KTL Test Report:	9R01681.1
Applicant:	Digital Security Controls Ltd. 1645 Flint Road Downsview, Ontario M3J 2J6
Equipment Under Test: **(E.U.T.)**	F2-210 PIR/μ Wave Motion Detector With MDU1420 Module
FCC ID:	F53FORCE2-21
In Accordance With:	**FCC Part 15, Subpart C** For Operation Within The Bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500-10550 MHz, 24075-24175 MHz Intentional Radiators Used As Field Disturbance Sensors Excluding Perimeter Protection Systems
Tested By:	KTL Ottawa Inc. 3325 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	Russell G Grant R. Grant, Senior RF Specialist
Date:	July 30, 1999
Total Number of Pages:	27

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Digital Security Controls Ltd.

Model No.: F2-210

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.245. All tests were conducted using measurement procedure ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

☐ New Submission ☒ Production Unit

☒ Class II Permissive Change ☐ Pre-Production Unit

F	D	S	Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".

NVLAP

NVLAP LAB CODE: 100351-0

TESTED BY: Wayne Clarke DATE: July 30, 99
Wayne Clarke, Senior EMC Specialist

Summary Of Test Data

Name of Test	Paragraph Number	Results
Radiated Emissions	15.245	Complies
Powerline Conducted Emissions	15.207	Not Applicable

Footnotes For N/A's: The E.U.T. is powered by 12 Vdc Nominal

Test Conditions:

Indoor Temperature: 22 °C
Humidity: 40 %

Outdoor Temperature: Not Applicable
Humidity: Not Applicable

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Range: 10.5 to 10.55 GHz

Operating Frequency(ies) of Sample: 10.525 GHz

Type of Emission: P0N

Emission Designator: 11M2P0N

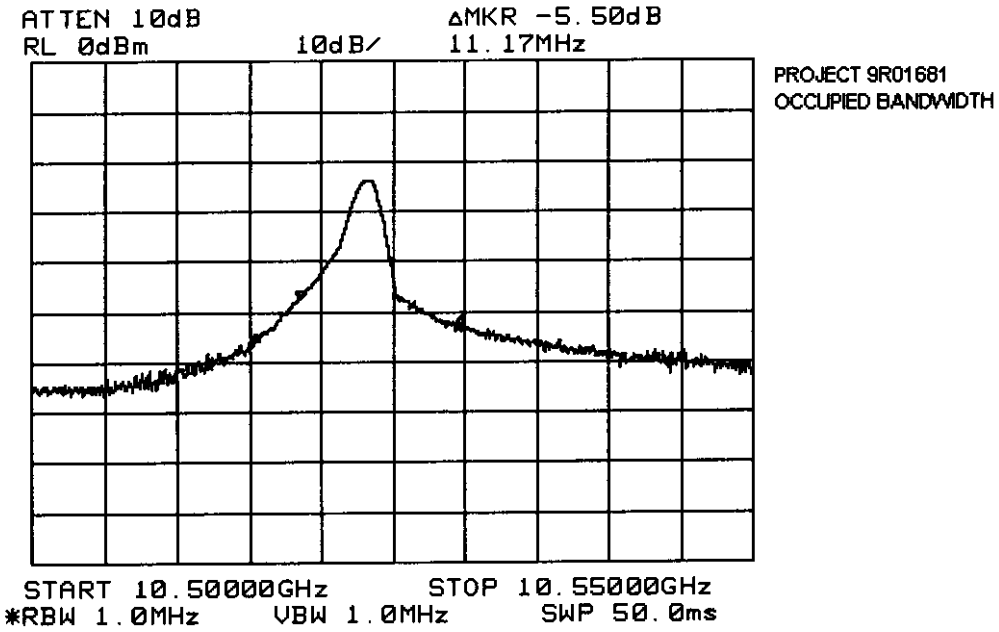
Supply Power Requirement: 9.5 to 14.5 Vdc

