TEST REPORT

Test Report No. : UL-RPT-RP90575JD03B

Manufacturer	:	Bluegiga Technologies OY
Model No.	:	BT111
FCC ID	:	QOQBT111
IC Certification No.	:	5123A-BGTBT111
Technology	:	Bluetooth – Low Energy
Test Standard(s)	:	FCC Parts 15.107(a), 15.109, 15.207, 15.209(a) & 15.247, Industry Canada RSS-210 A8.2(a), A8.2(b), A8.4(4) & A8.5 and RSS-Gen 4.6.1, 4.6.2, 4.8, 4.9, 4.10, 6 & 7.2.4

1. This test report shall not be reproduced in full or partial, without the written approval of RFI Global Services Ltd trading as UL.
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: 07 December 2012

Checked by:

Sarah Williams
WiSE Laboratory Engineer

Issued by :

pp

John Newell
Group Quality Manager, WiSE
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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:	Bluegiga Technologies OY
Address:	Sinikalliontie 5A FIN - 02631 Espoo Finland

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
Specification Reference:	RSS-GEN Issue 3 December 2010
Specification Title:	General Requirements and Information for the Certification of Radio Apparatus
Specification Reference:	RSS-210 Issue 8 December 2010
Specification Title:	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
Site Registration:	FCC: 209735; Industry Canada: 3245B-2
Location of Testing:	RFI Global Services Ltd trading as UL, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	08 November 2012 to 05 December 2012

2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.107(a)	RSS-Gen 7.2.4	Receiver/Idle Mode AC Conducted Emissions	✓
Part 15.109	RSS-Gen 4.10/6	Receiver/Idle Mode Radiated Spurious Emissions	✓
Part 15.207	RSS-Gen 7.2.4	Transmitter AC Conducted Emissions	✓
Part 15.247(a)(2)	RSS-Gen 4.6.2 RSS-210 A8.2(a)	Transmitter Minimum 6 dB Bandwidth	✓
N/A	RSS-Gen 4.6.1	Transmitter 99% Occupied Bandwidth	✓
Part 15.247(e)	RSS-210 A8.2(b)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	RSS-Gen 4.8 RSS-210 A8.4(4)	Transmitter Maximum Peak Output Power	✓
Part 15.247(d)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Radiated Emissions	✓
Part 15.247(d)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	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:	Bluegiga Technologies OY
Model Name or Number:	BT111
Test Sample Serial Number:	2 *(Radiated sample)*
Hardware Version Number:	1.0
Software Version Number:	1.0
FCC ID:	QOQBT111
Industry Canada Certification Number:	5123A-BGTBT111

Brand Name:	Bluegiga Technologies OY
Model Name or Number:	BT111
Test Sample Serial Number:	1 *(Conducted sample with RF port #1)*
Hardware Version Number:	1.0
Software Version Number:	1.0
FCC ID:	QOQBT111
Industry Canada Certification Number:	5123A-BGTBT111

Brand Name:	Bluegiga Technologies OY
Model Name or Number:	BT111
Test Sample Serial Number:	4 *(Conducted sample with RF port #2)*
Hardware Version Number:	1.0
Software Version Number:	1.0
FCC ID:	QOQBT111
Industry Canada Certification Number:	5123A-BGTBT111

3.2. Description of EUT

The equipment under test was a *Bluetooth* Smart Ready HCI Module.

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	5 VDC	
Maximum Conducted Output Power:	8.3 dBm		
Antenna Gain:	0.5 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:	2402 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
Brand Name:	Dell
Model Name or Number:	D610
Serial Number:	PCXX

Description:	Dual DC power supply
Brand Name:	TTi
Model Name or Number:	EL3020D
Serial Number:	249928

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 pay load set to set Pseudorandom Bit Sequence 9.

4.2. Configuration and Peripherals

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

- Receive/Idle tests: Standalone, with the Bluetooth mode active but not transmitting.
- The EUT was powered via an external DC power supply.
- Controlled using a software application on the laptop PC supplied by the Customer. The application was used to enable continuous transmission and idle mode (enabled but not transmitting) and to select the test channels as required.
- For Transmit tests: A test computer with the above mentioned software application was used to place the EUT into Bluetooth mode.
- The EUT conducted sample was used for 6 dB bandwidth, 99% emission bandwidth, power spectral density and maximum peak output power.
- The EUT radiated sample was 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:	Sandeep Bharat	**Test Date:**	03 December 2012
Test Sample Serial Number:	2		

FCC Reference:	Part 15.107(a)
Industry Canada Reference:	RSS-Gen 7.2.4
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	37

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.784	Live	36.6	56.0	19.4	Complied
1.788	Live	36.7	56.0	19.3	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.788	Live	31.4	46.0	14.6	Complied
2.679	Live	27.9	46.0	18.1	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

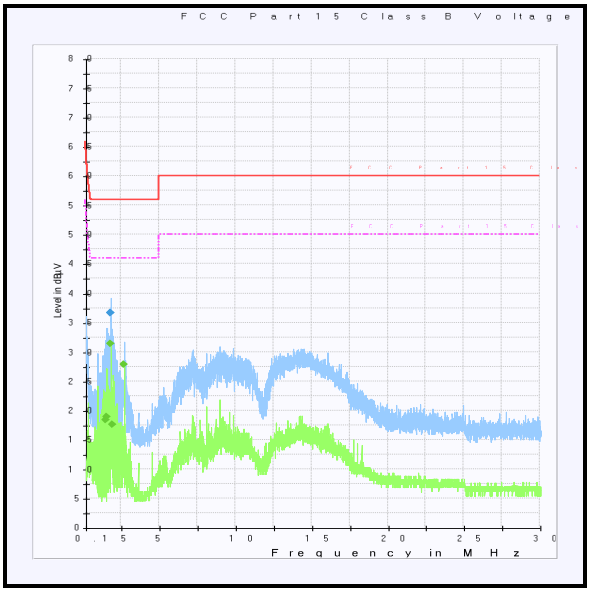
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.599	Neutral	32.8	56.0	23.2	Complied
1.694	Neutral	32.1	56.0	23.9	Complied
1.698	Neutral	32.6	56.0	23.4	Complied
1.725	Neutral	33.6	56.0	22.4	Complied
1.743	Neutral	32.1	56.0	23.9	Complied
1.788	Neutral	37.9	56.0	18.1	Complied
1.847	Neutral	33.1	56.0	22.9	Complied

