

EMC Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Parts 15.107, 15.109
&
Industry Canada (IC), ICES-003



REPORT NO.: RTS-6058-1408-09

PRODUCT MODEL NO.: RHA111LW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARHA110LW

DATE: August 06, 2014

RTS is accredited
according to
EN ISO/IEC 17025 by:



592

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW	
Test Report No. RTS-6058-1408-09	Date of Test July 09 to August 05, 2014	FCC ID: L6ARHA110LW

Statement of Performance:

The BlackBerry® smartphone, model RHA111LW, part number CER-59878-001 Rev2-001-02 and accessories when configured and operated per BlackBerry's operation instructions, performs within the requirements of the test standards.

Declaration:

We hereby certify that:

The test data reported herein is an accurate record of the performance of the sample(s) tested.

The test results are valid for the tested unit (s) only.

The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating parameters.

The test methods were consistent with the methods described in the relevant standards.

Documented by:

Reviewed by:

Savtej S. Sandhu
Compliance Specialist I

Kevin Guo
Compliance Specialist I

Reviewed and Approved by:

Masud S. Attayi, P.Eng.
Manager, Regulatory Compliance

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A. Scope

This report details the results of compliance tests that were performed in accordance with the requirements of:

- FCC CFR 47 Part 15, Subpart B, October, 2013 Class B Digital Devices, Unintentional Radiators
- IC ICES-003 Issue 5, August 2013, Information Technology Equipment (ITE) – Limits and methods of measurement

B. Associated Documents

- 1) RHA111LW-R139-HWD_CER-59878-001 – Rev2-001-01
- 2) RHA111LW-R139-HWD_CER-59878-001 – Rev2-001-02
- 3) MultiSourceDeclaration_R139-R140_10.3.0.890_Reg_only

C. Product Identification

Manufactured by BlackBerry Limited whose headquarters is located at:

2200 University Ave. East
Waterloo, Ontario
Canada, N2K 0A7
Phone: 519 888 7465
Fax: 519 888 6906

The equipment under test (EUT) was tested at the following locations:

BlackBerry RTS EMC test facilities:

305 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906

440 Phillip Street
Waterloo, Ontario
Canada, N2L 5R9
Phone: 519 888 7465
Fax: 519 888 6906

The testing was performed from July 09 to August 05, 2014.

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The sample EUT included:

SAMPLE	MODEL	HARDWARE	PIN	Software
1	RHA111LW	CER-59878-001 Rev1-001-00	2FFEB281	OS Version 10.3.0.686 Bundle: 686
2	RHA111LW	CER-59878-001 Rev2-001-02	2FFEC30C	OS Version 10.3.0.890 Bundle: 890

AC conducted testing was performed on sample 2.

Radiated Emissions testing was performed on samples 1 and 2.

Only the characteristics that may have been affected by the changes from RHA111LW Rev1-001-00 to RHA111LW Rev2-001-02 were re-tested.

For more details, refer to RHA111LW-R139-HWD_CER-59878-001 – Rev2-001-01 and RHA111LW-R139-HWD_CER-59878-001 – Rev2-001-02.

To view the differences between software bundles 10.3.0.686 to 10.3.0.890 for RHA111LW, see document MultiSourceDeclaration_R139-R140_10.3.0.890_Reg_only.

BlackBerry® smartphone Accessories Tested

- 1) Fixed Blade Charger Rev1, part number HDW-47725-001 with an output voltage of 5.0 volts dc, 850mA
- 2) Wired Headset, part number HDW-49299-005, with a lead length of 1.1 metres
- 3) USB Data Cable, part number HDW-50071-001 Rev2, 0.9 metres long
- 4) HDMI Cable, part number HDW-29572-001, 6 feet long

D. Support Equipment Used for the Testing of the EUT

- 1) Lenovo Thinkpad laptop, type 4236-D84, S/N PB-HX502 12/02, product ID 4236D84
- 2) Phillips Monitor, Model Number MWE12244T, Product ID 2444E1SB/27

