TEMPEST INC.

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**** Our 16th Year in Business: 1985 - 2001 ****

Report of Electromagnetic Interference Testing Performed in Accordance with the Rules of the Federal Communications Commission: Title 47, Part 15 of the Code of Federal Regulations on the Type 2 Cryptographic Support Server, Serial No. 14 made by 3S Group, Incorporated 125 Church Street NE, Vienna Virginia 22180

by_____

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Abstract

As requested by Purchase Order Number 21176 issued by 3S Group, Incorporated on October 24, 2001, on November 2, 2001 TEMPEST INC. performed Electromagnetic Compatibility tests in accordance with Title 47, Part 15 of The Code of Federal Regulations on the following device hereafter called the Equipment Under Test:

Type 2 Cryptographic Support Server, Serial number 4.
made by 3S Group, Incorporated of Vienna, Virginia.

When properly installed in a typical personal computer, the Equipment Under Test produces no measurable signals in the 30 to 1000 MHz frequency range when tested in an Open Area Test Site at a distance of 3 meters.

The Equipment Under Test complies with the requirements for both Class A and Class B digital devices of Title 47, Para. 15.109 of the Code of Federal Regulations. We recommend that production units maintain the same configuration as the sample that was tested.

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Reference Documents:

TITLE 47, PARA. 15.109 OF THE CODE OF FEDERAL REGULATIONS

1.0 Introduction.

As requested by Purchase Order Number 21176 issued by 3S Group, Incorporated on October 24, 2001, on November 2, 2001 TEMPEST INC. performed Electromagnetic Compatibility tests in accordance with Title 47, Part 15 of The Code of Federal Regulations on the following device hereafter called the Equipment Under Test:

Type 2 Cryptographic Support Server, Serial number 4.
made by 3S Group, Incorporated of Vienna, Virginia.

1.1 Purpose.

The purpose of this test was to determine if the Equipment Under Test complies with the requirements of Title 47, Para. 15.109 of The Code of Federal Regulations, otherwise known as the Rules of the Federal Communications Commission.

1.2 Test Location.

Preliminary testing was performed in the Laboratory facilities of TEMPEST INC. Final testing was performed in the FCC-listed Open Area Test Site of TEMPEST INC.

1.3 Cognizant Personnel.

The following personnel conducted, witnessed, or are cognizant of the test:

Mr. Jason Papadopoulos, Electronics Engineer
3S Group, Incorporated
125 Church Street NE #204
Vienna, Virginia 22180
(703) 281-5015 fax, 281-7816
info@threesi.com

Mr. Louis T. Gnecco, President, TEMPEST INC.
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(703) 836-7378 e-mail: info@tempest-inc.com

2.0 Description of the Equipment Under Test.

The Equipment Under Test consists of a Type 2 Cryptographic Support Server, a encryption device consisting of a single slot long card printed circuit board that is made to install in a Personal Computer.

Photos and detailed technical information are available at the following web sites:

http://www.threesi.com/prodserv.htm

http://www.threesi.com/specs.htm

The Equipment Under Test was activated by installing it in a PME Platinum Systems Personal Computer, model P3-500 (tower configuration.) After activating the software and getting the Equipment Under Test to run normally, the monitor, keyboard, and mouse were removed from the Personal Computer. This was done to reduce any ambients that could obscure the emissions from the Equipment Under Test.

3.0 Test Procedures.

As described below, final testing was performed in accordance with Title 47, Para. 15.109 of The Code of Federal Regulations, using TEMPEST INC.'s FCC-listed Open Area Test Site (OATS.) The Equipment Under Test is normally installed in a personal computer, and therefore does not connect to any a.c. power lines. For this reason, no Power Line Conducted Interference tests are applicable to this device, and none were performed.

3.1 Test Equipment.

Table 1 is a list of the test equipment used. As shown in the table, biconical and log periodic antennas and a Hewlett-Packard spectrum analyzer were used to detect the emissions produced by the Equipment Under Test.

3.2 Calibration Check.

Using its internal calibration source, the calibration of the spectrum analyzer was verified both immediately before and immediately after the test.

3.3 Dynamic Range and Detection System Sensitivity Tests.

Before testing, the dynamic range of the instrumentation was determined to be 80 dB, and the detection system sensitivity was -80 dBm.

