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Hazards of Electromagnetic Radiation to Fuel, Ordnance, & Personnel (HERO, HERF, HERP) Calculations

for

R-1410 Radar

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GLOSSARY

AESA – active electronically scanned array
AFSEC – Air Force Safety Center
AVGAS – Aviation Gasoline
dBi – Decibel Isotropic
dBW – Decibel Watts
EIRP – Effective Isotropically Radiated Power
EMR – ElectroMagnetic Radiation
f – Frequency
HERF – Hazards of ElectroMagnetic Radiation to Fuel
HERO – Hazards of ElectroMagnetic Radiation to Ordnance
HERP – Hazards of ElectroMagnetic Radiation to Personnel
IAW – In accordance with
m – Meters
MHz – Megahertz
MOGAS – Motor Vehicle Gasoline
MPE – Maximum Permissible Exposure
MTI – Moving Target Indication
mW – Milliwatts
NAVAIR –Naval Air Systems Command
NAVSEA – Naval Sea Systems Command
RF – Radio Frequency
SSD – Safe Separation Distance
W – Watts

1.0 PURPOSE

This document summarizes the calculated for ElectroMagnetic radiation hazards of the R1410 radar.

1.1 R1410 Background

The R1410 radar is a pulse doppler, X-Band, fully AESA multi-domain radar. It provides state-of-the-art MTI surveillance, tracking and classification on air, land, and sea targets.

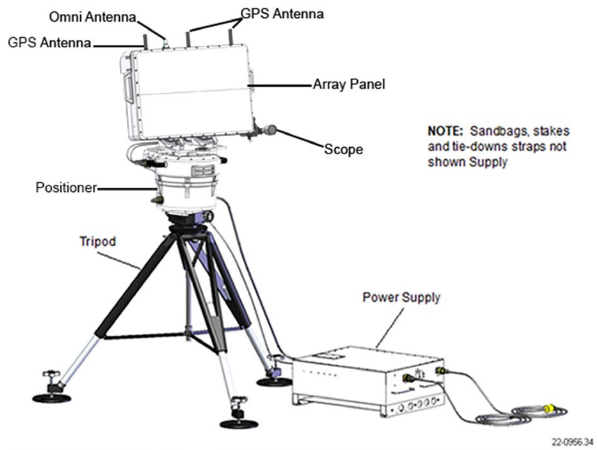


Figure 1. R1410 Components

The radar's operating X-Band frequencies range from 9300 MHz to 9800 MHz with 50 MHz channel separation.

The radar operates in either a stationary "stare mode" or in a spinning, 360 deg coverage mode. Non-transmitting, blanking sectors are available in either mode.

The peak transmitting power after losses is 512 W. Average transmit power, accounting for a conservative 10% duty factor is 51.3 W. The EIRP of the radar using the peak transmit power and transmit antenna gain of 30 dBi is 57.1 dBW.

The radar is normally emplaced on a tripod with a positioner or on a tower. The center height of the radar panel (peak transmit beam) is 1.83 m as depicted below.

Figure 2. Emitting Radar Panel Height

1.2 Radiation Hazard Equations

The following table shows the standards used for safe distance calculations and their applicability to either Personnel, Fuel, or Ordinance stand-off distances calculated in this document.

Table 1. RF Safety Standards

RF Safety Standard Reference	Applicability
FCC Bulletin OET-65	Personnel Safety Distance
IEEE C95.1-2019	Personnel Safety Distance
NAVSEA OP-3565/NAVAIR 16-1-529 Vol 2 (rev 16),	Fuel RF Safety Distance
NAVSEA OP-3565 Vol 1 (rev 7)	Ordnance RF Safety Distance
DAFMAN 91-208, 2025 edition	Ordnance RF Safety Distance

2.0 FCC OET-65 CALCULATIONS

The following equation was used to calculate both the minimum controlled and uncontrolled exposure safe distances for personnel.

$$Safe\ Distance = \sqrt{\frac{P_{T,AVG}G_A}{4\pi S}}$$

where:

$Safe\ Distance = \ minimum\ safe\ distance\ for\ personnel\ (meters),$

$P_{T,AVG} = \ the\ \boldsymbol{Average}\ Transmitted\ Power\ (watts),$

$G_A = \ the\ Antenna\ Gain\ (numeric),$

$S = \ the\ Power\ Density\ (\frac{\boldsymbol{W}}{\boldsymbol{m^2}}).$

The following figure is an excerpt of the FCC's OET-65, Appendix A, Table 1 where the Power Density values were selected for the safe distance calculation. The **Power Density value of 5 mW/cm² was converted to 50 W/m²** and the Power Density value of **1 mW/cm² was converted to 10 W/m²**.

