TEST REPORT

Test Report No. : UL-RPT-RP92315JD11B

Manufacturer	:	Panasonic Mobile Communications Development of Europe Ltd
Model No.	:	NTT docomo P-03E
FCC ID	:	UCE313058A
Technology	:	Bluetooth – Low Energy
Test Standard(s)	:	FCC Parts 15.107(a), 15.109, 15.207, 15.209(a) & 15.247

1. This test report shall not be reproduced in full or partial, without the written approval of UL.
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 1.0

Date of Issue: 13 April 2013

Checked by:

Ian Watch
Senior Engineer, Radio Laboratory

Issued by :

pp

John Newell
Group Quality Manager, WiSE
Basingstoke,
UL Verification Services

0644

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

RFI Global Services Ltd trading as UL

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1. Customer Information

Company Name:	Panasonic Mobile Communications Development of Europe Ltd
Address:	Panasonic House Willoughby Road Bracknell Berkshire RG12 8FP United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.107 and 47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart B (Unintentional Radiators) - Sections 15.107 and 15.109
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Site Registration:	FCC: 209735
Location of Testing:	RFI Global Services Ltd trading as UL, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	26 March 2013 to 08 April 2013

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.107(a)	Receiver/Idle Mode AC Conducted Emissions	✓
Part 15.109	Receiver/Idle Mode Radiated Spurious Emissions	✓
Part 15.207	Transmitter AC Conducted Emissions	✓
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.247(e)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	Transmitter Maximum Peak Output Power	✓
Part 15.247(d)/ 15.209(a)	Transmitter Radiated Emissions	✓
Part 15.247(d)/ 15.209(a)	Transmitter Band Edge Radiated Emissions	✓

Key to Results

✓ = Complied ✗ = Did not comply

Note(s):

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

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2003)
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	ANSI C63.10 (2009)
Title:	American National Standard for Testing Unlicensed Wireless Devices
Reference:	KDB 558074 D01 v02 10/04/2012
Title:	Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) devices operating Under 15.247

2.4. Deviations from the Test Specification

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

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	NTT docomo
Model Name or Number:	P-03E
IMEI:	355335050017244 *(Radiated sample)*
Hardware Version Number:	Rev B
Software Version Number:	ACPU: zoro-jb-10-0371 CCPU: 161022_DCM_00.15
FCC ID:	UCE313058A

Brand Name:	NTT docomo
Model Name or Number:	P-03E
IMEI:	355335050017228 *(Radiated sample #2)*
Hardware Version Number:	Rev B
Software Version Number:	ACPU: zoro-jb-10-0371 CCPU: 161022_DCM_00.15
FCC ID:	UCE313058A

Brand Name:	NTT docomo
Model Name or Number:	P-03E
IMEI:	355335050017236 *(Radiated sample #3)*
Hardware Version Number:	Rev B
Software Version Number:	ACPU: zoro-jb-10-0371 CCPU: 161022_DCM_00.15
FCC ID:	UCE313058A

Brand Name:	NTT docomo
Model Name or Number:	P-03E
IMEI:	355335050017087 *(Conducted RF port sample)*
Hardware Version Number:	Rev B
Software Version Number:	ACPU: zoro-jb-10-0371 CCPU: 161022_DCM_00.15
FCC ID:	UCE313058A

Brand Name:	NTT docomo
Description:	Battery
Model Name or Number:	P30

Identification of Equipment Under Test (EUT) (continued)

Brand Name:	NTT docomo
Description:	AC Charger
Model Name or Number:	AC04

Brand Name:	NTT docomo
Description:	Charge/USB Data cable
Model Name or Number:	Type 01

Brand Name:	NTT docomo
Description:	Personal Hands-Free
Model Name or Number:	Type 02

3.2. Description of EUT

The equipment under test was a Multi-Mode LTE/UMTS/GSM Mobile Phone with WLAN, *Bluetooth* and RFID.

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:	*Bluetooth* Low Energy (Digital Transmission System)		
Type of Unit:	Transceiver		
Channel Spacing:	2 MHz		
Modulation:	GFSK		
Data Rate:	1 Mbps		
Power Supply Requirement(s):	Nominal	3.8 V	
Maximum Conducted Output Power:	-0.3 dBm		
Declared Antenna Gain:	-2.0 dBi		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	0	2402
	Middle	19	2440
	Top	39	2480
Receive Frequency Range:	2405 MHz to 2480 MHz		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	0	2402
	Top	39	2480

3.5. Support Equipment

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

Description:	Laptop PC
Brand Name:	Panasonic
Model Name or Number:	Toughbook CF-74

Description:	Dummy Battery
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated

Description:	2 GB Micro SD card
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Receive/Idle Mode.
- Transmitting at maximum power in *Bluetooth* mode with modulation, maximum possible data length available, with a payload set to set Pseudorandom Bit Sequence 9.

4.2. Configuration and Peripherals

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

- Receive/Idle tests: The *Bluetooth* mode was active but not transmitting.
- Transmit tests: The laptop PC with the Customer's bespoke application was used to place the EUT into *Bluetooth* test mode.
- Idle mode and transmitter mode radiated spurious emissions tests were performed with the AC Charger and PHF connected to the EUT, as this was found to be the worst case during pre-scans. All accessories were individually connected during pre-scan measurements to determine the worst case combination.
- The EUT conducted sample with IMEI 355335050017087 was used for 6 dB bandwidth, power spectral density and conducted output power tests.
- The radiated samples with IMEI 355335050017228, IMEI 355335050017244 and IMEI 355335050017236 were used for AC conducted emissions and radiated spurious emissions 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. Receiver/Idle Mode AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	29 March 2013
Test Sample IMEI:	355335050017228		

FCC Reference:	Part 15.107(a)
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	30

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.155	Live	51.0	65.8	14.8	Complied
0.231	Live	46.2	62.4	16.2	Complied
0.398	Live	39.5	57.9	18.4	Complied
1.622	Live	39.5	56.0	16.5	Complied
1.856	Live	38.8	56.0	17.2	Complied
1.964	Live	39.7	56.0	16.3	Complied
2.252	Live	37.4	56.0	18.6	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
2.022	Live	28.2	46.0	17.8	Complied
2.594	Live	29.2	46.0	16.8	Complied
15.351	Live	30.0	50.0	20.0	Complied
15.414	Live	30.9	50.0	19.1	Complied
15.747	Live	32.6	50.0	17.4	Complied
15.842	Live	34.8	50.0	15.2	Complied
15.945	Live	30.0	50.0	20.0	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

