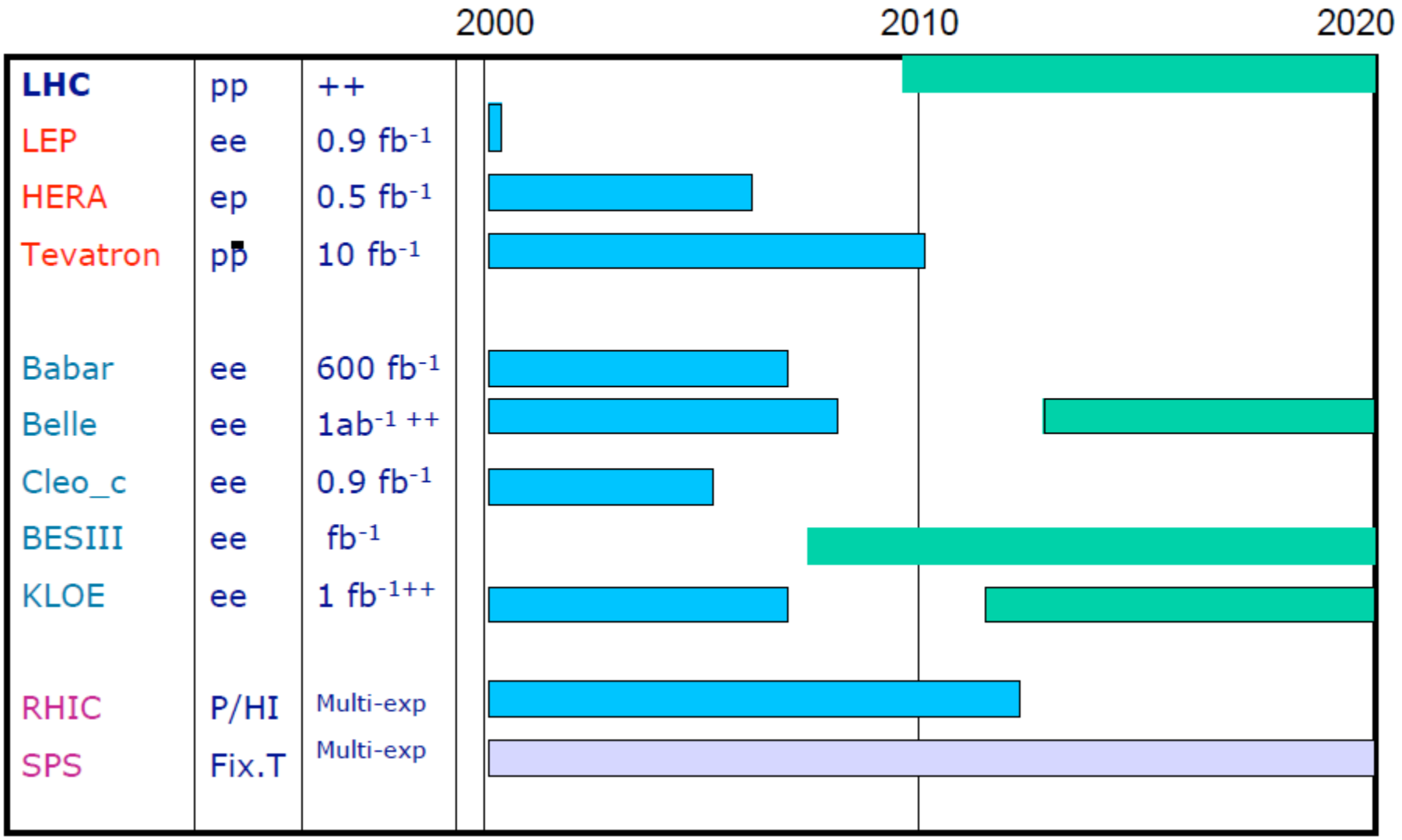
Résumé (très partiel) des conférences d'hiver

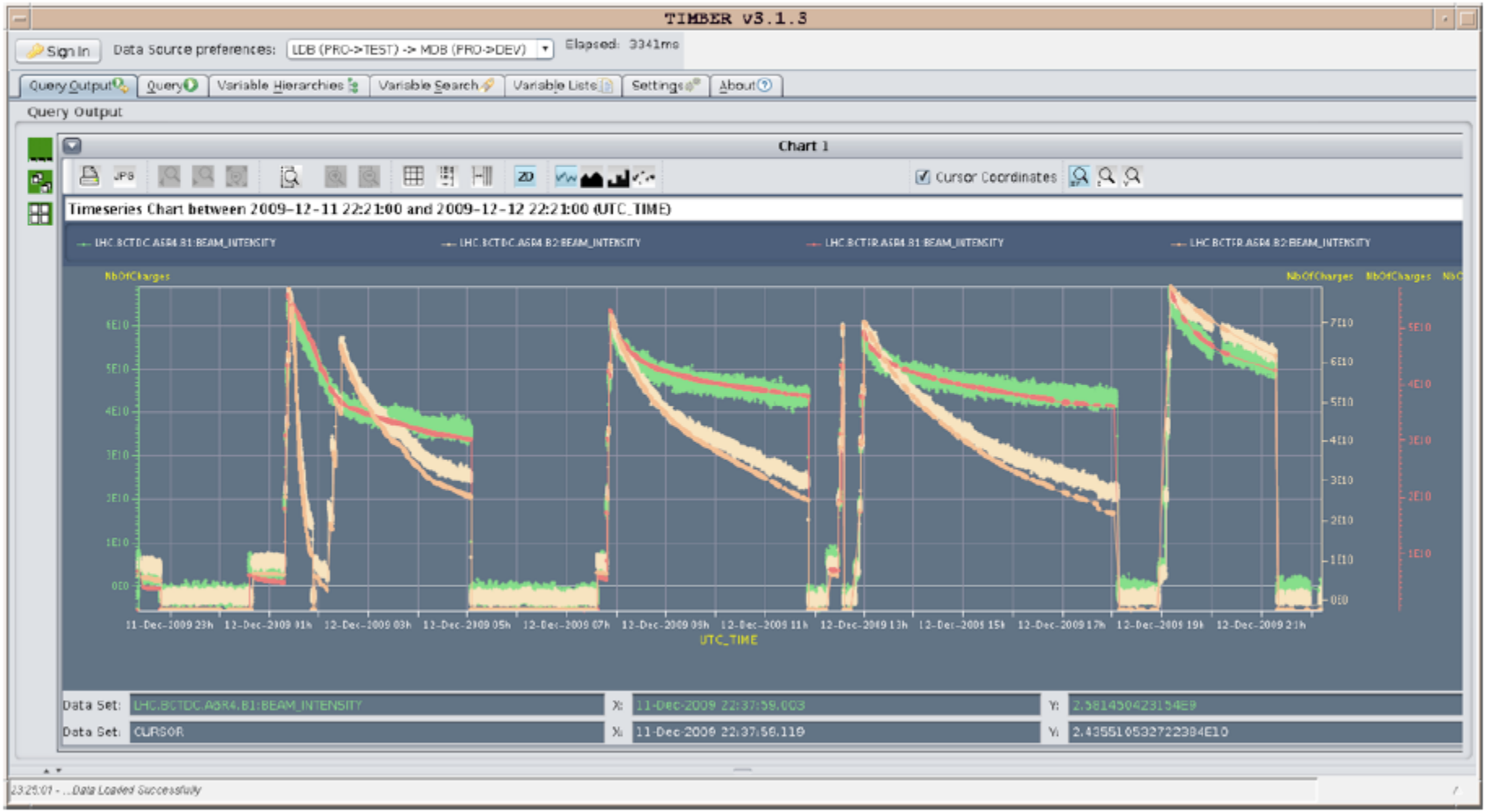
Irfu/SPP avril 2010

H.E.P. experimental plans



LHC startup

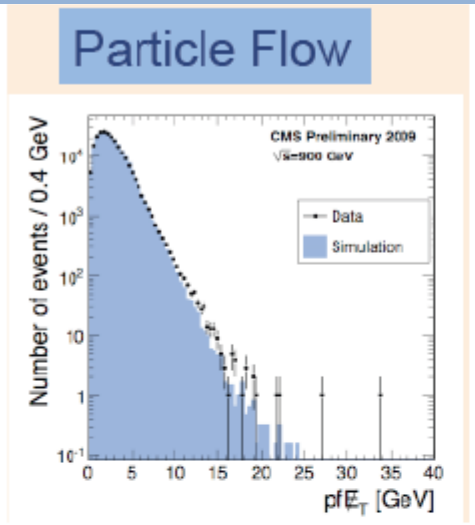
R. Bailey

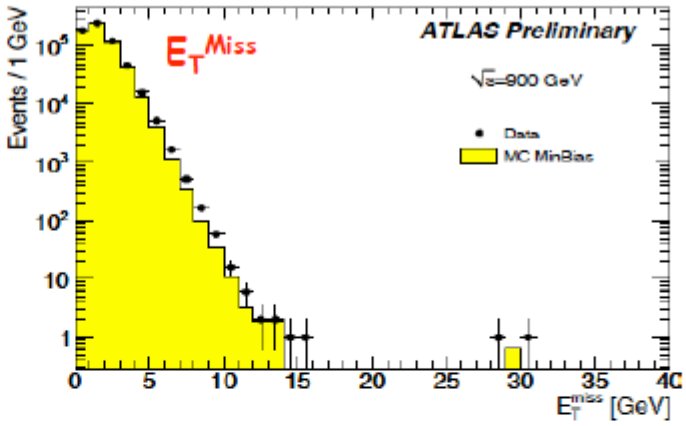


LHC detectors Readiness

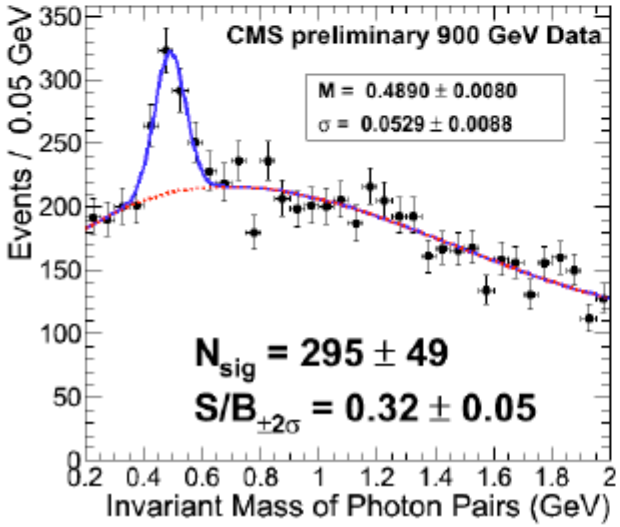
- ALICE, ATLAS, CMS, LHCb have proven ability to reconstruct data and do physics analysis (albeit small data set so far)
  - Fruitful preparation with cosmics
- Calorimeters and tracking in very good shape
  - Subtle studies performed: conversions, dE/dx
- Particle identification demonstrated
  - Electrons and photons
  - Muons
  - Hadronic final state (Ptmiss), energy flow (CMS)
- Simulation in agreement with the data
  - Very good starting point for the first analyses

