



# TEST REPORT

**Test Report No. : UL-RPT-RP11241886JD07C V3.0**

**Manufacturer** : Apple Inc.  
**Model No.** : A1779  
**FCC ID** : BCG-E3086A  
**Technology** : *Bluetooth – Low Energy (Using ePA)*  
**Test Standard(s)** : FCC Parts 15.209(a) & 15.247

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. The 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 3.0 supersedes all previous versions.

**Date of Issue:** 03 August 2016

**Checked by:**

Steven White  
Service Lead, Radio Laboratory

**Company Signatory:**

Sarah Williams  
Senior Engineer, Radio Laboratory  
UL VS LTD



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

The *Bluetooth*® word mark and logos are owned by the *Bluetooth* SIG, Inc. and any use of such marks by UL VS LTD is under licence. Other trademarks and trade names are those of their respective owners.

---

**UL VS LTD**

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG, UK  
Telephone: +44 (0)1256 312000  
Facsimile: +44 (0)1256 312001

This page has been left intentionally blank.

**Table of Contents**

<b>1. Customer Information.....</b>	<b>4</b>
<b>2. Summary of Testing.....</b>	<b>5</b>
2.1. General Information	5
2.2. Summary of Test Results	5
2.3. Methods and Procedures	6
2.4. Deviations from the Test Specification	6
<b>3. Equipment Under Test (EUT) .....</b>	<b>7</b>
3.1. Identification of Equipment Under Test (EUT)	7
3.2. Description of EUT	8
3.3. Modifications Incorporated in the EUT	8
3.4. Additional Information Related to Testing	8
3.5. Support Equipment	8
<b>4. Operation and Monitoring of the EUT during Testing .....</b>	<b>9</b>
4.1. Operating Modes	9
4.2. Configuration and Peripherals	9
<b>5. Measurements, Examinations and Derived Results.....</b>	<b>10</b>
5.1. General Comments	10
5.2. Test Results	11
5.2.1. Transmitter Minimum 6 dB Bandwidth	11
5.2.2. Transmitter Power Spectral Density	14
5.2.3. Transmitter Maximum Peak Output Power	17
5.2.4. Transmitter Radiated Emissions	21
5.2.5. Transmitter Band Edge Radiated Emissions	27
<b>6. Measurement Uncertainty .....</b>	<b>30</b>
<b>7. Report Revision History .....</b>	<b>31</b>

## **1. Customer Information**

<b>Company Name:</b>	Apple
<b>Address:</b>	1 Infinite Loop Cupertino, CA 95014 U.S.A

## 2. Summary of Testing

### 2.1. General Information

<b>Specification Reference:</b>	47CFR15.247
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
<b>Specification Reference:</b>	47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
<b>Site Registration:</b>	209735
<b>Location of Testing:</b>	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
<b>Test Dates:</b>	07 June 2016 to 06 July 2016

### 2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.247(e)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	Transmitter Maximum Peak Output Power	✓
Part 15.247(d)/15.209(a)	Transmitter Radiated Emissions	✓
Part 15.247(d)/15.209(a)	Transmitter Band Edge Radiated Emissions	✓
<b>Key to Results</b>		
 = Complied	 = Did not comply	

#### Note(s):

1. There are two vendors of the WiFi/Bluetooth radio modules, Vendor 1 and Vendor 2.
2. The WiFi/Bluetooth radio modules have the same mechanical outline (e.g. the same packaging dimension and pin layout), use the same on-board antenna matching circuit, have an identical antenna structure and are built and tested to conform to the same specification and to operate within the same tolerances.

Baseline testing was performed on the two vendors to determine the worst case.

### **2.3. Methods and Procedures**

<b>Reference:</b>	ANSI C63.10-2013
<b>Title:</b>	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
<b>Reference:</b>	KDB 558074 D01 DTS Meas Guidance v03r05 April 8, 2016
<b>Title:</b>	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) 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)**

<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A1779
<b>Test Sample Serial Number:</b>	C7CRR00BHCPX ( <i>Radiated sample</i> )
<b>Test Sample IMEI:</b>	358640070063996
<b>Hardware Version:</b>	REV 1.0
<b>Firmware Version:</b>	9.44.11.27
<b>Test Utility Software:</b>	wl 1.359 RC65.0
<b>FCC ID:</b>	BCG-E3086A

<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A1779
<b>Test Sample Serial Number:</b>	C7CRR00GHCPX ( <i>Radiated sample</i> )
<b>Test Sample IMEI:</b>	358640070066106
<b>Hardware Version:</b>	REV 1.0
<b>Firmware Version:</b>	9.44.11.27
<b>Test Utility Software:</b>	wl 1.359 RC65.0
<b>FCC ID:</b>	BCG-E3086A

<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A1779
<b>Test Sample Serial Number:</b>	C7CRG02QH6DH ( <i>Conducted sample #1 with RF port</i> )
<b>Test Sample IMEI:</b>	358640070529822
<b>Hardware Version:</b>	REV 1.0
<b>Firmware Version:</b>	9.44.11.27
<b>Test Utility Software:</b>	wl 1.359 RC65.0
<b>FCC ID:</b>	BCG-E3086A

<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A1779
<b>Test Sample Serial Number:</b>	C7CRR02BHCPX ( <i>Conducted sample #2 with RF port</i> )
<b>Test Sample IMEI:</b>	358640070098109
<b>Hardware Version:</b>	REV 1.0
<b>Firmware Version:</b>	9.44.11.27
<b>Test Utility Software:</b>	wl 1.359 RC65.0
<b>FCC ID:</b>	BCG-E3086A

### **3.2. Description of EUT**

The Equipment Under Test was a mobile phone, with GSM/GPRS/EGPRS/UMTS/LTE/TD-SCDMA and CDMA Technologies. It also supports IEEE 802.11 a/b/g/n/ac, Bluetooth®, GPS and NFC. The Rechargeable battery is not user accessible.

### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

### **3.4. Additional Information Related to Testing**

<b>Technology Tested:</b>	Bluetooth Low Energy (Digital Transmission System)				
<b>Type of Unit:</b>	Transceiver				
<b>Channel Spacing:</b>	2 MHz				
<b>Modulation:</b>	GFSK				
<b>Data Rate:</b>	1 Mbps				
<b>Power Supply Requirement(s):</b>	Nominal	3.8 VDC			
<b>Maximum Conducted Output Power:</b>	11.9 dBm				
<b>Antenna Gain:</b>	-1.8 dBi				
<b>Transmit Frequency Range:</b>	2402 MHz to 2480 MHz				
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>RF Channel</b>	<b>Channel Frequency (MHz)</b>		
	Bottom	0	2402		
	Middle	19	2440		
	Top	39	2480		

### **3.5. Support Equipment**

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

<b>Description:</b>	Apple
<b>Brand Name:</b>	Test Laptop
<b>Model Name or Number:</b>	MacBook Pro
<b>Serial Number:</b>	C2QH700QDY20

<b>Description:</b>	USB Power Adapter
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A1357
<b>Serial Number:</b>	Not Stated

## **4. Operation and Monitoring of the EUT during Testing**

### **4.1. Operating Modes**

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

- Transmitting in High power mode, *Bluetooth LE*, with a modulated carrier, maximum data length available and Pseudorandom Bit Sequence 9.

### **4.2. Configuration and Peripherals**

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

- A test laptop with a third party test application was provided by the customer and was used to place the EUT into *Bluetooth* test mode. The application was used to enable continuous transmission, set transmit power settings and change channels as required.
- The EUT was powered by a bench DC power supply whilst being connected to the test laptop via a USB diagnostic cable for all conducted tests.
- The customer supplied an RF connector cable to facilitate a conducted RF link between the EUT and a spectrum analyser through suitable attenuation. This was taken into account for path loss calculations.
- The customer supplied instructions to control the EUT in a document titled “AA1500\_BTLE\_ePA\_Sweep-V2.0.docx” dated 27-06-16 which is stored on the company server.
- The EUT was configured to transmit continuously, with a duty cycle of greater than or equal to 98 %.
- The EUT was placed in three orthogonal orientations X, Y and Z to determine the worst case orientation for radiated spurious emissions. The worst case orientation was Z.
- The worst-case radiated emission among all accessories is determined by the manufacturer to be with the headset connected. The compliance lab performed final testing only with the headset

## **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 Minimum 6 dB Bandwidth**

#### **Test Summary:**

Test Engineer:	Sandeep Bharat	Test Date:	08 June 2016
Test Sample Serial Number:	C7CRG02QH6DH		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	FCC KDB 558074 Section 8.1 Option 2

