10.0 TEST REPORTS

This section should include the test report and data showing compliance with all applicable technical standards. The rule sections which require the test report to be submitted are 2.983(e), and 2.1033(d)(6). Test report is defined as a "complete package" showing data, graphs, test method description, and a list of test equipment

10.1 RF Power Measurements

Figure 21 shows the block diagram of the test set-up used for the measurements. The results are shown in Table 2 below.

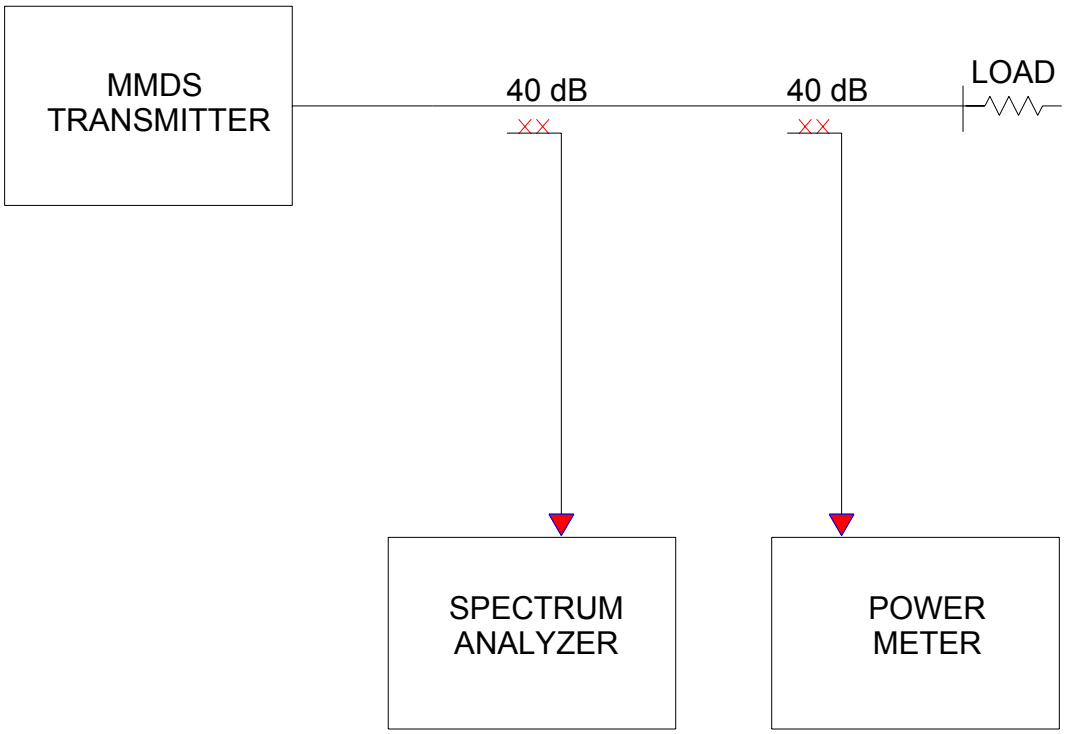

Figure 21. RF Power Measurement Test Set-up.

Table 2. RF Power Measurements.

Number of channels	Peak Sync Power (per channel)	Intermodulation Distortion Products (dBc below sync peak)
1	178 Watts	70.5
4	44.5 Watts	56.5
9	20.0 Watts	55.7
30	4.5 Watts	53.5

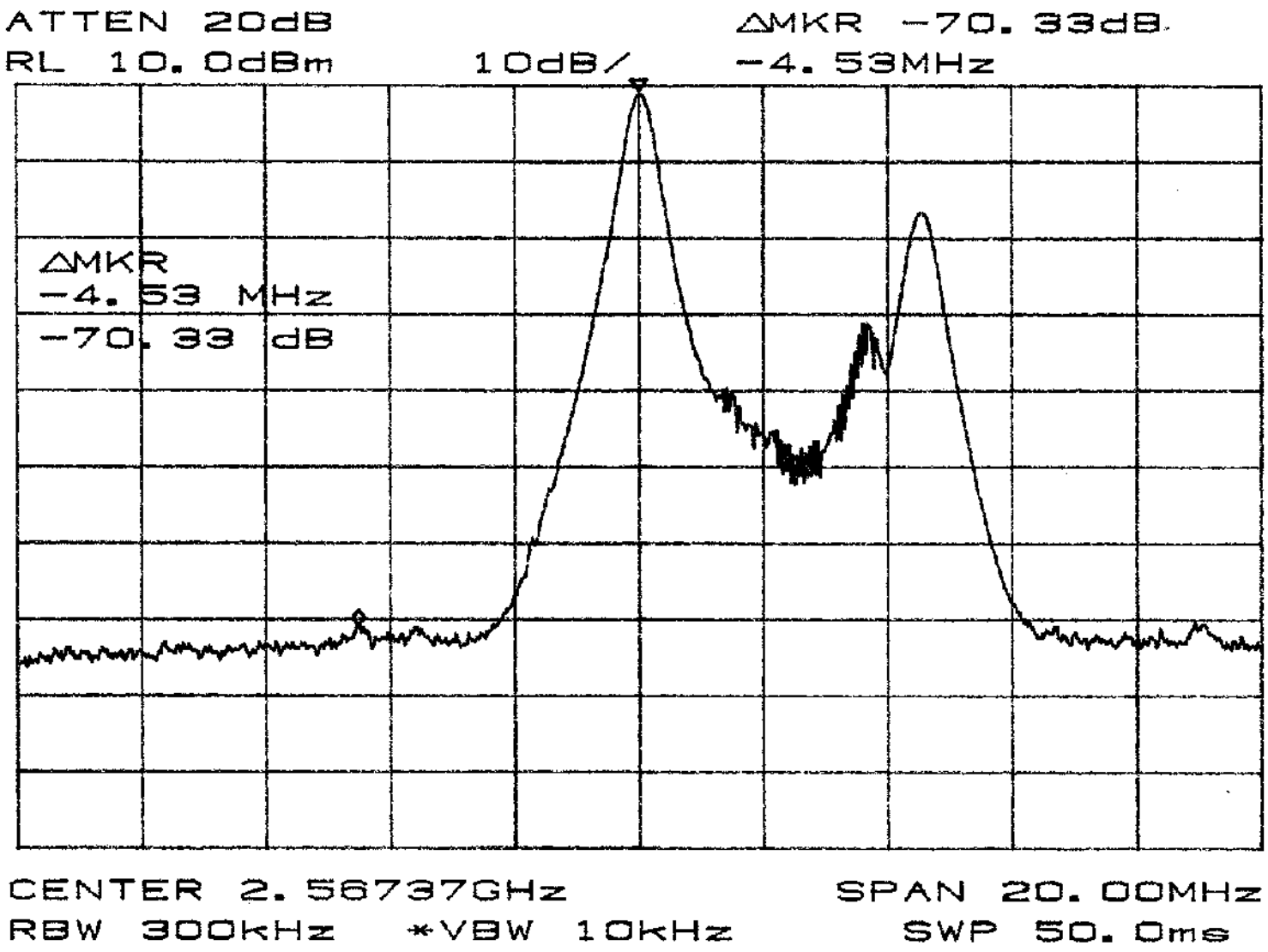

Figure 22. RF Power Measurement, Output Power Plot, 178 Watts - 1 Channel.

