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Accred. no. 1761
Testing
ISO/IEC 17025

EMF Test Report: Ericsson Dot 4455/4465 B77D B25 B66

Document number:	GFTL-22:001357 Uen, Rev B	Date of report:	2022-10-28
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Tests performed by:	Jens Eilers Bischoff	Dates of tests:	2022-10-26
Manufacturer and market name(s) of device:	Ericsson Dot 4455/4465 B77D B25 B66		
Testing has been performed in accordance with:	FCC OET Bulletin 65, KDB447498 D04 v01		
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 4455/4465 B77D B25 B66.		
Additional information:	Testing was conducted for mobile exposure conditions according to KDB447498 D04.		
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1 Summary of EMF Test Report¹

Equipment under test (EUT)

Product name	Ericsson Dot 4455 B77D B25 B66 (internal antenna) Ericsson Dot 4465 B77D B25 B66 (external antennas)		
Product number	KRY 901 523/1 KRY 901 523/2		
Supported bands, Tx frequency range (MHz), and standards	B77D	3700–3980	NR TDD
	B25	1930-1995	NR FDD, LTE FDD, NB-IoT
	B66	2110-2200	NR FDD, LTE FDD, NB-IoT
Exposure environment	General public/uncontrolled, Occupational/controlled		

Results

RF exposure compliance distances, required for the equipment under test (EUT) to comply with the mobile device exposure conditions and relevant limits applicable in the USA [1]-[3] are listed below for the general public (GP) and occupational (O) exposure limits.

RF exposure compliance assessment results for general public (GP) and occupational (O) exposure for Dot 4455/4465 B77D B25 B66, together with an assumed output power tolerance of 1 dB, using procedures applicable for the US market [3].

Band	Standard ²	Maximum nominal output power from the radio	TDD DL duty cycle	Compliance distance	
				GP	O
B77D +B25+B66	L/N (B77D), N/L/I (B25), N/L/I (B66)	4 x 0.4 W + 2 x 0.2 W + 2 x 0.2 W	75% (B77D)	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 The standards are abbreviated in this report according to: G for GSM, L for LTE, N for NR, and I for NB-IoT.

2 General information

The purpose of the tests was to verify that the EUT is in compliance with the appropriate RF exposure standards, recommendations and limits applicable in the USA [1]–[3]. Compliance is demonstrated by showing that the EUT meets the test exemption criteria specified in [3] at a minimum test separation distance of 20 cm. The details of the analysis are presented in Section 4.

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, the power tolerance and TDD downlink duty cycle specified in Table 2. These data, together with information on the physical separation of the antennas were supplied by the client and may affect the validity of the results.

The test results were determined for Dot 4455 (equipped with internal antennas) and are also applicable for Dot 4465 connected to external antennas provided that the antenna gain for each branch is equal to or smaller than 4.35 dBi and that the minimum distance between antennas remains equal or larger than 73 mm.

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. Photographs and drawing of the EUT are presented in Appendix C.

Table 1 Technical data for the EUT.

Product name	Ericsson Dot 4455/4465 B77D B25 B66									
Product tested	KRY 901 523/1									
Supported bands, Tx frequency range (MHz), and standards	B77D	3700–3980				NR TDD				
	B25	1930-1995				NR FDD, LTE FDD, NBIoT				
	B66	2110-2200				NR FDD, LTE FDD, NBIoT				
Dimensions of Radio head, H x D (mm)	79 x 230									
Configuration(s) covered by this report	B77D+B25+B66									
Antenna(s)	Eight internal antenna branches	Maximum antenna gain for each branch (dBi)								
		A: 4.33	B: 4.19	C: 4.19	D: 3.6	E: 4.35	F: 4.01	G: 4.20	H: 4.18	
Exposure environment	General public/uncontrolled, Occupational/controlled									

Output power levels of the EUT are given in Table 2.

Table 2 Output power levels of the EUT.

Band	Standard	Maximum nominal output power [W / dBm]	Power tolerance [dB]	TDD DL duty cycle	Maximum time-averaged output power ³ [W / dBm]
B77D +B25 +B66	L/N (B77D), N/L/I (B25), N/L/I (B66)	4 x 0.4 W + 2 x 0.2 W + 2 x 0.2 W	1	75%	2.27 / 33.56

The EUT related data in Table 1 and Table 2 were supplied by the client.

³ Conservative measure of the total maximum possible output power level delivered to the antennas including losses, tolerances, and maximum TDD DL duty cycle.