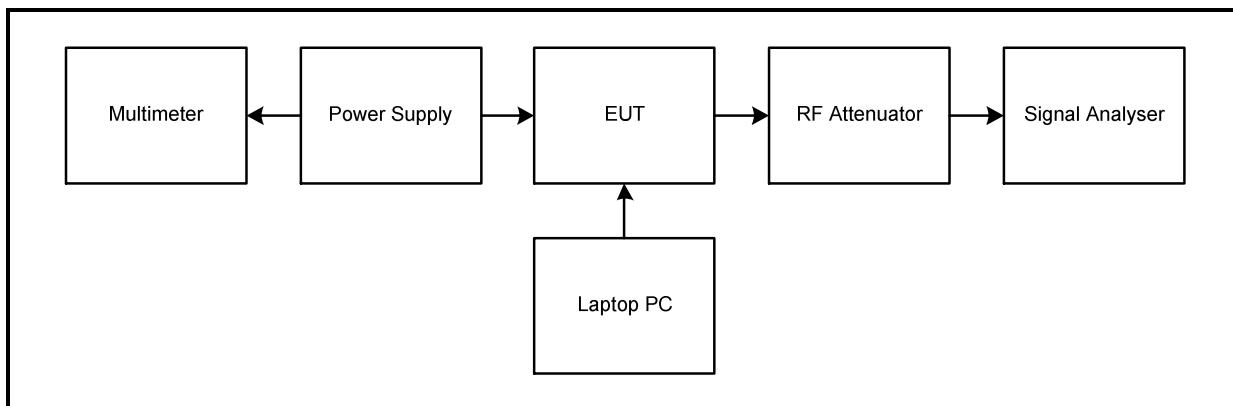
#### **Environmental Conditions:**

Temperature (°C):	25
Relative Humidity (%):	44

#### **Note(s):**

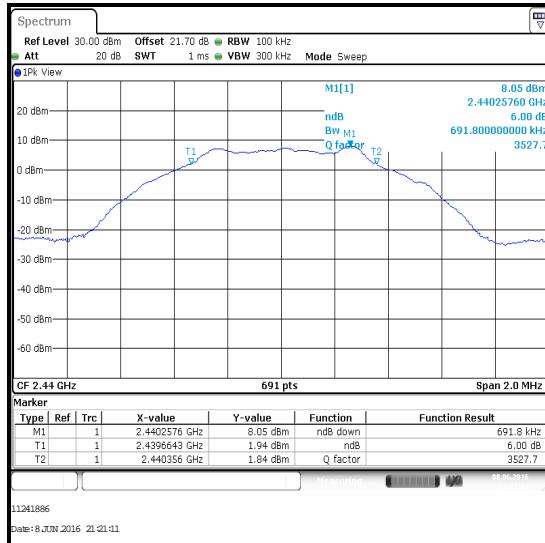
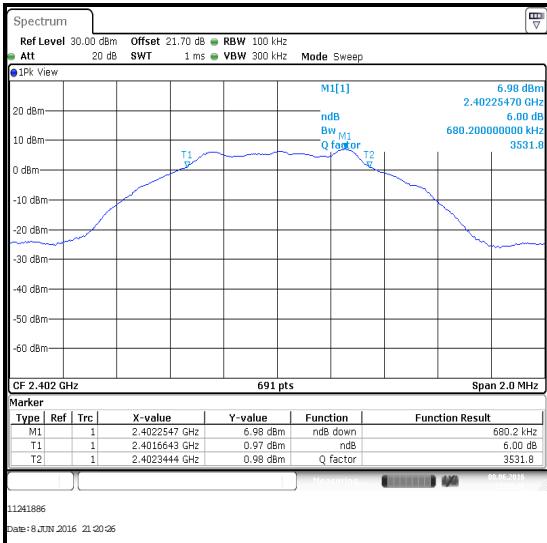
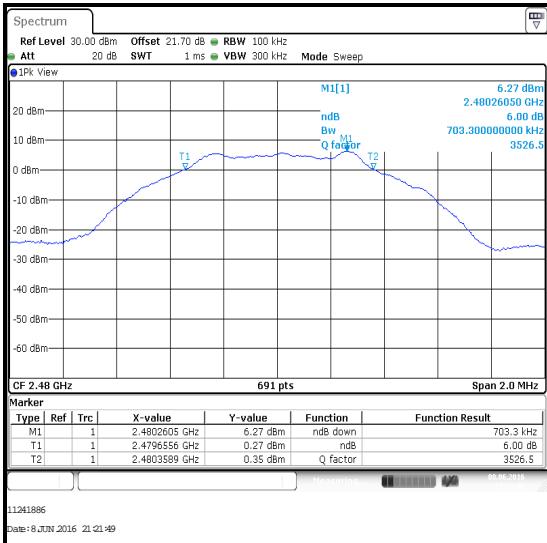
1. 6 dB DTS bandwidth tests were performed using a signal analyser in accordance with FCC KDB 558074 Section 8.1 Option 2 measurement procedure. The signal analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The DTS bandwidth was measured at 6 dB down from the peak of the signal.
2. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

#### **Test setup:**



**Transmitter Minimum 6 dB Bandwidth (continued)****Results:**

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	680.200	≥500	180.200	Complied
Middle	691.800	≥500	191.800	Complied
Top	703.300	≥500	203.300	Complied

**Bottom Channel****Top Channel****Middle Channel**

**Transmitter Minimum 6 dB Bandwidth (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2001	Thermohygrometer	Testo	608-H1	45041824	02 Apr 2017	12
M1883	Signal Analyser	Rohde & Schwarz	FSV30	103084	09 May 2017	12
A1999	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated before use	-
G0607	Signal Generator	Rohde & Schwarz	SMU200A	100943	10 May 2019	36
S0576	DC Power Supply	Thurlby Thandar	PL330QMD	066701	Calibrated before use	-
M122	Digital Multimeter	Fluke	77	64910017	21 Apr 2017	12

### **5.2.2. Transmitter Power Spectral Density**

#### **Test Summary:**

<b>Test Engineer:</b>	Sandeep Bharat	<b>Test Date:</b>	28 June 2016
<b>Test Sample Serial Number:</b>	C7CRR02BHCXPX		

<b>FCC Reference:</b>	Part 15.247(e)
<b>Test Method Used:</b>	FCC KDB 558074 Section 10.2

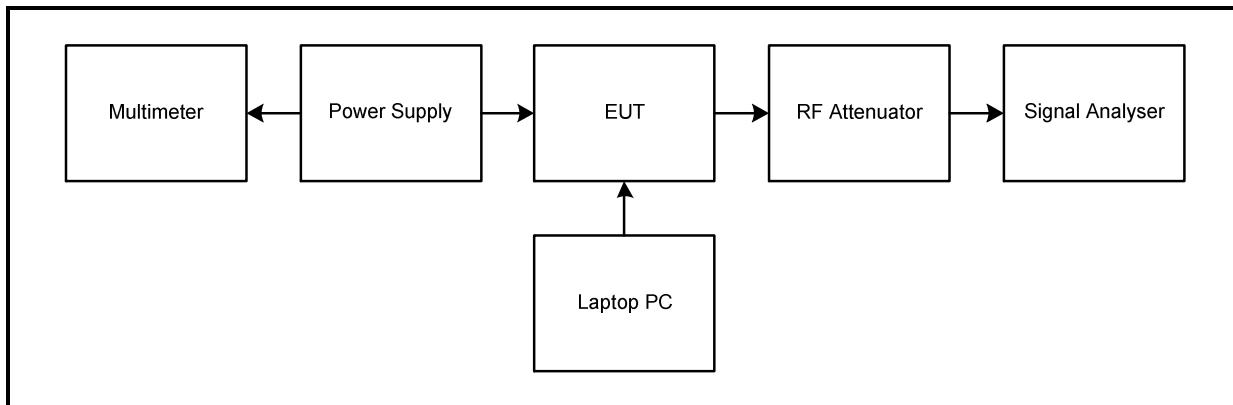
#### **Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	40

