

EMI Test Report



Research In Motion Limited

REPORT NO.: RIM-0204-03

PRODUCT Part No: PRD-4230-001 & PRD-4230-002
Type Name: RIM 1902G and 1902GS
FCC ID: L6AR6420GN

Approved by: Paul G. Cardinal
Paul G. Cardinal, Ph.D.
Manager, Compliance and Certification

Date: 8 May, 2002

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A) Scope

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

FCC CFR 47 Part 15, Subpart B, Class B Digital Devices, Unintentional Radiators

IC ICES-003, Class B Digital Devices, Unintentional Radiators

B) Product Identification

The equipment under test (EUT) was tested at the Research In Motion Limited (RIM) EMI test facility, located at:

305 Phillip Street

Waterloo, Ontario

Canada, N2L 3W8

The testing began on April 23, 2002 and completed on April 30, 2002. The sample equipment under test (EUT) were:

1. GPRS OEM Radio Modem kit, part number PRD-4230-001

The kit includes the following items:

- a. GPRS OEM Radio Modem, type RIM 1902G, model number R6420GN, IMEI 001020000070260, FCC ID L6AR6420GN (has 6 pin ZIF FPC connector for off-board SIM).
- b. AC Adapter, Globtek, model number SA-052AU-1, part number WR91A2400CCP, with an output voltage of 5volt dc.
- c. GPRS OEM Interface and Test Board, PCB-04020-002 Rev. A
- d. Broadcast Antenna, Andrew, Eclipse II, magnet mount
- e. Ribbon cable, Parlex Corp., part number 3999
- f. Ribbon cable, part number WIR-02214-001
- g. RF cable, MMCX male to SMA female, part number WIR-01908-001
- h. DB-9 to DB-9 straight through serial cable
- i. Audio headset, model number HDW-03458-001

2. GPRS OEM Radio Modem kit, part number PRD-4230-002

The kit includes the following items:

- a. GPRS OEM Radio Modem, type RIM 1902GS, model number R6420GN, IMEI 001020000070270, FCC ID L6AR6420GN (on-board SIM connector).
- b. AC Adapter, Globtek, model number SA-052AU-1, part number WR91A2400CCP, with an output voltage of 5volt dc.
- c. GPRS OEM Interface and Test Board, PCB-04020-002 Rev. A
- d. Broadcast Antenna, Andrew, Eclipse II, magnet mount
- e. Ribbon cable, part number WIR-02214-001
- f. RF cable, MMCX male to SMA female, part number WIR-01908-001
- g. DB-9 to DB-9 straight through serial cable
- h. Audio headset, model number HDW-03458-001

C) Support Equipment Used for the Testing of the EUT

1. Communication Tester, Rohde & Schwarz, model CMU200, serial number 837493/073
2. PC, Dell, model number MMP, serial number 6SPS20B
3. Monitor, KDS, model number KD-1460, serial number 4530019652
4. Printer, H/P, model number C5884A, serial number US8251W0VQ

D) Test Voltage

The ac input voltage to the ac Adapter, Globtek, model number SA-052AU-1 was 120 volts, 60 Hz. The ac adapter provided 5.0 volts dc to the GPRS OEM Radio Modem kit. This configuration was per RIM's specifications.

E) Test Results Chart

SPECIFICATION	Test Type	MEETS REQUIREMENTS	Performed By
FCC CFR 47 Part 15, Subpart B IC ICES-003	Class B	Yes	Masud Attayi

F) Modifications to EUT

No modifications were required on the EUT.

G) Summary of Results

The GPRS OEM Radio Modem Kit, part number PRD-4230-002 had higher emission levels, than GPRS OEM Radio Modem Kit, part number PRD-4230-001, therefore all the emission testing was done on the GPRS OEM Radio Modem Kit, part number PRD-4230-002.

