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Technical Report No. 01-087a

**"EMI Evaluation of the SENTECH EAS CORP AQUILA to FCC Part 15 Class A Conducted and Radiated Emission Requirements."**

Performed: 2 November 2001

Customer: SENTECH EAS CORP
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Performed and
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FAU EMI R & D Laboratory

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## 1. INTRODUCTION

The SENTECH EAS CORP Aquila Model No. AQA-100 for receiving, and Model No. AQA-200 for transmitting was evaluated for conformance to FCC requirements identified below. The Aquila received power from a power supply Model STC 8200-P. Evaluation results reported in this 13 page document apply only to the specific items of equipment, configurations (including software and unit operation), and procedures supplied to the Florida Atlantic University EMI Research Lab by SENTECH EAS CORP under the test conditions listed herein.

## 2. OBJECTIVE

This evaluation was performed to verify conformance of the SENTECH EAS CORP Aquila with reference to the U.S. Federal Communications Commission (FCC) Code of Federal Regulations (CFR), Title 47 - Telecommunication, Part 15 - Radio Frequency Devices, Subpart B - Unintentional Radiators, Section 15.107(b) Conducted limits, Section 15.109(b) Radiated Emission limits and Section 15.223 Operation in the Band 1.705-10 MHz.

## 3. CONCLUSION

The SENTECH EAS CORP Aquila met conducted and radiated emission requirements as described in the following test result section.

## 4.0 TEST PROCEDURES AND RESULTS

### 4.1 TEST PROCEDURES

The measurement techniques identified in measurement procedure ANSI C63.4-2001 *"American National Standard of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"* were followed as close as practical during this evaluation. Complete details and specific procedures used are discussed in the respective Tests Results sections.

## 4.2 TEST RESULTS

### 4.2.1 CONDUCTED POWERLINE EMISSIONS

The SENTECH EAS CORP Aquila Model No. AQA-100 for receiving, and Model No. AQA-200 was set up at the FAU EMI Research facilities conducted emissions shielded enclosure. The equipment as a pair was placed on the floor and 40 centimeters from the rear wall of the RF shielded room as defined in the referenced FCC adopted measurement procedure ANSI C63.4-2001.

Photograph 1 shows the physical positioning of the SENTECH EAS CORP Aquila and associated power supply during the conducted emissions test. The SENTECH EAS CORP Aquila was powered by a power supply Model STC8200-P which was plugged into a Solar model 8028-50, 50 Ω / 50 µH Line Impedance Stabilization Network (LISN). Conducted power line emissions were measured on both the phase and neutral lines in reference to earth ground over the specified 450 kHz to 30 MHz range on a Hewlett Packard HP 8566B Spectrum Analyzer. The spectrum analyzer was operated in the peak detector mode with a bandwidth of 9 kHz obtained through an HP 85650A Quasi-Peak Adapter. The HP 85864C EMI test program collected the conducted emissions over the specified frequency range and plotted the results.

Figures 1 and 2 show the peak detected conducted emissions from the SENTECH EAS CORP Aquila was below the FCC Class A conducted emission limit over the entire specified frequency range. A quasi peak was performed on both phase and neutral lines showing a 1-3 dB drop in the area close to the limit.

