Survey of CLIC-ILC Joint Working Groups

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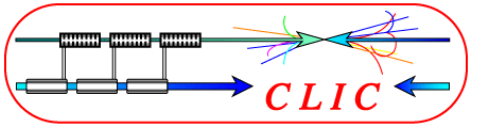
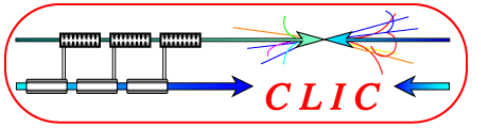
Report to ILC-EC
28 March 2010

Background



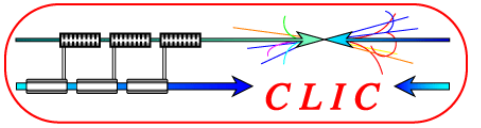
- Point of the mandate of the WG on accelerator issues reads *Identifying synergies to enable the design concepts of ILC and CLIC to be prepared efficiently*
- Under this point, conduct survey of collaborative work done and envisaged by existing topical CLIC-ILC WGs
  - Beam delivery systems & machine-detector interface
  - Civil engineering and conventional facilities
  - Positron generation
  - Damping rings
  - Beam dynamics
  - Cost & schedule
- From this survey, try and identify areas of greatest promise for future synergies between CLIC and ILC

Beam delivery systems [1/2]



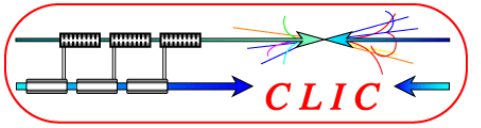
- Mandate of the joint WG:
  - Review and optimize the CLIC and ILC Beam Delivery Systems
- Membership of the joint WG (names, affiliations):
  - Conveners: Rogelio Tomas (CERN), Deepa Angal-Kalinin (CI) and Andrei Seryi (SLAC).
  - Members: Guillermo Zamudio (CERN), Javier Resta (Oxford), Amos Dexter (CI), Luis Fernandez (CI), Satyamurthy Polepalle (*BARC*) , Raymond Arnold (*SLAC*), Frank Jackson (STFC), Giovanni Rumolo (CERN), Daniel Schulte (CERN), Eduardo Marin (CERN), Helmut Burkhardt (CERN), Raphael Mutzner (CERN), Jochem Snuverink (CERN), Nigel Watson (CERN), Andrea Latina (Fermilab)
- Operating since:
  - September 2008 (started as CERN-CI collaboration but immediately converged to CLIC-ILC)
- Typical frequency of meetings (Webex, face-to-face):
  - Every 2 months
- Topics treated since WG creation:
  - Collimation performance review, FFS design and optimization, L* considerations, CLIC BDS layout, Crab Cavity tolerances and integration, beam dump design, ATF2 ultra-low beta proposal, ATF2 and CLIC FFS alignment and tuning.
- Deliverables produced (documents, publications, presentations,…) since WG creation:
  - "CLIC overview" Phys. Rev. ST Accel. Beams 13, 014801 (strong contr. from the WG)
  - PAC09:
    - "Status of the CLIC Beam Delivery System"
    - "ATF2 Ultra-Low IP Betas Proposal",
    - "Solenoid and Synchrotron Radiation Effects in CLIC"
    - "Design of Momentum Spoilers for the Compact Linear Collider"
  - "Summary of the BDS and MDI CLIC08 Working Group" CLIC-Note-776

Beam delivery systems [2/2]



- Topics to be addressed by the WG in 2010, with corresponding deliverables:
  - CDR
  - Numerous IPAC10 papers on CLIC and ATF2 lattice design, optimization and tuning.
  - ATF2 ultra-low beta proposal first experimental tests
- Future topics until 2012:
  - ATF2 ultra-low beta operation and extrapolation to the CLIC FFS
  - CLIC FFS tuning
- Main benefits from joint WG:
  - World wide experts reviewing the CLIC BDS
  - World wide experts contributing to the CLIC BDS
- Main difficulties in running joint WG:
- Remarks and suggestions to the CLIC-ILC WG on General Issues:
- Name of person(s) filling questionnaire:
  - Deepa Angal-Kalinin, Andrei Seryi and Rogelio Tomas

Civil enginering & conventional facilities [1/4]

