CDF

An Overview

Anna Sfyrla

UniGe CDF Group

Réunion du département

18 Décembre 2007

The UniGe CDF group

CDF Geneva Group

Allan Clark

Xin Wu

Anna Sfyrla

Till Hoffmann

Recently left the UniGe CDF Group

Mario Campanelli (2007)

Monica D'Onofrio (2005)

Mauro Donega (2006)

Regis Lefevre (2007)

Shulamit Moed (2007)

Sofia Vallecorsa (2007)

The TeVatron

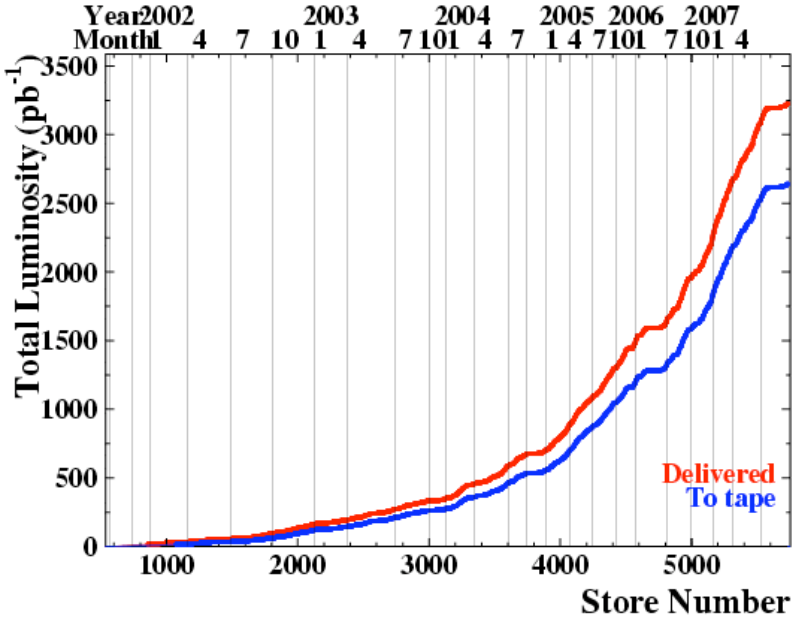
World's highest energy particle collider!