1 CONDUCTED AC LINE EMISSIONS

The conducted emissions were measured while using the test procedure outlined in CISPR Recommendation 22 through a 50 Ω 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 a spectrum analyzer system with characteristics that duplicate those of the receiver specified in CISPR Publication 16. The data taken was read from the instrument's display. The conducted emissions were measured in idle operation.

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart B/IC ICES-003, Class B limit. The sample EUT had a worse case test margin of 8.8 dB at 8.050 MHz on line L1 (hot).

Measurement Uncertainty ± 2.0 dB

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

2 RADIATED EMISSIONS

The radiated emissions from the EUT were measured while using the methods outlined in CISPR Recommendation 22. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned on a remotely rotatable turntable. The test distance used between the EUT and the receiving antenna was three metres. The measurements were done in a semi-anechoic chamber. The semi-anechoic chamber FCC registration number is **778487** and the Industry Canada file number is **IC4240**. The turntable was rotated to determine the azimuth of the peak emissions. At this point the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emissions level was recorded. The frequency range measured was from 30 MHz to 9.0 GHz which is the 5th harmonic of the highest RF local oscillator (LO) in the PCS band. Both the horizontal and vertical polarisations of the emissions were measured:

The EUT was configured and operated to produce the maximum radiated emissions while still keeping within RIM's specifications. The following test configurations were measured:

- ?? The GPRS OEM Radio Modem kit, part number PRD-4230-001 was connected to the support PC and communicating using HyperTerminal. The system's radiated emission levels in idle mode were compared with respect to the FCC CFR 47 Part 15, Subpart B/IC ICES-003, Class B limit. The system **passed** with a worse case emission test margin of 3.3 dB at 64.1 MHz, vertical polarisation.
- ?? The GPRS OEM Radio Modem kit, part number PRD-4230-002 was connected to the support PC and communicating using HyperTerminal. The system's radiated emission levels in idle mode were compared with respect to the FCC CFR 47 Part 15, Subpart B/IC ICES-003, Class B limit. The system **passed** with a worse case emission test margin of 1.2 dB at 195.00 MHz, vertical polarisation.

To view the test data see APPENDIX 2.

The following local oscillator (LO) radiated emission measurements were made using the GPRS OEM Radio Modem kit, part number PRD-4230-02 since this test configuration had the highest emission levels.

- 1) The IF fixed first LO emissions were measured with the EUT in idle mode. The fundamental frequency at 1048 MHz up to the 5th harmonic were investigated in both polarisations. No emissions could be seen.
- 2) The IF fixed second LO emissions were measured with the EUT in idle mode. The fundamental frequency at 1080 MHz up to the 5th harmonic were investigated in both polarisations. No emissions could be seen.
- 3) The PCS transmit variable LO emissions were measured. The fundamental frequencies at 1719.2, 1749 and 1779.8 MHz up to the 5th harmonic of each LO were investigated in both polarisations. No emissions could be seen.
- 4) The PCS receive variable LO emissions were measured. The fundamental frequencies at 1705.2, 1735 and 1764.8 MHz up to the 5th harmonic of each LO were investigated in both polarisations. No emissions could be seen.
- 5) The GSM850 transmit variable LO emissions were measured. The fundamental frequencies at 1086.2, 1099.6 and 1110.8 MHz up to the 5th harmonic of each LO were investigated in both polarisations. No emissions could be seen.
- 6) The GSM850 receive variable LO emissions were measured. The fundamental frequencies at 1094.2, 1107.6 and 1118.8 MHz up to the 5th harmonic of each LO were investigated in both polarisations. No emissions could be seen.

