

A tall, modern glass skyscraper with a blue-tinted facade, identified as Hotel Inter-Burgo. The building has a series of flags along its base and a satellite dish on the roof. In the foreground, there is a street with traffic lights, trees, and a lower building with 'bobos' signage. The sky is clear and blue.

ACFA Summary

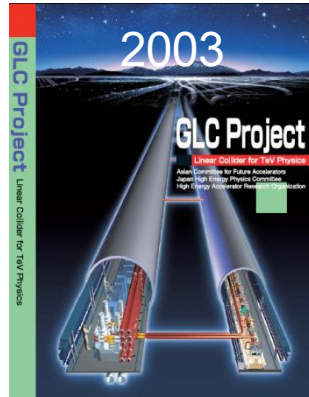
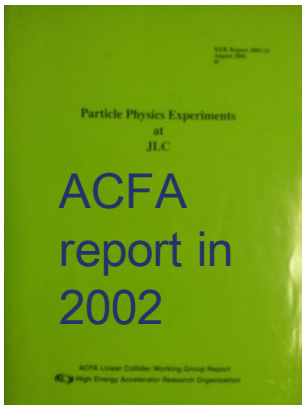
Akiya Miyamoto, KEK
KILC12
26 April, 2012

ACFA Sessions

- 5 talks in ACFA plenary
- 5 parallel sessions,
 - ◆ Physics and Benchmarking : 22 talks
 - ◆ Tracking and vertexing : 8 talks
 - ◆ Calorimeter/Muon/DAQ : 12 talks
 - ◆ Software : 10 talks
 - ◆ MDI : 19 talks
- Summary sessions : 30 min. ago.

Summary remark, not a summary of summary talks.

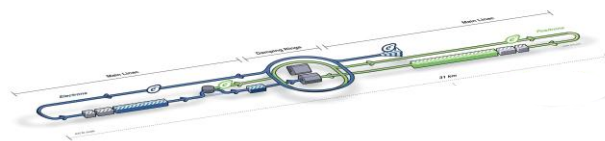
ACFA statement in 1998 initiated a formation of ACFA LCWG and a series of ACFA workshop



ITRP

European activity

North American activity



ILC RDR
2007

prospects in 2006

GDE Timeline (by Barry Barish)

2005

2006

2007

2008

2009

2010

→ 2012

Global Design Effort

Project

→ **Baseline configuration**

→ **Reference Design**

→ **Technical Design**

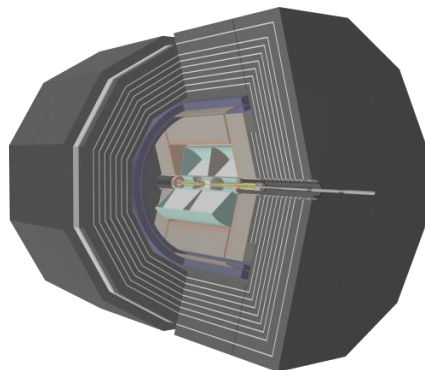
**LHC
Physics**

→ **ILC R&D Program**

→ **Bids to Host; Site Selection;**

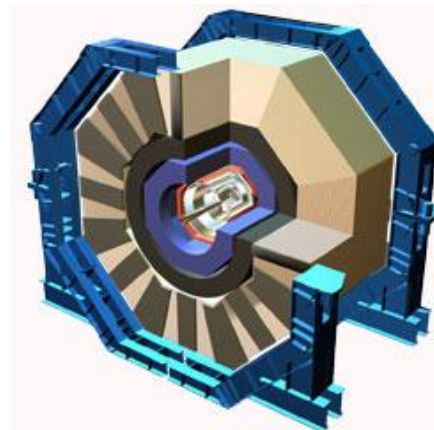
→ **International Mgmt**

Detector concepts (DCR)



