Project Managers' Report

JULY 2010

ILC Global Design Effort

In July, 2010, we report progress with the ILC-GDE R&D activities in TDP-1 as follows:

Major events and progress in July, 2010:

Technical Area	Event and/or Progress	held/hosted	Days
SCRF	- TAGL WebEx meeting	KEK	July 28
	- PM visit to Saclay	Saclay	July 21
CFS/GS	- CFS requirements workshop	Daresbury	July 12-13
	- TAGL webex meeting		July 7
AS	- TAGL webex meeting		July 14
	- Positron collaboration meeting	DESY	July 15-16
PM / AD&I	- Final editing for TDP R&D Plan Rel. 5		
	- AD&I webex meeting "Parameters"		July 23
	- Planning and preparation for BAWs		

TD Phase R&D Plan Release 5

The final draft for Release 5 of the R&D Plan has been completed and discussed during the face-to-face EC meeting (ICHEP, Paris). The PMs identified several items that required attention (structure and wording), and these have since been edited. The final release version is expected to be accepted by the Director / EC on August 5. http://ilc-edmsdirect.desy.de/ilc-edmsdirect/file.jsp?edmsid=*813385

AD&I meeting - Parameters (July 23)

Following on from the June AD&I meeting, which focused on 10Hz operation model for low-energy running, a second meeting was specifically on physics relevant parameters and in particular the low beam-power option. Presentations on overall scope, physics impact and issues and cost impact of the low-power option where made. The full agenda is available at

http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4625

In preparation for the meeting, a series of questions was proposed from the project management specifically to the Physics and Detector groups (who were well represented at the meeting itself). These questions, concerning the importance of key physics impact, as well as discussions on early running scenarios, are posted to the above url. Key outcome of the discussions was a clear delineation of the physics-relevant impact associated with the e+ source relocation to the end of the linac and the proposal to reduce the beam power by a factor of two. A request for a final and formal set of parameters was made by the physics and detector representatives for further studies between now and the January Baseline Assessment Workshop at SLAC.

A summary of the meeting can be found at http://ilc-edmsdirect.desy.de/ilc-edmsdirect/file.jsp?edmsid=*917095

Positron Source Collaboration Meeting July 15-16

The Seventh Positron Source Collaboration meeting was held at DESY on July 15-16. Full agenda and presentations can be found here:

https://indico.desy.de/conferenceOtherViews.py?view=standard&confId=3061

The meeting was well attended by collaborators from all regions, and focused mainly on the status of the baseline source R&D and plans for TD Phase 2. The meeting assessed and reaffirmed the priority R&D items for TD Phase 2 – namely target survivability studies, flux concentrator feasibility studies and design, engineering design for a rotating vacuum seal (target). Status of overall layout of the source, parameters and performance simulations were also a focus. Discussions on 10Hz running scenarios (low E_{cm}) opened up the discussions to alternative undulator technologies (Nb_3Sn) which could provide the required source performance with an electron beam energy of as low as 100 GeV. Action items for short, medium and long-term were agreed upon and are available here.

CFS requirements workshop, Daresbury 12-13 July

The first of two focus workshops on CFS requirements was held at Daresbury on 12-13 July. The intent was to review the CFS requirements for electrical power and cooling for the positron source, damping rings and BDS. In addition, a focus topic was the CFS requirements for the SiD and ILD detectors (detector hall). A second meeting at SLAC (2-3 August) will conclude the survey of the detector requirements, as well as the HLRF (main linacs), electron source, and RTML. It is expected to iterate these requirements at similar workshops in the future as the accelerator design progresses.

Preparations for BAW I (September, KEK)

Preparations continue for the first Baseline Assessment Workshop to he held at KEK on the 7-10 September. A complete tentative agenda can now be found at:

http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4593

The BAW will focus on gradient issues for the baseline and single-tunnel for the Main Linac – specifically the proposed single tunnel HLRF solutions (KCS, DRFS). Registration is open and a second announcement has been sent to the general GDE mailing list. The exact scope of the presentations will be developed in the remaining time period at two WebEx meetings

- SCRF ML TAG leaders meeting on Wednesday 25 August
- 3rd General AD&I meeting on Friday 27 August.

