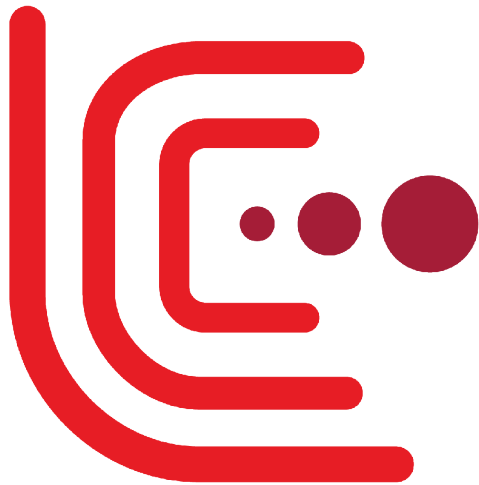


Running Scenarios from the Higgs Perspective



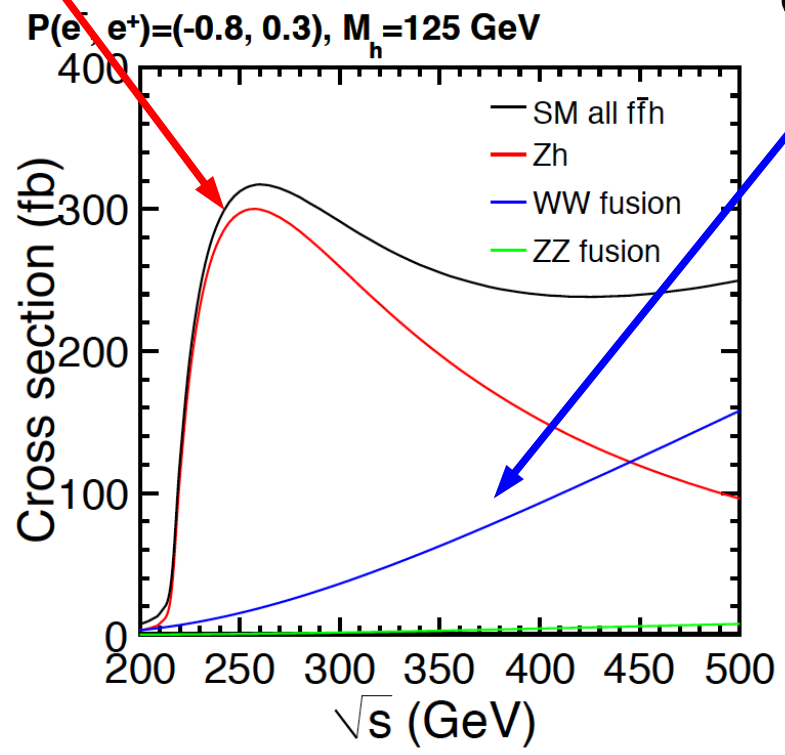
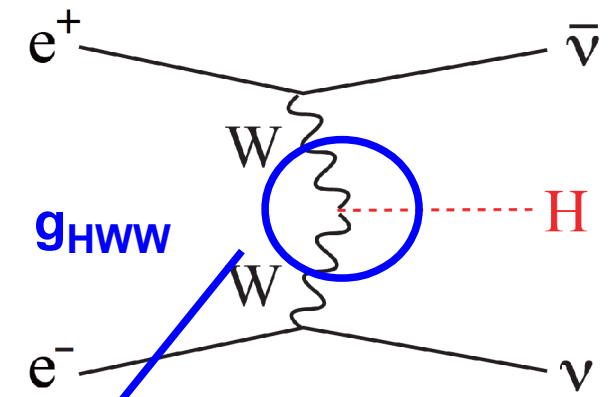
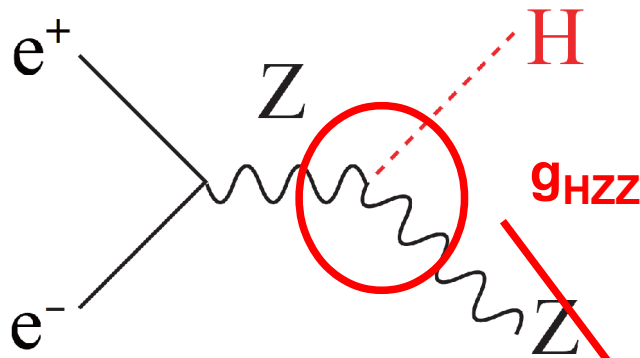
ILC @ DESY

