COMPLIANCE ENGINEERING IRELAND LTD

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Project Number: 10E2475-5

Prepared for:

Biancamed Ltd

By

Compliance Engineering Ireland Ltd
Ratoath Road
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FCC Site Registration: 92592
Industry Canada Assigned Code: 8517A

Date

4th May 2010

FCC EQUIPMENT AUTHORISATION
Test Report

EUT Description
Motion Sensor

Authorised:

List of Exhibits

Exhibit A – Technical Report

Biancamed Ltd.,
Sleepminder Motion Sensor

Applicant Name and Address

The system covered under this authorisation report was designed, manufactured and assembled by Biancamed Ltd. The company's full name and mailing address is given below:

BiancaMed Limited,
NovaUCD,
Belfield Innovation Park,
Dublin 4,
Ireland.

Model Name

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

Sleepminder

Description of Equipment

The EUT was a motion detector using a short range 5.8 GHz transceiver to detect motion, intended for use in clinical sleep trials in the volunteers' own home. Events were logged to a data card, which could later be analyzed on a computer using a custom algorithm to distinguish chest movement from background motion (not supplied by the manufacturer during testing).

Equipment Details

Brand Name:	Sleepminder
Manufacturer:	BiancaMed
Description:	5.8 GHz motion detector

Manufacturer:	Friwo
Description:	PSU
Model Number:	FW7333SM/12

Modifications

Several modifications were required in order to pass the radiated emissions test specification:

- A Würth Elektronik ferrite, Model No: 742 711 4, was placed on the DC supply cable (See Figure 1 following)

Operating Conditions during Test:

Normal Scanning

Table of Contents

1.0 EUT Description

The EUT was a motion detector using a short range 5.8 GHz transceiver to detect motion, intended for use in clinical sleep trials in the volunteers' own home. Events were logged to a data card, which could later be analyzed on a computer using a custom algorithm to distinguish chest movement from background motion (not supplied by the manufacturer during testing).

1.1 1.1 EUT Operation

The EUT was tested in normal scanning mode.

1.2 Modifications

Figure 1: *Location of Ferrite 742 711 4*

1.3 Date of Test

The tests were carried out on one sample of the EUT on the 14th of February 2010 and additional pulse width measurements on 26 April 2010.

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, 15.109 and 15.209. Tests were carried out to the requirements of CISPR 16-4 and ANSI C63.4-2009.

2.1.1 Measurement Uncertainty

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

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 40 GHz).

2.2 Test Criteria

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

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46*
0.5-5	56	46
5-30	60	50

2.3 Conducted Emissions Measurements

2.3.1 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.

The results of conducted emissions are shown in Appendix A, Figures 1 and 2.

Result: Pass

3.0 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.

3.1 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 1 GHz were made at a 3 metre distance. There were no emissions identified between 1 GHz and 40 GHz excepting the intended emission at 5.8 GHz.

A measuring receiver with peak detection was used to find the maximums of the radiated emissions during the variability testing below 1 GHz. 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.

3.2 Test Criteria

The FCC Part 15.209 radiated limits are given below for a measurement distance of 3 meters.

Frequency (MHz)	Field Strength μV/m	Field Strength (dBμV/m)
30-88	100	40.0
88-216	150	43.52
216-960	200	46.0
above 960	500	54.0

4.0 Field Strength of Fundamental

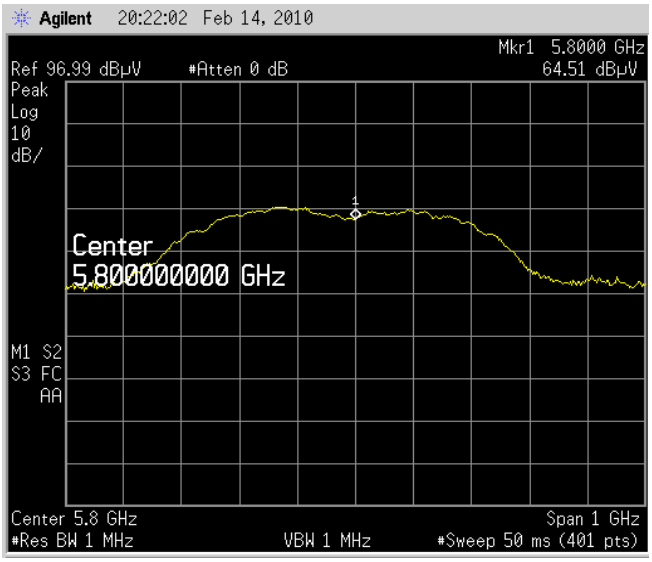
Test Specification: FCC PART 15, SECTION 47 CFR 15.209

The EUT was set up as described above. The measurement instrumentation used was a Spectrum Analyser with bandwidth parameters as stipulated in ANSI C63.4-2009.

The final measurements were carried out on the open area test site.

4.1 Test Data – Field Strength of Fundamental

The measurement plot below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.



Indicated		Correction			Corr	Turntable/Antenna			Class B		Det	EUT
Freq	Ampl	Ant	Cabl	Amp	Ampl	Ang	Ht	Pol	Ampl	Marg		Orien
GHz	dBµV	dB	dB	dB	dB µV/m	deg	m	V/H	dBµV/m	dB		
5.67	67	34.5	4.3	-38.5	67.3	0	1	V	74	6.7	Pk	V
5.89	66.9	34.5	4.3	-38.5	67.2	0	1.1	V	74	6.8	Pk	V
5.67	62.1	34.5	4.3	-38.5	62.4	0	1.2	V	74	11.6	Pk	H
5.875	63.2	34.5	4.3	-38.5	63.5	0	1	V	74	10.5	Pk	H
5.67	66.1	34.5	4.3	-38.5	66.4	0	1.2	H	74	7.6	Pk	H
5.89	66.3	34.5	4.3	-38.5	66.6	0	1	H	74	7.4	Pk	H

The margin is calculated as follows:
Margin = Corrected Amplitude – Limit, where Corrected Amplitude = Spectrum Analyser Amplitude + Cable Loss +Antenna Factor – Pre-Amp Gain.

Test-Data Summary – Peak Measurement:

Center Frequency	=	5670 MHz
Peak Level:	=	67.3 dBµV/m
Peak Limit (15.209)	=	74.00 dBµV/m (54 dBµV/m + 20 dB)

Average Level Calculation of Field Strength of Fundamental with Duty Cycle correction.

The duty cycle rating as provided by the manufacturer was 0.44% (or 0.0044) based on a 5 nS pulse width. Figures 8 and 9 show the measurements carried to determine the duty cycle.

The measurements were carried out on the transmitted signal via a crystal detector connected to the pre-amplifier output and a 2GHz bandwidth storage oscilloscope. The measurement exhibited a 5 nS peak pulse width (20 nS total width).

Pulse Repetition Frequency (prf): 330 kHz
Pulse Repetition Time: =1/prf = 2.53 µS (Figure 8)
Pulse Width: = 20 nS (Figure 9)
Duty Cycle: = Pulse Width/Pulse Repetition Time = 0.008 (0.8%)

Duty Cycle Correction	=	20 log (0.008) = -41.9 dB
Peak Level with Duty Cycle Correction	=	67.3 dBµV/m – 41.9 dB = 25.3 dBµV/m

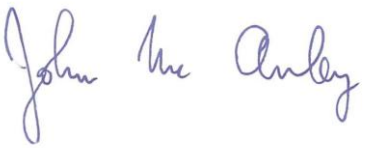
Test-Data Summary – Average Measurement:

Center Frequency	= 5800 MHz
Average Level:	= 25.3 dBµV/m (Calculated).
Average Limit (15.209)	= 54.00 dBµV/m

Conclusion

Sensor meets the requirements of the test reference for Fundamental Frequency Field Strength per FCC Part 15C

Result: Pass



5.0 Field Strength of Harmonics

Harmonics were measured up 40 GHz. No emissions of sufficient strength to exceed the minimum sensitivity of the instrumentation were measured.

