Specification for NRL Shipboard Radomes

1 Metal Space Frame (MSF) Radomes

The following specifications/requirements apply to the five (5) MSF radomes that will be procured. These MSF radomes are intended for sustained shipboard use in harsh operating environments, as described in Section 3 of this document.

1.1 MSF Radome Physical Characteristics

The MSF radomes must consist of a hemispherical cap supported on a 10 foot (3.048 m) high cylindrical base (composed entirely of MSF radome panels), each having a minimum inside diameter of 17.50 feet (5.334 m). The maximum outside diameter of the radome should be no greater than 20.10 feet (6.126 m). Figure 1 shows the critical dimensions of the MSF radomes.

The MSF radome color should be white.

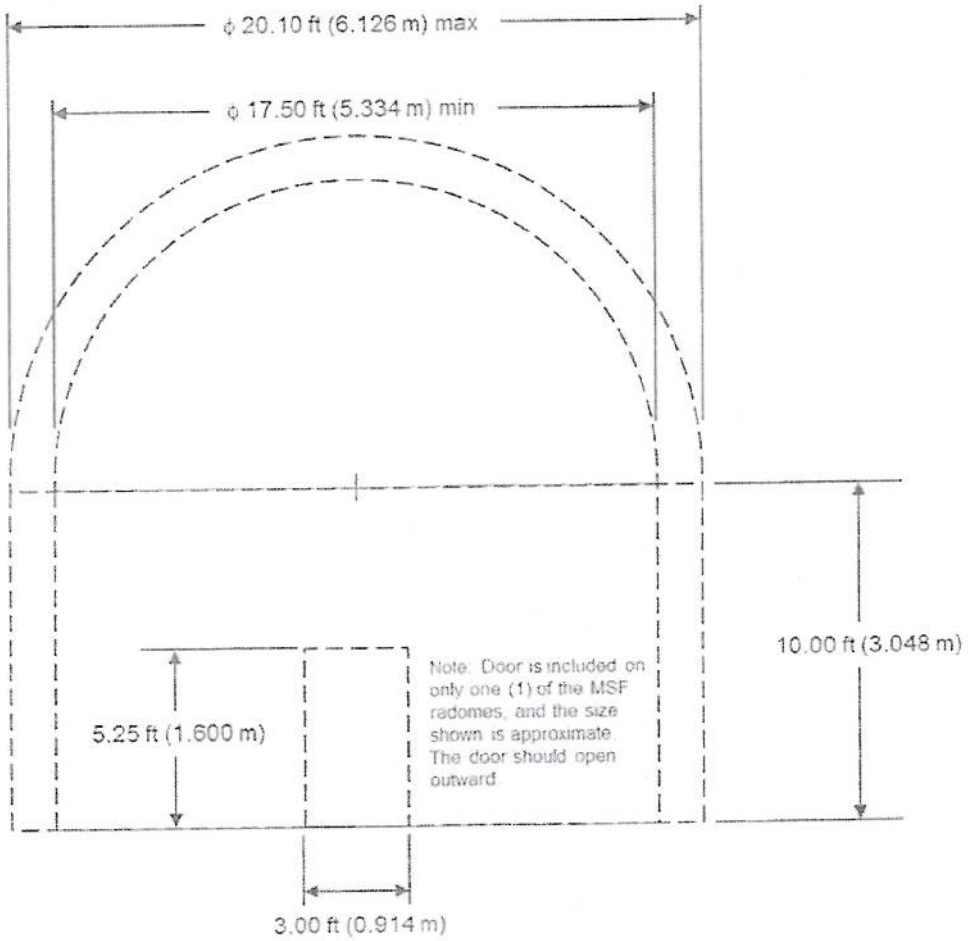

Figure 1: Metal Space Frame (MSF) Radome Critical Dimensions.

One (1) of the MSF radomes will require an access door to be supplied and integrated into the cylindrical base. The access door should be approximately 3 feet (0.914 m) wide and 5.25 feet (1.600 m) tall and should open outward.

The total weight of each MSF radome should not exceed 2200 lbs.

The proposed MSF radomes must interface with a pre-fabricated metal foundation plate ring (raised steel plate) that has an outside diameter of 20.10 feet (6.126 m) and an inside diameter of 18.46 feet (5.626 m). A drawing of the MSF radome foundation plate ring is shown in Fig. 2.

