MEASUREMENT/TECHNICAL REPORT

Company: TEK Industries, Inc.
FRN: 0006-4269-28
Model: RF100
FCC ID: P7PPROTEGE

Description: This is a report to support a request for an original grant of equipment authorization.

Equipment Type: Low Power Communications Device Transmitter (DXX)

Report prepared for: TEK Industries, Inc.
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Introduction

This report is an application for Certification of a Transmitter operating pursuant to Part 15.225 of the FCC Rules, Code of Federal Regulations 47. The model number covered by this report is RF100. This report is designed to demonstrate the compliance of this device with the requirements outlined in Part 15 of CFR 47 using the methods outlined in Part 2 of CFR 47.

Statement of Conformity

The TEK Protege RF100 has been found to conform with the following parts of the 47 CFR as detailed below:

Part 2	Part 15	Comments
	15.15(b)	The product contains no user accessible controls that increase transmission power above allowable levels.
2.925	15.19	The label is shown in the label exhibit.
	15.21	Information to the user is shown in the instruction manual exhibit.
	15.27	No special accessories are required for compliance.
	15.203	The antenna is soldered to the transmitter board, which is not user accessible, and there is no external antenna connection.
	15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209.
	15.207	The unit is battery powered without the capability of being recharged or operated from the AC mains.
	15.225(a)	The unit complies with the field strength limits of 15.225(a)
	15.225(b)	The unit complies with the field strength limits of the 15.209(a) table.
	15.225(c)	The unit's operating frequency is stable within ±0.01% in the temperature range: -10°C thru 50°C. (PDA does not operate correctly below –11°C)

Test Methodology

Radiated emission testing was performed according to the procedures in ANSI C63.4 (1992). The testing was performed at an antenna to EUT distance of 3 or 1 meters below 30MHz, and 3 meters above 30MHz. The actual test distance used is noted in the test data sheets. The device's performance was investigated to 1GHz. The EUT was powered by four rechargeable batteries. Freshly charged batteries were used for all testing. Since the device is a hand-held unit, the emissions were maximized around the three orthogonal axes and the maximum reading was recorded. The integrated antenna cannot be maximized separately.

The frequency stability test consisted of varying the temperature of the product in a temperature chamber while monitoring the peak of the fundamental frequency, and taking measurements when the product's temperature stabilizes.

All other performance tests were made in accordance with the procedures outlined in Part 15 of CFR 47. The applicable sections provided under Part 15 are provided in the measurement section of this report.

Test Facility

Curtis-Straus LLC
All testing for the range 9kHz–1000MHz was performed at Curtis-Straus (A2LA Certificate Number 1627-01). The open area test site used to collect the radiated data is located at 527 Great Road, Littleton, MA 01460. Sites ”F” and “T” were used.

Test Equipment

SPECTRUM ANALYZERS					
x	**Analyzer**	**Model No.**	**Company**	**Serial No.**	**Calibration Due**
X	**RED** 9kHz-1.8GHz	8591E	HP	3441A03559	15-MAY-2002
X	**GREEN** 9kHz-26.5GHz	8593E	HP	3829A03618	04-OCT-2002
X	**BLACK** 9kHz-12.8GHz	8596E	HP	3710A00944	29-JUN-2002

OPEN AREA TEST SITES (OATS)					
x	**Site**	**FCC Code**	**IC Code**	**VCCI Code**	**Calibration Due**
X	**"F"** Florida	93448	IC 2762-F	R-468/ C-480	23-JUN-2002
X	**"T"** Texas	93448	IC 2762-T	R-905/ C-480	09-SEP-2002

ANTENNAS					
x	**Antenna**	**Model No.**	**Company**	**Serial No.**	**Calibration Due**
X	**GREEN-WHITE** Bilog: 30MHz-2GHz	CBL6112B	Chase	2574	28-JUN-2002
X	**RED** Bilog: 30MHz-1GHz	3143	EMCO	1270	28-JUN-2002
X	**SMALL LOOP** Passive Loop: 9kHz-30MHz	PLA-130/A	ARA	1024	27-JAN-2003

PREAMPLIFIERS					
x	**Preamplifier**	**Model No.**	**Company**	**Serial No.**	**Calibration Due**
X	**BLUE-BLACK** 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	24-SEP-2002
X	**ORANGE** 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	18-DEC-2002

ENVIRONMENTAL CHAMBER				
x	**Model No.**	**Company**	**Serial No.**	**Calibration Due**
X	SGTH-31S	B-M-A Inc.	2245	11-JUN-2002

Unless otherwise noted the calibration interval is one year. All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Measurement Results

Operating Frequency

This device operates at 13.56MHz.