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E. Summary of Results

SPECIFICATION		TEST TYPE	Meets Requirement	Test Data APPENDIX
FCC CFR 47	IC			
Part 15.107	ICES-003,6.1	AC Powerline Conducted Emission	Yes	1
Part 15.109	ICES-003,6.1	Radiated Unintentional Spurious Emissions	Yes	2

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a) AC POWERLINE CONDUCTED EMISSIONS

The AC Powerline conducted emissions were measured using the test procedure outlined in CISPR Recommendation 22 through a 50 Ohm Line Impedance Stabilization Network (LISN), which was inserted in the power line to the equipment to provide the specified impedance for measurements. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned 40 cm from a vertical ground plane. The RF output of the network was connected to an EMI receiver system with characteristics that duplicate those of the receiver specified in CISPR Publication 16.

BlackBerry® smartphone was in battery charging mode. The input voltage was 120 V, 60 Hz.

Test Configuration	Operating Mode(s)	Charger + Accessories
1	PCS 1900 Idle, Charging, and Video Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable
2	LTE FDD 2, Idle, Charging and Audio Playback	Laptop + Wired Headset + 0.9m USB Cable
3	UMTS FDD II HSDPA+, Idle, Charging and Audio Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable + HDMI Cable + Monitor
4	UMTS FDD V DC HSDPA, Idle, Charging and Video Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15.107, Class B Limit, and IC ICES-003, 6.1. The sample EUT had a worst case test margin of 9.23 dB below the QP limit at 0.416 MHz using the QP detector and 4.47 dB below the AV limit at 0.416 MHz using the AV detector in Test Configuration 3.

Measurement Uncertainty ± 3.2 dB

To view the test data/plots, see APPENDIX 1.

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b) RADIATED UNINTENTIONAL SPURIOUS EMISSIONS

The radiated unintentional spurious emissions from the EUT were measured using the methods outlined in CISPR Recommendation 22. The EUT was placed on a nonconductive Styrofoam table, 80 cm high that was positioned on a remote controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The radiated emissions were measured up to the fifth harmonic of the highest frequency of the band tested. Both the horizontal and vertical polarizations of the emissions were measured.

The measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a modified semi-anechoic chamber (modified SAC) with floor absorbers above 1 GHz. The SAC's FCC registration number is **778487** and the Industry Canada (IC) file number is **2503B-1**. The modified SAC's FCC registration number is **959115** and the IC file number is **2503C-1**.

The EUT was configured and operated to produce the maximum radiated emissions while still keeping within BlackBerry's specifications.

The BlackBerry® smartphone was in battery charging mode for all configurations. The ac input voltage was 120V, 60Hz.

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Test Configuration	Operating Mode(s)	Charger + Accessories
1	PCS 1900, Idle, Charging and Video Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable
2	LTE FDD 2, Idle, Charging and Audio Playback	Laptop + Wired Headset + 0.9m USB Cable
3	NFC, Tx, Charging and Video Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable
4	UMTS FDD II HSDPA+, Idle, Charging and Audio Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable + HDMI Cable + Monitor
5	UMTS FDD V DC HSDPA, Idle, Charging and Video Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable
6	Bluetooth, Tx, Charging and Video Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable
7	802.11b, Tx, Charging and Audio Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable
8	802.11a, Tx, Charging and Video Playback	Fixed Blade Charger + Wired Headset + 0.9m USB Cable

The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15.109, Class B limit and IC ICES-003, 6.2.

The system met the requirements with a worst case emission test margin of 4.07 dB below the QP limit at 742.55 MHz using QP detector in Test Configuration 4.

To view the test data see APPENDIX 2.

