ACME TESTING INC., 2002 VALLEY HWY, P.O. BOX 3, ACME, WASHINGTON 98220-0003 888-226-3837.

REPORT OF MEASUREMENTS
PART 15C, 15.231 - INTENTIONAL RADIATOR

DEVICE:	2 CHANNEL KEYPAD SECURITY TRANSCEIVER
MODEL:	KYAA01
MANUFACTURER:	TANTALUS SYSTEMS CORP.
ADDRESS:	3118 BETA AVENUE BURNABY BRITISH COLUMBIA CANADA V5G 4K4

THE DATA CONTAINED IN THIS REPORT WAS
COLLECTED ON 06 MARCH 2000 AND COMPILED BY:

PAUL G. SLAVENS
CHIEF EMC ENGINEER

WORK ORDER: 2236

1. General

1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under section 15.231 of the Code of Federal Regulations title 47.

1.2 Manufacturer

Company Name:	Tantalus Systems Corp.
Contact:	Brad Kelly
Street Address:	3118 Beta Avenue
City/Province:	Burnaby British Columbia
Country/Postal Code:	Canada V5G 4K4
Telephone:	604 299-0458
Fax:	604 516-1422
E-mail:	75270.470@compuserve.com

1.3 Test location

Company:	Acme Testing Inc.
Street Address:	2002 Valley Highway
Mailing Address:	PO Box 3
City/State/Zip:	Acme WA 98220-0003
Laboratory:	Test Site 2
Telephone:	888 226-3837
Fax:	360 595-2722
E-mail:	acmetest@acmetesting.com
Web:	www.acmetesting.com

1.4 Test Personnel

Paul G. Slavens, Chief EMC Engineer

2. Test Results Summary

Summary of Test Results
Keypad Security Transceiver, M/N KYAA01

Requirement	CFR Section	Test Result
Antenna Requirement	15.203	Pass
Radiated Spurs < 15.209	15.205(b)	Pass
Conducted Emissions < 48.0 dBuV	15.207	Pass
Periodic Operation Characteristics	15.231(a)	Pass
Field Strength Limits	15.231(b)	Pass
20 dB Bandwidth	15.231(c)	Pass

The signed original of this report, supplied to the client, represents the only "official" copy. Retention of any additional copies (electronic or non-electronic media) is at Acme Testing's discretion to meet internal requirements only. The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

The measurements contained in this report were made in accordance with the procedure ANSI C63.4 - 1992 and all applicable Public Notices received prior to the date of testing. All emissions from the device were found to be within the limits outlined in this report. Acme Testing assumes responsibility only for the accuracy and completeness of this data as it pertains to the sample tested.

_____ _____

Paul G. Slavens
Chief EMC Engineer

Date of Issuance

3. Description of Equipment and Peripherals

3.1 Equipment Under Test (EUT)

Device:	2 Channel Keypad Security Transceiver
Model Number:	KYAA01
Serial Number:	AYRS24
FCC ID:	OZF-532856
Power:	120 V/60 Hz
Grounding:	Local
Antenna Distance:	3 meter

3.2 EUT Peripherals

Not applicable, the EUT is a stand-alone device.

3.3 Description of Interface Cables

Not applicable, the EUT is a stand-alone device.

3.4 Mode of Operation During Tests

The EUT was exercised by constantly transmitting.

3.5 Modifications Required for Compliance

1. None.

4. Antenna requirement

4.1 Regulation

15.203 An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.2 Result

The antenna for the transmitter is integral to the PCB.

5. Conducted Emissions Tests

Test Requirement: FCC CFR47, Part 15C

Test Procedure: ANSI C63.4:1992

5.1 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 19 November 1999, Calibration due Date: 19 November 2000

⇒ Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 1 September 1999, Calibration due Date: 01 September 2000

5.2 Purpose

The purpose of this test is to evaluate the level of conducted noise the EUT imposes on the AC mains.

