEL
MKR 915.297 MHz
7.70 dBm
REF 10.0 dBm ATTEN 20 dB
10 dB/
MARKER
915.297 MHz
7.70 dBm
DL
8.0
dBm
CORR'D
CENTER 915.32 MHz
RES BW 3 kHz
VBW 10 kHz
SPAN 2.00 MHz
SWP 667 sec

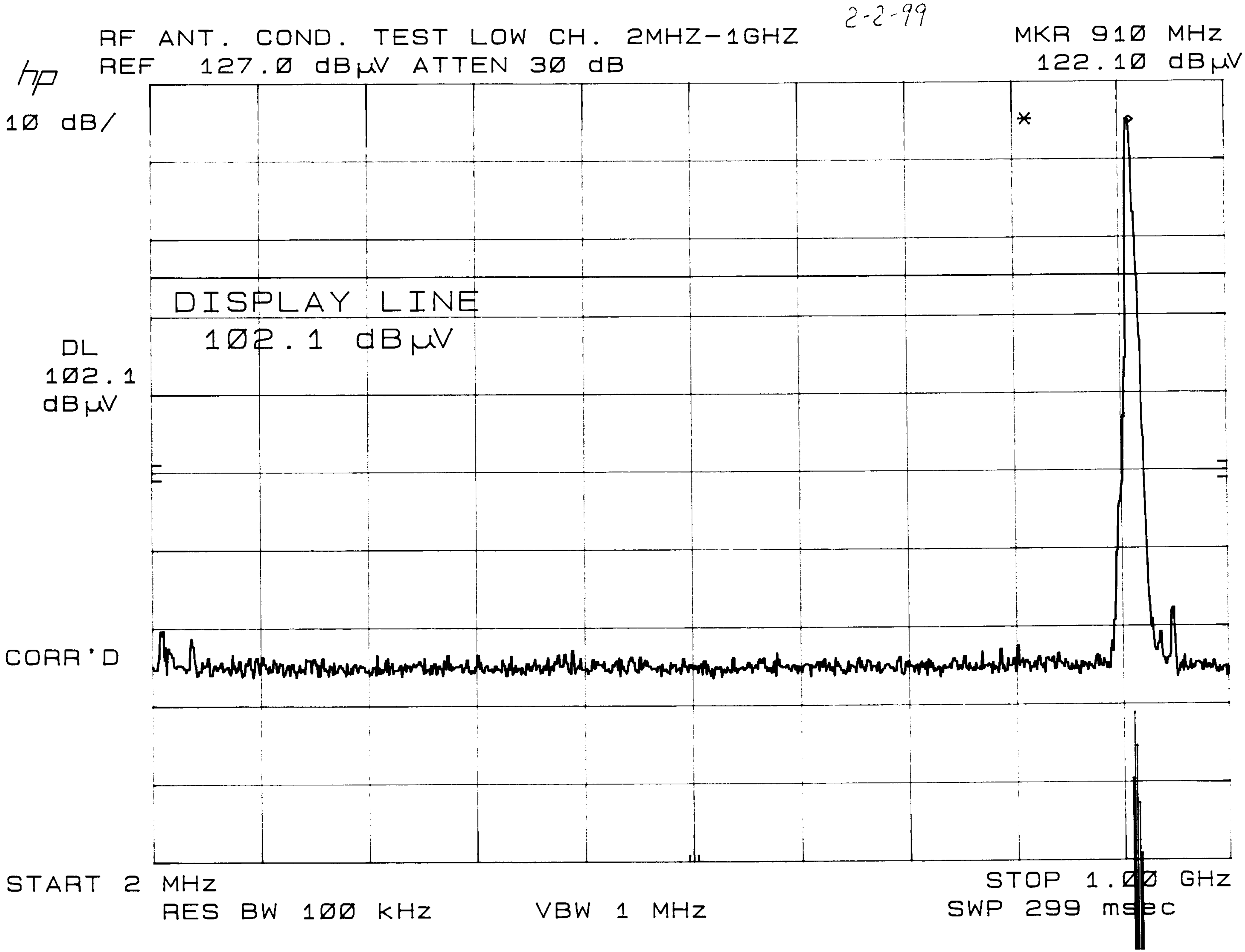
2-2-99


SPECTRAL DENSITY OUTPUT -- HIGH CHANNEL
MKR 922.631 MHz
REF 10.0 dBm ATTEN 20 dB
7.50 dBm
hp
10 dB/
MARKER
922.631 MHz
7.50 dBm
DL
8.0
dBm
CORR'D
CENTER 922.63 MHz
SPAN 2.00 MHz
RES BW 3 kHz
VBW 10 kHz
SWP 667 sec

