



# TEST REPORT

**Test Report No. : UL-RPT-RP10407443JD09E V2.0**

**Manufacturer** : Apple Inc.  
**Model No.** : A1600  
**FCC ID** : BCGA1600  
**Technology** : UMTS850 Band V  
**Test Standard(s)** : FCC Part 22

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 2.0 supersedes all previous versions.

**Date of Issue:** 15 September 2014

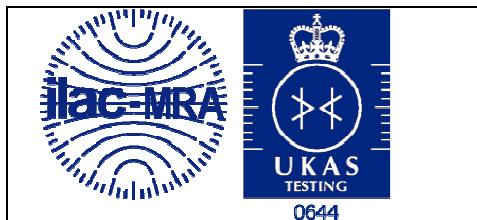
**Checked by:**

Sarah Williams  
Engineer, Radio Laboratory

**Issued by :**

pp

John Newell  
Quality Manager,  
UL VS LTD



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

---

**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	5
2.4. Deviations from the Test Specification	5
<b>3. Equipment Under Test (EUT) .....</b>	<b>6</b>
3.1. Identification of Equipment Under Test (EUT)	6
3.2. Description of EUT	6
3.3. Modifications Incorporated in the EUT	6
3.4. Additional Information Related to Testing	7
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 Effective Radiated Power (ERP)	11
5.2.2. Transmitter Occupied Bandwidth	14
5.2.3. Transmitter Out of Band Radiated Emissions	25
5.2.4. Transmitter Band Edge Radiated Emissions	28
5.2.5. Transmitter Frequency Stability (Temperature Variation)	39
5.2.6. Transmitter Frequency Stability (Voltage Variation)	41
<b>6. Measurement Uncertainty .....</b>	<b>42</b>
<b>7. Report Revision History .....</b>	<b>43</b>

## **1. Customer Information**

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

## 2. Summary of Testing

### 2.1. General Information

<b>Specification Reference:</b>	47CFR22
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 22 Subpart H (Public Mobile Services)
<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>	09 July 2014 to 23 July 2014

### 2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 22.913(a)(2)	Transmitter Effective Radiated Power (ERP)	✓
Part 2.1049	Transmitter Occupied Bandwidth	✓
Part 2.1053/22.917	Transmitter Out of Band Radiated Emissions	✓
Part 2.1053/22.917	Transmitter Band Edge Radiated Emissions	✓
Part 2.1055/22.355	Transmitter Frequency Stability (Temperature and Voltage Variation)	✓

**Key to Results**

✓ = Complied    ✘ = Did not comply

### 2.3. Methods and Procedures

<b>Reference:</b>	ANSI/TIA-603-C-2004
<b>Title:</b>	Land Mobile Communications Equipment, Measurements and performance Standards
<b>Reference:</b>	FCC KDB 971168 D01 v02r01, 7 June 2013
<b>Title:</b>	Measurement Guidance for Certification of Licensed Digital Transmitters

### 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>	A1600
<b>Test Sample IMEI:</b>	352025060238798 ( <i>Radiated sample</i> )
<b>Hardware Version Number:</b>	REV1.0
<b>Software Version Number:</b>	iOS 12A314 BB: 3.08.08
<b>FCC ID:</b>	BCGA1600

<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A1600
<b>Test Sample IMEI:</b>	352025060274728 ( <i>Conducted sample #1</i> )
<b>Hardware Version Number:</b>	REV1.0
<b>Software Version Number:</b>	iOS 12A314 BB: 3.08.08
<b>FCC ID:</b>	BCGA1600

<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	A1600
<b>Test Sample IMEI:</b>	352025060274538 ( <i>Conducted sample #2</i> )
<b>Hardware Version Number:</b>	REV1.0
<b>Software Version Number:</b>	iOS 12A314 BB: 3.08.08
<b>FCC ID:</b>	BCGA1600

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

The Equipment Under Test was a tablet with GSM/GPRS/EGPRS/UMTS/LTE and CDMA technologies. It also supports IEEE 802.11a/b/g/n (MIMO 2x2) and *Bluetooth*®. 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>	UMTS850		
<b>Type of Radio Device:</b>	Transceiver		
<b>Mode:</b>	UMTS FDD V		
<b>Modulation Type:</b>	QPSK / 8PSK		
<b>Channel Spacing:</b>	5 MHz		
<b>Power Supply Requirement(s):</b>	Nominal	3.8 V	
	Minimum	3.4 V	
	Maximum	4.2 V	
<b>Maximum Output Power (ERP):</b>	RMC (12.2 kbps)	22.1 dBm	
	HSDPA Sub-Test 2	22.5 dBm	
	HSUPA Sub-Test 5	23.1 dBm	
<b>Transmit Frequency Range:</b>	824 to 849 MHz		
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	4132	826.4
	Middle	4183	836.6
	Top	4233	846.6