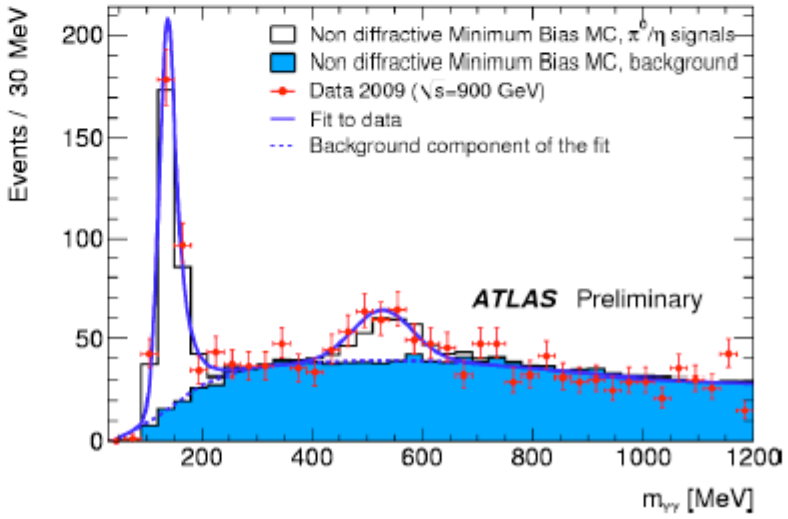
Calorimeters





E.Monnier
S.Rappocio
Chiara Rovelli

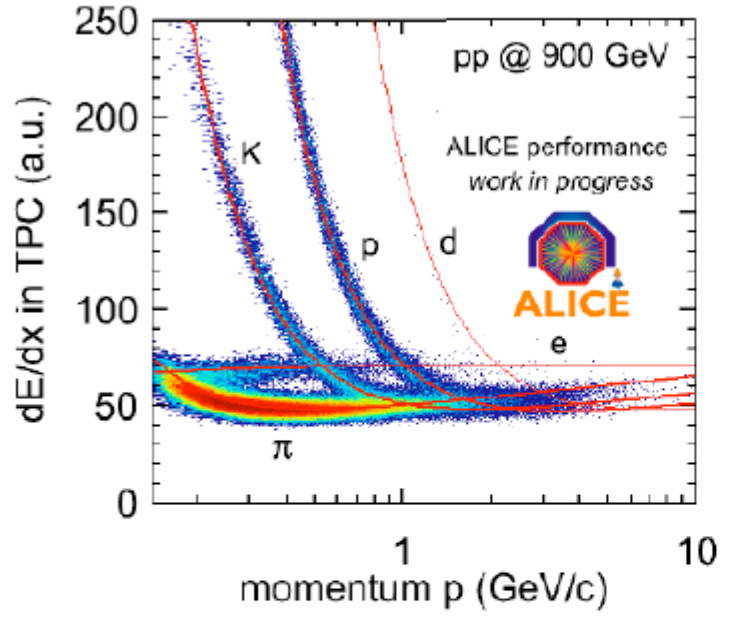




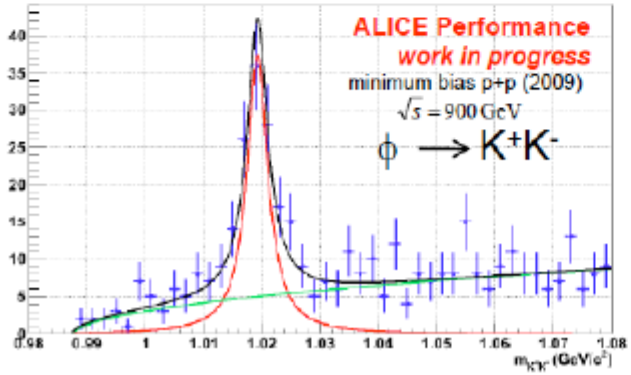
Particle identifications

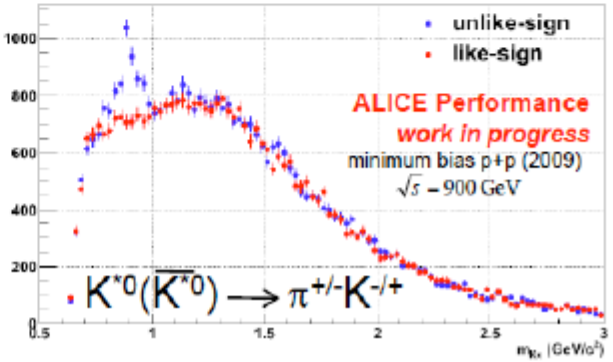
F.Noferini

dEdx in the TPC



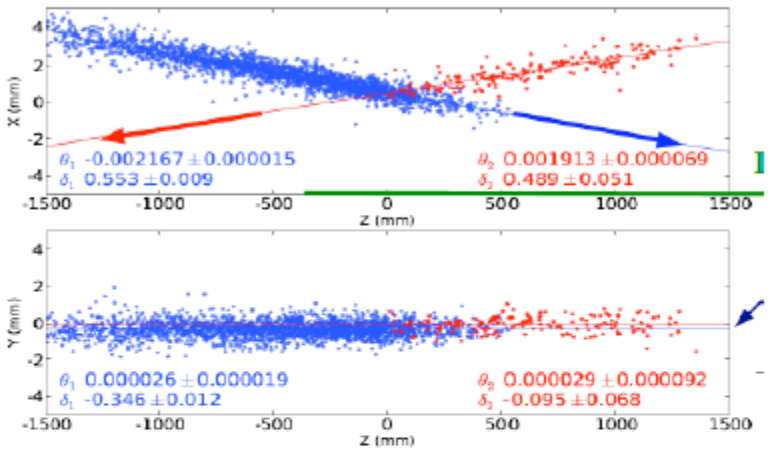
$m_{K\pi}$ system (GeV)

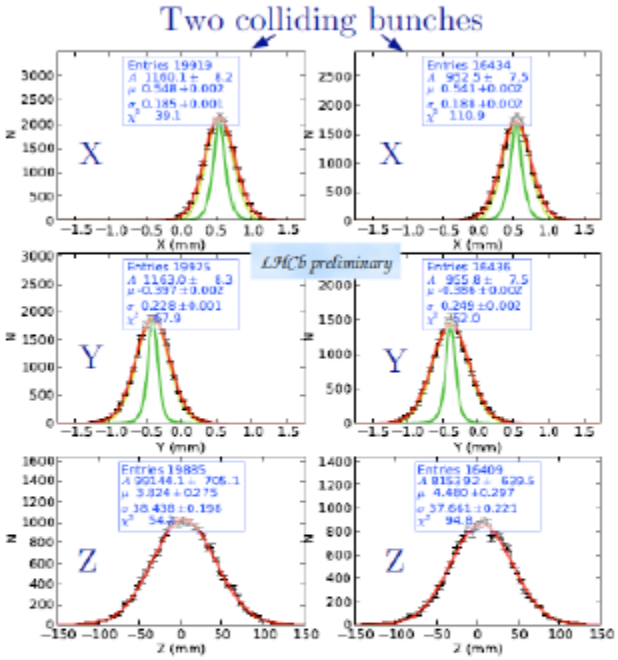


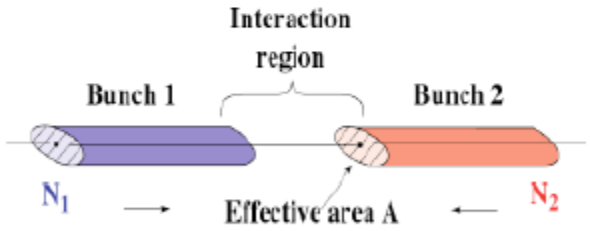


Luminosity measurement (LHCb)

Vladislav Balagura







$$\int L\,dt = f \times \int N_1 N_2\,dt \times \sum_{bunches} A^{-1} \times \frac{1}{\epsilon_{crossing}} \times \frac{1}{\epsilon_{phase}} \times \frac{1}{\epsilon_{debunching}}$$

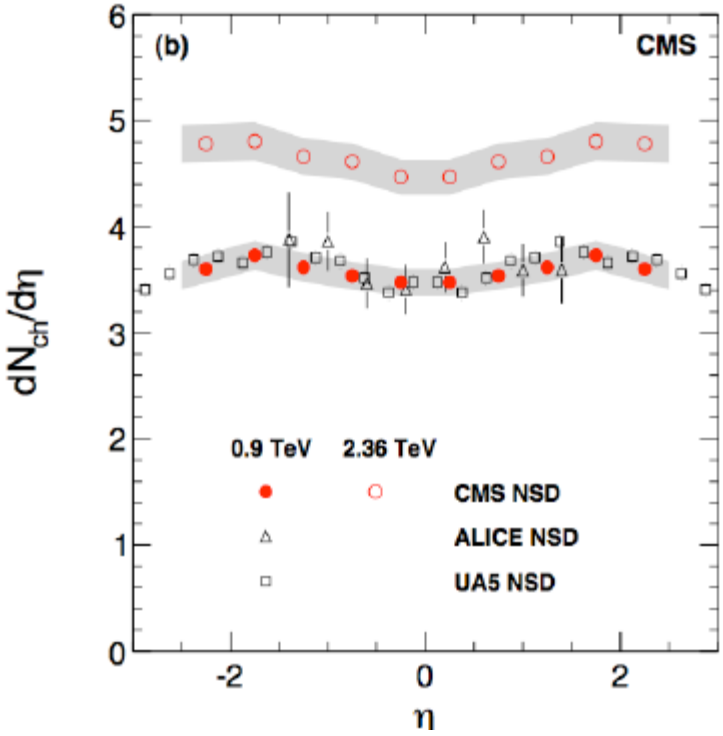
$$6.8 \pm 1.0\ \mu b^{-1}$$

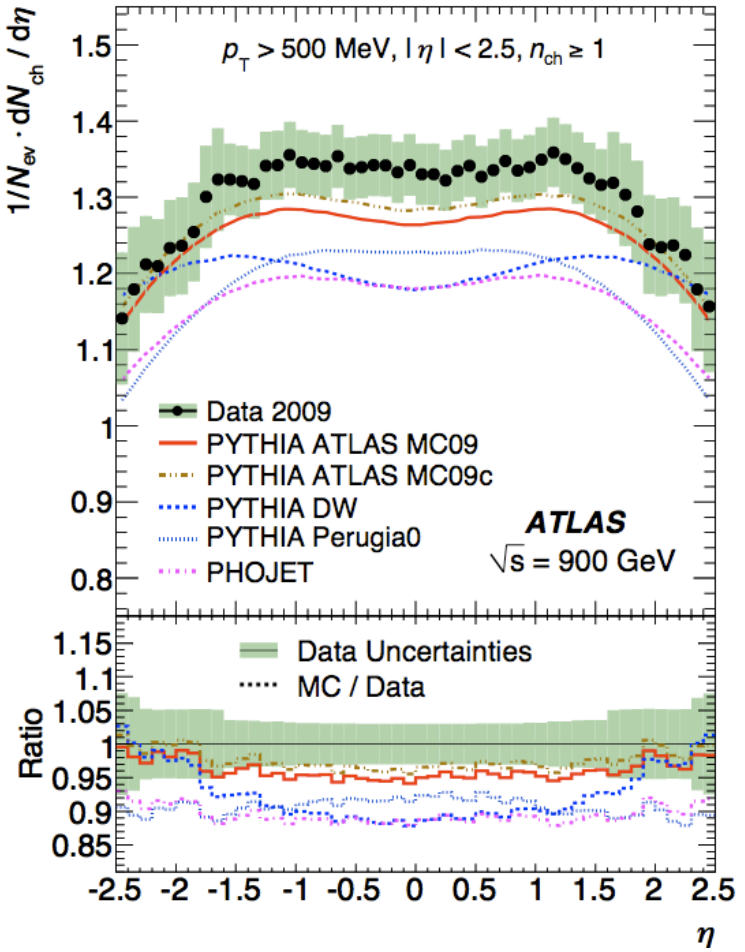
Luminosity measurement, succesful machine monitoring

Some results from ATLAS/CMS

Multiplicities… *with <Pt ^{2}> ~ Nhadrons*
MC generators do not describe the energy-dependence of the average multiplicity as well as the tail of the distributions correctly
Data @ 7TeV will give another point!

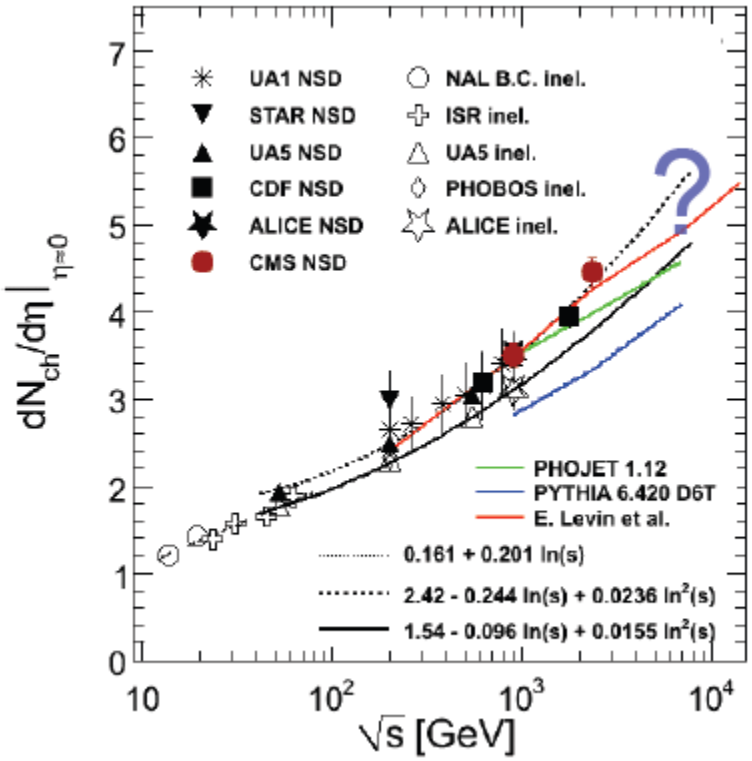
This is a 'known unknown'



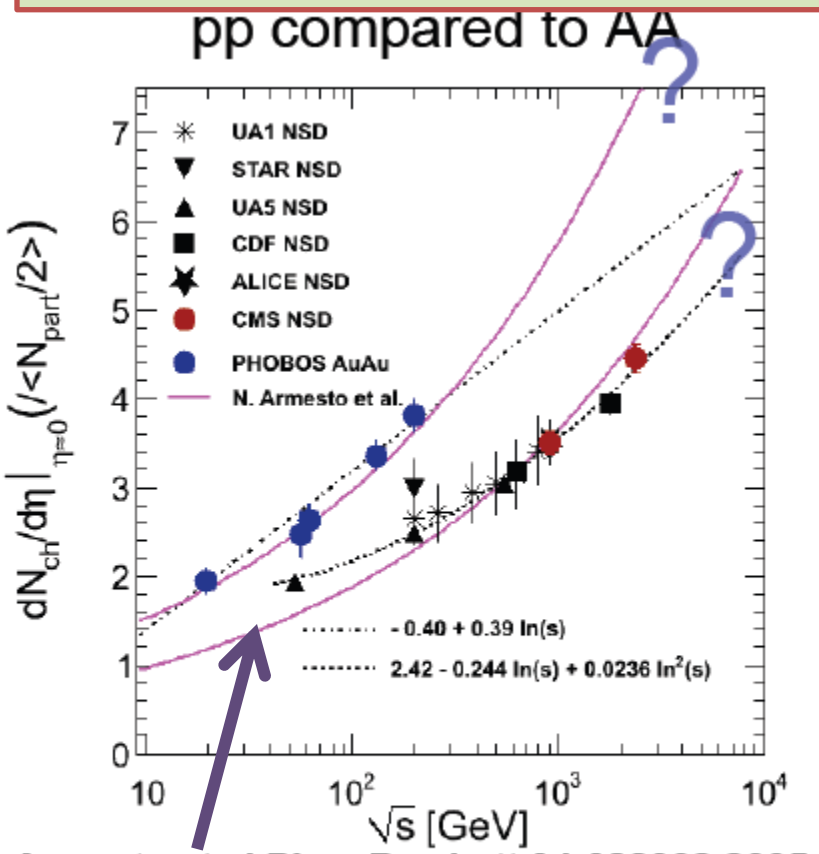


Discussion (very short)