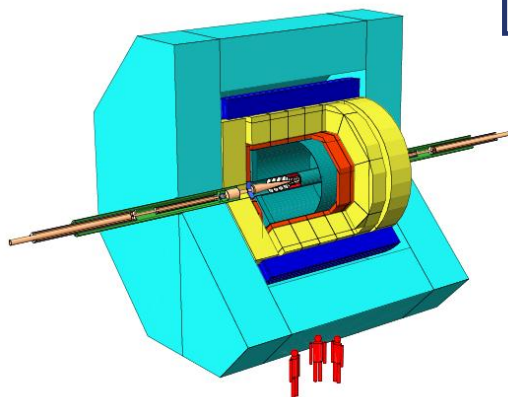
GLD

Small cell CAL.
Gaseous Tracker
3T
Asian based



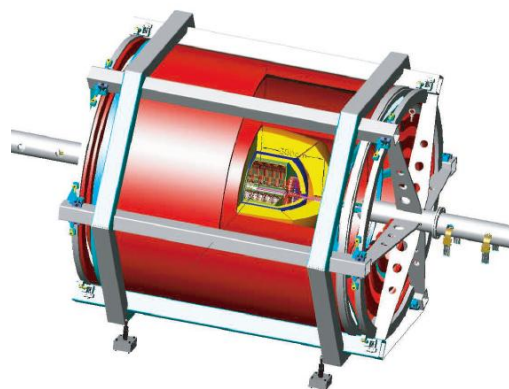
SiD

Small cell CAL.
Silicon Tracker
5T
NA based



LDC

Small cell CAL.
Gaseous Tracker
4T
European based

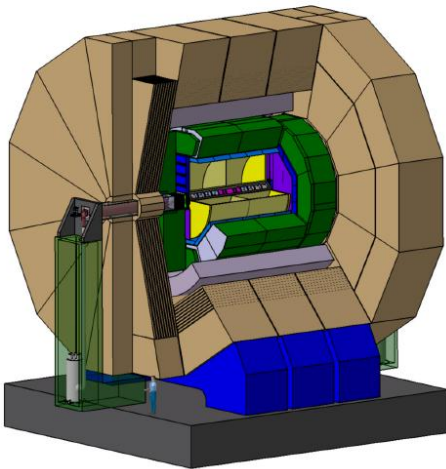


4th

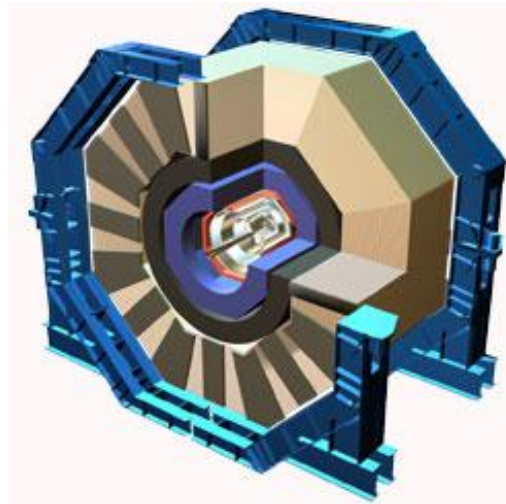
Dual RO CAL.
Gaseous Tracker
3.5T (Dual Sol.)

With the LOI a group expresses its interest to develop a design for a detector at the ILC. LOIs will form the basis on which two groups will be invited to further develop and detail their plans and eventually submit an engineering design report, EDR.

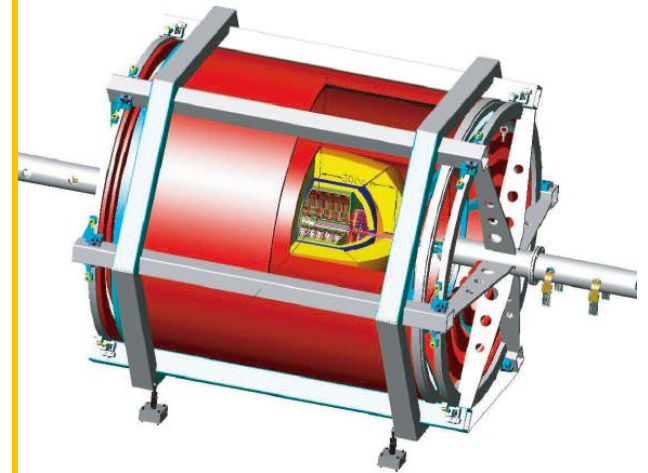
open process to develop detector concepts



ILD



SiD



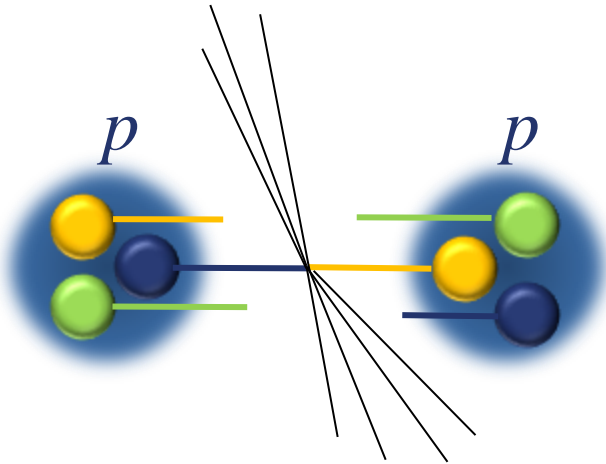
4th

validated by IDAG in 2009 → 2012 DBD

Pushing e^+e^- Linear Collider

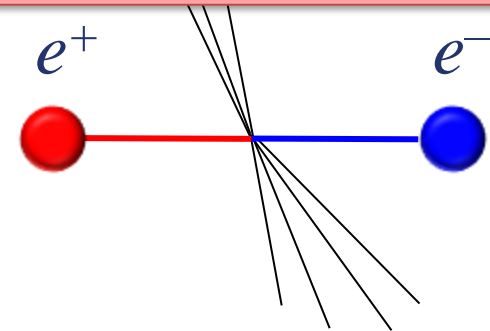
■ Characteristics of e^+e^- linear collider

- ◆ elementary particle collision
- ◆ Lower background
- ◆ polarized beam, energy scan
- ◆ many options: $\gamma\gamma$, $e\gamma$, e^-e^- , Zpole



Distinct signals at high energy
through collisions of colored particles

*Time to push
 e^+e^- energy frontier !*



Precise studies with a well controlled
environment

Two essential wheels to unveil the secret of the world of elementary particles

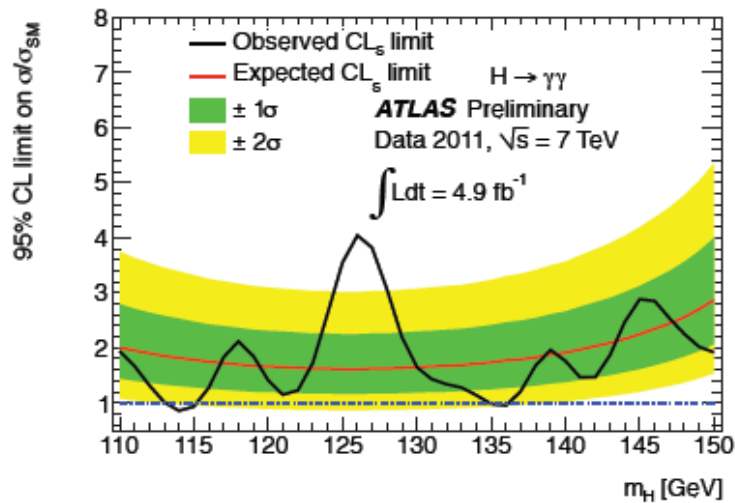
KILC12 Workshop Charge

The ACFA workshop will be devoted to the study of the physics case for high energy linear electron-positron colliders, taking into account the recent results from LHC, and to review the progress in the detector. This meeting will be the important milestone to start writing the Technical Design Report for the accelerator and the Detailed Baseline Design Report for the detectors to be completed within 2012, including the review of the ILC cost estimation.

