Project Managers' Report

October, 2009

ILC Global Design Effort

Project Managers Report

GDE meetings:

- Linear Collider Workshop Americas 2009 (LCWA-09) : as a Joint meeting of American Linear Collider Physics Group (ALCPG) meeting and GDE meeting, held at Albuquerque, Sept. 29 - Oct. 3, 2009,

- ILC positron source collaboration meeting was held at IPPP, Durham, UK, on Oct. 28 - 30.

Technical Area Meetings:

- SCRF & ML TA Group Meeting: Oct. 14,

- CF&S TA Group Meeting: Oct. 21,

In LCWA-09, we discussed a new GDE baseline document (PM Proposal), referred to as Strawman Baseline 2009 or 'SB2009'. In particular, a single tunnel design containing major accelerator components to be installed in the single tunnel. The preparation for the proposal is may be summarized, as follows:

1) Cavity field gradient of 31.5 MV/m is to be re-evaluated and the main linac length is to be consistent with an optimal choice of average accelerator gradient,

2) Single-tunnel solution for the Main Linacs and RTML, with two possible variants for the HLRF: Klystron cluster scheme, and distributed RF system scheme,

3) Undulator-based e+ source located at the end of the electron Main Linac (250 GeV),

4) In dumping ring design, reduced parameter set (with respect to the RDR): nb = 1312, so called 'Low Power'), and ~ 3.2 km circumference at 5 GeV with 6 mm bunch length for either 3 or 6 km ring,

5) Single-stage bunch compressor, with a compression factor of 20,

6) Integration of the e+ and e- sources into a common 'central region beam tunnel', together with the BDS,

At the Sixth ILC Positron Source Collaboration Meeting it was encouraging to hear reports covering renewed technical R & D on target technology and associated Matching Devices in all three regions (work is underway at KEK, UK-CI and – hopefully – growing in the US). We expect the next release of the ILC R & D Plan (January 2010) to have a better developed plan through, and perhaps beyond, the Technical Design Phase.

Barry Barish and Marc Ross participated in the CERN CLIC collaboration meeting held at CERN on Oct. 12 - 16, and reported the GDE R&D activities and cooperative efforts for common part/technology between CLIC and ILC.

The superconducting RF R&D is progressing. An achievement is that the 7th cavity manufactured by MHi, Japan has reached 33.6 MV/m with exceeding the ILC operational field gradient, first time in Japan. Further achievement is that two subsequent cavities #8 and #9 manufactured by an American Vender, AES, has reached 41 and 38 MV/m, with satisfying the ILC cavity goal with vertical tests.

1.0 SCRF

General SCRF

SCRF Meeting 14.OCT.09
Presentation files are available at the following Indico site;
http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4219

1) Report from Project Managers

Akira and Marc thank everyone for their participation at ALCPG09, and for the upcoming preparations for the AD&I meeting in December at DESY. Nobu will talk about writing assignments later. In addition, the ILC PAC meeting is the first week of November in Korea.

2) GL Reports

Hitoshi Hayano gave a brief report on cavity work at KEK. MHI07 will be tested tomorrow. If successful, it will be the fourth Japanese cavity for S1 Global. In addition, AES003 grinding is complete and it will be sent back to FNAL soon. Hitoshi is going to check the iris again before shipping. AES003 has received a 30~50 micron EP after the grinding to clean up dust, etc.

Rongli Geng noted that the next S0 WebEx meeting will be 27 October, preceding the S1 Global WebEx meeting on the same day. The S0 discussion topics will include the R&D and production gradient targets for further discussion at the AD&I meeting; Rongli and others noted that the allowable spread in the cavity gradient being discussed is actually a question for the HLRF (or maybe the next ML WebEx meeting in November), though the S0 database effort will be able to report what the current spread is.