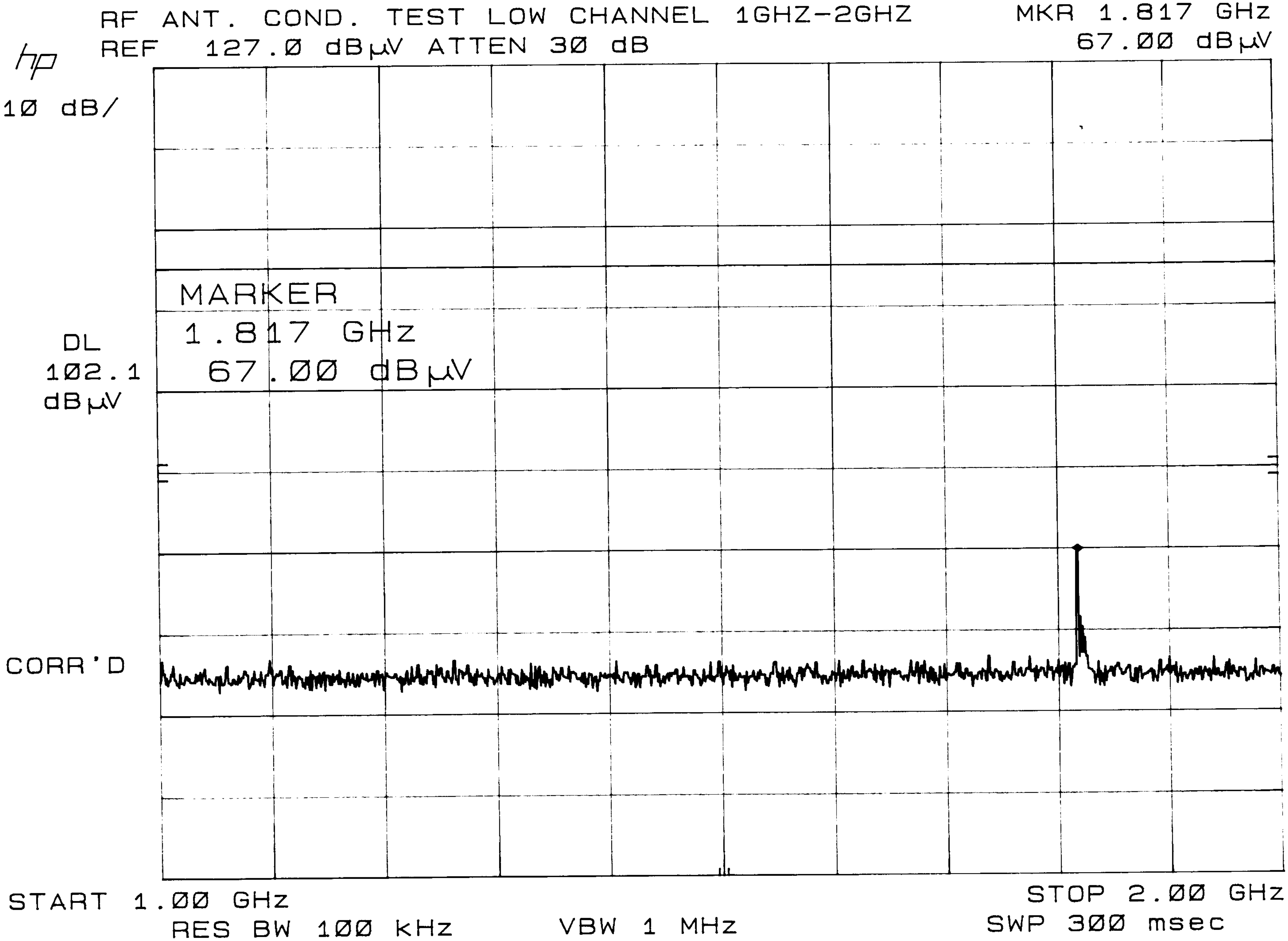
RF ANTENNA CONDUCTED DATA SHEETS

RETURN TO TEST PROCEDURES

114 OLINDA DRIVE, BREA, CALIFORNIA 92823 PHONE: (714) 579-0500 FAX: (714) 579-1850

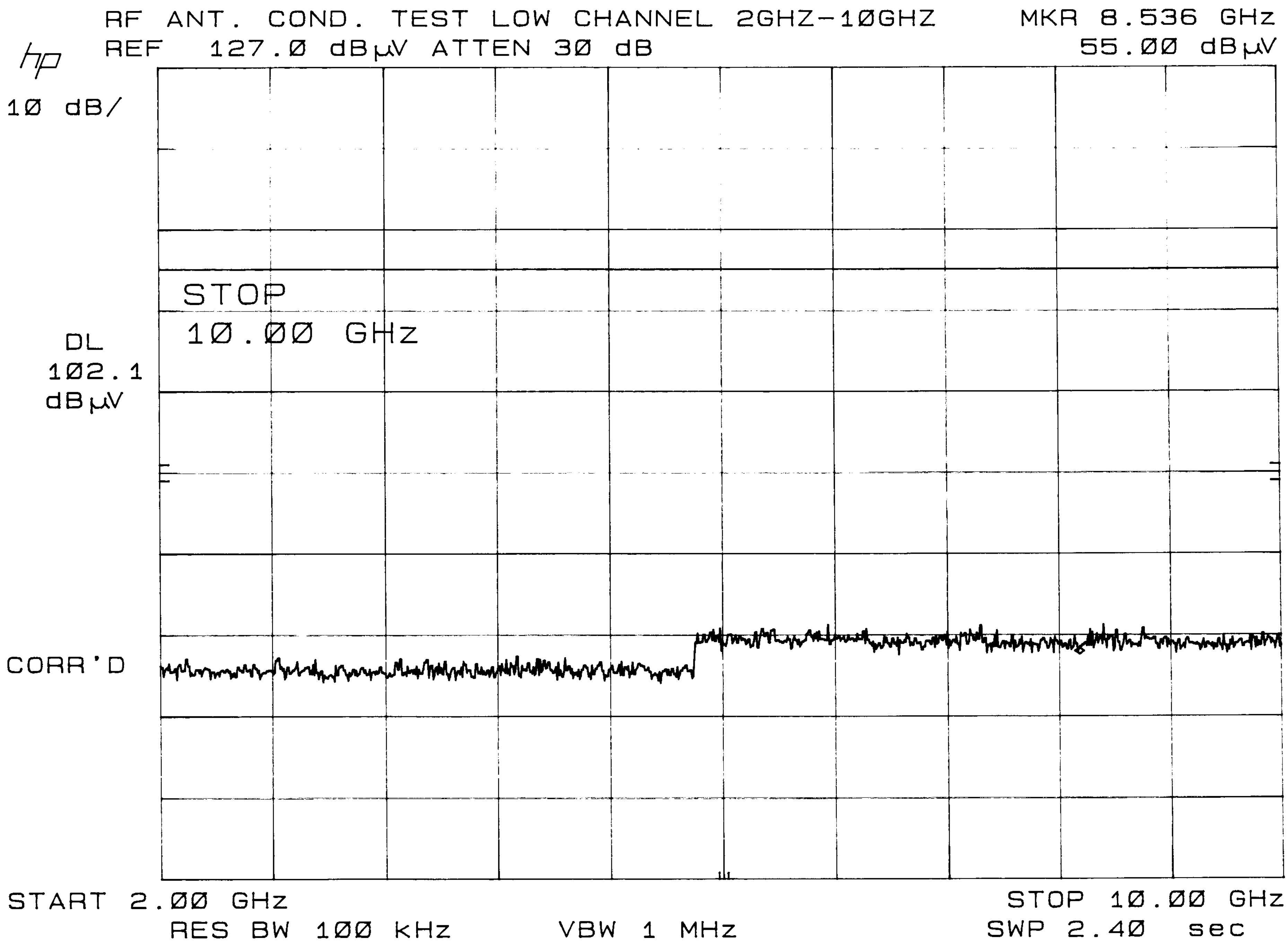

2-2-99
RF ANT. COND. TEST LOW CH. 2MHZ-1GHZ
REF 127.0 dBµV ATTEN 30 dB
MKR 910 MHz
122.10 dBµV
hp
10 dB/
DISPLAY LINE
102.1 dBµV
DL
102.1
dBµV
CORR'D
START 2 MHz
RES BW 100 kHz
VBW 1 MHz
STOP 1.00 GHz
SWP 299 msec