General Project Meeting

May 9, 2014

J.List

Higgs Production at the ILC (in a nutshell)



- Recoil method:

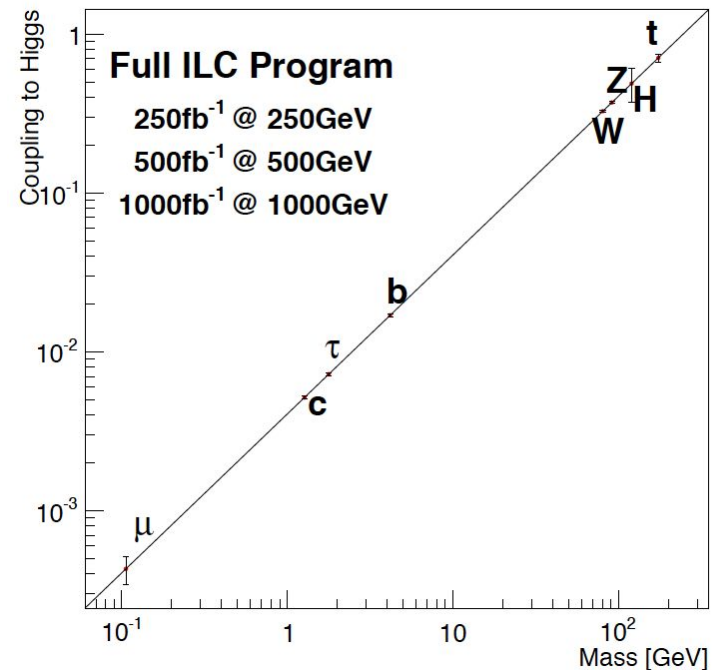
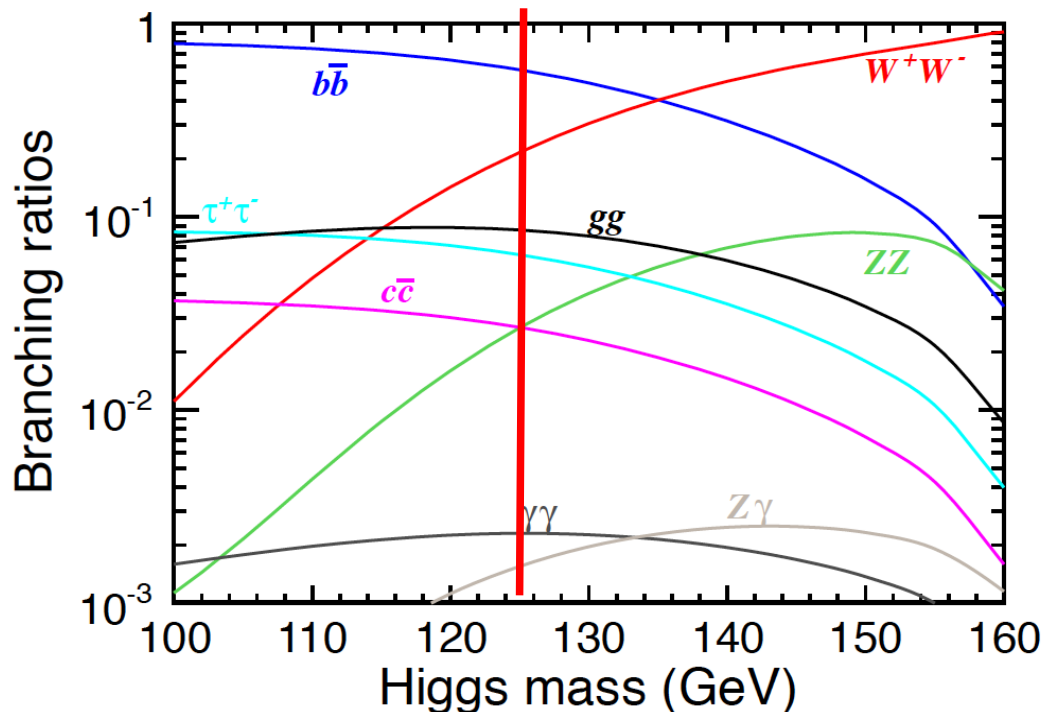
- g_{HZZ}
- M_H