Table 1. LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm²)	Averaging Time $\lvert E\rvert^2$, $\lvert H\rvert^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	$(900/f^2)$*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm²)	Averaging Time $\lvert E\rvert^2$, $\lvert H\rvert^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	$(180/f^2)$*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

NOTE 1: ***Occupational/controlled*** limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2: ***General population/uncontrolled*** exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Figure 3. Limits for Max. Permissible Exposure (MPE)

2.1 Minimum Personnel Safe Distance for Controlled and Uncontrolled Exposures

Table 2. Calculated Safe Distance for Controlled (Occupational) Exposure (FCC OET-65)

Frequency (MHz)	Transmitter Power Output $P_{T,AVG}$ (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	Power Density Controlled [occupational] (W/m^2)	FCC OET-65 Controlled Safe Distance (m)
9300	51.2	30	1000.0	50	9.0
9500	51.2	30	1000.0	50	9.0
9800	51.2	30	1000.0	50	9.0

Table 3. Calculated Safe Distance for Uncontrolled (General Public) Exposure (FCC OET-65)

Frequency (MHz)	Transmitter Power Output $P_{T,AVG}$ (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	Power Density Uncontrolled [General Public] (W/m^2)	FCC OET-65 Uncontrolled Safe Distance (m)
9300	51.2	30	1000.0	10	20.2
9500	51.2	30	1000.0	10	20.2
9800	51.2	30	1000.0	10	20.2

3.0 IEEE C95.1-2019 CALCULATIONS

The following equation was used to calculate both the restricted and unrestricted safe distances for personnel.

$$Safe\ Distance = \sqrt{\frac{P_{T,AVG} G_A}{4\pi S}}$$

where:

$Safe\ Distance =\ minimum\ safe\ distance\ for\ personnel\ (meters),$

$P_{T,AVG} =\ the\ \boldsymbol{Average}\ Transmitted\ Power\ (watts),$

$G_A =\ the\ Antenna\ Gain\ (numeric),$

$S =\ the\ Power\ Density\ (\frac{\boldsymbol{W}}{\boldsymbol{m^2}}), IAW\ IEEE\ C95.1 - 2019, Table\ 7\ or\ Table\ 8$

The following is an excerpt from IEEE C95.1-2019, Table 7 and Table 8, where the desired Power Density values were selected for the safe distance calculation.

Table 7—ERLs for whole-body exposure of persons in unrestricted environments (100 kHz to 300 GHz) [see Figure 3 for graphical representation]

Frequency range (MHz)	Electric field strength (E)[a,b,c] (V/m)	Magnetic field strength (H)[a,b,c] (A/m)	Power density (S)[a,b,c] (W/m²)		Averaging time (min)
			S_E	S_H	
0.1 to 1.34	614	$16.3 / f_M$	1000	$100\ 000 / f_M^2$	30
1.34 to 30	$823.8 / f_M$	$16.3 / f_M$	$1800 / f_M^2$	$100\ 000 / f_M^2$	30
30 to 100	27.5	$158.3 / f_M^{1.668}$	2	$9\ 400\ 000 / f_M^{3.336}$	30
100 to 400	27.5	0.0729	2		30
400 to 2000	—	—	$f_M / 200$		30
2000 to 300 000	—	—	10		30

NOTE—S_E and S_H are plane-wave-equivalent power density values, based on electric or magnetic field strength respectively, and are commonly used as a convenient comparison with ERLs at higher frequencies and are sometimes displayed on commonly used instruments.

[a] For exposures that are uniform over the dimensions of the body, such as certain far-field plane-wave exposures, the exposure field strengths and power densities are compared with the ERLs in Table 7. For more typical nonuniform exposures, the mean values of the exposure fields, as obtained by spatially averaging the plane-wave-equivalent power densities or the squares of the field strengths, are compared with the ERLs in Table 7. (See notes to Table 7 through Table 11 in 4.3.5.)

[b] f_M is the frequency in MHz.

[c] The E, H, and S values are those rms values unperturbed by the presence of the body.

