About L*

i.e. the distance between the end of the last quadrupole "QD0" and the IP

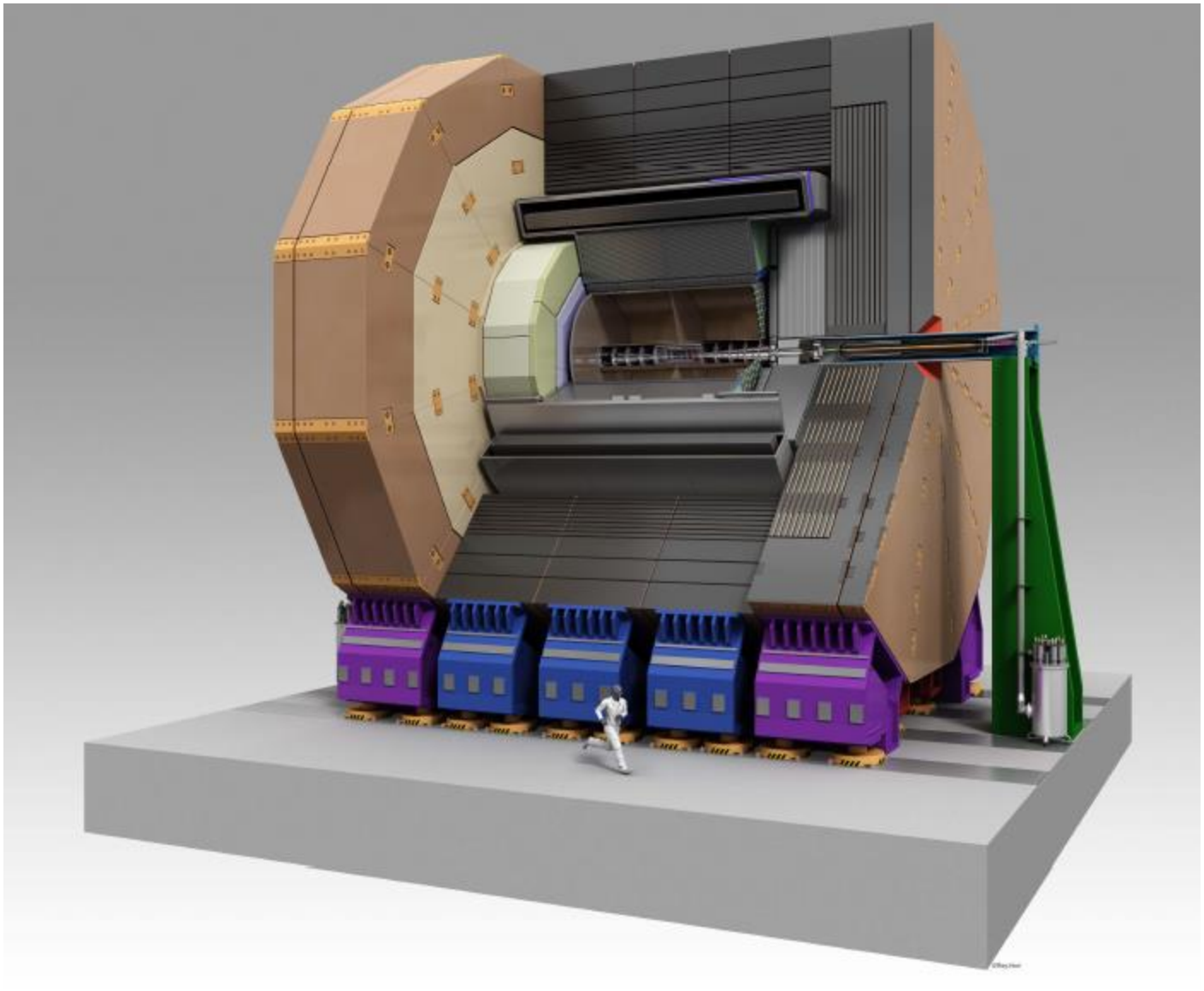
Until now, L* has been different for SiD and ILD,
-> due to detector technology / layout choices