**PHOTOGRAPH 1: CONDUCTED EMISSIONS TEST SETUP**

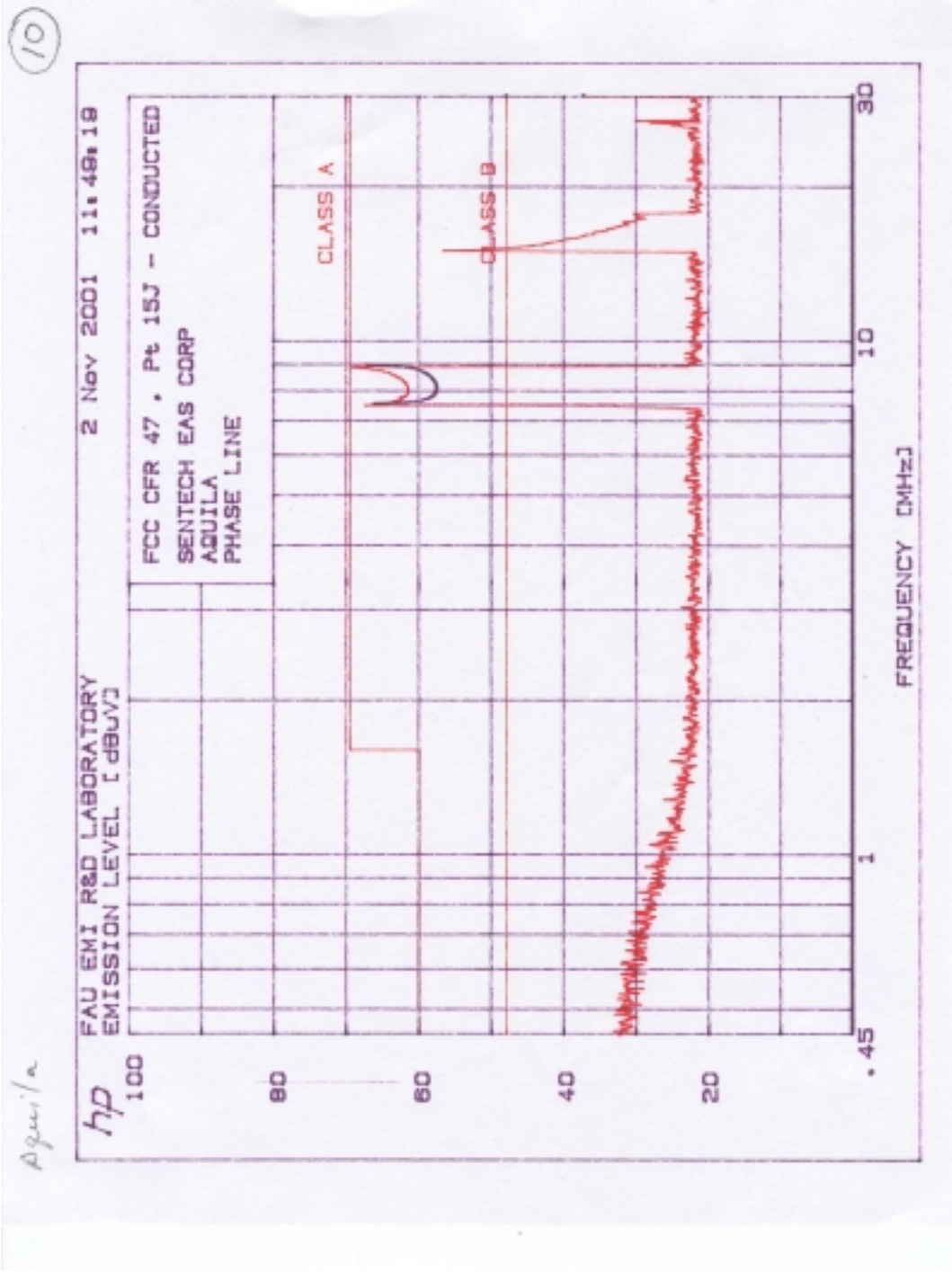


**FIGURE 1: CONDUCTED EMISSION LEVELS (PHASE LINE)**

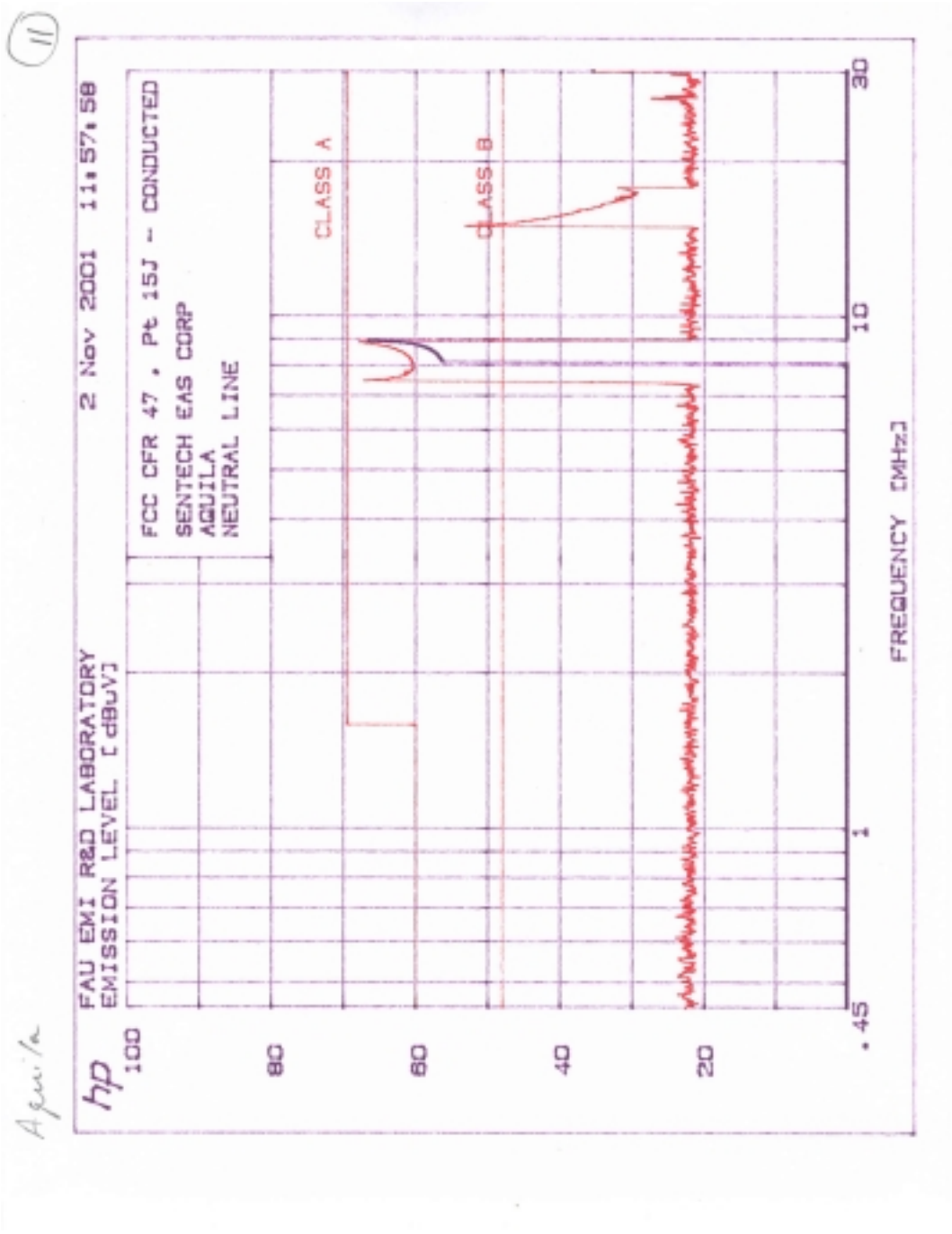


**FIGURE 2: CONDUCTED EMISSION LEVELS (NEUTRAL LINE).**

### 4.2.2 RADIATED EMISSIONS

The SENTECH EAS CORP Aquila unit was set up on a wooden turntable 80 centimeters above the ground plane of the FCC listed Semi-Anechoic test site. The radiated emission test was performed with the Aquila powered by a power supply Model STC-8200-P.

An EMCO 3104 Broadband Biconical antenna was installed on an EMCO pneumatically controlled Antenna Mast at a distance of 3 meters from the system. The 30 to 200 MHz frequency range was automatically scanned on the HP 8566B Spectrum Analyzer operated in the peak detector mode with a bandwidth of 120 kHz obtained through the HP 85650A Quasi Peak Adapter. The turntable was incrementally rotated through 360 degrees, the antenna was scanned in height from 1 to 4 meters in both the horizontal and vertical polarizations. An EMCO 3146 Log Periodic antenna was then installed and the above procedure was repeated for the 200 to 1000 MHz range.

Photographs 2 and 3 show the physical positioning of the Aquila and associated power supply during the radiated emissions test.

Figures 3 and 4 show the composite plot of the worst-case level radiated emissions in peak detector mode, at horizontal and vertical polarization between 30-200 MHz, independent of azimuth.

Figures 5 and 6 show the composite plot of the worst -case level radiated emissions in peak detector mode, at horizontal and vertical polarization between 200-1000 MHz, independent of azimuth.

