

# Problem with W transverse mass in invisible Higgs decays

- ⌘ Problem appears in WH channel

- ⌘ Not needed for ZH channel

- preliminary results reported at the May 2002 meeting

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# Event selection

Work all done with fortran based ATLFAST

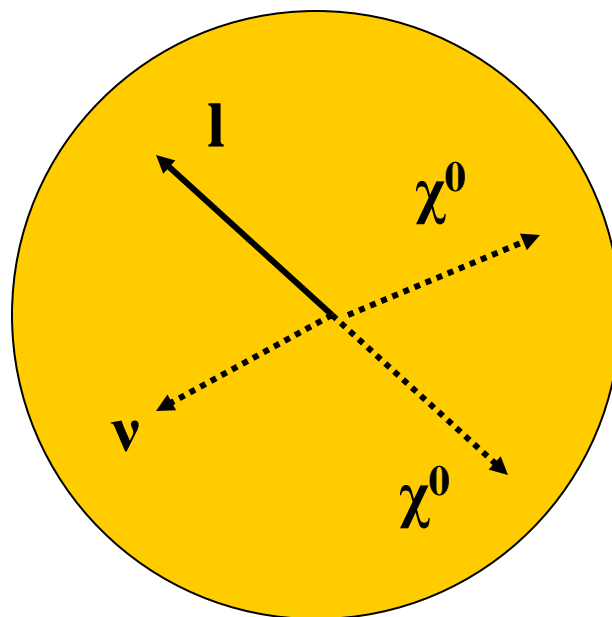
## WH selection

- ⌘ large missing  $p_T$
- ⌘ one prompt lepton
- ⌘ max. one jet

## Background:

- ⌘  $WZ \rightarrow l\nu \nu\nu$
- ⌘  $W$  incl.,  $W \rightarrow l\nu$
- ⌘  $t\bar{t} \rightarrow b\bar{b}, W \rightarrow l\nu$

$$\begin{aligned} \text{WH: } H &\longrightarrow \chi^0 \chi^0 \\ W &\longrightarrow l \nu \end{aligned}$$



