EXHIBIT 5

TECHNICAL TEST REPORT

FCC SUBPART C
TEST REPORT

for

AATC TRANSMITTER

Model: (P/N) 1721375-100

Prepared for:

RAYTHEON SYSTEMS COMPANY
2000 EAST EL SEGUNDO BOULEVARD
EL SEGUNDO, CALIFORNIA 90245

Prepared by: ______________

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DATE: JUNE 22, 1998

	REPORT BODY	APPENDICES				TOTAL
		A	*B*	*C*	*D*	
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B	Antenna and Effective Gain Factors
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D	Converter Amplifier and RF Assembly Descriptions.

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1	Plot Map And Layout of Test Site
2	Processing Gain Test Setup

GENERAL REPORT SUMMARY

This electromagnetic emission and immunity 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.

The immunity data included in this report are not covered by NVLAP accreditation. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Device Tested:	AATC Transmitter Model: (P/N) 1721375-100 S/N: 005
Modifications:	The EUT was modified in order to meet the specifications. Please see list located in Appendix C.
Manufacturer:	Raytheon Systems Company 2000 East El Segundo Boulevard El Segundo, California 90245
Test Dates:	February 2 and 3, 1998
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	This test was not performed because the EUT runs off of DC power only and cannot be connected into the AC public mains.
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 – 25 GHz	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.209(c)
4	Emissions produced by the intentional radiator in restricted bands, 10 kHz – 25 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 AATC Transmitter Model: (P/N) 1721375-100. 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 AATC Transmitter, referred to as EUT hereafter, are within the specification limits defined by FCC Title 47, Part 15, Subpart C, section 15.247.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

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

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

Raytheon Systems Company

D.N. Johnson	AATC Program Manager

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, 1998.

2.5 Disposition of the Test Sample

The test sample was returned to Raytheon Systems Company on February 4, 1998.

2.6 Abbreviations and Acronyms

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

HP	Hewlett Packard	RF	Radio Frequency
P/N	Part Number	EMI	Electromagnetic Interference
LISN	Line Impedance Stabilization Network	S/N	Serial Number
ITE	Information Technology Equipment	EUT	AATC Transmitter

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 1997	FCC Rules - Radio frequency devices (including digital devices).
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.

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

Specifics of the EUT and Peripherals Tested

The AATC Transmitter Model: (P/N) 1721375-100 (EUT) was placed on the wooden. The low (channel 1), medium (channel 16), and high (channel 31) channels were tested. The EUT was connected to the computer, DC power supply, and antenna via its data, input power, and antenna ports, respectively. The computer was connected to a mouse, keyboard, and monitor via its mouse, keyboard, and video ports, respectively. The computer system was located thirty feet from the test site. The EUT was constantly transmitting and sending data to the computer. The data ports on the EUT are wired in parallel, adding the second cable to the second data port on the EUT does not increase the emissions. The EUT was investigated for emissions in this configuration. All initial investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously in the configuration above. The final radiated data was taken with only one data port terminated, since the 2nd data cable did not increase the emissions. 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 6 foot foil shielded cable connecting the mouse to the computer. It has a 6 pin mini DIN metallic connector at the computer end and is hard wired into the mouse. The shield of the cable was grounded to the chassis via the connector.

Cable 2

This is a 4 foot shielded cable connecting the keyboard to the computer. It has a 6 pin mini DIN metallic connector at the computer end and is hard wired into the keyboard. The shield of the cable was grounded to the chassis via the connector.

Cable 3

This is a 6 foot braid and foil shielded cable connecting the monitor to the computer. It has a high density D-15 pin metallic connector at the computer end and is hard wired into the monitor and is hard wired into the monitor. The shield of the cable was grounded to the chassis via the connectors. The cable has a molded ferrite at the monitor end.

Cable 4

This is a 25 foot foil shielded cable connecting the EUT to the computer. It has a D-9 pin metallic connector at the computer end and a metallic Bendix connector at the EUT end. The shield of the cable was grounded to the chassis via the connectors.

Cable 5

This is a 3 foot unshielded cable connecting the EUT to the DC Power Supply. It has a triple banana plug connector at the DC power supply end and a metallic Bendix connector at the EUT end.

Cable 6

This is a 7 foot braid shielded cable connecting the EUT to the antenna. It has a metallic 'N" connector at each end. The cable was bundled to a 1 meter coil. The shield of the cable was grounded to the chassis via the connectors.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
AATC TRANSMITTER	RAYTHEON SYSTEMS COMPANY	(P/N) 1721375-100	005	NYV1721375
MONITOR	MAG TECH. CO. LTD.	DX17F	N/A	IAWDX17F
COMPUTER	GOLDEN STAR TECH., INC.	90 MHZ PENTIUM	N/A	HUSGST-8000PT
MOUSE	LOGITECH	PK32	LI50704 979	DZLMPK32
KEYBOARD	KEYTRONIC	E03601QLKT C	J950316763	N/A
AATC TRANSMITTER (FOR PROC. GAIN ONLY)	RAYTHEON SYSTEMS COMPANY	(P/N) 1721375-100	006	NYV1721375
POWER SUPPLY	HEWLETT PACKARD	6289A	N/A	N/A
POWER SUPPLY (FOR PROCESSING GAIN ONLY)	HEWLETT PACKARD	6291A	N/A	N/A
RF CONTROL MODULE (FOR PROCESSING GAIN ONLY)	RAYTHEON SYSTEMS COMPANY	AATC RTS	2	N/A

5.2 Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
Spectrum Analyzer	Hewlett Packard	8566B	2729A04566	July 2, 1997	1 Year
Preamplifier	Com Power	PA-102	1017	February 22, 1997	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650A	2521A00924	June 16, 1997	1 Year
RF Attenuator	Com-Power	A-410	1602	November 25, 1997	1 Year
LISN	Com Power	LI-200	1764	January 3, 1998	1 Year
LISN	Com Power	LI-200	1771	January 3, 1998	1 Year
LISN	Com Power	LI-200	1775	January 3, 1998	1 Year
LISN	Com Power	LI-200	1780	January 3, 1998	1 Year
Biconical Antenna	Com Power	AB-100	1548	March 27, 1997	1 Year
Log Periodic Antenna	Com Power	AL-100	1012	December 11, 1997	1 Year
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	HP98561A	2522A05178	N/A	N/A
Printer	Hewlett Packard	2225A	2925S33268	N/A	N/A
Plotter	Hewlett Packard	7440A	8726K38417	N/A	N/A
Signal Generator	Giga-Tronics	6062A	9620906	June 16, 1997	1 Year
Microwave Preamplifier	Hewlett Packard	8349B	2548A00432	February 22, 1997	N/A
Computer	Sony	PCV-240	5104422	N/A	N/A
Horn Antenna	Antenna Research	DRG-118/A	1053	December 8, 1995	N/A
Microwave Preamplifier	Com-Power	PA-122	Asset #1339	October 23, 1997	N/A
Harmonic Mixer	Hewlett Packard	11970K	3003A05460	July 14, 1997	1 Year
Amplifier	Hewlett Packard	11975A	2403A00202	August 4, 1997	1 Year
High-Pass Filter	Microwave Circuits, Inc.	H30G08G1	N/A	N/A	N/A

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

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

6.2 EUT Mounting, Bonding and Grounding

For all tests, the EUT was mounted on a 1.0 by 1.5 by 0.8 meter high non-conductive table, which was placed on the ground plane.

The EUT was not grounded.

7. CHARACTERISTICS OF THE TRANSMITTER

Please see the Converter Amplifier and Radio Frequency Assembly descriptions in Appendix D of this report.

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
28.5 dBm	+1/-1 dB

7.2 Channel Number and Frequencies

The RF channel output center frequencies are in 1 MHz steps from 2424.75 MHz for Channel #0 through 2455.75 MHz for Channel #31. In other words, Channel #n is centered at 2424.75 + n (MHz).

For example: Channel #16 is centered at 2424.75 MHz + 16 MHz = 2440.75 MHz

7.3 Chipping Rate

The chipping rate for the AATC radio is 5.0 Mpps. With the filtering used for the Continuous Phase Shift Modulation (CPSM), this results in a 3 dB RF bandwidth of 3 MHz.

7.4 Spreading Gain

The theoretical spreading gain, based on the 21 to 1 chip to symbol ratio, is 13.2 dB.

7.5 Antenna Gain

The antenna pattern gain is 6 to 7 dB, compared to a linear isotropic. When combined with cable and connector losses, the effective gain is 5 to 6 dB.

8. PROCESSING GAIN

This is NOT how FCC defines Gp

Effective processing gain for direct sequence spread spectrum is often tested by measuring the signal to narrow-band interference ratio (S/I) which results in a specified bit error rate (BER). This measured S/I is then compared to the theoretical S/I for a reference narrow-band modulation technique, such as BPSK. The difference between the theoretical S/I and the measured S/I is the effective processing gain.

The AATC radio uses a digital combination of de-spreading, data error correction, and residual data error correction within the Signal Processing Circuit Card Assembly (CCA). Because of this design, direct monitoring of BER is not practical. This is because any burst message which contains a residual error following the data error correction is rejected, and no message is output by the receiving radio. However, the rate of message rejection due to excess bit errors can be monitored, and this can be related to the received BER.

Gp may NOT incl. improvement due to error correction algorithms

The test setup consists of a Personal Computer (PC) connected to two AATC radios by data cables. The two radios are connected to each other via a cabled RF network, including attenuation and an interference source. The PC transfers a series of burst messages to one radio, termed the test asset radio, over a data cable. Each of these burst messages contains 168 bits of data and is addressed to the other radio, termed the radio under test. The test asset radio encodes, spreads, and transmits the message over the air (RF cable) to the radio under test. The error correction algorithm used is a double block 31,19 Reed Solomon code. The radio under test receives, de-spreads, decodes, and error checks each burst message. The radio under test then transfers each received message, which passes the error check, over a second data cable back to the PC. The PC then verifies that the received message is identical to the message which it sent, and counts the number of validly transferred messages. For each group of 50 attempted message transfers, the results is then displayed for the test operator, on the PC's monitor. The interference level is increased until the message throughput is just above an acceptable criteria, and this S/I is noted.

The criteria used for message throughput is >90% acceptance (i.e. <10% loss). When the error correction capability of the data coding is taken into account, this represents a BER of about 3% for randomly distributed errors. The code correction capability is somewhat better for bursts of errors than for random errors.

Therefore, the use of this PC based test program determines the S/I that results in a BER of approximately 3%. And the spectrum spreading processing gain is calculated from this S/I.

Rule of thumb for data transmission is BER ≈ 1×10^{-5}

→ theoretical $(S/N)_o$ must be taken into account

$G_p = (S/N)_o + M_j + L_{sys}$

9. TEST PROCEDURES

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

9.1 Emissions Tests

9.1.1 Radiated Emissions 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 PA-102 Preamplifier was used for frequencies between 30 MHz and 1 GHz. The Hewlett Packard 8349B Microwave Preamplifier was used for frequencies between 1 GHz and 5GHz. The Com Power Microwave Amplifier Model: PA-122 was used for frequencies from 5 GHz to 25 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 25 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.

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.

SECTION 9.1.1.1

RADIATED EMISSIONS DATA SHEETS

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON DATE: 2-2-98

EUT: AATC TRANSMITTER EUT S/N: 005

EUT MODEL: (P/N) 1721375-100 LOCATION: ■ BREA ☐ SILVERADO ☐ AGOURA

SPECIFICATION: FCC 15.247 CLASS: ______ TEST DISTANCE: 3 M LAB: D

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

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

NOTES: CHANNEL 1 (LOW CHANNEL)

DUTY CYCLE
20 log 19.48% =
-14.2dB

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)
2.005	48.1	33.9	2.0	0	26.7	5.1	28.1	37.6	-60.0	97.6
2.424	126.4	112.2	2.0	0	28.2	5.8	28.6	117.6	—	—
4.010	44.8	30.6	2.0	0	29.5	7.5	25.7	41.9	-12.1	54.0
4.848	42.5	28.3	3.0	90	32.3	8.3	23.8	45.1	-8.9	54.0
7.272	42.4	28.2	1.5	270	36.8	10.7	33.6	42.1	-11.9	54.0

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

** DELTA = CORRECTED READING - SPECIFICATION LIMIT

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON DATE: 2-2-98

EUT: AATC TRANSMITTER EUT S/N: 005

EUT MODEL: (P/N) 1721375-100 LOCATION: ■ BREA ☐ SILVERADO ☐ AGOURA

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

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

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

NOTES: CHANNEL 1 (LOW CHANNEL)

Duty Cycle
20 log 19.48%07
-14.2dB

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)
2.005	47.9	33.7	2.0	0	26.7	5.1	28.1	37.4	-60.2	97.6
2.424	112.2	98.0	2.0	0	28.2	5.8	28.6	103.4	—	—
4.010	40.0	25.8	1.0	90	29.5	7.5	25.7	37.1	-16.9	54.0
4.848	42.9	28.7	1.0	270	32.3	8.3	23.8	45.5	-8.5	54.0
7.272	42.0	27.8	1.5	270	36.8	10.7	33.6	41.7	-12.3	54.0

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

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

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON DATE: 2-2-98

EUT: AATC TRANSMITTER EUT S/N: 005

EUT MODEL: (P/N) 1721375-100 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: CHANNEL 16 (MIDDLE CHANNEL)

DUTY CYCLE
20 log 19.48% = -14.2dB

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)
2.005	47.2	33.0	2.0	0	26.7	5.1	28.1	36.7	-60.6	97.3
2.440	126.1	111.9	2.0	0	28.2	5.8	28.6	117.3	–	–
4.010	48.6	34.4	1.5	180	29.5	7.5	25.7	45.7	-8.3	54.0
4.879	42.8	28.6	3.0	90	32.3	8.3	23.8	45.4	-8.6	54.0
7.319	42.8	28.6	1.0	90	36.8	10.7	33.6	42.5	-11.5	54.0

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

** DELTA = CORRECTED READING - SPECIFICATION LIMIT

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON **DATE:** 2-2-98

EUT: AATC TRANSMITTER **EUT S/N:** 005

EUT MODEL: (P/N) 1721375-100 **LOCATION:** ■ BREA ☐ SILVERADO ☐ AGOURA

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

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

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

NOTES: CHANNEL 16 (MIDDLE CHANNEL) DUTY CYCLE 20 log 19.48% = -14.2 dB

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)
2.005	46.6	32.4	1.0	90	26.7	5.1	28.1	36.1	-61.2	97.3
2.440	110.9	96.7	2.0	90	28.2	5.8	28.6	102.1	–	–
4.010	42.2	28.0	1.0	270	29.5	7.5	25.7	39.3	-14.7	54.0
4.879	44.7	30.5	3.0	90	32.3	8.3	23.8	47.3	-6.7	54.0
7.319	43.3	29.1	3.5	180	36.8	10.7	33.6	43.0	-11.0	54.0

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

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

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON DATE: 2-2-98

EUT: AATC TRANSMITTER EUT S/N: 005

EUT MODEL: (P/N) 1721375-100 LOCATION: ■ BREA ☐ SILVERADO ☐ AGOURA

SPECIFICATION: FCC 15.247 CLASS: ______ TEST DISTANCE: 3 M LAB: D

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

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

NOTES: CHANNEL 31 (HIGH CHANNEL) DUTY CYCLE = 20 log 19.48% = -14.2dB

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)
2.005	47.4	33.2	1.0	90	26.7	5.1	28.1	36.9	-58.5	95.4
2.454	124.2	110.0	2.0	90	28.2	5.8	28.6	115.4	—	—
4.010	42.9	28.7	1.5	90	29.5	7.5	25.7	40.0	-14.0	54.0
4.913	43.2	29.0	3.0	90	32.3	8.3	23.8	45.8	-8.2	54.0
7.319	46.3	32.1	3.5	180	36.8	10.7	33.6	46.0	-8.0	54.0

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

** DELTA = CORRECTED READING - SPECIFICATION LIMIT

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON **DATE:** 2-2-98

EUT: AATC TRANSMITTER **EUT S/N:** 005

EUT MODEL: (P/N) 1721375-100 **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: CHANNEL 31 (HIGH CHANNEL)

DUTY CYCLE
20 log 19.48% = -14.2dB

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)
2.005	47.0	32.8	1.0	90	26.7	5.1	28.1	36.5	-58.9	95.4
2.454	111.6	97.4	2.0	90	28.2	5.8	28.6	102.8	–	–
4.010	42.5	28.3	3.0	90	29.5	7.5	25.7	41.5	-12.5	54.0
4.913	43.6	29.4	3.0	90	32.3	8.3	23.8	46.2	-7.8	54.0
7.363	43.4	29.2	1.0	180	36.8	10.7	33.6	43.1	-10.9	54.0

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

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

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375 PAGE 1 of 3

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON DATE: 2-3-98

EUT: AATC TRANSMITTER EUT S/N: 005

EUT MODEL: (P/N) 1721375-100 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 (MHz)	Peak Reading (dBuV/m)	Quasi-Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
30.42	61.6	58.0	1.0	0	-4.2	62.2	
50.06	60.8	—	1.0	180	-4.3	65.1	
55.06	59.6	—	1.0	0	-5.7	65.3	
60.07	53.0	—	1.0	180	-12.5	65.5	
70.09	45.9	—	1.0	0	-20.5	66.4	
80.05	44.7	—	1.0	0	-22.1	66.8	
85.08	44.5	—	1.0	270	-22.3	66.8	
90.01	51.4	—	1.0	180	-18.9	70.3	
100.11	55.4	—	1.0	180	-14.2	69.6	
105.04	61.1	—	1.0	180	-8.1	69.2	
110.10	59.8	—	1.0	0	-9.1	68.9	
115.05	51.3	—	1.0	0	-17.2	68.5	
120.07	51.8	—	1.0	0	-16.4	68.2	

* DELTA = METER READING - CORRECTED LIMIT

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375 PAGE 2 of 3

RADIATED EMISSIONS - CONTINUATION SHEET

COMPANY NAME: RAYTHEON DATE: 2-3-98

EUT: AATC TRANSMITTER EUT S/N: 005

EUT MODEL: (P/N) 1721375-100 ENGINEER: KYLE F

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

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi-Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
225.11	42.4	—	1.0	0	-21.7	64.1	
230.07	49.1	—	1.0	0	-15.1	64.2	
240.05	50.4	—	1.0	0	-13.9	64.3	
400.01	37.9	—	1.0	0	-26.8	64.7	

* DELTA = METER READING - CORRECTED LIMIT

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON DATE: 2-3-98

EUT: AATC TRANSMITTER EUT S/N: 005

EUT MODEL: (P/N) 1721375-100 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 (MHz)	Peak Reading (dBuV/m)	Quasi-Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
50.00	44.0	—	3.0	0	-21.1	65.1	
55.00	48.3	—	2.0	90	-17.0	65.3	
60.08	43.6	—	3.0	0	-21.9	65.5	
80.09	48.8	—	3.0	270	-18.0	66.8	
105.03	57.1	—	4.0	0	-12.1	69.2	
110.09	52.7	—	2.0	0	-16.2	68.9	
150.04	47.3	—	3.0	270	-18.6	65.9	
250.10	42.0	—	3.5	180	-22.5	64.5	
325.11	44.9	—	1.0	0	-20.7	65.6	

* DELTA = METER READING - CORRECTED LIMIT

COMPATIBLE ELECTRONICS

FCC ID: NYV1721375

RADIATED EMISSIONS

COMPANY NAME: RAYTHEON **DATE:** 2-3-98

EUT: AATC TRANSMITTER **EUT S/N:** 005

EUT MODEL: (P/N) 1721375-100 **LOCATION:** ■ BREA ☐ SILVERADO ☐ AGOURA

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

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

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

NOTES:

Frequency (kHz)	Peak Reading (dBuV)	Avg. ☐ Q.P. ☐ (dBuV)	Antenna Height (meters)	Azimuth (degrees)	Distance Factor (dB)	Antenna Gain (dB)	* Corrected Reading (dBuV)	Delta ** (dB)	Spec Limit (dBuV)
		NO EMISSIONS FOUND							
		BETWEEN 10KHZ AND 30 MHZ							

*** CORRECTED READING** = METER READING - DISTANCE FACTOR - ANTENNA GAIN

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

9.2 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 300 kHz.