SiD: **L* = 3.5 m**

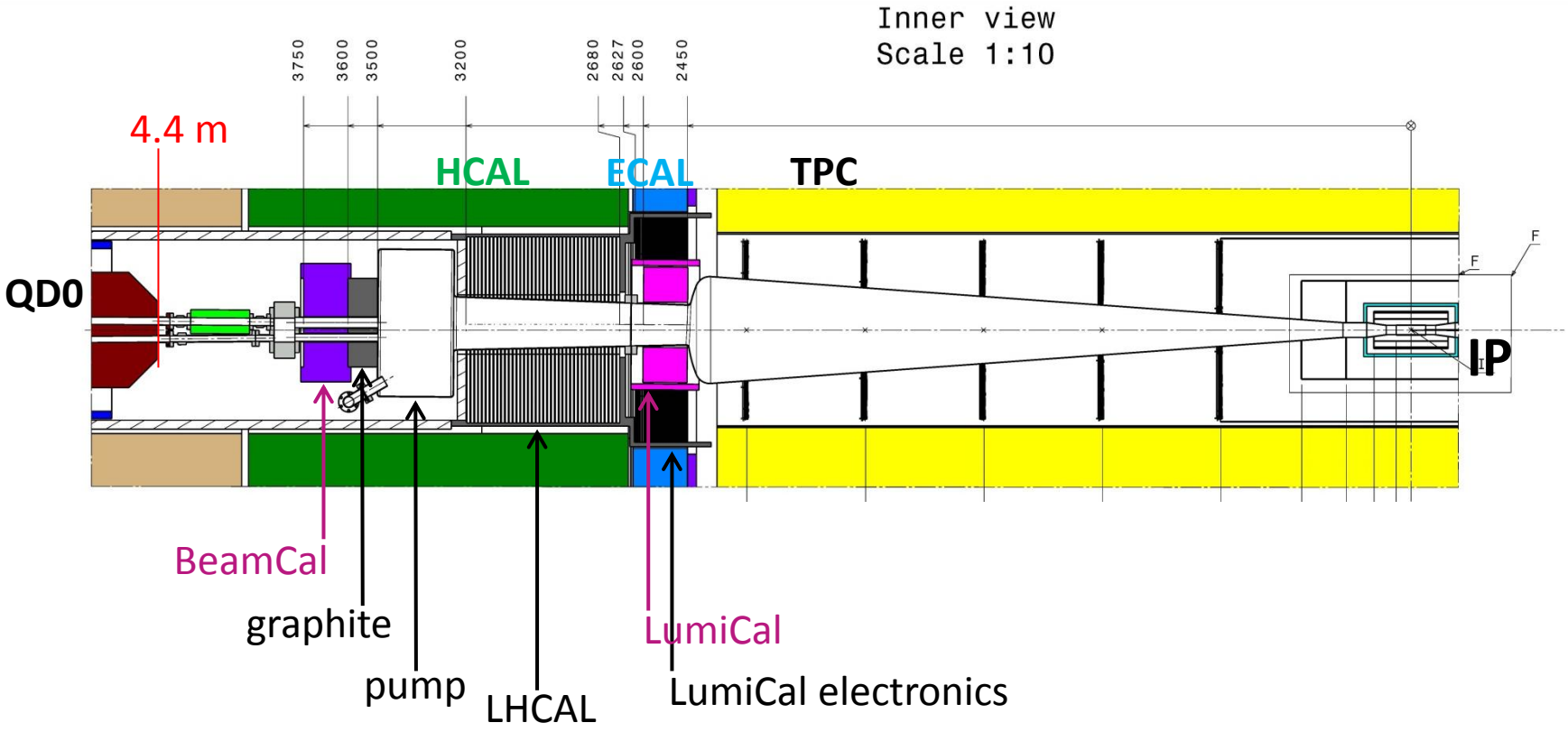
ILD: **L* = 4.4 m**

<u>This may not be the optimal situation</u>:
the two experiments are expected to regularly "push and pull" at the IP –
beam tuning with different settings would have to be re-done after every swap of experiment (which can be very time consuming !)

