



TEST REPORT

Test Report No. : UL-RPT-RP12185759JD12A V2.0

Customer : Apple Inc.

Model No./HVIN : A1990

PMN : MacBook Pro

FCC ID : BCGA1990

ISED Certification No. : IC: 579C-A1990

Technologies : *Bluetooth* – Low Energy;
Bluetooth – BR/EDR;
2.4 GHz WLAN & 5 GHz WLAN

Test Standard(s) : FCC Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada RSS-247 5.5, 6.2.1.2, 6.2.4.2 &
RSS-Gen 6.13, 8.9 & 8.10

Test Laboratory : UL VS LTD, Basingstoke, Hampshire, RG24 8AH, United Kingdom

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3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

Date of Issue: 30 June 2018

Checked by:

Ben Mercer
Senior Test Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
Senior Test Engineer, Radio Laboratory
UL VS LTD



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Customer Information

Company Name:	Apple Inc.
Address:	One Apple Park Way Cupertino, California 95014 U.S.A.
Contact Name:	Stuart Thomas

Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	28/06/2018	Initial Version	Ben Mercer
2.0	30/06/2018	Admin update	Sarah Williams

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1. Attestation of Test Results

1.1. Description of EUT

The equipment under test was a Laptop Computer with WLAN and *Bluetooth*.

1.2. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.209
Specification Reference:	47CFR15.407
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) – Sections 15.407
Specification Reference:	RSS-Gen Issue 4 November 2014
Specification Title:	General Requirements for Compliance of Radio Apparatus
Specification Reference:	RSS-247 Issue 2 February 2017
Specification Title:	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
Test Dates:	16 May 2018 to 03 June 2018

1.3. Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
Bluetooth Basic Rate & 5 GHz WLAN (SISO)			
15.209(a)/15.247(d) /15.407(b)	RSS-Gen 6.13 / RSS-247 5.5, 6.2.1.2, & 6.2.4.2	Transmitter Out of Band Radiated Emissions	Complied
Bluetooth LE & 5 GHz WLAN (SISO)			
15.209(a)/15.247(d) /15.407(b)	RSS-Gen 6.13 / RSS-247 5.5, 6.2.1.2, & 6.2.4.2	Transmitter Out of Band Radiated Emissions	Complied
2.4 GHz WLAN (MIMO) & 5 GHz WLAN (SISO)			
15.209(a)/15.247(d) /15.407(b)	RSS-Gen 6.13 / RSS-247 5.5, 6.2.1.2, & 6.2.4.2	Transmitter Out of Band Radiated Emissions	Complied
Bluetooth Basic Rate & 2.4 GHz WLAN (MIMO)			
15.209(a)/15.247(d)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Out of Band Radiated Emissions	Complied
Bluetooth LE & 2.4 GHz WLAN (MIMO)			
15.209(a)/15.247(d)	RSS-Gen 6.13 / RSS-247 5.5	Transmitter Out of Band Radiated Emissions	Complied
Bluetooth Basic Rate & 2.4 GHz WLAN (MIMO) & 5 GHz WLAN (SISO)			
15.209(a)/15.247(d) /15.407(b)	RSS-Gen 6.13 / RSS-247 5.5, 6.2.1.2, & 6.2.4.2	Transmitter Out of Band Radiated Emissions	Complied
Bluetooth LE & 2.4 GHz WLAN (MIMO) & 5 GHz WLAN (SISO)			
15.209(a)/15.247(d) /15.407(b)	RSS-Gen 6.13 / RSS-247 5.5, 6.2.1.2, & 6.2.4.2	Transmitter Out of Band Radiated Emissions	Complied
2.4 GHz WLAN (SISO) & 5 GHz WLAN (MIMO)			
15.209(a)/15.247(d) /15.407(b)	RSS-Gen 6.13 / RSS-247 5.5, 6.2.1.2, & 6.2.4.2	Transmitter Out of Band Radiated Emissions	Complied
Bluetooth Basic Rate & 2.4 GHz WLAN (SISO) & 5 GHz WLAN (MIMO)			
15.209(a)/15.247(d) /15.407(b)	RSS-Gen 6.13 / RSS-247 5.5, 6.2.1.2, & 6.2.4.2	Transmitter Out of Band Radiated Emissions	Complied
Bluetooth LE & 2.4 GHz WLAN (SISO) & 5 GHz WLAN (MIMO)			
15.209(a)/15.247(d) /15.407(b)	RSS-Gen 6.13 / RSS-247 5.5, 6.2.1.2, & 6.2.4.2	Transmitter Out of Band Radiated Emissions	Complied

Note(s):

1. There are two vendors of the WiFi/*Bluetooth* radio modules, Vendor 1 and Vendor 2.
2. The WiFi/*Bluetooth* radio modules have the same mechanical outline (i.e. the same packaging dimension and pin layout), use the same on-board antenna matching circuit, have an identical antenna structure and are built and tested to conform to the same specification and to operate within the same tolerances.

Baseline testing was performed on the two vendors to determine worst case.

3. The EUT supports Simultaneous-In-Band (SIB) and Simultaneous-Dual-Band (SDB) transmission. Testing was performed to verify compliance of radiated spurious emissions against applicable limits when the EUT was simultaneously transmitting in the 2.4 GHz and 5 GHz bands. Only radiated spurious emissions related to intermodulation products are recorded in this test report. The highest out-of-band noise floor levels were recorded if no intermodulation products were observed across the required measurement ranges.

1.4. 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.

2. Summary of Testing

2.1. Facilities and Accreditation

The test site and measurement facilities used to collect data are located at Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom. The following table identifies which facilities were utilised for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

Site 1	X
Site 2	X
Site 17	X

UL VS LTD is accredited by UKAS. The tests reported herein have been performed in accordance with its terms of accreditation.

2.2. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 558074 D01 DTS Meas Guidance v04 April 5, 2017
Title:	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under Section 15.247
Reference:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 December 14, 2017
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices (Part 15, Subpart E)

2.3. Calibration and Uncertainty

Measuring Instrument Calibration

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.

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
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±4.65 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±2.94 dB

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

2.4. Test and Measurement Equipment

Test Equipment Used for Transmitter Radiated Emissions Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	12 Mar 2019	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	08 Jun 2018	12
G0453	Pre-amplifier	Sonoma	310N	230801	15 Jun 2018	12
A1834	Attenuator	Hewlett Packard	8491B	10444	14 Mar 2019	12
M2009	Thermohygrometer	Testo	608-H1	45046699	20 Jun 2018	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	07 Feb 2019	12
M2016	Thermohygrometer	Testo	608-H1	45046428	26 Feb 2019	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	03 Aug 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	18 Apr 2019	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	28 Nov 2018	12
A2948	Pre Amplifier	Com-Power Corp	PAM-118A	551087	06 Apr 2019	12
A3025	Pre Amplifier	Com-Power Corp	PAM-118A	551126	12 Oct 2018	12
A2896	Pre Amplifier	Schwarzbeck	BBV 9721	9721-023	20 Feb 2019	12
A1818	Antenna	EMCO	3115	00075692	07 Feb 2019	12
A253	Antenna	Flann Microwave	128	12240-20	07 Feb 2019	12
A254	Antenna	Flann Microwave	139	14240-20	07 Feb 2019	12
A255	Antenna	Flann Microwave	519	16240-20	07 Feb 2019	12
A256	Antenna	Flann Microwave	400	18240-20	07 Feb 2019	12
A2895	Antenna	Schwarzbeck	BBHA 9170	9170-728	20 Feb 2019	12
A2141	Attenuator	AtlanTecRF	AN18-10	090918-04	08 Mar 2019	12
A2142	Attenuator	AtlanTecRF	AN18-20	081120-23	26 Feb 2019	12
A3009	Attenuator	AtlanTecRF	AN18-06	208801#4	09 Mar 2019	12
A2130	High Pass Filter	AtlanTecRF	AFH-08000	80rJFBD06-002	21 Feb 2019	12
A2974	High Pass Filter	AtlanTecRF	AFH-06000	15032501232	21 Feb 2019	12
A2973	High Pass Filter	AtlanTecRF	AFH-03000	16080900032	24 Jan 2019	12
A2176	High Pass Filter	AtlanTecRF	AFH-07000	800980	21 Feb 2019	12
A2133	Low Pass Filter	AtlanTecRF	AFL-04000	JFB1006-002	21 Feb 2019	12
K0017	3m RSE Chamber	Rainford	N/A	N/A	21 Feb 2019	12
M2003	Thermohygrometer	Testo	608-H1	45046428	27 Feb 2019	12
A2943	Attenuator	AtlanTecRF	AN18W5-06	208147#2	22 Feb 2019	12
A2915	Low pass filter	AtlanTecRF	AFL-04000	2156	22 Feb 2019	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	22 Feb 2019	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827	22 Feb 2019	12

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Apple
Model No. / HVIN:	A1990
Test Sample Serial Number:	C02VP00AJLDY (<i>Radiated sample #1</i>)
Hardware Version:	EVT
Software Version:	17G2033
BT BB Version:	V40
WLAN FW Version:	9.131.7
FCC ID:	BCGA1990
ISED Certification Number:	IC: 579C-A1990

Brand Name:	Apple
Model No. / HVIN:	A1990
Test Sample Serial Number:	C02WC006JTGW (<i>Radiated sample #2</i>)
Hardware Version:	EVT
Software Version:	17G2057
BT BB Version:	V45
WLAN FW Version:	9.131.7
FCC ID:	BCGA1990
ISED Certification Number:	IC: 579C-A1990

Brand Name:	Apple
Model No. / HVIN:	A1990
Test Sample Serial Number:	C02WC00DJMFL (<i>Radiated sample #3</i>)
Hardware Version:	EVT
Software Version:	17G2057
BT BB Version:	V45
WLAN FW Version:	9.131.7
FCC ID:	BCGA1990
ISED Certification Number:	IC: 579C-A1990

3.2. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3. Additional Information Related to Testing

Technology Tested:	<i>Bluetooth</i> Low Energy (Digital Transmission System)		
Type of Unit:	Transceiver		
Channel Spacing:	2 MHz		
Transmit Frequency Range:	2400 MHz to 2483.5 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	37	2402
	Top	39	2480

Tested Technology:	<i>Bluetooth</i> (FHSS)		
Mode:	Basic Rate		
Modulation:	GFSK		
Packet Type: (Maximum Payload)	DH5		
Data Rate (Mbps):	1		
Transmit Frequency Range:	2400 MHz to 2483.5 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	2402
	Top	78	2480

Technology Tested:	WLAN (IEEE 802.11b/g/n) / Digital Transmission System		
Channel Spacing:	20 MHz		
Modulation:	BPSK		
Data Rate:	802.11n HT20 (SISO)	MCS0	
	802.11n HT20 (MIMO)	MCS0 with CDD	
Transmit Frequency Range:	2400 MHz to 2483.5 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2412
	Top	13	2472

Additional Information Related to Testing (continued)

Technology Tested:	WLAN (IEEE 802.11a/n/ac) / U-NII / LE-LAN		
Channel Spacing:	20 MHz		
Modulation:	BPSK		
Data Rate:	802.11n HT20 (SISO)	MCS0	
	802.11n HT20 (MIMO)	MCS0 with CDD	
Transmit Frequency Range:	5150 MHz to 5850 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	36	5180
	Top	165	5825

3.4. Description of Available Antennas

The radio utilizes integrated antennas with the following maximum gains:

Bluetooth:

Frequency Range (MHz)	G_{Antenna Core1} (dBi)
2400 - 2480	2.1

2.4GHz WLAN:

Frequency Band (MHz)	G_{Antenna Core1} (dBi)	G_{Antenna Core0} (dBi)	G_{Antenna Core2} (dBi)
2400 - 2480	2.1	3.3	2.1

5GHz WLAN:

Frequency Band (MHz)	G_{Antenna Core1} (dBi)	G_{Antenna Core0} (dBi)	G_{Antenna Core2} (dBi)
5150 - 5250	4.9	6.7	3.8
5250 - 5350	6.0	7.6	4.9
5470 - 5725	5.2	7.4	4.9
5725 - 5850	4.7	6.3	4.0

3.5. Description of Test Setup

Support Equipment

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

Description:	Personal Hands-Free (PHF)
Brand Name:	Apple
Model Name or Number:	Apple EarPods
Serial Number:	Not marked or stated

Description:	USB-C Adapter
Brand Name:	Belkin
Model Name or Number:	F2CU040
Serial Number:	Not marked or stated

Description:	USB-C Power Adapter
Brand Name:	Apple
Model Name or Number:	A1718
Serial Number:	Not marked or stated

Description:	Type C USB Cable. Length 2.0 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	4 Port USB Hub
Brand Name:	Belkin
Model Name or Number:	F5U404-BLK
Serial Number:	Not marked or stated

Operating Modes

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

- Transmitting at maximum power on bottom and top channels using all combinations of technologies supported in the 2.4 and 5 GHz bands.

Configuration and Peripherals

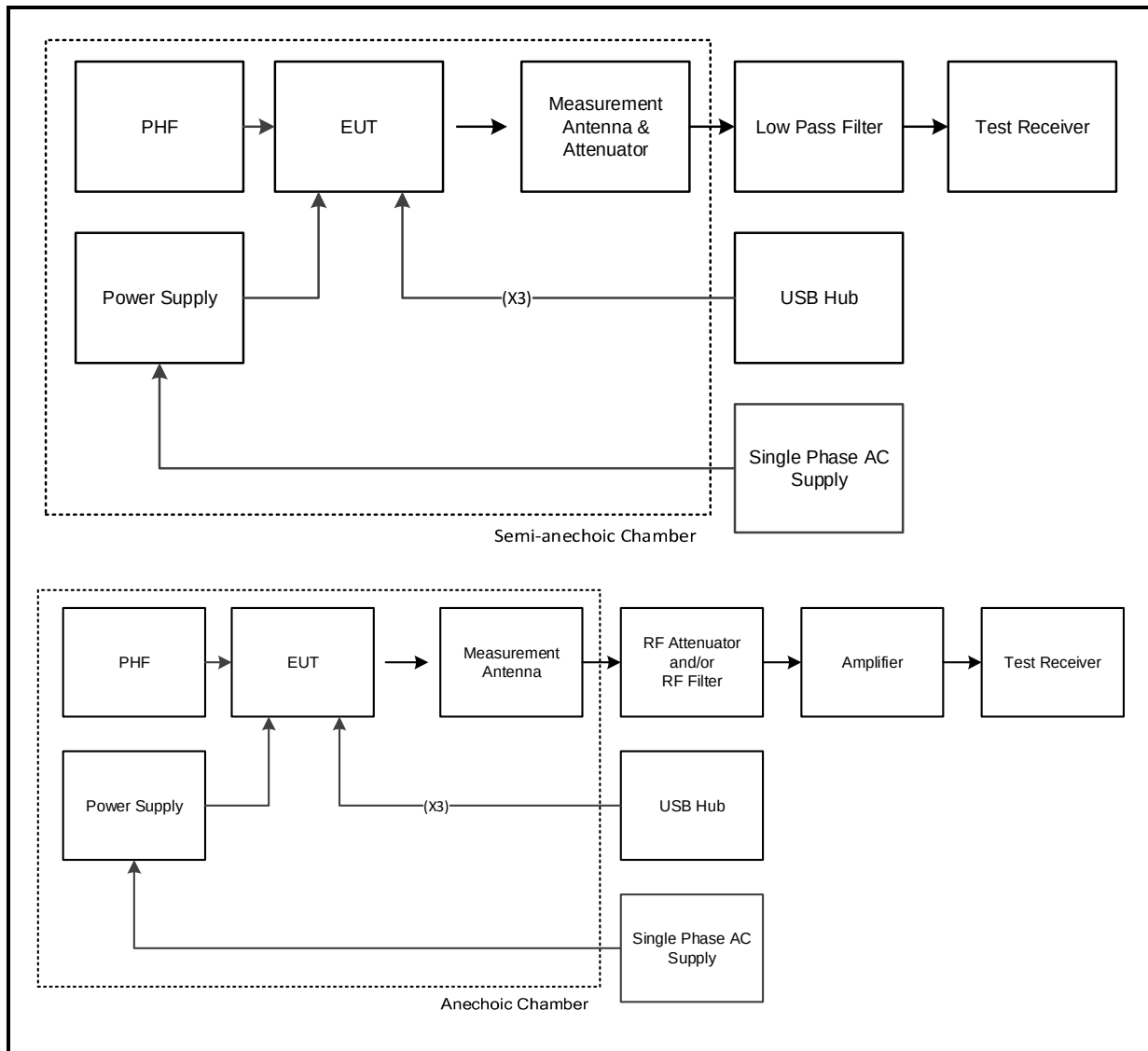
The EUT was tested in the following configuration(s):

- *Bluetooth* Basic Rate: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Basic Rate mode as this mode was found to transmit higher power than EDR mode.
- *Bluetooth* LE: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in LE mode as this mode was found to transmit higher power than LE2M mode.
- 2.4 GHz WLAN: Transmitter radiated spurious emissions tests were performed with the EUT transmitting using either 802.11n / HT20 / MCS0 / MIMO (CDD) or 802.11n / HT20 / MCS0 / SISO configuration as these modes were found to transmit higher EIRP than all the other 2.4 GHz WLAN modes.
- 5 GHz WLAN: Transmitter radiated spurious emissions tests were performed with the EUT transmitting using either 802.11n / HT20 / MCS0 / MIMO (CDD) or 802.11n / HT20 / MCS0 / SISO configuration as these modes were found to transmit higher EIRP than all the other 5 GHz WLAN modes.
- *Bluetooth* Basic Rate and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, *Bluetooth* on bottom channel and 5 GHz WLAN on top channel.
- *Bluetooth* Basic Rate and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, *Bluetooth* on top channel and 5 GHz WLAN on bottom channel.
- *Bluetooth* LE and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, *Bluetooth* LE on bottom channel and 5 GHz WLAN on top channel.
- *Bluetooth* LE and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, *Bluetooth* LE on top channel and 5 GHz WLAN on bottom channel.
- 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, 2.4 GHz WLAN on bottom channel and 5 GHz WLAN on top channel.
- 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, 2.4 GHz WLAN on top channel and 5 GHz WLAN on top channel.
- *Bluetooth* Basic Rate and 2.4 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, *Bluetooth* on bottom channel and 2.4 GHz WLAN on top channel.
- *Bluetooth* Basic Rate and 2.4 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, *Bluetooth* on top channel and 2.4 GHz WLAN on bottom channel.
- *Bluetooth* LE and 2.4 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, *Bluetooth* LE on bottom channel and 2.4 GHz WLAN on top channel.

Configuration and Peripherals (continued)

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

- *Bluetooth* LE and 2.4 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power, *Bluetooth* LE on top channel and 2.4 GHz WLAN on bottom channel.
- *Bluetooth* Basic Rate, 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit three signals at maximum output power, *Bluetooth* on top channel, 2.4 GHz WLAN on bottom channel and 5 GHz WLAN on bottom channel.
- *Bluetooth* Basic Rate, 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit three signals at maximum output power, *Bluetooth* on top channel, 2.4 GHz WLAN on bottom channel and 5 GHz WLAN on top channel.
- *Bluetooth* Basic Rate, 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit three signals at maximum output power, *Bluetooth* on bottom channel, 2.4 GHz WLAN on top channel and 5 GHz WLAN on bottom channel.
- *Bluetooth* Basic Rate, 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit three signals at maximum output power, *Bluetooth* on bottom channel, 2.4 GHz WLAN on top channel and 5 GHz WLAN on top channel.
- *Bluetooth* LE, 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit three signals at maximum output power, *Bluetooth* LE on top channel, 2.4 GHz WLAN on bottom channel and 5 GHz WLAN on bottom channel.
- *Bluetooth* LE, 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit three signals at maximum output power, *Bluetooth* LE on top channel, 2.4 GHz WLAN on bottom channel and 5 GHz WLAN on top channel.
- *Bluetooth* LE, 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit three signals at maximum output power, *Bluetooth* LE on bottom channel, 2.4 GHz WLAN on top channel and 5 GHz WLAN on bottom channel.
- *Bluetooth* LE, 2.4 GHz WLAN and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit three signals at maximum output power, *Bluetooth* LE on bottom channel, 2.4 GHz WLAN on top channel and 5 GHz WLAN top channel.
- The EUT was charging via a USB power supply connected a 120 VAC 60 Hz single phase mains supply.
- Pre-scans were performed with the EUT at maximum power. All final measurements were performed with the EUT configured for typical output power.

