

FCC Part 15C Certification Report

for the

**FirstPersonView
FPV24V1**





HURSLEY
EMC
SERVICES

EMC TEST REPORT

No. 09D261 FR

Issue#3: 27th August 2009

UKAS Accredited
EU Notified Body
FCC & VCCI Registered
BSMI Lab ID: SL2-IN-E-3008

FCC Part 15C Certification Report

for the

FirstPersonView

FPV24V1

Project Engineer: D. Tiroke

Approval Signatory

Approved signatories: S. M. Connolly I. P. Kenney J. A. Jones R. P. St John James

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Document History

Issue#1: 27th July 2009 was withdrawn and replaced by Issue#2: Additional data added.

Issue#2: 24th August 2009 was withdrawn and replaced by Issue#3: Correction to specified limits and measurement distance in section 4

1.0 DECLARATION

1.1 FCC Part 15C Statement

The Equipment Under Test (EUT), as described and reported within this document, complies with the part 15.249 of the CFR 47:2008 FCC rules in accordance with ANSI C63.4:2003. The EUT operates at frequency of 2.45 GHz and complies with part 15C emission requirements.

Note: The EUT is a battery powered device.

1.2 Related Submittal(s) Grants

This is an application for certification of an FPV24V1 (transmitting at 2.45 GHz), described in this report.

The sections of FCC Part 15 that apply to the EUT are:

15.249 applied to the 2.45 GHz transmitter

15.109 applied to the CCD Camera

1.3 EUT Manufacturer

Trade name:	FirstPersonView
Company name:	Fundamentum Limited
Company address:	4 St Peter's House 20-26 York Place Brighton East Sussex BN1 4LG
Manufacturing address:	As above.
Company representative:	Mr Simon Dale Tel: +44 (0) 1273 808777

2.0 EUT DESCRIPTION

2.1 Identity

EUT: FirstPersonView FPV24V1
Serial number: DO1
Sample build: Prototype

2.2 Product Operation

The EUT is a small 10mW transmitter used to transmit video from a CCD camera to a receiver. The transmitter has four channels operating at 2414, 2432, 2450 and 2468 MHz. The channels are selectable via a switch on the transmitter. The antenna is permanently connected to the transmitter.

2.3 Support Equipment

SUPPORTING EQUIPMENT	PART/MODEL NUMBER	SERIAL NUMBER
KT&C Co., Ltd CCD Camera	KPC-S226C	J51666-49

2.4 Exerciser Program

The EUT was powered from a fully charged 12V lead acid battery. A camera was connected to the video input on the EUT. The EUT continually transmitted video images from the camera. A 2.4GHz video receiver connected to video monitor was used to verify that the transmitter was functioning correctly.

3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

3.1 EMI Site Address & Test Date

EMI Company Offices	Hursley EMC Services Ltd Unit 16, Brickfield Lane, Chandlers Ford, Hampshire
EMI Measurement Site	Hursley EMC Services Ltd Hursley Park, Winchester; FCC Registered UK Designation number: UK0006
Test Date	23 rd to the 24 th June & 21 st and 24 th August 2009

3.2 General Operating Conditions

Testing was performed according to the procedures in ANSI C63.4:2003. Final radiated testing was performed at a EUT to antenna distance of three metres.

Instrumentation, including receiver and spectrum analyser bandwidth, comply with the requirements of ANSI C63.2:1996.

3.3 Environmental Ambient

Test Type	Temperature	Humidity	Atmospheric Pressure
Radiated	22 degrees Celsius	38 to 46% relative	1013 to 1015 millibars

3.4 Radiated Emissions

Initial Scan

A radiated profile scan was taken at a three metre distance on eight azimuths of the system under test in both vertical and horizontal polarities of the antenna in a semi-anechoic chamber. Instrumentation used in the chamber as below:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
010	1	HP	85680B	2601A02322	Spectrum analyser	27/10/2009
011	1	Q-par Angus	QSH20S20S	4350	Horn antenna (18-26.5GHz)	23/03/2010
026	LAB	Chase	CBL6140	1036	Antenna X-wing (20-2000MHz)	Internal
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	23/02/2010
050	1	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	10/09/2009
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	03/02/2010
071	1	Q-par Angus	WBH218HN	2895	Horn antenna (2-18GHz)	07/10/2009
091	1	ATM	E4888/911	CF210K	K' 10.5m cable assy (26.5GHz)	23/03/2010
127	1	Schwarzbeck	BBHA9120B	391	Horn antenna (1-10GHz)	05/12/2009
240	1	Sucoflex	106	52427/6	Cable SMA (18GHz)	21/01/2010

The EUT was measured in two configurations; with the EUT horizontal and with the EUT vertical.

The data obtained from the profile scan was used as a guide for the final Open Area Test Site (OATS) measurements.