Test Results:

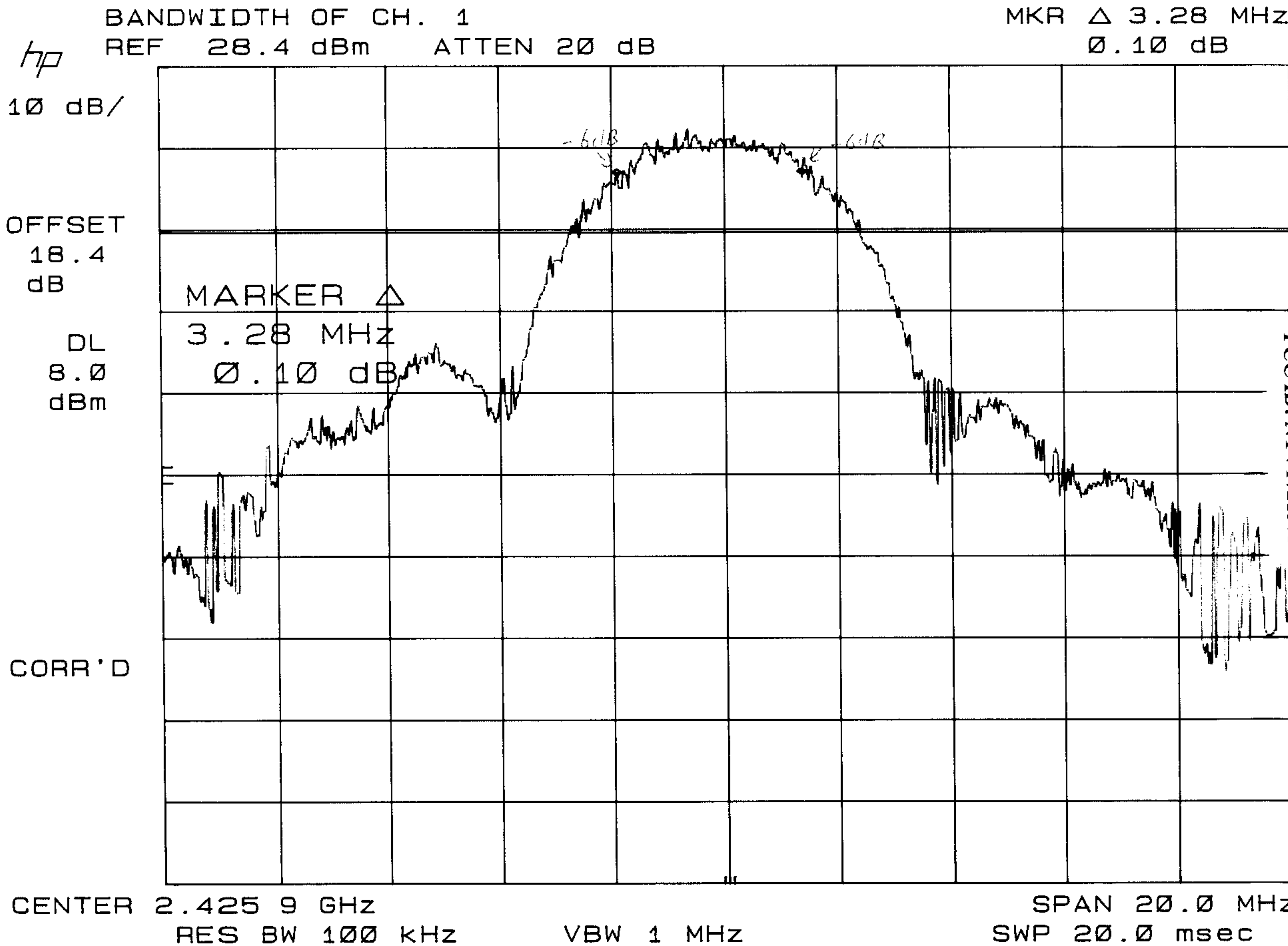
The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (a)(2). The bandwidth is at least 500 kHz.

SECTION 9.2.1

6 dB BANDWIDTH
DATA SHEETS

PAGE 19A

FCC ID: NYV1721375



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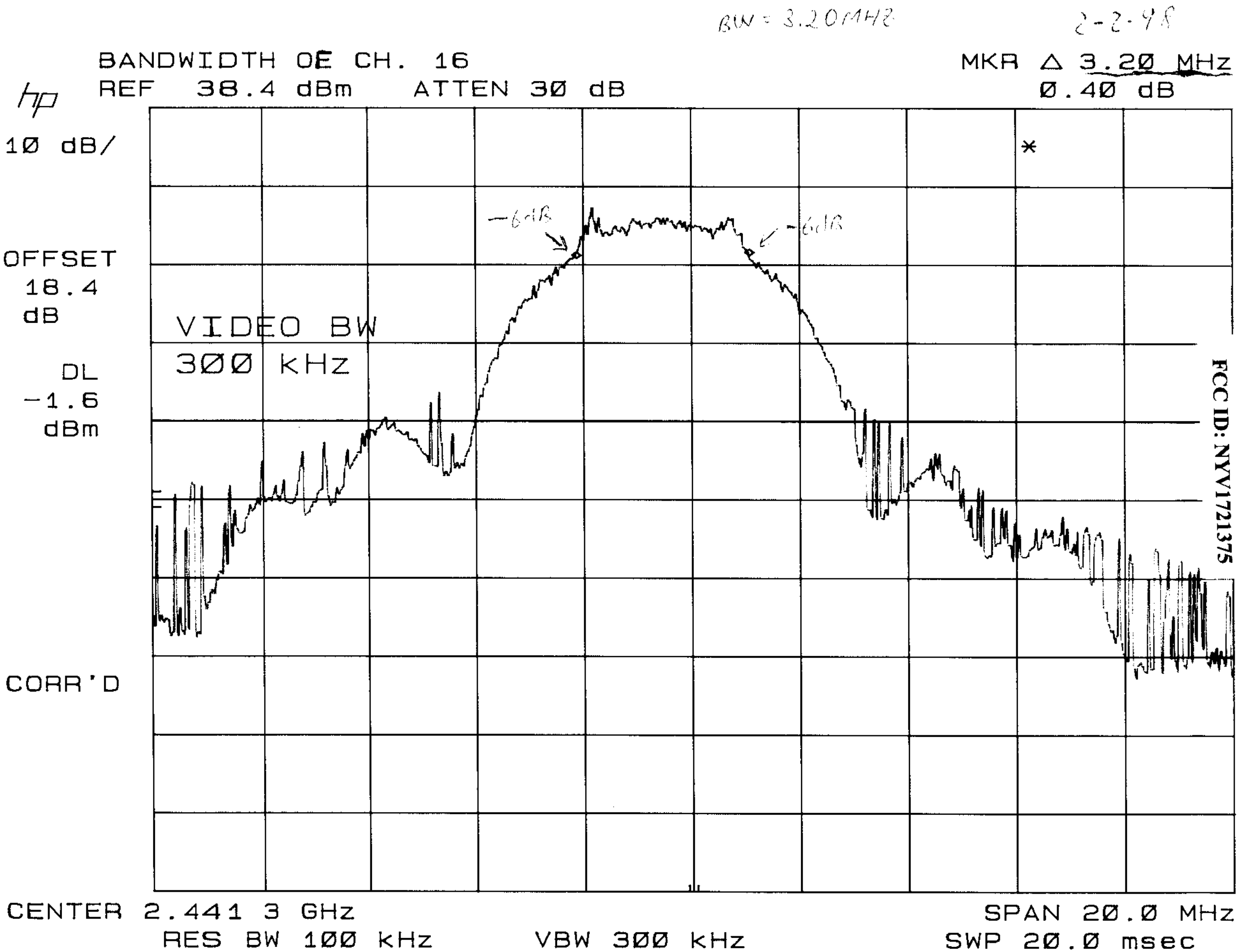
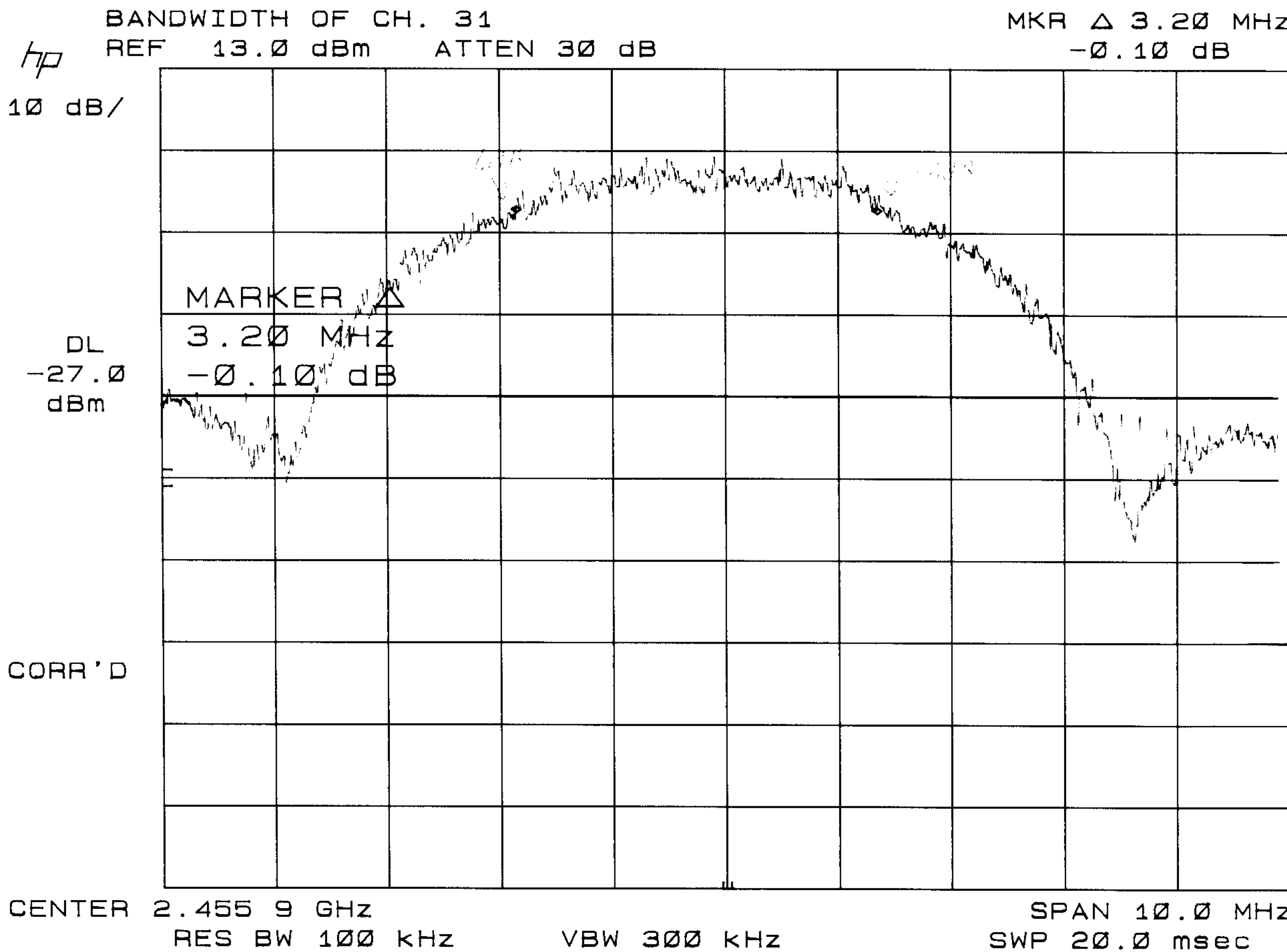



BANDWIDTH OF CH. 31
REF 13.0 dBm ATTEN 30 dB
MKR Δ 3.20 MHz
-0.10 dB
hp
10 dB/
DL
-27.0
dBm
MARKER Δ
3.20 MHz
-0.10 dB
CORR'D
CENTER 2.455 9 GHz
RES BW 100 kHz
VBW 300 kHz
SPAN 10.0 MHz
SWP 20.0 msec

9.3 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.

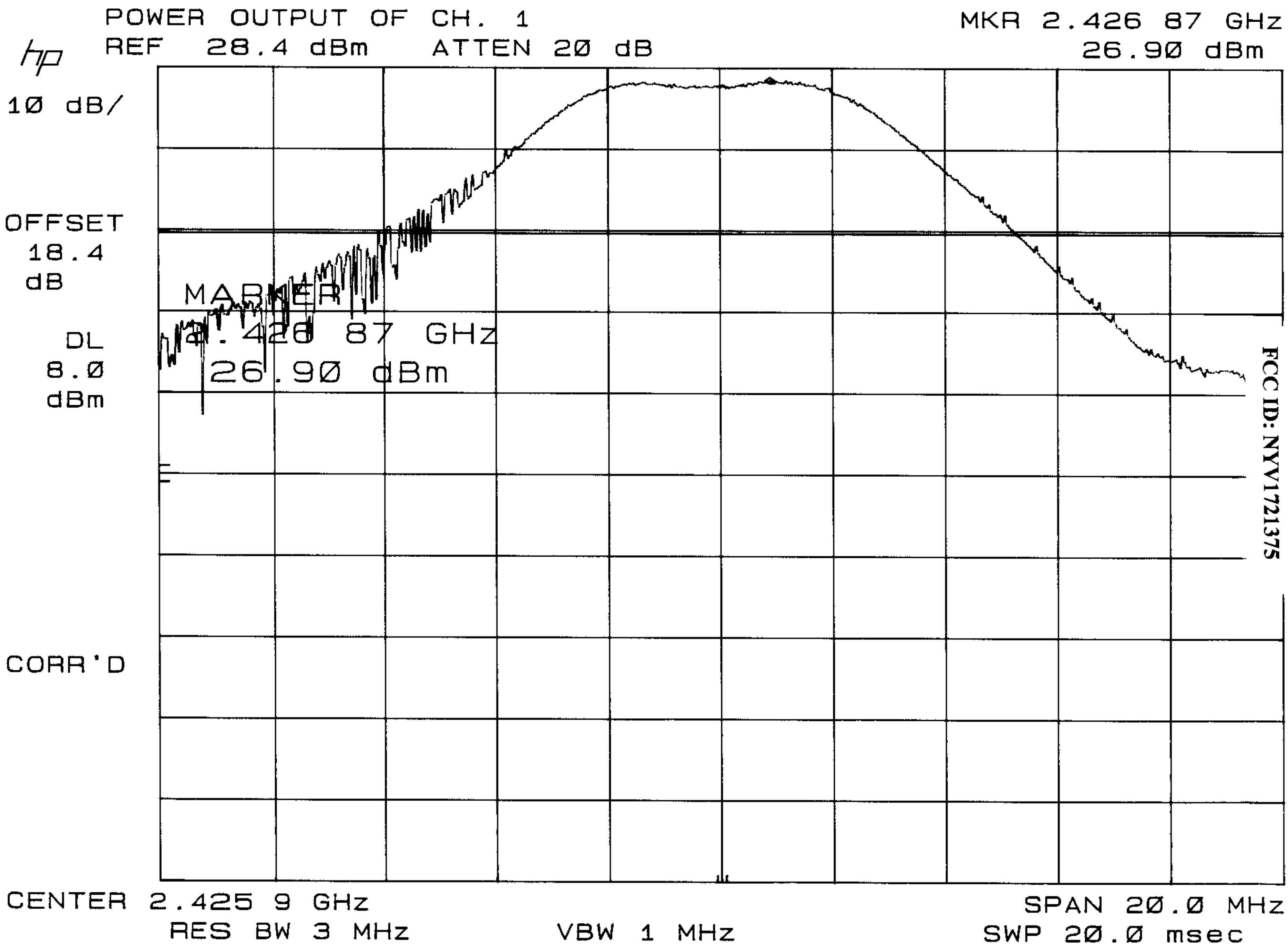
Test Results:

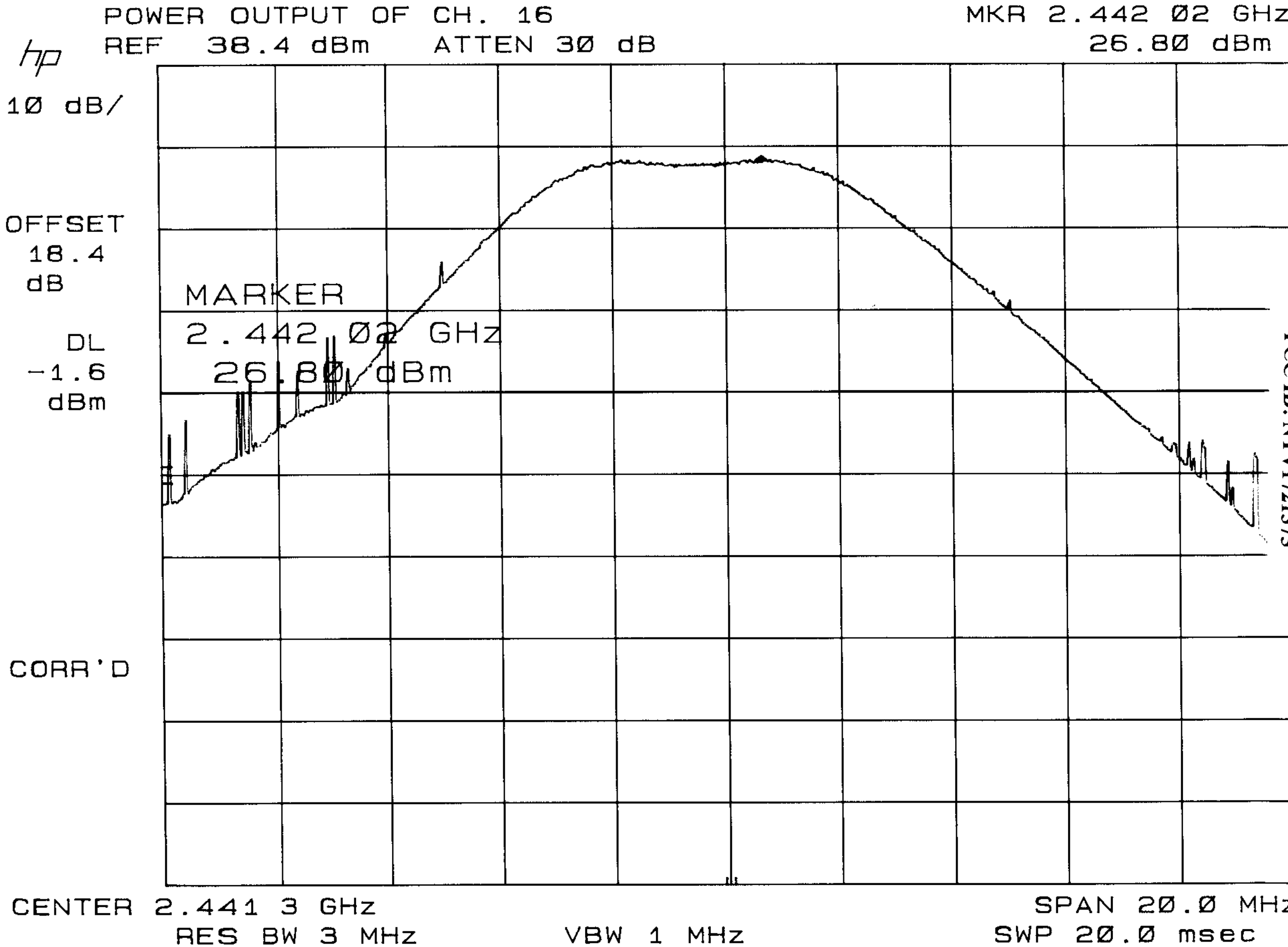
The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (b)(1). The maximum peak output power is less than 1 watt.

