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Wayne State University
ALCWS, 16 July 2003

IP Beam Instrumentation/IR and Backgrounds Summary

25 Min	IPBI Overview	David Cinabro
20 Min	3D Silicon Detector for Pair Monitor/Beam Profile	Hitoshi Yamamoto
20 Min	Beamstrahlung detector (for CESR and LC)	Mikhail Dubrovin
20 Min	Kink Instability and Bias for Luminosity Weighted Energy Determination	Mike Woods
15 Min	Luminosity Spectrum Studies	David Cinabro
20 Min	Fast Gas Cherenkov Luminosity Detector	Oleksiy Atramentov

Cinabro Overview: IPBI Introduction

Recognition that to do the physics we have to understand the colliding beams. Group dedicated to ensuring that Interaction Point Beam Instrumentation is not an after thought, but foreseen at the design stage.

Web Site:

http://www.slac.stanford.edu/xorg/lcd/ipbi/index.html

Three things that must be known about the beam:

- Polarization (Mike Woods)
- Energy (Eric Torrence)
- Luminosity and Luminosity Spectrum (David Cinabro)

We have a white paper that summarizes the requirements, discusses conceptual designs for measurement devices, and identifies areas where work is needed:

http://www.slac.stanford.edu/xorg/lcd/ipbi/notes/white.pdf

LCD-ALCPG-03-0001

Quick summary of requirements, concepts and areas of concern follows.

Cinabro Overview: IPBI Areas of Concern

- Detailed demonstration of extraction of $d\mathcal{L}/dE$
- Extraction line environment
- Forward tracking for radiative return and $d\mathcal{L}/dE$
- Width of the beam energy spread

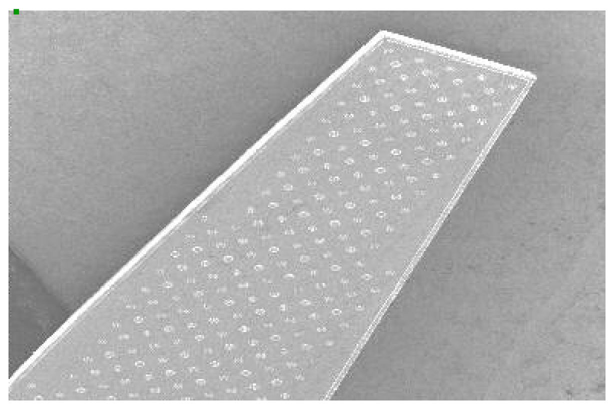
Other Points

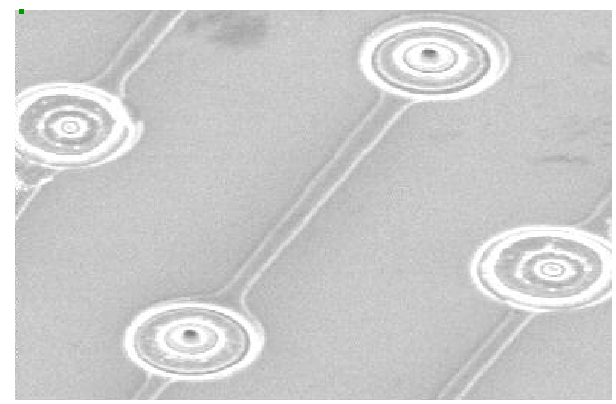
- Warm/Cold Differences, Impact on IPBI (Bunch Structure, Crossing Angle, Beam Jitter, Energy Spread)
- SLAC A-Line, a source of high energy polarized electrons
- $e^{-}e^{-}$ issues

Yamamoto: LC Far Forward Pair Monitor

Detector for pairs sensitive to size and shape of collision region. Talk focused on recent hardware development:

Fabrication of 3D pixel sensor





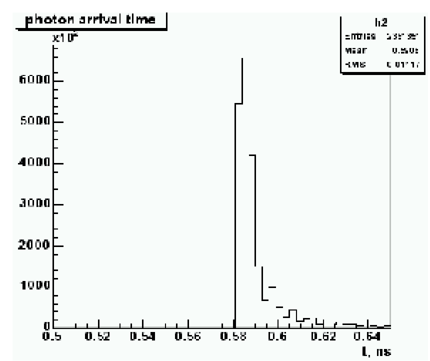
1. Fabricated by S. Parker et. al., at CIS, Stanford).
2. Trapezoidal shape possible for disk or cone. (180μm thick, 200μm readout pitch, 3mm long)
3. Fabrication completed and being tested at LBL and Tohoku.

