Introduction and Setting the Scene

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Welcome to Durham !

- Thanks to Gudi, Stefan and Linda for organising the workshop !!!

Aim of Meeting

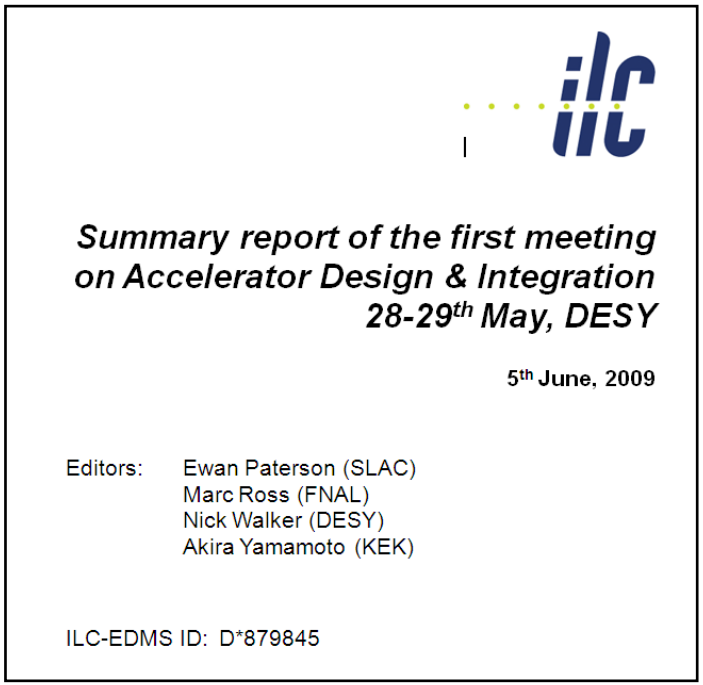
- Discuss the recent R&D for the baseline and the alternatives.
- Discuss the SB2009 proposal (undulator at end of linac) and assess the implications.
- Understand timescales for the new baseline
- Update the risk register using the new scoring system.
- Set actions and priorities for the short, medium, and long term.

Parallel Issues

- A number of issues are proceeding in parallel at present and these need our attention:
  - **The new baseline (SB2009)**
  - **Re-costing**
  - **Revising the Risk Register**
  - **Updating the R&D plan**
  - **Funding allocations (in the US)**
  - **ILC/CLIC cooperation**

The New Baseline

- Following the AD&I meeting at DESY in May 2009 we were asked to look in detail at the undulator at the end of the linac



Summary report of the first meeting on Accelerator Design & Integration 28-29th May, DESY

5th June, 2009

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AD&I Report Extract

Positron Source

The proposed SB2009 remains the undulator-driven RDR source with the following differences:

- The complete system is moved to the end of the main electron linac to facilitate better (cheaper) central region integration.
- A quarter-wave transformer should be assumed for the optical matching device.

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The first point has ramifications on the luminosity for E_{cm}<500 GeV running. A set of scenarios will be simulated and presented at ALCPG. The choice of production margin (captured e+ per initial e-) is a critical parameter. Suggested scenarios are to study values of 2 at E_{cm} = 500 GeV, and 1.5 at E_{cm}=300 GeV (the RDR values).

It is also intended to include an auxiliary 'conventional' source which would be housed in the same central region beam tunnel, and use the same photon target. The source should be capable of producing a positron current of a several % of the nominal. This source is to replace the original RDR 'keep alive' source proposed in the RDR.

Next AD&I Meeting

- We presented our latest findings at ALCPG09, Albuquerque
- There will be a special AD&I meeting to follow this up at DESY 2nd & 3rd December 2009
- A number of actions were placed upon us at the previous meeting

P source	13	Explore parameter options for end-of-linac operation (as a function of energy) for the following scenarios: yield of 2 at 250GeV; yield of 1.5 at 150 GeV; QWT and Flux Concentrator and/or Li lens options.	Clarke	
	14	Produce comprehensive target shielding curves (rate vs concrete shielding thickness) for above schemes	Clarke	
	15	Supply envelope dimensions ("box") for target and capture station	Clarke	
	16	Compile review of existing beam dynamics simulations (emittance preservation)	Clarke	
	17	Compile available documentation on target engineering solution	Clarke	
	18	300 Hz source - prepare exact comparison charts for planned R&D tests	Omori, Urakawa	Planned R&D at ATF
	19	300 Hz source - Identify scope and resources required for integrated design work	Clarke, Omori	Begin planning for a more integrated source design.

