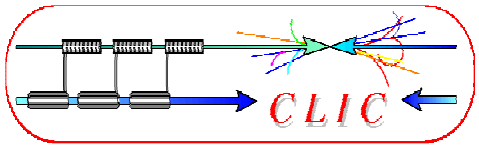
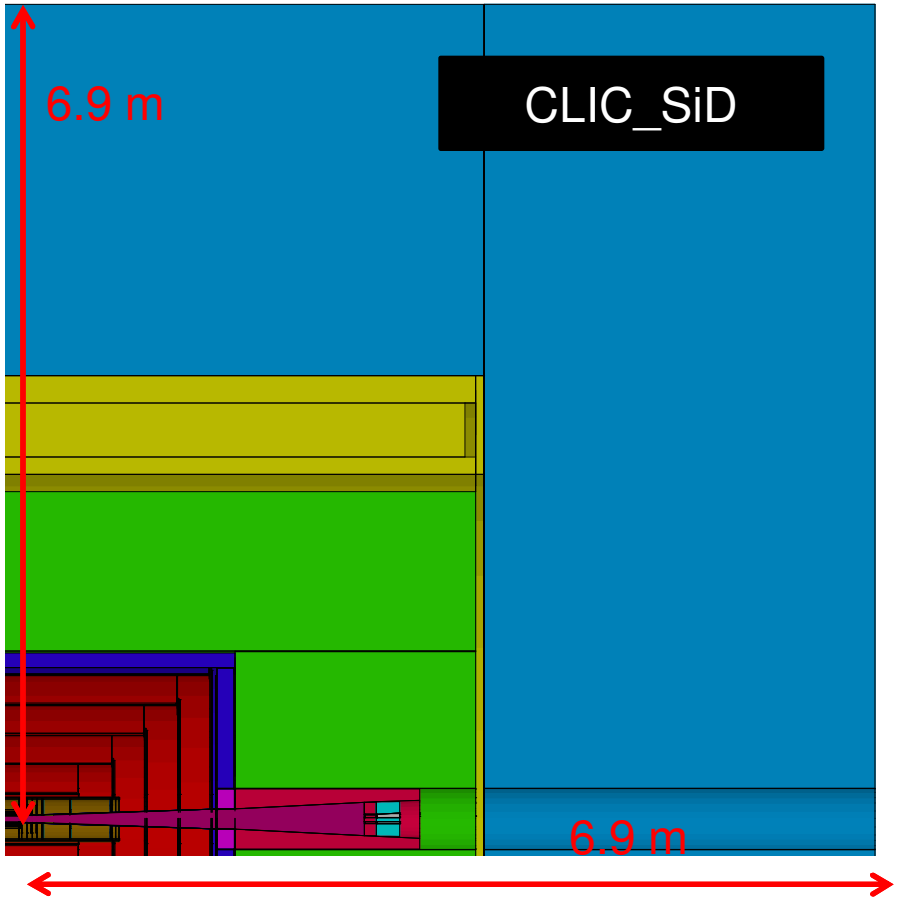


SiD and CLIC

Outline:

- Adaptation of SiD detector for CLIC
- Use of SiD software for CLIC
  - Tracking studies
  - Calorimetry studies
- Engineering of CLIC_SiD
  - General layout
  - Forward region layout with QD0 integration
  - Push-pull and experimental cavern
- CDR preparation: software/simulation and detector layout
- CDR preparation working groups
- CDR layout and organisation
- Next steps
- ….

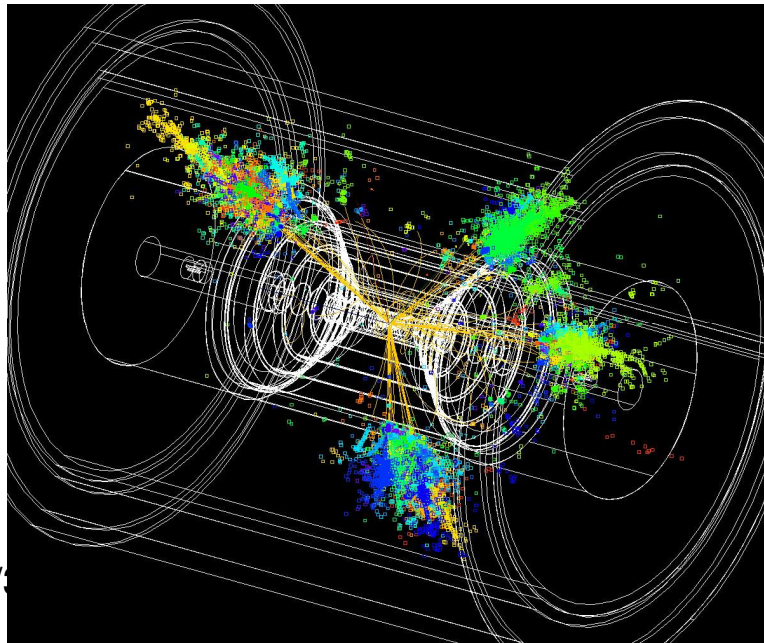
SiD concept adapted to CLIC



Changes to the SiD detector:

- 20 mrad crossing angle
- Vertex Detector to ~30 mm inner radius, due to Beam-Beam Background
- HCAL barrel with 77 layers of 1 cm tungsten
- HCAL endcap with 70 layers of 2 cm steel
- Inner bore of cryostat moved to 2.9 m radius
- Forward (FCAL) region adaptations

