

EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47 Parts 2, 22 and 24
&
Industry Canada (IC) RSS-132 and 133




A division of Research In Motion Limited

REPORT NO: RTS-1765-0908-31

PRODUCT MODEL NO:	RCP51UW
TYPE NAME:	BlackBerry® smartphone
FCC ID:	L6ARCP50UW
IC:	2503A-RCP50UW
EMISSION DESIGNATOR (GSM):	247KG7W
EMISSION DESIGNATOR (EDGE):	247KGXW

DATE: 26 August 2009

		EMI Test Report for the BlackBerry® smartphone Model RCP51UW
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino

Statement of Performance:

The BlackBerry® smartphone, model RCP51UW, part number CER-27169-001 Rev 2 and accessories performs within the requirements of the test standards when configured and operated per RIM's instructions.

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:



Michael Cino
Regulatory Compliance Intern
Date: 26 August, 2009

Reviewed by:



Masud S. Attayi, P.Eng.
Manager, Regulatory Compliance
Date: 31 August, 2009

Approved by:



Paul G. Cardinal, Ph.D.
Director
Date: 01 September, 2009


	EMI Test Report for the BlackBerry® smartphone Model RCP51UW	
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino

Table of Contents

A) Scope4

B) Associated Documents.....4

C) Product Identification.....4

D) Support Equipment Used for the Testing of the EUT5


E) Test Voltage5

F) Modifications to EUT5

G) Summary of Results6

H) Compliance Test Equipment Used.....9

APPENDIX 1 – GSM RADIATED EMISSIONS TEST DATA10

		EMI Test Report for the BlackBerry® smartphone Model RCP51UW
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino

A) Scope

This report details the results of compliance tests which were performed in accordance to the requirements of:

- FCC CFR 47 Part 2, Oct. 1, 2008
- FCC CFR 47 Part 22, Subpart H, Cellular Radiotelephone Services, Oct. 1, 2008
- FCC CFR 47 Part 24 Subpart E, Broadband PCS, Oct 1. 2008
- Industry Canada, RSS-132 Issue 2, September 2005, Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz.
- Industry Canada, RSS-133 Issue 5, February 2009, 2 GHz Personal Communications Services.

B) Associated Documents

1. RTS-1765-0907-21
2. Declaration_of_Test_Applicability

C) Product Identification

Manufactured by Research In Motion Limited whose headquarters is located at:


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

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

RIM Testing Services EMI test facilities

305 Phillip Street	440 Phillip Street
Waterloo, Ontario	Waterloo, Ontario,
Canada, N2L 3W8	Canada , N2L 5R9
Phone: 519 888 7465	Phone: 519 888 7465
Fax: 519 888 6906	Fax: 519 888 6906

The testing was performed from August 14 to 24, 2009.

		EMI Test Report for the BlackBerry® smartphone Model RCP51UW
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino

The sample EUT included:

SAMPLE	MODEL	CER NUMBER	PIN
1	RCP51UW	CER-27169-Rev 2	30D08AC1
2	RCP51UW	CER-27169-Rev 2	30D08B05

Radiated Emissions testing was performed on samples 1 and 2.

D) Support Equipment Used for the Testing of the EUT


No support equipment required; for list of equipment refer to section H, Compliance Test Equipment Used.

E) Test Voltage

The ac input voltage was 120 volts, 60 Hz where applicable. This configuration was per RIM's specifications.

F) Modifications to EUT

No modifications were required on the EUT.


		EMI Test Report for the BlackBerry® smartphone Model RCP51UW	
Test Report No. RTS-1765-0908-31		Dates of Test August 14 to 24, 2009	Author Data Michael Cino

