

Heavy Flavor Averaging Group
August 25th, 2004

Compilation of B^+ Semi-leptonic and Radiative Branching Fractions
All branching fractions are in units of 10^{-6}

In PDG2002 New since PDG2002 (preliminary) New since PDG2002 (published)

RPP#	Mode	PDG2002 Avg.	BaBar	Belle	CLEO	New Avg.
123	$K^*(892)^+\gamma$	38 ± 5	$38.7 \pm 2.8 \pm 2.6$	$42.5 \pm 3.1 \pm 2.4$	$37.6_{-8.3}^{+8.9} \pm 2.8$	40.3 ± 2.6
124	$K_1(1270)^+\gamma$	< 7300		$42.8 \pm 9.4 \pm 4.3$		42.8 ± 10.3
125	$K_1(1400)^+\gamma$	< 2200		< 14.4		< 14.4
126	$K_2^*(1430)^+\gamma$	< 1400	$14.4 \pm 4.0 \pm 1.3$			14.4 ± 4.2
130	$\rho^+\gamma$	< 13	< 1.8	< 2.2	< 13	< 1.8
–	$K^+\pi^-\pi^+\gamma$ §	New		$25 \pm 1.8 \pm 2.2$		25.0 ± 2.8
–	$K^{*0}\pi^+\gamma$ §	New		$20_{-6}^{+7} \pm 2$		20_{-6}^{+7}
–	$K^+\rho^0\gamma$ §	New		< 20		< 20
–	$K^+\pi^-\pi^+\gamma$ (N.R.) §	New		< 9.2		< 9.2
–	$K^+\phi\gamma$	New		$3.4 \pm 0.9 \pm 0.4$		3.4 ± 1.0
–	$p\bar{\Lambda}\gamma$	New		$2.16_{-0.53}^{+0.58} \pm 0.20$		$2.16_{-0.57}^{+0.61}$
–	$p\bar{\Sigma}^0\gamma$	New		< 3.3		< 3.3
–	$\pi^+\nu\bar{\nu}$	New	< 100			< 100
173	$K^+e^+e^-$	< 1.4	$1.05_{-0.22}^{+0.25} \pm 0.07$	$0.63_{-0.17}^{+0.19} \pm 0.03$	< 2.4	0.80 ± 0.15
174	$K^+\mu^+\mu^-$	$1.0_{-0.4}^{+0.5}$	$0.07_{-0.11}^{+0.19} \pm 0.02$	$0.45_{-0.12}^{+0.14} \pm 0.03$	< 3.68	0.34 ± 0.10
175	$K^+\nu\bar{\nu}$	< 240	< 52		< 240	< 52
176	$K^*(892)^+e^+e^-$	< 8.9	$0.20_{-0.87}^{+1.34} \pm 0.28$ ‡	$2.02_{-1.01-0.24}^{+1.27+0.23}$ ‡		$1.29_{-0.77}^{+0.90}$
177	$K^*(892)^+\mu^+\mu^-$	< 3.9	$3.07_{-1.78}^{+2.58} \pm 0.42$ ‡	$0.65_{-0.53-0.15}^{+0.69+0.14}$ ‡		$0.92_{-0.58}^{+0.70}$
182	$\pi^-e^+e^+$	< 3900			< 1.6	< 1.6
–	$\rho^-e^+e^+$	New			< 2.6	< 2.6
183	$\pi^-\mu^+\mu^+$	< 9100			< 1.4	< 1.4
–	$\rho^-\mu^+\mu^+$	New			< 5.0	< 5.0
184	$\pi^-e^+\mu^+$	< 6400			< 1.3	< 1.3
–	$\rho^-e^+\mu^+$	New			< 3.3	< 3.3
185	$K^-e^+e^+$	< 3900			< 1.0	< 1.0
186	$K^-\mu^+\mu^+$	< 9100			< 1.8	< 1.8
187	$K^-e^+\mu^+$	< 6400			< 2.0	< 2.0
–	$K^{*-}e^+\mu^+$	New			< 4.4	< 4.4
–	$K^{*-}e^+e^+$	New			< 2.8	< 2.8
–	$K^{*-}\mu^+\mu^+$	New			< 8.3	< 8.3

§ $M_{K\pi\pi} < 2.4 \text{ GeV}/c^2$ ‡ Central values are not significant.

