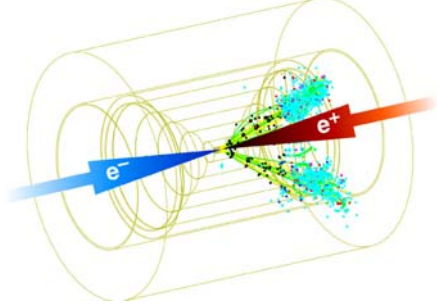
World-Wide Studies of ILC Physics and Detectors



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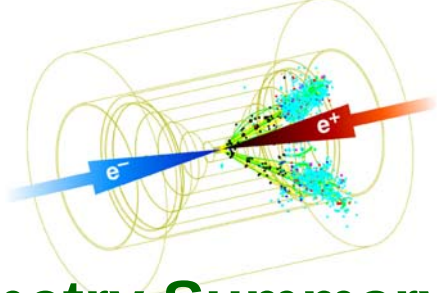
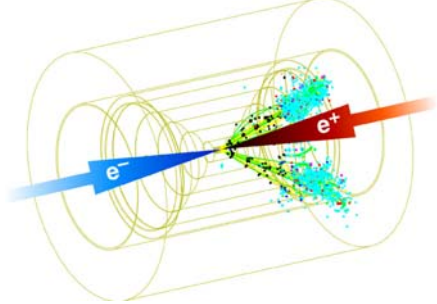
ILC Polarimetry

Mike Woods, *SLAC*

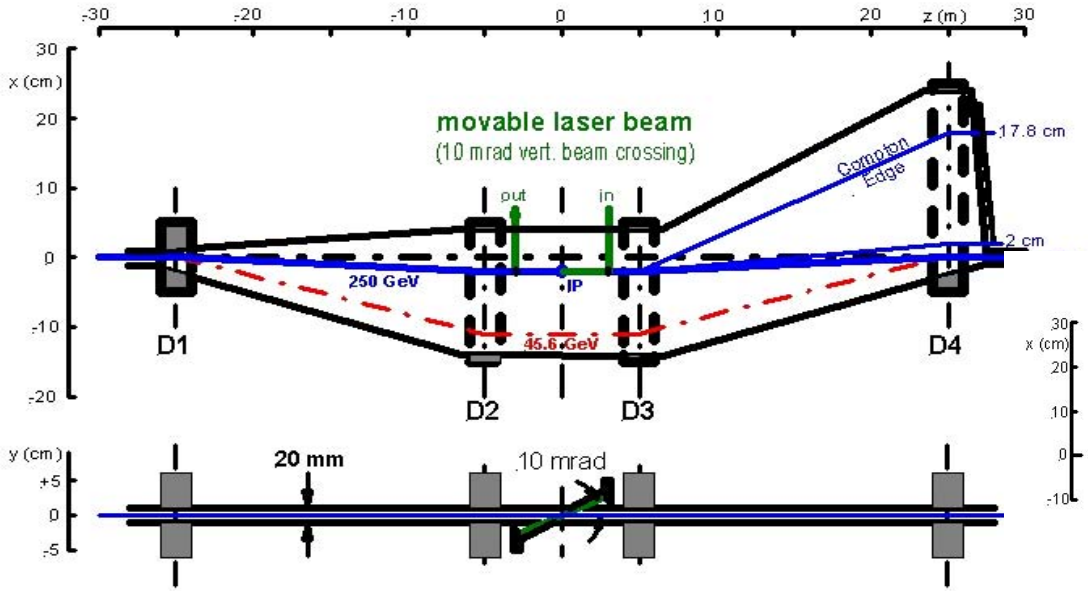


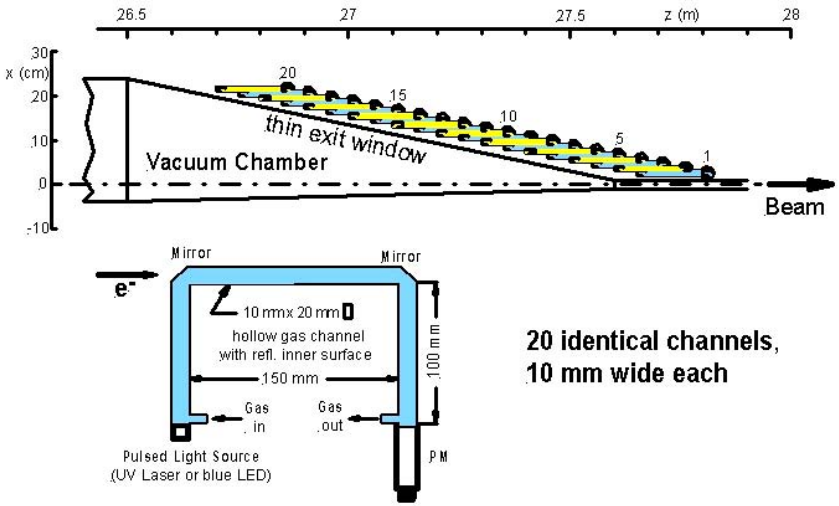
Polarimetry Summary from MDI workshop SLAC, January 2005

