

# Relativistic spin dynamics for vector mesons

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We propose a relativistic theory for spin density matrices of vector mesons based on Kadanoff-Baym equations in the closed-time-path formalism. The theory puts the calculation of spin observables such as the spin density matrix element  $\rho_{00}$  for vector mesons on a solid ground. Within the theory we formulate  $\rho_{00}$  for  $\phi$  mesons into a factorization form in separation of momentum and space-time variables. The key observation is that there is correlation inside the  $\phi$  meson wave function between the  $\phi$  field that polarizes the strange quark and that polarizes the strange antiquark. This is reflected by the fact that the contributions to  $\rho_{00}$  are all in squares of fields which are nonvanishing even if the fields may strongly fluctuate in space-time. The fluctuation of strong force fields can be extracted from  $\rho_{00}$  of quarkonium vector mesons as links to fundamental properties of quantum chromodynamics.

## Theory / experiment

Theory

## Group or collaboration name

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