Final Measurements

The system under test was transferred to the OATS from the semi-anechoic chamber. The data obtained from the chamber profile-scan was used to guide the test engineer. Each emission from the transmitter was maximised by revolving the system on the turntable and moving the antennae in height and azimuth. The worst-case data is presented in this report. Test instrumentation used in the OAT's measurements was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	23/02/2010
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	03/02/2010
109	1	Schwarzbeck	VULB 9163	9163-321	Trilog antenna (30-3000MHz)	05/12/2009
127	1	Schwarzbeck	BBHA9120B	391	Horn antenna (1-10GHz)	05/12/2009
240	1	Sucoflex	106	52427/6	Cable SMA (18GHz)	21/01/2010
241	1	Rohde Schwarz	ESVP	879962/049	Test receiver (30-1300MHz)	18/02/2010

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
 'Internal' means internally calibrated using HEMCS procedures

3.5 Conducted Emissions

The EUT is battery powered therefore the conducted emissions test does not apply.

4.0 TEST DATA

4.1 FCC – Radiated Emissions (Transmitting)

A search was made of the frequency spectrum from 30 MHz to 25.5 GHz and the measurements reported are the highest emissions relative to the 'FCC CFR 47 Section 15.209 and 15.249 Limits' at a measuring distance of 10m (extrapolated to 3m) below 1.0 GHz and at 3 metres above 1.0 GHz.

Both the transmit frequency and harmonics were measured for all four channels, the worst-case was channel 4 (2468MHz). The input voltage to the EUT is specified as 6-14V, the transmitter output was measured across the voltage range and the transmitter output remained the same regardless of the voltage. A fully charged 12V lead acid battery was therefore used for the testing.

The occupied bandwidth measurements were carried out at a measuring distance of 3m.

RESULTS 30 MHz to 1000 MHz

Highest Band – 2468 MHz

Frequency MHz	Actual quasi-peak value @ 3m	Specified limit @ 3m
	dB μ V/m	dB μ V/m
76.80	21.4	40.0
180.05	24.2	43.5
189.50	25.9	43.5
616.92	36.8	46.0

Mid Band – 2432 MHz

Frequency MHz	Actual quasi-peak value @ 3m	Specified limit @ 3m
	dB μ V/m	dB μ V/m
170.48	22.8	43.5
608.06	44.3 #	46.0

Lowest Band – 2414 MHz

Frequency MHz	Actual quasi-peak value @ 3m	Specified limit @ 3m
	dB μ V/m	dB μ V/m
170.47	22.9	43.5
603.511	45.3 #	46.0

Uncertainty of measurement: $\pm 4.2 \text{ dB}\mu\text{V}$ for a 95% confidence level for $<1.0 \text{ GHz}$

The measured result is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the EUT tested complies with the specification limit.

Radiated emissions (continued)
RESULTS 1.0 GHz to 25.5 GHz
Highest Band – 2468 MHz

Frequency GHz	Actual average value @ 3m		Specified limit @ 3m	
	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m
2.4678*	89.3 #	94.0	50,000	
4.9360	47.3	54.0	500	
7.4040	49.1	54.0	500	

Frequency GHz	Actual peak value @ 3m		Specified limit @ 3m	
	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m
2.4678*	98.5	114.0	500,000	
4.9360	57.0	74.0	5,000	
7.4040	54.8	74.0	5,000	

Mid Band – 2432MHz

Frequency GHz	Actual average value @ 3m		Specified limit @ 3m	
	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m
2.4327*	89.9 #	94.0	50,000	
4.8649	48.2	54.0	500	
7.2960	43.1	54.0	500	

Frequency GHz	Actual peak value @ 3m		Specified limit @ 3m	
	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m
2.4327*	97.2	114.0	500,000	
4.8649	48.1	74.0	5,000	
7.2960	53.3	74.0	5,000	

*Transmitter frequency

Uncertainty of measurement: $\pm 5.1 \text{dB}\mu\text{V}$ for a 95% confidence level for $>1\text{GHz}$

The measured result is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the EUT tested complies with the specification limit.

Radiated emissions (continued)

Lowest Band – 2414MHz

Frequency GHz	Actual average value @ 3m		Specified limit @ 3m	
	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m
2.4140*	89.8 #	94.0	94.0	50,000
4.8280	44.8	54.0	54.0	500
7.2420	39.8	54.0	54.0	500

Frequency GHz	Actual peak value @ 3m		Specified limit @ 3m	
	dB μ V/m	dB μ V/m	dB μ V/m	μ V/m
2.4140*	94.9	94.9	114.0	500,000
4.8280	53.7	53.7	74.0	5,000
7.2420	52.3	52.3	74.0	5,000

*Transmitter frequency

Uncertainty of measurement: $\pm 5.1\text{dB}\mu\text{V}$ for a 95% confidence level for $>1\text{GHz}$