4 Test exemption justification

FCC procedures [3] specify exemption criteria and exposure assessment methods to verify compliance with EMF exposure limits [1] of mobile devices. The minimum 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. A minimum test separation distance of at least 20 cm is required between the device and nearby persons to apply mobile device exposure limits.

4.1 Single antenna

The effective radiated power (ERP) for each of the eight antenna branches (including output power tolerance and TDD DL duty cycle) is calculated in Table 3 based on the EUT data provided by the client and reported in Table 1 and Table 2. Table 3 also specifies the ERP threshold derived by means of the SAR-based exemption threshold specified in [3]⁴ for a minimum test separation distance of 20 cm and applicable in the frequency range of B77D, B25 and B66.

Table 3 ERP per antenna branch and corresponding ERP test exemption threshold as specified by [3].

EUT branch	ERP per branch (mW)	Minimum test separation distance (cm)	ERP exemption threshold (mW)
A	417	20	3060
B	403		
C	403		
D	352		
E	628		
F	580		
G	606		
H	603		

All antenna branches meet the ERP exemption threshold.

4.2 Simultaneous transmission

The results in this section show that the EUT meets the test exemption requirement for simultaneous transmission based on the SAR to peak location separation ratio (SPLSR) procedure described in [3]. This ratio is defined as:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / R_i$$

where SAR_1 and SAR_2 are the estimated SAR values for the two antenna branches in the pair i , and R_i is their distance in millimeters. The estimated SAR for each antenna is determined as [3]:

$$SAR_{est} = 1.6 \cdot ERP / ERP_{th}$$

where ERP and ERP_{th} corresponds to the antenna ERP and the ERP exemption threshold in Table 3, respectively. The value of R_i as supplied by the client (see Annex C) and the corresponding $SPLSR$ rounded to two decimal digits are shown in Table 4.

⁴ See Section 2.1.3. SAR-based exemption is applicable to the frequency range between 300 MHz and 6 GHz, with test separation distances between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions.

Table 4 Distance between antenna branches and SPLSR values.

Branches in the pair	R_i (mm)	SPLSR
A and B	210	<0.01
A and C	155	<0.01
A and D	143	<0.01
A and E	134	<0.01
A and F	155	<0.01
A and G	210	<0.01
A and H	194	<0.01
B and C	81	<0.01
B and D	73	<0.01
B and E	197	<0.01
B and F	81	<0.01
B and G	194	<0.01
B and H	197	<0.01
C and D	73	<0.01
C and E	210	<0.01
C and F	197	<0.01
C and G	73	0.01
C and H	186	<0.01
D and E	95	<0.01
D and F	143	<0.01
D and G	155	<0.01
D and H	73	<0.01
E and F	197	<0.01
E and G	95	0.01
E and H	186	<0.01
F and G	155	<0.01
F and H	143	<0.01
G and H	210	<0.01

The SPLSR for all antenna pairs is below 0.04 and hence the EUT qualifies for simultaneous test exemption as specified in [3].

5 Results

Based on the applicability of FCC RF exposure test exemptions, the EUT RF exposure compliance distance is given in Table 5.

Table 5 RF exposure compliance assessment results for general public (GP) and occupational (O) exposure for for Dot 4455/4465 B77D B25 B66 together with an assumed output power tolerance of 1 dB using procedures applicable for the US market [3].

Band	Standard	Maximum nominal output power from the radio	TDD DL duty cycle	Compliance distance	
				GP	O
B77D +B25+B66	L/N (B77D), N/L/I (B25), N/L/I (B66)	$4 \times 0.4 \text{ W} + 2 \times 0.2 \text{ W} + 2 \times 0.2 \text{ W}$	75% (B77D)	20 cm	

6 Conclusion

The results in Section 4 show that the Ericsson Dot 4455 meets the FCC SAR-based test exemption criteria [3] and it is therefore compliant with the EMF exposure limits for a minimum separation distance of 20 cm.

As Dot 4465 is equipped with the same hardware as Dot 4455 except the antennas, the test results are also applicable for Dot 4465 connected to external antennas provided that the antenna gain for each branch is equal to or smaller than 4.35 dBi and that the minimum distance between antennas remains equal to or larger than 73 mm.

7 References

- [1] FCC, Code of Federal Regulations CFR title 47, part 1.1310 “Radiofrequency radiation exposure limits”, Federal Communications Commission (FCC), 2020.
- [2] FCC, OET Bulletin 65, “Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields”, 1997.
- [3] FCC KDB 447498 D04 Interim General RF Exposure Guidance v01, “RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices”, 2021.

