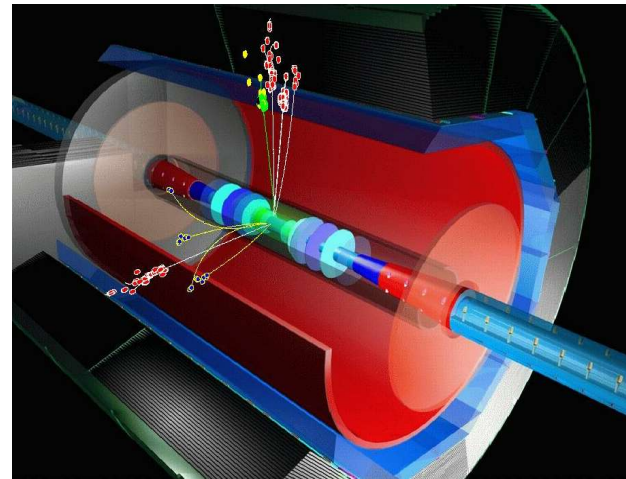
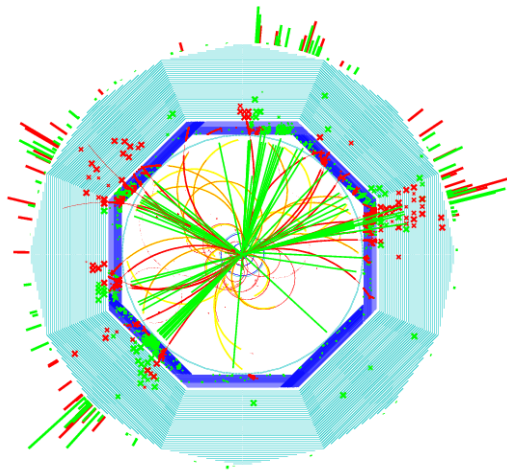


ILC Experimentation

Ties Behnke, DESY

- The physics program at the ILC@DESY
- The detector program at the ILC@DESY



Experimentation

- "long" history of intense physics and detector studies at DESY for the LC

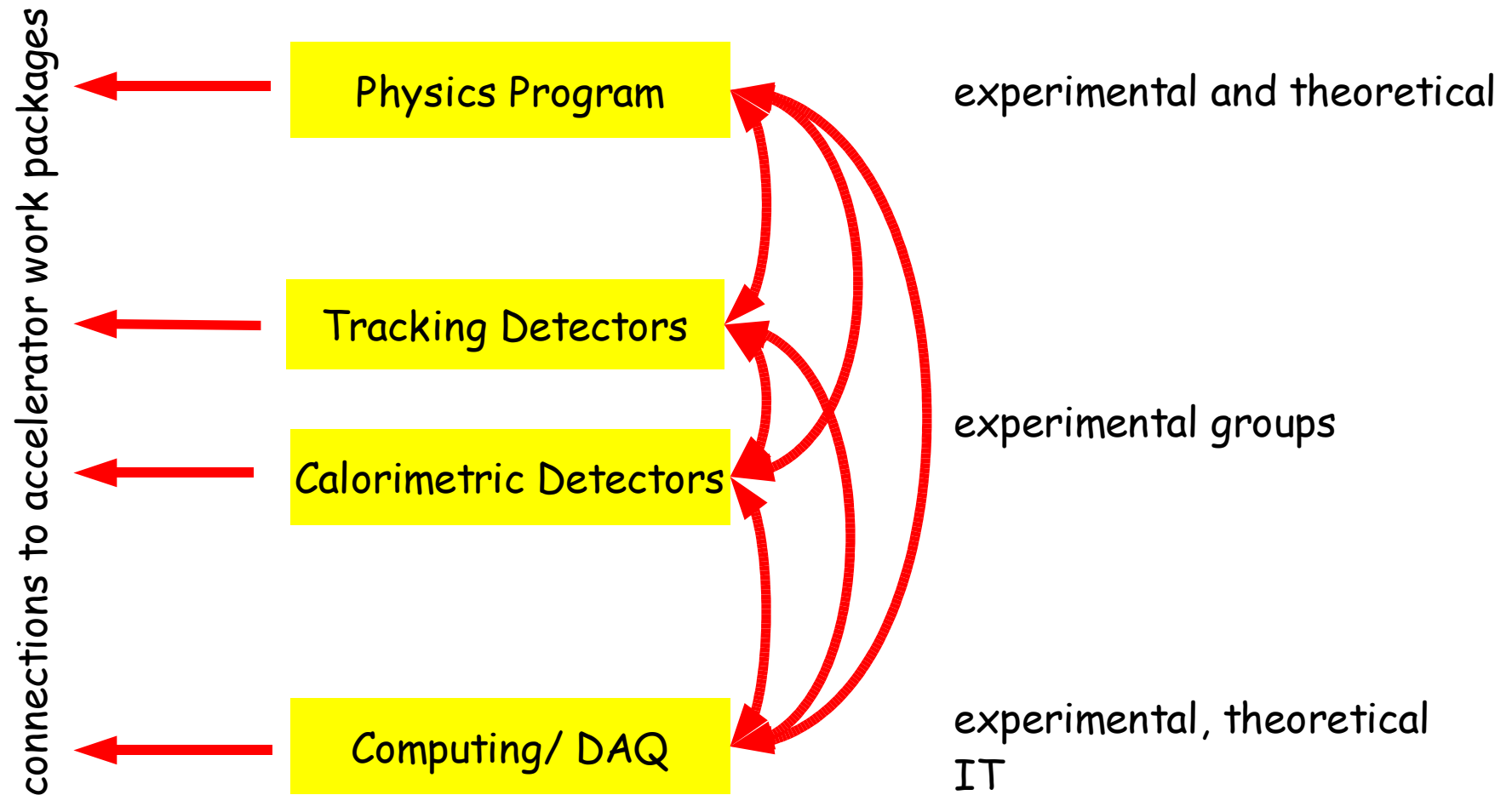
physics studies from day 1 of LC activities

