TEST REPORT

Test Report No. : UL-RPT-RP11241886JD07K V4.0

Manufacturer	:	Apple
Model No.	:	A1779
FCC ID	:	BCG-E3086A
Technology	:	UMTS850 Band V
Test Standard(s)	:	FCC Part 22 Subpart H

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 4.0 supersedes all previous versions.

Date of Issue: 03 August 2016

Checked by:

Ian Watch
Senior Engineer, Radio Laboratory

Company Signatory:

Steven White
Service Lead, Radio Laboratory
UL VS LTD

0644

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

UL VS LTD

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1. Customer Information

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

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR22
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 22 Subpart H (Public Mobile Services)
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	06 May 2016 to 12 July 2016

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 22.913(a)(2)	Transmitter E.R.P.	✓
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

Reference:	FCC KDB 971168 D01 v02r02, October 17 2014
Title:	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)

Brand Name:	Apple
Model Name or Number:	A1779
Test Sample IMEI:	358640070066221 *(Conducted Sample #1)*
Hardware Version:	REV1.0
Software Version:	OS: 14A241z BB FW: 0.16.04
FCC ID:	BCG-E3086A

Brand Name:	Apple
Model Name or Number:	A1779
Test Sample IMEI:	358640070036789 *(Conducted Sample #2)*
Hardware Version:	REV1.0
Software Version:	OS: 14A241z BB FW: 0.16.04
FCC ID:	BCG-E3086A

Brand Name:	Apple
Model Name or Number:	A1779
Test Sample IMEI:	358640070022893 *(Radiated Sample #1)*
Hardware Version:	REV1.0
Software Version:	OS: 14A241z BB FW: 0.16.04
FCC ID:	BCG-E3086A

Brand Name:	Apple
Model Name or Number:	A1779
Test Sample IMEI:	358640070087482 (*Radiated Sample #2)*
Hardware Version:	REV1.0
Software Version:	OS: 14A241z BB FW: 0.16.04
FCC ID:	BCG-E3086A

Brand Name:	Apple
Model Name or Number:	A1779
Test Sample Serial Number:	C7CRG02QH6DH *(Conducted Sample #3)*
Hardware Version:	REV1.0
Software Version:	OS: 14A241z BB FW: 0.16.04
FCC ID:	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 802.11a/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

Technology Tested:	UMTS850		
Type of Radio Device:	Transceiver		
Mode:	UMTS FDD V		
Modulation Type:	QPSK / 8PSK		
Channel Spacing:	5 MHz		
Power Supply Requirement(s):	Nominal	3.8 VDC	
	Minimum	3.5 VDC	
	Maximum	4.4 VDC	
Transmit Frequency Range:	824 to 849 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	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:

Description:	Laptop PC
Brand Name:	Lenovo
Model Name or Number:	L440
Serial Number:	R9-019EA0 14/04

Description:	USB diagnostic cable
Brand Name:	Not stated
Model Name or Number:	Kong
Serial Number:	2074F9

Description:	Personal Hands Free (PHF)
Brand Name:	Apple
Model Name or Number:	Apple Ear Plugs
Serial Number:	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. HSUPA subset 3 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):

- The EUT was placed into a non-ui mode by using the teraterm application on a UL laptop PC. Instructions were provided by the customer to enable the baseband and radio *(Cellular_RSE_setup_V3.0.doc)*. This enabled the EUT to connect via a radiated link with the Rohde & Schwarz CMW 500 system simulator operating in transceiver mode. The CMW 500 was used to configure the EUT operating mode.
- Transmitter radiated spurious emissions tests were performed with the PHF connected to the EUT as the declared by the customer. 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 for the LAT was Y and for the UAT was Y. Measurements at band edges were performed with the PHF removed as this was found to be the worst case.
- 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 attached.
- Testing for frequency stability and measurements at temperature and voltage extremes were 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 device contains two cellular antennas which do not transmit simultaneously.
    - o LAT – Lower Antenna (Primary)
    - o UAT – Upper Antenna (Secondary)

    Where applicable, both antennas have been tested to demonstrate compliance.

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 E.R.P. - LAT

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	12 July 2016
Test Sample IMEI:	358640070066221		

FCC Reference:	Part 22.913(a)(2)
Test Method Used:	KDB 971168 D01 Section 5.1.1 and 5.2.1

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	41

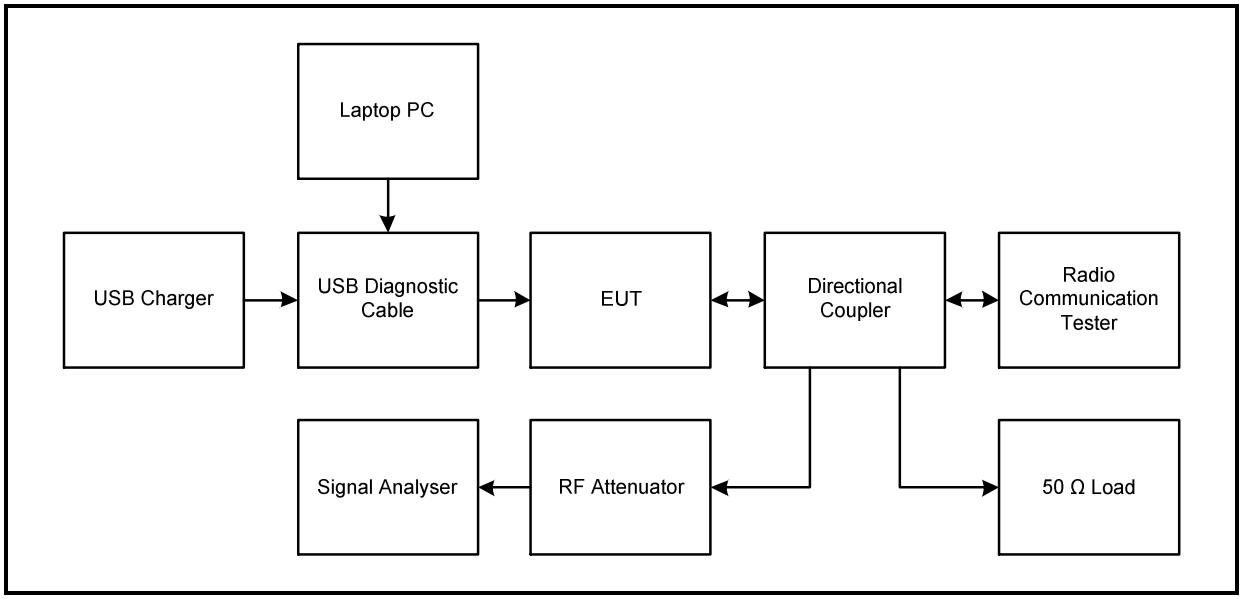
Note(s):

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 via the coupled port on an RF directional coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The EUT was transmitting at maximum power on a single channel.
4. The customer stated a maximum antenna gain of –3.74 dBi. As the limit is an ERP limit, the gain in dBi has been converted to dBd. The gain in dBd was calculated as:

-3.74 dBi – 2.15 dB = -5.89 dBd

5. The antenna gain was added to the conducted output power to obtain the ERP.

Test setup:



Transmitter Effective Radiated Power (ERP) (continued)

Results: Peak ERP / HSDPA and RMC

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	21.2	22.0	22.1	22.0	21.9	38.5	16.5	Complied
	4183	21.0	21.6	21.6	21.6	21.7	38.5	16.8	Complied
	4233	21.4	22.5	22.2	22.2	22.2	38.5	16.0	Complied
ßc		**2**	**11**	**15**	**15**				
ßd		**15**	**15**	**8**	**4**				
ΔACK, ΔNACK, ΔCQI		8	8	8	8				

Results: RMS ERP / HSDPA and RMC

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	15.7	14.0	12.9	12.4	16.9	38.5	21.6	Complied
	4183	15.6	13.7	12.6	12.2	16.6	38.5	21.9	Complied
	4233	15.8	13.9	13.1	12.4	16.8	38.5	21.7	Complied
ßc		**2**	**11**	**15**	**15**				
ßd		**15**	**15**	**8**	**4**				
ΔACK, ΔNACK, ΔCQI		8	8	8	8				

Results: Peak ERP / HSUPA

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	22.1	22.0	22.1	21.2	22.0	38.5	16.4	Complied
	4183	21.6	21.2	21.6	20.9	21.5	38.5	16.9	Complied
	4233	22.4	21.7	22.4	21.3	22.3	38.5	16.1	Complied
ßc		**11**	**6**	**15**	**2**	**15**			
ßd		**15**	**15**	**9**	**15**	**1**			
ΔACK, ΔNACK, ΔCQI		8	8	8	8	8			

Transmitter Effective Radiated Power (ERP) (continued)

Results: RMS ERP / HSUPA

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	14.8	15.3	15.9	15.8	15.4	38.5	22.6	Complied
	4183	15.6	14.5	15.6	15.6	15.1	38.5	22.9	Complied
	4233	15.9	15.5	15.8	15.8	15.4	38.5	22.7	Complied
ßc		**11**	**6**	**15**	**2**	**15**			
ßd		**15**	**15**	**9**	**15**	**1**			
ΔACK, ΔNACK, ΔCQI		8	8	8	8	8			

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	JM Handelspunkt	30.5015.134	Not stated	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24
M1021	Signal Generator	Rohde & Schwarz	SMP02	833286/004	19 May 2017	12

Transmitter Effective Radiated Power (ERP) - LAT (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	12 July 2016
Test Sample IMEI:	358640070066221		

FCC Reference:	Part 22.913(a)(2)
Test Method Used:	KDB 971168 D01 Section 5.1.1 and 5.2.1

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	41

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 via the coupled port on an RF directional coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The EUT was transmitting at maximum power in Dual Carrier HSDPA mode.
4. The customer stated a maximum antenna gain of –3.74 dBi. As the limit is an ERP limit, the gain in dBi has been converted to dBd. The gain in dBd was calculated as:

   -3.74 dBi – 2.15 dB = -5.89 dBd
5. The antenna gain was added to the conducted output power to obtain the ERP.

