Missing E_T with the First Data: $W \rightarrow l\nu$ ($l=e,\mu$)

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Munich Workshop 03-05/05/06

Introduction

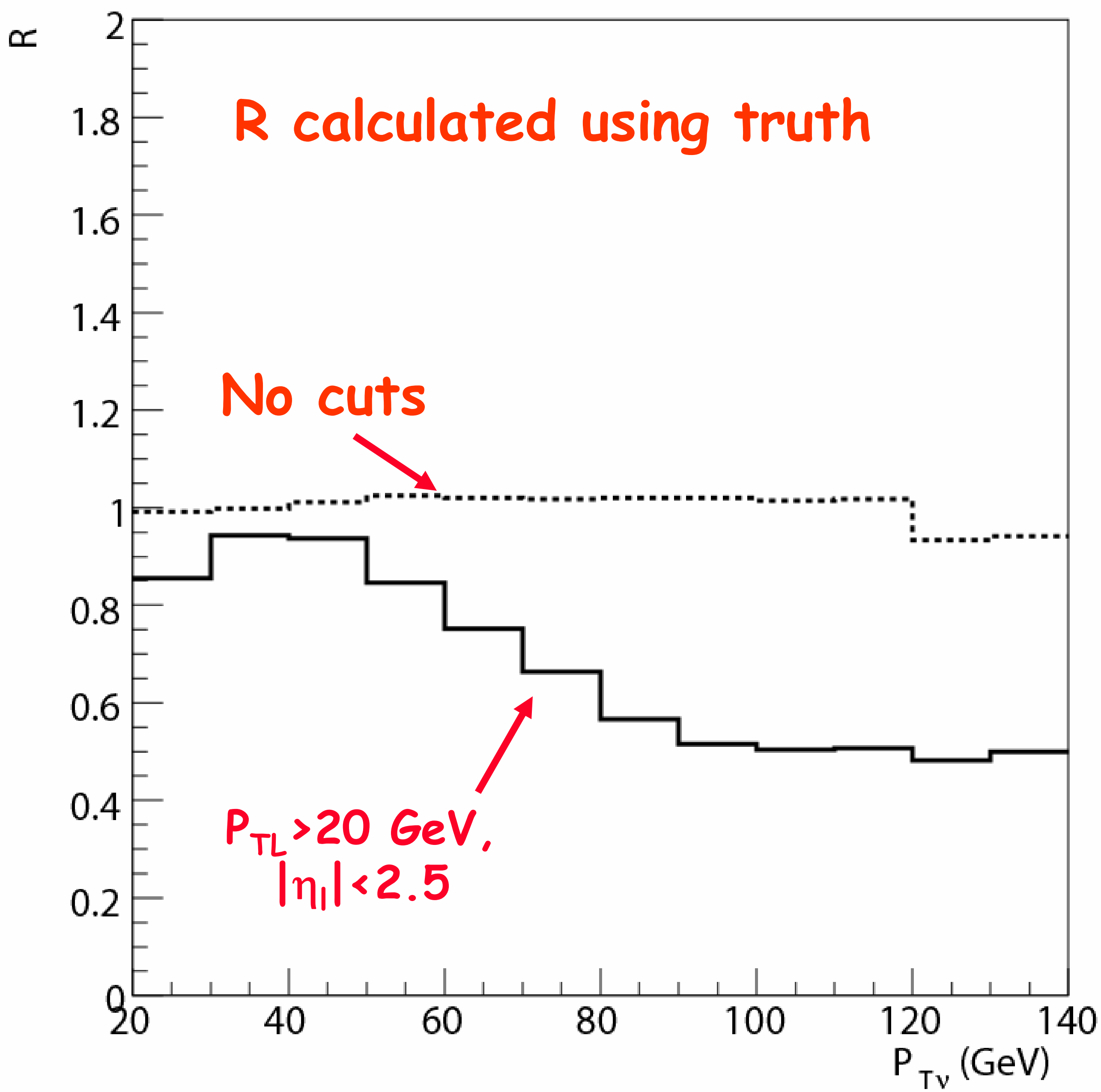
- Need control samples to evaluate and check the Missing E_T performance with the very first data
  - Need to address needs of discovery physics during the early stages of data taking
- Understanding of tails in missing E_T will come form events with no (large) "real" missing energy: multi-jets, $Z(\rightarrow ll)$+jets
  - Can also address resolution issues
- Use $W \rightarrow l\nu$ as high statistics sample to check missing E_T reconstruction with "real" missing energy
  - Same check can be made with more luminosity with $Z(\rightarrow ll)$+jets (turn electrons into "neutrino")

- One can use the sharp end of the transverse mass in different missing E_T bins
  - Shape of transverse mass changes with Missing E_T, due to acceptance
- One can also use the fact that in the average the pt of the charged lepton and the pt of the neutrino are of the W decay are known function, which can be calculated with MC

$$\frac{d\sigma}{dP_{T\nu}} \Big/ \frac{d\sigma}{dP_{TL}} = f(P_{TL})$$

Function can be calculated with MC (small uncertainties) and depends on experimental cuts

