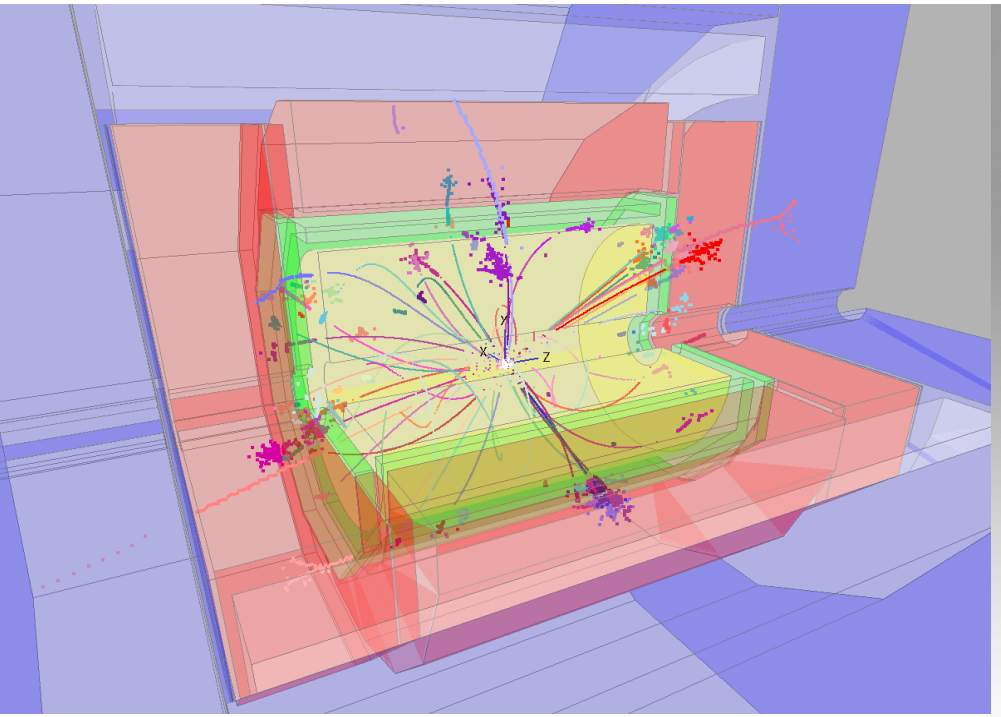
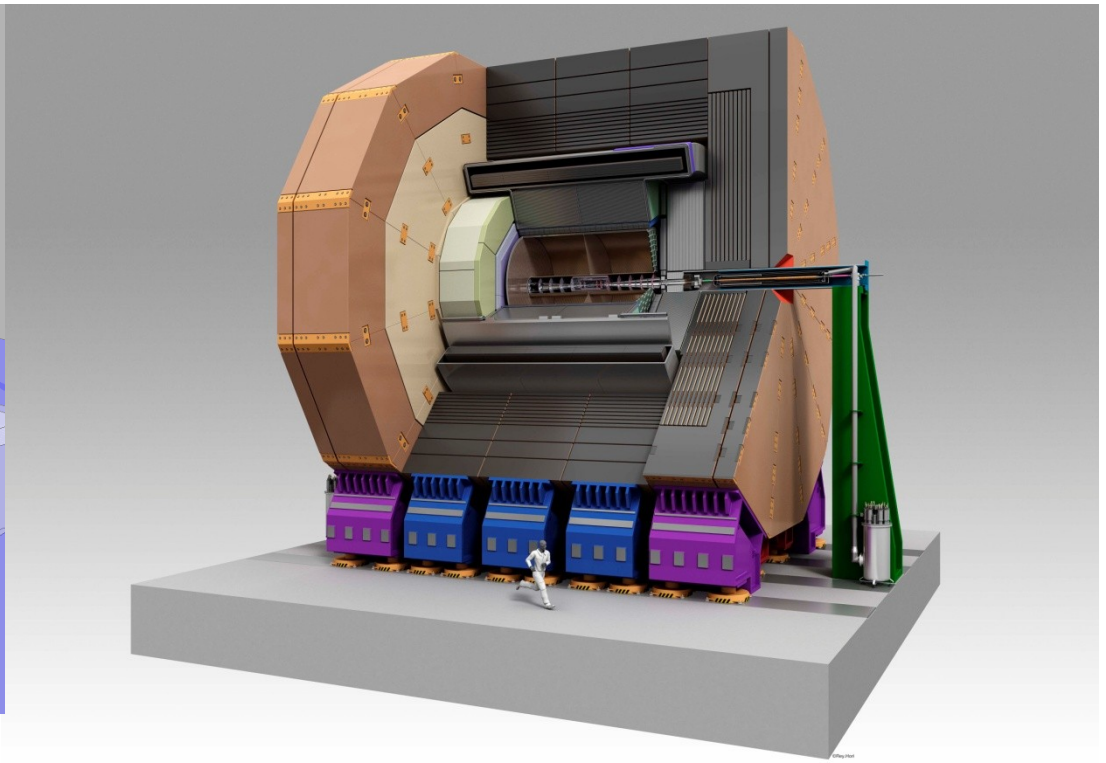
Report to IDAG

ILD concept group





From simulation to an “engineered” proposal

ILD since Eugene

ILD meeting in Paris in May 23-25, 2011

75 registered participants

Dense program

- review overall status
- review in detail integration status
- discuss and decide on simulation baseline

Common meeting with ILC CFS people

Discussion with ILC PM to understand better boundaries from collider

Participation from CLIC study

Many thanks to our collegues at KEK and LAL who worked together closely to move the ILD meeting on short notice from KEK to LAL

Integration meetings

Integration working group:

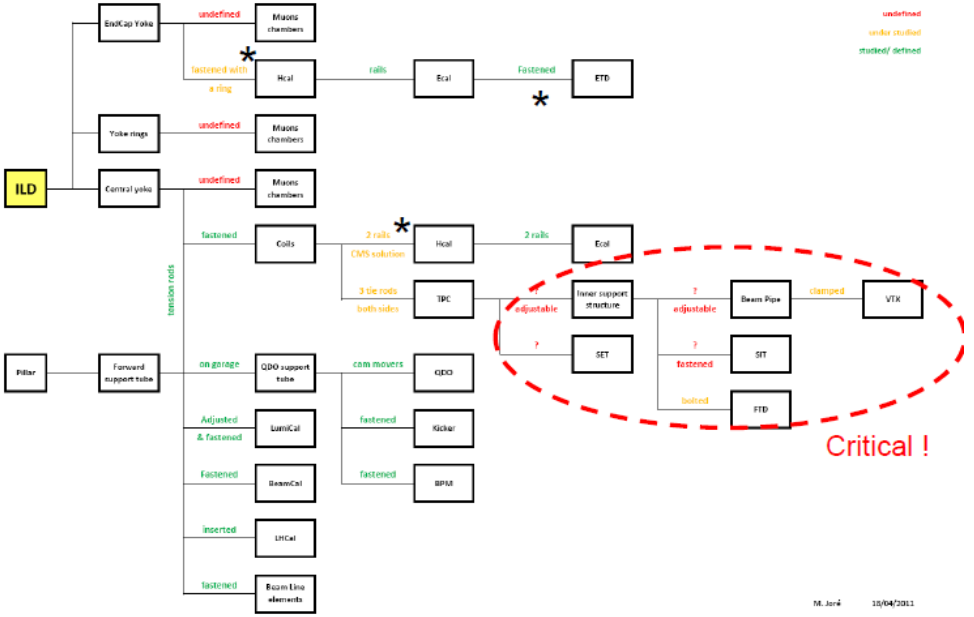
Very active, close cooperation with SiD and CLIC

