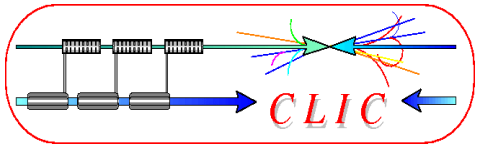
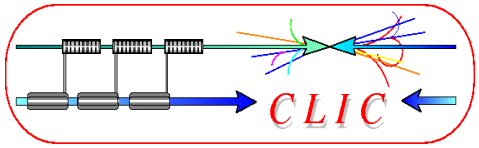


CLIC forward region layout

and the use of BeamCal for a fast beam-tuning feedback

Konrad Elsener

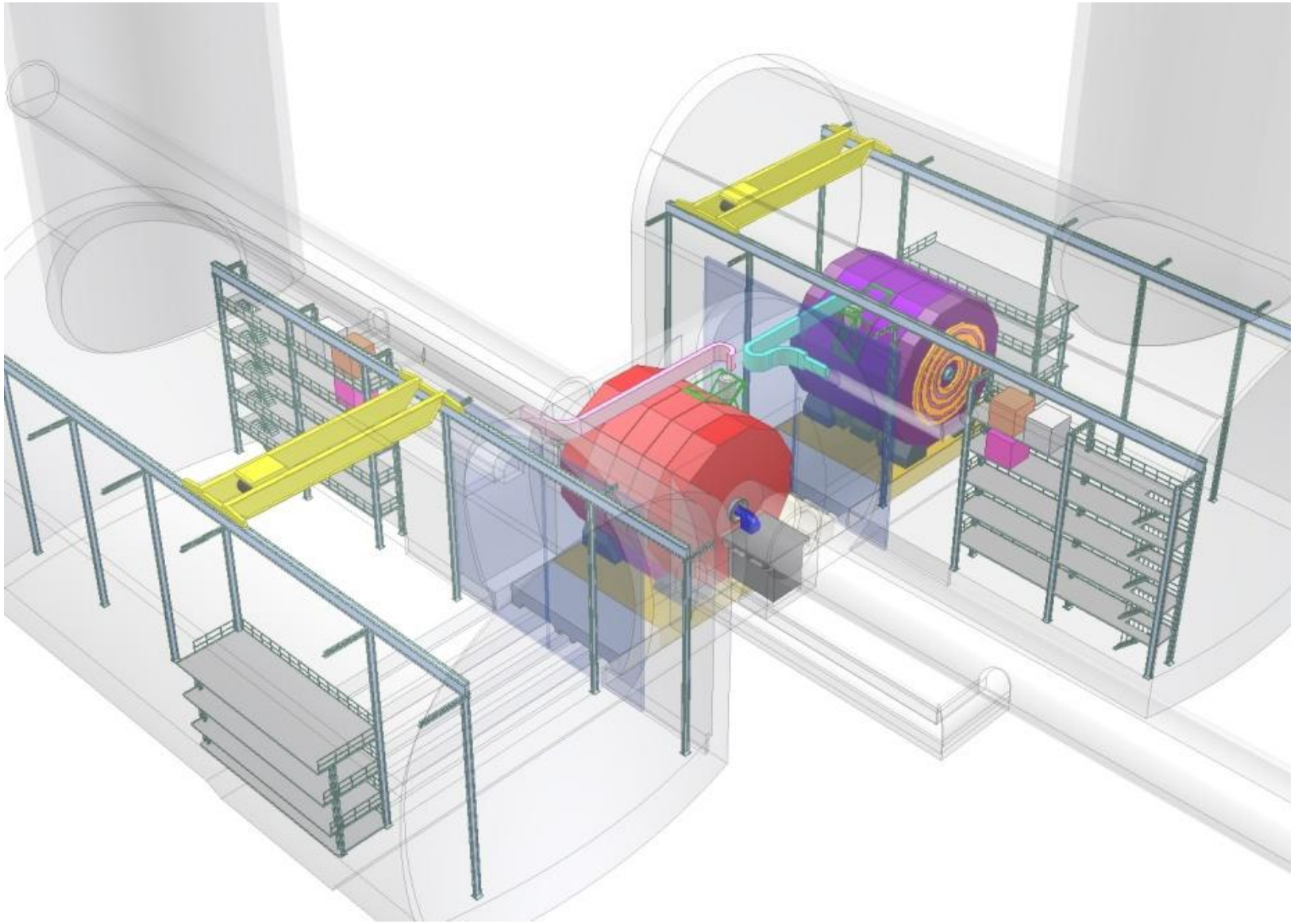
