B's, CP, CKM Elements and HFAG

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PDG Collaboration/Advisory Meeting,

Berkeley, Nov 19-20, 2010

- **What's new in RPP 2010**
- **Minireviews**
- **Issues in B's and CKM Elements**
- **Heavy Flavor Averaging Group Activities (HFAG)**
- **Prospects for 2012 Edition**

Encoders:

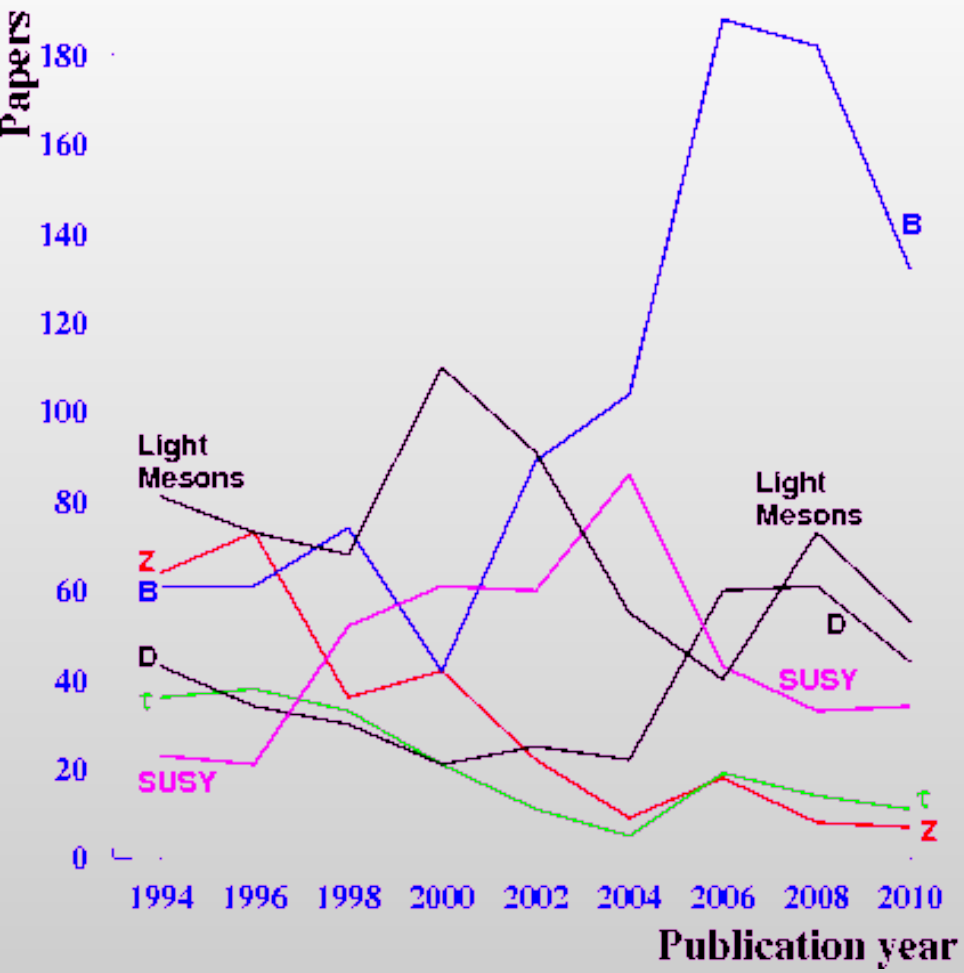
→ **Y. Kwon (Yonsei, Korea), J. Smith(Colorado, USA), G. Punzi(INFN, Italy)**

