AD-VANCE MAGNETICS, INC.

ISO 9001:2008 Certified Company

Calculations To Assist With Shield Design

Design:

1 (g) = Attenuation

Ho = Field intensity outside
Hin = Field intensity inside } Measured in oersteds

Where $g = \frac{Ho}{Hin}$

2 S.E. = Shielding efficiency in dBs

$S.E. = 20 \log_{10} g$

3 $\% \text{ Shielding} = \left(1 - \frac{1}{g}\right) 100$

4 Definitions:

Field:

Strength (H), in oersteds (lines/cm^2 in Air)

Flux Density (B), in gauss flux density in material (lines/cm^2)

Shield Material:

Permeability (μ), a ratio measure of material's capability to conduct magnetic lines of force or flux mu = B/H

Magnetic Saturation Level: The flux level at which the material can no longer conduct any additional lines of force.

Reluctance (R), measure of material's resistance to the passage of magnetic flux.

$$R = \frac{1}{\mu A}$$

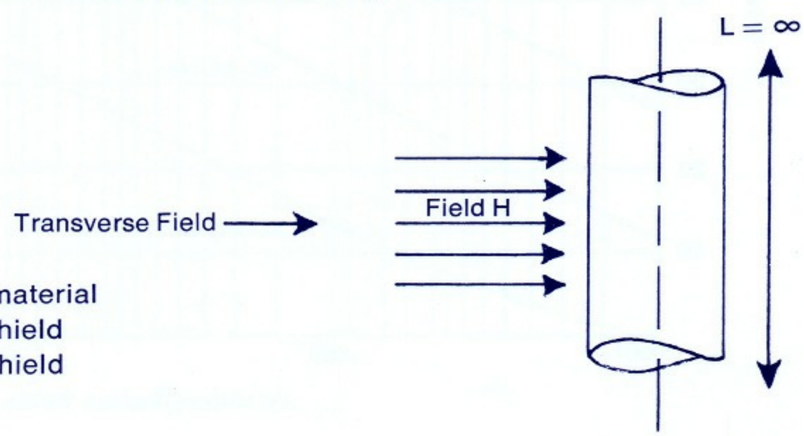
1 = flux path length (CM)

A = cross sectional area (CM^2)

5 Design Calculations

(A) Uniform DC field

$$g = \left(\frac{\mu}{4}\right)\left(1 - \frac{a^2}{b^2}\right)$$



Where: μ = permeability of material

a = inner radius of shield

b = outer radius of shield

Calculations To Assist With Shield Design

Substituting (b − T) for a (where T = material thickness) and simplify, we obtain

$$g = \left(\frac{\mu}{4}\right) \left(\frac{T}{b}\right) \left(2 - \frac{T}{b}\right) \approx \frac{\mu T}{2b}$$

Shielding effectiveness depends only on the permeability of the material and the ratio of wall thickness to outer radius. The above holds true for cylinders with a length to diameter ratio of 4 or more.

(B) AC Field

Designing for a DC field provides a maximized shield in AC fields of equal density (AC peak).

(C) Shield Geometry

Multiple Layer Shields should have an air gap of approximately .020 to .030″ or material thickness whichever is the greater.