B Hadron Lifetimes from CDF

• $\bar{B}^0$ and B^-

From the analysis of the full Run 1 data set (integrated luminosity of 110 pb^{-1} collected during 1992–1996) the exclusive signals from $B \to J/\psi K$ and $B \to \psi(2S)K$ yield

$$\begin{array}{ll} \tau(B^-) = (1.68 \pm 0.07 \pm 0.02) \text{ ps} & (\text{signal} = 824 \pm 36) \\ \tau(\bar{B}^0) = (1.58 \pm 0.09 \pm 0.02) \text{ ps} & (\text{signal} = 436 \pm 27) \\ \tau(B^-)/\tau(\bar{B}^0) = 1.06 \pm 0.07 \pm 0.01 & \end{array}$$

The first error is the statistical error and the second error is the systematic error. This result has been published: The CDF Collaboration, F. Abe *et al.,* Phys.Rev. D57, 5382 (1998).

From the analysis of partially reconstructed $B \to \ell D X$ decays, there is a published result from the analysis of Run 1a data (integrated luminosity of 19.3pb^{-1} collected during 1992–1993): The CDF Collaboration, F. Abe *et al.,* Phys.Rev.Lett. **76** (1996) 4462. The analysis of the full Run 1 data set (integrated luminosity of 110 pb^{-1} collected during 1992–1996) yields:

$$\begin{array}{l} \tau(B^-) = (1.637 \pm 0.058^{+0.045}_{-0.043}) \text{ ps} \\ \tau(\bar{B}^0) = (1.474 \pm 0.039^{+0.052}_{-0.051}) \text{ ps} \\ \tau(B^-)/\tau(\bar{B}^0) = 1.110 \pm 0.056^{+0.033}_{-0.030} \end{array}$$

This result has been published: The CDF Collaboration, F. Abe *et al.,* Phys.Rev. D58, 092002 (1998).

The combination of the above two results using exclusive and partially reconstructed B decays yields

$$\begin{array}{l} \tau(B^-) = (1.661 \pm 0.052) \text{ ps} \\ \tau(\bar{B}^0) = (1.513 \pm 0.053) \text{ ps} \\ \tau(B^-)/\tau(\bar{B}^0) = 1.091 \pm 0.050 \end{array}$$

The error is the sum of statistical and systematic errors, where the correlated systematic errors are taken into account.

• $\bar{B}^0_s$

From the analysis of the full Run 1 data set (110pb^{-1}), the exclusive signal $\bar{B}^0_s \to J/\psi\phi$ yields:

$$\tau(\bar{B}^0_s) = (1.34^{+0.23}_{-0.19} \pm 0.05) \text{ ps (signal} = 58 \pm 12).$$

This result has been published: The CDF Collaboration, F. Abe *et al.,* Phys.Rev.Lett. 77, 1945 (1996), and Phys.Rev. D57, 5382 (1998).

From the analysis of the partially reconstructed decay mode $\bar{B}_s^0 \to \ell^- D_s^+ X$, with using the full Run 1 data set (110 pb^{-1}), we have a result using four D_s^+ decay modes,

$$\tau(\bar{B}_s^0) = (1.36 \pm 0.09^{+0.06}_{-0.05}) \text{ ps (signal} \approx 600).$$

This result has been published: The CDF Collaboration, F. Abe *et al.,* Phys.Rev. D59, 032004 (1999).

No combination of the lifetime from the exclusive mode and partially reconstructed mode has been made. Using the average CDF B^0 lifetime and the B_s^0 lifetime from semileptonic decays, we determined the CDF average B_S^0/B^0 lifetime ratio to be

$$\tau(B^-)/\tau(\bar{B}^0) = 0.899 \pm 0.072$$

The error is the sum of statistical and systematic errors, where the correlated systematic errors are taken into account.

• B Baryons (Λ_b^0)

From the analysis of partially reconstructed $\Lambda_b^0 \to \ell^- \Lambda_c^+ X$, with $\Lambda_c^+ \to K^- p \pi^+$, using the full Run 1 data (110 pb^{-1}), we obtain:

$$\tau(\Lambda_b^0) = (1.32 \pm 0.15 \pm 0.07) \text{ ps (signal} = 197 \pm 25).$$

This result has been published: The CDF Collaboration, F. Abe *et al.,* Phys.Rev.Lett. 77 (1996) 1439.

• B_c^-

From the analysis of partially reconstructed $B_c^- \to J/\psi \ell^- X$, with $J/\psi \to \mu^+\mu^-$, $\ell = e, \mu$, using the full Run 1 data (110 pb^{-1}), we obtain:

$$\tau(B_c^-) = (0.46^{+0.18}_{-0.16} \pm 0.03) \text{ ps (signal } 20.4^{+6.2}_{-5.5}).$$

This result has been published: The CDF Collaboration, F. Abe *et al.,* Phys.Rev.Lett. 81, 2432 (1998), and F. Abe *et al.,* Phys.Rev. D58, 112004 (1998).

• Inclusive B Hadron Lifetime

From the analysis of $B \to J/\psi X$ using the Run 1 data set (110 pb^{-1}), we have obtained:

$$\tau(B) = (1.533 \pm 0.015^{+0.035}_{-0.031}) \text{ ps.}$$

This result has been published: The CDF Collaboration, F. Abe *et al.,* Phys.Rev. D57, 5382 (1998).

• Summary

This Figure shows a compilation of CDF's B hadron lifetime measurements. The same Figure without the B_c.

A postscript file of this summary can be obtained here.

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