ILD Optimization

Why – when – what

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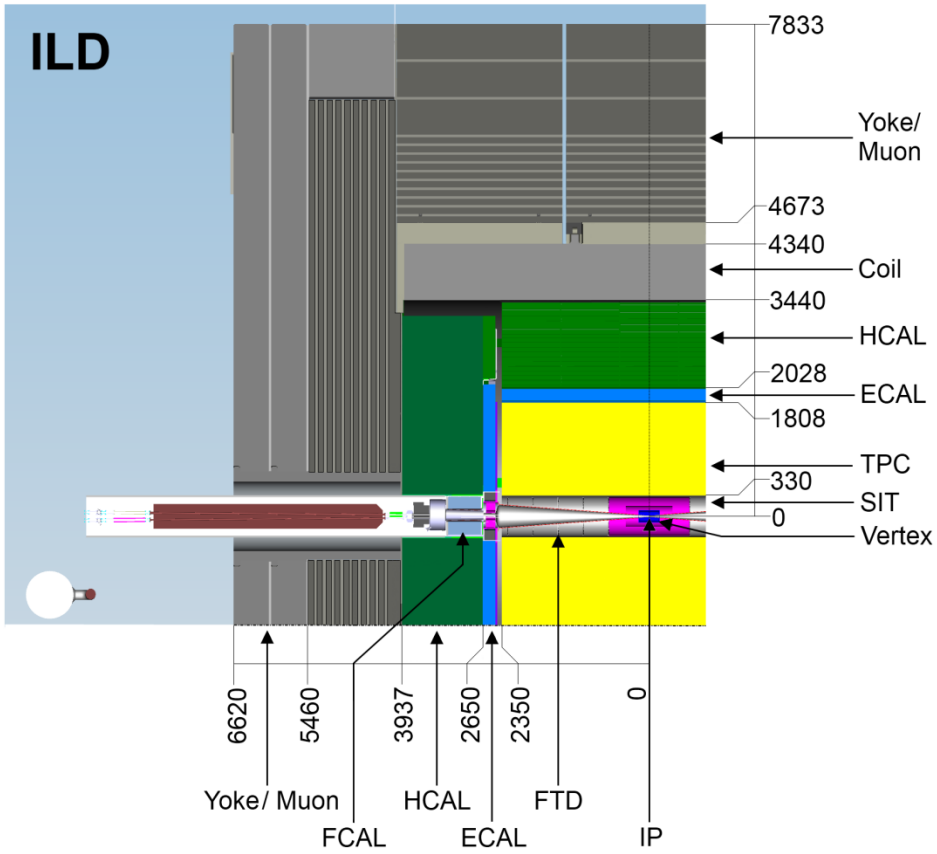
The current ILD concept



Started as a combination of GLD and LDC in 2007

(LCWS 2007 at DESY)

Some detailed optimization work done, but main parameter choices were “ad hoc” (politics) as much as physics driven

Now is the time to re-open the box and look at all choices:
There are no forbidden areas
There are no prejudices

The forbidden thoughts?

ILD fundamental design philosophy:

granular imaging detector, optimized for particle flow
large volume TPC in the center, supplemented by Silicon
ultimate performance ECAL and HCAL all inside the coil

I believe the concept is still sound, but we need to be prepared to answer:

All Silicon tracking?

Other technologies but TPC or Silicon in the central region?

How should particle flow calorimetry for a Higgs factory look like?

We need to be open: have good answers or study alternatives seriously

The inner system

Do we understand our performance requirements?

- VTX detector
- Silicon tracking?

Readout speed might be an important variable to control background and complexity:
Are the ambitious enough in ILD in this respect?

