



IP Beam Instrumentation Summary

ALCPG Linear Collider Workshop

January 10th, 2004

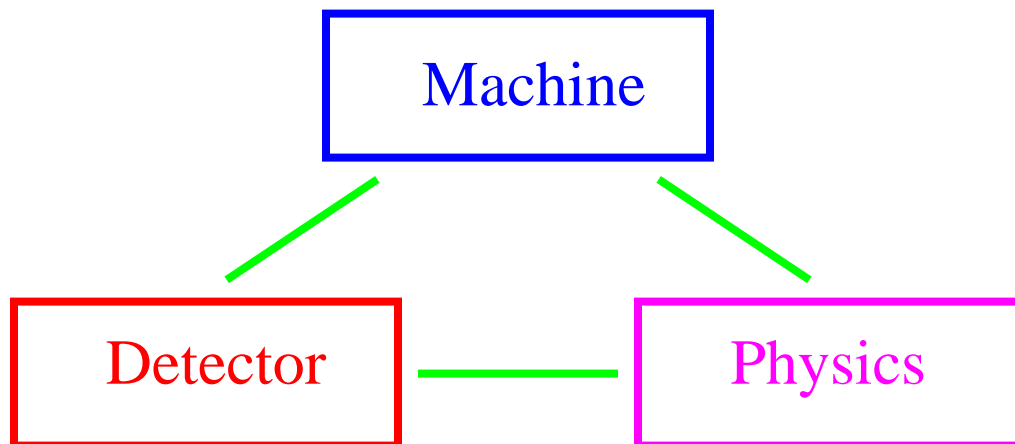
SLAC

Eric Torrence
University of Oregon

- Current Status
- Technology Issues
- Testbeams



Ensure adequate beam instrumentation to meet physics needs of LC



Prime topics

- Luminosity
- Beam Energy
- Polarization

We try to take a broad view...

International effort

Problems transcend **regional**
and **thermal** differences



Move from conceptual to more concrete designs

Polarimetry

- Pretty good shape

Luminosity (Spectrum)

- Sketch of hardware is there,
need to flesh out details
- Understanding Lumi spectrum not in hand

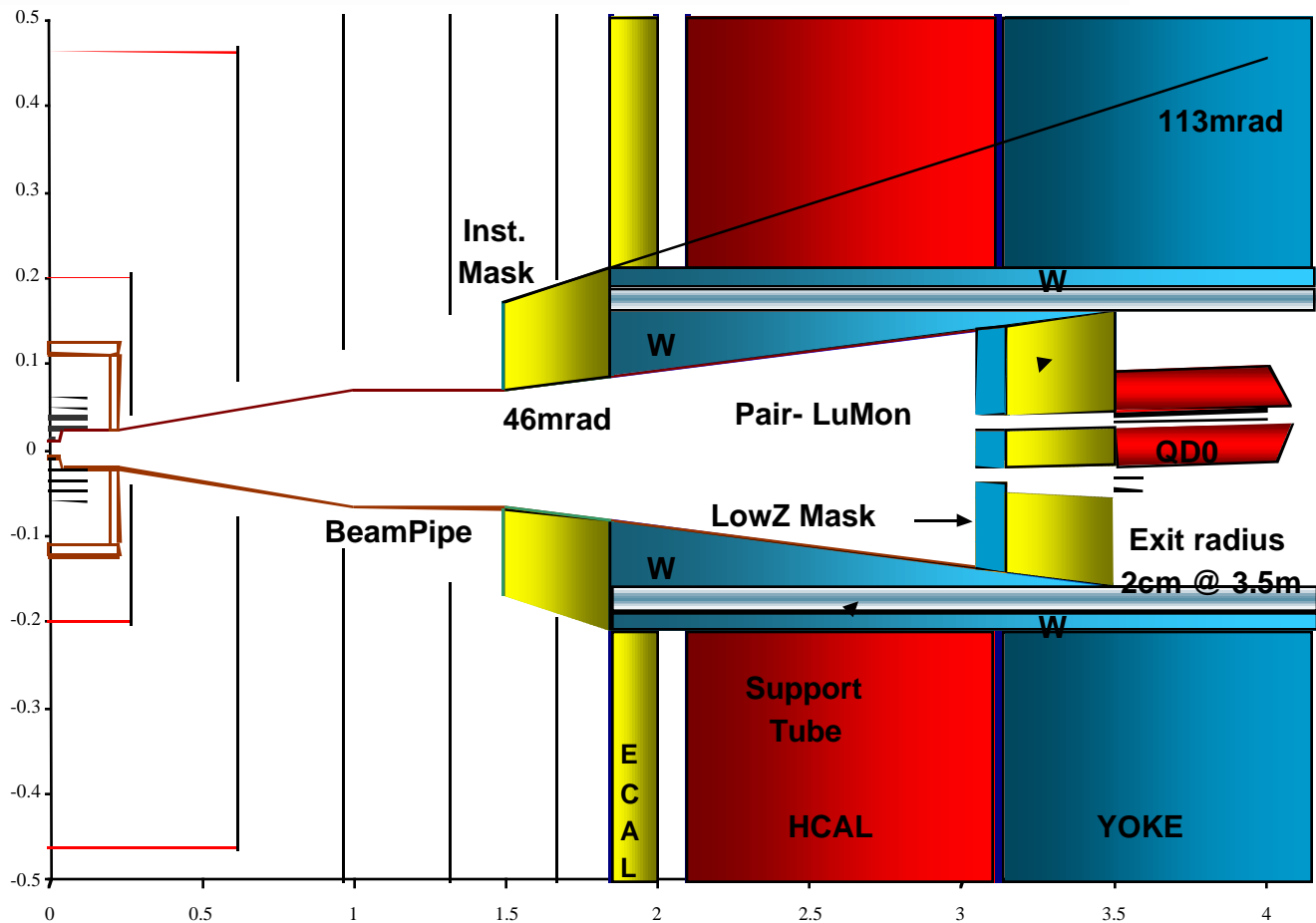
Need to engage physics groups!