3) Topics

Topics included 'potential vendor's cavities' into yield statistics, and rebaselining the field gradient, Q-value, and yield toward TDP-2. Akira led a discussion based on the ALCPG closeout cavity discussion (slides posted at above link). The questions center on what gradient, Q, and yield should be used in the upcoming months. For the moment, the proposal based on the recent results is that we keep the R&D target at 35MV/m, and the production target at 31.5MV/m. However, with our HLRF colleagues we should explore the cost associated with utilizing cavities with an average of 31.5MV/m, but a spread of +/-20% (for instance) about that value, and the economic impact of such a spread. This will be further discussed in upcoming HLRF and ML meetings.

As far as including cavities from vendors just starting up, Akira has the feeling for both MHI and AES that we start with cavity No.5 of each. MHI has agreed with such a proposal, and to date informal discussions with AES and colleagues in American region support this for AES as well. This will be confirmed amongst the S0 working group; in addition Jim will discuss it with Bob Kephart and Mark Champion at FNAL, among others. Within the database it would seem that designating early cavities as 'Production 0' or some such marker could accommodate this segregation.

S1 Global preparation and a meeting at KEK in November

Norihito described the progress in yesterday's WebEx meeting in agreeing on parts and participation in assembling S1 Global (slides posted). The next S1 WebEx meeting will be in 2 weeks, followed the week of November 9 by further longer discussions with FNAL and DESY. Paolo noted INFN's interest to participate as well, particularly in tuner installation, which is very much appreciated, and if arrangements can be made, INFN may be represented at KEK the week of November 9 as well.

SB2009 documentation plan and task assignment for SCRF part

Nobu (slides) described the process for assembling the TDR over the next couple of months, and those responsible for providing information (careful if you are already late!). There will be a WebEx meeting probably in the first week of November to push the process along, leading up to the meeting at DESY. Please check the temporary file repository at http://ilc.kek.jp/sb2009/ , his slides for your assignments, or contact Nobu if you need/want corrections to his mailing list, ml-sb2009@lcdev.kek.jp . (Note: After the meeting Nobu has added Paolo and Carlo to the SB2009 list)

4) Further Plans and Meetings

Next ML-SCRF WebEx meeting: 11 November, 13:00- GMT (to be confirmed).

1.1 Cavity

- EP facilities at KEK and ANL/FNAL are making progress with the successful processing of a first 9-cell cavity of > 30 MV/m in each facility with much reduced field emission.
- Second-pass cavity treatment and testing at JLab and KEK raises gradients. AES8 reached maximum gradient of 36 MV/m at Q_0=9E9 after a second-pass EP at JLab. There was no detectable field emission at the highest field, adding the number of field-emission-free 9-cell cavities at > 30 MV/m to five at JLab. MHI7 reached maximum gradient of 33 MV/m at Q_0=5E9 after a second-pass EP at KEK.
- Local repair method making progress with successful proof-of-principle demonstration of two different methods at KEK and JLab respectively. A 9-cell cavity MHI8 was treated with a local grinding method at KEK and raised the quench limit to 27 MV/m from 16 MV/m. A 1-cell cavity C1-1 was treated with a local electron beam re-melting method at JLab and raised the quench limit to 27 MV/m from 19 MV/m. These successes open up new possibilities to raise the gradient yield in a very cost-effective fashion.
- Discussions are under way toward the inclusion of AES and MHI cavities in the global yield evaluation. Global database team is making progress in merging the gradient data into the DESY cavity database tool.

