ELITE ELECTRONIC ENGINEERING INCORPORATED
1516 CENTRE CIRCLE
DOWNERS GROVE, ILLINOIS 60515-1082

ELITE PROJECT: 29995 DATES TESTED: June 19, 2001 to July 5, 2001

TEST PERSONNEL: Howard Horhold, Dan Crowder

TEST SPECIFICATION: FCC "Code of Federal Regulations" Title 47 Part 2 and FCC Part 90

ENGINEERING TEST REPORT NO. 23874

ELECTROMAGNETIC INTERFERENCE TESTS ON

BRIVO ACCESS CONTROL SYSTEM

FCC ID: 09UA206 MODEL: ACS 2000

FOR: Brivo Systems, Inc.
2349 W. Lake Street
Suite 100
Addison IL 60101

PURCHASE ORDER NO: EE2001-001

Report By: Richard King
Richard King

Approved By: Raymond J. Klouda
Raymond J. Klouda
Registered Professional
Engineer of Illinois - 44894

ENGINEERING TEST REPORT NO. 23874

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

DESCRIPTION OF TEST ITEM: Brivo Access Control System

MODEL NO: ACS 2000 **SERIAL NO:** None given.

MANUFACTURER: Brivo Systems, Inc.

APPLICABLE SPECIFICATIONS: FCC "Code of Federal Regulations" Title 47, Part 2 and 90

QUANTITY OF ITEMS TESTED: One (1)

TEST PERFORMED BY: ELITE ELECTRONIC ENGINEERING INCORPORATED
1516 Centre Circle
Downers Grove, Illinois 60515

DATE RECEIVED: June 15, 2001

DATES TESTED: June 19, 2001 to July 5, 2001

PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):
CUSTOMER: No Brivo Systems, Inc. personnel were present for the testing.
ELITE ELECTRONIC: Dan Crowder, Howard Herhold
ELITE JOB NO.: 29995

ABSTRACT: The Brivo Access Control System, does meet the RF power output, the occupied bandwidth, the antenna conducted emissions, radiated emissions and the frequency stability requirements of the FCC "Code of Federal Regulations", Title 47, Part 2 and 90. See test results and data pages for more details.

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(INCLUDING DATA SHEETS): 22

ENGINEERING TEST REPORT NO. 23874

ELECTROMAGNETIC INTERFERENCE TESTS ON

A BRIVO ACCESS CONTROL SYSTEM

1.0 INTRODUCTION:

1.1 DESCRIPTION OF TEST ITEM: This report presents the results of a series of radio interference measurements which were performed on Brivo Access Control System, model ACS 2000 (hereinafter referred to as the test item). The tests were performed for Brivo Systems, Inc. of Addison, Illinois.

The Brivo Access Control System is a web-based, wireless wide-area network access control solution. The Brivo Access Control System includes a control panel that contains the communication device and is installed in fixed mode at the access location. Access/entry authorization information is entered by the end user via a user website and transmitted to the control panel over the Mobitex wireless network, using the Research in Motion (RIM) 902M 900MHz packet data radio modem.

The test item has an external SMA type antenna port. In addition to the SMA port, the test item had eight additional ports: a DC power input port, communications port, telephone communication port and five ethernet ports which connected to the companion and display unit.

1.2 PURPOSE: The test series was performed to determine if the test item meets the type acceptance test requirements of the FCC "Code of Federal Regulations" Title 47, Part 2 and 90.

1.3 DEVIATIONS, ADDITIONS AND EXCLUSIONS: There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4 APPLICABLE DOCUMENTS: The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 90, dated 1 October 2000
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 2, dated 1 October 2000
- ANSI C63.4-1992, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

1.5 SUBCONTRACTOR IDENTIFICATION: This series of tests was performed by Elite Electronic Engineering Incorporated, of Downers Grove, Illinois.

1.6 LABORATORY CONDITIONS: The temperature at the time of the test was 25°C and the relative humidity was 48%.

2.0 TEST ITEM SETUP AND OPERATION:

For the radiated emissions tests, the test item was placed on a 0.8 meter high non-conductive table.

2.1 POWER INPUT: The test item includes the Malibu ML80P 120VAC/60Hz to 12VDC/80 watt power transformer which provides 12VDC to the control panel.

2.2 GROUNDING: The test item was not grounded during testing except for grounding that may be provided through the power source.

PERIPHERAL EQUIPMENT: The following peripheral equipment was submitted with the test item:

COMPUTER: Toshiba Laptop Computer used to control and program radio functions.

2.4 INTERCONNECT CABLES: The following interconnect cables were submitted with the test item:

ETHERNET CABLES:

Five category 5 ethernet networking cables 50 feet long were used to connect to the Brivo Keypad Display Box from the Brivo ACS control panel.