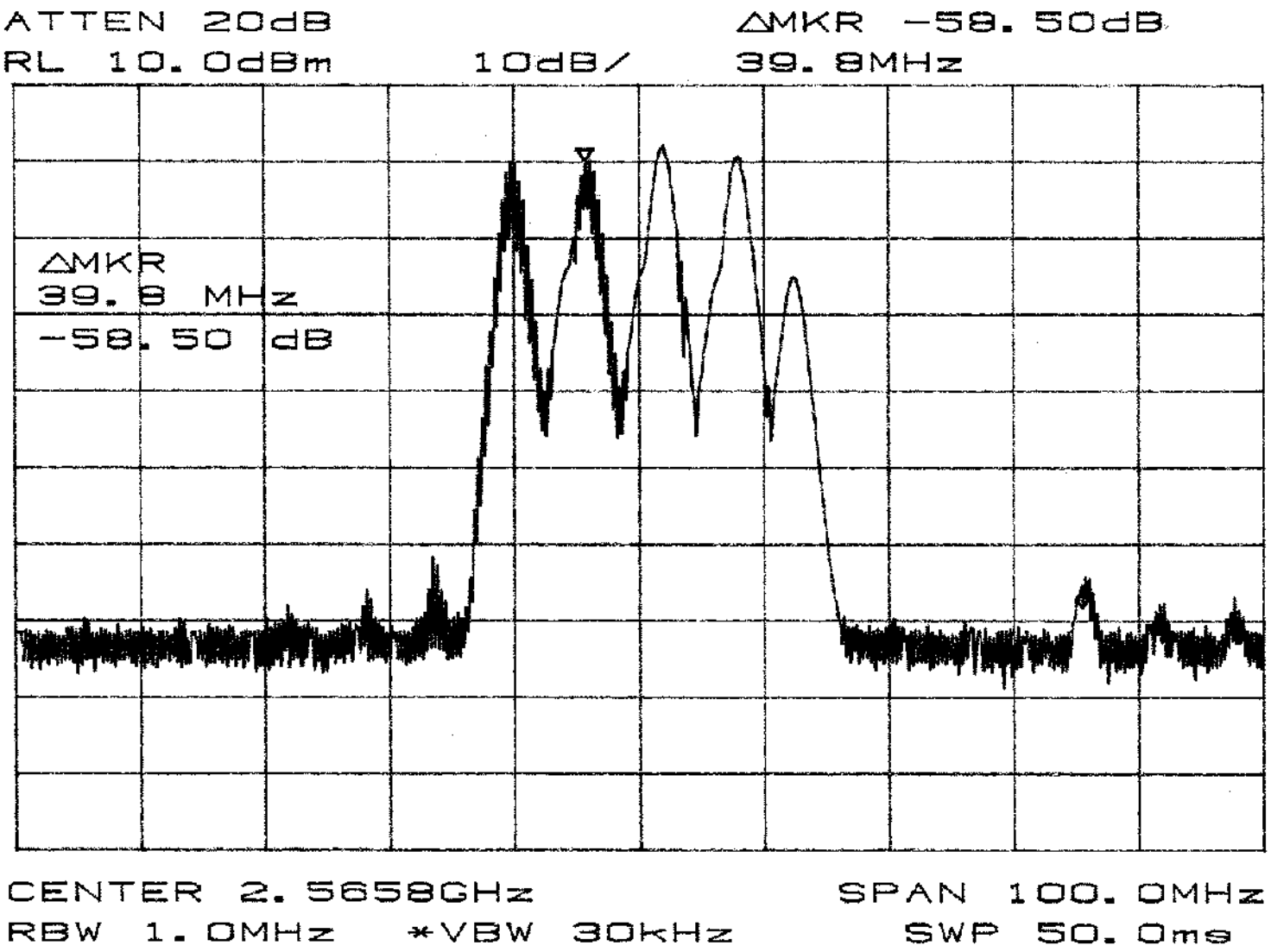

Figure 23. RF Power Measurement, Output Power Plot, 44.5 Watts - 4 Channel.

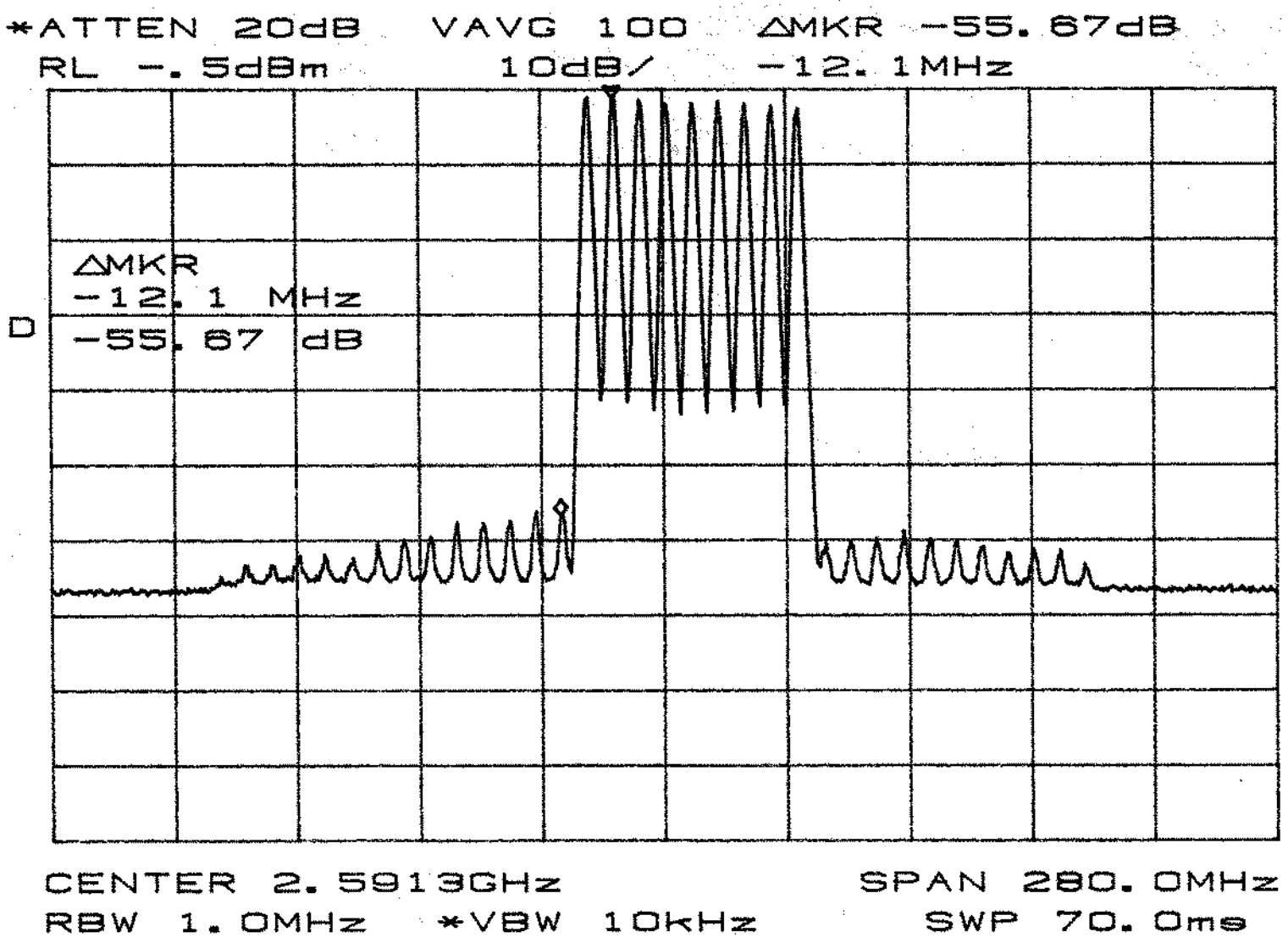

Figure 24. RF Power Measurement, Output Power Plot, 20.0 Watts Per Channel, 9 Channels.

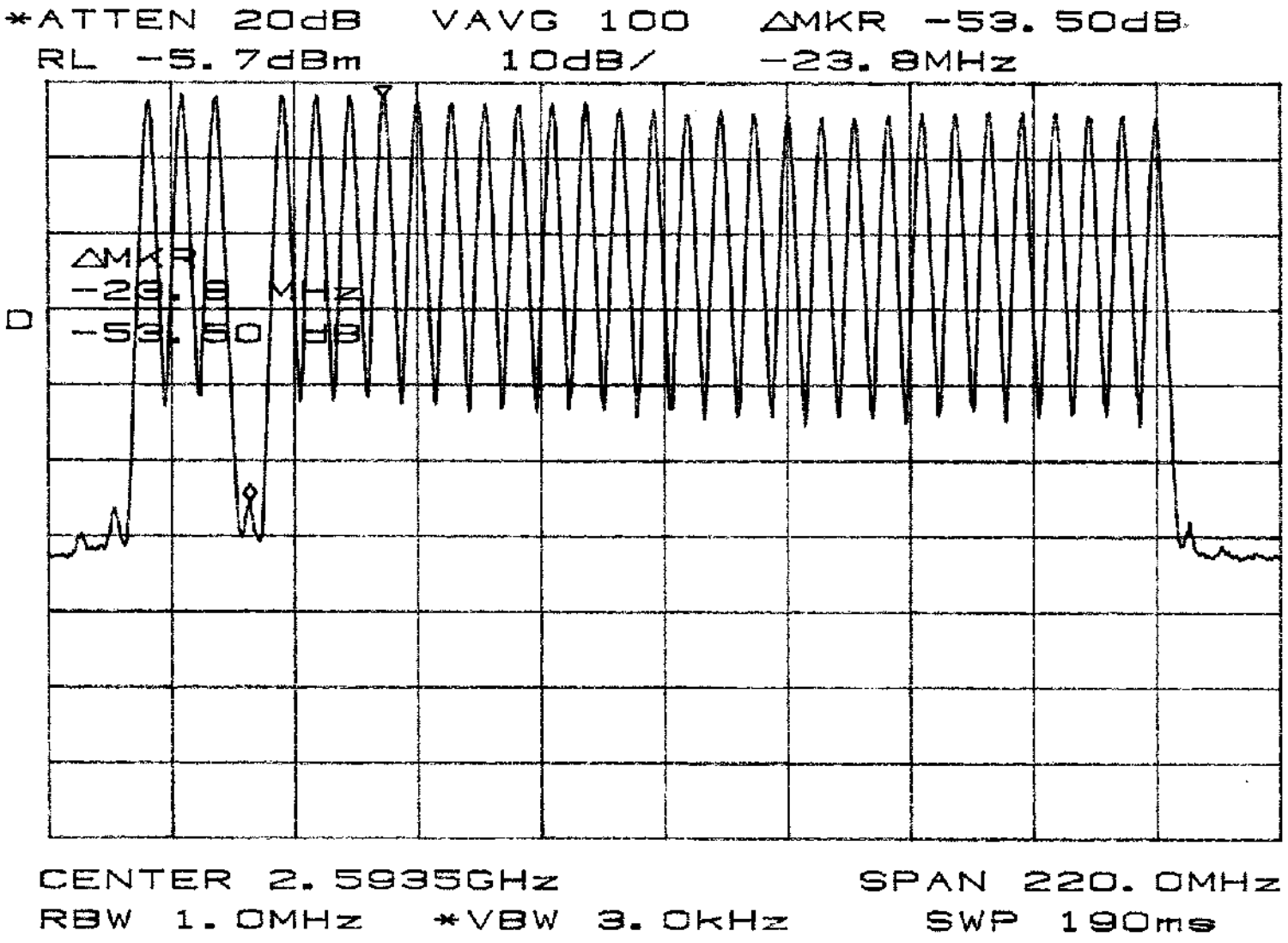

Figure 25. RF Power Measurement, Output Power Plot, 4.5 Watts Per Channel, 31 Channels.