Dedicated European integration meeting: April 19/20 2011

Integration tree
of the ILD detector
model

(red: critical inner integration)

from M. Joure, LAL



Test beams connected to ILD since Eugene

May/ June/ July 2011: DESY/ KEK: TPC GEM readout module at DESY

Summer 2011: CALICE; Digital HCAL at FNAL

Summer 2011: CALICE: Scintillator HCAL with Tungsten absorber at CERN

Fall 2011: CALICE: Semidigital HCAL at CERN

Summer 2011: Si strip detectors at CERN

Summer 2011: FCAL at DESY

…..

Subdetector R&D is progressing within the limits of person-power and funding

Software baseline

Intense discussion at Paris on software baseline and the treatment of options

ILD has a number of options

- Strength of ILD: makes the concept flexible and interesting, leverage latest developments, ensures broad participation

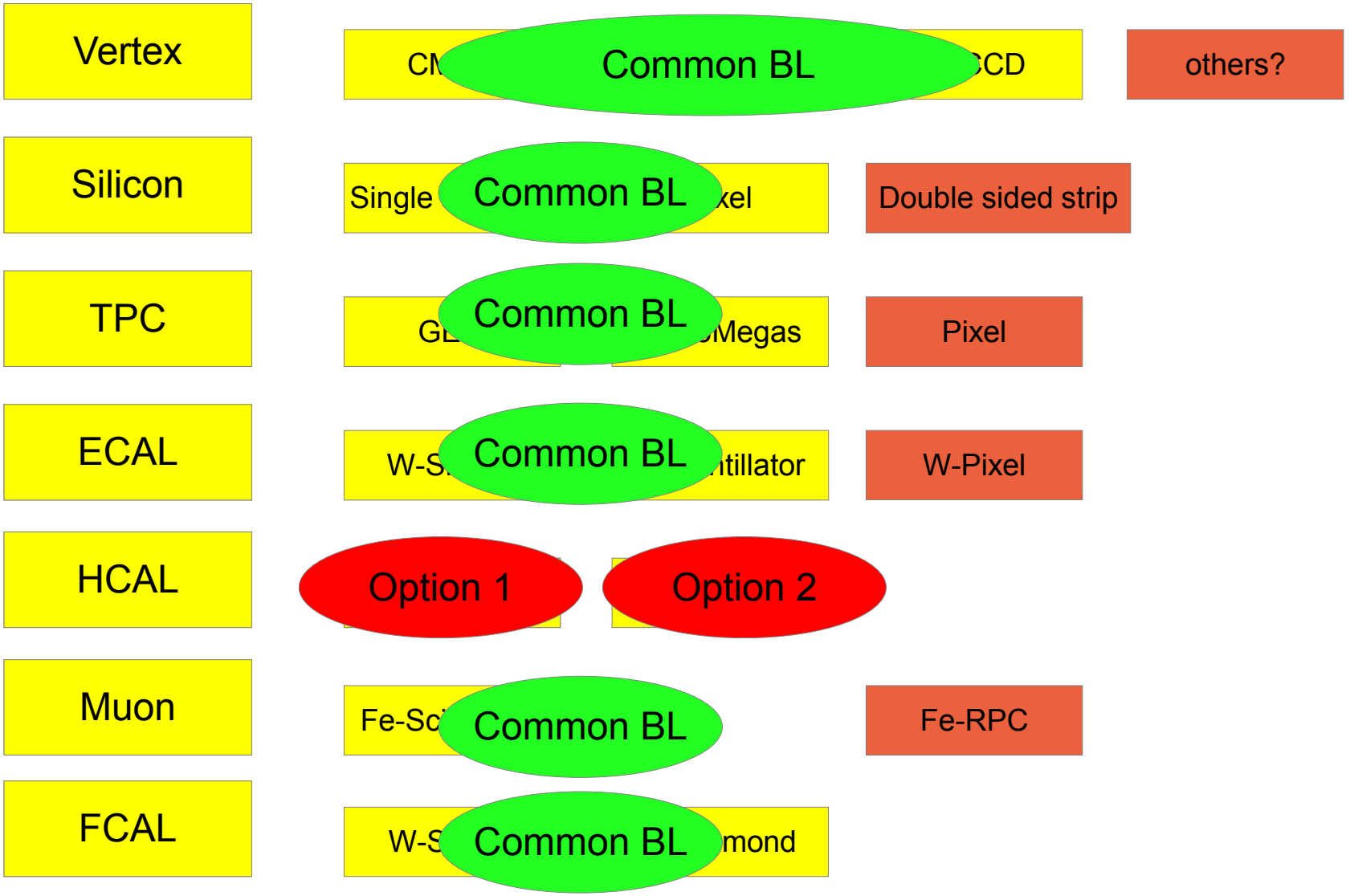
- Potential problem, since any break in the symmetry might be seen as a pre-selection

Status/ agreement at Paris:

- VTX, TPC, ECAL options have agreed on common reconstruction at this stage

- Only remaining option are AHCAL/ SDHCAL which will be treated symmetrically

ILD: baseline detector
The current picture



Strategy of ILD

★ Software models/reconstruction

- Push forward with validation of simulation and reconstruction of ILD01 model (SiW + AHCAL)
  - evolution of existing software
  - still, validation is non trivial and may take ~6 months
- Produce MC samples with this model for DBD physics
  - not a full O(50 Million event) SM production
- Guarantees ILD will meet DBD requirements

★ In parallel

- Support development of PFA for DHCAL and SciW ECAL
  - ~6 month programme of work
- Once "ILD01" production is safely underway
  - commence validation of full detector models with SDHCAL and SciW ECAL
- Full comparison of PFA perf. on 500 GeV physics
- If time allows, in position to redo 1 TeV DBD study

Plans of Software group

Software group (Akiya Miyamoto, Frank Gaede)

- Regular discussions on state and planning
- Have prepared detailed plan to achieve the goals for DBD

