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## **TEST REPORT**

In support of the Application for Grant of Equipment Authorisation of the  
Intermec Technologies Corporation Series 700C-SMC45 Handheld Computer Terminal

FCC ID: EHA700C-SMC45

November 2002

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**Equipment:** 700C-SMC45


**FCC ID:** EHA700C-SMC45

**Specification:** 47 CFR 2 & 47 CFR 24

**Applicant:** Intermec Technologies Corporation  
Norand Mobile Systems Division  
550 Second Street S.E.  
Cedar Rapids  
IOWA 52401  
USA

**Manufacturer:** As above

**Manufacturer's Representative:** Mr Scott Holub

**Approved by:**   
**M JENKINS**  
Wireless Group Leader

**Dated:** 18<sup>th</sup> November 2002

**Start of Test:** 11<sup>th</sup> October 2002

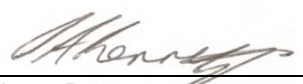
**Completion of Test:** 22<sup>nd</sup> October 2002

**Report Distribution:** Intermec Technologies Corporation Mr S Holub Copy No. 1  
BABT Copy No's. 2 & 3  
Copy No: 2

ENGINEERING STATEMENT

**I ATTEST:** the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the applicable limits. I assume full responsibility for the accuracy and completeness of these measurements. On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 2, and Part 24 of the FCC Rules under normal use and maintenance.



  
Simon Bennett  
Test Manager



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Subclause	Parameter to be measured	
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## Introduction

The information contained within this report is intended to show verification of compliance of the Intermecc Technologies Corporation 700C-SMC45 to the requirements of 47 CFR 2 and 47 CFR 24. Limited testing has been performed as the 700C-SMC45 contains a Transmitter Module which has previously gained approval to FCC Part 24. The FCC Identifier of this module was QIPMC45, the date of the FCC Grant was 13<sup>th</sup> September 2002.

## Location Of Testing

All testing was conducted at the premises of BABT, Segensworth Road, Fareham, Hampshire, PO15 5RH, by BABT Personnel, Simon Bennett, Phil Harrison and Steve Hartley. Radiated Emissions measurements were performed in a 3 metre Anechoic Chamber (OATS). A complete site description is on file with the FCC Laboratory Division, Registration Number: 90987. See Annex A.

## Test Equipment and Ancillaries Used For Test

No	Instrument/Ancillary	Type	Manufacturer	EMC No.	Cal Due
1	Screened Enclosure	----	Siemens/Matsushita	2533	--
2	BilogAntenna	CBL6143	Chase	2860	11Apr 04
3	Turntable & Controller	HD050	Emco	2528	--
4	Antenna Mast	2070	Emco	--	--
5	Antenna Controller	2090	Emco	--	--
6	EMI Receiver	8542E	Hewlett Packard	2286	11 Dec 02
7	Low Noise Amplifier (8-18GHz)	AMF-4E-080180-15-10P	Miteq	2430	--
8	Spectrum Analyser	8562A	Hewlett Packard	1427	7 Jan 03
9	Horn	3115	EMCO	2297	29 Jun 03
10	Signal Generator	8672A	Hewlett Packard	411	22 Dec 02
11	3GHz High Pass Filter	F-100-3000-5-R	RLC Electronics	INV4467	--
12	Signal Generator	2031	Marconi	1980	20 Aug 03
13	Spectrum Analyser	FSEM	Rohde & Schwarz	INV4034	28 Dec 02
14	Digital Radio Test Set	6103E	Racal	INV4506	2 Aug 03
15	Attenuator	HFP-50N	Trilithic	1600	30 May 03
16	Combiner	1506A	Weinschel Eng.	INV4494	15 Jan 03
17	Cable	1 metre N-Type	Reynolds	CS0561	T/U
18	Thermohygrograph	A1	Rotronic	INV3227	2 Oct 03
19	Cable	1 metre SMA Type	Reynolds	CS0569	T/U
20	Attenuator	HFP-50N	Trilithic	1602	30 May 03

Table 1



Test Equipment and Ancillaries Used For Test (continued)

Note(s)

- 1) All items are calibrated annually except where labelled T/U (Traceability Unscheduled). These items are calibrated within the test configurations using calibrated equipment.
- 2) Throughout the test report the test equipment used for each test is referenced using the number indicated in the table above.

