



Top Quark Physics within D0 France and Beyond

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**D0 France Meeting Lyon
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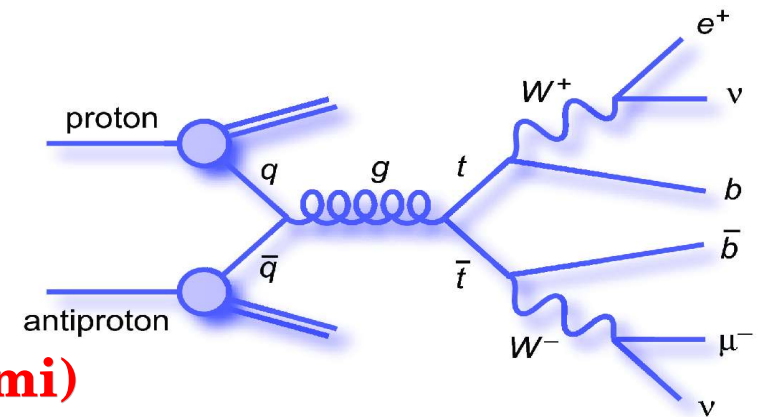
Top Quark Physics within D0 France

- ◆ mainly working on analyses in the dilepton channel
 - ◆ currently 10 people
 - ◆ from 2 institutes: CEA Saclay, LPC Clermont-Ferrand



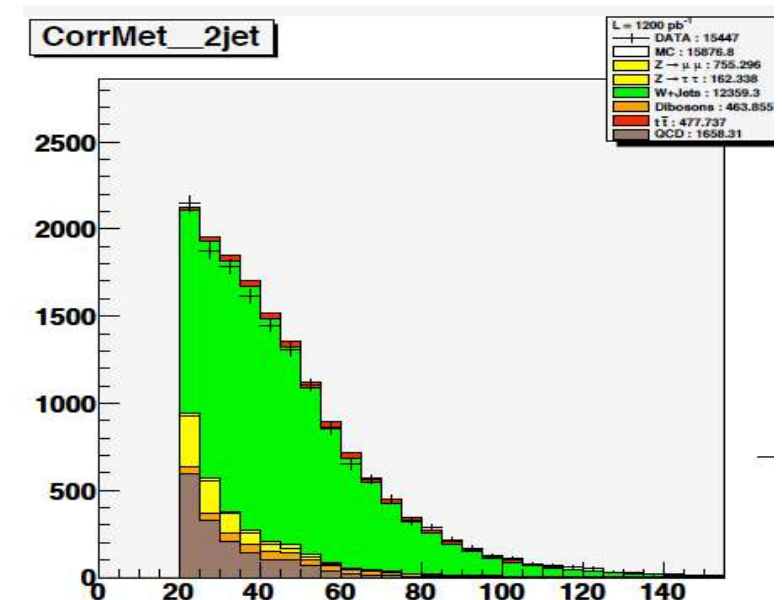
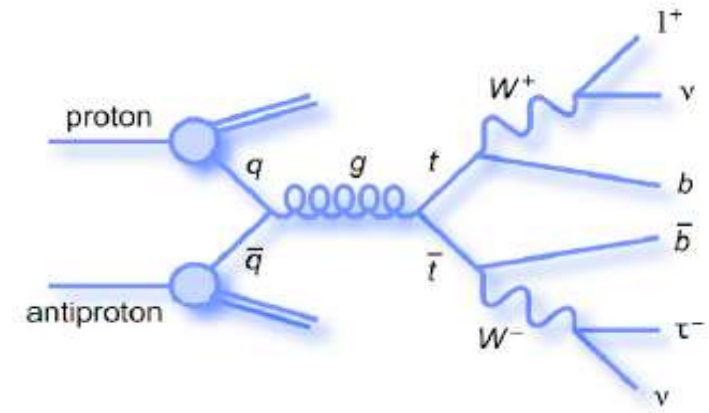
- ◆ cross section measurement in **ee/emu/mumu** channel based on **5.4 fb⁻¹** of D0 data released as a preliminary result for Moriond 2009:

$$\sigma_{\text{tbb}} = 8.4 \pm 0.4 \text{ (stat)} \pm 0.9 \text{ (syst)} \pm 0.7 \text{ (lumi)}$$



