Project Managers' Report

April, 2010

ILC Global Design Effort

Project Managers Report

April has seen a consolidation of the discussion and plans made at the ILC2010 workshop in Beijing. In particular as we transition from Phase 1 to Phase 2 of the Technical Design Phase, it is important to re-focus our plans and activities over the next two-years on producing the Technical Design Report. Also high on the agenda is the Top-Level Change Control (TLCC) process and the associated plans for the Baseline Assessment Workshops, first discuss in Beijing. These activities are now the central theme for further work on SB2009. There has also been much discussion on how to improve the communications with the Physics and Detector community, and to make sure they are in actively involved in the BAWs.

R&D Plan Release 5

The draft release 5 of the TD phase R&D plan must be submitted to the Executive Committee on June 10. Following on from Beijing, the PMs have begun the process of reviewing and restructuring the plan to focus on TD Phase 2 activities. This requires a major (if not complete) re-write of the original document (Release 4). The PMs have produced a new outline and will drive the editing. Instructions to the TAG leaders is expected early May.

Baseline Assessment Workshops

The dates for the first two BAWs have been set for September 7-10 at KEK. The first BAW (7-8.09) will focus on the issue of average accelerating gradient, while the second (9-10.09) will deal with the single-tunnel configurations and in particular the HRLF solutions (KCS and DRFS). A first announcement is being drafted with more details of the agendas and will be sent out in May. An important aspect of the initial planning is to develop the work running up to September. The second two BAWs (positron source location and reduced beam-power option) will be scheduled shortly. Tentative dates have been set for January 17-20, 2011. The exact dates (and location) still need to be confirmed with the Physics and Detector community, as their active participation in these particular workshops is considered mandatory.

10Hz Operation

Following on from the work at the Beijing workshop, a summary of the status of the 10Hz operation scenario for low-energy running has been produced and is available in ILC-EDMS (ID# D*907775). The document attempts to summarise the impact on all accelerator sub-systems of 10Hz running, and includes those items that should be addressed in a cost impact analysis. As part of the emerging TLCC process the PMs have encouraged discussions (via email) on the topics in the document. Several

outstanding action items remaining, most significant of which is the impact on the HLRF (Marx modulator and DLRFs MAK and modulator). A focus AD&I meeting on 10Hz operation is scheduled for June 23rd.

ILC-EDMS

Work has started in preparing document structures for the TD Phase 2 work leading up to the publication of the TDR. The PMs have emphasised the importance of consolidating all design and cost related documentation into a single repository (ILC-EDMS) in structured fashion. It is also understood that the technical design documentation needs to be more publically accessible to the community at large. Work has started this month on discussions with the ILC-EDMS team on providing such access, as well as templates for required documentation and a WBS structure within ILC-EDMS. A report is expected to be available by June.

TESLA Technology Collaboration Meeting at FNAL

The TTC meeting was hosted by FNAL from April 23-26. The worldwide collaboration remains an important aspect of the Global ILC SCRF R&D, and is attended by many of the ILC SCRF team. Although much of the focus of this year's meeting was not directly related to the ILC technology (in particular low-beta cavities), it still provided an important venue for ILC-related discussions. A Much better impression on the cavity field gradient was evident – specifically a better understanding on fundamental issue, coupled with visible progress in production yield according to the statistics accumulated for the ILC effort (global database). Other interesting topics were: the XFEL report on the current status of the cavity procurement (without information on the bidding progress itself); progress on the JLAB 12 GeV upgrades; Project X preparations; SNS experience in real steady service operation. The PMs would like to state their appreciation for TTC's continued support of the ILC community.

SCRF Industrialisation Meeting at IPAC10

The programme for the one-day mini-workshop on global SCRF industrialisation is now finalised and can found at

http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4530.

