TEST REPORT

Limited FCC Part 15C Testing (Co-Located Transmitters) for an Intermec 730 Handheld Computer Terminal with 802.11b Radio Module and Bluetooth Module
FCC ID: EHA-802CFI3 & EHA-BTM210

Report Number: OR611453-06 December 2003

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REPORT ON Limited FCC Part 15C Testing (Co-Located Transmitters) for an Intermec 730 Handheld Computer Terminal with 802.11b Radio Module and Bluetooth Module
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Report No OR611453-06

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EQUIPMENT: Intermec 730 Handheld Computer Terminal with 802.11b Radio Module and Bluetooth Module

FCC ID: EHA-802CFI3 & EHA-BTM210

SPECIFICATION: 47 CFR 15.247

PREPARED FOR: Intermec Technologies Corporation
550 Second Street S.E
Cedar Rapids
IOWA 52401
USA

MANUFACTURERS REPRESENTATIVE: Mr Scott Holub

APPROVED BY:

C H GOULD
EMC Signatory

DATED: 15th December 2003

DISTRIBUTION

Intermec Technologies	Copy 1 (CD)
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Total No of Pages 31
(Inclusive of Annex A)

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 15. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

G Lawler

M Larkin

CONTENTS

SECTION 1

REPORT SUMMARY

Limited FCC Part 15C Testing (Co-Located Transmitters) for an Intermec 730 Handheld Computer Terminal with 802.11b Radio Module and Bluetooth Module
FCC ID: EHA-802CFI3 & EHA-BTM210

1.1 STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Intermec 730 Handheld Computer Terminal with 802.11b Radio Module and Bluetooth Module
APPLICANT	Intermec Technologies Norand Mobile Systems Division 550 Second Street S.E Cedar Rapids IOWA 52401 USA
MANUFACTURERS TYPE NUMBER	730
HARDWARE REVISION	730A1E4004001
TEST SPECIFICATION NUMBER	FCC Part 15 Subpart C
REGISTRATION NUMBER	OR611453
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE **SERIAL NUMBER** **DATE**	Declaration of Build Status OR611453
DISPOSAL **REFERENCE NUMBER** **DATE**	Held pending disposal N/A N/A
START OF TEST **FINISH OF TEST**	04 November 2003 26 November 2003
TEST ENGINEERS	G Lawler M Larkin S Hartley
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)

1.2 INTRODUCTION

The information contained within this report is intended to show verification of compliance of the Intermec Technologies Inc Intermec 730 Handheld Computer Terminal with 802.11b Radio Module co-located with a BTM210 Bluetooth Module to the requirements of FCC Specification Part 15.

FCC ID EHA-802CF13 & EHA-BTM210

1.3 LOCATION OF TESTING

TUV Product Service Engineers Matthew Larkin, Steve Hartley and Graham Lawler conducted all testing at the premises TUV Product Service, Segensworth Road, Fareham, Hampshire, PO15 5RH. Spurious Radiated Emissions measurements were performed in a 3 metre Anechoic Chamber. A complete site description is on file with the FCC Laboratory Division, Registration Number: 90987. See Annex A.

1.4 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out is shown below.

Test	Spec Clause	Test Description	Result	Levels/Comments
2.1	FCC: Part 15.247(c)	Spurious Radiated Emissions	PASS	
2.2	FCC: Part 15.247(b)(3)	Maximum Peak Power Output (EIRP Method)	PASS	

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) was a 730 Handheld Computer Terminal with a 802.11b Radio Module, which offers 2.4GHz Wireless connectivity with other 802.11b devices, and a BTM210 Bluetooth Radio, which offers 2.4GHz Wireless connectivity with other Bluetooth devices.

An Intermec Technologies 730 Handheld Computer Terminal was supplied as the host unit, this was used to control the EUT during test.

Manufacturing Description:	Intermec 730 Handheld Computer Terminal with 802.11b Radio Module
Manufacturer:	Intermec Technologies
Model No:	730
Serial No:	28010300021

1.5.2 Modes of Operation

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

2.4GHz RLAN functionality

Bottom Channel:	2412MHz
Middle Channel:	2437MHz
Top Channel:	2462MHz

Bluetooth RLAN functionality

Bottom Channel:	2402MHz
Middle Channel:	2441MHz
Top Channel:	2480MHz

The EUT was set at the Maximum Output Power during testing.