The key deliverable from the BAW process will be a written recommendation to the Director/EC advocating proposed baseline modifications, as part of the TLCC process. A key part of the BAW planning is an understanding of the critical issues and associated R&D:

DRFS design and R&D

The current plan is to test 2-cavity DRFS with 2 klystrons as part of S1-Global, w/o Bouncer circuit. The nominal baseline RF source will be used till the end of November when new DRFS units will be installed and tested. There are follow up plans; Quantum beam project in 2012, and STF-2 in 2013.

Tunnel layout for DRFS has been studied and a 5.7-m diameter layout with cryomodules installed on the floor has been proposed. Akira is interested in the 5.7-m layout which makes it easier for other regions to adopt this scheme – it is clearly a benefit if the cryomodule can be mounted on the floor.

KCS design and R&D

Beyond the high-power tests of the key KCS components, large scale test of the KCS is only possible in stages and remains an issue. A full-scale test is not possible. Yamamoto and Ross visited SLAC in August to discuss this and other KCS related issues with Nantista and Adolphsen in preparation for September's BAW.

Requirements from LLRF on operational margin

Importance of the Pk-Ql control and operational gradient margin issues. Heavy beam loading is required for an exact determination of operational overhead and margin. R&D programmes at FLASH (within the TDR timescale) and STF and NML (>2012) will be critical in demonstrating the required margins.

Cavity gradient R&D and improvement strategy

R&D plans across the regions on high-gradient cavities is key to delivering the required performance. Since the goals for the gradient (yield) remain at TD Phase 2 deliverable, it will be necessary to understand the remaining risk associated with those goals, based on the status and plans for this programme.

Cavity gradient data base and statistics/ Accelerator gradient

Homework for global database group: to study Q0 at the 31.5 MV/m operating gradient and to evaluate annual progress. Current cavity gradient specification (margins) are -5% reduction in cryomodule w/o beam and another -5% in beam operation. These numbers be discussed at the BAW-1 meeting.

1.0 SCRF

TAGL meeting:
http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4725

The general activities in SCRF technical area in June is summarized in the minutes of SCRF monthly meeting as follows:

1.1 Cavity

Cavity Gradient

Progress on cavity tests were made in all regions. See

http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4706

for details. Work on cavities from new vendors or fabricators: Toshiba, Hitachi, IHEP-Beijing and

Niowave-Roark, is in process at KEK and JLab. Initial results (first vertical test) were presented. Of special note – the first Hitachi cavity HIT-01 achieved over 35 MV/m with Q_0 around 6e9. Field emission onset at 25 MV/m. This cavity has no end groups.

Cavity Integration (Hitoshi Hayano)

S1-Global status has progressed on schedule. Low power tests on mechanical tuners, Piezo tuners and HOM couplers, and mechanical vibration measurements have been performed since last month, and results were presented at the last S1-Global webex meeting:

http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4730

1.3	Cryomodule	The two cryomodule 'halves' are currently being warmed to be ready for the summer shutdown of the cryogenics operation. High-power conditioning of couplers is scheduled for August, and re-cool-down of the S1-Global cryomodules will be start in September.
1.4	HLRF	KCS test status at NLCTA, SLAC: The big pipe assembly has had a vacuum leak in the vicinity of the pump-out spool. The spool has been removed for leak checking. The 4th section is received and ready to be connected. The Coaxial Tap - Off QC measurements looked good although many gouges were later noticed around the inner wall. The CTO's are being mounted for cold testing. The aluminum vacuum window adaptors have been tested and repeatedly break down at ~300 kW under vacuum, but not with nitrogen. For future R&D on KCS: In 2011, design and testing of a bend for the large circular waveguide, and high power transmission and resonant tests of CTO's will be performed by adding 70 m more WC1890 waveguide to assembly. In 2012, tests at full travelling wave power are scheduled by acquiring additional waveguide to construct a 160 m resonant ring.