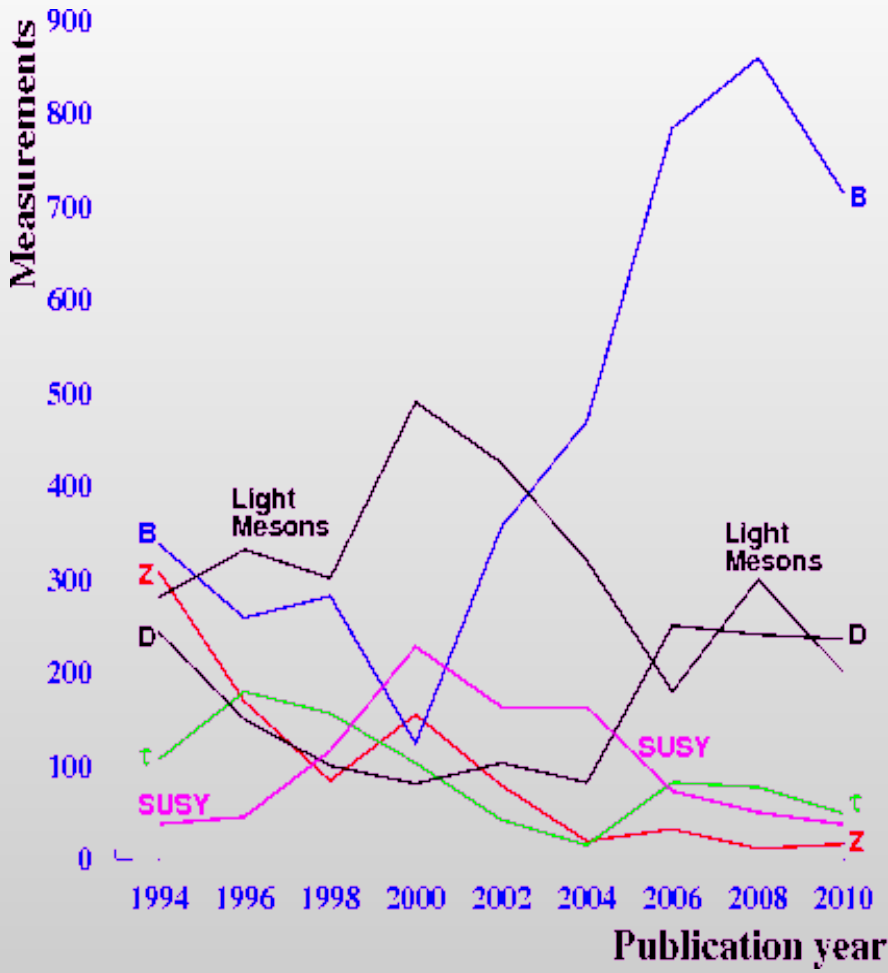
→ **With the help of HFAG**

What's New in RPP 2010

- **B physics continues to be one of the most productive fields in RPP.**
- **132 papers and 714 measurements were encoded for this edition.**
- **Highlights:**
  - **CPV and Unitarity Triangles**
  - **Bs Mixing and B lifetimes**
  - **Observation of new B hadrons and search for new physics**
  - **All data are consistent with SM, except few anomalies**
- **Excellent mini reviews:**
  - **B production and decays (Kwon, Punzi, and Smith)**
  - **BBbar mixing (Schneider)**
  - **Vcb/Vub determinations (Kowalewski and Mannel)**
  - **B Polarization (Gritsan and Smith)**

B Papers/Measurements

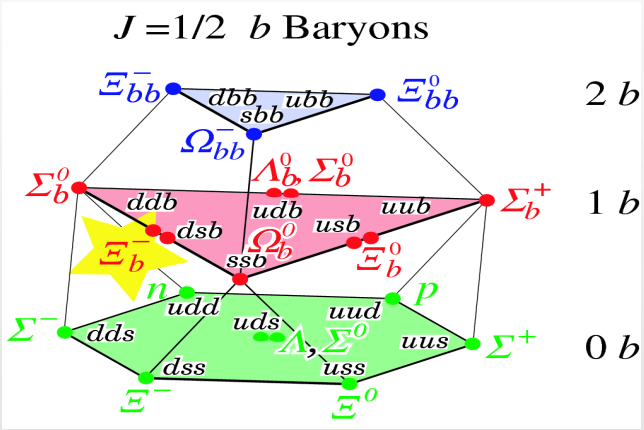


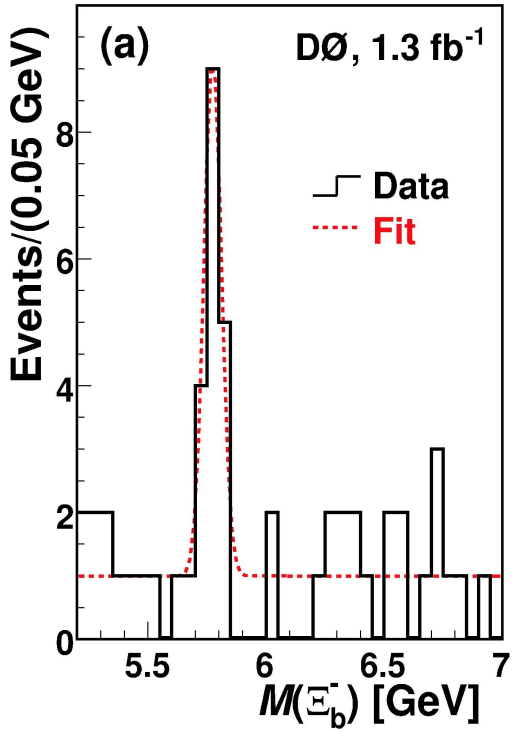


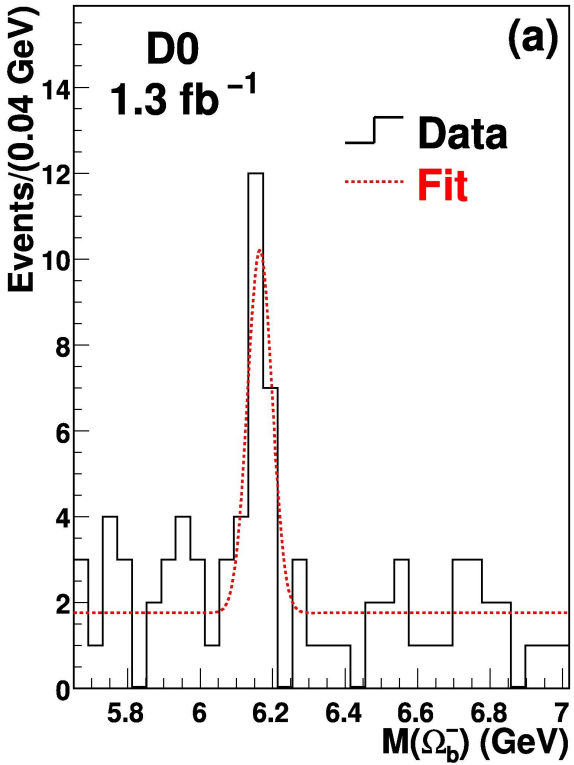
- **B's still outperform the rest, but at a slower pace.**