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the standard were made during testing.

1.7 MODIFICATION RECORD

No modifications were made to the test sample.

SECTION 2

TEST DETAILS

Limited FCC Part 15C Testing (Co-Located Transmitters) for an Intermec 730 Handheld Computer Terminal with 802.11b Radio Module and Bluetooth Module
FCC ID: EHA-802CFI3 & EHA-BTM210

2.1 SPURIOUS RADIATED EMISSIONS

2.1.1 Specification Reference

FCC Part 15.247(c)

2.1.2 Equipment Under Test

Intermec 730 Handheld Computer Terminal with 802.11b Radio Module and Bluetooth Radio Module.

2.1.3 Date of Test

04 - 26 November 2003

2.1.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14

2.1 SPURIOUS RADIATED EMISSIONS - Continued

2.1.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. 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. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

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

The EUT was operating via the internal power supply of the Host.

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

	RLAN	BLUETOOTH
Configuration 1	2.412GHz	2.402GHz
Configuration 2	2.437GHz	2.441GHz
Configuration 3	2.412GHz	4.480GHz

Performed by G Lawler, EMC Engineer, M Larkin, EMC Engineer.

2.1.6 Test Results

EUT Tx on Configuration 1: BT Bottom Channel (2402MHz), RLAN Bottom Channel (2412MHz)

30MHz – 1GHz Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
66.5	V	100	116	25.1	18.0	40.0	100
127.7	V	100	242	23.9	15.7	43.5	150
298.6	H	100	184	30.9	35.1	46.0	200
497.7	V	100	360	29.7	30.5	46.0	200
597.2	V	100	018	28.0	25.1	46.0	200
895.8	V	103	155	34.7	54.3	46.0	200

EUT Tx on Configuration 2: BT Middle Channel (2441MHz), RLAN Middle Channel (2437MHz)

30MHz – 1GHz Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	Cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
66.8	V	100	117	21.2	11.5	40.0	100
128.0	V	100	253	25.6	19.1	43.5	150
298.6	H	134	180	30.6	33.9	46.0	200
497.7	V	100	343	30.5	33.5	46.0	200
597.3	V	100	009	29.2	28.8	46.0	200
895.8	V	100	158	31.8	38.9	46.0	200

2.1.6 Test Results - Continued

EUT Tx on Configuration 3: BT Top Channel (2480MHz), RLAN Bottom Channel (2412MHz)

30MHz – 1GHz Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
30.90	V	100	320	21.1	11.3	40.0	100
65.67	V	100	104	25.7	19.3	40.0	100
127.7	V	100	233	24.3	16.4	43.5	150
298.5	H	130	176	31.7	38.5	46.0	200
497.7	V	100	339	30.6	33.9	46.0	200
598.0	V	100	013	27.4	23.4	46.0	200
895.8	V	100	143	31.5	37.6	46.0	200

ABBREVIATIONS FOR ABOVE TABLES

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

2.1.6 Test Results - Continued

EUT Tx on Configuration 1: BT Bottom Channel (2402MHz), RLAN Bottom Channel (2412MHz)

1GHz – 25GHz Test Site Results : The levels of the highest emissions measured in accordance with the specification are presented below: -

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Filed Strength	Average Limit
	Polarisation	Height	Azimuth				
GHz	H/V	Cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
4.804	V	100	225	45.1	74.0	36.5	54.0
4.804	H	100	259	46.2	74.0	37.5	54.0
4.824	V	100	178	45.5	74.0	37.4	54.0
4.524	H	100	263	45.7	74.0	38.0	54.0

EUT Tx on Configuration 2: BT Middle Channel (2441MHz), RLAN Middle Channel (2437MHz)

1GHz – 25GHz Test Site Results : The levels of the highest emissions measured in accordance with the specification are presented below: -

