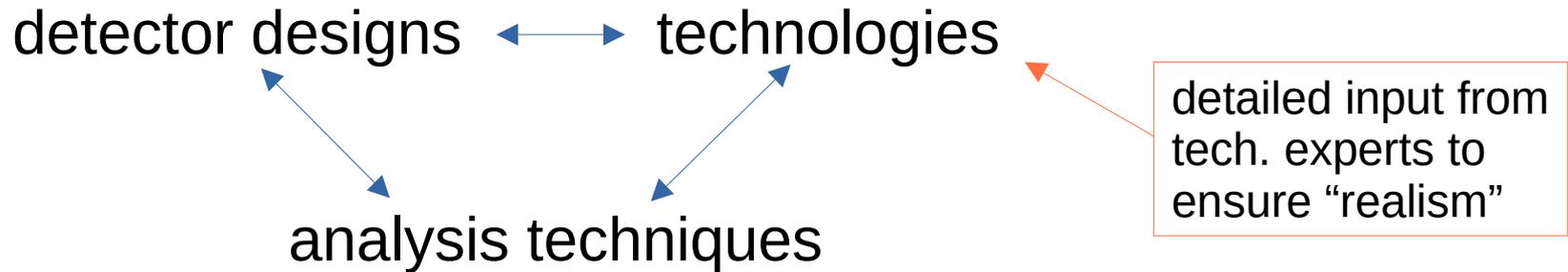


ILD : concept development, simulation models

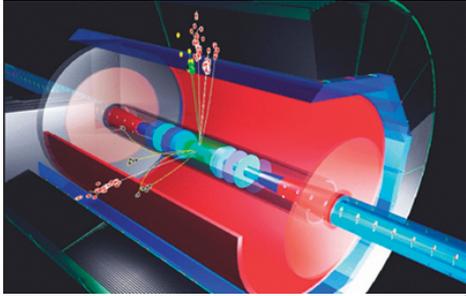
ILD provides framework to

- understand physics reach at a e+e- Higgs factory
realistic, full-sim, etc ...
- understand impact of new / different:



- variants to accommodate MDI at different colliders

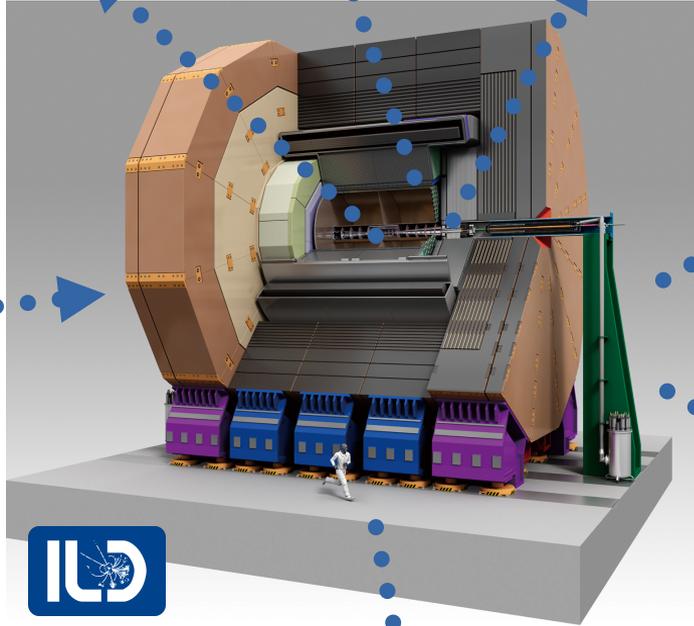
TESLA



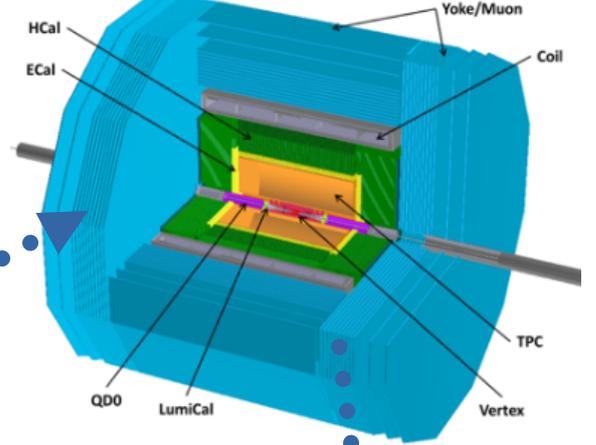
Belle II

CMS

LUXE

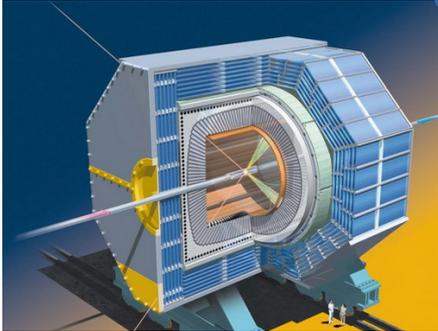


CEPC

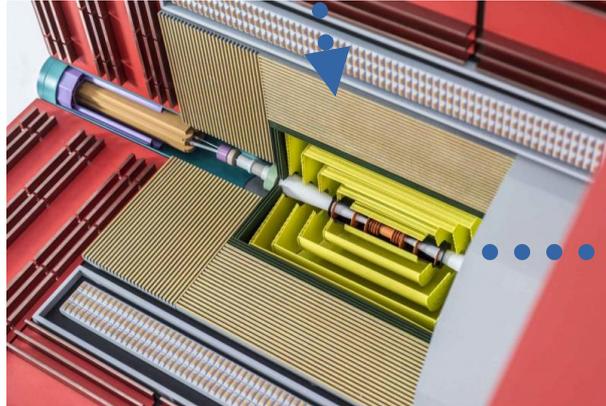


detector(s) realised at Higgs Factory

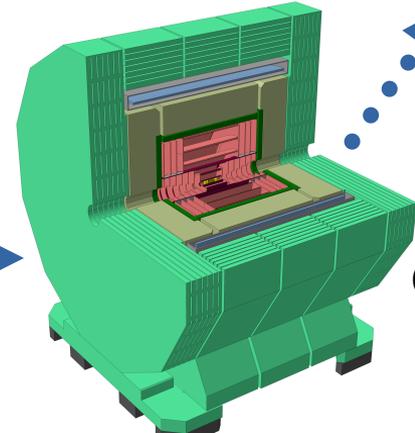
GLD



CLIC



CLD



ILD : LoI 2008, TDR 2013

design fixed 10+ years ago,
using technologies from those days

time for a refresh ?

complete re-design from scratch?

