
REPORT ON

FCC Part 15 Testing in support of an Application for Grant of Equipment Authorisation
of a Symbol 4111-GPRS Hand Held Data Terminal
FCC ID: H9P4111GPRS

Report No OR610741-2

July 2003

REPORT ON

FCC Part 15C Testing in support of an Application for Grant of
Equipment Authorisation of a Symbol 4111-GPRS Hand Held
Data Terminal

FCC ID: H9P4111GPRS

Report No OR610741-2

July 2003

PREPARED FOR

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DATED

09-07-03

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STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Hand Held Data Terminal
APPLICANT	Symbol Technologies Inc One Symbol Plaza Holtsville NY 11742-1300 New York United States of America
TYPE NUMBER	4111-GPRS
MANUFACTURERS MODEL NUMBER	4111-GPRS1
SERIAL NUMBER	ALP67837 (IMEI: 350030951706681)
HARDWARE VERSION	Rev 2
TEST SPECIFICATION NUMBER	FCC Part 15 Subpart C
REGISTRATION NUMBER	OR610741/05
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status OR610741
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal N/A N/A
START OF TEST FINISH OF TEST	9 th June 2003 13 th June 2003
TEST ENGINEERS	S C Hartley A Guy
RELATED DOCUMENTS	ANSI C63.4 2001. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. FCC Public Notice document (DA 00-705 released 30 March 2000)



TEST RATIONALE

The information contained within this report is intended to show verification of compliance of the Symbol Technologies Inc 4111-GPRS Hand Held Data Terminal to the requirements of FCC Specification Part 15.

FCC ID H9P4111GPRS

The unit supplied for testing was a 4111-GPRS hand held data terminal, which offers Tri Band GSM/GPRS, 2.4GHz 802.11b Wireless LAN and Bluetooth connectivity.

The terminal utilizes the Motorola G18 GSM/GPRS module to offer GSM GPRS data connectivity. Also included in the terminal is the approved LA-4137 Symbol Compact Flash 802.11b RLAN radio card and the 21-58466 Symbol Bluetooth module. FCC ID numbers are detailed below:

<u>Type:</u>	<u>Description</u>	<u>Approval</u>	<u>FCC ID</u>	<u>Date</u>
G18	Motorola GSM/GPRS module,	FCC Part 24	IHDT6AC1	8/01/2000.
LA4137	Symbol Compact Flash RLAN Radio	FCC Part15	H9PLA4137	21/03/2000
21-58466	Symbol Bluetooth Module	FCC Part15	H9PSNAPPER	10/11/2002

This report details testing carried out in accordance with:

- FCC: Part 15.247(c), Radiated Emission Measurement at the Band Edge (Marker Delta method)
- FCC: Part 15.247(c), Radiated Emissions
- FCC: Part 15.247(b), Maximum Peak Output Power



SYSTEM CONFIGURATION DURING EMC TESTING

The EUT was set-up simulating a typical user installation on the Alternative Open Field Test Site identified on page 42, and tested in accordance with the specification.

The test software in the EUT enabled the Test Engineer to select full power and continuous transmit on the following channels;

2.4GHz WLAN functionality

Channel 1: 2412MHz
Channel 6: 2437MHz
Channel 11: 2462MHz

The Output Power level (controlled by application software) was set to 169.

2.4GHz Bluetooth functionality

Channel 2: 2402MHz
Channel 41: 2441MHz
Channel 80: 2480MHz

TEST SETUP PHOTOGRAPH

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



Photograph 1



EQUIPMENT INFORMATION

Equipment under Test (EUT):

Equipment: 4111-GPRS Hand Held Data Terminal
Manufacturer: Symbol Technologies Inc
Type No: 4111-GPRS
Model No. 4111-GPRS1
Serial No: ALP67837
Drawing Revision: Not Supplied

Instrumentation used for Emission Testing:

Instrument	Manufacturer	Type No	EMC No	Cal to
Screened Enclosure	Siemens	EAC 54300	2533	TU
Turntable & Controller	HD GmbH	HD 050	2528	TU
Antenna Mast	Emco	1051	2182	TU
Antenna Mast Controller	Emco	1050	2090	TU
Test Receiver	Hewlett Packard	8542E	2286	13 Dec 03
Bilog Antenna	Chase	CBL 6143	2860	11 Apr 04
Test Receiver	Rhode and Schwarz	ESIB 40	2917	04 Feb 04
Horn (1 - 18GHz)	EMCO	3115	2397	29 Jun 03
Horn (18GHz - 40GHz)	Advanced Microtek	AM180HA-K-TU2	2945	20 May 04
Signal Generator	Hewlett Packard	8672A	411	26 Feb 04
Low Noise Amplifier (1 - 8GHz)	Miteq	AMF-3D-001080-18-13P	2457	TU
Low Noise Amplifier (8 - 18GHz)	Avantek	AWT 18036	1081	TU
Low Noise Amplifier (18 - 26GHz)	Avantek	AMT-26177-33	2072	TU
Low Noise Amplifier (18 - 40GHz)	Narda	DB02-0447	2936	23 Apr 04
3GHz High Pass Filter	RLC Electronics	F-100-3000-5-R	INV 04467	TU
Barometer	diplex	-	1938	TU
Hygrometer	Rotronic	A1	INV4066	28 Nov 03

Instrumentation used for Maximum Power measurements

Spectrum Analyser	Rohde and Schwarz	FSEM	INV4034	16 Dec 03
Signal Generator	Hewlett Packard	ESG 4000A	INV3709	21 Jan 04
DRG Antenna	EMCO	3115	INV3549	29 Jun 03
Substitution DRG Antenna	EMCO	3115	INV3777	20 Jan 04
Log Periodic Antenna	Rohde and Schwarz	HUF-Z3	INV2207	06 July 03
Log Periodic Antenna	Rohde and Schwarz	-	2328	17 May 04
Cable	Reynolds Industries	269-0088-3000	CS0565	TU
Cable	Rosenberger	FA210B-1-070M	CS0567	TU

TU - Traceability Unscheduled



RADIATED EMISSIONS: EUT in RLAN Mode

MEASUREMENT AT THE BAND EDGE (Marker Delta Method)

The following Test Results were obtained using the FCC Public Notice document (DA 00-705 released 30 March 2000) for making measurements at the Band Edge, incorporating the 'Marker Delta Method'.

Step 1

Bottom Channel Fundamental Field Strength Measurement.

Performed in accordance with ANSI C63.4

Peak measurements performed utilising a Resolution Bandwidth and Video Bandwidth of 1MHz.
Average measurements performed utilising a Resolution Bandwidth of 1MHz and Video Bandwidth of 10Hz.

Freq	Ant Pol	Hgt	Azi	Peak Field Strength	Average Field Strength
GHz	H/V	cm	deg	dB μ V/m	dB μ V/m
2.412	H	113	54	105.1	96.8

Step 2

Determine Marker delta amplitude between 2.412GHz fundamental and 2.390GHz the Band Edge under investigation.

Using a span of 30MHz with Resolution Bandwidth and Video Bandwidth of 300kHz.

2.412GHz Peak using above instrument settings = 70.1 dB μ V (uncorrected)

2.390GHz Peak using above instrument settings = 22.6dB μ V (uncorrected)

Therefore Marker Delta Amplitude (70.1dB μ V – 22.6 dB μ V) = 47.5dB

Step 3

Subtracting the Marker Delta obtained from Step 2 from the 2.412GHz Field Strength measurement from Step 1, gives following Result

Peak of 105.1dB μ V/m – 47.5dB (Delta) = 57.6dB μ V/m (Limit is 74.0dB μ V/m = Pass)

Average of 96.8dB μ V/m – 47.5dB (Delta) = 49.3dB μ V/m (Limit is 54.0dB μ V/m = Pass)



RADIATED EMISSIONS: EUT in RLAN Mode

MEASUREMENT AT THE BAND EDGE (Marker Delta Method) Continued

Step 1

Top Channel Fundamental Field Strength Measurement.

Performed in accordance with ANSI C63.4

Peak measurements performed utilising a Resolution Bandwidth and Video Bandwidth of 1MHz.
Average measurements performed utilising a Resolution Bandwidth of 1MHz and Video Bandwidth of 10Hz.

Freq	Ant Pol	Hgt	Azi	Peak FS	Average FS
GHz	H/V	cm	deg	dBµV/m	dBµV/m
2.462	H	113	54	107.6	99.5

Step 2

Determine Marker delta amplitude between 2.462GHz fundamental and 2.4835GHz the Band Edge under investigation.

Using a span of 30MHz with Resolution Bandwidth and Video Bandwidth of 300kHz.

2.462GHz Peak using above instrument settings = 73.2dBµV (uncorrected)
2.4835GHz Peak using above instrument settings = 21.1dBµV (uncorrected)

Therefore Marker Delta Amplitude (73.2dBµV – 21.1dBµV) = 52.1dB

Step 3

Subtracting the Marker Delta obtained from Step 2 from the 2.412GHz Field Strength measurement from Step 1, gives following Result

Peak of 107.6dBµV/m – 52.1dB (Delta) = 55.5dBµV/m (Limit is 74.0dBµV/m = Pass)

Average of 99.5dBµV/m – 52.1dB (Delta) = 47.4dBµV/m (Limit is 54.0dBµV/m = Pass)

EUT meets the measurement at the Band Edge requirements for the Top and Bottom Channel.