### **3.5. Support Equipment**

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

<b>Brand Name:</b>	Dell
<b>Description:</b>	Laptop computer
<b>Model Name or Number:</b>	Inspiron
<b>Serial Number:</b>	Asset RFI00788

<b>Brand Name:</b>	Not stated
<b>Description:</b>	USB Diagnostic cable
<b>Model Name or Number:</b>	Not stated
<b>Serial Number:</b>	Not stated

<b>Brand Name:</b>	Apple
<b>Description:</b>	USB Cable
<b>Model Name or Number:</b>	A1480
<b>Serial Number:</b>	Not stated

<b>Brand Name:</b>	Apple
<b>Description:</b>	USB Charger
<b>Model Name or Number:</b>	A1399
<b>Serial Number:</b>	Not stated

<b>Brand Name:</b>	Apple
<b>Description:</b>	PHF
<b>Model Name or Number:</b>	Apple Ear Plugs
<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):

- Constantly transmitting at full power on bottom, middle and top channels as required.
- Occupied bandwidth, ERP and band edge tests were performed with the EUT in RMC (12.2 kbps), HSDPA (Sub-tests 1 to 4) or HSUPA (Sub-tests 1 to 5) modes.
- Transmitter radiated spurious emissions were checked in all modes during pre-scans. RMC / 12.2 kbps was found to be the worst case and all final measurements were performed with the EUT in this mode.

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

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

- Connected to a Rohde & Schwarz CMW 500 Universal Radio Communications Tester, operating in UMTS Band V mode.
- Transmitter radiated spurious emission tests were performed with the EUT connected to a PHF and USB charger. The charger was connected to a 120 VAC 50 Hz supply. The EUT was placed in three orthogonal orientations X, Y and Z to determine the worst case orientation for radiated spurious emissions and all final measurements were performed in this orientation.
- Testing for frequency stability and measurements at temperature and voltage extremes was performed using a conducted sample supplied by the customer. Short 4-wire DC flying leads were connected internally to the device in place of the battery, and exited through a hole in the casing. These leads were then extended to a DC power supply for testing purposes.
- For conducted cellular measurements, the RF conducted port was created by removing a micro connector from the pcb antenna and extending it with a short flexible microstrip supplied by the customer. This microstrip exited the device through a hole in the casing and was terminated in a proprietary micro-coax to SMA adaptor.
- The conducted sample with IMEI 352025060274538 was used frequency stability.
- The conducted sample with IMEI 352025060274728 was used for conducted power and occupied bandwidth measurements.
- The radiated sample with IMEI 352025060238798 was used for all other measurements.

## **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 Effective Radiated Power (ERP)

#### Test Summary:

Test Engineer:	David Doyle	Test Date:	21 July 2014
Test Sample IMEI:	352025060274728		

FCC Reference:	Part 22.913(a)(2)
Test Method Used:	As detailed in KDB 971168 Section 5.1.1 and 5.2.1

#### Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	51

#### Note(s):

1. All modes were compared on each channel and the highest power recorded was subtracted from the limit to show the margin.
2. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the signal analyser to compensate for the loss of the attenuator and RF cable.
3. The customer stated a maximum antenna gain of -2.95 dBi. As the limit is an ERP limit, the gain in dBi has been converted to dBd. The dBd was calculated as:  

$$-2.95 \text{ dBi} - 2.15 \text{ dB} = -5.1 \text{ dBd.}$$
4. The antenna gain was added to the conducted output power to obtain the ERP.

#### Results: Peak ERP / HSDPA and RMC

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Limit (dBm)	Margin (dB)	Result				
850	4132	21.2	22.5	22.3	22.3	22.1	38.5	16.0	Complied
	4183	21.1	22.5	22.2	22.3	22.0	38.5	16.0	Complied
	4233	21.2	22.4	22.3	22.3	22.1	38.5	16.1	Complied
βc		2	11	15	15				
βd		15	15	8	4				
ΔACK, ΔNACK, ΔCQI		8	8	8	8				

**Transmitter Effective Radiated Power (ERP) (continued)****Results: RMS ERP / HSDPA and RMC**

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Limit (dBm)	Margin (dB)	Result				
850	4132	15.9	15.9	15.5	15.4	17.0	38.5	21.5	Complied
	4183	16.0	16.0	15.4	15.5	17.0	38.5	21.5	Complied
	4233	15.8	15.8	15.4	15.4	16.9	38.5	21.6	Complied
$\beta_c$		2	11	15	15				
$\beta_d$		15	15	8	4				
$\Delta$ ACK, $\Delta$ NACK, $\Delta$ CQI		8	8	8	8				

