TEST REPORT #211000

STANDARD: FCC PART 15

SUBPART B--UNINTENTIONAL RADIATORS
SECTION 15.109 RADIATION EMISSION LIMITS

EQUIPMENT TESTED:

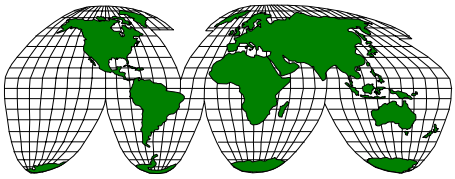
TRICORD SYSTEMS, INC.

MODEL: THE TRICORD SERVER APPLIANCE

TEST DATE: 21 OCTOBER 2000

INTERNATIONAL

1100 Falcon Avenue
Glencoe, MN 55336



Tele: 320-864-4444
Fax: 320-864-6611

CERTIFICATION SERVICES, INC.

Prepared for:

Tricord Systems, Inc.
2905 Northwest Blvd, Suite 20
Plymouth, MN 55441-2644

Test agent:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336
Tele: 320-864-4444
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Test location:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336
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Prepared by:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336

1.0 TEST SUMMARY

TEST REPORT: #211000	
COMPANY:	Tricord Systems, Inc.
AGENT:	International Certification Services, Inc.
PHONE:	320-864-4444
TEST DATE:	21 October, 2000
EQUIPMENT UNDER TEST:	High Capacity Storage Appliance System Model: The Tricord Server Appliance
GENERAL TEST SUMMARY:	The testing was performed at International Certification Services, Inc. at 1100 Falcon Ave, Glencoe, MN 55336
VERIFICATION / CERTIFICATION STATUS:	The Tricord Systems, Inc., Model: The Tricord Server Appliance system was found to be in compliance with the FCC Part 15 Subpart B, Section 15.109 requirements.
MODIFICATIONS NECESSARY:	None

TESTED BY	**WRITTEN BY**
Steve Wendlandt	Duane R. Bagdons

Applicable Standards

47 CFR Ch.1 (10-1-98 Edition)
FCC Part 15 Radio Frequency Devices
Subpart B Unintentional Radiators
Section 15.109 Radiated Emission Limits

2.1 Referenced Standards

ANSI C63.4-1992 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 Khz to 40 Ghz.

2.2 Equipment Units Tested

The Tricord Server Appliance is a specialized computer system that uses many standard computer components packaged in a rack mount chassis. The Tricord software running on the Linux operating system provides file storage over an Ethernet interface with browser based management. During testing a HUB was connected to the input and output LAN cables so data could be passed back and forth during the testing.

2.3 Equipment and Cable Configuration

See photos of the EUT pc board and schematic and test configuration setup in Attachment A

2.4 List of Test Equipment

Test Equipment	Model	S/N	Calibration Date
Spectrum Analyzer	Hewlett-Packard 8566B	2421A00458	09/24/00
Preamp	MiniCircuits ZKL-2R7	N/A	09/24/00
Biconical Antenna	AH Systems Model SAS-200/540	328	09/24/00
Log Periodic Antenna (200-1000 MHz)	EMCO 3146	9111-3280	09/24/00
Horn Antenna (1-10 Ghz)	EMCO 3115	2334	09/24/00

2.5 Units of Measurement.

All measurements were taken in dBuV/m with the antenna located at 3 meters distance from the EUT. Frequency measurements are recorded in Mhz

2.6 Location of Test Site

The open area test site (OATS) measurement facility used to collect the data was International Certification Services, Inc. at 1100 Falcon Ave in Glencoe, MN 55336. This site has been certified to be in spec of the normalized site attenuation per ANSI C63.4-1992**.** See letter of compliance from FCC dated July 23, 1998. (FCC 31040/SIT 1300F2)

2.7 Measurement Procedures

The Tricord Server Appliance was placed on a non conducting table with cables plugged into all external connectors. A peripheral HUB device was connected to the input and output LAN connectors to keep data flowing during the testing to the HUB. Data was turned around in the HUB and sent back to the EUT. This program was running continually during the testing. The ASUS CPU board was tested with both a 700 Mhz processor chip (P/N: Intel 700/256/100/1.65V P/N: 3018A253-0749), and a 800 Mhz processor chip (P/N: Intel 800/256/100/1.65V P/N: 3028A546-0556. The data presented is the maximum of both processors.