Procedure: Test Performed in accordance with FCC Public Notice document
(DA 00-705 released 30 March 2000)

Performed by: S Hartley, EMC Engineer.

Signature:

Date: 9th June 2003



RADIATED EMISSIONS: EUT in RLAN Mode

TEST PROCEDURE

Testing to the requirements of FCC Part 15 Subpart C, Section 15.247(c), for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed on page 40.

A preliminary profile of the Radiated 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 unless otherwise stated. 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 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.

30MHz – 1GHz emissions levels were then formally measured using a CISPR Quasi-Peak detector. 1GHz – 25GHz emissions levels were then formally measured using Peak and Average detectors.

(Note: Peak measurements performed using a Resolution and Video Bandwidth of 1MHz, Average measurements performed using a Resolution Bandwidth of 1MHz and a Video Bandwidth of 10Hz)

The EUT was operating off its internal battery; the battery was replaced at regular intervals to ensure optimum performance of the EUT.

Measurements were made with the EUT transmitting on the following channels.

Channel 1: 2412MHz
Channel 6: 2437MHz
Channel 11: 2462MHz

Radiated Emissions from 30MHz to 1GHz were made using a HP 8542E Test Receiver.

Radiated Emissions from 1GHz to 25GHz were made using a Rhode and Schwarz ESIB 40 Test Receiver.

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

The measurements were performed at a 3m distance unless otherwise stated.



RADIATED EMISSIONS TEST RESULTS: EUT in RLAN Mode (cont'd)

30MHz – 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 15.247© for Radiated Emissions (30MHz – 1GHz).

EUT Tx on Bottom Channel (2.412GHz)

30MHz – 1GHz Alternative Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented 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
50.01	V	100	106	8.3	0.9	13.0	22.2	12.9	40.0	100.0
340.20	H	110	20	10.1	2.7	14.6	27.4	23.4	46.0	200.0
431.70	V	100	150	11.0	3.0	16.4	30.4	33.1	46.0	200.0
498.20	V	100	146	12.7	3.3	17.1	33.1	45.2	46.0	200.0
527.10	V	100	146	15.0	3.4	17.4	35.8	61.7	46.0	200.0
623.20	V	100	146	14.7	3.7	18.7	37.1	71.6	46.0	200.0

Table of Results for Radiated Emissions

EUT Tx on Middle Channel (2.437GHz)

30MHz – 1GHz Alternative Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented 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
50.01	V	100	100	9.0	0.9	13.0	22.9	14.0	40.0	100.0
340.00	H	116	20	10.4	2.7	14.6	27.7	24.3	46.0	200.0
431.50	V	100	147	10.4	3.0	16.4	29.8	30.9	46.0	200.0
498.00	V	100	147	14.6	3.3	17.1	35.0	56.2	46.0	200.0
527.10	V	100	147	15.0	3.4	17.4	35.8	61.7	46.0	200.0
623.50	V	100	147	14.2	3.7	18.7	36.6	67.6	46.0	200.0

Table of Results for Radiated Emissions



RADIATED EMISSIONS TEST RESULTS: EUT in RLAN Mode (cont'd)

30MHz - 1GHz Frequency Range

EUT Tx on Top Channel (2.462GHz)

30MHz – 1GHz Alternative Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented 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
50.00	V	100	100	8.1	0.9	13.0	22.0	12.6	40.0	100.0
340.10	H	115	20	8.3	2.7	14.6	25.6	19.1	46.0	200.0
431.40	V	100	140	11.2	3.0	16.4	30.6	33.9	46.0	200.0
498.00	V	100	140	15.0	3.3	17.1	35.4	58.9	46.0	200.0
527.00	V	100	140	13.8	3.4	17.4	34.6	53.7	46.0	200.0
623.10	V	100	140	13.5	3.7	18.7	35.9	62.4	46.0	200.0

Table of Results for Radiated Emissions

ABBREVIATIONS FOR ABOVE TABLES

H Horizontal Polarisation
Pol Polarisation
deg degree

V Vertical Polarisation
Hgt Height
Azm Azimuth

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: A Guy, EMC Engineer.

Signature:

Date: 11th June 2003



RADIATED EMISSIONS TEST RESULTS: EUT in RLAN Mode (cont'd)

1GHz - 25GHz Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 15.247(c) for Radiated Emissions (1GHz – 25GHz).

EUT Tx on Bottom Channel (2.412GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
4.075	H	100	158	53.0	74.0	44.8	54.0

Table of Results for Radiated Emissions

EUT Tx on Middle Channel (2.437GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
2.349*	H	105	52	55.3	84.0	46.1	64.0
4.126	H	100	155	42.6	74.0	39.3	54.0
6.189	H	100	190	44.9	79.8	/	/

Table of Results for Radiated Emissions

* Measurements taken at 1m and results extrapolated to 3m



RADIATED EMISSIONS TEST RESULTS: EUT in RLAN Mode (cont'd)

1GHz - 25GHz Range

EUT Tx on Top Channel (2.462GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
4.175	H	100	276	56.2	74.0	50.9	54.0

Table of Results for Radiated Emissions

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: A Guy, EMC Engineer.

Signature: 

Date: 11th June 2003



MAXIMUM PEAK OUTPUT POWER: RLAN Mode

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.

The Spectrum Analyser was tuned to the test frequency. The device Output power setting was controlled via the 'Test Mode' on each handset being set to the conditions specified in the Summary on page 5 of this document. The device was then rotated through 360 degrees until the highest power level was observed in both planes of polarisation. The device was then replaced with a substitution antenna, the signal to the antenna was adjusted to equal the related level detected from the device.

Maximum Peak Output Power measurements were made with the EUT set to continuous transmit at maximum power on the following channels:

Channel 1: 2412MHz
Channel 6: 2437MHz
Channel 11: 2462MHz

TEST RESULTS

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

MAXIMUM POWER

Frequency (MHz)	Raw Result (dBm)	Substitution Level (dBm)	Cable Loss (dB)	Substitution Antenna Gain (dB)	Result ERP (dBm)	Result ERP (mW)
2412	-18.05	14.34	5.41	7.10	16.03	40.1
2437	-19.48	12.80	5.29	7.14	14.65	29.2
2462	-19.34	12.92	5.29	7.19	14.82	30.3

Table 1

Performed by: Ryan Henley, Radio Engineer.

Signature:

Ryan Henley.

Date: 10th June 2003



RADIATED EMISSIONS: EUT in Bluetooth Mode

MEASUREMENT AT THE BAND EDGE (Marker Delta Method)

The following Test Results were obtained using the FCC Public Notice document (DA 00-705 released 30 March 2000) for making measurements at the Band Edge, incorporating the 'Marker Delta Method'.

Step 1

Bottom Channel Fundamental Field Strength Measurement.

Performed in accordance with ANSI C63.4

Peak measurements performed utilising a Resolution Bandwidth and Video Bandwidth of 1MHz.
Average measurements performed utilising a Resolution Bandwidth of 1MHz and Video Bandwidth of 10Hz.

Freq	Ant Pol	Hgt	Azi	Peak Field Strength	Average Field Strength
GHz	H/V	cm	deg	dBμV/m	dBμV/m
2.402	V	100	3	93.6	89.8

Step 2

Determine Marker delta amplitude between 2.402GHz fundamental and 2.390GHz the Band Edge under investigation.

Using a span of 30MHz with Resolution Bandwidth and Video Bandwidth of 300kHz.

2.402GHz Peak using above instrument settings = 59.9 dBμV (uncorrected)

2.390GHz Peak using above instrument settings = 21.6dBμV (uncorrected)

Therefore Marker Delta Amplitude (59.9dBμV – 21.6 dBμV) = 38.3dB

Step 3

Subtracting the Marker Delta obtained from Step 2 from the 2.402GHz Field Strength measurement from Step 1, gives following Result

Peak of 93.6dBμV/m –38.3dB (Delta) = 55.3dBμV/m (Limit is 74.0dBμV/m = Pass)

Average of 89.8dBμV/m –38.3dB (Delta) = 51.5dBμV/m (Limit is 54.0dBμV/m = Pass)



RADIATED EMISSIONS: EUT in Bluetooth Mode

MEASUREMENT AT THE BAND EDGE (Marker Delta Method) Continued

Step 1

Top Channel Fundamental Field Strength Measurement.

Performed in accordance with ANSI C63.4

Peak measurements performed utilising a Resolution Bandwidth and Video Bandwidth of 1MHz.
Average measurements performed utilising a Resolution Bandwidth of 1MHz and Video Bandwidth of 10Hz.

Freq	Ant Pol	Hgt	Azi	Peak Field Strength	Average Field Strength
GHz	H/V	cm	deg	dBµV/m	dBµV/m
2.480	V	119	0	90.5	86.3

Step 2

Determine Marker delta amplitude between 2.480GHz fundamental and 2.483GHz the Band Edge under investigation.