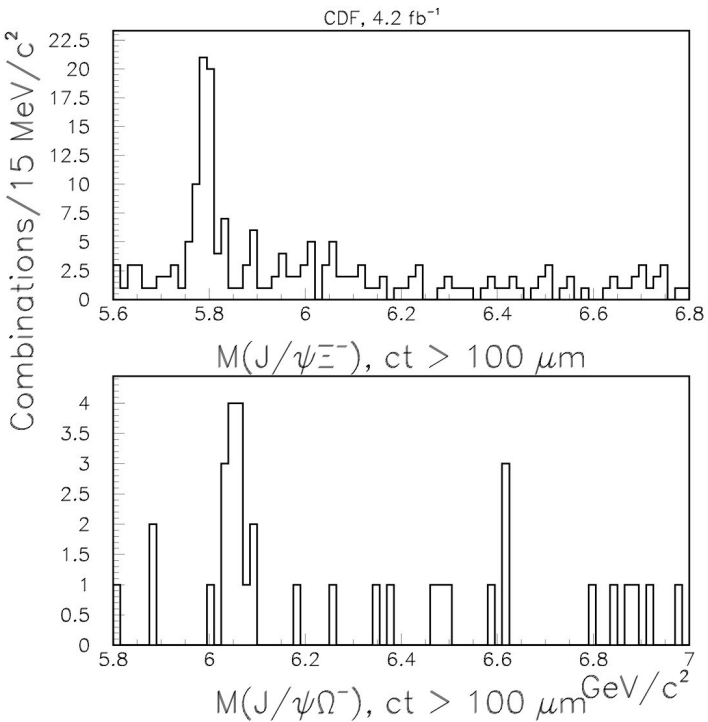
Observation of Ω_b^- and Ξ_b^-

- **Completing b-Baryon sector containing 1b.**
- **Ξ_b^- mass consistent between CDF and D0.**
- **Ω_b^- mass still needs work:**
  - **CDF: 6054.4 +- 6.8 +- 0.9 (MeV)**
  - **D0 : 6165 +- 10 +- 13 (MeV)**
  - **Avg: 6071 +- 40 (MeV)**



