Heavy Flavor Averaging Group - October 2016

Compilation of B^+ Semi-leptonic and Radiative Branching Fractions ($\times 10^{-6}$) - UL at 90% CL

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

RPP#	Mode	PDG2014 Avg.	BABAR	Belle	CLEO	LHCb	Our Avg.
363	$K^{*+}\gamma$	42.1 ± 1.8	$42.2 \pm 1.4 \pm 1.6$	$42.5 \pm 3.1 \pm 2.4$	$37.6^{+8.9}_{-8.3} \pm 2.8$		42.1 ± 1.8
364	$K_1^+(1270)\gamma$	43 ± 13	$44.1^{+6.3}_{-4.4} \pm 5.8$ †	$43 \pm 9 \pm 9$			$43.8^{+7.1}_{-6.3}$
365	$K^+\eta\gamma$	7.9 ± 0.9	$7.7 \pm 1.0 \pm 0.4$	$8.4^{+1.5}_{-1.2} \pm 0.9$			7.9 ± 0.9
366	$K^+\eta'\gamma$	$2.9^{+1.0}_{-0.9}$	$1.9^{+1.5}_{-1.2} \pm 0.1$	$3.6 \pm 1.2 \pm 0.4$			$2.9^{+1.0}_{-0.9}$
367	$K^+\phi\gamma$	2.7 ± 0.4	$3.5 \pm 0.6 \pm 0.4$	$2.48 \pm 0.30 \pm 0.24$			2.71 ± 0.34
368	$K^+\pi^-\pi^+\gamma$	27.6 ± 2.2	$24.5 \pm 0.9 \pm 1.2$ †	$25.0 \pm 1.8 \pm 2.2$ ‡			24.6 ± 1.3
369	$K^{*0}\pi^+\gamma$ §	20^{+7}_{-6}	$23.4 \pm 0.9^{+0.8}_{-0.7}$ †	$20^{+7}_{-6} \pm 2$			$23.3^{+1.2}_{-1.1}$
370	$K^+\rho^0\gamma$ §	< 20	$8.2 \pm 0.4 \pm 0.8$ †	< 20			8.2 ± 0.9
–	$(K\pi)_0^{*0}\pi^+\gamma$	New	$10.3^{+0.7+1.5}_{-0.8-2.0}$ †				$10.3^{+1.7}_{-2.2}$
371	$K^+\pi^-\pi^+\gamma$(N.R.)§	< 9.2	$9.9 \pm 0.7^{+1.5}_{-1.9}$ †	< 9.2			$9.9^{+1.7}_{-2.0}$
–	$K_0^*(1430)\pi^+\gamma$	New	$1.32^{+0.09+0.24}_{-0.10-0.30}$ †				$1.32^{+0.26}_{-0.32}$
372	$K^0\pi^+\pi^0\gamma$	46 ± 5	$45.6 \pm 4.2 \pm 3.1$ †				45.6 ± 5.2
373	$K_1^+(1400)\gamma$	< 15	$9.7^{+4.6+2.9}_{-2.9-2.4}$ †	< 15			$9.7^{+5.4}_{-3.8}$
–	$K^{*+}(1410)\gamma$	New	$27.1^{+5.4+5.9}_{-4.8-3.7}$ †				$27.1^{+8.0}_{-6.1}$
374	$K_2^*(1430)^+\gamma$	14 ± 4	$8.7^{+7.0+8.7}_{-5.3-10.4}$ †				$8.7^{+11.2}_{-11.7}$
375	$K^{*+}(1680)\gamma$	< 1900	$66.7^{+9.3+14.4}_{-7.8-11.4}$ †				$66.7^{+17.1}_{-13.8}$
376	$K_3^*(1780)^+\gamma$	< 39		< 39			< 39
378	$\rho^+\gamma$	0.98 ± 0.25	$1.20^{+0.42}_{-0.37} \pm 0.20$	$0.87^{+0.29+0.09}_{-0.27-0.11}$	< 13		$0.98^{+0.25}_{-0.24}$
428	$p\overline{\Lambda}\gamma$	$2.4^{+0.5}_{-0.4}$		$2.45^{+0.44}_{-0.38} \pm 0.22$			$2.45^{+0.49}_{-0.44}$
432	$p\overline{\Sigma^0}\gamma$	< 4.6		< 4.6			< 4.6
467	$\pi^+\ell^+\ell^-$	< 0.049	< 0.066	< 0.049			< 0.049
468	$\pi^+e^+e^-$	< 0.080	< 0.125	< 0.080			< 0.080
469	$\pi^+\mu^+\mu^-$	< 0.055	< 0.055	< 0.069		$0.0183 \pm 0.0024 \pm 0.0005$ ¶1	0.0180 ± 0.0020
470	$\pi^+\nu\overline{\nu}$	< 98	< 100	< 98			< 98
471	$K^+\ell^+\ell^-$	0.451 ± 0.023	$0.48 \pm 0.09 \pm 0.02$	$0.53^{+0.06}_{-0.05} \pm 0.03$		4	0.51 ± 0.05
