EMI Research and Development Laboratory
Department of Electrical Engineering
Florida Atlantic University
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
(561) 338-1650

Technical Report No. 04-027

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

Performed:12 April 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

ACCREDITED
2129.01

1. INTRODUCTION

The Jtech Communications, Inc. Guest-Alert Unit was connected to a Jtech Communications, Inc. Model TR36A-1303A03 Power Supply unit and the 465.9 MHz transmitter was terminated into a dummy load. Evaluation results reported in this 15-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 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, Part 90 - Section 90.210 (d) (3) and Radio Frequency Devices, Subpart B - Unintentional Radiators, Section 15.107(b) Conducted limits.

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.

4. TEST PROCEDURES AND RESULTS

4.1 TEST PROCEDURES

The measurement techniques identified in the measurement procedure of ANSI C63.4-1992 *"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.

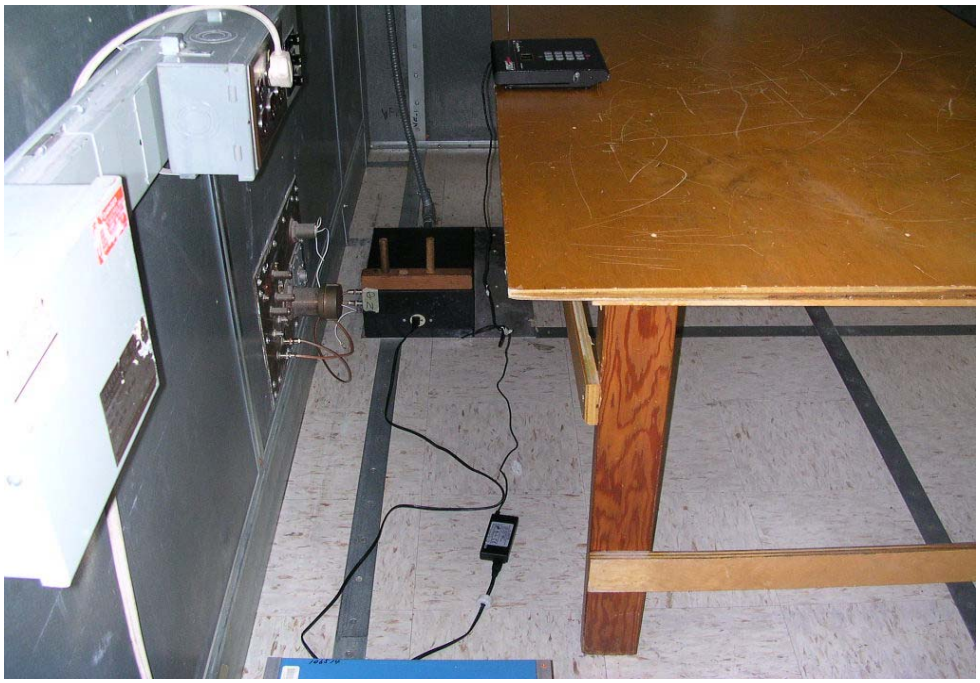
4.2 TEST RESULTS

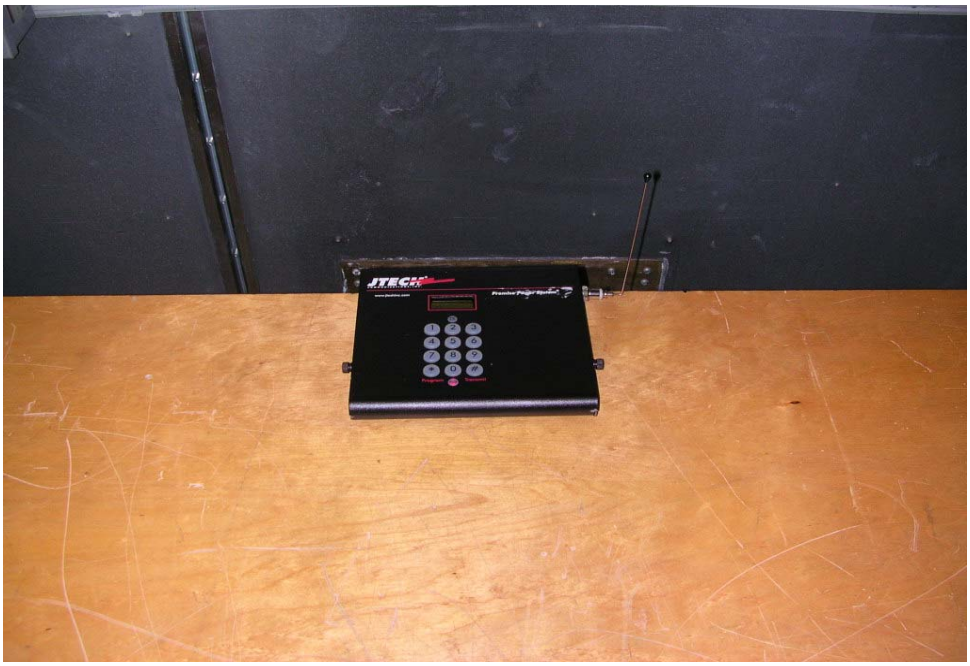
4.2.1 CONDUCTED POWERLINE EMISSIONS

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 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 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 detected emissions on both the phase and neutral lines. Since the readings were close to the limit, an average measurement technique was applied to both the phase and neutral lines. The average detected emissions, on both phase and neutral lines, are shown by the lower line over a selected frequency range. An approximate 6dB reduction in emissions was observed.





PHOTOGRAPHS 1 & 2: CONDUCTED EMISSIONS TEST SETUP

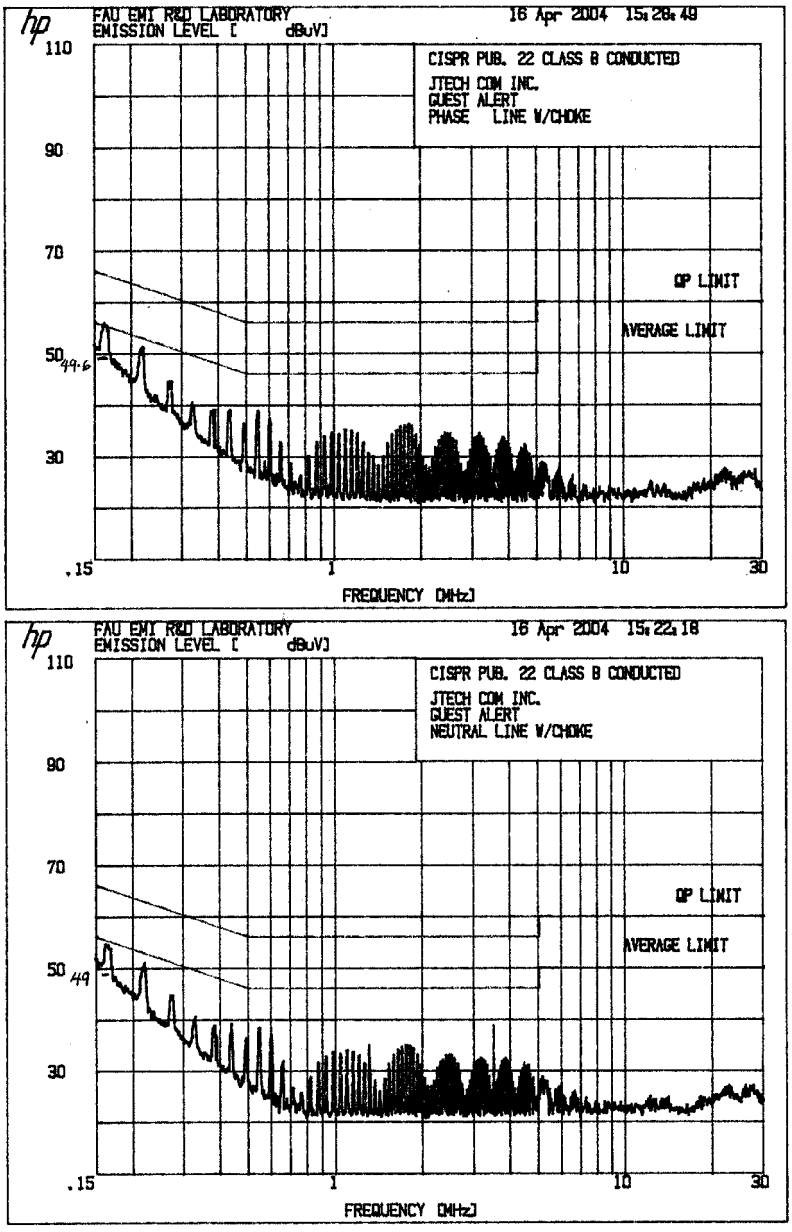


FIGURE 1: CONDUCTED EMISSION LEVELS - Guest-Alert.