Test Setup Diagrams**Transmitter Radiated Emissions**

4. Radiated Test Results

4.1. Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 5 GHz WLAN (SISO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Tom Sleigh	Test Dates:	16 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5 & 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1 KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	<i>Bluetooth</i> Basic Rate bottom channel / 5 GHz WLAN (SISO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	40 to 48

Note(s):

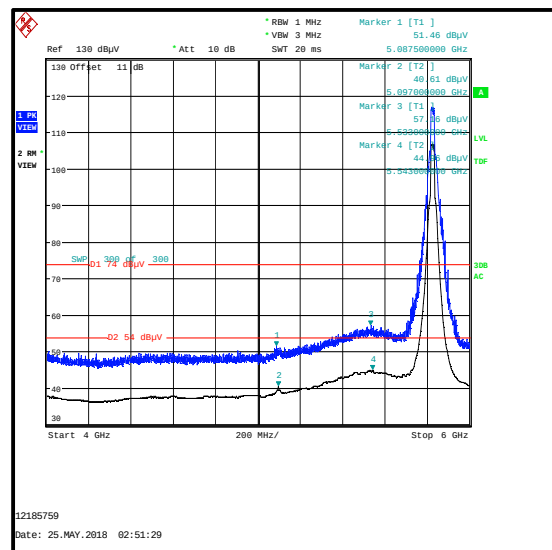
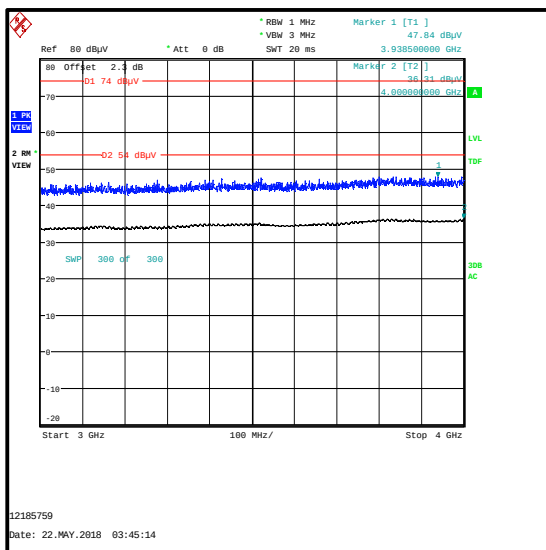
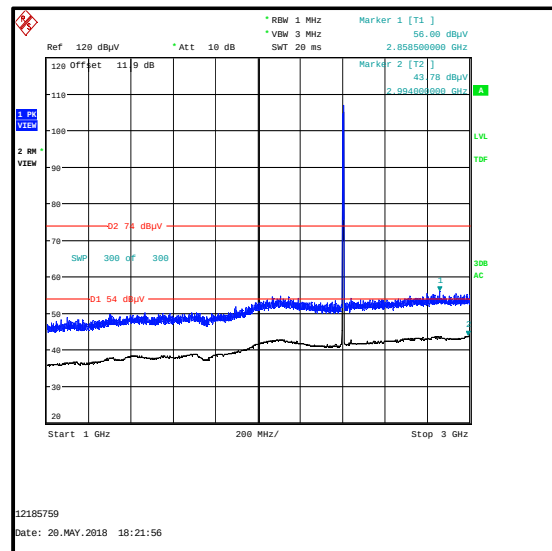
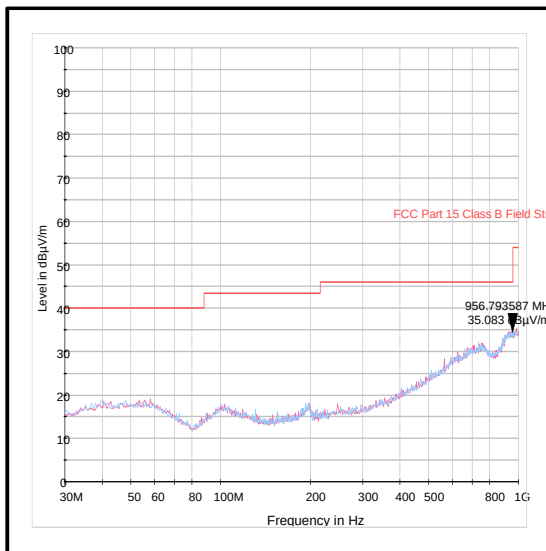
1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* fundamental is shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres

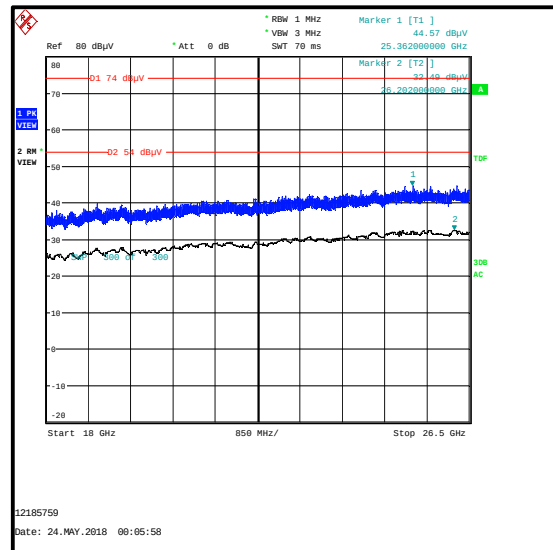
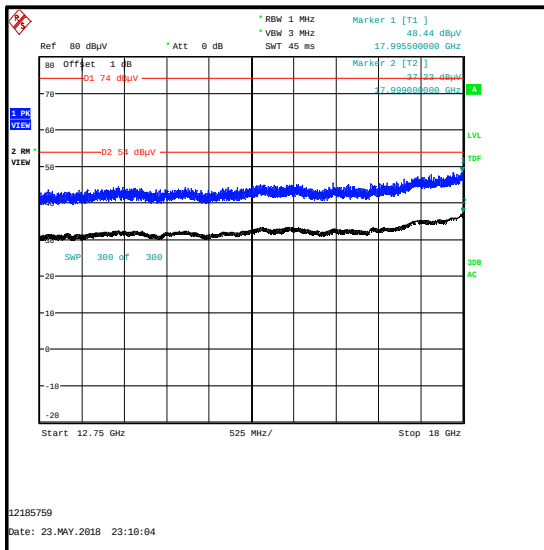
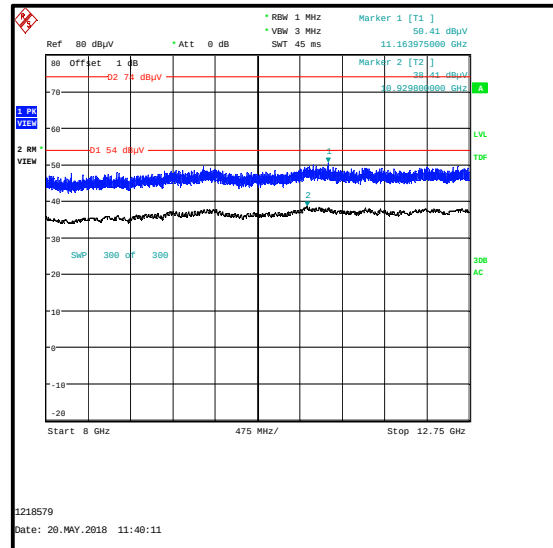
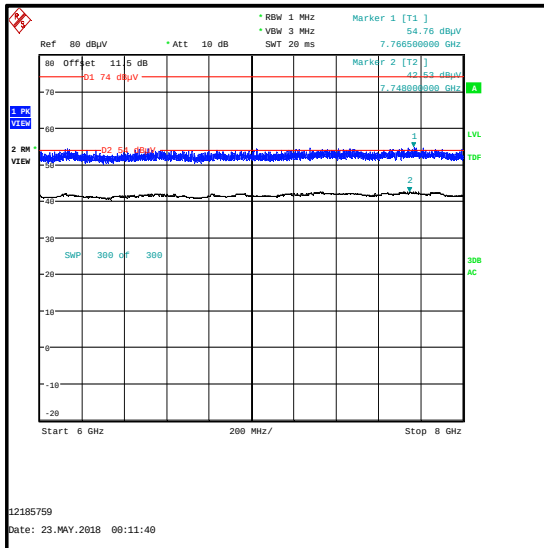
Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 5 GHz WLAN top channel (continued)**Results: Peak**

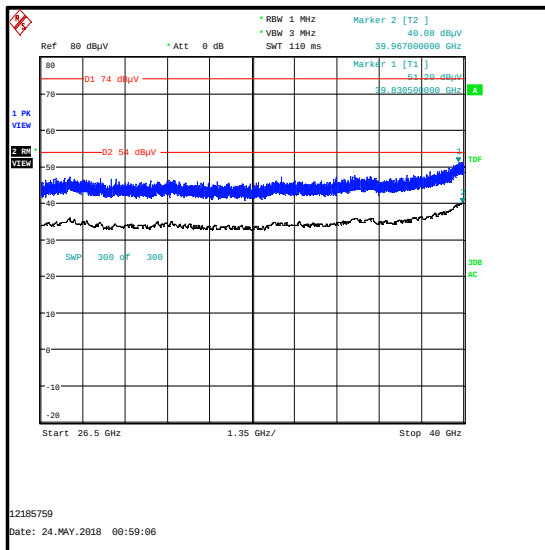
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 5 GHz WLAN (SISO) top channel (continued)

**Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 5 GHz
WLAN (SISO) top channel (continued)**

4.2. Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 5 GHz WLAN (SISO) bottom channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Tom Sleigh	Test Dates:	16 May 2018 to 24 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5 & 6.2.1.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	<i>Bluetooth</i> Basic Rate top channel / 5 GHz WLAN (SISO) bottom channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* fundamental is shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

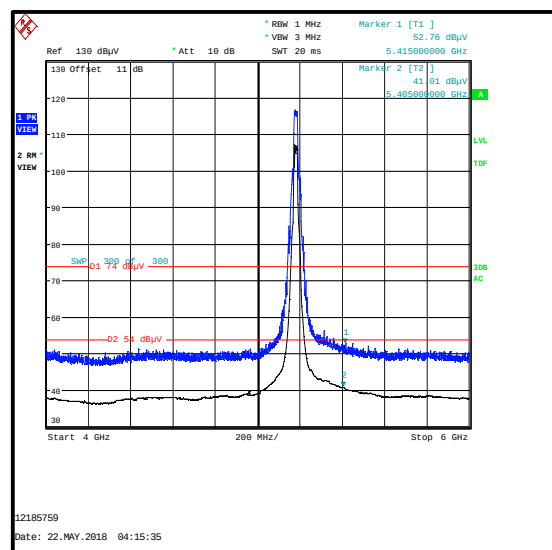
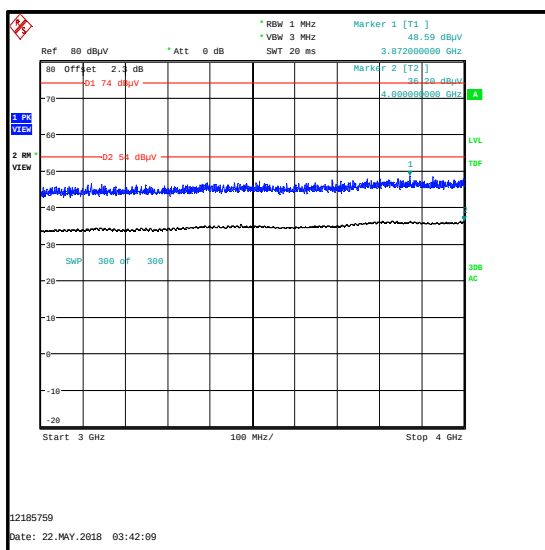
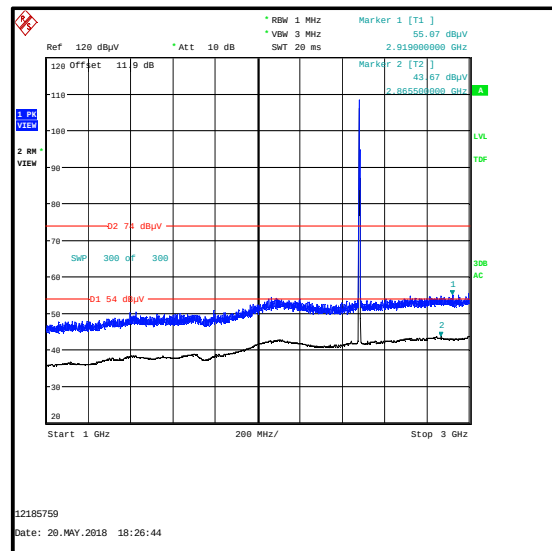
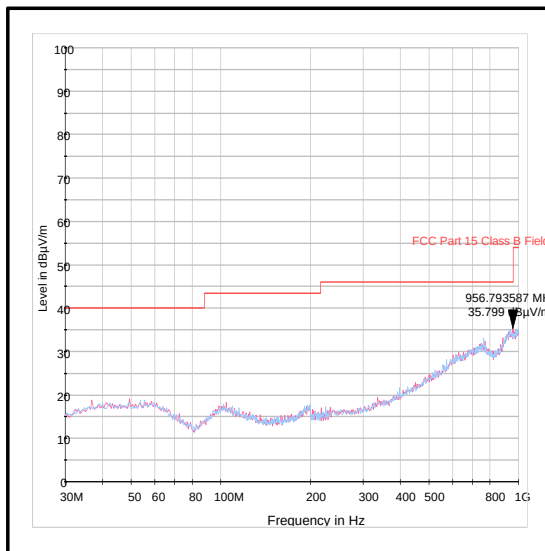
Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 5 GHz WLAN (SISO) bottom channel (continued)

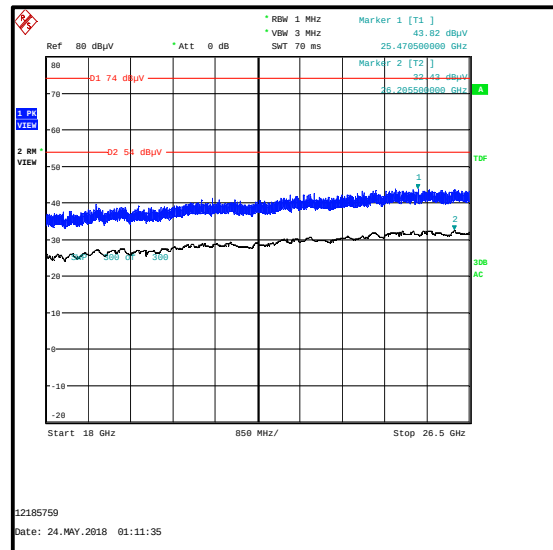
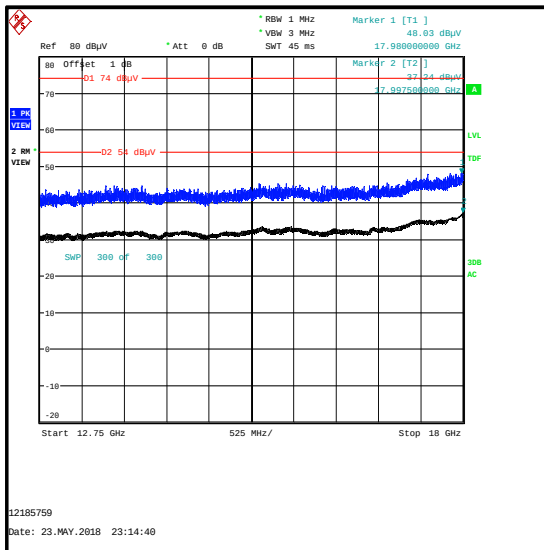
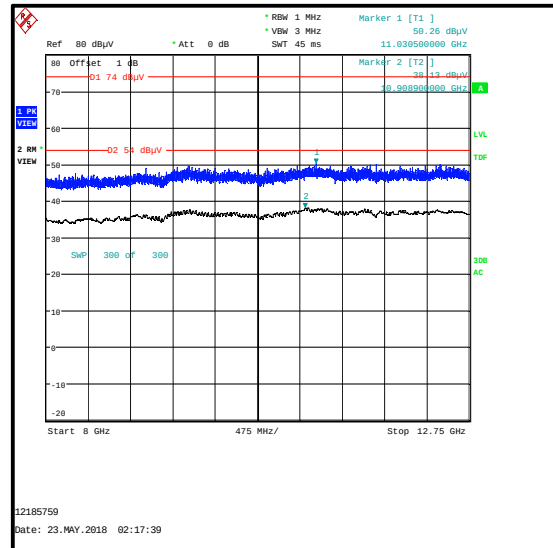
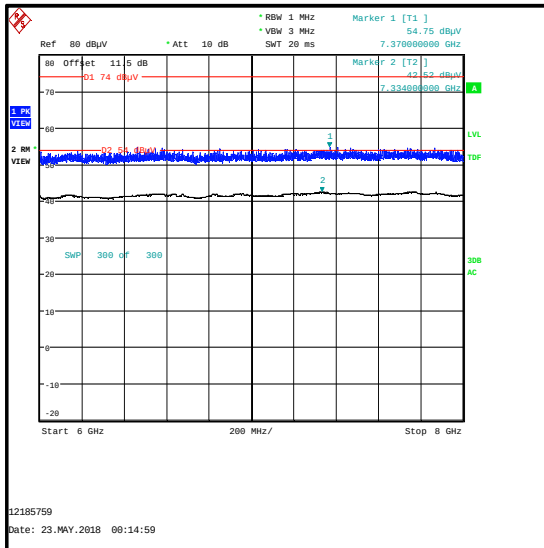
Results: Peak

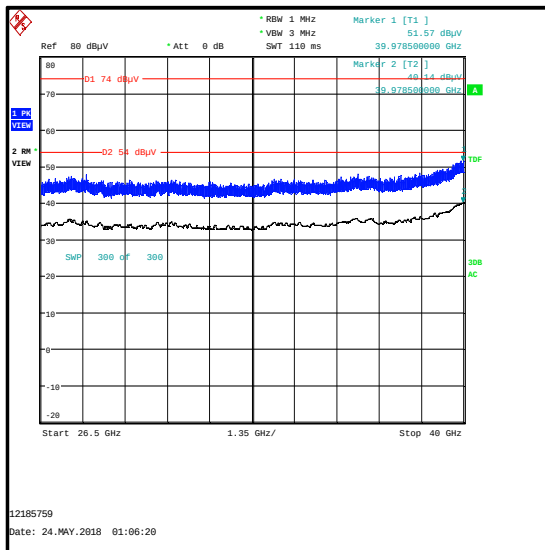
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



**Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 5 GHz
WLAN (SISO) bottom channel (continued)**

**Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 5 GHz
WLAN (SISO) bottom channel (continued)**

4.3. Transmitter Out of Band Radiated Emissions - Bluetooth LE bottom channel / 5 GHz WLAN (SISO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Tom Sleigh	Test Dates:	16 May 2018 to 24 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5 & 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	Bluetooth LE bottom channel / 5 GHz WLAN (SISO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The Bluetooth LE fundamental is shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The emission at approximately 5097.000 MHz is not an intermodulation product and was therefore not measured.
6. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
7. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
8. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

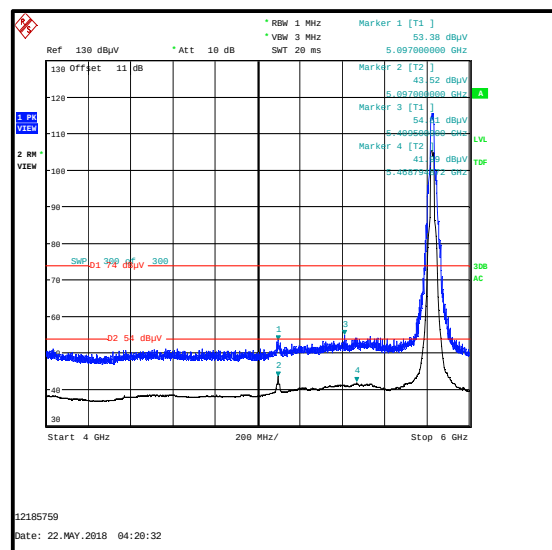
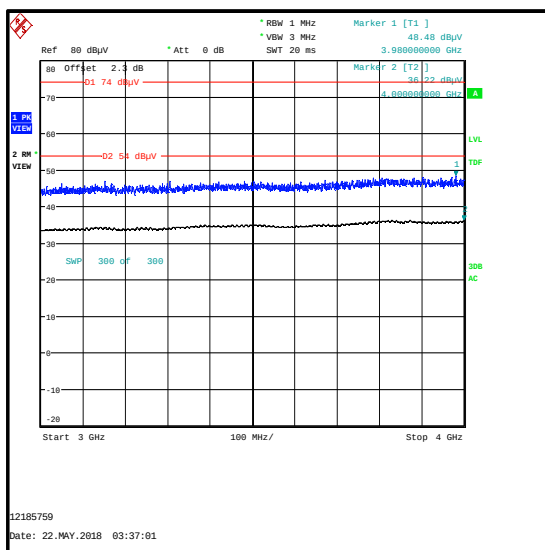
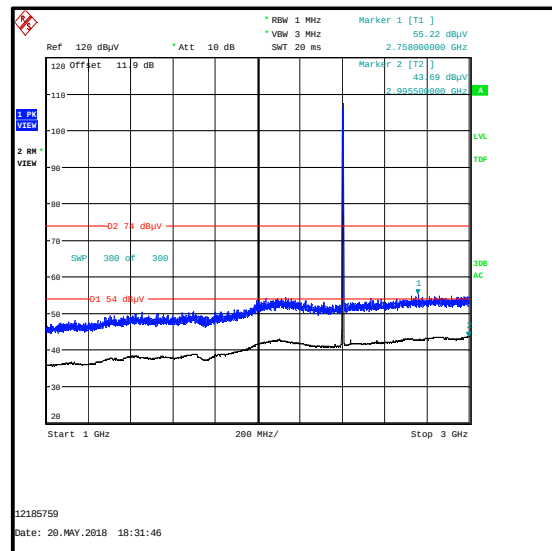
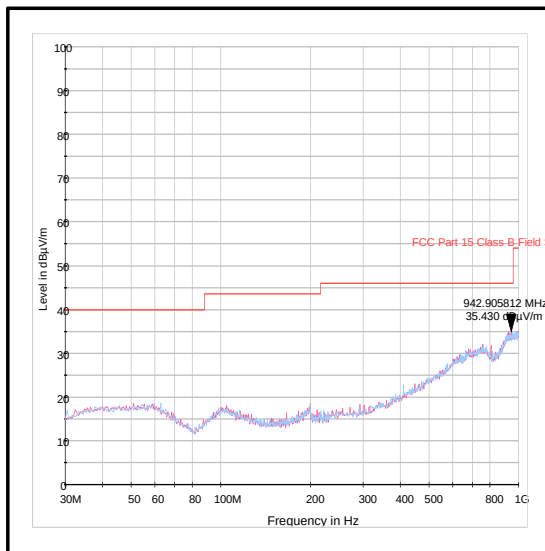
Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 5 GHz WLAN (SISO) top channel (continued)

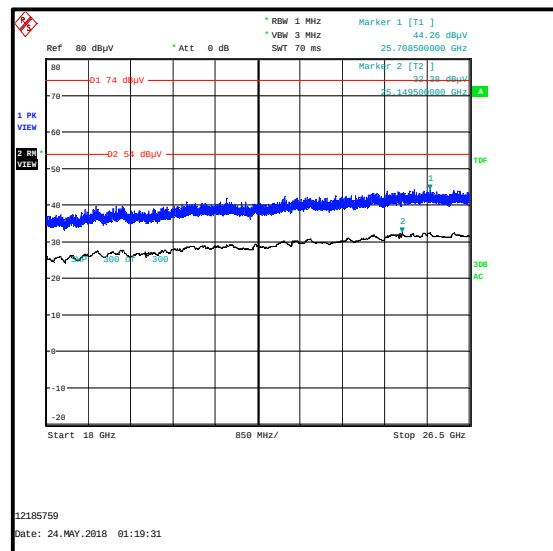
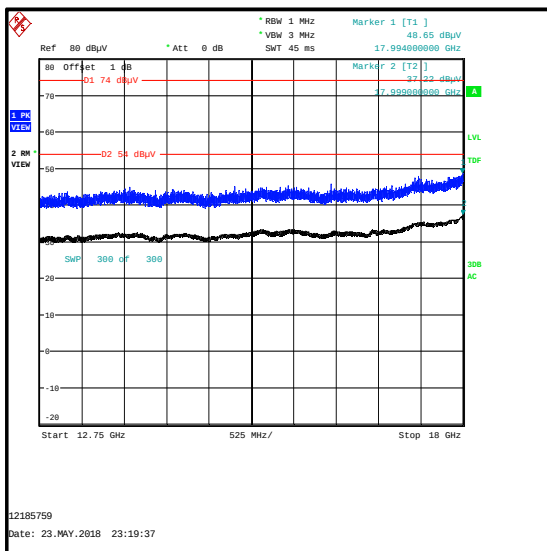
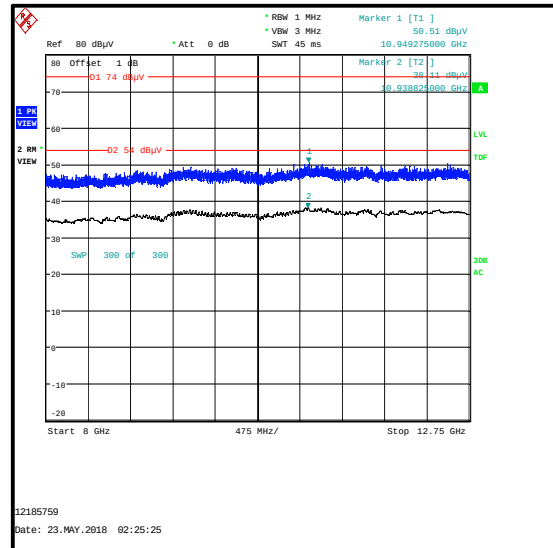
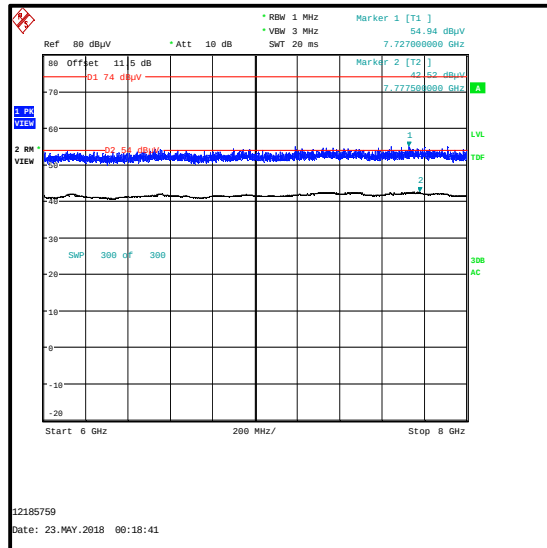
Results: Peak

