MEASUREMENT AND TECHNICAL REPORT ON THE MARCONI COMMERCE SYSTEMS TRIND™ TIRIS™ EG RADIO FREQUENCY IDENTIFICATION DEVICE

Southwest Research Institute
6220 Culebra Road
San Antonio, Texas 78228-0510

Project 10.04225.01.001
Report Number EMCR 00/080

Prepared for:

Marconi Commerce Systems
7300 West Friendly Avenue
P.O. Box 22087
Greensboro, NC 27420-2087

Prepared by:
David A. Carmony

November 2000

The results of this test report apply only to the specific samples tested. If the manufacturer extends the test results to apply to other samples of the same model, or from the same lot or batch, the manufacturer should ensure the additional samples are manufactured using identical electrical and mechanical components.

This test report shall not be reproduced, except in full, without written approval of the Electromagnetic Compatibility Research Section, Southwest Research Institute.

Reviewed by:

Ismael Martinez, Jr.
Sr. Engineering Technologist

Approved by:

James J. Polonis
Manager

Electromagnetic Compatibility Research Section
Communications Engineering Department

Electromagnetic Compatibility Research Section
Communications Engineering Department

TABLE OF CONTENTS

LIST OF TABLES

1.0 GENERAL INFORMATION

1.1 Product Description

The TRIND™ TIRIS™ EG (Part No. C00011-xxx) is a Radio Frequency Identification Device (RFID) which is designed for use with handheld battery-less transponders (Texas Instruments RI-TRP-Series such as a key ring tag). The handheld transponder is carried by the user. The transmitter portion of the TRIND™ TIRIS™ EG operates at 134.2 kHz and is subject to FCC Part 15, Subpart C, "Intentional Radiator," paragraphs 15.207 and 15.209. The digital electronics portion of the TRIND™ TIRIS™ EG is subject to FCC Part 15, Subpart B, "Unintentional Radiator," paragraph 15.109, under the Class A limits and as such, the TRIND™ TIRIS™ EG is incorporated into an application that is subject to Class A limits. Attachment 1 contains a detailed technical description and functionality of the TRIND™ TIRIS™ EG and its components. Photos of the TRIND™ TIRIS™ EG are provided in Appendix D.

1.2 Related Grants

A handheld battery-less transponder (Texas Instruments RI-TRP-Series key ring tag) was used to exercise the TRIND™ TIRIS™ EG during the intentional radiator radiated and conducted tests. The microreader module (Texas Instruments Part No. RI-STU-MRD1) which provides the 134.2 kHz fundamental emission is a component of the TRIND™ TIRIS™ EG and has previously received certification under FCC ID: A92MICRO.

1.3 Tested System Details

The TRIND™ TIRIS™ EG is intended to be mounted into an enclosure such as a fueling dispenser and includes an enhanced gateway controller, two 134.2 kHz LF PCA (printed circuit assembly) antennas, and two light microreader/LED bezel assemblies. These components are assembled per the drawings in Attachment 1.

The TRIND™ TIRIS™ EG operates from 120 VAC converted to 22.5 Vdc and 5 Vdc using power supply part number T20314-G1. The system description, functionality and block diagrams are located in Attachment 1. Cabling is denoted in the dispenser block diagram located in Attachment 1. The components on the system are listed below in Table 1.1.

TABLE 1.1
TRIND™ TIRIS™ EG COMPONENTS

Item	Component Description	Part Number
1	Marconi Power Supply	T20314-G1
2	TRIND Gateway Board	T20678-GX
3	LF Bezel Antennas (2 Per Installation)	T20524-G1 (Advantage/MPD-3)
4	Light/Microreader Board (2 Per Installation)	T20601 (Advantage/MPD-3)
5	Light/Microreader/Antenna Board (2 Per Installation)	M01218 (Encore/Eclipse)
Notes: The TRIND™ TIRIS™ EG will contain items 1, 2, 3, and 4 (Advantage/MPD-3 configuration), or 1, 2, and 5 (Encore/Eclipse configuration).		

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4-1992, and the limits prescribed in CFR 47, FCC 15.207, 15.109, and 15.209. Radiated testing was performed at antenna-to-EUT distances of 3, 10, and 30 meters.

1.5 Test Facility

The Open Area Test Site (OATS) and the Radiated/Conducted Measurement Facility used to collect data are located at Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas. Details concerning the test site and measurement facility are found in a letter from SwRI to the FCC dated 23 May 2000, which is on file with the FCC Laboratory Division in Columbia, Maryland. On June 2, 2000, the FCC approved the sites for the purpose of providing test results for submission with equipment authorization applications under the Commission's Equipment Authorization Program.

2.0 PRODUCT LABELING

2.1 FCC ID Label

The FCC ID label is shown in the drawing in Attachment 3.

