



TEST REPORT

Test Report No. : UL-RPT-RP10295122JD01K V2.0

Manufacturer : Sony Mobile Communications Inc.
FCC ID : PY7PM-0801
Technology : WLAN - 802.11n Only
Test Standard(s) : FCC Parts 15.209(a), 15.403(i) & 15.407

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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: 01 August 2014

Checked by:

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Engineer, Radio Laboratory

Issued by :

pp

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

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1. Customer Information

Company Name:	Sony Mobile Communications Inc.
Address:	Nya Vattentornet Mobilvägen 10 Lund 22188 Sweden

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.407 and 47CFR15.403
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) – Sections 15.403 and 15.407
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.209
Site Registration:	FCC: 209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	14 June 2014 to 17 July 2014

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.403(i)	Transmitter 26 dB Emission Bandwidth	
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.407(a)(1)(iv)	Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band)	
Part 15.407(a)(2)	Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)	
Part 15.407(a)(3)	Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band)	
Part 15.407(a)(1)(iv)	Transmitter Peak Power Spectral Density (5.15-5.25 GHz band)	
Part 15.407(a)(2)	Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)	
Part 15.407(a)(3)	Transmitter Peak Power Spectral Density (5.725-5.85 GHz band)	
Part 15.407(b)/ 15.209(a)	Transmitter Out of Band Radiated Emissions	
Part 15.407(b)/ 15.209(a)	Transmitter Band Edge Radiated Emissions	
Key to Results  = Complied  = Did not comply		

Note(s):

1. The measurement was performed to assist in the calculation of the level of average output power, power spectral density, peak excursion and emissions as the EUT employs pulsed operation.

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2009)
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	ANSI C63.10 (2009)
Title:	American National Standard for Testing Unlicensed Wireless Devices
Reference:	KDB 789033 D02 General UNII Test Procedures New Rules v01 June 6, 2014
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E

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 specifications identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Sony
IMEI:	004402452752599 (<i>Radiated sample</i>)
Serial Number:	CB5A1Z1RYU
Hardware Version Number:	A
Software Version Number:	ATPV: 1283-9868, 0_25_3_16_A
FCC ID:	PY7PM-0801

Brand Name:	Sony
IMEI:	004402452754017 (<i>Conducted sample</i>)
Serial Number:	CB5A1Z1RXW;
Hardware Version Number:	A
Software Version Number:	ATPV: 1283-9868, 0_25_3_16_A
FCC ID:	PY7PM-0801

Brand Name:	Sony
Description:	AC Charger
Model Name or Number:	EP880

Brand Name:	Monoprice
Description:	MHL Cable
Model Name or Number:	Not marked

Brand Name:	Sony
Description:	MHL Adaptor
Model Name or Number:	IM750

Brand Name:	Sony
Description:	USB Cable
Model Name or Number:	EC803

Brand Name:	Sony
Description:	Deskstand
Model Name or Number:	DK43

Identification of Equipment Under Test (EUT) (continued)

Brand Name:	Sony
Description:	PHF
Model Name or Number:	MH410c

3.2. Description of EUT

The equipment under test (EUT) was a GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac + NFC & ANT+.

The EUT supports DFS as a Client without Radar Detection.

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:	WLAN (IEEE 802.11n) / U-NII		
Type of Unit:	Transceiver		
Modulation:	BPSK, QPSK, 16QAM & 64QAM		
	802.11n HT20	MCS0 to MCS7 (1 spatial stream) GI = 800 ns or 400 ns	
	802.11n HT40	MCS0 to MCS7 (1 spatial stream) GI = 800 ns or 400 ns	
Power Supply Requirement(s):	Nominal	3.8 VDC via 120 VAC 60 Hz adaptor	
Antenna Gains:	5.15 to 5.35 GHz	-1.5 dBi	
	5.47 to 5.725 GHz	-2.9 dBi	
	5.725 to 5.85 GHz	-1.0 dBi	
Maximum Conducted Output Power:	20 MHz	16.5 dBm	
	40 MHz	13.9 dBm	
Channel Spacing:	20 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	36	5180
	Middle	40	5200
	Top	48	5240
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	52	5260
	Middle	56	5280
	Top	64	5320
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	100	5500
	Middle	116	5580
	Top	140	5700

Additional Information Related to Testing (continued)

Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	149	5745
	Middle	157	5785
	Top	165	5825
Channel Spacing:	40 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	38	5190
	Top	46	5230
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	54	5270
	Top	62	5310
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	102	5510
	Middle	110	5550
	Top	134	5670
Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	151	5755
	Top	159	5795

3.5. Support Equipment

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

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	E5410
Serial Number:	UL Number 00763

Description:	2 GB Micro SD Card
Brand Name:	SanDisk
Model Name or Number:	Not marked

Brand Name:	Logik
Description:	22" High Definition Television
Model Name or Number:	L22FE12A
Serial Number:	1309020661

Description:	Test jig
Brand Name:	Not marked
Model Name or Number:	Not marked
Serial Number:	Not marked

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Continuously transmitting with a modulated carrier at maximum power on the bottom, middle and top channels as required using the supported data rates/modulation types.

4.2. Configuration and Peripherals

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

- Controlled using a bespoke application on the laptop PC supplied by the customer. The application was used to enable continuous transmission and receive modes and to select the test channels, data rates and modulation schemes as required.
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and widest bandwidth for all bands were:
 - o Highest power
 - 802.11n HT20 – BPSK / 6.5 Mbps / MCS0 (GI = 800 ns)
 - 802.11n HT40 – BPSK / 13.5 Mbps / MCS0 (GI = 800 ns)
 - o Highest power spectral density
 - 802.11n HT20 – 16QAM / 26 Mbps / MCS3 (GI = 800 ns)
 - 802.11n HT40 – 16QAM / 81 Mbps / MCS4 (GI = 800 ns)
 - o Widest bandwidth
 - 802.11n HT20 – 16QAM / 26 Mbps / MCS3 (GI = 800 ns)
 - 802.11n HT40 – 16QAM / 81 Mbps / MCS4 (GI = 800 ns)

Pre-scan results for all modes are archived on the Company server and available for inspection if required.

- RF cables and attenuators connecting the test equipment to the EUT were calibrated before use and the calibration data incorporated into the conducted measurement results.
- Transmitter spurious emissions were performed with the EUT transmitting with a data rate of 6.5 Mbps (802.11n). This was found to be the worst case modulation scheme with regards to emissions after preliminary investigations and, as this mode emits the highest transmit output power level, it was deemed to be the worst case.
- Transmitter radiated spurious emission tests were performed with the following configurations, employing all available accessories:
 - o Configuration 1 – Handset with the AC charger, USB Cable, MHL cable (terminated in to a television), MHL adaptor and PHF
 - o Configuration 2 – Handset with the AC charger, Deskstand and PHF

Pre-scans below 1 GHz were performed in both configurations 1 and 2, with final measurements limited to the configuration which provided worst case results. Pre-scans above 1 GHz were performed in the configuration that employed the most accessories (Configuration 1), with any final measurements being performed in both configurations.

- The conducted sample with IMEI 004402452754017 was used for 26 dB bandwidth, duty cycle, maximum output power and peak power spectral density tests.
- The radiated sample with IMEI 004402452752599 was used for all other tests.

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 26 dB Emission Bandwidth

Test Summary:

Test Engineer:	Nick Steele	Test Dates:	15 July 2014 & 16 July 2014
Test Sample IMEI:	004402452754017		

FCC Reference:	Part 15.403(i)
Test Method Used:	As detailed in KDB 789033 D02 Section II.C.1.

Environmental Conditions:

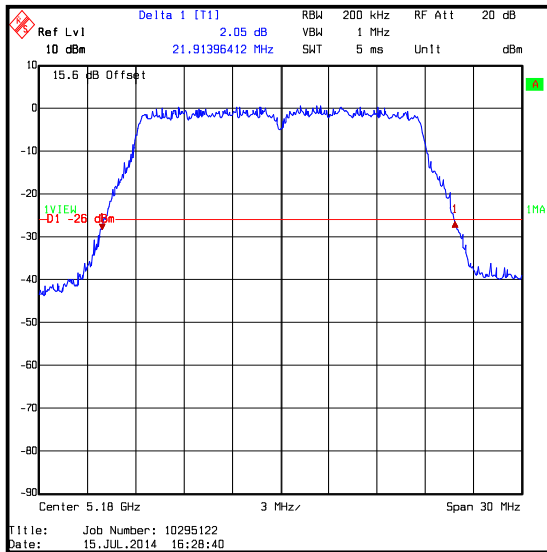
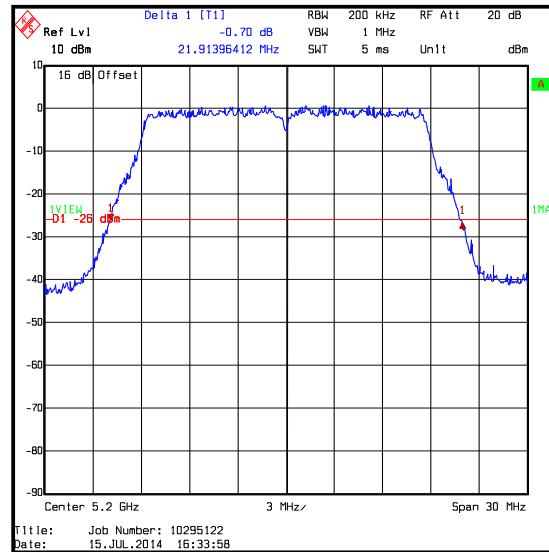
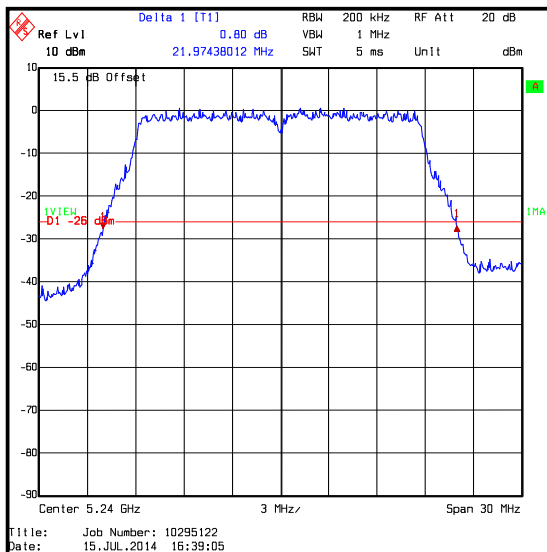
Temperatures (°C):	24 to 26
Relative Humidity (%):	36 to 40

Note(s):

1. All configurations supported by the EUT were investigated on the one channel in accordance with KDB 789033 Section II.C.1. Emission Bandwidth (EBW) test procedure. The data rates that produced the widest bandwidth and therefore deemed worst case were:
 - o 802.11n HT20 – BPSK / 6.5 Mbps / MCS0 (GI = 800 ns)
 - o 802.11n HT40 – BPSK / 13.5 Mbps / MCS0 (GI = 800 ns)
2. Final measurements were performed in each supported operating band using the above configurations on the bottom, middle and top or single channels.
3. Plots for all data rates are archived on the Company server and available for inspection upon request.
4. The test receiver was connected to the RF port on the EUT using suitable attenuation and RF cable.

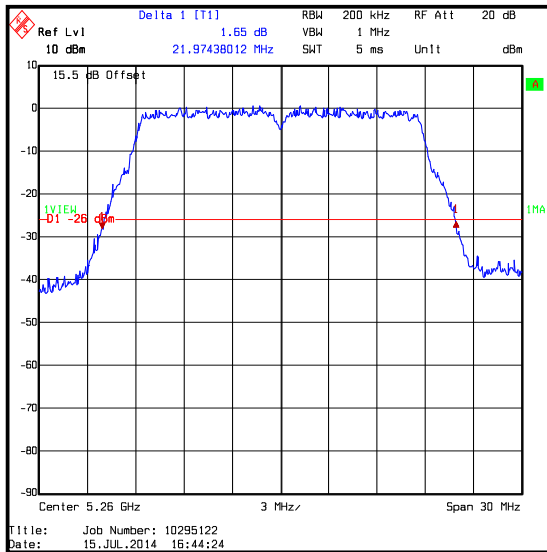
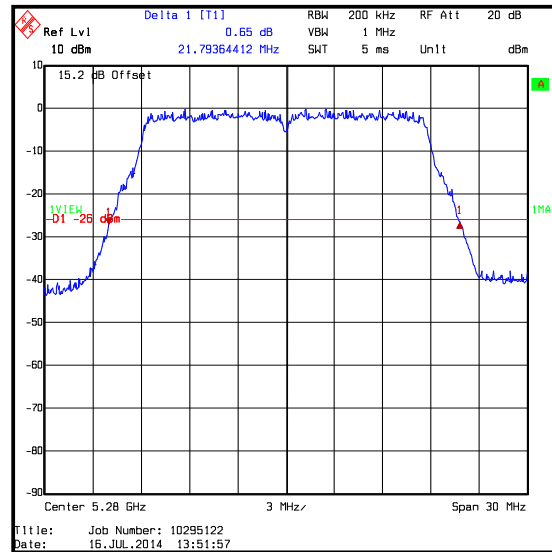
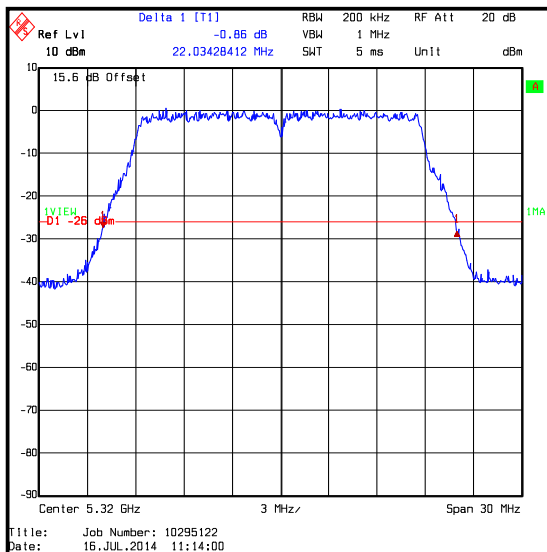
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / 5.15-5.25 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6.5 / 0	21.914
Middle	5200	BPSK	6.5 / 0	21.914
Top	5240	BPSK	6.5 / 0	21.974

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

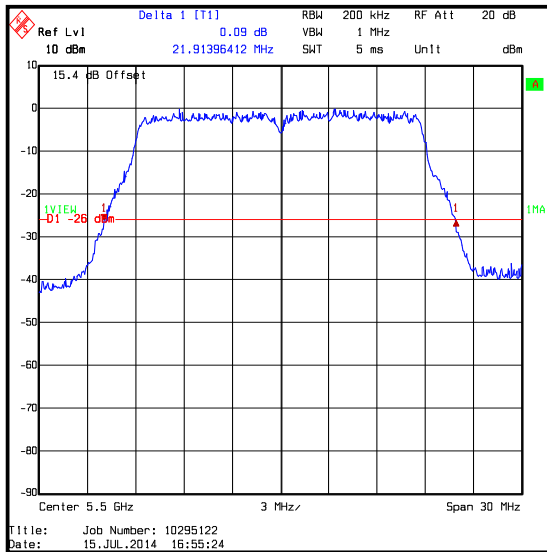
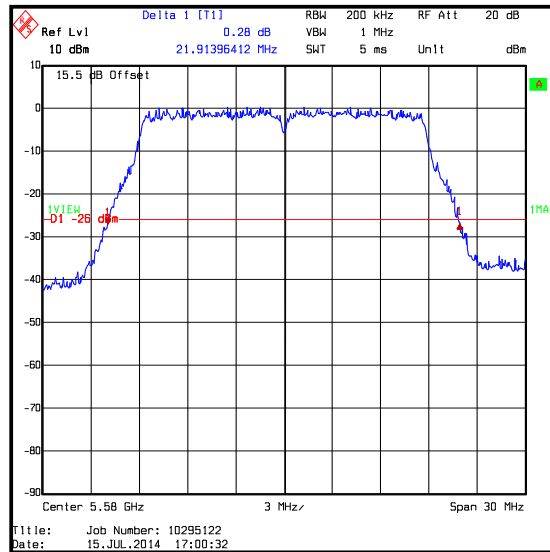
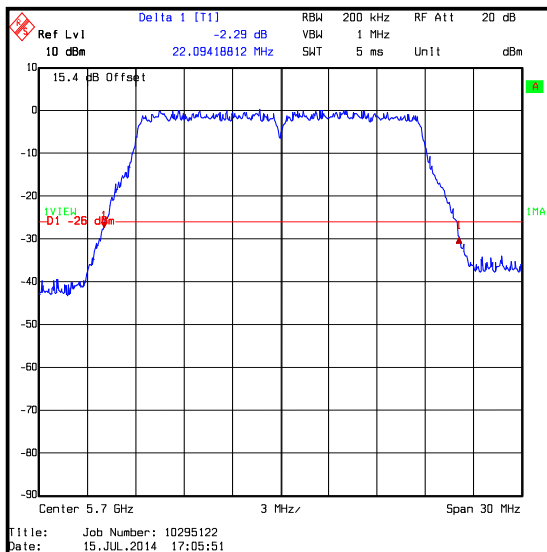
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / 5.25-5.35 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	21.974
Middle	5280	BPSK	6.5 / 0	21.794
Top	5320	BPSK	6.5 / 0	22.034

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

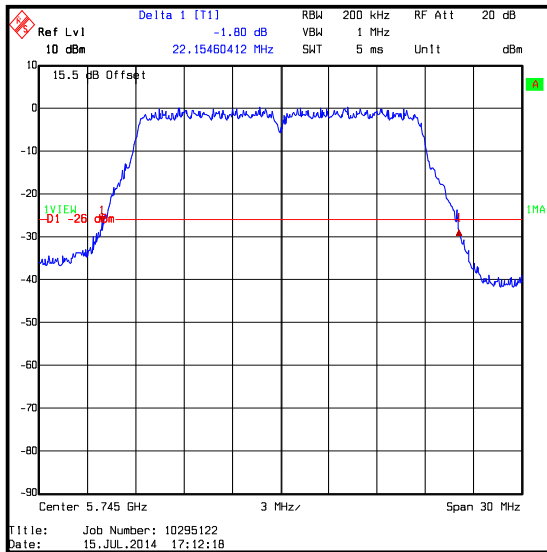
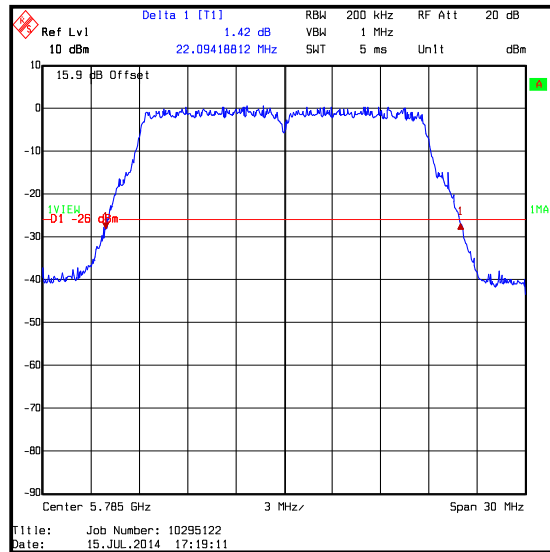
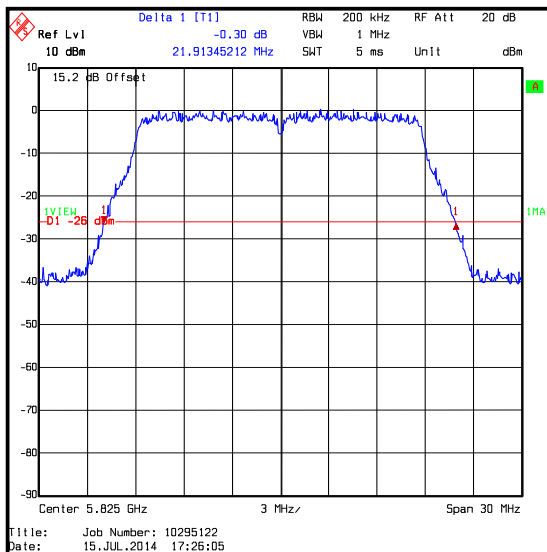
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / 5.47-5.725 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	21.914
Middle	5580	BPSK	6.5 / 0	21.914
Top	5700	BPSK	6.5 / 0	22.094

