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Project Number: 09E2503-7

Prepared for :

Smiths Detection Irl. Ltd.

By

Compliance Engineering Ireland Ltd
Ratoath Road
Ashbourne
Co. Meath
FCC Site Registration: 92592

Date

3rd July 2009

FCC EQUIPMENT AUTHORISATION
Test Report

EUT Description

eqo (Millimeter Wave Inspection System)

List of Exhibits

Exhibit A – Technical Report

Smiths Detection Irl Ltd.,
eqo (Millimeter Wave Inspection System)

Applicant Name and Address

The eqo (Millimeter Wave Inspection System) covered under this authorisation report was designed, manufactured and assembled by Smiths Detection Irl. Ltd. The company's full name and mailing address is given below:

Smiths Heimann GmbH
Im Herzen 4
65205 Wiesbaden
Germany

Model Name

The model number for the EUT covered under this application report is:

Eqo (Millimeter Wave Inspection System)

FCC ID

The FCC ID for the EUT covered under this application report is:

XM7-SD-E0001

Smiths Detection Irl Ltd.,
eqo (Millimeter Wave Inspection System)

Description of Equipment

The EUT has been developed to enhance the capability of security screening personnel by allowing the detection of weapons, explosives, or contraband hidden under clothing using millimetre-wave technology. The person to be screened stands with arms raised in the screening area of eqo and turns through 360°. All objects located in the screening area are scanned by means of millimetre waves. The system then processes this data. A two dimensional image of the person in the screening area is displayed on the viewing console.

Equipment Details

Model:	**eqo**
System Part No.:	**70500542**
System Serial No.:	**81932**

Hardware Revisions:

Tile Board	70500503
Digital Receiver	70500499
Trigger Board	70500482
Transceiver	70500444
Power Supply Assembly	34446006
PC	70500816
Monitor	70500541
Keyboard	70500540
Complete Cable Set	34445457

Software Revisions:

System Software:	BI-01-00-Q-001-01

Operating Conditions during Test:

Normal Scanning

Table of Contents

1.0 EUT Description

The EUT has been developed to enhance the capability of security screening personnel by allowing the detection of weapons, explosives, or contraband hidden under clothing using millimetre-wave technology. The person to be screened stands with arms raised in the screening area of eqo and turns through 360°. All objects located in the screening area are scanned by means of millimetre waves. The system then processes this data. A two dimensional image of the person in the screening area is displayed on the viewing console.

The system testing consisted of the following:

Equipment Details

Model:	**eqo**
System Part No.:	**70500542**
System Serial No.:	**81932**

Hardware Revisions:

Tile Board	70500503
Digital Receiver	70500499
Trigger Board	70500482
Transceiver	70500444
Power Supply Assembly	34446006
PC	70500816
Monitor	70500541
Keyboard	70500540
Complete Cable Set	34445457

Software Revisions:

System Software:	BI-01-00-Q-001-01

1.1 EUT Operation

The EUT was tested in normal scanning mode.

2.0 Electromagnetic Emissions Testing

The guidelines of CISPR 16-4 were used for all uncertainty calculations, estimates and expressions thereof for EMC testing. A copy of Compliance Engineering Ireland Ltd.'s policy for EMC Measurement Uncertainty is available on request.

RF Requirements: Spurious emissions in accordance with FCC CFR 15.107 and 15.109.

2.1 Conducted Emissions Measurements

2.1.1 Test Procedure

The measurements were taken using a Line Impedance Stabilisation Network (LISN). A Rohde and Schwarz ESHS30 Receiver with a bandwidth of 9 kHz was used to measure the conducted emissions. The measurements were carried out using the receiver analysis feature, which uses three detectors; peak, quasi peak and average. Using this mode the voltage emission spectrum was scanned in peak detection mode and the emissions which exceeded a sub range margin relevant to the respective limits were further measured using the quasi peak and average detectors. The live and neutral conductors were examined individually to determine the maximum. The receiver bandwidth was set to 10 kHz. Appendix A shows the plots from the test.

The excess interface cables were bundled in a non-inductive arrangement at the approximate centre of the cable with the bundle 30 to 40 centimetres in length.

The conducted emissions were maximised by varying the operating states and configuration of the EUT.

2.1.2 Test Criteria

The FCC Part 15 Class A conducted limits are given below.

Frequency:	150 kHz – 500 kHz
Limit:	Quasi Peak 79 dB(μV)
	Average 66 dB(μV)
Frequency:	500 kHz – 30 MHz
Limit:	Quasi Peak 73 dB(μV)
	Average 60 dB(μV)

The tighter limit shall apply at the edge between two frequency bands.

