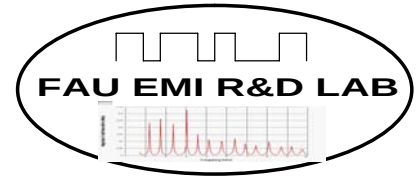




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Technical Report No. 04-027
(Revised)

**"EMI Evaluation of the Jtech Communications, Inc.
Guest-Alert Unit to FCC Part 15 Class B Conducted and Radiated Emission
Requirements and Part 90"**

Performed: 12 April 2004; 17 September 2004

Customer: Jtech Communications, Inc.
Attn: Richard Hoo
6413 Congress Ave, Suite 150
Boca Raton, FL 33487

Company Official responsible
for product(s) tested:

Richard Hoo
561-997-0772 ext. 148

Test Performed and
Reported By:



Raymond Aina, BSEE, BSME
FAU EMI R&D Laboratory

Approved by:



Vichate Ungvichian, Ph.D., P.E.
Director, FAU EMI R&D Laboratory



1. INTRODUCTION

The Jtech Communications, Inc. Guest-Alert Unit, operating at 465.9 MHz and with a vertical polarized $\lambda/4$ monopole antenna, was connected to a Jtech Communications, Inc. Model TR36A-1303A03 switching Power Supply unit. Evaluation results reported herein 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 Jtech Communications, Inc. under the test conditions listed herein.

2. OBJECTIVE

This evaluation was performed to verify the conformance of the Jtech Communications, Inc. Guest-Alert unit with reference to the U.S. Federal Communications Commission (FCC) Code of Federal Regulations (CFR), Title 47 - Telecommunication, FCC Part 15 Subpart B- Unintentional Radiators, Section 15.107 (a), conducted emissions and Section 15.109 (a) radiated emissions and FCC Part 90 - Section 90.210 (d) (3).

3. CONCLUSION

The Jtech Communications, Inc. Guest-Alert unit met the FCC radiated requirements of Part 90, Section 90.210 (d) (3) and the FCC Class B conducted and radiated emission requirements as described in the following pages. It should be noted that a ferrite was attached to the AC power cord.

4. TEST PROCEDURES AND RESULTS

4.1 TEST PROCEDURES

The measurement techniques identified in the measurement procedure of 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.