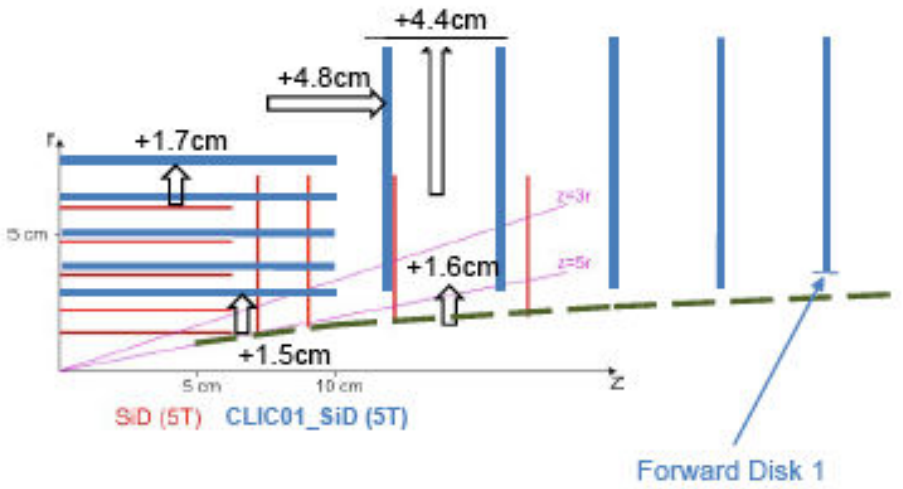
Fully implemented in SiD SLiC software

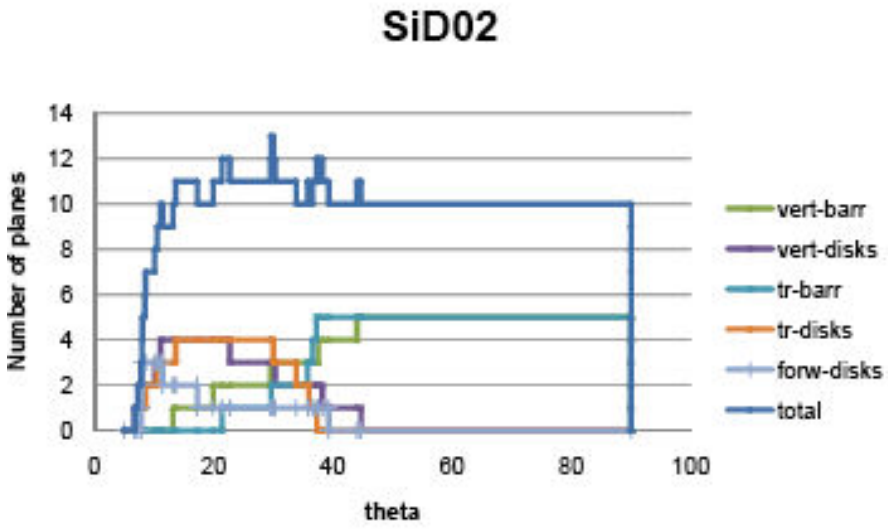


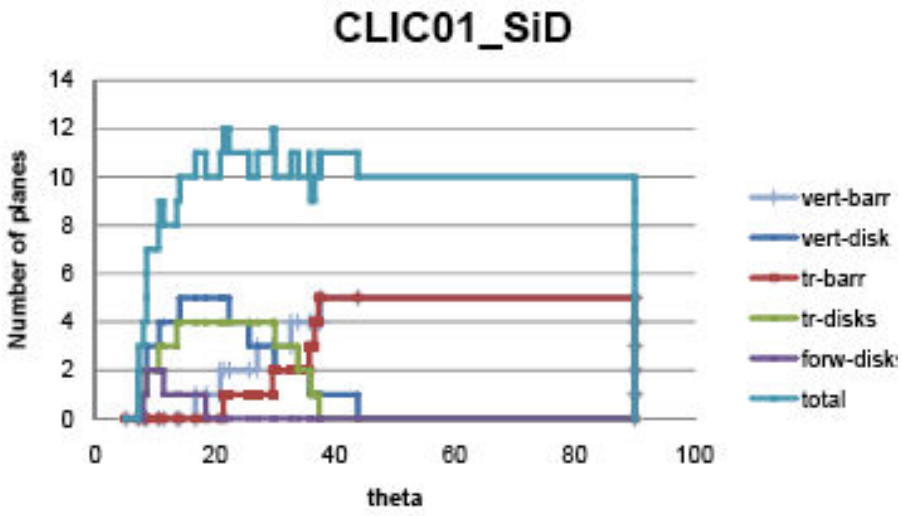
Christian Grefe
Bonn Univ. / CERN

CLIC-SiD vertex detector layout

- Vertex and forward tracker:
  - 5 barrel layers and 7 disks of 20 x 20 μm² Si-pixels
  - Modified layout to avoid pair background
- Main Tracker:
  - 5 barrel layers and 4 disks of 9 cm x 25 μm Si-strip







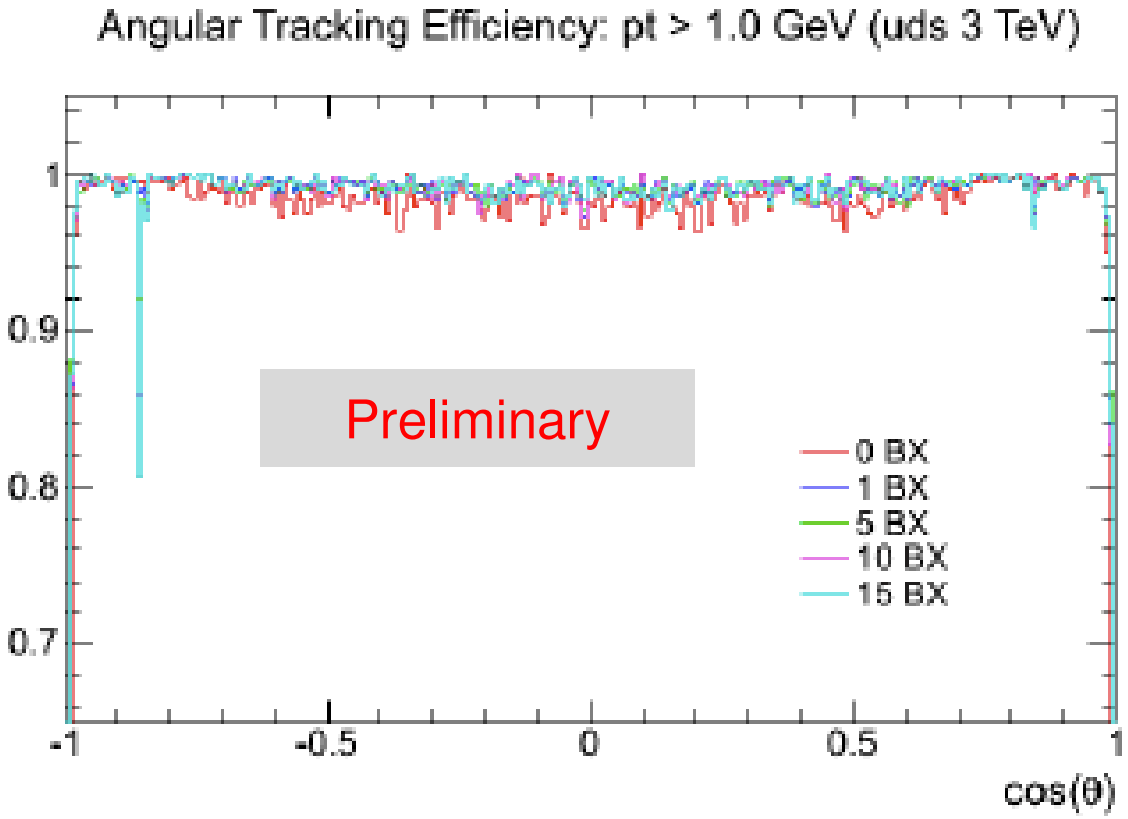
CLIC-SiD tracking studies (1)

3 TeV, tracking performance studies

With γγ=> hadron background overlay

Incoherent pairs still to be included.