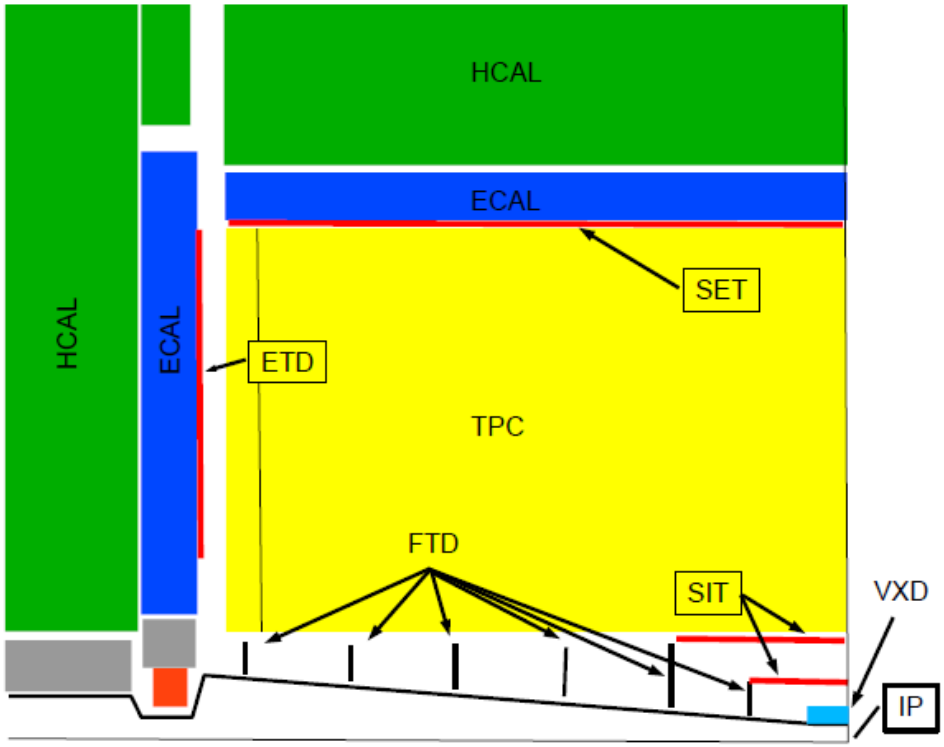
Do we understand / do we have a proper design of the beamtube etc?

We propose a big Silicon system for ILD: are we sure of its parameters?

What about the outer Silicon system?

Design of the VTX detector

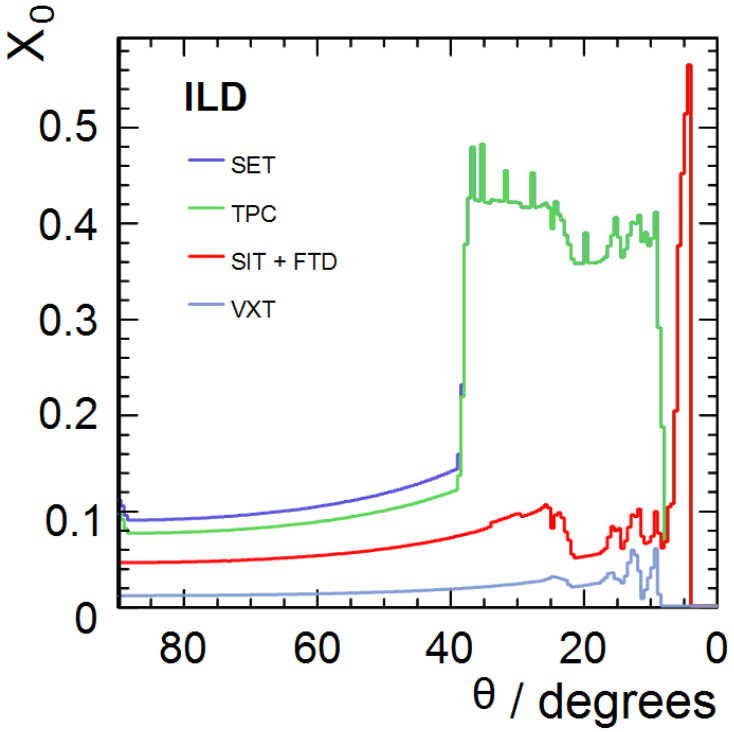
- Role and merrit of double layer
- Alternative geometries?



