Ron Settles / MPI - Munich
Cornell LCCOM
19 April 2002

SESSION on:

DETECTOR R&D OPPORTUNITIES

Topic#1: Machine-Detector Interface (MDI)

- Scientific - Political Framework
- Definition of "MDI"
- Issues affecting experimentation
- (some) activities → opportunities

– This is a status report –

- Some of the developments are fast breaking
- Some efforts not yet included

∴ Lists not yet complete

→ Your feedback welcome!

SCIENTIFIC - POLITICAL FRAMEWORK

- Regional — America
  Asia
  Europe

- Global Accelerator Network
  GAN
  (Don Hartill)

- Worldwide Aspects

Regional

Europe

- Tesla TDR — March 2001
  - Hamburg site — 4 G€ incl. FEL + manpower
  - German Science council
    - recomm: mid 2002
- ECFA Report — July 2001
  - recomm: "> 400 GeV LC, as timely as possible"

America

- Snowmass — July 2001
  - recomm: "LC complementary to LHC"
- HEPAP Report — fall 01/winter 02
  - recomm: "LC next accel: US host mach."

Asia

- ACFA Report — fall 01
  (acfa.hep.kek.jp)
  - recomm: "500 GeV LC + FEL, asian site"

Global Accelerator Network

International collaboration to build, operate and utilise large new accelerator

- similar to big detector coll:
  - limited in time
  - components built in home countries
  - remote operation
  - well-defined role of partners
  - minimum admin. structure
  - e.g. Hera, Pep II B, TTF, LHC
- Learn from
  - particle physics
  - astronomy
    - telescopes
    - ALMA
    - Gemini
  - space
    - Ariane
    - ISS
  - Industry

Worldwide Aspects

trsp → Detector R&D panel

overview being compiled

ICFA

- GAN study
  - Global } working groups
    Technical }
  - final report soon

→ • Technical Review Committee (Loew panel on ILC)
  - 1) Energy } working groups
    2) Luminosity }
    - TESLA
    - JLC(C)
    - JLC(X)/NLC(X)
    - CLIC
  - 1st draft summer 2002

OECD - Global Science Forum

Consultative group on HEP

- 3 WGs:
  - Roadmap of HEP
  - Formal aspects of GAN
  - Legal aspects of GAN
- Report June 2002

- Want more MDI info for this
- Draft to go public ~2 wks : Jim Brau's home page

Linear Collider Detector R&D

DRAFT 4....April 5, 2002
Caveat: This is a working draft; changes and additions are in the offing, but also comments are welcome.

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1 Introduction

There is now global consensus that the next accelerator project in particle physics needs to be an electron-positron linear collider (LC) with an energy range between $\sqrt{s} = M_Z$ and about 1 TeV. Physics and detector studies are ongoing in Asia [1, 2], Europe [3, 4] and North America [5, 6], and are co-operating within a World-Wide Study [7]. The co-chairs of the world-wide study [8] have suggested the compilation of this note to describe the detector R&D required for the timely construction of a detector with the required performance, to list the R&D efforts presently pursued and to point out the areas where efforts are missing or not adequately covered.

The purpose of this compilation is to help organise the R&D efforts more globally and to facilitate and foster interregional collaborations. This note is not meant to be prescriptive or exhaustive. There might well be areas of R&D which are useful to be exploited but which are not mentioned here. We also expect and encourage ideas on novel detector techniques. Explicitly included in considerations here are software developments in the context of the specific R&D efforts. We do not consider, however, generic software R&D which is mandatory but beyond the scope of this document.

In the past, much effort has been devoted to detector R&D for LHC experiments[9]. The principal challenges at the LHC are related to the high event rate and the high radiation levels associated with the luminosities and energies required to do physics. Both of these problems are dramatically reduced at the LC due to the much lower beam energies and the falling e^+e^- point-like total cross-section, in contrast to the much higher beam energy and approximately energy-independent total cross-section in *pp* collisions. The freedom from these problems at first sight might suggest that the LC detector requirements appear easily satisfied, but extensive studies since LCWS91[10]

Lots of meetings ...

- US LC meeting in Chicago: Jan.02
- LC 02 workshop in SLAC: Feb.02
- TRC meeting at CERN: Apr.02
- Ecfa/Desy workshop St.Malo: Apr.02
- US R&D meetings Fermilab/Cornell: Apr02
- TRC in Paris (EPAC): June02
- US LC meeting Santa Cruz: June02
- LCWS 2002 Korea (Cheju): Aug.02
- "Nanometer Beam Coll" Lausanne: Sept02

⋮

... to list a few related to Detector R&D

Meaning of "MDI" ?

- e.g. ILC-TRC (loew) panel → trsp
- e.g. LCΦ2 wg4 → trsp

MDI WG on Technical Review Committee

W. Kozanecki 12 Apr 02 TRC Plenary

Plans of the MDI sWG

Goal: consolidated draft posted by May 28.

