Exploration of the Derbenev-Kondratenko Equation in the MIT Bates South Hall Ring

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The MIT Bates lab is well positioned to map out the Kinetic term in the Derbenev-Kondratenko Self Polarization Formula. This term, which leads to a net loss of polarization at other facilities where the equilibrium Spin direction is mostly aligned with the guide field, can create equilibrium polarizations of ~50% in rings where the invariant spin field is perpendicular to the guide field, i.e. rings with Siberian Snakes. A thorough examination of this polarization mechanism is more tractable in a smaller ring where g is not too large and the number of the elements in the lattice is of order hundreds, not thousands.

The Bates ring is now equipped with a Siberian Snake and a Laser Back-scattering Compton Polarimeter. Further, Bates has a polarized source capable of >65% polarization. This enables important systematic checks of the equilibrium polarization. The addition of a wiggler and the extension of the Bates SHR energy from 1.1 to 1.5 GeV would greatly improve the quality of these measurements. It is expected that this information will be very useful in the design of spin transparent rotators for the electron ring side of a proposed electron-ion collider now under consideration.