Material

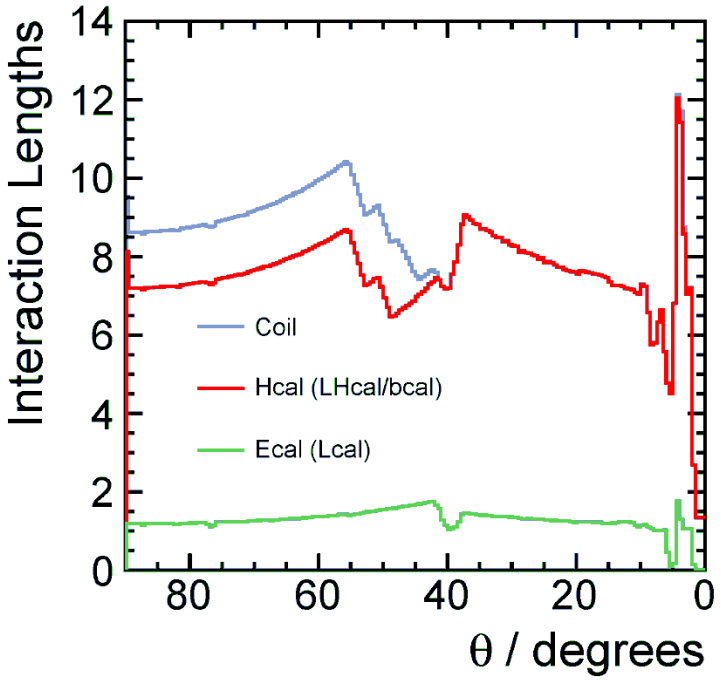
Material issues

- Silicon tracker
- TPC tracker



System thickness

- ECAL/ HCAL thickness
- choice of material?



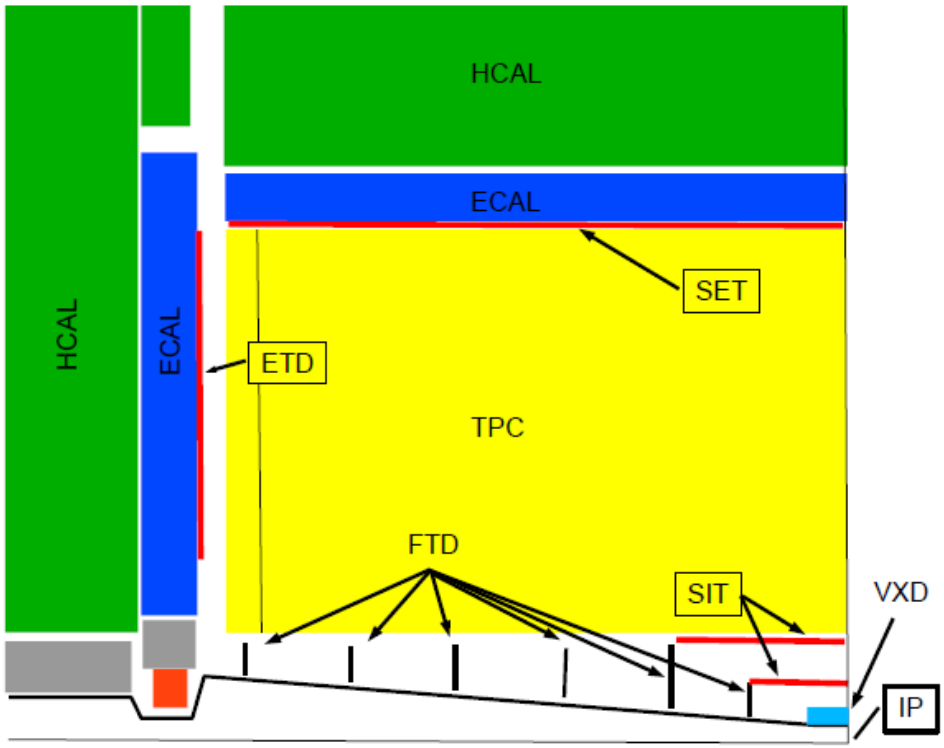
Tracking System

Overall system optimization:

