Polarization Working Group

News from

- POWER group: Polarization report
- HeLiCal Group
  - consolidating the baseline source
  - Depolarization project
- Webpages on 'ILC sources issues'
- Plans: 3 days 'sources' meeting at RAL from tomorrow on
- Summary and outlook

POWER Group

- POWER report: 'physics case for polarized e^+ at the ILC':

  about 150 pages (physics, polarimetry, machines) hep-ph/0507011

  - submitted to Physics Reports in 2005

- Status:

  - just received the referee report now in 2006

- Some changes needed:

  - but nothing substantial

  - makes only some work, but will be soon published in Phys. Reports

- So: physics case for polarized e^+ has been established!

  - exists also a 11 pages executive summary

  - also a 3 pages 'quintessence' .....

HeLiCal Group: news

- **Main activities**
  - design of helical prototypes for the ILC beam
  - Undulator-based source for unpolarized beams and the pol. e+ upgrade (photon collimation and longer undulator needed)
  - target design for the undulator-based source (together with Livermore)
  - study of depolarization effects from source up to IP
  - new member: Tony Hartin joined the spin tracking club ... Welcome Tony!
- **Please have a look on Duncans and Leo's talk yesterday**
  - covered practically all activities
- **Also under discussion: true cost estimates for the undulator-based source**
  - consolidation after Vancouver: cost increase to about 16% (but with 'old' DR position and auxiliary source)
  - compared: undulator-based source (pol. e+) vs. conventional source (2 targets ?) without pol e+ upgrade ....
  - now: DR moved close to IP .... probably now cheaper than conventional source

CAIN results

- **Goal of the project**
  - provide providing spin tracking from the source to the IP
  - calculation of possible depolarization effects
- **Depolarization at the IP: beam-beam interaction**
  - two major components: spin precession (BMT) and spin flip (Sokolov-Ternov)
  - Use: analytically-based program CAIN
- **Steps**
  - applying CAIN for the different ILC parameter sets: done, see EPAC contribution
  - working out all theoretical uncertainties: done .....
    - incoherent pairs need spin effects
    - bremsstrahlung does not work in EPA
    - T-BMT equation has to be derived for strong fields
  - now under work: solving last conceptual problems and implementing of results

News from the 1st and 2nd run of E166

- runs finished .... now everything dismanteled..... ;-(
- but results were very successful: pol. photons as well as polarized e+ have been proved
  - so, prototype experiment for producing polarized e+ via undulator radiation has been established
- all results within the theoretical expectations, so, no principle problems occur with that scheme
- final publication under work
  - next E166 meeting at Desy, Hamburg.... November 2nd, 3rd
- Further Spin-off of this experiment:
  - inclusion of spin-effects in GEANT 4 (by Andreas Schaelicke, Zeuthen)

Further news: sources webpage

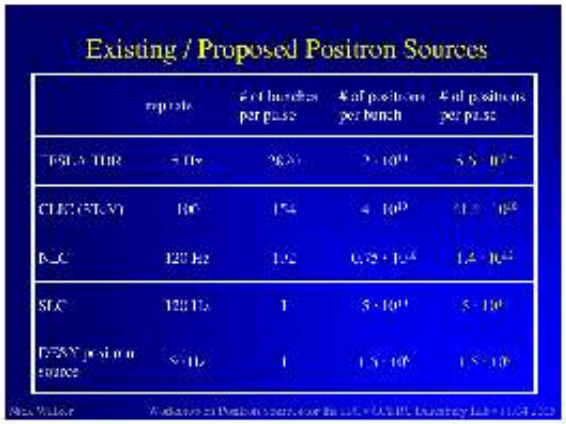
- **Goal: provide 'data base' for 'sources' and 'non-sources' experts**
  - all ILC sources covered
  - all agreed facts and numbers should be listed there to have ONE common set
  - all new results should be listed there as soon as possible
  - rule out long-standing prejudices etc. ...
  - indirect comparison between the sources
- **Pages should cover from source to IP**
  - all possible technologies
  - target issues
  - related topics, e.g. damping rings, reliability etc.
  - prototypes and current R&D status
  - also depolarization issues (not yet done)
- **Please look at:** ***http://www.ippp.dur.ac.uk/~gudrid/source***

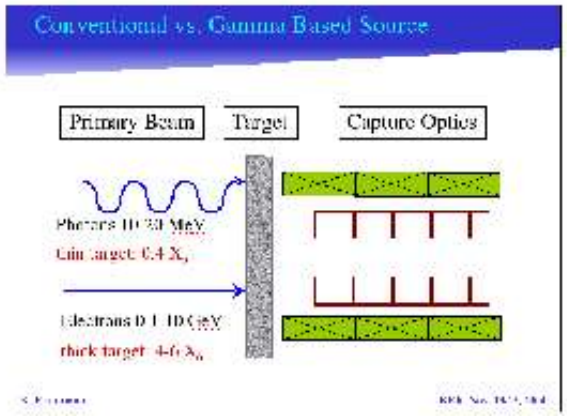
Introduction

Demands on a LC positron source and ILC designs:

An overview about the ILC parameters and the demands on the positron source is given in this talk: The ILC requires a large amount of positrons, about three orders of magnitude higher per pulse than at the positron source of SLC (see picture).