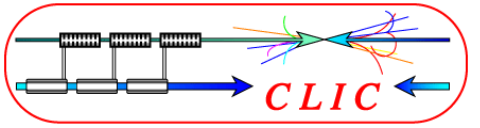


- Mandate of the joint WG:
  - CLIC-CES and ILC-CFS groups work independently on the civil engineering and services side of both projects.
  - However, it has been agreed that resources permitting, both groups will work together on areas of mutual interest for both projects, including :
  - Civil Engineering Studies
    - Optimisation of Tunnel and Shaft diameters, distance between shafts (linked to safety)
    - Overall layout of the machine and interaction region infrastructure
    - Shallow site v Deep Tunnel Option
    - Single Tunnel v Double Tunnel
    - Safety issues such as emergency egress
    - Environmental issues
  - Other Infrastructure
    - Cooling Water
    - Power Distribution
    - Air Handling
    - Transport Issues
    - Radiation simulations / shielding ?
  - The progress of these working groups on areas of mutual interest will be reported at the ILC-GDE and CLIC Collaboration Meetings working towards CLIC CDR and ILC TDP Phase.

Civil enginering & conventional facilities [2/4]

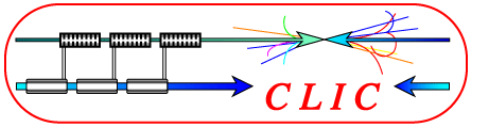
- Membership of the joint WG (names, affiliations):
  - CFS :
    - CERN J.Osborne
    - FNAL V.Kuchler, E.Huedem, T.Lackowski, L.Hammond
    - KEK A.Enomoto
    - JINR G.Shirkov, G.Trubnikov
  - CES :
    - Civil Engineering and Chairman J.Osborne
    - EN Co-ordinator C.Hauviller
    - CLIC Link persons (from other WG's) P.Lebrun / G.Riddone
    - Cooling and Ventilation CV M.Nonis / C.Martel
    - Electricity EL C.Jach
    - Survey SU H.Mainaud Durand
    - Controls, Safety ASE T.Pettersson
    - Horizontal Handling HE K.Kershaw
    - Vertical Handling HE I.Ruehl
    - CE Layouts, 3d models A.Kosmicki
    - SC Link Person R.Trant / F.Corsanego
    - Experimental Area Link Person & Technical Secretary M.Gastal
    - ILC members V.Kuchler (FNAL)/A.Enomoto (KEK)

Civil enginering & conventional facilities [3/4]



- Operating since:
  - Spring 2008
- Typical frequency of meetings (Webex, face-to-face):
  - ILC CFS weekly webex (Tuesday 2pm CERN time)
  - CLIC CES monthly webex (2nd Wednesday of month 2:30pm)
  - Also ad-hoc meetings….
- Topics treated since WG creation:
  - Optimisation of Tunnel and Shaft diameters, distance between shafts (linked to safety)
  - Overall layout of the machine and interaction region infrastructure
  - Shallow site v Deep Tunnel Option
  - Single Tunnel v Double Tunnel
  - Safety issues such as emergency egress
- Deliverables produced (documents, publications, presentations,…) since WG creation:
  - All reports/presentations are stored on either Indico or ILC EDMS. Most deliverables have been presented at the ILC & CLIC Workshops, and/or at the respective meetings, such as CES :
  - ***http://indico.cern.ch/categoryDisplay.py?categId=1882***
- Topics to be addressed by the WG in 2010, with corresponding deliverables:
  - CLIC : The civil engineering layout needs to be 'frozen' during 2010 for the CDR. This process has started via inviting the relevant experts from the area systems to the monthly CES meetings. This process was performed last year for the ILC SB2009, so many lessons learnt can be shared to the mutual benefit of both projects.
  - ILC : Work continues on the single tunnel layout, and of course CLIC can greatly assist in this area. CERN has particular expertise in 3d modeling of the underground structures which will be of benefit to ILC and CLIC.
- Future topics until 2012:
  - All CES issues will be further developed, cost estimates prepared and construction planning studied.