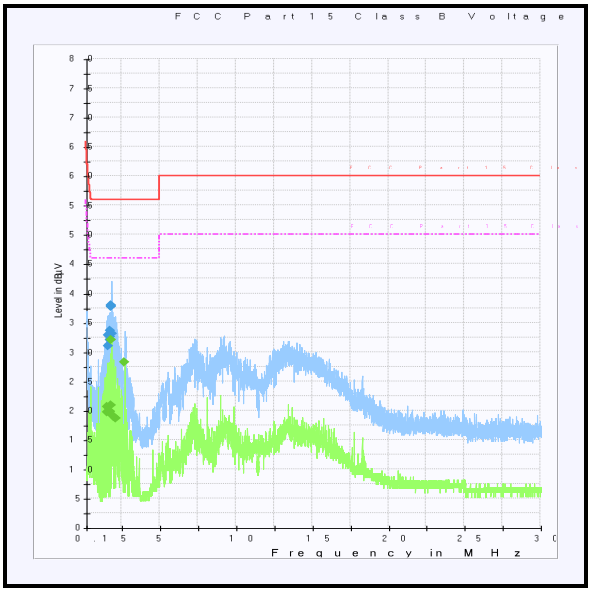
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.766	Neutral	20.9	46.0	25.1	Complied
1.784	Neutral	32.0	46.0	14.0	Complied
2.679	Neutral	28.2	46.0	17.8	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 Feb 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	25 Feb 2013	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:	Nick Steele	**Test Date:**	08 November 2012
Test Sample Serial Number:	2		

FCC Reference:	Part 15.109
Industry Canada Reference:	RSS-Gen 4.10/6
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 (%):	37

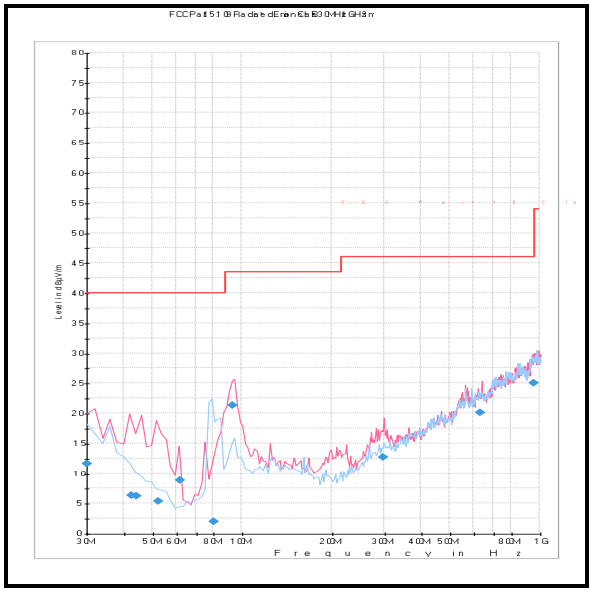
Note(s):

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
633.352	Vertical	20.1	46.0	25.9	Complied
953.035	Vertical	25.0	46.0	21.0	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:	Sandeep Bharat	**Test Date:**	21 November 2012
Test Sample Serial Number:	2		

FCC Reference:	Part 15.109
Industry Canada Reference:	RSS-Gen 4.10/6
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 (%):	38

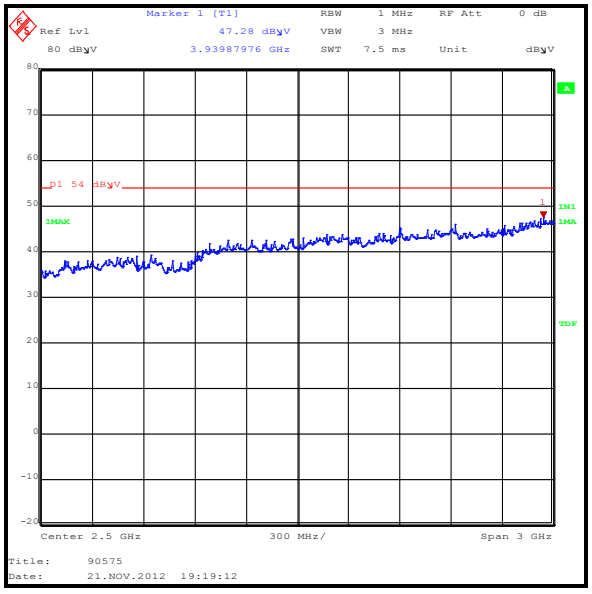
Note(s):

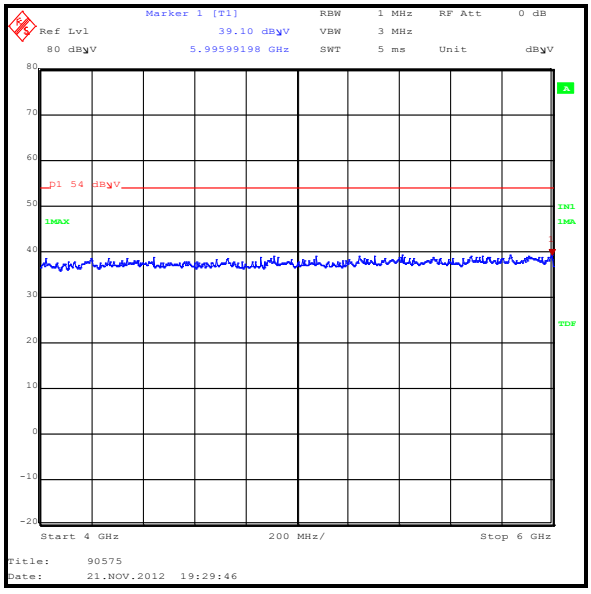
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded 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.

