

ADDENDUM

to the

Memorandum of Understanding

between

The Fermilab National Accelerator Laboratory

and

Cornell, LEPP

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concerning

Collaboration on Superconducting Radio Frequency Research and Development

Addendum III: "Processing and Assembly of 1.3 GHz ILC Cavities"

August 15, 2005

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1. Introduction

Fermilab has accepted responsibility for coordination of superconducting rf technology development within the US International Linear Collider R&D program. Fermilab and Cornell are collaborating with the goal of building and testing with beam 1.3 GHz acceleration modules that would be prototypes for a future International Linear Collider. To initiate ILC module fabrication and test activities in the US in the most expediate fashion, resources and expertise of many US Labs will be utilized. Cornell has infrastructure and expertise for the fabrication of superconducting cavities. It also has BCP capability necessary to achieve high gradient cavities and associated infrastructure and expertise that can be applied to the subsequent testing of cavities. An important goal of this work at Cornell is to establish proven processes for cavity preparation that can then be transferred to US industry.

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Deleted: The expertise and resources residing at Cornell are key toward the goal of producing the high gradient cavities necessary for the ILC program. In particular,

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This scope of this Addendum is to establish a program for near term ILC cavity and module development over the next two years. It is expected that further work will be carried out under subsequent Addenda.

The work detailed in this document falls within the scope of the Memorandum of Understanding (MOU) between FNAL and Cornell dated August 15, 2005. All terms and conditions under which the work will be carried out are found within the MOU.

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2. Work to be Performed by Cornell

2.1 Scope of Work

Cornell will carry out the following in support of 1.3 GHz cavity development for the ILC. Fermilab and and other SRF collaborators may participate in these studies for training.

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1. Commission and make reliable the Cornell cavity processing systems with 1.3 GHz TESLA cavities:

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Modification, as required, and subsequent commissioning tests of the Cornell cavity processing systems (tuning, BCP, HPR, Vertical Dewar Test) with TESLA-style 1.3 GHz cavities. It is anticipated that DESY will provide one cavity for the commissioning process: to qualify the process to ~25MV/m in accelerating mode. FNAL will be responsible for arranging shipment of these cavities to Cornell.

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2. Establish BCP Parameters:

Cornell will establish a set of BCP and HPR parameters to achieve optimal gradient and Q performance for these cavities. The process will include repeated cycles of BCP, HPR and VDT to establish reproducibility of process parameters and performance. At least 5 cycles will be performed.

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3. Processing, testing, and preparation for horizontal test of 1.3 GHz ILC cavities:

Cornell will process nine cell ILC cavities as described below. These cavities will be tuned, BCP processed, baked, HPR, and vertical dewar tested (VDT) at Cornell following the successful process commissioning described in 1) above.

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Cavities that are presently in the planning stage include:

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a) Four cavities from a FNAL-AES collaboration. These will be BCP processed and tested at Cornell. Oven treatment may be required. If so it will be carried out elsewhere (JLAB for example). Operations for the first cavity will be conducted by Cornell personnel with AES, FNAL, and other SRF institutions participating for personnel training. AES personnel will conduct the remaining operations for these cavities under Cornell supervision as part of the technology transfer program.

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b) Four cavities from KEK will be BCP process and tested at Cornell. Oven treatment may be required, which will be carried out elsewhere (JLAB for example). Personal from FNAL or other SRF institutions may participate for personnel training.

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c) Four cavities from Accel. Accel will fabricate and tune these cavities and do initial BCP etch. These cavities will be sent to Cornell for additional BCP if required, HPR, and vertical test. AES personnel will conduct all the operations under Cornell supervision as part of the technology transfer program.

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FNAL is responsible for providing shipment of these cavities to Cornell. A summary of the required processing steps and the number of operations at each step is indicated in the table below.

- 1) Cavity fabrication [FAB]
- 2) cavity tune [TUNE]
- 3) initial etch (BCP)
- 4) prep for VDT to and including VDT: HPR, VDT []

Step sequence	discription	# operations expected	Materials and man hr /operation
0	Commission BCP	6	
1	FAB	elsewhere	
2	TUNE	6+4+4+4= 18	
3	600 BAKE	elsewhere	
4	BCP-VDT	(6+4+4+4)=18	
5			

Supplied materials:

Fermilab to coordinate supplying the cavities from other labs and vendors (2+4+4+4 cavities) (scope 1, 2)

Cavity performance: This activity will be undertaken as a best effort activity. Fermilab personnel may participate in or witness any/all of these activities.

2.2 Deliverables

1. Procedures – Cornell to provide procedures. These will be mutually reviewed and agreed upon. Detailed travelers and data measurement and test info. Cornell to provide records of fabrication, measurement, tune, assembly, process and test results.

2 Processing:- Cornell in collaboration with SMTF collaboration would help develop the parameters for perfecting the BCP.

2.3 Schedule

Commissioning of the BCP, HPR and testing set-ups followed by reliability studies should be undertaken as soon as possible and may take ~ 12 months to achieve optimum results. (scope 1 & 2)

Processing of cavities provided by AES, KEK and ACCEL may take four months to complete for each batch of 4 cavities received from industry . (scope 3). When cavities are available, mutually agreeable specific schedules will be worked out.

2.4 Funding

Funding will be provided to Cornell for support of above activities as specified in the MOU. Total estimated costs for each year for the 2 year duration of activities described are as follows. It is assumed that the 20,000 L of liquid helium will be purchased for the tests described

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Direct	\$100k/ <u>year</u> (Personnel) + \$60k (He)
Overhead	<u>Provided by Cornell as an in kind contribution</u>
Total	\$ 260k

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It is anticipated that funding will be provided at the level of approximately \$130K per fiscal year for each of two years. Cornell assumes financial responsibility for any and all work performed in excess of the funds provided to Cornell in any fiscal year via Memoranda purchase orders unless Cornell receives written permission in advance from FNAL for such work.

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