CERN

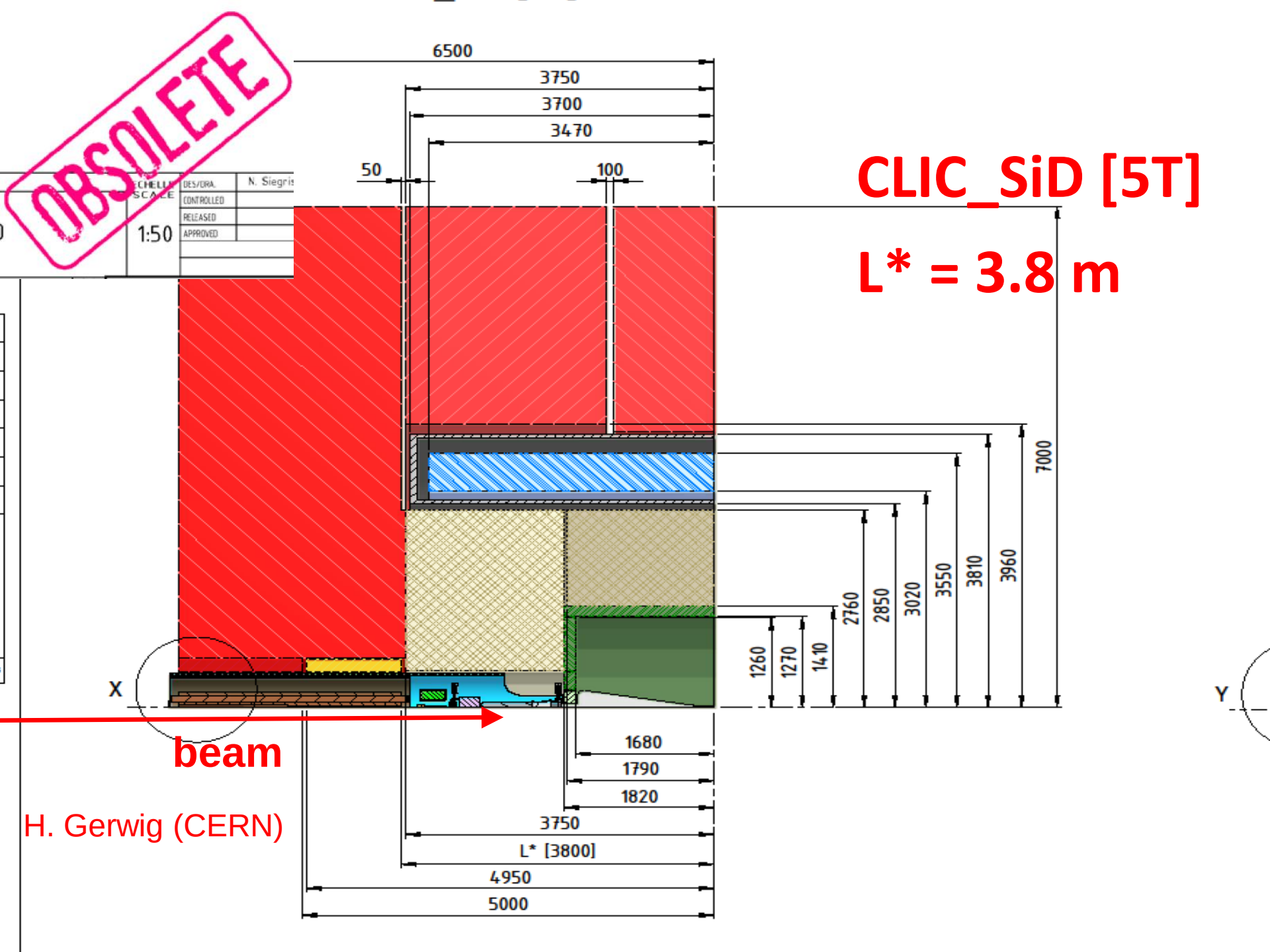


Outline:

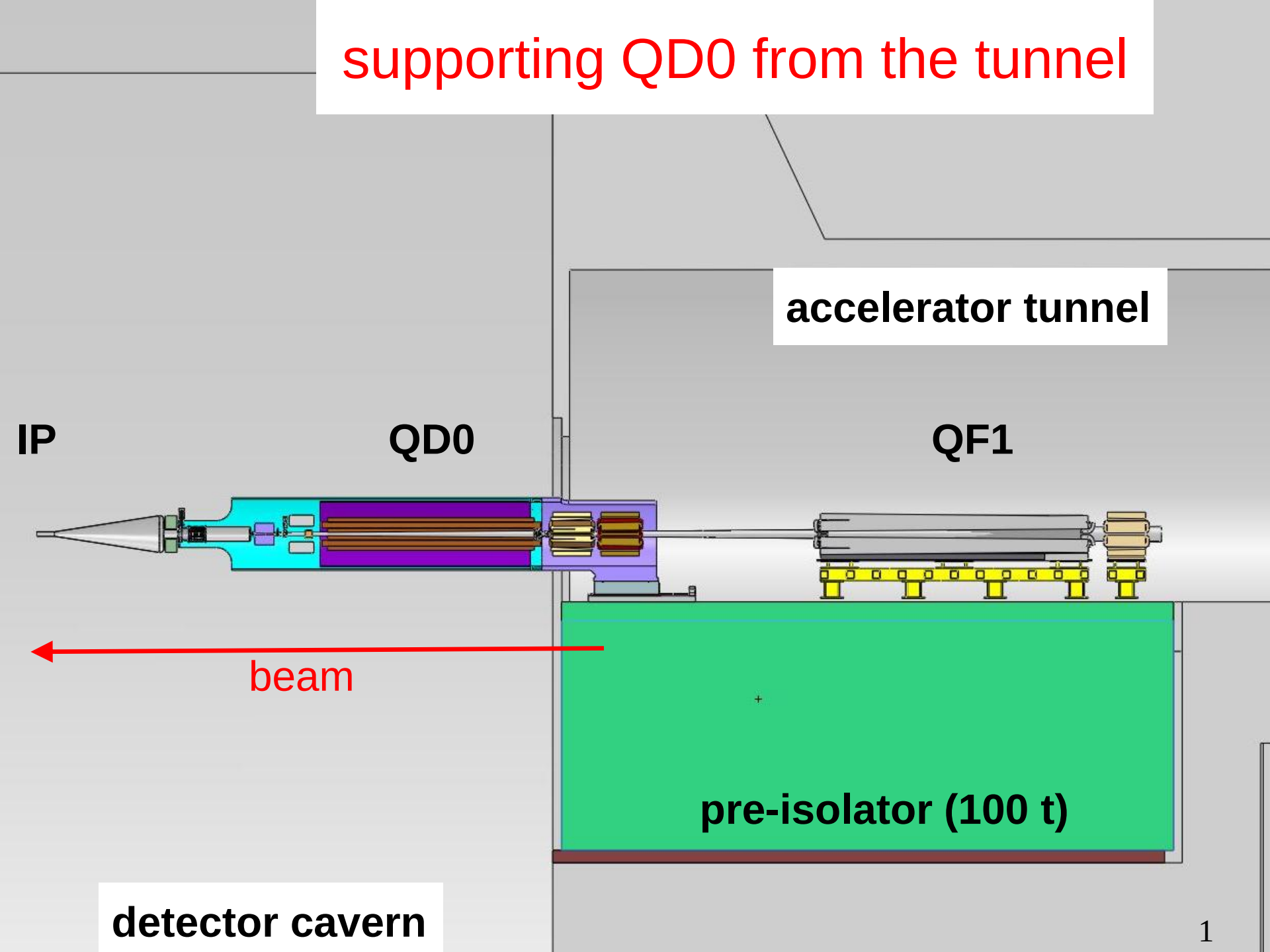
- CLIC forward region layout
  - Status FCal meeting Cracow
  - recent changes
- BeamCal for beam tuning at CLIC ?