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Filed Strength	Average Limit
	Polarisation	Height	Azimuth				
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
4.881	V	100	12	47.9	74.0	35.3	54.0
4.881	V	100	278	48.6	74.0	36.5	54.0

EUT Tx on Configuration 3: BT Top Channel (2480MHz), RLAN Bottom Channel (2412MHz)

1GHz – 25GHz Test Site Results : No Emissions Measured

2.2 MAXIMUM PEAK OUTPUT POWER (EIRP Method)

2.2.1 Specification Reference

FCC CFR 47: Part 15 Subpart C, Section 15.247(b)(3)

2.2.2 Equipment Under Test

Intermec 730 Handheld Computer Terminal with 802.11b Radio Module and Bluetooth Radio Module

2.2.3 Date of Test

26 November 2003

2.2.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 1,2,3,4,5,6,7,8,9,10,11,12

2.2.5 Test Procedure

Test Performed in accordance with FCC CFR 47: Part 15.247(b)(1).

The EUT contains an integral antenna and therefore the Maximum Peak Output Power was made using the EIRP method.

The Spectrum Analyser was tuned to the test frequency. The device Output Power setting was controlled as specified in the Product Information, Section 1.5 of this document. The device was then rotated through 360 degrees until the highest power level was observed in both horizontal and vertical polarisation. The device was then replaced with a substitution antenna, who's input signal level into the antenna was adjusted until the received level matched that of the previously detected emission.

Using previous EIRP results for the RLAN Module and the Bluetooth Module tested as individual transmitters, the sum of the individual EIRP results was taken. The test was only repeated if the sum of the EIRP measurements was within 5% of the limit as agreed with the TCB.

Performed by S Hartley, EMC Engineer

2.2.6 Test Results

The sum of the individual EIRP measurements for the RLAN Module and the Bluetooth Module was not within 5% of the limit so measurements with the two modules transmitting simultaneously was not carried out.

The table below outlines the individual EIRP Measurements:

Channel	Module	EIRP (dBm)	Sum (dBm)	Limit (dBm)
Bottom	Bluetooth	-9.1	10.7	36.0
	RLAN	19.8		
Middle	Bluetooth	-5.2	15.0	36.0
	RLAN	20.2		
Top	Bluetooth	-2.6	17.8	36.0
	RLAN	20.4		

SECTION 3

TEST EQUIPMENT USED & MEASUREMENT UNCERTAINTIES

3.1 TEST EQUIPMENT USED

Item	Instrument	Manufacturer	Type No	EMC / INV No	Cal. Due
1	Antenna Mast	EMCO	2070	-	TU
2	Antenna Mast Controller	EMCO	2090	-	TU
3	Screen Room 5	-	-	2533	TU
4	Low Noise Amplifier (1-8GHz)	Miteq	AMF-3D-001080-18-13P	2457	TU
5	Low Noise Amplifier (8-18GHz)	Miteq	AMF-4E-080180-15-10P	2430	TU
6	Horn	EMCO	3315	2397	04/07/04
7	EMI Test Receiver	Rohde & Schwarz	ESIB26	2958	05/08/04
8	T&H Monitor	Rotronic	Hygromer	4066	28/11/03
9	3dB Pad	HP	8491B	-	TU
10	18-40Watt Horn	Link Microtech Ltd	AM180HA –K – TUZ	2945	15/04/05
11	Amplifier	Avanteck	AMT-26177-33	2072	26/06/04
12	Amplifier	Avanteck	AWT-18036	1081	26/06/04
13	EMI receiver	HP	8542E	2286	13/12/03
14	Bilog Antenna	Chase	CBL6143	2860	11/04/04
15					
16					
17					
18					
19					
20					
21					
22					

TU – Traceability Unscheduled

3.2 MEASUREMENT UNCERTAINTY

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

IN THE FREQUENCY RANGE 30MHz TO 1000MHz		
TEST	**FREQUENCY**	**AMPLITUDE**
For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard EMI Receiver and Bilog Antenna	$\pm 2 \times 10^{-7}$ x Centre Frequency	5.15dB calculated in accordance with CISPR 16-4
IN THE FREQUENCY RANGE 1GHz TO 25GHz		
TEST	**FREQUENCY**	**AMPLITUDE**
For Spurious Radiated Emissions measurements	$\pm 2 \times 10^{-7}$ x Centre Frequency	±3.4dB
For Effective Radiated Power (ERP) measurements	Not Applicable	±1.45dBm

