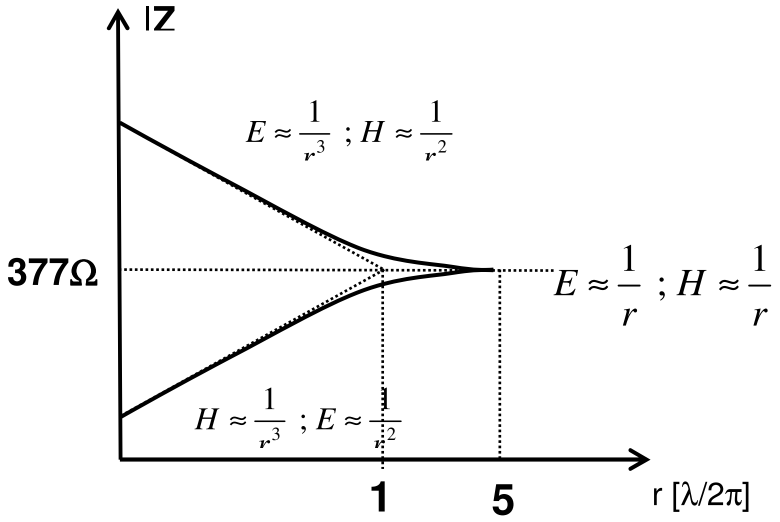
BLINDAJES:

- ABSORCIÓN DENTRO DEL MATERIAL.
- REFLEXIÓN.

Impedancia de una onda



$$Z_w = \frac{E}{H}$$

Impedancia característica de un medio

$$Z_0 = \sqrt{\frac{jw\mu}{\sigma + j\omega\xi}}$$

$$Cu = 3,68 \cdot 10^{-7}\sqrt{f}$$
$$Al = 4,71 \cdot 10^{-7}\sqrt{f}$$
$$Fe = 3,68 \cdot 10^{-5}\sqrt{f}$$
$$\mu met = 3 \cdot 10^{-4}\sqrt{f}$$

Para un aislador ($\sigma << j\omega\varepsilon$) : $Z_0 = \sqrt{\frac{\mu}{\xi}}$

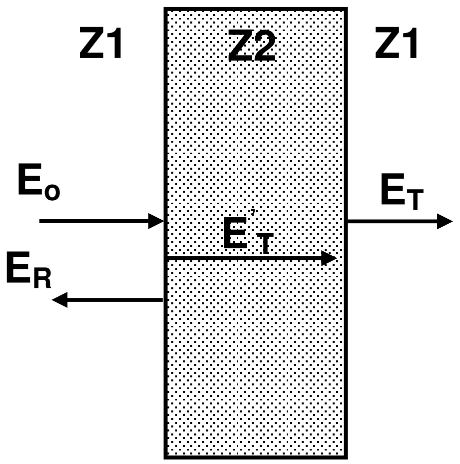
En general:

Para un conductor ($\sigma >> j\omega\varepsilon$) : $|Z_0| = \sqrt{\frac{w\mu}{\sigma}}$

$$|Z_{SH}| = 3,68 \cdot 10^{-7}\sqrt{f}\sqrt{\frac{\mu_r}{\varepsilon_r}}$$

(relativo a Cu)

ATENUACIÓN POR REFLEXIÓN (R): DEPENDE DE LA DIFERENCIA DE IMPEDANCIA DE LA ONDA (O CAMPOS E Y H) DENTRO Y FUERA DEL MATERIAL.



$$E'_T = \frac{2Z_2}{Z_1 + Z_2} E_0 \quad ; \quad H'_T = \frac{2Z_1}{Z_1 + Z_2} H_0$$

$$E_T = \frac{4Z_1 Z_2}{(Z_1 + Z_2)^2} E_0 \quad ; \quad H_T = \frac{4Z_1 Z_2}{(Z_1 + Z_2)^2} H_0$$

Si $Z_1 >> Z_2$

$$E_T(H_T) = \frac{4Z_2}{Z_1} E_0(H_0)$$

En el vacío: $Z_0 = 377\Omega$ $\mu = 4\pi.10^{-7}$ [Hy/m]

