



TEST REPORT

Test Report No. : UL-RPT-RP11618100JD04A V2.0

Manufacturer : Dataflex Design Communications Ltd

Model No. / HVIN : H604V4

FCC ID : 2AASBH604V4

ISED Certification No. : IC: 11329A-H604V4

Technology : WLAN, GSM 850, GSM1900, UMTS 1700, LTE Bands 13 & 17

Test Standard(s) : FCC Parts 2.1053, 15.209(a), 15.407(b), 22.917, 24.238, 27.53(c)(2), 27.53(g) & 27.53(h)(1);
ISED Canada RSS Gen 6.13, RSS-247 6.2, RSS-132 5.5, RSS-133 6.5, RSS-139 6.6 & RSS-130 4.6.1

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. This sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

Date of Issue: 13 October 2017

Checked by:

Ian Watch
Senior Test Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
Senior Test Engineer, Radio Laboratory
UL VS LTD



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

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1. Customer Information

Company Name:	Dataflex Design Communications Ltd
Address:	8 Frederick Sanger Road Surrey Research Park Guildford Surrey GU2 7YD United Kingdom

2. Summary of Testing

2.1. General Information

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:	47CFR22
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 22 Subpart H (Public Mobile Services)
Specification Reference:	47CFR24
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 24 Subpart E (Personal Communication Services)
Specification Reference:	47CFR27
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 27 Subpart C (Miscellaneous Wireless Communication Services)
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
Specification Reference:	RSS-130 Issue 1 October 2013
Specification Title:	Mobile Broadband Services (MBS) Equipment Operating in the Frequency Bands 698-756 MHz and 777-787 MHz
Specification Reference:	RSS-132 Issue 3, January 2013
Specification Title:	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869- 894 MHz
Specification Reference:	RSS-133 Issue 6, January 2013
Specification Title:	2 GHz Personal Communications Services
Specification Reference:	RSS-139 Issue 3, July 2015
Specification Title:	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710- 1755 MHz and 2110-2155 MHz
Site Registration:	FCC: 209735; ISED Canada: 3245B-3
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	27 June 2017 to 29 June 2017

2.2. Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
Transmit Mode; GSM 850 & 5 GHz WLAN			
15.209(a)/15.407(b)/2.1053/22.917	RSS-Gen 6.13/RSS-247 6.2, RSS-132 5.5	Transmitter Out of Band Radiated Emissions	
Transmit Mode; GSM 1900 & 5 GHz WLAN			
15.209(a)/15.407(b)/2.1053/24.238	RSS-Gen 6.13/RSS-247 6.2, RSS-133 6.5	Transmitter Out of Band Radiated Emissions	
Transmit Mode; UMTS 1700 & 5 GHz WLAN			
15.209(a)/15.407(b)/2.1053/27.53(h)(1)	RSS-Gen 6.13/RSS-247 6.2, RSS-139 6.6	Transmitter Out of Band Radiated Emissions	
Transmit Mode; LTE Band 13 & 5 GHz WLAN			
15.209(a)/15.407(b)/2.1053/27.53(c)(2)	RSS-Gen 6.13/RSS-247 6.2/RSS-130 4.6.1	Transmitter Out of Band Radiated Emissions	
Transmit Mode; LTE Band 17 & 5 GHz WLAN			
15.209(a)/15.407(b)/2.1053/27.53(g)	RSS-Gen 6.13 / RSS-247 6.2/RSS-130 4.6.1	Transmitter Out of Band Radiated Emissions	
Key to Results  = Complied  = Did not comply			

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	ANSI C63.26-2015
Title:	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
Reference:	ANSI C63.4-2014
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Reference:	FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04 May 2, 2017
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E
Reference:	FCC KDB 971168 D01 v02r02, October 17 2014
Title:	Measurement Guidance for Certification of Licensed Digital Transmitters
Reference:	FCC KDB 442401 June 12 2017
Title:	Radiated emission measurements for licensed radio service equipment

2.4. Deviations from the Test Specification

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

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Hera 604
Model No. / HVIN:	H604V4
Serial Number:	04423851816340100265
Hardware Version:	EPCB238002
Software Version:	1.1.0
FCC ID:	2AASBH604V4
ISED Certification Number:	11329A-H604V4

3.2. Description of EUT

The Equipment Under Test was an M2M indoor router. It supports 802.11a/n in the 5.15 GHz to 5.25 GHz, and 5.725 GHz to 5.850 GHz bands. The WLAN radio has two identical external antennas of 2.0 dBi gain with reverse SMA connectors. The device supports 5 GHz SISO or MIMO operation with either single-stream CDD or multi-stream SDM operation.

The EUT additionally has a GSM/GPRS/EDGE/CDMA/UMTS HSPA/LTE cellular radio (FCC ID: N7NMC7355) connected to a second pair of antennas.

It also features Ethernet and RS-232 serial I/O.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Type of Radio Device:	Transceiver		
Modulation Type:	GMSK		
Technology Tested:	GSM 850		
Transmit Frequency Range:	824 MHz to 849 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Middle	190	836.6
Technology Tested:	GSM 1900		
Transmit Frequency Range:	1850 MHz to 1910 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Middle	660	1879.8

Type of Radio Device:	Transceiver		
Modulation Type:	QPSK / 8PSK		
Technology Tested:	UMTS1700		
Channel Spacing:	5 MHz		
Transmit Frequency Range:	1710 MHz to 1755 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Middle	1412	1732.4

Type of Radio Device:	Transceiver		
Modulation Type:	QPSK		
Channel Bandwidth:	10 MHz		
Tested Technology:	LTE Band 13		
Transmit Frequency Range:	777 MHz to 787 MHz		
Transmit Channels Tested:	Channel ID	N _{ul}	Channel Frequency (MHz)
	Middle	23230	782.0
Tested Technology:	LTE Band 17		
Transmit Frequency Range:	704 MHz to 716 MHz		
Transmit Channels Tested:	Channel ID	N _{ul}	Channel Frequency (MHz)
	Middle	23790	710.0

Additional Information Related to Testing (continued)

Technology Tested:	WLAN (IEEE 802.11a) / U-NII / LE-LAN		
Type of Radio Device:	Transceiver		
Modulation:	BPSK		
Channel Spacing:	20 MHz		
Data Rate:	9 Mbit/s (MIMO)		
Transmit Frequency Range:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency(MHz)
	Middle	157	5785

3.5. Support Equipment

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

Description:	120 VAC to 12 VDC Power Adaptor
Brand Name:	Power Solve
Model Name or Number:	FJ-SW1201250N
Serial Number:	Not marked or stated

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Precision M65
Serial Number:	CN-03F242-48643-66F-0462

Description:	Ethernet cable. Quantity 4. Length 2 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Ethernet cable. Quantity 1. Length 10 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	RJ45 cable. Quantity 2. Length 2 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Serial to USB cable. Quantity 2. Length 1 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Wireless -G ADSL Gateway
Brand Name:	Linksys
Model Name or Number:	WAG54G
Serial Number:	CF61E100799 (UL VS LTD Asset No. A2986)

Support Equipment (continued)

Description:	USB Hub
Brand Name:	Hama
Model Name or Number:	00078498
Serial Number:	Not marked or stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Transmitting GSM and 5 GHz WLAN simultaneously at maximum power.
- Transmitting UMTS and 5 GHz WLAN simultaneously at maximum power.
- Transmitting LTE and 5 GHz WLAN simultaneously at maximum power.