2.2 Location of Label on EUT

The location of the label is shown in the drawing in Attachment 3.

2.3 Label for the Exterior of Devices Incorporating the EUT

The TRIND™ TIRIS™ EG will be incorporated in other devices such as a fuel dispenser (e.g., a fueling dispenser (gasoline pump) employed at a service station). A label will be supplied with the TRIND™ TIRIS™ EG for placement on the exterior of the device in which the equipment is incorporated. This label is shown in a drawing in Attachment 3.

2.4 Supplemental Information to be in the Reader Manual

In addition to reiteration of required information as on intentional radiator, in keeping with sections 15.21 and 15.105 of the FCC rules, the manual supplied with the TRIND™ TIRIS™ EG will also include the following admonitions:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference; in which case, the user will be required to correct the interference at his own expense.

NO MODIFICATIONS: Modifications to this device shall not be made without the written consent of Marconi Commerce Systems. Unauthorized modifications may void the authority granted under Federal Communications Commission Rules permitting the operation of this device.

3.0 SYSTEM TEST CONFIGURATION

3.1 Justification

Radiated tests were performed on the TRIND™ TIRIS™ EG intentional radiator from 110 kHz to 30 MHz for the highest fundamental and harmonics. Three polarizations of the receive loop antenna were used. Radiated tests were performed up to 1 GHz for spurious emissions related to the digital electronics portion of the unit. Both vertical and horizontal polarizations of the receive dipoles were tested. Radiated signature scans were made at 3 meters in a shielded anechoic chamber.

Conducted tests were performed on the AC power of the TRIND™ TIRIS™ EG from 450 kHz to 30 MHz.

3.2 EUT Exercise

The TRIND™ TIRIS™ EG is powered by 120VAC. During conducted tests, the unit was exercised by establishing the interrogation reply sequence using handheld transponders.

During radiated tests of the intentional radiator, the unit was exercised by establishing the interrogation reply sequence using handheld transponders. For radiated tests of the digital electronics, the 134 kHz microreader transmitter was disabled. L2 was lifted from the Vcc side to disable the microreader.

3.3 Special Accessories

No special accessories were required to meet the FCC radiated and conducted limits.

3.4 Equipment Modification

No equipment modifications were made during testing.

3.5 Configuration of Tested System

The TRIND™ TIRIS™ EG is used with Marconi Commerce Systems Advantage/MPD-3, and Encore/Eclipse line of fuel dispensers. Each type of fuel dispenser uses an identical TRIND™ TIRIS™ EG system with the exception of slight differences in the door antennas. The TRIND™ TIRIS™ EG will normally be configured with two Advantage/MPD-3 antennas, or two Encore/Eclipse antennas. For test purposes, the TRIND™ TIRIS™ EG was configured with one Advantage/MPD-3 antenna and one Encore/Eclipse antenna. The Advantage/MPD-3 antenna is a 5.2” x 10.2” antenna that is mounted to the plastic bezel door. The Encore/Eclipse antenna is a 3.5” x 10.25” antenna that is also mounted to the plastic bezel door. Refer to Section 4.0 for a block diagram of the tested configuration.

4.0 BLOCK DIAGRAM OF THE TRIND™ TIRIS™ EG SYSTEM

A block diagram of the TRIND™ TIRIS™ EG system is provided in Attachment 1.

5.0 CONDUCTED AND RADIATED MEASUREMENT PHOTOS

Refer to Appendix E for photographs of the conducted and radiated test setups.

6.0 CONDUCTED EMISSION DATA

6.1 Conducted Measurement Data

The TRIND™ TIRIS™ EG system was tested for conducted emissions. The initial step in collecting conducted data was to perform a spectrum analyzer peak scan of the measurement range to determine worst case. A computer-controlled spectrum analyzer was used to produce a peak measurement data plot. Quasi-peak measurements were made on signals that were close to or above the paragraph 15.207 limit. The worst case emission levels are provided in Table 6.1. Appendix A contains conducted emission measurement plots.

TABLE 6.1
WORST CASE CONDUCTED EMISSION LEVELS

Judgment EUT passed by 2.0 dB			
FREQUENCY (MHz)	**MEASURED LEVEL (dBuV)**		**LIMIT (dBuV)**
	LINE	**NEUTRAL**	
11.5		46[1]	48
12.0		41.5[1]	48
19.5		40.5[1]	48
9.8	44[1]		48
9.0	44[1]		48
16	44[1]		48

[1] Readings are peak measurements made with a spectrum analyzer, which are under the 15.207 (equivalent class B) limit.

6.2 Conducted Test Instrumentation

The test instrumentation used to make conducted measurements is given in Appendix C.