472	$K^+e^+e^-$	0.55 ± 0.07	$0.51^{+0.12}_{-0.11} \pm 0.02$	$0.57^{+0.09}_{-0.08} \pm 0.03$	< 2.4		0.55 ± 0.07
473	$K^+\mu^+\mu^-$	0.449 ± 0.023	$0.41^{+0.16}_{-0.15} \pm 0.02$	$0.53 \pm 0.08^{+0.07}_{-0.03}$	< 3.68	$0.429 \pm 0.007 \pm 0.021$	0.435 ± 0.021
–	$K^+\tau^+\tau^-$		< 2250				< 2250
476	$K^+\nu\overline{\nu}$	< 16	< 16	< 55	< 240		< 16
477	$\rho^+\nu\overline{\nu}$	< 213		< 213			< 213
478	$K^{*+}\ell^+\ell^-$	1.29 ± 0.21	$1.40^{+0.40}_{-0.37} \pm 0.09$	$1.24^{+0.23}_{-0.21} \pm 0.13$			$1.29^{+0.22}_{-0.21}$
479	$K^{*+}e^+e^-$	$1.55^{+0.40}_{-0.31}$	$1.38^{+0.47}_{-0.42} \pm 0.08$	$1.73^{+0.50}_{-0.42} \pm 0.20$			$1.55^{+0.35}_{-0.32}$
480	$K^{*+}\mu^+\mu^-$	1.12 ± 0.15	$1.46^{+0.79}_{-0.75} \pm 0.12$	$1.11^{+0.32}_{-0.27} \pm 0.10$		$0.924 \pm 0.093 \pm 0.067$	$0.958^{+0.107}_{-0.104}$
481	$K^{*+}\nu\overline{\nu}$	< 40	< 64	< 40			< 40
–	$K^+\pi^+\pi^-\mu^+\mu^-$	New				$0.436^{+0.029}_{-0.027} \pm 0.028$ ¶2	$0.436^{+0.040}_{-0.039}$
–	$K^+\phi\mu^+\mu^-$	New				$0.082^{+0.019+0.029}_{-0.017-0.027}$ ¶	$0.082^{+0.035}_{-0.032}$
484	$\pi^+e^\pm\mu^\mp$	< 0.17	< 0.17				< 0.17
485	$\pi^+e^+\tau^-$	< 74	< 74				< 74
486	$\pi^+e^-\tau^+$	< 20	< 20				< 20
487	$\pi^+e^\pm\tau^\mp$	< 75	< 75				< 75
488	$\pi^+\mu^+\tau^-$	< 62	< 62				< 62
489	$\pi^+\mu^-\tau^+$	< 45	< 45				< 45
490	$\pi^+\mu^\pm\tau^\mp$	< 72	< 72				< 72
491	$K^+e^+\mu^-$	< 0.091	< 0.091				< 0.091
492	$K^+e^-\mu^+$	< 0.13	< 0.13				< 0.13
493	$K^+e^\pm\mu^\mp$	< 0.091	< 0.091				< 0.091
494	$K^+e^+\tau^-$	< 43	< 43				< 43
495	$K^+e^-\tau^+$	< 15	< 15				< 15
496	$K^+e^\pm\tau^\mp$	< 30	< 30				< 30
497	$K^+\mu^+\tau^-$	< 45	< 45				< 45
498	$K^+\mu^-\tau^+$	< 28	< 28				< 28
499	$K^+\mu^\pm\tau^\mp$	< 48	< 48				< 48
500	$K^{*+}e^+\mu^-$	< 1.3	< 1.3				< 1.3
501	$K^{*+}e^-\mu^+$	< 0.99	< 0.99				< 0.99
502	$K^{*+}e^\pm\mu^\mp$	< 1.4	< 1.4				< 1.4
503	$\pi^-e^+e^+$	< 0.023	< 0.023		< 1.6		< 0.023
504	$\pi^-\mu^+\mu^+$	< 0.013	< 0.107		< 1.4	< 0.004 3	< 0.004 3
505	$\pi^-e^+\mu^+$	< 0.15	< 0.15		< 1.3		< 0.15
506	$\rho^-e^+e^+$	< 0.17	< 0.17		< 2.6		< 0.17
507	$\rho^-\mu^+\mu^+$	< 0.42	< 0.42		< 5.0		< 0.42
508	$\rho^-e^+\mu^+$	< 0.47	< 0.47		< 3.3		< 0.47
509	$K^-e^+e^+$	< 0.03	< 0.03		< 1.0		< 0.03
510	$K^-\mu^+\mu^+$	< 0.041	< 0.067		< 1.8	< 0.041	< 0.041
511	$K^-e^+\mu^+$	< 0.16	< 0.16		< 2.0		< 0.16
512	$K^{*-}e^+e^+$	< 0.40	< 0.40		< 2.8		< 0.40
513	$K^{*-}\mu^+\mu^+$	< 0.59	< 0.59		< 8.3		< 0.59
514	$K^{*-}e^+\mu^+$	< 0.30	< 0.30		< 4.4		< 0.30

