REPORT ON

FCC Part 15 Testing of a Dolphin 7400RF Mobile Computer
FCC ID: HD5-7400-3021

Report No OR609644A June 2002

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BABT

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REPORT ON EMC Testing of a Dolphin 7400RF Mobile Computer
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June 2002

PREPARED FOR

Hand Held Products
4619 Jordan Road
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APPROVED BY

C H Gould
Chief Engineer

DATED 13 June 2002

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STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Mobile Computer
APPLICANT	Hand Held Products 4619 Jordan Road Box 187 Skaneateles Falls NY 13153-0187 USA
MANUFACTURER	Hand Held Products 4619 Jordan Road Box 187 Skaneateles Falls NY 13153-0187 USA
MANUFACTURERS MODEL NUMBER	Dolphin 7400RF
SERIAL NUMBER	DL2/00877
TEST SPECIFICATION NUMBER	FCC Part 15 Subpart C: 2000
REGISTRATION NUMBER	OR609644
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal N/A N/A
ORDER NUMBER DATE	D080551-00 25 April 2002
START OF TEST FINISH OF TEST	1 May 2002 2 May 2002
TEST ENGINEERS	A R Hubbard
RELATED DOCUMENTS	ANSI C63.4 1992. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 10 kHz to 1 GHz.

SYSTEM CONFIGURATION DURING EMC TESTING

The Dolphin 7400RF was set-up simulating a typical user installation on the Open Field Test Site identified on page 11, and tested in accordance with the specification.

The EUT was functioning correctly during all testing, and was configured to scan a barcode, and transmit the information to a laptop computer via an Access Point, see Figure 1 and page 5.

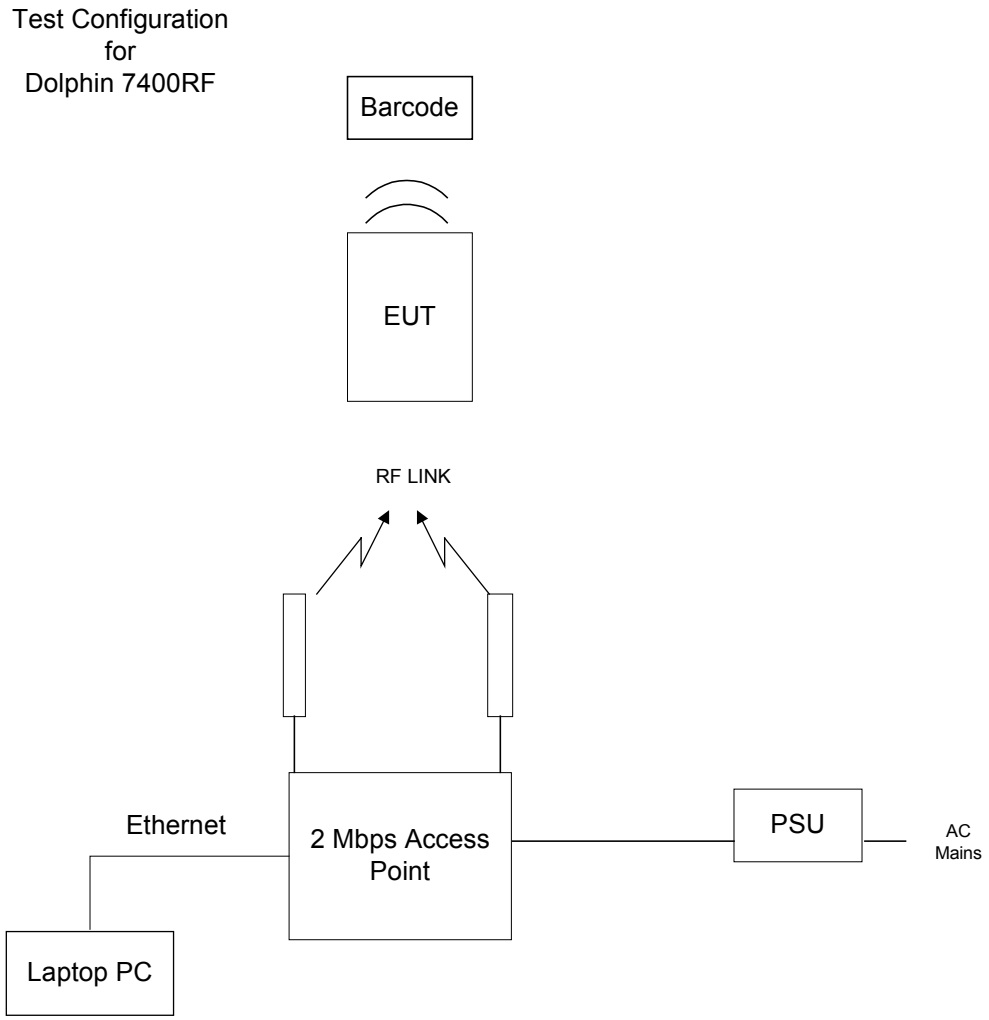


Figure 1

TEST SETUP PHOTOGRAPH

The photograph below shows the EUT configuration during Radiated Emission testing.