Result: Pass

6.0 Field Strength of Spurious Radiated Emissions

Test Specification: FCC PART 15, SECTION 47 CFR 15.209

For the spurious and harmonics measurements, below 1GHz, the EUT was set up at a 3 meter distance from the receiving antenna, on an Open Area Test Site (OATS), with the EUT running in a continuous mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT had previously been recorded in a 3m semi anechoic chamber. For measurements above 1GHz, the EUT was set up at a 3 meter distance from the antenna, in a semi-anechoic chamber, with the EUT running in a continuous mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits.

Appendix A shows the results of the measurements on the Open Area Test Site and the pre scans in the anechoic chamber.

Result: Pass

7.0 List of Test Equipment

Instrument	Mftr.	Model	Calibration Due
Measuring Receiver	Rohde and Schwarz	ESVS30	07/04/11
Bilog Antenna	Chase	CBL6111	02/10/10
Spectrum Analyser	Agilent	E4408L	23/6/10
Spectrum Analyser	Agilent	8565EC	10/2/11
Measuring Receiver	Rohde and Schwarz	ESHS30	27/10/11
LISN	Rohde and Schwarz	ESH3-Z5	30/07/10
Spectrum Analyser	Agilent	E4408B	23/06/10
Horn Antenna	EMCO	3115	12/04/10
Preamplifier	Hewlett Packard	83017A	13/10/10
Crystal Detector	Hewlett Packard	8470B	29/04/11
Oscilloscope	Tektronix	794D	30/04/11

Appendix A
Test Results

Table 1 - Radiated Emissions, OATS

Horizontal and Vertical Maximum

Antenna Distance: 3m
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)
30	24.0	40	Vertical	1.0	-16
38.28	25.2	40	Vertical	1.0	-14.8
53.64	26.0	40	Vertical	1.0	-14
60.24	32.9	40	Vertical	1.5	-7.1
83.52	19.0	40	Vertical	1.2	-21
112.56	21.2	43.52	Vertical	1.6	-22.32

Corrected Level = Recorded Level + Antenna Factor + Cable Loss

Note: Scans are shown below to 40 GHz, no spurious emissions found

COMMENT: PASS

Compliance Engineering Ireland ltd
Conducted Emissions

Comment: Live

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

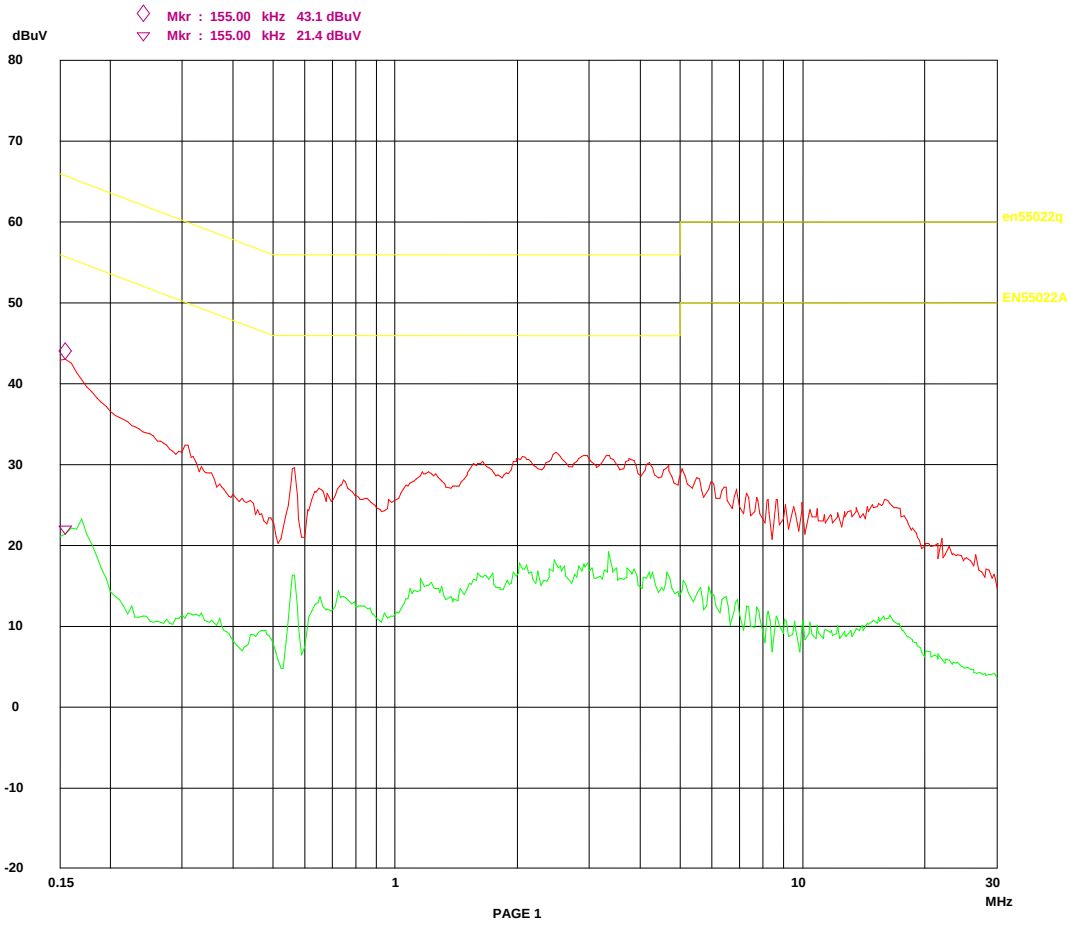


Figure 1: Conducted Emissions (Live)

