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Electromagnetic Energy Momentum Tensor in a Dielectric MICHAEL CRENSHAW, THOMAS BAHDER, US Army RDECOM — The Abraham-Minkowski controversy refers to the century-old inability to decide the energy-momentum tensor for an electromagnetic field traversing a dielectric medium. However, neither the Abraham momentum nor the Minkowski momentum is conserved and we show that the Abraham and Minkowski energy-momentum tensors are constructed from continuity equations, rather than conservation laws, and do not transform as tensors. We show that the Gordon [1] momentum is the unique total momentum in a thermodynamically closed system consisting of the field and a negligibly reflecting dielectric. We construct conservation laws based on the conserved Gordon momentum and use them to construct a symmetric traceless energy-momentum tensor in a coordinate system with time-like coordinate ct/n.

[1] J. P. Gordon, Phys. Rev. A 8 14 (1973).

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