

Processes for PFA

Andrei Nomerotski (Oxford)

13 Nov 2007

Benchmarking Processes

- ‘Compulsory’ processes is a subset of our benchmarking processes which we’ll compare to other concepts. The list
 - Must be short
 - Must be well defined
 - Must be agreed with all concepts. Need ‘Rules of the Game’ established (how detailed simulation needs to be etc). RD is driving this process in consultation with the concepts.
- SiD will study other processes for Lol
 - More relaxed and up to us requirements
 - Will emphasize strong features of SiD
- Below I list only processes relevant for PFA

SUSY Point 5

7. $e^+e^- \rightarrow \chi_1^+ \chi_1^- / \chi_2^0 \chi_2^0$ at Point 5 at $\sqrt{s}=0.5$ TeV;

- Chargino decays to on-shell W, neutralino decays to Z
- Measure SUSY masses and xsections
- Need W/Z separation in dijet masses
 - Need to identify manpower for this process
- ILD would like to have a pure PFA like $ZZ \rightarrow \nu\nu qq$
 - Should we swap it for 7) ?

Higgs Self-Coupling ZHH

4. $e^+e^- \rightarrow Zhh \rightarrow qqbbbb$, $m_h = 120$ GeV at $\sqrt{s}=0.5$ TeV;

- Six jets in final state
- Alternative: $ZHH \rightarrow \nu\nu bbbb$ at 1 TeV
 - Four jets final state
- Excellent benchmark for integrated performance

Single Particles

0. Single e^\pm , μ^\pm , π^\pm , π^0 , K^\pm , K_s^0 , γ , u , s , c , b , W , Z ; $0 < |\cos \theta| < 1$, $0 < p < 500$ GeV

Measure identification efficiency, misidentification efficiency, and energy resolution as a function of $|\cos \theta|$ and particle energy. Note that W and Z bosons have been added to the list; only light quark decays of the W and Z bosons should be considered.

- Move single quarks to ff production so no worries about fragmentation at this stage
- We assume that the groups will work on this as it is necessary to understand performance of the subsystems

Fermion-Antifermion Production

1. $e^+e^- \rightarrow f\bar{f}$, $f = \mu, c, \tau$ at $\sqrt{s}=1.0$ TeV;

- Add uds and b. Is it useful for PFA?
- Tau polarization $\rightarrow \pi^0$ reconstruction in EM CAL
 - Need somebody to study this

HZ

3. $e^+e^- \rightarrow Zh, h \rightarrow \mu^+\mu^-, m_h = 120 \text{ GeV}$ at $\sqrt{s}=0.25 \text{ TeV}$;

- SiD proposed $\mu\mu$ only
- Should we add more (cc, bb, $\gamma\gamma$..)? ILD will (most likely) request this. Then becomes relevant for PFA.

From Extended List: Top

- Anomalous top couplings
 - 6 jets final state
 - Forward region / Tracking
- Top mass

- Top Yukawa coupling – anybody?

Stop and sbottom

- Same cosmology motivation as for staus in SUSY Point 3 in 6)
- Final state : two soft charm or bottom jets – are they interesting for PFA?