detector studies started seriously around 1994 (triggered by MDI work done by Daniel Schulte)

- many contributions to the detector and physics part of the TESLA TDR
- close collaboration between experimental and theoretical groups
- close integration into the international LC studies
- in-house detector R&D started seriously in 1999 (TPC)

ILC experimentation @ DESY

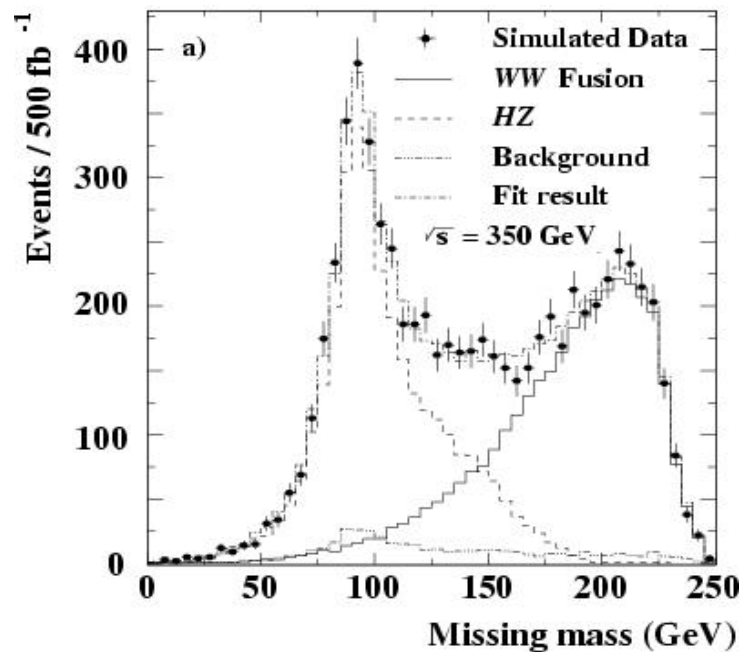
basic structure of ILC@DESY experimentation studies



Current Program: Physics

physics studies:

- participation in LC workshops
- intense work on many different physics studies
 - phenomenology
 - simulation of particular topics
 - feedback to detector groups