8 Revision History

Rev.	Date	Description
A	2022-10-27	First revision
B	2022-10-28	Minor editorial corrections

Appendix A. Information to be included in the CPI

Table A.1 below lists the compliance boundaries (exclusion zones), outside of which the RF EMF exposure from Dot 4455 B77DB25B66 and Dot 4465 B77DB25B66 is below the limits applicable in:

- USA (47 CFR 1.1310) and markets employing the FCC RF exposure limits

Table A.1: Compliance Distance for Radio Dots Applicable in USA and Markets Employing the FCC RF Exposure Limits.

Product	Standard	Maximum Nominal Output Power from the Radio Dot	Power tolerance	TDD DL duty cycle	Compliance distance	
					GP	O
Dot 4455/4465 B77D B25 B66	LTE NR	$4 \times 0.4 \text{ W} + 2 \times 0.2 \text{ W}$ $+ 2 \times 0.2 \text{ W}$	1 dB	75% (B77D)	20 cm	20 cm

Note to the table: The test results were determined for Dot 4455 equipped with internal antennas and are also applicable for Dot 4465 connected to external antennas provided that the antenna properties are similar.

Appendix B. Guidelines on how to install the product

The Ericsson Dot 4455 B77D B25 B66 and Dot 4465 B77D B25 B66 (KRY 901 523/1 and KRY 901 523/2) shall be installed to make sure that the general public does not have access to the applicable RF EMF compliance distance.

Appendix C. Photographs and drawings of the EUT



Figure C.1: View of the EUT.

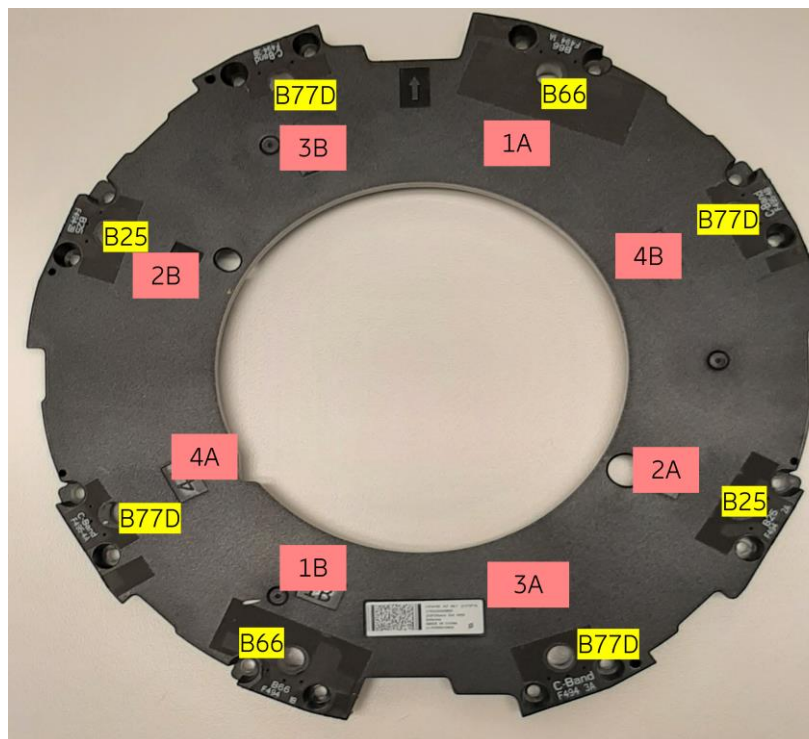


Figure C.2 Top view of the EUT without the radome with the active antenna elements labeled where '1A','1B','2A','2B','3A','3B','4A','4B' correspond to 'A','B','C','D','E','F','G','H' listed in the document.

Table C.1: Physical separation of active antennas measured from the feed points for EUT

	1A	1B	2A	2B	3A	3B	4A	4B
1A	/							
1B	210 mm	/						
2A	155 mm	143 mm	/					
2B	143 mm	155 mm	210 mm	/				
3A	194 mm	81 mm	73 mm	197 mm	/			
3B	81 mm	194 mm	197 mm	73 mm	210 mm	/		
4A	197 mm	73 mm	186 mm	95 mm	143 mm	155 mm	/	
4B	73 mm	197 mm	95 mm	186 mm	155 mm	143 mm	210 mm	/