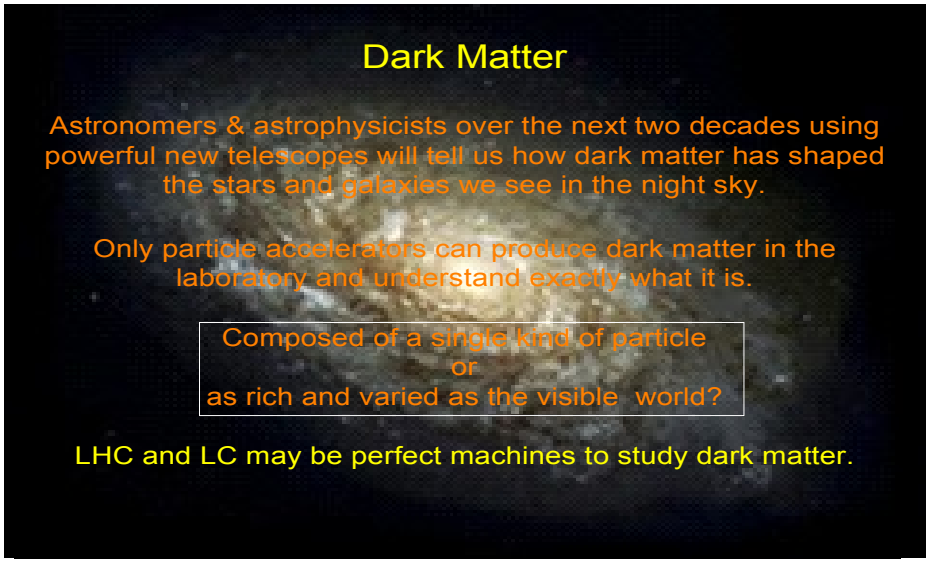
Review of ECFA 2008
Warsaw, June 9-12

4 days of meetings and talks,
ca 200 registrants
first meeting since a while without the GDE (which met in Dubna the week before)

The Theme

Physics: two main topics:
- the dark universe
- the ILC in the area of early LHC data



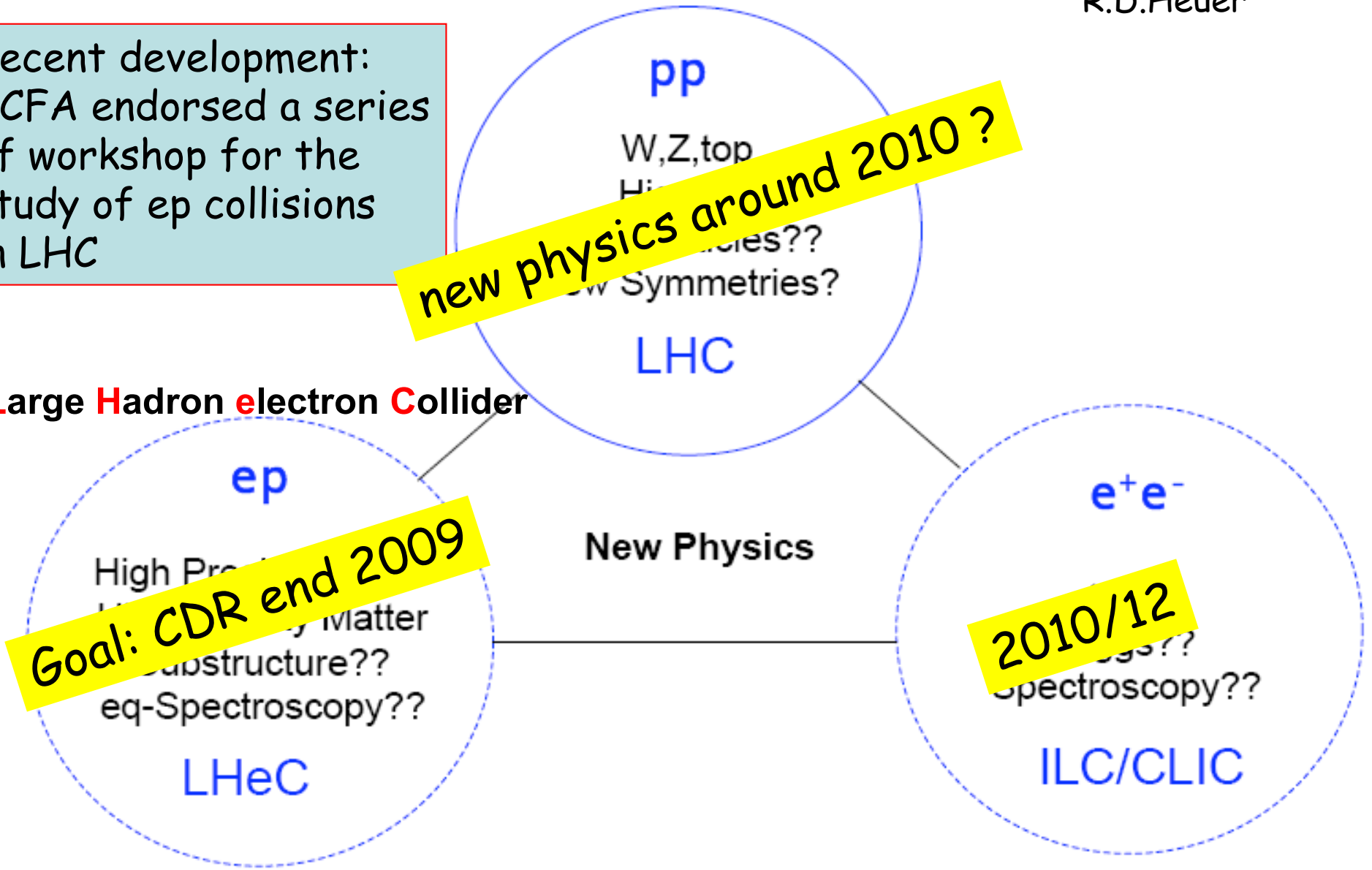
Detector
- the way forward towards LOI's
- the new organization of the detector community:
  - the age of the research director

Accelerators in the Future

R.D.Heuer

Recent development:
ECFA endorsed a series of workshop for the study of ep collisions in LHC

