

Details of Cavity Polarimeters for MIT-Bates and RHIC

W. Barry³, P. Cameron¹, M. Conte⁴, J. Corlett³, D.A. Goldberg³, A. Luccio¹, M. Palazzi⁴, M. Pusterla⁵, A. Ratti³, R. Rossmannith², W. MacKay¹, T. Zwart⁶

¹Brookhaven National Laboratory, Upton, NY 11973, USA

²Forschungszentrum Karlsruhe GmbH, D-76021 Karlsruhe, Germany

³Lawrence Berkeley National Laboratory, Berkeley, CA 94720 USA

⁴Universita and Sezione INFN di Genova, 16146 Genova, Italy

⁵Universita and Sezione INFN di Padova, 35131 Padova, Italy

⁶MIT-Bates Laboratory, Boston MA 01949 USA

A cavity mode has been reported [1,2] that permits spin-dependent energy to be extracted from a polarized beam without cancellation between contributions from the time and space gradients of the cavity field. In the mode under consideration the magnitude of the Stern-Gerlach force experienced by a magnetic moment traversing the cavity varies as the square of the relativistic factor gamma, so that the signal power varies as the fourth power of gamma. In addition, the interaction of this cavity mode with the beam charge varies as the inverse of the interaction with the magnetic moment, so that the background due to the beam charge varies as the inverse fourth power of gamma. The possibility is thus opened for very fast, accurate, and inexpensive polarimetry at accelerators like MIT-Bates[3] and RHIC. In addition, it might become possible to seriously consider Stern-Gerlach polarization of beams at LHC. We present details of polarimeters for the electron storage ring at MIT-Bates and the polarized proton beam at RHIC.

[1] M. Conte et al, "Stern-Gerlach Interaction in Particle Beams", Spin2000, Osaka.

[2] M. Conte et al, "The Stern-Gerlach Interaction between a travelling particle and a time varying magnetic field"
http://xxx.lanl.gov/list/physics/0003_preprint_0003069

[3] P. Cameron et al, "Proposal for a Cavity Polarimeter at MIT-Bates" PAC2001, NY.