ILD

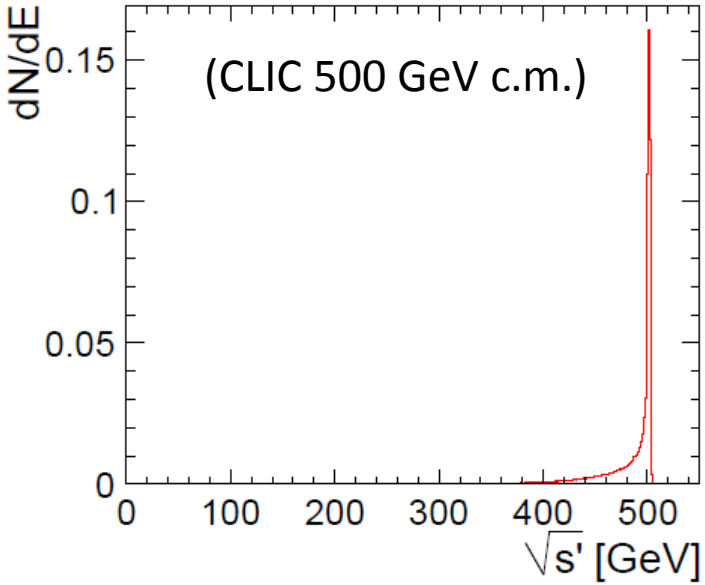


ILD with L* = 4.4 m (top view)

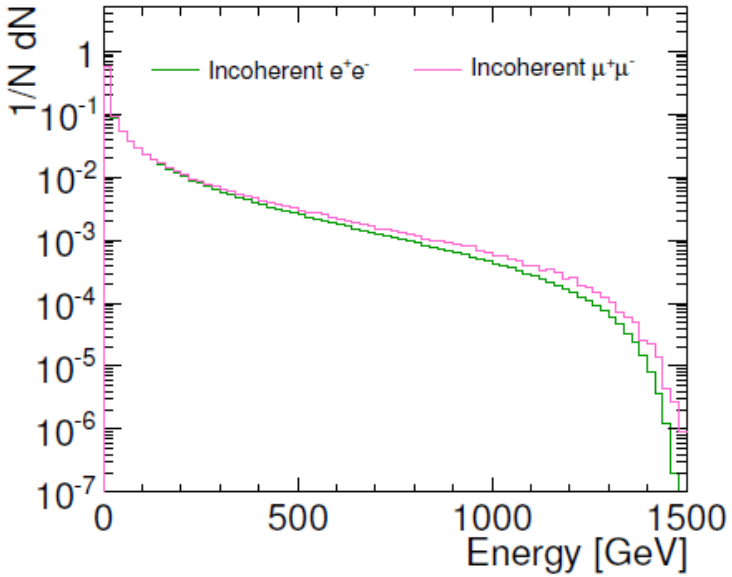


For any given L* :

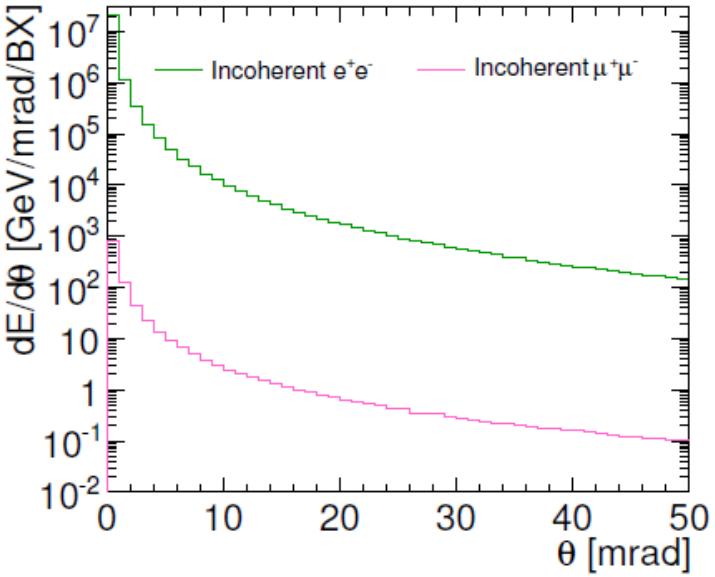
optimised accelerator settings -> beam sizes, luminosity, beam-beam effects,
incoherent pairs,
background from direct hits and back-splash …