1.2 Cryogenics – no report this month

1.3 Cryomodule – no report this month

1.4 HLRF – no report this month

1.5 Main Linac Integration – no report this month.

2.0 CFS/Global Systems

2.1 CFS

During October, the major emphasis for the CFS Group was to develop a comprehensive 2D machine layout in AutoCAD format. This drawing represents the results of the face to face CFS AD&I meetings held over the summer at SLAC and Daresbury as well as several CFS Video/Webex meetings which focused on specific Area System criteria. Norbert Collomb provided a detailed beamline layout for the Central Region based on available lattices and component information. This layout served as the basis for the development of the CFS 2D AutoCAD layout. The draft layout was completed, reviewed and iterated by the CFS Group and Marc Ross, Ewan Paterson and Peter Garbincius in two separate meetings in late October. Fundamental to the completion of the new layout were decisions to have the aborts and main dumps in the Central Region point from the Central Region tunnel away from the Damping Ring side of the Tunnel and to move the BDS Service Tunnel to the Damping Ring side of the main tunnel. The Service Tunnel will locally ramp up and over the ELTR and PLTR, but overall this configuration provides better access for penetrations from the Service Tunnel to the Central Region tunnel and also provides continuous aisle for personnel and equipment movement. It also allows the previous Service Tunnel Shaft to be combined with one of the Damping Ring Shafts, thus eliminating one shaft in the Central Region.

The 2D CFS machine layout drawing is the base drawing that needs to be completed before the Beamline "Arrow Diagram" and CFS Schematic layout can be completed. In addition, the 2D layout drawing is the basis for all of the section drawings that identify the beamline positions and extent of required tunnel widening required beyond the normal bored tunnel diameter. It is anticipated that all of these drawings will be completed by November 6th and posted on the EDMS system for review in the second week of November. The 2D drawing will also serve as the basis for the development of the CFS 3D enclosure drawing and the CFS 3D support utility drawings that will be forwarded to DESY for inclusion into the overall 3D ILC Layout Drawing. The CFS Group at CERN will be developing the CFS 3D enclosure drawing and the CFS Group at FNAL , through M+W Zander, will be developing the CFS 3D support utility drawings. It is the goal of the CFS Group to have all 3D drawings completed in time for the AD&I meeting at DESY in December. The CFS Group has also produced a draft of the CFS text to be inserted into the overall AD&I Proposal Document. This first draft has been reviewed internally by the CFS Group and by the Project Managers. A second draft will be available in the first week of November.

The CFS Group also devoted a good deal of effort toward cost estimates for various parts of the AD&I effort during the past month. Specifically, the Americas Region developed cost estimates for both the Klystron Cluster and DRFS RF Systems in both High Power and Low Power options for the main linacs only. A final cost estimate for the revised Central Region Design will be developed as soon as the 2D machine layout is finalized. The goal for the completion of that estimate is November 13.

The CFS Group was also represented at the CLIC 09 Meeting held at CERN. A talk was given that described the ILC Accelerator Integration and Design effort and several parallel sessions were held that provided descriptions of progress made on the CLIC design and opportunities for discussion of design elements common to both the CLIC and ILC designs. Specifically, Life Safety and Egress aspects of both designs were compared. The CERN/CLIC approach to Life Safety and Egress is similar to the approach taken in Asia, which focuses on "compartmentalization" of the tunnel into 500 m segments and a ducted, transverse ventilation system that provides fresh air

for exiting and smoke control for incident areas. The Americas approach to Life Safety and Egress focuses more on the containment of higher hazard areas, direct ventilation to required exit alcoves and a more generalized approach to tunnel ventilation and exhaust which uses the tunnel volume and shafts to supply and exhaust air.

3.0 Accelerator Systems

3.1 BDS (Beam Delivery System) – no report this month

3.2 Beam Dynamics – no report this month

3.3 Damping Ring

There is not much new work with respect to what has been presented at the LCWA09 Damping Ring session end of September.

Fast kickers at KEK

We started ATF operation from mid. of October. Naito succeeded the multi-bunch beam extraction bunch by bunch like attached file. However, we found physical aperture problem for multi-bunch beam injection which will be solved by January operation. Then we will start the continuous operation of fast extraction kicker system from January beam operation. Next week, we will replace the fast kicker to SLAC kicker for ATF beam study.

e-cloud studies

SLAC

Preliminary benchmarking of the CesrTA chicane data with simulations using CLOUDLAND (L. Wang) shows good qualitative results for the electron cloud resonance effect in magnetic field region.