Civil enginering & conventional facilities [4/4]

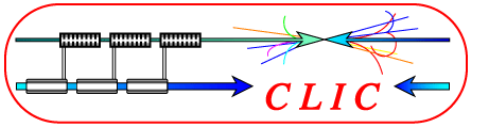


- Main benefits from joint WG:
  - From a civil engineering (and many services) point of view, both projects can be considered as 'similar'. Sharing experience is vital for both projects in order to make best use of the available resources. This is particularly important to allow comparison of CFS cost estimates for both projects.
- Main difficulties in running joint WG:
  - Sometimes, when entering into detail for the machine layout it can be very specific, for this reason we do not propose a true joint meeting, but have separate CFS and CES meetings. At these meeting, we generally discuss 'collaboration' issues first and then move into more project specific items later into the meeting. For example, this exercise of running through every area system to try and freeze the CLIC CE layout is of limited interest to ILC, but members from FNAL and KEK try and attend when possible.
- Remarks and suggestions to the CLIC-ILC WG on General Issues:
  - Some extra help from other CERN groups such as EN Cooling and Ventilation / Handling and transport would be appreciated.
- Name of person(s) filling questionnaire:
  - John Osborne (CERN), Vic Kuchler (FNAL), A.Enomoto (KEK)

Positron generation [1/5]

- Mandate of the joint WG:
  - For polarized electron sources, ILC and CLIC studies are based on photo-injectors using a DC gun with different parameters.
  - For polarized positron sources, the ILC study considers the Undulator option as the base line while the Compton schemes are alternative options. The CLIC study considers the Compton schemes as the base line while the Undulator is an alternative option. Additionally, both projects are interested in the development of conventional sources (ILC as an alternative option and CLIC as the baseline for the CDR).
  - The working group should:
    - Develop the synergy between the ILC and CLIC e+ and e- studies.
    - Evaluate the common technical issues related to production of unpolarized and polarized positrons.
    - Prioritize R&D.
    - Review the existing tests facilities where further tests could be performed.
    - Invite experts from different institutes to contribute to the studies.
    - Evaluate where cost savings could be obtained.
    - Promote common meetings and workshops.
- Membership of the joint WG (names, affiliations):
  - Ian Bailey (CI), A. Brachmann (SLAC), Eugene Bulyak (NSC-KIPT/Karkhov), Iryna Chaikovska (LAL), Robert Chehab (IPNL/Lyon), Jim Clarke (CI), N. Collomb (CI), O. Dadoun (LAL), E. Eroglu (Uludag University), Wei Gai (ANL), P. Gladkikh (NSC-KIPT/Karkhov), Jeff Gronberg (LLNL), Stephan Hesselbach (Durham University), Takuya Kamitani (KEK), Masao Kuriki (Hiroshima University), Wanming Liu (ANL), Alexander Mikhailichenko (Cornell), Gudi Moortgat-Pick (Desy), Tsunehiko Omori (KEK), Freddy Poirier (LAL), Matt Poelker (JLAB), Igor Pogorelski (BNL), Sabine Riemann (Desy), Louis Rinolfi (CERN), Andreas Schaelicke (Desy), Daniel Schulte (CERN), John Sheppard (SLAC), V.M.Strakhovenko (BINP), Tohru Takahashi (Hiroshima University), Junji Urakawa (KEK), Andriy Ushakov (Desy), Alessandro Variola (LAL), Alessandro Vivoli (CERN), Vitaly Yakimenko (BNL), Lei Zang (CI), Feng Zhou (SALC), Frank Zimmermann (CERN), Fabian Zomer (LAL)

Positron generation [2/5]

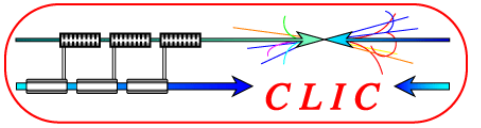


- Operating since: November 2008
- Typical frequency of meetings (Webex, face-to-face):
  - Webex: monthly meetings called "ILC/CLIC e+ studies".
  - Face-to-face meetings: LCWS08 (November 2008), GDE meeting (April 2009), POSIPOL workshop (June 2009), CLIC workshop (October 2009), ILC e+ source collaboration meeting (October 2009)
  - => at each ILC and CLIC workshops + general meetings/conferences.
- Topics treated since WG creation:
  - a) Undulator-based source
    - Geant4 model of collimator, target, capture optics, and capture RF assembly
    - Parameters wrt yield, polarisation
    - Electron beam quality issues.
  - b) Compton source
    - Main parameters for the Compton ring
    - Optical stacking cavity
    - High power lasers.
  - c) Lithium lens capture optics
    - Suitability for Undulator.
  - d) Unpolarized sources (Conventional targets and hybrid targets using channelling)
    - Simulations to optimize the unpolarized e+ yield.
  - e) Electron source
    - CERN, CI, JLAB, SLAC collaboration for tracking studies.
    - HV tests for DC guns.