- Three ways to measure polarization: upstream, downstream, data
- Issues to Understand:
  - Difference of incoming, outgoing and luminosity weighted polarization.
  - Correlations between electron and positron polarization.
  - Polarimeter corrections for data methods.
- More concrete questions:
  - Is downstream polarimetry with 2 mrad crossing angle possible?
  - If no, is upstream polarimetry enough?
  - Can we believe CAIN for depolarization?
  - Do we understand the polarization transport well enough?
  - Backgrounds.
  - Light sources for different polarimeters (backgrounds, correlations)
  - Switching between IRs, how, how often?
  - Real Designs
  - Common issues with beam energy/luminosity spectrum: correlations between beams, momentum-polarization correlations.



Upstream Polarimeter design by N. Meyners and P. Schuler, presented at LCWS05





Gas Cerenkov Hodoscope Detector

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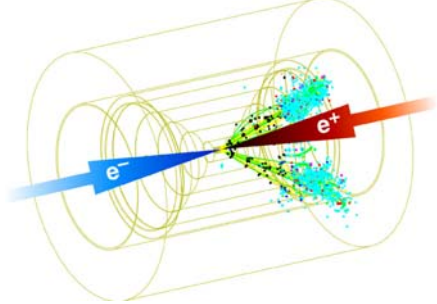

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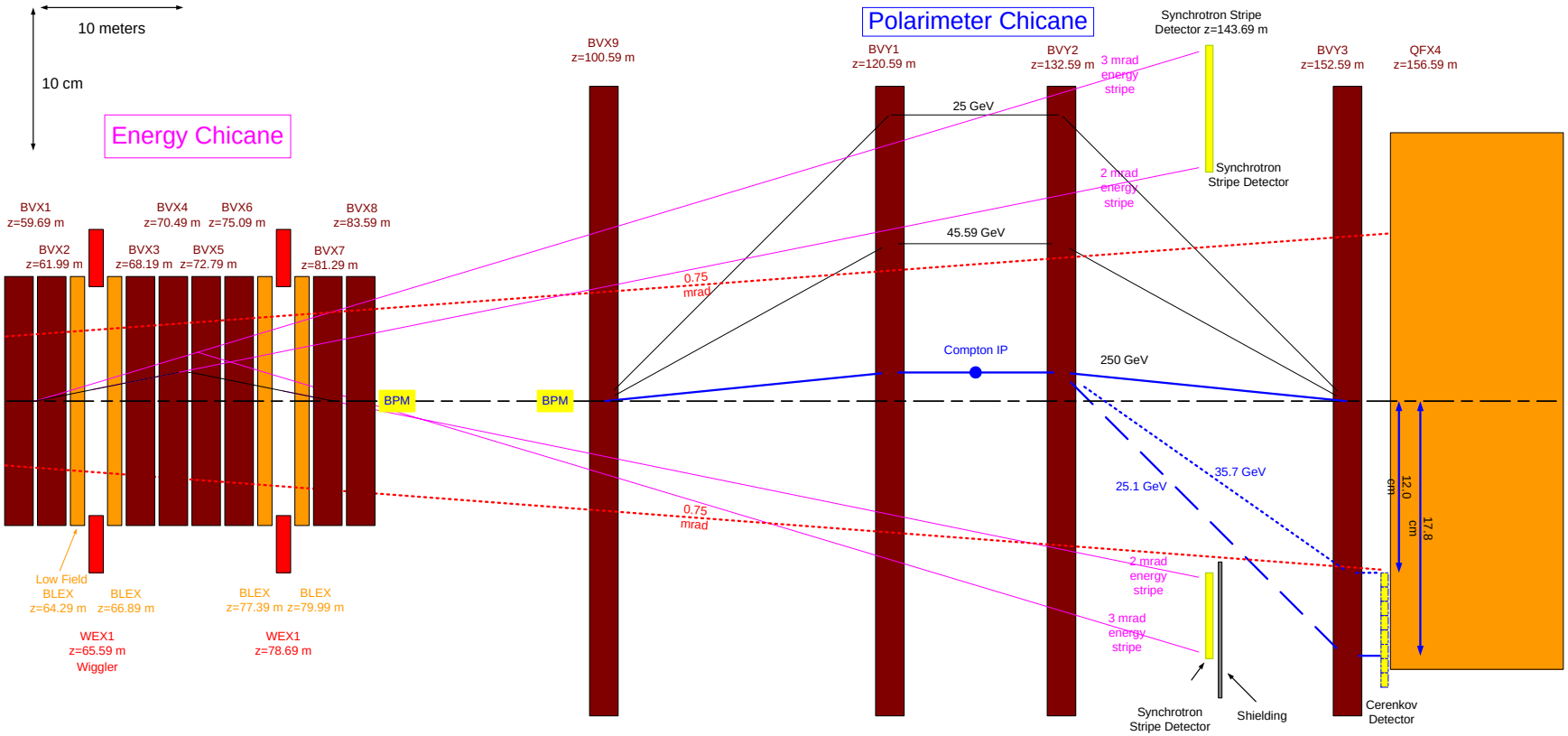