Transmitter Effective Radiated Power (ERP) (continued)

Results: Peak ERP / Dual Carrier HSDPA

Modes		HSDPA						
Sub-test		1	2	3	4			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	21.3	22.0	22.1	22.1	38.5	16.4	Complied
	4183	21.0	21.6	21.6	21.6	38.5	16.9	Complied
	4233	21.6	22.5	22.4	22.2	38.5	16.1	Complied
ßc		**2**	**11**	**15**	**15**			
ßd		**15**	**15**	**8**	**4**			
ΔACK, ΔNACK, ΔCQI		8	8	8	8			

Results: RMS ERP / HSDPA / Dual Carrier HSDPA

Modes		HSDPA						
Sub-test		1	2	3	4			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	15.7	13.9	13.0	12.5	38.5	22.8	Complied
	4183	15.6	13.7	12.6	12.2	38.5	22.9	Complied
	4233	15.8	13.9	12.8	12.6	38.5	22.7	Complied
ßc		**2**	**11**	**15**	**15**			
ßd		**15**	**15**	**8**	**4**			
ΔACK, ΔNACK, ΔCQI		8	8	8	8			

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	JM Handelspunkt	30.5015.134	Not stated	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24
M1021	Signal Generator	Rohde & Schwarz	SMP02	833286/004	19 May 2017	12

5.2.2. Transmitter E.R.P. - UAT

Test Summary:

Test Engineer:	David Doyle	**Test Dates:**	11 July 2016 & 12 July 2016
Test Sample IMEI:	358640070066221		

FCC Reference:	Part 22.913(a)(2)
Test Method Used:	KDB 971168 D01 Section 5.1.1 and 5.2.1

Environmental Conditions:

Temperature (°C):	24 to 25
Relative Humidity (%):	41 to 42

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 via the coupled port on an RF directional coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The EUT was transmitting at maximum power on a single channel.
4. The customer stated a maximum antenna gain of –2.89 dBi. As the limit is an ERP limit, the gain in dBi has been converted to dBd. The gain in dBd was calculated as:

   -2.89 dBi – 2.15 dB = -5.04 dBd

5. The antenna gain was added to the conducted output power to obtain the ERP.

Transmitter Effective Radiated Power (ERP) (continued)

Results: Peak ERP / HSDPA and RMC

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	19.7	19.8	20.1	19.9	19.9	38.5	18.4	Complied
	4183	20.4	20.5	20.4	20.6	20.4	38.5	17.9	Complied
	4233	19.2	20.3	20.1	20.2	20.0	38.5	18.2	Complied
ßc		**2**	**11**	**15**	**15**				
ßd		**15**	**15**	**8**	**4**				
ΔACK, ΔNACK, ΔCQI		8	8	8	8				

Results: RMS ERP / HSDPA and RMC

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	13.9	12.1	11.0	10.8	14.8	38.5	23.7	Complied
	4183	13.8	12.0	11.1	10.4	14.9	38.5	23.7	Complied
	4233	13.7	12.1	10.9	10.5	14.9	38.5	23.7	Complied
ßc		**2**	**11**	**15**	**15**				
ßd		**15**	**15**	**8**	**4**				
ΔACK, ΔNACK, ΔCQI		8	8	8	8				

Results: Peak ERP / HSUPA

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	20.3	19.5	19.9	19.6	19.9	38.5	18.2	Complied
	4183	20.7	20.3	20.9	19.6	20.8	38.5	17.6	Complied
	4233	20.3	20.2	20.5	19.2	20.3	38.5	18.0	Complied
ßc		**11**	**6**	**15**	**2**	**15**			
ßd		**15**	**15**	**9**	**15**	**1**			
ΔACK, ΔNACK, ΔCQI		8	8	8	8	8			

Transmitter Effective Radiated Power (ERP) (continued)

Results: RMS ERP / HSUPA

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	12.7	13.4	14.5	13.9	13.4	38.5	24.0	Complied
	4183	13.8	13.4	14.9	13.9	13.3	38.5	23.6	Complied
	4233	13.7	13.2	14.7	13.8	13.0	38.5	23.8	Complied
ßc		**11**	**6**	**15**	**2**	**15**			
ßd		**15**	**15**	**9**	**15**	**1**			
ΔACK, ΔNACK, ΔCQI		8	8	8	8	8			

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	JM Handelspunkt	30.5015.134	Not stated	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24
M1021	Signal Generator	Rohde & Schwarz	SMP02	833286/004	19 May 2017	12

Transmitter Effective Radiated Power (ERP) (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Dates:**	11 July 2016 & 12 July 2016
Test Sample IMEI:	358640070066221		

FCC Reference:	Part 22.913(a)(2)
Test Method Used:	KDB 971168 D01 Section 5.1.1 and 5.2.1

Environmental Conditions:

Temperature (°C):	24 to 25
Relative Humidity (%):	41 to 42

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 via the coupled port on an RF directional coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The EUT was transmitting at maximum power in Dual Carrier HSDPA mode.
4. The customer stated a maximum antenna gain of –2.89 dBi. As the limit is an ERP limit, the gain in dBi has been converted to dBd. The gain in dBd was calculated as:

   -2.89 dBi – 2.15 dB = -5.04 dBd

5. The antenna gain was added to the conducted output power to obtain the ERP.

Transmitter Effective Radiated Power (ERP) (continued) - UAT

Results: Peak ERP / Dual Carrier HSDPA

Modes		HSDPA						
Sub-test		1	2	3	4			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	19.7	19.7	19.7	19.8	38.5	18.7	Complied
	4183	20.4	20.5	20.4	20.4	38.5	18.0	Complied
	4233	19.2	20.2	20.2	20.2	38.5	18.3	Complied
ßc		**2**	**11**	**15**	**15**			
ßd		**15**	**15**	**8**	**4**			
ΔACK, ΔNACK, ΔCQI		8	8	8	8			

Results: RMS ERP / Dual Carrier HSDPA

Modes		HSDPA						
Sub-test		1	2	3	4			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	13.9	12.1	11.1	10.5	38.5	24.6	Complied
	4183	13.8	11.9	10.8	10.9	38.5	24.7	Complied
	4233	13.6	11.9	10.9	10.6	38.5	24.9	Complied
ßc		**2**	**11**	**15**	**15**			
ßd		**15**	**15**	**8**	**4**			
ΔACK, ΔNACK, ΔCQI		8	8	8	8			

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	JM Handelspunkt	30.5015.134	Not stated	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24
M1021	Signal Generator	Rohde & Schwarz	SMP02	833286/004	19 May 2017	12

5.2.3. Transmitter Occupied Bandwidth

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	15 June 2016
Test Sample IMEI:	358640070036789		

FCC Reference:	Part 2.1049
Test Method Used:	KDB 971168 D01 Section 4.2

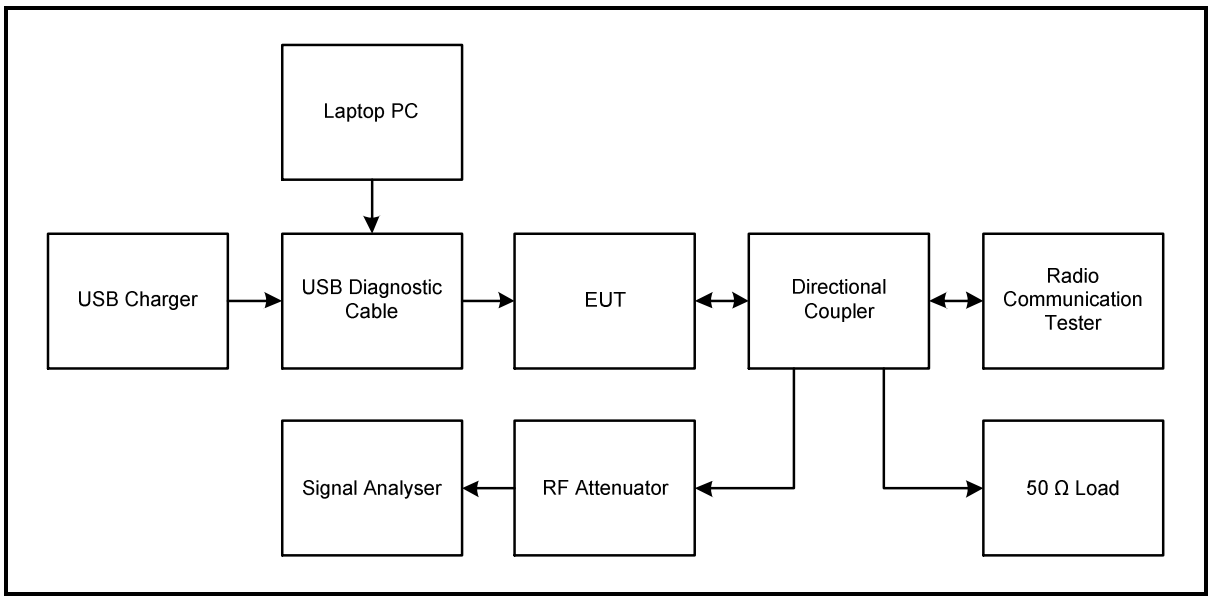
Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	34

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 via the coupled port on an RF directional coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.

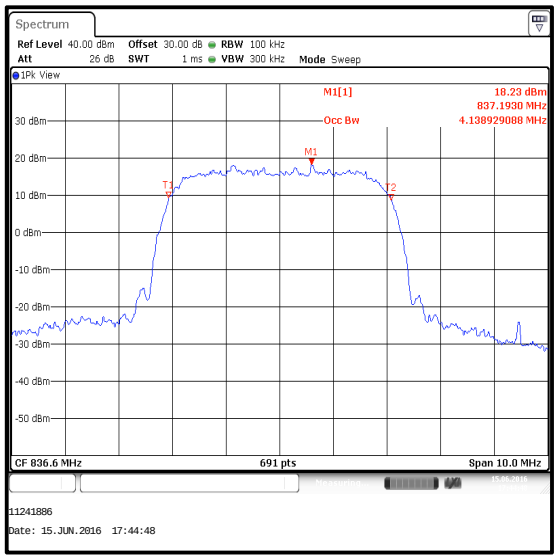
Test setup:



Transmitter Occupied Bandwidth (continued)