2.1.3 Test Results

The conducted test data is included as Figure 1. The conducted emissions generated by the EUT are below the FCC Class A maximum criteria.

2.1.4 Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the conducted emissions test was ±3.5 dB.

2.2 Radiated Emissions Measurements

Radiated Emissions measurements were made at the Compliance Engineering Ireland Ltd Open Area Test Site located in Ashbourne, Co. Meath, Ireland to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

2.2.1 Test Procedure

The EUT was centred on a motorised turntable, which allows 360 degree rotation. From frequencies between 30 MHz and 1000 MHz, a measurement antenna was positioned at a distance of 10 meters as measured from the closest point of the EUT. The radiated emissions were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 meters.

Emissions above 1000 MHz were made at a 3 metre distance. There were no emissions identified between 1 GHz and 24 GHz.

A Rohde and Schwarz ESVS30 measuring receiver with peak detection was used to find the maximums of the radiated emissions during the variability testing. All final measurements were taken using the quasi peak detector with a measurement bandwidth of 120 kHz. A drawing showing the test setup is given as Figure 2.

2.2.2 Test Criteria

The FCC Part 15 Class A radiated limits are given below for a measurement distance of 10 meters.

Frequency (MHz)	Distance (Meters)	Field Strength (dBμV/m)
30 to 88	10	39.1
88 to 216	10	43.5
216 to 960	10	46.4
Above 960	10	49.5

The more stringent limit shall apply at the transition between two frequency bands.

2.2.3 Test Results

The radiated test data is included asTable 1. The emissions were maximised at each frequency and the highest emissions identified were measured using a Quasi-Peak Adapter. The radiated emissions generated by the EUT are below the FCC Class A maximum criteria.

2.2.4 Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was ±5.3 dB (from 30 to 100 MHz), ±4.7 dB (from 100 to 300 MHz), ±3.9 dB (from 300 to 1000 MHz) and ±3.8 dB (from 1 GHz to 18 GHz).

3.0 List of Test Equipment

Instrument	Mftr.	Model	Date Last Calibrated	Calibration Due
Measuring Receiver	Rohde and Schwarz	ESVS30	07/04/08	07/04/11
Biconical Antenna	Schwarzbeck	BBA9106	02/10/06	02/10/09
Log Periodic Antenna	Chase	UPA6108	29/06/06	29/09/09
Measuring Receiver	Rohde and Schwarz	ESHS30	27/10/08	27/10/11
LISN	Rohde and Schwarz	ESH3-Z5	30/07/07	30/07/10
Spectrum Analyser	Agilent	E4408B	23/06/09	23/06/10
Horn Antenna	EMCO	3115	12/04/07	12/04/10

3.1 Date of Test

The tests were carried out on one sample of the EUT on the 3rd of July 2009.

Appendix A
Test Results

Table 1 - Radiated Emissions, OATS
Horizontal and Vertical Maximum

Antenna Distance: **10m**
Frequency Range: **30 MHz - 1000 MHz**
Detector Type: **Quasi peak**

Frequency (MHz)	Q.P. Level dB(µV/m)	Q.P. Limit dB(µV/m)	Polarisation	Antenna Height (m)	Margin dB(µV/m)
40.000	29.9	39.1	Vertical	1.000	-9.2
80.000	37.3	39.1	Horizontal	2.902	-1.8
120.000	42.8	43.5	Horizontal	2.654	-0.7
160.000	43.3	43.5	Horizontal	3.355	-0.2
180.000	22.3	43.5	Horizontal	2.617	-21.2
200.000	41.8	43.5	Horizontal	2.657	-1.7
220.000	26.7	46.4	Horizontal	2.946	-19.7
240.000	41.0	46.4	Horizontal	2.413	-5.4
280.000	30.1	46.4	Horizontal	2.530	-16.3
320.000	35.3	46.4	Horizontal	1.796	-11.1
360.000	28.5	46.4	Horizontal	1.500	-17.9
400.000	35.8	46.4	Horizontal	1.483	-10.6
440.000	36.4	46.4	Horizontal	1.202	-10.0
480.000	43.5	46.4	Horizontal	1.671	-2.9
520.000	45.2	46.4	Horizontal	1.306	-1.2
560.000	38.4	46.4	Horizontal	1.175	-8.0
600.000	31.5	46.4	Horizontal	1.189	-14.9
720.000	35.6	46.4	Horizontal	1.623	-10.8