Compliance Engineering Ireland ltd
Conducted Emissions

Comment: Neutral

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

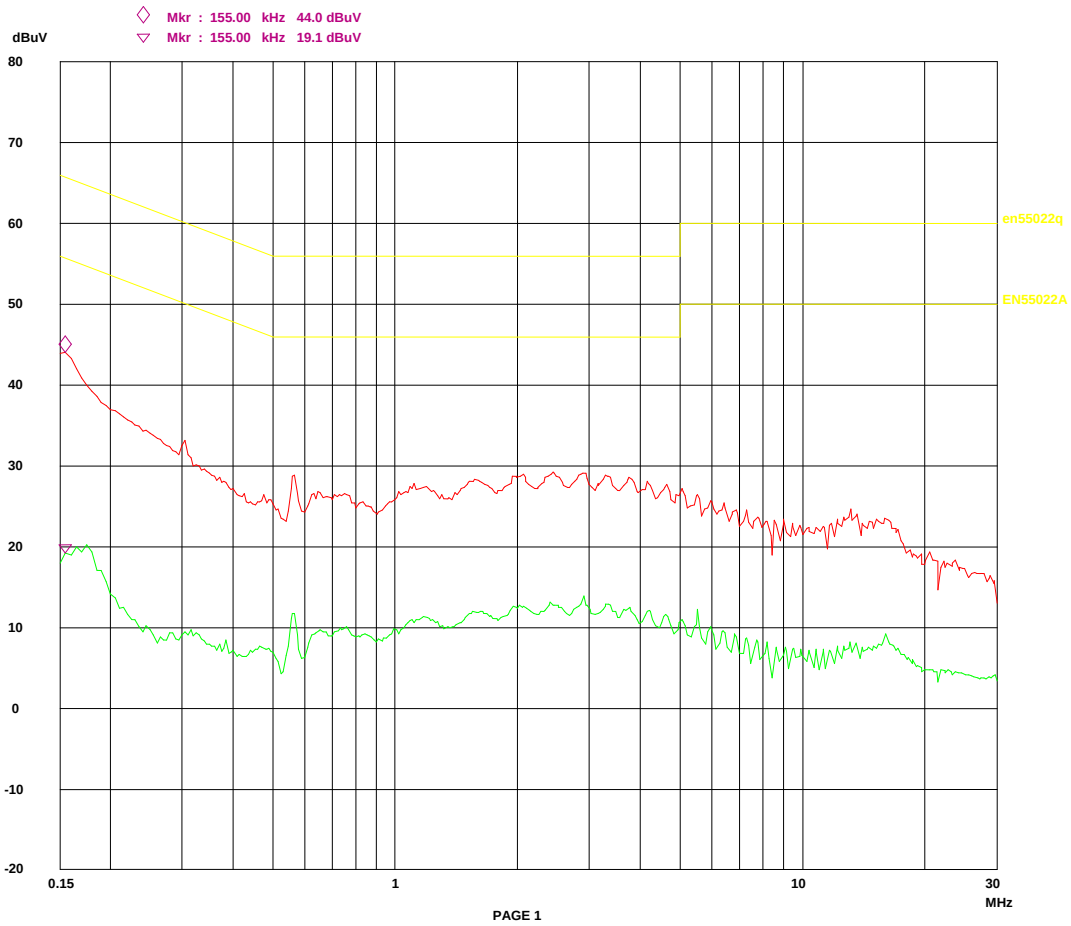


Figure 2: Conducted Emissions (Neutral)

RADIATED EMISSIONS

14. Feb 10 20:59

Operator: P Reilly
Test Spec: FCC 15.209

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	300M	120k	120k	PK	5ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
21	20M	300M	Bicn_615

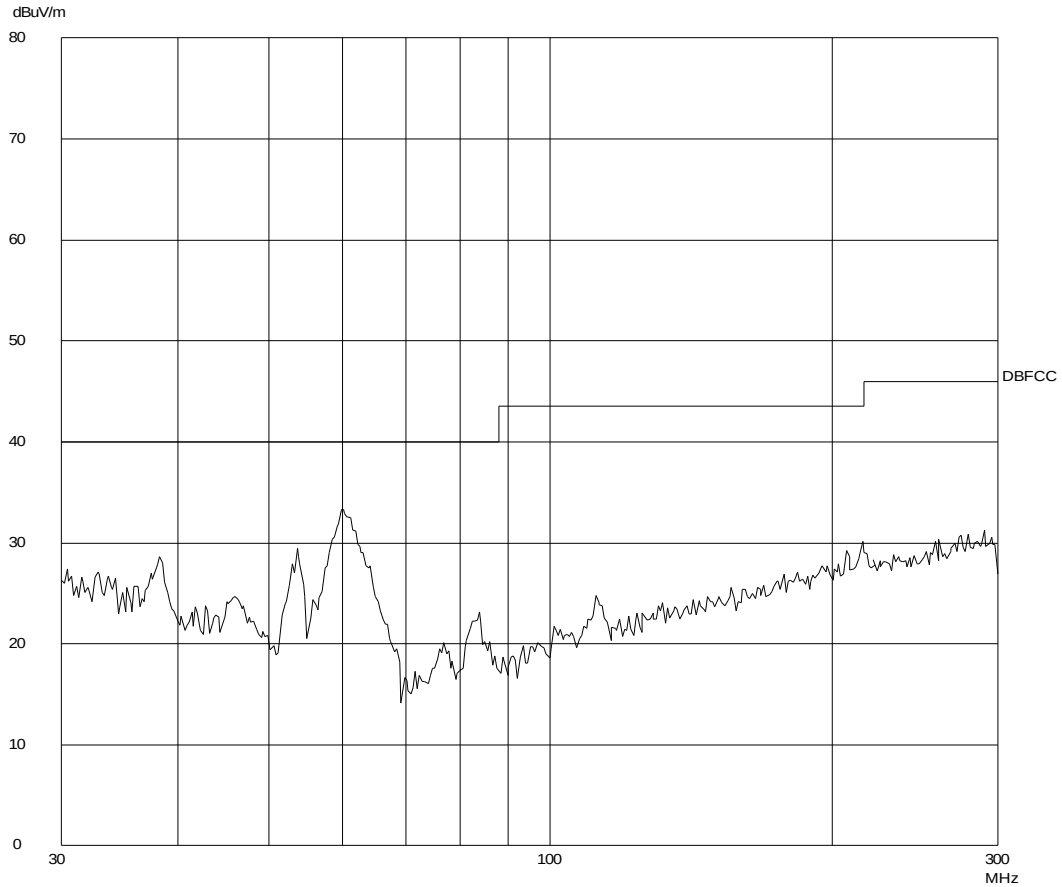


Figure 3: 3m pre-scan from 30 MHz to 300 MHz in anechoic chamber

RADIATED EMISSIONS

14. Feb 10 21:12

Operator: P Reilly
Test Spec: FCC 15.209

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
300M	1000M	120k	120k	PK	5ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
22	300M	1000M	LogP_615

