

# Spin Decoherence in the Frequency Domain Method for the EDM Search

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## Abstract

Spin coherence refers to a measure of preservation of polarization in an initially polarized beam. The spin vector of a particle injected into a storage ring starts to precess about the vertical magnetic field vector in accordance with the Thomas-BMT equation. The precession frequency is dependent on the equilibrium-level energy, which differs across the beam particles. This does not pose a problem when the initial polarization is vertical; however, the Frozen Spin Storage Ring EDM search method [\*] requires beam polarization along the momentum vector, i.e., in the horizontal plane.

In the present work we analyze the source of decoherence, and investigate the way it can be suppressed in the horizontal plane in a perfectly aligned ring by means of sextupole fields. We also consider the case of an imperfect ring, the vertical plane decoherence introduced by the field imperfections, and its effect on the EDM estimator used in the Frequency Domain method.

## References

[\*] D. Anastassopoulos et al. AGS Proposal: Search for a permanent electric dipole moment of the deuteron nucleus at the  $10^{-29}$  e · cm level. BNL report, 2008.