G) Summary of Results

SPECIFICATION		TEST TYPE	RESULT	TEST DATA APPENDIX
FCC CFR 47	IC			
Part 2.1051 Part 22.917 Part 22.901	RSS-GEN, 4.9	GSM 850 Conducted Spurious Emissions	See Test Report RTS-1765-0907-21	-
Part 2.1051 Part 24.238(a)	RSS-GEN, 4.9	GSM PCS Conducted Spurious Emissions	See Test Report RTS-1765-0907-21	-
Part 2.202 Part 22.917	RSS-GEN, 4.6	GSM 850 Occupied Bandwidth and Channel Mask	See Test Report RTS-1765-0907-21	-
Part 2.202 Part 24.238	RSS-GEN, 4.6	GSM PCS Occupied Bandwidth and Channel Mask	See Test Report RTS-1765-0907-21	-
Part 2.1046(a)	RSS-133, 6.4 RSS-132, 4.4	GSM Conducted RF Output Power	See Test Report RTS-1765-0907-21	-
Part 2.1055(a)(d) Part 22.917	RSS-132, 4.3	GSM 850 Frequency Stability vs. Temperature and Voltage	See Test Report RTS-1765-0907-21	-
Part 2.1055(a)(d) Part 24.235	RSS-132, 4.3	GSM PCS Frequency Stability vs. Temperature and Voltage	See Test Report RTS-1765-0907-21	-
Part 22, Subpart H, Part 24, Subpart E	RSS-GEN, 4.9	GSM ERP, EIRP	Pass	1
Part 22, Subpart H Part 24, Subpart E	RSS-GEN, 4.9	GSM Radiated Spurious/Harmonic Emissions	Pass	1

Model RCP51UW is identical to RCK71CW except that the CDMA section is depopulated. Only the characteristics that may have been impacted by the changes from RCK71CW to RCP51UW were re-measured. For more details, refer to the Declaration_of_Test_Applicability.

- 1) The radiated spurious emissions/harmonics and ERP/EIRP were measured for GSM 850 and PCS 1900 bands. The results are within the limits. The BlackBerry® smartphone was placed on a nonconductive styrofoam table, 100 cm high that was positioned on a remotely controlled turntable. The test distance used between the BlackBerry® smartphone and the receiving antenna was three metres. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The turntable was rotated to determine the azimuth of the peak emissions. Both the horizontal and vertical polarizations of the emissions were measured. The maximum emissions level was recorded. The BlackBerry® smartphone was then substituted with an antenna placed in the same location as the BlackBerry® smartphone. A Dipole antenna was used for the ERP measurements and a Horn antenna was used for EIRP measurements. The substitution antenna was connected into a signal generator that was set to the test frequency.

	EMI Test Report for the BlackBerry® smartphone Model RCP51UW	
	Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009

The emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The signal generator output was then adjusted to match the BlackBerry® smartphone output reading. The signal generator output was recorded. Both the horizontal and vertical polarizations of the emissions were measured.

The following measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a fully-anechoic room (FAR) above 1 GHz. The SAC's FCC registration number is **778487** and the Industry Canada (IC) file number is **2503B-1**. The FAR's FCC registration number is **959115** and the IC file number is **2503C-1**. The BlackBerry® smartphone was measured on the low, middle and high channels.

The ERP in the 850 band, GSM mode was measured on BlackBerry® smartphone. The highest ERP measured was 30.82 dBm (1.21 W) at 837.60 MHz (channel 195).

The ERP in the 850 band, EDGE mode was measured on BlackBerry® smartphone. The highest ERP measured was 24.05 dBm (0.25 W) at 837.60 MHz (channel 195).

The EIRP in the PCS band, GSM mode was measured on BlackBerry® smartphone. The highest ERP measured was 28.32 dBm (0.68 W) at 1850.2 MHz (channel 512).


The EIRP in the PCS band, EDGE mode was measured on BlackBerry® smartphone. The highest ERP measured was 25.38 dBm (0.35 W) at 1880.0 MHz (channel 661).

The radiated spurious emission and carrier harmonics were measured up to the 10th harmonic for low, middle and high channels in the GSM850 and PCS bands. Each band was measured in GSM and EDGE mode. Both the horizontal and vertical polarizations were measured.

The margin in the 850 band for GSM mode harmonic emissions was greater than 25 dB below the accepted limits for all test frequencies.

The worst case test margin measured in the 850 band for EDGE mode harmonic emissions was 24.39 dB below the limit at 2546.410 MHz.

The margins in the PCS band for GSM and EDGE modes harmonic emissions were greater than 25 dB below the accepted limits for all test frequencies.

