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Light Front Fermion Field Quantization with Explicit Lorentz Symmetry

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A novel quantization procedure with the explicit Lorentz symmetry is applied for a fermion field in $D = 3 + 1$ dimensions. The Wightman function for a free fermion field is evaluated in terms of the covariant singular function $\Delta_+(x)$. The singularities at the LF hypersurface $x^+ = 0$ appear whenever the “bad” component ψ_- is considered. Accordingly the anti-commutator function cannot follow from the canonical Dirac method for constrained systems. The chronological ordering in x^+ temporal variable leads to the Feynman propagator with a well-known addition of non-covariant term. The Yukawa model in $D = 3 + 1$ dimensions is considered for the Gaussian effective potential with the point-splitting regularization with a space-like separation.

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