

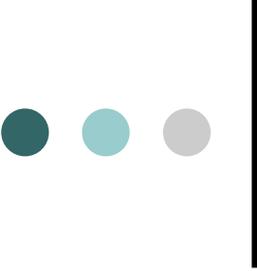
Heavy Flavor Averaging Group (HFAG)

Simon Eidelman

(Budker Institute of Nuclear Physics)

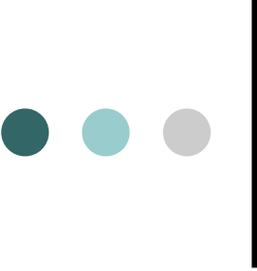
Soeren Prell

(Iowa State University)



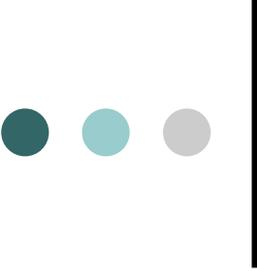
HFAG Organization

- **HFAG** formed in 2002 to continue activities of the LEP HF Steering Group with co-leaders D.Kirkby and Y.Sakai. Co-leaders since spring 2005 S.Eidelman and S.Prell
- **Goal:** provide up-to-date averages for measurements of b-flavor and c-flavor related quantities
- **6 Subgroups**
 - B Lifetimes and Mixing
 - Semileptonic B Decays
 - Unitarity Triangle
 - Rare B Decays
 - $b \rightarrow c$ Decays
 - Charm Physics (**new**)



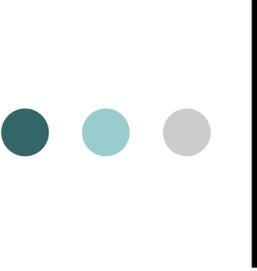
HFAG Documentation and PDG

- Provide averages for review speakers at winter and summer conferences
 - Averages include preliminary results
 - Publish results twice a year at <http://www.slac.stanford.edu/xorg/hfag/>
 - Publish results in ArXiv once a year (last one was hep-ex/0603003)
 - Write-up for summer 2006 conferences is in progress
- Provide averages for PDG (contact W.Yao)
 - E.g. Lifetimes, Δm_d , etc.
 - Averages only from published results



HFAG Averaging Methods

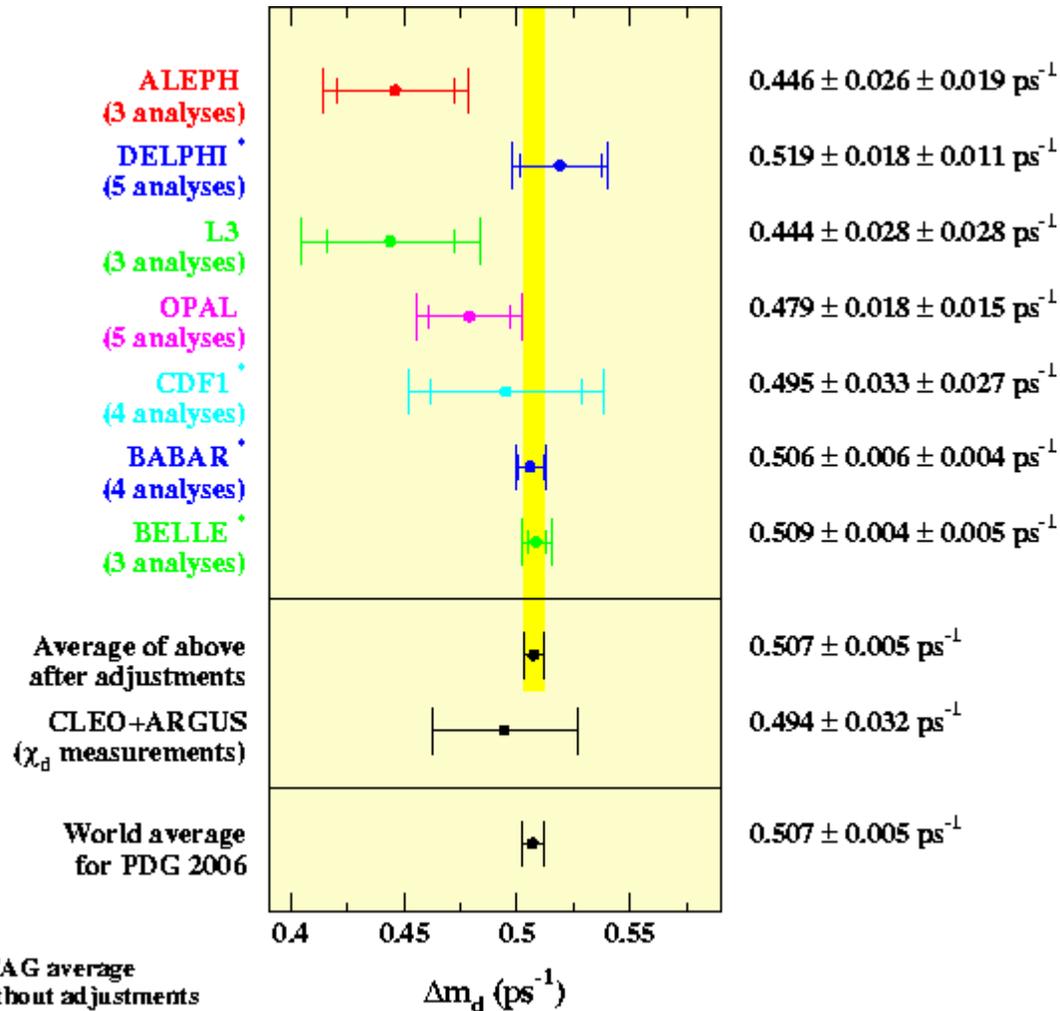
- Use similar averaging procedures as PDG, but without inflating error if $\chi^2/\text{dof} > 1$
- Accounting for possible correlations in statistical and systematic error between measurements and experiments
- Specific details for calculation of some averages described on web site and/or in hep-ex document