$$R = \frac{d\sigma}{dP_{T\nu}} \Big/ \frac{d\sigma}{dP_{TL}}$$



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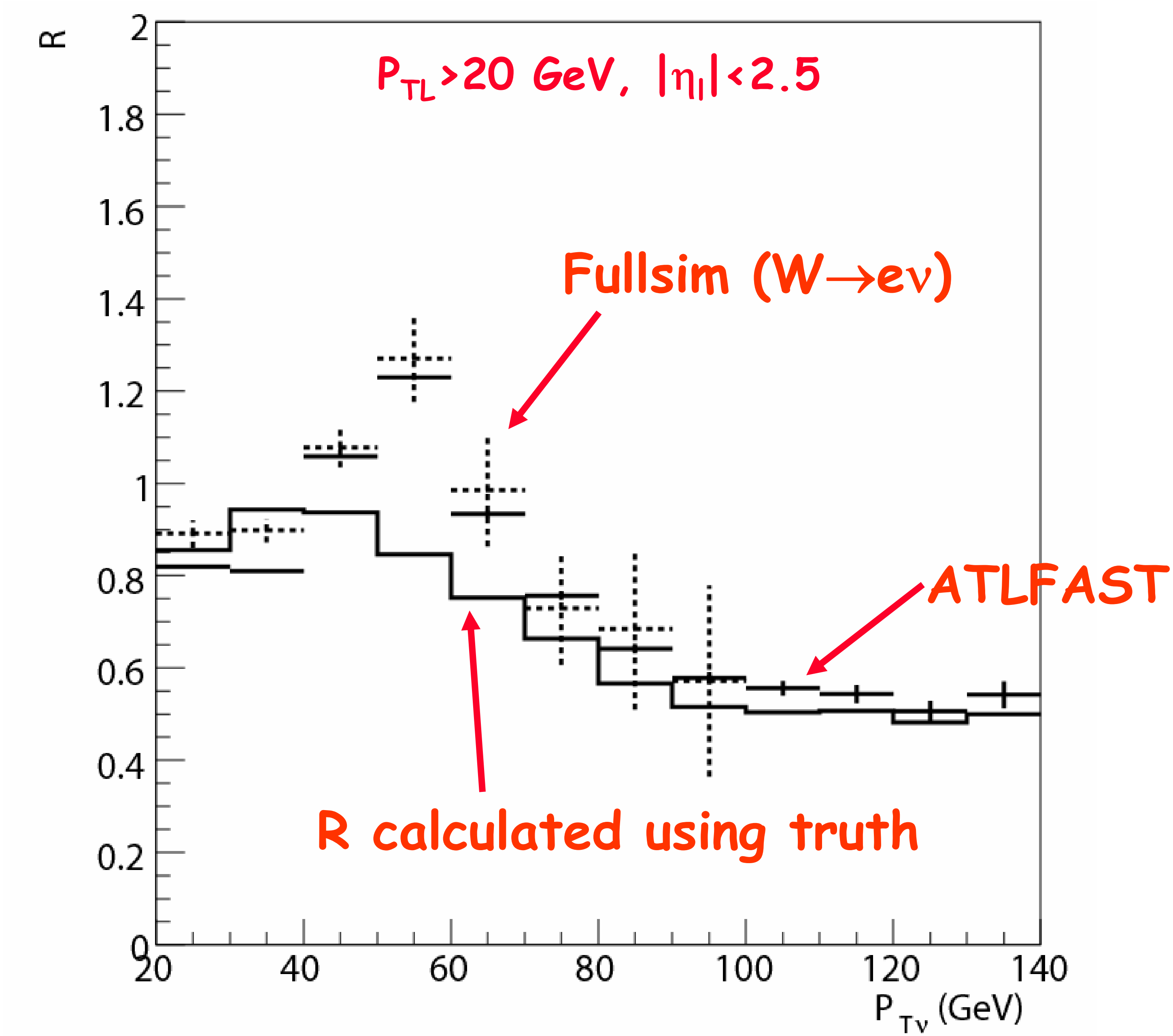
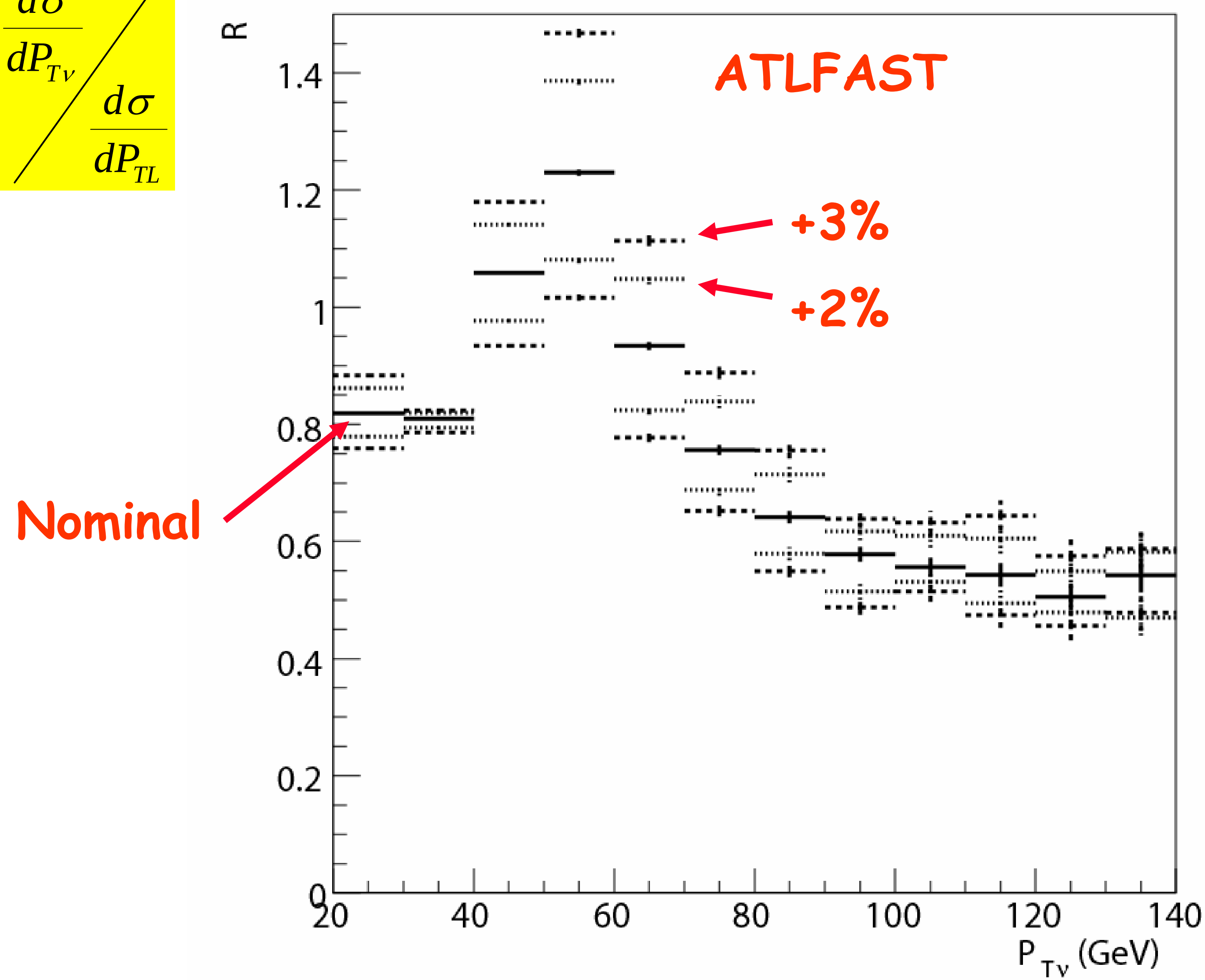


