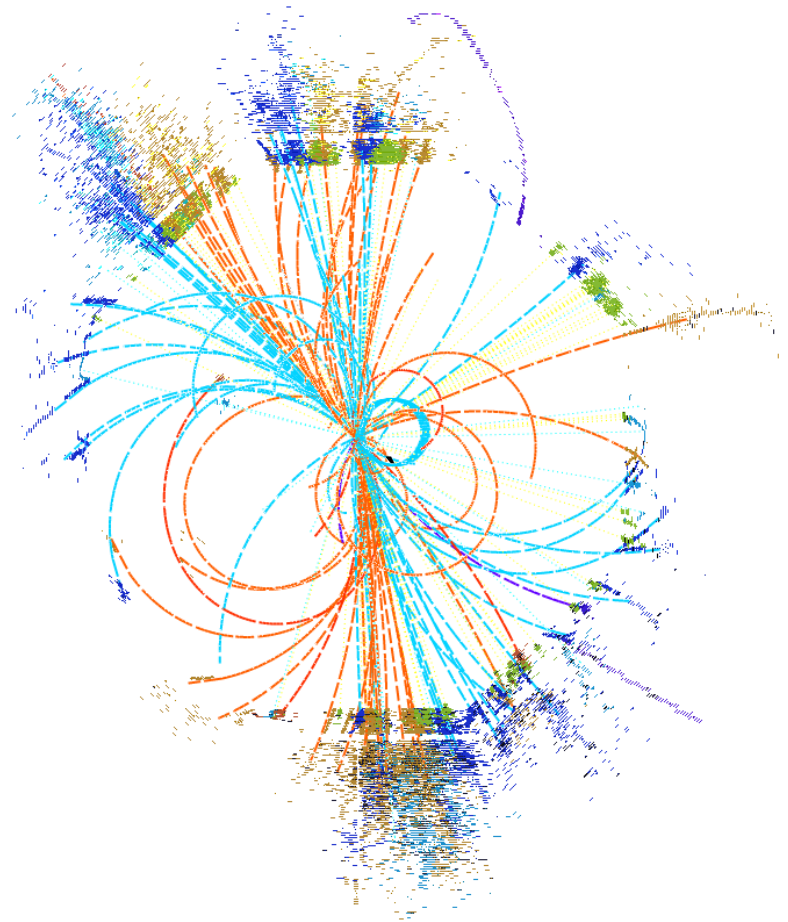




Status of $H \rightarrow \tau^+ \tau^-$ for the Higgs paper



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Plans

Current results:

| \sqrt{s} | 350 GeV | 1.4 TeV | 3 TeV |
|-----------------------------------|---------|---------|-------|
| $\sqrt{S + \bar{B}}/S$ (Method 1) | 6.9% | 4.2% | 7.3% |
| $\sqrt{S + \bar{B}}/S$ (Method 2) | 6.2% | 3.6% | 5.5% |

• Uncertainty on $\sigma \times BR$

• **3 TeV much worse than 1.4 TeV!**

Plans:

- No further idea to improve results.
- Kinematic variables more similar than at 1.4 TeV
- Background significantly larger than at 1.4 TeV mainly due to contribution from $\gamma\gamma \rightarrow \tau\tau$.

Started to prepare the LCD note. Goal is to finish this week and send first draft by next week.

350 GeV: $m(H) = 126$ GeV, backgrounds okay
→ results final

1.4 TeV: Reanalysis done:

- $m(H) = 120$ GeV → $m(H) = 126$ GeV
- included missing backgrounds
(before only initial-state photons from Beamstrahlung)
- found that “ $\gamma\gamma \rightarrow \tau\tau$ ” contains $\gamma\gamma \rightarrow \tau\nu\nu$ events
→ double counting of “ $\gamma\gamma \rightarrow \tau\nu\nu$ ” events (irreducible bkg.)
→ fixed

Result: 4.2% → shown at LCWS14

3 TeV: → see next slide

Changes compared to Astrid:

- Removed same issue of double counting backgrounds as at 1.4 TeV
→ **small improvement**
- Used TMVA in ROOT 5.28 (as for 350 GeV and 1.4 TeV)
→ **large improvement**

Current result:

$$\Delta[\sigma(H\nu_e\bar{\nu}_e) \times \text{BR}(H \rightarrow \tau^+\tau^-)] = 4.4\%$$

→ very similar precision at
1.4 and 3 TeV

→ $O(1\%)$ precision on $g_{\tau\tau H}$ from
1.4 + 3 TeV combined with -80% polarised
electron beam (exact number from fit)