2-2-99

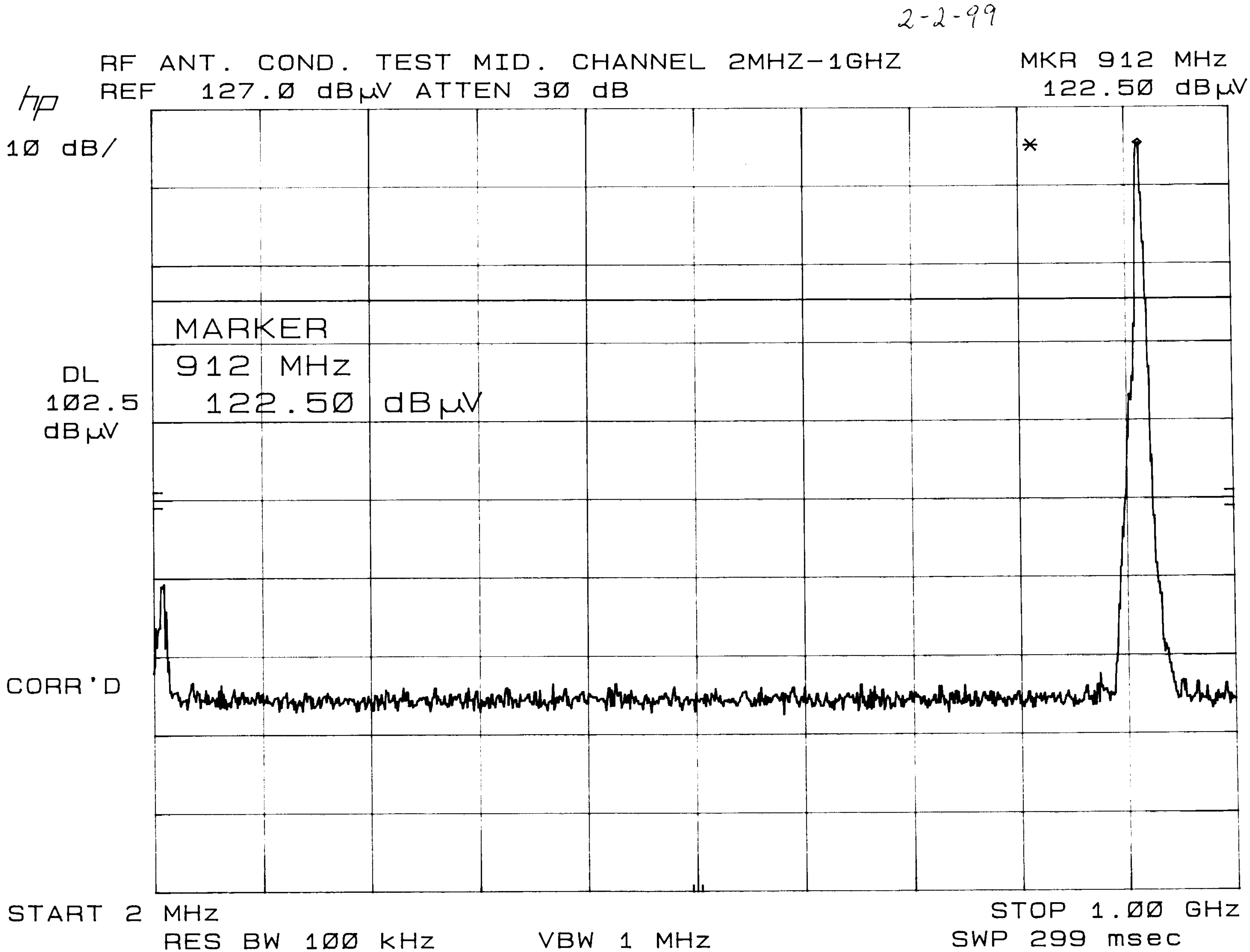


RF ANT. COND. TEST LOW CHANNEL 1GHZ-2GHZ
MKR 1.817 GHz
67.00 dBμV
hp
REF 127.0 dBμV ATTEN 30 dB
10 dB/
MARKER
1.817 GHz
67.00 dBμV
DL
102.1
dBμV
CORR'D
START 1.00 GHz
STOP 2.00 GHz
RES BW 100 kHz
VBW 1 MHz
SWP 300 msec

2-2-99



RF ANT. COND. TEST LOW CHANNEL 2GHZ-10GHZ
MKR 8.536 GHz
REF 127.0 dBµV ATTEN 30 dB
55.00 dBµV
hp
10 dB/
STOP
10.00 GHz
DL
102.1
dBµV
CORR'D
START 2.00 GHz
STOP 10.00 GHz
RES BW 100 kHz
VBW 1 MHz
SWP 2.40 sec


2-2-99
RF ANT. COND. TEST MID. CHANNEL 2MHZ-1GHZ
REF 127.0 dBµV ATTEN 30 dB
MKR 912 MHz
122.50 dBµV
hp
10 dB/
MARKER
912 MHz
122.50 dBµV
DL
102.5
dBµV
CORR'D
START 2 MHz
RES BW 100 kHz
VBW 1 MHz
STOP 1.00 GHz
SWP 299 msec

