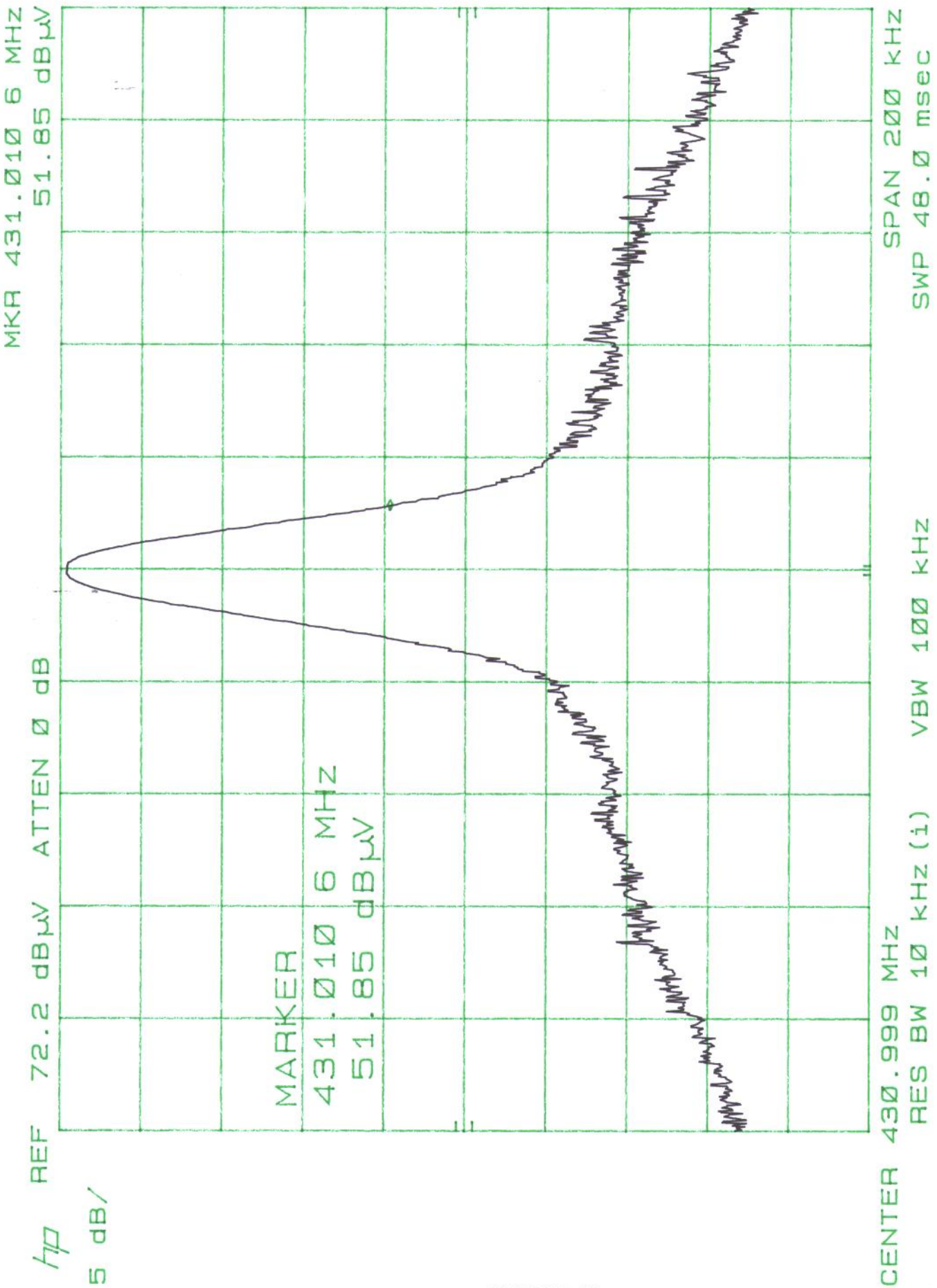
MKR 431.010 6 MHz
51.85 dBµV
REF 72.2 dBµV ATTEN Ø dB
5 dB/
MARKER
431.010 6 MHz
51.85 dBµV
CENTER 430.999 MHz
RES BW 10 kHz (i) VBW 100 kHz
SPAN 200 kHz
SWP 48.Ø msec

FIGURE 39

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq.: 437MHz

Test Personnel: J. Kavalusky JK
Date: 04/26/2006

Bandwidth of Fundamental Frequency

	Frequency (MHz)	Measurement (dBuV/m)
Center Frequency	437.000	69.35
20 dB down	436.986	49.10
20 dB down	437.009	49.05

The bandwidth is 23kHz.