	EMI Test Report for the BlackBerry® smartphone Model RCP51UW	
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino

Co-Location Measurements

The radiated emissions were measured up to 18 GHz for middle channels for simultaneous transmission in the following test configuration combinations: GSM850/Bluetooth, PCS1900/Bluetooth, GSM850/Wi-Fi 802.11b, and PCS1900/Wi-Fi 802.11b.

Both the horizontal and vertical polarizations were measured. The emissions due to different simultaneous transmission did not increase the amplitude of any emissions nor did it produce any new inter-modulation products as a result of mixing.

Sample Calculation:

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

$$FS = \text{Measured Level (dB}\mu\text{V)} + \text{A.F. (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp (dB)} + \text{Filter Loss (dB)}$$


To view the test data see APPENDIX 1.

Measurement Uncertainty ±4.6 dB

H) 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	09-11-07	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	09-11-07	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	10-05-08	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	10-03-31	Radiated Emissions
Hybrid Log Antenna	TDK	HLP-3003C	017301	09-10-24	Radiated Emissions
Horn Antenna	TDK	HRN-0118	030101	10-07-22	Radiated Emissions
Horn Antenna	TDK	HRN-0118	030201	11-03-17	Radiated Emissions
Horn Antenna	ETS-Lindgren	3117	47653	11-07-15	Radiated Emissions
Horn Antenna	CMT	LHA 0180	R52734-001	09-12-17	Radiated Emissions
Preamplifier	TDK	18-26	030002	09-11-07	Radiated Emissions
Dipole Antenna	Schwarzbeck	UHAP	1018	11-03-12	Radiated Emissions
Dipole Antenna	Schwarzbeck	UHAP	974	11-10-16	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	09-10-01	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	09-12-08	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	112394	09-12-07	Radiated Emissions
EMI Receiver	Rohde & Schwarz	ESIB-40	100255	09-12-02	Radiated Emissions
Environment Monitor	Control Company	1870	230355190	10-02-12	Radiated Emissions
Signal Generator	Agilent	E8257D	MY45140527	09-10-10	Radiated Emissions

APPENDIX 1 – GSM RADIATED EMISSIONS TEST DATA

	EMI Test Report for the BlackBerry® smartphone Model RCP51UW APPENDIX 1	
	Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009

Radiated Power Test Data Results

The following measurements were performed by Fahd Faisal.

Date of tests: August 14, 2009

The environmental tests conditions were: Temperature: 24 °C
 Pressure: 1018 mb
 Relative Humidity: 30 %

GSM850 Band

GSM Mode

The BlackBerry® smartphone PIN 30D08AC1 was in standalone, USB down position.
 Test distance is 3.0 metres.

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method				Limit (dBm)	Diff. To Limit (dB)
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Tracking Generator		Corrected Reading (relative to Dipole)			
								Pol. Tx-Rx	Reading (dBm)	(dBm)	(W)		
F0	128	824.20	850	Dipole	V	76.41	86.85	V-V	13.97	29.01	0.80	38.50	-9.49
F0	128	824.20	850	Dipole	H	86.85		H-H	11.78				
F0	195	837.60	850	Dipole	V	78.4	87.37	V-V	15.14	30.82	1.21	38.50	-7.68
F0	195	837.60	850	Dipole	H	87.37		H-H	12.46				
F0	251	848.80	850	Dipole	V	79.07	87.14	V-V	14.47	29.96	0.99	38.50	-8.54
F0	251	848.80	850	Dipole	H	87.14		H-H	12.47				

Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino
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Radiated Power Test Data Results, Cont'd

EDGE Mode

The BlackBerry® smartphone PIN 30D08AC1 was in standalone, USB down position
 Test distance is 3.0 metres.

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Tracking Generator		Corrected Reading (relative to Dipole)		Limit (dBm)	Diff. To Limit (dB)
								Pol.	Reading (dBm)	(dBm)	(W)		
F0	128	824.20	850	Dipole	V	70.27	79.94	V-V	6.84	21.88	0.15	38.50	-16.62
F0	128	824.20	850	Dipole	H	79.94		H-H	4.76				
F0	195	837.60	850	Dipole	V	71.64	80.79	V-V	8.37	24.05	0.25	38.50	-14.45
F0	195	837.60	850	Dipole	H	80.79		H-H	5.71				
F0	251	848.80	850	Dipole	V	72.35	80.88	V-V	8.03	23.52	0.22	38.50	-14.98
F0	251	848.80	850	Dipole	H	80.88		H-H	6.04				

Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino
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Radiated Power Test Data Results cont'd

The following measurements were performed by Fahd Faisal.