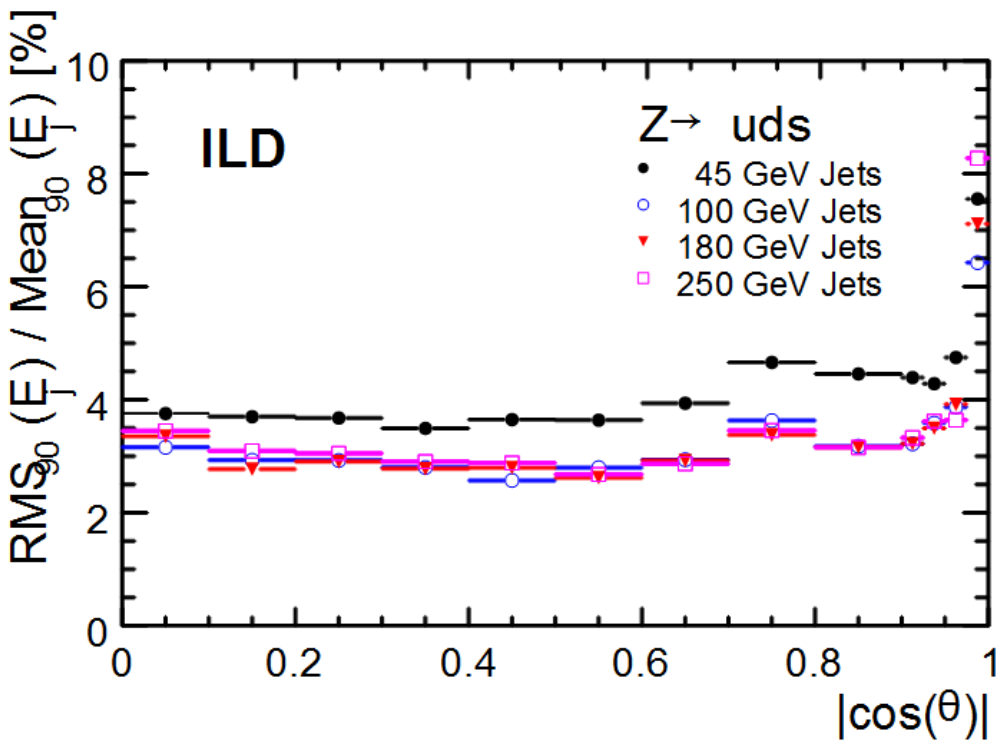
- Aspect ratio
- Outer radius
- Role of Silicon
- Role of material e.g. in the TPC system

We should ask fundamental questions

But we should also not forget about the constraints from real life: engineering needs to be factored in at the right level.



Pflow as a driving force



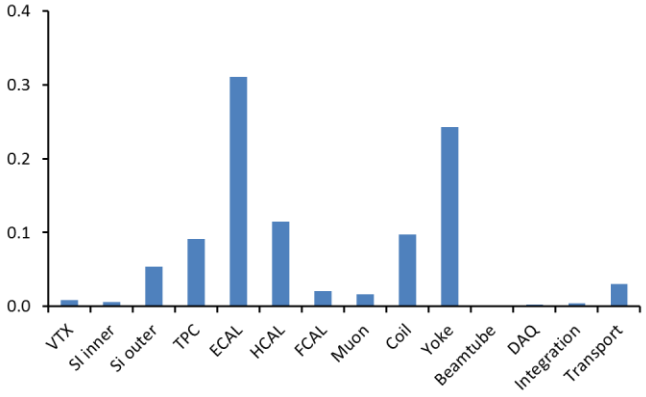
Pflow has been at the core of the definition of ILD

