ILC Detectors and



Detector View of MDI



Advanced Beam Dynamics Workshop NANOBEAM-2008

May 25-30, 2008, Budker INP, Novosibirsk, Russia







Max-Planck-Institut für Physik (Werner-Heisenberg-Institut)

03/06/2008

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NANDBEAM 2002 26th Advanced ICFA Beam Dynamics Workshop on Nanometre Size Colliding Beams

September 2-6, 2002, Lausanne, Switzerland



ational Advisory Committee:				Accelerators have produced high-energy particle beams with ma and with 500 nm beams is stable collision. These "namb
te te olahaye iteas stokawa	CEA/Sectory SLAC CERN PNAL NEX	S. Myers A. Shinsky D. Trines A. Wrolich IOTA Beam Dyn	CEIN BINF CESY PSI arrics Fanel	pent loterances on the magnet o focusing and the stability of ture inser colliders foresce colliding high-energy particle base dates down to the 1 nm lovel. For the production and con many new challenges must be met. The ICFA Workshop o Beans will look at:
ational Program and Organizing Committee:				Technical issues in producing and controlling particle beams ing the Final Focus, collimation, beam instrumentation, and
Tere.	CERN	L Rakin	PSI	back systems.
	Laucarne U.	J. Rogers	Cornell U.	Existurbing effects from ground motion, magnet vibration, optic
an ann ann an	DESY CESY	A Servi	SLAC	Achievable limits with present accelerator and stabilization te
rows	Cofferd U.	T. Shintake	KERGREREN.	Possible applications of nanobearts in and beyond particle ph
	SUAC	V. Shiftsev	PNAL.	The sector is addressed in
	CERN Dama II	S. SPUR	Caracoury	the workshop is addressed to:
	450	V. Televic	DINE.	The linear collider accelerator community, that relies on nm-
buty	CERN	N. Toga	KEK	the trontier of particle physics.
atato	String-8	N. Walker	OBSY	The synchrotron radiation accelerator constrainity, which he
paly	CEA/Secley	K. Yeboya	KEK	ence with accelerator stabilization and the control of small be
	W-SLAS	P. Simestary	GERN	The general accelerator physics community with interest in a order chromatic corrections, and advanced beam collimation.
Organizing Committee:				Scientists working with sub-rm stabilization, like for gravitation thip production, and Transmission Electron Microscopy (usin beams).
1. J. The	manifestant.	(Secretaria)		Estimates with interacts to use bigh second parabolities for ne
	Lausanne U.			industrial companies exected the in the development of a
nica faatli	CERN, Lauranne U.			positive stabilization equipment
nail: nanobeam@cern.ch				The workshop should inspire a lively exchange of advanced between the scientists involved in the different areas of rese goals should guide the workshop:
				Describe a path lowards proving feasibility of coliding and no far-size beams, document existing solutions, and identify ope
				Develop a opherent program for future research and develop
				Strengthen and expand international and inter-disciplinary of
				Hini-workshop on measurement of beam energy in linear
				A parallel session will be devoted to the precise measurement
ST (PFL				gy in linear colliders, based on the experience in existing an
				Details will be announced on the Nanobeant02 web site.
~				

NARNOBEAM 2005 We have been been to the been t

a beams to push astensive experis design, higherwave detectors, ow energy nanoapplications, noed active and

leas and concepts th. The following colliding nanome subtions.

hean

HELMHOLTZ

October 17-21, 2005 Uji Campus, Kyoto University



Courtesy of Byodoin / English information)

The symmetric building in reflected by the water to show the further symmetry. The building can be found also on the ten yen cain. The temple was registered in the UNESCO world heritage list in December 1994. "Byodo" can be translated as "equality" or "impartiality", which means that the Builda's help goes out cal bleings equality.

> The workshop is hosted by Institute for Chemical Research, Kyoto University, High Energy Accelerator Research Organization(KEK) and Yukawa Institute for Theoretical Physics.

> The workshop is sponsored by Center for Diversity and Universality in Physics(CDUP) and High Fnerov Accelerator Research Omanizatjon(KEK)











This is the 3rd workshop in the series as we all know. Notice the blossoming of logos! And where does this one come from...



