Safety Warning Justification
BR-1022 Doppler Radar

Safety warning contained in the BR-1022 User Manual:

"Based on limits specified by the Federal Communication Commission (FCC) on Radio Frequency (RF) emissions in a general population environment, continued exposure to radiation should be avoided within 4.0 meters in front of the radar. Radiation levels outside this region fall within regulations of 1 mW/cm2 and are not considered safety hazards. When setting up the antenna, special care should be taken to avoid situations where the antenna radiates towards individuals. The antenna should be positioned such that bystanders are located behind the antenna. During antenna setup, the antenna power cord should be unplugged to avoid accidental hazardous exposures to radiations. Always turn the antenna transmitter off during periods of inactivity. Direct visual contact with the radar when transmitting should be avoided at all times."

The maximum permissible exposure for general population / uncontrolled situations is obtained as follow:

Radar Specifications

Transmitter Frequency: 10.525 GHz
Transmitter Power: 2.0 W
Max. Antenna Gain: 30 dBi

Limits for General Population/Uncontrolled Exposure

Frequency Range: 1500 – 100000 MHz
Power Density: 1 mW/cm^2 or 10 W/m^2
Averaging Time: 30 minutes

Based on the radar equation, the power density at a given distance can be calculated as follow:

$$\frac{10^{G/10} * P}{4 * \pi * R^2} = PD$$

where
- G is the antenna gain [dBi]
- P Transmitter Power [W]
- R Range [m]
- PD Power Density [W/m^2]

The minimum range for a safe exposure based on the radar specifications is given by:

$$R \geq \sqrt{\frac{10^{G/10} * P}{PD * 4 * \pi}} = \sqrt{\frac{10^{30/10} * 2.0}{10 * 4 * \pi}} = 3.98m$$

where
- G = 30 dBi
- P = 2.0 W
- PD = 10 W/m^2

Exposure to radiation should be avoided within 4.0 meters in front of the radar.