Baseline Timescales

- **Dec 2-3: DESY AD&I meeting (2-3.12)**
  - First draft proposal document
  - Review outstanding Action Items and issues
  - Final editing tasks
- **Dec 18: Final Draft Proposal Document to EC/AAP**
- **Jan 6-8: AAP review**
- **Mar 26-30: Beijing LCWS 2010**
  - Final proposal document, including recommendations from AAP and community input
  - Acceptance of new baseline for TDP-2
  - Change Control devised and imposed
- **Jul 20-28: Paris ICHEP 2010**
  - Presentation of new TDP-2 baseline

The Baseline Document

- 2009/10/10: Most “outline” pieces posted
- 2009/10/17: First feedback from PMs and the editor to authors
- 2009/10/24: Most zeroth/first-order contents in place, with many holes, perhaps
- 2009/11/4 or 5: SB2009 Rebaseline Webex; Second feedback from PMS and the editor to authors
- 2009/11/14: Most first/second-order contents in place, with much less holes, hopefully
- 2009/11/21: Third feedback from PMs and the editor to authors.
- 2009/12/2-3: DESY meeting. Freeze technical contents.
- 2009/12/24: Freeze textual contents.

Outline of the Baseline Document

1.	Introduction	PM	2 pages
2.	SB2009 Overview	PM	4 pages
3.	SB2009 Layout	JMP	
4.	SB2009 Proposal (TAG leaders)		
1.	Parameters	PM	2 pages
2.	Gradient Issues	PM (AY)	2 pages
3.	Injectors	JC	2 pages
4.	Damping Rings	SG	2 pages
5.	Bunch Compressors	NS	2 pages
6.	Main Linac		
1.	Single Tunnel (Technical) Solution	VK	2 pages
2.	DRFS	SF	2 pages
3.	KCS	Chris	2 pages
7.	BDS/MDI	AS	2 pages
8.	CFS solutions	VK	4 pages
5.	Cost Increments/differentials (PHG)	2 pages	
6.	Risk	PMs	2 pages

- Appendices

1.	Report from Availability Task Force	TMH
2.	Report(s) on Tunnel Safety Concepts	CF/PMs
3.	Risk analysis … (here, or embed elsewhere)	

~30 pages

Probably end up with 50-60

The AAP Review

- We were reviewed in April 09 (Tsukuba)
- There will be another review in Jan 2010 (Oxford)

The **positron source** group has continued the study of the 4 m undulator prototype. It has been found that the undulator magnet in the prototype is not sufficiently straight and methods have been identified to stiffen the design. It may be possible to place the prototype in the extracted ATF2 beam. – The placement of the ILC undulator at the end of the linac (instead of at the 150 GeV position) is being studied in the context of the Minimum machine approach. While such an approach eases the handling of the electron beam it has implications for low energy running.

The group has made a risk assessment of the components in the positron production mechanism. While no high-risk items have been identified the flux concentrator and the rotating target wheel need further understanding to meet the required operating margins. If the current baseline for neither the flux concentrator nor quarter-wave transformer can be met a liquid lithium concentrator could be used. Such a device requires R&D and corresponding tests are foreseen. If the power load on the Ti-target wheel were excessive a liquid lead target could be used and is developed in collaboration with the Budker institute.

AAP Review continued

The beam dynamics implications of the undulator on the main linac beam are not sufficiently studied. The length of the undulator may have to be adjusted to the required photon flux.

> *The positron flux margins for the current layout are tight. The AAP suggests carrying out the detailed simulation studies to fully understand the requirements and possibly adapt the layout or choice of components.*
>
> *The AAP suggests studying or, if applicable, compiling the existing documentation on, the effect of the 150 m undulator on beam emittance, stability, and possibly implied constraints on, and requirements for, linac tuning.*

The positron group has also explored alternative designs based on an electron driven fixed target source and continues the effort of the Compton based source. These initiatives are welcome since they decouple positron production from the availability of the electron beam. R&D is need in both cases to develop realistic alternatives. However, the electron driven source does not provide polarized positrons and this would seriously diminish the ILC capability in some important areas of physics.