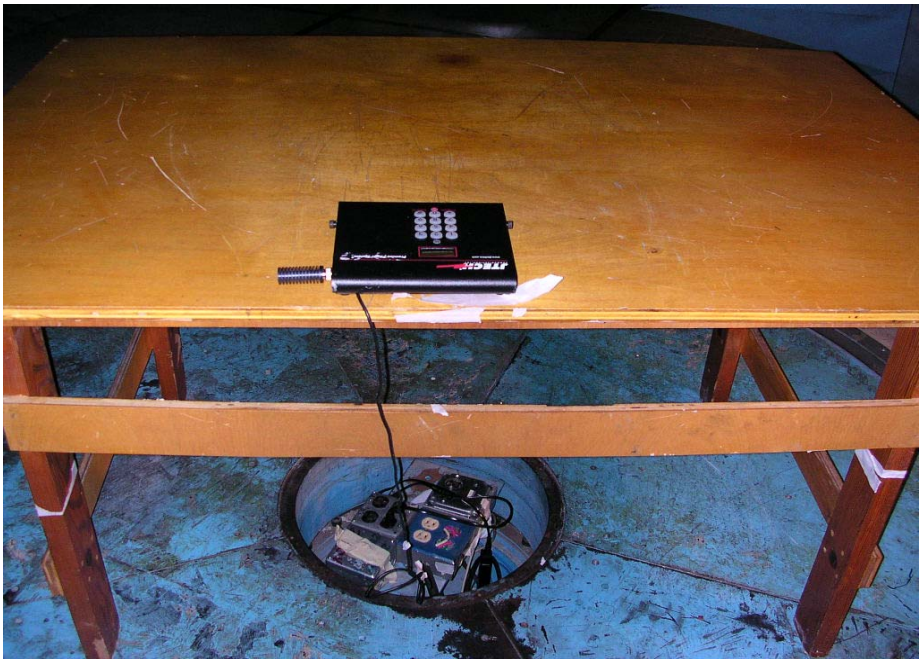
4.2.2 RADIATED EMISSIONS

The Jtech Communications, Inc. Guest-Alert Unit and power supply was set up on a wooden turntable 80 centimeters above the ground plane of the FCC listed FAU radiated emission test site. A 10-watt 50-ohm resistive load termination 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.

According to FCC Part 90, Section 90.210 (d)(3), any emission must be attenuated below the transmitting power (P) of the highest emission by at least 50 + 10 log (P) dB or 70 dB, whichever is the lesser. The Guest-Alert has a power rating of 2 watts, therefore, the attenuation factor is (50 + 10 log 2) 53 dB. For a maximum power of 2 watts and 1.67 dB gain of a dipole over an isotropic antenna and a distance of 3 meters, the rms voltage would be 3.3 volts per meter or 130.3 dBμV/m at the receiving antenna. Therefore, the allowable limit at 3 meters will be 130.3 dBμV/m –53 dB or 77.3 dBμV/m (7328 μV/m).

Since the operating frequency of this device is above 200 MHz, an EMCO, Model 3146 S/N 1385, Log Periodic antenna was selected and then installed on a Compliance Design Antenna Mast at a distance of 3 meters from the transmitter. The output of the antenna was fed through a 30 foot low loss coax cable to an Amplifier Model HP 8447D.The output was then fed through a low loss heliax coax cable to an HP 8566B Spectrum Analyzer. The turntable was rotated, and the antenna was scanned in height from 1 to 4 meters in both the horizontal and vertical polarizations. This procedure was done for the fundamental (LO) and 2x fundamental frequencies (2xLO). Since there is no high pass filter incorporated in this setup, the strongest fundamental (LO) signal was measured to be 101.85 dBμV. To test if the signal saturated the amplifier, an attenuator was inserted in front of the amplifier and a corresponding drop of the output was noted, confirming that the signal was below the amplifier saturation level.