Using a span of 30MHz with Resolution Bandwidth and Video Bandwidth of 300kHz.

2.480GHz Peak using above instrument settings = 57.0 dBµV (uncorrected)

2.483GHz Peak using above instrument settings = 20.7dBµV (uncorrected)

Therefore Marker Delta Amplitude (57.0dBµV – 20.7 dBµV) = 36.3dB

Step 3

Subtracting the Marker Delta obtained from Step 2 from the 2.480GHz Field Strength measurement from Step 1, gives following Result

Peak of 90.5dBµV/m –36.3dB (Delta) = 54.2dBµV/m (Limit is 74.0dBµV/m = Pass)

Average of 86.3dBµV/m –36.3dB (Delta) = 50.0dBµV/m (Limit is 54.0dBµV/m = Pass)

EUT meets the measurement at the Band Edge requirements for the Top and Bottom Channel.

Procedure: Test Performed in accordance with FCC Public Notice document
(DA 00-705 released 30 March 2000)

Performed by: A Guy, EMC Engineer.

Signature:

Date: 9th June 2003



RADIATED EMISSIONS: EUT in Bluetooth Mode

TEST PROCEDURE

Testing to the requirements of FCC Part 15 Subpart C, Section 15.247(c), for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed on page 40.

A preliminary profile of the Radiated 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 unless otherwise stated. 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 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.

30MHz - 1GHz emissions levels were then formally measured using a CISPR Quasi-Peak detector.
1GHz - 25GHz emissions levels were then formally measured using Peak and Average detectors.

(Note: Peak measurements performed using a Resolution and Video Bandwidth of 1MHz, Average measurements performed using a Resolution Bandwidth of 1MHz and a Video Bandwidth of 10Hz)

The EUT was operating off its internal battery, the battery was replaced at regular intervals to ensure optimum performance of the EUT.

Measurements were made with the EUT transmitting on the following channels.

Channel 2: 2402MHz
Channel 41: 2441MHz
Channel 80: 2480MHz

Radiated Emissions from 30MHz to 1GHz were made using a HP 8542E Test Receiver.

Radiated Emissions from 1GHz to 25GHz were made using a Rhode and Schwarz ESIB 40 Test Receiver.

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

The measurements were performed at a 3m distance unless otherwise stated.



RADIATED EMISSIONS TEST RESULTS: EUT in Bluetooth Mode (cont'd)

30MHz - 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 15.247(c) for Radiated Emissions (30MHz – 1GHz).

EUT Tx on Bottom Channel (2.402GHz)

30MHz – 1GHz Alternative Open Area Test Site Results : The levels of the six highest emissions measured in accordance with the specification are presented 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
214.60	H	120	300	30.2	2.0	11.0	25.9	19.7	43.5	150.0
335.50	V	120	300	36.8	2.6	14.4	35.2	57.5	46.0	200.0
431.30	V	120	300	34.3	3.0	16.4	31.7	38.5	46.0	200.0
527.15	V	120	300	36.4	3.4	17.4	33.7	48.4	46.0	200.0
575.08	V	120	300	35.2	3.5	18.2	31.8	38.9	46.0	200.0
623.00	V	120	300	38.2	3.7	18.7	35.3	58.2	46.0	200.0

Table of Results for Radiated Emissions

EUT Tx on Middle Channel (2.441GHz)

30MHz – 1GHz Alternative Open Area Test Site Results : The levels of the six highest emissions measured in accordance with the specification are presented 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
214.60	H	120	300	29.7	2.0	11.0	25.3	18.4	43.5	150.0
335.50	V	120	300	36.7	2.6	14.4	34.9	55.6	46.0	200.0
431.30	V	120	300	33.9	3.0	16.4	31.5	37.6	46.0	200.0
527.15	V	120	300	36.4	3.4	17.4	34.0	50.1	46.0	200.0
575.08	V	120	300	35.4	3.5	18.2	32.1	40.3	46.0	200.0
623.00	V	120	300	38.2	3.7	18.7	35.2	57.5	46.0	200.0

Table of Results for Radiated Emissions



RADIATED EMISSIONS TEST RESULTS: EUT in Bluetooth Mode (cont'd)

30MHz - 1GHz Frequency Range

EUT Tx on Top Channel (2.480GHz)

30MHz – 1GHz Alternative Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented 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
214.60	H	120	300	30.6	2.0	11.0	25.4	18.6	43.5	150.0
335.50	V	120	300	33.7	2.6	14.4	30.2	32.4	46.0	200.0
431.30	V	120	300	34.3	3.0	16.4	30.7	34.3	46.0	200.0
527.10	V	120	300	38.5	3.4	17.4	35.5	59.6	46.0	200.0
575.10	V	120	300	36.5	3.5	18.2	31.7	38.5	46.0	200.0
623.00	V	120	300	39.3	3.7	18.7	35.5	59.6	46.0	200.0

Table of Results for Radiated Emissions

ABBREVIATIONS FOR ABOVE TABLES

H Horizontal Polarisation
Pol Polarisation
deg degree

V Vertical Polarisation
Hgt Height
Azm Azimuth

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: S Hartley, A Guy, EMC Engineers.

Signature:

Steven Hartley *A Guy*

Date: 11th June 2003



RADIATED EMISSIONS TEST RESULTS: EUT in Bluetooth Mode (cont'd)

1GHz - 25GHz Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 15.247(c) for Radiated Emissions (1GHz – 25GHz).

EUT Tx on Bottom Channel (2.402GHz)

No emissions were detected within 30dB of the specification limit.

EUT Tx on Middle Channel (2.441GHz)

No emissions were detected within 30dB of the specification limit.

EUT Tx on Top Channel (2.480GHz)

No emissions were detected within 30dB of the specification limit.

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: A Guy, EMC Engineer.

Signature:  _____

Date: 12th June 2003



MAXIMUM PEAK OUTPUT POWER: EUT in Bluetooth Mode

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.

The Spectrum Analyser was tuned to the test frequency. The device Output power setting was controlled via the 'Test Mode' on each handset being set to the conditions specified in the Summary on page 5 of this document. The device was then rotated through 360 degrees until the highest power level was observed in both planes of polarisation. The device was then replaced with a substitution antenna, the signal to the antenna was adjusted to equal the related level detected from the device.

Maximum Peak Output Power measurements were made with the EUT set to continuous transmit at maximum power on the following channels:

Channel 2: 2402MHz
Channel 41: 2441MHz
Channel 80: 2480MHz

TEST RESULTS

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

MAXIMUM POWER

Frequency (MHz)	Raw Result (dBm)	Substitution Level (dBm)	Cable Loss (dB)	Substitution Antenna Gain (dB)	Result ERP (dBm)	Result ERP (mW)
2402	-46.98	-15.10	5.17	6.88	-13.39	0.05
2441	-50.09	-18.70	5.52	6.95	-17.27	0.02
2480	-50.73	-19.10	5.28	7.02	-17.36	0.02

Table of Results for Maximum Peak Output Power

Performed by: Ryan Henley, Radio Engineer.

Signature:

Date:

10th June 2003



PHOTOGRAPHS OF THE 4111-GPRS

PHOTOGRAPHS OF EQUIPMENT



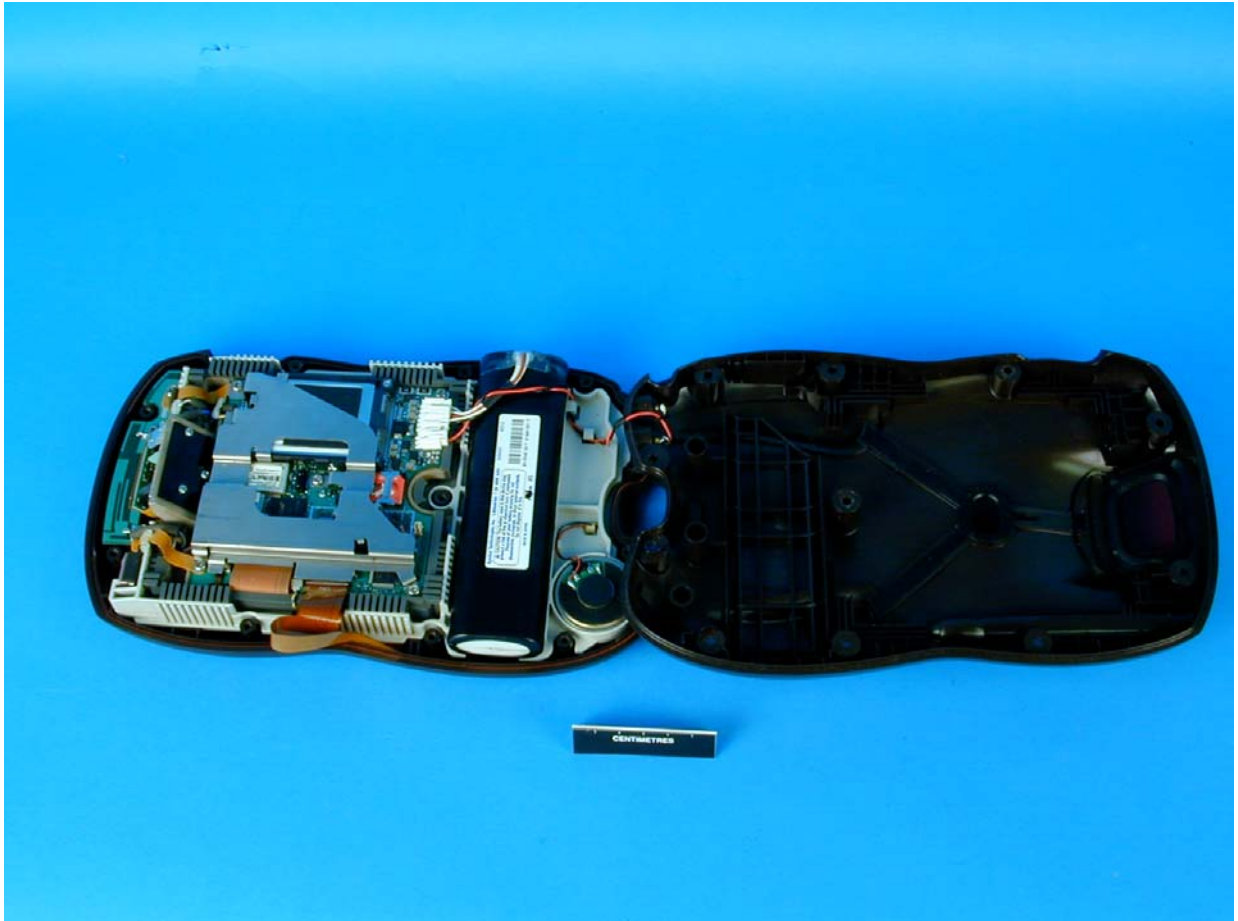
Photograph 2
4111-GPRS Front view

PHOTOGRAPHS OF EQUIPMENT



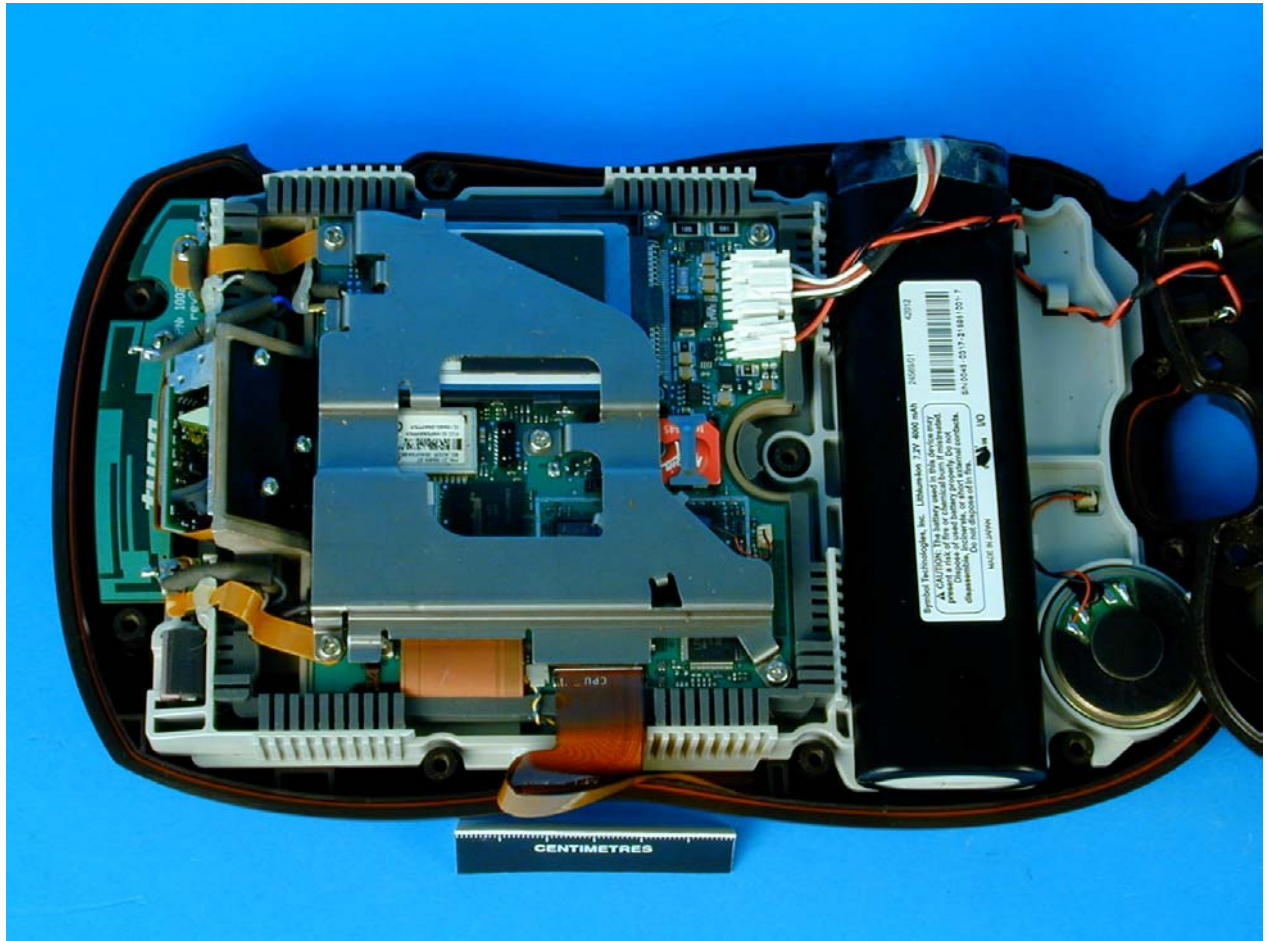
Photograph 3
4111-GPRS Rear View

PHOTOGRAPHS OF EQUIPMENT



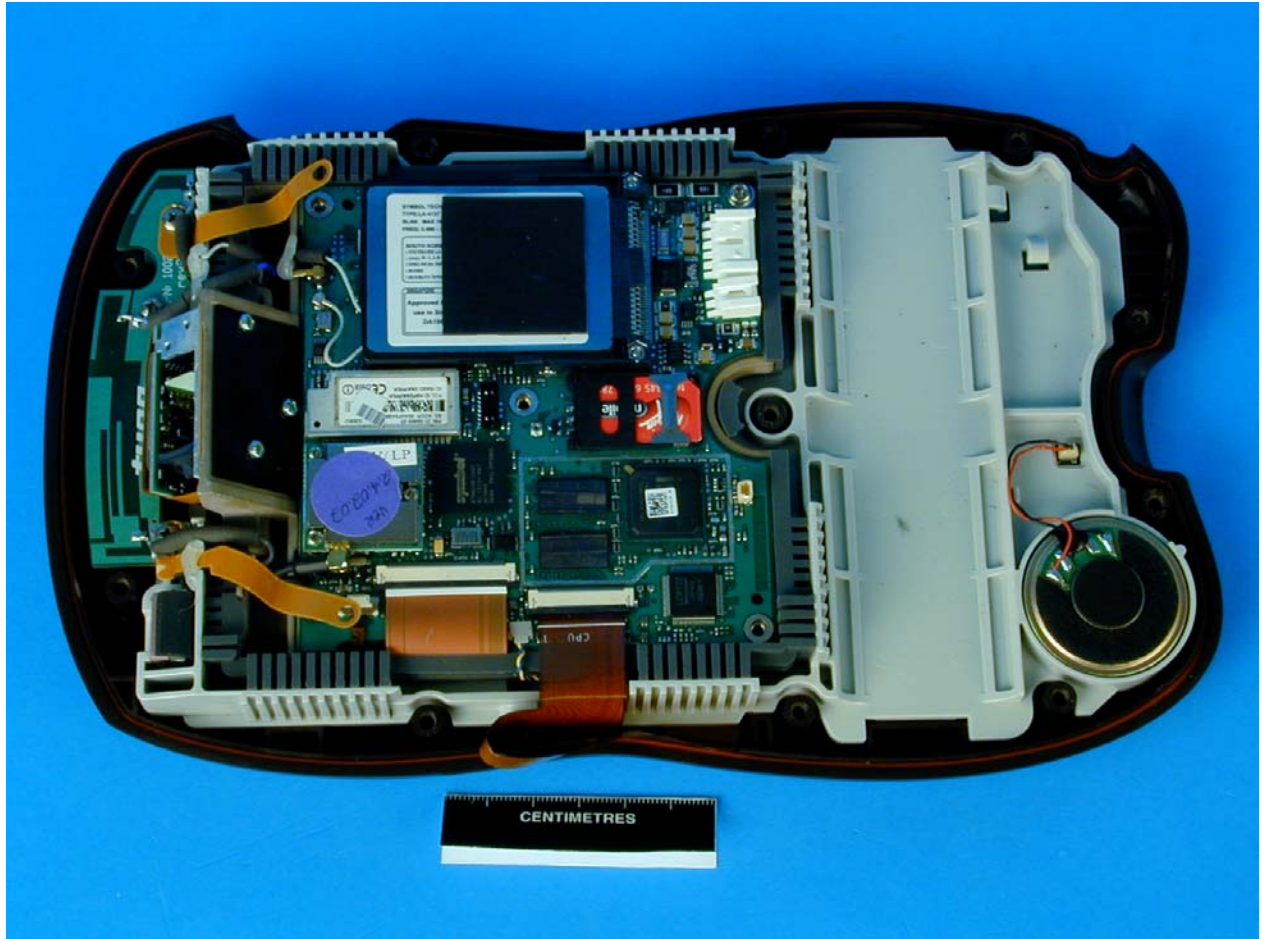
Photograph 4
4111-GPRS Internal view

PHOTOGRAPHS OF EQUIPMENT



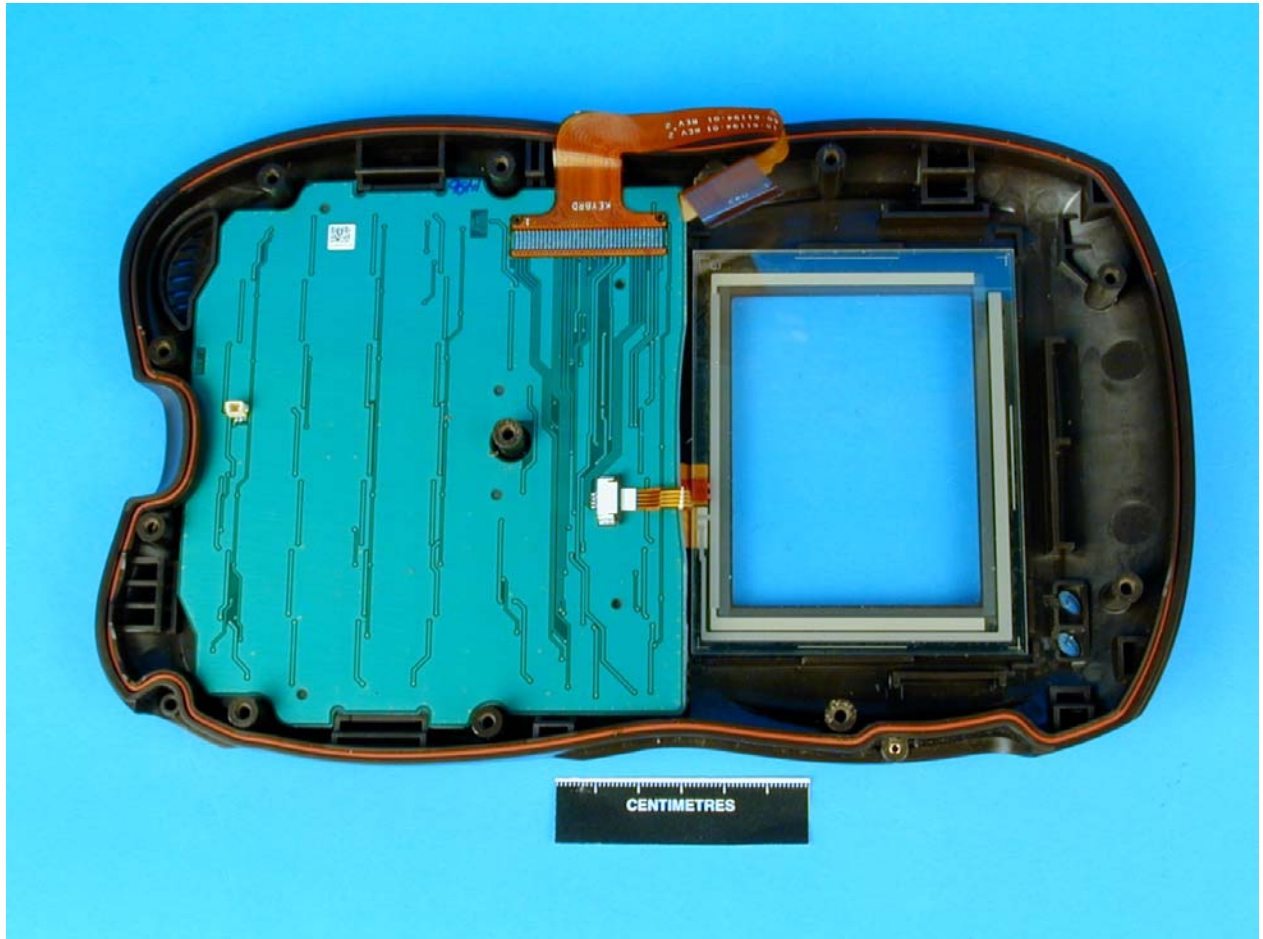
Photograph 5
4111 GPRS Internal view

PHOTOGRAPHS OF EQUIPMENT