Simulations for the ILC DR using CMAD (M. Pivi) show that given the same current and bunch distance we expect similar or even higher instability threshold for the shorter 3.2 km with respect to the longer 6.4 km damping ring.

KEK

Promising electron cloud mitigation ongoing tests at KEKB (Y. Suetsugu), as part of the SLAC-KEK collaboration, show that an improved groove design reduce even further the electron cloud effect in wigglers.

Low Emittance Tuning

PETRA III at DESY has achieved the design horizontal emittance of 1 nm turning on all the 20 wiggler magnets in the ring. This is the world record of the smallest horizontal emittance ever

measured at a storage ring light source and good news for all the accelerator teams aiming at very low emittances, congratulations!

3.4 RTML

- Single-Stage Bunch Compressor option is being analyzed. A working lattice exists and it is currently undergoing a matching optimization and performance tuning.
- Prepared a preliminary lattice for the central area region. Beam line geometry matches the tunnel layout and a preliminary version of the lattice is ready, including doglegs, collimation section, diagnostics, turnaround and spin rotator. Finalization of the beam lines and global matching between the individual subsystems are on-going.
- Complete cost estimate of SB2009 layout for the RTML has been carried out. Excel file with cost estimation and .doc file with description of the RTML new lattice are completed and sent to Peter Garbincius. RTML Section of the SB2009 document has been written and provided to Nobu Toge for the ILC new baseline document.

3.5 Sources

The positron source team held the 6th ILC Positron Source Workshop at Durham in the UK at the end of October. About 20 people attended and others joined by Webex. The meeting was very fruitful with good progress being reported in several areas. A key outcome of the meeting was an in-depth discussion of the SB2009 and the implications for the positron source. A provisional proposal by the PMs to handle the inherent loss in positron yield below ~150GeV by changing to a2.5Hz operation was discussed and adopted. The outcome appears to be that the number of positrons at the IP will be 2E10 at 5Hz between 150 and 250GeV electron beam energy, this then falls to 1E10 at 125GeV. Below 125GeV the number of positrons will again be 2E10 but at 2.5Hzinstead. All of the presentations from the workshop are available at: http://www.ippp.dur.ac.uk/Workshops/09/SourceMeeting/Programme .

4.0 Test Facilities

4.1 ATF

We started ATF operation in mid-October. Naito succeeded the multi-bunch beam extraction bunch by bunch like attached file. However, we found physical aperture problem for multi-bunch beam injection which will be solved by January operation. We start the continuous operation of fast extraction kicker system from January beam operation. We will replace the fast kicker to SLAC kicker for ATF beam study during the week of November 1.

4.2 ATF2 – no report this month

4.3 CesrTA

During the month of October, work on CesrTA has focused on preparations for our upcoming run (Nov. 17 – Dec. 23), preparations for future hardware installations, and ongoing analysis of the CesrTA data.

Hardware preparations for the November – December, 2009 run have included:

- Fabrication of additional test chambers for the Q15 East and West experimental locations (drifts) in CESR. Initial studies have compared amorphous carbon coated and aluminum surface vacuum chambers in these locations and we will deploy a TiN coated chamber for direct comparison in late November. Further mitigation comparisons are planned for the CesrTA runs in 2010.
- Preparation to upgrade the vacuum instrumentation at Q15E to match the configuration presently installed at Q15W.
- Fabrication of a set of dedicated beam buttons for installation in and around the magnet chicane in our L3 experimental region. These buttons will support more detailed microwave transmission studies in that region.
- Preparations to complete the deployment of our new digital BPM system all the way around the ring. The latest generation digital units with bunch-by-bunch and turn-by-turn measurement capability (for 4ns bunch spacing) presently cover approximately 80% of the ring, the first generation digital units (with single bunch turn-by-turn capability) cover approximately 10%, while the original CESR BPMs still provide measurements for the remaining 10%. We plan to complete the conversion to digital BPM readout in mid-November.
- Preparation of a 2nd generation prototype pre-amplifier/amplifier/digitizer chain for 4ns bunch-by-bunch readout of the x-ray beam size monitor. Testing of this hardware is planned for the 2nd half of the upcoming experimental run.
- Preparation and calibration of a new SEY station for measurement of sample coupons. This hardware is derived from the SLAC design formerly used at PEP-II but allows for in situ measurement of the samples through the processing cycle without having to remove them from CESR vacuum. Deployment and in situ testing is planned for December.