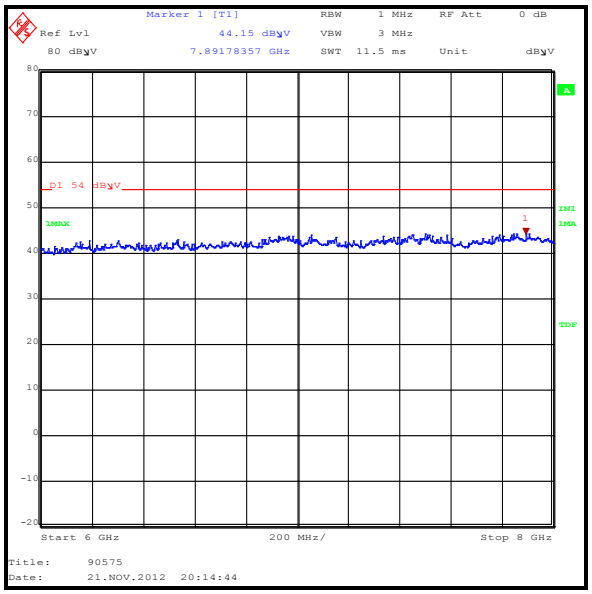
Results:

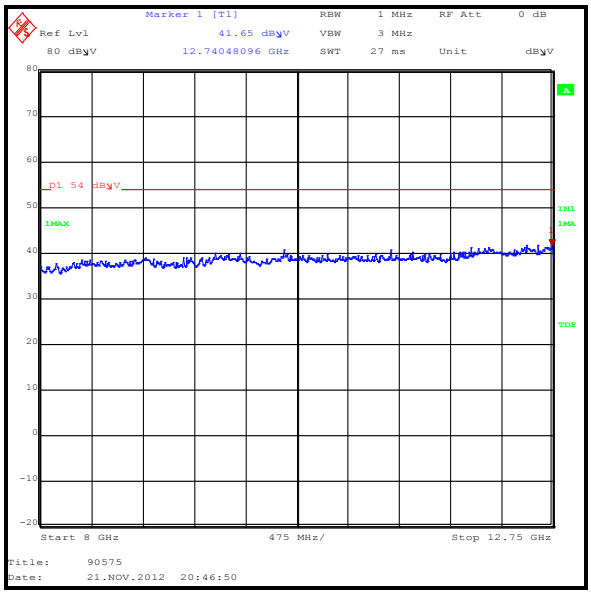
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
3939.880	Vertical	47.3	54.0	6.7	Complied

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
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
A288	Antenna	Chase	CBL6111A	1589	15 Aug 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:	Sandeep Bharat	**Test Date:**	05 December 2012
Test Sample Serial Number:	2		

FCC Reference:	Part 15.207
Industry Canada Reference:	RSS-Gen 7.2.4
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	18
Relative Humidity (%):	35

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.428	Live	32.7	56.0	23.3	Complied
1.487	Live	33.6	56.0	22.4	Complied
1.496	Live	33.1	56.0	22.9	Complied
1.527	Live	34.3	56.0	21.7	Complied
1.613	Live	34.2	56.0	21.8	Complied
1.788	Live	35.2	56.0	20.8	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.352	Live	18.8	46.0	27.2	Complied
1.397	Live	22.6	46.0	23.4	Complied
1.406	Live	21.7	46.0	24.3	Complied
1.460	Live	23.1	46.0	22.9	Complied
1.523	Live	23.7	46.0	22.3	Complied
1.527	Live	23.7	46.0	22.3	Complied
1.581	Live	20.2	46.0	25.8	Complied
1.658	Live	20.2	46.0	25.8	Complied
1.671	Live	18.8	46.0	27.2	Complied
1.788	Live	30.2	46.0	15.8	Complied

Transmitter AC Conducted Spurious Emissions (continued)

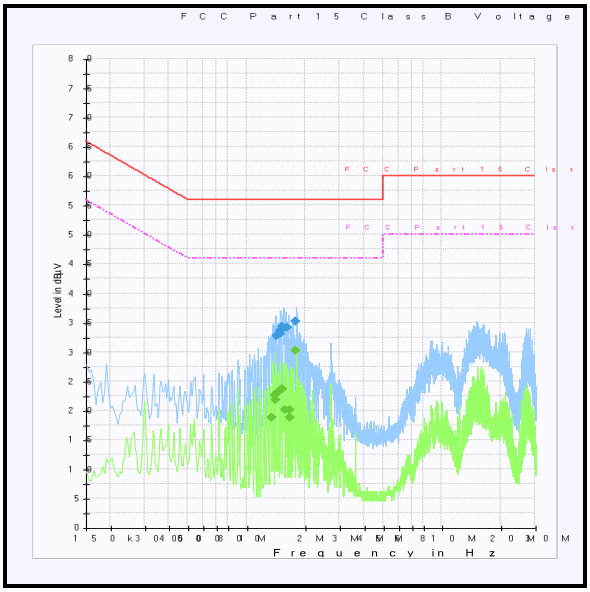
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.451	Neutral	32.7	56.0	23.3	Complied
1.487	Neutral	33.2	56.0	22.8	Complied
1.487	Neutral	33.1	56.0	22.9	Complied
1.523	Neutral	34.1	56.0	21.9	Complied
1.527	Neutral	34.0	56.0	22.0	Complied
1.784	Neutral	35.3	56.0	20.7	Complied

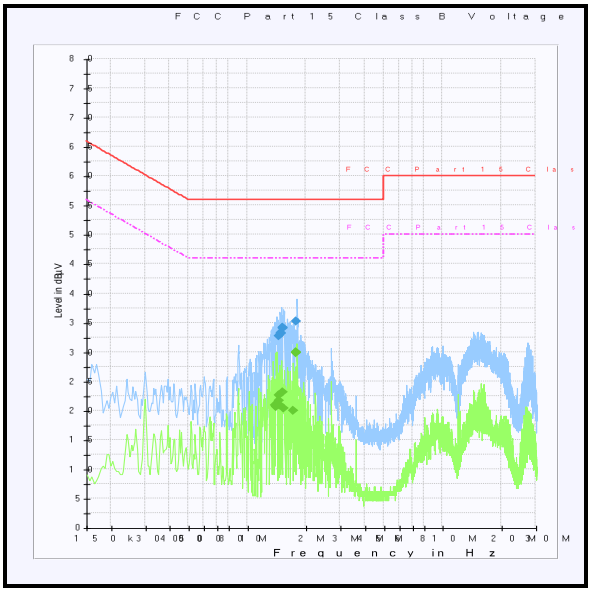
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
1.392	Neutral	20.9	46.0	25.1	Complied
1.406	Neutral	20.6	46.0	25.4	Complied
1.455	Neutral	21.6	46.0	24.4	Complied
1.460	Neutral	22.6	46.0	23.4	Complied
1.473	Neutral	20.9	46.0	25.1	Complied
1.523	Neutral	23.1	46.0	22.9	Complied
1.545	Neutral	20.3	46.0	25.7	Complied
1.725	Neutral	20.0	46.0	26.0	Complied
1.784	Neutral	29.9	46.0	16.1	Complied
1.788	Neutral	30.0	46.0	16.0	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)
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	19 Feb 2013	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	25 Feb 2013	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	09 Aug 2013	12

