

APPENDIX **A**

PHYSICAL CONSTANTS

c	wave velocity in free space	$= 1/\sqrt{\mu_0\epsilon_0} = 3 \times 10^8$	m/s
μ_0	permeability of free space	$4\pi \times 10^{-7}$	H/m
ϵ_0	permittivity of free space	8.854×10^{-12}	F/m
Z_0	intrinsic impedance of free space	$= \sqrt{\frac{\mu_0}{\epsilon_0}} = 377$	ohms
e	electron charge	-1.602×10^{-19}	C
k	Boltzmann's constant	1.38×10^{-23}	J/K (joules/kelvin)
h	Plank's constant	6.626×10^{-34}	J · s (joule-sec)
σ_c	conductivity of copper	5.8×10^7	mhos/m