ILC NEWS

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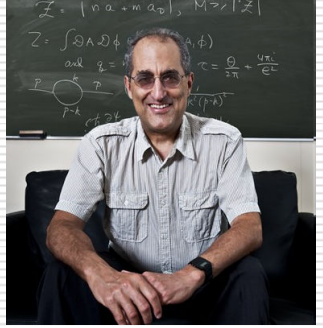
ECFA Study

Physics and Detectors for a Linear Collider

Introduction

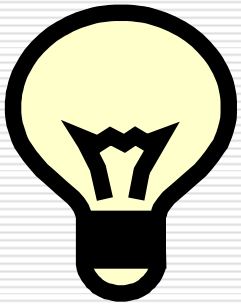
- Many things are going on !
- Selection of few topics influenced by the audience and by the limited competence of the speaker
- Strategy for Physics
- Strategy for Detectors
- Some machine aspects
- Politics (can be shortened)

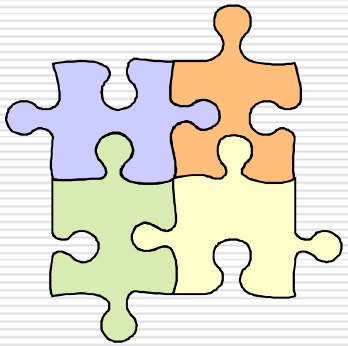
Strategy for Physics 1



- Understanding better our universe is the main motivation for ILC
- Up to know from LEP/SLC/TeVatron the wisdom has led to the need for a 500 GeV machine upgradeable at 1 TeV: light Higgs, top physics. The SUSY scenario does not predict a definite spectrum but could require >1 TeV -> CLIC option
- Since then competing models have appeared while SUSY in spite of its attractive features, mainly theoretical, still remains to be proven
- LHC (+ TeVatron) should give us an answer pretty soon to base a rational decision
- In the meanwhile CLIC-ILC groups collaborate on common items avoiding duplicated efforts and conflicting attitudes which should be damaging for both parties

Higgs boson ?





Elementary scalar	Absent	Composite
Minimal SUSY	Strong interactions	SI but ~ to ND>4
ZH guaranteed	New resonances ?	Affects H and top quark
SUSY masses ?	> 1 TeV	ZH top pairs at ILC

Strategy for Physics 2

- LHC (or TeVatron) should soon give 1st answers: SM only, SUSY, Composite ?
- ILC is ideal to study thoroughly/precisely the properties of a light Higgs
- ILC is very well suited to a composite scenario where Higgs precision measurements are most important
- ILC also ideal with SUSY BUT provided there is enough energy to observe the lightest particles
- ILC is not limited to 500 GeV (nor strictly to 1 TeV but certainly not >1.5 TeV)
- A Physics Panel created by the RD S. Yamada, will react to new/old ideas (options like $\gamma\gamma$ collider, positron polarisation in particular for GigaZ)
- Will react to new physics results