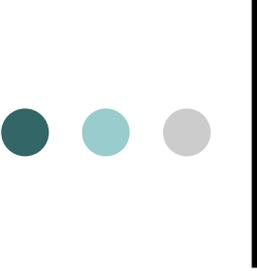


Lifetime and Mixing

- Group
 - O.Schneider (Belle)
 - R.Godang (BaBar)
 - K.Anikeev (CDF)
 - R.van Kooten (D0)
 - C.Weiser (LEP)
- Tasks - averages related to
 - b-hadron lifetimes
 - B_d^0 mixing ($\Delta\Gamma_d$, Δm_d)
 - B_s^0 mixing ($\Delta\Gamma_s$, Δm_s)
 - CPV in B^0 mixing
 - b-hadron fractions

Lifetime and Mixing – Oscillation Frequency Δm_d





Semileptonic B Decays

○ Group

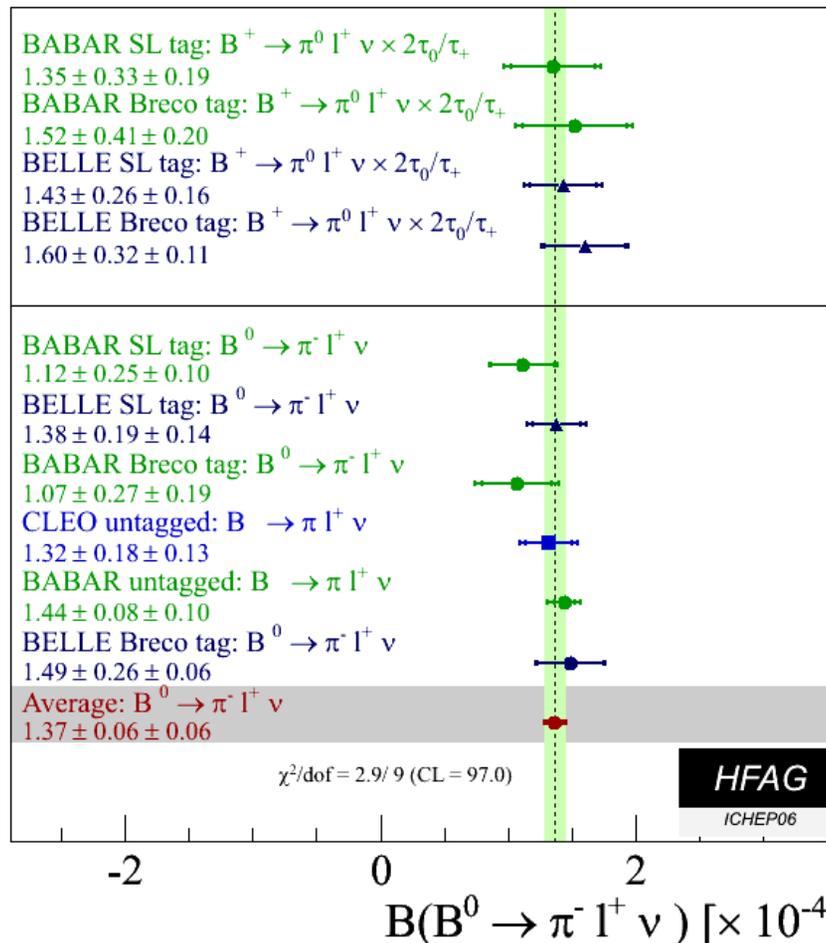
- A.Limosani (Belle)
- T.Iijima (Belle)
- E.Barberio (Belle)
- V.Luth (BaBar)
- H.Lacker (BaBar)
- F.di Lodovico (BaBar)
- A.Cerri (CDF)
- M.Artuso (CLEO)