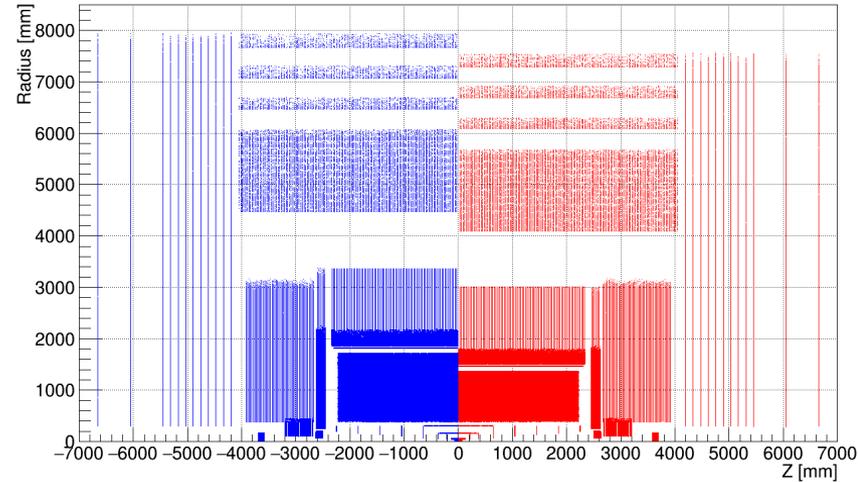
clear vision for revolution?

updated sub-detector designs?

perseverance to go through many iterations?

Interim Design Report 2020

Large \leftrightarrow Small radius
weaker \leftrightarrow stronger field

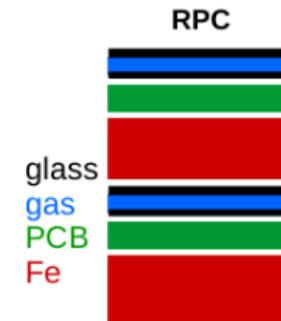
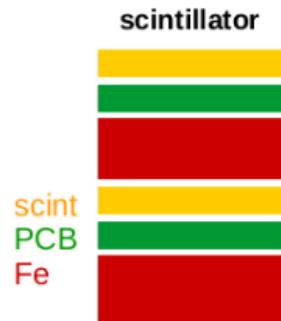


calorimeter technologies

Si \leftrightarrow Scint

RPC \leftrightarrow Scint

single “hybrid” simulation,
different reconstruction



available ILD simulation models

“IDR generation”

ILD_I5_v02 [“baseline”] ILD_s5_v02 [small version]

ILD_I5_v03 [field map]

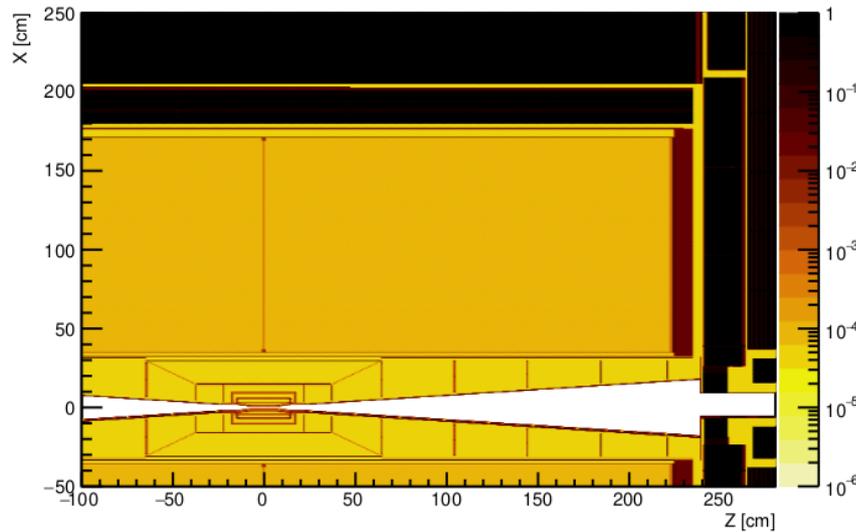
ILD_I5_v05 [field map + anti-DID]

ILD_I5_v09 [TPC & SET → **CLIC-like outer Si tracker**]

ILD_I5_v10 [VTX, SIT, FTD → **CLD-like inner Si tracker**]

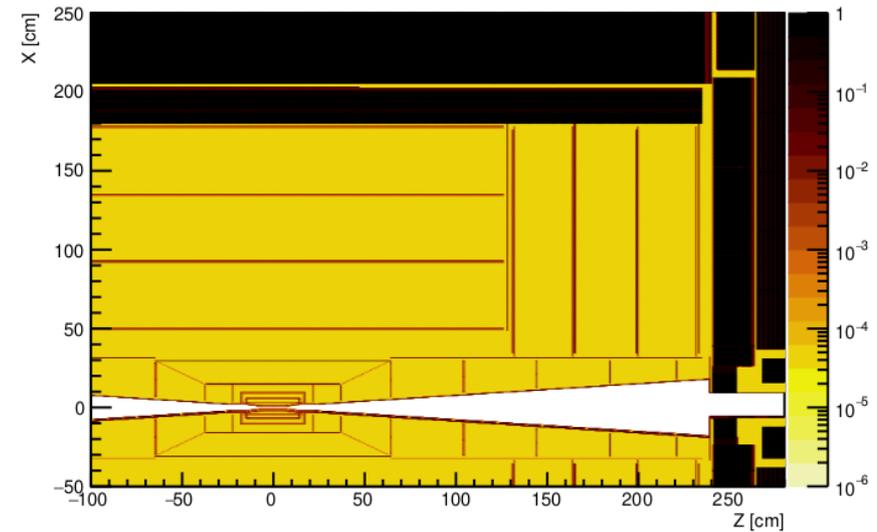
ILD_I5_v11 [**CLD-like inner Si tracker**, **FCCee MDI**]

