

ADDENDUM

to

**THE MEMORANDUM OF UNDERSTANDING FOR A
MULTI-LATERAL COLLABORATION**

between

**THE INSTITUTIONS AND FUNDING AGENCIES OF
THE CTF3 COLLABORATION**

concerning

**THE CONTRIBUTION OF
THE TSINGHUA UNIVERSITY OF BEIJING (CHINA)
TO THE CTF3 COLLABORATION**

August 2013

CONSIDERING:

The Memorandum of Understanding for a multi-lateral collaboration between the institutions and funding agencies of the CTF3 collaboration (the “MoU”) defining the framework applicable to the construction of a 3rd generation Compact Linear Collider test facility (CTF3) and the performance of experiments to demonstrate the feasibility of key issues of the CLIC scheme;

That Article 1.2 of the MoU envisages the conclusion of Addenda defining each contribution pledged to the CTF3 Collaboration,

THE TSINGHUA UNIVERSITY OF BEIJING (CHINA) (“Tsinghua Un.”),

in its capacity as Member of the CTF3 Collaboration and represented by **Professor Huaibi Chen and Dr. Jiaru Shi,**

HEREWITH AGREES to make the following contributions:

1. Develop an alternative to the CLIC baseline accelerating structure based on choke-mode damping

Tsinghua Un. will take on the task of developing a CLIC accelerating structure based on choke-mode damping in order to evaluate a highly promising alternative design to the baseline CLIC waveguide-damped structure. This will include:

- 1) design of a choke-mode structure with appropriate fundamental-mode properties, higher-order mode damping and expected high-power performance.
- 2) Low power measurement on a prototype structure, with beam-excited wakefield measurement at Argonne.
- 3) Fabrication of high-power test structures, which may include a single-cell structure, a C10-Choke, and a full structure. Tsinghua Un. will take responsibility for the detailed design, cooling and vacuum system design, tendering, ordering, fabrication and assembly of the test structures.
- 4) High-power tests of the test structures mentioned in the previous point, at KEK if agreement on testing time can be made.

CERN's role is to provide guidance to Tsinghua Un. experts throughout this process and to help them understand and apply the relevant techniques and technology. This includes joint supervision by Tsinghua Un. and CERN of one or two PhD students based partly at CERN. In addition CERN will coordinate production steps for the test structure made at CERN which may include dimensional control, SEM inspections.

Deliverables: Publication of the rf design of the CLIC choke mode cavity and a test report of the high-power test structure.

Time schedule: 2013-2016

Resources: 1 university faculty member, 1 to 2 PhD students (based at Tsinghua, visiting CERN for one year or more and CERN funds) , 1 CERN fellow

2. Establish the fabrication and assembly expertise for high-gradient X-band structures.

Tsinghua Un. will be responsible for producing several T24 high-power test accelerating structure. Comparison of eventual high-power test results with those from structures produced elsewhere will allow the Tsinghua Un.'s high-gradient manufacturing capability to be validated. Tsinghua Un.'s role is to produce the structures including

- 1) A T24 structure from CERN-supplied parts.
- 2) A T24 structure from Tsinghua machined parts

CERN's role is to provide the engineering drawings of the structure with the corresponding technical system. In addition CERN will coordinate production steps made at CERN which may include dimensional control, SEM inspections.

Deliverables: Test report of the T24 accelerating structure

Time schedule: 2013-2016

Resources: 1 University faculty member, 1 technician and 1 student based at Tsinghua Un.

3. General X-band High-Gradient R&D

Tsinghua Un. will conduct certain activities on general X-band high-gradient research and development. This may include high power test of some specially designed RF structures, development of an X-band PETS, the study of the RF breakdown phenomenon and the scaling law.

CERN's role is to support these activities by providing the general interests of the high-gradient study and other researches such as the high-power test results at CERN and the analysis procedure of the data, codes for analysis, SEM inspections.

Time schedule: 2013-2016

Resources: 1 University faculty member and 1 student based at Tsinghua Un.

4. Help with high power test stands at CERN

Tsinghua Un. will make available an expert, who will be an employee of Tsinghua Un., to provide support with respect to the high power test stand at CERN. The expert's task may include system setup, high-power operation and data analysis.

CERN's role is to provide supervision and necessary training for the expert.

Time schedule: 2013-2014

Resources: 1 man*year at CERN with CERN providing standard subsistence allowance pursuant to CERN Staff Rules and Regulations.

Other arrangements concerning this collaboration:

1. The total manpower expense amounts to 14 man*years of which Tsinghua Un. funds 8 man*years (experts based at Tsinghua Un.) and CERN funds 6 man*years (experts based at CERN).
2. Subject to the conclusion of detailed arrangements, Tsinghua Un. will also collaborate in other areas related to CLIC, such as CLIC detectors development and the high energy particle physics of CLIC.

Signed on 23/8/2013

For the Tsinghua University of Beijing,

Huaibi Chen

Professor Huaibi CHEN

Chair of Engineering Physics Department

For the European Organization for Nuclear Research (CERN)

Prof. Steinze STARNES

Name

Prof. Steinze STARNES

Capacity

Linear Collider Study Leader