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

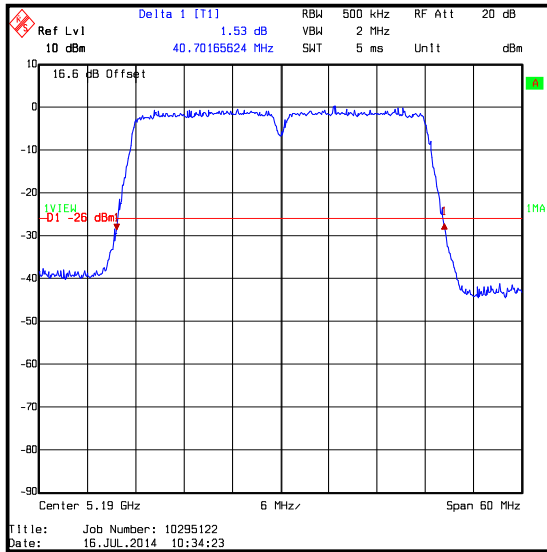
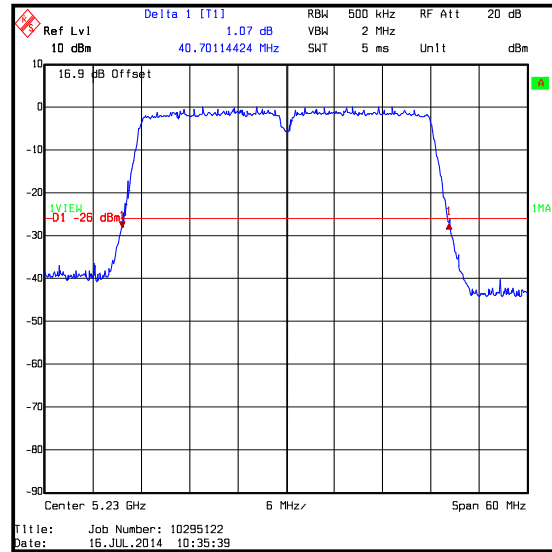
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / 5.725-5.85 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	22.155
Middle	5785	BPSK	6.5 / 0	22.094
Top	5825	BPSK	6.5 / 0	21.913

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

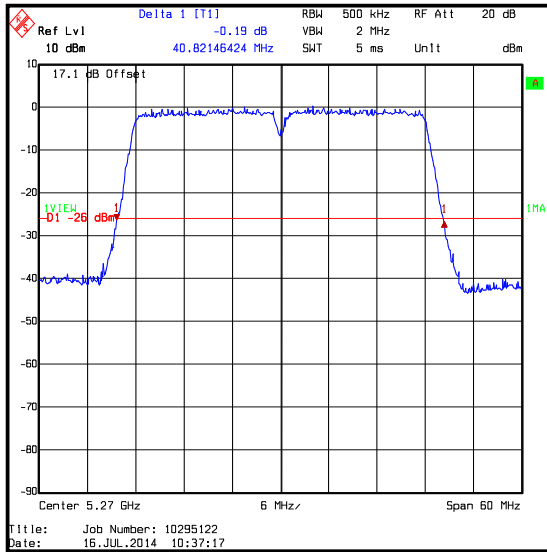
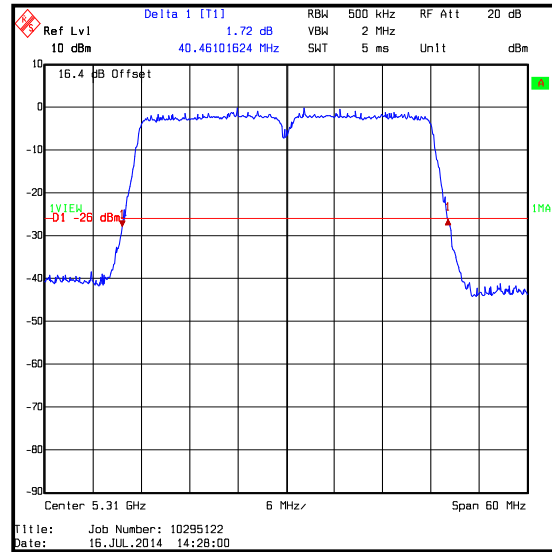
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / 5.15-5.25 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	BPSK	13.5 / 0	40.702
Top	5230	BPSK	13.5 / 0	40.701

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

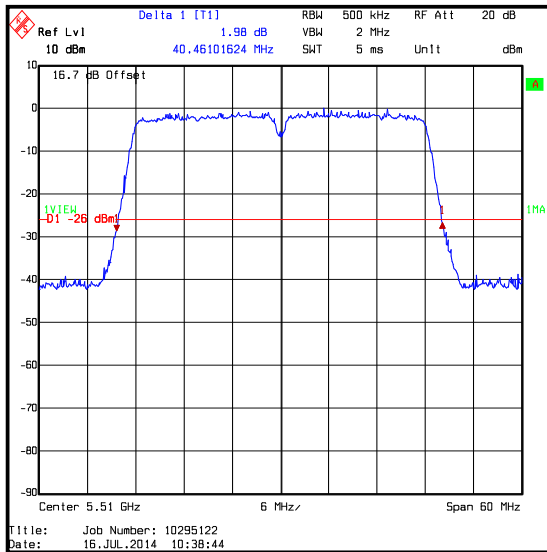
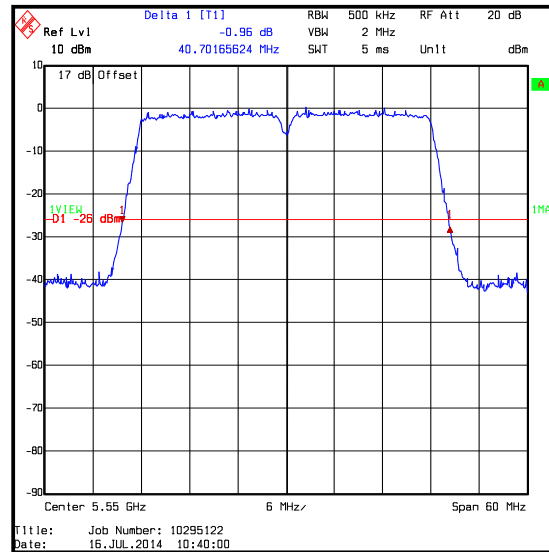
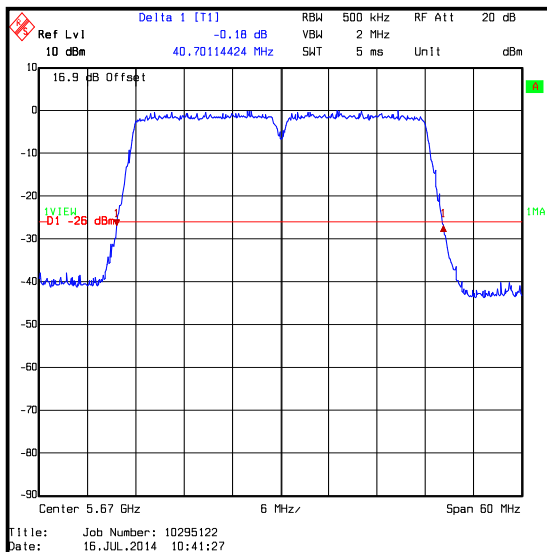
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / 5.25-5.35 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	BPSK	13.5 / 0	40.821
Top	5310	BPSK	13.5 / 0	40.461

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

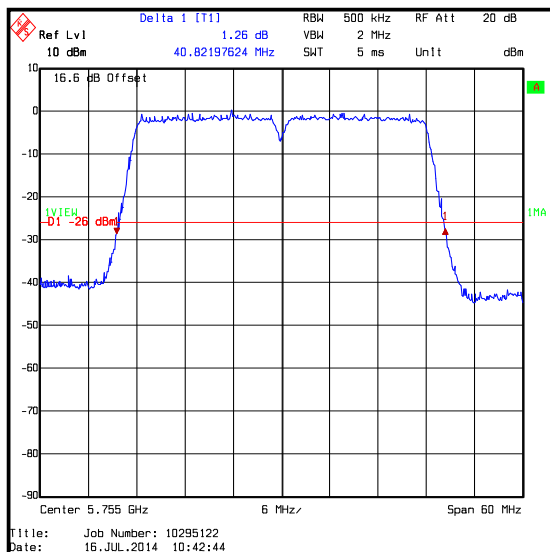
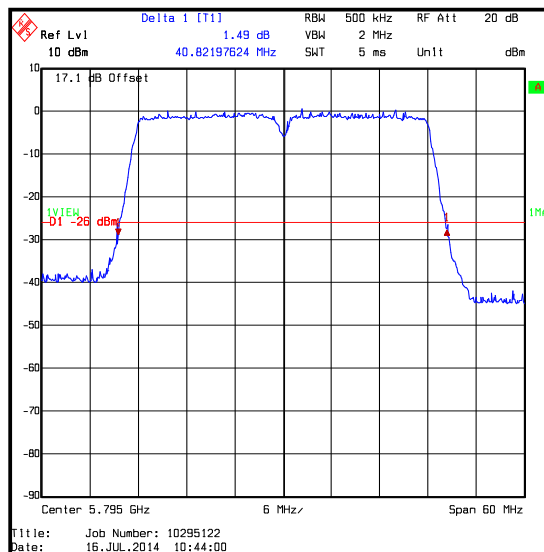
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / 5.47-5.725 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	BPSK	13.5 / 0	40.461
Middle	5550	BPSK	13.5 / 0	40.701
Top	5670	BPSK	13.5 / 0	40.701

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

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / 5.725-5.85 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	BPSK	13.5 / 0	40.822
Top	5795	BPSK	13.5 / 0	40.822

**Bottom Channel****Top 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	Not stated	14 Mar 2015	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	19 Aug 2014	12
A1999	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated before use	-
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	14 Feb 2015	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	08 Apr 2016	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	23 Apr 2016	24
A1256	Power Supply Unit	Farnell	11E30/1B	000378	Calibrated before use	-
M1229	Multimeter	Fluke	179	87640015	24 Apr 2015	12

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

Test Engineer:	Nick Steele	Test Date:	14 June 2014
Test Sample IMEI:	004402452754017		

FCC Reference:	Part 15.35(c)
Test Method Used:	As detailed in KDB 789033 D02 Section II.B.2.b)

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	45

Note(s):

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

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

$$802.11n \text{ HT20} / 26 \text{ Mbps duty cycle: } 10 \log (1 / (752.798/774.842)) = 0.1$$

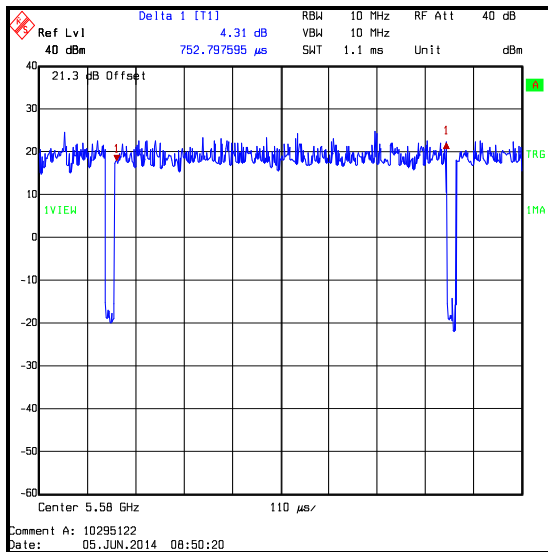
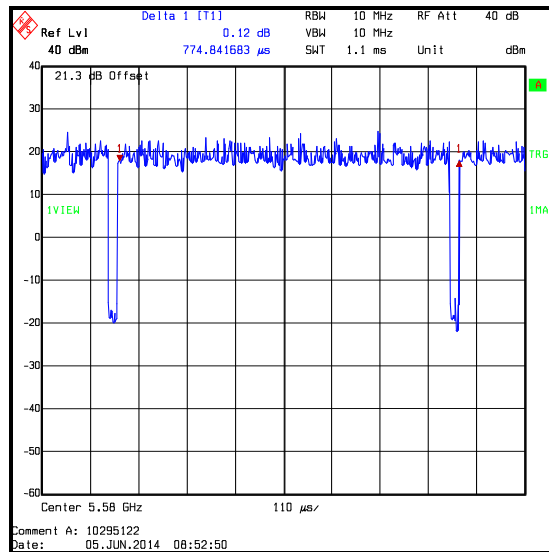
$$802.11n \text{ HT40} / 81 \text{ Mbps duty cycle: } 10 \log (1 / (269.499/290.862)) = 0.3$$

2. Plots below are for data rates with a duty cycle less than 98%. Results for all other modes are archived on the Company server and available for inspection if required.

Transmitter Duty Cycle (continued)**Results: 802.11n / 20 MHz / 26 Mbps / MCS3**

Pulse Duration (μ s)	Duty Cycle (dB)
752.798	0.1

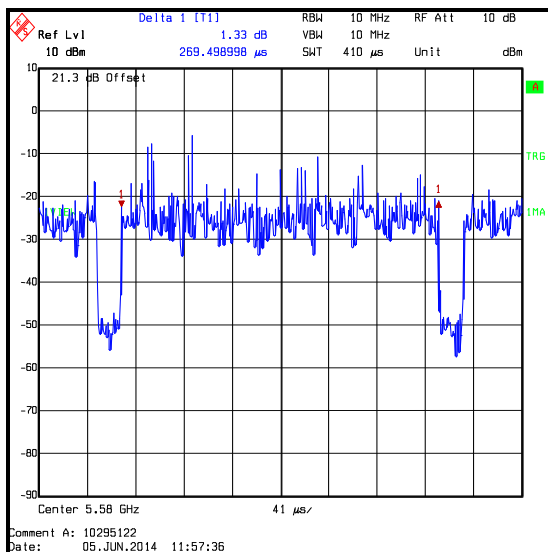
Period (μ s)
774.842

**TX on time****TX on + off time**

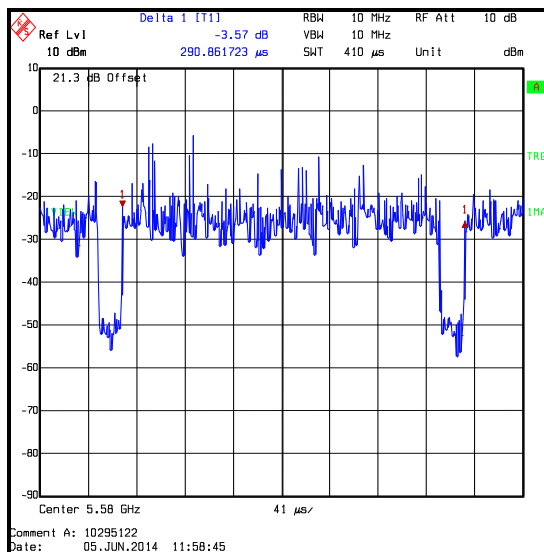
Transmitter Duty Cycle (continued)**Results: 802.11n / 40 MHz / 81 Mbps / MCS4**

Pulse Duration (μ s)	Duty Cycle (dB)
269.499	0.3

Period (μ s)
290.862



TX on time



TX on + off time

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	14 Mar 2015	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	19 Aug 2014	12
A1999	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated before use	-
A1256	Power Supply Unit	Farnell	11E30/1B	000378	Calibrated before use	-
M1229	Multimeter	Fluke	179	87640015	24 Apr 2015	12

5.2.3. Transmitter Maximum Conducted Output Power**Test Summary:**

Test Engineer:	Nick Steele	Test Dates:	15 July 2014 & 16 July 2014
Test Sample IMEI:	004402452754017		

FCC Reference:	Part 15.407(a)(1)(iv)
Test Method Used:	As detailed in KDB 789033 D02 Section II.E.2.e)

Environmental Conditions:

Temperature (°C):	24 to 26
Relative Humidity (%):	36 to 40

Note(s):

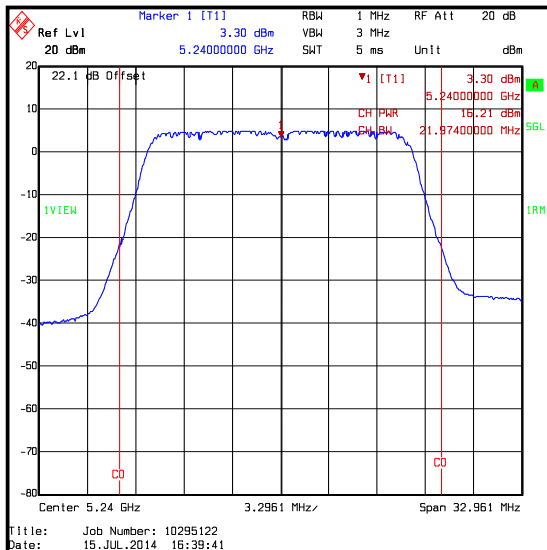
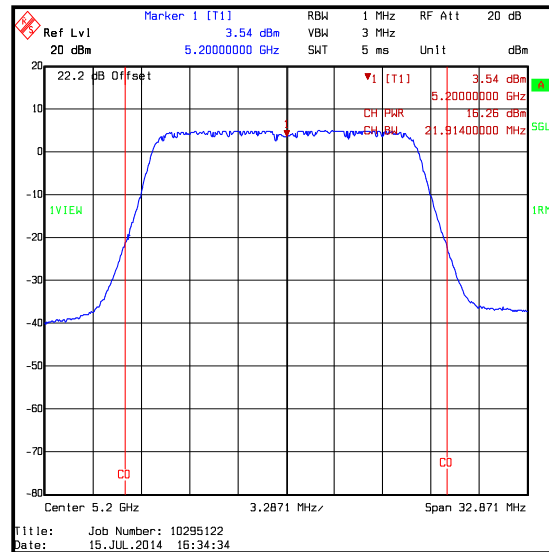
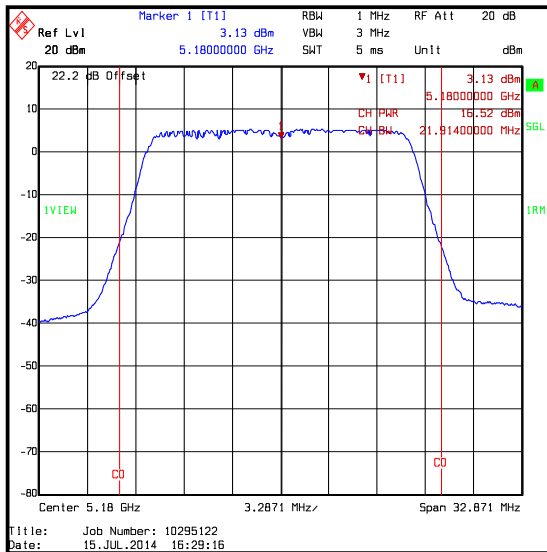
1. All conducted power tests were performed using a test receiver in accordance with KDB 789033 II.E.2.e) Method SA-2 Alternative.
2. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and therefore deemed worst case were:
 - 802.11n HT20 – BPSK / 6.5 Mbps / MCS0 (GI = 800 ns)
 - 802.11n HT40 – BPSK / 13.5 Mbps / MCS0 (GI = 800 ns)

Measurements were then performed in these modes on bottom, middle and top channels in all operating bands.

3. The EUT antenna has a gain of <6 dBi.
4. 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.
5. The Part 15.407(a)(1)(iv) limit shall not exceed 250 mW (24.0 dBm).