Actions from Daresbury Workshop

- Actions were placed on many groups at the Daresbury Workshop (Oct 2008)
  - **Short Term (ILC 08)**
  - **Medium Term (KEK April 09)**
  - **Longer Term (end 2009)**
  - **General comments/outstanding items**

- The actions as of Oct 2008 follow

Undulator

- Jim R's presentation in Chicago to Akira (straightness & training) – Jim
- "Real" Undulator spectrums required for modelling of source – Duncan (next meeting)
- Write a Report on vertical test results – Nick/Duncan/RAL (next meeting)
- Complete 4m cryomodule & test (fix leak!) – Jim
- Cross-check und parameters selected for minimum machine (probably easier) - RAL
- Alignment requirements justified/jitter studies/impact on polarisation – Duncan
- Generate beam test plan – Jim
- Horizontal magnet measurements required at some stage
- Electron beam tests required at some stage
- Modules need to be engineered for large scale production and operation
- Intermodule connections need engineering
- Store cryomodule safely so can be powered at a later date

Source Modelling

- Write-up undulator emittance effect – Wei (next meeting)
- Write list of current simulation codes and objectives + input files – Ian
- How thick does concrete/other material need to be - Andriy
- Move undulator to 250GeV, reoptimise source parameters (und, target, OMD) - Wei
- Running at 50GeV for calibration (what is energy spread etc) – Wei
- Look at PTRAN losses in ANL simulations - Wei
- Ongoing yield/polarisation evaluation with source design evolution (Wei)
- Operating scenario (hours in tunnel when off) – Nick/Marc suggest 200 hours per year, 10mSv allowed dose per year

Compton

- Continue DR stacking studies and work with DR group to ensure optimum solution - Frank
- cavity stability tests (LAL/KEK) - Omori
- Laser demonstration – Fabian Zomer, Vitaly
- ATF demo – Omori
- 2010/11 demo with new cavity of high gamma flux at ATF

Polarisation

- Write brief report justifying need for 5Hz positron spin flipping at some point and ability to reverse – Sabine (next meeting)
- Confirm investigation showing we can destroy polarisation in DR completely – Larissa
- Select spin rotator design (5GeV/400MeV?) – check concern of Alexander - Sabine
- Close contact with IP group polarimeter (Tony)
- Ensure spin survives to DR
- Close contact with simulations group – spin track to IP
- Electron spin also within undulator – Des

Collimation

- High power photon collimator needs to be studied
  - **Study activation – Lei (next meeting)**
- Positron collimation – design documented, needs updating as source evolves
- Variable aperture collimator needed for polarisation upgrade?

Target

- Report on hybrid target scheme for ILC - Omori
- Complete Eddy current tests at Daresbury – Ian/Leo
- Store target properly – Ian/Jim
- Generate simulations to compare with experimental results – Jeff / RAL/Leo
- Pressure shock wave analysis – Stephan (next meeting) and numerical modelling later
- Energy compression before DR to be studied – Nick?/Wan Ming
- RIA Ferrofluidic seal study information – Jeff
- Lifetime studies of target (LLNL)
- Alternative liquid metal & window (BINP/KEK tests) – Junji
- Joint target for auxiliary & und source (3 X0 and 0.4 X0)
- Engineered solution, including prototype tests – water, vacuum, …

OMD

- Li Lens
  - **Evaluate level of radiation damage in window & implications for lifetime**
  - **Stress-strain in window with liquid flow**
  - **Thermal cycling fatigue**
  - **Cavitation wear on windows**
  - **Proton beam tests?**
  - **Contact experienced Li lens experts to discuss this idea (Jerry Dugan?) – Marc to provide names**
  - **KEKB BN window tests (liquid lead target)**
  - **Discuss with M Harrison (solid/liquid?)**
  - **Concern with liquid li containment in steel (Pavel)**
  - **Discuss with Harrison and create work package for 2009 – Jim/Nick/Marc/Jeff/Alexander/Wei**
- Flux Concentrator
  - **Need feasible design - Jeff**

Remote Handling

- Preliminary use of detailed target model in Fluka – Luis/Lei/Andriy (next meeting)
- Collimator in RH (next mtg)
- Shielding thickness around target etc – Andriy (next mtg) - duplicated
- Auxiliary source (needs RH as well) – KEKB?/Kuriki
- RH scenarios refined
  - **Changeover times (requirement ties in with lifetime of kit in RH)**
  - **Replacement of pillow seals?**
- Pillow seals need R&D
- Need engineered design compatible with source layout (remove inconsistencies!)
- If yield increases then RH not needed (limited only?)

Integration

- Understand timing issues for ILC, work with DR group to look at options – Jim/Andy W
- Minimum machine integration with BDS etc - Norbert

EDMS work package

- Define structure - Jim
- Report back on EDMS status – ongoing action Ian/Lars

Auxiliary Source

- Define new specification for Auxiliary positron source – Jim
- Establish link with KEKB high intensity conventional source project – Jim/Kamitani

The Agenda …