The ILC Roadmap

Mark Oreglia
University of Chicago and Enrico Fermi Institute
and ALCPG!

…with contributions from Jim Brau and Harry Weerts

LBL RPM Seminar, 27 February 2007

- ILC progress, schedule, options
- Detectors, Physics, Areas of Need
- WWS Roadmap towards detectors
- R&D, funding, oversight
- ALCPG info, future steps

070207 Sticker Shock

- Reference Design Report release at the ACFA/GDE meeting in Beijing two weeks ago:
  - No detector(s), contingency, or inflation
- After an intensive 17 months of costing and reexamination of the requirements

http://www.linearcollider.org

Summary
RDR "Value" Costs

Total Value Cost (FY07)

4.87B ILC Units - Shared
+
1.78B ILC Units - Site Specific
+
13.0K person-years
("explicit" labor = 22.2 M person-hrs @ 1,700 hrs/yr)

For this estimate
1 ILC Unit = 1 US 2007$ (= 0.83 Euro = 117 Yen)

The Physics Scope

- WorldWide Study created the Scope Ctte to define the machine; iterated with GDE last autumn
  - R Heuer (chair), F Richard; P Grannis, M Oreglia; S Komamiya, D-S Son … and we created WGs
- **E_{cm} adjustable from 200 – 500 GeV**
- **Luminosity → $\int L dt$ = 500 fb^{-1} in 4 years**
- **Ability to scan between 200 and 500 GeV**
- **Energy stability and precision below 0.1%**
- **Electron polarization of at least 80%**
- **The machine must be upgradeable to 1 TeV**

http://www.fnal.gov/directorate/icfa/LC_parameters.pdf

RDR Tradeoffs

- In the last 4 months before ACFA07, cost of machine brought down 30% … many 1%'s
- Physics tradeoffs *for now*:
  - One IR; 2nd beamline+switch = 650B$
  - …but still open to 2 detectors in "push-pull"
  - Luminosity starts low (lower klystron overhead) but still gets up to requisite level in 4 years
  - Collisions at 14 mrad angle
    - Awkward for $\gamma\gamma$ option, not well developed yet
- So why more expensive than TESLA?
  - 2 tunnels, damping rings difficult, buried contingency

Push-Pull and 2nd Detector

- This has certainly been controversial … will have to defend need for 2nd detector
  - Snowmass debate: http://www-conf.slac.stanford.edu/snowmass05/proceedings/proc/papers/PLEN0059.PDF

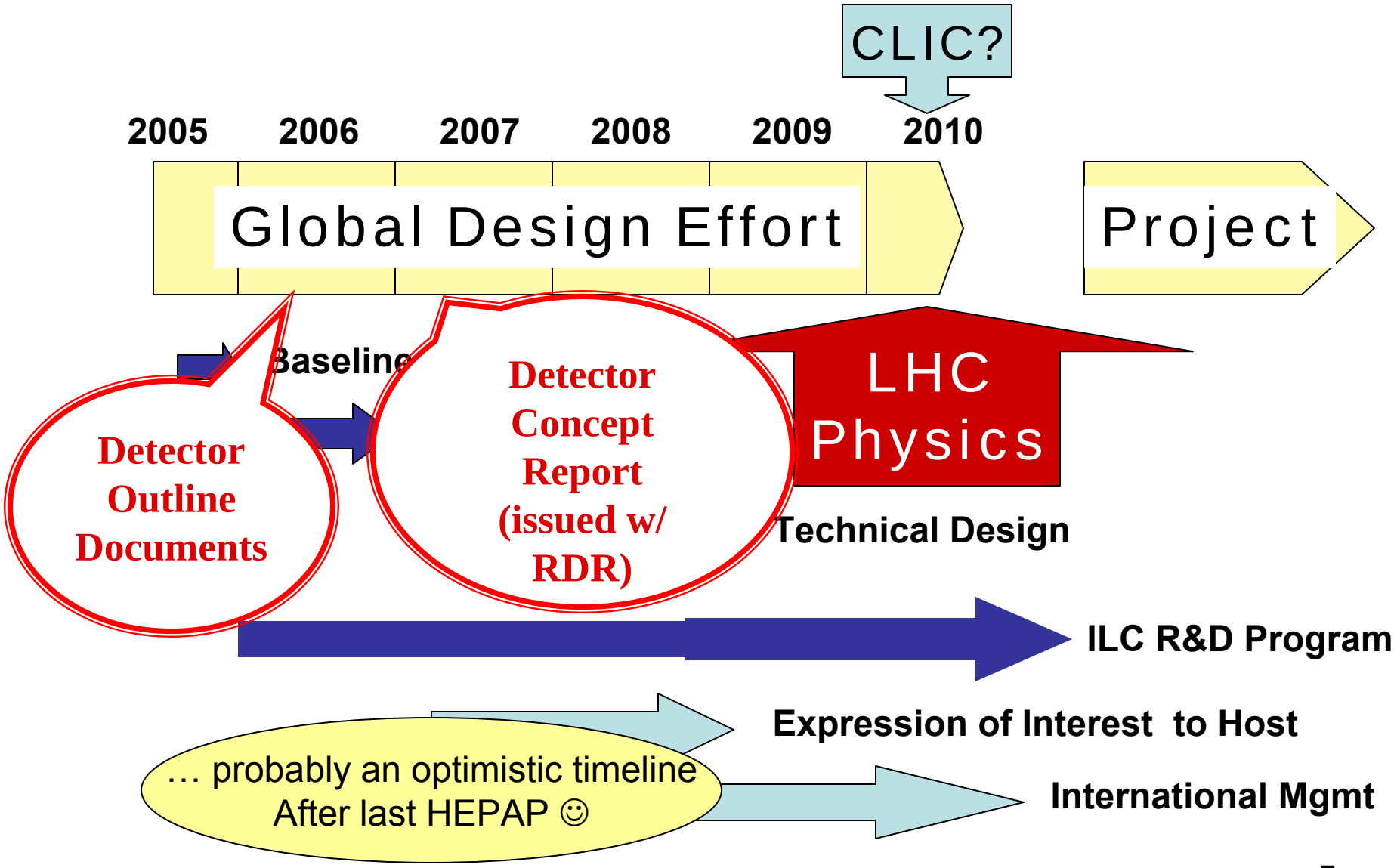
- At ILC detectors *share* the luminosity

- Push-pull technically challenging, but preliminary findings from committees set up to look at this from detector standpoint saw no roadblocks:
  - http://physics.uoregon.edu/~lc/wwstudy/ccr23/

RDR Machine Parameters

bunch spacing	337	nsec
#bunch/train	2820	
length of train	950	μsec
#train/sec	5	Hz
train spacing	199	msec
Maximum E_{CM}	500	GeV
Peak Luminosity	2×10^{34}	$cm^{-2}s^{-1}$
Beam current	9	ma
Avg gradient	31.5	MV/m
Total site length	31	Km
Total power consumption	230	MW

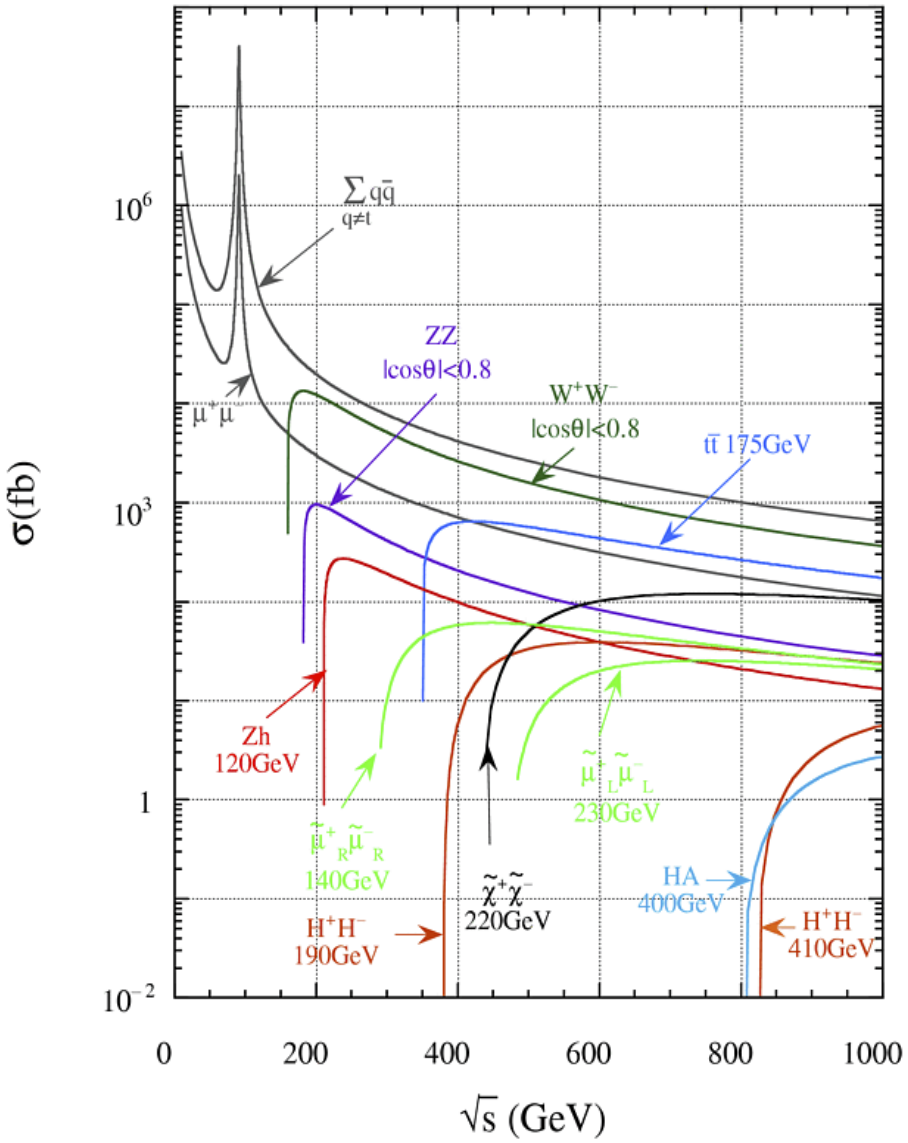
The GDE Schedule



Orbach's Feb 22 Remarks (Excerpt)