EQUIPMENT INFORMATION

Equipment under Test (EUT):

Equipment	Manufacturer	Type No	Serial No
Mobile Computer	Hand Held Products	Dolphin 7400RF	DL2/00877

Instrumentation used for Emission Testing:

Instrument	Manufacturer	Type No	EMC No	Cal to
EMI Receiver	Hewlett Packard	8542E	2286	11 Dec 02
Biconical Antenna	Ailtech	94455-1	422	5 Dec 02
Log Periodic Antenna	Amplifier Research	AT1000	829	16 Nov 02
Biconical Antenna	Ailtech	94455-1	618	17 May 02
Log Periodic Antenna	Amplifier Research	AT1000	956	16 May 02
Turntable & Controller	Emco	1060	1322	TU
Antenna Mast & Controller	Emco	1050	1321	TU
Spectrum Analyser	Agilent	E4407B	2783	11 Feb 03
Horn	EMCO	3115	2397	26 May 02
Horn	EMCO	3115	2297	26 May 02
Signal Generator	Rohde & Schwarz	SMR40	2768	23 Feb 03
Low Noise Amplifier	Adams Russell	AWT18036	1081	25 Apr 03
Low Noise Amplifier	Avanteck	AMT-26177-33	2072	TU
Attenuator 10dB	Wenschel	48-10-43	2719	20 Dec 02
Attenuator 10dB	Marconi	6534/3	1494	TU
Horn	FMI	2024/20	1396	TU
Waveguide to Coax Adaptor	FMI	2093SF40	S/N 595	TU

TU - Traceability Unscheduled

Equipment used to exercise EUT during testing:

Equipment	Manufacturer	Model	Serial No.
Laptop Computer	Dell	PPL	0009321C-12800-86C-4090
AC/DC Adapter	Dell	AA20031	16291-95F-4678
Access Point	Symbol Technologies	AP3020	ALPH4576
AC/DC Adapter	Symbol Technologies	50-24000-006	973002965

RADIATED ELECTRIC FIELD EMISSIONS

TEST PROCEDURE

Testing to the requirements of FCC Part 15 Subpart C, Section 15.209, for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed on page 11.

A preliminary profile of the Radiated Electric Field Emissions was obtained by operating the Equipment Under Test (EUT) on a remotely controlled turntable within a Characterisation Chamber; measurements were taken at a 3m distance. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst case emissions together with the EUT azimuth and antenna polarisation.

The EUT was then transferred to the Open Field Site and placed on a remotely controlled turntable. Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 30MHz to 25GHz. The list of worst case emissions was then confirmed or updated under Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. Emissions levels were then formally measured using a Quasi-Peak Detector which met the CISPR requirements in the frequency range 30MHz to 1000MHz and a peak detector in the frequency range 1GHz to 25GHz. The details of the worst case emissions were then recorded and are presented in Table 1.

Radiated Electric Field Emissions measurements were made using a Hewlett Packard 8542E EMI Receiver in the frequency range 30MHz to 1000MHz and an Agilent E4407B Spectrum Analyser in the frequency range 1GHz to 25GHz.

The test was performed in accordance with ANSI C63.4.

RADIATED ELECTRIC FIELD EMISSIONS (cont'd)

TEST RESULTS

Equipment Designation : Intentional Radiator.

The EUT met the requirements of FCC Part 15 Subpart C for Radiated Electric Field Emissions.

The emissions were measured at 3m.

Open Field Site Results : The levels of the 2 highest emissions measured in accordance with the specification are presented in Table 1 below :-

Emission Frequency	Pol	Hgt	Azm	Level at 3m	Cable Loss	Antenna Factor	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV	dB	dB	dBµV/m	µV/m	dBµV/m	µV/m
722.6	V	100	0	11.9	5.3	21.2	38.4	83.2	46.0	200.0
825.2	V	100	0	-1.2	5.6	22.5	26.9	22.1	46.0	200.0

Table 1

The margin between the specification requirements and all other emissions was 15dB or more below the specification limit.

Calculations**:** The results in the above table were calculated using the following formulae:

Field Strength (dBµV/m) = Level at 3m + Cable loss + Antenna Factor

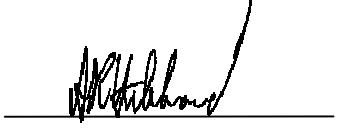
Field Strength µV/m = $10^{\left(\frac{dB\mu V/m}{20}\right)}$

ABBREVIATIONS FOR ABOVE TABLE

H	Horizontal Polarisation	V	Vertical Polarisation
Pol	Polarisation	Hgt	Height
deg	degree	Azm	Azimuth

Procedure Test Performed in accordance with ANSI C63.4.

Performed by: A R Hubbard, EMC Engineer.

Signature: 

Date: 1 May 2002

MAXIMUM PEAK OUTPUT POWER

TEST PROCEDURE

Testing to the requirements of FCC Part 15 Subpart C, Section 15.247(b)(1), for Maximum Peak Output Power was carried out on the Measurement Test Facility detailed on page 11.

The EUT was placed on a remotely controlled turntable on the Open Field Site. Measurements of the Maximum Peak Output Power of the EUT carrier were made in both antenna polarisations. Emission levels were maximised by adjusting the antenna height and turntable azimuth. Emissions levels were then formally measured using a Peak Detector. The details of the worst case emissions were then recorded and are presented in Table 2.

Maximum Peak Output Power measurements were made using an Agilent E4407B Spectrum Analyser.

The test was performed in accordance with ANSI C63.4.

MAXIMUM PEAK OUTPUT POWER (cont'd)

TEST RESULTS

The EUT met the requirements of FCC Part 15.247(b)(1) for Maximum Peak Output Power.

The emissions were measured at 3m.