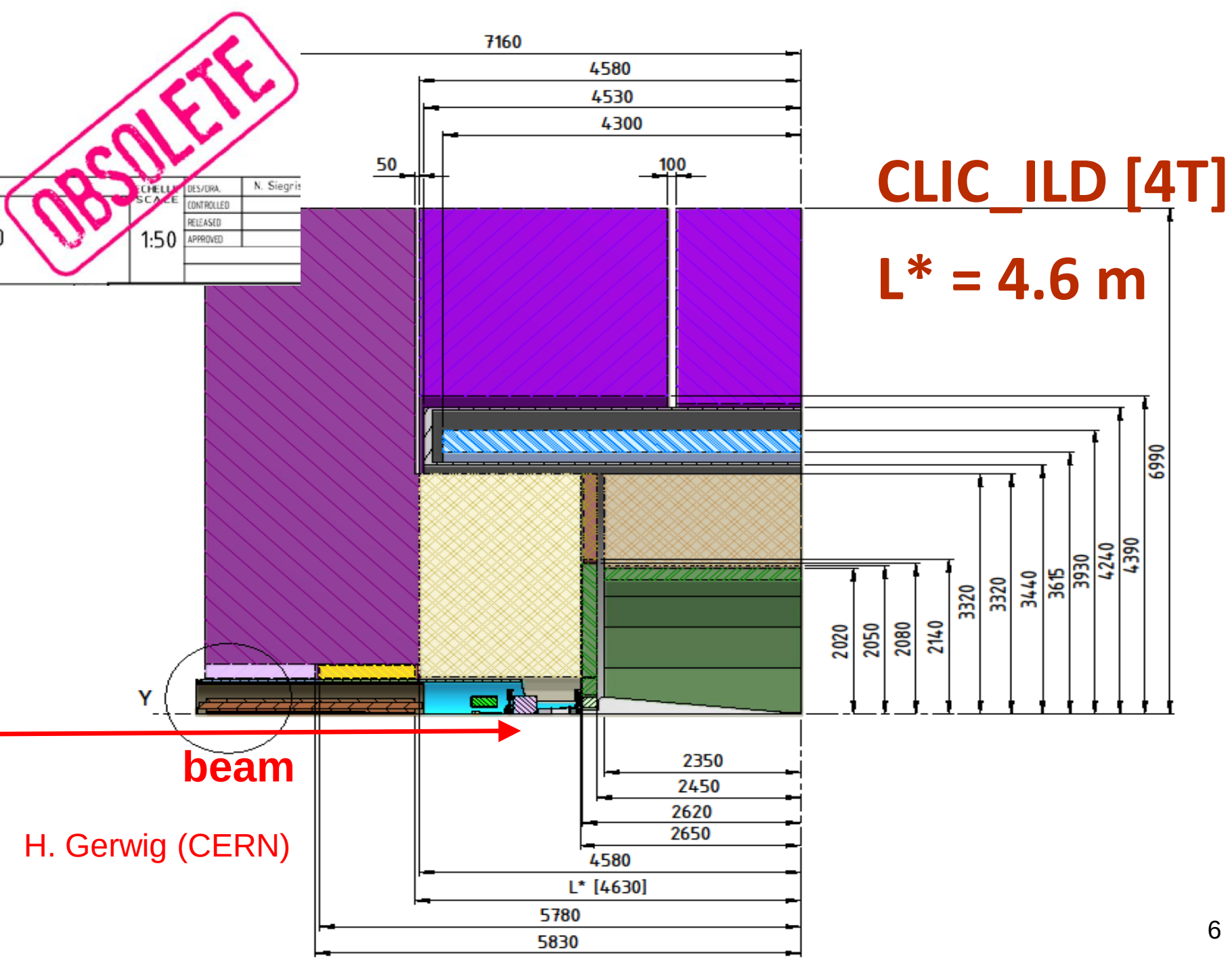
a possible CLIC MDI region




OBSOLETE
CLIC_SiD [5T]
L* = 3.8 m
6500
3750
3700
3470
50
100
7000
3960
3810
3550
3020
2850
2760
1410
1270
1260
1680
1790
1820
3750
L* [3800]
4950
5000
X
Y
beam
H. Gerwig (CERN)

supporting QD0 from the tunnel





CLIC_ILD [4T]

L* = 4.6 m

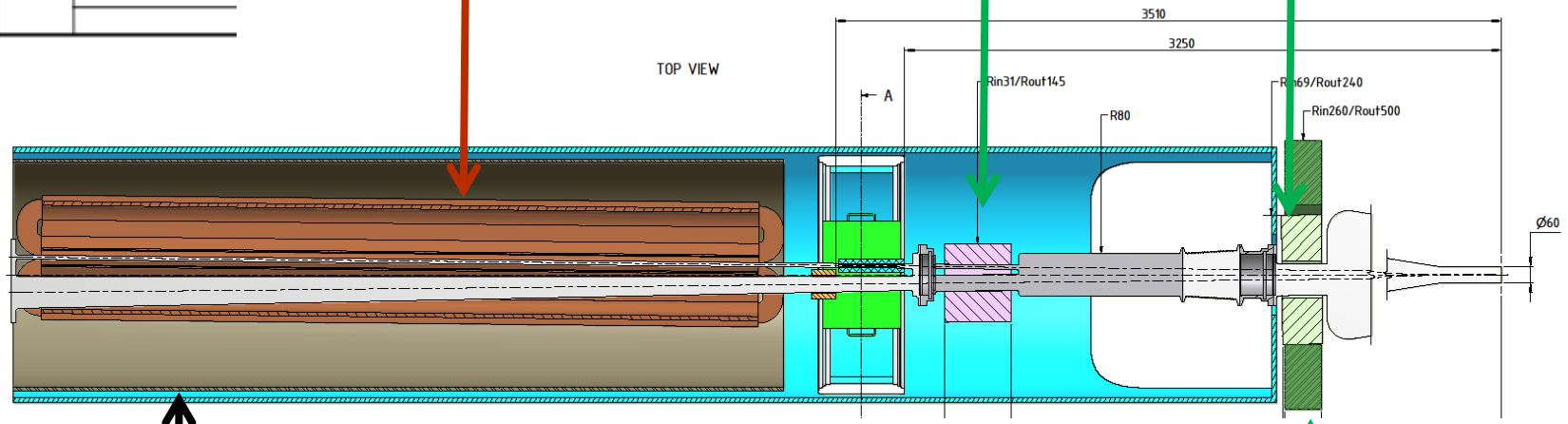
H. Gerwig (CERN)