Large Hadron electron Collider



The European Strategy

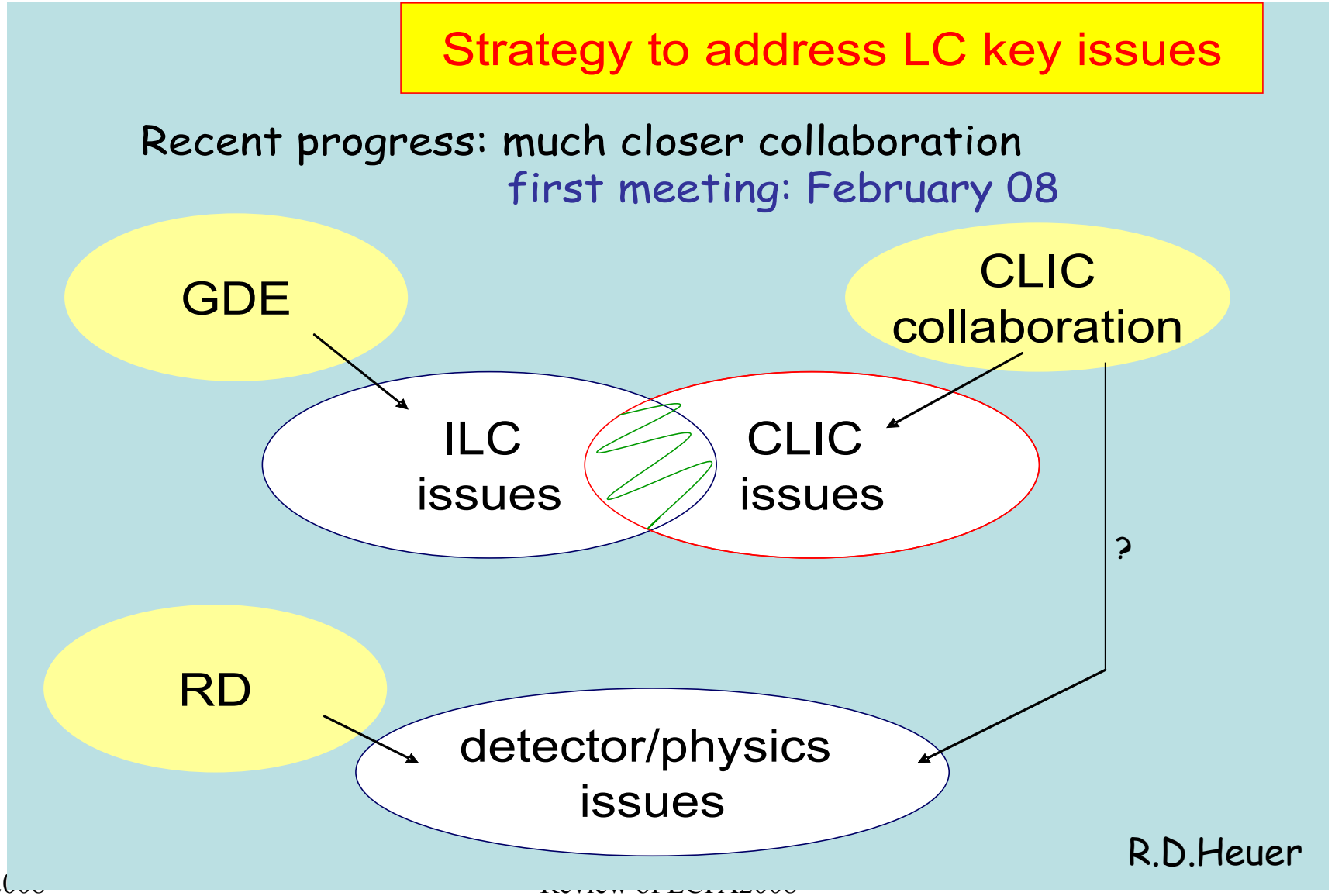
1. LHC

2. sLHC

4. In order to be in the position to push the energy and luminosity frontier even further it is vital to strengthen the advanced accelerator R&D programme; *a coordinated programme should be intensified, to develop the CLIC technology and high performance magnets for future accelerators, and to play a significant role in the study and development of a high-intensity neutrino facility.*

5. It is fundamental to complement the results of the LHC with measurements at a linear collider. In the energy range of 0.5 to 1 TeV, the ILC, based on superconducting technology, will provide a unique scientific opportunity at the precision frontier; *there should be a strong well-coordinated European activity, including CERN, through the Global Design Effort, for its design and technical preparation towards the construction decision, to be ready for a new assessment by Council around 2010.*

Cooperation with CLIC



Global R&D Plan
Consensus in SCRF-TA

Calender Year		2008	2009	2010	2011	2012
EDR	TDP1				TDP-II	
S0: **Cavity Gradient (MV/m)**	30	35 (> 50%)				35 (>90%)
KEK-STF-0.5a: 1 Tesla-like/LL						
KEK-STF1: 4 cavities						
S1-Global (AS-US-EU) 1 CM (4+2+2 cavities)			CM (4_{AS}+2_{US}+2_{EU}) <31.5 MV/m>			
S1(2) -ILC-NML-Fermilab CM1- 4 with beam			CM2	CM3	CM4	
S2:STF2/KEK: 1 RF-unit with beam			Fabrication in industries		STF2 (3 CMs) Assemble & test	

Physics

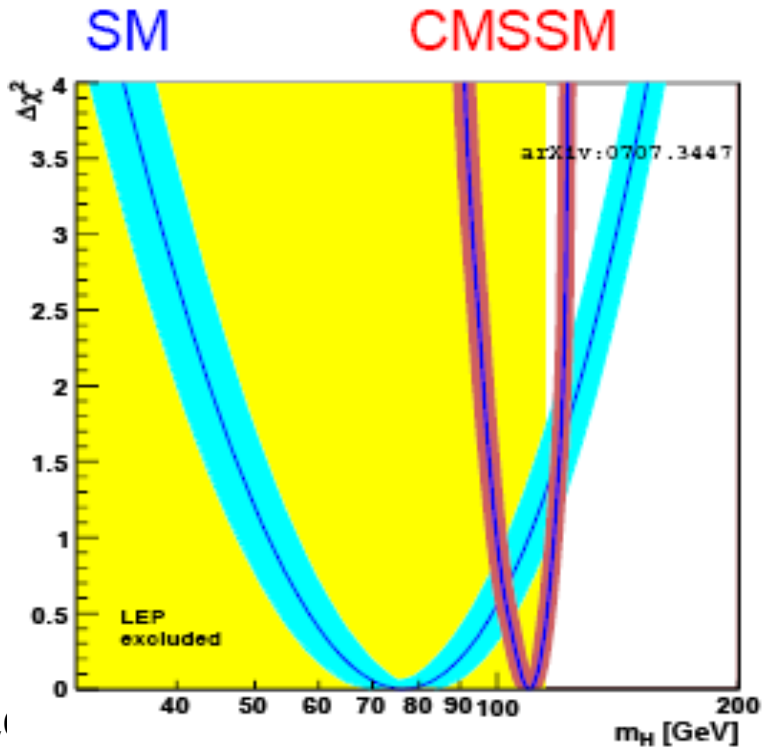
Physics justification for a ILC type linear collider:

unchanged from a few year ago,

strong indirect evidence that TeV physics means physics at and just above the electroweak scale

"the blue band plot"
revisited
including information from
neutrino experiments,
dark matter searches etc

