

RF EXPOSURE REPORT

Equipment Under Test	1DIN AUDIO (RADIO+DAB+USB+BT)
Model Name	ARA-5290WF-E
Variant Model Name	-
FCC ID	2ARFV-ARA5290WFE
IC Number	24404-ARA5290WFE
Applicant	WORLDPLUS ELECTRONICS CO.,LTD
Manufacturer	WORLDPLUS ELECTRONICS CO.,LTD
Date of Test(s)	2020. 08. 26 ~ 2020. 09. 18
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Issue to	Issue by
WORLDPLUS ELECTRONICS CO.,LTD 29, Cheomdan venture-ro 40beon- gil, Buk-gu, Gwangju, Korea Tel.: +82-2-576-8217 Fax: +82-2-576-8218	MOVON Test Lab Co., Ltd 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Rep. of Korea Tel.: +82-31-338-8837 Fax: +82-31-338-8847

RF EXPOSURE

1. Regulation

The SAR exclusion table from RSS-102 issue 5 is reproduced below:

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤ 5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤ 300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of 50 mm
≤ 300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
<u>2450</u>	83 mW	123 mW	173 mW	235 mW	<u>309 mW</u>
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

RF EXPOSURE

1. Regulation

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Limits for Maximum Permissible Exposure: RF exposure is calculated.

Frequency Range	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm ²]	Averaging Time [minute]
Limits for General Population / Uncontrolled Exposure				
0.3 ~ 1.34	614	1.63	*(100)	30
1.34 ~ 30	824/f	2.19/f	*(180/f ²)	30
30 ~ 300	27.5	0.073	0.2	30
300 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1	30

f=frequency in MHz, *= plane-wave equivalent power density

MPE (Maximum Permissible Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad (\Rightarrow R = \sqrt{PG/4\pi S})$$

S = power density [mW/cm²]

P = Power input to antenna [mW]

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna [cm]

2. RF Exposure Compliance Issue

The information should be included in the user's manual:

This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

MPE Calculations : Bluetooth BDR

- Frequency Range : 2 402 MHz ~ 2 480 MHz
- Measured RF Output Power (Peak) : 3.96 dBm
- Target Power & Tolerance 2.00 dBm & $\pm$ 2.00 dB
(Maximum : 4.00 dBm & Minimum : 0.00 dBm)
- Maximum Peak Antenna Gain : 0.50 dBi
- Maximum Output Power for the Calculation : 4.00 dBm

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the
The MPE calculation for this exposure is shown below.

- EIRP = P + G = <u>4.00</u> dBm + <u>0.50</u> dBi = <u>4.50</u> dBm = <u>2.82</u> mW	- NOTE P : Max tuneup Power (dBm) G : Maximum Peak Antenna Gain (dBi)
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Power Density at the specific separation

- S = EIRP / (4 X R²π) = <u>2.82</u> / (4 X 20² X π) = <u>0.000 561</u> mW/cm²	- NOTE S : Maximum Power Density (mW/cm²) EIRP : Equivalent Isotropic Radiated Power (mW) R : Distance to the center of the radiation of the antenna (<u>20</u> cm)
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RF Exposure Compliance Issue

Therefore, EUT is not required the SAR Evaluation.

MPE Calculations : Bluetooth EDR

- Frequency Range : 2 402 MHz ~ 2 480 MHz
- Measured RF Output Power (Peak) : 4.83 dBm
- Target Power & Tolerance 4.50 dBm & $\pm$ 2.00 dB
(Maximum : 6.50 dBm & Minimum : 2.50 dBm)
- Maximum Peak Antenna Gain : 0.50 dBi
- Maximum Output Power for the Calculation : 6.50 dBm

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the
The MPE calculation for this exposure is shown below.

- EIRP = P + G = <u>6.50</u> dBm + <u>0.50</u> dBi = <u>7.00</u> dBm = <u>5.01</u> mW	- NOTE - P : Max tuneup Power (dBm) - G : Maximum Peak Antenna Gain (dBi)
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Power Density at the specific separation

- S = EIRP / (4 X R²π) = <u>5.01</u> / (4 X 20² X π) = <u>0.000 997</u> mW/cm²	- NOTE - S : Maximum Power Density (mW/cm²) - EIRP : Equivalent Isotropic Radiated Power (mW) - R : Distance to the center of the radiation of the antenna (<u>20</u> cm)
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RF Exposure Compliance Issue

Therefore, EUT is not required the SAR Evaluation.