Status of Higgs to WW Analysis

Nigel Watson
(Birmingham Univ.)

- **Motivation**
- **Scope**

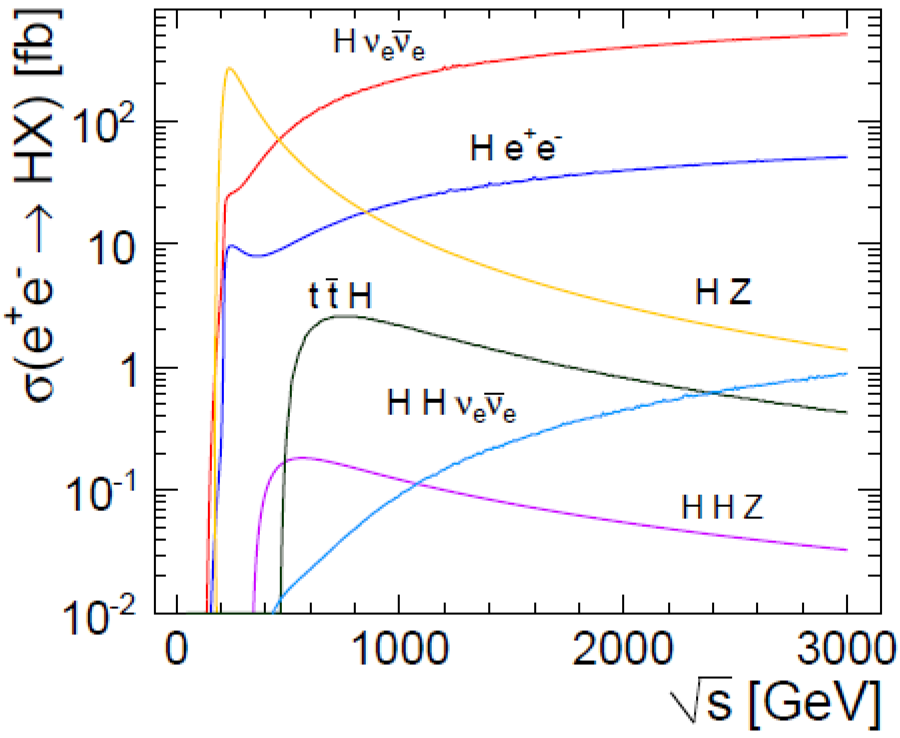
- **Summary**

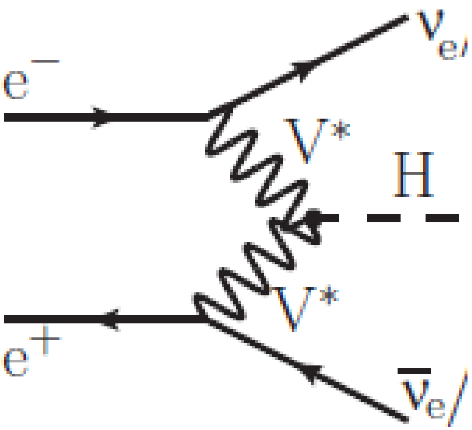
Overview

Scope

- Studies intended for 0.5, 1.4, 3 TeV
- Build on earlier benchmarking work
- Important to quantify <3 TeV performance
- Emphasis on physics reach for energy-staged CLIC
- Benefit from WW fusion cross-section~$\log(s/M^2)$

Cross-section





$\log(s/M^2_H)$

WW-fusion

- Concentrate on semileptonic final state
- 4-jet final state in parallel

$$\nu\bar{\nu}\ H \rightarrow \nu\bar{\nu}\ WW^{*}$$
$$\rightarrow \nu\bar{\nu}\ q\bar{q}'\,\ell\,\nu_{\ell}$$
$$\rightarrow \nu\bar{\nu}\ q\bar{q}'\,q\bar{q}'$$