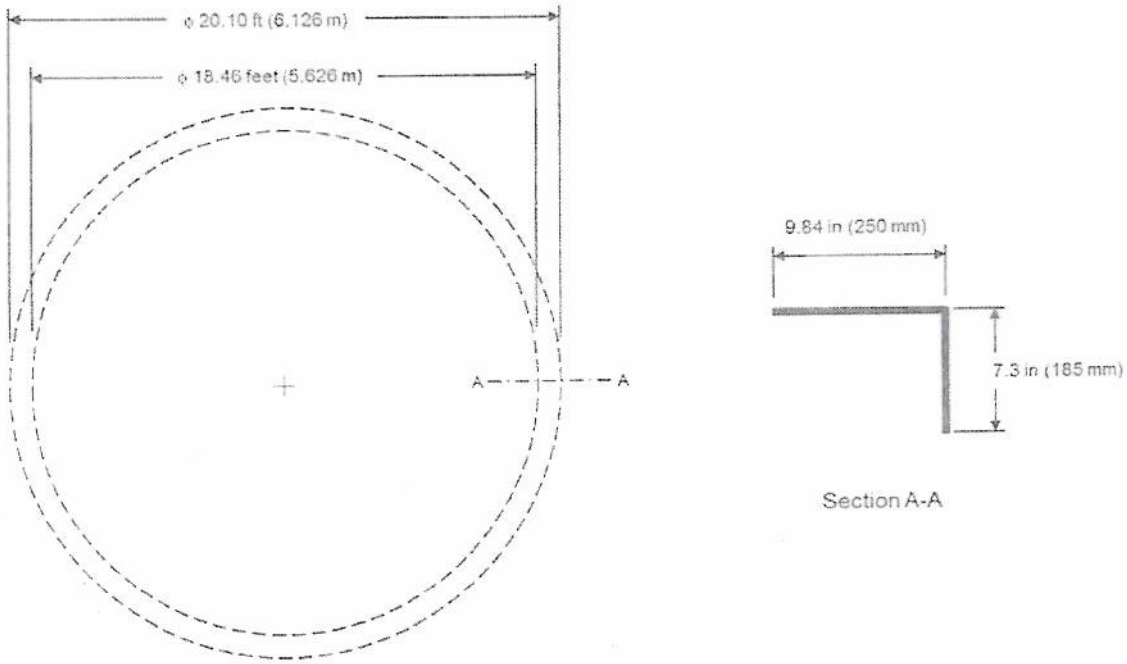

Figure 2: Pre-Fabricated Foundation Plate Ring for the MSF Radomes.

1.2 MSF Radome Electrical Performance

The MSF radomes will house a variety of high and moderate gain apertures, which are listed in Table 1. The proposed radomes should meet or exceed the mean and maximum transmission loss values listed in Table 1 for each of the specified apertures, assuming that each aperture is physically located at the center of the radome. Note that the mean and max transmission loss should be those calculated to occur at the worst case frequency and polarization (H or V) combination for each aperture's operating frequency range.

Table 1: MSF Radome Apertures and Transmission Loss Requirements

Aperture Type and Size (m)	Operating Frequency Range (GHz)	Mean Transmission Loss (dB)*	Max Transmission Loss (dB)*
LPA, 1.33 x 1.33	0.1 – 1.0 GHz	0.7	1.1
Dish, 3.0	1.0 – 12.0 GHz	0.7	0.8
Dish, 1.8	1.0 – 8.0 GHz	0.8	1.2
Dish, 1.2	8.0 – 18.0 GHz	1.2	2.1
Dish, 0.8	8.0 – 18.0 GHz	1.3	2.9
Dish, 0.6 m	18.0 – 40.0 GHz	2.2	4.3
Dish, 0.34 m	18.0 – 40.0 GHz	1.7	6.2

* Computed for worst case frequency and polarization (H or V) within frequency range of each aperture.

2 Sandwich Radome and Base Ring

The following specifications/requirements apply to the single (1) sandwich composite radome and base ring that will be procured as two separate items. This sandwich radome and associated base ring is intended for sustained shipboard use in harsh operating environments, as described in Section 3 of this document.

2.1 Sandwich Radome Physical Characteristics

The sandwich radome must be spherical with an 87 percent truncation and have a minimum inside diameter of 26.80 feet (8.169 m). The maximum diameter of the radome should be no greater than 27.10 feet (8.260 m). Figure 3 illustrates the physical constraints placed upon the sandwich radome.

The sandwich radome color should be white.

The total weight of the truncated sandwich radome should not exceed 2500 lbs.

The truncated sandwich radome may or may not be mounted on the base ring described in Section 2.2, thus the base of the radome must interface with a pre-fabricated metal foundation plate ring (raised steel plate) that has an outside diameter of 18.05 feet (5.502 m) and an inside diameter of 16.08 feet (4.902 m). A drawing of the sandwich radome foundation plate ring is shown in Fig. 4.

