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Algebraic Characterization of the Vacuum in Light-Front Field Theory[1] MARC HERRMANN, WAYNE POLYZOU, University of Iowa — In the light-front formulation of quantum field theory, the vacuum vector of an interacting field theory has a relatively simple relationship to the vacuum of a free field theory. This is a benefit over the usual equal-time formulation where the interacting vacuum vector has infinite norm with respect to the Hilbert space of the free field theory. By describing the vacuum as a positive linear functional on an operator algebra constructed from free fields with two distinct masses, it can be demonstrated that the complications associated with adding dynamics to the vacuum of a free theory are not present in the construction of the light-front vacuum. Instead, the complications are moved into defining a subalgebra of the light-front algebra which corresponds to the physically relevant algebra of local fields. These results can then be applied to interacting fields by first describing them in terms of asymptotic in or out fields. However, in order to treat local operators products, the vacuum functional may need to be modified to include states with zero eigenvalue of the generator of translations in the direction along the light front, $x^- = \frac{1}{\sqrt{2}}(x^0 - x^3)$.

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Marc Herrmann
University of Iowa

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