

## **FY07 ILC Statement of Work – WBS 3.3.3 SRF Polarized Gun**

### **Work to be accomplished in FY07**

This would be the first year of a 3 year R&D program with the goal of building and testing a superconducting RF gun capable of making a flat, polarized electron beam. The members of the collaboration include two national laboratories (BNL and FNAL), a university (MIT) and industry (AES).

At BNL:

We will design an electron injector consisting of a 1½cell SRF gun producing a magnetized beam, a 30-50 MeV linac and a round-to-flat converter. We will optimize all parameters of this device including gun parameters, bunch charge distribution and perform a front-to-end simulation to calculate the beam quality.

### **Relevance to the FY07 goals of the ILC Global Design Effort**

This program comprises R&D on a superconducting RF photoemission gun to deliver polarized electrons bunches at low emittance for the ILC with a high ratio of transverse emittances.

RF guns are likely to provide better emittance beams, ideally good enough to eliminate the need for a damping ring. At a minimum, such a gun will save costs in bunching systems and damping ring wiggler length as well as reduce polarized electron loss at the damping ring. The ultimate emittance and quantum efficiency lifetime needs to be demonstrated.

The program is highly leveraged by the use of non-ILC contributions such as the construction of the SRF gun (BNL) and the diagnostic line (FNAL) to make it extremely cost effective.

### **Key Milestones/Personnel**

Conceptual design of cathode preparation chambers	January 2007
Design of the preparation chamber	March 2007
Design of the load-locked gun for Bates	August 2007
Design of transmission polarimeter	August 2007
Layout and front-to-end simulation based on the existing gun design	January 2007
Layout and front-to-end simulation with optimized gun shape	March 2007
Design of laser system	January 2007
Procurement of oscillator	March 2007
Design and installation of beam transport	September 2007
Design of load-lock and transfer mechanism	March 2007
Design of cesiation/ test chamber	March 2007
Design/layout of relevant tests	April 2007
EM Simulation	June 2007
Initiate procurement of materials for initial SRF gun tests	July 2007

All materials in house for vacuum chambers

September 2007

**WBS work package leader** Ilan Ben-Zvi, BNL

**FY07 Deliverables**

Completed designs for both Bates and BNL cathode systems

Front-to-end simulation of the injector.

Design of the laser system, laser oscillator

Design gun system, tests to quantify contamination and lifetime study.

**Cost**

This WBS level carries no costs. For cost elements, see lower level WBS lines.

The work done by FNAL will not be charged to ILC.

The construction of the SRF gun and the test facility at BNL is covered by other grants and not charged to ILC.