#### **Note(s):**

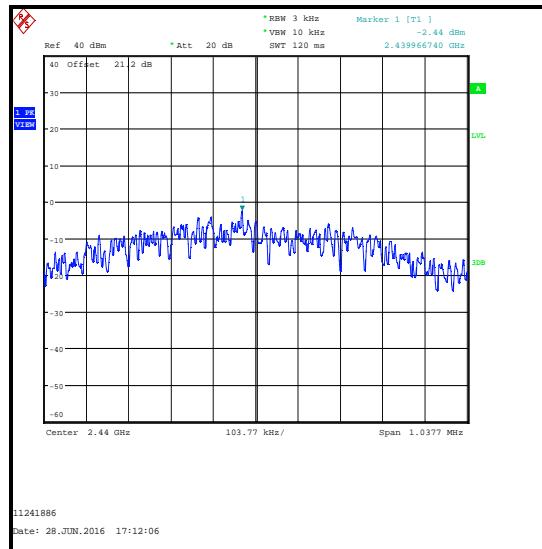
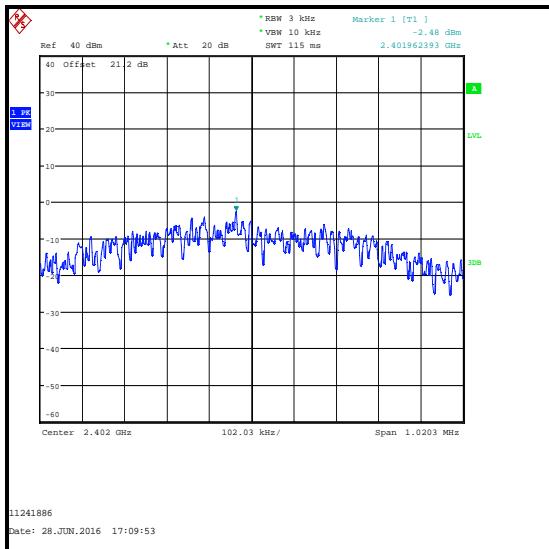
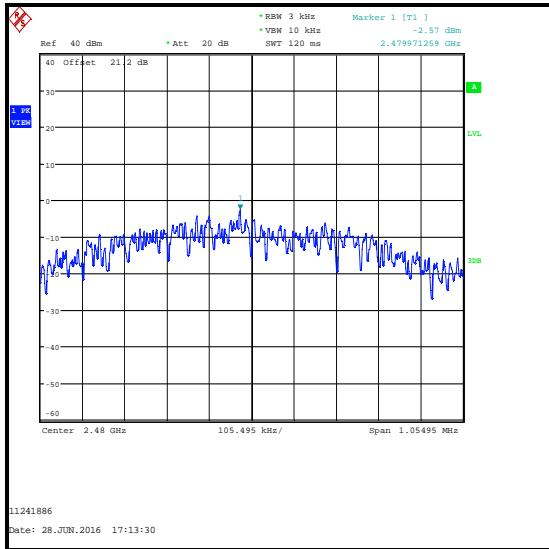
1. Transmitter Power Spectral Density tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 10.2.
2. The signal analyser resolution bandwidth was set to 3 kHz and video bandwidth of 10 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 1.5 times the measured DTS bandwidth. A marker was placed at the peak of the signal and the results recorded in the table below.
3. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.

#### **Test setup:**



**Transmitter Power Spectral Density (continued)****Results:**

Channel	Output Power (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-2.5	8.0	10.5	Complied
Middle	-2.4	8.0	10.4	Complied
Top	-2.6	8.0	10.6	Complied

**Bottom Channel****Middle Channel****Top Channel**

**Transmitter Power Spectral Density (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
S021	Power Supply Unit	Thurlby Thandar	CPX200	061034	Calibrated before use	-
M1642	Multimeter	Fluke	52II	18890119	25 Apr 2017	12
A2724	Directional Coupler	AAMCS	AAMCS-UDC-0.5G-18G-10dB-SF	000641	Calibrated before use	-
G0607	Signal Generator	Rohde & Schwarz	SMU200A	100943	10 May 2019	36
A2521	Attenuator	AtlanTecRF	AN18-20	832797#2	Calibrated before use	-
M1794	Spectrum Analyser	Rohde & Schwarz	FSU26	100027	09 Feb 2018	24

### **5.2.3. Transmitter Maximum Peak Output Power**

#### **Test Summary:**

<b>Test Engineer:</b>	Sandeep Bharat	<b>Test Date:</b>	28 June 2016
<b>Test Sample Serial Number:</b>	C7CRR02BHCPX		

<b>FCC Reference:</b>	Part 15.247(b)(3)
<b>Test Method Used:</b>	FCC KDB 558074 Section 9.1.1