ILD_I5_v02



baseline

ILD_I5_v09

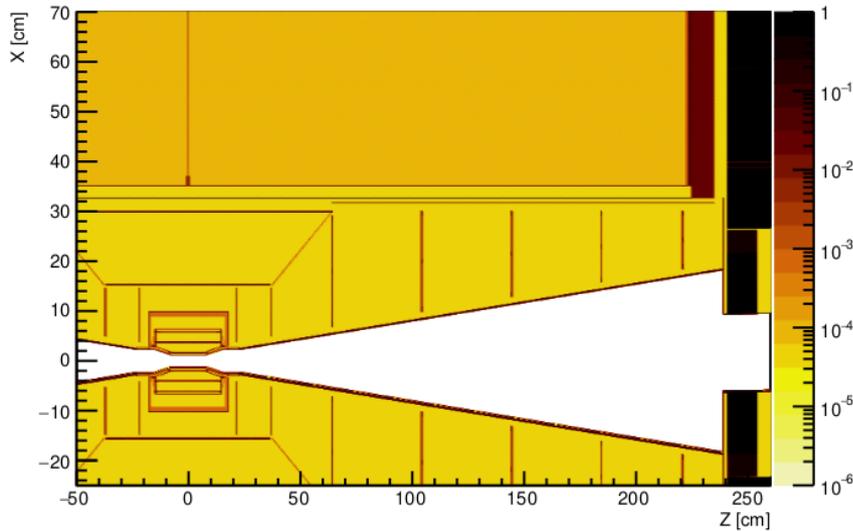


all-Si

ILD_I5_v09 [TPC & SET → **CLIC-like outer Si tracker**]

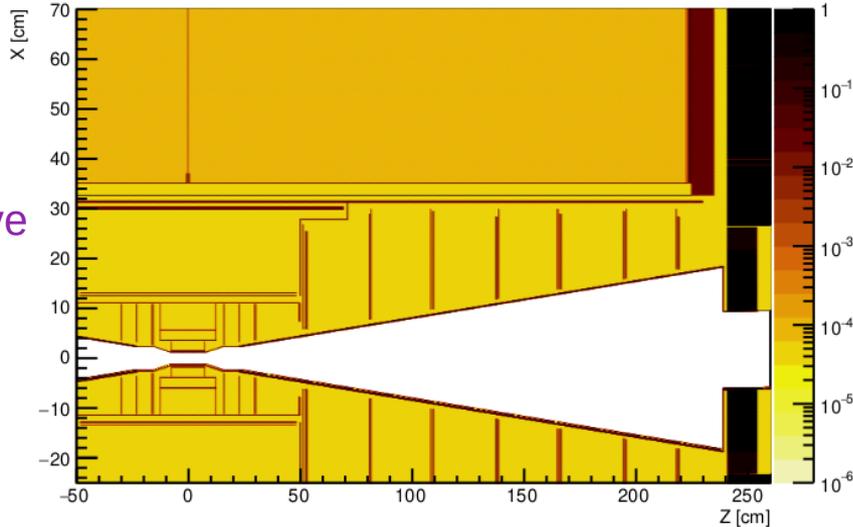
no careful optimisation of Si tracker layout,
 naively squeezed/stretched to fit into available space
 not “validated” by any experts within ILD

ILD_I5_v02



baseline

ILD_I5_v10

alternative
inner Si

ILD_I5_v10

[VTX, SIT, FTD

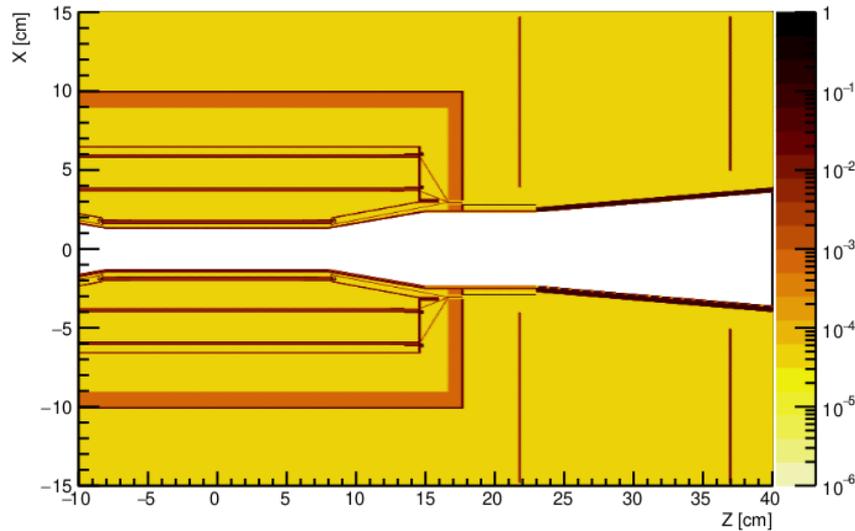
→ **CLD-like inner Si tracker**]no careful optimisation of
inner Si tracker layoutnaively squeezed/stretched to fit into
available space

not “validated” by any experts within ILD

* example of alternative inner Si layout
[more detail next slide]

