Antenna Spec
Flood Freeze Sensor

Rev 1, 02/02/2023

The device uses a wire antenna exhibiting a loop type structure and characteristics. The antenna is not accessible or changeable by the user. No modifications can be made to the radiating mechanism (antenna or tuning elements) by the user. The peak antenna gain is estimated to be -11.9 dBi.

Worksheet for peak antenna gain estimation :

Peak gain is estimated from the measured peak Electric field value in the lab of 96.3 dBuV/m. We use the following expressions to evaluate the peak antenna gain from the measured Electric field.

Power density at a given direction from a radiator :

$$P_d = \frac{P_T G_T}{4\pi r^2}$$

Here,
P_d: Power density in $\frac{W}{m^2}$
P_T: Power transmitted in W
G_T: Antenna Gain in that direction
r: Distance in (m)

Also, in terms of field strength, power density can be expressed as :

$$P_d = \frac{E^2}{Z}$$

Here,
E: Electric field strength in V/m
Z : Free space impedance (377 ohms)

Equating both the expressions above yields :

$$E = \frac{\sqrt{30 P_T G_T}}{r}$$

From measurement and conducted power, we have :
P_T: 13 dBm (0.02 W)
r : 3 m
E : 96 dBuV/m (0.0653 V/m) – peak value measured

So, evaluated peak gain of the antenna, $G_T = -11.9\ dBi$