Open Field Site Results : The levels of the carrier in both polarisations measured in accordance with the specification are presented in Table 2 below :-

Emission Frequency	Pol	Hgt	Azm	EIRP at 3m	
MHz	H/V	cm	deg	dBm	Watts
2435.9	V	111	300	19.78	0.095
2445.1	H	100	212	15.869	0.039

Table 2

Calculations: The figures in Watts in the above table were calculated using the formula:

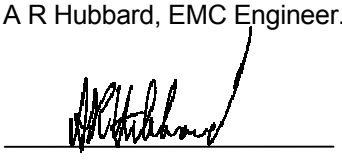
$$\text{EIRP in Watts} = \frac{10^{\left(\frac{dBm}{10}\right)}}{1000}$$

ABBREVIATIONS FOR ABOVE TABLE

H	Horizontal Polarisation	V	Vertical Polarisation
Pol	Polarisation	Hgt	Height
deg	degree	Azm	Azimuth

Procedure Test Performed in accordance with ANSI C63.4.

Performed by: A R Hubbard, EMC Engineer.

Signature: 

Date: 1 May 2002

PHOTOGRAPHS OF EQUIPMENT

Photograph 2
General view of Dolphin 7400RF

PHOTOGRAPHS OF EQUIPMENT

Photograph 3
Rear view of Dolphin 7400RF

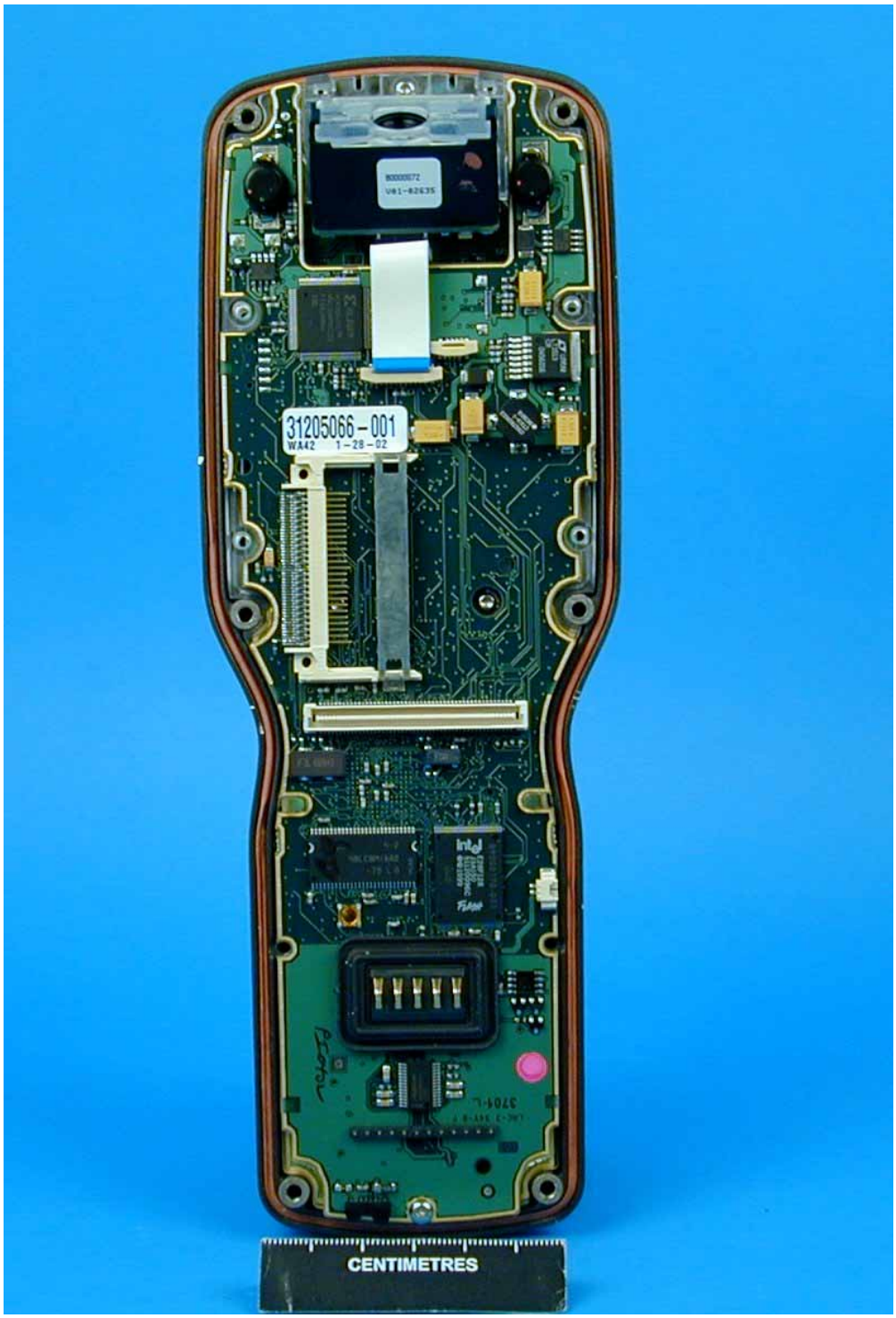
PHOTOGRAPHS OF EQUIPMENT

Photograph 4
Dolphin 7400RF, battery removed

PHOTOGRAPHS OF EQUIPMENT

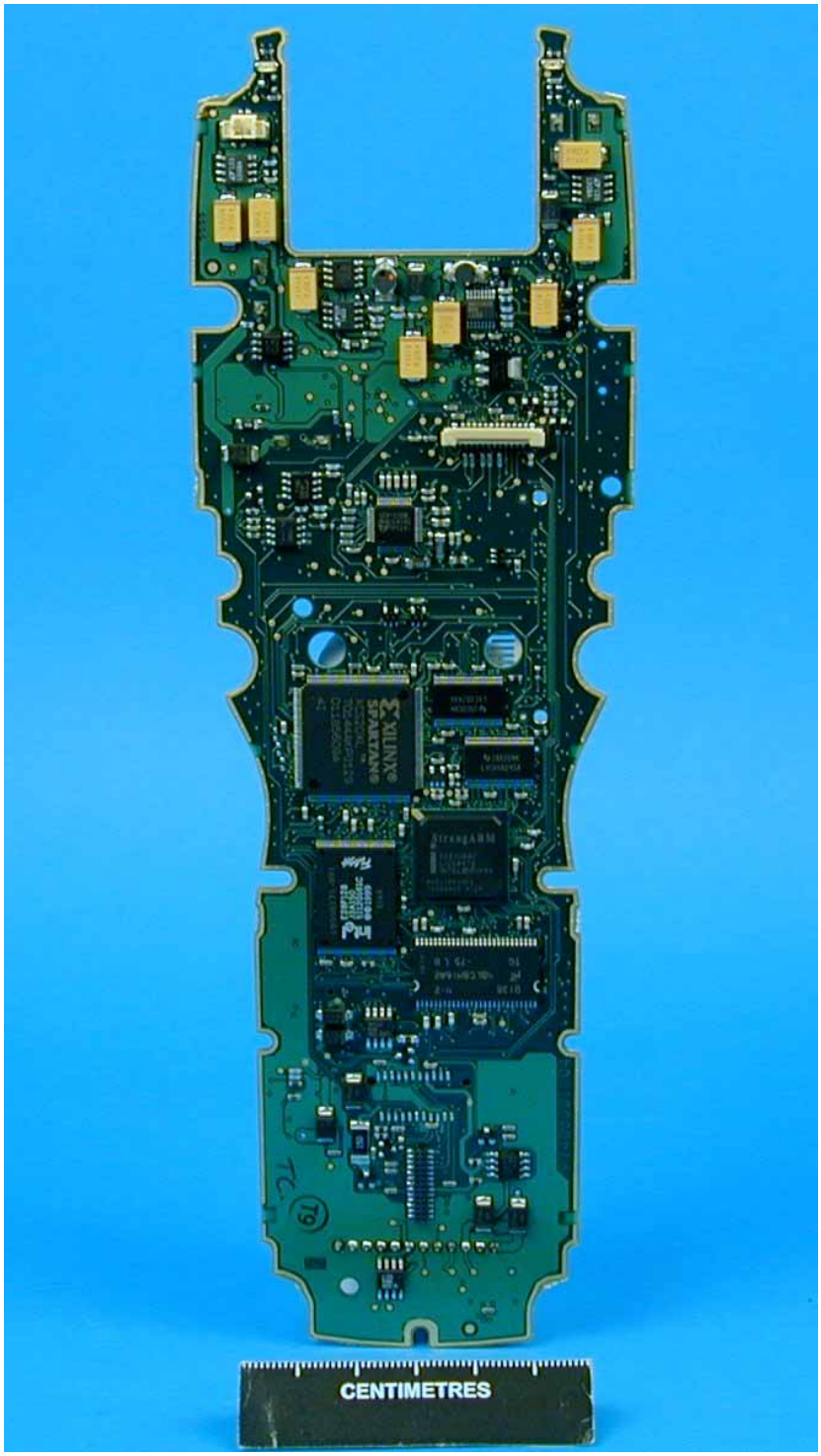
Photograph 5
Dolphin 7400RF, internal view

