

RF PROPERTIES OF STANDARD AND ODD-SIZE S-BAND WAVEGUIDES

The choice of the proper waveguide cross-section for the 50 ft runs linking each klystron to the corresponding accelerator section must be based on rf, vacuum, mechanical and cost considerations. The rf properties are given below for standard and odd-size S-band waveguides.

<u>Standard S-Band Waveguide</u>	<u>Odd-Size S-Band Waveguide</u>
$a = 2.840"$	$a = 3.900"$
$b = 1.340"$	$b = 1.950"$
$f_c = 2080 \text{ Mc/sec}$	$f_c = 1514 \text{ Mc/sec}$
$\lambda_g = 15.32 \text{ cm at } 2856 \text{ Mc/sec}$	$\lambda_g = 12.40 \text{ cm at } 2856 \text{ Mc/sec}$
$R_s = 1.395 \times 10^{-2} \text{ ohms}$	$R_s = 1.395 \times 10^{-2} \text{ ohms}$

Attenuation of TE₁₀ Mode at 2856 Mc/sec

$\alpha = 2.38 \times 10^{-3} \text{ nep/m}$	$\alpha = 1.124 \times 10^{-3} \text{ nep/m}$
$\alpha = 2.067 \times 10^{-2} \text{ db/m}$	$\alpha = 9.763 \times 10^{-3} \text{ db/m}$
$\alpha = 6.30 \times 10^{-3} \text{ db/ft}$	$\alpha = 2.976 \times 10^{-3} \text{ db/ft}$

Attenuation of Higher Modes

TE ₀₁ $\alpha = 610 \text{ db/m}$	TE ₀₁ $\alpha = 312 \text{ db/m}$
TM ₁₁ $\alpha = 703 \text{ db/m}$	TM ₁₁ $\alpha = 338 \text{ db/m}$
TE ₁₁ $\alpha = 703 \text{ db/m}$	TE ₁₁ $\alpha = 338 \text{ db/m}$

Phase Shift Change in Degrees per °C Change for 50 ft Length

$\delta\phi = 1.23^\circ/^\circ\text{C}$	$\delta\phi = 0.92^\circ/^\circ\text{C}$
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Average Heat Dissipation in 50 ft Length

$P_{in} = 6 \text{ Mw } \Delta P = 2.78 \times 10^{-3} \frac{\text{cal}}{\text{cm}^2}$	$P_{in} = 6 \text{ Mw } \Delta P = 0.97 \times 10^{-3} \frac{\text{cal}}{\text{cm}^2}$
$P_{in} = 24 \text{ Mw } \Delta P = 11.1 \times 10^{-3} \frac{\text{cal}}{\text{cm}^2}$	$P_{in} = 24 \text{ Mw } \Delta P = 3.87 \times 10^{-3} \frac{\text{cal}}{\text{cm}^2}$