MID. 2-2-99

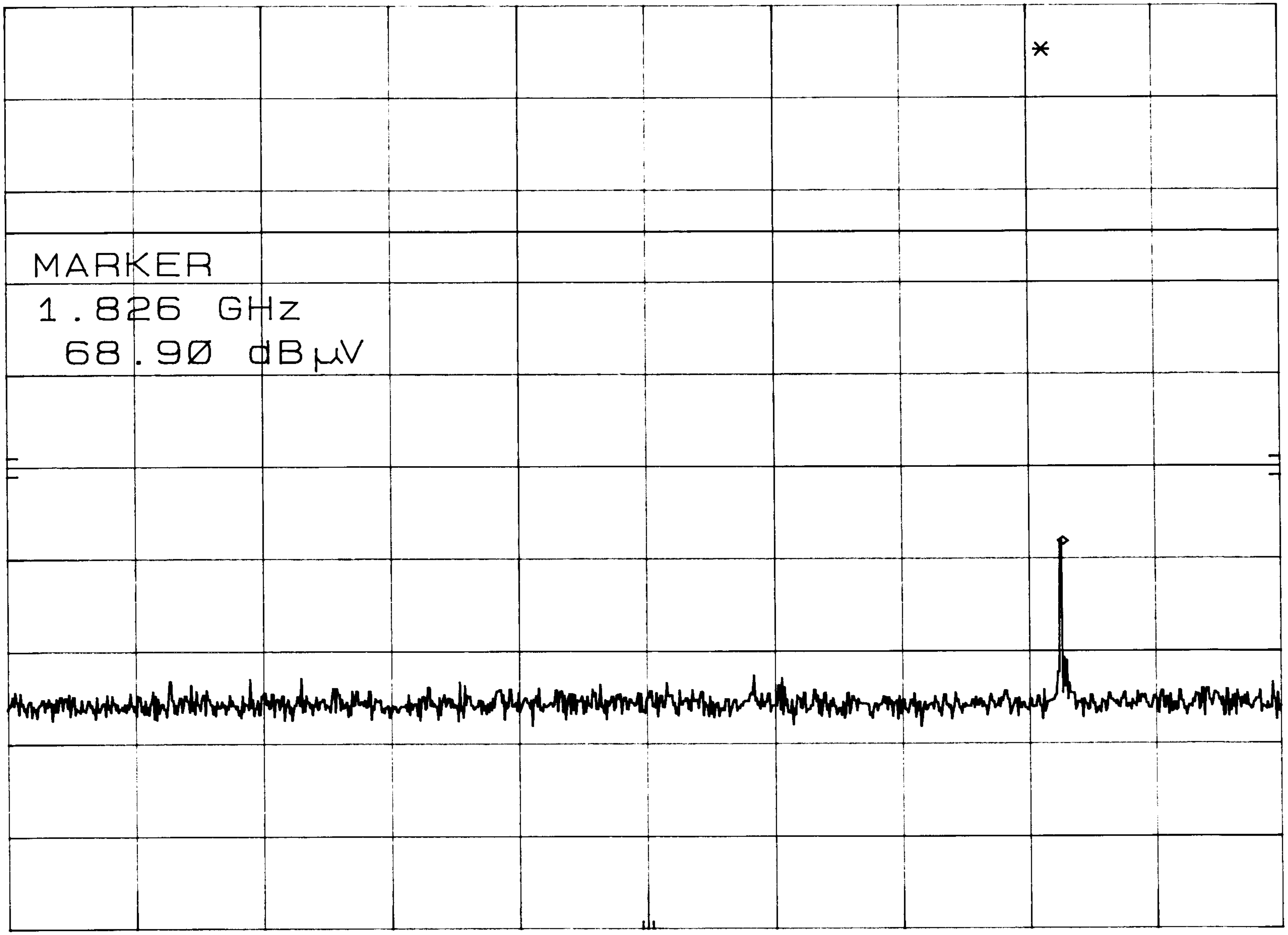
RF ANT. COND. TEST CHANNEL 1GHZ-2GHZ MKR 1.826 GHz
REF 127.0 dBµV ATTEN 30 dB 68.90 dBµV

