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Scattering in Euclidean formulations of relativistic quantum theory

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Scattering theory can be formulated given a representation of the quantum mechanical Hilbert space and a set of self-adjoint Poincar\'e generators satisfying cluster properties. These are both provided by the Osterwalder-Schrader reconstruction theorem, where the input is a collection of Euclidean-covariant reflection-positive distributions. In this representation both Hilbert space inner products and matrix elements of the generators can be expressed directly in terms of Euclidean variables, without analytic continuation. A Euclidean version of Haag-Ruelle scattering can be formulated in this representation, which leads to expressions for scattering observables as strong limits. I discuss the construction of one-particle Haag-Ruelle states in this representation and show how these states can be used to construct wave operators. I exhibit toy model calculations of sharp-momentum transition matrix elements over a wide range of energies that suggest the feasibility of formulating numerical methods to compute scattering observables in this Euclidean representation.

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