5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Floor standing equipment is placed directly on the groundplane. Any supplemental grounding mechanisms are connected, if appropriate. The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter. The EUT is connected to a dedicated LISN and all peripherals are connected to a second separate LISN circuit. The LISNs are bonded to the groundplane.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, final conducted measurements are taken. Conducted measurements are made on each current carrying conductor with respect to ground.

Conducted Emissions Test Characteristics	
Frequency range	0.45 MHz - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1/Line 2

5.4 Test Results

A summary of the highest amplitude emissions is listed below. For detailed plots of all emissions from 0.15 MHz - 30 MHz, please refer to the accompanying data in the list of attachments.

LINE 1

PEAK #	FREQ. (MHz)	AMPL (dBuV)
1	6.143	27.9
2	15.59	26.8
3	0.9417	26.4
4	5.129	25.9
5	1.737	25.8
6	25.79	25.7

LINE 2

PEAK #	FREQ. (MHz)	AMPL (dBuV)
1	9.745	28.4
2	1.551	26.1
3	4.124	25.7

6. Periodic Operation

6.1 Regulation

15.231(a) The provisions of this Section are restricted to periodic operation within the band 40.66 - 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted. Continuous transmissions, such as voice or video, and data transmissions are not permitted. The prohibition against data transmissions does not preclude the use of recognition codes. Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system.

6.2 Result

The operating characteristics of the device meets the requirement of this section.

7. Manually Operated Transmitter Deactivation

7.1 Regulation

15.231(a1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

7.2 Result

The operating characteristics of the device meets the requirement of this section.

8. Automatically Operated Transmitter Deactivation

8.1 Regulation

15.231(a2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

8.2 Result

The operating characteristics of the device meets the requirement of this section.

9. Prohibition of Periodic Transmission

9.1 Regulation

15.231(a3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

9.2 Result

The operating characteristics of the device meets the requirement of this section.

10. Continuous Transmission During an Alarm Condition

10.1 Regulation

15.231(a4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

10.2 Result

The operating characteristics of the device meets the requirement of this section.

11. Radiated Spurious Emissions

11.1 Regulation

15.231(b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	75
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, μV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in Section 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength

11.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 19 November 1999, Calibration due Date: 19 November 2000

⇒ Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 1 September 1999, Calibration due Date: 01 September 2000

⇒ Broadband Biconical Antenna (red) (20 MHz to 200 MHz): EMCO 3110, Serial Number 1115, Calibrated: 28 December 1999, Calibration due Date: 28 December 2000

⇒ Broadband Log Periodic Antenna (red) (200 MHz to 1000 MHz): EMCO 3146, Serial Number 2853, Calibrated: 28 December 1999, Calibration due Date: 28 December 2000

⇒ EUT Turntable Position Controller: EMCO 1061-3M, Serial Number 9003-1441, No Calibration Required

⇒ Antenna Mast with Controller: EMCO 1051, Serial Number 9002-1457, No Calibration Required

⇒ 2 GHz to 10 GHz Low Noise Preamplifier: Milliwave 593-2898, Serial Number 2494, No Calibration Required

⇒ Double Ridge Guide Horn Antenna: EMCO 3115, Serial Number 9807-5534, Calibrated: 30 December 1999, Calibration due Date: 30 December 2000

11.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz - 5000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 MHz - 1000 MHz) 1 MHz (1000 MHz - 5000 MHz)
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

11.4 Calculation of Field Strength Limits

Fundamental field strength limits for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333. = 41.6667*433.28 –7083.3 = 10,970 uV = 80.8 dBuV/m

Fundamental field strength limits for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333. = 41.6667*434.56 –7083.3 = 11,023.5 uV = 80.8 dBuV/m