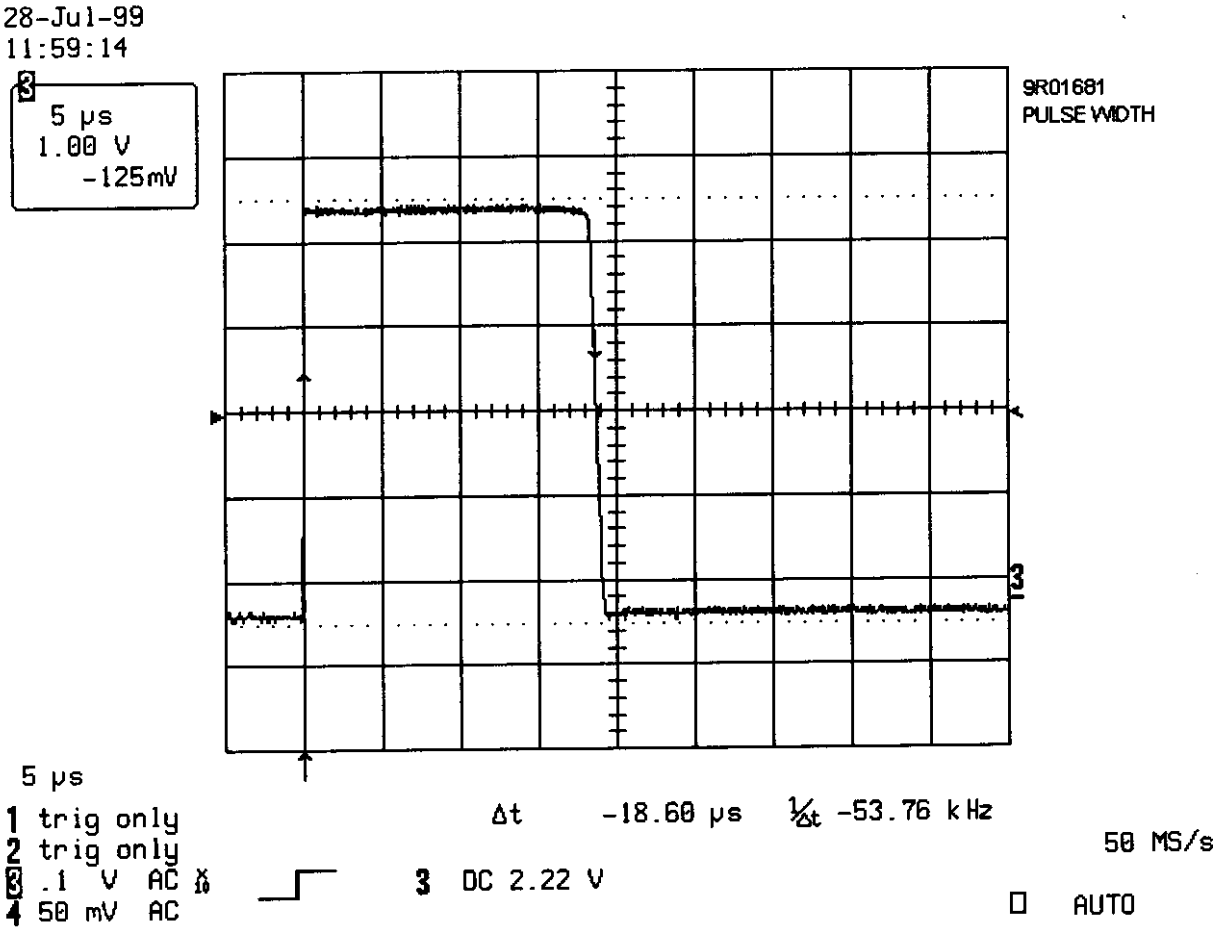
Duty Cycle Calculation:

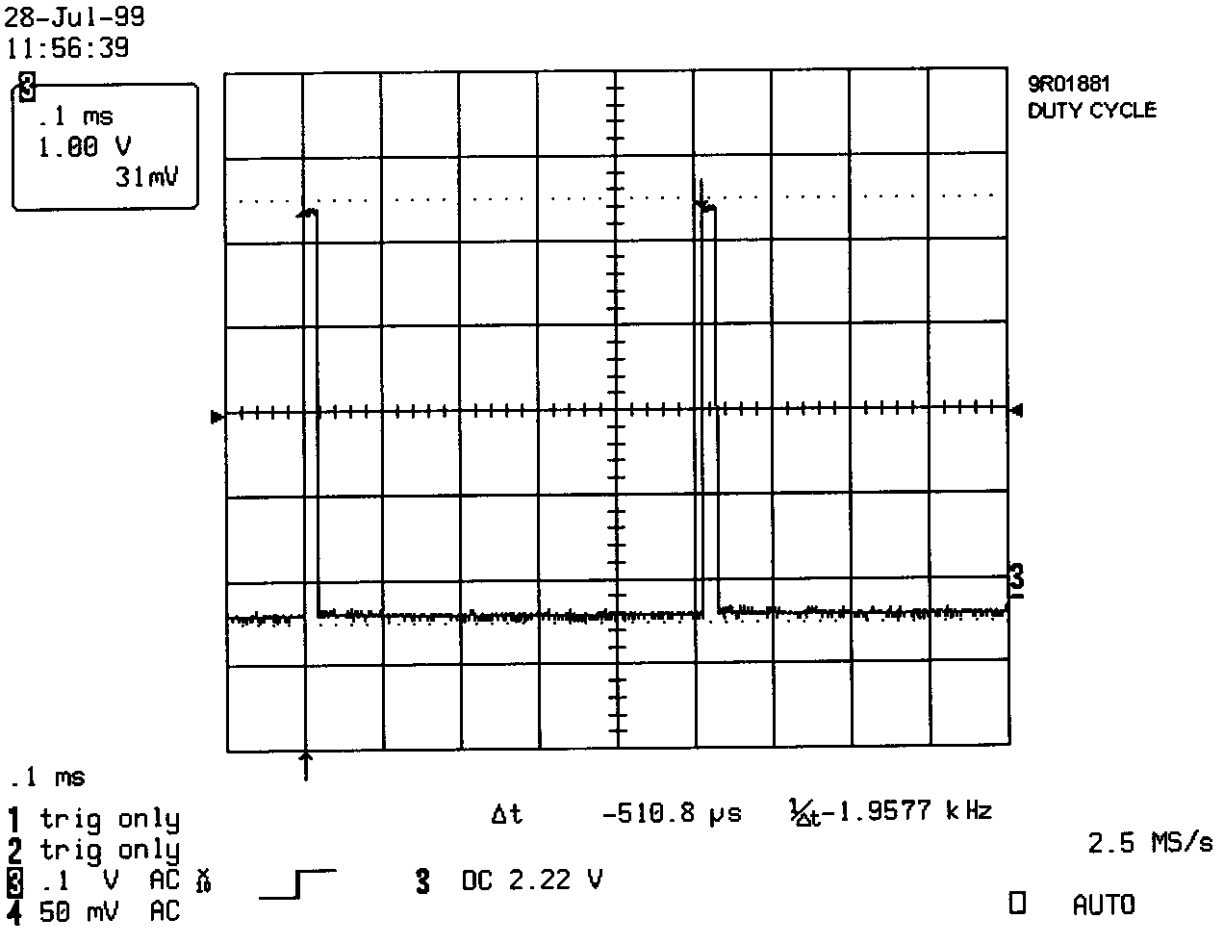
D = 20 log (Teff * P.R.F.)
Teff = Pulse Width In Seconds
P.R.F. = Pulse Repetition Rate In Hertz

The pulse width is: 0.0000186 seconds
The pulse repetition is: 1957 Hz

Therefore: D = 20 log (0.0000186 * 1957)
= -28.8 dB


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -5.50dB
11.17MHz
PROJECT 9R01681
OCCUPIED BANDWIDTH
START 10.50000GHz
STOP 10.55000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms


28-Jul-99
11:59:14
3
5 μs
1.00 V
-125mV
9R01681
PULSE WIDTH
3
5 μs
1 trig only
2 trig only
3 .1 V AC
4 50 mV AC
Δt -18.60 μs 1/Δt -53.76 kHz
50 MS/s
3 DC 2.22 V
AUTO


28-Jul-99
11:56:39
.1 ms
1.00 V
31mV
9R01881
DUTY CYCLE
.1 ms
1 trig only
2 trig only
3 .1 V AC
4 50 mV AC
Δt -510.8 μs 1/Δt-1.9577 kHz
3 DC 2.22 V
2.5 MS/s
AUTO

Description of E.U.T.

The E.U.T. is a combination passive infrared and microwave field disturbance sensor for use in a residential or commercial alarm system.

This is a Class II Permissive change as a new microwave module has been added to the original product.

Modifications Incorporated in E.U.T.

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

Theory of Operation

The E.U.T. is a field disturbance sensor.

Justification

The E.U.T. was configured for testing as per typical installation.