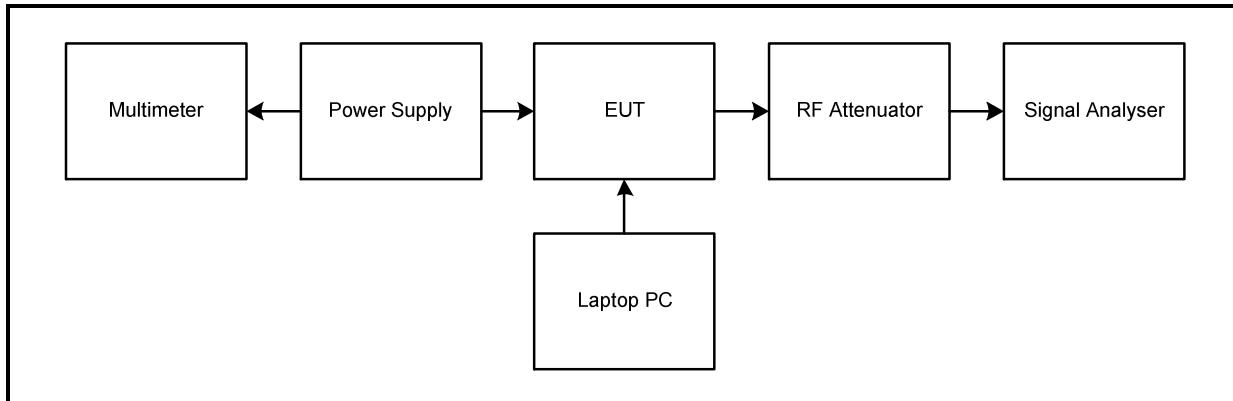
#### **Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	40

#### **Note(s):**

1. Conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 9.1.1 with the RBW > *DTS bandwidth* procedure.
2. The signal analyser resolution bandwidth was set to 1 MHz and video bandwidth of 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 5 MHz. A marker was placed at the peak of the signal and the results recorded in the table below.
3. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.
4. The conducted power was added to the declared antenna gain to obtain the EIRP.

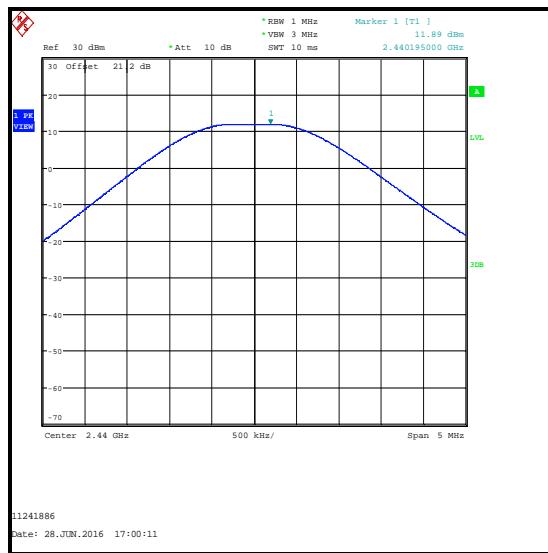
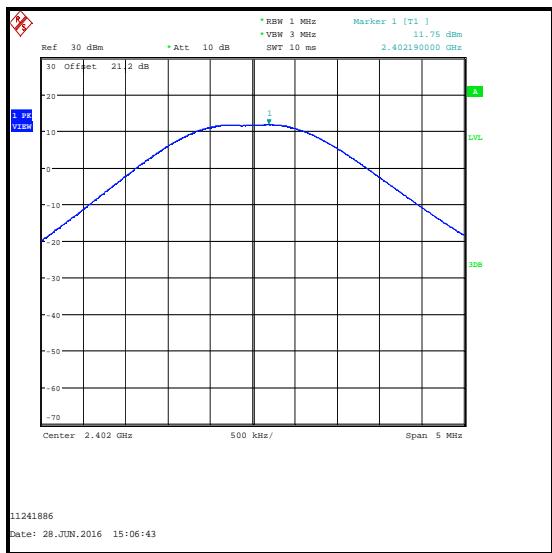
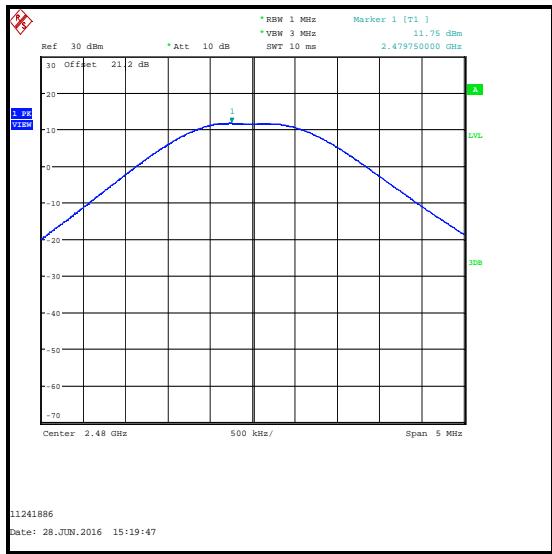
#### **Test setup:**