10.2 Frequency Response

The frequency response test set-up is shown in Figure 26. Table 3 shows the measured frequency response. The sweep display is shown in Figure 27.

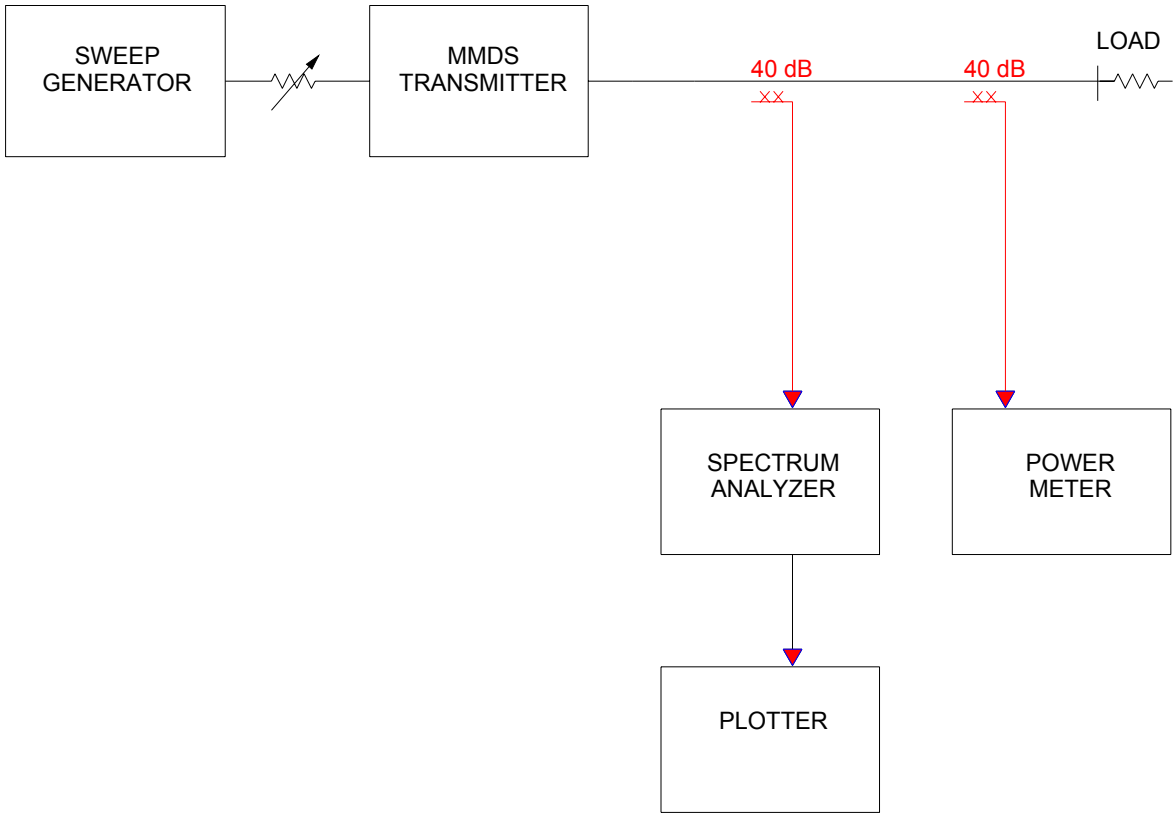

Figure 26. Frequency Response Test Set-up.

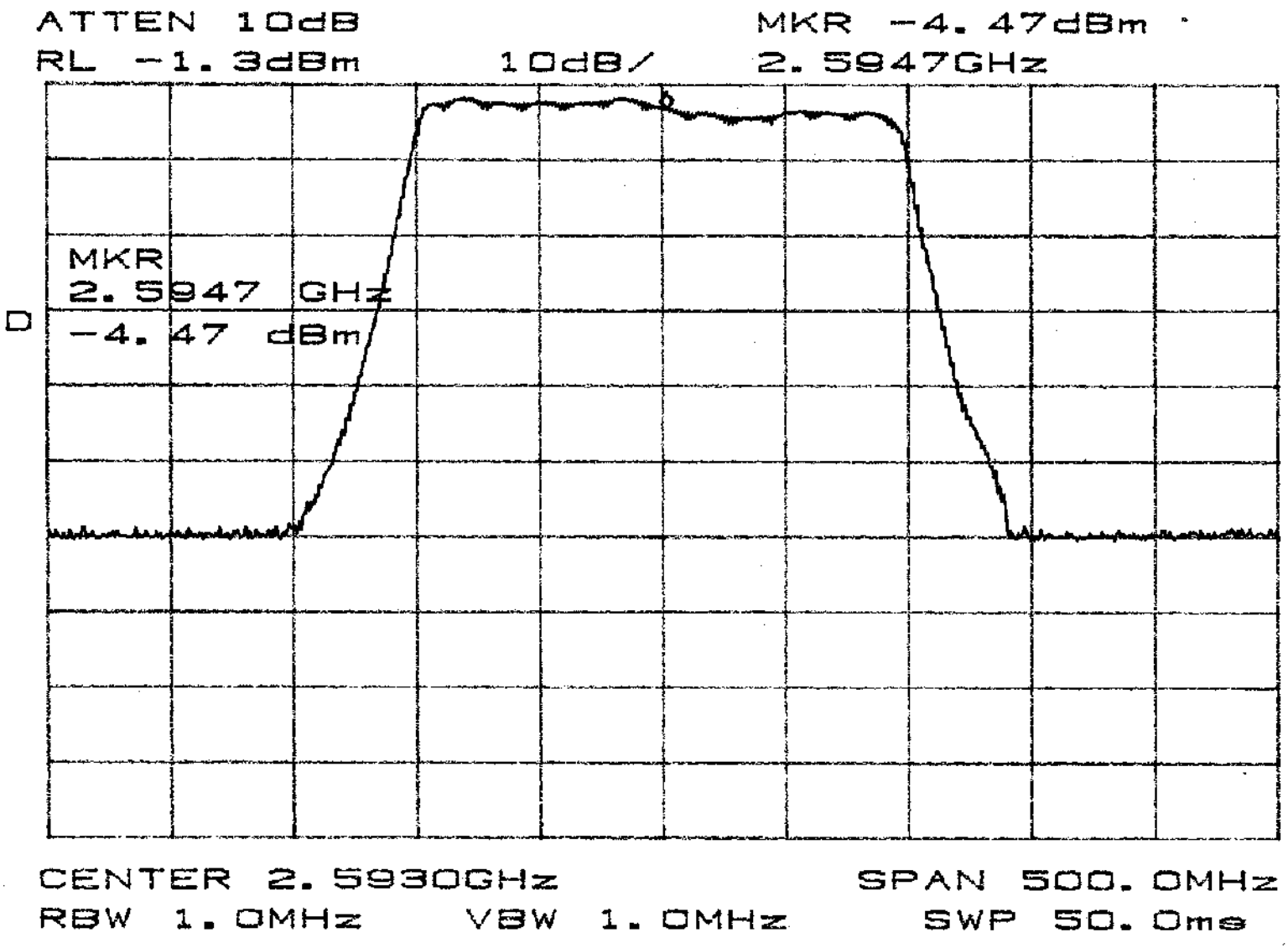

Figure 27. Frequency Response.

Table 3. Measured Frequency Response

Frequency (MHz)	Level (dBm)	Delta (dB)	Frequency (MHz)	Level (dBm)	Delta (dB)
2423.25	-71.5	-63.0	2603.25	-8.8	-0.3
2429.25	-71.5	-63.0	2609.25	-9.0	-0.5
2435.25	-71.5	-63.0	2615.25	-9.3	-0.8
2441.25	-69.6	-61.1	2621.25	-9.5	-1.0
2447.25	-65.3	-56.8	2627.25	-9.8	-1.3
2453.25	-59.2	-50.7	2633.25	-9.6	-1.1
2459.25	-52.8	-44.3	2639.25	-9.4	-0.9
2465.25	-46.6	-38.1	2645.25	-9.2	-0.7
2471.25	-39.8	-31.3	2651.25	-9.2	-0.7
2477.25	-32.0	-23.5	2657.25	-9.5	-1.0
2483.25	-22.6	-14.1	2663.25	-9.7	-1.2
2489.25	-12.1	-3.6	2669.25	-9.7	-1.2
2495.25	-7.1	1.4	2675.25	-9.7	-1.2
2501.25	-7.1	1.4	2681.25	-10.3	-1.8
2507.25	-6.6	1.9	2687.25	-12.7	-4.2
2513.25	-6.5	2.0	2693.25	-23.4	-14.9
2519.25	-6.6	1.9	2699.25	-32.2	-23.7
2525.25	-6.7	1.8	2705.25	-41.1	-32.6
2531.25	-6.6	1.9	2711.25	-48.1	-39.6
2537.25	-6.6	1.9	2717.25	-53.8	-45.3
2543.25	-6.6	1.9	2723.25	-58.7	-50.2
2549.25	-7.1	1.4	2729.25	-64.3	-55.8
2555.25	-7.4	1.1	2735.25	-68.7	-60.2
2561.25	-7.6	0.9	2741.25	-71.5	-63.0
2567.25	-7.3	1.2	2747.25	-71.5	-63.0
2573.25	-7.4	1.1	2753.25	-71.5	-63.0
2579.25	-7.5	1.0	2759.25	-71.5	-63.0
2585.25	-8.0	0.5	2765.25	-71.5	-63.0
2591.25	-8.5	0.0	2771.25	-71.5	-63.0
2597.25	-8.7	-0.2	2777.25	-71.5	-63.0

10.3 Occupied Bandwidth

The test set-up for occupied bandwidth is shown in Figure 21. The occupied bandwidth spectrum is shown in Figure 28.