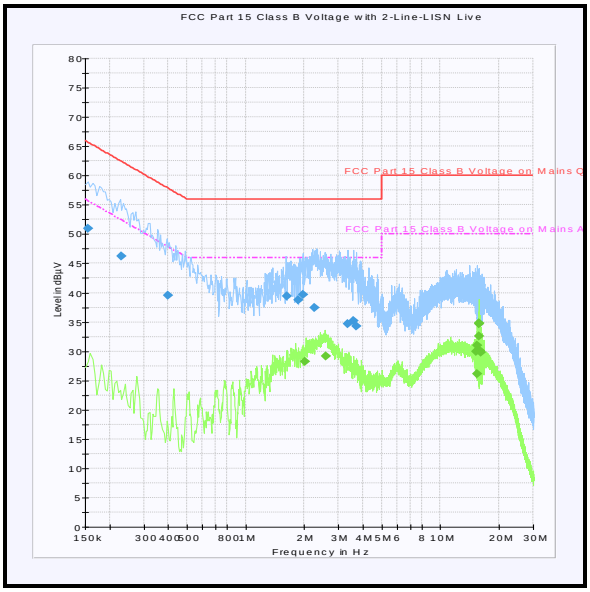
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.155	Neutral	57.3	65.8	8.5	Complied
0.245	Neutral	52.7	61.9	9.2	Complied
0.267	Neutral	51.8	61.2	9.4	Complied
0.285	Neutral	50.8	60.7	9.9	Complied
0.303	Neutral	50.5	60.2	9.7	Complied
0.335	Neutral	48.8	59.3	10.5	Complied
0.344	Neutral	49.1	59.1	10.0	Complied
0.384	Neutral	46.5	58.2	11.7	Complied
0.411	Neutral	44.9	57.6	12.7	Complied
0.443	Neutral	45.5	57.0	11.5	Complied

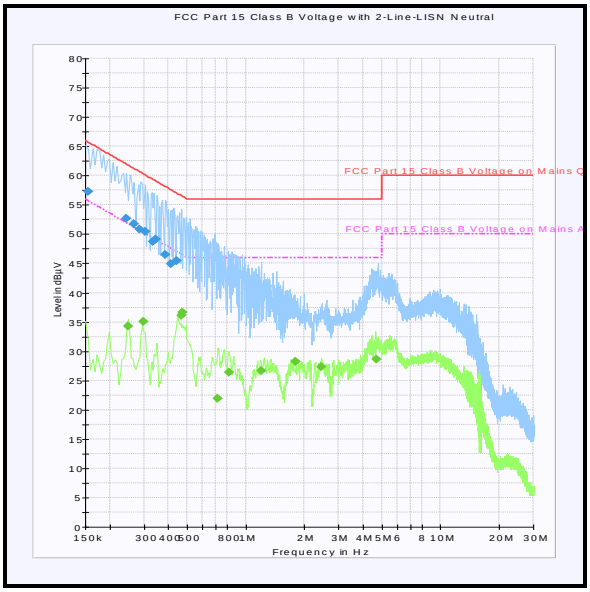
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.249	Neutral	34.3	51.8	17.5	Complied
0.299	Neutral	35.1	50.3	15.2	Complied
0.465	Neutral	36.1	46.6	10.5	Complied
0.474	Neutral	36.6	46.4	9.8	Complied
0.816	Neutral	26.4	46.0	19.6	Complied
1.199	Neutral	26.7	46.0	19.3	Complied
1.806	Neutral	28.3	46.0	17.7	Complied
2.432	Neutral	27.3	46.0	18.7	Complied
4.668	Neutral	28.7	46.0	17.3	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)



Live



Neutral

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

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	19 Apr 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	19 Feb 2014	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	09 Aug 2013	12

5.2.2. Receiver/Idle Mode Radiated Spurious Emissions

Test Summary:

Test Engineer:	Sarah Williams	**Test Date:**	29 March 2013
Test Sample IMEI:	355335050017236		

FCC Reference:	Part 15.109
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	26

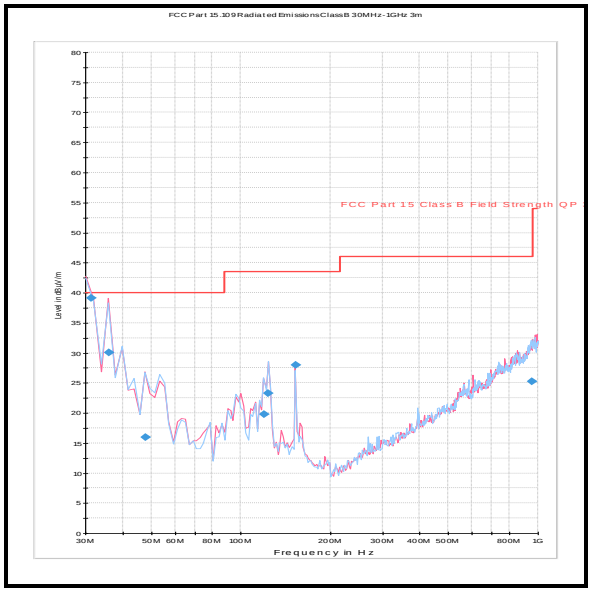
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All 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.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
31.337	Vertical	39.1	40.0	0.9	Complied
36.096	Vertical	30.0	40.0	10.0	Complied
123.571	Horizontal	23.3	43.5	20.2	Complied
153.307	Vertical	28.0	43.5	15.5	Complied
956.200	Vertical	25.3	46.0	20.7	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)



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

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1834	Attenuator	Hewlett Packard	8491B	10444	27 Jan 2014	12
A490	Antenna	Chase	CBL6111A	1590	14 May 2013	12
G0543	Amplifier	Sonoma	310N	230801	03 Apr 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2014	12

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	26 March 2013
Test Sample IMEI:	355335050017244		

FCC Reference:	Part 15.109
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range:	1 GHz to 12.5 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	29

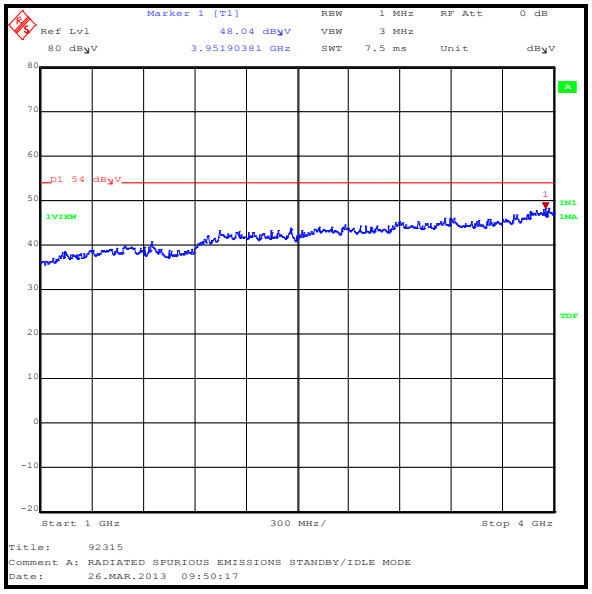
Note(s):