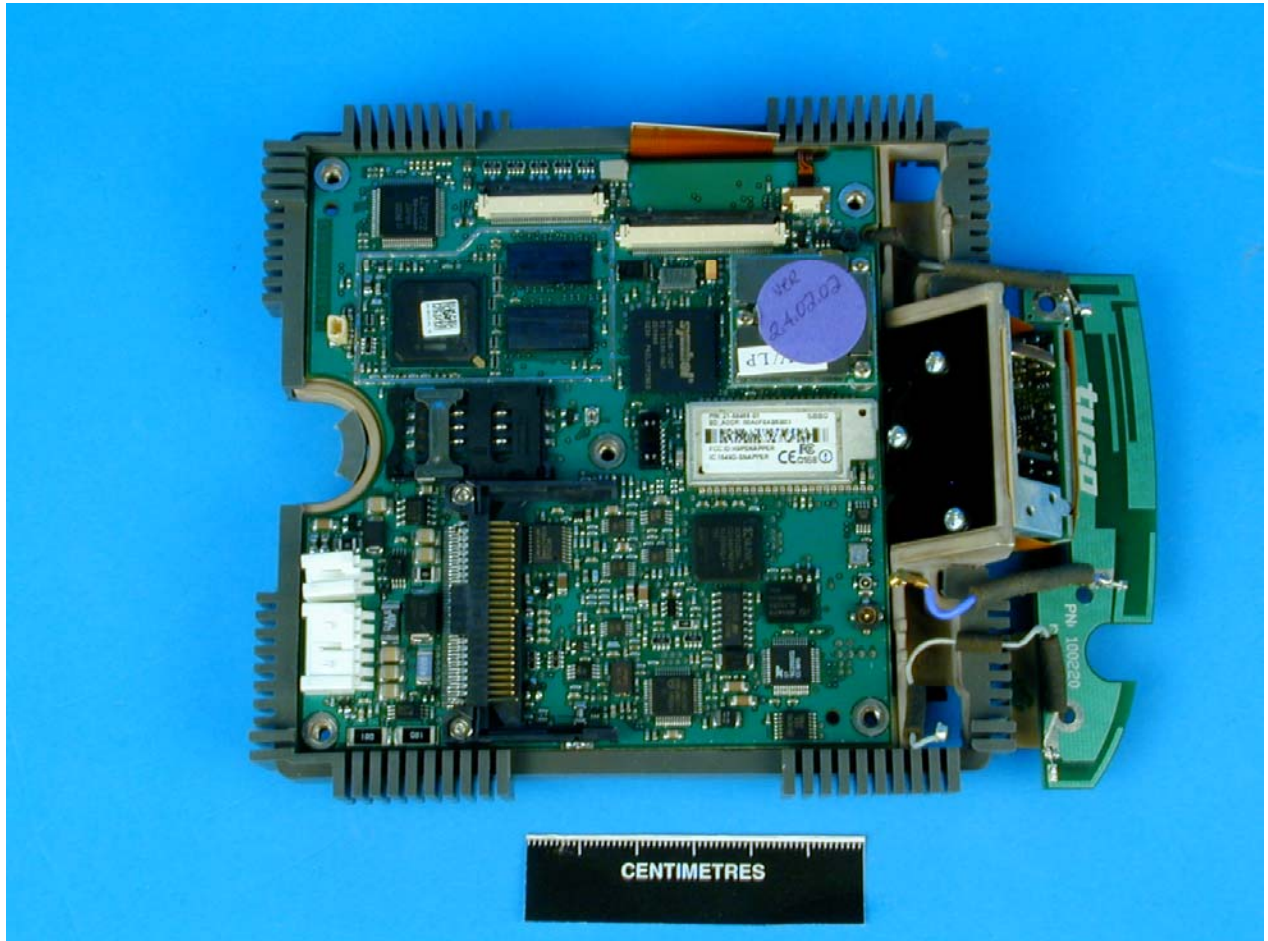
Photograph 6
4111-GPRS Internal View

PHOTOGRAPHS OF EQUIPMENT



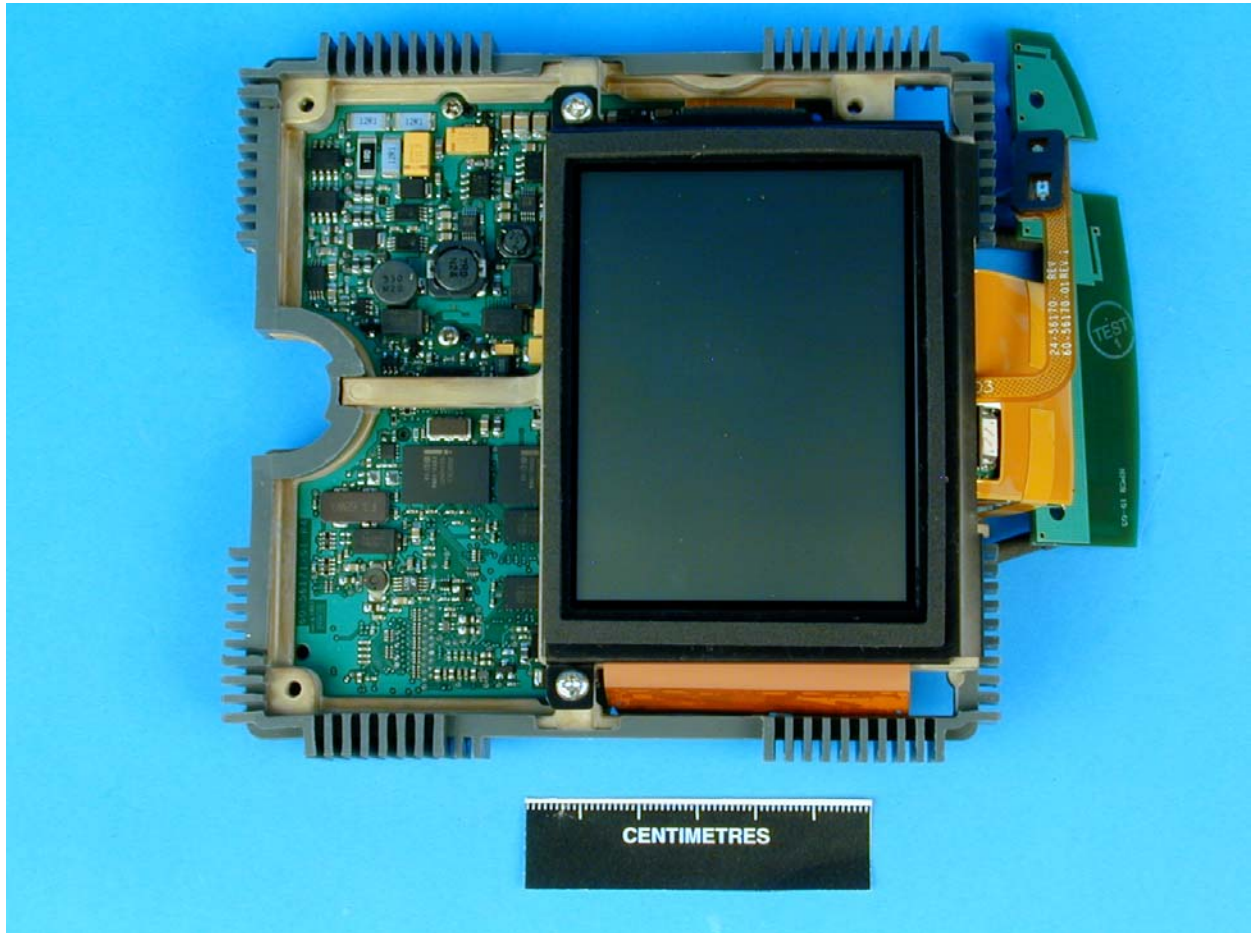
Photograph 7
4111-GPRS Internal view

PHOTOGRAPHS OF EQUIPMENT



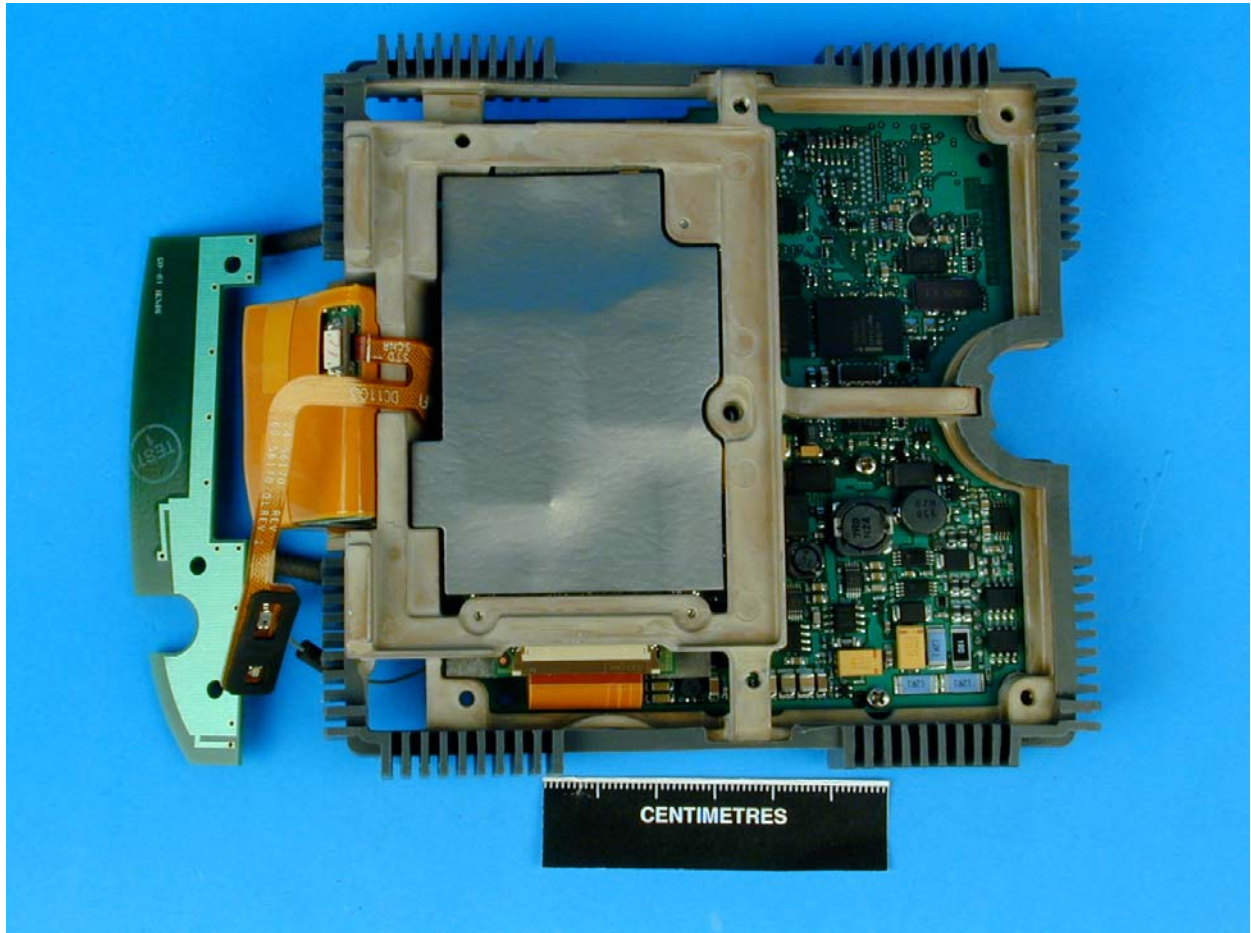
Photograph 8
4111-GPRS Internal View

PHOTOGRAPHS OF EQUIPMENT



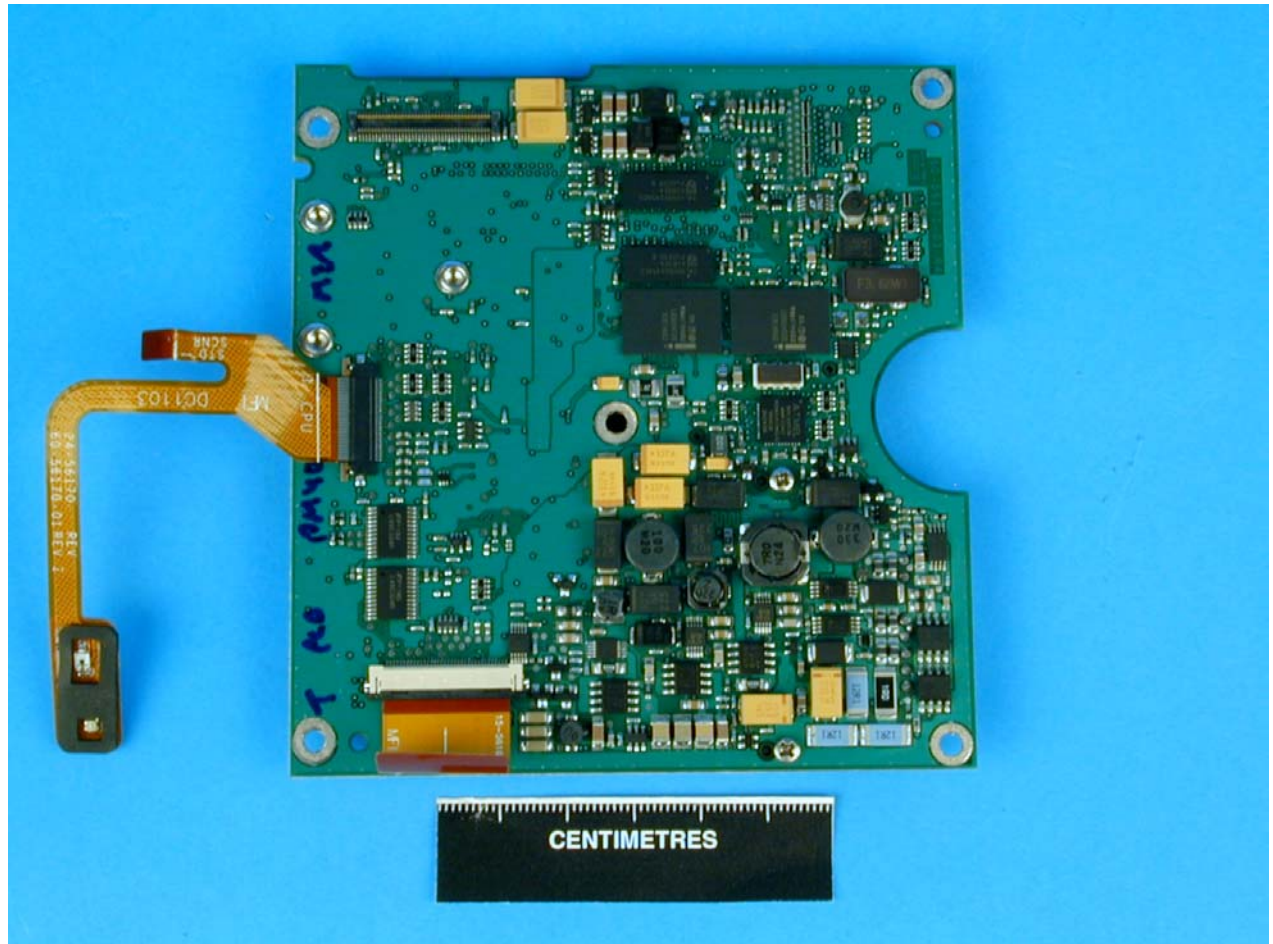
Photograph 9
4111-GPRS Internal View

PHOTOGRAPHS OF EQUIPMENT



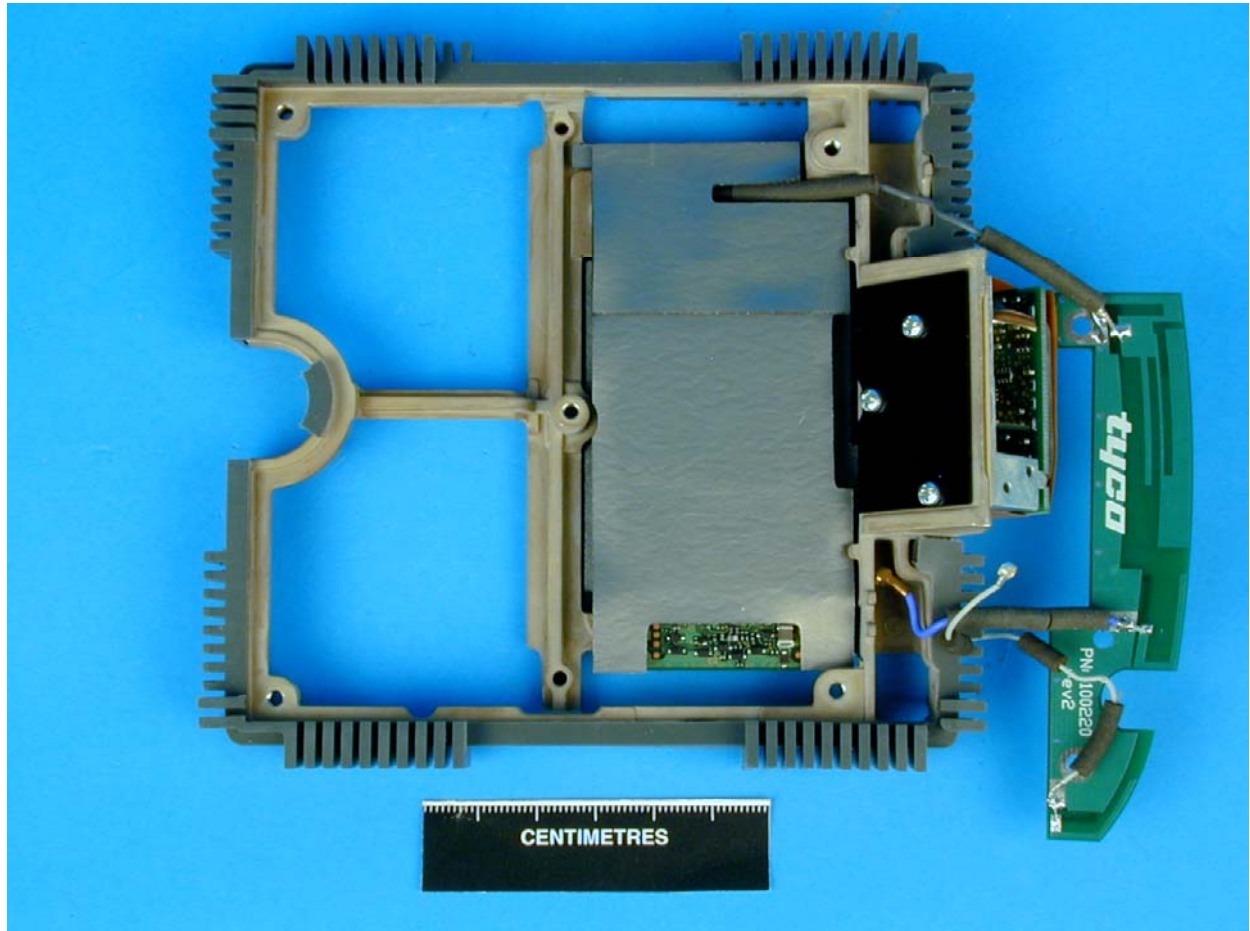
Photograph 10
4111-GPRS Internal View

PHOTOGRAPHS OF EQUIPMENT



