TEST REPORT

Test Report No. : UL-RPT-RP91427JD04A

Manufacturer	:	CSR
Model No.	:	CSR Retail Tag
FCC ID	:	PIWCNS12015
Technology	:	*Bluetooth* – Low Energy
Test Standard(s)	:	FCC Parts 15.109, 15.209(a) & 15.247

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2. The results in this report apply only to the sample(s) tested.
3. This 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: 20 February 2013

Checked by:

Sarah Williams
WiSE Laboratory Engineer

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.

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1. Customer Information

Company Name:	CSR
Address:	Churchill House Cambridge Business Park Cowley Road Cambridge CB4 0WZ 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:	47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart B (Unintentional Radiators) - Section 15.109
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart C (Intentional Radiators) - Section 15.209
Site Registration:	209735
Location of Testing:	RFI Global Services Ltd trading as UL, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	09 December 2012 to 10 December 2012

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.109	Receiver/Idle Mode Radiated Spurious Emissions	✓
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.247(e)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	Transmitter Maximum Average 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

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 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:	CSR Retail Tag
Model Name or Number:	CSR Retail Tag
Serial Number:	271683 *(Radiated sample)*
Hardware Version Number:	1
Software Version Number:	1
FCC ID:	PIWCNS12015

Brand Name:	CSR Retail Tag
Model Name or Number:	CSR Retail Tag
Serial Number:	N120505 *(Conducted RF port sample)*
Hardware Version Number:	1
Software Version Number:	1
FCC ID:	PIWCNS12015

3.2. Description of EUT

The equipment under test was a *Bluetooth* Low Energy Retail Tag for retail outlet use

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	3.2 VDC	
Maximum Conducted Output Power:	-2.7 dBm		
Antenna Gain:	2.15 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
	Middle	19	2440
	Top	39	2480

3.5. Support Equipment

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

Description:	Development board
Brand Name:	CSR
Model Name or Number:	Dev-PC-1504C
Serial Number:	145714

Description:	SPI communication port and Ethernet cable
Brand Name:	CSR
Model Name or Number:	XSPI
Serial Number:	Not stated or marked

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	D610
Serial Number:	PC401 NT

Description:	Alkaline Batteries (x2)
Brand Name:	Power one
Model Name or Number:	AA 1.5 V Mignon LR6
Serial Number:	Not stated or marked

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 (packet length 37).

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: Connected to a laptop PC via a SPI communication cable using the Customer's bespoke application was used to place the EUT into *Bluetooth* test mode.
- The EUT was powered by two Alkaline Batteries which were checked before testing using a calibrated digital multimeter.
- The EUT conducted sample with serial number N120505 was used for 6 dB bandwidth, power spectral density and conducted output power tests.
- The radiated sample with serial number 271683 was used for 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 Radiated Spurious Emissions

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	10 December 2012
Test Sample Serial Number:	271683		

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):	23
Relative Humidity (%):	29

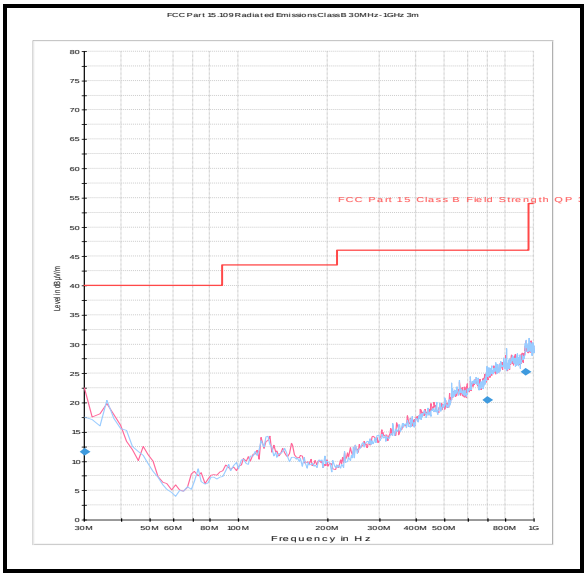
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. 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
30.289	Vertical	11.6	40.0	28.4	Complied
695.574	Horizontal	20.4	46.0	25.6	Complied
941.514	Horizontal	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	29 Jan 2013	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma	310N	230801	02 Jan 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	09 December 2012
Test Sample Serial Number:	271683		

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 (%):	31

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. 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: Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
9601.961	Horizontal	47.0	54.0	7.0	Complied