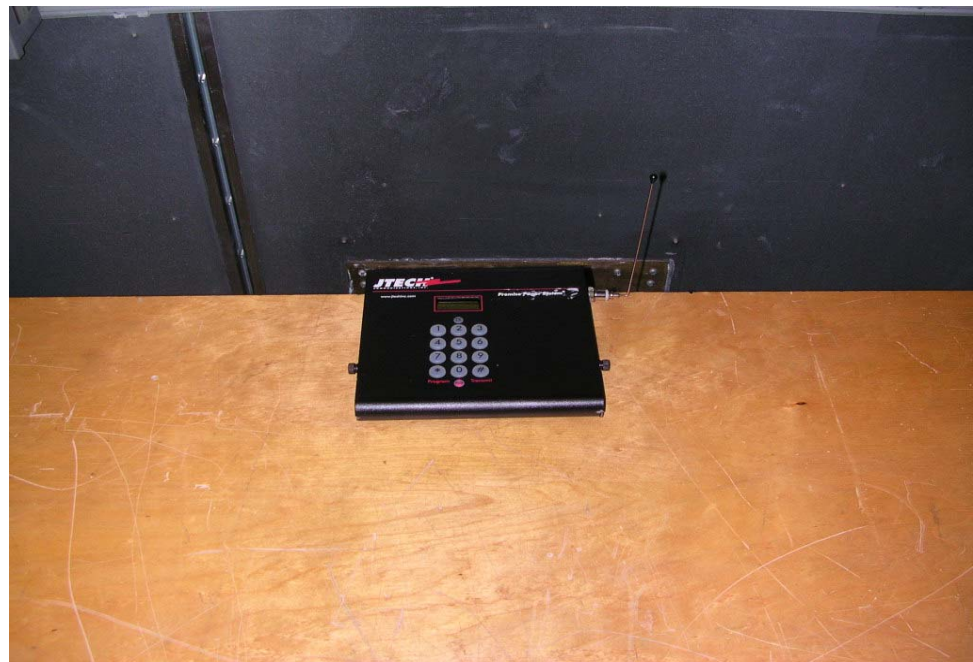
4.2 TEST RESULTS

4.2.1 CONDUCTED POWERLINE EMISSIONS

The Jtech Communications, Inc. Guest-Alert unit and support devices were set up at the FAU EMI facilities conducted emissions room. The unit was placed on a test table 80 centimeters above the ground plane floor and 40 centimeters from the rear wall of the RF room as defined in the referenced FCC adopted measurement procedure ANSI C63.4-1992. Photographs 1 and 2 show the physical positioning of the Guest-Alert unit during the conducted emission measurements. Photograph 1 also shows a ferrite attached to the AC power cord of the unit and remained attached for the duration of the conducted test.

The AC power cord of the Jtech Communications, Inc. Model TR1303A03 power supply unit was plugged into a Solar, Model 8028-50, 50- Ω /50 μ H 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 150 kHz to 30 MHz range on an HP 8566B Spectrum Analyzer. The spectrum analyzer was operated in the peak response 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.

Figure 1 shows the emissions on both the phase and neutral lines. Since the readings were close to the limit, an average measurement technique was applied to both lines. The average detected emissions are about 6 dB below the limits over selected frequencies.