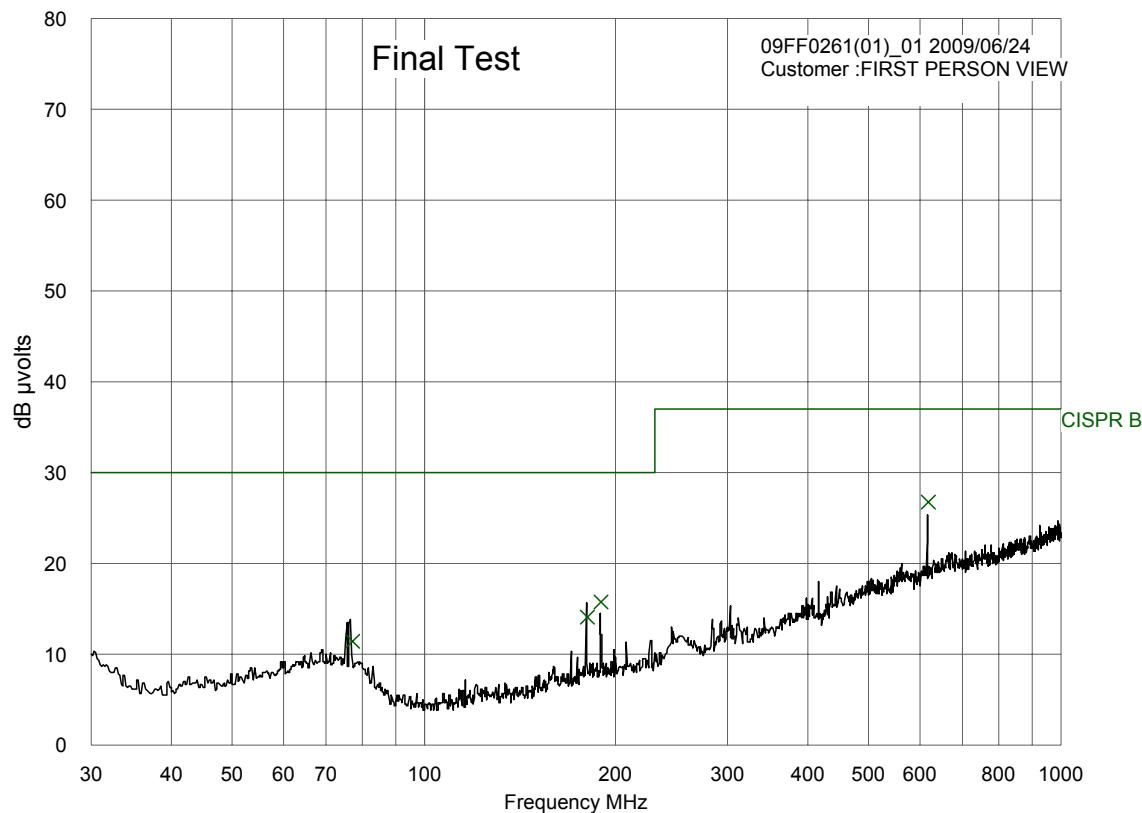
The measured result is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the EUT tested complies with the specification limit.

Procedure: In accordance with ANSI C63.4:2003

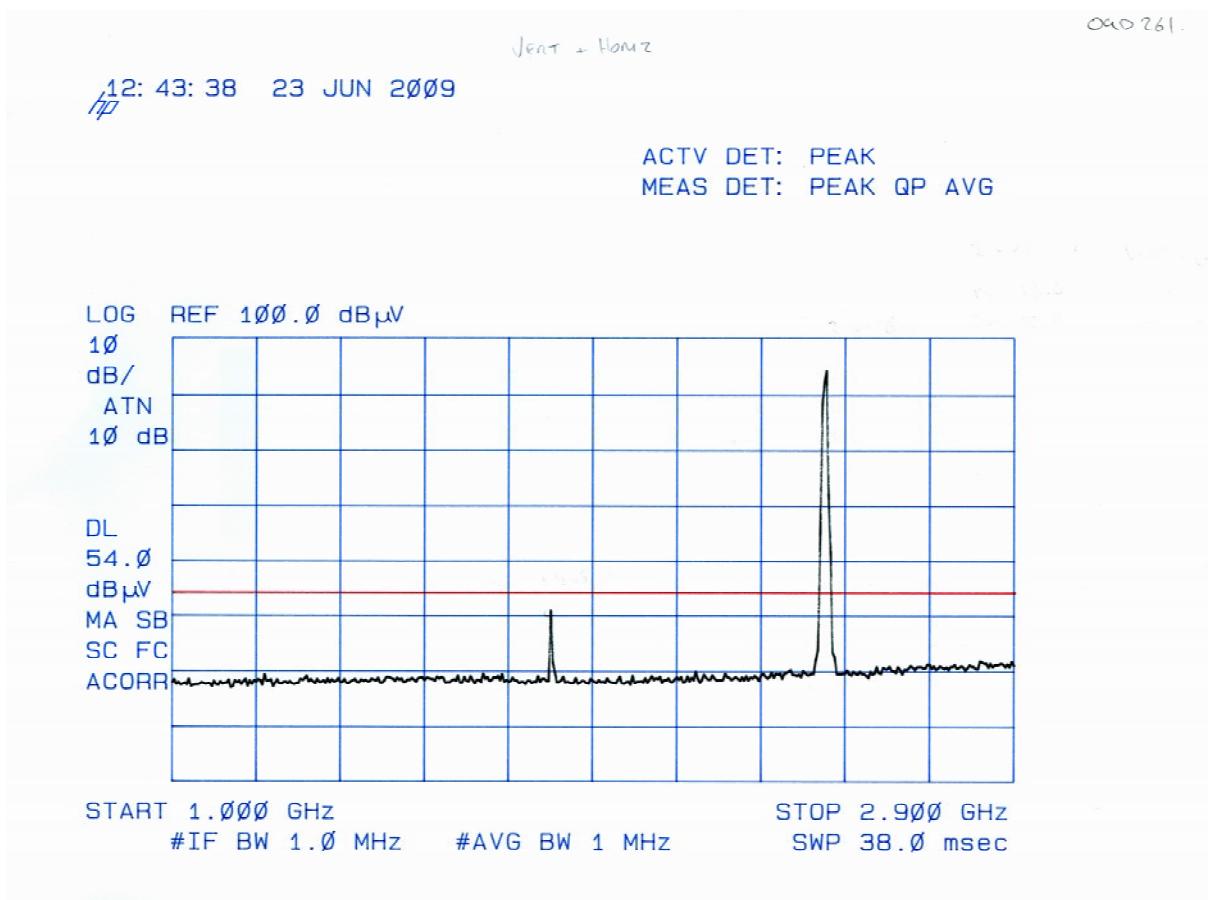
Measurements below 1.0 GHz performed with a quasi-peak detector. Measurements above 1.0 GHz performed with an average and peak detector.