2.0	CFS/Global Systems	Meeting indico page: http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4739
2.1	CFS	Daresbury/SLAC requirements workshop progress Summary: **e+ Source**: Base criteria were reviewed and some adjustments were made. Base Criteria is the Same as RDR Except for a 5% Increase due to geometry changes. The Issue of 5 Hz to 10 Hz operation will Increase the electrical power and heat loads. Issues on the Number of Dumps Needs to be Revisited. e+ source will not be the driver for temperature stability in the BDS enclosures. **Damping Ring**: Existing criteria is correct however there are new requirements for a water-cooled buss system. Criteria will be developed for the new power distribution requirements and it's effect on the tunnel cross section configuration. CFS needs to study alternative ambient tunnel temperatures (94F and 77F). Basis of CFS tunnel design should be large enough to accommodate one electron ring and two positron rings. **RTML:** Some discrepancies were noted in the criteria tables and will be corrected**.** 6 of the original 42 RDR cryomodules will remain in the RTML if a single stage compressor is adopted. The Remaining 36 cryomodules will be sdded to the Main Linac**.** Again the Issue of the number

		of dumps was noted as needing review. **Main Linac:** Surface building configuration studies for the KCS were presented. Marx modulator configuration was shown to reduce the equipment footprint required – CFS will adjust surface building studies to reflect Marx configuration. C. Nantista will update criteria for KCS based Main Linac. DRFS tunnel diameter is now 5.7 m. Americas Region will review tunnel cross sections and provide uniform dimensioning for all tunnel components and clearances required and provide to all regions for consistent tunnel cross section development. **BDS:** Spreadsheets for power supplies, magnet numbers and magnet power need to be updated**.** A. Seryi will update "environmental requirements in BDS". CFS will investigate the most sensitive areas of the BDS and determine if segmenting with respect to ambient temperature is the right approach**.** N. Collomb will Develop a spreadsheet with BDS Magnet information. **MDI/Detectors:** Overview of Items Included in the RDR detector estimates. Criteria spreadsheet for the SiD for CFS criteria provided. Frank and productive discussions helped to Identify fundamental issues that need to be addressed: - Shielding around the beampipe during commissioning - Regional geological constraints and characterization - Dimensional differences between the two detectors - Platform requirements for the ILD Detector - No platform required for SiD - Unique requirements for a mountain site - M. Oriunno needs geologic information to complete vibration modeling for Detectors – CFS Will help to compile. - CFS will develop a design for a flat, post-tensioned floor.
2.2	Low Level RF	Report on status, plans and preparations for FLASH 9mA studies. FLASH is currently being re-commissioned after 6 month shutdown for a major upgrade. Successful lasing with 13 mJ energy at 13nm wavelength have been achieved. However, problems with the RF gun may have serious impact on the long bunch-train programme. Gun is currently limited to ~100 micro-seconds pulse due to discharge activity somewhere in the waveguide. Although not clear, suspicion is the RF window. Plans to deal with this situation will evolve over the next weeks and possible scenarios are under discussion. In the meantime, plans for a further 9mA run in January continue. A solution for 6mA beam current to give flat gradient operation has been found that requires only adjustment to the loaded-Qs of the cavities in ACC6 and ACC7. A solution for the full 9mA has been found, with detuning the two lowest gradient cavities. (Simulation) work continues on understanding best way to commission these configurations in practice. Due to the gun crisis and the almost certain lack of long bunch train operation for FEL users in September, the workshop planned for October has been postponed until next February. A smaller focus mini-workshop is expected sometime late this year to plan for the January studies.

3.0	Accelerator Systems	Meeting minutes:
3.1	Sources	
3.2	Damping Ring	Electron cloud WG had a webex meeting on June 17. Work is in progress on the comparison between 6ns and 3ns bunch spacing in the 3km DR. Evaluation is under way for implications of the 10Hz operation: Modifications needed in the RF system and in the wiggler section, both for the 6.4km and 3.2km rings, have been evaluated. A main issue is the alternate 10Hz cycles in the DR RF operation. CFS meeting was held on July 12, and it confirmed the present CFS table for the electrical and heat power. An issue of the tunnel temperature (104deg F) was discussed. Traditional ultra low emittance rings operate at much lower temperature. This issue requires further study, and will be discussed in the next CFS meeting.