Table 8—ERLs for whole-body exposure of persons permitted in restricted environments (100 kHz to 300 GHz) [see Figure 4 for graphical representation]

Frequency range (MHz)	Electric field strength (E)[a,b,c] (V/m)	Magnetic field strength (H)[a,b,c] (A/m)	Power density (S)[a,b,c] (W/m²)		Averaging time (min)
			S_E	S_H	
0.1 to 1.0	1842	$16.3 / f_M$	9000	$100\ 000 / f_M^2$	30
1.0 to 30	$1842 / f_M$	$16.3 / f_M$	$9000 / f_M^2$	$100\ 000 / f_M^2$	30
30 to 100	61.4	$16.3 / f_M$	10	$100\ 000 / f_M^2$	30
100 to 400	61.4	0.163	10		30
400 to 2000	—	—	$f_M / 40$		30
2000 to 300 000	—	—	50		30

NOTE—S_E and S_H are plane-wave-equivalent power density values, based on electric or magnetic field strength respectively, and are commonly used as a convenient comparison with ERLs at higher frequencies and are sometimes displayed on commonly used instruments.

[a] For exposures that are uniform over the dimensions of the body, such as certain far-field plane-wave exposures, the exposure field strengths and power densities are compared with the ERLs in Table 8. For more typical nonuniform exposures, the mean values of the exposure fields, as obtained by spatially averaging the plane-wave-equivalent power densities or the squares of the field strengths, are compared with the ERLs in Table 8. (See notes to Table 7 through Table 11 in 4.3.5.)

[b] f_M is the frequency in MHz.

[c] The E, H, and S values are those rms values unperturbed by the presence of the body.

Figure 4. Exposure Reference Levels

3.1 Minimum Safe Distances for Personnel in Restricted and Unrestricted Environments

Table 4. Calculated Safe Distance for Restricted Environment (IEEE C95.1-2019)

Frequency (MHz)	Transmitter Power Output $P_{T,AVG}$ (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	Power Density [Restricted Environment] (W/m^2)	IEEE C95.1-2019 Restricted Environment Safe Distance (m)
9300	51.2	30	1000.0	50	9.0
9500	51.2	30	1000.0	50	9.0
9800	51.2	30	1000.0	50	9.0

Table 5. Calculated Safe Distance for Unrestricted Environment (IEEE C95.1-2019)

Frequency (MHz)	Transmitter Power Output $P_{T,AVG}$ (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	Power Density [Unrestricted Environment] (W/m^2)	IEEE C95.1-2019 Unrestricted Environment Safe Distance (m)
9300	51.2	30	1000.0	10	20.2
9500	51.2	30	1000.0	10	20.2
9800	51.2	30	1000.0	10	20.2

4.0 NAVSEA OP 3565/NAVAIR 16-1-529 VOL 1 CALCULATIONS

The following equation was used to calculate safe distances for MOGAS and/or AVGAS.

$$Safe\ Distance = \sqrt{\frac{P_T G_A}{4\pi S}}$$

where:

$Safe\ Distance = \ minimum\ safe\ distance\ for\ personnel\ (meters),$
$P_T = \ the\ \boldsymbol{Peak}\ Transmitted\ Power\ (watts),$
$G_A = \ the\ Antenna\ Gain\ (numeric),$
$S = \ the\ Peak\ Power\ Density\ \left(\frac{\boldsymbol{W}}{\boldsymbol{m^2}}\right)$

The following is an excerpt from NAVSEA OP 3565/NAVAIR 16-1-529, Vol 1, para. 6-3.4, where the **Power Density value of 5 W/cm^2 converted to 50,000 W/m^2** was used for safe distance calculation.

6-3.4. Radar and communication systems which operate at or above 225 MHz, and which are capable of mainbeam illumination of fuel-handling areas with a peak power density of 5 W/cm^2 (5000 mW/cm^2) or greater, shall:

a. cease transmitting during fueling operations,

b. be inhibited from illuminating these areas by suitable cutout devices or operational procedures, or

c. be located a sufficient distance from fueling areas such that the power density (in the fueling area) is less than 5 W/cm^2.

Figure 5. NAVSEA OP 3565/NAVAIR 16-1-529 HERF Safe Distance Calculation

4.1 Minimum safe distances for fuel handling areas

The following table lists minimum safe distance results for fuel handling areas.

