TEST REPORT

Limited FCC Parts 15 C and E Testing (Co-Located Transmitters)
for a Symbol WSAP-5030 Access Port and WSM-5030 RF Module
FCC ID: H9PWSAP5030 & H9PWSM5030

Report Number: OR610776/06/Issue 2 October 2003

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REPORT ON	Limited FCC Parts 15 C and E Testing (Co-Located Transmitters) for a Symbol WSAP-5030 Access Port and WSM-5030 RF Module Report No OR610776/06/Issue 2 October 2003
EQUIPMENT:	WSAP-5030 Access Port and WSM-5030 RLAN Radio Module
FCC ID:	H9PWSAP5030 & H9PWSM5030
SPECIFICATION:	47 CFR 15 Subparts C & E
PREPARED FOR:	Symbol Technologies Inc One Symbol Plaza Holtsville NY 11742-1300 New York United States of America
MANUFACTURERS REPRESENTATIVE:	Mr Alan Parrish
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DATED:	10-10-03

DISTRIBUTION	Symbol Technologies	Copy 1 (CD)
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Table of Contents

Page No

STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Access Port and RLAN Radio Module
APPLICANT	Symbol Technologies Symbol Place Winnersh Triangle Berkshire RG41 5TP
MANUFACTURERS TYPE NUMBER	WSAP-5030 and WSM-5030
MANUFACTURERS PART NUMBER	WSAP-5030 and WSM-5030
SERIAL NUMBER	No 5
HARDWARE REVISION	DVT3.1
TEST SPECIFICATION NUMBER	FCC Part 15 Subparts C and E, 2002-08
REGISTRATION NUMBER	OR610776
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status 610776 29th June 2003
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal N/A N/A
START OF TEST FINISH OF TEST	5th July 2003 15th August 2003
TEST ENGINEERS	Bob Bennett Anthony Guy Phil Harrison Graeme Lawler Malcolm Terry
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

This report has been re-issued as Issue 2 to cover some minor typographical errors and also include some test clause references that were omitted from the original report. This report is intended to replace the original report OR610776-06 Issued in September 2003.

The information contained within this report is intended to show verification of limited compliance of the Symbol Technologies Inc WSAP-5030 Access Port and WSM-5030 RLAN Radio Module as co-located transmitters to the requirements of FCC Specification Part 15c.

FCC ID H9PWSAP5030 & H9PWSM5030

The unit supplied for testing was a WSAP-5030 Access Port, which offers 5GHz 802.11a Wireless LAN connectivity fitted with a WSM-5030 RLAN Radio Module, which offers 2.4GHz 802.11b Wireless LAN connectivity.

For all radiated emissions measurements made at 5.15-5.25GHz Unit No 5 was configured as a WSAP-5030 Access Port using Integral Antennas and a 120V, 60Hz Power Supply Unit Symbol Part No SNP-PA5T.
For all radiated emissions measurements made at 5.25-5.35GHz and 5.725-5.825GHz Unit No 5 was configured as a WSAP-5030 Access Port using Dipole Antennas and a 120V, 60Hz Power Supply Unit Symbol Part No SNP-PA5T.
For all conducted emissions measurements made at all operating frequencies Unit No 5 was configured as a WSAP-5030 Access Port using Dipole Antennas and a 120V, 60Hz Power Supply Unit Symbol Part No SNP-PA5T.

This report details testing carried out in accordance with:

- FCC: Part 15.207, Spurious Conducted Emissions Power Line
- FCC: Part 15.247(c), Spurious Radiated Emissions
- FCC: Part 15.407(b)(5)(6), Undesirable Emission Limits

Location Of Testing

BABT Engineers, Anthony Guy, Phil Harrison, and Graeme Lawler, conducted all testing (except Spurious Radiated Emissions from 30MHz to 1GHz, which were performed at our Bearley Site) at the premises BABT, 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.
BABT Engineers Malcolm Terry and Bob Bennett conducted all Spurious Radiated Emissions (from 30MHz to 1GHz) testing at the premises BABT, Snitterfield Road, Bearley, Stratford upon Avon, Warwickshire, CV37 0EX. A complete site description is on file with the FCC Laboratory Division, Registration Number: 90986. See Annex A.

SYSTEM CONFIGURATION DURING EMC TESTING

The EUT was set-up simulating a typical user installation on the Alternative Open Field Test Site identified in Annex A, 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 and 5GHz functionality

Part 1
2437MHz and 5180MHz

The Output Power level (controlled by application software) was set to 1 (max power).

Part 2
2437MHz and 5280MHz

The Output Power level (controlled by application software) was set to 1 (max power).

Part 3
2437MHz and 5830MHz

The Output Power level (controlled by application software) was set to 1 (max power).

TEST SETUP PHOTOGRAPH

The photograph below shows the EUT configuration during Radiated Emission testing for 2.4GHz & 5.15-5.25GHz.

Photograph 1

TEST SETUP PHOTOGRAPH

The photograph below shows the EUT configuration during Radiated Emission testing for 2.4GHz & 5.25-5.35GHz and 5.725-5.825GHz.

Photograph 2

EQUIPMENT INFORMATION

Equipment under Test (EUT):

Equipment:	Access Port	RLAN Module for use with host unit WSAP-5030	Power Supply Unit	Integral Antenna (5.15-5.25GHz only)	Dipole Antenna (Rubber Duck) (5.25-5.35GHz & 5.725-5.825GHz)
Manufacturer:	Symbol Technologies Inc	Symbol Technologies Inc	Skynet	Tecom	Cushcraft
Type No.	WSAP-5030	WSM-5030	1119327	Not Applicable	Not Applicable
Part No:	WSAP-5030	WSM-5030	Not applicable	WSM-5030-210-WW	ML-5299-APA
Serial No:	No 5	No 5	S/N03	Not applicable	Not Applicable
Drawing Revision:	DVT3.1	DVT3.1	Not applicable	Not applicable	Not Applicable