Our experimental focus for the November – December 2009 run will include a major emphasis on the low emittance program. With the availability of the digital BPM system and high precision x-ray beam size monitors, we hope to make substantial progress during the upcoming run. Thus considerable effort has been devoted over the last month to ensuring the readiness of these new systems for the experimental program. We are also preparing to carry out a detailed round of mitigation characterizations now that the new vacuum chambers deployed in July have seen approximately two months of processing during Cornell High Energy Synchrotron Source operations.

Longer term hardware preparations in the last month have focused on design, prototyping and fabrication work for the ongoing program of electron cloud mitigation tests:

- Prototyping work with LBNL and KEK on a wiggler electrode chamber is underway. The final prototypes (testing both the thermal spray electrode application process and two variants of the proposed vacuum feed through configuration) are presently in transit from LBNL to KEK for electrode application. We expect to make the final design down selects in mid-

December so that we can have an operational chamber ready for installation into CESR in late March 2010.

- Design of a test section (to be located in the CESR L3 straight) for studies of the SEY performance of NEG coatings. We expect that these chambers will also be ready for installation in our March 2010 down period.
- Planning for follow-up tests of amorphous carbon coatings with CERN
- Fabrication of a quadrupole chamber with mitigation for deployment in the L3 experimental region. Installation is also targeted for March 2010.

During the last month, the electron cloud simulation and analysis effort has made further progress on incorporation of the RFA into the modeling, systematic determination of the electron cloud modeling parameters using tune shift measurements for both positron and electron beams, and further cross-checks between simulation codes. One specific result is that the source of discrepancies between POSINST and ECLOUD modeling of the tune-shift data has now been confirmed to be the need to include the re-diffused electron contribution in the ECLOUD simulations. Close participation on simulation efforts with collaborators from Argonne, CERN, INFN, LBNL, and SLAC continues.

A final note is that we are preparing for an NSF review of our proposal to extend the CesrTA R&D program (electron cloud, low emittance tuning, IBS, etc) for an additional 3 years. This extension would be at a somewhat reduced duty cycle – we are targeting 35-40 experimental days per year. The review will take place on December 2-3, 2009 at Cornell and collaborators are welcome to attend.

4.4 FLASH – no report this month

5.0 Other

5.1 AD&I – no report this month

5.2 Cost Management

Accelerator Design and Integration (AD&I) Activities:

The main work during this month was to get the updated cost estimates for the SB2009 studies from the appropriate Area System and CFS regional group leaders. I did receive a complete updated set of estimates from the Americas CFS team (including Central Region optimization, Klystron Cluster and DRFS, and for the low Power version of both), an updated set of estimates for the DRFS from Shigeki Fukuda, the estimate for the 3.2 KM Racetrack Damping Ring from Susanna Guiducci (at ABQ), and some updated magnet information for RTML from Andrea Latina. I was informed by Norbert Collomb and Deepa Angal-Kalinin that the SB2009 estimates for the Positron Source and the Beam Delivery System would not be sent until after mid-November. This seems too late to digest in time for the meeting at DESY on December 2-3 to finalize our SB2009 proposal and to prepare the final document to be sent to the Accelerator Advisory Panel (AAP)

by December 18. (November 2: Marc Ross reported that he and the Fermilab CFS team have received the updated Asian CFS estimates from Atsushi Enomoto, but they have not yet been forwarded to Peter.) There still are inconsistencies and lack of documentation of the tunnel lengths which need reconciliation between the CFS and Area System leaders.