Electric Field Strength Radiation Measurements

Radiated Emissions Table — *Curtis-Straus LLC*

Date: 28-Jan-02 **Company:** Tek Industries **Table** 1
Engineer: Evan Gould **EUT Desc:** RFID Adaptor **Work Order:** C0014
Frequency Range: 9kHz-30MHz **Measurement Distance:** 3 m
Notes: Unit in "Read" mode **EUT Max Freq:** 13.56MHz
Analyzer: Red

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	47 CFR 15.225 (a) and (b) Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Lower Band Edge									
0°	13.553	28.4	22.8	38.2	0.0	43.8	69.5	-25.7	Pass
Fundamental									
0°	13.56	40.5	22.8	38.2	0.0	55.9	120.0	-64.1	Pass
Higher Band Edge									
0°	13.567	34.6	22.8	38.2	0.0	50.0	69.5	-19.5	Pass
0° 1m	27.12	22.0	22.7	36.6	0.0	35.9	88.5	-52.6	Pass

Table Result: Pass by -19.5 dB ***Worst Freq:*** 13.567 MHz

Test Site: "F" **Pre-Amp:** Blue-Blk **Cable:** 65 ft RG8A/U **Antenna:** Sm Loop (high)

Radiated Emissions Table — *Curtis-Straus LLC*

Date: 28-Jan-02 **Company:** Tek Industries **Table** 2
Engineer: Evan Gould **EUT Desc:** RFID Adaptor **Work Order:** C0014
Frequency Range: 30-1000MHz **Measurement Distance:** 3 m
Notes: Unit in "Read" mode **EUT Max Freq:** 13.56MHz
Analyzer: Red

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	47 CFR 15.225 (b) Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
V	40.7	42.1	22.6	12.1	0.5	32.1	40.0	-7.9	Pass
V	108.5	26.4	22.6	11.0	1.0	15.8	43.5	-27.7	Pass
V	122.0	34.2	22.6	11.7	1.0	24.3	43.5	-19.2	Pass
V	149.2	29.2	22.5	10.0	1.2	17.9	43.5	-25.6	Pass
V	217.0	23.8	22.4	10.1	1.6	13.1	46.0	-32.9	Pass
V	339.0	33.1	22.6	14.1	2.1	26.7	46.0	-19.3	Pass

Table Result: Pass by -7.9 dB ***Worst Freq:*** 40.7 MHz

Test Site: "F" **Pre-Amp:** Blue-Blk **Cable:** 65 ft RG8A/U **Antenna:** Grn-Wht

Radiated Emissions Table

Curtis-Straus LLC

Date: 29-Jan-02 **Company:** Tek Industries **Table** 3
Engineer: Evan Gould **EUT Desc:** RFID Adapter **Work Order:** C0014

Frequency Range: 9kHz-30MHz **Measurement Distance:** 3 m

Notes: Unit in "Write" mode **EUT Max Freq:** 13.56MHz
Analyzer: Green

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	47 CFR 15.225 (a) and (b) Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Lower Band Edge									
0deg	13.553	34.4	24.8	38.2	0.0	47.8	69.5	-21.7	Pass
Fundamental									
0deg	13.56	46.3	24.8	38.2	0.0	59.7	120.0	-60.3	Pass
Higher Band Edge									
0deg	13.567	35.4	24.8	38.2	0.0	48.8	69.5	-20.7	Pass
0deg 1m	27.12	32.2	24.8	36.6	0.0	44.0	88.5	-44.5	Pass

Table Result: Pass by -20.7 dB ***Worst Freq:*** 13.567 MHz

Test Site: "T" **Pre-Amp:** Orange **Cable:** 65 ft RG8A/U **Antenna:** Sm Loop (high)

Radiated Emissions Table

Curtis-Straus LLC

Date: 29-Jan-02 **Company:** Tek Industries **Table** 4
Engineer: Evan Gould **EUT Desc:** RFID Adapter **Work Order:** C0014

