





Rapport utfärdad av ackrediterat provningslaboratorium
Test report issued by an Accredited Testing Laboratory

EMF Test Report: Ericsson RD 2242 B2 R2C

Document number:	GFTE-15:000278 Uen Rev A	Date of report:	2015-06-09
Testing laboratory:	Ericsson EMF Research Laboratory Ericsson AB SE-164 80 Stockholm Sweden	Company/Client:	FJB/RIC Tanvir Alam Ericsson Canada Inc. 349 Terry Fox Drive Ottawa, K2K 2V6 Canada
Tests performed by:	Björn Thors	Dates of tests:	2015-06-01
Manufacturer and market name(s) of device:	Ericsson RD 2242 B2 R2C		
Testing has been performed in accordance with:	FCC CFR title 47, part 1.1310, FCC OET Bulletin 65, FCC KDB447498 D01, Industry Canada RSS 102		
Test results:	The tested device complies with the requirements in respect of all parameters subject to the test.		
Additional information:	Testing was conducted for mobile exposure conditions assuming a separation distance between the tested device and the user or any bystander of at least 20 cm.		
Signature:	Test Engineer  Björn Thors Senior Specialist - RF Exposure Assessment bjorn.thors@ericsson.com Tel: +46 10 717 1824	Deputy Quality Manager  Jaroslav Kazejev Experienced Researcher jaroslav.kazejev@ericsson.com Tel: +46 10 7134344	

1 Summary of EMF Test Report¹

Frequency Band [MHz]	B2
Modes	WCDMA, LTE
Supported	<input checked="" type="checkbox"/>
Covered by report	<input checked="" type="checkbox"/>
Exposure environment	General public

1.1 Results

Radio frequency (RF) exposure assessment results for general public (uncontrolled) exposure applicable in USA [1], [2], [4] are given in the table below. The equipment under test (EUT) conforms to the requirements of the relevant standards when the combined exposure ratio is less than one.

RF exposure assessment results for general public (uncontrolled) exposure as obtained for the RDS together with an assumed output power tolerance of 2.0 dB and a transmission loss of 0.5 dB using procedures applicable for the US market [4].

3GPP band	Standard	Nominal output power from the radio	Test position	Test separation distance	Exposure ratio	Result
B2 (1900)	W/L	2 x 0.05 W	Direction of maximum gain	20 cm	0.11	PASSED

For Canadian regulations [3], [5], exemption limits for routine evaluations have been found to apply. Thus, the EUT is deemed to comply with the relevant exposure limits at a separation distance of 20 cm between the equipment and any nearby person.

¹ This page contains a summary of the test results. The full report provides a complete description of all test details and results.

2 General information

The test results reported in this document have been obtained by simple calculations according to plane-wave equivalent conditions [4] or by demonstrating that exemption limits for routine evaluations apply [3]. The purpose of the tests was to verify that the EUT is in compliance with the appropriate RF exposure standards, recommendations and limits [1] - [5].

3 Equipment under test

Table 1 summarizes the technical data for the EUT. Photographs of the EUT are presented in Appendix A.

Table 1 Technical data for the EUT.

Product name	RD 2242 B2 R2C		
Product tested	KRY 901 328/1		
Dimensions, Thickness x Diameter (mm)	50 x 109		
Configurations(s) covered by this report	LTE/WCDMA 1900 (B2)		
Antenna(s)	Internal antennas	Product number	Maximum gain (dBi)
		KRE 101 2191/2 R1B	3 dBi
Transmitter frequency range (MHz)	LTE 1900 (B2): 1930-1990		

In Table 2 nominal output power levels are given.

Table 2 Nominal output power levels.

Band / Mode	Nominal output power² (dBm)	Tolerance, upper limit (dB)	Transmission loss (dB)	Maximum output power³ (dBm)
LTE/WCDMA B2 (1900), 2x50mW	17	2.0	0.5	21.5

4 EMF exposure assessments

FCC procedures [4] specify exposure assessment methods to verify compliance with EMF exposure limits [1] of mobile devices. A minimum test separation distance of at least 20 cm is required between the device and nearby persons to apply mobile device exposure limits. The test separation distance for which the equipment is shown to comply with the exposure limits must be clearly provided in the operating and installation instructions.

For the Canadian market, Industry Canada specifications [3] sets out the requirements and methods used to evaluate radio frequency (RF) exposure compliance of radiocommunication apparatus designed to be used in the vicinity of the human body. In general, RF exposure evaluation is required if the separation distance between the user or bystander and the device is greater than 20 cm.

² Nominal output power per port.

³ Conservative measure of the total maximum possible output power level delivered to the antennas including losses and tolerances.

