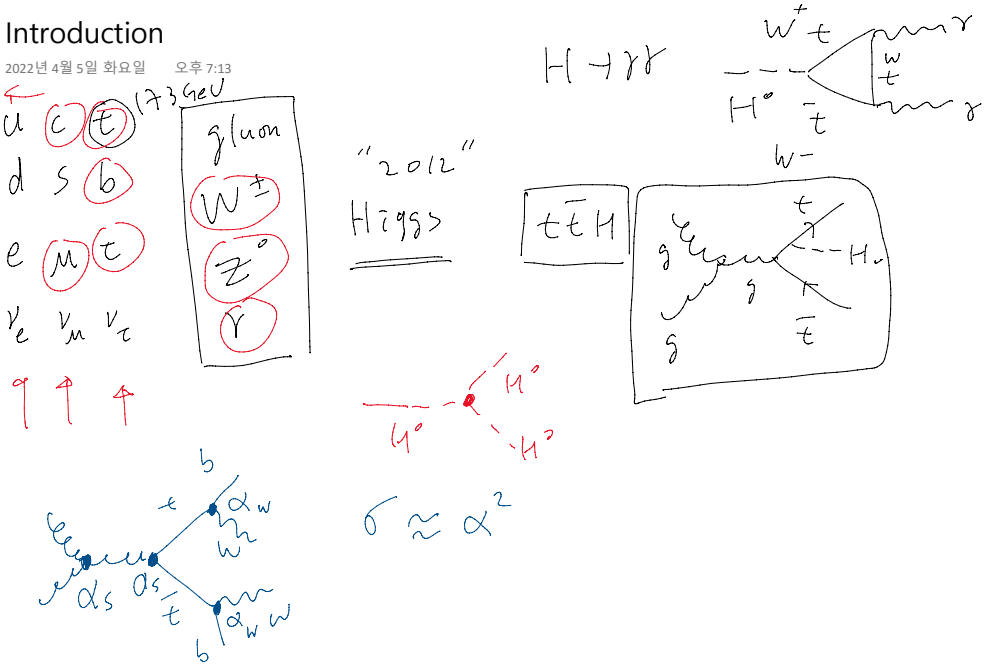
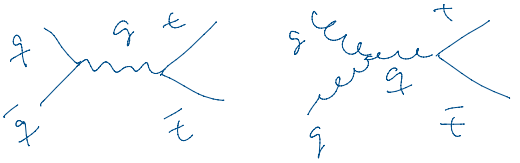
Introduction

2022년 4월 5일 화요일 오후 7:13



$t\bar{t}$ pair production – strong interaction LHC vs Tevatron



172.5 GeV $\sqrt{s} = 13$ TeV $\sqrt{s} = 1.96$ TeV ≈ 2 TeV

$\sigma \approx \frac{1}{E^2}$

$\sqrt{s} = 13$ TeV

$s = (p_1 + p_2)^2 = (E_1 + E_2)^2 - (\vec{p}_1 + \vec{p}_2)^2 = (E_1 + E_2)^2$ $\because \sqrt{s} = E_1 + E_2$

$s' = (x_1 p_1 + x_2 p_2)^2$ 6.5 TeV 6.5 TeV

$s' = 172.5 \times 2 = 350 (GeV)$

$s' = x^2 \underbrace{p_1^2}_{\approx 0} + 2x_1 x_2 p_1 p_2 + \underbrace{x_2^2 p_2^2}_{\approx 0}$ ($m_1 \approx 0$)

$= 2 x_1 x_2 p_1 p_2 = 2x^2 p_1 p_2$

$x^2 = \frac{s'}{2 p_1 p_2} = \frac{s'}{s}$

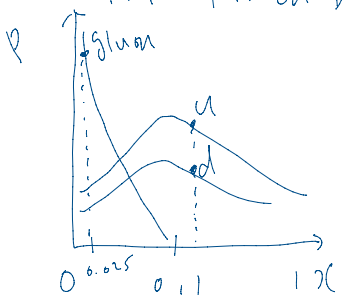
at LHC $x = \frac{0.345 \text{ TeV}}{13 \text{ TeV}} \simeq 0.025$

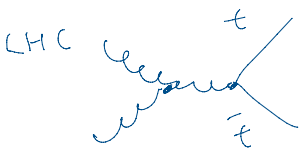
at Tevatron $x = \frac{0.345 \text{ TeV}}{2 \text{ TeV}} \simeq 0.19$

PDF = parton Distribution Function

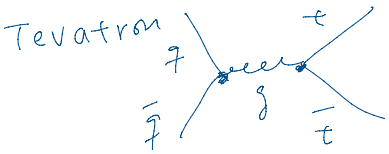
p T gluon

PDF = parton Distribution Function



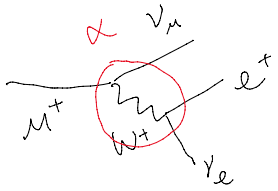


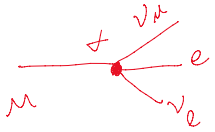
90%



dominant

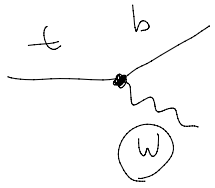
Top Quark Decay





GZM 10^{-14}

$\begin{pmatrix} u \\ d \end{pmatrix} \begin{pmatrix} c & t \\ s & b \end{pmatrix}$