Test Equipment and Ancillaries Used For Test

Instrument	Manufacturer	Type No	EMC	Cal. Due
Esvp Test Receiver	ROH	ESVP	1807	24 July 04
Bilog Antenna	YRK	CBL6111B	2451	07 Oct 03
Turntable Controller	VAR	RH253	1858	TU
Mast Controller	EMC	1050	1844	TU
Antenna Mast	EMC	1050	1845	TU
Open Area Site 2	ASS	OATS2	2280	28 Nov 05
Aneroid Barometer	VAR	750-1210-02	1932	TU
High Pass Filter	LOR	9HP7-7000-SR	INV4903	TU
Signal Generator	HEW	8673B	953	05 June 04
Emi Test Receiver	ROH	ESIB40	2917	04 Feb 02
Turntable Controller	H-D	HD 050	2528	TU
DRG Ant	EMC	3115	2397	04 July 04
Horn Ant	EMC	3115	2297	04 July 04
EMI Receiver	ROH	8542E	2286	13 Dec 03
Bilog Antenna	CHA	CBL 6143	2860	11Apr 04
Turntable & Controller	HD	HD 050	2528	TU
Antenna Mast	EMC	2070	-	TU
Antenna Mast Controller	EMC	2090	-	TU
Screened Room 5	SIE	EAC 54300	2533	TU
Low Noise Amplifier (1-8GHz)	MIT	AMF-3D-001080-18-13P	2457	TU
Signal Generator	HEW	8672A	411	26 Feb 04
Transient Limiter	HEW	11947A	2243	23 Jan 04
Three Phase LISN	ROH	ESH2-Z5	2380	09 Jan 04
Test Receiver	ROH	ESIB 40	2917	04 Feb 04
Amplifier (8-18GHz)	AVA	AWT-18036	1081	26 June 04
YIG Filter (4-40GHz)	FIL	FD 3103	-	TU
Horn (18-40GHz)	ADV	AM180HA-K-TU2	2945	15 May 05
Amplifier (18-40GHz)	NAR	DB02-0447	2936	23 Apr 04

EQUIPMENT INFORMATION - continued

Test Equipment and Ancillaries Used For Test-continued

Instrument	Manufacturer	Type No	EMC	Cal. Due
Barometer	DIP	-	1938	TU
Hygrometer	Rotronic	A1	INV4066	28 Oct 03

Note(s)

All items are calibrated annually, except where labelled T/U (Traceability Unscheduled). These items are calibrated within the test configurations using calibrated equipment.

Key To Manufacturers

ADV	Advanced Microtek
ASS	No Data
AVA	Avantek
CHA	Chase
DIP	Diplex
ELE	Electrometrics
EMC	Emco
FIL	Filtronic
FLA	Flann
FLU	Fluke
HEW	Hewlett Packard
LOR	Lorch
LEC	LeCroy
H-D	No Data
MIT	Miteq
MON	Montford
NAR	Narda
SIE	Siemens
RAY	Rayproof
REY	Reynolds
ROH	Rohde & Schwarz
RTC	Rotronic
THU	Thurlby
WEI	Weinschel
VAR	Various
VLT	Voltech
VOL	Volteck
YRK	York Electronics

EQUIPMENT INFORMATION - continued

INSTRUMENTATION USED FOR EXERCISING THE EUT

Instrument	Manufacturer	Type No	INV No
Laptop Computer	Dell	Latitude CPI	N/A
Laptop Computer	Dell	Latitude C400	N/A

PART 1
2.437GHz and 5.180GHz

Test Case : Spurious Conducted Emissions on Power Lines

Test Date : 1st August 2003

Rule Parts : 15.207& 15.407(b)(5)

Test Procedure

In accordance with Part 15 Subpart C, Section 15.207 and Part 15 Subpart E Section 15.407(b)(5), the Spurious Conducted Emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9kHz to 40GHz. The EUT was set to transmit on full power at maximum and minimum data rates. The EUT was tested on Bottom, Middle and Top channels. The resolution and video bandwidths were set to 1MHz and 3MHz respectively in accordance with 15.407(b). The spectrum analyser detector was set to Max Hold.

Conducted Emission Measurements were undertaken within the semi-anechoic chamber. Emissions were measured on the Live and Neutral Lines.

Emissions were formally measured using a Quasi-Peak Detector, which meets the CISPR requirements. The details of the worst-case emissions for the Live and Neutral Lines are presented in the tables below.

The EUT was connected to a 120V 60Hz supply.

The Conducted Emission measurements were made using a Hewlett Packard 8542E EMI Receiver.

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

Test Case : Spurious Conducted Emissions on Power Lines - continued

Test Date : 1st August 2003

Rule Parts : 15.207& 15.407(b)(5)

Test Results

The EUT met the Class B requirements of 47 CFR 15.207and 15.407(b)(5) for Conducted Emissions on the Live and Neutral Lines.

EUT Tx on 2.427GHz and 5.180GHz

Conducted Emissions - Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.2828	43.3	60.8	39.4	50.8
0.3184	38.4	59.8	35.8	49.8
0.4955	40.9	56.1	32.0	46.1
0.6208	30.3	56.0	28.9	46.0
0.9320	34.6	56.0	34.1	46.0
2.6570	35.2	56.0	26.9	46.0

The margin between the specification requirements and all other emissions were 23.5dB or more below the specified Quasi-Peak limit and 23.3dB or more below the Average limit.

Conducted Emissions Neutral Line :

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.2833	43.6	60.7	39.5	50.7
0.3192	38.7	59.7	35.6	49.7
0.4958	39.9	56.1	33.8	46.1
0.6215	30.4	56.0	29.1	46.0
0.9316	34.7	56.0	34.1	46.0
2.6220	35.6	56.0	26.6	46.0

The margin between the specification requirements and all other emissions were 26.8dB or more below the specified Quasi-peak limit and 26.9dB or more below the specified Average limit.

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

Performed by: G Lawler, EMC Engineer.

Test Case	:	Undesirable Emissions
Test Date	:	6th August 2003
Rule Parts	:	15.407(b)(5) (6)

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart E, 15.407(b)(5) (6), for Undesirable Emissions was carried out on the Measurement Test Facility detailed in Annex A. Section 15.407(b)(5) (6) also requires Rule parts 15.205 and 15.209 to be applied.

A preliminary profile of the Undesirable 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 connected to a 120V 60Hz supply.

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

2437MHz and 5180MHz

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

Spurious 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.

Test Case : Undesirable Emissions - continued

Test Date : 6th August 2003

Rule Parts : 15.407(b)(5) (6)

30MHz - 25GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 15.407(b)(5) (6), 15.205 and 15.209 for Undesirable Emissions (30MHz – 25GHz).

EUT Tx on 2.437GHz and 5.180GHz

30MHz – 25GHz 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	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
40.3840	V	100	88	34.3	51.9	40.0	100.0
48.4448	V	100	301	29.8	30.9	40.0	100.0
58.7452	V	100	195	36.2	64.6	40.0	100.0
64.7869	V	100	162	31.0	35.5	40.0	100.0
82.0695	V	100	276	32.8	43.7	40.0	100.0
86.0312	V	100	356	31.8	38.9	40.0	100.0

ABBREVIATIONS FOR ABOVE TABLES

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: M Terry, P J Harrison and A Guy, EMC Engineer.

Test Case	:	Spurious Radiated Emissions
Test Date	:	5th August 2003
Rule Parts	:	15.247 (c)

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c), for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed in Annex A. Section 15.247(c) also requires Rule parts 15.205 and 15.209 to be applied.

A preliminary profile of the Spurious 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 1GHz. 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.

The EUT was connected to a 120V 60Hz supply.

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

2437MHz and 5180MHz

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

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

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

Test Case : Spurious Radiated Emissions - continued

Test Date : 5th August 2003

Rule Parts : Part 15.247 (c)

30MHz - 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of Part 15.247(c), 15.205 and 15.209 for Spurious Radiated Emissions (30MHz – 1GHz).