diploma thesis of
of a student doing
ILC simulations

Current Program: LHC-LC

physics at the ILC: more than just physics

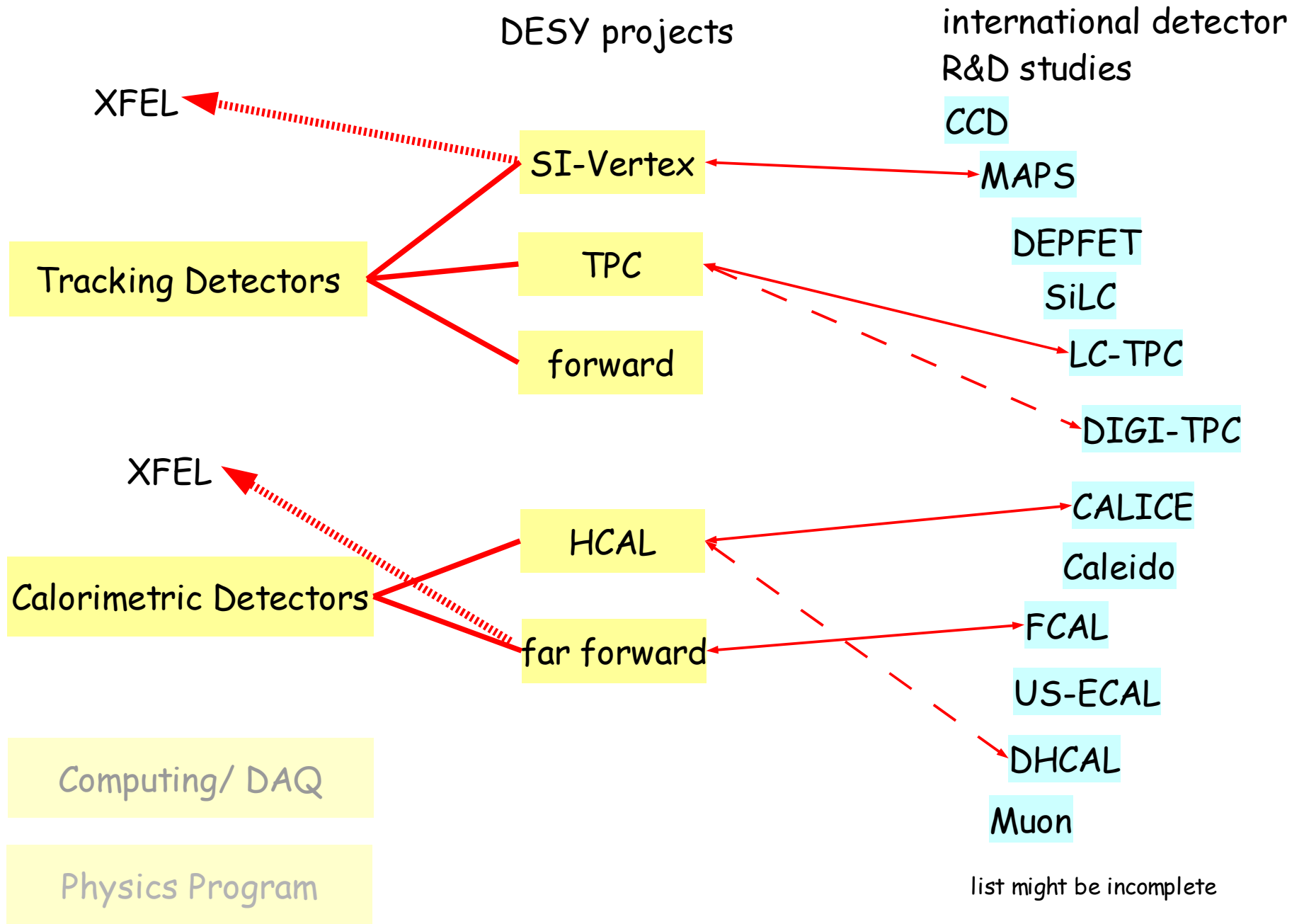
explore / define the role of ILC in the world which has LHC (Tevatron)

LHC-LC workshop started 2002 as a worldwide effort to study the interplay between LHC and ILC

important inputs for both ILC and LHC program through close cooperation of both communities

DESY physicists have played and will continue to play an important role in this study

Detector R&D



Detector R&D: Concept studies

Detector concept studies are forming:

"groups to explore the optimization of a specific detector concept"

- SiD: Silicon based tracking, compact size
- Large: TPC + SI based tracking, SI-W calorimetry
- Huge: TPC (or Jet) based tracking, conventional calo technology: very large size