Results: RMC / 12.2 kbps

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4138.929

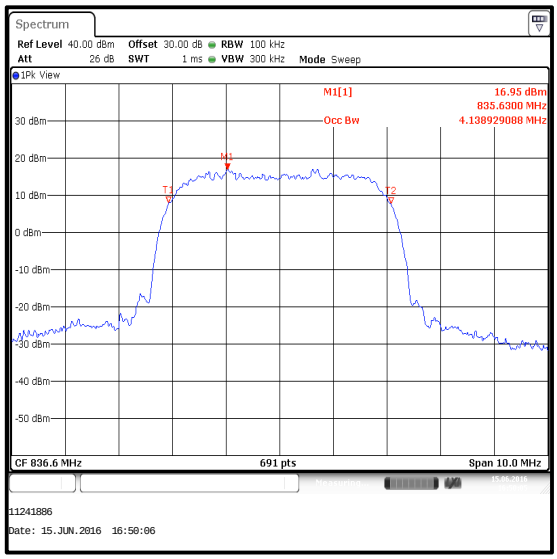


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 1

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4138.929

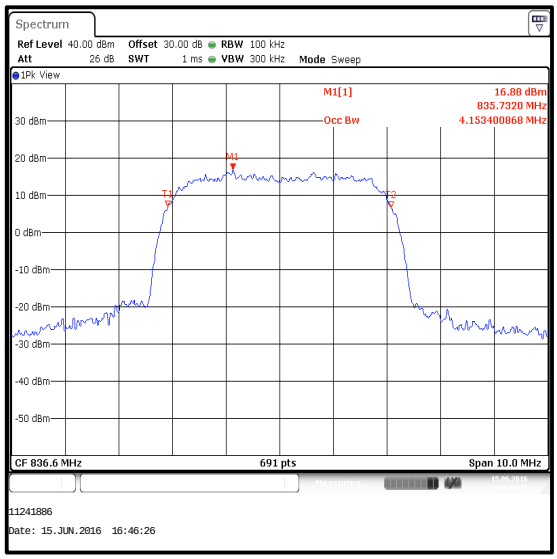


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 2

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

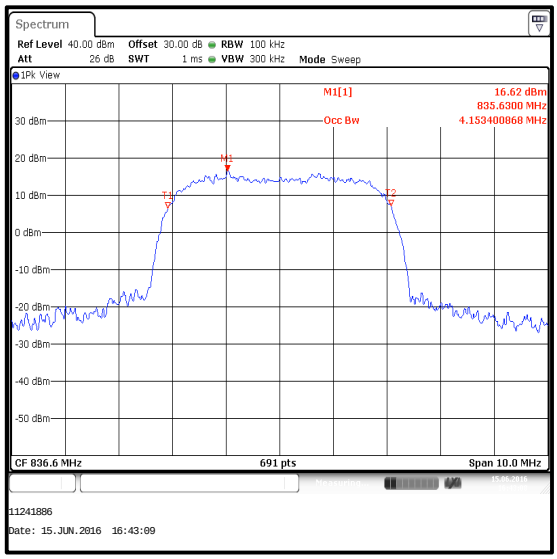


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 3

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

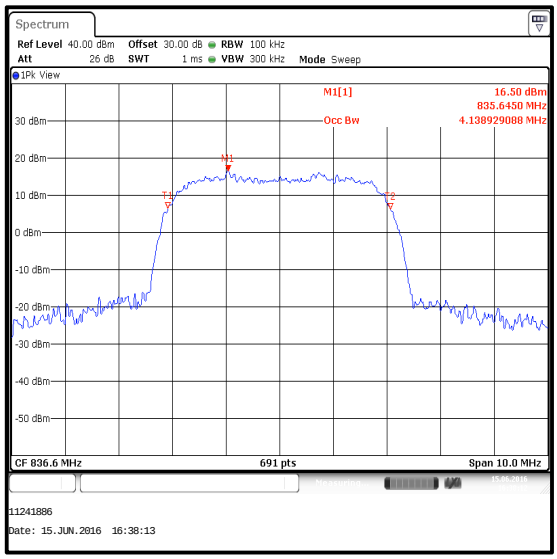


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 4

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4138.929

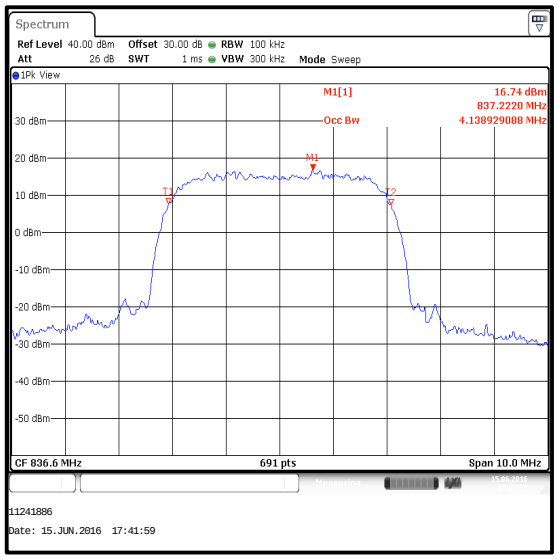


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 1

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4138.929

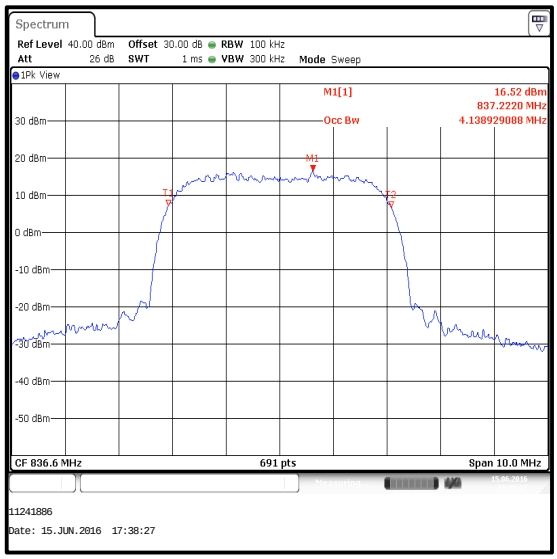


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 2

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4138.929

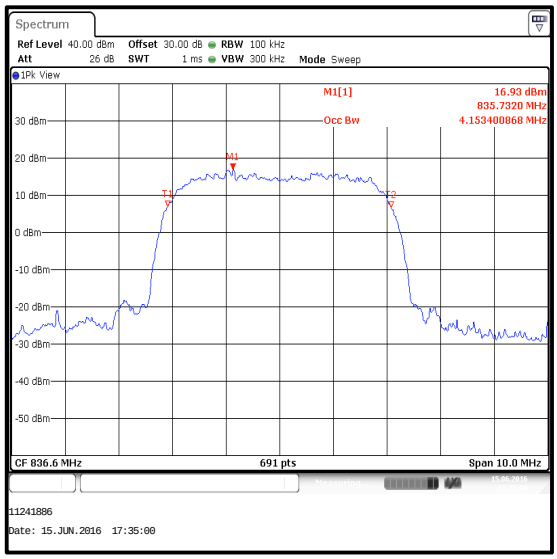


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 3

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

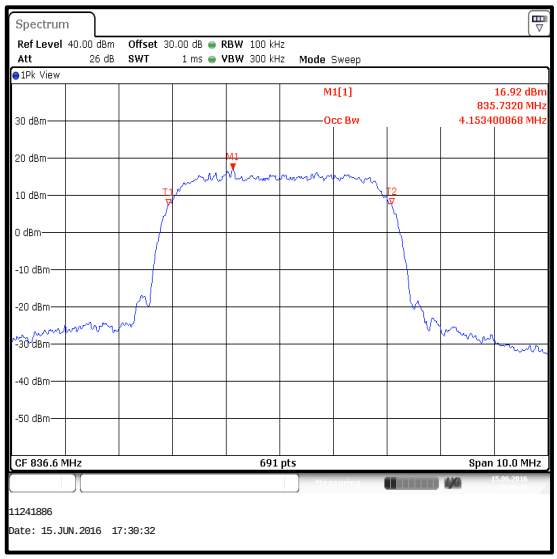


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 4

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

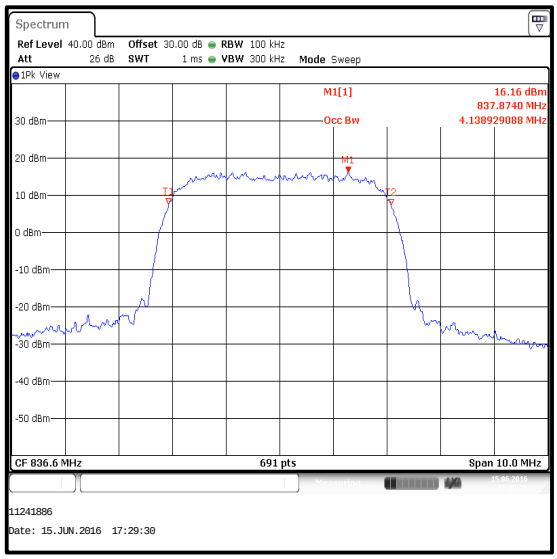


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 5

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4138.929



Middle Channel

Test Equipment Used

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	JM Handelspunkt	30.5015.134	Not stated	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24
M1021	Signal Generator	Rohde & Schwarz	SMP02	833286/004	19 May 2017	12

5.2.4. Transmitter Out of Band Radiated Emissions - LAT

Test Summary:

Test Engineers:	Nick Steele & David Doyle	**Test Dates:**	06 May 2016 to 06 July 2016
Test Sample IMEI:	358640070087482		

FCC Reference:	Parts 2.1053 & 22.917
Test Method Used:	KDB 971168 D01 Section 6.1 / FCC Part 2.1053
Frequency Range:	30 MHz to 9 GHz
Configuration:	Voice / 12.2 kbps

Environmental Conditions:

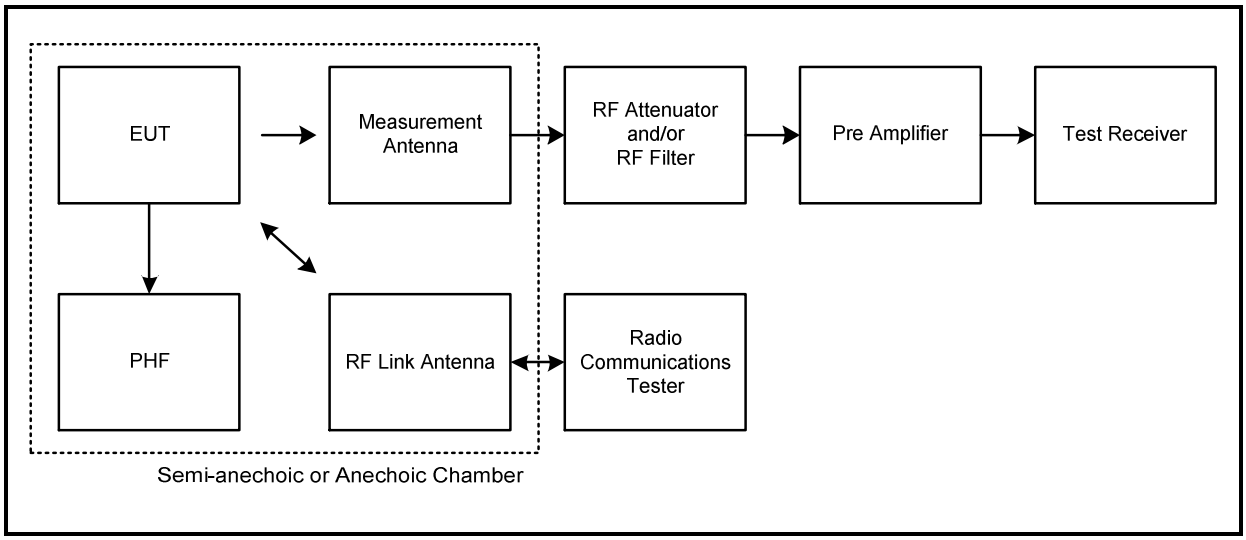
Temperature (°C):	24 to 26
Relative Humidity (%):	30 to 41

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, therefore the highest peak noise floor reading of the measuring receiver was recorded.
3. 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.
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 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.
6. Radiated spurious emission testing between 150 kHz and 30 MHz was performed for support of the NFC test report. No spurious emissions were observed above the noise floor of the measurement system.

Transmitter Out of Band Radiated Emissions (continued)

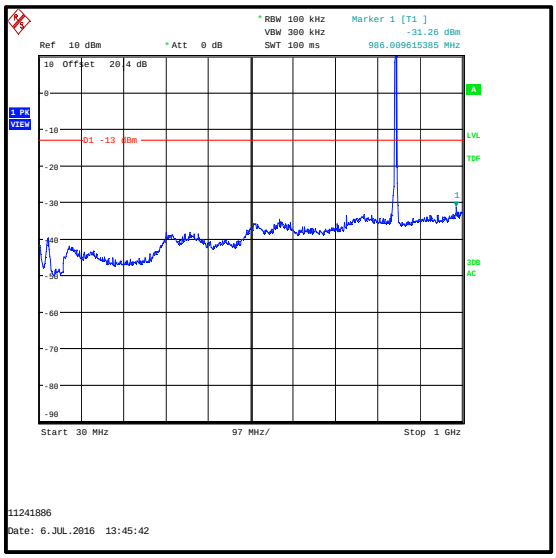
Test setup for radiated measurements:

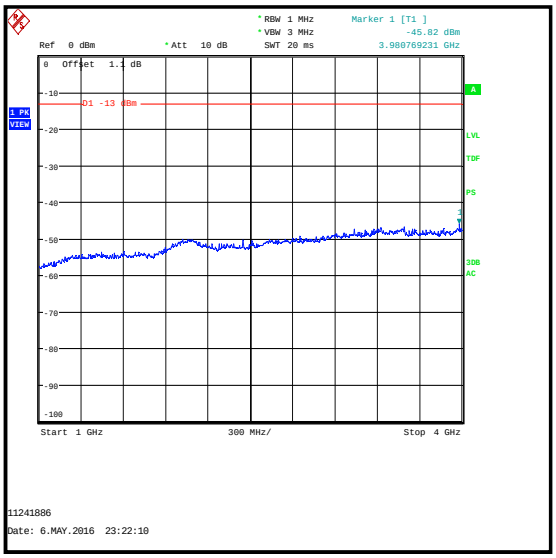


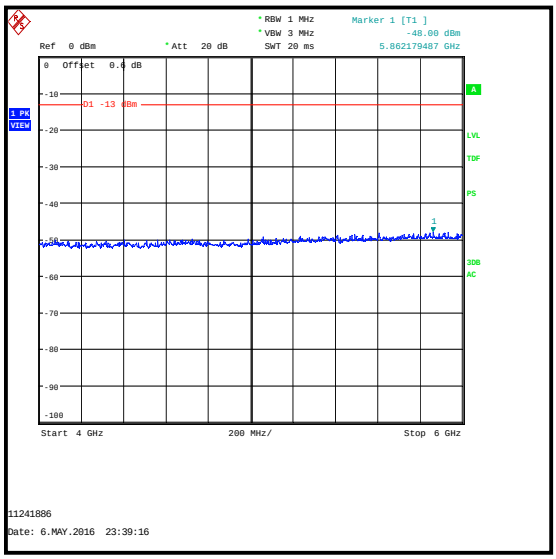
Results: Voice / 12.2 kbps - Middle Channel