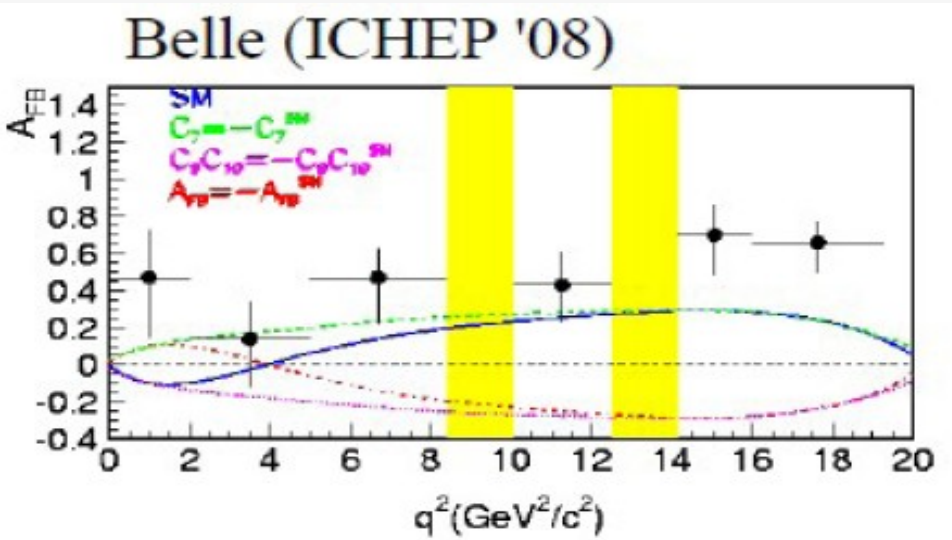


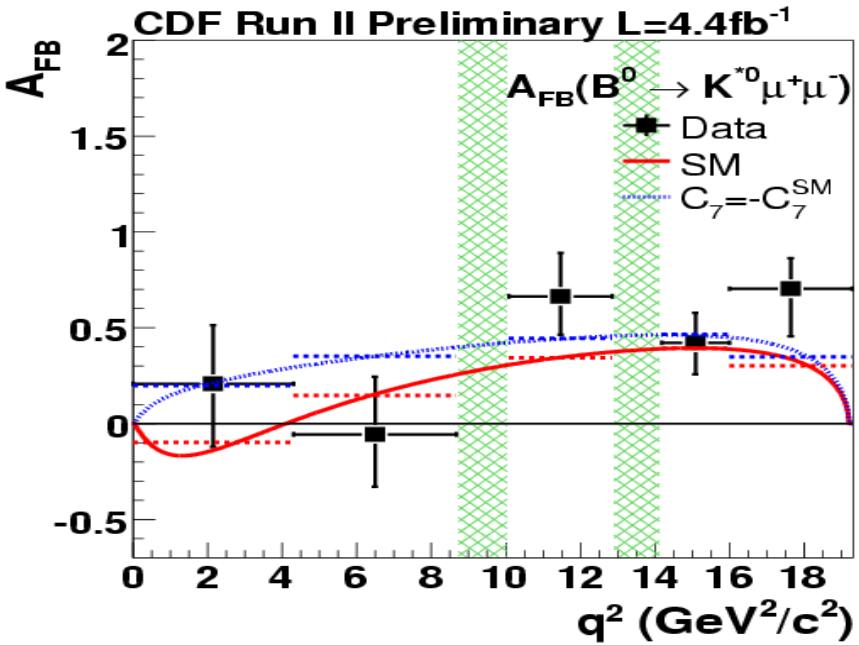


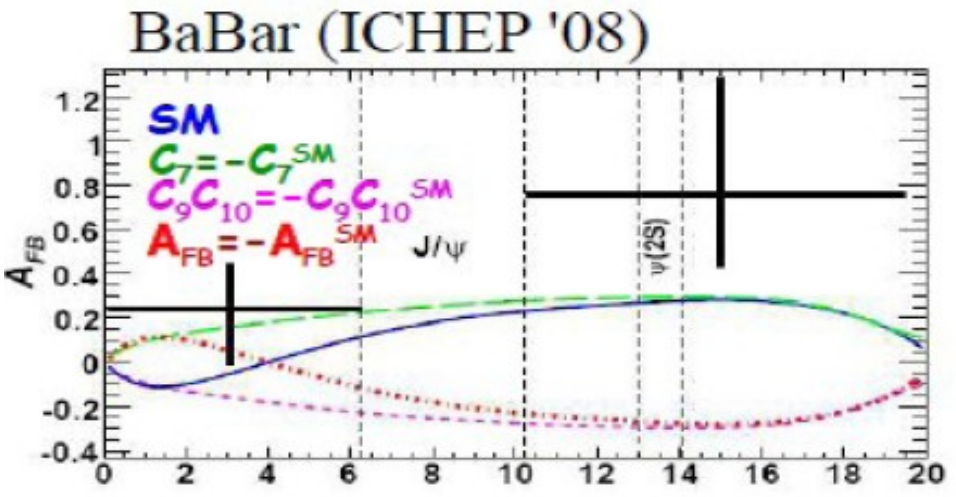


A_{FB} in $B \to K^* l^+ l^-$

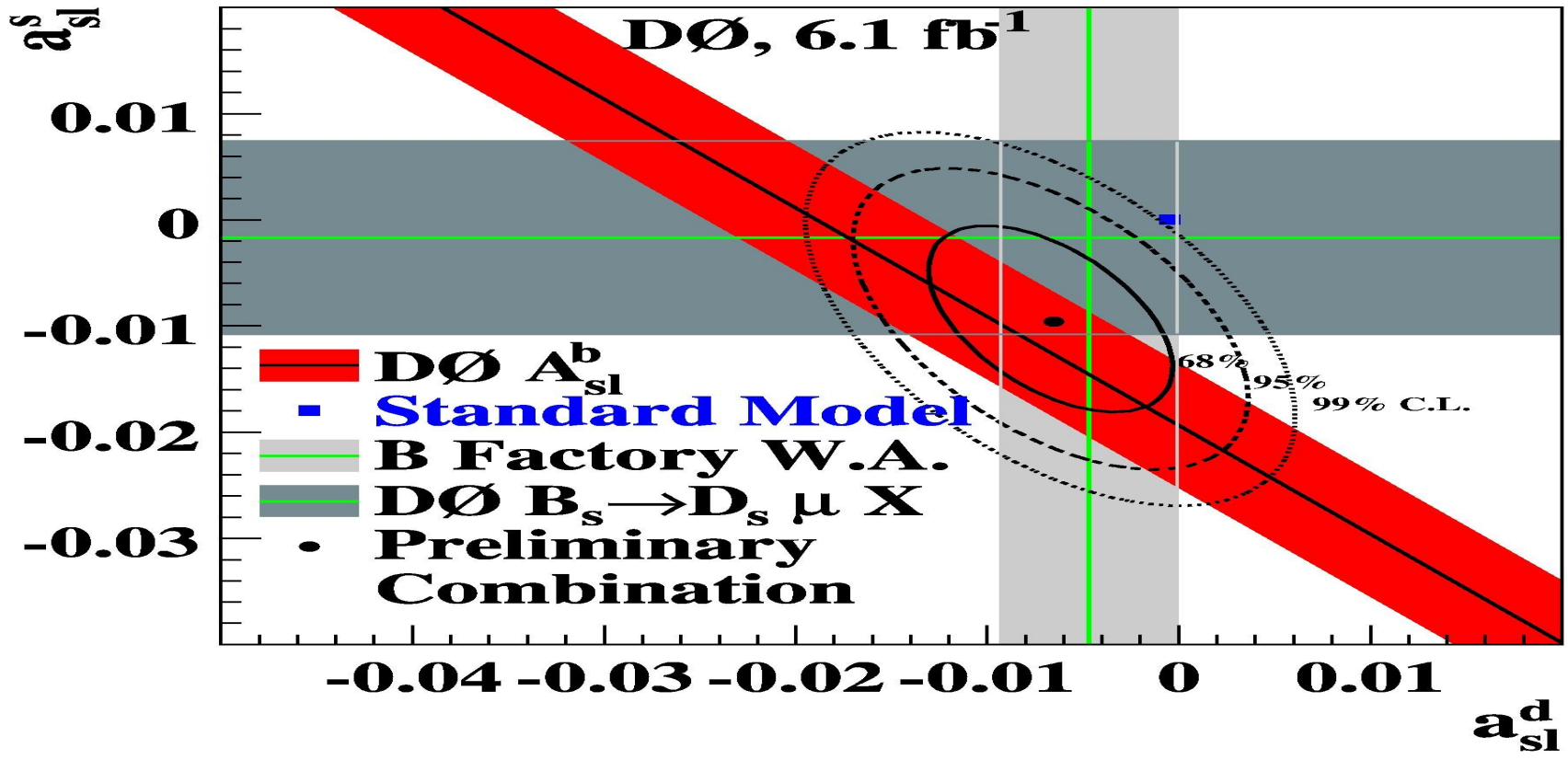
- Belle reported 2.7σ deviation from SM in F_{AB} using 250 $B \to K^* l^+ l^-$.
- CDF reported similar excess using ~100 $B \to K^* \mu^+ \mu^-$.
- Difficult to encode F_{AB} vs q^2 with different bin sizes.