Positrons have to be produced from photons of some MeV energy via pair production in a target: either the photons are produced via bremsstrahlung from electrons in electromagnetic cascade processes in a rather thick target or via radiation processes of an electron beam and the direct conversion in a rather thin target.





Three kinds of positron sources for the ILC are under discussion:
a) conventional source (unpolarized positrons only)
b) gamma-based source via undulator radiation
c) gamma-based source via laser backscattering

More technical details, BCD design, current R&D status (in particular of prototypes) and still critical issues like target, availability, stacking are linked.

Current status

- **Still under work:**
  - basics of undulator, laser-Compton and conventional scheme
  - spin tracking
- **Comments so far from:**
  - Andy W., Andreas Sch., Alexander, Chris, Duncan, Ian, Omori, Karim, Klaus, Sebastian etc
  - further comments are expected
- **Plans**
  - permanent update as soon as new (reliable) results are on the market
  - not only 'source issues alone'.....target, DR, BDS everything is related.....
  - please, let me know

1st ILC positron meeting at RAL

- Starting tomorrow until Friday
- Then every four month around the three regions
- Webpage:

  http://www.te.rl.ac.uk/ILC_Positron_Source_Meeting/ILCMeeting.html

- Charge:

> **Goal:** The goal of the Oxford ILC Positron Systems Meeting is to facilitate the development of the collaboration to design and carry out R&D in support of the ILC Positron System. It is important to organize the international activities so that the essential work for the TDR is accomplished on a priority basis and to reduce unnecessary duplication and activities not relevant to the ILC e+ system requirements.

→ **Please come, you are very welcome!**

	Wednesday September 27	Thursday September 28	Friday September 29
09:00 10:45	*Discussion 1* *(John Sheppard)* 09:00 Welcome and information (10 min) - *Yury Ivanyushenkov* 09:10 Introduction (20 min) - *John Sheppard* 09:30 ILC Update (30 min) - *John Sheppard* 10:00 Undulator-Based Design Update (20 min) - *John Sheppard / Jim Clarke* 10:20 Laser-Compton Scheme Design Update (20 min) - *Masao Kuriki*	*Discussion 5: Undulators* *(Jim Clarke)* 09:00 Introduction (5 min) - *Jim Clarke* 09:05 Status & Plans of UK Undulator Prototyping R&D (15 min) - *Yury Ivanyushenkov* 09:20 Trajectories and End Field Issues (15 min) - *Duncan Scott* 09:35 Status & Plans of Cornell Undulator Prototyping R&D (15 min) - *Alexander Mikhailichenko* 09:50 Plans at Argonne for Undulator related R&D (15 min) - *Efim Gluskin* 10:05 Title to be announced (15 min) - *Eckhard Elsen* 10:20 Discussion	*Discussion 9* *(John Sheppard)* Z2: Summary
	Break	Break	Break
11:00 12:45	*Discussion 2: Target Station & Target Damage* *(Ian Bailey)* 11:00 Introduction (10 min) - *Ian Bailey* 11:10 Technical issues for baseline design (15 min) - *?* 11:25 Target damage simulations (15 min) - *Andriy Ushakov* 11:40 Discussion (40 min) - *All* 12:20 Alternative target design status (5 min) - *Ian Bailey (TBC)* 12:25 New results for crystallized W target from KEK (10 min) - *Masao Kuriki* 12:35 Discussion (10 min) - *All*	*Discussion 6* *(Masao Kuriki)* F2: Laser-Compton Scheme Optical Chamber F3: Laser-Compton Scheme Lasers	*Discussion 10* *(John Sheppard)* Z2: Summary
	Lunch	Lunch	Lunch
14:00 15:45	*Discussion 3* *(Masao Kuriki)* F4: Laser-Compton Scheme Rings, Stacking	*Discussion 7: Target Hall Design & Activation, Remote Handling* *(Vinod Bharadwaj)* 14:00 Introduction (15 min) - *Vinod* 14:15 Target Hall Activation (15 min) - *Remann / Ushakov* 14:30 Remote handling intro (15 min) - *Tim Broome* 14:45 Target Hall layout draft (30 min) - *Chris Densham (Brian Smith)* 15:15 Discussion / how to proceed (30 min) - *Everybody*	Tours 14:00 Tour to Undulator R&D Facility (45 min) - *Yury Ivanyushenkov* 15:00 ISIS Tour (60 min) - *Tim Broome*
	Break	Break	
16:00 17:45	*Discussion 4: AMD* *(Jeff Gronberg)* 16:00 Introduction - *Gronberg* 16:15 Current Activities in AMD design - *Bharadwaj* 16:30 Issues for the Rotating Target - *Mikhailichenko* 16:45 Discussion and Planning - *All*	*Discussion 8* *(Gudi Moortgat)* H: Accelerator Physics	
19:00		Dinner at Cosener's House	

Summary and Outlook

- Finish the CAIN project
- Get the undulator prototypes
- Final E166 publication
- Working out last open question for the undulator-based source within the 'ILC sources group'
- Still on my list: helicity-flipping project
  - combination of suitably combined undulator sections to flip the helicity
- And never-ending story: physics case for pol. e+
  - session in Valencia: polarization report, target, radiation, news from RAL meeting etc.
  - please, let me know, in case you would like to present something there
- Please, do not forget: Your proof reading and input is needed for the 'new webpages'! *(http://www.ippp.dur.ac.uk/~gudrid/source/)*