SECTION 4

PHOTOGRAPHS OF TEST SAMPLE

4.1 PHOTOGRAPHS OF EQUIPMENT

4.1 PHOTOGRAPHS OF EQUIPMENT - Continued

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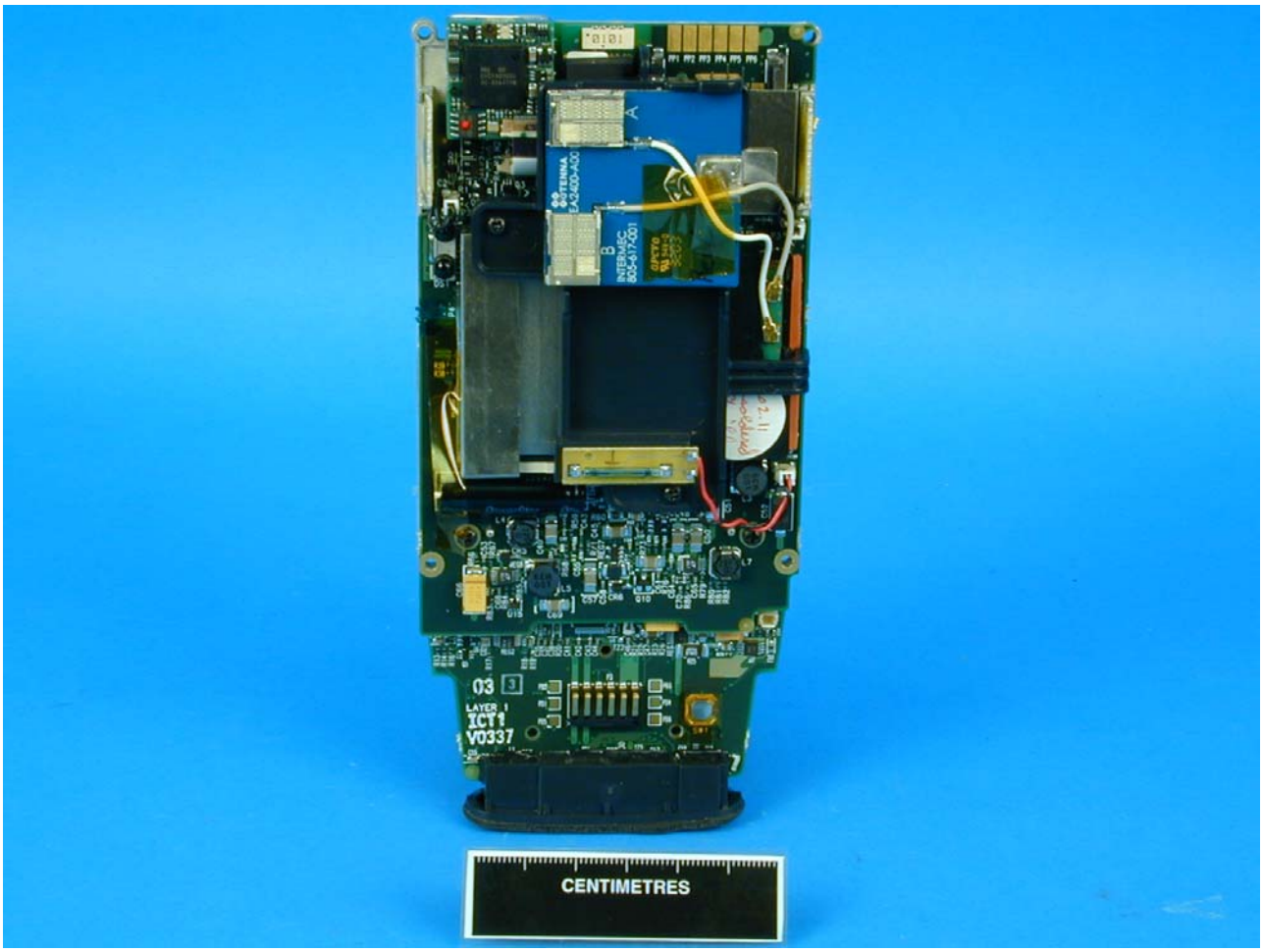