**INSTRUMENTATION USED FOR EXERCISING THE EUT**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Type No</b>	<b>INV No</b>
GSM Test Set	Hewlett Packard	8922M	3803
DCS Test Set	Hewlett Packard	83220E	3804

Table 2



Description of Equipment Under Test

The 700C-SMC45 is a handheld computer terminal with a tri band GSM/GPRS radio module used for inventory control purposes.

The equipment under test is made up of the following component parts.

<u>Module</u>	<u>Vendor</u>	<u>Kit Number</u>	<u>Serial Number</u>
Handheld Computer Terminal	Intermec Technologies Corporation	700C-SMC45	350450410044088

Table 3

List of Performed Measurements using the configuration in Table 3

- i) Power Output

<u>Module</u>	<u>Vendor</u>	<u>Kit Number</u>	<u>Serial Number</u>
Handheld Computer Terminal	Intermec Technologies Corporation	700C-SMC45	19927020017

Table 4

List of Performed Measurements using the configuration in Table 4

- i) Radiated Emissions



Test Case	Radiated Emissions
Test Date	10 <sup>th</sup> October 2002
Rule Parts	24.238

#### System Configuration During EMC Testing

The Intermec 700C with GSM/GPRS Radio Module was powered by its own internal battery.

A communication link was established between the EUT and a Digital Radiocommunications Test Set.

#### Test Procedure

Testing to the requirements of FCC Part 24, Section 24.238, Emission Limits, was carried out on the Measurement Test Facility detailed in Annex A.

In order to determine the Radiated Emission Limits, measurements of transmitter power (P) were first carried out on top, middle and bottom channels using a peak detector and the results are shown in Table 5 below.

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 semi-anechoic 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.

Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 30MHz to 20GHz. 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 peak detector. The details of the worst case emissions were then recorded and are presented in Tables 6 and 7.

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

All measurements made at 3m



Test Case : Radiated Emissions (continued)  
 Test Date : 10<sup>th</sup> October 2002  
 Rule Parts : 24.238

**TEST RESULTS**

Measurement of transmitter power (P) on top and bottom channels are detailed in Table 5 below.

Freq MHz	Res BW Hz	Vid BW Hz	Ant Pol V/H	Ant Hgt cm	EUT Arc Deg	Raw PEAK dBµV	Cable loss / Amp gain dB	Antenna Factor DB	Result Peak dBµV/m
Tx Channel 512									
1850.000	1M	3M	V	165	180	96.33	2.17	27.4	125.9
1850.400	1M	3M	H	100	080	999.50	2.17	27.4	129.1
Tx Channel 810									
1909.600	1M	3M	V	122	180	95.67	1.83	27.7	125.2
1909.570	1M	3M	H	100	073	100.33	1.83	27.7	129.9

Table 5

The limit for spurious emissions in accordance with FCC 47CFR 24.238 is 43dB – 10Log(P) down on the carrier where P is the power in Watts

As the manufacturer’s declared power is 1W the spurious limit is 43dB – 10Log(1) = 43dB down on the carrier

Using the results obtained on the two channels the following limits were calculated:

Bottom channel 512: 125.9dBµV/m – 43dB = 85.9dBµV/m

Top channel 810: 125.2dBµV/m – 43dB = 85.2dBµV/m

These figures have been used to determine Pass or Fail on the harmonics detailed in Tables 6 and 7:





Test Case : Radiated Emissions (continued)  
 Test Date : 10<sup>th</sup> October 2002  
 Rule Parts : 24.238

