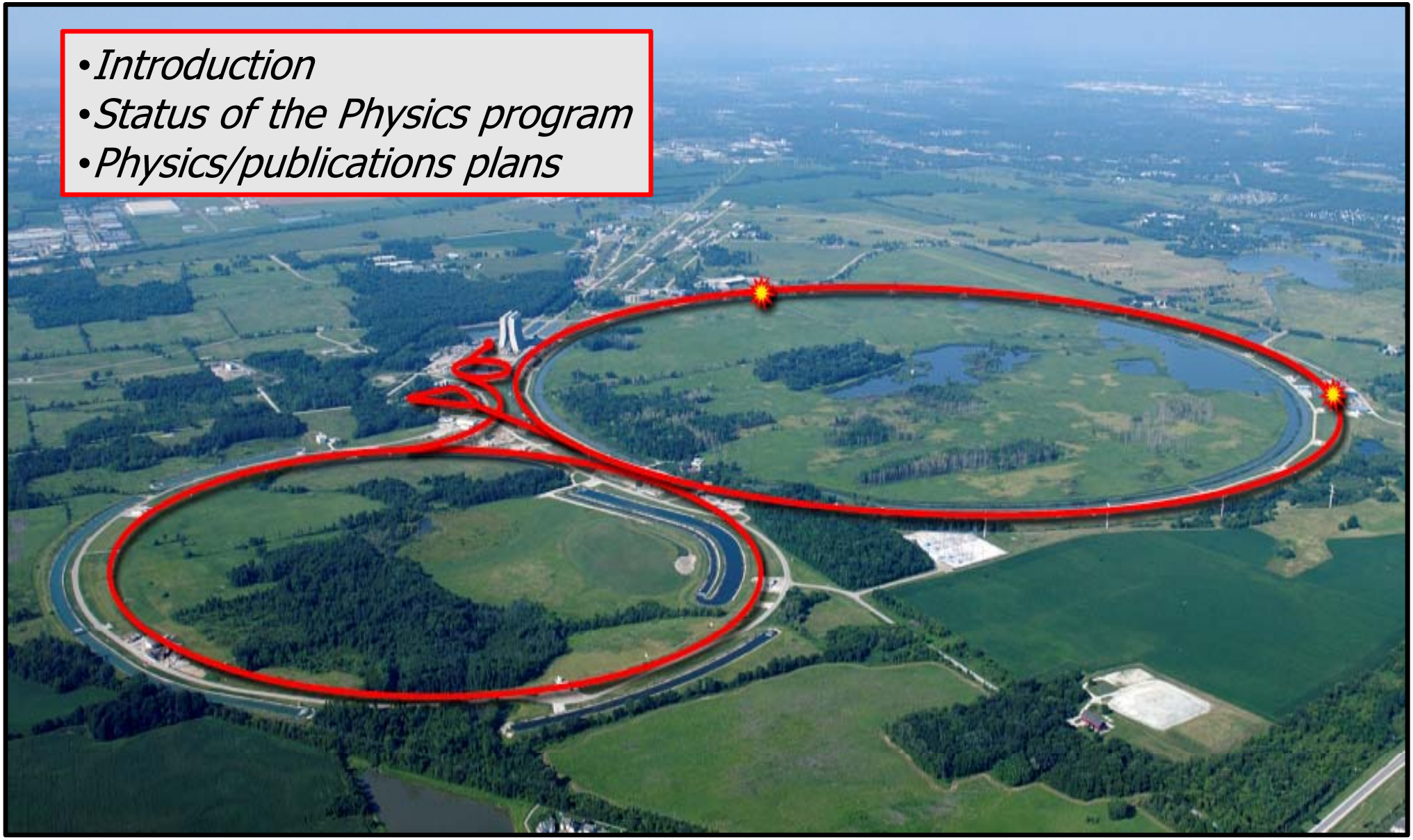
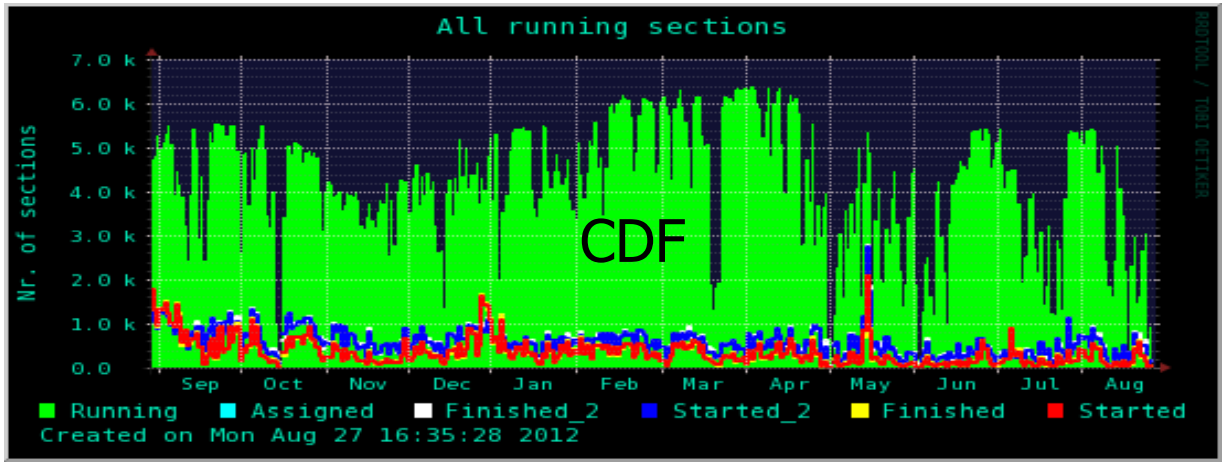
Tevatron Physics Status and Plans



Gregorio Bernardi, **Dmitri Denisov, Luciano Ristori, Costas Vellidis,**
on behalf of the D0 and CDF collaboration,
HEPAP, November 5th 2012

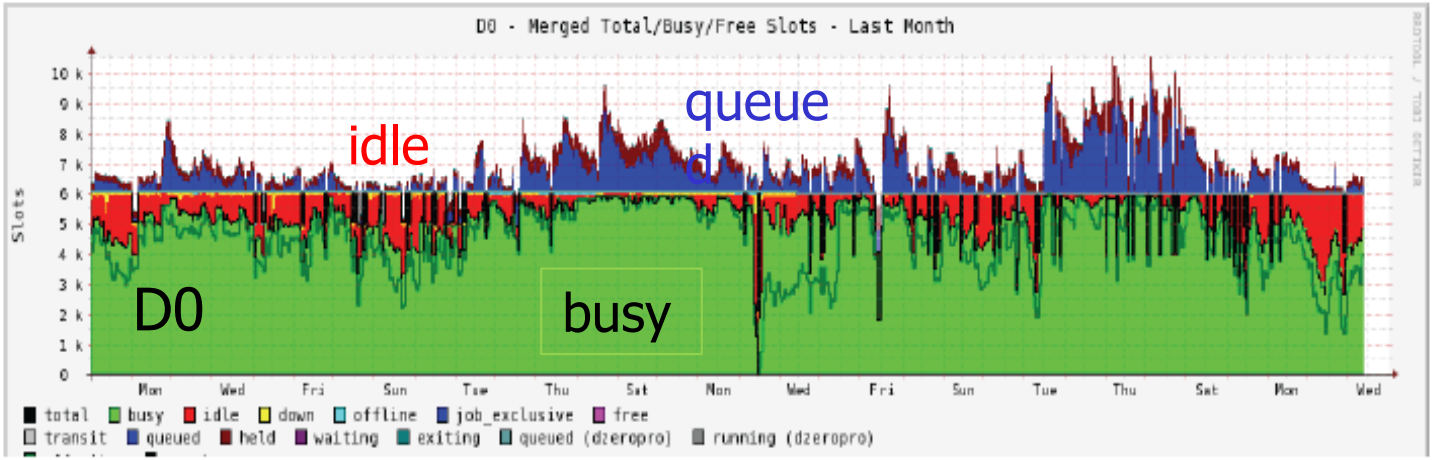
Data and Computing resources

- 15B+9B events total in Run II
- Total dataset 9.5+9 PB (including Monte Carlo)
- Computing resources are well matched to analysis effort
- Constant load of Grid resources over the last year shows the continuous analysis effort



D0 Computing Farm, 6000 CPU

Recent Usage: 88%



Monte Carlo generation

- Effective use of GRID resources
- ~50 million events per week generated

Data Preservation

Data preservation is an important goal of the two collaborations.

The most important aspect is the publication of all results obtained in physics, algorithms and detectors groups

Access to the data will be preserved for about five years after the end of the data taking, including support of analysis software and Monte Carlo generation

Working on preserving other elements of the accumulated information
- About 16000 notes at CDF and DZero
- Agenda server with 10,000's of talks
- Local Web pages

Special CDF and DZero task forces presented their reports to the Lab in August 2012

In the process of developing detailed plan between CDF, DZero, and Fermilab, not only to preserve the data but also the knowledge on how to look at it successfully.

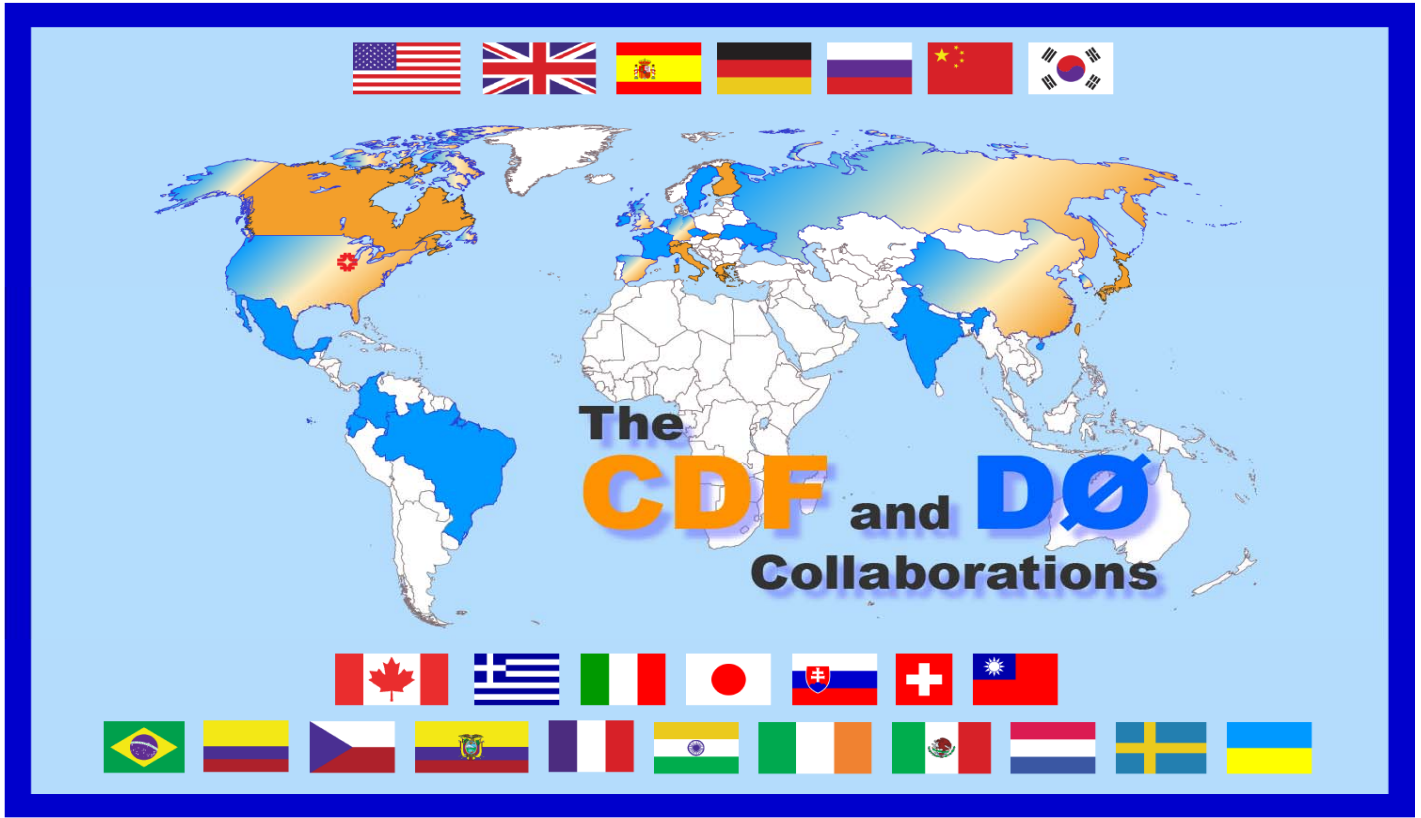
Gregorio Bernardi / LPNHE-Paris

Collaborations Status

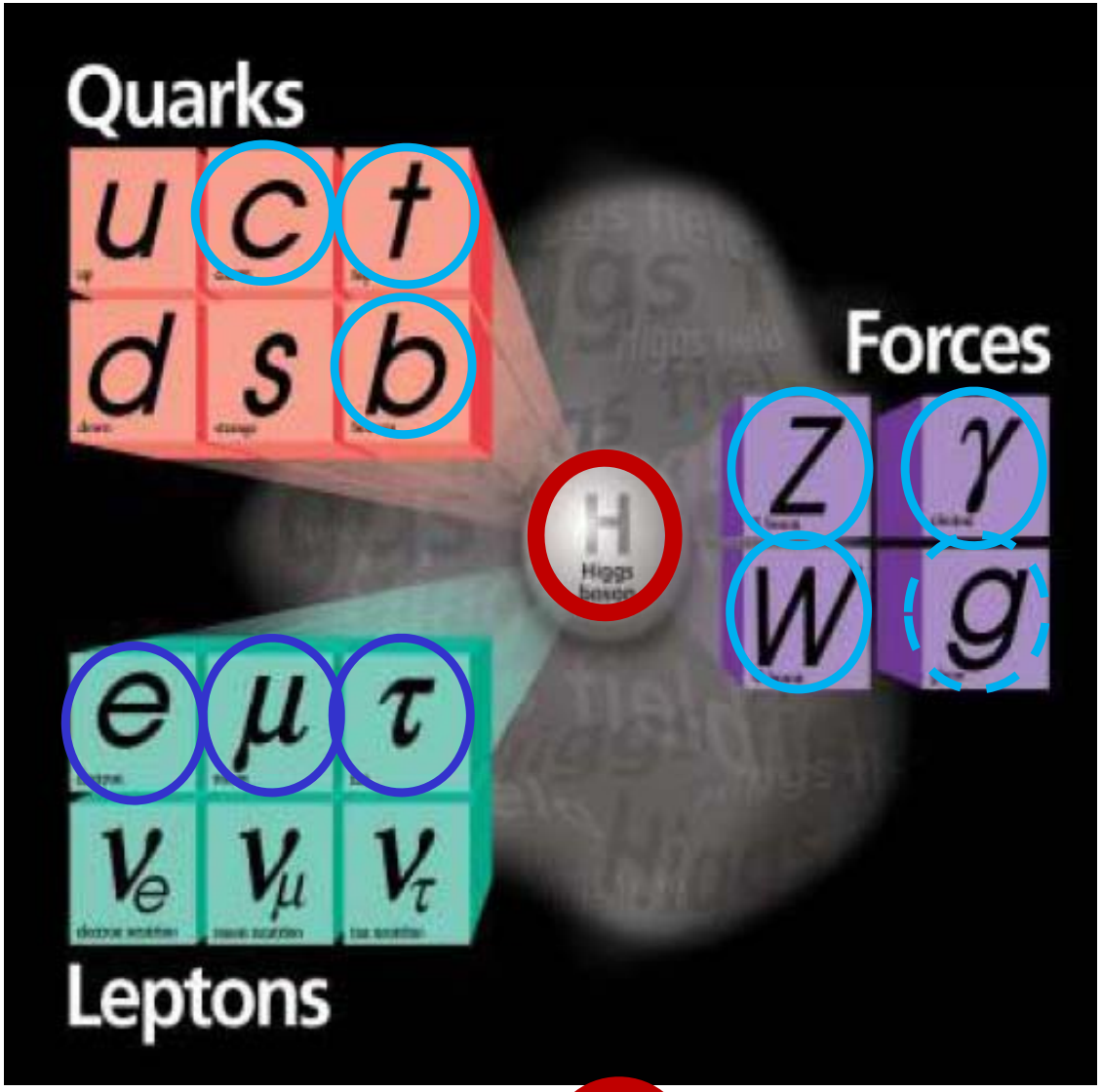
Both CDF and DZero Collaborations have commitments to accomplish the remaining list of exciting results to come from the Tevatron.
Analysis infrastructure and algorithms are well developed