† $M_{K\pi\pi} < 1.8$ GeV/c^2; ‡ $1.0 < M_{K\pi\pi} < 2.0$ GeV/c^2; § $M_{K\pi\pi} < 2.4$ GeV/c^2.
¶ Relative BF converted to absolute BF.
[1] PDG2014 cites only the measurement: $\mathcal{B}(\pi^+\mu^+\mu^-)/\mathcal{B}(K^+\mu^+\mu^-) = 0.053 \pm 0.014 \pm 0.01$.
[2] Differential BF in bins of $m(\mu\mu)$ is also available.
[3] At 95% C.L.
[4] PDG considers here the BF measured in $B^+ \to K^+\mu^+\mu^-$.

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Compilation of B^0 Semi-leptonic and Radiative Branching Fractions ($\times 10^{-6}$) - UL at 90% CL

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

RPP#	Mode	PDG2014 Avg.	BABAR	Belle	CLEO	LHCb	Our Avg.
336	$K^0\eta\gamma$	7.6 ± 1.8	$7.1^{+2.1}_{-2.0} \pm 0.4$	$8.7^{+3.1+1.9}_{-2.7-1.6}$			$7.6^{+1.8}_{-1.7}$
337	$K^0\eta'\gamma$	< 6.4	< 6.6	< 6.4			< 6.4
338	$K^0\phi\gamma$	2.7 ± 0.7	< 2.7	$2.74 \pm 0.60 \pm 0.32$			2.74 ± 0.68
339	$K^+\pi^-\gamma$ §	4.6 ± 1.4		$4.6^{+1.3+0.5}_{-1.2-0.7}$			4.6 ± 1.4
340	$K^{*0}\gamma$	43.3 ± 1.5	$44.7 \pm 1.0 \pm 1.6$	$40.1 \pm 2.1 \pm 1.7$	$45.5^{+7.2}_{-6.8} \pm 3.4$		43.3 ± 1.5
341	$K^*(1410)^0\gamma$	< 130		< 130			< 130
342	$K^+\pi^-\gamma$ (N.R.) §	< 2.6		< 2.6			< 2.6
344	$K^0\pi^+\pi^-\gamma$	19.5 ± 2.2	$18.5 \pm 2.1 \pm 1.2$ †	$24 \pm 4 \pm 3$ ‡			19.5 ± 2.2
345	$K^+\pi^-\pi^0\gamma$	41 ± 4	$40.7 \pm 2.2 \pm 3.1$ †				40.7 ± 3.8
346	$K_1^0(1270)\gamma$	< 58		< 58			< 58
347	$K_1^0(1400)\gamma$	< 12		< 12			< 12
348	$K_2^*(1430)^0\gamma$	12.4 ± 2.4	$12.2 \pm 2.5 \pm 1.0$	$13 \pm 5 \pm 1$			12.4 ± 2.4
350	$K_3^*(1780)^0\gamma$	< 83		< 83			< 83
352	$\rho^0\gamma$	0.86 ± 0.15	$0.97^{+0.24}_{-0.22} \pm 0.06$	$0.78^{+0.17+0.09}_{-0.16-0.10}$	< 17		$0.86^{+0.15}_{-0.14}$
354	$\omega\gamma$	$0.44^{+0.18}_{-0.16}$	$0.50^{+0.27}_{-0.23} \pm 0.09$	$0.40^{+0.19}_{-0.17} \pm 0.13$	< 9.2		$0.44^{+0.18}_{-0.16}$
355	$\phi\gamma$	< 0.85	< 0.85	< 0.1	< 3.3		< 0.1
–	$p\overline{\Lambda}\pi^-\gamma$	New		< 0.65			< 0.65
465	$\pi^0\ell^+\ell^-$	< 0.053	< 0.053	< 0.154			< 0.053
466	$\pi^0 e^+ e^-$	< 0.084	< 0.084	< 0.227			< 0.084
467	$\pi^0\mu^+\mu^-$	< 0.069	< 0.069	< 0.184			< 0.069
468	$\eta\ell^+\ell^-$	< 0.064	< 0.064				< 0.064