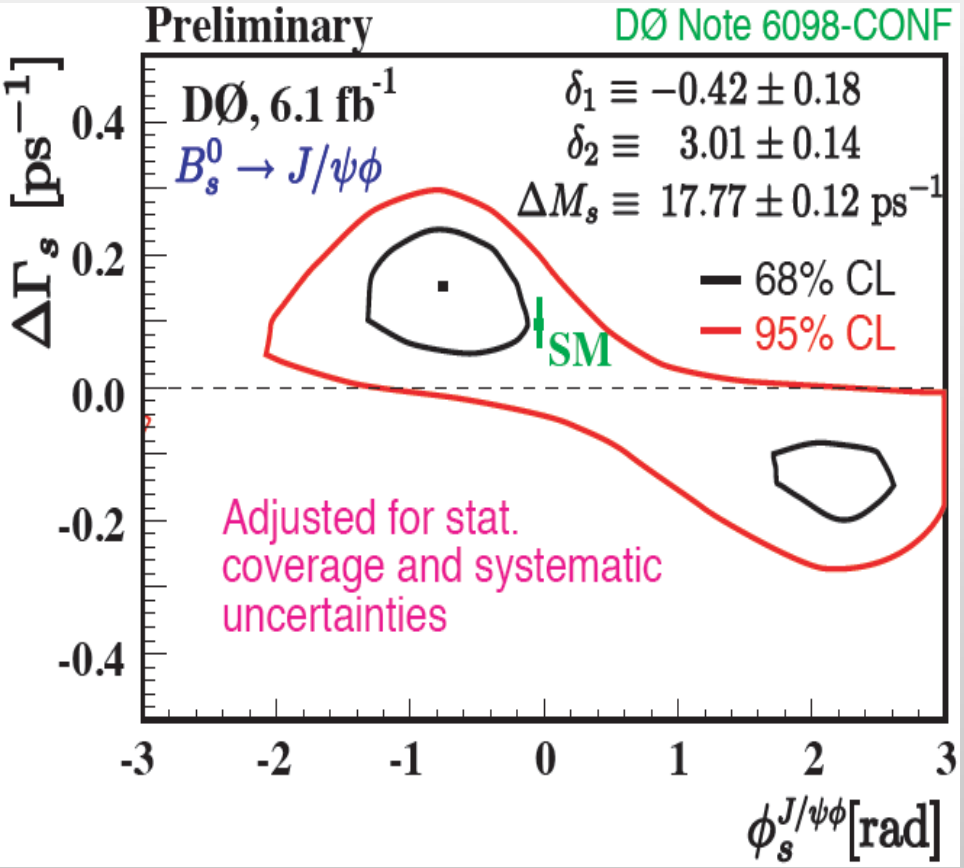
Evidence for an anomalous like-sign dimuon charge asymmetry