Table 6. Calculated Safe Distance for Fuel Handling (NAVSEA OP 3565/ NAVAIR 16-1-529)

Frequency (MHz)	Transmitter Power Output P_T (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	Peak Power Density Controlled [occupational] (W/m^2)	NAVSEA OP 3565 Fuel Handling Safe Distance (m)
9300	**512**	30	1000.0	50,000	0.903
9500	**512**	30	1000.0	50,000	0.903
9800	**512**	30	1000.0	50,000	0.903

5.0 NAVSEA OP 3565/NAVAIR 16-1-529 VOL 2 CALCULATIONS

5.1 HERO SUSCEPTIBLE ORDNANCE Calculation

The following equation was used to calculate safe distances for HERO SUSCEPTIBLE ORDNANCE.

$$Safe\ Distance = \mathbf{219} f^{-1} \sqrt{P_{T,AVG} G_A}$$

where:
$Safe\ Distance = \ minimum\ safe\ distance\ for\ personnel\ (meters),$
$P_{T,AVG} = \ the\ \boldsymbol{Average}\ Transmitted\ Power\ (watts),$
$G_A = \ the\ Antenna\ Gain\ (numeric),$
$f = \ the\ transmitting\ frequency\ (MHz)$

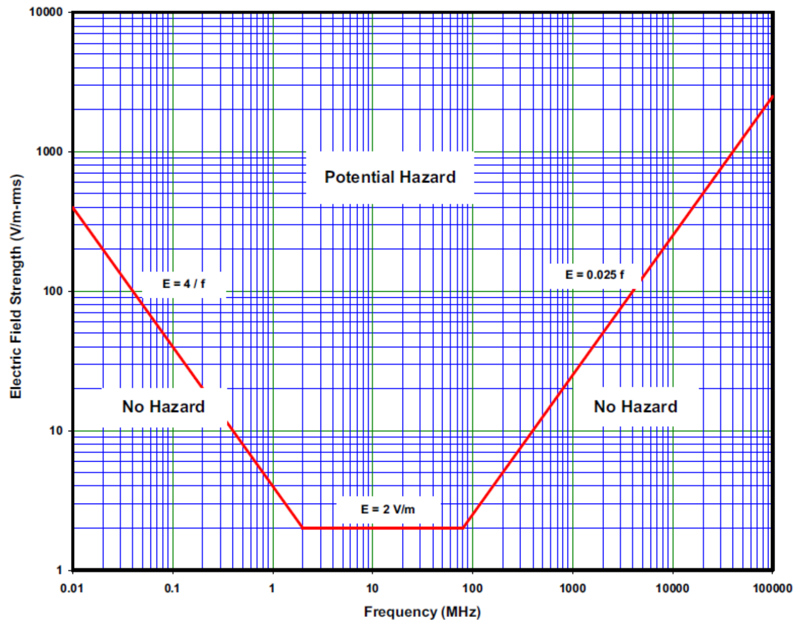
5.2 HERO UNSAFE ORDNANCE or UNRELIABLE ORDNANCE Calculation

The following equation was used to calculate safe distances for HERO UNSAFE OR HERO UNRELIABLE ORDNANCE.

$$Safe\ Distance = \mathbf{876} f^{-1} \sqrt{P_{T,AVG} G_A}$$

where:
$Safe\ Distance = \ minimum\ safe\ distance\ for\ personnel\ (meters),$
$P_{T,AVG} = \ the\ \boldsymbol{Average}\ Transmitted\ Power\ (watts),$
$G_A = \ the\ Antenna\ Gain\ (numeric),$
$f = \ the\ transmitting\ frequency\ (MHz)$

The following is an excerpt from NAVSEA OP 3565/NAVAIR 16-1-529, Vol 2, Figure 2-1, where the desired safe distance equation is directed IAW para. 2-2.1, Safe Field Strength/Distance Calculation for HERO SUSCEPTIBLE ORDNANCE.