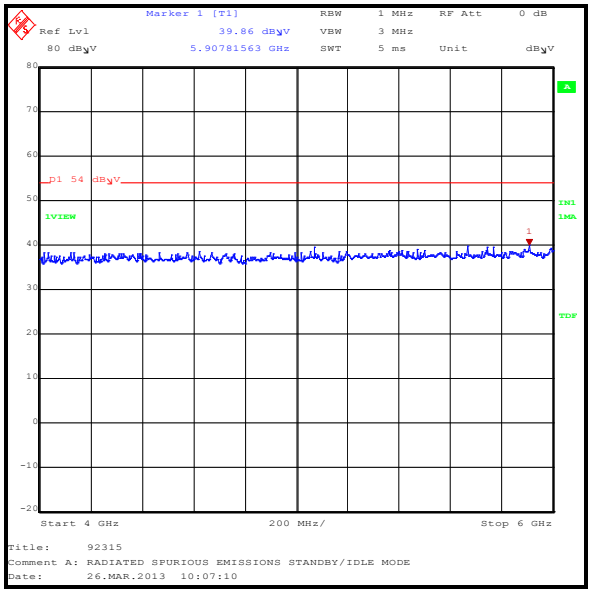
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
3. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI 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 (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

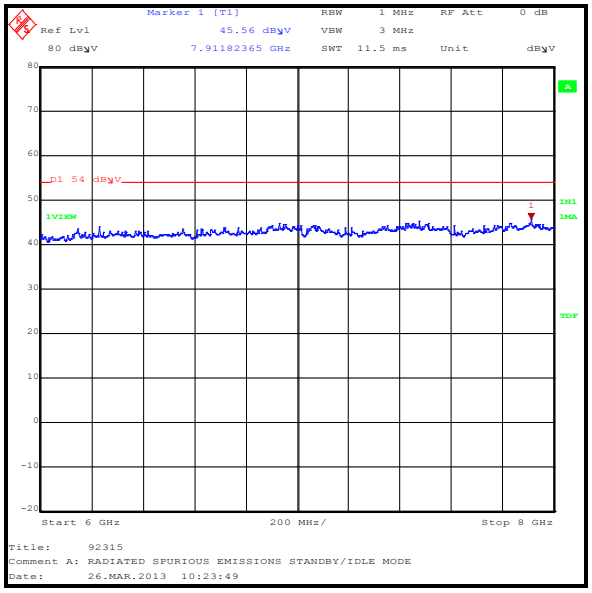
Results:

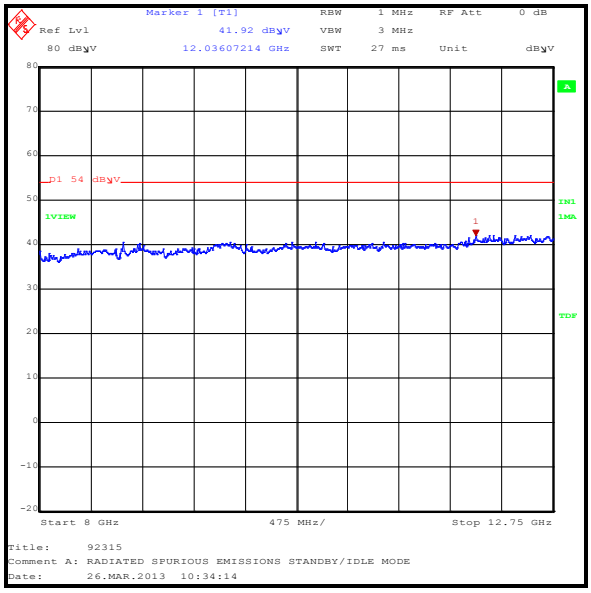
Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
3951.904	Vertical	48.0	54.0	6.0	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)









Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0002	3m RSE Chamber	Rainford	N/A	N/A	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A253	Antenna	Flann Microwave	12240-20	128	04 Nov 2013	12
A254	Antenna	Flann Microwave	14240-20	139	04 Nov 2013	12
A255	Antenna	Flann Microwave	16240-20	519	04 Nov 2013	12

5.2.3. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Patrick Jones	**Test Date:**	08 April 2013
Test Sample IMEI:	355335050017244		

FCC Reference:	Part 15.207
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	29

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150000	Live	59.6	66.0	6.4	Complied
0.186000	Live	57.1	64.2	7.1	Complied
0.222000	Live	55.5	62.7	7.2	Complied
0.253500	Live	53.6	61.6	8.0	Complied
0.303000	Live	51.6	60.2	8.6	Complied
0.325500	Live	49.3	59.6	10.3	Complied
0.487500	Live	45.8	56.2	10.4	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.199500	Live	36.0	53.6	17.6	Complied
0.253500	Live	34.3	51.6	17.3	Complied
0.357000	Live	33.2	48.8	15.6	Complied
0.492000	Live	40.0	46.1	6.1	Complied
1.864500	Live	27.1	46.0	18.9	Complied
2.818500	Live	25.5	46.0	20.5	Complied
4.326000	Live	24.7	46.0	21.3	Complied
6.549000	Live	29.1	50.0	20.9	Complied

Transmitter AC Conducted Spurious Emissions (continued)

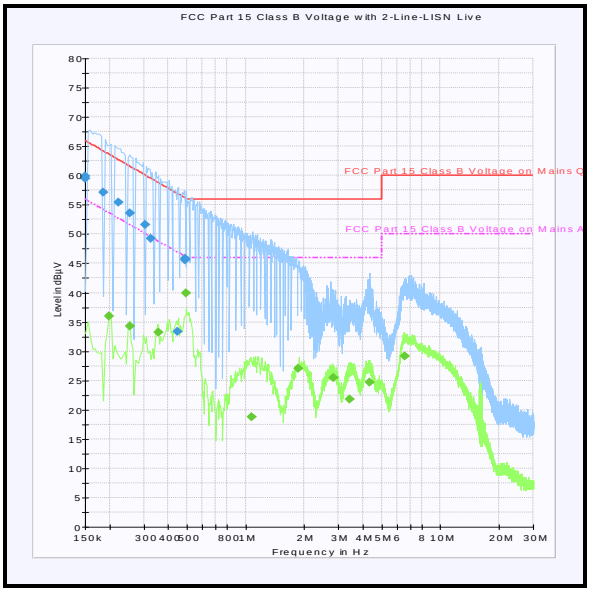
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150000	Neutral	63.4	66.0	2.6	Complied
0.154500	Neutral	62.8	65.8	3.0	Complied
0.159000	Neutral	63.4	65.5	2.1	Complied
0.172500	Neutral	63.1	64.8	1.7	Complied
0.186000	Neutral	62.1	64.2	2.1	Complied
0.199500	Neutral	61.2	63.6	2.4	Complied
0.235500	Neutral	59.8	62.3	2.5	Complied
0.244500	Neutral	59.6	61.9	2.3	Complied

