Minutes of the CLIC-CTF3 Collaboration Board
01/02/2013

Participation:

Present:

CERN	R. Corsini (CERN)
	L. Linssen (CERN)
	S. Stapnes (CERN)
	A. Augier (CERN)
China	C. Huaibi (Tsinghua University)
	Q. Gu (SINAP)
Estonia	V. Zadin (University of Tartu)
Finland	K. Osterberg (HIP)
France	O. Napoly (CEA Saclay)
Germany	A. Berhnard (KIT)
India	P. Shrivastava (RRCAT Indore)
Italy	A. Ghigo (INFN-LNF)
	G. D'Auria (Synchotrone Trieste)
Norway	E. Adli (University of Oslo)
Serbia	I. Bozovic (Vinca Institute for Nuclear Sciences)
Spain	L. Sanchez (CIEMAT)
	F. Perez (Alba CELLS)
Sweden	T. Ekelöf (Uppsala University)
	R. Ruber (Uppsala University)
Switzerland	L. Rivkin (PSI, EPFL) – *Chairman*
Russia	G. Shirkov (JINR)
UK	P. Burrows (Oxford)
USA	W. Gai (ANL)
	M. Wendt (FNAL)

Apologies received:

Greece	E. Gazis (NTUA)
USA	R. Ruth (SLAC)

1. Approval of minutes and agenda (11.05.2012)

L. Rivkin welcomes all participants and reminds that CB agenda and corresponding documentation are available on Indico at:
http://indico.cern.ch/conferenceDisplay.py?confId=223685

Minutes of previous meeting (11.05.2012) are approved without any modification. Two actions out of six are still on-going (review committees) and will be discussed under the next agenda item.

2. Follow-up of issues and matters arising not in the agenda

S. Stapnes reminds that 2 committees were discussed during the last CB meeting in May 2012:
- A new machine advisory committee for which a small group of CB members was identified to help defining the Committee's mandate.
- A special expert group to consider the CLIC programme beyond 2016 (CLIC zero, emittance conservation tests, etc.). A mandate was drafted and several potential members have been contacted.
There were however some concerns about the existence of similar groups (internal review committees, a possible machine advisory at LCC level, etc.) Moreover and since then, the overall context towards the LC

programmes has changed ("wait and see" attitude). It is thus suggested to keep the goal of setting up a single relevant CLIC advisory committee in consultation with L. Evans (LCC Director) and CERN management (Director of Accelerator & Technology sector). This committee should also look into the CLIC programme for 2017-2022. How this committee is linked to a general LCC advisory committee or CERN MAC, over overlapping, remains to see.

Timescale would be the end of 2013.

- **Action: L. Rivkin, S. Stapnes, CTF3 spokesperson advised by V. Ziemann, A. Seryi and P. Bambade.**

3. Main issues from the CLIC workshop

The CLIC workshop was held this week at CERN (295 participants). There was a good representation of external collaborators during the workshop. S. Stapnes presents some of the goals for 2013:

- Re-baselining
- Many technical challenges and first priority: a set of milestones (by WP and activities) to be defined by the end of 2013
- Implementation in terms of resources at CERN and collaborating countries (consequences of the European Strategy)
- Integration within the new Linear Collider Collaboration (LCC)
- Power reduction: a clear program is needed to solve this point.
- Interactions established during the High-Gradient day should be established
- Establishment of a Project Implementation Plan (form to be defined)

4. Spokesperson mandate and future election

L. Rivkin reminds that a new spokesperson has to be found (R. Corsini's mandate is coming to an end). It is suggested to form a search committee (the CLIC chairman and 3 others persons) to review the mandate for the forthcoming period. In parallel, it is also suggested to renew R. Corsini's mandate by up to 12 months.

Search Committee:

- A. Ghigo
- P. Burrows
- T. Ekelof

T. Ekelof wonders if the spokesperson has to be approved by the CERN DG as for the LHC experiments?
S. Stapnes says that it is up to the Search Committee to think about this. Most likely it is sufficient to consult with the CERN management concerning the candidate shortlist.
The real 1st step is to define the mandate.

- **Action: L. Rivkin to call for the search committee**

5. Detector and Physics Institute Board

L. Linssen presents the new organisation of the CLIC detector and physics study: a Memorandum of Cooperation has been signed by 12 institutes (including CERN) and discussions are on-going with 8 others. A first meeting of the Institute Board was held on 29.01.2013. Priority has been made on the preparation of CLIC physics input to USA Snowmass process.