4.1 PHOTOGRAPHS OF EQUIPMENT - Continued

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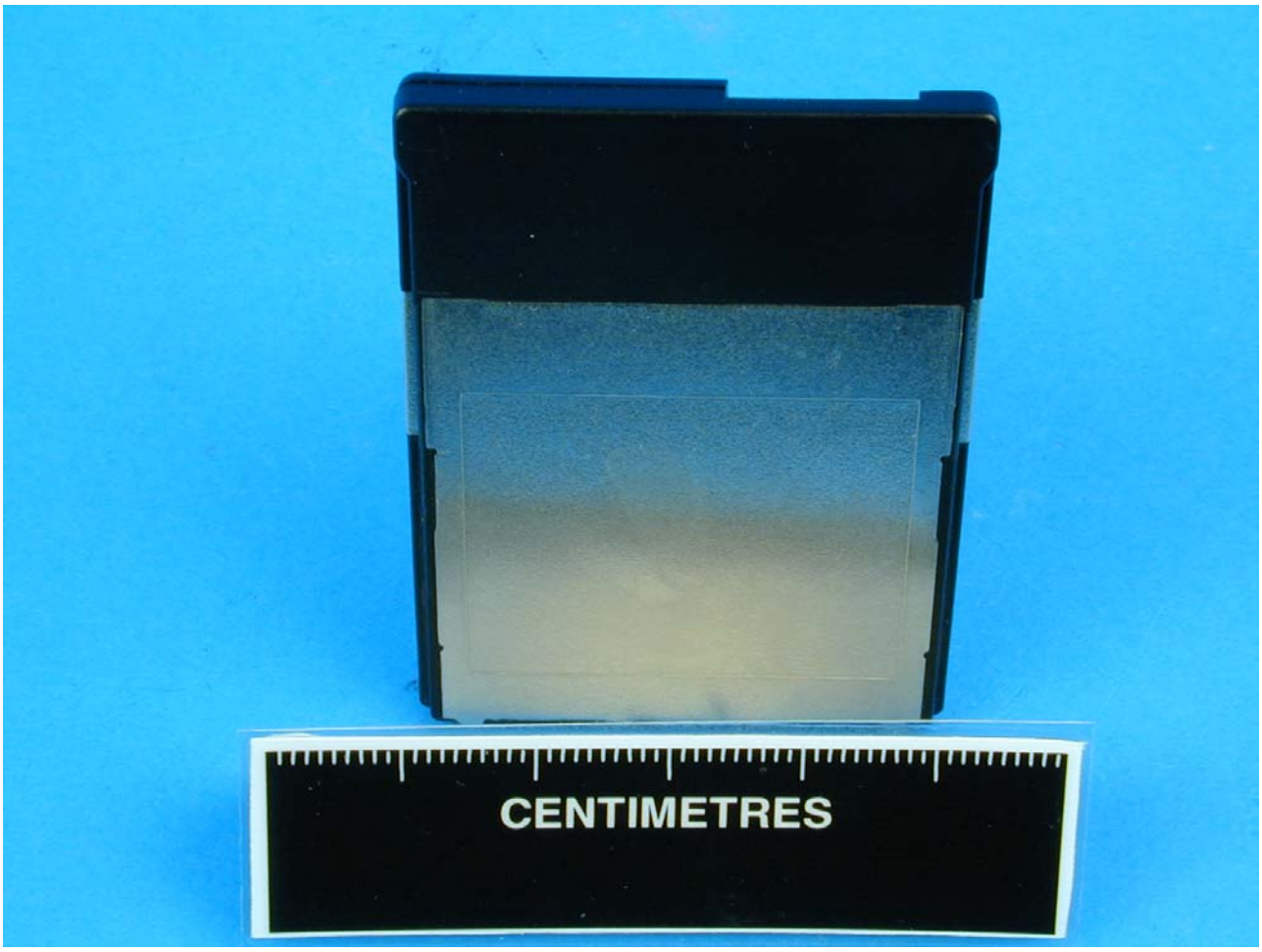