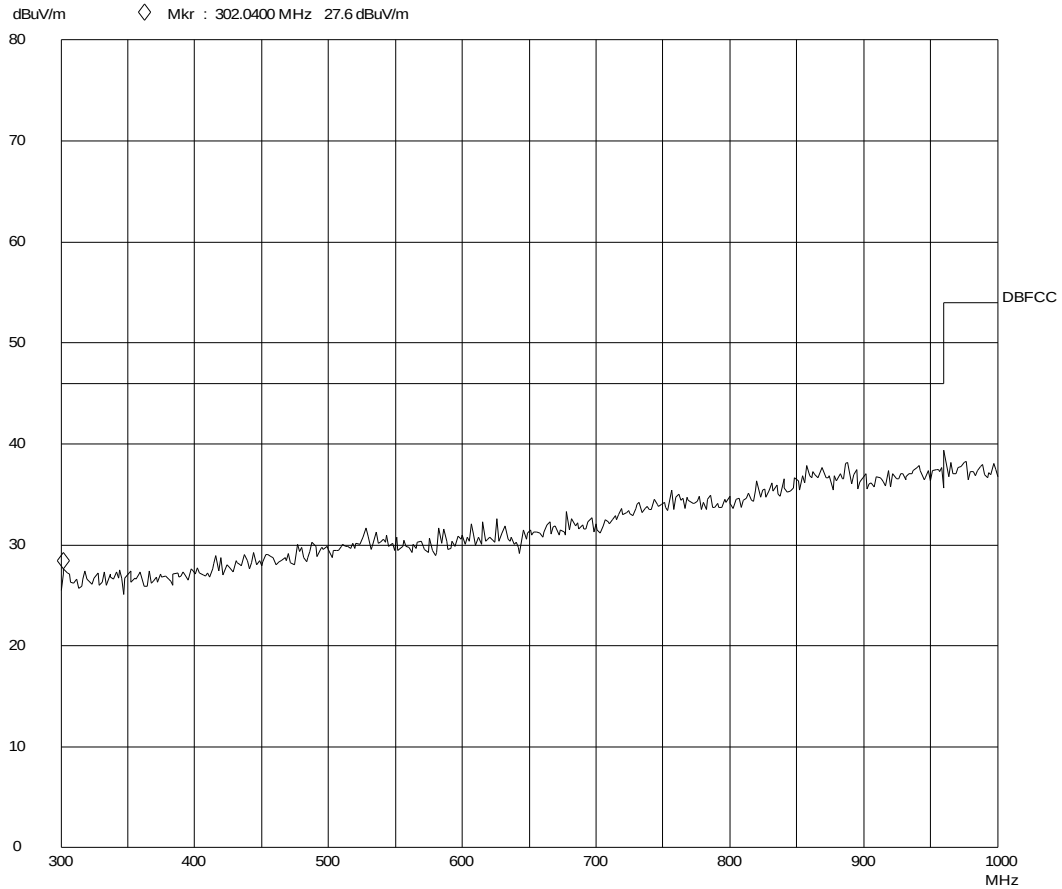


Figure 4: 3m pre-scan from 300 MHz to 1000 MHz in anechoic chamber

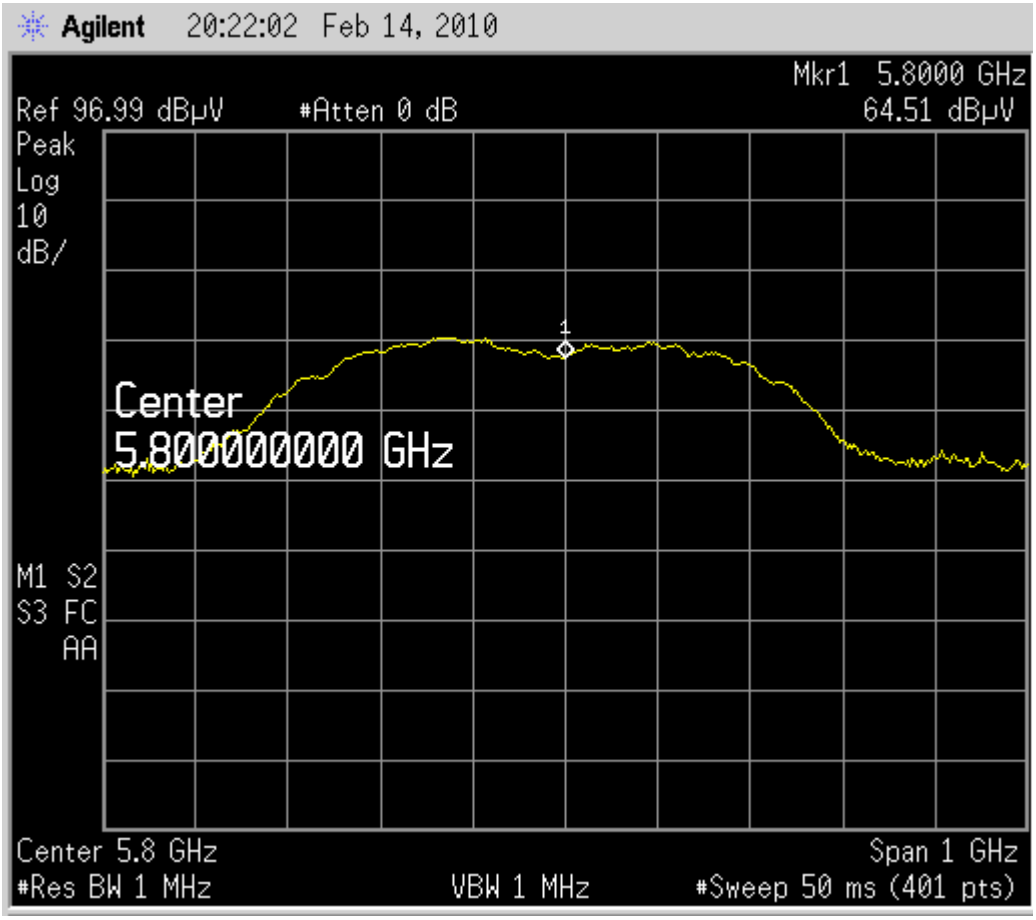


Figure 5: Field Strength of Fundamental

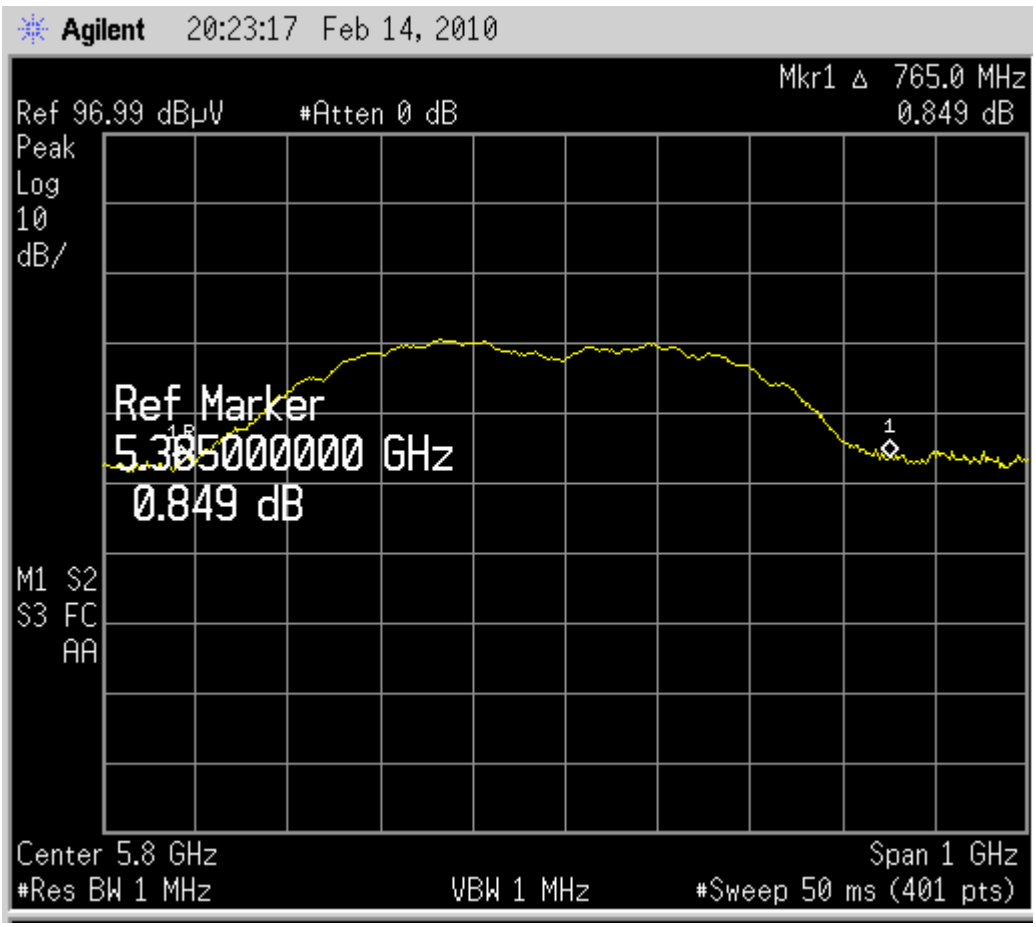


Figure 6: Occupied Bandwidth