7.0 RADIATED EMISSION DATA

7.1 Configurations Tested

The TRIND™ TIRIS™ EG system was tested for radiated emissions. The TRIND™ TIRIS™ EG was configured with one Advantage/MPD-3 antenna and one Encore/Eclipse antenna. When measurements of the fundamental emission from the Advantage/MPD-3 antenna was made, the Encore/Eclipse antenna was disconnected. When measurements of the fundamental emission from the Encore/Eclipse antenna was made, the Advantage/MPD-3 antenna was disconnected.

7.2 Radiated Measurement Data

The data below are the corrected highest level emission measurements taken from the radiated data sheets in Appendix B. The data sheets include the emission frequencies and the corrected level. An explanation of the field strength calculation is given in paragraph 7.4.

Measurements were made of the fundamental frequency of 134.2 kHz on both the Advantage/MPD-3 antenna configuration and the Encore/Eclipse antenna configuration. The fundamental emissions could not be detected beyond a distance of 20 meters. The spectrum was also investigated for harmonics and spurious emissions to 30 MHz at a 20 meter test distance. No harmonics or spurious emissions were detected up to 30 MHz at 20 meters. The receive loop antenna was placed in three polarizations for the testing below 30 MHz. Scans were performed starting at 110 kHz to verify that neither the fundamental emission, nor any harmonic emission was in the 90-110 kHz restricted band. The measurement level of the fundamental emission from each antenna configuration is shown in Table 7.1.

TABLE 7.1
MEASUREMENT OF FUNDAMENTAL FREQUENCY

Judgment: EUT Passed by 19.5 dB								
Configuration	**Freq. (kHz)**	**Receive Loop Antenna Polarization**	**Corrected Level dB(uV/m)**		**Limit @ 20 Meters[1] dB(uV/m)**		**dB Under Limit**	
			Peak	**Average**	**Peak**	**Average**	**Peak**	**Average**
Advantage/ MPD-3	134.2	Parallel to EUT	61.6	52.5	92	72	30.4	19.5
Advantage/ MPD-3	134.2	Perpendicular to EUT	51.1	43.1	92	72	40.9	28.9
Encore/ Eclipse	134.2	Parallel to EUT	56.5	47.4	92	72	35.5	24.6
Encore/ Eclipse	134.2	Perpendicular to EUT	50.7	41.3	92	72	41.3	30.7

[1]Limit at 20 meters calculated using a 40 dB/decade extrapolation factor, in accordance with FCC Part 15, Subpart C, Intentional Radiator, paragraph 15.31, (f), (2). Fundamental emissions could not be detected beyond the 20 meter distance.

The spectrum from 30 MHz to 1000 MHz was investigated for spurious emissions. When an emission was detected above the paragraph 15.209 limit, the 134 kHz microreader transmitter was disabled to identify whether the emission was related to the 134 kHz transmitter circuitry or the digital electronics. All emissions identified in this manner were found to be related to the digital electronics, and therefore, were required to meet the 15.109 Class A limit. The worst case spurious emission levels, taken from the data sheets in Appendix B, are given in Table 7.2.

TABLE 7.2
MEASUREMENT OF SPURIOUS EMISSIONS

Judgment EUT passed by 1.2 dB			
Frequency (MHz)	**Corrected Level [1] dB(uV/m)**	**Limit[2] dB(uV/m)**	**dB under limit**
72.005	37.8	39	1.2
137.434	40.0	43.5	3.5
36	34.0	39	5.0
59.994	34.8	39	4.2
77.993	32.4	39	6.6
137.577	35.8	43.5	7.7

[1] All readings are quasi-peak manual measurements made with a receiver.
[2] These emissions were related to the digital electronics and are compared to the 15.109 Class A limit.

The frequency stability of the TRIND™ TIRIS™ EG fundamental emission was verified by varying the AC input voltage between 85% and 115% of the nominal 120 VAC. The frequency of the fundamental emission changed by a maximum of 100 Hz.

7.3 Test Instrumentation for Radiated Measurements

Scans were made at an open area test site (OATS) and in an RF semi-anechoic chamber 28' long x 16' wide x 16' high with its interior lined on the ceiling and four walls with pyramidal absorber material up to four feet in length. Measurements were made with a spectrum analyzer and a quasi-peak adapter in the anechoic chamber and with a receiver at the OATS. The list of test instrumentation used to perform the testing is shown in Appendix C.