SECTION 9.3.1

PEAK OUTPUT POWER DATA SHEETS

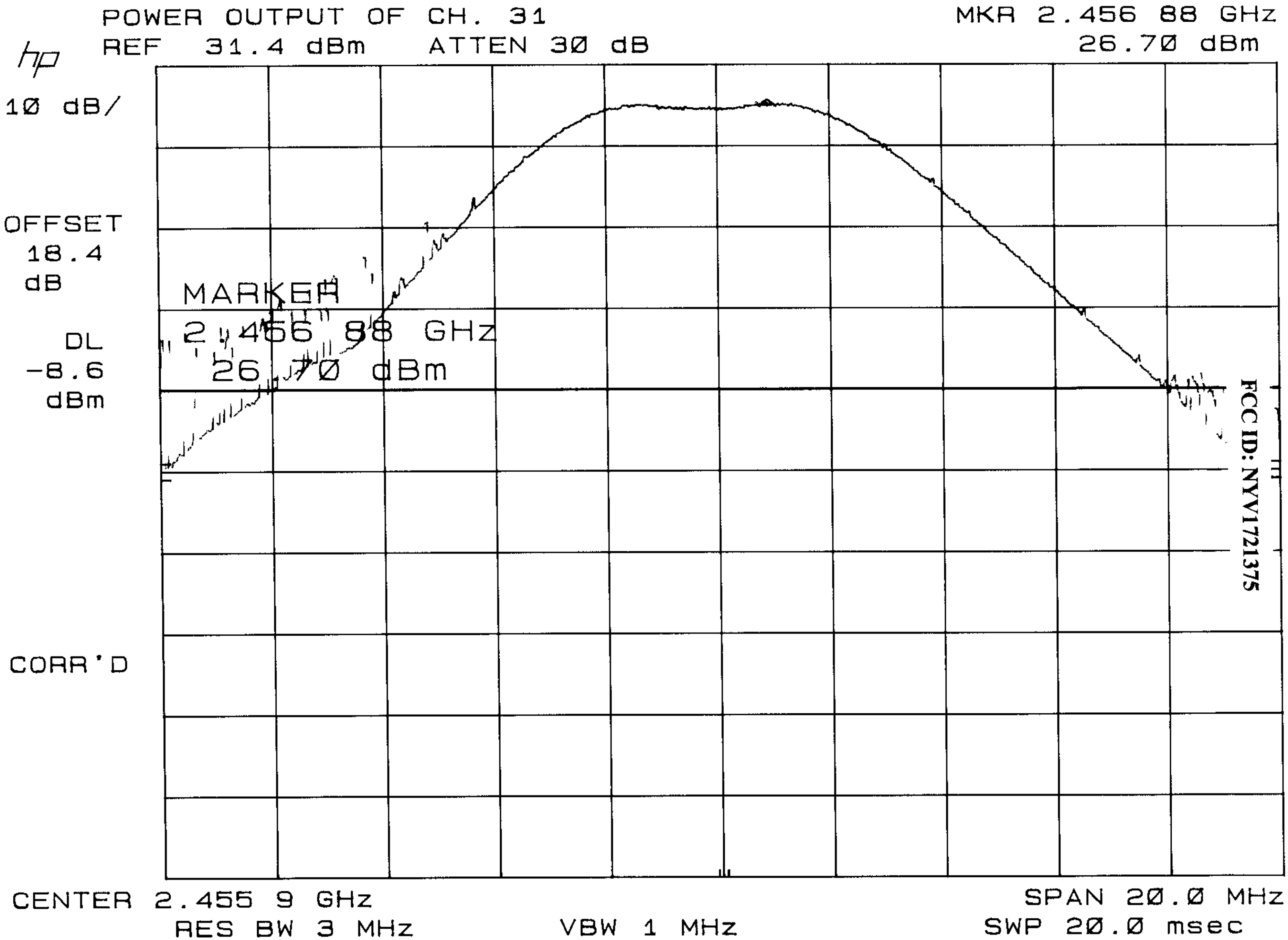
FCC ID: NYV1721375





FCC ID: NYV1721375

FCC ID: NYV1721375



9.4 Spectral Density Output

The spectral density output was taken through an attenuation pad 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 500 kHz of the signal was used as the frequency span with the sweep rate being 1 second for every 3 kHz of span.

Test Results:

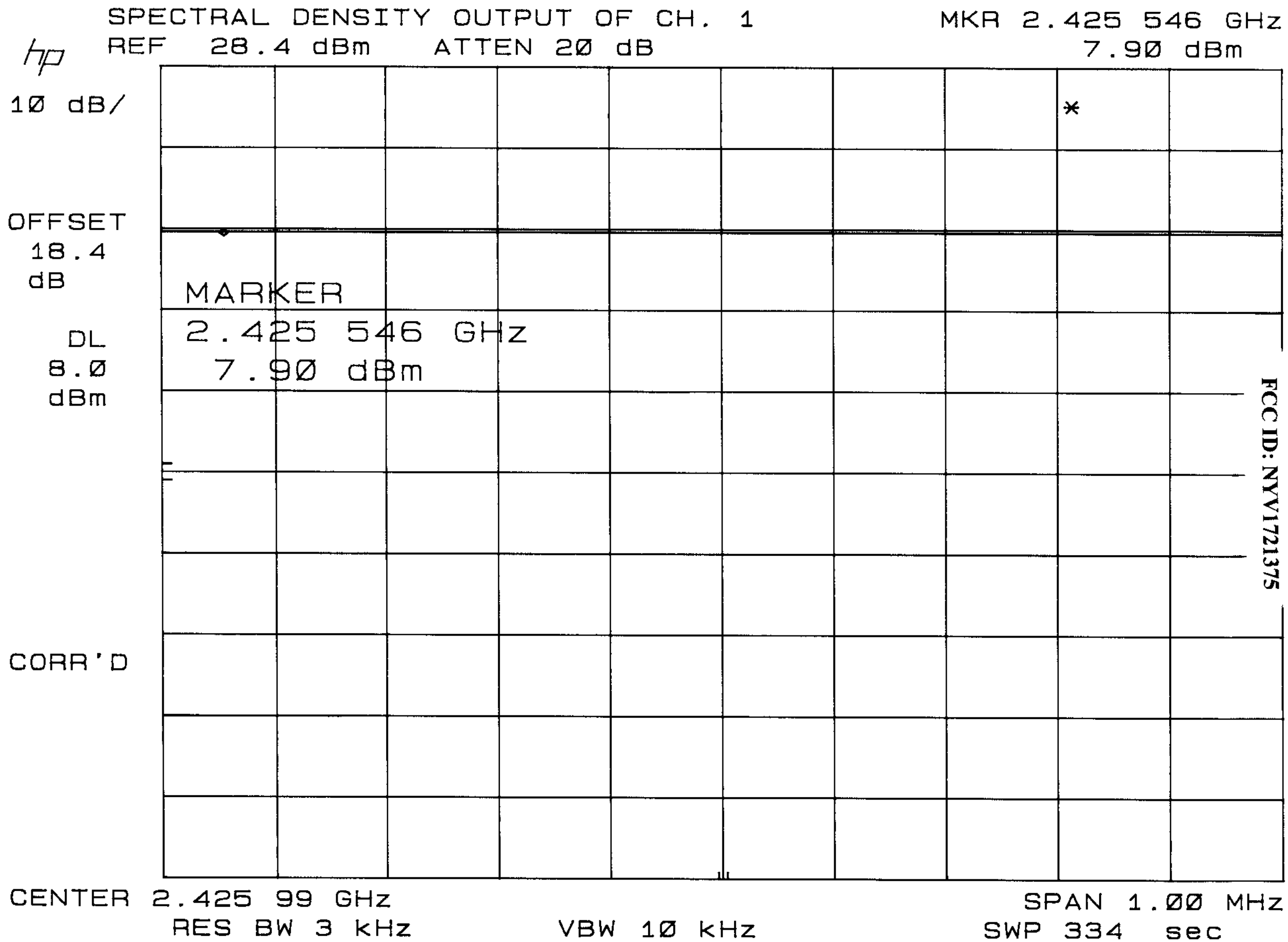
The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (d). The spectral density output does not exceed 8 dBm in any 3 KHz band.

SECTION 9.4.1

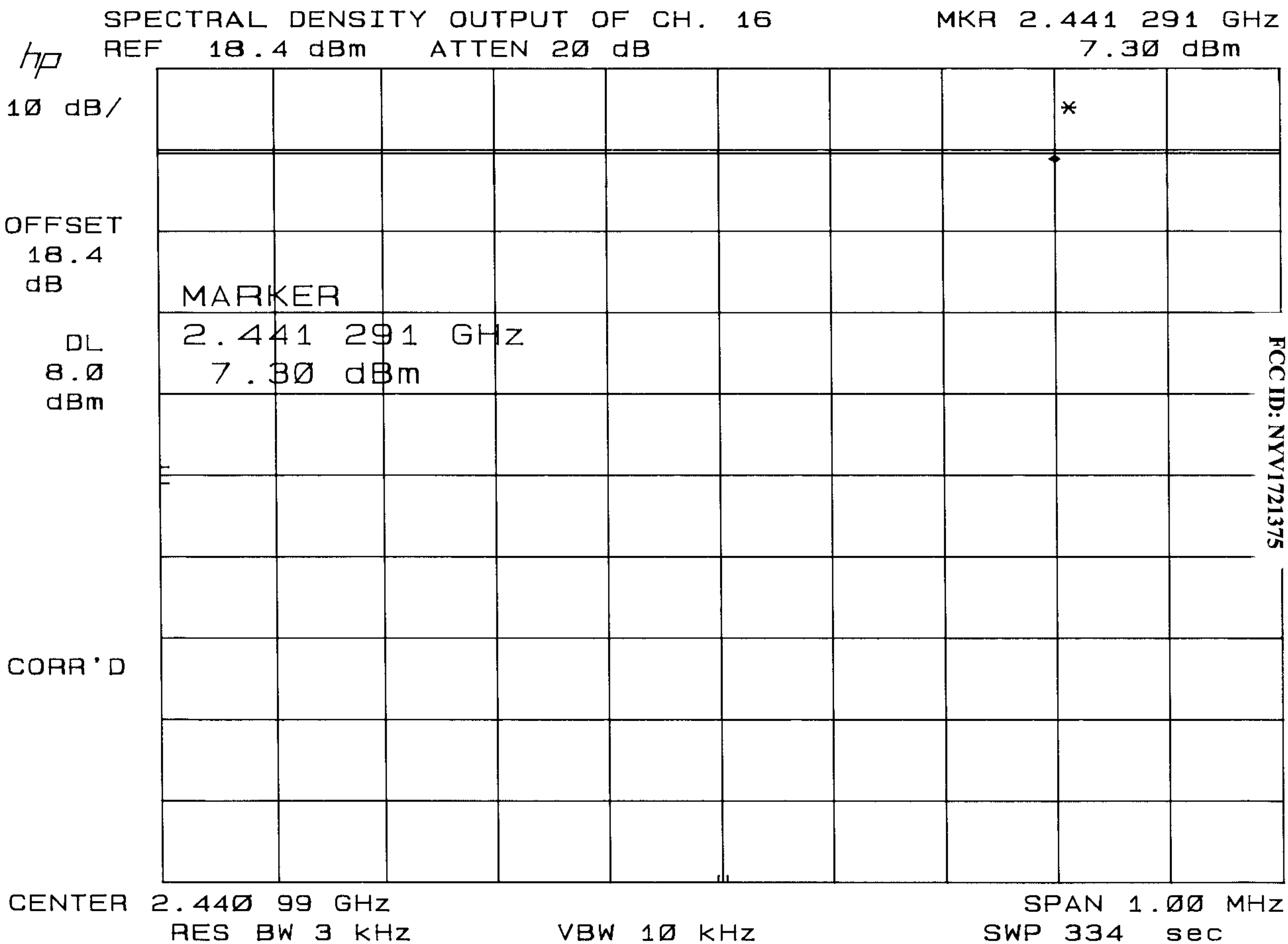
SPECTRAL DENSITY OUTPUT DATA SHEETS

FCC ID: NYV1721375

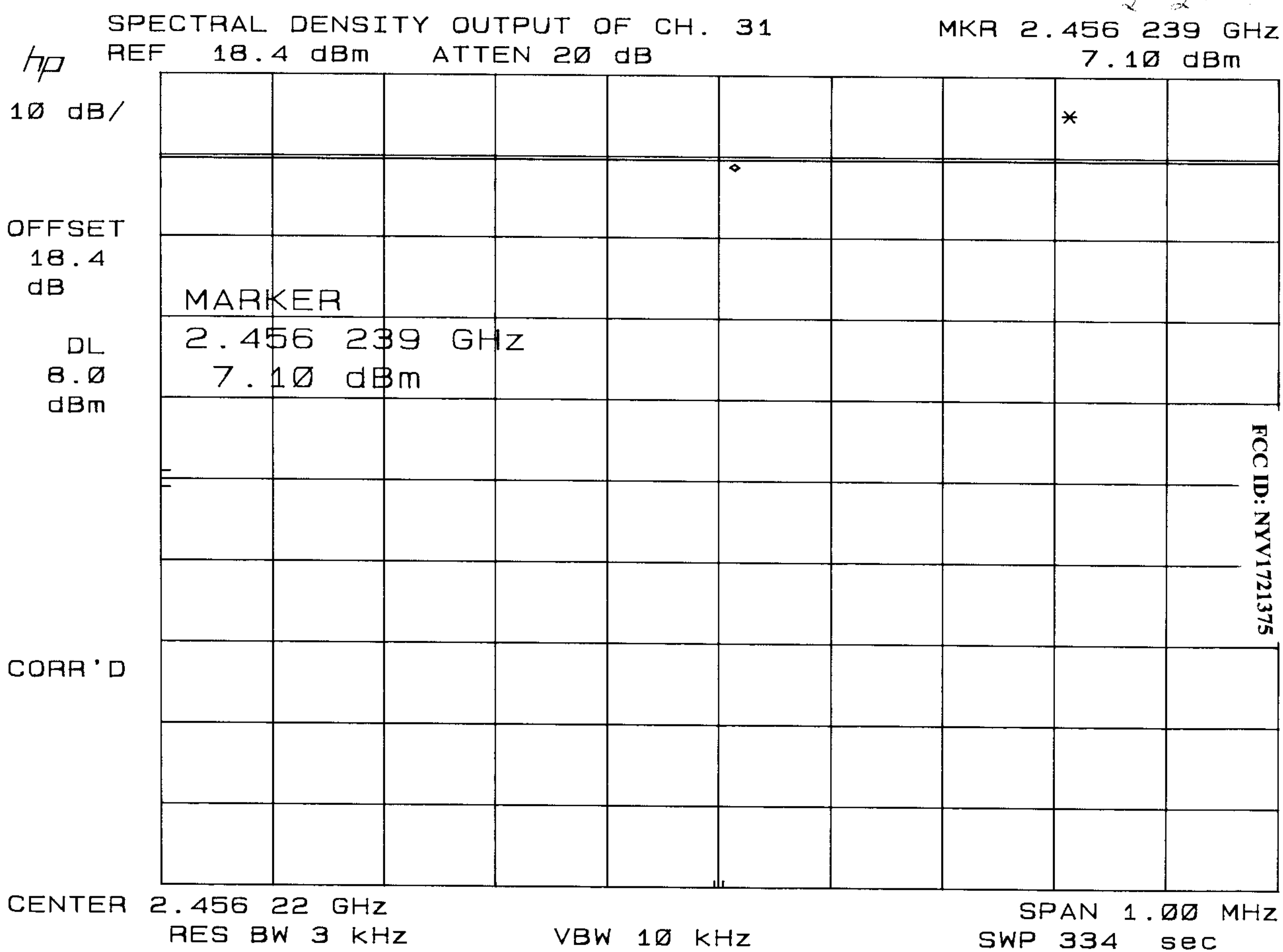
2-2-98



FCC ID: NYV1721375



2-2-98


hp
SPECTRAL DENSITY OUTPUT OF CH. 31
REF 18.4 dBm ATTEN 20 dB
MKR 2.456 239 GHz
7.10 dBm
10 dB/
OFFSET
18.4
dB
DL
8.0
dBm
MARKER
2.456 239 GHz
7.10 dBm
CORR'D
FCC ID: NYV1721375
CENTER 2.456 22 GHz
RES BW 3 kHz
VBW 10 kHz
SPAN 1.00 MHz
SWP 334 sec

9.5 RF Antenna Conducted Test

The RF antenna conducted test was taken through an attenuation pad 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 300 kHz. The spans were wide enough to include all the harmonics and emissions that were produced by the intentional radiator.

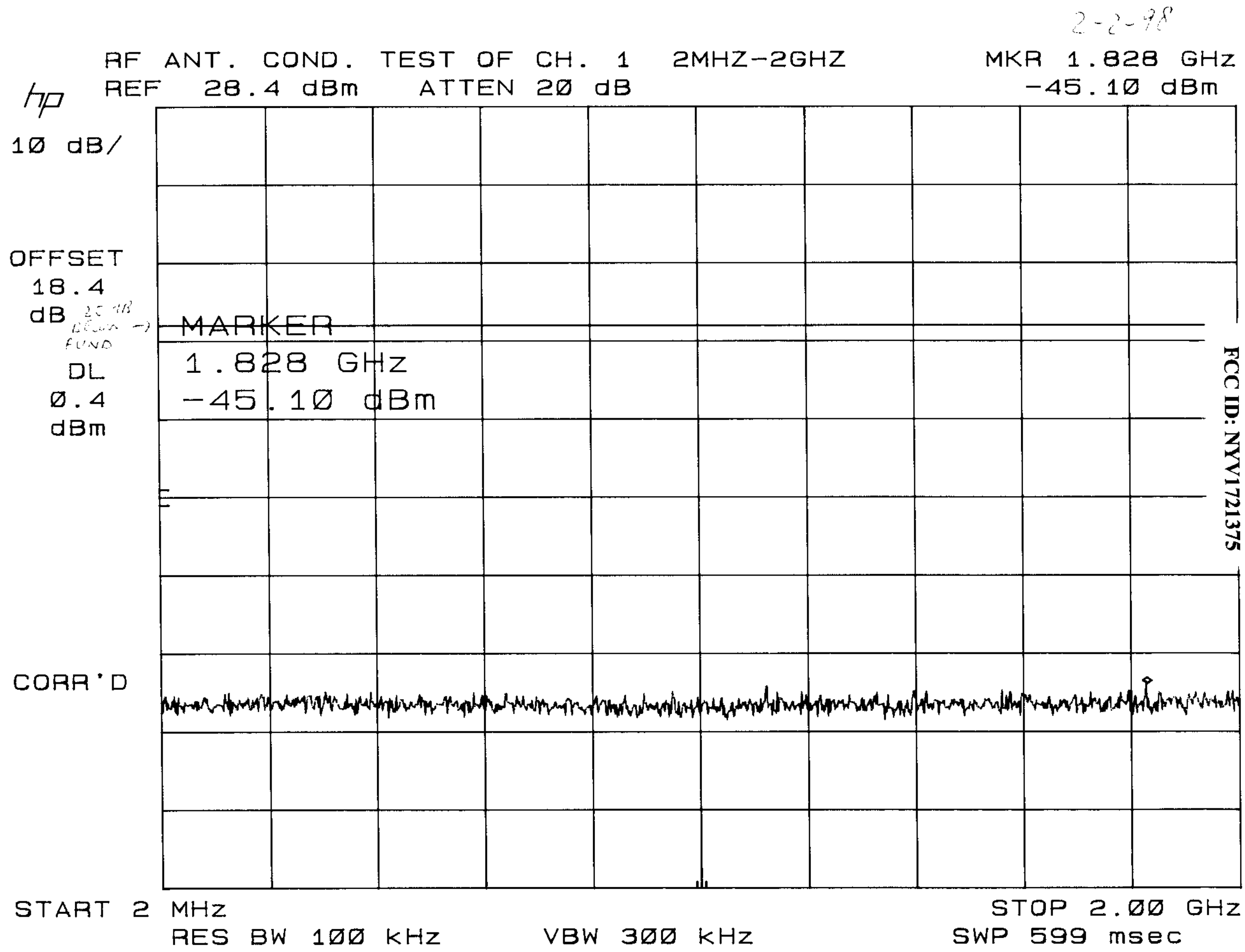
Test Results:

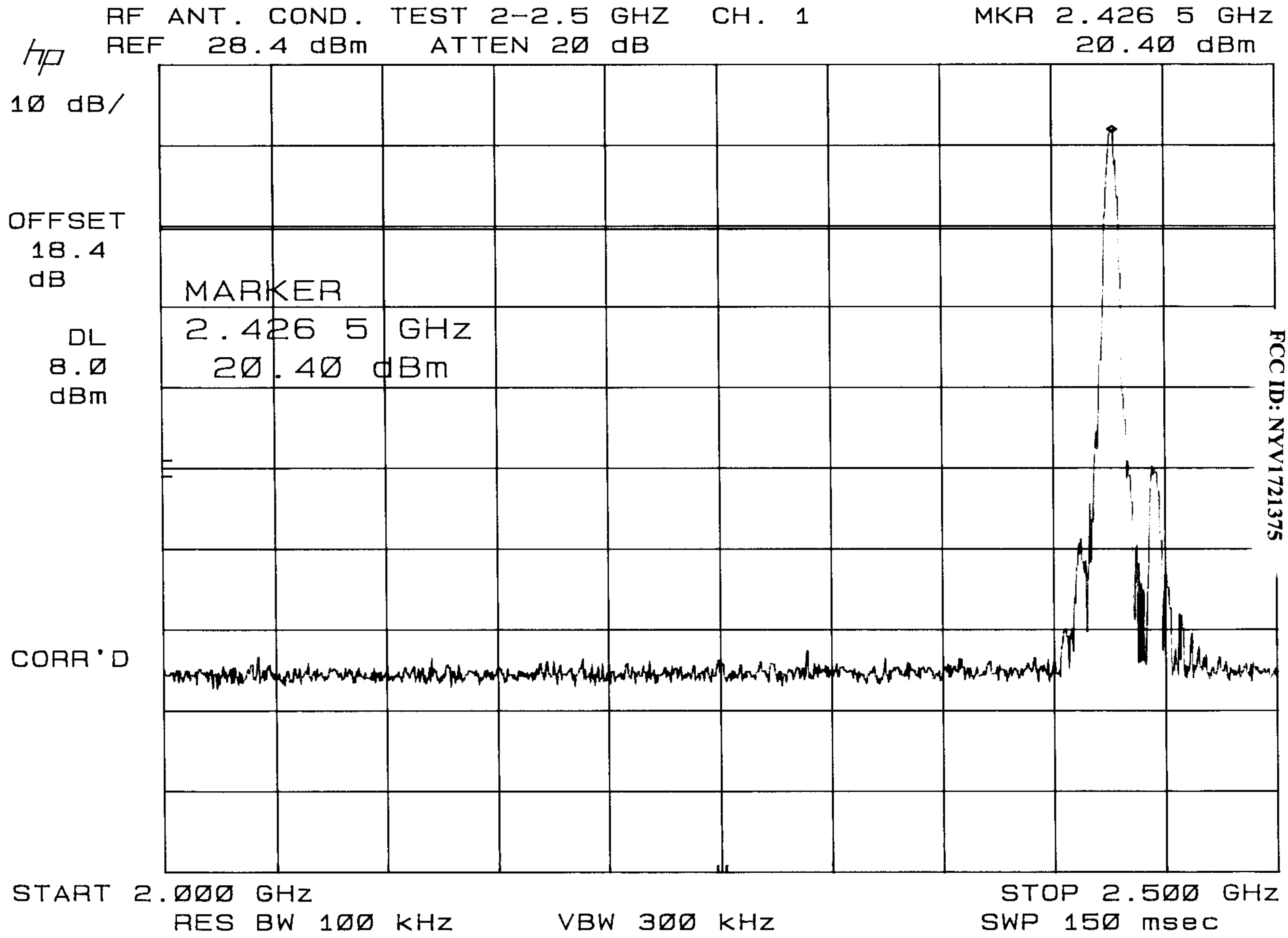
The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (c). The RF power that is produced by the intentional radiator is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

SECTION 9.5.1

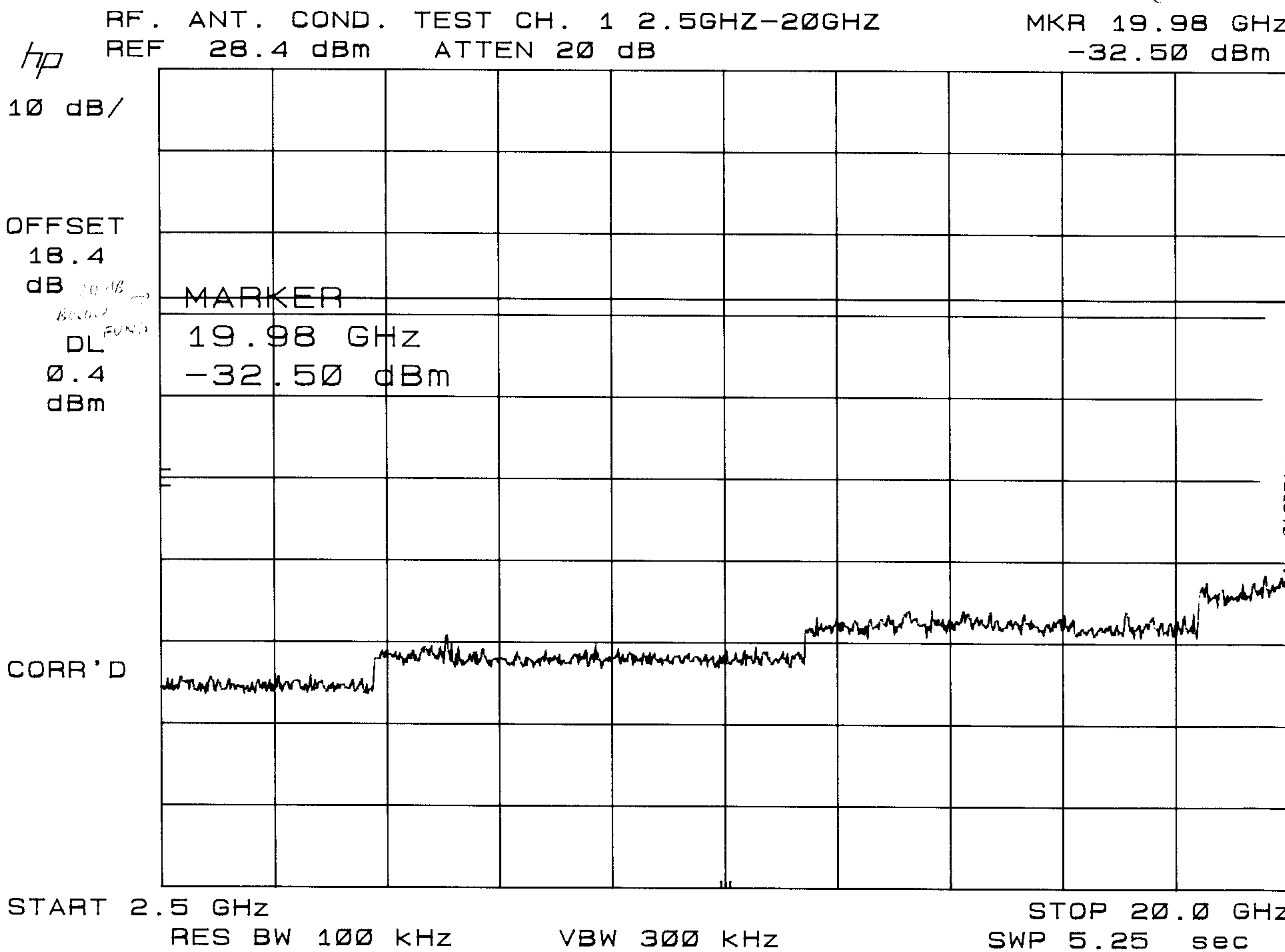
RF ANTENNA CONDUCTED DATA SHEETS

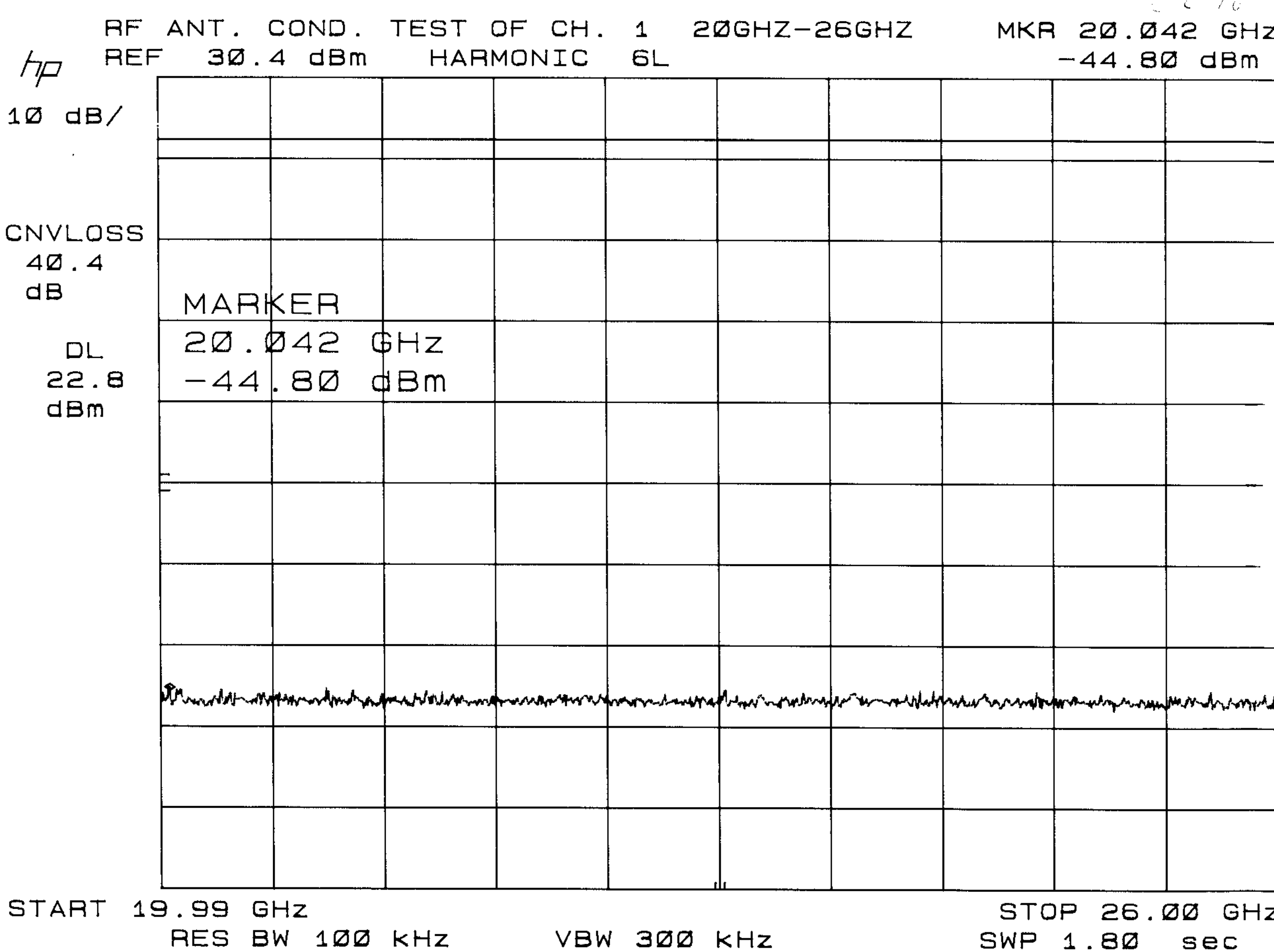
FCC ID: NYV1721375




RF ANT. COND. TEST 2-2.5 GHZ CH. 1
REF 28.4 dBm ATTEN 20 dB
MKR 2.426 5 GHz
20.40 dBm
10 dB/
OFFSET
18.4
dB
DL
8.0
dBm
MARKER
2.426 5 GHz
20.40 dBm
CORR'D
START 2.000 GHz
RES BW 100 kHz
VBW 300 kHz
STOP 2.500 GHz
SWP 150 msec
FCC ID: NYV1721375

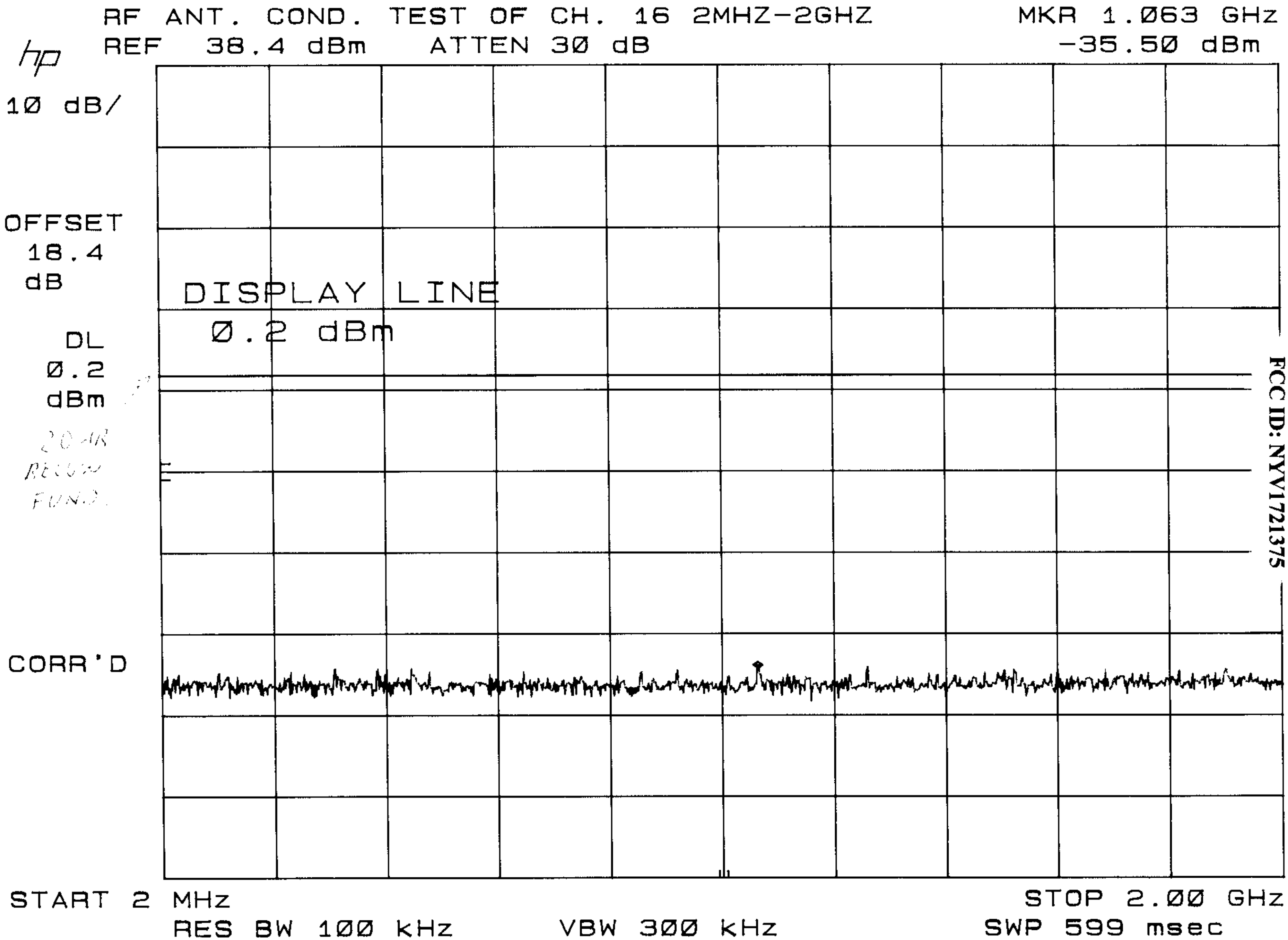
FCC ID: NYV1721375




hp
RF ANT. COND. TEST OF CH. 1 20GHZ-26GHZ
REF 30.4 dBm HARMONIC 6L
MKR 20.042 GHz
-44.80 dBm
10 dB/
CNVLOSS
40.4
dB
DL
22.8
dBm
MARKER
20.042 GHz
-44.80 dBm
START 19.99 GHz
RES BW 100 kHz
VBW 300 kHz
STOP 26.00 GHz
SWP 1.80 sec