PHOTOGRAPHS 1 & 2: CONDUCTED EMISSIONS TEST SETUP

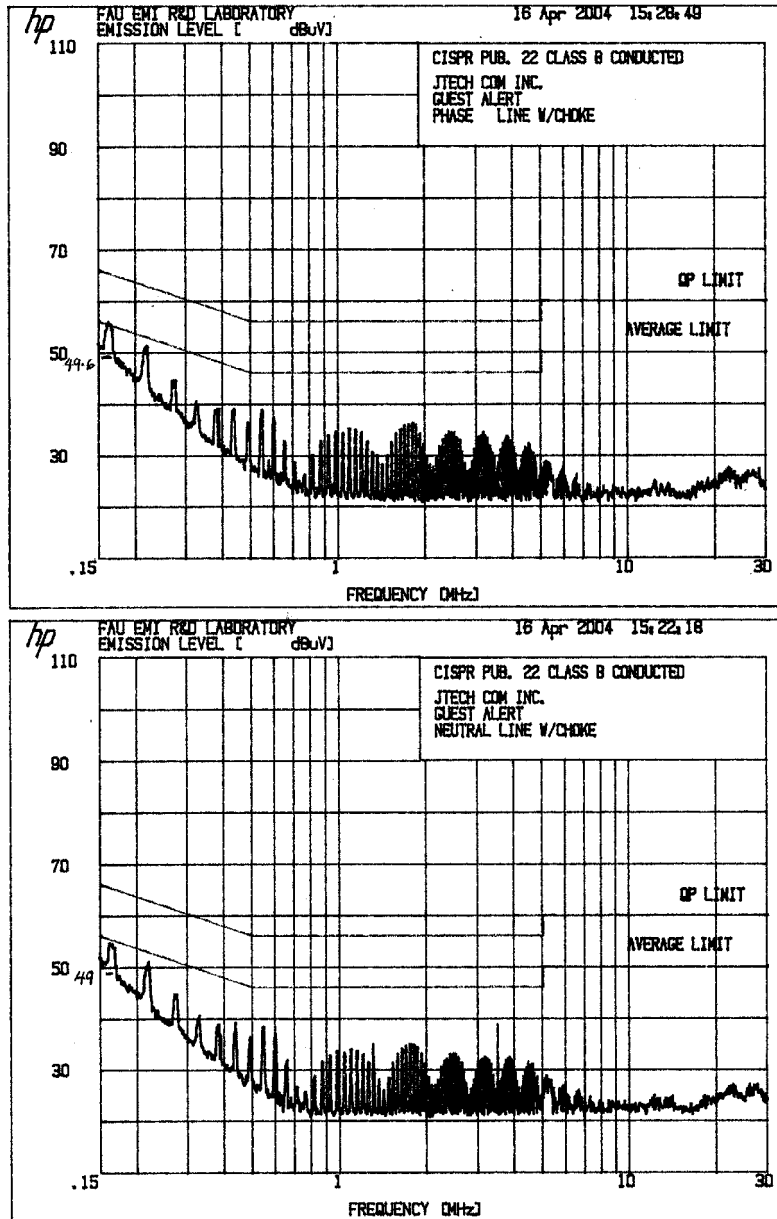


FIGURE 1: CONDUCTED EMISSION LEVELS

4.2.2 RADIATED EMISSIONS

The Jtech Communications, Inc. Guest-Alert unit was set up on a wooden turntable 80 centimeters above the ground plane of the FCC listed FAU radiated emission test site. The power cord was plugged into the receptacle at the center of the turntable. For Part 90, a 10-watt 50-ohm resistive load was connected to the RF output port (Antenna port) of the unit. Photographs 3 and 4 show the physical configuration used during the radiated emissions testing from the system.

4.2.2.1 Part 15, Section 109 (a):

An EMCO, Model 3104, S/N 299988A, Broadband Biconical antenna was installed on an EMCO pneumatically controlled Antenna Mast at a distance of 3 meters from the unit. 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. It should be noted that the RES BW and VBW of the spectrum analyzer must be set to 1 MHz for the Quasi Peak Adapter to provide 120 kHz bandwidth correctly. Hence, in the figures, RES BW and VBW are still indicated as 1 MHz. The turntable was incrementally rotated through 360 degrees and at the same time the receiving antenna was scanned in height from 1 to 4 meters in both the horizontal and vertical polarizations. An EMCO, Model 3146, Log Periodic antenna was then installed and the above procedure was repeated for the 200 to 1,000 MHz range.

Figures 2-5 show the worse case radiated emissions, independent of azimuth or antenna height, which are below the required Class B limits. The limit lines have been corrected for the appropriate antenna factor, cable loss, and amplifier gain based on the following equation:

$$E \text{ (dB}\mu\text{V/m)} = \text{SA reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amp Gain (dB)}$$

4.2.2.2 Part 90, Section 90.210 d (3):

With reference to FCC Part 90, Section 90.210 d (3), any spurious emission must be attenuated below the transmitting power (P) of the highest emission contained within the authorized bandwidth by at least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation. The power output measured at the antenna port was 1.8 W. Therefore, the attenuation factor of $50 + 10 \log (1.8)$ or 52.55 dB was used in this report.

Since the transmitting frequency of this device is 465.9 MHz, the Log periodic antenna was used. It should be noted that there was no need for the amplifier on the receiving side. The substitution method was implemented for vertical polarization. The unit was set to transmit an RF power via the $\lambda/4$ monopole antenna.

The unit was rotated and at the same time the vertical polarized receiving antenna was scanned from 1-4 meters to search for maximum field strength registered on the HP receiver for future comparison. Then the unit was substituted with a half-wave dipole antenna which was energized via a cable with known cable loss to a signal generator. The signal generator power level was adjusted until the same field strength was obtained as before. The HP power, Model 436A, was used to measure the power arriving at the dipole antenna feed point.

$$\text{The effective radiated power} = \text{power at the feed point} + \text{gain of the dipole adjusted to the ideal lossless } \lambda/2 \text{ dipole}$$

