



CLIC-CTF3 Collaboration Board
Minutes of the 23rd meeting
24th January 2019

Participation:

CERN	A. Augier R. Corsini A. Latina (invited talk) S. Stapnes
Canada	C. Serpico
France	A. Faus-Golfe (LAL IN2P3)
Finland	M. Aicheler (HIP) K. Osterberg (HIP)
Greece	E. Gazis (NTUA)
India	P. Shrivastava (RRCAT) – Vidyo
Italy	A. Ghigo (INFN)
Norway	E. Adli (University of Oslo)
Spain	F. Perez (ALBA-CELLS)
Sweden	M. Jacewicz (Uppsala University) R. Ruber (Uppsala University)
Switzerland	L. Rivkin (PSI) - Vidyo
Russia	G. Shirkov (JINR)
UK	P. Burrows (Oxford) A. Dexter (Lancaster)

Apologies:

Canada	M. Boland (Saskatoon University)
Italy	G. D’Auria (Synchrotrone Trieste)
Sweden	T. Ekelöf (Uppsala University)
Spain	F. Toral (CIEMAT)
UK	R. Jones (Manchester)

1. Welcome

R. Ruber thanks everyone for attending the meeting and also A. Augier for organizing it and providing constant support to collaborators during the year. He reminds that the agenda and corresponding documentation are available on Indico at:

<https://indico.cern.ch/event/786281/>

The agenda is approved without any modification. Minutes of the previous meeting (25.01.2018) were sent earlier in the week and are online. There were no pending actions to mention. Minutes are considered as approved by default, knowing that any modification/comments can still be made after the meeting by sending an email to A. Augier.

2. Election of CB Chair

P. Burrows reminded that R. Ruber was elected 3 years ago (22 January 2016).

The election should take place no later than 6 months before the end of the term in progress.

Ordinary the election process should have taken place 6 months in advance. However given the specific context (PIP preparation, European Strategy decision, final ILC decision expected from Japan, etc.), it is suggested to extend the mandate by one year.

This proposal is approved by all members.



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3. Collaboration Issues and Status

New Collaboration Members

53 institutes with 31 countries

1 new member MGFI

S. Stapnes presents the CLIC contribution to the CERN Annual Report 2018 prepared by R. Strom and himself. Both documents can be used by institute if needed:

<https://indico.cern.ch/event/786281/contributions/3268464/attachments/1783999/2903663/annual-reports-2018.pdf>

Annual Reports from the Collaboration (these reports were sent by email to A. Augier prior to or after the meeting)

University of Oslo

The group had one post.doc. researchers (Kyrre N. Sjøbæk), one Oslo student (Carl A. Lindstrøm) and two CERN-Oslo PhD student (Lukas Malina, Ben Chen) contributing to the CLIC project, in addition to Oslo accelerator group leader (Assoc. Prof. Erik Adli). Our main activities have included experimental tests of CLIC wake field monitors in CLEAR, emittance preservation schemes (numerical studies as well as experimental tests) and contributions to the new CLIC working group on Novel Acceleration Techniques, which Oslo is chairing. In particular, we have successfully implemented and commissioned a new experiment on plasma lensing in CLEAR, and also helped significantly with commissioning and operation the CLEAR beam

CIEMAT

CIEMAT continues the contribution to CLIC in two main items: the dipole with longitudinally variable field and the accelerating structure.

Concerning the dipole, the calculations and engineering design are finished, and the manufacturing drawings are now under revision. The material procurement will start soon and the pieces will be put into fabrication once the drawings are approved.

Concerning the structure, all the disks are finished. The waveguide parts are under production. First sample copper disks have been successfully bonded. We have problems to find a clean furnace for the brazing and bonding of the structure. We are now performing a last attempt to find the reason for the pollution. If it fails, we will use the same furnace used for the structures produced by CERN.

Uppsala University

1) Experiments with spectrometer in XBox1 within ARIES program:

Study of high-field effects on normal-conducting accelerating structures using a setup consisting of a spectrometer magnet, collimator, screens and fast camera.

Achievements:

- Installation and commissioning at the new site
- Successful dark current scans with respect to incident RF power and pulse length
- Collection of data needed for validating dark current simulation and necessary for the decision for an setup upgrade with focus on fundamental studies of the dark current

2) Construction of the cold DC spark system in Uppsala (K-contract with CERN)

This new experimental infrastructure will enable study of breakdown physics at cryogenic temperatures. With this we hope to extend the understanding of high-field physics and material science to low temperatures and make new and potentially important connections between the high-gradient normal-conducting and superconducting fields.