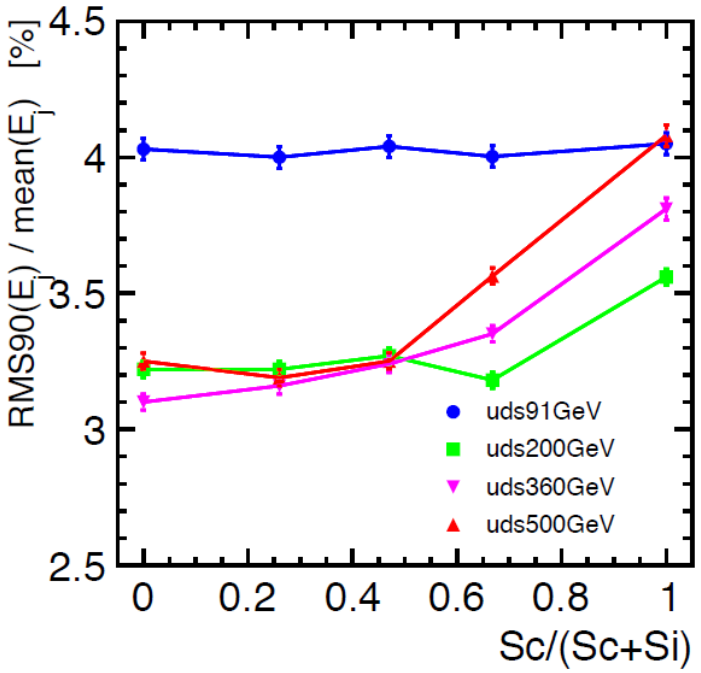
- Size
- Calorimeter performance
- Tracking performance