At the fundamental frequency, the Log periodic antenna gain is 2.2 dBi, Hence,

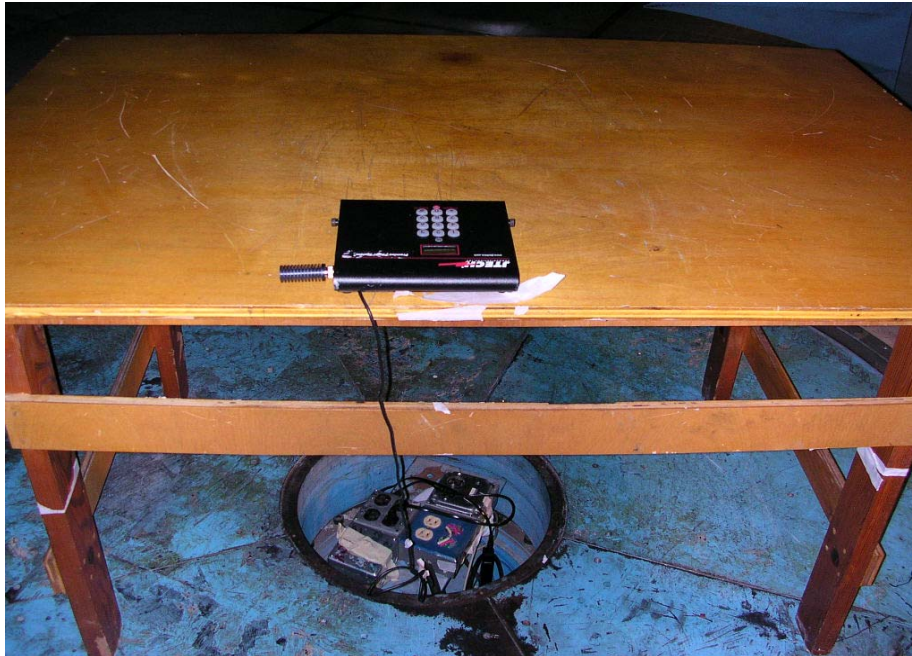
$$\text{ERP} = 12.7 \text{ dBm} + (2.15 - 2.2) \text{ dB} = 12.65 \text{ dBm}$$

To prevent the HP receiver front end overload, a notch filter (provided by Jtech) was used. The same substitution procedure was repeated for 2nd to 10th harmonics. Due to receiving sensitivity, the data was observed only the 3rd harmonic. Hence, the report will reflect only at 1.3977 GHz. The spurious limit in dBm for this frequency is (12.65-52.55 attenuation) or -39.9 dBm.

From the substitution measurement, at 1.3977 GHz, the double ridge horn gain is 6.5 dBi and the power at the feed point is -50.73 dBm. Hence,

$$\text{ERP} = -50.73 \text{ dBm} + (6.5 - 2.15) \text{ dB} = -46.38 \text{ dBm}$$

Therefore, the spurious emission is below the limit by $(-39.9 \text{ dBm} - (-46.38 \text{ dBm}))$ or 6.48 dB.