1. **Introduction**

✗ 2. **Beam Halo, Collimation, and Machine Protection**

✓ 3. **IR & MDI issues**

✓ 4. **Beam-Beam Effects and Backgrounds**

✓ 5. **IP diagnostics & instrumentation**

6. **Summary**

LC02 Working Group 4

Navigate to:

IP and Experimental Issues (including g-g)

Conveners: P. Burrows (Oxford), J. Gronberg (LLNL), R. Settles (MPI Munich), H. Aihara (Tokyo)

WG4 Goals:

-Review the status of interaction region design, including:

- ✓ -Stabilization and fast feedback
- ✓ -Energy and Polarization measurements
- ✓ -Backgrounds and their mitigation
- ✗ -Photon collider design
- ✗ -Detector design
- ✓ -Test facilities, i.e. LINX

Tentative List of Presentations

Monday 13:30, Interaction Region Overview

30	Organization / Working Group Discussion	Conveners / all
35+5	NLC IR Overview	T. Markiewicz
25+5	Photon Collider Interaction Region Issues	J. Gronberg
35+5	CLIC Beam Delivery System	F. Zimmermann

Tuesday 9:00, Interaction Region Overview

15+5	Beam Stability in the Main Linac of CLIC	D. Schulte
35+5	JLC IR Overview	Tauchi-san
35+5	TESLA Interaction Region: IR Layout, Beam Induced Backgrounds	O. Napoly

Tuesday 11:00 Background Calculations

15+5	Machine Backgrounds in CLIC	F. Zimmermann
15+5	Beam-Beam Instability Driven by Wakefield Effects in Linear Colliders	D. Schulte
25+5	Neutron Background at TESLA	G. Wagner
15+5	History of Muon Backgrounds at SLAC	L. Keller

Tuesday 13:30 Detector Design Issues

Detectors from the North American LC Working

- in WG4

NLC - The Next Linear Collider Project

NLC IR Overview

Tom Markiewicz / SLAC

LC'02, SLAC

04 February 2002

- also TESLA IR by Olivier Napoly

so, what is meant by "MDI"?
(for this talk)

MDI ≡ machine ingredients needed for e^+e^- detector design, i.e.

machine delivers:	"MDI" task:
energy	measure
luminosity	measure, keep
polarization	measure
backgrounds	detector design

(no photon collider, only e^+e^- in the following)

Recent development

(mentioned by Tom Himel)

For the issues ...

- energy
- polarization
- luminosity

... centralize info on the work under the name "IP Instrumentation"

America:

www.slac.stanford.edu/~torrence/ipbi/

Europe:

www.desy.de/~schreibr/ecfa/topics-of-interest.html

These will be linked together

(and to the Asians ultimately)

and to

America:

http://www-project.slac.stanford.edu/lc/local/systems/specialprojects

(several projects related to IP → Mike Woods gathering info)

http://www-sldnt.slac.stanford.edu/nlc/beamdeliveryhome.htm

(NLC Beam Delivery and Interaction Region Home Page)

http://www-conf.slac.stanford.edu/lc02/workinggroups.html

(LC02 workshop)

Europe:

http://tesla.desy.de/tdr

(Tesla TDR)

Welcome

Meetings

Contacts

Announcement

Luminosity

Energy

Polarization

IP Parameters

Simulation Tools

NLC IR Home Page

Related Sites

IPBIS Home

IP Beam Instrumentation Study

www.slac.stanford.edu/~torrence/ipbi/

First Announcement

We are pleased to invite you to participate in a joint machine-detector study group devoted to the topic of IP beam instrumentation for the Next Linear Collider. The principle goal of this study is to move beyond broad conceptual ideas and begin to specify in detail the beam instrumentation and associated infrastructure necessary to realize the full physics potential of a 500 GeV linear collider. The first meeting of this study group will be held at SLAC on June 26th.

One of the distinct advantages of a high energy e+e- linear collider is the well defined initial state in the collision process. This advantage can only be realized, however, if there is adequate beam instrumentation available to measure the beam properties at the interaction point.

The instrumentation topics to be addressed by this study include beam polarization, beam energy scale, luminosity spectrum, and control of IP parameters for luminosity optimization. Beyond discussing the target precision and prospective technologies for this instrumentation, this study will aim to develop detailed beam line designs, propose concrete operational strategies, and identify specific topics for further research.

The format of the first meeting at SLAC will be designed to promote discussion and brainstorming, with short introductory talks given in each topical area followed by a round table discussion directed by a list of questions to be prepared in advance. It is expected that this meeting will be the first in a series which will continue until the primary goal of a more detailed plan for the IP instrumentation is achieved. To limit the scope of topics considered at this initial meeting, we will focus on the physics needs for high energy operations of the 500 GeV NLC design.