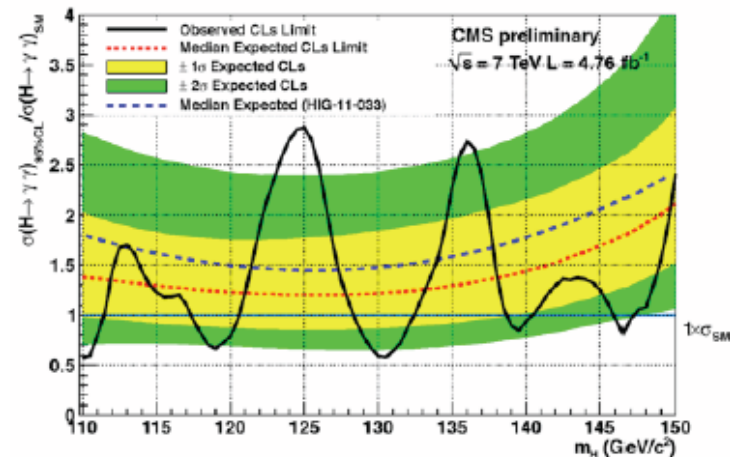
Emerging low mass Higgs

Higgs to $\gamma\gamma$

ATLAS
arXiv:1202.1414



CMS-HIG-12-001



- **ATLAS**
 - Observed exclusion [113-115], [134.5-136]
- **CMS**
 - Observed exclusion [110.0-111.0], [117.5-120.5], [128.5-132.0], [139.0-140.0]

Higgs is a window to new physics

- Higgs is the elementary scalar particle.
 - ◆ Condensed in vacuum. Responsible for EWSM and mass generation to gauge bosons, quarks and leptons.
- Higgs sector in the standard model is hardly constrained.

Higgs and New Physics

Kanemura

What is the essence of the Higgs field?

Higgs nature



New Physics scenario

- Elementary Scalar?
- Composite?
- Pseudo NG Boson?
- A gauge field in Extra D?
-

Supersymmetry

Dynamical Symmetry Breaking

Little Higgs

Gauge-Higgs unification

.....

Each model has a specific Higgs sector

Higgs sector = Window to new physics

- Many possibilities of new physics, which expect deviations from the SM branching ratios. (M.Peskin)

Essential to measure Higgs property and pin down Higgs sector

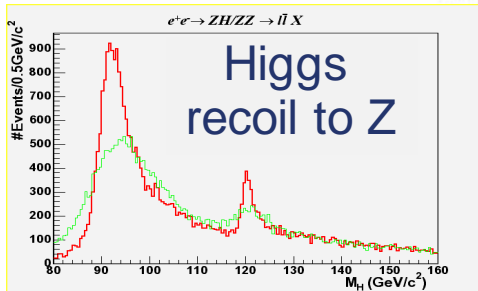
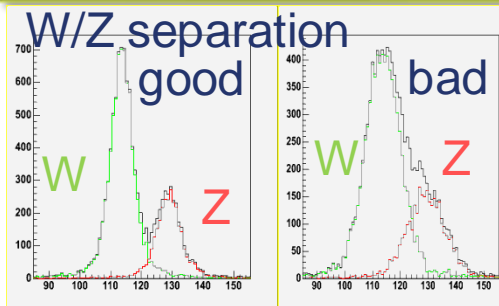
Rich physics program

- top physics :
 - ◆ M_{top}
 - ◆ anomalous couplings
- Anomalous gauge boson couplings
- Searches for new particles
 - ◆ SUSY partners of top, bottom, Higgs, Leptons,
 - ◆ heavy quarks, new gauge bosons,
 - ◆ un-expected

relatively clean e^+e^- collider environment is suitable
for studies of small signals
which are hard to do at hadron colliders

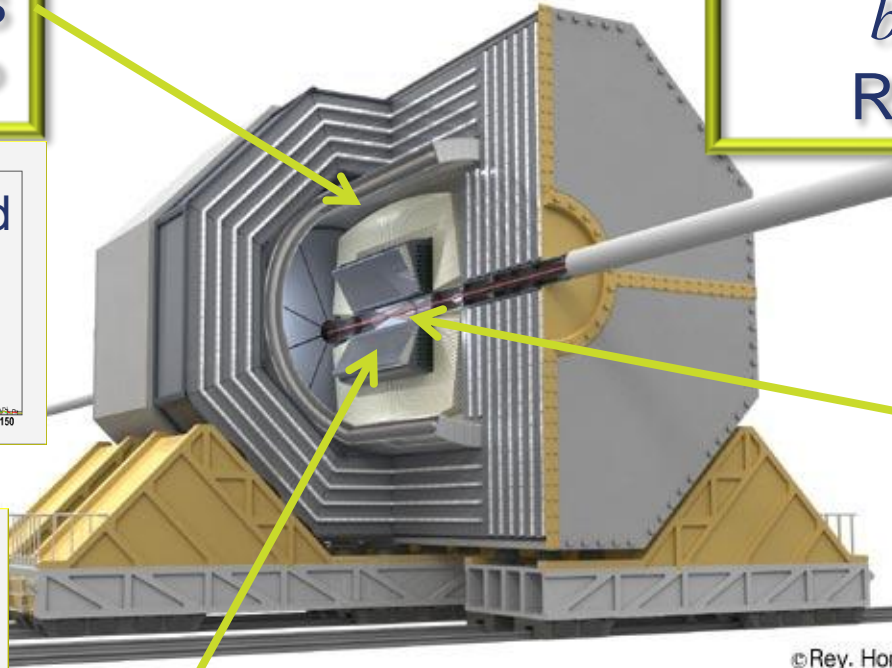
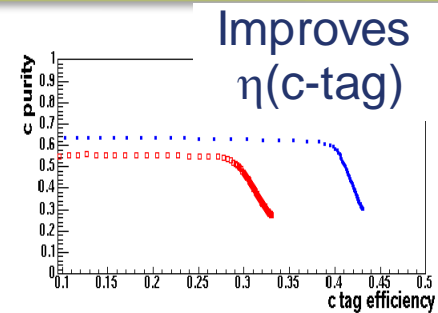
Detector challenge