- WW-Fusion:

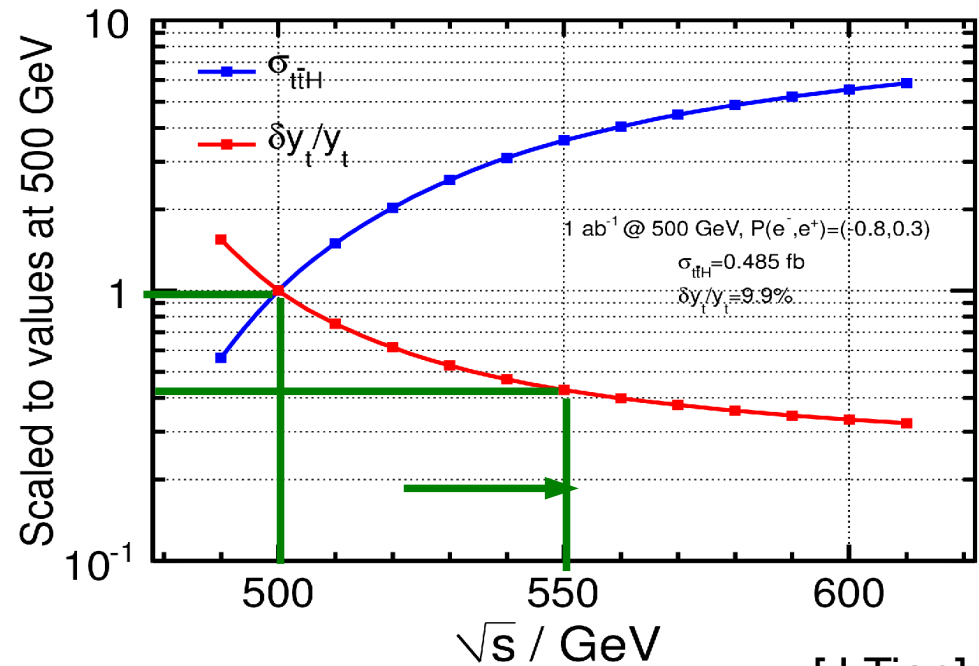
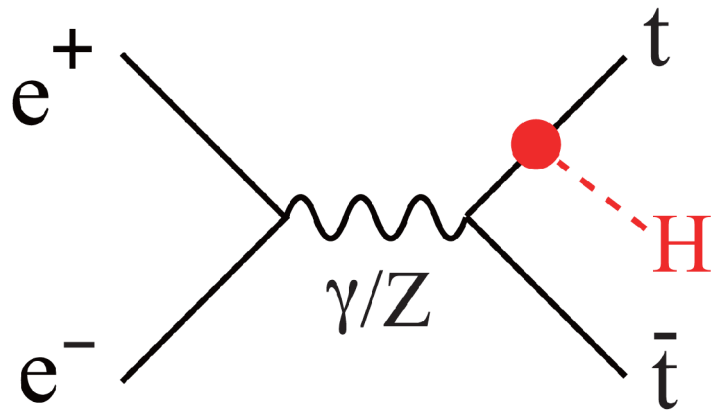
- High rates
- Precision $\sigma \times \text{BR}$

Higgs Decay at the ILC (in a nutshell)

- Measuring Higgs couplings to fermions requires
 - High statistics on $\sigma \times \text{BR}$
 - Model-independent cross-section normalisation



The special case: $y_t = g_{Htt}$



[J.Tian]

- Nick two weeks ago:
Tunnel length to be fixed to $\pm 300\text{m}$ by end of year \Rightarrow top priority question!
- large impact on ttH , eg $500\text{ GeV} \rightarrow 550\text{ GeV}$:
- σ_{ttH} increases by 3.7, while background decreases
- Coupling precision becomes better by factor ~ 2.4

