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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-SMC45-1

June 2003

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**Equipment:** 700C-SMC45 with Mobile Mark Antenna

**FCC ID:** EHA700C-SMC45-1

**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:** \_\_\_\_\_

**Mark Jenkins**  
**Wireless Group Leader**

**Dated:** \_\_\_\_\_

**Start of Test:** 2<sup>nd</sup> June 2003

**Completion of Test:** 4<sup>th</sup> June 2003

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

**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.

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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 Intermec Technologies Corporation 700C-SMC45 with Mobile Mark Antenna 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, Phi Harrison. 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	Manufacturer	Type	EMC No.	Cal To
1	Screened Enclosure	Siemens/Matsushita	----	2533	T/U
2	Bilog Antenna	Chase	CBL6143	2860	11 Apr 04
3	Turntable & Controller	Emco	HD050	2528	T/U
4	Antenna Mast	Emco	1051	—	T/U
5	Antenna Controller	Emco	2090	—	T/U
6	EMI Receiver	Hewlett Packard	8542E	2286	13 Dec 03
7	Low Noise Amplifier (1-8GHz)	Avantek	AWT - 18036	1081	T/U
8	Low Noise Amplifier (8-18GHz)	Miteq	AMF-4E-080180-15-10P	2430	T/U
9	Low Noise Amplifier (18-26.5GHz)	Avantek	AMT 26177-33	2072	T/U
10	Spectrum Analyser	Hewlett Packard	8562A	2282	5 Apr 04
11	Horn	EMCO	3115	2297	29 Jun 03
12	Signal Generator	Hewlett Packard	8672A	411	26 Feb 04

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.

**INSTRUMENTATION USED FOR EXERCISING THE EUT**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Type No</b>	<b>INV No</b>
Universal Radio Communications Tester	Rohde & Schwarz	CMU 200	4858

Table 2





Test Case	Radiated Emissions
Test Date	2 <sup>nd</sup> June 2003
Rule Parts	24.238

#### System Configuration During EMC Testing

The EUT was set-up on the Alternative Open Area Test Site identified in Annex A, and tested in accordance with the specification.

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

In addition to the GSM/GPRS Radio Module the EUT also contains an 802.11b radio. This testing was performed with both radios transmitting simultaneously to produce the 'worst case' result.

A communication link was established between the EUT and a Digital Radiocommunications Test Set transmitting on 2 time slots.

#### Test Procedure

Testing to the requirements of 47 CFR 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 radiated carrier field strength were first carried out on top and bottom channels using a peak detector and the results are shown in Table 3 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. 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 4 and 5.

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

All measurements made at 3m.



Test Case : Radiated Emissions (continued)  
 Test Date : 2<sup>nd</sup> June 2003  
 Rule Parts : 24.238

**TEST RESULTS**

Measurement of radiated carrier field strength on top and bottom channels are detailed in Table 4 below.

Freq MHz	Res BW Hz	Vid BW Hz	Ant Pol V/H	Ant Hgt cm	EUT Arc Deg	Raw PEAK dBµV	Cable loss dB	Antenna Factor dB	Result Peak dBµV/m
Tx Channel 512									
1850.020	1M	1M	V	100	070	97.17	1.5	27.2	125.87
Tx Channel 810									
1909.960	1M	1M	V	121	347	91.67	1.67	27.6	120.94

Table 4

The limit for spurious emissions in accordance with 47 CFR 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: 125.87dBµV/m – 43dB = 82.87dBµV/m

Top channel 810: 120.94dBµV/m – 43dB = 77.94dBµV/m

These figures have been used to determine Pass or Fail on the harmonics detailed in Tables 5 and 6:





Test Case : Radiated Emissions (continued)  
 Test Date : 2<sup>nd</sup> June 2003  
 Rule Parts : 24.238

## Tx Channel 512

Freq GHz	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
2.4498	1M	1M	H	100	150	38.17	1.87	28.7	68.74	Pass
3.7007	1M	1M	H	100	192	45.67	14.8	32.3	63.17	Pass
3.7003	1M	1M	V	107	181	46.67	14.8	32.3	64.17	Pass
4.0706	1M	1M	V	100	185	46.00	23.33	33.2	55.87	Pass
7.4006	1M	1M	H	100	202	47.17	9.67	38.0	75.5	Pass
12.951	1M	1M	V	100	064	48.17	21.84	39.9	66.23	Pass