K Moffeit 4 Apr 05

Polarimeter design for 20-mrad Extraction Line

Eight Cerenkov Cells 1 cm wide
Six cover the region between
36 GeV (12 cm from beam line)
25.1 GeV (17.8 cm)
And 2 outside the kinematic limit

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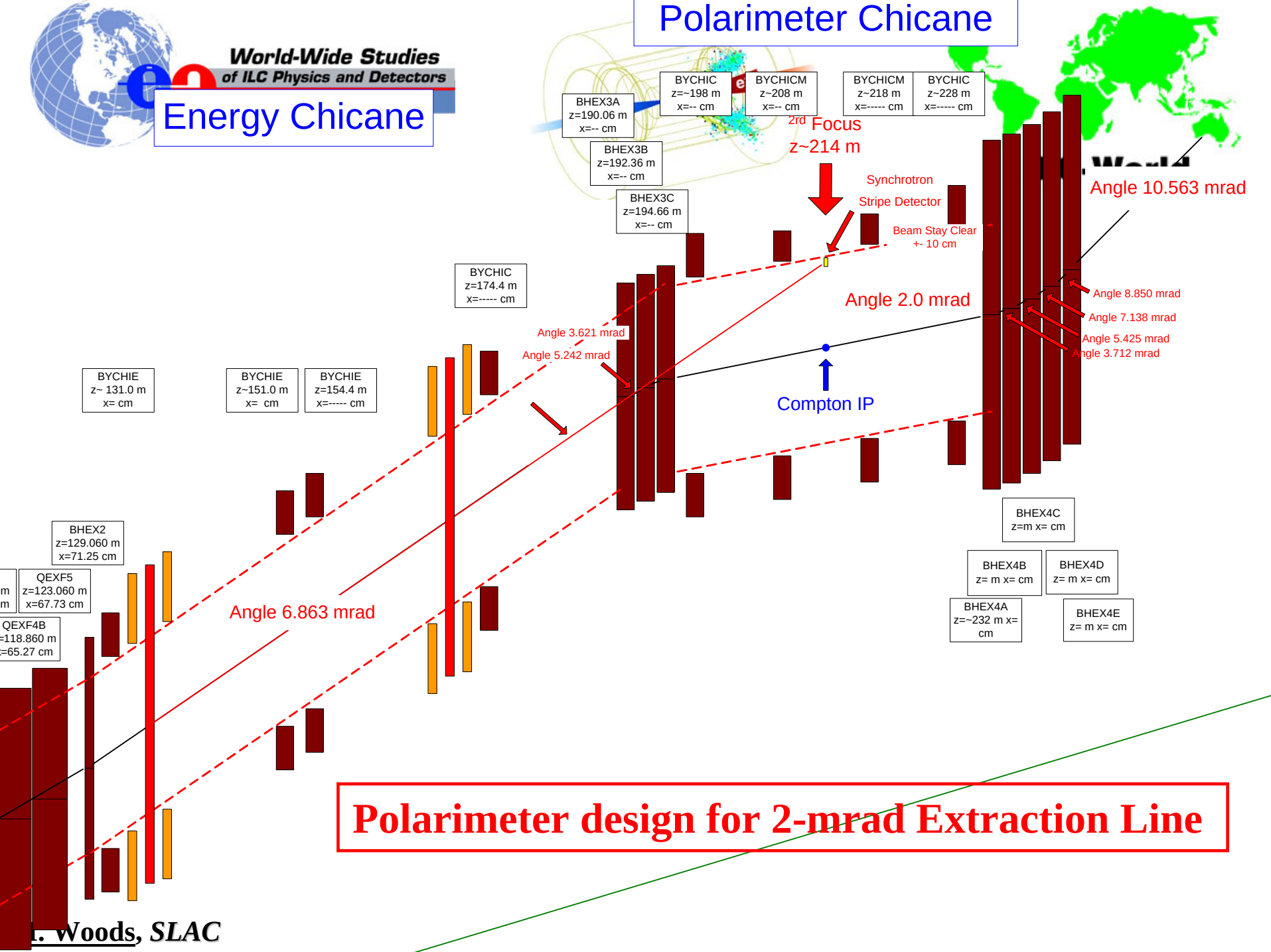
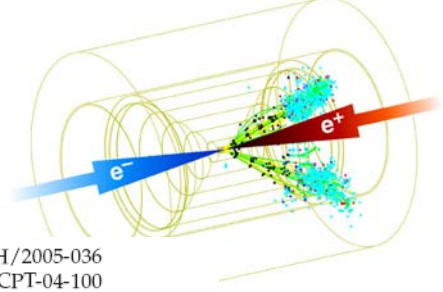
Energy Chicane