TELEPHONE CABLE:

A 25 foot long RJ-11 type cable. One end was connected to the telephone port of the test item.

INPUT/OUTPUT DATA CABLE:

A 6 foot long communication cable. Used to connect the Laptop PC to the test item for programming and initializing the test item.

2.5 OPERATIONAL MODES: The test item was operated in the "FCC Mode" during testing. This mode is achieved by loading the RIM software from the Toshiba Laptop. The transmit frequency was set to 899.0MHz. Power was set to +33dBm (max). "Carrier" or "Pseudo Random" modulation was selected as required.

3.0 TEST EQUIPMENT:

3.1 TEST EQUIPMENT LIST: A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

3.2 CALIBRATION TRACEABILITY: The test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.1 RF POWER OUTPUT:

4.1.1 REQUIREMENTS: In accordance with FCC part 90.635 (d) the maximum allowable output power of the transmitter for mobile stations is 100 watts.

4.1.2 PROCEDURES: The transmit carrier power transmitted directly into the antenna was measured. The output of the test item into a spectrum analyzer. The readings were made with peak detection. A 100kHz bandwidth was used, which exceeded the emissions bandwidth of the test signal.

4.1.3 RESULTS: Data page 15 shows the results of the output power measurements. As can be seen from this data page, the maximum output power at the fundamental was 32.6dBm or 1.82 watts, which is below the 100 watt limit.

4.2 OCCUPIED BANDWIDTH MEASUREMENTS:

4.2.1 REQUIREMENTS: In accordance with Paragraph 90.209(b)(5), the maximum authorized bandwidth shall be 13.6kHz for operations in the bands of 896MHz to 901MHz.

In accordance with paragraph 90.210, the occupied bandwidth shall comply with Mask J. For Mask J, the peak power of any emission shall be attenuated below the unmodulated carrier power (P) in accordance with the following schedule:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 2.5 kHz, but no more than 6.25 kHz: At least 53 log (f/2.5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 6.25

kHz, but no more than 9.5 kHz: At least 103 log (f/3.9) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency by more than 9.5 kHz: At least 157 log (f/5.3)dB, or 50+10 log(P) dB or 70 dB, whichever is the lesser attenuation.

4.2.2 PROCEDURES: The measurement equipment was connected to the test item's antenna port. The test item was configured in the FCC mode with 'Psuedo Random' modulation.

The measurement bandwidth was set to 300 Hz. The emissions near the fundamental frequency were plotted.

4.2.3 RESULTS: The plot of the emissions near the fundamental frequency are presented on data pages 16 and 17. As can be seen from these data pages, the transmitter met the occupied bandwidth requirements.

4.3 ANTENNA CONDUCTED EMISSIONS:

4.3.1 REQUIREMENTS: This test determines whether the test item produces excessive spurious emissions at the antenna terminals.

In accordance with FCC 90.210(J)(3), spurious emissions shall be attenuated by 50+10log (P)dB. For output at 2 watts, the spurious emissions shall be attenuated by a minimum of 53 dB. This requirement translates to a limit of -20dBm. The peak power of the emissions shall be measured at the antenna terminal from 30MHz up to the 10th harmonic of the fundamental frequency.

4.3.2 PROCEDURES:

This test will measure spurious emissions at the antenna terminals.

(a) The test item was connected to the spectrum analyzer.

(b) The analyzer bandwidth was set to 100kHz. The emission levels were measured and plotted over the frequency range from 30MHz to 10GHz.

4.3.3 RESULTS: The plots of the antenna conducted output measurements are presented on data pages 18 and 19.

As can be seen from the data, the test item did not produce spurious emissions in excess of 53dB below unmodulated carrier level with the nominal output power of 2 watts.

4.4 SPURIOUS RADIATED EMISSIONS:

4.4.1 REQUIREMENTS: In accordance with Paragraph FCC 90.210(J)(3), spurious emissions shall be attenuated by 50+10log (P)dB. For output at 2 watts, the spurious emissions shall be attenuated by a minimum of 53 dB. This requirement translates to a limit of -20dBm. The peak power of the emissions shall be measured at the antenna terminal from 30MHz up to the 10th harmonic of the fundamental frequency.

4.4.2 PROCEDURES: The preliminary radiated measurements were performed in an RF absorber lined chamber located in Cocoa Beach, Florida. This data is presented for a reference, and is not used to determine compliance.

All significant radiated emissions were subsequently measured at open field test site. The open field test site is located in a clear area and is equipped with a 1/4-inch wire mesh ground plane. The test

was performed at a 3 meter test distance between the test item and the measurement antenna.

The broadband measuring antenna was positioned at a 3 meter distance from the test item. The frequency range from 30MHz to 10GHz was investigated.