TEST ENGINEERS: Rob St John James & Daniel Tiroke

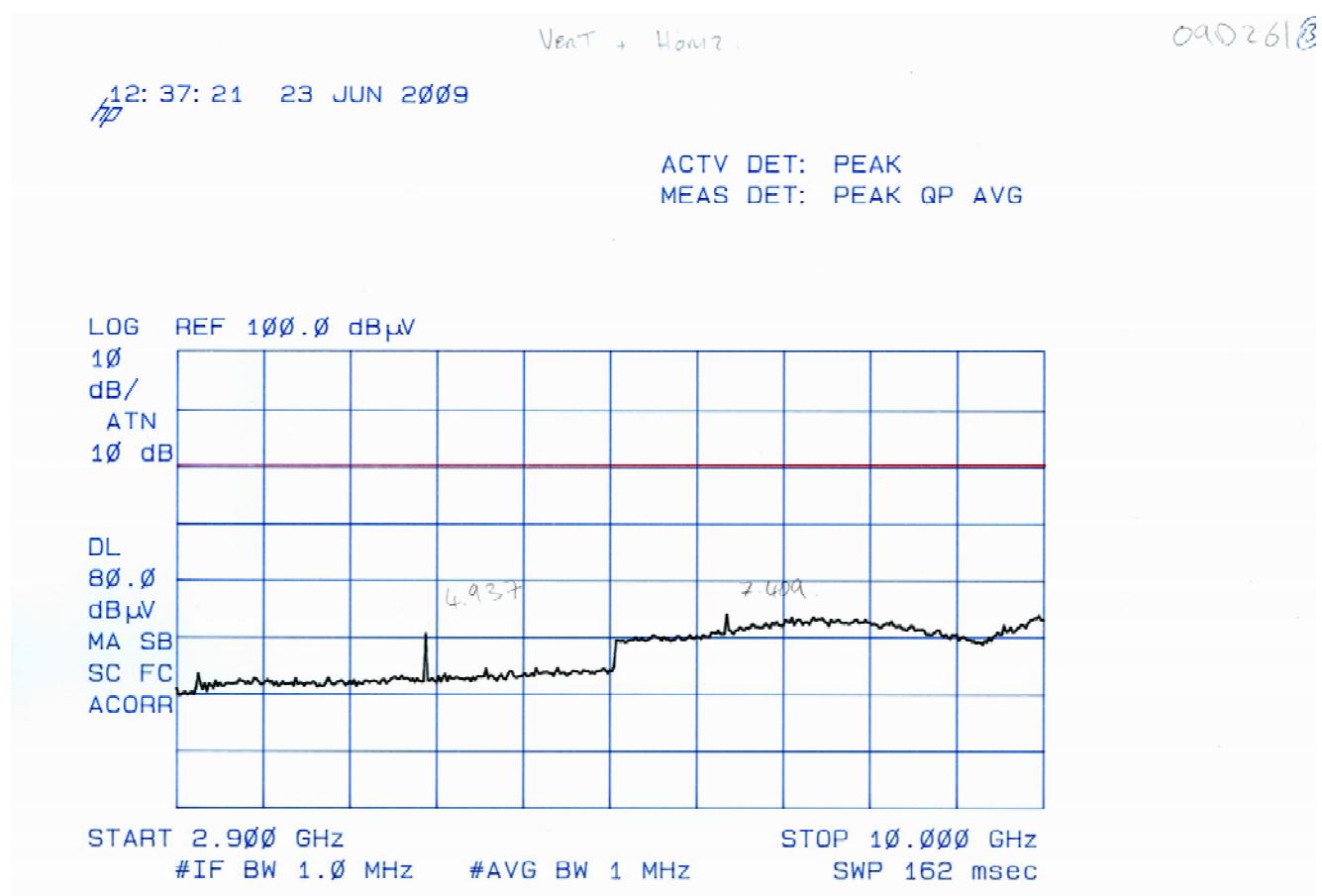
4.1.1 Plot 30 to 1000 MHz (sample plot)