PHOTOGRAPHS OF EQUIPMENT



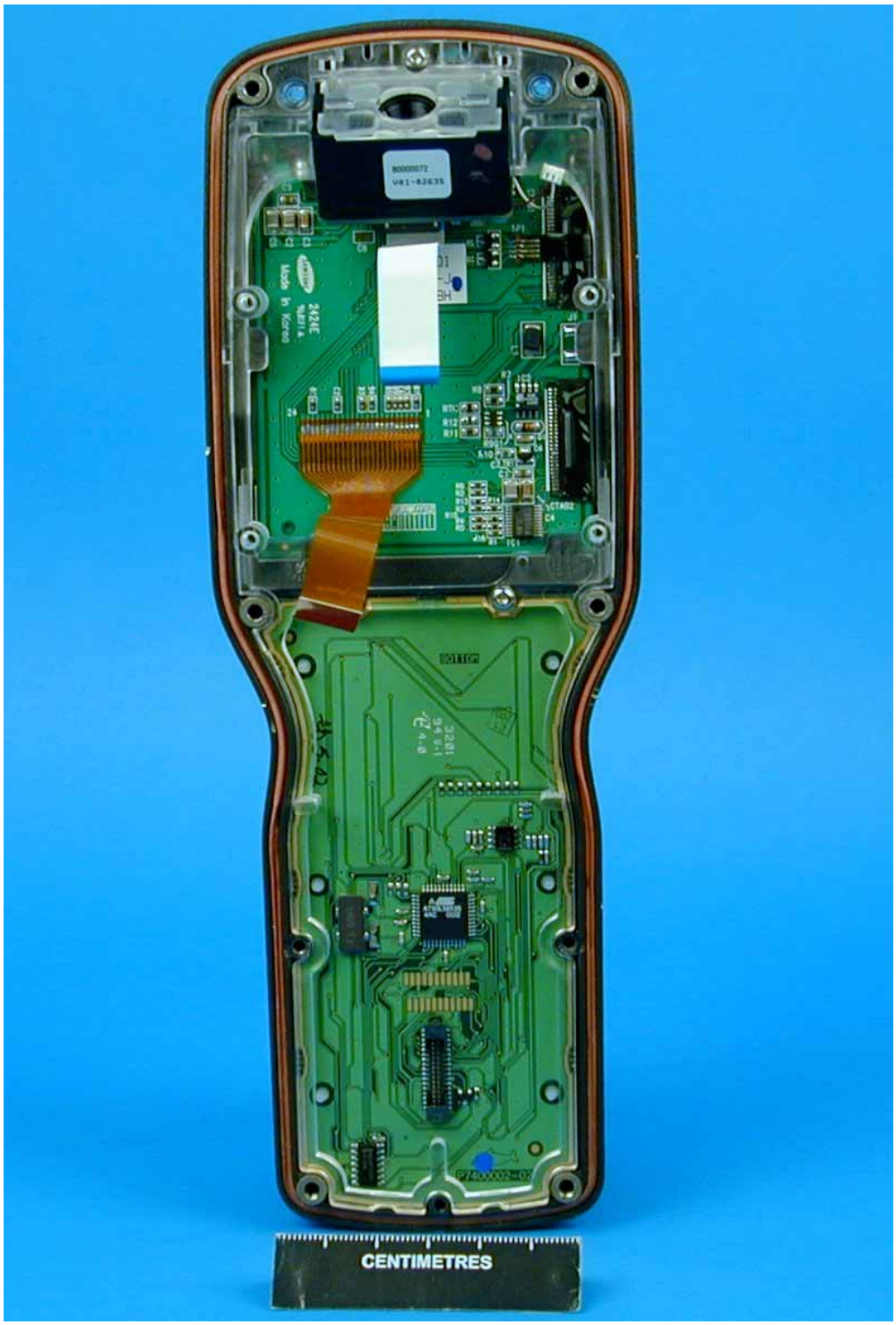
Photograph 6
Dolphin 7400RF, internal view showing top pcb

PHOTOGRAPHS OF EQUIPMENT



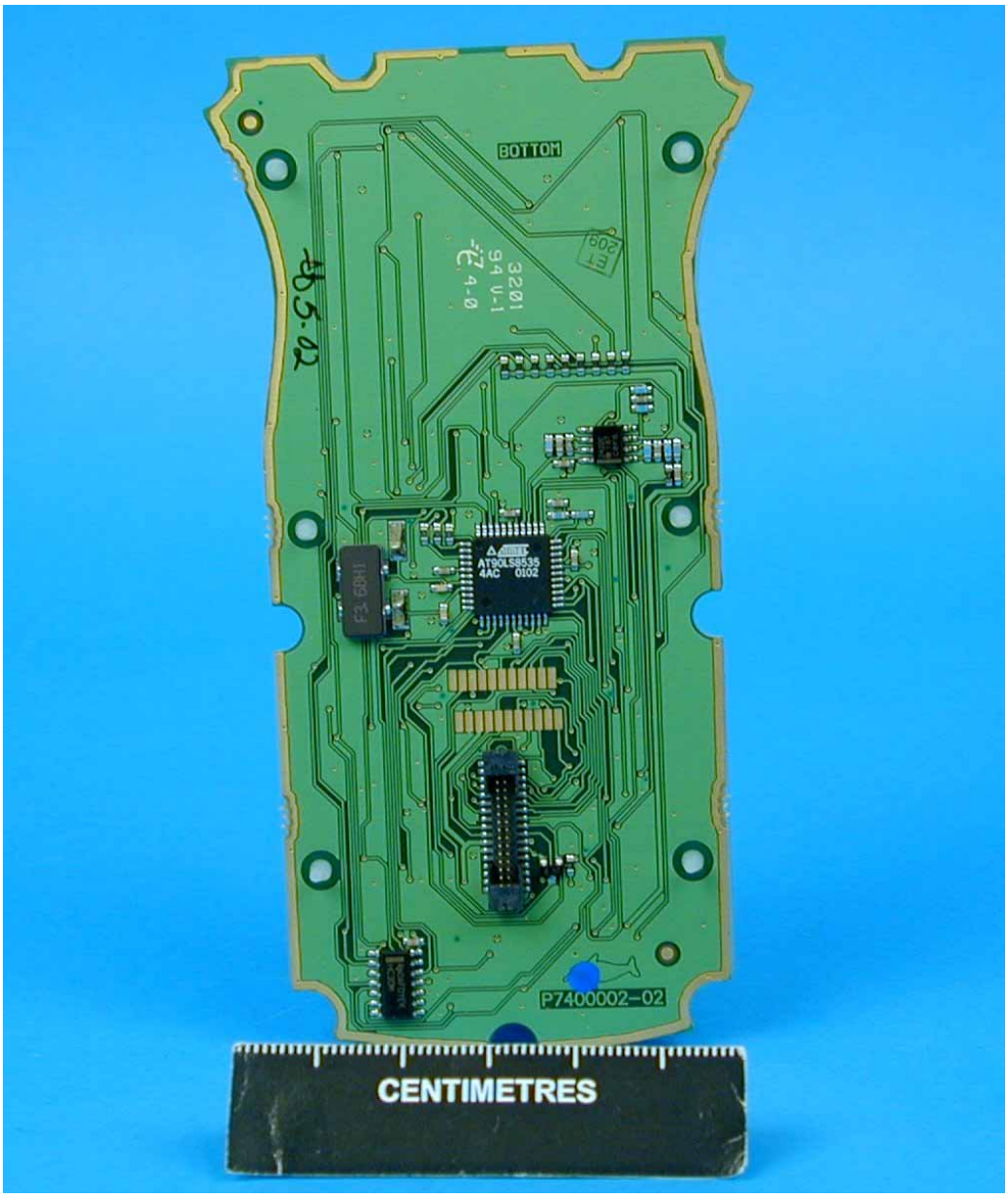
Photograph 7
View of underside of top pcb