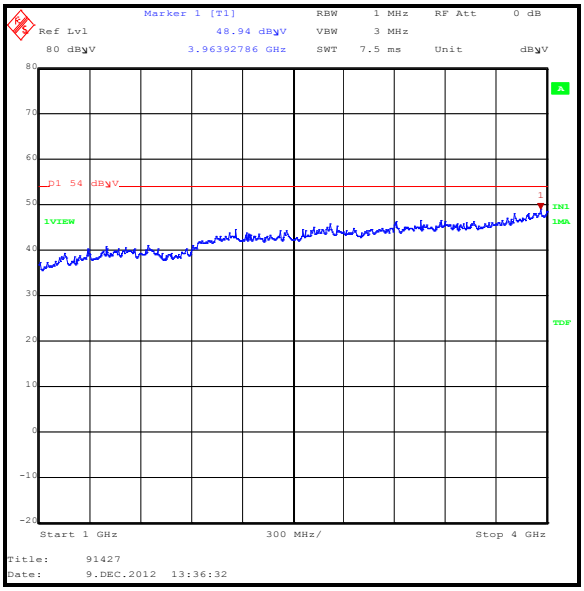
Results: Middle Channel

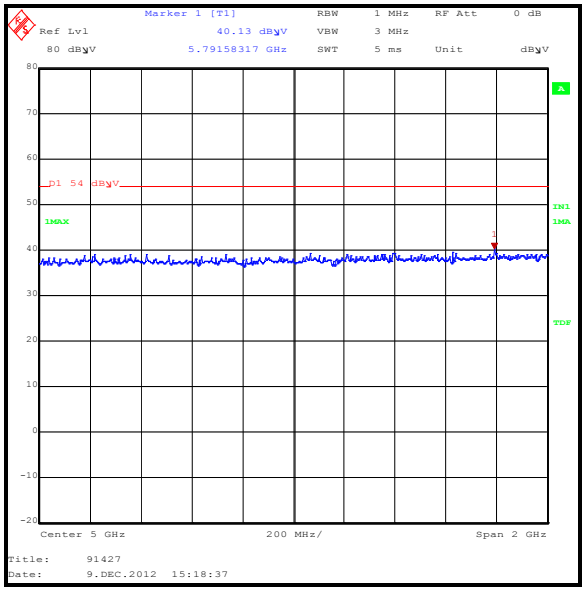
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
9754.108	Horizontal	47.9	54.0	6.1	Complied

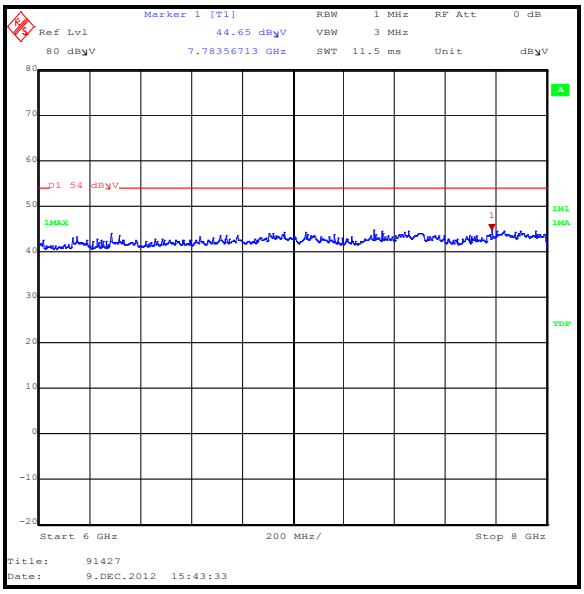
Results: Top Channel

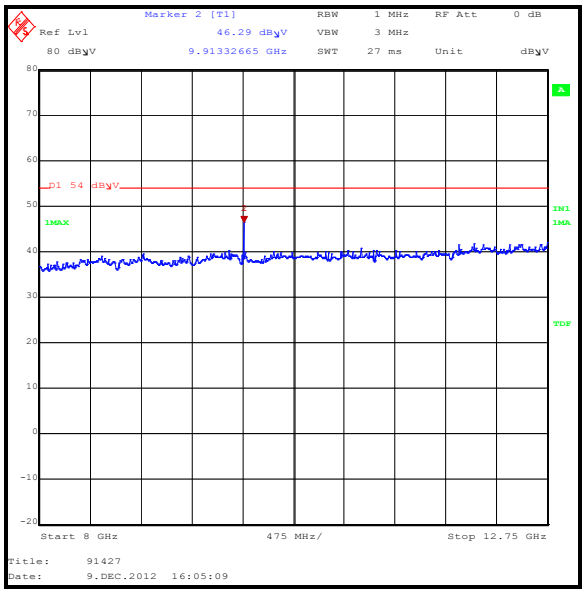
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
9913.988	Horizontal	47.8	54.0	6.2	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)









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

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
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
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	N/A	14 Aug 2013	12

5.2.2. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	09 December 2012
Test Sample Serial Number:	N120505		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	31

Note(s):

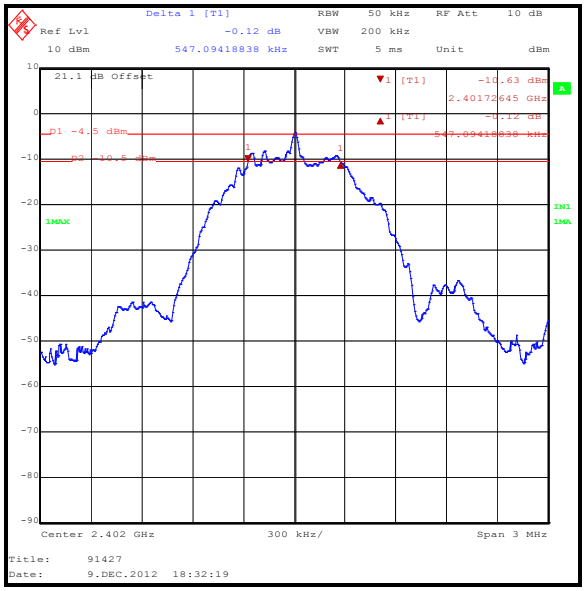
1. Transmitter minimum 6 dB bandwidth tests were performed using a test receiver in accordance with FCC KDB 558074 Section 7.1 Option 1.