4.2. Configuration and Peripherals

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

- GSM 850 and 5 GHz WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power (GSM 850 GPRS one timeslot in the uplink on middle channel 190 / 836.6 MHz and 5 GHz WLAN U-NII Band 3 802.11a 9 Mbit/s (MIMO) carrier on middle channel 157 / 5785 MHz).
- GSM 1900 and WLAN co-location, with the EUT configured to simultaneously transmit two signals at maximum output power (GSM 1900 GPRS one timeslot in the uplink on middle channel 660 / 1879.8 MHz and 5 GHz WLAN U-NII Band 3 802.11a 9 Mbit/s (MIMO) carrier on middle channel 157 / 5785 MHz).
- UMTS 1700 and WLAN co-location, with EUT configured to simultaneously transmit two signals at maximum output power (UMTS 1700 HSDPA Sub test 2 on middle channel 1412 / 1732.4 MHz and 5 GHz WLAN U-NII Band 3 802.11a 9 Mbit/s (MIMO) carrier on middle channel 157 / 5785 MHz).
- LTE Band 13 and WLAN co-location, with EUT configured to simultaneously transmit two signals at maximum output power (LTE Band 13 QPSK / 10 MHz Channel bandwidth / 1RB offset 49 on middle channel 23230 / 782 MHz and 5 GHz WLAN U-NII Band 3 802.11a 9 Mbit/s (MIMO) carrier on middle channel 157 / 5785 MHz).
- LTE Band 17 and WLAN co-location, with EUT configured to simultaneously transmit two signals at maximum output power (LTE Band 17 QPSK / 10 MHz Channel bandwidth / 1RB offset 49 on middle channel 23790 / 710 MHz and 5 GHz WLAN U-NII Band 3 802.11a 9 Mbit/s (MIMO) carrier on middle channel 157 / 5785 MHz).
- The cellular link was controlled using a Rohde & Schwarz CMW500 GSM / UMTS / LTE system simulator.
- WLAN 802.11a was controlled using a bespoke application on the laptop PC supplied by the customer. The application was used to enable continuous transmission and receive modes and to select the test channels, data rates and modulation schemes as required. The instructions were called 'HERA600v4_Notes_for_configuring_test_modes.docx' dated 28 June 2017.
- All active ports were terminated.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6 Measurement Uncertainty* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results**5.2.1. Transmitter Out of Band Radiated Emissions (GSM 850 & 5 GHz WLAN)****Test Summary:**

Test Engineer:	Andrew Edwards	Test Dates:	27 June 2017, 28 June 2017 & 29 June 2017
Test Sample Serial Number:	04423851816340100265		

FCC Reference:	Parts 15.209(a), 15.407(b), 2.1053 & 22.917
ISED Canada Reference:	RSS-Gen 6.13, RSS-247 6.2 & RSS-132 5.5
Test Method Used:	ANSI C63.26 5.5, KDB 971168 Section 6.1 referencing ANSI C63.4, FCC Part 2.1053, KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 40 GHz
Configuration:	GSM 850 GPRS / 5 GHz WLAN 802.11a 9 Mbit/s (MIMO)

Environmental Conditions:

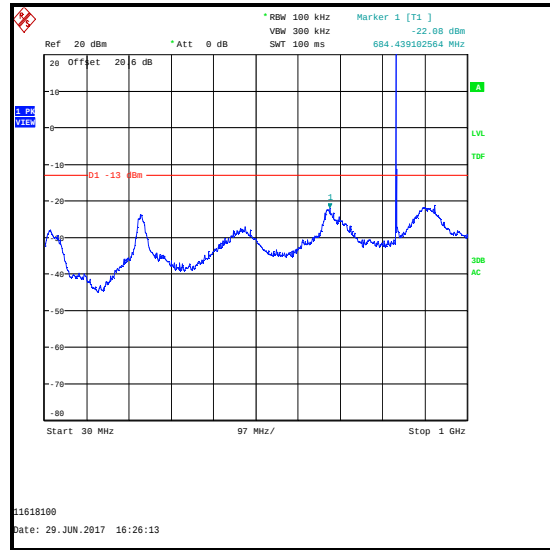
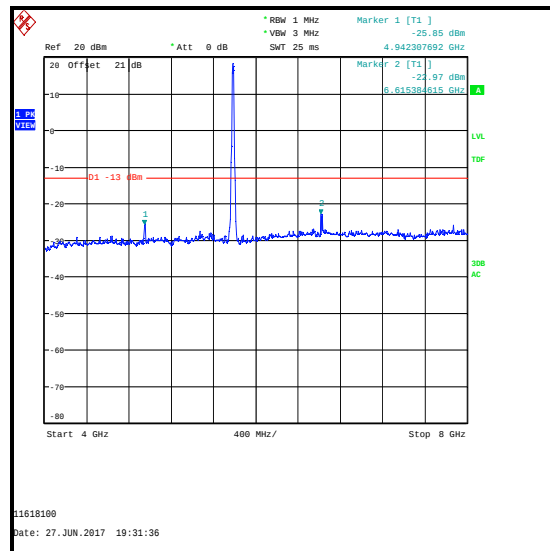
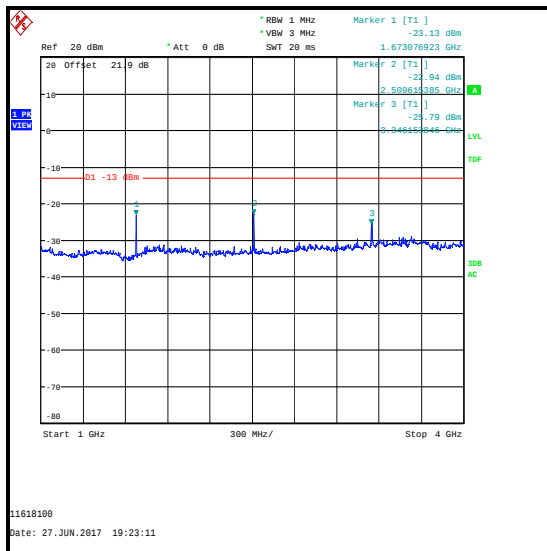
Temperature (°C):	25 to 26
Relative Humidity (%):	42 to 44

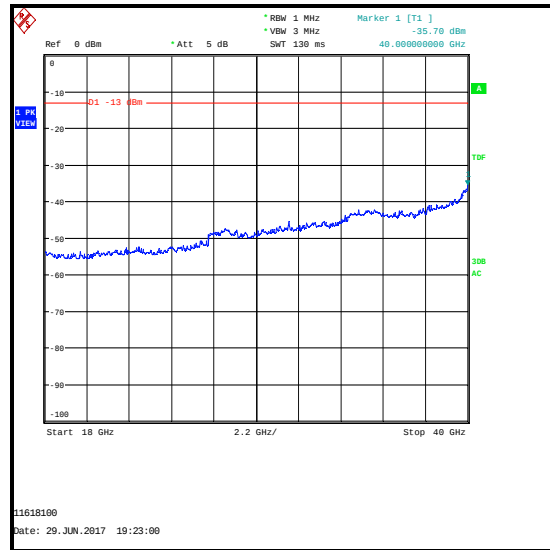
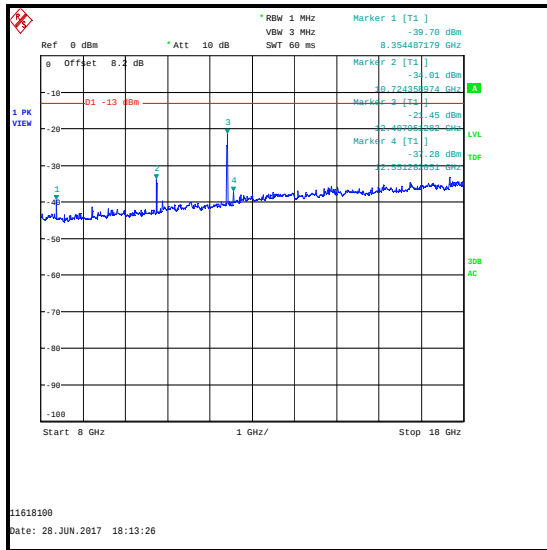
Transmitter Out of Band Radiated Emissions (GSM 850 & 5 GHz WLAN) (continued)**Note(s):**