Calorimeter:
Neutral particles
 $\Delta E/E < 1/2$ of LEP

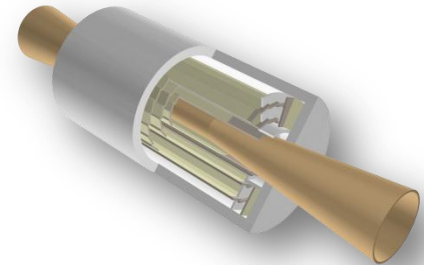


Tracker: Charged particles
 $\Delta p_t/p_t : 1/10$ of LHC

Vertex Detector
 $b/c/\tau$ tagging
 $R_{vtx} < 1/5$ LHC



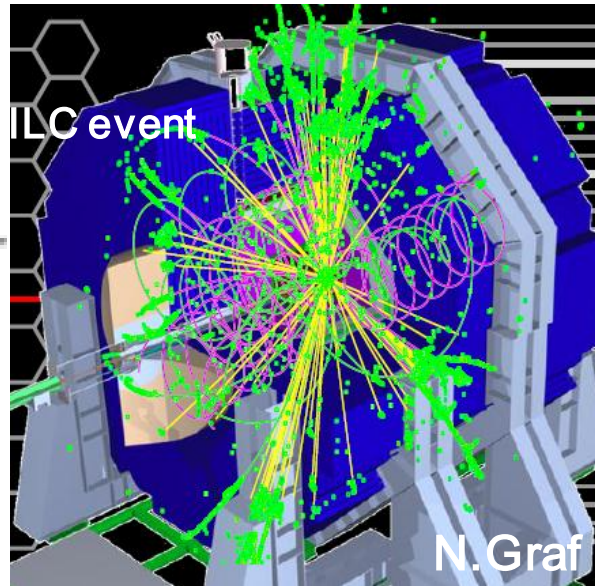
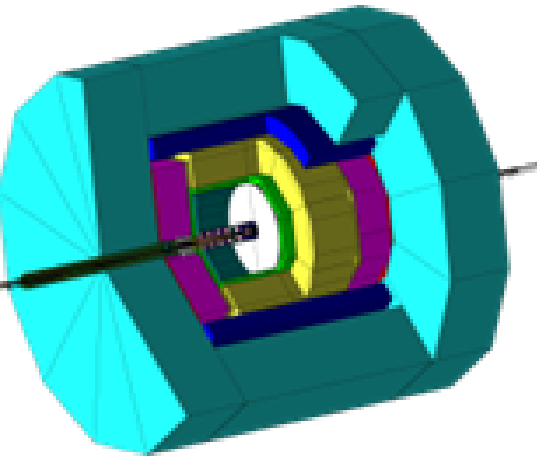
©Rey. Hori



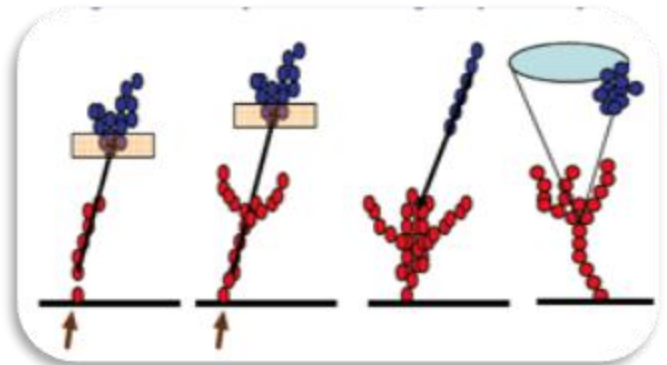
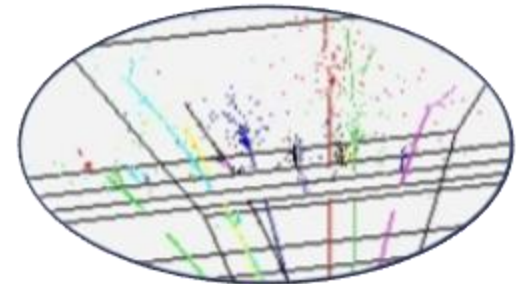
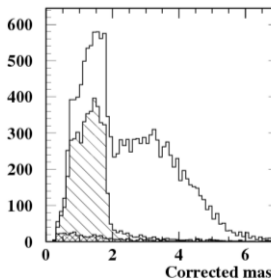
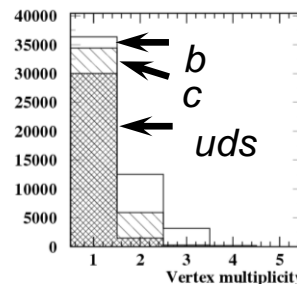
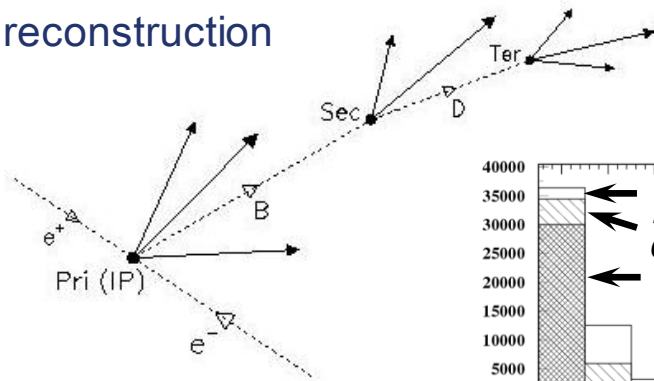
Software challenge

