



TEST REPORT

Test Report No. : UL-RPT-RP89096JD07A V2.0

Manufacturer : Intelesens Limited
Model No. : Aingeal Version 3
FCC ID : YVF-VS200
Test Standard(s) : FCC Part 15.247(b)(3)

1. This test report shall not be reproduced in full or partial, without the written approval of RFI Global Services Ltd trading as UL.
2. The results in this report apply only to the sample(s) tested.
3. This sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

Date of Issue: 19 February 2013

Checked by:

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pp

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This laboratory is accredited by UKAS.
The tests reported herein have been
performed in accordance with its' terms
of accreditation.

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1. Customer Information




Company Name:	Intelesens Limited
Address:	4 Heron Road Belfast Northern Ireland BT3 9LE United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart C (Intentional Radiators) - Section 15.247
Site Registration:	209735
Location of Testing:	RFI Global Services Ltd trading as UL, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Date:	04 February 2013

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.247(b)(3)	Transmitter Maximum Output Power	
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Key to Results  = Complied  = Did not comply		

Note(s):

1. The measurement was performed to assist in the calculation of the level of maximum output power as the EUT employs pulsed operation.

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2009)
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	ANSI C63.10 (2009)
Title:	American National Standard for Testing Unlicensed Wireless Devices
Reference:	KDB 558074 D01 v02 10/04/2012
Title:	Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) devices operating Under §15.247

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Vitalsens
Model Name or Number:	Aingeal Version 3
Serial Number:	QB003-03700066614C458 (<i>transmit sample - bottom channel</i>)
Hardware Version Number:	QB003
Software Version Number:	2513
FCC ID:	YVF-VS200

Brand Name:	Vitalsens
Model Name or Number:	Aingeal Version 3
Serial Number:	QB003-03800066614C45B (<i>transmit sample - middle channel</i>)
Hardware Version Number:	QB003
Software Version Number:	2513
FCC ID:	YVF-VS200

Brand Name:	Vitalsens
Model Name or Number:	Aingeal Version 3
Serial Number:	QB003-03900066614C449 (<i>transmit sample - top channel</i>)
Hardware Version Number:	QB003
Software Version Number:	2513
FCC ID:	YVF-VS200

3.2. Description of EUT

The equipment under test was a monitoring device for various physiological parameters, including heart rate, skin temperature and respiration. An embedded Wi-Fi radio is used to transmit the data to a central processing station.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	Digital Transmission System		
Type of Unit:	Transceiver		
Modulation Type:	DBPSK, DQPSK, CCK, BPSK, QPSK, 16 QAM & 64QAM		
Data Rate:	802.11b	1, 2, 5.5 & 11 Mbps	
	802.11g	6, 9, 12, 18, 24, 36, 48 & 54 Mbps	
Maximum Conducted Output Power:	18.3 dBm		
Transmit Frequency Range:	2412 MHz to 2462 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2412
	Middle	6	2437
	Top	11	2462

3.5. Support Equipment

No support equipment was used to exercise the EUT during testing:

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Continuously transmitting at maximum power, on channels 1, 6 or 11.

4.2. Configuration and Peripherals

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

- The EUT is a battery powered device.
- Transmit Mode – The Customer supplied three constant transmit samples, one for the bottom channel, one for the middle channel and one for the top channel. The EUT's had a bespoke firmware installed, which allowed the data rates to be selected by depressing the on button by x times (0 presses = 1 Mbps, 1 press = 2 Mbps, 2 presses = 5.5 Mbps, 3 presses = 11 Mbps etc.).
- All supported modes were initially investigated on one channel. The modes that produced the highest power were:
 - 802.11b – CCK / 11 Mbps
 - 802.11g – BPSK / 9 Mbps

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.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results

5.2.1. Transmitter Maximum Output Power

Test Summary:

Test Engineer:	Nick Steele	Test Date:	04 February 2013
Test Sample Serial Numbers:	QB003-03700066614C458, QB003-03800066614C45B & QB003-03900066614C449		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	As detailed in FCC KDB 558074 Section 8.2 / Alternative 1 referencing ANSI C63.4 (see note below)

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	30

Note(s):