For the remaining harmonic frequencies (3xLO-10xLO), the log periodic antenna was then replaced with an EMCO, Model 3115, S/N 2573, horn antenna, the output of which was fed through a 30 foot low loss coax cable to a Trilithic High pass filter Model 23042, which has a cut off frequency of 1.24 GHz (provided by FAU). The high pass filter was used as an overload protector for the very sensitive (HP 83017A) amplifier. The output of the filter was connected to an HP 83017A Amplifier, which was fed through a low loss heliax coax cable to an HP 8566B Spectrum Analyzer, and the above procedure was therefore repeated.



PHOTOGRAPHS 3 & 4: RADIATED EMISSIONS TEST SETUP

Table 1 shows the worst-case emission levels detected for both vertical and horizontal antenna polarizations for the 2nd through the 10th harmonic.

The following are explanation notes for data in Table 1:

FREQ	= Frequency in MHz.
ANT. POL.	= Receiving antenna polarization.
READING	= Induced emission level in dBμV.
DIRECT	= Total Cable Loss
SYSTEM	= Amplifier Gain + Total Cable Loss
SYSTEM GAIN	= Gain of HP 8447D amplifier or HP83017Amplifier including cable loss and loss of filter in dB.
AF	= Antenna factors for EMCO 3146 log periodic or 3115 Horn. in dBμV/m
TOTAL	= Total electric-field intensity measured at 3 meters in dBμV/m = (READING. dBμv + CL dB - GAIN dB + AF) dBμV.
RNL	= Receiver Noise-floor Level in dBμV

4/12/04			JTech	Guest Alert System					
			fundamental (LO) = 465.9MHz						
		Direct	System	System	Antenna	E-field	Reading	Failing Limit	Margin below
		(dBuV)	(dBuV)	Gain(dBuV)	Factor	Limit(dBuV)	(dBuV)	(dBuV)	Limit (dB)
LO	465.9								
				Horizontal Polarization					
2XLO	931.8	75.5	98	22.5	24.58	77.3	45.75	75.22	29.47
3XLO	1397.7	75.9	105.4	29.5	30.44	77.3	48.5	76.36	27.86
4XLO	1863.6	76	104.1	28.1	33.72	77.3	30	71.68	41.68
5XLO	2329.5	76.35	103.4	27.05	34.44	77.3	29.2	69.91	40.71
6XLO	2795.4	76.2	102.2	26	35.8	77.3	27.55	67.5	39.95
7XLO	3261.3	76.05	101.4	25.35	36.54	77.3	*	66.11	66.11
8XLO	3727.2	75.5	99.75	24.25	37.73	77.3	*	63.82	63.82
9XLO	4193.1	75.5	98.85	23.35	38.99	77.3	*	61.66	61.66
10XLO	4659	76.4	98.75	22.35	39.06	77.3	*	60.59	60.59
				Vertical Polarization					
2XLO	931.8	75.5	98	22.5	24.58	77.3	49.15	75.22	26.07
3XLO	1397.7	75.9	105.4	29.5	30.44	77.3	47.95	76.36	28.41
4XLO	1863.6	76	104.1	28.1	33.72	77.3	34.3	71.68	37.38
5XLO	2329.5	76.35	103.4	27.05	34.44	77.3	33.4	69.91	36.51
6XLO	2795.4	76.2	102.2	26	35.8	77.3	31.1	67.5	36.4
7XLO	3261.3	76.05	101.4	25.35	36.54	77.3	*	66.11	66.11
8XLO	3727.2	75.5	99.75	24.25	37.73	77.3	*	63.82	63.82
9XLO	4193.1	75.5	98.85	23.35	38.99	77.3	*	61.66	61.66
10XLO	4659	76.4	98.75	22.35	39.06	77.3	*	60.59	60.59
*	**Denotes**	**signal**	**Is below**	**Noise floor**	**Of**	**receiver**			