# Production cross-sections

For  $m_H = 120$  GeV

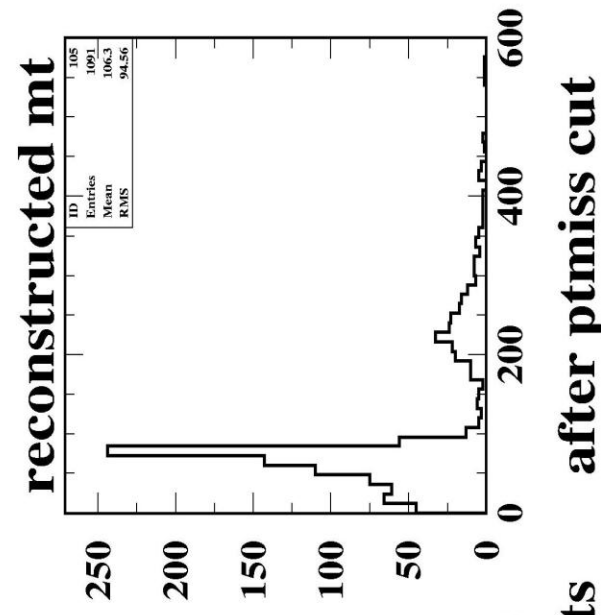
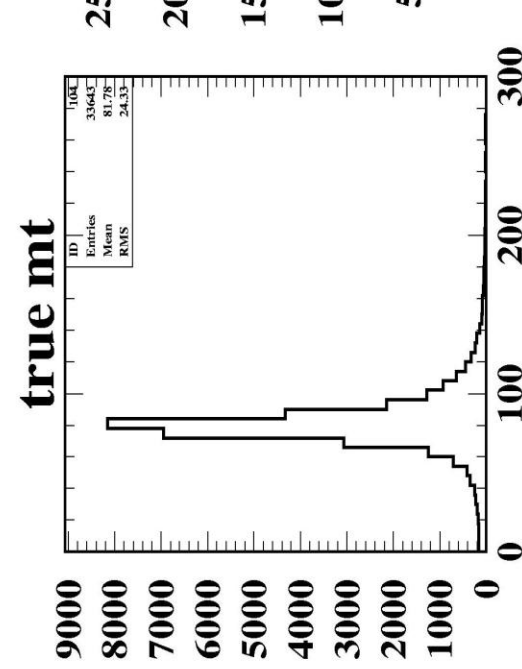
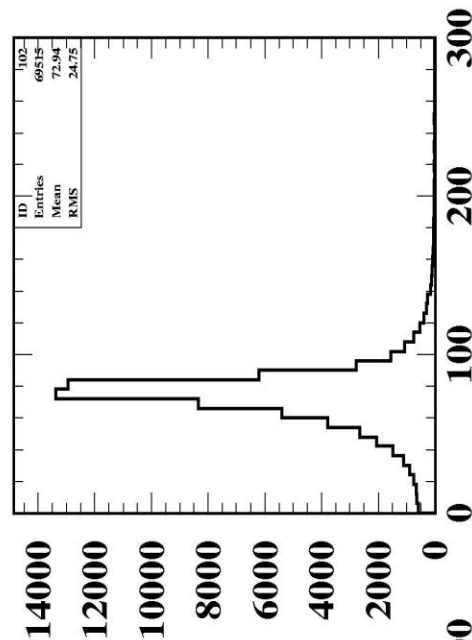
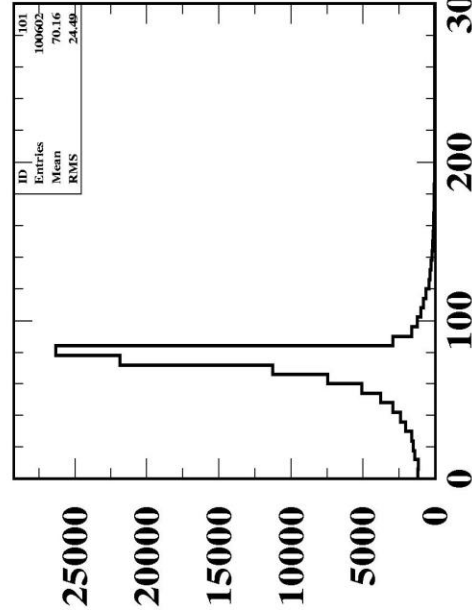
	<b>WH</b>	<b>WZ</b>	<b>W incl</b>	<b>tt</b>
<b><math>\sigma</math> (pb)</b>	<b>0.2244</b>	<b>1.055</b>	<b>28540</b>	<b>126.1</b>
<b>#evts @ 10 fb<sup>-1</sup></b>	<b>2244</b>	<b>10050</b>	<b>285.4 M</b>	<b>1.261 M</b>
<b># generated</b>	<b>1.5 M</b>	<b>1.51 M</b>	<b>158.4 M</b>	<b>59.16 M</b>

**W incl. background five orders of magnitude larger  
... but should disappear with a transverse mass cut  
(see Physics TDR p. 546)**

# Transverse mass in W decays

$$m_T = [2 p_T^l p_T^{\nu} (1 - \cos \phi)]^{1/2}$$

For 155 million generated W incl events



after ptlep and njet cuts      after ptmiss cut

# Signal is completely lost:

**182 WH events vs**

**28032 W incl. events after  $p_T$ miss cut ( $10\text{fb}^{-1}$ )**

Checks done so far:

- ⌘ Problem also seen at parton level
- ⌘ Used Elzbieta's code as a cross-check
- ⌘ All events are  $W \rightarrow l\nu$
- ⌘ Same number of electrons and muons

**Need some new ideas!**