7.4 Field Strength Calculation

The field strength was calculated by adding the antenna factor and cable factor, and subtracting the amplifier gain (when used) from the measured reading. The basic equation with a sample calculation is provided below:

FS = RA + AF + CF - AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation
AG = Amplifier Gain

For example, reducing the first row of the enclosed radiated data sheet on page 16 (36 MHz):

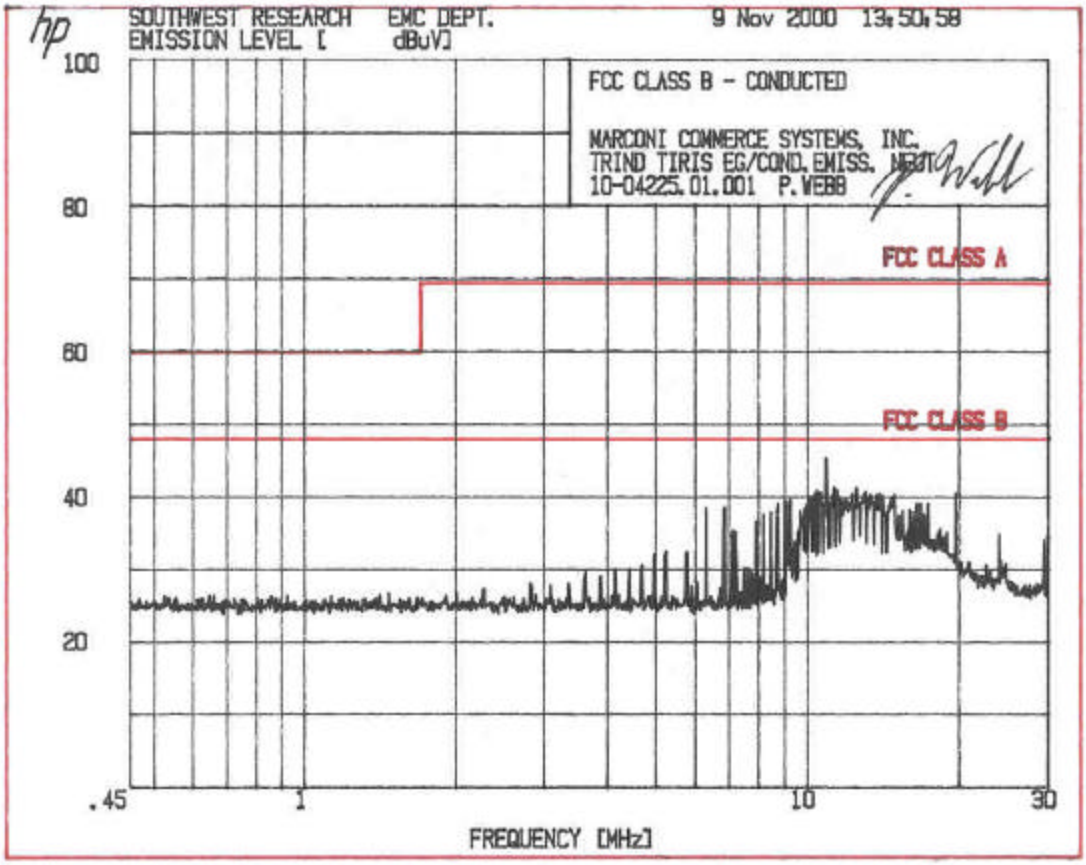
13.3 dB(uV)
19.2 dB(1/m)
2.4 dB (CF/AG FACTOR)
FS = 35.0 dB(uV/m)

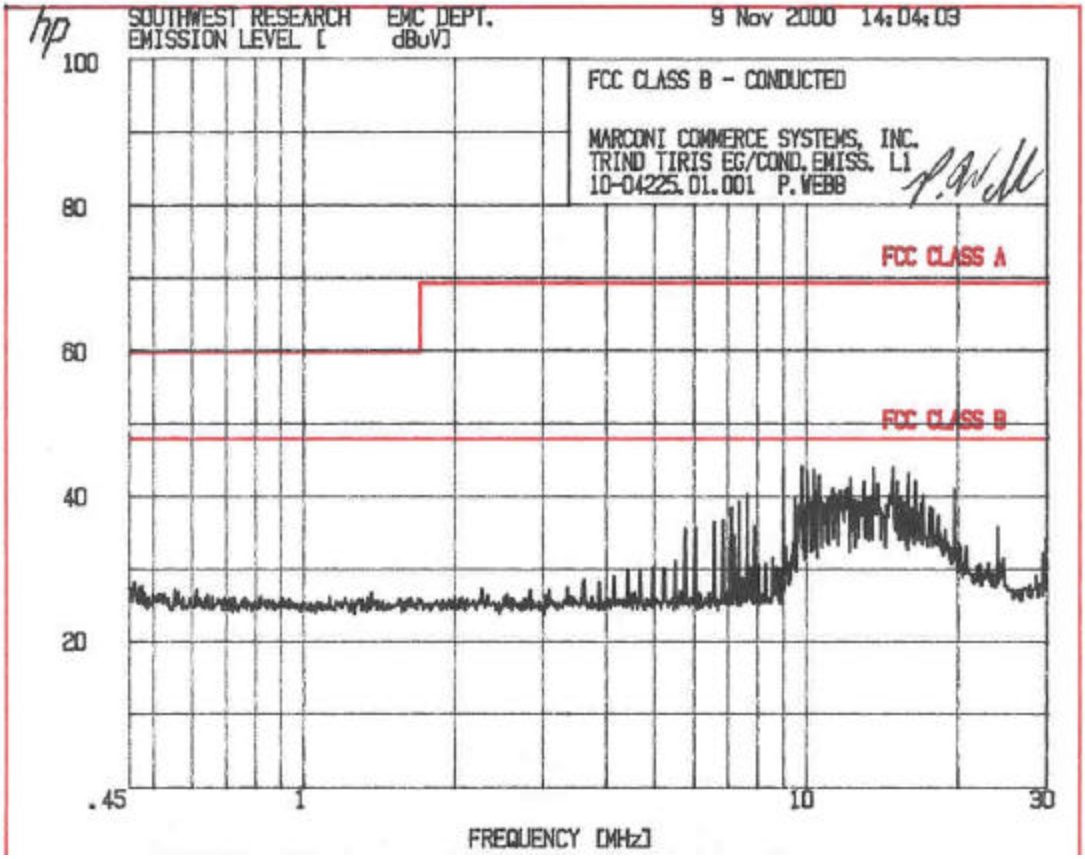
To convert the dB(uV/m) value to its corresponding level in uV/m is as follows:

Level in uV/m Common Antilogarithm [(35.0 dBuV/m)/20] = 56.23 uV/m

APPENDIX A

CONDUCTED MEASUREMENT PLOTS


SOUTHWEST RESEARCH EMC DEPT. 9 Nov 2000 13:50:58
EMISSION LEVEL [dBuV]
FCC CLASS B - CONDUCTED
MARCONI COMMERCE SYSTEMS, INC.
TRIND TIRIS EG/COND.EMISS. NEUT
10-04225.01.001 P.WEBB
FCC CLASS A
FCC CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


SOUTHWEST RESEARCH EMC DEPT. 9 Nov 2000 14:04:03
EMISSION LEVEL [dBuV]
FCC CLASS B - CONDUCTED
MARCONI COMMERCE SYSTEMS, INC.
TRIND TIRIS EG/COND.EMISS. L1
10-04225.01.001 P.WEBB
FCC CLASS A
FCC CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

APPENDIX B

RADIATED MEASUREMENT DATA SHEETS

SwRI Open Area Test Site Radiated Emissions v2_2

Project Number: 10-04225.01.001
Device Under Test: TRIND TIRIS EG
Detection Method: QP
EUT Mode:
Date / Time: 11/7/00 0:00
Test Receiver: Rohde&Schwarz ESS EMI sn: DE31157
Test Standard(primary limit): Custom
Antenna:
Test Standard(optional limit): none
Test Sponsor: MARCONI
Test Technician: D. SMITH
Temp.(°F)/Humidity(%): 51.4 F 65%