Challenging perfect reconstruction of ILC events

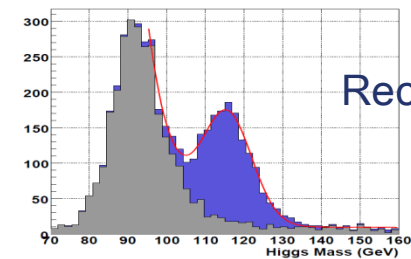
Geant4 simulation



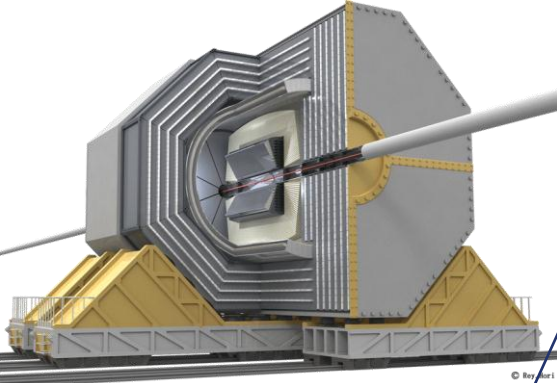
Vertex reconstruction



Cal hits and track matching: PFA



Reconstruct Higgs in jet-mode



ILD

LOI to DBD



LP2 endplate (D. Peterson)



PCMAG



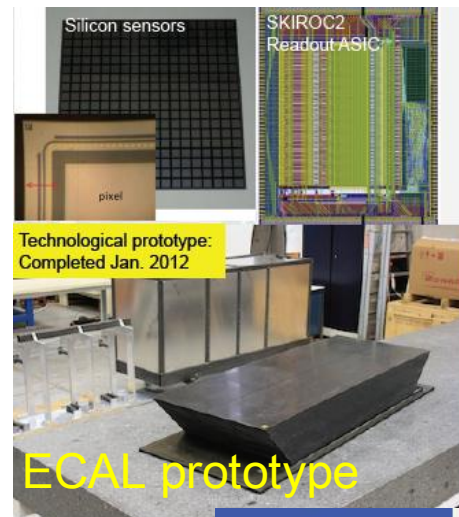
New Micromegas module with T2K electronics