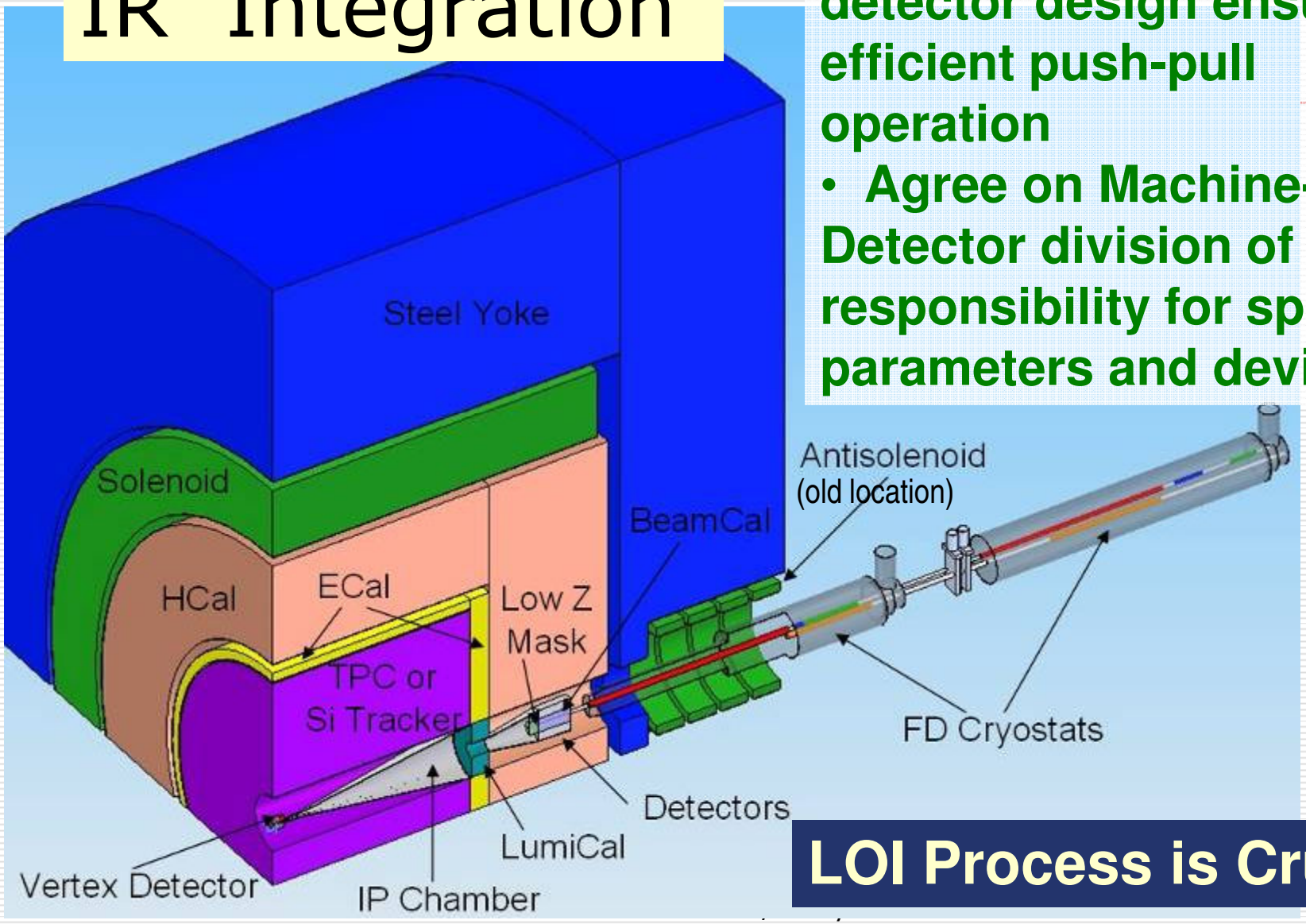
Strategy for Detectors

- Several important steps have occurred
- LoI's received from the 3 concepts and under scrutiny by **IDAG** an international peer review committee
- Is examining these concepts not for a selection but for a validation
- Is the detector feasible? Does it accomplish the physics? Is the team able to produce a valid design study in close collaboration with the GDE, can it perform the critical R&D (manpower & resources)
- Will converge during this summer

IR Integration

CHALLENGES:

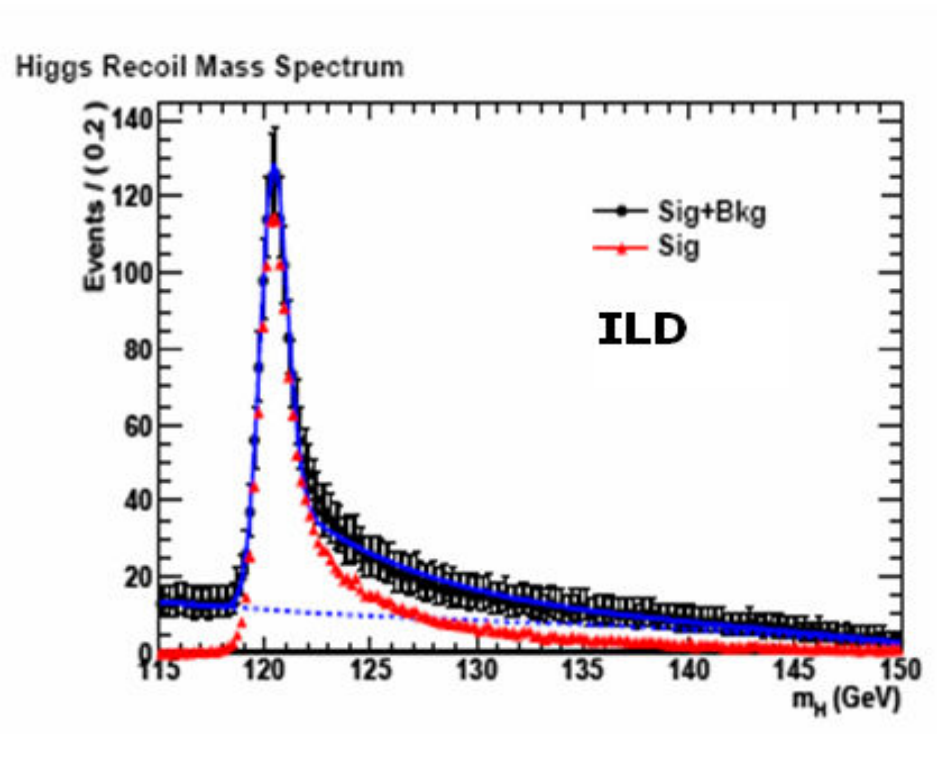
- **Optimize IR and detector design ensuring efficient push-pull operation**
- **Agree on Machine-Detector division of responsibility for space, parameters and devices**



LOI Process is Crucial

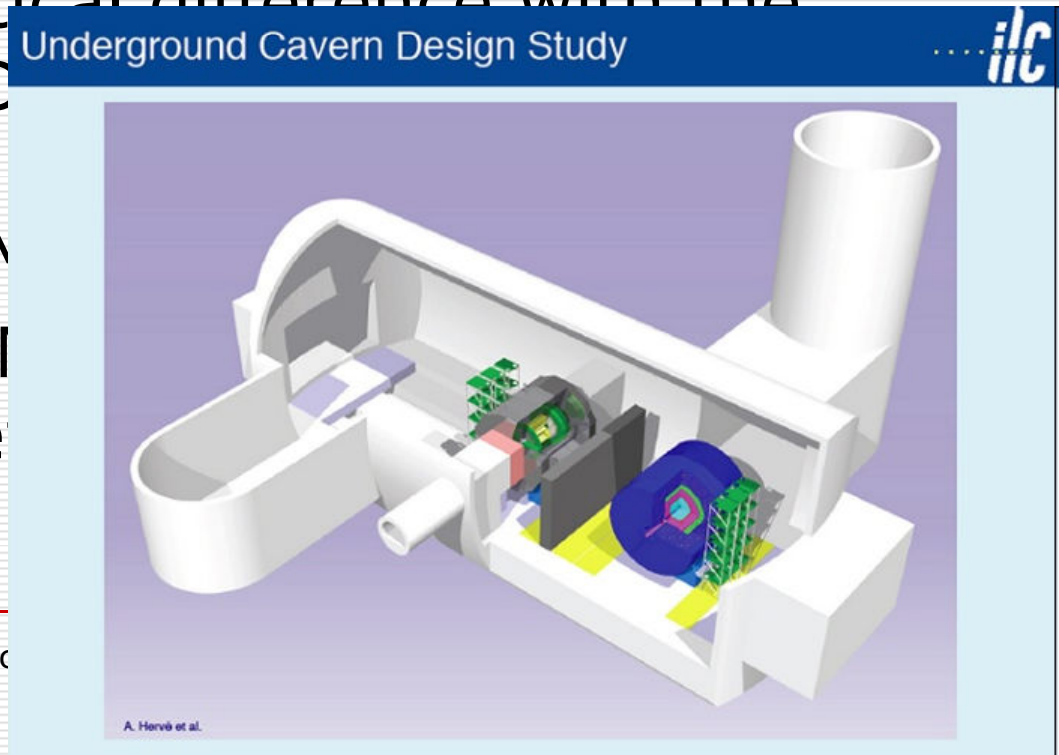
Example of a full LoI study

- HZ with Z->μμ at 250 GeV
- σ_{RM} ~ 650 MeV which allows ~30 MeV on M_H
- Note that σ_{RM} ~300 MeV from the detector the rest is due to beam spread (0.18% on positrons and 0.28% for electrons due to **undulator**)
- Can one improve ?