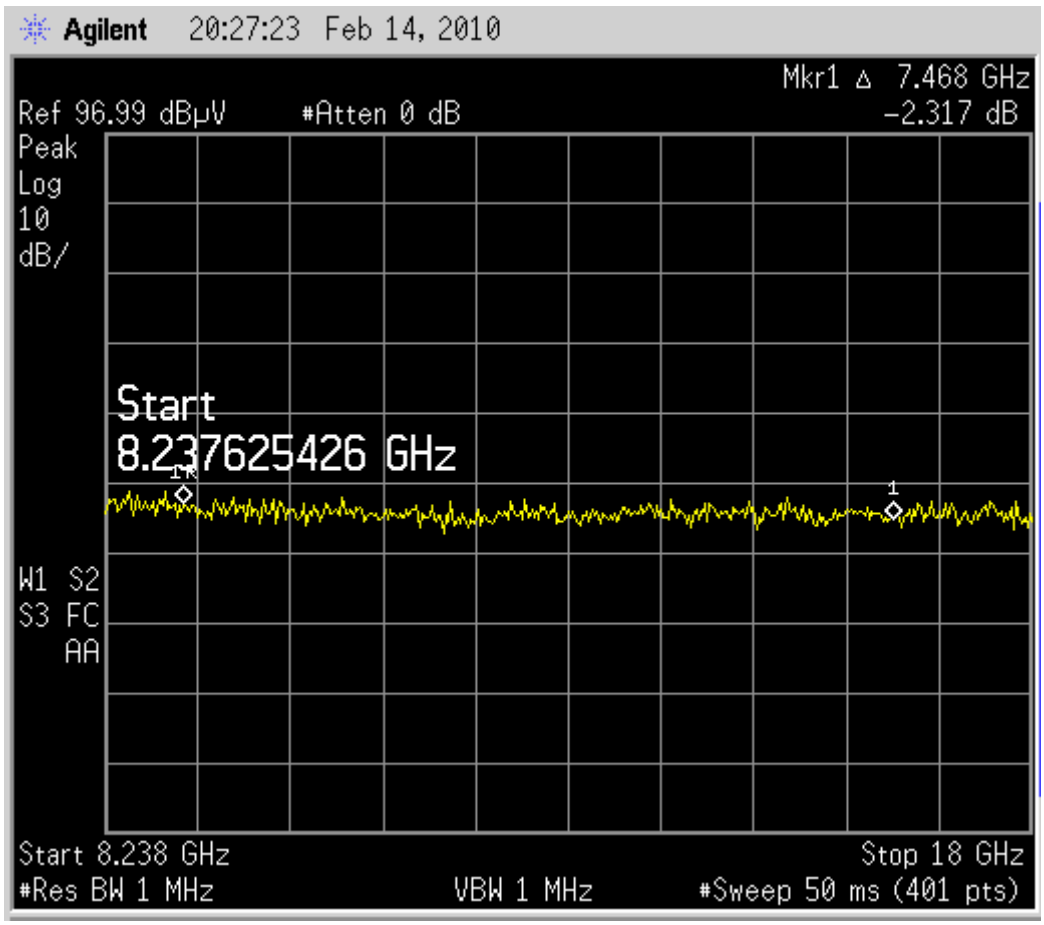


Figure 7: 8 GHz to 18 GHz

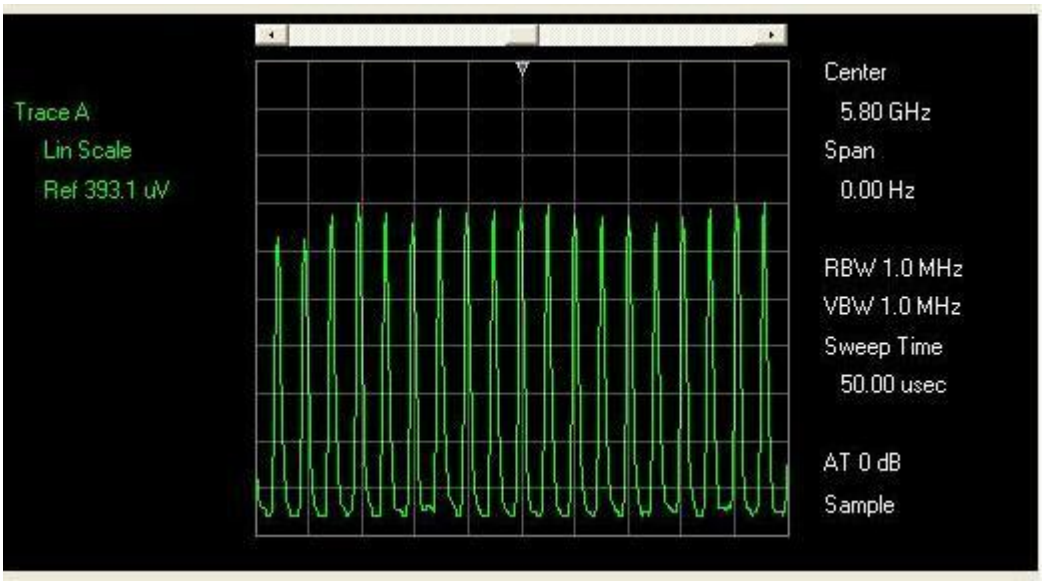


Figure 8: Repetition Rate

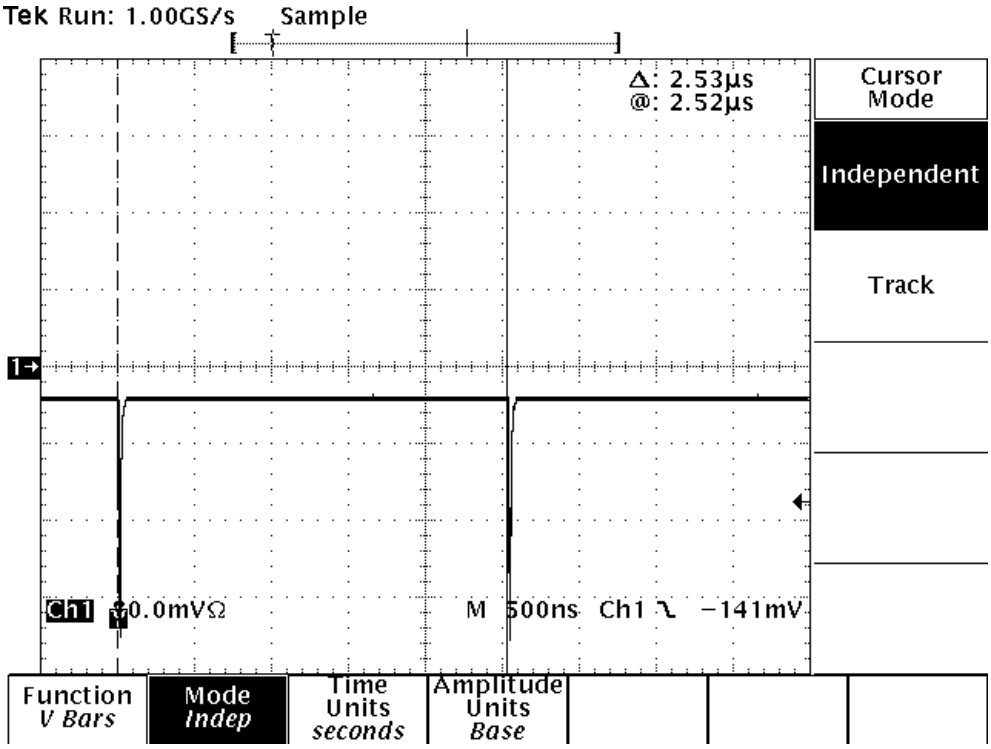


Figure 8a: Pulse Repetition Rate, Time Domain Measurement

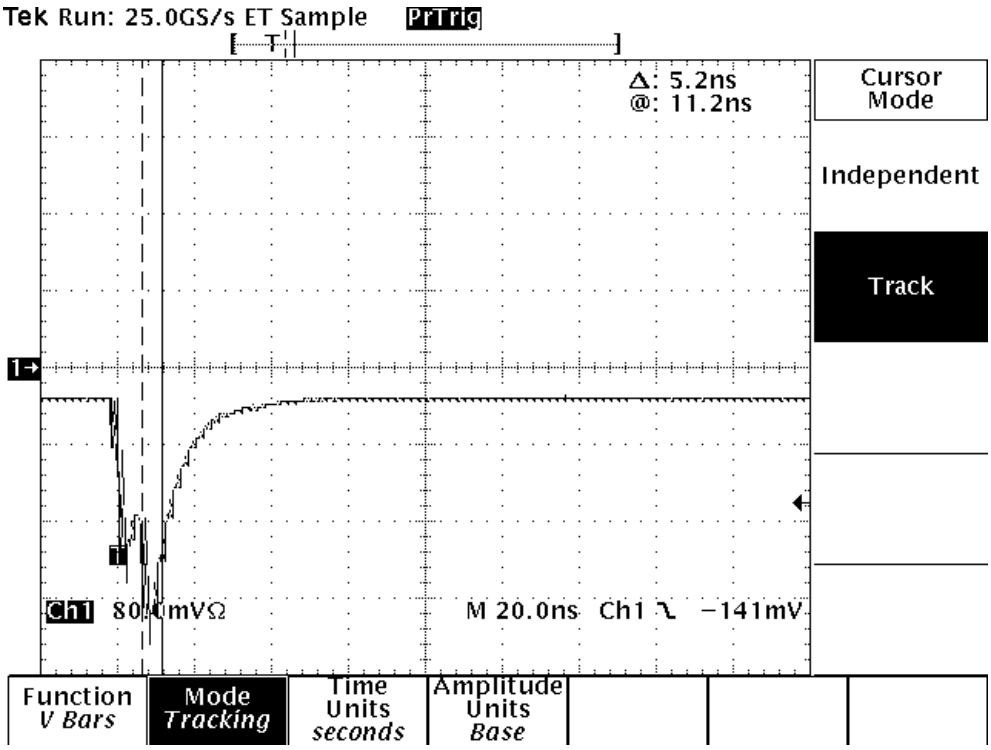