1. As both GSM and WLAN conducted powers were measured with an average detector, all final measurements have been performed with the same detector type as stated in KDB 971168 Section 6.0. All pre-scans were performed with a peak detector and tested against a -13 dBm limit.
2. The uplink and downlink GSM 850 traffic channels are shown on the 30 MHz to 1 GHz plot.
3. The WLAN carrier is shown on the 4 GHz to 8 GHz plot.
4. The emission at approximately 1673.077 MHz is the second harmonic of the GSM 850 signal and was therefore not measured.
5. The emission at approximately 2509.615 MHz is the third harmonic of the GSM 850 signal and was therefore not measured.
6. The emission at approximately 3346.154 MHz is the fourth harmonic of the GSM 850 signal and was therefore not measured.
7. The emission at 4945.601 MHz was an intermodulation product produced by the WLAN carrier minus the GSM 850 carrier.
8. The emission at 6626.587 MHz was an intermodulation product produced by the WLAN carrier plus the GSM 850 carrier.
9. The emission at 8354.487 MHz is the tenth harmonic of the GSM 850 signal and was therefore not measured.
10. The emission at 10733.100 MHz was an intermodulation product produced by the twice WLAN carrier minus the GSM 850 carrier. As the intermodulation emission is greater than 20 dB below the applicable limit, it has not been recorded.
11. The emission at 12406.330 MHz was an intermodulation product produced by the twice WLAN carrier plus the GSM 850 carrier.
12. The emission at approximately 12551.282 MHz is the fifteenth harmonic of the GSM 850 signal and was therefore not measured.
13. Measurements were made using appropriate RF attenuators and filters where required.
14. Pre-scans below 1 GHz were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. The sweep time was set to auto. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
15. Pre-scans above 1 GHz were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
16. Measurements were performed in a semi-anechoic/anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 80 cm (measurements below 1 GHz) and 1.5 metres (measurements above 1 GHz) 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 (GSM 850 & 5 GHz WLAN) (continued)**Results: GSM 850 - Middle Channel / 5 GHz WLAN – Middle Channel**

Emission Frequency (MHz)	Emission Level (dBm)	Applicable Limit (dBm)	Margin (dB)	Result
4945.601	-22.7	-13.0	9.7	Complied
6626.587	-18.1	-13.0	5.1	Complied
12406.330	-29.1	-13.0	16.1	Complied

Transmitter Out of Band Radiated Emissions (GSM 850 & 5 GHz WLAN) (continued)**Vertical polarisation****Horizontal polarisation**

Transmitter Out of Band Radiated Emissions (GSM 850 & 5 GHz WLAN) (continued)

Transmitter Out of Band Radiated Emissions (GSM 850 & 5 GHz WLAN) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford	N/A	N/A	14 Apr 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	13 Apr 2018	12
A2863	Pre-Amplifier	Agilent	8449B	3008A02100	11 Apr 2018	12
A2891	Pre-Amplifier	Schwarzbeck	BBV 9718	9718-306	11 Apr 2018	12
A2893	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-021	11 Apr 2018	12
A2903	Antenna	Schwarzbeck	VULB 9163	9163-944	22 Aug 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	11 Apr 2018	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	11 Apr 2018	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	11 Apr 2018	12
A2482	Band Reject Cavity Filter	Wainwright Instruments GmbH	WRCJV8-5665-5725-5850-5910-50SS	2	Calibrated before use	-
A2937	Attenuator	AtlanTecRF	AN18W5-06	208147#1	06 Mar 2018	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#1	03 Mar 2018	12
A2134	Low Pass Filter	AtlanTecRF	AFL-05000	300195	01 Mar 2018	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2130	06 Mar 2018	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	18 May 2018	12
A2130	High Pass Filter	AtlanTecRF	AFH-08000	80rJFBD06-002	06 Mar 2018	12
A032	Antenna	EMCO	3115	2874	01 Mar 2019	36
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	12 Apr 2018	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24

5.2.2. Transmitter Out of Band Radiated Emissions (GSM 1900 & 5 GHz WLAN)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Dates:	27 June 2017, 28 June 2017 & 29 June 2017
Test Sample Serial Number:	04423851816340100265		

FCC Reference:	Parts 15.209(a), 15.407(b), 2.1053 & 24.238
ISED Canada Reference:	RSS-Gen 6.13, RSS-247 6.2 & RSS-133 6.5
Test Method Used:	ANSI C63.26 5.5, KDB 971168 Section 6.1 referencing ANSI C63.4, FCC Part 2.1053, KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 40 GHz
Configuration:	GSM 1900 GPRS / 5 GHz WLAN 802.11a 9 Mbit/s (MIMO)

Environmental Conditions:

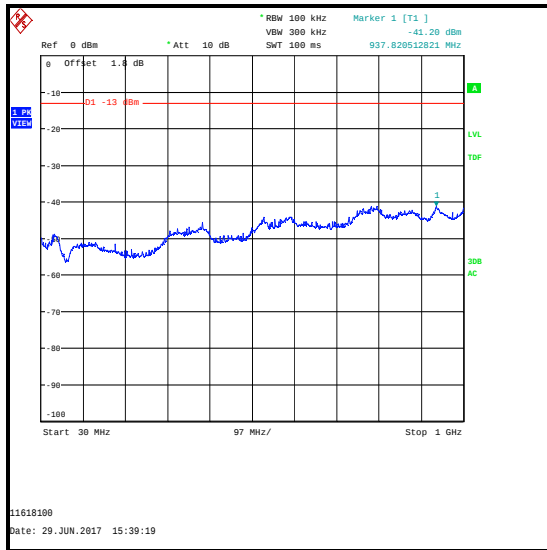
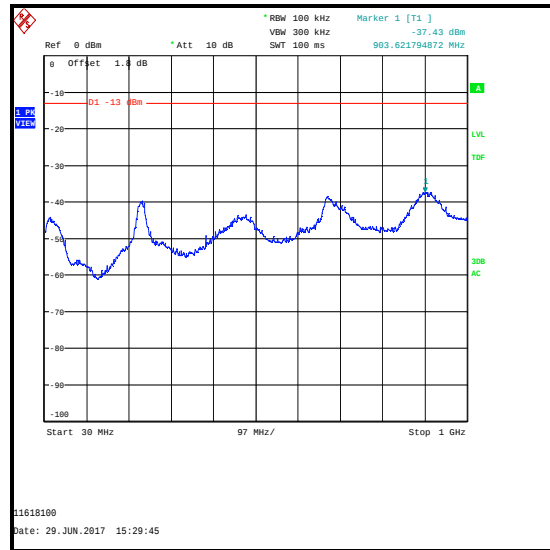
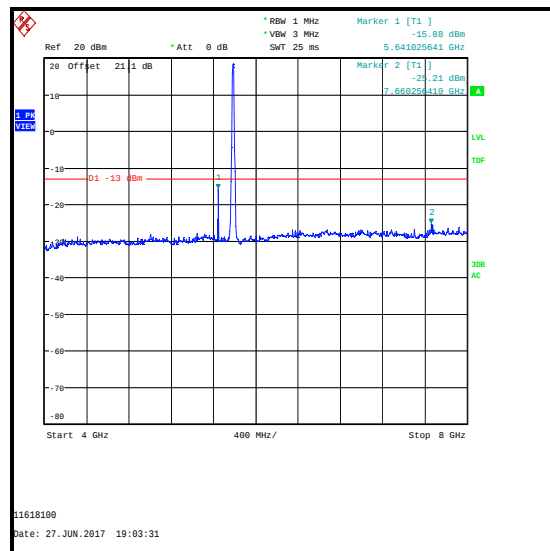
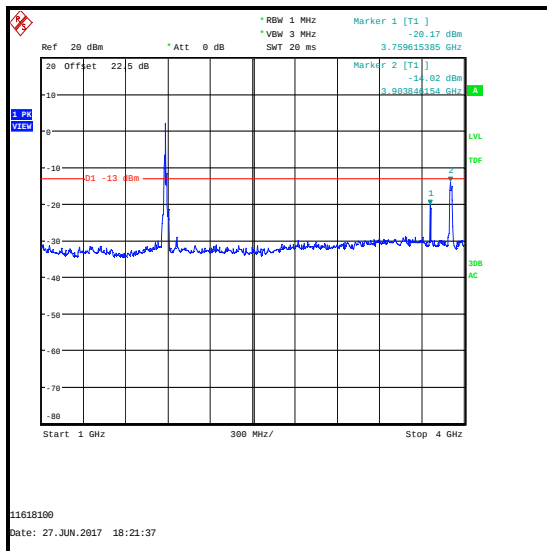
Temperature (°C):	25 to 26
Relative Humidity (%):	42 to 44