Results:

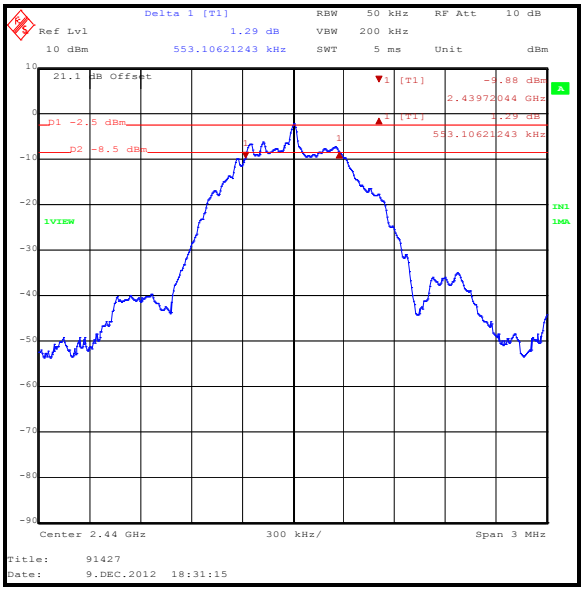
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	547.094	≥500	47.094	Complied
Middle	553.106	≥500	53.106	Complied
Top	541.082	≥500	41.082	Complied

Transmitter Minimum 6 dB Bandwidth (continued)

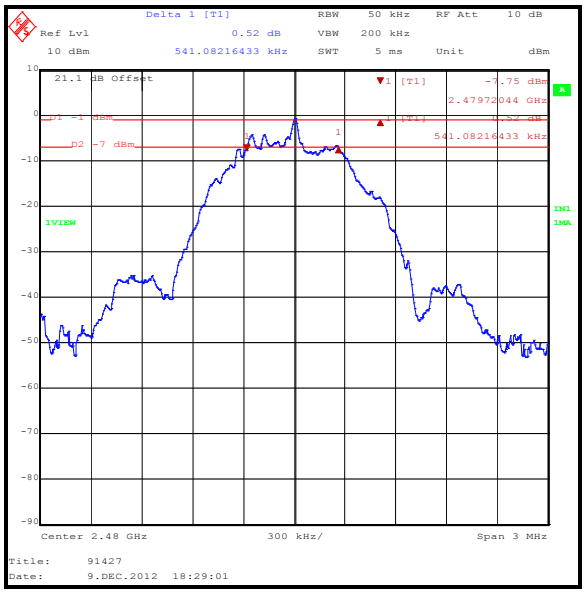
Results:



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A2144	Attenuator	Atlan TecRF	AN18-20	081120-23	25 May 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12

5.2.3.Transmitter Duty Cycle

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	09 December 2012
Test Sample Serial Number:	N120505		

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

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	31

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])).

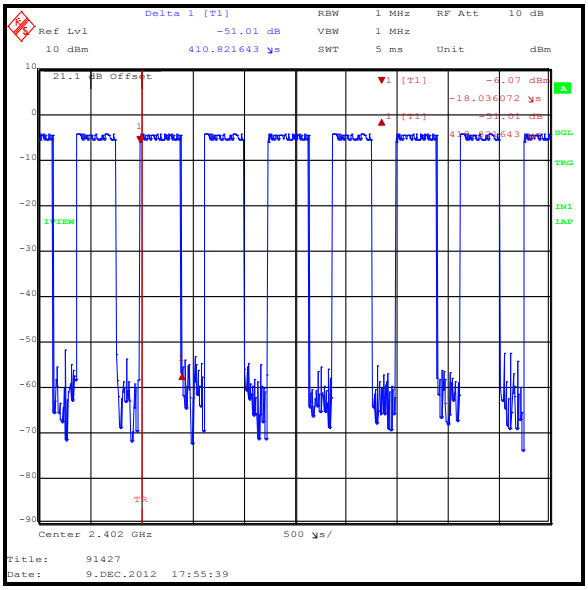
10 log (1 / (410.822 µs */ 621.242* µs*)) = 1.8 dB*

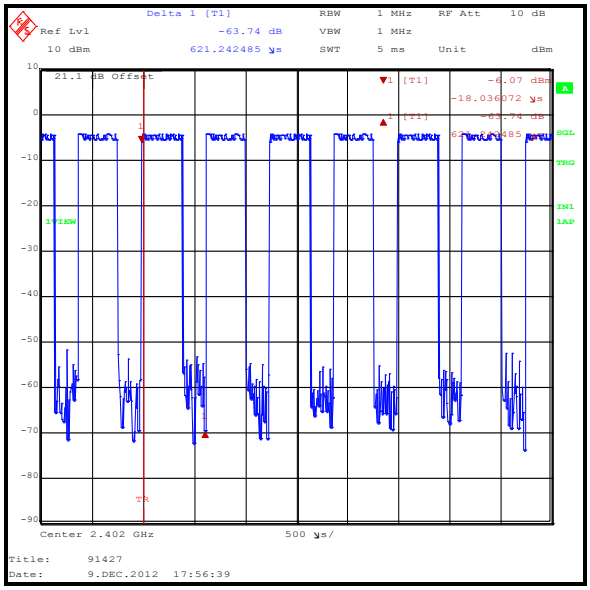
Transmitter Duty Cycle (continued)