**Results: Peak ERP / HSUPA**

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Limit (dBm)	Margin (dB)	Result				
850	4132	22.0	21.6	22.7	21.3	22.9	38.5	15.6	Complied
	4183	22.1	21.7	22.8	21.4	23.1	38.5	15.4	Complied
	4233	22.1	21.7	22.8	21.4	22.9	38.5	15.6	Complied
$\beta_c$		10	6	15	2	15			
$\beta_d$		15	15	9	15	1			
$\Delta$ ACK, $\Delta$ NACK, $\Delta$ CQI		8	8	8	8	8			

**Results: RMS ERP / HSUPA**

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Limit (dBm)	Margin (dB)	Result				
850	4132	15.4	15.4	16.0	15.9	15.9	38.5	22.5	Complied
	4183	15.5	15.5	16.1	15.9	16.1	38.5	22.4	Complied
	4233	15.4	15.5	15.8	15.8	15.9	38.5	22.6	Complied
$\beta_c$		10	6	15	2	15			
$\beta_d$		15	15	9	15	1			
$\Delta$ ACK, $\Delta$ NACK, $\Delta$ CQI		8	8	8	8	8			

**Transmitter Effective Radiated Power (ERP) (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
A2504	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501839	Calibrated before use	-
A2526	Attenuator	AtlanTecRF	AN18W5-20	832828#1	Calibrated before use	-
M1873	Signal Analyser	Rohde & Schwarz	FSV30	103074	15 May 2015	12

**5.2.2. Transmitter Occupied Bandwidth****Test Summary:**

<b>Test Engineer:</b>	David Doyle	<b>Test Dates:</b>	21 July 2014 & 23 July 2014
<b>Test Sample IMEI:</b>	352025060274728		

<b>FCC Reference:</b>	Part 2.1049
<b>Test Method Used:</b>	As detailed in KBD 971168 Section 4.2

**Environmental Conditions:**

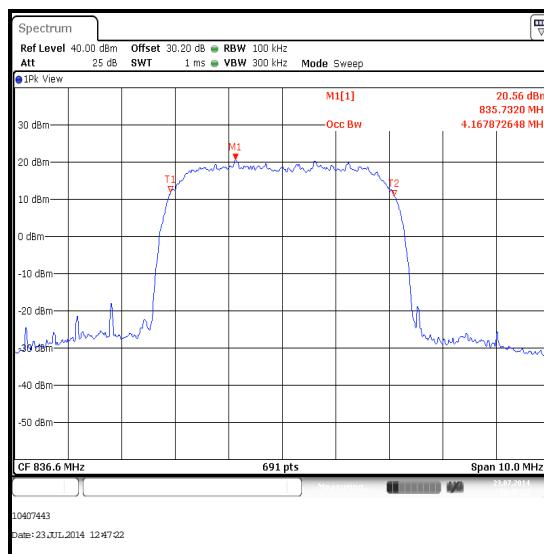
<b>Temperature (°C):</b>	21 to 23
<b>Relative Humidity (%):</b>	50 to 55

**Note(s):**

1. Occupied bandwidth (99% bandwidth) was measured using a signal analyser occupied bandwidth function.
2. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

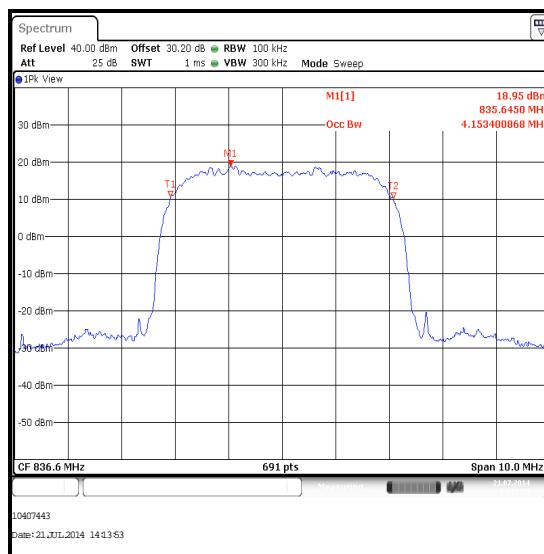
**Transmitter Occupied Bandwidth (continued)****Results: RMC / 12.2 kbps**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873

**Middle Channel**

**Transmitter Occupied Bandwidth (continued)****Results: HSDPA Sub-Test 1**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4153.401