3.3.1 Preliminary Laboratory Tests:

Before installing the Equipment Under Test, the emissions produced by the host computer alone were first measured and recorded at a distance of one meter inside the 10 ft. x12 ft. x 8 ft. high 100 dB shielded anechoic chamber in the laboratory of TEMPEST INC. The Equipment under test was then installed and activated. With the cover of the host computer removed, the emissions produced by the equipment under test were recorded using both an antenna and a hand held probe. This preliminary test showed that the Equipment Under test produces emissions at 300, 340, 400 and 610 MHz.

3.4 Local Interference Test.

With the Equipment Under Test turned off, the ambient signals in the Open Area Test Site were measured and recorded, to verify that any signals being measured were coming from the Equipment Under Test, and not from other local sources, such as cellular telephones. The ambients listed in Table 2 are narrow band signals, with nothing above the detection system's sensitivity appearing between them. The frequency and signal strength of the ambient signals made them easily identifiable, and they did not interfere with the test.

3.5 Measurements.

The Equipment Under Test was placed 3 meters from the antenna hoist, and rotated about 360 degrees. The receive antenna was raised from 10 cm to 4 meters above the ground plane while the emissions were measured over the 30 MHz - 1 GHz frequency range. The peak values of the strongest signals were recorded in dBm. These were converted to μV/m using the following formulas:

level (dBm) +107 dB + antenna factor (dB) = level in dBμV/m

level in dBμV/m = 20 Log $_{10}$ (level in μV/m)

4.0 Results.

As shown in Table 2, the Equipment Under Test produces no measurable signals in the 30 to 1000 MHz frequency range measured at a distance of 3 meters. This is in compliance with Title 47, Para. 15.109 of the Code of Federal Regulations.

Removing the cover of the host computer revealed the 300, 340 and 400 MHz signals found in the preliminary laboratory test, with signal to noise ratios of 10 dB or less. Replacing the cover of the host computer caused these signals to disappear completely. This indicates that the host computer provides at least 10 dB of shielding effectiveness at these frequencies.

5.0 Conclusions and Recommendations.

The Equipment Under Test complies with the requirements for both Class A and Class B digital devices of Title 47, Para. 15.109 of the Code of Federal Regulations. We recommend that production units maintain the same configuration as the sample that was tested.

Appendix A: Tables.

Table 1: List of Test Equipment Used

all equipment was calibrated within 9 months of the test

spectrum analyzer calibration was spot checked both before and after test.

Manufacturer	Model	Name	Serial No.
Hewlett-Packard	141T	Spectrum Analyzer Display	2233A-22141
" "	8555A	RF Section 1.5 MHz-40 GHz	TI-750
" "	8552B	Display Section	TI-751
Tensor	4104	Biconical antenna	2154
TEMPEST INC.	NA 200/2G	Log Periodic Antenna	82

Table 2: Test Data

Ambients at 2 meters above ground plane

Bandwidth: 300 kHz Detection System Sensitivity: -80 dBm

Frequency MHz	Level dBm	level dBμV rms	Antenna Factor	Level dBμV/m	Level μV/m	Limit μV/m Class A
Biconical Antenna: Horizontal Polarization						
20	-70	37	14	51	360	n/a
28	-70	37	10	47	225	n/a
32	-80	27	10	37	72	90
50	-80	27	13	40	100	
52	-70	37	13	50	320	
58	-66	41	10	51	360	
60	-70	37	10	47	225	
64	-80	27	10	37	72	
70	-66	41	7	48	256	
75	-62	45	8	53	450	
80	-42	65	9	74	5000	
84	-56	51	9	60	1000	
86	-56	51	10	61	1125	—
90	-46	61	11	72	4000	150
100	-40	67	13	80	10000	
106	-80	27	14	41	110	
110	-80	27	14	41	110	
115	-70	37	14	51	360	
118	-80	27	13	40	100	
120	-80	27	13	40	100	
130	-60 intermittent	47	14	61	1125	
150	-70	37	15	52	400	
158	-56	51	15	66	2000	
162	-68	39	15	54	500	
170	-70	37	16	53	450	
180	-45	61	17	78	8000	
190	-80	27	17	44	160	
195	-45	61	17	78	8000	

