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Fermionic one-particle states in curved spacetimes. (English) Zbl 1395.83034

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Summary: We show that a notion of one-particle state and the corresponding vacuum state exists in general curved backgrounds for spin $\frac{1}{2}$ fields. A curved spacetime can be equipped with a coordinate system in which the metric component $g_{--} = 0$. We separate the component of the left-handed massless Dirac field which is annihilated by the null vector ∂_- and compute the corresponding Feynman propagator. We find that the propagating modes are localized on two dimensional subspaces and the Feynman propagator is similar to the Feynman propagator of chiral fermions in two dimensional Minkowski spacetime. Therefore, it can be interpreted in terms of one-particle states and the corresponding vacuum state similarly to the second quantization in Minkowski spacetime.

MSC:

83C47 Methods of quantum field theory in general relativity and gravitational theory
81T16 Nonperturbative methods of renormalization applied to problems in quantum field theory
81S40 Path integrals in quantum mechanics

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Keywords:

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