See talk of C. Grefe, Monday 11 hrs



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CLIC-SiD tracking studies (2)

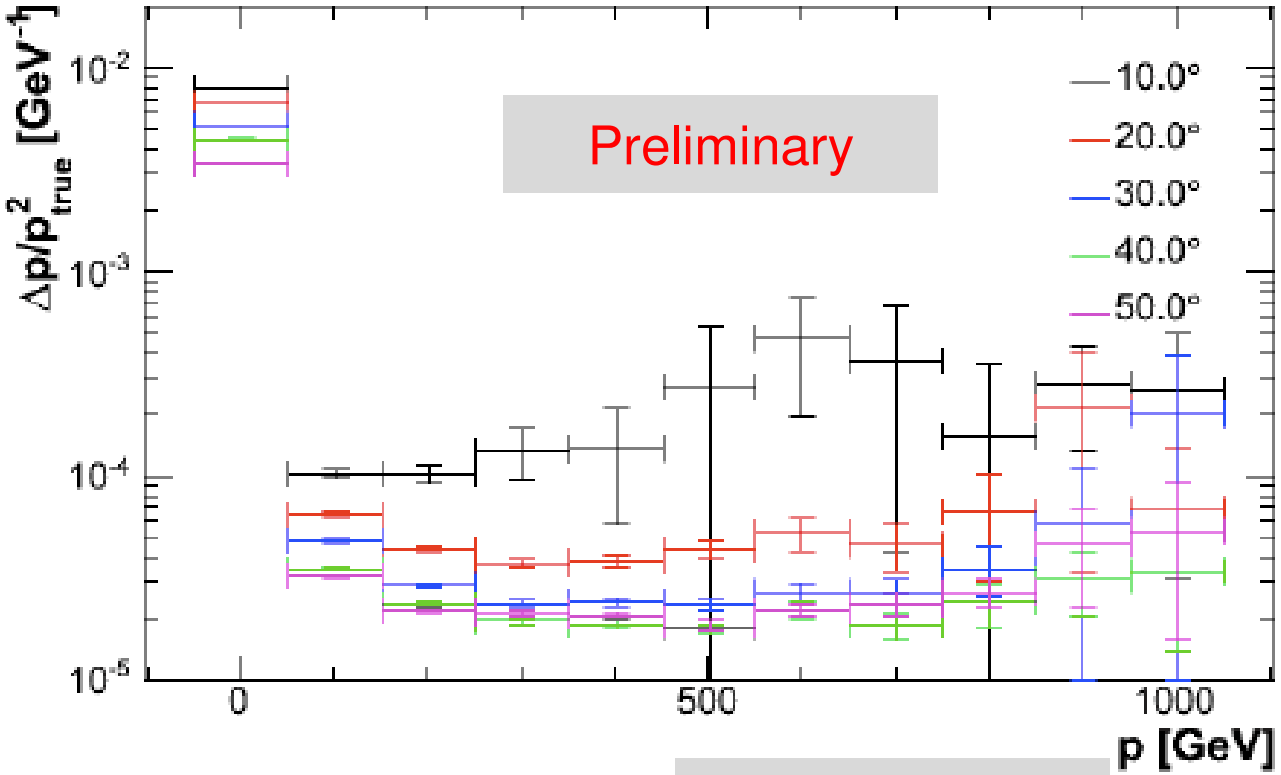
Tracking resolution with γγ=>hadron background overlay

uds (3 TeV) 15BX

Preliminary conclusion:
Tracking performance
is maintained with
15 BX overlaid.

Software slows down…

More studies needed.



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CLIC-SiD calorimetry studies (1)

Due to higher CLIC energy: => need deeper HCAL

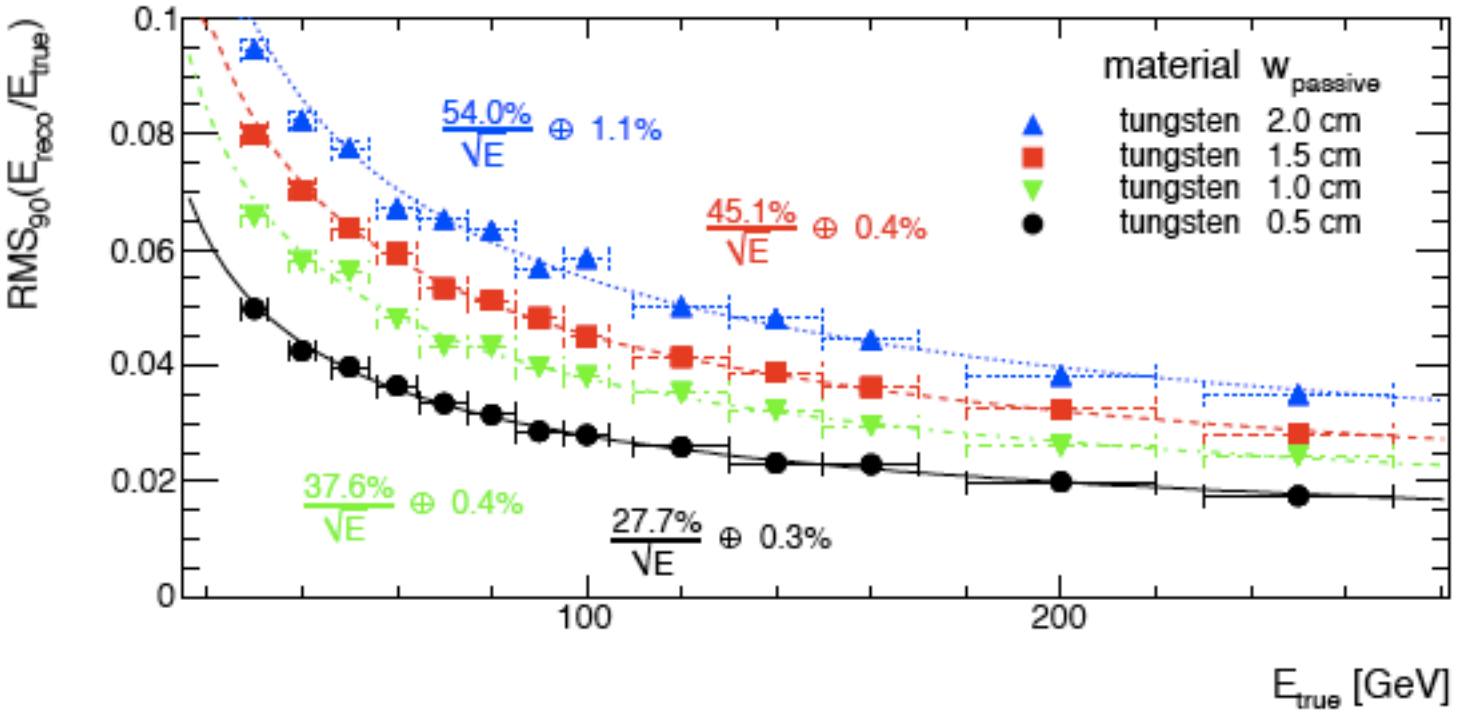
Option: increase coil radius => significant increase in cost and in risk