2.2 Base Ring to Support Sandwich Radome

The truncated sandwich radome described in Section 2.1 must be supported upon a base ring that is 3.50 feet (1.067 m) in height in order to bring the center of the spherical radome to the desired height of 13.5 feet (4.115 m). The base ring must be constructed to withstand the combined loadings of itself and the supported sandwich radome in response to the environmental (wind/snow/ice) described in Section 3.

The top of the proposed base ring must interface with the truncated sandwich radome described in Section 2.1 and its bottom must interface with a pre-fabricated metal foundation plate ring (raised steel plate) that has an outside diameter of 18.05 feet (5.502 m) and an inside diameter of 16.08 feet (4.902 m). A drawing of the sandwich radome foundation plate ring is shown in Fig. 4.

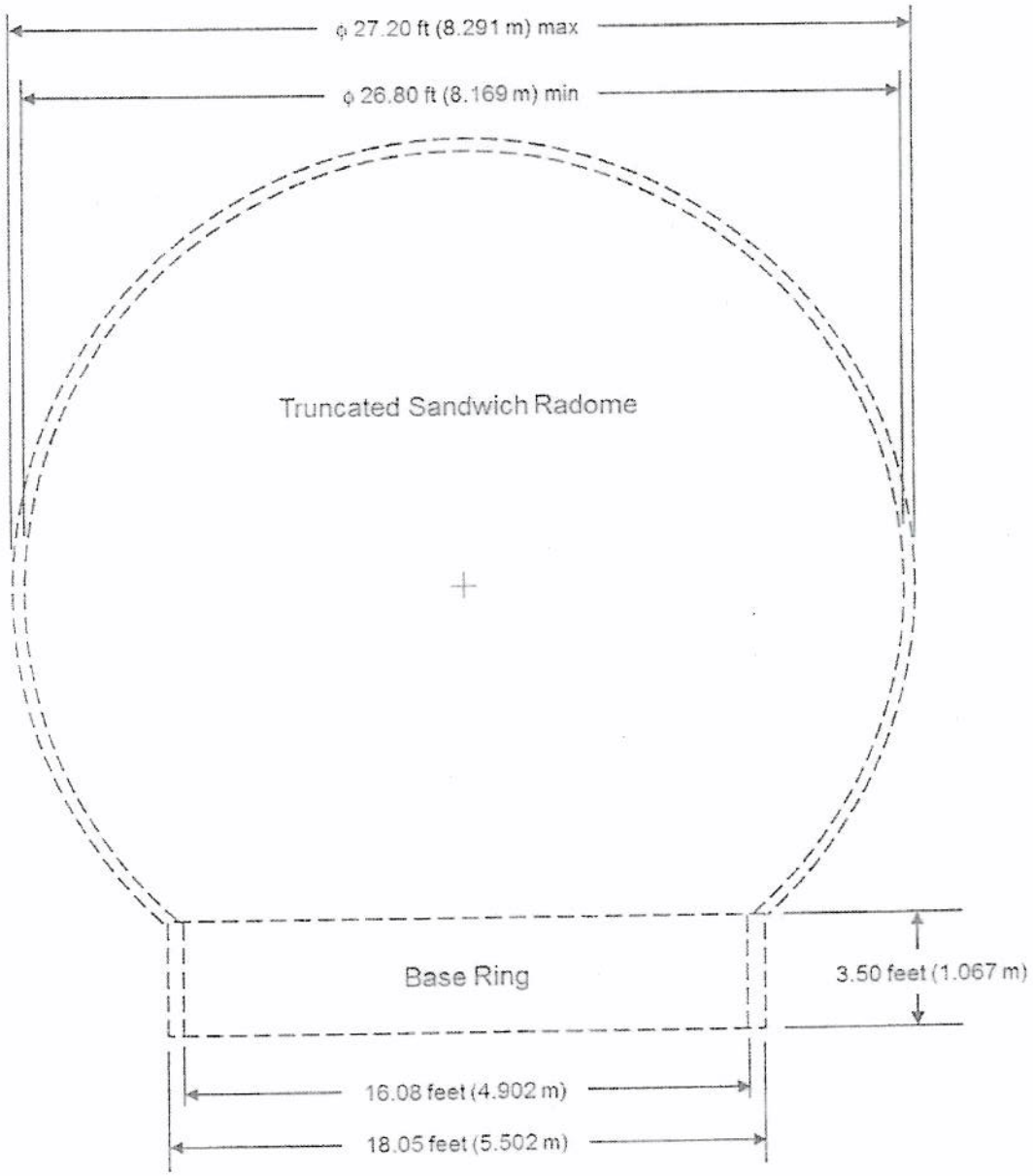

Figure 3: Truncated Sandwich Radome and Base Ring Critical Dimensions

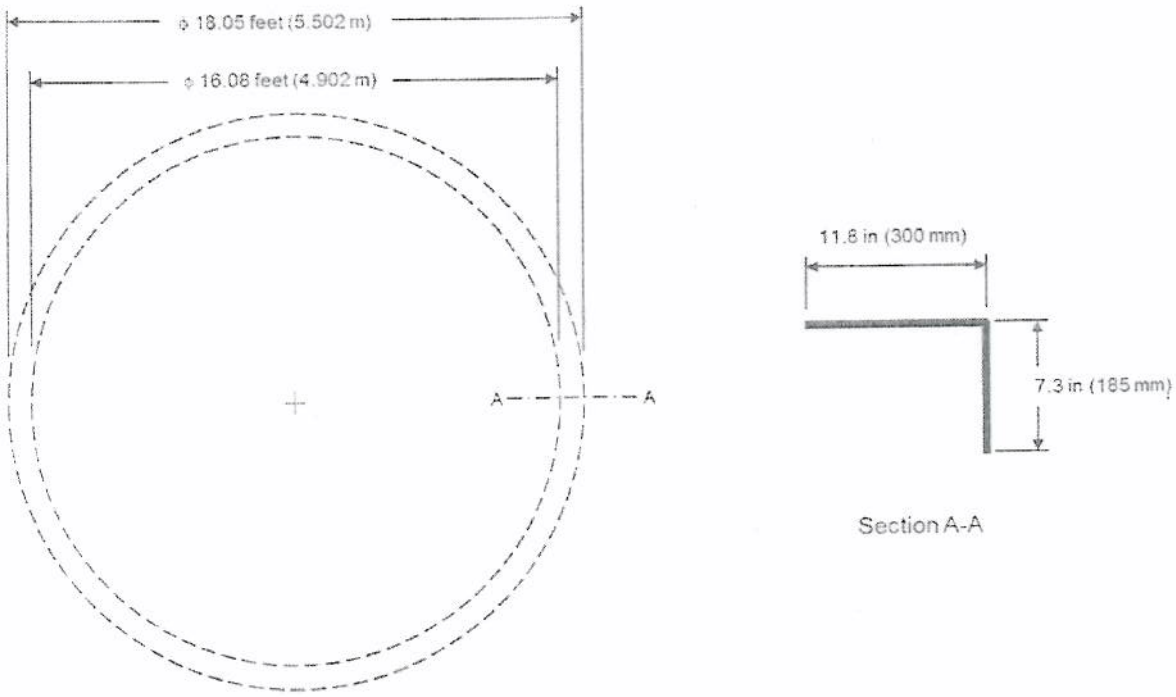

Figure 4: Pre-Fabricated Foundation Plate Ring for Sandwich Radome and Base Ring.

2.3 Truncated Sandwich Radome Electrical Performance

The truncated sandwich radome will house three low and moderate gain apertures, which are listed in Table 2. The proposed sandwich radome should meet or exceed the mean and maximum transmission loss values listed in Table 2 for each of the