



01.11.2019

# **ILD DESIGN REPORT STATUS**

# The IDR



Comprehensive document to describe the state of ILD

- Description of the system and its “philosophy”
- Describe the development in particular of technology which has happened since our last document
  - Subdetectors
  - Simulation
  - reconstruction
- Describe the effort to optimise ILD: IDR-S and IDR-L
- Describe the science program we want to do with ILD
- Update the costing
- Update the ILD integration
- Update the site specific considerations

# IDR Status/ Plans



- First Circulation to the collaboration: July 6
- Circulation to internal reviewers: August 2019
- Submission to group of external reviewers: October 3, 2019
  - Paul Grannis
  - Lucie Linssen
  - Katsuo Tokushuku
- Second circulation to ILD: October 25, 2019
- Discussion in ILC meeting: today

# Schedule



Today	Discussion on the state of the document, discussion on conclusions
November	Finalisation Finalisation of the author list Layout finalisation
28/29.11.2019	2-day editing session at DESY with main editors, make final version
1.12.2019	Final circulation to ILD for 1 week
15.12.2019	Submission to archive

# Status of common sections



Introduction	Final, no major comments received, no significant updates are planned
Conclusion	First version exists, currently only descriptive. Need to further develop this and include conclusion from the work we have done.



# IDR Conclusions



- Technical
- Software/ Reconstruction
- Physics

# What are our conclusions





# IDR-S and IDR-L

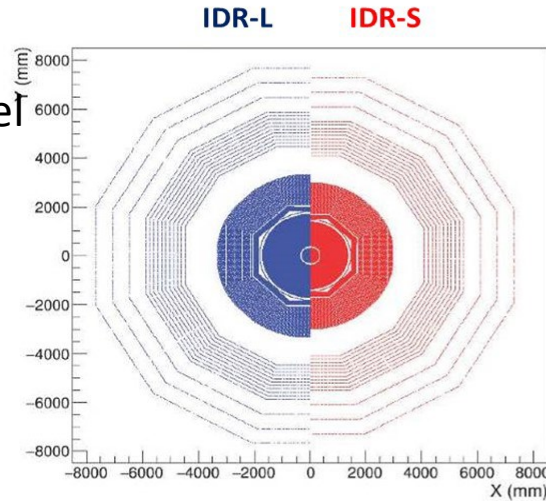


## IDR-L:

- Nearly identical to DBD model
- “large”