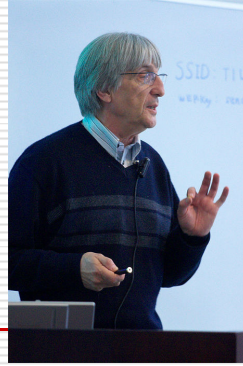


Organisation

- Horizontal structure set under a RD to monitor the various aspects common to the 3 concepts R&D, Software, Physics, MDI…
- Note a major polit… machine: not a TD… **Baseline Design** … with the GDE for M…
- Good progress in … and engineering e…



CLIC-ILC on detectors



- An MoU was signed and is effective for mutual benefit
- Well advanced on detector R&D and software
- CERN experience with CMS will help ILC
- In practice CLIC and ILC can share very similar concepts:
  + Similar SC coil derived from CMS
  + Similar calorimetry ideas ->~80% of the cost !
- PFLOW has been tried by ILD at CLIC energies
- DREAM (4th concept) to go beyond 500 GeV jets ?
- CERN has signed the 3 LoIs and CALICE (largest R&D collaboration on Calorimetry for PFLOW)

Next steps

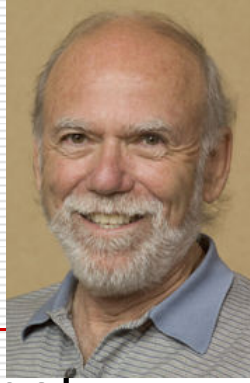
- Complete the R&D critical to define a baseline (choice for sub-detectors) by 2012
- Improve on the understanding of Detector Performances (Reference Reactions) with a more realistic detector (cooling, cabling, dead zones)
- Understand the costing better
- At the moment (ILC units), very preliminary

  SiD 234 M$

  ILD 454 M$

  4th 411 M$

Some Machine aspects



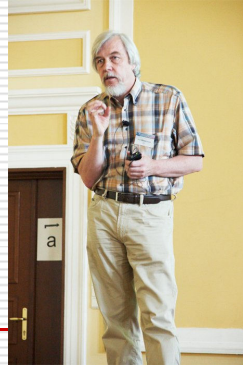
- The initial goal of a full **Machine TDR** in 2012 cannot be fulfilled with less resources and no decision on a site
- What will it be?
  - **Cost performance optimized technical design**
  - **It will include a project implementation plan**
- Who will it be for?
  - **It will be a detailed design and project plan ready for serious consideration by potential collaborating governments**
- What it will not be?
  - **It will not be a complete engineering design with drawings, etc.**

Comments

- Cost reduction examples: single tunnel, low power option (several savings), klystrons in clusters…
- Discussion on organisation/siting have started which is essential (ILC like ITER and contrary to LHC does not benefit from a CERN type framework)->EU has provided a 'Preparatory Phase' contract called **ILC-Higrade**
- Proposal for a new machine baseline early 2010
- Avoid compromising on **1 TeV** upgrade (BDS geometry)
- Reminder: a **Scope Document** (R. Heuer et al) defines the performances of the baseline machine and the options (Polarized positrons, $\gamma\gamma$, GigaZ)
- As stated by Barry ADC (**Alternate Design Concepts**) can/should go on beyond 2012 in particular for the positron sources

SEVENTH FRAMEWORK PROGRAMME

Politics in Europe



- Construction of the **XFEL** at DESY brings a major asset
- Europe leads R&D on detectors **EUDET**
- RH: We are NOW in a new exciting era of accelerator planning-design-construction-running and need intensified efforts on R&D and technical design work to enable these decisions
- Global collaboration and stability on long time scales