Table 5

All emissions measured over the frequency range 30MHz to 1GHz were greater than 52.17 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
2.2840	1M	1M	H	100	132	39.50	1.67	28.6	69.77	Pass
2.3510	1M	1M	H	100	213	37.00	1.87	28.6	67.47	Pass
2.4000	1M	1M	H	106	083	38.67	1.87	28.7	69.24	Pass
3.8197	1M	1M	H	100	083	51.67	16.66	32.7	67.71	Pass
9.4587	1M	1M	H	110	112	52.00	25.5	39.3	65.80	Pass
11.4584	1M	1M	H	100	107	58.00	22.67	39.6	74.93	Pass

Table 6

All emissions measured over the frequency range 30MHz to 1GHz were greater than 47.84 dB $\mu$ 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.



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)

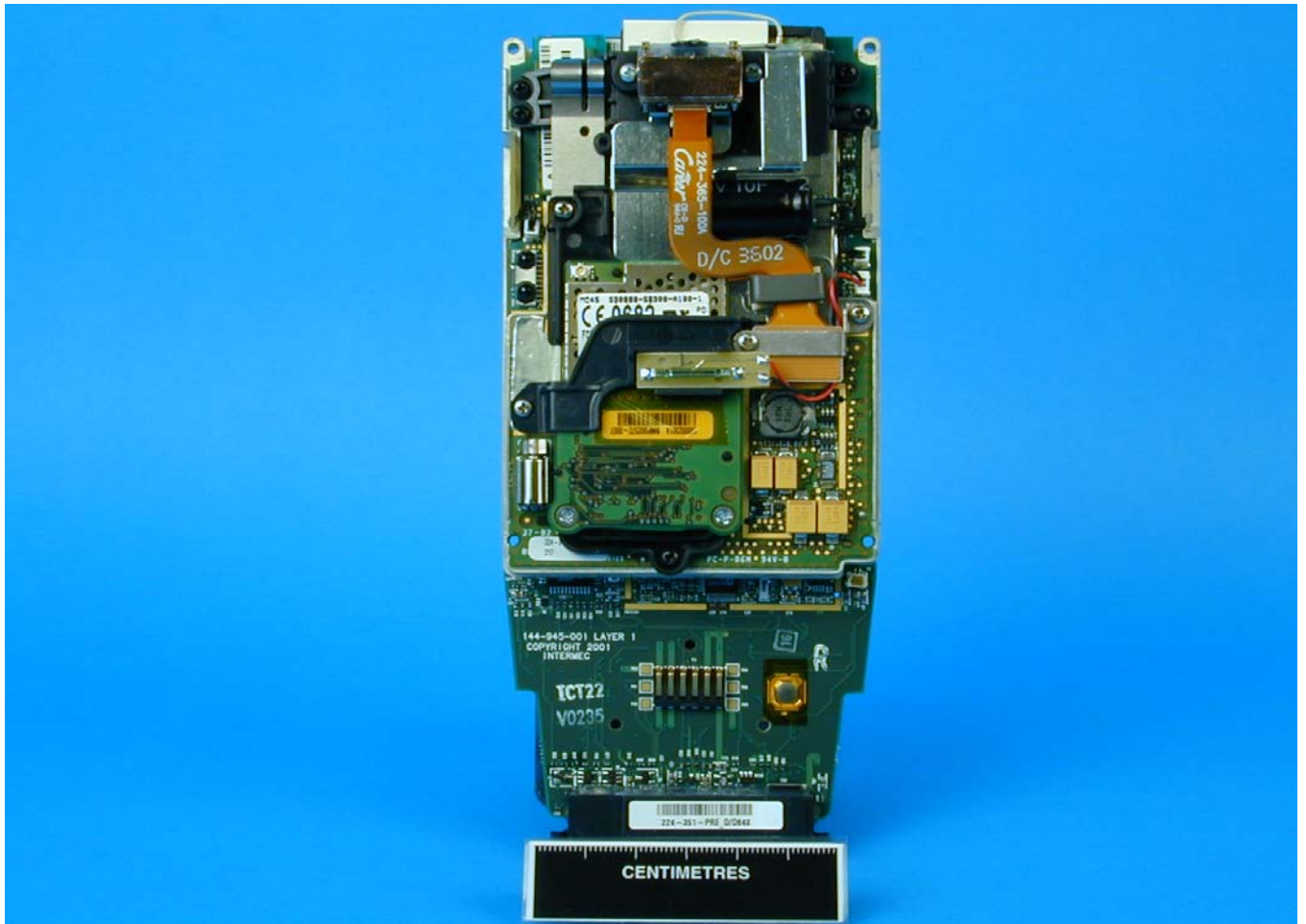




700C-SMC45  
Internal 1



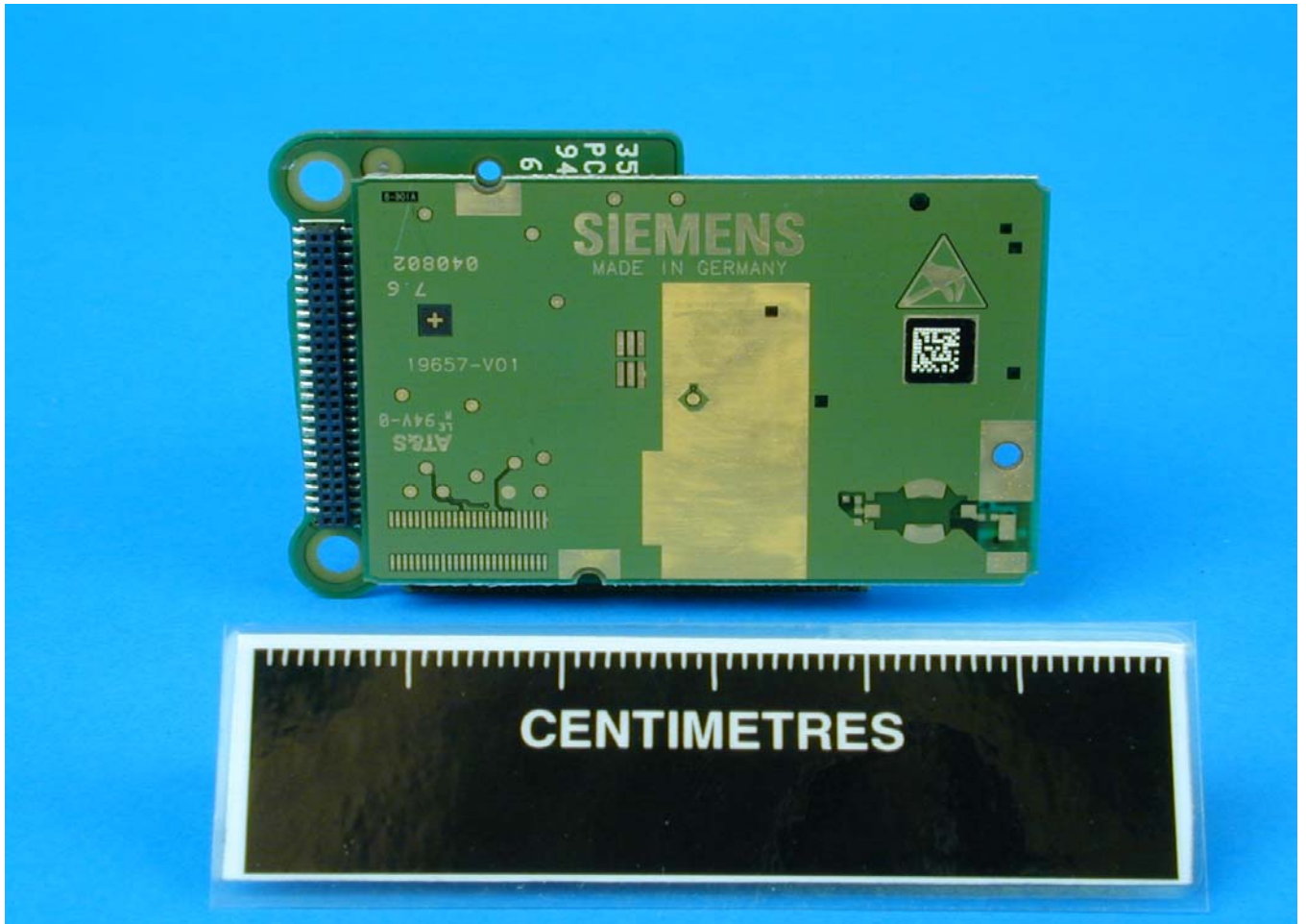
