FY07 ILC Statement of Work – WBS 3.10.4 Final Focus Quad Full length Prototype

This proposal is to design, build and test a full length prototype of the insertion region magnet system. In the accelerator, this magnet system is comprised of several magnetic elements, including incoming line elements QD0, SD0/OC0, QF1, SF1/OC1, and also the extraction line elements QDEX1A, QDEX1B and QFEX2A. All the aforementioned elements are in close proximity to one another, and are furthermore in an externally constricted space, such that they must be built as a single module. This requirement then complicates the alignment and stability of the various elements, and has an impact on the configuration of the cryogenic system needed to cool the elements. The proposal then includes the design and engineering of a representative magnet module, as follows. A cryostatted magnet structure shall be engineered, designed and built to the configuration of the full insertion region. This structure shall include a working prototype QD0 magnetic element, with suitable coils and support structure. It may also include mechanical components of the remaining magnetic elements as needed without coils. These components shall be assembled into a common helium vessel, heat shield, and cryostat as is envisioned for the actual magnet system. This prototype system shall include features for independent adjustment of the prototype QD0 element, and shall also include the sub-cooled helium cryogenic heat exchanger needed for maintaining the operating temperature of 1.8K. The FY07 activities will be comprised of the engineering and design tasks. In the subsequent years FY08 and FY09, a fully instrumented, full length prototype will be constructed and tested at operating conditions to validate the design.

Work to be Accomplished in FY07

This will be the first year of a 3 year R&D program with the goal of building and testing a prototype final focus magnet. We will complete the engineering and design of the prototype magnet. We will complete the engineering and design of the tooling required to fabricate full length, small diameter direct wind coils needed for this program. Also, we will begin test winding of full length direct wind coils. Finally, we will fabricate a mechanical model (from parts to be utilized later for the prototype magnet) to be used for initial vibration measurement benchmark tests.

Relevance to the FY07 goals of the ILC Global Design Effort

This work is being conducted in support of the Conceptual Design Report (CDR) on the Insertion Region Magnet System for the ILC. Several of the key concepts to be included in the CDR are untested in the configuration needed for the ILC, namely the combination of small coil diameter and long coil length, as well as the narrow separation between elements. It is anticipated that many lessons can be learned from the construction of a prototype which will provide great benefit in terms of technical and schedule risk avoidance in the subsequent years of the R&D program.

Key Milestones/Personnel

long coil tooling design complete Jan 07

vibration mechanical model construction complete	Jun 07
full length test winding complete	Sep 07
prototype magnet design complete	Sep 07

WBS work package leader	Michael Anerella
Lead mechanical engineer	Andrew Marone
Lead electrical engineer	John Escallier

FY07 Deliverables

Prototype magnet engineering and design
Cryogenic heat exchanger engineering
Coil fabrication tooling design and construction
Test coil winding
Mechanical assembly for vibration measurements

Cost

Labor FTE's	Labor $K Direct	M&S $K Direct	Indirect costs $K		Total Costs $K
6.5	760	80	560		1,400

Labor consists of 1.0 FTE mech eng, 2.5 FTE designer, 0.50 elect. eng., 0.5 cryo eng., 2.0 FTE mech tech