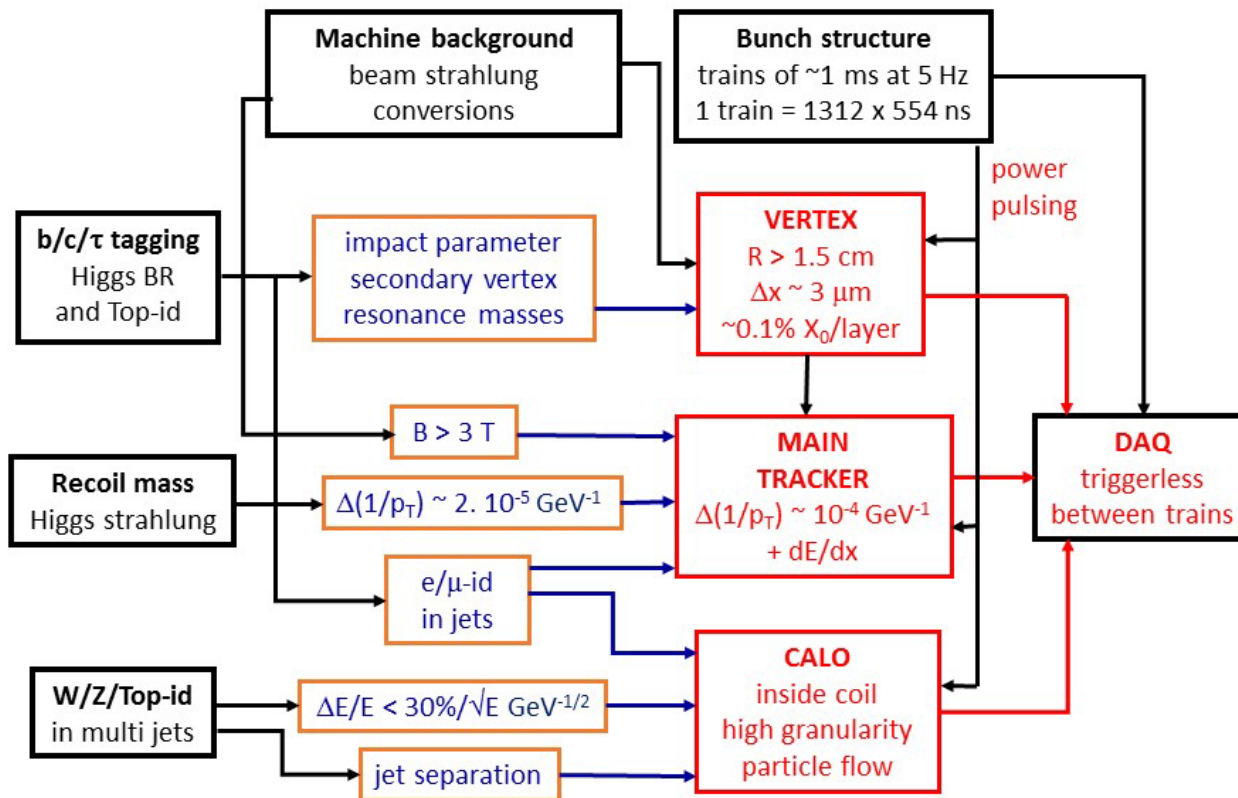
## IDR-S

- Keep the length
- Reduce the radius

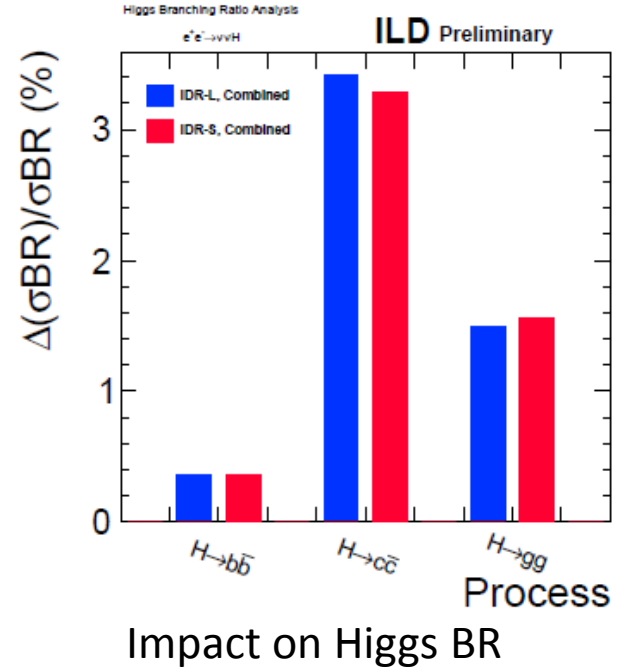
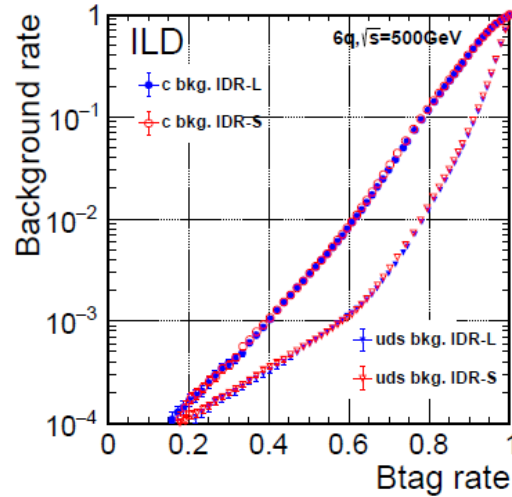
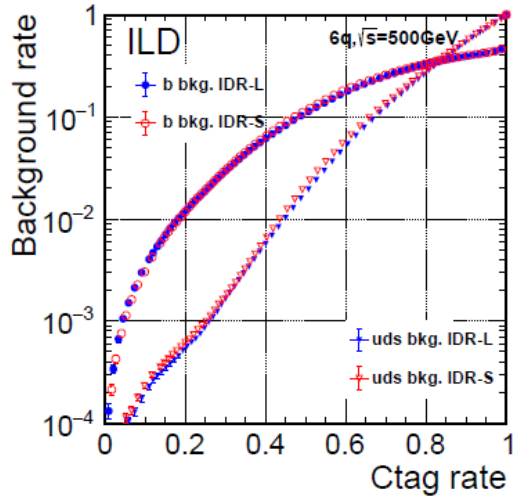