Better option: increase HCAL density => Tungsten HCAL absorber

SiD software was used to study implications of tungsten HCAL

See talk of P. Speckmayer, Sunday 11 hrs

Christian Grefe
Peter Speckmayer



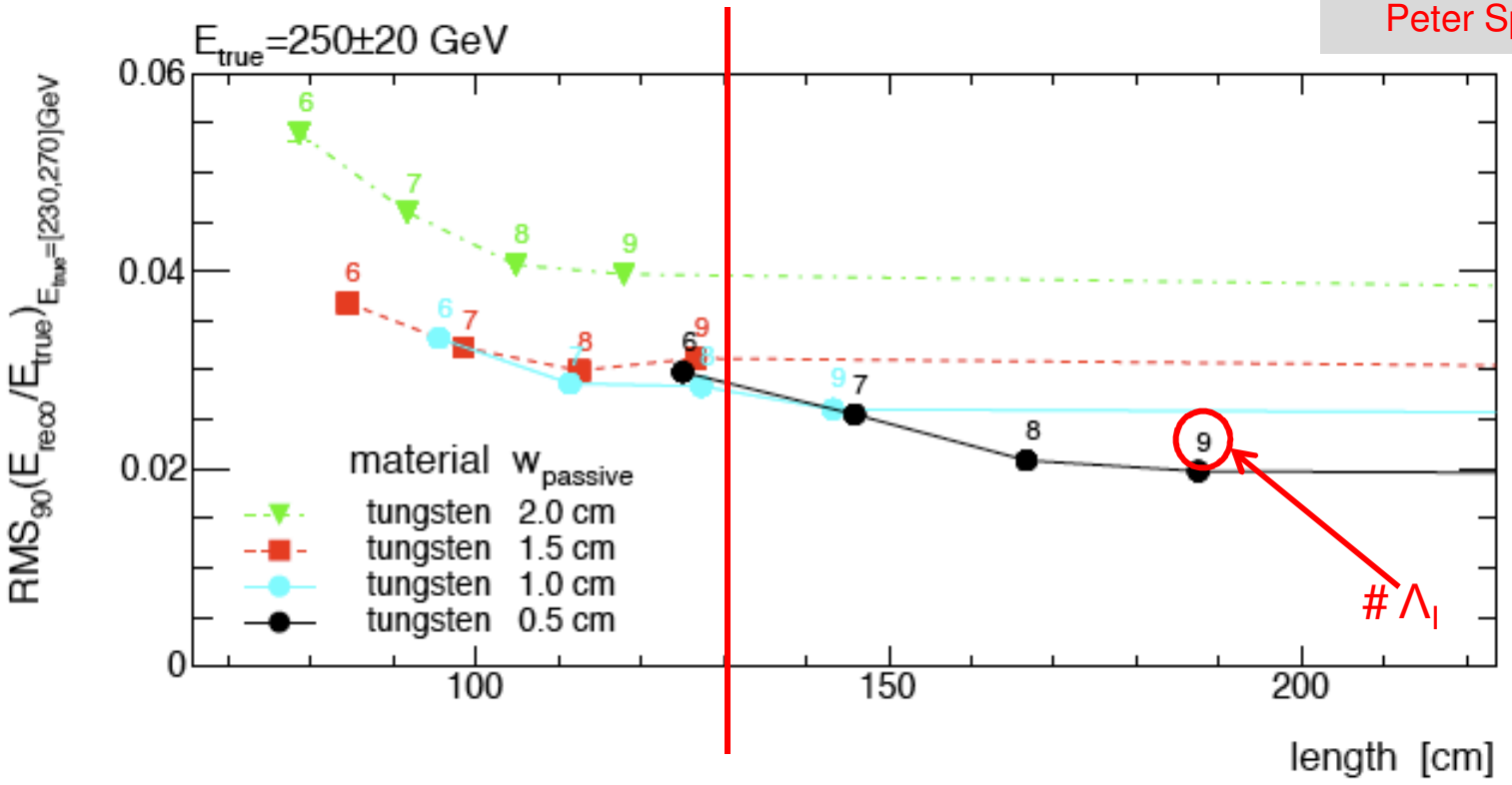
CLIC-SiD calorimetry studies (2)

Optimise choices for tungsten-based HCAL

Trade-off: plate thickness, total HCAL depth, etc.