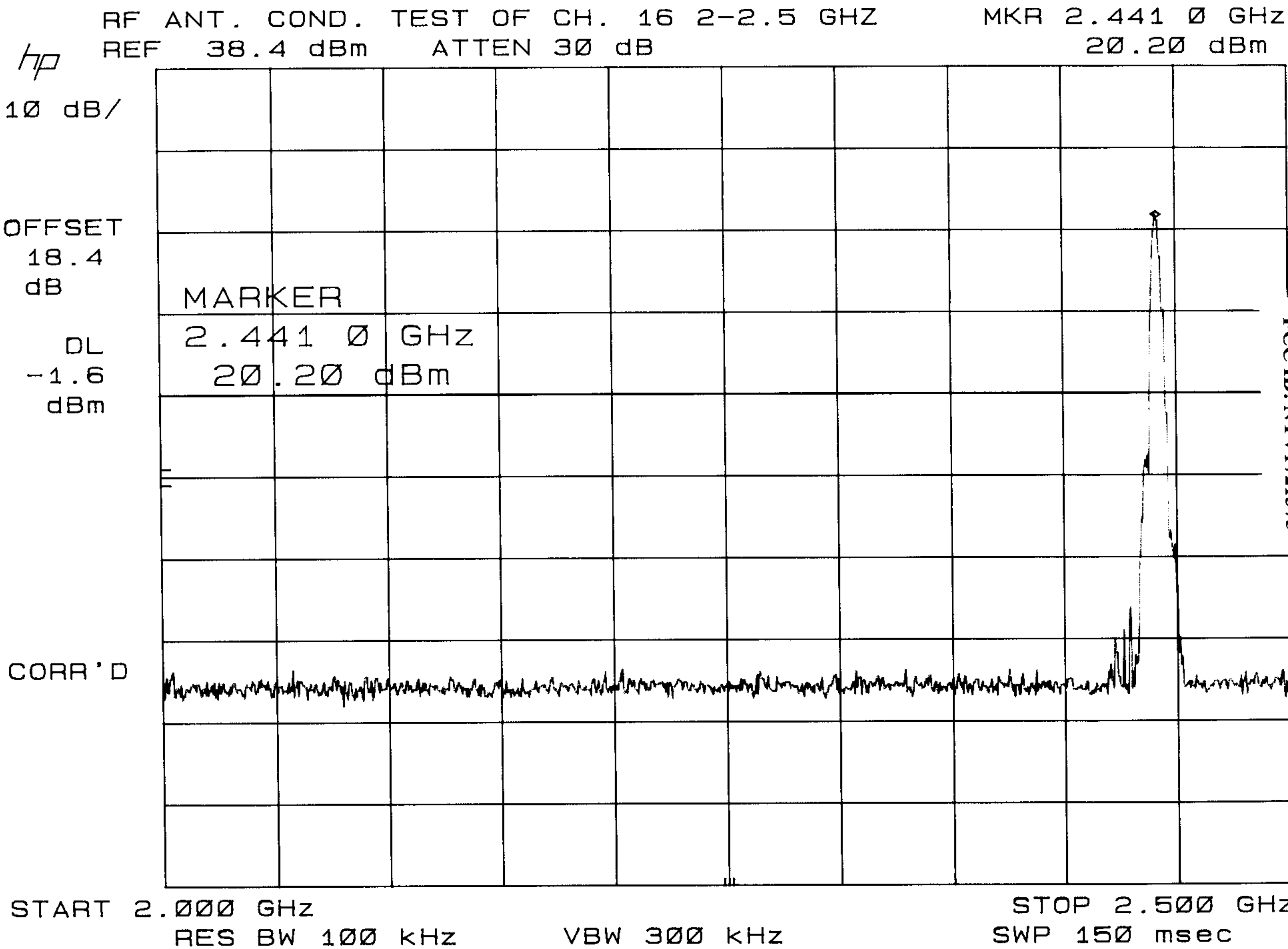
2-2-98

2-2-98



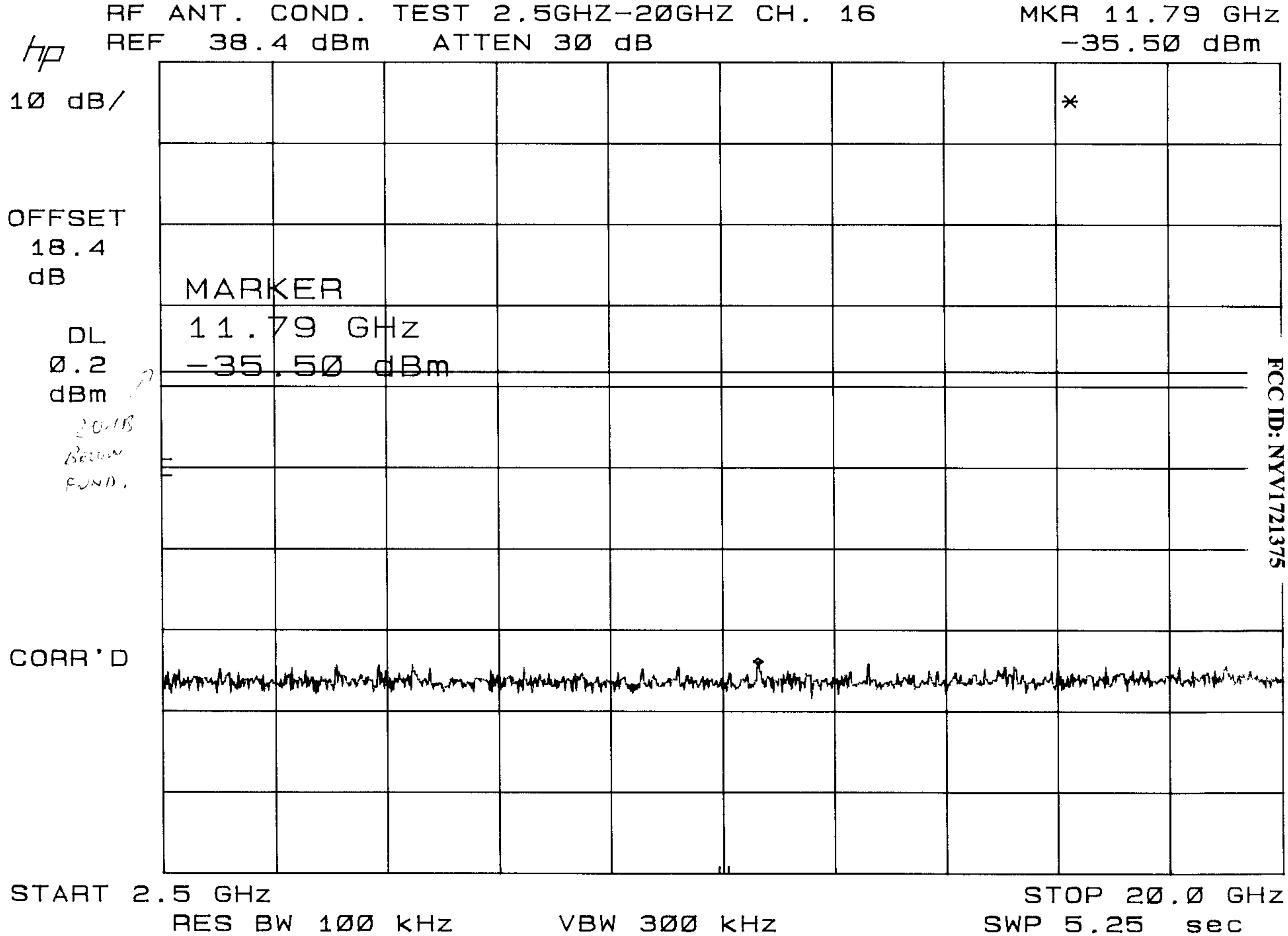
RF ANT. COND. TEST OF CH. 16 2MHZ-2GHZ
REF 38.4 dBm ATTEN 30 dB
MKR 1.063 GHz
-35.50 dBm
hp
10 dB/
OFFSET
18.4
dB
DISPLAY LINE
Ø.2 dBm
DL
Ø.2
dBm
CORR'D
FCC ID: NYV1721375
START 2 MHz
RES BW 100 kHz
VBW 300 kHz
STOP 2.00 GHz
SWP 599 msec

2-2-98



FCC ID: NYV1721375

2-2-98



20dB BELOW FUND.

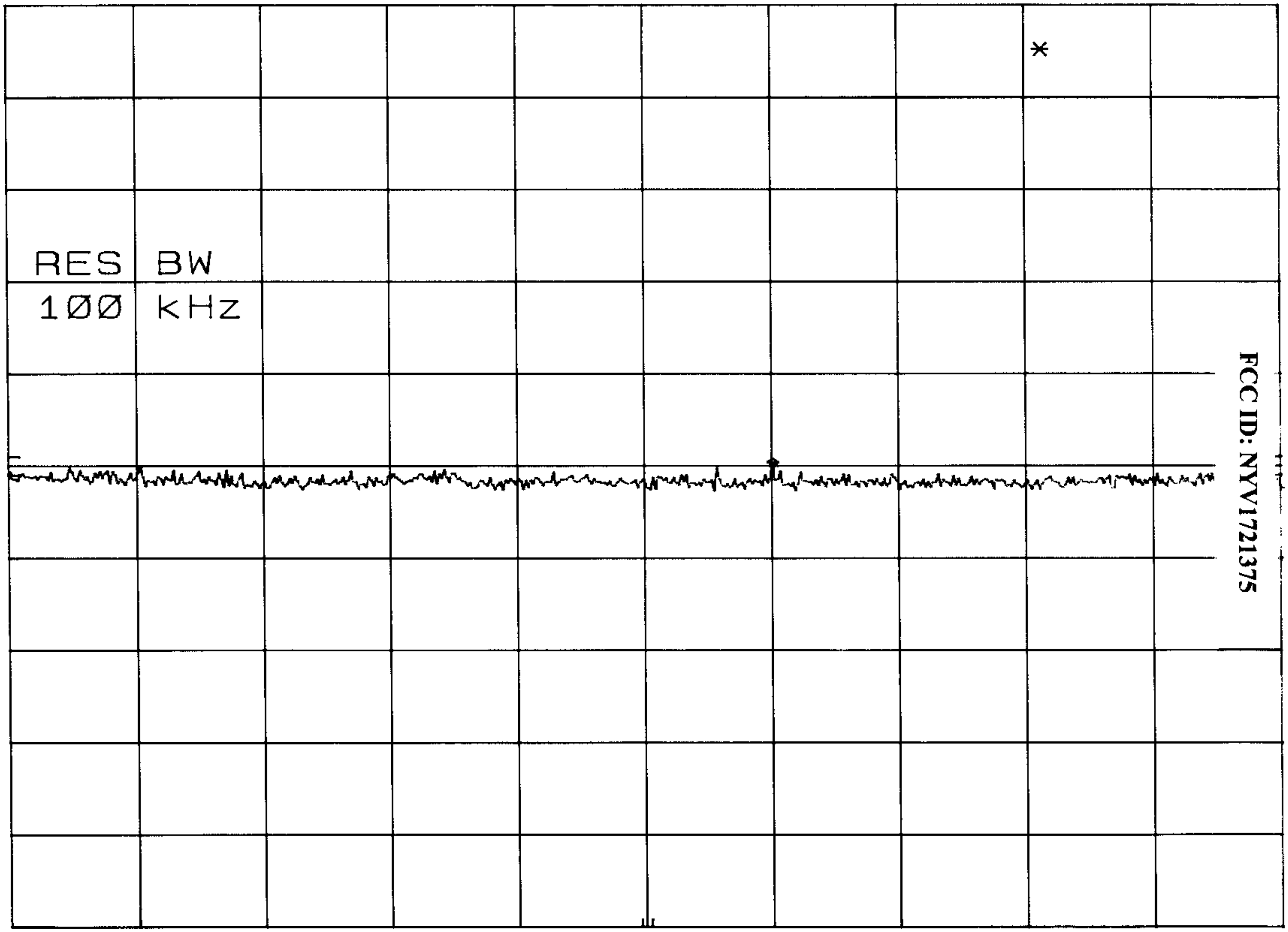
2-2-98

ANT. COND. TEST OF CH. 16 20GHZ-26GHZ MKR 23.600 GHz
REF 0.0 dBm HARMONIC 6L -49.60 dBm

hp
10 dB/

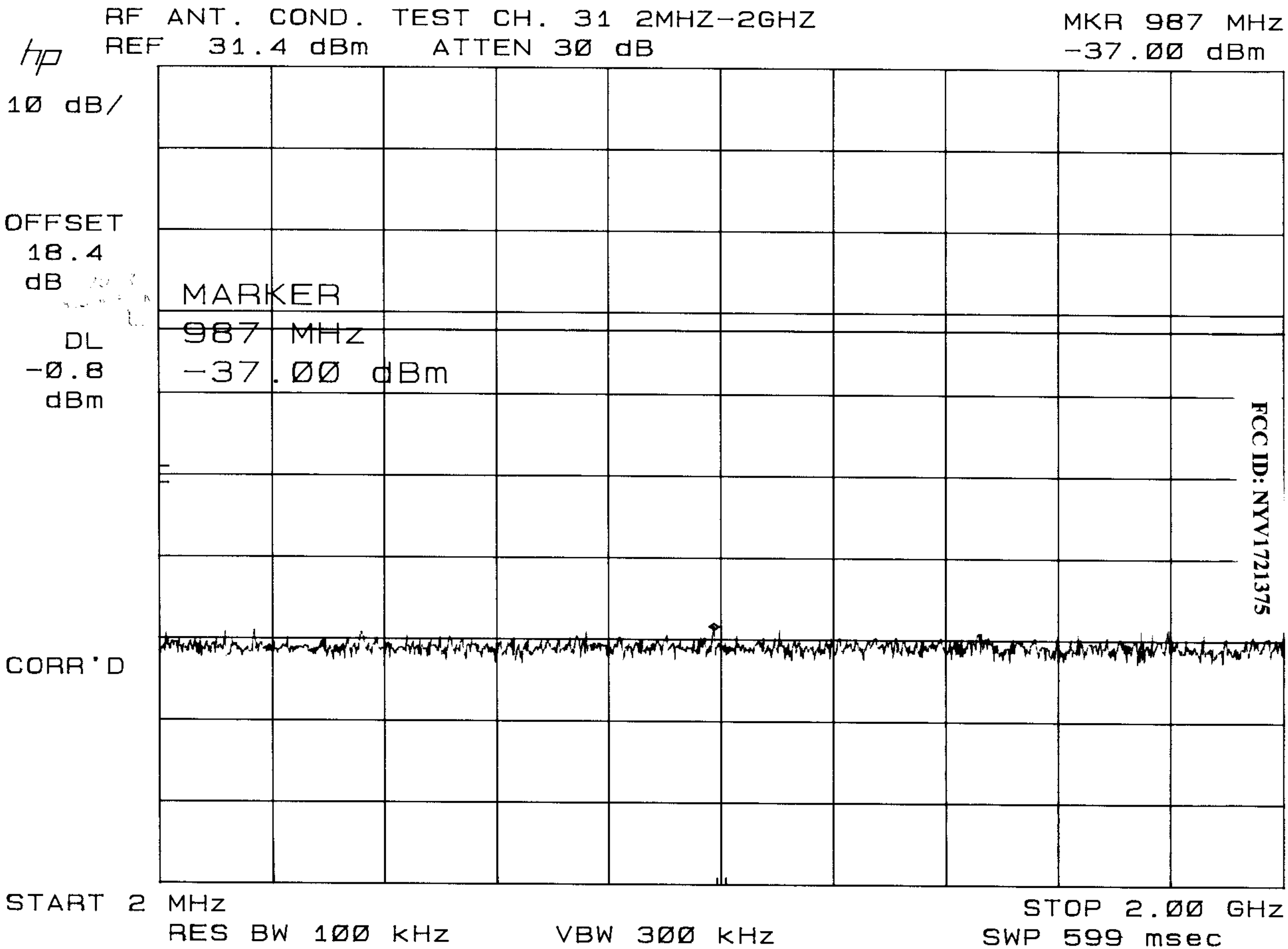
CNVLOSS
40.4
dB

DL
-10.0
dBm

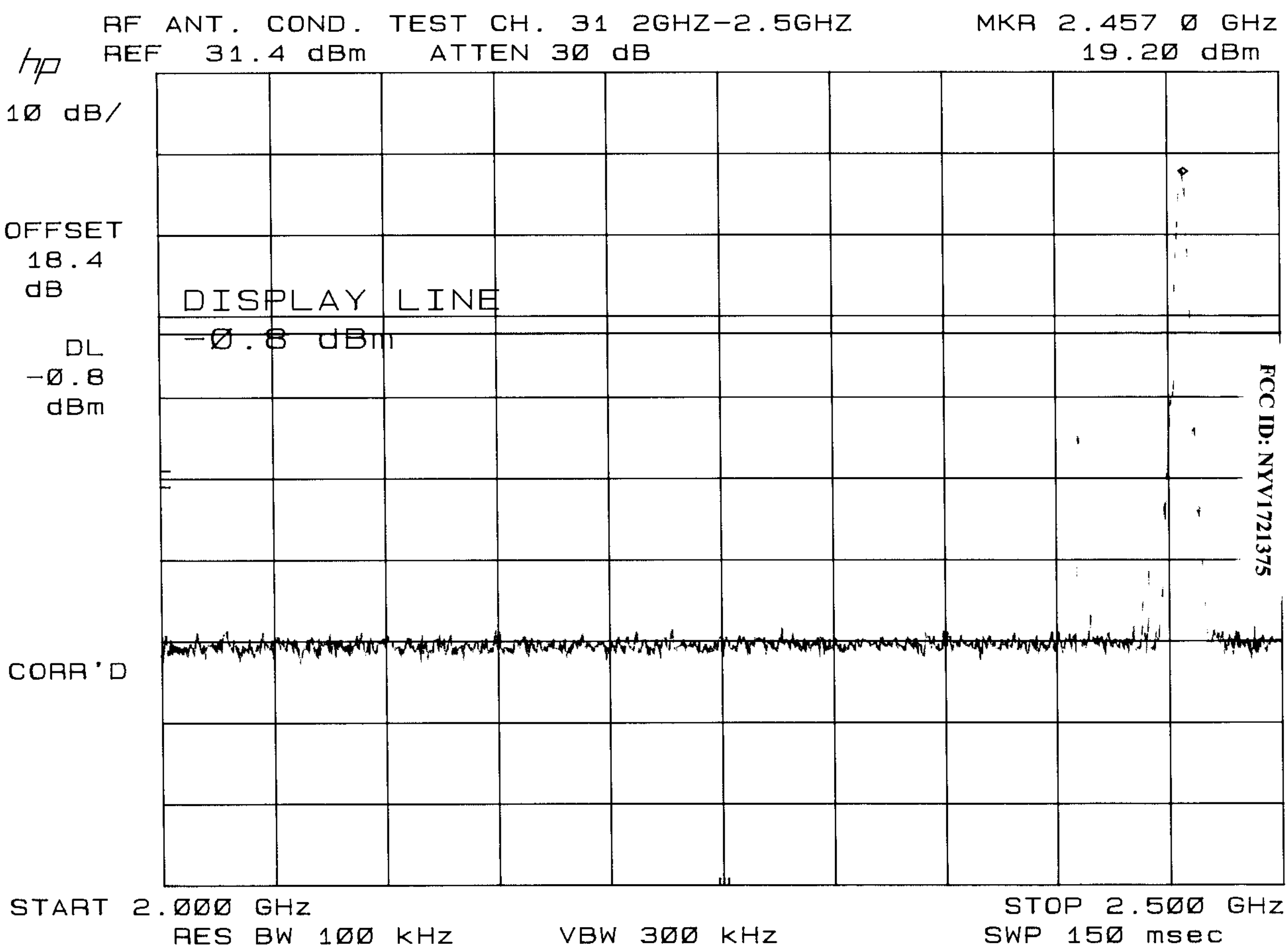


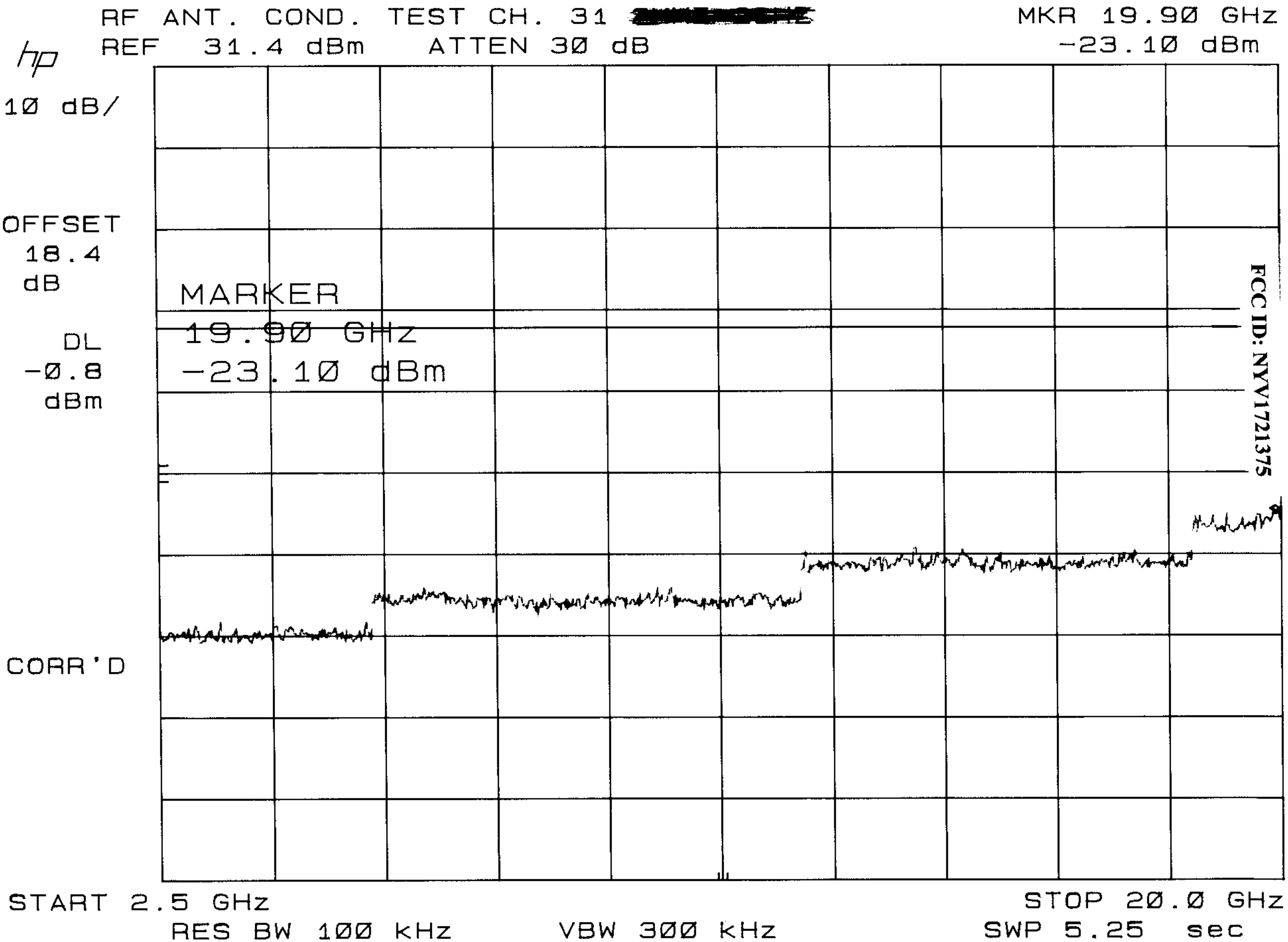
START 20.00 GHz STOP 26.00 GHz
RES BW 100 kHz VBW 300 kHz SWP 1.80 sec