Sample Calculation:

Field Strength (dB μ V/M) is calculated as follows:

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

H) Compliance Test Equipment Used

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u> / <u>SERIAL NUMBER</u>	<u>CAL DUE DATE</u>	<u>USE</u>
Preamplifier system	TDK RF Solutions	PA-02 080010	02-06-21	Radiated Emissions
Preamplifier	EMC Automation	PA-02-1 030002	02-06-21	Radiated Emissions
Double Ridged Waveguide Horn Ant.	EMC	3116 2538	02-06-21	Radiated Emissions
Linear Power Supply	EMC Automation	LPS-04 2001300	02-06-21	Radiated Emissions
Preamplifier	Sonoma	310N/11909A 185831	02-06-21	Radiated Emissions
EMC Analyzer	Agilent	E7405A US40240226	03-03-21	Radiated Emissions
L.I.S.N.	Emco	3816/2 1120	02-05-31	Conducted Emissions
L.I.S.N.	Emco	3816/2 1118	02-05-31	Conducted Emissions
Impulse Limiter	Rohde & Schwarz	ESHS-Z2 836248/052	02-05-03	Conducted Emissions
EMI Receiver	Agilent	85462A 3942A00517	03-04-04	Conducted Emissions
RF Filter Section	Agilent	85460A 3704A00481	03-04-04	Conducted Emissions
Hybrid Log Antenna	TDK	HLP-3003C 17301	02-10-03	Radiated Emissions
Horn Antenna	TDK	HRN-0118 090301	02-10-03	Radiated Emissions
Horn Antenna	TDK	HRN-0118 090601	02-10-03	Radiated Emissions
Signal Generator	HP	83712B US37101080	02-08-14	Radiated Emissions
Wireless Communications Test Set	Rohde & Schwarz	CMU200 837493/073	03-03-27	Radiated Emissions
Dipole Antenna	Schwarzbeck	VHAP 1006	03-03-05	Radiated Emissions
Dipole Antenna	Schwarzbeck	VHAP 1007	03-03-05	Radiated Emissions

I) Declaration

Statement of Performance:

The GPRS OEM Radio Modem kit, part number PRD-4230-001 and part number PRD-4230-002, when configured and operated per RIM'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 equipment used was suitable for the tests performed and within manufacturer's published specifications.

The test equipment was used within its published operating parameters.

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

Tested by:

Masud S. Attayi, P.Eng.

Senior Engineer, Compliance and Certification

Date: 7 May 2002

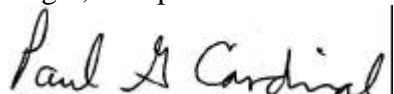


Reviewed and Approved by:

Paul G. Cardinal, Ph.D.

Manager, Compliance and Certification

Date: 8 May 2002



APPENDIX 1

AC LINE CONDUCTED EMISSIONS TEST DATA/PLOTS

Conducted Emissions Test Results

FCC CFR 47 Part 15, Subpart B, Class B

<u>Freq.</u> (MHz)	<u>Line</u>	<u>Reading</u> <u>Quasi-Peak</u> (dB μ V)	<u>Impulse</u> <u>Limiter loss</u> (dB)	<u>Cable +</u> <u>LISN</u> <u>Factor</u> (dB)	<u>Corrected</u> <u>Reading</u>	<u>LIMIT</u> (dB μ V)	<u>MARGIN</u> (dB)
0.770	L1	24.12	10.0	0.09	34.21	48.0	-13.79
0.770	L2	23.41	10.0	0.09	33.50	48.0	-14.50
7.91	L1	24.79	10.0	0.23	35.02	48.0	-12.98
7.91	L2	24.68	10.0	0.23	34.91	48.0	-13.09
8.05	L1	28.93	10.0	0.22	39.15	48.0	-8.85
8.05	L2	28.74	10.0	0.22	38.96	48.0	-9.04
8.19	L1	27.65	10.0	0.19	37.84	48.0	-10.16
8.19	L2	27.31	10.0	0.19	37.50	48.0	-10.50
8.32	L1	21.76	10.0	0.19	31.95	48.0	-16.05
8.32	L2	21.63	10.0	0.19	31.82	48.0	-16.18
13.31	L1	18.48	10.0	0.17	28.65	48.0	-19.35
13.31	L2	18.17	10.0	0.17	28.34	48.0	-19.66

120 volt, 60 Hz input to ac Adapter, Globtek, model number SA-052AU-1, part number WR91A2400CCP connected to the GPRS OEM Radio Modem kit, part number PRD-4230-002 in idle mode.