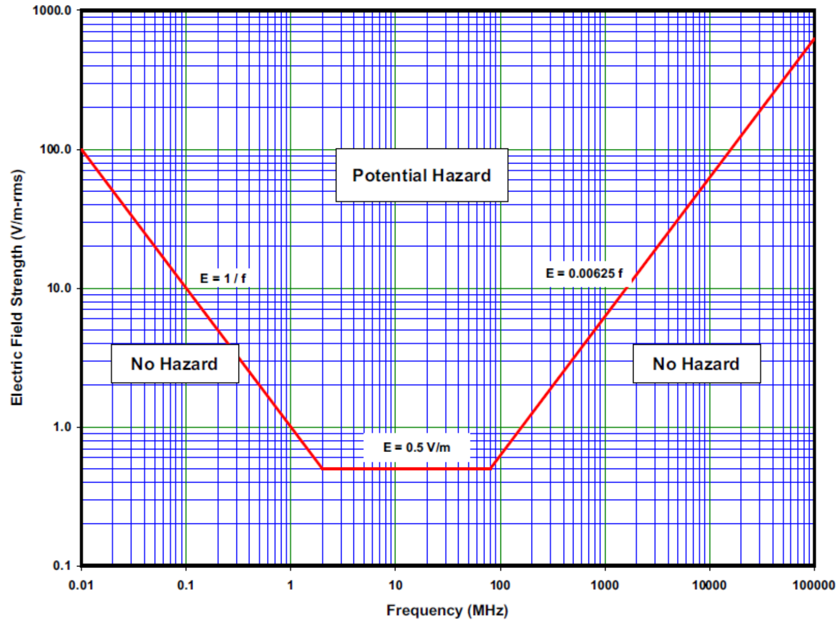
Frequency Ranges (MHz)	Distance Equations
$0.01 \leq f < 2.0$	$D = 1.37\ f\sqrt{PtGt}$ meters $D = 4.5\ f\sqrt{PtGt}$ feet
$2.0 \leq f < 80.0$	$D = 2.74\ \sqrt{PtGt}$ meters $D = 9\ \sqrt{PtGt}$ feet
$80.0 \leq f < 100,000$	$D = 219\ f^{-1}\sqrt{PtGt}$ meters $D = 718\ f^{-1}\sqrt{PtGt}$ feet

Where: D is the distance in the units designated.
P_t is the average power output of the transmitter in watts.
G_t is the numerical (far-field) gain ratio (not the dB value) of the transmitting antenna, derived as follows:
$G_t = 1 \times 10^{G/10}$ where
G = gain in dBi, and
f is the transmitting frequency in megahertz (MHz).

Notes:
1. The information above represents "worst-case" conditions for safe distance required.
2. Equations are provided with the proper numerical multipliers to yield distances in either meters or feet.
3. In cases where the computed safe separation distance is less than 3 meters (10 feet), refer to paragraph 7-3.1.16 and table 3-1 for guidance.

Figure 6. NAVSEA OP 3565 HERO SUSCEPTIBLE Safe Distance Calculation

The following is an excerpt from NAVSEA OP 3565/NAVAIR 16-1-529, Vol 2, Figure 2-2, where the desired safe distance equation is directed IAW para. 2-2.1, Safe Field Strength/Distance Calculation for HERO UNSAFE ORDNANCE or HERO UNRELIABLE ORDNANCE.



Frequency Ranges (MHz)	Distance Equations
$0.01 \leq f < 2.0$	$D = 5.5\, f\sqrt{PtGt}$ meters $D = 18\, f\sqrt{PtGt}$ feet
$2.0 \leq f < 80.0$	$D = 10.95\sqrt{PtGt}$ meters $D = 36\sqrt{PtGt}$ feet
$80.0 \leq f < 100,000$	$D = 876\, f^{-1}\sqrt{PtGt}$ meters $D = 2,873\, f^{-1}\sqrt{PtGt}$ feet

Where:
- D is the distance in the units designated.
- P_t is the average power output of the transmitter in watts.
- G_t is the numerical (far-field) gain ratio (not the dB value) of the transmitting antenna, derived as follows:
  - $G_t = 1 \times 10^{G/10}$ where
  - G = gain in dBi, and
- f is the transmitting frequency in megahertz (MHz)

Notes:
1. The information above represents "worst-case" conditions for safe distance required.
2. Equations are provided with the proper numerical multipliers to yield distances in either meters or feet.
3. In cases where the computed safe separation distance is less than 3 meters (10 feet), refer to paragraph 7-3.1.16 and table 3-1 for guidance.