CLIC Detector – Forward Region

QD0

BeamCal

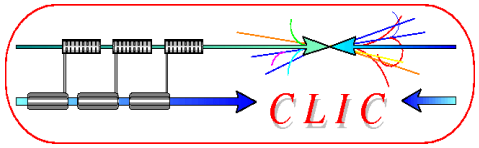
LumiCal



E-Cal Ring

Double Support Tube

beam

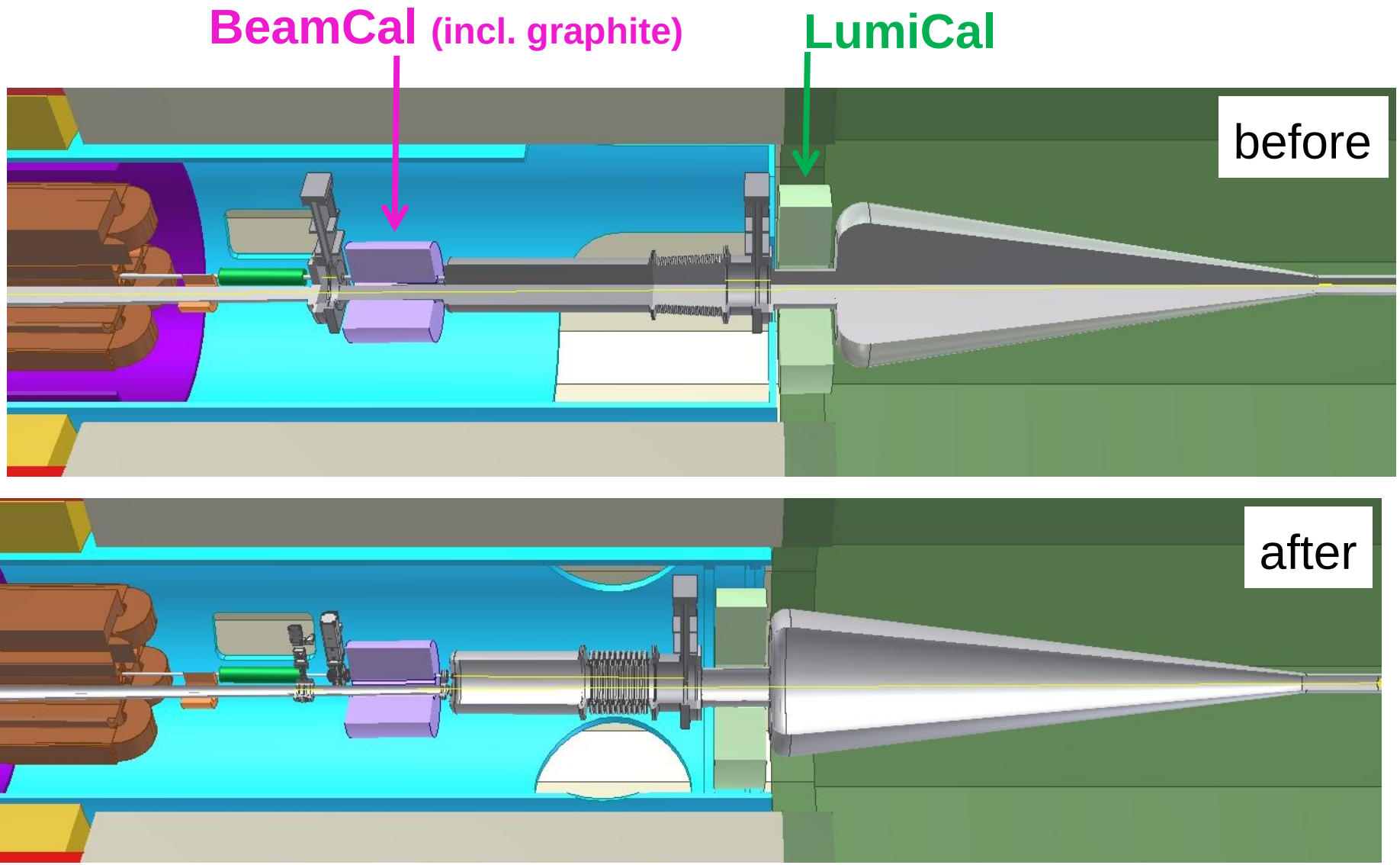


recent changes to detector layout:

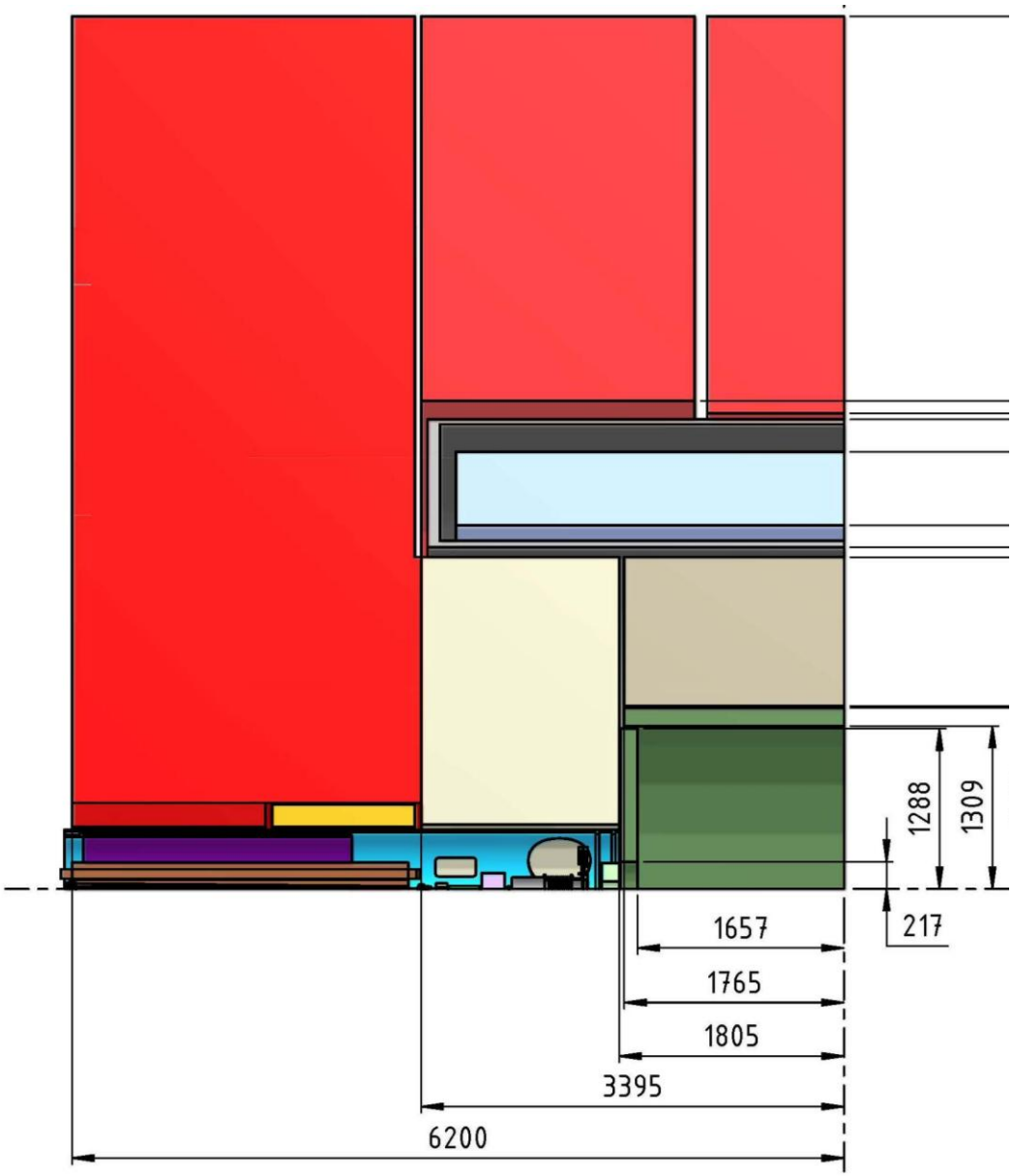
1) Insist on **good overlap** between LumiCal and ECal end-cap