Beam Energy

- Need 'real-estate' planning
- Understand role of beam-based vs. physics



Forward Detectors



Specify geometry detail for both Gas Cherenkov
and 3D Silicon detectors in this region

Must be fast (1 ns) to avoid pair pileup
in far-forward region (warm)

T. Maruyama



Warm vs. Cold?



Crossing Angle



- Big push in Europe to study this for Paris
- Many issues: IP layout, backgrounds, physics acceptance, extraction-line design, risk
- being well covered by Beam Delivery & NLC
- Also BI issue of downstream instrumentation

Nice talk from G. Wilson on physics and hermeticity in the forward detectors

Biggest question: is this really an issue at all?

Meeting at Zeuthen January 19th
Please attend (at least virtually) if you have input



1.4ns sounds hard
337ns sounds easier

Need a much more quantitative statement

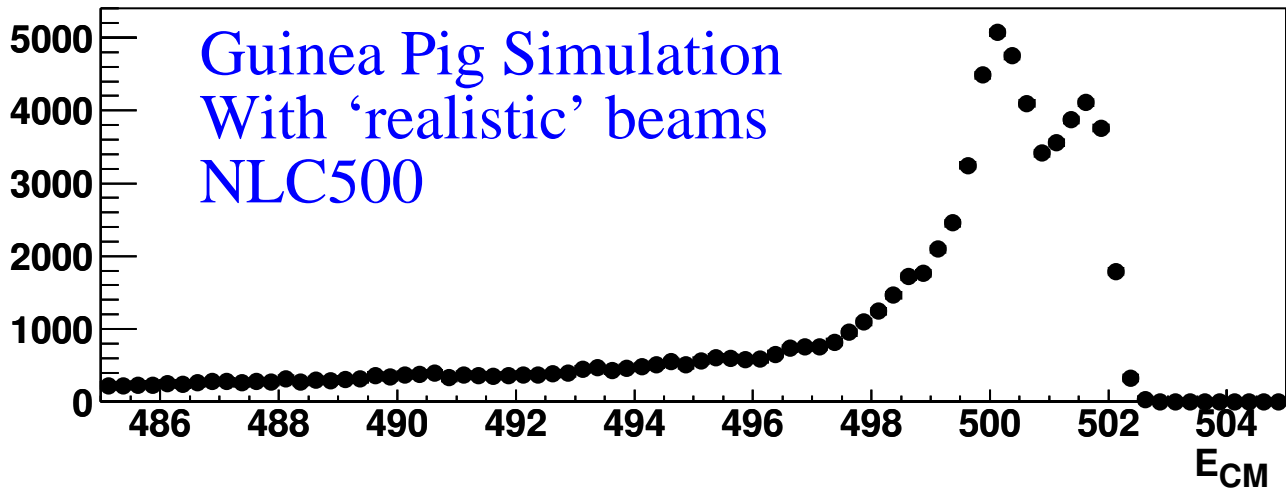
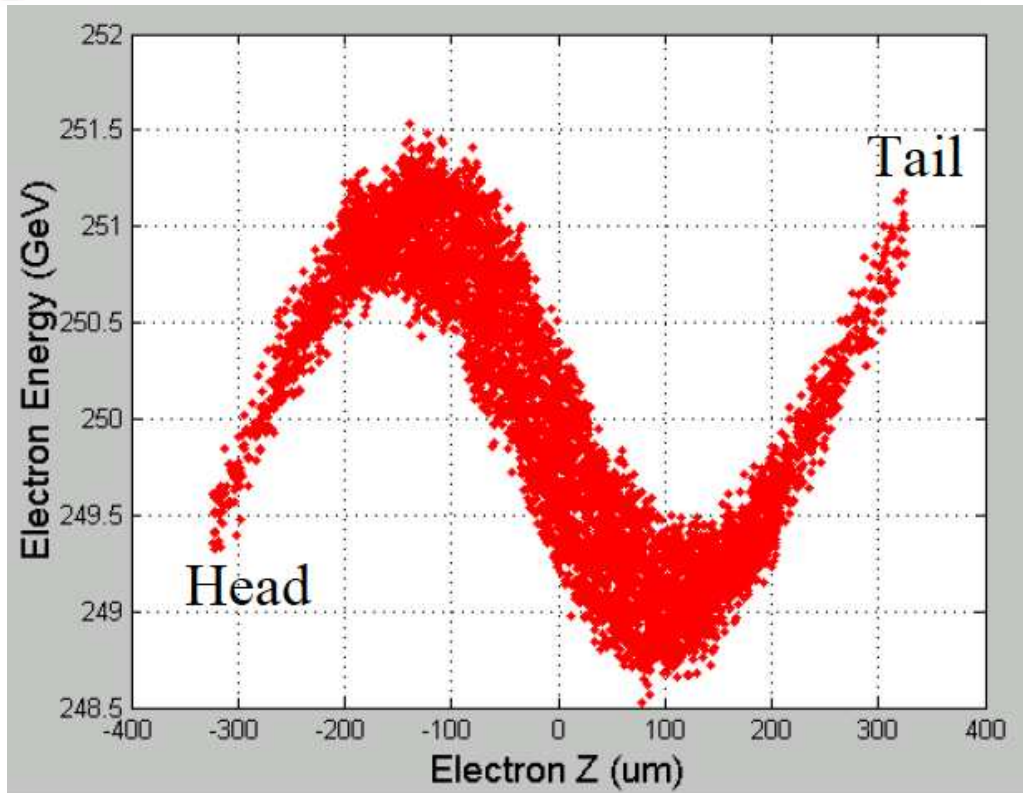
Understand needs for fast diagnostics