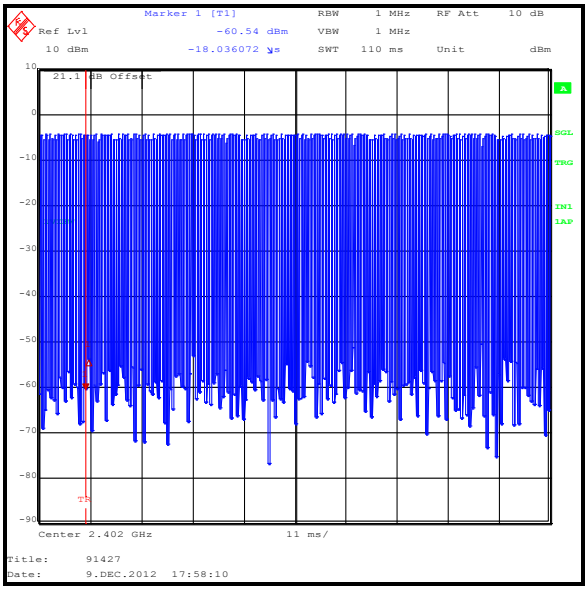
Results:

Pulse Duration (µS)	Duty Cycle (dB)
410.822	1.8

Period (µS)
621.242







Transmitter Duty Cycle (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A2144	Attenuator	Atlan TecRF	AN18-20	081120-23	25 May 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12

5.2.4. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	09 December 2012
Test Sample Serial Number:	N120505		

FCC Reference:	Part 15.247(e)
Test Method Used:	As detailed in FCC KDB 558074 Sections 9.3 & 9.4

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	32

Note(s):

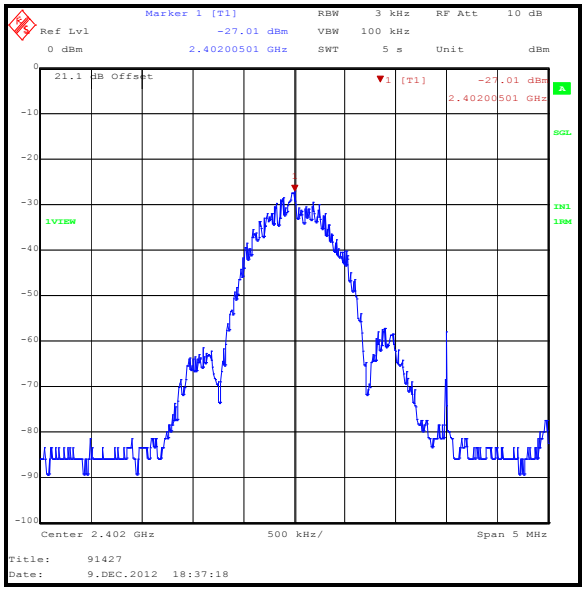
1. Transmitter Power Spectral Density tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 9.3 Option 3 and Section 9.4 Alternative 1.
2. The spectrum analyser was connected to the RF port on the EUT using a suitable attenuation and RF cable. An RF level offset of 21.1 dB was entered on the Test Receiver to compensate for the loss of the attenuator and RF cable.
3. The EUT was transmitting at <98% duty cycle. The calculated duty cycle in section 5.2.5 was added to the measured average power spectral density in order to compute the power spectral density.

Results:

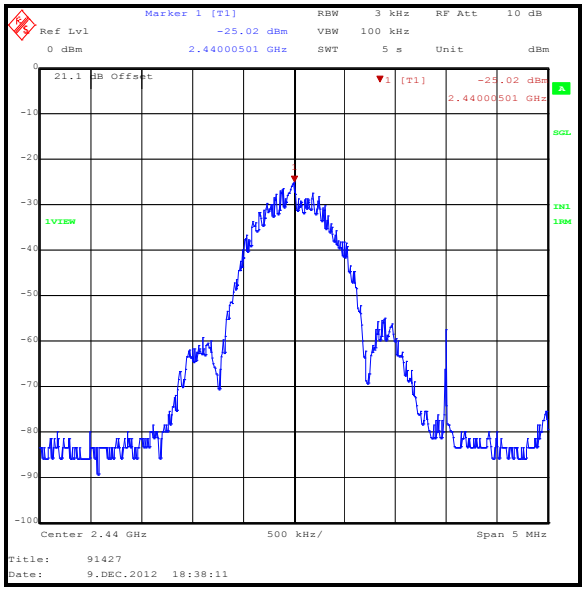
Channel	Output Power (dBm/3 kHz)	Duty cycle correction (dB)	Corrected Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-27.0	1.8	-25.2	8.0	33.2	Complied
Middle	-25.0	1.8	-23.2	8.0	31.2	Complied
Top	-23.5	1.8	-21.7	8.0	29.7	Complied