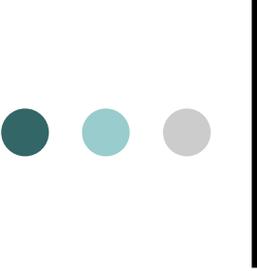
○ Tasks

- Branching ratios for inclusive and exclusive semi-leptonic B decays
- $|V_{cb}|$ and $|V_{ub}|$
- Consistent approach to moments

Semileptonic B Decays –

$$B \rightarrow \pi l \nu$$





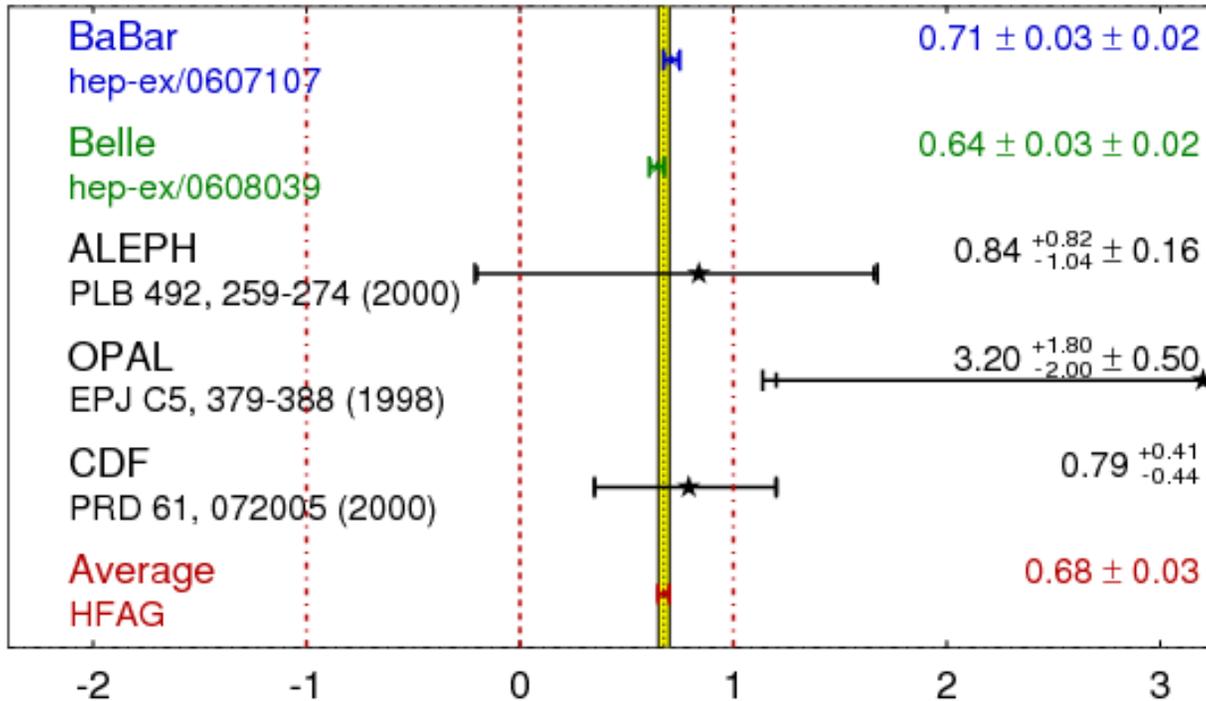
Unitarity Triangle

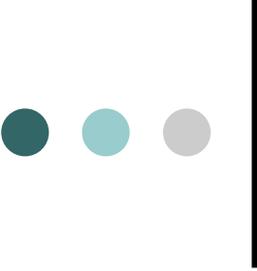
- Group
 - T. Gershon (BaBar)
 - K.Trabelsi (Belle)
 - Y.Sakai (Belle)
 - G.Cavoto (BaBar)
 - O.Long (BaBar)
 - A.Stocchi (BaBar)
 - C. Blocker (CDF)
 - F. Wuerthwein (CDF)
 - H. Evans (D0)
- Tasks – averages related to the UT angles
 - α/ϕ_2
 - β/ϕ_1
 - γ/ϕ_3

