

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Partial Test of: BTM411

To: FCC Part 15.247: 2008 Subpart C, RSS-210 Issue 7 June 2007
& RSS-Gen Issue 2 June 2007

Test Report Serial No:
RFI/RPT1/RP76018JD03A

This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director:		
Checked By:	Tony Henriques	
Signature:		
Date of Issue:	03 November 2009	

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1. Customer Information

Company Name:	Ezurio Ltd
Address:	Saturn House, Mercury Park Wycome Lane Woodburn Green Bucks HP10 0HH

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 15 Subpart C (Radio Frequency Devices) - Section 15.247
Specification Reference:	RSS-210 Issue 7 June 2007
Specification Title:	Low-power Licence-exempt Radio communication Devices (All Frequency Bands): Category I Equipment.
Specification Reference:	RSS-GEN Issue 2 June 2007
Specification Title:	General Requirements and Information for the Certification of Radio communication Equipment
Site Registration:	FCC: 209735; Industry Canada: 3245B-2
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	28 September 2009 to 07 October 2009

2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Port Type	Result
Part 15.109	RSS-Gen 4.10/6	Receiver/Idle Mode Radiated Spurious Emissions	Antenna	
Part 15.247(b)(3)	RSS-Gen 4.8 RSS-210 A8.4(2)	Transmitter Maximum Peak Output Power	Antenna	
Part 15.247(d) & 15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Radiated Emissions	Antenna	
Part 15.247(d) & 15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Band Edge Radiated Emissions	Antenna	
Key to Results  = Complied  = Did not comply				

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2003)
Title:	American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Reference:	DA00-705 (2000)
Title:	Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

2.4. Deviations from the Test Specification

Radiated testing only was performed as requested by the customer.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	<i>Bluetooth</i> Data Module
Model Name or Number:	BTM411
Serial Number:	None stated
Hardware Version Number:	02
Software Version Number:	16.1
FCC ID Number:	PI4411B
Industry Canada Certification Number:	1931B-BTM411

3.2. Description of EUT

The equipment under test was a *Bluetooth* data module.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	Bluetooth		
Power Supply Requirement:	Nominal	5.0 V	
Type of Unit:	Transceiver		
Channel Spacing:	1 MHz		
Mode:	Basic Rate	Enhanced Data Rate	
Modulation:	GFSK	$\pi/4$ -DQPSK	8DQPSK
Packet Type: (Maximum Payload)	DH5	2DH5	3DH5
Data Rate (Mbit/s):	1	2	3
Maximum Transmit EIRP:	0.4 dBm		
Transmit Frequency Range:	2402 to 2480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480
Receive Frequency Range:	2402 to 2480 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Laptop
Brand Name:	Sony
Model Name or Number:	Vaio
Serial Number:	218982505100620

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Transmit mode with Basic rate (DH5 packets) or EDR (2DH5 or 3DH5 packets) as required.
- Receive Mode: Standalone, with the Bluetooth mode active but not transmitting.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- EUT was connected via a radio link to a *Bluetooth* tester in order to place the EUT into *Bluetooth* test mode. The laptop PC with the client's bespoke application was used to place the EUT into *Bluetooth* Test mode.
- For Transmitter Radiated Spurious Emissions, both EDR/Basic rate modes were compared and tests were performed with the mode that presented a worse case result.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

5.2. Test Results

5.2.1. Receiver/Idle Mode Radiated Spurious Emissions

Test Summary:

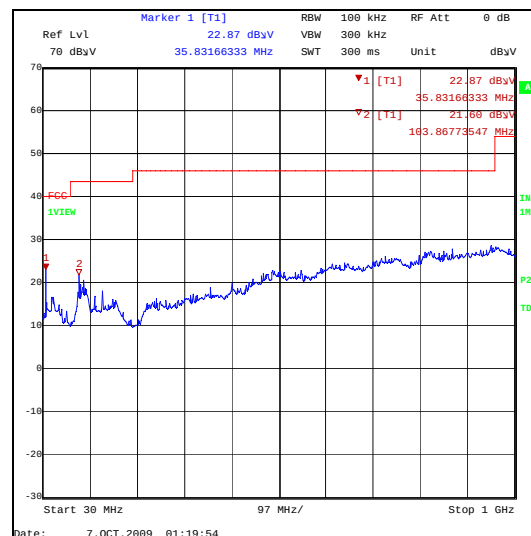
FCC Part:	15.109
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	33

Results:

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
36.523	Vertical	18.9	40.0	21.1	Complied
104.096	Vertical	21.0	43.5	22.5	Complied



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.