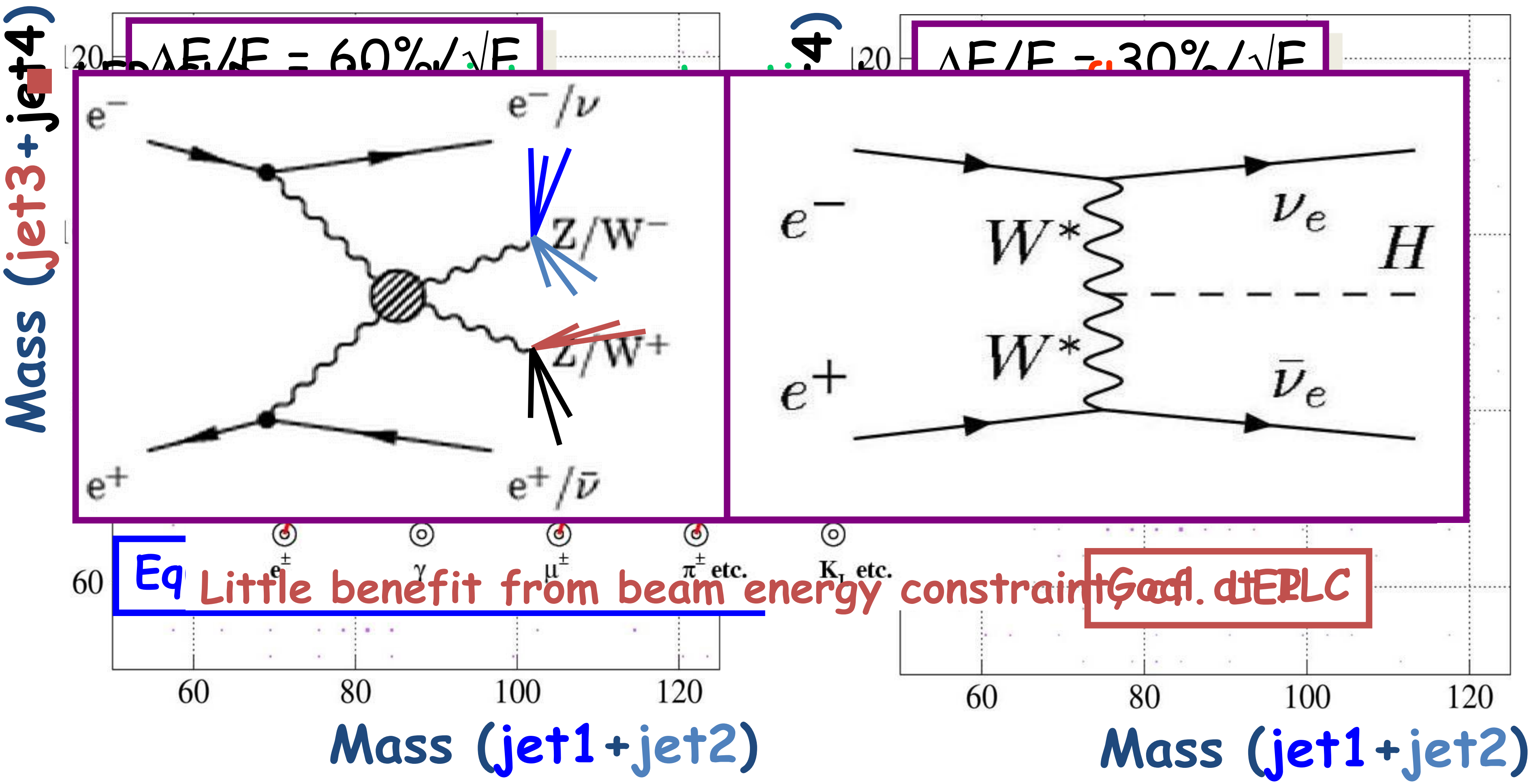
- Both channels, assume on W will be ~on shell