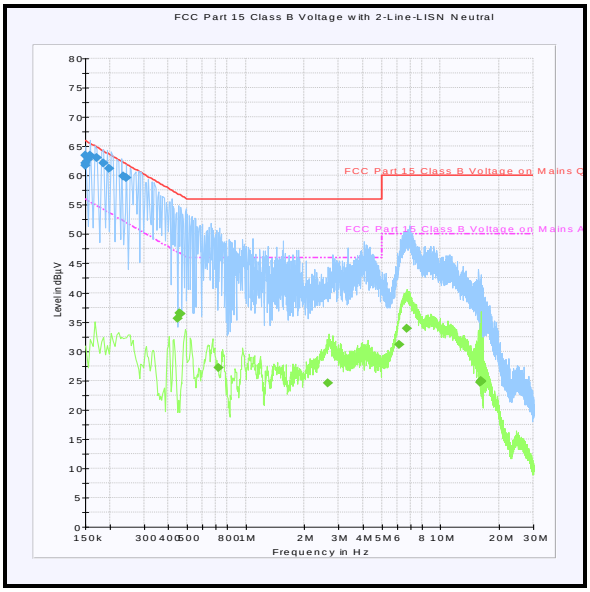
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.447000	Neutral	35.6	46.9	11.3	Complied
0.456000	Neutral	36.6	46.8	10.2	Complied
0.460500	Neutral	36.4	46.7	10.3	Complied
0.721500	Neutral	27.2	46.0	18.8	Complied
2.647500	Neutral	24.6	46.0	21.4	Complied
6.112500	Neutral	31.1	50.0	18.9	Complied
6.733500	Neutral	33.9	50.0	16.2	Complied
16.053000	Neutral	24.6	50.0	25.4	Complied
16.156500	Neutral	24.9	50.0	25.1	Complied

Transmitter AC Conducted Spurious Emissions (continued)



Live



Neutral

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

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	09 Aug 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	19 Feb 2014	12
A649	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	825562/008	19 Apr 2013	12

5.2.4. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	27 March 2013
Test Sample IMEI:	355335050017087		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	As detailed in FCC KDB 558074 Section 7.1 Option 1

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	30

Note(s):

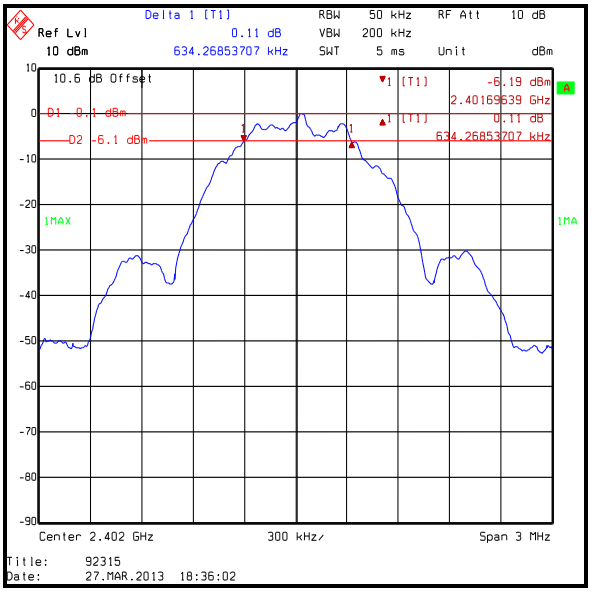
1. Transmitter minimum 6 dB bandwidth tests were performed using a test receiver in accordance with FCC KDB 558074 Section 7.1 Option 1.

Results:

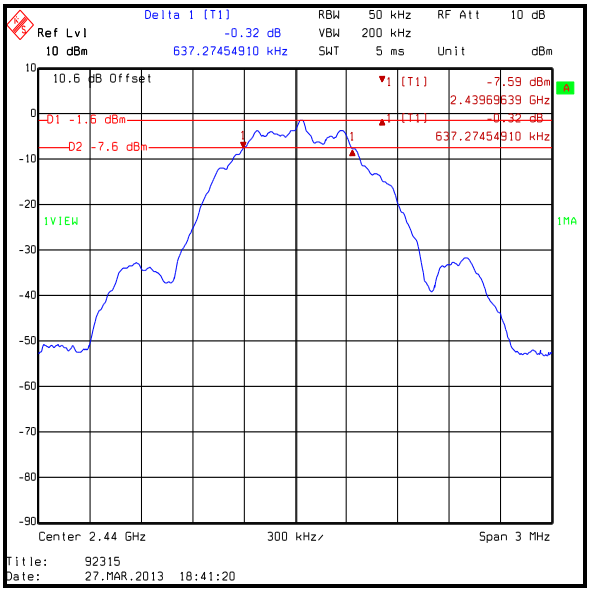
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	634.269	≥500	134.269	Complied
Middle	637.275	≥500	137.275	Complied
Top	631.263	≥500	131.263	Complied

Transmitter Minimum 6 dB Bandwidth (continued)

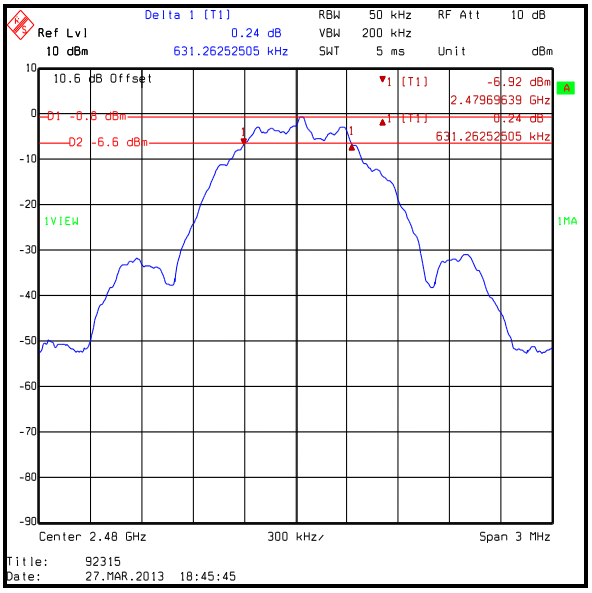
Results:



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1996	Attenuator	Huber & Suhner	6810.17.B	301749	03 Apr 2013	12
M1242	Test Receiver	Rohde & Schwarz	FSEM30	845986/022	19 Dec 2013	12

5.2.5. Transmitter Duty Cycle

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	27 March 2013
Test Sample IMEI:	355335050017087		

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

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	30

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 / (On Time / [Period or 100mS whichever is the lesser])).