Sample Calculation:

Field Strength (dBμV/m) is calculated as follows:

FS = Measured Level (dBμV) + A.F. (dB/m) + Cable Loss (dB) - Preamp (dB) + Filter Loss (dB)

Measurement Uncertainty ±4.3 dB

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F. Compliance Test Equipment Used

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>	<u>CAL DUE DATE</u> (YY MM DD)	<u>USE</u>
Preamplifier	Sonoma	310N/11909A	185831	14-10-16	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	14-10-16	Radiated Emissions
EMI Receiver	Rohde & Schwarz	ESIB 40	100255	14-12-11	Radiated Emissions
Environment Monitor	OMEGA	iTHX-SD	0380561	16-11-15	Radiated Emission
Environment Monitor	OMEGA	iTHX-SD	0380567	16-11-15	Radiated Emission
L.I.S.N.	Rohde & Schwarz	ENV216	100060	15-10-08	AC Powerline Conducted Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	081701	14-08-13	Radiated Emissions
Horn Antenna	EMC Automation	HRN-0118	030101	14-08-07	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	14-10-13	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	14-11-24	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	112394	14-11-25	Radiated/AC Powerline Conducted Emission
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	101469	14-12-09	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	109949	14-12-07	Radiated /RF Conducted Emission
EMI Test Receiver	Rohde & Schwarz	ESU 40	100162	14-12-08	Radiated/AC Powerline Conducted Emission
Bluetooth Tester	Rohde & Schwarz	CBT	100368	14-12-04	Radiated Emissions
Bluetooth Tester	Rohde & Schwarz	CBT	100737	14-12-05	Radiated/AC Powerline Conducted Emission

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G. Test Software Used

<u>SOFTWARE</u>	<u>COMPANY</u>	<u>VERSION</u>	<u>USE</u>
EMC32	Rohde & Schwarz	8.52.0	Radiated Emissions
TDK Standard Emission Test	TDK RF Solutions	8.53.1.62	Radiated Emissions

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APPENDIX 1 - AC POWERLINE CONDUCTED EMISSIONS TEST DATA

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AC Powerline Conducted Emissions Test Results

The following tests were performed by Kevin Guo.

Test Configuration 1

Date of the test: August 05, 2014

The environmental conditions were: Temperature: 23.9 °C
Humidity: 38.2 %

Frequency (MHz)	Line	Reading (QP) (dBμV)	Correction Factor (dB)	Corrected Reading (QP) (dBμV)	Limit (QP) (dBμV)	Limit (AV) (dBμV)	Margin (QP) Limits (dB)
0.182	L1	33.75	10.99	44.74	64.40	54.40	-19.66
0.186	N	34.90	10.98	45.88	64.20	54.20	-18.32
0.371	L1	35.67	10.06	45.73	58.50	48.50	-12.77
0.375	N	37.24	10.06	47.30	58.40	48.40	-11.10
0.398	N	34.80	10.03	44.82	57.90	47.90	-13.08
0.749	N	28.83	9.83	38.65	56.00	46.00	-17.35
0.848	L1	30.49	9.81	40.30	56.00	46.00	-15.70
1.473	L1	32.70	9.80	42.50	56.00	46.00	-13.50
2.436	L1	28.56	9.85	38.41	56.00	46.00	-17.59
2.643	N	24.82	9.86	34.68	56.00	46.00	-21.32

All other emissions are at least 25 dB below the limit.

Measurements were done with the quasi-peak detector.

See figure 1-1 and figure 1-2 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

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AC Powerline Conducted Emissions Test Graphs