		Guiducci and Palmer will prepare a table for the SB2009 power load scaling from the present one and assuming high-power operation at 5Hz and high-power operation at 10Hz (due end of August).
3.3	RTML	Further studies to consolidate the RTML emittance performance are under way and were reported at the recent Beam Dynamics meeting (see Beam Dynamics below). Walker noted that the current plans for bunch compressor phase stability test in TTF/FLASH are unlikely to happen in calendar year 2011. The new release of the R&D Plan will tentatively put 2012 for this milestone.
3.4	BDS	ATF2 project meeting was held at KEK in the week of June 30 http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4600 The present status of ATF/ATF2 and the short-term activity plans in the rest of 2010 and 2011 were discussed for realization of the 37nm beam size. The proposal for the SC quad to test, replacing QF1, was discussed. It was decided to defer development of a SC quadrupole for ATF2 for now. This discussion may be resumed on the timescale of 6 months to a year. (Note: updated after meeting.) Also, a longer-term activity plans were discussed for 2012 and beyond. The summary slide from the Technical Board meeting, which immediately followed the ATF2 project meeting, is available as - http://ilcagenda.linearcollider.org/getFile.py/access?contribId=55&sessionId=9&resId=0&materialId=slides&confId=4600.
3.5	Beam Dynamics	WebEx meeting was held on July 9 where A. Latina presented updated simulations on the RTML "front end", i.e. the area upstream of the bunch compressor. The emittance growth is not too bad, but is currently over 'budget' and approximately a factor of 2 higher than previous studies. Further study is required, and improvements are expected. Simulations for 10Hz alternative pulse scheme will be made with more realistic conditions (reduced gradient in the linac). Next beam dynamics / simulation meeting is scheduled in August.

4.0 Test Facilities

4.1	ATF	In June, the Fermilab team led by Manfred Wendt installed new electronics for the ATF ring. The synchronous digitizer electronics, developed from scratch by the Fermilab team, will allow precision beam tuning of the damping ring. A few beam tests were done, but full commissioning awaits the end of the shutdown in October.
4.2	ATF2	ATF is in downtime for the summer. See note 3.4 above.
4.3	CesrTA	During the first 3 weeks of July, CESRTA effort focused on preparations for Run 6b which took place from July 20-August 4. Several machine modifications were completed in support of the R&D program during the transition period from Cornell High Energy Synchrotron Source (CHESS) to CESRTA operations: • Repair/upgrade of the thermal control for the CESR Master Timing system in order to mitigate timing variations that were impacting orbit monitoring stability. The observed symptom was the appearance of 1 microHz variations in BPM position measurements with RMS peak amplitudes at the 20 micron scale after repairs to an existing system at the end of 2009. Variations were reduced to the 2□m scale (more than 2× below specification) after the modifications were complete. • Upgrade of the CESR sextupole power supply current monitoring circuits to provide improved current calibrations. The upgrade is intended to provide better control of sextupole-driven resonances for multi-bunch operations and will benefit both CESRTA and CHESS operations • Implementation of 16 new skew quadrupoles around the ring by activating skew quad windings on CESR sextupoles to provide improved local coupling correction around the ring. The modifications also provide the ability to use local coupling bumps through each wiggler straight for emittance control and tuning.

- A new round of magnet alignment was carried out using the recently completed full measurement of the entire CESR tunnel network.

One major contingency item was also dealt with during the transition. Near the conclusion of the CHESS run, we experienced failures on two 13kV transformers for the CESR RF high voltage power supplies. This resulted in a 1-day loss of running time for repairs at the start of Run 6b which was made up by extending the run by 1 day into our scheduled summer maintenance down.

CESRTA Run 6b focused primarily on low emittance operations and beam dynamics studies. Working vertical emittances of <20pm were achieved and studies were carried out to identify sources of errors in the optics correction so that further reductions in the vertical emittance can be achieved. Bunch-by-bunch beam size measurements were obtained for both positron and electron bunch trains and a major effort was devoted to utilizing bunch-by-bunch spectrum measurements to characterize the onset of EC-induced instabilities and to do preliminary comparisons with predictions from CMAD and other programs. Several EC build-up measurements were also completed during the run. Analysis of the Run 6b data is presently underway. We expect to provide a preliminary report at a CESRTA Collaboration Meeting scheduled for Tuesday, August 17.