**Middle Channel**

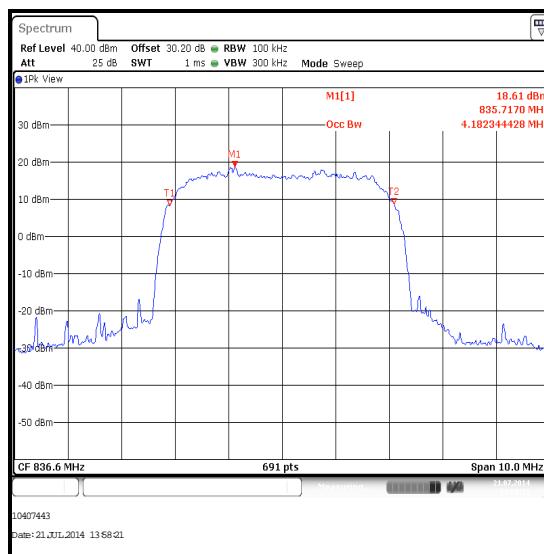
**Transmitter Occupied Bandwidth (continued)****Results: HSDPA Sub-Test 2**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4182.344

**Middle Channel**

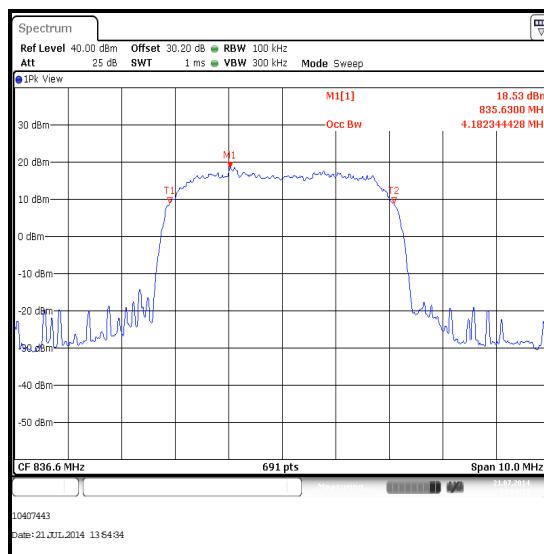
**Transmitter Occupied Bandwidth (continued)****Results: HSDPA Sub-Test 3**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4182.344

**Middle Channel**

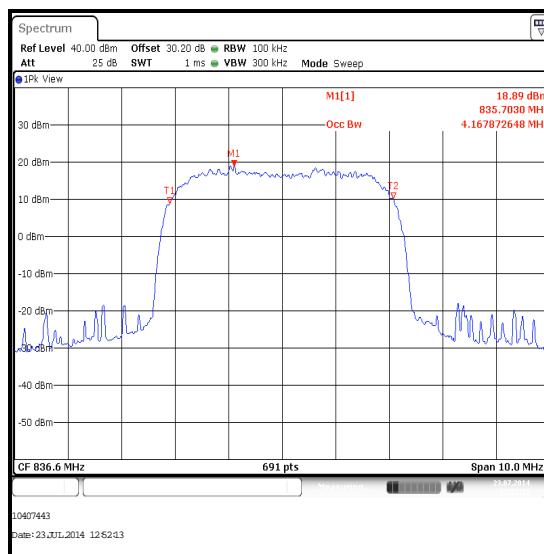
**Transmitter Occupied Bandwidth (continued)****Results: HSDPA Sub-Test 4**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4182.344

**Middle Channel**

**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 1**

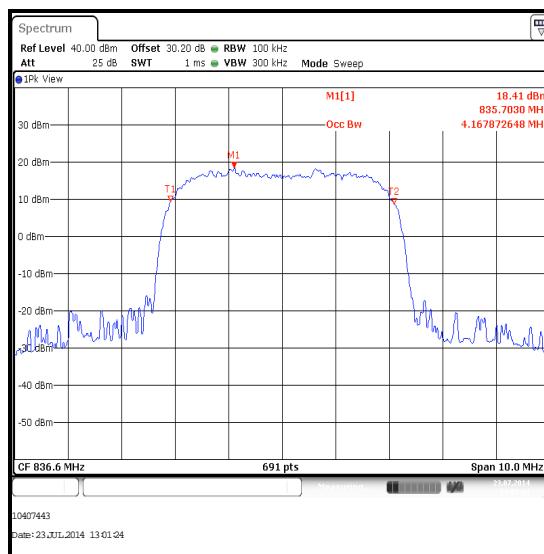
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873

