

Having a BLAST with Spin Physics

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The Bates Large Acceptance Spectrometer Toroid (BLAST) has recently been constructed at the MIT Bates Accelerator Laboratory. BLAST is an eight sector toroidal magnet with two opposing sectors each instrumented with three layers of wire chambers, a layer of aerogel Čerenkov detectors, a layer of time-of-flight scintillators, a wall of plastic neutron detection scintillators, and a forward angle Pb-glass calorimeter. BLAST is situated at the internal target area of the Bates South Hall Ring which is capable of providing stored electron beams with average currents of 80 *mA*, lifetimes of 10 – 20 minutes, short refill times, and polarization of 70%. The present target is an Atomic Beam Source (ABS) designed to produce neutral atomic beams of both polarized ^1H and vector and tensor polarized ^2H . The ABS injects these atomic beams into a 40 *cm* long thin-walled “storage” cell which is open at both ends. The ABS/storage cell system thus provides undiluted polarized targets of both ^1H and ^2H with polarizations expected to reach approximately 70–80%. Massive pumping in the region of the cell maintains the high ring vacuum necessary for reasonable lifetimes. Luminosities, with 80 *mA* average current, are in the range of $5 \times 10^{31} \text{ cm}^{-2} \text{ s}^{-1}$.

The program of research that is planned and approved for BLAST includes (1) measurements of G_E/G_M on the proton, (2) measurements of G_E/G_M on the neutron using quasi-elastic scattering on the neutron in vector polarized ^2H , (3) studies of the spin-dependent momentum distributions in ^2H using quasi-elastic scattering on the proton, and (4) extraction of the deuteron form factors G_C , G_Q , and G_M from elastic electron deuteron scattering using both vector and tensor polarized targets. Because of the large BLAST acceptance and symmetry about the beam axis, these measurements will be made with unprecedented statistical accuracy and with minimal systematic uncertainties.

BLAST is presently undergoing commissioning. The detector systems are functioning as designed. The toroidal field has met specifications. The ABS is in the process of being commissioned. Preliminary results will be presented which show the quality of the data we expect to take within the year.