SCRF-related industry representatives will be in attendance, and the workshop will overview the industrial status in all three regions. The workshop marks an important step in beginning to define the global mass-production models required for the TDR Project Implementation Plan, which will also form a base for the updated SCRF cost estimate

1.0 SCRF

1.1 Cavity

Summary: At the ILC10 meeting in Beijing (March 24 – 30, 2010), 12 talks were presented at the main linac cavity session. A review talk summarized the cavity gradient R&D status and proposed plan and priority for TDP-2. A major top level change control topic is “average acceleration gradient”. At the TTC meeting at FNAL (April 19 – 23, 2010), a number of presentations were made related to ILC gradient R&D.

Asian Region: MHI10 and MHI11 processing and RF testing are underway at KEK. The first RF test of MHI11 was limited by field emission at ~ 5MV/m. It is suspected some accident happened during cavity processing or handling. MHI10 and MHI11 are dedicated for S0 activities at KEK – these cavities are not specifically allocated for installation in a KEK cryomodule and will be sent to Jlab in summer 2010 for comparative testing.

European Region: DESY started commissioning ‘oscillating super-leak transducers’, (OST’s), with T-mapping cavity AC126.

American Region: FNAL tested two 9-cell cavities, TB9RI024 (heavy EP at RI and light EP at ANL/FNAL) and TB9RI026 (heavy EP and light EP both at ANL/FNAL). Both reached a gradient of 28-29 MV/m limited by field emission/quench. JLab tested TB9RI18 after heavy EP and first light EP, reaching 33 MV/m limited by low-Q (due to wrong EP acid mixture). The vacuum furnace is being re-qualified at JLab by testing cavity between 800C treatment and the first light EP. Cornell re-tested LR9-1 after field flatness tuning and confirmed the previous result of gradient improvement by defect removal through tumbling. 1-cell cavity EP was done for EP optimization. 9-cell cavity AES5 tumbling paused due to broken machine.

(Submitted by Rongli Geng)

1.2 Cryogenics

1.3 Cryomodule

S1 Global: Status and Test Plan

Current schedule for Module A (KEK cavities) is going well. Scheduled progress in general over the past 4 months has been exceptional and all collaborators are thanked for their excellent efforts. The planned testing schedule is built to the extent possible around various workshops, meetings, and holidays, and all collaborators are invited to attend. In particular participation in low-level RF tests in July, coupler processing in August, and then later in the year high-level cavity testing, Lorentz detuning studies, and cryomodule heat loads measurements (including dynamic heat loads), and RF system tests were mentioned. A possibility of SLAC participation in the coupler aging work is being investigated (Chris Nantissa). Jim Kerby is discussing the schedule with Fermilab personnel to review availability for the proposed tests.

1.4 HLRF

The KEK DRFS is developing and will be tested using a two-klystron test system. At SLAC the first big pipe HLRF system has been cleaned and preparations for initial tests are ongoing.

1.5 Main Linac Integration

BS1S lattice file for the 300um bunch-length version has been finalized. The lattice has been matched to Main Linac twiss parameters. The Main Linac from 5GeV to 15GeV has been added to the ILC2007b lattice. Review of tolerances and emittance budget for RTML underway.

Bunch compressor studies have been made for the single-stage design (partly in response to AAP recommendations on performance limits). Current results indicated that 200 □m will be very difficult to achieve. Shortest bunches obtained in simulations are: 250 □m the current BC1S design; 235□m with optimized sextupoles, and 220 □m using a 3rd harmonic cavity.

Proposal for RTML RF amplitude and phase stability at TTF/FLASH have been further developed and submitted as part of the summary report from the recent Long Bunch Trains workshop at DESY (February).

Dark current simulation studies are in progress (MARS modelling with beam dynamics). A possible proposal for dark-current studies at FLASH is being discussed.

2.0 CFS/Global Systems

2.1 CFS

With the conclusion of the LCWS Workshop in Beijing on March 30, 2010, CFS work in April reviewed progress made during the Beijing Workshop. The CFS Parallel sessions at the workshop were held jointly with both the Main Linac and High Level RF Area Systems as well as jointly with all Area Systems impacted by the revisions to the central project region. Up to date information regarding both the Klystron Cluster and the DRFS alternatives was presented which will affect CFS Main Linac tunnel layouts and cross sectional tunnel sizes in the three regions. A new central region layout was also presented based on current lattice design and enclosure layout. The CFS group continues to work on an updated conventional design based on this current information. The Americas Region will continue to develop Main Linac tunnel layout for both the Klystron Cluster and DRFS systems. The European Region will continue initial studies for the Klystron Cluster system and the Asian Region will continue initial studies for the DRFS system primarily due to resource limitations. Both the European and Asian Regions will develop solution for the alternate RF system as resources become available during TDP II.