TPC BT



Slab

AHCAL slab



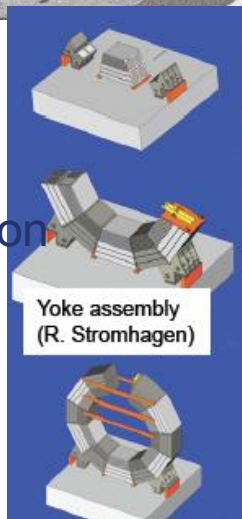
Silicon sensors

SKIROC2 Readout ASIC

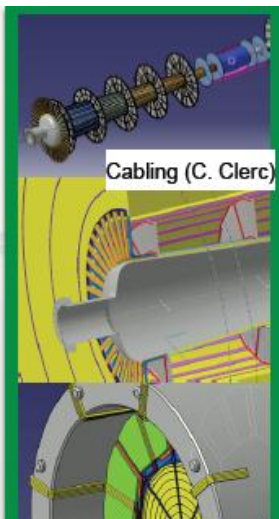
pixel

Technological prototype: Completed Jan. 2012

ECAL prototype

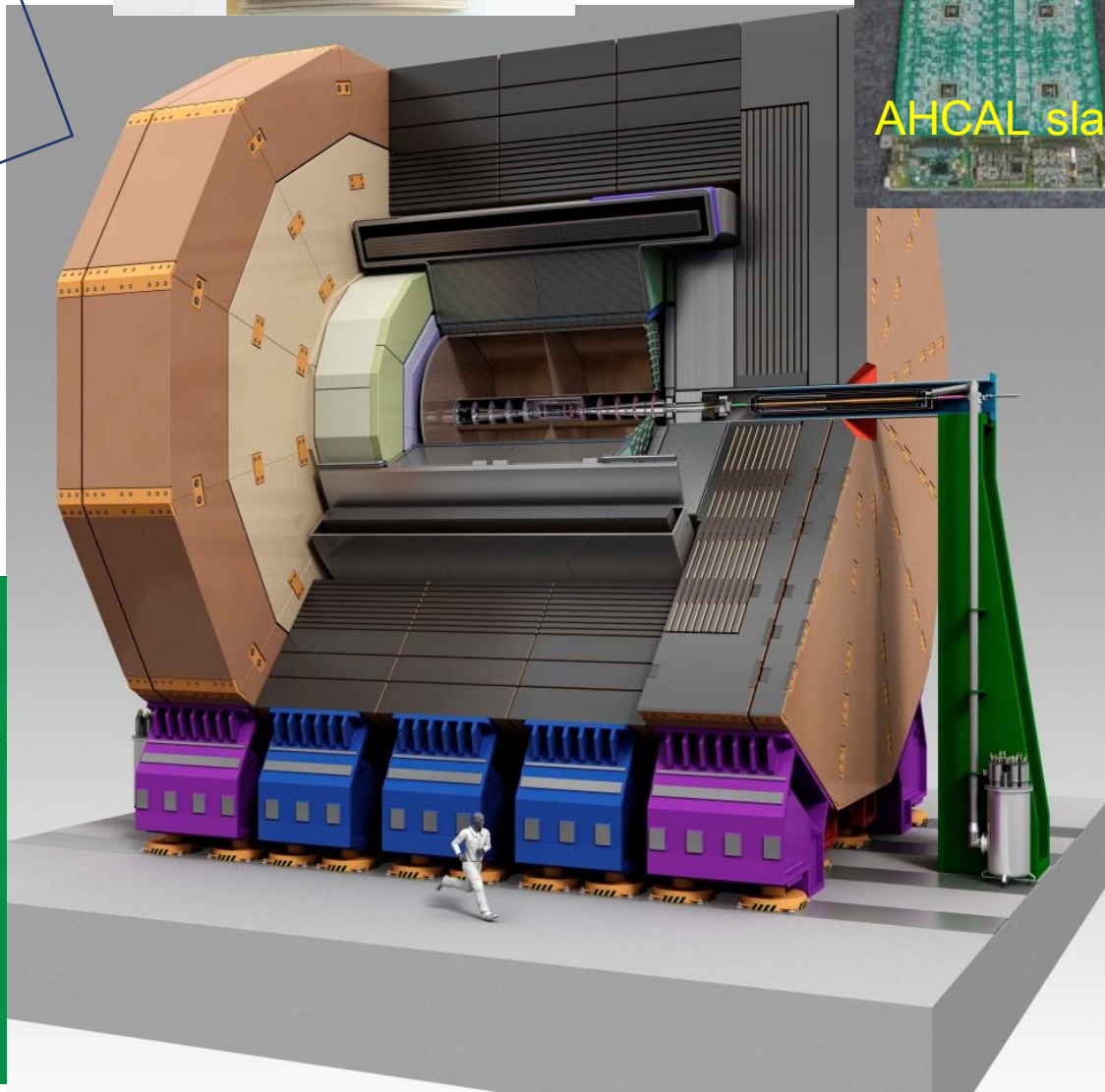


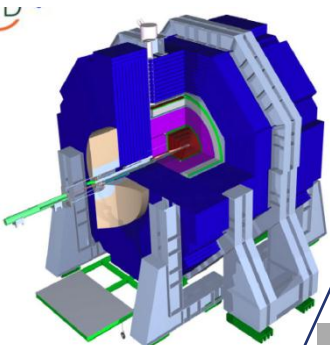
Yoke assembly (R. Stromhagen)



Cabling (C. Clerc)

Integration

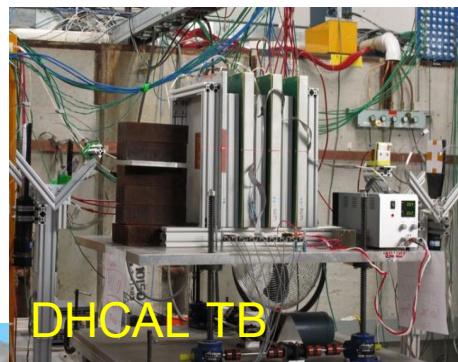
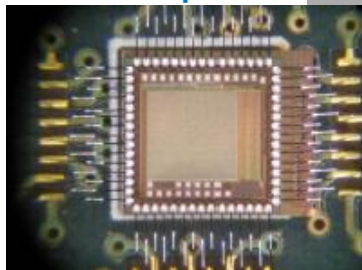




SiD

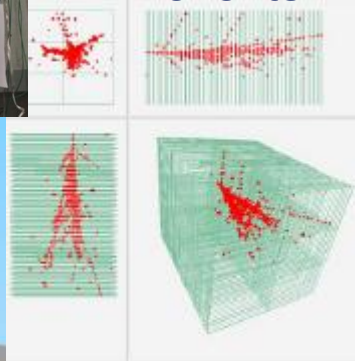
LOI to
DBD

VIP chip

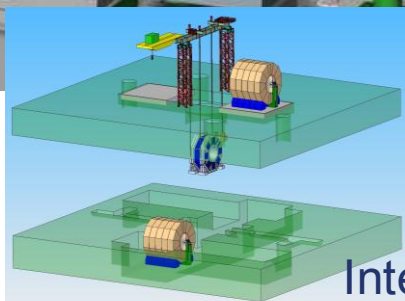
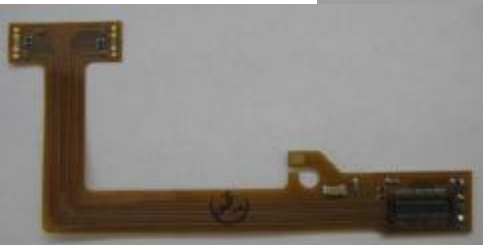
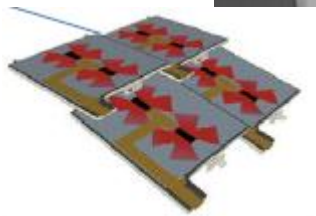
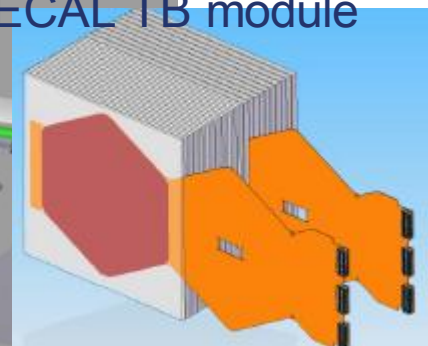


