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Consistent currents in relativistic models of strongly interacting systems

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We discuss a systematic method for constructing many-body electromagnetic current operators that are needed to ensure covariance and current conservation in phenomenological relativistic Hamiltonian models of strongly interacting systems. The construction represents a general Hamiltonian in the Weyl representation. Momentum operators in this representation are replaced by gauge covariant derivatives and the part of the resulting operator that is linear in the electromagnetic field is extracted. Non-commuting operators are treated explicitly using Trotter methods. Because the resulting current is an operator, it can be consistently applied to different reactions.

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