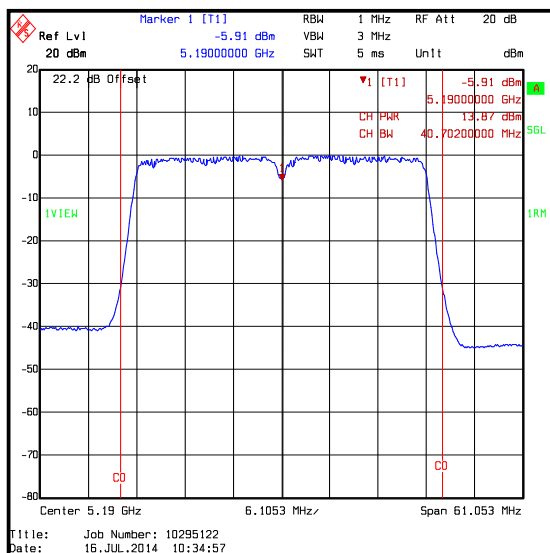
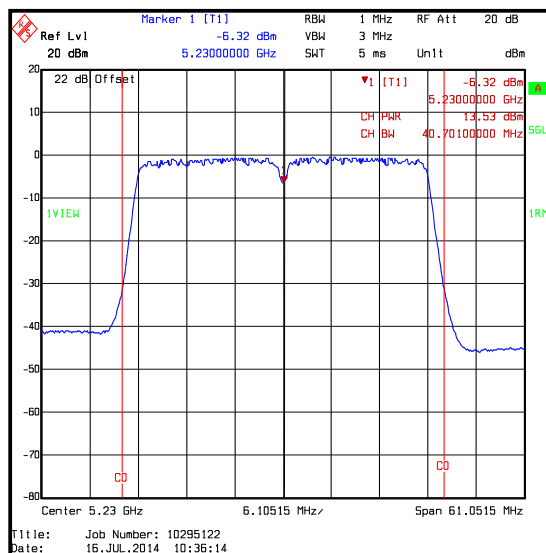
Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (continued)**Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5180	16.5	24.0	7.5	Complied
Middle	5200	16.3	24.0	7.7	Complied
Top	5240	16.2	24.0	7.8	Complied



Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (continued)**Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5190	13.9	24.0	10.1	Complied
Top	5230	13.5	24.0	10.5	Complied

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

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)**Test Summary:**

Test Engineer:	Nick Steele	Test Dates:	15 July 2014 & 16 July 2014
Test Sample IMEI:	004402452754017		

FCC Reference:	Part 15.407(a)(2)
Test Method Used:	As detailed in KDB 789033 D02 Section II.E.2.e)

Environmental Conditions:

Temperature (°C):	24 to 26
Relative Humidity (%):	36 to 40

Note(s):

1. The FCC Part 15.407(a)(2) limit is the lesser of 250 mW (24.0 dBm) or $11 \text{ dBm} + 10 \log_{10} B$, where B is the previously measured 26 dB emission bandwidth in MHz. The limit for each channel was calculated as below:

5.25-5.35 GHz band

$802.11n \text{ 20 MHz channel width / Bottom channel} = 11 \text{ dBm} + 10 \log_{10} 21.974 = 24.4 \text{ dBm}$
 $802.11n \text{ 20 MHz channel width / Middle channel} = 11 \text{ dBm} + 10 \log_{10} 21.794 = 24.4 \text{ dBm}$
 $802.11n \text{ 20 MHz channel width / Top channel} = 11 \text{ dBm} + 10 \log_{10} 22.034 = 24.4 \text{ dBm}$
 $802.11n \text{ 40 MHz channel width / Bottom channel} = 11 \text{ dBm} + 10 \log_{10} 40.821 = 27.1 \text{ dBm}$
 $802.11n \text{ 40 MHz channel width / Top channel} = 11 \text{ dBm} + 10 \log_{10} 40.461 = 27.1 \text{ dBm}$

5.47-5.725 GHz band

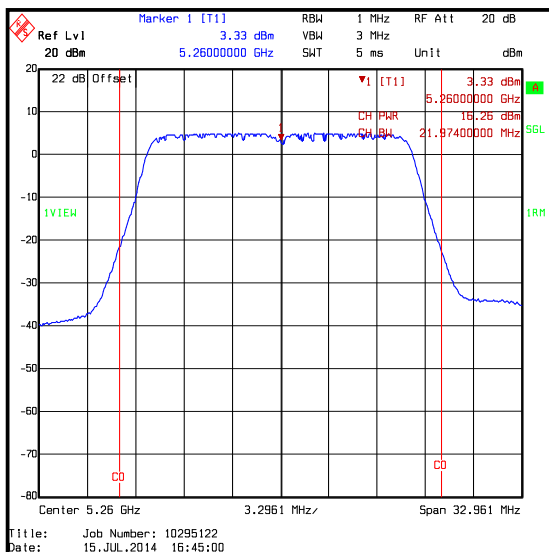
$802.11n \text{ 20 MHz channel width / Bottom channel} = 11 \text{ dBm} + 10 \log_{10} 21.914 = 24.4 \text{ dBm}$
 $802.11n \text{ 20 MHz channel width / Middle channel} = 11 \text{ dBm} + 10 \log_{10} 21.914 = 24.4 \text{ dBm}$
 $802.11n \text{ 20 MHz channel width / Top channel} = 11 \text{ dBm} + 10 \log_{10} 22.094 = 24.4 \text{ dBm}$
 $802.11n \text{ 40 MHz channel width / Bottom channel} = 11 \text{ dBm} + 10 \log_{10} 40.461 = 27.1 \text{ dBm}$
 $802.11n \text{ 40 MHz channel width / Middle channel} = 11 \text{ dBm} + 10 \log_{10} 40.701 = 27.1 \text{ dBm}$
 $802.11n \text{ 40 MHz channel width / Top channel} = 11 \text{ dBm} + 10 \log_{10} 40.701 = 27.1 \text{ dBm}$

The lesser of the two limits is the fixed limit of 250 mW (24.0 dBm). This was applied to the results.

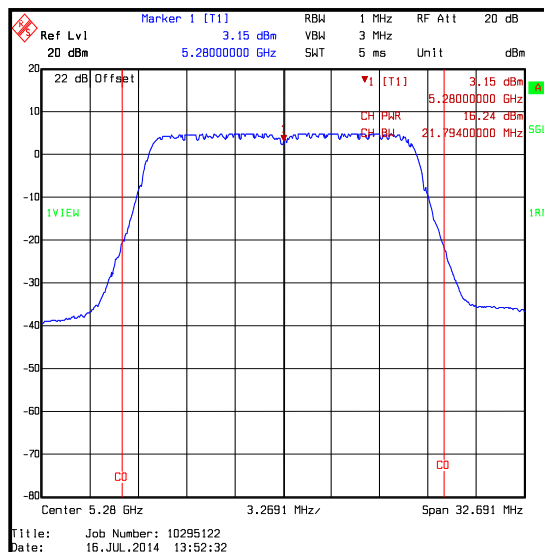
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0 / 5.25-5.35 GHz band

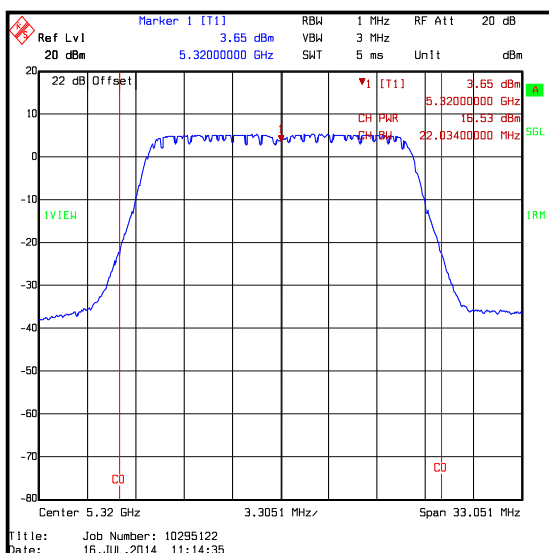
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	16.3	24.0	7.7	Complied
Middle	5280	16.2	24.0	7.8	Complied
Top	5320	16.5	24.0	7.5	Complied



Bottom Channel



Middle Channel

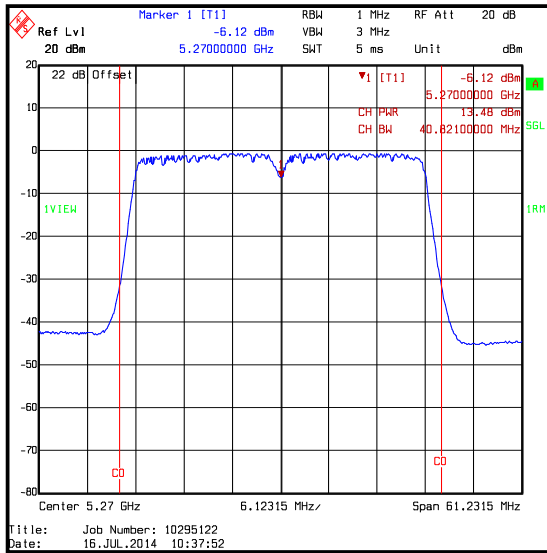


Top Channel

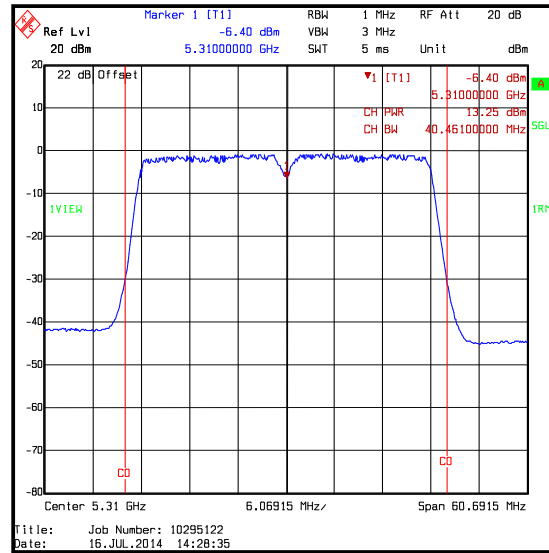
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5270	13.5	24.0	10.5	Complied
Top	5310	13.3	24.0	10.7	Complied



Bottom Channel

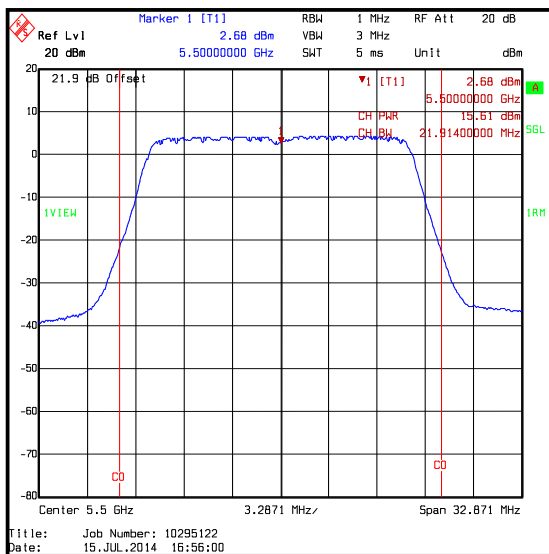


Top Channel

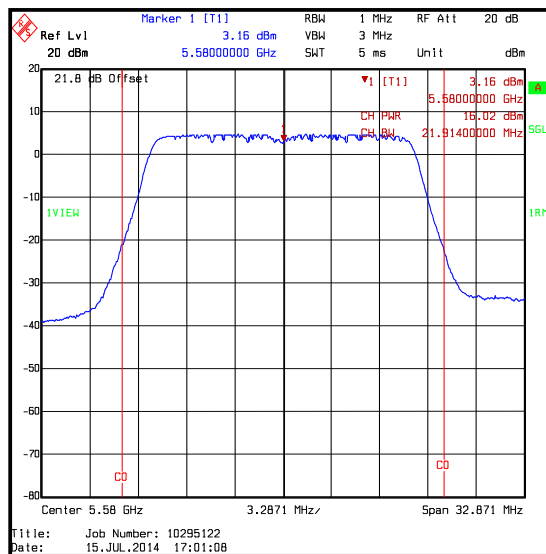
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0 / 5.47-5.725 GHz band

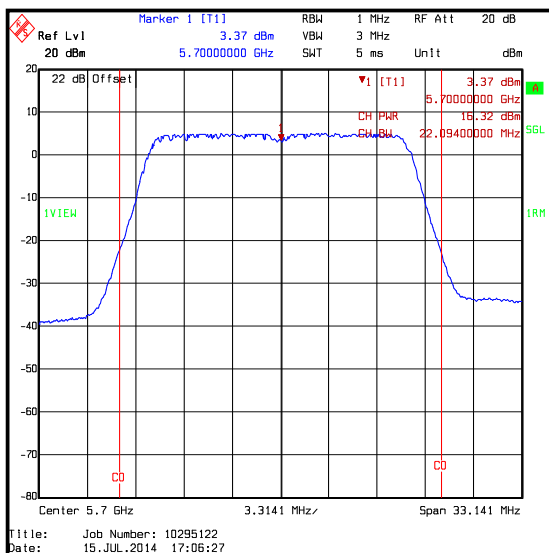
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	15.6	24.0	8.4	Complied
Middle	5580	16.0	24.0	8.0	Complied
Top	5700	16.3	24.0	7.7	Complied



Bottom Channel



Middle Channel

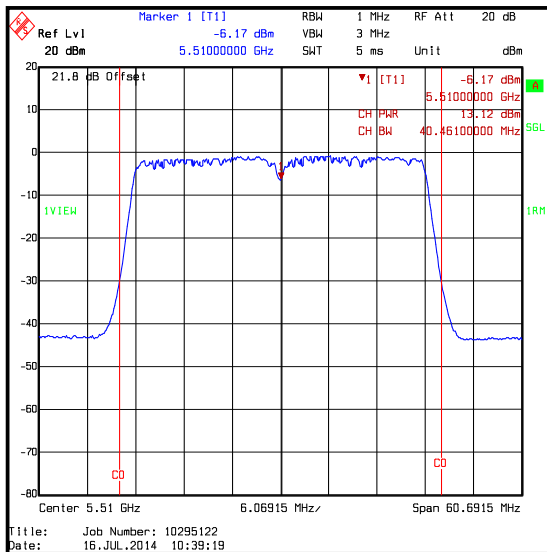


Top Channel

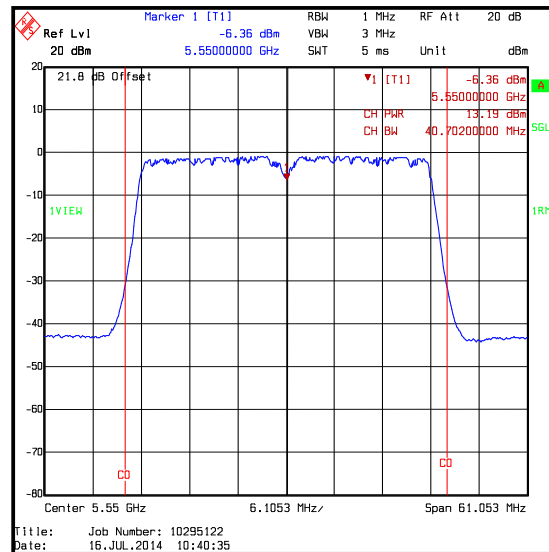
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0 / 5.47-5.725 GHz band

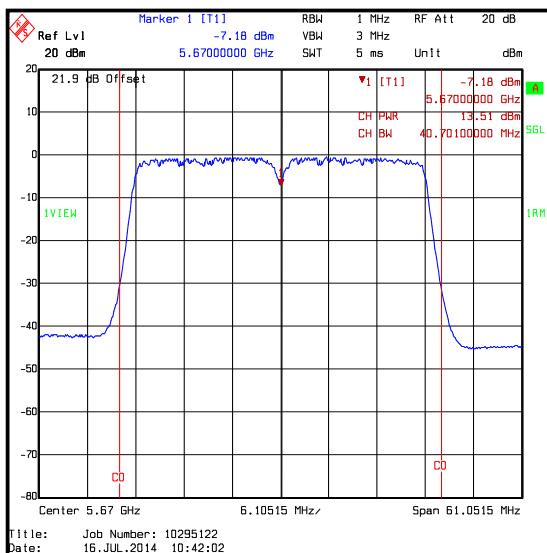
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5510	13.1	24.0	10.9	Complied
Middle	5550	13.2	24.0	10.8	Complied
Top	5670	13.5	24.0	10.5	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band)**Test Summary:**

Test Engineer:	Nick Steele	Test Dates:	15 July 2014 & 16 July 2014
Test Sample IMEI:	004402452754017		

FCC Reference:	Part 15.407(a)(3)
Test Method Used:	As detailed in KDB 789033 D02 Section II.E.2.e)

Environmental Conditions:

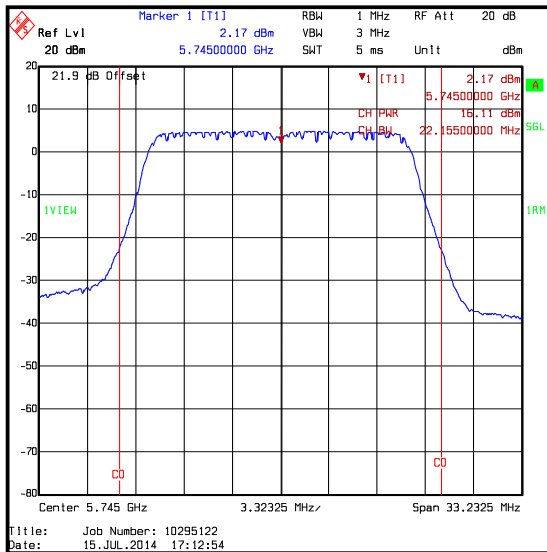
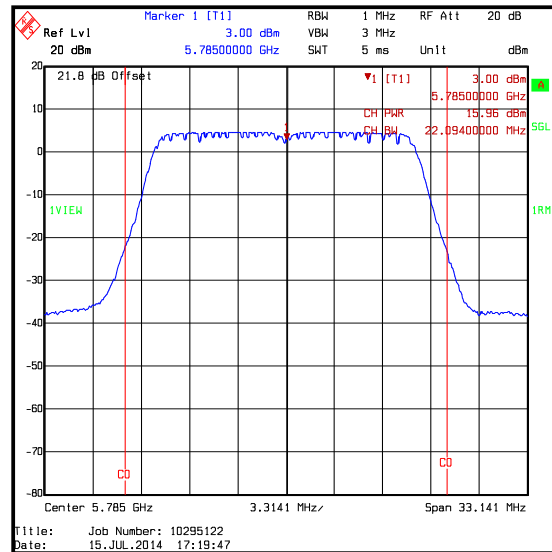
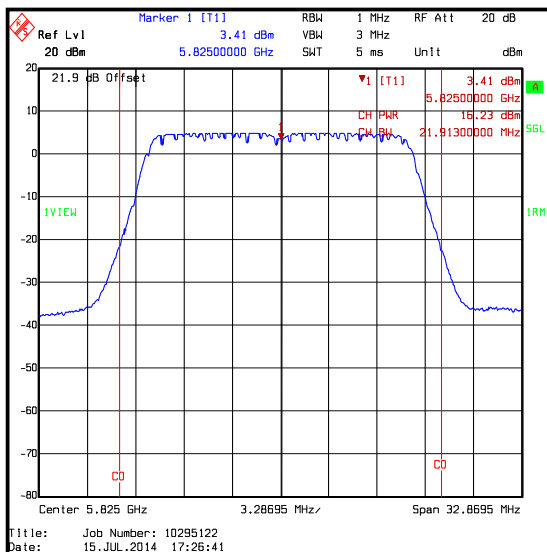
Temperature (°C):	24 to 26
Relative Humidity (%):	36 to 40

Note(s):