Date of test: August 14 and 24, 2009

The environmental tests conditions were: Temperature: 24 – 25 °C
 Pressure: 1017 – 1018 mb
 Relative Humidity: 30 %

PCS1900 Band

GSM Mode

The BlackBerry® smartphone PIN 30D08AC1 was in standalone, USB down position
 Test distance is 3.0 metres.

								Substitution Method					
EUT				Receive Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) dBuV	Pol.	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator)		Limit (dBm)	Diff to Limit (dB)
								Tx-Rx		(dBm)	(W)		
F0	512	1850.20	1900	Horn	V	90.26	90.26	V-V	-8.95	28.32	0.68	33.00	-4.68
F0	512	1850.20	1900	Horn	H	83.06		H-H	-8.06				
F0	661	1880.00	1900	Horn	V	89.52	89.52	V-V	-9.21	28.12	0.65	33.00	-4.88
F0	661	1880.00	1900	Horn	H	81.91		H-H	-8.16				
F0	810	1909.80	1900	Horn	V	89.72	89.72	V-V	-9.00	28.23	0.67	33.00	-4.77
F0	810	1909.80	1900	Horn	H	82.36		H-H	-8.09				


Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino
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Radiated Power Test Data Results cont'd

EDGE Mode

The BlackBerry® smartphone PIN 30D08AC1 was in standalone, USB down position
 Test Distance was 3.0 metres.

EUT								Substitution Method					
EUT				Receive Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) dBuV	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator)		Limit (dBm)	Diff to Limit (dB)
										(dBm)	(W)		
F0	512	1850.20	1900	Horn	V	85.97	85.97	V-V	-12.44	25.36	0.34	33.00	-7.64
F0	512	1850.20	1900	Horn	H	78.31		H-H	-11.02				
F0	661	1880.00	1900	Horn	V	84.93	84.93	V-V	-12.98	25.38	0.35	33.00	-7.62
F0	661	1880.00	1900	Horn	H	78.66		H-H	-10.90				
F0	810	1909.80	1900	Horn	V	85.51	85.51	V-V	-12.13	24.83	0.30	33.00	-8.17
F0	810	1909.80	1900	Horn	H	77.85		H-H	-11.49				

	EMI Test Report for the BlackBerry® smartphone Model RCP51UW	
	APPENDIX 1	
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino

Radiated Emissions Test Data Results

GSM850

GSM Mode

The following measurements were performed by Kevin Rose.

Date of Test: August 14, 2009

The environmental test conditions were: Temperature: 24 °C
 Pressure: 1008 mb
 Relative Humidity: 30 %

Test Distance was 3.0 metres with a height of 1.0 metres, 30 MHz to 1000 MHz.
 The BlackBerry® smartphone PIN 30D08AC1 was in standalone, vertical position.

The measurements were performed in GSM850 Tx mode, on channels 128, 195, and 251.

All emissions had a test margin greater than 25.0 dB.

The following measurements were performed by Savtej Sandhu.


Date of Test: August 14, 2009

The environmental test conditions were: Temperature: 25 °C
 Pressure: 1020 mb
 Relative Humidity: 27 – 30 %

Test Distance was 3.0 metres with a height of 1.0 metres, 1 GHz to 9 GHz.
 The BlackBerry® smartphone PIN 30D08B05 was in standalone, Vertical upright position.

The measurements were performed in GSM Tx mode, channel 128, 195 and 251.

All emissions had a test margin greater than 25.0 dB.

		EMI Test Report for the BlackBerry® smartphone Model RCP51UW APPENDIX 1	
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino	

Radiated Emissions Test Data Results cont'd

GSM850

EDGE Mode

The following measurements were performed by Kevin Rose.