Positron generation [3/5]

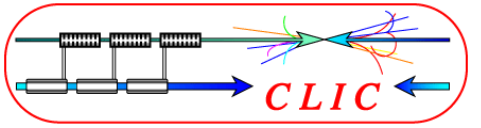
- Deliverables produced (documents, publications, presentations,…) since WG creation:
  - a) Undulator-based source
    - 1) "*Study on an undulator based source" by L. Zang for his PhD*
    - 2) "*Emittance change in the main ILC electron beam due to interaction with the positron source undulator: A review of the studies" by J. Clarke.*
  - b) Compton source
    - *1) "Photon Generation by Laser-Compton Scattering Using an Optical Resonant Cavity at the KEK-ATF Electron Ring" by H. Shimizu et al., Journal of the Physical Society of Japan, Vol. 78, No. 7, July, 2009, 074501*
    - *2) "High finesse Fabry–Perot cavities in picosecond regime" by V. Brisson et al., NIM A 608 (2009)*
    - *3) "200 W picosecond fiber laser for external cavity enhancement: toward 1 MW average power" by L. Meignien et al.*
    - *4) "The CLIC positron source based on Compton schemes" by L. Rinolfi presented at PAC09 conference, CLIC Note 788.*
    - *5) "Stacking simulations for Compton positron sources of future linear colliders" by F. Zimmermann presented at PAC09 conference, CLIC Note 814.*
  - c) Lithium lens capture optics
  - d) Unpolarized sources (Conventional targets and hybrid targets)
    - *1)"Study of an hybrid positron source using channelling for CLIC" I. Chaikovska et al., December 2009, CLIC Note 808*
    - *2) "Polarized and unpolarized positron sources for electron-positron colliders" X.Artru et al. Nucl.Instrum.Methods B 266 (2008)3868-3875*
  - e) Electron source
    - *"Preliminary design of a bunching system for CLIC polarized electron source" by F. Zhou et al., December 2009, CLIC Note 813.*
  - For the year 2009, a lot of presentations by members of the joint working group are found in:
    - 1) TILC09 in Tsukuba (April 2009): http://tilc.kek.jp/
    - 2) ALCPG09 in Albuquerque (September 2009): http://panda.unm.edu/LCWA09/
    - 3) CLIC09 workshop at CERN (October 2009): http://indico.cern.ch/conferenceDisplay.py?confId=45580
    - 4) 6th ILC Positron source workshop in Durham University (October 2009): http://www.ippp.dur.ac.uk/Workshops/09/SourceMeeting/

Positron generation [4/5]



- Topics to be addressed by the WG in 2010, with corresponding deliverables:
  - a) Undulator-based source
    - Optimal target technology: thermal load, shock waves, activation
    - Timing constraints issues and upgrade paths
    - Loss studies
    - Cost evaluation.
  - b) Compton source
    - Extend Geant4 model to Compton source
    - Stacking simulations in transverse planes.
  - c) Lithium lens tests
    - Suitability for Compton schemes.
  - d) Unpolarized sources
    - Perform experiments at KEKB positron source
    - Study of a hybrid solution for ILC.
  - e) Complete the design of the pre-injector linacs.
  - f) Electron source
    - Perform tracking studies
    - Hardware tests at JLAB and SLAC for the DC gun at very HV.
- Future topics until 2012:
  - a) Conventional sources
    - Channelling measurements for an e+ source (KEK?, CERN?).
    - Applicability of the Li lens.
  - b) Compton source
    - Complete design of the Compton ring
    - Stacking simulations studied in 6D.
  - c) Lithium lens capture optics
    - Tests at BINP and CesrTA.