- ◆ measurement for the first time limited by systematics
- ◆ **base selection** for mass and property measurements (mass, spin) where the topological discriminant cut will be chosen such that the statistical uncertainty is minimal
- ◆ Saclay group currently working on points raised during EB review to **publish this measurement**
- ◆ more details are given in Solene's talk
- ◆ plan to add **b-tagging** and measure the fraction of **BR(t->b)**

- ◆ analysis performed by Frederique, Jerome and Philippe
 - ◆ starting from trees used for stop analysis (Philippe)
 - ◆ same **preselection** as in **lepton+jets** cross section measurement
 - ◆ **QCD determination** and **W+jet normalization in e+jets done**
- ◆ plans for summer
 - ◆ **QCD determination for mu+jets**
 - ◆ add **b-tagging**
 - ◆ extract cross section
- ◆ maybe no preliminary result in the timescale of ICHEP
- ◆ more details in Frederique's talk





- ◆ **dilepton Matrix Element mass** intended for **publication** this summer
 - ❖ significant improvements and modifications since Moriond 2008, e.g. hidden effects from choice of integration variables discovered and removed
 - => gained **15% of sensitivity** due to improved pull width
 - ❖ method frozen, started to turn the crank
 - currently trying to improve the **performance** of the integration on the **GRID** (fast sites, good efficiency, ...)
 - integration with large MC sets on the GRID also challenging as LHC has started
 - ❖ will start **group review** within the **next 3-4 weeks** with first points (e.g. p17 + p20 emu, p20 ee, p20 mumu central values + main systematic uncertainties)
 - ❖ first dilepton result that will not be limited by statistics
 - ❖ plan to check for the effect of **stop quarks in dilepton** with NP group

- ◆ **first Run II measurement of spin correlations in top quark events (Manchester/Saclay)**

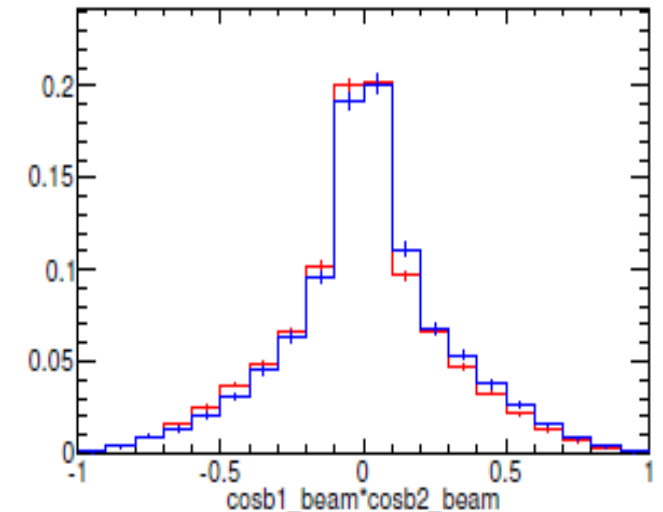
$$\frac{1}{\sigma} \frac{d^2\sigma}{d\cos(\theta_1)d\cos(\theta_2)} = \frac{1}{4} (1 - C \cdot \cos(\theta_1) \cos(\theta_2))$$

$C=0.777$ in NLO QCD

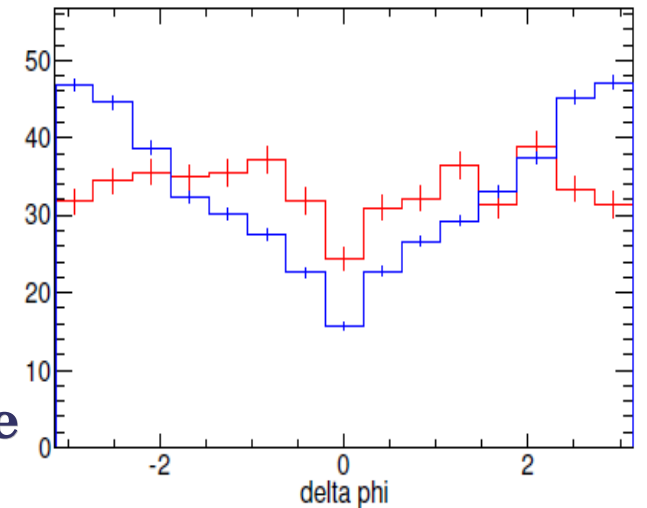
- ◆ **preliminary result last summer using p20 emu and p17 ee/emu/mumu events:**