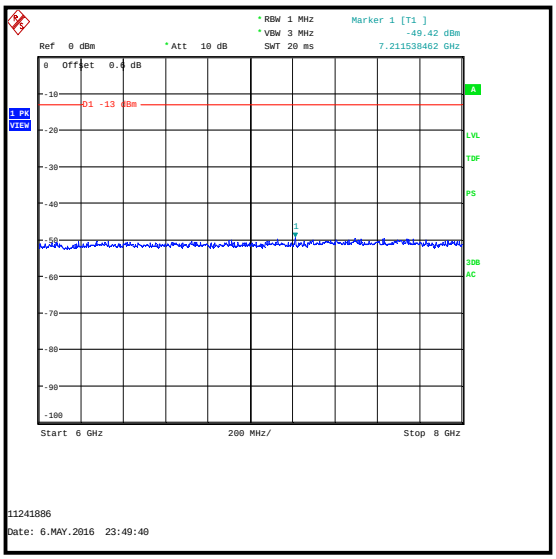
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
986.010	-31.3	-13.0	18.3	Complied

Transmitter Out of Band Radiated Emissions (continued)

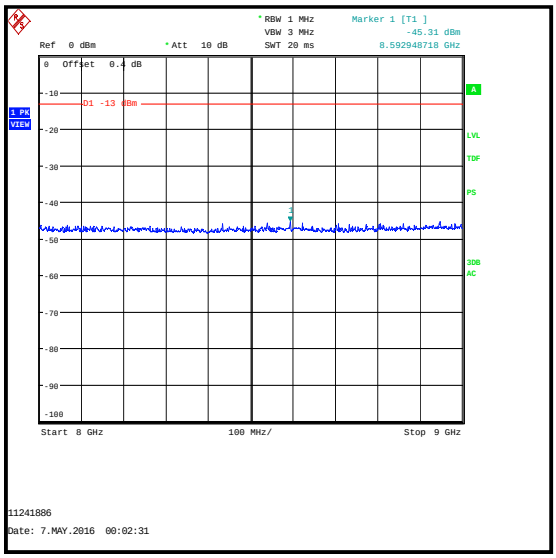








Transmitter Out of Band Radiated Emissions (continued)



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
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
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	21 Mar 2017	12
A1393	Attenuator	Huber & Suhner	6820.17.B	757456	26 Apr 2017	12
A2467	High Pass Filter	Wainwright Instruments GmbH	WHJE5-920-1000-4000-60EE	2	09 Mar 2017	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	26 Apr 2017	12
A1534	Pre-Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A253	Antenna	Flann Microwave	12240-20	128	17 Dec 2016	12
A254	Antenna	Flann Microwave	14240-20	139	17 Dec 2016	12
A255	Antenna	Flann Microwave	16240-20	519	17 Dec 2016	12
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	07 Apr 2017	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#1	19 May 2017	12

5.2.5. Transmitter Out of Band Radiated Emissions - UAT

Test Summary:

Test Engineers:	Nick Steele & Andrew Edwards	**Test Dates:**	07 May 2016 & 10 June 2016
Test Sample IMEI:	358640070022893		

FCC Reference:	Parts 2.1053 & 22.917
Test Method Used:	KDB 971168 D01 Section 6.1 / FCC Part 2.1053
Frequency Range:	30 MHz to 9 GHz
Configuration:	Voice / 12.2 kbps

Environmental Conditions:

Temperature (°C):	24 to 26
Relative Humidity (%):	30 to 38

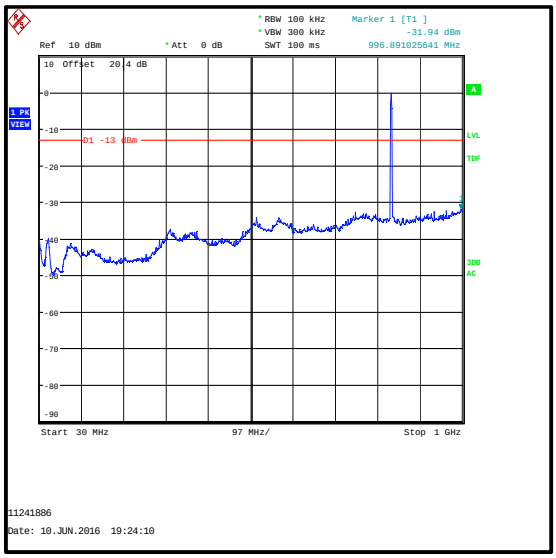
Note(s):

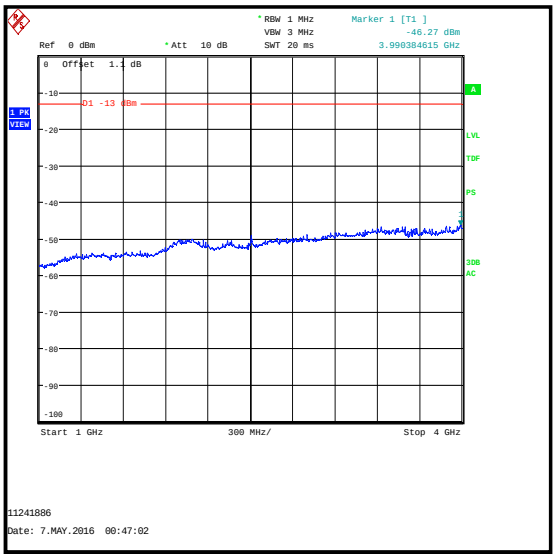
1. The uplink traffic channel is shown on the 30 MHz to 1 GHz plot.
2. No spurious emissions were detected above the noise floor of the measuring receiver, therefore the highest peak noise floor reading of the measuring receiver was recorded.
3. Middle channel results are recorded in this report and are representative of bottom and top channel results which are held on the UL IT server and available for inspection on request.
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 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.
6. Radiated spurious emission testing between 150 kHz and 30 MHz was performed for support of the NFC test report. No spurious emissions were observed above the noise floor of the measurement system.

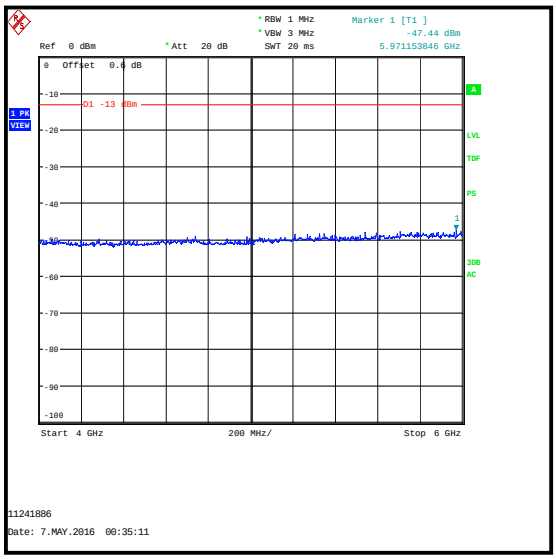
Results: Voice / 12.2 kbps - Middle Channel

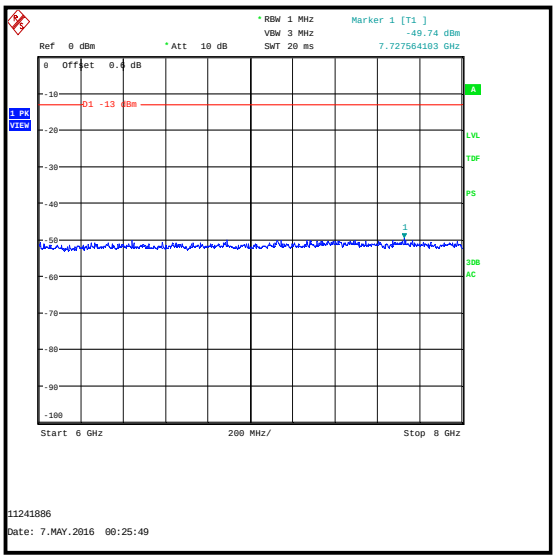
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
896.891	-31.9	-13.0	18.9	Complied

Transmitter Out of Band Radiated Emissions (continued)

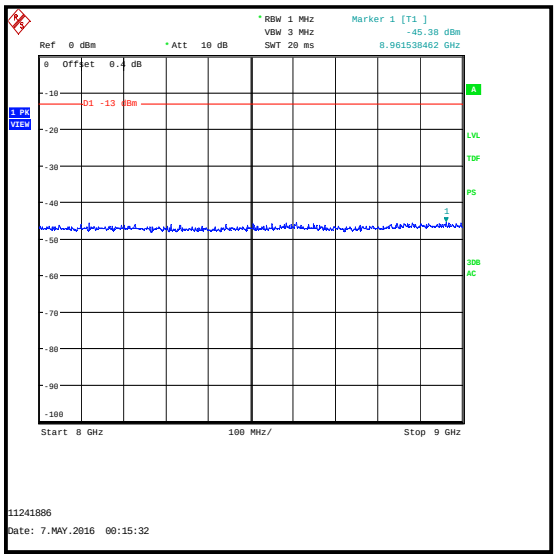








Transmitter Out of Band Radiated Emissions (continued)



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
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
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	21 Mar 2017	12
A1393	Attenuator	Huber & Suhner	6820.17.B	757456	26 Apr 2017	12
A2467	High Pass Filter	Wainwright Instruments GmbH	WHJE5-920-1000-4000-60EE	2	09 Mar 2017	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	26 Apr 2017	12
A1534	Pre-Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A253	Antenna	Flann Microwave	12240-20	128	17 Dec 2016	12
A254	Antenna	Flann Microwave	14240-20	139	17 Dec 2016	12
A255	Antenna	Flann Microwave	16240-20	519	17 Dec 2016	12
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	07 Apr 2017	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#1	19 May 2017	12

5.2.6. Transmitter Band Edge Radiated Emissions - LAT

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	06 July 2016
Test Sample IMEI:	358640070087482		

FCC Reference:	Parts 2.1053 & 22.917
Test Method Used:	KDB 971168 D01 Section 6, Section 7 & notes below

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	41

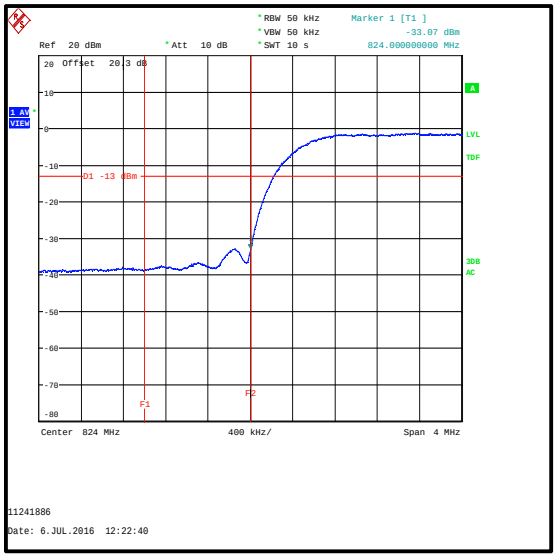
Note(s):

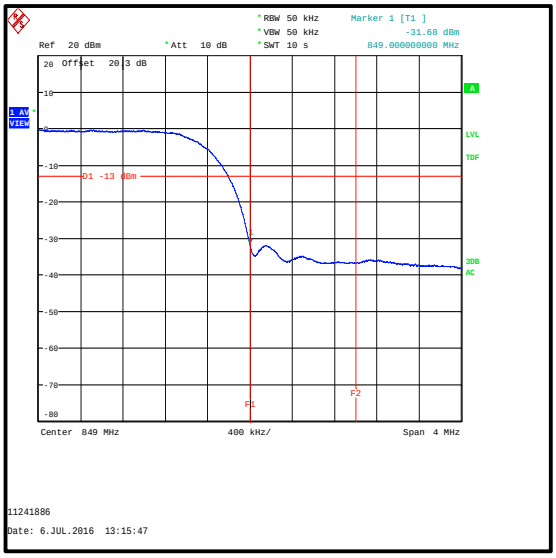
1. Measurements were performed with the EUT transmitting in all operating modes.
2. Measurements were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. 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 band, the test receiver resolution bandwidth was set to approximately 1% of the occupied bandwidth and video bandwidth 3%. Sweep time was set to 10 seconds and an average detector with maximum hold was used.