- DOE is committed to continuing a vigorous R&D program of accelerator technology. SCRF is a core capability having broad applicability, both to the ILC and to other future accelerator-based facilities as well. Our FY2008 request for ILC R&D and SCRF technology confirms this commitment. We welcome our R&D partnerships with those around the world, in Asia. in Europe, and the Americas. The science is indeed very exciting.
- • In making our plans for the future, it is important to be conservative and to learn from our experiences. Even assuming a positive decision to build an ILC, the schedules will almost certainly be lengthier than the optimistic projections. Completing the R&D and engineering design, negotiating an international structure, selecting a site, obtaining firm financial commitments, and building the machine could take us well into the mid-2020s, if not later.
- • Within this context, I would like to re-engage HEPAP in discussion of the future of particle physics. If the ILC were not to turn on until the middle or end of the 2020s, what are the right investment choices to ensure the vitality and continuity of the field during the next two to three decades and to maximize the potentialfor major discovery during that period?

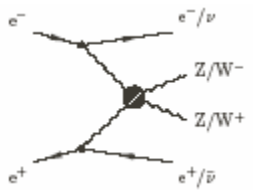
Towards Detectors: ILC Physics



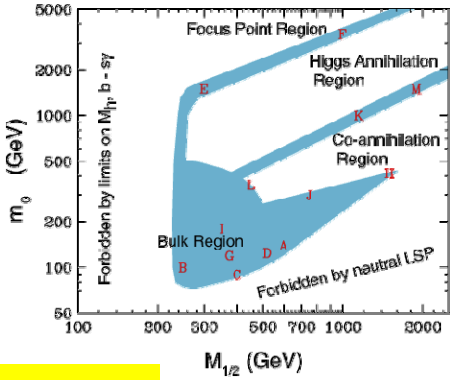
- EW cross sections are small … need good efficiency, acceptance
- Precision measurements mean reconstructing final state
  - WW, ZZ separation
  - Good resonance mass
- Need to reconstruct collision energy
- Polarized beam(s):
  - Tune couplings
  - Increase S/N

Archetypal Physics Processes

- Light Higgs -- tracker
  - Best recoil mass resolution in Z-> dileptons
- Higgs couplings – VTX
  - Tagging and charge ID
- Strong EWSB -- calorimeter
  - Important to look at WW scattering
  - W/Z jet separation crucial

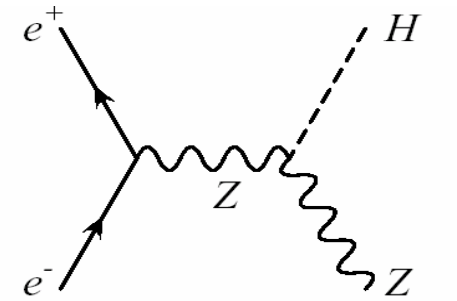


- Some SUSY scenarios -- hermeticity
  - Cosmology "benchmarks" summarized:
  - "bulk" -> $\chi\chi$ annihilation -> smuon/selectron
  - "coannihilation" -> χ–sτau annihil. -> staus
  - Low angle backgrounds

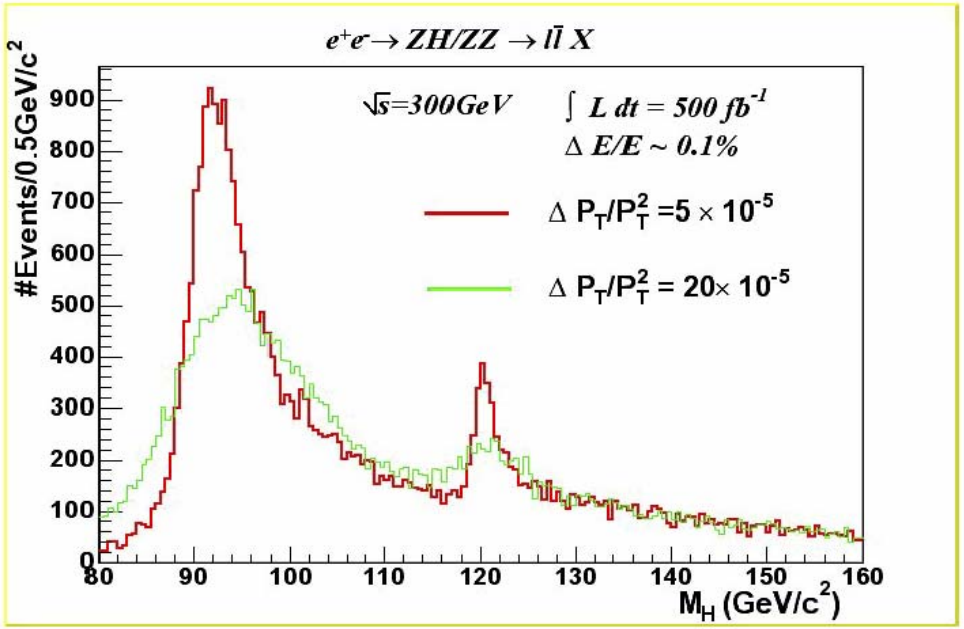


See the DCR Physics draft:
http://www.linearcollider.org/wiki/doku.php?id=ilcdcr:ilcdcr_home

Momentum Resolution



- $e^+e^- \rightarrow ZH \rightarrow ll\ X$
  - Golden physics channel!
- goal: $\delta M_{\mu\mu} < 0.1 \times \Gamma_Z$
  - δM_H dominated by ***beamstrahlung***
  - *$\delta(1/p)$ = few x 10^{-5}/GeV*
- ***1/10 LEP !!!***



Impact Parameter

Essential to physics mission

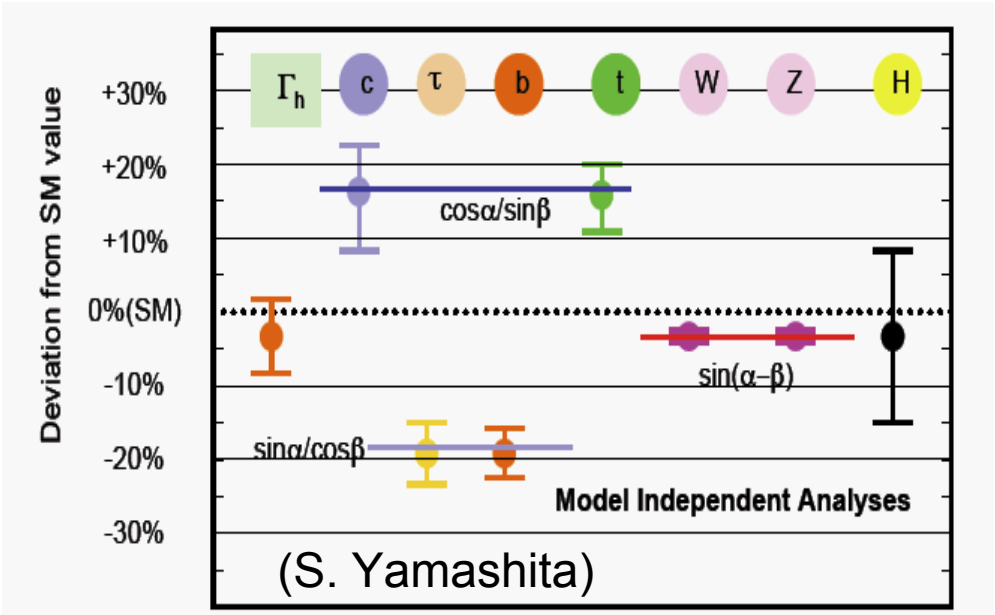
- Measure individual couplings with small relative error
- Forward-Backward asymetries, charge identified

