DRAFT Minutes of the CLIC project meeting of 31.03.2015

The program and transparencies can be found here:
https://indico.cern.ch/event/379754/

Steinar presented the minutes of the previous project meeting from December that had many technical presentations. The main item today is the future electron beam facility.

News:
The CLIC workshop took place in January with about 260 participants. A survey of the collaborating institutes shows that around 70 students are involved in CLIC. The 2015 budget allocation is as expected and is distributed on the accounts. A text for the CERN annual report has been prepared. The first budget estimates will go to the SPC and will be decided by Council in September.
Contracts with Spanish institutes are underway.
There will be a LCB Program Advisory Committee meeting in Orsay on 13-14/4 focused on ILC but with a CLIC presentation.
The Asian LC workshop takes place at KEK on 20-24/4. It will be (as is natural) focused on ILC but will have some CLIC talks and presentation (http://www-conf.kek.jp/alcw2015/)
The 2015 Linear Collider School is confirmed for 26/10–6/11 at Delta Whistler Village Suites, Whistler, Canada, partly overlapping with the 2015 International Linear Collider Workshop, 2-6/11/2015, also in Whistler.
The CLIC workshop 2016 is planned for 18-22 January 2016.
Other workshops are the High Gradient Workshop on 16-19/6 - Tsinghua University (https://indico.cern.ch/event/358352/), and the 5th MEVArc (2-4/9) Lapland Hotels Riekonlinna (https://indico.cern.ch/event/354854/).

Steinar presents the goals for 2015, with the main ones being:

- Follow up new baseline parameters
- Summarize beam test plans at CERN beyond CTF3
- Get all test-stands into full operation and define new structures
- Follow up XFEL collaboration plans.

Roberto summarizes the plans for 'CERN electron beam facility(ies) beyond CTF3'. He shows the rationale for uses of CTF3 hardware (CALIFES) beyond 2016. CALIFES is very interesting for beam instrumentation tests due to its availability. An upgrade for CALIFES would add an existing 3 GHz klystron and modulator. The test area would have to be installed and Roberto presents the layout of an 'ultimate' area to cover BI needs.
For impedance studies at CALIFES, direct measurements of generated EM fields from available antennas, buttons, striplines, etc. would be useful to benchmark CST. A direct measurement of the wake function can be done with short e-bunches. Variations of the test bunch and source bunch charge is needed.
The former CTF2 area for X-band and S-band testing could be further used for RF tests.
The CLIC drive-beam front-end could possibly be installed in the CTF3 linac.
A continuation of the beam-loading experiment could be envisaged.

Alexey wonders if one considered an X-band upgrade to CALIFES to show routine running. Roberto replies that in conjunction with XFEL tests, it is discussed to use XBOX-1 and a 12 GHz structure, not for BI or impedance tests, but this could be done as upgrade.
Steinar asks if an energy upgrade by 150MeV would change the test capabilities. Not for BI or impedance tests, maybe for plasma.
Steinar comments that one must mention the use for HG research itself.
Erk remarks that the main reason of stopping CTF3 is freeing resources. There are 9.3 FTE in RF presently but the future manpower need has to be evaluated.
Roberto explains that for CTF3 there are 14 staff allocated (12 real) + 2.5 fellows. An estimate for running CALIFES is being made but it is clearly much less.

Erik presents the possible uses of CALIFES for Plasma Wake Field Acceleration (PWFA), Irradiation tests for the European Space Agency (ESA), and XFEL tests.
For PWFA, beam parameters don't allow very high gradients but reducing the plasma density allows tests at CTF3 with ~100MV/m gradient. The plasma source can be gas-discharge based and are not a significant cost driver. Institutes showing interest are University of Oslo, MPI Munich, Imperial College London, and Uppsala University.
CERN and ESA have signed a bilateral co-operation agreement. ESA is interested for the JUICE (JUpiter ICy moons Explorer) mission in irradiation tests with high-energy electrons ranging from 20-200 MeV. First tests with CALIFES beam are already planned and would be helpful to strengthen the CALIFES case.
An international collaboration consisting of 12 institutes worldwide (10 from Europe) is actively studying the design of a compact and cost-effective FEL based on acceleration using CLIC Xband technology. In addition, a few institutes have expressed particular interests in CALIFES tests: PSI, Elettra-Sincrotrone Trieste, and Ankara University.

Walter asks if an additional PWFA experiment is perceived as complementary to AWAKE or competitive. Erik replies that it obviously has to be complementary and not competing, neither in terms of scientific scope or resources. The first is clear given the parameters, the second has to implemented as a rule if PWFA experiments indeed will take place at CALIFES.
Tord wonders how short the bunch compressor from PSI can make the bunches.
Gerardo D'Auria replies that the compression factor is around 10, resulting in sub-ps bunches. **Steffen** adds that bunches at the PSI XFEL are 50fs. **Walter** comments that it is not the goal to have a FEL at CERN.
Igor suggests using the PHIN gun at CALIFES to produce high bunch charge. But the PHIN installation goes to AWAKE.
Steinar comments that we need to carefully find out the interest and eventually conflicting interests.
Erk suggests as a little word of caution to look at the program what you can realistically do.
Steinar announces that the 3-page report will be finished shortly after Easter; talks with the management are planned.
Thibaut asks how much time is required just for CLIC related activity. **Walter** replies that HG activity is not heavy on time, it is more in the background. **Daniel** comments that the facility is profitable for Xband but serves beam to users.