$\sqrt{s}$ = 1.96 TeV

Run II started in 2001

$\int L\,dt$ currently on tape : ~2.5 fb^{-1}

$\int L\,dt$ expected for 2009: 6-8 fb^{-1}



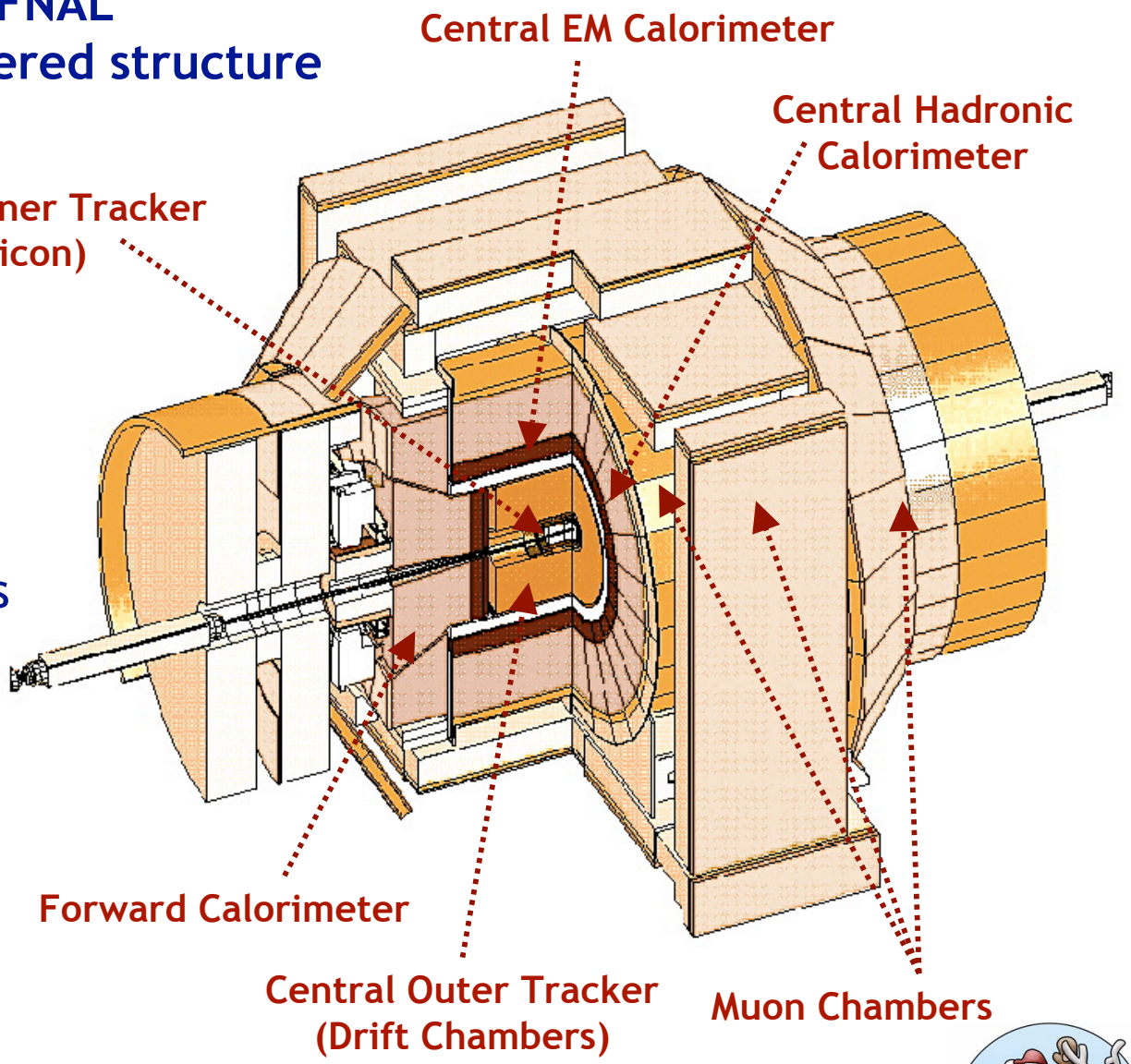
The CDF detector

A general purpose detector at FNAL
Designed with the classical layered structure

Precise tracking
- Silicon Detector
- Central Drift Chamber

Calorimetry
- EM and Hadronic scintillator-based calorimeters
- Coverage up to $|\eta|<3.0$

Muon Chambers
- System of scintillators and proportional chambers
- Coverage up to $|\eta|<2.0$

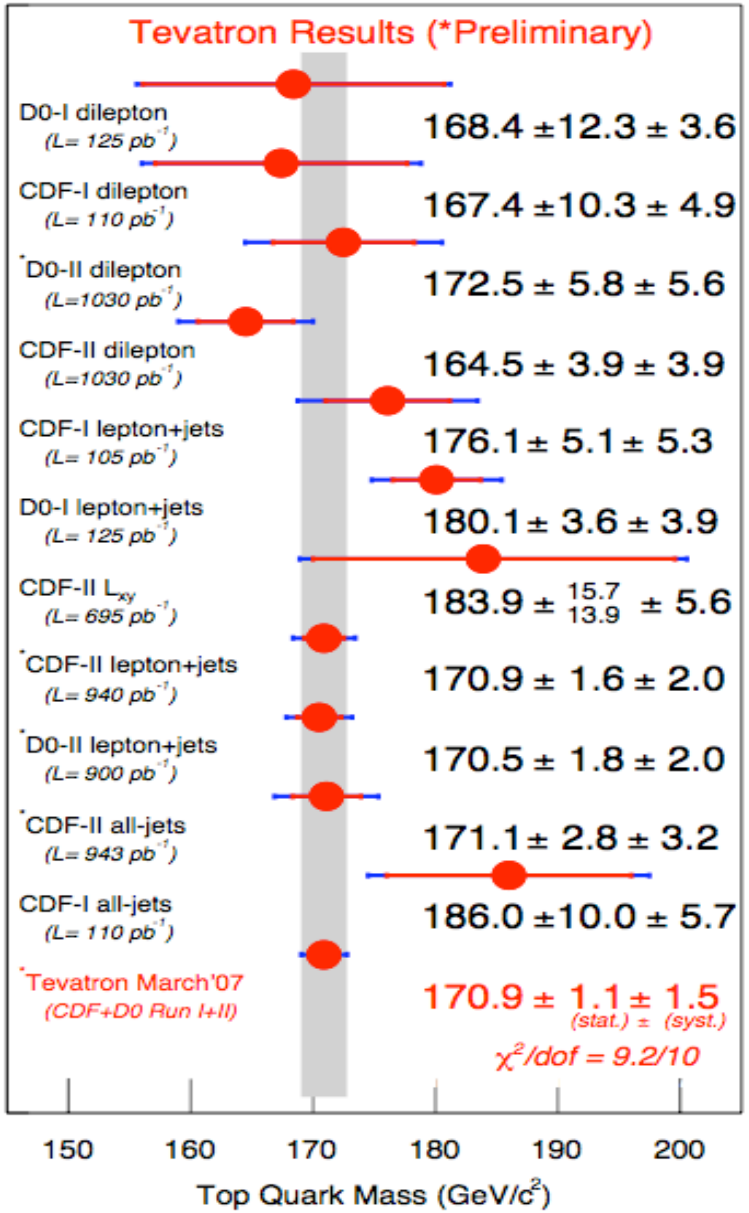


Physics at CDF

Many groups doing great measurements and searches!