Dubrovin: Beamstrahlung Detector at CESR/CLEO

Status report on detector for wide angle beamstrahlung photons. Sensitive to complete geometry of the collision region. Results expected later this year.

Atramentov: Fast Gas Cherenkov Calorimeter

GEANT simulation, fast response:

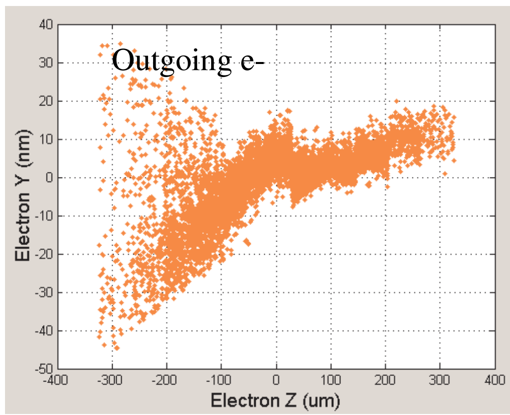


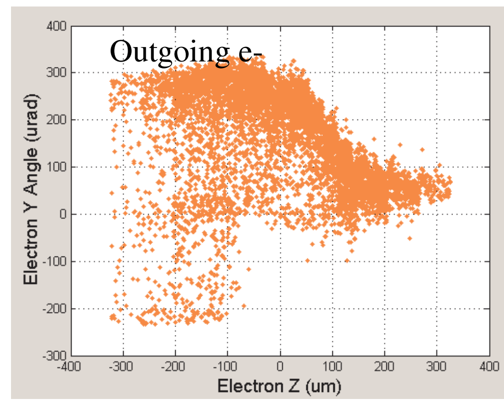
Time spread ~ $11ps$!

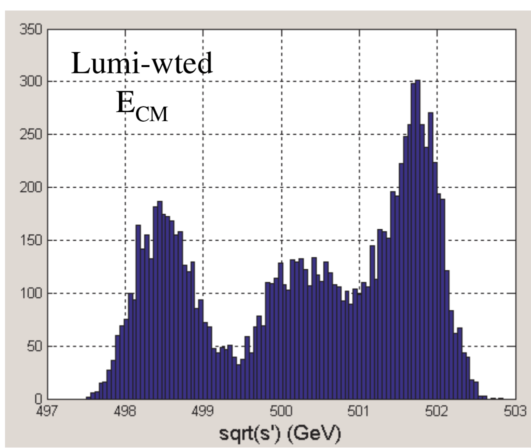
Woods: Kink Instability and Collision Energy

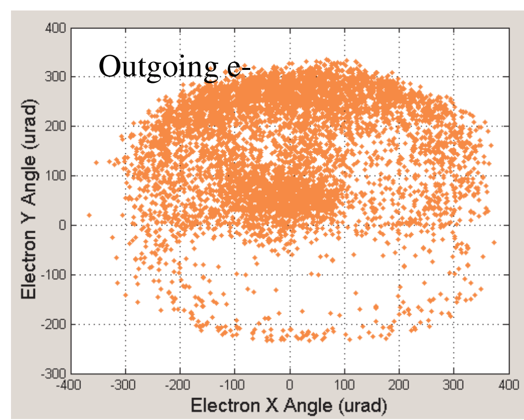
Showed collision induced kink disrupts bunch tail, causing bias (500 PPM) towards high energy ($e^-e^- >$ NLC $>$ TESLA).

e^-e^- (NLC-6)