Allowable Bandwidth: 0.25% of Fundamental Frequency
For 437MHz: ±0.5463MHz

Figure 40

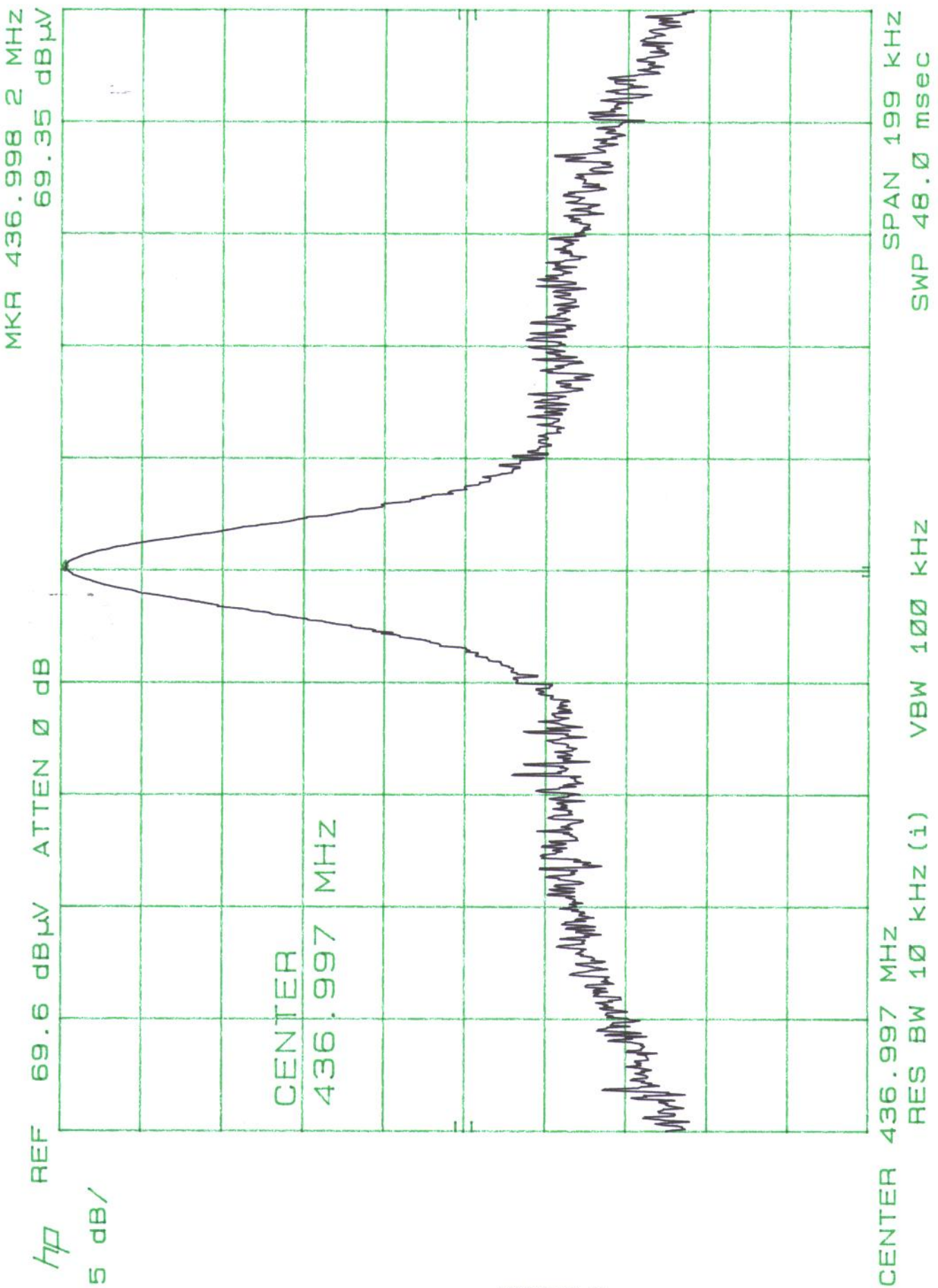
MKR 436.998 2 MHz
69.35 dBµV
SPAN 199 kHz
SWP 48.0 msec
REF 69.6 dBµV
ATTEN Ø dB
5 dB/
CENTER
436.997 MHz
VBW 100 kHz
CENTER 436.997 MHz
RES BW 10 kHz (i)

FIGURE 41

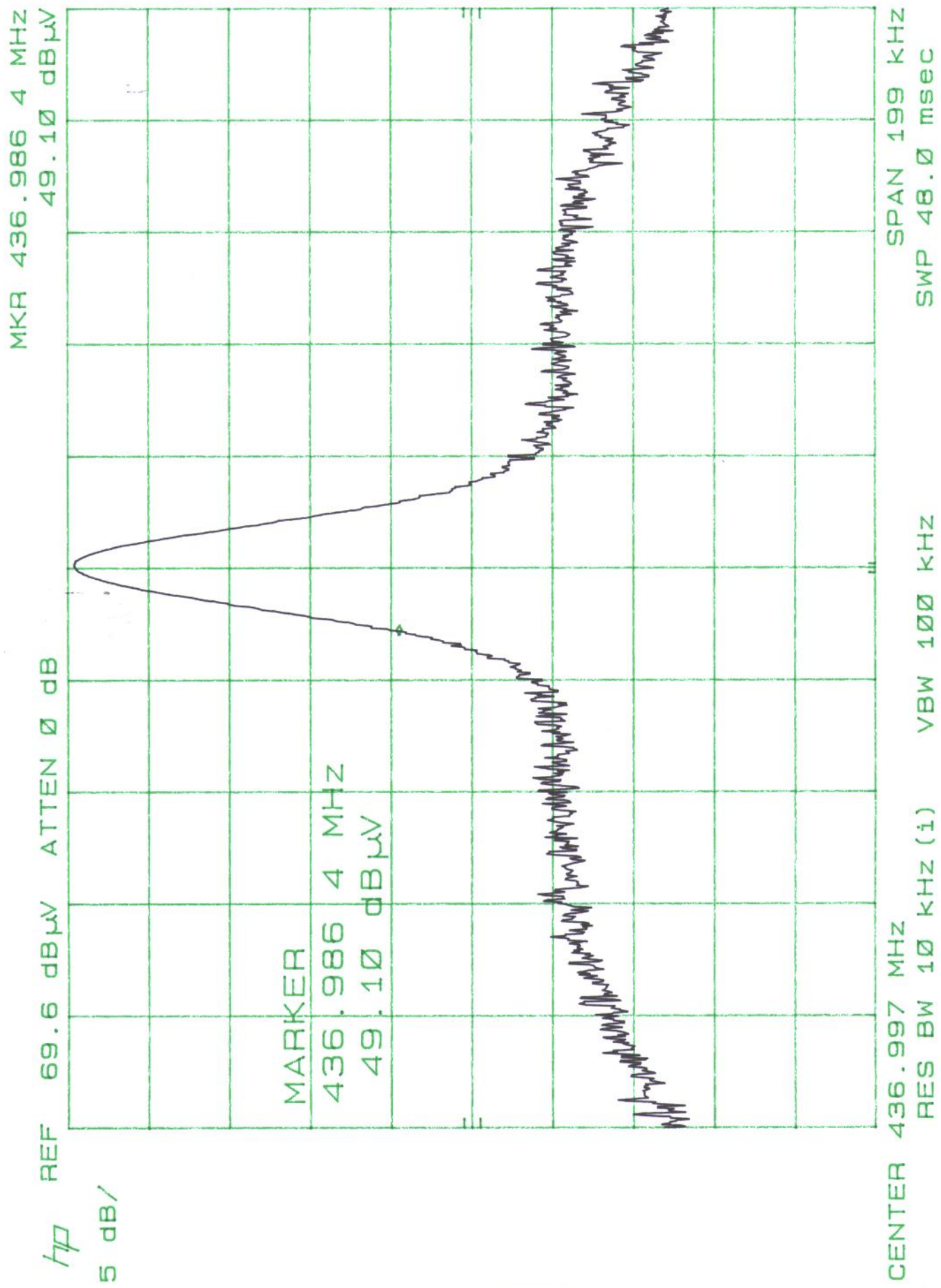
MKR 436.986 4 MHz
49.10 dBµV
SPAN 199 kHz
SWP 48.0 msec
REF 69.6 dBµV ATTEN 0 dB
5 dB/
MARKER
436.986 4 MHz
49.10 dBµV
CENTER 436.997 MHz
RES BW 10 kHz (i) VBW 100 kHz