$$R = \frac{d\sigma}{dP_{T\nu}} \Big/ \frac{d\sigma}{dP_{TL}}$$

P_{TL}>20 GeV, $|\eta_l|$<2.5

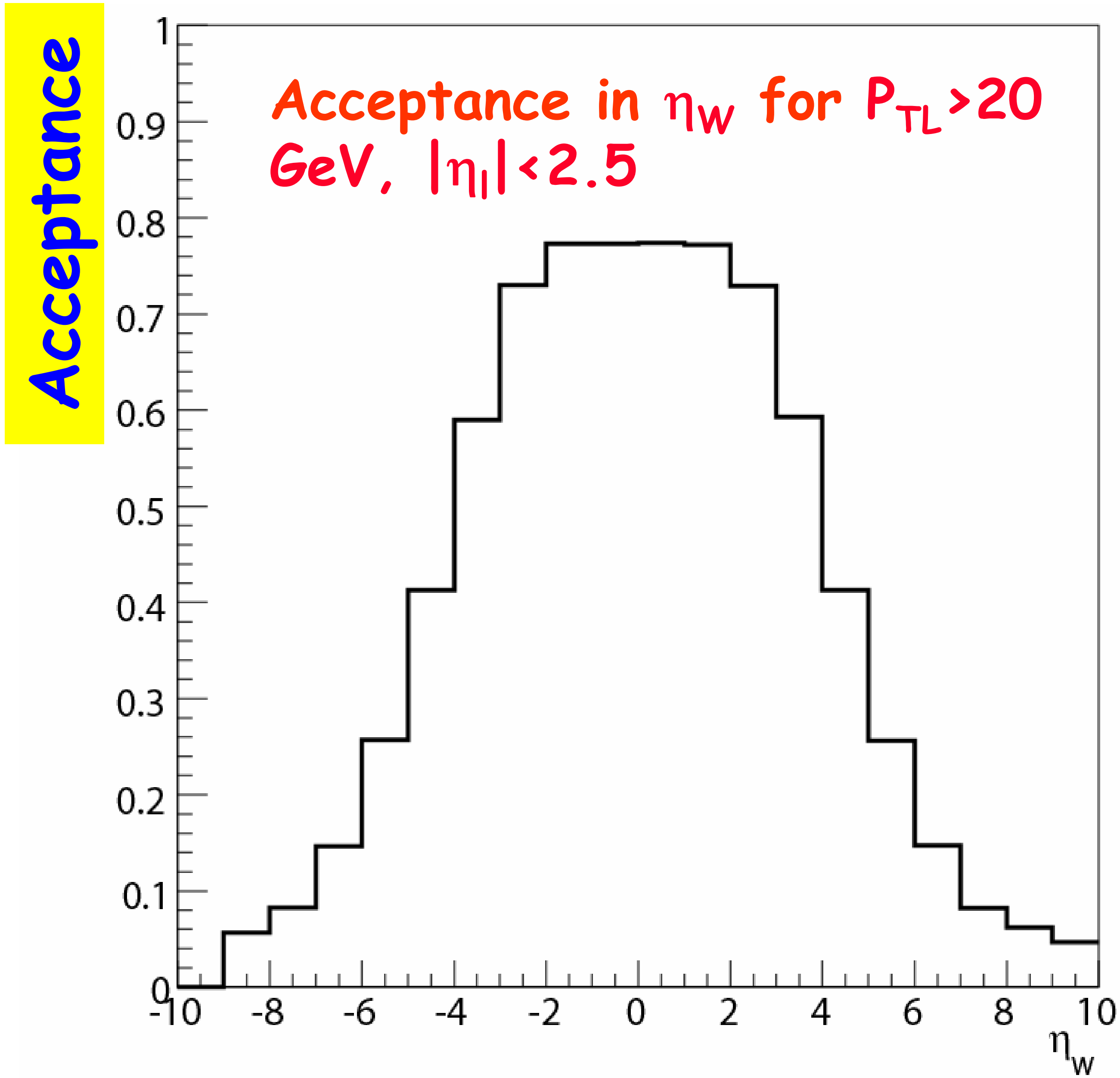
100pb^{-1}



Back-up Slides

Outlook and Plans

- $pp \rightarrow W(\rightarrow l\nu,\ l=e,\mu\ )+X$ is a copious source of events with missing energy.
  - Expect O(10K) per $1pb^{-1}$
  - With 100 pb^{-1} of data can check missing E_T in most of useful range for low mass Higgs physics
  - Allows to perform checks with different jet topologies
- Method is very sensitive to shifts in missing E_T
  - Less sensitive to missing E_T resolution. This can be better constrained with di-jets
- Need to address luminosity required to study missing E_T with different jet topologies
- Need to address contamination from top