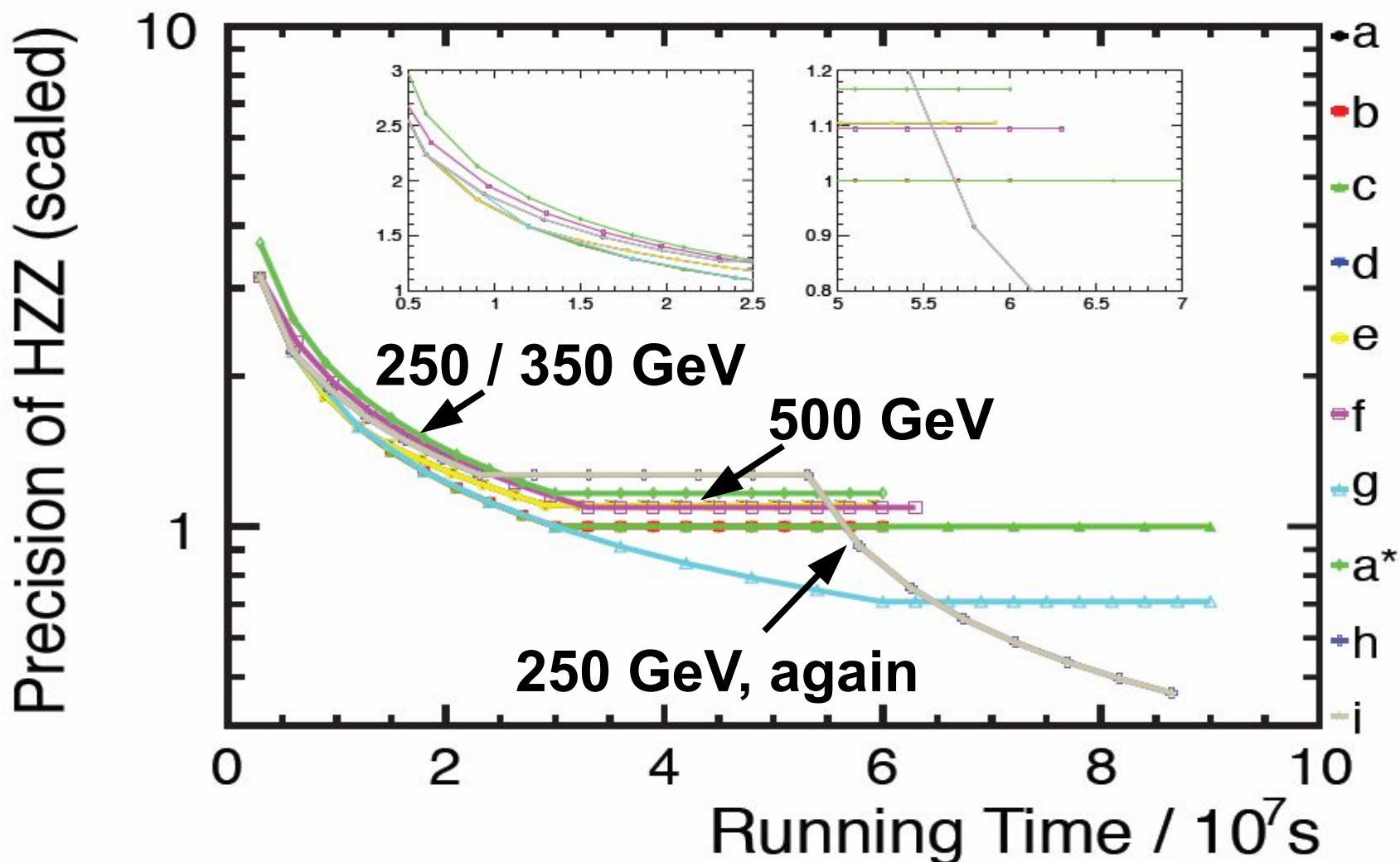
Example Running Scenarios

- a) 250 fb⁻¹ @ 250 GeV, 500 fb⁻¹ @ 500 GeV
- a*) 350 fb⁻¹ @ 350 GeV, 500 fb⁻¹ @ 500 GeV
- b) 250 fb⁻¹ @ 250 GeV, 500 fb⁻¹ @ 550 GeV
- c) 250 fb⁻¹ @ 250 GeV, 1000 fb⁻¹ @ 500 GeV
- d) 100 fb⁻¹ @ 250 GeV, 200 fb⁻¹ @ 350 GeV, 500 fb⁻¹ @ 500 GeV
- e) 100 fb⁻¹ @ 250 GeV, 200 fb⁻¹ @ 350 GeV, 500 fb⁻¹ @ 550 GeV
- f) 25 fb⁻¹ @ 250 GeV, 350 fb⁻¹ @ 350 GeV, 500 fb⁻¹ @ 500 GeV
- g) 500 fb⁻¹ @ 250 GeV, 500 fb⁻¹ @ 500 GeV
- h) 50 fb⁻¹ @ 250 GeV, 200 fb⁻¹ @ 350 GeV, 500 fb⁻¹ @ 500 GeV,
then 1000 fb⁻¹ @ 250 GeV
- i) 50 fb⁻¹ @ 250 GeV, 200 fb⁻¹ @ 350 GeV, 500 fb⁻¹ @ 550 GeV, *then*
1000 fb⁻¹ @ 250 GeV