  (reminder: first workshop on LHC was 1984. . .)
- Very positive evolution of CERN but LHC constraints

  - For 2009, the reallocation of resources to the LHC repair means that work on the LHC upgrade and a future linear collider will proceed more slowly than originally foreseen

  - LHC spending to be reprofiled, and that's what we plan to do. Instead of paying off the loan by 2011, we propose to do it by 2013, freeing up resources for the MTP

Other regions

- **Japan** is pushing very hard boosted by the 2008 Nobel
- Lobbying at the highest level, includes industry etc..but not yet an Asian organisation with **India**, **China**, **Korea** while these 3 countries are progressing very well on ILC
- Very ambitious ILC dedicated R&D

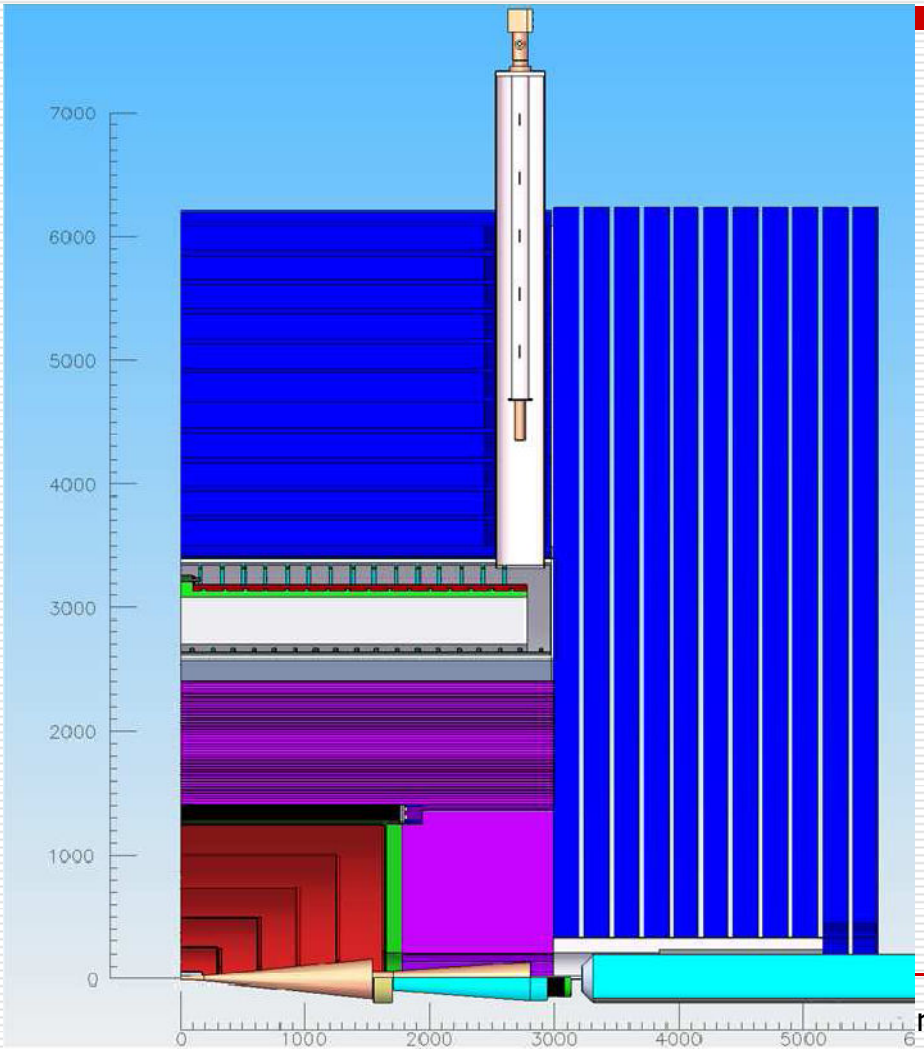
  - KeK demonstrator for ILC with 3 cryomodules (full RF unit) in 2013