Global Design Effort

ILC INTERACTION REGION ENGINEERING DESIGN WORKSHOP

SLAC

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TLC IRENGO7: SLA

LDC Engineering Design (Status)

MEA

17. Sept. 2007

Norbert Meyners, MEA

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It started at the LC92,LC93 workshops in Garmisch-Partenkirchen,SLAC to emphasize the correlation between the three, and ended up in a contribution to Nanobeam02...

INTERACTION-REGION ISSUES

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Abstract

The jobs at hand concern everybody in the LC business. Establishing and controlling the e^+e^- luminosity at a level



of $10^{34} \text{ cm}^{-2} \text{s}^{-1}$ in the interaction region (IR), i.e., from the final quadrupoles to the interaction point (IP), will require a sophisicated interplay of several technologies dealing with gymnastics on nanometer-sized colliding beams. An overview of the issues is given in this contribution to Session[4] of the Nanobeam Workshop[1]-[9]. ...and I shall follow the circle clockwise for this talk:

0-Machine...

- 1-Physics...
- 2-Detector...
- 3-MDI...
- In addition to my own, I have borrowed some slides from several colleagues for this talk, to give a better feel for the activities...Thanks to them!



Now to the detector. We want:

PHYSICS MACHINE DETECTOR



Andrei Seryi at IRENG07 : Detector - machine interfaces



- The two complementary detectors for ILC IR may have different design, sizes, etc.
- Differences of their interfaces to the machine should be understood, and if possible, unified

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Borrowed from Henri Videau at a CLIC workshop; we are discussing with them about the detector (ILC has done a lot of work on the detector)...

LDC

A large detector with 1.6 m tracker radius and 4T 12.4m x 12m



A TPC for tracker

A highly granular W-Si 25 mm² 80M ch electro-magnetic calorimeter and hadronic calorimeter read analogically 9cm² or digitally 1 cm² in iron or brass

A HCAL in the very forward

Henri Videau LII-École polytechnique



CHAPTER 1. DESCRIPTION OF THE CONCEPT

The largest detector with a 2m tracker radius and a 3T field

The innermost detectors are similar in the different concepts but for the inner radius of the Vdet dictated by the field

A TPC for tracker

GLD

A large yoke to provide an adequate B field in the TPC and a small stray field at the level of the quads. A granular calorimetry in scintillator by fear of the silicon cost

The a size W then Pb for 5.7 λ

CLIC 2007 CERN, October 2007

16m x 15.3m

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Joined to 'ILD' for LOI



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P-flow performance today

from Mark Thompson, CALICE-UK, Cambridge



E. Garutti

03/06/2008



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Combination of detector and machine elements."Detector view of MDI"? Nanobeam02 paper...

Abstract

The jobs at hand concern everybody in the LC business. Establishing and controlling the $\rm e^+e^-$ luminosity at a level



of 10^{34} cm⁻²s⁻¹ in the interaction region (IR), i.e., from the final quadrupoles to the interaction point (IP), will require a sophisicated interplay of several technologies dealing with gymnastics on nanometer-sized colliding beams. An overview of the issues is given in this contribution to Session[4] of the Nanobeam Workshop[1]-[9].

1 INTRODUCTION

One way to break down the tasks at the IR is to categorize them according to: Vibration, beam Optics, Instrumentation, Backgrounds/masking and Engineering, as illustrated in Fig.1. The tasks are highly correlated as evidenced by the repetition in the descriptions below.



Figure 1:

A detailed account of the LC technological status, including topics in this paper, has been prepared by the International Linear Collider Technical Review Committee (ILCTRC) chaired by Greg Loew[8].

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Many very

correlated

tasks‼

03/06/2008

Combining MDI/Integration makes a lot of sense, as the IRENG07 workshop, the ILD task list and Andrei's/Toshiaki's lists today show, maybe something like:

> •Vibration—det&hall design to avoid unwanted (µm-mm!) vibrations

•Optics—machine, BDS design/layout (details in Andrei's and Toshiaki's talks today)

•Instrumentation/diagnostics—fast feedback, beamcal e.g.

·Background—beam induced bgrd, inner detector design

•Engineering—

·Detector design/integration

•MDI magnets (antiDID)

·IR hall/push-pull design (Andrei's talk today)

Shielding

•Etc...

No Conclusion

- Many correlated/challenging issues
- Nevertheless progress by our excellent and highly motivated machine physicists is evolving well
- Iterating on engineering designs
- W.I.P., 'interface' (='integration'?) document April 2009 will be very significant (will it give 'Master Lists'?)