5.2.4. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	20 November 2012
Test Sample Serial Number:	1		

FCC Reference:	Part 15.247(a)(2)
Industry Canada Reference:	RSS-Gen 4.6.2, RSS-210 A8.2(a)
Test Method Used:	As detailed in FCC KDB 558074 Section 7.1

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	37

Note(s):

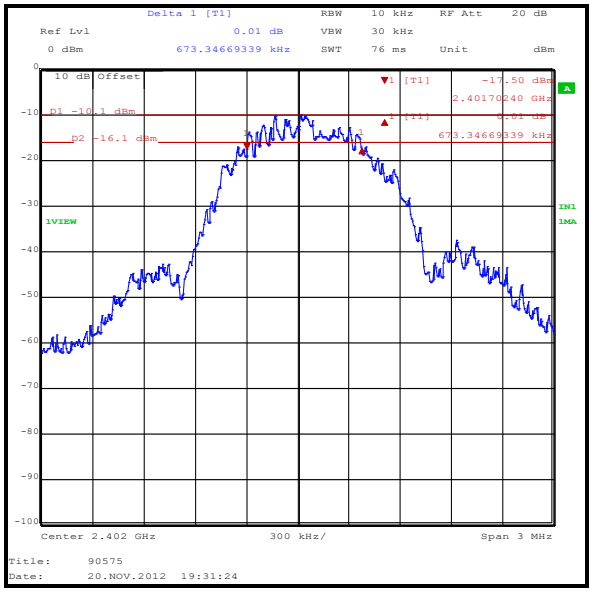
1. 6 dB DTS bandwidth tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 7.1 option 1.
2. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

Results:

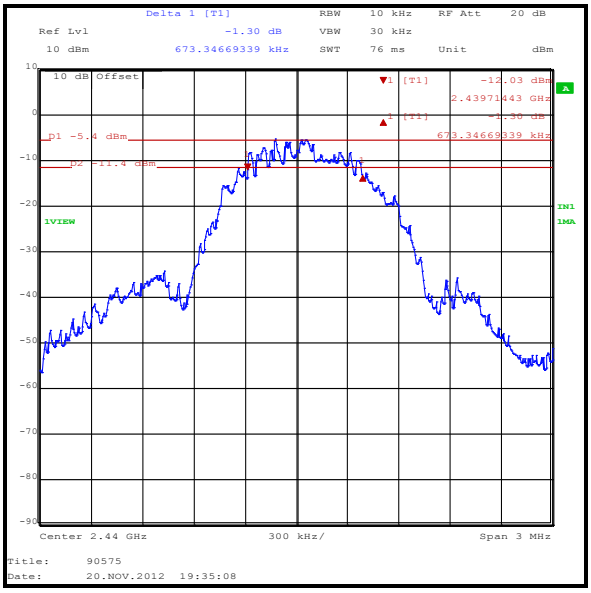
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	673.347	≥500	173.347	Complied
Middle	673.347	≥500	173.347	Complied
Top	691.383	≥500	191.383	Complied

Transmitter Minimum 6 dB Bandwidth (continued)

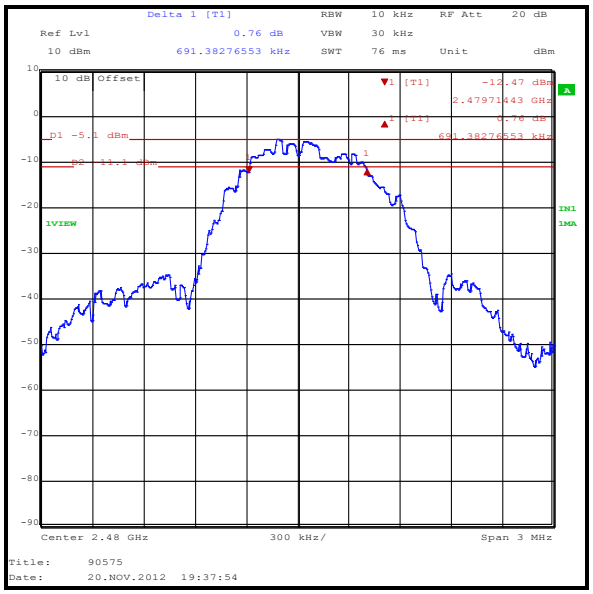
Results:



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB7	100330	15 Oct 2013	12
A2141	RF Attenuator	Atlan TecRF	AN18-10	090918-04	Calibrated before use	-
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12

5.2.5. Transmitter 99% Occupied Bandwidth

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	05 December 2012
Test Sample Serial Number:	4		

Industry Canada Reference:	RSS-Gen 4.6.1
Test Method Used:	Spectrum Analyser Occupied Bandwidth function

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	35

Note(s):

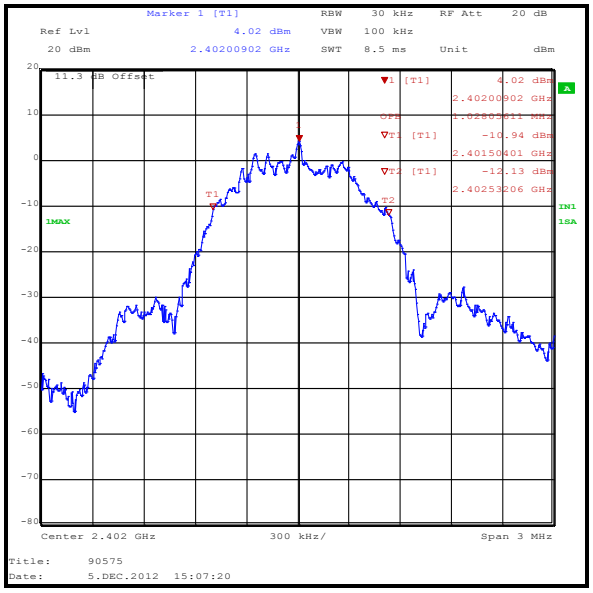
1. Occupied bandwidth (99% bandwidth) was measured using a test receiver occupied bandwidth function with the test receiver set to the appropriate bandwidth according to the channel width under test. Measurement bandwidths were set automatically by the test receiver.