Receiver/Idle Mode Radiated Spurious Emissions (continued)**Test Summary:**

FCC Part:	15.109
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes
Frequency Range:	1 GHz to 12.75 GHz

Environmental Conditions:

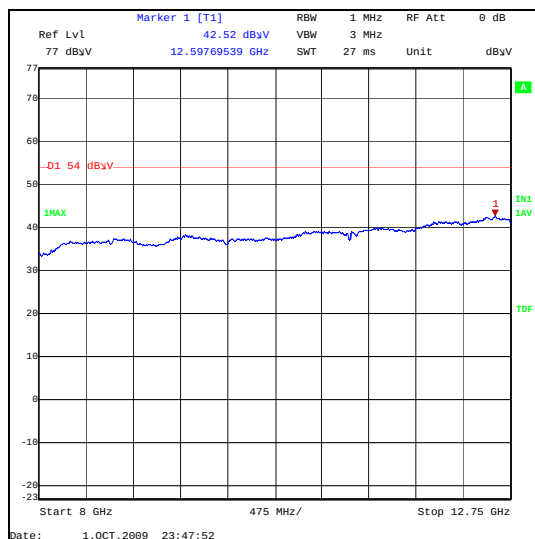
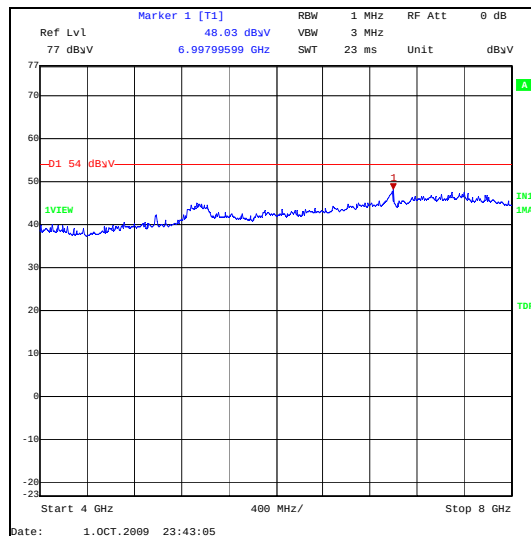
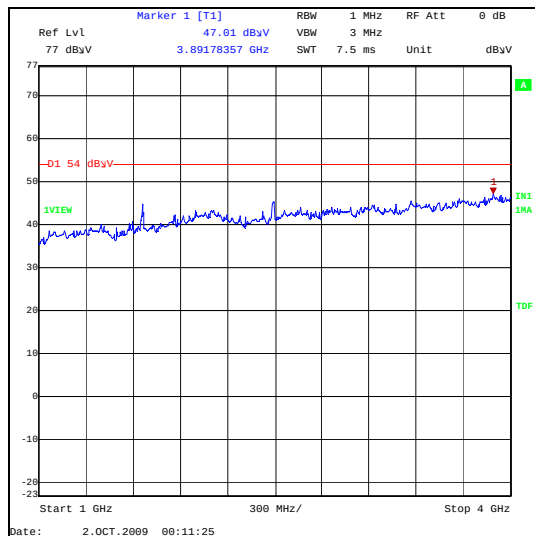
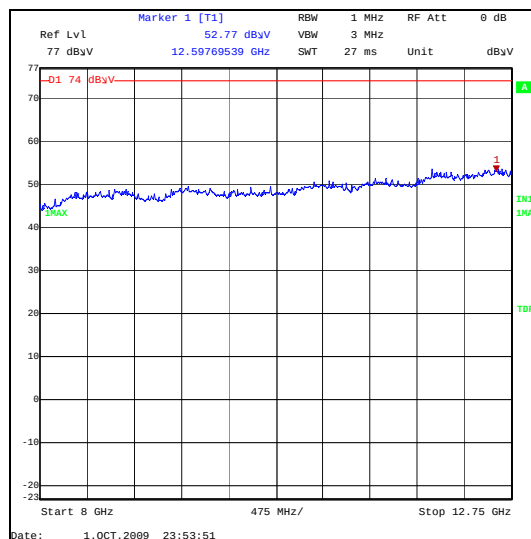
Temperature (°C):	27
Relative Humidity (%):	25

Results:

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
6997.996	Horizontal	48.0	54.0	6.0	Complied

Note(s):

1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
2. All pre-scans were performed with a peak detector against the average limit apart from measurements made in the range of 8 to 12.75 GHz where pre-scans were performed with peak and average detectors and the applicable limit applied. This was due to the noise floor being very close to the average limit when using a peak detector.

Receiver/Idle Mode Radiated Spurious Emissions (continued)**Average Measurement****Peak Measurement**

5.2.2. Transmitter Maximum Peak Output Power (EIRP)**Test Summary:**

FCC Part:	15.247(b)(3)
Test Method Used:	As detailed in Public Notice DA 00-705 (March 30, 2000), ANSI TIA-603-C-2004 and FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	32

Results: Basic Rate DH5

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-2.3	30.0	32.3	Complied
Middle	0.4	30.0	29.6	Complied
Top	0.3	30.0	29.7	Complied

Results: EDR 2DH5

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-2.8	21.0	23.8	Complied
Middle	-0.4	21.0	21.4	Complied
Top	-1.1	21.0	22.1	Complied

Results: EDR 3DH5

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-2.5	21.0	23.5	Complied
Middle	-0.2	21.0	21.2	Complied
Top	-0.1	21.0	21.1	Complied

Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.