**Middle Channel**

### **Transmitter Occupied Bandwidth (continued)**

## Results: HSUPA Sub-Test 2

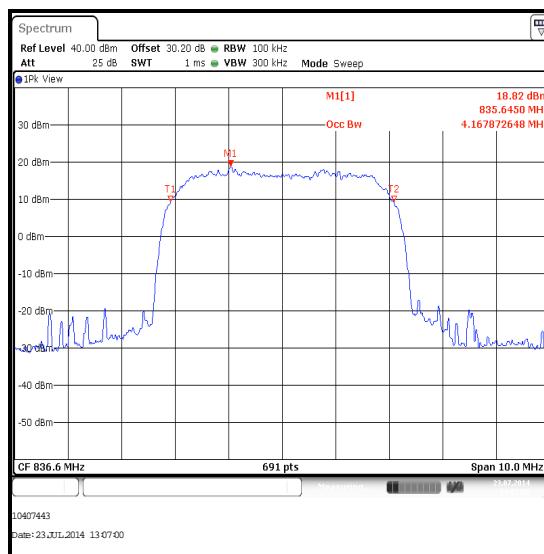
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873



## Middle Channel

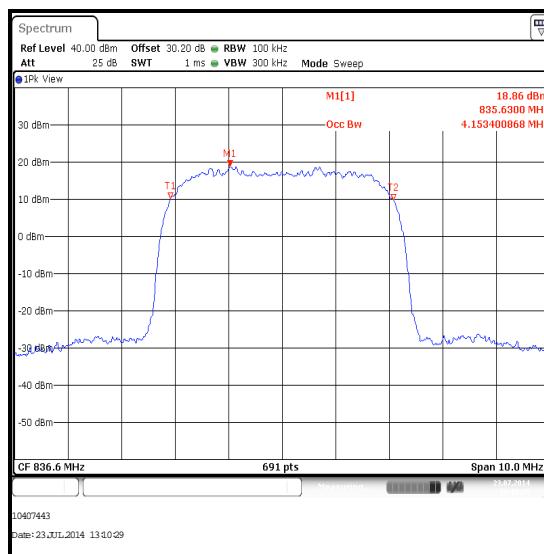
**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 3**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873

**Middle Channel**

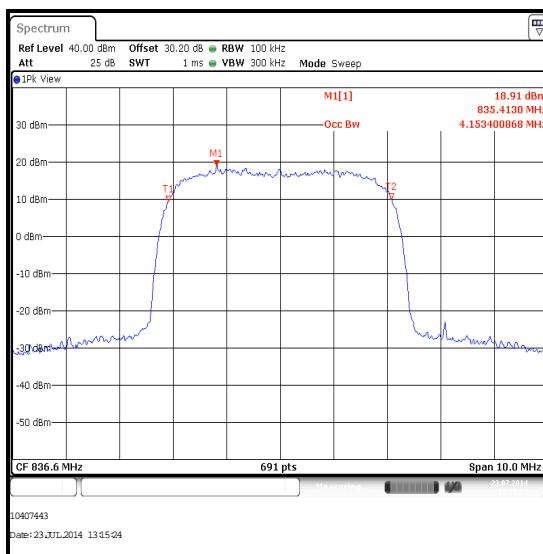
**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 4**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4153.401

**Middle Channel**

**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 5**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4153.401

**Middle Channel****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
A2504	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501839	Calibrated before use	-
A2526	Attenuator	AtlanTecRF	AN18W5-20	832828#1	Calibrated before use	-
M1873	Signal Analyser	Rohde & Schwarz	FSV30	103074	15 May 2015	12

### **5.2.3. Transmitter Out of Band Radiated Emissions**

#### **Test Summary:**

<b>Test Engineers:</b>	David Doyle & Georgios Vrezas	<b>Test Dates:</b>	21 July 2014 & 23 July 2014
<b>Test Sample IMEI:</b>	352025060238798		

<b>FCC Reference:</b>	Parts 2.1053 & 22.917
<b>Test Method Used:</b>	As detailed in KDB 971168 Section 6.1 referencing FCC Part 2.1053
<b>Frequency Range:</b>	30 MHz to 9 GHz
<b>Configuration:</b>	RMC / 12.2 kbps

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	22 to 25
<b>Relative Humidity (%):</b>	28 to 44