Transmitter Band Edge Radiated Emissions (continued)

Results: RMC / 12.2 kbps

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.1	-13.0	20.1	Complied
849	-31.7	-13.0	18.7	Complied

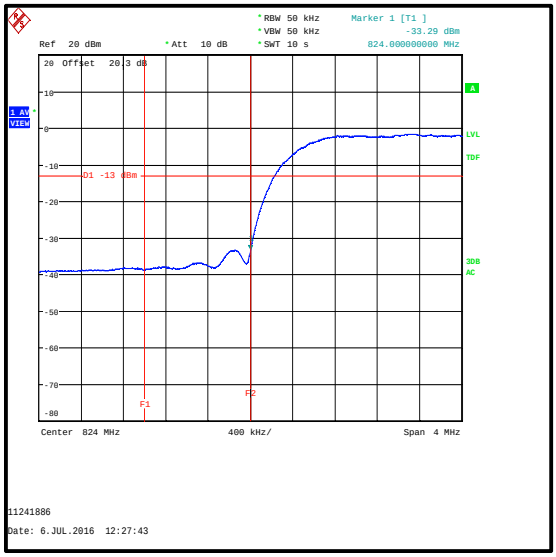


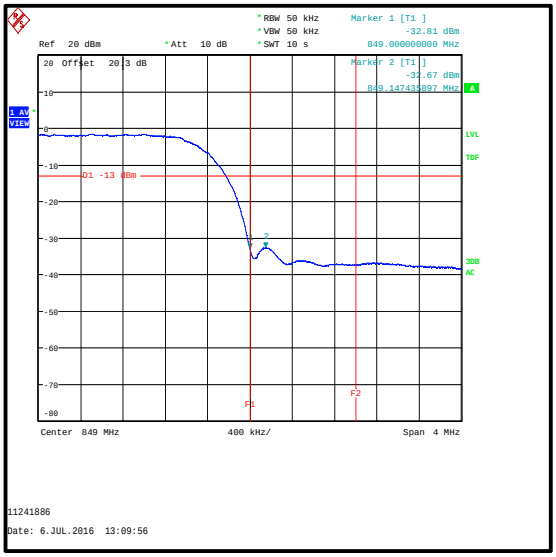


Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 1

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.3	-13.0	20.3	Complied
849	-32.8	-13.0	19.8	Complied
849.147	-32.7	-13.0	19.7	Complied

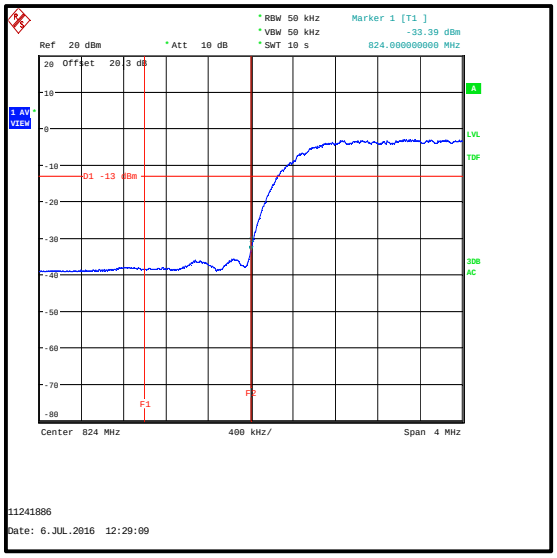


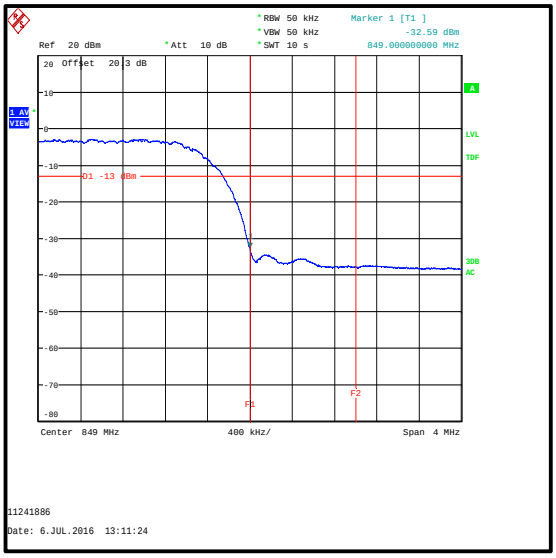


Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 2

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.4	-13.0	20.4	Complied
849	-32.6	-13.0	19.6	Complied

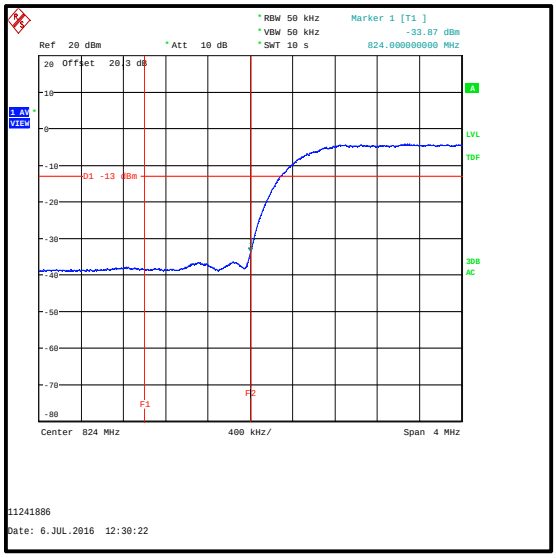


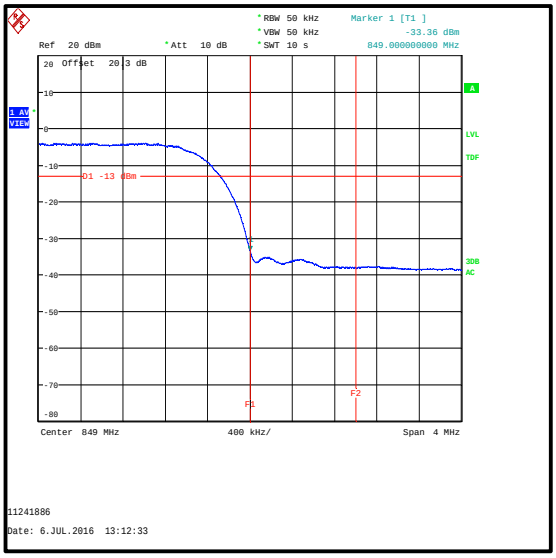


Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 3

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.9	-13.0	20.9	Complied
849	-33.4	-13.0	20.4	Complied

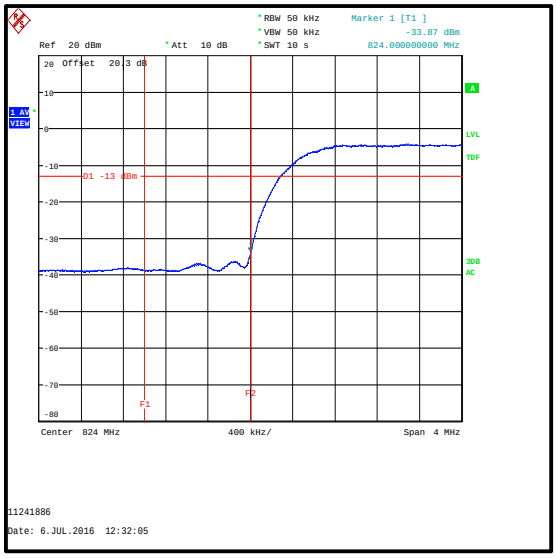


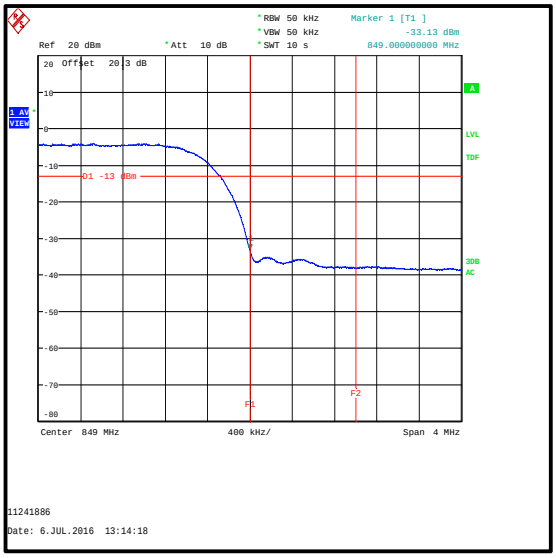


Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 4

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.4	-13.0	20.4	Complied
849	-33.1	-13.0	20.1	Complied

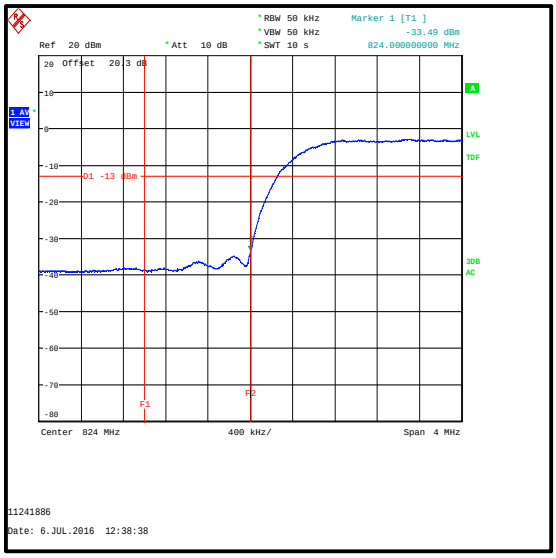


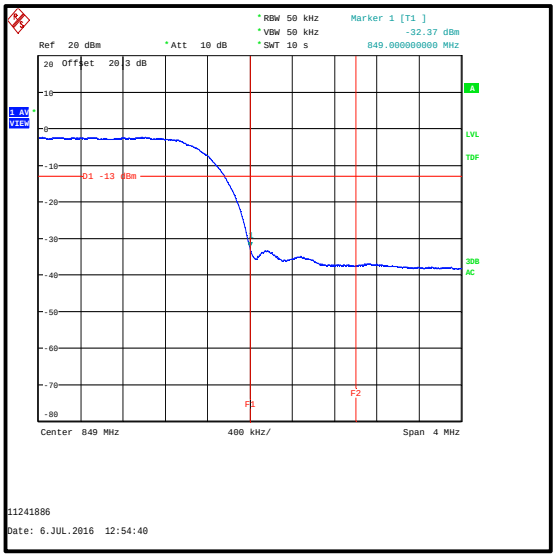


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 1

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.5	-13.0	20.5	Complied
849	-32.4	-13.0	19.4	Complied