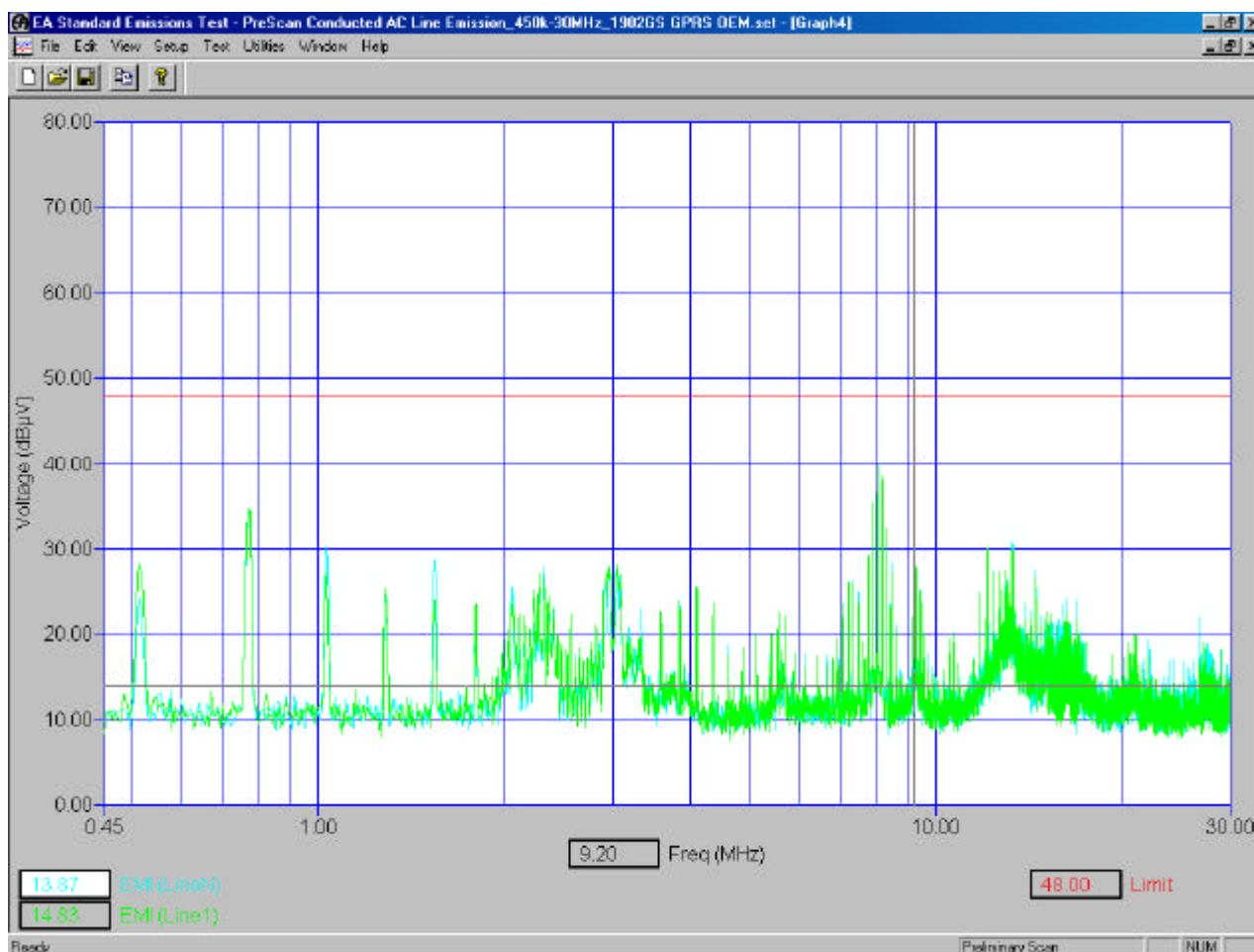
There was no change in emissions between GPRS OEM Radio Modem kit, part number PRD-4230-001 and GPRS OEM Radio Modem kit, part number PRD-4230-002.