FCC ID: NYV1721375



FCC ID: NYV1721375





FCC ID: NYV1721375

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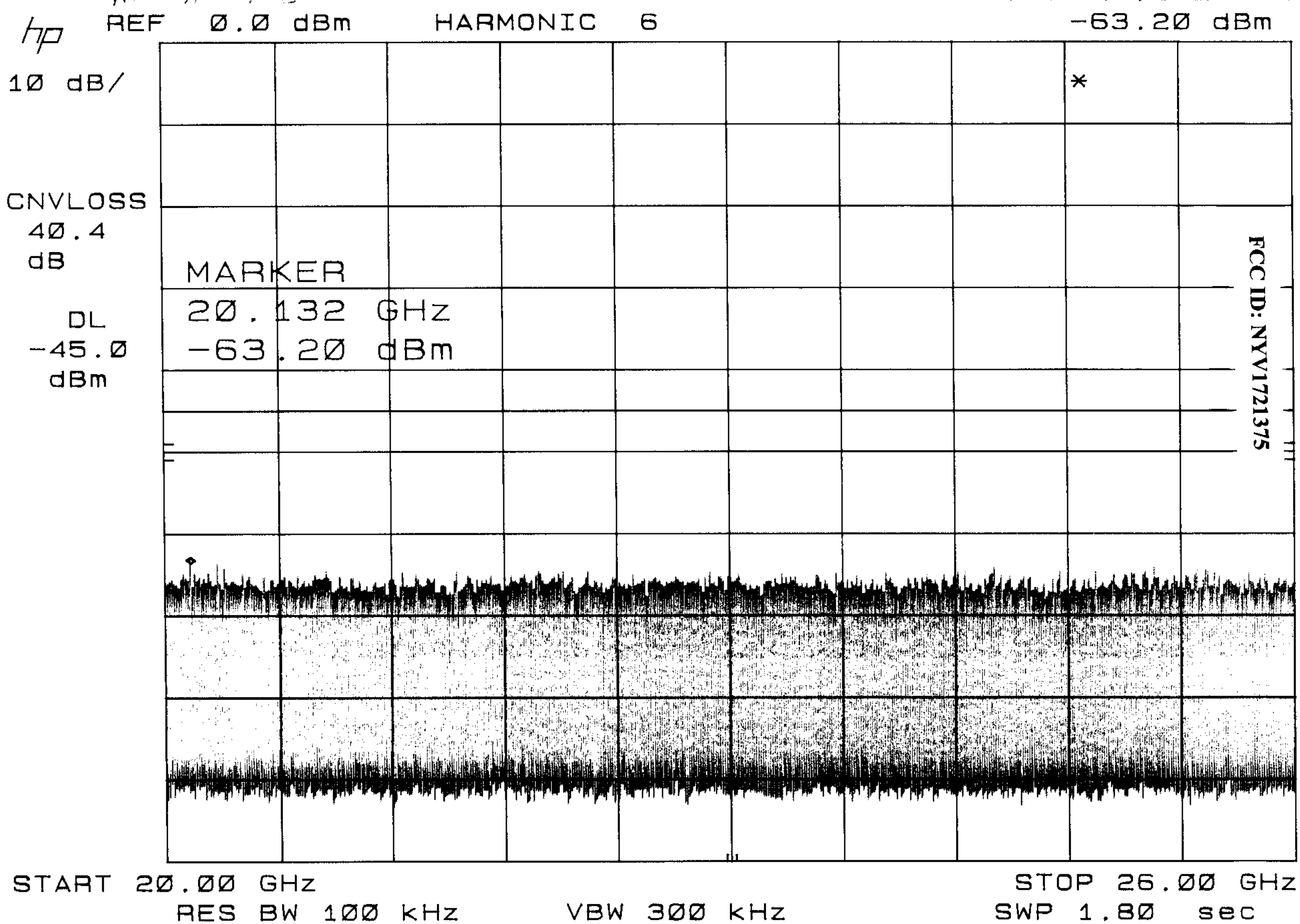
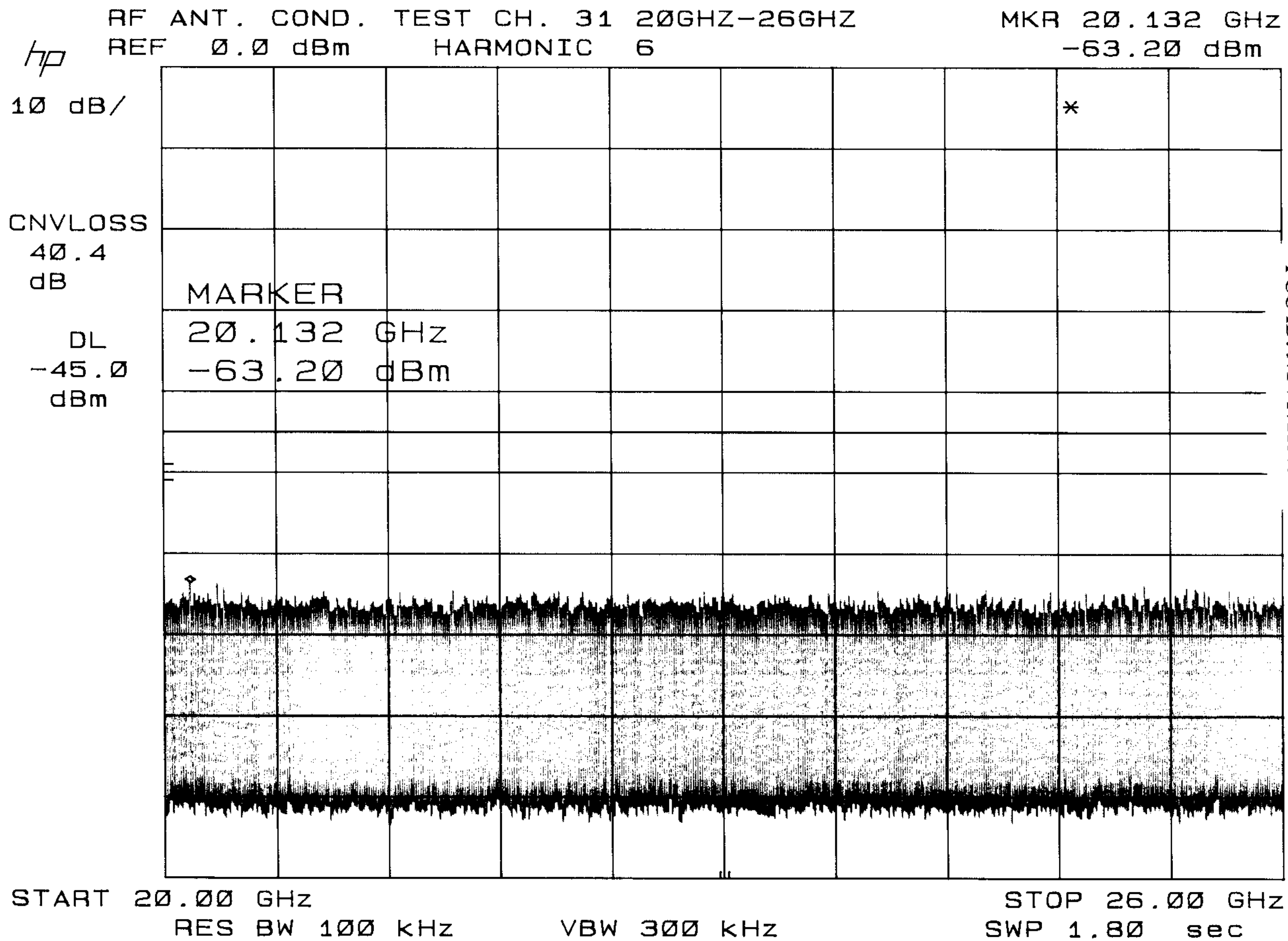
2-2-98

RF ANT. COND. TEST OF CH. 31 20-26 GHZ



FCC ID: NYV1721375

FCC ID: NYV1721375



9.6 RF Band Edges

The RF band edges were taken at the edges of the ISM spectrum (2400 MHz when the EUT was on channel 1 and 2483.5 MHz when the EUT was on channel 31) using the spectrum analyzer. The RF band edges were measured using a direct connection through an attenuation pad 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 2400 MHz (for channel 1) and 2483.5 MHz (for channel 31). This frequency was then checked to see that it was 20 dB below the band that contained the highest level of desired power.

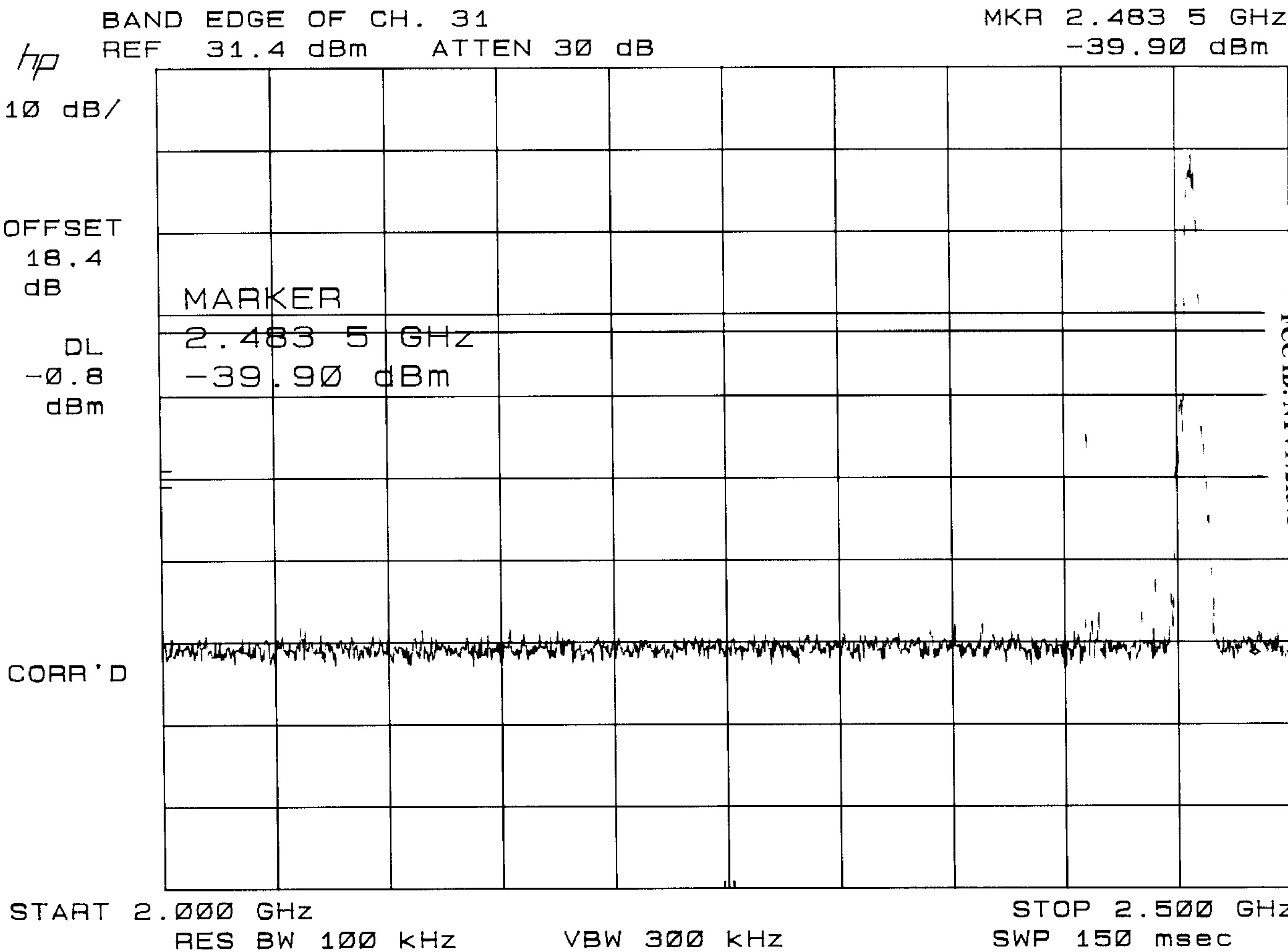
Test Results:

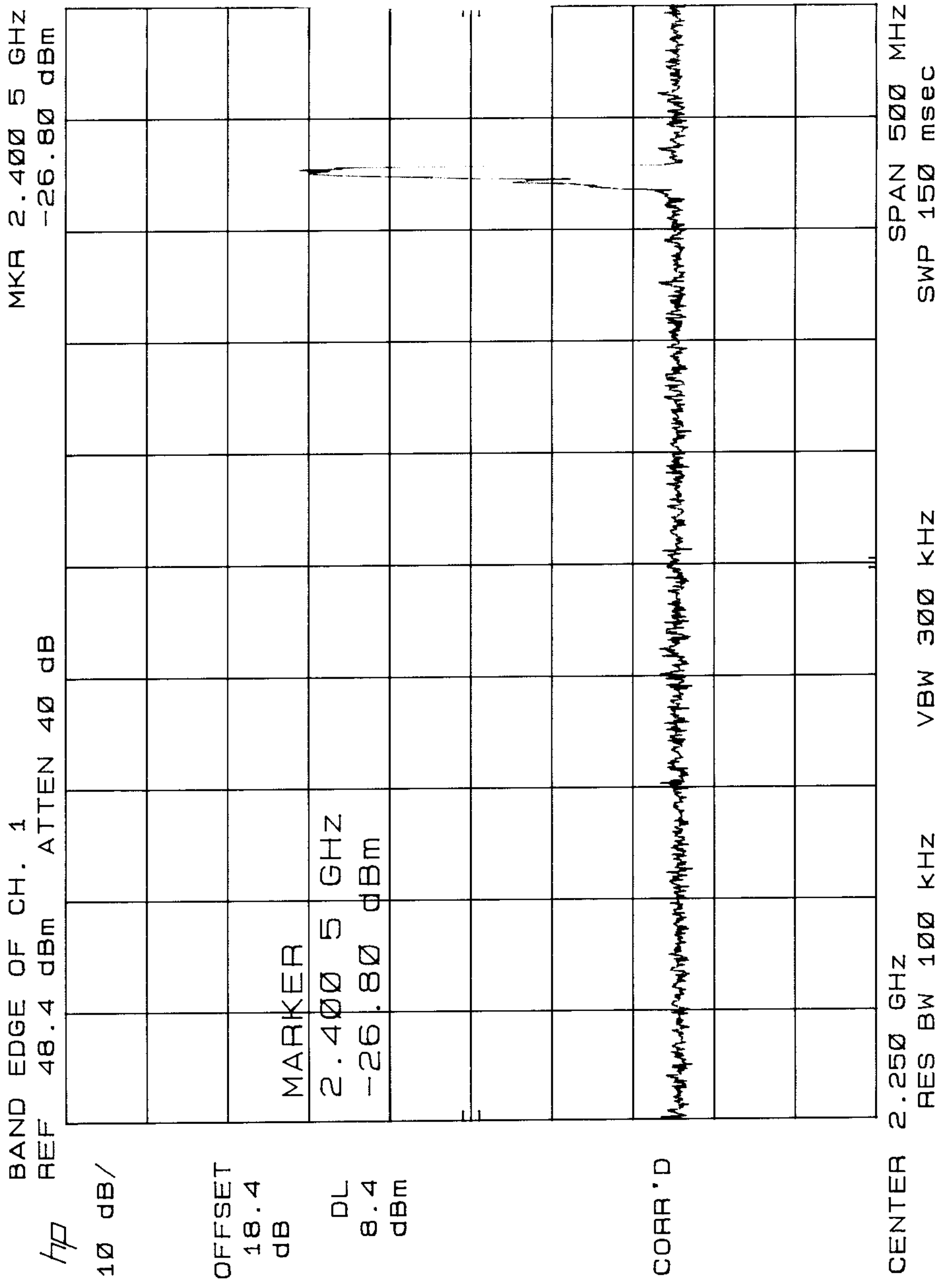
The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.209 (c). The RF power at the band edges is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

SECTION 9.6.1

RF BAND EDGES DATA SHEETS

FCC ID: NYV1721375




BAND EDGE OF CH. 1
REF 48.4 dBm
ATTEN 40 dB
MKR 2.400 5 GHz
-26.80 dBm
10 dB/
OFFSET
18.4
dB
DL
8.4
dBm
MARKER
2.400 5 GHz
-26.80 dBm
CORR'D
CENTER 2.250 GHz
SPAN 500 MHz
RES BW 100 kHz
VBW 300 kHz
SWP 150 msec

9.7 Processing Gain Measurement Procedure

Please see section 8 for the procedure.