Test Configuration 1

Figure 1-1: L1 lines

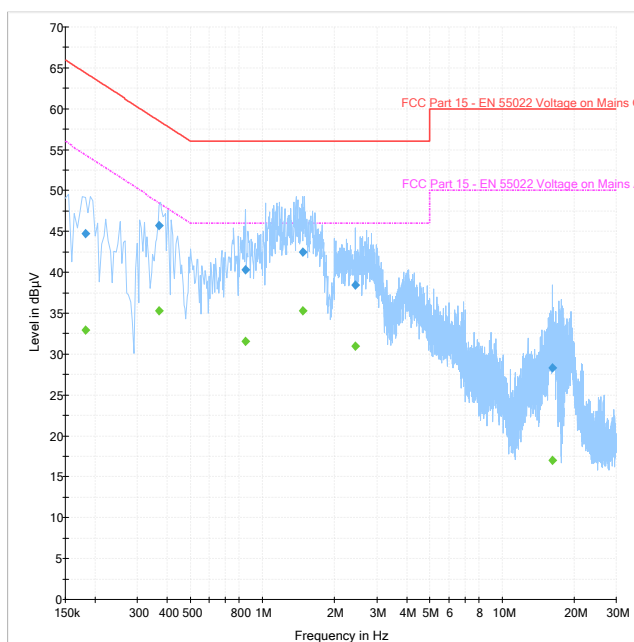
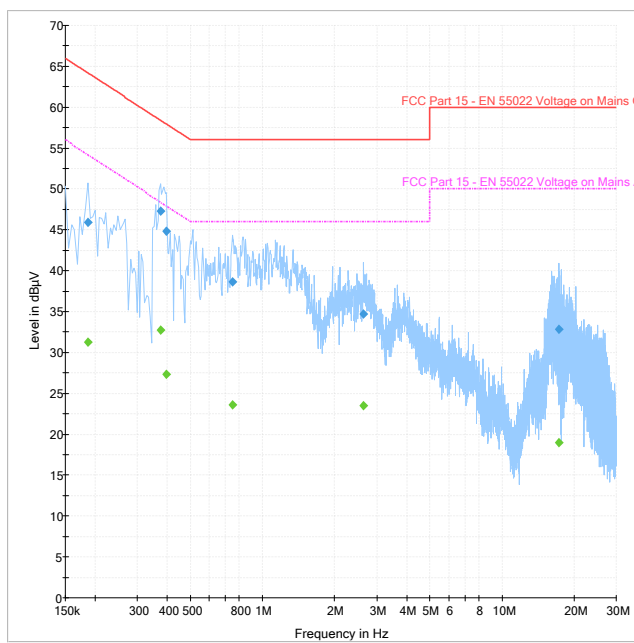


Figure 1-2: N Lines



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AC Powerline Conducted Emissions Test Graphs

Test Configuration 2

Figure 1-3: L1 lines

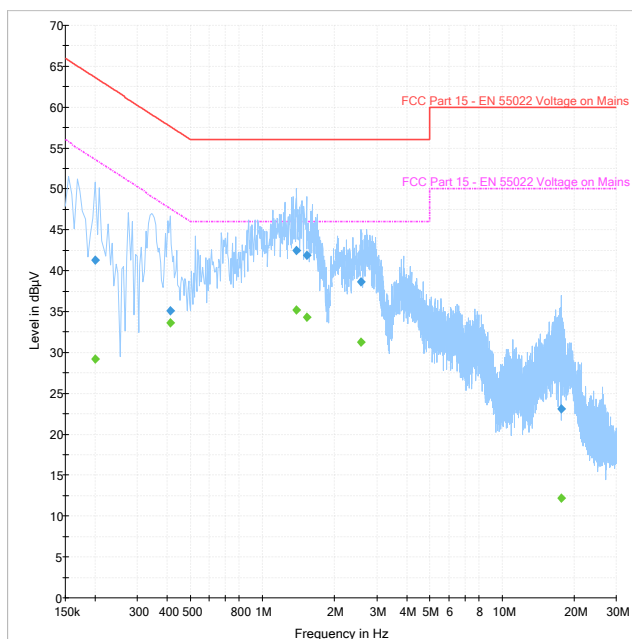
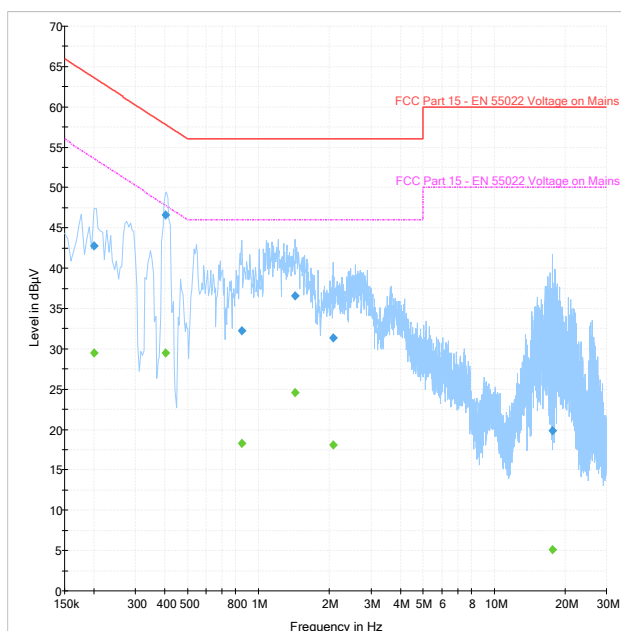


