



1601 North A.W. Grimes Blvd., Suite B
 Round Rock, TX 78665
 e-mail: info@ptitest.com
 (512) 244-3371 Fax: (512) 244-1846

1.0 Maximum Permissible Exposure Evaluation (Supplements the test report.)

The results of power measurement and intended use are compared to the RF exposure exemption criteria.

1.2 Criteria

Section Reference	Date
KDB 447498 D01 Mobile Portable RF Exposure v05r01	3 May 2017

1.3 Procedure

Measured peak power, calculated average, and spacing for the intended application are used to determine the maximum permissible exposure.

1.4 Exposure Calculation

This is an aircraft transponder which is mounted within the airframe with an installer-supplied antenna on the exterior of the aircraft surface. The modulation of the transmitted signal is OOK. The distance evaluated is 20 cm (200 mm) for uncontrolled exposure.

Table 1.4.1 Peak Power Measured In 10 MHz RBW, 50 MHz VBW

Measured Power (peak)	56.5 dBm or 446.7 Watts
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Table 1.4.2 Calculated Duty Cycle and Average Power

Measured Power (peak)	56.5 dBm or 446.7 Watts
Transmit Times (μs)	Per DO-181E: 500 Mode A/C, 50 Mode S replies, 6.2 Squitters/second
Total Transmit Time	7215 μs
Maximum Duty Cycle	0.72 %
Averaging Factor	$10 \log_{10} (0.72\%) = -21.4 \text{ dB}$ (Using transmission packet length.)
Modulation Average	-3 dB* (Modulation OOK duty cycle 50%).
Average Power	$P_{\text{peak}} + \text{Factor}_{\text{avg}} + \text{Modulation}_{\text{avg}} = 56.5 - 21.4 - 3 = 32.1 \text{ dBm}$ or 1622 mW

Table 1.4.3 Power Calculation for Exposure, Highest frequency 1090.0 MHz

Average Power dBm	Maximum Antenna Gain dBi	Calculated EIRP dBm	EIRP In Linear Terms mW
32.1	3.1*	35.2	3311

*The manufacturer does not supply antennas. Monopole is typical antenna type where monopole gain would be 2.19 dBi.)

$$S = \frac{Pwr_{avg} * Gain_{Antenna}}{4 * \pi * Distance_{Antenna}^2}$$

Find safe Distance for maximum exposure of $f/1500 = 1090/1500 = 0.73 \text{ mW/cm}^2$:

$\text{Distance}_{\text{safe}} = \sqrt{(P \cdot G / 4 \cdot \pi \cdot S)}$ given $Pwr_{avg} = 3311 \text{ mW}$, $\text{Gain} = 1^*$, $S = 0.73 \text{ mW/cm}^2$.
**Gain included in term P.*

$$\text{Distance}_{\text{safe}} = \sqrt{(3311 / 4 \cdot \pi \cdot 0.73)} = 19 \text{ cm.}$$

Find field density at 20 cm for General Population (uncontrolled) exposure:

$$\text{Limit } S = 1090/1500 = 0.73 \text{ mW/cm}^2.$$

$S = (P \cdot G) / (4 \cdot \pi \cdot [\text{Distance}]^2)$ given $Pwr_{avg} = 3311 \text{ mW}$, $\text{Gain} = 1^*$, $\text{Distance} = 20 \text{ cm}$.
**Gain included in term P.*

$$S = (3311) / (4 \cdot \pi \cdot [20 \text{ cm}]^2) = 0.66 \text{ mW/cm}^2$$

$$0.66 \text{ mW/cm}^2 < 0.73 \text{ mW/cm}^2$$

Therefore, the exposure meets the applicable FCC SAR exemption requirements.

Signed:



Eric Lifsey