SECTION 9.7.1

PROCESSING GAIN DATA SHEETS

PROCESSING GAIN WORKSHEET FCC ID: NYV1721375

PROCESSING GAIN TEST

CHANNEL 1 (2441.75 MHz)

Jammer Freq. (MHz)	Transmitter Output (dBm)	Signal Level (dBm)	CW Noise (dBm)	Mj J/S ratio (dB)	Processing Gain (dBm)
2440.75	27.80	-66.20	-56.00	9.20	11.20
2440.80	27.80	-66.20	-56.00	9.20	11.20
2440.85	27.80	-66.20	-56.00	9.20	11.20
2440.90	27.80	-66.20	-55.50	9.70	11.70
2440.95	27.80	-66.20	-55.50	9.70	11.70
2441.00	27.80	-66.20	-55.50	9.70	11.70
2441.05	27.80	-66.20	-55.50	9.70	11.70
2441.10	27.80	-66.20	-55.00	10.20	12.20
2441.15	27.80	-66.20	-55.00	11.20	13.20
2441.20	27.80	-66.20	-55.20	11.00	13.00
2441.25	27.80	-66.20	-55.20	11.00	13.00
2441.30	27.80	-66.20	-55.20	11.00	13.00
2441.35	27.80	-66.20	-55.20	10.00	12.00
2441.40	27.80	-66.20	-55.20	10.00	12.00
2441.45	27.80	-66.20	-55.20	10.00	12.00
2441.50	27.80	-66.20	-55.20	10.00	12.00

LOSSES

Attenuation	93
Combiner Loss	0
Cable Loss	1
System Loss	2
S/N ratio	0

Signal Level = TX Ouput - Attenuation - Combiner Loss - Cable Loss

Mj J/S radio = CW Noise - Sig. Level - Combiner Loss - Cable Loss

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

CHANNEL 1 (2441.75 MHz)

Jammer Freq. (MHz)	Transmitter Output (dBm)	Signal Level (dBm)	CW Noise (dBm)	Mj J/S ratio (dB)	Processing Gain (dBm)
2441.55	27.80	-66.20	-55.20	10.00	12.00
2441.60	27.80	-66.20	-55.20	10.00	12.00
2441.65	27.80	-66.20	-55.20	10.00	12.00
2441.70	27.80	-66.20	-55.20	10.00	12.00
2441.75	27.80	-66.20	-55.20	10.00	12.00
2441.80	27.80	-66.20	-55.20	10.00	12.00
2441.85	27.80	-66.20	-55.20	10.00	12.00
2441.90	27.80	-66.20	-55.20	10.00	12.00
2441.95	27.80	-66.20	-55.20	10.00	12.00
2442.00	27.80	-66.20	-55.20	10.00	12.00
2442.05	27.80	-66.20	-55.20	10.00	12.00
2442.10	27.80	-66.20	-55.20	10.00	12.00
2442.15	27.80	-66.20	-55.10	10.10	12.10
2442.20	27.80	-66.20	-55.10	10.10	12.10
2442.25	27.80	-66.20	-55.10	10.10	12.10

PROCESSING GAIN WORKSHEET FCC ID: NYV1721375

CHANNEL 1 (2441.75 MHz)

Jammer Freq. (MHz)	**Transmitter Output (dBm)**	**Signal Level (dBm)**	**CW Noise (dBm)**	**Mj J/S ratio (dB)**	**Processing Gain (dBm)**
2440.70	27.80	-66.20	-55.00	10.20	12.20
2440.65	27.80	-66.20	-55.00	10.20	12.20
2440.60	27.80	-66.20	-55.10	10.10	12.10
2440.55	27.80	-66.20	-55.00	10.20	12.20
2440.50	27.80	-66.20	-55.00	10.20	12.20
2440.45	27.80	-66.20	-55.10	10.10	12.10
2440.40	27.80	-66.20	-55.00	10.20	12.20
2440.35	27.80	-66.20	-55.00	10.20	12.20
2440.30	27.80	-66.20	-55.10	10.10	12.10
2440.25	27.80	-66.20	-55.00	10.20	12.20
2440.20	27.80	-66.20	-55.00	10.20	12.20
2440.15	27.80	-66.20	-55.10	10.10	12.10
2440.10	27.80	-66.20	-55.00	10.20	12.20
2440.05	27.80	-66.20	-55.00	10.20	12.20
2440.00	27.80	-66.20	-55.00	10.20	12.20
2339.95	27.80	-66.20	-55.10	10.10	12.10
2339.90	27.80	-66.20	-55.00	10.20	12.20
2339.85	27.80	-66.20	-55.00	10.20	12.20
2339.80	27.80	-66.20	-55.00	10.20	12.20

LOSSES

Attenuation	**93**
Combiner Loss	**0**
Cable Loss	**1**
System Loss	**2**
S/N ratio	**0**

Signal Level = TX Ouput - Attenuation - Combiner Loss - Cable Loss

Mj J/S radio =
CW Noise - Sig. Level - Combiner Loss - Cable Loss

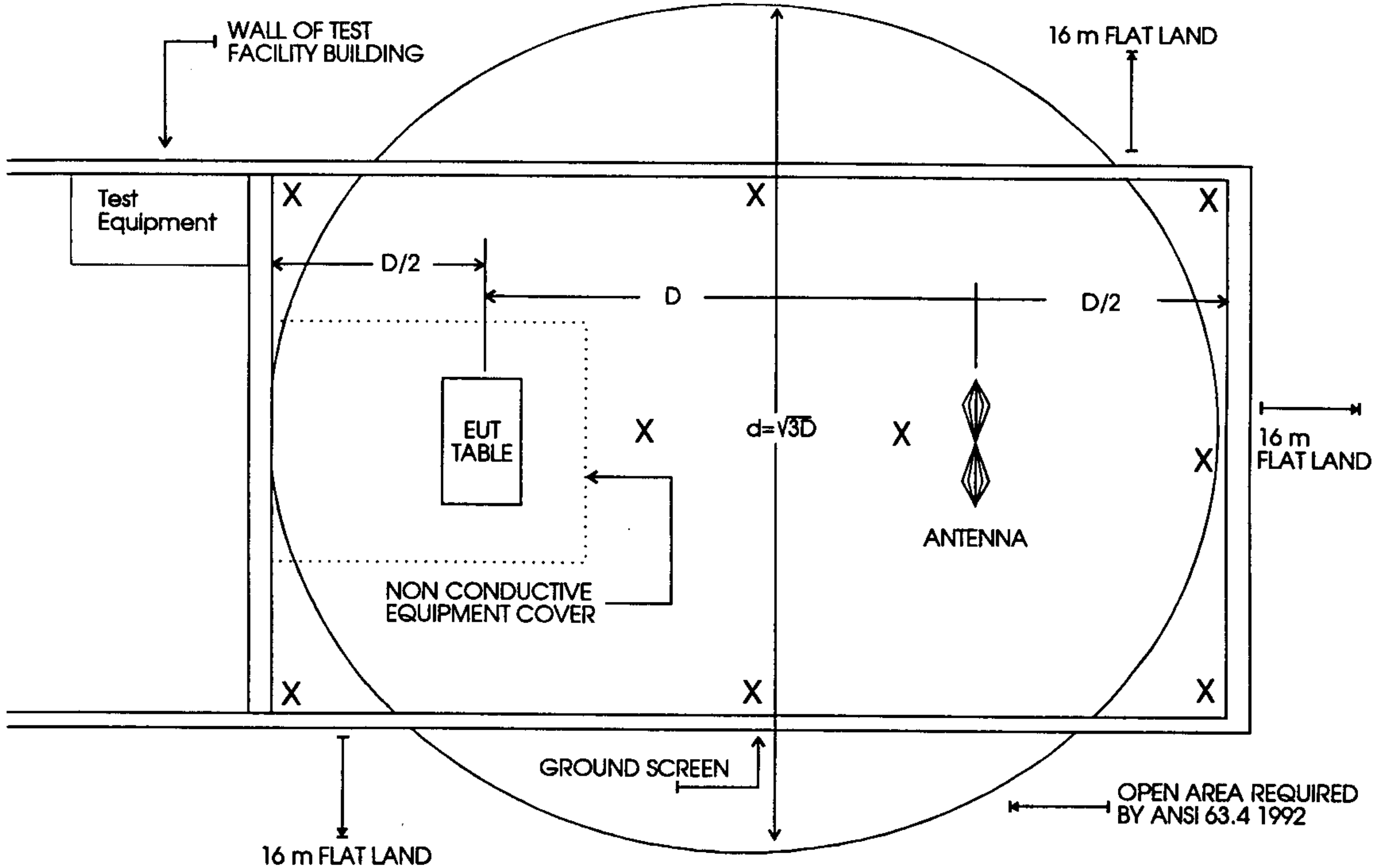
Processing Gain =
Mj J/S ratio + System Loss + S/N ratio.

10. CONCLUSIONS

The AATC Transmitter Model: (P/N) 1721375-100 meets all of the specification limits defined in FCC Title 47, Part 15, Subpart C section 15.247.

APPENDIX A

TEST SETUP DIAGRAMS AND PHOTOS



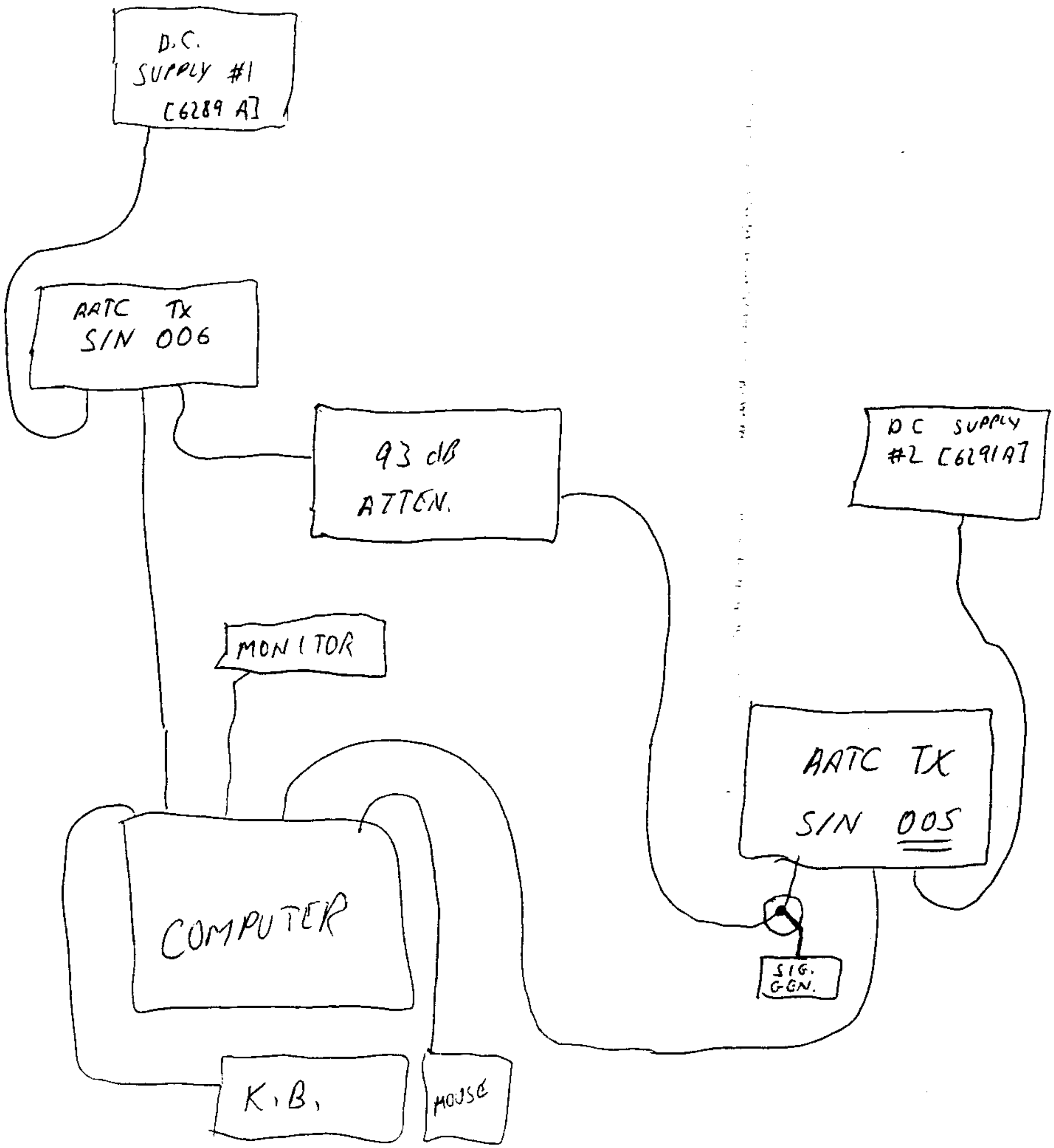
X = COPPER RODS USED FOR GROUNDING

D = DISTANCE

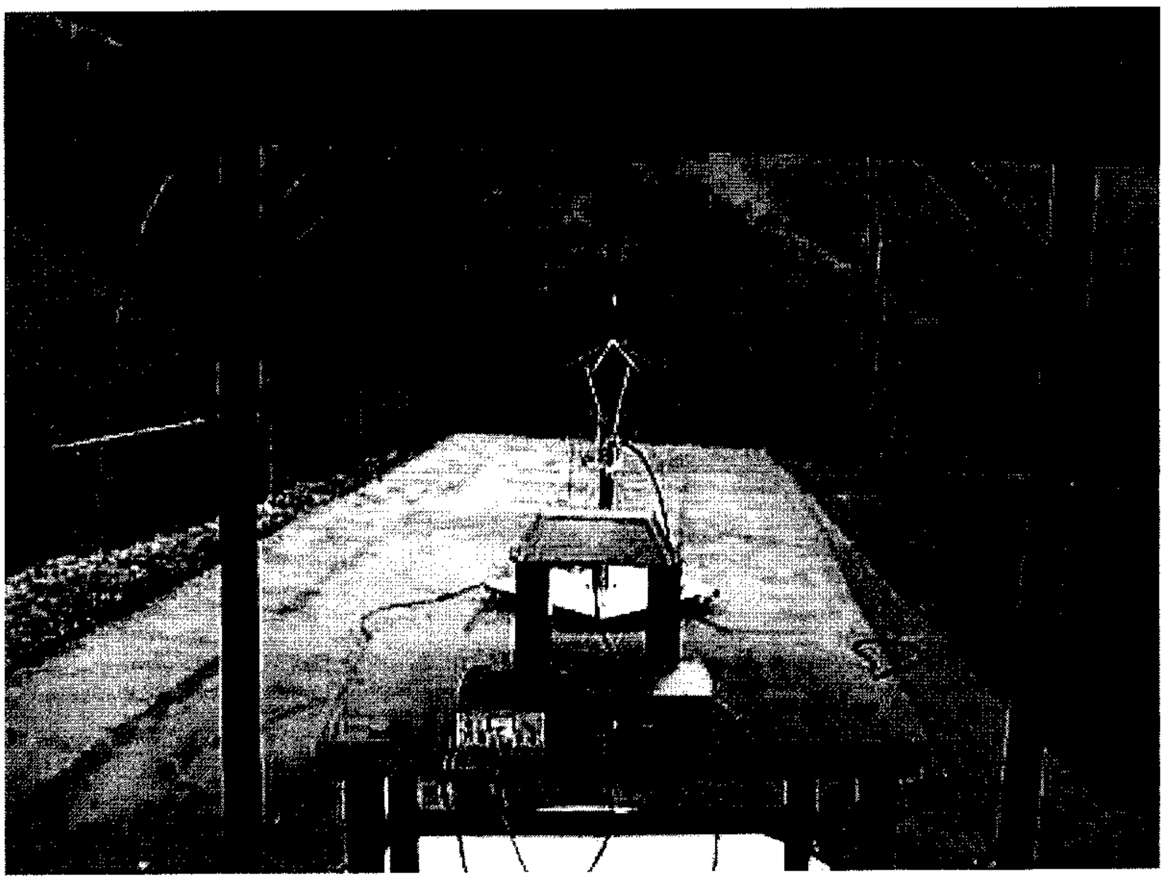
Figure 1: Plot Map and Layout of Test Site D

SKETCH FOR PROC. GAIN NOT TO SCALE

FIGURE 2



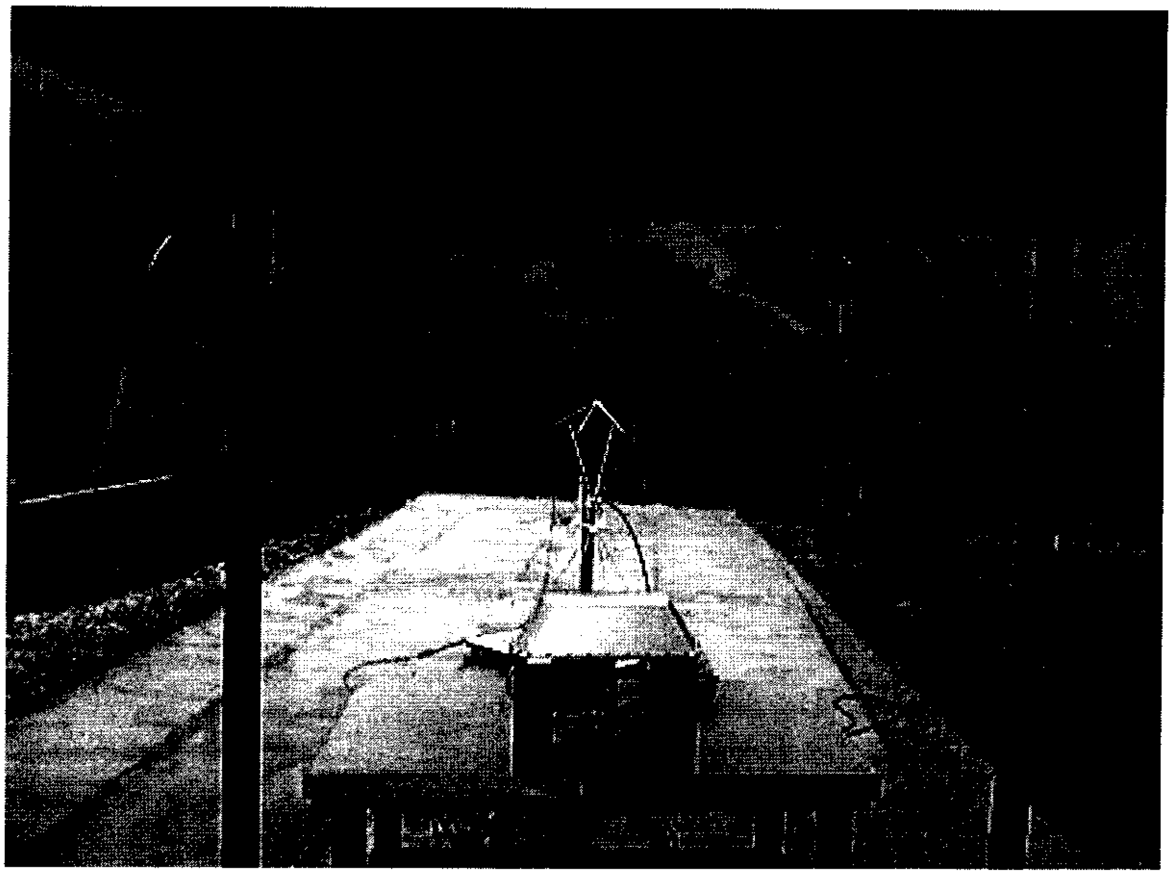
O = T crossing



FRONT VIEW

RAYTHEON SYSTEMS COMPANY
AATC TRANSMITTER
MODEL: (P/N) 1721375-100
FCC SUBPART C - RADIATED EMISSIONS -2-2-98 AND 2-3-98

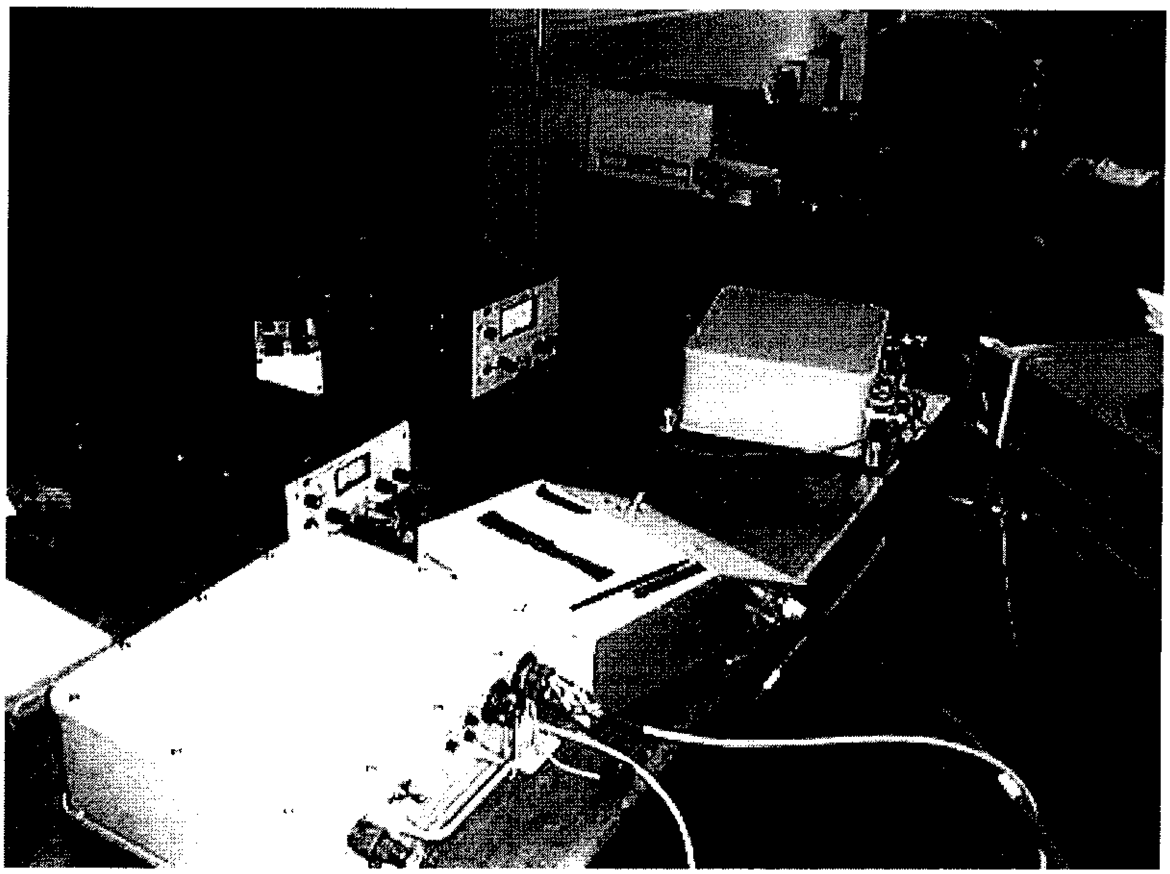
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