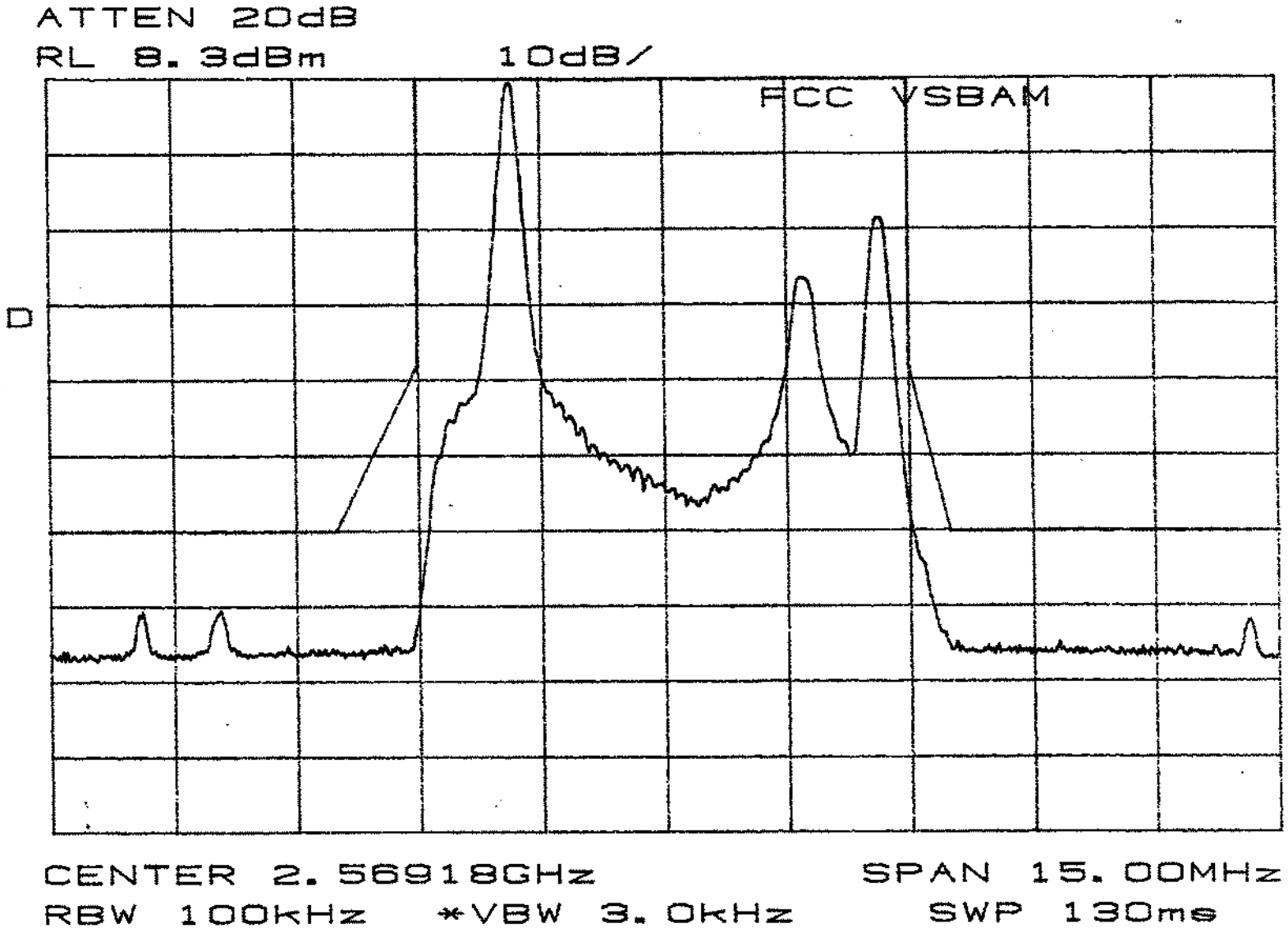

Figure 28. Occupied Bandwidth.

10.4 Conducted Spurious Emissions

The test set-up for conducted spurious emissions is shown in Figure 21. Spectrum Analyzer presentations of the measured results are shown in Figure 29, through Figure 32. Table 4 and Table 5 contain the tabulated results of these measurements.

Table 4. Thirty (30) Channel Loading Data.

Frequency	Source	Peak Sync level Observed/Channel
2500 to 2686 MHz	30 Carriers	4.5 Watts
2300 to 2500 MHz	Lower Composite Triple Beat Products	-61 dBc
2700 to 2900 MHz	Upper Composite Triple Beat Products	-62 dBc
5000 to 5400 MHz	Second Harmonic	-78 dBc
7500 to 8100 MHz	Third Harmonic	-82 dBc

Table 5. Four (4) Channel Loading Data.

Frequency	Source	Peak Sync level Observed/Channel
2500 to 2700 MHz	4 Carriers	44.5 Watts
2300 to 2500 MHz	Lower Composite Triple Beat Products	-68 dBc
2700 to 2900 MHz	Upper Composite Triple Beat Products	-68 dBc
5000 to 5400 MHz	Second Harmonic	-78 dBc
7500 to 8100 MHz	Third Harmonic	-82 dBc

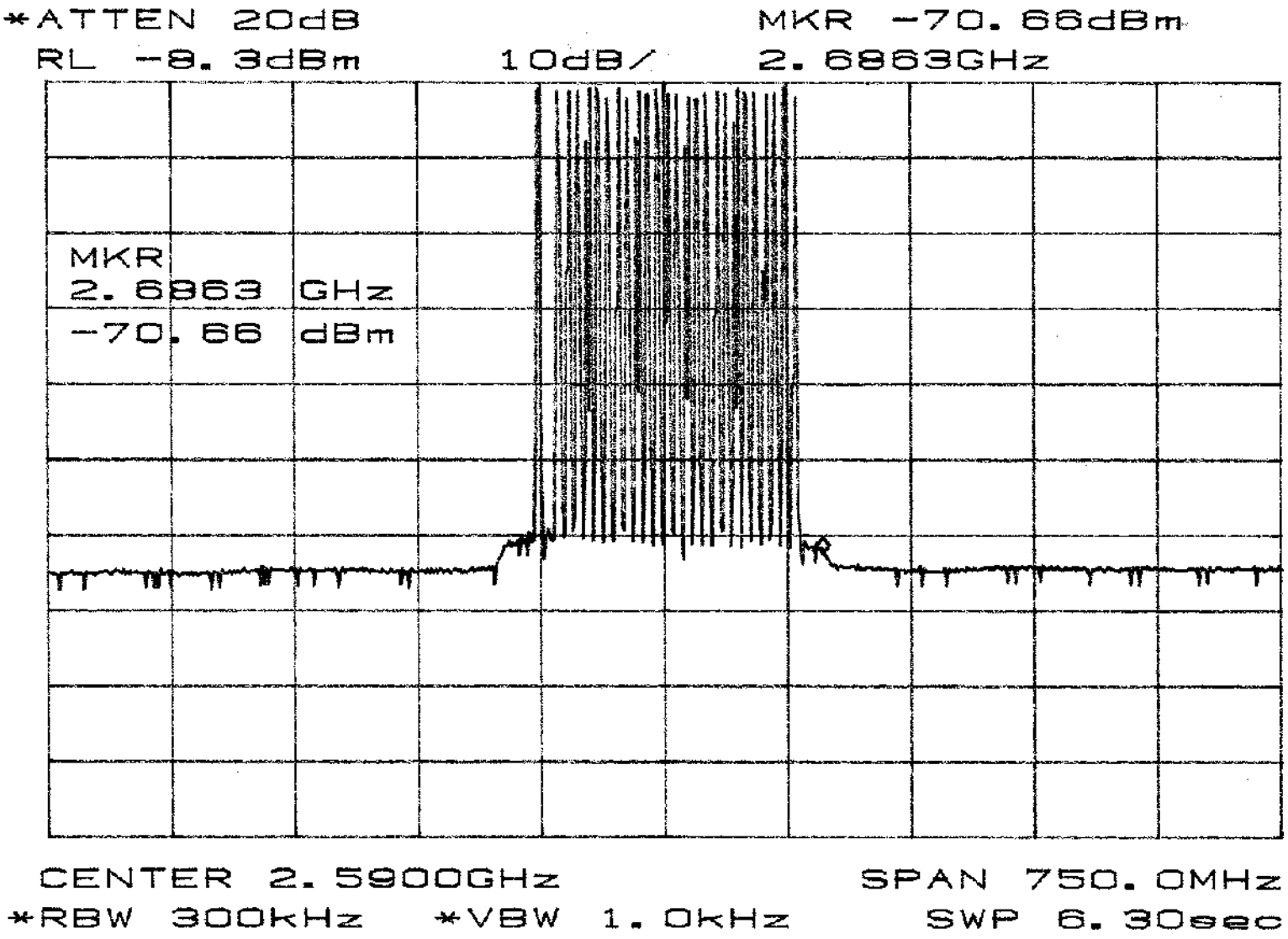

Figure 29. Conducted Spurious Emissions 30 Channel Loading.