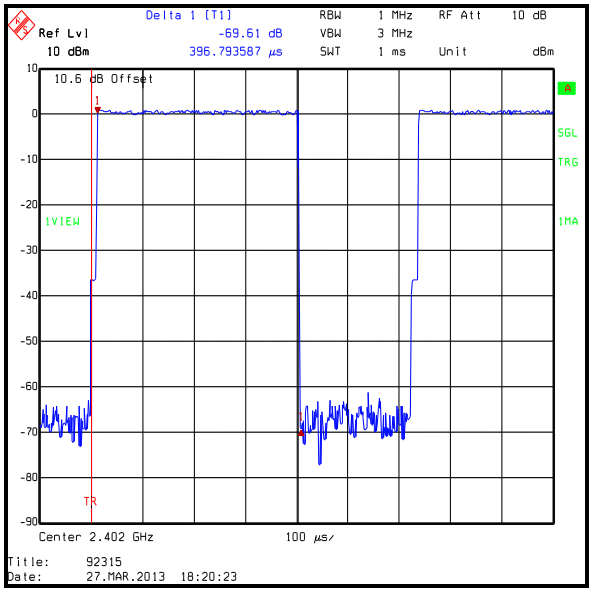
*10 log (1 / (*396.794 µs / 627.255 µs*)) = 2.0 dB.*

Transmitter Duty Cycle (continued)

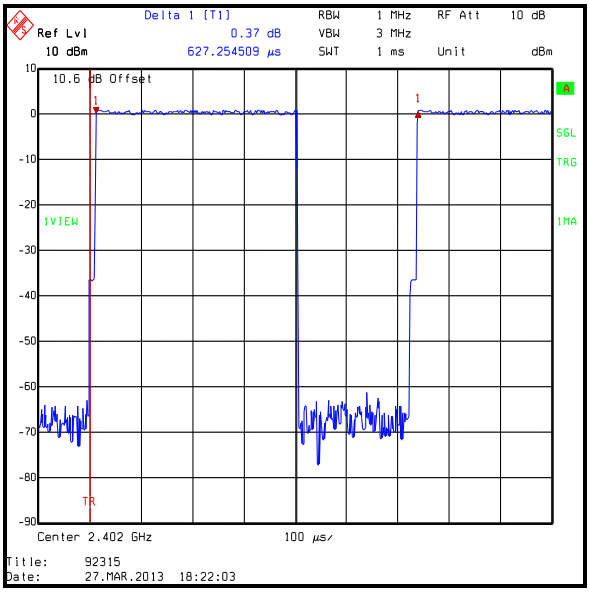
Results:

Pulse Duration (µs)	Duty Cycle (dB)
396.794	2.0

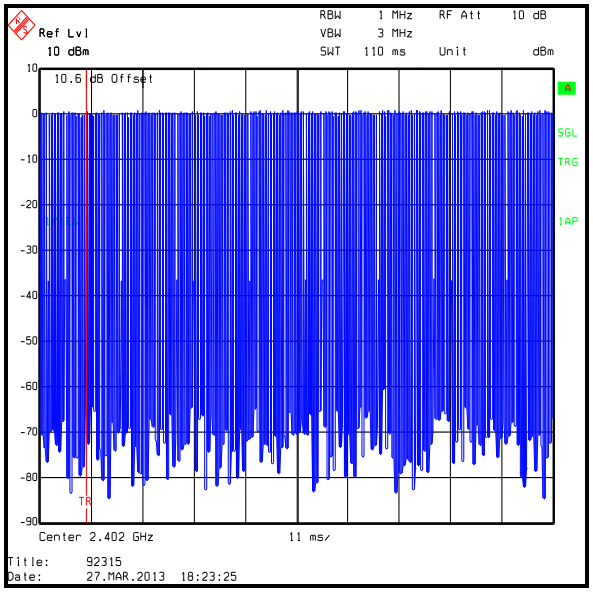
Period (µs)
627.255



TX on time



TX on + off time / period



100 ms

Transmitter Duty Cycle (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1996	Attenuator	Huber & Suhner	6810.17.B	301749	03 Apr 2013	12
M1242	Test Receiver	Rohde & Schwarz	FSEM30	845986/022	19 Dec 2013	12

5.2.6. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	27 March 2013
Test Sample IMEI:	355335050017087		

FCC Reference:	Part 15.247(e)
Test Method Used:	As detailed in FCC KDB 558074 Sections 9.2 & 9.4

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	30

Note(s):

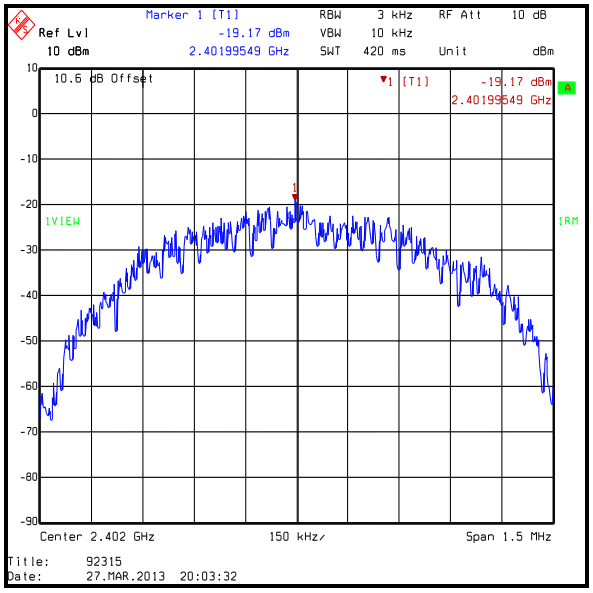
1. Transmitter Power Spectral Density tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 558074 Sections 9.2 measurement procedure Option 2 and 9.4 Alternative 1.
2. The EUT was transmitting at <98% duty cycle. The calculated duty cycle measured in section 5.2.5 was added to the measured average power spectral density in order to compute the power spectral density.
3. The spectrum analyser was connected to the RF port on the EUT using a suitable attenuation and RF cable. An RF level offset of 10.6 dB was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.

Results:

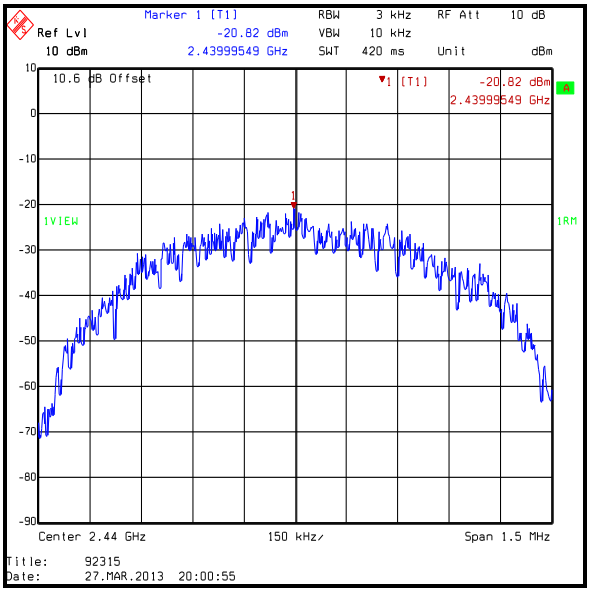
Channel	Output Power (dBm / 3 kHz)	Duty Cycle correction (dB)	Corrected Output Power (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-19.2	2.0	-17.2	8.0	25.2	Complied
Middle	-20.8	2.0	-18.8	8.0	26.8	Complied
Top	-19.9	2.0	-17.9	8.0	25.9	Complied