Detector	IDR-L	IDR-S
B-field	3.5 T	4 T
VTX inner radius	1.6 cm	1.6 cm
TPC inner radius	33 cm	33 cm
TPC outer radius	177 cm	143 cm
TPC length (z/2)	235 cm	235 cm
ECAL inner radius	180 cm	146 cm
ECAL outer radius	203 cm	169 cm
HCAL inner radius	206 cm	172 cm
HCAL outer radius	334 cm	300 cm
Coil inner radius	342 cm	308 cm

# ILD specifications

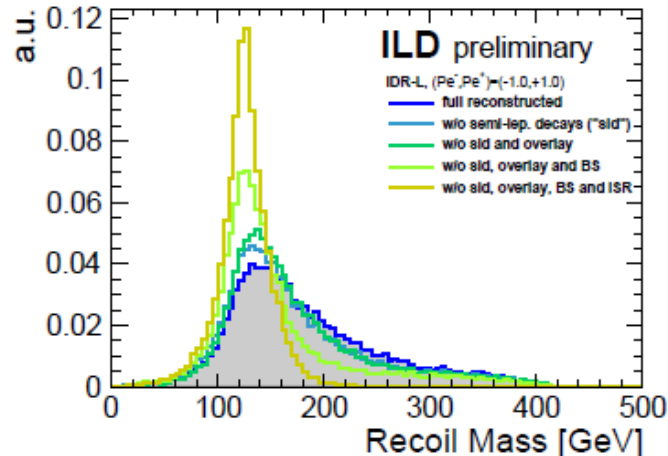
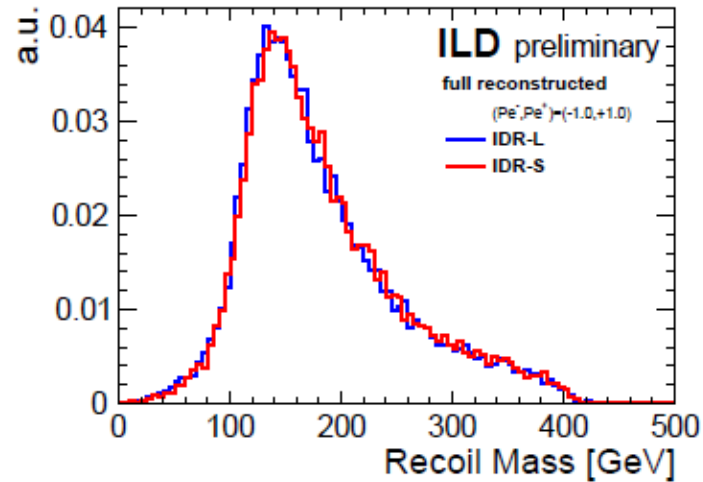
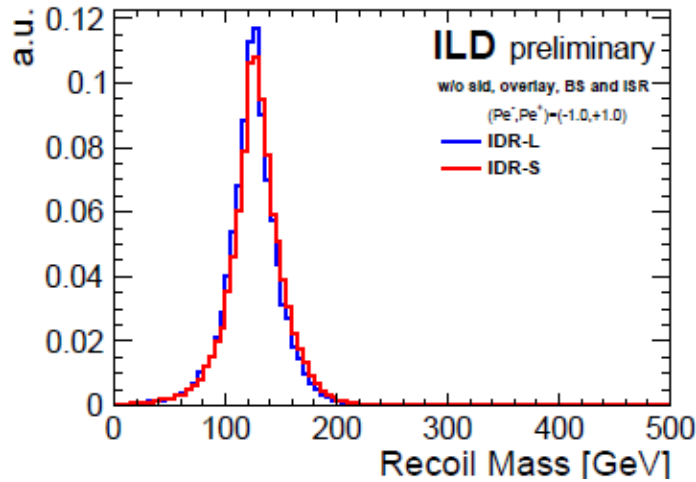