CDF	CY2010	CY2011	CY2012	CY2013	CY2014
Totals FTEs	280	260	~160	~90	~40
DZero	**CY2010**	**CY2011**	**CY2012**	**CY2013**	**CY2014**
Totals FTEs	258	218	~170	~110	~50

~45+50 Ph.D students currently working on their theses at CDF +DZero

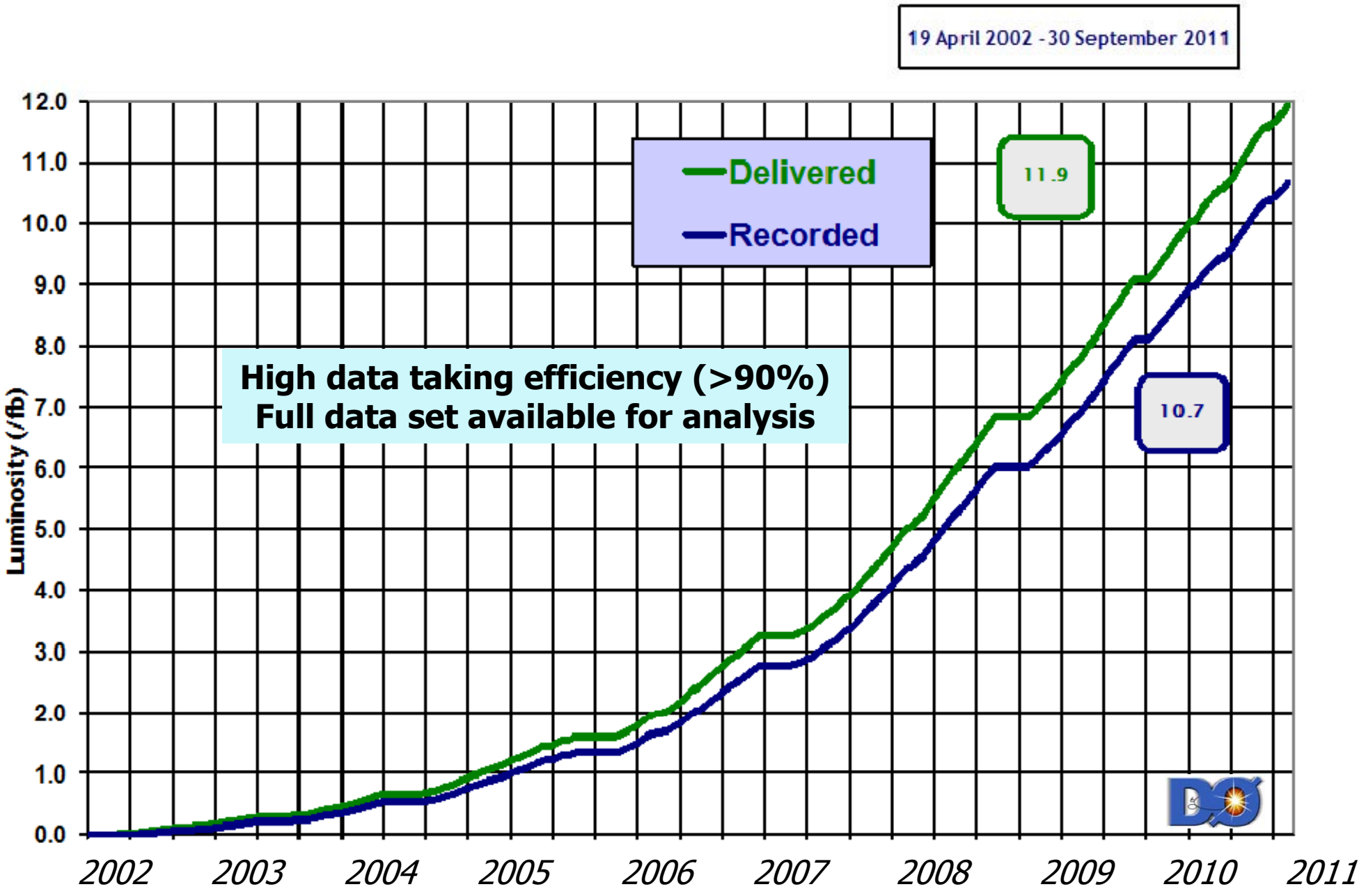


Physics: we're going strong!



Now measuring it!

Tevatron provided a great dataset



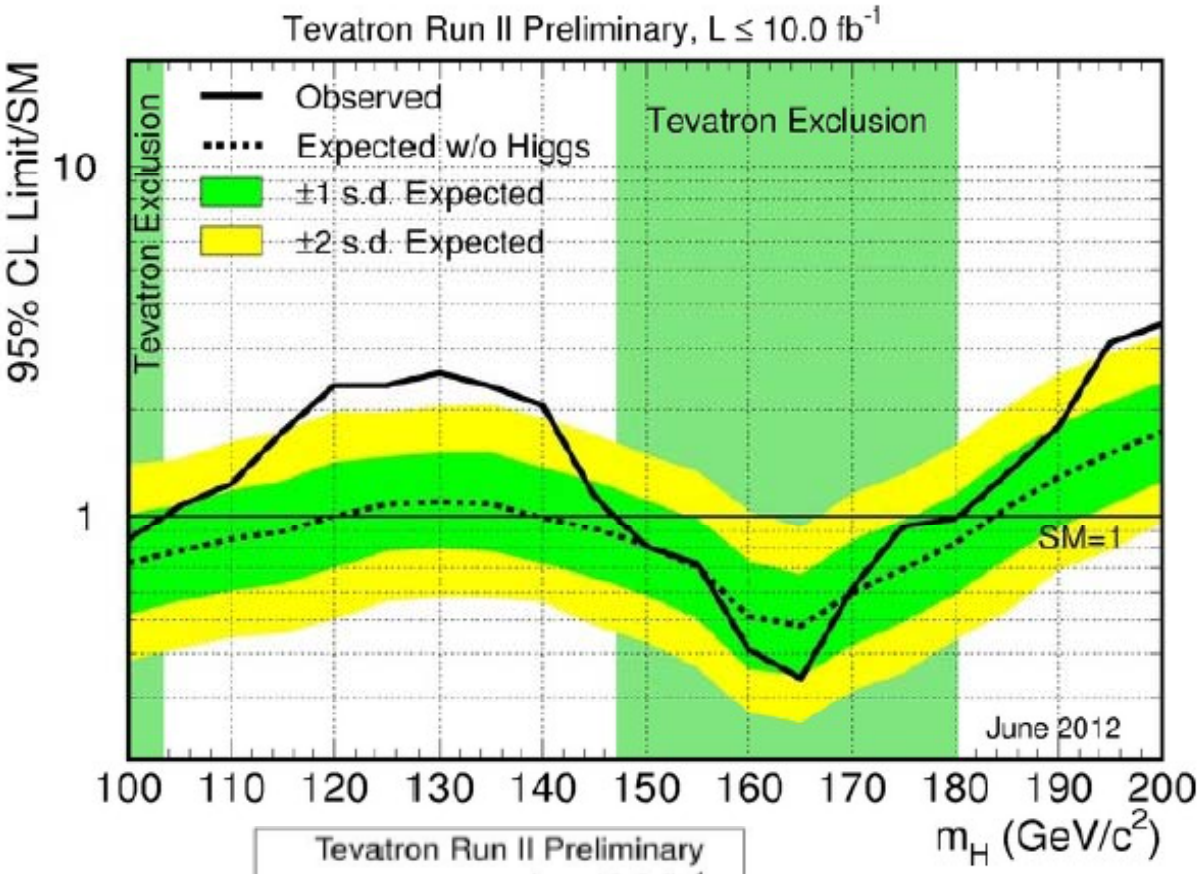
Run Stopped September 30th 2011…

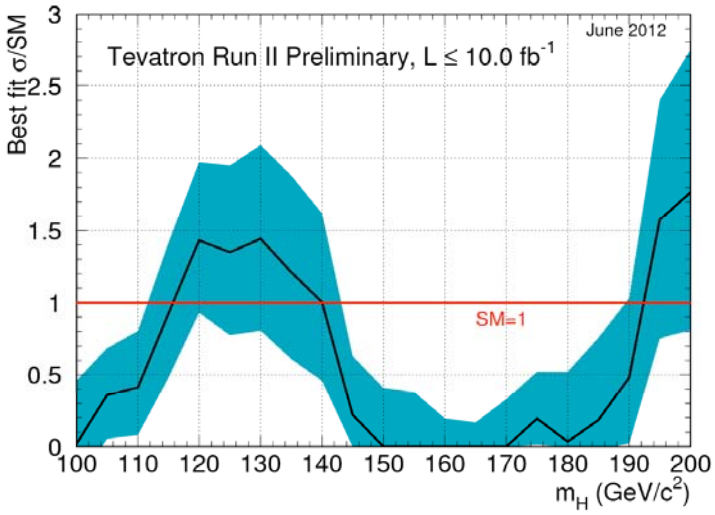
July 2nd 2012…less than a year later

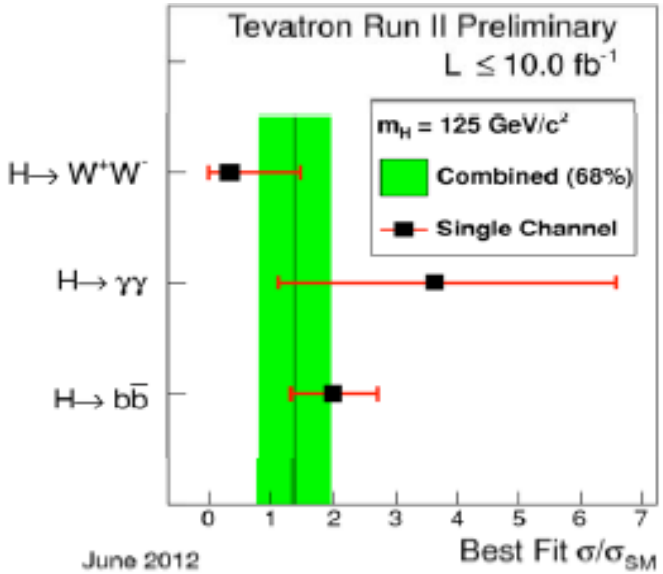
We confirmed on full statistics with a ~3σ excess around 120-130 GeV the 2.4σ excess presented in March 2012 on a smaller statistics.

Rate compatible with SM Higgs
In all sub-channels

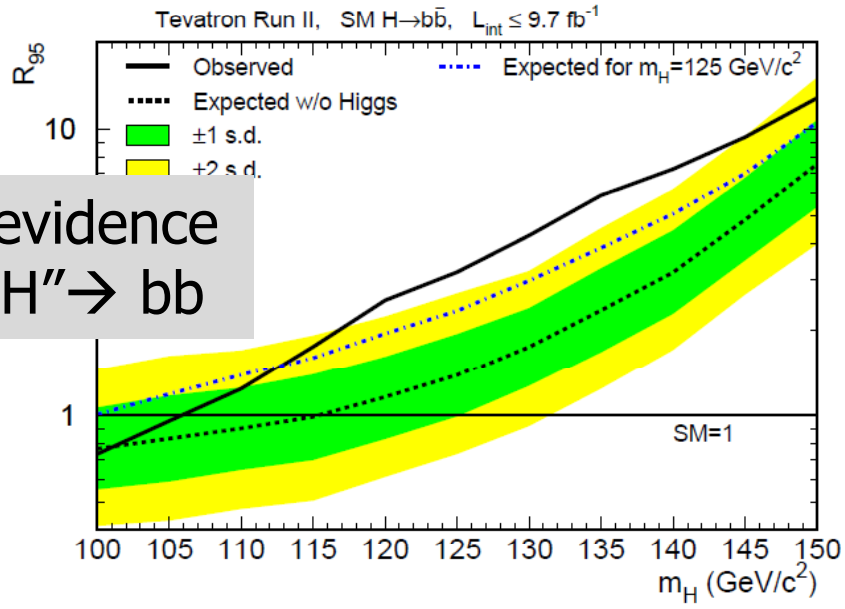
Most significant in H→bb







Fermionic decays of the Higgs-like particle

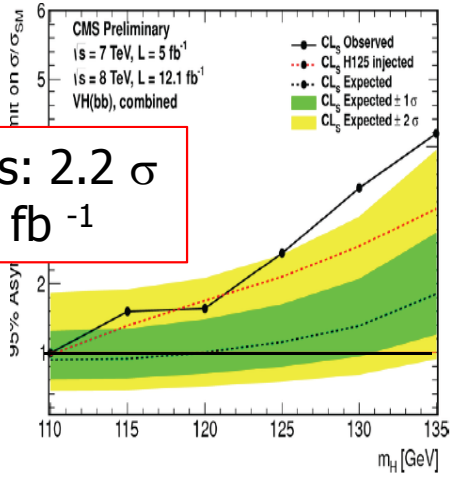


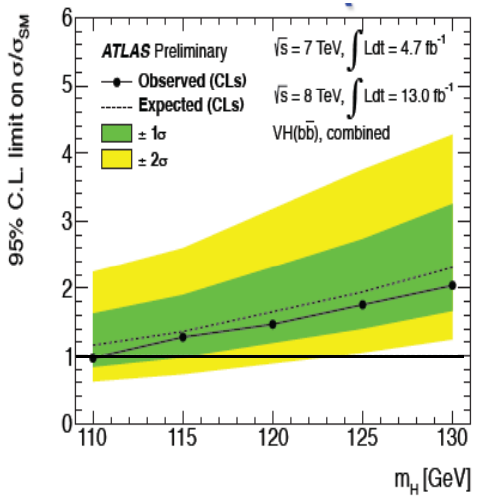
3 σ evidence for "H"→ bb

Submitted July 2012

November 2012:

CMS indications: 2.2 σ @125 GeV / 17 fb $^{-1}$





ATLAS sensitivity ~1.5 times lower (using 18 fb $^{-1}$) data deficit vs background (mu=-0.4 +/-1.1)

More than half of the total statistics has already been analyzed at LHC
Expected sensitivity will remain limited in this channel at LHC until the 2015

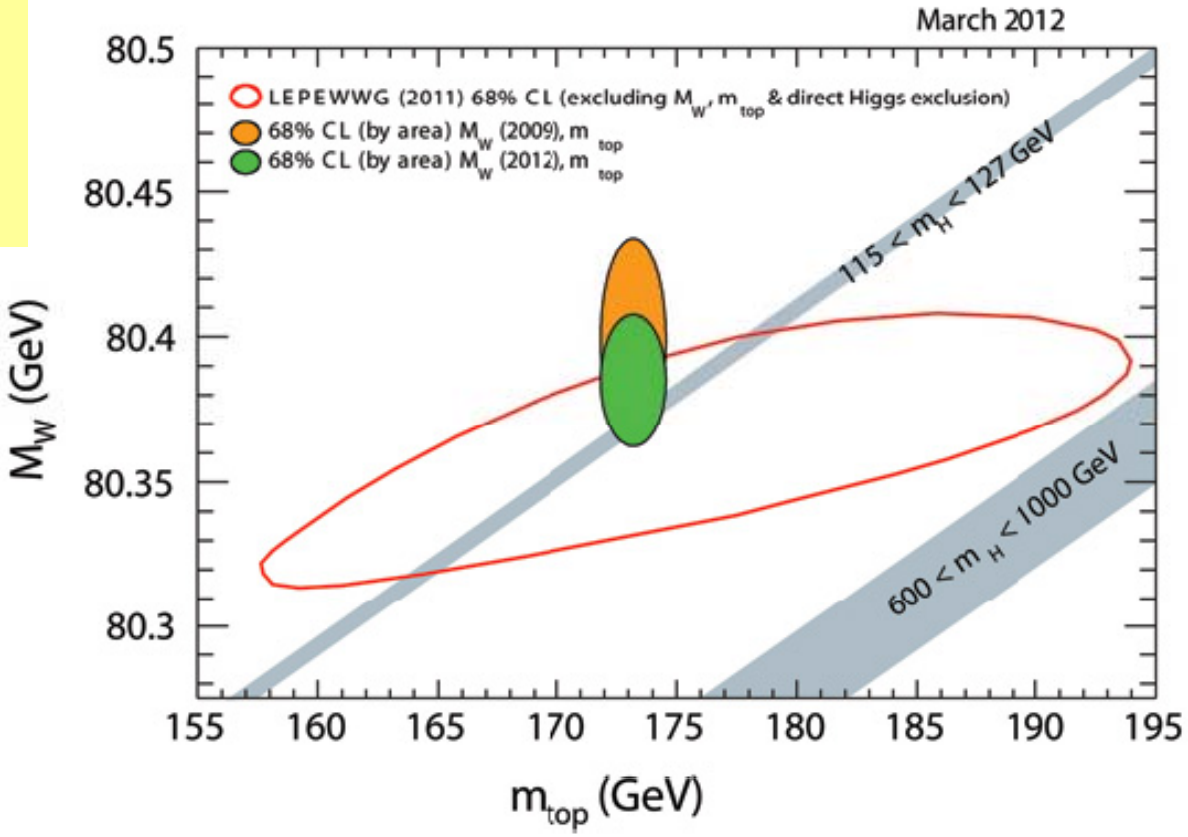
Tevatron provides important complementary information

Indirect SM Higgs constraints

Recently updated top quark and W boson mass measurements from the Tevatron

$m_W = 80385 \pm 15$ MeV

$m_t = 173.2 \pm 0.9$ GeV



The particle discovered at the LHC and seen at the Tevatron looks like the SM Higgs also from the indirect point of view.

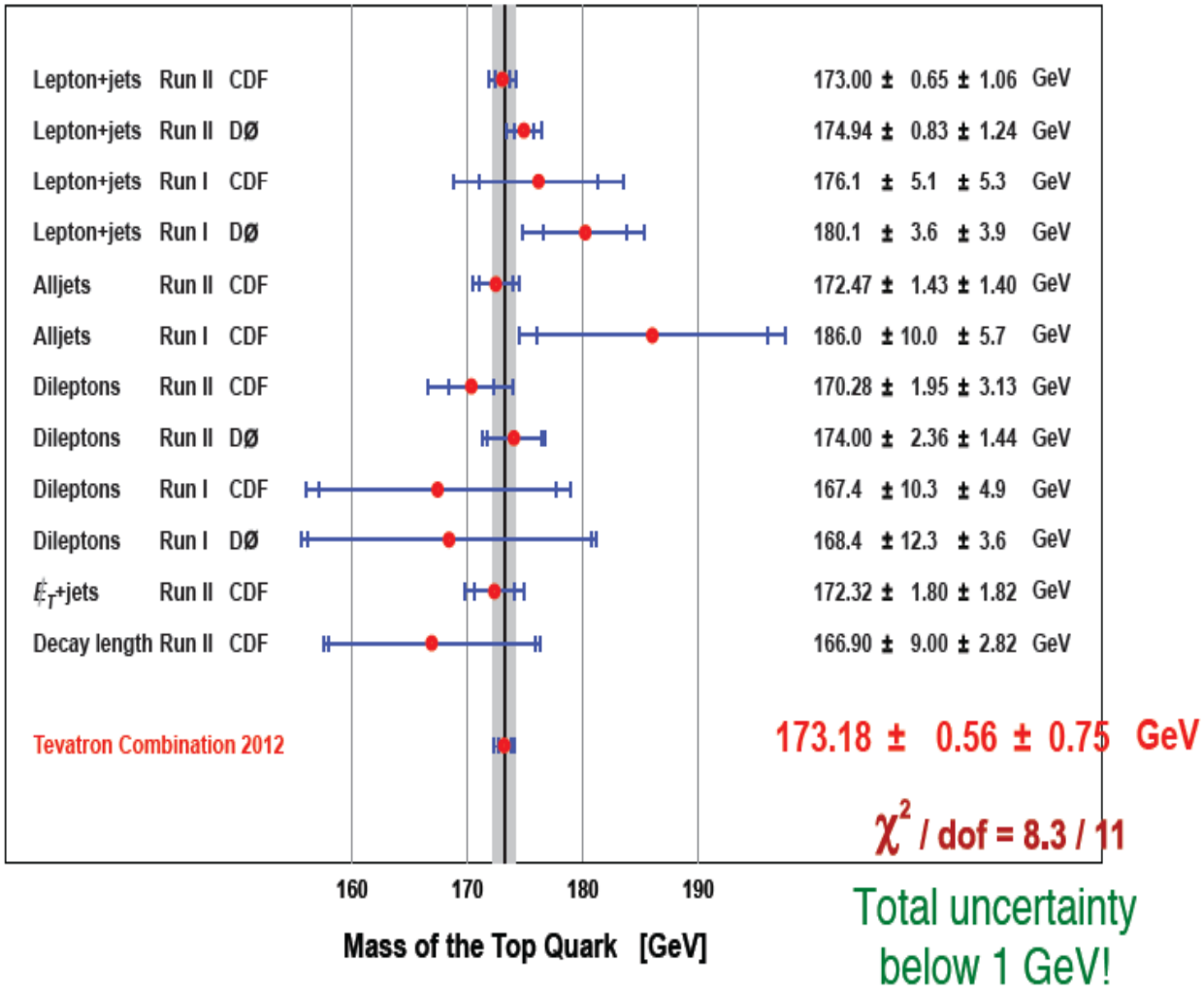
Tevatron has unique opportunity to check it indirectly

Top Mass and cross sections

•Top mass Tevatron combination just published in PRD (on about half of the statistics), more precise than latest preliminary LHC combination (HCP-2012).

	Top Mass (GeV)
Tevatron	$173.2 \pm 0.6 \pm 0.8$
LHC	$173.3 \pm 0.5 \pm 1.3$

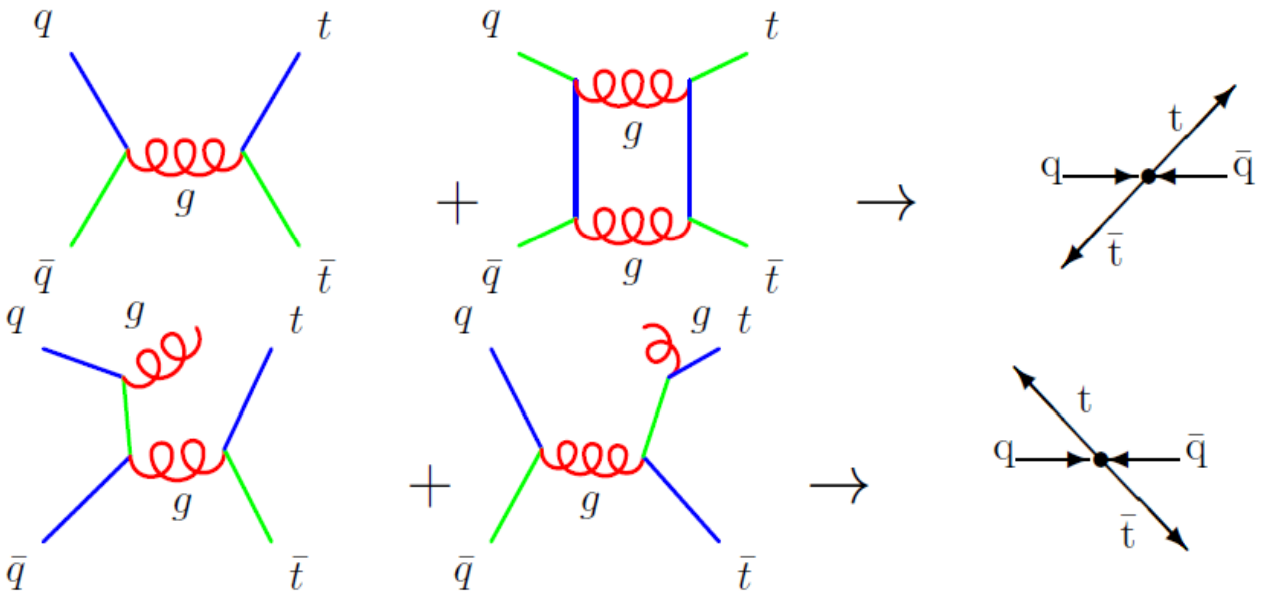
•New measurements and combination in preparation (2013), with full dataset



Top pair production cross section combination close to be released, unique to Tevatron energies

Forward-backward top asymmetry

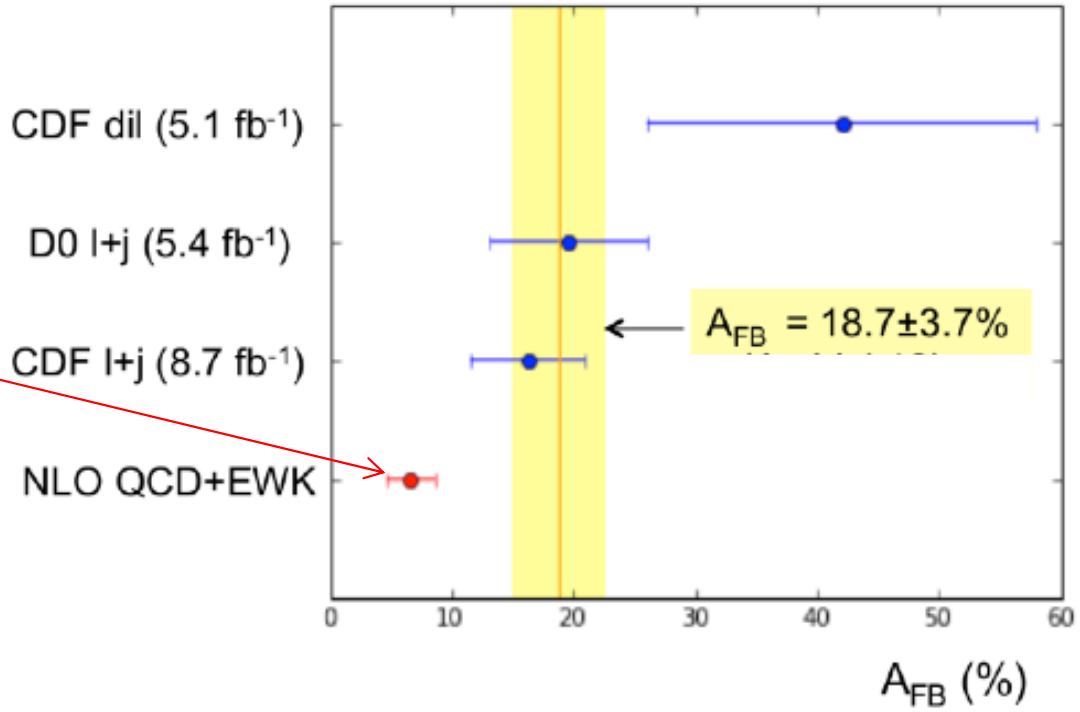
- In the SM, this effect only happens for $q\bar{q}$ initial states
- SM predicts no asymmetry at LO in QCD, and a small asymmetry at NLO



Effects at LHC are "diluted" by a factor ~10, →more difficult to measure

Combination of measured asymmetries is ~3.3σ from NLO QCD+EWK predictior

kinematics dependence under study (invariant mass dependence)



Top quark recent highlights

2012: **Red color code**→ CDF-D0 combination (or similar paper by the two collaborations)

Combination of the top-quark mass measurements from the Tevatron collider
Combination of CDF and D0 measurements of the W boson helicity in top quark decays,

CDF:

Measurements of the top-quark mass and the tt-bar cross section in the hadronic τ+jets channel
Precision top-quark mass measurements at CDF
Measurement of the top quark mass in the all-hadronic mode at CDF

DZero:

Measurement of Leptonic Asymmetries and Top Quark Polarization in tt Production
Measurement of the Top Quark Mass in pp Collisions using Events with Two Leptons
Improved Determination of the Width of the Top Quark
Evidence for Spin Correlation in tt Production

2011

CDF:

Evidence for a mass dependent forward-backward asymmetry in top quark pair production
Search for a very light CP-odd Higgs boson in top quark decays from p-anti-p collisions

DZero:

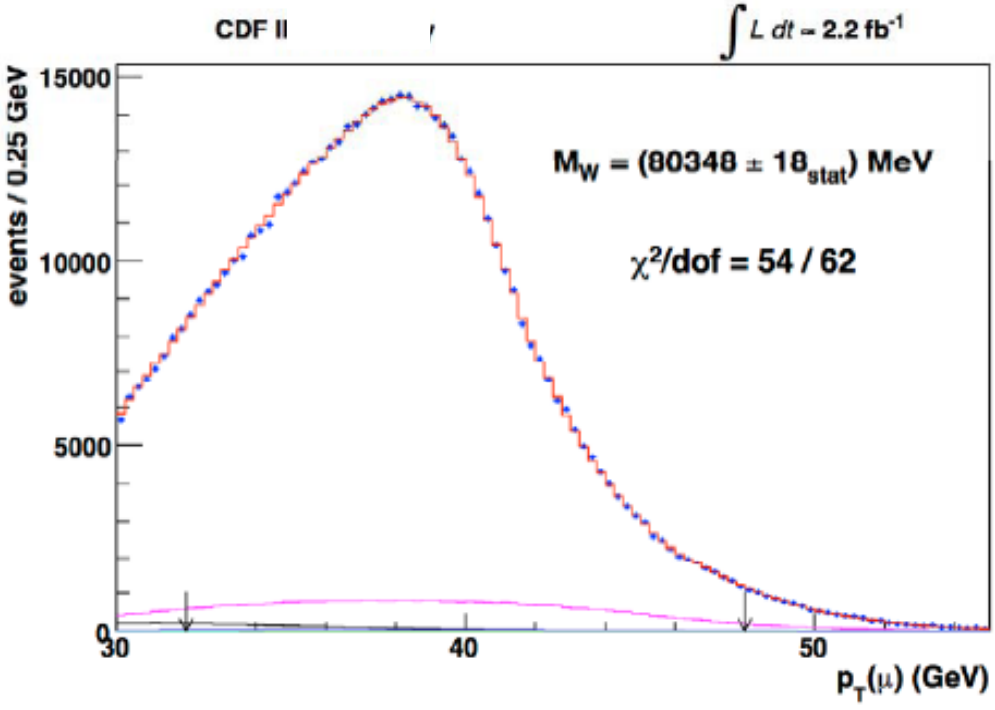
Forward-Backward Asymmetry in Top Quark-Antiquark Production
Measurements of Single Top Quark Production Cross Sections and $|V_{tb}|$ in pp Collisions

Before:

Observation of single top quark production and measurement of $|V_{tb}|$ by CDF and by Dzero

Electroweak Physics

W Mass



- Full data set, go into end caps (less dependence on PDFs),
  Target total uncertainty ~10 MeV

  LHC will take a long time to improve on this

W and *Z* Asymmetry Measurements

$W \to \mu\nu$ lepton asymmetry with 7.3 fb-1 in review

$W \to e\nu$

$Z \to ee$ $\mathcal{A}_{\mathcal{FB}}$

$Z \to \mu\mu$ $\mathcal{A}_{\mathcal{FB}}$

with full Run II data set!

- Constrain PDF fits
- Probe quark and electron EW couplings
- Measure $\sin^2\theta_W^{\text{eff}}$
- Improve *W* mass measurement
- Search for additional gauge bosons

Due to ppbar collisions, the physics from W and Z asymmetries @ Tevatron will remain competitive for a long time

Electroweak recent highlights

2012:

CDF:

Precise measurement of the W-boson mass with the CDF II detector
Measurement of ZZ production in leptonic final states at √s of 1.96 TeV at CDF
Search for the rare radiative decay W→πγ in pp-bar collisions at √s=1.96 TeV

DZero:

Limits on anomalous trilinear gauge boson complings from WW, WZ and Wγ production
Measurement of the WZ and ZZ Production Cross Sections using Leptonic Final States
Measurements of WW and WZ Production in W+jets Final States in pp Collisions
Measurement of the W Boson Mass with the DØ Detector

2011:

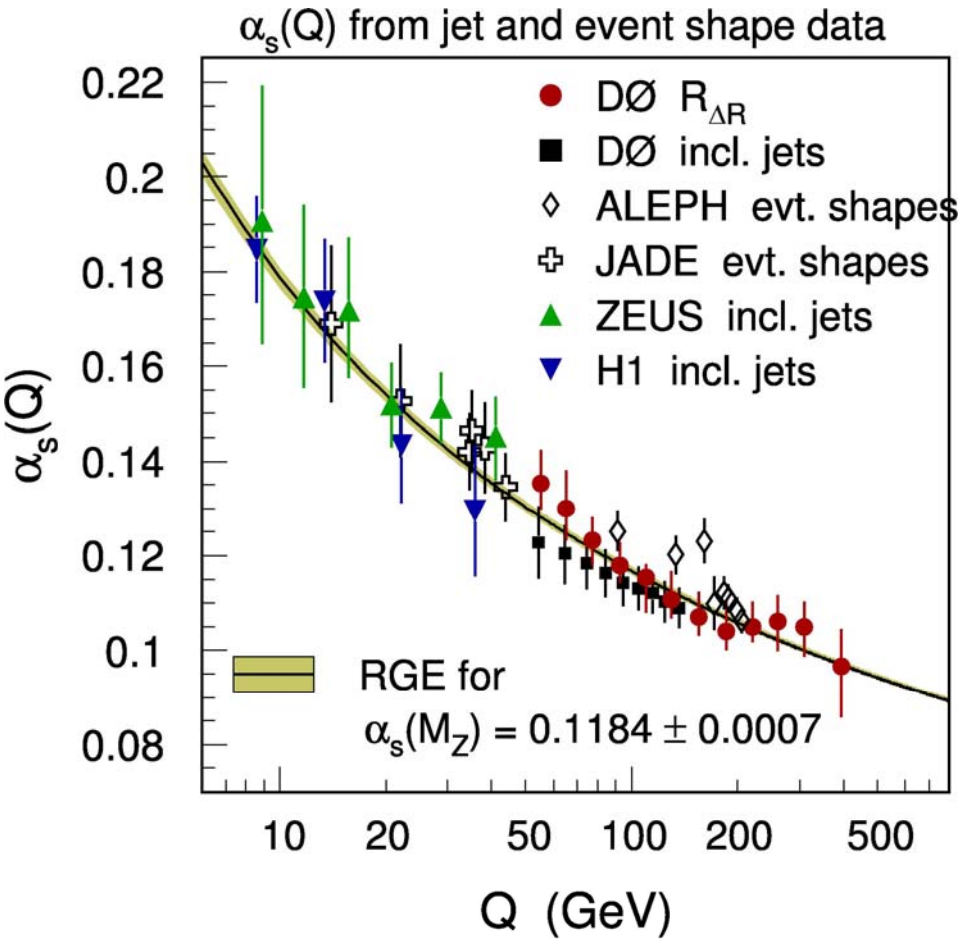
CDF:

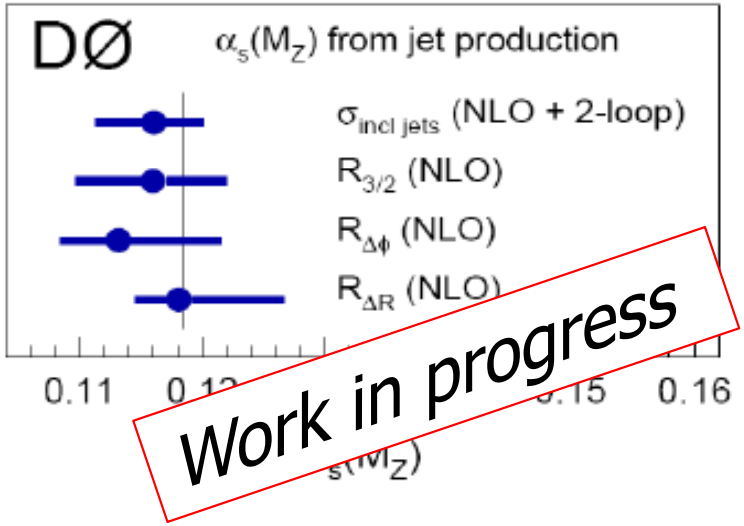
First measurement of the angular coefficients of Drell-Yan e^+e^- pairs in the Z mass region
Limits on anomalous trilinear gauge couplings in Zγ events from pp-bar collisions at √s=1.96 TeV

DZero:

Wγ Production and Limits on Anomalous WWγ Couplings in pp Collisions at √s = 1.96 TeV
Measurement of the $\sin^2\theta^l_{eff}$ and Z-Light Quark Couplings using the FB Charge Asymmetry in $pp\rightarrow Z/\gamma^*\rightarrow e^+e^-$
Measurement of the ZZ Production Cross Section in pp Collisions at √s = 1.96 TeV

QCD: alpha_s from 3jet/2jet ratio





→ First α_s results above 208 GeV, obtained at LEP

Three approaches to 3-jet/2-jet ratio

First publication: Measurement of $R_{\Delta R}$ with α_s result, followed by $R_{3/2}$ and $R_{\Delta\phi}$ measurements and PRD with all α_s results

QCD recent highlights

2012:

CDF:

Observation of exclusive $\gamma\gamma$ production in pp-bar collisions at $\sqrt{s}$=1.96 TeV,
Study of substructure of high transverse momentum jets produced in ppbar collisions

DZero:

Measurement of the γ+c-jet cross section and the ratio γ+c and γ+b cross sections
Measurement of the pp to W + b + X production cross section at $\sqrt{s}$ = 1.96 TeV
Measurement of the Differential Cross Section dσ/dt in Elastic pp Scattering at $\sqrt{s}$ = 1.96 TeV
Measurement of the Photon + b-Jet Production Differential Cross Section in pp Collisions

2011:

CDF:

Measurement of event shapes in pp-bar collisions at $\sqrt{s}$=1.96 TeV
Measurement of the cross section for prompt isolated diphoton production in pp-bar
Diffractive W and Z production at the Fermilab Tevatron (2010)

DZero:

Measurement of the Inclusive Jet Cross Section in pp Collisions at $\sqrt{s}$ = 1.96 TeV
High Mass Exclusive Diffractive Dijet Production in pp Collisions at $\sqrt{s}$ = 1.96 TeV
Measurements of Inclusive W+Jets Production Rates as a Function of Jet Transverse Momentum

Heavy Flavor highlights

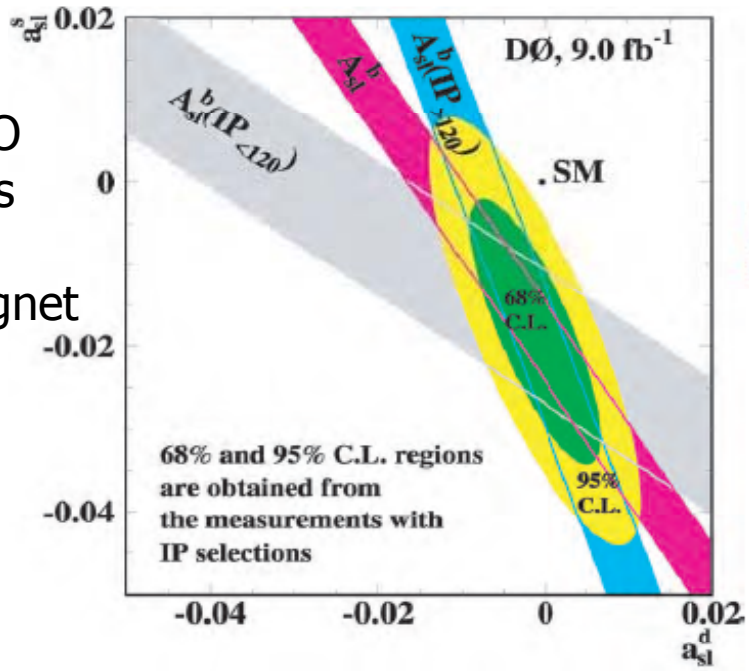
CPV in B (DZero)

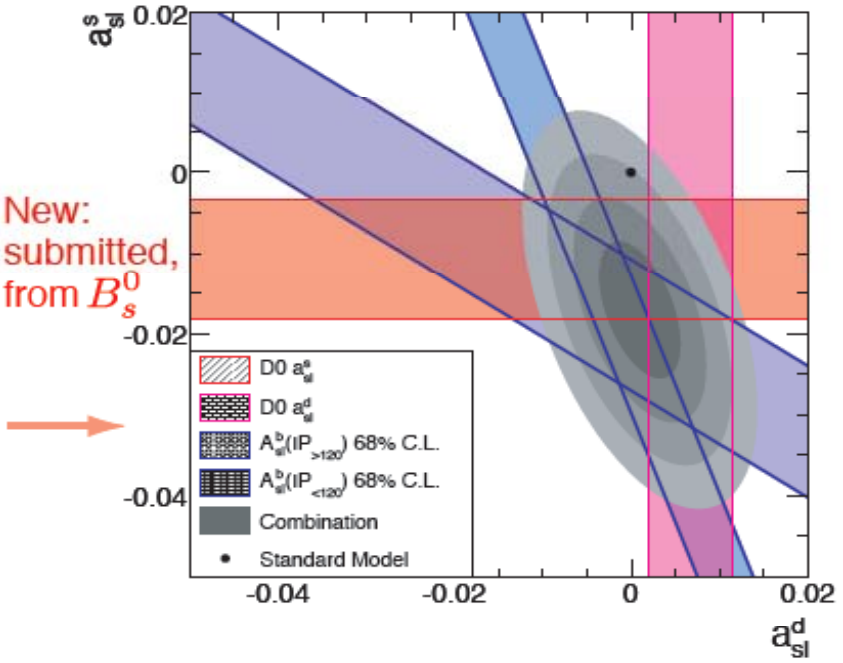
Dimuon CP asymmetry, 3.9σ from SM

New: submitted, from B_d^0

Take advantage of ppbar initial state (→NO production asymmetries

Regular reversal of magnet polarities→ reduced detector asymmetries



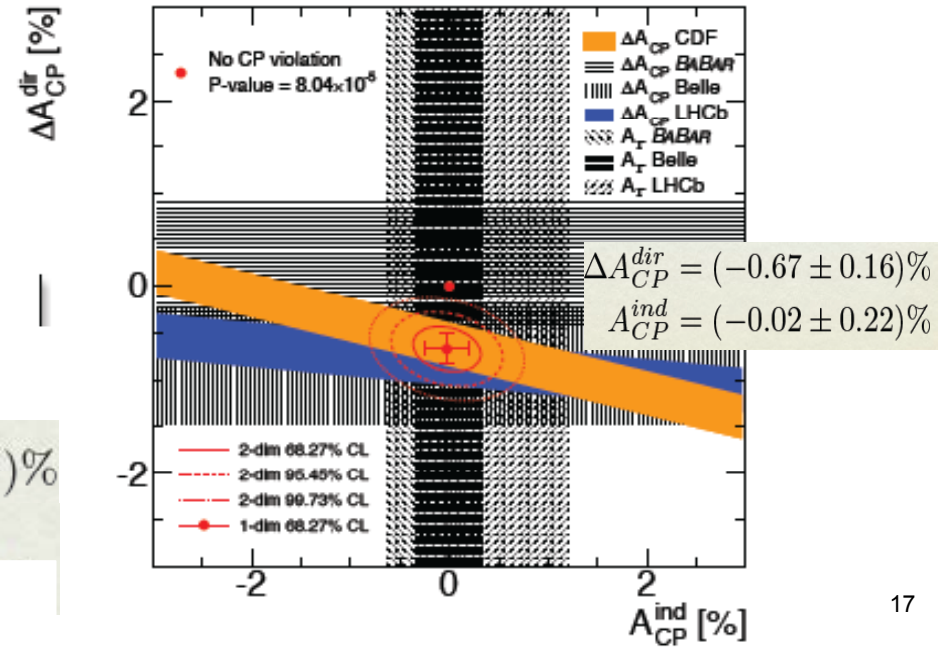


CPV in Charm (CDF)