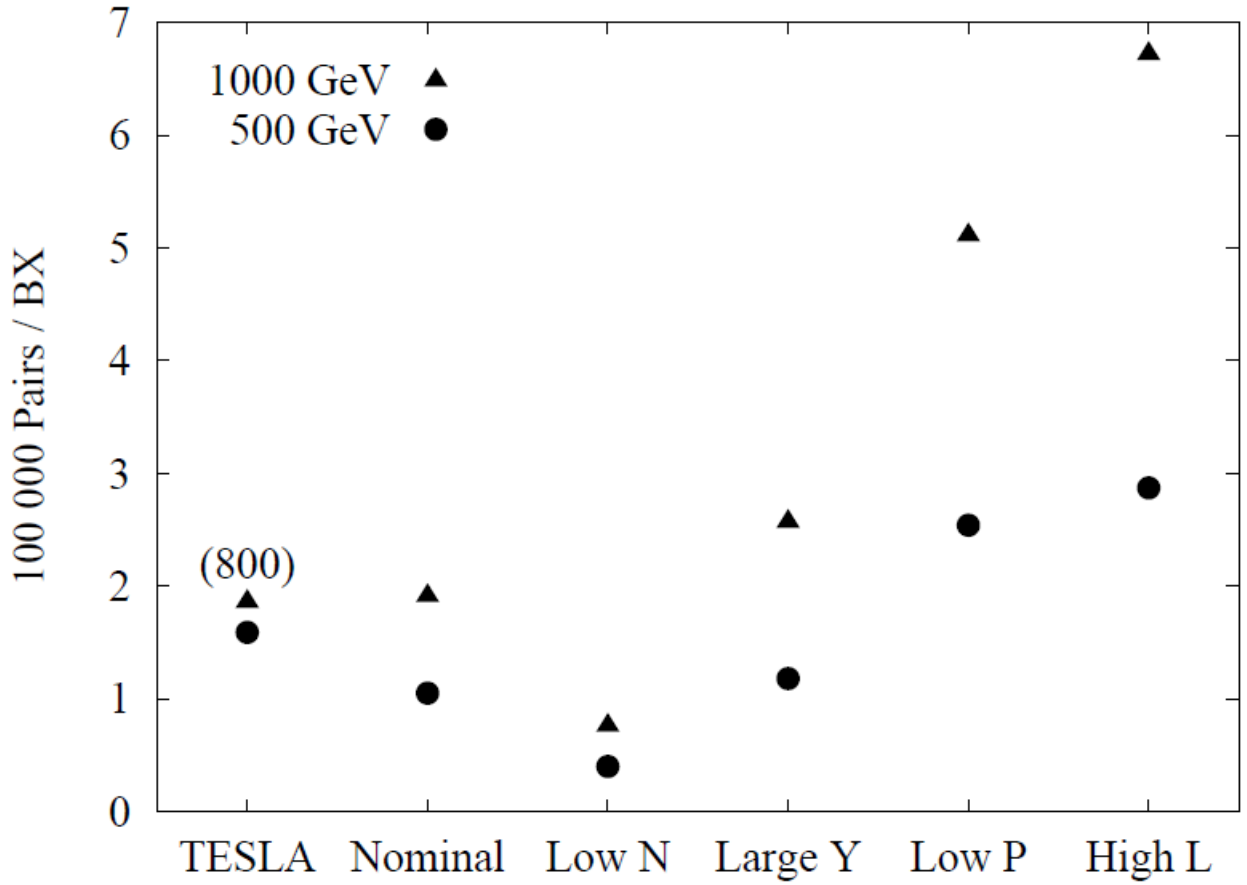
(CLIC 3 TeV c.m.) -- thesis Andre Sailer



(a) Energy spectrum



(b) Angular distribution of the energy



ILC – thesis Adrian Vogel (2008)