# Flavour tag performance



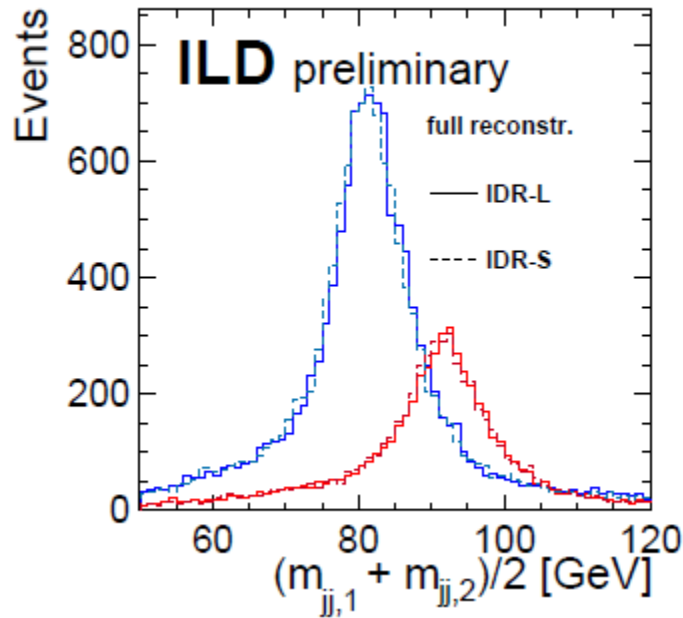
- Hardly any difference for flavour tag performance for L and S model
- Not very surprising, given, that the VTX is identical (except B field)

# Recoil Mass Analysis



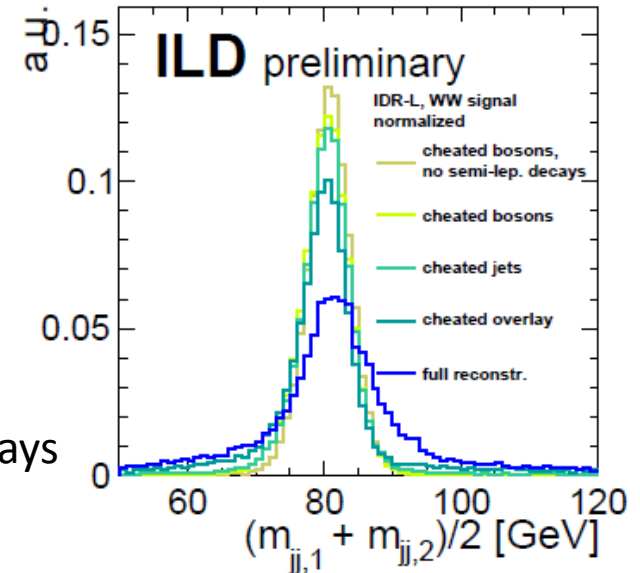
- Hardly any difference
- The performance is driven by other effects

# WW/ ZZ reconstruction



- Impact on dijet mass is small
- Strongly dominated by other effects:

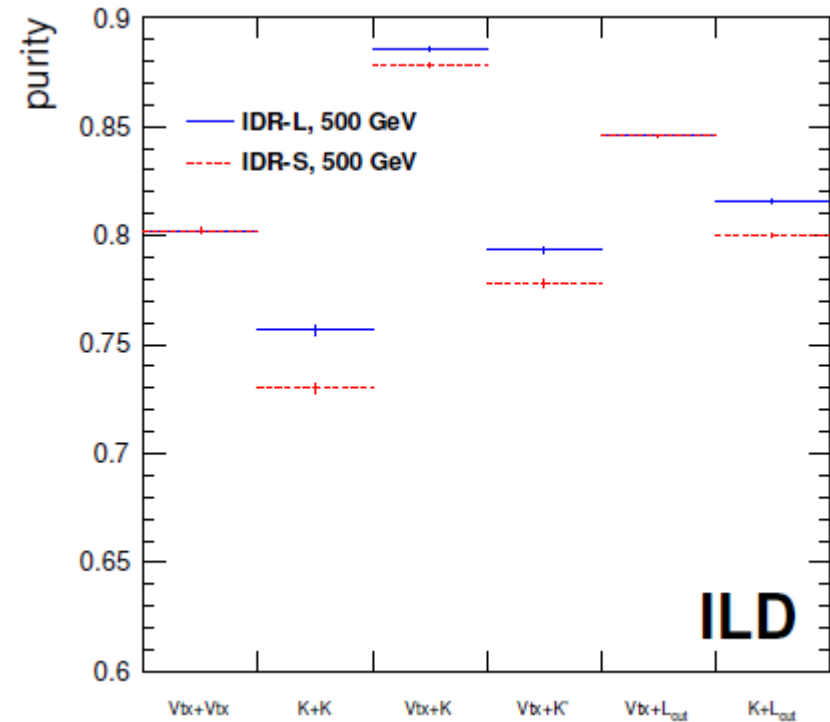
- Overlay removal
- Jet clustering
- Semi-leptonic decays



# AFB from $tt \rightarrow bbqq\nu$

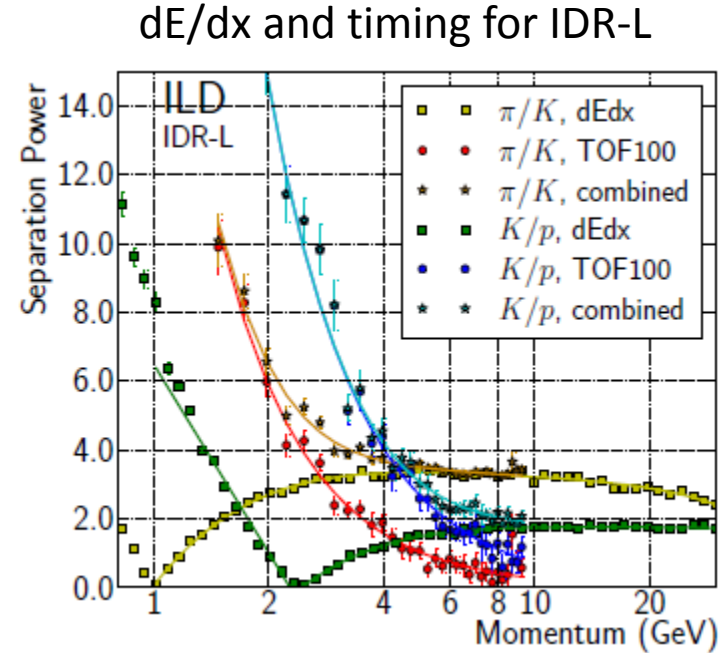
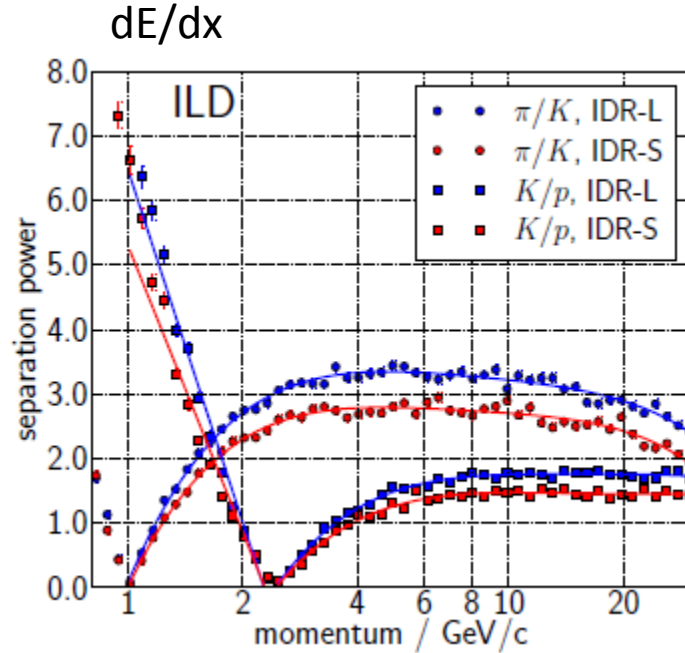