Transmitter Power Spectral Density (continued)

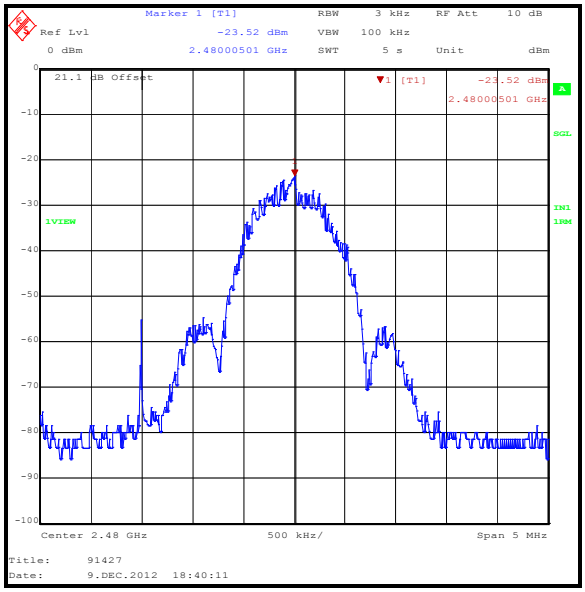
Results:



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A2144	Attenuator	Atlan TecRF	AN18-20	081120-23	25 May 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	07 Jun 2013	12
M199	Power Meter	Rohde & Schwarz	NVRS	827023/075	07 Jun 2013	12
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	14 Jun 2013	12

5.2.5. Transmitter Maximum Average Output Power

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	09 December 2012
Test Sample Serial Number:	N120505		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	32

Note(s):

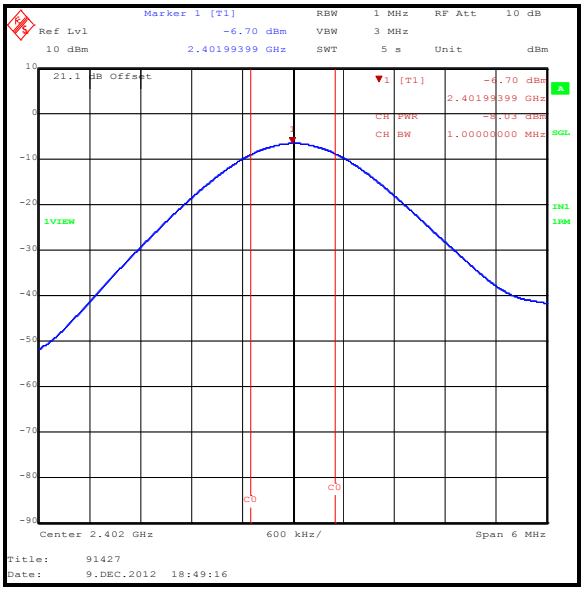
1. Conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.2.2 Option 2 and Section 8.2.4 Alternative 1.
2. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset of 21.1 dB was entered on the Test Receiver to compensate for the loss of the attenuator and RF cable.
3. 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.

Results:

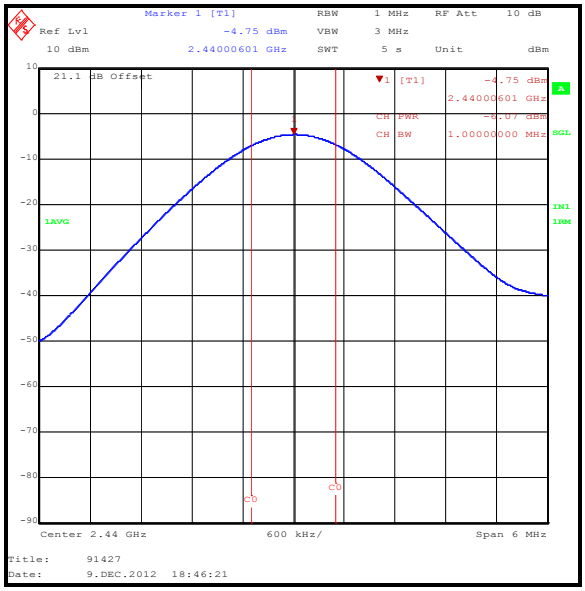
Channel	Conducted Power (dBm)	Duty cycle correction (dB)	Corrected Conducted Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-8.0	1.8	-6.2	30.0	36.2	Complied
Middle	-6.1	1.8	-4.3	30.0	34.3	Complied
Top	-4.5	1.8	-2.7	30.0	32.7	Complied

Channel	Corrected Conducted Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-6.2	2.15	-4.05	36.0	40.05	Complied
Middle	-4.3	2.15	-2.15	36.0	38.15	Complied
Top	-2.7	2.15	-0.55	36.0	36.55	Complied