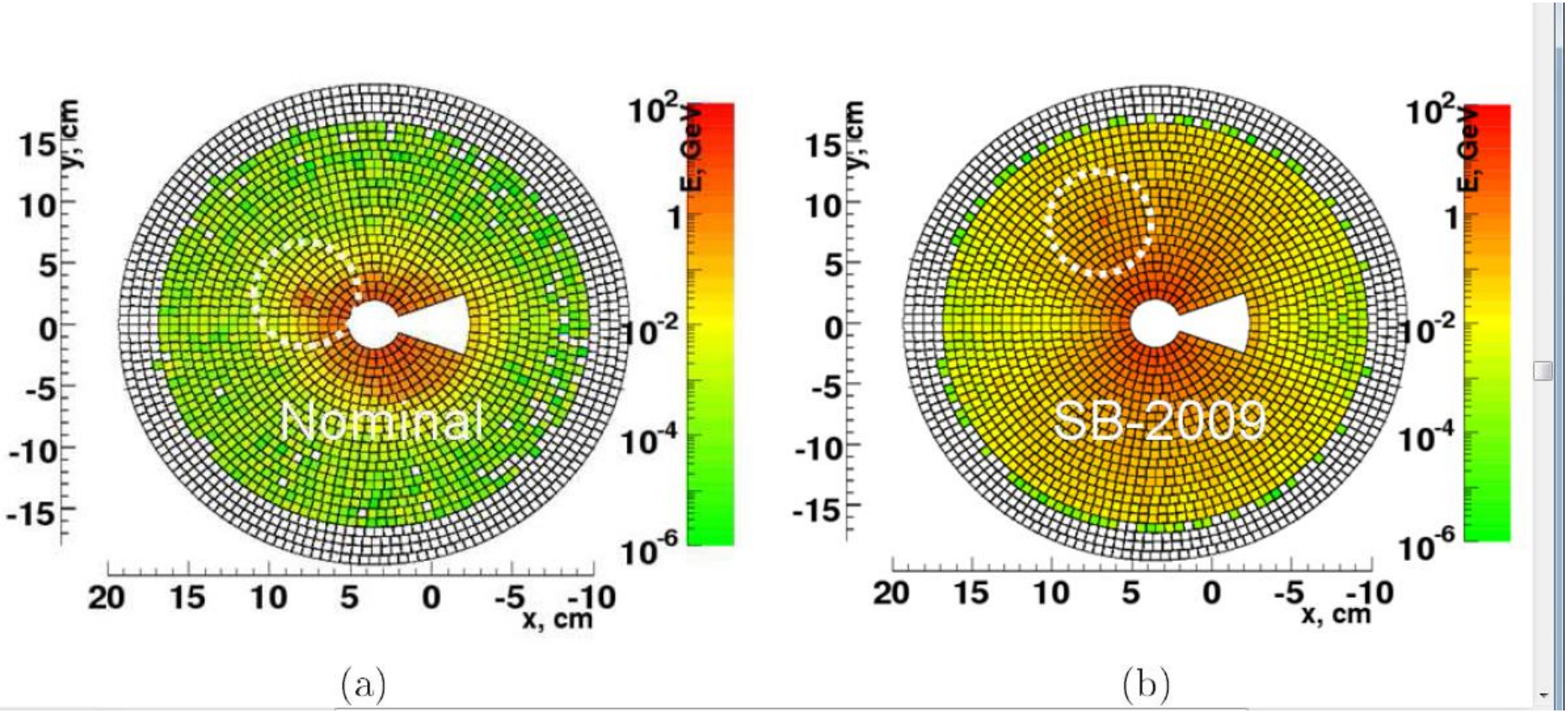
Figure 3.4: The number of electron-positron pairs created per bunch crossing for different beam parameter sets (adapted from [57])

… a more “recent” example

SB2009 Proposal Document

Release 1.1

December 2009



thesis Olga Novgorodova (2013)

References:

Thesis Adrian Vogel http://www-library.desy.de/cgi-bin/showprep.pl?desy-thesis-08-036

Thesis Andre Sailer https://cds.cern.ch/record/1506163?ln=en

Thesis Olga Novgorodova http://www-library.desy.de/cgi-bin/showprep.pl?desy-thesis-13-052

ILC RDR https://www.linearcollider.org/ILC/Publications/Reference-Design-Report

SB2009 https://ilc-edmsdirect.desy.de/ilc-edmsdirect/file.jsp?edmsid=D00000000900425