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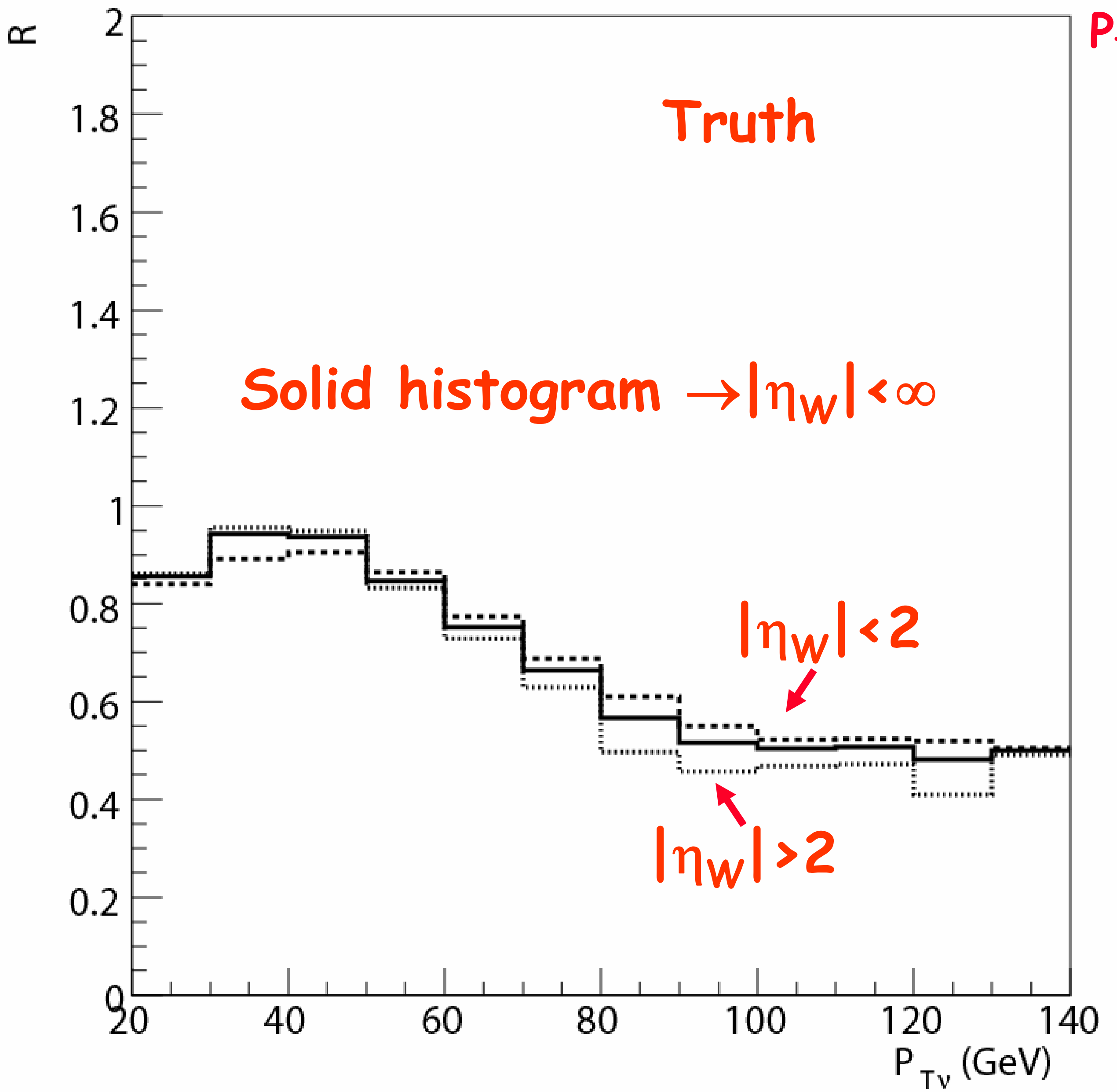