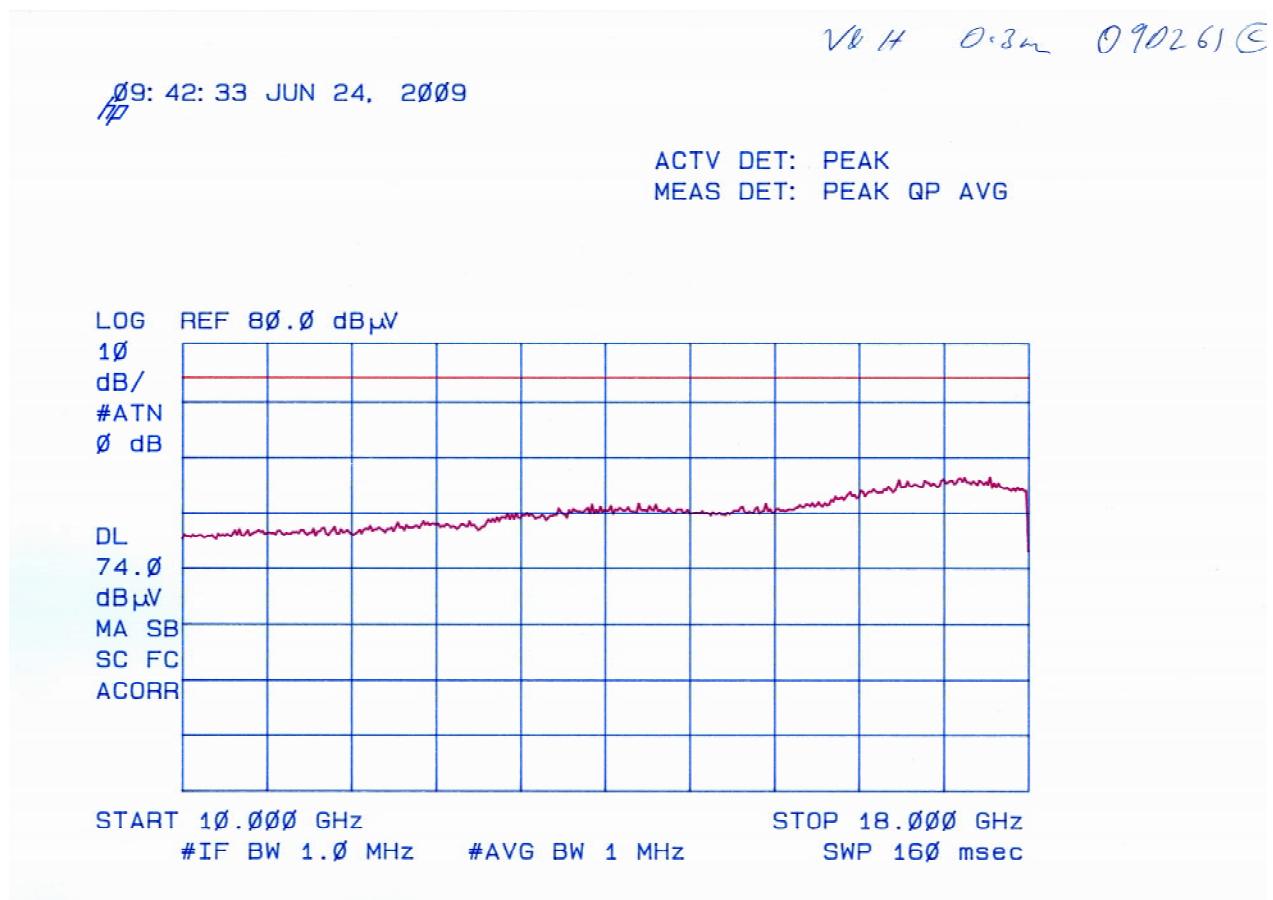
4.1.2 Plot 1 to 2.9 GHz (sample plot)



