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The Vacuum in Light Front Field Theory[1] MARC HERRMANN, WAYNE POLYZOU, University of Iowa — In the light-front formulation of quantum field theory, one finds that the interacting vacuum and the free-field vacuum are both the same trivial Fock vacuum. This stands in contrast to the more usual equal time formulation, where the interacting vacuum and the free vacuum have a complicated relationship. To examine this apparent inconsistency, we first focus on free-fields with two distinct masses. The characterization of the vacuum by annihilation operators is incomplete, and leads to an apparent contradiction concerning the creation and annihilation operators of the two theories. Alternatively, the vacuum can be considered as a positive linear functional on an operator algebra generated by the field. In this characterization, the definition of the vacuum depends on the choice of algebra. The physically relevant algebra should be Poincare invariant and contain local observables. Extending the light-front algebra to this local algebra provides a resolution to the apparent inconsistency, but allows one to still use the Fock vacuum. These results can then be applied to interacting theories.

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