4.4.3 RESULTS:

The preliminary plot is presented on data page 21. The plot is presented for a reference only, and is not used to determine compliance. Only the fundamental frequency and some harmonics were detected. No other spurious emissions were detected.

The final open area radiated levels are presented on data page 22. The radiated emissions were measured through the 10th harmonic. Ambient levels were recorded if the harmonic signals were not detected above the ambient. All emissions were within the specification limits.

4.5 FREQUENCY STABILITY:

4.5.1 REQUIREMENTS: In accordance with FCC part 90.213 the test item must maintain a frequency stability of ±1.5 parts per million (ppm).

4.5.2 PROCEDURES:

(a) Frequency Stability vs. Temperature

(1) The test item was placed in a Thermotron temperature chamber. The test item was powered up.

(2) The measurement equipment was set to monitor the transmitted frequency.

(3) At ambient room temperature a reference frequency was

recorded.

(4) The temperature was varied from -30 to +50 degrees centigrade in 10 degree increments. The test item was allowed to soak from 30 to 45 minutes at each temperature.

(5) The frequency was measured at each 10 degree step.

(6) The frequency stability was calculated for each temperature step.

(b) Frequency Stability vs. Voltage:

(1) The measurement equipment was connected to the test item's antenna port.

(2) The AC input voltage was varied from 85% to 115% of the nominal voltage.

4.5.3 RESULTS: The results of the frequency stability tests can be found on data page 20. As can be seen from the data, the frequency stability is within the ±1.5 ppm tolerance.

5.0 CONCLUSION:

It was found that the Brivo Systems, Inc. Unattended Package System, Model No. , does meet the RF Power, the occupied bandwidth, the radiated emissions, the antenna conducted emissions and the frequency stability requirements of the FCC "Code of Federal Regulations", Title 47, Part 2 and 90.

6.0 CERTIFICATION:

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specification.

The data presented in this test report pertains only to the test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

7.0 ENDORSEMENT DISCLAIMER:

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.

TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC.

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: AMPLIFIERS								
APIO	PRE-AMPLIFIER - FL	MITEQ	AFS4-0010200	180314	0.1-20GHZ	06/18/01	12	06/18/02
APJO	RF PRE-AMPLIFIER	MINI-CIRCUITS L	ZFL-2000	860902	10-2000MHZ	02/28/01	12	02/28/02
APJ2	RF PRE-AMPLIFIER - FL	MINI-CIRCUITS L	ZFL-2000	003	10-2000MHZ	02/28/01	12	02/28/02
Equipment Type: ANTENNAS								
NBLO	BICONICAL ANTENNA - FL	COMPLIANCE DESI	B100	---	20-220MHZ	08/01/00	12	08/01/01
NBMO	BICONICAL ANTENNA - FL	COMPLIANCE DESI	B200	---	175-400MHZ	11/09/00	12	11/09/01
NBNO	BICONICAL ANTENNA - FL	COMPLIANCE DESI	B300	---	400-1000MHZ	11/09/00	12	11/09/01
NSCO	LOG SPIRAL ANTENNA - FL	EMCO	3101	2661	200-1000MHZ	01/09/01	12	01/09/02
NWF1	RIDGED WAVE GUIDE - FL	EMCO	3105	2041	1-12.4GHGZ	08/01/00	12	08/01/01
Equipment Type: ATTENUATORS								
T1K4	10DB, 2.5W LIMITER - FL	HEWLETT PACKARD	11947A	3107A01978	0.009-200MHZ	10/26/00	12	10/26/01
T2C3	20DB, 20W ATTENUATOR-FL	NARDA	768-20	37	DC-11GHZ	03/16/01	12	03/16/02
T2D4	20DB, 25W ATTENUATOR-FL.	WEINSCHEL	46 20 43	AY9243	DC-18GHZ	03/16/01	12	03/16/02
Equipment Type: CONTROLLERS								
CCA2	CALCULATOR - FL	HEWLETT PACKARD	9825A	1622A08377	---		N/A	
CDA4	COMPUTER - FL	HEWLETT PACKARD	9836A	2440A09718	---		N/A	
CDI4	LAPTOP COMPUTER	TOSHIBA	2140XCD5	10405685U-1			N/A	
CRAB	INTERFACE - FL	SCIENTIFIC ENG.	488-80C	1299	---		N/A	
Equipment Type: PROBES; CLAMP-ON & LISNS								
PLL7	50UH LISN 462D-FL.	ELITE	462D/70A	008	0.01-400MHZ	10/27/00	12	10/27/01
PLL8	50UH LISN 462D-FL.	ELITE	462D/70A	009	0.01-400MHZ	10/27/00	12	10/27/01
Equipment Type: PRINTERS AND PLOTTERS								
HLK2	GRAPHICS PLOTTER-FL	HEWLETT PACKARD	7550A	2631A53539	---		N/A	
HRB2	PRINTER - FL	HEWLETT PACKARD	2631B	2121A19858	---		N/A	
Equipment Type: RECEIVERS								
RAE3	SPECTRUM ANALYZER - FL	HEWLETT PACKARD	85660A	2209A01339	100HZ-22GHZ	10/27/00	12	10/27/01
RAF2	QUASIPEAK ADAPTER - FL	HEWLETT PACKARD	85650A	2043A00245	0.01-1000MHZ	10/27/00	12	10/27/01