FREQ	Orient.	Antenna				UnCorr'd Level	Correction Factors (dB)		Corr'd Level	Primary Limit	Optional Limit	Margin (Primary)	Comments (** denotes a measurement above the primary limit) Note: Cable factor includes preamplifier gain at frequencies above 200 MHz.
MHz	θ°	I.D.	Pol.	Ht(m)	Dis(m)	(dBuV)	Ant	Cable	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
36.000	68	3	V	1.54	10	13.3	19.2	2.4	35.0	39.0		-4.0	DIGITAL EMISSION
47.999	26	3	V	1.54	10	10.7	12.6	2.7	26.1	39.0		-12.9	
47.999	73	3	V	1.41	10	12.4	12.6	2.7	27.7	39.0		-11.3	REMOVE PWR/DATA FERRITES
36.000	266	3	V	1.41	10	12.4	19.2	2.4	34.0	39.0		-5.0	REMOVE PWR/DATA FERRITES DIGITAL EMISSION
48.006	76	3	V	1.41	10	12.1	12.6	2.8	27.4	39.0		-11.6	
54.013	332	3	V	1.28	10	14.0	9.4	3.1	26.5	39.0		-12.5	
59.994	77	3	V	2.39	10	24.2	7.2	3.3	34.8	39.0		-4.2	DIGITAL EMISSION
65.997	322	3	V	2.07	10	18.6	7.2	3.5	29.3	39.0		-9.7	
69.387	88	3	V	2.30	10	14.7	7.4	3.6	25.7	39.0		-13.3	
72.005	93	3	V	1.61	10	26.6	7.5	3.7	37.8	39.0		-1.2	DIGITAL EMISSION
75.008	119	3	V	2.11	10	18.6	7.8	3.9	30.3	39.0		-8.7	DIGITAL EMISSION
77.993	87	3	V	1.97	10	20.4	8.3	3.8	32.4	39.0		-6.6	DIGITAL EMISSION
83.997	233	3	V	1.77	10	16.2	9.3	4.0	29.5	39.0		-9.5	
119.997	215	3	V	1.34	10	0.0	13.8	5.0	18.9	43.5		-24.6	
137.439	70	3	V	2.03	10	13.5	15.0	5.5	34.1	43.5		-9.4	DIGITAL EMISSION
171.796	132	3	V	1.76	10	10.5	17.8	6.3	34.5	43.5		-9.0	DIGITAL EMISSION
171.785	82	3	H	3.75	10	9.0	17.8	6.3	33.0	43.5		-10.5	
144.014	270	3	H	3.44	10	14.4	15.5	5.7	35.6	43.5		-7.9	DIGITAL EMISSION
137.837	246	3	H	3.44	10	9.2	15.1	5.6	29.9	43.5		-13.6	DIGITAL EMISSION
137.577	263	3	H	3.75	10	15.2	15.1	5.5	35.8	43.5		-7.7	DIGITAL EMISSION
137.434	269	3	H	3.75	10	19.5	15.0	5.5	40.0	43.5		-3.5	DIGITAL EMISSION
83.994	289	3	H	4.00	10	10.4	9.3	4.0	23.7	39.0		-15.3	
66.000	278	3	H	3.50	10	12.6	7.2	3.5	23.2	39.0		-15.8	
48.009	238	3	H	4.00	10	10.9	12.6	2.8	26.2	39.0		-12.8	
36.000	256	3	H	4.00	10	5.7	19.2	2.4	27.4	39.0		-11.6	
203.995	227	5	V	1.47	10	36.8	19.4	-20.9	35.3	43.5		-8.2	DIGITAL EMISSION
209.991	187	5	V	1.34	10	30.2	19.8	-20.8	29.1	43.5		-14.4	
215.991	251	5	V	1.18	10	32.7	20.5	-20.7	32.5	43.5		-11.0	

SwRI Open Area Test Site Radiated Emissions v2_2

Project Number: 10-04225.01.001
Device Under Test: TRIND TIRIS EG
Detection Method: QP
EUT Mode:
Date / Time: 11/7/00 0:00
Test Receiver: Rohde&Schwarz ESS EMI sn: DE31157
Test Standard(primary limit): Custom
Antenna:
Test Standard(optional limit): none
Test Sponsor: MARCONI
Test Technician: D. SMITH
Temp.(°F)/Humidity(%): 51.4 F 65%

FREQ	Orient.	Antenna				UnCorr'd Level	Correction Factors (dB)		Corr'd Level	Primary Limit	Optional Limit	Margin (Primary)	Comments (** denotes a measurement above the primary limit) Note: Cable factor includes preamplifier gain at frequencies above 200 MHz.
MHz	θ°	I.D.	Pol.	Ht(m)	Dis(m)	(dBuV)	Ant	Cable	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
221.995	228	5	V	1.18	10	30.7	20.2	-20.6	30.3	46.5		-16.2	
257.991	243	5	V	1.00	10	26.4	21.8	-19.9	28.2	46.5		-18.3	
299.991	234	5	V	1.08	10	24.7	18.6	-19.1	24.2	46.5		-22.3	
399.940	300	5	V	1.08	10	16.0	21.9	-17.4	20.5	46.5		-26.0	
399.977	0	5	H	3.55	10	14.8	21.9	-17.4	19.3	46.5		-27.2	
299.988	252	5	H	3.03	10	24.0	18.6	-19.1	23.5	46.5		-23.0	
239.994	196	5	H	3.51	10	28.8	21.9	-20.2	30.5	46.5		-16.0	
510.600	154	7	V	1.16	10	12.5	28.1	-15.7	24.9	46.5		-21.6	AMBIENT
538.482	269	7	V	1.00	10	11.9	24.4	-15.4	20.9	46.5		-25.6	
999.813	286	7	V	1.00	10	7.7	33.0	-11.2	29.6	49.5		-19.9	AMBIENT
999.813	286	7	H	3.63	10	7.7	33.0	-11.2	29.5	49.5		-20.0	AMBIENT
532.579	137	7	H	2.56	10	18.5	24.6	-15.5	27.6	46.5		-18.9	
0.134	230		PAR	1.00	20	-12.5	59.5	0.4	47.4	72.0		-24.6	ENCORE AVER ALR25 S/N 86
0.134	230		PAR	1.00	20	-3.4	59.5	0.4	56.5	92.0		-35.5	ENCORE PEAK ALR25 S/N 86
0.134	230		PER	1.00	20	-9.2	59.5	0.4	50.7	92.0		-41.3	ENCORE PEAK ALR25 S/N 86
0.134	230		PER	1.00	20	-18.6	59.5	0.4	41.3	72.0		-30.7	ENCORE AVER ALR25 S/N 86
0.134	230		PG	1.00	20	-20.3	59.5	0.4	39.6	72.0		-32.4	ENCORE AVER ALR25 S/N 86
0.134	230		PG	1.00	20	-20.7	59.5	0.4	39.2	92.0		-52.8	ENCORE PEAK ALR25 S/N 86
0.110	230		PAR	1.00	20	-12.5	65.9	0.4	53.8	94.0		-40.2	ENCORE PEAK EMCO 6512
0.110	230		PAR	1.00	20	-23.2	65.9	0.4	43.1	74.0		-30.9	ENCORE AVER EMCO 6512
0.403	230		PAR	1.00	20	-25.7	54.0	0.4	28.7	62.0		-33.3	ENCORE AVER EMCO 6512 - Ambient
0.403	230		PAR	1.00	20	-16.7	54.0	0.4	37.7	82.0		-44.3	ENCORE PEAK EMCO 6512 - Ambient
0.110	230		PER	1.00	20	-16.5	65.9	0.4	49.8	94.0		-44.2	ENCORE PEAK EMCO 6512 - Ambient
0.110	230		PER	1.00	20	-25.7	65.9	0.4	40.6	74.0		-33.4	ENCORE AVER EMCO 6512 - Ambient
0.403	230		PER	1.00	20	-24.3	54.0	0.4	30.1	62.0		-31.9	ENCORE AVER EMCO 6512 - Ambient
0.403	230		PER	1.00	20	-17.2	54.0	0.4	37.2	82.0		-44.8	ENCORE PEAK EMCO 6512 - Ambient
0.110	230		PG	1.00	20	-17.3	65.9	0.4	49.0	94.0		-45.0	ENCORE PEAK EMCO 6512 - Ambient
0.110	230		PG	1.00	20	-25.6	65.9	0.4	40.7	74.0		-33.3	ENCORE AVER EMCO 6512 - Ambient