$\varepsilon = 8{,}85.10^{-12}$ [F/m]

| Zs| de algunos materiales comunmente utilizados:

Cu= $3{,}68.10^{-7}\sqrt{f}$

Al= $4{,}71.10^{-7}\sqrt{f}$

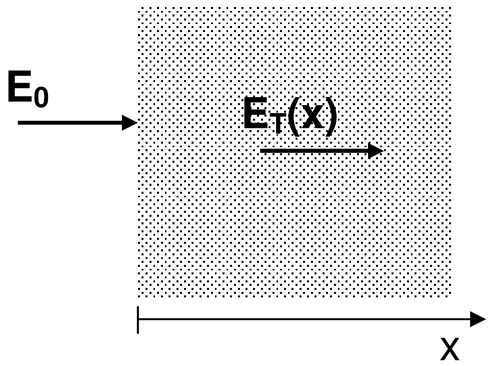
Fe= $3{,}68.10^{-5}\sqrt{f}$

µmetal= $3.10^{-4}\sqrt{f}$

$$\boxed{R = 20\log\frac{Z_w}{Z_S}}$$

$$R[db] = 20\log\frac{E_0}{E_T}$$

ATENUACIÓN POR ABSORCIÓN:



$$E_T(x) = E_0.e^{-\frac{x}{\delta}}$$

$$\delta = \sqrt{\frac{2}{\omega\mu\delta}} \text{ [m]}$$

$$A[db] = 20\log\frac{E_0}{E_T}$$

$$\boxed{A = 8,69\frac{d}{\delta} \text{ [db]}}$$

Table 6-2 Skin Depths of Various Materials

Frequency	Copper (in.)	Aluminum (in.)	Steel (in.)	Mumetal (in.)
60 Hz	0.335	0.429	0.034	0.014
100 Hz	0.260	0.333	0.026	0.011
1 kHz	0.082	0.105	0.008	0.003
10 kHz	0.026	0.033	0.003	—
100 kHz	0.008	0.011	0.0008	—
1 MHz	0.003	0.003	0.0003	—
10 MHz	0.0008	0.001	0.0001	—
100 MHz	0.00026	0.0003	0.00008	—
1000 MHz	0.00008	0.0001	0.00004	—

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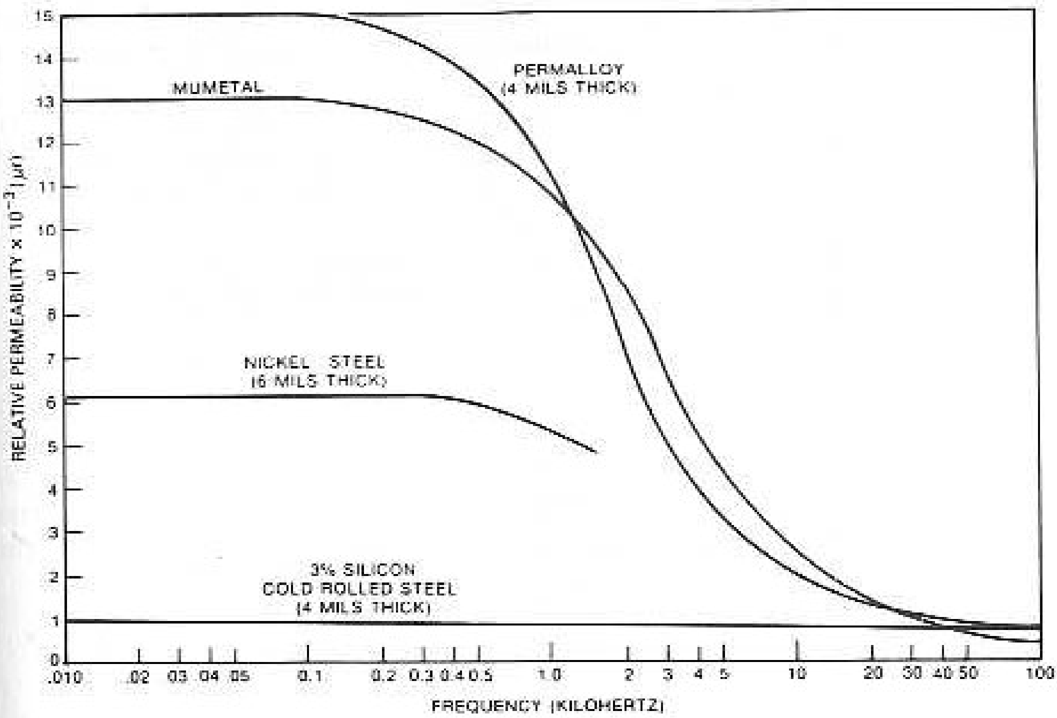