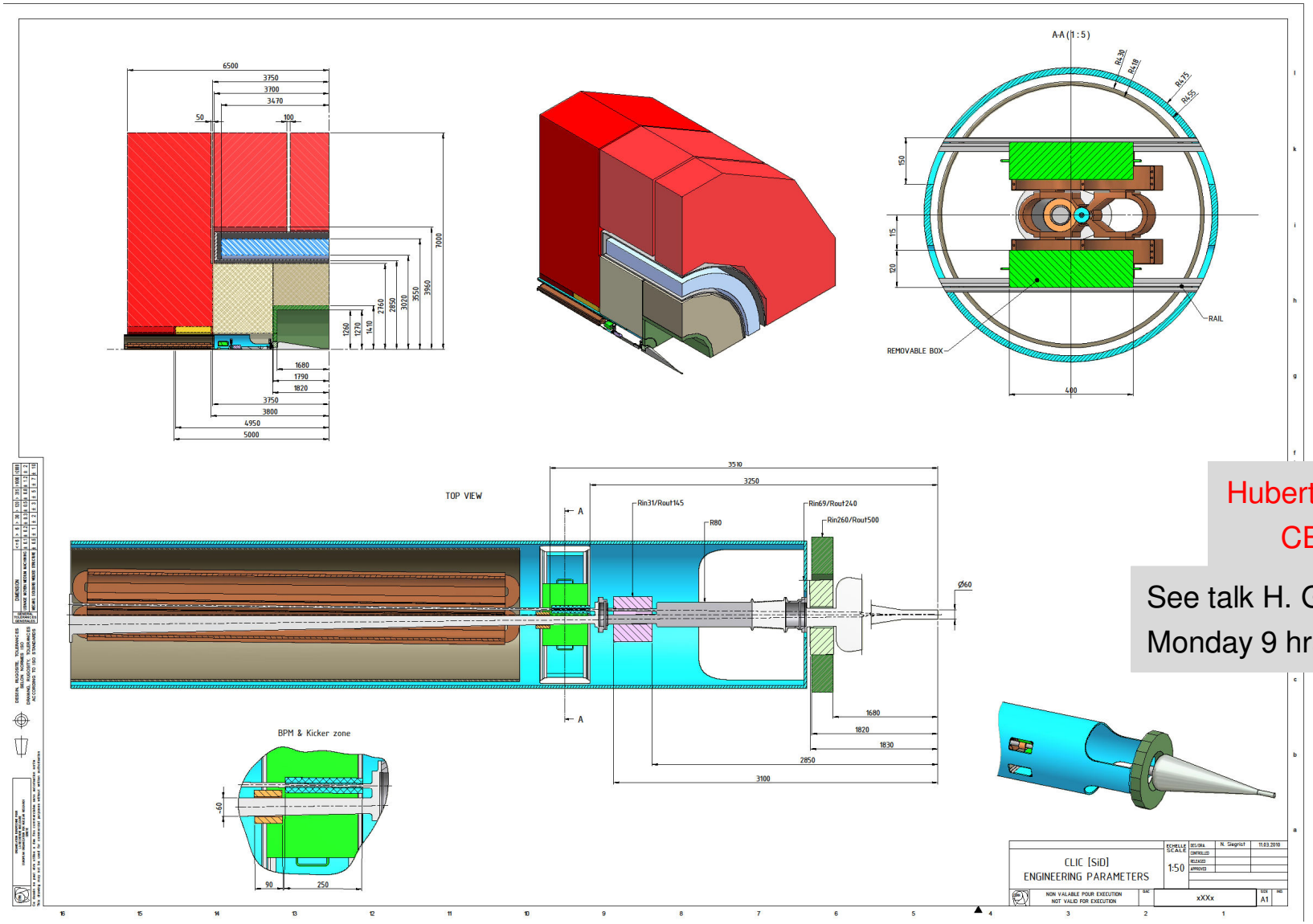
Has to fit in coil with inner cryostat bore at R=2.9 m