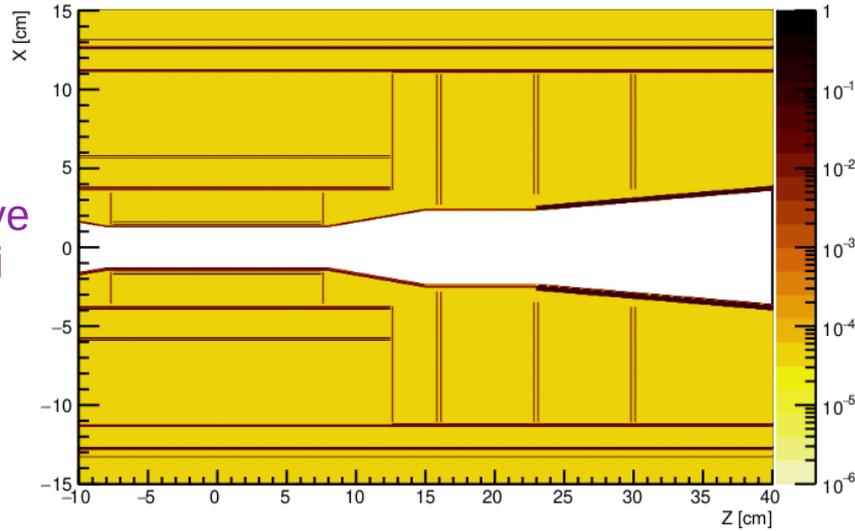
* transition to CLD-like inner region

ILD_I5_v02



baseline

ILD_I5_v10



alternative
inner Si

ILD_I5_v10

[VTX, SIT, FTD

→ **CLD-like inner Si tracker**]

no careful optimisation of
inner Si tracker layout

naively squeezed/stretched to fit into
available space

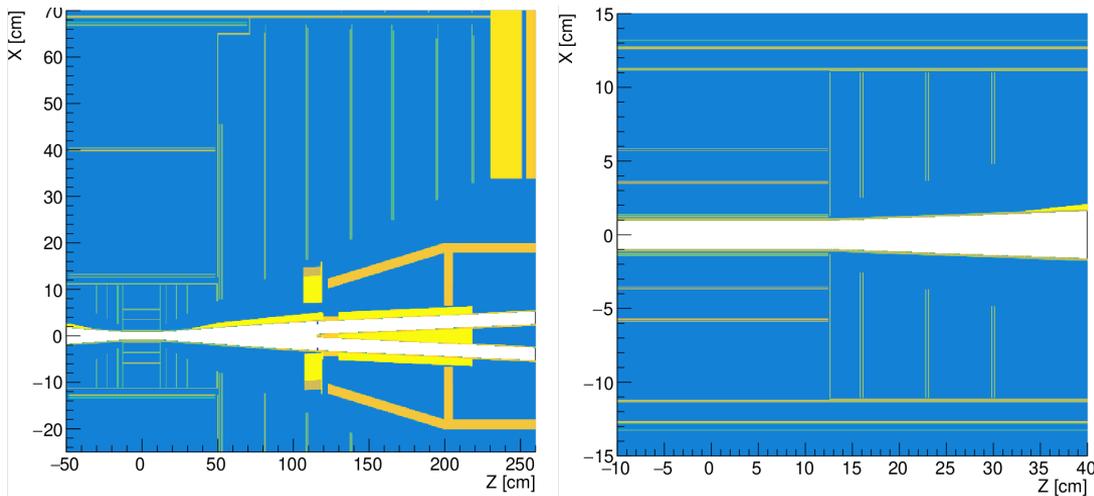
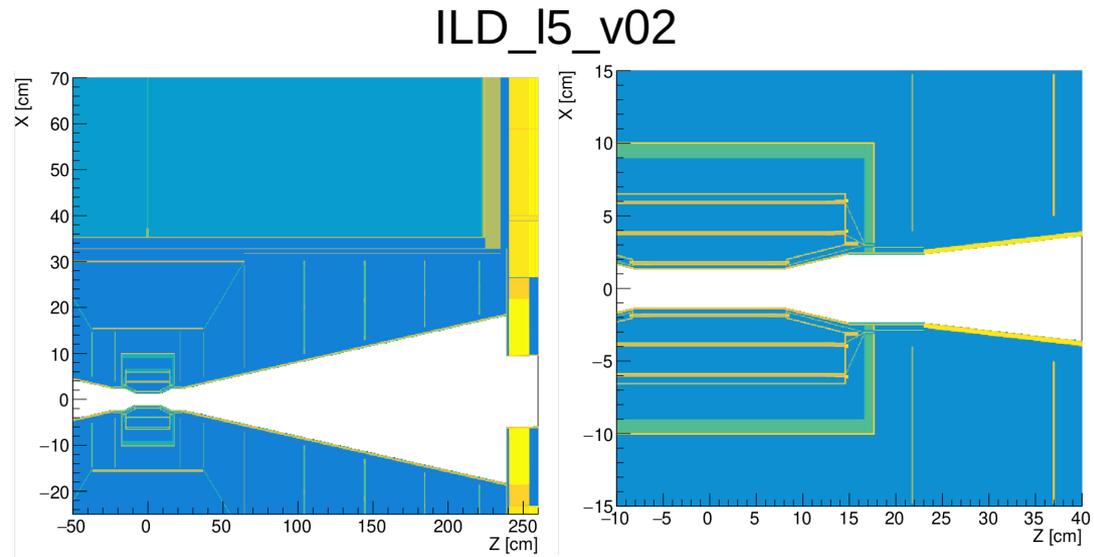
not “validated” by any experts within ILD

* example of alternative inner Si layout

* transition to CLD-like inner region

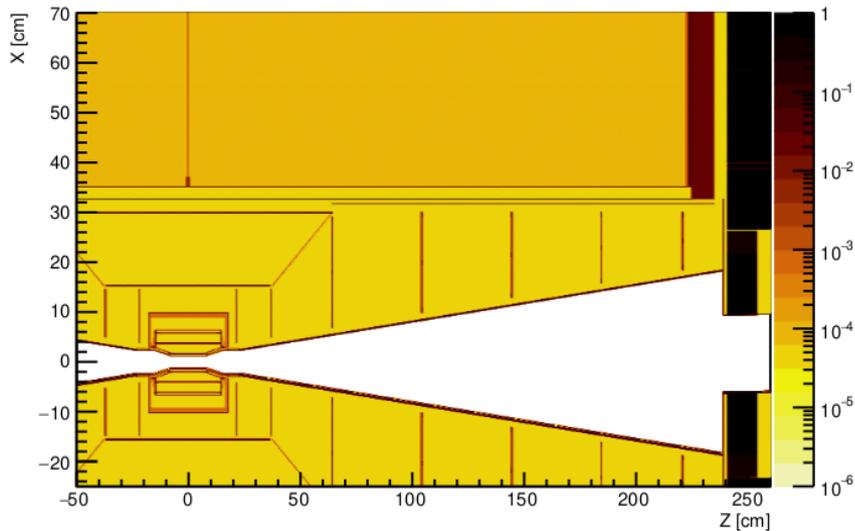
machine-detector interface

	ILC	FCCee
crossing angle	14 mrad	30 mrad
L^* [distance from IP to last accel focusing quadrupole magnet]	4.1 m	2.0 m
detector solenoid	3.5 T	2.0 T
additional B-fields	anti-DID (?)	- compensating - screening