Figure 7. NAVSEA OP 3565 HERO UNSAFE OR UNRELIABLE Safe Distance Calculation

5.2.1 Minimum safe distances for HERO SUSCEPTIBLE, HERO UNSAFE or HERO UNRELIABLE ORDNANCE

Table 7. Calculated HERO SUSCEPTIBLE ORDNANCE Safe Distance (NAVSEA OP 3565 / NAVAIR 16-1-529)

Frequency (MHz)	Transmitter Power Output $P_{T,AVG}$ (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	NAVSEA OP 3565 HERO SUSCEPTIBLE ORDNANCE Safe Distance (m)
9300	51.2	30	1000.0	5.33
9500	51.2	30	1000.0	5.22
9800	51.2	30	1000.0	5.06

Table 8. Calculated HERO UNSAFE ORDNANCE or HERO UNRELIABLE ORDNANCE Safe Distance (NAVSEA OP 3565 / NAVAIR 16-1-529)

Frequency (MHz)	Transmitter Power Output $P_{T,AVG}$ (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	NAVSEA OP 3565 HERO UNSAFE ORDNANCE or HERO UNRELIABLE ORDNANCE Safe Distance (m)
9300	51.2	30	1000.0	21.31
9500	51.2	30	1000.0	20.86
9800	51.2	30	1000.0	20.23

6.0 DAFMAN 91-208 CALCULATIONS

6.1 HERO SUSCEPTIBLE (Conventional Ordnance) Calculation

The following equation was used to calculate safe distances for HERO SUSCEPTIBLE ORDNANCE.

$$Safe\ Distance = \mathbf{718}f^{-1}\sqrt{P_{T,AVG}G_A}$$

where:
$Safe\ Distance = \ minimum\ safe\ distance\ for\ personnel\ (meters),$
$P_{T,AVG} = \ the\ \boldsymbol{Average}\ Transmitted\ Power\ (watts),$
$G_A = \ the\ Antenna\ Gain\ (numeric),$
$f = \ the\ transmitting\ frequency\ (MHz)$

6.2 HERO UNSAFE (Conventional Ordnance) Calculation

The following equation was used to calculate safe distances for HERO SUSCEPTIBLE ORDNANCE.

$$Safe\ Distance = \mathbf{2873}f^{-1}\sqrt{P_{T,AVG}G_A}$$

where:
$Safe\ Distance = \ minimum\ safe\ distance\ for\ personnel\ (meters),$
$P_{T,AVG} = \ the\ \boldsymbol{Average}\ Transmitted\ Power\ (watts),$
$G_A = \ the\ Antenna\ Gain\ (numeric),$
$f = \ the\ transmitting\ frequency\ (MHz)$

6.3 HERO UNSAFE (Nuclear Weapons) Calculation

The following equation was used to calculate safe distances for HERO SUSCEPTIBLE ORDNANCE.

$$Safe\ Distance = \mathbf{0.0925}\sqrt{P_{T,AVG}G_A}$$

where:
$Safe\ Distance = \ minimum\ safe\ distance\ for\ personnel\ (meters),$
$P_{T,AVG} = \ the\ \boldsymbol{Average}\ Transmitted\ Power\ (watts),$
$G_A = \ the\ Antenna\ Gain\ (numeric),$

The following figure is an excerpt from DAFMAN 91-208, para. 5.4., Safe Separation Distances (SSD) Requirements where the desired safe distance equation is directed IAW Table 5.4 AFSEC SSD Calculator Equations (feet) and Table 5.5 Minimum SSD Exceptions for HERO Certified Ordnance.

5.4. SSD Requirements.

5.4.1. EMR emitters must be maintained at a minimum 10 feet SSD from HERO SAFE ordnance. **(T-1)** Alternative SSDs may be authorized in accordance with the AFSEC/SEW approval for use memorandum, ordnance-specific technical orders, or when determined by the installation safety office through the AFSEC SSD calculator.

5.4.2. EMR emitters must maintain the appropriate SSD for HERO UNSAFE and SUSCEPTIBLE ordnance. **(T-1)** If relying on a RADHAZ survey, the E_{MAE} will not exceed the levels delineated in **paragraph 5.3** **(T-1)** Otherwise, use the AFSEC SSD calculator which uses the equations specified in **Table 5.4** and **Table 5.5**, where the effective isotropic radiated power (EIRP) is in Watts. The AFSEC SSD calculator is limited to frequencies specified. For frequencies not included request assistance from AFSEC/SEW.

Table 5.4. AFSEC SSD Calculator Equations (feet).