DHCAL TB

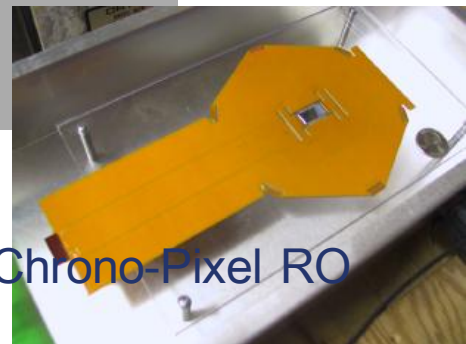
TB events



ECAL TB module



Integration



Chrono-Pixel RO

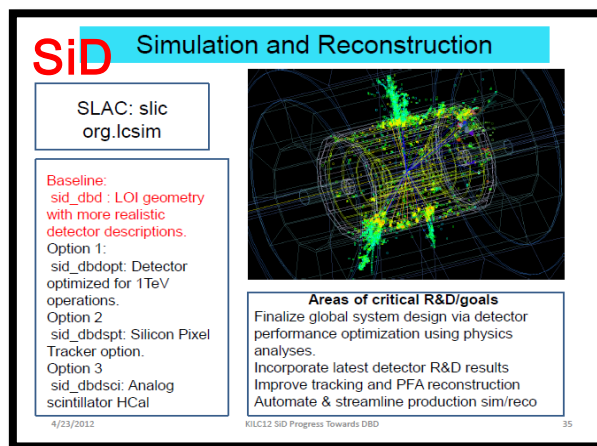
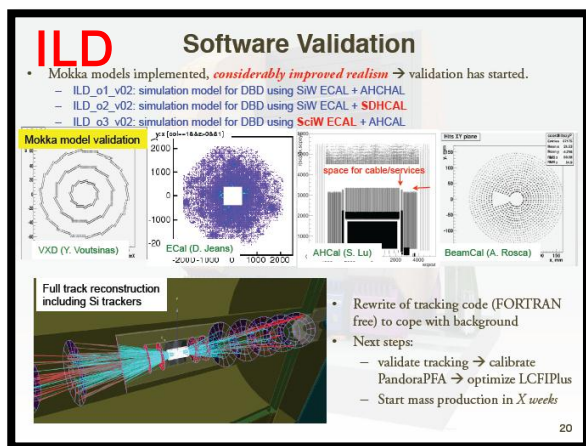
DBD Benchmark studies

■ Processes

- ◆ 1 TeV 1 ab^{-1} : $\nu\bar{\nu}h$, $t\bar{t}h$, WW with BKGs of $2f$, $4f$, $6f$, and $\gamma\gamma$, $e\gamma$, pairs
- ◆ 500 GeV : $t\bar{t}$ (as one of LOI)

■ Status :

- ◆ Common gen. : done except 1 TeV $\gamma\gamma$ lowPt hadrons and 500 GeV
- ◆ O(10)M events of GRID based MC production will start as soon as simulation and reconstruction codes are fixed.



■ Plan :

- ◆ MC Production : 2~3 months work on the world wide ILC VO GRID
- ◆ Analysis groups are waiting samples to be ready for analysis

Cooperation with CLIC

Similar detector needs and concepts based on ILC

physics aims => detector needs

★ momentum resolution:

e.g. Smuon endpoint

Higgs recoil mass, Higgs coupling to muons

$$\sigma_{p_T}/p_T^2 \sim 2 \times 10^{-5} \text{ GeV}^{-1}$$

★ jet energy resolution:

e.g. W/Z/h di-jet mass separation

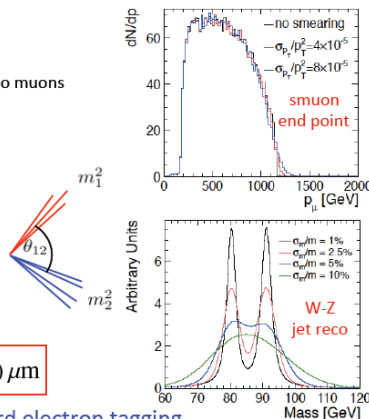
$$\frac{\sigma_E}{E} \sim 3.5 - 5\% \quad (\text{for high-E jets})$$

★ impact parameter resolution:

e.g. c/b-tagging, Higgs BR

$$\sigma_{r_\phi} = 5 \oplus 15/(p[\text{GeV}] \sin^2 \theta) \mu\text{m}$$

★ angular coverage, very forward electron tagging



Lucie Linssen, KILC workshop Daegu, April 23 2012

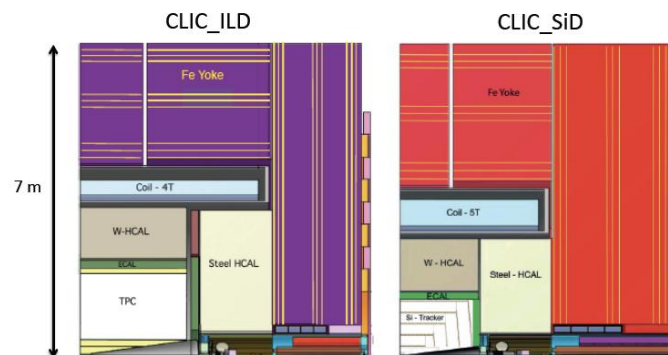
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CLIC_ILD and CLIC_SiD

Two general-purpose CLIC detector concepts

Based in initial ILC concepts (ILD and SiD)