Results:

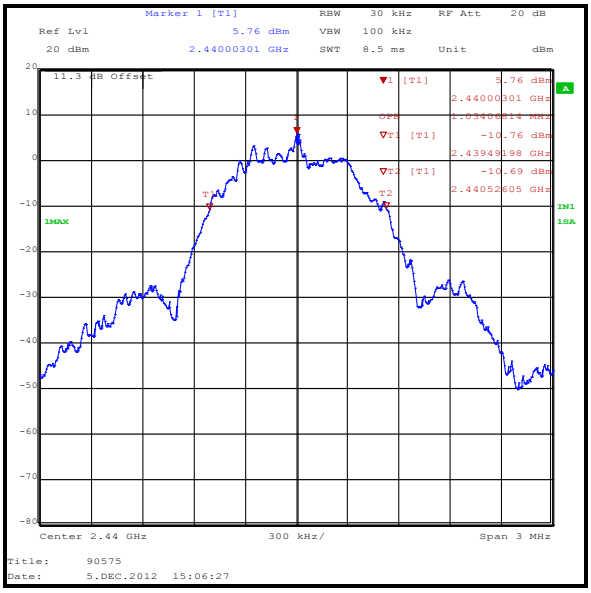
Channel	99% Occupied Bandwidth (MHz)
Bottom	1.028
Middle	1.034
Top	1.028

Transmitter 99% Occupied Bandwidth (continued)

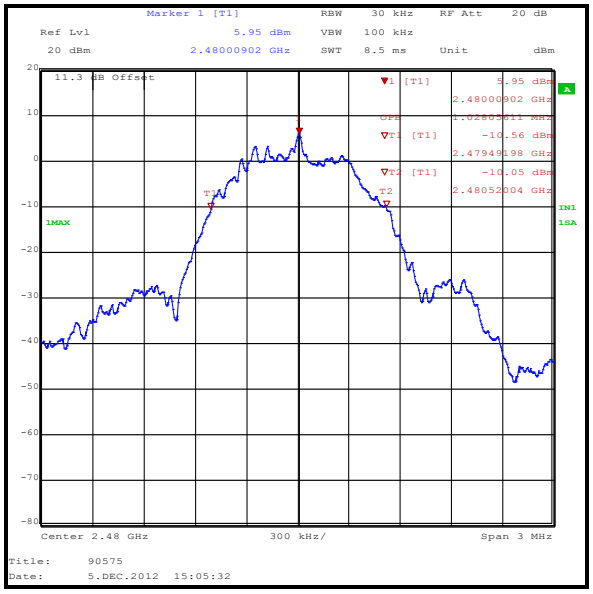
Results:



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB7	100330	15 Oct 2013	12
A2141	RF Attenuator	Atlan TecRF	AN18-10	090918-04	Calibrated before use	-
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12

5.2.6. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	01 December 2012
Test Sample Serial Number:	4		

FCC Reference:	Part 15.247(e)
Industry Canada Reference:	RSS-210 A8.2(b)
Test Method Used:	As detailed in FCC KDB 558074 Section 9.1

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	38

Note(s):

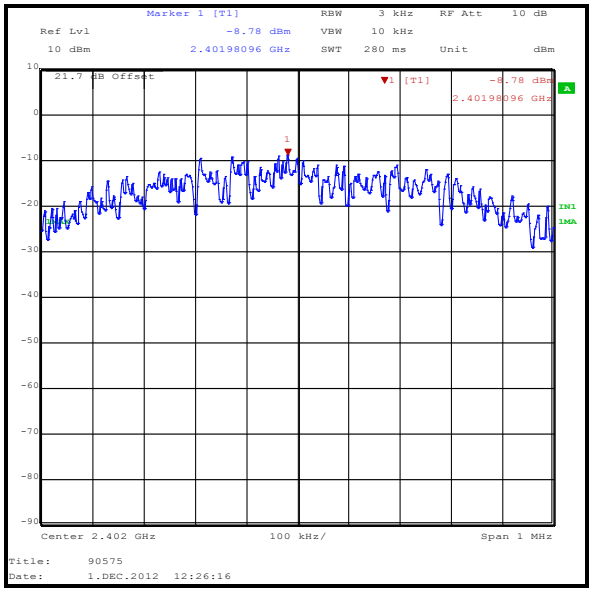
1. Transmitter Power Spectral Density tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 9.1 option 1.
2. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.

Results:

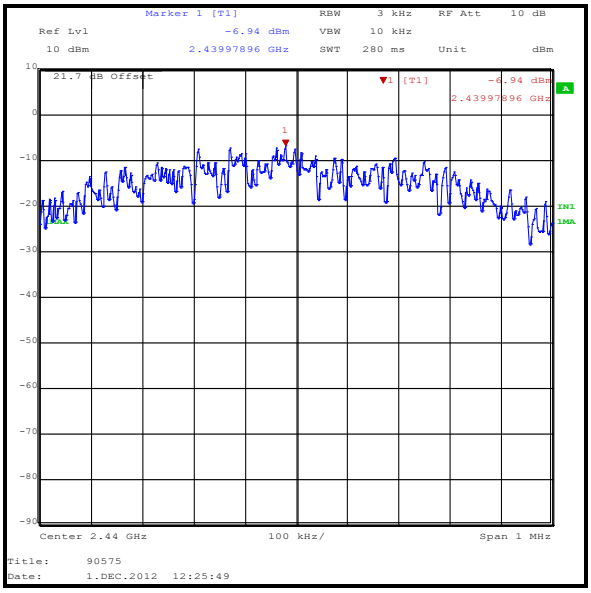
Channel	Output Power (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-8.8	8.0	16.8	Complied
Middle	-6.9	8.0	14.9	Complied
Top	-7.3	8.0	15.3	Complied

Transmitter Power Spectral Density (continued)

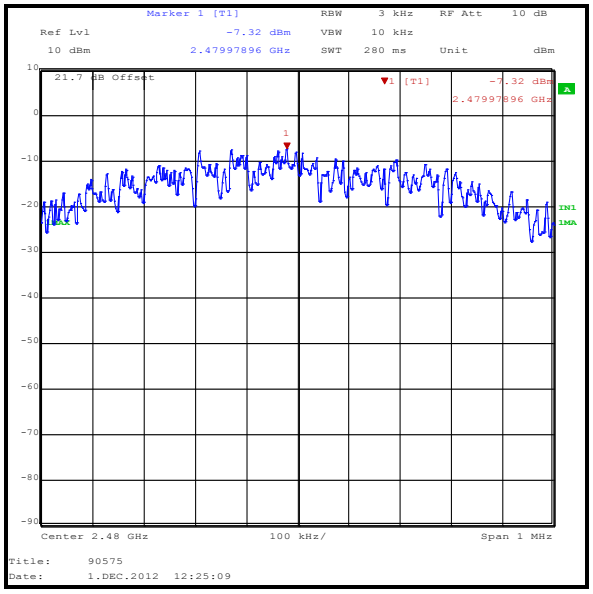
Results:



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB7	100330	15 Oct 2013	12
A2141	RF Attenuator	Atlan TecRF	AN18-10	090918-04	Calibrated before use	-
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12

5.2.7. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	01 December 2012
Test Sample Serial Number:	4		

FCC Reference:	Part 15.247(b)(3)
Industry Canada Reference:	RSS-Gen 4.8, RSS-210 A8.4(4)
Test Method Used:	As detailed in FCC KDB 558074 Section 8.1.1

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	38

Note(s):

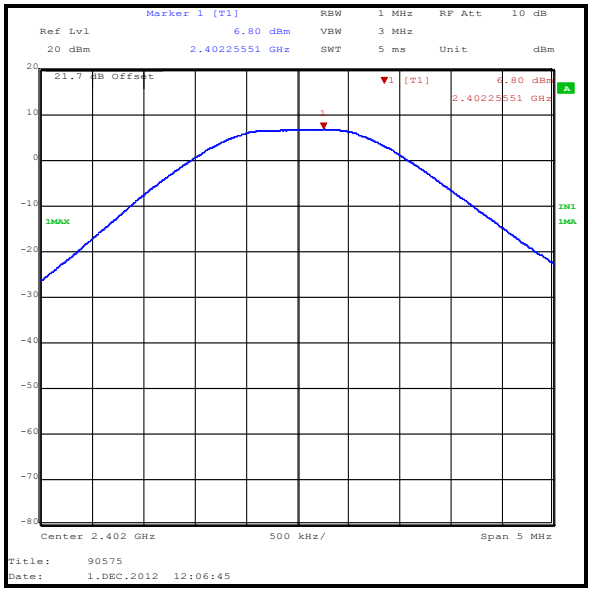
1. Conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.1.1 option 1.
2. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.

Results:

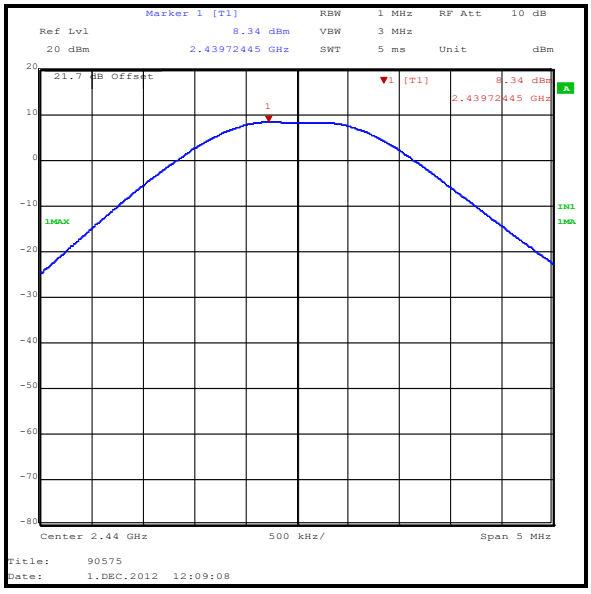
Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	6.8	30.0	23.2	Complied
Middle	8.3	30.0	21.7	Complied
Top	8.1	30.0	21.9	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	6.8	0.5	7.3	36.0	28.7	Complied
Middle	8.3	0.5	8.8	36.0	27.2	Complied
Top	8.1	0.5	8.6	36.0	27.4	Complied

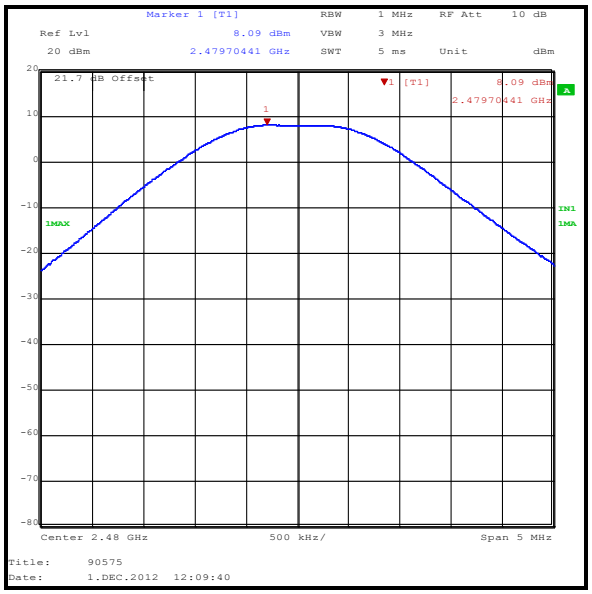
Transmitter Maximum Peak Output Power (continued)



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB7	100330	15 Oct 2013	12
A2141	RF Attenuator	Atlan TecRF	AN18-10	090918-04	Calibrated before use	-
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-
M1269	Multimeter	Fluke	179	90250210	30 Jul 2013	12

5.2.8. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	05 December 2012
Test Sample Serial Number:	2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9, RSS-210 A8.5
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):	18
Relative Humidity (%):	35

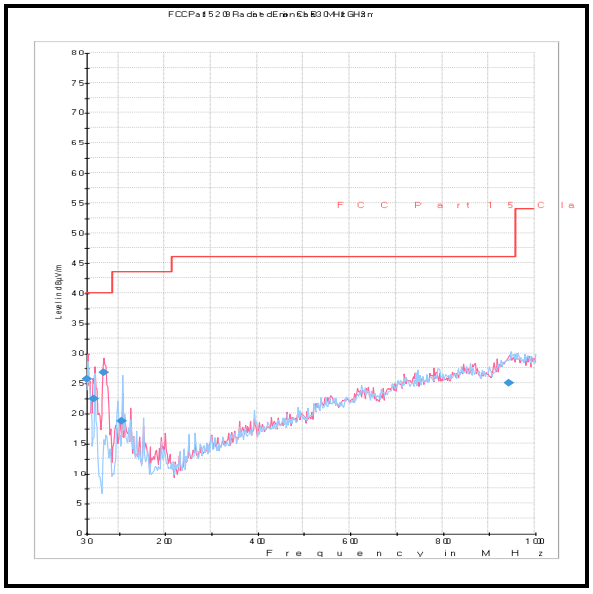
Note(s):

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. All emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
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.
5. * -20 dBc limit

Results: Top Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
69.007	Vertical	26.8	*79.0	52.2	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:	Nick Steele	**Test Date:**	05 December 2012
Test Sample Serial Number:	2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9, RSS-210 A8.5
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):	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. 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.