FIGURE 42

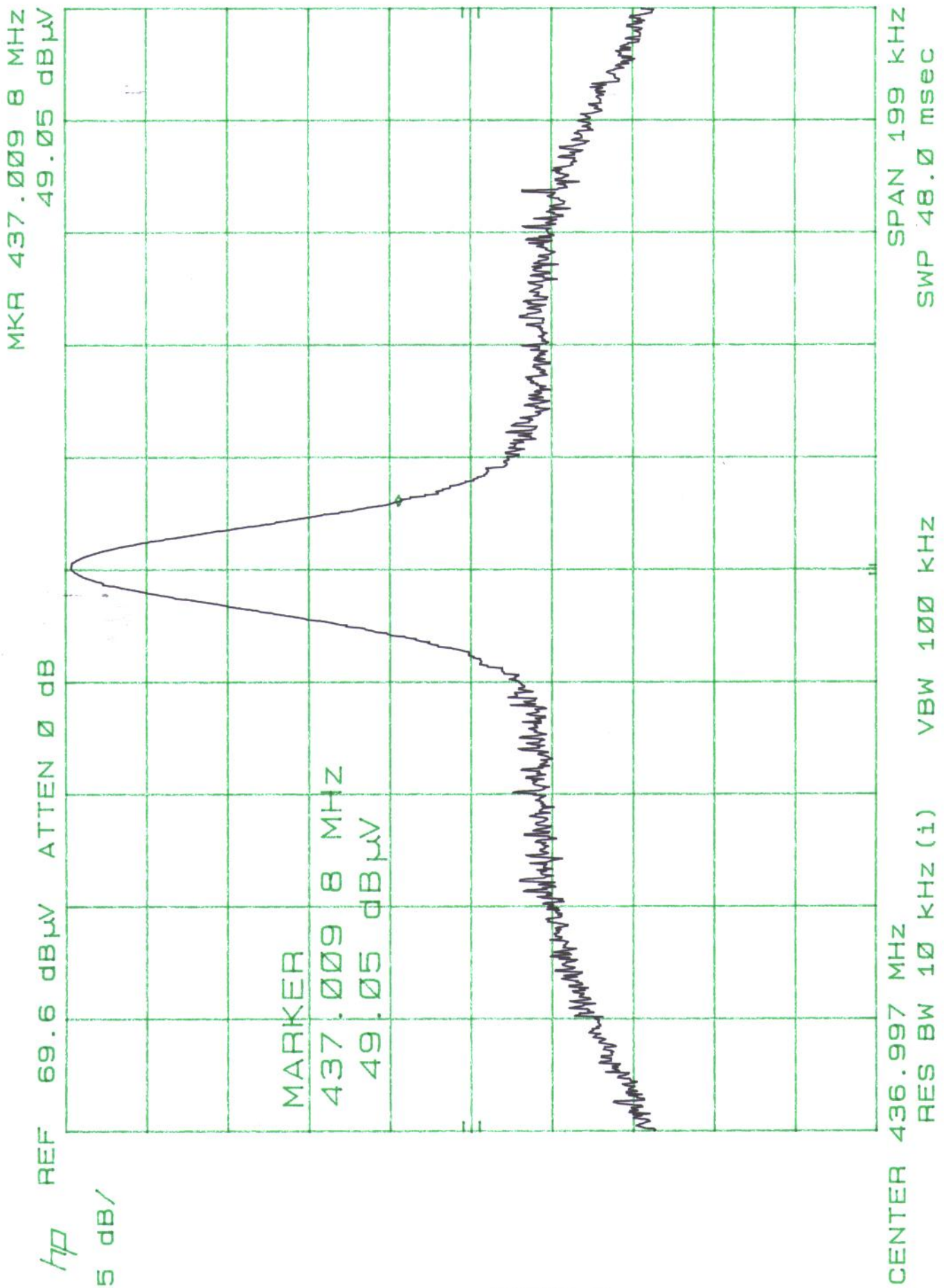
MKR 437.009 8 MHz
49.05 dBµV
REF 69.6 dBµV
ATTEN 0 dB
5 dB/
MARKER
437.009 8 MHz
49.05 dBµV
CENTER 436.997 MHz
RES BW 10 kHz (i)
VBW 100 kHz
SPAN 199 kHz
SWP 48.0 msec

FIGURE 43

4.4 Radiated Emissions Measurements, §15.33, §15.35, §15.109, §15.205, §15.209, §15.231

Radiated Emissions measurements were recorded for the test sample at a distance of 3 meters. Radiated Emissions were measured with the antenna in both the horizontal and vertical polarizations. The antenna was raised 1 to 4 meters in height and the Equipment Under Test **(EUT)** was rotated 360° to maximize the emission. No significant emission level changes occurred while positioning the **EUT** power cable. The **EUT** was tested in FM Packet Mode.

For intentional radiators the field strength of emissions of the **EUT** was measured out to the tenth harmonic of the carrier frequency. The carrier frequency was set to 431 and 437MHz.

Figure 24 is a test setup diagram for Radiated Emissions and Figure 25 are the photographs of the test setup.

The test results for Radiated Emissions testing are shown in the following figures:

Figure 44 Unintentional Radiated Emissions Test Results Data FM Tx Mode 431MHz, Vert.
Figure 45 Unintentional Radiated Emissions Test Results Data, FM Tx Mode, 431MHz, Horiz.
Figure 46 Unintentional Radiated Emissions Test Results Data, FM Tx Mode, 437MHz, Vert.
Figure 47 Unintentional Radiated Emissions Test Results Data, FM Tx Mode, 437MHz, Horiz.
Figure 48 Intentional Radiated Emissions Test Results Data, FM Tx Mode 431MHz
Figure 49 Intentional Radiated Emissions Test Results Data, FM Tx Mode 437MHz

ALL LEVELS COMPLY WITH THE APPLICABLE FCC LIMITS FOR RADIATED EMISSIONS PER THE APPLICABLE PARAGRAPHS.