Optimised and adapted to CLIC conditions

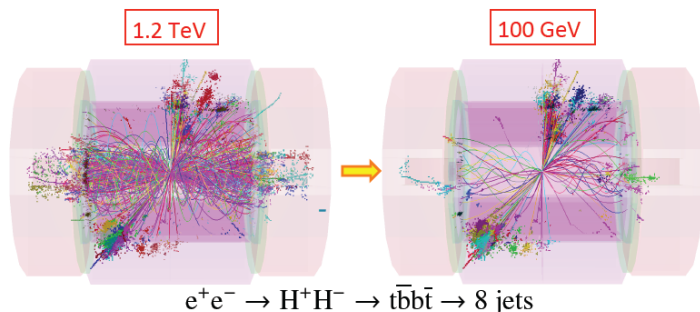


Lucie Linssen, KILC workshop Daegu, April 23 2012

22

L.Linssen

combined p_T and timing cuts



$e^+e^- \rightarrow H^+H^- \rightarrow t\bar{b}b\bar{t} \rightarrow 8 \text{ jets}$

1.2 TeV background in reconstruction time window

100 GeV background after tight cuts

Lucie Linssen, KILC workshop Daegu, April 23 2012

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Challenged a severe experimental conditions and obtained encouraging results

CLIC tools and experiences are/will be beneficial for ILC community

Busy year, many milestones

- May 16: European Strategy Meeting @ PARIS
- May 23-25 : ILDWS @ Kyushu, Japan
- July 4-10 : ICHEP 2012, first results from 2012 LHC running
- Soon after ICHEP 2012: **Public draft of Physics panel.**
comments and signatures will be asked.
- **July 31 : Deadline for submission of materials to the Cracow meeting**
updated version of physics panel document
- Aug 21-23: SiD WS@SLAC
- Sept. 11-13: Cracow meeting
- **Sep. 21 : DBD first draft**
- Oct.22-26: LCWS2012 @ Arlignton
- **End Nov. : Polished DBD draft given to PAC**
- **Dec. 21: Final DBD given to PAC**

- June 2013: Snowmass



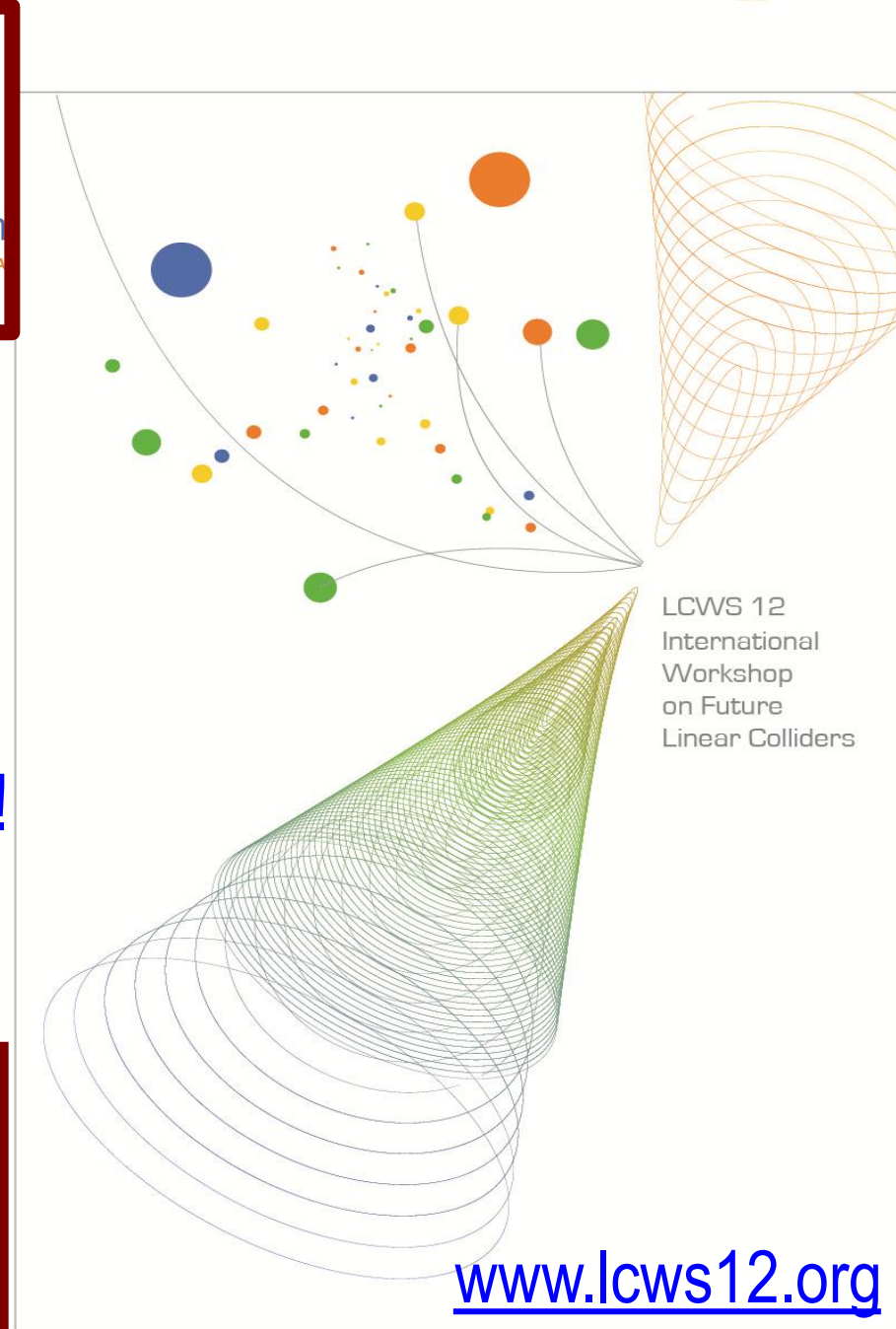
LCWS2012

Oct. 22 – 26, 2012

University of Texas at Arlington

Registration to open May 1 (US time)!

See you all in Arlington, Yee-Ha!



Conclusion

LHC result is emerging

Approaching the end of DBD era

Let's

Complete DBD as planned

Be ready for the next step

A step to realize a project