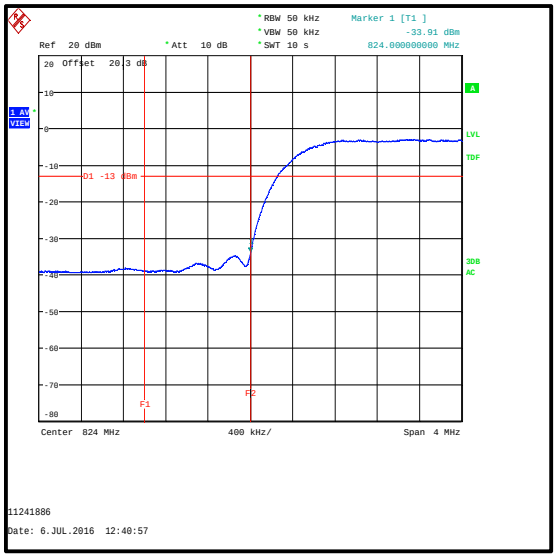


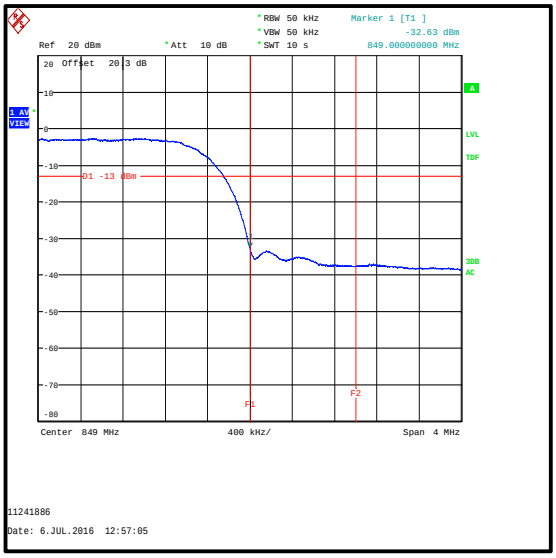


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 2

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.9	-13.0	20.9	Complied
849	-32.6	-13.0	19.6	Complied

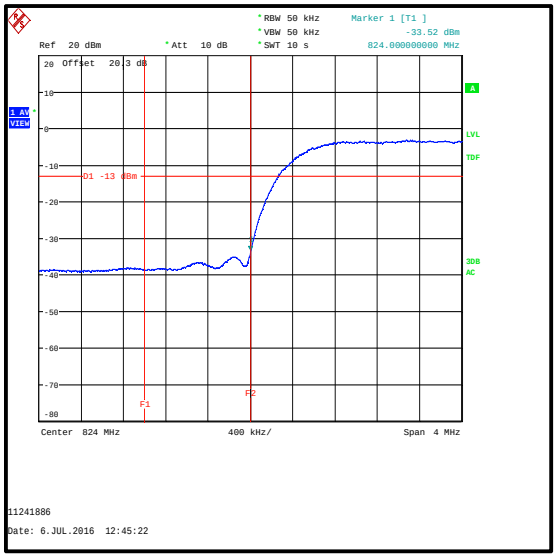


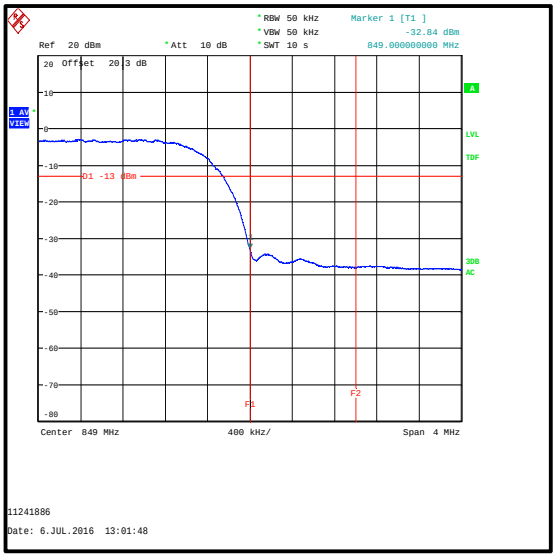


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 3

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.5	-13.0	20.5	Complied
849	-32.8	-13.0	19.8	Complied

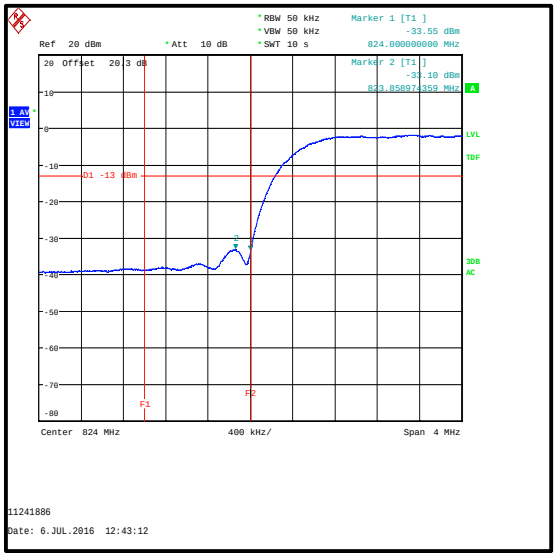


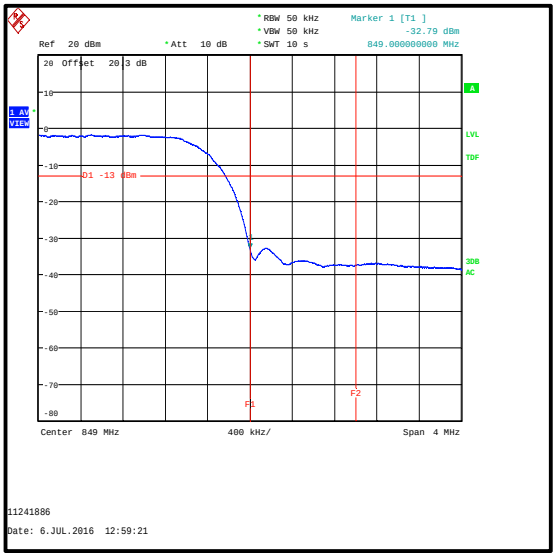


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 4

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.860	-33.1	-13.0	20.1	Complied
824	-33.6	-13.0	20.6	Complied
849	-32.8	-13.0	19.8	Complied

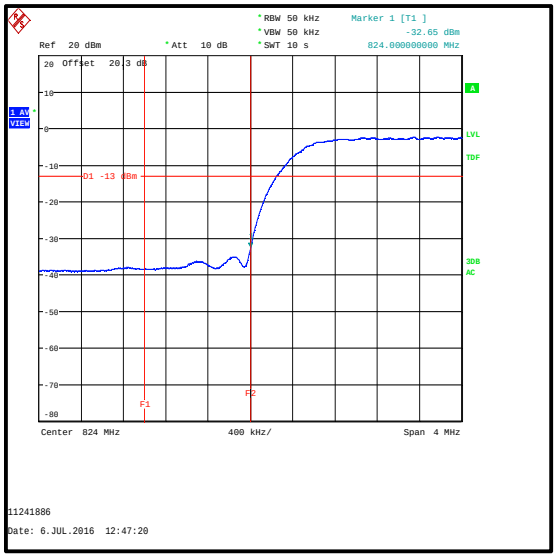


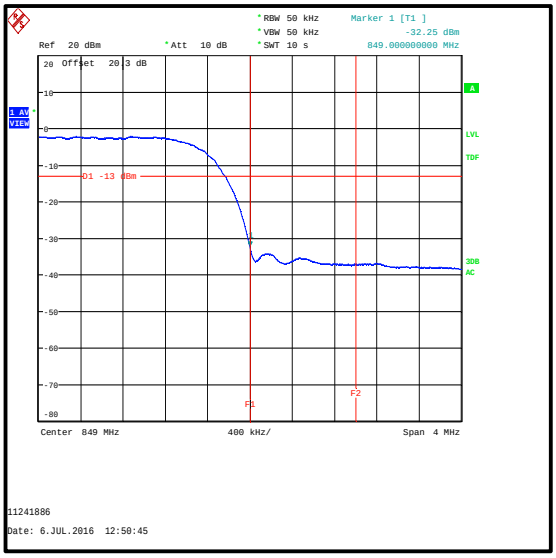


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 5

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-32.7	-13.0	19.7	Complied
849	-32.3	-13.0	19.3	Complied





Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	07 Apr 2017	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#1	19 May 2017	12

5.2.7. Transmitter Band Edge Radiated Emissions - UAT

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	06 July 2016
Test Sample IMEI:	358640070022893		

FCC Reference:	Parts 2.1053 & 22.917
Test Method Used:	KDB 971168 D01 Section 6, Section 7 & notes below

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	41

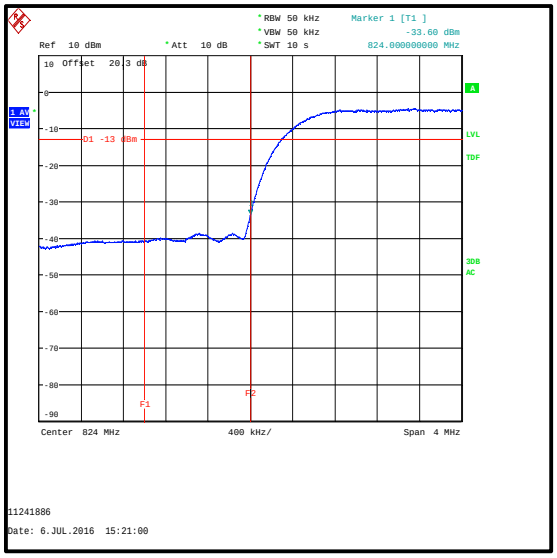
Note(s):

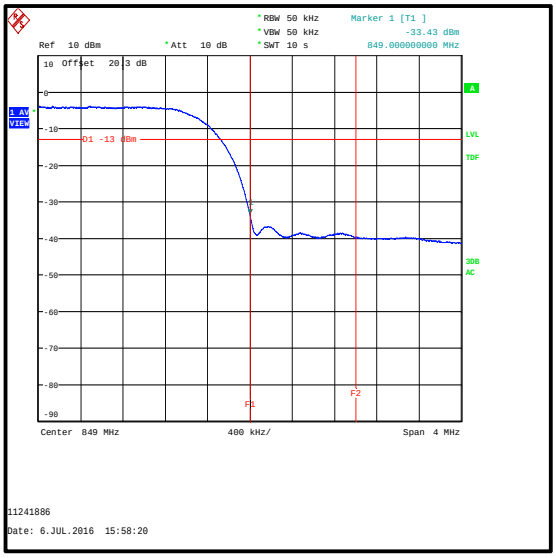
1. Measurements were performed with the EUT transmitting in all operating modes.
2. Measurements were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. 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 band, the test receiver resolution bandwidth was set to approximately 1% of the occupied bandwidth and video bandwidth 3%. Sweep time was set to 10 seconds and an average detector with maximum hold was used.