Transmitter Power Spectral Density (continued)

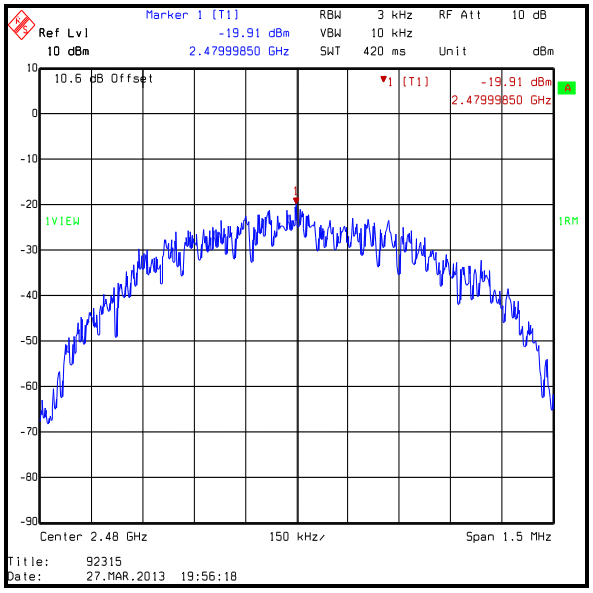
Results:



Bottom Channel



Middle Channel



Top Channel

Transmitter Power Spectral Density (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1996	Attenuator	Huber & Suhner	6810.17.B	301749	03 Apr 2013	12
G085	Continuous Wave Generator	Hewlett Packard	83650L	3614A00104	28 Nov 2014	24
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	19 Dec 2013	12
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	07 Jun 2013	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	07 Jun 2013	12

5.2.7. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	27 March 2013
Test Sample IMEI:	355335050017087		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	As detailed in FCC KDB 558074 Sections 8.2.2 & 8.2.4

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	30

Note(s):

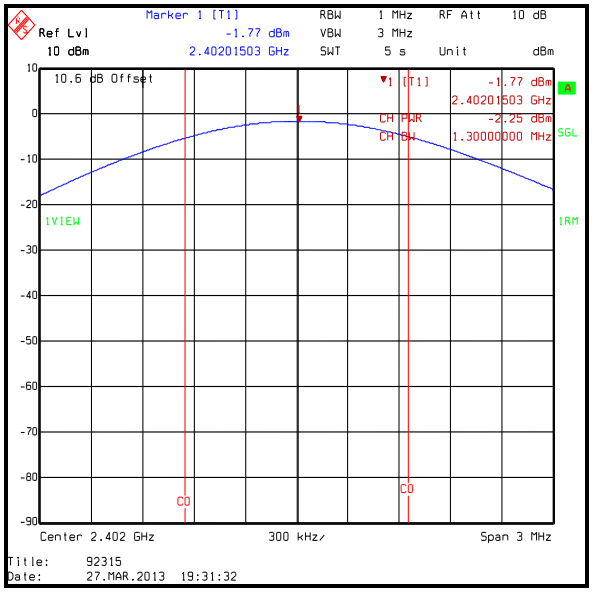
1. Conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.2.2 Option 2 and Section 8.2.4 Alternative 1.
2. The EUT was transmitting at <98% duty cycle. The calculated duty cycle in section 5.2.5 was added to the measured average power in order to compute the power during the actual transmission time.
3. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.

Results:

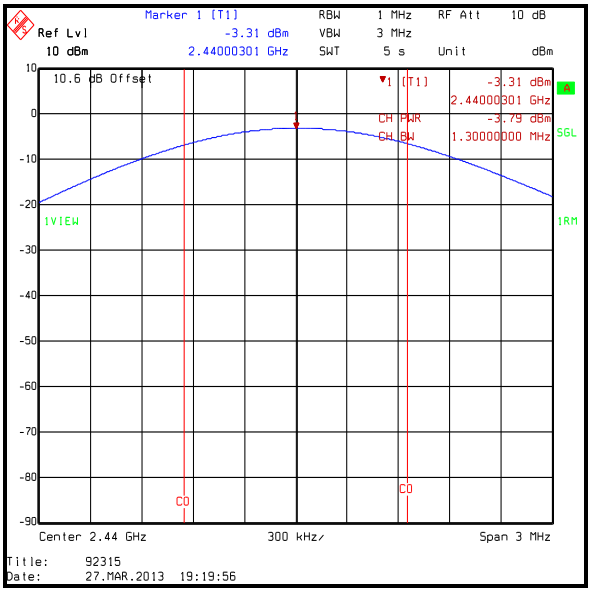
Channel	Conducted Power (dBm)	Duty Cycle correction (dB)	Corrected Conducted Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-2.3	2.0	-0.3	30.0	30.3	Complied
Middle	-3.8	2.0	-1.8	30.0	31.8	Complied
Top	-3.0	2.0	-1.0	30.0	31.0	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-0.3	-2.0	-2.3	36.0	38.3	Complied
Middle	-1.8	-2.0	-3.8	36.0	39.8	Complied
Top	-1.0	-2.0	-3.0	36.0	39.0	Complied

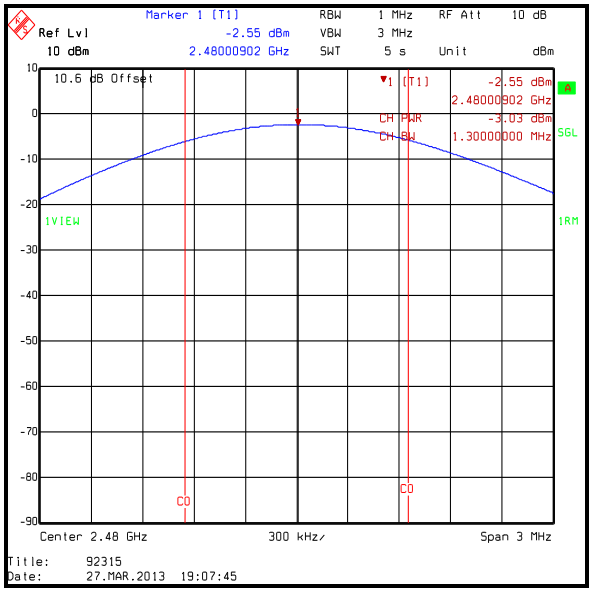
Transmitter Maximum Peak Output Power (continued)



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1996	Attenuator	Huber & Suhner	6810.17.B	301749	03 Apr 2013	12
G085	Continuous Wave Generator	Hewlett Packard	83650L	3614A00104	28 Nov 2014	24
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	19 Dec 2013	12
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	07 Jun 2013	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	07 Jun 2013	12

5.2.8. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Mark Percival	**Test Date:**	04 April 2013
Test Sample IMEI:	355335050017236		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	25