700C-SMC45  
Internal 2



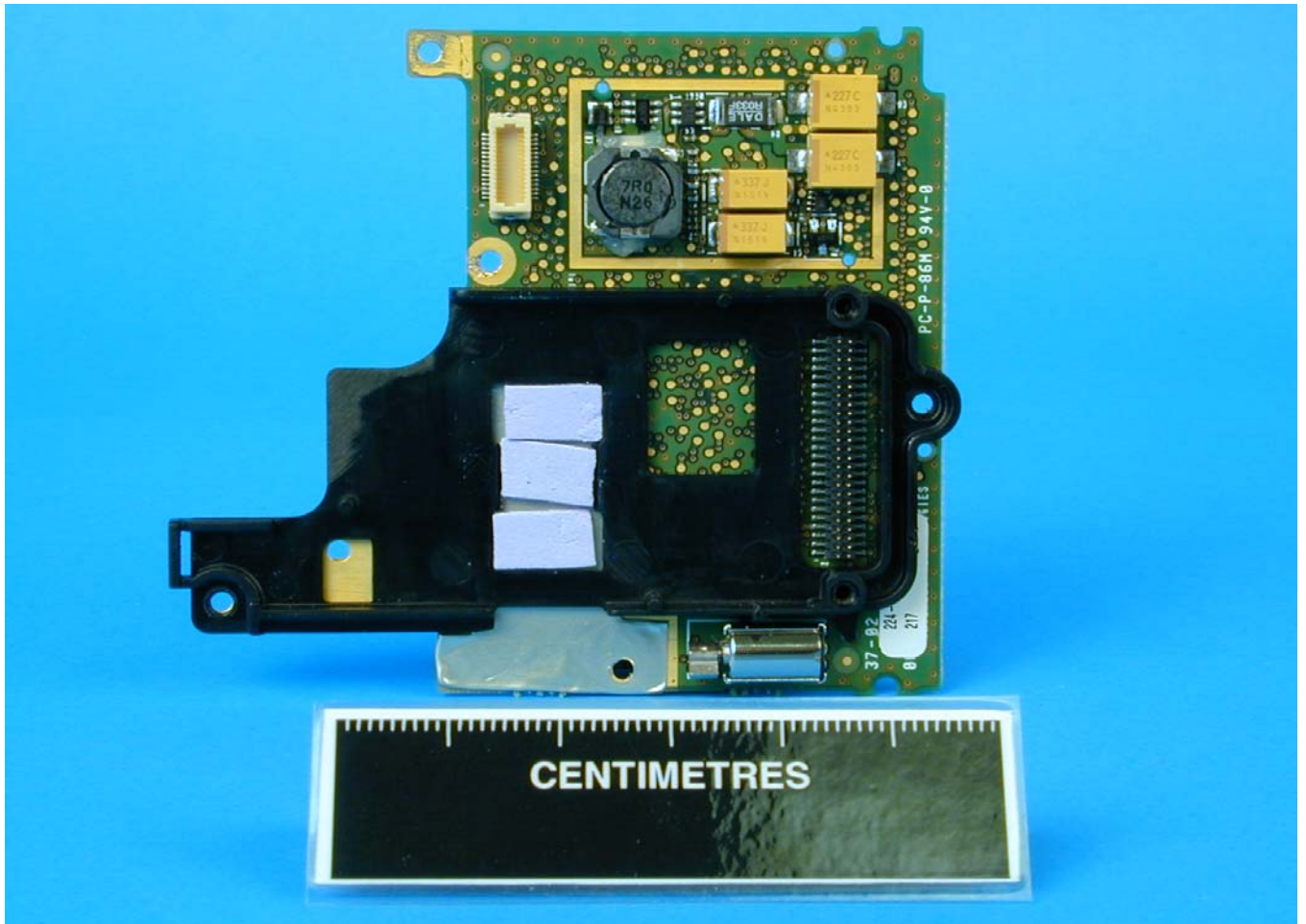
700C-SMC45  
Internal 3



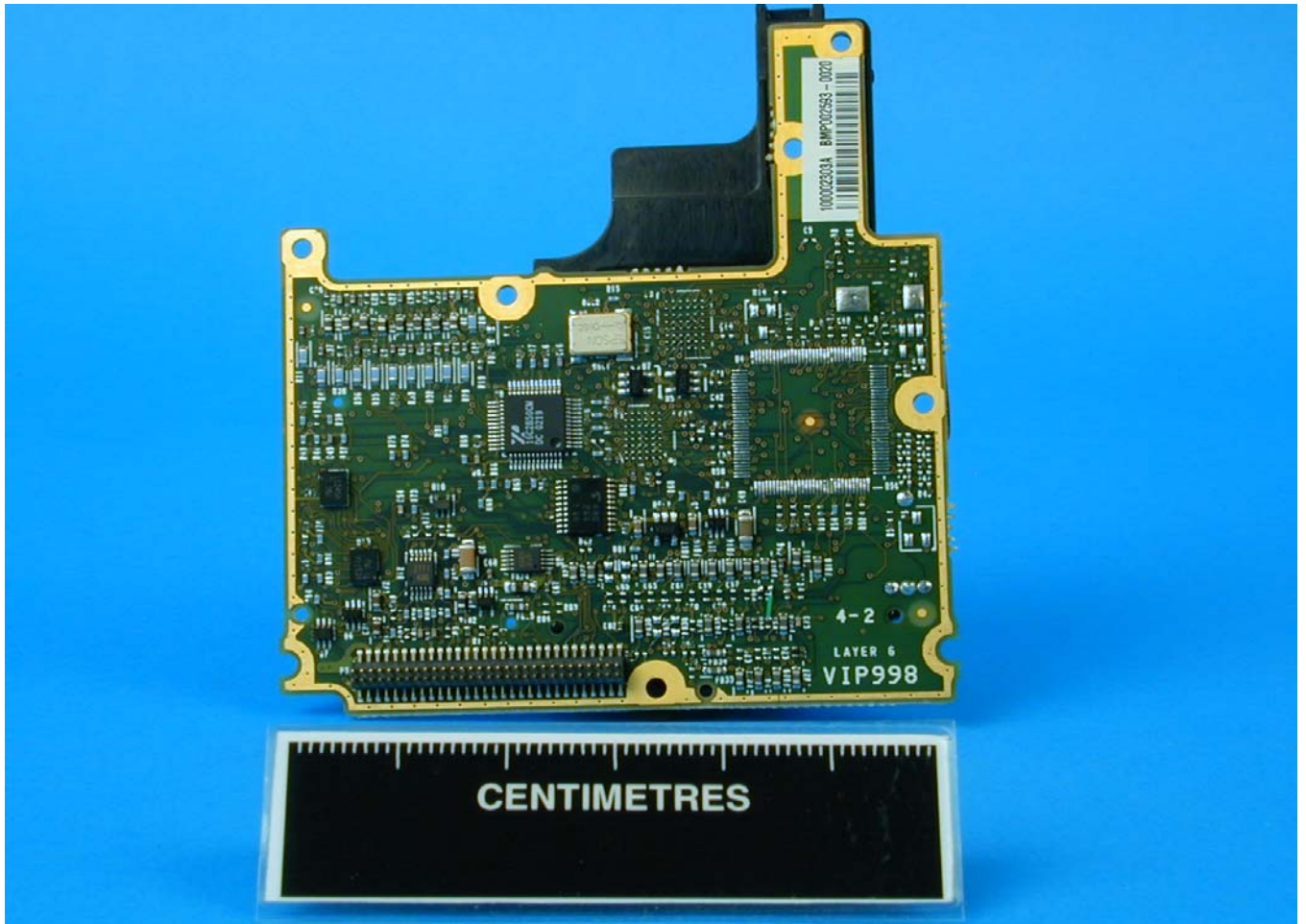
700C-SMC45  
Internal 4



700C-SMC45  
Internal 5



700C-SMC45  
Internal 6



700C-SMC45  
Internal 7