Figure 9: Pulse Width Measurement, 20 nS full width

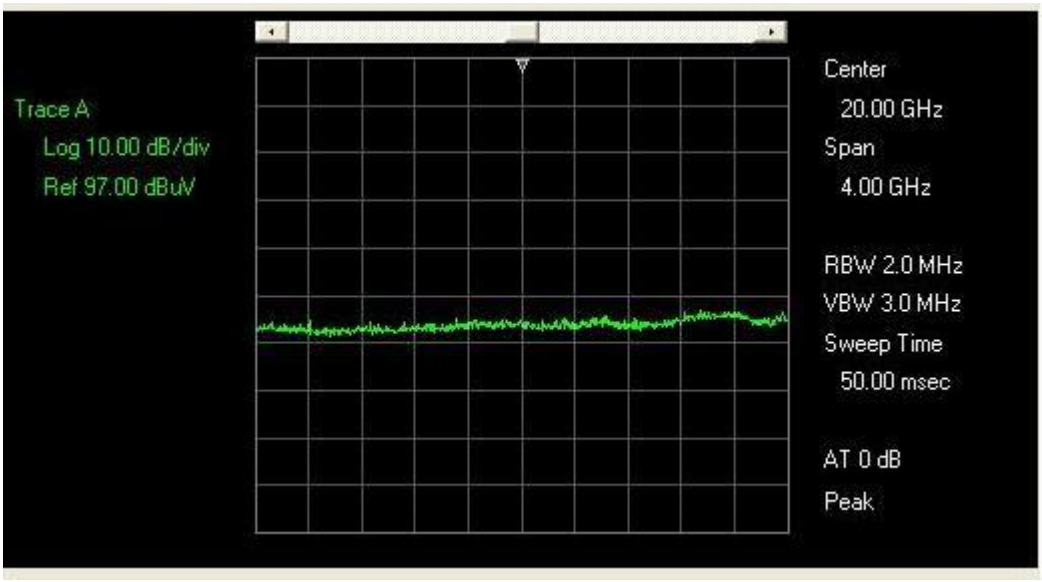


Figure 10: 18 GHz to 22 GHz

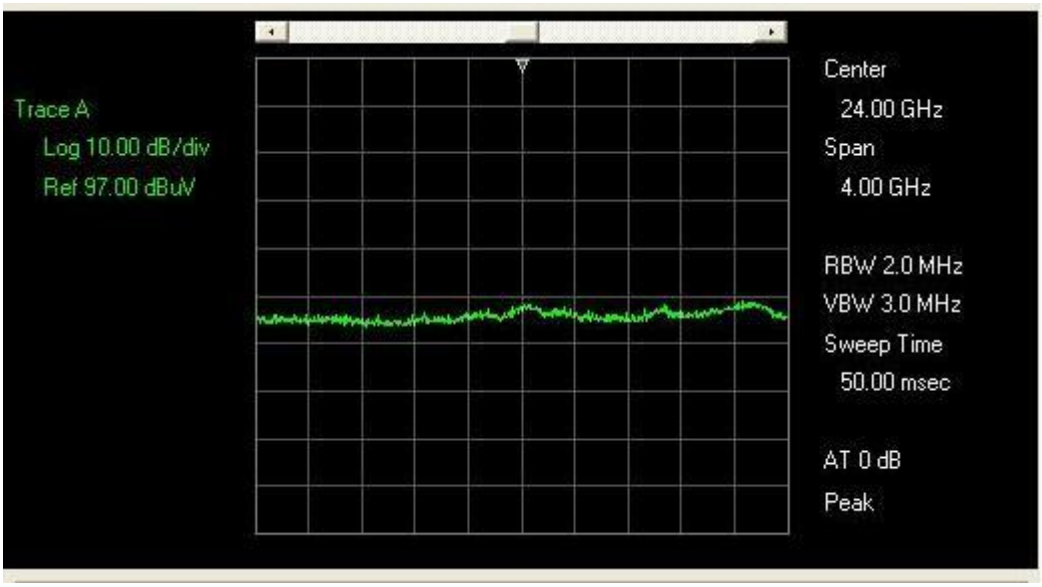


Figure 11: 22 GHz to 26 GHz

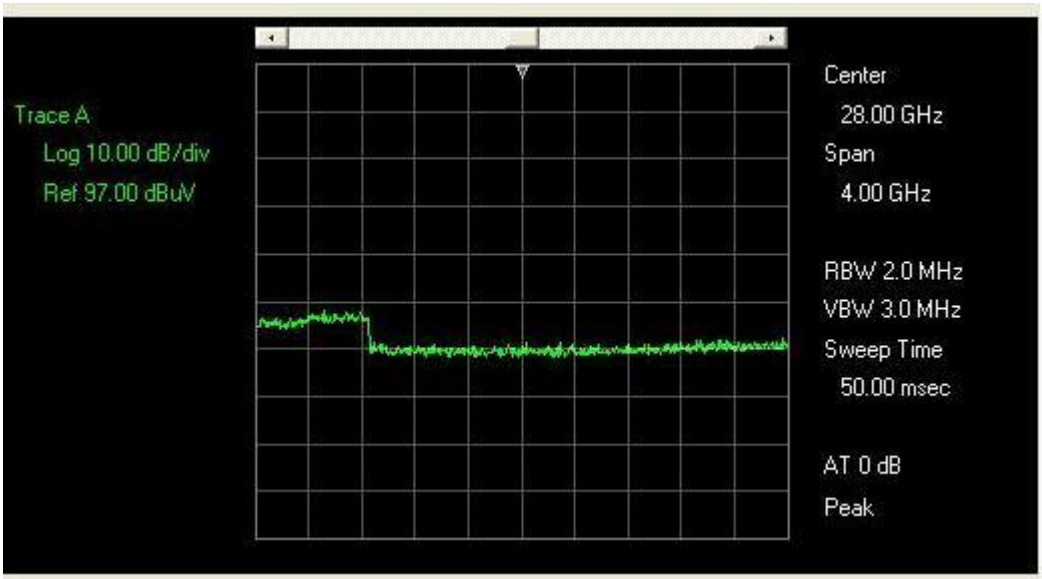


Figure 12: 26 GHz to 30 GHz