Christian Grefe
Peter Speckmayer



Choose 10-12 mm plate thickness => => validate simulations at test beam

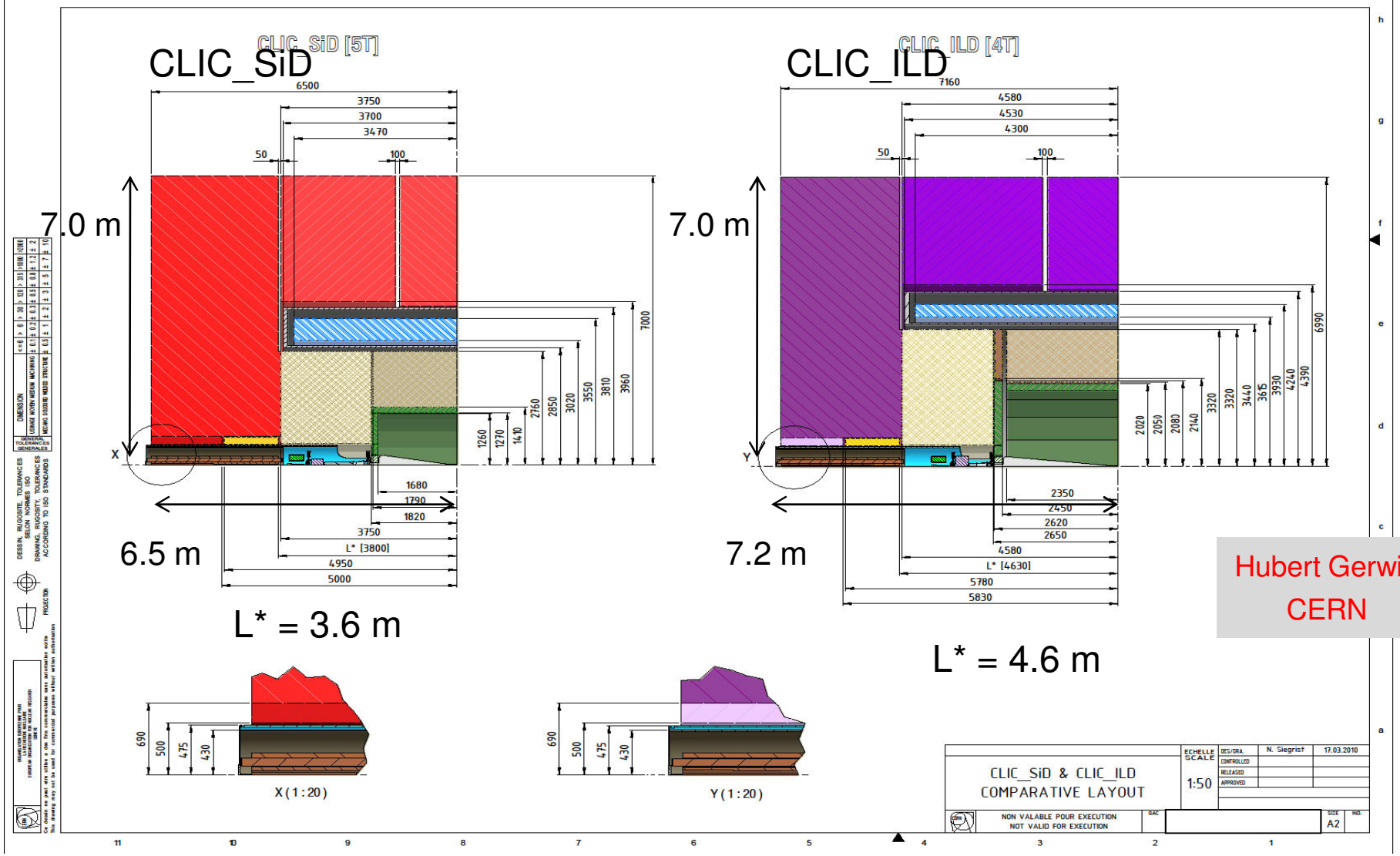
Parameter drawing CLIC_SiD



Hubert Gerwig
CERN

See talk H. Gerwig, Monday 9 hrs

Two detectors based on SiD & ILD



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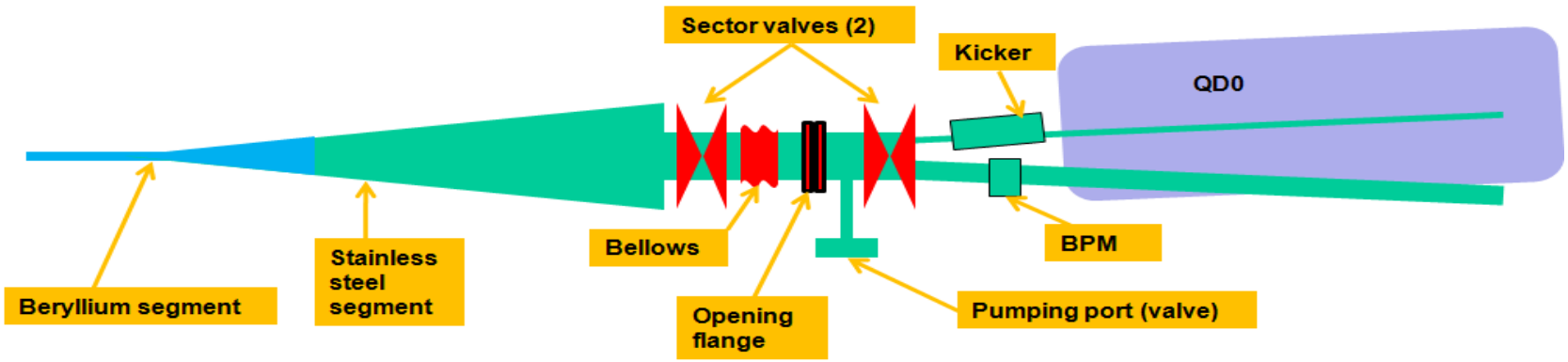
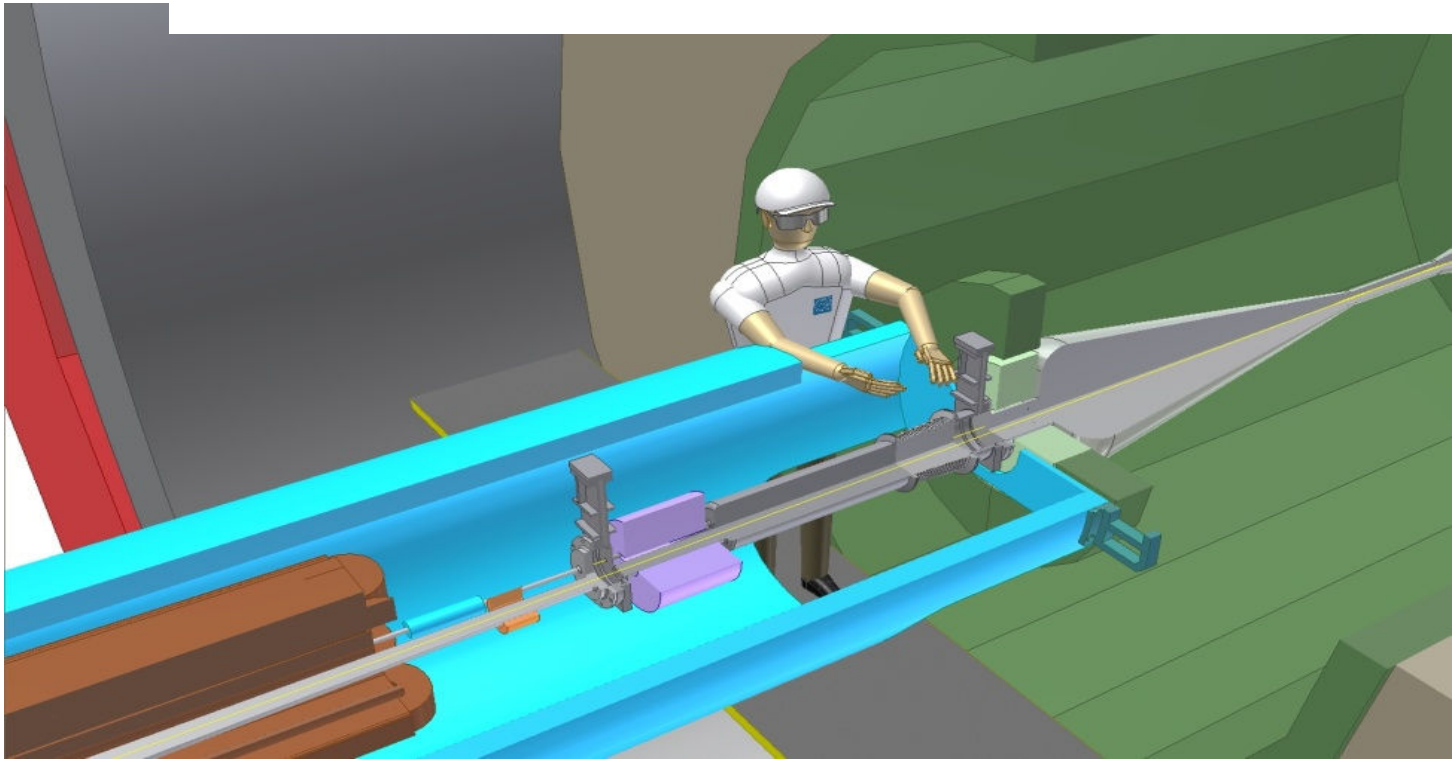
Forward region QD0 integration + vacuum implementation