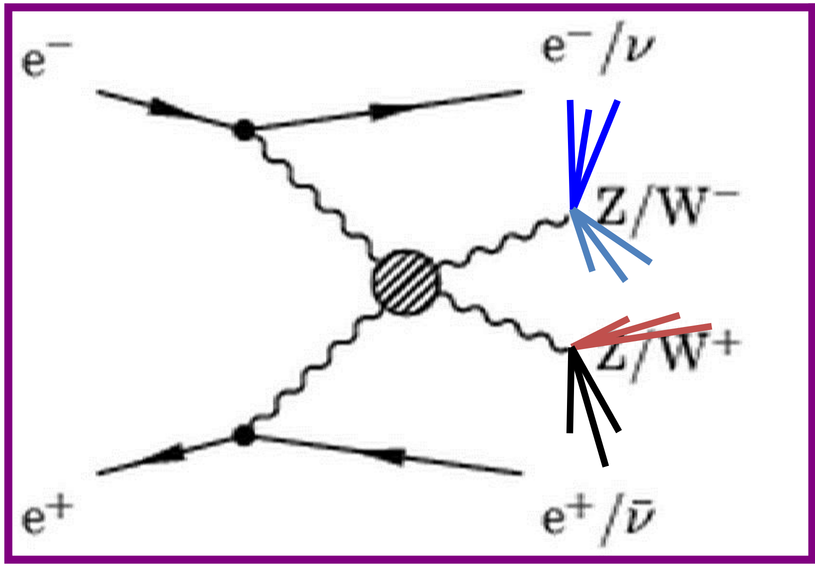
- Backgrounds

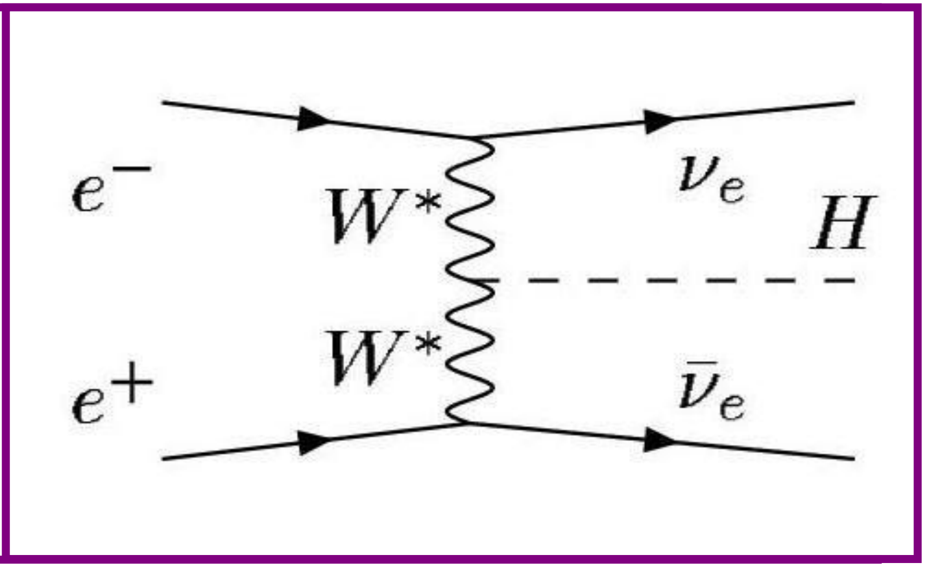
$$2f - \ \ell^{+}\ell^{-}, q\bar{q}$$
$$4f - W^{+}W^{-}, ZZ, Z\nu\bar{\nu} \text{ and } Ze^{+}e^{-}$$
$$6f - ZW^{+}W^{-} \text{and } t\bar{t}$$

ILC: high performance calorimetry

- Essential to reconstruct jet-jet invariant masses in hadronic final states, e.g. separation of $\nu\nu W^{+}W^{-}$, $\nu\nu Z^{0}Z^{0}$, tth, Zhh, $\nu\nu H$



