

Heavy Flavor Averaging Group  
April 2007

Compilation of  $B_s$  Rare Branching Fractions  
All branching fractions are in units of  $10^{-6}$

In PDG2006    New since PDG2006 (preliminary)    New since PDG2006 (published)

RPP#	Mode	PDG2006 Avg.	Belle	CDF	D0	New Avg.
9	$\pi^+\pi^-$	< 170		<span style="color: blue;"><math>0.53 \pm 0.31 \pm 0.40</math></span>		$0.53 \pm 0.51$
15	$\phi\phi$	$14 \pm 8$		$14_{-5}^{+6} \pm 6$ †		$14_{-7}^{+8}$
16	$\pi^+K^-$	< 210		<span style="color: blue;"><math>5.0 \pm 0.75 \pm 1.0</math></span>		$5.00 \pm 1.25$
17	$K^+K^-$	< 59	< 340	<span style="color: blue;"><math>24.4 \pm 1.4 \pm 4.6</math></span>		$24.4 \pm 4.8$
22	$\gamma\gamma$	< 148	< 56			< 56
23	$\phi\gamma$	< 120	< 410			< 410
24	$\mu^+\mu^-$	< 0.15		< 0.080	< 0.075	< 0.075
26	$e^\pm\mu^\mp$	< 6.1		< 6.1		< 6.1
27	$\mu^+\mu^-\phi$	< 47		< 2.3	< 3.2	< 2.3

†Relative BF converted to absolute BF

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April 2007

Compilation of  $B_s^0$  Rare Relative Branching Fractions (UL 90% CL)

In PDG2006      New since PDG2006 (preliminary)      New since PDG2006 (published)

RPP#	Mode	PDG2006 Avg.	CDF	D0	New Avg.
9	$f_s \mathcal{B}(B_s^0 \rightarrow \pi^+ \pi^-) / f_d \mathcal{B}(B^0 \rightarrow K^+ \pi^-)$		<span style="color: blue;"><math>0.007 \pm 0.004 \pm 0.005</math></span>		$0.007 \pm 0.006$
15	$\mathcal{B}(B_s^0 \rightarrow \phi \phi) / \mathcal{B}(B_s^0 \rightarrow J/\psi \phi)$		$(10_{-4}^{+5} \pm 1) \times 10^{-3}$		$10_{-6}^{+7}$
16	$f_s \mathcal{B}(B_s^0 \rightarrow K^+ \pi^-) / f_d \mathcal{B}(B_d^0 \rightarrow K^+ \pi^-)$		<span style="color: blue;"><math>0.066 \pm 0.010 \pm 0.010</math></span>		$0.066 \pm 0.014$
17	$f_s \mathcal{B}(B_s^0 \rightarrow K^+ K^-) / f_d \mathcal{B}(B_d^0 \rightarrow K^+ \pi^-)$		<span style="color: blue;"><math>0.324 \pm 0.019 \pm 0.041</math></span>		$0.324 \pm 0.045$
27	$\mathcal{B}(B_s^0 \rightarrow \mu^+ \mu^- \phi) / \mathcal{B}(B_s^0 \rightarrow J/\psi \phi)$		<span style="color: blue;"><math>1.24 \pm 0.60 \pm 0.15</math></span>	$< 3.5 \times 10^{-3}$	$1.24 \pm 0.62$

## $B_s$ References

### CDF References

- [1] Diego Tonelli for the CDF Collaboration, hep-ex/0605038 (2006).
- [2]
- [3] CDF Collaboration (F. Abe *et al.*), Phys. Rev. Lett. **81**, 5742 (1998).
- [4] CDF Collaboration, talk by M. Rescigno at CKM 2006, Nagoya, Japan, Dec. 2006.
- [5] CDF Collaboration (D. Acosta *et al.*), Phys. Rev. Lett. **95**, 031801 (2005).
- [6] CDF Collaboration, M. Morello, hep-ex/0612018 (Beauty 2006 contributed paper).

### DØ References

- [7] DØ Collaboration (V. Abazov *et al.*), DØ Note 5344-CONF (2007).
- [8] DØ Collaboration (V. Abazov *et al.*), Phys. Rev. D **74**, 031107 (2006).

### Belle References

- [9] A. Drutskoy for the Belle Collaboration, talk presented at Moriond EW 2006.