Figure 6-19. *Relation between permeability and frequency for various magnetic materials.*

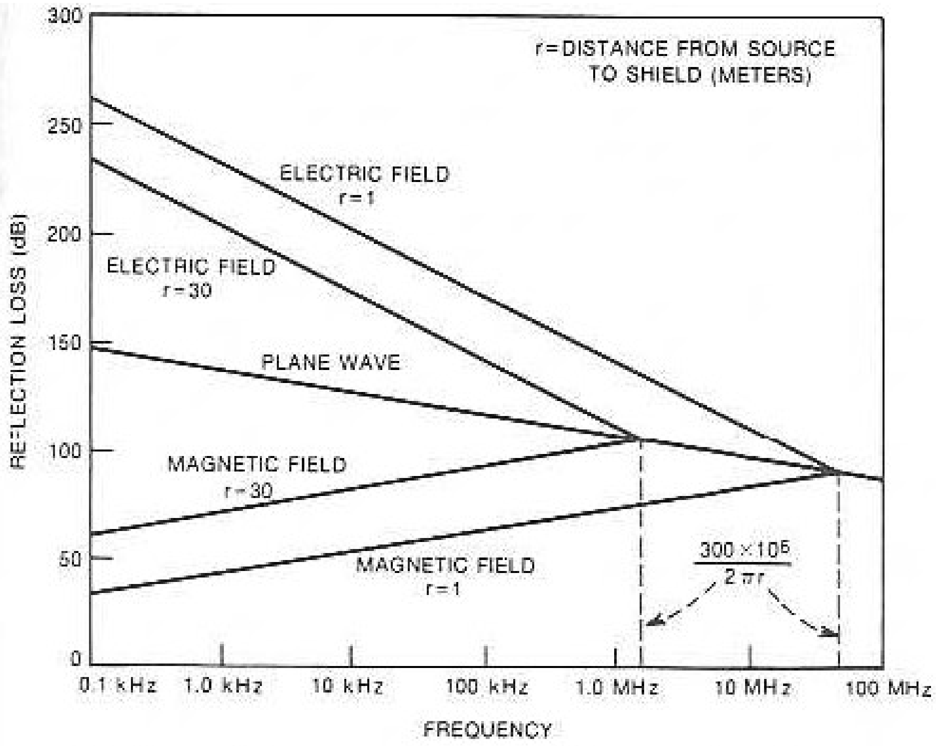

Figure 6-12. *Reflection loss in a copper shield varies with frequency, distance from the source, and type of wave.*

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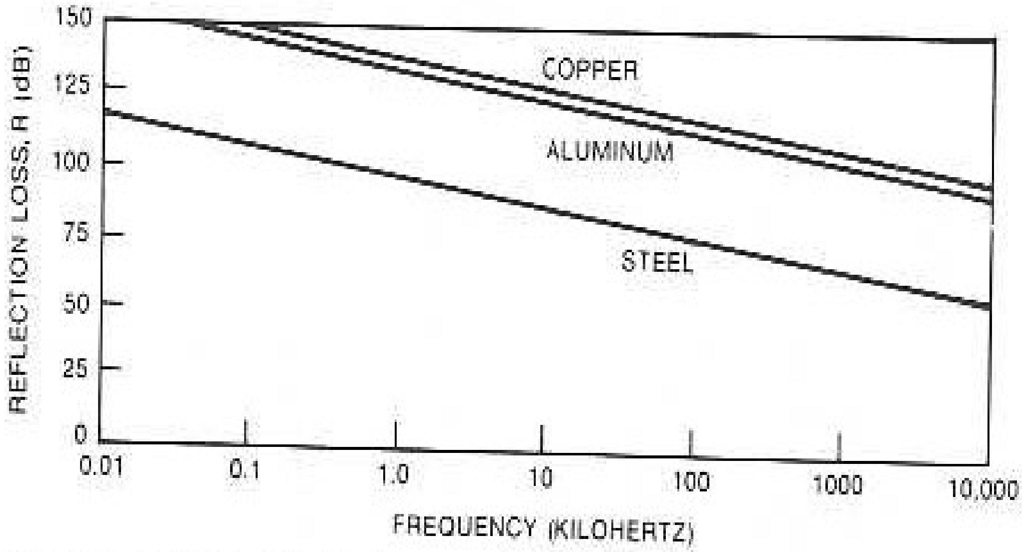