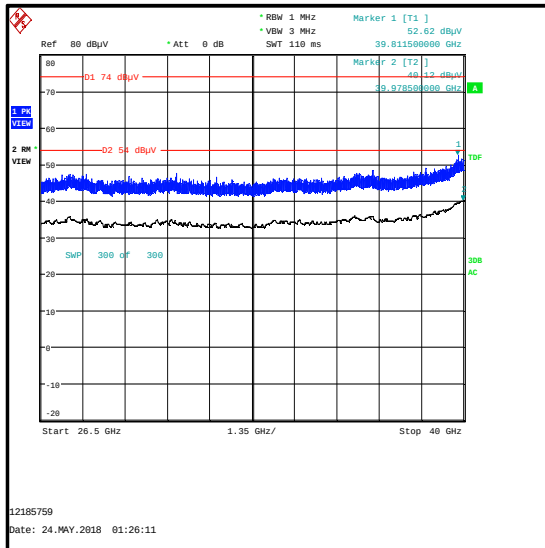
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 5 GHz WLAN (SISO) top channel (continued)

Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 5 GHz WLAN (SISO) top channel (continued)

4.4. Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 5 GHz WLAN (SISO) bottom channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Tom Sleigh	Test Dates:	16 May 2018 to 24 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5 & 6.2.1.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	<i>Bluetooth</i> LE top channel / 5 GHz WLAN (SISO) bottom channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* LE fundamental is shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

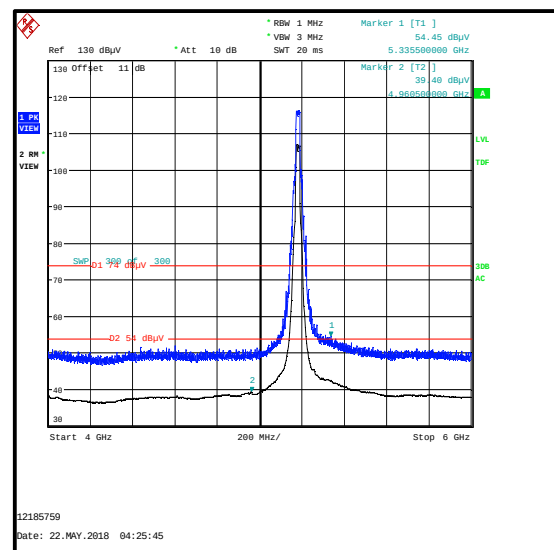
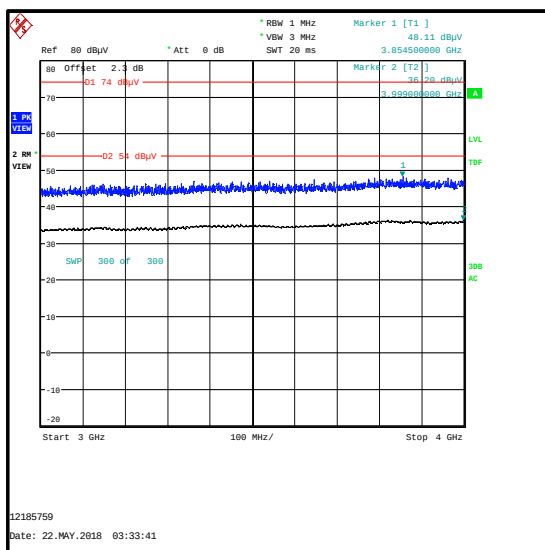
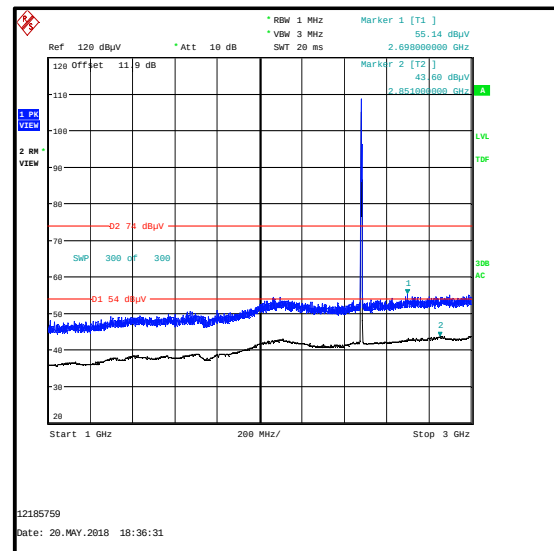
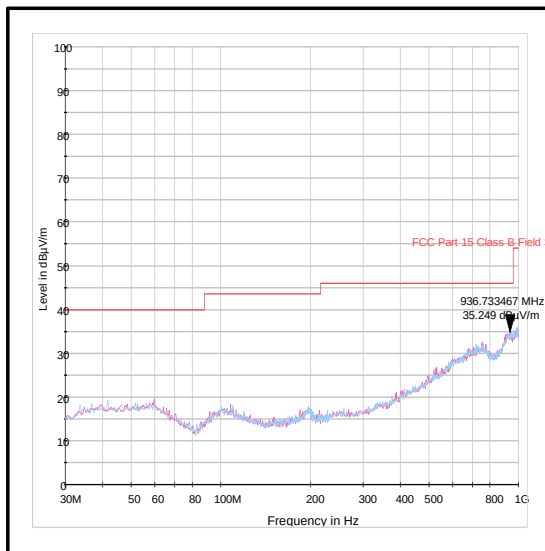
Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 5 GHz WLAN (SISO) bottom channel (continued)

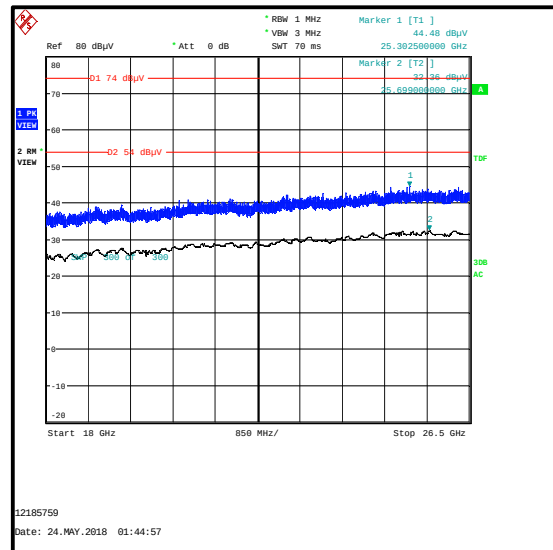
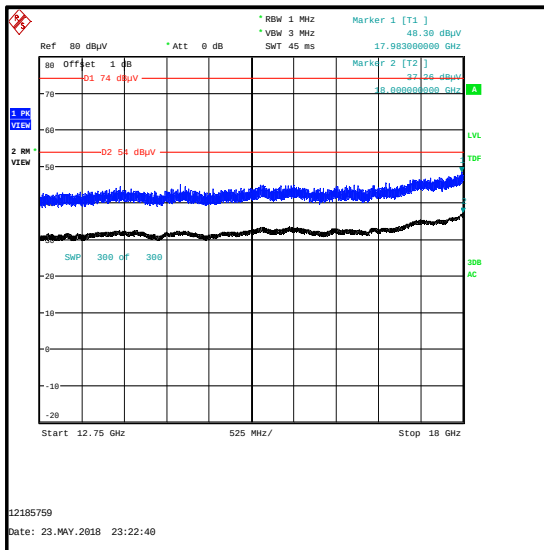
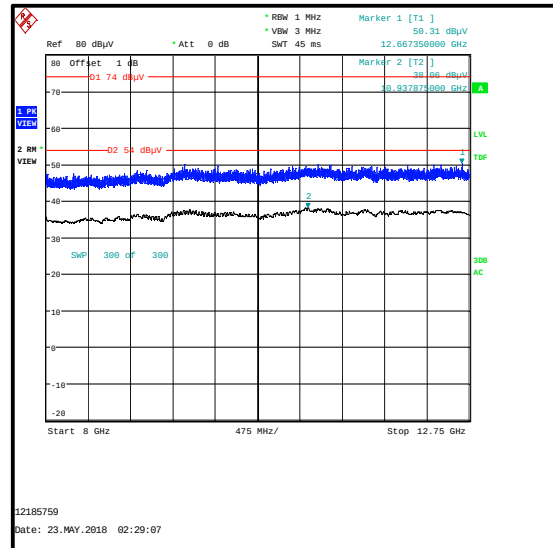
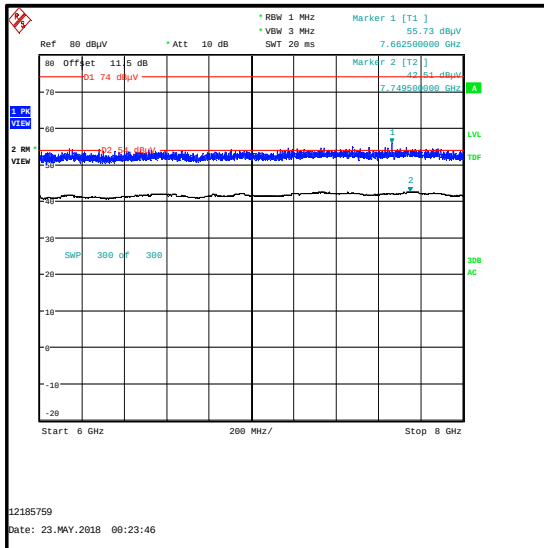
Results: Peak

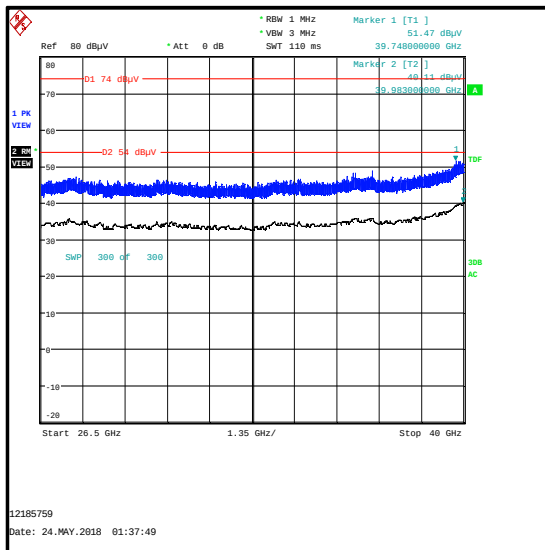
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Combination 4 - Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 5 GHz WLAN (SISO) bottom channel (continued)

Combination 4 - Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 5 GHz WLAN (SISO) bottom channel (continued)

4.5. Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers, Tom Sleigh & Mark Perry	Test Dates:	16 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5 & 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	2.4 GHz WLAN (3Tx MIMO) bottom channel / 5 GHz WLAN (SISO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The 2.4 GHz WLAN fundamental is shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

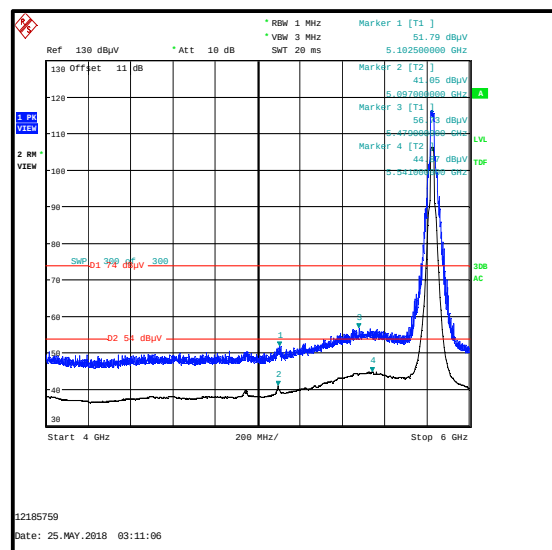
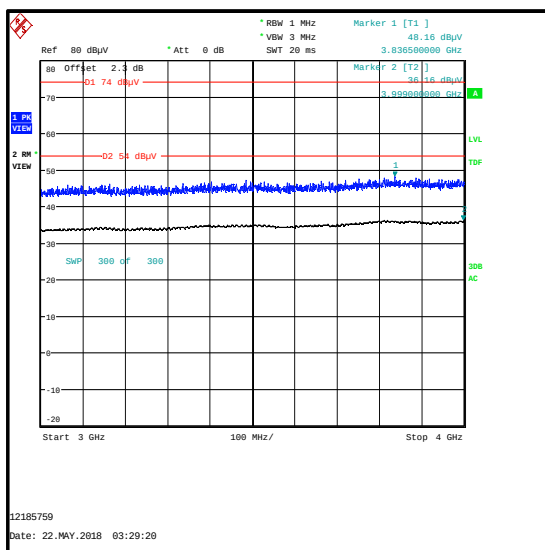
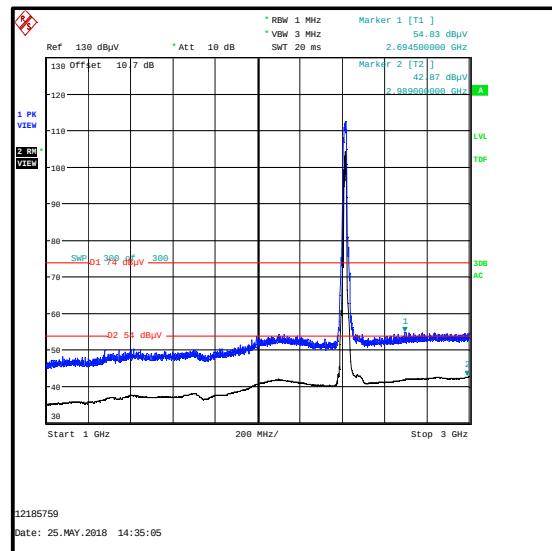
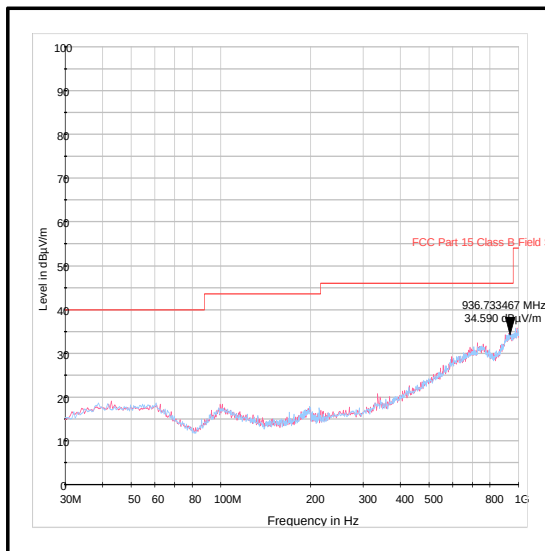
Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)

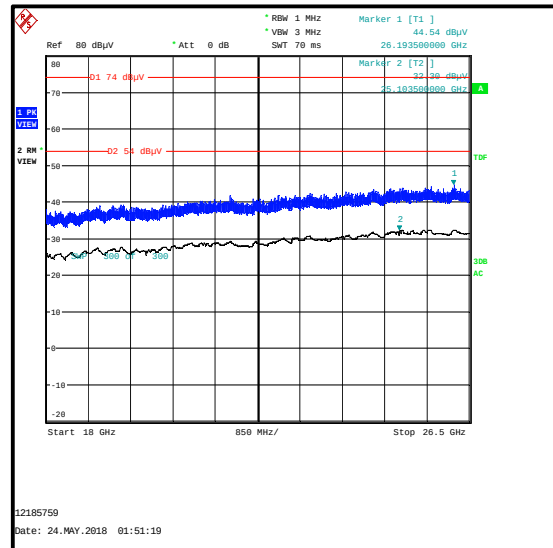
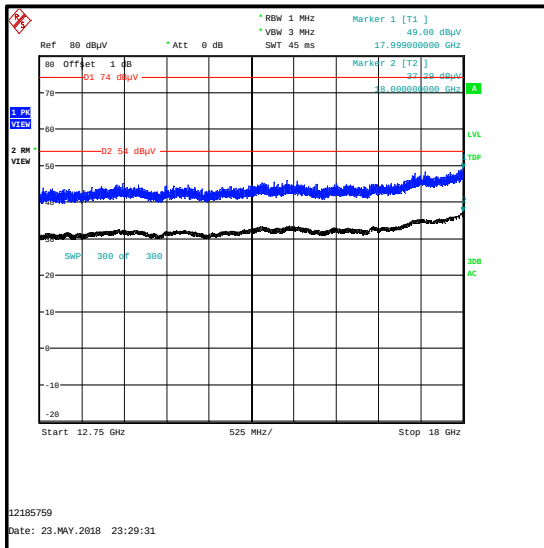
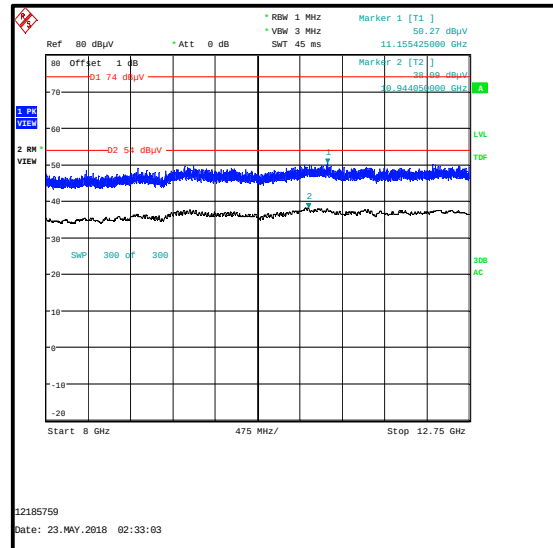
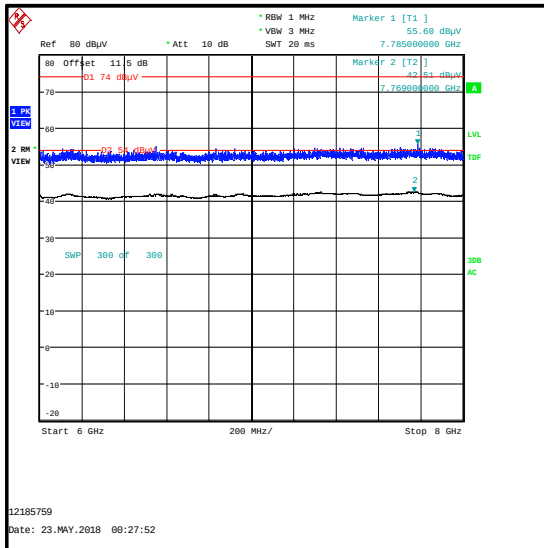
Results: Peak

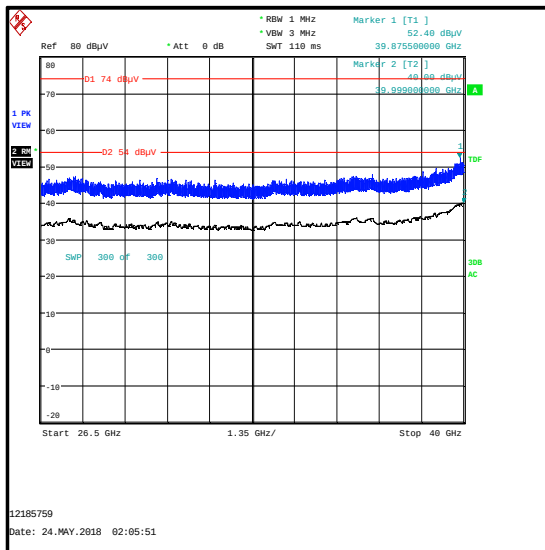
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)

Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)

4.6. Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers, Tom Sleigh & Mark Perry	Test Dates:	16 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5 & 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	2.4 GHz WLAN (3Tx MIMO) top channel / 5 GHz WLAN (SISO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The 2.4 GHz WLAN fundamental is shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

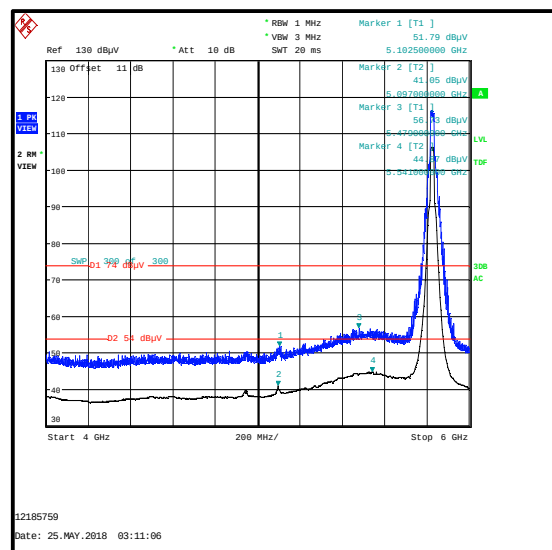
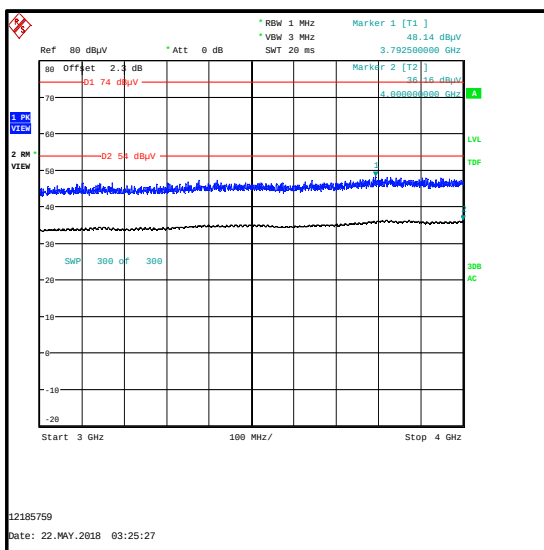
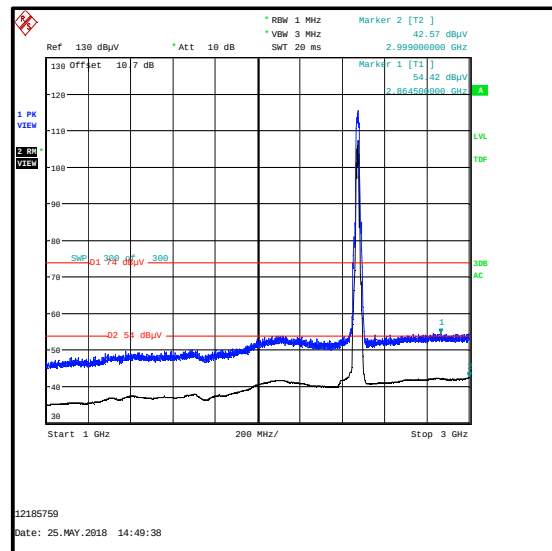
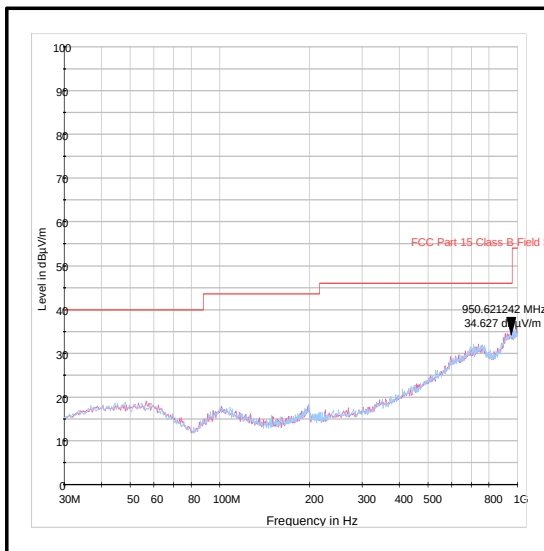
Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)