There were other CFS Planning decisions made at the Beijing meeting. First, the Asian CFS Group announced a review of the Asian Single Tunnel Main Linac configuration which will be held at the KEK laboratory on June 1-2, 2010. The review committee will be primarily made up of CFS Group members for the Americas and European Regions as well as local experts from Japan with Vic Kuchler acting as the Review Committee Chair. CFS video/webex meetings during April devoted much of the time to the planning for this review. Additionally at the Beijing meeting, the CFS Group announced two CFS/Area System workshops to be held in the summer prior to the fall ILC meeting at CERN in October. The first workshop will be held at the Daresbury Laboratory in the UK on July 12-13, 2010 and the second will be held at the SLAC Laboratory in the US on August 2-3, 2010. Similar to last year's workshops, the CFS group will interact with the Area Systems with a primary goal of establishing updated mechanical and electrical requirements for the new baseline ILC design. In addition, these workshops will invite representatives of the MDI and both Detector communities to participate in these meetings. This will provide an initial

opportunity for these groups and the CFS group to establish contact points and plan for future discussions during the parallel sessions scheduled for the fall meeting at CERN.

During April, the Americas Region also began working with an outside A/E consultant, Holibard and Root, to develop an initial programming study for the surface building layout and the various shaft locations, beginning with the Klystron Cluster RF alternate, with work on the DRFS alternate to follow.
(Submitted by Vic Kuchler)

3.0 Accelerator Systems

3.1 BDS (Beam Delivery System)

3.2 Beam Dynamics

3.3 Damping Ring

Damping Ring Webex Collaboration meetings
Wednesday 3 February 2010
Tuesday 23 February 2010 - ECLOUD WG meeting
Wednesday 10 March 2010 - ECLOUD WG meeting
Tuesday 23 March 2010 - ECLOUD WG meeting

The slides of the presentations are at:
https://wiki.lepp.cornell.edu/ilc/bin/view/Public/DampingRings/TeleConference#Agendas_and_Materials_Archive

R&D status
A quite complete review of the R&D on ILC damping rings was presented at ILC10. DR sessions where dedicated to: Lattices, R&D status, EC Working Group, CesrTA and ATF test facilities, TDPII organization and plans and DR Collaboration.
Lattices
3 lattices where presented. The 6.4 km DCO lattice, designed by CI, has been adopted as baseline at TILC08 and is now well assessed. Technical design work on this lattice is ongoing at CI, the arc layout has been completed and wiggler section is in progress.
Two lattices have been proposed for the 3.2 km ring: one by LNF based on SuperB arc cell and one by IHEP based on FODO. Both have racetrack layout and the same straight section layout as DCO. Lattice optimization is in progress.
Kickers R&D
SLAC is developing a DR kicker modulator functionally similar to DSRD systems: a 2-ns prototype has been demonstrated (FY08), a 4-ns modulator for ATF2 is under development. A good progress in the pulser modulator has been recently achieved: the post pulse in the output waveform has been eliminated.
ATF - Multi-bunch beam extraction by the fast kicker, 27 (max 30) bunches with 308 ns spacing, has been performed. Good amplitude and time stability has been achieved in single bunch mode. Work is in progress to obtain good stability also in multi-bunch mode.
Electron Cloud (EC)
R&D on mitigation techniques at KEK: comparison between coatings, grooves and electrodes has been performed. Evaluation of impact on beam impedances just started.
At LNF clearing electrodes have been installed in the DAFNE rings (dipoles and wigglers), beam tests will be performed early in the summer.
Simulation work at SLAC continues on impedance and SEY of grooved surface, EC build-up in quadrupole and sextupole magnets.

