ELAN NETWORK WP1

LINAC TECHNOLOGY, NORMAL CONDUCTING

LTECNC

CARE-ELAN outline

Coordination of R&D on electron accelerators at European level.
Evaluating the various technologies for improving present infrastructures.
Contributing to defining a roadmap for future electron accelerators and colliders.
Broadening the participation and promoting new groups.

ELAN – LTECNC - Aims

Support studies on the understanding of the two-beam technique, as a solution for producing RF power at frequencies beyond those at which high-power klystrons are presently available (Drive-beam Generation, RF Power-source).

Support studies on the understanding of the gradient limits of NC structures associated with dark current, RF break-down, surface field and structure geometry. Gain experience on NC structure engineering (Accelerating Structures, Power Transfer Structures).

Consider possible improvement of the present test facility used for beam manipulation, structure prototype powering, and equipment tests, and suggestions of other applications (Existing Infrastructure: CTF3).

Support studies on precision alignment and vibration control.

Support progress on electron source (related to PHIN).

Identify the points common to NC and SC linear colliders gathering the efforts on these topics.

Use the existing meetings/groups:

- **CTF3 Collaboration meetings (IN2P3, INFN, North West Uni, RAL, SLAC, Uppsala Uni).**
- **work-sessions and technical visits associated with the study of NC structures**
- **workshops about stabilization, nanometer issues and alignment.**
- **accelerator/linac conferences and LC workshops.**

Participants into LTECNC & Expertise

CERN	**LC based on two-beam scheme, acceleration by very high-gradients, high-frequency accelerating structures and RF production through deceleration. CTF3 to demonstrate the concept. Damping ring, short final focus, collimation system. Micro-alignment, photo-cathodes, and beam dynamics. Acceleration structures and breakdown phenomena, high currents, long pulse photoinjectors.**
CEA	**High gradient cavities, polarised electron injector, damping ring design, final focus, emittance preservation, beam position monitor**
PSI	**RF- and RF-gun control. Electro-Optical Autocorrelation .Radiometric Bunch length Monitor**
DESY	**High gradient cavities, RF power sources, high power couplers, reliability. Positron and electron sources, damping rings, fast kicker magnets, bunch compressors. Beam position monitors, laser-wire devices, diagnostic for vibration stabilization, feedbacks systems, machine protection system. Final focus, collimation systems, septums, final doublets, beam extraction, IP diagnostics. Low emittance transport.**

Participants into LTECNC & Expertise (continued)

FZR	**Superconducting photoinjectors, bunch length measurement.**
CNRS-Orsay	**Superconducting electron linac, proton colliders, electron injectors (LIL,CLIO,TTF,CTF...) and R&D on guns and structure (CANDELA, NEPAL). Studies on electron storage ring, LC, wake fields, emittance growth.**
INFN-LNF	**e+ e- accelerators and colliders: DAFNE at Frascati; CTF3 with design of recombination rings, transfer lines and RF; TTF collaboration on damping ring technical design, diagnostics systems and BDYN. Design of an injection system independent on the linac technology**
TEU	**FEL with electron beams from photo injectors. R&D on photo cathode. Expertise on lasers, non-linear optics and optical parametric processes. Instrumentation (button, current monitors, optical transition) for feedback of diagnostics on a high quality electron beam.**

Participants into LTECNC & Expertise (continued)

CCLRC	**Daresbury: accelerator technology and physics e.g. build large electron accelerators. Linear colliders, superconducting RF and small emittance electron sources. Rutherford Appleton Laboratory: Expertise in laser design and plasmas, interest in photo injectors and laser acceleration. SC cavity design, coupler design. High brightness gun design (high power diode pumped lasers), damping ring design. Beam diagnostics. BDS design, optimisation of overall system.**
ICL	**High gradient acceleration techniques using laser produced plasmas. Diagnostic for short pulse electron. Theoretical modelling of laser-plasma interactions.**
UOX	**Alignment procedures and survey technologies, disgnostics and online monitoring, longitudinal profile, BDS design and instrumentation, plasma channels.**
UMA	**Coordination of the network activities for a consortium of physicist from UK Universities contributing to the design of linear colliders**

Associates Participating into LTECNC & Expertise

ETHZ	**Interest in the study and development of very high frequency optical oscillators. The Institute is a fast optics laboratory, specialized in short pulses and high frequency optical oscillators, which is a crucial issue for the CTF3 laser**
TUBE	**High-frequency planar RF cavities, beam position monitors, wake-field calculations**
UPSA	**CTF3 commissioning, tests of optics and modelling; beam monitoring equipment**