Figure 1-4: N Lines



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AC Powerline Conducted Emissions Test Results cont'd

Test Configuration 3

Date of the test: August 05, 2014

The environmental conditions were: Temperature: 23.9 °C
Humidity: 38.2 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dBµV)	Limit (QP) (dBµV)	Margin (QP) Limits (dB)
0.173	N	30.37	11.08	41.45	64.80	-23.35
0.371	L1	35.11	10.06	45.17	58.50	-13.33
0.380	N	33.84	10.05	43.89	58.30	-14.41
0.416	L1	38.28	9.99	48.27	57.50	-9.23
0.416	N	36.86	10.00	46.86	57.50	-10.64
0.564	N	25.23	9.88	35.11	56.00	-20.89
1.064	L1	32.25	9.80	42.06	56.00	-13.94
1.383	L1	32.08	9.80	41.88	56.00	-14.12
3.818	L1	26.67	9.90	36.57	56.00	-19.44

Frequency (MHz)	Line	Reading (AV) (dBµV)	Correction Factor (dB)	Corrected Reading (AV) (dBµV)	Limit (AV) (dBµV)	Margin (AV) Limits (dB)
0.371	L1	29.28	10.06	39.34	48.50	-9.17
0.380	N	22.89	10.05	32.94	48.30	-15.36
0.416	L1	33.04	9.99	43.03	47.50	-4.47
0.416	N	21.33	10.00	31.33	47.50	-16.17
1.064	L1	13.34	9.80	23.15	46.00	-22.85
1.383	L1	21.80	9.80	31.60	46.00	-14.40
3.818	L1	11.48	9.90	21.37	46.00	-24.63

All other emissions are at least 25 dB below the limit.

Measurements were done with the quasi-peak and average detectors.

See figure 1-5 and figure 1-6 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

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AC Powerline Conducted Emissions Test Graphs

Test Configuration 3

Figure 1-5: L1 lines

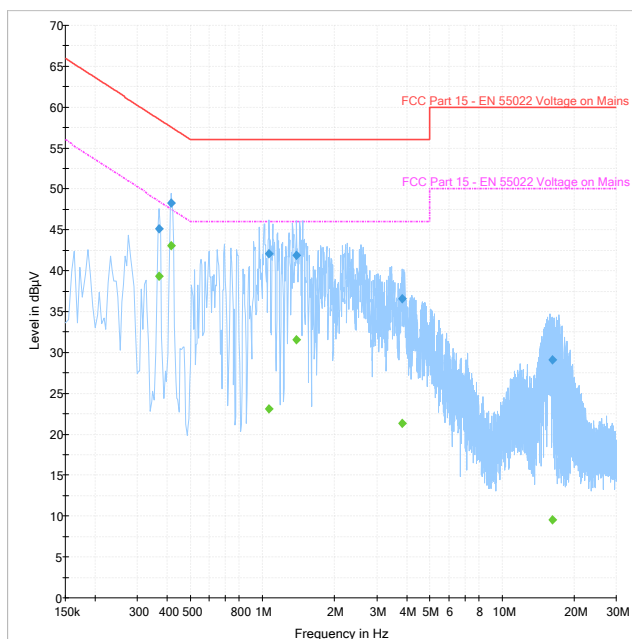
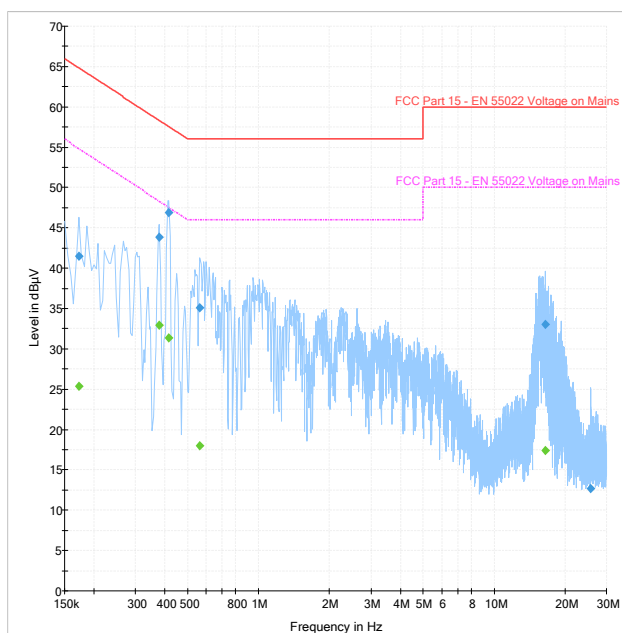