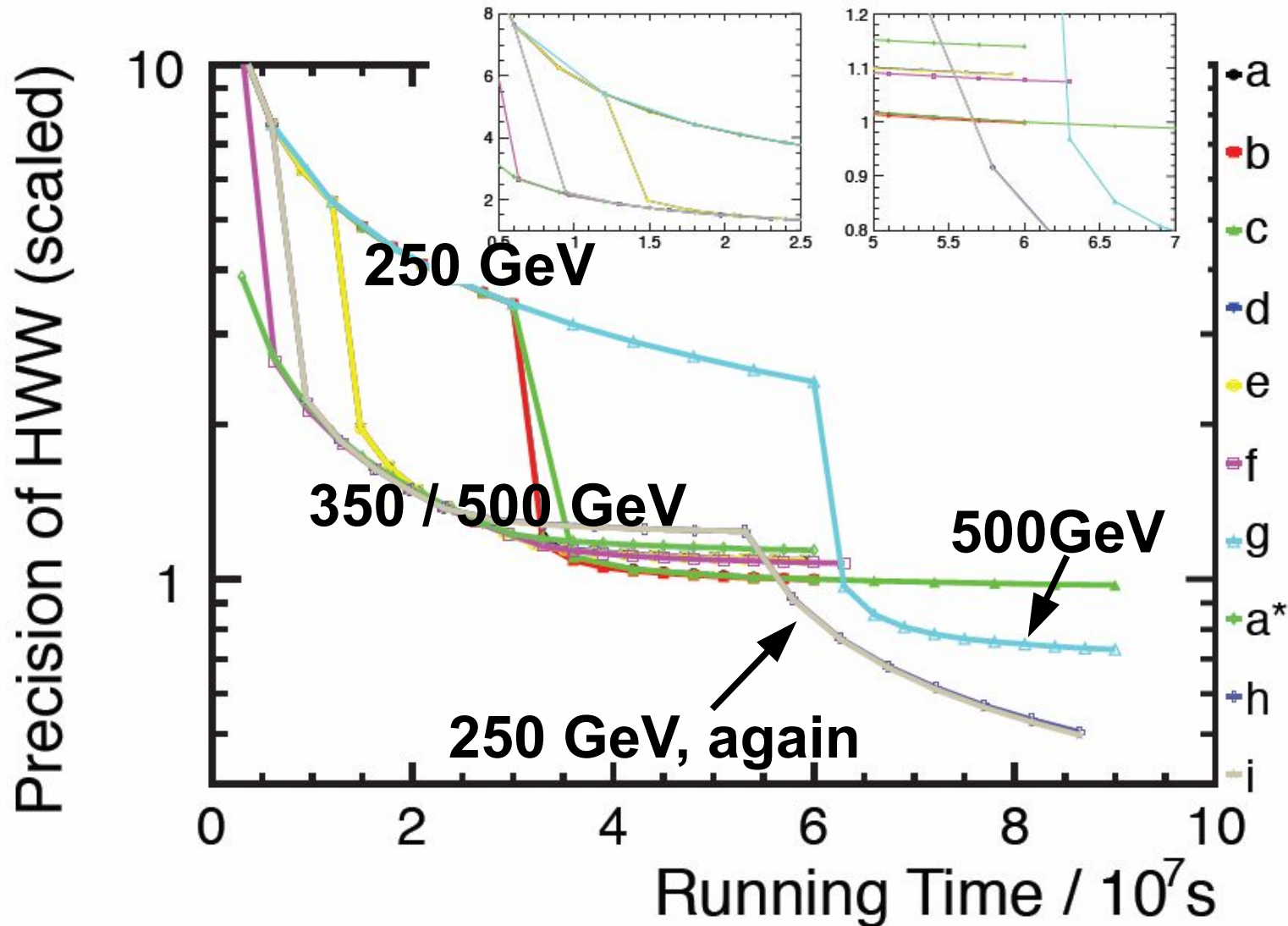
First attempt to assess their potential

- Currently based on extrapolations at many places, in particular at 350 GeV
- All plots by Junping Tian
- More details on method:
cf Junping's recent presentation in ILD Analysis meeting
- “1 year” = 10^7 s operation at peak luminosity, no ramp-up, commissioning, shut-downs, ...
- Will be updated for AWLC with to include these