The following combinations were investigated to establish worst case configuration:

(1) Orientation of the E.U.T.

Exercise Program

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise Mode:

(1) Normal operation.

Section 3. Equipment Configuration

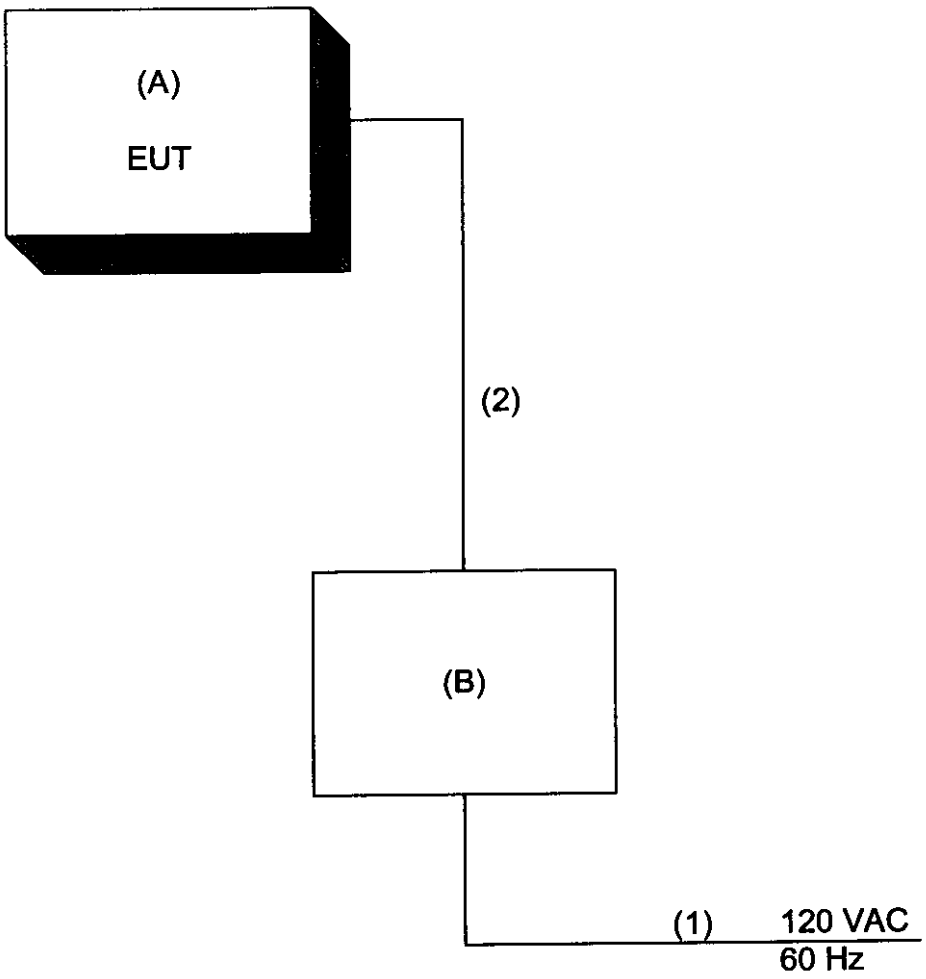
Equipment Configuration List:

Item	Description	Model No.	Serial.	Rev.
(A)	Microwave Motion Detector	F2-210	None	01A
(B)	Astron Power Supply	None	None	—

Inter-connection Cables:

Item	Description	Length (m)
(1)	Standard AC Cable	1.8
(2)	18 Gauge Wire 2-Conductor Wire	2.0

Configuration of the Equipment Under Test (E.U.T)



Section 4. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.245
TESTED BY: Wayne Clarke	DATE: July 28, 1999

Minimum Standard: See Annex B

Test Results: Complies. The worst-case emission level is 43.5 dBμV/m @ 3m at 10.55 MHz. This is 10.5 dB below the specification limit.

Test Data: See attached table.

Above 1 GHz a spectrum analyzer and low noise amplifier are used to measure emission levels. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was 3 MHz.

In the case of handheld equipment, the E.U.T. is rotated in three planes to obtain worst-case results.