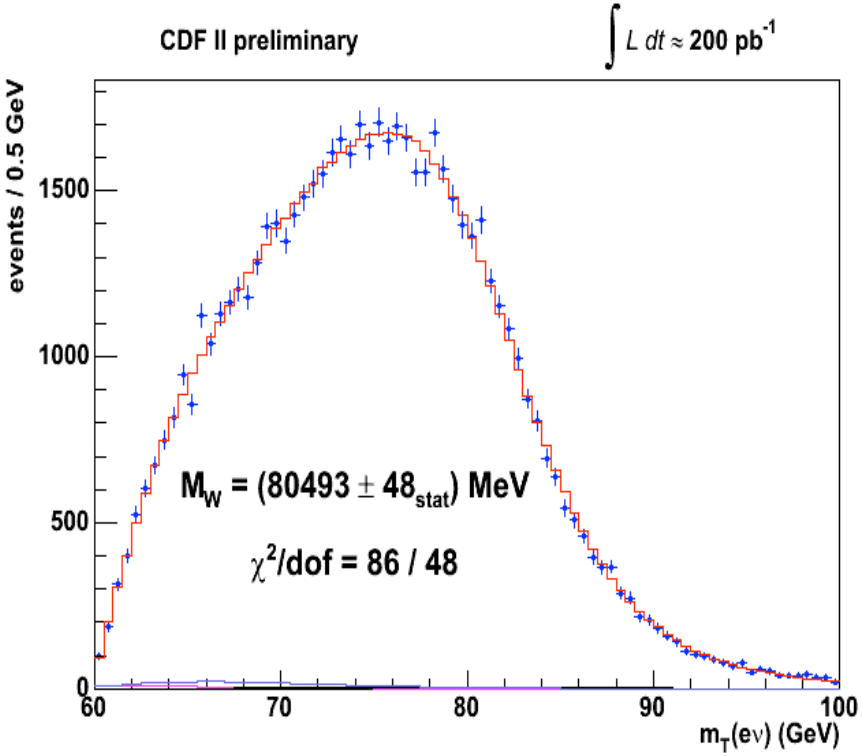
- High P_T Physics
  - W mass and width measurements
  - top mass measurement
  - rich diboson physics program
- QCD measurements
  - Event shapes and underlying events
- Low P_T Physics
  - B_S system properties (mixing, $\Delta\Gamma$, CP violation)
- Searches
  - Higgs
  - Supersymmetry
  - other exotic phenomena…