ILD Software workplan (June 2011)

detector	sw type	ID	task	comment	due date	persons	status
VXD	simulation	1.1	increase material	current support material is to optimistic		Y.Sugimoto M.Winter	open
		1.2	add/check services	possibly need to be added to beamline or FTD		Y.Sugimoto M.Winter	open
		1.3	implement in Mokka			G.Musat	open
	digitization	1.4	finallize FPCCD digitizer	code is in MarlinReco		D.Kamai	ongoing
		1.5	decide which digitizer to use in DBD production	in Grenada ?		ILD	open
	tracking	2.1	pattern recognition	first step: re-write SilconTracking using IMarlinTrack (5.6)		S.Aplin	open
		2.2		develop new algorithm ?		?	
		2.3		pick-up hits from clupatra TPC tracks		F.Gaede	open
		2.4	KalTest: implement bounded planes	need algorithm for sorting wrt. overlaps → first version exists in KalTest example		S.Aplin F.Gaede K.Fujii D.Kamai	ongoing
SIT, SET	simulation	3.1	check new drivers (overlaps geometry, material)			A.Charpy	open
		3.2	cabling and services			A.Charpy G.Musat (C.Clerk)	open
		3.3	check if there is a support frame	is there a mechanical design?		G.Musat H.Videau	open
			write proper GEAR parameters	see 3.6		A.Charpy S.Aplin F.Gaede	open
	digitization	3.3	develop strip digitizer	a digitizer exists for Belle2 by Z.Drasal → can this be used ?		???	open
			define strip orientation	do we have 90deg or shallow angle stereo layers ? or just parallel to z ?		???	open
	tracking	3.4	pattern recognition	first step: re-write SilconTracking using IMarlinTrack (5.6)		S.Aplin	open
		3.5	KalTest: implement bounded planes	same as 2.3		S.Aplin F.Gaede K.Fujii D.Kamai	ongoing
	core	3.6	need GEAR parameters	copy code from VXDParameters		S.Aplin F.Gaede	open

detector	sw type	ID	task	comment	due date	persons	status
FTD	simulation	4.1	check new drivers (overlaps geometry, material)	after 4.3		I.Alvarez	open
		4.15	first two layers pixels ?	different mechanical design - cryostate, etc		I.Alvarez	
		4.2	cabling and services	check with Integration WG		I.Alvarez G.Musat	open
		4.3	rewrite geometry using non-tilted planes ?	in principle KalTest can deal with tilted planes - pat rec might be simplified with non-tilted planes		I.Alvarez	open
	core	4.4	need GEAR parameters	develop new GEAR parameters for Si-disks		I.Alvarez S.Aplin F.Gaede	open
	digitization	4.4	develop strip digitizer	a digitizer exists for Belle2 by Z.Drasal → can this be used ? need to know the strip orientation		I.Alvarez	open
	tracking	4.5	pattern recognition	-> same as 2.1 and 3.4		S.Aplin	open
		4.6	pattern recognition	develop new standalone algorithm		W.Mittarof R.Glattauer	open
ETD		3.7	remove from ILD_01 for now	there is currently no one working on the code for tracking of uvw-planes		G.Musat	open
		3.8	consider new u,v (x,y) design for ETD	needs discussion in ILD - need mechanical design - and implementation is sw		H.Videau G.Musat	open
TPC	simulation	5.1	check cabling and services	cooling material vs. endplate material		S.Aplin	closed
	digitization	5.2	improve parameterization field inhomogeneities, double hit resolution,...	parameterization needs to come from LCTPC		S.Aplin	open
	tracking	5.3	finalize new pat rec (Clupatra)	use IMarlinTrack (5.6)		F.Gaede	open
		5.6	develop IMarlinTrack interface	needed for all trackers		S.Aplin F.Gaede	ongoing

ECal	simulation	6.1	check drivers → mixing of Si-and Sci layers ?	probably not for large DBD production	G.Musat K.Kotera	open
	reconstruction	6.2	finalize Sci-strip clustering		K.Kotera	ongoing
		6.3	adopt Pandora PFA to work with both strip and digitial	calibration !?	M.Thomson J.Marshall	ongoing
AHCal	simulation	7.1	check latest driver	sci-thickness consistent with mechanical design ?	S.Lu F.Sefkow	open
		7.15	desirable to have an AHCal with Videau geometry		???	
	reconstruction	7.2	verify Pandora PFA (calibration)	sci-thickness has been decreased	M.Thomson J.Marshall	open
(S)DHCal	simulation	8.1	finalize Mokka (Tesla) driver: - endcap missing - include in Mokka release	Note: endcap design is the same in Videau&Tesla	G.Grenier G.Musat	partly done
	digitization	8.2	realistic digitization with crosstalk	some code exists - needs MCParticle ::getStepPosition(i) → LCIO v1.6 (see 12.1)	G.Grenier et al	ongoing
				alternative is to use 1x1mm^2 cells	M.Ruan	partly done
	reconstruction	8.3	adopt Pandora PFA to work with (S)DHCal	calibration	M.Thomson J.Marshall	open
Muon	simulation	9.1	cleanup current Mokka driver	hardcoded numbers etc.	V.Saveliev N.D'Ascenzo	open
		9.2	verify layer layout (coil layers?)	check with integration group !	V.Saveliev N.D'Ascenzo	open
	digitization	9.3	verify current MuonDigi		V.Saveliev N.D'Ascenzo	open
	reconstruction	9.4	adopt Pandora PFA to work with final layer layout		M.Thomson J.Marshall	open
FCAL	simulation	9.5	verify existing drivers		A.Sailer B.Pawlik	open
	reconstruction	9.6	check PandoraPFA works with BeamCal (standalone clusters)	should beamCal clusters be integrated in PFO collection ?	M.Berggren M.Thomson J.Marshall	open

detector	sw type	ID	task	comment	due date	persons	status
ILD	simulation	10.1	integrate all new drivers in three models - AHCal:SiEcal - SDHCal:SiEcal - AHCal:SciEcal	prepare pre-models: ILD_01_pre02 ILD_01_SDH_pre00 ILD_01_SciW_pre00		G.Musat	open
		10.2	services in overall detector	pipes, cables, supports that are not attached to subdetector driver - as defined by integration Wg		G.Musat (C.Clerk)	ongoing
	tracking	11.1	integrate all new tracking code into one consistent package			S.Aplin F.Gaede	ongoing
	LCIO	12.1	release v01-06	provides StepPosition needed by 8.2	this week	J.Engels	ongoing
		12.2	release v02-00 provide new Track (multiple TrackStates), TrackerHitPlane, TrackerHitZCylinder	need for new tracking code: strip digitizers VXD track fitting	summer	S.Aplin F.Gaede J.Engels	ongoing
	LCFIVertex	13.1	release new standalone LCFIVertex flavor tag	new package in marlinreco or new release of LCFIV. ?		T.Tanabe	ongoing
		13.2	provide version that runs on DST	depends on 17.1 (DST format)		T.Tanabe	open
	reconstruction	14.1	integrate all new code into a standard reconstruction	check calibration and performance		"all"	open
	generator	15.1	provide first generated samples	some test sample for WW and nunuH exists (ttH soon)		A.Miyamoto M.Berggren T.Barklow	ongoing
	MC production	16.1	produce first 1TeV test samples	need 15.1 can use ILD_00 now or wait for ILD_01_pre02 (and preliminary new tracking)		J.Engels	open
		16.2	define event samples needed for DBD production	ILD physics WGs → talk/discussion in ILD Physics Meeting		ILD	open
		16.3	define/verify new DST format	drop the Jet collections new MCTruth link other .... → collect input from ILD → talk/discussion in Physics and Analysis Meeting		M.Berggren	open
	Background	18.1	strategy for dealing w/ bg	see discussion at Orsay ILD meeting		M.Thomson + ILD bg WG	ongoing
		18.2	pair bg standalone hit densities tracking performance			???	open
		18.3	incl. gamma gamma in physics samples			???	open
	Analysis	20.1 ...					

