

Summary Notes of

5th Institute Board Meeting of the CLIC Detector and Physics Study

Held at CERN on 23 September 2014, 12:30 - 13:30

Present at CERN: Jean-Jacques BLAISING for Yannis Karyotakis, (LAPP **Annecy**), Phil BURROWS (University of **Oxford**), Gerald EIGEN (University of **Bergen**) Konrad ELSENER (**CERN**), Jose Repond for Harry WEERTS (**Argonne**), Aidan ROBSON (University of **Glasgow**), Alberto RUIZ (**Spanish Network for Future Linear Colliders**), Frank SIMON (**Max Planck Institut für Physik**, Munich),

Also present: Lucie LINSSEN (CERN), CLICdp spokesperson

Attended via Webex: Konstantin AFANACIEV (**Minsk**, Bielorrussia), Ivanka BOZOVIC-JELISAVCIC (**Vinca** Institute of Nuclear Sciences, Belgrade), Joel GOLDSTEIN (University of **Bristol**), Aharon LEVY (**Tel Aviv** University), Titi PREDA (**Institute for Space Science**, Bucharest), Mark THOMSON (University of **Cambridge**), Joost VOSSEBELD (University of **Liverpool**), Leszek Zawiejski (The Henryk Niewodniczanski Institute of Nuclear Physics, **Polish Academy of Sciences**, Cracow)

Apologies/absences: Marc BOLAND (Australian Collaboration for Accelerator Science **ACAS**), Marco Aurelio DIAZ GUTIERREZ (Pontifica Universidad Catolica de Chile, **Santiago**), Marek IDZIK (**AGH** University of Science and Technology, Cracow), Tomas LASTOVICKA (Institute of Physics, Academy of Sciences, **Prague**), Ulrik UGGERHOJ (**Aarhus** University), Nigel WATSON (University of **Birmingham**), James WELLS (University of **Michigan**)

Link to Meeting (Indico page): <https://indico.cern.ch/event/332410/>

1) Welcome

Frank Simon welcomed everybody to this 5th IB meeting.

2) Report from the Spokesperson

The first part of Lucie Linssen's report was on the forthcoming CLICdp publication on "Higgs Physics at the CLIC electron-positron linear collider". An almost complete draft exists, but material from a few on-going physics studies is missing.

3) Discussion of CLIC staging strategies

a) CDR Volume 3

As an introduction to the topic, Lucie recalled the main lines of the staging strategy described in CLIC CDR Volume 3. Two scenarios with different luminosities in the lower

energy stages had been worked out. In correspondingly different numbers of years, an integrated luminosity of 600 fb^{-1} at 500 GeV, 1.4(1.5) TeV and of 2 ab^{-1} at 3 TeV could be reached. A "CLIC year" was considered to be 200 days of operation with 50% efficiency. In the discussion, the "Snowmass year" of 100 days was mentioned. As a side remark, it appears that the "ILC year" is estimated in a somewhat more optimistic manner.

b) New staging baseline

Working on a new baseline for the CLIC energy staging scenario is motivated by several factors:

- As announced in the CDR, the focus had been very much on 3 TeV, with lower energies stages "added on" - a new scenario will give more weight to the initial stages, while keeping the goal of a 3 TeV collider;
- An improved cost model for the accelerator, including a vast number of parameters, has become available;
- New insight into physics (theory, aspects of top physics) and lessons learnt from the Higgs benchmark studies can be taken into account.

A team of CLIC accelerator and CLICdp experts has started working, with the aim of producing a single new CLIC staging scenario (described in a short report), possibly by the end of 2014. At least one option (klystron-based CLIC at the lowest energy stage) will be included, possibly as an appendix.

c) Trade-off between top physics and Higgs physics

In the past years, the CLIC physics studies have focused mainly on the Higgs, and on the threshold scan for the top. Recently, Lucie triggered a discussion on the impact of top production forward-backward asymmetries for a CLIC physics programme. In particular, the energies chosen for the first stage of CLIC might be higher than the 360-370 GeV needed for the threshold scan. For details, see Lucie's slides at the CLICdp analysis WG meeting of 23 September, <https://indico.cern.ch/event/334680/contribution/4/material/slides/1.pdf>.

It appears clear that a c.m. energy of 420 GeV or even higher might be a better choice in view of top physics - however, the possible impact on the Higgs physics results also needs to be assessed. *Note that, in any of these first-stage scenarios for CLIC, one would always foresee dedicated short runs at c.m. energies around 350 GeV, for the top threshold scan.*

During the discussion on this topic, the "history" of initial CLIC energy stages in various phases of the project was clarified:

(a) The 500 GeV chosen for the CDR was driven by the comparison with the ILC and fact that many important cross sections rise with energy.

(b) The 350 GeV assumed as first stage, and chosen for the more recent Higgs analyses, was driven by the assumption that the best (model independent) measurement of the HZZ coupling using Z recoil would be achieved using the Z \rightarrow lepton_pair measurement (which is impossible or very poor at 500 GeV). Meanwhile, it has turned out in the CLIC physics studies that a more accurate measurement of this coupling is obtained using the Z \rightarrow quark_pair measurement. This might be of the same or better accuracy when going from 350 to 420 GeV or higher.

Finally, it was pointed out that 1.4 TeV might be an even better energy for top forward-backward asymmetry physics, but that this would imply a delay of approximately 10 years - the issue today is to define the most convincing physics case for the energy of an initial CLIC stage.

4) CLIC workshop January 2015

As has now become the tradition, a CLIC workshop will be held at CERN from 26 to 30 January 2015. The accelerator team suggests having plenary sessions on general topics (physics, detectors and accelerators, including other energy frontier projects) on Wednesday afternoon and possibly Friday morning.

After a short discussion, the IB agreed that for the detector and physics part, the meeting should not last the full week. Instead, working group sessions should be scheduled for Tuesday afternoon, Wednesday morning and all of Thursday. Parallel sessions should be avoided as much as possible (this will depend on the number of contributions - we should encourage young colleagues, in particular from outside CERN, to participate and give talks).

Further discussion points were:

- the need for summary talks (or not) on Friday;
- the composition of the organising committee (for CLICdp, this used to be the ET);
- the fact that there are already other important events scheduled in January, and that plenary speakers (in particular from other h.e. projects) for the CLIC workshop should be invited soon.

Input from IB members to the organisation of this workshop is welcome at any time - please contact Lucie with your suggestions.

5) Detector Optimisation Working Group

As announced to the IB members ahead of time by Lucie Linssen, the departure of Christian Grefe from LCD to ATLAS makes it necessary to look for a new co-convenor of the Detector Optimisation Working Group. The IB accepted unanimously the proposal to nominate Konrad Elsener for this task (together with Frank Simon, who continues to act as co-convenor).

6) A.O.B.

A) Aidan Robson pointed out that for him, it was very useful to have several CLICdp meetings combined into one day (in this case, analysis WG, Institute Board and detector optimisation WG).

B) Concerning LCWS14, all is "under control" from the CLICdp side, rehearsal talks are being scheduled (the attendance at the workshop seems to be a bit lower than usual in LCWS, but this is not due to the CLICdp attendance).

C) Next meeting: will take place during the CLIC workshop end of January 2015 (likely dates are 27, 28 or 29 January, exact date and time to be decided via DOODLE poll)

(Notes drafted by Konrad Elsener - CERN, 25 September 2014)