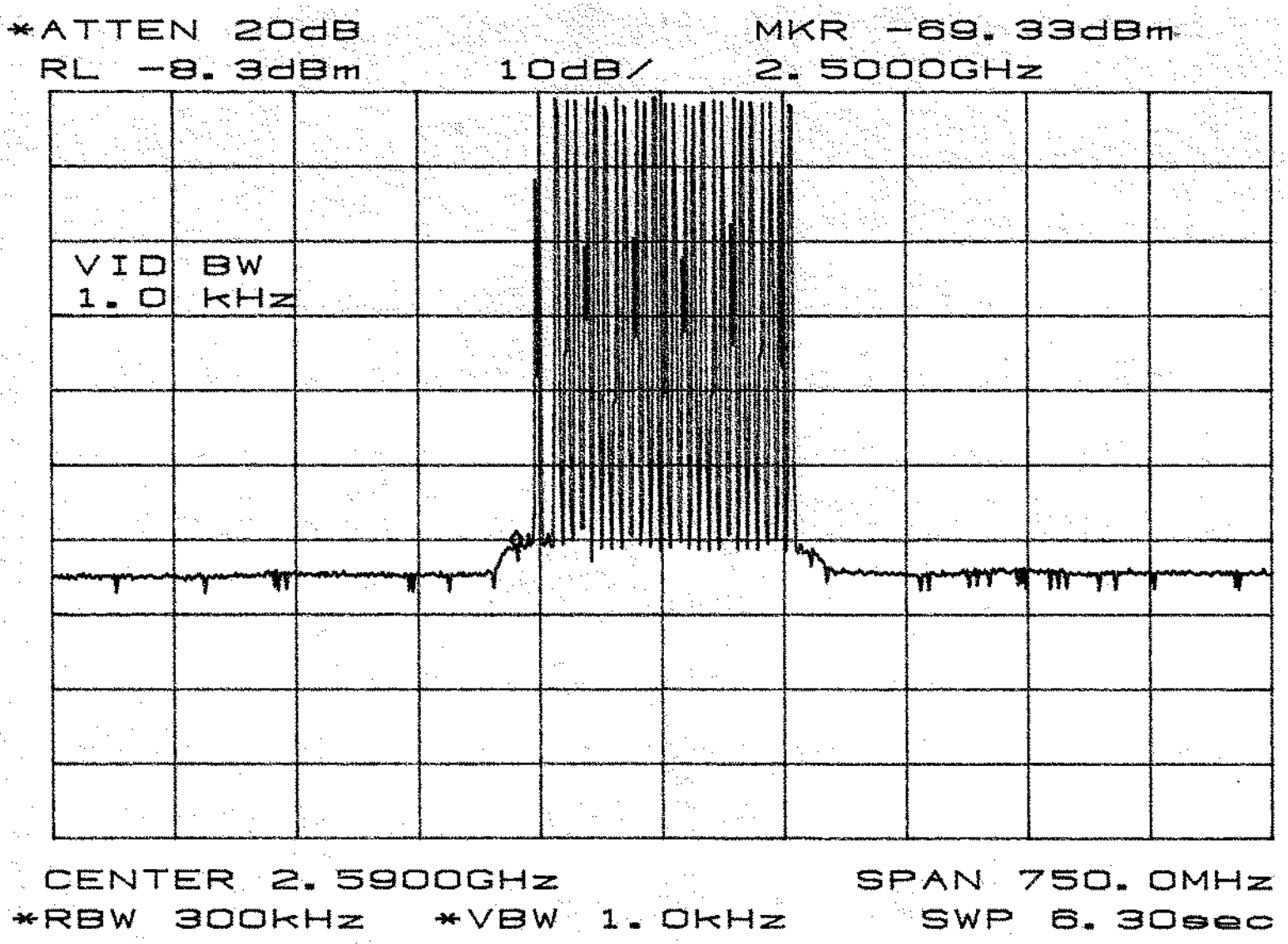

Figure 30. Conducted Spurious Emissions 30 Channel Loading.

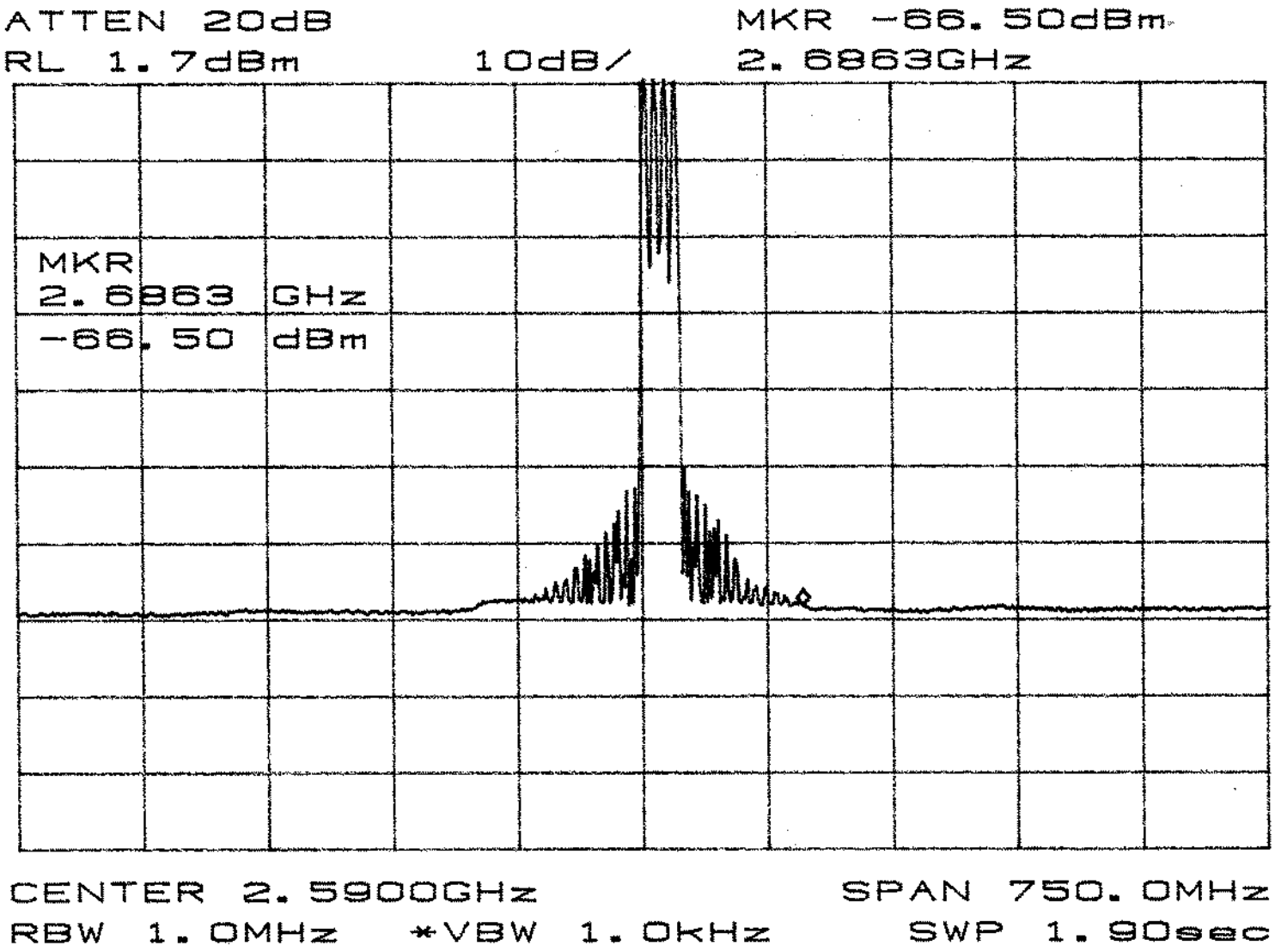

Figure 31. Conducted Spurious Emissions 4 Channel Loading.