Frequency Range: 30-1000MHz **Measurement Distance:** 3 m

Notes: Unit in "Write" mode **EUT Max Freq:** 13.56MHz
Analyzer: Green

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	47 CFR 15.225 (b) Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
V	40.68	43.2	24.8	9.6	0.5	28.5	40.0	-11.5	Pass
V	108.5	37.6	24.8	6.8	1.0	20.6	43.5	-22.9	Pass
V	122.0	36.3	24.8	7.0	1.0	19.5	43.5	-24.0	Pass
V	149.2	34.5	24.8	10.4	1.2	21.3	43.5	-22.2	Pass
V	217.0	26.2	24.7	11.1	1.6	14.2	46.0	-31.8	Pass
V	339.0	37.6	24.5	14.8	2.1	30.0	46.0	-16.0	Pass

Table Result: Pass by -11.5 dB ***Worst Freq:*** 40.68 MHz

Test Site: "T" **Pre-Amp:** Orange **Cable:** 65 ft RG8A/U **Antenna:** Red

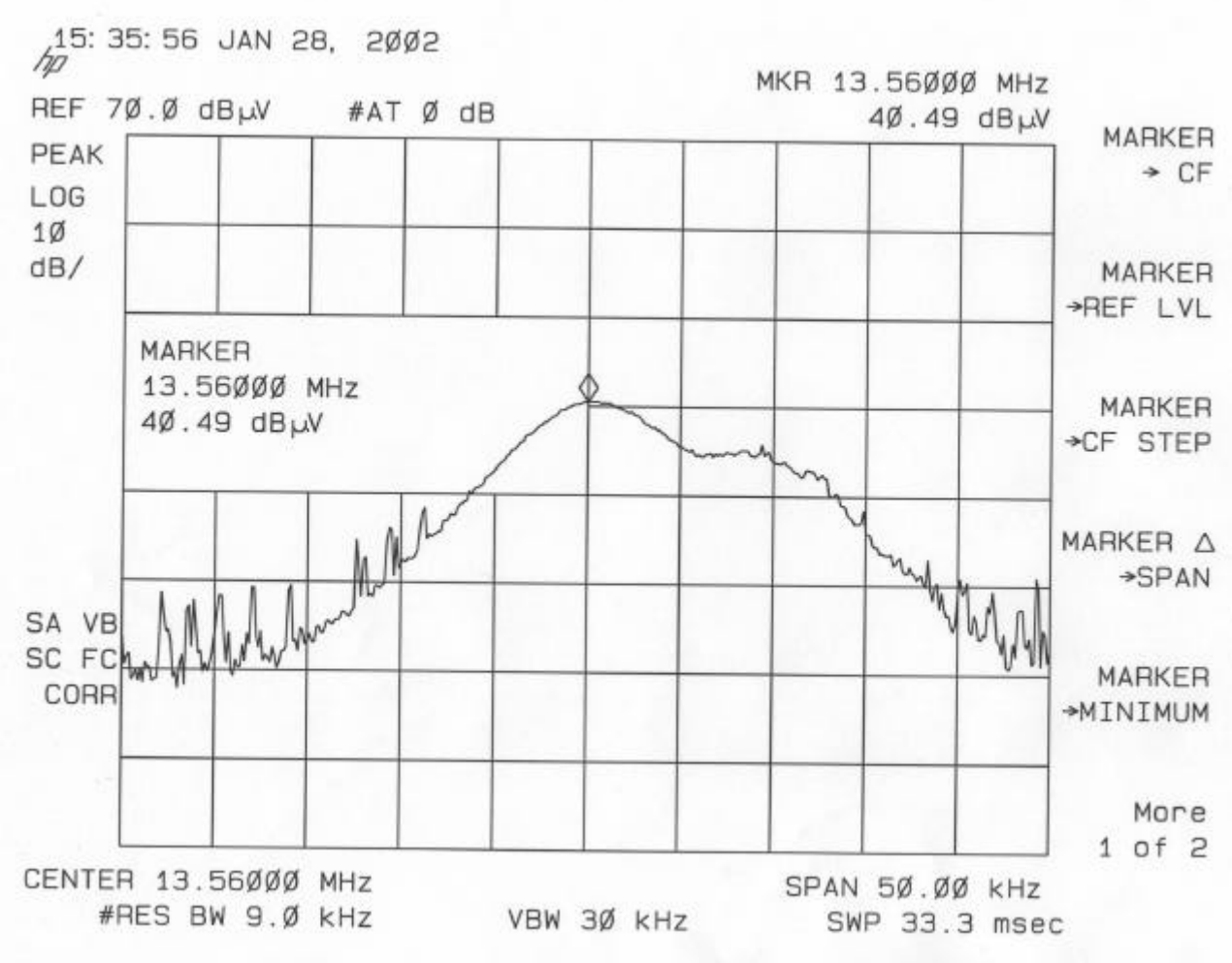
47 CFR 15.225(c) Frequency Stability

Ambient Temperature (°C)	Measured Frequency (MHz)	Operating Frequency (MHz)	Frequency Delta (%)	Pass or Fail
-10	13.5603	13.56	0.000022	Pass
0	13.5602	13.56	0.000014	Pass
10	13.5602	13.56	0.000014	Pass
20	13.5602	13.56	0.000014	Pass
30	13.5601	13.56	0.000007	Pass
40	13.5601	13.56	0.000007	Pass
50	13.5600	13.56	0	Pass

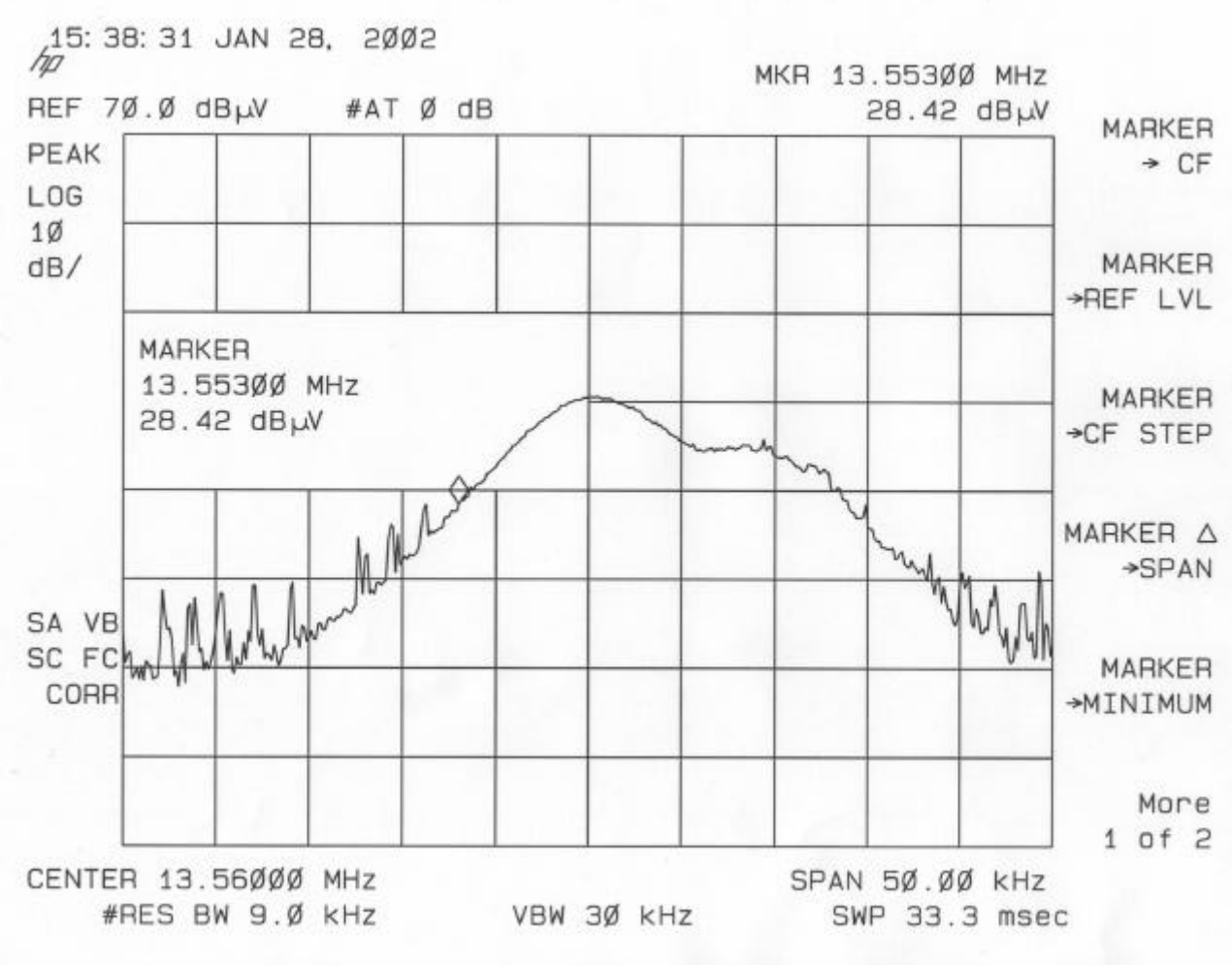
Note: PDA does not operate correctly below -11°C