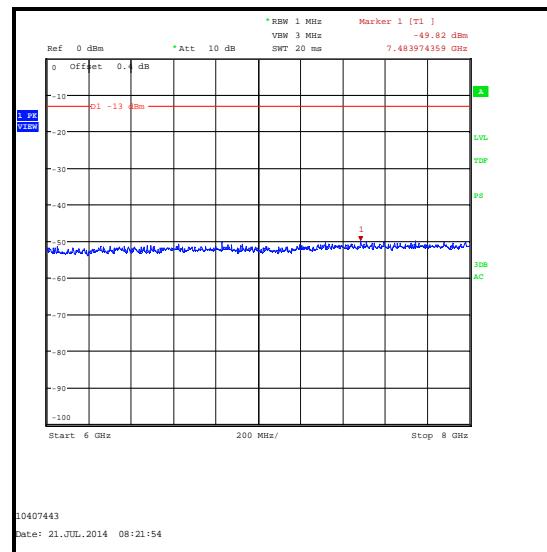
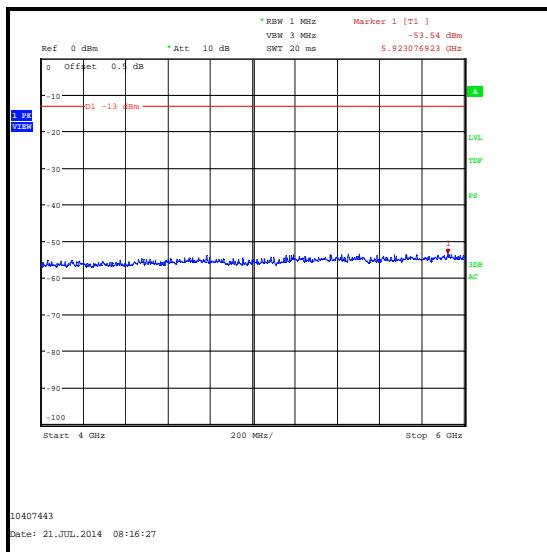
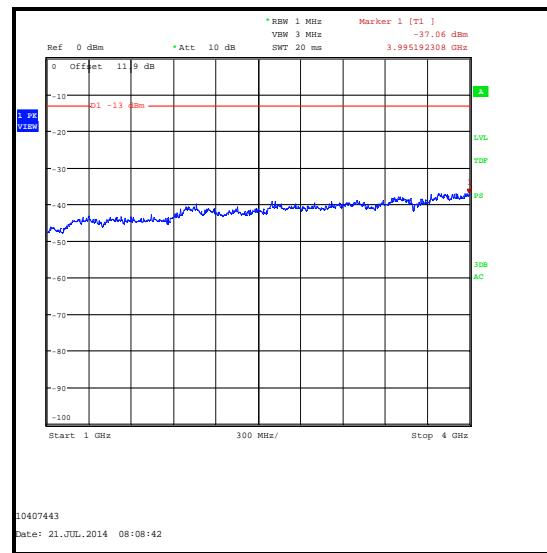
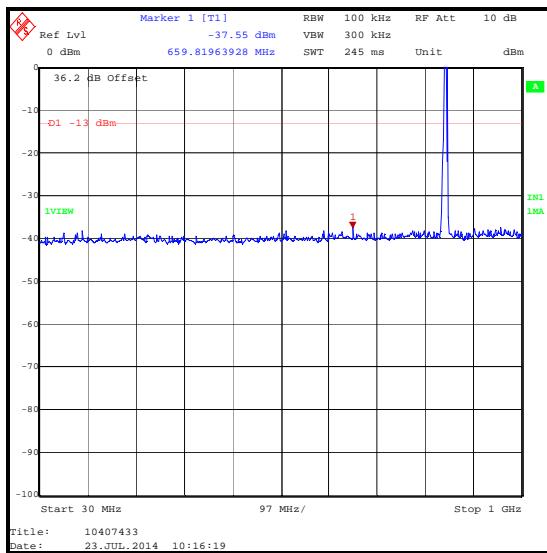
#### **Note(s):**

1. The uplink traffic channel is shown on the 30 MHz to 1 GHz plot.
2. No spurious emissions were detected above the noise floor of the measuring receiver; the highest peak noise floor reading of the measuring receiver was recorded.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) 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.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) 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. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) 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.

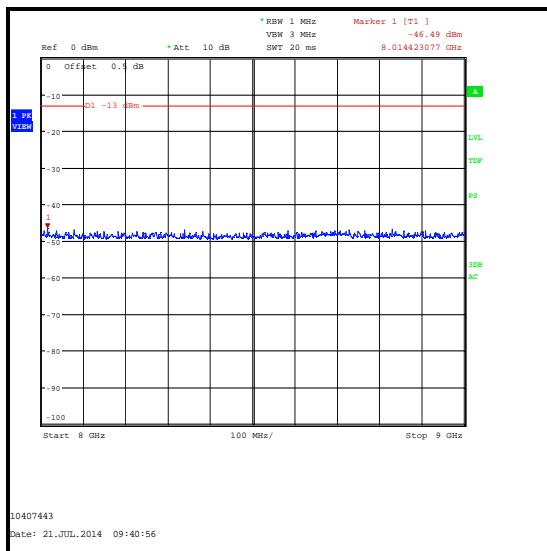
#### **Results: RMC / 12.2 kbps - Top Channel**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
3995.192	-37.1	-13.0	24.1	Complied