Analysis for ILD

Analysis Topic	Name	Comment
e+e- → ZH → l+ l- X	Youssef Khoulaki, Hassan II, Morocco	
e+e- → ZH → l+ l- X	Georgios Gerasimos Voutsinas, Strassbourg	for Vertex detector background/optimisation
BR(H→bb/cc/gg) in BR(H->bb/cc/gg) at 250 GeV and 350 GeV and 1 TeV	Hiroaki Ono, Nippon Dental University	
Little Higgs with T-Parity at 1 TeV	Eriko Kato, Tohoku	
Top Physics at 500 GeV	Phillipe Doublet, Roman Poescl, Francois Richard, LAL	
W e nu, ZZ, Z nu nu, nu nu h at 1 TeV	Graham Wilson, Brian van Doren, and Marco Carrasco-Lizaragga, Kan	
ZHH	Junping Tian, Tsing	
H->nu nu, H-> gamma gamma	Not yet covered, but optimistic to cover due to increased Japanese involvement	
ttH	Harjah Tabassam, Edinburgh Ryo Yonamine, KEK	
long-lived staus	Wataru Yamaura and Katsushige Kotera, Shinshu, DESY	
Model-independent WIMP searches in e+e--->ngamma + invis	Christoph Bartels, DESY	
Bi-linear R-parity violating SUSY	Benedikt Vormwald, DESY	
SPS1a' in general, selectrons with small mass-differences	Mikael Berggren, DESY	
TGC:s and polarisation	Ivan Marchesini, DESY	
SUSY "point 5"	Jenny List, DESY	

Detector R&D

R&D continues to be pursued actively by the R&D collaborations in consultation with ILD for the ILD specific issues

- Review within the R&D collaborations early in 2012 concerning inclusion in ILD
- Review of hardware baseline early summer 2012 by ILD (dedicated ILD meeting, probably in Asia)

Major Challenges for R&D for ILD

Of course different systems face different challenges.

But, there are some commonalities:

- Availability of test beam

test beam time is scarce, and – e.g. SDHCAL tests – problematic
Will be particularly challenging after in 2013/ 2014, during CERN shutdown
Appreciate the continued support from CERN and FNAL

- Tests for power pulsing:

Power pulsing tests are central to the ILC (and CLIC) program
Facility with high magnetic field are rare, facility at DESY had to be shut down, recommissioning is uncertain: need to look for alternatives in earnest

- General:

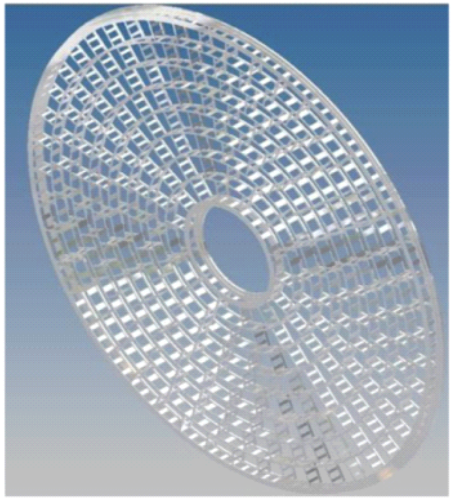
Personpower is critical and low, in particular engineering support is rather limited.

Integration

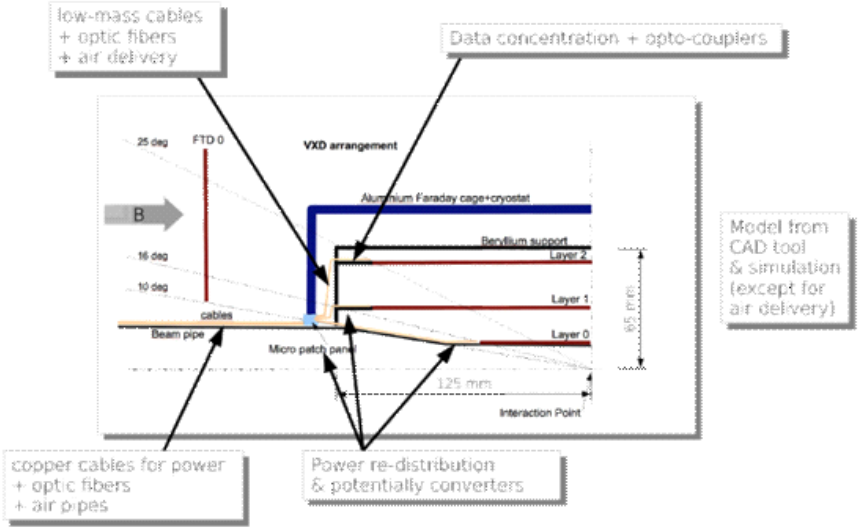
Significant progress on the overall detector integration