A fairly complete bullet list for the **description** of the differential cost impacts for the SB2009 document was prepared and sent to Nobu Toge, editor. A GDE Executive Committee decision is to include the differential cost impacts only in a **separate version** of the cost section of the document, which then would be provided to the GDE Director, Project Managers, and Cost Management Team, and to appropriate review panels, such as the AAP.

To support Ewan Paterson's presentation to the PAC in Pohang, Korea on November 2, the cost impacts of the above bullet list were developed and provided to Ewan and Marc Ross using the Americas CFS and the available Area System estimates. The Americas CFS estimate for the Central Region optimization was not provided in sufficient detail to check geometries or to answer more detailed questions, such as, "What is the cost impact of moving the undulator positron source to the end of the e- Main Linac?"

Triad's ILC Cost Estimating Tool (ICET):
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)

Triad-EDMS-ILC WebEx meetings were held on the following dates (with agendas & meeting notes posted on EDMS): Oct 6 (EDMS *896315), Oct 13 (EDMS *896345), and Oct 20 (EDMS *896375). There was no meeting Oct 27.

Triad released the latest version of ICET_V1.6 on October 13 and posted it at EDMS ID # *895295. This version has covered almost all the shortcomings of prior versions and has no known bugs remaining. Of course, there are still opportunities to improve. David Seigel recently provided embedded comments within the code that he provided for DataCube/Pivot Table Report and ReportGenerator/Compare Two Cost Reports. These comments will be included in the next release of ICET.

The main Triad effort remains on completing documentation. On October 13, Triad posted at EDMS ID # 895245 updated versions of the ICET_V1.6_UserGuide_RevA.pdf, ICET_V1.6_QuickRef.pdf, and ICET_V1.6_InstallationInstructions.doc. These documents are being reviewed and comments and suggestions by the ILC team. Kevin Long was allocated up to 5 days work to produce a "Programmer's Guide".

In last month's report it was noted that copies of mysql databases residing on individual personal computers should be backed-up frequently. Triad is working on a button for the ICET Dashboard

which will minimize the number of steps the user must execute – simply hit the button and pick the database name.

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

There are two (very minor, just procedural) remaining interactions with EDMS:

1. We are waiting for Jasper Damman (DESY-EDMS) to complete a scheme for moving files or folders between EDMS teams – Peter responded that Jasper's first moves were OK and asked Jasper questions on how to optimize the overall effort for this task. This feature was requested because approximately 150 RDR cost estimate reference items were placed into EDMS confidentiality teams before it was realized that the plan for the structure of these teams would have to be modified. If this file transfer proves too labor intensive, the same files could simply be re-posted to the new and functional EDMS cost confidentiality teams. This would take one or two person-days of effort at most. We will need those reference files to be in their appropriate confidentiality teams before we start loading the RDR cost estimate into ICET by early November.
2. Since we are still exercising Stager and Generic Parts with ICET V1.5b, we would like to maintain the set of **released** test files used for testing of confidentiality teams and projects, until the tests are complete, before requesting DESY-EDMS to permanently remove these test files. There doesn't seem to be any pressing need for this removal from either the ICET or EDMS viewpoints.

Maura and Kevin F have been exercising the issue tracking and code management software TRAC/SVN at CERN. They are impressed with its functionality and ease of use, configuration, and administration.

CLIC-ILC Cost & Schedule Working Group:

G. Riddone, P. Lebrun, J. Carwardine, T. Shidara, and P. Garbincius

Due another commitment, his daughter Ellen's wedding to Justin Pierce (how's that for a proud Papa!), Peter was not able to participate in the CLIC Workshop at CERN, October 12-16, 2009, which would have been a natural opportunity for face-to-face collaboration. However, this was only two weeks after we had met at the ALCPG-2009 meeting in Albuquerque. We will try to schedule a WebEx meeting in November.