1. The FCC Part 15.407(a)(3) limit shall not exceed 1 W (30.0 dBm).

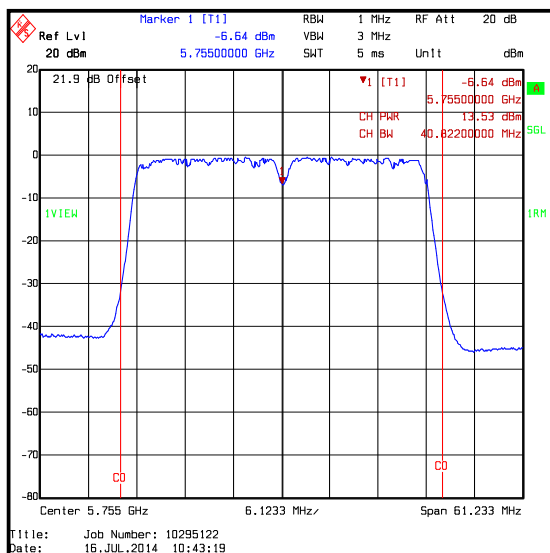
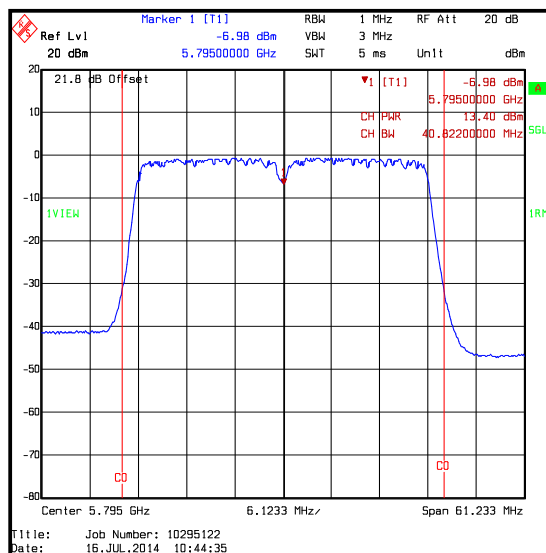
Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)**Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	16.1	30.0	13.9	Complied
Middle	5785	16.0	30.0	14.0	Complied
Top	5825	16.2	30.0	13.8	Complied

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

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)**Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5755	13.5	30.0	16.5	Complied
Top	5795	13.4	30.0	16.6	Complied

**Bottom Channel****Top 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	Not stated	14 Mar 2015	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	19 Aug 2014	12
A1999	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated before use	-
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	14 Feb 2015	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	08 Apr 2016	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	23 Apr 2016	24
A1256	Power Supply Unit	Farnell	11E30/1B	000378	Calibrated before use	-
M1229	Multimeter	Fluke	179	87640015	24 Apr 2015	12

5.2.4. Transmitter Maximum Power Spectral Density**Test Summary:**

Test Engineer:	Nick Steele	Test Date:	15 July 2014
Test Sample IMEI:	004402452754017		

FCC Reference:	Part 15.407(a)(1)(iv)
Test Method Used:	As detailed in KDB 789033 D02 Section II.F. referencing II.E.2.e)

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	36

Note(s):

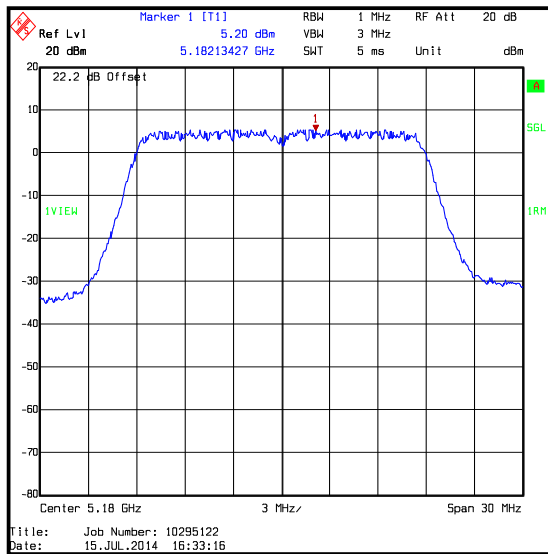
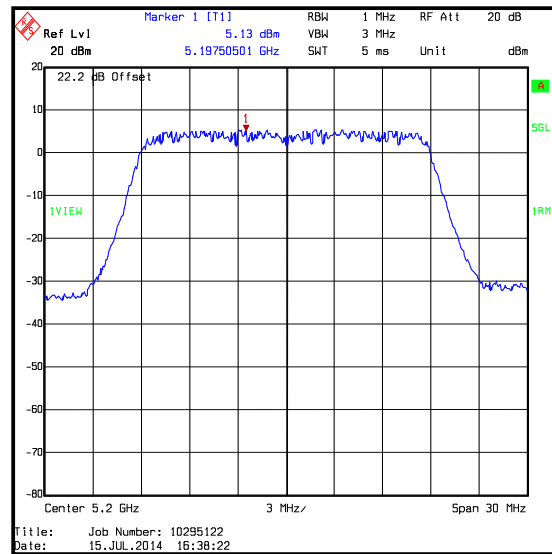
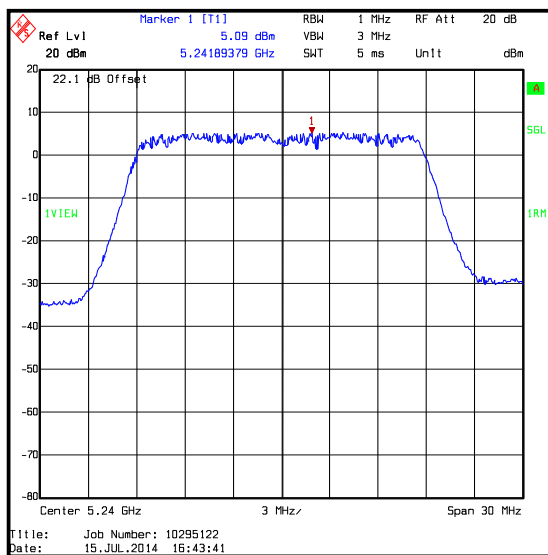
1. Transmitter Maximum Power Spectral Density tests in all bands were performed using a test receiver in accordance with KDB 789033 II. F referencing II.E.2.e) Method SA-2 Alternative.
2. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and therefore deemed worst case were:
 - o 802.11n HT20 – 16QAM / 26 Mbps / MCS3 (GI = 800 ns)
 - o 802.11n HT40 – 16QAM / 81 Mbps / MCS4 (GI = 800 ns)

Measurements were then performed in these modes on bottom, middle and top channels in all operating bands.

3. For data rates where the EUT was transmitting at <98% duty cycle, the calculated duty cycle in section 5.2.2 was added to the measured maximum power spectral density in order to compute the average maximum power spectral density during the actual transmission time.
4. The EUT antenna has a gain of <6 dBi.
5. 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.

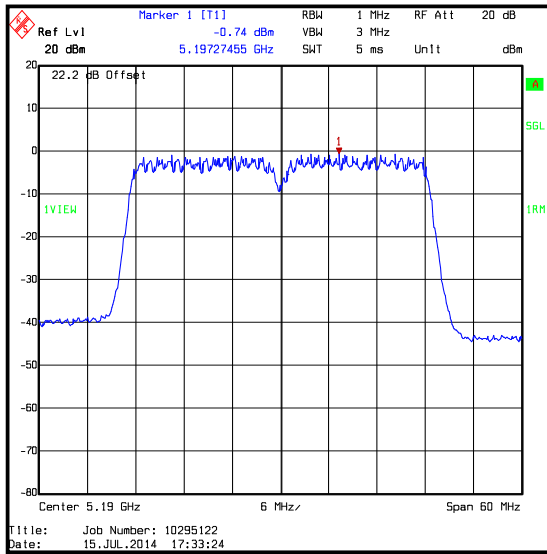
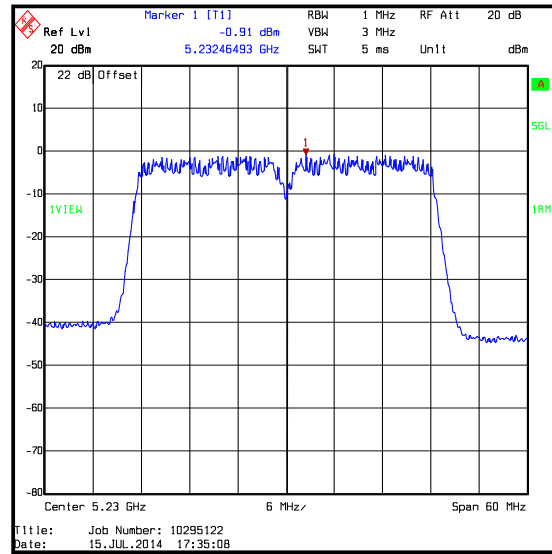
Transmitter Maximum Power Spectral Density (5.15-5.25 GHz band) (continued)**Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3**

Channel	Frequency (MHz)	PPSD (dBm /MHz)	Duty cycle correction factor (dB)	Corrected PPSP (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5180	5.2	0.1	5.3	11.0	5.7	Complied
Middle	5200	5.1	0.1	5.2	11.0	5.8	Complied
Top	5240	5.1	0.1	5.2	11.0	5.8	Complied

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

Transmitter Maximum Power Spectral Density (5.15-5.25 GHz band) (continued)**Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4**

Channel	Frequency (MHz)	PPSD (dBm /MHz)	Duty cycle correction	Corrected PPSP (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5190	-0.7	0.3	-0.4	11.0	11.4	Complied
Top	5230	-0.9	0.3	-0.6	11.0	11.6	Complied

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

Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)**Test Summary:**

Test Engineer:	Nick Steele	Test Dates:	15 July 2014 & 16 July 2014
Test Sample IMEI:	004402452754017		

FCC Reference:	Part 15.407(a)(2)
Test Method Used:	As detailed in KDB 789033 D02 Section II.F. referencing II.E.2.e)

Environmental Conditions:

Temperature (°C):	24 to 26
Relative Humidity (%):	36 to 40

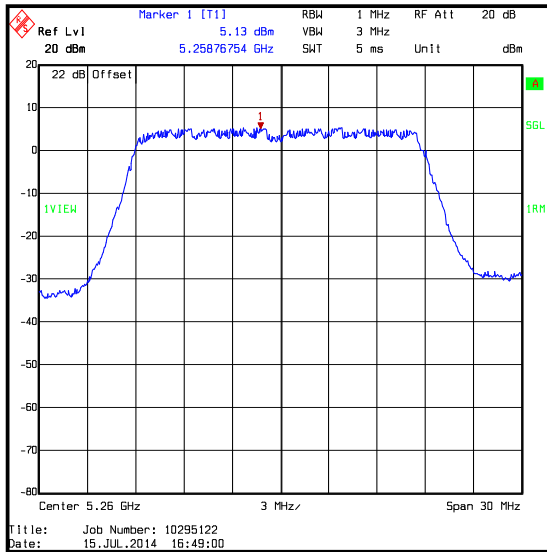
Note(s):

1. FCC Part 15.407(a)(2) limit for PPSD in the 5.25-5.35 GHz and 5.47-5.725 GHz operating bands is <11 dBm/MHz.

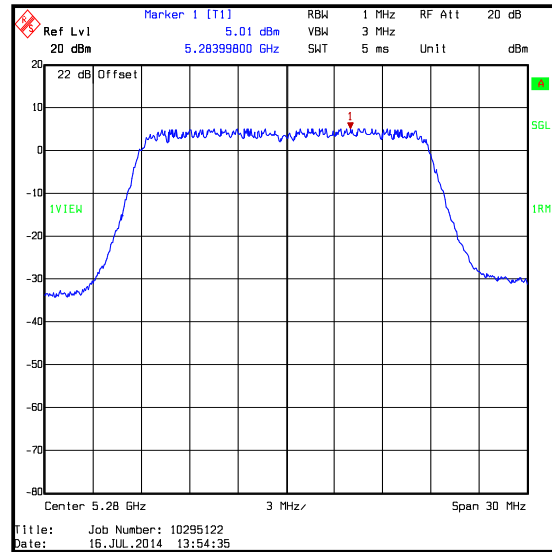
Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3 / 5.25-5.35 GHz band

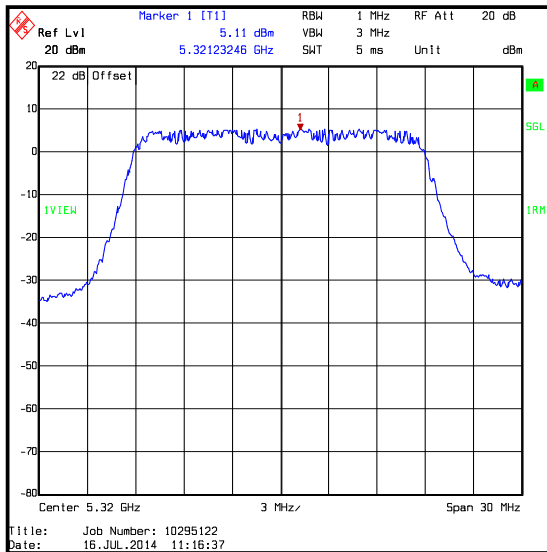
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Duty cycle correction factor (dB)	Corrected PPSP (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5260	5.1	0.1	5.2	11.0	5.8	Complied
Middle	5280	5.0	0.1	5.1	11.0	5.9	Complied
Top	5320	5.1	0.1	5.2	11.0	5.8	Complied



Bottom Channel



Middle Channel

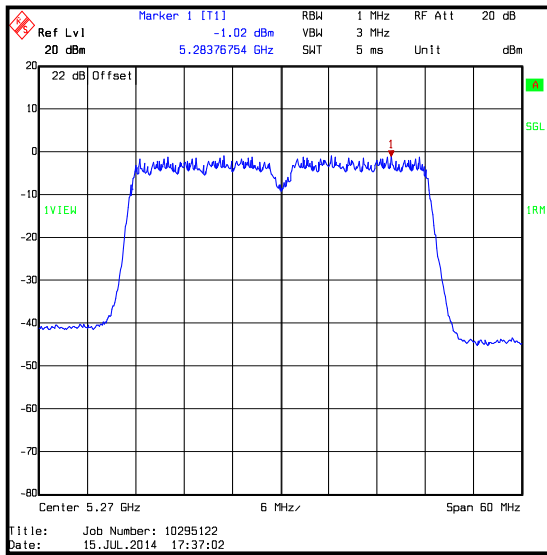


Top Channel

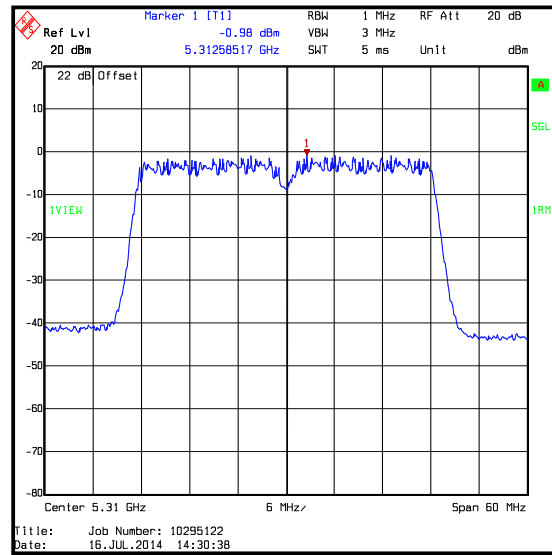
Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	PPSD (dBm /MHz)	Duty cycle correction factor (dB)	Corrected PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5270	-1.0	0.3	-0.7	11.0	11.7	Complied
Top	5310	-1.0	0.3	-0.7	11.0	11.7	Complied



Bottom Channel

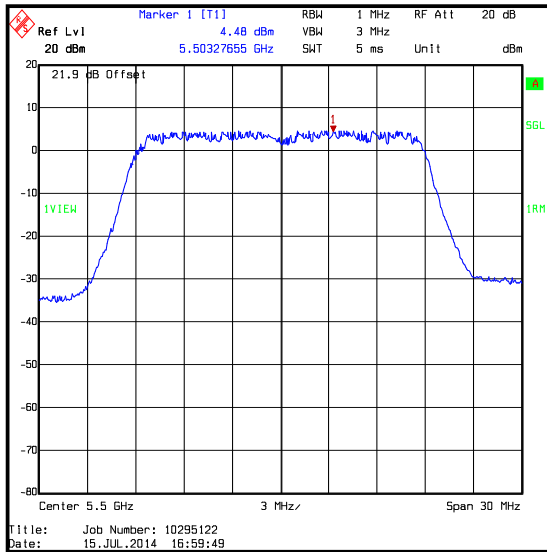


Top Channel

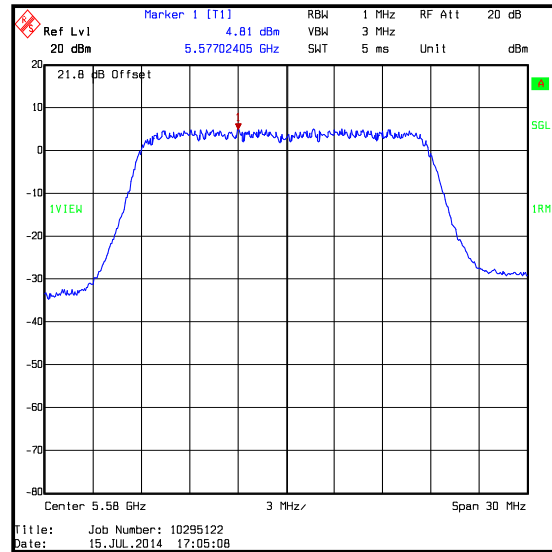
Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3 / 5.47-5.725 GHz band

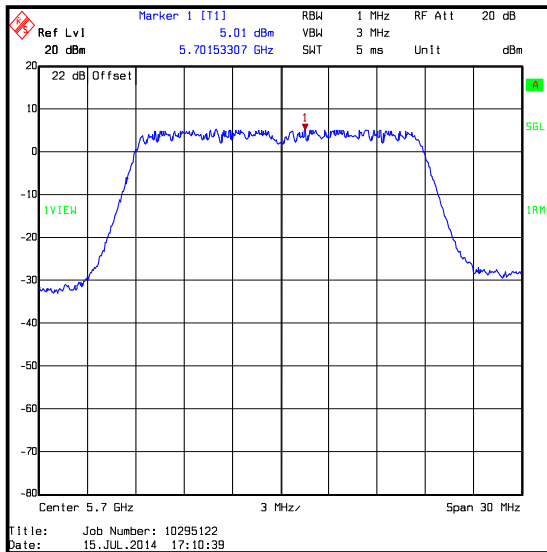
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Duty cycle correction factor (dB)	Corrected PPSP (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5500	4.5	0.1	4.6	11.0	6.4	Complied
Middle	5580	4.8	0.1	4.9	11.0	6.1	Complied
Top	5700	5.0	0.1	5.1	11.0	5.9	Complied



Bottom Channel



Middle Channel

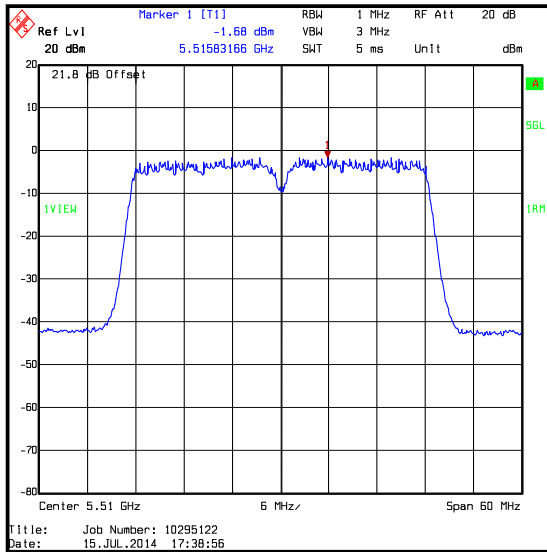


Top Channel

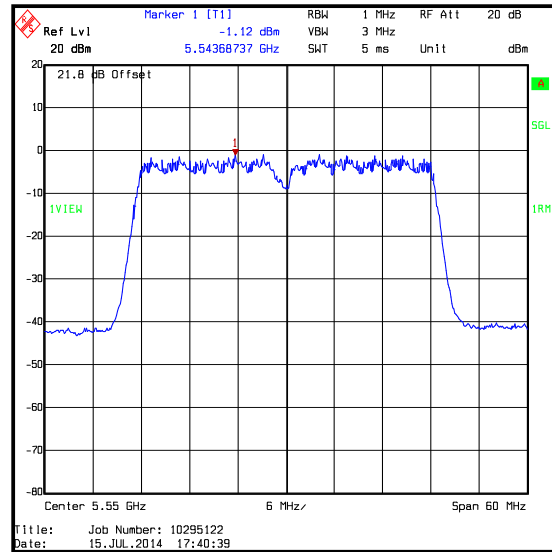
Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4 / 5.47-5.725 GHz band