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable

Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

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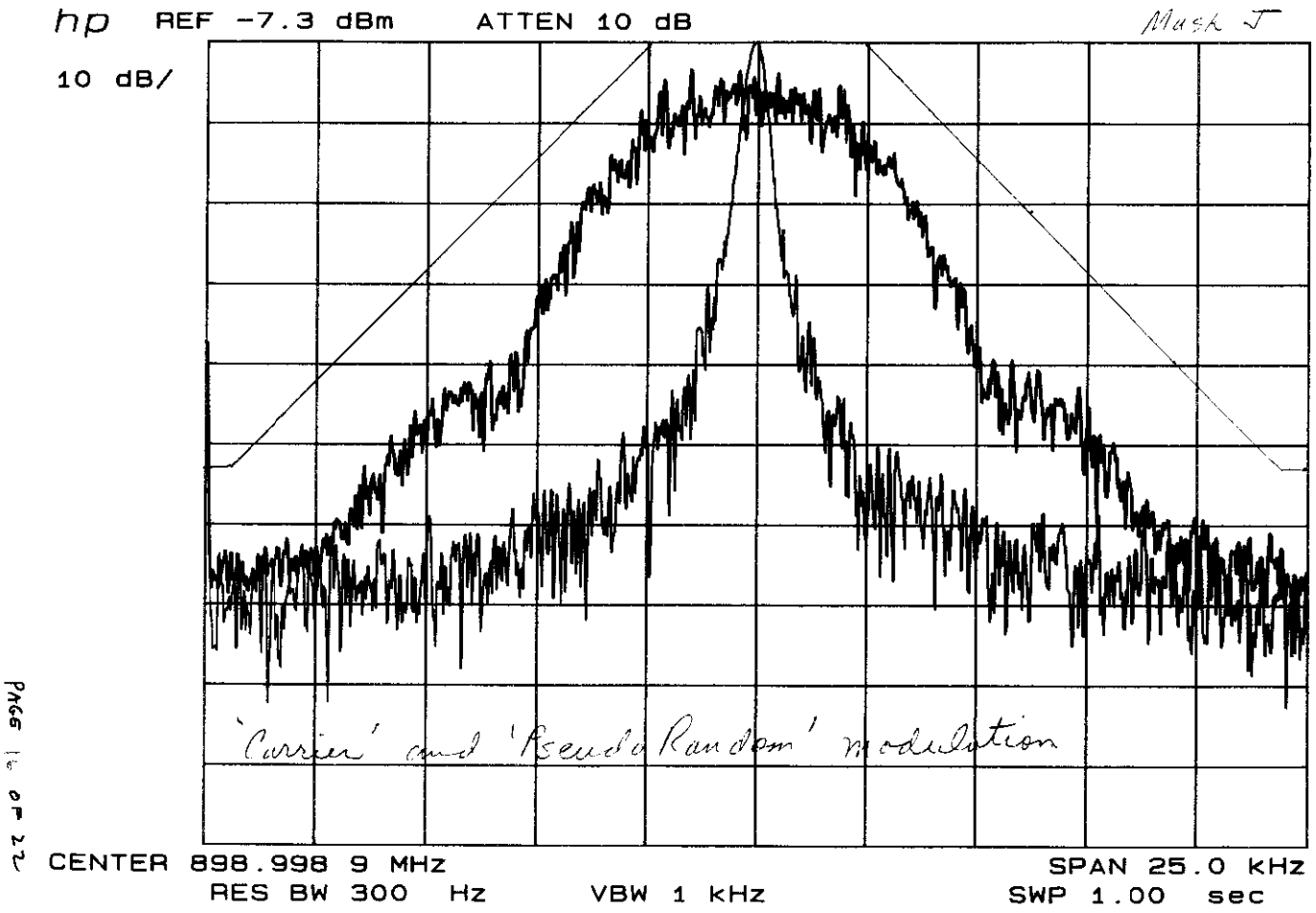
DATA SHEET

MANUFACTURER	: Brivo Systems, Inc.
TEST ITEM	: Access Control System
MODEL	: ACS 2000
SERIAL NUMBER	: None Assigned
TEST PERFORMED	: FCC 90 RF Power Output
DATE TESTED	: June 20, 2001
NOTES	:

Freq.	Mtr	Pads	Total	Total
MHz	RDG(dBm)	dB	dBm	Watts
899	-7.4	40	32.6	1.82

Checked By: Richard N. King

Customer: Brivo Systems
Job: 29995
Test: FCC Part 90 - Occupied Bandwidth ETR No. 23874
Date: 20 June 2001



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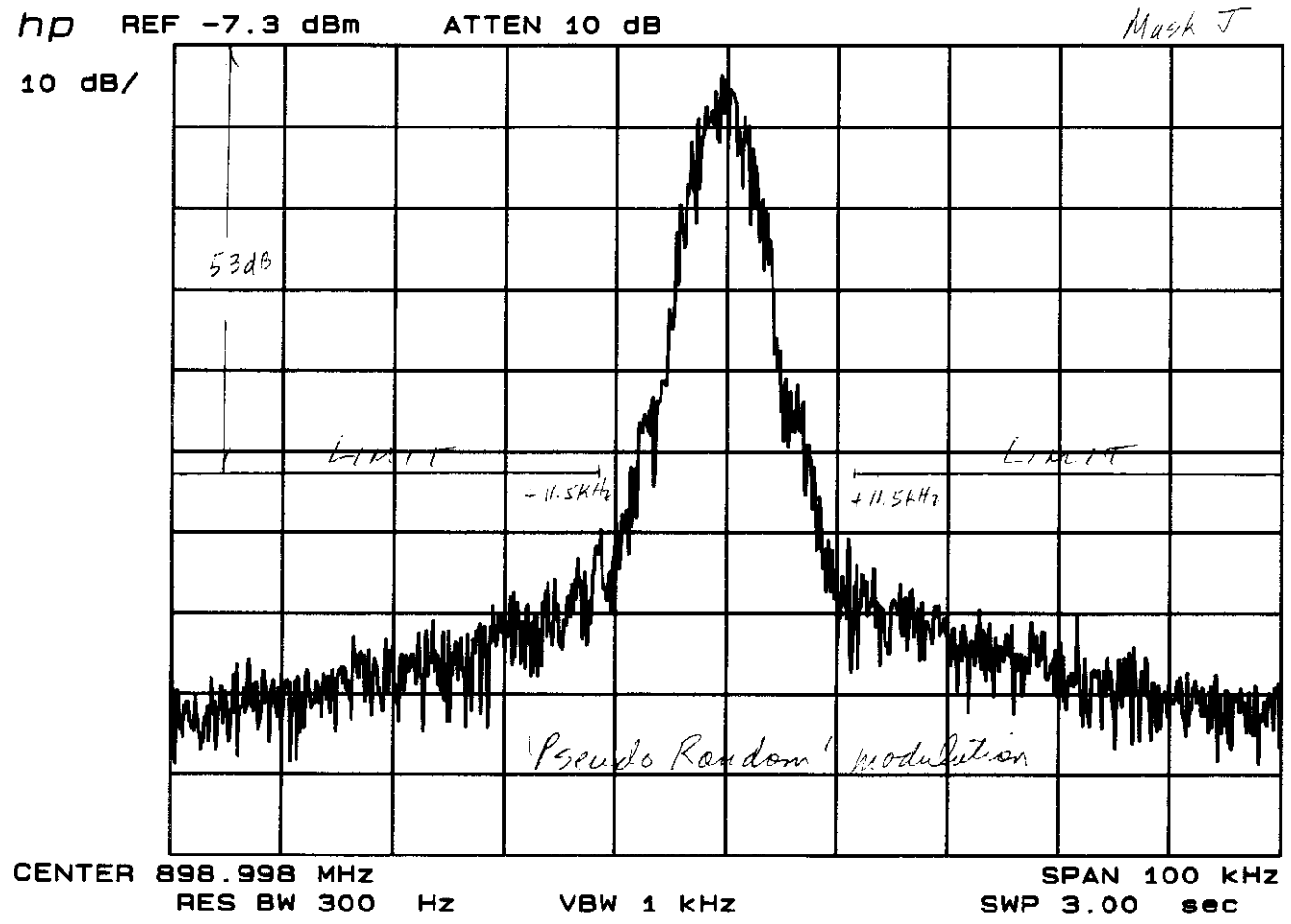
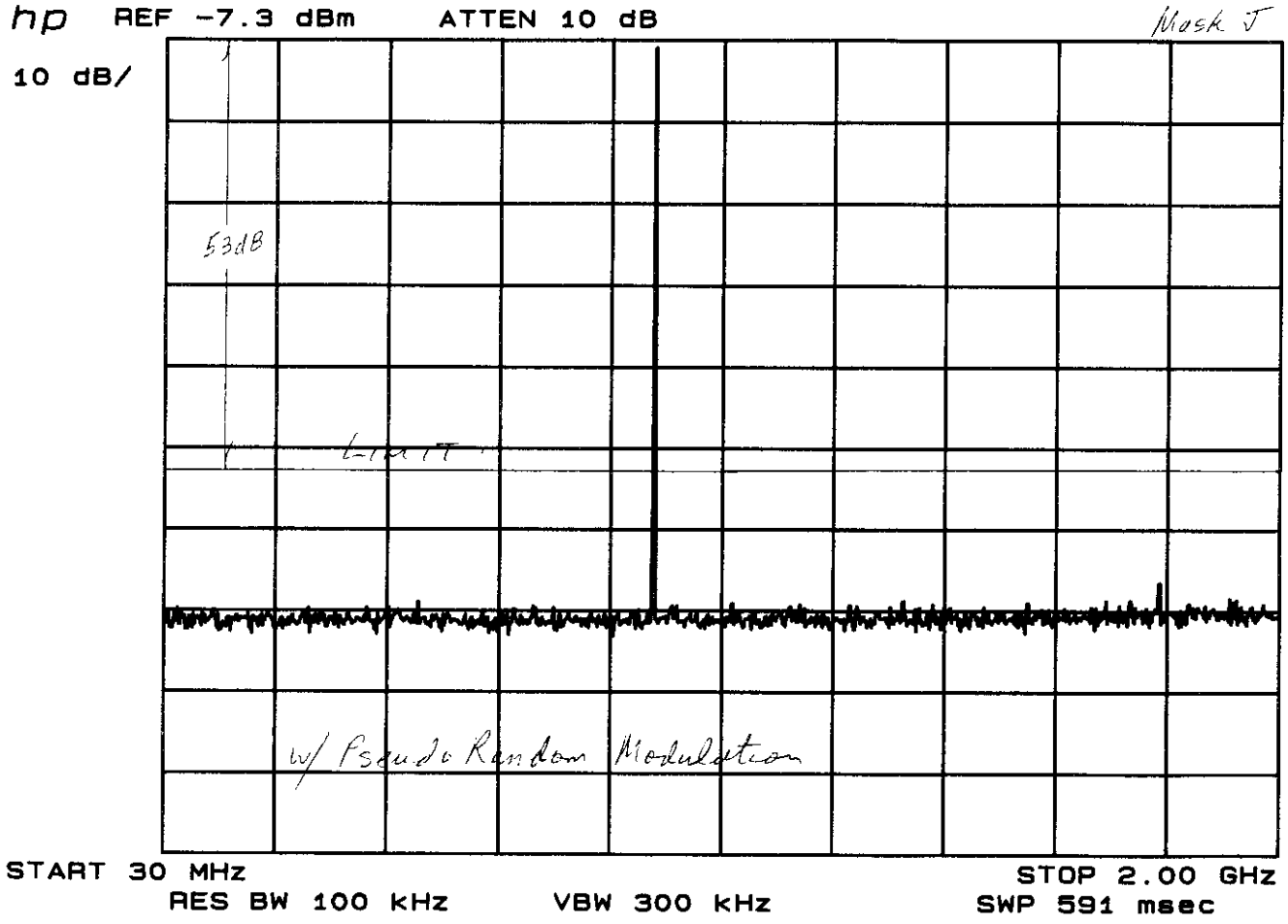
Customer: Brivo Systems
Job: 29995
Test: FCC Part 90 - Occupied Bandwidth
Date: 20 June 2001