Conventional Ordnance			Nuclear Weapons	
Frequency Range (MHz)	HERO UNSAFE	HERO SUSCEPTIBLE	Frequency Range (MHz)	HERO UNSAFE
$0.01 \le f < 2$	$18f\sqrt{EIRP}$	$4.5f\sqrt{EIRP}$	$0.0132 < f$	$0.0925\sqrt{EIRP}$
$2 \le f < 80$	$36\sqrt{EIRP}$	$9\sqrt{EIRP}$	$0.0132 \le f < 8$	$7.01f\sqrt{EIRP}$
$80 \le f \le 100{,}000$	$\frac{2{,}873\sqrt{EIRP}}{f}$	$\frac{718\sqrt{EIRP}}{f}$	$8 \le f < 4{,}850$	$\frac{448.625\sqrt{EIRP}}{f}$
			$4{,}850 \le f < 45{,}000$	$0.0925\sqrt{EIRP}$

5.4.3. There are exceptions whereby EMR emitters are expected to be, or are required to be, closer than 10 feet to HERO certified ordnance. Their proximity to ordnance and low-powered EMR emitters requires a different technique for mitigating HERO. The AFSEC SSD calculator will determine SSDs less than 10 feet if the EMR emitter's characteristics meet the criteria set forth in **Table 5.5**.

Table 5.5. Minimum SSD Exceptions for HERO Certified Ordnance.

Minimum SSD (feet)	HERO Certification		
	SAFE	SUSCEPTIBLE	UNSAFE
5	$0.5 < EIRP \le 5$ All f	$EIRP \le 0.5$ $f \ge 100$ MHz	$0.025 < EIRP \le 0.1$ $200\text{ MHz} \le f < 1\text{ GHz}$
1	$0.1 < EIRP \le 0.5$ All f	$0.025 < EIRP \le 0.1$ $f \ge 200$ MHz	$0.025 < EIRP \le 0.1$ $f \ge 1$ GHz
0*	$EIRP \le 0.1$ All f	$EIRP \le 0.025$ All f	$EIRP \le 0.025$ $f \ge 100$ MHz

***WARNING: Do not touch antenna to ordnance.**

5.4.4. For multiple EMR emitters collocated, determine the SSD for each individual EMR emitter and if any emitter affects munitions operations, request a RADHAZ survey. **(T-1)**

Figure 8. DAFMAN 91-208 HERO UNSAFE and HERO SUSCEPTIBLE Safe Distance Calculation

6.3.1 Minimum safe distances for HERO SUSCEPTIBLE (Conventional Ordnance) HERO UNSAFE (Conventional Ordnance)

The following tables lists minimum safe distances results for HERO SUSCEPTIBLE (CONVENTIONAL ORDNANCE) and HERO UNSAFE (CONVENTIONAL ORDNANCE). The results were converted from feet to meters for consistency with the prior calculations.

Table 9. Calculated HERO SUSCEPTIBLE (Conventional Ordnance) Safe Distance (DAFMAN 91-208)

Frequency (MHz)	Transmitter Power Output P_T (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	DAFMAN 91-208 HERO SUSCEPTIBLE (Conventional Ordnance) Safe Distance (m)
9300	51.2	30	1000.0	5.32
9500	51.2	30	1000.0	5.21
9800	51.2	30	1000.0	5.05

Table 10. Calculated HERO SUSCEPTIBLE (Conventional Ordnance) Safe Distance (DAFMAN 91-208)

Frequency (MHz)	Transmitter Power Output P_T (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	DAFMAN 91-208 HERO UNSAFE (Conventional Ordnance) Safe Distance (m)
9300	51.2	30	1000.0	21.30
9500	51.2	30	1000.0	20.86
9800	51.2	30	1000.0	20.22

6.3.2 Minimum safe distances for HERO UNSAFE (Nuclear Weapons)

The following tables lists minimum safe distances results for HERO UNSAFE (NUCLEAR WEAPONS). The results were converted from feet to meters for consistency with the prior calculations.

Table 11. Calculated HERO UNSAFE (Nuclear Weapons) Safe Distance (DAFMAN 91-208)

Frequency (MHz)	Transmitter Power Output P_T (W)	Antenna Gain (dBi)	Antenna Gain (Numeric)	DAFMAN 91-208 HERO UNSAFE (Nuclear Weapons) Safe Distance (m)
9300	51.2	30	1000.0	6.38
9500	51.2	30	1000.0	6.38
9800	51.2	30	1000.0	6.38