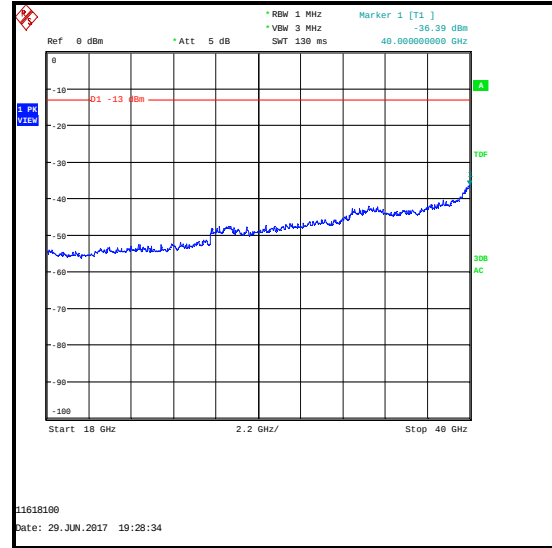
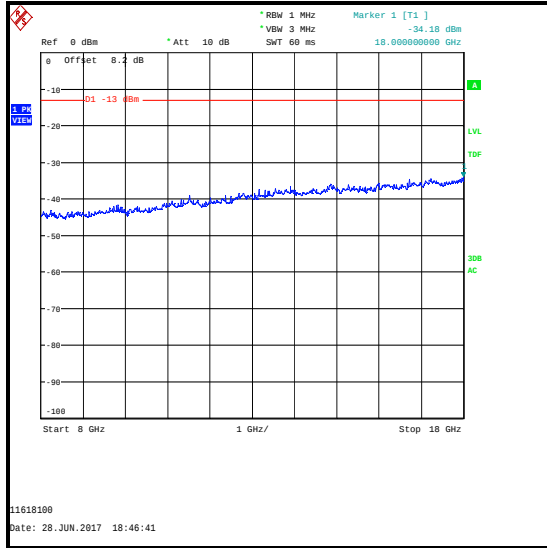
Transmitter Out of Band Radiated Emissions (GSM 1900 & 5 GHz WLAN) (continued)**Note(s):**

1. As both GSM and WLAN conducted powers were measured with an average detector, all final measurements have been performed with the same detector type as stated in KDB 971168 Section 6.0. All pre-scans were performed with a peak detector and tested against a -13 dBm limit.
2. The uplink and downlink GSM 1900 traffic channels are shown on the 1 GHz to 4 GHz plot.
3. The WLAN carrier is shown on the 4 GHz to 8 GHz plot.
4. The emission at 3904.247 MHz was an intermodulation product produced by the WLAN carrier minus the GSM 1900 carrier.
5. The emission at 7665.850 MHz was an intermodulation product produced by the WLAN carrier plus the GSM 1900 carrier.
6. The emission at approximately 3759.615 MHz is the second harmonic of the GSM 1900 signal and was therefore not measured.
7. The emission at approximately 5641.026 MHz is the third harmonic of the GSM 1900 signal and was therefore not measured.
8. Final measurements were made using appropriate RF attenuators and filters where required.
9. Pre-scans below 1 GHz were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. The sweep time was set to auto. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
10. Pre-scans above 1 GHz were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
11. Measurements were performed in a semi-anechoic/anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 80 cm (measurements below 1 GHz) and 1.5 metres (measurements above 1 GHz) 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 (GSM 1900 & 5 GHz WLAN) (continued)**Results: GSM 1900 - Middle Channel / 5 GHz WLAN – Middle Channel**

Emission Frequency (MHz)	Emission Level (dBm)	Applicable Limit (dBm)	Margin (dB)	Result
3904.247	-18.8	-13.0	5.8	Complied
7665.850	-31.0	-13.0	18.0	Complied

Transmitter Out of Band Radiated Emissions (GSM 1900 & 5 GHz WLAN) (continued)**Vertical polarisation****Horizontal polarisation**

Transmitter Out of Band Radiated Emissions (GSM 1900 & 5 GHz WLAN) (continued)

Transmitter Out of Band Radiated Emissions (GSM 1900 & 5 GHz WLAN) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford	N/A	N/A	14 Apr 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	13 Apr 2018	12
A2863	Pre-Amplifier	Agilent	8449B	3008A02100	11 Apr 2018	12
A2891	Pre-Amplifier	Schwarzbeck	BBV 9718	9718-306	11 Apr 2018	12
A2893	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-021	11 Apr 2018	12
A2903	Antenna	Schwarzbeck	VULB 9163	9163-944	22 Aug 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	11 Apr 2018	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	11 Apr 2018	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	11 Apr 2018	12
A2937	Attenuator	AtlanTecRF	AN18W5-06	208147#1	06 Mar 2018	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#1	03 Mar 2018	12
A2175	Low Pass Filter	AtlanTecRF	AFL-01000	800976	28 Feb 2018	12
A2134	Low Pass Filter	AtlanTecRF	AFL-05000	300195	01 Mar 2018	12
A2262	Notch Filter	Wainwright Instruments GmbH	WRCD1879.8-0.3/60-5EE	2	Calibrated before use	-
A2482	Notch Filter	Wainwright Instruments GmbH	WRCJV8-5665-5725-5850-5910-50SS	2	Calibrated before use	-
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	06 Mar 2018	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	18 May 2018	12
A2130	High Pass Filter	AtlanTecRF	AFH-08000	80rJFBD06-002	06 Mar 2018	12
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	12 Apr 2018	12
A032	Antenna	EMCO	3115	2874	01 Mar 2019	36
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24

5.2.3. Transmitter Out of Band Radiated Emissions (UMTS 1700 & 5 GHz WLAN)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Dates:	27 June 2017, 28 June 2017 & 29 June 2017
Test Sample Serial Number:	04423851816340100265		