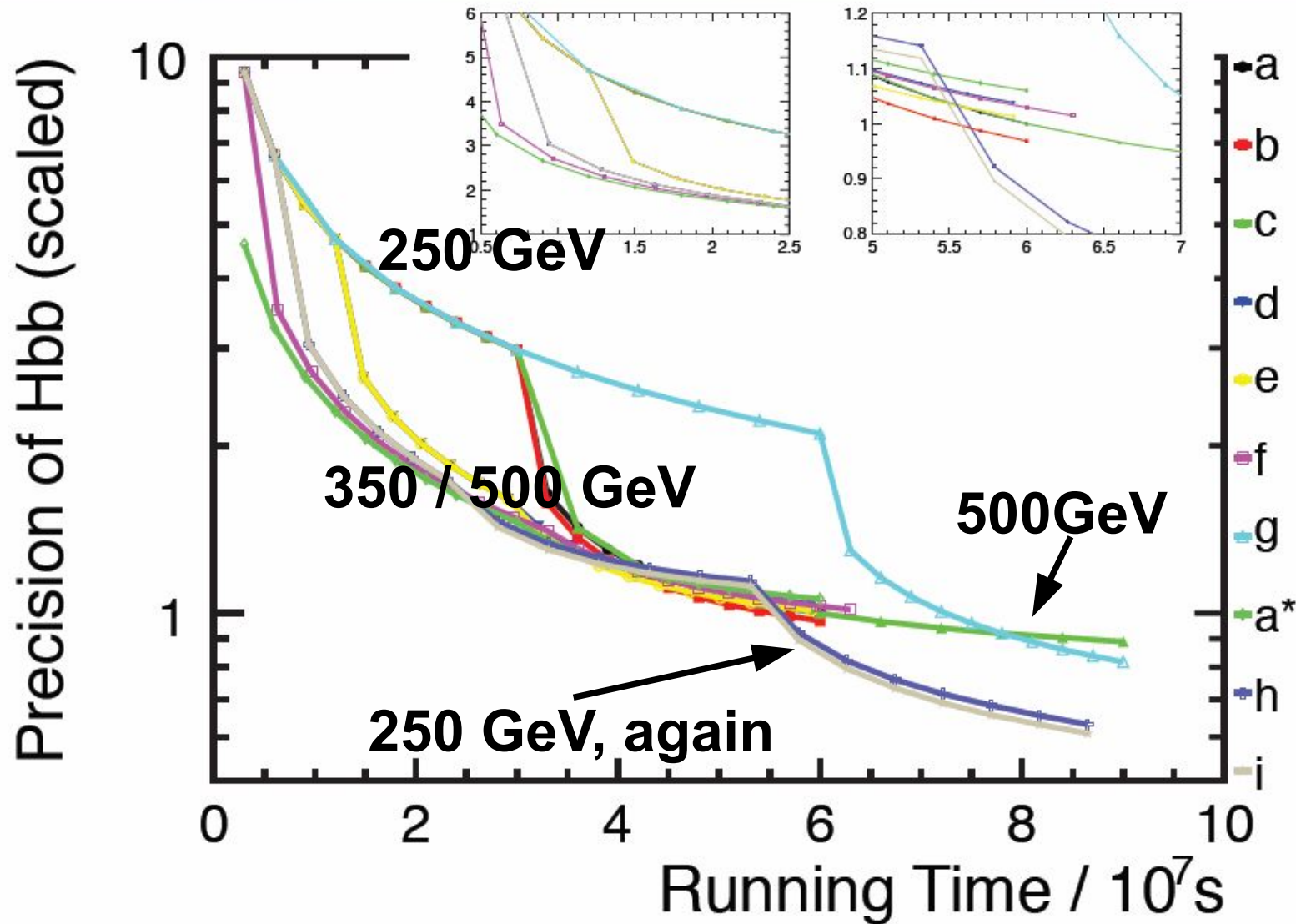
HZZ: It's all at 250 (350?) GeV



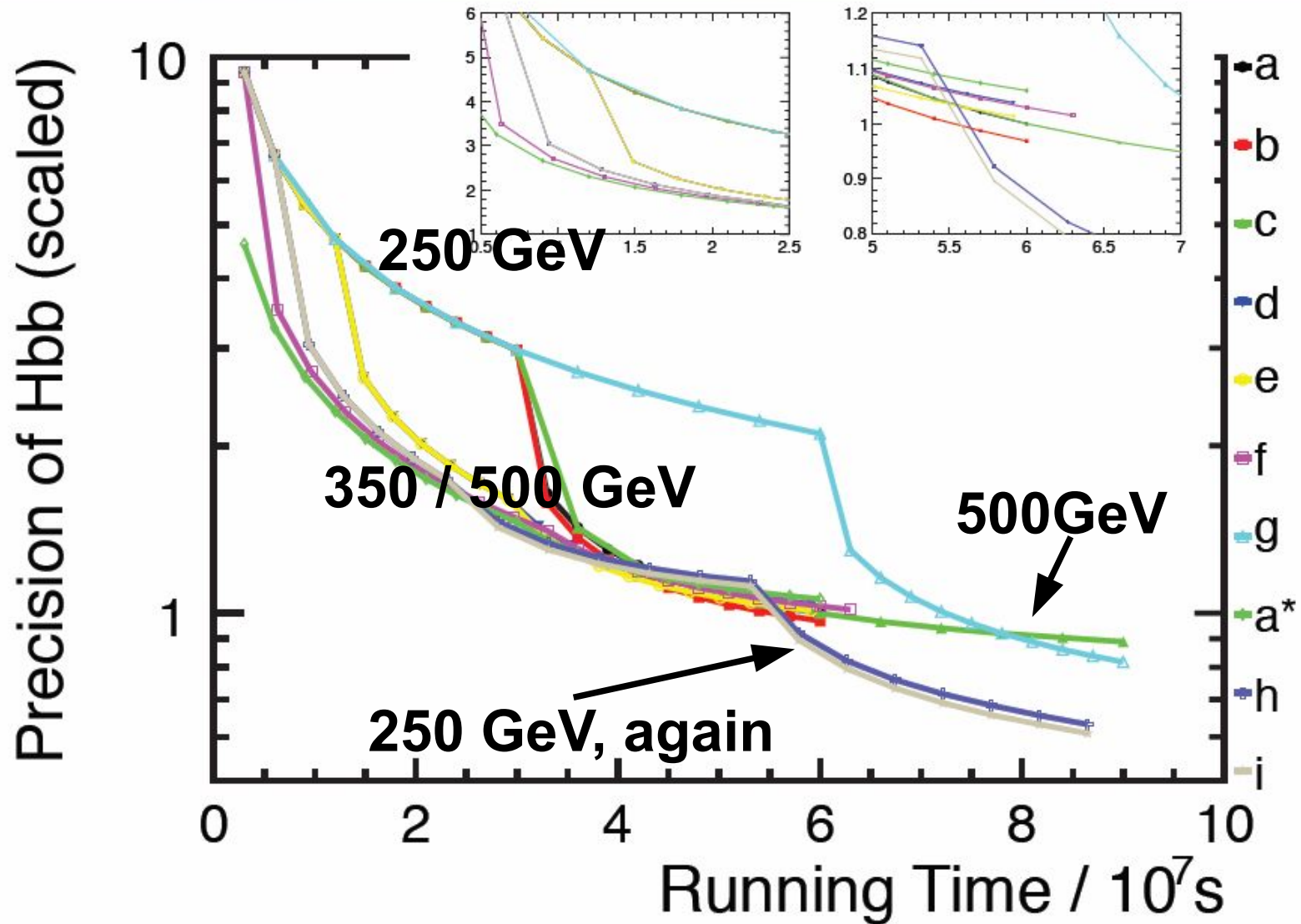
HWW: initially needs fusion ≥ 350 GeV



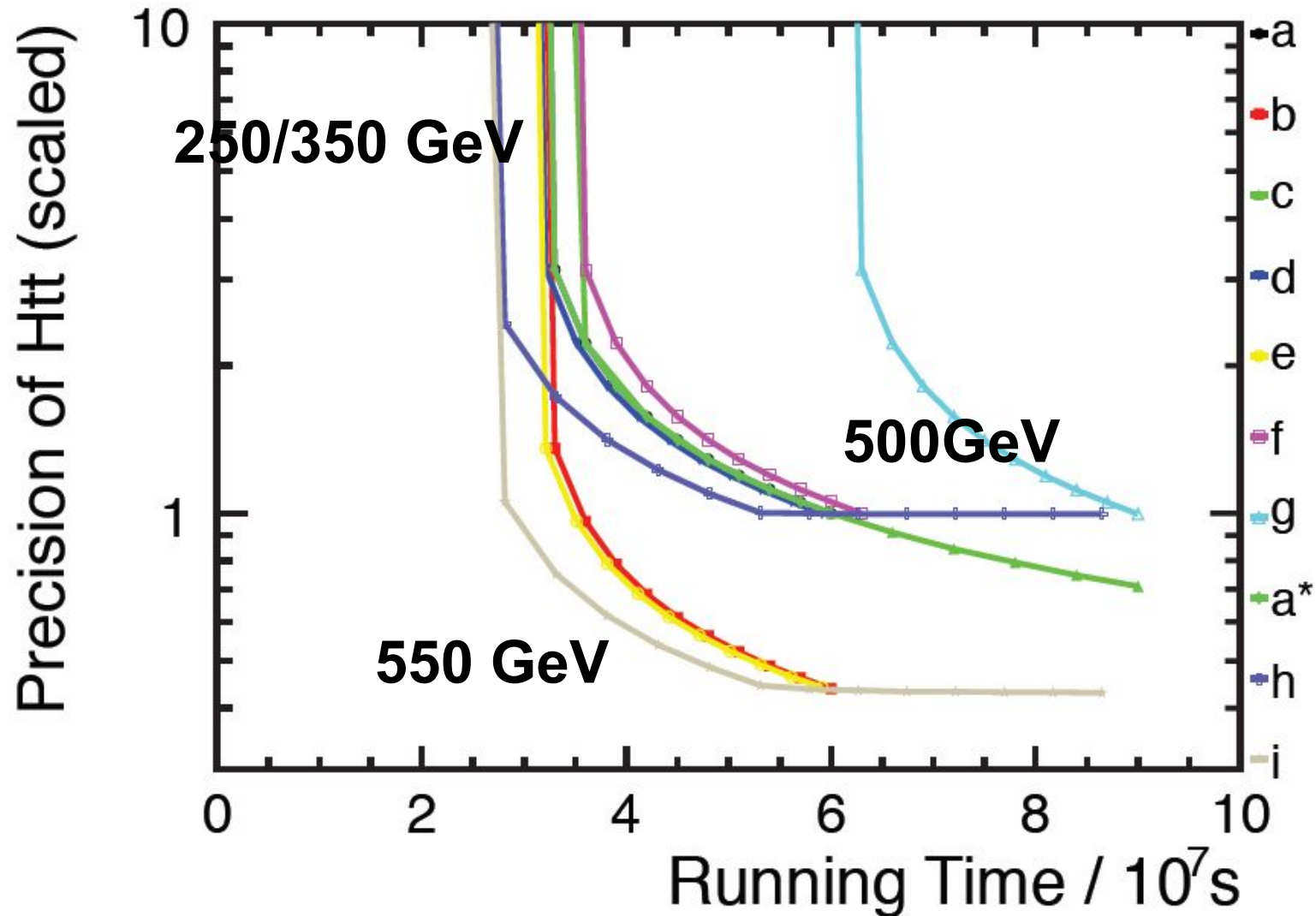
Hbb: needs ≥ 350 GeV and 250 GeV



Total Width Γ_H



Htt: starts at ≥ 500 GeV



Conclusions?

None yet:
need eg solid studies at 350 GeV

Qualitative Observations

- g_{HZZ} wants maximal dataset at 250 (350?) GeV
- All other couplings are initially limited by statistics
=> WW-fusion important
(thus: polarisation important!)
=> have better initial precision at ≥ 350 GeV
- Until at some point they become limited by knowledge of g_{HZZ}
=> *then* profit from (more) 250 GeV data
- Ultimately, $\geq 1 \text{ ab}^{-1}$ @ 250 GeV useful
- g_{ttH} profits from energy increase beyond 500 GeV