Thus, need excellent vertex charge ID as well as flavor tagging

- … And with a very small thickness
- … And withing 1.5 cm of beam

$\delta d = 5\ \mu m \oplus 10/p(GeV)\ \mu m$

- ***1/3 SLD !!!***



R&D challenges

- ***Beam noise***
- ***Bunch structure***
- ***Spatial resolution***

Vertex detector characteristics

point resolution 1-5 μm

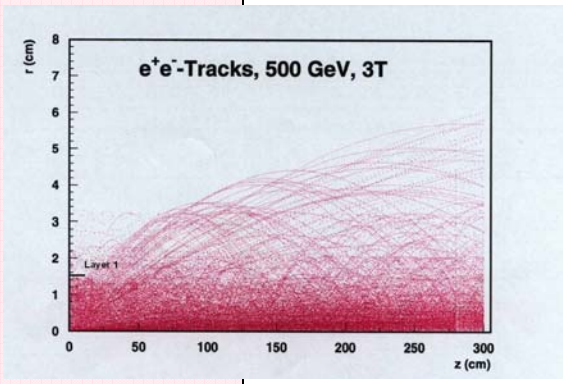
Thickness ~ 0.1 % X_0

5 layers

Inner radius ~ 1.5 cm

radiation tolerance ~ 360 kRad /year

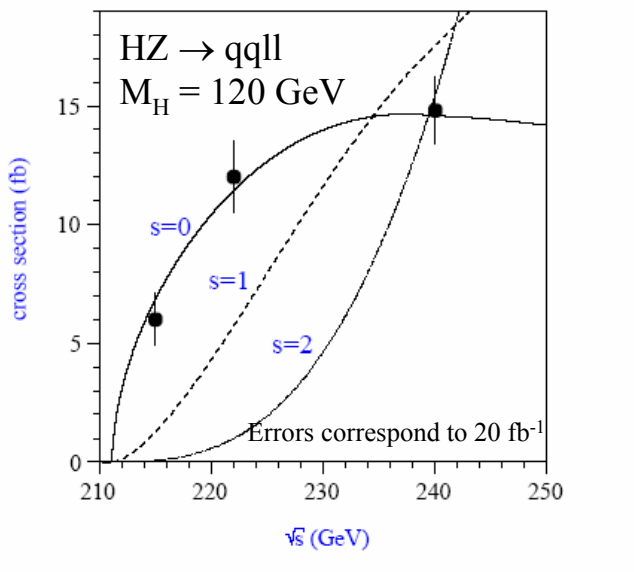
Occupancy: must read inner layer every 50μs

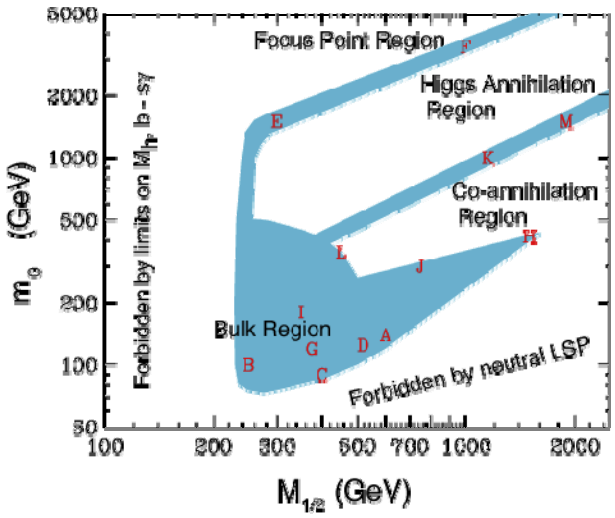


Hermeticity

- A_{fb} requires good coverage
- Some SUSY scenarios of interest require good handle on missing energy down to low angles
- Want beam diagnostics at low angles

- Challenge:
  - Crossing angle
  - Beamstrahlung, etc





Jet Energy Resolution

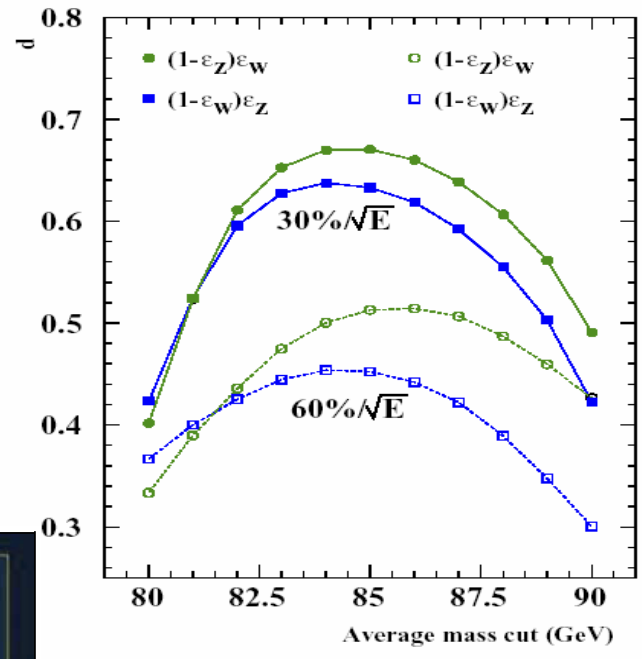
- Ability to differentiate $e^+e^- \rightarrow WW\nu\nu$, $WZe\nu$, $ZZ\nu\nu$
  - Could indicate strong EWSB
- Measure Higgs Self-coupling λ_{HHH}
  - Two production processes
    - ZHH and W-fusion
  - Small cross section on large multijet background;
  - need high resolution calorimetry to identify

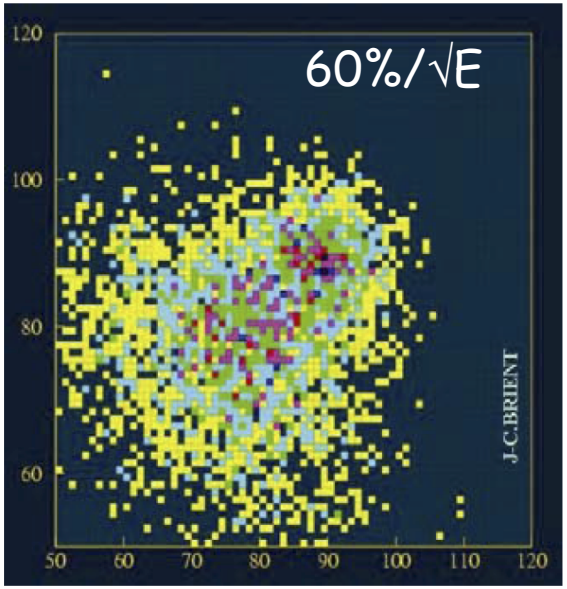
- *Figure of merit:* $\Delta M_{Dijet} \sim \Gamma_{Z/W}$
  - $\delta E/E = 0.3/\sqrt{E(GeV)}$ ...
  - ***... Probably does not scale this way***

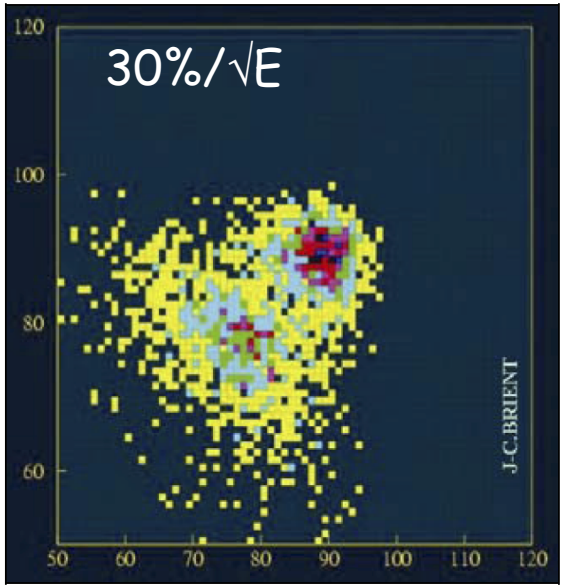
  - ***its a tall order: <1/2 LEP***

What you get for the cost

- Better resolution, efficiency, and acceptance mean less luminosity for the same significance