200	-60	47	18	65	1900	——
NO EMISSIONS ABOVE AMBIENTS SHOWN						

Table 2: Test Data, continued

Ambients at 2 meters above ground plane

Bandwidth: 300 kHz Detection System Sensitivity: -80 dBm

Frequency MHz	Level dBm	level dBμV rms	Antenna Factor	Level dBμV/m	Level μV/m	Limit μV/m
Biconical Antenna: Vertical Polarization						
20	-72	35	14	49	288	n/a
28	-76	31	10	41	110	n/a
32	-80	27	10	37	70	90
50	-76	31	13	44	160	↓
52	-66	41	13	54	500	
58	-66	41	10	51	352	
60	-68	35	10	45	170	
64	-80	27	10	37	72	
70	-60	47	7	54	500	
75	-68	35	8	43	480	
80	-40	67	9	76	6400	
84	-52	55	9	64	1600	▼
86	-52	55	10	65	1650	___
90	-40	67	11	78	8000	150
100	-40	67	13	80	10000	↓
106	-80	27	14	41	100	
110	-80	27	14	41	100	
115	-64	43	14	57	700	
118	-80	27	13	40	100	
120	-80	27	13	40	100	
130	-56 intermittent	51	14	65	2000	
150	-62	45	15	60	1000	
158	-50	57	15	72	4000	
162	-62	45	15	60	1000	
170	-68	39	16	55	600	
180	-42	65	17	82	1250	
190	-80	27	17	44	160	
195	-44	63	17	80	10000	▼

200	-54	53	18	71	4000	___
NO EMISSIONS ABOVE AMBIENTS SHOWN						

Table 2: Test Data, continued

Ambients at 2 meters above ground plane

Bandwidth: 300 kHz Detection System Sensitivity: -80 dBm

Frequency MHz	Level dBm	level dBμV rms	Antenna Factor	Level dBμV/m	Level μV/m	Limit μV/m
Log Periodic Antenna: Vertical Polarization						
200	-54	53	20	73	5000	150
210	-80	27	20	47	225	150
300	-78 intermittent	29	12	41	110	210
370	-78 intermittent	29	11	40	100	
410	-76	31	11	42	125	
420	-80	27	11	38	80	
450-490	-66	41	11	52	400	
500	-80	27	14	41	110	
520	-50	67	14	81	10125	
550	-64	43	13	56	640	
600	-56	51	12	63	1300	
650	-70	37	13	50	320	
700	-68	39	14	53	450	
710	-80	27	14	41	110	
740	-40	67	14	81	10125	
750	-80	27	14	41	110	
800	-62	45	14	59	900	
810	-80	27	14	41	110	
860	-66	41	14	55	600	
900	-72	35	14	49	288	
950	-68	39	14	53	450	
960	-60	47	14	61	1125	___
980	-60	47	14	61	1125	300
1000	-80	27	14	41	110	300
NO EMISSIONS ABOVE AMBIENTS SHOWN						

Table 2: Test Data, continued

Ambients at 2 meters above ground plane

Bandwidth: 300 kHz Detection System Sensitivity: -80 dBm

Frequency MHz	Level dBm	level dBμV rms	Antenna Factor	Level dBμV/m	Level μV/m	Limit μV/m
Log Periodic Antenna: Vertical Polarization						
200	-50	57	20	77	7000	150
210	-80	27	20	47	225	
300	-75 intermittent	32	12	44	160	200
370	-70 intermittent	37	11	48	256	
410	-70	37	11	48	256	
420	-80	27	11	38	80	
450-490	-60	47	11	58	800	
500	-80	27	14	41	110	
520	-45	62	14	76	6400	
550	-60	47	13	60	1000	
600	-58	49	12	61	1125	
650	-70	37	13	50	320	
700	-60	47	14	61	1125	
710	-80	27	14	41	110	
740	-35	72	14	86	20000	
750	-80	27	14	41	110	
800	-60	47	14	61	1125	
810	-80	27	14	41	110	
860	-60	47	14	61	1125	
900	-70	37	14	51	360	—
950	-66	41	14	55	600	
960	-60	47	14	61	1125	
980	-55	52	14	66	2000	
1000	-80	27	14	41	110	500
NO EMISSIONS ABOVE AMBIENTS SHOWN						

Appendix B: Glossary

a.c.	alternating current
d.c.	direct current
cm	centimeters
dB	decibels
dBi	dB ref. an isotropic radiator.
dBm	dB reference 1 milliwatt
dBμV	dB reference 1 microvolt
dBμV/m	dB reference 1 microvolt/meter
EMC	Electromagnetic Compatibility
EUT	Equipment Under Test
ft	feet
Hz	Hertz (cycles per second)
in.	inches
m	meters
mV	millivolts
mV/m	millivolts per meter
NARTE ®	National Association of Radio and Telecommunications Engineers, Inc.: The United States certification body for Electromagnetic Compatibility professionals.
V	Volts