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level = 60.8 dBuV/m

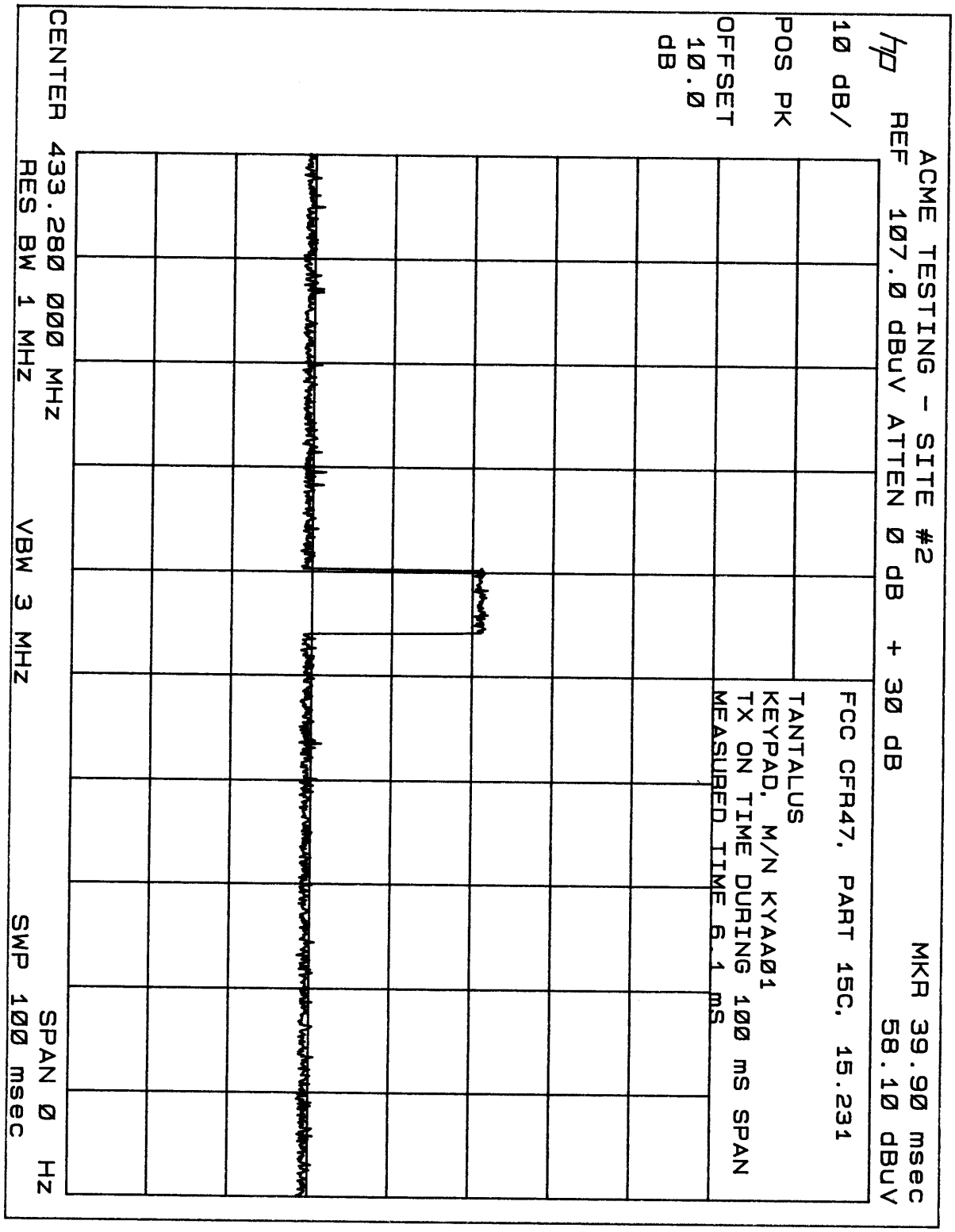
11.5 Calculation of Average Correction Factor

The average correction factor is computed by analyzing the "worst case" on time in **any** 100 mSec time period and using the formula:

Correction Factor (dB) = 20*log (worst case on time/100 mSec).