L. Linssen reminds the purpose of this Snowmass process (several meetings to be held in the US between April and August in the framework of the physicists input into US strategy). A CLIC whitepaper summarizing the CLIC results and presenting a synoptic publication for the long term will be submitted.

Plans for the phase 2013-2016 are also presented (further exploration of the physics potential, detector optimisation studies and technology demonstrators).

S. Stapnes congratulates the Detector and Physics team for these good developments.

6. Linear Collider Issues

S. Stapnes shows the final organogramme of the new Linear Collider Collaboration (LCC).
According to L. Evans, LCC Director, the main objectives of this new collaboration are:

- support of the Japanese initiative to construct a linear collider as a stage project in Japan
- prepare the CLIC machine and detectors as an option for a future high-energy linear collider at CERN
- improve collaboration between CLIC and ILC machine experts
- move towards a "more normal" structure of collaboration in the detector community (preparation for the construction of two-high performance detectors)

A LC Board has been defined and will have its first meeting on 21.02 in Vancouver.

7. Strategy issues and other regional news

S. Stapnes informs that the document (Proposed Update of the European Strategy for Particle Physics) is now available:
https://indico.cern.ch/getFile.py/access?resId=0&materialId=0&confId=217656

L. Rivkin stresses out the importance of see point l) and m) of the document.

8. Tour de Table

JINR (G. Shirkov)

The CLIC Team of JINR at CERN now consists of about 20 experts on engineering design, IT, mechanics and some other specializations.
4 Addendums to Cooperation Agreement between JINR and CERN were signed in January 2013, namely:

- *Inspection of RF Components, RF Measurements and Vacuum Testing for the CLIC Study;*
- *Engineering Design, Integration and Optimization of Components and Structures for the CLIC Study;*
- *Quality Assurance, Technical Specifications and Inventory for the CLIC Study;*
- *Design and Construction of Magnets for the CERN Accelerator Complex.*

2 other projects on production and testing of RF components are in a stage of investigation and preparation now.

HIP (K. Osterberg)

HIP and Department of Physics, University of Helsinki:

- *Continues development of multi-scale model of electrical breakdown. In parallel: surface charging and short time evolution ($t \leq$ ns) under high electric field, plasma simulations and surface damage.*
- *Continues to study properties of Cu surfaces: plastic response to tensile stress due to interaction of charged surface with field itself, dynamics of tip growth due to self-reinforcing field enhancement.*
- *Sets up series of experiment (carried out in Helsinki or at CERN) to verify the developing model.*
- *Continues to contribute to machining, high precision assembly (especially diffusion bonding) and cost study for CLIC RF structures involving several Finnish industrial and academic partners.*
- *Continues thermo-mechanical modeling of the complete CLIC module especially the lab test module.*
- *Continues development of method to measure dynamically vacuum inside RF structures during their operation with aim to be able to do measurements at the CERN Xbox in future.*

- *Develops non-contact method for measuring RF structures internal shape after assembly/operation.*

Vinca Institute (I. Bozovic)

- *New member since end of 2012 and motivated to contribute to the CLIC Physics and Detector program*
- *Over a decade history of activity at ILC, from TESLA TDR to ILC CDR with particular interest in instrumentation of the very forward region (FCAL Collaboration since 2005)*
- *Initial interest in the beam induced effects in luminosity measurement at TeV energy linear collider, including the CLIC case, resulted in LCD-Note-2012-008 http://cds.cern.ch/record/1507547*
- *Contribution over the period 2012-2016 (12.5 person years over the period):*
  - *Contribute to the physics and detector study of the very forward region at CLIC*
  - *Contribute to the study of the beam-induced effects in luminosity measurement at CLIC*
  - *Contributes to studies of the physics potential at CLIC*
- *2 encouraging news:*
  - *We took over H-> μ+ μ - BR measurement at 1.4 TeV with the first results being presented at this Workshop: https://indico.cern.ch/contributionDisplay.py?sessionId=17&contribId=235&confId=204269 with the goal to complete the Higgs analyses for the CLIC Snowmass paper,*
  - *it is very probable that we will have additional 1 PhD student available to start immediately with the CLIC related PhD topic (we are waiting on the funding approval from the local funding agency).*

CIEMAT (L. Sanchez/ F. Toral)

