

Heavy Flavor Averaging group (HFLAV) - November 2016

Compilation of B_s^0 Branching Fractions ($\times 10^{-6}$) - UL at 90% CL

In PDG2014 **New since PDG2014 (preliminary)** **New since PDG2014 (published)**

RFP#	Mode	PDG2014 Avg.	Belle	CDF	D0	LHCb	CMS	ATLAS	Our Avg.
45	$\pi^+\pi^-$	0.76 ± 0.19	< 12	$0.60 \pm 0.17 \pm 0.04^\dagger$ [2]		$0.691 \pm 0.083 \pm 0.044^\dagger$ [3]			0.671 ± 0.083
51	$\phi\phi$	19.1 ± 3.1		$19.1 \pm 2.6 \pm 1.6^\dagger$ [4]		$18.4 \pm 0.5 \pm 1.8^\S$ [5]			18.6 ± 1.6
52	π^+K^-	5.5 ± 0.6	< 26	$5.3 \pm 0.9 \pm 0.3^\dagger$ [6]		$5.6 \pm 0.6 \pm 0.3^\dagger$ [7]			5.5 ± 0.5
53	K^+K^-	24.9 ± 1.7	$38^{+10}_{-9} \pm 7$	$25.9 \pm 2.2 \pm 1.7^\dagger$ [8]		$23.7 \pm 1.6 \pm 1.5^\dagger$ [7]			24.8 ± 1.7
54	$K^0\bar{K}^0$	< 66	$19.6^{+5.8}_{-5.1} \pm 1.0 \pm 2.0^\dagger$ [9]						$19.6^{+6.2}_{-5.6}$
55	$K^0\pi^+\pi^-$	19 ± 5				$19 \pm 5 \pm 2^\dagger$ [10]			19 ± 5
56	$K^0K^-\pi^+\pi^-$ ¶	97 ± 17				$97 \pm 12 \pm 12^\dagger$ [10]			97 ± 16
57	$K^0K^+K^-$	< 4				< 4 [†]			< 4 [†]
	$K^*\pm K^\mp$					$12.7 \pm 1.9 \pm 1.9$			12.7 ± 2.7
	$K^{*0}\pi^+$					$3.3 \pm 1.1 \pm 0.5$			3.3 ± 1.2
59	$K^{*0}K^{*0}$	$28.1 \pm 4.6 \pm 5.6$				$10.8 \pm 1.4 \pm 1.5^\S$ [12]			10.8 ± 2.1
60	ϕK^{*0}	1.13 ± 0.3				$1.13 \pm 0.29 \pm 0.06^\dagger$ [13]			1.13 ± 0.30
61	$p\bar{p}$	$0.028^{+0.022}_{-0.017}$				$0.0284^{+0.0203+0.0085}_{-0.0108-0.0018}$ [14]			$0.0280^{+0.0220}_{-0.0170}$
63	$\gamma\gamma$	< 8.7	< 3.1						< 3.1
64	$\phi\gamma$	36 ± 4	$36 \pm 5 \pm 7$ [15]			$35.1 \pm 3.5 \pm 1.2^\dagger$ [16]			35.2 ± 3.4
65	$\mu^+\mu^-$	0.0031 ± 0.0007		$0.013^{+0.009}_{-0.007}$ [17]	< 0.012 [18]	$0.0029^{+0.0011+0.0003}_{-0.0010-0.0001}$ [19]	$0.0030^{+0.0010}_{-0.0009}$ [20]	< 0.003 [†] [21]	$0.0029^{+0.0007}_{-0.0006}$
66	e^+e^-	< 0.28		< 0.28		< 0.011			< 0.011
67	$e^\pm\mu^\mp$	< 0.011		< 0.20		< 0.012			< 0.012
68	$\mu^+\mu^-\mu^+\mu^-$	< 0.012				$0.797^{+0.045}_{-0.043} \pm 0.068$ [23]			$0.797^{+0.082}_{-0.080}$
70	$\phi\mu^+\mu^-$	0.76 ± 0.15			< 3.2 [25]	$33.1 \pm 7.0 \pm 1.2^\dagger$ [27]			33.1 ± 7.1
	η/η'					$0.086 \pm 0.015 \pm 0.010^2$ [5]			0.086 ± 0.018
	$\pi^+\pi^-\mu^+\mu^-$					$16.4 \pm 3.4 \pm 2.3$ [28]			16.4 ± 4.1
	$K^{*0}K^{*0}$ ¶					$3.48 \pm 0.29 \pm 0.35^4$ [29]			3.48 ± 0.46
	$\phi\pi^+\pi^-$					$1.12 \pm 0.18 \pm 0.11$ [29]			1.12 ± 0.21
	$\phi f_0(980), f_0(980) \rightarrow \pi^+\pi^-$					$0.61^{+0.18}_{-0.14} \pm 0.06$			$0.61^{+0.19}_{-0.15}$
	$\phi f_2(1270), f_2(1270) \rightarrow \pi^+\pi^-$					$0.27 \pm 0.07 \pm 0.02$ [29]			0.27 ± 0.07
	$\phi\rho^0(770)$								

Results for CDF, D0, LHCb, CMS and ATLAS are relative BFs converted to absolute BFs.

[†] The first error is experimental, and the second is from the reference BF.

[‡] Last error represents the uncertainty due to the total number of $B_s^0\bar{B}_s^0$ pairs.

[§] Last error takes into account $\mathcal{B}(B^0 \rightarrow \phi K^{*0})$ and f_d/f_s .