Analysis of the system transmitter worst case on time in any 100 mSec time period is an on time of 6.1 mSec. Correction Factor (dB) = 20*log (6.1/100) = -24.3 dB. The maximum correction factor to be applied is 20 dB per section 15.35 of the FCC rules. Therefore the allowed Correction Factor (dB) = -20 dB

11.6 Scan of Transmitter On Time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REF 107.0 dBuV ATTEN 0 dB + 30 dB
MKR 39.90 msec
58.10 dBuV
10 dB/
POS PK
OFFSET
10.0
dB
FCC CFR47, PART 15C, 15.231
TANTALUS
KEYPAD, M/N KYAA01
TX ON TIME DURING 100 mS SPAN
MEASURED TIME 6.1 mS
CENTER 433.280 000 MHz
RES BW 1 MHz
VBW 3 MHz
SPAN 0 Hz
SWP 100 msec

11.7 Test Results

PRODUCT EMISSIONS
AVERAGE DATA
CHANNEL A
NOT 15.205 BANDS

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS	dLIM dB	MODE	POL	SITE HGT cm	AZM deg
1	433.323	80.8	77.4	-3.4	AVG	V	151	236
2	866.680	60.8	19.4	-41.4	AVG	H	100	130
3	1733.40	60.8	30.7	-30.1	AVG	V	134	191
4	2600.17	60.8	29.9	-30.9	AVG	V	109	095
5	3033.50	60.8	28.2	-32.6	AVG	V	118	096

* Average data is the measured peak data – calculated correction factor.

PRODUCT EMISSIONS
PEAK DATA
CHANNEL A
15.205 BANDS

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS	dLIM dB	MODE	POL	SITE HGT cm	AZM deg
1	1300.05	54.0	49.7	-4.3	PK	H	231	141

PRODUCT EMISSIONS
***AVERAGE** DATA
CHANNEL B
NOT 15.205 BANDS

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS	dLIM dB	MODE	POL	SITE HGT cm	AZM deg
1	434.604	80.8	77.3	-3.5	AVG	V	148	233
2	869.245	60.8	20.5	-40.3	AVG	V	126	254
3	1738.01	60.8	30.1	-30.7	AVG	V	100	187
4	2606.90	60.8	30.4	-30.4	AVG	V	115	327
5	3042.50	60.8	27.7	-33.1	AVG	V	114	086

* Average data is the measured peak data – calculated correction factor.

PRODUCT EMISSIONS
PEAK DATA
CHANNEL B
15.205 BANDS

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS	dLIM dB	MODE	POL	SITE HGT cm	AZM deg
1	1300.05	54.0	50.7	-3.3	PK	V	231	141