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq.: 431MHz
Mode:Tx (FM)

Test Personnel: J. Kavalusky
Date: 7/24/06

Radiated Emissions for UnIntentional Radiators

Frequency (MHz)	Polarity	Antenna Height (Meters)	Azimuth (Degrees)	Indicated Level (dBuV)	Antenna Factor (dB)	Pre-Amp Gain Factor (dB)	Cable Loss (dB)	Averaging Factor (dB)	Field Strength @ 3m (dBuV/m)	Limits @ 3m (dBuV/m)	Margin (dB)
52.6	Vert	1.00	0	19.6	9.6	0.0	1.1		30.3	41.93	-11.6
52.9	Vert	1.00	0	19.4	9.6	0.0	1.1		30.1	41.93	-11.8
120.0	Vert	1.00	0	5.0	11.2	0.0	1.9		18.10	41.53	-23.4
200.0	Vert	1.00	0	1.5	14.6	0.0	2.3		18.4	51.48	-33.1
300.0	Vert	1.00	0	0.2	14.8	0.0	3.0		18.0	54.67	-36.7
427.67	Vert	1.00	267.0	24.5	17.4	0.0	3.6		45.5	60.61	-15.1
434.31	Vert	1.00	267.0	19.1	17.2	0.0	3.6		39.9	60.84	-20.9
435	Vert	1.00	44.0	21.4	17.3	0.0	3.7		40.20	60.86	-20.7
435.6	Vert	1.36	8.5	21.2	17.4	0.0	3.6		42.2	60.88	-18.7
500.0	Vert	1.00	0	1.0	17.9	0.0	4.0		22.9	61.9	-39.0
861.386	Vert	1.22	128.4	2.4	22.4	0.0	5.4		30.2	61.9	-31.7
1000.0	Vert	1.00	0	-0.2	24.2	0.0	5.8		29.8	61.9	-32.1
1292.0	Vert	1.00	0	49.7	25.0	-31.0	1.0		44.7	61.9	-17.2
1723.0	Vert	1.00	0	49.0	26.3	-33.0	1.0		43.3	61.9	-18.6
2153.0	Vert	1.00	0	44.6	28.0	-29.0	1.0		44.6	61.9	-17.3

Figure 44

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq.: 431MHz
Mode: Tx. (FM)

Test Personnel: J. Kavalusky
Date: 7/24/06

Radiated Emissions for UnIntentional Radiators

Frequency (MHz)	Polarity	Antenna Height (Meters)	Azimuth (Degrees)	Indicated Level (dBuV)	Antenna Factor (dB)	Pre-Amp Gain Factor (dB)	Cable Loss (dB)	Averaging Factor (dB)	Field Strength @ 3m (dBuV/m)	Limits @ 3m (dBuV/m)	Margin (dB)
72	Horiz	2.43	180.0	24.2	8.6	0.0	1.4		34.2	41.93	-7.7
75.6	Horiz	2.43	180.0	24.2	8.8	0.0	1.4		34.4	41.93	-7.5
120.0	Horiz	2.33	180.0	9.0	11.0	0.0	1.9		21.9	41.58	-19.7
200.0	Horiz	1.65	180.0	7.2	14.0	0.0	2.3		23.5	51.48	-28.0
300.0	Horiz	1.00	127.9	-0.7	15.2	0.0	3.0		17.5	54.67	-37.2
427.67	Horiz	1.00	113.0	25.1	16.6	0.0	3.6		45.3	60.85	-15.6
434.36	Horiz	1.00	236.0	21.3	17.3	0.0	3.6		42.2	60.67	-18.5
435	Horiz	1.00	150.6	23.1	17.20	0.0	3.6		43.9	60.86	-17.0
500.0	Horiz	1.00	0	-1.1	18.2	0.0	4.0		21.1	61.9	-40.8
861.386	Horiz	1.00	0	10.0	22.7	0.0	5.4		38.1	61.9	-23.8
1000.0	Horiz	1.00	0	-0.2	24.6	0.0	5.8		30.2	61.9	-31.7
1292.0	Horiz	1.00	0	53.8	25.0	-31.0	1.0		48.8	61.9	-13.1
1723.0	Horiz	1.00	0	53.1	26.6	-33.0	1.0		47.7	61.9	-14.2
2153.0	Horiz	1.00	0	43.6	28.0	-29.0	1.0		43.6	61.9	-18.3

Figure 45

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq.: 437MHz
Mode: Tx. (FM)

Test Personnel:J. Kavalusky
Date: 7/24/06

Radiated Emissions for UnIntentional Radiators

Frequency (MHz)	Polarity	Antenna Height (Meters)	Azimuth (Degrees)	Indicated Level (dBuV)	Antenna Factor (dB)	Pre-Amp Gain Factor (dB)	Cable Loss (dB)	Averaging Factor (dB)	Field Strength @ 3m (dBuV/m)	Limits @ 3m (dBuV/m)	Margin (dB)
52.6	Vert	1.00	0.0	19.3	9.6	0.0	1.1		30.0	41.93	-11.9
120	Vert	1.00	0.0	4.5	11.2	0.0	1.9		17.6	41.53	-23.9
192.0	Vert	1.00	248	4.4	14.2	0.0	2.2		20.8	51.48	-30.7
200.0	Vert	1.00	102	1.7	14.6	0.0	2.3		18.6	51.48	-32.9
300.0	Vert	1.00	0	-1.1	14.8	0.0	3.0		16.7	54.67	-38.0
427.63	Vert	1.00	243.0	19.00	16.6	0.0	3.6		39.2	60.61	-21.4
434.36	Vert	1.00	94.1	8.6	17.2	0.0	3.6		29.4	60.84	-31.4
435	Vert	1.00	160.3	14.2	17.3	0.0	3.7		35.2	60.92	-25.7
500.0	Vert	1.40	97	-1.1	17.9	0.0	4.0		20.8	61.9	-41.1
873.386	Vert	1.38	97	2.4	22.8	0.0	5.4		30.6	61.9	-31.3
1000.0	Vert	1.38	97	-0.2	24.2	0.0	5.8		29.8	61.9	-32.1
1310.0	Vert	1.00	0.0	53.1	25.1	-31.0	1.0		48.2	61.9	-13.7
1747.0	Vert	1.00	0.0	52.5	26.3	-33.0	1.0		46.8	61.9	-15.1
2183.0	Vert	1.00	0.0	44.4	28.2	-29.0	1.0		44.6	61.9	-17.3

Figure 46

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq.: 437MHz
Mode:Tx. (FM)