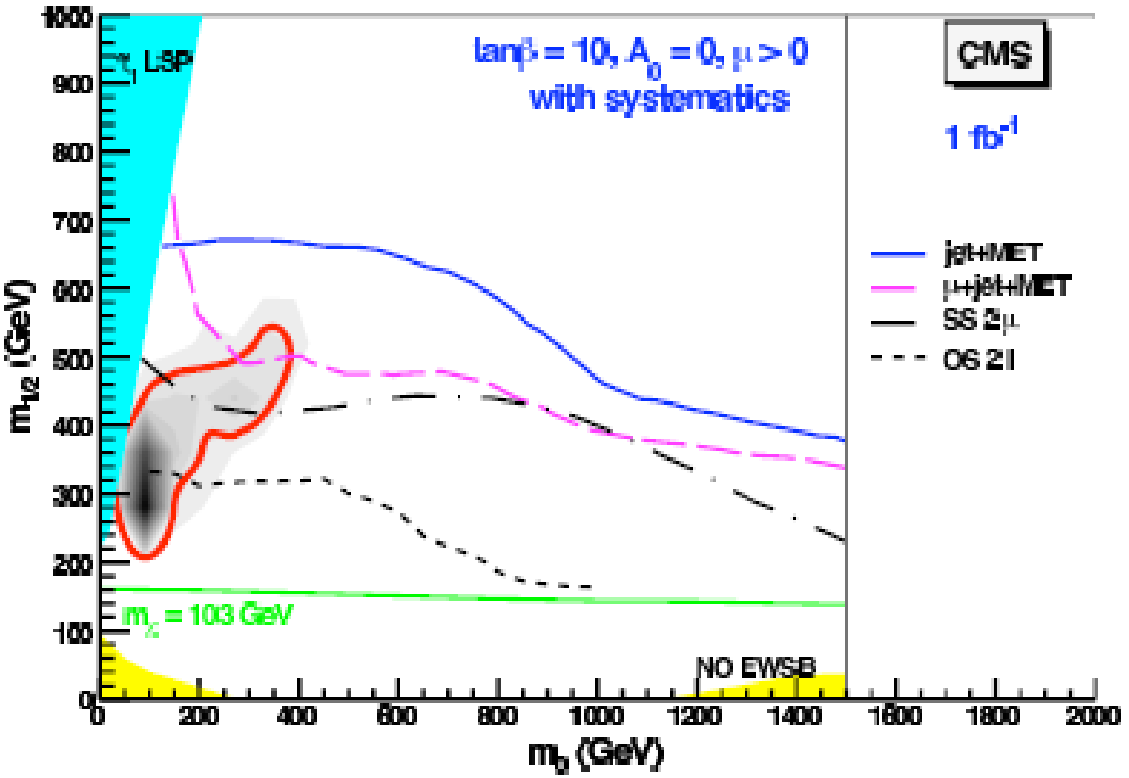
talk by G. Weiglein



Supersymmetry

Recent theoretical studies:
LHC discovery reach for 1 fb-1 of understood data

Close to SPS1A benchmark point would lead to early discovery



Impact of early LHC on ILC

The way the case for the LC has been phrased so far (consensus documents, . . .) has been:

There is a clear and solid physics case for a 500 GeV LC, even before we know what the LHC will tell us

However, LHC results will cause a phase transition putting our expectations about TeV-scale physics into a completely new context

LHC results will set the framework for discussing the physics potential for the LC, its operation parameters and its decision time-line

The LHC early phase: Implications for the Linear Collider, Georg Weiglein, Warsaw, 06/2008 – p.10

LHC-ILC complementarity

LHC: gluon factory, good prospects for production of coloured particles

LC: e^+e^- factory, good prospects for production of colour-neutral particles

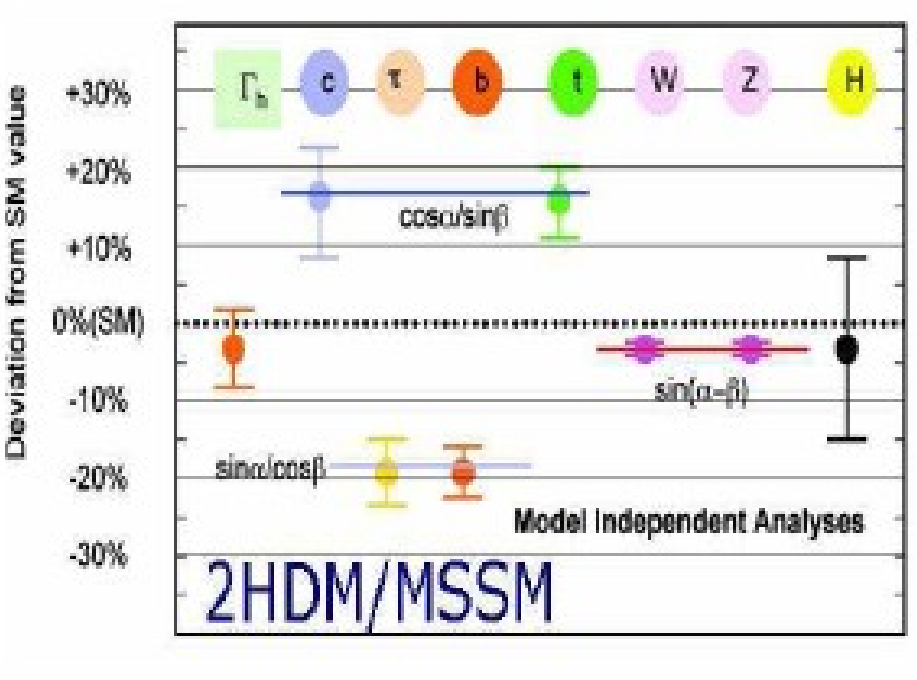
Complementarity is good for obataining a comprehensive picture of physics at the TeV scale from LHC $\oplus$ LC

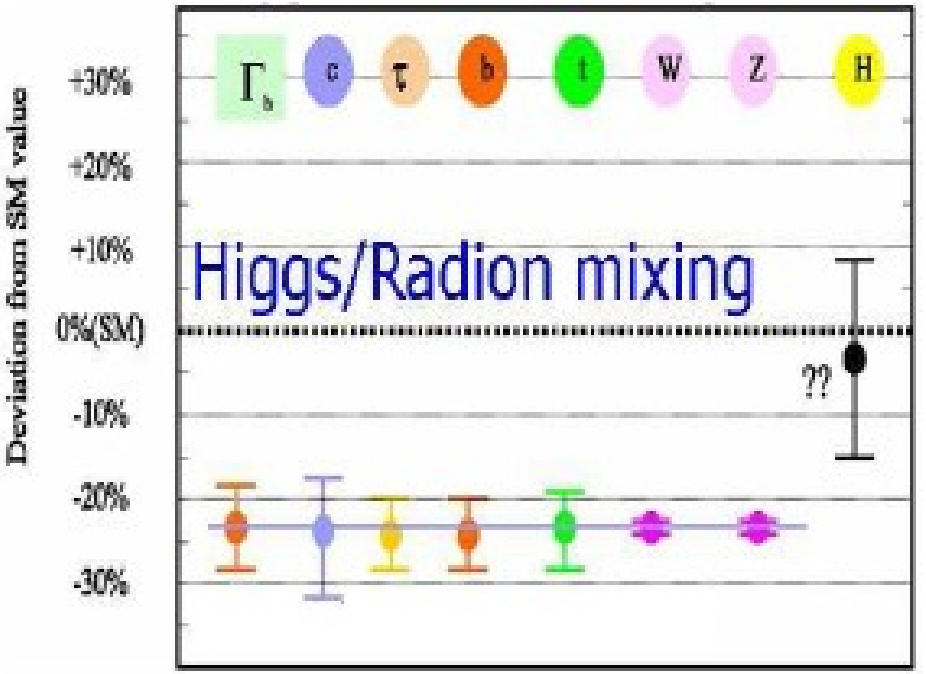
But it makes it difficult to infer from LHC results what the prospects for the LC will be

The LHC early phase: Implications for the Linear Collider, Georg Weiglein, Warsaw, 06/2008 – p.19

If nature is nice to us...

