



**ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE**  
**EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH**

Laboratoire Européen pour la Physique des Particules  
European Laboratory for Particle Physics

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**Minutes of the CTF3 Collaboration Board**  
**(Formerly called CTF3 Coordination Committee)**

**held at CERN on 22 June 2007**

**Participation:**

CERN	R.Aymar/DG, J.P.Delahaye, G.Geschonke
France	Ph. Lavocat, Ph. Rebourgeard (DSM- CEA-DAPNIA) R.Roux (LAL-Orsay) S. Vilalte (LAPP-Annecy)
India:	V.C. Sahni, P. Shrivastava (RRCAT)
Italy	M. Calvetti, A. Ghigo (INFN-LNF)
Spain	L. Garcia-Tabares (CIEMAT),
Sweden	T. Ekelof, V.Ziemann (Uppsala University)
Switzerland	L. Rivkin (PSI)
USA	S. Tantawi (SLAC)
UK	G. Blair (J.Adams Institute)
Russia	A.N. Skrinski (BINP)

**CLIC Advisory Committee chairman:** T.Raubenheimer (SLAC)

**Excused:**

Pakistan	H. Hoorani
Turkey	A. Kenan Ciftci (Ankara University)
France	Y.Karyotakis (LAPP) G. Wormser (LAL)
UK	J. Dainton, S.Chattopadhyay, (Cockcroft Institute)
US	M. Velasco, Northwestern Univ. A. Hutton (Thomas Jefferson Lab)

## Introduction

The third meeting of the CTF3 Collaboration Board was held on 22. June 2007. It concluded a week of CLIC-related meetings at CERN. [The X-Band Accelerating Structure Design and Test Programme Workshop](#) was held on 18/19 June. This was followed by the first [CLIC Advisory Committee \(ACE\)](#) from 20.7. until 22.7.

The agenda and all slides of the Collaboration Board meeting are [here](#).

### 1. Welcome address by the Chairman

The Chairman of the CTF3 Collaboration Board, Mario Calvetti opened the meeting and welcomed all participants. He announced that the John Adams Institute, Royal Holloway, University of London had signed the Memorandum of Understanding and is now a full member of the collaboration ([link](#) to the add.).

In this context the question of membership in the CTF3 collaboration was discussed. Since some institutes wish to collaborate on CLIC issues within a formal framework, without direct relation to CTF3, it was decided to open the membership of the CTF3 collaboration also for general CLIC related issues.

Mario Calvetti pointed out the main subject of the meeting on point 5 of the agenda, and welcomed T. Raubenheimer, CLIC-ACE Chairman.

Mario Calvetti announced the approval by Council of the "White Paper" proposal which provides additional resources to CERN at the level of 240 MCHF over 4 years (2008 to 2011) and especially to CLIC/CTF3-related R&D at the level of 12 MCHF and 60 FTE.

However the deadline of CLIC to demonstrate the CLIC feasibility by the year 2010 requires these resources to be available during the years 2008 until 2010.

Moreover, since the change of the CLIC RF frequency from 30 to 12 GHz, the need of a stand-alone 12 GHz RF power source at for development of CLIC accelerating structures has been pointed out. This was strongly supported by the CTF3 Collaboration Board at its meeting in January 2007. Since then, contacts with other laboratories and industry have been established and a 12 GHz stand-alone power source at CERN has been included into the base-line programme. The resources needed for this power test stand (3.5 MCHF and 9 FTE) are included in the CLIC budget planning,

The resulting CLIC resource planning is shown in the table below.

		2008	2009	2010	Total
Material budget (kCHF)	<b>Present MTP</b>	<b>3485</b>	<b>3485</b>	<b>3485</b>	<b>10455</b>
	<b>Additional LTP (CLIC-PLO/06-17 and White Paper)</b>	<b>4000</b>	<b>4000</b>	<b>4000</b>	<b>12000</b>
	<b>12 GHz power test stand and structure tests</b>	<b>1050</b>	<b>1850</b>	<b>600</b>	<b>3500</b>
	<b>Total additional (to present MTP plans) resources</b>	<b>5050</b>	<b>5850</b>	<b>4600</b>	<b>15500</b>
	<b>Total needed resources (to be included in future MTP)</b>	<b>8535</b>	<b>9335</b>	<b>8085</b>	<b>25955</b>
Manpower (FTE)	<b>Present MTP</b>	<b>30.5</b>	<b>28</b>	<b>26.5</b>	<b>85</b>
	<b>Additional LTP (CLIC-PLO/06-17 and White Paper)</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>60</b>
	<b>12 GHz power test stand and structure tests</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>9</b>
	<b>Total additional (to present MTP plans) resources</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>69</b>
	<b>Total needed resources (to be included in future MTP)</b>	<b>53.5</b>	<b>51</b>	<b>49.5</b>	<b>154</b>

## 2. Approbation of the Minutes of the last meeting

The minutes of the last meeting were approved.