Emissions Plots

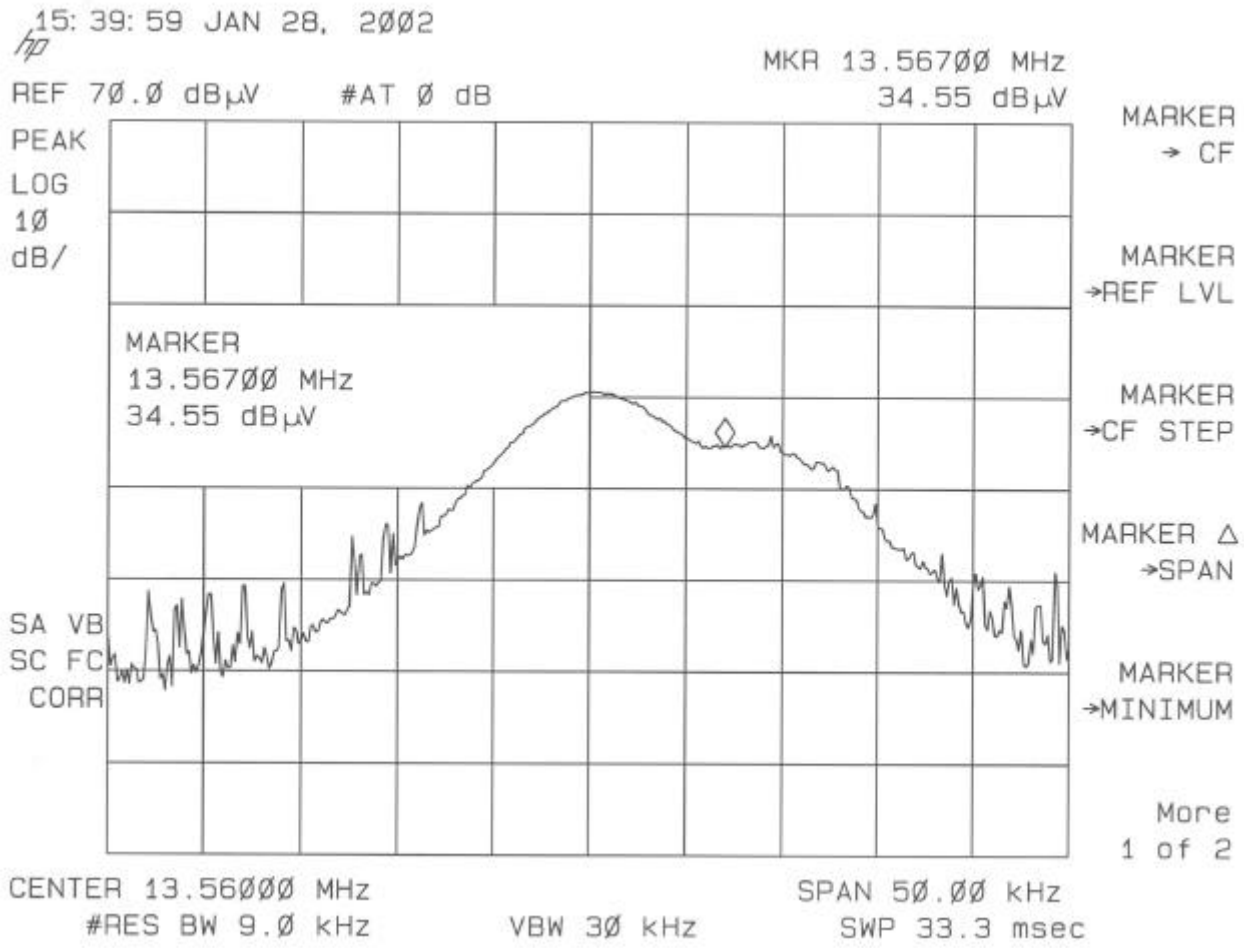
"Read" Mode Fundamental



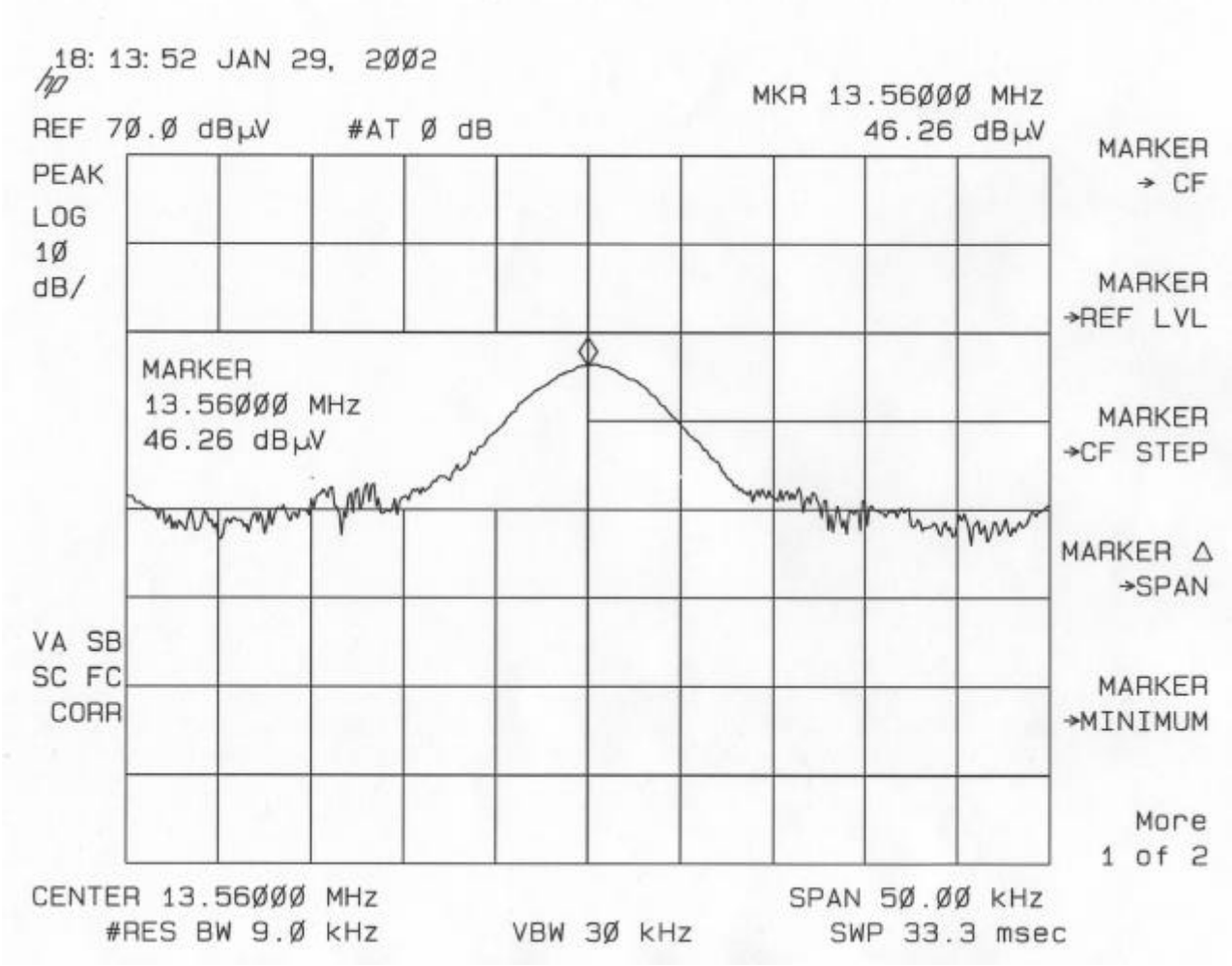