FCC Reference:	Parts 15.209(a), 15.407(b), 2.1053 & 27.53(h)(1)
ISED Canada Reference:	RSS-Gen 6.13, RSS-247 6.2 & RSS-139 6.6
Test Method Used:	ANSI C63.26 5.5, KDB 971168 Section 6.1 referencing ANSI C63.4, FCC Part 2.1053, KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 40 GHz
Configuration:	UMTS 1700 HSDPA Sub test 2 / 5 GHz WLAN 802.11a 9 Mbit/s (MIMO)

Environmental Conditions:

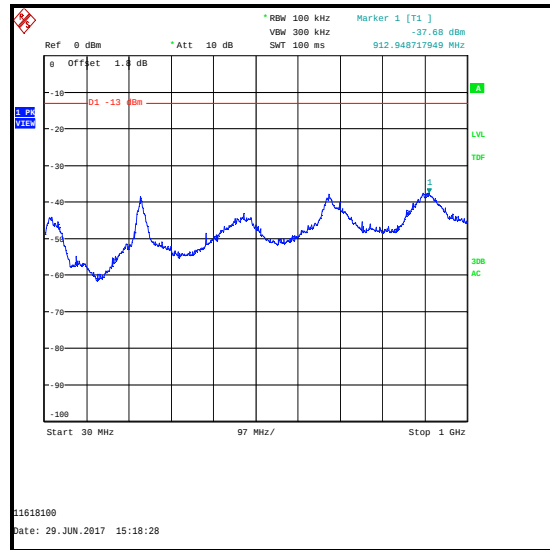
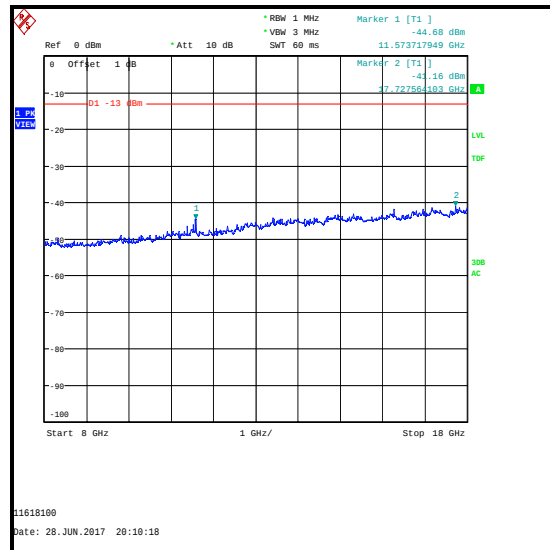
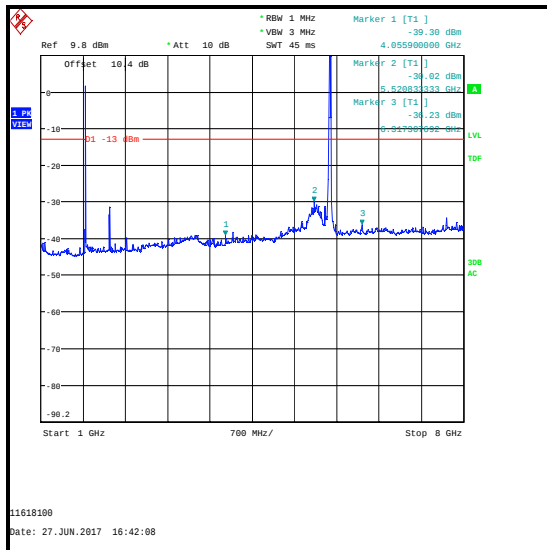
Temperature (°C):	25 to 26
Relative Humidity (%):	42 to 44

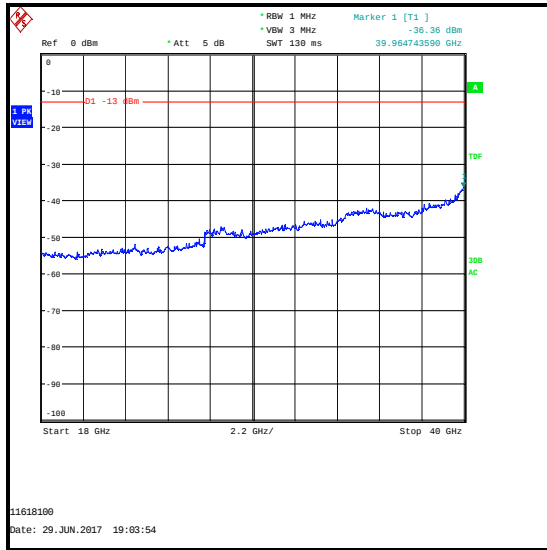
Transmitter Out of Band Radiated Emissions (UMTS 1700 & 5 GHz WLAN) (continued)**Note(s):**

1. As both UMTS and WLAN conducted powers were measured with an average detector, all final measurements have been performed with the same detector type as stated in KDB 971168 Section 6.0. All pre-scans were performed with a peak detector and tested against a -13 dBm limit.
2. All intermodulation products were below the measurement system noise floor level or greater than 20 dB below the applicable limit. Therefore the highest noise floor measurement is recorded in the table below.
3. The uplink and downlink UMTS 1700 traffic channels and are shown on the 1 GHz to 8 GHz plot.
4. The WLAN carrier is shown on the 1 GHz to 8 GHz plot.
5. The emission at approximately 4055.900 MHz was an intermodulation product produced by the WLAN carrier minus the UMTS 1700 signal. As the intermodulation emission is greater than 20 dB below the specification limit, it has not been recorded.
6. The emission at 6317.076 MHz was an intermodulation product produced by the WLAN carrier minus the third harmonic of the UMTS 1700 signal. As the intermodulation emission is greater than 20 dB below the specification limit, it has not been recorded.
7. The emission at 7719.550 MHz is an emission associated with the WLAN signal and was therefore not measured for this test report. This emission has been measured during WLAN testing and is included in UL-RPT-11618100JD02A and UL-RPT-11618100JD02B test reports.
8. Measurements were made using appropriate RF attenuators and filters where required.
9. Pre-scans below 1 GHz were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. The sweep time was set to auto. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
10. Pre-scans above 1 GHz were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
11. Measurements were performed in a semi-anechoic/anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 80 cm (measurements below 1 GHz) and 1.5 metres (measurements above 1 GHz) 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 (UMTS 1700 & 5 GHz WLAN) (continued)**Results: UMTS 1700 – Middle Channel / 5 GHz WLAN – Middle Channel**

Emission Frequency (MHz)	Emission Level (dBm)	Applicable Limit (dBm)	Margin (dB)	Result
5520.833	-30.0	-13.0	17.0	Complied

Transmitter Out of Band Radiated Emissions (UMTS 1700 & 5 GHz WLAN) (continued)**Vertical polarisation****Horizontal polarisation**

Transmitter Out of Band Radiated Emissions (UMTS 1700 & 5 GHz WLAN) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford	N/A	N/A	14 Apr 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	13 Apr 2018	12
A2863	Pre-Amplifier	Agilent	8449B	3008A02100	11 Apr 2018	12
A2891	Pre-Amplifier	Schwarzbeck	BBV 9718	9718-306	11 Apr 2018	12
A2893	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-021	11 Apr 2018	12
A2903	Antenna	Schwarzbeck	VULB 9163	9163-944	22 Aug 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	11 Apr 2018	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	11 Apr 2018	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	11 Apr 2018	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	03 Mar 2018	12
A2175	Low Pass Filter	AtlanTecRF	AFL-01000	800976	28 Feb 2018	12
A2134	Low Pass Filter	AtlanTecRF	AFL-05000	300195	01 Mar 2018	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	18 May 2018	12