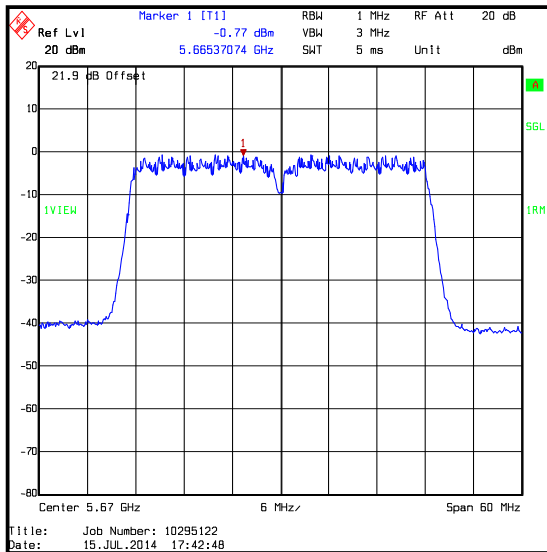
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Duty cycle correction factor (dB)	Corrected PPSP (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5510	-1.7	0.3	-1.4	11.0	12.4	Complied
Middle	5550	-1.1	0.3	-0.8	11.0	11.8	Complied
Top	5670	-0.8	0.3	-0.5	11.0	11.5	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Power Spectral Density (5.725-5.85 GHz band)**Test Summary:**

Test Engineer:	Nick Steele	Test Date:	15 July 2014
Test Sample IMEI:	004402452754017		

FCC Reference:	Part 15.407(a)(3)
Test Method Used:	As detailed in KDB 789033 D02 Section II.F. referencing II.E.2.e)

Environmental Conditions:

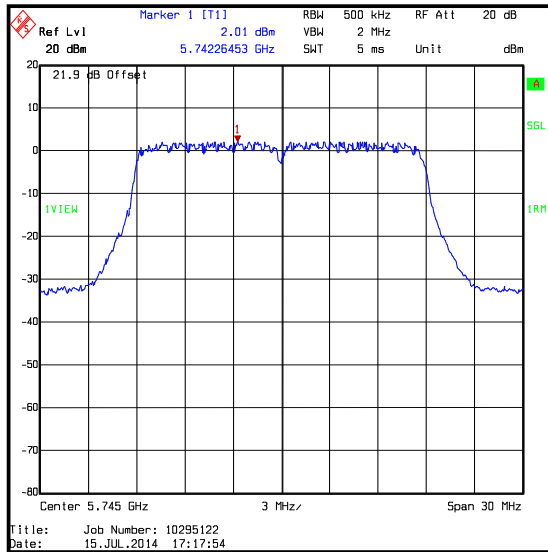
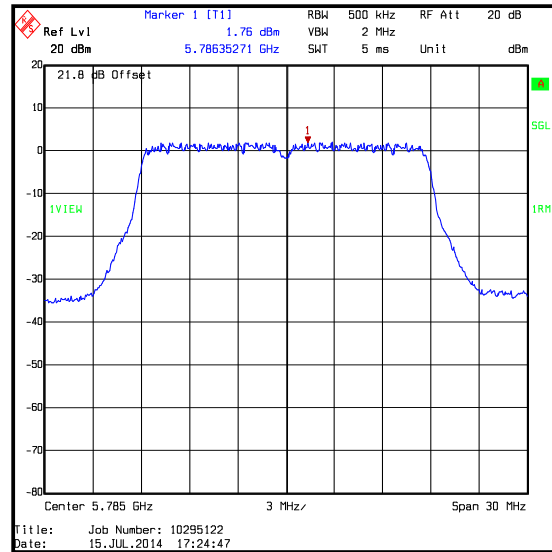
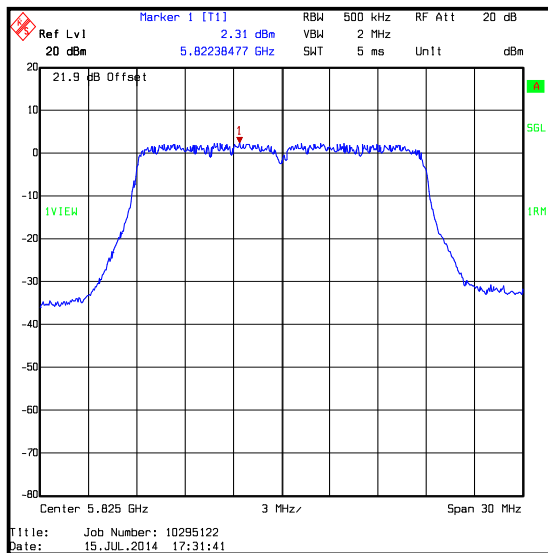
Temperature (°C):	26
Relative Humidity (%):	36

Note(s):

1. FCC Part 15.407(a)(3) limit for PPSD in the 5.725-5.85 GHz operating band is <30 dBm/500 kHz.

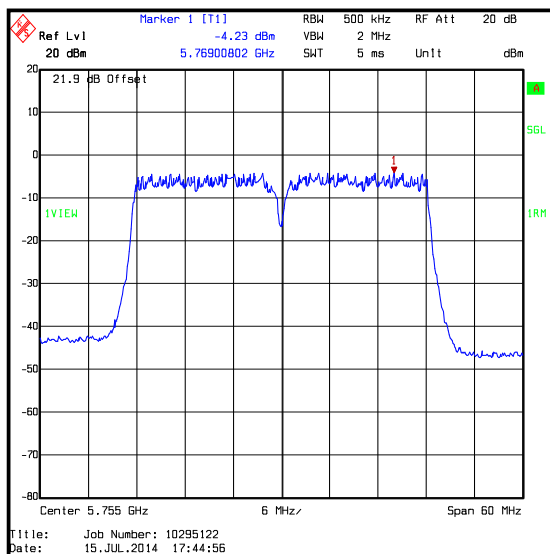
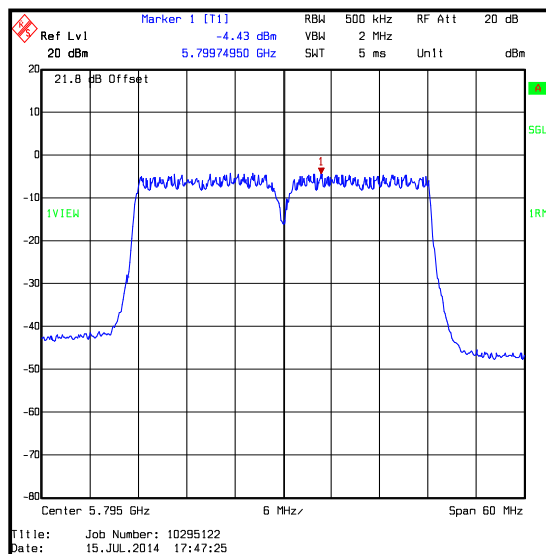
Transmitter Maximum Power Spectral Density (5.725-5.85 GHz band) (continued)**Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3**

Channel	Frequency (MHz)	PPSD (dBm / 500 kHz)	Duty cycle correction factor (dB)	Corrected PPSD (dBm / 500 kHz)	Limit (dBm / 500 kHz)	Margin (dB)	Result
Bottom	5745	2.0	0.1	2.1	30.0	27.9	Complied
Middle	5785	1.8	0.1	1.9	30.0	28.1	Complied
Top	5825	2.3	0.1	2.4	30.0	27.6	Complied

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

Transmitter Maximum Power Spectral Density (5.725-5.85 GHz band) (continued)**Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4**

Channel	Frequency (MHz)	PPSD (dBm / 500 kHz)	Duty cycle correction factor (dB)	Corrected PPSD (dBm / 500 kHz)	Limit (dBm / 500 kHz)	Margin (dB)	Result
Bottom	5755	-4.2	0.3	-3.9	30.0	33.9	Complied
Top	5795	-4.4	0.3	-4.1	30.0	34.1	Complied

**Bottom Channel****Top 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	Not stated	14 Mar 2015	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	19 Aug 2014	12
A1999	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated before use	-
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	14 Feb 2015	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	08 Apr 2016	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	23 Apr 2016	24
A1256	Power Supply Unit	Farnell	11E30/1B	000378	Calibrated before use	-
M1229	Multimeter	Fluke	179	87640015	24 Apr 2015	12

5.2.5. Transmitter Out of Band Radiated Emissions**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	17 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Parts 15.407(b)(2),(6),(7) & 15.209(a)
Test Method Used:	FCC KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

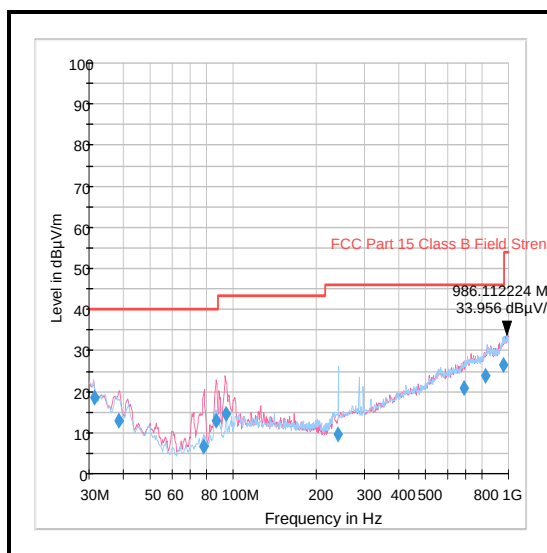
Temperature (°C):	26
Relative Humidity (%):	34

Note(s):

1. Measurements below 1 GHz were limited to the 5.25-5.35 GHz band, the EUT was transmitting with a data rate of 6.5 Mbps (802.11n HT20) as it produced the highest conducted output power and was therefore deemed worst case.
2. Pre-scans with the EUT transmitting on the top channel were measured according to FCC Part 15.407(b)(2) which states for transmitters operating in the band 5.25 to 5.35 GHz: all emissions outside of the band 5.15-5.35 GHz band shall not exceed -27 dBm/MHz. Part(b)(6) states unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209. Part(b)(7) states the provisions of 15.205 apply, e.g. restricted bands of operation.
3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
4. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
5. In accordance with FCC part 15.33, pre-scans were performed from 9 kHz to 30 MHz. As there were no emissions observed within 20 dB of the limit, in accordance with 15.31(o), no pre-scans are included in this test report. The pre-scans are kept on file and available upon request.
6. All emissions shown on the pre-scan plots were found to be below the measurement system noise floor or ambient, therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below.
7. 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.

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: Top Channel / Field Strength**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
986.112	Vertical	34.0	54.0	20.0	Complied

**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

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	17 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Part 15.407(b)(1),(7) & 15.209(a)
Test Method Used:	As detailed in KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	46

Note(s):

1. FCC Part 15.407(b)(1) states for transmitters operating in the band 5.15 to 5.25 GHz: all emissions outside of the band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Pre-scans were performed with the EUT transmitting on top channel in the 5.25 to 5.35 GHz band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emissions seen in each band.
3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
4. Appropriate RF filters and attenuators were used during pre-scans and final measurements. Insertion losses were entered on the spectrum analyser as RF levels offsets.
5. *In accordance with KDB 789033 Section II.G.1.c) if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.
6. The second harmonic can be seen on the pre-scan plot 8 to 12.75 GHz when the EUT is transmitting on top channel in the 5.25 to 5.35 band. This harmonic was investigated for this band and found to be below the measurement noise floor on bottom, middle and top channels.
7. All other emissions shown on the pre-scan plots were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
8. 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.

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: Bottom Channel / EIRP**

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5387.692	Vertical	-46.0	-27.0	19.0	Complied
8636.458	Horizontal	-45.6	-27.0	18.6	Complied
15536.955	Horizontal	-37.7	-27.0	10.7	Complied

Results: Bottom Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5387.692	Vertical	49.2	54.0*	4.8	Complied
15536.955	Horizontal	57.5	74.0	16.5	Complied

Results: Bottom Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
15536.955	Horizontal	43.3	54.0	10.7	Complied

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5419.904	Vertical	-46.0	-27.0	19.0	Complied
8663.822	Horizontal	-45.9	-27.0	18.9	Complied
15596.154	Horizontal	-39.4	-27.0	12.4	Complied

Results: Middle Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5419.904	Vertical	49.2	54.0*	4.8	Complied
15596.154	Horizontal	55.8	74.0	18.2	Complied

Results: Middle Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
15599.840	Horizontal	42.5	54.0	11.5	Complied

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: Top Channel / EIRP**

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5451.282	Vertical	-45.1	-27.0	18.1	Complied
8737.099	Horizontal	-45.6	-27.0	18.6	Complied
15712.788	Horizontal	-39.4	-27.0	12.4	Complied

Results: Top Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5451.282	Vertical	50.1	54.0*	3.9	Complied
15712.788	Horizontal	55.8	74.0	18.2	Complied

Results: Top Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
15719.840	Horizontal	42.3	54.0	11.7	Complied

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	17 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Part 15.407(b)(2),(7) & 15.209(a)
Test Method Used:	As detailed in KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	49

Note(s):

1. FCC Part 15.407(b)(2) states for transmitters operating in the band 5.25 to 5.35 GHz: all emissions outside of the 5.15-5.35 GHz band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Pre-scans were performed with the EUT transmitting on the top channel in this band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power (802.11nHT20 / 6.5 Mbps) and all final measurements should be performed on any emission seen for each band.
3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
4. Appropriate RF filters and attenuators were used during pre-scans and final measurements. Insertion losses were entered on the spectrum analyser as RF levels offsets.
5. The emission shown on the 4 GHz to 6 GHz plot is the EUT fundamental.
6. *In accordance with KDB 789033 Section II.G.1.c) if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.
7. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
8. Pre-scan plots 4 to 6 GHz and the two restricted band plots (4.5 to 5.15 and 5.35 to 5.46 GHz) were performed with 4000 Sweep points and 100 sweep points in accordance with KDB 789033 II.G.6.c)(iii). All other measurements were performed with the instruments default setting of 625 sweep points.
9. Measurements were performed across the two restricted bands closest to the bands of operation with the EUT transmitting on the top channel in the 5.25 to 5.35 GHz band. Plots are included in this section of the test report. Peak and average measurements were made.
10. 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.

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: Bottom Channel / EIRP**

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5472.821	Vertical	-45.6	-27.0	18.6	Complied
8768.429	Horizontal	-45.5	-27.0	18.5	Complied
15776.731	Horizontal	-39.8	-27.0	12.8	Complied

Results: Bottom Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
15776.731	Horizontal	55.4	74.0	18.6	Complied

Results: Bottom Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
15780.256	Horizontal	42.0	54.0	12.0	Complied

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5507.821	Vertical	-45.6	-27.0	18.6	Complied
8798.157	Horizontal	-45.7	-27.0	18.7	Complied
15837.628	Horizontal	-38.9	-27.0	11.9	Complied

Results: Middle Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
15837.628	Horizontal	56.3	74.0	17.7	Complied

Results: Middle Channel / Field Strength/ Average

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
15838.910	Horizontal	42.0	54.0	12.0	Complied

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: Top Channel / EIRP**

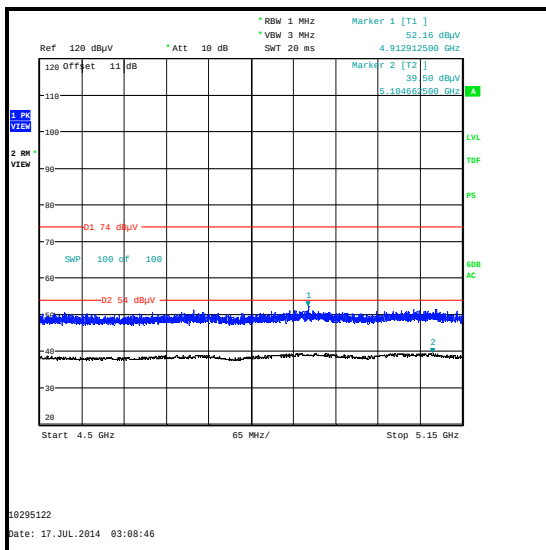
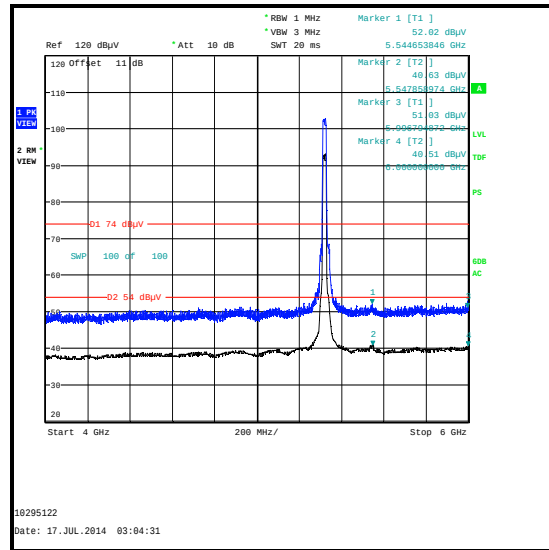
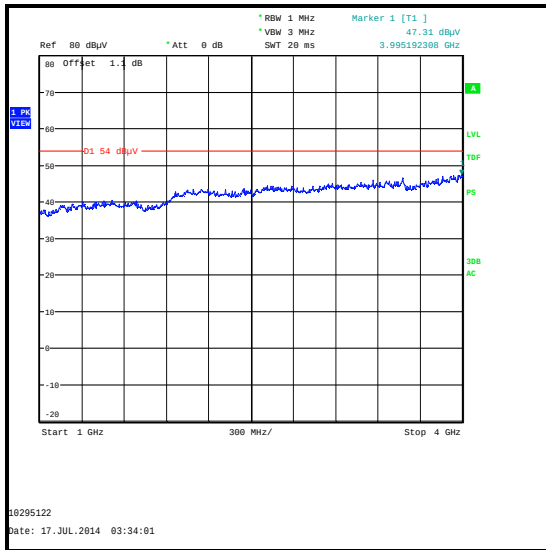
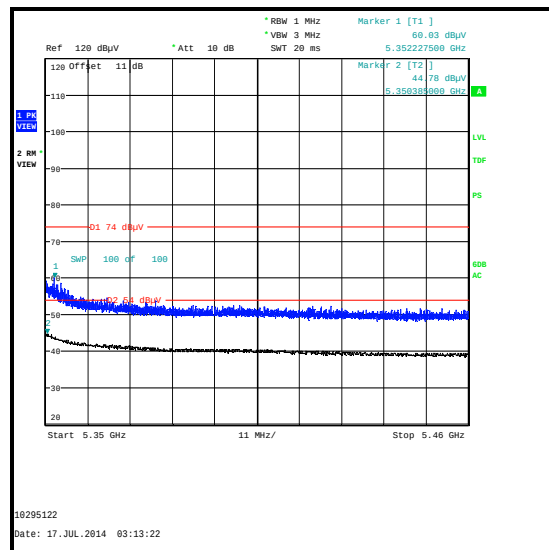
Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5546.442	Vertical	-44.9	-27.0	17.9	Complied
8864.663	Horizontal	-46.1	-27.0	19.1	Complied
15956.635	Horizontal	-40.2	-27.0	13.2	Complied