"Read" Mode Lower Band Edge



"Read" Mode Upper Band Edge



"Write" Mode Fundamental



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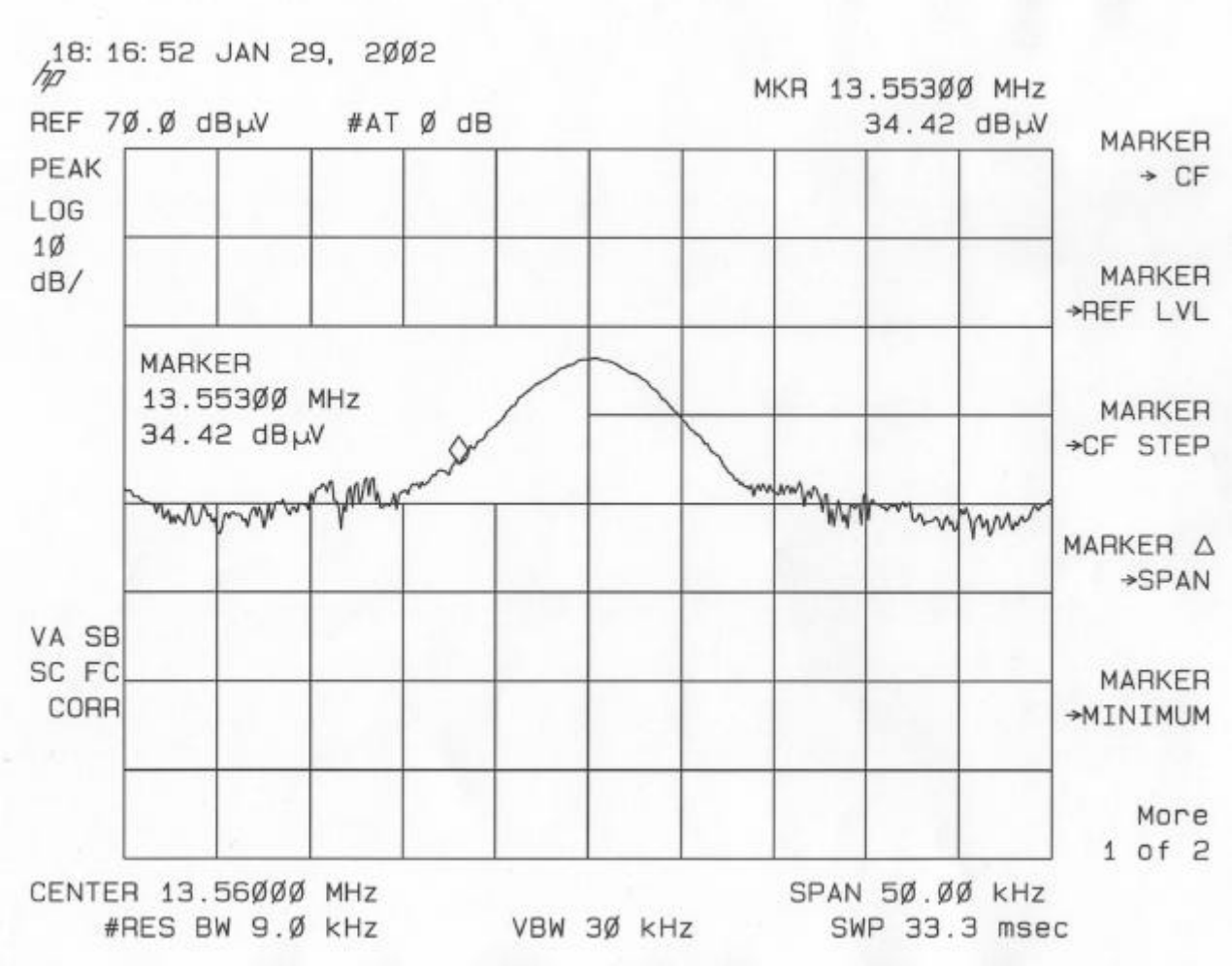

"Write" Mode Upper Band Edge