All data compared:
We confirm that <n>(s) is not well known



Personal comment:
Evidence of satiration (small x phys)



N. Armesto et al.Phys.Rev.Lett.94:022002,2005
Prediction of charged particle multiplicity evolution with collision energy in HI and pp based on Geometrical Scaling and Q^2_{Sat}

LHC outlook

2009			2010			2011		
Repair of Sector 34	1.18 TeV	nQPS 6kA	3.5 TeV Isafe < I < 0.2 Inom $\beta^* > 2$ m	Ions		3.5 TeV ~ 0.2 Inom $\beta^* \sim 2$ m	Ions	
No Beam	B		Beam			Beam		

Plan: **100 pb-1 in 2010 , 1fb-1 by 2011 + Heavy Ions @ 7 TeV**

If this is achieved, a vigourous start of the physics program is expected soon:

- Early B-physics
- W and Z production
- Top
- Higgs
- High mass dilepton resonances
- SUSY
- Universal Extra Dimensions

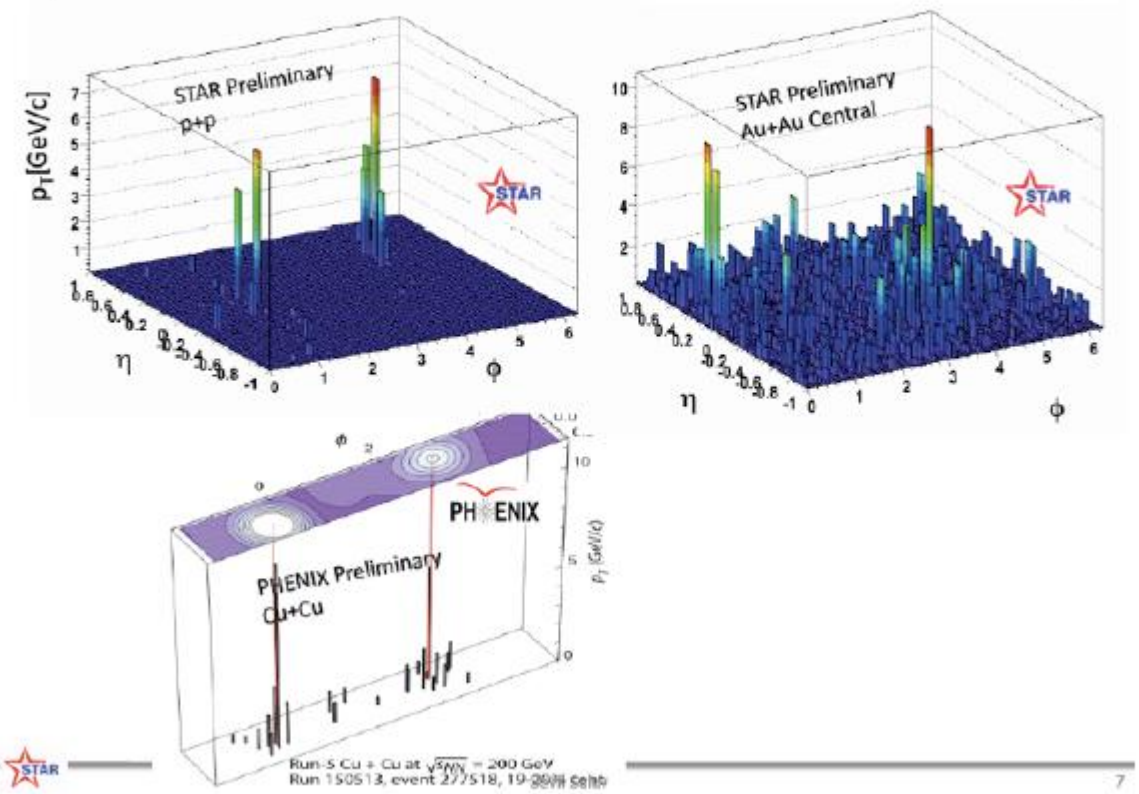
I.Vichou

Reaching the saturation (RHIC)

Talk by S.Salur

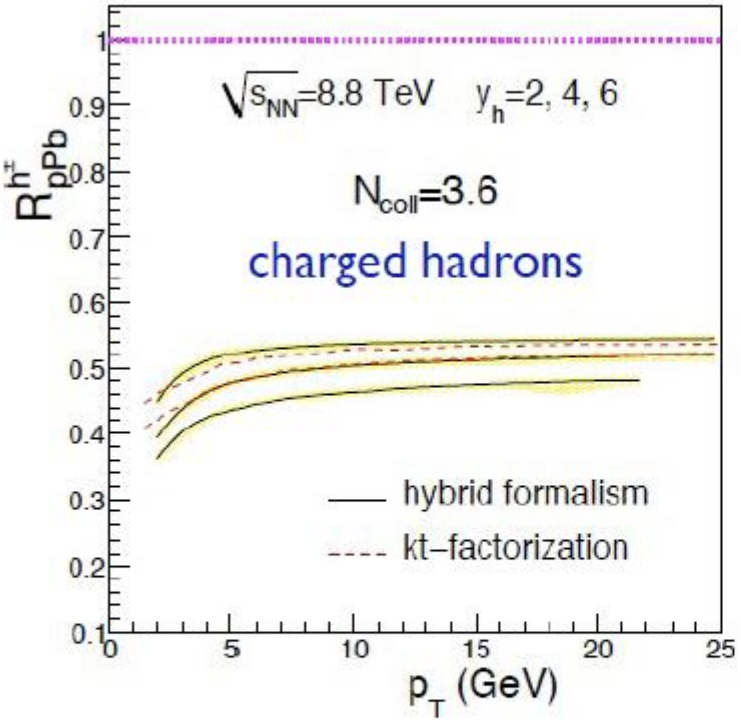
Jet Reconstruction at RHIC

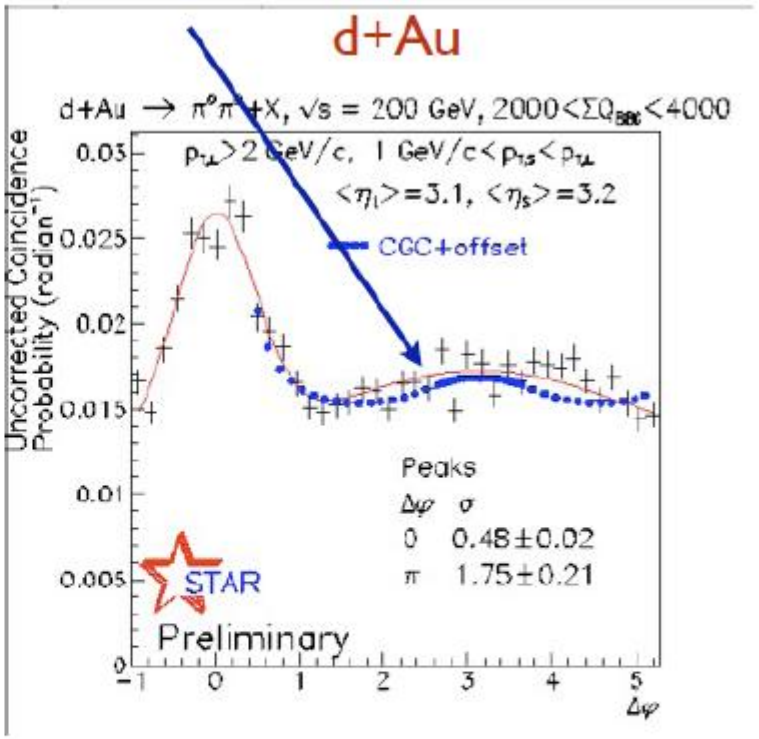
Jets are visible at RHIC!



RHIC at work

Talk by J. Albacete



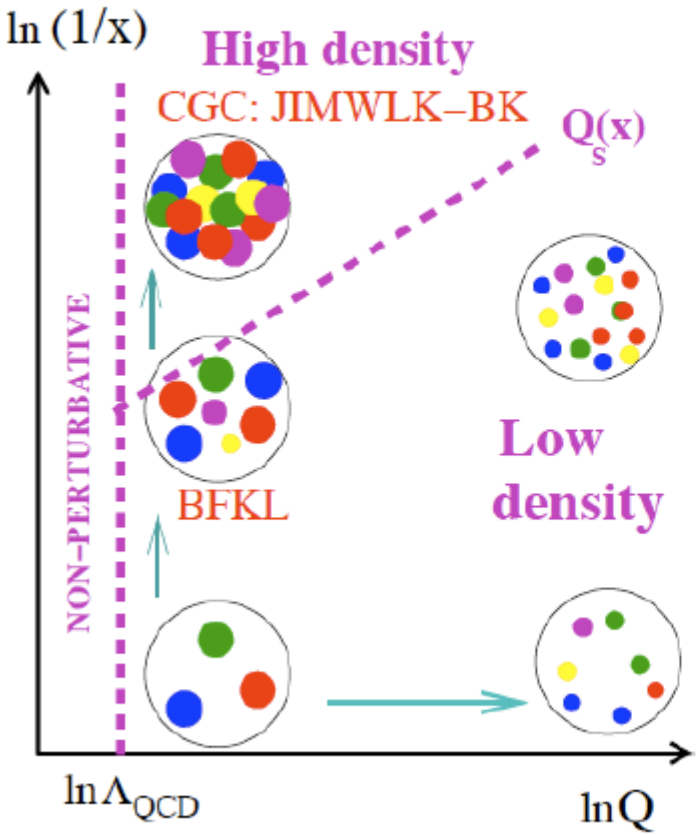


Expect strong suppression of high transverse momentum hadrons at LHC

"Mono-jets": disappearance of quantum fluctuations in a semi-classical gluon distribution

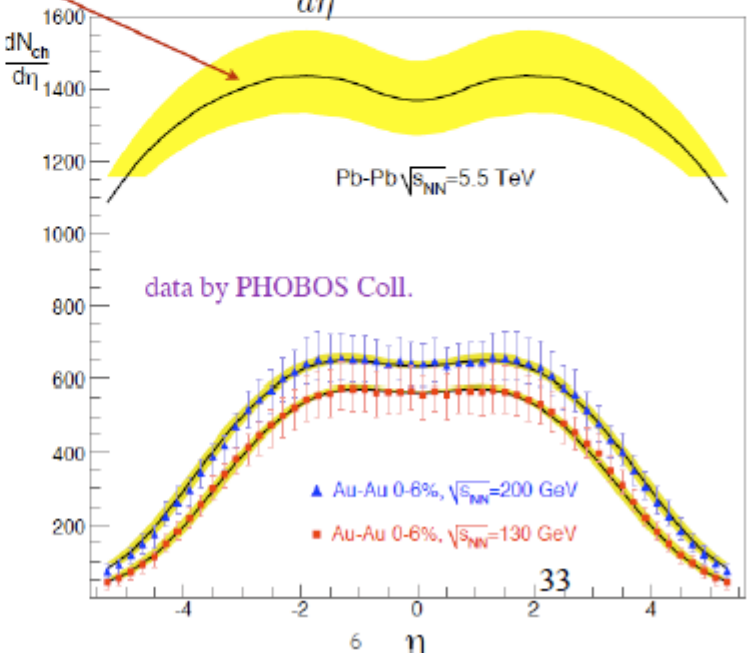
Parton saturation at work

Talk by J. Albacete



Parton saturation/ CGC greatly reduces the hadron multiplicity in high-energy heavy ion collisions

$$\frac{dN_{ch}^{Pb-Pb}(\sqrt{s}=5.5\,\mathrm{TeV},\eta=0)}{d\eta} \approx 1290 \div 1480$$