Positron generation [5/5]

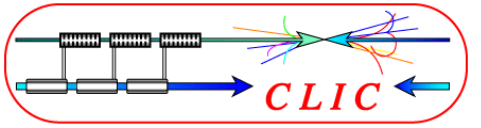


- Main benefits from joint WG:
  - A lot of progress have been done thank to the motivation and the synergy between the members of the working group.
  - Experiments performed at SLAC and JLAB have given a great confidence regarding the polarized electron source for ILC and CLIC.
  - For unpolarized positrons, important challenges need a strong R&D program and several topics are studied by the various members and laboratories.
  - For polarized positrons, the joint WG is certainly a crucial group who can make proposals and find solutions for the critical issues.
- Main difficulties in running joint WG:
  - Lack of resources hampering progress, particularly to set up experiments about target issues and to build prototypes.
- Remarks and suggestions to the CLIC-ILC WG on General Issues:
- Name of person(s) filling questionnaire:
  - Jim Clarke (CI)
  - Louis Rinolfi (CERN)

Damping rings [1/3]

- Mandate of the joint WG:
  - Develop synergies and collaborate in beam dynamics and technical issues of common interest in damping ring design
  - Use common research approaches and studies when possible including numerical tools
  - Take advantage of existing test facilities or storage rings and participate in a common experimental program
  - Trigger communication, establish links between the two communities, share knowledge and document common work
- Membership of the joint WG (names, affiliations):
  - Ioannis Papaphilippou – CERN
  - Mark Palmer - Cornell University
  - Sergio Calatroni – CERN
  - Giovanni Rumolo – CERN
  - Fanouria Antoniou – CERN
  - Alessandro Vivoli – CERN
  - Gerald Dugan – Cornell University
  - Yulin Li – Cornell University
  - David Rubin – Cornell University
  - Susanna Guiducci – INFN-LNF, Frascati
  - Mauro Pivi – SLAC
- Operating since: November 2008
- Typical frequency of meetings (Webex, face-to-face):
  - WebEx meetings somewhat sporadic to date, but we are targeting at least 6 per year.
  - Face-to-face meetings at CLIC, ILC, or damping ring workshops are presently held about 4 times per year.

Damping rings [2/3]



- Topics treated since WG creation:
  - Principle efforts have been to:
    - Raise awareness among members of each of the damping ring teams of similar efforts being carried out by the other team and to encourage close collaboration wherever possible
    - Develop experimental plans to use the available test facilities (CesrTA and KEK-ATF)
    - Organize a joint workshop (LER2010) to bring together both damping ring groups as well as representatives of the light source and collider communities
- Deliverables produced (documents, publications, presentations,…) since WG creation:
  - Presentations have been made at several workshops:
    - LCWA09
    - CLIC09
    - LER2010
- Topics to be addressed by the WG in 2010, with corresponding deliverables:
  - LER2010 Workshop
    - Deliverable: Development of joint working teams on key design and R&D topics seeded from the meetings/discussions at LER2010 (targeting the involvement of researchers from the light source and collider communities in addition to the DR development teams)
  - Experimental R&D
    - Deliverables: Updated assessment of EC mitigation issues, review of items requiring further R&D through 2013 which are suitable for joint investigation, collaboration on low emittance lattice design and development of a joint experimental effort on low emittance tuning.

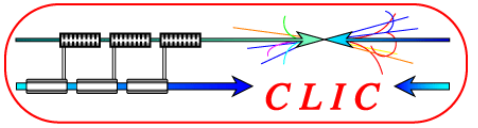
Damping rings [3/3]

- Future topics until 2012:
  - Working groups (which span the low emittance ring community) are being formed for the following research areas (coordinators still being confirmed):

	Subject	Coordinators
1	**Low emittance cells design**	M. Borland (APS), Y. Cai (SLAC), A. Nadgi (Soleil)
2	**Non-linear optimization**	R. Bartolini (DIAMOND/JAI), C. Steier (LBNL)
3	**Minimization of vertical emittance**	A. Streun (PSI), R. Dowd (Australian Synchrotron)
4	**Integration of collective effects in lattice design**	R. Nagaoka (SOLEIL), Y. Papaphilippou (CERN)
5	**Insertion device, magnet design and alignment**	S. Prestemon (LBNL), E. Wallen (MAXlab)
6	**Instrumentation for low emittance**	M. Palmer (Cornell), G. Decker (APS)
7	**Fast Kicker design**	P. Lebasque (Soleil), C. Burkhardt (SLAC)
8	**Feedback systems (slow and fast)**	A. Drago (INFN/LNF), B. Podobedov (BNL), T. Nakamura (JASRI/SPring8)
9	**Beam instabilities**	G. Rumolo (CERN), R. Nagaoka (SOLEIL)
10	**Impedance and vacuum design**	K. Bane (SLAC), S. Krinsky (BNL), E. Karantzoulis (Elettra), Y. Suetsugu (KEK)