2) HCAL: decision on depth in barrel and end-cap

LumiCal overlap with ECal



HCal now 7.5 lambda

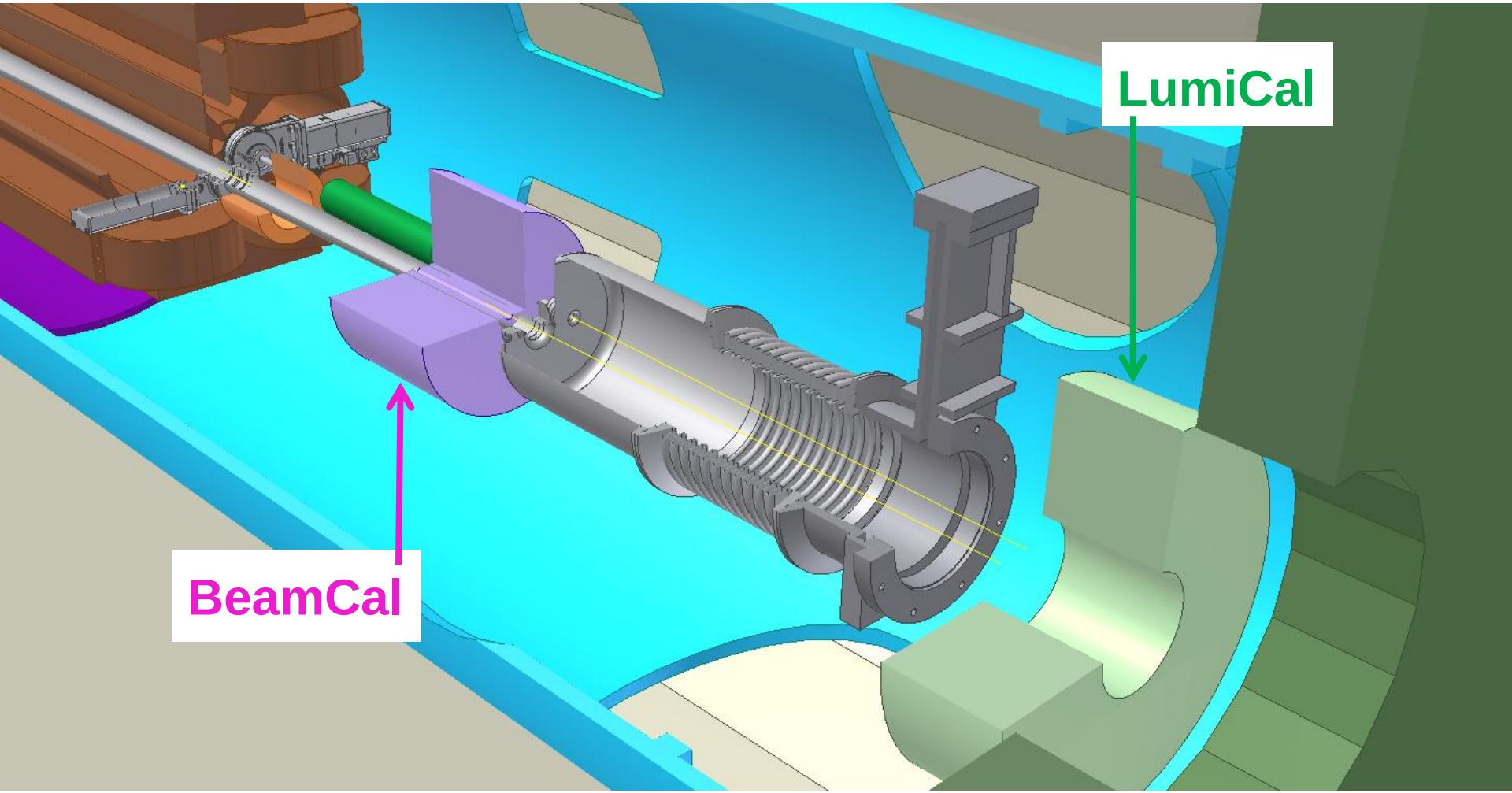


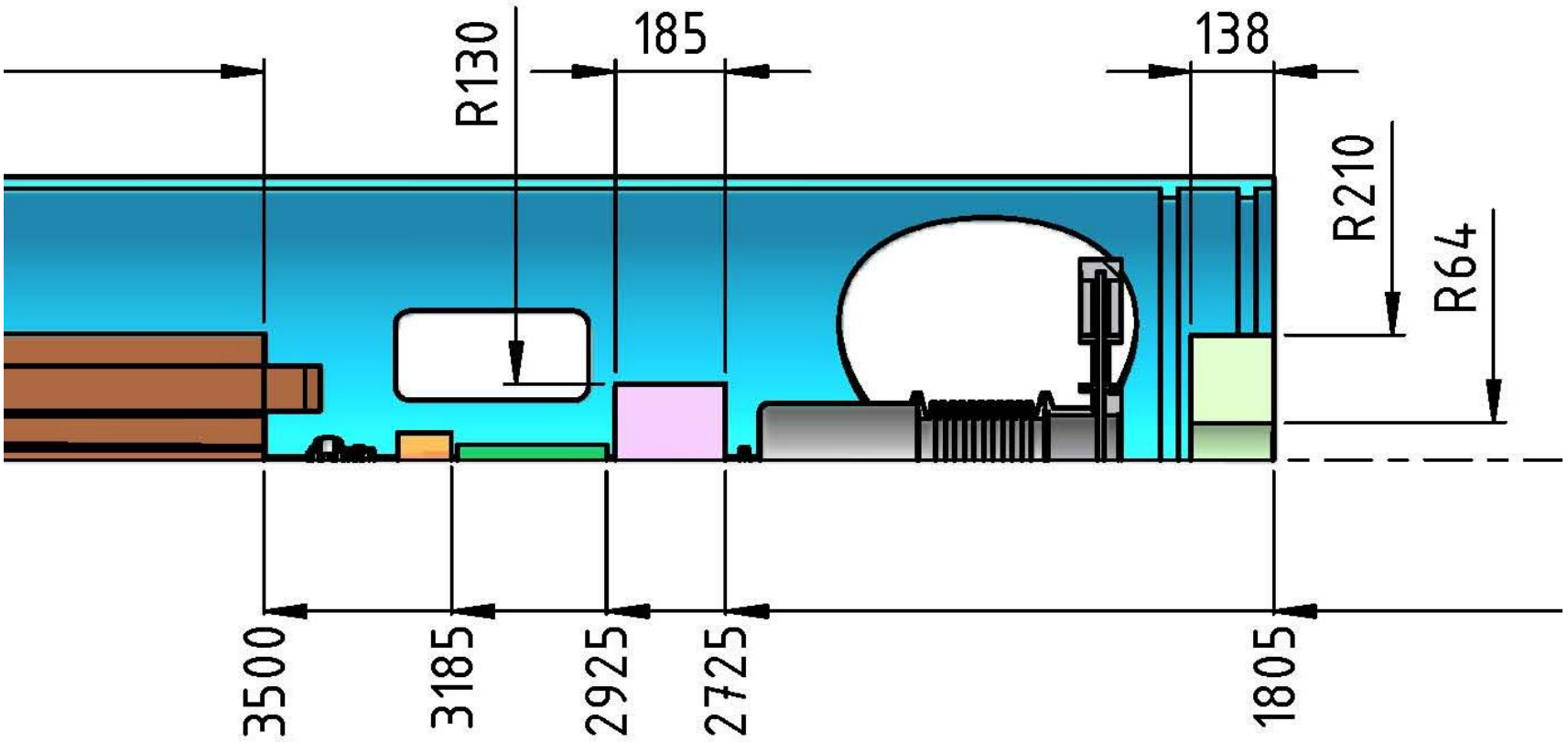
-> detector shorter
by 355 mm (x2)

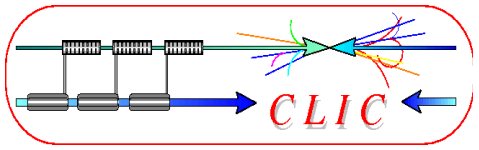
DRAFT:
CLIC_SiD_CDR
L* 3.5 m

-> changes to forward region

DRAFT: CLIC_SiD_CDR



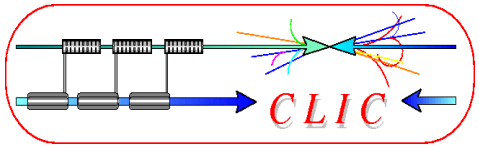

R130
185
138
R210
R64
3500
3185
2925
2725
1805



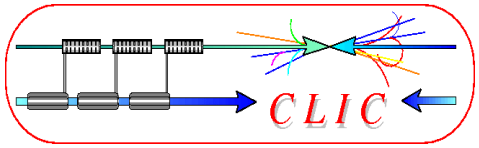
LumiCal and BeamCal for CLIC CDR

	CLIC_ILD		**CLIC_SiD**	
	LumiCal	BeamCal	LumiCal	BeamCal
Z (from IP)	2.65 m (2.27 m)*	2.88 m	1.81 m	2.83 m
min. acc. angle	38 mrad (44 mrad)*	11 mrad	35 mrad	11 mrad
max. acc. Angle (given by ECal)	≈120 mrad (153 mrad)*	38 mrad	≈ 130 mrad	35 mrad