12. 20 dB bandwidth

12.1 Regulation

15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

12.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

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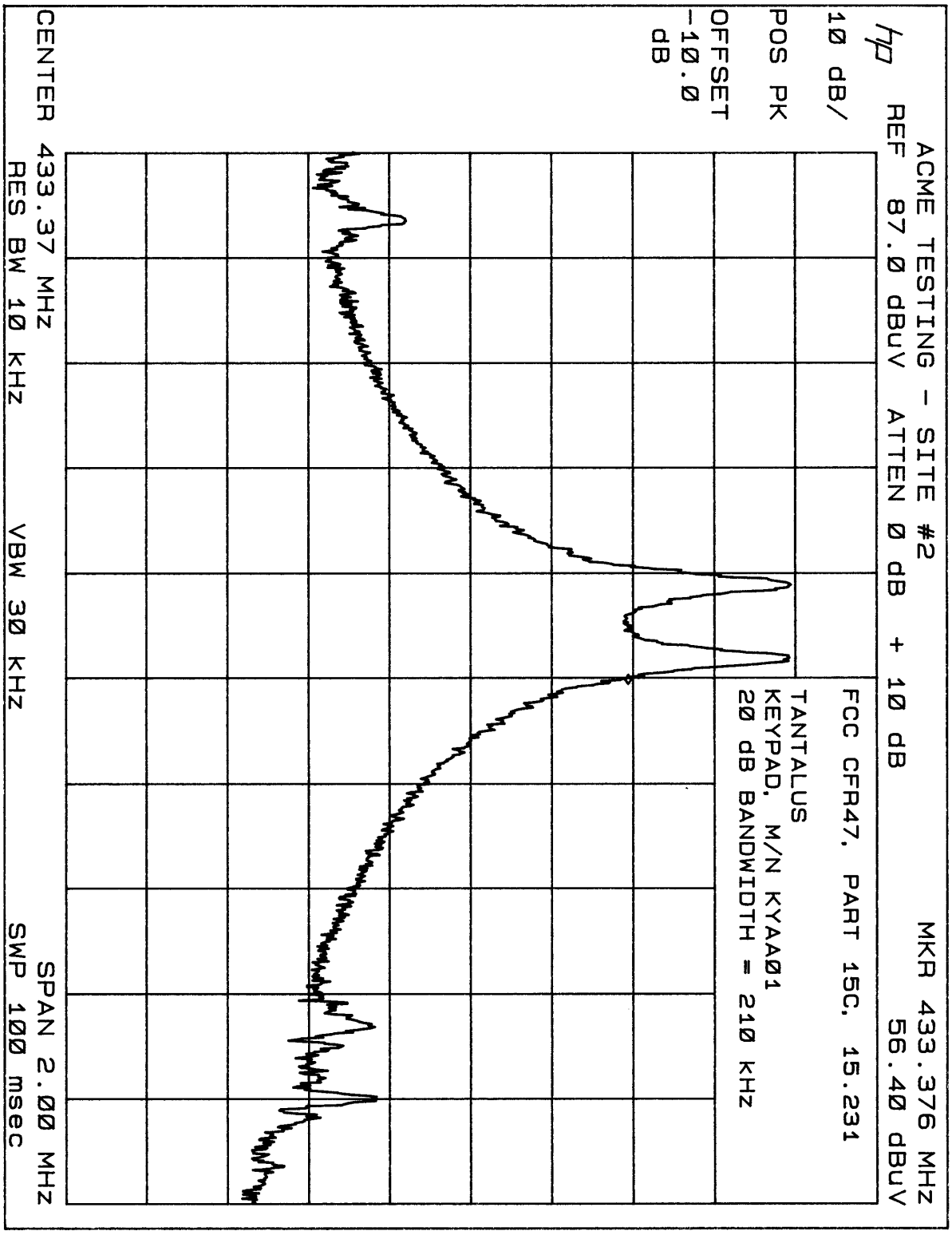
⇒ Broadband Log Periodic Antenna (red) (200 MHz to 1000 MHz): EMCO 3146, Serial Number 2853, Calibrated: 28 December 1999, Calibration due Date: 28 December 2000

12.3 Calculation of 20 dB Bandwidth and Result

The 20 dB bandwidth limit = 0.0025 * 447.7 MHz.
1.08 MHz

The Measured 20 dB bandwidth is 210 kHz.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MKR 433.376 MHz
REF 87.0 dBuV ATTEN 0 dB + 10 dB
56.40 dBuV
10 dB/
FCC CFR47, PART 15C, 15.231
POS PK
TANTALUS
KEYPAD, M/N KYAA01
OFFSET
-10.0
dB
20 dB BANDWIDTH = 210 kHz
CENTER 433.37 MHz
SPAN 2.00 MHz
RES BW 10 kHz
VBW 30 kHz
SWP 100 msec

13. Receiver Verification

13.1 Regulation

15.109(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

13.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

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13.3 Test Procedures

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Radiated Emissions Test Characteristics	
Frequency range	30 MHz - 5000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 MHz - 1000 MHz) 1 MHz (1000 MHz - 5000 MHz)
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

13.4 Test Results

PRODUCT EMISSIONS
RECEIVER DATA

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS	dLIM dB	MODE	POL	SITE HGT cm	AZM deg
1	42.938	40.0	20.8	-19.2	PK	V	107	359
2	503.58	46.0	26.4	-19.6	PK	V	100	260

14. Miscellaneous Comments and Notes

1. None.

15. List of Attachments

1. Plots of all conducted emissions. (2)
2. Photograph of Test Set Up. (1)