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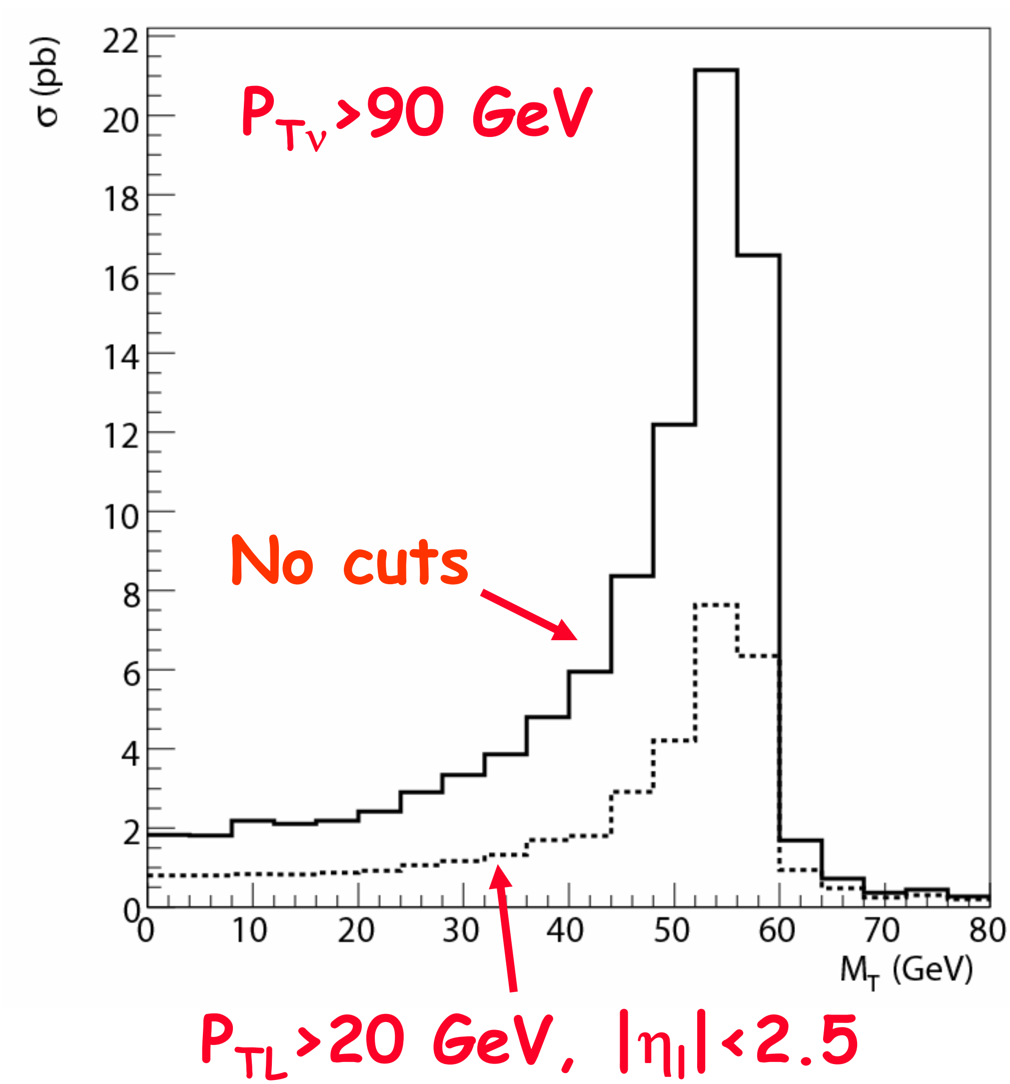