Transmitter Radiated Emissions (continued)

Results: Peak Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4804.622	Horizontal	54.3	74.0	19.7	Complied
7205.966	Vertical	43.4	74.0	30.6	Complied

Results: Average Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4804.622	Horizontal	40.7	54.0	13.3	Complied
7205.966	Vertical	30.8	54.0	23.2	Complied

Results: Peak Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4876.017	Horizontal	55.6	74.0	18.4	Complied
7319.072	Vertical	45.9	74.0	28.1	Complied

Results: Average Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4876.017	Horizontal	42.0	54.0	12.0	Complied
7319.072	Vertical	32.2	54.0	21.8	Complied

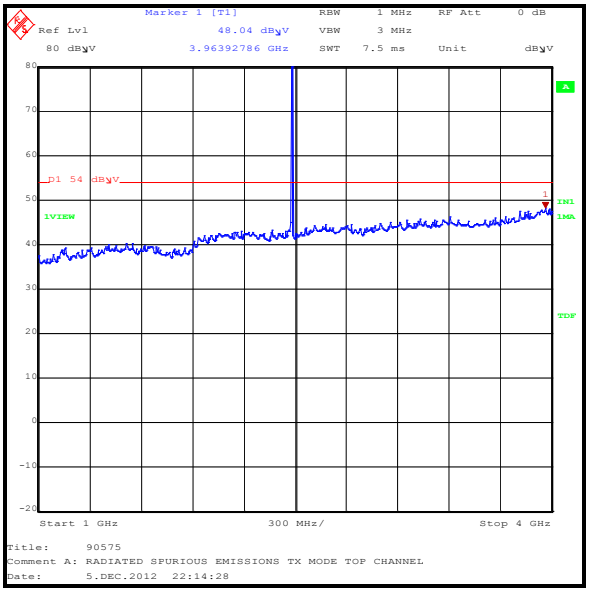
Results: Peak Top Channel

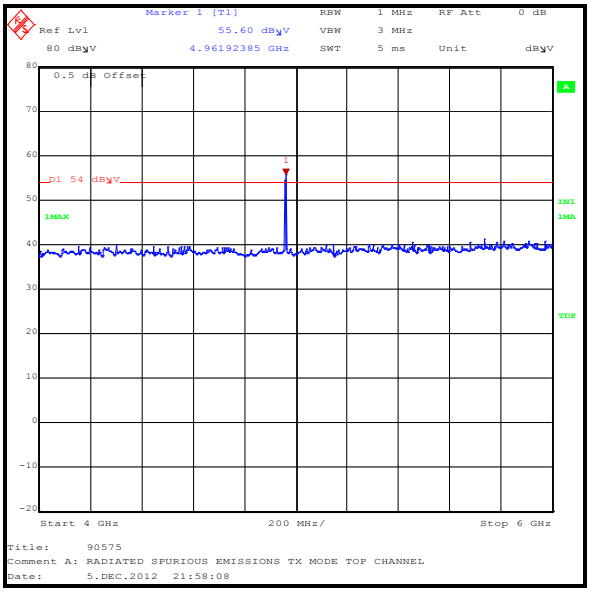
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4959.587	Horizontal	55.8	74.0	18.2	Complied
7439.046	Vertical	48.9	74.0	25.1	Complied

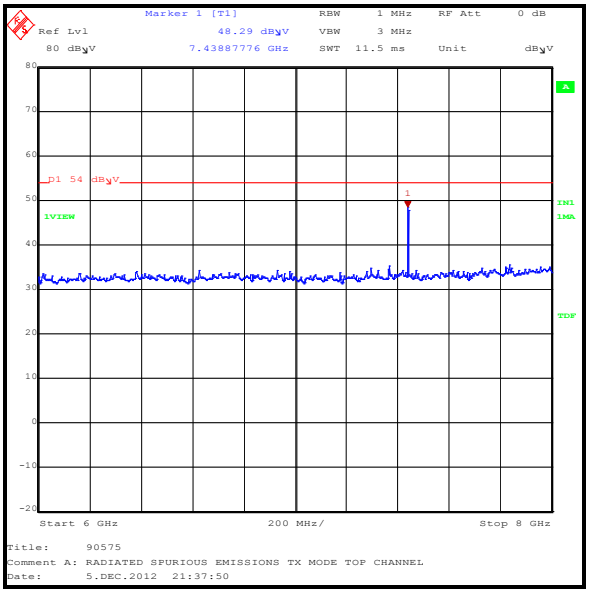
Results: Average Top Channel

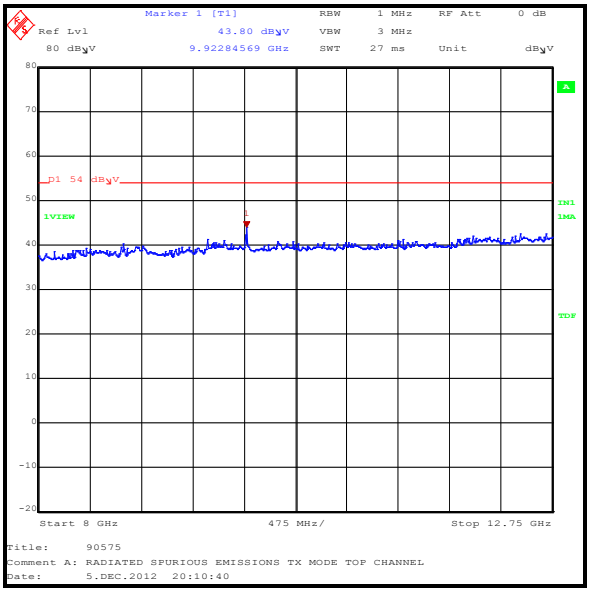
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4959.587	Horizontal	42.2	54.0	11.8	Complied
7439.046	Vertical	34.1	54.0	19.9	Complied

Transmitter Radiated Emissions (continued)