* I. Sadeh et al, “A Luminosity Calorimeter for CLIC”, Nov. 2009



BeamCal for beam tuning



BeamCal for beam tuning

Proposals made for the ILC:

use BeamCal (spatial energy distribution of incoherent pairs) +
GamCal (Total E of beamstrahlung photons)

C. Grah & A, Sapronov, JINST 2008

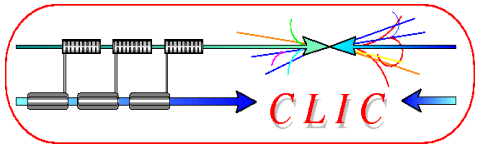
-> single parameter determination works (not done for imperfections)

-> multi-parameter determination mostly fails

use Pair Monitor (counts) + BeamCal (total depos. energy):

K. Ito et al., LCWS/ILC 2008

determine beam sizes (but not done for general imperfections)



beam-beam at CLIC

Incoherent effects:

beamstrahlung photons + single electrons -> incoherent pairs

Coherent effects:

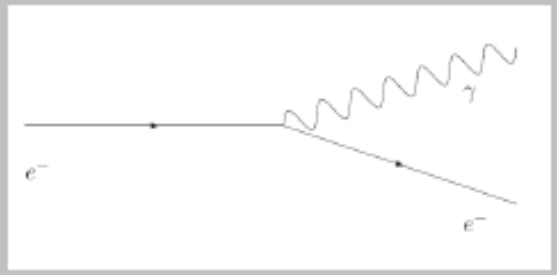
beamstr. photons + coh. field of oncoming bunch -> coherent pairs

electron / virtual photon + coh. field of oncoming bunch -> trident pairs

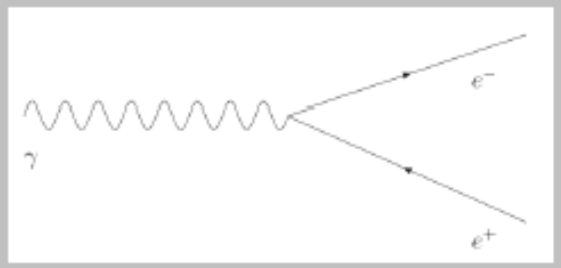
Semi-coherent effects ? (>> more soon, from J. Esberg)

The sequential trident process (coherent pairs)

Production of a real (beamstrahlung) photon in an electric – or magnetic - field



Subsequent conversion to an electron/positron pair in a constant field

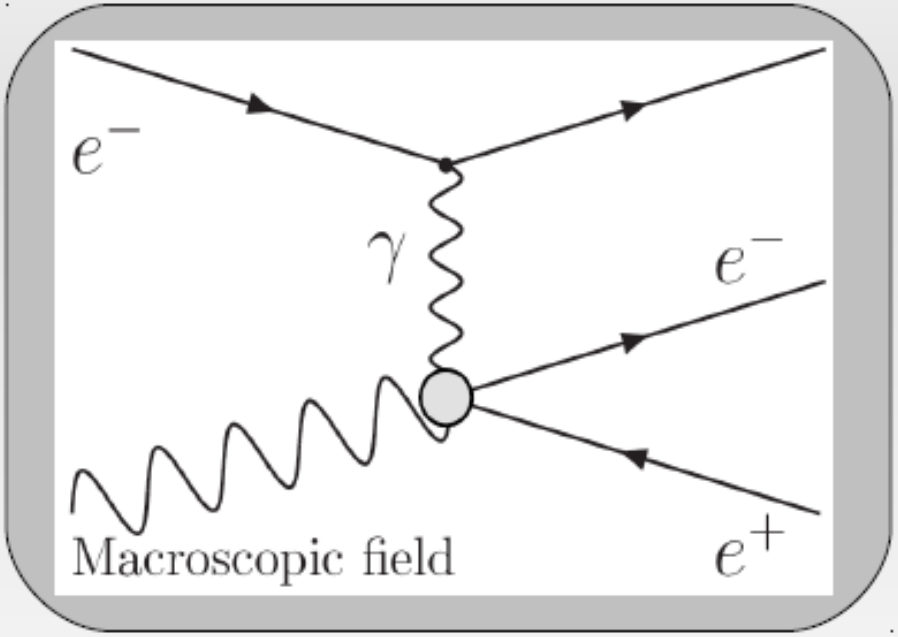


This process is already a part of GUINEA-PIG
Depends strongly on Υ

20

J. Esberg
Aarhus
&
CERN

The cascade trident process



The trident process is mediated by a *virtual* photon
No accurate single cross section available in litterature
Depends strongly on Υ