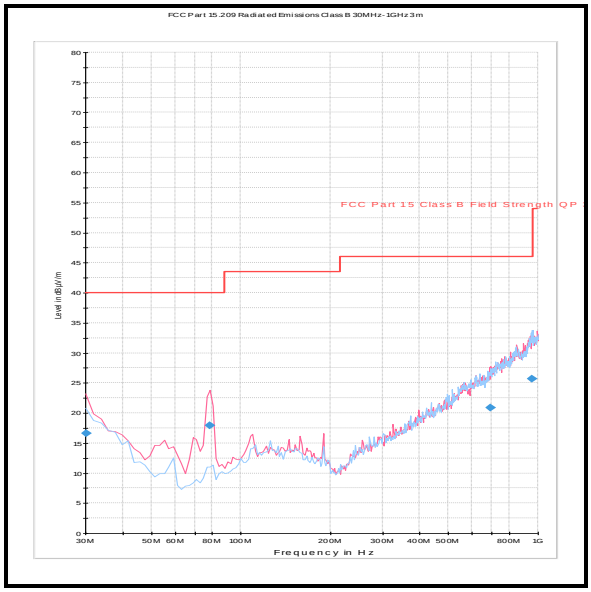
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore, final radiated emissions measurements were performed with the EUT set to the top channel only.
3. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: Top Channel

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
957.556	Horizontal	25.7	46.0	20.3	Complied

Transmitter Radiated Emissions (continued)



Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1834	Attenuator	Hewlett Packard	8491B	10444	27 Jan 2014	12
A490	Antenna	Chase	CBL6111A	1590	14 May 2013	12
G0543	Amplifier	Sonoma	310N	230801	04 Jul 2013	3
K0001	5m RSE Chamber	Rainford	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2014	12

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineers:	David Doyle & Sandeep Bharat	**Test Date:**	04 April 2013
Test Sample IMEI:	355335050017228		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	29

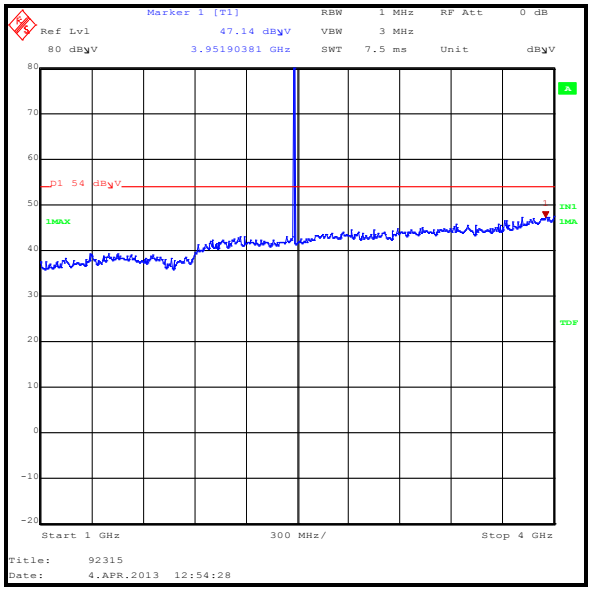
Note(s):

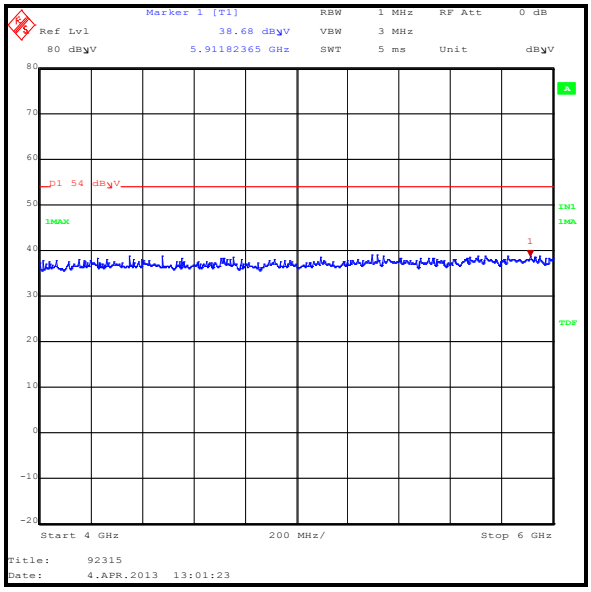
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
3. The emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI 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 (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

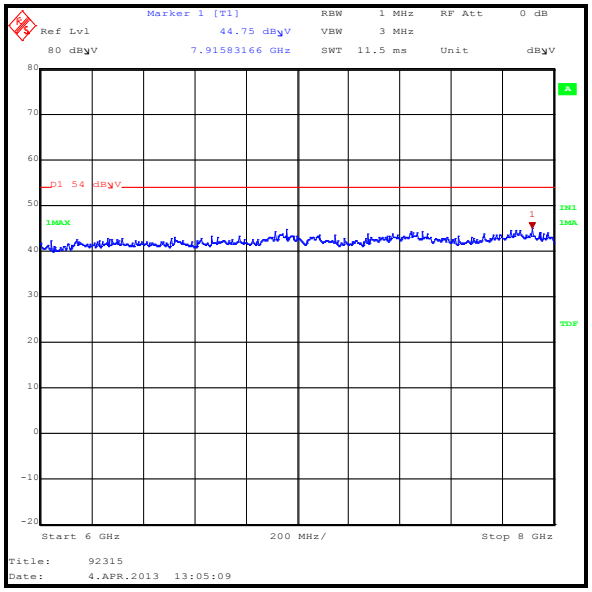
Results:

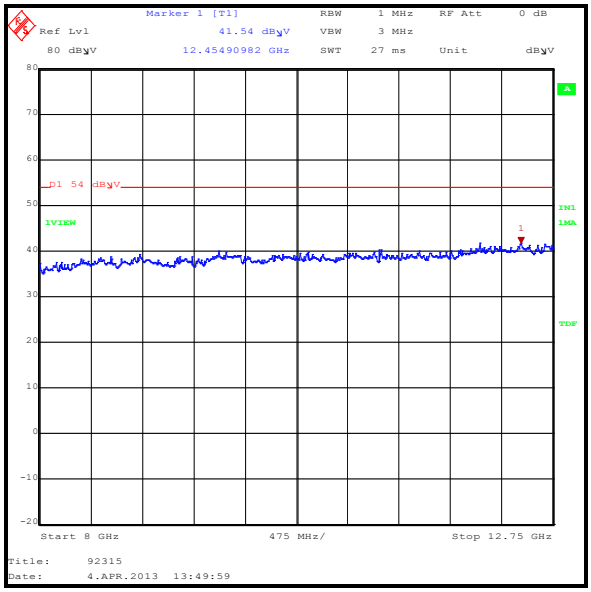
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
16958.417	Horizontal	48.1	54.0	5.9	Complied

Transmitter Radiated Emissions (continued)