5.2.3. Transmitter Radiated Emissions**Test Summary:**

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.4 Section 8 and Public Notice DA 00-705 (March 30, 2000)
Frequency Range	30 MHz to 1000MHz

Environmental Conditions:

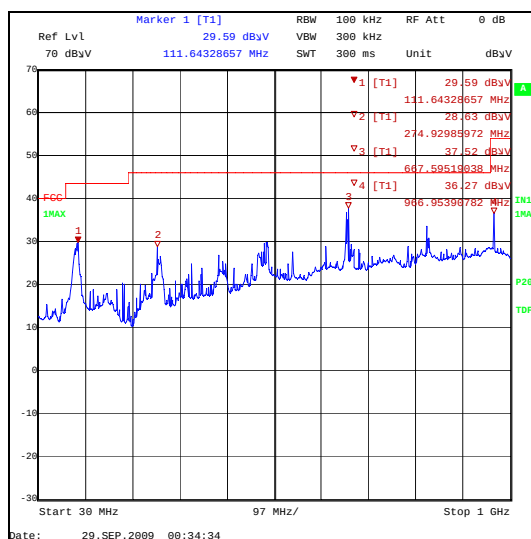
Temperature (°C):	27
Relative Humidity (%):	31

Results: Top Channel - Emissions Occurring in the Restricted Bands

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
111.922	Vertical	37.9	43.5	5.6	Complied
275.783	Vertical	28.3	46.0	17.7	Complied
666.608	Horizontal	39.4	46.0	6.6	Complied
965.266	Vertical	33.8	54.0	20.2	Complied

Note(s):

1. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
2. Transmitter Radiated Spurious emissions were performed in Basic Rate, which was found as the worst case on investigation.



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

5.2.4. Transmitter Radiated Emissions**Test Summary:**

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.4 Section 8 and Public Notice DA 00-705 (March 30, 2000)
Frequency Range	1GHz to 26.5 GHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	31

Results: Highest Peak Level. Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4804.045	Vertical	56.8	-1.2	58.0	74.0	26.0	Complied

Results: Highest Average Level. Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4803.983	Vertical	46.9	-1.2	48.1*	54.0	5.9	Complied

Results: Highest Peak Level. Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4881.716	Vertical	57.1	-1.2	58.3	74.0	15.7	Complied

Results: Highest Average Level. Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4881.685	Vertical	46.5	-1.2	47.7*	54.0	6.3	Complied

Results: Highest Peak Level. Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4959.763	Vertical	53.9	-1.2	55.1	74.0	18.9	Complied

Transmitter Radiated Emissions (continued)**Results: Highest Average Level. Top Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4960.201	Vertical	43.2	-1.2	44.4*	54.0	9.6	Complied