The timing of the first meeting, which immediately precedes the Santa Cruz meeting, has been chosen to encourage the participation of all interested parties. While the NLC design will be principally used to make the discussion concrete, most of the topics to be addressed are universal beyond specific machine designs, and we warmly welcome participation from the Tesla and JLC communities. Non-experts and people interested in potential new research opportunities are also strongly encouraged to attend.

More detailed information about the study and the first meeting will be available at the IP BI Study web page: http://www.slac.stanford.edu/~torrence/ipbi/

-Eric Torrence
-Mike Woods

Updated: April 14th, 2002
IPBIS HomeIPBIS Home

- invitation
- polarization
- energy
→ beam energy scale
- lumi spectrum
- control of IP param. for lumi optimization
- slac meeting just before Santa Cruz mtg.

1st MEETING:

JUNE 26, 2002 @ SLAC

8:45 - 9:00 ***Coffee and Donuts***

9:00 - 9:20 IP Instrumentation Study: Goals and organization (E. Torrence)

9:20 - 10:50 Energy (Chair: E. Torrence)

Overview	(20 mins)
Short contributions*	(30 mins)
Discussion	(40 mins)

10:50 - 11:15 ***Coffee Break***

11:15 - 12:45 Polarization (Chair: M. Woods)

Overview	(20 mins)
Short contributions*	(30 mins)
Discussion	(40 mins)

12:45 - 2:00 ***Lunch***

2:00 - 3:30 Luminosity (Chair: D. Cinabro)

Overview	(20 mins)
Short contributions*	(30 mins)
Discussion	(40 mins)

3:30 - 4:00 ***Coffee Break***

4:00 - 5:00 Discussion and Planning

*** short contributions are 10 mins, ma**

Contact Information

For information related to the SLAC meeting on June 26th, please contact Eric Torrence or Mike Woods. For more detailed information about a specific topic or if you would like to know what you can do to help, please contact one of the people listed below.

Luminosity

- David Cinabro
-

Energy

- Eric Torrence
-

Polarization

- Mike Woods
-

Updated: April 14th, 2002
IPBIS Home

Contacts in America

Extended Joint ECFA/DESY Study on Physics and Detectors for a Linear Electron-Positron Collider

ECFA DESY
Linear Collider Workshop

Toptics of Interest Related to the Study

- FNAL Circle Line Tours
  Series of 'CIRCLE LINE TOUR' talks being held at Fermilab to address physics issues central to future colliders.
- Line Drive
  FNAL series of Linear Collider Double Headers
  The subsequent talks will follow at approximately two week intervals. We have a draft schedule with ideas for dates, talks, and speakers but none are fixed beyond February 15. The web page above provides access to archived versions of previous talks, including the Witherell introduction and Grannis seminar from Jan 18. The web site for viewing the talks live is also linked to the above page.
- Laser based beam diagnostics R&D activities
  The aim of the Laser Based Beam Diagnostics (LBBD) Collaboration is to study the feasibility of laser based diagnostics tools for future linear electron positron colliders (FLC). The objectives of the laserwire project are to develop laser based techniques to measure the dimensions of electron (positron) bunches in a FLC and optimising their application using simulations.

ECFA/DESY Workshop Home Page

DESY Home Page
last updated by S Schreiber on 14-Apr-2002

European info being linked to "topics of interest" page
www.desy.de/~schreibr/ecfa/topics-of-interest.html
- LBBD up to 2 days ago
- more to be added

Laser Based Beam Diagn
R&D Activities

Laserwire

News | Resources | Scientific Case | Goals | Collaborations | Activities | Opportunities

The mission of the Laser Based Beam Diagnostics (LBBD) Collaboration is to study the feasibility of laser based diagnostics tools for future linear electron positron collider (FLC). The objectives of the laserwire project are to develop laser based techniques for determining the dimensions of electron (positron) bunches in a FLC and optimising their application using simulations.

News

- 27/03/02 Installation of the CTF2 Laserwire (Photos)
- 06/12/01 Laserwire meeting at Desy Hamburg 28/11/01 (Transparencies)
- 06/09/01 Laserwire workshop at KEK Japan 27-29/08/01 (Program and transparencies)
- 28/03/01 Laserwire meeting at Desy Hamburg 28/03/01 (Transparencies)
- 21/11/00 Opportunities for master projects in 2001
- 16/11/00 Launch of the LBBD Collaboration webpage

Resources

In our archive you find handouts and copies of talks held at conferences and workshops. Furthermore published papers and student reports are available for download.