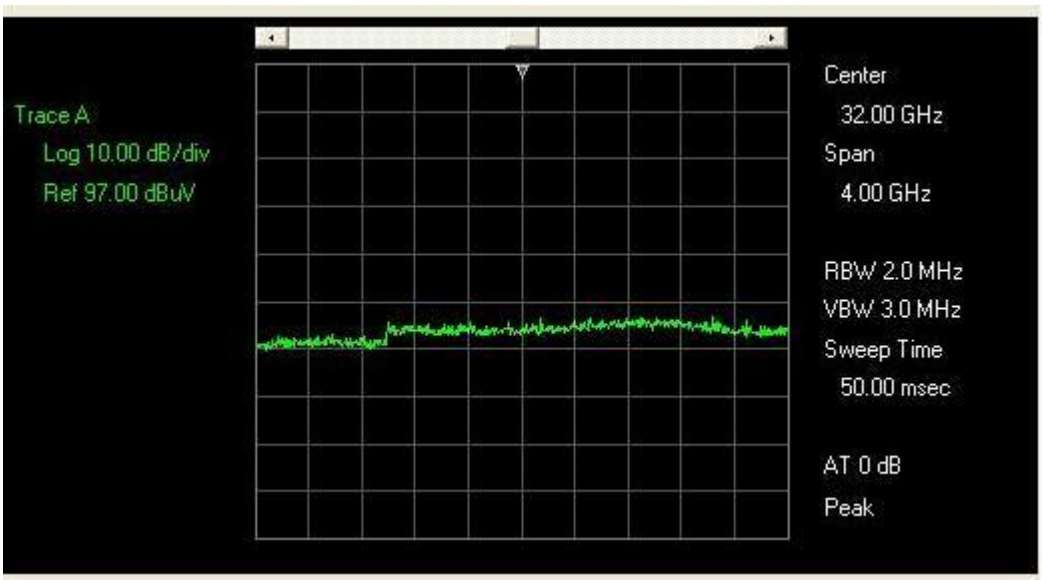


Figure 13: 30 GHz to 34 GHz

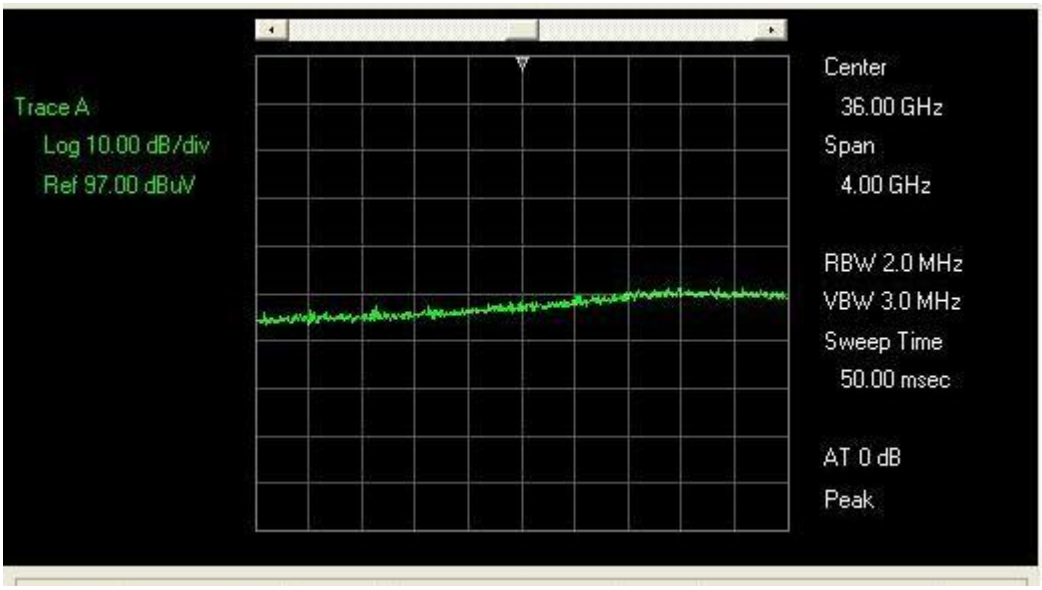


Figure 14: 34 GHz to 38 GHz

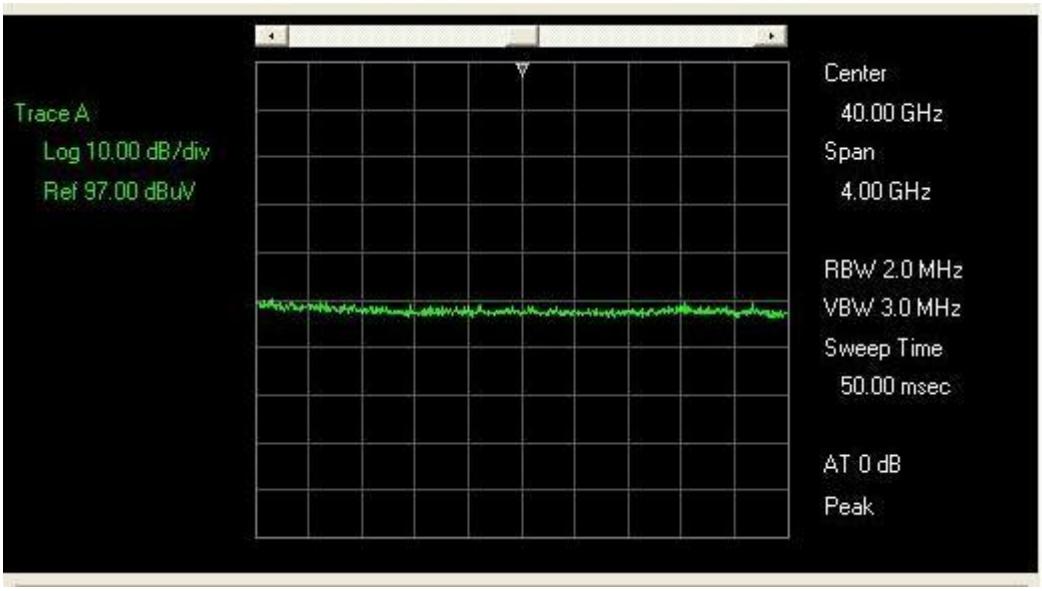


Figure 15: 38 GHz to 42 GHz

Appendix B
Test Setups

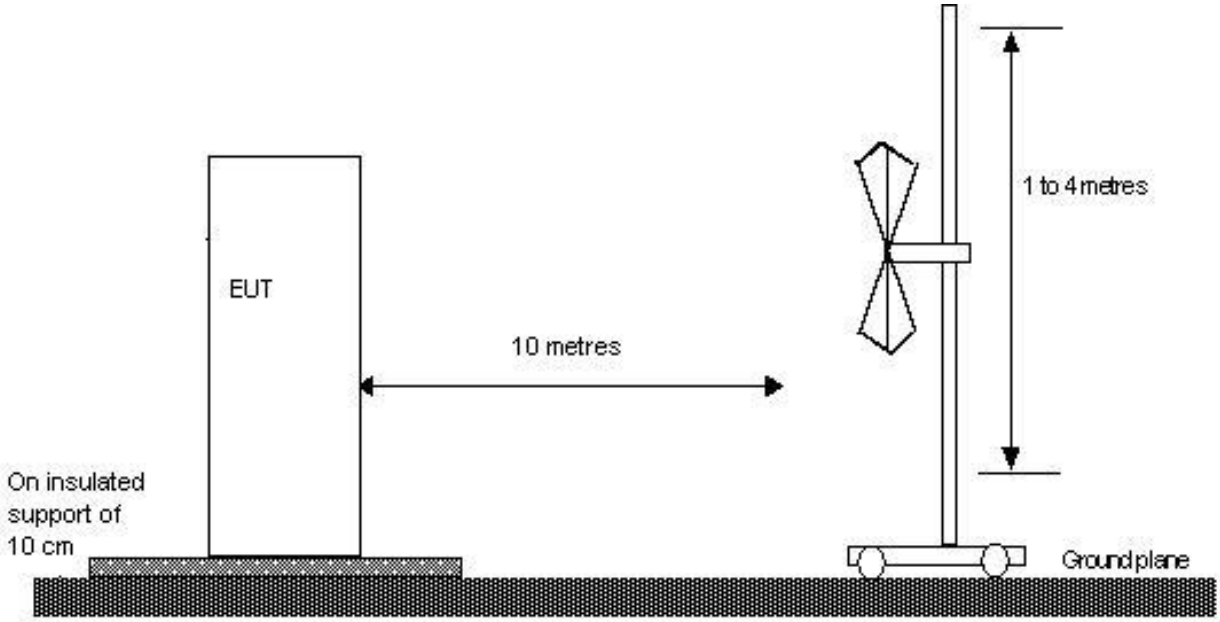