Polarimeter Chicane



Polarimeter design for 2-mrad Extraction Line

. Woods, *SLAC*



CERN-PH-TH/2005-036
DCPT-04-100
DESY 05–059
FERMILAB-PUB-05-060-T
IPPP-04-50
KEK Preprint 2005-16
PRL-TH-05/01
SHEP-05-03
SLAC-PUB-11087

The role of polarized positrons and electrons in revealing fundamental interactions at the Linear Collider

Sections 5.5 and 5.6 are on polarimetry (Moenig, Moffeit, Schuler, Woods)

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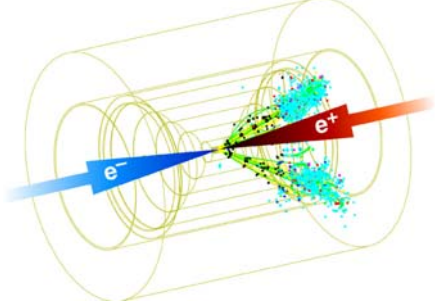
	e^+/e^- beam	Upstream laser beam	Downstream laser beam
Energy	250 GeV	2.3 eV	2.3 eV
Charge or energy/bunch	$2 \cdot 10^{10}$	35 μJ	100 mJ
Bunches/sec	14100	14100	5
Bunch length σ_t	1.3 ps	10 ps	1 ns
Average current(power)	45 μA	0.5 W	0.5 W
$\sigma_x \cdot \sigma_y$ (μm)	$10 \cdot 1$ upstream $30 \cdot 60$ downstream	$50 \cdot 50$	$100 \cdot 100$
		Upstream polarimeter	**Downstream polarimeter**
Beam crossing angle		10 mrad	11.5 mrad
Luminosity		$1.5 \cdot 10^{32} cm^{-2} s^{-1}$	$5 \cdot 10^{30} cm^{-2} s^{-1}$
Event rate at 25-GeV Endpoint		300,000/GeV/sec	10,000/GeV/sec
$\Delta P/P$ stat. error		$< 1\%$ / sec	$< 1\%$ / min
$\Delta P/P$ syst. error		0.25%	0.25%

Table 5.4: Compton polarimeter parameters at 250 GeV.



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More questions / issues:

- detailed evaluation/comparison of polarimeter performance for
  2-mrad and 20-mrad extraction line designs
  - disrupted bunch parameters at Compton IP
  - backgrounds: disrupted beam, synchrotron radiation, beamsstrahlung, rad. Bhabhas
  - collimator design
  - sensitivity to misalignments and collision offsets
  - evaluating different parameter sets
- transverse polarimetry
- $\sqrt{s}$ = 91 GeV to 1 TeV
- document reference polarimetry design by Feb 2006