$$\Delta A_{CP} = A(K^+K^-) - A(\pi^+\pi^-)$$
$$= A_{CP}(K^+K^-) - A_{CP}(\pi^+\pi^-)$$
$$= \Delta A_{CP}^{\text{dir}} + A_{CP}^{\text{ind}} \Delta\langle t\rangle/\tau.$$

$$\Delta A_{CP} = (-0.62 \pm 0.21\ (\text{stat}) \pm 0.10\ (\text{syst}))\%$$

2.7 standard deviation from 0



Heavy Flavor recent highlights

2012:

CDF:

Measurement of the difference of CP-violating asymmetries in $D^0 \to K^+K^-$ and $D^0 \to \pi^+\pi^-$ decays
Measurement of CP-violation asymmetries in $D^0 \to K_s\pi^+\pi^-$,
Measurements of angular distributions of muons from upsilon meson decays..
Evidence for the charmless annihilation decay mode $B_s^0 \to \pi^+\pi^-$,

DZero:

Measurement of the Semileptonic Charge Asymmetry using B^0 meson mixing with the D0 detector
Measurement of the Semileptonic Charge Asymmetry using $B_s^0 \to D_s\mu X$ Decays
Observation of a Narrow State Decaying into Y(1S) + γ in pp Collisions at $\sqrt{s}$ = 1.96 TeV
Measurement of the Λ_b^0 Lifetime in the Exclusive Decay $\Lambda_b^0 \to J/\psi\Lambda^0$ in pp Collisions
Measurement of the CP-Violating Phase $\phi_s^{J/\psi\,\phi}$ using the Flavor-Tagged Decay $B_s^0 \to J/\psi\,\phi$ in 8 fb^{-1}

2011:

CDF:

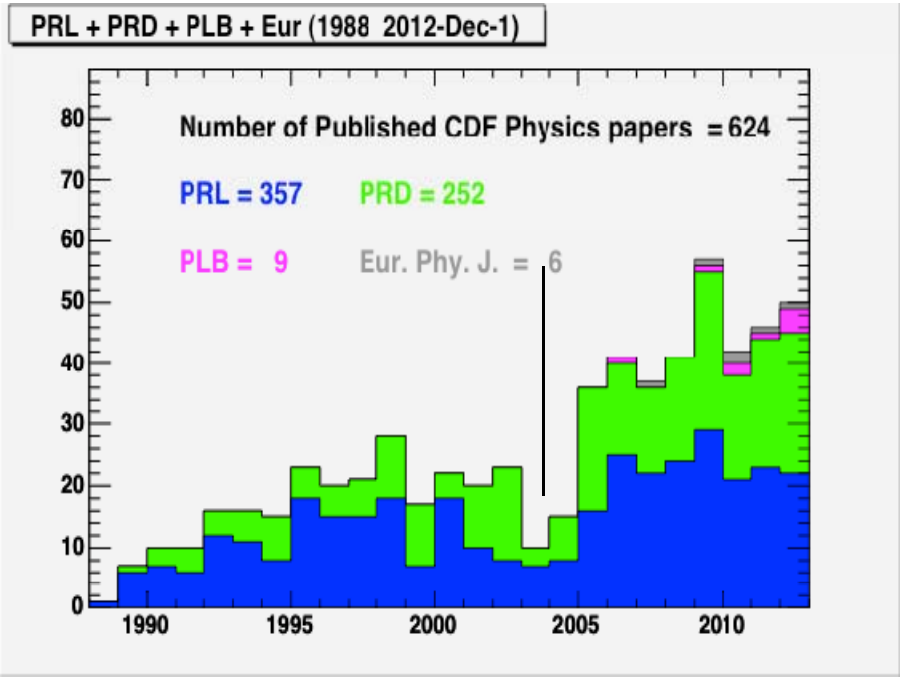
Observation of the Ξ_b^0 baryon
Measurement of CP-violating asymmetries in $D^0 \to K^+K^-$ and $D^0 \to \pi^+\pi^-$ decays at CDF
Measurements of direct CP violating asymmetries in charmless decays of strange b mesons/baryons

DZero:

Measurement of the Anomalous Like-Sign Dimuon Charge Asymmetry with 9 fb^{-1} of pp Collisions
Measurement of the Production Fraction Times Branching Fraction $f(b \to \Lambda_b) \cdot B(\Lambda_b \to J/\psi\,\Lambda)$

Publications in Run II, so far

Already now, many more publications in Run II than in Run I

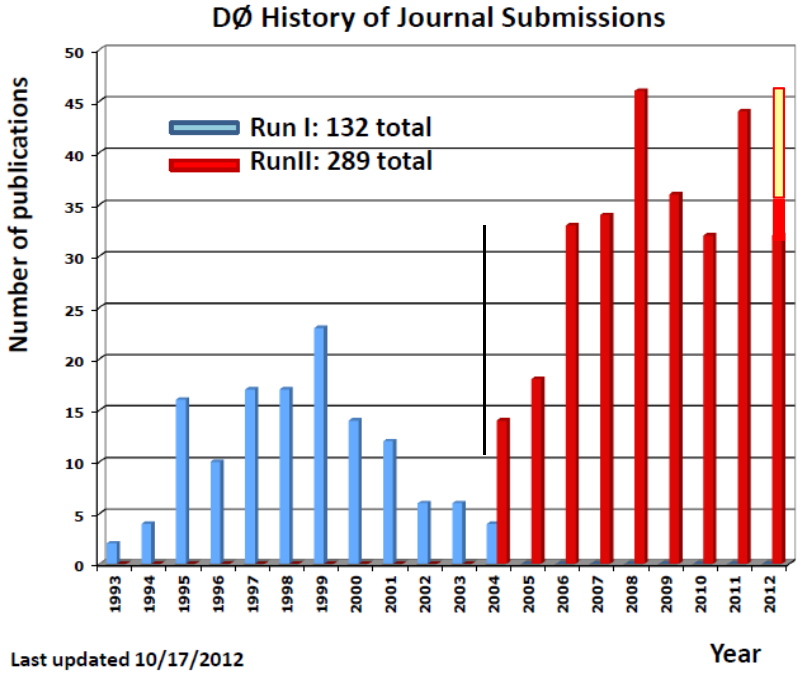


CDF: 365 publications so far

~10 additional papers to be submitted by end of the year

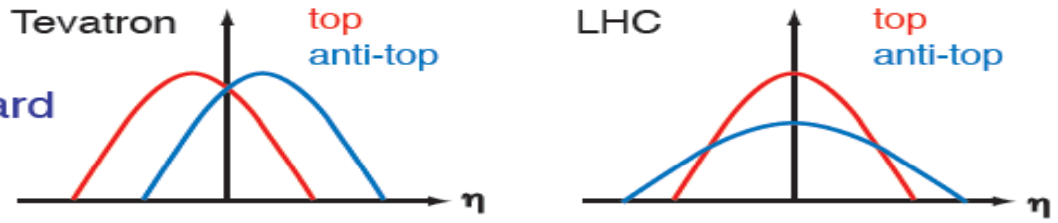
Dzero: 295 publications so far

On pace for best year ever, with ~10 additional papers to be submitted by year end.



Tevatron Unique Dataset

- Different collision energy, $\sqrt{s_{\rm eff}}$
  - Cross sections, asymmetries; e.g., top, electroweak
  - Different (QCD) backgrounds → Tevatron evidence for $H \to b\bar{b}$ (only evidence for direct coupling to fermion mass)
- $p\bar{p}$ collisions instead of $p\bar{p}$
  - Top quark forward-backward asymmetries:



  - is an initial CP invariant state (*B* physics)
- Complementary! Production processes different mix of $q\bar{q}$ vs. gg collisions
  - $t\bar{t}$ spin correlations
- Well understood detector + *experts* (and their past inputs) (plus lower level of pileup, only getting worse at LHC)
  - *W* boson mass
  - top quark mass

  (with full data set) & (potential of reprocessed data)
- Clever detector operation, regular flipping of solenoid and toroid magnets
  - cancels charge tracking asymmetries to first order → competitive CP invariance tests in heavy flavor

New Phenomena: status and prospects

The planned new phenomena searches are close to completion

It has been a very rich program, more than 150 NP papers published in Run II by CDF and DZero.

Some open questions (see also Top, B group sections):

➔ Wjj resonance at CDF, full dataset being analyzed.

Most future new phenomena results/interpretations will be performed through specific analyses in other physics groups

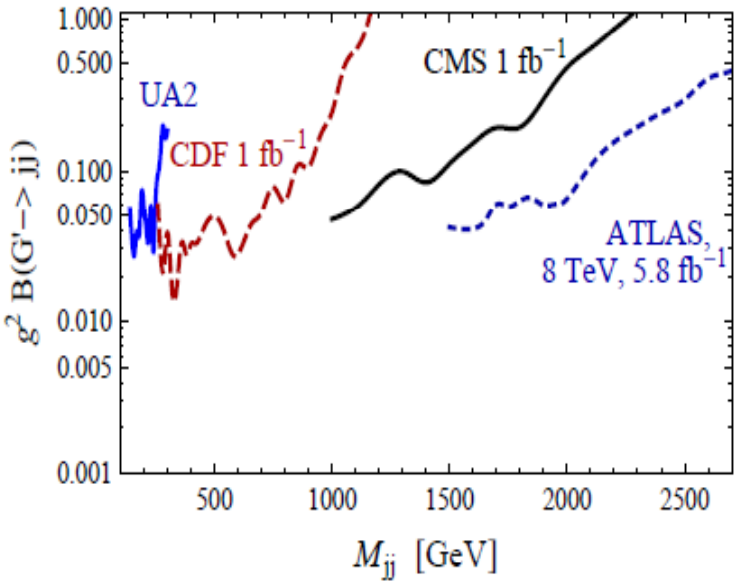
Some regions of phase spaces are unique to the Tevatron

Searches for the Tevatron, Difficult at LHC

Bogdan Dobrescu (*Fermilab*)

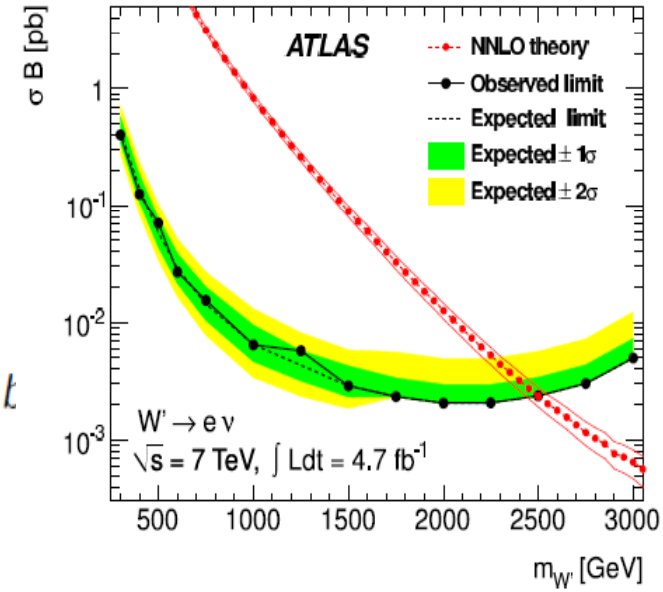
ATLAS and CMS jj resonance searches start at $M_{jj} \gtrsim 1$ TeV

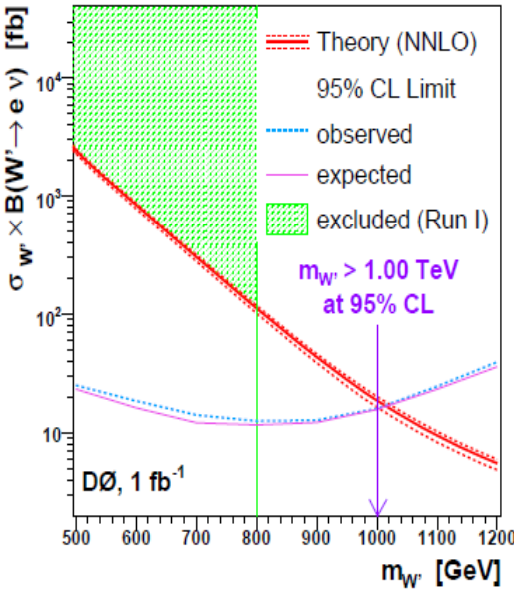
For $M_{jj} < 200$ GeV, limits only from UA2 & UA1.



Dijet resonances

W′





Theoretical cross section is proportional to $g^2_{W'} B(W' \to e\nu)$.

E.g. A W' boson with couplings to quarks $g_{W'} \approx 0.1 g_{\rm SM}$, and $B(W' \to e\nu) \lesssim B(W \to e\nu)$ is not yet constrained.