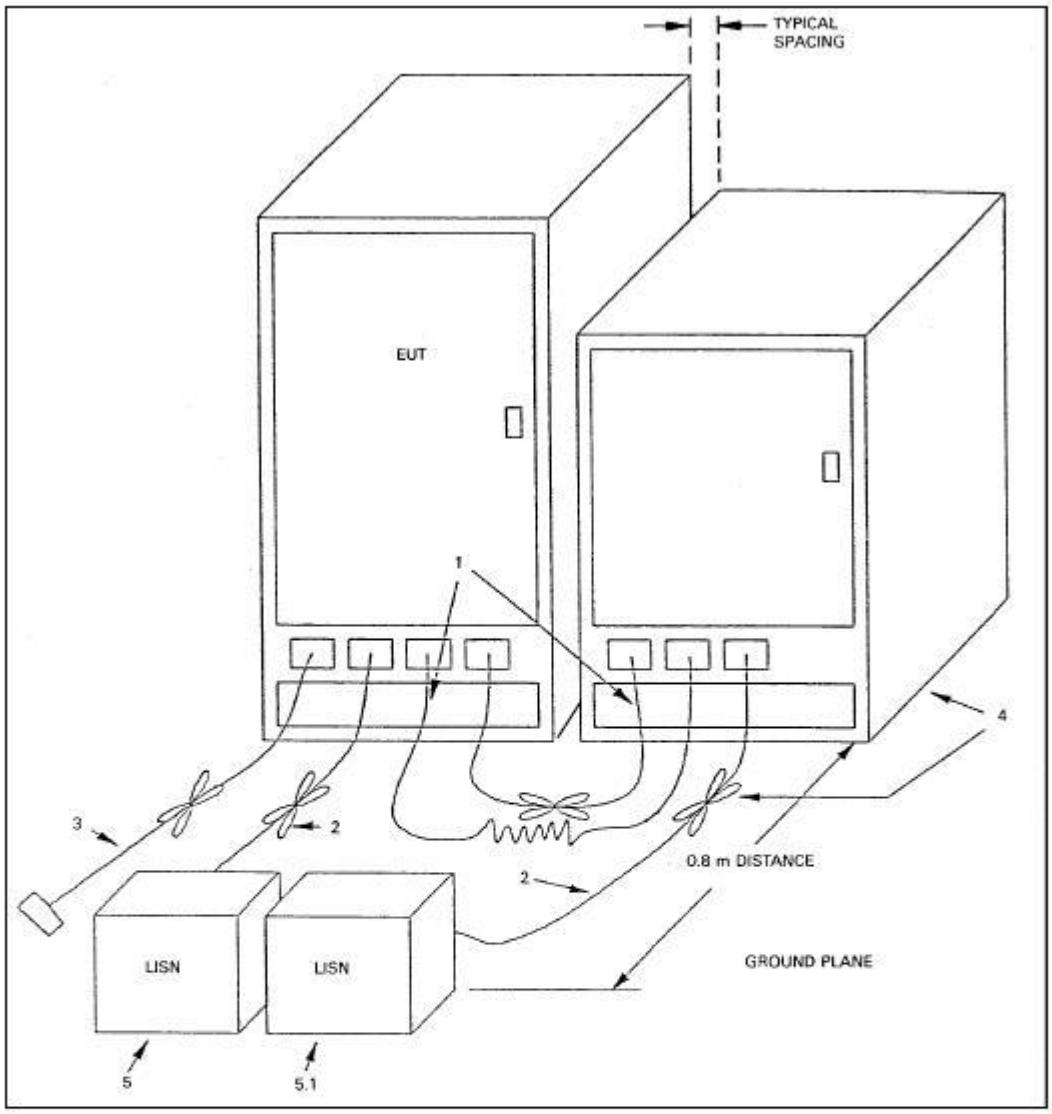


FIGURE 1: Radiated Emissions Test Setup – Test Distance 3m



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

Figure 1: Radiated emissions setup on open area site

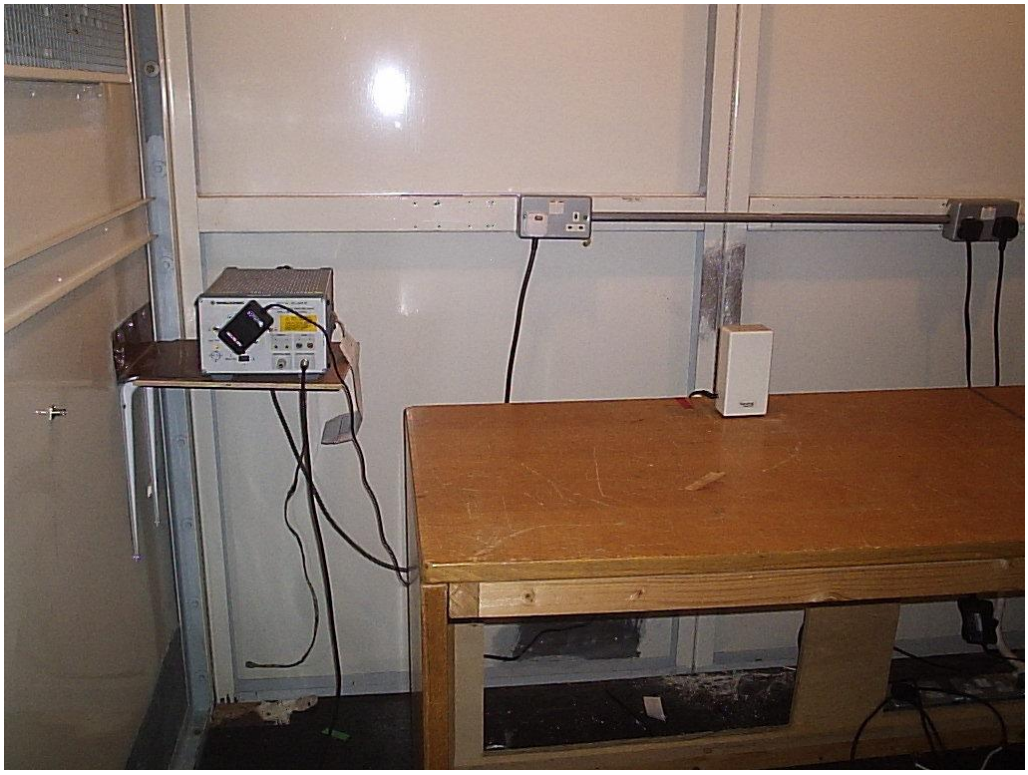


Figure 2: Conducted Emissions setup