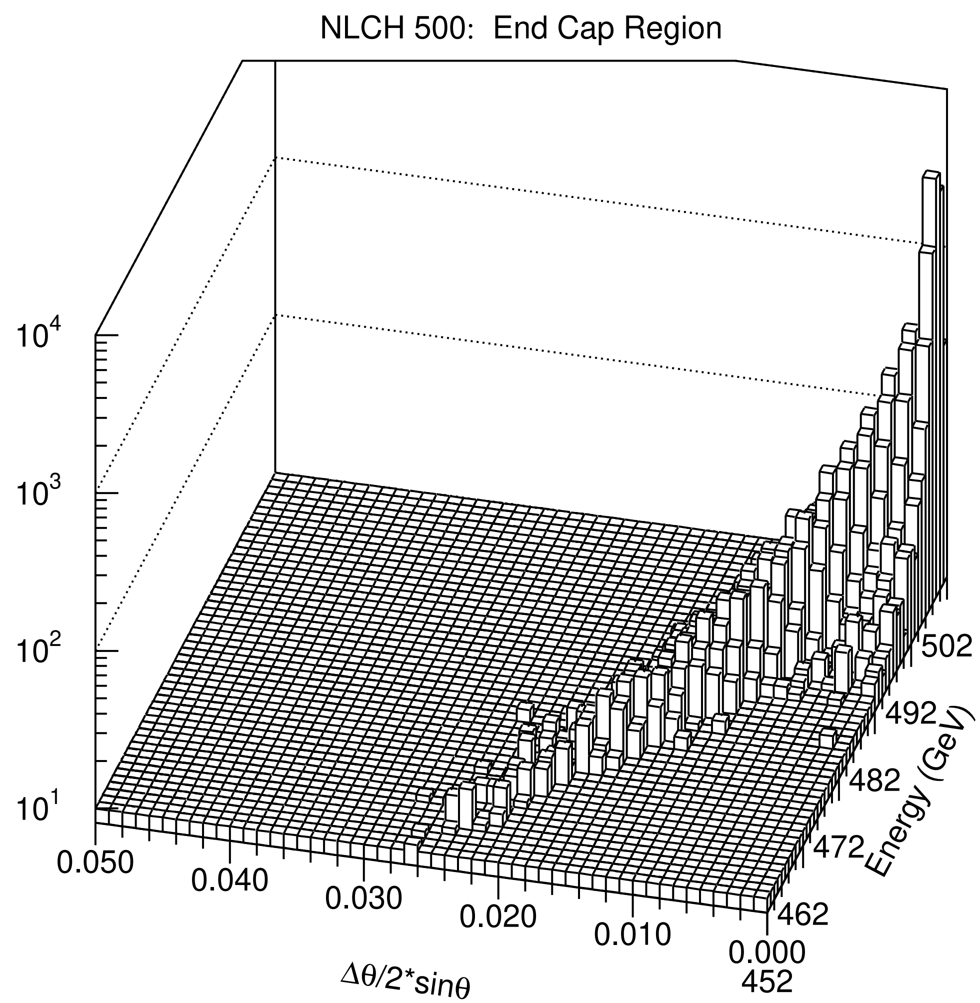




M. Woods (SLAC)

Cinabro: Luminosity Spectrum Studies

Steps towards extracting $d\mathcal{L}/dE$. Dave Strom also spoke on asymmetric collisions and the effect on $d\mathcal{L}/dE$ in New Physics.