5.2.4. Transmitter Out of Band Radiated Emissions (LTE Band 13 & 5 GHz WLAN)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Dates:	28 June 2017 & 29 June 2017
Test Sample Serial Number:	04423851816340100265		

FCC Reference:	Parts 15.209(a), 15.407(b), 2.1053 & 27.53(c)(2)
ISED Canada Reference:	RSS-Gen 6.13, RSS-247 6.2 & RSS-130 4.6.1
Test Method Used:	ANSI C63.26 5.5, KDB 971168 Section 6.1 referencing ANSI C63.4, FCC Part 2.1053, KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 40 GHz
Configuration:	LTE Band 13 (QPSK / 10 MHz Channel Bandwidth / 1RB 49 offset) / 5 GHz WLAN 802.11a 9 Mbit/s (MIMO)

Environmental Conditions:

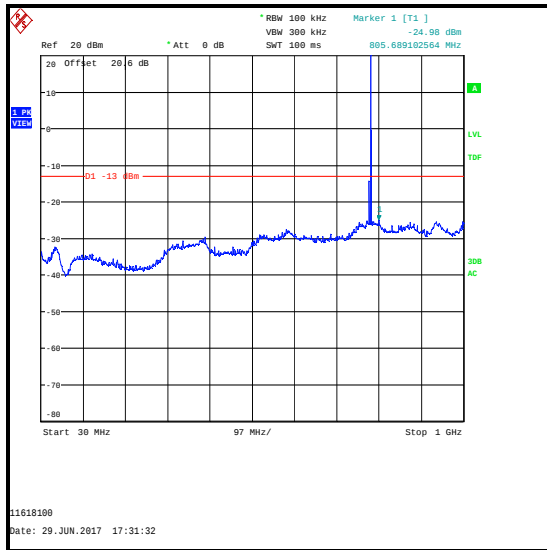
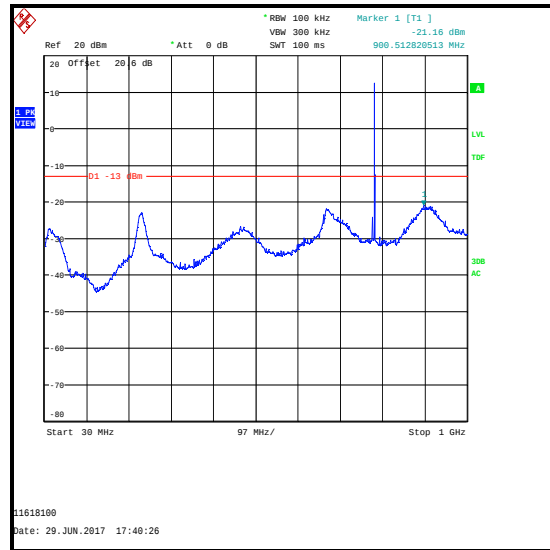
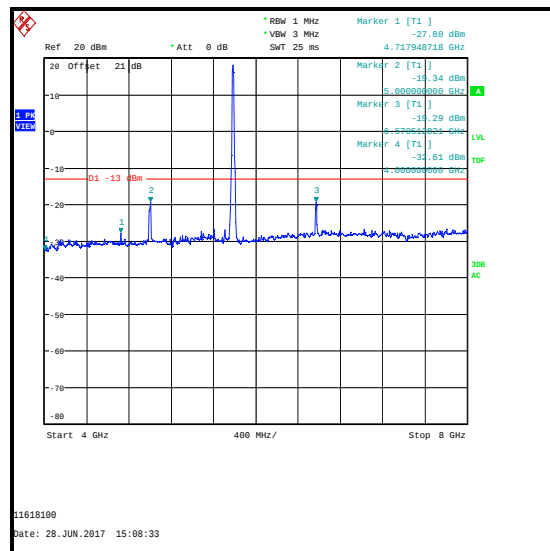
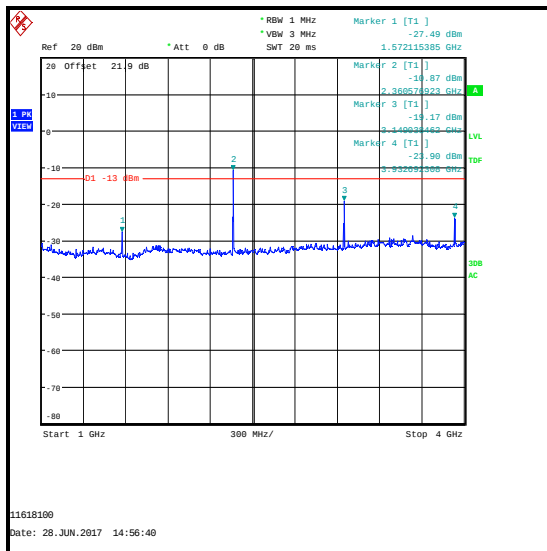
Temperature (°C):	25 to 26
Relative Humidity (%):	42 to 44

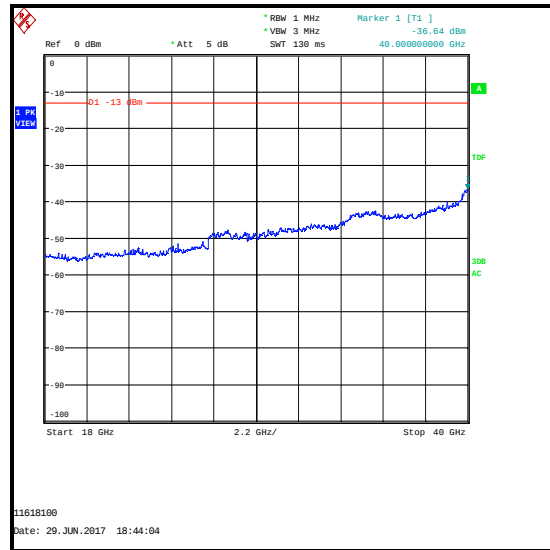
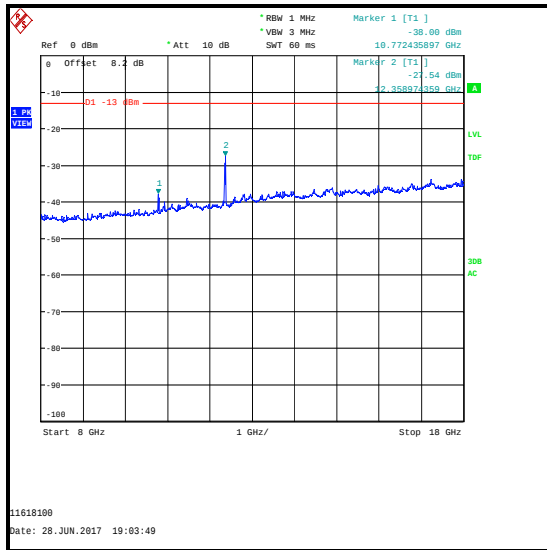
Transmitter out of Band Radiated Emissions (LTE Band 13 / 5 GHz WLAN) (continued)**Note(s):**