¶ Includes two distinct decay processes: $\mathcal{B}(B_s^0 \rightarrow f) + \mathcal{B}(B_s^0 \rightarrow \bar{f})$.

¹ UL at 95% CL.

² Muon pairs do not originate from resonances and $0.5 < m(\pi^+\pi^-) < 1.3$ GeV/c.

³ The average is done between the combined LHCb and CMS result, $0.0028^{+0.0007}_{-0.0006}$ (Ref. [45]) and CDF.

⁴ In the mass range $400 < m(\pi^+\pi^-) < 1600$ GeV/c.

RPP#	Mode	PDG2014 Avg.	CDF	LHCb	Our Avg.
45	$f_s \mathcal{B}(B_s^0 \rightarrow \pi^+ \pi^-) / f_d \mathcal{B}(B^0 \rightarrow K^+ \pi^-)$		$0.008 \pm 0.002 \pm 0.001$ [2]	$0.00915 \pm 0.00071 \pm 0.00083$ [3]	0.00880 ± 0.00090
45	$f_s \mathcal{B}(B_s^0 \rightarrow \pi^+ \pi^-) / f_d \mathcal{B}(B^0 \rightarrow \pi^+ \pi^-)$			$0.050_{-0.009}^{+0.011} \pm 0.004$ [7]	$0.050_{-0.010}^{+0.012}$
51	$\mathcal{B}(B_s^0 \rightarrow \phi \phi) / \mathcal{B}(B_s^0 \rightarrow J/\psi \phi)$		$0.0178 \pm 0.0014 \pm 0.0020$ [4]		0.0180 ± 0.0020
	$\mathcal{B}(B_s^0 \rightarrow \phi \phi) / \mathcal{B}(B^0 \rightarrow \phi K^*)$			$1.84 \pm 0.05 \pm 0.13$ [5]	1.84 ± 0.14
52	$f_s \mathcal{B}(B_s^0 \rightarrow K^+ \pi^-) / f_d \mathcal{B}(B_d^0 \rightarrow K^+ \pi^-)$		$0.071 \pm 0.010 \pm 0.007$ [6]	$0.074 \pm 0.006 \pm 0.006$ [7]	0.073 ± 0.007
53	$f_s \mathcal{B}(B_s^0 \rightarrow K^+ K^-) / f_d \mathcal{B}(B_d^0 \rightarrow K^+ \pi^-)$		$0.347 \pm 0.020 \pm 0.021$ [8]	$0.316 \pm 0.009 \pm 0.019$ [7]	0.327 ± 0.017
55	$\mathcal{B}(B_s^0 \rightarrow K^0 \pi^+ \pi^-) / \mathcal{B}(B^0 \rightarrow K^0 \pi^+ \pi^-)$			$0.29 \pm 0.06 \pm 0.04$ [10]	0.29 ± 0.07
56	$\mathcal{B}(B_s^0 \rightarrow K^0 K^- \pi^+) / \mathcal{B}(B^0 \rightarrow K^0 K^- \pi^+)$ †			$1.48 \pm 0.12 \pm 0.14$ [10]	1.48 ± 0.18
57	$\mathcal{B}(B_s^0 \rightarrow K^0 K^+ K^-) / \mathcal{B}(B^0 \rightarrow K^0 K^+ K^-)$			< 0.068 [10]	< 0.068
	$\mathcal{B}(B_s^0 \rightarrow K^{*0} K^+) / \mathcal{B}(B^0 \rightarrow K^{*0} \pi^-)$			$1.49 \pm 0.22 \pm 0.18$ [11]	1.49 ± 0.28
	$\mathcal{B}(B_s^0 \rightarrow K^{*0} \pi^+) / \mathcal{B}(B^0 \rightarrow K^{*0} \pi^-)$			$0.39 \pm 0.13 \pm 0.05$ [11]	0.39 ± 0.14
59	$\mathcal{B}(B_s^0 \rightarrow K^{*0} \bar{K}^{*0}) / \mathcal{B}(B^0 \rightarrow K^{*0} \pi^-)$			$1.11 \pm 0.22 \pm 0.13$ [12]	1.11 ± 0.26
60	$\mathcal{B}(B_s^0 \rightarrow \phi \bar{K}^{*0}) / \mathcal{B}(B^0 \rightarrow \phi K^{*0})$			$0.113 \pm 0.024 \pm 0.016$ [24]	0.113 ± 0.029
64	$\mathcal{B}(B_s^0 \rightarrow \phi \gamma) / \mathcal{B}(B^0 \rightarrow K^{*0} \gamma)$			$0.81 \pm 0.04 \pm 0.07$ [16]	0.81 ± 0.08
70	$\mathcal{B}(B_s^0 \rightarrow \phi \mu^+ \mu^-) / \mathcal{B}(B_s^0 \rightarrow J/\psi \phi) \times 10^4$	7.1 ± 1.3		$7.41_{-0.40}^{+0.42} \pm 0.29$ [26]	$7.41_{-0.49}^{+0.51}$
	$\mathcal{B}(B_s^0 \rightarrow K_S^0 K^{*0}) / \mathcal{B}(B^0 \rightarrow K_S^0 \pi^+ \pi^-)$ †			$0.33 \pm 0.07 \pm 0.04$ [28]	0.33 ± 0.08

† Numerator includes two distinct decay processes: $\mathcal{B}(B_s^0 \rightarrow f) + \mathcal{B}(B_s^0 \rightarrow \bar{f})$.

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