Test Data - Radiated Emissions

Test Distance (meters) : 1		Range:		Receiver:		RBW: 1 MHz		Detector: Average			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBμV/m)	Ant. Factor (dB)**	Duty Cycle (dB)***	Dist. Corr. (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10.525		V			81.5	38.1	-28.8	-9.5	81.3	128.0	46.7
10.525		H			72.5	38.1	-28.8	-9.5	72.3	128.0	55.7
21.05		V			40.3	40.6	-28.8	-9.5	42.6	88.0	45.4
21.05		H			47.2	40.6	-28.8	-9.5	49.5	88.0	38.5
31.575		V			42.7	44.1	-28.8	-9.5	48.5	88.0	39.5
31.575		H			42.0	44.1	-28.8	-9.5	47.8	88.0	40.2
+ 10.50		V			34.0	38.1	-28.8	-9.5	33.8	54.0	20.2
+ 10.50		H			30.0	38.1	-28.8	-9.5	29.8	54.0	24.2
+ 10.55		V			43.7	38.1	-28.8	-9.5	43.5	54.0	10.5
+ 10.55		H			30.0	38.1	-28.8	-9.5	29.8	54.0	24.2

Notes:
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
* Re-measured using dipole antenna.
** Includes cable loss when amplifier is not used.
*** Includes cable loss.
( ) Denotes failing emission level.
15.254 (b)(3) * General Limits 15.209 Apply
\+ Restricted band limit 88 dBμV 15.245 (b)(1)(1)

Section 5. Powerline Conducted Emissions

NOT APPLICABLE

NAME OF TEST: Powerline Conducted Emissions	PAR... N... 15.207
TESTED BY:	D...

Minimum Standard:

Frequency(MHz)	Ma... Powerline Conducted RF Voltage	
	...	dBμV
0.45 - 30.0	...	48

Test Results: ...ies/Does Not Comply. See attached graphs and table.

Test Data: See attached table and graphs.

Method Of Measurement: (Procedure ANSI C63.4-1992)

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak detector.

Broadband emissions are identified by switching the receiver detector function from Quasi-Peak to Average. If the amplitude of the emission drops by 6 dB or more then the emission is classified as broadband and the Quasi-Peak level is reduced by a factor of 13 dB.

All emissions within 10 dB of limit have been recorded.

Measurement Data:

Conductor	Frequency (MHz)	CISPR (dBμV)	Average (dBμV)	BB/NB	[illegible]	Result (dBμV)

NOT APPLICABLE

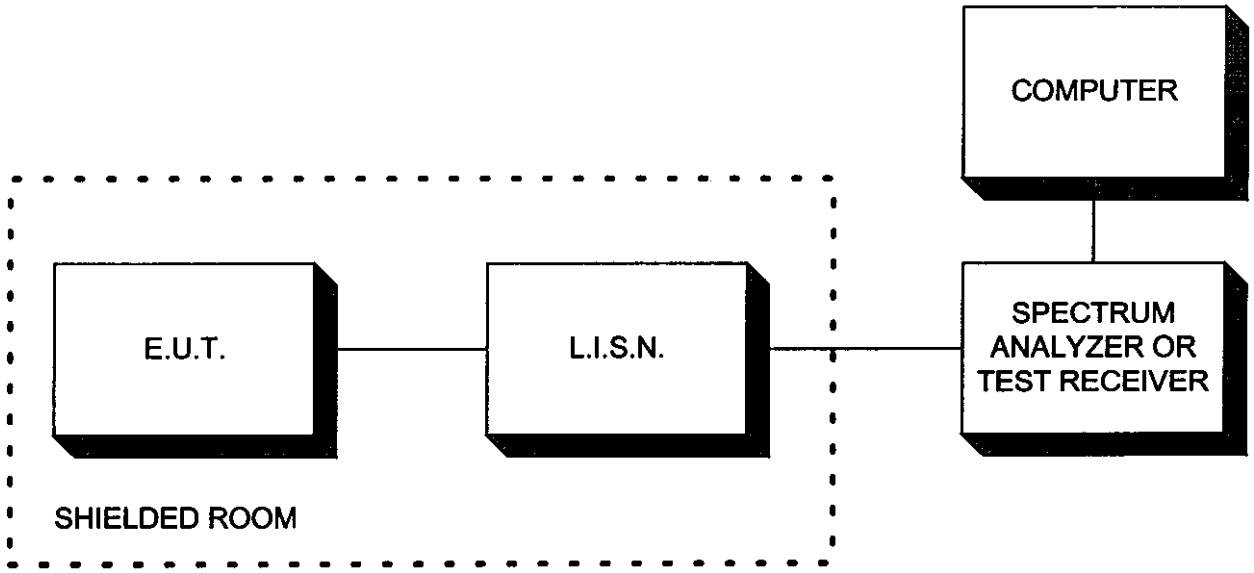
Conducted Photographs (Worst Case Configuration)