## 3. Report on the X-band structure workshop

J.P.Delahaye presented a résumé of the two-day X-band accelerating structure workshop which was held earlier in the week. It was attended by about 75 participants, nearly half of them from outside CERN. The new CLIC frequency opens up interesting opportunities of collaboration with other institutes, especially with SLAC and KEK, which have facilities for power testing at 11.4 GHz. Such tests are of vital importance for CLIC structure development. The accelerating structures are still in a R&D phase, but important progress has been achieved and a possible path to a demonstration the design parameters has been outlined.

## 4. Status of CTF3 (G.Geschonke)

The collaboration comprises presently 17 members, involving 22 institutes.

Machine installation is on schedule, the Combiner Ring is basically complete. Beam has been injected and kept circulating for several hundred turns. Recombination by a factor of two has been demonstrated, however, with a continuous beam without passing through the Delay Loop. Commissioning will continue during most of the year 2007.

Operation of the first part of the linac for production of RF power and testing of CLIC accelerating structures at 30 GHz has continued as foreseen, mainly

during nights and weekends with supervision from the main control room CCC using automatic conditioning software. The switch to 12 GHz has no hardware impact on CTF3, (apart from the PETS); the combination factor of the Combiner Ring will simply be reduced from five to four, and the path length will be changed slightly, which is well within the range of the wiggler. The 30 GHz testing work will continue for the moment, many issues with relevance to CLIC structures can still be tested. A test schedule (from the Structure Workshop) was shown, which indicates the 30 GHz work for 2007 and 2008, from 2009 onwards the 12 GHz power source should become available at CERN.

The next major system to be installed will be the transfer line TL2 which transports the beam from the Combiner Ring into CLEX and from there either into the Test Beam Line TBL or the Two Beam Test Stand. The optics design is completed, engineering drawings of the mechanical layout exist and procurement of components has started. Installation will begin during July and August, the major part of this line will be mounted during the winter shut-down with the aim to inject beam into the CLEX building from April 2008 onwards.

The CLEX building is nearly complete; installation of equipment for the Probe Beam (Califes) has started. The klystron gallery is progressing well; installation of the racks for the electronics equipment will start in July.

Most of the items for CLEX are covered by members of the collaboration, with the exception of the series production of elements for the Test Beam Line, TBL. Prototypes for Beam Position Monitors, PETS structures and tanks are being built by Spain; the series production is still open.

The Instrumentation Test Beam Line (ITB) is presently not part of the base-line programme, but members of the collaboration are welcome to take responsibilities for parts of it or of the whole line.

The Photo Injector (PHIN) developed jointly by RAL, LAL and CERN with partial funding from the EU FP6 programme, has accumulated some delays and difficulties. The RF gun suffered from various difficulties during fabrication, but installation in the test stand at CERN is foreseen for the end of 2007. The laser system, developed by RAL has severe difficulties; RAL has sent the equipment to CERN and has ceased all further development. The nominal specifications of the amplifier system has never been reached and many sub-systems such as the phase coding, feed-backs, controls are missing.

The laser system is not only used for the Photo Injector, but part of the beam is used for the photo-gun of the Probe Beam, it is therefore vital to finish this work as soon as possible. Fortunately INFN Frascati, INFN Milano and CERN have provided help to advance this work, but a lot still remains to be done. Mario Calvetti suggested to organize a workshop with all interested parties to find solutions.

## 5. Report on the CLIC Advisory Committee (ACE)

The mandate of ACE is to advise on the CLIC study in general and as part of this also on CTF3. ACE reports to the CERN DG and the CTF3 Collaboration Board. The chairman of ACE, Tor Raubenheimer gave a presentation of the committee's findings and recommendations of this first meeting. The slides can be found [here](#), in these minutes only some major issues will be repeated.

The committee strongly supports the recent change of frequency and gradient of CLIC accelerating structures; it feels, however, that another iteration on structure optimization will be necessary. The Committee also suggests additional experiments to check the scaling rules assumed in the optimization. Concerning the structure R&D programme, the development of a detailed plan and the move towards a "project mode" with well defined milestones is recommended.

The Committee is concerned by the ultra-low emittance assumed for CLIC, which seems to be pushed to the limits. It suggests to consider a design based on a staged approach where a low-energy CLIC design would rely on relaxed and more established emittances.