PHOTOGRAPHS 3 & 4: RADIATED EMISSIONS TEST SETUP

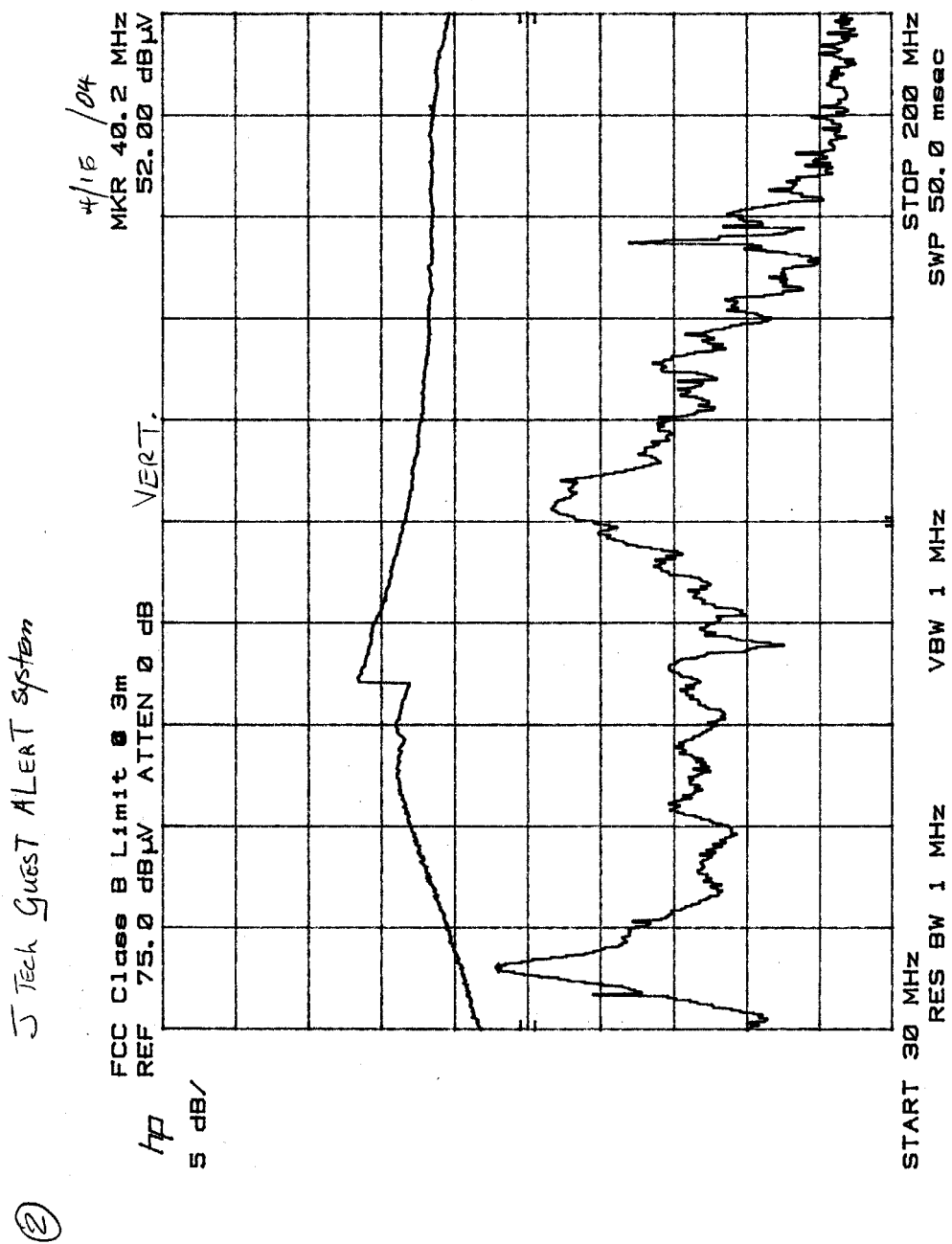


FIGURE 2: RADIATED EMISSIONS 30 - 200 MHz VERTICAL

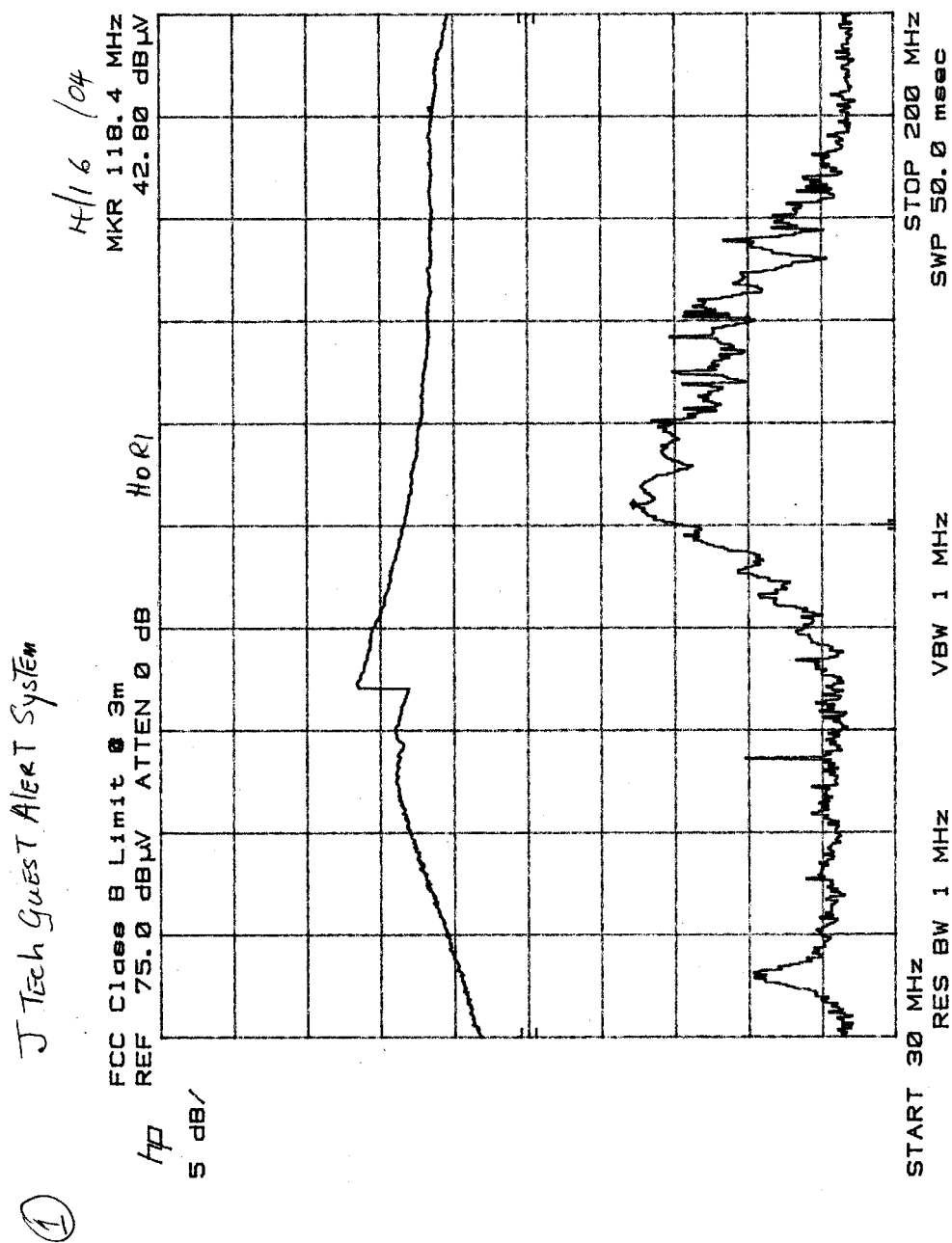


FIGURE 3: RADIATED EMISSIONS 30 - 200 MHz HORIZONTAL

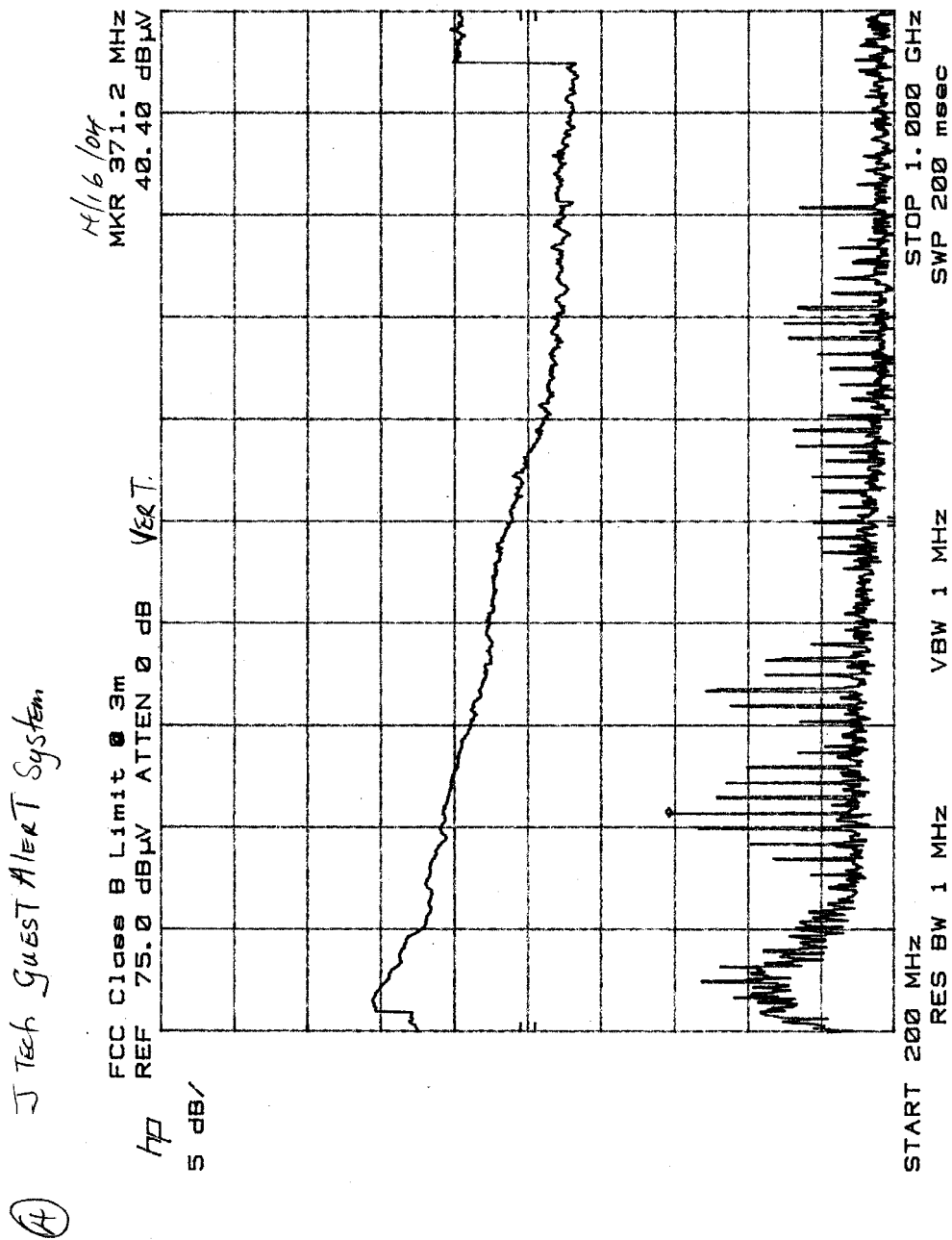


FIGURE 4: RADIATED EMISSIONS 200 MHZ - 1 GHZ VERTICAL

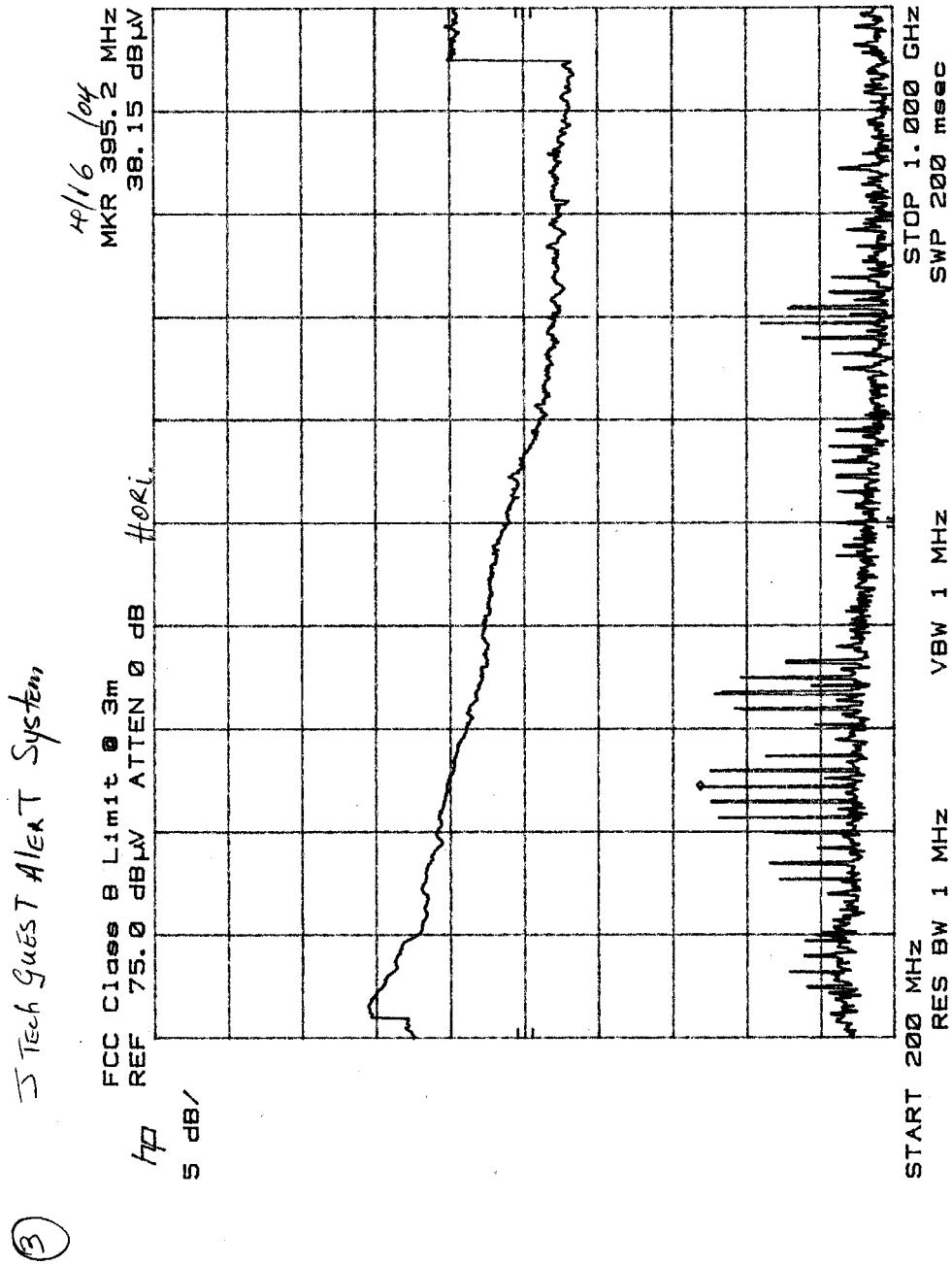


FIGURE 5: RADIATED EMISSIONS 200 MHZ - 1 GHZ HORIZONTAL

TEST EQUIPMENT

FAU EMI R & D Laboratory Test Equipment