Figure 1-6: N Lines



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AC Powerline Conducted Emissions Test Results cont'd

Test Configuration 4

Date of the test: August 05, 2014

The environmental conditions were: Temperature: 23.9 °C
Humidity: 38.2 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dBµV)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.393	N	30.50	10.03	40.53	58.00	48.00	-17.47
0.402	L1	33.91	10.01	43.92	57.80	47.80	-13.88
0.411	N	27.85	10.01	37.86	57.60	47.60	-19.74
0.609	N	24.37	9.86	34.23	56.00	46.00	-21.77
1.446	L1	25.61	9.80	35.42	56.00	46.00	-20.58

All other emissions are at least 25 dB below the limit.

Measurements were done with the quasi-peak detector.

See figure 1-7 and figure 1-8 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

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AC Powerline Conducted Emissions Test Graphs

Test Configuration 4

Figure 1-7: L1 lines

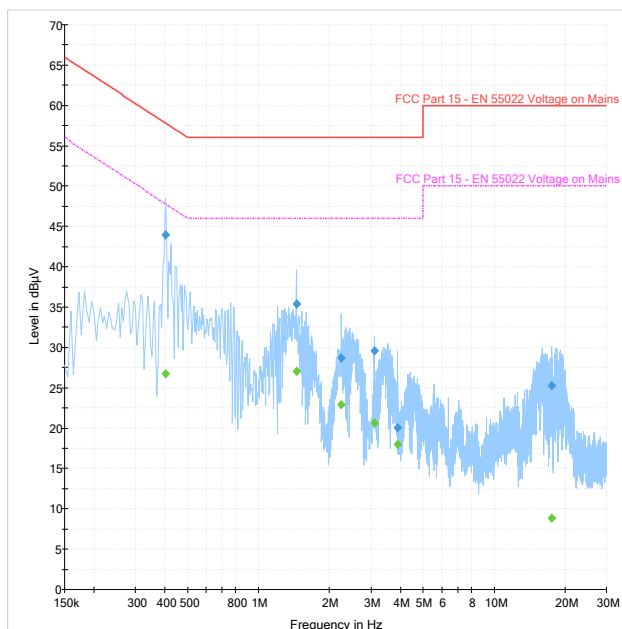
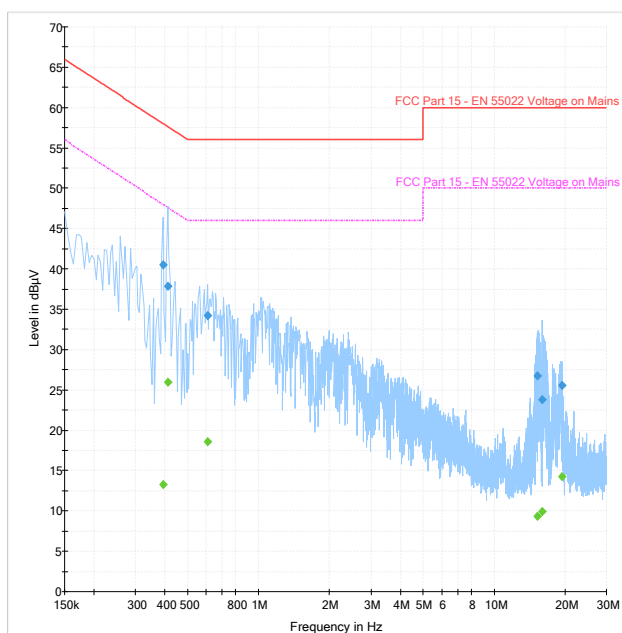