Transmitter Band Edge Radiated Emissions (continued)

Results: RMC / 12.2 kbps

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-33.6	-13.0	20.6	Complied
849	-33.4	-13.0	20.4	Complied

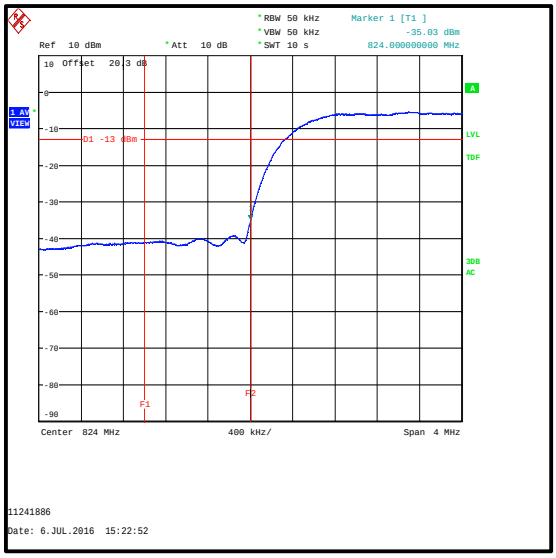


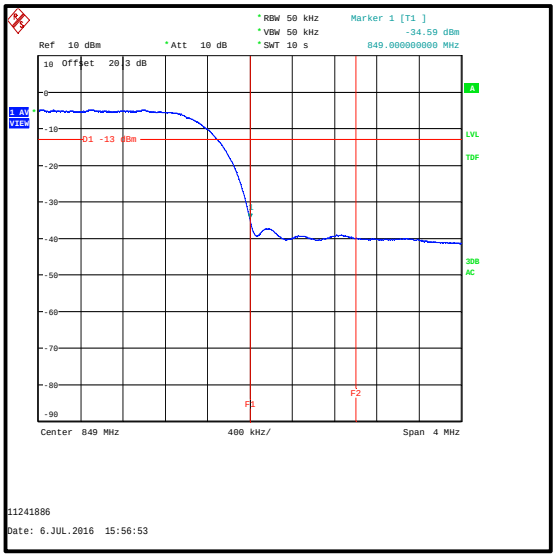


Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 1

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-35.0	-13.0	22.0	Complied
849	-34.6	-13.0	21.6	Complied

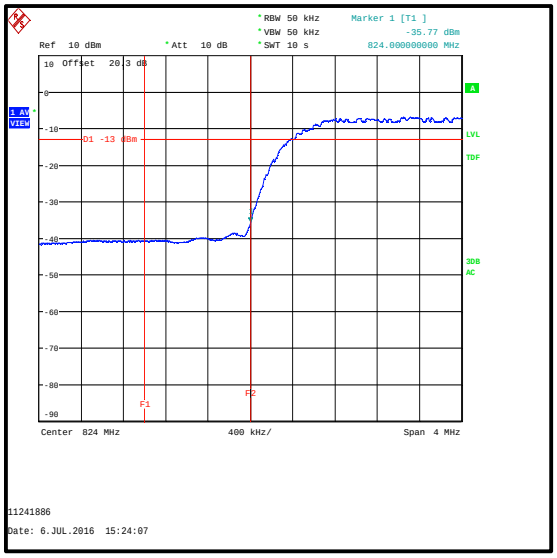


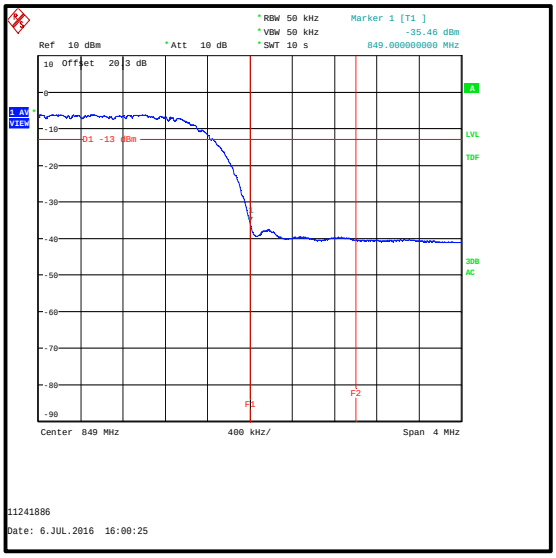


Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 2

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-35.8	-13.0	22.8	Complied
849	-35.5	-13.0	22.5	Complied

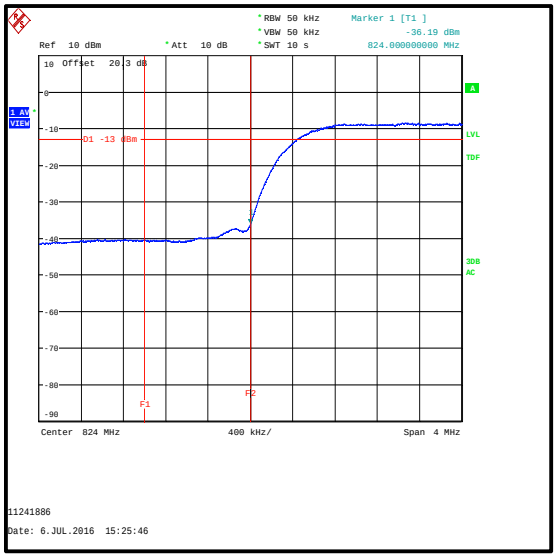


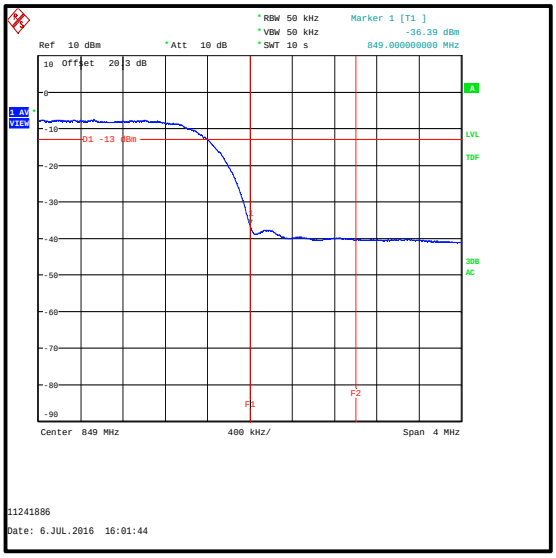


Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 3

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

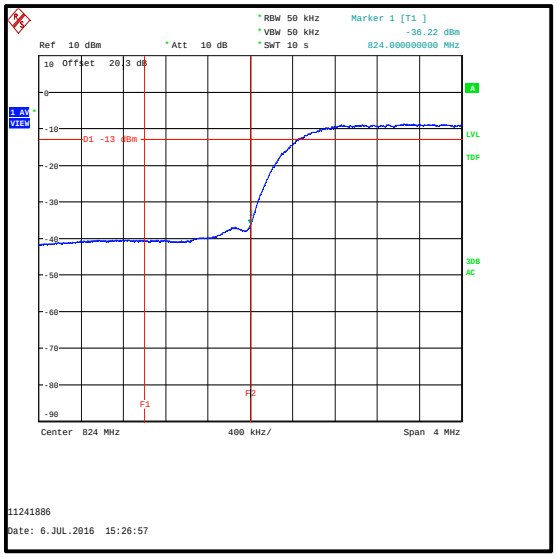


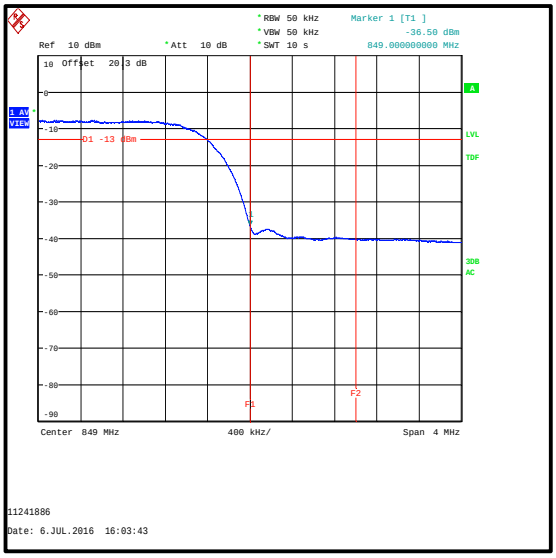


Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 4

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-36.2	-13.0	23.2	Complied
849	-36.5	-13.0	23.5	Complied

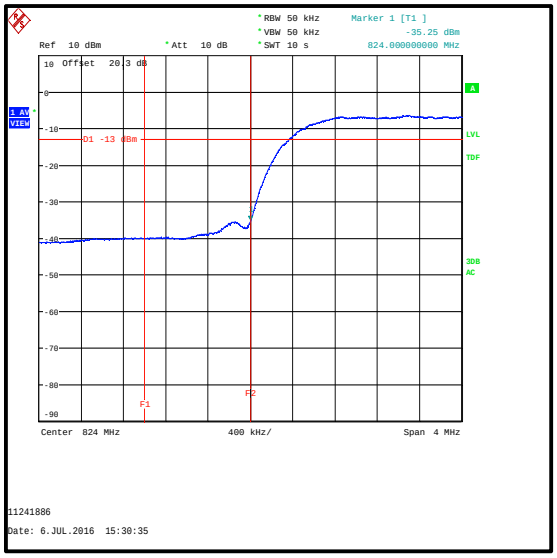


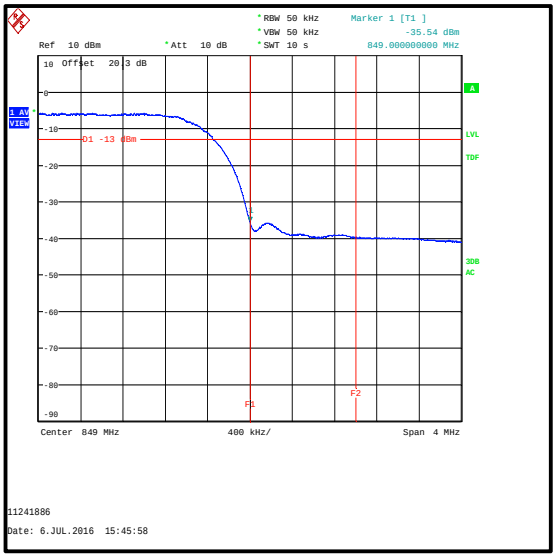


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 1

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-35.3	-13.0	23.3	Complied
849	-35.5	-13.0	23.5	Complied

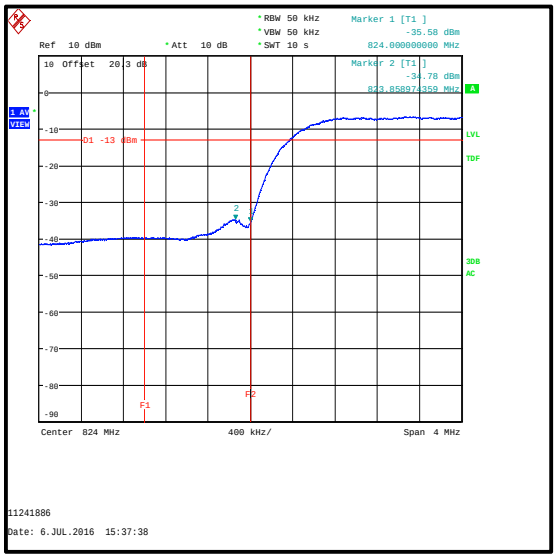


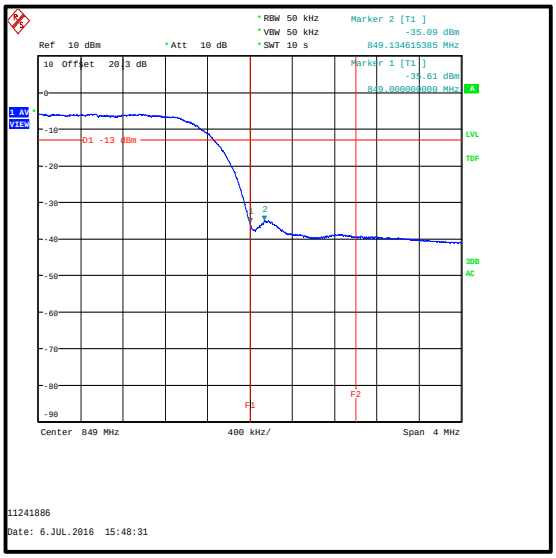


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 2

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.860	-34.8	-13.0	21.8	Complied
824	-35.6	-13.0	22.6	Complied
849	-35.6	-13.0	22.6	Complied
849.135	-35.1	-13.0	22.1	Complied