## Tx Channel 512

Freq MHz	Res BW Hz	Vid BW Hz	Ant Pol V/H	Ant Hgt cm	EUT Arc Deg	Raw PEAK dB $\mu$ V	Cable loss / Amp gain dB	Antenna Factor dB	Result Peak dB $\mu$ V/m	Pass / Fail
1.93050	1M	3M	V	100	270	44.50	-1.67	27.75	73.92	Pass
1.96800	1M	3M	V	100	270	45.17	-1.83	28.00	75.00	Pass
3.70061	1M	3M	V	130	180	44.50	+8.50	32.33	68.33	Pass
5.55039	1M	3M	V	100	195	54.83	+23.5	35.00	66.33	Pass
7.40060	1M	3M	H	100	195	53.67	+27.0	38.00	64.64	Pass
9.25050	1M	3M	H	110	100	50.33	+23.0	39.0	66.33	Pass

Table 6

All emissions measured over the frequency range <1GHz were greater than 49.4 dB $\mu$ V/m below the limit shown above.

## Tx Channel 810

Freq MHz	Res BW Hz	Vid BW Hz	Ant Pol V/H	Ant Hgt cm	EUT Arc Deg	Raw PEAK dB $\mu$ V	Cable loss / Amp gain dB	Antenna Factor dB	Result Peak dB $\mu$ V/m	Pass / Fail
1.9673	1M	3M	V	100	263	44.17	-1.83	28.00	74.00	Pass
1.9899	1M	3M	V	100	251	44.33	-1.50	28.0	73.83	Pass
3.8196	1M	3M	H	110	198	42.83	+11.33	32.67	64.17	Pass
5.7292	1M	3M	H	100	195	58.0	+24.66	35.25	68.59	Pass
7.6389	1M	3M	H	100	195	53.67	+26.16	38.67	66.18	Pass
9.5491	1M	3M	V	135	265	53.67	+23.50	39.25	69.42	Pass
11.4584	1M	3M	V	100	193	51.67	+21.33	39.75	70.09	Pass

Table 7

All emissions measured over the frequency range <1GHz were greater than 47.7dB $\mu$ V/m below the limit shown above.