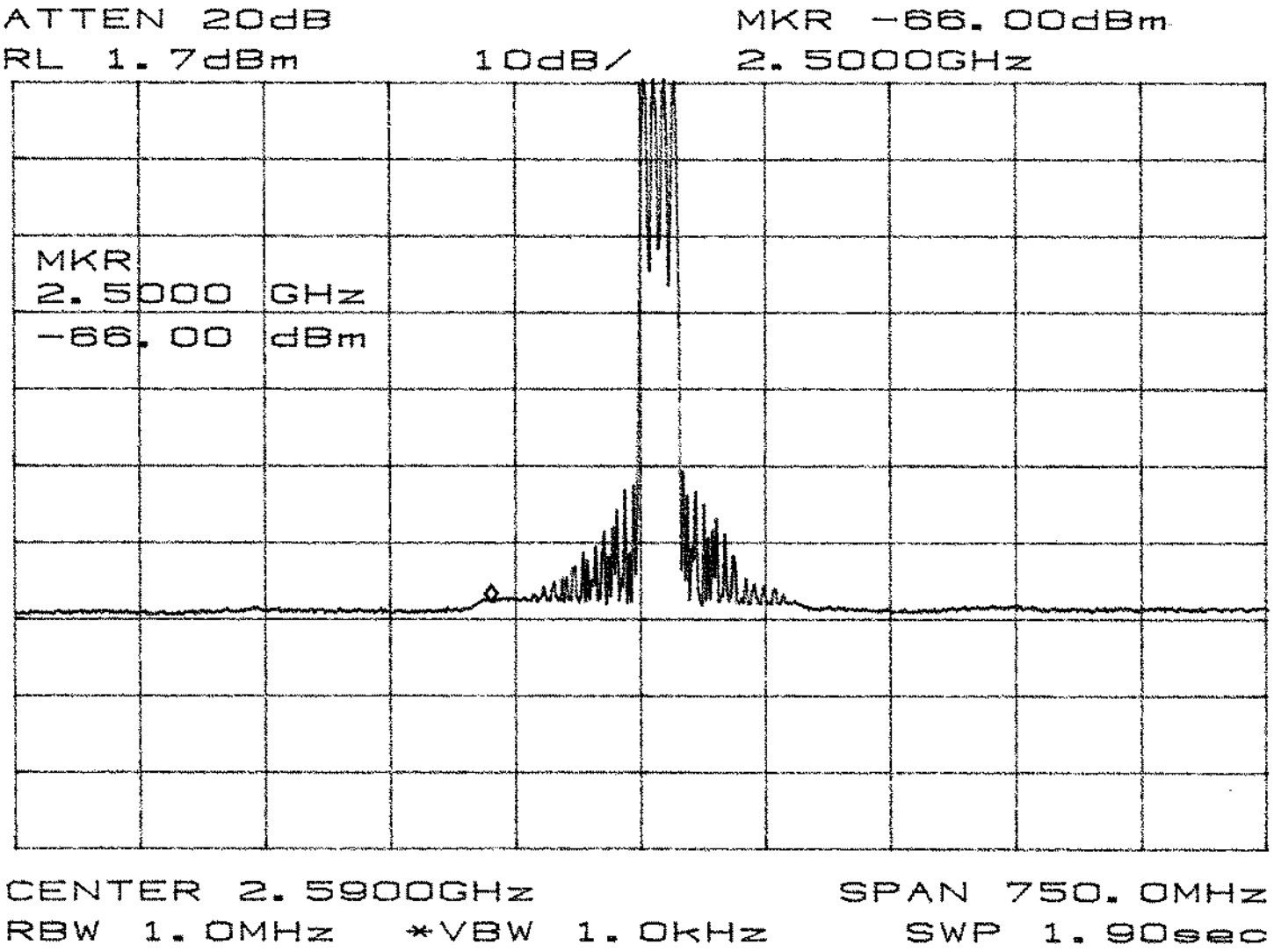

Figure 32. Conducted Spurious Emissions 4 Channel Loading.

10.5 Radiated Emissions

The transmitter was loaded at full power with four channels and its output terminated with a high power 50-ohm termination. An antenna dipole was located 4 meters from the transmitter and connected to the Spectrum Analyzer. The antenna was rotated for maximum signal and the data recorded. This procedure was repeated for the second and third harmonics of the signal, with the following results:

Table 6. Radiated Emissions.

Frequency	Measured Level
2500 to 2700 MHz	-93.0 dBm
5000 to 5400 MHz	Less than –99 dBm
7500 to 8100 MHz	Less than –95 dBm

The procedure was repeated with an adjustable length dipole for the 40 to 230 MHz range and extended in the upper range to 12,000 MHz. No measurable signals were observed in this range, with the Spectrum Analyzer set at a minimum sensitivity of -97 dBm.

A Spectrum Analyzer presentation of the data shown in Table 6 above is shown in Figure 33, Figure 34 and Figure 35. The observed radiation level in the 2500 to 2700 MHz range can be referenced to the transmitter output power as follows:

Assuming isotropic radiation of a signal of 44.5 watts peak power, the power density at 4 meters would be:

$$\text{Power density} = P / 4\pi D^2 = 44.5 / 4\pi 4^2 = 221.32 \times 10^{-3} \text{ Watt/m}^2$$

Assuming a transmission with the pattern of a dipole antenna, the power density is increased by a factor of 1.64 times to:

$$1.64 \times 221.32 \times 10^{-3} \text{ Watt/ m}^2 = 362.96 \times 10^{-3} \text{ Watt/m}^2$$

Since a dipole is used to receive the signal, the received signal level equals the power density times the effective area of the receive antenna, which is 1.64 $(\lambda^2)/ 4\pi$:

Received signal level = $362.96 \times 10^{-3} \times (1.64 \times (0.12)^2/4\pi) = 682.11 \times 10^{-6}$ Watts = -1.66 dBm

Since the actual received signal level is –93.0 dBm (from Table 6 above), the relative level is:

Relative receive signal level = -1.66 -(-93.0) = 91.34 dBc

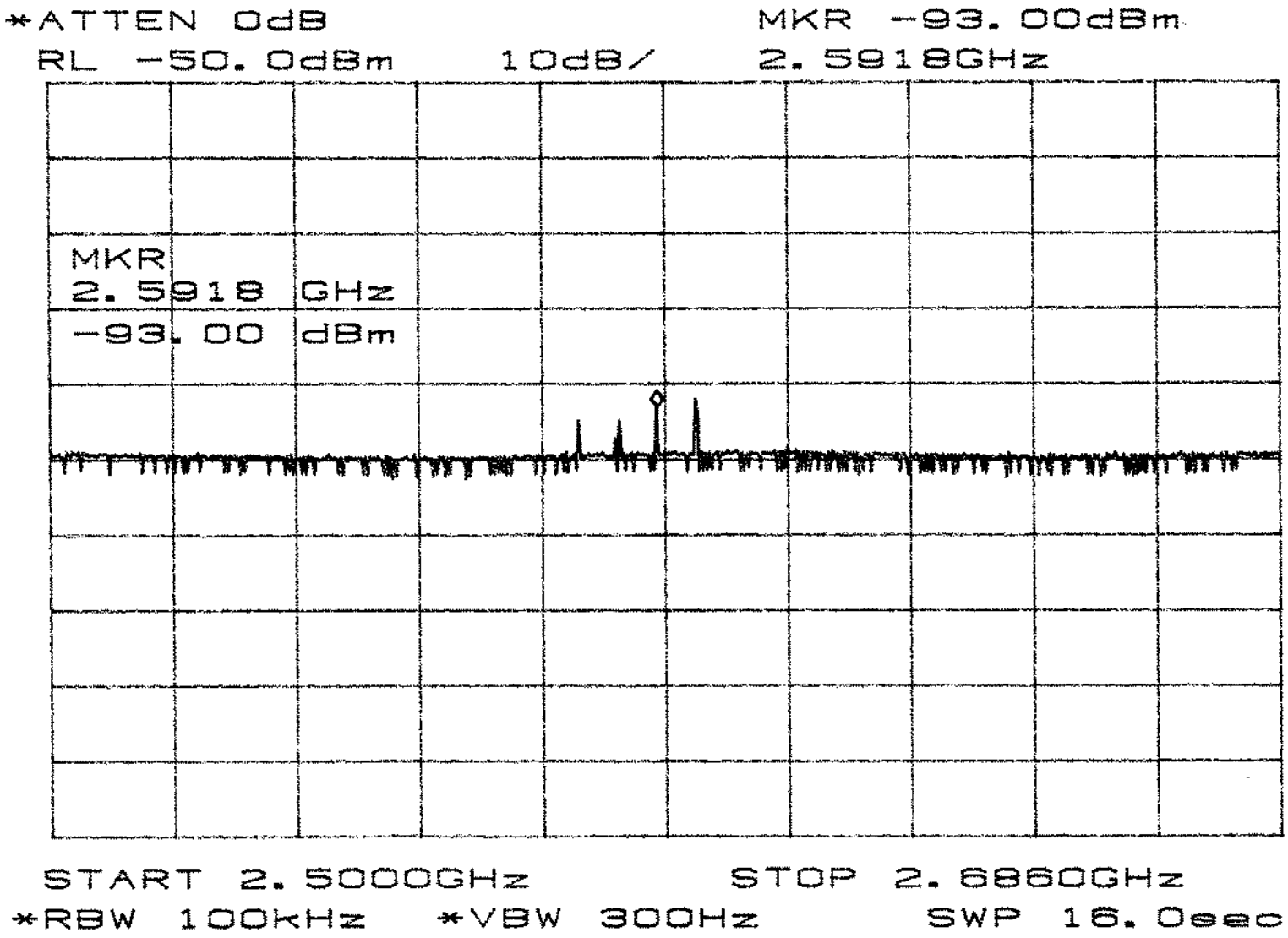

Figure 33. Radiated Emissions Fundamental.