The receiving antenna was placed at a distance of 3 meters from the EUT. The EUT was set on an insulating table in the OATS site and rotated through 360 degrees to determine the worst case EUT orientation. The antenna was positioned vertical and horizontal to determine which antenna polarity orientation was worst case. Then certification data was recorded at all the frequencies from the fundamental to the 10^{th} harmonic at an antenna height variation of from 1-4 meters.

2.8 Reporting Measurement Data

See data sheets and plots in Attachment B.

2.9 Radiated Emissions Data

The frequency and amplitude of the tuned frequency of the EUT along with the frequencies and amplitudes of the harmonics are reported in the data sheets in Attachment B. This information is plotted against the limit of section 15.109 of FCC Part 15 subpart B. The polarization of the antenna for each measurement is also recorded.

The Final Level, expressed in dBuV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBuV) and adding the antenna correction factor and cable loss factor (Factor dB) and subtracting the preamp gain. This result then has the FCC limit subtracted from it to provide the margin which gives the tabular data as shown in the data sheets in Attachment B.

Example:

Frequency (MHz)	Level (dBuV)	+	Factor (dB)	=	Corr Data (dBuV/m)	-	FCC Limit (dBuV/m)	=	Margin (dB)
100.0	20.6	+	11.0	=	31.6	-	43.5	=	-11.9

2.10 Operating Frequency Data for Unintentional Radiators

All operating frequencies and harmonic frequencies and ambient temperature at which all data was taken at is recorded in the data sheets in Attachment B.

2.11 Summary of Results

The EUT passed the requirements of FCC Part 15 Subpart B, Section 15.109 with a minimum passing margin of –4.462 dBuV/m at 888 Mhz. for radiated emissions and –3.88 dBuV at 10.505 Mhz for conducted emissions. No modifications were necessary to accomplish this compliance.

ATTACHMENT A

RADIATED MEASUREMENT SCHEMATIC, PHOTOS AND TEST CONFIGURATION

Tricord Systems, Inc.
Model: The Tricord Server Appliance
Radiated Emissions Test Configuration