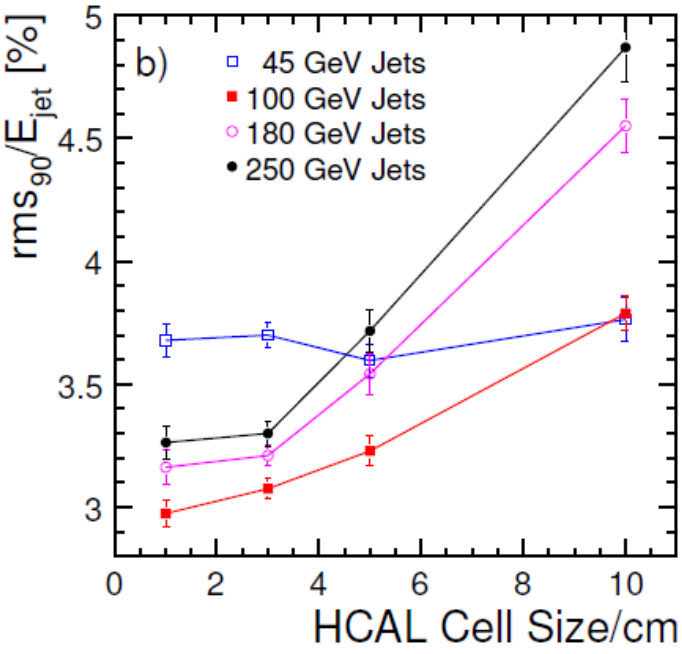
Imaging Calorimeter

Calorimetry is clearly a main part of ILD

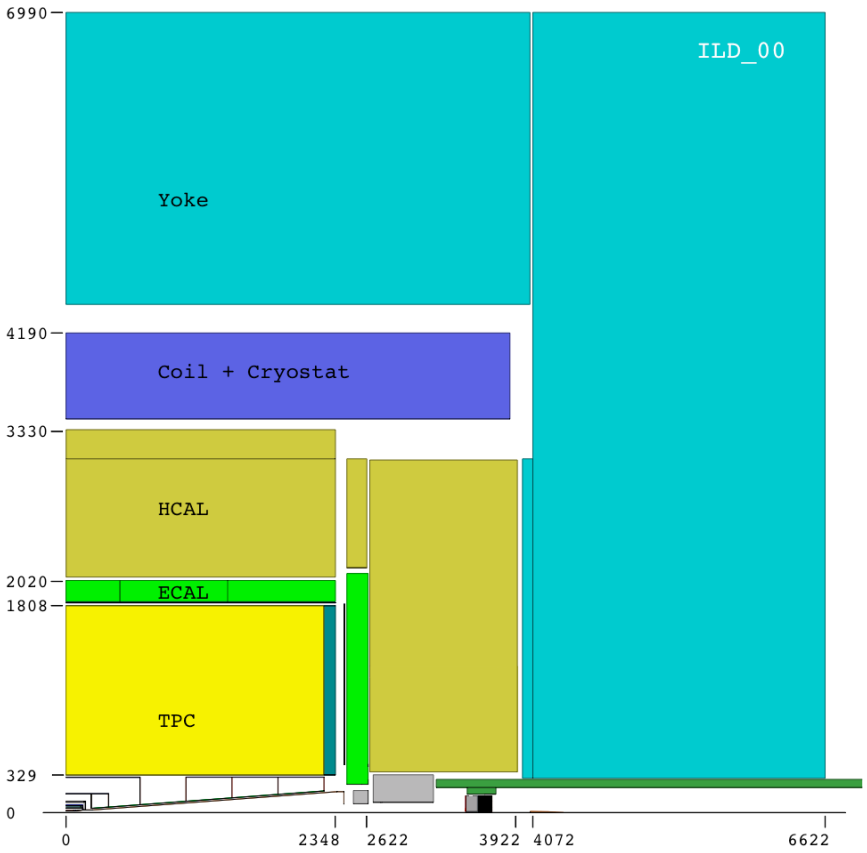
- Can we make our calorimeter cheaper?
- Can we make the step from ECAL to HCAL less severe?
- Can we find an intelligent way to stage the system?
- Si for the ECAL is a very attractive, but also very expensive option







Overall Detector size



Outer radius of Yoke:

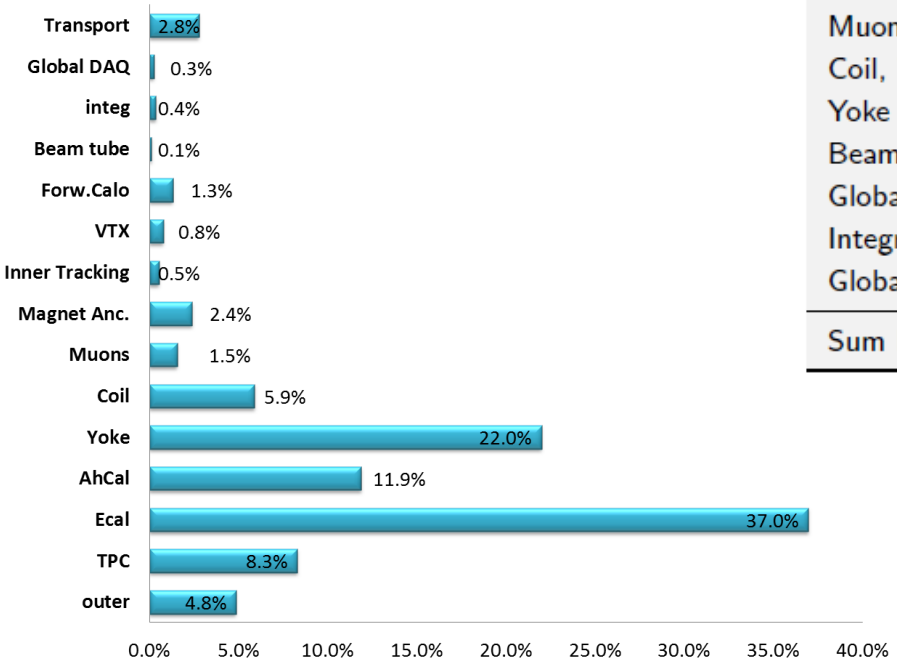
Defined from push-pull condition on field < 50 mG

- Is this the correct requirement
- Changing this will have a hige impact on size (and cotst)

Costs

Costing exercise as part of DBD
Needs significant more work and checking, but main messages are clear.