PHOTOGRAPHS OF EQUIPMENT



Photograph 8
Internal view, top pcb removed

PHOTOGRAPHS OF EQUIPMENT

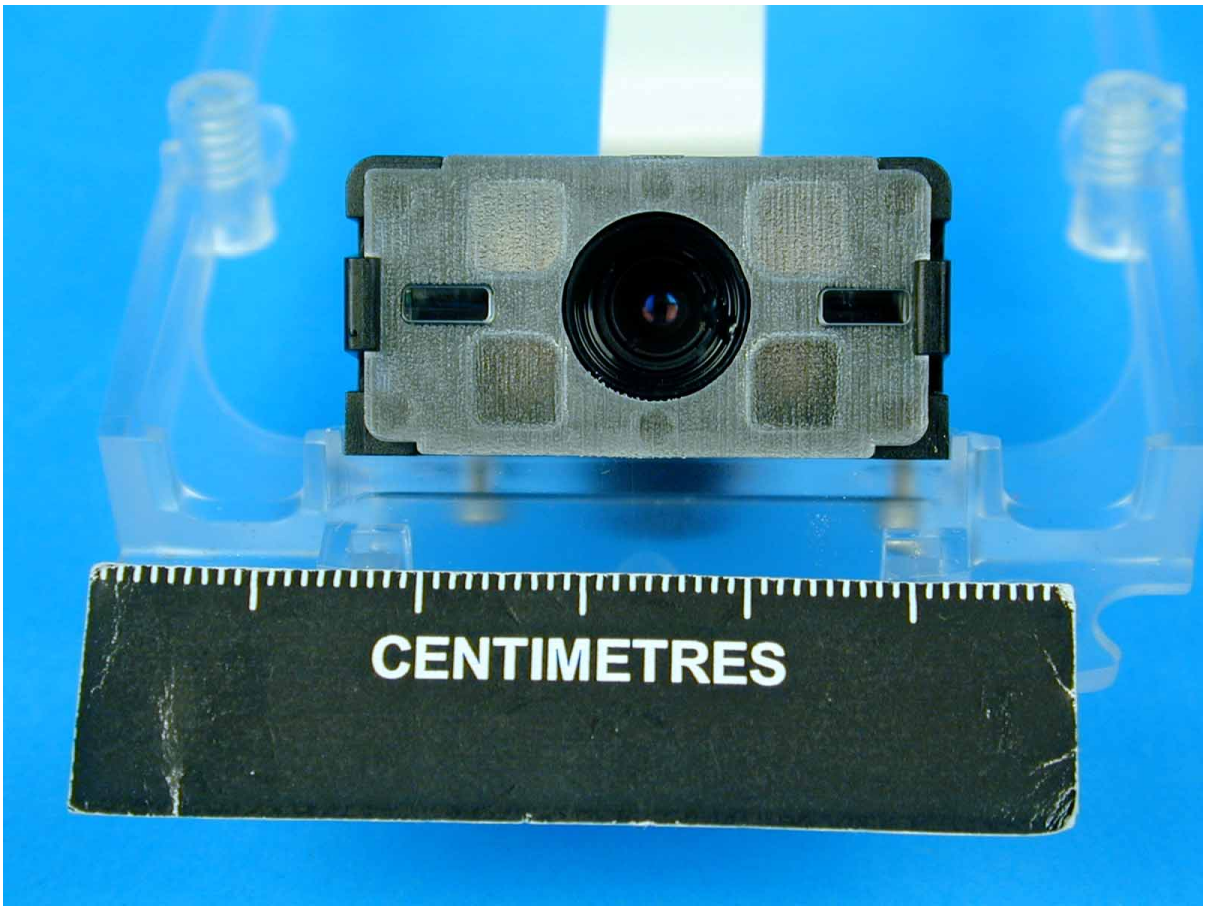


Photograph 9
View of reverse side of pcb

PHOTOGRAPHS OF EQUIPMENT

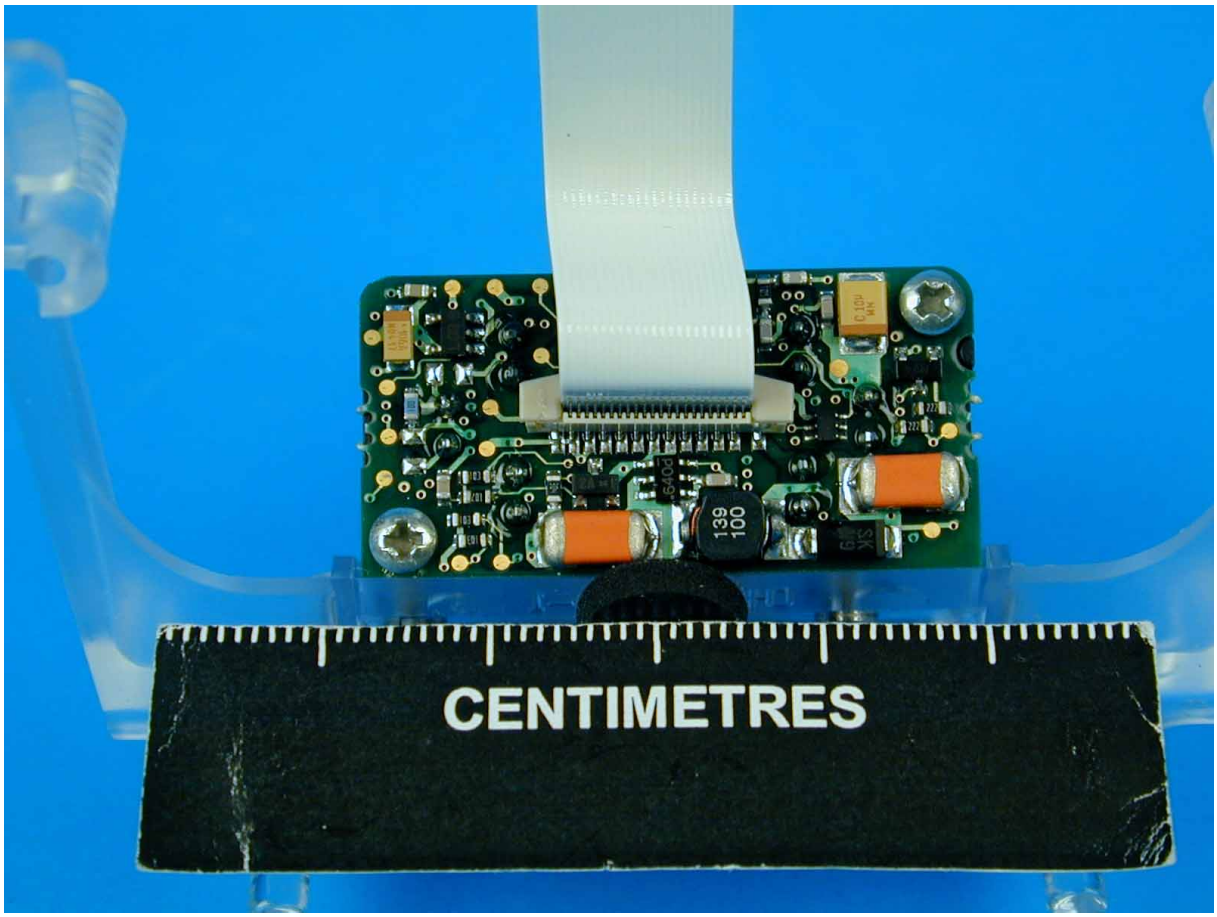
Photograph 10
View of pcb attached to rear of display

