CLIC-CTF3 Collaboration Board #25
7 December 2022

Participation:

CERN	A. Augier
	R. Corsini
	S. Stapnes
France	A. Faus-Golfe (LAL IN2P3)
Finland	K. Osterberg (HIP) – *Remote*
India	P. Shrivastava (RRCAT) – *Remote*
Italy	G. D'Auria (Synchotrone Trieste)
Norway	E. Adli (University of Oslo) – *Remote*
	D. Gavela (CIEMAT) – *Remote*
Sweden	T. Ekelöf (Uppsala University) – *Remote*
Switzerland	L. Rivkin (PSI)
UK	P. Burrows (Oxford)

Apologies:

Denmark	Ulrik Ingerslev Uggerhøj (Aarhus University)

1. Welcome

G. D'Auria welcomes participants for his first meeting as Chair of the CLIC Collaboration Board. He reminds that the agenda and corresponding documentation are available on the link below:
https://indico.cern.ch/event/1222436/

The agenda is approved without any modification. Minutes of the previous meeting are online. There were no pending actions. 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. Collaboration Issues and Status

Steinar presents few highlights on CLIC and Linear Collider activities which also include information on: collaboration CHUV-CERN (FLASH therapy), Compact Light, IFAST project, CREATE Proposal. His presentation is available on the link below
https://indico.cern.ch/event/1222436/

The CLIC Project Readiness process is also highlighted.

Regarding the Collaboration and since CTF3 has now been decommissioned, T. Ekelof wonders if it is still possible for institutes to register under CTF3 vs CLIC. The answer is yes. It is also mentioned that few messages were sent recently by CERN User Office in order to remind about the Team Leader extension (if needed).

Last but not least Steinar informs the board of the structure defined within Europe for the ITN (ILC Technology Network) programme.

3. Recent achievements and plans towards 2025-2026
This point was included in the previous one (See slides)

4. Collaboration updates. Around the table, news and relevant updates from collaborating institutes

CIEMAT
Presently, waiting for the power test of the accelerating structure that we produced in collaboration with Egile. Besides. CIEMAT is working on the analysis of the magnetic measurements performed on the prototype dipole with variable longitudinal field. New iron blocks were ordered to machine the poles for the low field modules. These blocks will be magnetically characterized before the assembly.

CLEAR – Long run, FLASH measurement, contributions to AWAKE and CLIC, same programme expected for 2023. CLEAR Scientific Committee in February 2023 will give guidelines for 2023 and the future.

ICJlab (slides)

Helsinki Institute of Physics (HIP) at University of Helsinki (UH)
HIP and UH are interested in various accelerator technology challenges related to the application of X-band technology in CLIC. Design of efficient RF accelerating structures for CLIC components rely on good understanding of fundamental mechanisms causing surface modification under high electric and electromagnetic fields. HIP and UH play a leading role in multi-scale modelling of the relevant processes. The current focus of the study is on surface diffusion affected by strong electric fields, which explains self-growth on surface field emitters. Moreover, we work on the dislocation dynamics under the surface in the presence of pulsing fields at the surface with the collaborators from the University of Jerusalem and CERN.
The total contribution of HIP and UH to the CLIC study in 2023 will be about 1.5 FTE.

Oslo (slides)

Oxford
The John Adams Institute, Oxford University, has continued to support CLIC in 2022. We support a mechanical engineer based at CERN full-time for design of the next CLIC module. We support a postdoc full-time at CERN for operation of CLEAR, as well as several graduate students who also provide CLEAR operational support for beamline experiments for CLIC and other projects. Burrows attends the CASC and has represented CLIC by providing status report presentations on the CLIC (and ILC) project at ICHEP22 (Bologna, July 2022) and ICTS (Bangalore, November 2022). We are a lead partner in an STFC-funded project for developing UK manufacturing capability for CLIC X-band structures.

RRCAT
India had been participating in the CLIC R & D. Just to recall we did optics design of TL2 for CTF3 and participated in its commissioning. Our other inkind contributions had been dipole magnets, vacuum chambers and CTF3 controls system commissioning and tests. We also developed a broad band solid state amplifier of 20kW with 50MHz band having a special feature of fast phase switching. This was used to develop and test the source and a prototype 500 MHz buncher made out of aluminium. The amplifier was used to to perform a high power test of the buncher without beam. All this was successful.
We are deeply interested in the high efficiency S Band klystron development as well as other technologies which may spin off from the CLIC R & D efforts. We extend our full cooperation and support for the CLIC collaboration.

Uppsala

Uppsala activities were mainly focused on the cryogenic DC spark system in Uppsala built in collaboration with CERN. The setup is used to investigate field emission and vacuum arcs, which limit the accelerating gradient of normal conducting and superconducting accelerating cavities. The system can be operated at ambient to cryogenic temperatures measuring conditioning data, breakdown threshold and field emissions.

The system was upgraded in 2022 to lower the achievable temperature below 10 K. This was successful and the first copper electrodes were tested at 4 K. With this milestone behind the setup is ready for measurements of niobium electrodes from room temperature through the superconducting transition. Further goal is to measure electrodes, both normal and superconducting, which have been prepared using superconducting cavity preparation protocols.

Unique features were identified on the surface of the cryo-conditioned electrodes using microscopy done after field exposure (shape changes from circular craters to star-like formations). The features are common for the surfaces tested at cryogenic temperature and very rare for the electrodes after the test at room temperature. The investigation into the origin of the features are proceeding with the help from material science experts from the Hebrew University of Jerusalem.

Uppsala also recently joined the ongoing study at CERN, of the effects of H- irradiation on different materials to providing data on the field reached during conditioning for irradiated and non-irradiated electrodes in cryogenic conditioning. One pair of partly irradiated electrodes is currently being tested in Uppsala.

A new PhD student started the work on the cryo-DC setup with the main aim to measure changes in the resistivity before and after conditioning process as a way to quantify movement of dislocations. This study could shed light on the question if movement of dislocations in the crystal structure is indeed the underlying mechanism for breakdown phenomenon. The plan is to use the electrode system as a resonance cavity and induce a high frequency (GHz) current in the electrodes that will only flow near the surface exposed to high fields and affected by dislocations. Huge advantage of our system is the cryogenic environment since resistivity at low temperature is due only to dislocations, vacancies, impurities and all possible material defects. With this we hope to extend the understanding of high-field physics and material science to low temperatures and make also new and potentially important connections between the high-gradient normal-conducting and superconducting fields.

5. Next CB meeting, option of CLIC days in autumn 2023, AOB and close¶

CLIC Project Meetings are expected in the Spring and in the end of the year.
CB meeting

Uppsala
T. Ekelof mentions that as from 01.01.2023, Marek Jacewicz will replace him in the CLIC Collaboration Board.