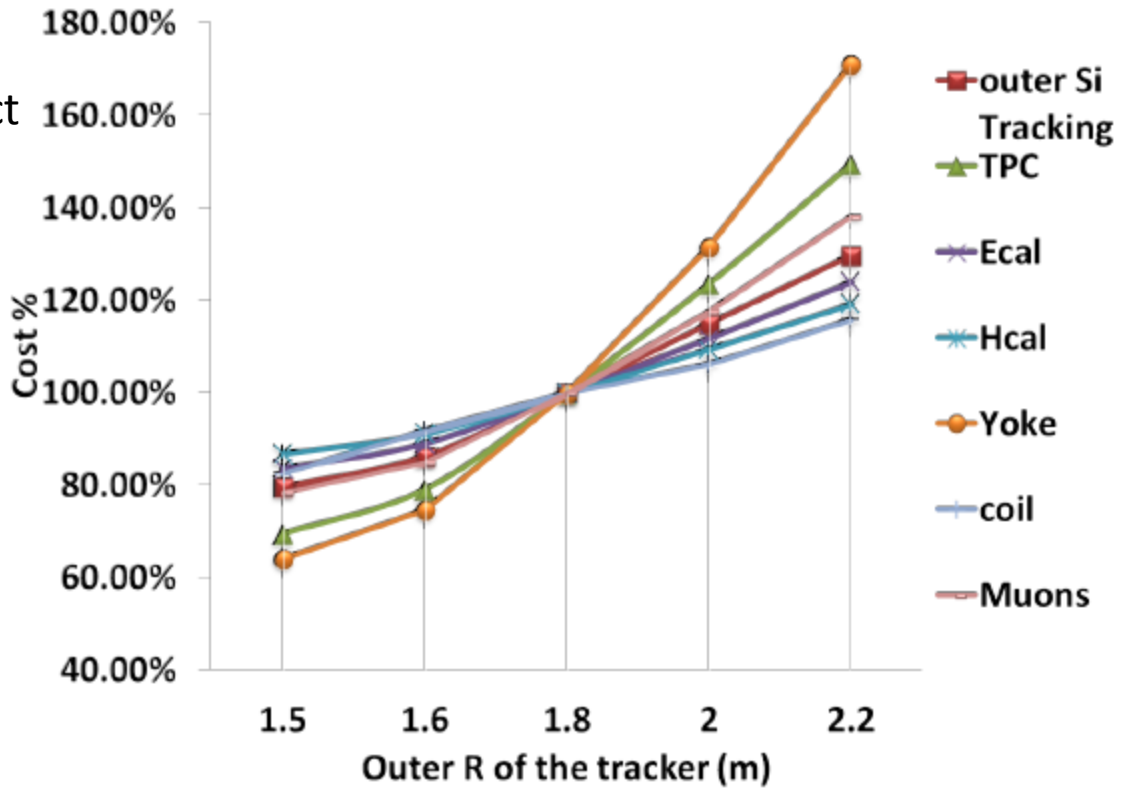
System	Option	Cost [MILCU]	Mean Cost [MILCU]
Vertex			3.4
Silicon tracking	inner	2.3	2.3
Silicon tracking	outer	21.0	21.0
TPC		35.9	35.9
ECAL			116.9
	SiECAL	157.7	
	ScECAL	74.0	
HCAL			44.9
	AHCAL	44.9	
	SDHCAL	44.8	
FCAL		8.1	8.1
Muon		6.5	6.5
Coil, incl anciliaries		38.0	38.0
Yoke		95.0	95.0
Beamtube		0.5	0.5
Global DAQ		1.1	1.1
Integration		1.5	1.5
Global Transportation		12.0	12.0
Sum ILD			391.8



ILD size? Cost?

Cost scaling law with different systems radius

- Potentially large impact on the cost
- Careful optimization of cost –performance benefit is needed



Procedure

- We should approach a re-optimization in an open way, without excluding anything
- We need to do this in a structured way, systematically
- We need to make sure that this does not interfere with our drive to prepare a construction ready project
- We probably should include some “review” mechanism to get external input into this question.

    - See also the discussion session after coffee break as an opportunity to discuss structures and organizational issues.