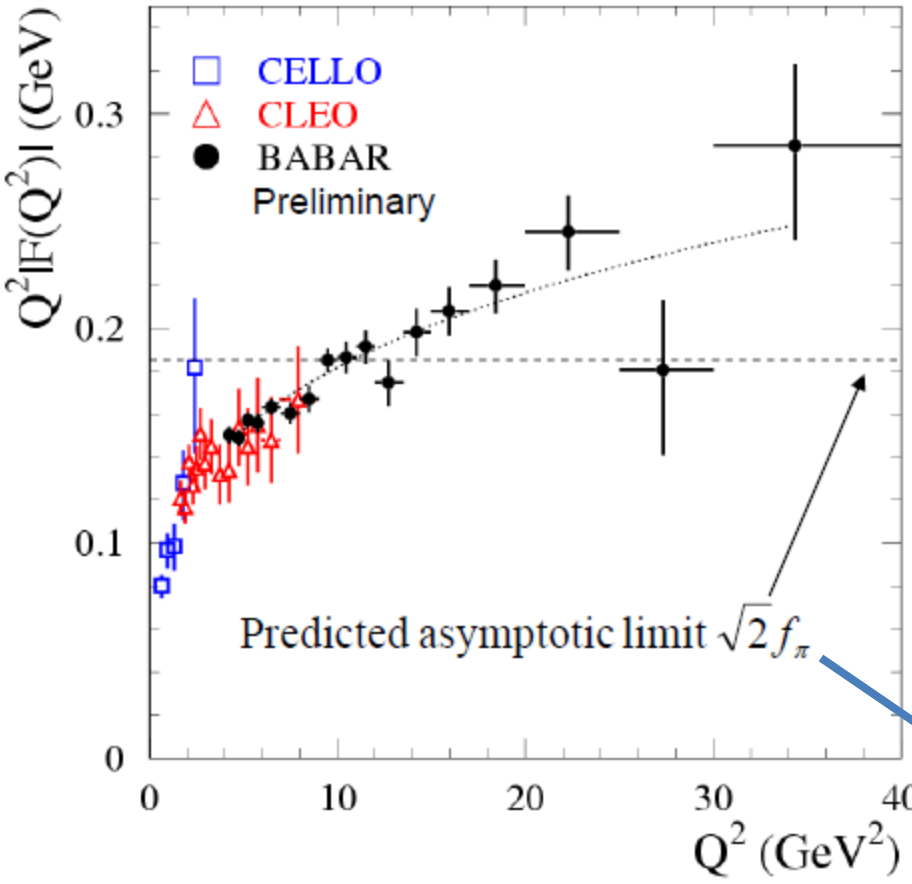
Other know unknowns

Collinear pQCD is well established, but the physics related to intrinsic transverse momentum / impact parameter is not.
Extremely difficult task, which requires fundamentally new techniques and concepts

- reaction phenomenology, e.g. $\gamma^* + \gamma \to \pi^0$
- double hard interactions

Intrinsic Pt @ Babar

BABAR $e^+ e^- \to e^+ e^- \gamma \gamma^*$ $\gamma \gamma^* \to \pi^0$



The Q^2-independent systematic error: 2.3%

The form factor multiplied by Q² is fit with:

$$Q^2\left|F(Q^2)\right| = A\left(\frac{Q^2}{10\,\mathrm{GeV}^2}\right)^{\beta}$$ for 4<Q²<40 GeV²,

where A=0.182±0.002 GeV and β=0.25±0.02.

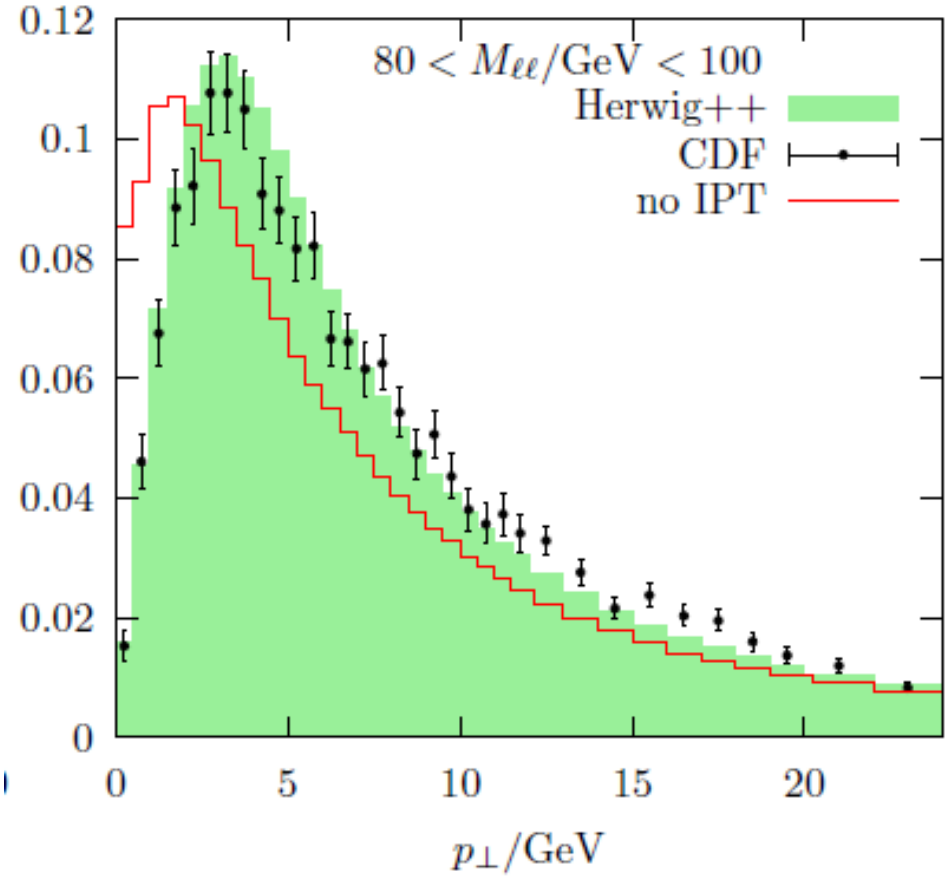
$$(\epsilon_\perp \times q_\perp) F^{\bar{q}q}_{\gamma^*\gamma\pi^0}(Q^2) = \frac{1}{4\pi^3\sqrt{3}} \int_0^1 dx \int \frac{(\epsilon_\perp \times (xq_\perp + k_\perp))}{(xq_\perp + k_\perp)^2 - i\epsilon} \times \Psi(x, k_\perp)\, d^2k_\perp$$

$$\Psi(x, k_\perp) = \frac{4\pi^2 \varphi_\pi(x)}{x\bar{x}\sigma\sqrt{6}} \exp\left(-\frac{k_\perp^2}{2\sigma x\bar{x}}\right)$$

$$\varphi(x) = f_\pi$$

without intrinsic kT

Intrisic Pt @ Tevatron



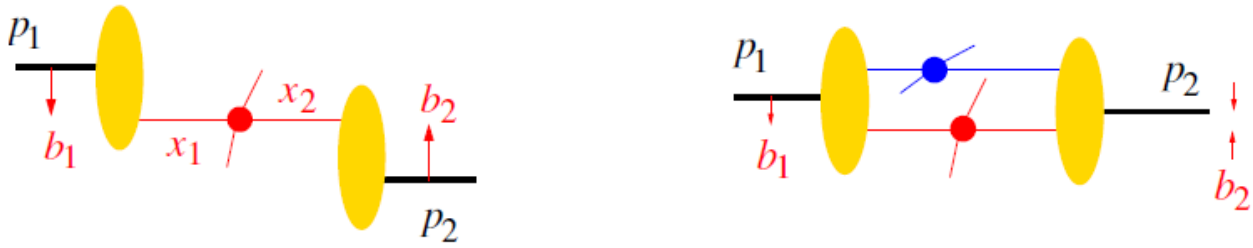
Intrinsic p_T=2.1 GeV >> 0.5 GeV (Fermi motion)

This is a high scale of perturbative origin/ Non-perturbative?

Parton Shower not well known? A lot of modeling needed…

Essential aspects of future LHC measuement also…

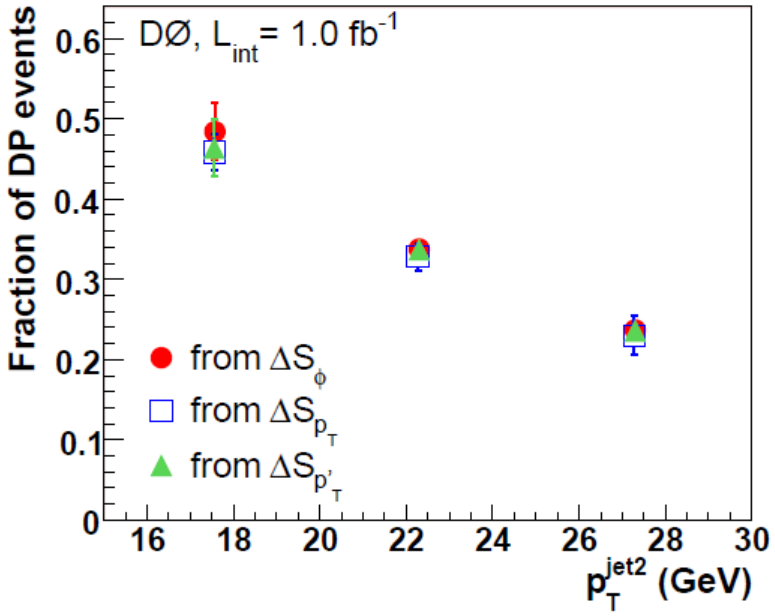
Transverse distributions



double hard interactions

Already at Tevatron double-hard reactions are very relevant

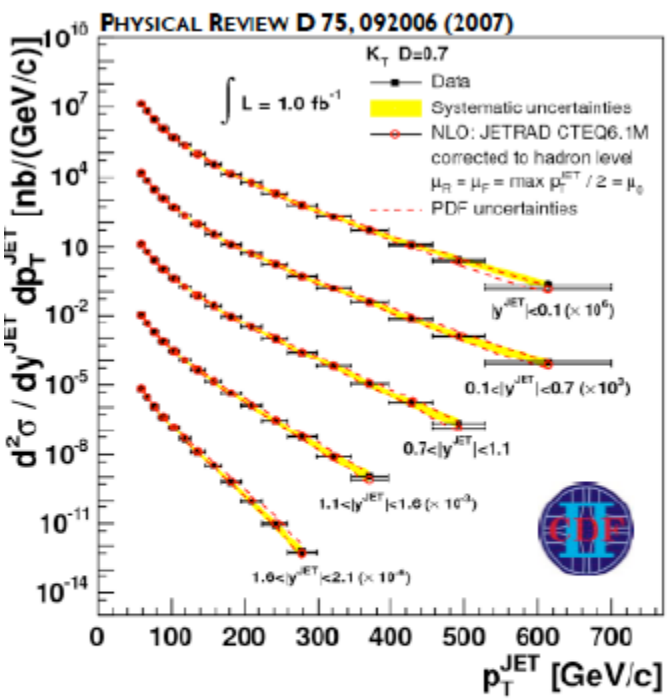
D0 analyzed γ +3 jet relative 2 jet to get the fraction of double hard reactions in $p + \bar{p}$ at $\sqrt{s} = 1.96$ TeV

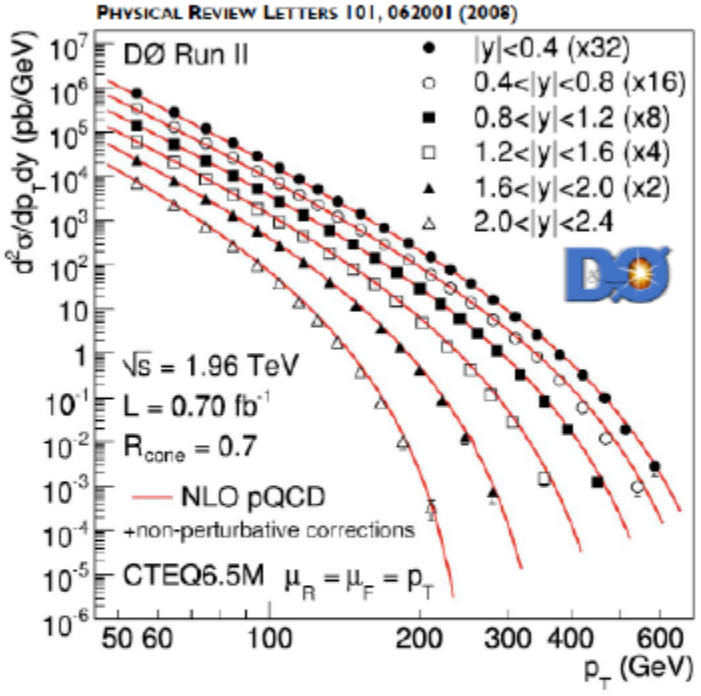


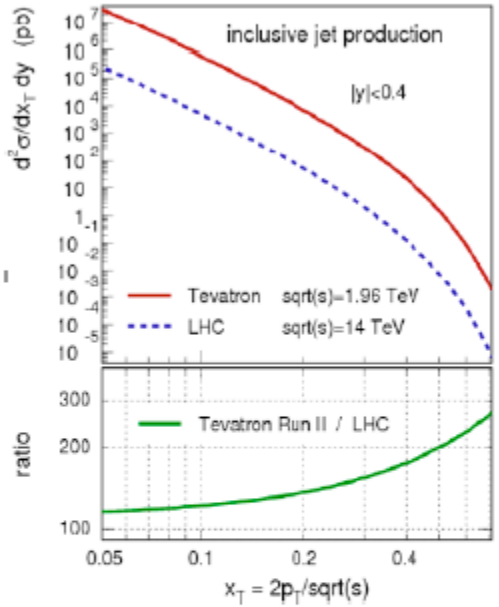
Important non-trivial issue in central collisions (triggered by particle flow)