Date of Test: August 14, 2009

The environmental test conditions were: Temperature: 24 °C
 Pressure: 1008 mb
 Relative Humidity: 30 %

Test Distance was 3.0 metres with a height of 1.0 metres, 30 MHz to 1000 MHz.
 The BlackBerry® smartphone PIN 30D08AC1 was in standalone, vertical upright position.

The measurements were performed in GSM850 EDGE Tx mode, channels 128, 195 and 251.

All emissions had a test margin greater than 25.0 dB

The following measurements were performed by Heng Lin.

Date of Test: August 14 – 17, 2009


The environmental test conditions were: Temperature: 25 – 26 °C
 Pressure: 1018 – 1020 mb
 Relative Humidity: 29 – 30 %

Test Distance was 3.0 metres with a height of 1.0 metres, 1 GHz to 9 GHz.
 The BlackBerry® smartphone PIN 30D08B05 was in standalone, vertical position.

The measurements were performed in GSM850 EDGE Tx mode, channels 128, 195 and 251.

Frequency (MHz)	Channel	Antenna		Test Angle (Deg.)	Detector (PK or QP)	Measured Level (dBµV)	Correction Factor for preamp/antenna/cables/ filter (dB)	Field Strength Level (reading+corr) (dBm)	Limit @ 3.0 m (dBm)	Test Margin (dB)
		Pol. (V/H)	Height (metres)							
2546.410	251	V	1.00	148.00	PK	49.48	-86.87	-37.39	-13.00	-24.39

All other emissions had a test margin greater than 25.0 dB

	EMI Test Report for the BlackBerry® smartphone Model RCP51UW	
	APPENDIX 1	
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino

Radiated Emissions Test Data Results cont'd

PCS1900

GSM Mode

The following measurements were performed by Kevin Rose.

Date of Test: August 14, 2009

The environmental test conditions were: Temperature: 24 °C
Pressure: 1008 mb
Relative Humidity: 30 %

Test Distance was 3.0 metres with a height of 1.0 metres, 30 MHz to 1000 MHz.
The BlackBerry® smartphone PIN 30D08AC1 was in standalone, vertical position.

The measurements were performed in PCS1900 Tx mode, channels 512, 661 and 810.

All emissions had a test margin greater than 25.0 dB.

The following measurements were performed by Savtej Sandhu.


Date of Test: August 14 – 18, 2009

The environmental test conditions were: Temperature: 25 – 26 °C
Pressure: 1012 – 1020 mb
Relative Humidity: 27 – 30 %

Test Distance was 3.0 metres with a height of 1.0 metres, 1 GHz to 20 GHz.
The BlackBerry® smartphone PIN 30D08B05 was in standalone, USB up position.

The measurements were performed in PCS1900 Tx mode, channels 512, 661 and 810.

All emissions had a test margin greater than 25.0 dB.

	EMI Test Report for the BlackBerry® smartphone Model RCP51UW	
	APPENDIX 1	
Test Report No. RTS-1765-0908-31	Dates of Test August 14 to 24, 2009	Author Data Michael Cino

Radiated Emissions Test Data Results cont'd

PCS1900

EDGE Mode

The following measurements were performed by Fahd Faisal.

Date of Test: August 14, 2009

The environmental test conditions were: Temperature: 25 °C
Pressure: 1016 mb
Relative Humidity: 32 %

Test Distance was 3.0 metres with a height of 1.0 metres, 30 MHz to 1000 MHz.
The BlackBerry® smartphone PIN 30D08AC1 was in standalone, vertical position.

The measurements were performed in PCS1900 EDGE Tx mode on channels 512, 661 and 810.

All emissions had a test margin greater than 25.0 dB.

The following measurements were performed by Savtej Sandhu.

Date of Test: August 14 – 19, 2009

The environmental test conditions were: Temperature: 25 – 26 °C
Pressure: 1013 – 1020mb
Relative Humidity: 27 – 30 %

Test Distance was 3.0 metres with a height of 1.0 metres, 1 GHz to 20 GHz.
The BlackBerry® smartphone PIN 30D08B05 was in standalone, USB up position.

The measurements were performed in PCS1900 EDGE Tx mode on channels 512, 661 and 810.

All emissions had a test margin greater than 25.0 dB.