1. As both LTE and WLAN conducted powers were measured with an average detector, all final measurements have been performed with the same detector type as stated in KDB 971168 Section 6.0. All pre-scans were performed with a peak detector and tested against a -13 dBm limit.
2. The uplink and downlink LTE Band 13 traffic channels are shown on the 30 MHz to 1 GHz.
3. WLAN carrier is shown on the 4 GHz to 8 GHz plot.
4. The emission at approximately 1572.115 MHz is the second harmonic of the LTE Band 13 signal and was therefore not measured.
5. The emission at approximately 2360.577 MHz is the third harmonic of the LTE Band 13 signal and was therefore not measured.
6. The emission at approximately 3149.038 MHz is the fourth harmonic of the LTE Band 13 signal and was therefore not measured.
7. The emission at approximately 3932.692 MHz is the fifth harmonic of the LTE Band 13 signal and was therefore not measured.
8. The emission at approximately 4717.948 MHz is the sixth harmonic of the harmonic of the LTE Band 13 signal and was therefore not measured.
9. The emission at 4995.577 MHz was an intermodulation product produced by the WLAN carrier minus the LTE band 13 carrier.
10. The emission at 6576.471 MHz was an intermodulation product produced by the WLAN carrier plus the LTE band 13 carrier.
11. The emission at approximately 10792.917 MHz was an intermodulation product produced by the twice WLAN carrier minus the LTE band 13 carrier. This was measured against the limits of Part 27; a -13.0 dBm limit was applied. As the intermodulation emission is greater than 20 dB below the applicable limit, it has not been recorded.
12. The emission at approximately 12355.609 MHz was an intermodulation product produced by the twice WLAN carrier plus the LTE band 13 carrier. This was measured against the limits of Part 27; a -13.0 dBm limit was applied. As the intermodulation emission is greater than 20 dB below the applicable limit, it has not been recorded.
13. Any other intermodulation products were below the noise floor level or greater than 20 dB of the specification limit.
14. Measurements were made using appropriate RF attenuators and filters where required.
15. Pre-scans below 1 GHz were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. The sweep time was set to auto. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
16. Pre-scans above 1 GHz were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
17. Measurements were performed in a semi-anechoic/anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 80 cm (measurements below 1 GHz) and 1.5 metres (measurements above 1 GHz) 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 (LTE Band 13 / 5 GHz WLAN) (continued)**Results: LTE Band 13 - Middle Channel / 5 GHz WLAN - Middle Channel**

Emission Frequency (MHz)	Emission Level (dBm)	Applicable Limit (dBm)	Margin (dB)	Result
4995.577	-30.6	-13.0	17.6	Complied
6576.471	-27.8	-13.0	14.8	Complied

Transmitter out of Band Radiated Emissions (LTE Band 13 / 5 GHz WLAN) (continued)**Horizontal polarisation****Horizontal polarisation**

Transmitter out of Band Radiated Emissions (LTE Band 13 / 5 GHz WLAN) (continued)

Transmitter out of Band Radiated Emissions (LTE Band 13 / 5 GHz WLAN) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford	N/A	N/A	14 Apr 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	13 Apr 2018	12
A2863	Pre-Amplifier	Agilent	8449B	3008A02100	11 Apr 2018	12
A2891	Pre-Amplifier	Schwarzbeck	BBV 9718	9718-306	11 Apr 2018	12
A2893	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-021	11 Apr 2018	12
A2903	Antenna	Schwarzbeck	VULB 9163	9163-944	22 Aug 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	11 Apr 2018	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	11 Apr 2018	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	11 Apr 2018	12
A2937	Attenuator	AtlanTecRF	AN18W5-06	208147#1	06 Mar 2018	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#1	03 Mar 2018	12
A2134	Low Pass Filter	AtlanTecRF	AFL-05000	300195	01 Mar 2018	12
A2908	High Pass Filter	Wainwright Instruments GmbH	WHJE5-920-1000-4000-60EE	3	06 Mar 2018	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	06 Mar 2018	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	18 May 2018	12
A2130	High Pass Filter	AtlanTecRF	AFH-08000	80rJFBD06-002	06 Mar 2018	12
A032	Antenna	EMCO	3115	2874	01 Mar 2019	36
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	12 Apr 2018	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24

5.2.5. Transmitter Out of Band Radiated Emissions (LTE Band 17 & 5 GHz WLAN)**Test Summary:**

Test Engineer:	Andrew Edwards	Test Dates:	28 June 2017 & 29 June 2017
Test Sample Serial Number:	04423851816340100265		

FCC Reference:	Parts 15.209(a), 15.407(b), 2.1053 & 27.53(g)
ISED Canada Reference:	RSS-Gen 6.13, RSS-247 6.2 & RSS-130 4.6.1
Test Method Used:	ANSI C63.26 5.5, KDB 971168 Section 6.1 referencing ANSI C63.4, FCC Part 2.1053, KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 40 GHz
Configuration:	LTE Band 17 (QPSK / 10 MHz Channel Bandwidth / 1RB 49 offset) / WLAN 802.11a 9 Mbit/s (MIMO)

Environmental Conditions:

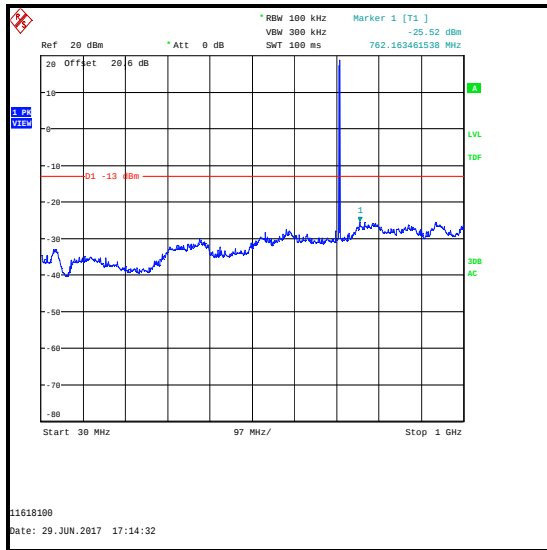
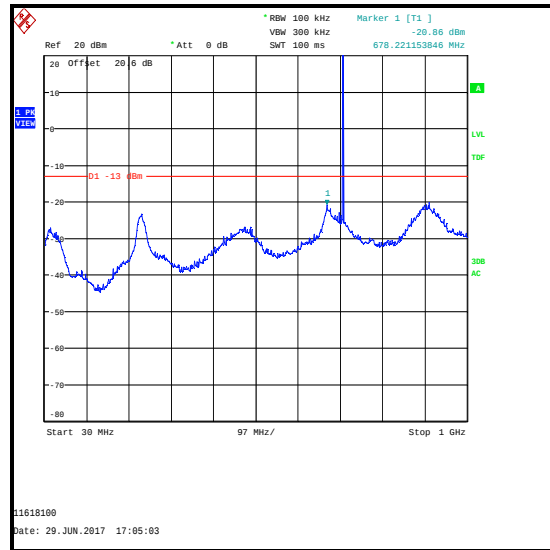
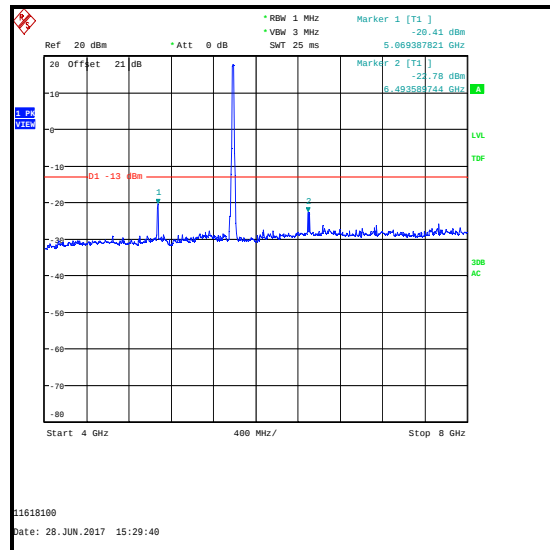
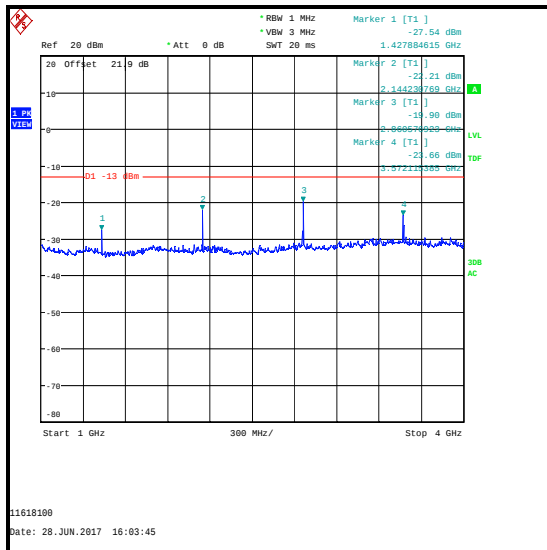
Temperature (°C):	25 to 26
Relative Humidity (%):	42 to 44