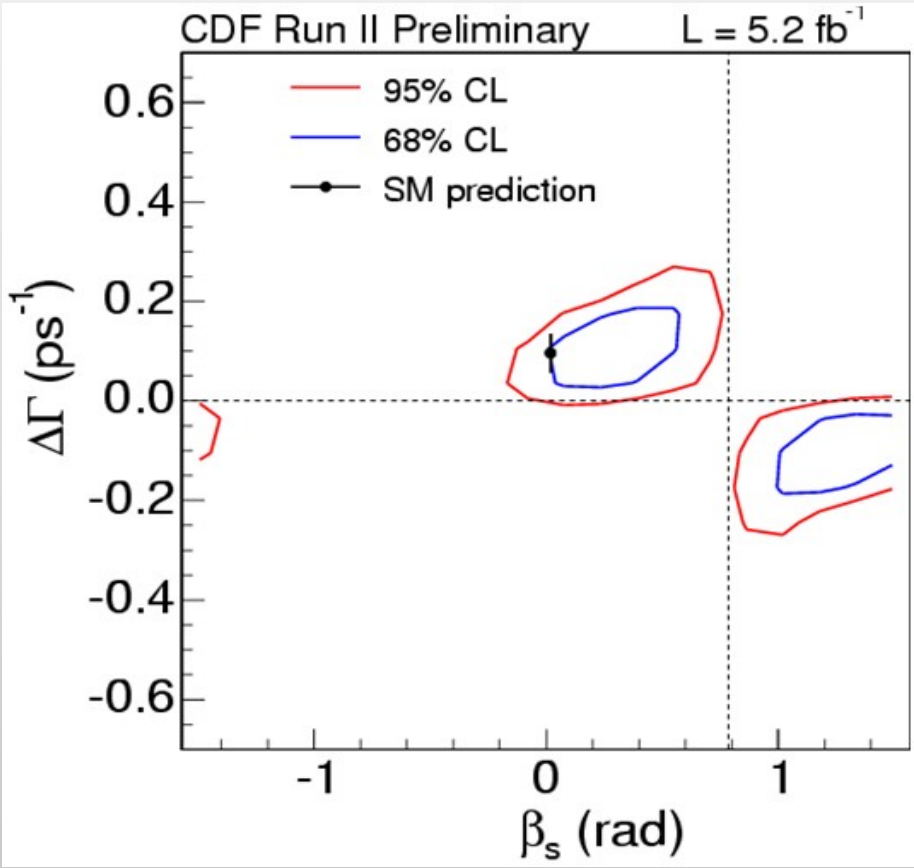


- $a_{sl}^b = (N^{++} - N^{--})/(N^{++} + N^{--})$
- D0 measurements is ~3σ from SM predictions, need a confirmation!
- PRL 105, 081801 (2010)

CP Asymmetry in Bs->J/psi phi

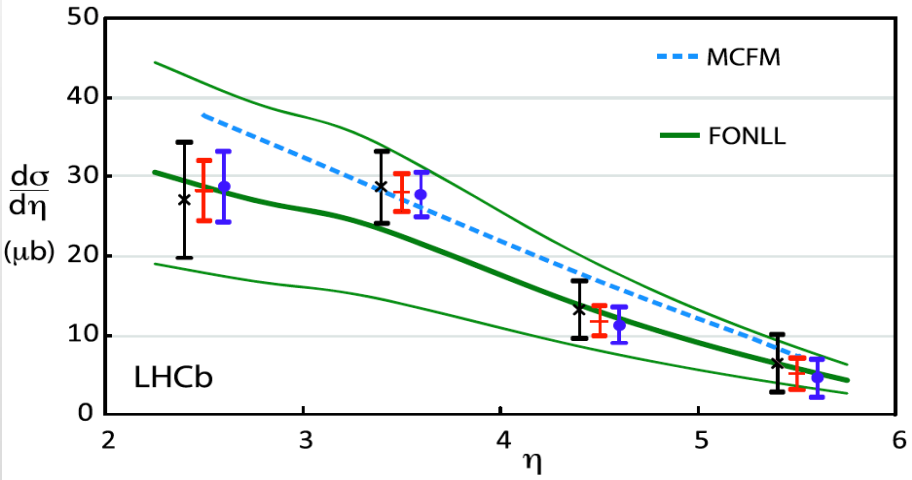
- **Bs→J/ψφ measures CPV B_s mixing phase $-2\beta_s$, Sensitive to NP at loop.**
- **CDF and D0 recently updated results that are consistent with SM at 1σ.**