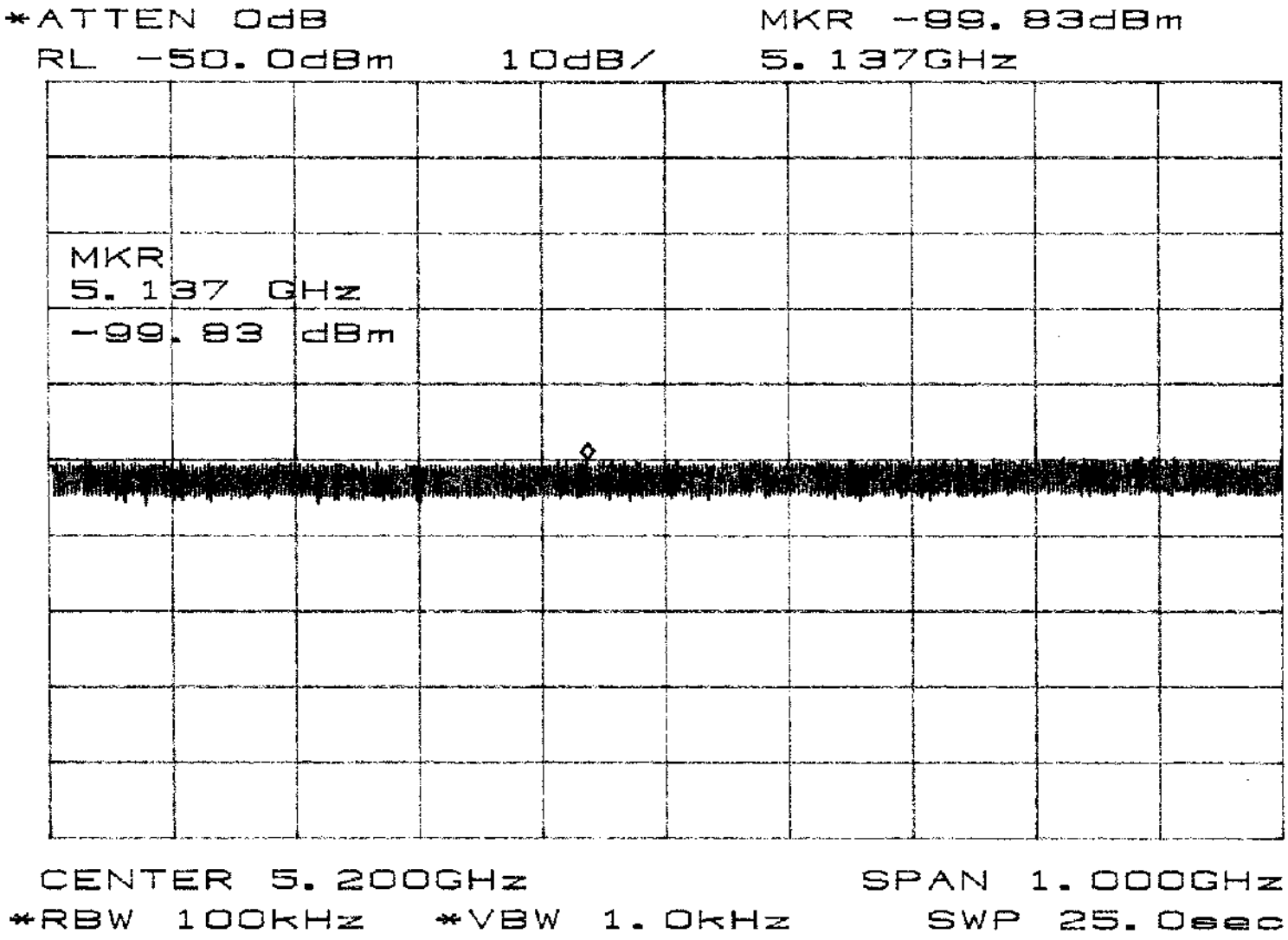

Figure 34. Radiated Emissions 2nd Harmonic.

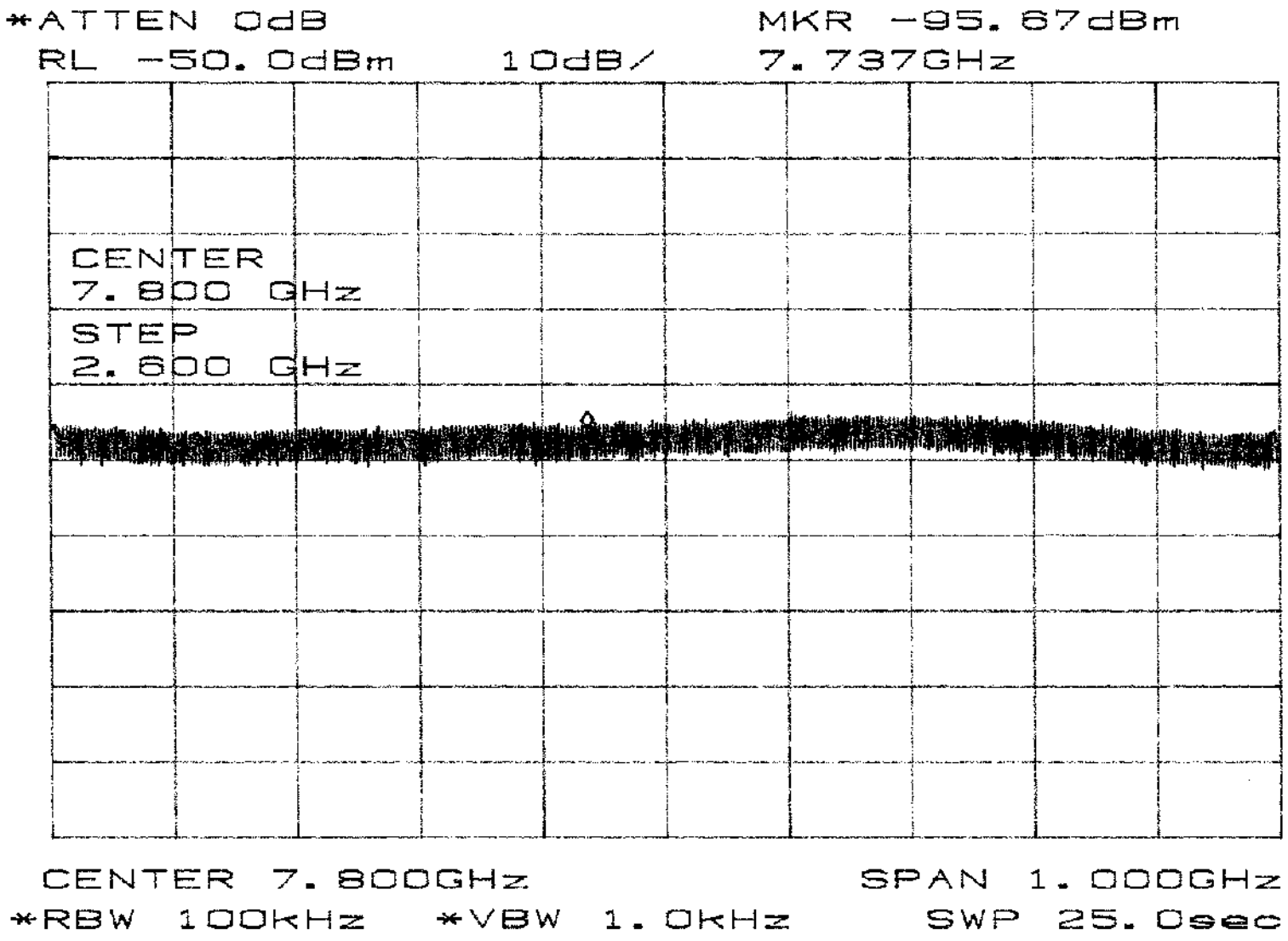

Figure 35. Radiated Emissions 3rd Harmonic.