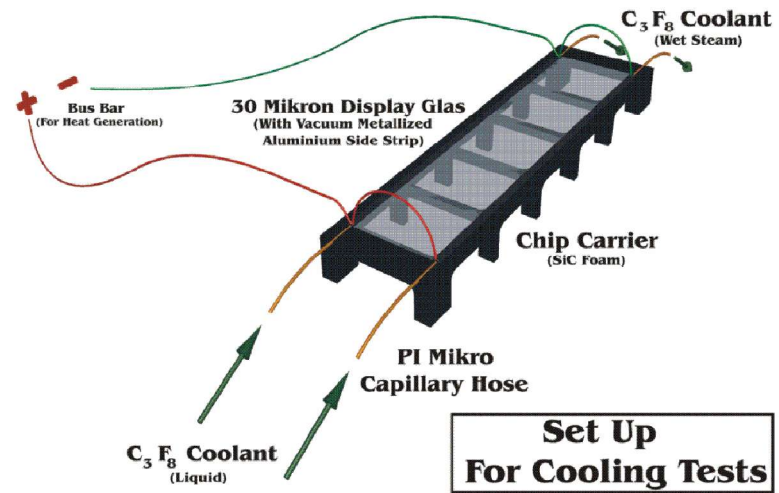
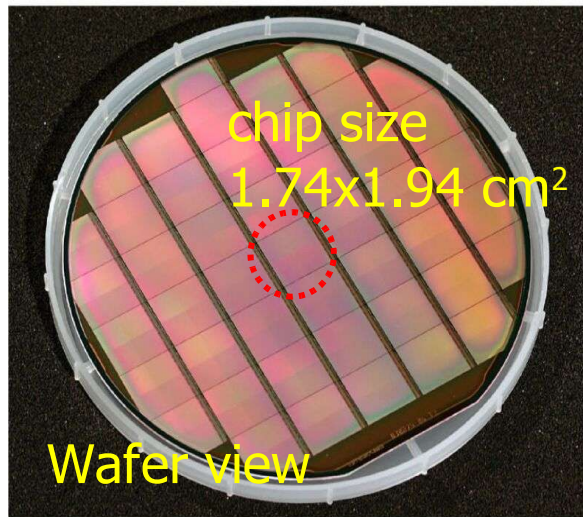
	Si-VTX	intermediate tracking	SI-tracking	TPC	conventional ECAL	Si-W ECAL	analog HCAL	digital HCAL	forward calorimetry	Muon systems	Data acquisition	Computing
SiD	x		x			x		x	x	x	x	x
Large	x	x		x		x	x	x	x	x	x	x
Huge	x	x		x	x		x	x	x	x	x	x

matrix structure
between
concepts
and R&D groups

The VTX detector R&D

Goal: study the CMOS based technology for a ILC vertex detector

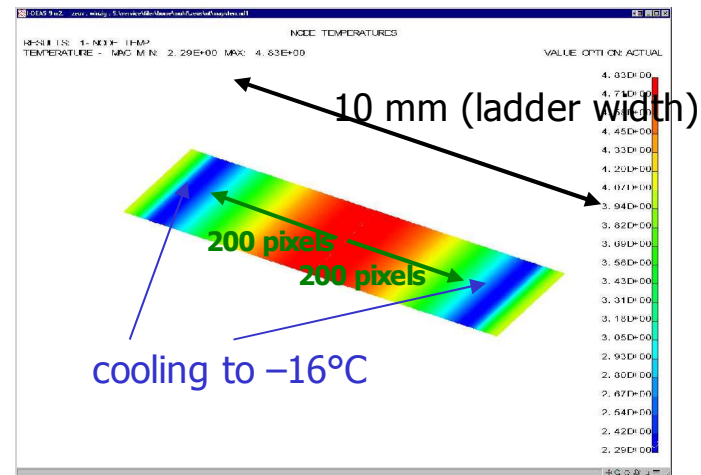
- physics case and detector benchmarking
- technology developments



Example for central ladder (portion)

close collaboration with group in Strassbourg

contributions to chip testing
power management, cooling etc.



TPC R&D

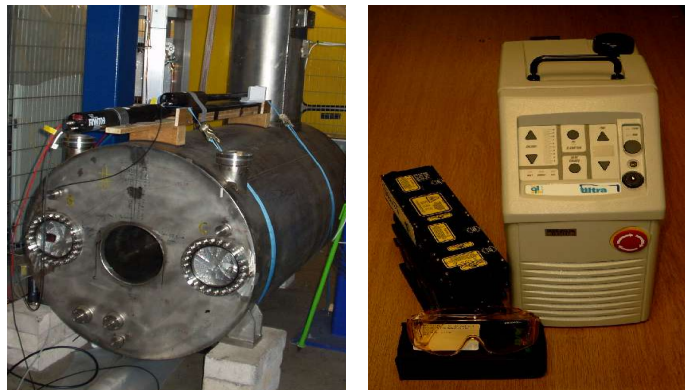
Goal: build a high precision gaseous tracker with robust performance
technology investigated: TPC with GEM readout



build and operated several small scale
prototype TPC's

study basic performance of TPC-GEM
system: resolution, ion feedback, stability
etc.