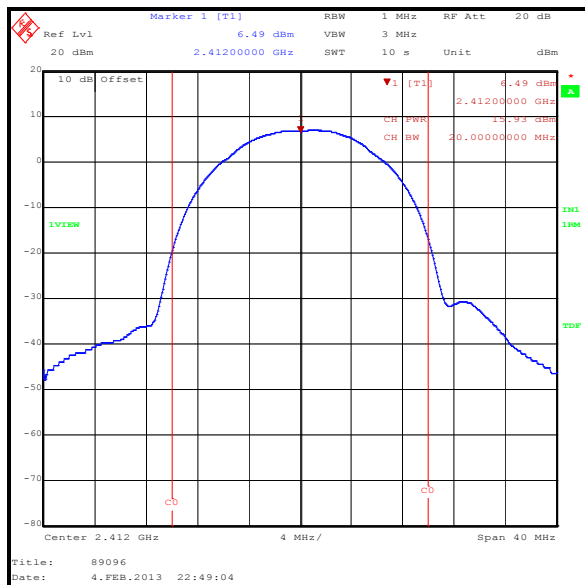
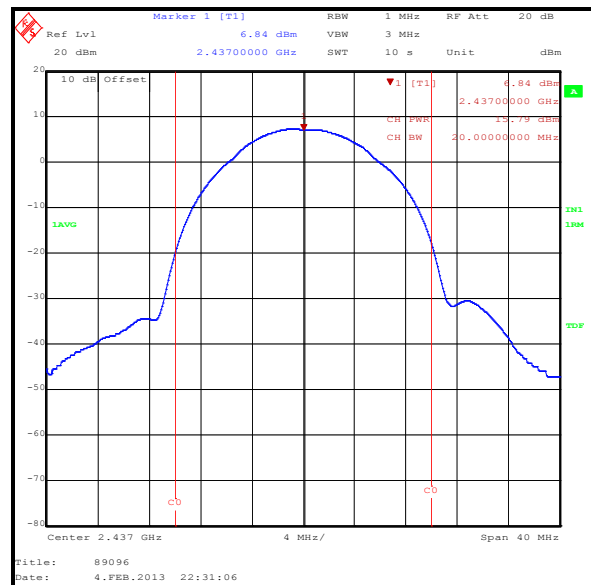
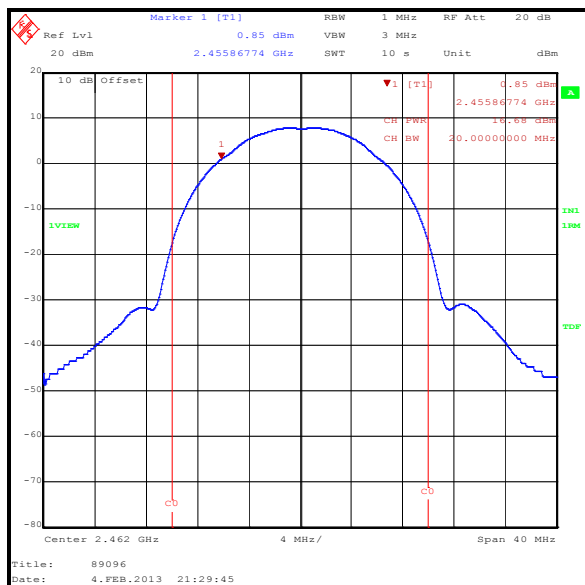
1. Tests were performed using a combination of the conducted test method described in FCC KDB 558074 Section 8.2 and the test methods for radiated emissions measurements described in Sections 6.3 and 6.6. The reason for this being that the measurements were performed radiated as the EUT has an integral antenna and does not have an external antenna port.
2. All configurations supported by the EUT were investigated on one channel in accordance with KDB 558074 Section 8.2.2 measurement procedure and 8.2.4 Alternative 1. The data rates that produced the highest power and therefore deemed worst case were:
 - 802.11b – CCK / 11 Mbps
 - 802.11g – BPSK / 9 Mbps
3. Final measurements were performed using the above configurations on the bottom, middle and top channels.
4. The EUT was transmitting at <98% duty cycle. The calculated duty cycle in section 5.2.2 was added to the measured average power in order to compute the power during the actual transmission time.