- Fairly detailed idea about many subdetectors and their services

Temperature profile of ladder



TPC endplate design

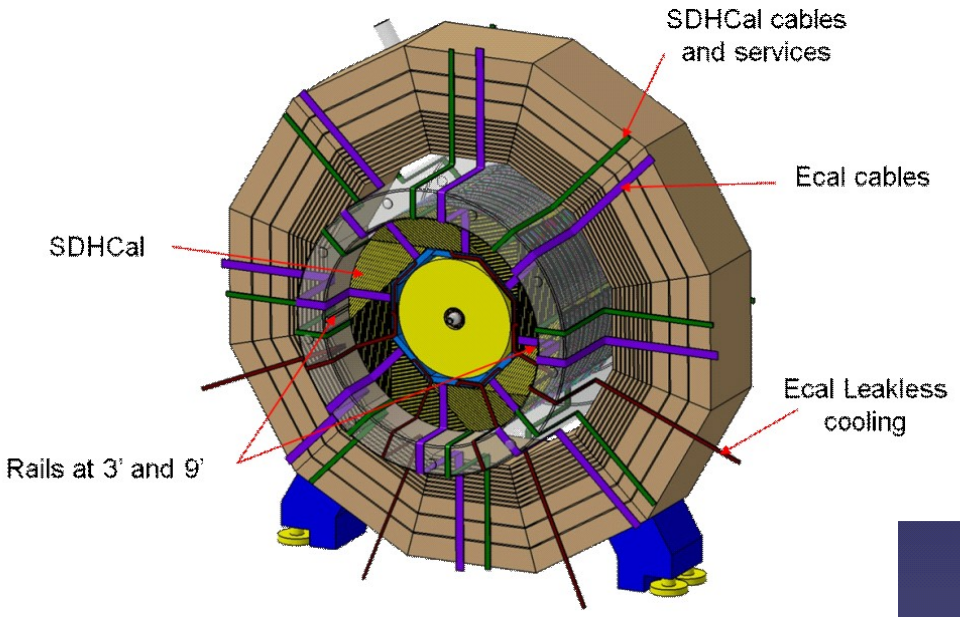


Detailed vertex design

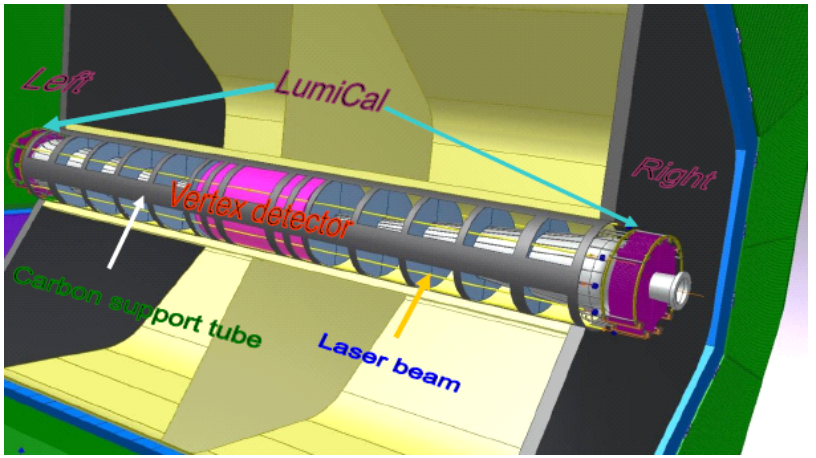
Forward disk design

Integration

Concrete plans for the integration are being developed

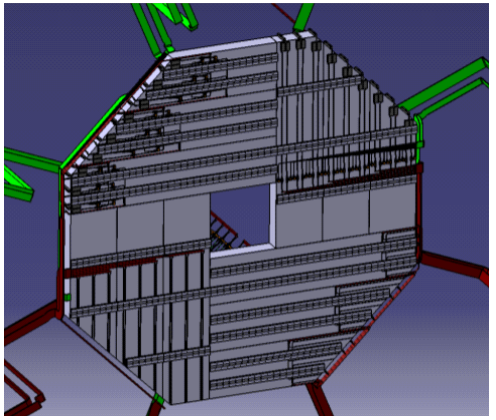


Cabling and services to calorimeter



Integration of forward and central detectors:

Critical issue, both technically and in terms of manpower



Integration: open central issues

Open issues:

- Work on a coherent solution for the central region (in particular Si tracking) is not finished

Forward region might need to be re-optimised

- FT pixel disks are not well developed

- Potential problem with material along the beam line identified, need specific R&D to address this.

- We do not so far have a common cooling concept
  - Leak less water for ECAL
  - CO2 cooling for VTX and TPC
  - Forced air cooling for VTX

- Power pulsing tests in high magnetic field are central, but problematic

And, of course, continually making sure that engineering and simulation stay in synch

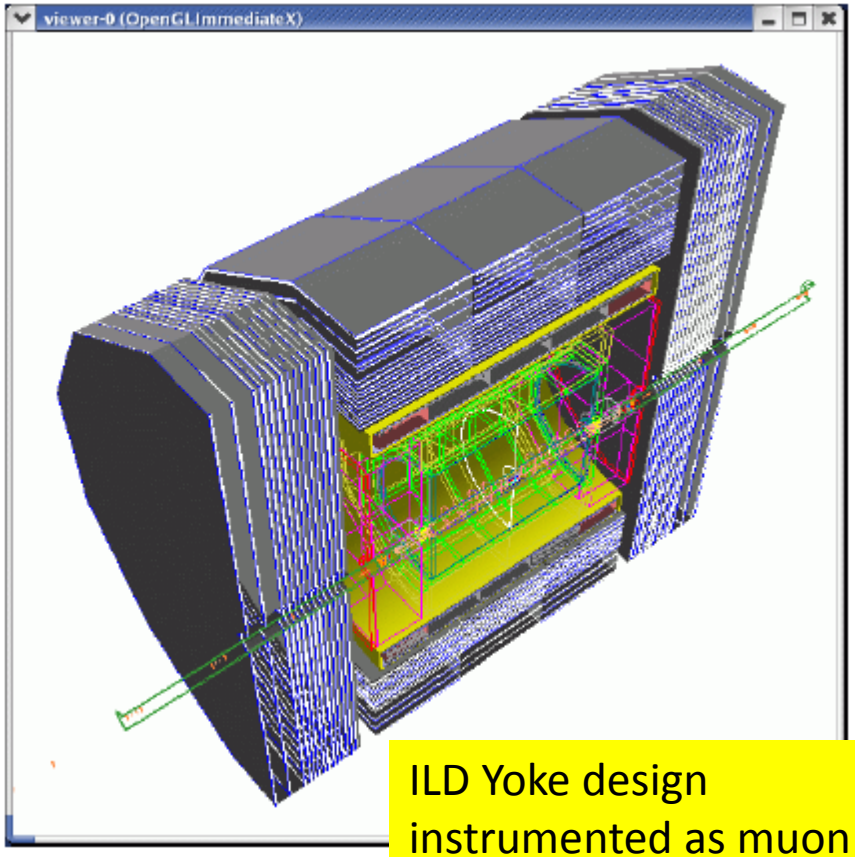
(e.g., found some inconsistencies when trying to make the ILD detector drawing)

YOKE

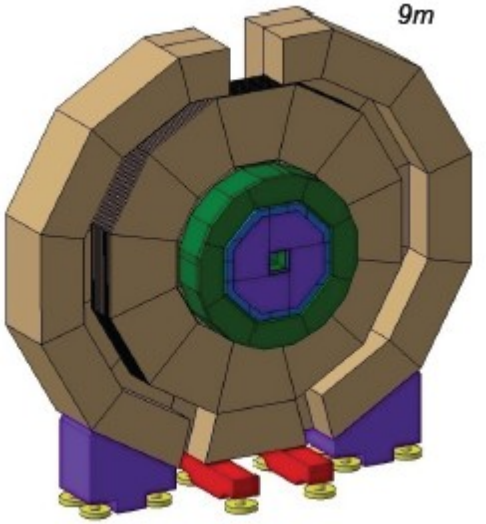
Yoke:

Decision was taken to remove correction coils

This might allow reoptimisation (reduction) of the yoke → possibly impact on cost