FCCee_o2_v02 "CLD"

ILD_I5_v02



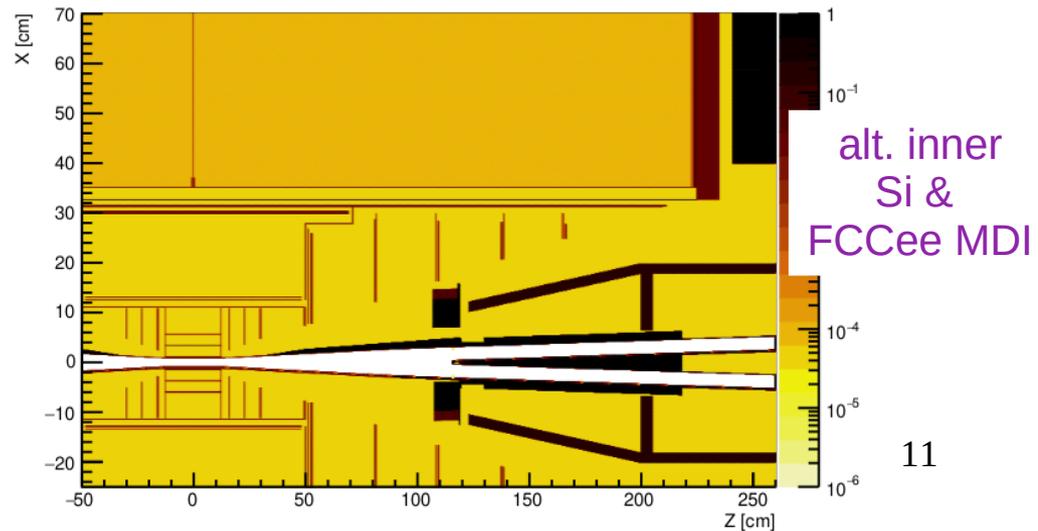
baseline

ILD_I5_v11

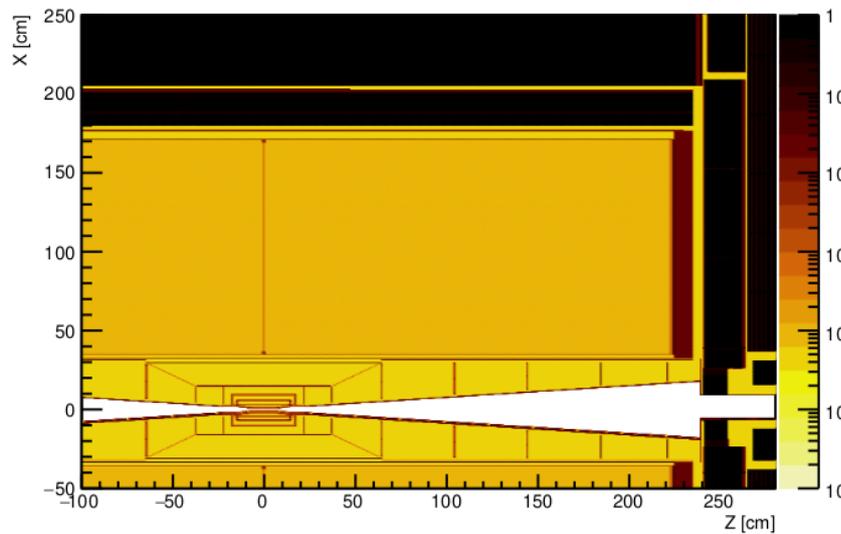
[CLD-like inner Si tracker, FCCee MDI]