W and t mass

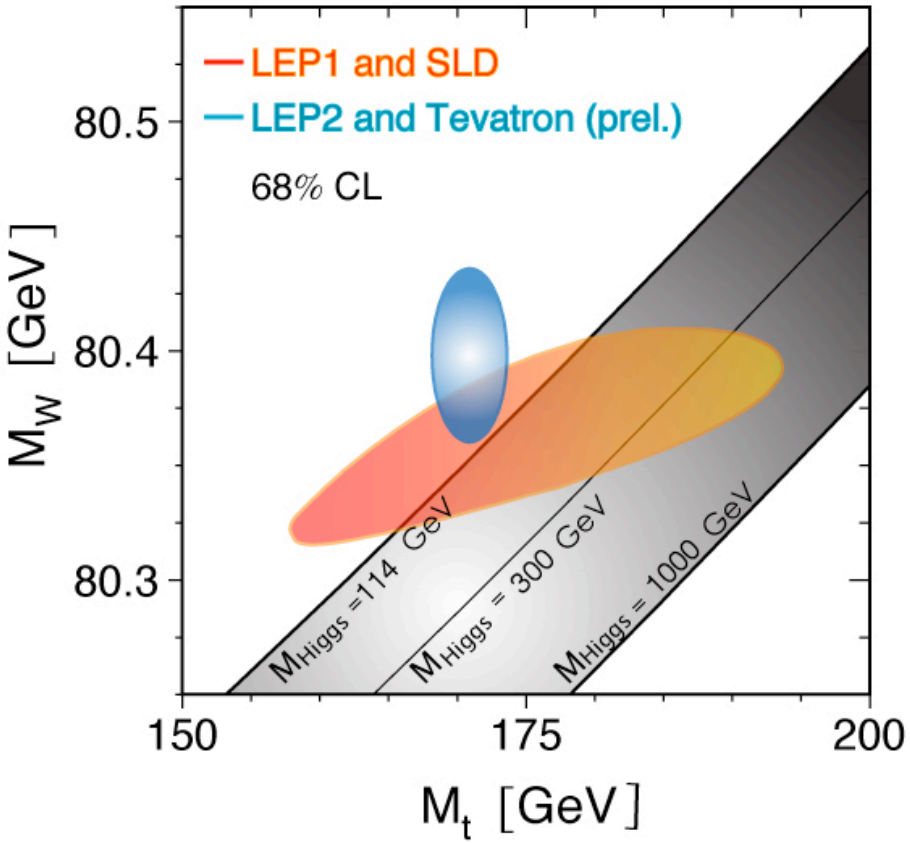


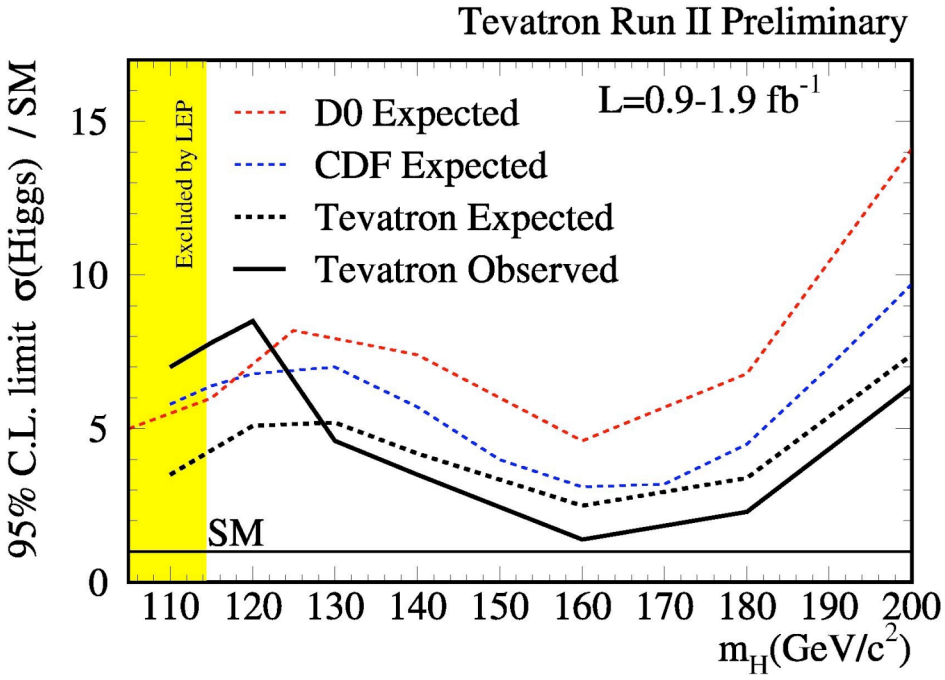
M_W = 80413 ± 48 MeV/c2

The world's most precise single measurement!



Hunting the Higgs





The UniGe at CDF

The University of Geneva has been involved in many analyses!

- High P_T Physics
  - Currently
    - Diboson production in semileptonic decays ***(Anna)***
  - Previously
    - W Helicity ***(Shulamit, 2007)***

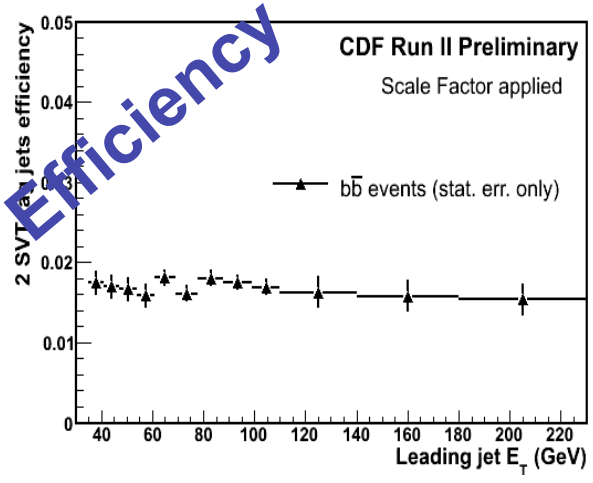
- QCD measurements
  - Currenty
    - b-bbar-gamma ***(Till & Mario)***
  - Previously
    - b-bbar cross section ***(Sofia)***
    - b-gamma ***(Mario, 2007)***
    - Inclusive b jets cross section ***(Monica, 2005)***
    - …