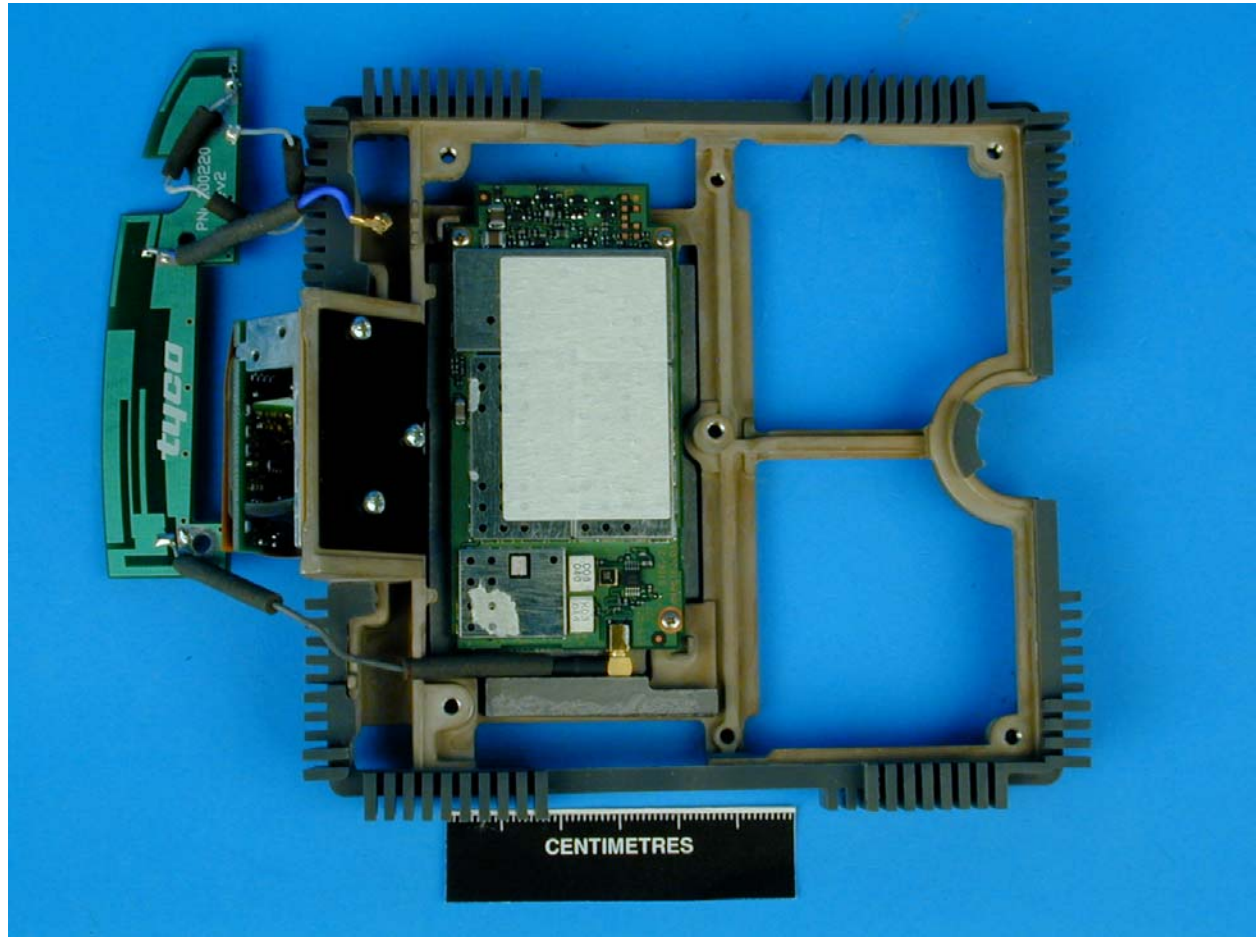
Photograph 11
4111-GPRS Internal View

PHOTOGRAPHS OF EQUIPMENT



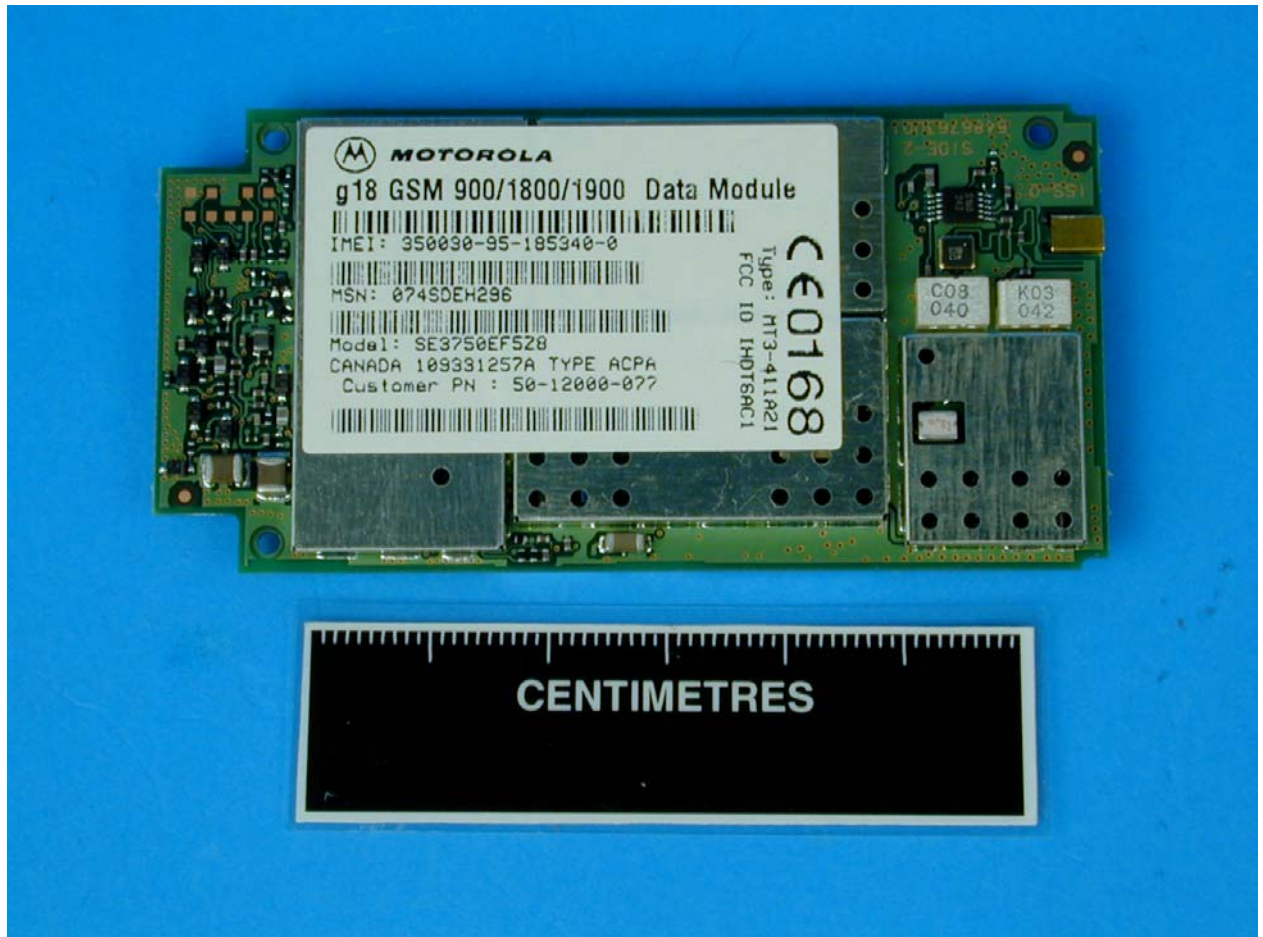
Photograph 12
4111-GPRS Internal view

PHOTOGRAPHS OF EQUIPMENT



Photograph 13
4111-GPRS Internal view

PHOTOGRAPHS OF EQUIPMENT



Photograph 14
4111-GPRS Front view of G18 GSM/GPRS Module

PHOTOGRAPHS OF EQUIPMENT



Photograph 15
4111-GPRS View of LA-4137 RLAN Card

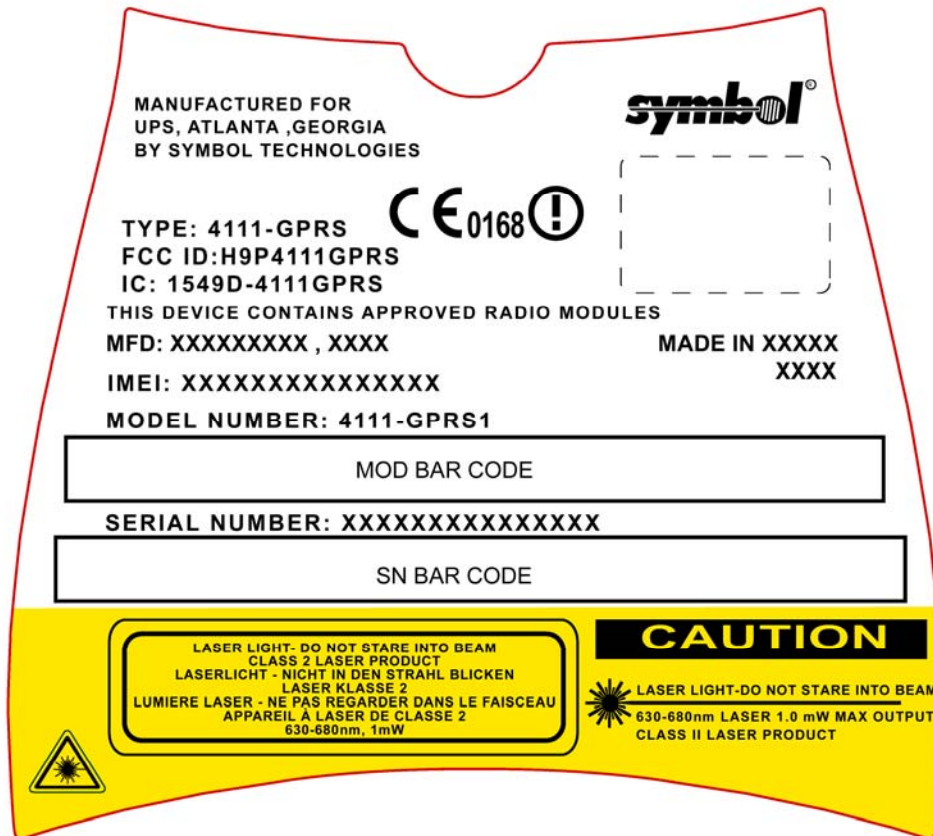
PHOTOGRAPHS OF EQUIPMENT



Photograph 16
4111-GPRS Front View Symbol 21-58466 Bluetooth Module



MANUFACTURERS LABEL DIAGRAM



4111-GPRS Label View



FCC SITE COMPLIANCE LETTER

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 under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

**Thomas W Phillips
Electronics Engineer**



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	$\pm 2 \times 10^{-7} \times \text{Centre Frequency}$
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 measurements: -

Frequency	$\pm 2 \times 10^{-7} \times \text{Centre Frequency}$
Amplitude	$\pm 3.4\text{dB}$

For Effective Radiated Power (ERP) measurements: -

Amplitude	$\pm 1.45\text{dBm}$
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This report relates only to the actual item/items tested.

UKAS Accreditation's do not cover opinions and interpretations and any expressed herein are outside the scope of any UKAS Accreditation.

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

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