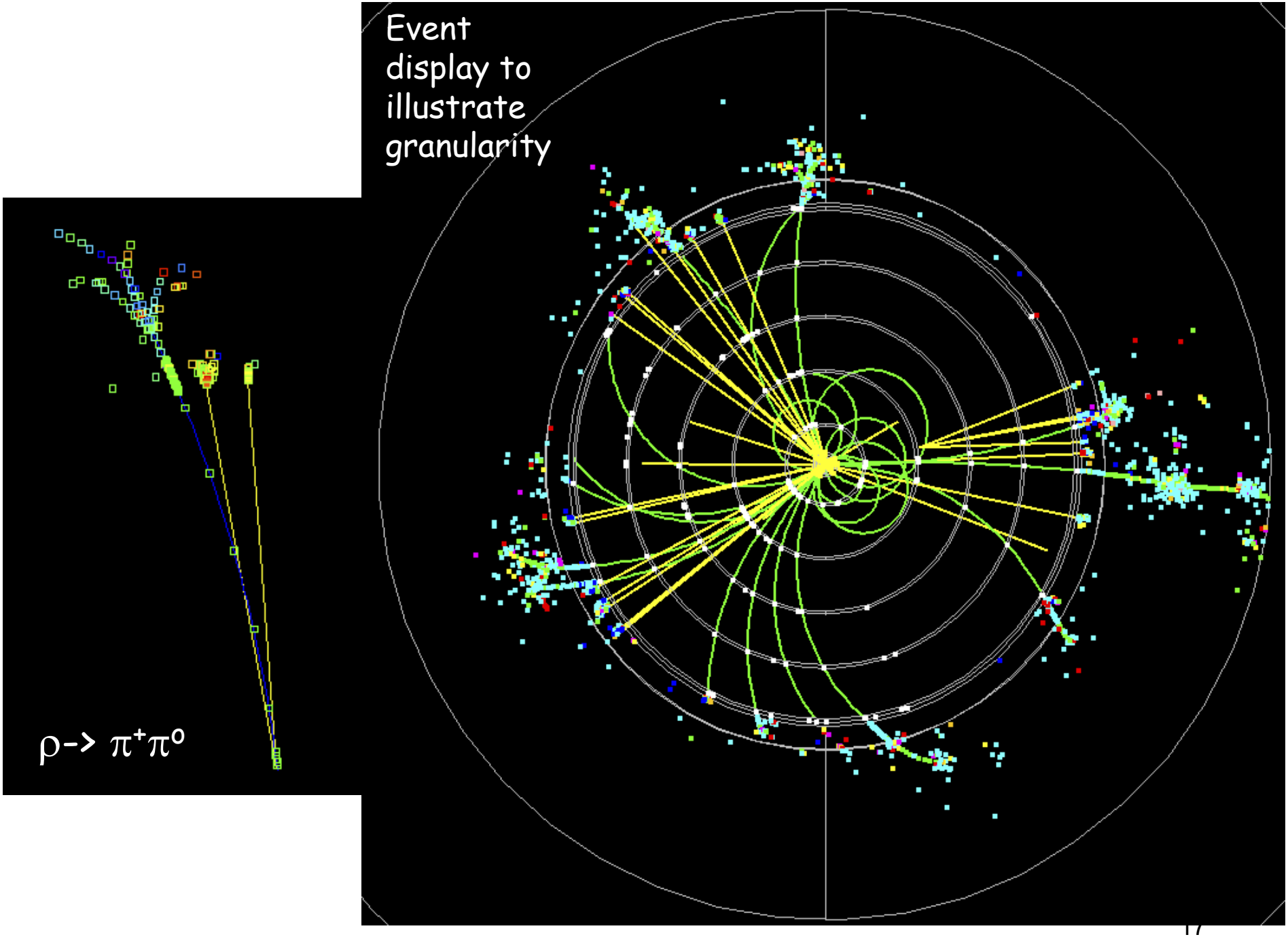


going from 60% to 30% almost doubles effective luminosity

How to achieve 30%

- Quiet environment of ILC means we can consider methods other than tracking and separate sampling calorimeter
- *Particle Flow* concept:
  - use tracking on charged components in jet
  - Identify calorimetric clusters and differentiate from tracks to measure separate neutral particle energy

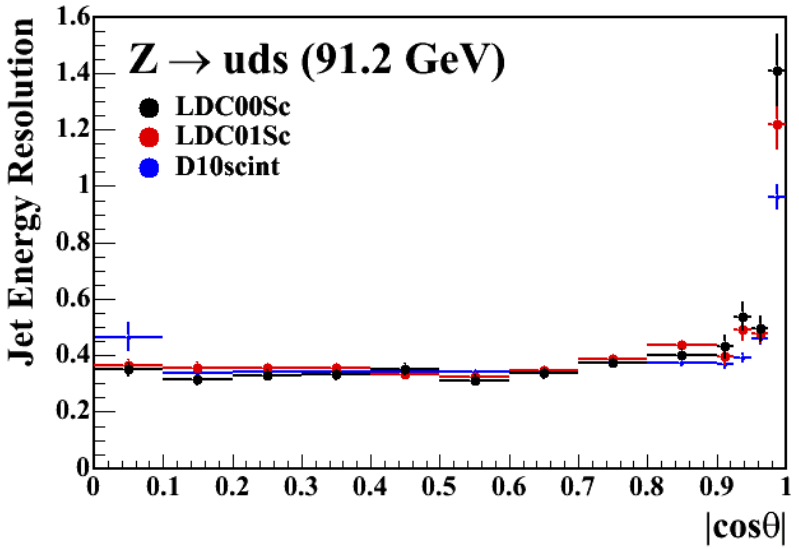
Particles in Jet	Fraction of Visible Energy	Detector	Resolution
Charged	**~65%**	**Tracker**	**< 0.005% p_T negligible**
Photons	**~25%**	**ECAL**	**~ 15% / √E**
Neutral Hadrons	**~10%**	**ECAL+HCAL**	**~ 60% / √E**
Confusion term		**(PFA)**	**???**


Event
display to
illustrate
granularity
ρ-> π+π0

Particle Flow = Fine Granularity

- **Channels: (SiD concept)**
  - EMCal 90 Mcells (12 mm^2)
  - HADCal 40 Mcells (1 cm^2)
- Emphasis on *combined* systems now
  - Need good *integrated* detector concept
  - New idea: Digital mode possible for HCAL

People are making progress,
But have not achieved goal at high E yet!
from Mark Thomson ->



Particle Flow

- Area of intensive work, not just within SiD, but in whole ILC community
- Many, many open issues
  - Algorithms
    - Cluster finding, …
  - Physics
    - Dependence on environment
    - Missing neutrinos, FSR, …
  - Detector
    - Linearity, e/p, E-resolution, granularity
    - Sampling fluctuations, leakage, …

	Algorithm	Institution
γ	Minimum Spanning Tree	Iowa
	H-matrix + nearest neighbor	ANL, KU, SLAC
Hadrons	Minimum Spanning Tree	Iowa
	Hit Density-weighted	ANL
	Spatial Density-weighted	NIU
	Directed Tree cluster	NIU
	NN based	ANL, SLAC
	Divisive	FNAL

IR-Related Issues

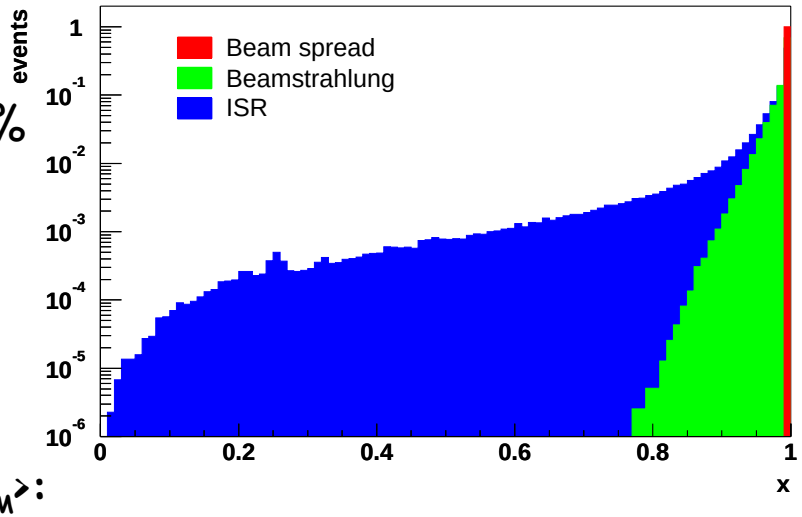
- Good measurements in the low-angle region
  - Need to make p_T cuts for physics analyses
  - Need to mask and reduce occupancies in low angle region

- Beam-beam interaction
- broadening of energy distribution (beamstrahlung)
- ~5% of power at 500 GeV
- backgrounds
- e+e- pairs
- radiative Bhabhas
- low energy tail of disrupted beam
- neutron "back-shine" from dump
- hadrons from gamma-gamma

√s (GeV)	Beam	# e^+e^- per BX	Total Energy (TeV)
500	Nominal	98 K	197
1000	Nominal	174 K	1042

Beam Energy

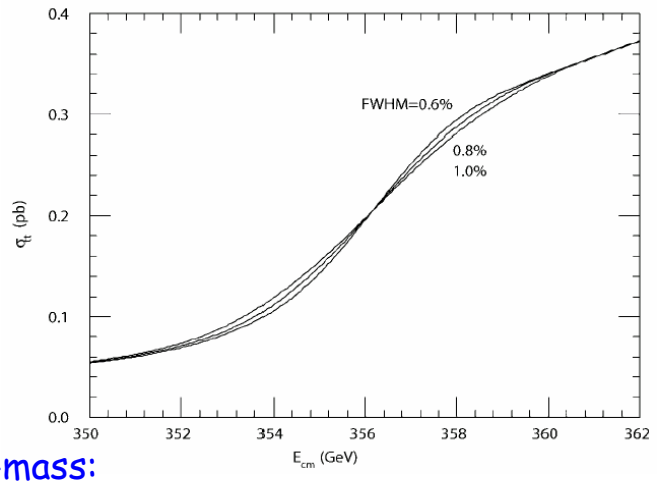
- need to know $\langle E \rangle_{\text{lumi-weighted}}$
  - Accelerator energy spread typically ~0.1%
  - Beamstrahlung:
    0.7% at 350 GeV
    1.7% at 800 GeV