- Low P_T Physics
  - Previously
    - $B_S \rightarrow hh$ lifetime ***(Mauro, 2006)***
    - …

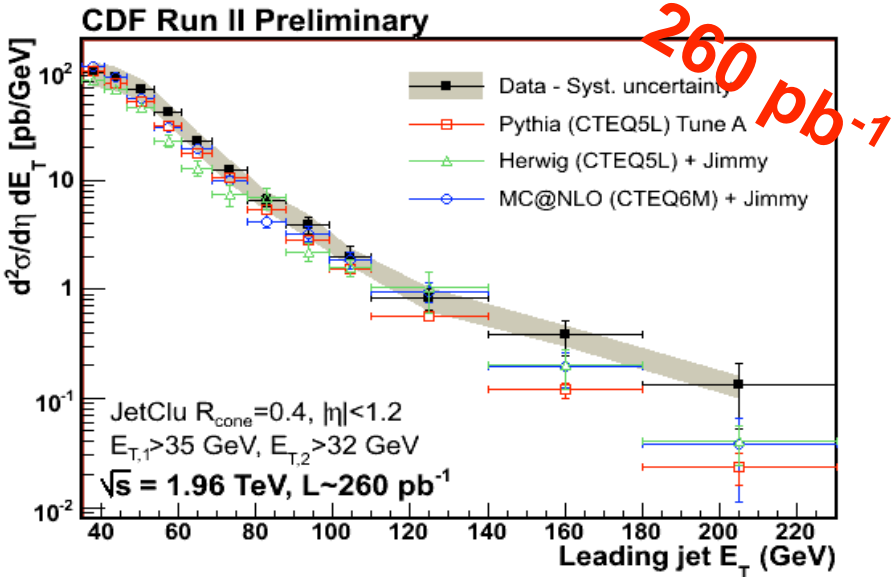
$b+\bar{b}$ cross section

Measurement in SVT triggered sample

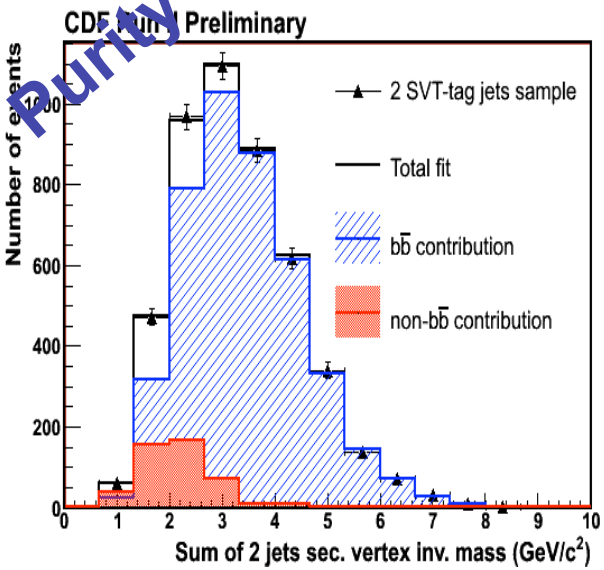
Efficiency



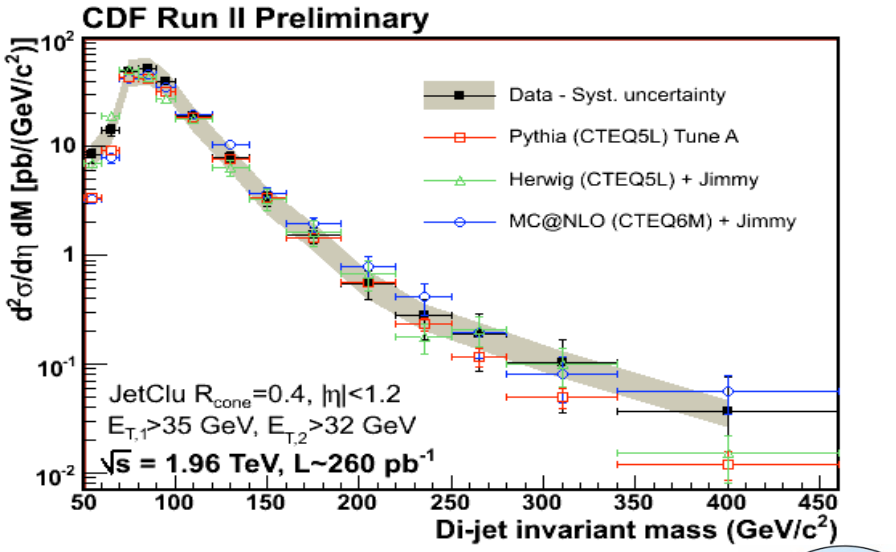
Two SecVtx tagged jets associated to two SVT tracks