Figure 1-8: N Lines



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APPENDIX 2 - RADIATED UNINTENTIONAL SPURIOUS EMISSIONS TEST DATA

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Radiated Unintentional Spurious Emissions Test Results

The following tests were performed by Savtej Sandhu and Kevin Guo.

Test Configuration 1

Date of the test: July 09 and 29, 2014

The environmental conditions were: Temperature: 23.9 – 24.2 °C

Humidity: 38.2 – 44.5 %

Frequency (MHz)	Antenna		Test Angle (Deg.)	Detector (Q.P. or Peak)	Measured Level (dBµV)	Correction Factor for preamp/antenna / cables/ filter (dB/m)	Field Strength Level (reading +corr) (dBµV/m)	Limit @ 3.0 m (dBµV/m)	Test Margin (dB)
	Pol. (V/H)	Height (metres)							
41.350	V	1.44	149.00	Q.P.	45.79	-14.29	31.50	40.00	-8.50
55.900	V	1.47	17.00	Q.P.	40.59	-16.48	24.11	40.00	-15.89
76.850	V	1.56	181.00	Q.P.	32.14	-14.05	18.09	40.00	-21.91
85.250	V	1.51	79.00	Q.P.	33.37	-13.25	20.12	40.00	-19.88

All other emissions are at least 25 dB below the limit.

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Radiated Unintentional Spurious Emissions Test Results cont'd

Test Configuration 4

Date of the test: July 15 and 29, 2014

The environmental conditions were: Temperature: 23.9 – 24.2 °C
 Humidity: 38.2 – 44.5 %

Frequency (MHz)	Antenna		Test Angle (Deg.)	Detect or (Q.P. or Peak)	Measured Level (dBμV)	Correction Factor for preamp/antenna / cables/ filter (dB/m)	Field Strength Level (reading+corr) (dBμV/m)	Limit @ 3.0 m (dBμV/m)	Test Margin (dB)
	Pol. (V/H)	Height (metres)							
34.150	V	1.41	188.00	Q.P.	41.38	-12.39	28.99	40.00	-11.01
73.950	V	1.59	126.00	Q.P.	41.32	-14.41	26.91	40.00	-13.09
142.150	V	1.41	354.00	Q.P.	41.01	-11.50	29.51	43.50	-13.99
251.450	H	1.23	160.00	Q.P.	50.00	-8.41	41.59	46.00	-4.41
375.500	H	1.71	335.00	Q.P.	43.76	-3.74	40.02	46.00	-5.98
742.550	H	1.07	143.00	Q.P.	36.44	5.49	41.93	46.00	-4.07

All other emissions are at least 25 dB below the limit.