Corrected Level = Recorded Level + Antenna Factor + Cable Loss

COMMENT: PASS

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04 Jul 2009 00:38

Conducted Emissions

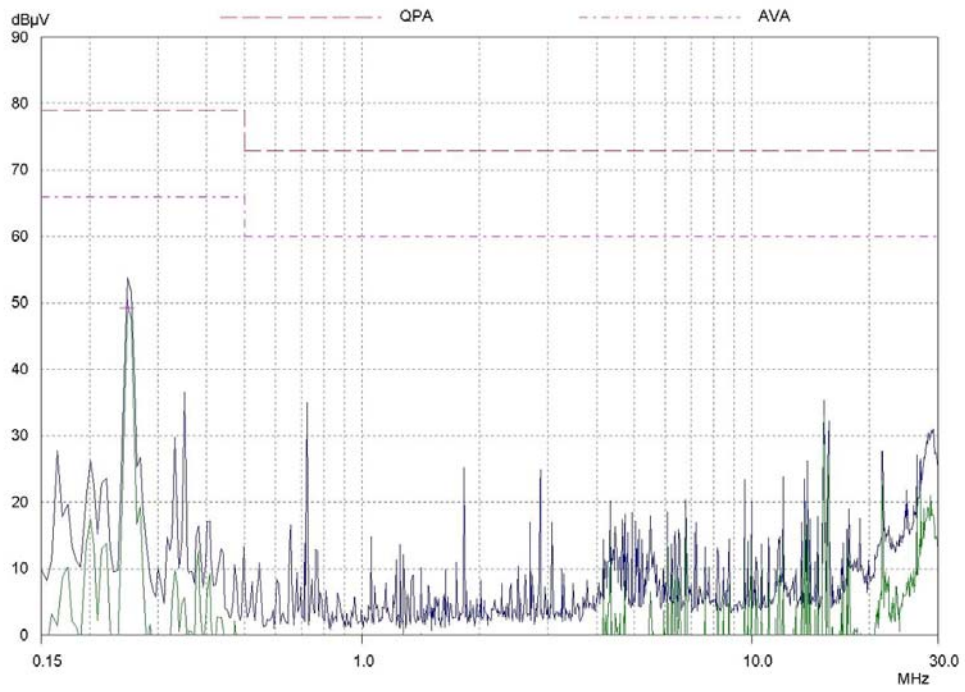
EUT:	Eqo
Manuf:	Smiths Detection
Op Cond:	Normal
Operator:	Paul Reilly
Comment:	Live

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB

Final Measurement:

Detectors:	X QP / + AV
Meas Time:	1sec
Subranges:	25
Acc Margin:	20 dB



Compliance Engineering Ireland ltd 04 Jul 2009 00:38

Conducted Emissions

EUT: Eqo
Manuf: Smiths Detection
Op Cond: Normal
Operator: Paul Reilly

Comment: Live

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Phase -	PE -

No results

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB	Phase -	PE -
0.25	49.27	66.00	16.73	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

PAGE 2

Figure 1: Conducted Emissions (Live)

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04 Jul 2009 00:50

Conducted Emissions

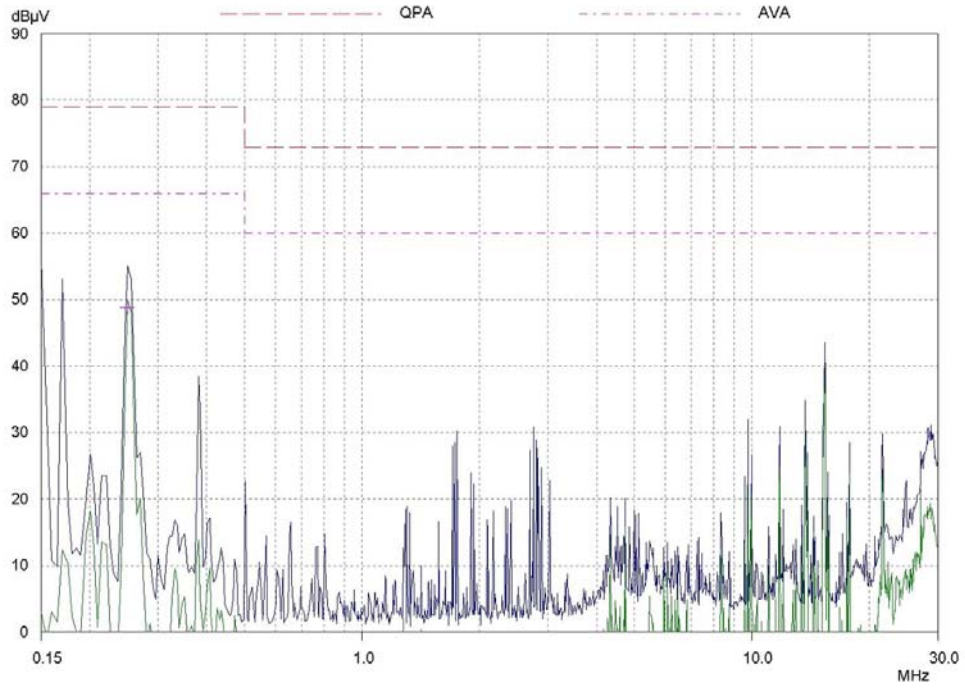
EUT:	Eqo
Manuf:	Smiths Detection
Op Cond:	Normal
Operator:	Paul Reilly
Comment:	Neutral