Some modeling needed

The 'well' known (thanks to 10y work)

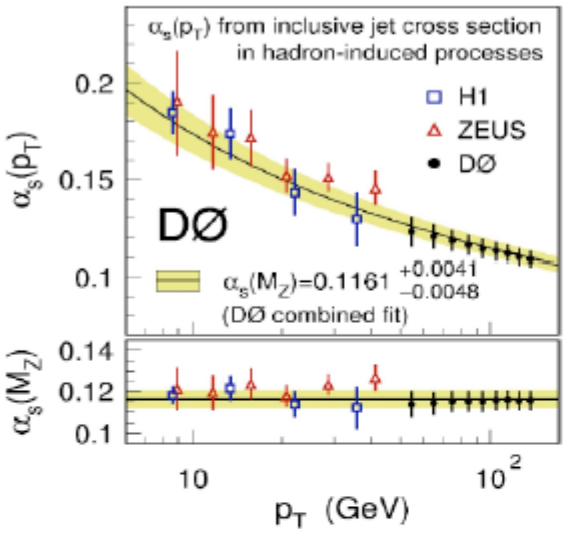


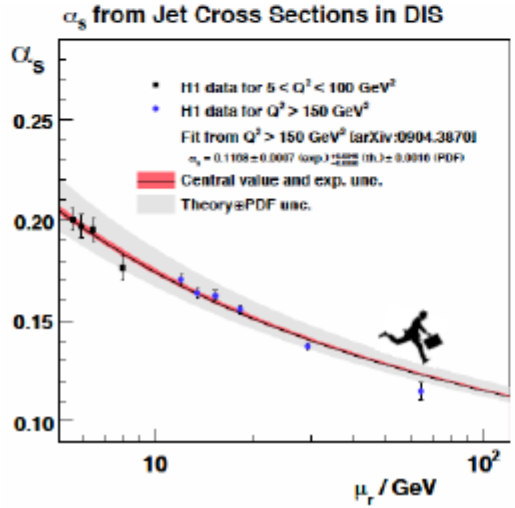




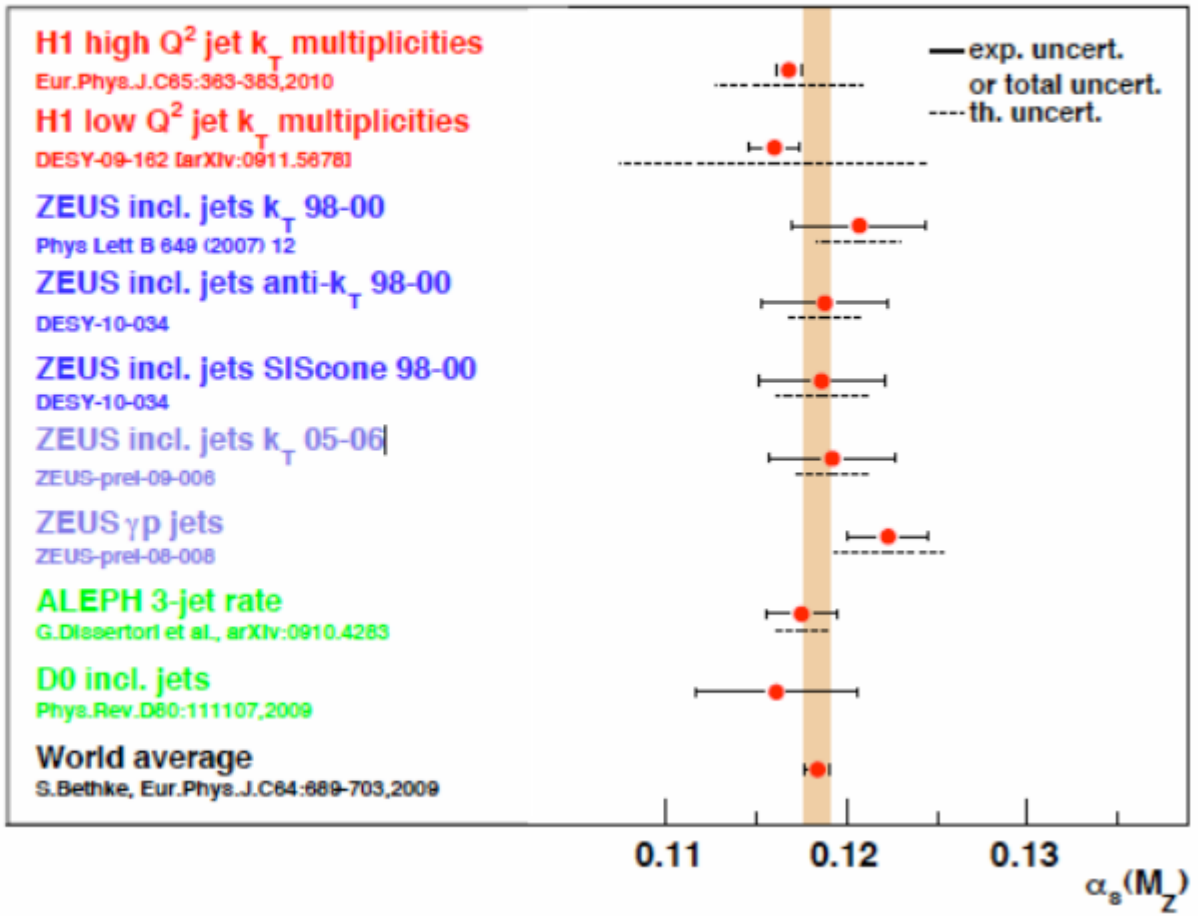
Check QCD at very large PT
Constrain PDF's at large x
Unique sensitivity (not superceded by LHC)

Strong QCD coupling





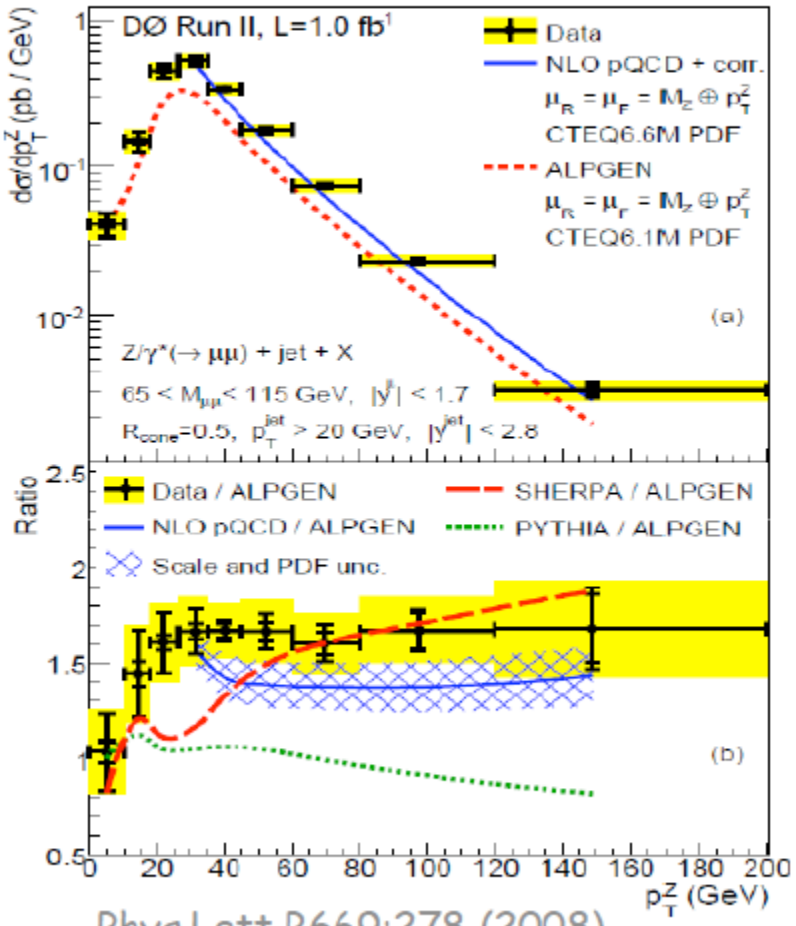
B.Hiroski
G.Grindhammer



More theory (NNLO) needed for DIS

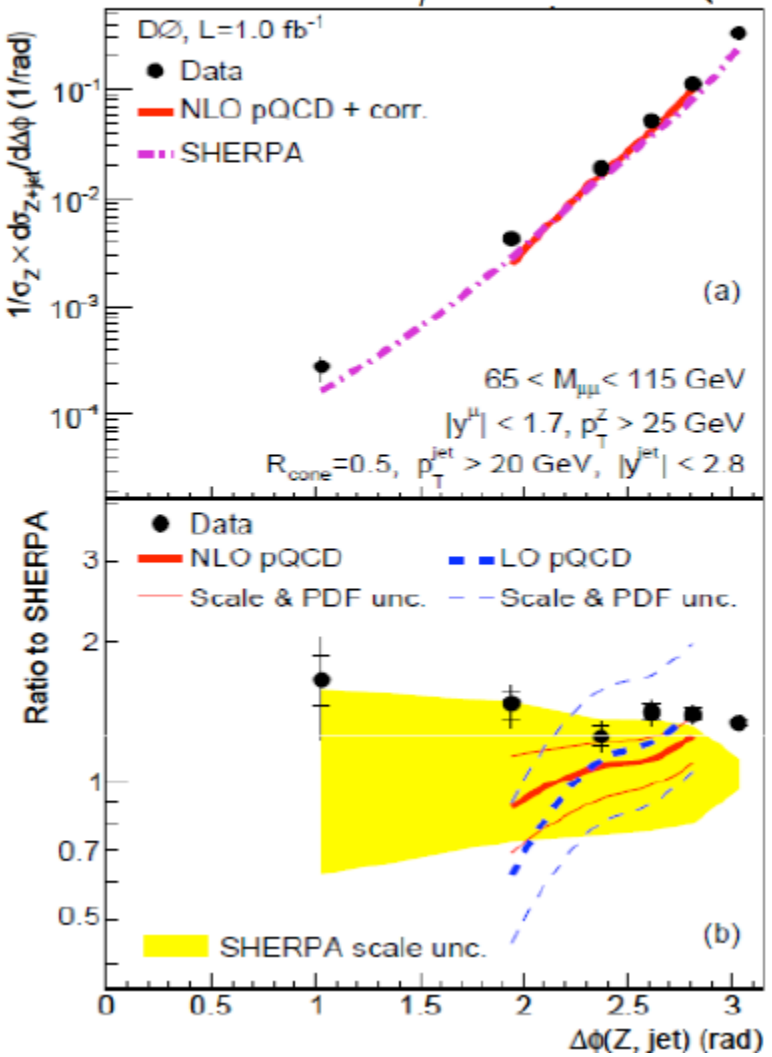
EW bosons as QCD workers

S. Grinstein



Phys.Lett.B669:278 (2008)

Phys.Lett.B682:370 (2010)

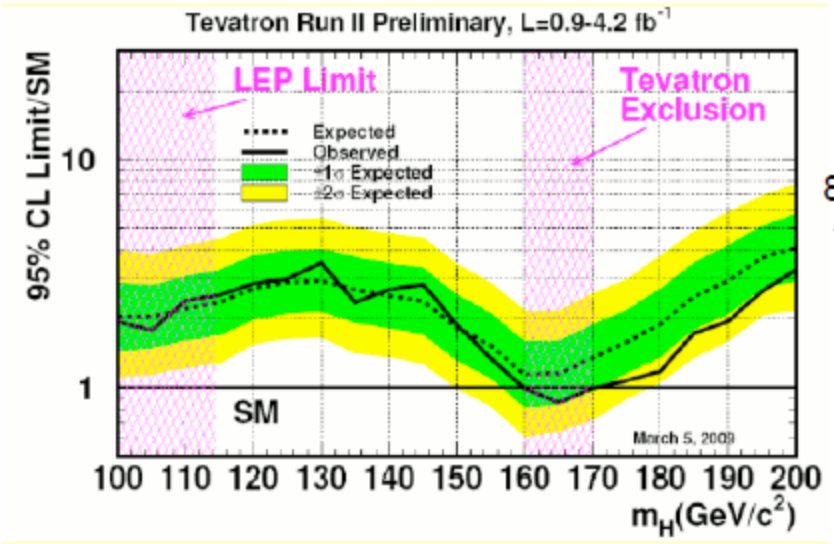


Higgs searched @ Tevatron

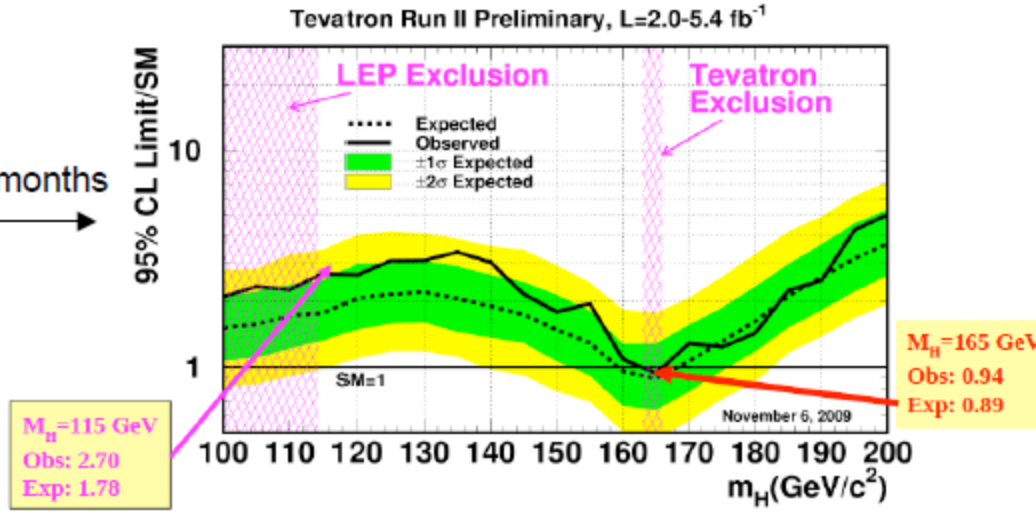
Weiming Yao
Ralf Bernhard
Shalhout Z. Shalhout