Results: Highest Peak Level. Hopping Mode

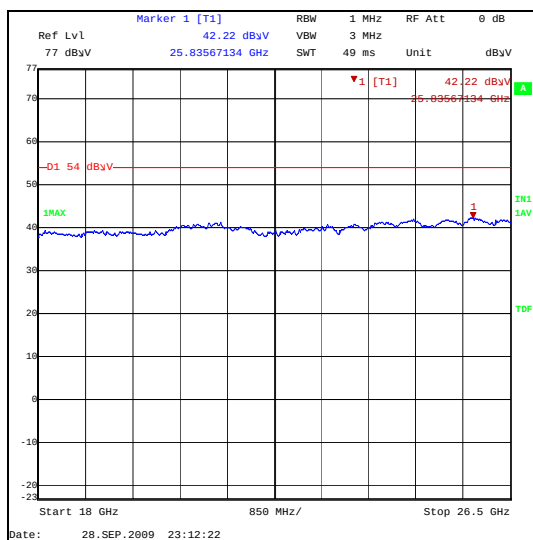
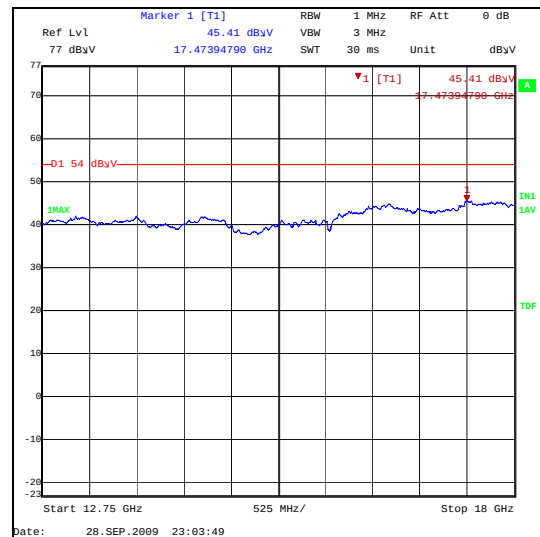
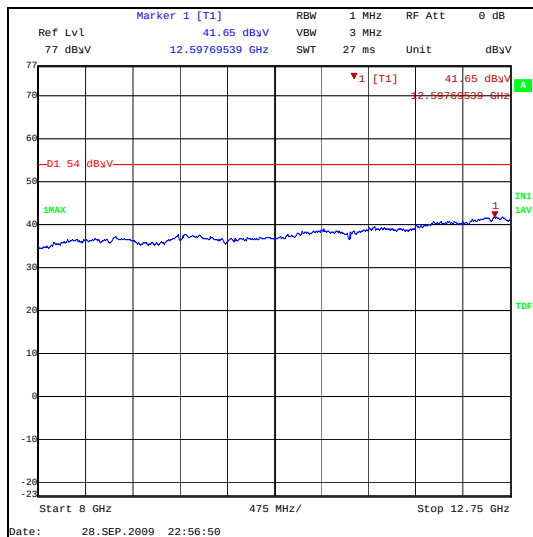
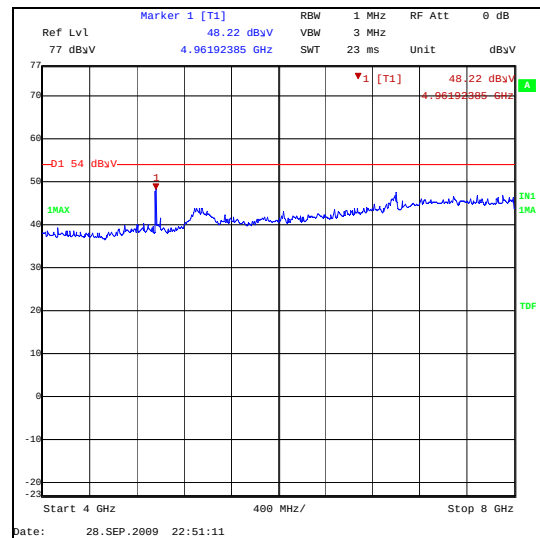
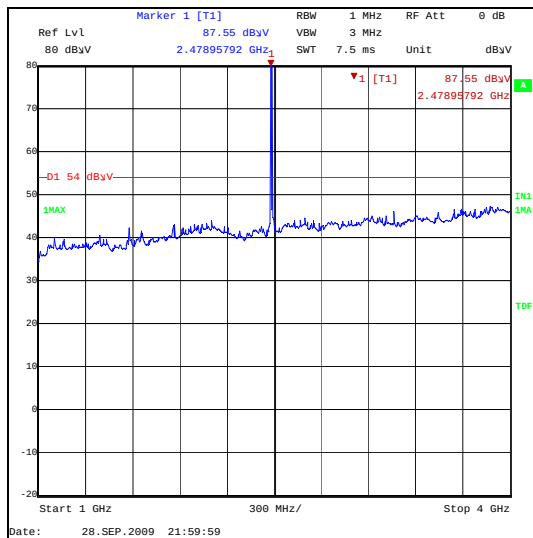
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4881.716	Vertical	57.1	-1.2	58.3	74.0	15.7	Complied

Results: Highest Average Level. Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4803.983	Vertical	46.9	-1.2	48.1*	54.0	5.9	Complied

Note(s):

*Average values were calculated using the Duty cycle correction factor method as stated in DA 00 -705. This value was calculated to be -9.757 dB.

Transmitter Radiated Emissions (continued)

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

5.2.5. Transmitter Band Edge Radiated Emissions**Test Summary:**

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.4 Section 8 and Public Notice DA 00-705 (March 30, 2000)

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	31

Results: Peak Power Level Hopping Mode DH5:

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Vertical	50.3	-0.2	50.5	*72.9	22.4	Complied
2.4835	Vertical	55.8	-0.3	56.1	74.0	17.9	Complied

* -20 dBc limit

Results: Average Power Level Hopping Mode DH5

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (Db)	Result
2.4835	Vertical	38.1	-0.3	38.4	54	15.6	Complied

Results: Peak Power Level Hopping Mode 2DH5:

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Vertical	46.7	-0.2	46.9	*72.4	25.5	Complied
2.4835	Vertical	57.3	-0.3	57.6	74.0	16.4	Complied

* -20 dBc limit

Results: Average Power Level Hopping Mode 2DH5

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4835	Vertical	37.4	-0.3	37.7	54	16.3	Complied

Transmitter Band Edge Radiated Emissions (continued)**Results: Peak Power Level Hopping Mode 3DH5:**