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3) Hosting and organization of mini-MeVArc meeting in Uppsala.

Groups at CERN, Helsinki, Jerusalem, Uppsala and Tartu are working closely together on physics of vacuum discharges. The purpose of this meeting was to discuss the latest efforts in understanding field emissions and vacuum arcs. This covers theory, simulation and experiments.

Oxford University

The John Adams Institute - Oxford University team continues to work as part of the CLIC-UK consortium. In addition to providing CLIC Collaboration leadership, in the past year we have contributed in 4 main areas:

- Development of high-resolution cavity BPM readout at KEK/ATF2: real-time beam position resolution of 20nm has been demonstrated by incorporating real-time signal integration into the fast digital BPM readout.
- Beam stabilisation at the ATF2 IP: real-time beam orbit stabilisation to c. 50nm and 41nm has been demonstrated in 1-BPM and 2-BPM feedback modes, respectively, using the above real-time signal integration techniques.
- Beam stabilization in the upstream section of the ATF2 extraction beamline using the FONT5 FB system based on stripline BPMs. The BPM processors have been upgraded and beam jitter stabilization to better than 200nm has been demonstrated. The upstream jitter stabilization has been observed to result in a reduction in beam-angle jitter at the ATF2 IP, and there is some evidence that it might contribute to a modest reduction in the beam-spot size at the IP.
- Design of a new diode-based stripline BPM signal processor for the CLIC IP FB system. The processor was tested with beam at ATF and showed a latency of c. 3ns, equivalent to 1ns at CLIC, with a position resolution of about 300nm, meeting the goal for the CLIC IP FB system.

A paper on the LC IP FB system concept and prototyping was published in December 2018:

<https://journals.aps.org/prab/abstract/10.1103/PhysRevAccelBeams.21.122802>

Helsinki Institute of Physics

HIP and UH are interested in various challenges in accelerator technology related to the application of X-band technology in CLIC. We are involved in the R&D for the CLIC RF structures manufacturing. To that end we are developing an instrument for assessing the inner geometry of an accelerating structure in a non-destructive way as well as an ultrasound microscope for mapping of mechanical properties of copper surfaces in AS. Additionally, we heavily contribute to the re-engineering of the CLIC module and all its related studies.

Fundamental level understanding of breakdown phenomena near metal surfaces under high electric and high-gradient electromagnetic fields will enable the design of efficient RF accelerating structure for CLIC components. HIP and UH play a leading role in the development of a multi-scale model spanning from electron-scale processes to microscopic mechanical behavior of surfaces. The recent result shows a full dynamic of metal tip evolution due to field and temperature effects induced by emission currents.

The total contribution of HIP and UH is about 11 FTE to the CLIC study.

University of Saskatchewan

The University of Saskatchewan (UofS) has recently joined the CLIC Collaboration through Mark Boland who has moved from Australia to Associate Professor at the Department of Physics and Engineering Physics and Machine Director of the Canadian Light Source (CLS). The UofS/CLS contribution will be expanded from the high gradient work contributed from Australia to contributing to the CLEAR operations and injector upgrade. The CLS is working on its own upgrades, including the full replacement of the existing 250 MeV, S-band injector Linac. CLS is also building an Electron Source and Radiofrequency Lab for testing of electron sources, S-band accelerating structures and development of beam diagnostics. These activities overlap with CLIC activities and sets the grounds for fruitful collaboration. The experienced staff at the CLS and the new cohort of students from the UofS who will do graduate research in accelerator physics will be able to make significant contributions to the CLIC Collaboration.



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CLS also intends to contribute in CLIC high gradient program, participating in the X-band high-gradient testing effort in the CERN Xbox facilities, and the CLEAR program, contributing to the operation of the CLEAR facility. CLS contribution includes up to 4 FTE*year of research support. Related Addendum will be drafted in the coming weeks. The first step will be for CLIC to host an MSc student at CERN to contribute to the operation of CLEAR and working the injector upgrade design.