### Transmitter Out of Band Radiated Emissions (continued)



### Transmitter Out of Band Radiated Emissions (continued)



### Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
G0543	Amplifier	Sonoma	310N	230801	19 Aug 2014	3
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
A1834	Attenuator	Hewlett Packard	8491B	10444	15 Nov 2014	12
A2142	Attenuator	AtlanTechRF	AN18-20	081120-23	25 Apr 2015	12
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12
A1974	High Pass Filter	AtlanTechRF	AFH - 01000	090000283	12 Apr 2015	12
A1975	High Pass Filter	AtlanTechRF	AFH - 03000	090424010	12 Apr 2015	12
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12
A254	Antenna	Flann Microwave	14240-20	139	14 Nov 2014	12
A255	Antenna	Flann Microwave	16240-20	519	14 Nov 2014	12

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

Test Engineer:	David Doyle	Test Date:	21 July 2014
Test Sample IMEI:	352025060238798		

FCC Reference:	Parts 2.1053 & 22.917
Test Method Used:	As detailed in KDB 971168 Section 6.1 referencing FCC Part 22.917

**Environmental Conditions:**

Temperature (°C):	22
Relative Humidity (%):	44

**Note(s):**

1. Measurements were performed with the EUT transmitting in all operating modes.
2. Measurements were performed in a fully anechoic chamber (Asset Number K0002) 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. The measurement antenna was placed at a fixed height of 1.5 metres above the test chamber floor in line with the EUT.
3. In the first 1.0 MHz immediately outside and adjacent to the operating band, the test receiver resolution bandwidth was set to 50 kHz (>1% of 4.7 MHz, the widest 26 dB emission bandwidth) and video bandwidth 50 kHz ( $\geq$  the resolution bandwidth).

**Transmitter Band Edge Radiated Emissions (continued)****Results: RMC / 12.2 kbps**

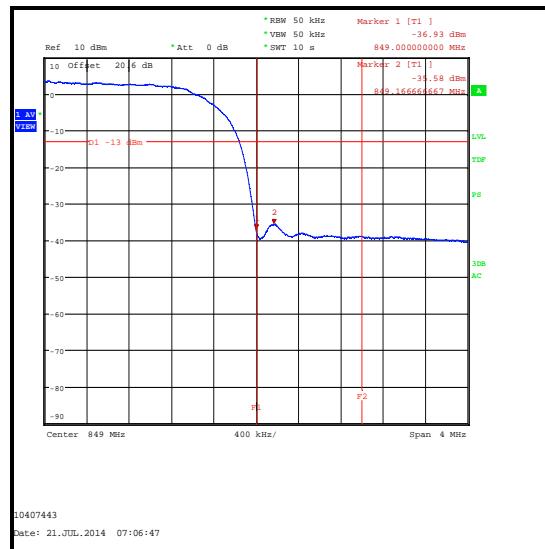
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.968	-34.1	-13.0	21.1	Complied
824	-35.0	-13.0	22.0	Complied
849	-33.6	-13.0	20.6	Complied
849.167	-32.6	-13.0	19.6	Complied



### Transmitter Band Edge Radiated Emissions (continued)

## Results: HSDPA Sub-Test 1

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.962	-34.9	-13.0	21.9	Complied
824	-36.2	-13.0	23.2	Complied
849	-36.9	-13.0	23.9	Complied
849.167	-35.6	-13.0	22.6	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 2**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.968	-35.1	-13.0	22.1	Complied
824	-35.5	-13.0	22.5	Complied
849	-32.4	-13.0	19.4	Complied
849.032	-32.1	-13.0	19.1	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 3**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.840	-34.1	-13.0	21.1	Complied
824	-35.4	-13.0	22.4	Complied
849	-32.6	-13.0	19.6	Complied
849.032	-32.1	-13.0	19.1	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 4**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.833	-33.7	-13.0	20.7	Complied
824	-35.5	-13.0	22.5	Complied
849	-32.4	-13.0	19.4	Complied
849.045	-31.8	-13.0	18.8	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 1**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.968	-35.5	-13.0	22.5	Complied
824	-36.0	-13.0	23.0	Complied
849	-34.1	-13.0	21.1	Complied
849.026	-33.8	-13.0	20.8	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 2**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.962	-35.3	-13.0	22.3	Complied
824	-36.4	-13.0	23.4	Complied
849	-36.2	-13.0	23.2	Complied
849.147	-35.3	-13.0	22.3	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 3**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.833	-33.9	-13.0	20.9	Complied
824	-35.1	-13.0	22.1	Complied
849	-31.0	-13.0	18.0	Complied
849.038	-30.3	-13.0	17.3	Complied



### Transmitter Band Edge Radiated Emissions (continued)

## **Results: HSUPA Sub-Test 4**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.968	-35.0	-13.0	22.0	Complied
824	-36.3	-13.0	23.3	Complied
849	-36.6	-13.0	23.6	Complied
849.154	-35.4	-13.0	22.4	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 5**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.968	-35.5	-13.0	22.5	Complied
824	-36.0	-13.0	23.0	Complied
849	-34.2	-13.0	21.2	Complied