SM vs. BSM physics:





⇒ Precision measurement of Higgs couplings allows distinction between different models

The nightmare scenario

A missing energy signal at the LHC

[*LHC4ILC WS '07, WG4 report*]

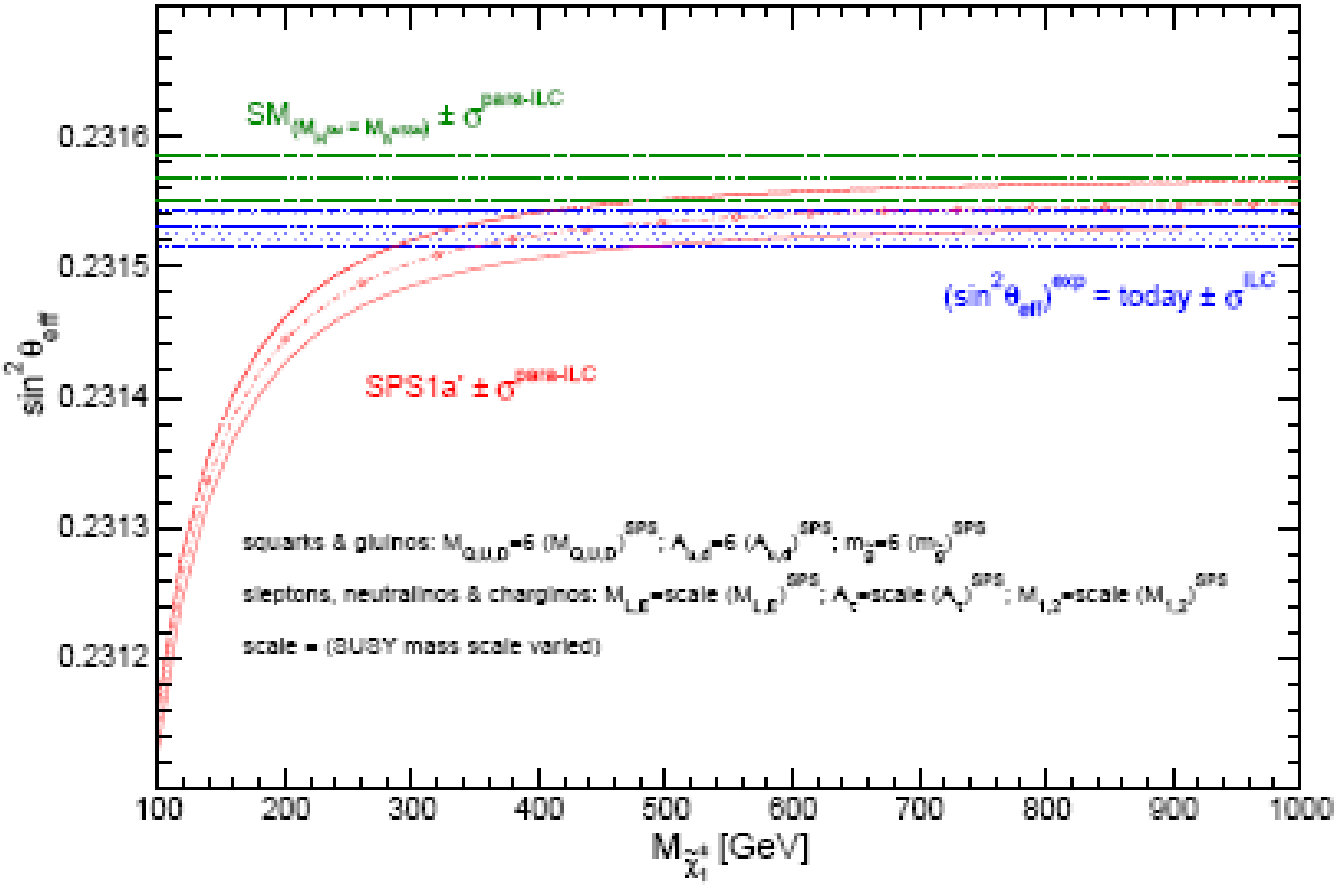
G. Wilson

- Suppose:
  - –A light Higgs is found. Consistent with SM, SUSY.
  - –Only a jets+MET signal is found at LHC.
- What is the minimum √shat involved in the signal ?
  - –Can we estimate the e^+e^- production threshold reliably ?
- Can the signal be produced in e^+e^- (does it couple to the γ, W, Z, h) ?
  - –Presumably no info will be available.
  - –If it's a gluino, e^+e^- is probably irrelevant for direct tests ...
- Is there ANY robust logical inference on the masses of lighter particles that can be made, e.g. M_{LSP} ???

We may find that LHC can't tell very much of value in diagnosing this new physics.
And that ILC at any energy may not be a useful diagnostic tool for certain hadron collider signatures.

Can GigaZ help?

[*S. Heinemeyer, W. Hollik, A.M. Weber, G. W. '07*]



⇒ GigaZ measurement provides sensitivity to SUSY scale, extends the direct search reach of ILC(500)

Be prepared

We need to be well prepared,

regardless of the findings of the LHC

> we need to be able to answer honestly what the ILC can do depending on what the LHC will find
>
> we need to develop strategies for those (few) cases where neither the LHC nor the ILC can give conclusive answers.

Conclusion: a strong and lively theoretical / physics driven community is needed to maintain and update the physics case for the ILC

Detectors for the ILC

Currently (at least on the surface) dominating:

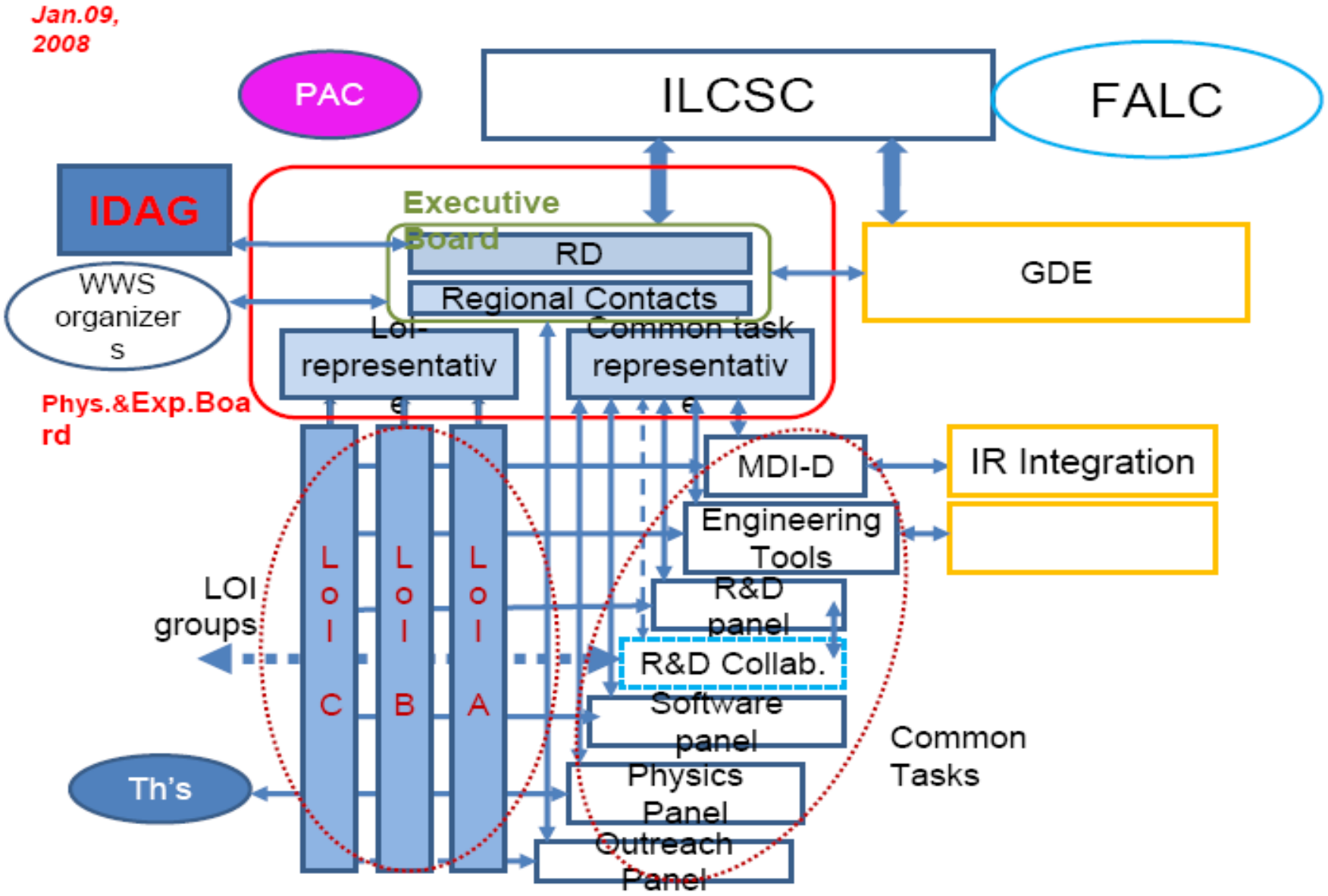
discussions about concepts, about LOIs etc

ECFA was a very important meeting to remind people
that the R&D collaborations are alive and well
and are the core of the business

CALICE, LC-TPC, FCAL, VTX, ...

ECFA2008 was also the first meeting where the Research Director played an important role

The RD Organization structure



Organization

My personal impression:

... seems complicated

IDAG: members have been nominated, first meeting of IDAG in Warsaw
Chair: Michel Davier

note:

it seems that the RD structures will replace the WWS structures

no clear solution yet for the physics working groups of the WWS:

they are needed, need to understand how to fit them in

IDAG members

In total 16 members

10 Experimentalists
3 Accelerator physicists
3 Theorists

Most of the experimentalist are from out of ILC community.

All the accelerator members and theorists are ILC experts

- Prof. Michael Danilov (ITEP)
- Prof. Michel Davier (LAL) (Chair)
- Prof. Abdelhak Djouadi (Paris Sud)
- Dr. Eckhard Elsen (DESY)
- Prof. Paul Grannis (SUNY)
- Prof. Rohini Godbole (IIS)
- Dr. Dan Green (FNAL)
- Prof. JoAnne Hewett (SLAC)
- Prof. Thomas Himel (SLAC)
- Prof. Dean Karlen (Victoria)
- Prof. Sun-Kee Kim (Seoul)
- Prof. Tomio Kobayashi (Tokyo)
- Dr. Weiguo Li (IHEP)
- Prof. Richard Nickerson (Oxford)
- Dr. Sandro Palestini (CERN)
- Prof. Nobukazu Toge (KEK)

Detector

ECFA is concept independent

but: ECFA (Europe) is strongly dominated by ILD (formerly TESLA, LDC, GLD)

Some highlight results from

Calorimeter

TPC

VTX

Calorimeter

Testbeam Programs (2005 - today)

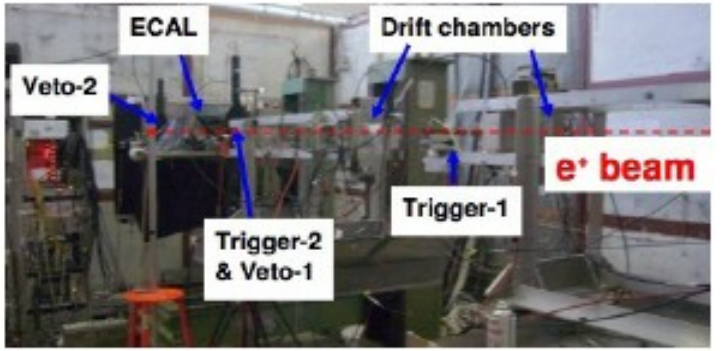
CALICE Calorimeter for ILC

High granularity calorimeters and PFA
Testbeam programs at DESY, CERN, FNAL and KEK

