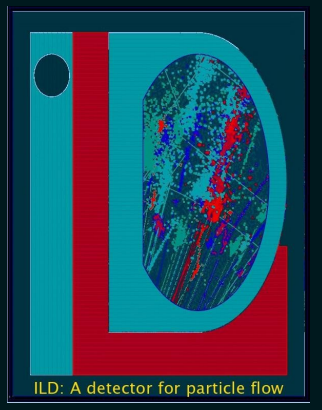


What about optimising ILD ?

with a little optimism ?

or the long journey to the linear collider

Henri Videau

Laboratoire Leprince-Ringuet

Quite from a calorimetric perspective

Why not rethinking rather?

Optimisation - What do we hide behind this word?

It is meant to be some choices of parameters to improve the performances
or some function of while respecting constraints

The choices can be discreet like choice of technology
or continuous like sizes.

What are the constraints?,
technical and engineering, cost?

How do we measure the performances?
in an unbiased and unblurred way!

This may be the wildest challenge.

And the wildest question is

Does it matter at the end?

See at the end

ILD has an agreed baseline

But

What is the ILD detector today?

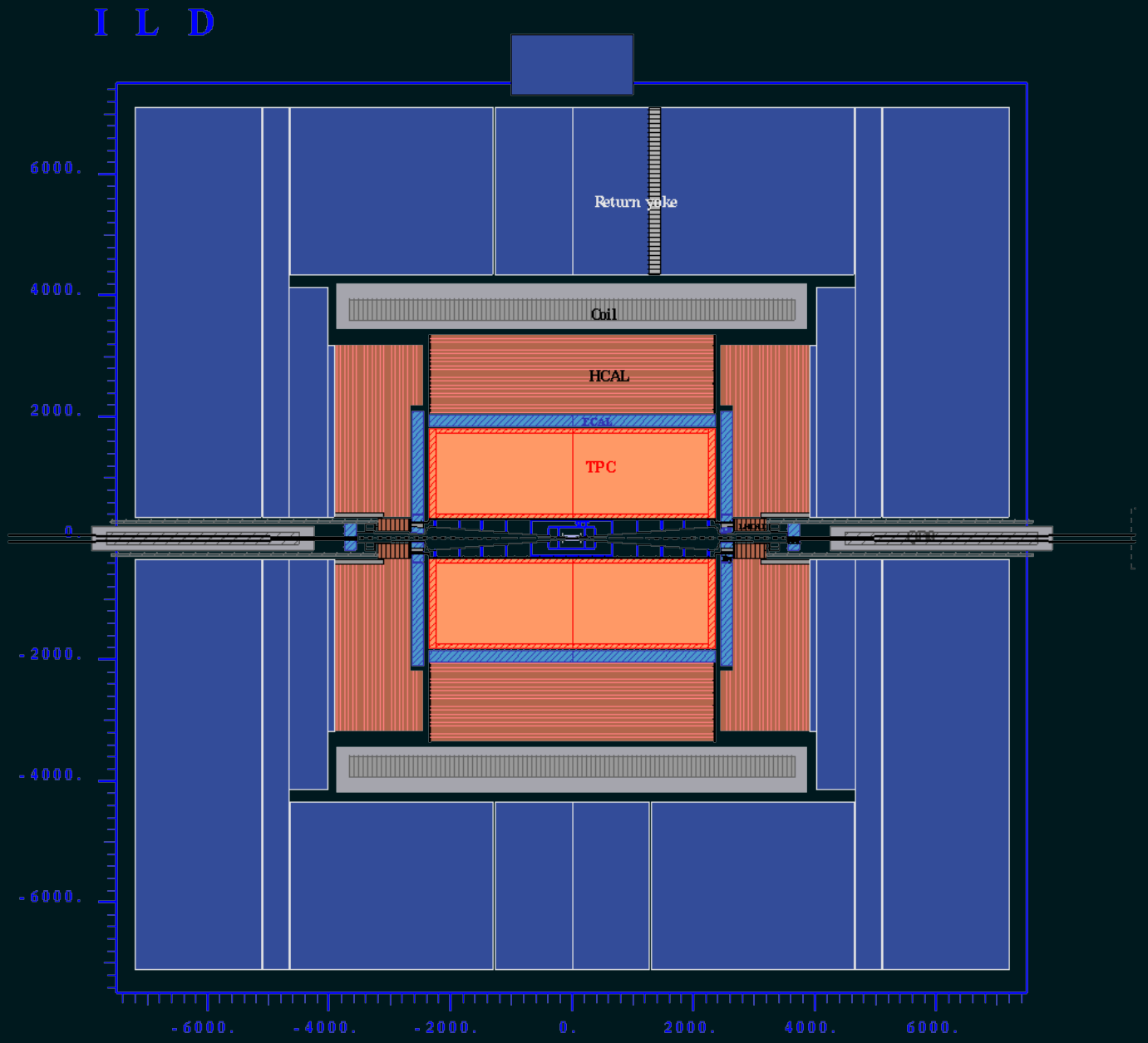
A baseline design illustrated by
A very partial description in the DBD, definitely not a technical report
A CAD maquette quite complete but at a rather coarse level for some parts
A simulation model with a very varied state of technical accuracy