Test Personnel: J. Kavalusky
Date: 7/24/06

Radiated Emissions for UnIntentional Radiators

Frequency (MHz)	Polarity	Antenna Height (Meters)	Azimuth (Degrees)	Indicated Level (dBuV)	Antenna Factor (dB)	Pre-Amp Gain Factor (dB)	Cable Loss (dB)	Averaging Factor (dB)	Field Strength @ 3m (dBuV/m)	Limits @ 3m (dBuV/m)	Margin (dB)
52.9	Horiz	2.38	178.4	25.2	10.5	0.0	1.1		36.8	41.93	-5.1
75	Horiz	2.39	135	24.8	8.8	0.0	1.4		35.0	41.93	-6.9
120.0	Horiz	2.21	0.0	8.0	11.0	0.0	1.9		20.90	41.58	-20.7
200.0	Horiz	2.21	0.0	6.8	14.0	0.0	2.3		23.1	51.48	-28.4
300.0	Horiz	1.00	126	-1.1	15.2	0.0	3.0		17.1	54.67	-37.6
427.63	Horiz	1.00	255.0	21.2	17.3	0.0	3.6		42.1	60.61	-18.5
434	Horiz	1.00	255.0	12.5	17.2	0.0	3.6		33.3	60.84	-27.5
435	Horiz	1.13	150.8	15.4	17.3	0.0	3.7		36.40	60.86	-24.5
500.0	Horiz	1.00	0	-1.1	18.2	0.0	4.0		21.1	61.9	-40.8
873.386	Horiz	1.00	252	2.4	23.3	0.0	5.4		31.1	61.9	-30.8
1000.0	Horiz	2.00	97	0.2	24.6	0.0	5.8		30.6	61.9	-31.3
1310.0	Horiz	1.00	0.0	53.8	25.1	-31.0	1.0		48.9	61.9	-13.0
1747.0	Horiz	1.00	0.0	47.0	26.6	-33.0	1.0		41.6	61.9	-20.3
2183.0	Horiz	1.00	0.0	46.3	28.2	-29.0	1.0		46.5	61.9	-15.4

Figure 47

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq. 431 MHz.
Mode Tx (FM)

Test Personnel: J. Kavalusky
Date: 7/24/2006

Radiated Emission for Intentional Radiators

Frequency (MHz)	Polarity	Antenna Height (Meters)	Azimuth (Degrees)	Indicated Level (dBuV)	Antenna Factor (dB)	Pre-Amp Gain Factor (dB)	Cable Loss (dB)	Averaging Factor (dB)	Field Strength @ 3m (dBuV/m)	Limits @ 3m (dBuV/m)	Margin (dB)
431	Vert	1.00	238.9	70.0	17.4	0.0	3.6	-20.0	71.0	80.73	-9.7
862	Vert	1.00	238.9	49.0	22.5	0.0	5.4	-20.0	56.9	61.93	-5.0
1293	Vert	1.00	0	46.00	25.0	-31.0	1.0	-20.0	21.00	61.93	-40.9
1724	Vert	1.00	0	44.00	26.3	-33.0	1.0	-20.0	18.30	61.93	-43.6
2155	Vert	1.00	0	48.1	28.0	-29.0	1.0	-20.0	28.1	61.93	-33.8
2586	Vert	1.00	0	46.00	30.0	-32.0	1.0	-20.0	25.00	61.93	-36.9
3017	Vert	1.00	0	42.00	30.3	-27.0	1.0	-20.0	26.30	61.93	-35.6
3448	Vert	1.00	0	41.0	31.3	-25.0	1.0	-20.0	28.3	61.93	-33.6
3879	Vert	1.00	0	41.5	32.4	-23.3	1.0	-20.0	31.60	54.0	-22.4
4310	Vert	1.00	0	41.5	32.5	-22.0	1.0	-20.0	33.0	54.0	-21.0
431	Horiz	1.00	238.9	70.3	17.3	0.0	3.6	-20.0	71.2	80.73	-9.5
862	Horiz	1.00	238.9	45.4	22.8	0.0	5.4	-20.0	53.6	61.93	-8.3
1293	Horiz	1.00	198	56.7	25.0	-31.0	1.0	-20.0	31.7	61.93	-30.2
1724	Horiz	1.00	0	50.4	26.6	-33.0	1.0	-20.0	25.0	61.93	-36.9
2155	Horiz	1.00	0	47.40	28.0	-29.0	1.0	-20.0	27.40	61.93	-34.5
2586	Horiz	1.00	0	45.70	29.9	-32.0	1.0	-20.0	24.6	61.93	-37.3
3017	Horiz	1.00	0	44.50	30.4	-27.0	1.0	-20.0	28.90	61.93	-33.0
3448	Horiz	1.00	0	41.40	31.4	-25.0	1.0	-20.0	28.80	61.93	-33.1
3879	Horiz	1.00	0	41.50	32.5	-23.3	1.0	-20.0	31.70	54.0	-22.3
4310	Horiz	1.00	0	41.50	32.5	-22.0	1.0	-20.0	33.00	54.0	-21.0

Figure 48

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq.: 437MHz
Mode: Tx (CW)

Test Personnel: J. Kavalusky
Date: 7/24/06

Radiated Emission for Intentional Radiators

Frequency (MHz)	Polarity	Antenna Height (Meters)	Azimuth (Degrees)	Indicated Level (dBuV)	Antenna Factor (dB)	Pre-Amp Gain Factor (dB)	Cable Loss (dB)	Averaging Factor (dB)	Field Strength @ 3m (dBuV/m)	Limits @ 3m (dBuV/m)	Margin (dB)
437	Vert	1.28	242.9	68.9	17.4	0.0	3.6	-20.0	69.9	80.3	-10.4
874	Vert	3.50	242.9	40.0	22.8	0.0	5.4	-20.0	48.2	61.9	-13.7
1311	Vert	1.00	0	53.20	25.1	-32.0	1.0	-20.0	27.3	61.9	-34.6
1748	Vert	1.00	0	50.00	26.3	-33.0	1.0	-20.0	24.30	54.0	-29.7
2185	Vert	1.00	0	44.0	28.2	-29.0	1.0	-20.0	24.2	61.9	-37.7
2622	Vert	1.00	0	45.00	30.0	-32.0	1.0	-20.0	24.00	61.9	-37.9
3059	Vert	1.00	0	42.30	30.3	-27.0	1.0	-20.0	26.60	61.9	-35.3
3496	Vert	1.00	0	42.0	31.4	-25.0	1.0	-20.0	29.4	54.0	-24.6
3933	Vert	1.00	0	41.0	32.44	-23.3	1.0	-20.0	31.14	54.0	-22.9
4370	Vert	1.00	0	41.0	32.5	-22.0	1.0	-20.0	32.5	54.0	-21.5
437	Horiz	1.00	255.0	74.0	17.3	0.0	3.6	-20.0	74.9	80.3	-5.4
874	Horiz	1.00	255.0	40.0	23.3	0.0	5.4	-20.0	48.7	61.9	-13.2
1311	Horiz	1.00	255.0	53.50	25.1	-32.0	1.0	-20.0	27.60	61.9	-34.3
1748	Horiz	1.00	0	47.30	26.6	-33.0	1.0	-20.0	21.90	54.0	-32.1
2185	Horiz	1.00	0	43.00	28.2	-29.0	1.0	-20.0	23.2	61.9	-38.7
2622	Horiz	1.00	0	45.10	29.9	-32.0	1.0	-20.0	24.00	61.9	-37.9
3059	Horiz	1.00	0	41.70	30.4	-27.0	1.0	-20.0	26.10	61.9	-35.8
3496	Horiz	1.00	0	41.70	31.5	-25.0	1.0	-20.0	29.20	54.0	-24.8
3933	Horiz	1.00	0	41.40	32.54	-23.3	1.0	-20.0	31.64	54.0	-22.4
4370	Horiz	1.00	0	40.80	32.5	-22.0	1.0	-20.0	32.30	54.0	-21.7

Figure 49

4.5 Bandwidth Measurements, Paragraph 15.231

Bandwidth measurements were made at the three transmit frequencies of 431 and 437MHz.