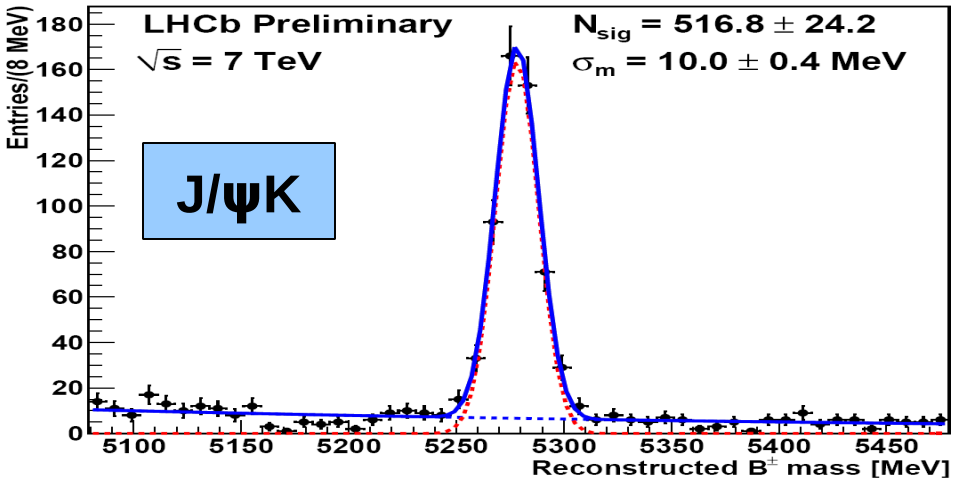


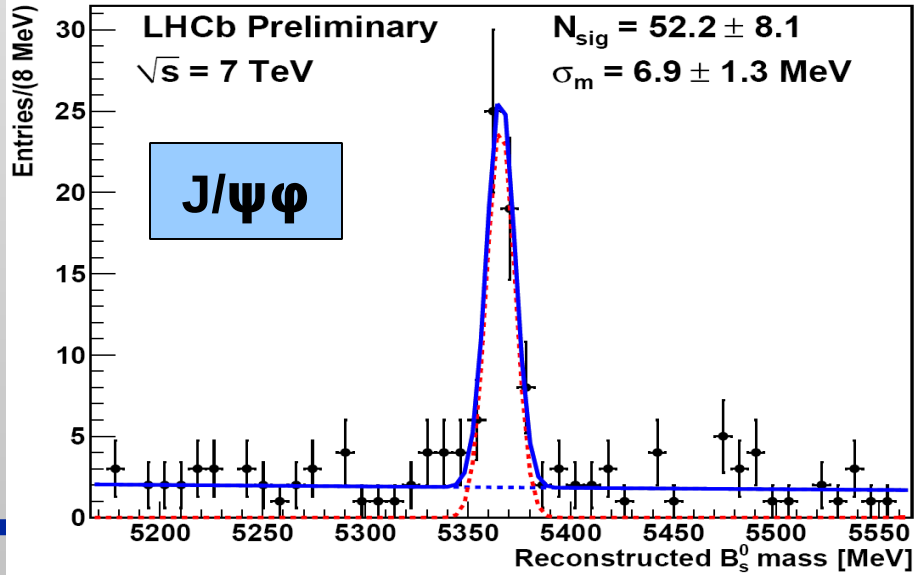


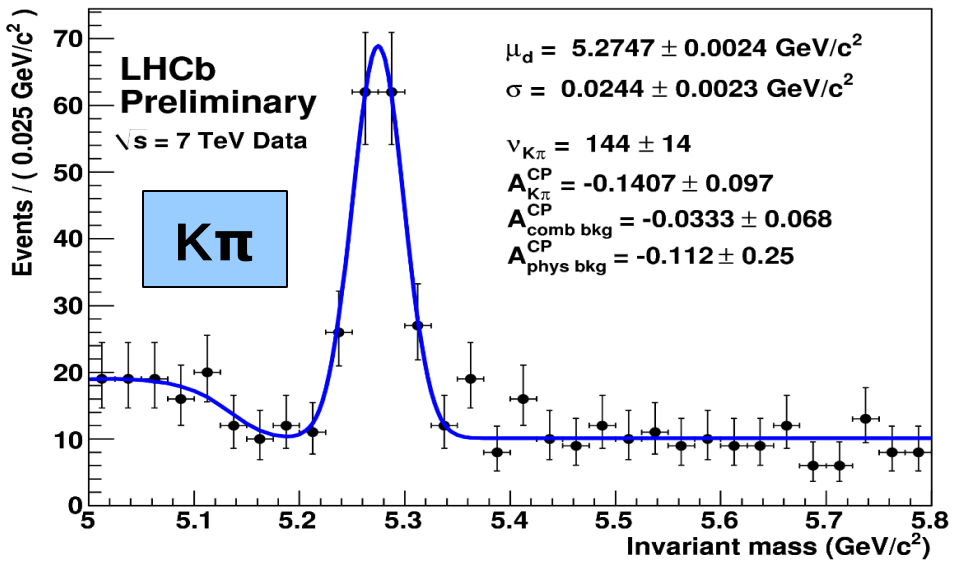
B Physics from LHCb

- LHCb is doing very well and published the first paper on σ(pp→bbx) and more to come.