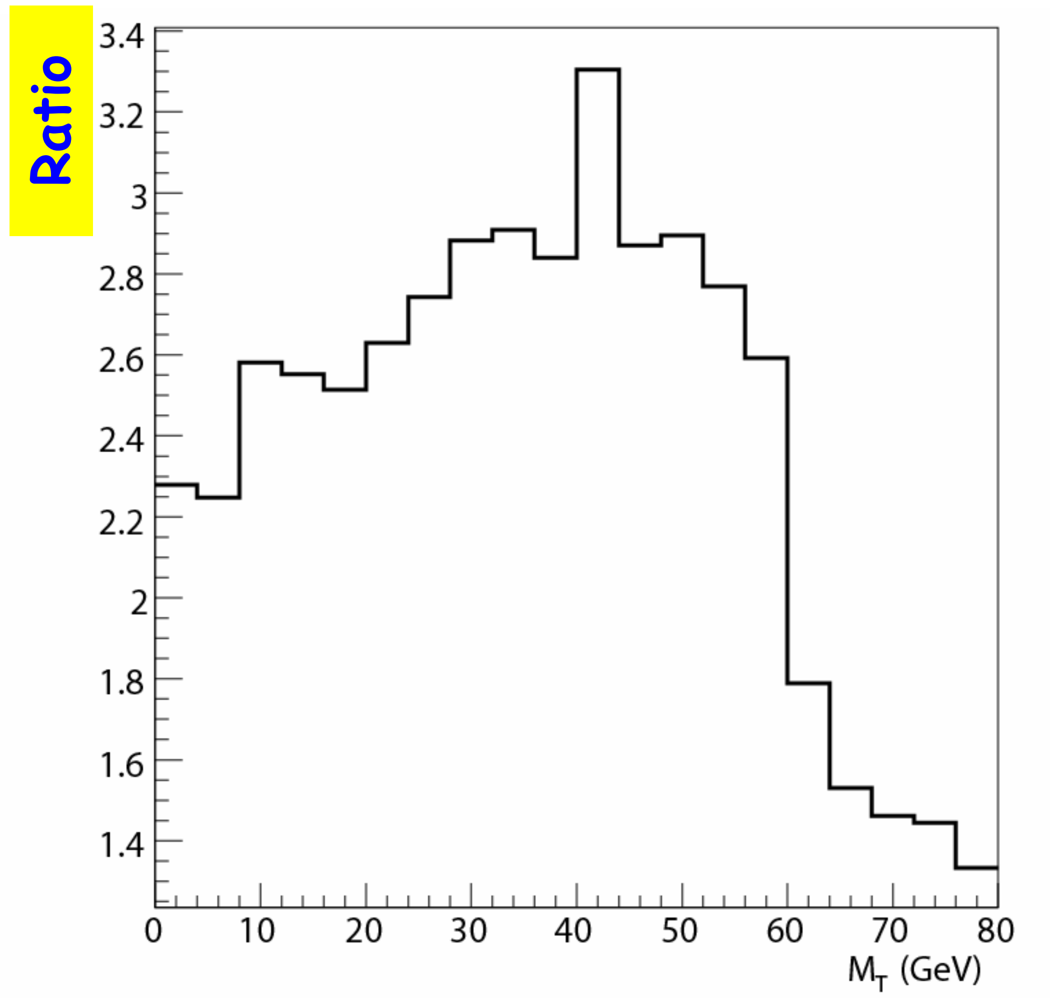
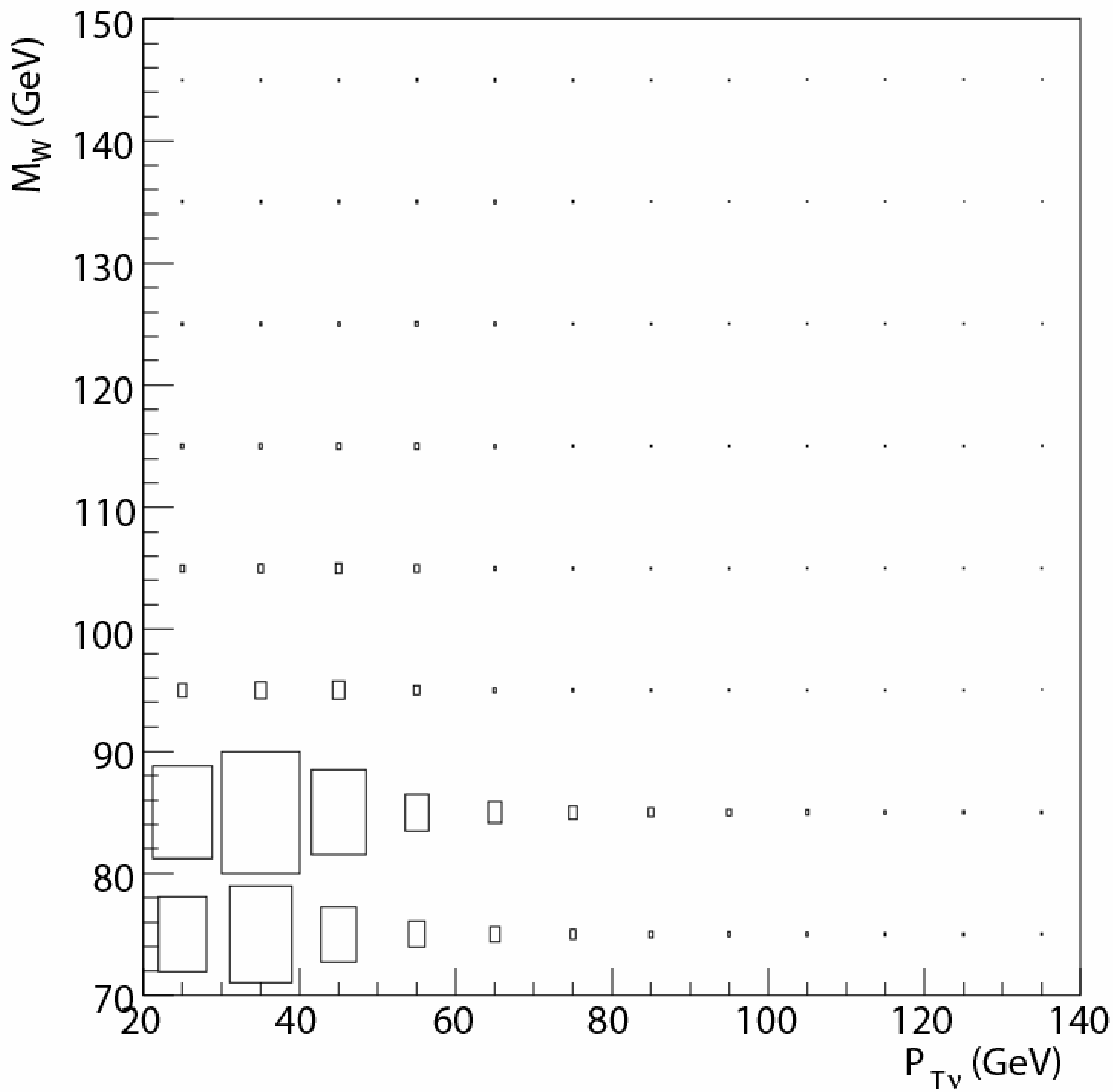
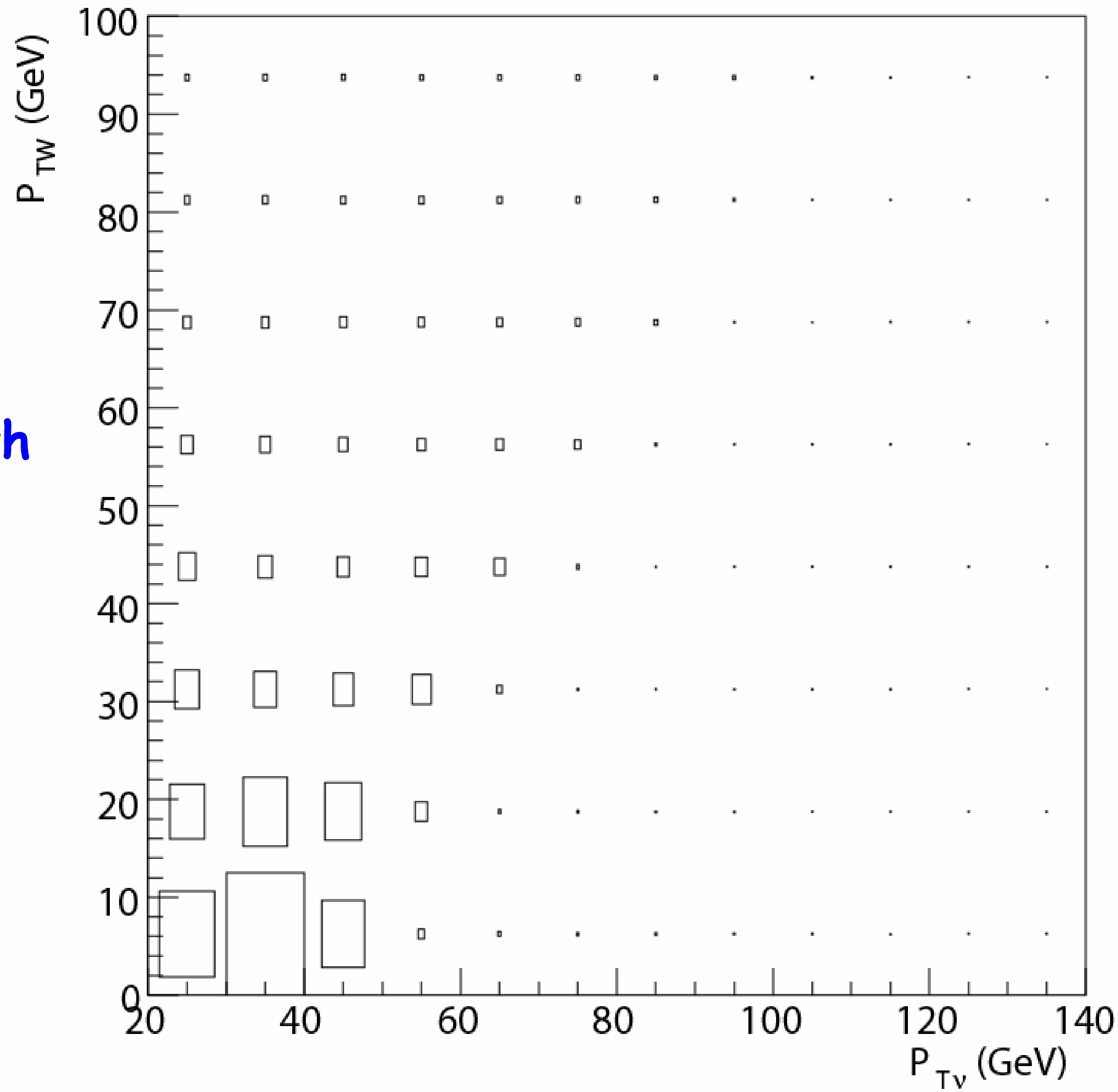