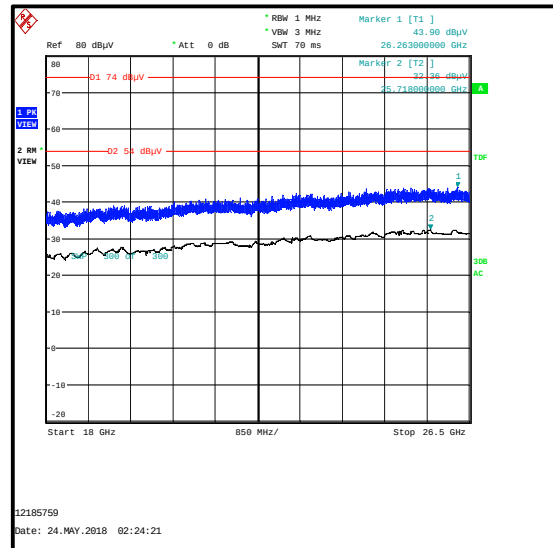
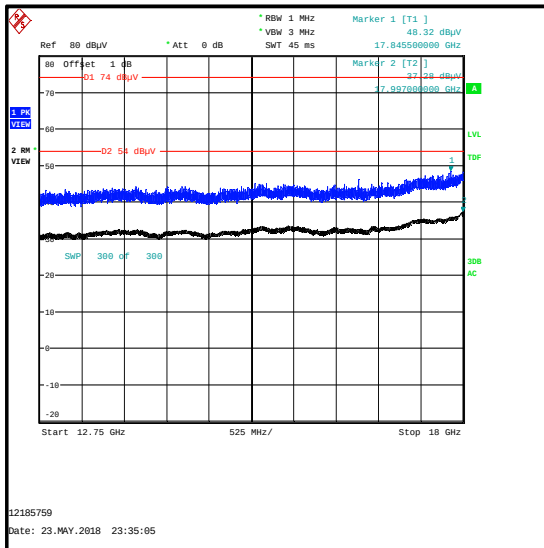
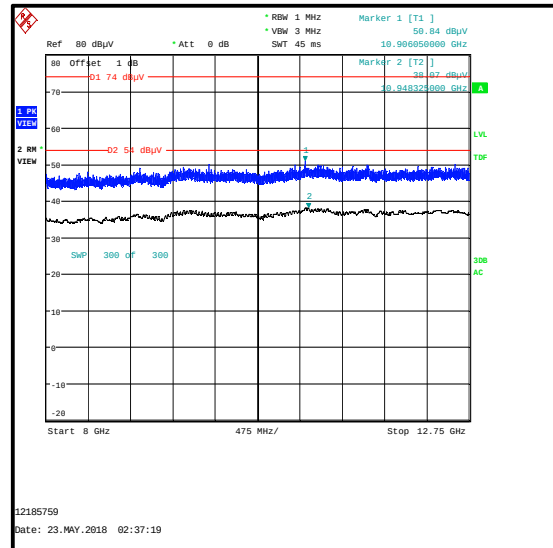
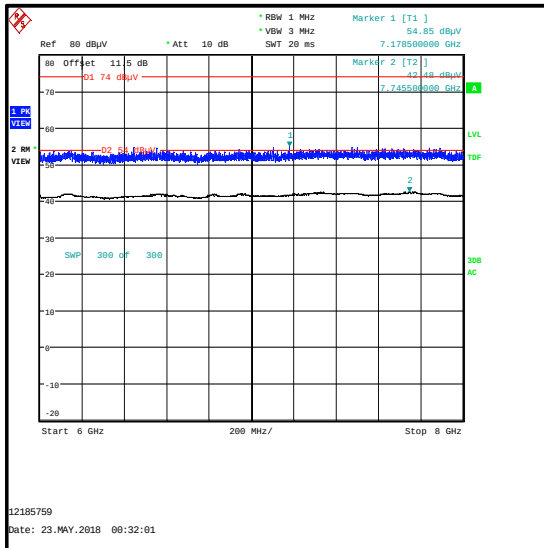
Results: Peak

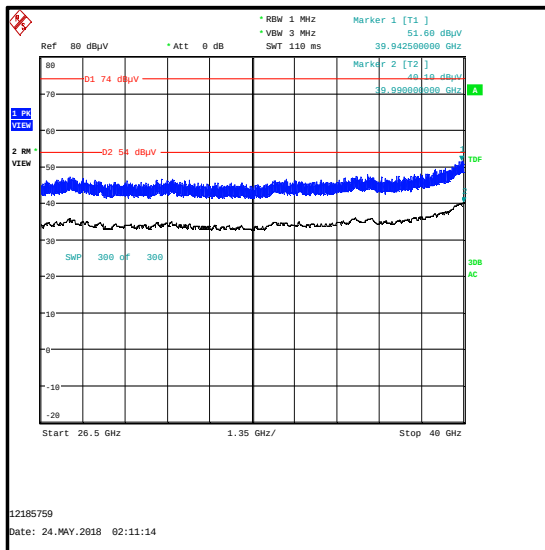
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)

Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)

4.7. Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers, Tom Sleigh & Mark Perry	Test Dates:	16 May 2018 to 30 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a) & 15.247(d)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1
Frequency Range:	30 MHz to 26.5 GHz
Configuration:	<i>Bluetooth</i> Basic Rate bottom channel / 2.4 GHz WLAN (2Tx MIMO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

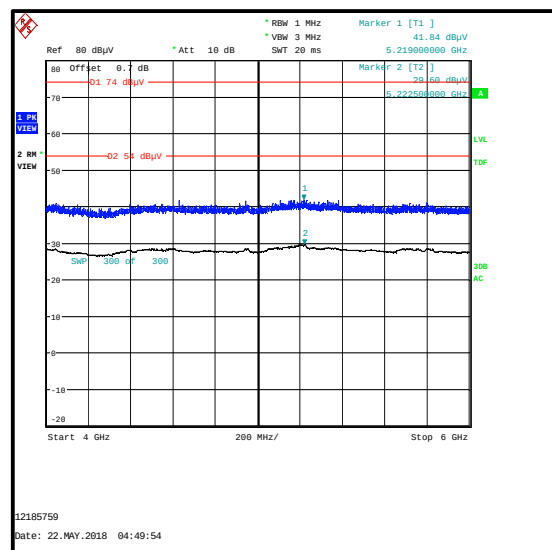
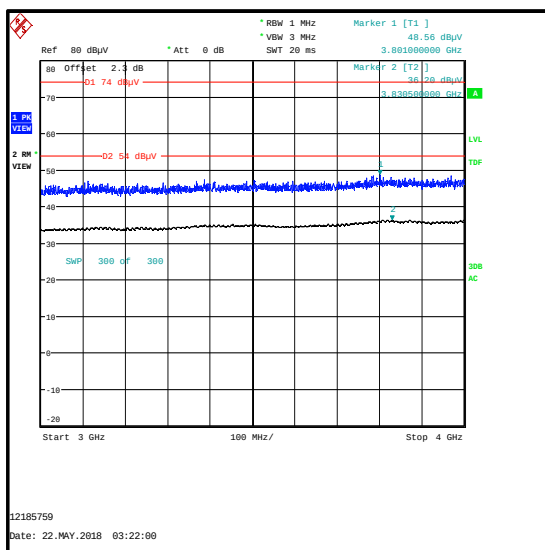
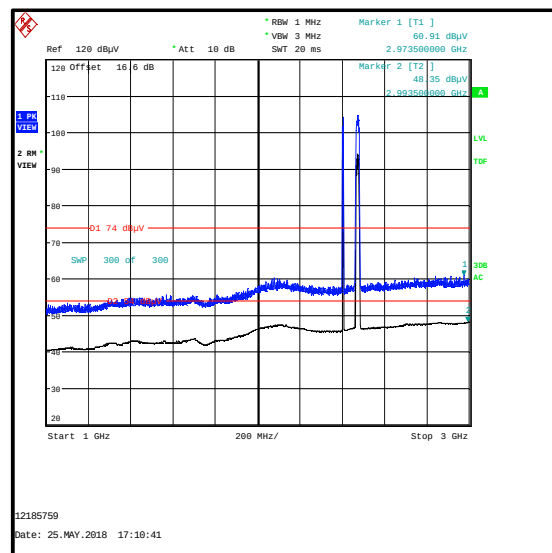
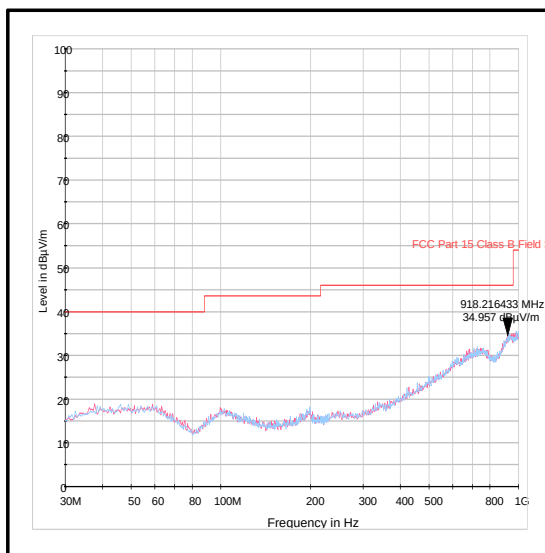
1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification
2. The *Bluetooth* and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
4. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

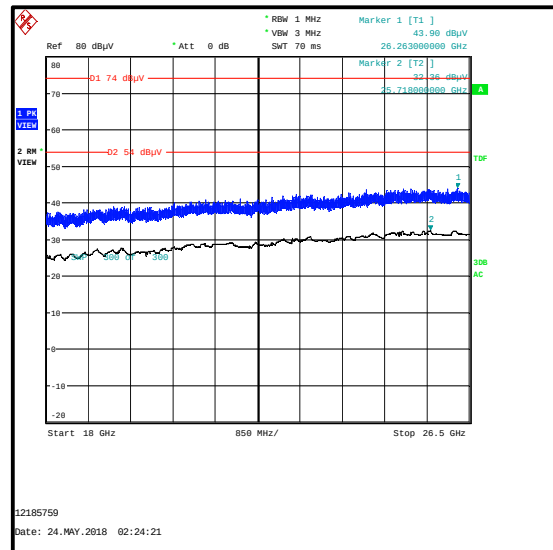
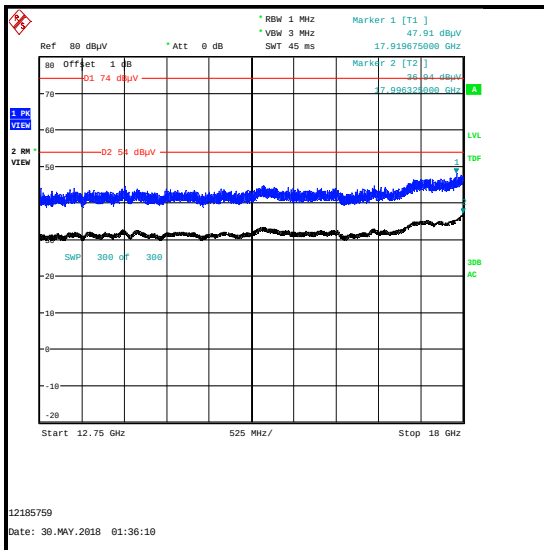
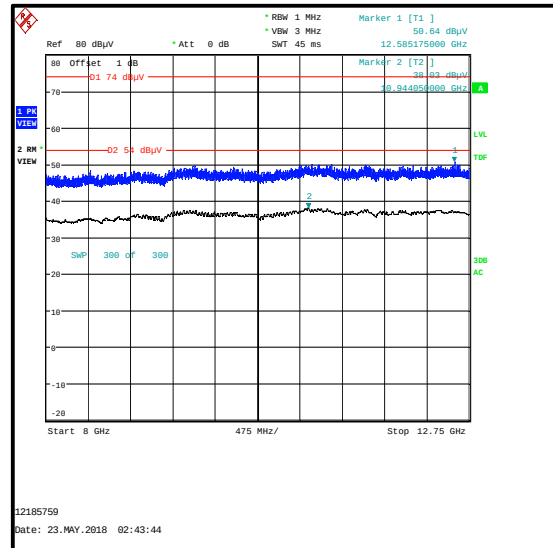
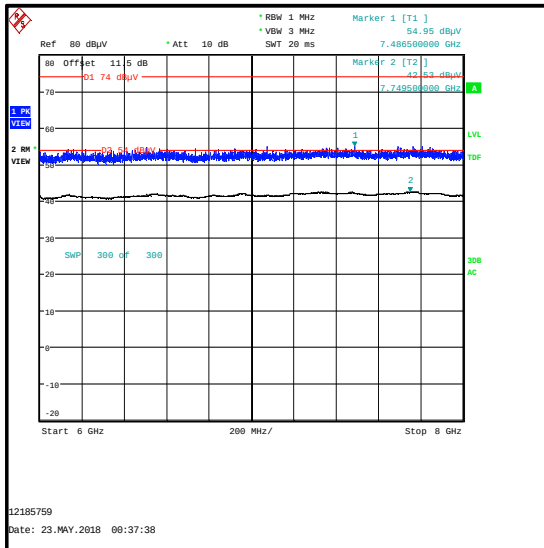
Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel (continued)**Results: Peak**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel (continued)

4.8. Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz WLAN (MIMO) bottom channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 02 June 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a) & 15.247(d)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1
Frequency Range:	30 MHz to 26.5 GHz
Configuration:	<i>Bluetooth</i> Basic Rate top channel / 2.4 GHz WLAN (2Tx MIMO) bottom channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 50

Note(s):

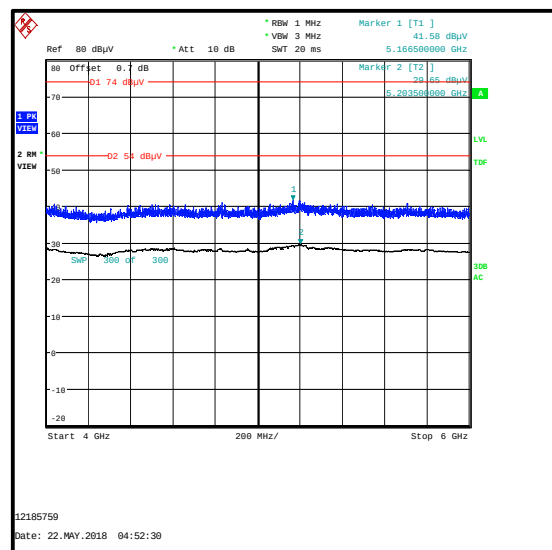
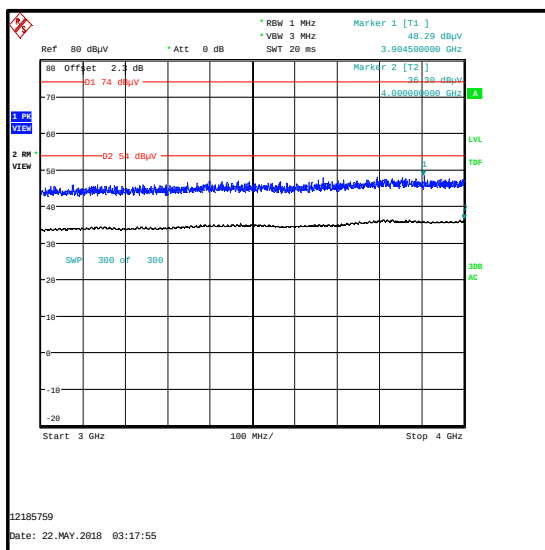
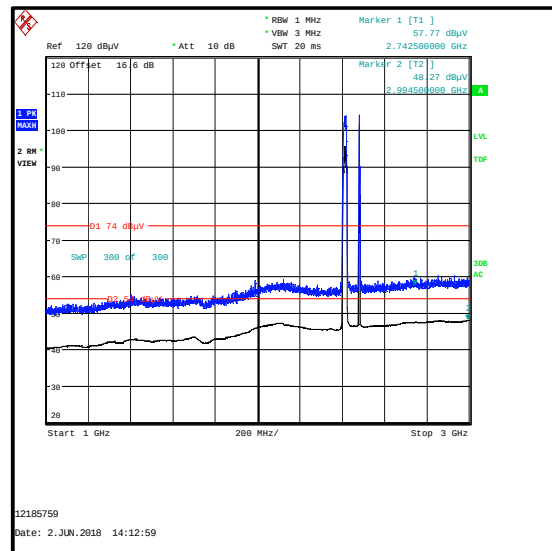
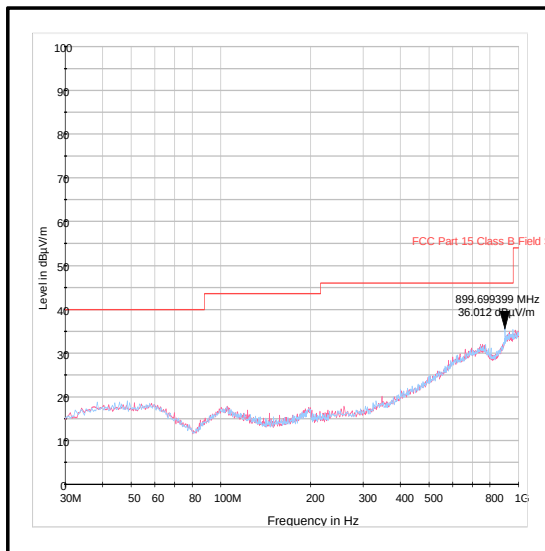
1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
4. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

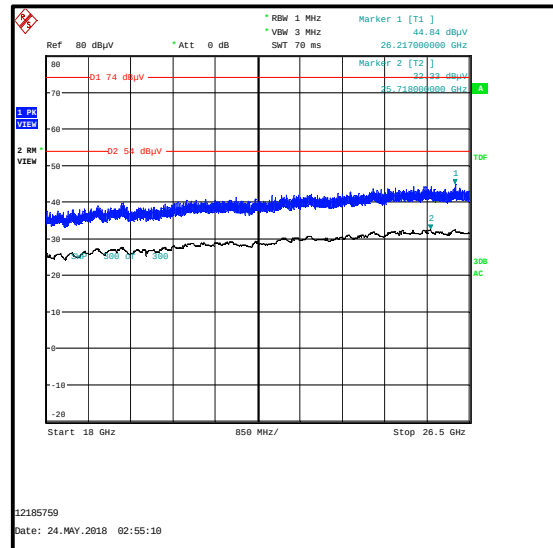
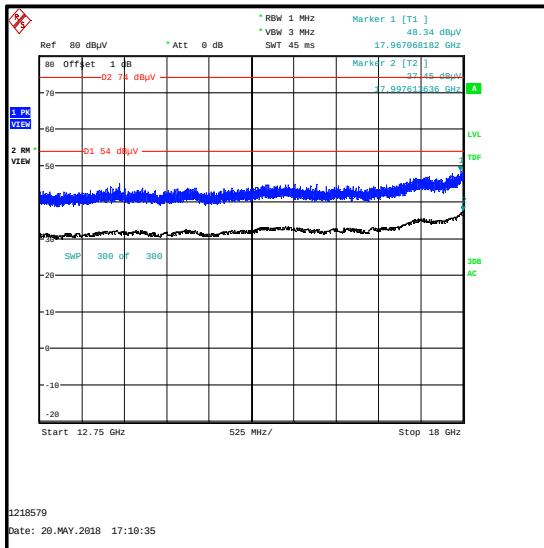
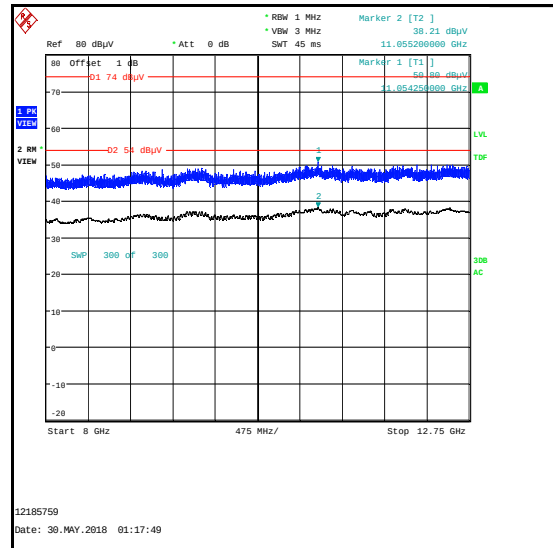
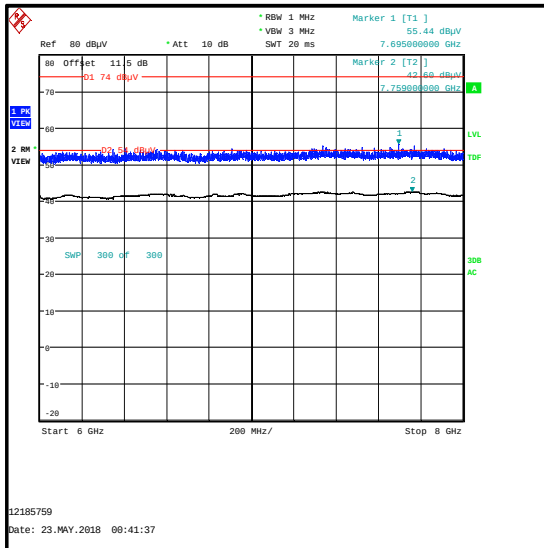
Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz WLAN (MIMO) bottom channel (continued)**Results: Peak**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz WLAN (MIMO) bottom channel (continued)

4.9. Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 2.4 GHz WLAN (MIMO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a) & 15.247(d)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1
Frequency Range:	30 MHz to 26.5 GHz
Configuration:	<i>Bluetooth</i> LE bottom channel / 2.4 GHz WLAN (2Tx MIMO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