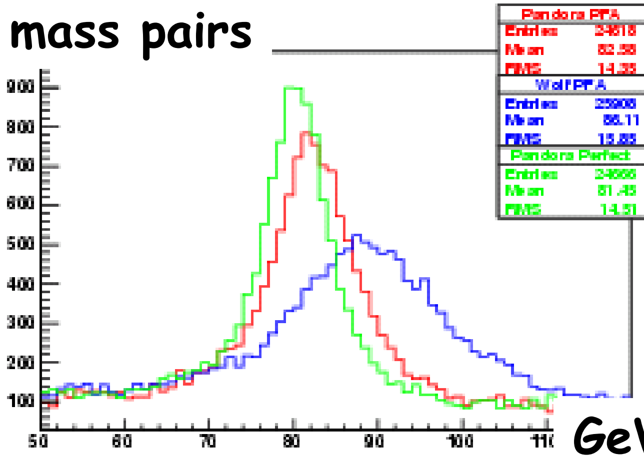




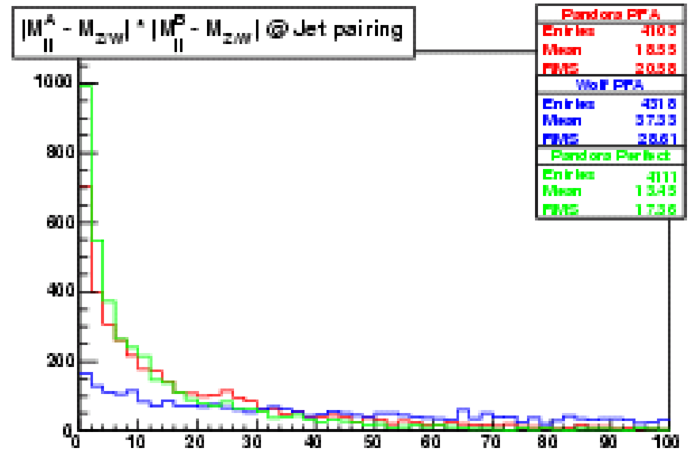
Little benefit from beam energy constraint, cf. LEP