EUT Rx on 2.437GHz and 5.180GHz

30MHz – 1GHz 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	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
37.4600	V	100	98	34.2	51.3	40.0	100.0
56.0300	V	100	210	33.0	44.7	40.0	100.0
56.5300	V	100	210	33.2	45.7	40.0	100.0
59.2452	V	100	215	33.5	47.3	40.0	100.0
60.1825	V	100	182	35.9	62.4	40.0	100.0
60.8001	V	100	167	33.4	46.8	40.0	100.0

ABBREVIATIONS FOR ABOVE TABLES

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: M Terry, EMC Engineer.

PART 2
2.437GHz and 5.280GHz

Test Case	:	Spurious Conducted Emissions on Power Lines
Test Date	:	2nd August 2003
Rule Parts	:	15.207& 15.407(b)(5)

Test Procedure

In accordance with Part 15 Subpart C, Section 15.207 and Part 15 Subpart E Section 15.407(b)(5), the Spurious Conducted Emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9kHz to 40GHz. The EUT was set to transmit on full power at maximum and minimum data rates. The EUT was tested on Bottom, Middle and Top channels. The resolution and video bandwidths were set to 1MHz and 3MHz respectively in accordance with 15.407(b). The spectrum analyser detector was set to Max Hold.

Conducted Emission Measurements were undertaken within the semi-anechoic chamber. Emissions were measured on the Live and Neutral Lines.

Emissions were formally measured using a Quasi-Peak Detector, which meets the CISPR requirements. The details of the worst-case emissions for the Live and Neutral Lines are presented in the tables below.

The EUT was connected to a 120V 60Hz supply.

The Conducted Emission measurements were made using a Hewlett Packard 8542E EMI Receiver.

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

Test Case : Spurious Conducted Emissions on Power Lines - continued

Test Date : 2nd August 2003

Rule Parts : 15.207& 15.407(b)(5)

Test Results

The EUT met the Class B requirements of 47 CFR 15.207and 15.407(b)(5), for Conducted Emissions on the Live and Neutral Lines.

EUT Tx 2.437GHz and 5.280GHz

Conducted Emissions - Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.2830	43.4	60.7	40.2	50.7
0.3186	39.7	59.7	36.5	49.7
0.4971	40.8	56.1	31.5	46.1
0.6210	37.7	56.0	29.7	46.0
0.7788	35.6	56.0	35.2	46.0
2.5660	37.5	56.0	30.5	46.0

The margin between the specification requirements and all other emissions were 20.4dB or more below the specified Quasi-Peak limit and 17.3dB or more below the Average limit.

Conducted Emissions Neutral Line :

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.2841	43.7	60.7	40.3	50.7
0.3197	39.3	59.7	36.3	49.7
0.4967	40.0	56.1	33.8	46.1
0.5340	36.0	56.0	29.6	46.0
0.9345	35.2	56.0	34.7	46.0
2.3070	36.8	56.0	29.6	46.0

The margin between the specification requirements and all other emissions were 21.1dB or more below the specified Quasi-peak limit and 16.5dB or more below the specified Average limit.

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

Performed by: A Guy, EMC Engineer.

Test Case	:	Undesirable Emissions
Test Date	:	17th July 2003
Rule Parts	:	15.407(b)(5) (6)

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart E, 15.407(b)(5) (6), for Undesirable Emissions was carried out on the Measurement Test Facility detailed in Annex A. Section 15.407(b)(5) (6) also requires Rule parts 15.205 and 15.209 to be applied.

A preliminary profile of the Undesirable 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 via the internal power supply of the Host.

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

2.437GHz and 5.280GHz

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

Spurious 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.

Test Case : Undesirable Emissions - continued

Test Date : 7th August 2003

Rule Parts : 15.407(b)(5) (6)

30MHz - 25GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part The EUT met the requirements of FCC Part 15.407(b)(5) (6), 15.205 and 15.209 for Undesirable Emissions (30MHz – 25GHz).

EUT Tx on 2.437GHz and 5.280GHz

30MHz – 25GHz 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	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
37.5050	V	100	91	34.5	53.0	40.0	100.0
40.3281	V	100	101	34.4	52.5	40.0	100.0
54.1835	V	101	178	32.0	39.8	40.0	100.0
58.7427	V	100	201	36.3	65.3	40.0	100.0
62.0299	V	100	202	33.4	46.8	40.0	100.0
79.7721	V	101	337	32.1	40.3	40.0	100.0

ABBREVIATIONS FOR ABOVE TABLES

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: M Terry, EMC Engineer.

Test Case	:	Spurious Radiated Emissions
Test Date	:	5th August 2003
Rule Parts	:	15.247 (c)

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c), for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed in Annex A. Section 15.247(c) also requires Rule parts 15.205 and 15.209 to be applied.

A preliminary profile of the Spurious 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 1GHz. 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.

The EUT was connected to a 120V 60Hz supply.

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

2437MHz and 5280MHz

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

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

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

Test Case : Spurious Radiated Emissions - continued

Test Date : 5th August 2003

Rule Parts : Part 15.247 (c)

30MHz - 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of Part 15.247(c), 15.205 and 15.209 for Spurious Radiated Emissions (30MHz – 1GHz).

EUT Rx on 2.437GHz and 5.280GHz

30MHz – 1GHz 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	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
37.4600	V	100	93	33.8	49.0	40.0	100.0
40.0255	V	100	76	30.4	33.1	40.0	100.0
43.7780	V	100	239	31.8	39.0	40.0	100.0
50.4400	V	100	305	31.1	35.9	40.0	100.0
56.5300	V	100	349	32.3	41.2	40.0	100.0
60.0225	V	100	176	30.0	31.6	40.0	100.0

ABBREVIATIONS FOR ABOVE TABLES

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: M Terry, EMC Engineer.

PART 3
2.437GHz and 5.830GHz

Test Case	:	Spurious Conducted Emissions on Power Lines
Test Date	:	2nd August 2003
Rule Parts	:	15.207& 15.407(b)(1)(2)(3)

Test Procedure

In accordance with Part 15 Subpart C, Section 15.207 and Part 15 Subpart E Section 15.407(b)(5), the Spurious Conducted Emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9kHz to 40GHz. The EUT was set to transmit on full power at maximum and minimum data rates. The EUT was tested on Bottom, Middle and Top channels. The resolution and video bandwidths were set to 1MHz and 3MHz respectively in accordance with 15.407(b). The spectrum analyser detector was set to Max Hold.

Conducted Emission Measurements were undertaken within the semi-anechoic chamber. Emissions were measured on the Live and Neutral Lines.

Emissions were formally measured using a Quasi-Peak Detector, which meets the CISPR requirements. The details of the worst-case emissions for the Live and Neutral Lines are presented in the tables below respectively.

The EUT was connected to a 120V 60Hz supply.

The Conducted Emission measurements were made using a Hewlett Packard 8542E EMI Receiver.