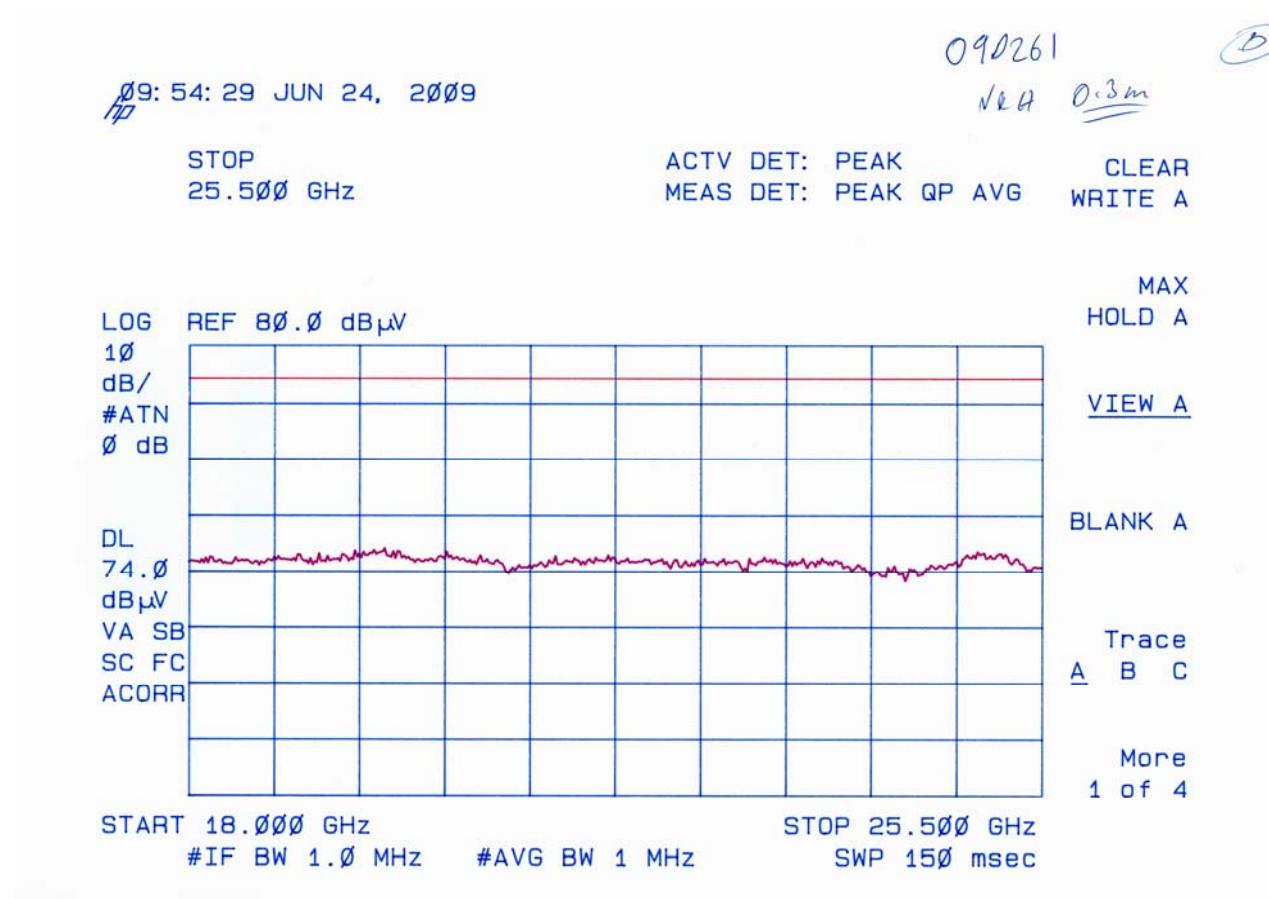
4.1.3 Plot 2.9 to 10.0 GHz (sample plot)