RSI used an HP 8566 Spectrum Analyzer to perform bandwidth measurements. Bandwidth plots are shown on data sheets.

The requirement states that the bandwidth shall be no wider than .25% of the center frequency at the 20dB down points. Results of testing are shown in Figures 50 through 55.

THE BANDWIDTH MEASUREMENTS COMPLIED WITH THE FCC REQUIREMENTS SET FORTH IN PARAGRAPH 15.231.

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq.: 431MHz

Test Personnel: John Kavalusky
Date: 8/01/06

Bandwidth of Fundamental Frequency

	Frequency (MHz)	Measurement (dBuV/m)
Center Frequency	430.198	75.85
20 dB down	431.168	57.00
20 dB down	429.878	57.00

The bandwidth is 440kHz.

Allowable Bandwidth: 0.25% of Fundamental Frequency
For 431MHz: ±0.5388MHz

Figure 50

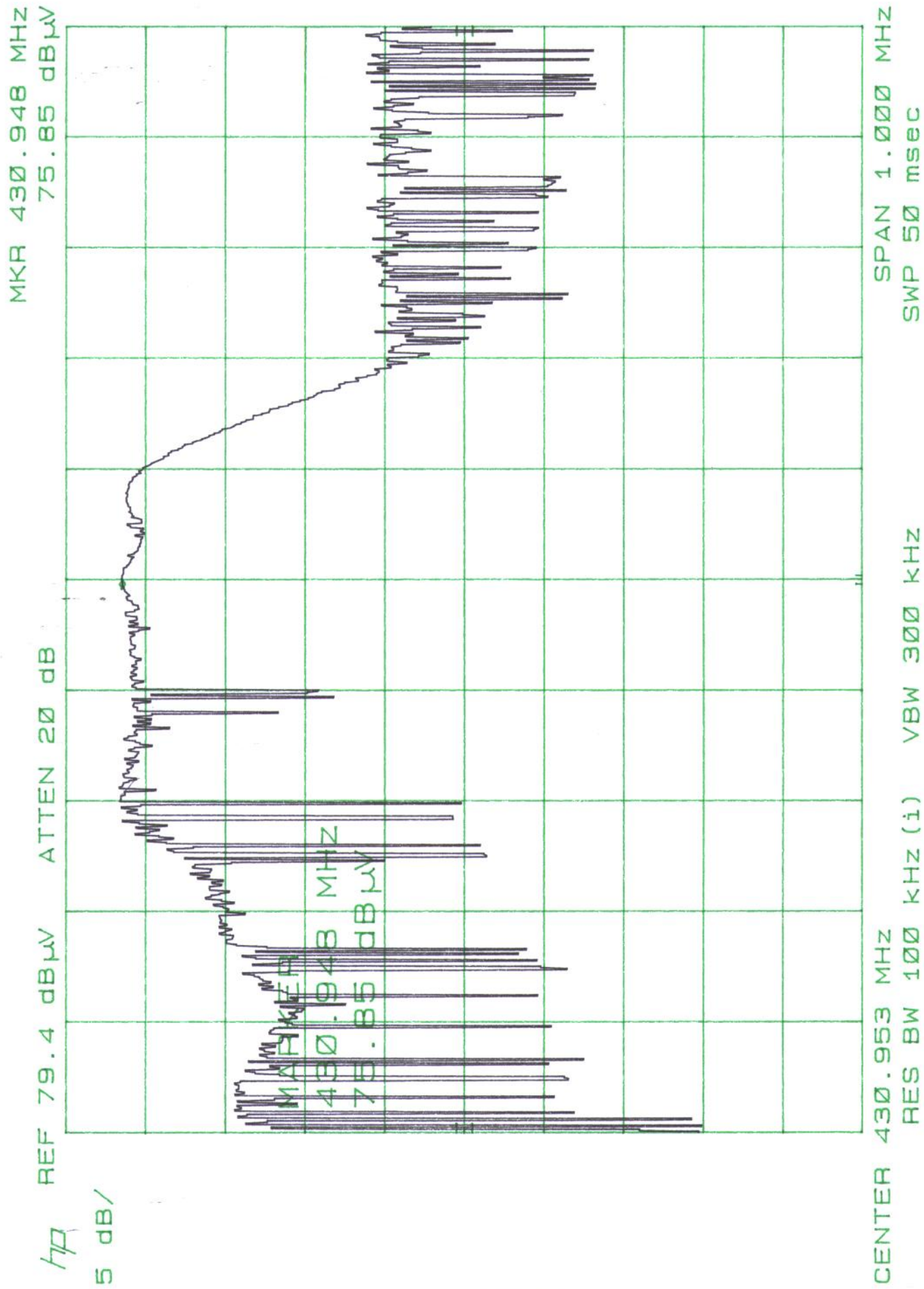
MKR 430.948 MHz
75.85 dBµV
SPAN 1.000 MHz
SWP 50 msec
REF 79.4 dBµV
ATTEN 20 dB
VBW 300 kHz
5 dB/
MARKER
430.948 MHz
75.85 dBµV
CENTER 430.953 MHz
RES BW 100 kHz (i)