CIEMAT has delivered in September, 2012 the first double-length PETS for one of the CLIC modules, based on the mini-tank concept. The structure has been successfully characterized at low power: the resonant frequency is less than 10 kHz off the nominal one.
CIEMAT is now working on the second PETS, with some minor improvements compared to the first one, to ease the assembly. Most of the parts are already under fabrication and the expected delivery date is April, 2013.
CIEMAT is also working on the repair of the cooling circuits of the first PETS tank delivered for TBL experiment, due to corrosion problems in the gaskets. They will be replaced by circuits based on a different design, where the gasket under vacuum is not in contact with the water.
Finally, CIEMAT is interested to continue working on the development of more PETS, specially one of the actual length for CLIC PETS. We are trying to define this extension of the collaboration with CERN colleagues

Syncrotrone Trieste (G. D'auria)

- 2nd klystron received
- High Gradient workshop will be organized in Trieste (June 3-6, 2013).
Website: http://indico.cern.ch/conferenceDisplay.py?confId=231116

Tartu University (V. Zadin)

New member (MoU and addendum signed during the CLIC workshop)

INFN (A. Ghigo)

Main activity: delivery of beam phase monitor programme.

NCP Pakistan (A. Nawaz)

Pakistani collaboration is very active. A complete overview of what has been produced by the team in design and production jobs is summarized in the presentation of Mr. Nawaz (see: http://indico.cern.ch/getFile.py/access?contribId=15&resId=0&materialId=0&confId=223685)
The possible production of RF structures in the near future is also mentioned.

SINAP (Q. Gu)

Not yet a collaboration member but interested in collaborating (Xband technologies)

Tsinghua University (C. Huaibi)

Lot of efforts made on choke mode.

ANL (W. Gai)

ALBA Cells (F. Perez)

In the pipeline to collaborate, mainly in the damping rings field.

Oslo university (E. Adli)

Report from the CLIC activities of the High-Energy Physics group at the University of Oslo, Norway :
- Two PhD students working full time on CLIC :
** Reidar L Lillestøl (est. graduation 2014) on CTF3 activities, focusing on experimental verification of the decelerator feasibility in the TBL. The project is well advanced and we aim to publish a comprehensive summary paper on the TBL results this year.*
** Kyrre N. Sjøbæk (est. graduation 2013) on rf design and breakdown studies. His PIC simulations work shows promising results concerning the understanding of arc formations, which is important to understand the fundamental high gradient limitation.*
- The Oslo group has opened up a permanent academic position for an accelerator physicist, who will also act as leader of the Norwegian CLIC activities. This position will probably be filled sometime during 2013.
- For the next period up to 2017, the Oslo group plans to be involved in the CLIC project on at least the same level as today (two PhD students plus project leadership). An increase in the available resources could be possible, depending on the results of National and European funding applications.

CEA (Napoly)

One CEA Staff detached at CERN. Working mainly on CTF3 activities

JAI Oxford (P. Burrows)

The JAI/Oxford group:

- *Comprises 3 faculties, 2 postdocs, 5 PhD students and 1 engineer;*
- *Is working on the drive beam phase feed-forward system; we are developing a prototype for beam tests at CTF3 starting in summer 2013; we are providing the high-power, high-bandwidth, low-latency drive amplifier, as well as the digital system for feed-forward control;*

- *Is working on intra-pulse beam-based feedback (for the interaction point and elsewhere); prototypes are deployed and tested at the ATF2 at KEK;*
- *Is working on laser-based beam diagnostics, primarily the laserwire emittance measurement system;*
- *Is making good progress on all projects;*
- *Gave 3 of the 250 workshop talks, and contributed to several others.*

FNAL (M. Wendt)

FNAL is a member of the CLIC CTF3 Collaboration since 2010. A new CB representative needs to be found as M. Wendt is now affiliated with CERN.
Major contribution of FNAL was the design and development of an ultra high resolution cavity BPM for the main beam (a prototype has been manufactured and installed in CTF-CLEX). Future FNAL contributions may include BPM read-out R&D.

