# Preliminary L1T and HLT MET studies with ORCA

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- Level 1 trigger rate
- MET resolution
- Some HLT elements
- What events do we need ?

## 1 Level 1 trigger rate

- Previous studies (S.Dasu et al.)
  - toy Monte Carlo
  - 1 kHz rate at 80 GeV MET
- ORCA study using Level 1 quantities (fig1, fig2, fig3)
  - $qq$ events with pile-up (jet background sample)
  - 80 kHz rate at 80 GeV MET
  - message is the same as from trigger towers
- ORCA study using trigger tower quantities (fig4, fig5, fig6)
  - 41 kHz rate at 80 GeV MET
  - low $p_t$ bins are dominant even above 80 GeV MET

$$15GeV \le p_t \le 20GeV : 63.7\% : 26kHz$$

$$20GeV \le p_t \le 30GeV : 27.8\% : 11kHz$$

$$p_t \ge 30GeV : 8.5\% : 4kHz$$

  - increase Level 1 MET cut to 88-90 GeV ?

## 2 MET resolution

- very preliminary (fig7, fig8, fig9)
- problems with 'genmet' of jpgcode (nan for paw)
- using towers or digis seems to make no real difference
- more study needed with high statistics
  - pile-up
  - thresholds
  - pseudorapidity
  - trigger tower granularity (probably slight effect)

## 3 HLT elements

- very preliminary (fig10, fig11, fig12)
- sphericity tensor (Pythia manual 15.1.1.)
  - 2 dimensions : $E_x$ and $E_y$ only
  - calculate eigenvalues : $\lambda_1$, $\lambda_2$
  - $\Delta\lambda = |\lambda_1 - \lambda_2|$
    * $\sim 0$ for minimum bias and low $p_t$ (fig)
    * $\sim 1$ for high MET and high $p_t$ (fig)
  - more study needed with high statistics
    * pile-up
    * thresholds
    * pseudorapidity
    * trigger tower granularity

## 4 What events do we need ?

- many more statistics is needed under 20 GeV $p_t$
- may need for events under 15 GeV $p_t$
- 'minimum bias with pile-up' study is necessary
  - low $p_t$ events look like minimum bias (fig11, fig12)
  - that is what we have from nature
  - 100000 events in db for first test ?
- We want to reduce 40 MHz to 100 Hz
  - 1 event from 400000 - 100 % statistical error
    * from minimum bias could we have it in db ?
    * good crosscheck to jet background events
  - 3 events from 1.2 million - 57.7 % statistical error
  - 10 events from 4 million - 31.6 % statistical error
  - we have enough $p_t > 50GeV/c$
  - we need 3-5 more than in the lower bin for $p_t < 50GeV/c$ ?

| $p_t$ $(GeV/c)$ | $\sigma$ (mbarn) | $Ratio$ $(MET > 80GeV)$ | $Ratio$ $(MET > 90GeV)$ |
|---|---|---|---|
| $mb$ | 55 | ??? | ??? |
| $10-15$ | 1.71 | ??? | ??? |
| $15-20$ | 0.65 | 68.1% | ??? |
| $20-30$ | 0.15 | 16.3% | 35.6% |
| $30-50$ | | 7.5% | 17.9% |
| $50-80$ | | 3.2% | 12.1% |
| $80-120$ | | 2.7% | 17.8% |
| $120-170$ | | 1.5% | 10.5% |
| $170-230$ | | 0.7% | 6.1% |
| $230-300$ | | | |
| $300-380$ | | | |
| $380-470$ | | | |

Table 1: Semileptonic decay channels (90 nodes)