RF Exposure Requirements

General information:

Device category: Marine Radar
Environment: Controlled Exposure

Devices that operate under Parts 80 and 90 are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use.

Antenna:

The manufacturer does specify an antenna to be used with this device.

This device has provisions for operation in ship board service.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Commercial ship		Narrow beam array	27

Operating configuration and exposure conditions:

Inherent in most radars of this type is the fact that a very narrow beam width antenna is used and the duty factor of the pulse is very short.. The transmitter is of the magnetron type and increased duty factor would destroy the vacuum tube. A second duty cycle correction factor can be taken for exposure to the RF field in 6 minutes based on the fact that the antenna rotates. Typical installation of this device is on a commercial shipping vessel and as such the radar and its antenna would not be mounted where the general public would be exposed. In the event the antenna does not rotate the RF is turned off

MPE Calculation:

The minimum separation distance is calculated as follows:

$$E(V/m) = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power density: } P_d(mW/cm^2) = \frac{E^2}{3770}$$

The limit for general controlled exposure environment above 1500 MHz is 5.0 mW/cm^2 .

Channel frequency: 3050 MHz
The mean power 40W Watts.
Antenna gain was taken as 26.2 dBi

$P := 40000$ mean power in mW

$Gi := 26.2$ Gain in dBi

$Gn := 10^{\left(\frac{Gi}{10}\right)}$

$Gn = 416.869$ Gain numeric

$f := 3050$ MHz

$D := 243.84$ cm

$\lambda := \left(\frac{29892}{3050}\right)$

$\lambda = 9.801$ centimeters

$R := \frac{(0.6 \cdot D^2)}{\lambda}$

$R = 3.64 \times 10^3$ Distance to center of radiation

$Slimit := \frac{(P \cdot Gn)}{(4 \cdot \pi \cdot R^2)}$

$Slimit = 0.1 \quad \frac{mW}{cm^2}$

$\Sigma Sexp*(texp) = Slimit*(tave)$

$\Sigma := Slimit \cdot 6$

$\Sigma = 0.601 \quad \frac{mW}{cm^2}$

Conclusion:

The device complies with the MPE requirements including any radiating structure, and any persons when normally operated.