ADDENDUM

to

THE MEMORANDUM OF UNDERSTANDING FOR A MULTI-LATERAL COLLABORATION

between

THE INSTITUTIONS AND FUNDING AGENCIES OF THE CLIC/CTF3 COLLABORATION

concerning

THE CONTRIBUTION OF

Royal Holloway, University of London, (UK)
acting for the benefit of
The John Adams Institute for Accelerator Science (JAI)

TO THE CLIC/CTF3 COLLABORATION

Date: February 2010

CONSIDERING:

The Memorandum of Understanding ("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 Addenda defining each contribution pledged to the CTF3 Collaboration,

ROYAL HOLLOWAY, UNIVERSITY OF LONDON, UK, acting for the benefit of the **JOHN ADAMS INSTITUTE FOR ACCELERATOR SCIENCE (JAI) REPRESENTED BY PROFESSOR GRAHAME BLAIR,** in its capacity as Member of the CTF3 Collaboration, **HEREWITH AGREES** to make the following contributions:

- Work package I: Laser Wire Scanner for Profile Measurements on the CLIC Main Beam LINAC
- Work package II: Laser Wire Scanner for Profile Measurements on the CLIC Main Beam LINAC
- Work package III: Integration of a Laser System in the CLIC Main Tunnel
- Work package IV: Diffraction radiation techniques for short bunch length measurement on the CLIC Main Beam LINAC
- Work package V: Design of a Choke Type Cavity BPM

details of which are attached to this addendum.

This Addendum shall form an integral part of the MoU.

For CERN in Geneva on the February 2010	For Royal Holloway and Bedford New College, in London on the 17 February 2010	For the John Adams Institute for Accelerator Science in London on the 17 February 2010
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	Dr Hitesh Patel Deputy Head (Research) RHUL	Professor Grahame Blair Deputy Director of the John Adams Institute

WORK PACKAGE I

Laser Wire Scanner for Profile Measurements on the CLIC Main Beam LINAC
This addendum concerns the demonstration of transverse profile measurements with resolutions of 1 micron or below as a possible technology for determining the beam size on the CLIC Main Beam LINAC.

RHUL Deliverables:

- August 2010 – upgraded micron-scale (aiming for sigma of ~1.5 microns) laser wire system installed at the ATF2 facility.
- November 2010 – complete tests of the system at ATF2 and establish key performance indicators.
- August 2010 – simulation of the laser-wire signal extraction.
- December 2010 – a report on the results and key cost drivers.

RHUL are committed to provide up to 0.6 FTE (50% in the form of research associate time and 50% academic time) to enable this work to be completed within the planning outlined above.

CERN are committed to provide RHUL with the latest up-to-date parameter list for the CLIC main beam throughout the collaboration and will fund one trip by CERN personnel to the ATF2 facility and/or RHUL.

WORK PACKAGE II

Laser Wire Scanner for Profile Measurements on the CLIC Drive Beam LINAC
Laser Wire Scanners will be one of the non-intercepting techniques capable of measuring transverse profiles on the high current Drive Beam. In this case spatial resolution is no longer a problem, with the beam size sigma typically in the order of 200 microns. This addendum therefore concerns the design of such a monitor with performance and cost optimisation in mind.

RHUL Deliverables:

- October 2010 – upgraded demonstration system at PETRAIII (aiming for sigma of ~8 microns).
- November 2010 – specification of the problem for the drive beam, with main parameters and constraints; including signal extraction.
- December 2010 – a report on the results and key cost drivers.

RHUL are committed to provide up to 0.3 FTE (67% in the form of research associate time and 33% academic time) to enable this work to be completed within the planning outlined above.

CERN are committed to provide RHUL with the latest up-to-date parameter list for the CLIC main beam throughout the collaboration and will fund one trip by CERN personnel to the PETRAIII facility and/or RHUL.

WORK PACKAGE III

Integration of a Laser System in the CLIC Main Tunnel
Design study to see how best to deliver the laser power required to the laser profile station locations in the CLIC tunnel, with cost optimization in mind. A report on the various options available with performance and cost estimates would be expected by the end of 2010.

RHUL Deliverables:

- October 2009 – outline of first iteration, with definition of key cost drivers.
- June 2010 – first draft of a report listing the various possibilities and identification of where more detailed cost estimates are required.
- Dec 2010 – a report on the key cost drivers and suggested optimized solution.

RHUL are committed to provide up to 0.3 FTE (67% in the form of research associate time and 33% academic time) to enable this work to be completed within the planning outlined above.

CERN are committed to provide RHUL with the latest up-to-date parameter list for the CLIC main beam throughout the collaboration.

WORK PACKAGE IV

Diffraction radiation techniques for short bunch length measurement on the CLIC Main Beam LINAC

This addendum concerns the production of a cost effective design for the measurement of 150fs sigma bunch lengths with 30fs resolution for deployment at the 50 stations foreseen for such measurements along the CLIC Main Beam LINAC.

RHUL Deilverables

- October 2010 – Finish the beam test of the first system with a single target. Purpose: Check the hardware performance, estimate background contribution and its effect on the bunch length measurements
- Nov 2010 – Upgrade the system by integrating a second target to cut the background coming with the beam, design microwave terminators to dump any multiple reflections
- Dec 2010 – Finish beam tests, demonstrate the bunch profile monitor performance, cross check the measurements with RF deflector, study the tolerances and produce a cost effective design.

RHUL are committed to provide up to 2.3 FTE (2 in the form of PhD students and 0.3 as academic support) to enable this work to be completed within the planning outlined above.

CERN are committed to provide RHUL with support for design office time for eventual modifications, mechanical workshop time for upgrades and testing time at the CTF3 facility. The total cost of this support shall not exceed 50kCHF.

WORK PACKAGE V

Design of a Choke Type Cavity BPM

This addendum concerns the design of a choke type cavity BPM as an alternative to the standard cavity BPM. The task would initially be to model such a choke cavity BPM, then to build a prototype. This prototype shall be fully characterized in the laboratory and tested with beam for comparison with a standard cavity BPM.

RHUL Deliverables

- June 2010 - Preliminary study of Choke or low-Q BPM system
- July 2010 – Design of cost optimised beam position monitor system
- December 2010 – Fabrication and bench performance measurements of prototype
- December 2010 – Input into CLIC CDR on possible available technologies/designs.
- July 2011 – Fabrication of vacuum compatible prototype with electronics
- December 2011 – Beam tests of prototype with performance indicators, cost estimates.

RHUL are committed to provide up to 1.4 FTE (1 in the form of a PhD student and 0.4 as academic support time) to enable this work to be completed within the planning outlined above.

CERN are committed to provide RHUL with the following support:

- Up to 40kCHF for CERN design office time.
- Up to 50kCHF for prototype production through the CERN mechanical workshop.
- Up to 50kCHF for equipping a full laboratory test bench.
- The funding of two trips per year of CERN personnel to RHUL.