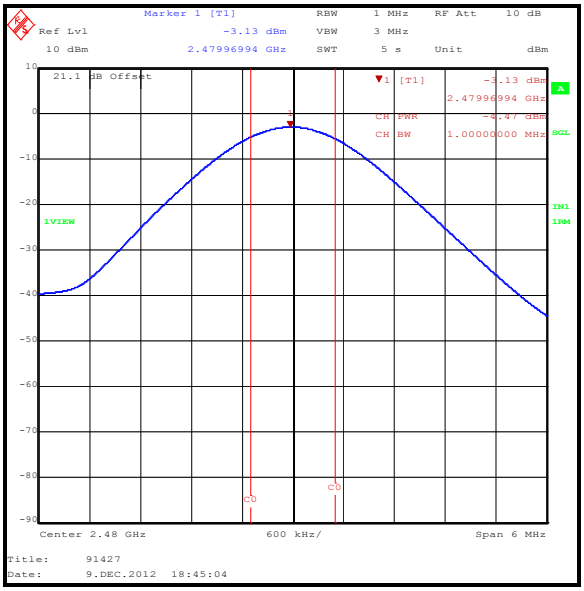
Transmitter Maximum Average Output Power (continued)



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A2144	Attenuator	Atlan TecRF	AN18-20	081120-23	25 May 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	07 Jun 2013	12
M199	Power Meter	Rohde & Schwarz	NVRS	827023/075	07 Jun 2013	12
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	14 Jun 2013	12

5.2.6. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	10 December 2012
Test Sample Serial Number:	271683		

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):	23
Relative Humidity (%):	29

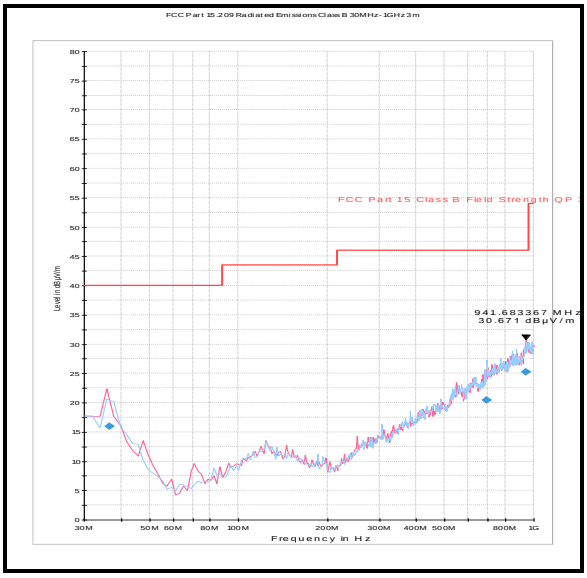
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. 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 measurement system therefore the highest peak noise floor reading of the measurement receiver was recorded as shown in the results 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
941.683	Vertical	30.7	46.0	15.3	Complied

Transmitter Radiated 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	29 Jan 2013	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma	310N	230801	02 Jan 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	09 December 2012
Test Sample Serial Number:	271683		

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 FCC KDB 558074 Section 10.1
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	31

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 plots were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
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.
5. As the conducted output power and spectral density were measured using an RMS detector, the emission in the non-restricted band was compared against a limit of -30 dBc as specified in FCC KDB 558074 Section 10.0.
6. * -30 dBc limit.

Transmitter Radiated Emissions (continued)

Results: Peak Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4804.776	Horizontal	44.5	74.0	29.5	Complied
9613.985	Horizontal	40.6	62.0*	21.4	Complied

Results: Average Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4804.015	Horizontal	33.7	54.0	20.3	Complied

Results: Peak Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4880.427	Horizontal	46.7	74.0	27.3	Complied
9759.986	Horizontal	39.1	66.2*	27.1	Complied

Results: Average Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4880.015	Horizontal	35.8	54.0	18.2	Complied