Transmitter Maximum Output Power (continued)**Results: 802.11b / 20 MHz / CCK / 11 Mbps****De Facto EIRP Limit Comparison**

Channel	EIRP (dBm)	Duty cycle correction (dB)	Corrected EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	15.9	0.4	16.3	36.0	19.7	Complied
Middle	15.8	0.4	16.2	36.0	19.8	Complied
Top	16.7	0.4	17.1	36.0	18.9	Complied

Conducted Limit Comparison

Channel	EIRP (dBm)	Declared Antenna Gain (dBi)	Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	16.3	-1.2	17.5	30.0	12.5	Complied
Middle	16.2	-1.2	17.4	30.0	12.6	Complied
Top	17.1	-1.2	18.3	30.0	11.7	Complied

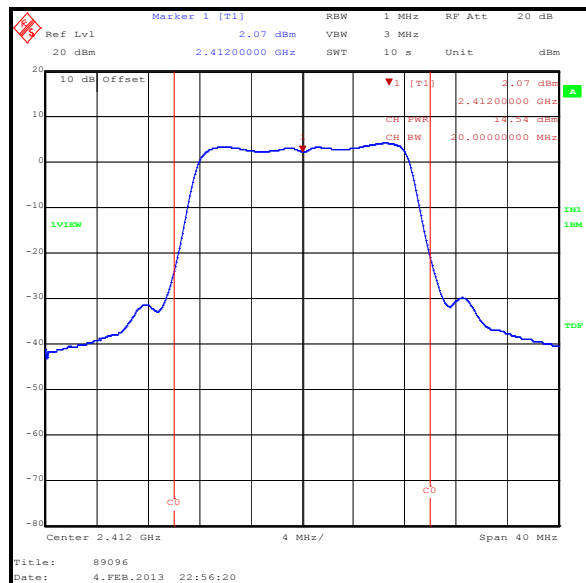
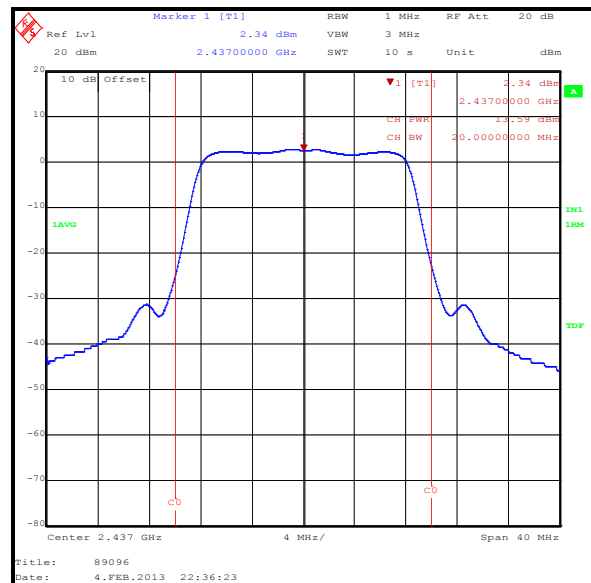
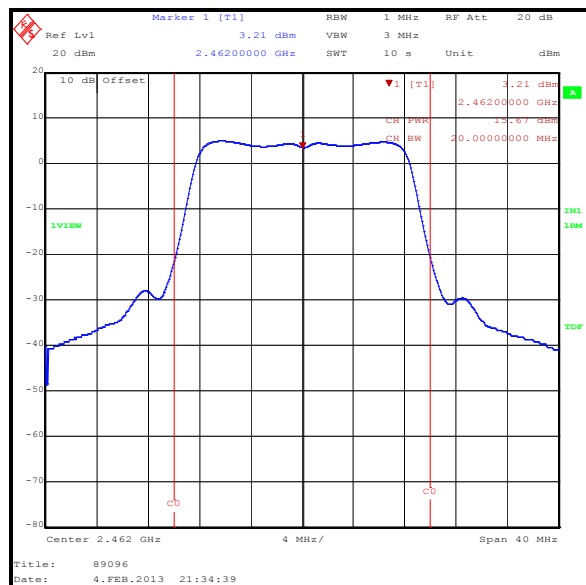
Transmitter Maximum Output Power (continued)**Results: 802.11b / 20 MHz / CCK / 11 Mbps****Bottom Channel****Middle Channel****Top Channel**

Transmitter Maximum Peak Output Power (continued)**Results: 802.11g / 20 MHz / BPSK / 9 Mbps****De Facto EIRP Limit Comparison**

Channel	EIRP (dBm)	Duty cycle correction (dB)	Corrected EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	14.5	0.6	15.1	36.0	20.9	Complied
Middle	13.6	0.6	14.2	36.0	21.8	Complied
Top	15.7	0.6	16.3	36.0	19.7	Complied