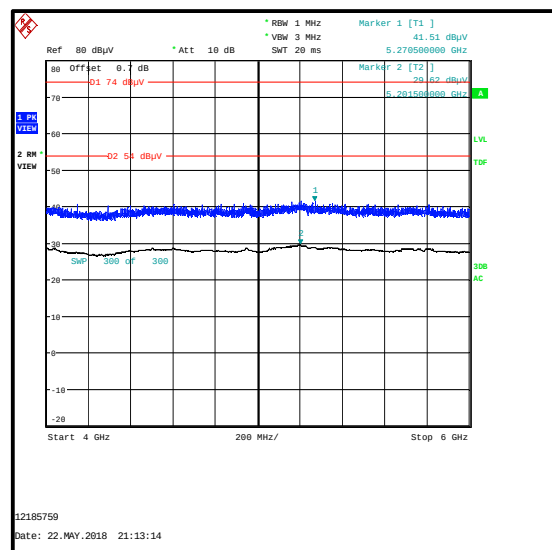
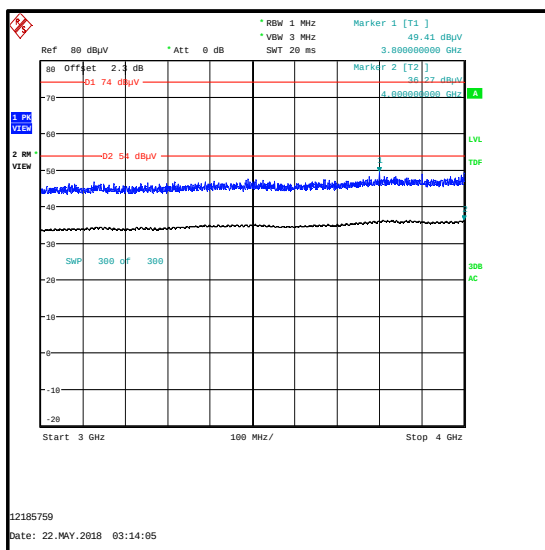
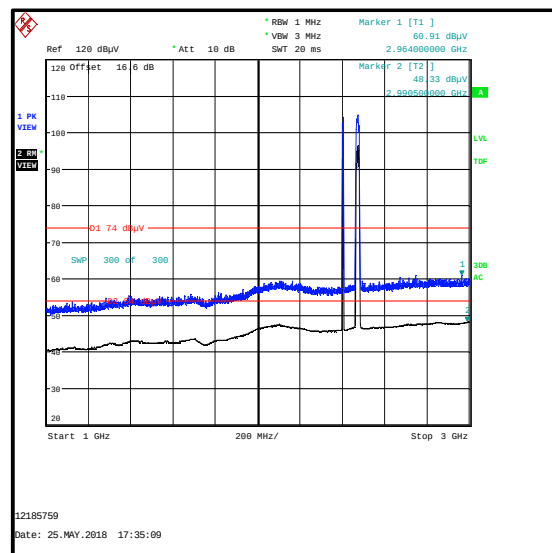
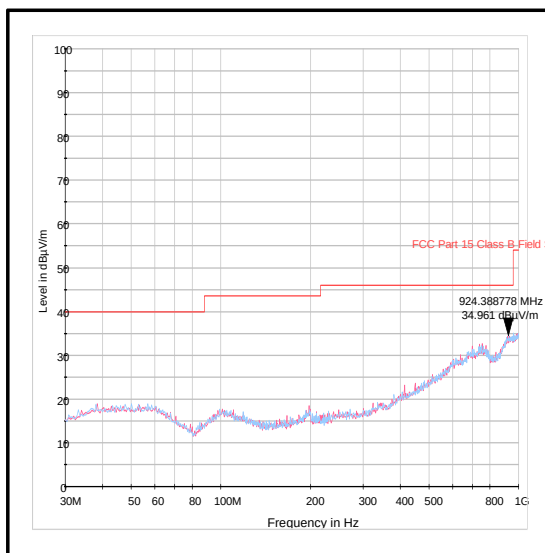
1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* LE and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
4. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

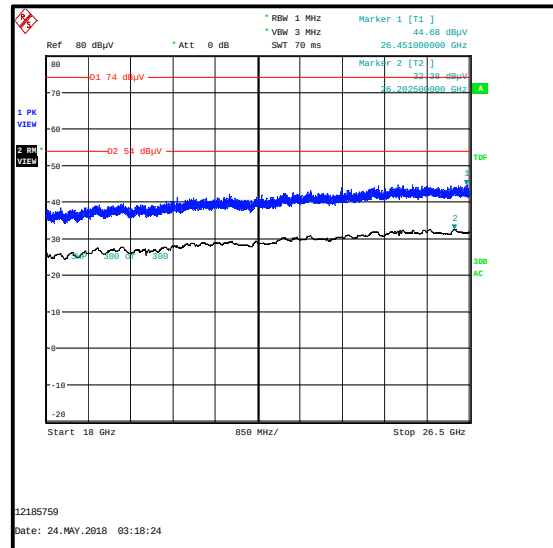
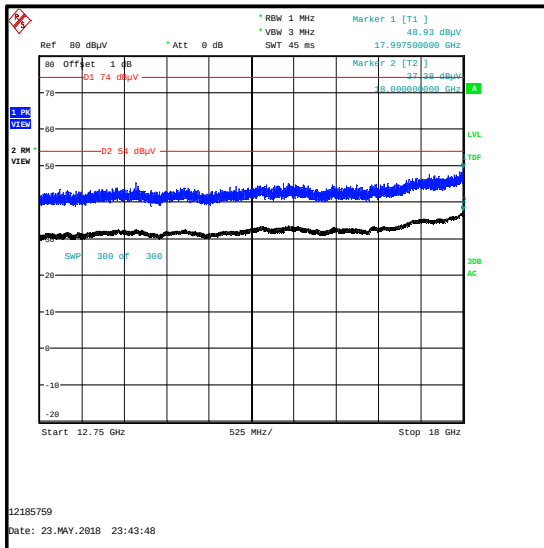
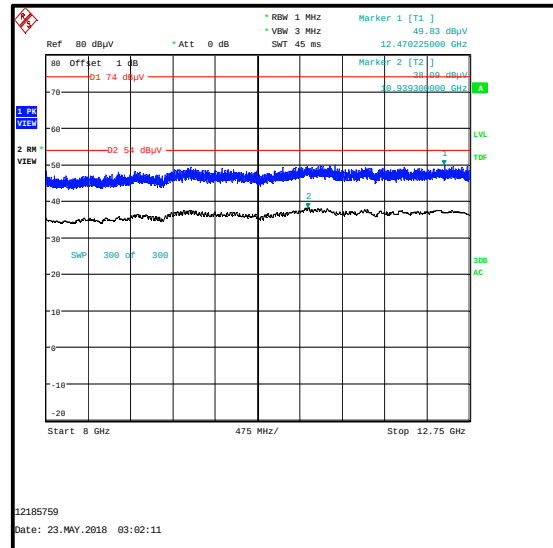
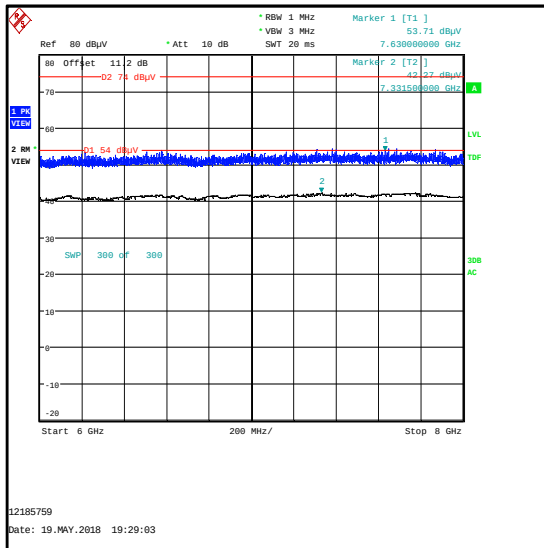
Transmitter Out of Band Radiated Emissions - Bluetooth LE bottom channel / 2.4 GHz WLAN (MIMO) top channel (continued)**Results: Peak**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 2.4 GHz WLAN (MIMO) top channel (continued)

4.10. Transmitter Out of Band Radiated Emissions - Bluetooth LE top channel / 2.4 GHz WLAN (MIMO) bottom channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 02 June 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a) & 15.247(d)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1
Frequency Range:	30 MHz to 26.5 GHz
Configuration:	Bluetooth LE top channel / 2.4 GHz WLAN (2Tx MIMO) bottom channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 50

Note(s):

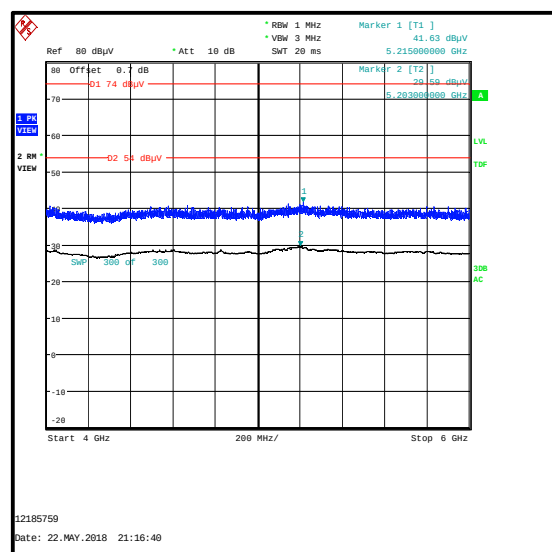
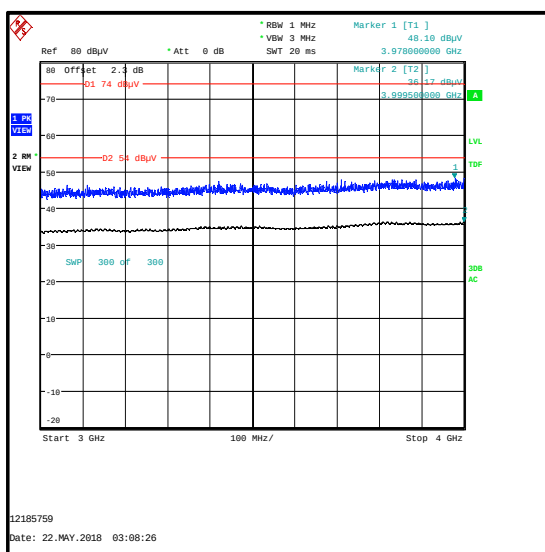
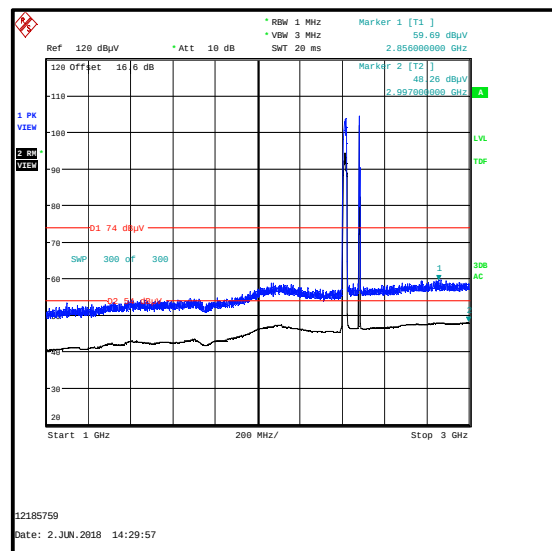
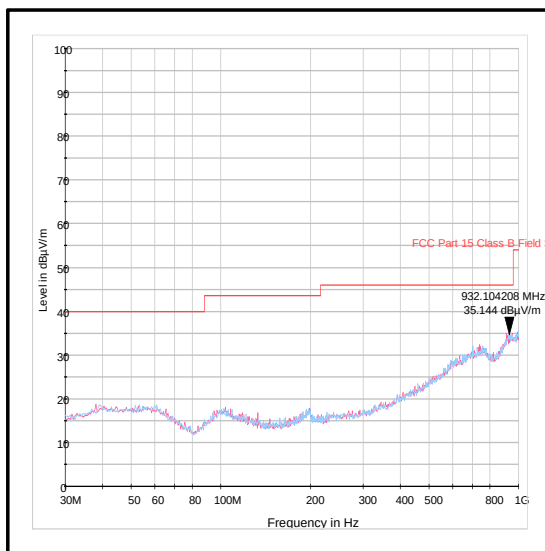
1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The Bluetooth LE and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
4. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

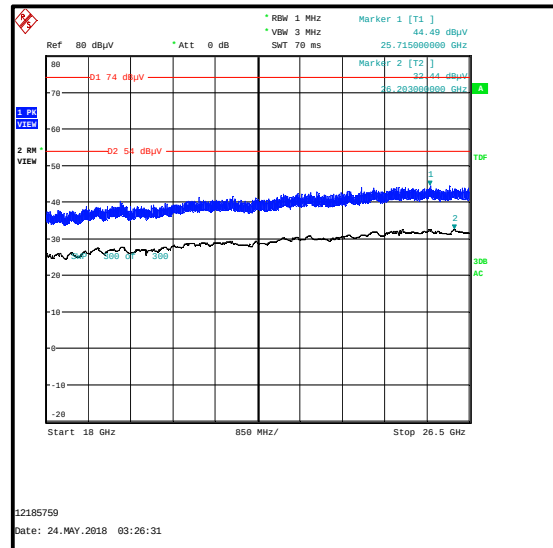
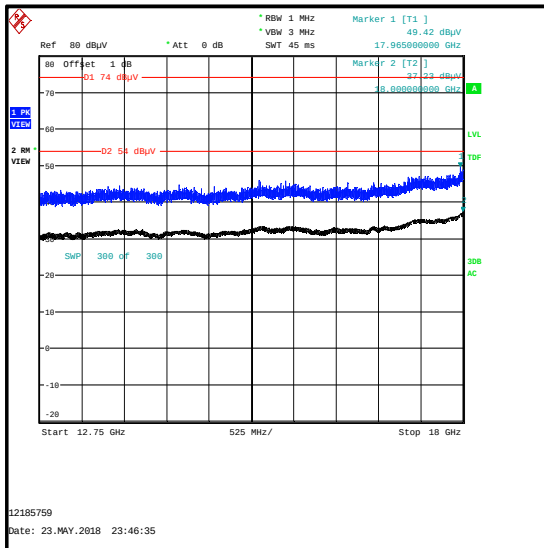
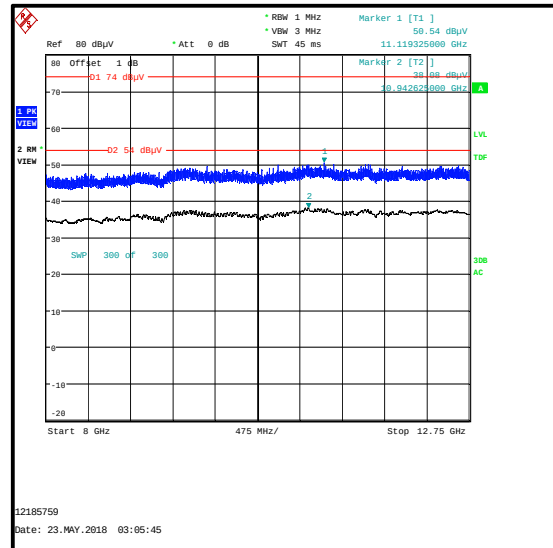
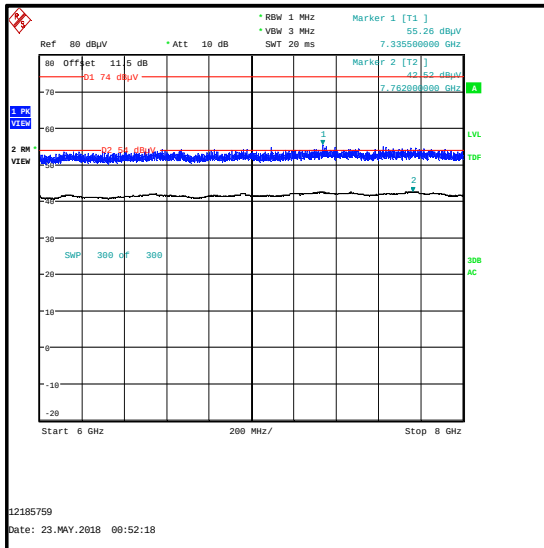
Transmitter Out of Band Radiated Emissions - Bluetooth LE top channel / 2.4 GHz WLAN (MIMO) bottom channel (continued)**Results: Peak**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 2.4 GHz WLAN (MIMO) bottom channel (continued)

4.11. Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5, 6.2.1.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4, 12.2.5.1, 12.7, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	<i>Bluetooth</i> Basic Rate bottom channel / 2.4 GHz WLAN (2Tx MIMO) top channel / 5 GHz WLAN (SISO) bottom channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The emission at approximately 4944.000 MHz is the second harmonic of the 2.4GHz WLAN signal and was therefore not measured.
6. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
7. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
8. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

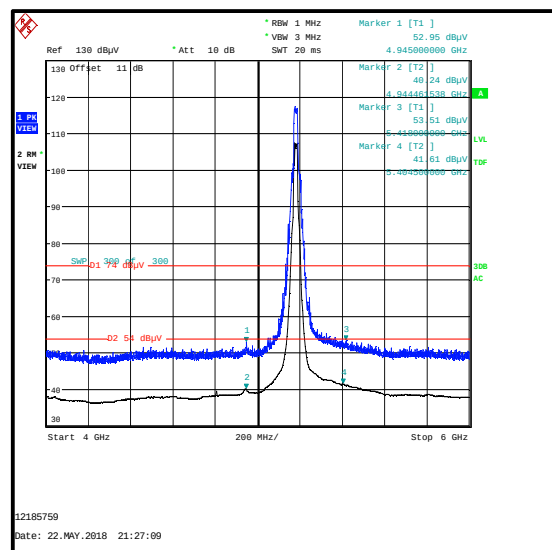
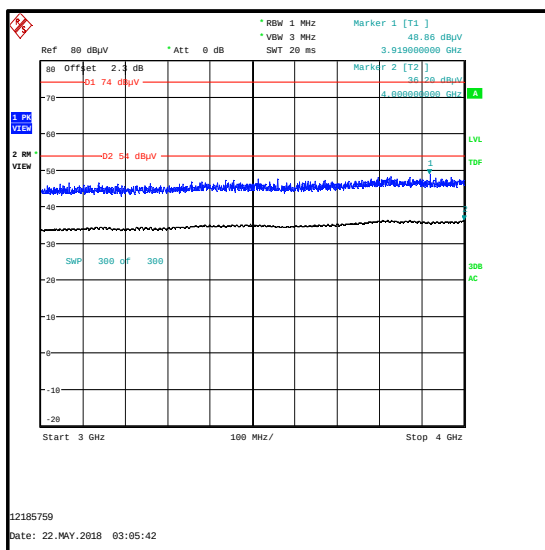
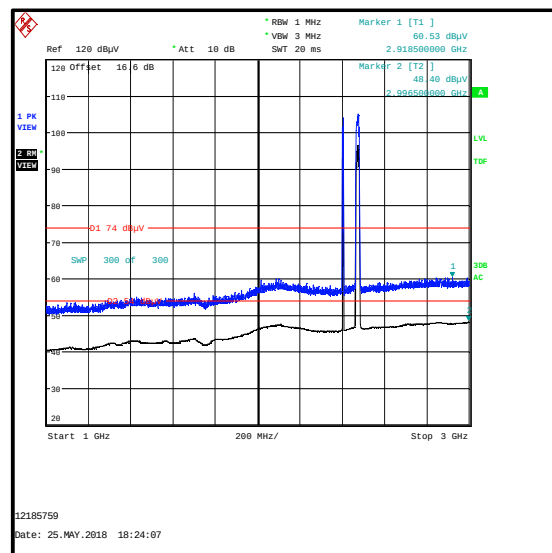
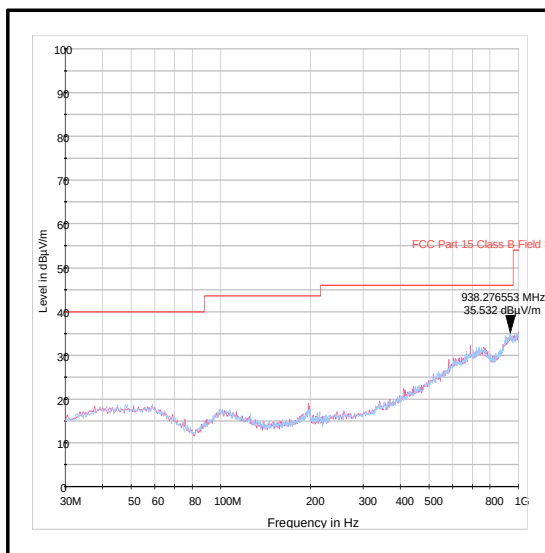
Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)

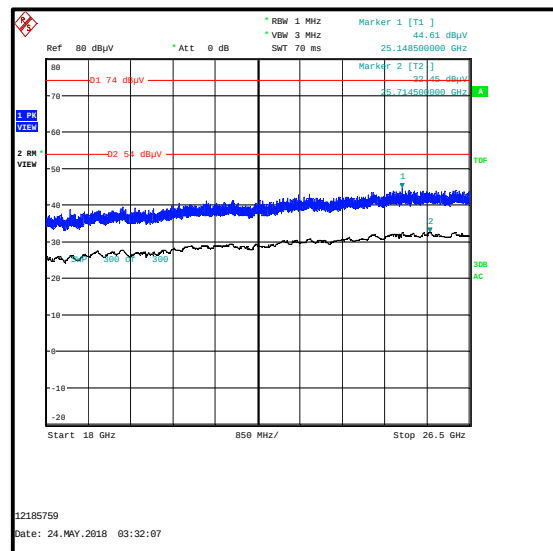
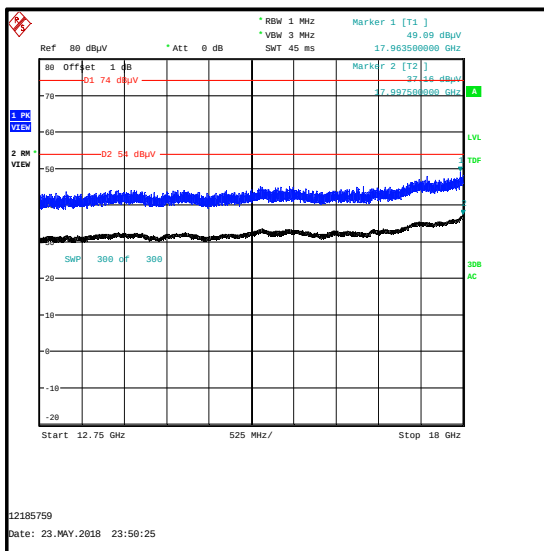
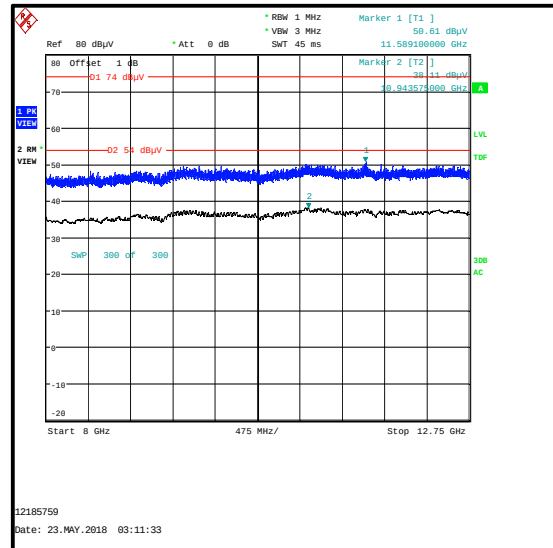
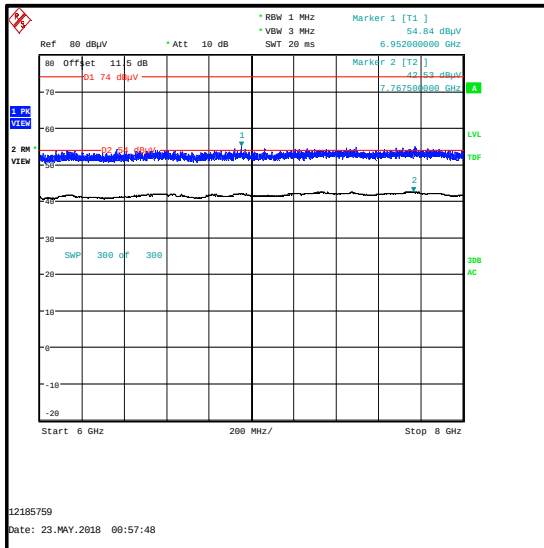
Results: Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

