

RF Exposure Estimation

1. Introduction

Applicant:	NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD.
Address:	No.168 Shengguang Road, Luotuo, Zhenhai, Ningbo ZHEJIANG, China
Product:	Connector Mini Bridge
FCC ID:	VYY1554EV01
Model No.:	DD1554E
Reference RF report #	709502230034-00A

2. B.2 Blanket 1 mW Blanket Exemption

According to KDB 447498 D04, The 1 mW Blanket Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance. The 1 mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph § 1.1307(b)(3)(ii)(A). The 1 mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

3. RF Exposure Evaluation

Per the test report included herein, for 433.92MHz

According to C63.10 Annex G

$$EIRP = pt \times gt = (E \times d)^2 / 30, \text{ so } pt = (E \times d)^2 / 30 \times gt$$

where

pt is the transmitter output power in watts

gt is the numeric gain of the transmitting antenna (dimensionless)

E is the electric field strength in V/m

d is the measurement distance in meters (m)

transmitter output power for 433.92MHz Function

Field strength (E):	67.55 (dBuV/m) = 0.0024(V/m)
Measurement distance (D):	3 (m)
Antenna Gain, typical (dBi):	0.79
Numerical gain of the transmit antenna (gt):	1.20
Transmitter output power (TP):	0.000001(W)
Transmitter output power (TP):	0.001(mW)

We used the maximum ERP/EIRP to perform RF exposure exemption evaluation.

	Evaluation method	Exempt Limit (mW)	Verdict
■	Blanket 1 mW Blanket Exemption	1mW	Yes
□	MPE-based Exemption (ERP)	7mW (ERP)	N/A
□	SAR-based Exemption (Pth)	3060mW	N/A

According to KDB 447498 D04 v01 Appendix E, the simultaneous transmission SAR test exemption should be addressed. Estimated SAR shall be used to determine simultaneous transmission SAR test exemption. $SAR_{est} = 1.6 \cdot P_{ant} / P_{th}$ [W/kg]. Where P_{ant} is maximum time-average power or ERP, whichever is greater. P_{th} is defined as in Formula (B.2)

$$ERP_{20cm} = 2040f = 2040 \cdot 0.43392 = 885.196mW \quad (0.3GHz \leq f < 1.5GHz) \quad (B.1)$$

$$P_{th} (mW) = ERP_{20cm} (d / 20)^X \quad (\text{for distance } d \leq 20cm) \quad (B.2)$$

$$\text{Where } X = -\log \left(\frac{60}{ERP_{20cm} \sqrt{f}} \right)$$

$$433.92MHz: P_{th}(mW) = 885.196 \cdot (0.5/20)^{-\log \left(\frac{60}{885.196 \sqrt{0.43392}} \right)} = 23.82mW$$

$$SAR_{est} = 1.6 \cdot 0.001 / 23.82 = 0.00006717 \text{ W/kg}$$

*Note: The Wi-Fi and Bluetooth modules have been certified by C2PC. (Date of Grant: 07/06/2023)
The change is: RF exposure is evaluated under portable condition.
The highest reported SAR for stand-alone transmission exposure conditions is 0.23 W/kg, respectively.*

According to KDB 447498 D04 v01 clause 2.2.3, This ratio is defined as $SPLSR = (SAR1 + SAR2)^{1.5} / R_i$, where SAR1 and SAR2 are the highest reported SAR or estimated SAR [Glossary] values for the two sources in the pair i, and R_i is their distance in millimeters.
When $SPLSR \leq 0.04$ (rounded to two decimal digits), for all antenna pairs in the configuration, then the device qualifies for 1-g SAR test exemption.

So, $SPLSR = (SAR1 + SAR2)^{1.5} / R_i = (0.00006717 + 0.23)^{1.5} / 15 = 0.0073$ less than 0.04 and the device qualifies for 1-g SAR test exemption.

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

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-----End of Test Report-----