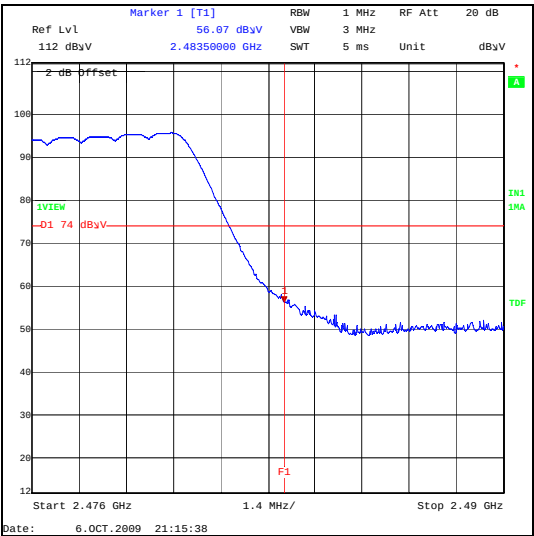
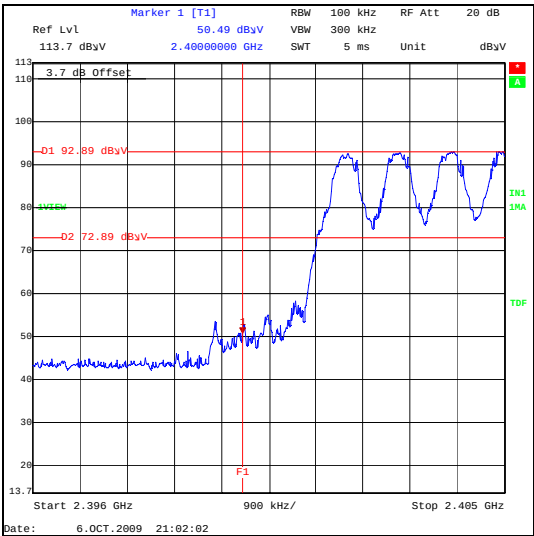
Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Vertical	43.8	-0.2	44.0	*72.7	28.7	Complied
2.4835	Vertical	58.3	-0.3	58.6	74.0	15.4	Complied

* -20 dBc limit

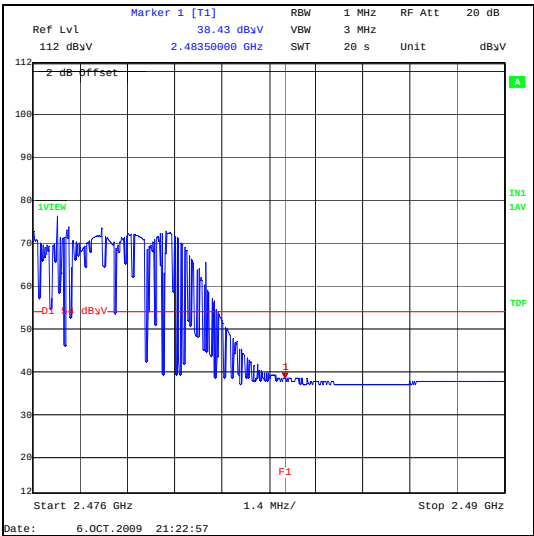
Results: Average Power Level Hopping Mode 3DH5

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4835	Vertical	36.7	-0.3	37.0	54.0	17.0	Complied

Transmitter Band Edge Radiated Emissions (continued)

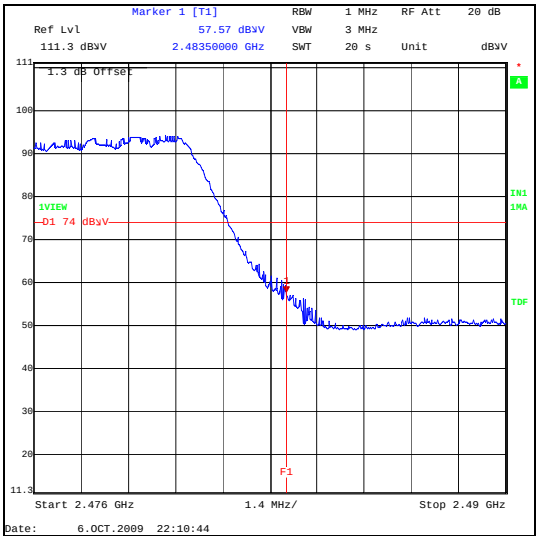
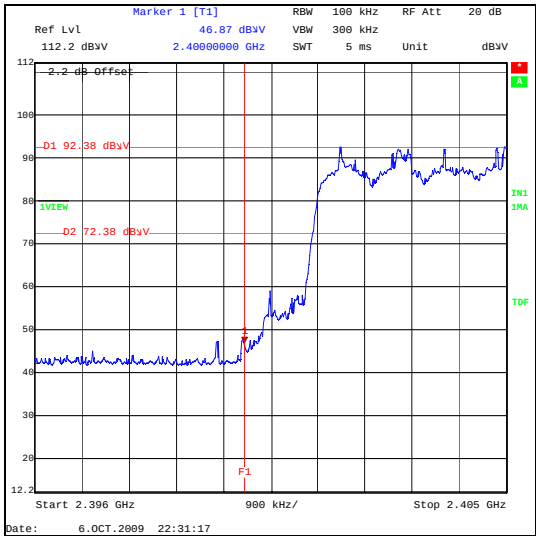