Unitarity Triangle – $\sin(2\beta) / \sin(2\phi_1)$

$$\sin(2\beta) \equiv \sin(2\phi_1)$$

HFAG
ICHEP 2006
PRELIMINARY

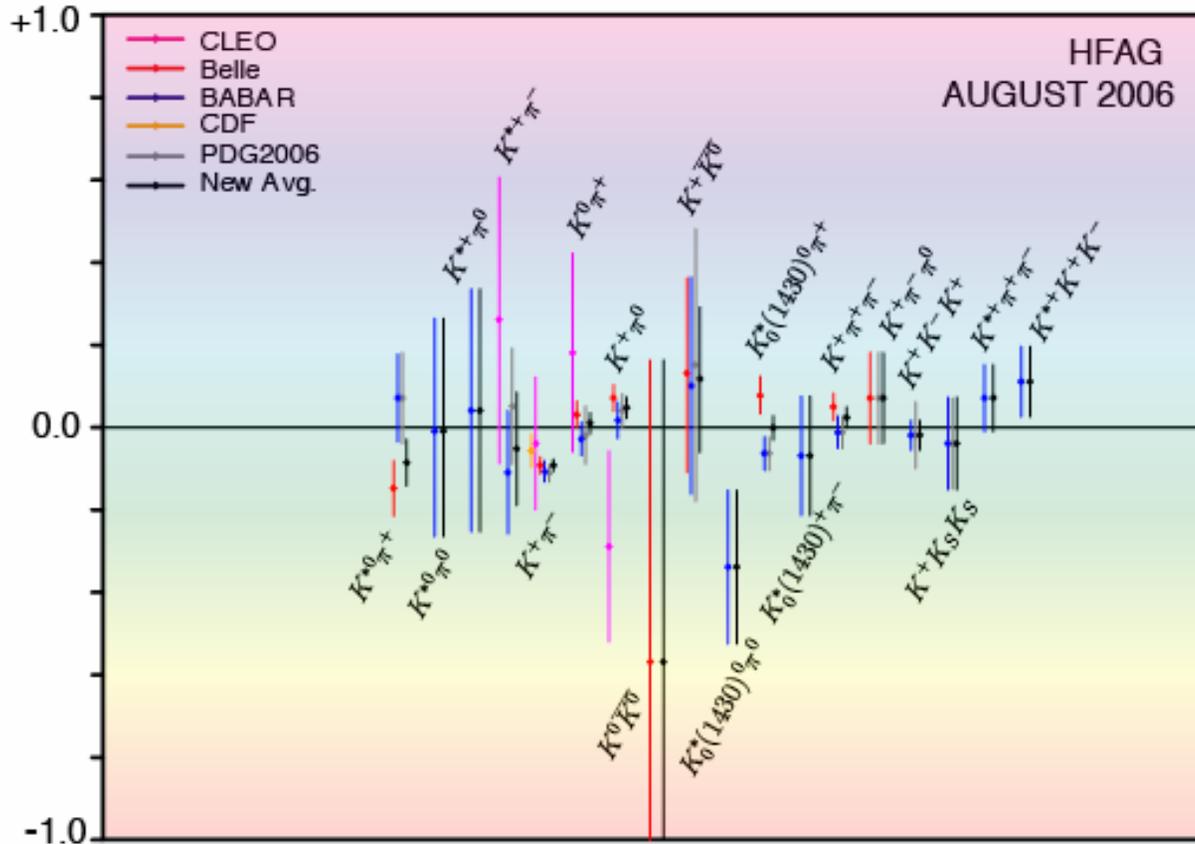


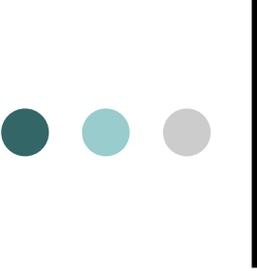


Rare Decays

- Group
 - P.Chang (Belle)
 - J.Smith (BaBar)
 - R.Harr (CDF)
 - F.Lehner (D0)
- Tasks – averages of branching ratios and A_{CP} for rare hadronic B decays
 - Charmless B decays
 - Radiative B decays
 - Leptonic B decays
 - Baryonic B decays

