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EMF Test Report: Ericsson Dot 2274/2284 B25 B66 (FCC)

Document number:	, Rev A	Date of report:	2020-10-29
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Tests performed by:	Davide Colombi	Dates of tests:	2020-10-28 (Rev A)
Manufacturer and market name(s) of device:	Ericsson Dot 2274 B25 B66 Ericsson Dot 2284 B25 B66		
Testing has been performed in accordance with:	FCC OET Bulletin 65		
Test results:	Minimum separation distance for which the RF EMF exposure complies with the limits in FCC 47 CFR 1.1310 to be included in the Customer Product Information (CPI) for Ericsson Dot 2274/2284 B25 B66.		
Additional information:	Testing was conducted for mobile exposure conditions according to KDB447498 DO1.		
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1 Summary of EMF Test Report¹

Equipment under test (EUT)

Product name	Ericsson Dot 2274 B25 B66 (internal antennas), Ericsson Dot 2284 B25 B66 (external antennas)		
Product number	KRY 901 468/1 KRY 901 468/2		
Supported bands, Tx frequency range (MHz), and standards	B25 + B66	1930 – 1995 + 2100 – 2180	WCDMA, LTE, NR (FDD)
Exposure environment	General public/uncontrolled		

Results

The minimum (test) separation distance required for the equipment under test (EUT) to comply with the mobile device exposure conditions and relevant limits applicable in the USA [1]-[3] is provided in the table below for the general public (uncontrolled exposure).

RF exposure assessment results for general public (uncontrolled) exposure as obtained for Dot 2274 and Dot 2284 B25 B66 together with an assumed output power tolerance of 2 dB using procedures applicable for the US market [3].

Band	Standard	Nominal output power from the radio	Test position	Separation distance
B25 + B66	WCDMA, LTE, NR	2 x 0.2 W + 2 x 0.2 W	Direction of maximum gain	20 cm

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 [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]–[3].

It should be noted that the test results presented in this test report are valid for the frequency range and for the antenna properties specified in Table 1, in addition to the power level and the power tolerance specified in Table 2. These data were supplied by the client and may affect the validity of the results.

The test results were determined for Dot 2274 B25 B66 (equipped with internal antennas) and are also applicable for Dot 2284 B25 B66 which must be connected to external antennas, provided that the antenna gain is equal to or smaller than 1.3 dBi.

Proposed EMF health and safety information for inclusion in the Customer Product Information (CPI) is provided in Appendices A and B.

3 Equipment under test

Table 1 summarizes the technical data for the EUT.

Table 1 Technical data for the EUT.

Product name	Ericsson Dot 2274 B25 B66 (internal antennas), Ericsson Dot 2284 B25 B66 (external antennas)		
Product tested	KRY 901 468/1 KRY 901 468/1		
Supported bands, Tx frequency range (MHz), and standards	B25 + B66	1930 – 1995 + 2100 – 2180	WCDMA, LTE, NR (FDD)
Dimensions, Thickness x Diameter (mm)	67 x 210		
Configuration(s) covered by this report	B25 + B66		
Antenna(s)	Two antenna branches per band	Maximum antenna gain ² : 1.3 dBi	
Exposure environment	General public/uncontrolled		

In Table 2 nominal output power levels are given. The EUT related data in Table 1 and Table 2 were supplied by the client.

Table 2 Nominal output power levels.

Band	Standard	Nominal output power ³ [dBm]	Power tolerance [dB]	Transmission loss [dB]	Maximum output power per band ⁴ [dBm]
B25 + B66	WCDMA, LTE, NR	23	2	0	28

4 EMF exposure assessments

FCC procedures [3] 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 minimum test separation distance for which the

² Maximum antenna gain (per port) among all available antenna branches.

³ Nominal output power per port.

⁴ Conservative measure of the total maximum possible output power level per band delivered to the antennas including losses and power tolerances.

equipment is shown to comply with the exposure limits must be clearly provided in the operating and installation instructions.

The assessments were conducted for maximum power configurations, i.e., by assuming 100% utilization. Effects of real RBS utilization (time-averaged) is reasonably foreseeable and will significantly reduce the time-averaged power and the RF exposure. This factor was not considered in this assessment, which adds to the conservativeness of the obtained compliance boundaries.

4.1 Field strength calculations

Transmit signals from the two antenna ports of the same band have been assumed to be correlated. Based on the maximum gain of the single antenna ($G_{ant} = 1.3$ dBi, see Table 1), the directional gain, G , may be taken as 4.3 dBi according to [4] ($G = G_{ant} + 10 \log_{10} N$, where N is the number of simultaneously transmitting antennas). This is most likely a very conservative assumption since the antennas are spatially separated and their maximum gain occurs at different locations which add extra conservativeness of the results.