Conducted Limit Comparison

Channel	EIRP (dBm)	Declared Antenna Gain (dBi)	Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	15.1	-1.2	16.3	30.0	13.7	Complied
Middle	14.2	-1.2	15.4	30.0	14.6	Complied
Top	16.3	-1.2	17.5	30.0	12.5	Complied

Transmitter Maximum Peak Output Power (continued)**Results: 802.11g / 20 MHz / BPSK / 9 Mbps****Bottom Channel****Middle Channel****Top Channel****Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0002	3m RSE Chamber	Rainford	N/A	N/A	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	06 Jul 2013	12

5.2.2.Transmitter Duty Cycle**Test Summary:**

Test Engineer:	Nick Steele	Test Date:	04 February 2013
Test Sample Serial Number:	QB003-03900066614C449		

FCC Part:	15.35(c)
Test Method Used:	FCC KDB 558074 Section 5.0

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	32

Note(s):

1. In order to assist with the determination of the average level of fundamental and spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by using the following calculation:

$$10 \log (1 / (\text{On Time} / [\text{Period or } 100\text{mS whichever is the lesser}])).$$

$$802.11b \text{ duty cycle: } 10 \log (1 / (0.472/0.513)) = 0.4 \text{ dB}$$

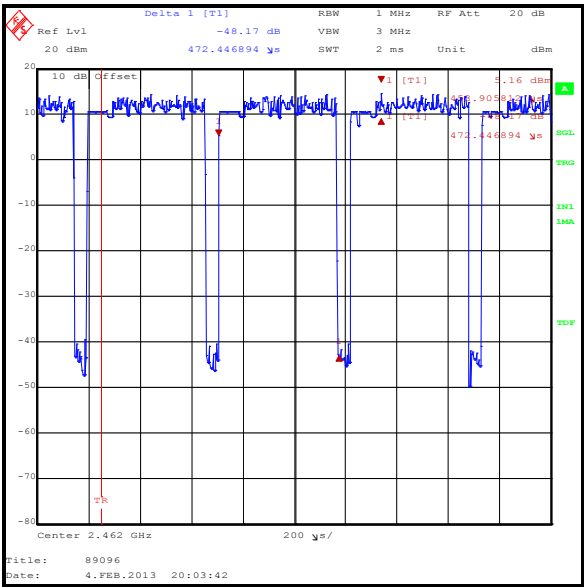
$$802.11g \text{ duty cycle } 10 \log (1 / (0.470/0.539)) = 0.6 \text{ dB}$$

Transmitter Duty Cycle (continued)