**Transmitter Maximum Peak Output Power (continued)****Results:**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	11.8	30.0	18.2	Complied
Middle	11.9	30.0	18.1	Complied
Top	11.8	30.0	18.2	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	11.8	-1.8	10.0	36.0	26.0	Complied
Middle	11.9	-1.8	10.1	36.0	25.9	Complied
Top	11.8	-1.8	10.0	36.0	26.0	Complied

**Transmitter Maximum Peak Output Power (continued)****Bottom Channel****Middle Channel****Top Channel**

**Transmitter Maximum Peak Output Power (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
S021	Power Supply Unit	Thurlby Thandar	CPX200	061034	Calibrated before use	-
M1642	Multimeter	Fluke	52II	18890119	25 Apr 2017	12
A2724	Directional Coupler	AAMCS	AAMCS-UDC-0.5G-18G-10dB-SF	000641	Calibrated before use	-
G0607	Signal Generator	Rohde & Schwarz	SMU200A	100943	10 May 2019	36
A2521	Attenuator	AtlanTecRF	AN18-20	832797#2	Calibrated before use	-
M1794	Spectrum Analyser	Rohde & Schwarz	FSU26	100027	09 Feb 2018	24

### **5.2.4. Transmitter Radiated Emissions**

#### **Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	09 June 2016
<b>Test Sample Serial Number:</b>	C7CRR00BHCPX		

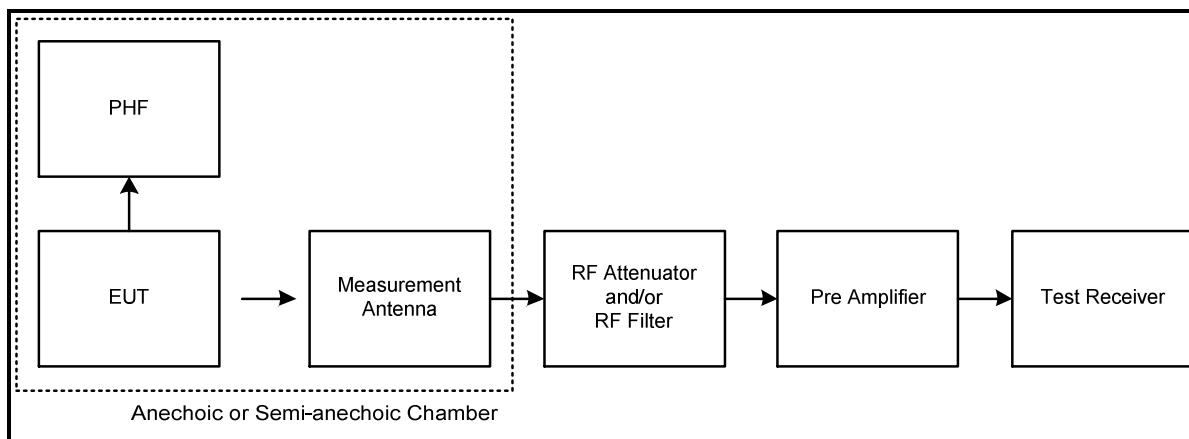
<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Test Method Used:</b>	FCC KDB 558074 Sections 11 & 12 referencing ANSI C63.10
<b>Frequency Range</b>	30 MHz to 1000 MHz

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	24 to 26
<b>Relative Humidity (%):</b>	42 to 48

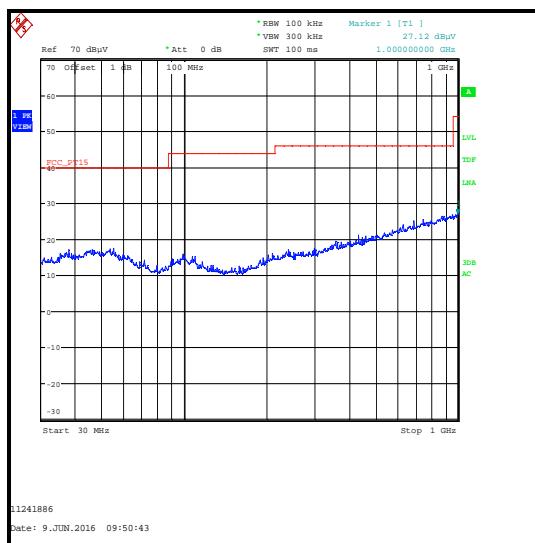
#### **Note(s):**

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. 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 middle channel only.
3. All emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system. Therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
6. Final measurements were performed on the marker frequencies and the results entered into the table below. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span big enough to see the whole emission.

**Transmitter Radiated Emissions (continued)****Test setup for radiated measurements:**

**Transmitter Radiated Emissions (continued)****Results: Middle Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1000.00	Horizontal	27.12	54.00	26.88	Complied



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

**Transmitter Radiated Emissions (continued)****Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Dates:</b>	07 June 2016 & 08 June 2016
<b>Test Sample Serial Number:</b>	C7CRR00BHCpx		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Test Method Used:</b>	FCC KDB 558074 Sections 11 & 12 referencing ANSI C63.10 Sections 6.3 and 6.6
<b>Frequency Range</b>	1 GHz to 25 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	24 to 26
<b>Relative Humidity (%):</b>	42 to 48