Scientific Case

The performance of future linear collider depends strongly on the control of the transverse particle beam size along the complete machine, for example to verify beam optics and to measure the transverse beam emittance. Some of the expected beam sizes are in the range between 500 nm and 10 µm, where conventional wire scanners are at the limit of their resolution. To provide a non-invasive measurement we suggest to use a laser beam to probe the electron beam. The central idea is to use Compton scattering between electrons in the bunch and photons in the laser beam

further links to e.g. - ATF
- FFTB
- HASYLAB

→ MS thesis topics

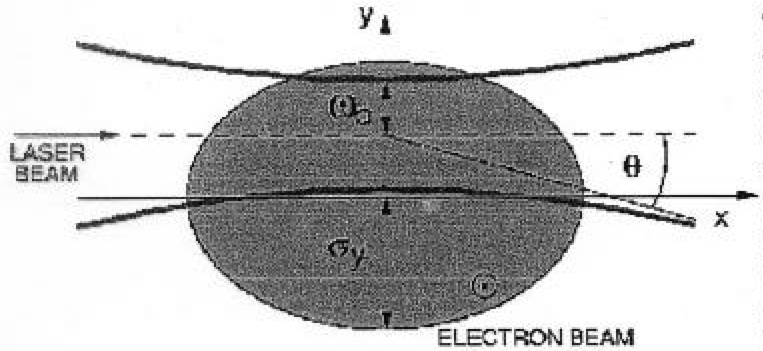
Opportunities
Master Projects

laserwire -F.F system
-imaging system
-optical transport
-Compton polarimeter

Introduction

For application at future linear colliders, laser based diagnostics tools are foreseen for the measurement of the transverse charge distribution of the electron beam. Beam sizes in the order of a few ten micrometer and bunch charges in the nC range are expected for the beam delivery system. To measure this small beam sizes it is planned to scan a finely focused laser beam under 90 degree angle through the electron beam and collect the Compton back- scattered photons as a function of the relative laser beam position. The Research and Development effort is carried out by the Laser Based Electron Beam Diagnostics Collaboration, in which the RHUL group is responsible for the laser system.

Development of a Laser Final Focus System for the Laserwire Experiment (appointed)



The laser final focus system is of major importance for the successful operation of the laserwire beam size monitor. In order to use the laserbeam as a non-invasive scanning techniques, the transverse beam size of the laserbeam at the interaction point must be in the order of a few micrometer. To achieve this, an aberration-corrected optics design must be developed to focus the intense laser beam inside the electron beam chamber.

In this project a student can achieve skills in laser optics for intense laser beams as well as accelerator physics. The study includes the design of an optical system and realization on a testbench in lab at RHUL. The outcome of the work will find an application at the laserwire experiments at the PETRA/TTF2 accelerators at DESY or at the ATF at KEK.

Design and Test of an Imaging System for the Laserwire Experiment (free)

MDI issues ...

- measure energy
- measure polarization
- measure, keep luminosity
- backgrounds

... some examples

- Energy measurement

→ see Eric Torrence's talk in WG4 at LC02

www-conf.slac.stanford.edu/lc02/workinggroups.html

and Tesla TDR

tesla.desy.de/tdr

- spectrometer $\frac{\Delta E}{E} \sim 10^{-4}$ possible ($2 \cdot 10^{-4}$ LEP 2)

- Møller spectrometer $\frac{\Delta E}{E} \sim$ few $\cdot 10^{-5}$ possible

- radiative returns $\frac{\Delta E}{E} \sim 5 \cdot 10^{-4}$ with $2fb^{-1}$ at LEP 2

Energy Spectrometry Experience at LEP2

9th International Workshop on Linear Colliders
February 6th, 2002
SLAC

Eric Torrence
University of Oregon

- LEPII Beam Energy Experience
- Future LC Beam Energy Prospects

http://physics.uoregon.edu/~torrence/talks/LC02

LEP II Beam Energy Experience

www-conf.slac.stanford.edu/lc02/workinggroups.html

Examples of MDI issues...

- Polarization measurement
  - → see Mike Woods' talk in WG4 at LC02
    www-conf.slac.stanford.edu/lc02/workinggroups.html
    and Tesla TDR
    tesla.desy.de/tdr
  - Compton polarimeter
    - only before IP at Tesla
    - after IP at SLC/NLC

    $\frac{\delta P}{P} \sim 0.25\% \Rightarrow \delta s_w^2\theta \sim 5 \cdot 10^{-5}$
  - Møller polarimeter → under study (TDR)
  - W-pair + SM asymmetries → under study (Mike)
  - Blondel scheme for Giga Z (P_{e^-} & P_{e^+})

    $\frac{\delta P}{P} \sim 0.1\% \Rightarrow \delta s_w^2\theta \sim 2 \cdot 10^{-5}$

(Some) Aspects of Polarimetry At a Future Linear Collider

Polarimetry Requirements

precision electroweak:

- measurements of A_{LR} for weak mixing angle determinations from Giga-Z, Bhabha/Moller scattering
- W-pair asymmetry and other Standard Model Asymmetries

background estimations

Polarimetry for the SLD Experiment at SLC

design and systematic errors

Polarimeter Design Issues at NLC

www-conf.slac.stanford.edu/lc02/workinggroups.html

M. Woods, SLA

Examples of MDI issues

- Measure Luminosity

→ see www.slac.stanford.edu/~torrence/ipbi/

and tesla.desy.de/tdr

Luminosity Overview

This topic covers the issues related to understanding the luminosity delivered at the interaction point. In addition to the instantaneous and total integrated luminosity, many physics analyses also require a detailed understanding of the differential luminosity spectrum (dL/dE) resulting mainly from the large beam-beam interactions in the collision process. All forseen measurements of particle masses, for example, are highly sensitive to the exact shape of this luminosity spectrum. Methods for optimizing the delivered luminosity will also be considered in this topic, due to the significant overlap in required instrumentation.