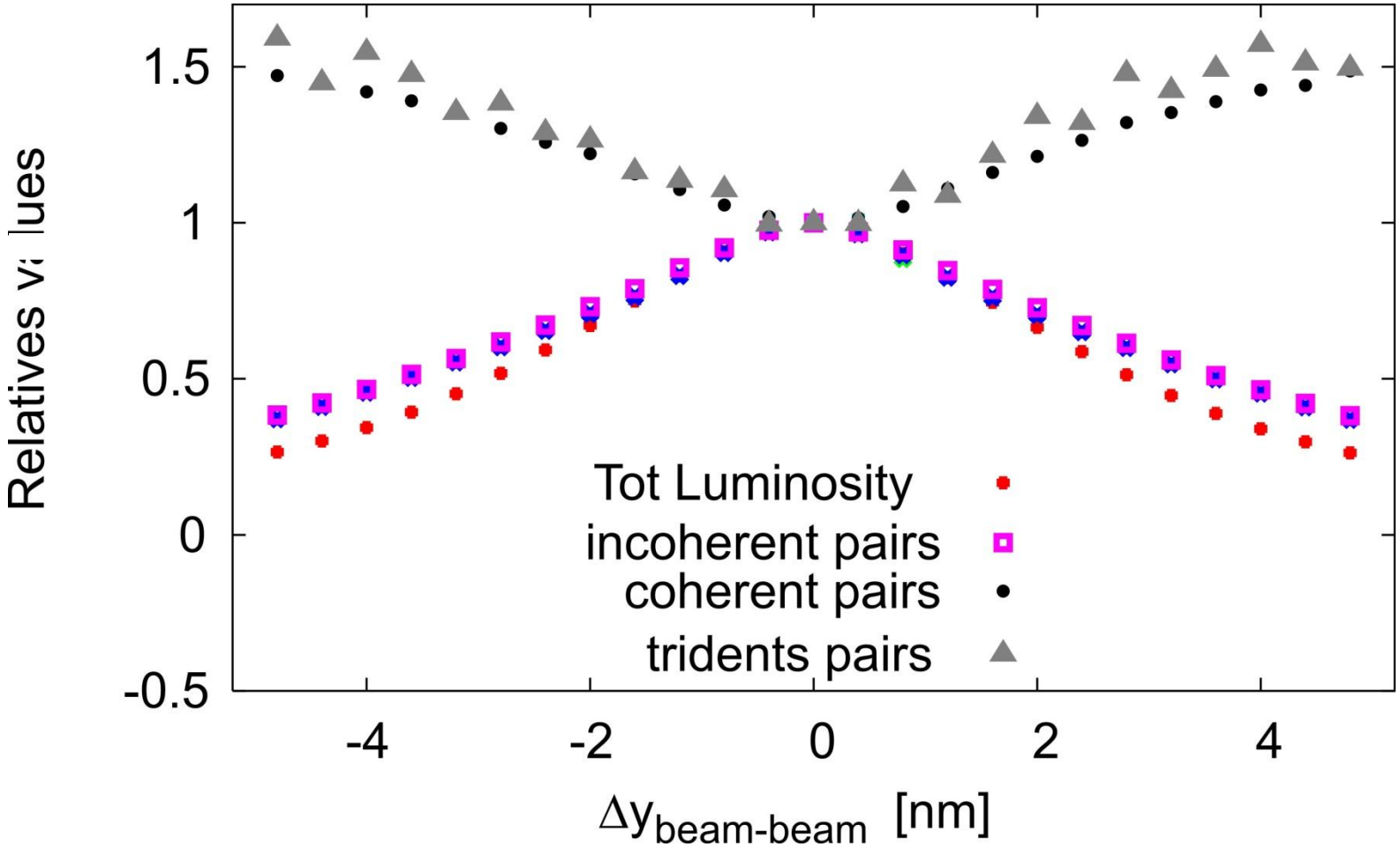
21

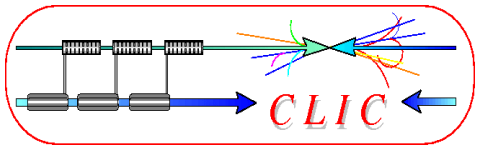
J. Esberg
Aarhus
&
CERN

BeamCal for beam tuning at CLIC ?

VERY PRELIMINARY – Barbara Dalena (CERN), 22 Sept. 2010

Sensitivity of observables vs. vertical beam-beam offset





BeamCal for beam tuning at CLIC ?

Since there is a large angular and energy overlap between incoherent pairs and trident pairs in a detector…

… it is very probable that BeamCal is not useful for beam tuning at CLIC

NB.

CLIC beam experts have assumed this for a long time

- push for alternative methods

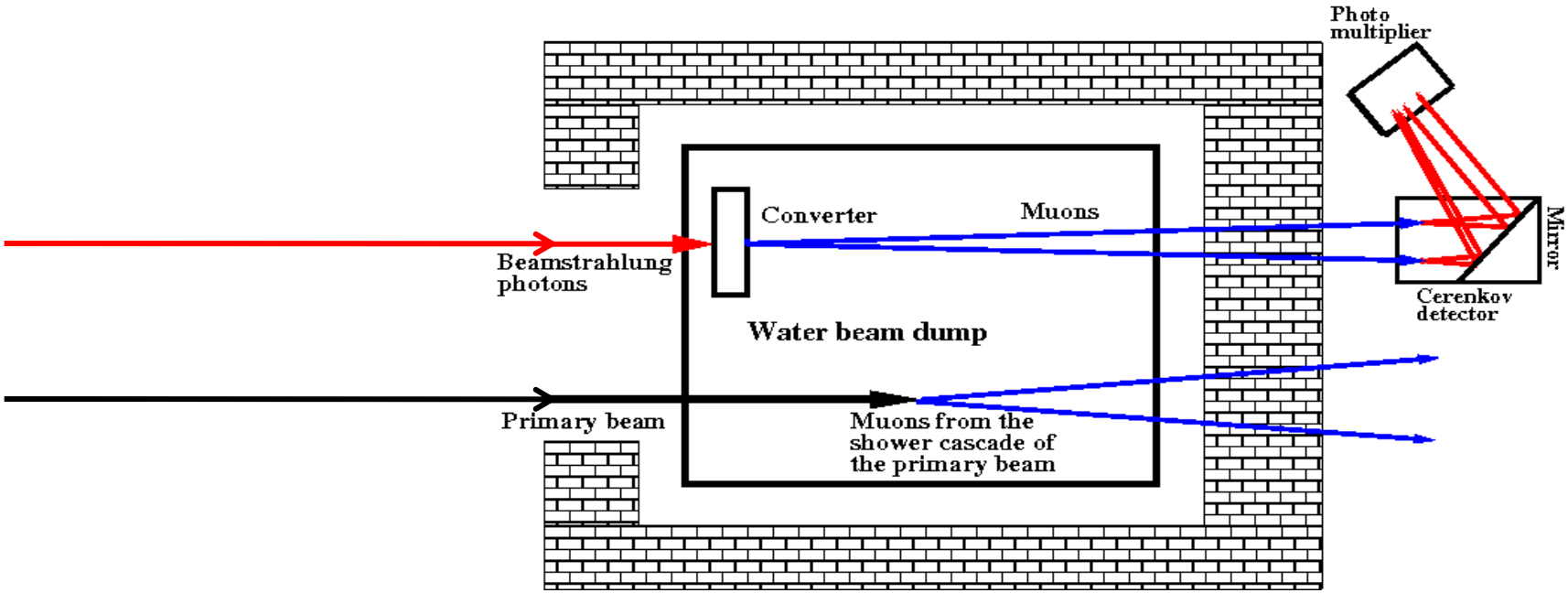
Luminosity Monitoring at CLIC (under study)

