

TYPE OF EXHIBIT:	MPE (Maximum Permissible Exposure) Calculation
FCC PART:	2.1091(d)(4)
IC PART:	
MANUFACTURER:	RITRON, INC.
MODELS:	RBS-477DMR
TYPE OF UNIT:	UHF DMR Digital / Analog 2-Way Desktop Radio
FCC ID:	AIERIT50-477DMR
IC ID:	1084A-RIT50477DMR
DATE:	November 20, 2020

DETERMINING MPE DISTANCE:

Because this product is used as a mobile device, an RF calculation can be done to determine maximum permissible exposure. The RBS-477DMR MPE is calculated at the maximum output power of 2.5W with the following 2 antennas:

AFB-1545 (included with radio)	-2 dBi gain
RAM-1545 (optional magnet-mount antenna)	2 dBi gain

The ERP must be converted to EIRP to simulate an isotropic radiator. Typical transmit duty cycles are between 5% and 10%. Over the 30 minute averaging period for General Population/Uncontrolled MPE limits, a 50% maximum duty cycle is reasonable, and will be used in the MPE calculations for this device. Since the unit is categorized as a mobile radio, a 50% duty cycle may be used, therefore $EIRP = 1.64 (ERP/2)$.

For the RBS-477DMR w/AFB-1545:	EIRP = 1.29 W
For the RBS-477DMR w/RAM-1545:	EIRP = 3.25 W

Power density is related to EIRP:

$S(W/m^2) = EIRP(W)/4\pi r^2$ where r is the distance from the source in meters. Solving for distance as a function of transmitter power and required power density per area we get:

$$r = \sqrt{(EIRP/4\pi S)}$$

The MPE (maximum permissible exposure) for a device operating in a General Population/Uncontrolled exposure environment is $f(MHz)/1500 \text{ mW/cm}^2$. Converting to W/m^2 , the limit becomes $f(MHz)/150 \text{ W/m}^2$. The MPE limit is substituted for S and EIRP is entered in the above equation.

Required antenna separation for AFB-1545 (included with radio)

Frequency (MHz)	EIRP (Watts)	Duty Cycle (%)	S limit (W/m ²)	Distance (cm)	Distance (in)
450.000	1.29	50	3.00	18.5	7.3
460.000	1.29	50	3.07	18.3	7.2
470.000	1.29	50	3.13	18.1	7.1

Required antenna separation for RAM-1545 (optional magnet-mount antenna)

Frequency (MHz)	EIRP (Watts)	Duty Cycle (%)	S limit (W/m ²)	Distance (cm)	Distance (in)
450.000	3.25	50	3.00	29.4	11.6
460.000	3.25	50	3.07	29.0	11.4
470.000	3.25	50	3.13	28.7	11.3

SIGNED:

Michael A. Pickard

Michael A. Pickard - Project Engineer

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RF WARNING STATEMENT:

The following statement appears in the User Manual regarding RF safety:

EXPOSURE TO RADIO FREQUENCY ENERGY

These products generate radio frequency (RF) energy when the PTT button on the front of the unit is depressed. The product has been evaluated for compliance with the maximum permissible exposure limits for RF energy at the maximum power rating of the unit when using antennas available from RITRON. Antennas other than those mentioned below have not been tested for compliance and may or may not meet the exposure limits at the distances given. Higher gain antennas are capable of generating higher fields in the strongest part of their field and would, therefore, require a greater separation from the antenna.

AFB-1545 (included with radio)	-2 dBi gain
RAM-1545 (optional magnet-mount antenna)	2 dBi gain

RBS-477DMR:

Using the AFB-1545 antenna (included with the product) in a vertical orientation at the 20 cm (7.9 inches) minimum expected separation distance and greater, the maximum RF exposure is well below the General Population/Uncontrolled limits. When using the RAM-1545 (optional magnet-mount antenna with 25' cable) in a vertical orientation a 29.4 cm separation distance is required. Antennas other than those available from RITRON have not been tested for compliance and may or may not meet the exposure limits at the distances given. Higher gain antennas are capable of generating higher fields in the strongest part of their field and would, therefore, require a greater separation from the antenna. This product is not to be used by the general public in an uncontrolled environment unless compliance with the Uncontrolled/General Population limits for RF exposure can be assured.

En utilisant l'antenne AFB-1545 (fournie avec le produit) dans une orientation verticale à la distance de séparation minimale prévue de 20 cm (7.9 pouces) et plus, l'exposition RF maximale est bien inférieure aux limites de la population générale / non contrôlées. Lors de l'utilisation de la RAM-1545 (antenne optionnelle à montage magnétique avec câble de 25 pi) dans une orientation verticale, une distance de séparation de 29.4 cm est requise. Les antennes autres que celles disponibles chez RITRON n'ont pas été testées pour leur conformité et peuvent ou non respecter les limites d'exposition aux distances indiquées. Les antennes à gain plus élevé sont capables de générer des champs plus élevés dans la partie la plus forte de leur champ et nécessiteraient donc une plus grande séparation de l'antenne. Ce produit ne doit pas être utilisé par le grand public dans un environnement non contrôlé, à moins que le respect des limites d'exposition aux RF pour la population non contrôlée / générale ne puisse être assuré.

To limit exposure to RF energy to levels below the limit, please observe the following:

- Use only the antenna(s) available from RITRON for these models. DO NOT operate the radio without an antenna.
- DO NOT transmit more than 50% of the time.
- When transmitting, make certain that the distance limits for the particular model in use are observed.
- DO NOT allow children to operate the radio.

When used as directed, this series of radios is designed to comply with the FCC and IC RF exposure limits for "Uncontrolled/General Population". In addition, they are designed to comply with the following Standards and Guidelines:

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR §§ 2 sub-part J.
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992.
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition.

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