The following is a list of topics and questions which is almost certainly incomplete. Please feel free to suggest additional questions, provide answers, or express an interest in thinking about any of these issues.

Physics Questions

- Which analyses require an absolute luminosity measurement, and with what precision?
- What is the ultimate precision required on the luminosity spectrum?
- What are the relative luminosity requirements for threshold scans at high energy?
- What relative luminosity precision is required to calibrate the energy scale at the Z-pole?

Potential Beam Instrumentation

- Beamstralung monitor
- Pairs monitor
- Laser Wire
- 'Wire' scanner at point of high dispersion
- Radiative bhabha monitor
- Deflection scans
- Bunch length monitor

Potential Detector Measurements

- Bhabha acolinearity
- Low-angle bhabha scattering

Operational Questions

- What is the possible variance on short time scales?
- How precise do we need real-time measurements?
- What are the likely correlations with other parameters (energy, polarization, etc.)?
- How often are invasive measurements required?
- How easy is it to trade luminosity for energy spread?
- Just what is the strategy for optimizing delivered lumi?

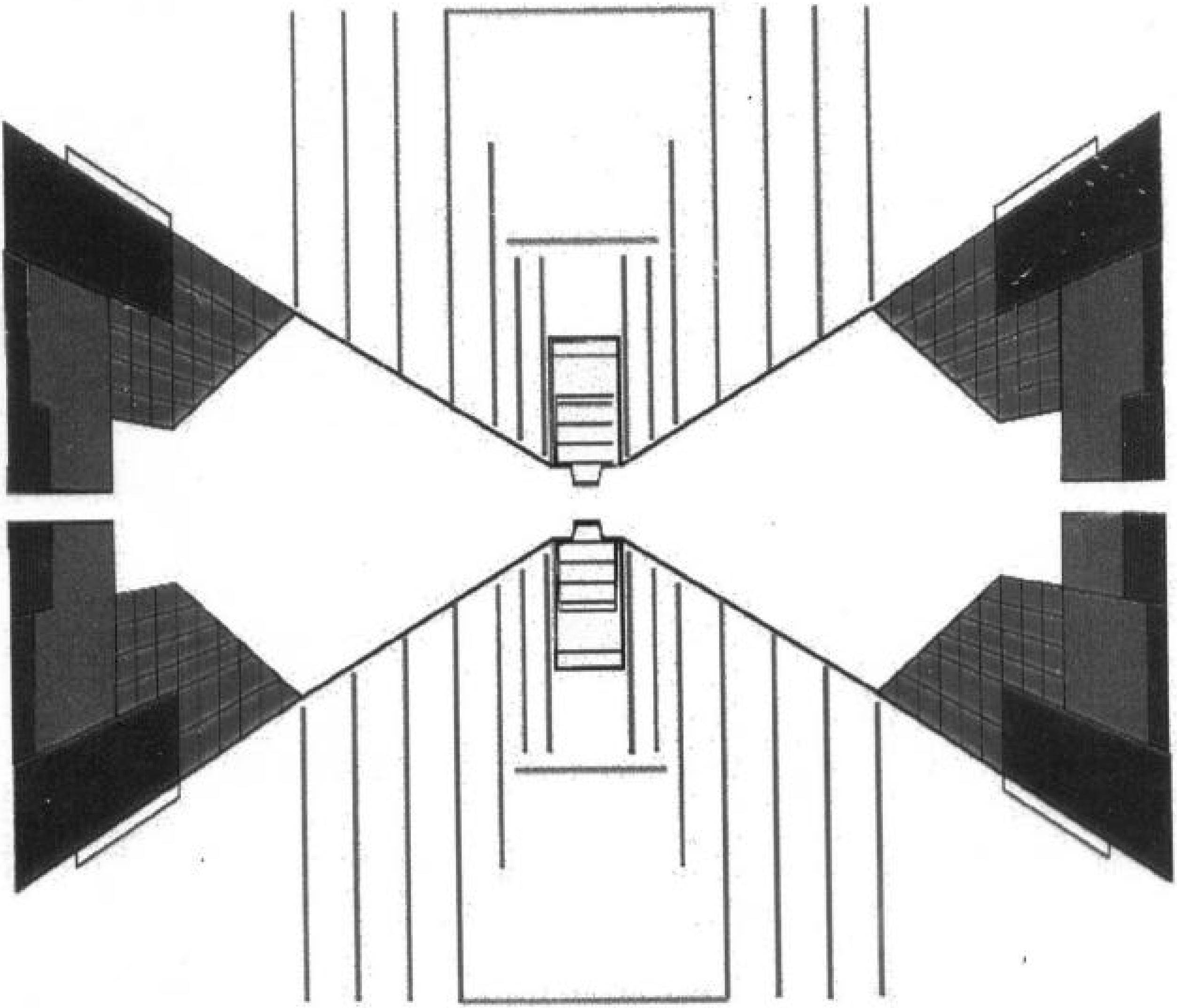
Detector Questions

- Where does the luminosity spectrum monitor go?
- What sort of alignment tolerance is needed for the acolinearity measurement?
- How much time is needed to reach the target precision?
- How does an IP boost effect this measurement?

www.slac.stanford.edu/~torrence/ipbi/

The Mask as a Detector

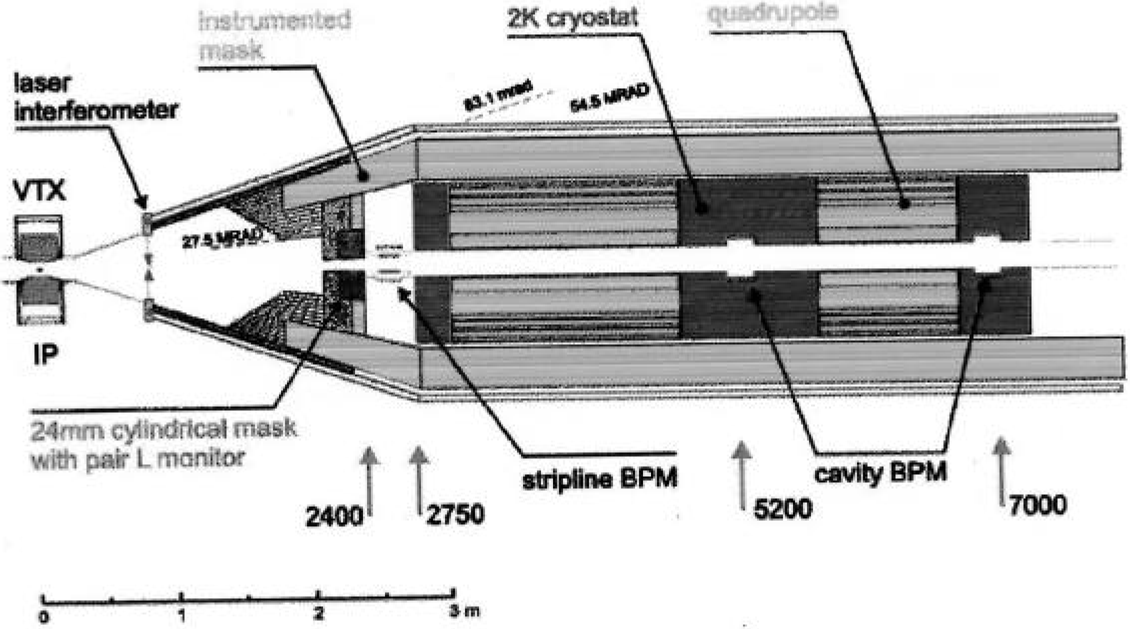
- CDR mask: not really a detector, large acceptance hole between 50 and 80 mrad.
- physics importance: e.g. for small ΔM SUSY searches. Need sensitivity for small angles, as far down as possible.
- detector requirements: Need electron, muon and pion detection capabilities down to small angles.
- the proposed new mask design:



NLC - The Next Linear Collider Project

TESLA IR

Instrumented W Mask & Pair-LumMon w/ Low Z Mask

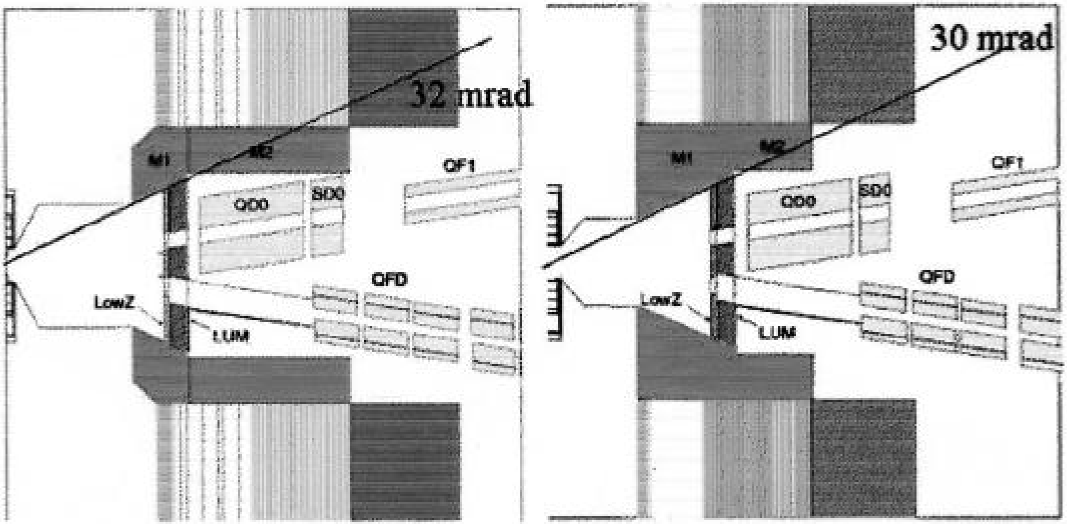


First
Back Next Synchronize Video

NLC Detector Masking
Plan View w/ 20mrad X-angle

Large Det.- 3 T

Silicon Det.- 5 T



Tom Markiewicz

Examples of MDI issues

- Keep the luminosity
  - dynamic range of final focus

→ see Tesla TDR
tesla.desy.de/tdr

  - vibration suppression
(mentioned by Joe Rogers)

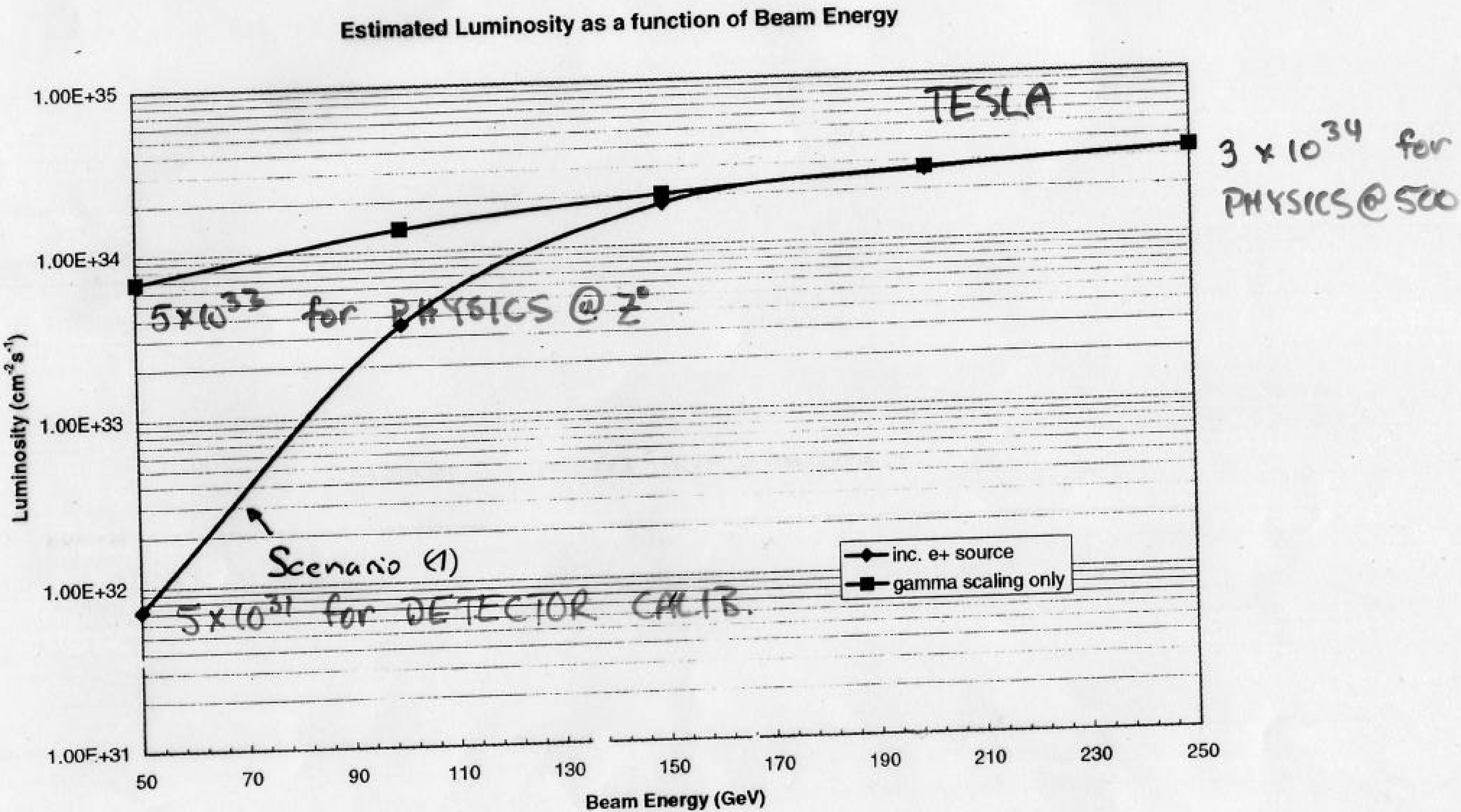
→ see NLC BD & IR HOME PAGE

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

→ see Joe Frisch's talk in WG3 at LC02

www-conf.slac.stanford.edu/lc02/workinggroups.html

NEW for 2nd STUDY :