Interaction between WP involving LTECNC

Work Package	LTECNC	LTECSC	BDYN	INSTR	ANAD
Emittance preservation	Information exchange to ensure correct modelling of wakefields and RF effects. Collaboration to optimise the main accelerator parameters Feedbacks, alignt	Same as for WP1	Coordinating Package	Determination of required instrumentation performance. Info exchange for realistic modelling of instrumentation	Identification of common problems and tools Provide and preserve the emittance in a 100 micron diameter plasma over 10 cm
Low cost	Reduce accel. length Maximise energy High lumi while keeping reasonable energy consumption Develop efficient power source Industrialisation of accelerator components	Coordinating Package Same as for WP1	Define optimal diagnostics for reliable operation at low cost Evaluate reliable control systems for efficient lumi tuning	Define optimum diagnostics for reliable operation at low cost	Ultra-high gradients in plasmas -> Reduce accelerator length Maximise energy reach High lumi while keeping the energy consumption within reasonable limits
Feasibility of a SC Collid. upgradable to higher gradient normal conducting technology	Optimise system compatibility	Optimise system compatibility	Definition of optimal common beam parameters		

WP	Task		Year 1	Year 2	Year 3	Year 4	Year 5
All	Review of all ELAN activities Dissemination of knowledge	Period	←	—	—	—	→
		MS	Annual meeting	Annual meeting	Annual meeting	Annual meeting	Annual meeting
		ID/**MD**	**Web Site**	Annual Report	Annual Report	Annual Report	**Final Report**
LTECNC	*Understanding the two-beam technique as a solution for producing RF power at frequencies beyond those at which high-power klystrons are presently available. Understand the gradient limits of NC structures associated with dark current, RF break-down, surface field and structure geometry. Gain experience on NC structure engineering. Improvement of the present test facility used for beam manipulation, structure prototype powering, and equipment tests, and suggestions of other applications. Identify the points, which are common to all NC and LC linear colliders gathering the efforts on these topics.*						
	Periodic review of the test facility (CTF3) results at the yearly Collaboration Meetings (CM)	Period	←	—	—	—	→
		MS	CM	CM	CM	CM	CM
		ID	Proceedings	Proceedings	Proceedings	Proceedings	Proceedings
	Monitoring of WP activity and suggestions	Period		←	—	→	
		MS		Workshop	Workshop	Workshop	Workshop
		ID		Report	Report	Report	Report
	Identification of topics to be addressed and of the topics common to WP1 and WP2. Review of the available data and results on these topics	Period	← →				
		MS	Coordination				
		ID	Report				
	Identification of possible benchmarks. Define the work plan and documentation (data base)	Period	←	→			
		MD		**Data Base**			
		ID	Work plan	Documentation			
	Review of results obtained with structure prototypes (including US labs).	Period			←	— →	
		MS				Review	
		ID				Report	
	Proposals for possible complementary JRA and DS.	Period	←	→			
		MS		Proposals JRA			
		ID		Report			
	Benchmarks are reviewed and work plan revisited.	Period		←	—	→	
		MS			Review		
		ID				Report	
	Review on sources including the outcome of photo-injector R&D for the drive-beam	Period		←	— →		
		MS		Review			
		ID			Report		

Corresponding Plan of the LTECNC session in this 1st ELAN meeting

Through overviews of the ongoing studies, launch exchanges of information and discussions about the topics mentioned above:

- **the two beam technique and the status of the test facility CTF3**
- **the high-gradient accelerating structures**
- **the e^- source and the photo-injector technology**
- **the vibration stabilization**
- **the RF deflectors for ring injection/extraction**

the following topics raising common interests of some WPs:

■ source and injector	LTECNC, LTECSC, ANAD
■ stabilization and deflectors	LTECNC, LTECSC
■ combining technologies for reaching higher energies	LTECNC, LTECSC

….

Participants should indicate where and how they plan to contribute to these topics and make suggestions → Review of deliverables

Topics	2004		2005		2006		2007		2008		Milestones
Periodic review of the test facility (CTF3) results.		CM Proc		CM Proc		CM Proc		CM Proc		CM Proc	Proceedings Each year
Monitoring of WP1 activity and suggestions	WS	Rep	WS	Rep	WS	Rep	WS	Rep	WS	Rep	Workshop + Document Every year
Identification of topics to be addressed and of the topics common to WP1 and WP2. Review of the available data and test results on these topics	Coord.	Rep.									Coordination + Document in 2004
Identification of possible benchmarks. Define the work plan and documentation (web, data base)		Work plan		Docs (web)							Docs in 2005
Review of results obtained with structure prototypes (incl. in US labs) and on photo-injector components.								Review report			Report end 2007
Proposals for possible complementary JRP and DS.				Poss. Prop.							Document in 2005
Benchmarks are reviewed and work plan revisited.						Review	Doc				Rev in 2006 Doc in 2007
Outcome of photo-injector R&D for the drive-beam				Review	Doc						Document mid. 2006

Milestones and Deliverables