no careful design of
forward tracking
endcap calos

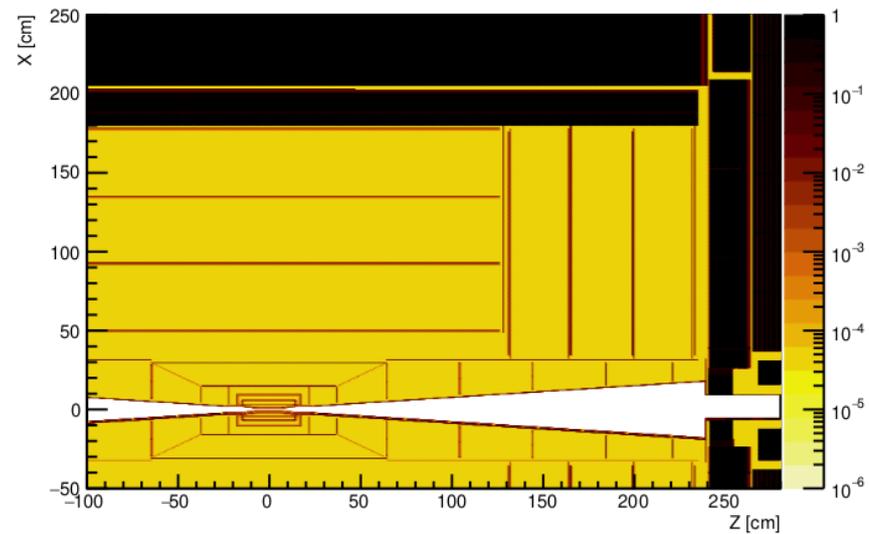
ILD_I5_v11



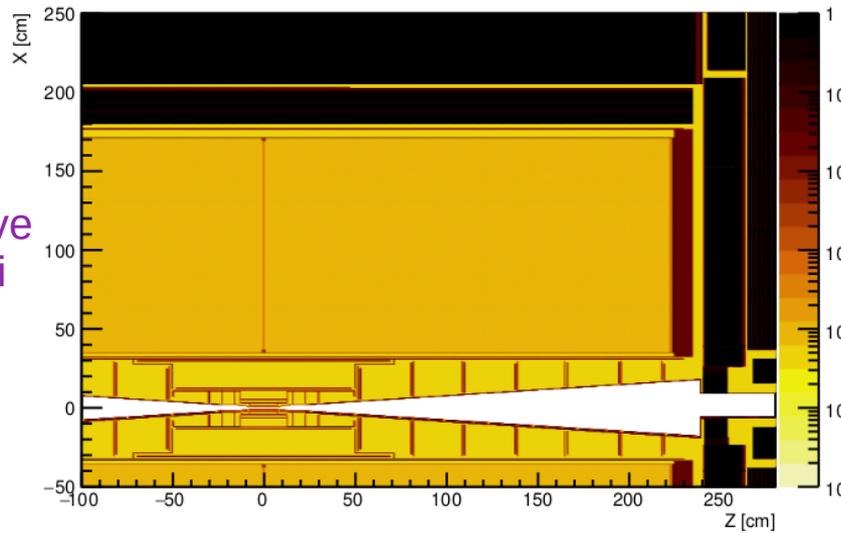
ILD_15_v02



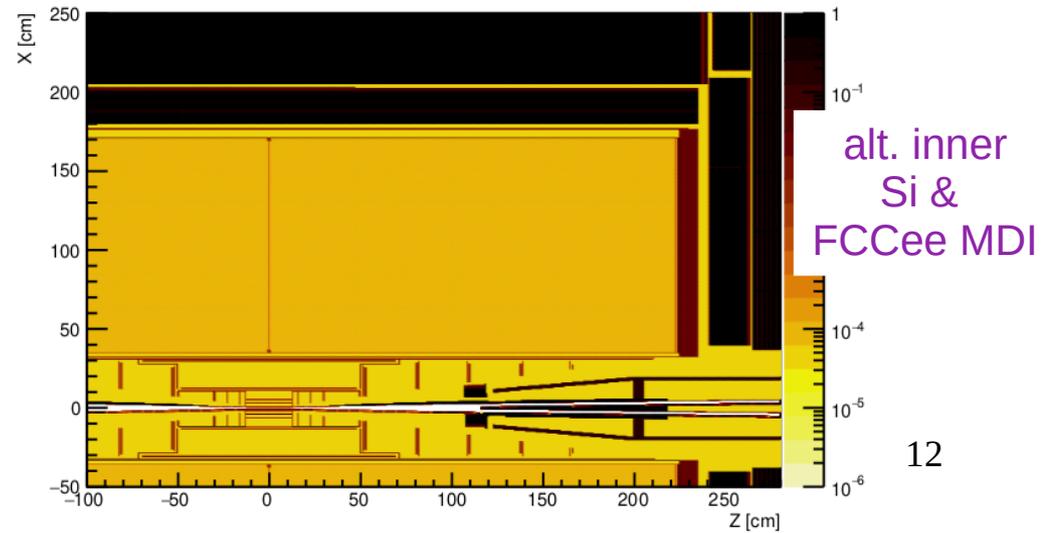
ILD_15_v09



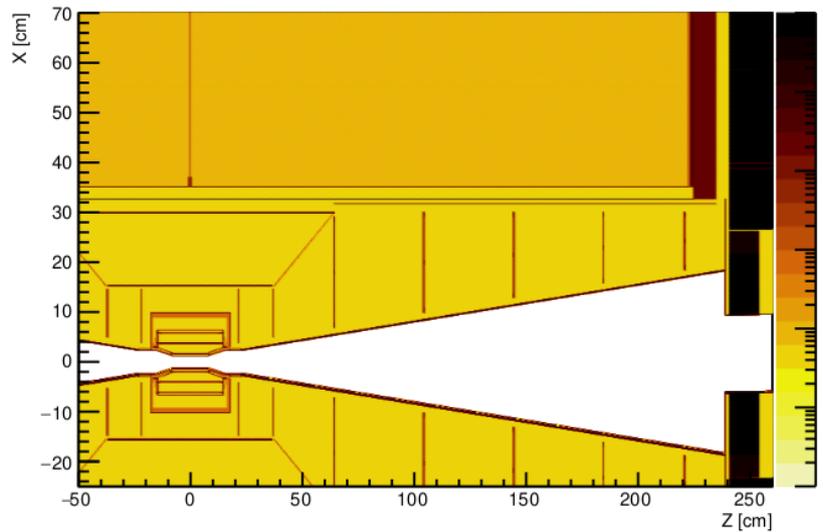
ILD_15_v10



ILD_15_v11

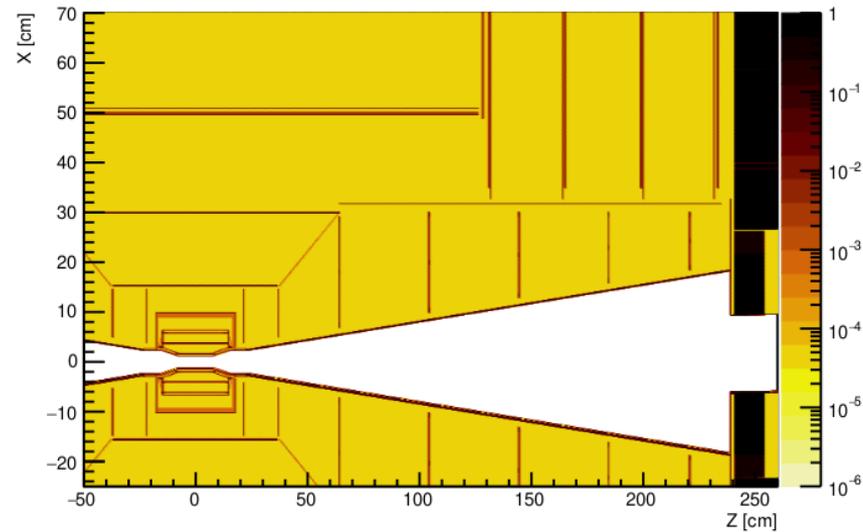


ILD_I5_v02



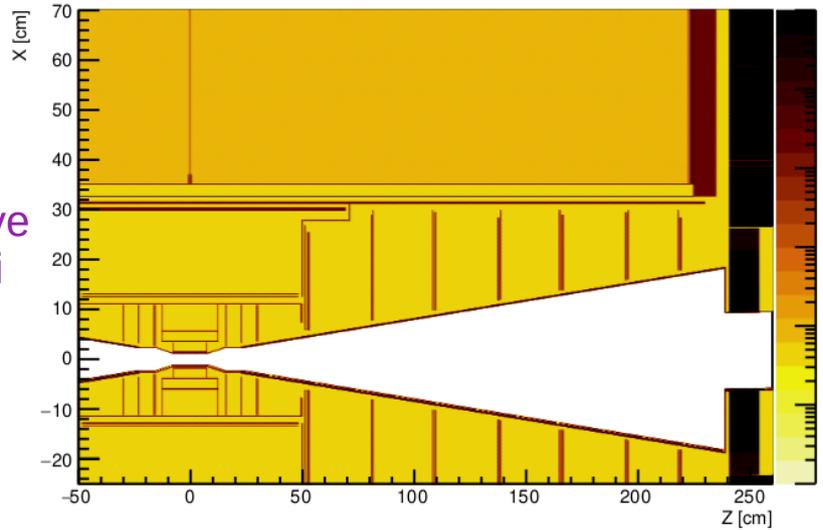
baseline

ILD_I5_v09

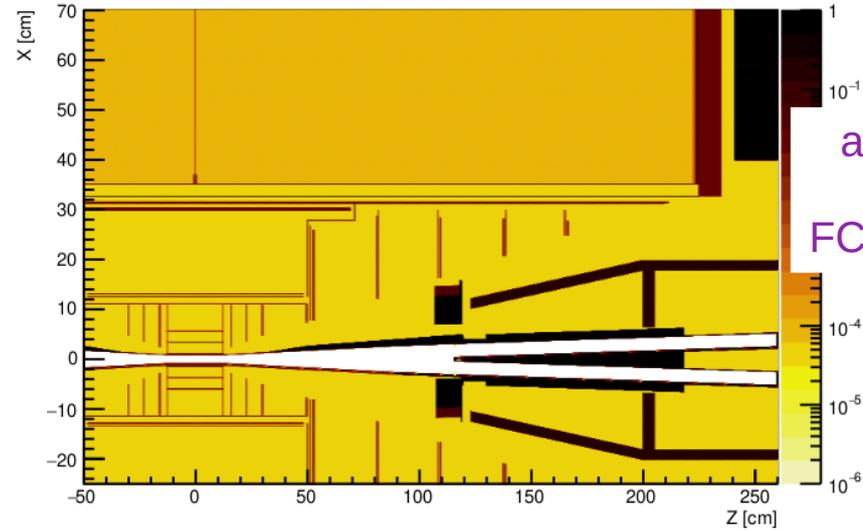


all-Si

ILD_I5_v10

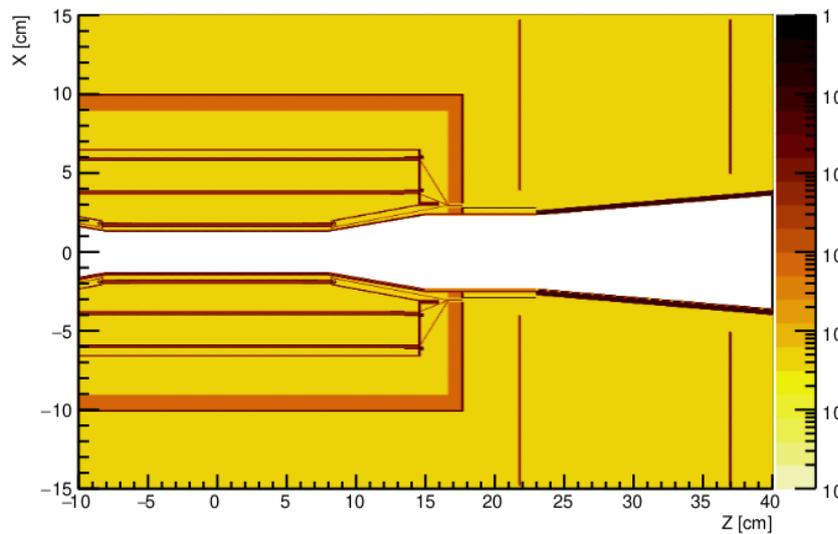
alternative
inner Si

ILD_I5_v11

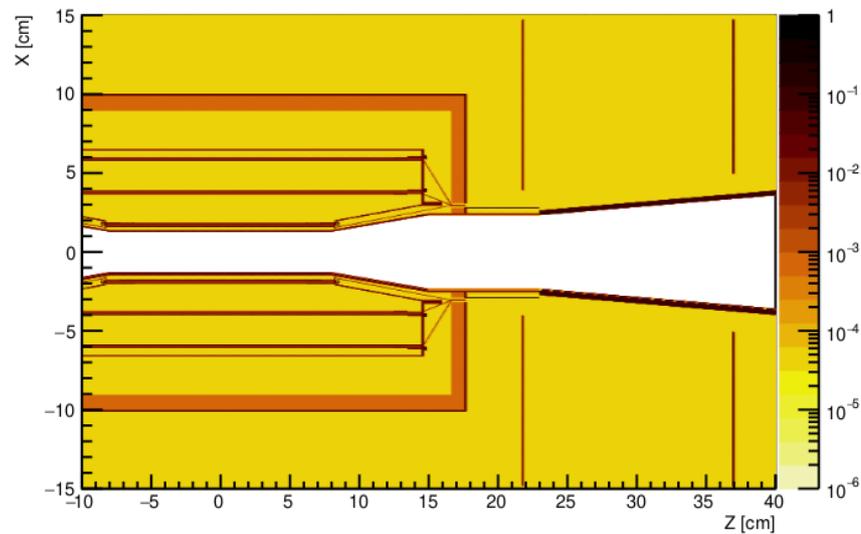
alt. inner
Si &
FCc ee MDI

13

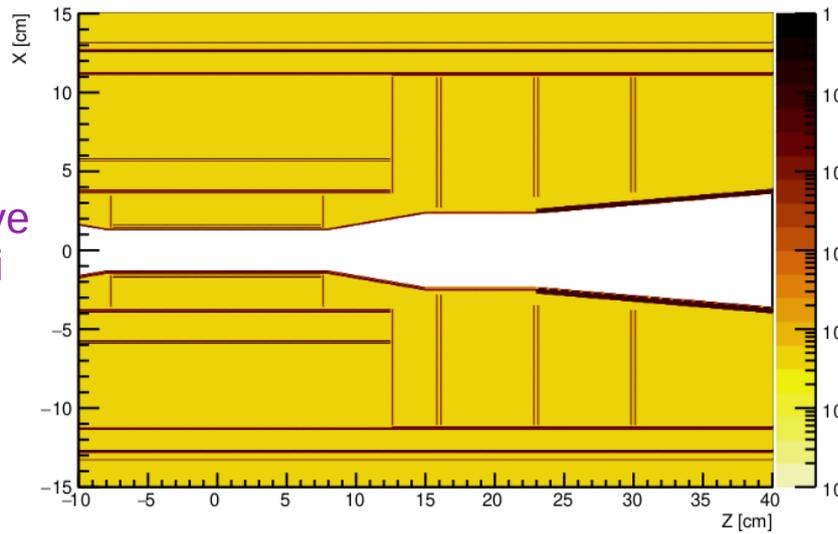
ILD_I5_v02



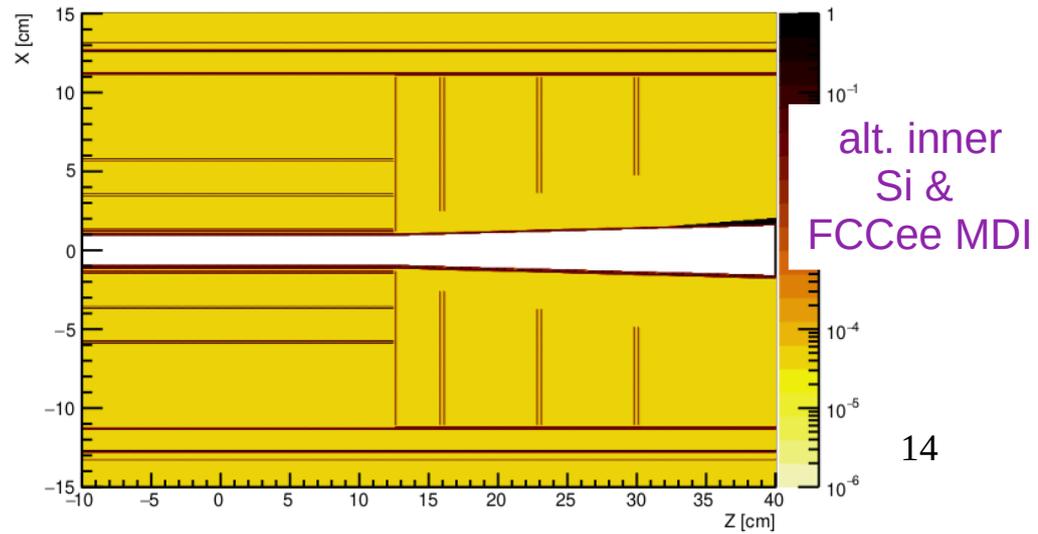
ILD_I5_v09



ILD_I5_v10



ILD_I5_v11



these 3 new models were an illustrative exercise

iteration needed to reach

realistic and optimal
reconfigurations of ILD