First joint CDF&D0 publication on SM Higgs search(PRL 104 061802 2010)

- Set 95% CL mass exclusion: $162<m_H<166$ GeV/c_2 ($159<m_H<169$ expected)

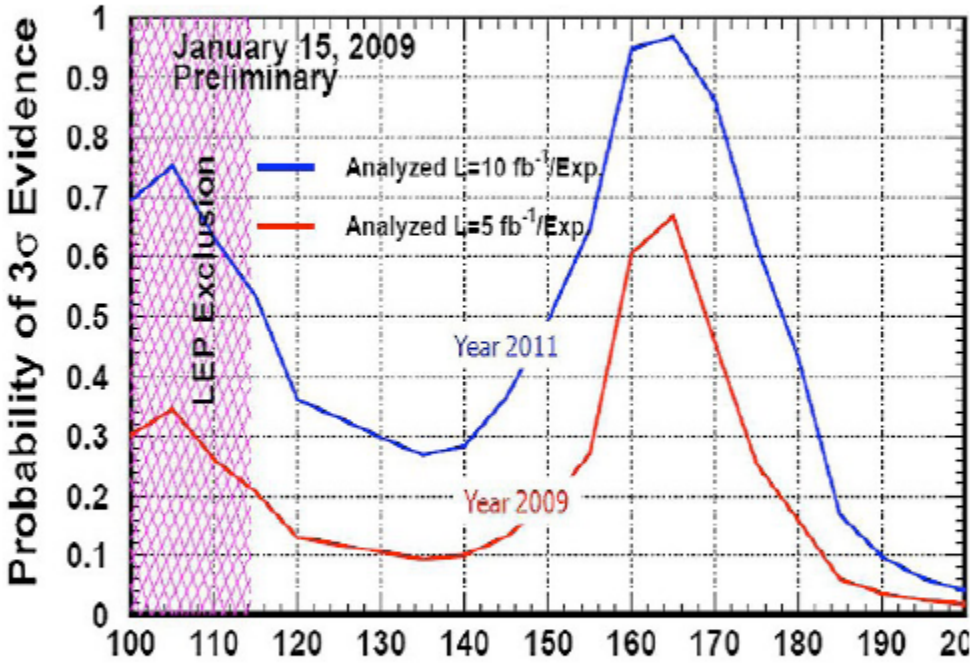


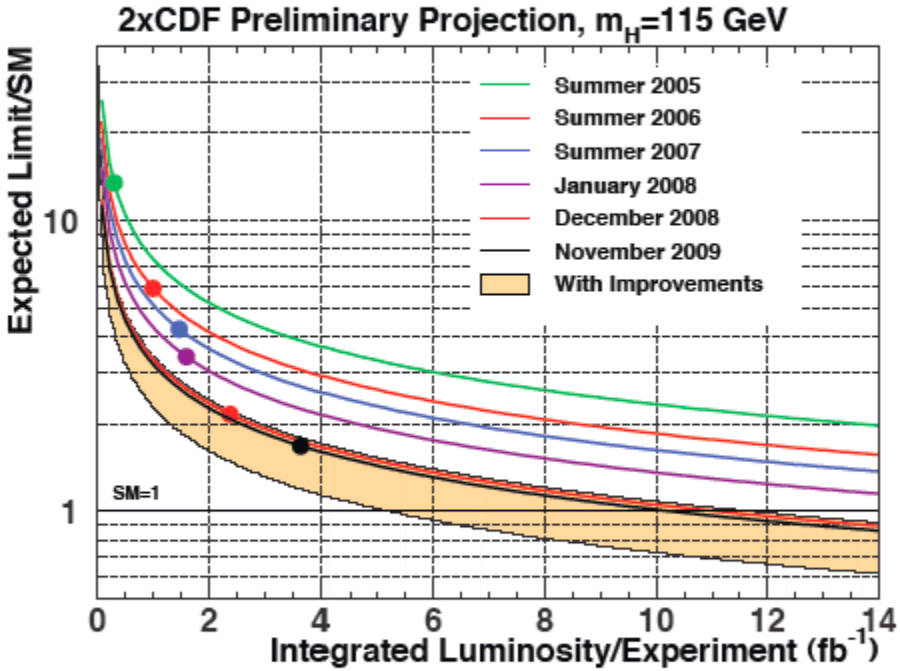
8 months



Since march 2009:
The sensitivity improved: work on many channels,
Grab as much sensitivity as possible (even 1/100 is useful)
Slight excess, exclusion domain reduced.

Higgs prospects

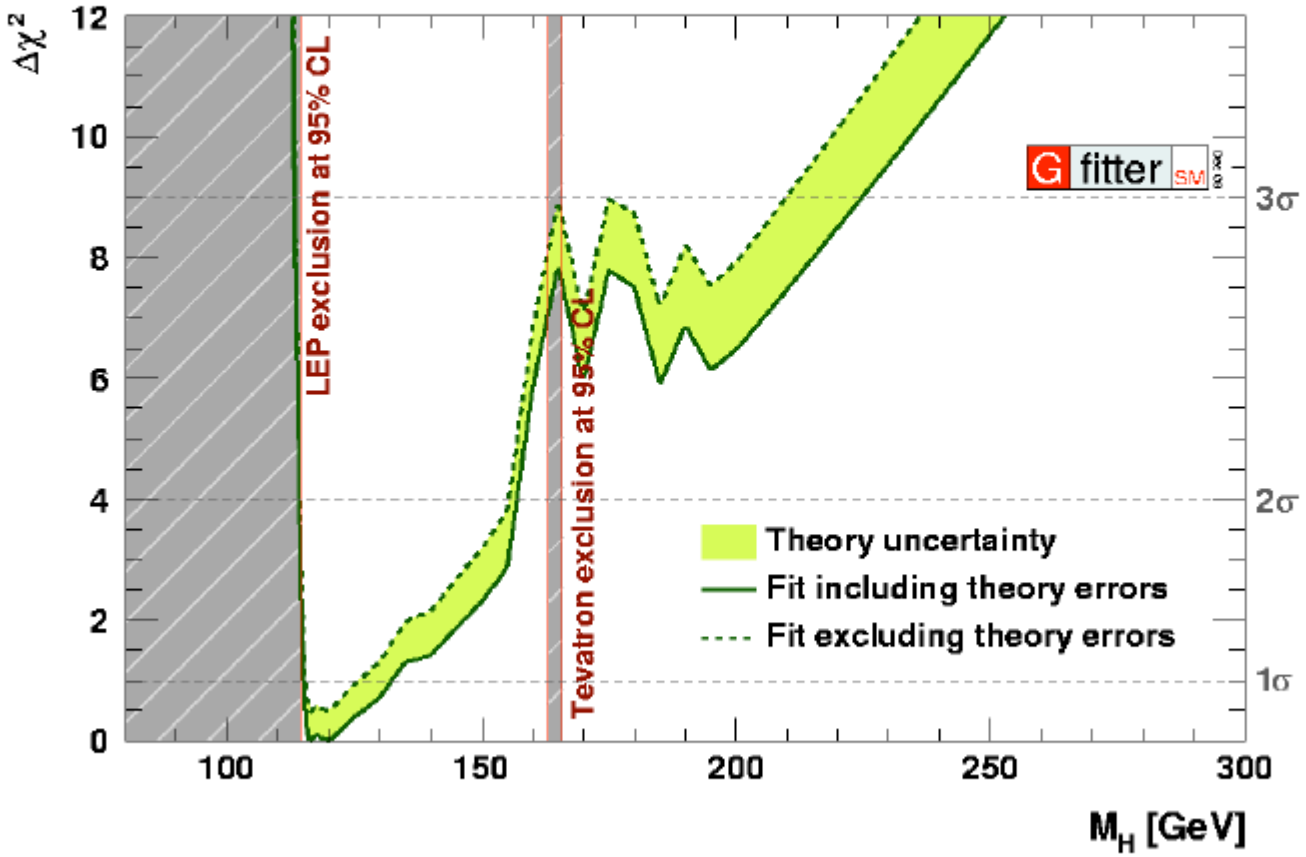




Large data sets accumulated in the last/next 18 months may lead to another “step”
Exciting times ahead!

Higgs from precision fits

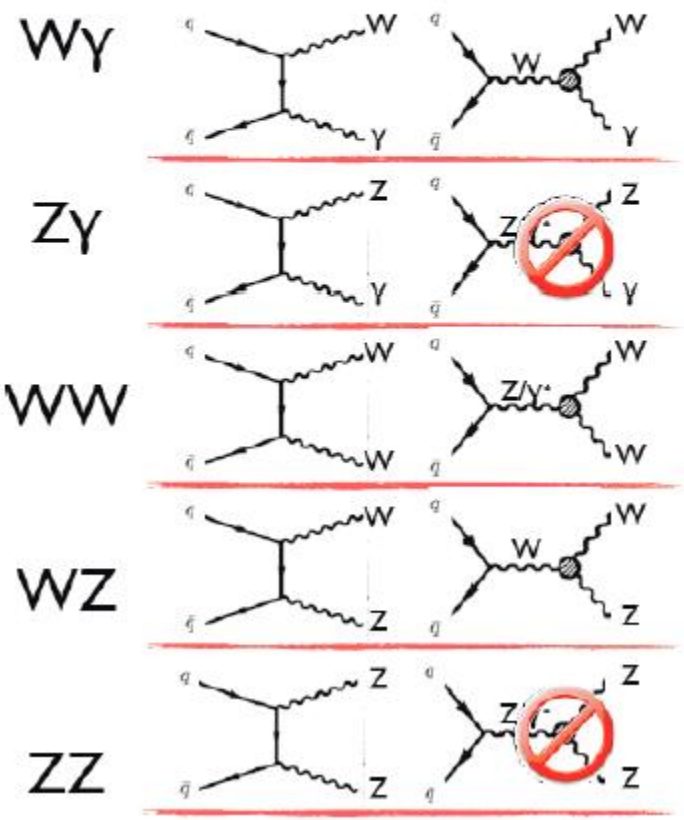
Johannes Haller

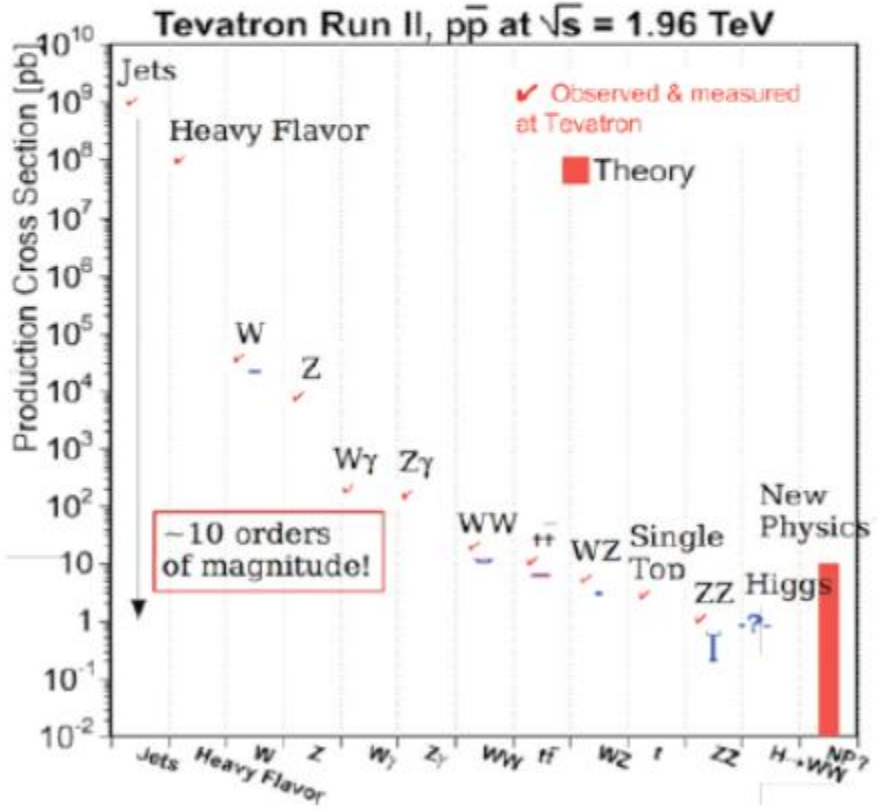


Di-bosons @ Tevatron: a wide physics program already achieved

Direct probe into the gauge structure of the SM
Benchmark for experimental capabilities (Higgs)
New Physics effects