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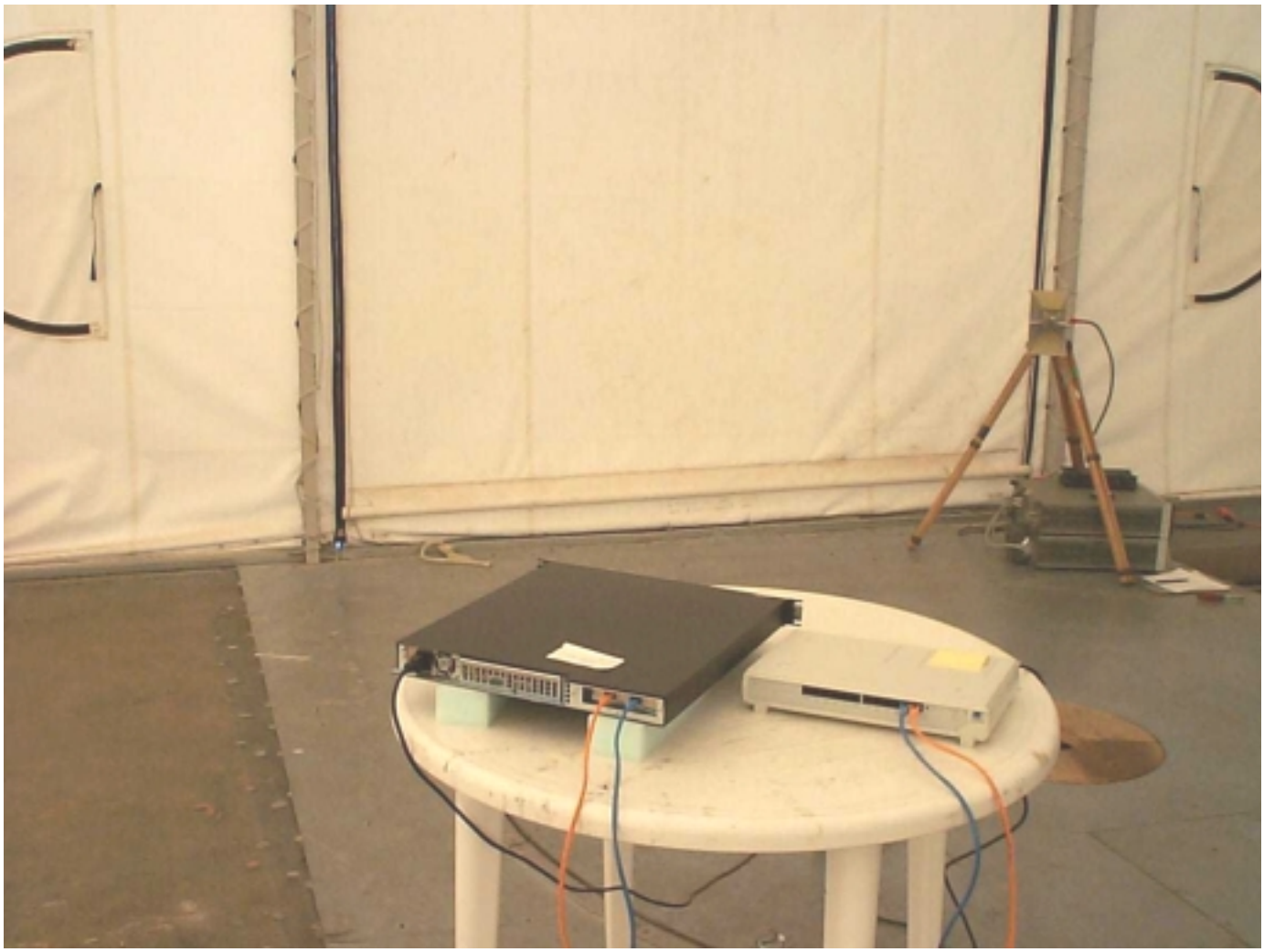
Model: The Tricord Server Appliance
Radiated Emissions Test Configuration



Tricord Systems, Inc.
Model: The Tricord Server Appliance
Conducted Emissions Test Configuration

ATTACHMENT B

DETAILED TEST DATA SHEETS

Each radiated emissions plot indicates the receiving antenna measurement distance in meters and the emission amplitudes with respect to their applicable limits. The associated tabulation for each radiated plot lists the emission frequency, the final emission level, and the margin from the limit.

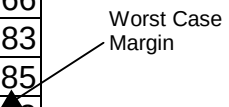
Tricord Systems, Inc.
Model: The Tricord Server Appliance
Temperature: 65 Deg F.
Humidity: 66 % R.H.

Test Technician: Duane R. Bagdons

Certification testing was performed at the OATS site with an antenna distance of 3 meters and the EUT at 0-360 Degrees to the antenna. Data was optimized at antenna heights of from 1-4 meters.

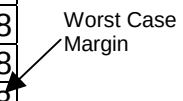
The limit for section 15.109 is 100 uV/m from 30-88 Mhz, 150 uV/m from 88-216, 200 uV/m from 216-960 Mhz and 500 uV/m above 960 Mhz. All data is taken with the required Quasi-Peak Detector except for over 1000 Mhz. This data was taken with an Average detector in place. This converted to dBuV is the limit shown in the next table.