The total effective radiated power based on the maximum antenna gain of 4.3 dBi as described above and the output power level of Table 2 is 2.1 W, including both bands, which is less than the categorical exclusion limit for routine RF exposure evaluation of 3 W⁵ specified in the FCC CFR title 47, § 2.1091(c) [5]. As a consequence, the minimum test separation distance may be estimated by simple calculations according to plane-wave equivalent conditions [3].

Power density for each of the transmitting band may be conservatively estimated as

$$S = \frac{P_a G}{4\pi r^2},$$

where

P_a : Total conducted power per band⁶,

G : Directional gain for the corresponding band⁷,

r : Separation distance from antenna,

S : Estimated power density.

The total power density, S_{tot} , for B25 and B66 is therefore given by

$$S_{tot} = S_{B25} + S_{B66}.$$

For a minimum test separation distance of 20 cm the estimated total power density is 6.75 W/m² (see Table 3). This complies with the RF exposure evaluation conditions and the relevant exposure limit applicable in the USA [1]-[3] (see Table 4) for the general public (uncontrolled exposure).

Table 3 RF exposure assessment results for general public (uncontrolled) exposure as obtained for Dot 2274 and Dot 2284 B25 B66 together with an assumed output power tolerance of 2 dB using procedures applicable for the US market [3].

Band	Standard	Nominal output power from the radio	Test position	Separation distance	Total power density
B25 + B66	WCDMA, LTE, NR	2 x 0.2 W + 2 x 0.2 W	Direction of maximum gain	20 cm	6.75 W/m ²

⁵ Valid for frequency > 1500 MHz.

⁶ This is equal to the maximum output power (in W) in Table 2.

⁷ This is equal to linear value of G .

Table 4 General public (uncontrolled) RF EMF exposure limits applicable in the US market [1],[2]. The lowest exposure limit value within the tested frequency band was used for the assessment and is reported in the table.

Band	S_{lim} (W/m ²)
B25 and B66	10.0

5 Uncertainty

For the input parameters defined in the test report, the approach described in Section 4 results in a conservative estimate of the RF exposure. This compliance was determined by comparing the evaluated RF exposure directly with the limits.

6 Conclusion

The results in Section 4 show that the plane-wave equivalent power density for the Ericsson Dot 2274 B25 B66, estimated according to the requirements of FCC [3] is below the relevant MPE limits [1] at a separation distance of at least 20 cm between the equipment and any nearby person.

As Dot 2284 B25 B66 is equipped with the same hardware as Dot 2274 B25 B66 except for the antennas, the test results are also applicable for Dot 2284 connected to external antennas with similar radiation characteristics as the Dot 2274 antennas, and provided that the antenna gain is equal to or smaller than 1.3 dBi.

7 References

- [1] FCC, Code of Federal Regulations CFR title 47, part 1.1310 “Radiofrequency radiation exposure limits”, Federal Communications Commission (FCC), 2017.
- [2] FCC, OET Bulletin 65, “Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields”, 1997.
- [3] FCC KDB 447498 D01, “Mobile and Portable Devices RF exposure procedures and Equipment Authorization Policies”, 2015.
- [4] FCC KDB 662911 D01, “Emissions Testing of Transmitters with Multiple Outputs in the Same Band”, 2013.
- [5] FCC, Code of Federal Regulations CFR title 47, part 2.1091, “ Radiofrequency radiation exposure evaluation: mobile devices”, Federal Communications Commission (FCC), 2017.

8 Revision History

Rev.	Date	Description
A	2020-10-29	First revision

Appendix A. Information to be included in the CPI

Table A.1 lists the minimum separation distance for which the RF EMF exposure from Dot 2274 B25 B66 is below the limits specified by the FCC as applicable in:

- USA (47 CFR 1.1310)

Table A.1: Minimum separation distance for general public/uncontrolled exposure applicable in USA and markets employing the FCC RF exposure limits (including 2 dB output power tolerance).

Band	Standard	Nominal output power from the radio	Test position	Separation distance
B25 + B66	WCDMA, LTE, NR	2 x 0.2 W + 2 x 0.2 W	Direction of maximum gain	20 cm

Note to the table: The test results were determined for Dot 2274 (equipped with internal antennas) and are also applicable for Dot 2284 connected to external antennas provided that the antenna gain is equal to or smaller than 1.3 dBi.

Appendix B. Guidelines on how to install the product

The Ericsson Dot 2274 B25 B66 and 2284 B25 B66 (KRY 901 468/1, KRY 901 468/2) shall be installed to make sure that the general public does not have access to the applicable RF EMF compliance boundary. The compliance boundary dimensions were determined for the product transmitting in free space.

Appendix C. Photographs of the EUT



Figure C.1 view of the EUT