Figure 6-11. *Reflection loss for plane waves is greatest at low frequencies and for high conductivity material.*

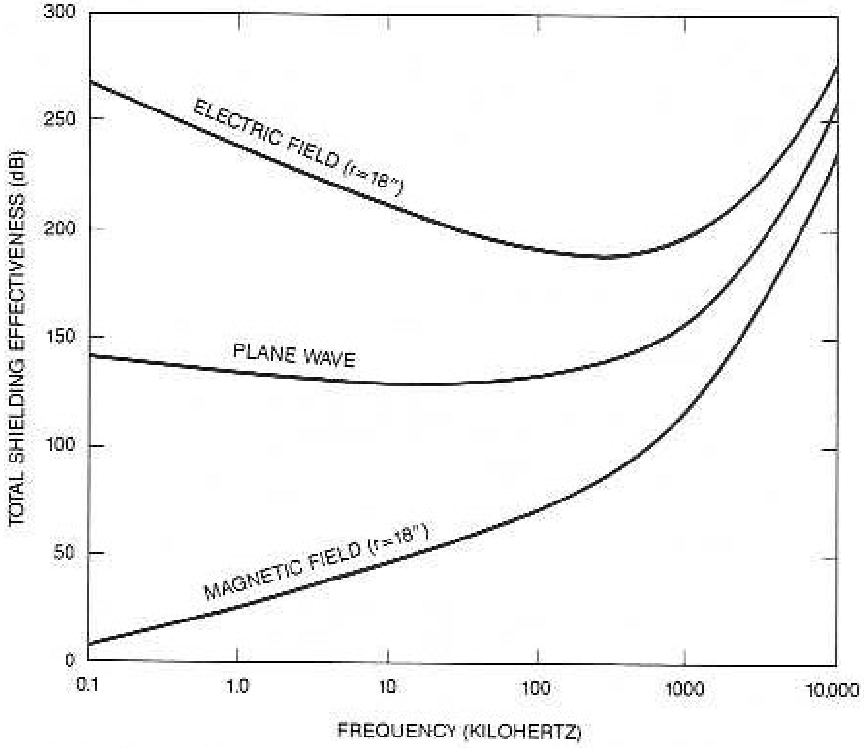

Figure 6-17. *Electric field, plane wave, and magnetic field shielding effectiveness of a 0.02-in. thick solid aluminum shield.*