TABLE 1. RADIATED EMISSION DATA

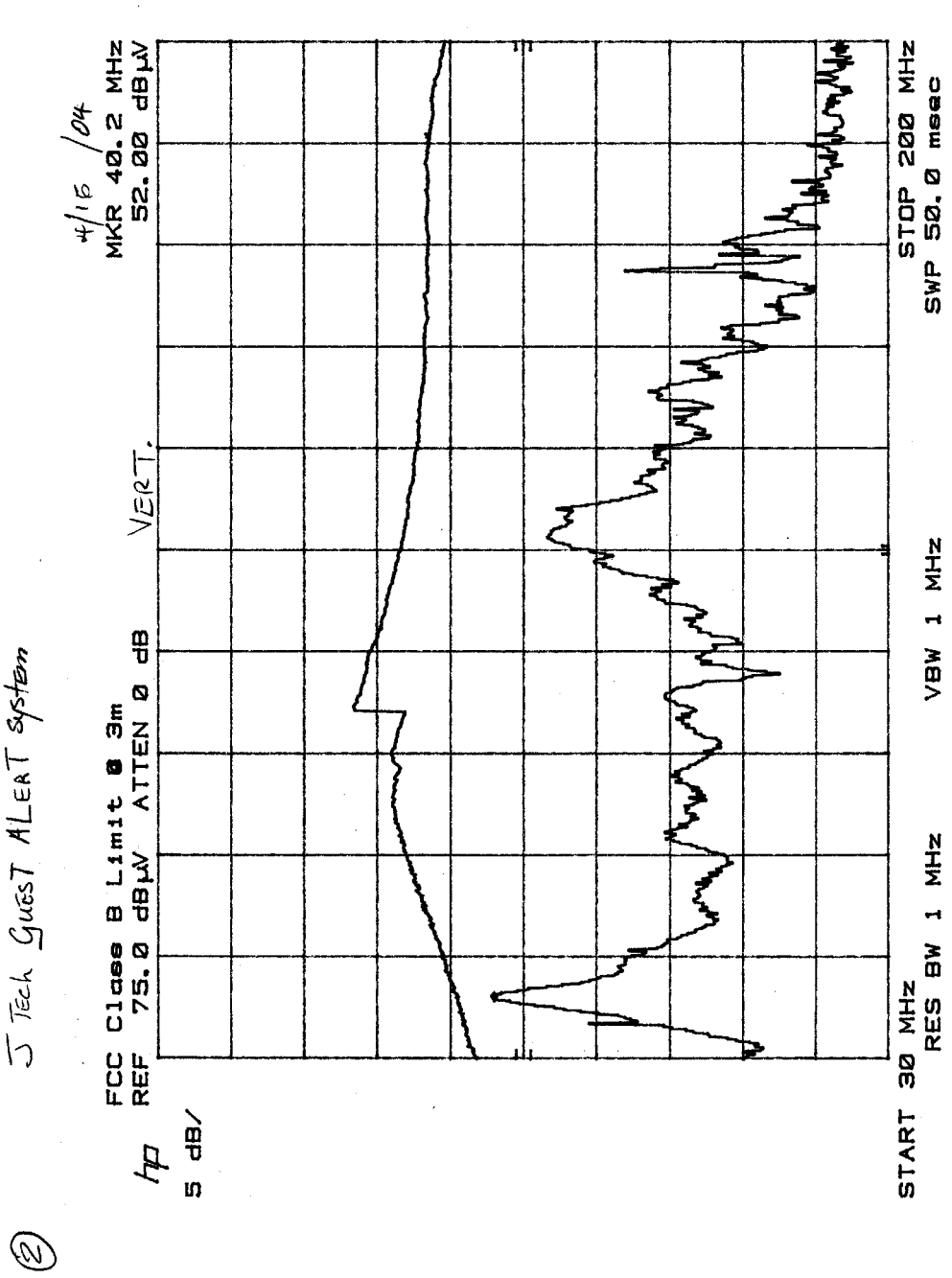


TABLE 2: RADIATED EMISSIONS 30 - 200 MHZ VERTICAL.