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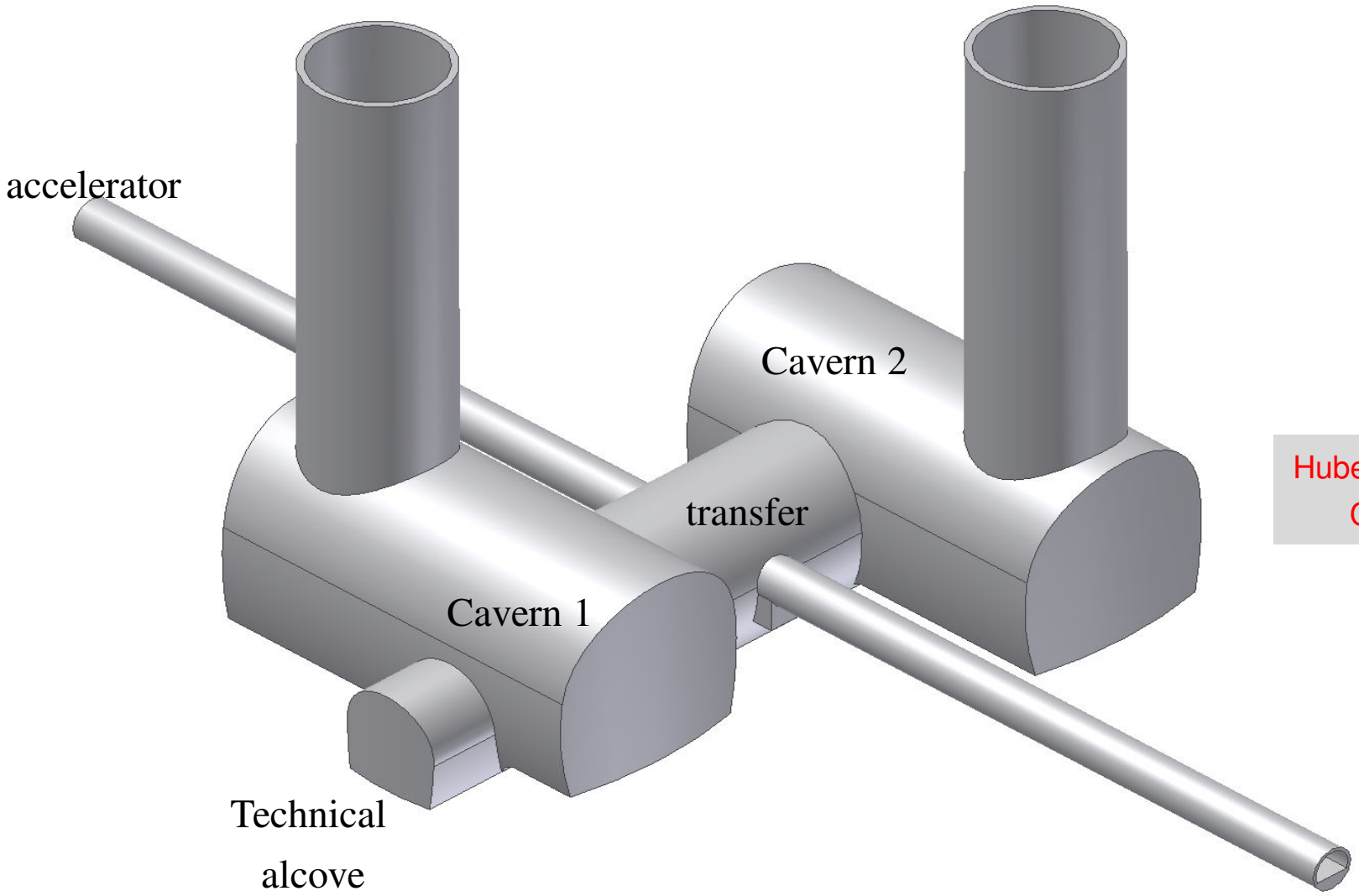
Push-pull experimental area (1)



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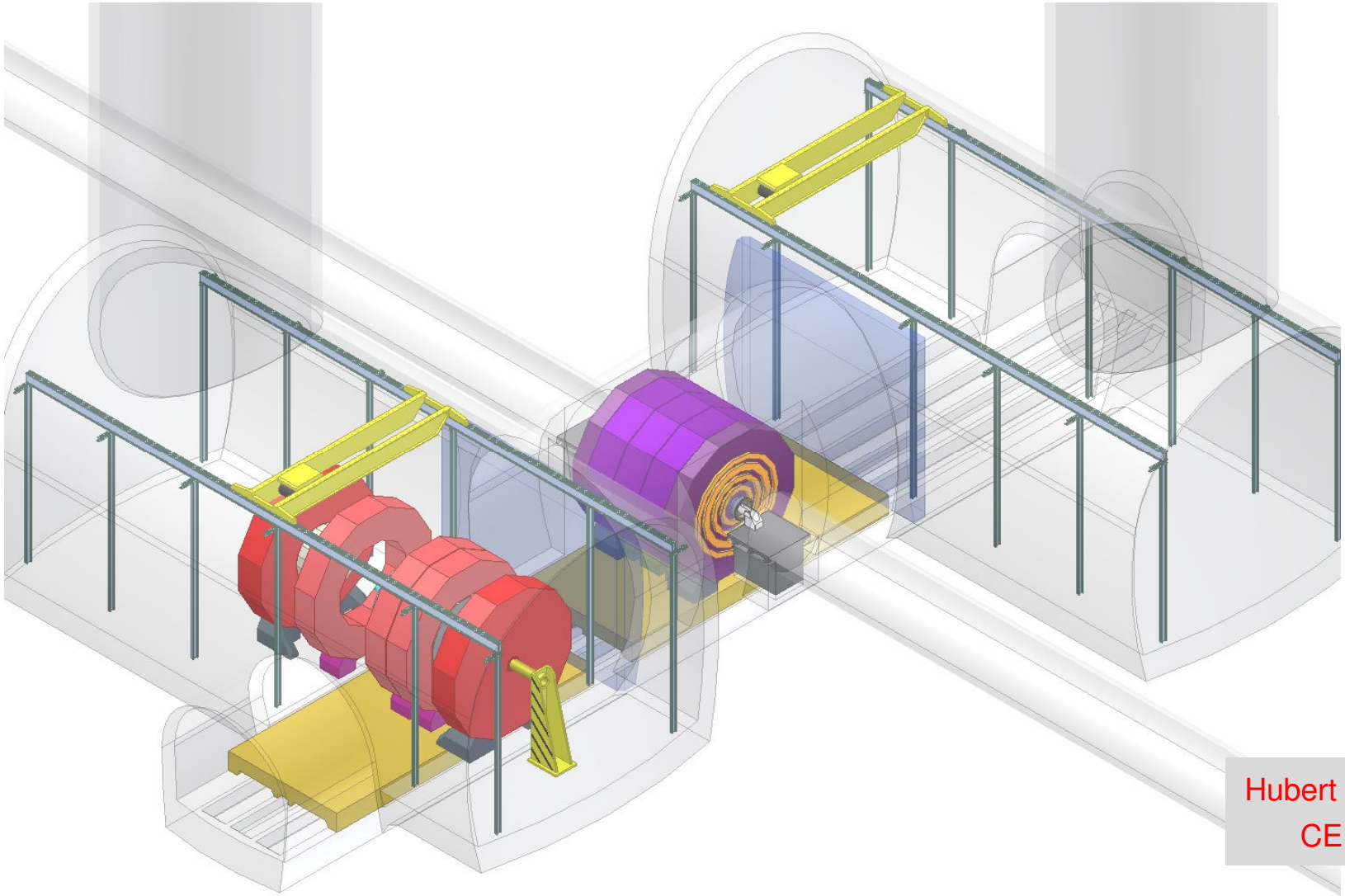
Push-pull experimental area (2)