4.1 Field strength calculations

The maximum gain, G_{ANT} , of the two antennas used is 3 dBi (2), see Table 1. Assuming correlated transmit signals, the directional gain, G , may be taken as 6 dBi according to [6]. This is most likely a very conservative assumption given the used transmission modes and antenna topology.

The total effective radiated power and effective isotropically radiated power for the omni-directional antennas is and 0.56 W, respectively. As a consequence, the categorical exclusion provision of FCC CFR title 47, § and the exemption limits from routine evaluation in Industry Canada RSS-102 [3] apply, see Table 3 and

Table 4. According to Industry Canada specifications [3], no further exposure assessments are therefore required.

Table 3 Rationale for use of FCC categorical exclusion provision limitis.

Band / Mode	Maximum output power (dBm)	Maximum gain assuming correlated exposure (dBi)	Total effective radiated power (W)	Categorical exclusion provision limits (W)
LTE/WCDMA B2 (1900), 2x50mW	21.5	6	0.35	3

Table 4 Rationale for use of Industry Canada exemption limits for routine evaluations.

Band / Mode	Maximum output power (dBm)	Maximum gain assuming correlated exposure (dBi)	Total effective isotropically radiated power (W)	Exemption limits for routine evaluation (W)
LTE/WCDMA B2 (1900), 2x50mW	21.5	6	0.56	2.3

According to FCC procedures [4], the minimum test separation distance and power density may be estimated by simple calculations according to plane-wave equivalent conditions. Thus, the exposure ratio, ER , may be conservatively estimated as

$$ER = \frac{S_{est}}{S_{lim}} = \frac{P_{tot}G}{4\pi r^2 S_{lim}}$$

where

P_{tot} : Total conducted power for the cellular bands (21.5 dBm),

G : Directional gain (6 dBi),

r : Separation distance from antenna,

S_{lim} : Power density exposure limit of 10 W/m².

Setting $P_{tot} = 0.14$ W, $G = 4.0$, $r = 0.20$ m and $S_{lim} = 10$ W/m² gives the result for a 20 cm test separation distance in

Table 5.

Table 5 RF exposure assessment results for general public (uncontrolled) exposure as obtained for the RDS using procedures applicable for the US market [4].

3GPP band	Standard	Nominal output power from the radio	Test position ⁴	Test separation distance ⁵	Exposure ratio	Result
B2 (1900)	W/L	2 x 0.05 W	Direction of maximum gain	20 cm	0.11	PASSED

The exposure ratio is well below one. Hence, the RF EMF exposure is below the relevant exposure limits [1] for the 20 cm test separation distance.

5 Conclusions

The results in Section 4 show that the plane-wave equivalent power density, estimated according to the requirements of FCC [4] is below the relevant exposure limits [1] at a separation distance of 20 cm between the equipment and any nearby person.

For Canadian regulations [3], [5], exemption limits for routine evaluations have been found to apply. Thus, the EUT is deemed to comply with the relevant exposure limits at a separation distance of 20 cm between the equipment and any nearby person.

Consequently, the EUT is in compliance with the appropriate RF exposure standards and recommendations.

6 References

- [1] FCC, Code of Federal Regulations CFR title 47, part 1.1310 “Radiofrequency radiation exposure limits”, Federal Communications Commission (FCC), August 1997.
- [2] FCC, OET Bulletin 65, “Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields”, August 1977.
- [3] Industry Canada, Radio Standard Specification (RSS) 102, (Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), March 2015.
- [4] FCC KDB447498 D01, “Mobile and Portable Devices RF exposure procedures and Equipment Authorization Policies”, February 2014.
- [5] Health Canada, Safety Code 6 , “Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz”, 2015.
- [6] FCC KDB662911 D01, “Emissions Testing of Transmitters with Multiple Outputs in the Same Band”, October 2013.
- [7] FCC, Code of Federal Regulations CFR title 47, part 2.1091, “ Radiofrequency radiation exposure evaluation: mobile devices”, Federal Communications Commission (FCC).

7 Revision History

Rev.	Date	Description
A	2015-06-09	First revision

⁴ For a test separation distance of 20 cm, the exposure was found to be well below applicable exposure limits in the direction of maximum gain. Since this test position corresponds to the direction of maximum exposure and the RDS is classified as a mobile device with an intended separation distance to the user or nearby persons of at least 20 cm, other test positions were not considered.

⁵ The test separation distance is measured from the EUT casing.

APPENDIX A: Photographs of the EUT



(a)

(b)

Figure A.1 The EUT. (a) Front view with radome. (b) Front view without radome.