SiW Ecal, Ahcal TCMT

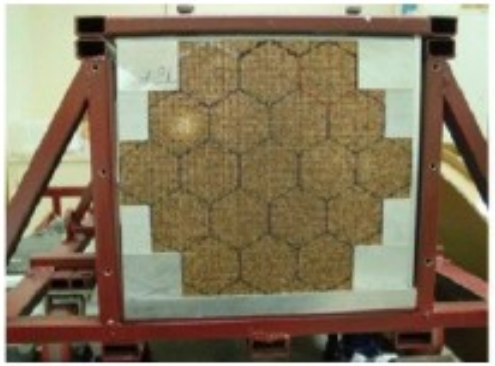
DHCAL with RPC

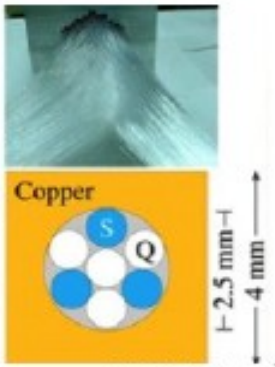
CALICE @ DESY

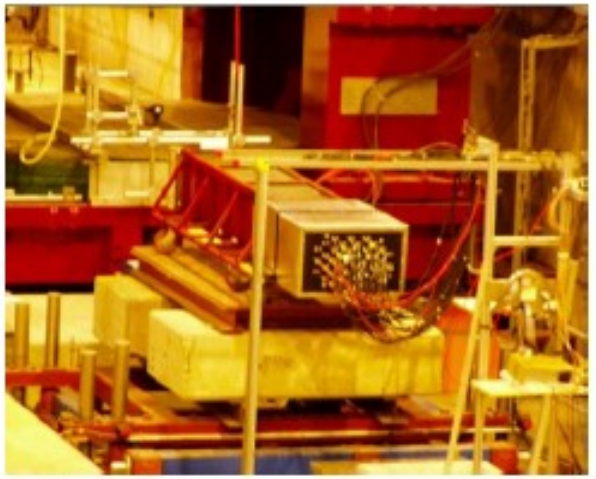


SiW and Scint Ecal, MAPS

DREAM Project:
Optimising the energy resolution for hadronic showers

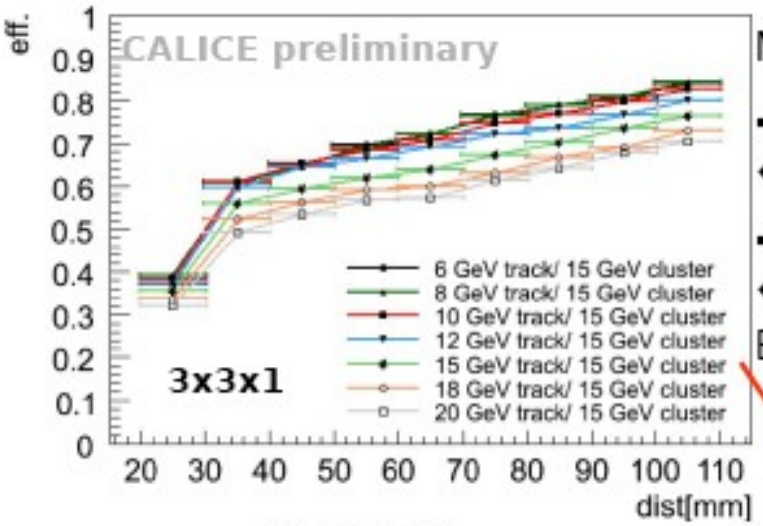






Physics with Calo Prototypes - II

Particle Separation in highly granular Ecal

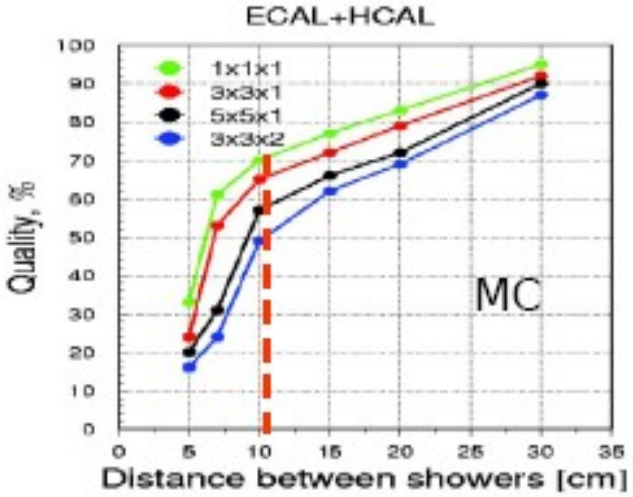


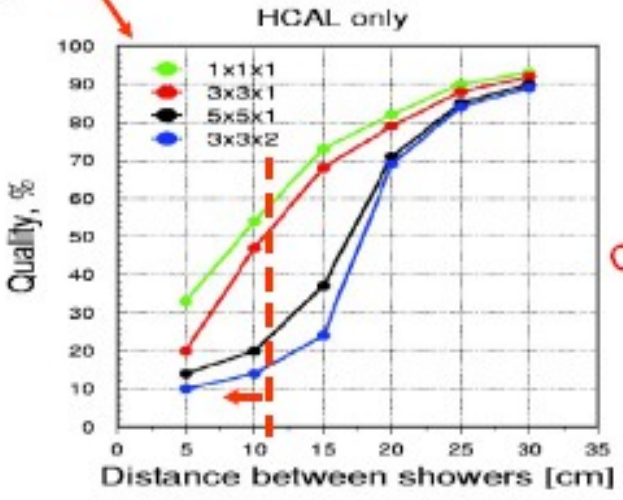
MC studies for AHCAL geometry optimization

➔ MC 1 charge + 1 neutral hadron simulated
➔ data 2 charged pions

➔ MC with HCAL only
➔data contained showers in AHCAL but ECAL used as tracker

qualitative good agreement



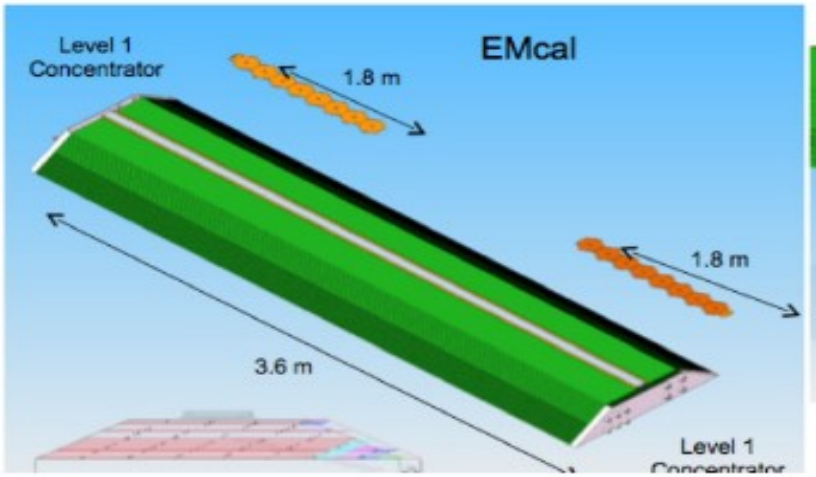


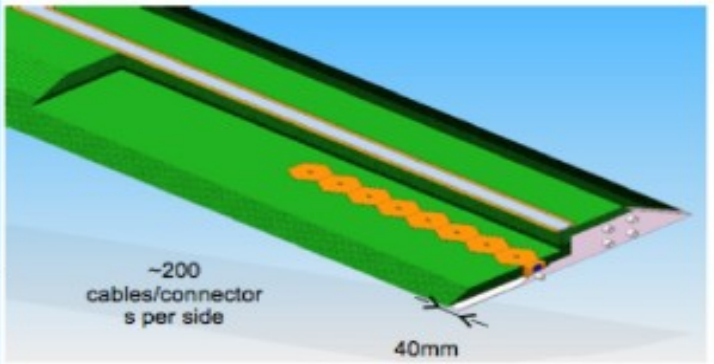
only distances <10cm probed by data

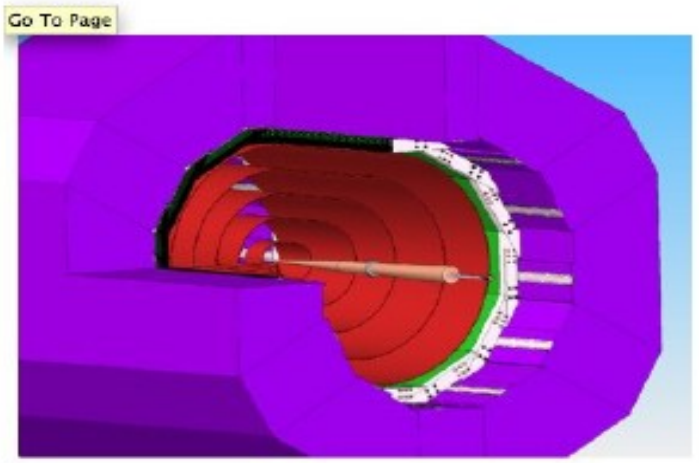
A. Raspereza, 2004

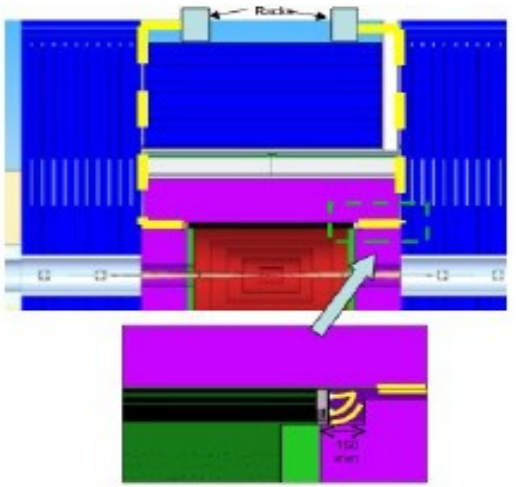
Particle Flow in Real Data !!!

