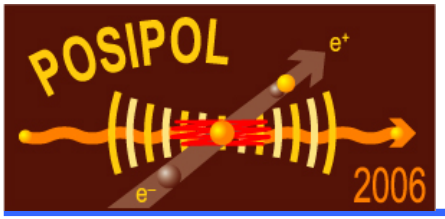
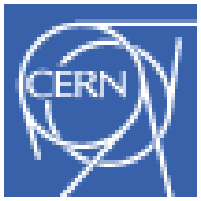
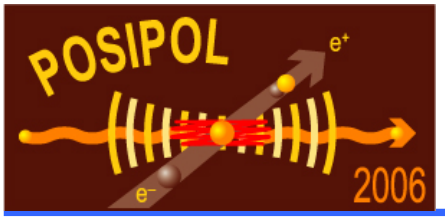




Review of the aims and recommendations from the workshop

L. Rinolfi

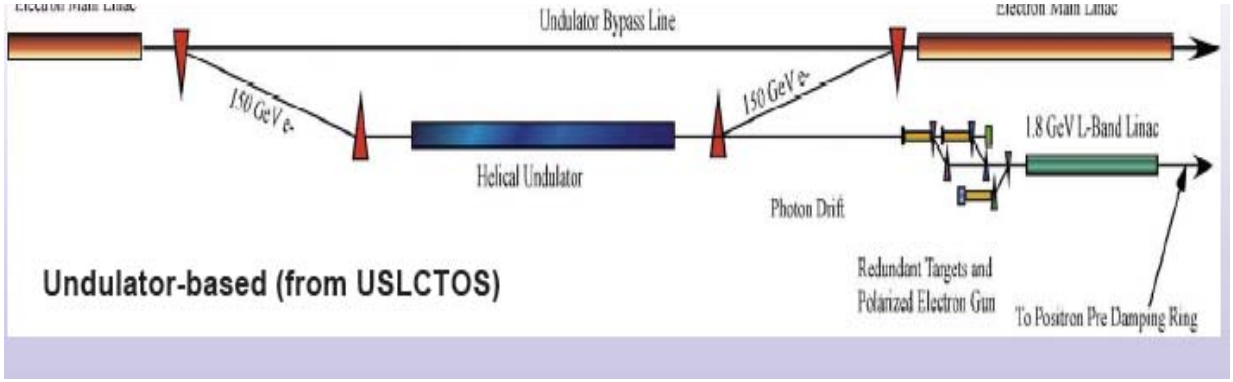


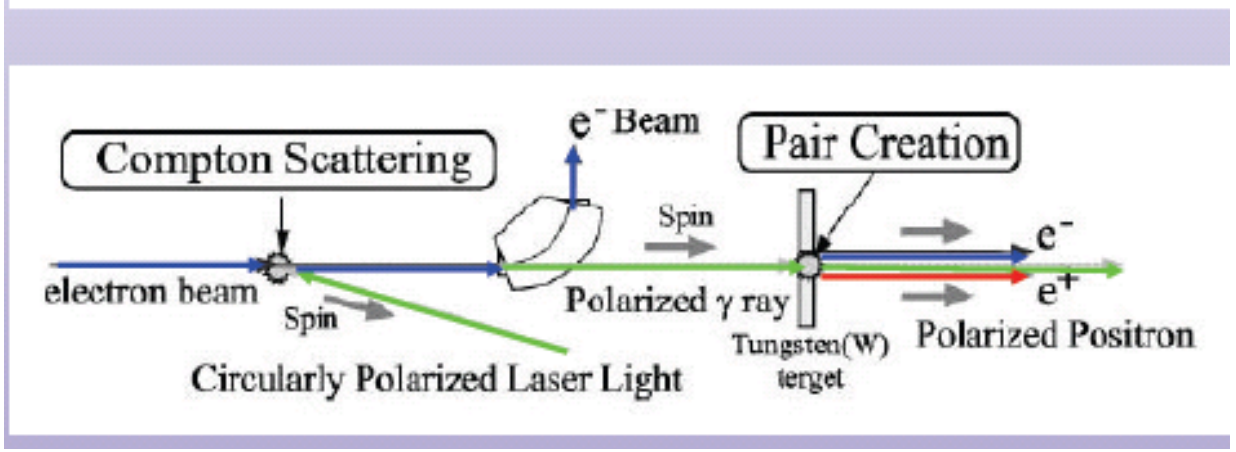
Aims of the POSIPOL workshop

- discuss options and open issues of polarized positron source, based on laser Compton back scattering, for CLIC and ILC.
- assess and coordinate the outstanding R & D efforts towards a complete Compton source design.
- compare the issues with the undulator source.
- analyze the experimental programs carried out in the different laboratories.
- elaborate the baseline recommendation for CLIC.