establish feasibility of Gem-TPC operation



Work is done in the context of the international LC-TPC cooperation:
Canada - France - Germany - Japan - US (plus smaller contributions by others)

program for the next years: finish the feasibility experiment, do first system tests

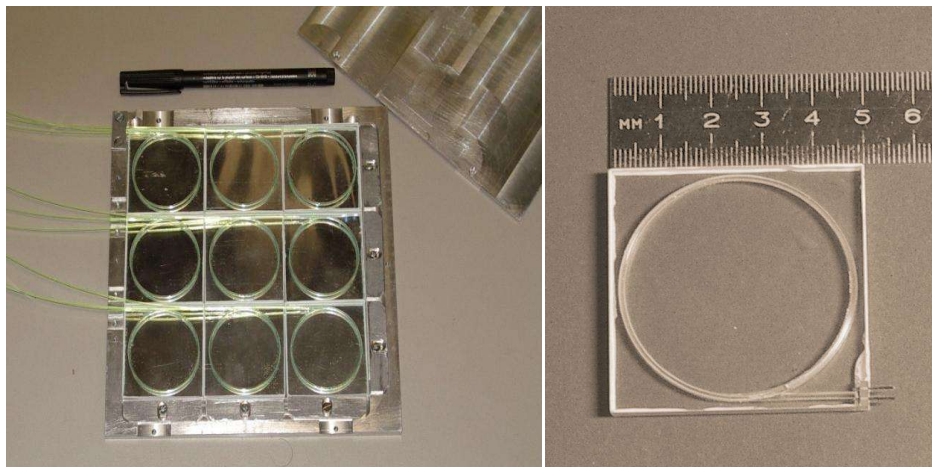
Calorimeter R&D

calorimetry at the ILC: a new game

particle flow requires excellent granularity and decent resolution:
challenging optimization of a granular calorimeter

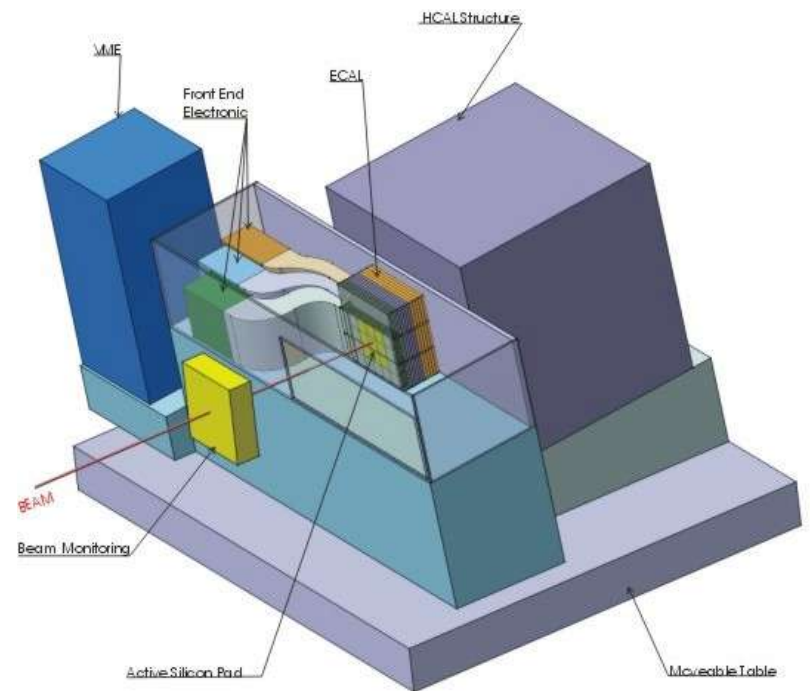
DESY: design and build a hadronic calorimeter

technology: scintillator tile sampling calorimeter
readout with SiPM devices
excellent granularity



tiles

SiPM readout



3D view of the planned prototype

Calorimeter R&D

Goals:

- optimise the design of an analogue HCAL for ILC
- study in test beams detailed shower development and compare to models:
 - much improved understanding of hadronic shower physics
 - improve existing simulation models

Work done at DESY within the CALICE collaboration
(international collaboration to develop a calorimeter for the linear collider)

Future:

construct 1m^3 prototype in 2005
extensive test beam studies at DESY and outside (hadron beam) for the next year(s).
continue photo detector R&D (SiPM and further developments)