Purity

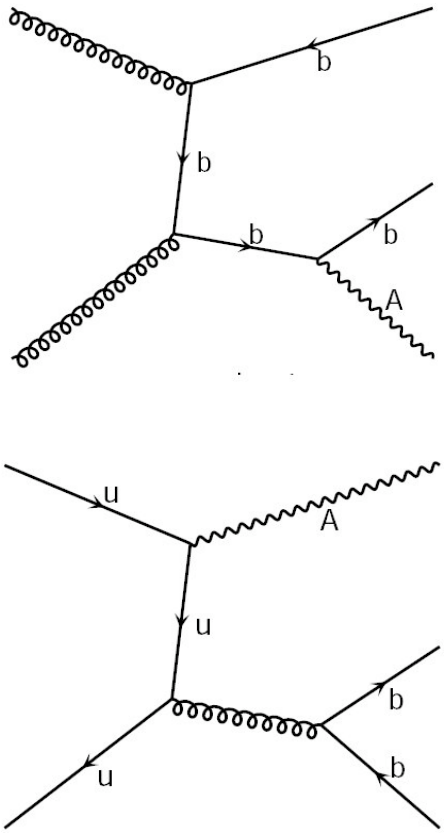


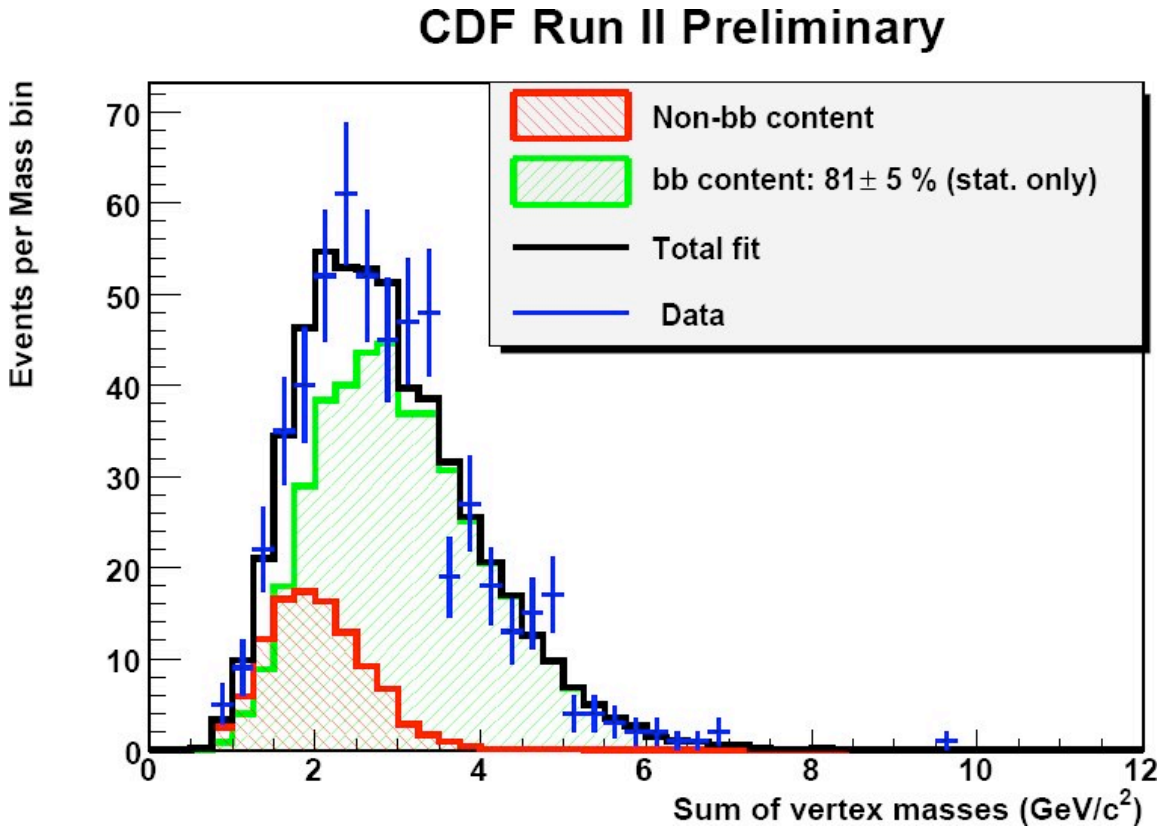
Use sum of two jets sec. vertex mass to get bb purity (>80 %)



