

## RF Exposure/Environmental Evaluation

The device (FCC ID: PII-RDS1000) being submitted by Vantage Controls is a wall switch that incorporates a low power frequency hopping spread spectrum transceiver. It operates in the 902-928 MHz ISM band. It has a monopole type antenna integrated into the device. In normal operation the antenna is a minimum of 2.5 cm from a person's body.

CFR 47 Section 1.310 specifies (A) Limits for Occupational/Controlled Exposures and (B) Limits for General Population/Uncontrolled Exposure. The limits in (B) are the most stringent, so these are what we will use in our calculation.

From CFR 47 Section 1.310 Table 1 (B):

For 300-1500 MHz the limit is given in  $\text{mW}/\text{cm}^2$  and is calculated from the following equation:  $\text{Frequency}/1500$   
For our frequency range (902-928 MHz) the worst case limit comes out to  **$0.6\text{mW}/\text{cm}^2$** .

The MPE distance will be calculated for the worst case of a 100% transmitter duty cycle, transmitter power of 15dBm (32mW), and less than 0dBi (1) antenna gain.

For an isotropic radiator, the surface area of a sphere can be used to determine the area over which the transceiver energy is radiated.

$$\text{Surface area of a sphere} = 4 * \pi * \text{radius}^2$$

In the case where there is an antenna gain, the worst-case energy density is increased by the antenna gain. In this case, the exposure level for a controlled environment can be calculated as follows:

$$\text{MPE distance} = ((\text{output power} * \text{duty cycle} * \text{antenna gain}) / (4 * \pi * \text{ExposureLimit}[\text{mw}/\text{cm}^2]))^{1/2}$$

For our device

$$\begin{aligned}\text{MPE distance} &= ((32 * 1 * 1) / (4 * \pi * 0.6))^{1/2} \\ &= \underline{\underline{2.06 \text{ cm}}}\end{aligned}$$

This is less than the normal separation distance from the user's body to the antenna. Also, in accordance with the instructions found in Table 1 on page 22 of the document **“Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields” Supplement C (Edition 97-01) to OET Bulletin 65 (Edition 97-01)**, no special instructions or warnings are required to ensure compliance with RF Exposure limits. The table referred to appears on the following page:

**Table 1. Applicable Methods to Ensure Compliance for Spread Spectrum Transmitters.**

<u>Transmitter or Device Type<sup>16</sup></u>	<u>EIRP<sup>17</sup></u>	<u>Applicable Methods to Ensure Compliance</u>
Cordless phone handsets and most other transmitters using monopole or dipole type antennas as an integral part of the device.	$\leq 0.3$ W at 915 MHz or $\leq 0.2$ W at 2450 MHz	These transmitters generally are not expected to exceed MPE limits ( $0.61 \text{ mW/cm}^2$ at 915 MHz and $1.0 \text{ mW/cm}^2$ at 2450 MHz); special instructions or warnings are normally not necessary to ensure compliance.
Cordless phone handsets and other transmitters that are carried next to the body of the user or operate at distances closer than approximately 5 cm to the body of users or nearby persons.	$> 0.3$ W at 915 MHz or $> 0.2$ W at 2450 MHz	Generally at above 300 mW EIRP (200 mW at 2450 MHz), the potential for exceeding MPE and/or SAR limits is dependent on the design of the antenna and device operating conditions.  Warning instructions and warning labels may be used to limit the exposure durations and/or conditions to ensure compliance. However, if manufacturers believe that such warning instructions and labels will not be effective in keeping persons at the specified distances necessary to ensure compliance, it may be necessary to demonstrate compliance with respect to SAR limits; especially when the output is greater than 400-500 mW EIRP.

---

<sup>16</sup> The applicable methods for ensuring compliance are divided into transmitter groups according to their output power levels.

<sup>17</sup> The EIRP indicated in the above table is the product of the maximum output power available at the antenna terminal of the transmitter, the gain of the antenna and the applicable duty factor described in this section. It is important that the normal usage conditions for the particular transmitter/antenna must be defined in order for the above procedures to be applicable.

Therefore, the Vantage RDSx (FCC ID: PII-RDS1000) complies with the FCC RF Exposure/Environmental Evaluation requirements.

It should be noted that the above calculations are based on absolute worst-case scenarios that will rarely occur in normal use. This is a Time-Division-Duplex system, so the transmitter duty cycle will never be 100%, and the transmitter power was measured during compliance testing to be slightly less than 15dBm (refer to the test report).

**Vantage Controls**  
**RDSx**  
**FCC ID: PII-RDS1000**  
**Antenna**

MFG	MODEL	FREQ	GAIN	TYPE	CONNECTOR
VANTAGE	VDA-0055	902-928	0dBi	OMNI	NONE(solder)