Three options

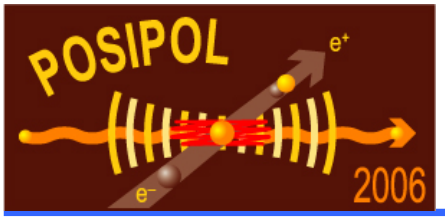
Electron Main Linac





Ring or Linac ?

Stacking or No-stacking ?



Ring or Linac? Stacking or No-stacking?

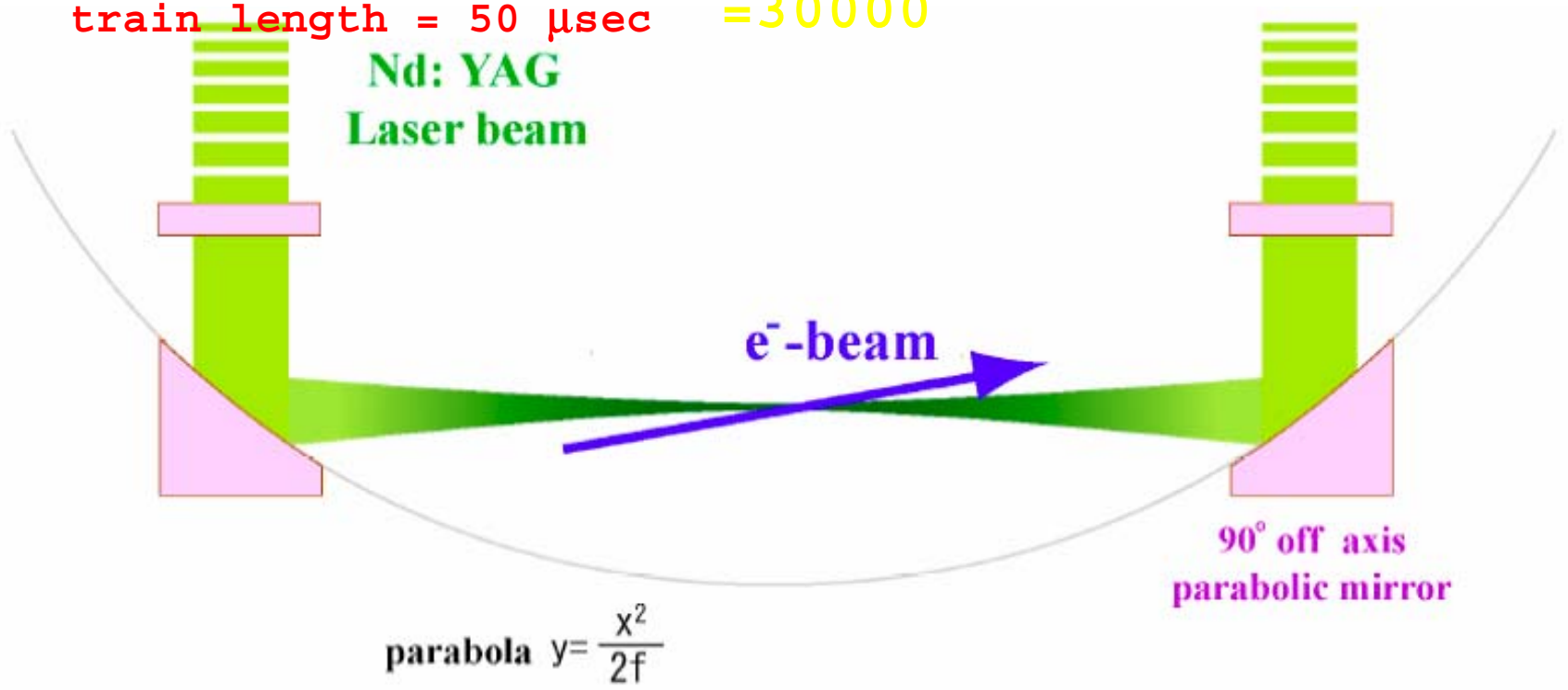
- RMS energy spread in 6 GeV Compton ring ~2% for CO_2 laser interaction with 4MW in synchrotron radiation. Difficult ring and very difficult laser (high repetition rate, average power, cavity stacking).
- Head on Compton back scattering will be realized in the Linac design (electron beam will pass through small halls in the mirrors.)
- Aperture requirements for the ring design dictate less efficient small angle Compton back scattering scheme.
- For scheme without accumulation the main issue is high current ~4A in macro pulse (requires short accelerator sections, more klystrons and longer linac or a ring to change bunch spacing from ~12ns to 3ns).
- The average beam power is increased with higher repetition rate required for the scheme with accumulation. It is 3MW for 150Hz. SC and NC linac structures can be used. Very difficult laser
- Simpler damping ring and laser system at 5Hz for the scheme without accumulation might offset linac complexity.