It is not exactly a starting point to build the detector.

We are all quite conscious of that
and there is a processus to start now to review thoroughly the design
not to do rethinking but...

Sketch of the baseline model

Isn't that model pretty?



Where are we?

State of the simulation

We have a pretty complete simulation of the baseline but
It does not necessarily simulate a feasible detector (Si-W ECAL thickness)
It shows strange features (stairs in the ECAL end caps)

I may know better the ECAL

To be thoroughly or sorrowly revisited

State of the reconstruction tools

We have with Pandora a working package (thanks Mark) but
its sensitivity to some features, separation between showers, is not perfect

Effects in scaling

Most of the studies on size effects have made use of the automatic scaling in MOKKA without caring about border effects like dropping of wafers

Different parameters have been looked at:

- Number of layers
- cell sizes
- radial size

Notice that these are cost drivers

On the ECAL we could probably draw some conclusions:

- the number of layers may be slightly reduced without much harm
  In particular if we go to thicker wafers which looks natural

- the cell size, smaller than 5mm, could do slightly better (SiW)
  but not in the presence of cracks between sensors(Sc-W)
  and I doubt we would go for n times more electronics for a little fun

- the radial size may be linked to cell size,
  the impact on calorimetry seems manageable (in a decent range),
  it comes from the confusion term which is software related
  the impact on tracking may be nastier (we expect it)
  but I am not sure that the detailed technicalities have been
  looked at, like longer drifts in inhomogeneous field, diffusion

Some constraints have been overlooked

Examples

Do you believe that an SET 1.8m radius
can provide a 7.5µm precision in a stable way?

How sensitive are the thermal constraints on size?

What are the constraints from the power supply
in terms of cooling and material on the particle path?

Our design is now pretty old, in parts it dates from Tesla (2000)
when, in particular, the crossing angle was 0.

Nasty antiDID

We have benchmarks defined (see presentation by J List at the optimisation meeting)

That provides means of testing performances at the ultimate level
but also provides momentum spectra relevant for tracker and calos
and should also provide angular distributions.

Importance of the end caps versus barrel.

The end caps are often overlooked (DBD)

What should be the aspect ratio?
from physics point of view;
from the calorimeter point of view,
from the TPC point of view?

Overlap size

Are the TPC end plates such a mess that we want to reduce their angular size?
Do we really like long drift in inhomogeneous fields?

Is the cost the diving constraint for optimising (resizing)

It has been demonstrated on fast simulation that by reducing
the ECAL inner radius from 1843 to 1400mm
the accuracy (for the recoil mass) was reduced by about 12%.

The cost of ILD is concurrently reduced by 1/2

You can say that 12% accuracy means that you need 25% more data
5 years instead of 4

Considering the cost for running ILC one year, the gain on ILD cost is peanuts
but for a very green ILC

On the other side, if instead of improving on LHC by a factor 10, it would be by 9?
And, don't we loose more in luminosity and money with push-pull?

Isn't all that more a politico-psycho question rather than a physics or economical one?

Except when finding the money for the detector!