- **Some analyses require better than 0.1%**
- techniques for determining the lumi-weighted $\langle E_{CM} \rangle$:
  energy spectrometers
  Bhabha acolinearity

- Other possibilities :
  γZ, ZZ and WW events; use existing Z and W mass
  utilize Bhabha energies in addition to Bhabha acol
  μ-pair events; use measured muon momentum

- **200 ppm feasible; 50 ppm a difficult challenge**

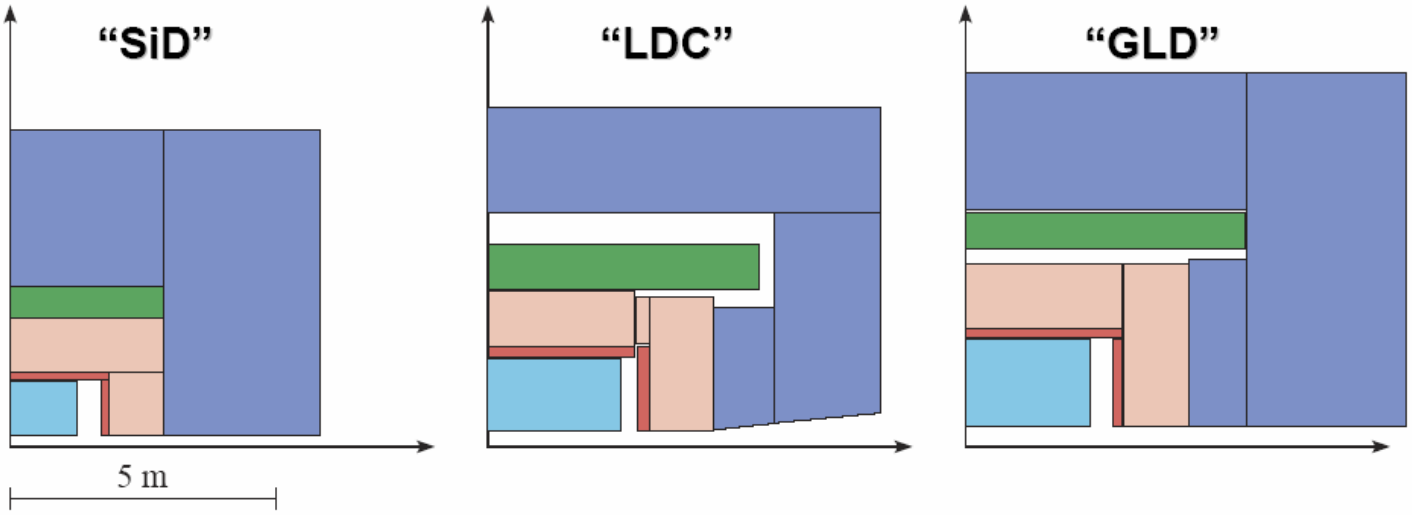


Top-mass:
need knowledge of E-spread FWHM to level of ~0.1%

The Sobering Situation:

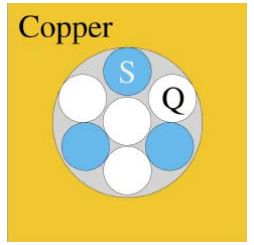
Requirement for ILC	Best to date
VTX: $\sigma_{impact} \approx 5 + 10/(p \sin^{3/2}\theta)$ μm	Need factor 3 better than SLD
Tracking: $\approx 5\times10^{-5}$ GeV^{-1}	Need factor 10 (3) better than LEP (CMS)
HCAL: 30% /$\sqrt{E_{jet}}$ (at higher E_{jet})	Need factor 2 better than ZEUS
Detector implications: Calorimeter granularity Pixel size Material budget, central Material budget, forward	Detector implications: Need factor ~200 better than LHC Need factor ~20 smaller than LHC Need factor ~10 less than LHC Need factor ~ >100 less than LHC
High Field Solenoid (5T?)	CMS
Forward region; beam analytics	No precedent

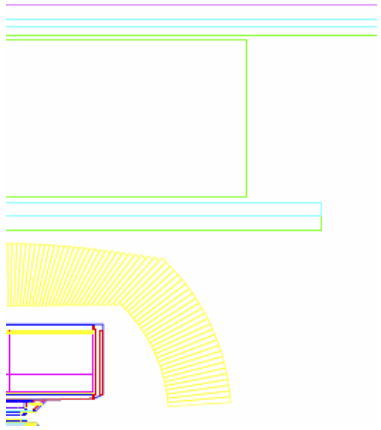
Detector Concepts



- SiD: Silicon Detector — SiD: **B R²**
  - Small, 'all' silicon
- LDC: Large Detector Concept — LDC: **B R²**
  - TPC based
- GLD: Global Large Detector — GLD: **B R²**

"4th "





Hopes to use DREAM Technique

"Detector Outline Documents" were requested by WWS last April:

http://physics.uoregon.edu/~lc/wwstudy/concepts

GLD http://ilcphys.kek.jp/gld/documents/dod/glddod.pdf
LDC http://www.ilcldc.org/documents/dod/outline.pdf
SiD http://hep.uchicago.edu/~oreglia/siddod.pdf
4th http://www.physics.iastate.edu/getfiles/1965.pdf

Current R&D & Design Studies

	Vxd 4-5	SiLC	TPC	Jet	Calice EM	Calice HAD	LC cal	Cal Asia	EM OR/ SLAC	EM hybrid	Muon
SiD	X	X			X	X		X	X	X	X
LDC	X	X	X	X	X	X	X	X	X	X	X
GLD	X	?	X	X		X	X	X			X
4th	X		X								

	Fwd trac	Fwd cal	Fwd Cher	DAQ	$\gamma\gamma$	BDIR
SiD	X	X		X		X
LDC	X	X	?	X		X
GLD	X	X	?	X		X

Detector Concept Report

a companion document to the RDR

- **Physics**
- **Concepts**
  - **Based on four detector concept DOD's**

  The goal:
  - **can do the ILC physics**
  - **different and complementary solutions**
  - **clear vision on how to reach the goals (R&D)**
  - **some understanding on the cost for these detectors**
- **Integrated presentation of Concepts**
- **Case for Two Detectors/IRs**

DCR Orchestration

- **WWS has established teams of editors for the companion volume, the DCR**
  - **Physics editors - K. Moenig, A. Djouadi, M. Yamaguchi, Y. Okada, M. Oreglia, J. Lykken**
  - **Detector editors – T. Behnke, C. Damerell, J. Jaros, A. Miyamoto**
  - **Cost analysis of the concepts – M. Breidenbach, H. Maki, H. Videau – interacting with GDE Cost Board**
- **Read the version on the Wiki and *PLEASE COMMENT***

http://www.linearcollider.org/wiki/doku.php

Beyond the DCR

- GDE plans EDR for 2010
  - Experiments must remain on same timeline as machine ⇒ Detector TDRs ~2010
  - TDRs require 2 years or more
    ⇒ select concepts by 2008!!!
- Questions we hope to resolve by summer:
  (Discussions in WWS, with GDE and ILCSC)
  - Downselect of detectors?
  - Authority to do this?
  - Intermediate step? CDR?

WWS Preliminary Plan: Phase I
(from F Richard @ ACFA07)

- Start immediately, for ~1/2 year, an open and intense study held in common between the 4 concepts on critical items: μvertexing, tracking, PFLOW
- Set horizontal WGs on these items, with the concept experts, to understand the differences, weaknesses, strong points, R&D issues, of each concept
- First results presented at LCWS07
- Try, based on these comparisons, to converge on two optimal concepts by summer 2007