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

Test Case : Spurious Conducted Emissions on Power Lines - continued

Test Date : 2nd August 2003

Rule Parts : 15.207& 15.407(b)(1)(2)(3)

Test Results

The EUT met the Class B requirements of 47 CFR 15.207and 15.407(b)(1)(2)(3) for Conducted Emissions on the Live and Neutral Lines.

EUT Tx on 2.437GHz and 5.830GHz

Conducted Emissions - Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.2823	43.2	60.8	40.1	50.8
0.3182	39.6	59.8	36.5	49.8
0.4950	41.0	56.1	31.9	46.1
0.5664	38.2	56.0	30.9	46.0
0.9315	35.8	56.0	35.3	46.0
2.302	37.8	56.0	30.7	46.0

The margin between the specification requirements and all other emissions were 20.5dB or more below the specified Quasi-Peak limit and 17.6dB or more below the Average limit.

Conducted Emissions Neutral Line :

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.2826	43.5	60.8	40.5	50.8
0.3181	39.2	59.8	36.3	49.8
0.4953	40.1	56.1	33.9	46.1
0.5309	36.5	56.0	29.8	46.0
0.5669	37.2	56.0	30.3	46.0
0.9336	35.5	56.0	35.0	46.0

The margin between the specification requirements and all other emissions were 20.5dB or more below the specified Quasi-peak limit and 16.2dB or more below the specified Average limit.

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

Performed by: A Guy, EMC Engineer.

Test Case	:	Undesirable Emissions
Test Date	:	7th August 2003
Rule Parts	:	15.407(b)(5) (6)

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart E, 15.407(b)(5) (6), for Undesirable Emissions was carried out on the Measurement Test Facility detailed in Annex A. Section 15.407(b)(5) (6) also requires Rule parts 15.205 and 15.209 to be applied.

A preliminary profile of the Undesirable 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 via the internal power supply of the Host.

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

2.437GHz and 5.830GHz

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

Spurious 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.

Test Case : Undesirable Emissions - continued

Test Date : 7th August 2003

Rule Parts : 15.407(b)(5) (6)

30MHz - 25GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part The EUT met the requirements of FCC Part 15.407(b)(5) (6), 15.205 and 15.209 for Undesirable Emissions (30MHz – 25GHz).

EUT Tx on 5.830GHz

30MHz – 25GHz 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	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
37.5330	V	100	92	34.3	51.9	40.0	100.0
40.0255	V	100	79	33.9	49.5	40.0	100.0
40.3381	V	100	70	34.3	51.9	40.0	100.0
58.6617	V	100	201	35.3	58.2	40.0	100.0
60.1695	V	100	197	35.9	62.4	40.0	100.0
81.1904	V	100	279	33.3	46.2	40.0	100.0

ABBREVIATIONS FOR ABOVE TABLES

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: M Terry, EMC Engineers.

Test Case	:	Spurious Radiated Emissions
Test Date	:	6th August 2003
Rule Parts	:	15.247 (c)

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c), for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed in Annex A. Section 15.247(c) also requires Rule parts 15.205 and 15.209 to be applied.

A preliminary profile of the Spurious 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 1GHz. 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.

The EUT was connected to a 120V 60Hz supply.

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

2437MHz and 5830MHz

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

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

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

Test Case : Spurious Radiated Emissions - continued

Test Date : 6th August 2003

Rule Parts : Part 15.247 (c)

30MHz - 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of Part 15.247(c), 15.205 and 15.209 for Spurious Radiated Emissions (30MHz – 1GHz).

EUT Rx on 2.437GHz and 5.830GHz

30MHz – 1GHz 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	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
37.3145	V	100	59	34.6	53.7	40.0	100.0
40.3381	V	100	61	33.3	46.2	40.0	100.0
58.6357	V	100	205	32.8	43.7	40.0	100.0
60.1985	V	100	192	36.9	70.0	40.0	100.0
60.8091	V	100	206	34.3	51.9	40.0	100.0
61.9839	V	100	182	32.9	44.2	40.0	100.0

ABBREVIATIONS FOR ABOVE TABLES

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: B Bennett, EMC Engineer.

PHOTOGRAPHS OF EQUIPMENT

Photograph 3
Front View Symbol WSAP 5030 Access Port with WSM 5030 RF Module and Integral Antennas (2.4GHz & 5.15-5.25GHz only)