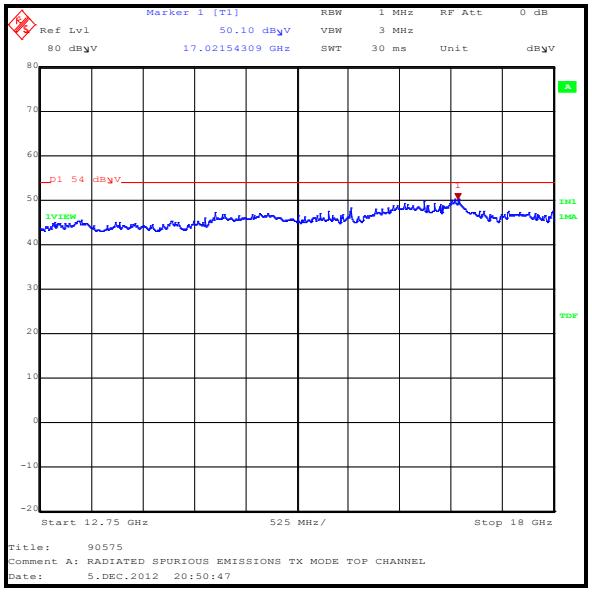


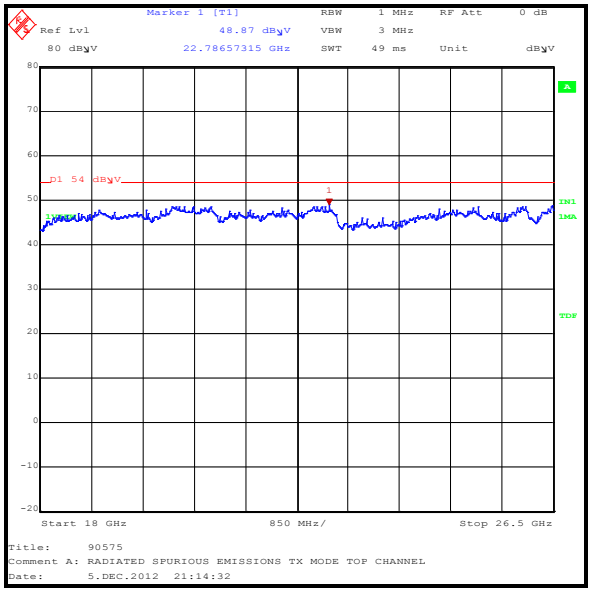






Transmitter Radiated Emissions (continued)





Note: The above 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)
K0002	3m RSE Chamber	Rainford	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
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
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	15 Mar 2013	12

5.2.9. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	05 December 2012
Test Sample Serial Number:	2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9, RSS-210 A8.5
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.2

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	30

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.

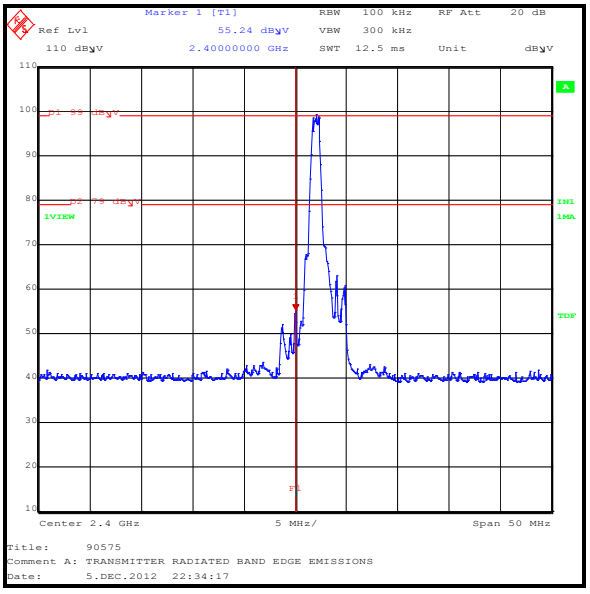
Results: Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2400.0	55.2	79.0*	23.8	Complied
2483.5	60.9	74.0	13.1	Complied

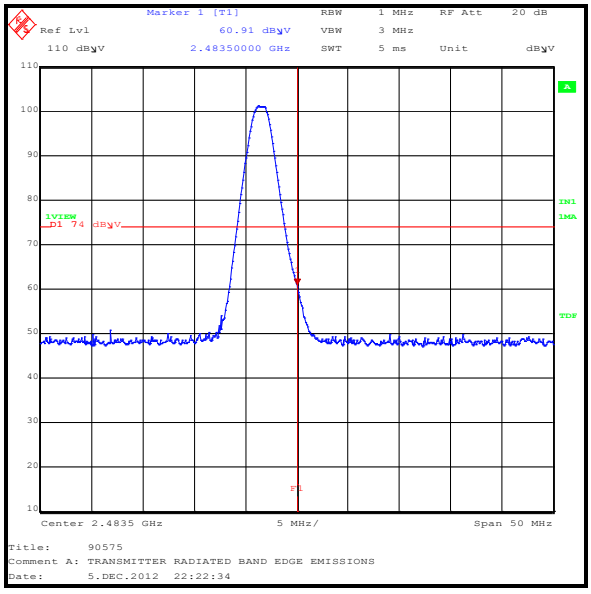
Results: Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	45.1	54.0	8.9	Complied

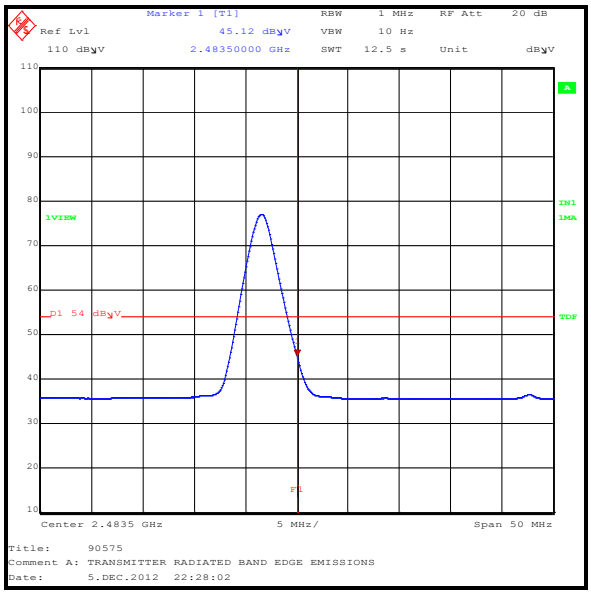
Transmitter Band Edge Radiated Emissions (continued)



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	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

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 measured (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%	±3.25 dB
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±0.27 dB
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±2.94 dB
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
99% Occupied 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