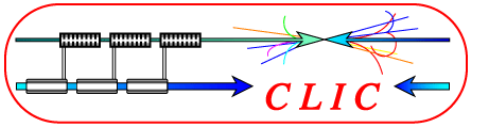
- Main benefits from joint WG:
  - The working group has helped to significantly strengthen the ties and collaboration between the CLIC and ILC design teams. Members of each team are working to unify the research efforts in key areas. A key benefit has been the increase in the flow of information between different stakeholders in the low emittance ring community. This helps to enable the most efficient use of the limited resources that are available within the groups designing the linear collider damping rings.

Beam dynamics [1/2]



- Mandate of the joint WG:
  - The working group should foster the exploitation of synergy between the ILC and CLIC beam physics studies. It should promote common meetings, standards, codes and studies
- Membership of the joint WG (names, affiliations):
  - A long mailing list exists. The common workshop has been attended by 36 participants.
- Operating since:
  - 2008. The collaboration had started in 2005 within the EUROTeV framework.
- Typical frequency of meetings (Webex, face-to-face):
  - Normally experts from ILC attend some of the CLIC meetings and experts from CLIC attend some ILC meetings. We tend to have one dedicated ILC-CLIC workshop per year. We will have phone meetings roughly once per month.
- Topics treated since WG creation:
  - Benchmarking of main linac simulations.
  - Design of the beam transport from the damping ring to the main linac.
  - Study of the impact of the kicks from couplers of the superconducting cavities.
  - Feedback studies.
  - Pre-alignment studies.
  - Impact of stray magnetic fields.
- Deliverables produced (documents, publications, presentations,…) since WG creation:
  - Low Emittance Transport Workshop 2009 (http://indico.cern.ch/conferenceDisplay.py?confId=56133).

Beam dynamics [2/2]



- Topics to be addressed by the WG in 2010, with corresponding deliverables:
  - Review of list of key issues for ILC and CLIC.
  - Integrated simulations of the dynamic effects in the CLIC low emittance transport system. In particular beam phase and amplitude stability, transverse element jitter.
  - Conceptual design of the CLIC beam-based feedback system.
  - Exploration of the implications of the operation of ILC and CLIC at lower energies
  - Review of ILC and CLIC emittance preservation at different energies.
  - Review travelling focus for ILC.
  - Common workshop, maybe as part of the ILC-CLIC workshop at CERN.
- Future topics until 2012:
  - Reports on individual topics
- Main benefits from joint WG:
  - Benchmarking of codes and agreement on standards for simulations.
  - Exchange of ideas for beam-based correction techniques.
  - Identification of potential issues.
  - Availability of common software tools.
- Main difficulties in running joint WG:
  - Lack of resources, in particular on the ILC beam dynamics (about 2FTE).
- Remarks and suggestions to the CLIC-ILC WG on General Issues:
- Name of person(s) filling questionnaire:
  - Kiyoshi Kubo
  - Daniel Schulte
  - Nick Walker

Cost & schedule [1/4]

- Mandate of the joint WG

  - Compare the **assumptions and methodology** adopted by both projects in matter of cost.
  - Establish **functionalities for cost data analysis**:
    - Parametric cost models to define variation of costs as a function of the main parameters
    - Risk/uncertainty assessment.
  - **Compare costs for certain items** (to be defined with the agreement of management) to better understand the difference subsystem by subsystem between the two technologies
  - Develop ***common approaches*** to traceability, requirements, cost estimates, and the bases of estimates.
  - Compare the basic **assumptions and baseline units for schedule**.