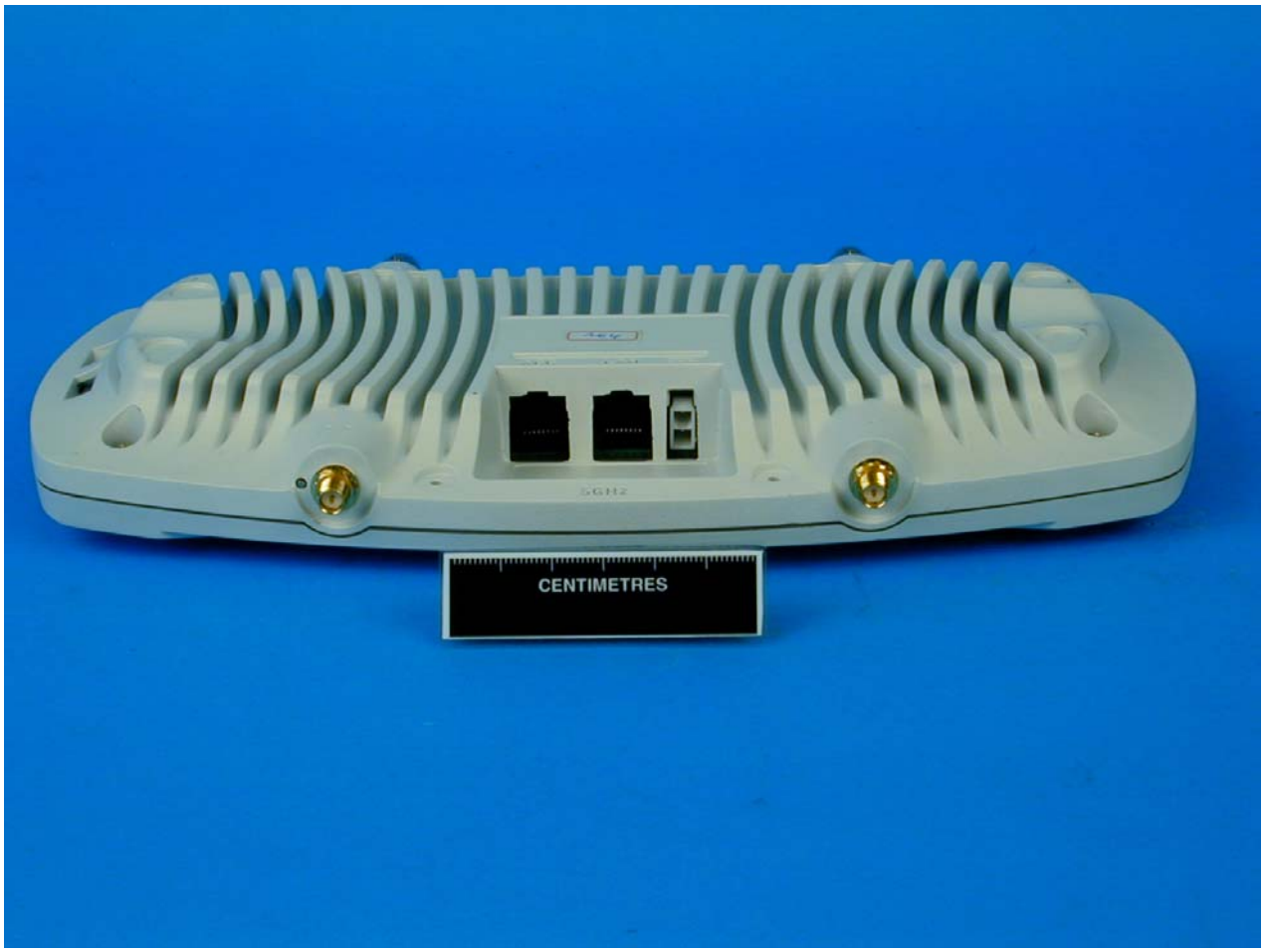
PHOTOGRAPHS OF EQUIPMENT

Photograph 4
Rear View Symbol WSAP 5030 Access Port with WSM 5030 RF Module and Integral Antennas (2.4GHz & 5.15-5.25GHz only)

PHOTOGRAPHS OF EQUIPMENT

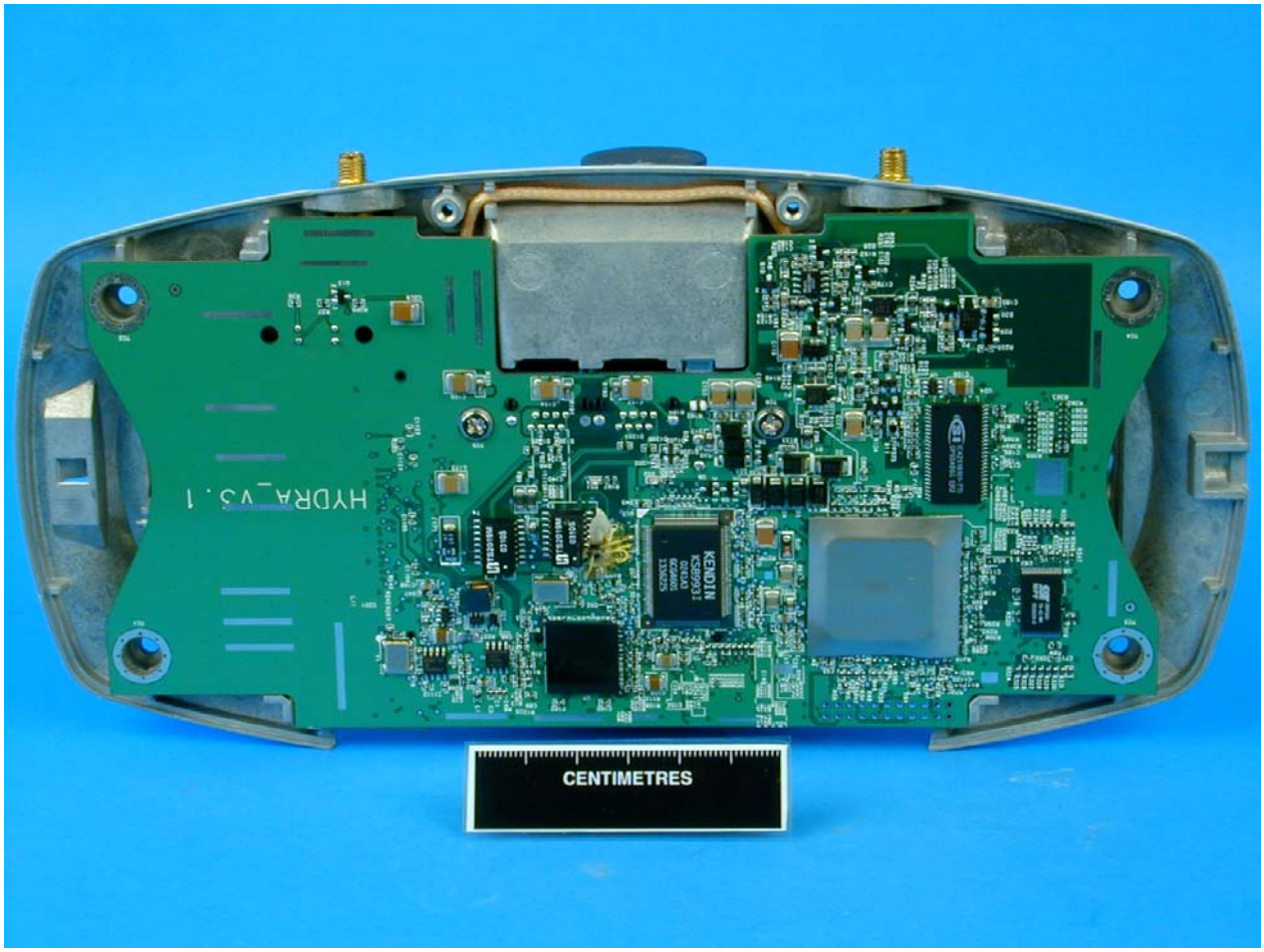
Photograph 5
Front View Symbol WSAP 5030 Access Port with WSM 5030 RF Module and Dipole (Rubber Duck Antennas (2.4GHz & 5.25-5.35 and 5.725-5.830GHz)