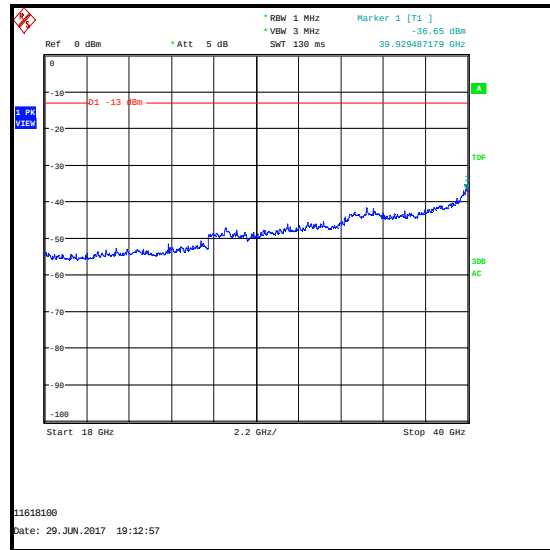
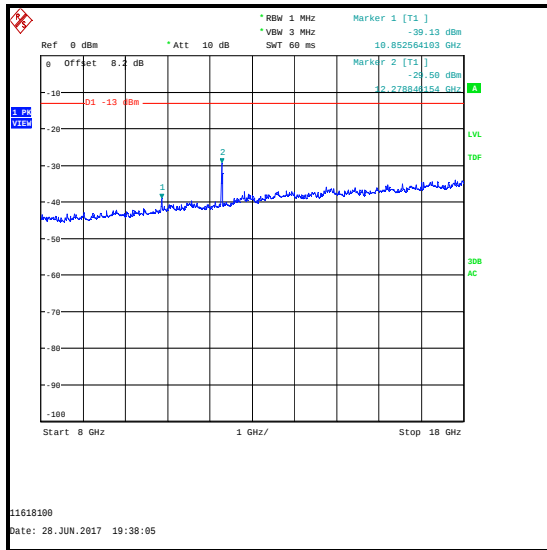
Transmitter out of Band Radiated Emissions (LTE Band 17 / 5 GHz WLAN) (continued)**Note(s):**

1. As both LTE and WLAN conducted powers were measured with an average detector, all final measurements have been performed with the same detector type as stated in KDB 971168 Section 6.0. All pre-scans were performed with a peak detector and tested against a -13 dBm limit.
2. The uplink and downlink LTE Band 17 traffic channels are shown on the 30 MHz to 1 GHz.
3. WLAN carrier is shown on the 4 GHz to 8 GHz plot.
4. The emission at approximately 1427.884 MHz is the second harmonic of the LTE Band 17 signal and was therefore not measured.
5. The emission at approximately 2144.231 MHz is the third harmonic of the LTE Band 17 signal and was therefore not measured.
6. The emission at approximately 2860.577 MHz is the fourth harmonic of the LTE Band 17 signal and was therefore not measured.
7. The emission at approximately 3572.115 MHz is the fifth harmonic of the LTE Band 17 signal and was therefore not measured.
8. The emission at 5067.337 MHz was an intermodulation product produced by the WLAN carrier minus the LTE band 17 carrier.
9. The emission at 6494.188 MHz was an intermodulation product produced by the WLAN carrier plus the LTE band 17 carrier.
10. The emission at 10853.910 MHz was an intermodulation product produced by the twice WLAN carrier minus the LTE band 17 carrier. As the intermodulation emission is greater than 20 dB below the applicable limit, it has not been recorded.
11. The emission at 12283.215 MHz was an intermodulation product produced by the twice WLAN carrier plus the LTE band 17 carrier. As the intermodulation emission is greater than 20 dB below the specification limit, it has not been recorded.
12. Any other intermodulation products were below the noise floor level or greater than 20 dB of the specification limit.
13. Measurements were made using appropriate RF attenuators and filters where required.
14. Pre-scans below 1 GHz were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. The sweep time was set to auto. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
15. Pre-scans above 1 GHz were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
16. Measurements were performed in a semi-anechoic/anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 80 cm (measurements below 1 GHz) and 1.5 metres (measurements above 1 GHz) 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 (LTE Band 17 / 5 GHz WLAN) (continued)**Results: LTE Band 17 - Middle Channel / 5 GHz WLAN - Middle Channel**

Emission Frequency (MHz)	Emission Level (dBm)	Applicable Limit (dBm)	Margin (dB)	Result
5067.337	-28.5	-13.0	15.5	Complied
6494.188	-30.7	-13.0	17.7	Complied

Transmitter out of Band Radiated Emissions (LTE Band 17 / 5 GHz WLAN) (continued)**Vertical polarisation****Horizontal polarisation**

Transmitter out of Band Radiated Emissions (LTE Band 17 / 5 GHz WLAN) (continued)

Transmitter out of Band Radiated Emissions (LTE Band 17 / 5 GHz WLAN) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford	N/A	N/A	14 Apr 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	13 Apr 2018	12
A2863	Pre-Amplifier	Agilent	8449B	3008A02100	11 Apr 2018	12
A2891	Pre-Amplifier	Schwarzbeck	BBV 9718	9718-306	11 Apr 2018	12
A2893	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-021	11 Apr 2018	12
A2903	Antenna	Schwarzbeck	VULB 9163	9163-944	22 Aug 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	11 Apr 2018	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	11 Apr 2018	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	11 Apr 2018	12
A2937	Attenuator	AtlanTecRF	AN18W5-06	208147#1	06 Mar 2018	12
A2918	Attenuator	AtlanTecRF	AN18W5-20	832828#1	03 Mar 2018	12
A2134	Low Pass Filter	AtlanTecRF	AFL-05000	300195	01 Mar 2018	12
A2908	High Pass Filter	Wainwright Instruments GmbH	WHJE5-920-1000-4000-60EE	3	06 Mar 2018	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	06 Mar 2018	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	18 May 2018	12
A2130	High Pass Filter	AtlanTecRF	AFH-08000	80rJFBD06-002	06 Mar 2018	12
A032	Antenna	EMCO	3115	2874	01 Mar 2019	36
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	12 Apr 2018	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24

6. Measurement Uncertainty

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

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

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

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

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Radiated Spurious Emissions	30 MHz to 40 GHz	95%	±2.94 dB

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

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	1 7	-	Changed Model No. 'Hera604' to 'H604V4' Section 3.1: Changed Model No. 'Hera604' to 'H604V4' Changed Brand Name 'Hera' to 'Hera 604' Section 3.2: 2 nd paragraph removed Inserted FCC ID for cellular radio part

--- END OF REPORT ---