The MIT-Bates Large Acceptance Spectrometer Toroid

The Bates Large Acceptance Spectrometer Toroid (BLAST) is a detector designed to study in a comprehensive and precise way the spin-dependent electromagnetic response of few-body nuclei at momentum transfers up to 1 $(GeV/c)^2$ at the MIT-Bates South Hall Ring. The BLAST scientific program is focused on the study of these systems in terms of nucleon structure, the ground state few body structure built from the nucleon-nucleon interaction and the nature of the interaction of the virtual photon for $Q^2 \leq 1$ $(GeV/c)^2$. To accomplish its scientific goals, BLAST will utilize the latest technology available in the form of polarized electron scattering from pure, polarized internal gas targets.

The BLAST detector consists of an eight-sector copper coil array producing a toroidal magnetic field, instrumented with two opposing wedge-shaped sectors of wire chambers, scintillation detectors, Cerenkov counters, neutron detectors, a lead-glass forward calorimeter, and recoil detectors. A polarized hydrogen/deuterium target and an electron beam polarimeter are also part of the project initial instrumentation. Construction of BLAST has been successfully completed on cost and schedule. The toroidal magent system is fully operational at design specifications in the internal target area of the Bates South Hall Ring. All target and detector elements have been constructed and perform according to design specifications. They are in the process of installation. Commissioning of BLAST with beam is scheduled to commence in June 2002.

For the next few years we are planning a series of measurements using a polarized proton target, a vector-, and a tensor-polarized deuterium target. The main scientific goals are:

- Precise measurements of the neutron form factors for momentum transfers up to about 1 $(GeV/c)^2$ using quasielastic scattering from a vector-polarized deuterium target.

- Precise data with a tensor polarized deuterium target from elastic e-d scattering (T_{20}), particularly in the region of the first minimum of the charge form factor of the deuteron.

- Precise measurements of the proton form factors ratio, G_E^p / G_M^p. for momentum transfers up to about 1 $(GeV/c)^2$ using elastic scattering from a polarized proton target.

In addition, due to BLAST large acceptance and particle ID capability, data will be obtained in these experiments for many other reaction channels in order to address significant issues relevant to intermediate energy nuclear physics. Beyond these measurements, BLAST has a rich program involving polarized ^{3}He targets, and nuclear targets for problems relevant to nuclear astrophysics.