ILC TDR http://www.linearcollider.org/ILC/Publications/Technical-Design-Report

“Technical Note for ILD beam pipe” by Y. Suetsugu, KEK, 30 March 2009
http://www.ilcild.org/documents/ild-letter-of-intent/ild-loi-material/Suetsugu_beam_pipe.pdf/view

Changing L*

-> in the first place, a geometrical / layout change
(need to find space/appropriate location for all the elements in the forward region)

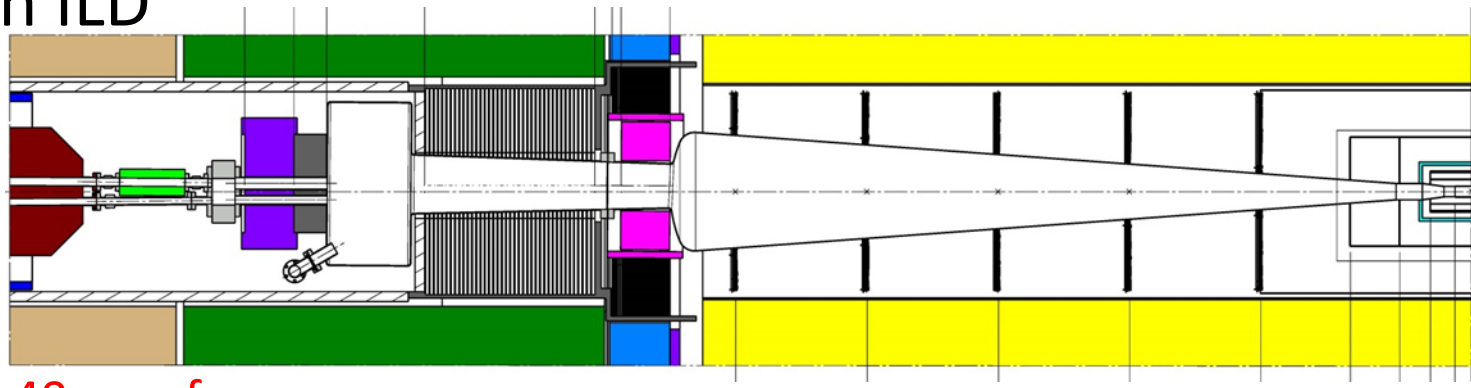
-> if "many" other elements are changed in the last part of the accelerator
(the "*beam delivery system*"), the beam optics can be adjusted…
within a certain range… to reproduce nearly the same conditions at collision
(beam sizes and bunch charge -> determines beam-beam interactions,
luminosity spectrum / incoherent pairs and $\gamma\gamma$ -> hadrons)

It seems that for ILC, this is being worked on for a **new L* of 4 m**
-> need to wait and see what the new beam parameters are
i.e. need the new ***GuineaPig*** output files, compare them to the "old" ones

so where is the problem ?

-> in SiD: "not much"
-> in ILD: several open questions (cf. Karsten Buesser)

Changing L* in ILD



need to find about 40 cm of space …

“in principle” there are two basic ways to do this:

a) change everything starting with the length of the tracker
(could seem natural if the tracker radius is changed -> ILD Detector Optimisation)

b) change as little as possible … remove some elements (vacuum pump ?)
and shorten others (LHCAL ?) to gain the 40 cm of space needed

IF a) -> huge amount of work / all systems are concerned

IF b) -> some work for vacuum experts;
re-design of LHCAL (or the whole forward region ? shielding ??)
BeamCal will be closer to the IP
-> more backscattering into the vertex region ? to be studied

Changing L* in SiD

IF it is accepted that a longer L* will not worsen the expected physics results,

and **IF** it is accepted that BeamCal, LumiCal etc. will remain in the same location…