Forward Detector

Very forward region of the detector:

huge radiation exposure

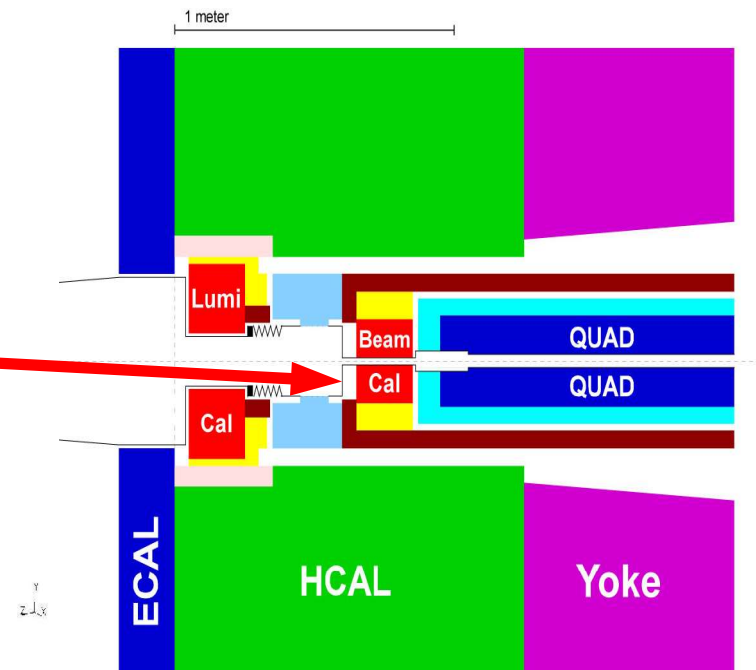
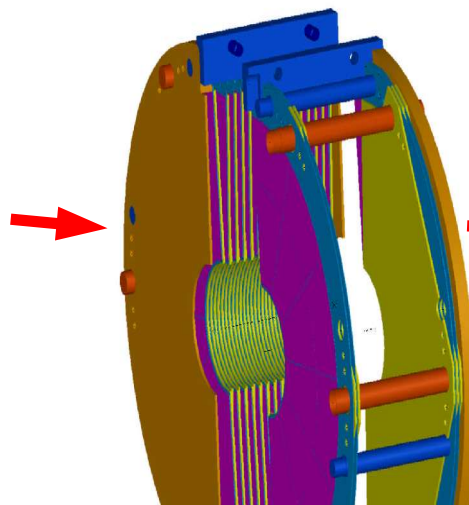
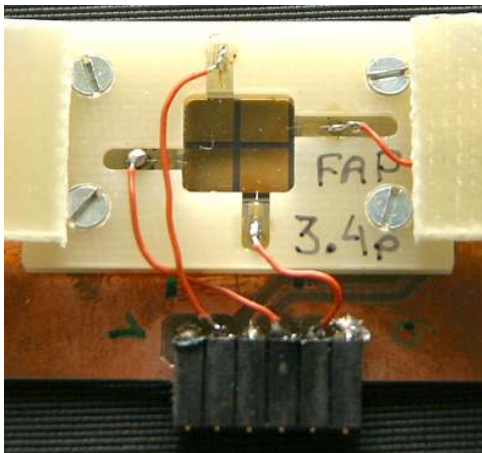
instrumentation is essential for luminosity, fast beam monitoring,
closing the angular coverage

DESY contributions:

optimisation of the very forward region

development of very radiation hard and fast calorimeter technologies

diamond detectors



Computing

Computing plays an important role

ILC@DESY: develop central software tools for physics and detector studies

- GEANT4 based simulation

- C++ based analysis frame work (MARLIN)

- Reconstruction software

- DAQ concepts (global detector network -> GAN)

- close cooperation with international partners (LLR, SLAC, ...)

- operate central services:

 - CVS depository

 - in the future: GRID services for LC physics studies

 - already now: analysis cluster

 - future: central "data" processing for physics studies

Computing is a central and important part of ILC@DESY!

Summary

Active physics program to study the ILC physics

- future emphasis on new physics signatures
- increased reliance on detailed simulation
- closer cooperation with other machines (LHC-LC, Tevatron-LC,)
- close connections to "other" areas (cosmology, ...)

Active R&D program for detector developments for the LC

- VTX developments
- LC-TPC
- HCAL (tile technology) + novel photodetectors
- forward detectors

DESY plays an important role in detector R&D and physics studies for a LC

The [ILC@DESY](#) project will ensure that DESY maintains its leading role and develops into a European center for LC-detector studies