- Membership of the joint WG (names, affiliations):
  - CERN: Philippe Lebrun, Germana Riddone, Katy Foraz
  - Fermilab: Peter Garbincius
  - Argonne National Lab: John Carwardine
  - KEK: Tetsuo Shidara
  - DESY: Frank Lehner

Cost & schedule [2/4]

- Operating since: May 2008
- Typical frequency of meetings (Webex, face-to-face):
  - We try to have a quasi-monthly WEBEX meeting.
  - We also have a few hours' face-to-face at Linear Collider workshops
- Topics treated since WG creation:
  - Descriptions & comparisons of CLIC & ILC cost estimating & cost risk methodologies
  - CLIC WBS and CLIC Study Costing Tooll
  - ILC Cost Estimating Tool (ICET)
  - Scheduling of ILC civil construction and installation using LHC methodology
  - Transfer of complete ILC WBS template (without estimates) and the specific ILC Beam Delivery System estimate (with costs) and back-up documentation to CLIC
  - Probabilistic Cost Analysis (European/LHC experience & methods, Ph. Lebrun) compared with US (P. Garbincius) and XFEL (F. Lehner) methods
- Deliverables produced (documents, publications, presentations,…) since WG creation:
  - Peter Garbincius' presentations
    - LCWS08, Chicago, November 2008
    - TILC09, Tsukuba, April 2009
    - ILC PAC Review, Vancouver, May 2009
  - PhL's presentations
    - TILC09, Tsukuba, April 2009
    - CLIC ACE, May 2009
    - CLIC-ILC Executive Meeting, June 2009
    - CLIC Two-beam Module Review, September 2009
    - CLIC Workshop, October 2009

Cost & schedule [3/4]

- Topics to be addressed by the WG in 2010, with corresponding deliverables:
  - Submitted abstract to IPAC2010, Kyoto, May 2010 on "Assessing risk in costing high-energy accelerators: from existing projects to the future linear collider"
  - We will need to write this up and present it, and maybe a more complete version
  - Continuing to develop scheduling methodology, depending on personnel availability
  - We've had a goal of compiling a standard methodology and parameterization for estimating the cost of warm (room temperature copper) magnets and their associated power supplies and cabling, but again, have been limited by availability of experts
  - WG will provide expert members for Peer Review of CLIC Costs in Autumn 2010
- Future topics until 2012:
  - Keep informed on both the CLIC and ILC cost estimating
  - Ensure that both estimates are presented in a way that facilitates comparison
  - Goal is to serve on each other's internal quality assurance/review boards to make sure CLIC and ILC design reports (including cost estimates) for 2012 are ready for international review and public release.
- Main benefits from joint WG:
  - Since both ILC and CLIC will be international projects, it is vital to get as many view points as possible from each country and region.
  - The CLIC-ILC Collaboration is a good start, but it is still too narrow.
  - The "Governance" studies by Brian Foster and his committee address some of the political logistics. Maybe it is always a matter of international politics, but similar things must be done from the component fabrication, installation, operation and maintenance viewpoints. The LHC experience was a start. Much experience (some good, much bad) is being provided by XFEL & ITER.

Cost & schedule [4/4]

- Main difficulties in running joint WG:
  - Lack of availability of people!
- Remarks and suggestions to the CLIC-ILC WG on General Issues:
  - See response to "Main benefits from joining WG"
- Name of person(s) filling questionnaire:
  - Peter Garbincius
  - Philippe Lebrun

Summary [1/6]

- All topical WGs operating
  - since (spring to autumn) 2008, with locally some pre-history (EUROTeV)
  - typically monthly meetings (WebEx), face-to-face during ILC or CLIC events
- Membership
  - Truly international, involving many labs/institutes
  - Ranging from 7 to 37 participants
- Main benefits
  - Strengthening of ties between CLIC and ILC study teams
  - Improved collaboration among stakeholders in community beyond CLIC/ILC
  - Peer contribution/expertise on topics of common concern
  - Pooling of expert resources
  - Identification of potential issues
  - Sharing of experience, methods and tools for efficiency and mutual transparency
  - Benchmarking of codes and agreement on standards
  - Access to experimental facilities
- Main difficulties
  - Time spent on project-specific items with little common interest
  - Lack of resources (!)