$$C = -0.17^{+0.63}_{-0.53}$$

- ◆ **large uncertainties, still statistically limited**
- ◆ **currently working on an update for this summer**
 - ◆ **observed problems with neutrino weighting**
 - ◆ **try to use BDT/NN to gain sensitivity**
- ◆ **combination with CDF could lead to first evidence**
- ◆ **additional feature: fraction of gg and qqbar events can be estimated from lepton angular**



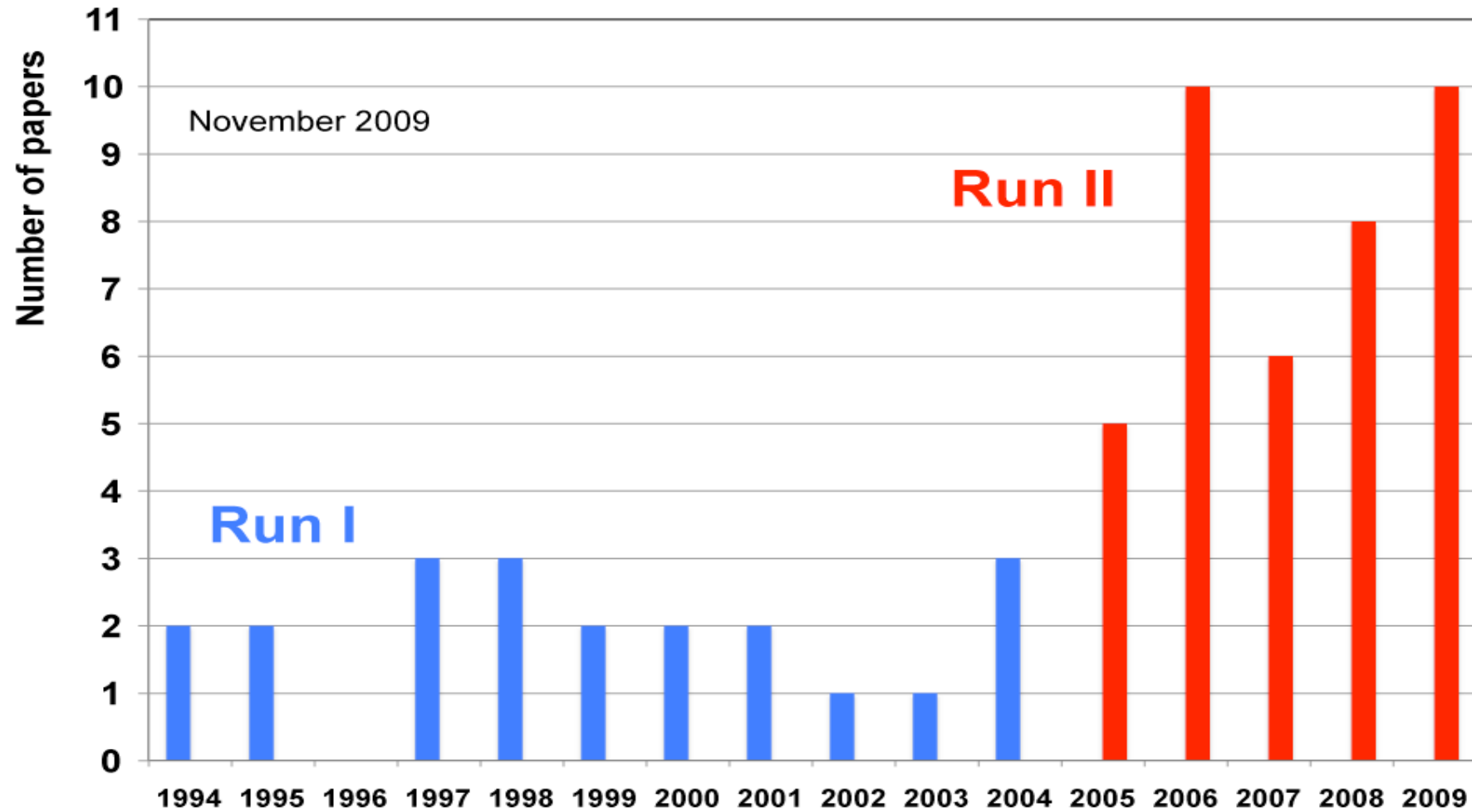
■ with spin, ■ without spin



■ gg, ■ qq̄

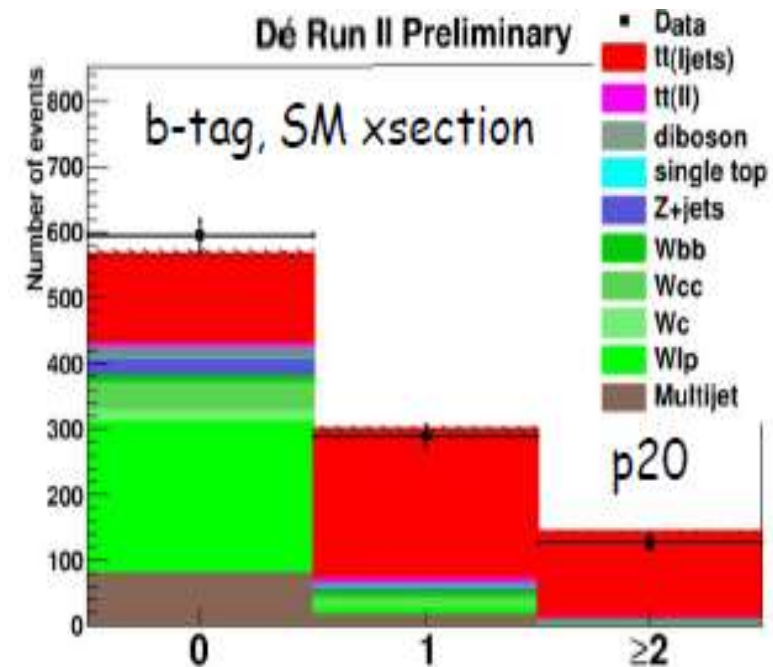
Top Quark Physics Summer 2010 (Not only D0 France)

DØ's Top Quark Journal Paper Submissions



- ◆ **analyses that are intended to converge for Top Workshop or ICHEP 2010**
 - ◆ **lepton+jets cross section measurement (topological and b-tag)**
 - ◆ **dilepton mass using ME**
 - ◆ **measurement of forward-backward asymmetry**
 - ◆ **measurement of W helicity**
 - ◆ **spin correlations in top quark decays**
 - ◆ **search for t' in lepton+jets events**
 - ◆ **search for FCNC in single top, search for W' in single top (not in this talk)**
- ◆ **analyses that could converge (tight schedule)**
 - ◆ **allhadronic mass, lepton+jets mass with ideogram method**
 - ◆ **top mass difference with ME method**

- ◆ measurement based on the summer extended data set of **5.4 fb⁻¹**
- ◆ analysis currently in EB review
 - ❖ extensive checks of **jet energy resolution** (now larger than in previous publication)
 - ❖ several other **updates since Moriond** (new muon trigger spc's, certified TRF's, new eps QCD values)
 - ❖ updated note with new p20 numbers in the incoming days
 - ❖ measurement planned as a **preliminary result for Top 2010**, if possible, and **journal publication** for summer