DH5

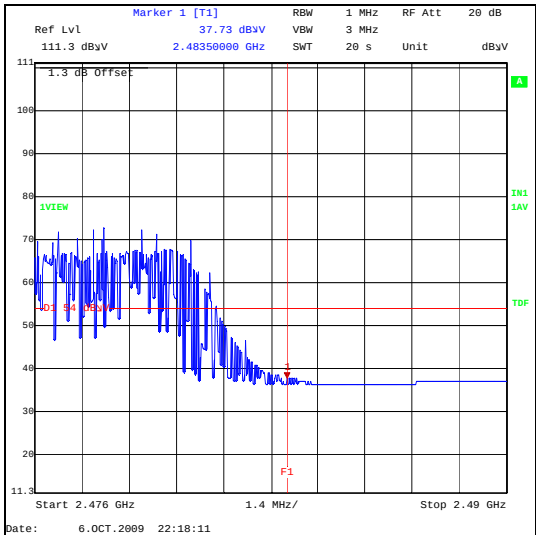


Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

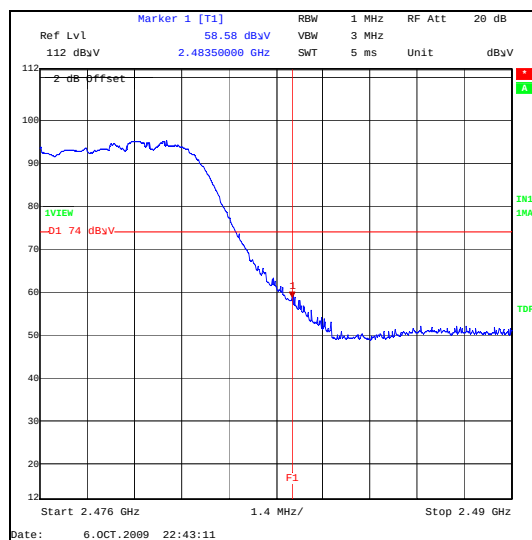
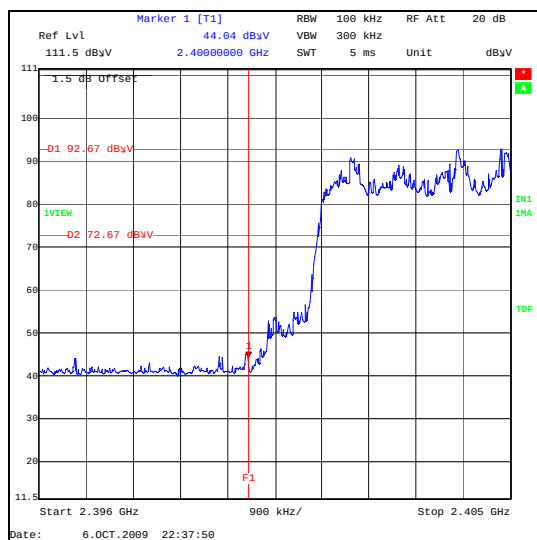
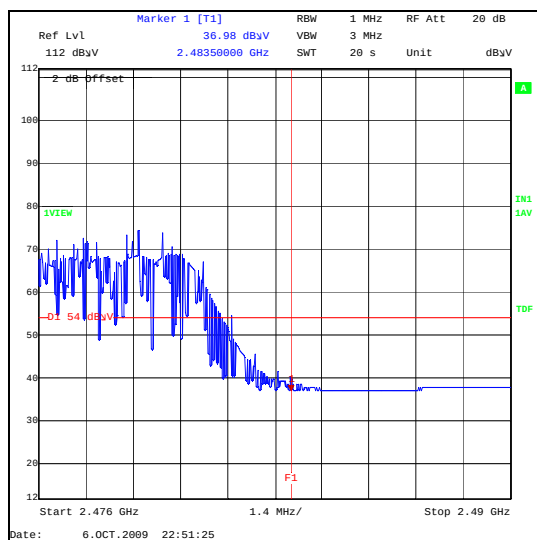
Transmitter Band Edge Radiated Emissions (continued)



2DH5



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Band Edge Radiated Emissions (continued)**3DH5**

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Band Edge Radiated Emissions (continued)**Results: Peak Power Level Static Mode DH5**

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Vertical	54.7	-0.2	54.9	*73.0	18.1	Complied
2.4835	Vertical	57.0	-0.3	57.3	74.0	16.7	Complied

* -20 dBc limit

Results: Average Power Level Static Mode DH5

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4835	Vertical	43.9	-0.3	44.2	54.0	9.8	Complied

Results: Peak Power Level Static Mode 2DH5

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Vertical	48.4	-0.2	48.6	*72.4	23.8	Complied
2.4835	Vertical	58.6	-0.3	58.9	74.0	15.1	Complied

Results: Average Power Level Static Mode 2DH5

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4835	Vertical	42.4	-0.3	42.7	54.0	11.3	Complied