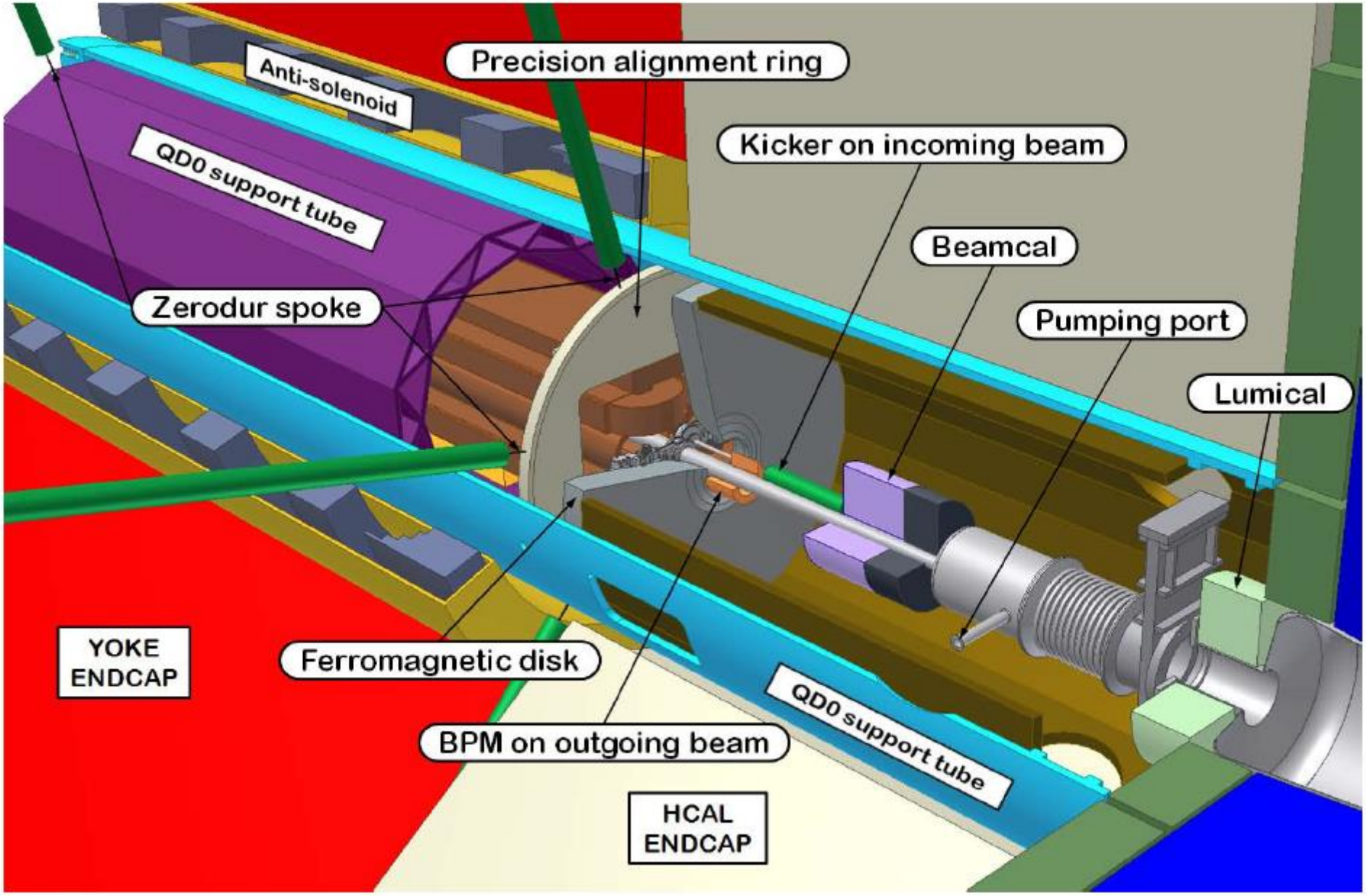
… there may be some remaining issues, possibly on the engineering side (?):
supporting the QD0 in the new location ;
opening/closing the detector with QD0 in the new location

What about CLIC and L* ?

CLIC detector optimisation on-going

Looking for better HCAL acceptance in the forward region

-> long L* (QD0 outside of the detector) ?


Anti-solenoid
Precision alignment ring
QD0 support tube
Kicker on incoming beam
Beamcal
Zerodur spoke
Pumping port
Lumical
YOKE ENDCAP
Ferromagnetic disk
QD0 support tube
BPM on outgoing beam
HCAL ENDCAP

CLIC_ILD