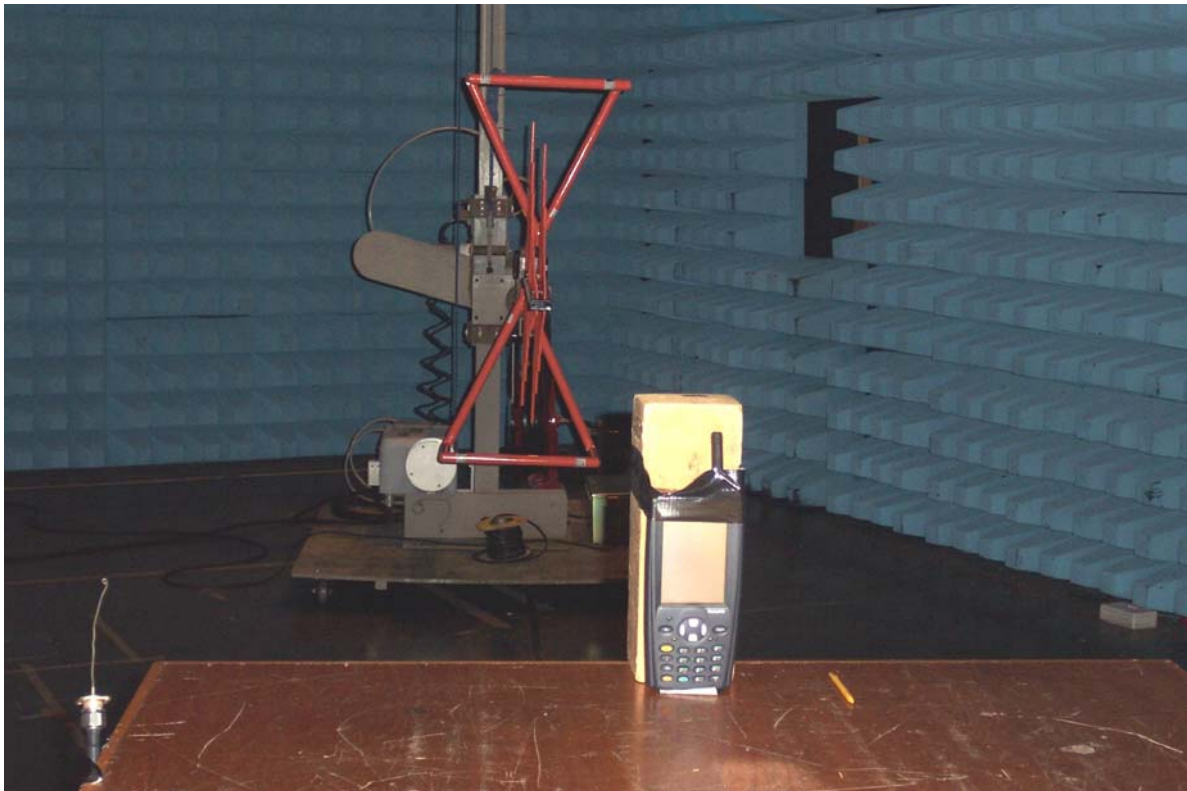
**ABBREVIATIONS FOR ABOVE TABLE**

ERP Effective Radiated Power  
 H Horizontal Polarisation  
 V Vertical Polarisation

Procedure Test Performed in accordance with ANSI C63.4.



**TEST SETUP PHOTOGRAPH**



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



Test Case : RF Output Power  
 Test Date : 22<sup>nd</sup> October 2002  
 Rule Parts : 2.1046, 24.232

Measurement Method

Using a spectrum analyser and attenuator(s), the output power of the EUT was measured at the antenna terminal. The carrier power was measured on each channel on Power Setting 0.

The spectrum analyser RBW and VBW were set to 1MHz and the path loss measured and entered as a reference level offset.

Results

Maximum Power - Power Setting 0

Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
1850.2	+2.33	27.79	+30.12	1.028
1880.0	+1.74	27.42	+29.16	0.824
1909.8	+1.91	27.44	+29.35	0.861

Minimum Power - Power Setting 7

Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)	Result (mW)
1850.2	-11.43	27.79	+16.36	0.043
1880.0	-11.87	27.42	+15.55	0.036
1909.8	-11.76	27.44	+15.68	0.037

Limit	<100W or <+50dBm
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Remarks

EUT complies with CFR 47 2.1046 and 24.232(b). The EUT does not exceed 2W or +33dBm at the measured frequencies.

Test Equipment Used:  
 13, 14, 15, 16, 17, 18, 19, 20  
 .....



700C-SMC45  
Front



700C-SMC45  
Rear



700C-SMC45  
Side/End





700C-SMC45  
Side/Top



700C-SMC45  
Side/Top (SIM cover removed)





700C-SMC45  
Rear (battery removed)