SwRI Open Area Test Site Radiated Emissions v2_2

Project Number: 10-04225.01.001
Device Under Test: TRIND TIRIS EG
Detection Method: QP
EUT Mode:
Date / Time: 11/7/00 0:00
Test Receiver: Rohde&Schwarz ESS EMI sn: DE31157
Test Standard(primary limit): Custom
Antenna:
Test Standard(optional limit): none
Test Sponsor: MARCONI
Test Technician: D. SMITH
Temp.(°F)/Humidity(%): 51.4 F 65%

FREQ	Orient.	Antenna				UnCorr'd Level	Correction Factors (dB)		Corr'd Level	Primary Limit	Optional Limit	Margin (Primary)	Comments (** denotes a measurement above the primary limit) Note: Cable factor includes preamplifier gain at frequencies above 200 MHz.
MHz	θ°	I.D.	Pol.	Ht(m)	Dis(m)	(dBuV)	Ant	Cable	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
0.403	230		PG	1.00	20	-23.6	54.0	0.4	30.8	62.0		-31.2	ENCORE AVER EMCO 6512 - Ambient
0.403	230		PG	1.00	20	-17.6	54.0	0.4	36.8	82.0		-45.2	ENCORE PEAK EMCO 6512 - Ambient
0.134	80		PAR	1.00	20	-7.4	59.5	0.4	52.5	72.0		-19.5	ADV+ AVER ALR25 S/N 86
0.134	80		PAR	1.00	20	1.7	59.5	0.4	61.6	92.0		-30.4	ADV+ PEAK ALR25 S/N 86
0.134	65		PER	1.00	20	-8.8	59.5	0.4	51.1	92.0		-40.9	ADV+ PEAK ALR25 S/N 86
0.134	65		PER	1.00	20	-16.8	59.5	0.4	43.1	72.0		-28.9	ADV+ AVER ALR25 S/N 86
0.134	65		PG	1.00	20	-27.0	59.5	0.4	32.9	72.0		-39.1	ADV+ AVER ALR25 S/N 86
0.134	65		PG	1.00	20	-16.3	59.5	0.4	43.6	92.0		-48.4	ADV+ PEAK ALR25 S/N 86
0.110	65		PG	1.00	20	-18.5	65.9	0.4	47.8	94.0		-46.2	ADV+ PEAK EMCO 6512 - ambient
0.110	65		PG	1.00	20	-28.2	65.9	0.4	38.1	74.0		-35.9	ADV+ AVER EMCO 6512 - ambient
0.403	65		PG	1.00	20	-22.5	54.0	0.4	31.9	62.0		-30.1	ADV+ AVER EMCO 6512 - ambient
0.403	65		PG	1.00	20	-16.5	54.0	0.4	37.9	82.0		-44.1	ADV+ PEAK EMCO 6512 - ambient
0.110	80		PAR	1.00	20	-21.2	65.9	0.4	45.1	94.0		-48.9	ADV+ PEAK EMCO 6512 - ambient
0.110	80		PAR	1.00	20	-29.8	65.9	0.4	36.5	74.0		-37.5	ADV+ AVER EMCO 6512 - ambient
0.403	80		PAR	1.00	20	-24.7	54.0	0.4	29.7	62.0		-32.3	ADV+ AVER EMCO 6512 - ambient
0.403	80		PAR	1.00	20	-17.2	54.0	0.4	37.2	82.0		-44.8	ADV+ PEAK EMCO 6512 - ambient
0.110	65		PER	1.00	20	-19.2	65.9	0.4	47.1	94.0		-46.9	ADV+ PEAK EMCO 6512 - ambient
0.110	65		PER	1.00	20	-29.1	65.9	0.4	37.2	74.0		-36.8	ADV+ AVER EMCO 6512 - ambient
0.403	65		PER	1.00	20	-21.9	54.0	0.4	32.5	62.0		-29.5	ADV+ AVER EMCO 6512 - ambient
0.403	65		PER	1.00	20	-15.9	54.0	0.4	38.5	82.0		-43.5	ADV+ PEAK EMCO 6512 - ambient
3.000	65		PER	1.00	20	-3.6	33.4	0.4	30.2	29.5		**0.7**	AMBIENT
30.000	65		PER	1.00	20	-18.5	33.8	0.4	15.7	29.5		-13.8	AMBIENT
30.000	65		PAR	1.00	20	-17.8	33.8	0.4	16.4	29.5		-13.1	AMBIENT
3.000	65		PAR	1.00	20	0.0	33.4	0.4	33.8	29.5		**4.3**	AMBIENT
3.000	65		PG	1.00	20	-17.0	33.4	0.4	16.8	29.5		-12.7	AMBIENT
30.000	65		PG	1.00	20	-18.0	33.8	0.4	16.2	29.5		-13.3	AMBIENT