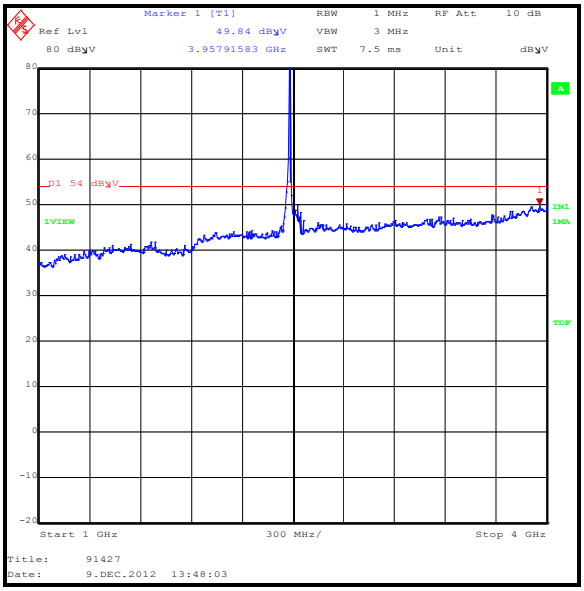
Results: Peak Top Channel

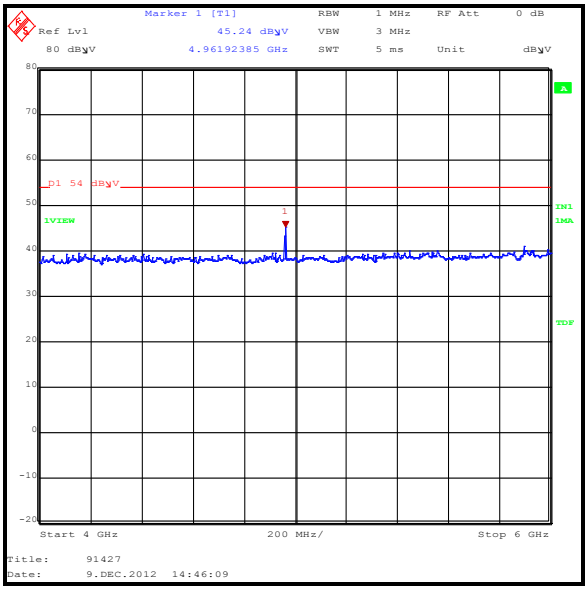
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4959.260	Horizontal	47.7	74.0	26.3	Complied
9913.988	Horizontal	45.2	69.1*	23.9	Complied

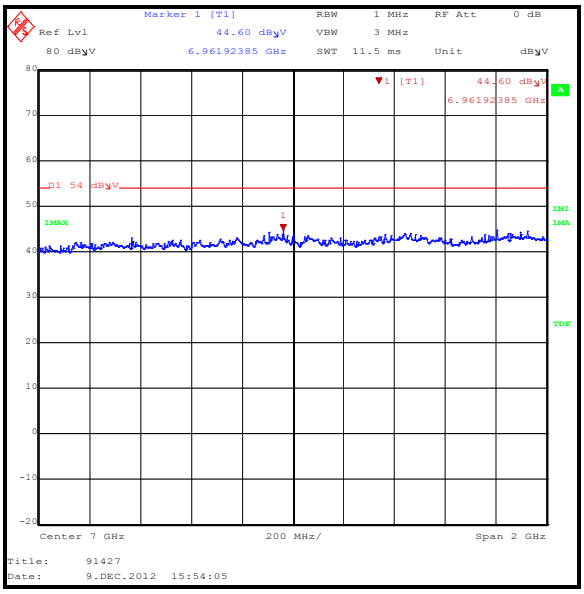
Results: Average Top Channel

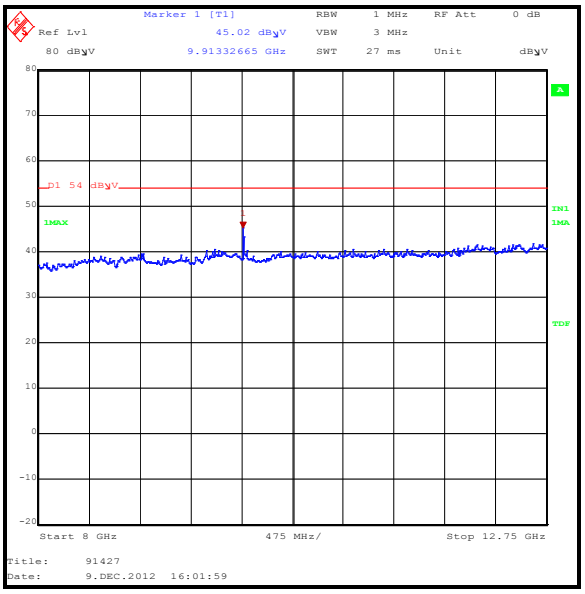
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4959.990	Horizontal	36.6	54.0	17.4	Complied

Transmitter Radiated Emissions (continued)

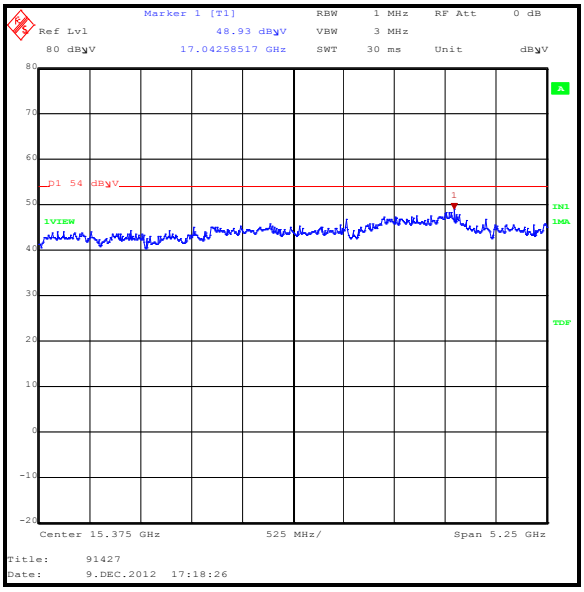


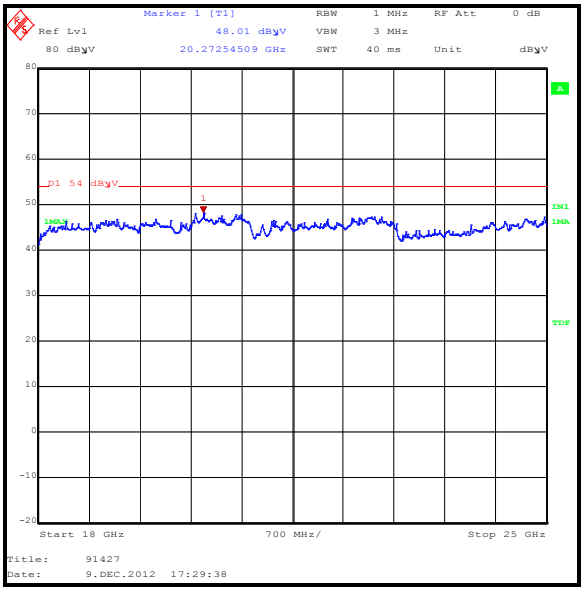






Transmitter Radiated Emissions (continued)