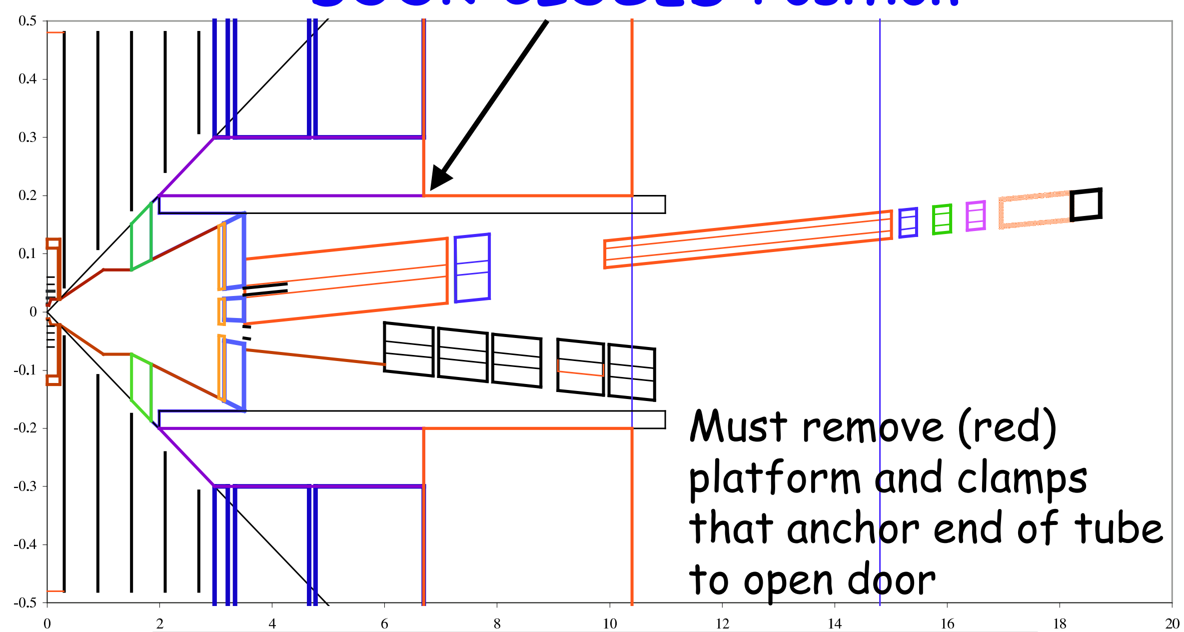
IR and Backgrounds

20 Min	IR Configuration for Large and the Silicon Detector	Tom Markiewicz
20 Min	DIMAD Simulations for the Extraction Line Energy Spectrometer	Stan Hertzbach Caleb Mills
20 Min	FONT (Nano-Second Feedback to Stabilize Collisions)	Phil Burrows
20 Min	Background Updates	Tom Markiewicz
20 Min	Extraction Line Polarimeter Studies	Mike Woods Bill Oliver
20 Min	Discussion	All

Markiewicz: IR Configurations

Start to face real world problems of installation, support, and access.
Rethinking some basic layout and hall parameters:

Current Final Quad Support Scheme: Cantilever 40cm diameter Tube from DOOR CLOSED Position