  - New Cavity Fabrication Facility is under discussion aiming for a model factory for ILC cavity fabrication, material inspection, machining, press, EBW for cells, chemical polish, rinsing, clean room, various inspections, RF measurements, etc.
- US: political change may help (**Obama** to Academy of Sciences mentions 'colliders')
- 'U.S. Secretary of Energy Steven Chu and the leader of the project don't agree' on the real cost'
- Issue: how can we prove our costing? Learn the lessons from **ITER**, **XFEL** etc…

In Summary

- Be prepared with realistic projects for the machine & detectors end of 2012 in case…
- LHC : technical success + scientific inputs are crucial
- XFEL provides a solid baseline for ILC
- 2010 proof of ILC gradients and results from Cornell and KeK
- R&D is a key issue both for machine and detectors
- It will go on beyond 2012 e.g. on positrons
- Good work !

SiD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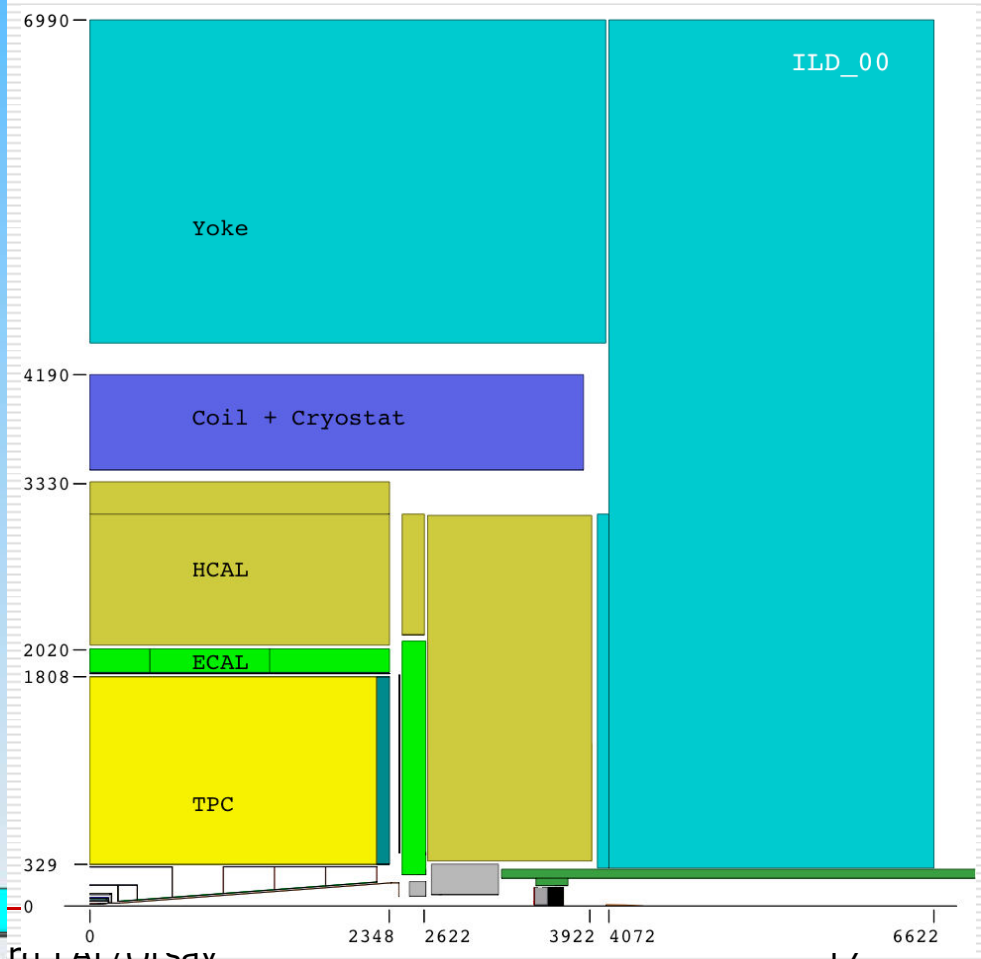
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