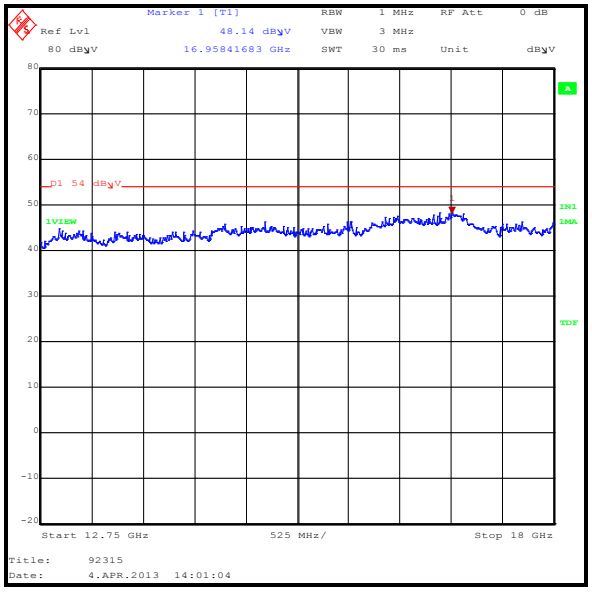


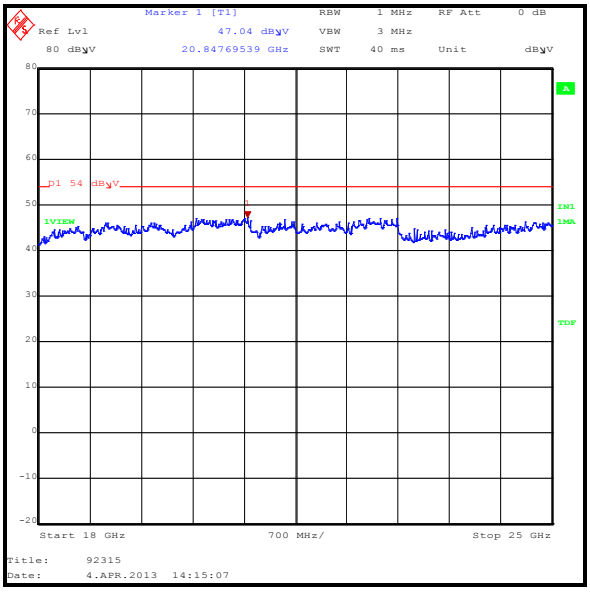






Transmitter Radiated Emissions (continued)





Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A253	Antenna	Flann Microwave	12240-20	128	04 Nov 2013	12
A254	Antenna	Flann Microwave	14240-20	139	04 Nov 2013	12
A255	Antenna	Flann Microwave	16240-20	519	04 Nov 2013	12
A256	Antenna	Flann Microwave	18240-20	400	04 Nov 2013	12
A436	Antenna	Flann Microwave	20249-20	330	04 Nov 2013	12

5.2.9. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	04 April 2013
Test Sample IMEI:	355335050017228		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.2

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	29

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. * -20 dBc limit.

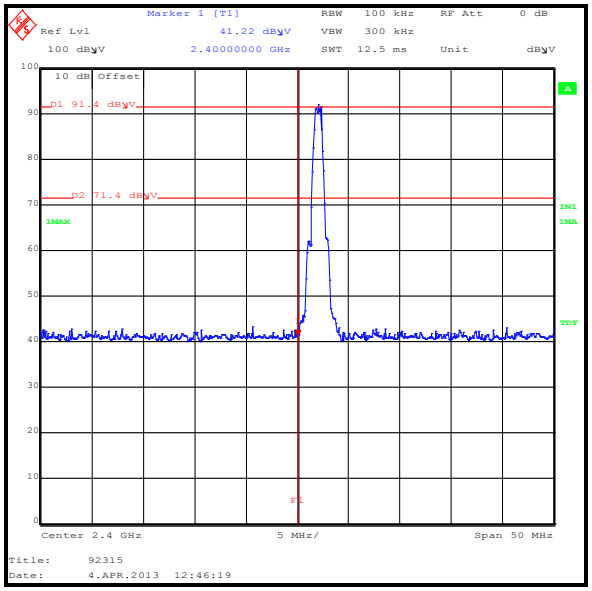
Results: Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400	41.2	71.4*	30.2	Complied
2483.5	51.9	74.0	22.1	Complied

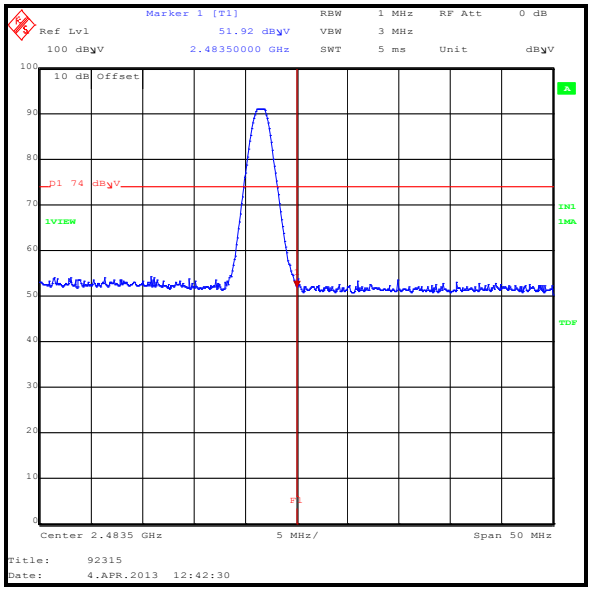
Results: Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	40.4	54.0	13.6	Complied

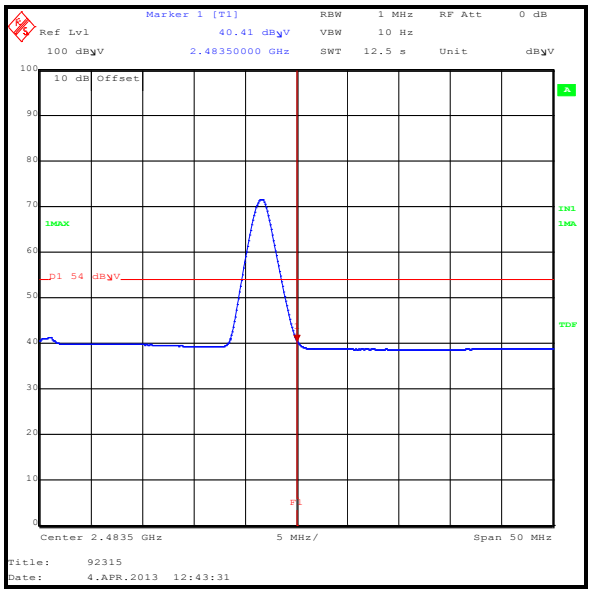
Transmitter Band Edge Radiated Emissions (continued)



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

Test Equipment Used:

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

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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 dB
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 26.5 GHz	95%	±2.94 dB

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

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version