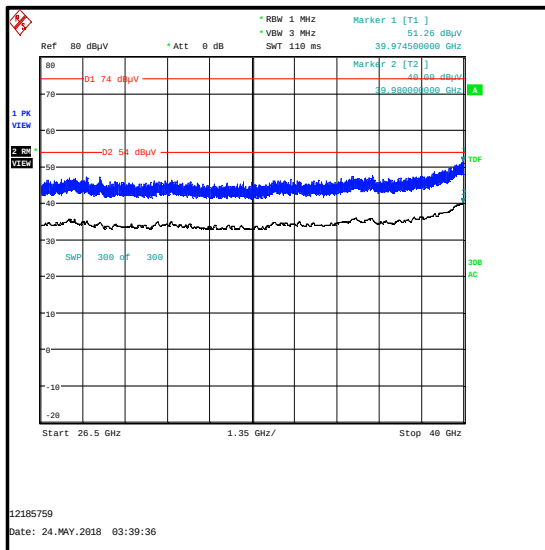
Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)

Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)



4.12. Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5, 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1 KDB 558074 Sections 11, 12.2.4, 12.2.5.1, 12.7, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	<i>Bluetooth</i> Basic Rate bottom channel / 2.4 GHz WLAN (2Tx MIMO) top channel / 5 GHz WLAN (SISO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

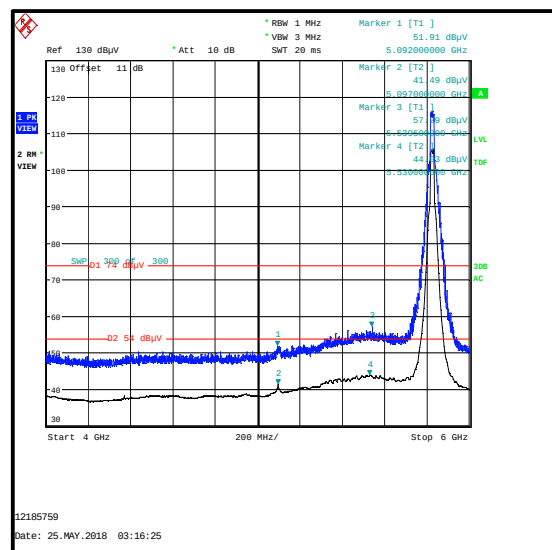
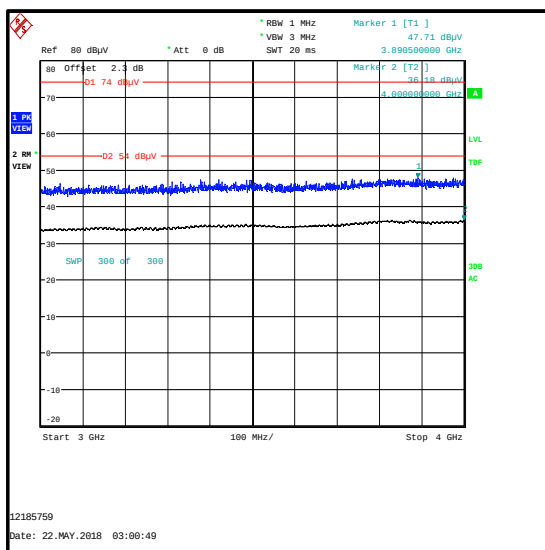
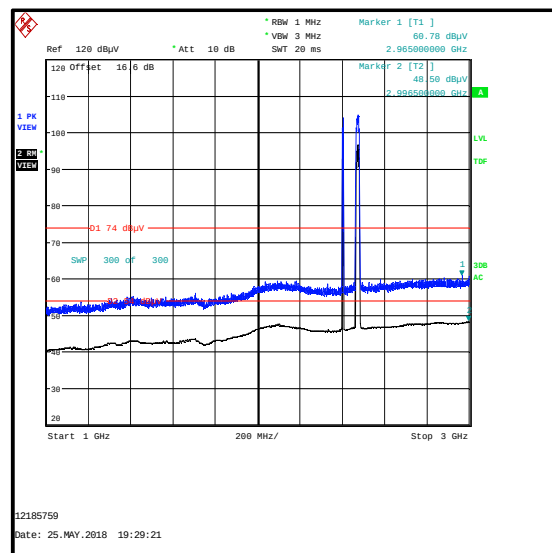
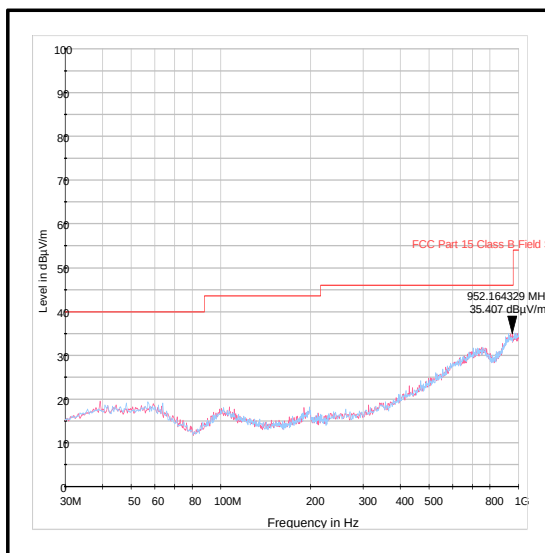
Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel (continued)

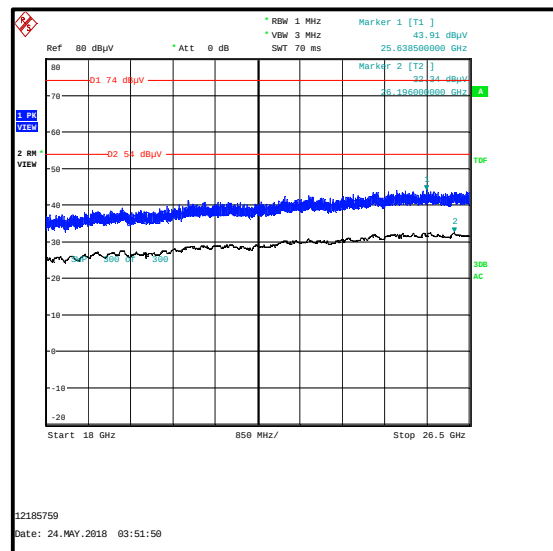
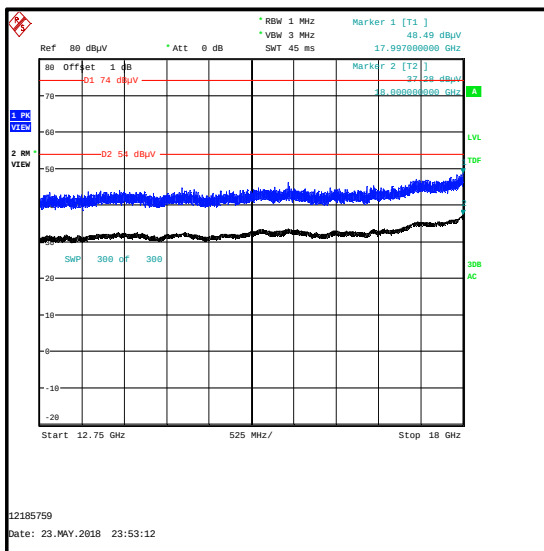
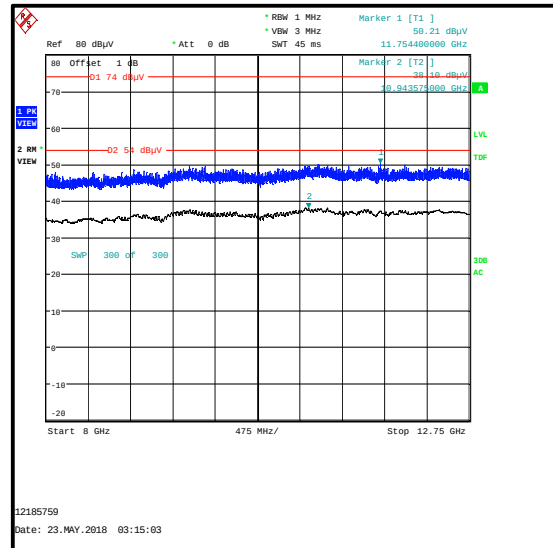
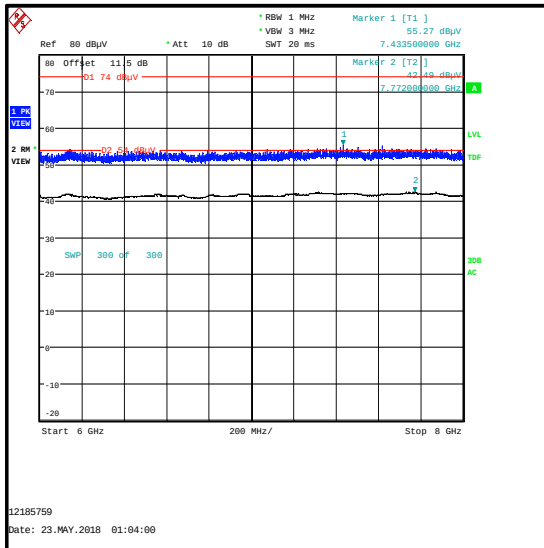
Results: Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

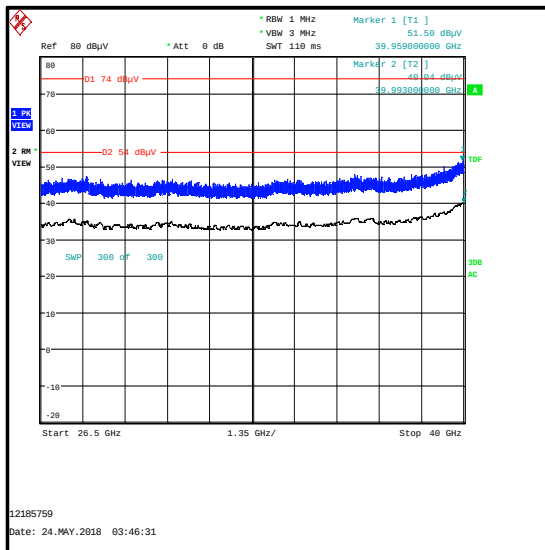
Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel (continued)

Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel (continued)



4.13. Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 02 June 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5, 6.2.1.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4, 12.2.5.1, 12.7, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	<i>Bluetooth</i> Basic Rate top channel / 2.4 GHz WLAN (2Tx MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 50

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The emission at approximately 4824.000 MHz is the second harmonic of the 2.4GHz WLAN signal and was therefore not measured.
6. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
7. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
8. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

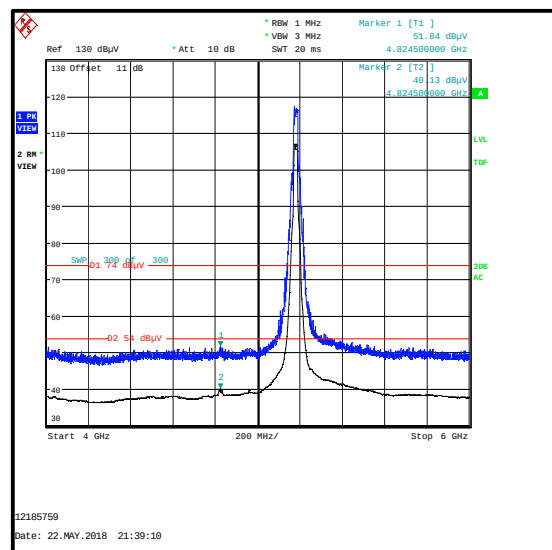
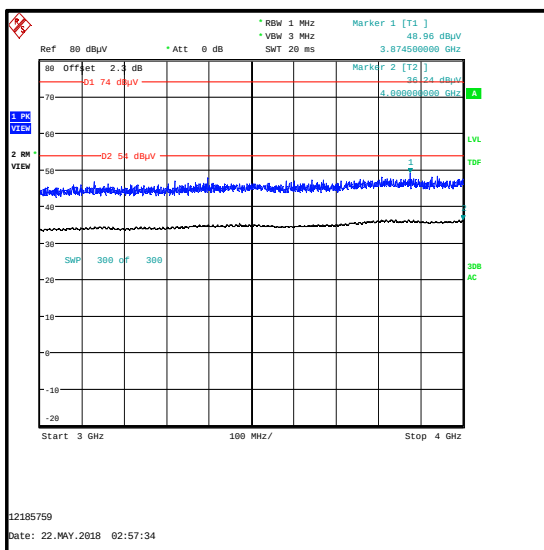
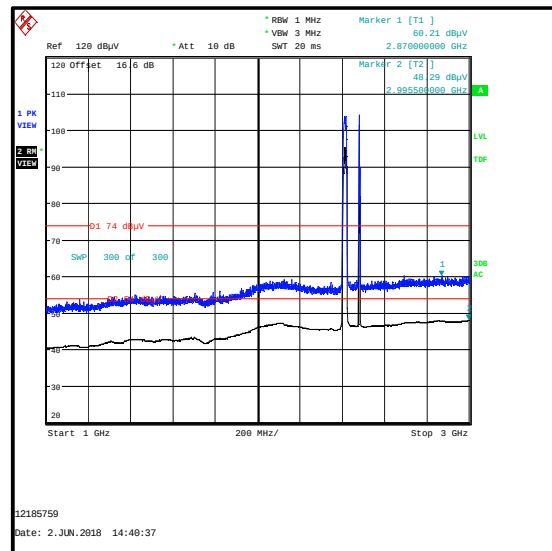
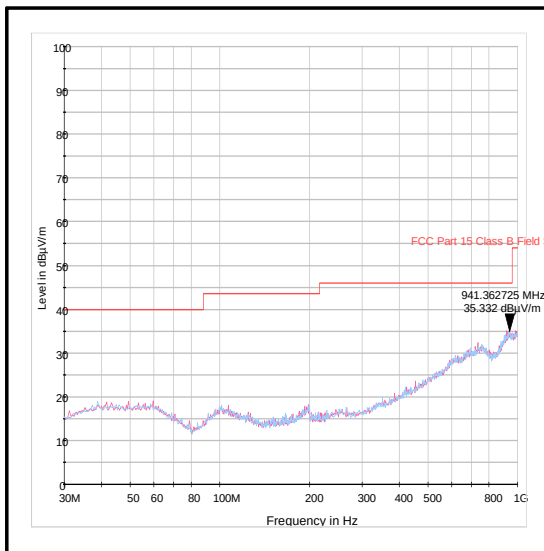
Transmitter Out of Band Radiated Emissions (*Bluetooth* Basic Rate top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel) (continued)

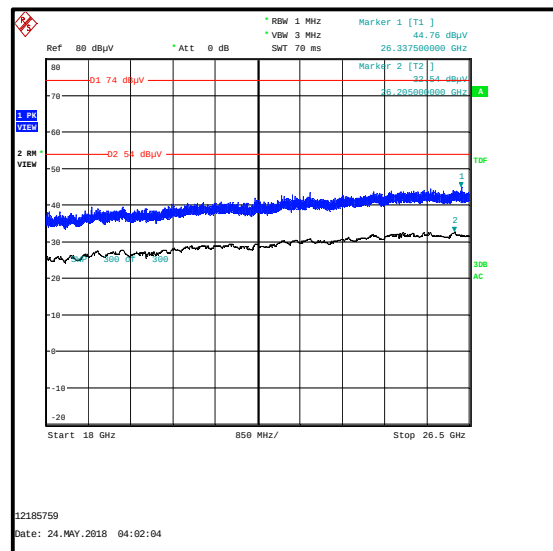
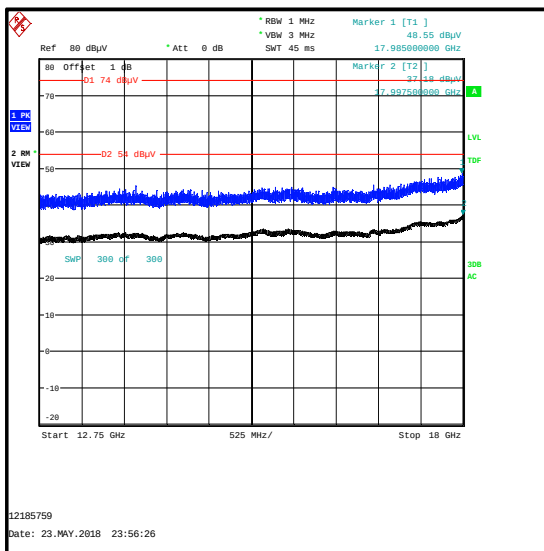
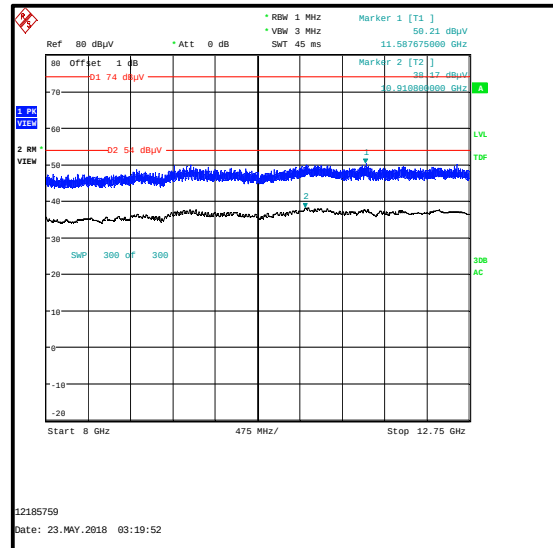
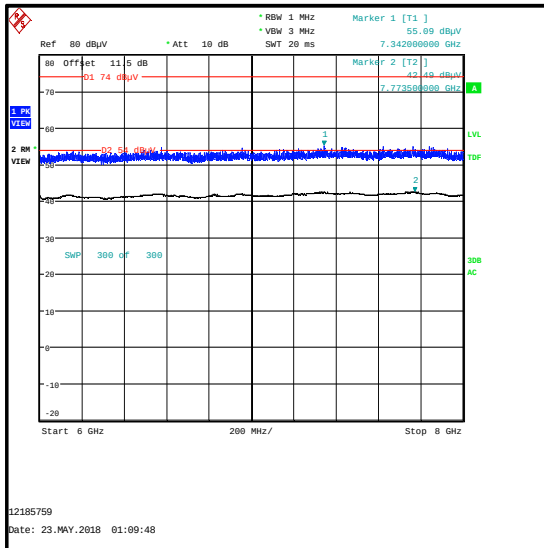
Results: Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

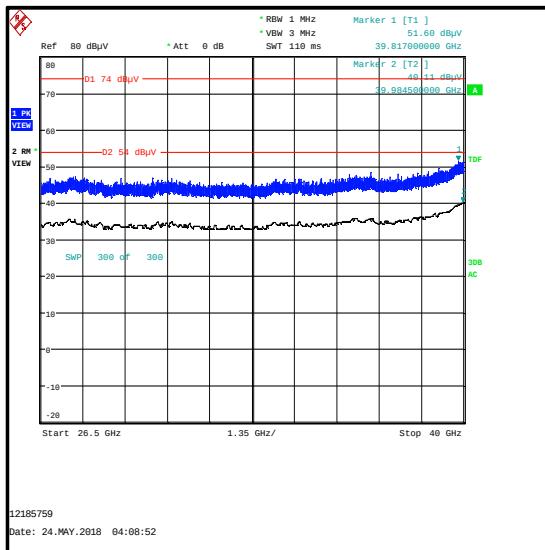
Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



**Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz
WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel (continued)**

**Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz
WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel (continued)**



4.14. Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 02 June 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5, 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4, 12.2.5.1, 12.7 KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	<i>Bluetooth</i> Basic Rate top channel / 2.4 GHz WLAN (2Tx MIMO) bottom channel / 5 GHz WLAN (SISO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 50

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The *Bluetooth* and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

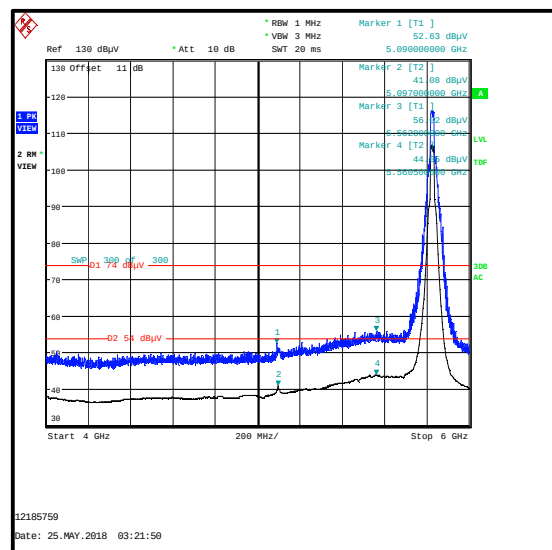
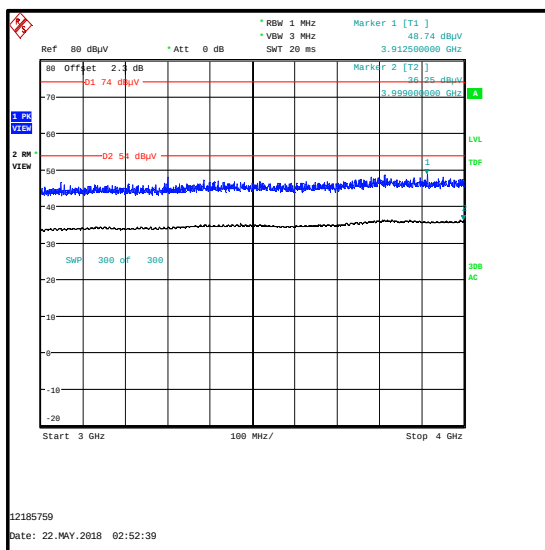
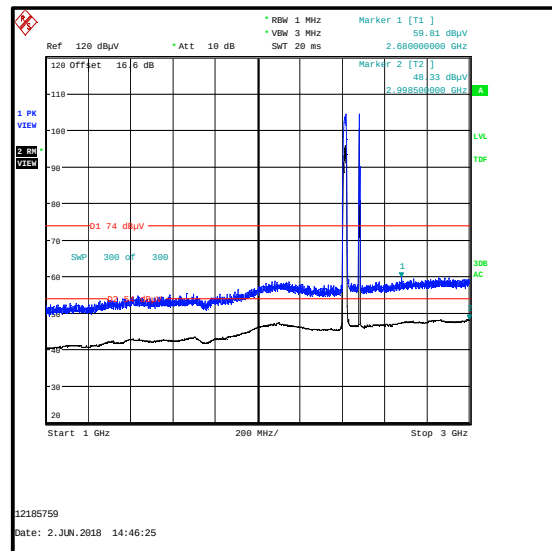
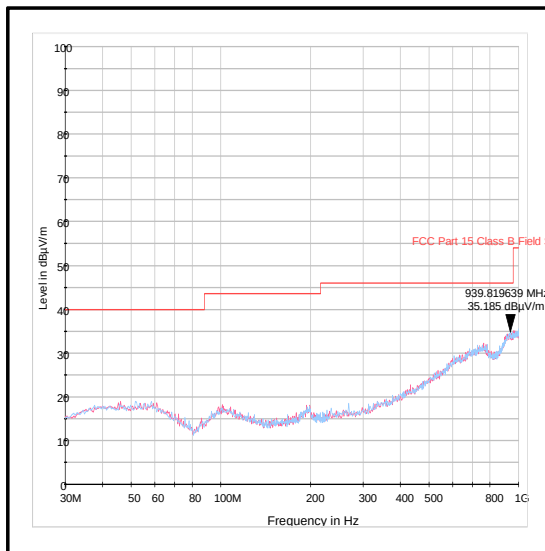
Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)