Equipment Type	Manufacturer	Description	Model No.	Serial No.	Cal Date
Spectrum Analyzer	Hewlett Packard	RF Section	8566B	2403A0638 1	Aug-23-04
Spectrum Analyzer	Hewlett Packard	Display	85662A	2407A0638 1	Aug-23-04
Spectrum Analyzer	Hewlett Packard	Quasi Peak Adapter	85650A	2430A0055 9	Aug-23-04
RF Amplifier	Hewlett Packard	RF Amplifier	83017A	3123A0032 4	Apr-20-03
RF Amplifier	Hewlett Packard	RF Amplifier	HP8447D	2443A0395 2	Apr-20-03
LISN	Solar	Line Impedance Stabilization Network	8028-50	001	Sept-30-03
LISN	EMCO	Line Impedance Stabilization Network	3825/2R	1095	Sept-23-03
ANTENNA	EMCO	Biconical	3108	2147	Sept-24-03
ANTENNA	EMCO	Log Periodic	3146	3185	Sept-24-03
Receiving Cables (#1,2,3,4 and 1 heliax)					Aug-03-03

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A2LA Certificate Number: 2129.01
FCC Registration: 90599
Industry of Canada: IC46405-4076

Description:	The 3-m semi anechoic chamber and Power Line Conducted Spurious Voltage test setup is constructed and calibrated to meet the FCC requirements of Section 2.948, as well as Industry Canada RSS 212 Issue 1.
Site Filing:	A site description is on file with the Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046, and with the Industry Canada, Certification and Engineering Bureau, 3701 Carling Ave., Building 94, P.O. Box 11490, Station "H", Ottawa Ontario, K2H 8S2.
Instrument Tolerance:	All measuring equipment is in accordance with ANSI C63.4 and CISPR 22 requirements.

End of Report