specified apertures, assuming that each aperture is physically located at the center of the radome. Note that the mean and max transmission loss should be those calculated to occur at the worst case frequency and polarization (H or V) combination for each aperture's operating frequency range.

Table 2: Sandwich Radome Apertures and Transmission Loss Requirements

Aperture Type and Size (m)	Operating Frequency Range (GHz)	Mean Transmission Loss (dB)*	Max Transmission Loss (dB)*
LPA Array, 2.66 x 2.66	0.1 – 1.3 GHz	0.08	0.08
Dish, 0.9	1.0 – 8.0 GHz	0.6	0.9
Dish, 0.34	8.0 – 18.0 GHz	2.2	4.1

* Computed for worst case frequency and polarization (H or V) within frequency range of each aperture.

3 Environmental Conditions

The MSF and sandwich radome/base ring structures shall meet, without damage, any or all of the environmental conditions listed in Table 3.

Note that there is no green water requirement to be met.

Table 3: Environmental Conditions to be Met.

Category	Environmental Condition	Note
Wind	Maximum sustained wind speed of at least 100 knots	Wind speed measured at the top of the radome
Wind	Gusts up to at least 113 knots	Wind speed measured at the top of the radome
Temperature	-30 °C to + 40 °C	
Relative Humidity	20% to 100% (condensing)	
Salinity in Air	At least 2.5%	
Precipitation	Up to at least 18 pounds per square foot	any combination of ice and snow