Integration studies







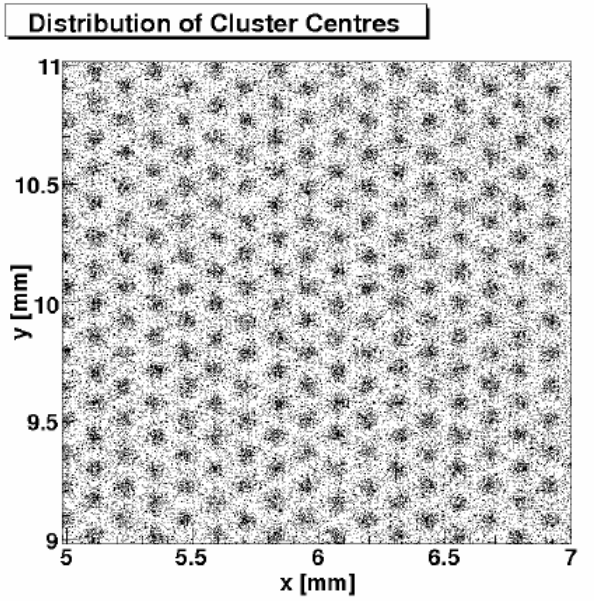


Detector Integration studies are ongoing in all three studies

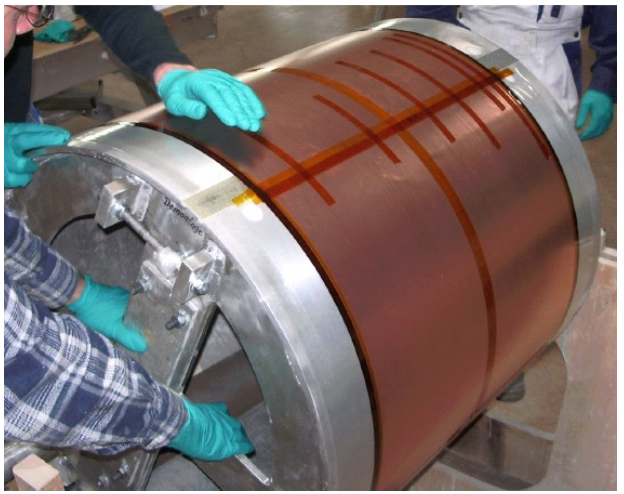
Gaseous Tracking

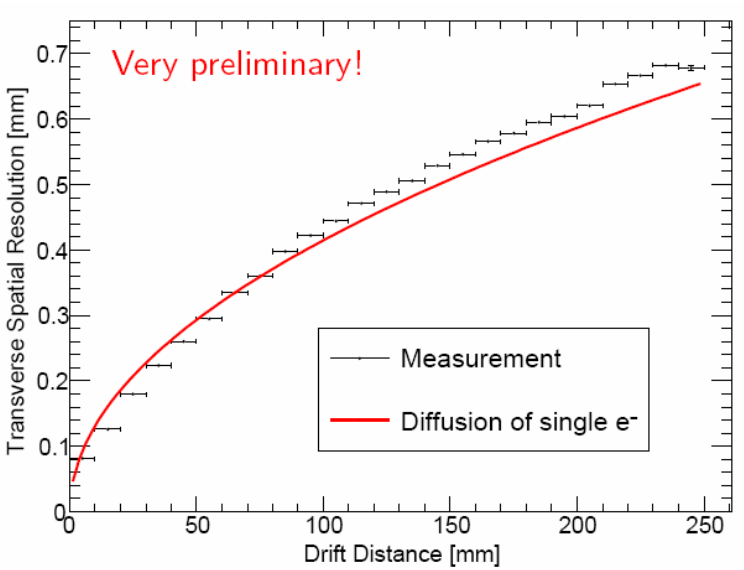
Solid State readout for a TPC:

see individual holes in a GEM
as a pattern on the readout
Resolutions are compatible



Field cage construction ongoing

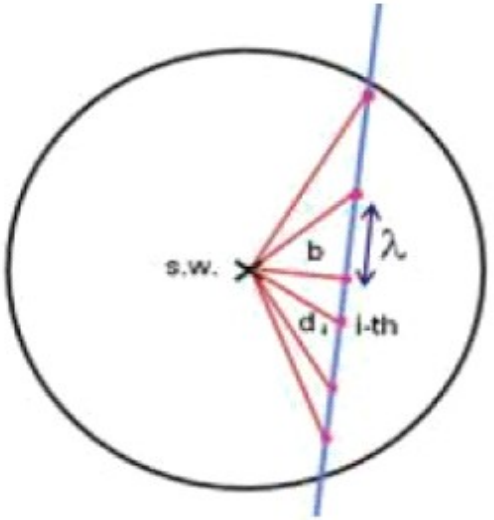


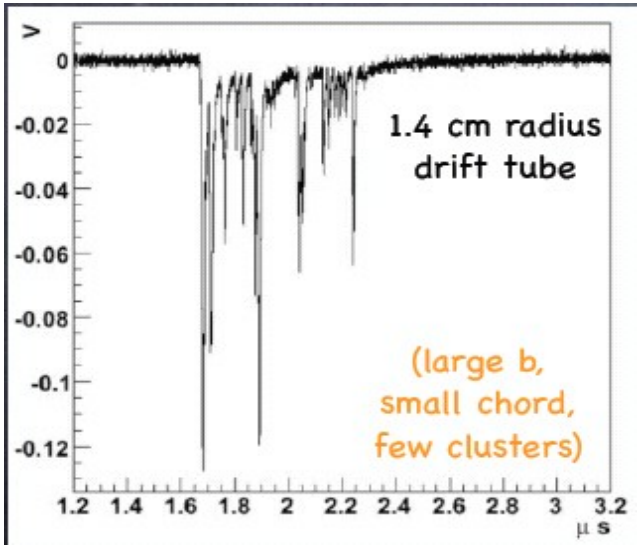


CluCou Drift Chamber

F.Grancagnolo,
INFN Lecce

Idea: improve space resolution + dE/dx by
measuring pulses from individual primary electrons/clusters