Optimising

I would rather start by optimising versus the technical/engineering constraints and the risks

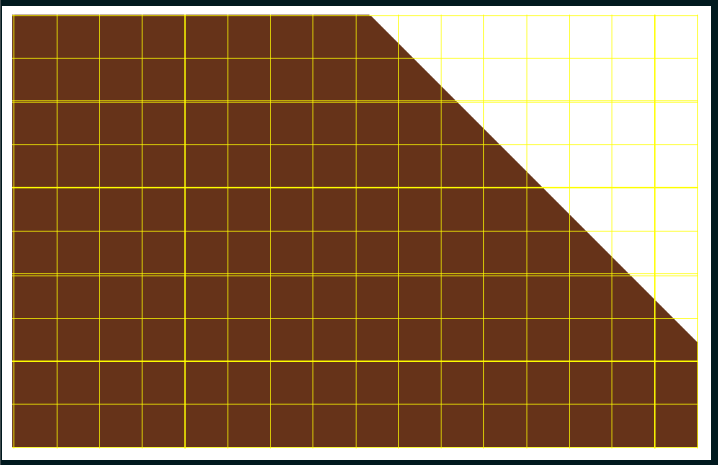
After clearing some points like the aspect ratio

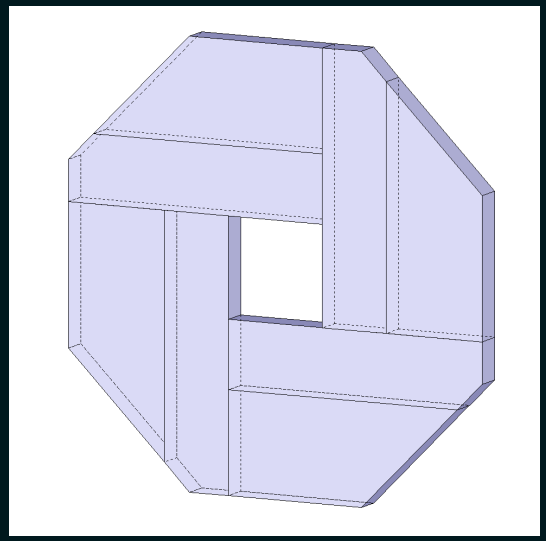
Big may be best but not necessarily feasible!

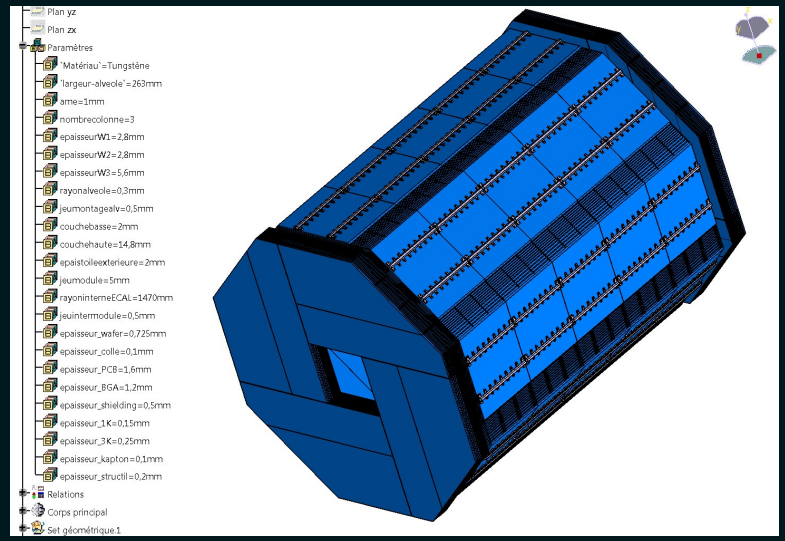
Check not by scaling but with (few) new models,
more accurate, respecting what has been learned from our long R&D
with some touch of optimism though

And you could even estimate the cost !

Example for ECAL







More philosophically

Is the precise design of the detector relevant to physics results?

But we have to produce a detailed design

Can we believe in the intrinsic performances of sub-detectors?

What are the chances to observe the expected momentum resolution?
What are the chances to observe a 10 times worse resolution?

What impact would that have on physics?

More philosophically

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Observing the past, detectors have rarely reached their expected performances
but in the end their harvest was often far above expected.

The origin of that is in the software and analysis effort in a highly competitive atmosphere
We'd better not wait.

Software is cheaper, is it less fun?

The end

As usual it is at the same time partial and partial

Poubelle

Que reste-il à optimiser ?

Contraintes mécaniques ?

Precision

Infrastructure

Contraintes thermiques ?

Cooling

Contraintes magnétiques

Uniformité

Contraintes électroniques

Contraintes d'alimentation (PP)

Calo granularity

↔ SW

Benchmarks momentum,
Angular distribution.

The state of the baseline

More on engineering versus scaling, defining new models.

The end caps
Angle of the corner?

Link to the review process

A sole question of cost?

Evaluation of performances, the means, are'nt they biased or blurred?

Sketch of the baseline model

Is'nt that model pretty?