SIDE VIEW

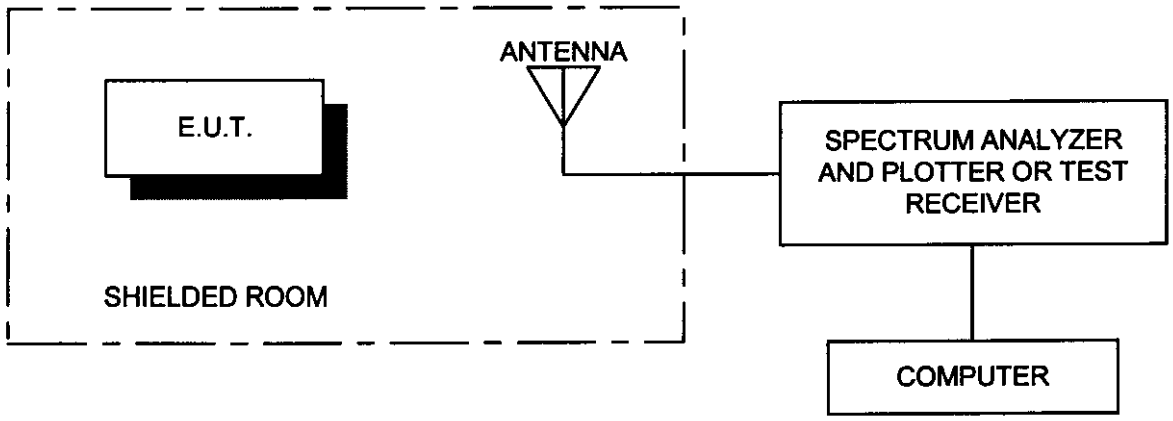
FRONT VIEW

Section 6. Block Diagrams

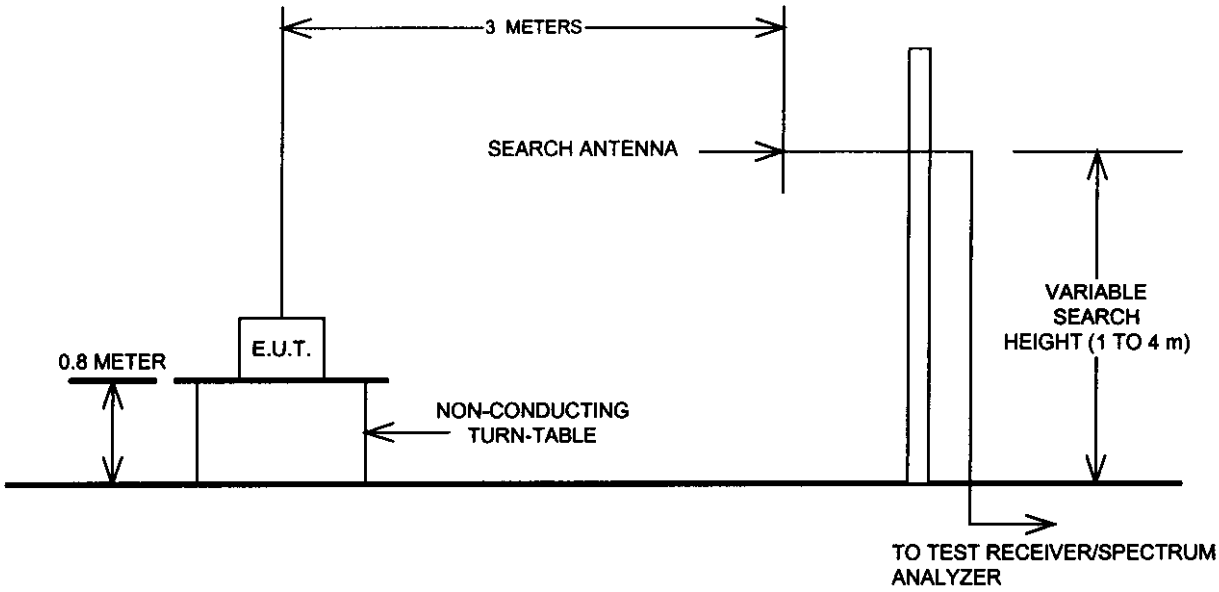
Conducted Emissions



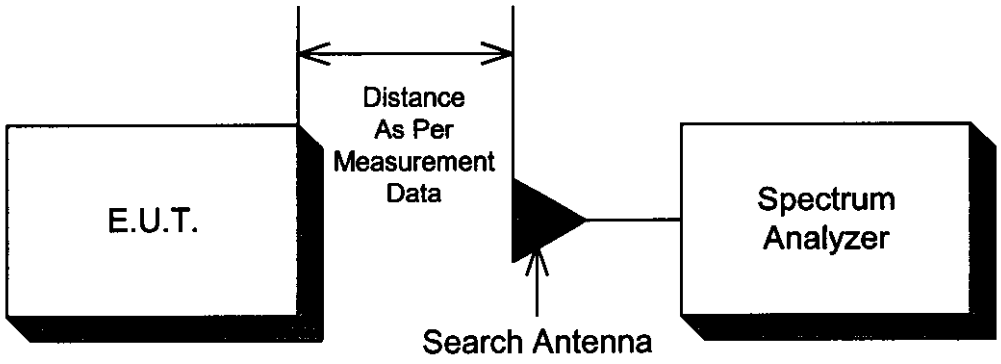
Radiated Prescan



Outdoor Test Site For Radiated Emissions



Indoor Measurement Setup for Emissions Above 10 GHz



Section 7. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	June 16/99	June 16/00	
	Power Supply	Astron	VS-50M	8405071	NCR	NCR	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
1 Year	Digital Oscillator	Lecroy	LC564A	10145	May 26/99	May 26/00	
3 Year	Standard Gain Horn	Electro-Metrics	SH-50/60-1	FA000479	July 29/97	July 29/00	
3 Year	Standard Gain Horn	Electro-Metrics	SH-50/60-2	FA000485	July 29/97	July 29/00	
3 Year	Standard Gain Horn	Millitech	SGH-19-RP000	021	Apr. 25/97	Apr. 25/00	

NA: Not Applicable
NCR: No Cal Required
COU: CAL On Use

ANNEX A

RESTRICTED BANDS

Section A Restricted Bands of Operation

(a) Except as shown in paragraph (d) of this section , only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.49 - 0.51	16.69475-16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425-16.80475	960-1240	7.25-7.75
3.020 - 3.026	25.5-25.67	1300-1427	8.025-8.5
4.125 - 4.128	37.5-38.25	1435-1626.6	9.0-9.2
4.17725 - 4.17775	73-74.6	1645.5-1646.5	9.3-9.5
4.20725 - 4.20775	74.8-75.2	1660-1710	10.6-12.7
6.215 - 6.218	108-121.94	1718.8-1722.2	13.25-13.4
6.31175 - 6.31225	123-138	2220-2300	14.47-14.5
8.291 - 8.294	149.9-150.05	2310-2390	15.35-16.2
8.362 - 8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625 - 8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425 - 8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29 - 12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975 - 12.52025	240-285	3345.8-3358	36.43-36.5
12.57675 - 12.57725	322-335.4	3600-4400	Above 38.6
13.36 - 13.41			

ANNEX B

RADIATED EMISSION LIMITS

Radiated Emission Limits

§15.245 Operation within the bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500-10550 MHz and 24075-24175 MHz.

(a) Operation under the provision of this section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength Of Fundamental (millivolts/meter)	Field Strength of Harmonics (millitvolts/meter)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

(i) For field disturbance sensors designed for use only within a building or to open building doors, 25 mV/m.

(ii) For all other field disturbance sensors, 7.5 mV/m.

(iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands fully comply with the limits given in §15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment; vehicles such as fork-lifts that are intended primarily for use indoors or for very specialized operations. Or railroad locomotives, railroad cars and other equipment which travel on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g. putting a vehicle in reverse gear, activating a turn signal, etc.).

§15.245, continued

(2) Field strength limits are specified at a distance of 3 meters.

(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(4) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

§15.209 Radiated Emission Limits, General Requirements

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (millivolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	2400/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3