$b\bar{b}$ resonances

Higgs: prospects

In preparation (CDF)

- Full CDF-D0 combination
- ZH→vvbb search
- Hbb combination
- CDF All-channels combination
- VV and V+jj bckgds in VH - searches
- Z(ll)+jj distributions
- W(lv)+jj distributions
- MET+jj distributions

In preparation (Dzero)

- Full CDF-D0combination
- SM Higgs in WH or lnujj/jjjj final s.
- Higgs in trilepton and SS dilepton
- HCP-D0 All-channels combination
- ZH→llbb H+
- X → tautau
- H→$\gamma\gamma$
- Search for ttH
- bϕ→bbb (full dataset)

2013

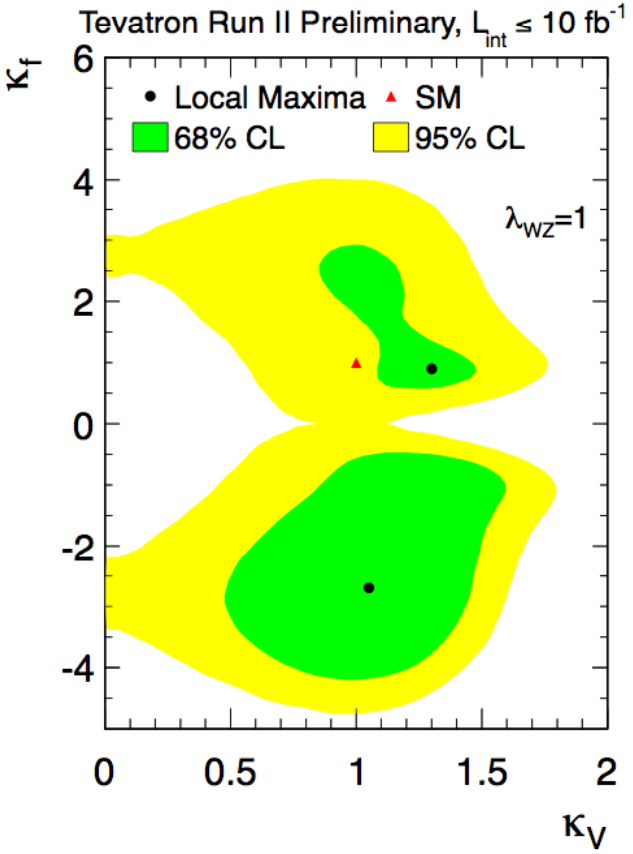
➔ Couplings in H→bb
➔ Spin-parity discrimination
➔ Final D0 Combination

Program will be completed in 2013

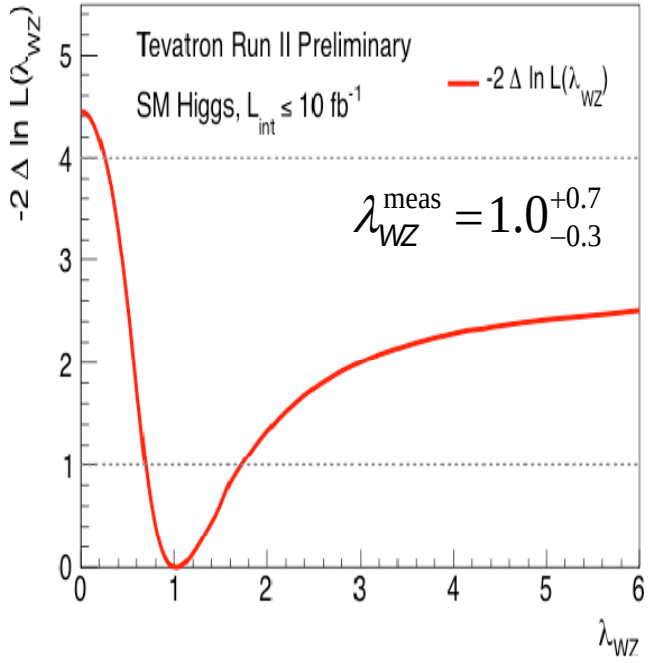
Higgs Results Finalizations and Interpretation

- Finalize measurements and combinations (winter 2013)
- measure deviations of couplings from the SM prediction (arXiv:1209.0040).
  Basic assumptions: only one underlying state at m_H~125 GeV, negligible width, CP-even scalar
- Under these assumptions all production cross sections and branching ratios can be expressed in terms of a few common multiplicative factors to the SM Higgs couplings:

$$\sigma(WH)BR(H \to bb) = \sigma_{SM}(WH)BR_{SM}(H \to bb)\frac{\kappa_W^2 \kappa_b^2}{\kappa_H^2}$$

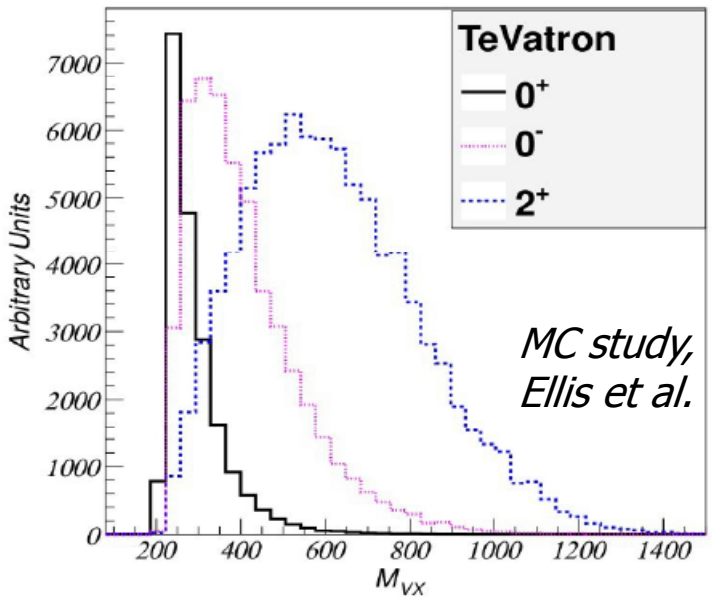


Measure custodial symmetry, via WH vs ZH:



Spin-Parity from VH final state

competitive sensitivity
Final results:
Spring 2013



QCD: prospects

In preparation:

- γ+b, γ+c production with full sample
- $\gamma\gamma$ production with full sample
- W+light flavor cross section
- Observation of W+c production

≥ 2013:

- Inclusive γ production with full sample
- Double parton interactions
- Double pomeron exchange in exclusive hadron production
- Underlying event studies with 3 collision energ.
- γ+light flavor production with full sample
- Studies of minimum bias events at 3 collision en.
- Diffraction studies (Bose-Einstein correlations, exclusive hadron production, pomerons in jet evts)

In preparation:

- Ratio of Z+b/Z+jet differential cross sections
- Rapidity dependence of $\Delta\phi$ in Dijet events
- Diphoton differential cross sections
- W+jets differential distributions
- Photon+jet triple differential cross section
- Ratios of Z+c/Z+jet & Z+c/Z+b cross sections

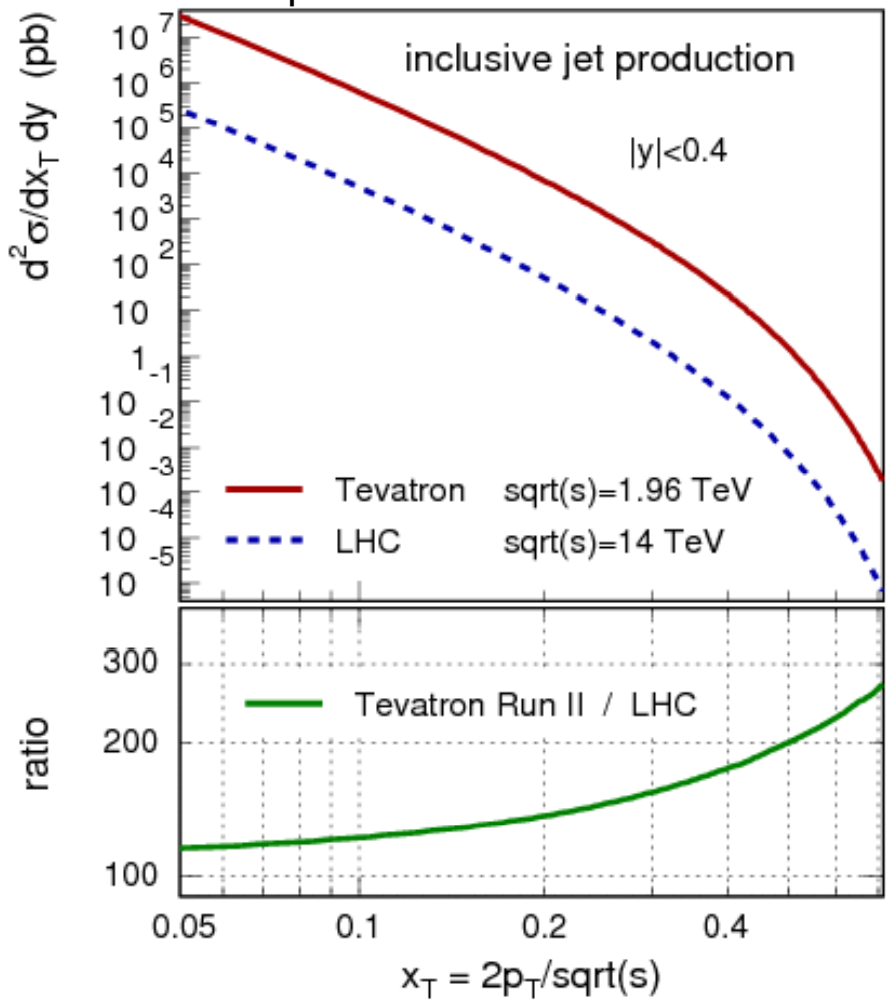
≥ 2013:

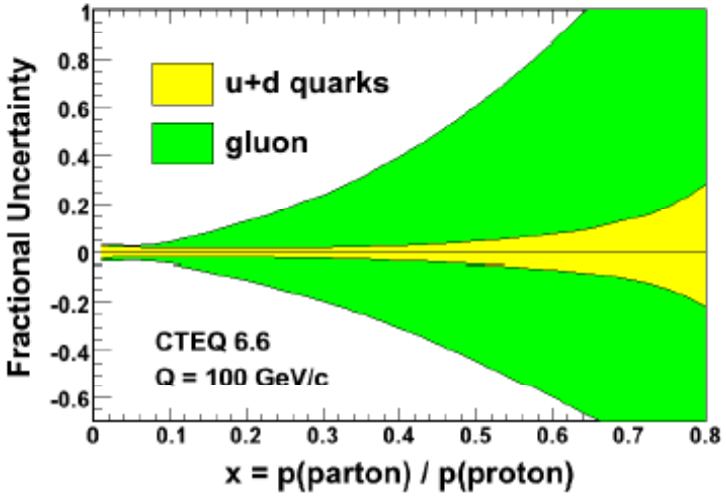
- alpha_s combination from jet measurements
- Single diffraction diff. cross section
- W+c/b differential cross sections
- J/ψ+J/ψ cross section
- Double parton (DP) interactions in ψ+HF+2jets
- Di-b-jet/Dijet mass cross section ratio
- Triple jet differential cross section
- Jet event shapes
- Inclusive jet cross section
- DP interactions in $\gamma\gamma$+jj - DP in J/ψ+J/ψ events
- γ+bb(cc) diff. cross section
- FB asym. In b+bbar(c+cbar) events

Inclusive Jets: Tevatron vs. LHC

- x-Q^2 regions accessible at fixed target, DIS, Tevatron and LHC are complementary
- Tevatron jet data are main source constraining gluon PDF at high x

fastNLO prediction





Tevatron (ppbar)
>100x higher cross section @ all x_T
>200x higher cross section @ x_T >0.5

LHC (pp)
- need more than 2400 fb^{-1} luminosity to improve Tevatron @ 12 fb^{-1}
- more high-x gluon contributions
- but more steeply falling cross sect. at highest p_T (=larger uncertainties)

→ Tevatron results will dominate high-x gluon for some years

Heavy Flavor: prospects

In preparation:

- Bc lifetime in Bc→J/ψπ decays
- D^0 mixing with full sample
- b→sll decays with full sample
- Evidence for Λ_b^*
- A_{CP} in B→hh' decays with full sample
- Search for $B_{s,d}$→μμ with full sample
- BR(B_s→J/ψϕ) and fragmentation fractions
- K production associated D_s^+/D^+ mesons

2013:

- B^{**} decays
- Y cross section and polarization
- Charm production in minimum bias events
- Excited baryons (K_s^0, Λ0) in min. bias evts

>2013:

- Quarkonia (χ_b, χ_c fractions, Y+X spectroscopy, fragmentations in Y events, h_b searches, low mass Drell-Yan and J/ψ studies)
- Doubly charmed and bottom-charmed baryons
- Multiple heavy flavor production
- Baryon polarization
- Heavy flavor in jets

In preparation:

Search for B_s→μμ
B_s lifetime in semileptonic decays

2013:

Final dimuon asymmetry paper
B_s →J/ψf_0 lifetime and CPV
Search for B_s →D_s μμX decays
Search for direct CPV in B^+→J/ψK^+ decays
Λ_b→ψ(2S)Λ_0 branching ratio
ψ(2S) →μμ cross-section

> 2013:

Exotic states, XYZ
J/ψ polarization
di-J/ψ production
CPV asymmetry in Charm (D^0→KμνX)
Search for B_c^+ →J/ψD_s^+
Λ(2S) →μμ cross-section

Top quark: prospects

In preparation:

- Top charge in l+jets channel with full sample
- Top mass in MET+jets channel
- Top pair cross section in dilepton channel
- BR(t→Wb)/BR(t→Wq) in l+jets channel
- Top pair cross section in e/μ+τ channel
- Top mass in dilepton channel (Dalitz-Goldstein method)
- Top pair cross section Tevatron combination

2013 and beyond:

- Direct top width measurement in l+jets channel
- Top pair differential cross sections in l+jets
- A_{FB} in dilepton channel
- A_{FB} in high-p_T bottom pairs
- Spin correlations/top polarization in dileptons
- Top charge in dilepton channel
- Single top x-section in l+jets channel & MET+jets
- BR(t→Wb)/BR(t→Wq) in dilepton channel
- Top mass in dilepton channel (φ_v-weighting method)
- Top mass in all-jets channel
- Top pair cross section in l+jets channel
- Combinations (M_{top}, σ_{tt}, A_{FB}, single top)

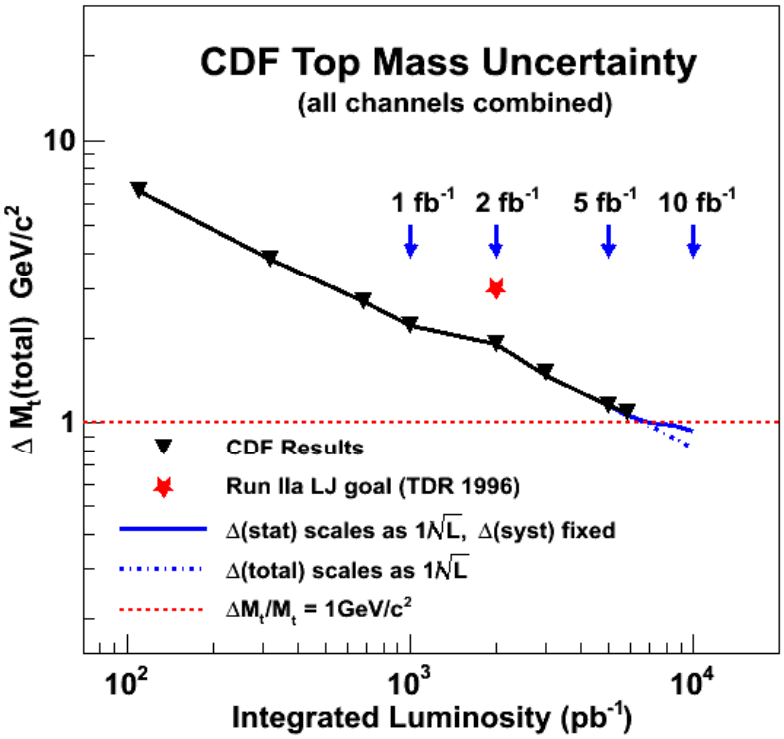
In preparation:

- FB asymmetry in dilepton channel
- Top pair cross section Tevatron combi.