ILD Yoke design
instrumented as muon detector



ILD endcap Yoke design

Integration/ MDI

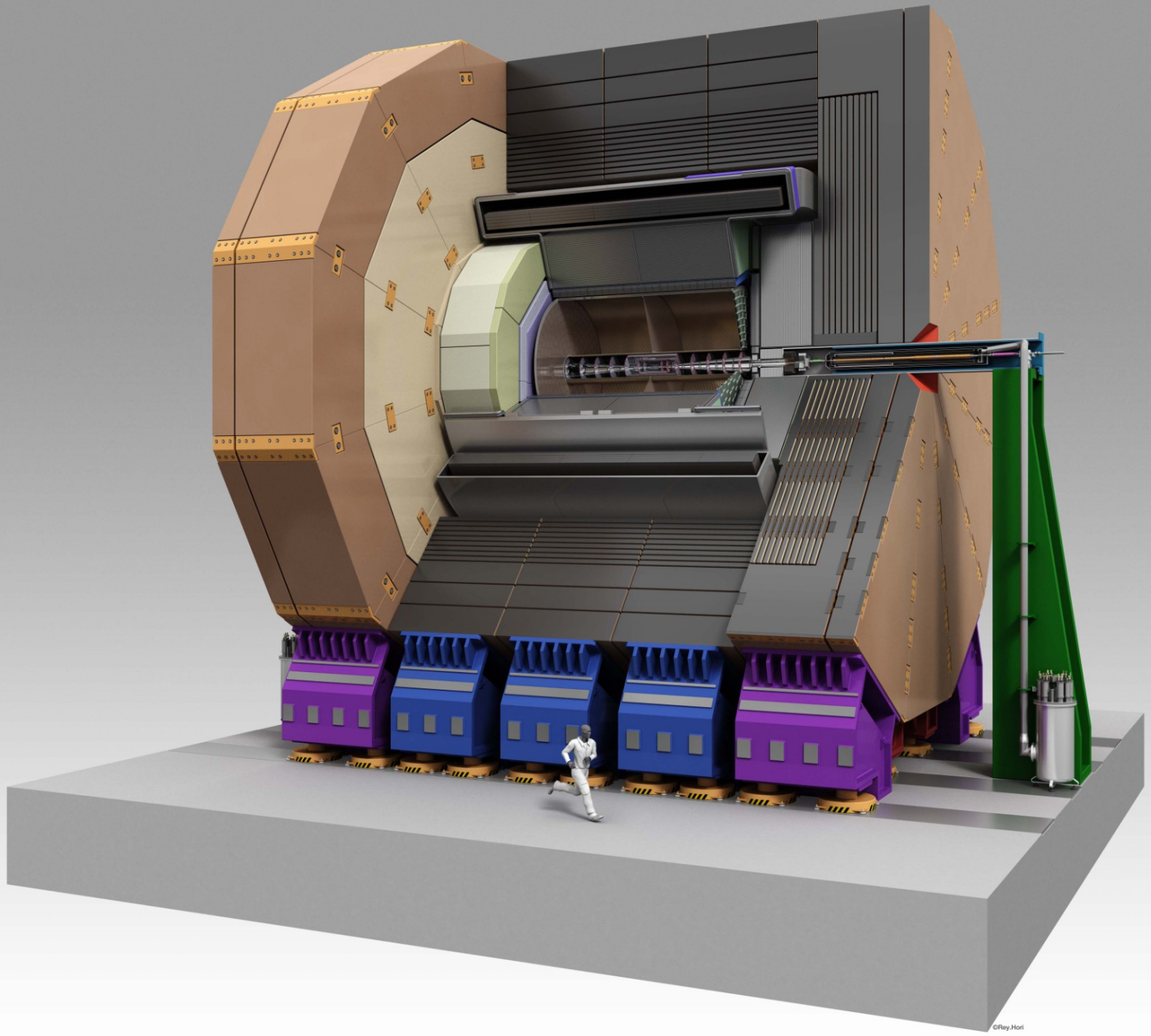
Integration/ MDI is very active group

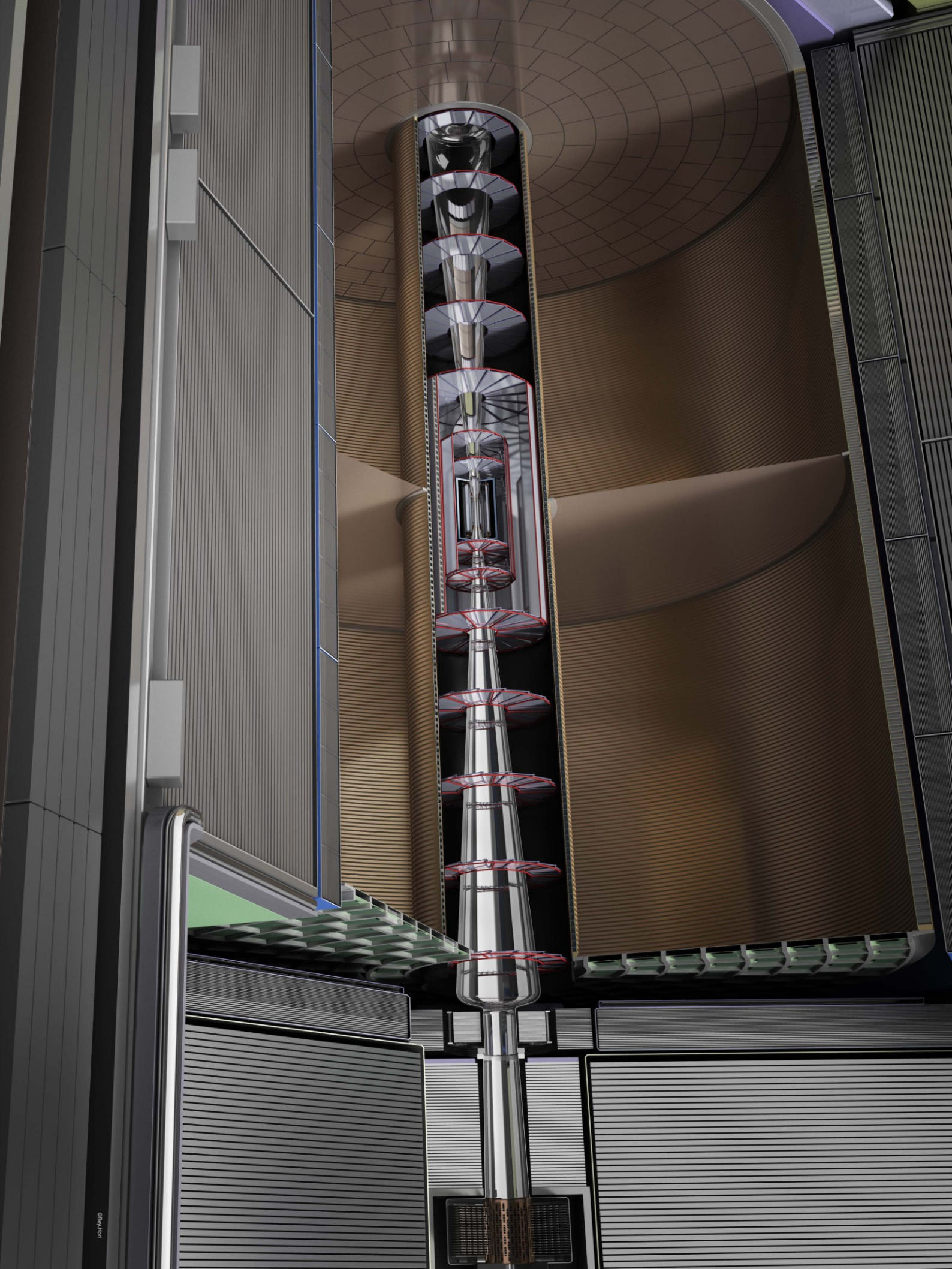
- series of dedicated integration and MDI meetings both on phone and in person