In WG3 at LC02

IP Stabilization for the NLC

Eric Doyle - Mechanical engineering: Sensors
Leif Eriksson - Mechanical engineering: Test system
Linda Hendrickson - Software, modeling
Thomas Himel - Feedback Algorithms
Tom Mattison - Optical anchor development (UBC)
Andrei Seryi: Ground motion and Linac modeling
Steve Smith: Fast beam feedback modeling
Duane Thompson - Electronics
Michael Woods - Optical anchor development
<u>Josef Frisch</u>: Speaker

www-conf.slac.stanford.edu/lc02/workinggroups.htm

Joe Frisch

www-project.slac.stanford.edu/lc/local/systems/special projects

Under Construction

Vibration Stabilization for the NLC final focus

(Special Projects Group)

Link to software group vibration feedback page

The final focus doublets for the NLC need to be stabilized to a relative position of ~1nm. On long timescales (>1second) the beam - beam deflection provides the best measure. For shorter timescales, several options have been suggested:

- Passive isolation: The vibration levels measured at various sites suggest that passive isolation may provide sufficient isolation. This approach has the advantage of simplicity, however it may fail if "cultural" noise due to the accelerator is larger than expected.
- "Optical Anchor" This system uses an interferometer to measure the relative positions of the magnets. Interferometers can provide sub-nanometer resolution at high data rates (>1KHz). The primary disadvantage is that differential ground motion can mimic the effects of magnet motion. In addition the optical anchor requires penetrations through the detector for the light paths
- "Inertial anchor" This system uses accelerometers mounted to the magnets and feedback. This system locks the magnets to the "fixed stars". This system has the disadvantage of not providing information at low frequencies, and of locking the final focus quads to the "fixed stars" while the rest of the accelerator is presumably referenced to the ground.
- "Super fast feedback" This system would use a very fast (10ns) feedback (or feedforward) to correct the trajectory of the later parts of the bunch train based on deflection measurements on the early bunches in the train.

Ground motion: Ground motion varies substantially between sites. For many sites, the measured ground motion would allow the use of passive isolation for the final focus quads. There is concern, however, that the installation of the accelerator and associated systems may produce an unacceptable increase in ground motion, necessitating the use of some form of active isolation. A good discussion of ground motion effects and measurements for the NLC can be found in the NLC ZDR.

Note on overall vibration issues for NLC vibration.pdf

Vibration control systems consist of three components:

Sensor: Detects the motion of the device which is controlled (Electron beam, Laser Interferometer, Accelerometer)

Feedback Loop: An algorithm for controling the actuators based on the sensor readings (Analog, Digital, Adaptive)

Actuators: These provide the actual mechanical feedback. (Piezo-pushers, Inertial pushers)

Most recent talk LC2002talk.pdf

Old material (some out of data)

LC02 SLAC

WG 4: IP & Expt'al Issues for e^+e^- and $\gamma\gamma$

Conveners: Phil Burrows, Jeff Gronberg, Ron Settles, Hiro Aihara

What are main tasks over next 2,3 years?

- MDI
  - BDS: iterate on refined designs, understand dynamic range
  - IR: need realistic engineering design of
    - instrum. mask + support
    - final quads with
    - diagnostics, e.g. IP feedback
      - intertrain
      - intra train
      - optical anchor
      - inertial dev.

      } LINX crucial

  ⇒ what does this do to the detector?

- Backgrounds
  - machine
  - beam-beam
  - neutrons
  - muons

  } 1st round of simulations encouraging

  ⇒ cross-checks necessary, improve confidence from $\mathcal{O}(10)$ to $\mathcal{O}(2)$

Examples of MDI issues

- Backgrounds

Ron Settles 12.4.02
St. Malo

"Backgrounds-in-the detector"-Discussion

INTRODUCTION

- ILC-TRC (Loew panel) Report
  - compare energy & luminosity perf. of machine options Tesla, JLC, NLC, Clic
  - MDI wg → backgrounds big issue
    → machine phys. working hard on it (e.g. Table 7.1.6 in TDR)
    → also fundamental for det. phys.

  ⇒ can we get feeling for "limit of pain" for backgrounds in the det.?

- Ecfa/Desy input?
  - there is no generic answer: depends on sub-det. / technology
    → but, can make guesstimates for Tesla (as an example)
  - how this will be used in ILC-TRC report, I don't know, but try to gather the information and then see...