700C-SMC45  
Internal 1



700C-SMC45  
Internal 2



700C-SMC45  
Internal 3

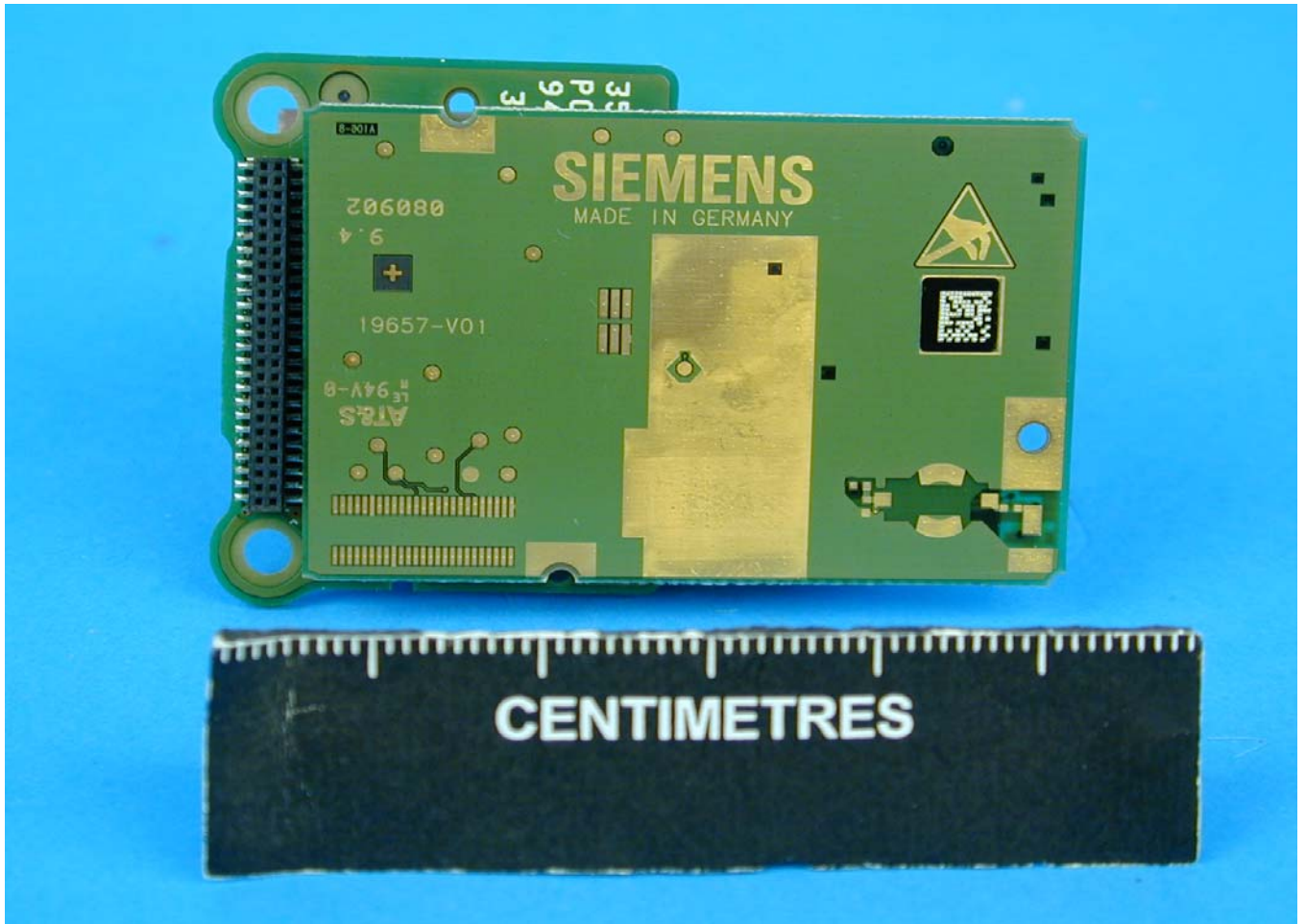


700C-SMC45  
Internal 4





700C-SMC45  
Internal 5



700C-SMC45  
Internal 6

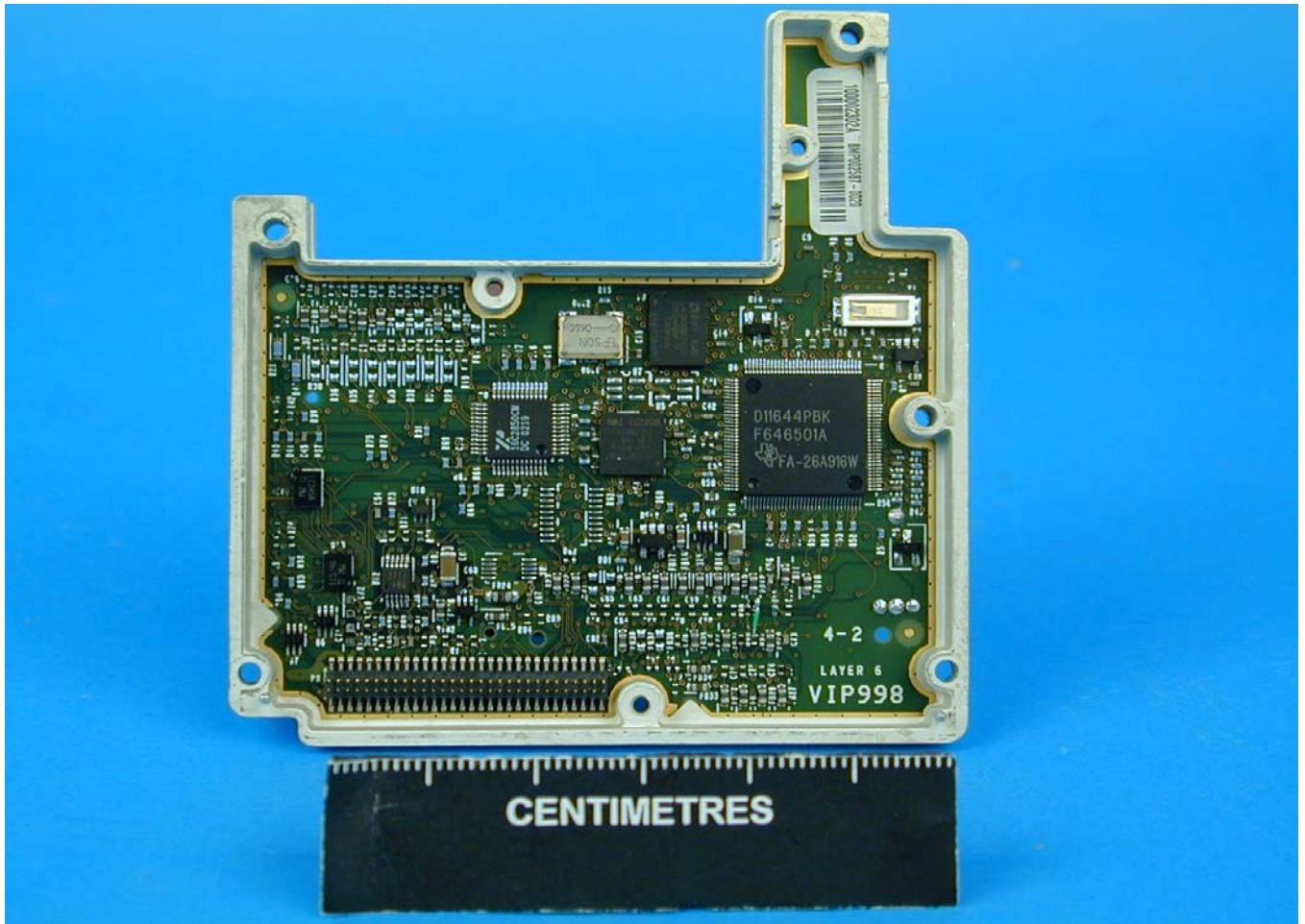


700C-SMC45  
Internal 7





700C-SMC45  
Internal 8

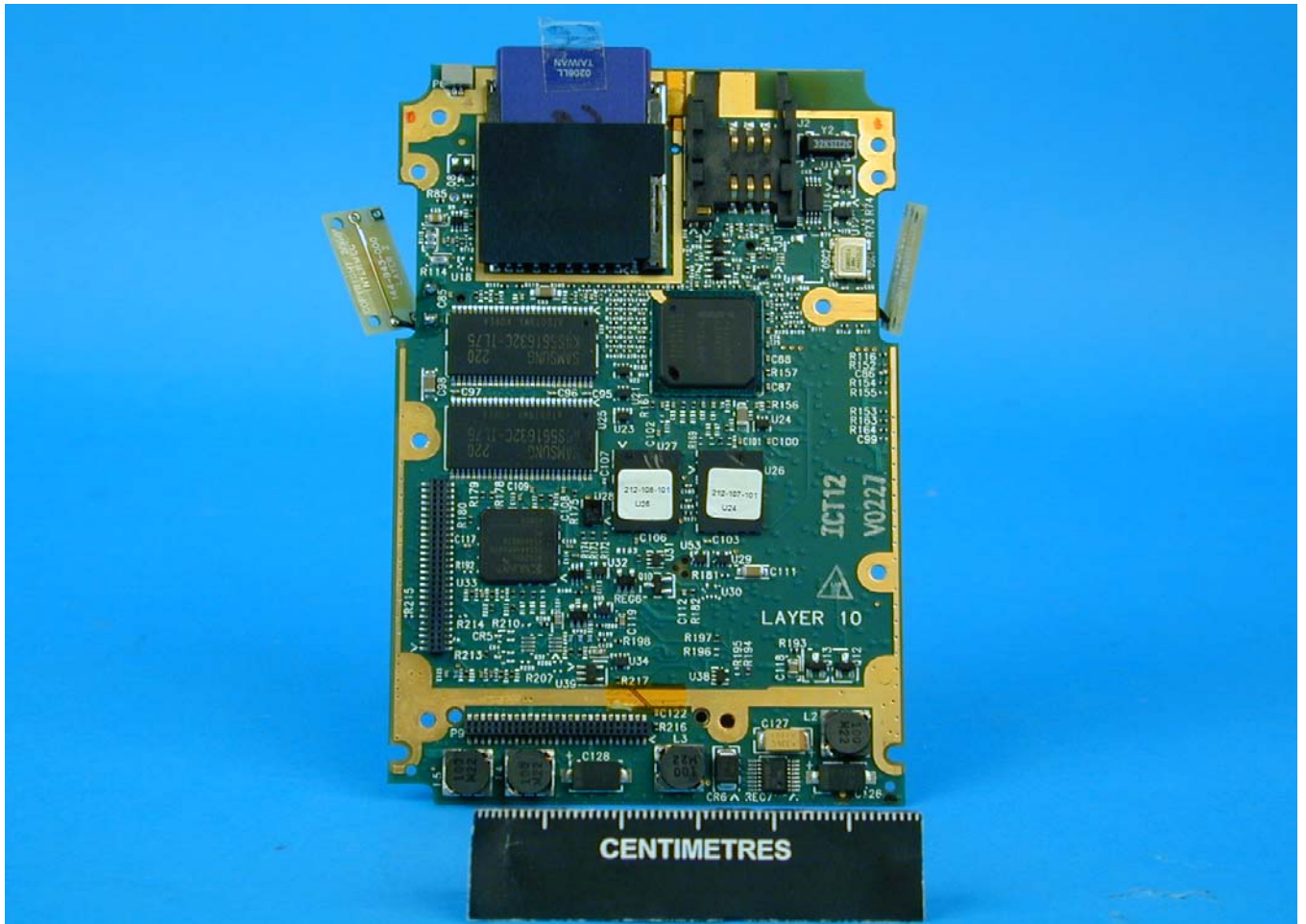


700C-SMC45  
Internal 9



700C-SMC45  
Internal 10





700C-SMC45  
Internal 11



700C-SMC45  
Internal 12



700C-SMC45  
Antennas



0141  
Group

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**Annex A**

**FCC Measurement Facility Compliance Letter**

(comprising of 1 page)





**FEDERAL COMMUNICATIONS COMMISSION**

**Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046**

October 18, 2002

Registration Number: 90987

TUV Product Service Ltd  
Segensworth Road  
Titchfield  
Fareham, Hampshire, PO15 5RH  
United Kingdom  
Attention: Kevan Adsetts

Re: Measurement facility located at Titchfield  
Anechoic chamber (3 meters) and 3 & 10 meter OATS  
Date of Listing: October 18, 2002

Gentlemen:

Your request for registration 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 information has, therefore, been placed on file and the name of your organization added to the 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 the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website [www.fcc.gov](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Thomas W Phillips  
Electronics Engineer