hp

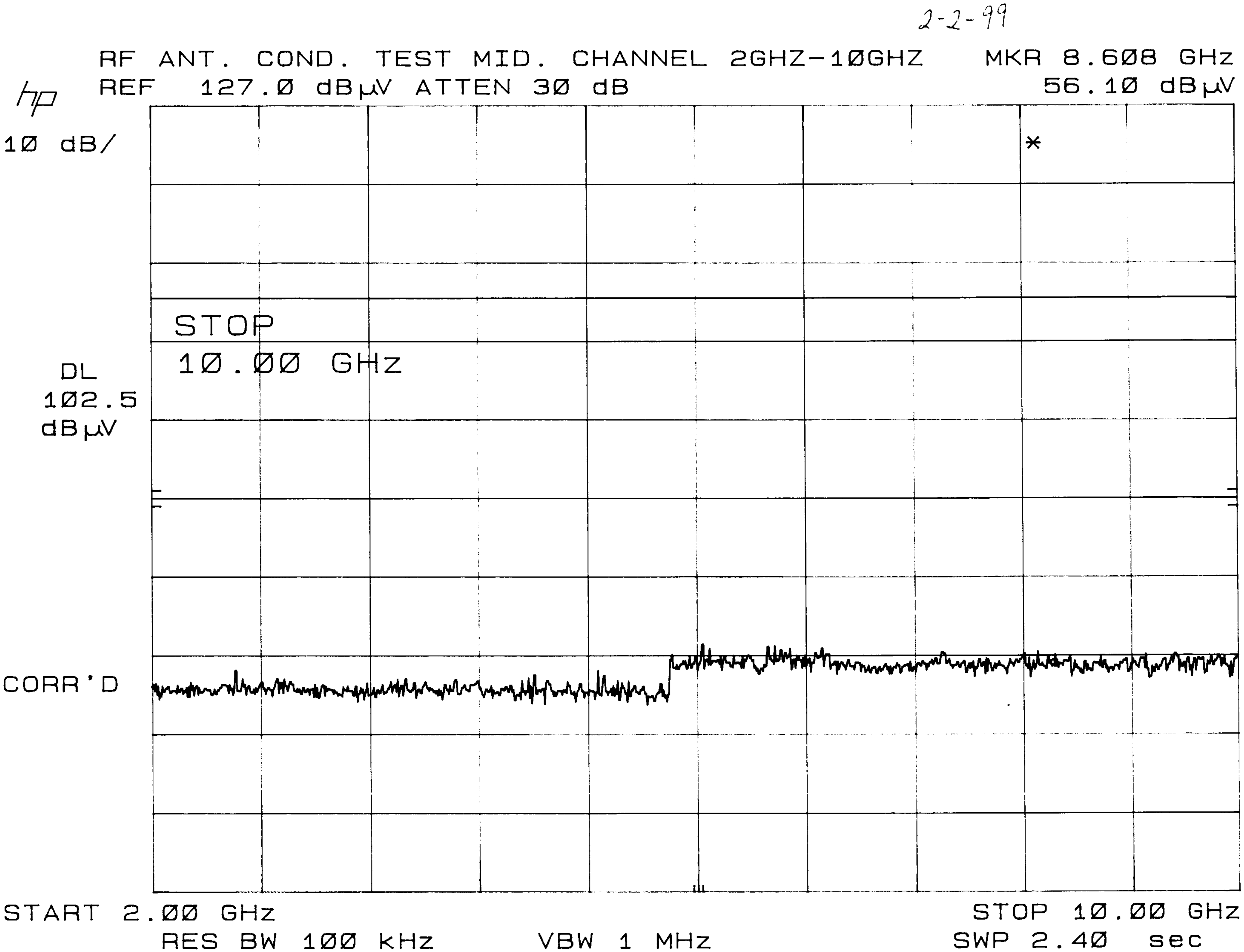
10 dB/

DL
102.5
dBµV

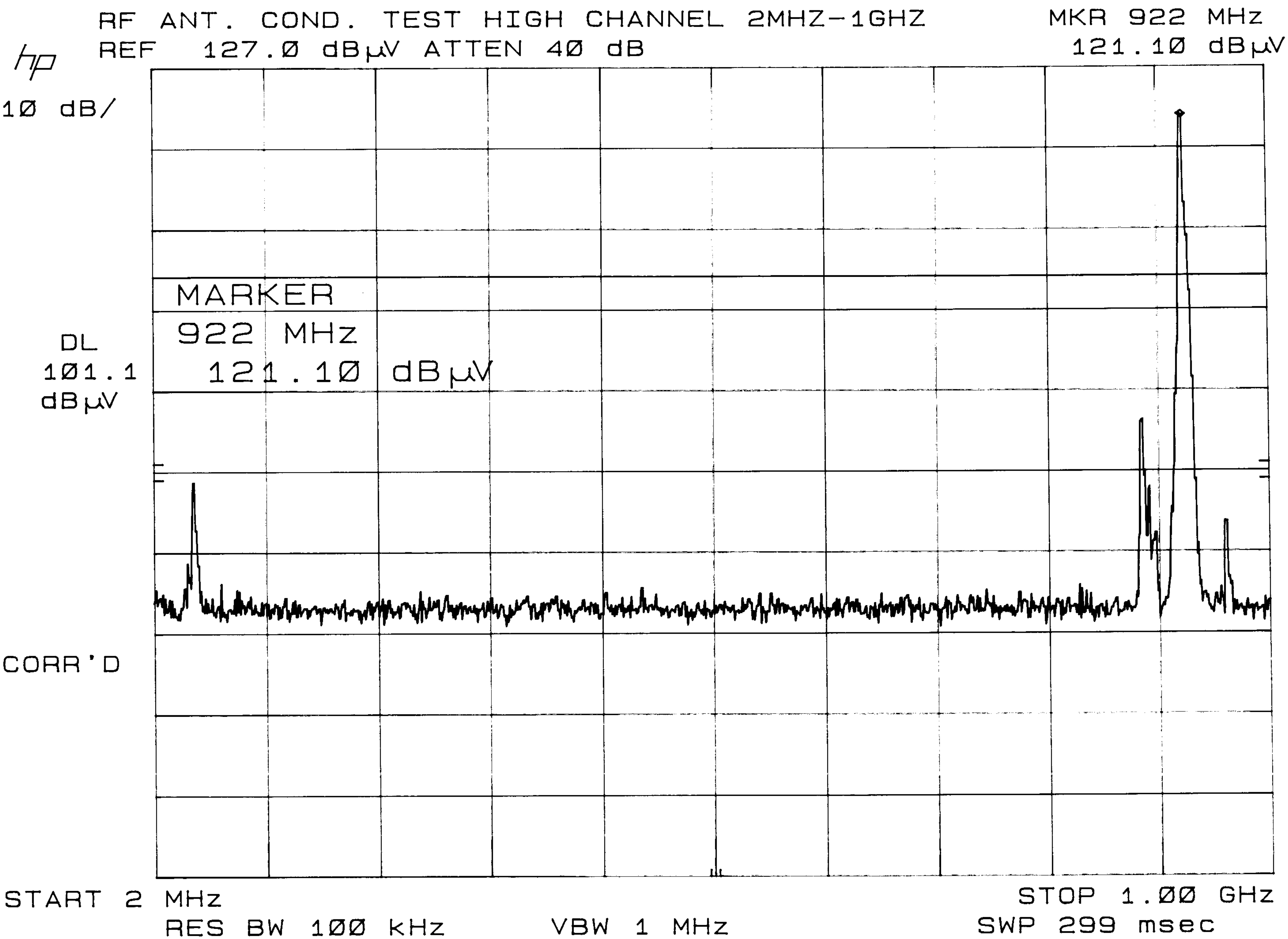
CORR'D

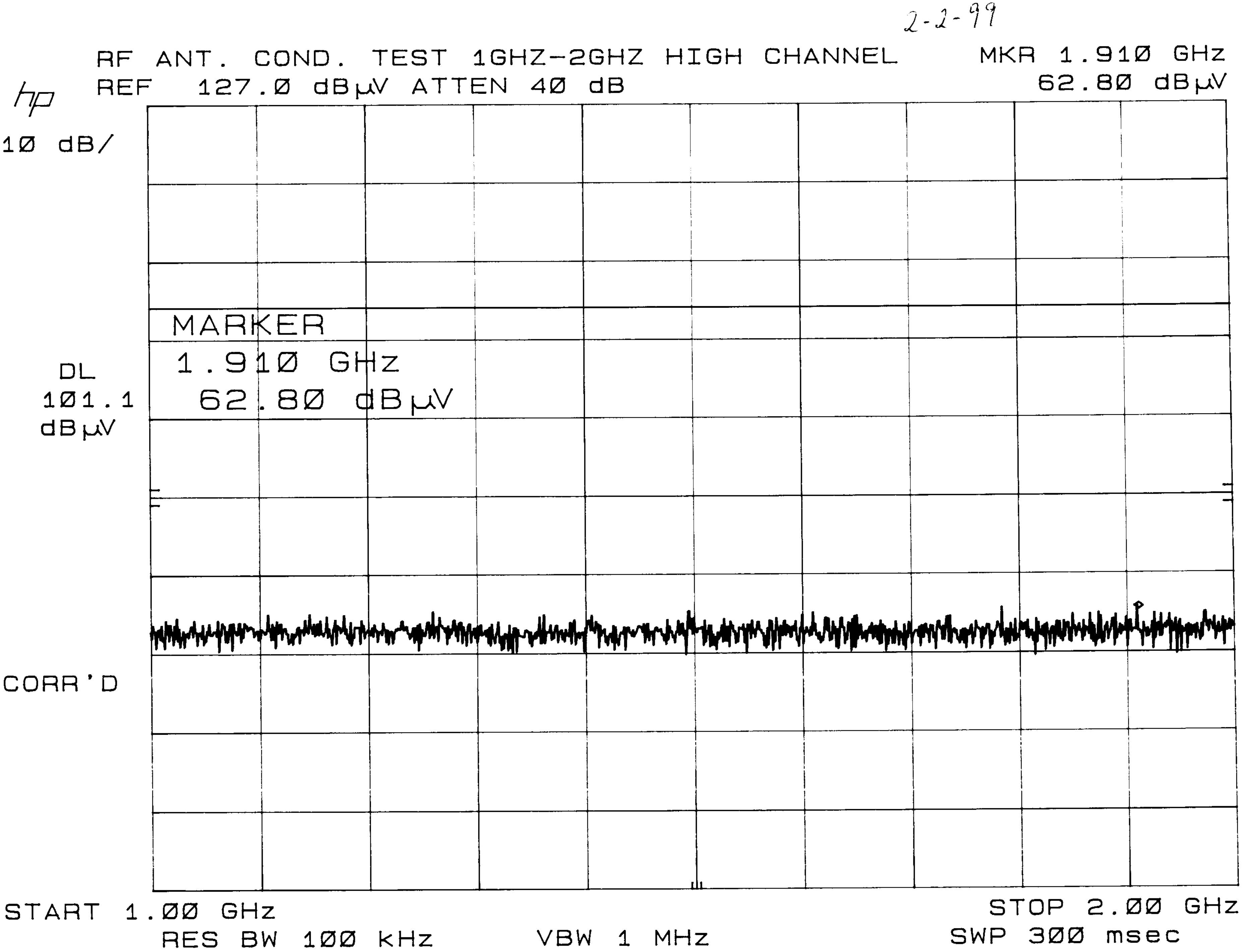


START 1.00 GHz STOP 2.00 GHz
RES BW 100 kHz VBW 1 MHz SWP 300 msec

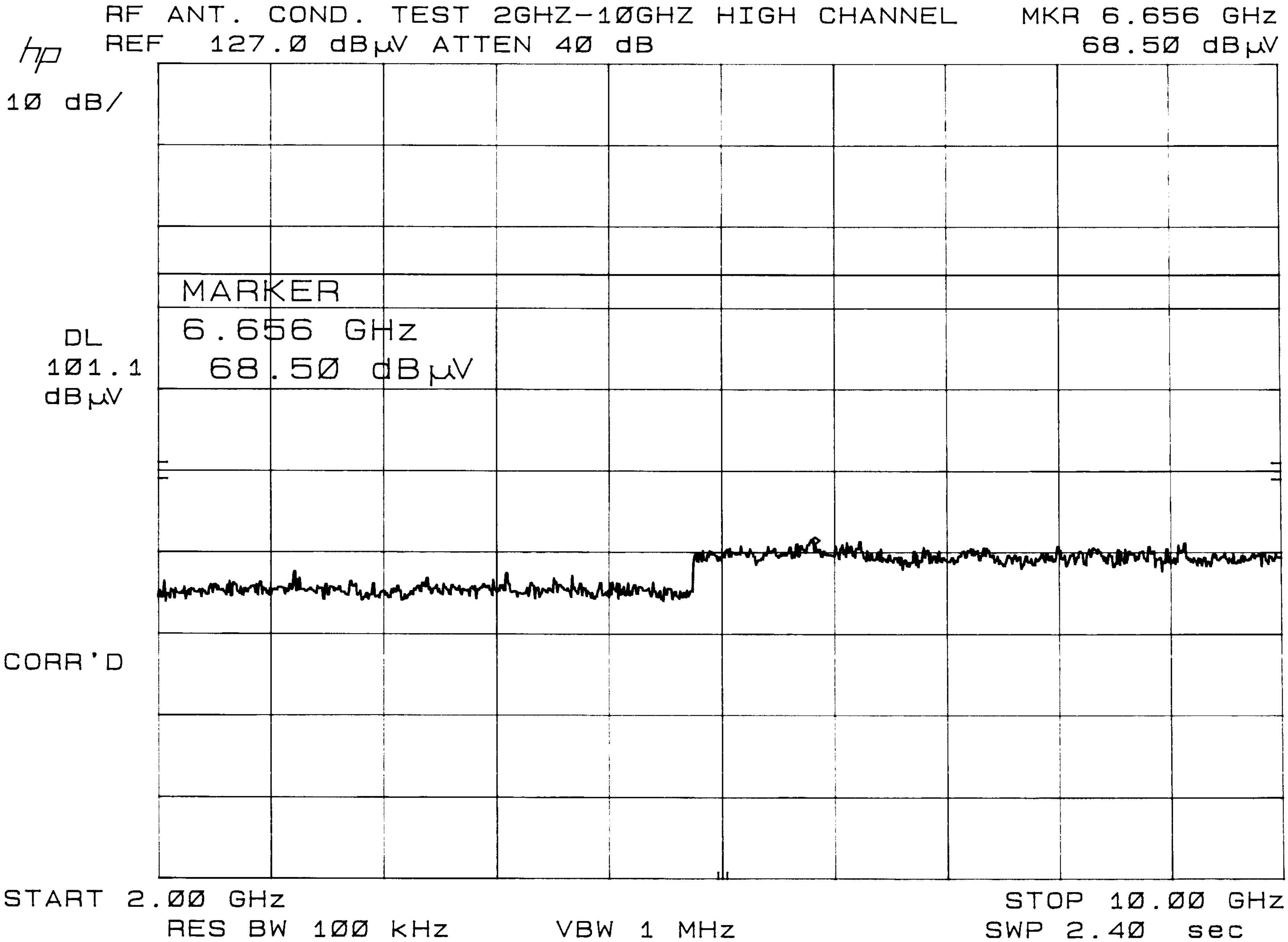

2-2-99
RF ANT. COND. TEST MID. CHANNEL 2GHZ-10GHZ
MKR 8.608 GHz
REF 127.0 dBμV ATTEN 30 dB
56.10 dBμV
10 dB/
STOP
10.00 GHz
DL
102.5
dBμV
CORR'D
START 2.00 GHz
STOP 10.00 GHz
RES BW 100 kHz
VBW 1 MHz
SWP 2.40 sec

2-2-99


RF ANT. COND. TEST HIGH CHANNEL 2MHZ-1GHZ
REF 127.0 dBµV ATTEN 40 dB
MKR 922 MHz
121.10 dBµV
hp
10 dB/
MARKER
922 MHz
121.10 dBµV
DL
101.1
dBµV
CORR'D
START 2 MHz
RES BW 100 kHz
VBW 1 MHz
STOP 1.00 GHz
SWP 299 msec