σ (pb)
$P_{T\nu}$>90 GeV
No cuts
P_{TL}>20 GeV, $|\eta_l|$<2.5
M_T (GeV)


Ratio
M_T (GeV)

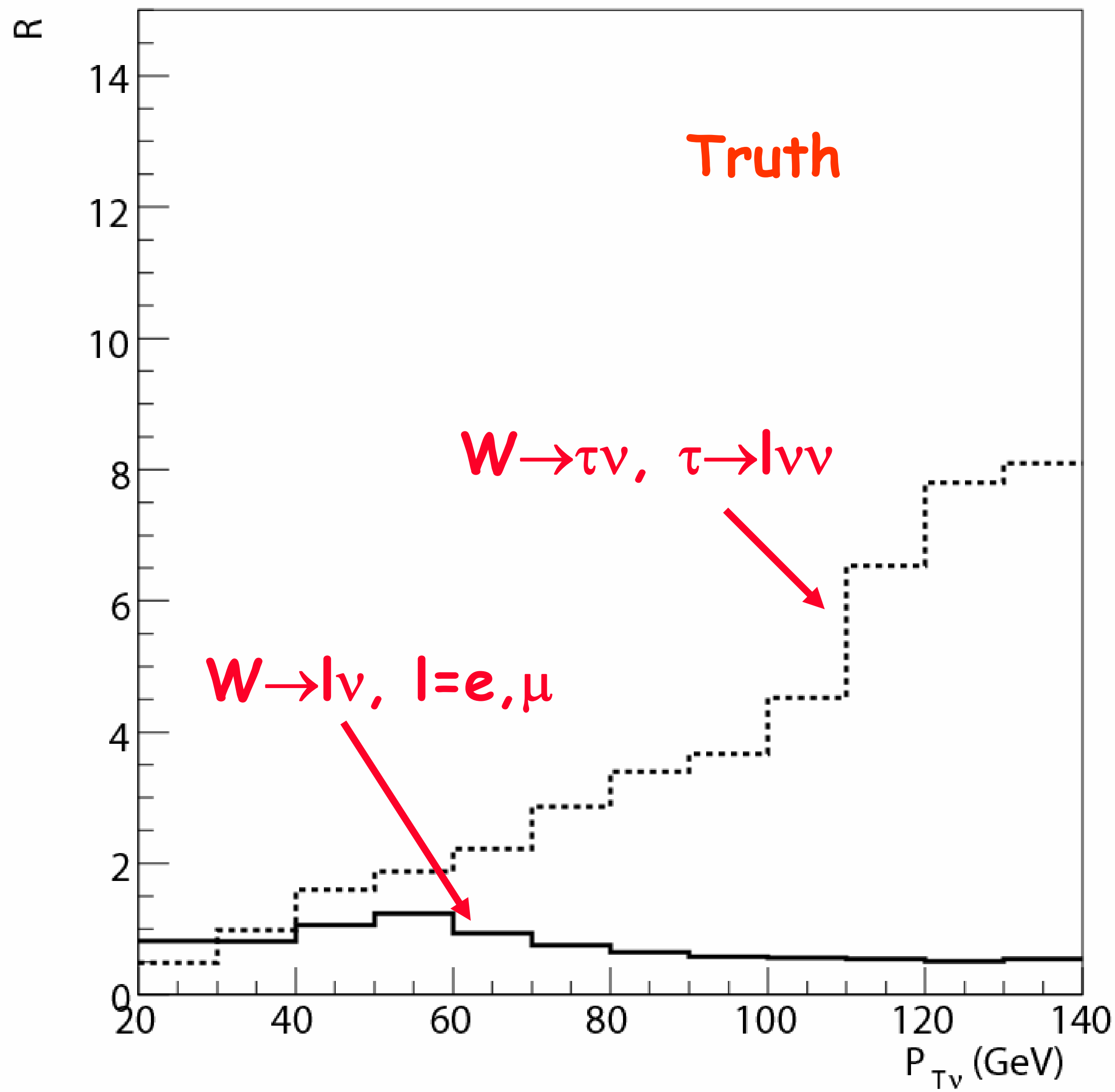


150
140
130
120
110
100
90
80
70
M_W (GeV)
20
40
60
80
100
120
140
$P_{T\nu}$ (GeV)

- Events here were produced with Pythia
- Will re-do analysis with ALPGEN
  - Expect harder P_{TW} spectrum