Tord asks about the latest news from ILC. An ILC report is due middle of April to give more information on scientific progress and readiness. Tord adds that the facility would be useful to maintain e- expertise in Europe in general.
Thibaut wonders about the manpower for the tests. **Roberto** replies that CLIC has slightly decreasing manpower in the MTP in the future years. CLIC should not provide all but could contribute maybe around 50%. We should make an exercise how to run the facility.
Steinar outlines that the LHC has three outcomes: no new particle, which could favour a future Higgs factory, very high-energy particles beyond the CLIC range, or "intermediate energy" particles accessible for CLIC.

Daniel presents the rebaselining status. He shows the stages and the strategy toward a staged design from 380 GeV to 3 TeV. He explains the 3 upgrade scenarios. The parameters of the CLIC_G structure are very similar to the most efficient structure at 3 TeV. The best parameters are around 250ns and 300+ bunches, so CLIC_G is in a good regime.
Daniel shows possible choice examples: DB optimized, klystron optimized with longer pulse length, and DB and klystron optimized with 244ns pulse length. The cost for a DB-based first stage does not change very much with the structure and the cheapest klystron-based design is almost good enough. There is a larger cost increase using the DB-optimized structure for a klystron based first stage.
The best structure identified for drive beam-based first stage should have a Gradient of 72MV/m. One should probably go for a drive beam-based structure design and a klystron-based structure design at 380GeV.
The next steps are to document the conclusions, start developing the new baseline, review the power model and optimize the design and models.
He shows a possible structure of the document.

Tord wonders which optimization has lead to 72MV/m and if the first part remains klystrons driven after the upgrade to higher energy. The gradient is the outcome from optimization, it reached the boundary condition that is needed for 4 sectors, as the RF pulse length was fixed, so defining the decelerator length. The first stage could stay klystron based.
Steinar comments that we have to decide which of the structure to take for design prototypes.

Walter presents 'Accelerator structure program: design and testing'. Since the present structure dates from 2007/2008, he highlights the developments and the logic for designing new CLIC baseline structures. So a new CLIC-G* and CLIC-G* with SiC, and optimized 3 TeV structures with new cell shape and optimized damping features will be designed. Two more structures are being defined: CLIC-380 and CLIC-ST (strong tapering). Design and production take 12-18 months.
Additional new structures are: a structure made from halves by SLAC, a choke-mode damping structure, 4 XFEL structures by SINAP, and a high-gradient proton 3 GHz structure funded by KT.
TD26CC and T24 structures are built by KEK, CIEMAT, PSI and SINAP. Furthermore, it is planned to have whole structures built by industry.
Walter shows the foreseen testing program and a test band status overview. Finally, he advertises the HG and MeVARC workshops.

Andrea gives an X-band FEL update. The Horizon 2020 application was not approved and the plan had to be updated. Due to SINAP commitment and widespread interest, the activities continue with work in three work packages and regular meetings. Andrea shows example of work from Design and parameters WP: phase space linearization, emittance growth due to misalignments, and simulations of X-ray production. For the hardware WP, SINAP will provide 4 X-band structures for the XbFEL collaboration before 2018. The third WP, X-ray production and user requirements, has UK, Ankara and Fermi-upgrade proposals.
Andrea shows the main topics for future activities and the plans to progress in the three WP.
Steffen remarked that a RF module at CERN is listed in the contributions. **Walter** replies that only testing SINAP structures in Xboxes is foreseen.
Steinar comments that it is a good goal to continue with these three WP.

Steffen gives an update on 'Two-beam module results and plans' both for CLEX and the lab modules. The second CLEX structure was installed and Steffen thanks all people involved. The first beam was transported easily on 10 March. RF and wakefield measurements have improved, the 180 degree phase difference between the two structures has been corrected. The drive beam alignment goals have been met, but not for the main beam due to non-straightness of structures. The move of components was compared without and with waveguide connections. Differences up to 50-100μm were measured with connections.
The CLEX module production and installation review showed that the superstructure is too complicated and fragile. Other points noted were issues for the cooling system, alignment, general communication, and the need for compact loads. Finally, Steffen shows the experimental program for the CLEX module.
For the lab module, the time constants and amplitude of movements have been measured. It is planned to install another type 0 and a type 1 module and replace the mockup quadrupole by a real one. A call for tender for 6 structure mock-ups has been launched.
The experimental program for the lab module string includes now vacuum and outgassing with SiC, module interconnects and girder coupling.
A further module review is foreseen for end of April to review results and plans.

Steinar asks if the review is internal. **Steffen** replies that it is not too formal, it is planned to invite previous participants.
Walter wonders about a plan for a final report end of next year. There will be certainly a report, though it is not yet decided if this will be combined CLEX/Lab or separate.

Steinar announces that the next Project meeting in June will be dedicated again to technical developments. A review of that area is foreseen before or after in May/June.

A.O.B.:

Frank Tecker, April 2015