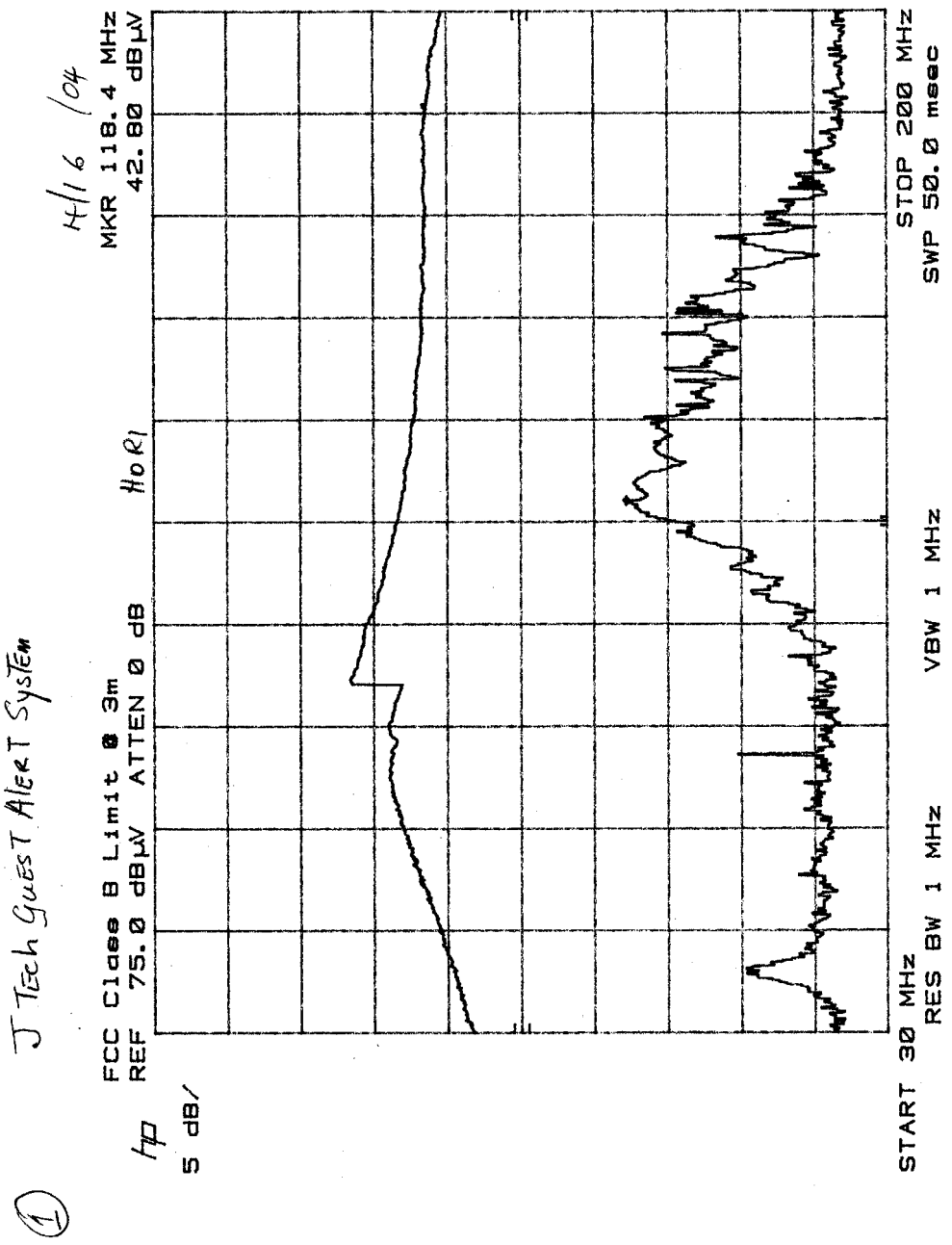


TABLE 3: RADIATED EMISSIONS 30 - 200 MHZ HORIZONTAL.