Summary [2/6]

- Topics already treated
  - Beam delivery systems
    - Collimation performance review, FFS design and optimization, L* considerations, CLIC BDS layout, Crab Cavity tolerances and integration, beam dump design, ATF2 ultra-low beta proposal, ATF2 and CLIC FFS alignment and tuning
  - Civil engineering & conventional facilities
    - Optimisation of Tunnel and Shaft diameters, distance between shafts (linked to safety)
    - Overall layout of the machine and interaction region infrastructure
    - Shallow site v Deep Tunnel Option
    - Single Tunnel v Double Tunnel
    - Safety issues such as emergency egress
  - Positron generation
    - Undulator-based source
      - Geant4 model of collimator, target, capture optics, and capture RF assembly
      - Parameters wrt yield, polarisation
      - Electron beam quality issues.
    - Compton source
      - Main parameters for the Compton ring
      - Optical stacking cavity
      - High power lasers.
    - Lithium lens capture optics
      - Suitability for Undulator.
    - Unpolarized sources (Conventional targets and hybrid targets using channelling)
      - Simulations to optimize the unpolarized e+ yield.
    - Electron source
      - CERN, CI, JLAB, SLAC collaboration for tracking studies.
      - HV tests for DC guns.

Summary [3/6]

- Topics already treated (continued)
  - Damping rings
    - Raise awareness among members of each of the damping ring teams of similar efforts being carried out by the other team and to encourage close collaboration wherever possible
    - Develop experimental plans to use the available test facilities (CesrTA and KEK-ATF)
    - Organize a joint workshop (LER2010) to bring together both damping ring groups as well as representatives of the light source and collider communities
  - Beam dynamics
    - Benchmarking of main linac simulations.
    - Design of the beam transport from the damping ring to the main linac.
    - Study of the impact of the kicks from couplers of the superconducting cavities.
    - Feedback studies.
    - Pre-alignment studies.
    - Impact of stray magnetic fields
  - Cost & schedule
    - Descriptions & comparisons of CLIC & ILC cost estimating & cost risk methodologies
    - CLIC WBS and CLIC Study Costing Tooll
    - ILC Cost Estimating Tool (ICET)
    - Scheduling of ILC civil construction and installation using LHC methodology
    - Transfer of complete ILC WBS template (without estimates) and the specific ILC Beam Delivery System estimate (with costs) and back-up documentation to CLIC
    - Probabilistic Cost Analysis (European/LHC experience & methods, Ph. Lebrun) compared with US (P. Garbincius) and XFEL (F. Lehner) methods

Summary [4/6]

- Topics addressed in 2010
  - General
    - CLIC-CDR related
  - Beam delivery systems
    - ATF2 ultra low-beta proposed tests
  - Civil engineering & conventional facilities
    - ILC single-tunnel layout (3D modeling)
  - Positron generation
    - Design of undulator-based source
    - Simulation of Compton source
    - Li lens tests for Compton scheme
    - Experiments at KEKB unpolarized source
    - Study hybrid solution for ILC unpolarized source
    - Complete design of pre-injector linacs
    - Electron source: tracking studies and HW tests for DC gun at JLAB & SLAC
  - Damping rings
    - LER2010 workshop: development of joint working teams
    - Assessment of EC mitigation issues
    - Review of items for future common R&D
    - Low-emittance lattice design
    - Low-emittance tuning (experimental)

Summary [5/6]

- Topics addressed in 2010 (continued)
  - Beam dynamics
    - Review list of key issues for CLIC & ILC
    - Integrated simulations of dynamic effects in CLIC low-emittance beam transport
    - Conceptual design of CLIC beam-based feedback system
    - Implications of operating CLIC and ILC at lower energies
    - Review travelling focus for ILC
    - Common workshop
  - Cost & Schedule
    - Common paper on cost risk analysis
    - Contuinue developing scheduling methodology
    - Peer review of CLIC costs

Summary [6/6]

- Future topics until 2012
  - Beam delivery systems
    - ATF2 ultra low-beta operation, extrapolation to CLIC FFS
    - Tuning of CLIC FFS
  - Civil engineering & conventional facilities
    - Further development of all CES issues, incl cost estimates and construction planning
  - Positron generation
    - Channeling measurements for positron source
    - Applicability of Li lens
    - Complete design of Compton ring, incl 6D stacking simulations
    - Tests of Li lens capture optics at BINP and CesrTA
  - Damping rings
    - Implementation of 10 specific WG spanning the low-emittance ring community
  - Beam dynamics
    - Continuation of current topics
  - Cost & schedule
    - Continue mutual information on CLIC & ILC cost estimations, facilitating comparisons
    - Serve on each others's internal review boards