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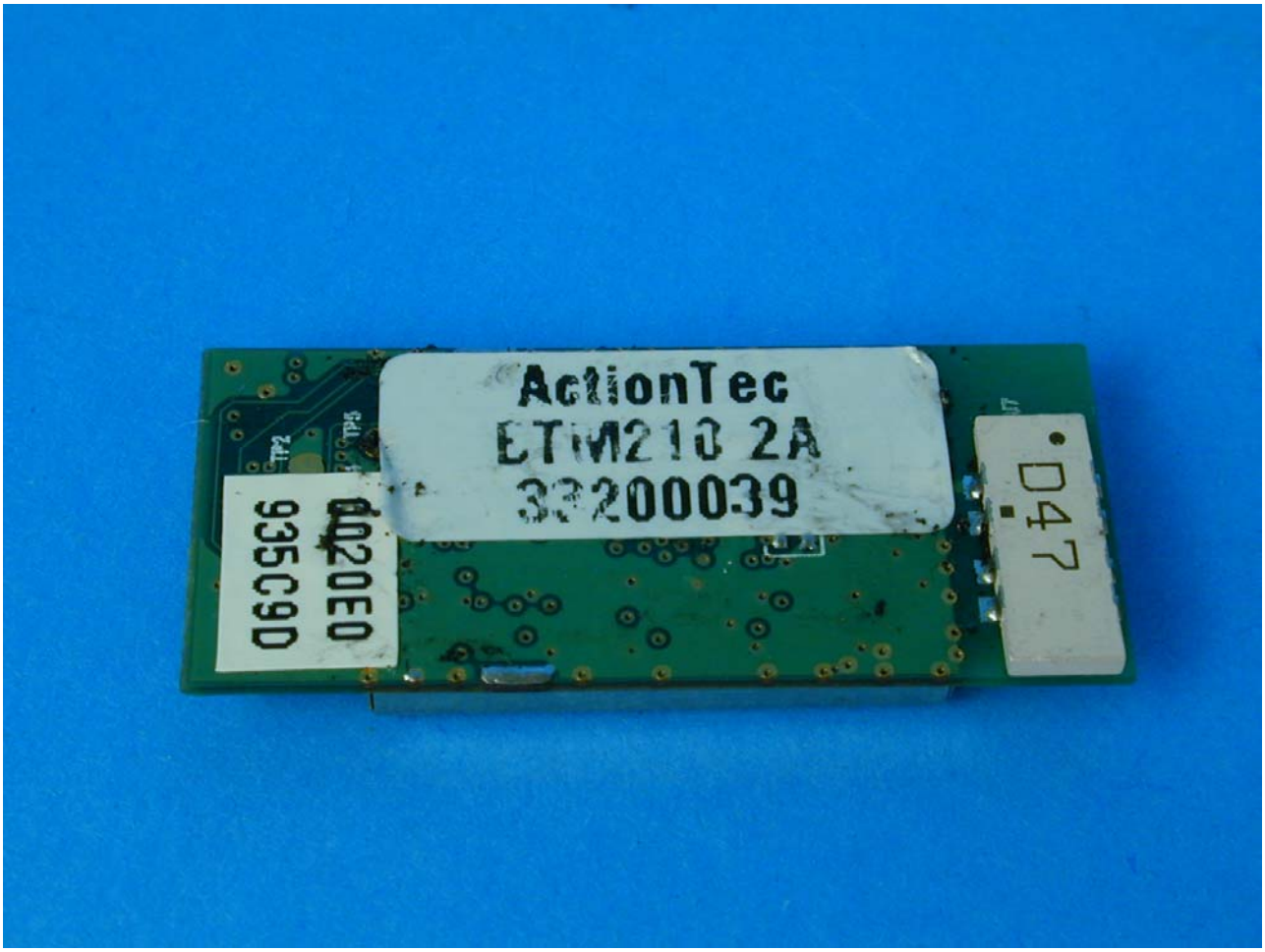