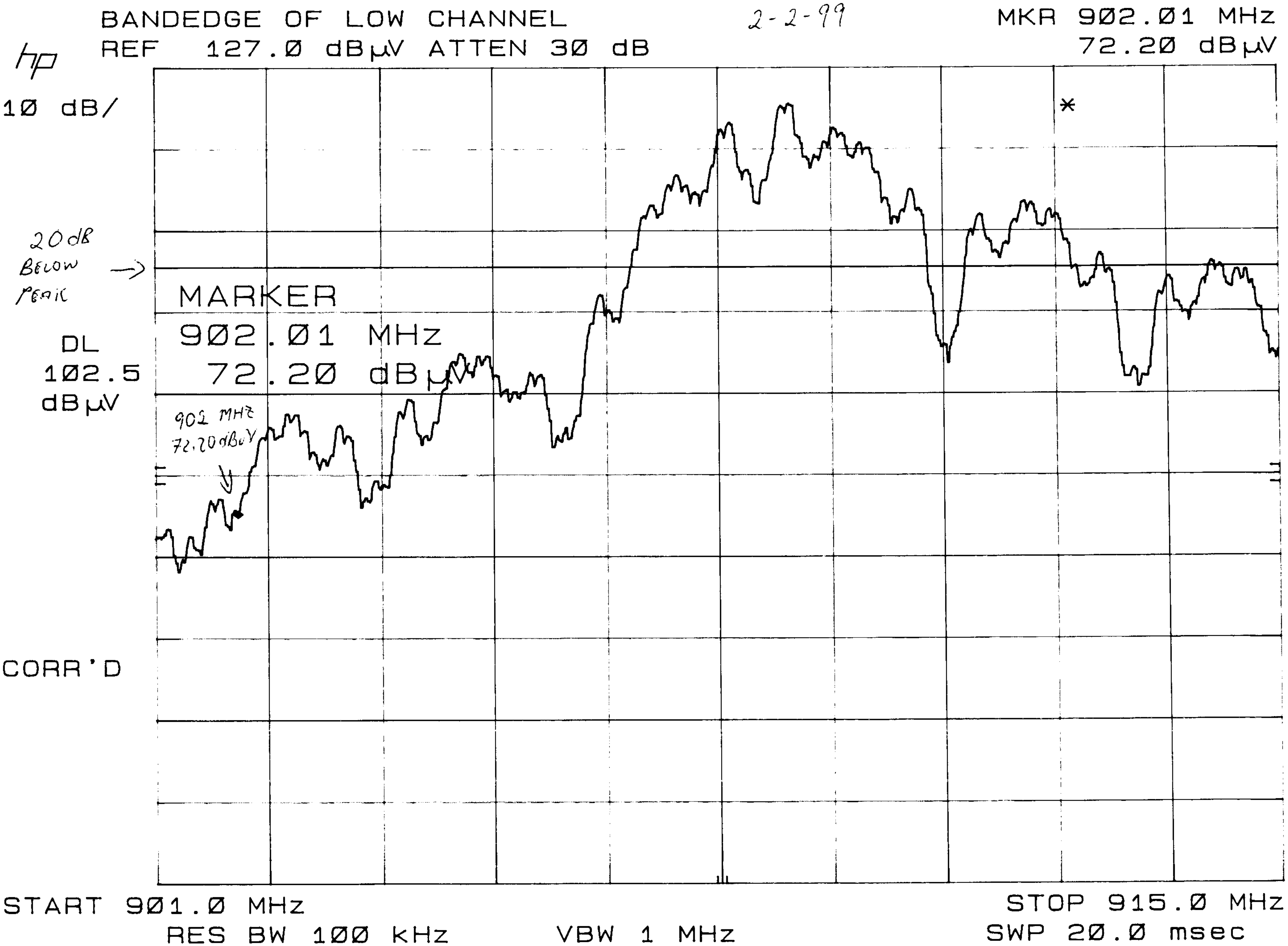

2-2-99
RF ANT. COND. TEST 1GHZ-2GHZ HIGH CHANNEL
MKR 1.910 GHz
REF 127.0 dBµV ATTEN 40 dB
62.80 dBµV
hp
10 dB/
MARKER
1.910 GHz
62.80 dBµV
DL
101.1
dBµV
CORR'D
START 1.00 GHz
RES BW 100 kHz
VBW 1 MHz
STOP 2.00 GHz
SWP 300 msec