* -20 dBc limit

Results: Peak Power Level Static Mode 3DH5

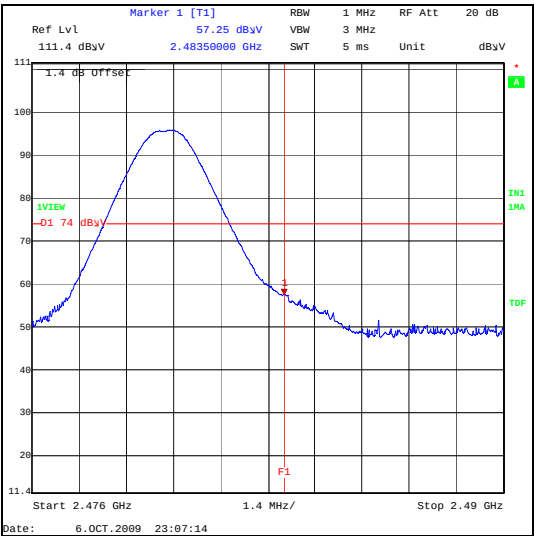
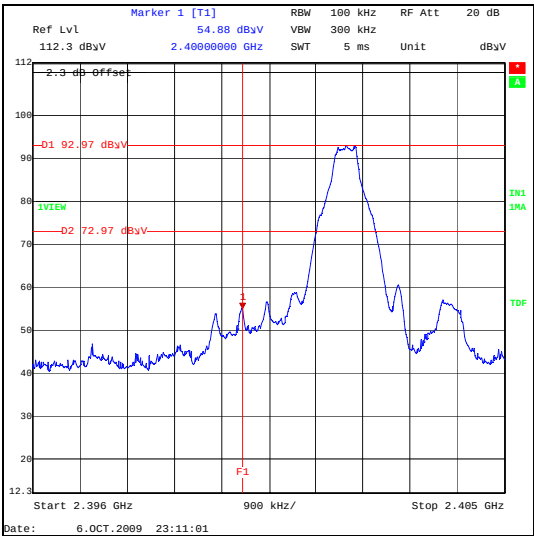
Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Vertical	47.2	-0.2	47.4	*72.7	25.3	Complied
2.4835	Vertical	58.9	-0.3	59.2	74.0	14.8	Complied

* -20 dBc limit

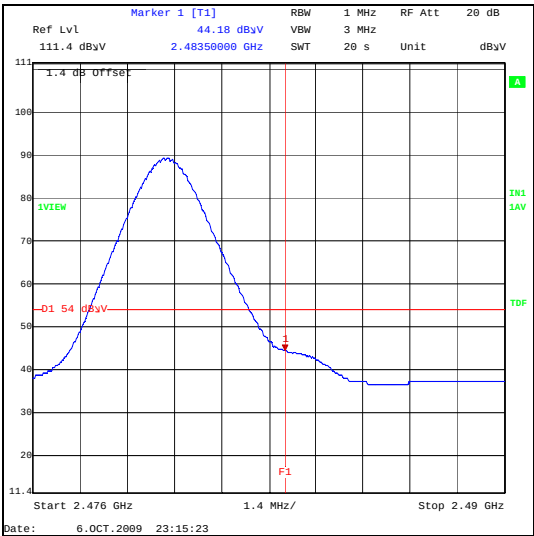
Results: Average Power Level Static Mode 3DH5

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4835	Vertical	42.9	-0.3	43.2	54.0	10.8	Complied

Transmitter Band Edge Radiated Emissions (continued)

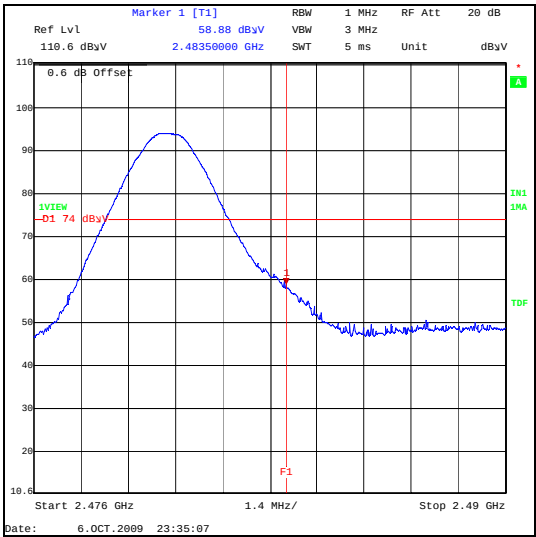
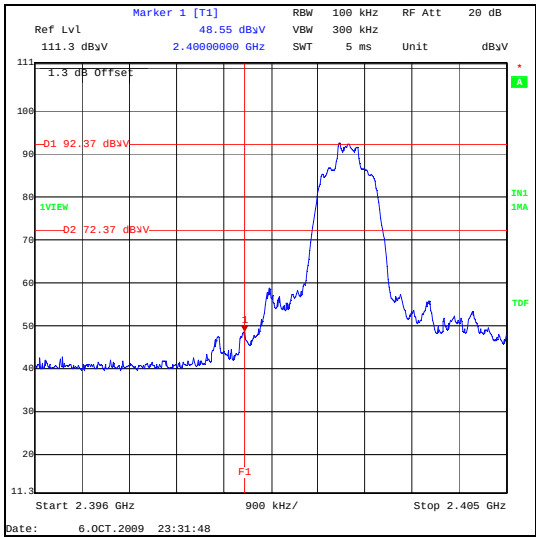


