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Spin Alignment Induced by Curvature of Freezeout Hypersurface

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We derive a Cooper-Frye-type formula for the spin alignment of spin-1 bosons at local thermal equilibrium described by a grand canonical ensemble specified by temperature, fluid velocity, and spin potential. We develop a set of Feynman rules to evaluate the Wigner function order by order in space-time gradient.

We assume that the vector mesons freeze out on a space-like hypersurface in the Minkowski space-time that is close to a hyperplane. We find that the leading order of the spin alignment is proportional to the curvature of the hypersurface and the hydrodynamic fields at first-order space-time gradient, such as thermal shear. It is a non-dissipate mechanism that induces spin alignment proportional to the hydrodynamic fields with the first-order space-time gradient.

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