FIGURE 51

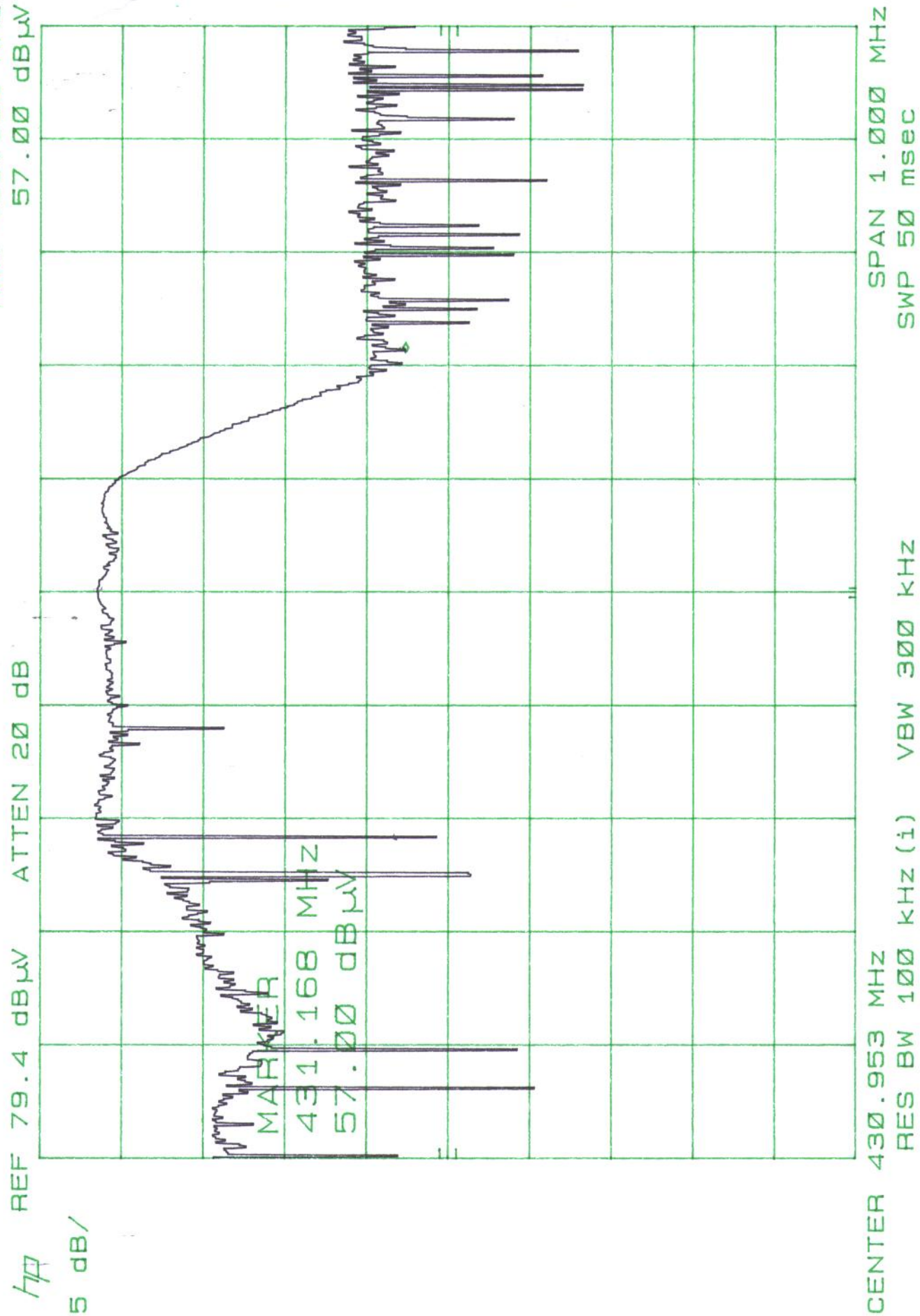
MKR 431.168 MHz
57.00 dBµV
REF 79.4 dBµV
ATTEN 20 dB
5 dB/
MARKER
431.168 MHz
57.00 dBµV
CENTER 430.953 MHz
RES BW 100 kHz (i)
VBW 300 kHz
SPAN 1.000 MHz
SWP 50 msec

FIGURE 52

Company: Lutron Electronics
Model # HRT-3LD
Fund. Freq.: 437MHz

Test Personnel: John Kavalusky
Date: 8/01/06

Bandwidth of Fundamental Frequency

	Frequency (MHz)	Measurement (dBuV/m)
Center Frequency	431.000	77.75
20 dB down	437.177	55.95
20 dB down	436.729	55.95

The bandwidth is 448 kHz.

Allowable Bandwidth: 0.25% of Fundamental Frequency
For 437MHz: ±0.5463MHz

Figure 53

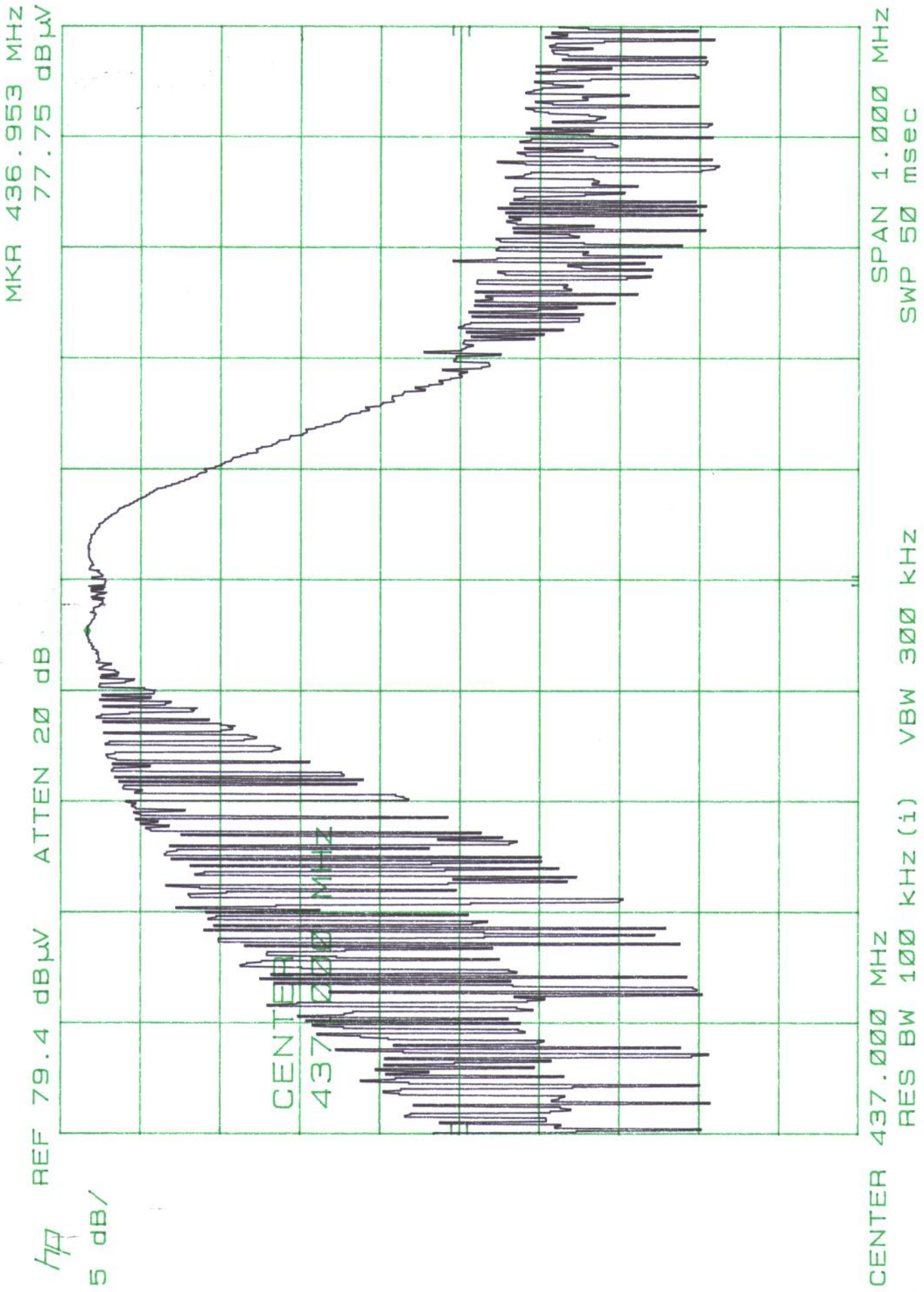
MKR 436.953 MHz
77.75 dBµV
REF 79.4 dBµV
ATTEN 20 dB
5 dB/
CENTER 437.000 MHz
SPAN 1.000 MHz
SWP 50 msec
RES BW 100 kHz (i)
VBW 300 kHz