PHOTOGRAPHS OF EQUIPMENT



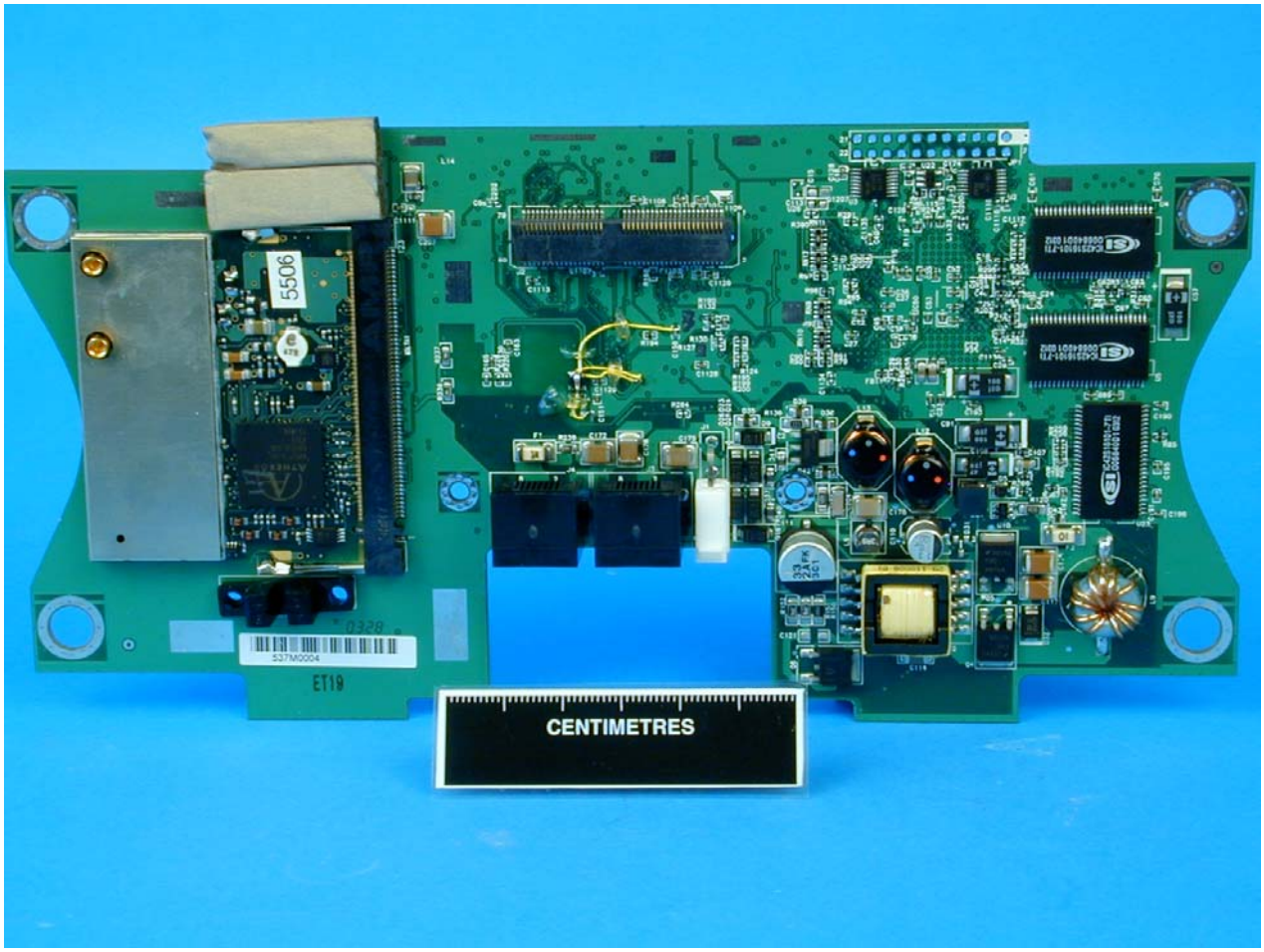
Photograph 6
Rear View Symbol WSAP 5030 Access Port with WSM 5030 RF Module and Antenna connectors (2.4GHz & 5.25-5.35 and 5.725-5.830GHz)

PHOTOGRAPHS OF EQUIPMENT



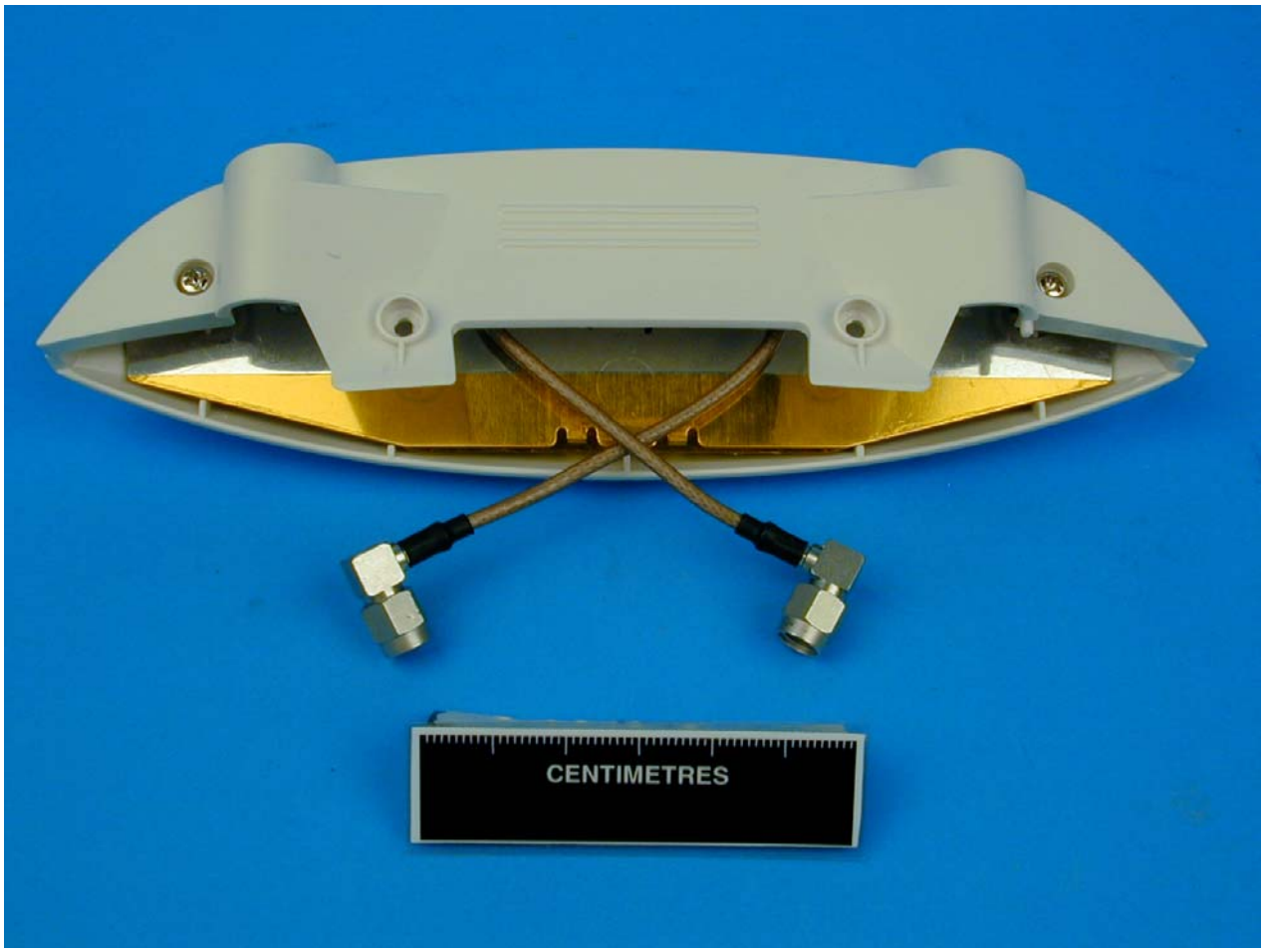
Photograph 7
Internal View Symbol WSAP 5030 Access Port