APPENDIX C

TEST INSTRUMENTATION

EQUIPMENT USE REPORT

MANUFACTURER	MODEL NO.	DESCRIPTION	SERIAL NO.	CAL DATE
CONDUCTED EMISSIONS				
HP	85650A	Quasi-Peak Adapter	2043A00254	01 May 01
HP	8568B	Spectrum Analyzer	2140A01685	24 Apr 01
SwRI	---	3 dB Transient Suppressor	L2	Verified
Rhode & Schwarz	ESH2-Z5	LISN	872461/021	26 Apr 01
ANECHOIC CHAMBER				
Hewlett Packard	8568B	Spectrum Analyzer	1839A00395	21 Aug 01
Hewlett Packard	9836C	Computer/Controller	2441A03889	NCR
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00254	01 May 01
Hewlett Packard	7470A	Plotter	2308A47732	NCR
Hewlett Packard	2225A	Printer	2448S3097	NCR
Electro Metrics	ALR-25	Loop Antenna	371	04 Apr 01
EMCO	3121-DB4	Dipole Antenna	1097	Checked
EMCO	3121-DB4	Dipole Antenna	148	Checked
EMCO	3121-DB2	Dipole Antenna	148	Checked
OATS				
Rhode & Schwarz	ESS	EMI Test Receiver	848588/003	16 May 01
SwRI	2 MHz-1GHz	OATS Pre-Amp	14-82-020	Verified
Electro Metrics	BDA-25S	Dipole Antenna	535	28 May 01
Electro Metrics	DM-105-T2	Dipole Antenna	L-000178	30 May 01
Electro Metrics	DM-105-T3	Dipole Antenna	L-000108	30 May 01
EMCO	6512	Loop Antenna	0001-1265	31 Jul 01
VOLTAGE VARIATION				
Hewlett Packard	8568B	Spectrum Analyzer	1839A00395	21 Aug 01
Electro Metrics	ALR-25	Loop Antenna	371	04 Apr 01
Behlman	150C	AC Power Source	6946	NCR
Fluke	8060A	True RMS Voltmeter	3925140	11 Feb 01

APPENDIX D

PHOTOS OF TESTED EUT

The photos of the tested EUT are in the electronic file “Appendix D Photos of Tested EUT.jpg”

APPENDIX E

PHOTOS OF TEST SETUPS

The test setup photos are in the electronic file “Appendix E Test Setup Photos.jpg”

ATTACHMENT 1

FUNCTIONAL DESCRIPTION AND BLOCK DIAGRAM

ATTACHMENT 2

INSTALLATION INSTRUCTIONS

ATTACHMENT 3

FCC ID LABEL

ATTACHMENT 4

SCHEMATICS