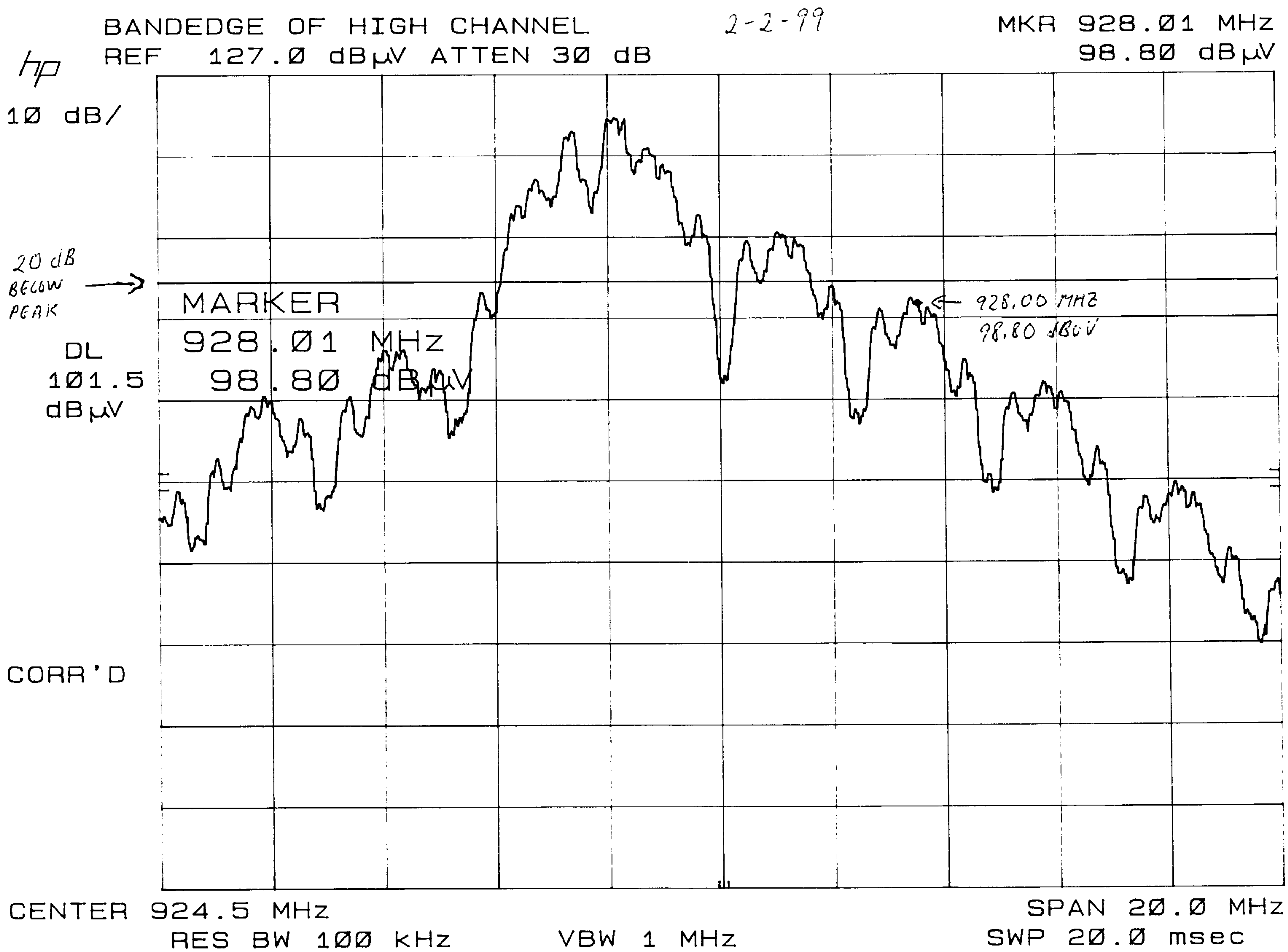
2-2-99


RF ANT. COND. TEST 2GHZ-10GHZ HIGH CHANNEL
MKR 6.656 GHz
68.50 dBμV
REF 127.0 dBμV ATTEN 40 dB
hp
10 dB/
MARKER
6.656 GHz
68.50 dBμV
DL
101.1
dBμV
CORR'D
START 2.00 GHz
STOP 10.00 GHz
RES BW 100 kHz
VBW 1 MHz
SWP 2.40 sec

RF BAND EDGES DATA SHEETS

RETURN TO TEST PROCEDURES


BANDEDGE OF LOW CHANNEL
2-2-99
MKR 902.01 MHz
72.20 dBμV
REF 127.0 dBμV ATTEN 30 dB
hp
10 dB/
20 dB BELOW PEAK
MARKER
902.01 MHz
72.20 dBμV
DL
102.5
dBμV
902 MHz
72.20 dBμV
CORR'D
START 901.0 MHz
RES BW 100 kHz
VBW 1 MHz
STOP 915.0 MHz
SWP 20.0 msec



BANDEDGE OF HIGH CHANNEL
2-2-99
MKR 928.01 MHz
98.80 dBμV
hp
REF 127.0 dBμV ATTEN 30 dB
10 dB/
20 dB BELOW PEAK
MARKER
928.01 MHz
98.80 dBμV
928.00 MHz
98.80 dBμV
DL
101.5
dBμV
CORR'D
CENTER 924.5 MHz
RES BW 100 kHz
VBW 1 MHz
SPAN 20.0 MHz
SWP 20.0 msec

PROCESSING GAIN DATA SHEETS

RETURN TO TEST PROCEDURES

PROCESSING GAIN TEST

CHANNEL 3 (915.00 MHz)

Jammer Freq. (MHz)	Signal Level (dBm)	CW Noise (dBm)	Mj J/S ratio (dB)	Processing Gain (dBm)
913.50	-60.00	-60.70	-0.70	16.70
913.55	-60.00	-61.10	-1.10	16.30
913.60	-60.00	-62.30	-2.30	15.10
913.65	-60.00	-62.50	-2.50	14.90
913.70	-60.00	-63.50	-3.50	13.90
913.75	-60.00	-65.00	-5.00	12.40
913.80	-60.00	-64.10	-4.10	13.30
913.85	-60.00	-64.40	-4.40	13.00
913.90	-60.00	-64.10	-4.10	13.30
913.95	-60.00	-65.00	-5.00	12.40
914.00	-60.00	-63.90	-3.90	13.50
914.05	-60.00	-64.70	-4.70	12.70
914.10	-60.00	-64.70	-4.70	12.70
914.15	-60.00	-64.70	-4.70	12.70
914.20	-60.00	-64.30	-4.30	13.10
914.25	-60.00	-64.90	-4.90	12.50
914.30	-60.00	-64.40	-4.40	13.00
914.35	-60.00	-64.10	-4.10	13.30
914.40	-60.00	-64.30	-4.30	13.10
914.45	-60.00	-64.30	-4.30	13.10
914.50	-60.00	-65.60	-5.60	11.80
914.55	-60.00	-66.00	-6.00	11.40
914.60	-60.00	-66.20	-6.20	11.20
914.65	-60.00	-66.40	-6.40	11.00
914.70	-60.00	-65.10	-5.10	12.30
914.75	-60.00	-64.60	-4.60	12.80
914.80	-60.00	-64.20	-4.20	13.20
914.85	-60.00	-63.50	-3.50	13.90
914.90	-60.00	-63.80	-3.80	13.60
914.95	-60.00	-63.40	-3.40	14.00

S/N ratio	**17.4**
System Loss	**0**

Processing Gain =
Mj J/S ratio + System Loss + S/N ratio.

PROCESSING GAIN TEST

CHANNEL 3 (915.00 MHz)

Jammer Freq. (MHz)	Signal Level (dBm)	CW Noise (dBm)	Mj J/S ratio (dB)	Processing Gain (dBm)
915.00	-60.00	-63.60	-3.60	13.80
915.05	-60.00	-63.10	-3.10	14.30
915.10	-60.00	-63.10	-3.10	14.30
915.15	-60.00	-63.50	-3.50	13.90
915.20	-60.00	-63.20	-3.20	14.20
915.25	-60.00	-64.20	-4.20	13.20
915.30	-60.00	-64.40	-4.40	13.00
915.35	-60.00	-64.50	-4.50	12.90
915.40	-60.00	-64.80	-4.80	12.60
915.45	-60.00	-64.80	-4.80	12.60
915.50	-60.00	-62.80	-2.80	14.60
915.55	-60.00	-63.00	-3.00	14.40
915.60	-60.00	-63.00	-3.00	14.40
915.65	-60.00	-62.10	-2.10	15.30
915.70	-60.00	-62.20	-2.20	15.20
915.75	-60.00	-62.60	-2.60	14.80
915.80	-60.00	-62.50	-2.50	14.90
915.85	-60.00	-63.10	-3.10	14.30
915.90	-60.00	-64.00	-4.00	13.40
915.95	-60.00	-62.90	-2.90	14.50
916.00	-60.00	-63.20	-3.20	14.20
916.05	-60.00	-63.80	-3.80	13.60
916.10	-60.00	-63.30	-3.30	14.10
916.15	-60.00	-61.80	-1.80	15.60
916.20	-60.00	-62.50	-2.50	14.90
916.25	-60.00	-62.50	-2.50	14.90
916.30	-60.00	-62.10	-2.10	15.30
916.35	-60.00	-61.80	-1.80	15.60
916.40	-60.00	-62.30	-2.30	15.10
916.45	-60.00	-60.60	-0.60	16.80
916.50	-60.00	-60.70	-0.70	16.70

S/N ratio	**17.4**
System Loss	**0**

Processing Gain =
Mj J/S ratio + System Loss + S/N ratio.