RRCAT

India has been participating in the CLIC collaboration activities under India-CERN Novel Accelerator Technology Protocol. Just to recall, we had contributed to the construction, commissioning and controls software development for CTF3 with contributions of dipole magnets for TL2, Optics Design of TL2, Vacuum Chambers for TL2 and software development for CTF3 controls (software controls contribution by RRCAT and BARC engineers). The recent contributions are design, development, supply and commissioning of a 20 kW broad band solid state amplifier for the sub harmonic buncher for CLIC injector Linac. RRCAT has also shipped eight PETS bars and spare vacuum chambers of various profiles for CTF3/CLIC. There had been a request from CLIC (Dr. Steffen Doebert) to look into upgrading the fast switching response of broad band solid state amplifiers for CLIC SH buncher. These studies have been done with prototypes and experimental results have been obtained successfully at RRCAT. We look forward for further participation and contributions to CLIC.

4. CLIC Report

S. Stapnes reminds that 2018 was a very busy year with the production of several important documentation.

Summary Report – 90 pages – condensed executive report

Project Implementation Plan – Main document from Accelerator Side.

P. Burrows thanks everybody for their contribution, several hundred authors having contributed.

Xband activities are progressing well.

An Internal review for the CLEAR facility is coming (7.02) with a good hope that the program will continue.

E. Adli wonders if the CERN's management was positively surprised with the information provided..

S. Stapnes confirms that it was the first time the CLIC Community was showing complete data on 380 GeV solution and new physics results. The documentation shows realistic program in terms of times scale, cost, physics results.... It also reflects that CLIC is a project that has been developing during several years and is more mature than others proposition. S. Stapnes also reminds that others important documents were prepared by the Detector community.

Prof. Gazis wonders if ECFA has already expressed a preference between Linear Collider machine and Circular Machine? S. Stapnes is not aware of this but mentions the point of view of the ECFA Chair is indeed important.

5. CTF3 report

R. Corsini informs that a full report on CTF3 is being prepared. Due to lack of resources, it could not be finalized yet. R. Ruber proposes his help with the preparation of the documentation.

R. Corsini also reminds that a contribution on the same topic was made during the IPAC 2017 conference (the document "Final Results from the CLIC Test Facility" CLIC-Note-1113 can be found in [CDS](#))

Regarding the dismantling of CTF3, the following institutes have made requests:

CERN – AWAKE

INFN

IFIC

Uppsala University

LAL, Orsay



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IPN-Orsay
CANDLE Institute , Armenia
IPM
Cockroft Institute
ELETTRA
PAKISTAN Atomic Energy Commission National Technical University of Athens
CERN – LEIR and several others CERN groups

R. Corsini reminds that this list is not exhaustive, the process is on-going.

6. Compact Light Report

Andrea reminds the aim and status of the Compact Light Project (See [slides](#)).
A mid-term Review is foreseen in July 2019 (Helsinki).s

7. Upcoming activities and near future strategy

S. Stapnes informs on the following meetings to be held in 2019

- **Linear Collider Community Meeting – Lausanne, 8 & 9 April 2019**

This meeting is rather difficult to organize because linked to the expected ILC decision by Japan (early March). The aim is to prepare the case of a Linear Collider Solution in view of the ESPP meeting in Granada. The Program Committee has just started.

P. Burrows says that one should not underestimate the impact of the Press. The LC community meeting in Lausanne is therefore really important.

CB Members are strongly encouraged to participate to this meeting in Lausanne if they feel that Linear Collider project should be supported.

- **Open Meeting ESPP– Granada, May 2019**
- **CLIC Project Meetings in 2019 (dates to be defined)**
- **High Gradient Workshop 10-14 June 2019**

CLIC program for 2019-2025

S. Stapnes explains that the budget situation at CERN is tight for the period 2019-2021. Several options can be discussed:

Plan A : 100 MCHF over the period for Material (same amount for personnel)

Plan B: Little 3.5 GeV Linac based on CLIC technologies, klystron based is important for CERN's management. Future for X-Band technologies.

Plan C: "Wait and See" budget. Maintain responsibilities towards collaborators but cannot invest in new plan.

Plan D: Project line disappear after the Strategy.

He also reminds that the following subjects need to be discussed within CLIC activities:

- EU calls coming during the Autumn 2019.
- Continuation of ARIES (submission of new proposal for Spring 2020).

8. Next CB meeting

The next CB meeting will be held during the CLIC workshop 2020 (Thursday 12 March 2020)