The frequency band of operation is 7.47 to 9.00. The worst emission was determined to be at 8.9 MHz. The unit under test was brought out to the 30 ft. by 70 ft. Open Field 10 meter Test Site and measurements were done at the maximum azimuth with a loop antenna model no. ALR 25M , see Photograph 4. The data was extrapolated to 30 meters as per Section 15.223 restricting the field strength of any emission to 100 μV/m at a distance of 30 meters.

The antenna factor is 42 dB/m and the amplifier gain and cable loss is 26.3dB. Distance factor is 20 log(30/10) = 9.54. For horizontal polarization the SA reading was 31.35 dBμV therefore, $E_{field}$ = 31.35 + 42 – 26.3 – 9.54 = 37.51 dBμV/m or = 75.07 μv/m. For vertical polarization the SA reading was 28.91 dBμV thus, $E_{field}$= 28.91 + 42 – 26.3 – 9.54 = 35.07 dBμV or = 56.7 μv/m. Hence, the field strength in each case was below the 100μV/m limit.

**PHOTOGRAPHS 2 & 3: RADIATED EMISSION SETUP.**

**PHOTOGRAPH 4: 10 METER OPEN FIELD TEST SITE**

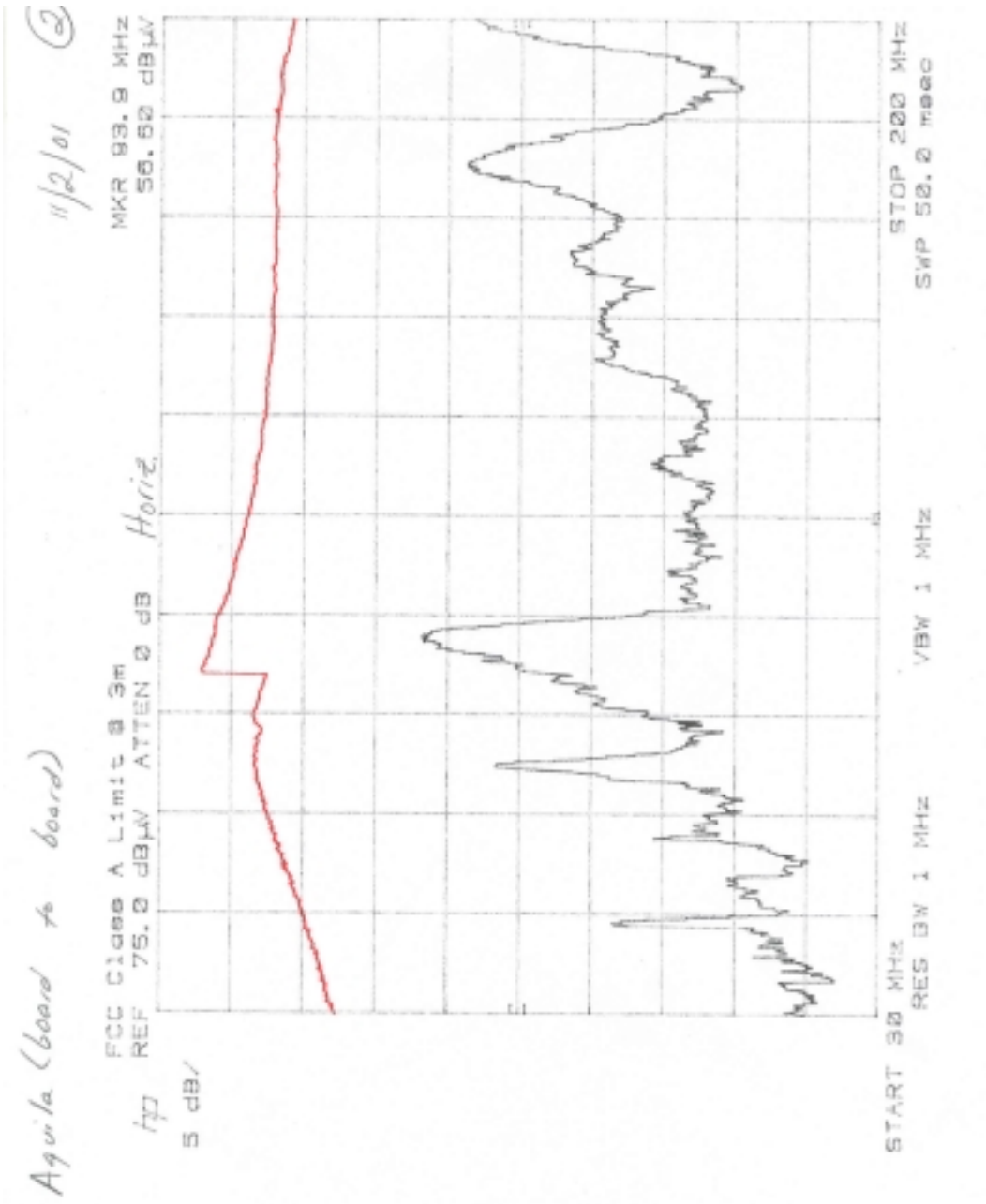