RAYTHEON SYSTEMS COMPANY
AATC TRANSMITTER
Model: (P/N) 1721375-100
FCC SUBPART C - RADIATED EMISSIONS –2-2-98 AND 2-3-98

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



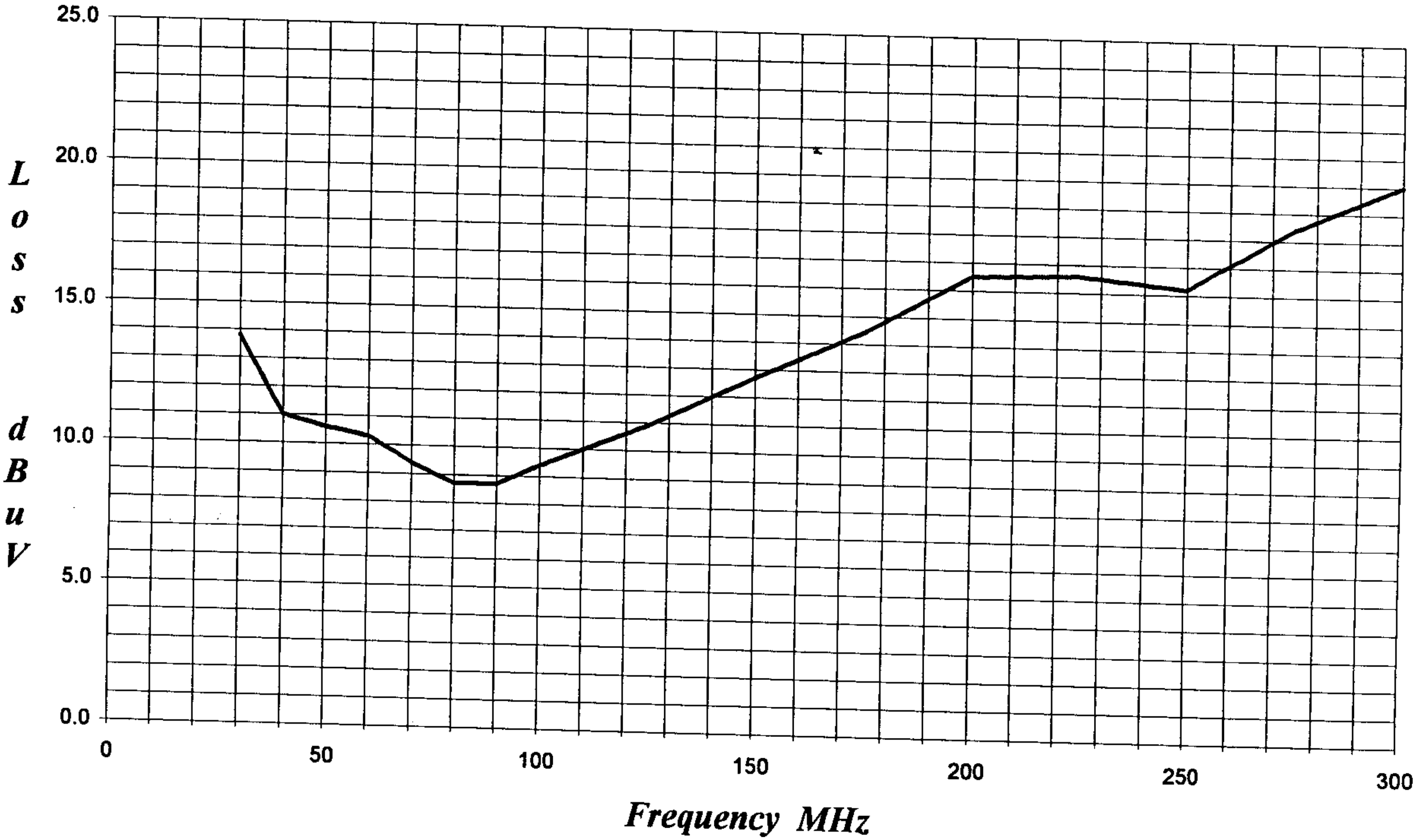
RAYTHEON SYSTEMS COMPANY
AATC TRANSMITTER
Model: (P/N) 1721375-100
FCC SUBPART C – PROCESSING GAIN – 02-03-98

APPENDIX B

ANTENNA FACTORS AND EFFECTIVE GAIN FACTORS

Cal: 3/27/97

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



COMPATIBLE ELECTRONICS

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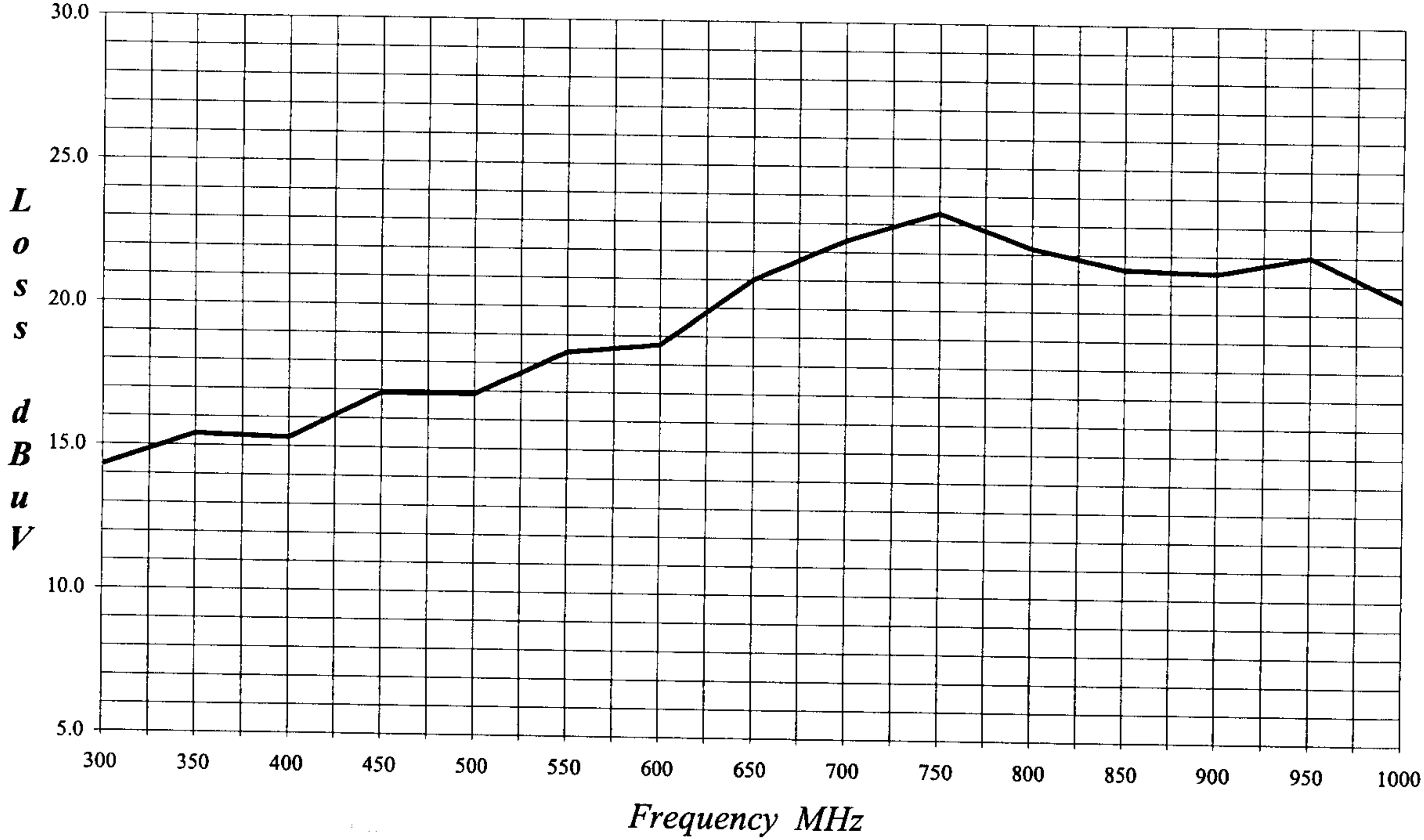
Cal: 12/11/97

LAB "D" LOG PERIODIC ANTENNA AL-100 S/N 01012



COMPATIBLE ELECTRONICS

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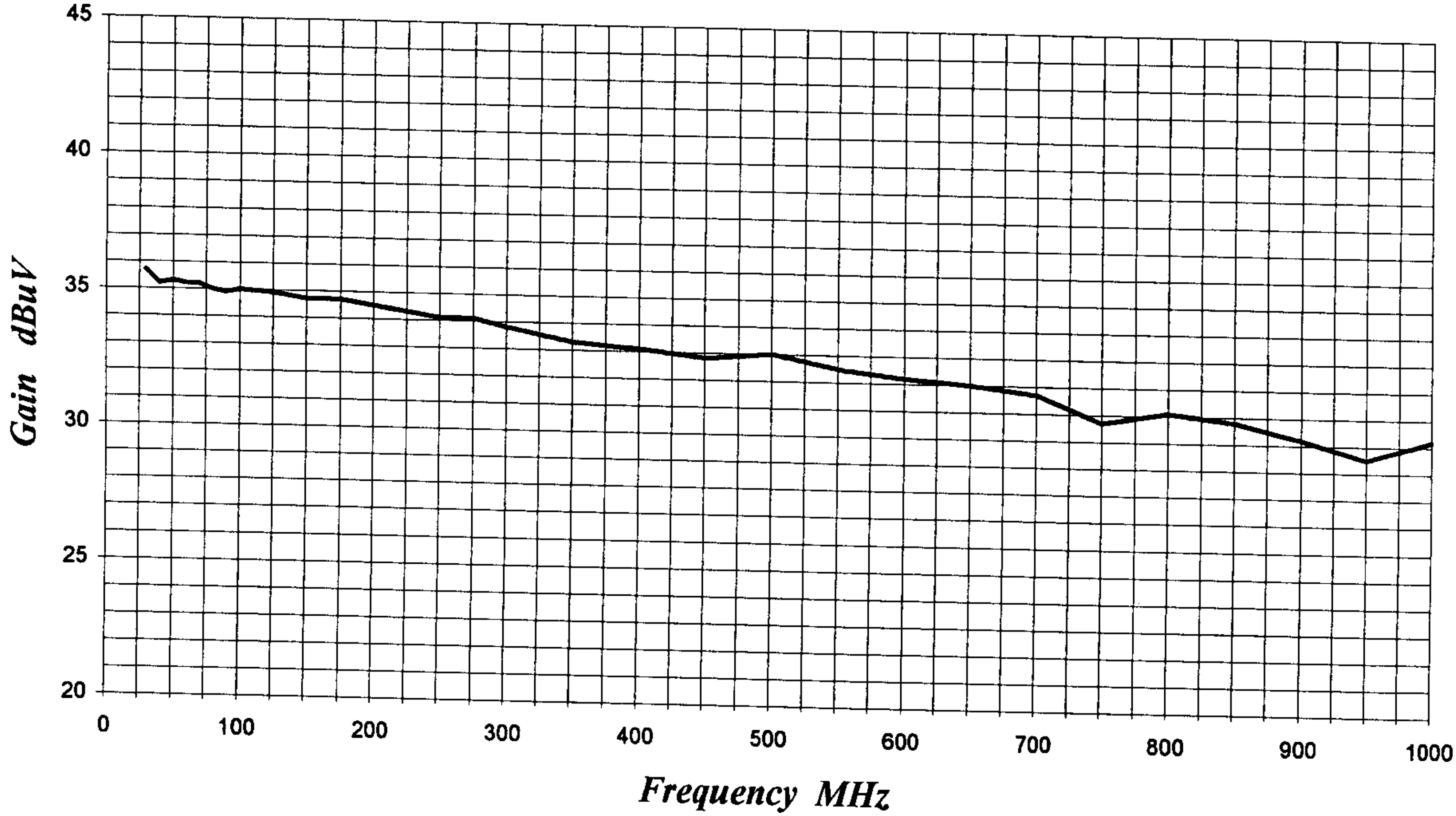
PREAMPLIFIER EFFECTIVE GAIN AT 10 METERS PA-102 S/N: 1017



HEWLETT PACKARD 8349B

MICROWAVE PREAMPLIFIER

S/N: 2548A00432

CALIBRATION DATE: FEBRUARY 22, 1997

FREQUENCY (GHz)	GAIN (dB)	FREQUENCY (GHz)	GAIN (dB)
1.0	10.5	2.5	28.6
1.1	18.2	3.0	28.0
1.2	22.6	3.5	26.7
1.3	25.1	4.0	25.7
1.4	26.8	4.5	24.6
1.5	27.9	5.0	23.8
1.6	28.3	5.5	23.5
1.7	28.3	6.0	22.9
1.8	28.3	6.5	24.9
1.9	28.7	7.0	25.5
2.0	28.1		

COM-POWER PA-122

MICROWAVE PREAMPLIFIER

ASSET #: 01339

CALIBRATION DATE: OCTOBER 23, 1997

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
7.5	33.6	15.0	34.2
8.0	32.9	15.5	32.4
8.5	35.1	16.0	31.1
9.0	37.3	16.5	31.0
9.5	35.9	17.0	31.0
10.0	34.6	17.5	32.7
10.5	33.9	18.0	33.2
11.0	33.6	19.0	34.1
11.5	31.5	20.0	33.0
12.0	33.8	21.0	31.7
12.5	36.8	22.0	30.2
13.0	33.1	23.0	30.2
13.5	34.4	24.0	37.4
14.0	33.4	25.0	33.9
14.5	34.0	26.0	31.7

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	28.7	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

3-11-97

EMC TEST SYSTEMS, L.P.
ANTENNA FACTORS
FOR
EMC TEST SYSTEMS
MODEL 6502
ACTIVE LOOP ANTENNA
S/N 2759

FREQUENCY (MHz)	MAGNETIC ANTENNA FACTOR (dB)	ELECTRIC ANTENNA FACTOR (dB)
.009	-31.3	20.2
.010	-32.3	19.2
.020	-36.9	14.6
.050	-40.1	11.4
.075	-40.8	10.7
.100	-40.8	10.7
.150	-40.9	10.6
.250	-41.0	10.5
.500	-41.0	10.5
.750	-40.9	10.6
1.000	-40.6	10.9
2.000	-40.2	11.3
3.000	-40.3	11.2
4.000	-40.3	11.2
5.000	-40.3	11.2
10.000	-40.9	10.6
15.000	-41.3	10.2
20.000	-41.6	9.9
25.000	-42.3	9.3
30.000	-43.6	8.0

SPECIFICATION COMPLIANCE TESTING FACTOR TO BE ADDED TO RECEIVER READING IN dBuV TO CONVERT TO MAGNETIC FIELD INTENSITY IN dBuA/METER OR TO EQUIVALENT ELECTRIC FIELD INTENSITY IN dBuV/METER.
CALIBRATION PER IEEE STD-291, INDUCTION FIELD METHOD.

APPENDIX C

MODIFICATION TO THE EUT

MODIFICATION TO THE EUT

The modification listed below were made to the EUT to pass FCC Subpart C, section 15.247 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.

Modification:

1) Added a clamp on ferrite around the data output cable. (FairRite P/N: 2643164151). See exhibit for a photograph of the exact location.

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Raytheon Systems Company
2000 East El Segundo Boulevard
Po Box 902
El Segundo, CA 90245-0902
310.616.1375

16 June 1998

In Reply Refer To:
98/7002.B0-0038

To: Federal Communication Commission
Equipment Authorization Branch
7435 Oakland Mills Road, Columbia, MD 21046

Subject: Compliance with FCC Regulations - Raytheon Receiver/Transmitter, Part Number 1721391

Reference: Applicant/Grantee Code NYV, File No. 31010/EQU-Code

FCC testing of Raytheon's Receiver/Transmitter, part number 1721391, which has been conducted by Compatible Electronics indicated that, to meet compliance with FCC regulations, a ferrite device needed to be clamped around the data output cable. The RFI Suppression Core used for the testing was a Fair-Rite part number 2643164151. This RFI Suppression Core has been added to the manufacturing drawings included with this application, and is located in the same position as in the testing. This RFI Suppression Core will be incorporated in all Receiver/Transmitter units to be manufactured under this license. No other modifications were needed in order for the Receiver/Transmitter to meet compliance with FCC regulations.

If you have any questions regarding this correspondence, please contact the undersigned at (310) 416-3471.

Very truly yours,

D. N. Johnson
AATC Program Manager

APPENDIX D

CONVERTER AMPLIFIER AND RF

ASSEMBLY DESCRIPTIONS

FCC ID: NYV1721375

Converter/Amplifier Assembly (CAA) Description:

The ANTENNA port is used for both transmit and receive. Logic signals are provided from the Signal and Message Processor (SMP) module for receive/transmit control. The CAA contains a 2.005 GHz synthesizer which is phase-locked to a 5 MHz reference. The 2.005 GHz signal is used as the local oscillator (LO) in both up-conversion and down-conversion.

In transmit mode, the incoming signal (419.75 to 450.75 MHz) at the TXRF port, from the Radio Frequency Assembly (RFA), is up-converted using the 2.005 GHz LO from the synthesizer to the transmit frequency (2.42475 GHz to 2.45575 GHz). The signal is amplified, incorporating Automatic Gain Control (AGC) to maintain the desired output level of 28.5 dBm $\pm$ 1.0 dB at the ANTENNA port. A bandpass filter near the ANTENNA port is used to suppress out-of-band spurious and harmonics.

In receive mode, the incoming signal (ANTENNA port, 2.42475 GHz to 2.45575 GHz) is down-converted using the 2.005 GHz LO to the receive frequency (419.75 MHz to 450.75 MHz). The bandpass filter near the ANTENNA port provides suppression of out-of-band signals, which could otherwise reduce receiver sensitivity. The receive path of the CAA provides low-noise amplification, additional filtering, and has an overall gain of 13.0 $\pm$ 3.0 dB. This signal is then output to the RFA via the RXRF port.

The photo shows the top (component) side of the various circuit boards that comprise the CAA.. The back side of the circuit boards contain only interconnect etch; no components are mounted on the back sides. The large silver module is a Low Noise Amplifier procurred from Salisbury Engineering, Inc.

Radio Frequency Assembly (RFA) Description:

In transmit mode, the RFA performs direct-sequence spreading using 21 chips per message symbol. A 250 MHz local oscillator (LO) and Surface-Acoustic Wave (SAW) filter are used to perform the continuous-phase-shift-modulation (CPSM) which converts the digital signal to a spread signal at the RFA's 248.75 MHz intermediate frequency (IF). After the CPSM modulation, the spread signal is up-converted to 1 of 32 (1 MHz increments) center frequencies (range of 419.75 MHz to 450.75 MHz) using the appropriate LO frequency (range of 171 MHz to 202 MHz). This signal is output to the Converter Amplifier Assembly (CAA) via the TXRF port.

In receive mode, the reverse process is performed. The incoming receive signal (419.75 to 450.75 MHz) from the CAA is down-converted to the RFA's IF frequency of 248.75 MHz using the appropriate LO frequency (range of 171 to 202 MHz). The IF signal is then down-converted to baseband using the 250 MHz LO. At this point the data is recovered using the 2-bit adaptive A/D converter. The I and Q data is output to the Signal and Message Processor (SMP) module - the I-channel being the data and the Q-channel used for decision-making for phase-adjustments of the 250 MHz LO.

The photo shows the component side of the circuit board and the cover. No electrical components are mounted on the back side of the circuit board; only the interface connector is mounted to the back side.

EXHIBIT 6

PHOTOGRAPHS