4.1.4 Plot 10 to 18 GHz (sample plot)

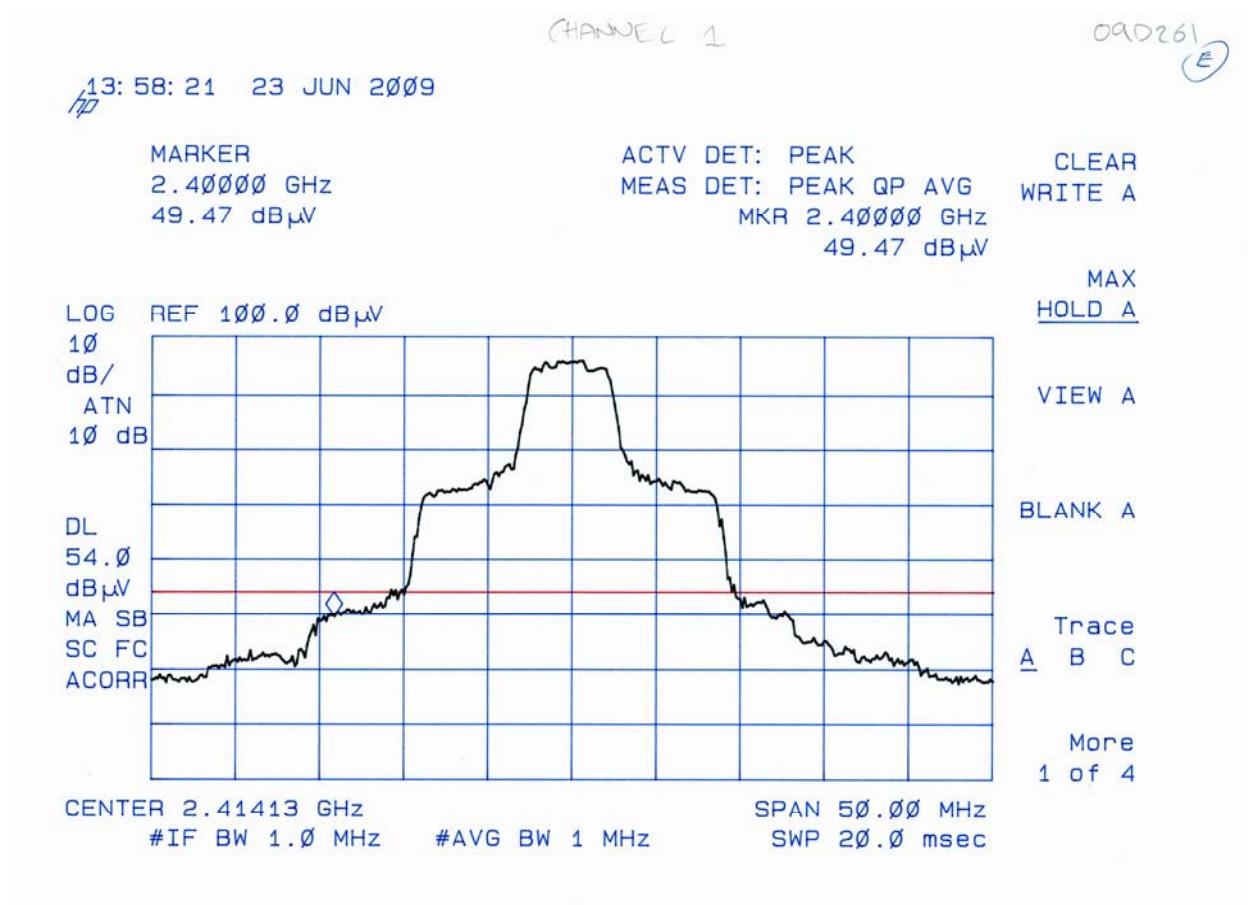


4.1.5 Plot 18 to 25.5 GHz (sample plot)



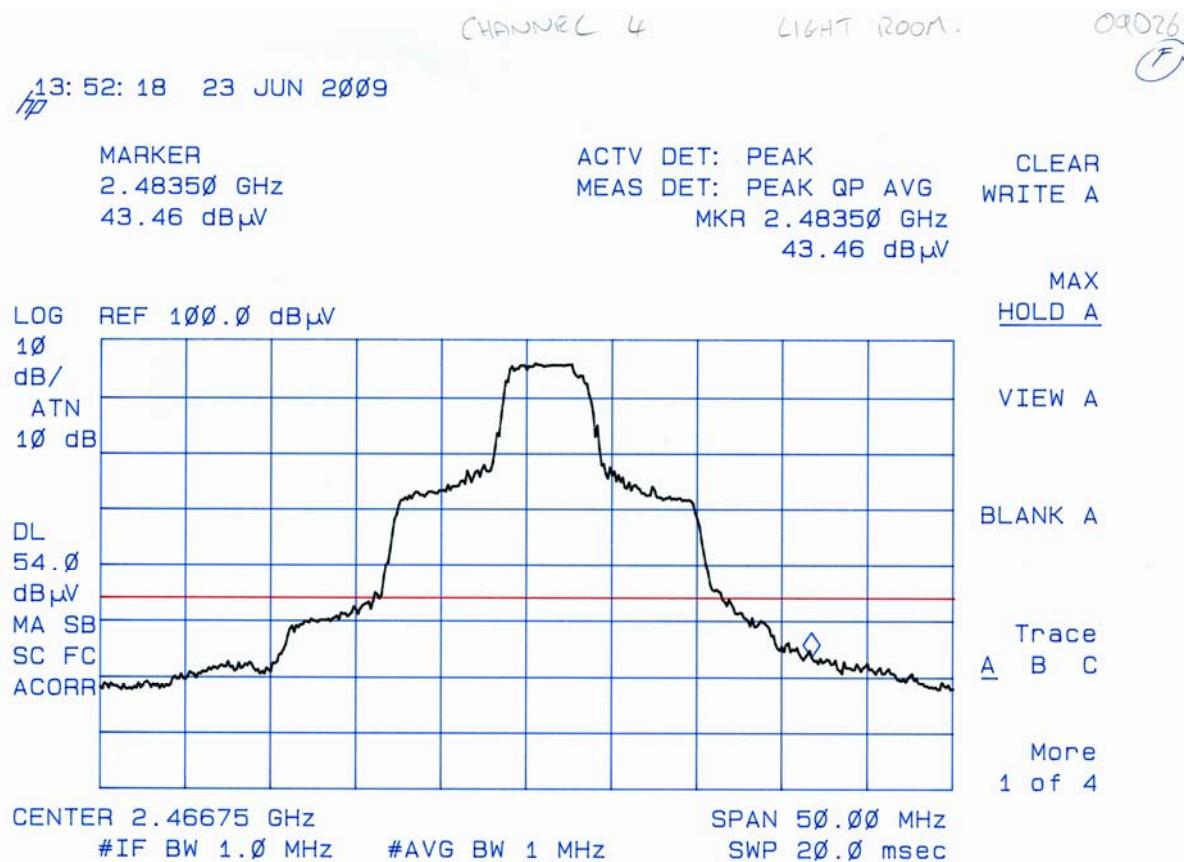
4.2 FCC –Transmitter Emissions Plot (Occupied Band)

Plot showing lowest frequency (Channel 1: 2414MHz).



FCC –Transmitter Emissions Plot (Occupied Band) (continued)

Plot showing highest frequency (Channel 4: 2468MHz).