WW: Pandora PFA vs. Wolf PFA

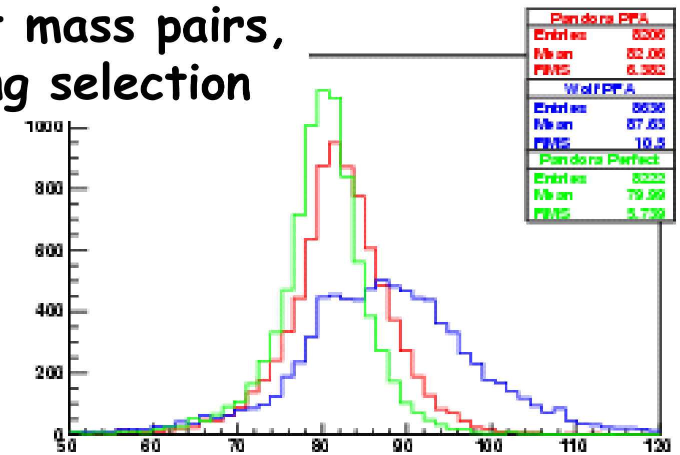
All 2-jet mass pairs

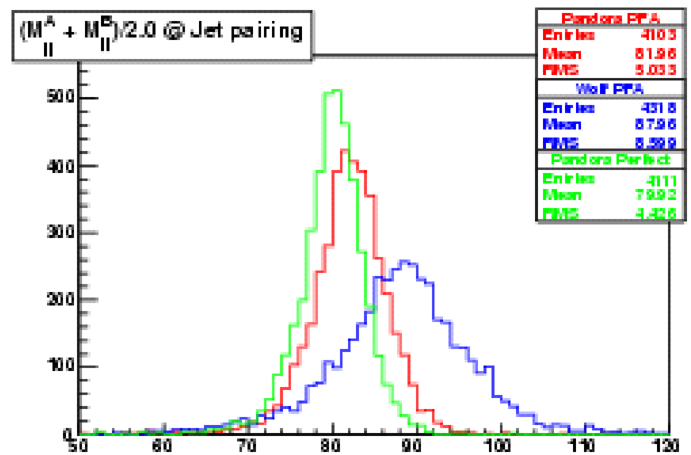


GeV



2-jet mass pairs,
pairing selection



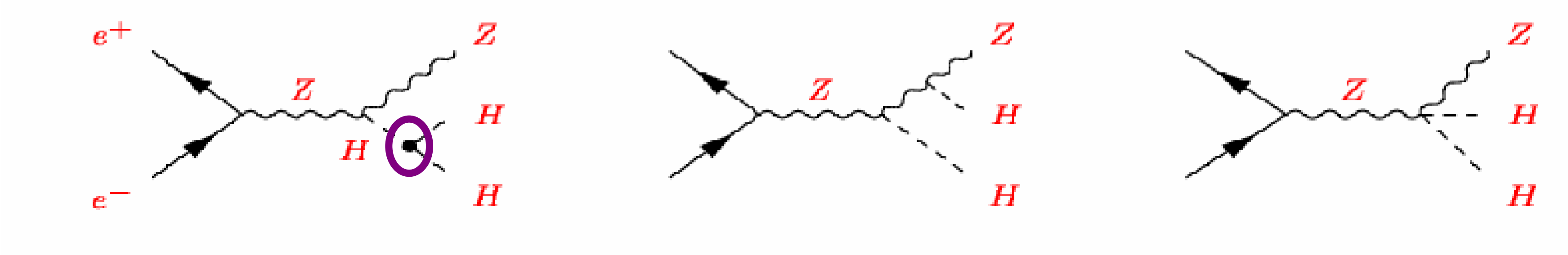


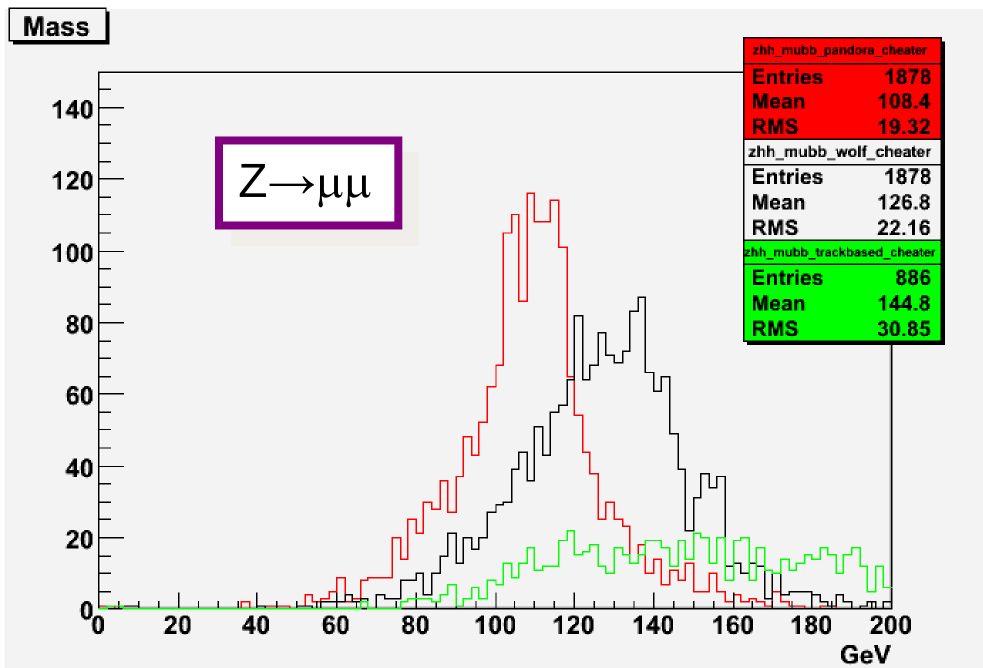
GeV

[W.Yan, DR Ward]

- Without W mass cut @ LDC00Sc: W peak @ Wolf PFA ???

Higgs self coupling study





- Exploits PandoraPFA, compares with other public algorithms (Wolf, newer trackbased PFA)
- Significantly better performance in Pandora PFA in mean and resolution

[M.Faucci Giannelli]

MAPS

- Silicon pixel readout, minimal interlayer gaps, stability – prohibitive cost?
- UK developing "swap-in" alternative to baseline Si diode designs in ILD (+SiD)

- CMOS process, more mainstream:
  - Industry standard, multiple vendors (schedule, cost)
  - (At least) as performant – ongoing studies
  - Simpler assembly
  - Power consumption larger than analogue Si, ~x40 with 1st sensors, BUT
    - ~Zero effort on reducing this so far
    - Better thermal properties (uniform heat load), perhaps passive cooling
    - Factor ~10 straightforward to gain (diode size, reset time, voltage)