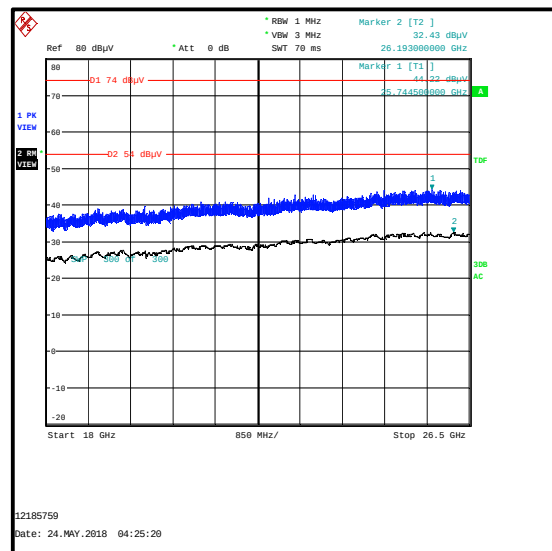
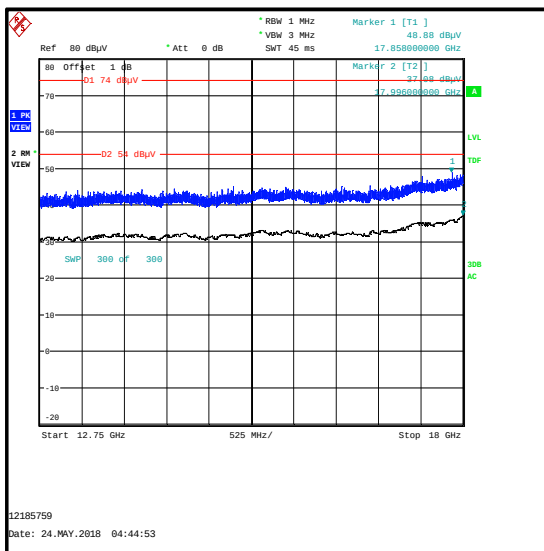
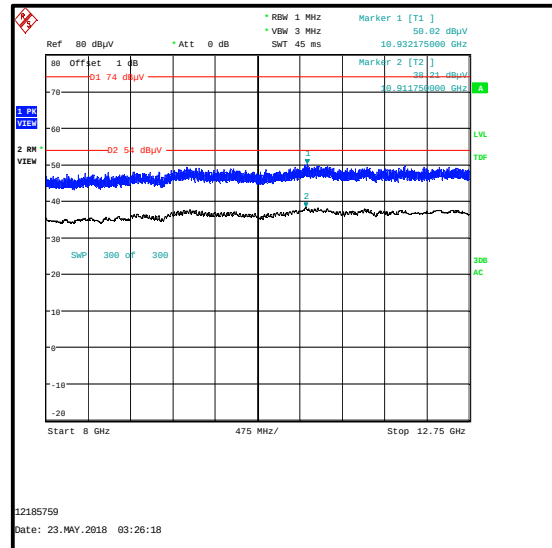
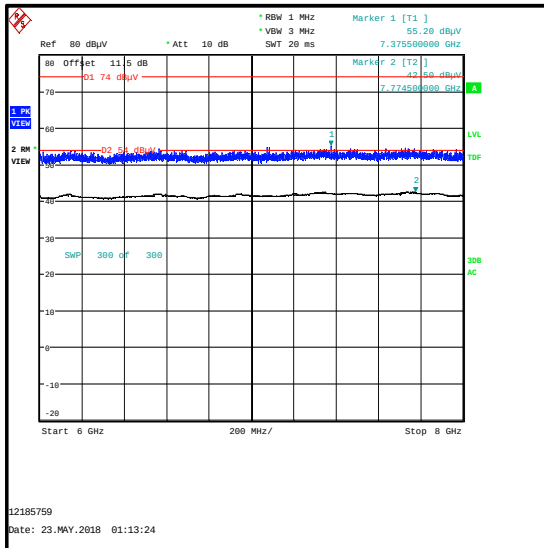
Results: Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

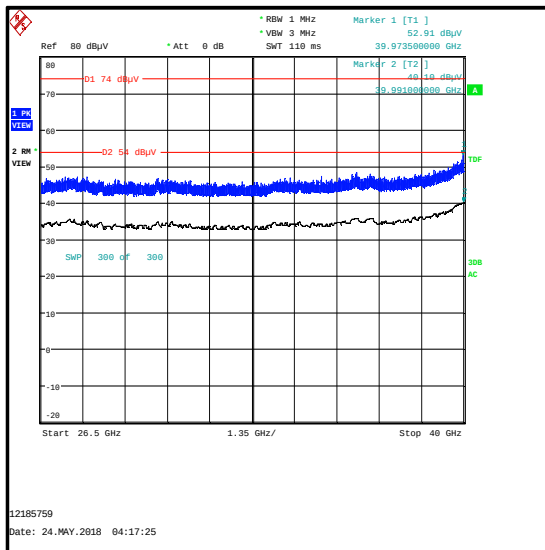
Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)

**Transmitter Out of Band Radiated Emissions - *Bluetooth* Basic Rate top channel / 2.4 GHz
WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)**



4.15. Transmitter Out of Band Radiated Emissions - Bluetooth LE bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5, 6.2.1.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4, 12.2.5.1, 12.7, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	Bluetooth LE bottom channel / 2.4 GHz WLAN (2Tx MIMO) top channel / 5 GHz WLAN (SISO) bottom channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The Bluetooth LE and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The emission at approximately 4944.000 MHz is the second harmonic of the 2.4GHz WLAN signal and was therefore not measured
6. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
7. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
8. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

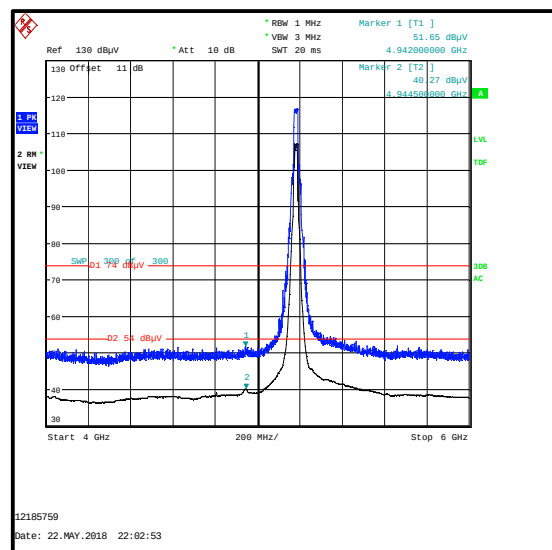
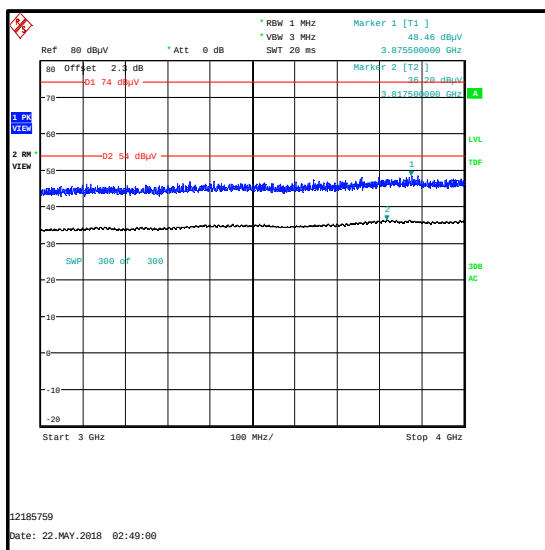
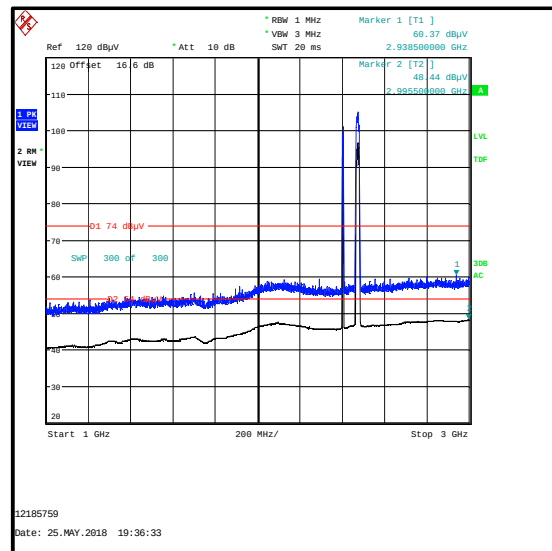
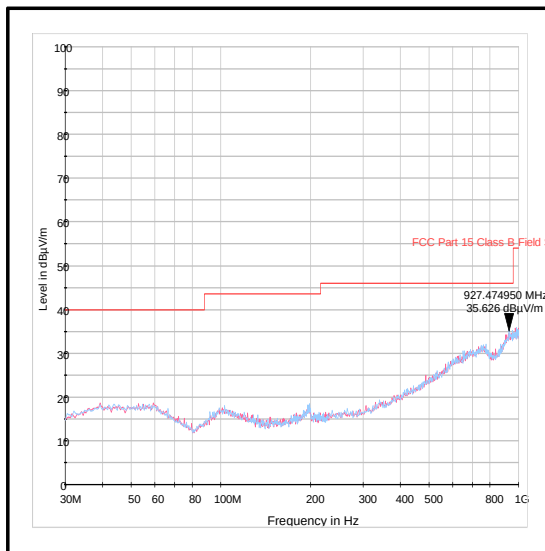
Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)

Results: Peak

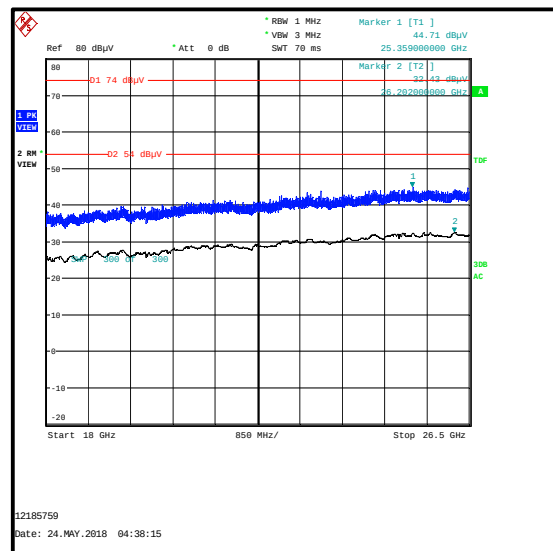
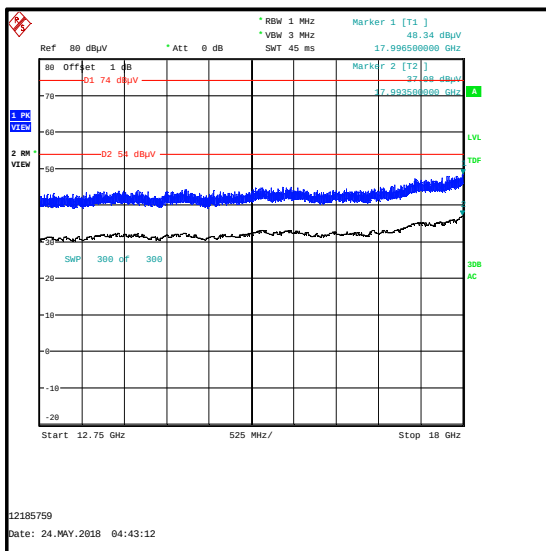
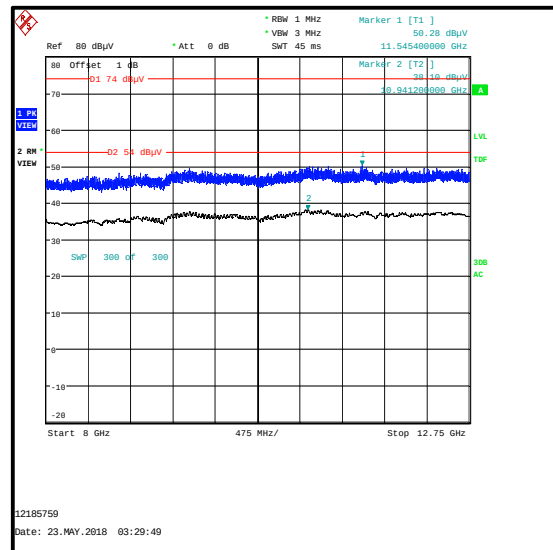
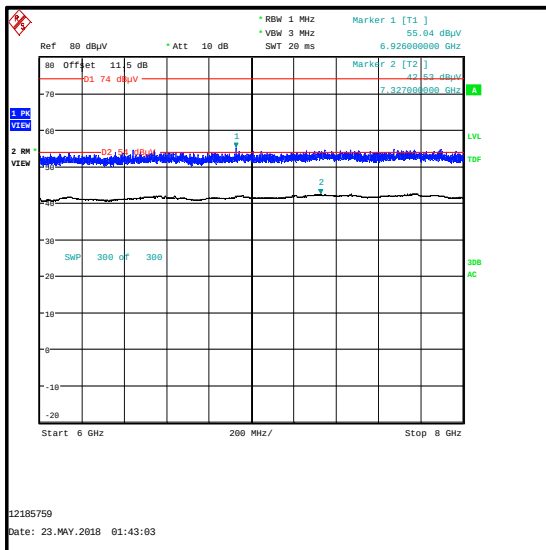
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

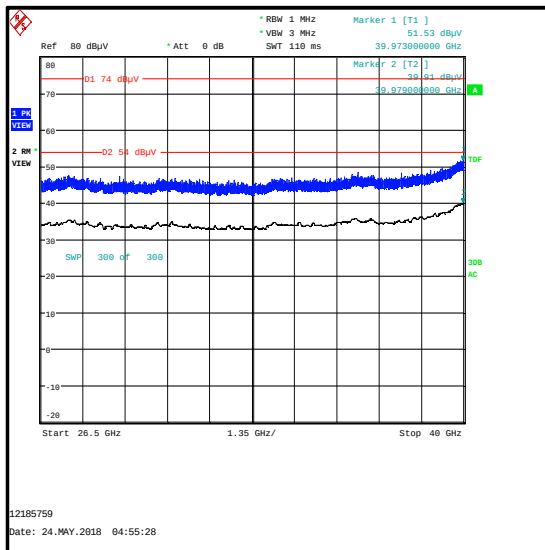
Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - Bluetooth LE bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)



**Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 2.4 GHz
WLAN (MIMO) top channel / 5 GHz WLAN (SISO) bottom channel (continued)**



4.16. Transmitter Out of Band Radiated Emissions - Bluetooth LE bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5, 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4, 12.2.5.1, 12.7 KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	Bluetooth LE bottom channel / 2.4 GHz WLAN (2Tx MIMO) top channel / 5 GHz WLAN (SISO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The Bluetooth LE and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

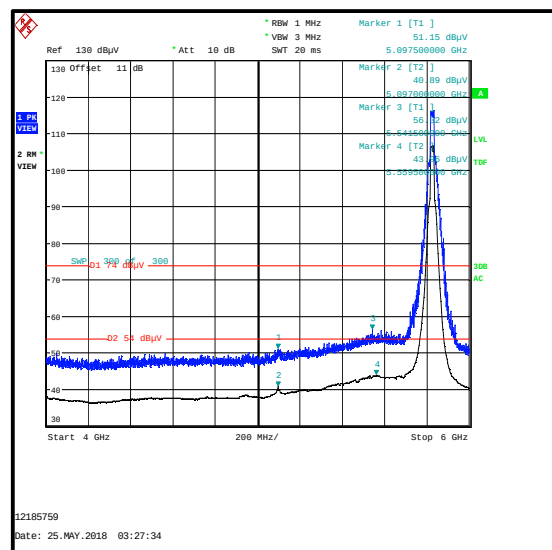
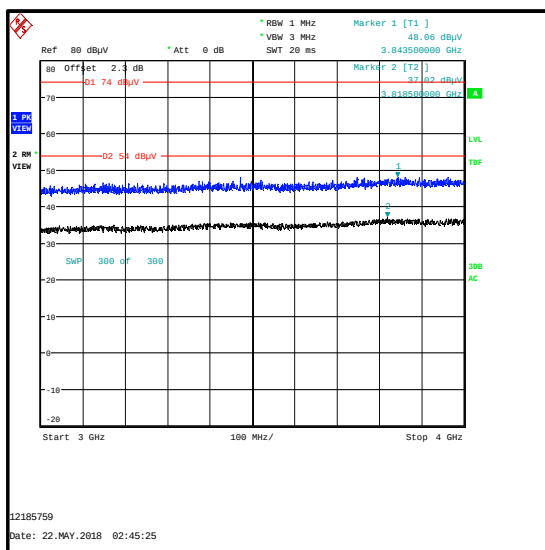
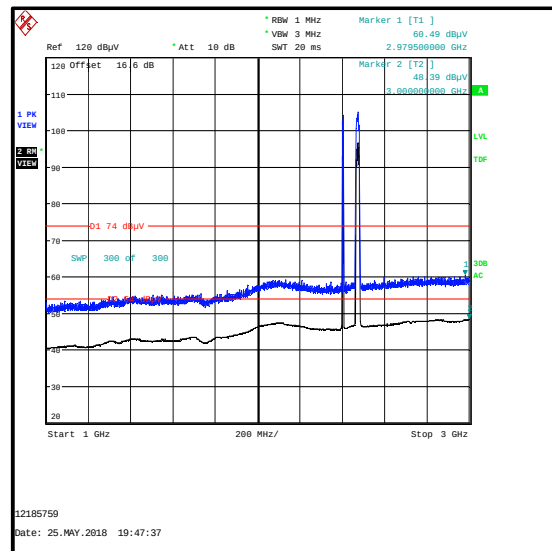
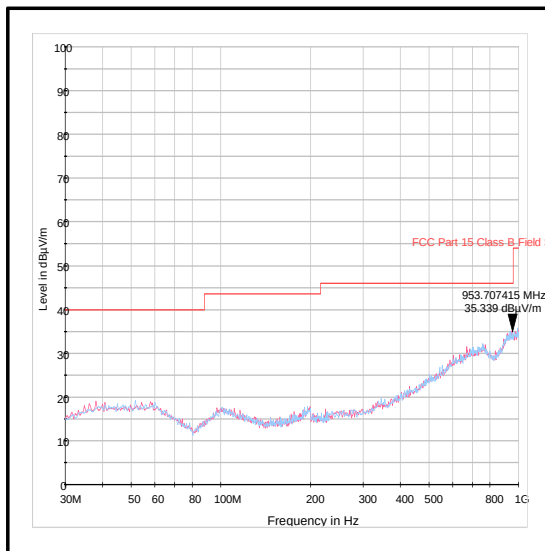
Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 2.4 GHz WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel (continued)

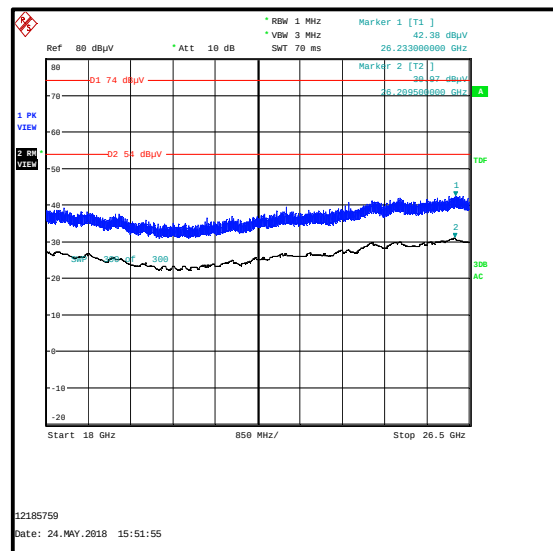
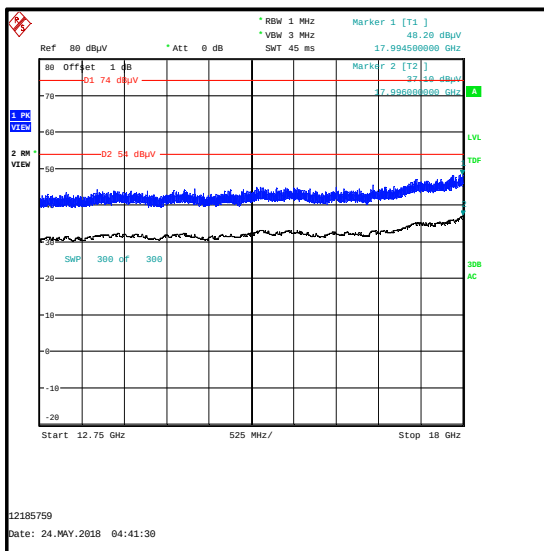
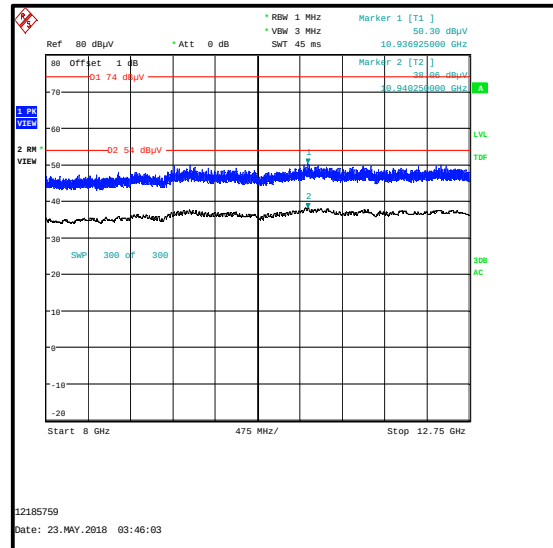
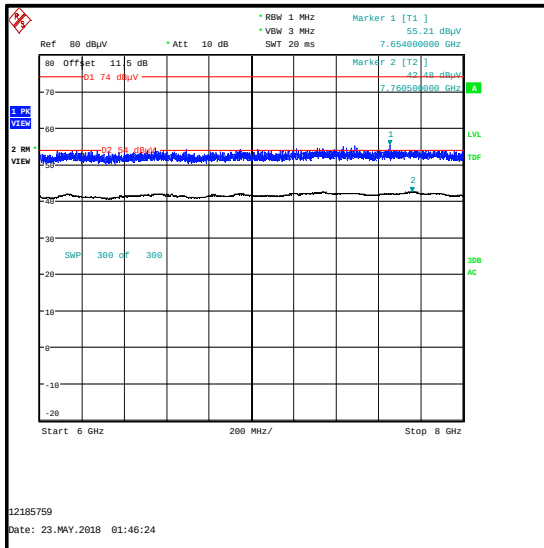
Results: Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