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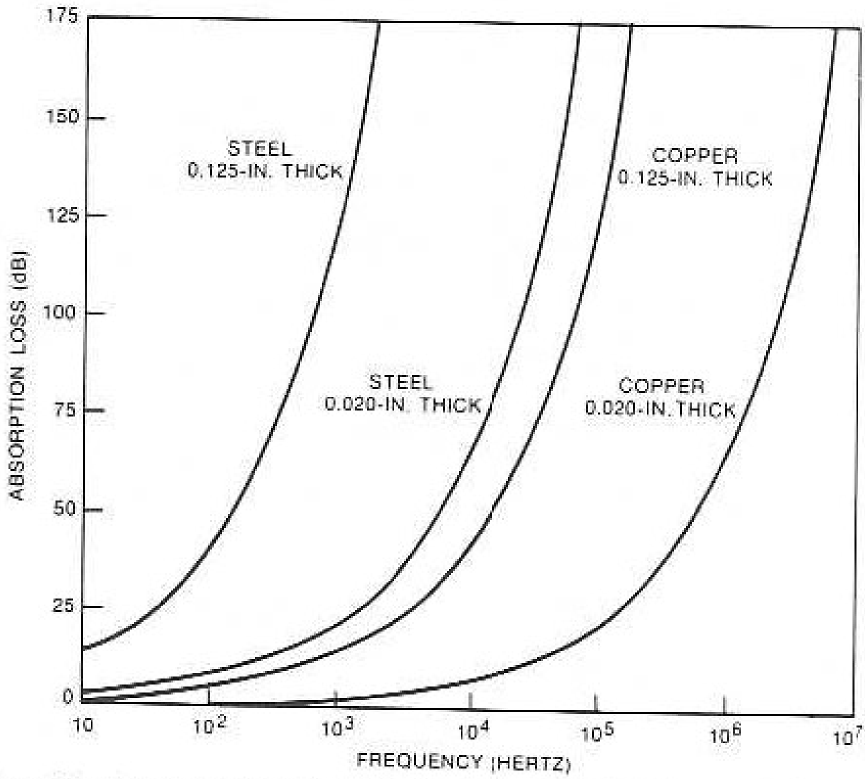

Figure 6-8. *Absorption loss increases with frequency and with shield thickness; steel offers more absorption loss than copper of the same thickness.*

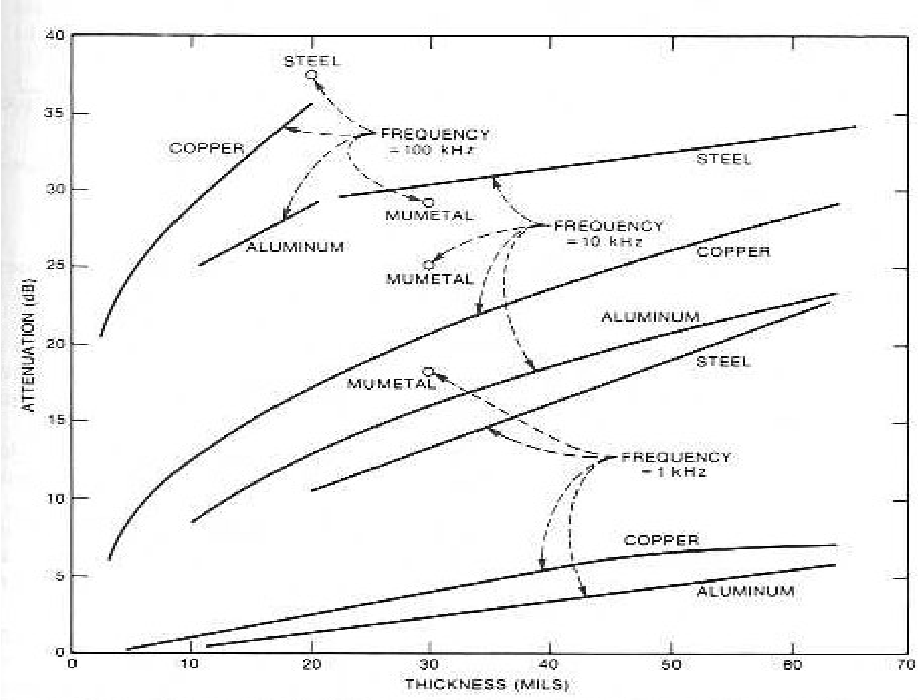

Figure 6-22. *Experimental data on magnetic attenuation by metallic sheets in the near field.*

RESUMIENDO:

MATERIAL	Frecuencia [KHz]	Absorción (.8mm)	Reflexión		
			E	H	Onda plana
Magnético μ_r=1000 σ_r=0.1	< 1	M-R	E	M	E
	1 - 10	A-B	E	M-R	E
	10 -100	E	E	R	B
	> 100	E	B	R-A	A-B
No magnético μr=1 σr=1	< 1	M	E	M	E
	1 - 10	M	E	A	E
	10 -100	R	E	A	E
	> 100	A-B	E	B	E

M: mala < 10 db
R: regular 10-30 db
A: aceptable 30-60 db
B: buena 60-90 db
E: excelente >90 db