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB

Final Measurement:

Detectors:	X QP / + AV
Meas Time:	1sec
Subranges:	25
Acc Margin:	20 dB



PAGE 1

Compliance Engineering Ireland ltd 04 Jul 2009 00:50

Conducted Emissions

EUT: Eqo
Manuf: Smiths Detection
Op Cond: Normal
Operator: Paul Reilly

Comment: Neutral

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 20 dB

Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Phase -	PE -

No results

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB	Phase -	PE -
0.25	48.85	66.00	17.15	N	gnd
15.365	-7.38	60.00	67.38	N	gnd

* limit exceeded

Indicated Phase/PE shows Configuration of max. Emission

PAGE 2

Figure 2: Conducted Emissions (Neutral)

Radiated Emissions

02. July 09 14:53

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	120k	120k	PK	5ms	AUTO	LD	ON

Transducer	No.	Start	Stop	Name
3	9	20M	1000M	CEIL615
	10	30M	1000M	CEIL620
	15	30M	1000M	739
	19	30M	1000M	BILOG

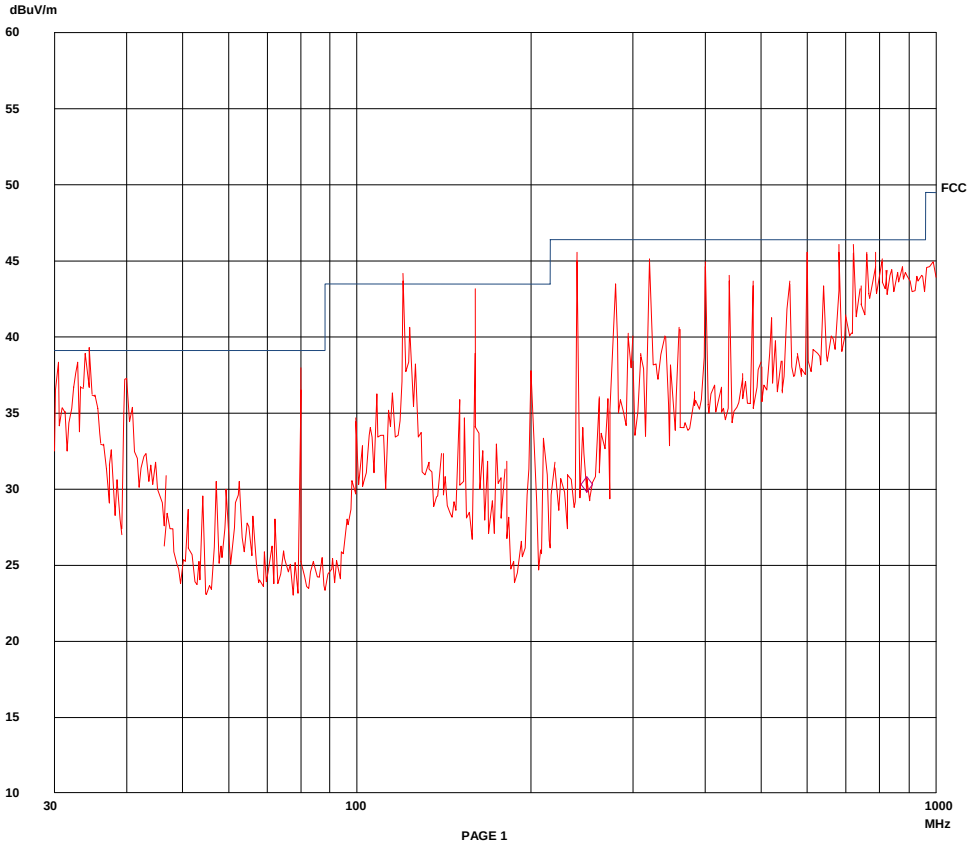