Aims of the POSIPOL workshop

- discuss options and open issues of polarized positron source, based on laser Compton back scattering, for CLIC and ILC.
- assess and coordinate the outstanding R & D efforts towards a complete Compton source design.
- compare the issues with the undulator source.
- analyze the experimental programs carried out in the different laboratories.
- elaborate the baseline recommendation for CLIC.

Input laser (YAGlaser)
Energy 0.75 mJ/bunch
3.077 nsec laser pulse spacing
train length = 50 μsec

Cavity Enhancement Factor
=30000



10 IP will be reduced to 1 IP. ???

Friday 28th April 2006

Laser pulse in cavity
22500 mJ/pulse
single pulse in a cavity

Summary
- Alternative -
► Alternative ILC e+ source has also a constraint on DR, but it is not a system wide and less limitation.
► DR must have a divisor (~10) on the harmonic number and super-periods on the fill pattern.
► Only "Step" solution is possible, but there is no fundamental difficulties on this solution.
► Total availability of cavity is studied. Independent cavity system is proffered; by assuming some spares, availability is not an issue at all.

- 4 mirrors 2D or 3D high finesse cavity foreseen at LAL (start autumn 2006)
  - Beam waist reduction & mechanical stability
  - Polarisation transport can be controlled & astigmatism effects reduced with 3D configuration
    - ➔ Measurements needed
  - Non-paraxial corrections may limit the waist reduction
    - ➔ measurement and calculations needed
- Future R&D: use a high power fibre laser to increase the laser power inside the cavity
  - Thermal effects & non-linear effects need to be estimated

Aims of the POSIPOL workshop

- discuss options and open issues of polarized positron source, based on laser Compton back scattering, for CLIC and ILC.
- assess and coordinate the outstanding R & D efforts towards a complete Compton source design.
- compare the issues with the undulator source.
- analyze the experimental programs carried out in the different laboratories.
- elaborate the baseline recommendation for CLIC.

ILC e+ BCD/RDR Summary

All (?) pieces identified

High Level Parts List Complete

Ongoing R&D:

- Undulator parameters
- Target
- AMDs
- NC RF
- (Remote handling, not started)