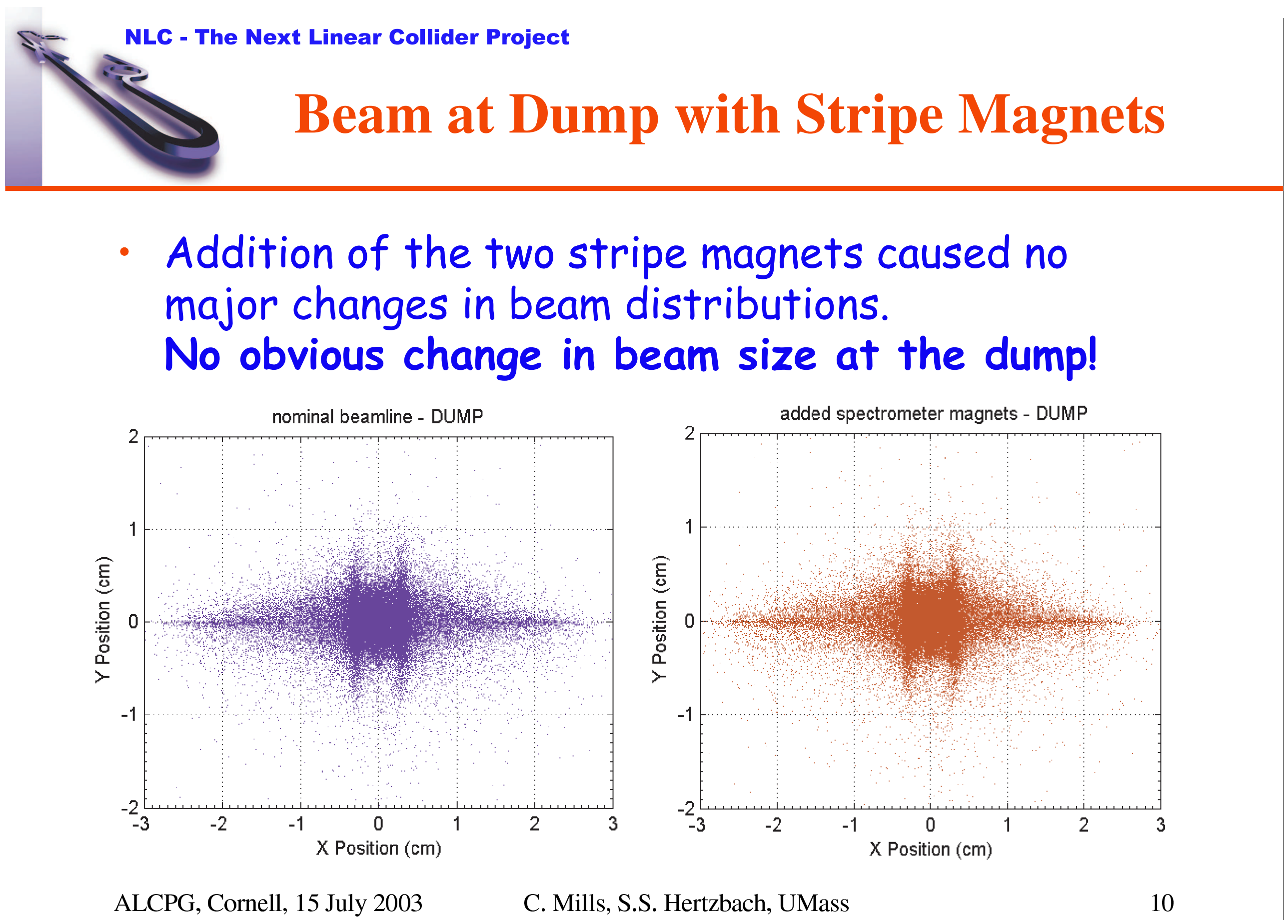


Point 2: Save 3.7m (-10.4-6.7) of extra cantilever but limit access, or is there a better way?

Tom Markiewicz

Hertzbach and Mills: Extraction Line Energy Spectrometer

SLC-style spectrometer magnets have minimal impact on the spent beam, starting to think about aspects of the design that may have to change at LC, and reported on initial hardware work by Eric Torrence on a fiber based SR detector.



Burrows: Nano-Second Feedback Collision Stabilization

Impressive progress in tests at NLCTA in implementing nanosecond scale feedback. Achieved latency of 66 ns (32 ns from path length). Plans to shorten latency in second round of tests at ATF. See FONT web site:

`hepwww.ph.qmul.ac.uk/∼white/FONT/default.htm`

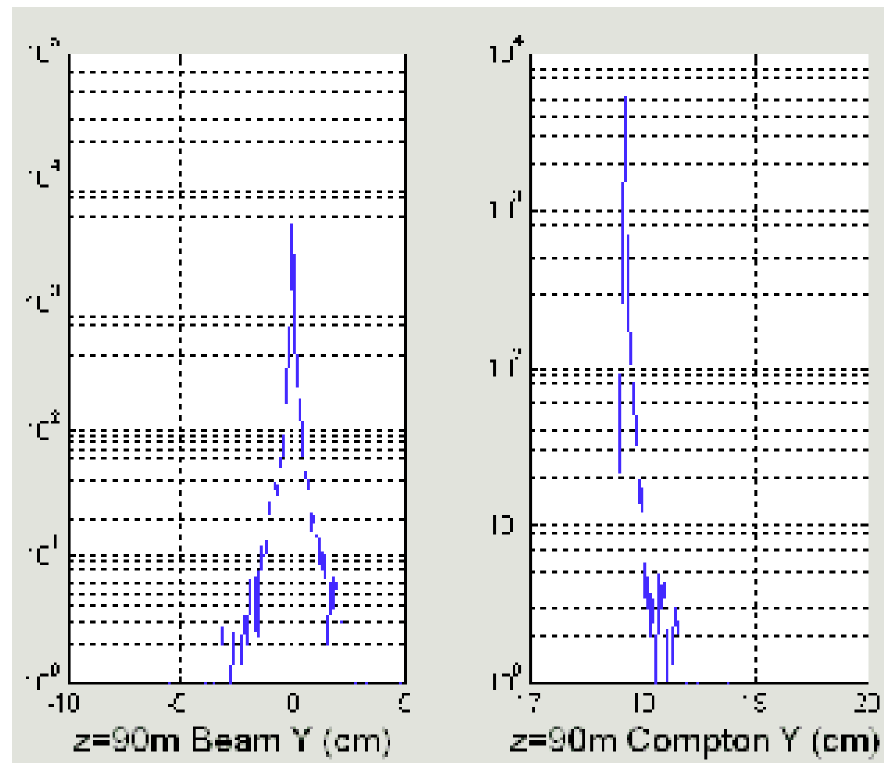
Markiewicz: Background Update

Lots of work on where the energy from pairs is deposited, start up situation assuming background 1000 times nominal, and muon background in the new short beam delivery system. See Beam Delivery home page:

`www-sldnt.slac.stanford.edu/nlc/beamdeliveryhome.htm`

Woods and Oliver: Extraction Line Polarimeter

Studies of Compton polarimeter in extraction line chicane. Looks good (spin diffusion under control, good separation between Compton-edge electrons and disrupted beam) and starting to look at backgrounds in the detector.



Colliding beams; includes disruption

Conclusion

- Lots of activity in both groups; IPBI has four DOE funded projects.
- Starting to grapple with the real world (beam-beam disruption, support, installation, access, background details).
- Still much to do. Volunteers always welcome. Get in touch with David Cinabro, Stan Hertzbach, Tom Markiewicz, Eric Torrence and/or Mike Woods.