Freq (Mhz)	dBuV	Ant Corr Fac	Cable Corr Fac	Preamp Gain	Corr Data (dBuV)	FCC Part 15.109 Class B Limit (dBuV/m)	Margin
494.4	39.2	17.964	5.08725	22	40.2512	46.02	-5.7688
667.2	35.9	20.688	5.7018	22	40.2898	46.02	-5.7302
700	35.2	21.5	5.72806	22	40.4281	46.02	-5.5919
700.8	35.2	21.492	5.7287	22	40.4207	46.02	-5.5993
856.8	32.6	22.636	7.0074	22	40.2434	46.02	-5.7766
857.6	32.6	22.652	7.00972	22	40.2617	46.02	-5.7583
872	33	23	7.05152	22	41.0515	46.02	-4.9685
888	33.3	23.16	7.09796	22	41.558	46.02	-4.462
920.8	32.4	23.1	7.07373	22	40.5737	46.02	-5.4463
921.6	32.4	23.1	7.07083	22	40.5708	46.02	-5.4492



Conducted tests were performed at 120 VAC, 60 Hz. The limit for section 15.109 is 250 uV or 48 dBuV from .45-30 Mhz. All data is taken with the required Quasi-Peak Detector. This converted to dBuV is the limit shown in the next table.

Freq (Mhz)	dBuV	Cond	LISN Corr Fac	Cable Corr Fac	EM7600 Corr Fac	Corr Data (dBuV)	FCC Part 15 Class B Limit	Margin
8.759	31	Line1	-0.48	0.5	10	41.02	48	-6.98
9.379	31.8	Line1	-0.48	0.4	10	41.72	48	-6.28
9.785	32.8	Neutral	-0.48	0.4	10	42.72	48	-5.28
10.505	34.1	Line1	-0.48	0.5	10	44.12	48	-3.88
10.72	33.8	Line1	-0.48	0.42	10	43.74	48	-4.26
14.135	28.3	Neutral	-0.48	0.5	10	38.32	48	-9.68
15.595	32.9	Line1	-0.48	0.6	10	43.02	48	-4.98
17.81	32.3	Line1	-0.48	0.7	10	42.52	48	-5.48
17.835	33.8	Neutral	-0.48	0.7	10	44.02	48	-3.98
20.01	28	Line1	-0.48	0.6	10	38.12	48	-9.88



ATTACHMENT C

PRODUCT DATA SHEET OR PRODUCT INFORMATION FORM AS SUPPLIED BY THE CUSTOMER

COMPANY NAME: Tricord Systems, Inc.

CUSTOMER REPRESENTATIVE: International Certification Services, Inc.

EQUIPMENT DESCRIPTION: High capacity data storage device

MODEL NUMBER: The Tricord Server Appliance

SERIAL NUMBER: engineering model

TYPE OF TEST:

	Development
X	Initial Design Verification
	Design Change (Please describe exact changes below)
	Production Sample (Audit Test)

OSCILLATOR FREQUENCIES: 12 Mhz, 32.768 Khz, 14.318 Mhz, 25 Mhz.

POWER INTERFACE:
Frequency: 60 Hz
Voltage: 120 VAC
Number of Phases: 1
Current N/A

POWER SUPPLY:
Description: switching type
Manufacturer: 3P Pacific Power Products
Model Number: KPT230C-49
Switching Frequencies:

POWER CABLE:

☐ Hardwired ☒ Flexible

☐ Shielded ☒ Unshielded

☐ Current ☒ Removable

POWER LINE FILTER: (Included in the HOST computer)
Manufacturer: N/A
Model Number: N/A

CABINET SHIELDING PROVISION:
Painted metal enclosure.

SOFTWARE AND / OR OPERATING MODES:
Tricord TFS routine

INTERFACING EQUIPMENT OR SIMULATORS

Description	Model Number	Serial Number	FCC ID (If Applicable)
Tricord Server	Server Appliance	Engineering unit	N/A
HUB (3COM)	TP-12	0100/7HDV046392	N/a
Hard Drive (IBM) (X2)	Model: DTLA-307045	S/N: YMLB8223, YMT1B540	
Hard Drive (Seagae)	Model: ST340823A	S/N: 1EF0034Z	
Ethernet Board (Kalex)	Model: 00DOB7BA08-3303 711269-004		EJMNPDOHI0

I/O CABLES:

Function	Length	Connector Type	Shield Termination Location
LAN Cable (x2)	10 feet	RJ45	Unshielded

Tricord Systems, Inc.
Model: The Tricord Server Appliance
Test Configuration

EUT