ETR No. 23879



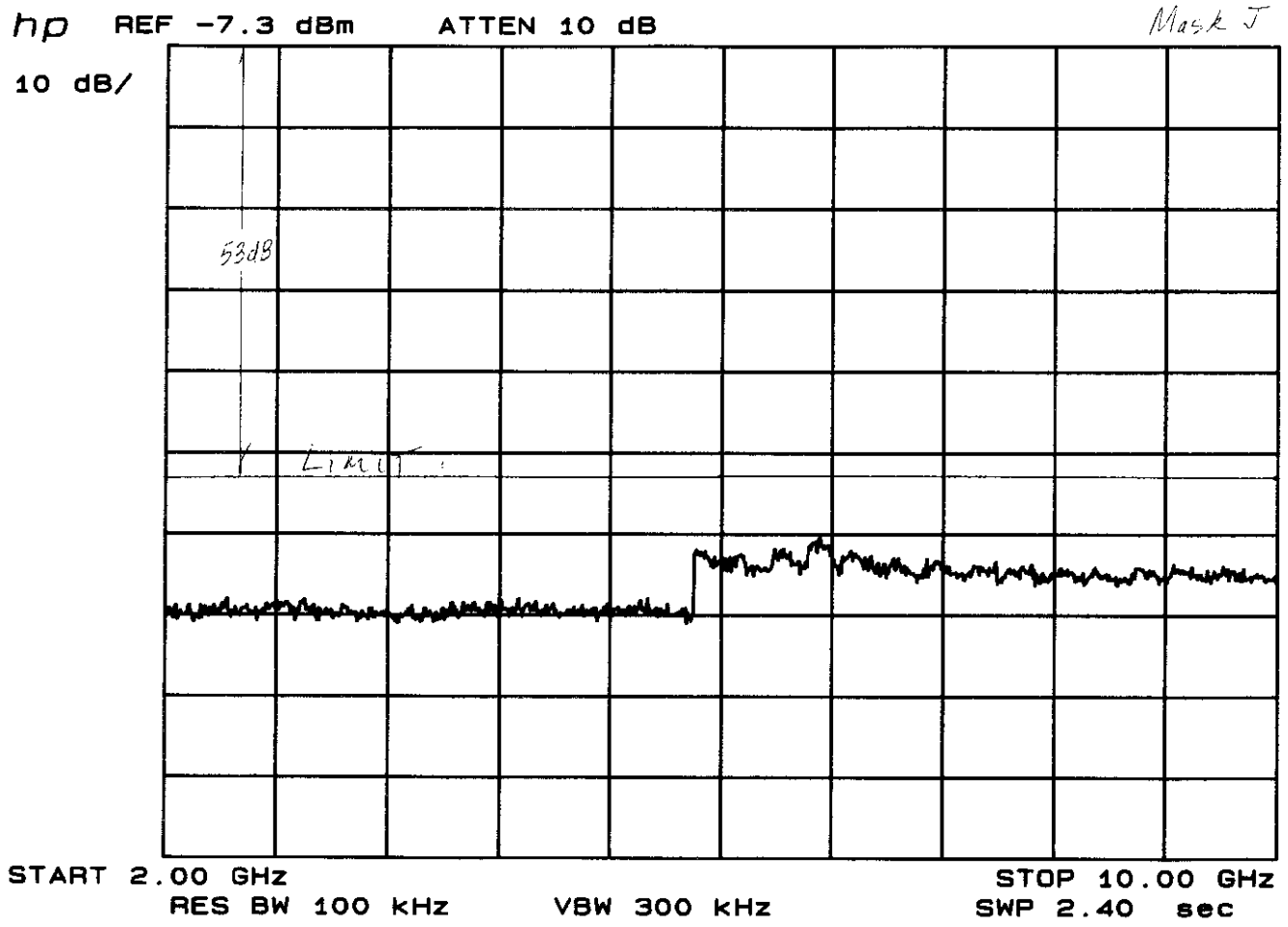
CUSTOMER: BLIND SYSTEMS
Date: 20 JUNE 2001
Test: FCC Part 90 - Antenna conducted

CTR NO. 25874



Customer: Orion Systems
Job: 29995
Date: 20 Jan 2001
Test: FCC Part 90 - Antenna conducted