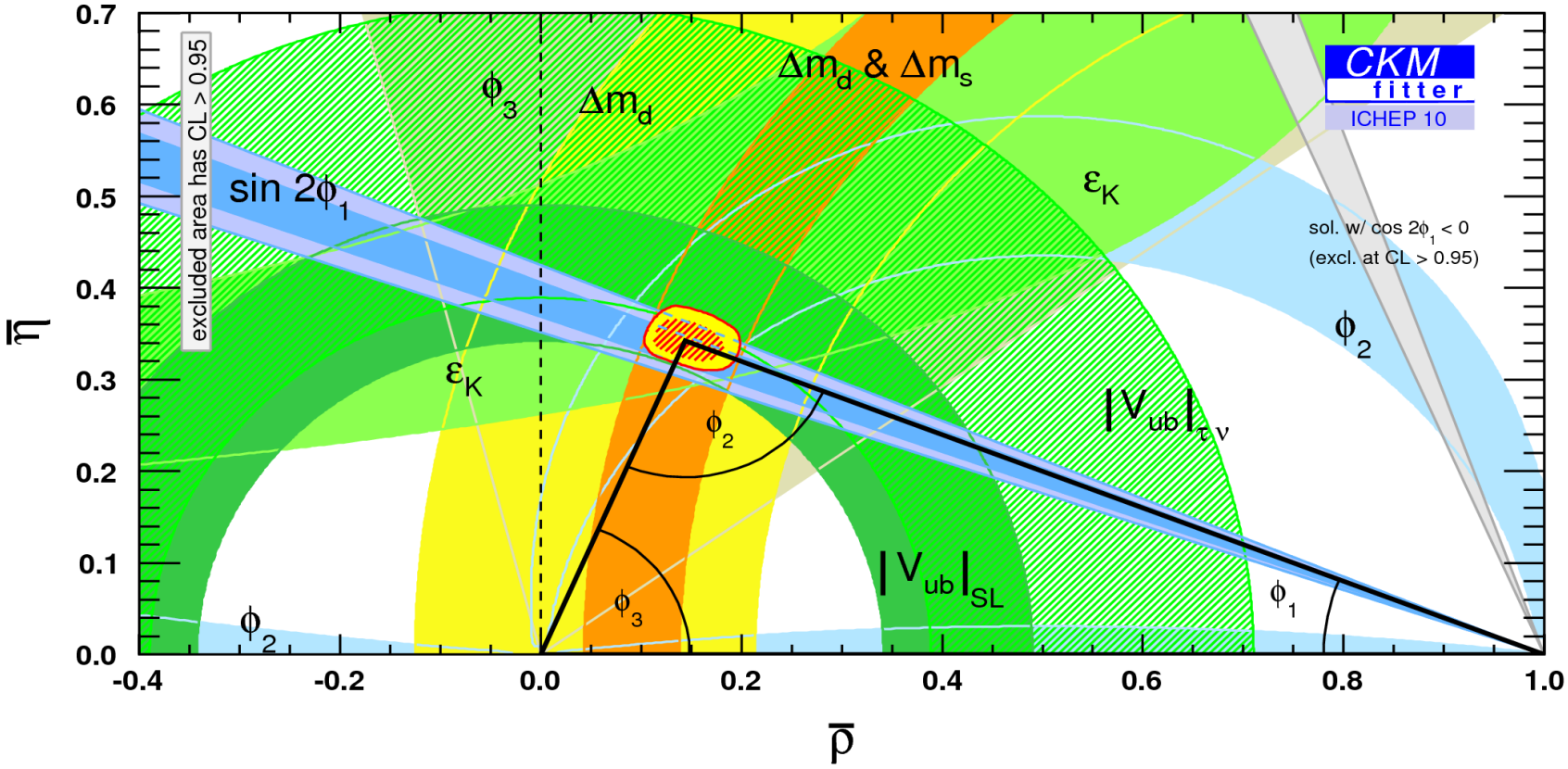






CKM Matrix Elements

- Most CKM elements are measured based on branching ratios or decay asymmetry with some help of theoretical assumptions.
- B section provides: Δm_d, Δm_s, φ_1, φ_2, φ_3, V_{cb}, V_{ub}
- They are discussed in mini-review or CKM review



Computer Readable file for Decay Branching Ratio (BR)

- PDG has provided a computer readable file for HEP, but so far for mass, width and lifetimes.
- Including BR would be next step.
- Recently, we got few urgent requests from LHCb people that they want to have the latest decay BR in a computer readable form to improve their MC event generators.
- In the past, they basically did it by hand, but do not want to do it again second time.
- Some sort of dump for the summary table in ASCII seems fit their needs.

Outside Working Groups (HFAG)

- **The PDG averaging method is not designed for handling correlations in statistical and systematic errors between measurements and experiments.**
- **Have to rely heavily on the outside working groups and their expertise to provide the best averages for PDG that use only published results.**
- **HFAG provided their averages for PDG for many years, whose combination procedure takes all known correlations into account as well as re-scaling each individual measurements using the common set of input parameters before averaging.**
- **HFAG consists of 7 subgroups: B lifetime/Mixing, Semileptonic B decays, Unitarity Triangle, Rare B Decays, b→c Decays, Charm, and τ physics.**
- **Details see the slides from HFAG (Alan Schwartz).**

Prospects for 2012 Edition

- **Continue to work with HFAG providing the world best B decay parameters.**
- **Planning for data driven minireviews:**
  - **Vcb and Vub CKM Elements**
  - **Production and Decay of b-flavor Hadrons**
  - **BBbar Mixing**
  - **Polarization in B decay**
- **All the data are consistent with SM, except few anomalies.**
- **This is an exciting time for flavor physics and we will continue to meet the challenges in 2012.**