Electromagnetic Theory Handbook for Objective-First Optimization

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1 Maxwell's equations

According to Eqs. 3.7 and 3.8 in [1], Maxwell's time-harmonic equations are

$$-i\omega H = -\frac{1}{\mu}\nabla \times E - \frac{1}{\mu}M \tag{1}$$

$$-i\omega E = \frac{1}{\epsilon}\nabla \times H - \frac{1}{\epsilon}J \tag{2}$$

where M and J are the magnetic and electric current densities, respectively.

The wave equations are then,

$$\nabla \times \frac{1}{\mu}\nabla \times E - \omega^2 \epsilon E = i\omega J - \nabla \times \frac{1}{\mu}M \tag{3}$$

$$\nabla \times \frac{1}{\epsilon}\nabla \times H - \omega^2 \mu H = i\omega M + \nabla \times \frac{1}{\epsilon}J \tag{4}$$

References

[1] Allen Taflove, Susan C. Hagness, *Computational Electrodynamics, Third Edition* (Artech House, 2005).