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Radiated Unintentional Spurious Emissions Test Results cont'd

Test Configuration 5

Date of the test: July 15 and 29, 2014

The environmental conditions were: Temperature: 23.9 – 24.2 °C
 Humidity: 38.2 – 44.5 %

Frequency (MHz)	Antenna		Test Angle (Deg.)	Detector (Q.P. or Peak)	Measured Level (dBμV)	Correction Factor for preamp/antenna / cables/ filter (dB/m)	Field Strength Level (reading+c orr) (dBμV/m)	Limit @ 3.0 m (dBμV/m)	Test Margin (dB)
	Pol. (V/H)	Height (metres)							
41.650	V	1.50	327.00	Q.P.	36.23	-14.35	21.88	40.00	-18.12
57.600	V	1.66	211.00	Q.P.	37.21	-16.32	20.89	40.00	-19.11
72.750	V	1.47	87.00	Q.P.	35.17	-14.65	20.52	40.00	-19.48

All other emissions are at least 25 dB below the limit.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW Appendix 2	
Test Report No. RTS-6058-1408-09	Date of Test July 09 to August 05, 2014	FCC ID: L6ARHA110LW

Radiated Unintentional Spurious Emissions Test Results cont'd

Test Configuration 6

Date of the test: July 09 and 29, 2014

The environmental conditions were: Temperature: 23.9 – 24.2 °C
 Humidity: 38.2 – 44.5 %

Frequency (MHz)	Antenna		Test Angle (Deg.)	Detector (Q.P. or Peak)	Measured Level (dBµV)	Correction Factor for preamp/antenna / cables/ filter (dB/m)	Field Strength Level (reading+c orr) (dBµV/m)	Limit @ 3.0 m (dBµV/m)	Test Margin (dB)
	Pol. (V/H)	Height (metres)							
40.950	V	1.47	184.00	Q.P.	42.91	-14.20	28.71	40.00	-11.29
57.350	V	1.79	319.00	Q.P.	37.73	-16.30	21.43	40.00	-18.57

All other emissions are at least 25 dB below the limit.

		EMC Test Report for the BlackBerry® smartphone Model RHA111LW Appendix 2	
Test Report No. RTS-6058-1408-09	Date of Test July 09 to August 05, 2014	FCC ID: L6ARHA110LW	

Radiated Unintentional Spurious Emissions Test Results cont'd

Test Configuration 7

Date of the test: July 09 and 29, 2014

The environmental conditions were: Temperature: 23.9 – 24.2 °C
 Humidity: 38.2 – 44.5 %

Frequency (MHz)	Antenna		Test Angle (Deg.)	Detector (Q.P. or Peak)	Measured Level (dBμV)	Correction Factor for preamp/antenna / cables/ filter (dB/m)	Field Strength Level (reading+c orr) (dBμV/m)	Limit @ 3.0 m (dBμV/m)	Test Margin (dB)
	Pol. (V/H)	Height (metres)							
40.550	V	1.42	314.00	Q.P.	46.55	-14.04	32.51	40.00	-7.49
56.300	V	1.47	12.00	Q.P.	39.53	-16.44	23.09	40.00	-16.91
76.200	V	1.52	67.00	Q.P.	36.68	-14.14	22.54	40.00	-17.46

All other emissions are at least 25 dB below the limit.

		EMC Test Report for the BlackBerry® smartphone Model RHA111LW Appendix 2	
Test Report No. RTS-6058-1408-09	Date of Test July 09 to August 05, 2014	FCC ID: L6ARHA110LW	

Radiated Unintentional Spurious Emissions Test Results cont'd

Test Configuration 8

Date of the test: July 09 and 29, 2014

The environmental conditions were: Temperature: 23.9 – 24.2 °C
 Humidity: 38.2 – 44.5 %

Frequency (MHz)	Antenna		Test Angle (Deg.)	Detector (Q.P. or Peak)	Measured Level (dBµV)	Correction Factor for preamp/antenna / cables/ filter (dB/m)	Field Strength Level (reading+corr) (dBµV/m)	Limit @ 3.0 m (dBµV/m)	Test Margin (dB)
	Pol. (V/H)	Height (metres)							
41.350	V	2.13	154.00	Q.P.	41.87	-14.29	27.58	40.00	-12.42
55.950	V	1.64	40.00	Q.P.	38.90	-16.50	22.40	40.00	-17.60
76.100	V	1.44	40.00	Q.P.	34.78	-14.15	20.63	40.00	-19.37

All other emissions are at least 25 dB below the limit.