ETR No. 23879



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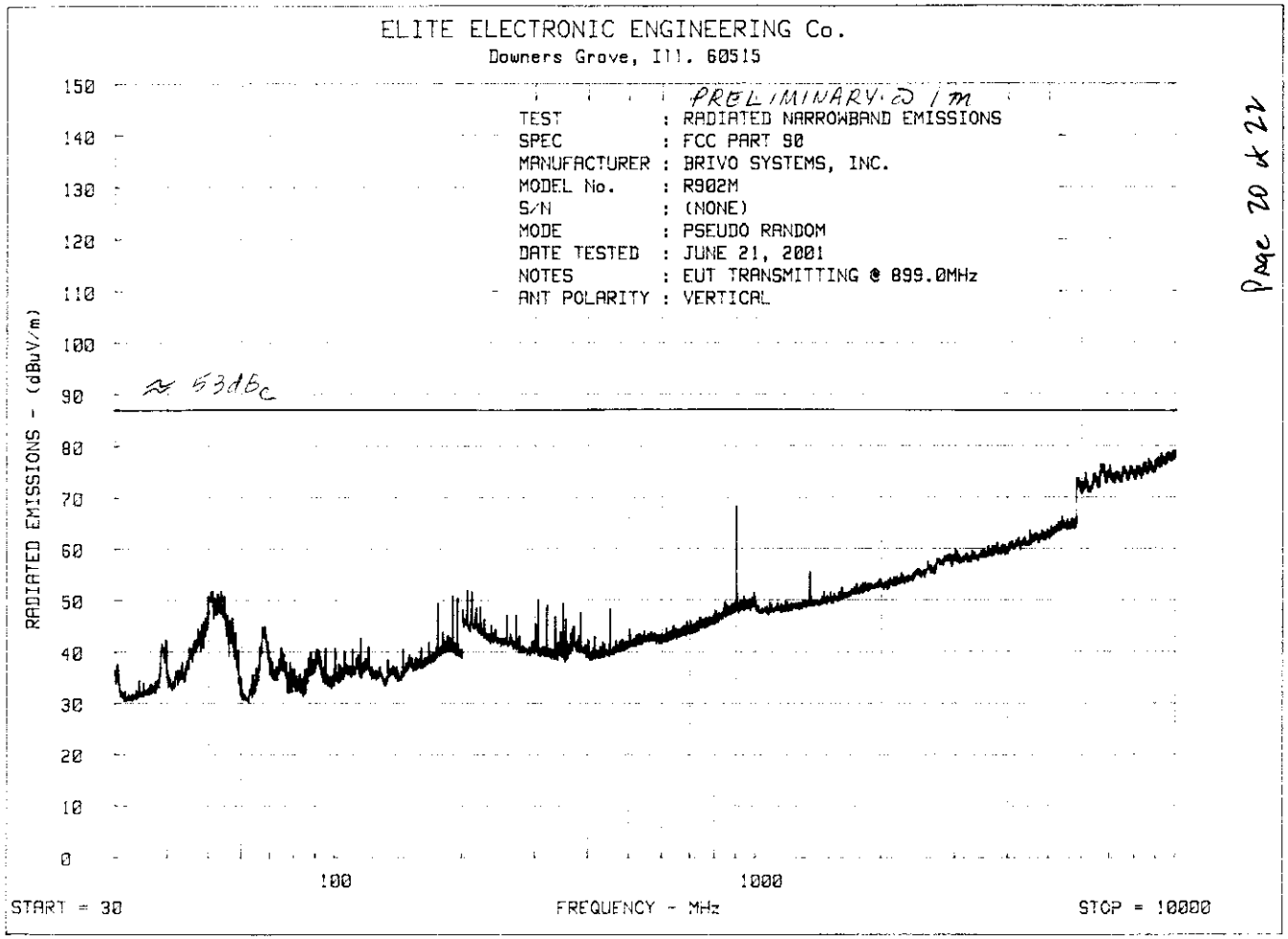

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ETR No. 23874
DATA SHEET

MANUFACTURER : Brivo Systems Inc.
MODEL : None Assigned
S/N : None Assigned
SPECIFICATION : FCC-90 Case Spurious Radiated Emissions
DATE : July 1, 2001
NOTES :
: TEST DISTANCE IS 3 METERS

FREQ.	ANTENNA	METER READING		ERP	Attn.	Minimum
MHz	POLARITY	dBuV	AMB.	dBm	dB	dB
1798	Vert.	36.8		-53.70	86.70	53
	Horv.	33.6		-56.90	89.90	53
2697	Vert.	35.4		-51.40	84.40	53
	Horv.	37.4		-49.40	82.40	53
3596	Vert	47.5		-35.90	68.90	53
	Horv	45.3		-38.10	71.10	53
4495	Vert.	36.1		-45.40	78.40	53
	Horv.	36.7		-44.80	77.80	53
5394	Vert.	29.7		-49.00	82.00	53
	Horv.	28.3		-50.40	83.40	53
6293	Vert.	29.6		-47.61	80.61	53
	Horv.	29.9		-47.31	80.31	53
7192	Vert.	27.3	*	-47.50	80.50	53
	Horv	25.4	*	-49.40	82.40	53
8091	Vert	25.8	*	-47.60	80.60	53
	Horv.	24.8	*	-48.60	81.60	53
8990	Vert.	24.5	*	-47.10	80.10	53
	Horv.	24.1	*	-47.50	80.50	53

CHECKED BY: Richard E. King

ENGINEERING TEST REPORT NO. 23874

DATA SHEET

MANUFACTURER	: Brivo Systems, Inc.
TEST ITEM	: Access Control System
MODEL	: ACS 2000
SERIAL NUMBER	: None assigned
TEST PERFORMED	: FCC Part 90 Frequency Stability
DATE TESTED	: July 5, 2001
TEST SPECIFICATION	: Tolerance 1.5ppm

Frequency vs. Temperature

Temperature Degrees Centigrade	Frequency MHz	Duration Minutes	Change ppm	Limit ppm
	898.999454	---	Ref.	---
-30	DNO	---	---	---
-20	DNO	---	---	---
-10	899.000871	30	.97	±1.5
0	899.000944	30	1.05	±1.5
10	899.000518	30	.58	±1.5
20	899.000455	30	.51	±1.5
30	898.999921	30	-.09	±1.5
40	898.999483	30	-.58	±1.5
50	898.998660	30	-1.49	±1.5

DNO - Did not operate.

Frequency vs. Voltage

Voltage (VAC)	Frequency MHz	Change (ppm)	Limit (ppm)
120	898999451	---	±1.5
102(85%)	898999528	-.53	±1.5
138(115%)	898999911	-.10	±1.5

Checked By: Richard S. Kung