

Physics 233B (Murayama)

HW #4, due Nov 5, 12:30 pm

1. Compute the decay widths $\Gamma(H \rightarrow W_L^+ W_L^-)$ and $\Gamma(H \rightarrow Z_L Z_L)$. Also compute the decay widths into unphysical Nambu–Goldstone bosons in the R_ξ -gauge for $0 \leq \xi \leq 1$. Compare them in the limit $m_H \gg m_W$.
2. Using the HDECAY package, plot the partial widths for $b\bar{b}$, $\tau^+ \tau^-$, $c\bar{c}$, gg , $\gamma\gamma$, $Z\gamma$, $W^+ W^-$ (including off-shell), ZZ (including off-shell), $t\bar{t}$ final states.
3. Consider $t\bar{t}$ production at Tevatron, in particular its lepton+jet final state. Show how the decay angle distribution in the W -rest frame can be reconstructed even though we do not know \hat{s} nor the longitudinal boost. This is the crucial step in demonstrating the $V - A$ nature of the $t \rightarrow bW^+$ decay as we discussed in class. You can also learn from the paper *Phys. Rev.* **D75**, 052001 (2007) by CDF collaboration.