5.0 PHOTO LOG

Emissions:

Radiated emissions, 30 to 1000 MHz



Radiated emissions, above 1.0 GHz

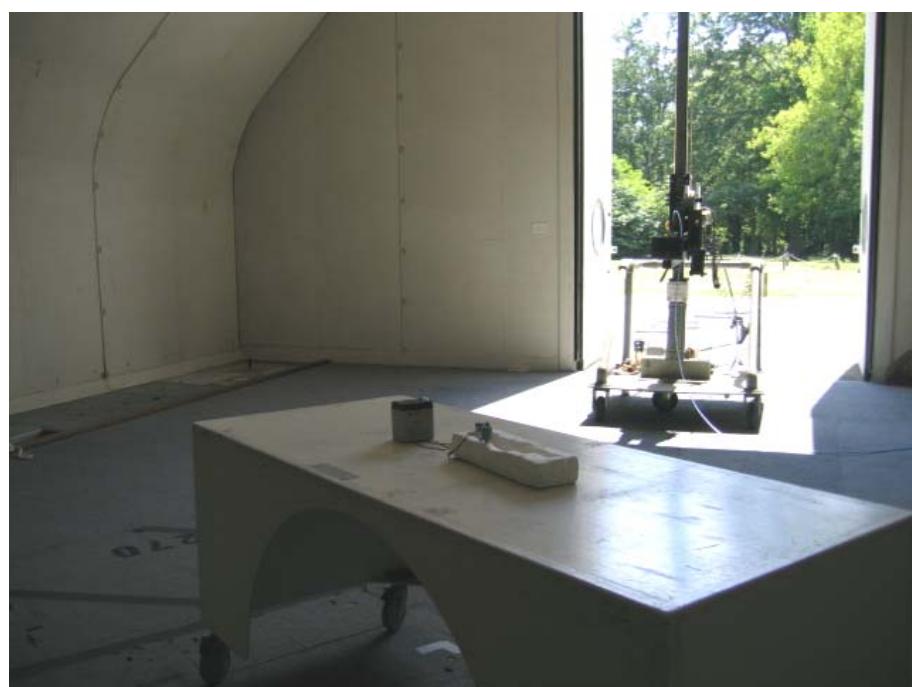
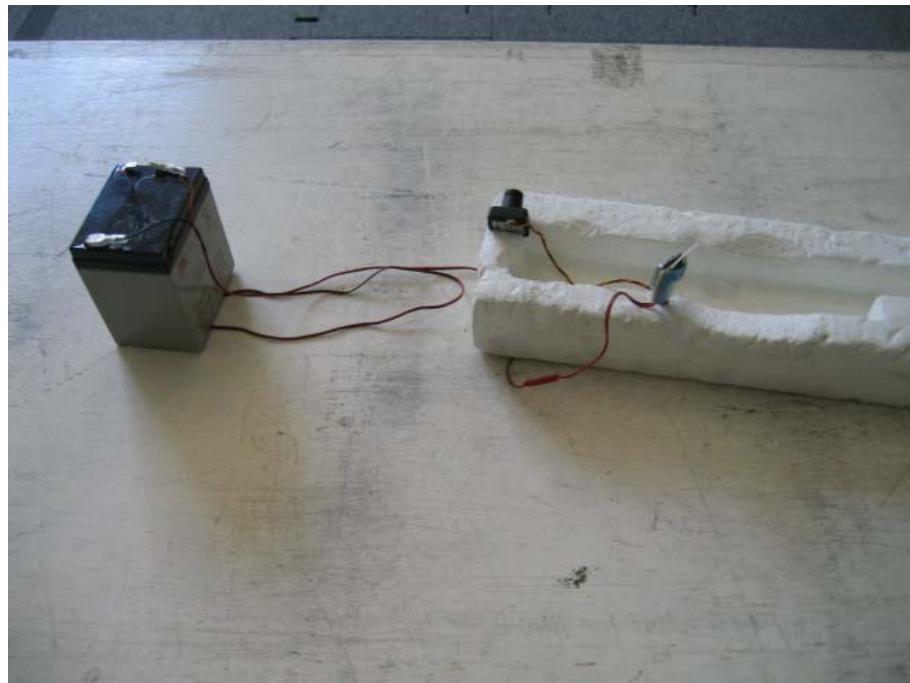


Photo Log (continued)

EUT Test Configuration



6.0 FCC DETAILS

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

February 13, 2006

Hursley EMC Services Ltd.
Unit 16
Brickfield Lane
Chandlers Ford - Hampshire, SO53 4DB
United Kingdom
Attention: R P St John James

Re: Accreditation of Hursley EMC Services Ltd.
Designation Number: UK0006

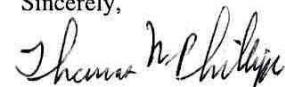
Dear Sir or Madam:

We have been notified by Department of Trade and Industry (DTI) that Hursley EMC Services Ltd. has been accredited as a Conformity Assessment Body (CAB).

At this time your organization is hereby designated to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Parts 15 and 18 of the Commission's Rules.

This designation will expire upon expiration of the accreditation or notification of withdrawal of designation.

Sincerely,



Thomas Phillips
Electronics Engineer