FIGURE 54

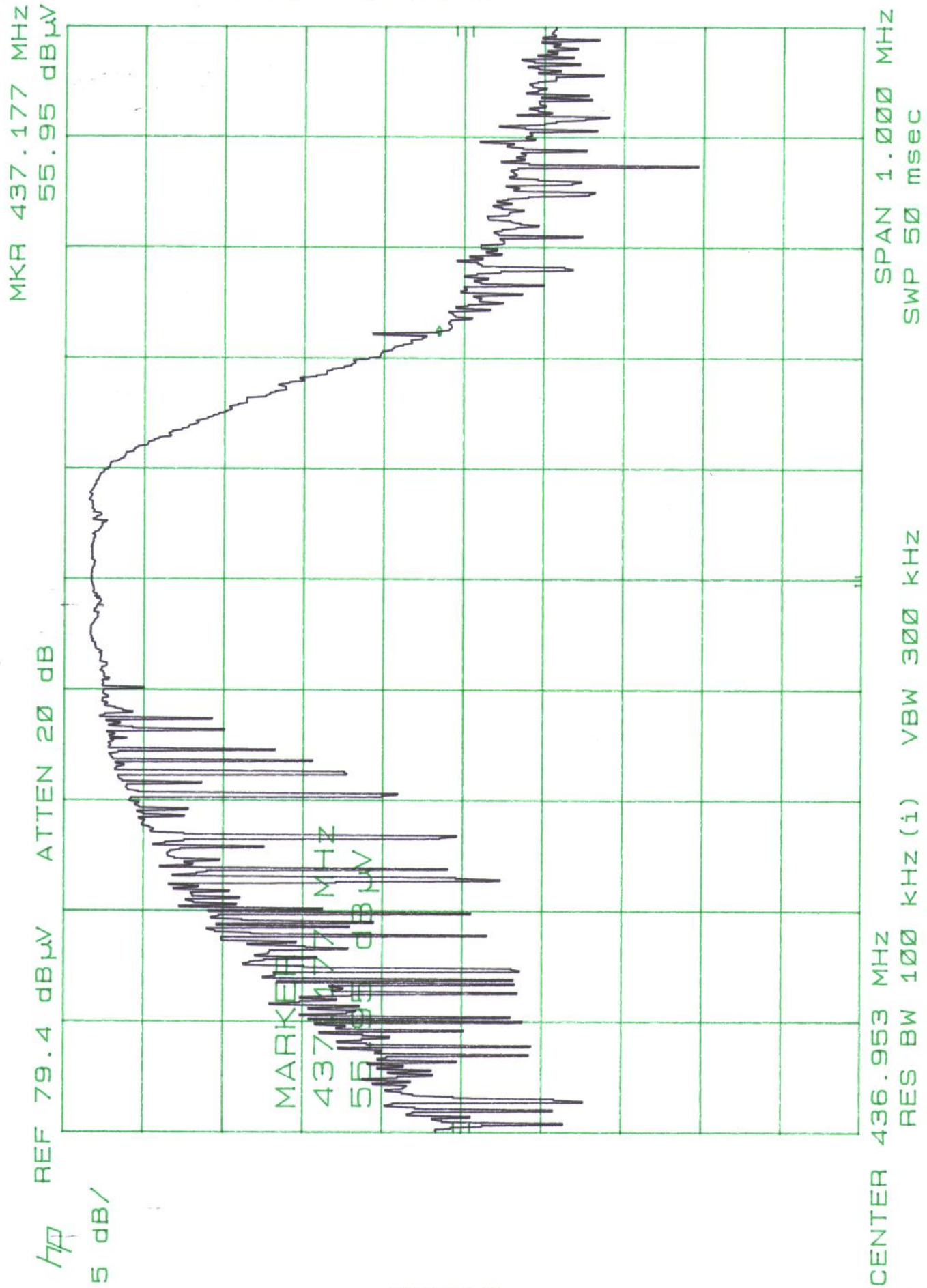
MKR 437.177 MHz
55.95 dBµV
SPAN 1.000 MHz
SWP 50 msec
REF 79.4 dBµV
ATTEN 20 dB
5 dB/
MARKER
437.177 MHz
55.95 dBµV
CENTER 436.953 MHz
RES BW 100 kHz (i)
VBW 300 kHz

FIGURE 55

5.0 CONCLUSIONS

The evaluation of the **Lutron Electronics Model #: HRT-3LD**, configured as described herein, indicated that the unit complies with the requirements set forth in Subpart B and C of Part 15 of the **FCC** Rules for unintentional and intentional radiators.

1. The **EUT** meets the Conducted Emissions limits set forth in §15.107
2. The **EUT** meets the Radiated Emissions limits for unintentional radiators set forth in §15.109.
3. The **EUT** meets the Radiated Emissions limits for intentional radiators set forth in §15.205, §15.209, and §15.231 (c).