- review of subdetector layout, material, ...
- technical checks (geometrical overlaps, ...)
- validation in reconstruction / physics performance

a lot of work → only possible for a small number of models

available ILD simulation models: **digi. & reco. status**

ILD_I5_v02 ["baseline"]

ILD_s5_v02 [small version]

✓ (all det. sizes & calo. options)

ILD_I5_v03 [field map]

ILD_I5_v05 [field map + anti-DID]

Pixel TPC digi. + reco. **W.I.P.**
C. Ligtenberg → J. Klamka

SET & ECAL timing for PID ✓
[realism ?]

ILD_I5_v09 [TPC & SET → **CLIC-like outer Si tracker**]

conformal tracking ✓
[Jan Klamka]

<https://github.com/iLCSoft/ILDConfig/blob/master/StandardConfig/production/README.md#running-the-full-reconstruction-chain-with-all-silicon-ild-model>

ILD_I5_v10 [VTX, SIT, FTD → **CLD-like inner Si tracker**]

not yet tried ✗

ILD_I5_v11 [**CLD-like inner Si tracker**, **FCCee MDI**]

We have heard several cool new (and not-so-new) ideas for updates

ILD @ HALHF → now SVG fast-sim model

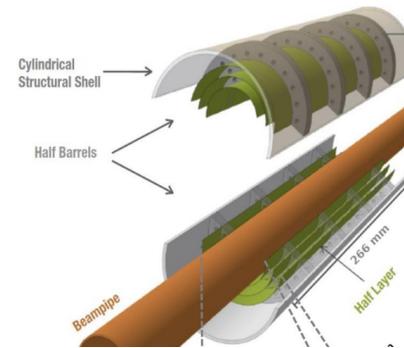
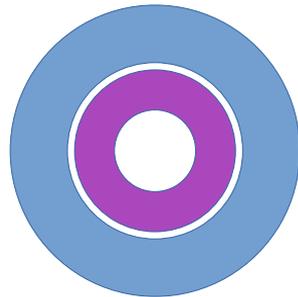
ILD @ FCC → power/cooling → granularity, material

VTX with large bent sensors

precision timing

inner barrel ↔ forward transition

”double TPC”



to implement any of these to “ILD standard” is a significant work from all of us technical / software / analysis

summary

ILD has a long and illustrious history

we have several ideas for updates to

- incorporate newest technologies
- adapt to environment at different colliders

to study these

with our usual attention to realism and detail
is a major work

given currently available personpower

we should focus on a small number of principal directions,
and define bite-size studies for other possibilities