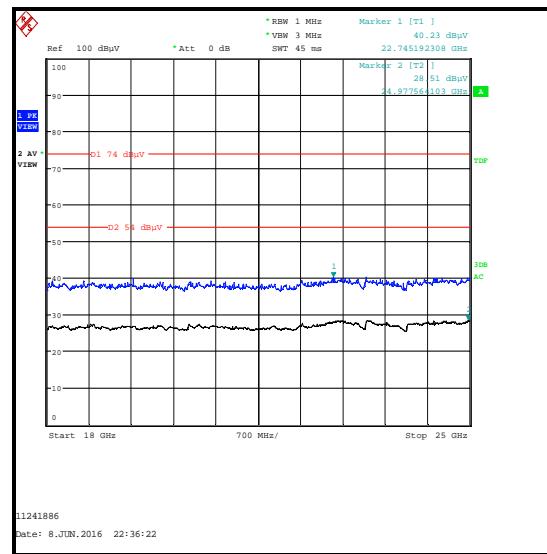
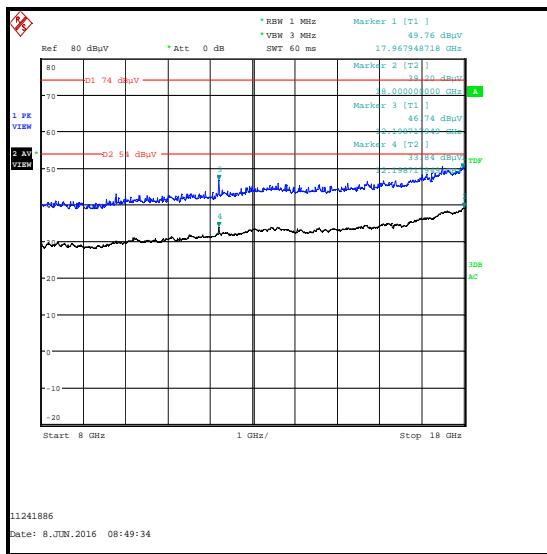
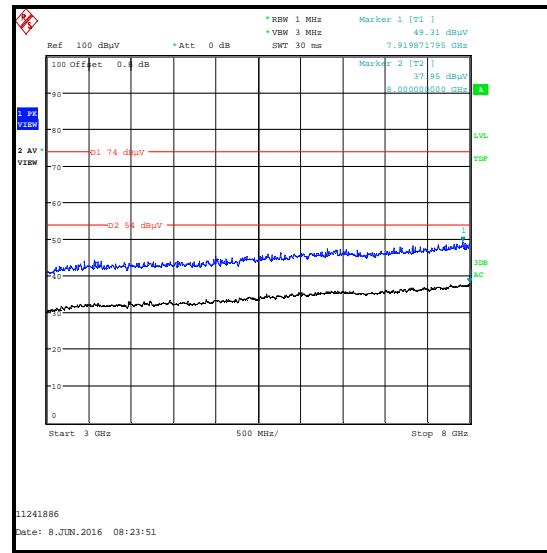
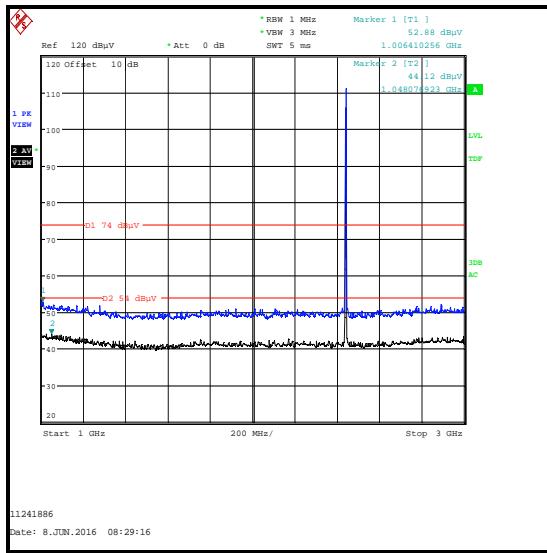
**Note(s):**

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All 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.
3. The emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental.
4. Middle channel results are recorded in this report and are representative of bottom and top channel results which are held on the UL IT server and available for inspection on request.
5. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable.
6. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.

**Results:**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
18000.000	Vertical	51.5	54.0	2.5	Complied

## Transmitter Radiated Emissions (continued)



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

**Transmitter Radiated Emissions (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	JM Handelpunkt	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	19 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B 653	BBHA 9120 B 653	07 Apr 2017	12
A2863	Pre Amplifier	Agilent	8449B	3008A02100	07 Jan 2017	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	06 May 2017	12
A2891	Pre Amplifier	Schwarzbeck	BBV 9718	9718-306	07 Apr 2017	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	07 Apr 2017	12
A2893	Pre Amplifier	Schwarzbeck	BBV 9721	9721-021	07 Apr 2017	12
S0582	Power Supply	Schwarzbeck	PS9721	00005	Calibrated before use	-
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	19 May 2017	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	19 May 2017	12
M1818	Multimeter	Fluke	79 Series II	71811580	27 Apr 2017	12

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

<b>Test Engineer:</b>	Sandeep Bharat	<b>Test Dates:</b>	05 July 2016 to 06 July 2016
<b>Test Sample Serial Number:</b>	C7CRR00BHCPX		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Test Method Used:</b>	ANSI C63.10 Section 6.10.4, 6.10.5 & KDB 558074 Sections 11 & 13