Figure 3: Prescan from 30 MHz to 1000 MHz in anechoic chamber

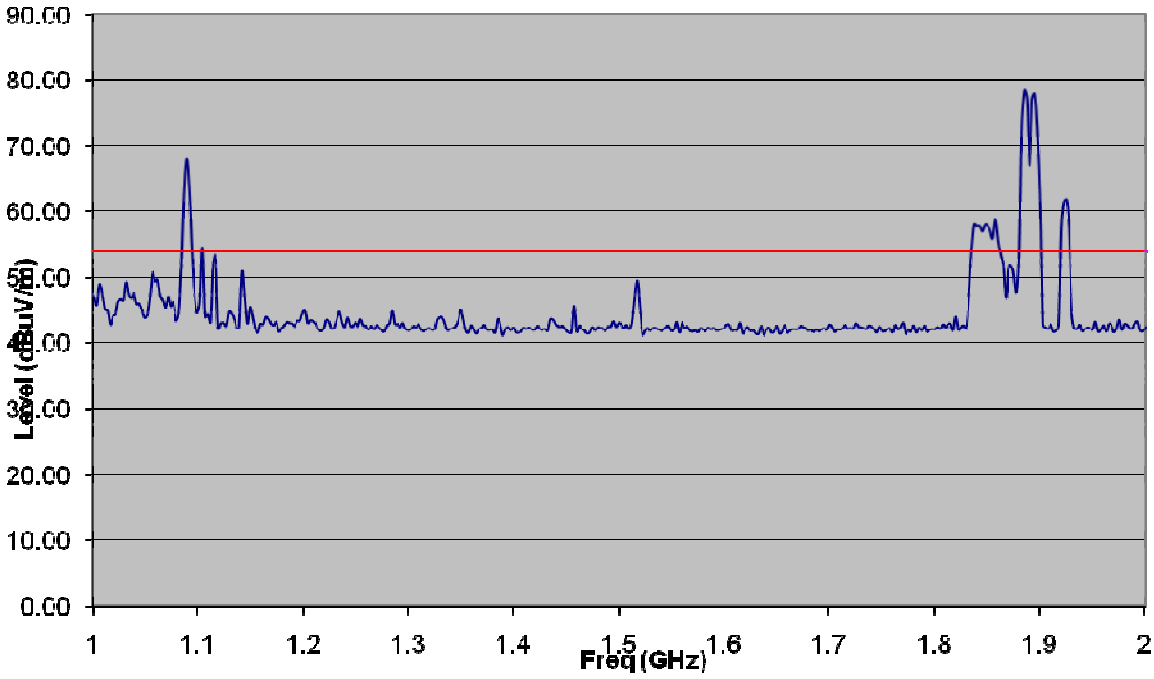


Figure 4: Plot from 1 GHz to 2 GHz

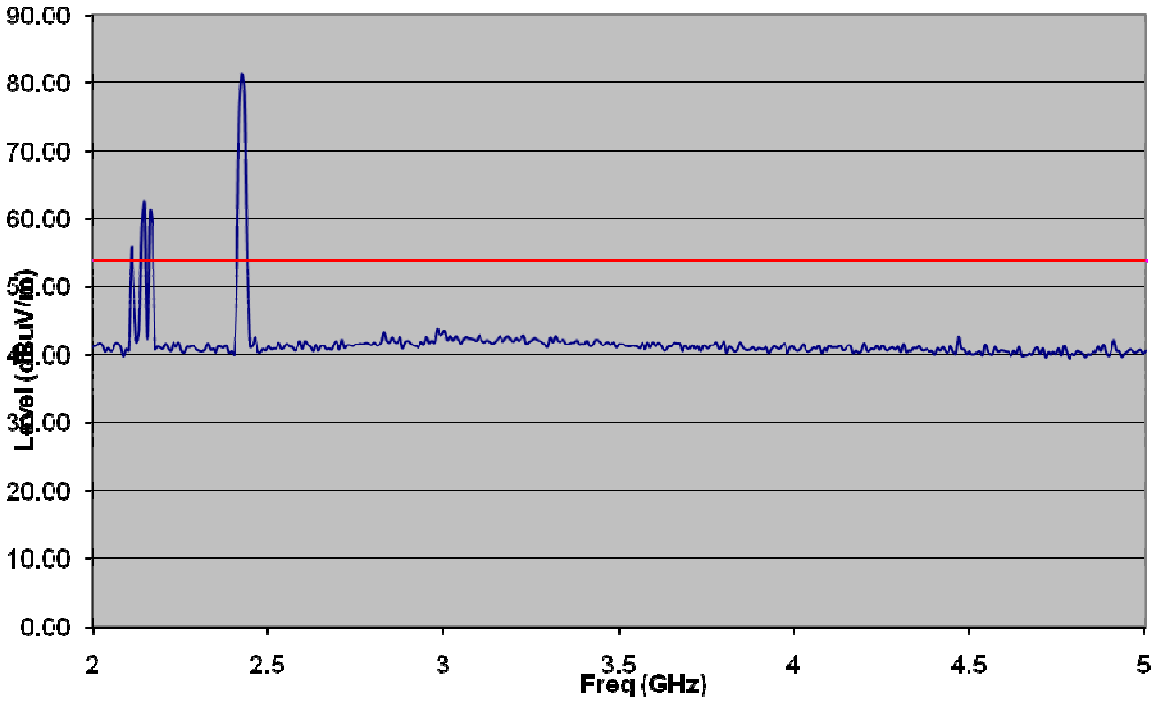


Figure 5: Plot from 2 GHz to 5 GHz

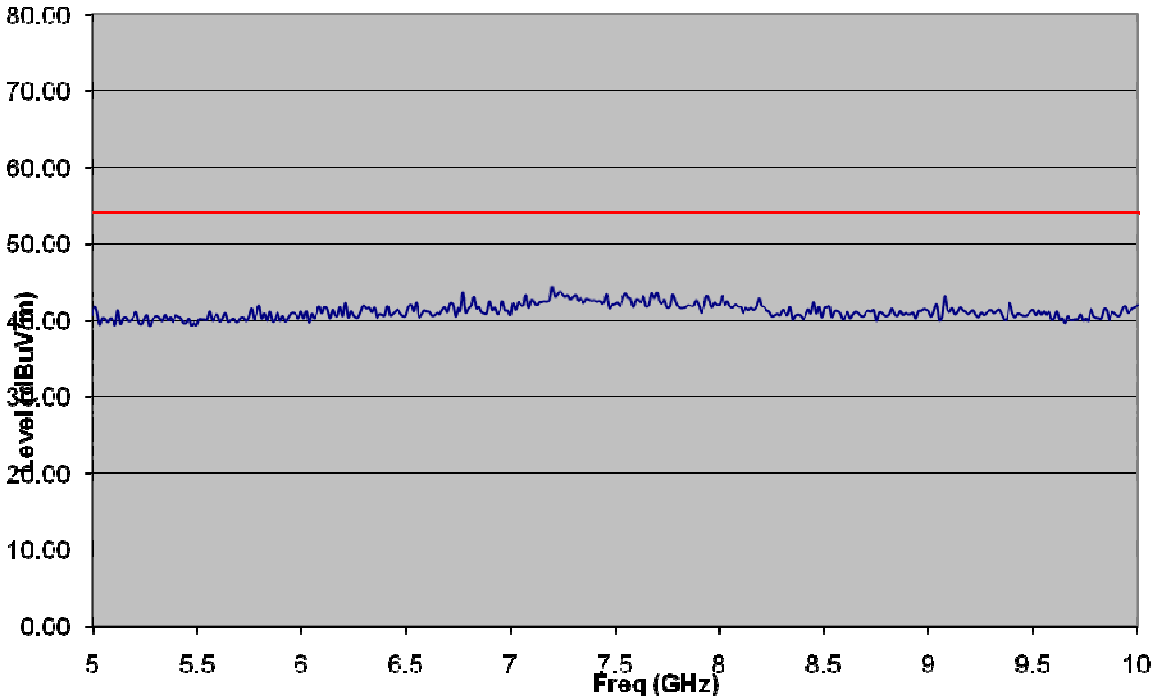


Figure 6: Plot from 5 GHz to 10 GHz

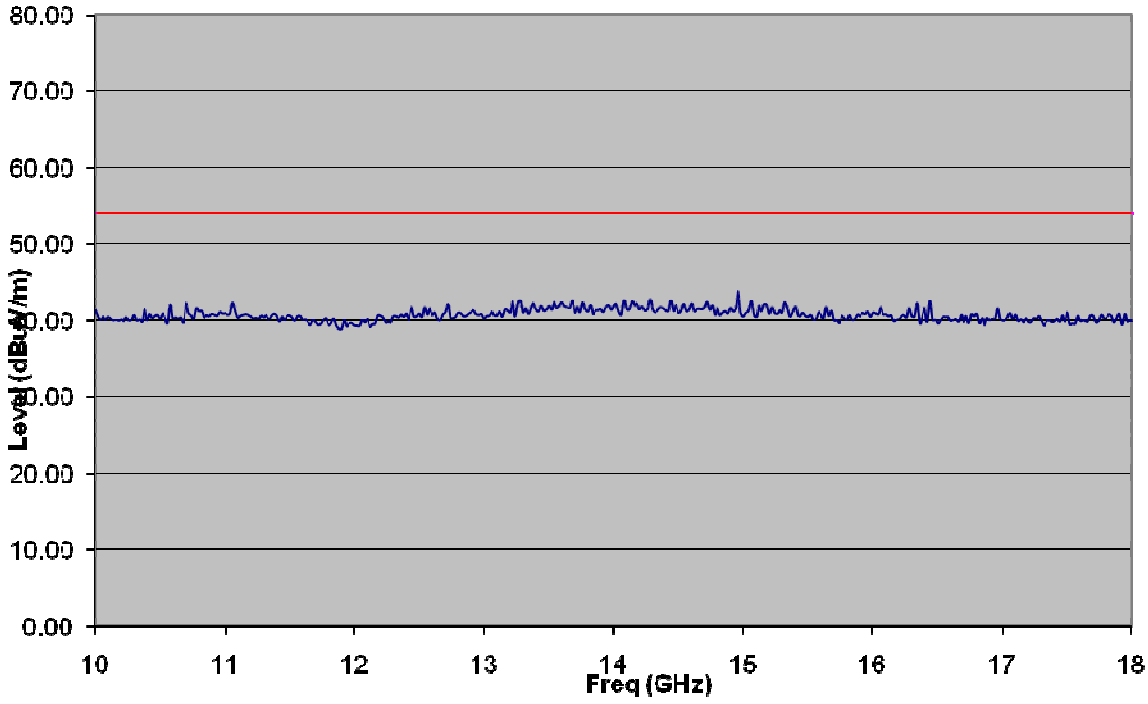


Figure 7: Plot from 10 GHz to 18 GHz

Appendix B
Test Setups

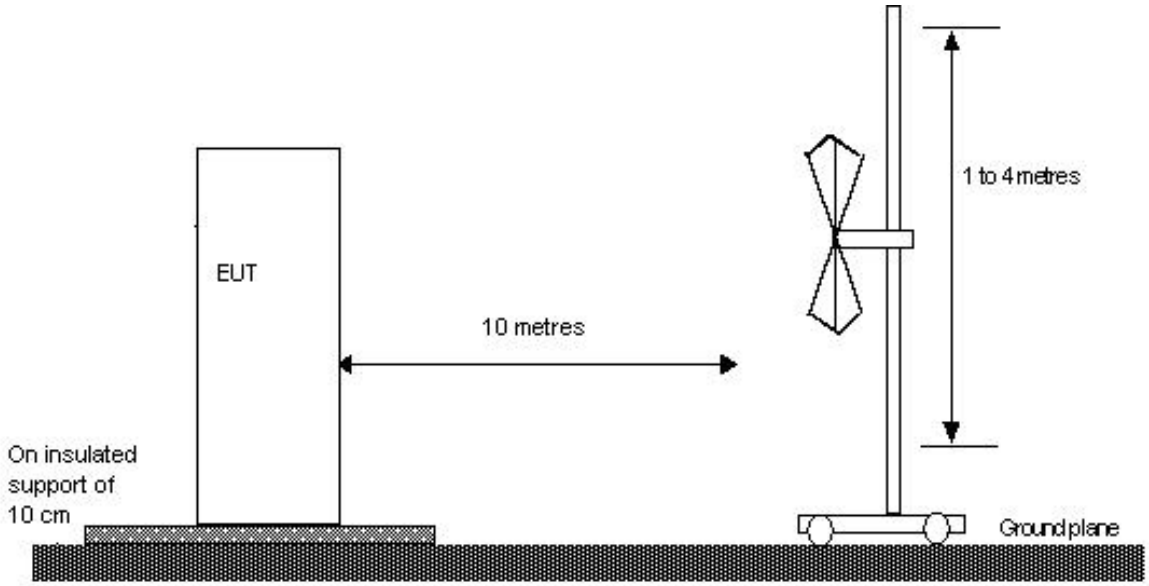
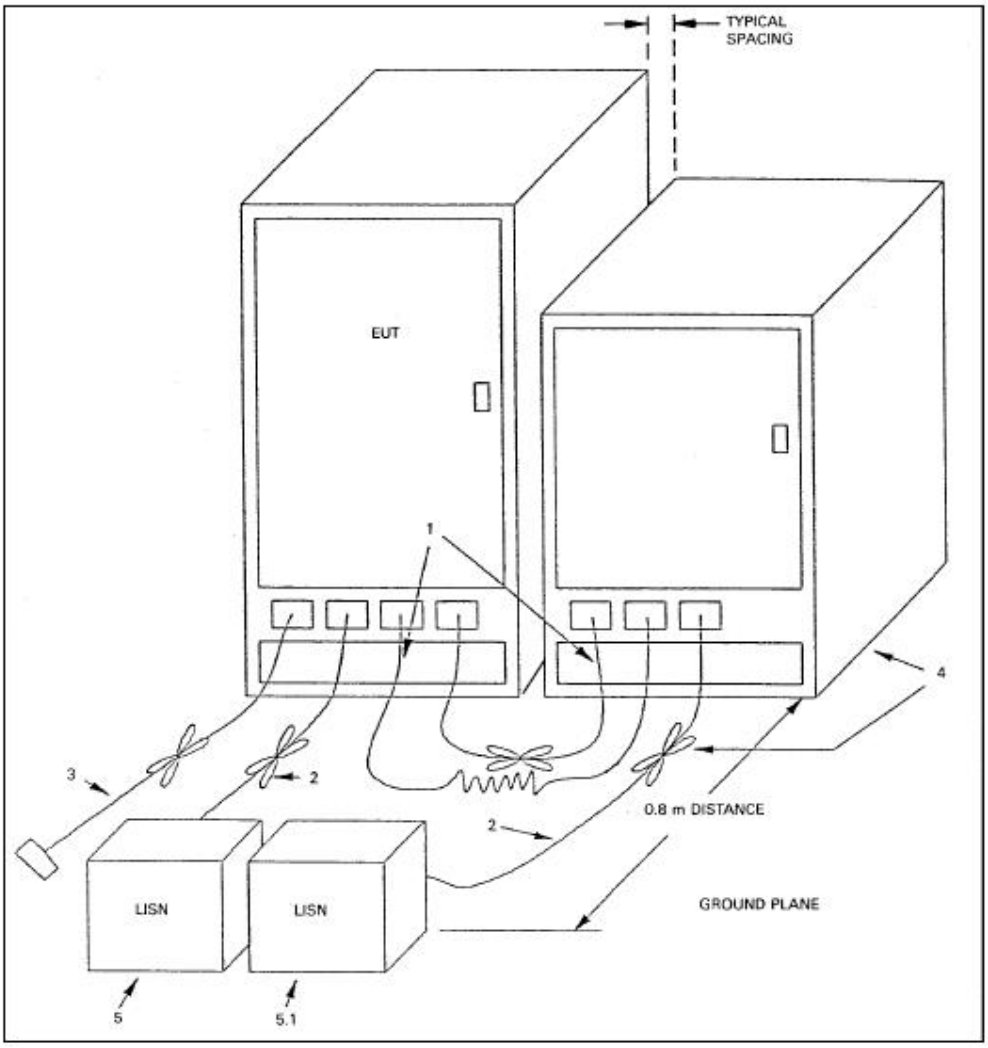


FIGURE 1: Radiated Emissions Test Setup



LEGEND:

1) Excess I/O cables shall be bundled in the center. If bundling is not possible, the cables shall be arranged in serpentine fashion. Bundling shall not exceed 40 cm in length (see 6.1.4 and 11.2.4).
2) Excess power cords shall be bundled in the center or shortened to appropriate length (see 7.2.1).
3) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. If bundling is not possible, the cable shall be arranged in serpentine fashion (see 6.1.4).
4) EUT and all cables shall be insulated, if required, from the groundplane by up to 12 mm of insulating material (see 6.1.4 and 6.2.2).
5) EUT connected to one LISN. LISN can be placed on top of, or immediately beneath, the groundplane.
   5.1) All other equipment powered from a second LISN or additional LISN(s) (see 5.2.3 and 7.2.1).
   5.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

FIGURE 2: Conducted Emissions Test Setup

Exhibit B
Test Configurations

Photographs

Figure 1: Radiated emissions setup on open area site

Figure 2: Conducted Emissions setup