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RPP#	Mode	PDG2002 Avg.	BaBar	Belle	CLEO	New Avg.
123	$K^*(892)^0\gamma$	43 ± 4	$39.2 \pm 2.0 \pm 2.4$	$40.1 \pm 2.1 \pm 1.7$	$45.5^{+7.2}_{-6.8} \pm 3.4$	40.1 ± 2.0
–	$K^*(1410)^0\gamma$	New		< 130		< 130
126	$K_2^*(1430)^0\gamma$	< 400	$12.2 \pm 2.5 \pm 1.1$	$13 \pm 5 \pm 1$		12.4 ± 2.4
130	$\rho^0\gamma$	< 17	< 0.4	< 0.8	< 17	< 0.4
131	$\omega\gamma$	< 9.2	< 1.0	< 0.8	< 9.2	< 0.8
132	$\phi\gamma$	< 3.3	< 0.94		< 3.3	< 0.94
–	$K^+\pi^-\gamma$ †	New		$4.6^{+1.3+0.5}_{-1.2-0.7}$		4.6 ± 1.4
–	$K^0\pi^+\pi^-\gamma$	New		$24.3 \pm 3.6 \pm 3.4$		24.3 ± 5.0
–	$K^+\pi^-\gamma$ (N.R.) †	New		< 2.6		< 2.6
–	$K^0\phi\gamma$	New		< 8.3		< 8.3
184	$K^0e^+e^-$	< 2.7	$-0.21^{+0.23}_{-0.16} \pm 0.08$ ‡	$0.00^{+0.20+0.02}_{-0.12-0.05}$ ‡	< 8.45	$-0.06^{+0.14}_{-0.10}$
185	$K^0\mu^+\mu^-$	< 3.3	$1.63^{+0.82}_{-0.63} \pm 0.14$	$0.56^{+0.29}_{-0.23} \pm 0.05$	< 6.64	$0.73^{+0.28}_{-0.25}$
186	$K^*(892)^0e^+e^-$	< 6.4	$1.11^{+0.56}_{-0.47} \pm 0.11$	$1.29^{+0.57+0.13}_{-0.49-0.10}$		$1.20^{+0.41}_{-0.35}$
187	$K^*(892)^0\mu^+\mu^-$	< 4.2	$0.86^{+0.79}_{-0.58} \pm 0.11$	$1.33^{+0.42}_{-0.37} \pm 0.11$		$1.22^{+0.39}_{-0.33}$

† $1.25 \text{ GeV}/c^2 < M_{K\pi} < 1.6 \text{ GeV}/c^2$ ‡ Central values are not significant.