Uppsala University (T. Ekelof)

We have measured the effects of RF breakdown on the beam in the TBTS. The results were presented at the workshop by Andrea Palaia (PhD student) last Tuesday. An article describing the results has been submitted for publication. The trajectory of the beam shows transverse displacements in the presence of RF breakdown. We did not observe any dependence of this displacement on the amount of power dissipated by the RF breakdown, nor on the presumed location of the RF breakdown inside the structure. We observed a transverse kick of the beam due to misalignment between the beam trajectory and the accelerating structure axis, which had a well defined magnitude that depends on the beam energy.
The performance of the TBL beam profile and emittance monitoring has been investigated by Maja Olvegaard (PhD student). She has also submitted an article for publication. Her research focused on how to use beam profile monitors when the beam has a large energy spread. This is useful for the TBL decelerator line with several PETS and for the CLIC decelerator. The large energy spread induces significant chromatic effects, but the methods have been elaborated to correct for that.
Last year we have performed the first measurements with the Flashbox installed in the TBTS to investigate RF breakdown currents emitted by the accelerating structures. Alexey Dubrovskiy (CERN project associate) has been analyzing the data and found possible evidence of hydrogen. He presented his work to the workshop on Tuesday.
Work made by Marek Jacewicz (Uppsala) on the diagnostics for the 12 GHz stand-alone test-stand is progressing well with the assembly of a precision spectrometer for joint energy and beam size measurements with a magnet and pepper pot.
A new doctoral student Panos Zisopoulos has started with joint supervision by Yannis Papaphilipou (CERN) and Volker Ziemann (Uppsala). Panos will work on the coupling control in the CLIC damping rings.
We have employed Christopher Borgmann as from 1 February (today) to manage the Uppsala part of the TBTS. Christopher will remain based at CERN.

PSI (L. Rivkin)

1. Design of MPTS (Multi-Purpose Test Structure) for the FACET experiment (by Giovanni De Michele as part of his PSI/SNF funded Ph.D) and financial contribution (108 kF) to the construction of the structure.

2. Construction and installation of the new low emittance monitor of the SLS via the TIARA project. The monitor is available for shifts involving CERN staff on CLIC related damping ring studies.

IPM (R. Corsini)

3 students working on Beam dynamics from IPM Iran.

RRCAT Indore (P. Shrivastava)

We welcome Prof. Lenny Rivkin, as new CLIC-CTF3 Collaboration Chairman, and would like to mention our thanks to Prof. Ken Peach for his vibrant efforts to steer the collaboration with great joy for all during his mandate. RRCAT is the nodal institute of DAE, India to participate and contribute in the CERN accelerator projects through the cooperation agreement, protocol and Addenda. Further to the successful contributions to the LHC accelerator, LHC hardware commissioning and detectors, RRCAT is contributing to the CERN's Novel Accelerator Projects like SPL(LINAC4) and CLIC(CTF3) under NAT protocol. Several contributions have been made to LINAC 4 project. For CLIC, we are continuing our support on the software development for the CTF3 controls and as a continuation we would be sending RRCAT engineers from March 2013 onwards for carrying out the tasks under the collaboration. Earlier RRCAT has made contributions to CTF3 project for its TL2 optics design, 62 vacuum chambers for TL2, 5 dipole magnets for TL2 and software development for the CTF3 controls. We have made three prototypes of 800mm long PETS bar out of which a final one has been accepted. Additional contributions for the L Band microwave components, smaller PETS bars are under preparations. We also had exchange of information on prototyping of long pulse solid state modulators and would like to discuss the solid state amplifiers development. We reaffirm our interest in providing necessary contributions to the CLIC project on behalf of DAE of India.

NTUA (E. Gazis)

The NTUA and the University of Patras team has continued our project on last year, about the mechanical design and prototype construction of the 2-beams module girder. In addition radiation test and fatigue tests of different materials for the girder construction were performed and compared with simulated data.

A recent effort is to find Greek firms for PETS prototype module construction and then tests at NTUA. Hopefully, to have better news to the next CB.

Two PhD and 3 PJAS students are working under the team supervised by G. Riddone.

CESTA (R. Corsini)

Potential new collaborators (SS)

Good contacts have been established with Shandong University (China), METAS (Switzerland), KIPT (Ukraine) and NCBJ (Poland).

9. AOB

- S. Stapnes informs that a CLIC workshop should be organised in 2014: January or February? T. Ekelof agrees that this workshop really had a big impact. Participations from firms were also important.

Note: the dates are now defined: Monday 3.02 to Friday 07.02.2014.

- CLIC show room to be improved in view of the Open days. CLEX will be opened. Consider having some modules available. For collaborators, it will be also more attractive to bring visitors in.