Example: To what precision do we need Ebeam pulse-to-pulse? With what frequency?

Assess impact or risk on physics!



Luminosity Spectrum



Ugly profile for warm, broader width
Need real numbers on physics from real analyses



End Station A Testbeams



Beam Instrumentation Tests for the Linear Collider
using the SLAC A-Line and End Station A

M. Woods, *et. al.*

SLAC-LOI-2003.2

27 Physicists, 10 Institutions

<http://www.slac.stanford.edu/grp/rd/epac/LOI/LOI-2003.2.pdf>

Letter of Intent submitted Nov. 2003

Well received by SLAC EPAC and lab

Testbeam for Beam Instrumentation Detectors

Exploit infrastructure/knowledge from E158

Test some of the **high risk** BI components

Start a facility for beam instrumentation R&D



X-band Comparison



	E158	NLC
Charge/pulse	6×10^{11}	14×10^{11}
Rate	120 Hz	120 Hz
Energy	45 GeV	250 GeV
Pulse Train	270 ns	267 ns
uBunch spacing	0.35 ns	1.4 ns
Beam Loading	13%	22%
Energy Spread	0.15%	0.16%
Intensity Jitter	0.5%	0.5%
Energy Jitter	0.03%	0.3%
Transverse Jitter	5% of spot	20-50%