Phase II

- Depe
  CDR
- An I
  and
  unify
  of ec
- Conv
- Proc
  ILCS
  dete

- Write IDAG charge (begin now)
  - Will be discussed with concepts
- Recruit IDAG chair (2007)
- Form IDAG (by end of 2007)
- Invite CDRs (beginning of 2007,
  to be submitted 2008)
- IDAG Reviews CDRs (during 2008)
  - With guidance, community Defines 2 detectors
- Invite EDRs (end of 2008)
- Take action at Beijing following discussion and input from community

two

ILCSC
, will
eatures

ILCSC Enacts IDAG

26 February 2007

To: Co-Chairs of the WWS International Organizing Committee

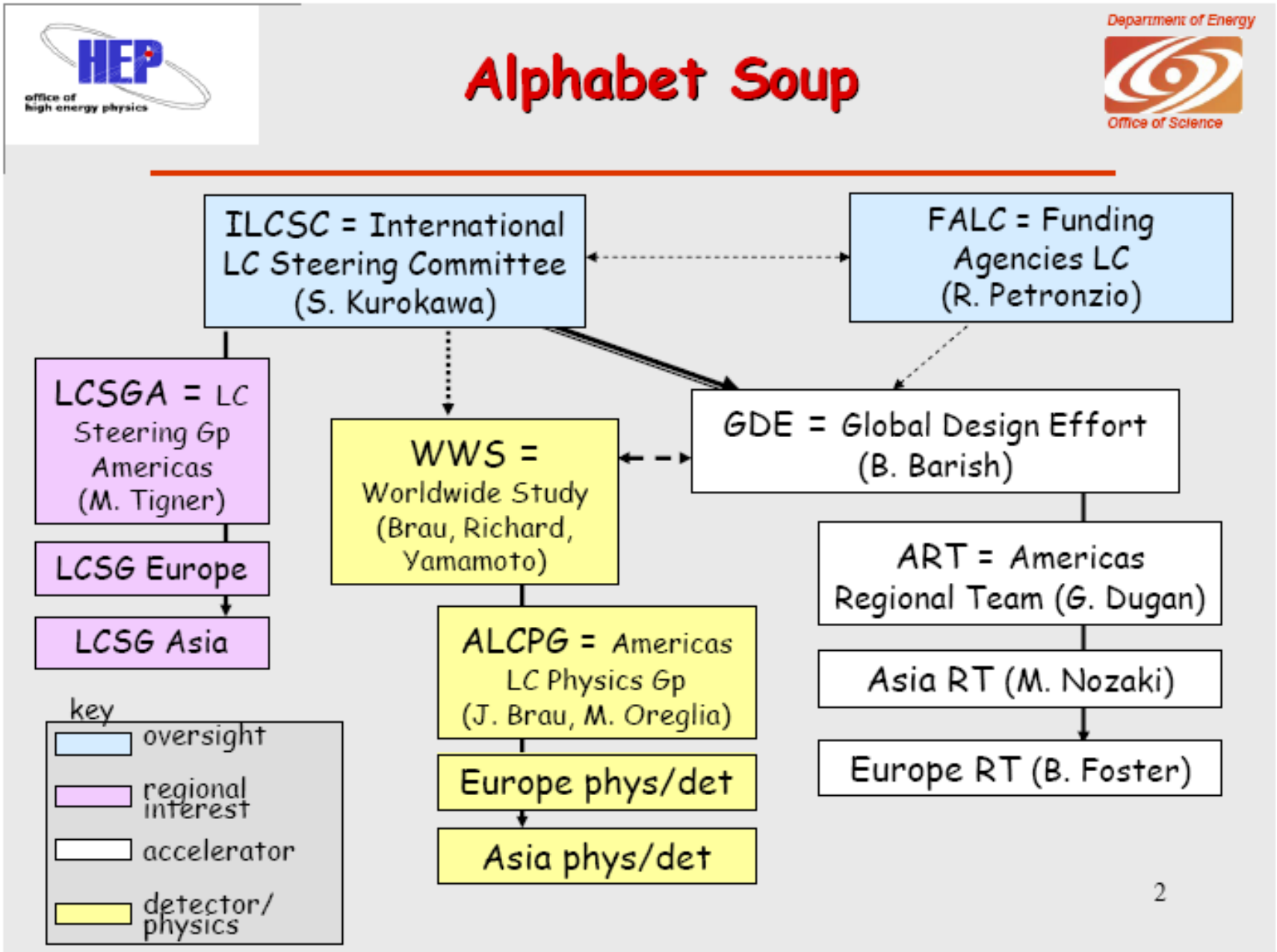
From: ILCSC

The realization of the International Linear Collider has taken major steps forward in recent years. This could not have happened without the leadership taken coherently by the particle physics community, within the framework of ICFA. Unprecedented collaborative steps have been necessary, and the community has adapted successfully to what, in some regions, required major redirections of traditional accelerator R&D effort.

Two major milestones, the selection of the main-linac RF technology and the GDE's announcement of the RDR budget and associated design choices, keep the GDE on pace to complete a construction-ready engineering design for the ILC accelerator-complex by 2010.

Maintaining this momentum requires also that the equivalent strategic decisions and the level of technical maturity for the two ILC detector proposals keep pace with the accelerator schedule. Major progress in this regard is ongoing under the auspices of WWS. In addition, a definite plan together with milestones is needed to have detector designs of a maturity similar to that of the accelerator by 2010. This needs an enhanced effort by the community. ILCSC will support the formation of an International Detector Advisory Group to assist this effort. ICFA looks forward to receiving such a plan from WWS at the June 1, 2007 ILCSC meeting at DESY.

Organizing and Orchestrating
(from Paul Grannis)



Global Organization

- World wide Study (of the Phy. & Det. for Future Lin. e^+e^- Colliders)
  http://physics.uoregon.edu/~lc/wwstudy/
  - Co-chairs: H.Yamamoto, F. Richard, J. Brau
  - Workshops 2004 Paris
    2005 Stanford 397 participants
    2006 Bangalore 326 participants
    2007 DESY
  - Coordinates ILC Detector R&D world-wide
- ALCPG (American Linear Collider Physics Group)
  http://physics.uoregon.edu/~lc/alcpg/
  - Regional workshops (2005 Snowmass (650), 2006 Vancouver)
  - Detector and Physics R&D in the Americas
  - Co-chairs: M. Oreglia, J. Brau
- GDE
  - WWS co-chairs are members
  - R&D Board – C. Damerell (WWS R&D Panel Chair) member

Detector R&D - WWS

- R&D Panel Report
  - http://physics.uoregon.edu/~lc/wwstudy/R&D Report-final.pdf
  - Urgent needs require $32M and 1870 man-years over next 3-5 years - globally
  - Established support over 3-5 years $15M and 1160 man-years - globally
  - Translating man-years to dollars ($100k/man-year)
    - $33M/yr established over 4 years, $22M/yr more required
  - Support notably behind in North America and Japan
- Planning global review of R&D
  - With GDE R&D Board and WWS-OC