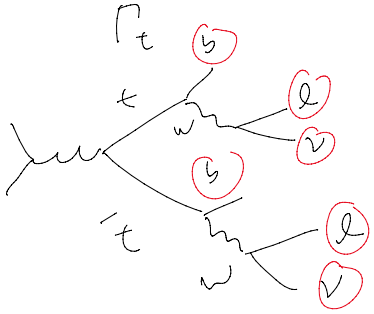


99.999%

$\Gamma_t \cong 1.5$ GeV 173 GeV

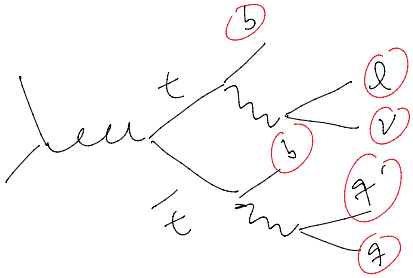
10^{-24} s

$\tau = \frac{1}{\Gamma_t} \cong 10^{-25}$ s



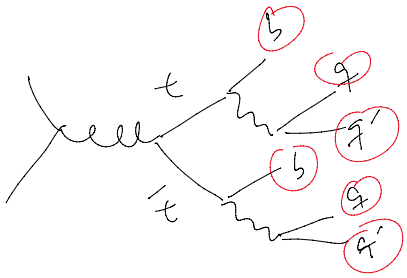
$2l\,2b\,2\nu$

→ Dilepton



$l\,2b\,1\nu\,2q$

→ Semi Leptonic channel



2b 4q

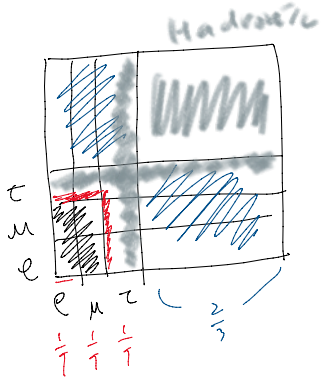
→ Hadronic channel

W branching ratio

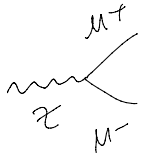
PDG " pdg.lbl.gov "

$W^+ \to \ell^+ \nu$ 10.86% $\approx \frac{1}{9}$

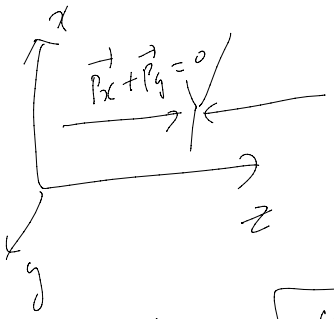
$W \to q\bar{q}'$ 67.41% $\approx \frac{2}{3}$



$\tau \to \mu \nu_\mu \nu_\tau \approx 17\%$



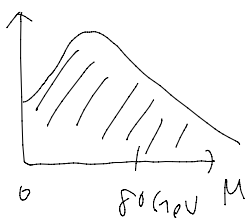
$m_Z^2 = (p_{\mu^+} + p_{\mu^-})^2$

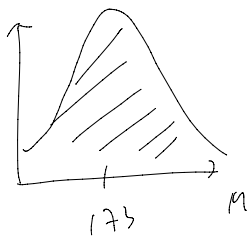


$p_\nu = -\sum_{i=0}^{n} \vec{p}_i$

MET = //

$M_T = \sqrt{2(p_T^\mu p_T^\nu - \vec{p}_T^{\,\mu} \cdot \vec{p}_T^{\,\nu})}$





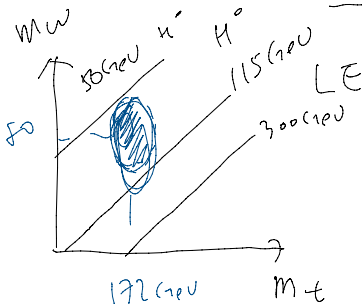
M(top) = 172.5 GeV ± 0.5 GeV

1995 GeV

(+)

(11°)

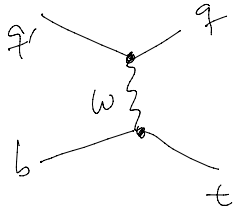
1995 GeV



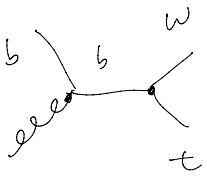
80GeV < m_H < 150 GeV

Sigle top quark

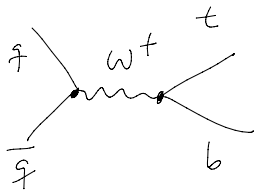
t-channel



tW channel



s-channel



LHC 13TeV

216.99pb

71.7pb

10.32pb