- Vertex charge as a means to tag the charge of top/ anti-top
- Purity of the flavour tag via vtx charge and Kaon ID method
- Some advantage seen for the large detector



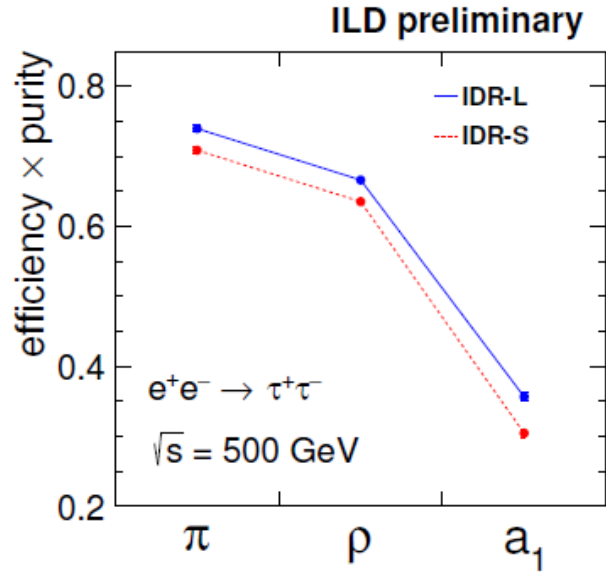
**ILD**

# Particle ID



- Particle ID via dE/dx
- Impact of smaller detector / smaller TPC is visible

# Hadron ID

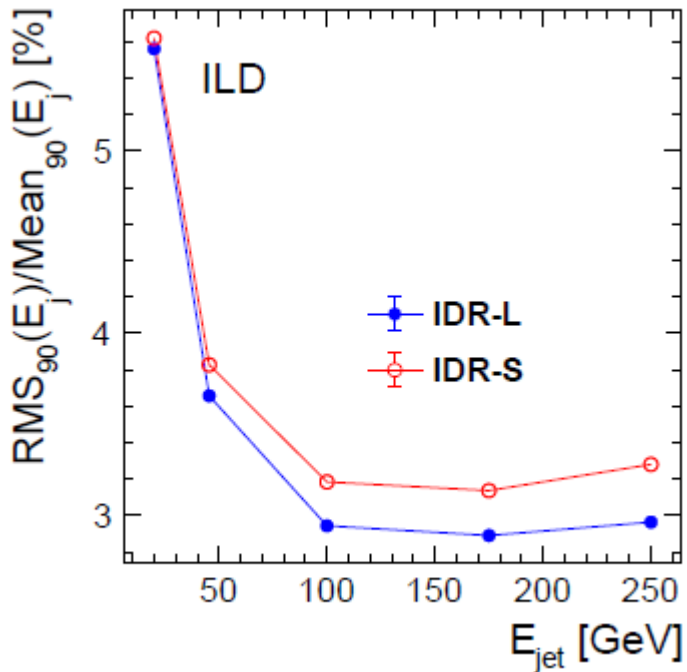


## Tau identification in ILD

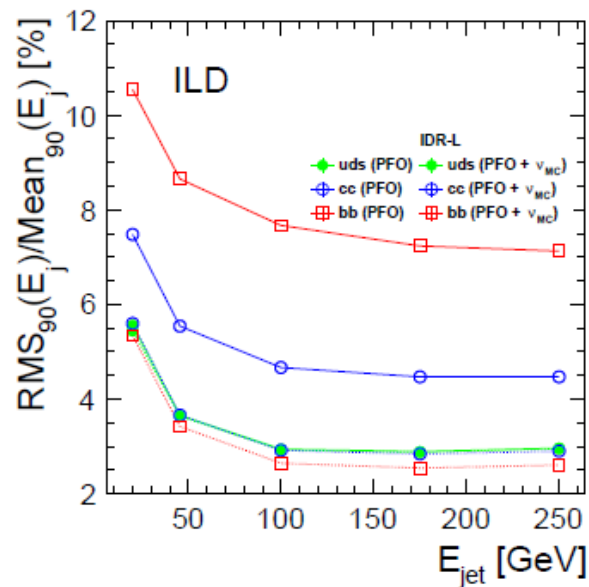
- Slight improvement for the large detector



# Particle Flow

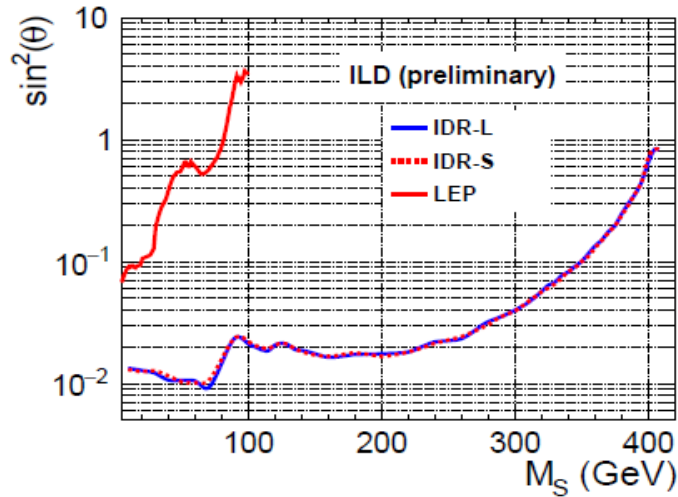


- The larger detector does better
- The improvement grows with energy



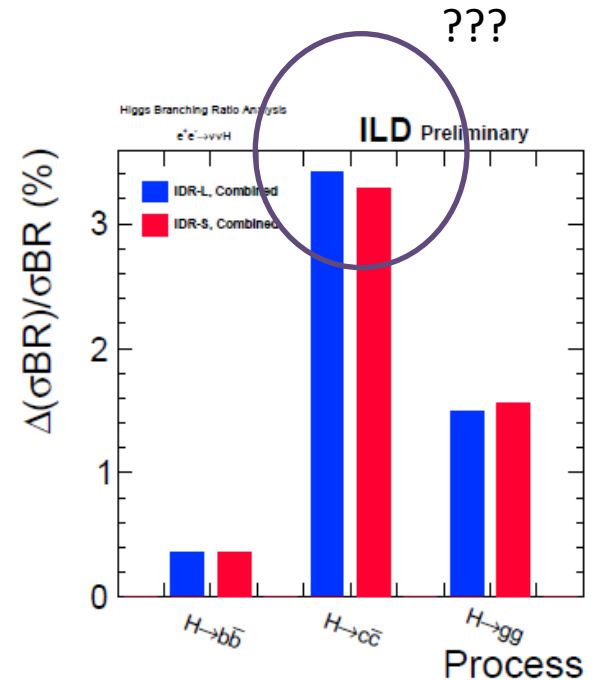
Intrinsic differences due to flavour are much larger

# Science impact



Sensitivity for a new scalar particle, as a function of its mass and of the mixing angle with the SM Higgs boson.

Expected precision reachable for H BR measurements, for large and small ILD detector version.



# Summary ILD size study



- The particle flow performance of the IDR-L is slightly better than IDR-S
- Most other performance criteria are very similar (nearly by design)
- The impact on the science is small, at least up to energies of 500 GeV.
- The performance at 1TeV might show a stronger dependence, but has not been studied in enough detail

# Summary



The ILD IDR is getting there

- Significant document, significant new information compared to the DBD
- Excellent progress on many fronts

The optimization did not result in very surprising results, but we understand the scalings much better

The process led to much improved software and models, with much improved reliability for scientific results: significant impact on EUP