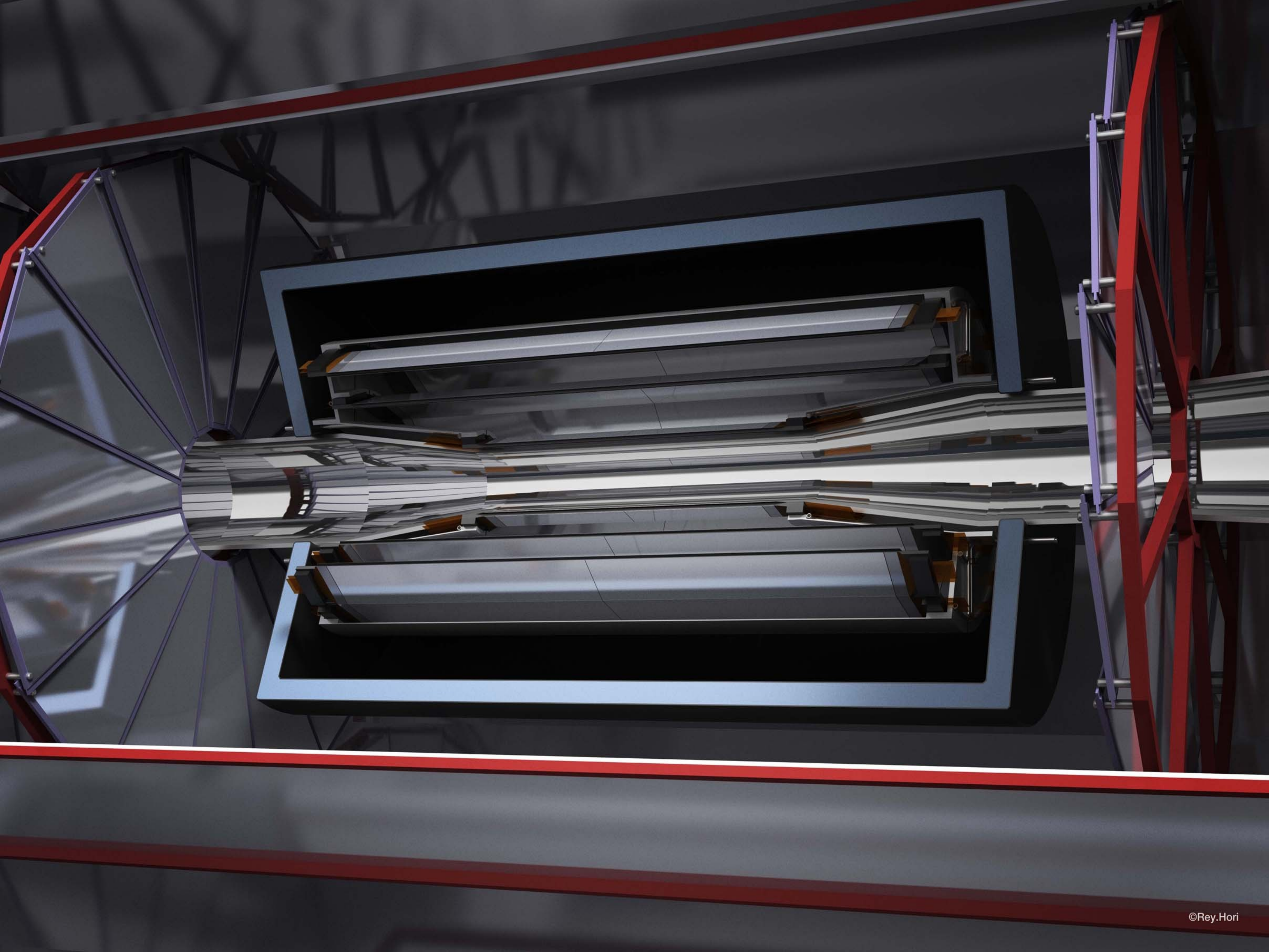
- close cooperation between ILD, SiD and CLIC on MDI and hall integration aspects

- recent problem

Lost our main integration engineer at LAL, replacement is being sought. Candidates have been identified, negotiations are ongoing, but look promising.


©Rey.Hori




©Rey.Hori

DBD

Detector Baseline Document

More than just another document

For ILD the DBD might consist of:

- A written document, which will be part of the official TDR/ DBD package
- A common depository for documentation and detailed information, using EDMS
- A collection of backup notes etc, which will give much more detail than the main document

Setup of EDMS for ILD has started in earnest:

First test project is TPC, others to follow (supported in part by the AIDA program)

EDMS for ILD

Use EDMS for a central tool/ depository to manage, maintain and publish ILD information

Basic structure in EDMS has been created,

Content and users are rather limited at the moment

First example project:

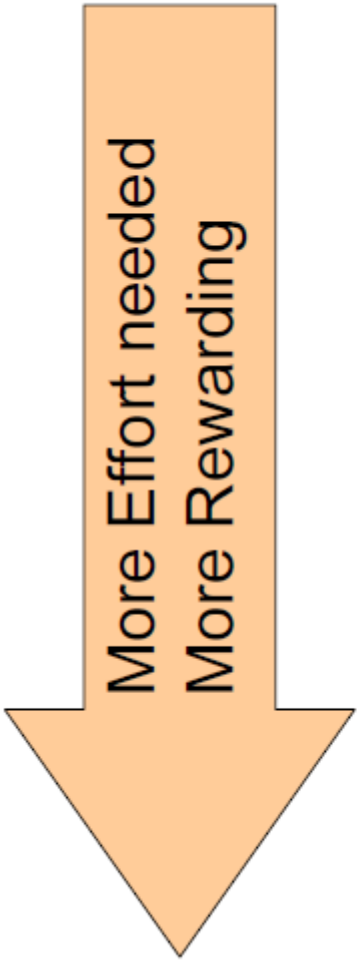
TPC (in particular large prototype project)

Information currently kept in many places:

- DESY Ideas database
- Orsay drawings (CATIA)
- Cornell Web page and drawings (Autocad)
- Private notes and logbooks
- Notes (lcnotes, preprints, papers, conference proceedings)

Try to assemble and concentrate all relevant information within EDMS

EDMS



Document Persistency

Documents are just „dumped“ into EDMS so they don't get lost

Document Traceability and Consistency a posteriori

Documents are dumped into EDMS and
Relationships between documents are drawn (A depends on B),

Document Traceability and Consistency during development

***EDMS is integrated in design process**: Dependencies between documents are used to make sure documents are correct, complete, consistent*

Costing ILD for the DBD

Mission:

We are requested to provide for the DBD an estimate of the ILD cost
with an uncertainty on the number
and a clear description of the methodology and the assumptions.