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RPP#	Mode	PDG2002 Avg.	BaBar	Belle	CLEO	New Avg.
63	$s\gamma$	330 ± 40	$388 \pm 36^{+57}_{-46}$	$355 \pm 32^{+30+11}_{-31-7}$	$321 \pm 43^{+32}_{-29}$	352^{+30}_{-28}
–	$s\gamma$ with baryons	New			$< 38 \dagger$	$< 38 \dagger$
67	$\rho\gamma$	< 14	< 1.2	< 1.4	< 14	< 1.2
–	$K\eta\gamma$	New		$6.9^{+1.7+1.3}_{-1.6-1.0}$		$6.9^{+2.1}_{-1.9}$
–	$K_3^*(1780)\gamma$	New		< 34		< 34
97	$se^+e^- \ddagger$	< 57	$6.0 \pm 1.7 \pm 1.3$	$4.04 \pm 1.30^{+0.80}_{-0.76}$	< 57	$4.70^{+1.24}_{-1.23}$
98	$s\mu^+\mu^-$	< 58	$5.0 \pm 2.8 \pm 1.2$	$4.13 \pm 1.05^{+0.73}_{-0.69}$	< 58	$4.26^{+1.18}_{-1.16}$
–	$sl^+\ell^- \ddagger$	New	$5.6 \pm 1.5 \pm 1.3$	$4.11 \pm 0.83^{+0.74}_{-0.70}$	< 42	$4.46^{+0.98}_{-0.96}$
99	Ke^+e^-	< 1.3	$0.74^{+0.18}_{-0.16} \pm 0.05$	$0.454^{+0.116+0.023}_{-0.104-0.025}$		$0.547^{+0.098}_{-0.095}$
100	$K^*(892)e^+e^-$	< 5.6	$0.98^{+0.50}_{-0.42} \pm 0.11$	$1.84^{+0.48}_{-0.44} \pm 0.17$		$1.44^{+0.35}_{-0.34}$
101	$K\mu^+\mu^-$	$0.99^{+0.40+0.13}_{-0.32-0.14}$	$0.45^{+0.23}_{-0.19} \pm 0.04$	$0.626^{+0.103+0.033}_{-0.064-0.034}$		$0.605^{+0.090}_{-0.064}$
102	$K^*(892)\mu^+\mu^-$	< 3.1	$1.27^{+0.76}_{-0.61} \pm 0.16$	$1.81^{+0.30}_{-0.28} \pm 0.11$		$1.73^{+0.30}_{-0.27}$
103	$K\ell^+\ell^-$	$0.75^{+0.25}_{-0.21} \pm 0.06$	$0.65^{+0.14}_{-0.13} \pm 0.04$	$0.550^{+0.075}_{-0.070} \pm 0.027$	< 1.7	$0.574^{+0.071}_{-0.066}$
104	$K^*(892)\ell^+\ell^-$	< 3.3	$0.88^{+0.33}_{-0.29} \pm 0.10$	$1.65^{+0.23}_{-0.23} \pm 0.10$	< 3.3	1.38 ± 0.20
–	$Ke^\pm\mu^\mp$	New			< 1.6	< 1.6
–	$K^*e^\pm\mu^\mp$	New			< 6.2	< 6.2
–	$\pi e^\pm\mu^\mp$	New			< 1.6	< 1.6
–	$\rho e^\pm\mu^\mp$	New			< 3.2	< 3.2

$\dagger E_\gamma > 2.0$ GeV; $\ddagger M(\ell^+\ell^-) > 0.2$ GeV/ c^2

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RPP#	Mode	PDG2002 Avg.	BaBar	Belle	CLEO	CDF	D0	New Avg.
10	$e^+\nu$	< 15		< 5.4	< 15			< 5.4
11	$\mu^+\nu$	< 21	< 6.6	< 2.0	< 21			< 2.0
12	$\tau^+\nu$	< 570	< 330	< 290	< 840			< 290
–	$e^+\nu_e\gamma$	New		< 22	< 200			< 22
–	$\mu^+\nu_\mu\gamma$	New		< 23	< 52			< 23
182	e^+e^-	< 0.83	< 0.06	< 0.19	< 0.83			< 0.06
183	$\mu^+\mu^-$	< 0.61	< 0.08	< 0.16	< 0.61	< 0.15		< 0.08
189	$e^\pm\mu^\mp$	< 1.5	< 0.18	< 0.17	< 1.5			< 0.17
190	$e^\pm\tau^\mp$	< 530			< 110			< 110
191	$\mu^\pm\tau^\mp$	< 830			< 38			< 38
–	$\nu\bar{\nu}$	New	< 220					< 220
–	$\nu\bar{\nu}\gamma$	New	< 47					< 47

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

In PDG2002 New since PDG2002 (preliminary) New since PDG2002 (published)

RPP#	Mode	PDG2002 Avg.	CDF	D0	New Avg.
–	$\mu^+\mu^-$	New	< 0.58	< 1.6	< 0.58

Radiative and Leptonic Decays:

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