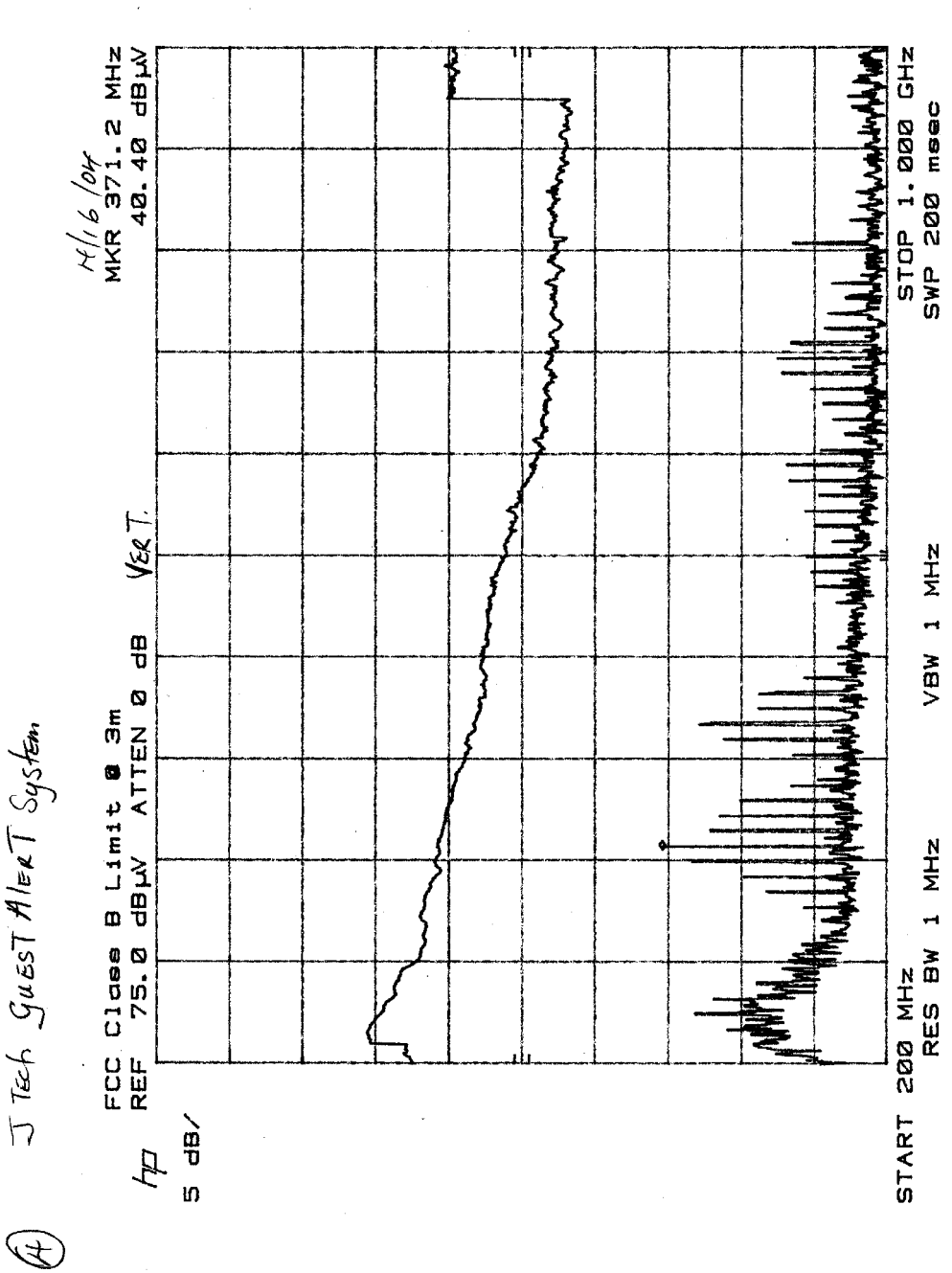


TABLE 4: RADIATED EMISSIONS 200 MHZ - 1 GHZ VERTICAL.