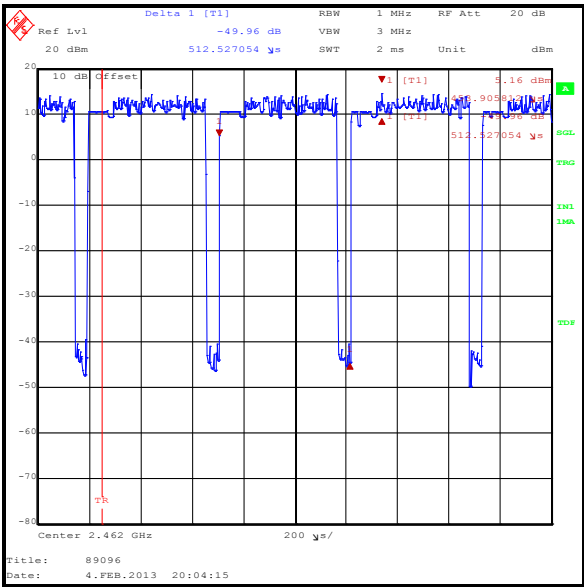
Results: 802.11b / 20 MHz / 11 Mbps

Pulse Duration (mS)	Duty Cycle (dB)
0.472	0.4

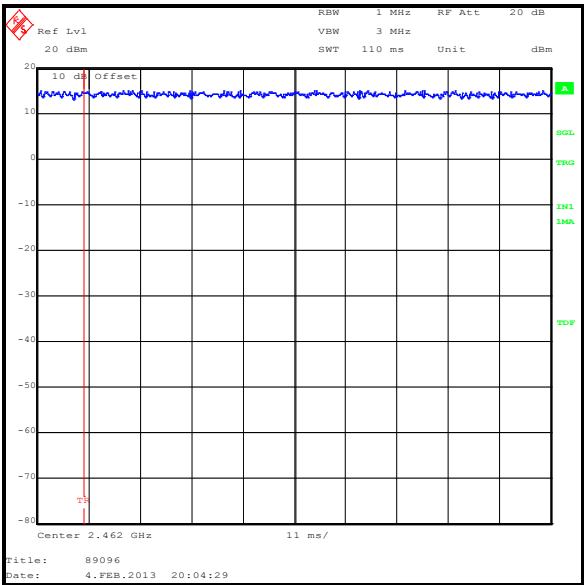
Period (mS)
0.513



TX on time



TX on + off time / period



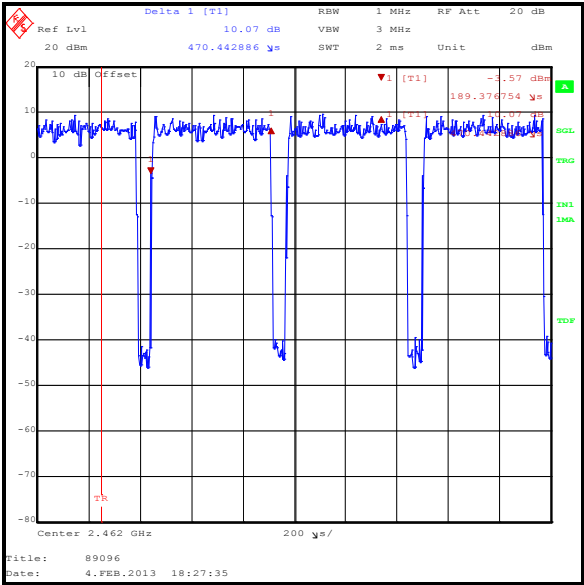
100 ms

Transmitter Duty Cycle (continued)

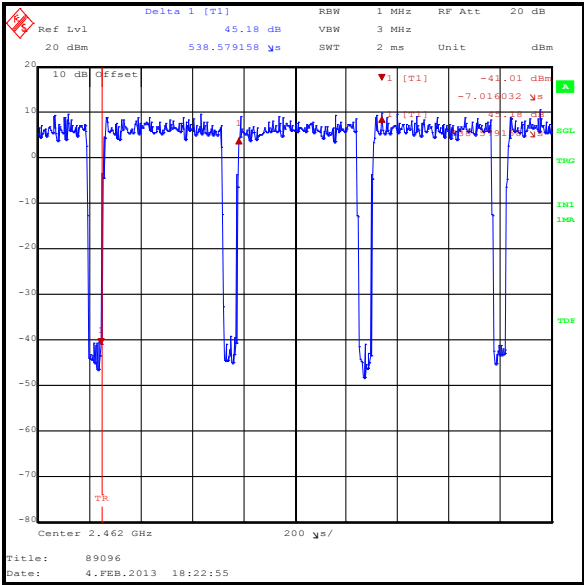
Results: 802.11g / 20 MHz / 9 Mbps

Pulse Duration (mS)	Duty Cycle (dB)
0.470	0.6

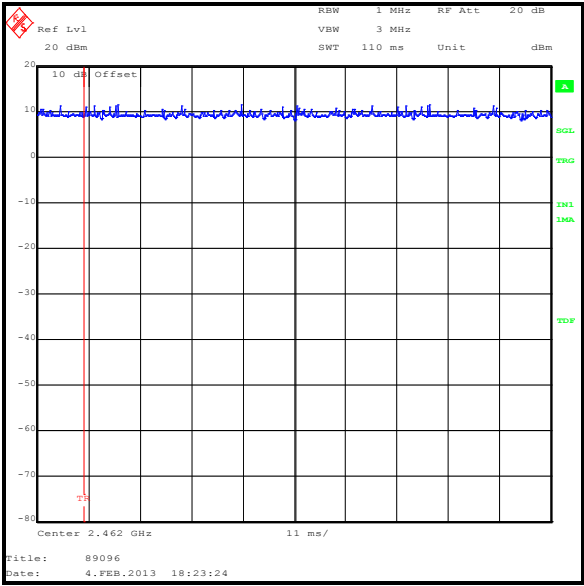
Period (mS)
0.539



TX on time



TX on + off time / period



100 ms

Transmitter Duty Cycle (continued)**Test Equipment Used:**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12

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
Radiated Maximum Output Power	2.4 GHz to 2.4835 GHz	95%	±2.94 dB
Duty Cycle	2.4 GHz to 2.4835 GHz	95%	±0.3 ns

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.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	Front Page Page 7	-	Model Name updated as requested by Customer