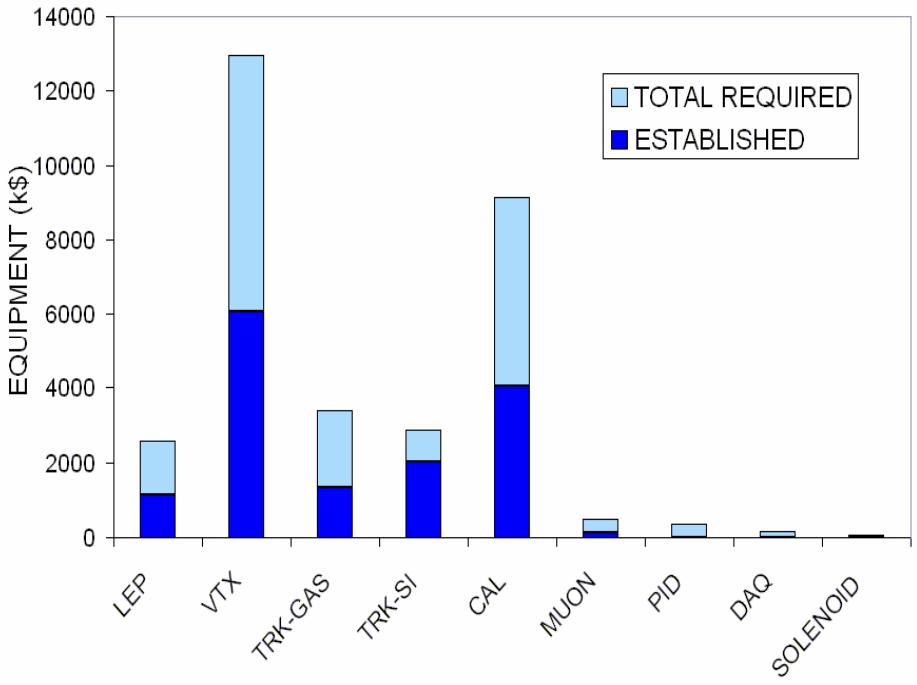
WWS R&D Panel

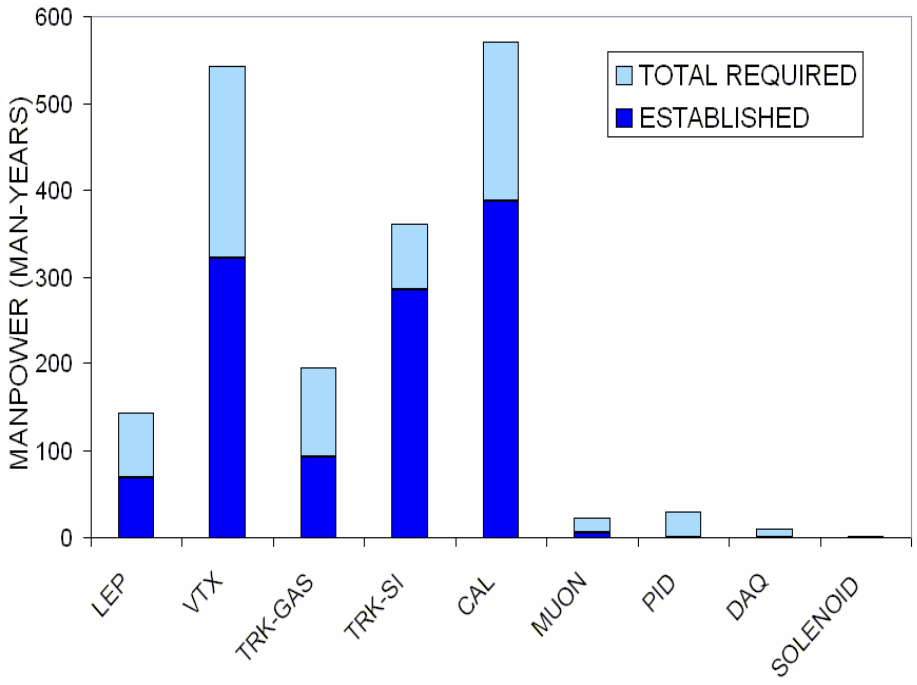
- Created by WWS, Spring 2005
- J-C.Brient, IN3P3 C.Damerell, RAL *(chair)* R. Frey, OREGON
  H.J.Kim, KYUNGPOOK W. Lohmann, DESY D.Peterson, CORNELL
  Y. Sugimoto, KEK T.Takeshita, SHINSHU H.Weerts, ARGONNE
- Input from all R&D groups and "Concepts"
- Compiled global data, analyzed for gaps
- **ILC Detector Research and Development**
  Status Report and Urgent Requirements for Funding
  http://physics.uoregon.edu/~lc/wwstudy/R&D Report-final.pdf

World Wide Study R&D Panel

- The World Wide Study Organizing Committee has established the Detector R&D Panel to promote and coordinate detector R&D for the ILC. Under direction of Chris Damerell
  - https://wiki.lepp.cornell.edu/wws/bin/view/Projects/WebHome

ILC detector R&D needs: funded & needed

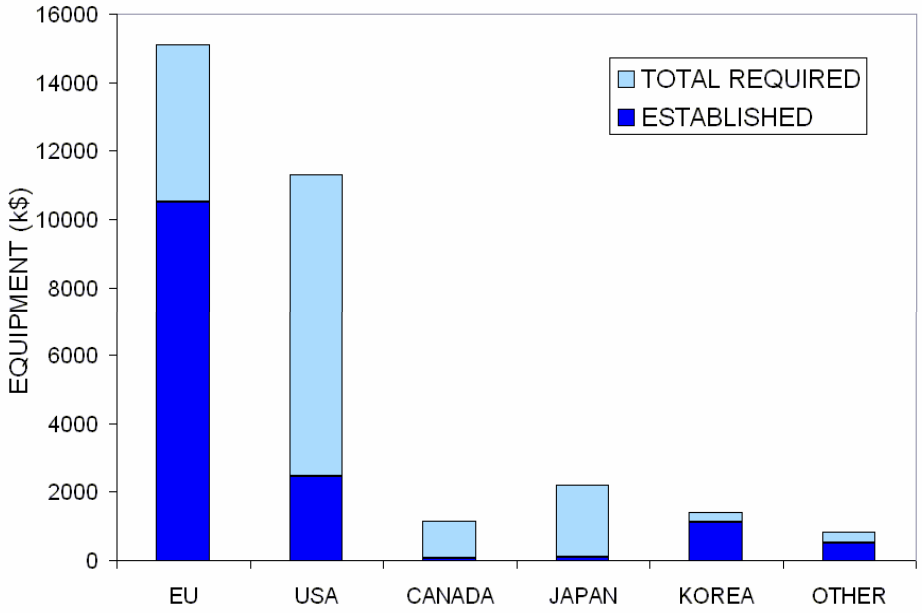


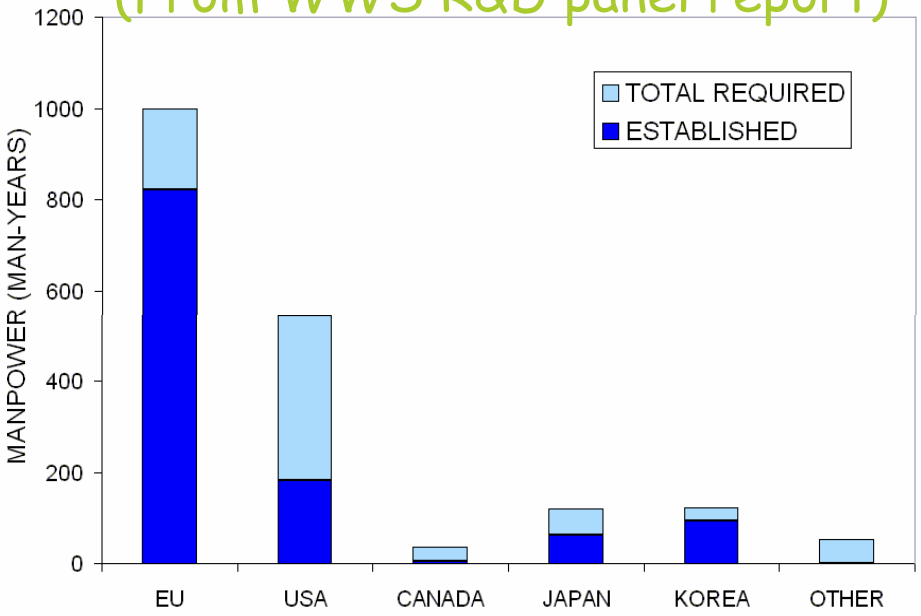


Urgent R&D support levels over the next 3-5 years, by subdetector type. 'Established' levels are what people think they will get under current conditions, and 'total required' are what they need to establish proof-of-principle for their project.

ILC detector funding worldwide

(From WWS R&D panel report)





US groups part of worldwide "Calorimeter" R&D (CALICE), but can not fulfill commitments, because of lack of funding: EM & HAD calorimeter efforts with testbeam

Efforts underway to increase support in US for detector R&D as part of total US ILC R&D funding

The WWS Subsystem Reviews

- WWS and the R&D Panel assess one subsystem status at each ILC workshop
- Place the R&D in global context
- Reviews, recent and future:
  - Beijing (Feb, 2007)--tracking
  - DESY (LCWS) (June 2007)--calorimetry
  - Fermilab (Oct. 2007)--vertexing
  - Asia (tbd 2008)--particle ID, muon tracking, solenoid, beam diagnostics, and DAQ

Testbeam for ILC

- Proposal for multi-year testbeam program for study of high performance calorimeters for the ILC with the CALICE collaboration at Fermilab
  - Summer 2006: Muon system tests, RPC tests
  - Fall 2006: Muon Tailcatcher and RPC readout (slice tests)
  - tentative: summer 2007: CALICE full 1 m^3 EM and HCAL (scint + RPC)

Strong commitments, but limited funding for US partners:

NIU/ANL/UTA/Iowa/UoC: analog/digital hadron calorimetry
SLAC/Oregon/BNL: EMCAL Tracking & Vertex tests
LBL/Purdue/INFN: Monolithic pixel telescope

ILC Detector Test Beam Workshop
January 17 - 19, 2007

https://conferences.fnal.gov/idtb07/

FNAL Facility:

- Momentum between 4 and 120 GeV
- protons, pions, muons, electrons

University Detector R&D in US

American Linear Collider Physics Group

FY06 was the fourth year of support for detector R&D from the agencies since it was first organized by the LCSGA (formerly USLCSG) and the ALCPG

- http://www.hep.uiuc.edu/LCRD/html_files/index.html

FY05 LCDRD funds	FY06 LCDRD funds
$700,000 – DOE	$1,048,000 - DOE
$117,000 – NSF	$ 300,000 - NSF
25 projects	33 projects
25 universities	26 universities/labs

http://physics.uoregon.edu/~lc/lcdrd/fy05-awards.html
http://physics.uoregon.edu/~lc/lcdrd/fy06-awards.html

U.S. LCDRD Program

Topic	FY05 Projects	FY05 Funding $0.817M DOE $0.700M NSF $0.117M	FY06 Projects	FY06 Funding $1.348M DOE $1.048M NSF $ .300M
LEP	5	15.7%	6	12.4%
VXD	1	9.0%	4	12.5%
TRK	8	32.6%	8	36.7%
CAL	9	39.0%	13	42.3%
PID(mu)	2	3.8%	2	5.4%
total prj:	25		33	

WWS R&D Panel reviewed the scope of the global program, and noted there was effort on most topics;

Noteworthy weaknesses: particle ID other than muon, and forward tracking

LCDRD – FY06 – Projects
LEP,VXD, Tracking

Funded FY06 Detector R&D Projects

Luminosity, Energy, Polarization

3.1	John Hauptman	Gas Cerenkov Cal for Lum Measm't
3.4	Eric Torrence	Extraction Line Energy Spectrometer
3.5	Mike Hildreth	BPM-Based Energy Spectrometer
3.6	Yasar Onel	Polarimetry
3.7	William Oliver	Compton polarimeter backgrounds
3.8	Gio. Bonvicini	Incoherent and coherent beamstrahlung