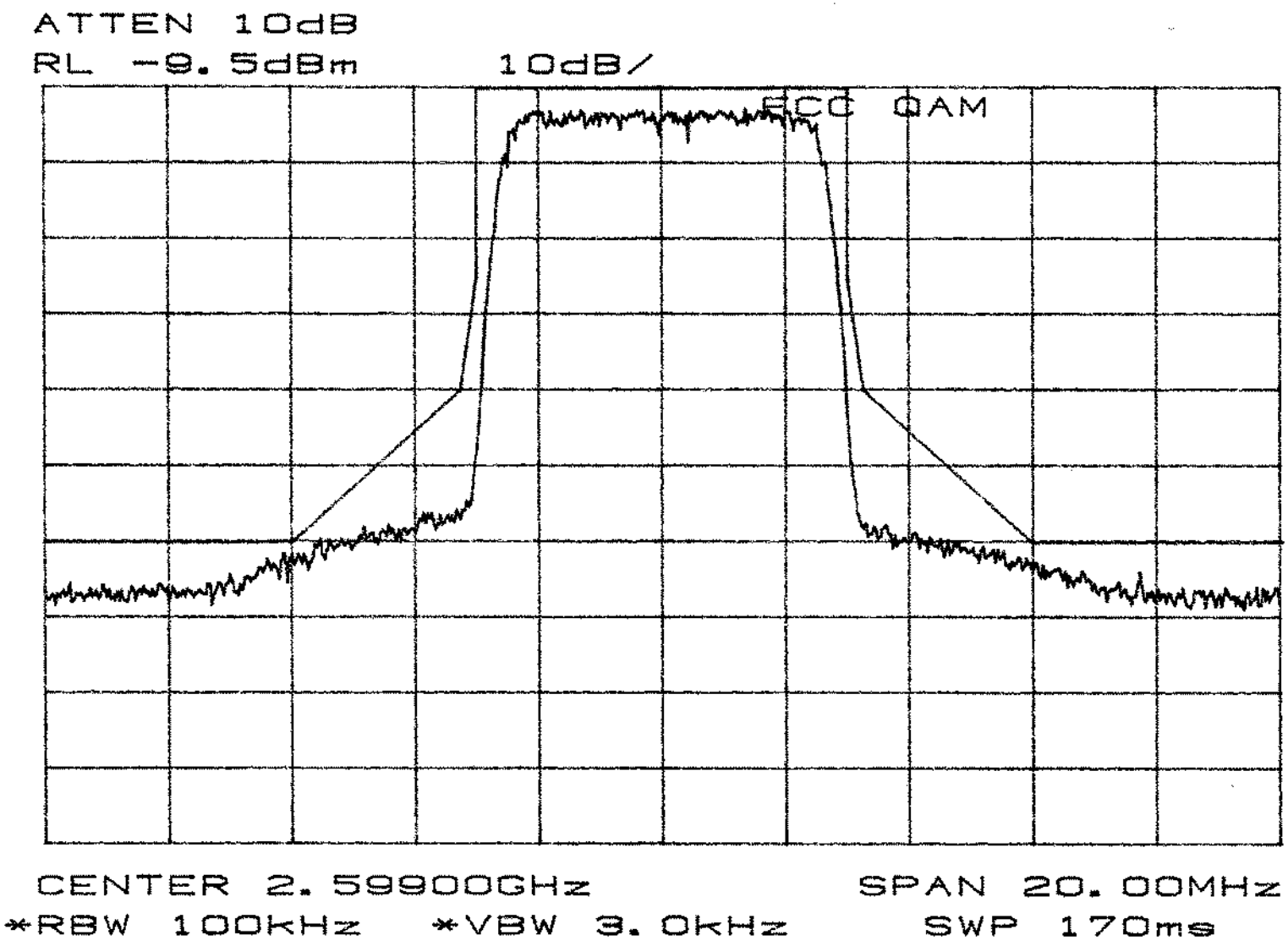

Figure 36. QAM Spectral Mask.

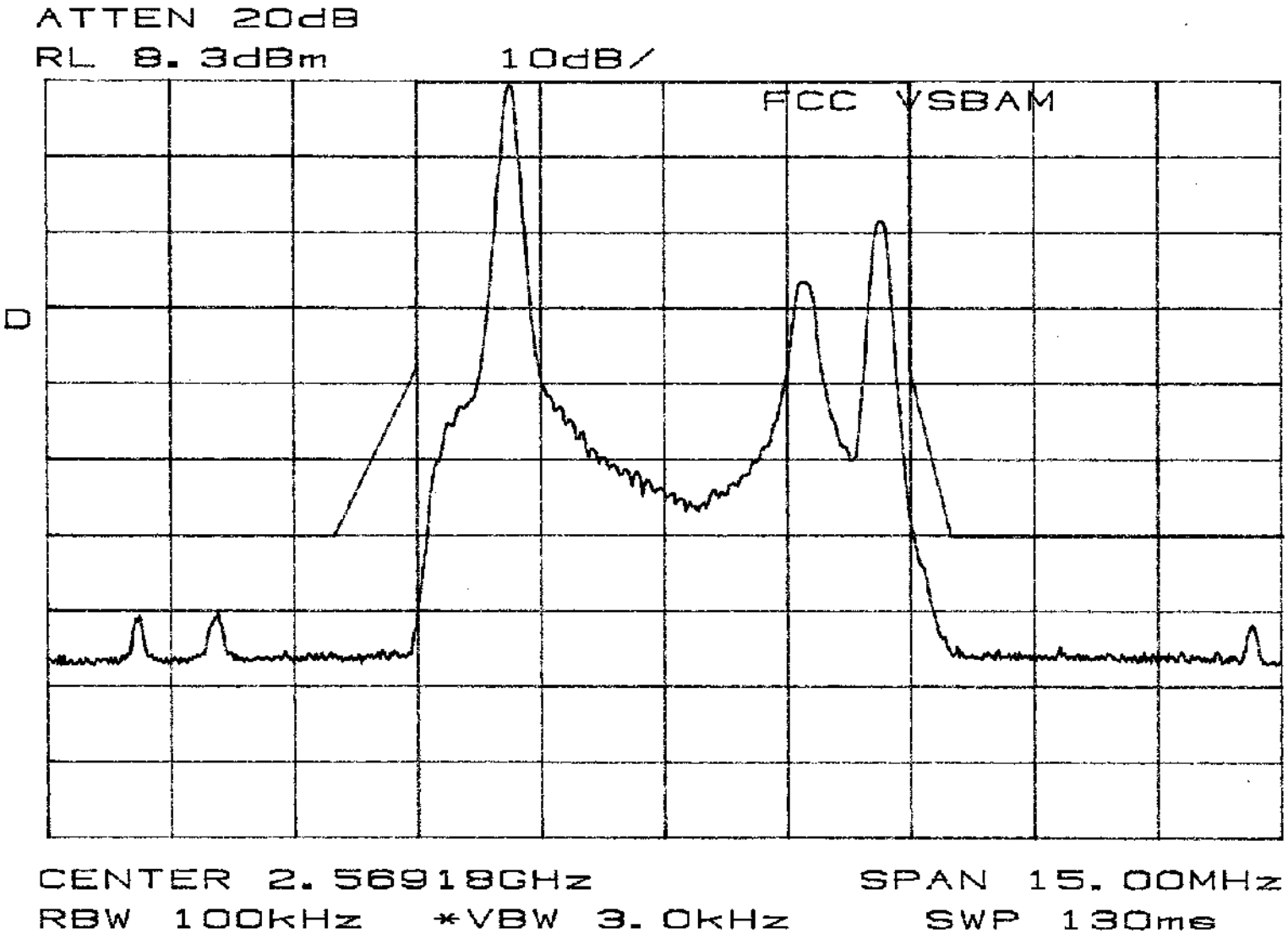

Figure 37. VSBAM Spectral Mask.

10.6 Frequency Stability

The frequency stability test set-up is shown in Figure 38. Table 7 shows the measured results.

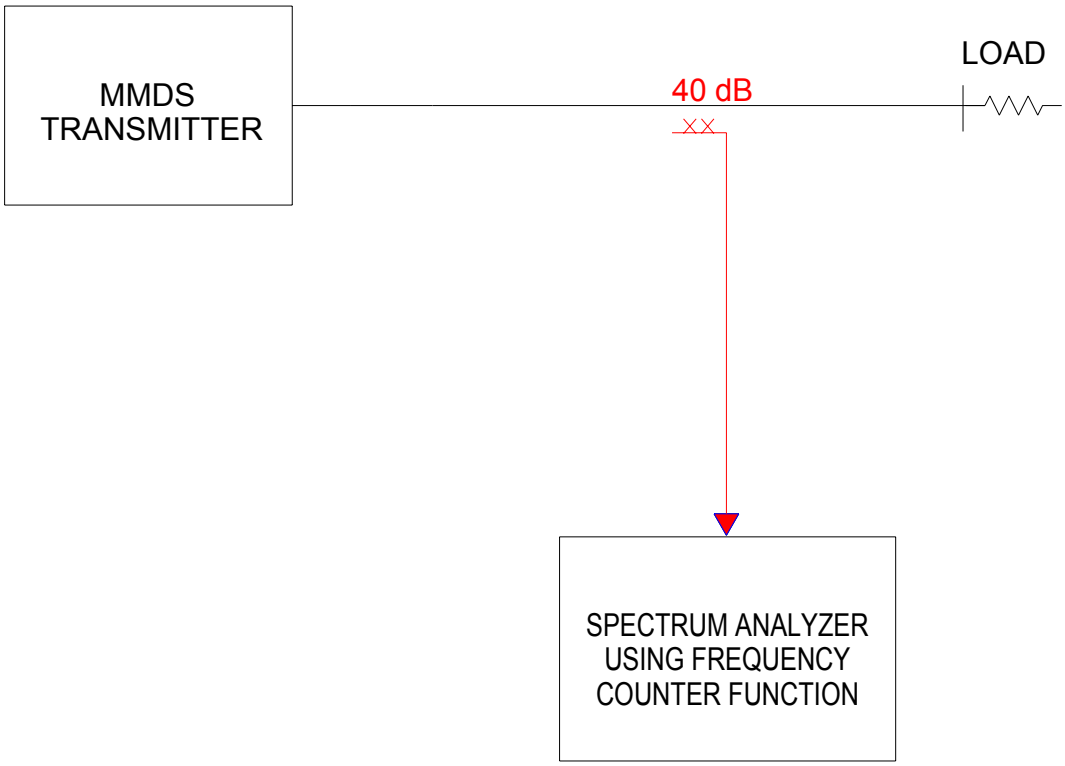

Figure 38. Frequency Stability Test Set-up.

Table 7. Frequency Stability.

Date	FREQUENCY-Hz	DRIFT-Hz
5-5-03	2278000000	0
5-12-03	2278000002	2
5-19-03	2278000032	32
5-26-03	2278000097	97
6-2-03	2278000045	45

10.7 Certification of Test Data

This equipment has been tested in accordance with the requirements contained in the appropriate Commission regulation. To the best of my knowledge, these tests were performed using measurement procedures consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards. Each unit manufactured, imported, or marketed, as defined in the Commission's regulations, will conform to the sample(s) tested within variations that can be expected due to quantity production and testing on a statistical basis. I further certify that the necessary measurements were made by Cable AML, Inc., 3427 Lomita Boulevard, Torrance, CA 90505, USA.

Dr. Francisco Bernues