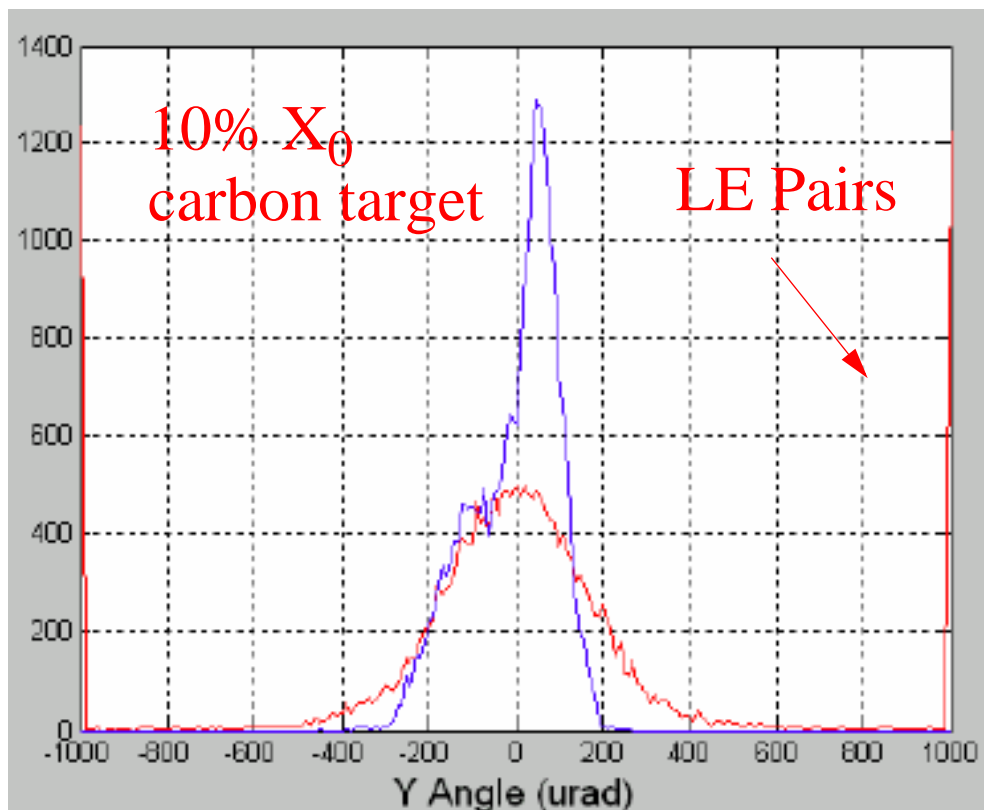
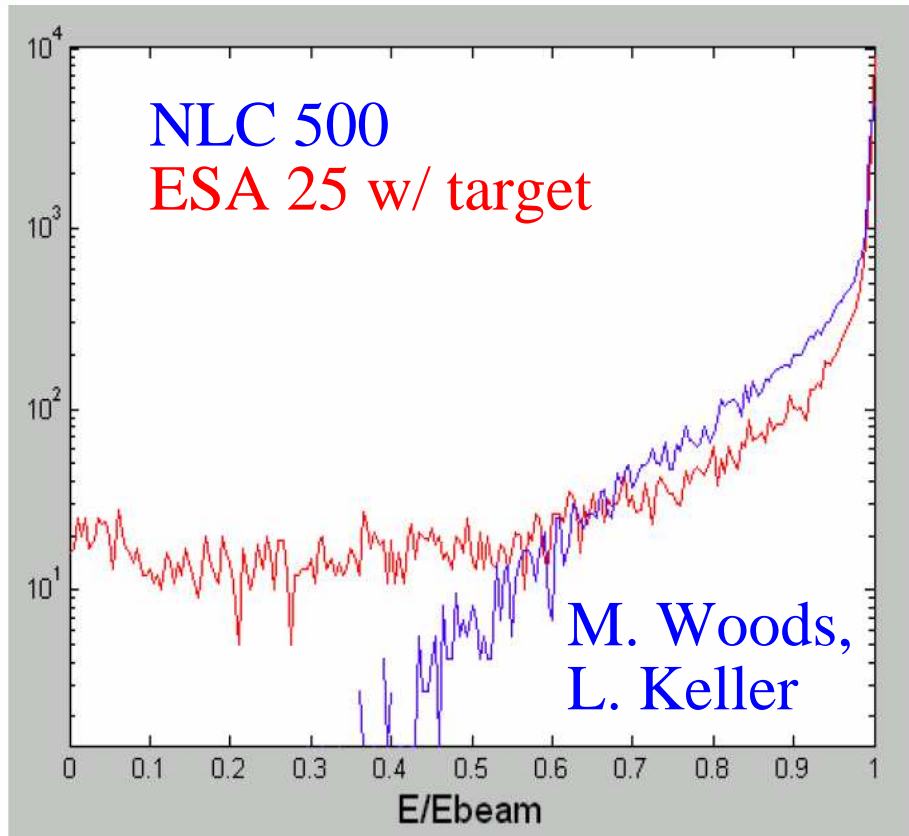
For X-band, current beam very comparable
(except energy and spot-size)

Thin radiator can replicate disrupted beam

**Good infrastructure currently exists, but
no physics planned for ESA!**



Disrupted Beam





Testbeam Proposals



- User-driven proposals
- Need technical descriptions
- Combine requests into blocks, run plan

Proposal to SLAC EPAC by May 2004

First Phase

- IP BPMs - fast feedbacks
- Energy BPMs
- Synchrotron-stripe diagnostics (WISRD)

Starting with ~1 week in 2005

Later Phase(s)

- Pair-monitor tests
- Beam diagnostics, “wire” scanners
- Spectrometer prototype
- Polarimeter prototype
- Your good idea!

Expect 1-2 weeks per year

Please contact M. Woods or E. Torrence
Greater participation is welcome