DH5

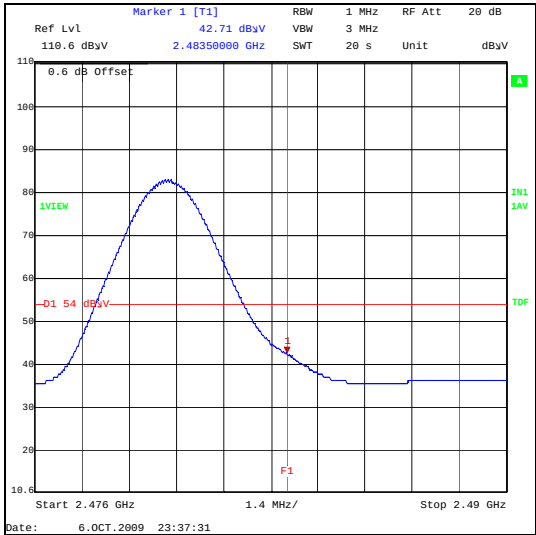


Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Band Edge Radiated Emissions (continued)

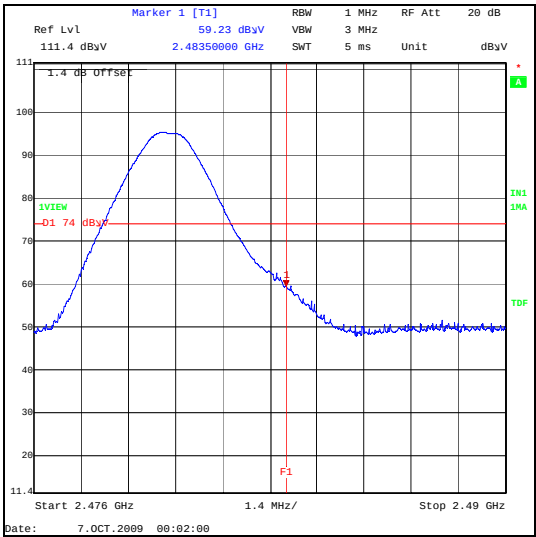
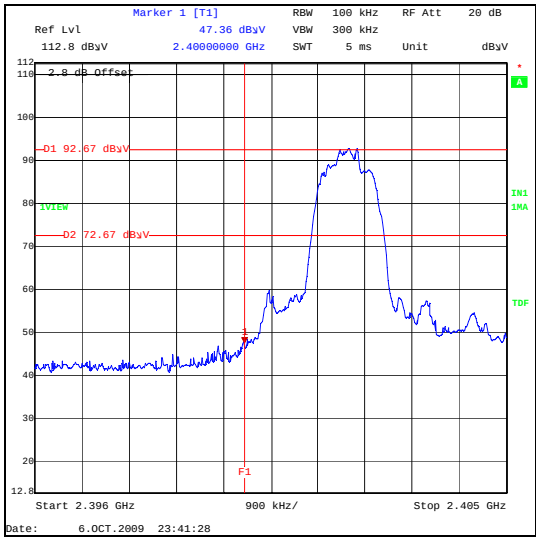


2DH5

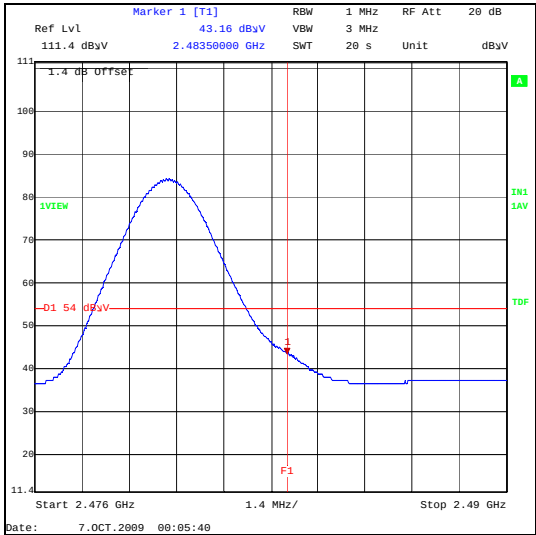


Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Band Edge Radiated Emissions (continued)



3DH5



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Maximum Peak Output Power	Not Applicable	95%	±2.94 dB
Radiated Spurious Emissions	30 MHz to 40 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	25 Oct 2008	12
A288	Antenna	Chase	CBL6111A	1589	13 Mar 2009	12
A436	Antenna	Flann	20240-20	330	24 Apr 2009	36
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	01 Sep 2009	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	09 Mar 2009	12
M1447	CBT	Rohde & Schwarz	1153.9000.35	100329	19 Jan 2009	12

NB In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.