ILD and SID have to be coherent in their numbers.

Organization:

A costing group has been formed in ILC
under the supervision of S. Yamada
with representatives of SiD: M. Breidenbach, K. Krempetz
representatives of ILD: T. Sanuki, H. Videau
and P. Garbincius as expert advisor

In parallel there is a CLIC detector costing group
with the same ILD/SID representatives and K. Elsener.

We have been asked to revisit our estimates
with real consultation and clear agreement
- on some basic costs like tungsten, iron or silicon,

Table 16.1: Assumed unit cost for some materials [1]	agreed unit cost
Tungsten for HCAL	105 $ / kg
Tungsten for ECAL (tighter mechanical tolerances)	180 $ / kg
Steel for Yoke (semi-product)	1000 $ / ton
Steel for Yoke (final product, including assembly supervision)	6000 $ / ton
Stainless Steel for HCAL	4500 $ / ton
Silicon Detector	6 $ / cm^2

- on procedures for accounting,

-The cost is the cost for construction, R&D is not taken into account except specific R&D for transferring to industry.
-We consider that the manpower at the industrial level is already taken care of in the price, then we should focus on manpower which could be provided by institutions.
There we want to evaluate in man*years with few levels of qualification (2 or 3).
-A risk analysis should be performed at least at a certain level and a mitigation for the recognised risks studied.
-No assumptions should be made about future technology impact or demand fluctuations on the unit prices used.

- on exchange rates, the prices being those of 2012.

to escalate the prices we can use the tables
provided by CERN for the evolution of material prices

State of the estimate

We are focussing in common (SID/ILD) only on the driving cost items:
Coil and return yoke, calorimeters
currently we work on the coil.

We need to know the model we cost, some choices are still to be made, or their consequences analysed.

Since the LoI estimate has been published,
many sub-detectors have developed rather large prototypes
much closer to the ILD design.
A better estimate of their cost is at hand.

On top of this quite some work has been done on the integration of the detector and services,
understanding how the detector can be mounted and maintained,
tools are better understood.

Then the services and tools costs can be properly included.

Funding

Dedicated ILD funding: extremely limited

Most funding through detector R&D projects, often in synergy with other projects

Big funding sources:

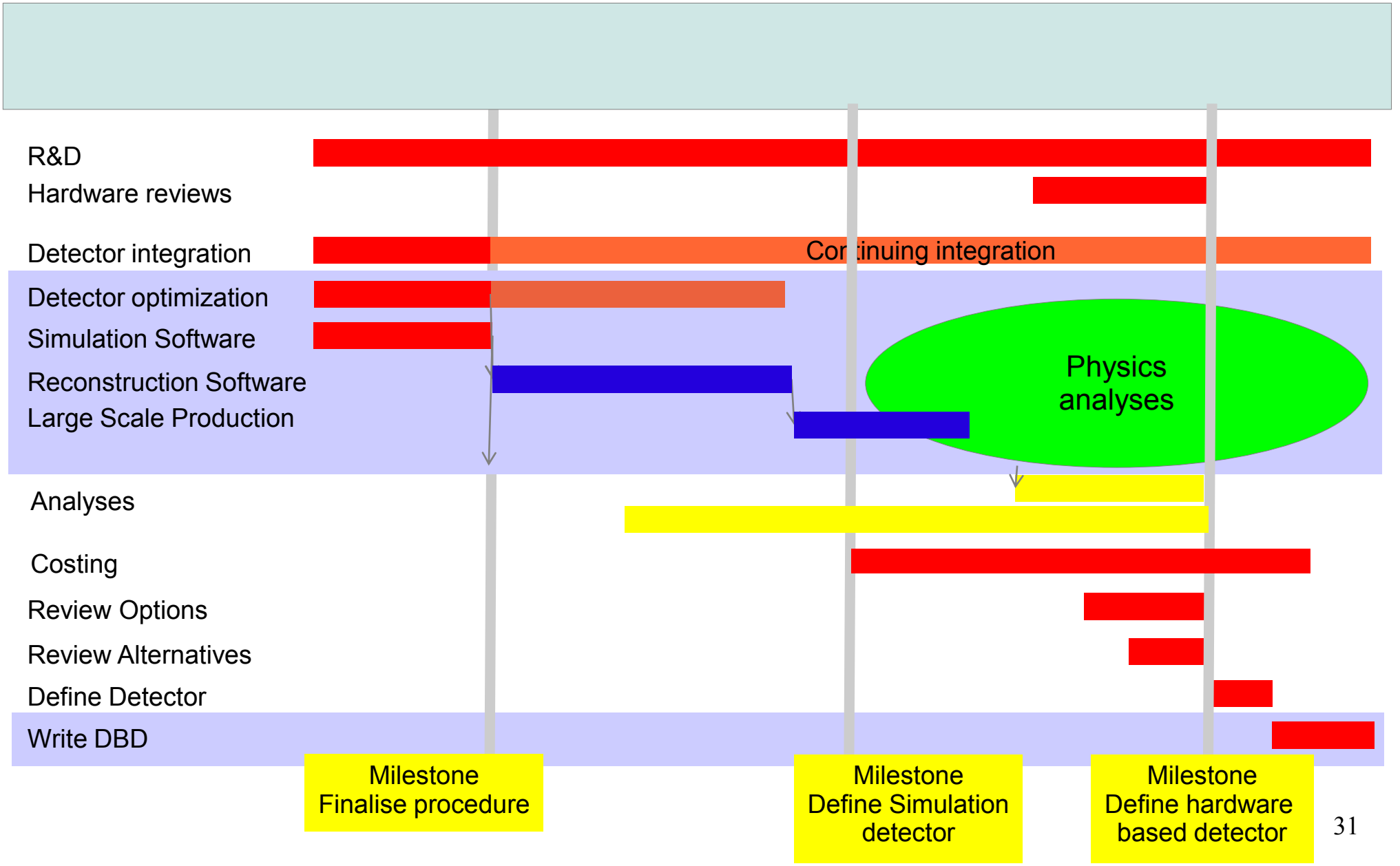
AIDA: European FP7 detector R&D project (LHC, Neutrinos, ILC)
2010-2015
JSPS: Japanese special funds for ILD detector R&D
2011 – 2016 (?) kickoff meeting last week in Sendai, Japan
University R&D program in the US

Institutional funds

Spinoffs become increasingly important also for funding

e.g. forward calorimeters: LHC
e.g. Vertex Detector (MAPS) technology: Star upgrade
e.g. SiPM technology: medical imaging and others

ILD Timeline



Summary

ILD is continuing to move towards the DBD

Significant progress on the side of simulation and reconstruction

Detector R&D is proceeding: expect to be able to freeze the hardware baseline in late spring 2012, as planned

Continuing worries:

Person-power

Availability of test beams

Overall resources (though JSPS program and AIDA are welcome relief)

Overall: ILD is moving, and expects to be able to deliver the DBD on time