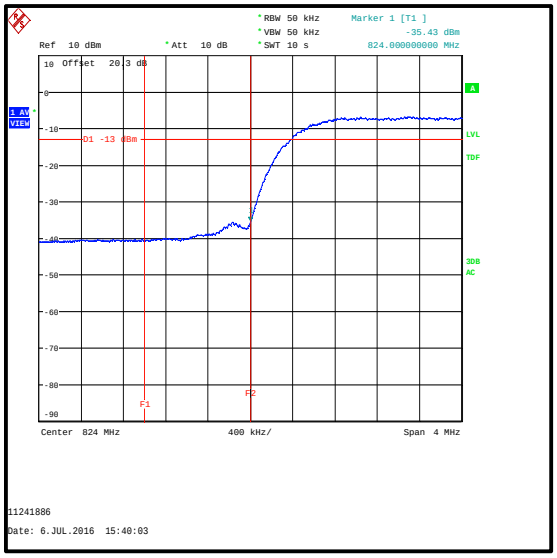


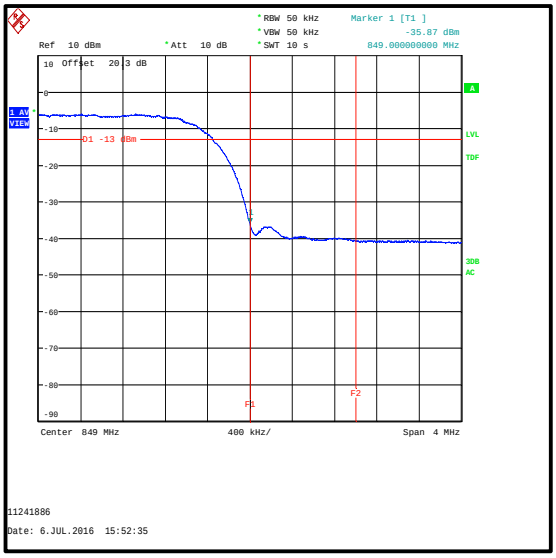


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 3

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-35.4	-13.0	22.4	Complied
849	-35.9	-13.0	22.9	Complied

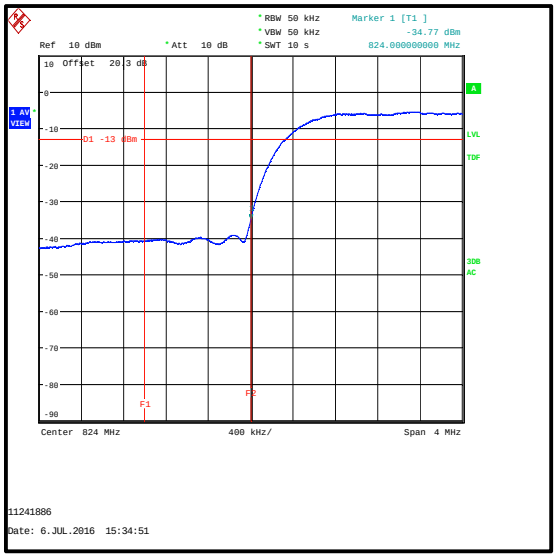


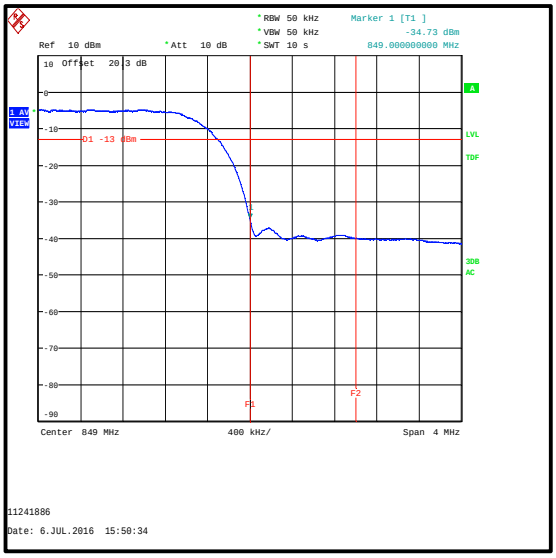


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 4

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-34.8	-13.0	21.8	Complied
849	-34.7	-13.0	21.7	Complied

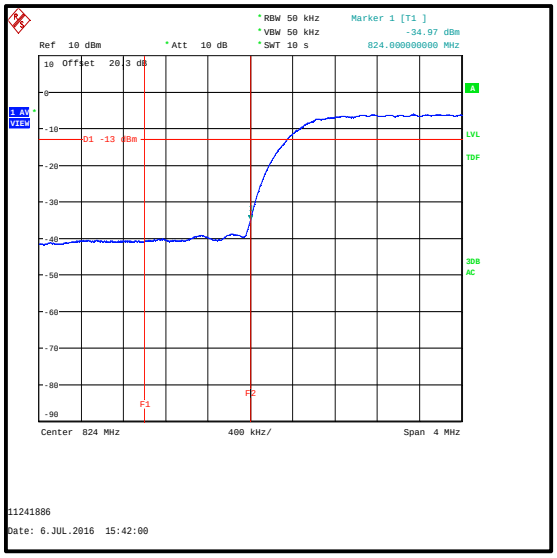


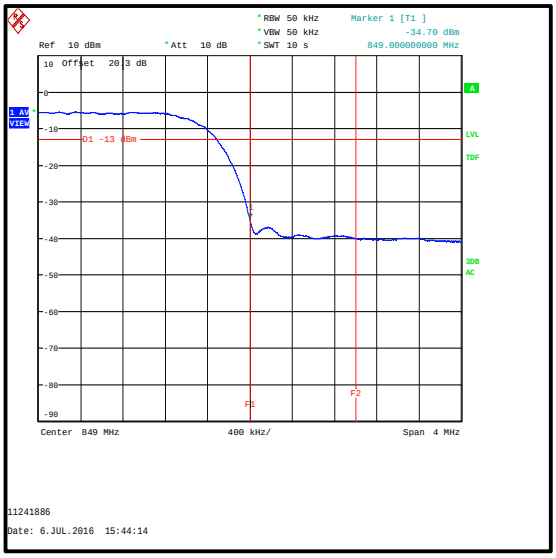


Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 5

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824	-35.0	-13.0	22.0	Complied
849	-34.7	-13.0	21.7	Complied





Test Equipment Used: :

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	07 Apr 2017	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#1	19 May 2017	12

5.2.8. Transmitter Frequency Stability (Temperature Variation)

Test Summary:

Test Engineer:	Stefan Ho	**Test Date:**	11 May 2016
Test Sample Serial Number:	C7CRG02QH6DH		

FCC Reference:	Parts 2.1055 / 22.355
Test Method Used:	KDB 971168 D01 Section 9, FCC Part 2.1055 and notes below
Test Mode:	RMC

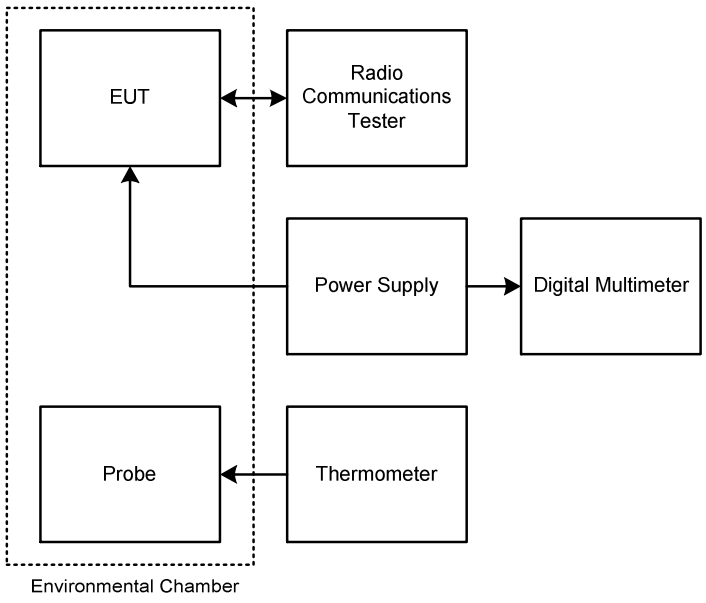
Environmental Conditions:

Ambient Temperature (°C):	23
Ambient Relative Humidity (%):	40

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. Nominal voltage was monitored throughout the test with a calibrated digital voltmeter.

Test setup:



Transmitter Frequency Stability (Temperature Variation) (continued)

Results: Middle Channel (836.6 MHz)

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	836.600004	4	0.0048	2.5	2.4952	Complied
-20	836.599995	5	0.0060	2.5	2.4940	Complied
-10	836.599995	5	0.0060	2.5	2.4940	Complied
0	836.600005	5	0.0060	2.5	2.4940	Complied
10	836.600009	9	0.0108	2.5	2.4892	Complied
20	836.600004	4	0.0048	2.5	2.4952	Complied
30	836.600002	2	0.0024	2.5	2.4976	Complied
40	836.600006	6	0.0072	2.5	2.4928	Complied
50	836.600004	4	0.0048	2.5	2.4952	Complied

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
M1869	Wideband Radio Comms Tester	Rohde & Schwarz	CMW 500	145923	05 Apr 2017	12
M1674	Environmental Chamber	Espec Corporation	SU-241	90213139	Calibrated before use	-
E013	Environmental Chamber	Sanyo	MTH-4200PR	None stated	Calibrated before use	-
M1642	Thermometer	Fluke	52II	18890119	25 Apr 2017	12
S021	Dual DC power supply	Thurlby Thandar Instruments	PL330QMD	066701	Calibrated before use	-
M122	Multimeter	Fluke	77	64910017	21 Apr 2017	12

5.2.9. Transmitter Frequency Stability (Voltage Variation)

Test Summary:

Test Engineer:	Stefan Ho	**Test Date:**	11 May 2016
Test Sample Serial Number:	C7CRG02QH6DH		

FCC Reference:	Parts 2.1055 & 22.355
Test Method Used:	KDB 971168 D01 Section 9, FCC Part 2.1055 and notes below
Test Mode:	RMC

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	40

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 and Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde and 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
3.5	836.600006	6	0.0072	2.5	2.4928	Complied
4.4	836.600005	5	0.0060	2.5	2.4940	Complied

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
M1869	Wideband Radio Comms Tester	Rohde & Schwarz	CMW 500	145923	05 Apr 2017	12
S0576	Dual DC power supply	Thurlby Thandar Instruments	PL330QMD	066701	Calibrated before use	-
M122	Multimeter	Fluke	77	64910017	21 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 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
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
Frequency Stability	824 to 849 MHz	95%	±23 Hz

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	- 6 & 7 7 9 All 32 & 36	- - - - - -	At the request of the TCB: Inserted usage of sample Changed 'RFID' reference to 'NFC' Updated Sections 4.1 and 4.2 Changed 'KDB 971168' references to 'KDB 971168 D01' Inserted Notes 3 & 6
3.0	12, 13, 17 & 18	-	Corrected ßc value for HSUPA Sub-test 1
4.0	- 9	- -	At the request of the TCB: Section 4.2. Inserted Bullet 3

--- END OF REPORT ---