PHOTOGRAPHS OF EQUIPMENT



Photograph 8
Internal View Symbol WSAP 5030 Access Port

PHOTOGRAPHS OF EQUIPMENT

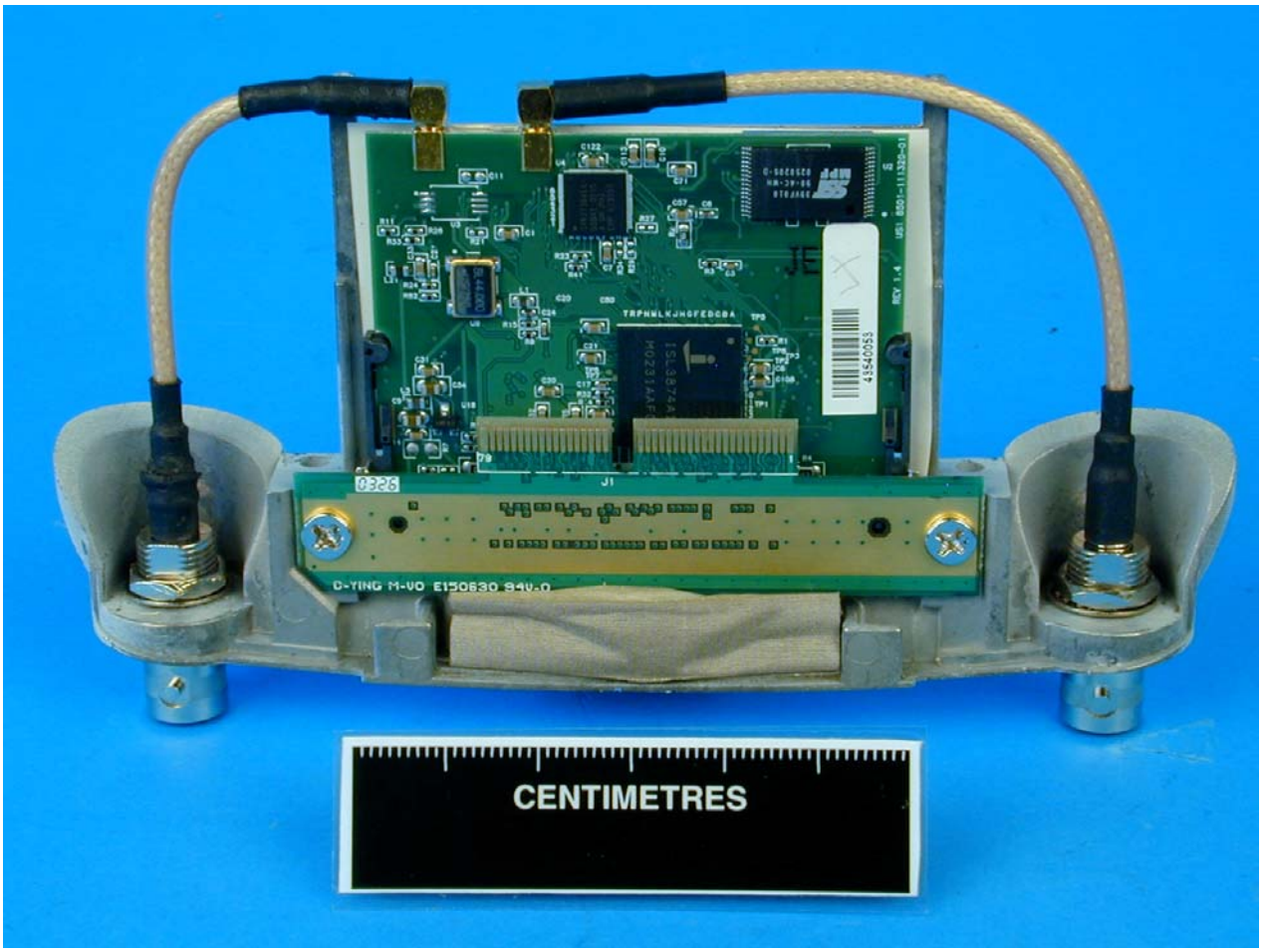


Photograph 9
Internal View Symbol WSAP 5030 Access Port Integral Antennas (5.15-5.25GHz only)

PHOTOGRAPHS OF EQUIPMENT

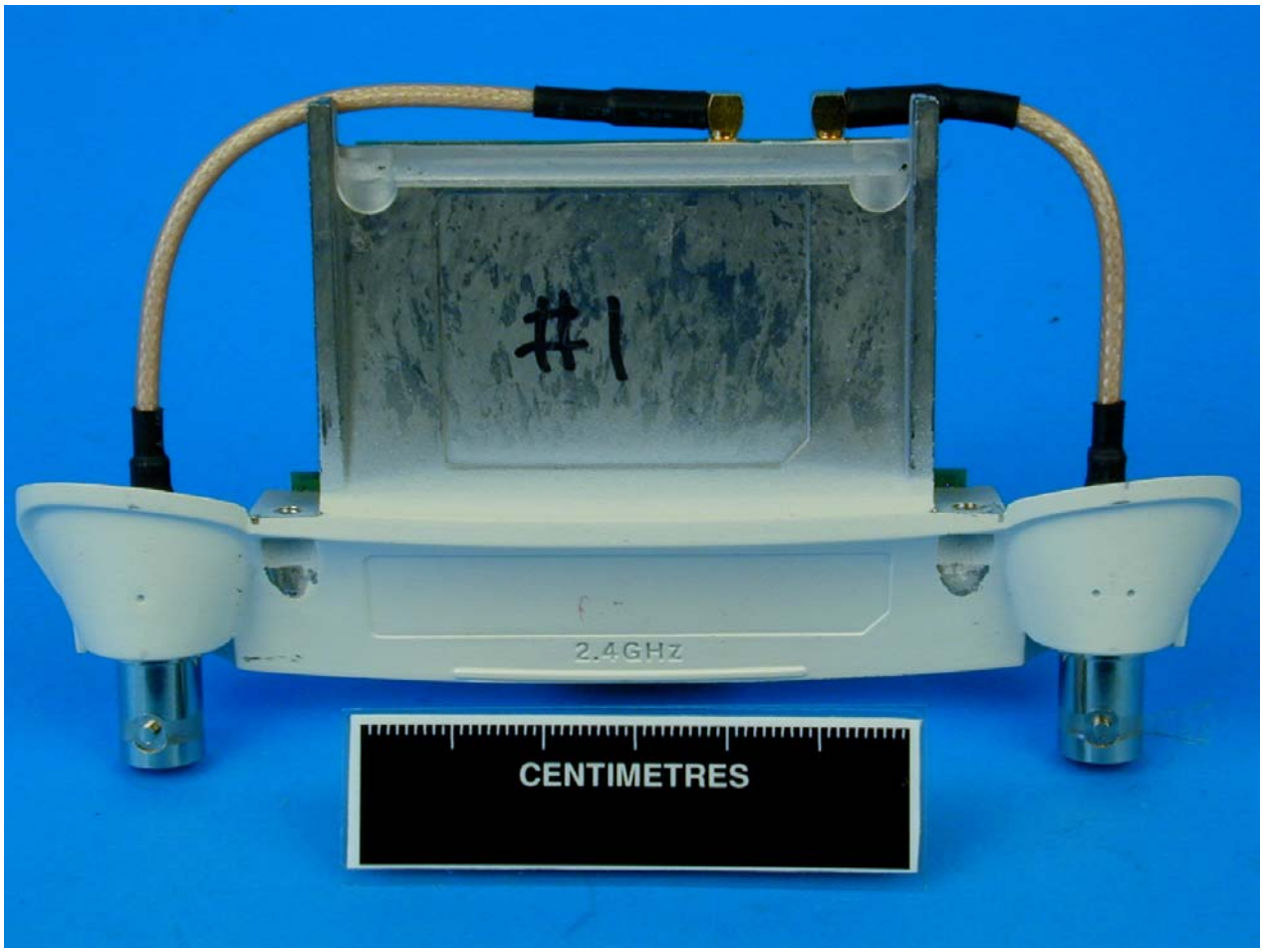
Photograph 10
View of 5GHz and 2.4GHz Antennas Symbol WSAP 5030 Access Port (5.25-5.35 and 5.725-5.830GHz)