Data is compared to LO and MC@NLO

$\gamma+b+\bar{b}$ cross section





Uses SVT to lower the photon E_T threshold, increasing event acceptance

Using 1.1 fb^{-1} of data

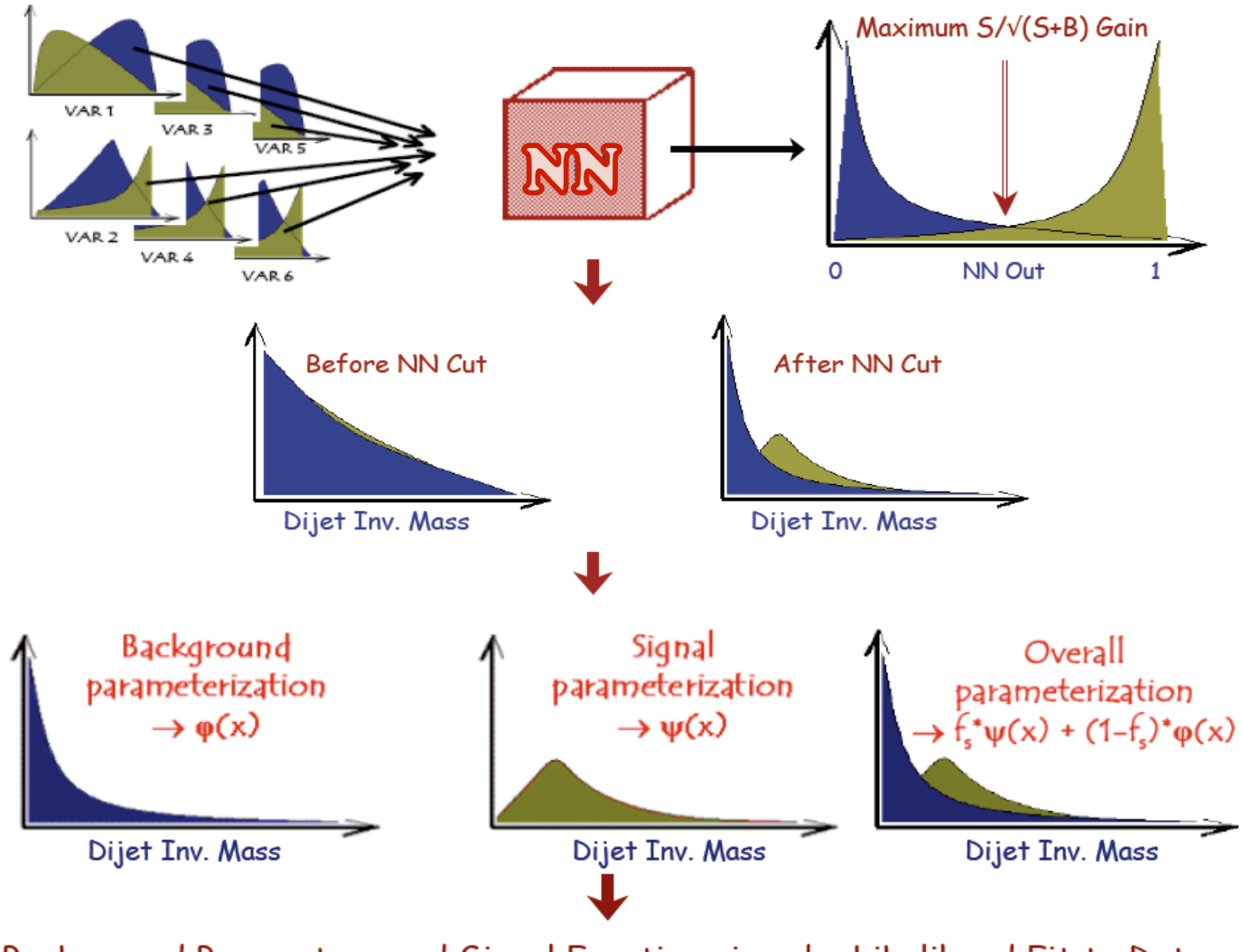
$\sigma(\gamma+b+\bar{b}) = 8.60\pm1.07(stat)+1.44-1.56(sys)$ pb

WW/WZ→lνjj

Why?