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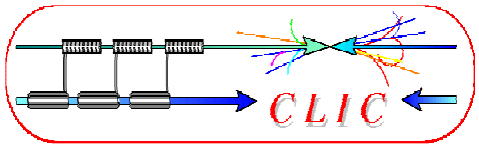
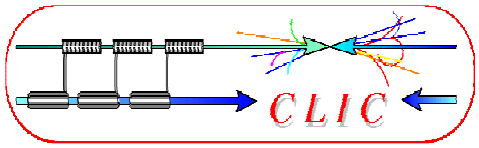


CDR preparation: software/simulation and detector layout

CLIC_SiD simulation plans for CDR preparation (all to be done before April 2011):

- Continue tracking studies
  - Include full background overlap
  - Resolve issues, optimise tools
  - Some iteration on vertex/tracker layout, in particular forward region
- Once new Pandora-PFA available…
  - Optimise Pandora-PFA for high energies
- Optimise jet algorithms (in presence of background) + lepton/flavour tagging

- Set up Grid production for SLiC/LCSIM using DIRAC tool
  - (See talk Stephane Poss LCWS2010 27/3)
- Launch production
- Perform benchmark studies



CDR preparation, working groups

Targeted CDR preparation working groups now place:

1: CLIC physics potential

=> convener Gian Giudice, co-convener James Wells

2: Physics observables related to jets

=> convener Mark Thomson, co-convener Jean-Jacques Blaising

3: Physics observables related to tracks

=> convener Marco Battaglia, co-convener tbd

4: Vertex detector technology

=> conveners ad-interim Marcel Stanitzki, Lucie Linssen

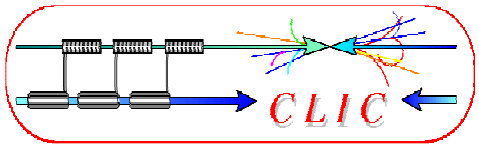
5: Engineering, layout, solenoid, cost

=> convener Konrad Elsener, co-convener Hubert Gerwig

Indico pages, web pages and mailing lists have been created.

First meetings very soon.

There is also an MDI study group (active since >0.5 yr) => convener Lau Gatignon



Physics/detector CDR layout and organisation

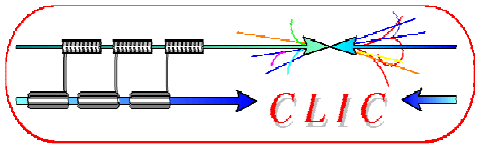
CLIC CDR due for end April 2011 (for CERN council meeting of June 2011)

1. Introduction
2. CLIC physics potential
3. CLIC experimental conditions and physics performance requirements
4. The CLIC_ILD detector concept
5. The CLIC_SiD detector concept
6. CLIC vertex detectors
7. Tracking systems
8. Calorimetry
9. Superconducting cols and magnet systems
10. Muon systems at CLIC
11. Very forward caorimeters
12. Readout electronics and data acquisition
13. Detector integration
14. Physics performance
15. R&D prospects
16. Detector Cost
17. Conclusions

Four main editors

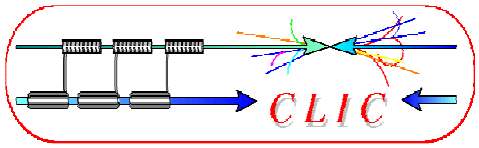
- Harry Weerts (SiD + Americas)
- Akiya Miyamoto (ILD + Asia)
- Marcel Stanitzki + LL (CLIC + Europe)

Chapter editors to be nominated

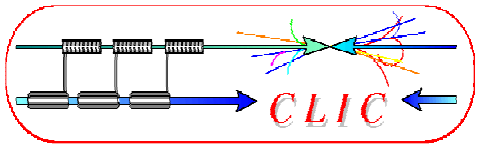


And also….

- Generator-level production tools:
  - Possible common ILC+CLIC generator samples at 500 GeV, 1 TeV, 3 TeV (with respective accelerator parameters)
  - SiD contact person?
- We have started looking into muon system => advice/contact welcome
- We would like to organise a mini-workshop on power delivery (pulsing) => SiD contact for organising such event?
- Volunteers for benchmarking studies or for any other CDR participation most welcome



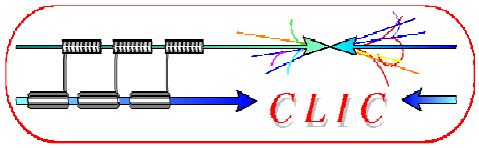
Thank you !



Current LCD activities

Current activities: preparation for physics/detector CDR, due April 2011

- Mostly simulation studies:
  - Demonstrate that CLIC physics potential can be extracted from detector
  - Propose ILD-like and SiD-like detectors that can do the job
- Concentrate on critical issues
  - Propose ways to reduce impact of background on the performance
  - Redesign of the very forward region
  - Take engineering aspects, cost etc into account
- Preparing a targeted hardware R&D plan



Hardware/engineering/software development

LCD hardware/engineering R&D (for CLIC, beyond ILC developments):

- Time stamping
  - Most challenging in vertex detector: trade-off between pixel size, amount of material and timing resolution
- Hadron calorimetry
  - Tungsten-based HCAL (PFA calo, beam tests in preparation, within CALICE)
- Solenoid coil
  - Large high-field solenoid concept and reinforced conductor R&D
- Power pulsing
  - In view of the 50 Hz CLIC time structure => allows for low-mass detectors
- Engineering developments
  - For tungsten-based HCAL calorimeter
  - For sub-nm stability for FF quadrupoles within experiment volume

In addition: Collaboration with ILC on Core Software Development