Vertex

4.1	Charlie Baltay	Pixel Vertex Detector
4.2	Marco Battaglia	Monolithic Pixel Detector Module
4.4	Henry Lubatti	Vertex Detector Mech. Structures
4.5	Gary Varner	Pixel-level Sampling CMOS VxDet

Tracking

5.2	Lee Sawyer	GEM-based Forward Tracking
5.7	Dan Peterson	MPGD Readout for a TPC
5.8	Keith Riles	Tracker Simulation and Alignment Sys.
5.10	Bruce Schumm	Long Shaping-Time Silicon Strip
5.13	Stephen Wagner	Reconstruction Studies for SiD Trk
5.15	Eckh. von Toerne	Calor-based Tracking-Long-lived Part.
5.17	Dan. Bortoletto	Thin silicon sensors
5.19	Dan Peterson	TPC signal digitization

LCDRD – FY06 – Projects
Calorimetry, PID/Muons

Calorimetry		
6.1	Vishnu Zutshi	Scintillator-based Hadron Calorimeter
6.2	Uriel Nauenberg	Scintillator EM/Had Cal and BeamCal
6.4	Usha Mallik	Particle Flow Studies
6.5	Raymond Frey	Silicon-tungsten EM calorimeter
6.6	Andy White	Digital Hadron Calorimetry w/ GEMs
6.9	Dhi. Chakraborty	Particle-Flow Algorithms and Sim.
6.10	Graham Wilson	ECAL Concepts for Particle Flow
6.14	José Repond	Had Cal with Digital Readout (RPCs)
6.18	John Hauptman	New Concept Detector
6.19	A.J.S. Smith	Calorimeter and Muon ID
6.20	Tianchi Zhao	Scint/Cheren Rad Plates Cal w/ SiPMs
6.21	Satish Dhawan	Modular DAQ Development
6.22	Gerry Blazey	Design and Prototyping of a Scintillator-based Tail-catcher/Muon Tracker
Muon		
7.2	Paul Karchin	Scintillator Based Muon System
7.5	Robert Wilson	Geiger-Mode APDs for Muon Sys.

FY07 University Detector R&D in US

We were anticipating increased funding in FY07 – discussed $3M with agencies
(meanwhile, a 5 year R&D plan being developed by ALCPG)

Encouragement led to developing a proposal early for a few (9) high priority, urgent efforts (~$1M)
followed by annual round for another $2M

Supplemental proposal prepared this summer
1 – call for abstracts (received 22)
2 – selection of highest priorities/urgent needs (9)

December 15, 2006 – status reports and new project descriptions due
May – awards announced - revised budgets/descriptions
September, 2007 – funded year begins

http://physics.uoregon.edu/~lc/lcdrd/supplement-06a.html

We are reviewing proposals as I speak

- LEP: Eric Torrence, Mike Woods, Tom Mattison
- VTX: John Jaros, Ron Lipton
- TRK: Bruce Schumm, Dean Karlen, Keith Riles
- CAL: Andy White, David Strom, Jose Repond
- MUON: Bill Morse, Bob Tschirhart
- SIMULATIONS: Norman Graf, Dhiman Chakraborty, Patty Mcbride

Then Brau, Weerts and I will submit these ALCPG reviews to the agencies, who still consult their own reviewers

We believe the ALCPC review assesses urgency seen from ILC

FY06 review

- 36 projects for FY06 from univ. and "small" labs
- $2.828 M – limited by realization of limited availability of funds
- 24 continuations of efforts supported in FY05
- 12 requests for new projects.

- Review teams of two or three experts looking at each of the specific topics
- Executive committee of six independently reviewing all of the proposals.
  - Conflict of interest was considered carefully, and dealt with to avoid inappropriate influence in the review process.
- Evaluation of each proposal for the following factors:

  RATING: overall quality of the research plan and goals, and the strength of the team to carry out the objectives (excellent, good, satisfactory, poor)

  RELEVANCE: the relevance of the project to the linear collider detectors (critical, important, useful, irrelevant)

  CONCEPTS: the importance of the work (except for the LEP - luminosity, energy, polarization proposals) to an active linear collider detector concept (critical, important, useful, irrelevant)

critical that project contributes to advancing detector technology for specific sub-detector capabilities of priority for the ILC physics program

ALCPG+DOE+NSF 5-Yr Plan

But when we summarized the program in Germantown just after EPP2010, They told us we were not asking enough to get the job done!

Since then, we have been working to devise a realisic 5-Yr US plan

"Top Down" ILC US detector R&D program Version - AR 0.12

TOTAL		FY07 Cost(K$)	FY08 Cost(K$)	FY09 Cost(K$)	FY10 Cost(K$)	FY11 Cost(K$)	Total Cost
LEP	TOTAL	$ 1,684	$ 1,684	$ 1,684	$ 2,916	$ 2,916	$ 10,883
VXD	TOTAL	$ 2,440	$ 2,800	$ 3,440	$ 3,650	$ 3,650	$ 15,980
Si-tr_tot	TOTAL	$ 1,025	$ 1,215	$ 1,375	$ 1,330	$ 1,280	$ 6,225
TPC	TOTAL	$ 822	$ 1,519	$ 1,315	$ 1,566	$ 943	$ 6,165
ECALall	TOTAL	$ 1,175	$ 1,490	$ 1,825	$ 1,630	$ 1,485	$ 7,605
HCALall	TOTAL	$ 4,084	$ 3,631	$ 2,404	$ 2,110	$ 1,850	$ 14,079
Forward	TOTAL	$ 565	$ 793	$ 813	$ 813	$ 788	$ 3,772
Solenoid	TOTAL	*$ 452*	*$ 724*	*$ 1,004*	*$ 1,114*	*$ 702*	*$ 3,996*
MUON	TOTAL	*$ 661*	*$ 1,105*	*$ 1,141*	*$ 1,224*	*$ 1,281*	*$ 5,412*
							$ -
Algo & Reco	TOTAL	*$ 1,570*	*$ 1,630*	*$ 1,630*	*$ 1,630*	*$ 1,630*	*$ 8,090*
							$ -
							$ -
Back End Elec	TOTAL	*$ 205*	*$ 375*	*$ 660*	*$ 920*	*$ 1,020*	*$ 3,180*
INFRA_EE	TOTAL	*$ 182*	*$ 188*	*$ 193*	*$ 199*	*$ 205*	*$ 968*
Test_FNAL	TOTAL	$ 970	$ 1,270	$ 870	$ 1,255	$ 1,515	$ 5,880
Test-SLAC	TOTAL	$ 525	$ 525	$ 525	$ 625	$ 625	$ 2,825
US program		**$ 16,360**	**$ 18,948**	**$ 18,879**	**$ 20,982**	**$ 19,890**	**$ 95,060**
Mngmt reserve	10%	$ 1,000	$ 1,500	$ 2,000	$ 2,500	$ 2,000	$ 9,000
US program	TOTAL	**$ 17,360**	**$ 20,448**	**$ 20,879**	**$ 23,482**	**$ 21,890**	**104060**

Bottoms up numbers for reference

Total Cost	Savings..
$ 17,850	$ 6,968
$ 21,141	$ 5,161
$ 7,075	$ 850
$ 7,410	$ 1,245
$ 11,700	$ 4,095
	$ -
$ 17,020	$ 2,941
	$ -
$ 3,785	$ 13
$ 3,246	$ (750)
$ 6,292	$ 880
$ -	$ -
$ 22,000	$ 13,910
$ -	$ -
$ -	$ -
$ 3,180	$ -
$ 968	$ -
$ 6,440	$ 560
$ 3,240	$ 415
128106	$ 33,047

Weekly R&D Tele-meetings

- Replaces bi-weekly LCD study group organized by SLAC
  - http://www-sldnt.slac.stanford.edu/nld/meetings/index.htm

  and Fermilab weekly ILC R&D meeting

- ALCPG Physics and Detector R&D Meeting
  - http://ilcagenda.cern.ch/categoryDisplay.py?categId=87
  - Weekly meeting to exchange results and information about ILC physics studies and detector R&D
  - open to everybody
  - organized jointly by Fermilab & SLAC
  - Thursdays, 11 AM PDT, 1 PM CDT

Future Meetings

- **LHC Early Phase for ILC** — **12-14 April 2007**
  - **Fermilab** — http://conferences.fnal.gov/ilclhc07/
- **LCWS 2007 (joint with GDE)** — **30 May – 3 June 2007**
  - **DESY/Hamburg** — http://lcws07.desy.de/
- ***ALCPG (joint with GDE)*** — **22-26 October 2007**
  - **Fermilab**

Acronymia

- ACFA
- ALCPG
- ART
- CALICE
- CDR
- DCR
- DOD
- DOE
- DREAM
- ECFA
- EDR
- FALC
- GDE
- GLD
- HEPAP
- ICFA
- IDAG
- ILCSC
- LCDRD
- LCSGA
- LDC
- LHCILC
- MTBF
- NSF
- PFA
- RDR
- SiD
- SiLC
- TDR
- TESLA
- WWS