ACE basically endorses the CTF3 programme, which will eventually be the largest Linear Collider test facility constructed. It suggests to make use of the high RF power at 12 GHz produced in TBL to accelerate a beam to higher energies as presently planned in the Two Beam Test Stand. 800 MeV could be reached, which would be a very convincing demonstration of the CLIC technology. The committee also recommends to make CTF3 a reliable operational facility, not only a demonstration set-up.

Considering the significant differences between CTF3 and CLIC, especially the average beam power and pulse length, the extrapolation to CLIC still needs to be found.

ACE feels that additional support is required for CTF3 to reach its goals.

Other critical issues mentioned are the R&D programme for PETS, vibration control, instrumentation, beam phase stabilization and emittance transport.

The committee acknowledges the huge effort going into all aspects of CLIC and the limited, insufficient resources. The goal to produce a CLIC CDR by 2010 is a tremendous task requiring a large engineering effort, which is presently not available. The "CDR" scope possibly has to be reviewed in view of clearly limited resources.

Mario Calvetti thanked Tor Raubenheimer for the extremely useful analysis of the ACE and is looking forward to its report including comments and recommendations.

## 6. Updating of contributions

The Chairman reminded the delegations to provide an update of their contributions.

A list of the CTF3 workpackages still available has been circulated and will be reviewed at the next Collaboration Board.

## 7. "Tour de Table"

**Spain - J.Fuster and L.Garcia-Tabares:** Many components have already been delivered, i.e. corrector magnets and septa. They are already installed and operational. Present efforts concentrate on a strip-line kicker and its pulsed power supply, a kicker system for the "tail clipper", PETS prototyping for TBL including the vacuum tank, TBL magnet movers for TBL as well as development of hardware and electronics for the TBL beam position monitors prototypes.

**Switzerland (PSI, EPFL) - L.Rivkin:** is presently considering a proposal for increasing its participation in CLIC. He mentioned that some recent work on beam emittance might have some relevance for CLIC.

**INFN - A.Ghigo:** LNF has finished installation of the bunch length chicane, the Delay Loop and the Combiner Ring. Some modifications will be implemented in the system of beam position monitors in summer. LNF staff will continue to participate in machine commissioning.

INFN has provided and will continue to do so, expert manpower for the commissioning of the Probe Beam laser.

**SLAC - S.Tantawi:** For the moment the US participation is mainly focused on High Gradient work for accelerating structures. This is done in the frame of a "US High Gradient Collaboration" chaired by S.Tantawi, especially with test of 11.4 GHz accelerating structures in NLCTA. The SLAC management recently agreed to intensify the test programme by making available existing facilities at SLAC as well as to build and test dedicated structures to evaluate the field limitations on the surface of accelerating structures.

**BINP - A.S.Skrinski:** The magnets are all finished and delivered to CTF3. Future collaboration might be envisaged.

**Uppsala University - T.Ekelöf:** Presently five full-time persons are working on CTF3, mainly on the Two Beam Test Stand. All equipment will become available at the end of the year; the installation should be ready by February 2008.

**J.Adams Institute - G.Blair:** The J.Adams Institute has recently joined the CTF3 collaboration. The main focus of their work will be for the moment the study of issues related to diffraction radiation and bunch length measurements.

**CEA/DAPNIA:** In absence of a representative from CEA Saclay G.Geschonke reported on the substantial amount of work going on for the Probe Beam complex. A modulator for the klystron has been ordered, installation of equipment in CLEX has already started.

**LAL - R.Roux:** LAL is building two RF guns, one for PHIN, the other one for the Probe Beam. Both should be ready before the end of 2007.

**LAPP - S.Vilalte:** LAPP is active in the development and series production of electronics for Beam Position Monitoring. The analogue front-end electronics is working; the digital part has been successfully tested and will - after some finishing work - be used for a large fraction of the beam position monitors for future parts of the machine.

**RRCAT - V.C. Sahni:** India is collaborating with CTF3 on several topics. Two software engineers have developed applications programming for machine operation. The optics design for TL2 done by RRCAT is completed. The vacuum chambers as well as five dipole magnets will be built, detailed engineering design is under way and fabrication of some components has already started.

Delegations also expressed their wish for a CTF3 visit to be organised.

## **8. Discussion and Conclusion**

The chairman summarized the meeting, congratulates all members of the Collaborations for their excellent contribution and achievements.

## **9. AoB**

J.P. Delahaye announced the CLIC workshop to be held from 16. - 19. October 2007 and encouraged everybody to participate.

After the meeting the dates for the next meetings in 2008 were proposed:

January 15. to 18. am: CLIC Advisory Committee (ACE)

January 21 to 23: CTF3 Collaboration Meeting

**January 23. pm or 24 am.: CTF3 Collaboration Board**

G.Geschonke

J.P. Delahaye