

**FY07 ILC Statement of Work – WBS 3.3.3.5 Design and Fabrication of the Complete Cathode System for the Superconducting RF Photocathode Gun.**

**Work to be accomplished in FY07**

In FY07, the designs for the components of the cathode system will be completed and material procurement well underway. The fabrication of all components will be completed within the first six months of FY08 provided the design task starts in October 06. At present, AES has completed the design and is commencing fabrication of a superconducting RF (SRF) photoemission gun for the US Navy. This gun will reside at BNL to be used in an energy recovery linac. The BNL team plans to utilize this gun in FY08 to determine if one can achieve the low emittance required for the ILC. To accomplish this goal, that is to measure cathode lifetime, beam emittance and degree of polarization utilizing the SRF gun, AES must design and fabricate two GaAs cathode preparation chambers, a transport cart, an antechamber to install new GaAs cathodes in the transport cart, and a new cathode stalk that can accommodate both the GaAs cathodes and a BNL-supplied solenoid for producing flat beams. It is anticipated that the GaAs cathodes will be prepared and activated at MIT and transported to BNL. Subsequent activation can be done at BNL. The system will be designed so that after activation, the cathodes will always be under high vacuum. AES will be supported in this design by the MIT Bates Research and Engineering Center, where a large knowledge base exists for the preparation and handling of GaAs cathodes for polarized electron sources.

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

This program is an element of R&D on a superconducting RF photoemission gun to deliver polarized electron bunches at low emittance for the ILC with a high ratio of transverse emittance. RF guns are likely to provide better emittance beams, ideally good enough to eliminate the need for a damping ring. The ultimate emittance and quantum efficiency lifetime needs to be demonstrated.

**Key Milestones/Personnel**

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|--|--------------------------------|
| • GaAs preparation chamber design complete | 4 Months After Contract Award  |
| • Cathode stalk design complete            | 4 Months After Contract Award  |
| • Cathode transport cart design complete   | 7 Months After Contract Award  |
| • Antechamber design complete              | 8 Months After Contract Award  |
| • Purchased components received            | 12 Months After Contract Award |

**WBS work leader**                      Bruce Abel, Advanced Energy Systems.

**FY07 Deliverables**

Complete design of GaAs Cathode Preparation and Transport System.

**Cost**

Labor FTE's	Labor \$K Direct	M&S \$K Direct	Indirect costs \$K		Total Costs \$K
NA	280	500			780

The total cost is a bottom-line contract number to accomplish all goals.