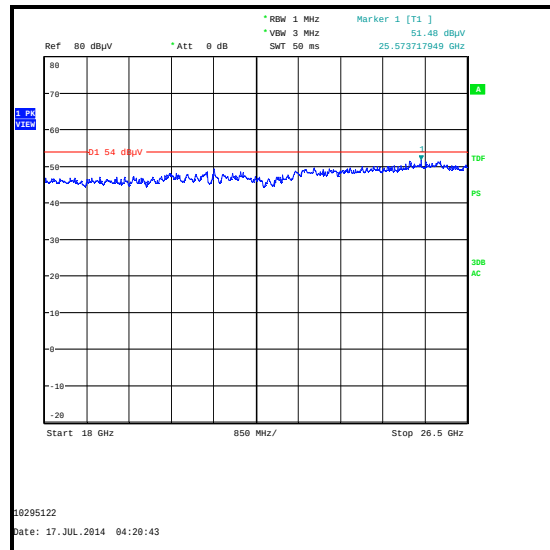
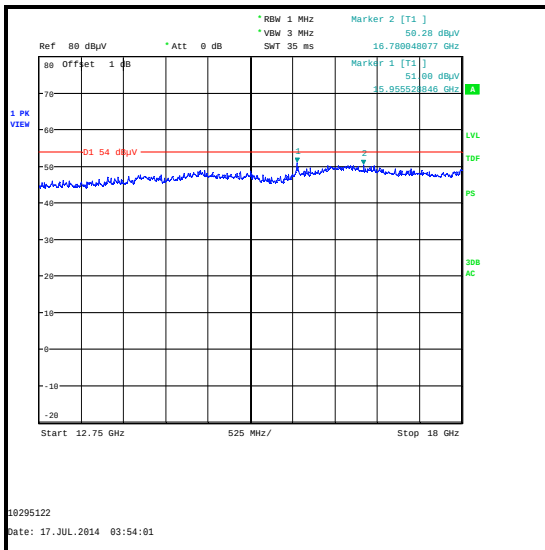
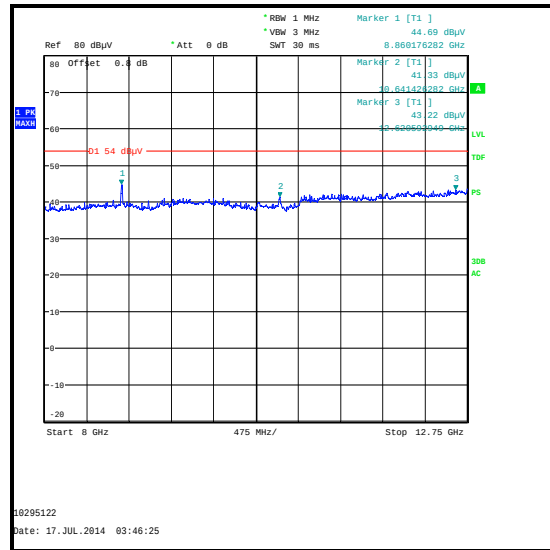
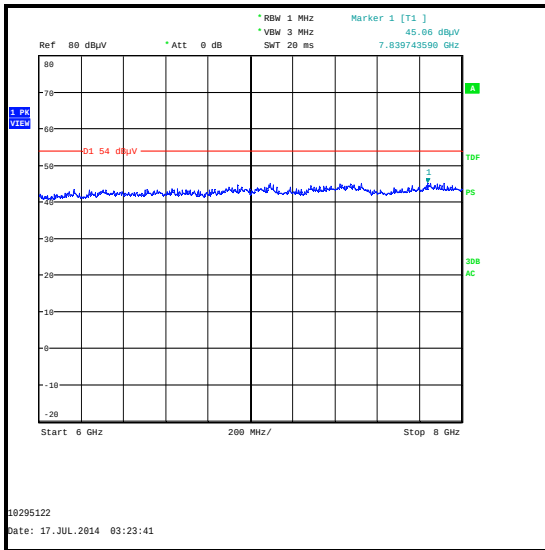
Results: Top Channel / Field Strength / Peak

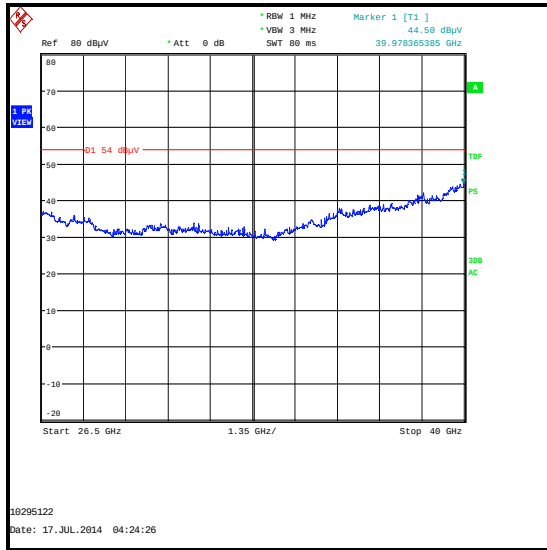
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
10644.487	Vertical	42.5	54.0*	11.5	Complied
15956.635	Horizontal	55.0	74.0	19.0	Complied

Results: Top Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
15959.038	Horizontal	41.6	54.0	12.4	Complied

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Restricted Band 4.5 GHz to 5.15 GHz****Restricted Band 5.35 GHz to 5.46 GHz**

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)

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

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	17 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Part 15.407(b)(3),(7) & 15.209(a)
Test Method Used:	As detailed in KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	46

Note(s):

1. FCC Part 15.407(b)(3) states for transmitters operating in the band 5.47 to 5.725 GHz: all emissions outside of the band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Pre-scans were performed with the EUT transmitting on top channel in the 5.25 to 5.35 GHz band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emissions seen in each band.
3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
4. Appropriate RF filters and attenuators were used during pre-scans and final measurements. Insertion losses were entered on the spectrum analyser as RF levels offsets.
5. In accordance with KDB 789033 Section II.G.1.c) if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.
6. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
7. The emission on the 8 to 12.75 GHz pre-scan at approximately 8636 MHz was investigated on bottom, middle and top channels for this band. No emissions were observed for all three channels.
8. The third harmonic can be seen on the pre-scan plot 12.75 to 18 GHz when the EUT is transmitting on top channel in the 5.25 to 5.35 band. This harmonic was investigated for this band and found to be below the measurement noise floor on bottom, middle and top channels.
9. 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.

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: Bottom Channel / EIRP**

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5720.737	Vertical	-46.0	-27.0	19.0	Complied
11000.801	Vertical	-45.6	-27.0	18.6	Complied

Results: Bottom Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
11000.801	Vertical	49.6	54.0	4.4	Complied

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11158.116	Vertical	-43.5	-27.0	16.5	Complied

Results: Middle Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
11158.116	Vertical	51.7	54.0	2.3	Complied

Results: Top Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
11388.846	Vertical	46.9	54.0	7.1	Complied

Transmitter Out of Band Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	17 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Part 15.407(b)(4),(7) & 15.209(a)
Test Method Used:	As detailed in KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	47

Note(s):

1. FCC Part 15.407(b)(4) states for transmitters operating in the band 5.725 to 5.85 GHz: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Pre-scans were performed with the EUT transmitting on top channel in 5.25 to 5.35 GHz band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emissions seen in each band.
3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
4. Appropriate RF filters and attenuators were used during pre-scans and final measurements. Insertion losses were entered on the spectrum analyser as RF levels offsets.
5. In accordance with KDB 789033 Section II.G.1.c) if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.
6. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
7. The emission on the 4 to 6 GHz pre-scan at approximately 5464 MHz was investigated on bottom, middle and top channels for this band. No emissions were observed for middle and top channels.
8. The emission on the 8 to 12.75 GHz pre-scan at approximately 8636 MHz was investigated on bottom, middle and top channels for this band. No emissions were observed for all three channels.
9. The third harmonic can be seen on the pre-scan plot 12.75 to 18 GHz when the EUT is transmitting on top channel in the 5.25 to 5.35 band. This harmonic was investigated for this band and found to be below the measurement noise floor on bottom, middle and top channels.
10. 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.

Transmitter Out of Band Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: Bottom Channel / Field Strength**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
11483.718	Vertical	45.1	54.0	8.9	Complied

Results: Middle Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
11562.564	Vertical	45.6	54.0	8.4	Complied

Results: Top Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
11646.744	Vertical	44.8	54.0	9.2	Complied

Transmitter Out of Band Radiated Emissions (5.725-5.85 GHz band operation) (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	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
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
A256	Antenna	Flann Microwave	18240-20	400	14 Nov 2014	12
A436	Antenna	Flann Microwave	20240-20	330	14 Nov 2014	12
A203	Antenna	Flann Microwave	22240-20	343	19 May 2016	36
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12
A2133	Low Pass Filter	AtlanTecRF	AFL-04000	JFB1006-002	25 Apr 2015	12
A2176	High Pass Filter	AtlanTecRF	AFH-07000	800980	12 Apr 2015	12
A1785	Pre Amplifier	Farran Technology	FLNA-28-30	FTL 6483	13 Jan 2015	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	13 Mar 2015	12
M1251	Multimeter	Fluke	175	89170179	19 May 2015	12
S0557	DC Power Supply	TTi	EL303R	395819	Calibrated before use	-

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

Test Engineer:	Andrew Edwards	Test Date:	16 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Parts 15.407(b)(1),(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & KDB 789033 II.G.

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	44

Note(s):

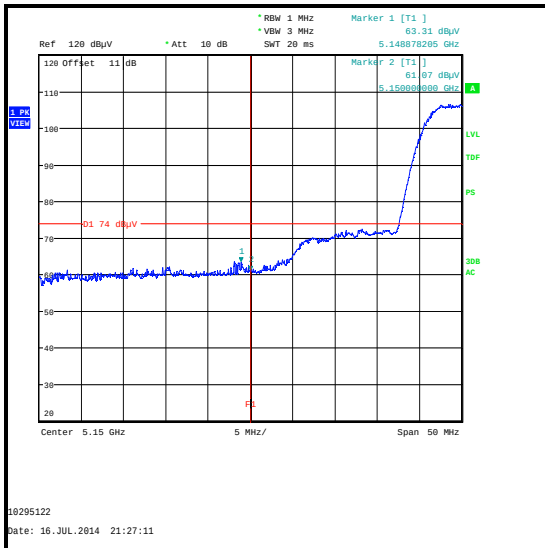
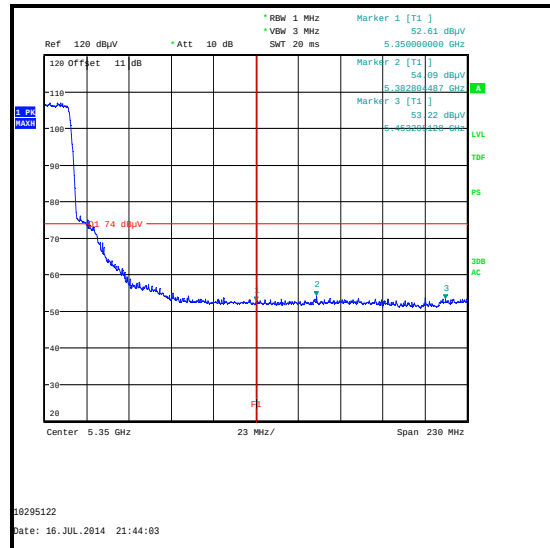
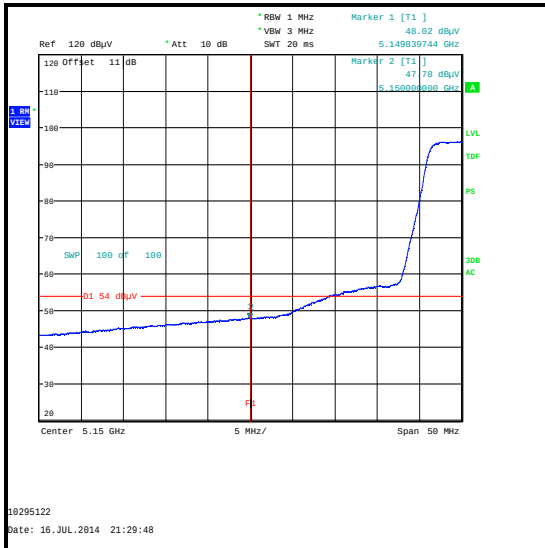
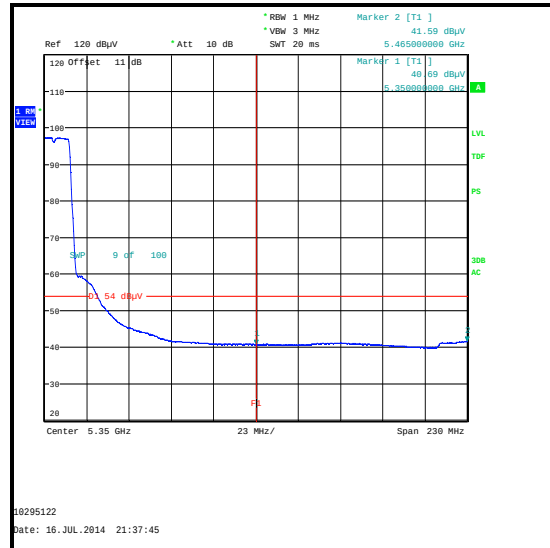
1. An Inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
 - o 802.11n HT20 – BPSK / 6.5 Mbps / MCS0 & 16QAM / 26 Mbps / MCS3
 - o 802.11n HT40 – BPSK / 13.5 Mbps / MCS0 & 16QAM / 81 Mbps / MCS4
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply.
4. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.
5. In accordance with KDB 789033 Section II.G.1.c) if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.
6. In accordance with KDB 789033 Section II.G.6.c) Method AD (vi), the average measurements were performed using an increased number of sweeps as calculated below:
 - o 802.11n HT20 / 6.5 Mbps / MCS0 – 100 sweeps
 - o 802.11n HT20 / 26 Mbps / MCS3 – 103 sweeps
 - o 802.11n HT40 / 13.5 Mbps / MCS0 – 100 sweeps
 - o 802.11n HT20 / 81 Mbps / MCS4 – 108 sweeps
7. In accordance with KDB 789033 Section II.G.6.c) Method AD (vii), for average measurements, data rates where the EUT was transmitting <98% duty cycle, the duty cycle correction factor calculated in section 5.2.2 was added to the measured result.

Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0 / Peak**

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5148.878	63.3	74.0	10.7	Complied
5150	61.1	74.0	12.9	Complied
5350	52.6	74.0	21.4	Complied
5382.804	54.1	74.0	19.9	Complied

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0 / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5149.840	48.0	54.0	6.0	Complied
5150	47.8	54.0	6.2	Complied
5350	40.7	54.0	13.3	Complied
5465.000	41.6	54.0	12.4	Complied

Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0****Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****Lower Band Edge Average Measurement****Upper Band Edge Average Measurement**

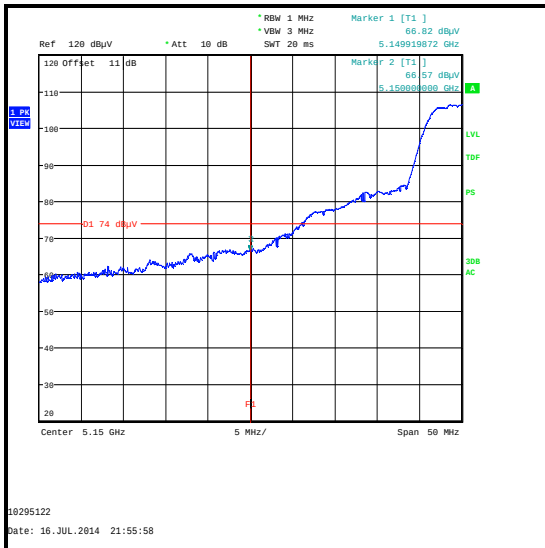
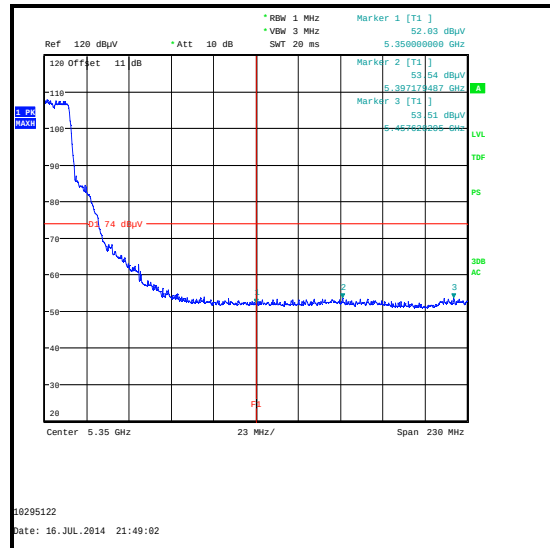
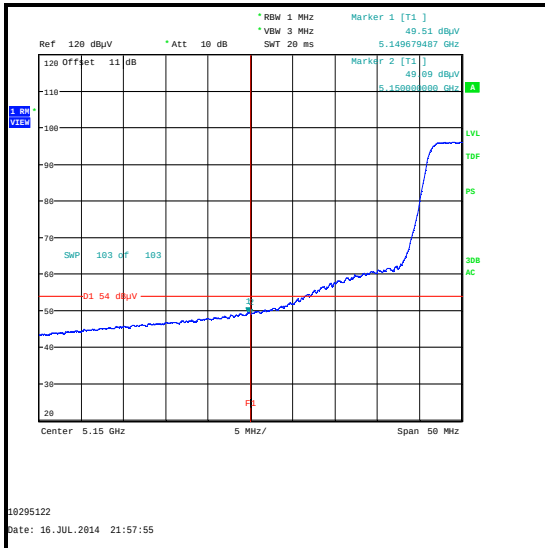
Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3 / Peak**

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5149.920	66.8	74.0	7.2	Complied
5150	66.6	74.0	7.4	Complied

Frequency (MHz)	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
5350	52.0	54.0	2.0	Complied
5397.179	53.5	54.0	0.5	Complied

Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3 / Average

Frequency (MHz)	Level (dBμV/m)	Duty cycle correction (dB)	Corrected Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5149.679	49.5	0.1	49.6	54.0	4.4	Complied
5150	49.1	0.1	49.2	54.0	4.8	Complied

Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3****Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****Lower Band Edge Average Measurement**

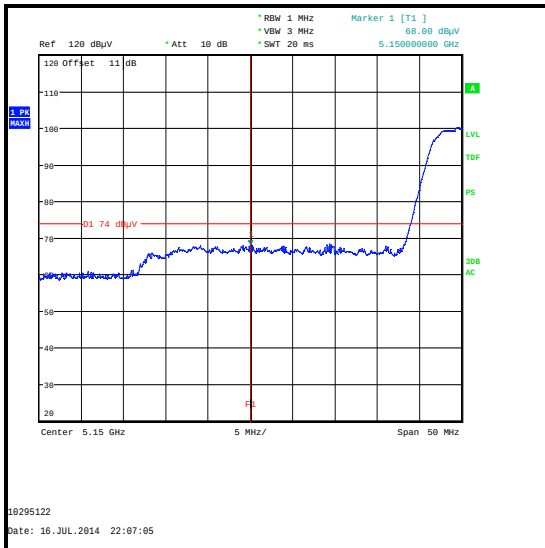
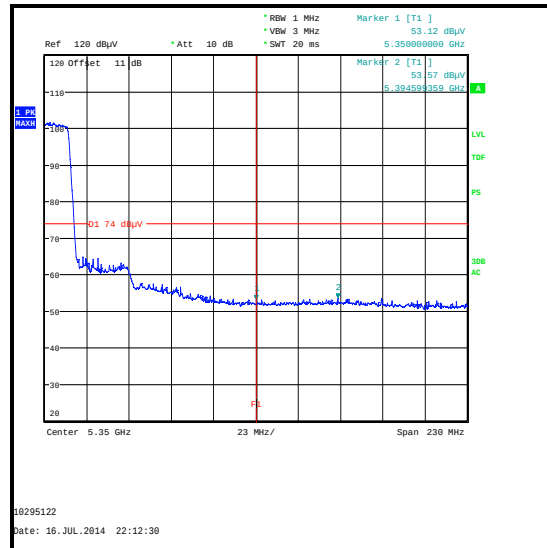
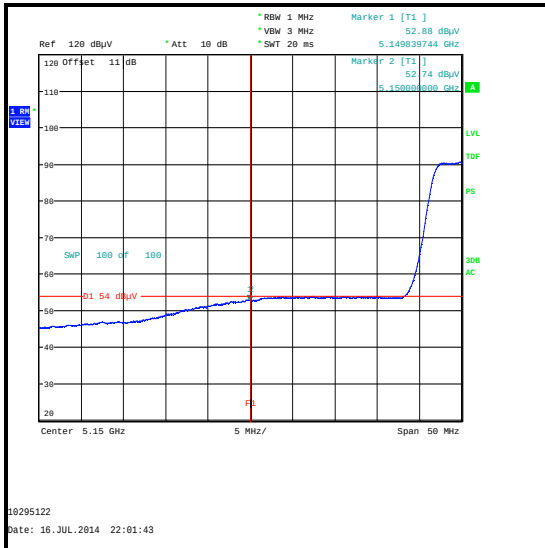
Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0 / Peak**

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5150	68.0	74.0	6.0	Complied

Frequency (MHz)	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
5350	53.1	54.0	0.9	Complied
5394.599	53.6	54.0	0.4	Complied

Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0 / Average

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5149.840	52.9	54.0	1.1	Complied
5150	52.7	54.0	1.3	Complied