PHOTOGRAPHS OF EQUIPMENT



Photograph 11
Internal View Symbol WSM 5030 RLAN Radio Module

PHOTOGRAPHS OF EQUIPMENT



Photograph 12
Internal View Symbol WSM 5030 RLAN Radio Module

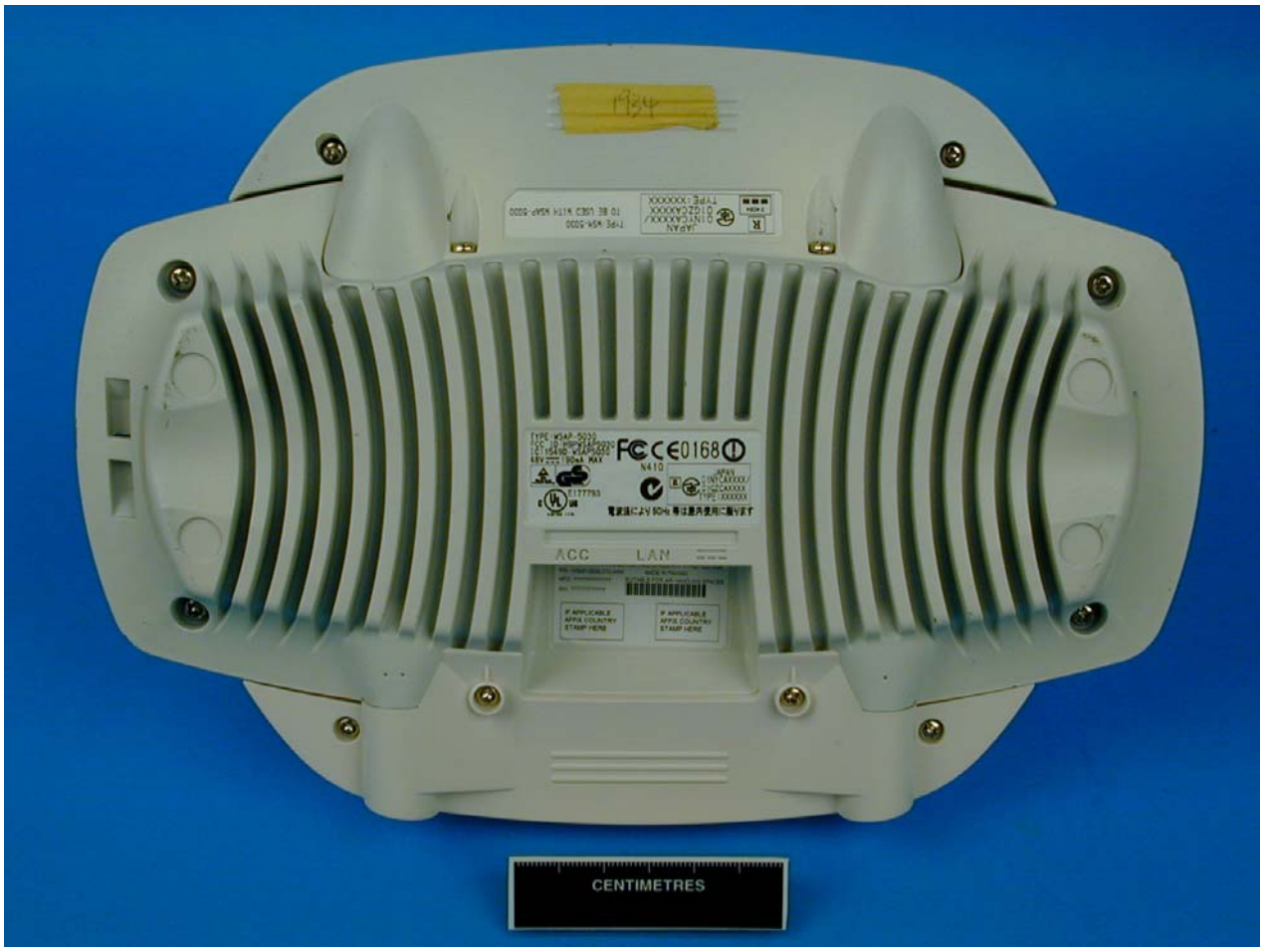
PHOTOGRAPHS OF EQUIPMENT

Photograph 13
Label View Symbol WSAP 5030 Access Port

PHOTOGRAPHS OF EQUIPMENT

Photograph 14
Label View Symbol WSM-5030 RLAN Radio Module

PHOTOGRAPHS OF EQUIPMENT



Photograph 15
Label View Symbol WSAP 5030 Access Port

MEASUREMENT UNCERTAINTY

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

In the frequency range 30MHz to 1000MHz

For Spurious Radiated Emissions, Quasi-Peak Measurements using the ESVP Test Receiver and Bilog Antenna: - Frequency ±5ppm + 500Hz Amplitude ±4.1dB

Conducted Emissions Tests:

Frequency	15ppm + 50kHz
Amplitude	±2.7dB

In the frequency range 1GHz to 25GHz

For Out of Band Emissions measurements: -

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

For Peak Power Spectral Density

Amplitude	±1.8dB

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Group

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).

ANNEX A
FCC SITE COMPLIANCE LETTERS

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

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

September 08, 2000

Registration Number: 90986

BABT Product Service
Snitterfield Road
Bearley, Stratford-upon-Avon
Warwickshire CV37 0EX
United Kingdom
Attention: Jensen Adams

Re: Measurement facility located at Bearley
3 & 10 meter site
Date of Listing: September 08, 2000

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