Conducted Emission Graph

FCC CFR 47 Part 15, Subpart B, Class B

April 29, 2002

The conducted emission levels on the graph are measured in Peak. The 10 dB insertion loss of the Impulse Limiter has been added to the emission levels on the graph.



120 volt, 60 Hz ac input to ac Adapter, Globtek, model number SA-052AU-1, part number WR91A2400CCP connected to the GPRS OEM Radio Modem kit, part number PRD-4230-002 in idle mode.

Conducted Emission Test-Setup Photo

FCC CFR 47 Part 15, Subpart B, Class B



APPENDIX 2

RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results

FCC CFR 47 Part 15, Subpart B, Class B

April 26, 2002

Operating Mode: The GPRS OEM Radio Modem kit, part number PRD-4230-001 was operating in idle mode with the support equipment. 120 volts, 60 Hz ac input.
The EUT was tested as received.

Frequency (MHz)	Pol (V/H)	Detector (Q.P. or Peak)	Reading @ 3.0 m (dBμV)	Correction Factors for amp./antennae/cables (dB/m)	Level (reading+corr.) (dBμV/m)	Limit @ 3.0 m (dBμV/m)	Test Margin (dB)
64.100	V	Q.P.	57.9	-21.24	36.66	40.0	-3.34
66.400	H	Q.P.	46.6	-21.17	25.43	40.0	-14.57
83.600	H	Q.P.	44.9	-20.5	24.40	40.0	-15.6
195.000	V	Q.P.	54.3	-15.78	38.52	43.5	-4.98
198.600	H	Q.P.	45.9	-15.41	30.49	43.5	-13.01
199.000	H	Q.P.	47.8	-15.36	32.44	43.5	-11.06
360.100	V	Q.P.	51.0	-11.81	39.19	46.0	-6.81
598.400	V	Q.P.	44.3	-5.79	38.51	46.0	-7.49
599.700	V	Q.P.	45.4	-5.74	39.66	46.0	-6.34
899.600	H	Q.P.	41.4	-1.4	40.0	46.0	-6.0

Radiated Emissions Test Results con't

Operating Mode: The GPRS OEM Radio Modem kit, part number PRD-4230-002 was operating in idle mode with the support equipment. 120 volts, 60 Hz ac input.

The EUT was tested as received.

Frequency (MHz)	Pol (V/H)	Detector (Q.P. or Peak)	Reading @ 3.0 m (dB μ V)	Correction Factors for amp./antennae/cables (dB/m)	Level (reading+corr.) (dB μ V/m)	Limit @ 3.0 m (dB μ V/m)	Test Margin (dB)
64.000	V	Q.P.	59.1	-21.24	37.86	40.0	-2.14
65.200	V	Q.P.	49.3	-21.17	28.13	40.0	-11.87
97.600	H	Q.P.	53.9	-19.11	34.79	43.5	-8.71
195.000	V	Q.P.	58.1	-15.78	42.32	43.5	-1.18
197.600	H	Q.P.	45.4	-15.5	29.9	43.5	-13.60
199.600	H	Q.P.	47.3	-15.29	32.01	43.5	-11.49
208.100	H	Q.P.	42.1	-15.36	26.74	43.5	-16.76
360.100	V	Q.P.	51.0	-11.81	39.19	46.0	-6.81
596.600	H	Q.P.	40.7	-5.85	34.85	46.0	-11.15
894.700	H	Q.P.	36.2	-1.46	34.74	46.0	-11.26

Radiated Emissions Test Set-up