700C-SMC45  
Internal 8

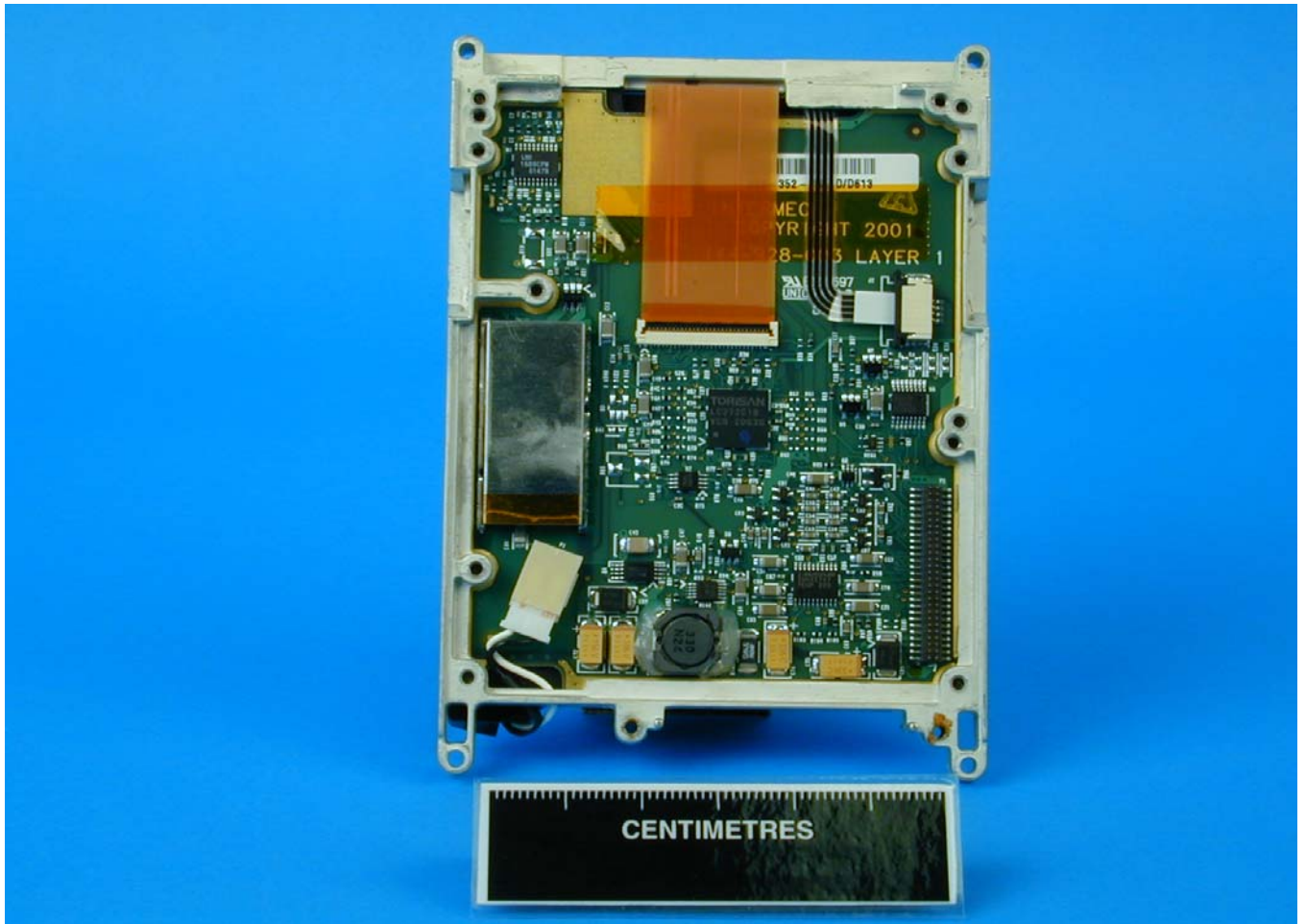




700C-SMC45  
Internal 9







700C-SMC45  
Internal 12



700C - SMC45  
Internal 13



700C-SMC45  
Antennas



0141  
Group

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