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)
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	06 Jul 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	15 Mar 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	20240-20	330	04 Nov 2013	12
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

5.2.7. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	09 December 2012
Test Sample Serial Number:	271683		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.2 & FCC KDB 558074 Section 10.1

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	31

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 lower band edge plot shows display line 2 at -20 dBc, as the conducted output power and spectral density were measured using an RMS detector, the limit is -30 dBc as specified in FCC KDB 558074 Section 10.0. The limit has been adjusted to reflect this in the results table.
3. * -30 dBc limit.

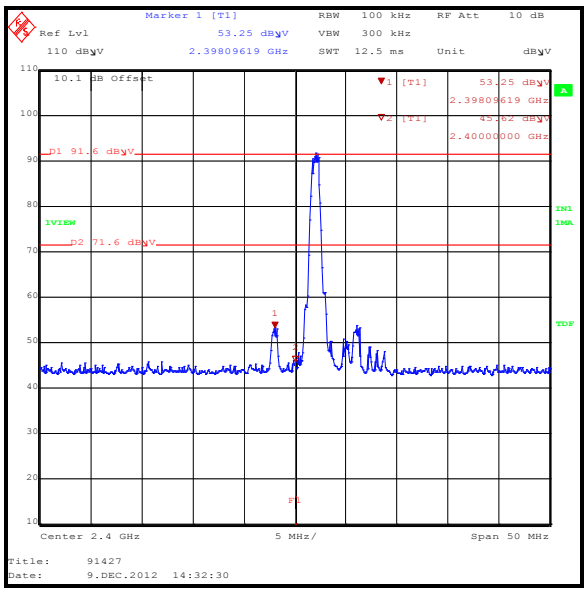
Results: Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2398.096	53.3	61.6*	8.3	Complied
2400	45.6	61.6*	16.0	Complied
2483.5	65.8	74.0	8.2	Complied

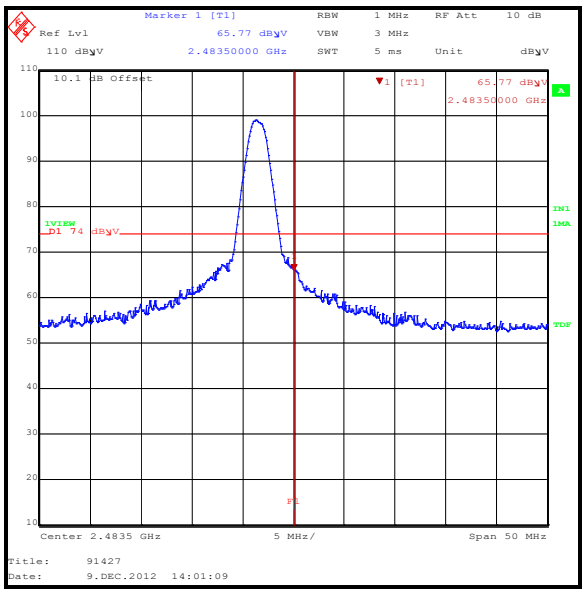
Results: Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	49.8	54.0	4.2	Complied
2484.051	51.4	54.0	2.6	Complied

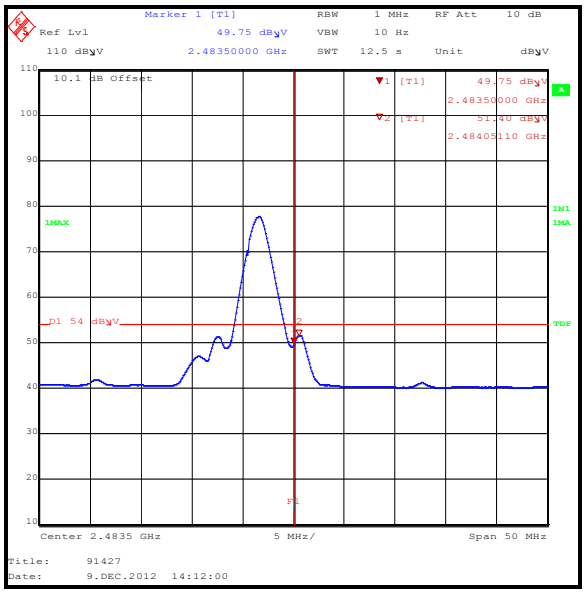
Transmitter Band Edge Radiated Emissions (continued)



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)
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	06 Jul 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
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

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±0.28 dB
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±0.28 dB
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 25.0 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