Vadim Rusu

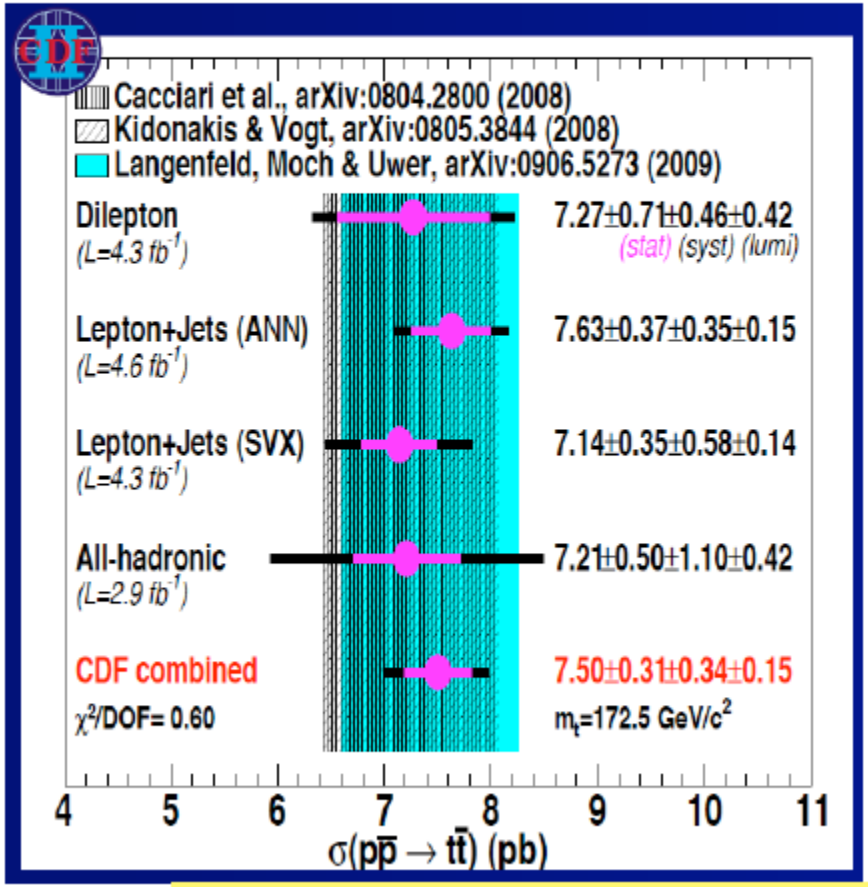


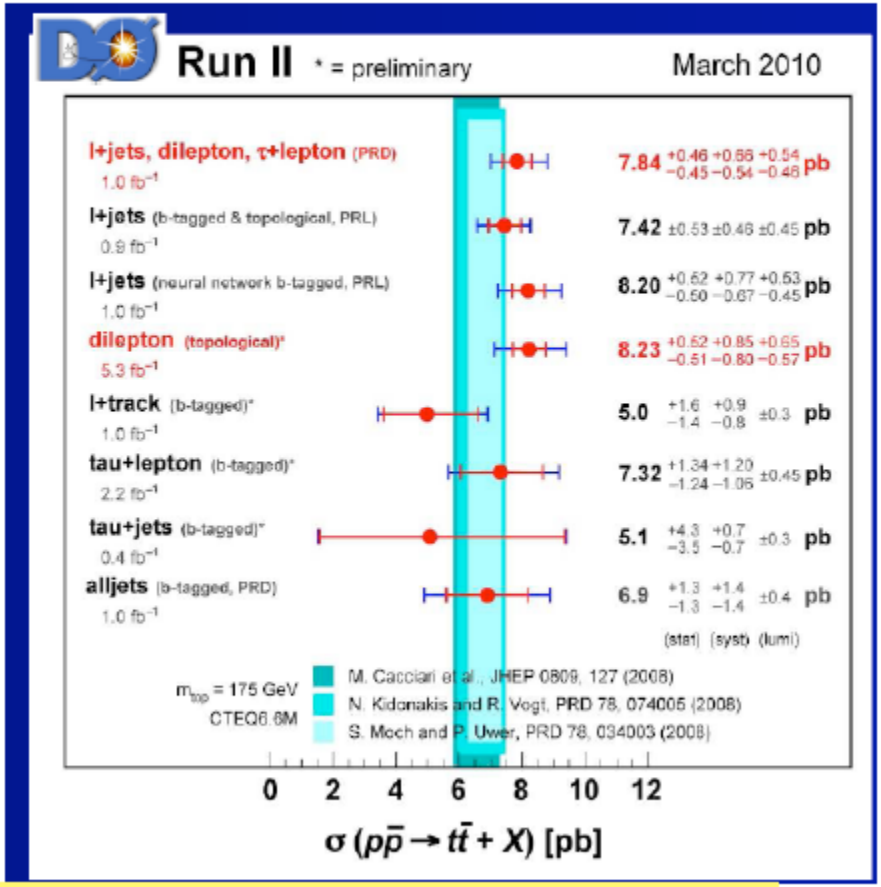


Top physics @ Tevatron

Michael Begel

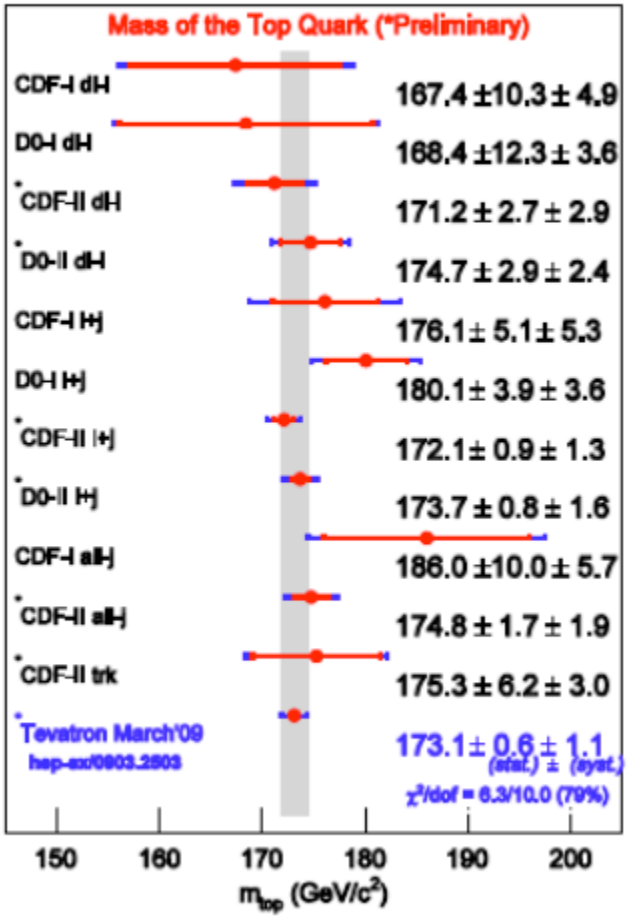
12 new measurements (1-5 fb^{-1}) released in the last year





Inclusive $t\bar{t}$ production cross section known to $\sim$ 6.5%

top mass (news)



$m_{top} = 173.1 \pm 1.3$ GeV/c²

Hyunsu Lee

New measurements

CDF LJ (ME) =172.8 ± 1.3 GeV/c²

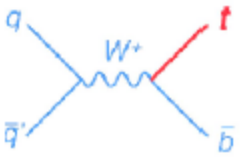
CDF LJ (TM) =172.1 ± 1.5 GeV/c²

CDF DIL(TM) = 170.6 ± 3.8 GeV/c²

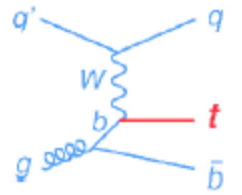
Precision to 1.3 GeV (0.75%)
from single measurements

Single top

Arán García-Bellido
Nathan Goldschmidt



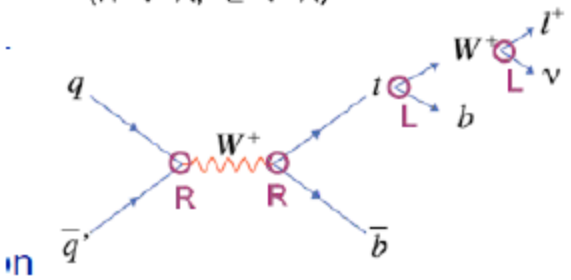
s-channel
$\sigma(tb)=0.88\pm0.05$pb

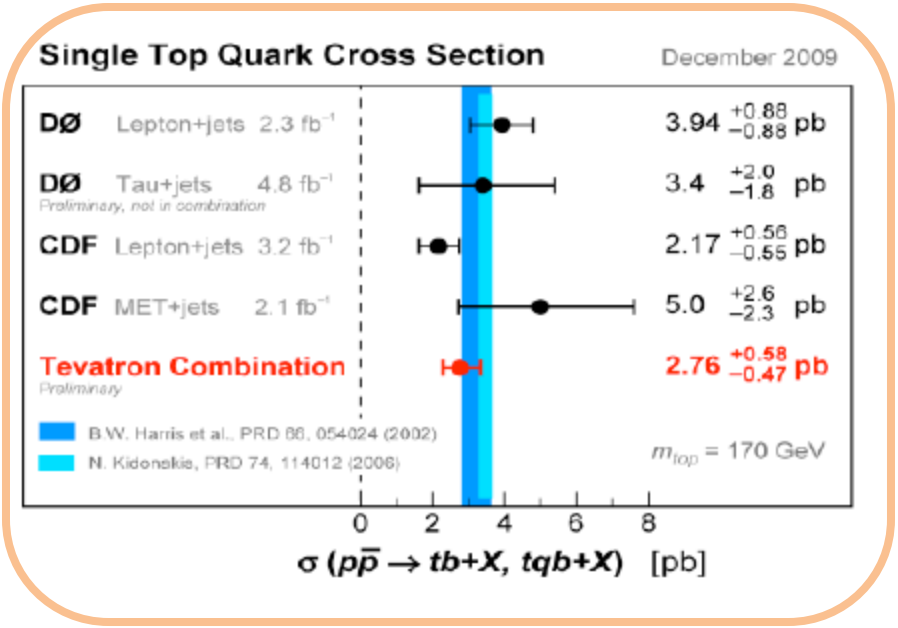


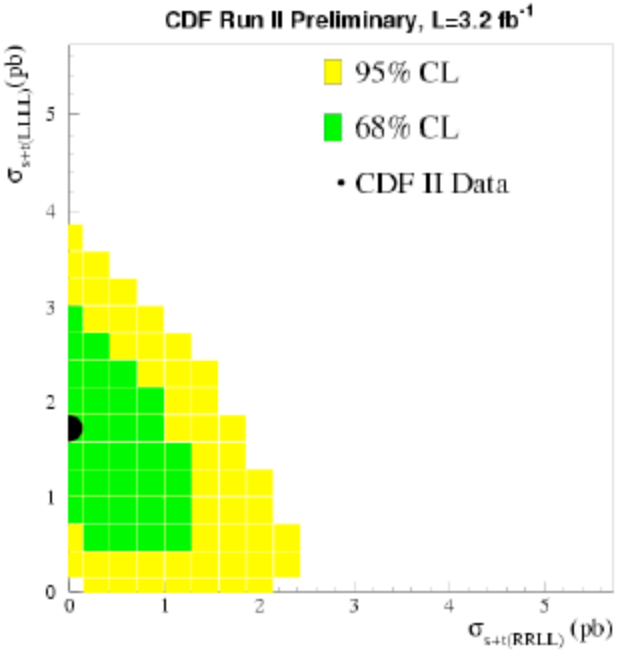
t-channel
$\sigma(tqb)=2.34\pm0.13$pb

Surgery of the single top production:
s/t cross sections, polarisation, width, searches
Amazing program!