A new shielded pickup unit designed at LBNL to use in the NEG coated chamber at CesrTA and compare with results on the aluminum chamber.
The ECLOUD WG has produced comparison of thresholds for 6 km and 3km DR (SLAC, LBNL, LNF, Cornell, CI) and risk assessment:
•With respect to the RDR baseline, the EC risk level for adopting a reduced 3km Damping Ring while maintaining the same bunch spacing is: Low.
•The acceptable surface Secondary Electron Yield (SEY) may strongly depend on issues not yet thoroughly investigated such as beam jitter and slow incoherent emittance growth. Refined estimations of the photoelectron production rate by simulations will better define the maximum acceptable SEY.
•Reducing the positron ring circumference to 3-km eliminates the back up option of 12 ns bunch spacing (safer e- cloud regime) and may reduce the luminosity margins.
•In the event that effective EC mitigations cannot be devised for a 3km damping ring, an option of last resort would be to add a second positron damping ring
10 Hz Operation - A 10Hz repetition rate has been proposed to increase low energy luminosity. This appears to be a reasonable option for the 3.2km configuration and rather expensive for the 6.4 km (double the damping rate: increase wiggler field and number, reduce wiggler period, double the number of RF cavities).

At ILC10 lot of time was spent discussing work planning, organization, reviewing test facilities in terms of R&D plan, trying to work on detailed timeline over next two years.
(Submitted by Susanna Guiducci)

3.4 RTML

3.5 Sources

Rotating target eddy-current testing is now taken up to 1800 rpm (specified to operated at 2000rpm) and running with 1Tesla field. Results indicate the target should be fine under these conditions. However the results do not match simulations very well, with the measured performance better than predicted: simulations showed that the 5 spokes should be evident in data, but this is not the observed case. Two independent simulations are consistent, but both disagree with the measurements. Currently we are looking at the key inputs into simulations; particularly important is the electrical properties of materials.

Liquid Lead target – tests will happen later this year in KEK.

Flux concentrator: Livermore conceptual design looks promising. However prototyping will be required before being convinced it will work. (PMs are looking into possible funding.)

Liquid lithium lens: A detailed report on Magneto Hydro-dynamics has been published. Need subject matter expert to assess very carefully (under review).

Engineering design of target system – not started yet due to UK resource issues. (Probably won't happen in UK with present anticipated funding.) A rotating seal will be tested at LLNL.

Hybrid target tests are taking place at KEK (but are not currently part of the R&D plan, but should be included in Release 5).

4.0 Test Facilities

4.1 ATF

4.2 ATF2

Work on ATF2 continues and measurement of sub-micron beams at the 'IP' with the Schintaki beam size monitor is expected soon. With respect to the R&D Plan update, delays to the original proposed ATF2 schedule are likely, with the 35nm goal (originally 2010) now looking more like 2011. It is still hoped to demonstrate the optics goals (i.e. required demagnification) this year. The delay is due to the available emittance in ATF.

BDS/MDI design work will now begin to focus more on the detector hall and push-pull interface issues (in collaboration with the detector concepts).

4.3 CesrTA

The CESR reconfiguration for CesrTA is complete. Recent results include: Machine correction to ey ~ 31pm (within factor of ~1.5 of target), EC mitigation comparisons, First single-pass bunch-by-bunch beam size measurements, Extensive progress on EC simulations. Results are described in CesrTA report.
During the recent down, new hardware has been installed for the EC Mitigation Test Program:

- New wiggler vacuum chamber with clearing electrodes
- New quadrupole vacuum chamber with TiN coatings
- New NEG test section (drift)
- New amorphous Carbon test chamber (drift) due to concerns about Si contamination
- Add time-resolved EC measurement capability (3 locations instrumented during down).

An upgrade of visible beam size measurement capability (high resolution vertical polarization measurements, 4ns longitudinal measurements with upgraded streak camera lines), as well as testing of x-ray beam size hardware continues. New high and low energy xBSM coded aperture x-ray optics has been installed, together with new 4ns pre-amplifier and digitizer electronics. Further work includes: improved BPM gain calibration techniques; complete re-survey of ring alignment and magnet power supply upgrades. A three-week machine run is currently on-going.