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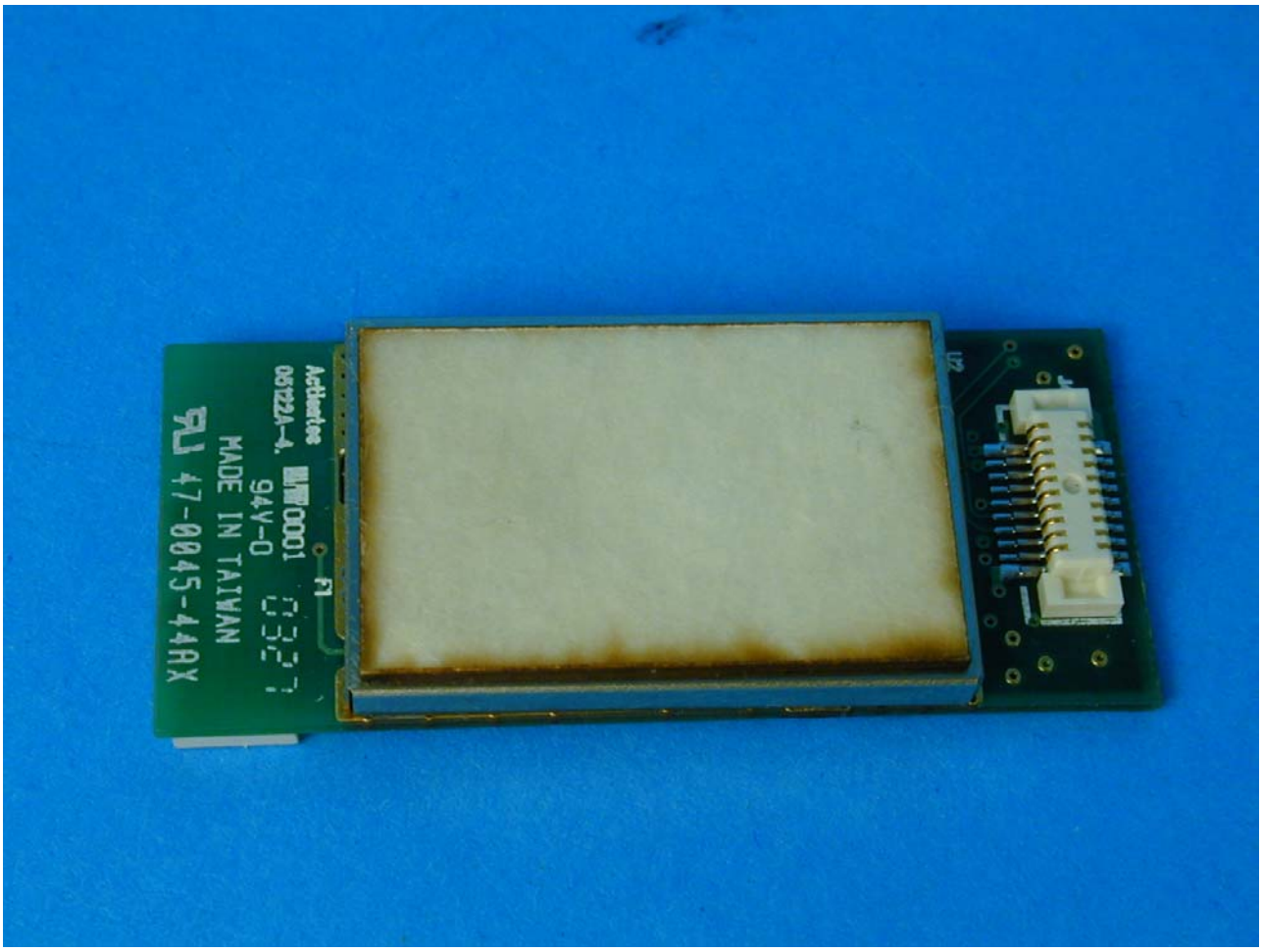

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

ANNEX A
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

Thomas W Phillips
Electronics Engineer