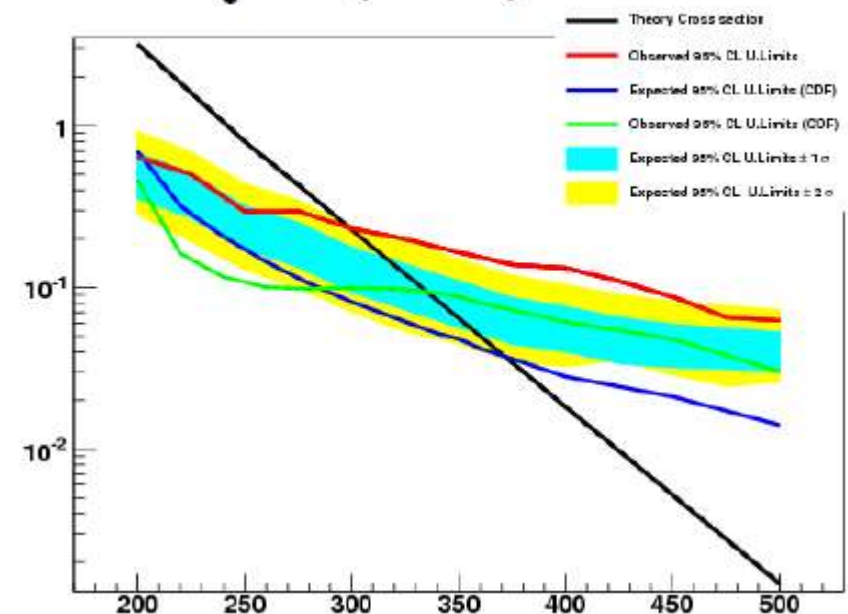
- ◆ besides dilepton ME mass several mass measurements planned to be updated for summer or later this year
 - ◆ **lepton+jets** mass with **Ideogram** method (5.4 fb^{-1})
 - still need to tune parton level correction to get both the correct top and W mass, update Hitfit, include background
 - ◆ **lepton+jets ME** mass (3.6 fb^{-1})
 - reestimate and decrease the main jet systematics for publication
 - determine MC/data corrections using particle jets and single pion response
 - ◆ **allhadronic mass** (5.4 fb^{-1})
 - all pieces in place (bkg model, ...) besides trigger turn ons
 - new iterative method to extract mass (presented last week 29th April)

- ◆ update of the dilepton spin correlation measurement using 5.4 fb^{-1}
- ◆ also try to add **lepton+jets events** to the measurement
 - ◆ with 2 b-tags easy to reconstruct whole event
 - ◆ but challenging to identify the down type jet (55% efficiency)
- ◆ investigate the **usage of ME** information
 - ◆ nice separation between spin correlation and no spin correlation
 - ◆ not easy to evaluate spin correlation factor for ensemble tests
- ◆ **W helicity measurement** with 5.4 fb^{-1} **lepton+jets** and **dilepton** events
 - ◆ analysis in group review, soon moving to EB
 - ◆ method unchanged since previous publication, blinded result
 - ◆ background checks, comparing yields to cross section measurements ongoing

- ◆ **forward-backward charge asymmetry** using 5.3 fb^{-1} of lepton+jets events
 - ◆ already published with 0.9 fb^{-1}
 - ◆ same selection as used in the cross section measurement
 - ◆ new result in group review: $A_{fb} = 10.1 \pm 3.8 \%$ (combined p17+p20)
 - ◆ systematics underway ($\sim 2\%$)
 - ◆ planned to unfold the result after Top Workshop

- ◆ search based on **5.4 fb⁻¹** of **lepton+jets** events
- ◆ analysis currently in **EB review**
- ◆ some updates since Moriond (e.g. muon trigger spc's, ..)
- ◆ yield comparisons to lepton+jets cross section measurement
- ◆ still observing a **2 σ effect** in the **mu+jets** channel
- ◆ trying to **improve** the **limit** (2 dimensional fit)
- ◆ plan to release the result for ICHEP

4 jets (e+mu) 2D limits



- ◆ active **participation** of **D0 France** in the field of top quark physics
- ◆ a lot of top quark measurements planned to be updated to **$\sim 5.4 \text{ fb}^{-1}$** this summer
 - ◆ most of the analyses will directly go to a **journal publication**:
lepton+jets cross section, ME mass dilepton +lepton+jets, W helicity, ...
- ◆ mass and cross section **combinations planned with CDF**
- ◆ also started the discussion of combining other property results (spin, asymmetry, W helicity)