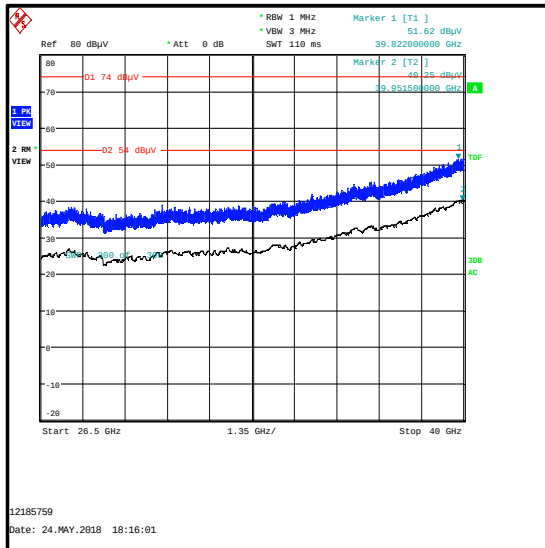
Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



**Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 2.4 GHz
WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel (continued)**

**Transmitter Out of Band Radiated Emissions - *Bluetooth* LE bottom channel / 2.4 GHz
WLAN (MIMO) top channel / 5 GHz WLAN (SISO) top channel (continued)**



4.17. Transmitter Out of Band Radiated Emissions - Bluetooth LE top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 02 June 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5, 6.2.1.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4, 12.2.5.1, 12.7 KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	Bluetooth LE top channel / 2.4 GHz WLAN (2Tx MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 50

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The Bluetooth LE and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

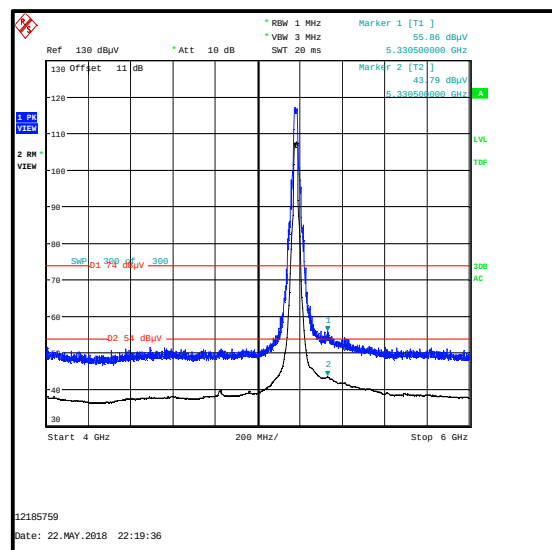
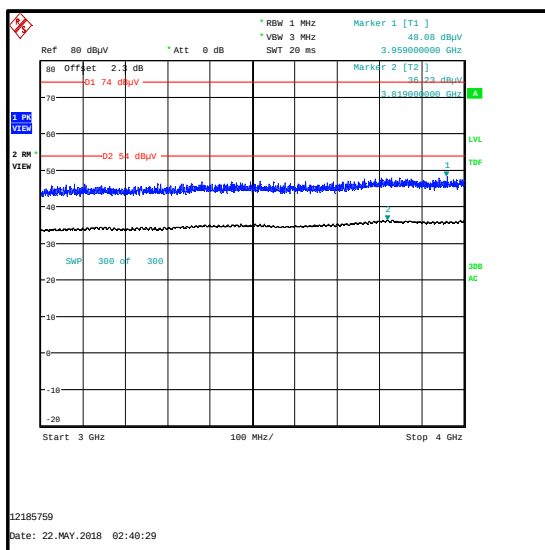
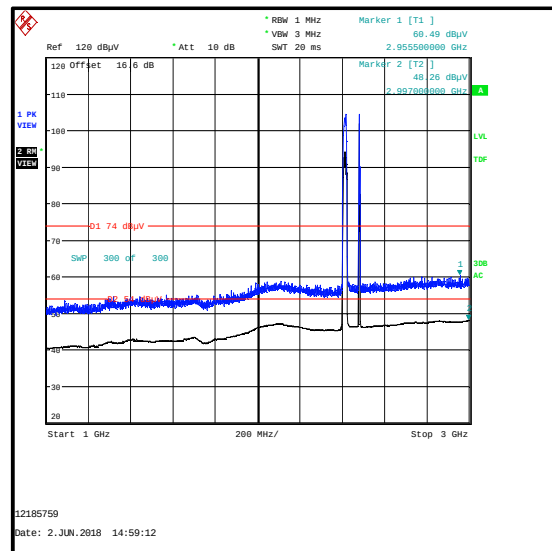
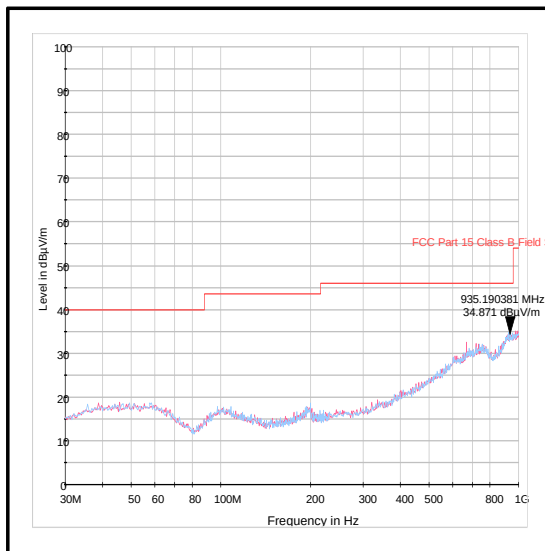
Transmitter Out of Band Radiated Emissions -Bluetooth LE top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel (continued)

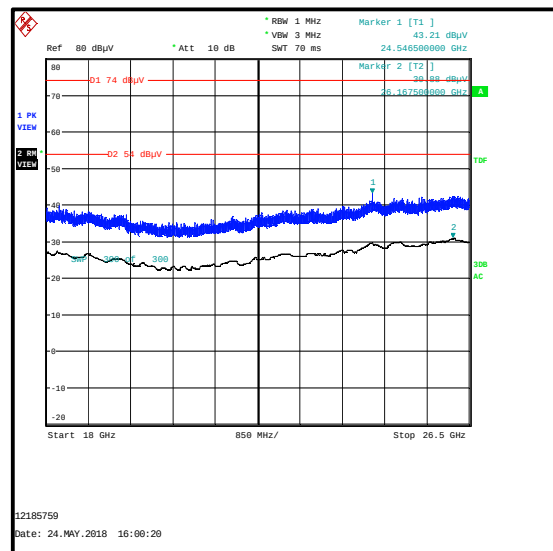
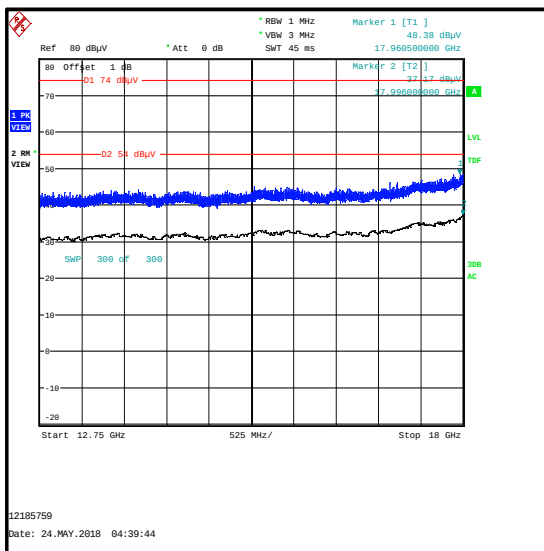
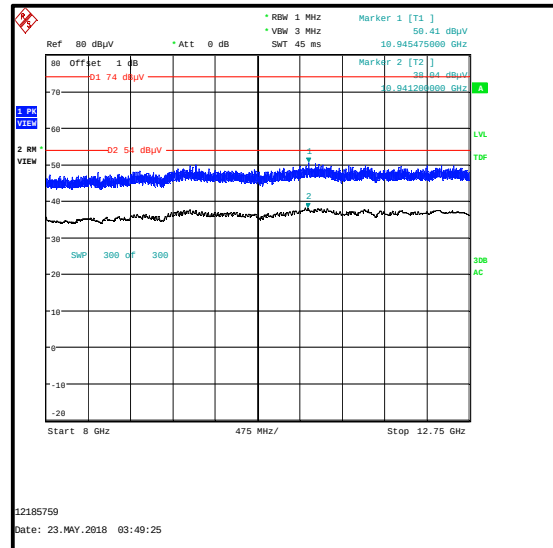
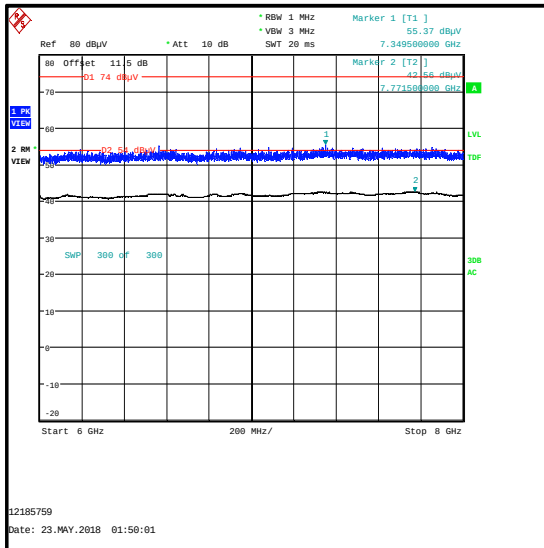
Results: Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

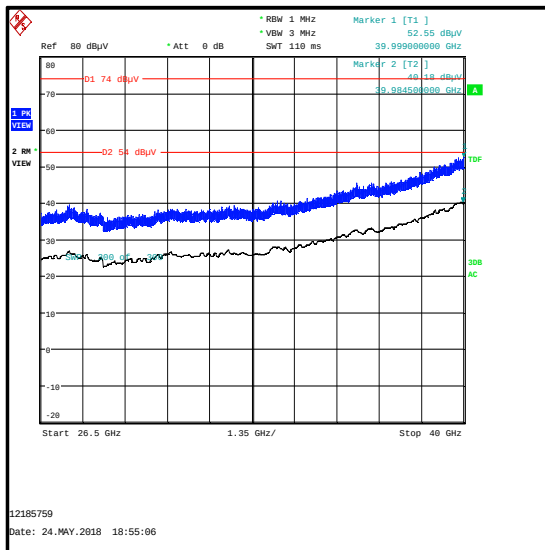
Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel (continued)

Transmitter Out of Band Radiated Emissions - Bluetooth LE top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) bottom channel (continued)



4.18. Transmitter Out of Band Radiated Emissions - Bluetooth LE top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 02 June 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5, 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4, 12.2.5.1, 12.7, KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	Bluetooth LE top channel / 2.4 GHz WLAN (2Tx MIMO) bottom channel / 5 GHz WLAN (SISO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 50

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The Bluetooth LE and 2.4 GHz WLAN fundamentals are shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
7. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

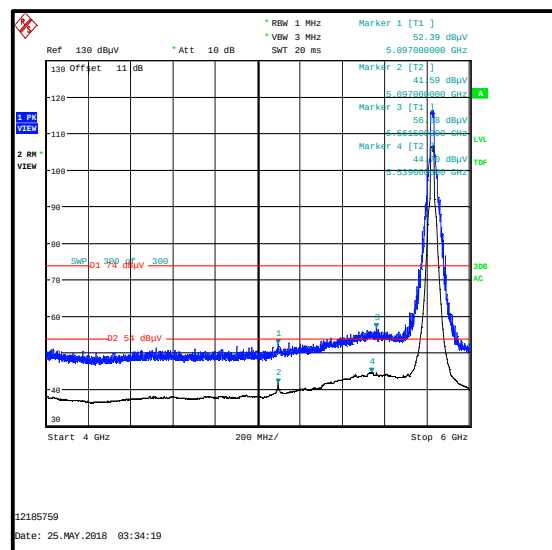
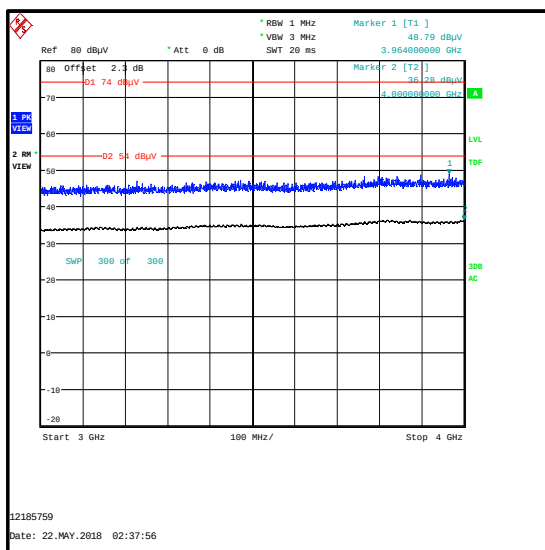
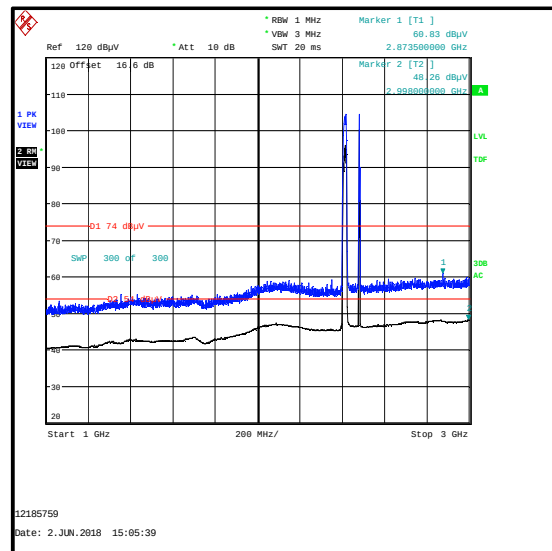
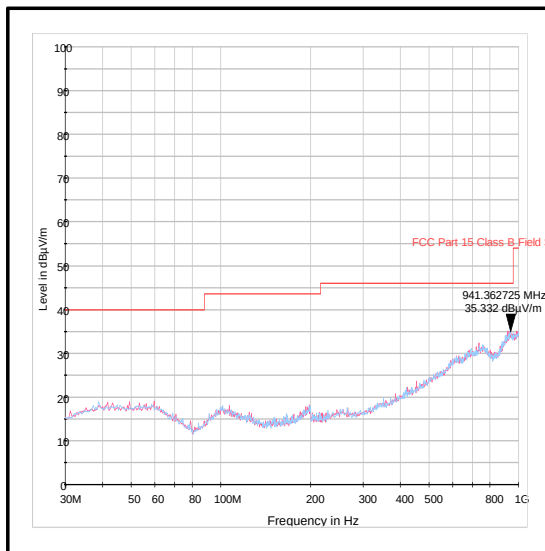
Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)

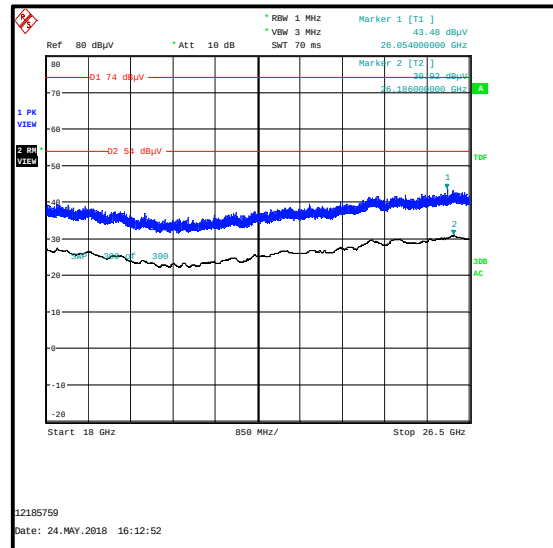
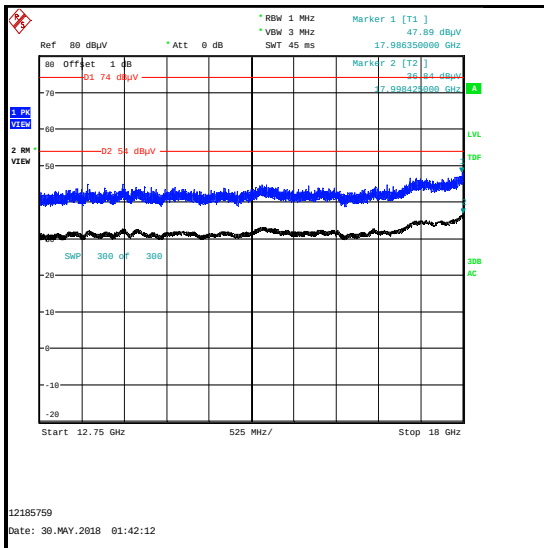
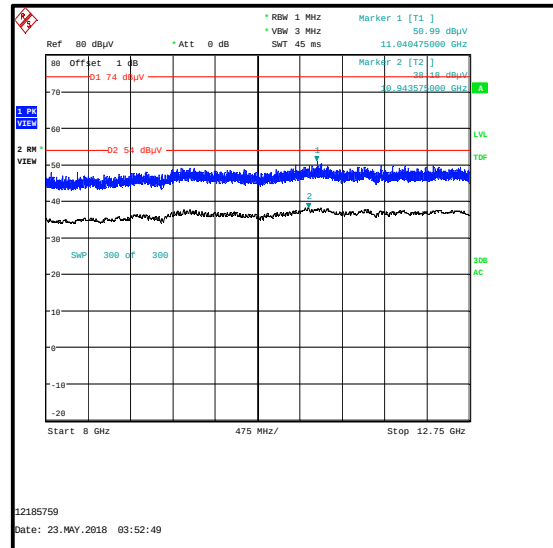
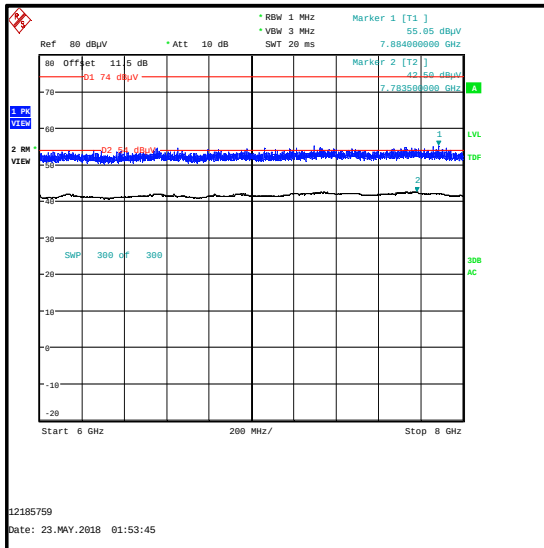
Results: Peak

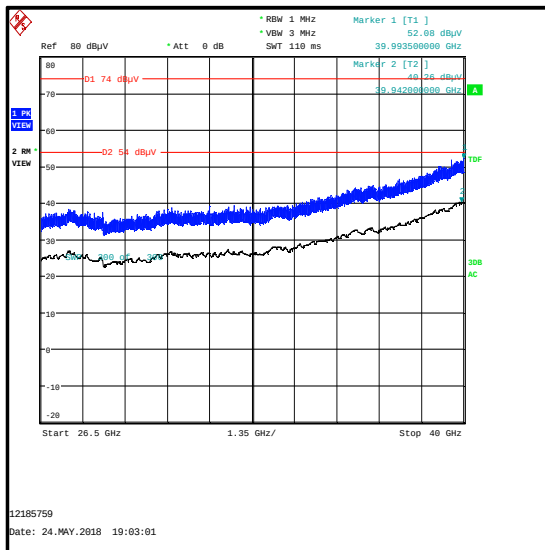
Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					

Results: Average

Frequency (MHz)	Antenna Polarity	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
See Note 1					



Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)

Transmitter Out of Band Radiated Emissions - *Bluetooth* LE top channel / 2.4 GHz WLAN (MIMO) bottom channel / 5 GHz WLAN (SISO) top channel (continued)

4.19. Transmitter Out of Band Radiated Emissions - 2.4 GHz WLAN (SISO) bottom channel / 5 GHz WLAN (MIMO) top channel

Test Summary:

Test Engineers:	Nicholas Steele, Marco Zunarelli, Mohamed Toubella, Alan Withers & Mark Perry	Test Dates:	17 May 2018 to 25 May 2018
Test Sample Serial Numbers:	C02VP00AJLDY, C02WC00DJMFL		

FCC Reference:	Parts 15.33, 15.205(a), 15.209(a), 15.247(d) & 15.407(b)
ISED Canada Reference:	RSS-Gen 6.13 & 8.9 / RSS-247 5.5 & 6.2.4.2
Test Method Used:	ANSI C63.10 Sections 6.3, 6.5, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.1, KDB 558074 Sections 11, 12.2.4 & 12.2.5.1 KDB 789033 II.G
Frequency Range:	30 MHz to 40 GHz
Configuration:	2.4 GHz WLAN (SISO) bottom channel / 5 GHz WLAN (3Tx MIMO) top channel

Environmental Conditions:

Temperature (°C):	22 to 26
Relative Humidity (%):	38 to 48

Note(s):

1. All intermodulation products were below the noise floor level or greater than 20 dB from the specification limit.
2. The 2.4 GHz WLAN fundamental is shown on the 1 GHz to 3 GHz plot.
3. The 5 GHz WLAN fundamental is shown on the 4 GHz to 6 GHz plot.
4. Pre-scans were made against the FCC Part 15 general limits for radiated emissions.
5. The emissions at approximately 5390.000 MHz, 5601.000 MHz and 6032.500 MHz are not intermodulation products and were therefore not measured.
6. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth to 500 kHz, for measurements below 1 GHz. For measurements above 1 GHz the resolution bandwidth was set to 1 MHz and video bandwidth to 3 MHz, with the sweep time set to auto. Markers were placed on the highest measured level.
7. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
8. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m 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.