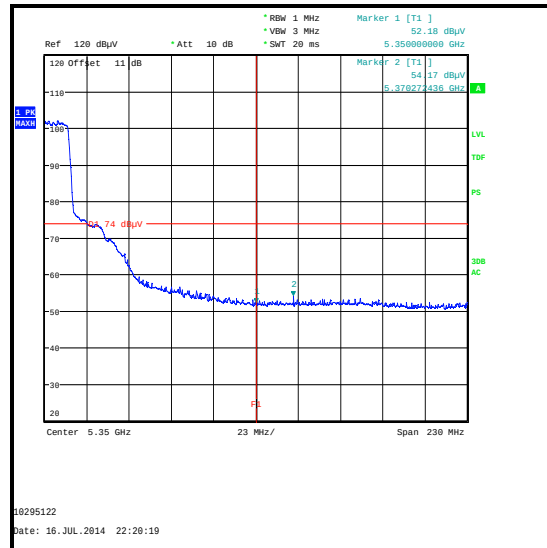
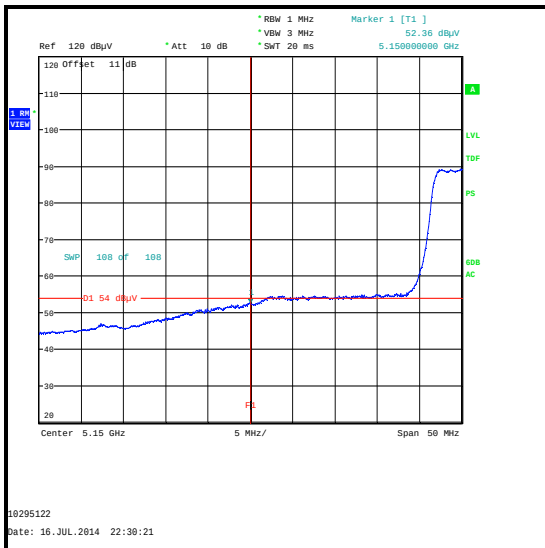
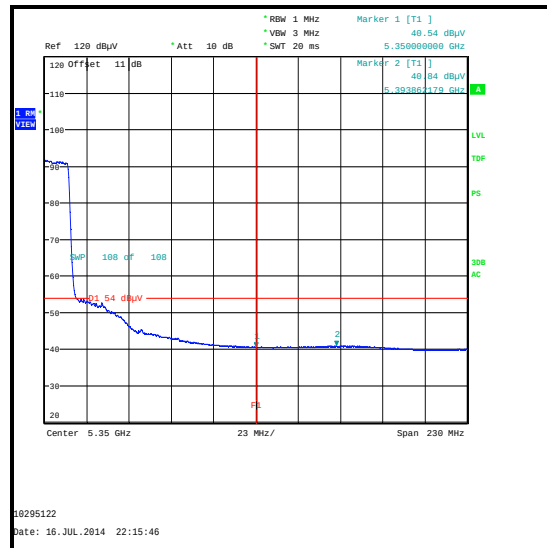
Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0****Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****Lower Band Edge Average Measurement**

Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4/ Peak**

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5149.679	71.4	74.0	2.6	Complied
5150	70.7	74.0	3.3	Complied
5350	52.2	74.0	21.8	Complied
5370.272	54.2	74.0	19.8	Complied

Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4/ Average

Frequency (MHz)	Level (dBμV/m)	Duty cycle correction (dB)	Corrected Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5150	52.4	0.3	52.7	54.0	1.3	Complied
5350	40.5	0.3	40.8	54.0	13.2	Complied
5393.862	40.8	0.3	41.1	54.0	12.9	Complied

Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4****Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****Lower Band Edge Average Measurement****Upper Band Edge Average Measurement**

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	16 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Parts 15.407(b)(2),(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & KDB 789033 II.G.

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	45

Note(s):

1. An Inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
 - o 802.11n HT20 – BPSK / 6.5 Mbps / MCS0 & 16QAM / 26 Mbps / MCS3
 - o 802.11n HT40 – BPSK / 13.5 Mbps / MCS0 & 16QAM / 81 Mbps / MCS4
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply. Tests were performed in these restricted bands of operation with the EUT transmitting on the bottom and top channels within 5.25-5.35 GHz band, the results are included in the transmitter 5.25-5.35 GHz band radiated spurious emissions section of this test report.
4. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.
5. In accordance with KDB 789033 Section II.G.1.c) if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.
6. In accordance with KDB 789033 Section II.G.6.c) Method AD (vi), the average measurements were performed using an increased number of sweeps as calculated below:
 - o 802.11n HT20 / 6.5 Mbps / MCS0 – 100 sweeps
 - o 802.11n HT20 / 26 Mbps / MCS3 – 103 sweeps
 - o 802.11n HT40 / 13.5 Mbps / MCS0 – 100 sweeps
 - o 802.11n HT20 / 81 Mbps / MCS4 – 108 sweeps
7. In accordance with KDB 789033 Section II.G.6.c) Method AD (vii), for average measurements, data rates where the EUT was transmitting <98% duty cycle, the duty cycle correction factor calculated in section 5.2.2 was added to the measured result.

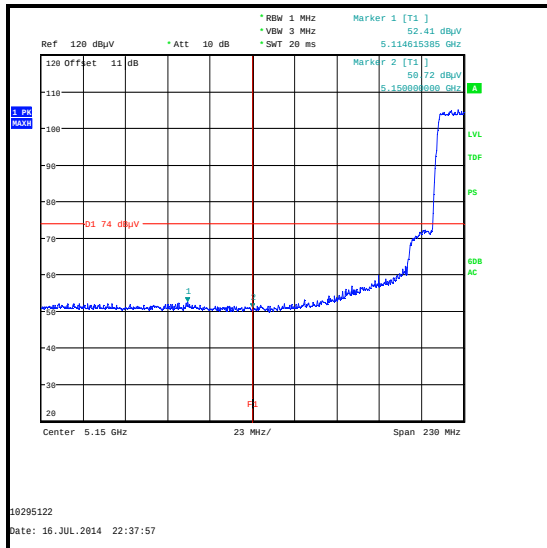
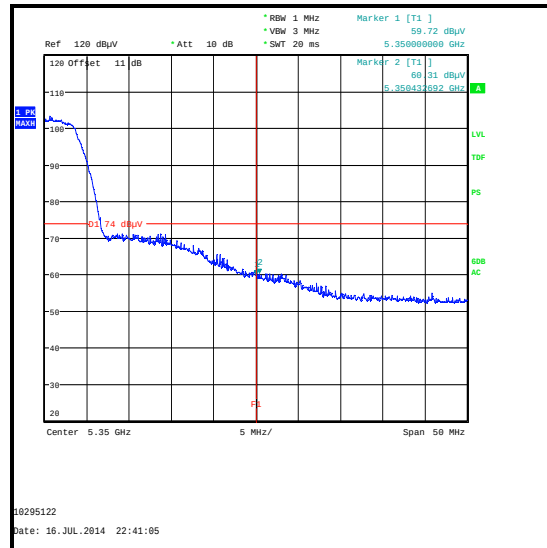
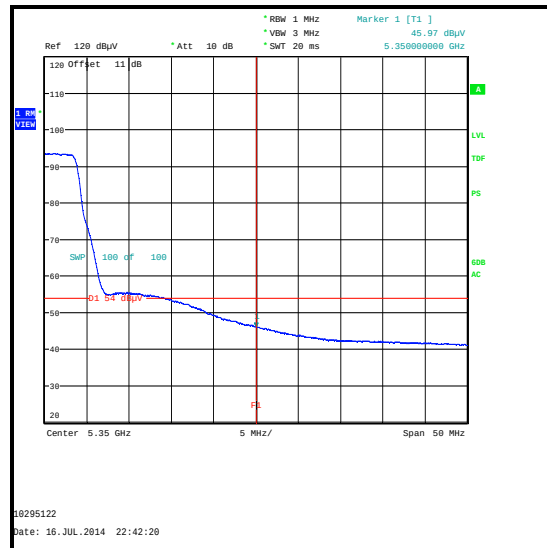
Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0 / Peak**

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	59.7	74.0	14.3	Complied
5350.433	60.3	74.0	13.7	Complied

Frequency (MHz)	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
5114.615	52.4	54.0	1.6	Complied
5150	50.7	54.0	3.3	Complied

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0 / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	46.0	54.0	8.0	Complied

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0****Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****Upper Band Edge Average Measurement**

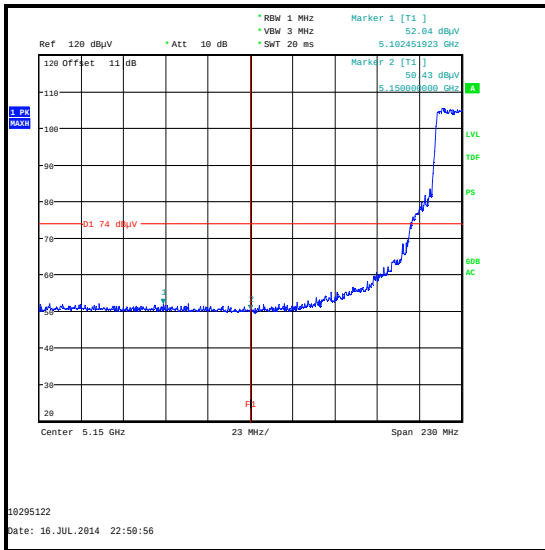
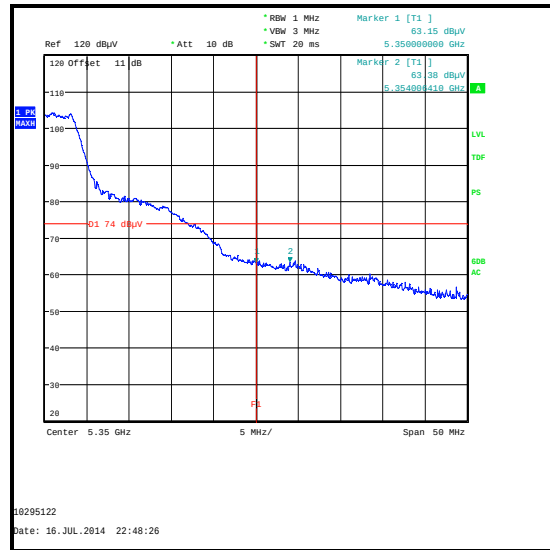
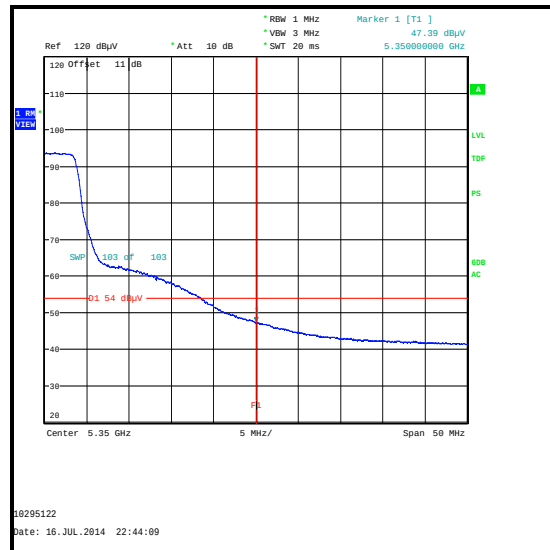
Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3 / Peak**

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	63.2	74.0	10.8	Complied
5354.006	63.4	74.0	10.6	Complied

Frequency (MHz)	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
5102.452	52.0	54.0	2.0	Complied
5150	50.4	54.0	3.6	Complied

Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3 / Average

Frequency (MHz)	Level (dB μ V/m)	Duty cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	47.4	0.1	47.5	54.0	6.5	Complied

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3****Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****Upper Band Edge Average Measurement**

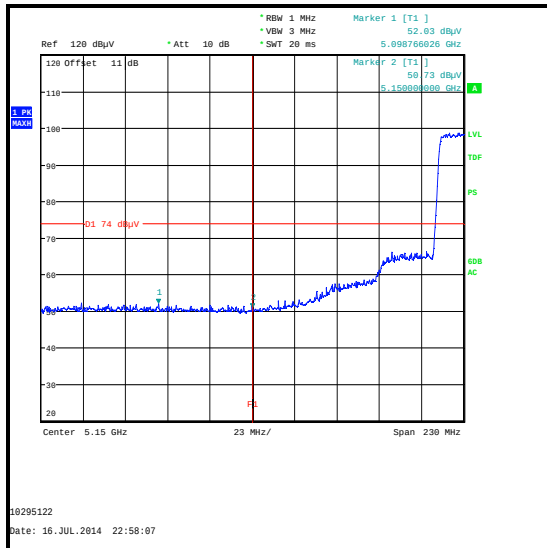
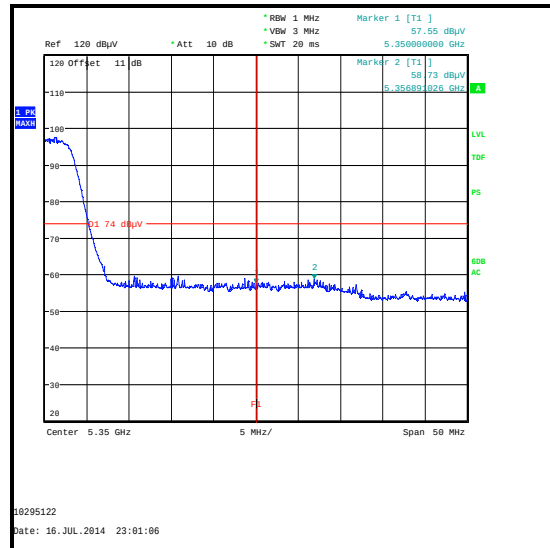
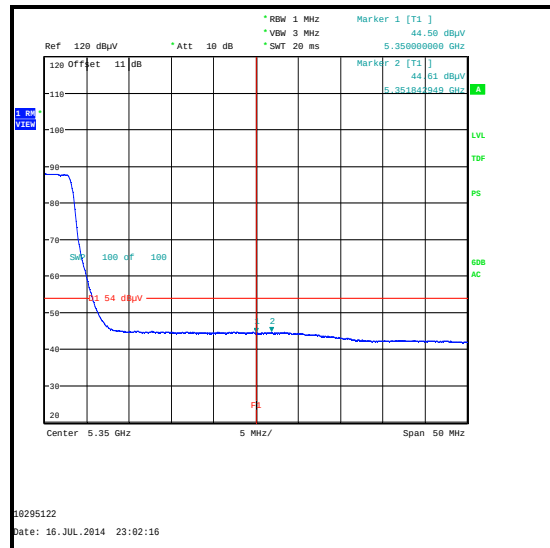
Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0 / Peak**

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	57.6	74.0	16.4	Complied
5356.891	58.7	74.0	15.3	Complied

Frequency (MHz)	Peak Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
5098.766	52.0	54.0	2.0	Complied
5150	50.7	54.0	3.3	Complied

Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0 / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	44.5	54.0	9.5	Complied
5351.843	44.6	54.0	9.4	Complied

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0****Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****Upper Band Edge Average Measurement**

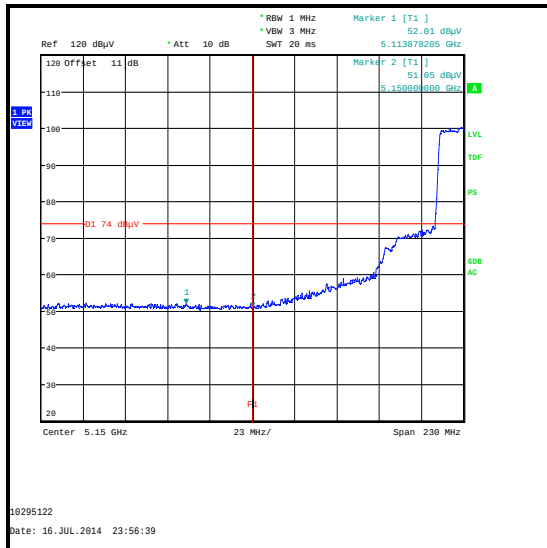
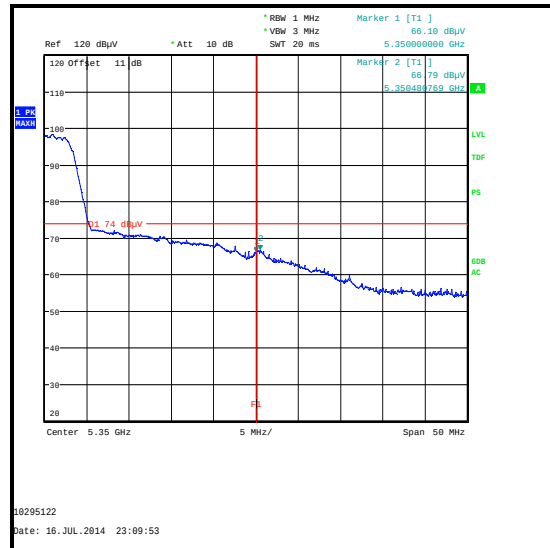
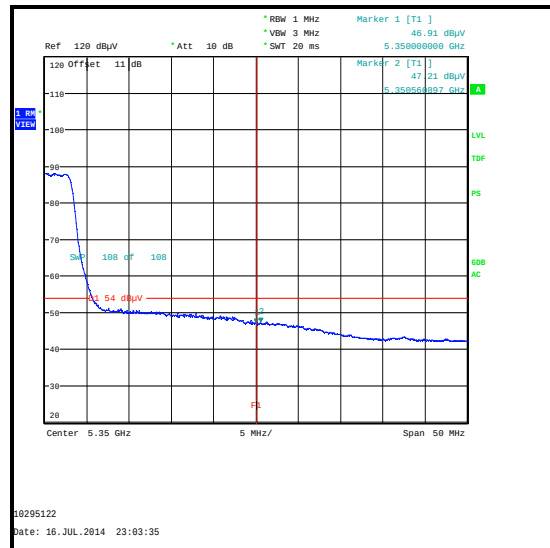
Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4 / Peak**

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5350	66.1	74.0	7.9	Complied
5350.481	66.8	74.0	7.2	Complied

Frequency (MHz)	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
5113.878	52.0	54.0	2.0	Complied
5150	51.1	54.0	2.9	Complied

Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4 / Average

Frequency (MHz)	Level (dBμV/m)	Duty cycle correction (dB)	Corrected Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5350	46.9	0.3	47.2	54.0	6.8	Complied
5350.561	47.2	0.3	47.5	54.0	6.5	Complied

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4****Lower Band Edge Peak Measurement****Upper Band Edge Peak Measurement****Upper Band Edge Average Measurement**

Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	17 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Parts 15.407(b)(3),(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & KDB 789033 II.G.

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	51

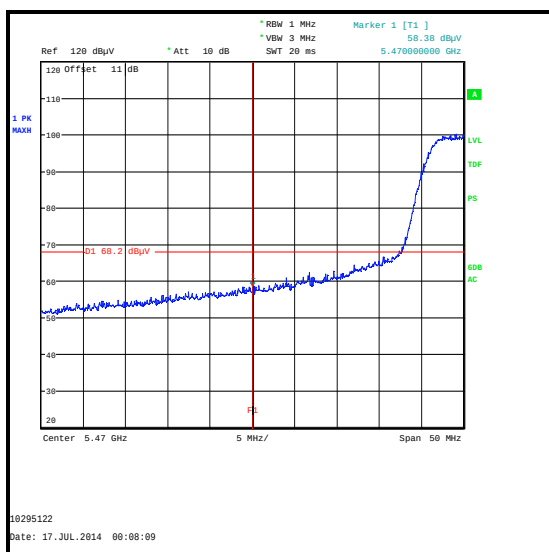
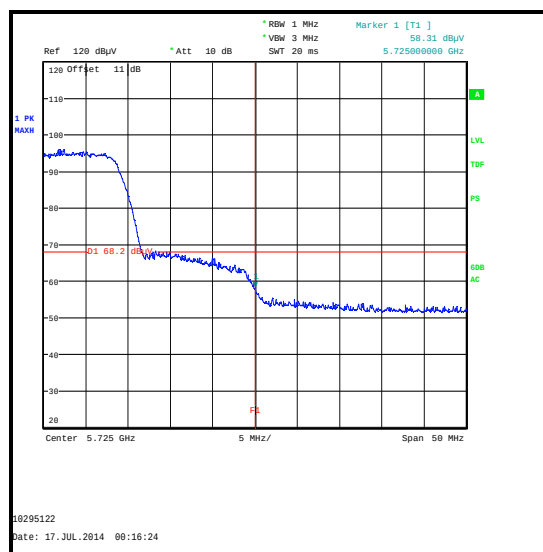
Note(s):

1. An Inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
 - o 802.11n HT20 – BPSK / 6.5 Mbps / MCS0. & 16QAM / 26 Mbps / MCS3.
 - o 802.11n HT40 – BPSK / 13.5 Mbps / MCS0 & 16QAM / 81 Mbps / MCS4.
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply. Tests were performed in these restricted bands of operation with the EUT transmitting on the bottom and top channels within 5.47-5.725 GHz band, the results are included in the transmitter 5.25-5.35 GHz band radiated spurious emissions section of this test report.
4. For completeness, results are also shown as EIRP in dBm and also as field strength in dBμV/m. Measured field strength was converted to EIRP in accordance with KDB 789033 II.G.2.d.(iii) using a conversion factor of 95.2.

Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-36.8	-27.0	9.8	Complied
5725	-36.9	-27.0	9.9	Complied

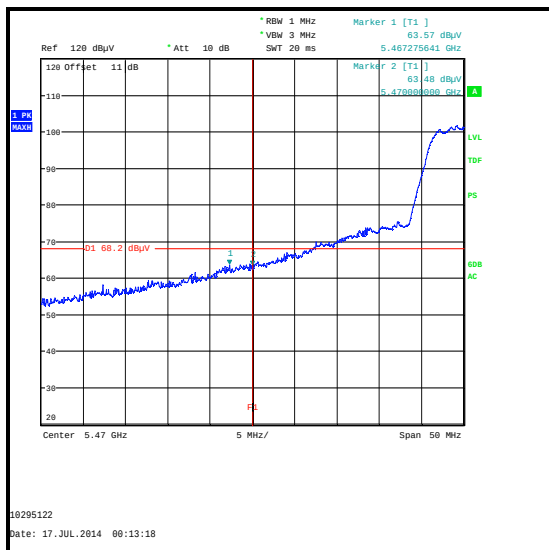
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5470	58.4	68.2	9.8	Complied
5725	58.3	68.2	9.9	Complied

**Lower Band Edge Measurement****Upper Band Edge Measurement**

Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: 802.11n / 20 MHz / 16QAM / 26 Mbps / MCS3 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5467.276	-31.6	-27.0	4.6	Complied
5470	-31.7	-27.0	4.7	Complied
5725	-35.5	-27.0	8.5	Complied
5725.240	-34.9	-27.0	7.9	Complied

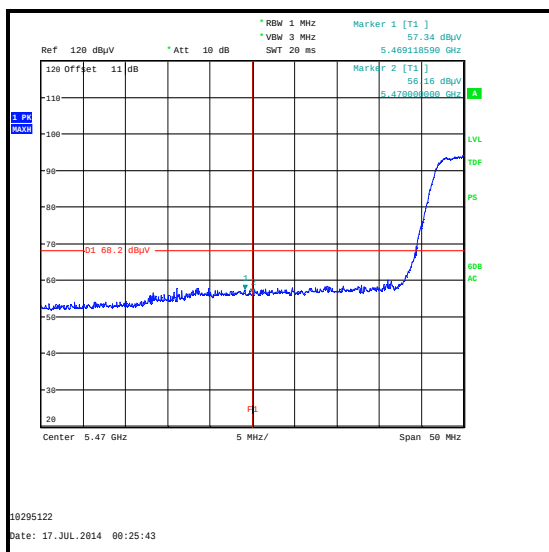
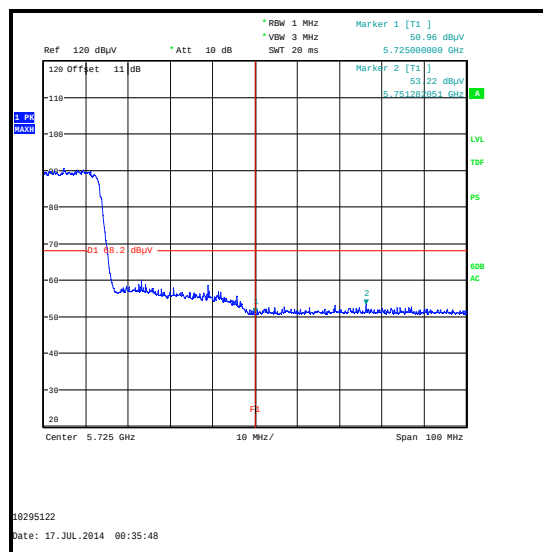
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5467.276	63.6	68.2	4.6	Complied
5470	63.5	68.2	4.7	Complied
5725	59.7	68.2	8.5	Complied
5725.240	60.3	68.2	7.9	Complied

**Lower Band Edge Measurement****Upper Band Edge Measurement**

Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK 13.5 Mbps / MCS0 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5469.119	-37.9	-27.0	10.9	Complied
5470	-39.0	-27.0	12.0	Complied
5725	-44.2	-27.0	17.2	Complied
5751.282	-42.0	-27.0	15.0	Complied

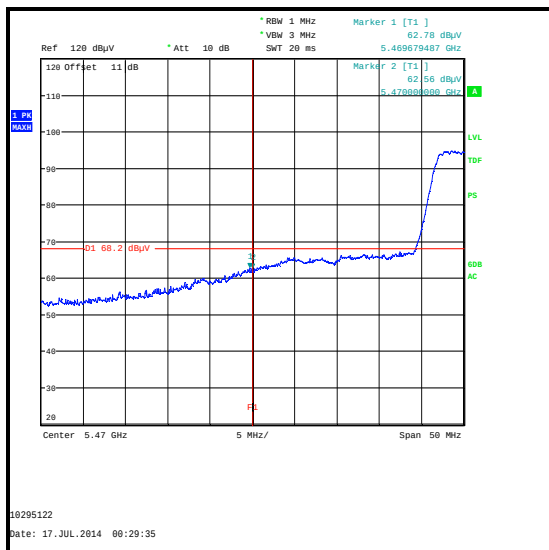
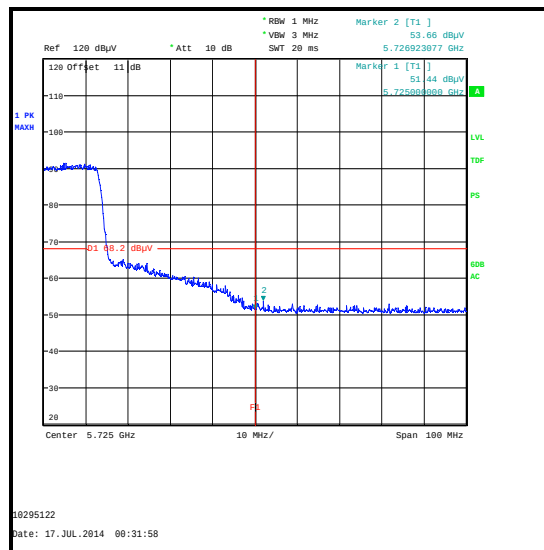
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5469.119	57.3	68.2	10.9	Complied
5470	56.2	68.2	12.0	Complied
5725	51.0	68.2	17.2	Complied
5751.282	53.2	68.2	15.0	Complied

**Lower Band Edge Measurement****Upper Band Edge Measurement**

Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5469.679	-32.4	-27.0	5.4	Complied
5470	-32.6	-27.0	5.6	Complied
5725	-43.8	-27.0	16.8	Complied
5726.923	-41.5	-27.0	14.5	Complied

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5469.679	62.8	68.2	5.4	Complied
5470	62.6	68.2	5.6	Complied
5725	51.4	68.2	16.8	Complied
5726.923	53.7	68.2	14.5	Complied

**Lower Band Edge Measurement****Upper Band Edge Measurement**

Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	17 July 2014
Test Sample IMEI:	004402452752599		

FCC Reference:	Parts 15.407(b)(4),(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & KDB 789033 II.G.

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	46

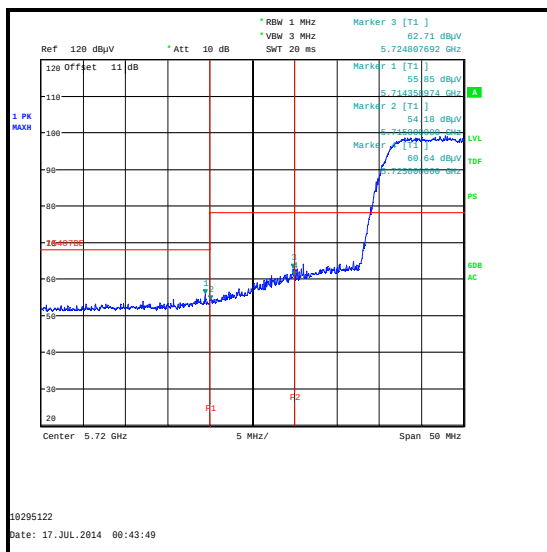
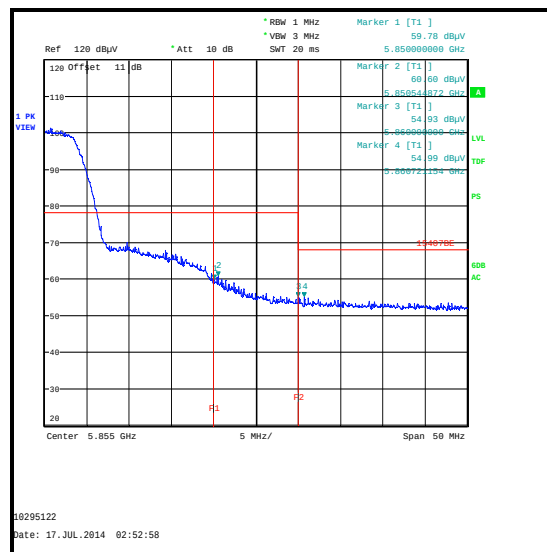
Note(s):

1. An Inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
 - o 802.11n HT20 – BPSK / 6.5 Mbps / MCS0 & 16QAM / 26Mbps / MCS3.
 - o 802.11n HT40 – BPSK / 13.5 Mbps / MCS0 & 16QAM / 81Mbps / MCS4.
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For completeness, results are also shown as EIRP in dBm and also as field strength in dBμV/m. Measured field strength was converted to EIRP in accordance with KDB 789033 G.2.d)(iii) using a conversion factor of 95.2.

Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / 6.5 Mbps / MCS0 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5714.359	-39.3	-27.0	12.3	Complied
5715	-41.0	-27.0	14.0	Complied
5724.808	-32.5	-17.0	15.5	Complied
5725	-34.6	-17.0	17.6	Complied
5850	-35.4	-17.0	18.4	Complied
5850.545	-34.6	-17.0	17.6	Complied
5860	-40.3	-27.0	13.3	Complied
5860.721	-40.2	-27.0	13.2	Complied

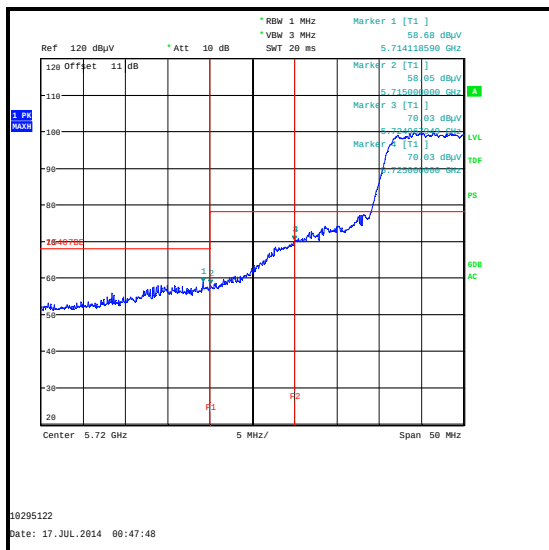
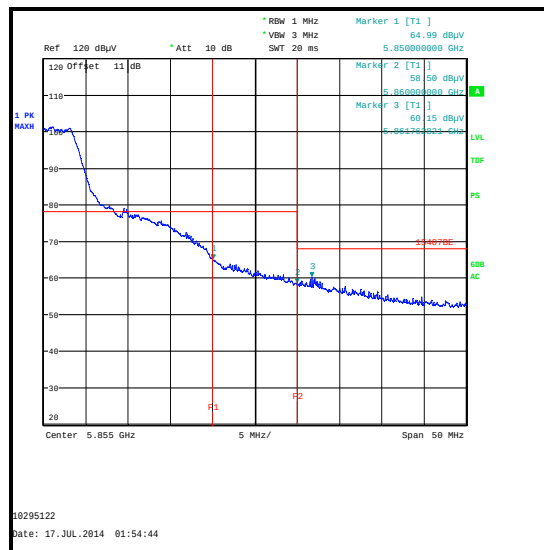
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5714.359	55.9	68.2	12.3	Complied
5715	54.2	68.2	14.0	Complied
5724.808	62.7	78.2	15.5	Complied
5725	60.6	78.2	17.6	Complied
5850	59.8	78.2	18.4	Complied
5850.545	60.6	78.2	17.6	Complied
5860	54.9	68.2	13.3	Complied
5860.721	55.0	68.2	13.2	Complied

**Lower Band Edge Measurement****Upper Band Edge Measurement**

Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: 802.11n / 20 MHz / 16QAM / 26Mbps / MCS3 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5714.119	-36.5	-27.0	9.5	Complied
5715	-37.1	-27.0	10.1	Complied
5725	-25.2	-17.0	8.2	Complied
5850	-30.2	-17.0	13.2	Complied
5860	-36.7	-27.0	9.7	Complied
5861.763	-35.0	-27.0	8.0	Complied

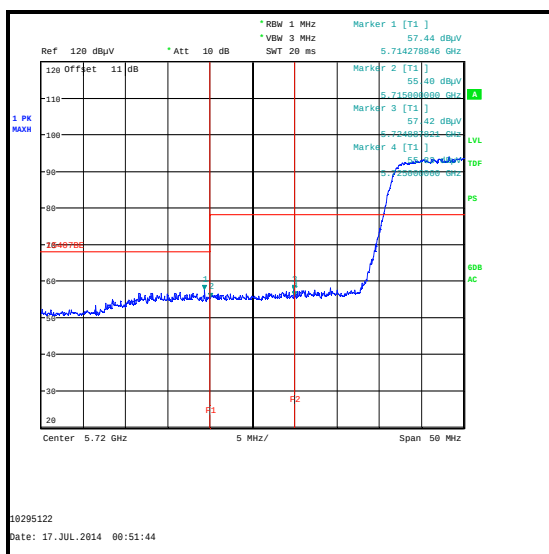
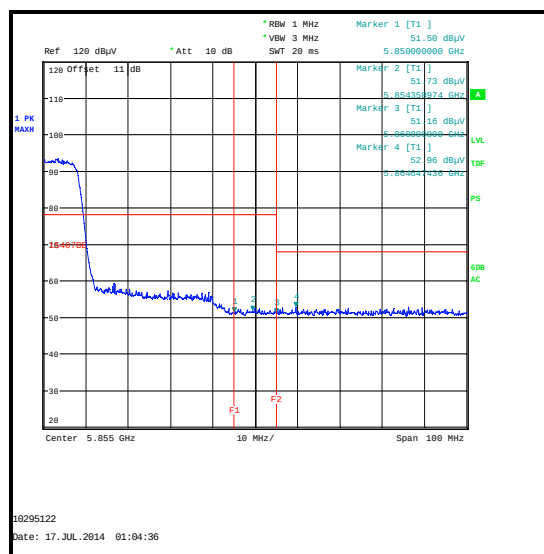
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5714.119	58.7	68.2	9.5	Complied
5715	58.1	68.2	10.1	Complied
5725	70.0	78.2	8.2	Complied
5850	65.0	78.2	13.2	Complied
5860	58.5	68.2	9.7	Complied
5861.763	60.2	68.2	8.0	Complied

**Lower Band Edge Measurement****Upper Band Edge Measurement**

Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / 13.5 Mbps / MCS0 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5714.279	-37.8	-27.0	10.8	Complied
5715	-39.8	-27.0	12.8	Complied
5724.888	-37.8	-17.0	20.8	Complied
5725	-39.4	-17.0	22.4	Complied
5850	-43.7	-17.0	26.7	Complied
5854.359	-43.5	-17.0	26.5	Complied
5860	-44.0	-27.0	17.0	Complied
5864.647	-42.2	-27.0	15.2	Complied

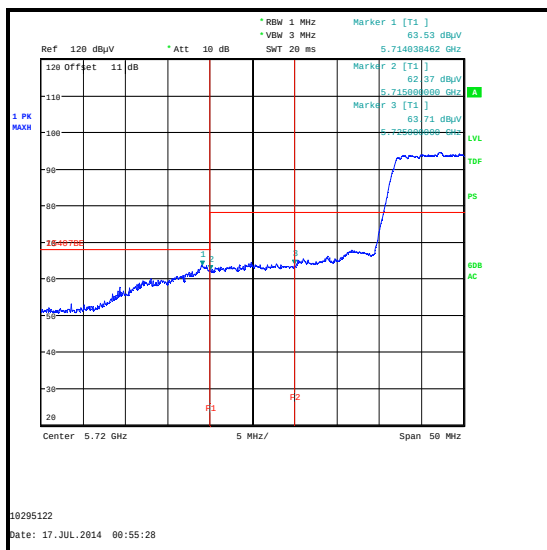
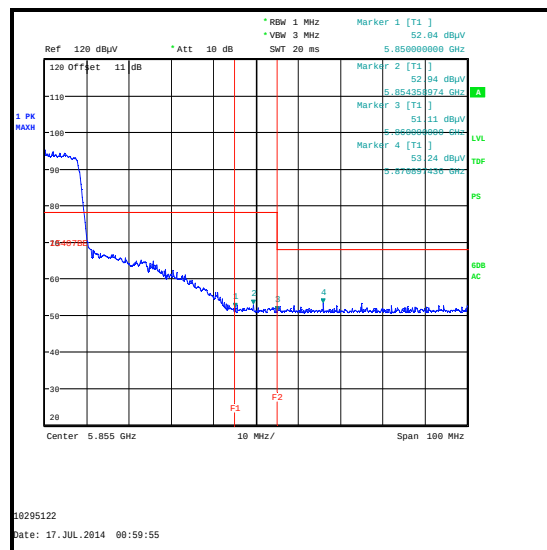
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5714.279	57.4	68.2	10.8	Complied
5715	55.4	68.2	12.8	Complied
5724.888	57.4	78.2	20.8	Complied
5725	55.8	78.2	22.4	Complied
5850	51.5	78.2	26.7	Complied
5854.359	51.7	78.2	26.5	Complied
5860	51.2	68.2	17.0	Complied
5864.647	53.0	68.2	15.2	Complied

**Lower Band Edge Measurement****Upper Band Edge Measurement**

Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: 802.11n / 40 MHz / 16QAM / 81 Mbps / MCS4 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5714.038	-31.7	-27.0	4.7	Complied
5715	-32.8	-27.0	5.8	Complied
5725	-31.5	-17.0	14.5	Complied
5850	-43.2	-17.0	26.2	Complied
5854.359	-42.3	-17.0	25.3	Complied
5860	-44.1	-27.0	17.1	Complied
5870.897	-42.0	-27.0	15.0	Complied

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5714.038	63.5	68.2	4.7	Complied
5715	62.4	68.2	5.8	Complied
5725	63.7	78.2	14.5	Complied
5850	52.0	78.2	26.2	Complied
5854.359	52.9	78.2	25.3	Complied
5860	51.1	68.2	17.1	Complied
5870.897	53.2	68.2	15.0	Complied

**Lower Band Edge Measurement****Upper Band Edge 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	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
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 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
Maximum Conducted Output Power	5.15 GHz to 5.850 GHz	95%	±1.13 dB
Maximum Power Spectral Density	5.15 GHz to 5.850 GHz	95%	±1.13 dB
26 dB Emission Bandwidth	5.15 GHz to 5.850 GHz	95%	±3.92 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±2.94 dB

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

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	EUT Description update

--- END OF REPORT ---