PHOTOGRAPHS OF EQUIPMENT



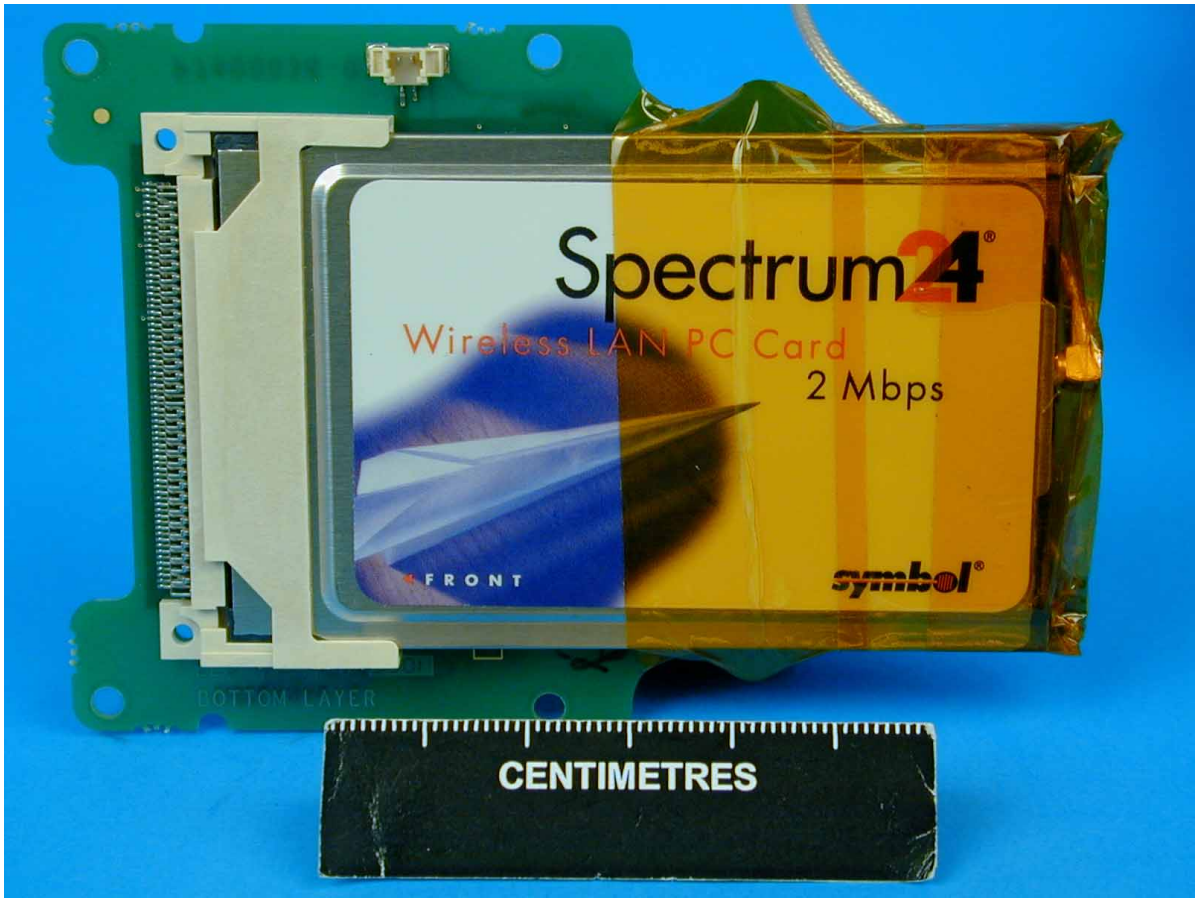
Photograph 11
View of Scanner

PHOTOGRAPHS OF EQUIPMENT



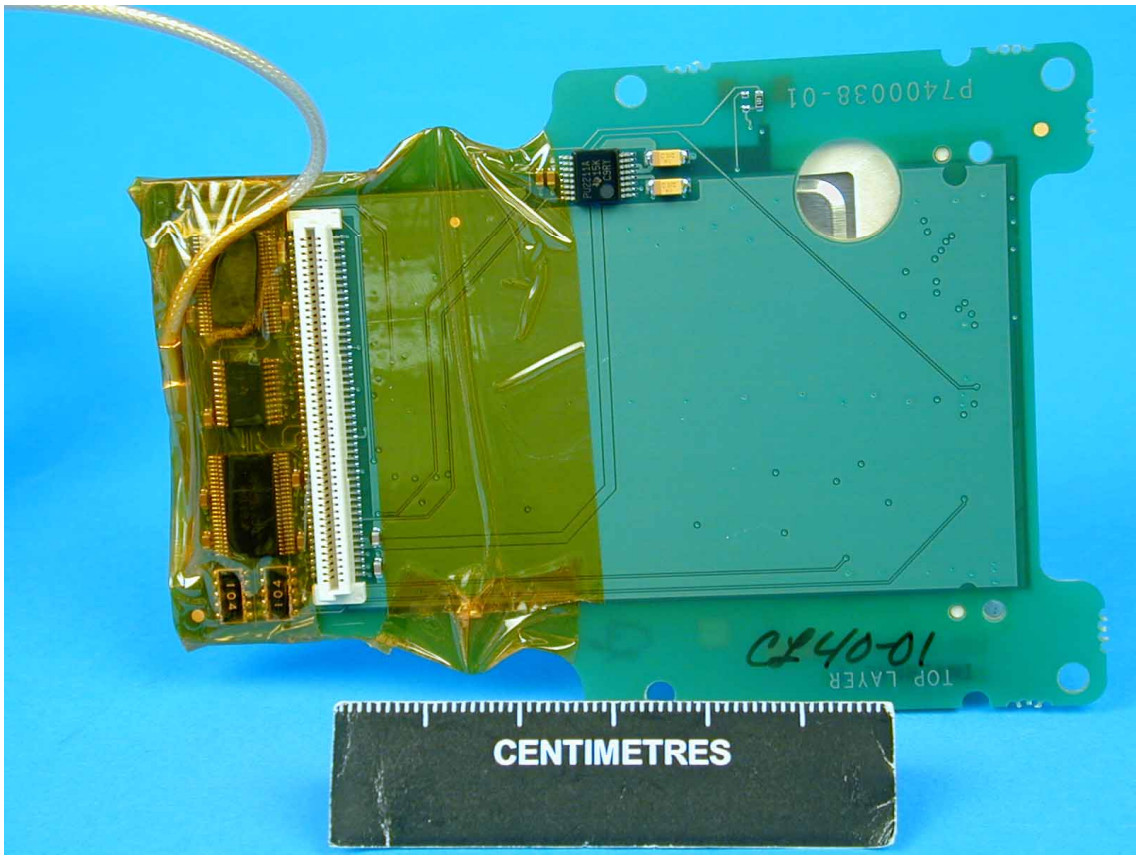
Photograph 12
Reverse side of scanner

PHOTOGRAPHS OF EQUIPMENT



Photograph 13
View of radio card and interface board

PHOTOGRAPHS OF EQUIPMENT



Photograph 14
Reverse side of radio card and interface board

FCC SITE COMPLIANCE LETTER

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD. 21046

April 10, 2001

Registration Number: 90987

BABT Product Service
Segensworth Road
Titchfield, Fareham
Hampshire PO15 5RH
United Kingdom
Attention: Jensen Adams

Re: Measurement facility located at Titchfield
3 & 10 meter site
Date of Listing: April 10, 2001

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that this filing must be updated for any changes made to the facility, and at least every three years from the date of listing the data on file must be certified as current.

If requested, the above mentioned facility has been added to our list of those who perform these measurement services for the public on a fee basis. An up-to-date list of such public test facilities is available on the Internet on the FCC Website at WWW.FCC.GOV, E-Filing, OET Equipment Authorization Electronic Filing.

Sincerely,

Thomas W Phillips
Electronics Engineer

SYSTEM MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems, are :-

In the frequency range 30MHz to 1000MHz

For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard EMI Receiver:-

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	+4.45dB (30-200MHz; 3m Measurements) -4.42dB (30-200MHz; 3m Measurements) +4.80dB (200-1000MHz; 3m Measurements) -3.81dB (200-1000MHz; 3m Measurements)

In the frequency range 1GHz to 25GHz

For Radiated Emissions Spurious and EIRP Measurements:-

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	±3.0dB (1-25GHz; 3m Measurements)

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Group

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Results of tests not yet included in our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).