**FIGURE 3: RADIATED EMISSIONS 30 - 200 MHZ HORIZONTal**

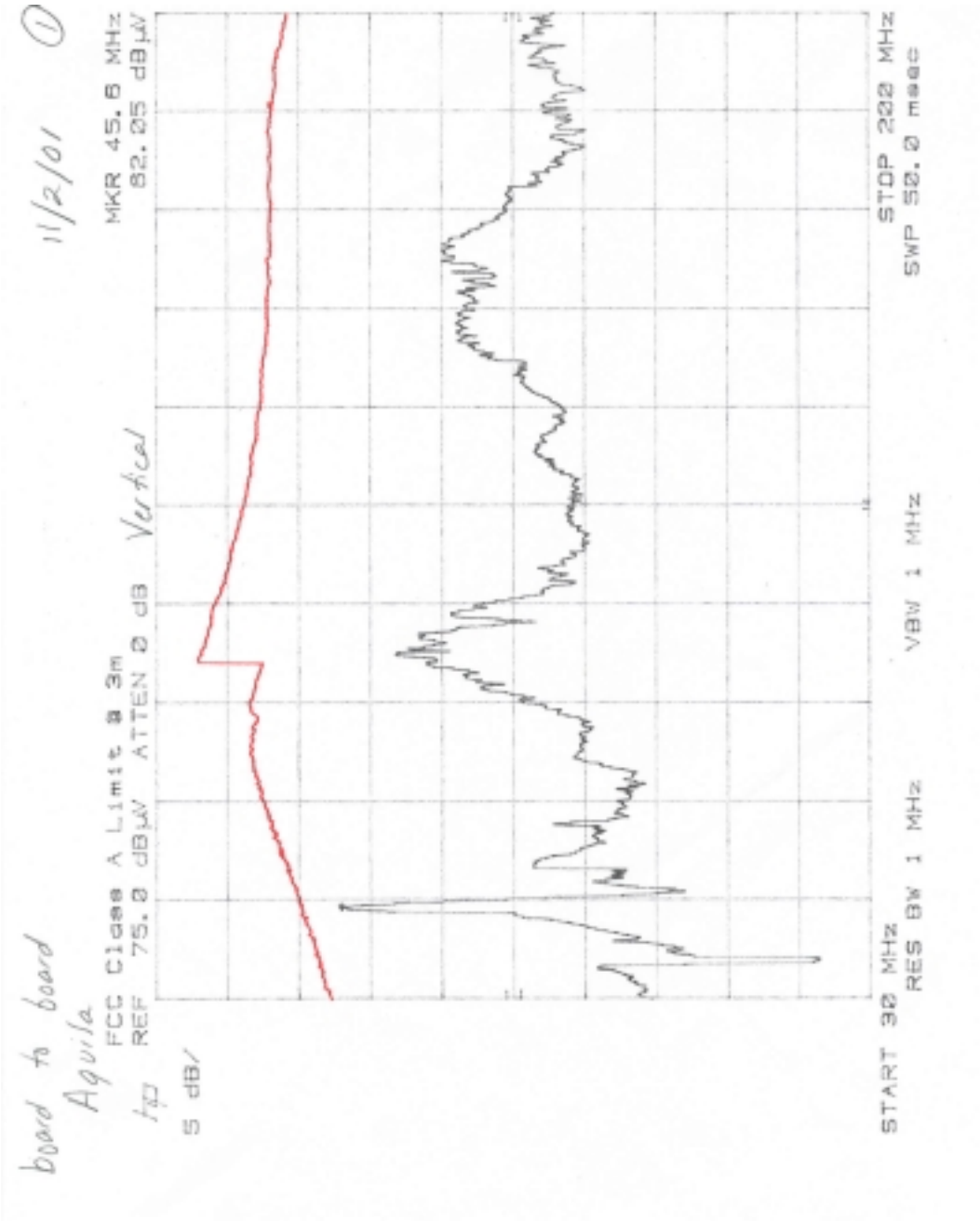


**FIGURE 4: RADIATED EMISSIONS 30 - 200 MHZ VERTICAL**

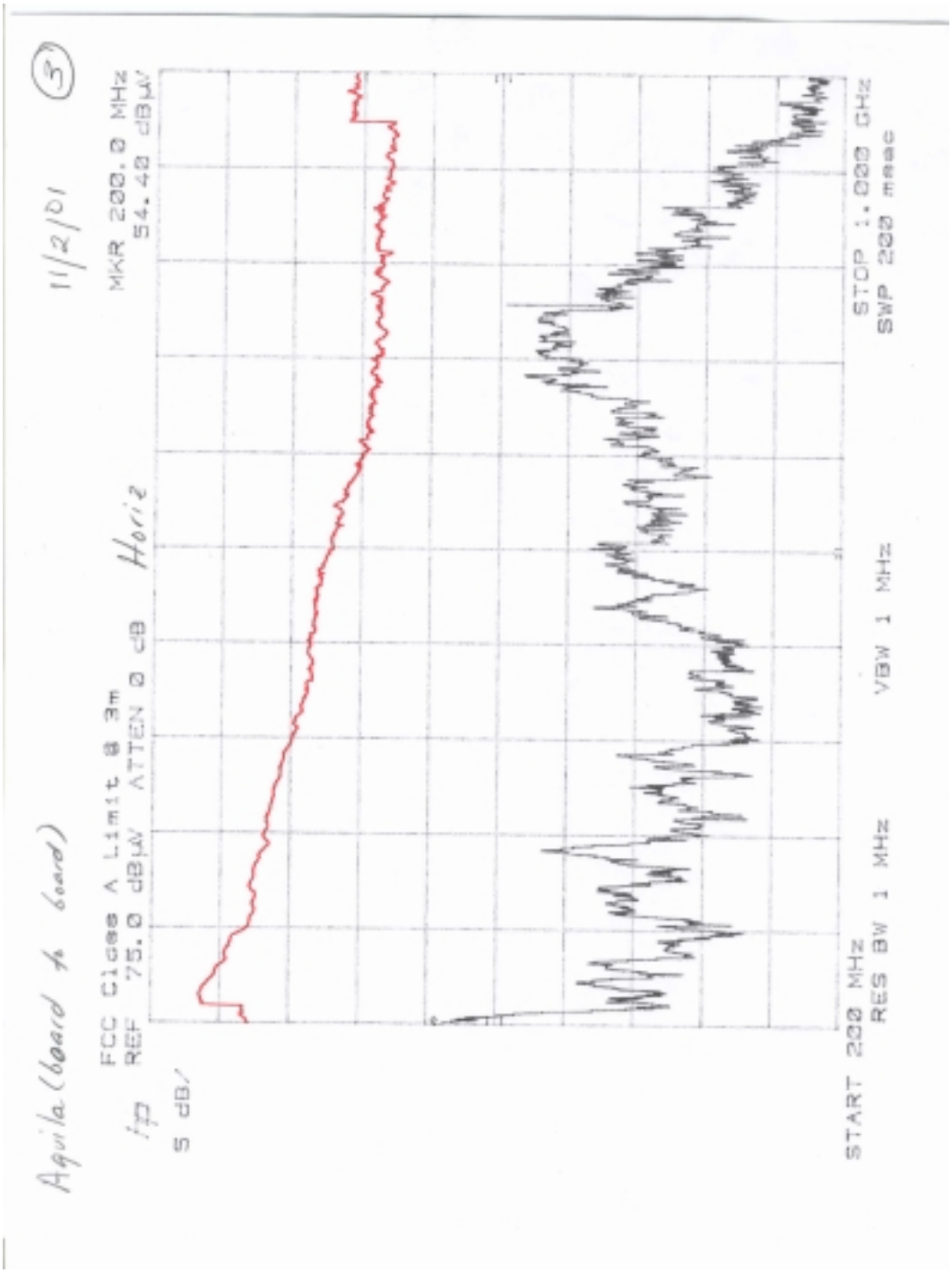


**FIGURE 5: RADIATED EMISSIONS 200 MHZ - 1 GHZ HORIZONTAL**

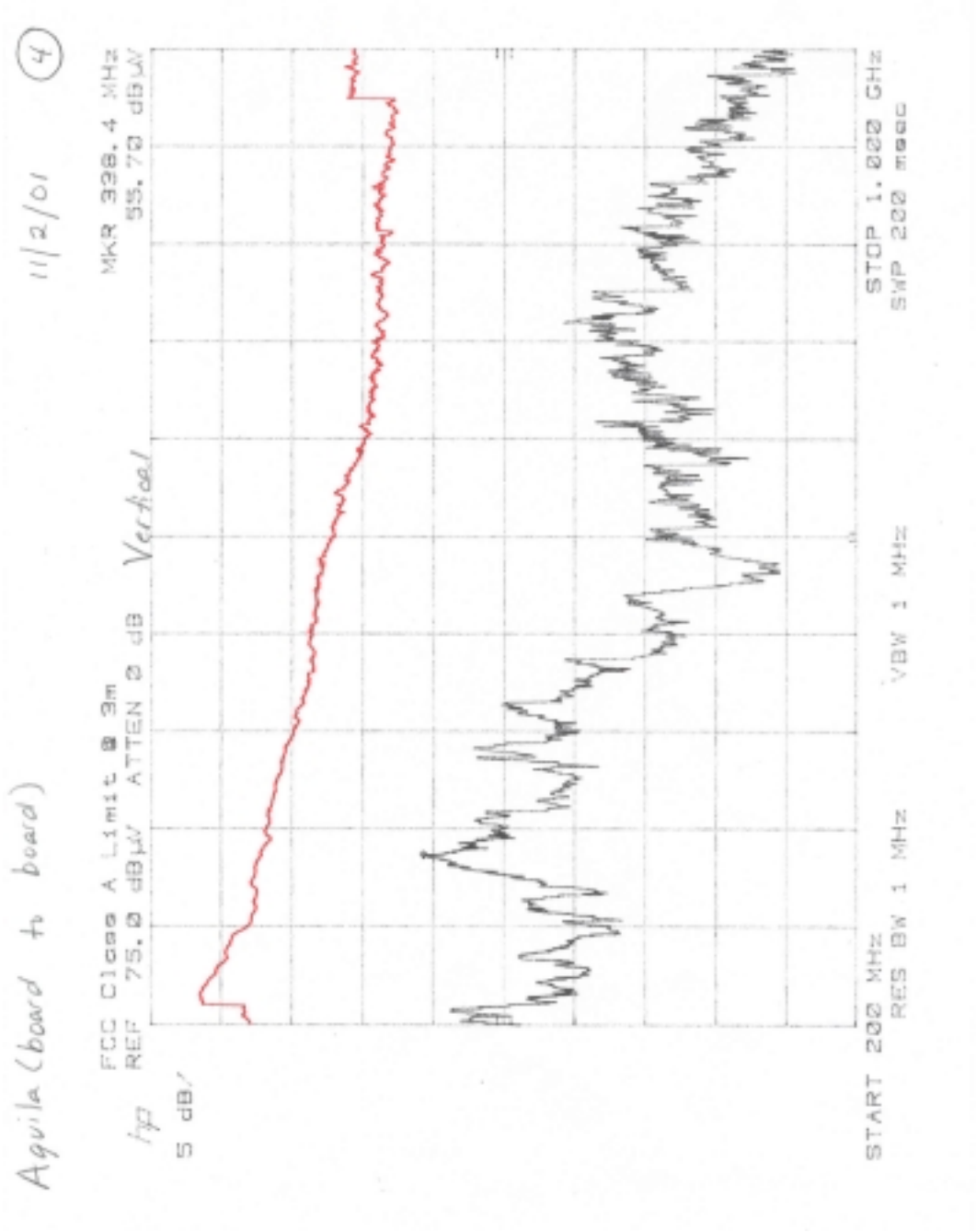


**FIGURE 6: RADIATED EMISSIONS 200 MHZ - 1 GHZ VERTICAL**