ELECTRICITY AND MAGNETISM

In the following, ϵ = dielectric permittivity, μ = permeability of conductor, μ' = permeability of surrounding medium, σ = conductivity, $f = \omega/2\pi$ = radiation frequency, $\kappa_m = \mu/\mu_0$ and $\kappa_e = \epsilon/\epsilon_0$. Where subscripts are used, '1' denotes a conducting medium and '2' a propagating (lossless dielectric) medium. All units are SI unless otherwise specified.

Permittivity of free space	$\epsilon_0 = 8.8542 \times 10^{-12}\,\mathrm{F\,m^{-1}}$
Permeability of free space	$\mu_0 = 4\pi \times 10^{-7}\,\mathrm{H\,m^{-1}}$ $= 1.2566 \times 10^{-6}\,\mathrm{H\,m^{-1}}$
Resistance of free space	$R_0 = (\mu_0/\epsilon_0)^{1/2} = 376.73\,\Omega$
Capacity of parallel plates of area A, separated by distance d	$C = \epsilon A/d$
Capacity of concentric cylinders of length l, radii a, b	$C = 2\pi\epsilon l/\ln(b/a)$
Capacity of concentric spheres of radii a, b	$C = 4\pi\epsilon ab/(b-a)$
Self-inductance of wire of length l, carrying uniform current	$L = \mu l$
Mutual inductance of parallel wires of length l, radius a, separated by distance d	$L = (\mu' l/4\pi)\,[1 + 4\ln(d/a)]$
Inductance of circular loop of radius b, made of wire of radius a, carrying uniform current	$L = b\left\{\mu'\,[\ln(8b/a) - 2] + \mu/4\right\}$
Relaxation time in a lossy medium	$\tau = \epsilon/\sigma$
Skin depth in a lossy medium	$\delta = (2/\omega\mu\sigma)^{1/2} = (\pi f\mu\sigma)^{-1/2}$
Wave impedance in a lossy medium	$Z = [\mu/(\epsilon + i\sigma/\omega)]^{1/2}$
Transmission coefficient at conducting surface[9] (good only for $T \ll 1$)	$T = 4.22 \times 10^{-4}(f\kappa_{m1}\kappa_{e2}/\sigma)^{1/2}$
Field at distance r from straight wire carrying current I (amperes)	$B_\theta = \mu I/2\pi r$ tesla $= 0.2I/r$ gauss (r in cm)
Field at distance z along axis from circular loop of radius a carrying current I	$B_z = \mu a^2 I/[2(a^2+z^2)^{3/2}]$