Rare Decays – CP Asymmetries in Charmless B Decays

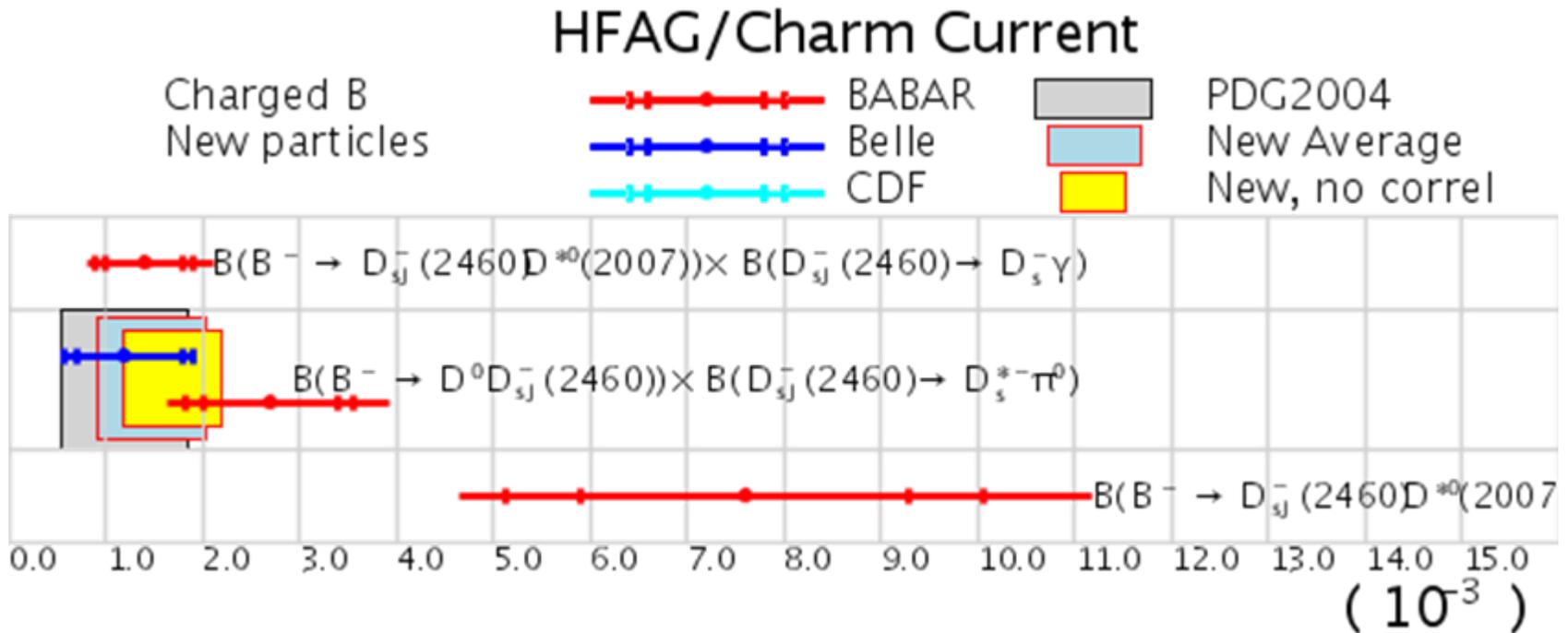




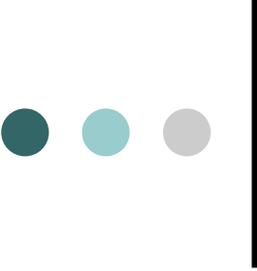
$b \rightarrow c$ Decays

- Group
 - S.Blyth (Belle)
 - S.Tosi (BaBar)
 - C.Voena (BaBar)
 - R.Harr (CDF)
 - C.J.S.Lin (CDF)
 - A.Nomerotski (D0)
- Tasks – averages of B decays to charmed and charmonium final states including
 - D^\pm , D^0 , D_s
 - Charmonia
 - Charmed Baryons
 - New particles

$b \rightarrow c$ Decays



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Charm Physics

New since
summer 2006

- Group
 - M.Purohit (BaBar,E791)
 - B.Petersen (BaBar)
 - B.Golob (Belle)
 - A.Schwartz (Belle)
 - L.Gibbons (CLEO)
 - O.Behnke (H1)
 - L.Gladilin (ZEUS)
 - B.Casey (D0)
 - M.Mattson (CDF)
 - D.Pedrini (FOCUS)
 - C.Z.Yuan (BES)
- Tasks – averages related to
 - D^0 mixing
 - D CP violation
 - rare D decay modes
 - properties of broad D^{**} and new D_{sJ} states
 - fragmentation of charmed hadrons
 - Semileptonic charm decays