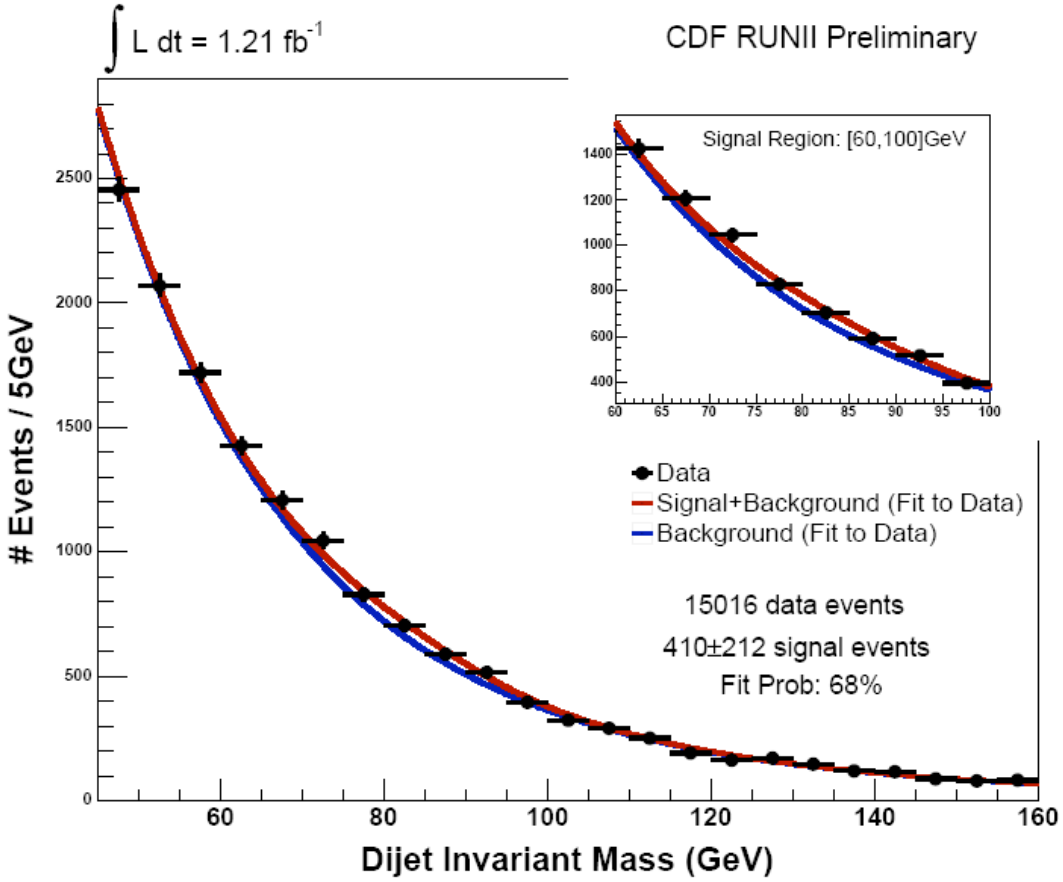
- Cross section measurement
- Main background in many interesting processes
- Topologically similar to WH…

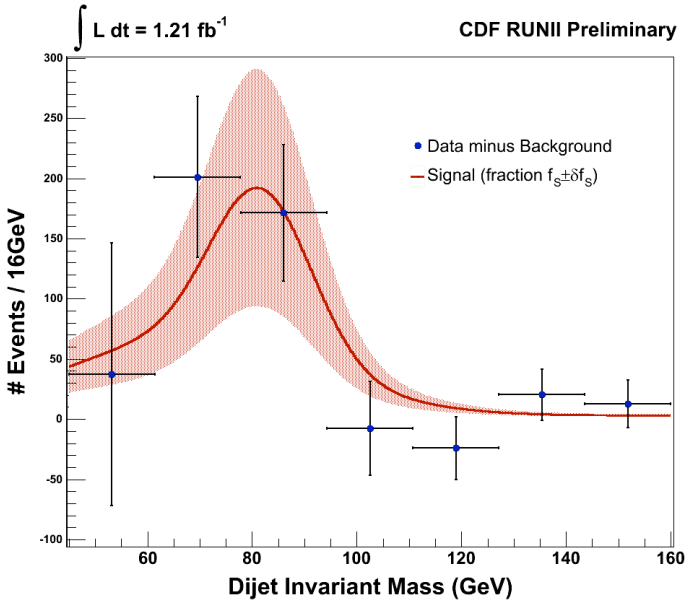
How?



WW/WZ→lνjj

Results





Measured cross section

$$\sigma_{WW/WZ} \times Br(W \to \ell\nu, W/Z \to jj) = 1.47 \pm 0.77(stat) \pm 0.38(sys)\ pb$$

$$\sigma^{theory}_{WW/WZ} \times Br(W \to \ell\nu, W/Z \to jj) = 2.1 \pm 0.2\ pb$$

95% CL Upper Limit

$$\sigma \times Br < 2.88\ pb$$

The End

(of the CDF Geneva Group)