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Abraham-Minkowksi controversy view from MHD theory

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The Minkowski-Abraham controversy has been discussed by a number of authors over a hundred years. Minkowski (1910) proposed the electromagnetic momentum density in a dielectric medium must be **D x B**, while Abraham (1909) proposed **E x H**. There have been published numerous papers on this problem both theoretically and experimentally, but the final conclusion is still yet to come; papers are still being published in this century.

The momentum of an MHD wave has been examined from the view point of the electromagnetic momentum expression derived by Minkowski in the present study. Basic calculations show that the Minkowski momentum is the sum of electromagnetic momentum and the momentum of the medium, as proposed in some of the past literature. The result has been explicitly confirmed by an example of an MHD wave, whose dynamics can be easily and precisely calculated from basic equations. The example of MHD wave also demonstrates the possibility to construct a symmetric energy-momentum tensor based on the Minkowski momentum.

Keywords: Abraham-Minkowski controversy, electromagnetic momentum, MHD waves