(R: V+A, L: V−A)

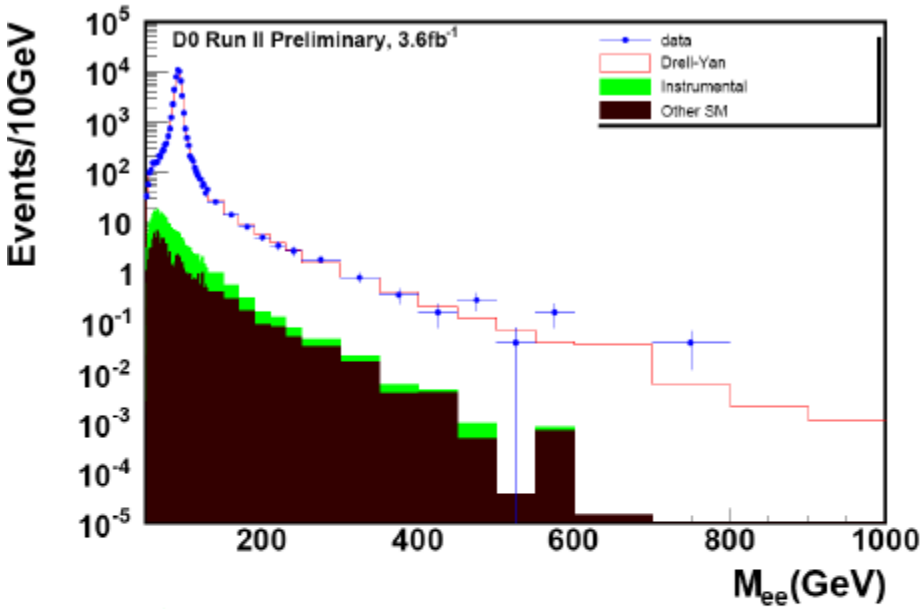


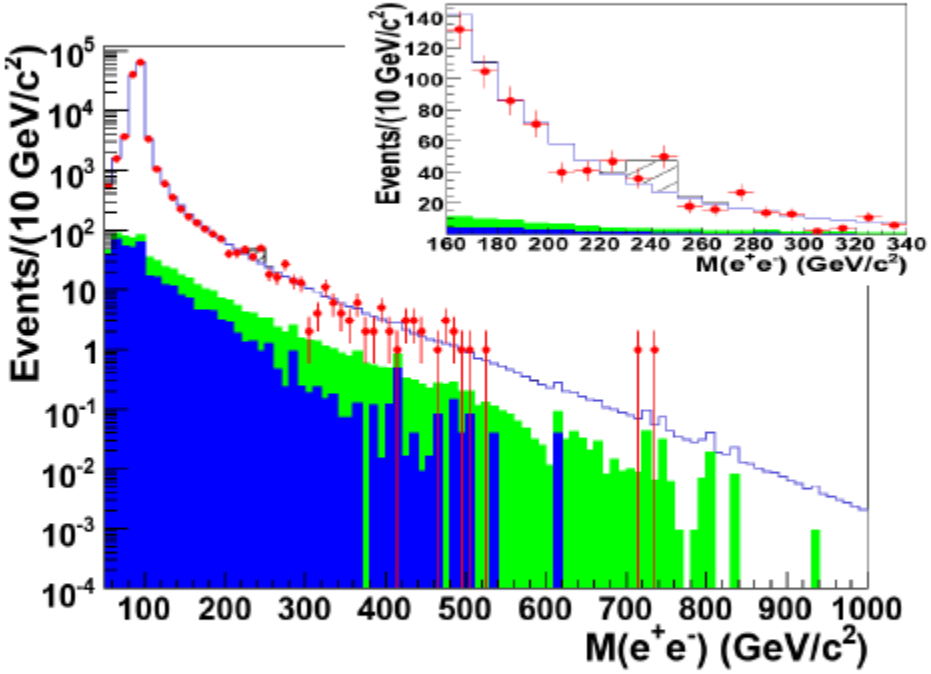


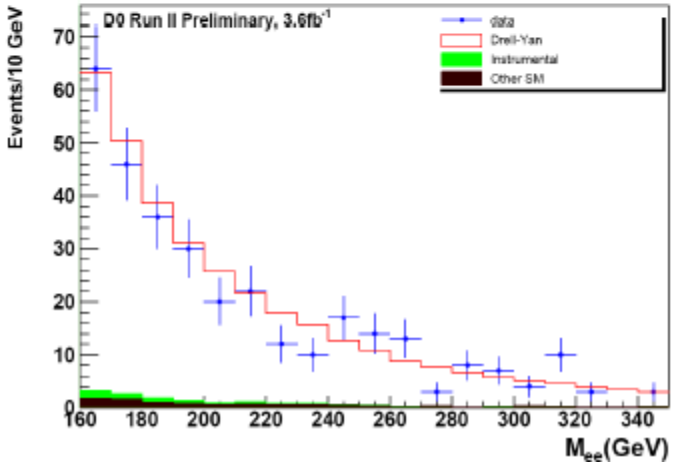


Di-electron resonances

- ee resonance → new Z' boson ?





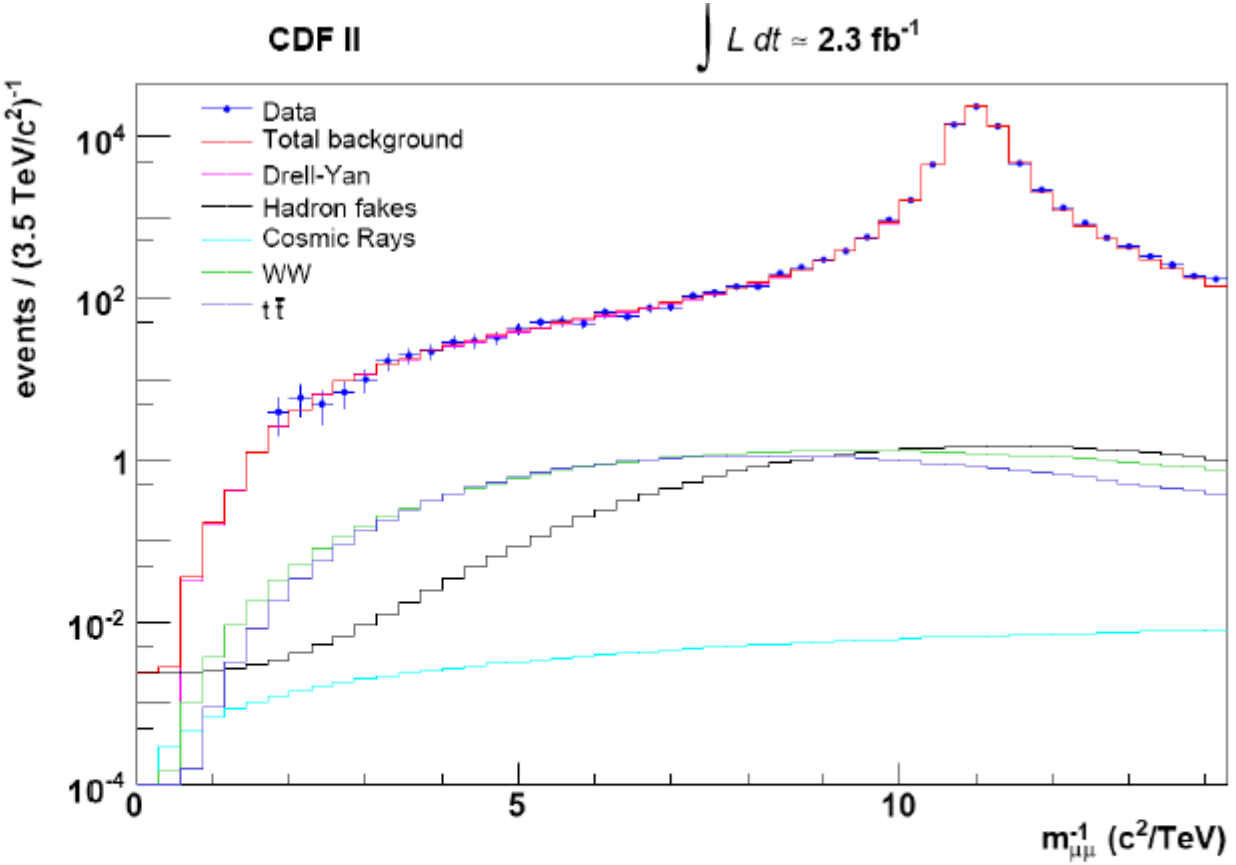


→ CDF fluctuation at 240 GeV not confirmed by D0

→ $M_{Z'} < 963$ GeV excluded.

Di-muon resonances

- Use m^{-1} for a constant resolution



➔ Data well described

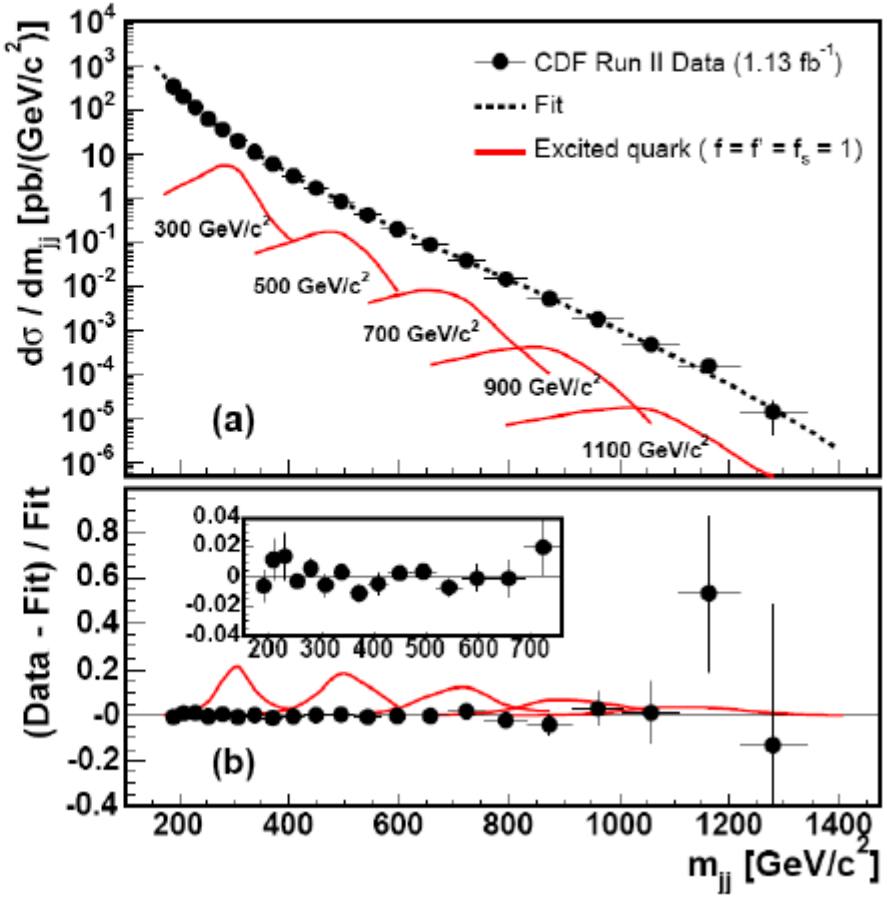
➔ Z' excluded up to 1030 GeV

➔ Limits set also on other models

Di-jet resonances

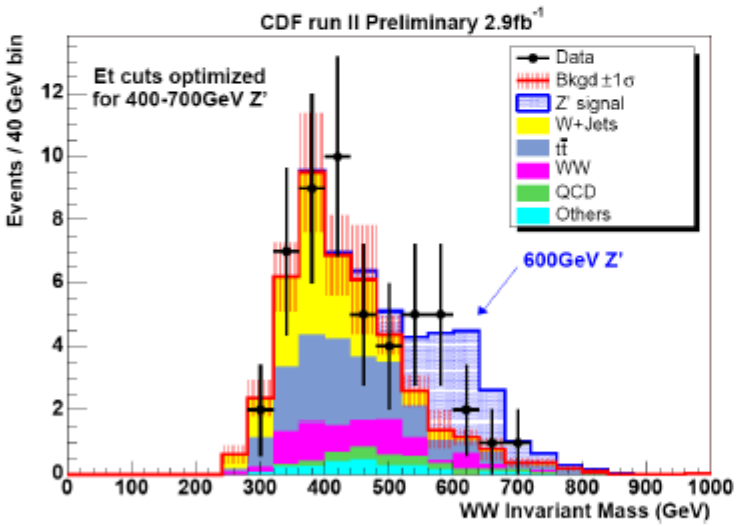
- Investigate the di-jet distribution
- Poorer resolution than for leptons
- Large QCD background

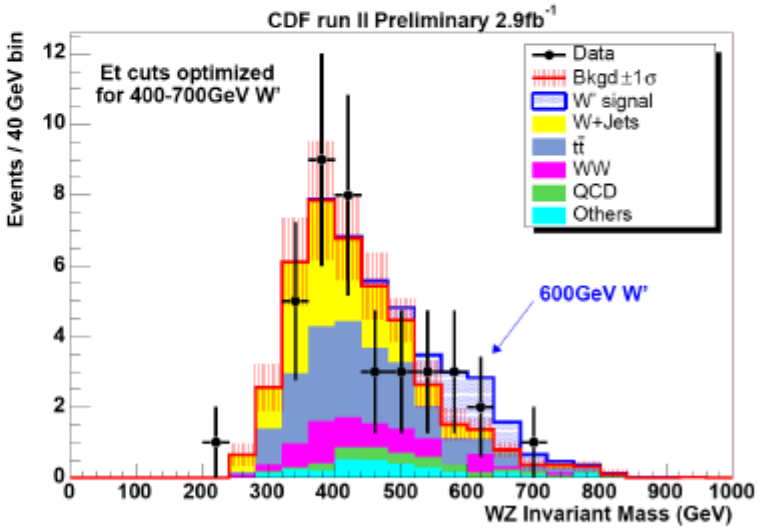
  - ➔ Good agreement with NLO pQCD predictions
  - ➔ Excited quarks excluded up to 870 GeV (f=f'=fs)
  - ➔ W' up to 840 GeV
  - ➔ Z' up to 740 GeV



Heavy resonances: X-> VV

- Search for X → WW/WZ → (eν)(jj) by CDF
- Analysis based on SM di-boson production studies
  - → Look for possible excess (e + 2 jets + MET)
- Selection: → W → eν with 2 solutions
  - → di-jets in [65,95] for WW
  - → di-jets in [70,105] for WZ





- → Small fluctuation in WW at ~ 600 GeV
- → Limit set within different models

Brief² summary