**Environmental Conditions:**

<b>Temperature (°C):</b>	23 to 25
<b>Relative Humidity (%):</b>	42 to 50

**Note(s):**

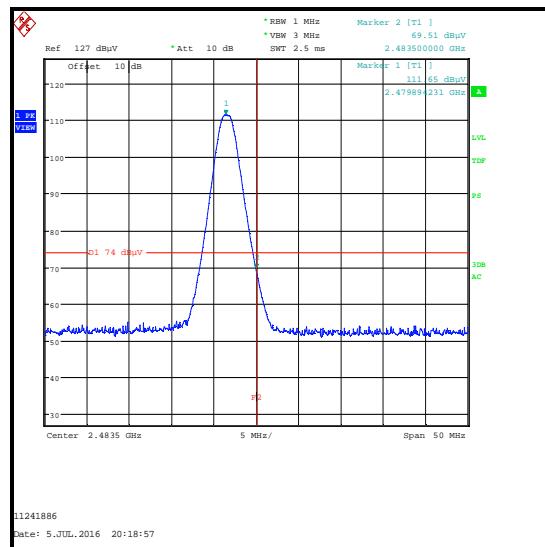
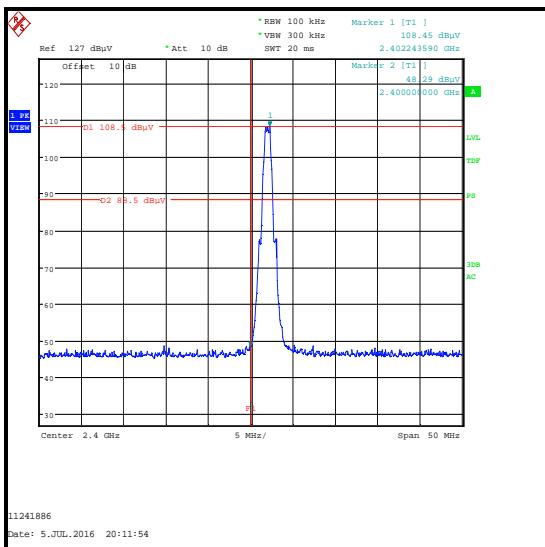
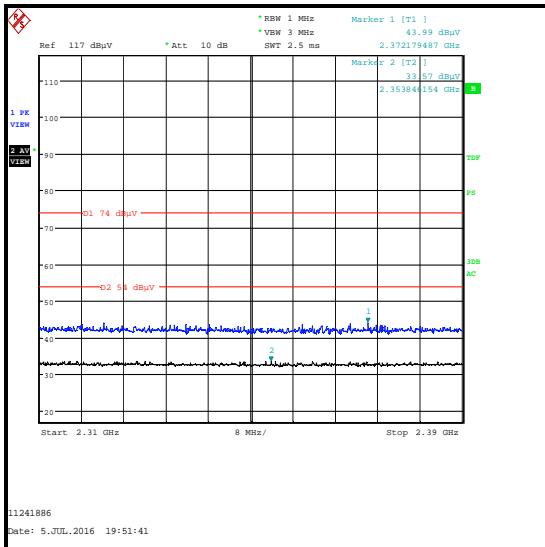
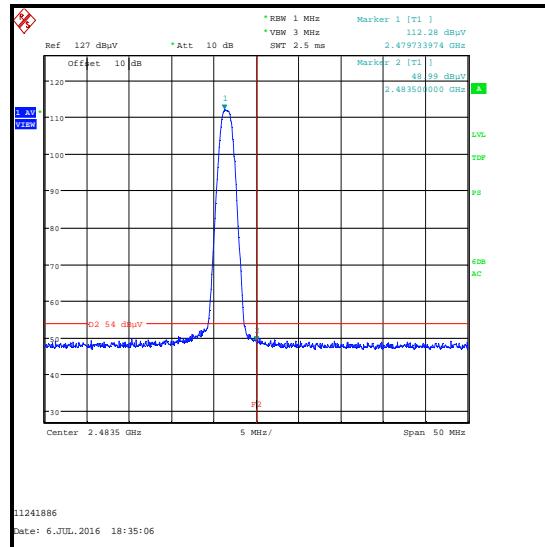
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The maximum peak conducted output power was previously measured. In accordance with FCC KDB 558074 Section 11.1(a), the lower band edge measurement was performed with a peak detector and the -20 dBc limit applied.
3. As the lower band edge falls within a non-restricted band, only peak measurements are required. In accordance with FCC KDB 558074 Section 11.1, the test method in Section 11.3 was followed: the test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker and corresponding reference level line were placed on the peak of the carrier. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent non-restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
4. As the upper band edge falls within a restricted band both peak and average measurements were recorded by placing a marker at the edge of the band. The test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. Peak and Average detectors were used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
5. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with their respective detectors. Markers were placed on the highest point on each trace.
6. \* -20 dBc limit.

**Transmitter Band Edge Radiated Emissions (continued)****Results: Peak**

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	48.3	88.5*	40.2	Complied
2483.5	69.5	74.0	4.5	Complied

**Results: Average**

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	49.0	54.0	5.0	Complied

**Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****2310 MHz to 2390 MHz Restricted Band Plot****Upper Band Edge Average Measurement**

**Transmitter Band Edge Radiated Emissions (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	21 Mar 2017	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	26 Apr 2017	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 measured (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
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±3.92 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 26.5 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.

## **7. Report Revision History**

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Updates as requested by the TCB
3.0	-	-	Updates to section 4.2

--- END OF REPORT ---