$$R = \frac{d\sigma}{dP_{T\nu}} \Big/ \frac{d\sigma}{dP_{TL}}$$



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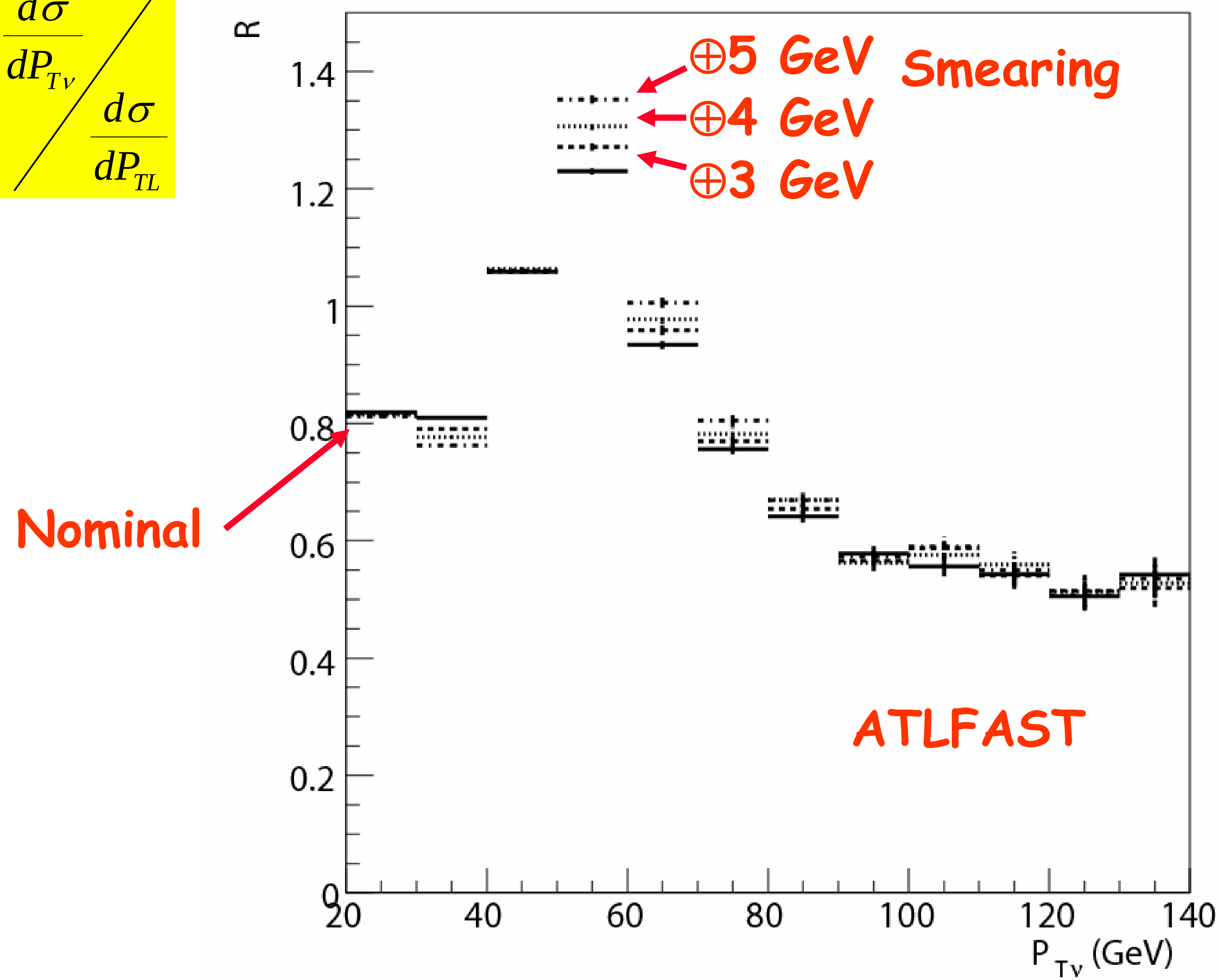
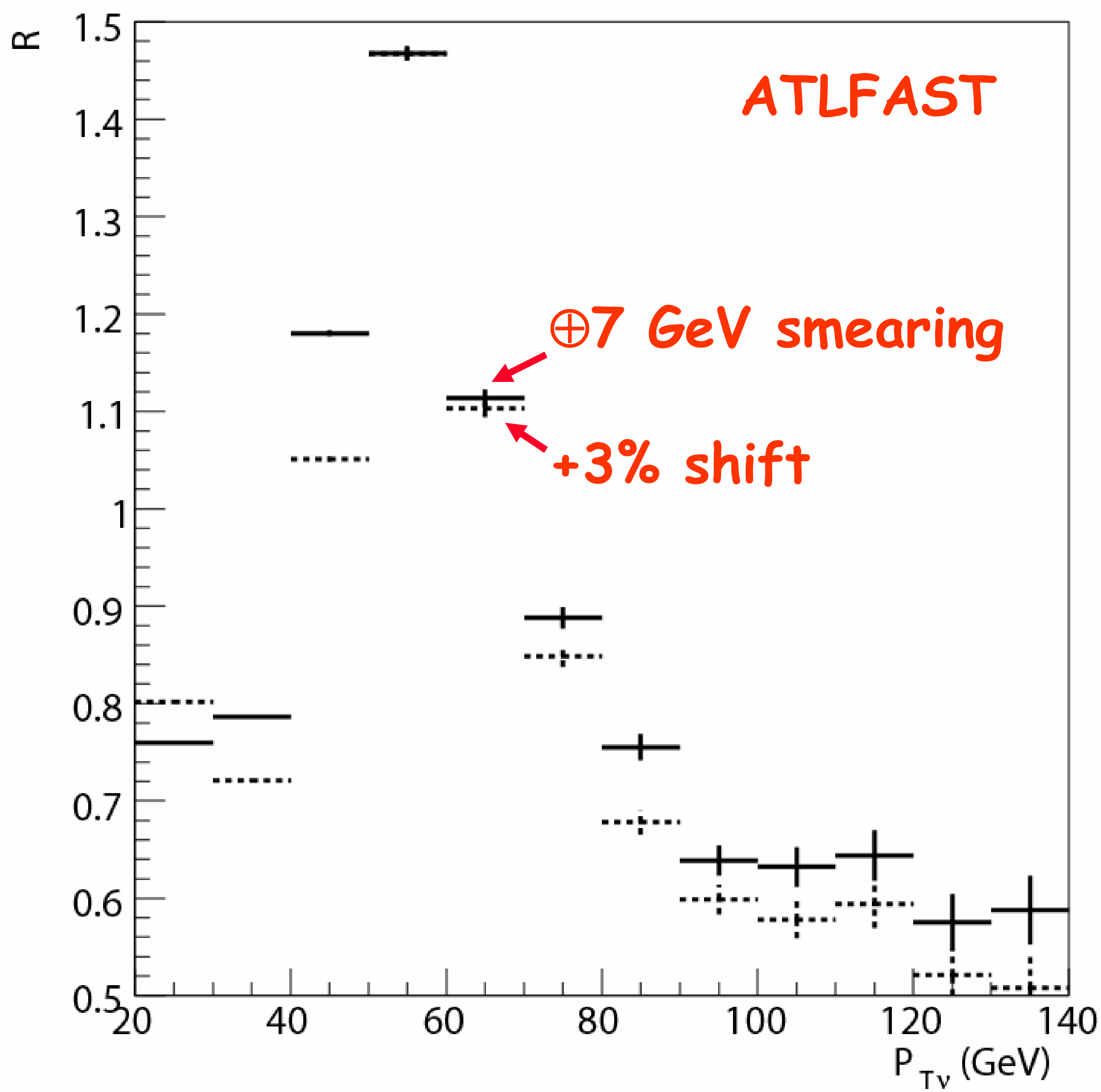


$P_{TL} > 20$ GeV, $|\eta_l| < 2.5$

$100pb^{-1}$

$$R = \frac{d\sigma}{dP_{T\nu}} \Big/ \frac{d\sigma}{dP_{TL}}$$



P_{TL}>20 GeV, $|\eta_l|$<2.5

$100pb^{-1}$

- **After the application of P_{TL}>20 GeV, $|\eta_l|$<2.5 cuts the contribution from $W \to \tau\nu$, $\tau \to l\nu\nu$ amounts to few % of signal and can be easily subtracted with MC**