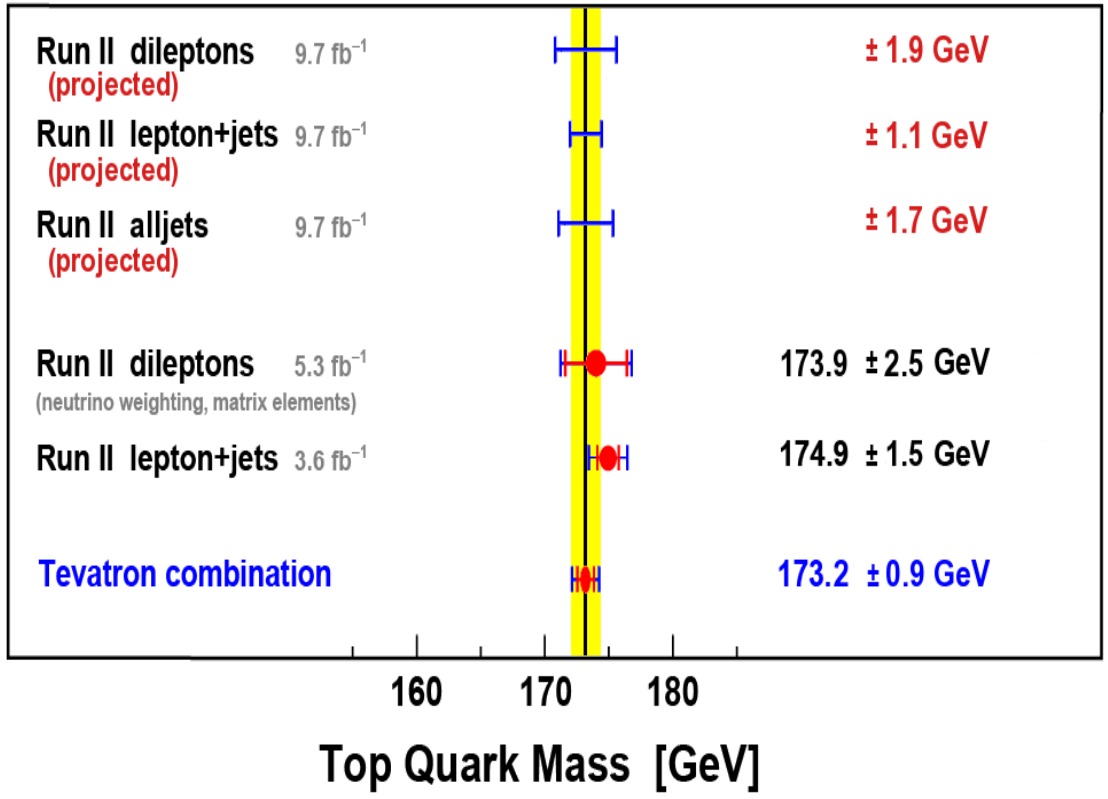
2013 and beyond

- differential ttbar cross sections
- inclusive cross section
- l+jets ME top mass
- s-channel single top
- leptonic asymmetry in l+jets
- top charge
- all-jets top mass
- *ttbar spin correlations*
- Combinations (M_{top}, σ_{tt}, A_{FB}, single top)

Expected top mass precision



Dzero Top Mass uncertainty (projected and achieved)

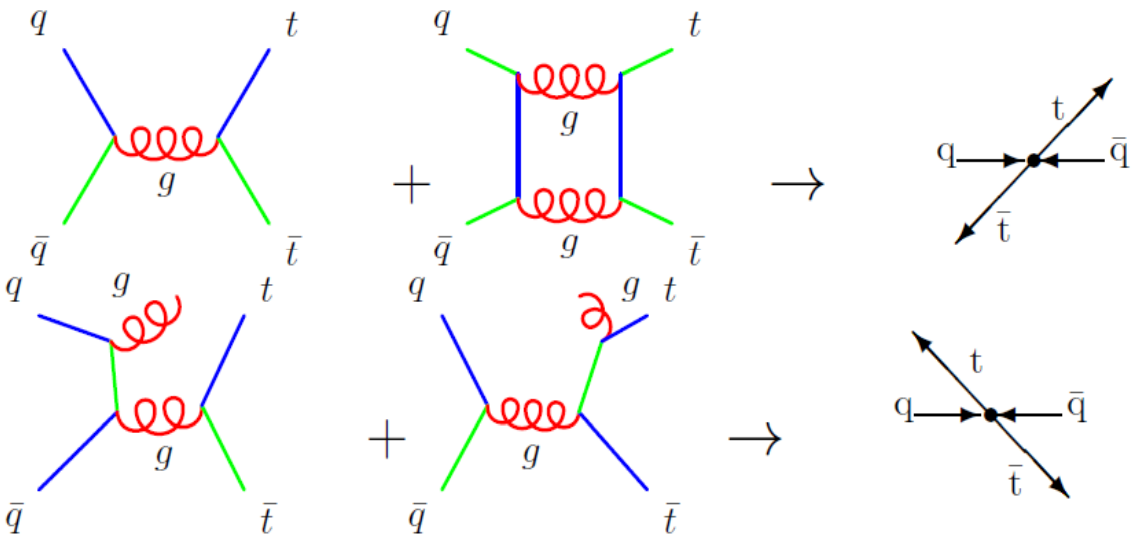


With the improvements achieved or planned at CDF (~30% in b-tagged dilepton channel, 20 and 27% in lepton and MET+jet channels, 10% in all jets) and at Dzero (~30% in dilepton and lepton+jets, and a new result in all jets) we expect a ~20% improvement in the new Tevatron combination,

from 0.9 GeV (2011) down to 0.7 GeV with the full sample

Projections on Forward Backward Asymmetry

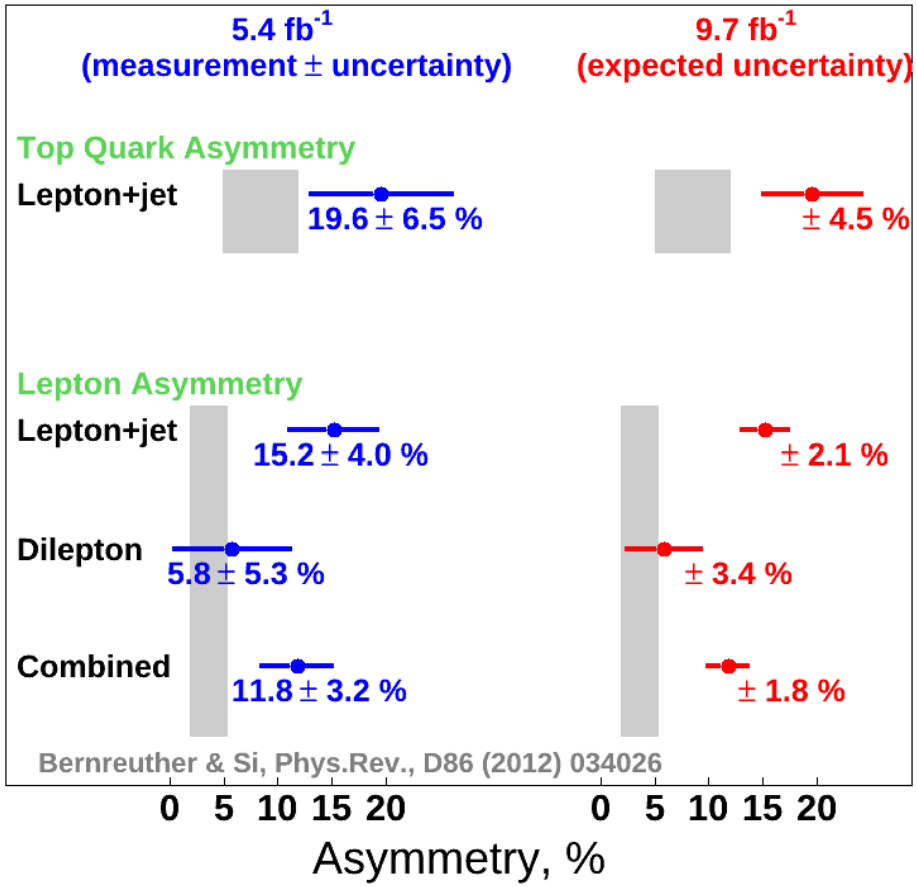
- In the SM, this effect only happens for $q\bar{q}$ initial states
- SM predicts no asymmetry at LO in QCD, and a small asymmetry at NLO



Working on the full data sample, both in dilepton and lepton+jet final state to confirm or not tantalizing excess seen by CDF and Dzero

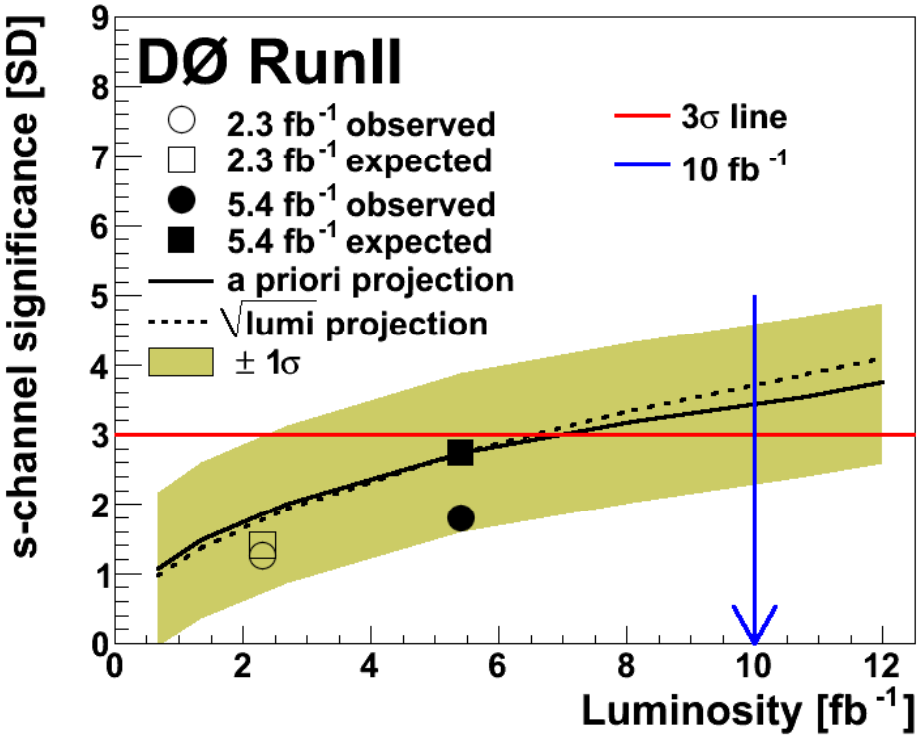
Potential for 5σ deviation from NLO QCD with final Tevatron combination in 2013

Dzero projected uncertainty on Afb



Expected s-channel single top significance

Difficult channel at LHC since produced by qqbar anihilation.
Important channel since BSM effects may manifest
differently in s and t channel



Significance is difficult to anticipate as it depends on the measured result

We expect ~4σ s-channel significance from CDF and Dzero separately
(combining lepton+jets and MET+jets decay modes using full data sample)

With Tevatron combination a 5σ significance (observation) is within reach

Electroweak: prospects

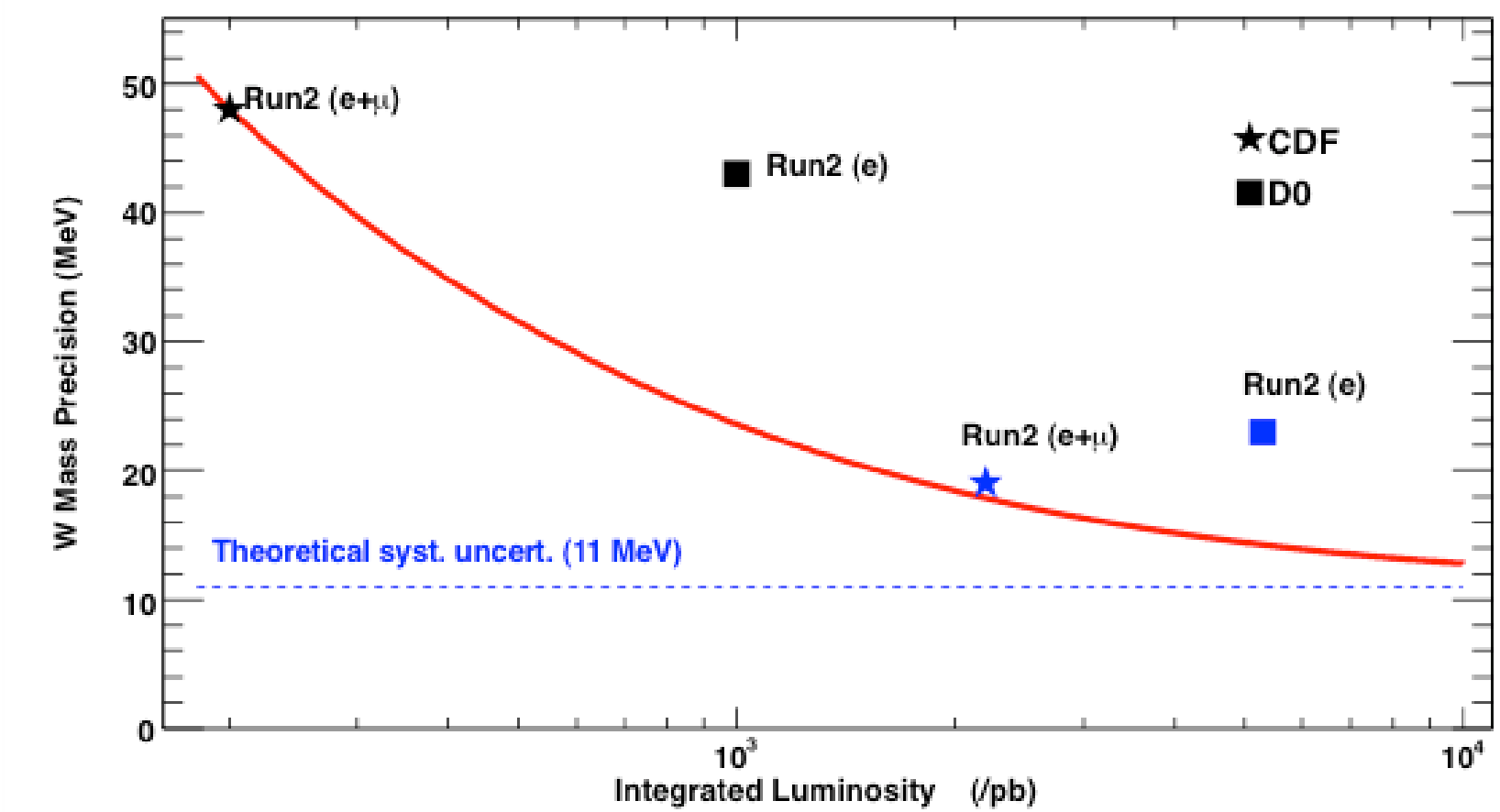
2013:

- Weinberg angle with full sample
- W+jets differential cross sections with full sample (CDF)
- Search for $Z \to \gamma\gamma$ with full sample (CDF)
- W Charge asymmetry (D0)
- Z boson angular coefficients (D0)
- Z boson Forward-Backwards Asymmetry (D0)
- Z boson rapidity (D0)
- ZZ production cross section with full sample

>2013:

- W mass with full sample
- W width with full sample
- W mass Tevatron combination
- W mass with forward electrons (D0)
- Search for rare decays ($Z \to J/\psi\gamma$, $W \to \pi\gamma$) with full sample (CDF)

Expected W mass precision



Assumptions:

- The red curve starts from the 200/pb total uncertainty and scales all uncertainties (except the theoretical ones) down as √L
- The theory blue line is from the most recent analysis:
  - 4 MeV from QED and 10 MeV from PDFs

  it is expected to go down, and is lower for forward leptons

W mass systematic uncertainties

CDF projected uncertainties

Source	0.2/fb (MeV)	2.2/fb (MeV)	10/fb (MeV)	
Lepton energy scale	23	7	3	→ Assume 50% reduction in BC-NBC and QED/energy loss uncertainties
Lepton energy resolution	4	2	1	} Assume the same scaling as 0.2/fb → 2.2/fb
Recoil energy scale	8	4	2	
Lepton removal	6	2	1	
Backgrounds	6	3	2	
pT(W) model	4	5	2	→ Assume 1/ √L scaling
PDFs	11	10	5	→ Assume 50% reduction in PDF uncertainty
QED radiation	10	4	4	→ Assume the same QED
Total systematics	**34**	**15**	**8**	
W statistics	34	12	6	→ Assume 1/ √L scaling
Total	**48**	**19**	10	

Limiting factors:
1). PDFs (and QED)
2). BC-NBC difference
3). QED/energy loss modeling

BC = beam-constrained tracks
NBC = non-beam-constrained tracks

W-mass systematic uncertainties

DZero projected uncertainties

Source (Unit in MeV)	Published (2009) 1 fb^{-1} CC	Published (2012) 4.3 fb^{-1} CC	Projection 10 fb^{-1} CC	Projection 10 fb^{-1} CC+EC	Projection improved 10 fb^{-1} CC	Projection improved 10 fb^{-1} CC+EC
Statistical	**23**	**13**	**9**	**8**	**9**	**8**
Experimental syst.						
Electron energy scale	34	16	11	10	11	10
Electron energy resolution	2	2	2	2	2	2
Electron energy nonlinearity	4	4	4	4	2	2
W and Z electron energy loss differences	4	4	4	4	2	2
Recoil model	6	5	3	2	3	2
Electron efficiencies	5	1	1	1	1	1
Backgrounds	2	2	2	2	2	2
Exp. Syst. Subtotal	35	18	13	12	12	11
Theoretical syst.						
PDF	9	11	11	5	11	5
QED	7	7	7	7	3	3
Boson pT	2	2	2	2	2	2
Theo. Syst. Subtotal	12	13	13	9	12	6
Systematic total	**37**	**22**	**19**	**15**	**17**	**13**
Total	**44**	**26**	**21**	**17**	**19**	**15**

Electron channel only

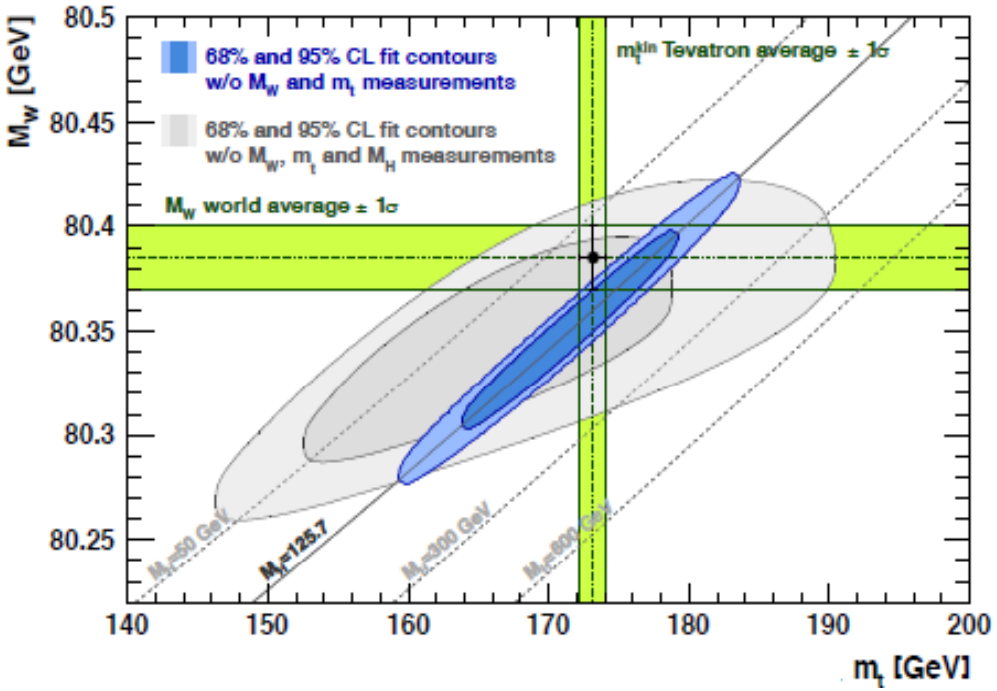
W-mass : how far can we go?

If we use the measured mass of the Higgs-like boson to constrain the W boson mass based on SM, we get:

$m_W = 80.359 \pm 0.011$ GeV

Comparing with the current world average directly measured value:

$m_W = 80.385 \pm 0.015$ GeV



With a world average around 10 MeV dominated by the Tevatron, and no change in central values, test direct and indirect Higgs mass values.

Significant anomaly could be detected if central value would slightly move apart, while reducing uncertainties .

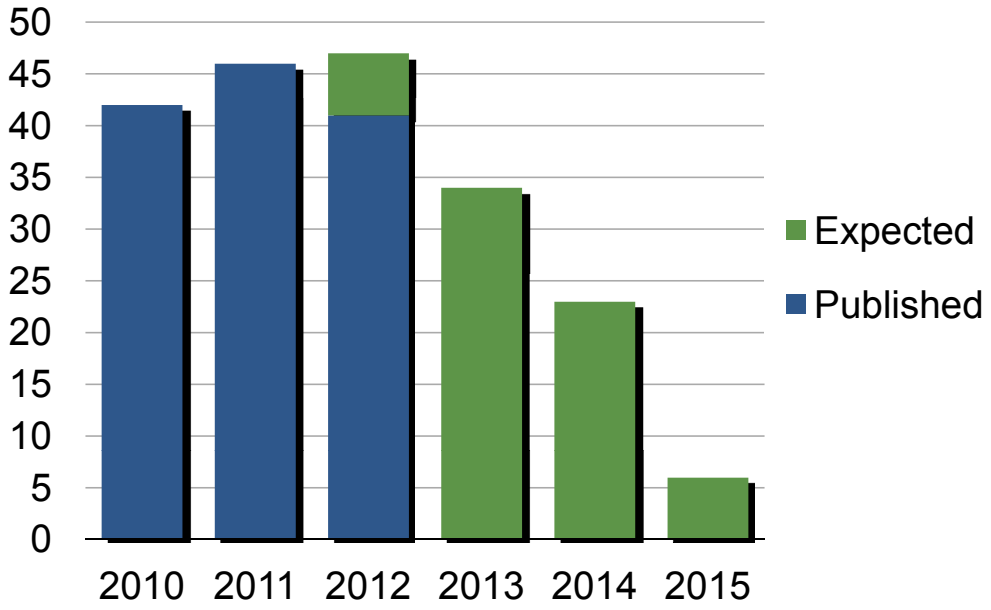
Currently we have good agreement !!!

test SM consistency at > 2 sigma level

CDF Paper Projections

Topic	close	~2013	>2013	Totals
Electroweak	1	4	1	6
Higgs + BSM	10	5	2	17
Top	7	14	3	24
QCD	1	2	6	9
Heavy Flavor	1	5	7	13
Totals	20	30	19	69

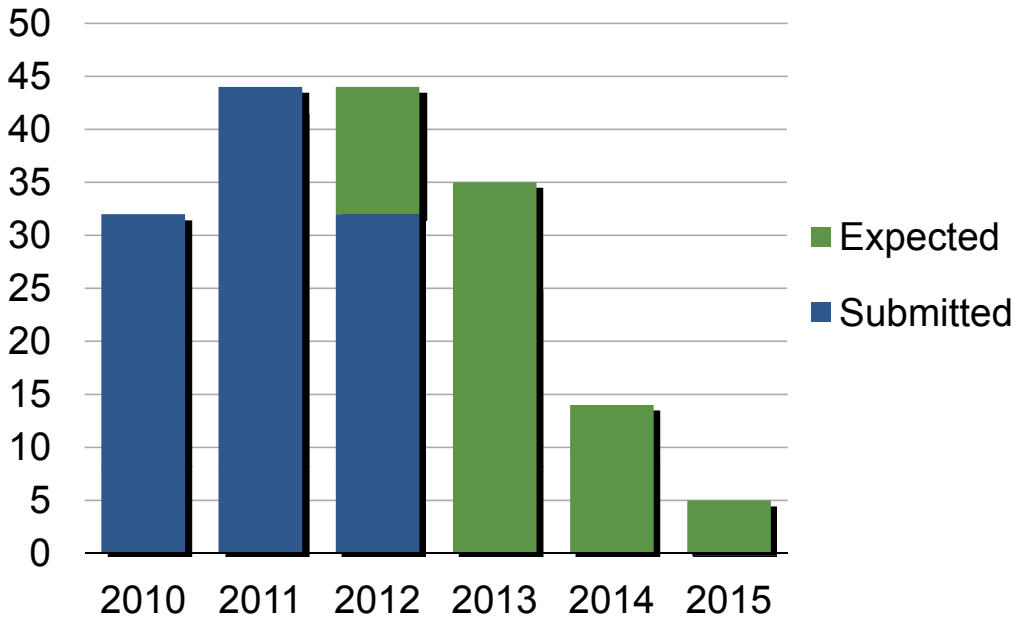
69 papers expected,
most of them in 2013-2014



Dzero Paper Projections

Topic	close	~2013	> 2013	Total
Electroweak	1	8	4	13
Higgs + BSM	8	7	2	17
Top	4	9	2	15
QCD	2	8	5	15
Heavy Flavor	1	5	4	10
Totals	16	37	17	70

70 papers expected, most of them in 2013-2014



CDF Milestone papers to come

- **QCD**
  - Photon production (γ inclusive, γ +light or heavy flavor, $\gamma\,\gamma$)
  - Diffraction studies at 3 collision energies (300, 900, 1960 GeV)
  - Double parton interactions

- **Heavy Flavor**
  - CP violation in the charm sector (D^+, D_s, A_{SL})
  - BR($B \rightarrow hh$)

- **Top**
  - Forward-backward asymmetry, differential cross sections
  - Single top observation in s-channel combining l+j and v+j decay modes
  - M_{top} with all data in all decay modes (all-jets, l+jets, v+jets, ll)
  - Combinations (CDF, Tevatron)

- **Electroweak**
  - W+jets differential cross sections
  - θ_W with all data
  - M_W with all data, combination (Tevatron)

- **Higgs**
  - Couplings, spin and parity determination, combinations (CDF, Tevatron)

Dzero Milestone papers to come

- **QCD**
  - di-b-jet/di-jet cross section ratio
  - V+Heavy flavor differential measurements
  - Double parton interactions
  - Jet event shapes
- **B Physics**
  - Final dimuon asymmetry measurement (D0)
  - Search for direct CPV in $B^+ \rightarrow j/Psi\ K^+$
- **Top**
  - Mass with full dataset (Tevatron combination)
  - Forward-Backward asymmetry (combination of leptons and l+jets, Tevatron comb)
  - Observation of single top s-channel (Tevatron combination)
- **Electroweak**
  - Forward-backward aymmetries (PDF constraints, θ_W)
  - W mass (~10 MeV precision), tests of the Standard Model (Tevatron combination)
- **Higgs**
  - Measurement of Hbb couplings, determination of Spin-Parity
  - Tevatron combinations

Summary

The CDF and Dzero collaboration are producing milestones results at high rate. The current computing & algorithms activities are being finalized, the physics keep coming out at an impressive rate, with a clear program ahead.

We are exploiting this unique 10 fb^{-1} proton-antiproton dataset, with optimized reconstruction, simulation and analysis methods

Major results are world best (Top mass, W mass, H→bb significance) , often with only a subset of the full Data sample, progress in front of us.

Anomalies (Top Afb, Dimuon Asymmetry..) uniquely studied at the Tevatron need final results on complete dataset

Looking forward, there are several important achievements to be realized, including for each collaboration ~70 publications and ~45 theses.

We are writing the legacy of the Tevatron, and contributing to answer several fundamental open questions of high energy physics

→exciting times (2013-2014) ahead of us