Goals

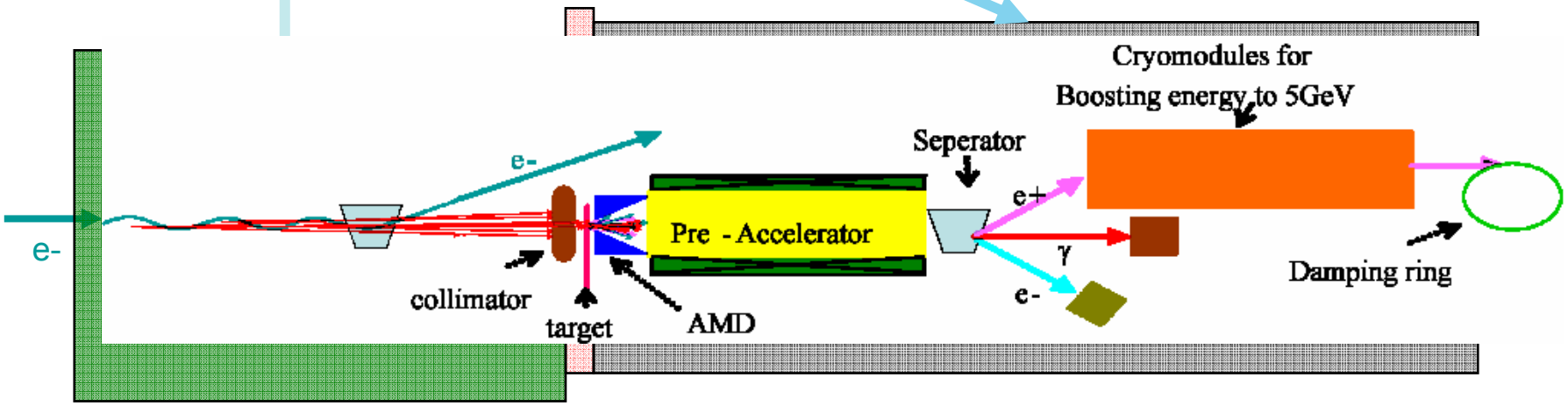
- RDR and Cost Estimate, end of calendar 2006
- TDR w/ key technology demos, end of calendar 2009

Start-to-end Model of the Positron Source
W. Gai

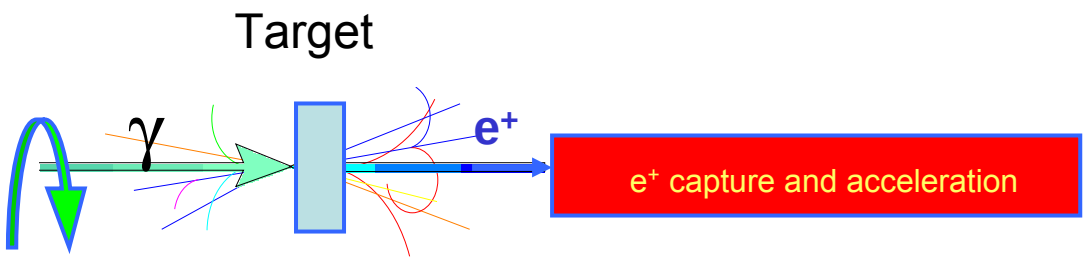
Electron Gamma
Shower code: EGSnrc

Analytical + Monte carlo

Particle dynamic code:
PARMELA



Common challenges for all schemes



Common

Target issues

Capture systems (Magnets and RF)

Remote handling

Reliability

Pre-Damping Ring acceptance

Cost estimate

…

Recommendations

Compton

1) Publish a design of a Compton ring with chicane
2) Develop reliable power laser and increasing cavity finesse taking account polarization
3) Simulate stacking into DR
4) Experimental demonstration of fast stacking (KEK-ATF or DAFNE).
5) Use CTF3 to test head-on scheme
6) Crab angle crossing scheme
7) Try to relax parameters in the Compton ring increasing the duty cycle
8) Optimization on the energy of Compton photon
9) Experimental optimization of Compton source inside laser cavity at BNL-ATF
10) Comparison of single pass scheme and ring scheme
11) Experimental demonstration using optical cavity and storage ring.
12) Compare CO2, YAG and Fibers
13) Possible use of laser cavity for gamma-gamma collisions

Undulator

1) Publish results from E-166
2) Evaluate and publish the emittance degradation in the undulator (CLIC emittance constraints, dynamic vacuum issues, wake fileds, ion effects, spurious linac dispersion)
3) Evaluate the coupling of operation specially for CLIC
4) Do technical demonstration of undulator (several meters)
5) Finalize the complete layout
6) Do systematic studies of the collimators
7) Describe the transition between the keep-alive source and the Main linac

Common Recommendations

for Compton and Undulator

1) Analyze systematic errors of polarization measurements
2) Compare yield and polarization for both cases
3) Remote handling in radioactive area
4) Compare heat load dynamics for the 3 schemes
5) Capture and transmission
6) Optimize pre and post selection of e+
7) Evaluate cost estimate

Aims of the POSIPOL workshop

- discuss options and open issues of polarized positron source, based on laser Compton back scattering, for CLIC and ILC.
- assess and coordinate the outstanding R & D efforts towards a complete Compton source design.
- compare the issues with the undulator source.
- analyze the experimental programs carried out in the different laboratories.
- Recommendation for CLIC ?