V.Ziemann – Eurotev-2008-016

μ+μ- pair production from beamstrahlung photons

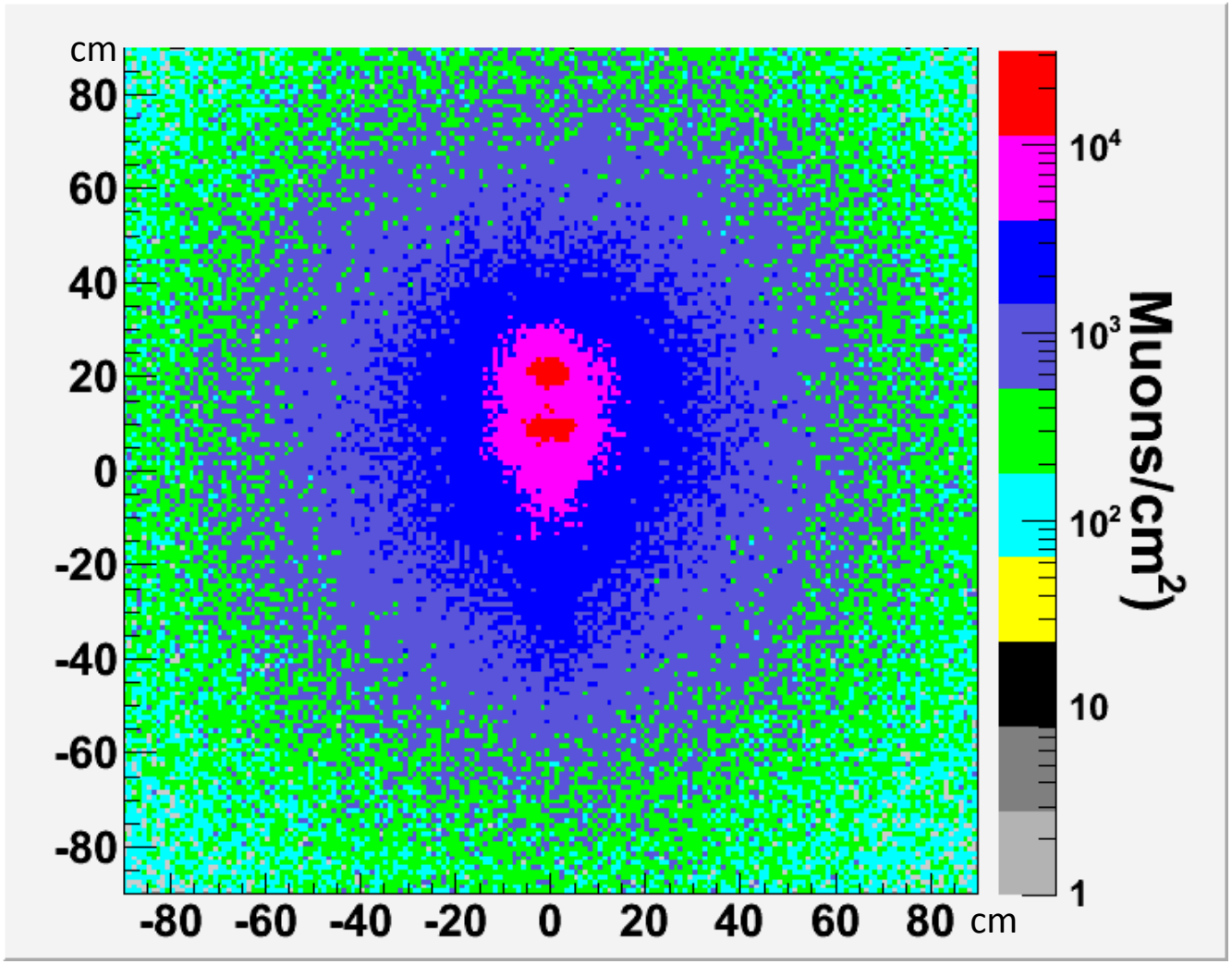
Converter is the main dump → muons → install detector behind dump

- With a Cherenkov detector: 2×10^5 Cherenkov photons / bunch crossing

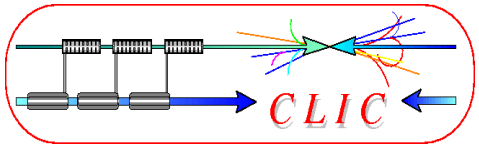


Luminosity Monitoring at CLIC (under study)

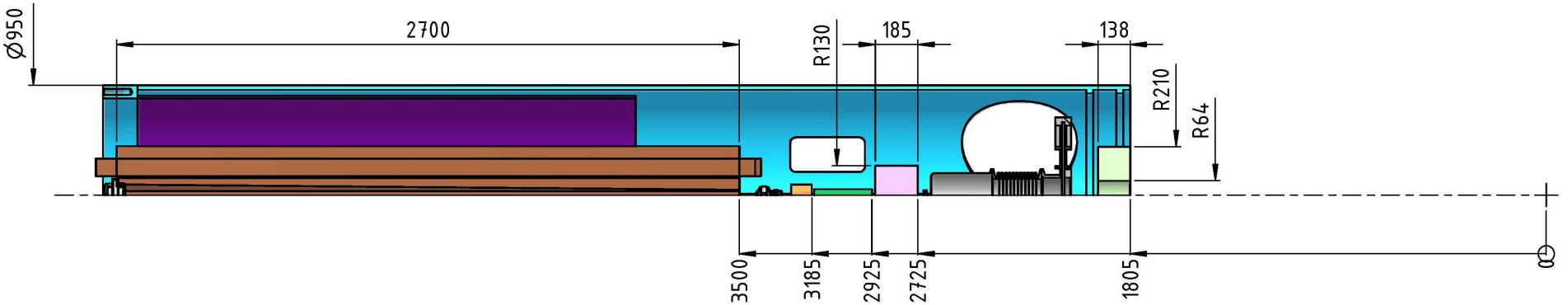
Muon distribution with E> 212MeV behind the beam dump and shielding

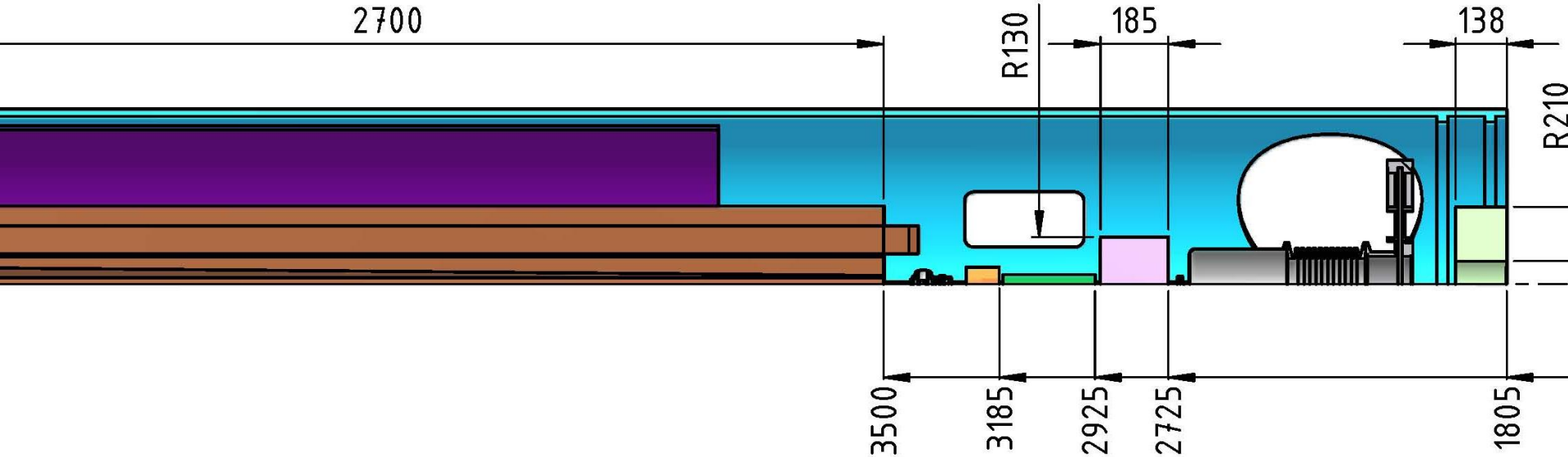


A. Apyan, CERN EN-MEF



Thank you !


Ø950
2700
R130
185
138
R210
R64
3500
3185
2925
2725
1805


2700
R130
185
138
R210
3500
3185
2925
2725
1805