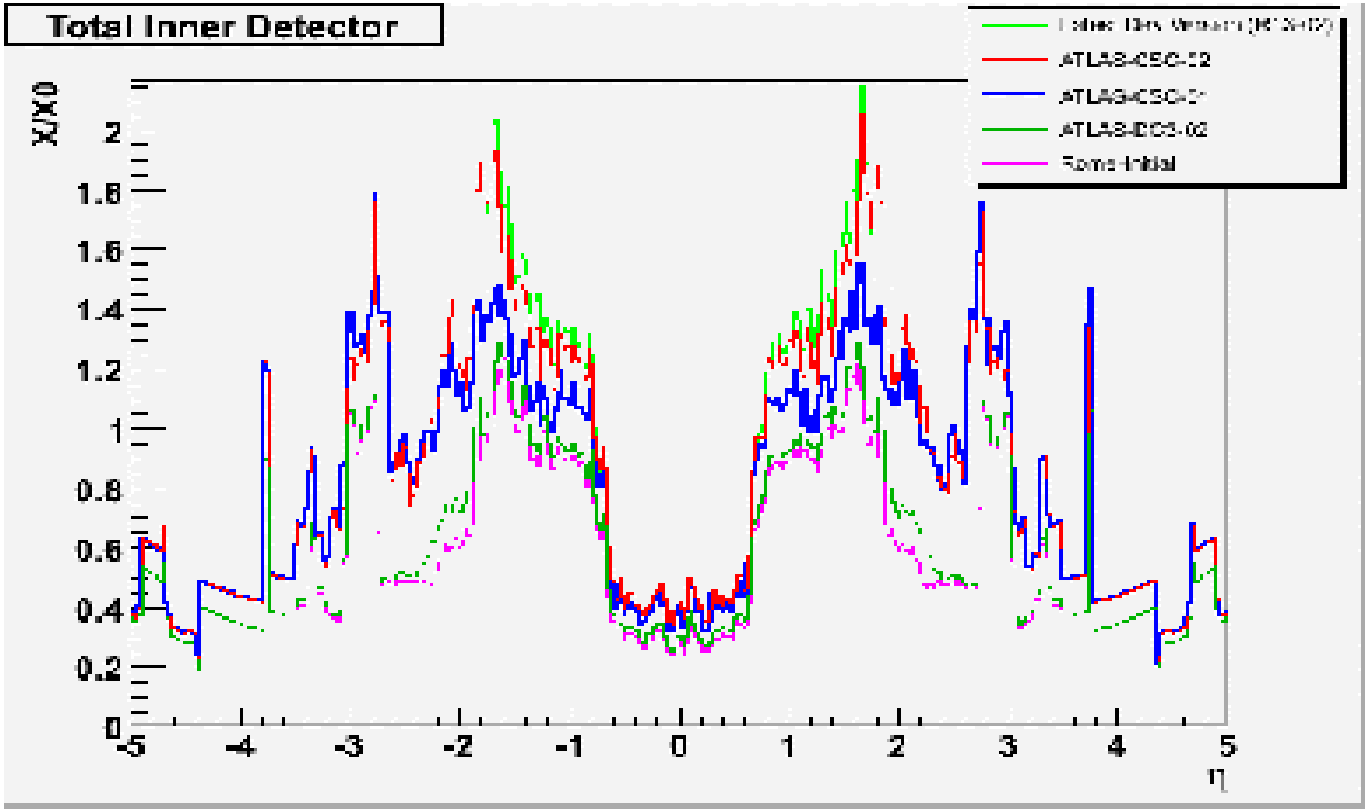


- low-ionisiation gas (He)
- high sampling rate (١-٢Gs/s) – high bandwidth digitization (١GHz)
- efficient counting algorithm

Feasibility at a LC? Needs to be investigated

VTX Detectors

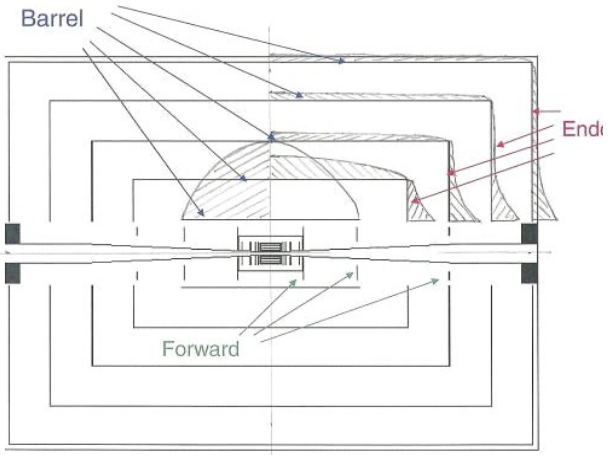
LHC reality

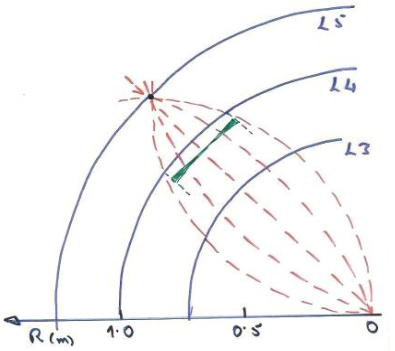


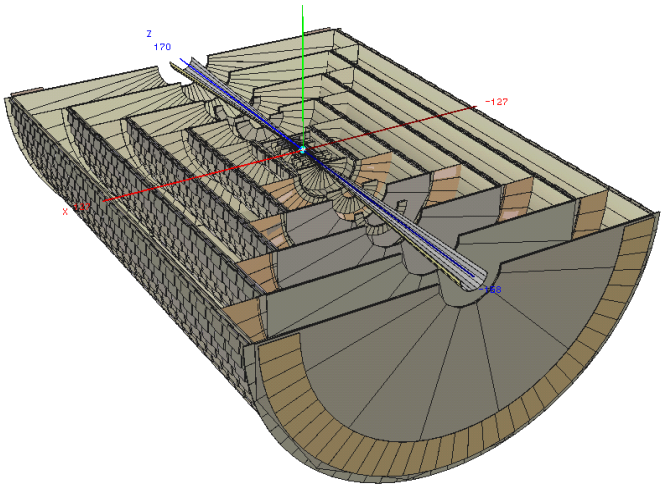
ILC goal: 1% VTX, 10% tracker: very ambitious!

Silicon Tracking

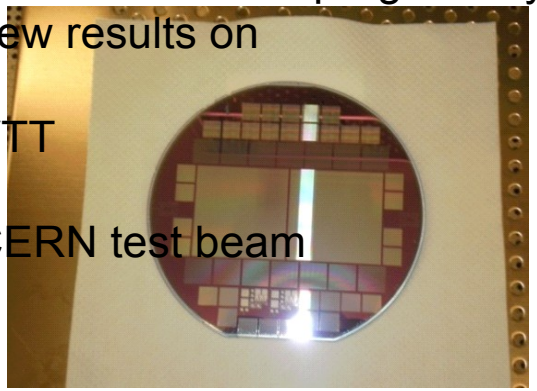
- Presentation by M. Demarteau on the progress on Silicon tracking by the SiD Collaboration
- Progress on the all-pixel tracker by C. Damerell







- Review on SiLC progress by V. Saveliev with several dedicated presentations on new results on



VTT

CERN test beam

- Sensor R&D : new ³D planar sensors by

  HPK Test structures tested at

- Electronic R&D (DAQ session)
- Alignment (M. Fernandez)
- Simulations

Summary

Active detector and physics community
but need to take care to keep the physics community alive

Many new results from detector tests and studies

Concepts groups are gearing up for the LOI: ILD is dominating the European field

Organization is taking shape: needs iteration and input from the community

The next few years will be difficult:

waiting for LHC results
facing difficult funding situation