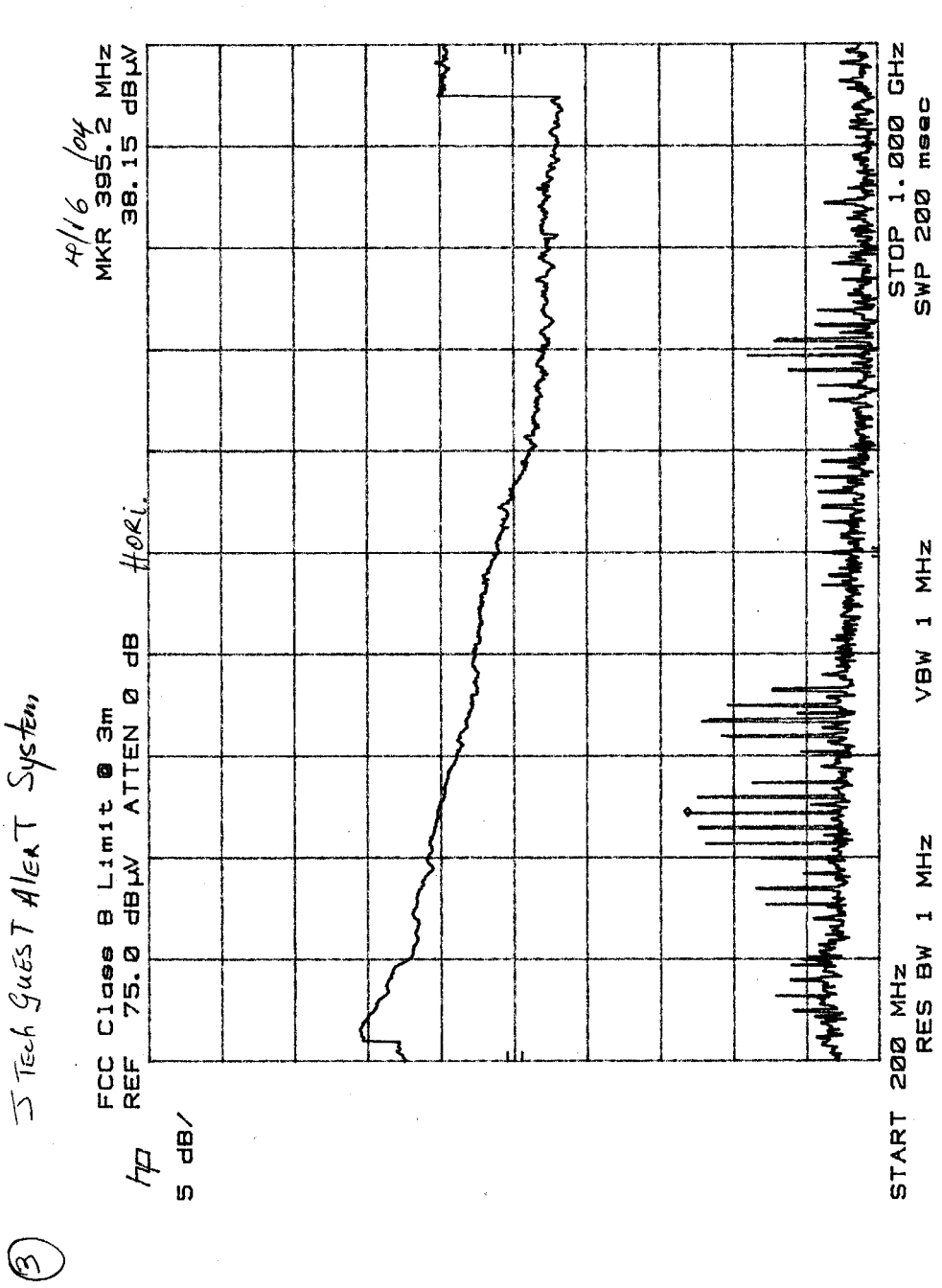


TABLE 5: RADIATED EMISSIONS 200 MHZ - 1 GHZ HORIZONTAL

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	2403A06381	Aug-20-03
Spectrum Analyzer	Hewlett Packard	Display	85662A	2407A06381	Aug-20-03
Spectrum Analyzer	Hewlett Packard	Quasi Peak Adapter	85650A	2430A00559	Aug-20-03
RF Amplifier	Hewlett Packard	RF Amplifier	83017A	3123A00324	Apr-20-03
RF Amplifier	Hewlett Packard	RF Amplifier	HP8447D	2443A03952	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

TEST FACILITY

FAU EMI Research and Development Laboratory
Department of Electrical Engineering
Florida Atlantic University
Boca Raton, Florida 33431
(561) 338-1650

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 Report