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1393	Attenuator	Huber & Suhner	6820.17.B	757456	02 May 2015	12
A288	Antenna	Chase	CBL6111A	1589	20 Aug 2014	12

### **5.2.5. Transmitter Frequency Stability (Temperature Variation)**

#### **Test Summary:**

<b>Test Engineer:</b>	Keith Tucker	<b>Test Dates:</b>	09 July 2014 & 10 July 2014
<b>Test Sample IMEI:</b>	352025060274538		

<b>FCC Reference:</b>	Parts 2.1055 & 22.355
<b>Test Method Used:</b>	As detailed in KDB 971168 Section 9.0 referencing ANSI TIA-603-C-2004 Section 2.2.2 and FCC Part 2.1055
<b>Test Mode:</b>	RMC

#### **Environmental Conditions:**

<b>Ambient Temperature (°C):</b>	22 to 23
<b>Ambient Relative Humidity (%):</b>	38 to 49

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

1. Flying leads were connected internally to the EUT in place of the battery. These leads were extended and connected to a bench power supply.
2. Frequency error was measured using a calibrated Rohde & Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde & Schwarz application notes. The EUT was connected by suitable RF cables to the CMW 500. A bi-directional communications link was established between the EUT and CMW 500. The frequency meter value was recorded.
3. Temperature was monitored throughout the test with a calibrated digital thermometer.

#### **Results: Middle Channel (836.6 MHz)**

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	836.600003	3	0.0036	2.5	2.4964	Complied
-20	836.599996	4	0.0048	2.5	2.4952	Complied
-10	836.600003	3	0.0036	2.5	2.4964	Complied
0	836.599996	4	0.0048	2.5	2.4952	Complied
10	836.600004	4	0.0048	2.5	2.4952	Complied
20	836.600003	3	0.0036	2.5	2.4964	Complied
30	836.599997	3	0.0036	2.5	2.4964	Complied
40	836.600003	3	0.0036	2.5	2.4964	Complied
50	836.600003	3	0.0036	2.5	2.4964	Complied

**Transmitter Frequency Stability (Temperature Variation) (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1658	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
M1870	Wideband Radio Comms Tester	Rohde & Schwarz	CMW500	145919	05 May 2015	12
G088	Dual DC power supply	TTi	CPX200	100700	Calibrated before use	-
M1251	Multimeter	Fluke	175	89170179	19 May 2015	12
M1643	Thermometer	Fluke	52II	18890136	07 Apr 2015	12
E013	Environmental Chamber	Sanyo	MTH-4200PR	none	Calibrated before use	-

**5.2.6. Transmitter Frequency Stability (Voltage Variation)****Test Summary:**

<b>Test Engineer:</b>	Keith Tucker	<b>Test Dates:</b>	09 July 2014 & 10 July 2014
<b>Test Sample IMEI:</b>	352025060274538		

<b>FCC Reference:</b>	Parts 2.1055 & 22.355
<b>Test Method Used:</b>	As detailed in KDB 971168 Section 9.0 referencing ANSI TIA-603-C-2004 Section 2.2.2 and FCC Part 2.1055
<b>Test Mode:</b>	RMC

**Environmental Conditions:**

<b>Temperature (°C):</b>	22 to 23
<b>Relative Humidity (%):</b>	38 to 49

**Note(s):**

1. Flying leads were connected internally to the EUT in place of the battery. These leads were extended and connected to a bench power supply.
2. Frequency error was measured using a calibrated Rohde & Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde & Schwarz application notes. The EUT was connected by suitable RF cables to the CMW 500. A bi-directional communications link was established between the EUT and CMW 500. The frequency meter value was recorded.
3. Voltage was monitored throughout the test with a calibrated digital voltmeter.

**Results: Middle Channel (836.6 MHz)**

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
3.4	836.599997	3	0.0036	2.5	2.4964	Complied
4.2	836.600003	3	0.0036	2.5	2.4964	Complied

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1658	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
M1870	Wideband Radio Comms Tester	Rohde & Schwarz	CMW500	145919	05 May 2015	12
G088	Dual DC power supply	TTi	CPX200	100700	Calibrated before use	-
M1251	Multimeter	Fluke	175	89170179	19 May 2015	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
Conducted Output Power	824 to 849 MHz	95%	±1.13 dB
Frequency Stability	824 to 849 MHz	95%	±23 Hz
Occupied Bandwidth	824 to 849 MHz	95%	±3.92 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 9 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	-	-	Admin updates

--- END OF REPORT ---