CESR is presently in a 1 month maintenance down which will be followed by CESRTA Run 7a which will begin on September 8 and continue through the remainder of the month. This run will continue our focus on EC instability measurements and operations at ultra-low emittance.

In addition to the experimental effort, work was carried out in preparation for the ECLOUD`10 workshop to be held on the Cornell campus (Oct 8-12) and the associated damping rings EC working group meeting (Oct 13). Finally, given assurances from NSF that our request for a 3 year extension will be supported, we have begun detailed planning for a 2011 operating schedule with our CHESS colleagues.
(*submitted by Mark Palmer* – Figure removed – see:
http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4745)

	4.4	FLASH	See note 2.2 above

5.0	Other		
	5.1	AD&I	
	5.2	Cost Management – AD&I	**Accelerator Design and Integration (AD&I) Activities:** Peter participated in the CFS - Area Systems Workshop at Daresbury, July 12-13, 2010 (by webex). He presented "What is Included in the Cost Estimates for the ILC Detectors" which outlined the status of the requirements and specifications for the ILC experiments. This information was provided as spreadsheets in 2007 to a team consisting of Sakue Yamada, Jean-Eude Augustin, and Peter Garbincius which assisted in forming the cost estimate for Volume 4: Detectors for the ILC Reference Design Report, and from information later contained within the Letters of Intent (LoIs). There was also a compilation of specifications and requirements for experiments generated in Fall 2007. At the CFS-AS-Darsbury-July2010 Workshop, Phil Burrows provided a later spreadsheet SiD_Umbilicals.xls. Peter reviewed, asked, and received clarification on a few points from Marty Breidenbach. Since then, Nick Walker (private discussion) asked Karsten Buesser for similar specifications and requirements for LDI. Karsten acknowledged the request and indicated that this information would be forwarded to CFS but did not indicate at what timescale. A similar presentation and discussion will be had with the experiments at the CFS-Area Systems Workshop at SLAC, August 2-3.

Peter participated in the face-to-face ILC-GDE Executive Committee meeting on July 23 and attended ICHEP-2010, July 22-28, both in Paris. He presented "Industrial Production of Cavities (& Cryomodules)" which reviewed learning curves, production experience, and contracting methods for the TESLA and XFEL industrial studies, RHIC, and LHC dipole collared coils and cryostats. His main suggestion was to get industrial experts to evaluate the costs for cavities and cryomodules for both a single vendor for the full quantity and dividing the required quantity equally over six vendors. Akira Yamamoto reminded us that the production timescales for both scenarios must be the same. There seemed to be agreement by the majority of EC members that such direct comparisons of these production alternatives should be done by industrial experts, and not just the ILC scientists and engineers.

Peter also presented "SB2009 Low Power Cost Impacts", based on a highly reduced version of his presentation at the January, 2010 AAP Review at Oxford, specifically to give the Physics and Detector representatives an idea of the scope of the technical performance and cost reductions under consideration. Since this contained confidential cost estimating information, this presentation was not posted on Indico.

Peter prepared a draft section for the Technical Design Phase R&D Plan for producing the TDR chapter on cost estimating which he sent to Nick Walker on July 12, re-formatted and revised by Nick on July 18, accepted with some suggestions for further minor modifications by Peter on July 22, and final version from Nick on July 27.

ICET

Triad's ILC Cost Estimating Tool (ICET) and applications to ILC RDR Estimate:

As mentioning in last month's report, Peter requested some simple Cost Estimating Module (CEM) format changes (relabeling headers to avoid confusion for estimators entering data) from Kevin Long (Triad). These requested changes were listed in:

ICET_format_changes-PHG-3july2010.doc

An up-to-date graphical status sheet of the loading of the RDR Estimate into ICET is at:
http://www-ilcdcb.fnal.gov/RDR-ICET-Status.pdf

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

(*submitted by Peter Garbincius*)