Plans to produce a final analysis report – complete with a recommendation on e-cloud mitigation strategy – are still on track for the end of 2010.

Proposals for extending testing in a 5-10pm vertical emittance regime (beyond 2010) are being discussed with NSF.

Damping Ring (general)

This report is based on the presentations given at the Damping Ring session of ILC10 Workshop, Beijing, March 26-30 and at the DR webex Collaboration meetings:

4.4 FLASH

FLASH is currently being re-commissioned after a major upgrade. No dedicated 9mA beam time is expected until early 2011. However, plans to run long bunch trains at lower currents (<1 mA) for photon users later this year will greatly benefit the ILC programme, mainly by commissioning the new LLRF hardware, and in general by gaining routine experience with long bunch trains. Analysis of the existing data from the September 09 run is progressing slowly due to lack of available people, and plans for this analysis will need to be reviewed. The summary report from the February workshop on long bunch-train operations should be published at the end of May, and contains proposals for experiments and measurements from the ILC groups. A second follow-up

workshop is planned for October 4-6 at DESY, where plans for the early 2011 running will be discussed.

5.0 Other

5.1 AD&I

5.2 Cost Management

Peter worked on preparation documents for the Baseline Assessment Workshops (BAWs) and responses to questions from the previous PAC (Pohang-Nov2009) for the upcoming PAC (Valencia-May2010).

Triad's ILC Cost Estimating Tool (ICET) and applications to ILC RDR Estimate:
J. Carwardine, T. Himel, T. Shidara, P. Garbincius, Maura Barone, Kevin Flannery, and David Seigle (summer student still participating as he has time)
Triad: S. Curtis, L. Lew, and K. Long, and
DESY-EDMS: Daniel Szepielak (& Jasper Dammann working on a technical file transfer solution)

During March, 2010, I started installing the RDR cost estimate into ICET. This last month, I completed the Cost Estimating Modules (CEMs) for CFS-Europe (~1/3 CFS) and CFS-Asia (~1/3 of CFS) completing CFS. I also completed the common sections, mainly common labor, for Installation; Dumps & Collimators; Vacuum; Magnets & PS; Accelerator Physics; and Commissioning, Operations, & Reliability. Weighting by the fractions of the RDR estimate, this represents approximately 73% of the total entries. In addition, I generated the blank CEMS for the remaining 27% of the total RDR estimate. This is tedious and pretty slow going, but I anticipate slow, but steady progress as my time permits. An up-to-date graphical status sheet is at:http://www-ilcdcb.fnal.gov/RDR-ICET-Status.pdfI encountered some problems with losing URL references and bombing during saving operations after "Add New Sheet". I will eventually report to TRIAD to see if they can reproduce these errors and whether they can correct. I would also like TRIAD to add an extra column to go from the most probable to mean estimates and to roll-up in the same format.

Peter still has to personally learn: REBUILDER, STAGER, and EDMS GENERIC PARTS.

CLIC-ILC Cost & Schedule Working Group:
G. Riddone, P. Lebrun, K. Foraz, F. Lehner, J. Carwardine, T. Shidara, and P. Garbincius

Philippe and Peter are preparing a common CLIC-ILC poster/paper on Cost Risk Methodologies to be presented by Philippe at IPAC-2010 in Kyoto in May, 2010. On April 23, Philippe and Peter (joined by Wilhelm) had a working webex meeting to discuss details and Peter's draft sections of the IPAC paper. Peter completed his proposed 11 page section and forwarded to Philippe on April 27. Philippe sent his initial draft embedded in the IPAC template on April 28, leaving slightly more than one column, out of six, to insert the section on Cost Risk Assessment for the ILC. This will be insufficient to cover the cost risk techniques of KEK, CERN, DESY, DOE, GAO, NASA, and US Air Force. Peter proposed that only the ILC plans be included in IPAC paper, and that a separate longer ILC/CLIC document be prepared adding this extra information to the IPAC contents.
(Submitted by Peter Garbincius)