469	$\eta e^+ e^-$	< 0.108	< 0.108				< 0.108
470	$\eta\mu^+\mu^-$	< 0.112	< 0.112				< 0.112
471	$\pi^0\nu\overline{\nu}$	< 69		< 69			< 69
472	$K^0\ell^+\ell^-$	$0.31^{+0.08}_{-0.07}$	$0.21^{+0.15}_{-0.13} \pm 0.02$	$0.34^{+0.09}_{-0.08} \pm 0.02$			$0.31^{+0.08}_{-0.07}$
473	$K^0 e^+ e^-$	$0.16^{+0.10}_{-0.08}$	$0.08^{+0.15}_{-0.12} \pm 0.01$	$0.20^{+0.14}_{-0.10} \pm 0.01$	< 8.45		$0.16^{+0.10}_{-0.08}$
474	$K^0\mu^+\mu^-$	0.34 ± 0.05	$0.49^{+0.29}_{-0.25} \pm 0.03$	$0.44^{+0.13}_{-0.10} \pm 0.03$	< 6.64	$0.327 \pm 0.034 \pm 0.017$	$0.343^{+0.036}_{-0.035}$
475	$K^0\nu\overline{\nu}$	< 49	< 49	< 194			< 49
476	$\rho^0\nu\overline{\nu}$	< 208		< 208			< 208
477	$K^{*0}\ell^+\ell^-$	$0.99^{+0.12}_{-0.11}$	$1.03^{+0.22}_{-0.21} \pm 0.07$	$0.97^{+0.13}_{-0.11} \pm 0.07$			$0.99^{+0.13}_{-0.11}$
478	$K^{*0}e^+e^-$	$1.03^{+0.19}_{-0.17}$	$0.86^{+0.26}_{-0.24} \pm 0.05$	$1.18^{+0.27}_{-0.22} \pm 0.09$			$1.03^{+0.19}_{-0.17}$
479	$K^{*0}\mu^+\mu^-$	1.05 ± 0.10	$1.35^{+0.40}_{-0.37} \pm 0.10$	$1.06^{+0.19}_{-0.14} \pm 0.07$		$1.036^{+0.018}_{-0.017} \pm 0.071$*	$1.049^{+0.067}_{-0.065}$
480	$K^{*0}\nu\overline{\nu}$	< 55	< 120	< 55			< 55
481	$\phi\nu\overline{\nu}$	< 127		< 127			< 127
	$\pi^+\pi^-\mu^+\mu^-$					$0.0211 \pm 0.0051 \pm 0.0022$ [1]	0.0210 ± 0.0060
483	$\pi^0 e^\pm\mu^\mp$	< 0.14	< 0.14				< 0.14
484	$K^0 e^\pm\mu^\mp$	< 0.27	< 0.27				< 0.27
485	$K^{*0}e^\pm\mu^\mp$	< 0.53	< 0.53				< 0.53

† $M_{K\pi\pi} < 1.8$ GeV/c^2; ‡ $1.0 < M_{K\pi\pi} < 2.0$ GeV/c^2.
§ 1.25 GeV/$c^2 < M_{K\pi} < 1.6$ GeV/c^2.
* This result takes into account the Swave fraction in the $K\pi$ system.
[1] Muon pairs do not originate from resonances and $0.5 < m(\pi^+\pi^-) < 1.3$ GeV/c.

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

RPP#	Mode	PDG2014 Avg.	BABAR	Belle	CLEO	CDF	Our Avg.
66	$K\eta\gamma$	$8.5^{+1.8}_{-1.6}$		$8.5^{+1.3}_{-1.2} \pm 0.9$			$8.5^{+1.6}_{-1.5}$
68	$K_2^*(1430)\gamma$	17^{+6}_{-5}			$17 \pm 6 \pm 1$		17 ± 6
70	$K_3^*(1780)\gamma$	< 37		< 2.8 §			< 2.8 §
77	$s\gamma$ †	349 ± 19	341 ± 28 [1]	328 ± 20 [1]	$329 \pm 44 \pm 29$		332 ± 15
77	$s\gamma$ [2]		336 ± 46 [1]	305 ± 16 [1]			308 ± 15
78	$d\gamma$	9.2 ± 3.0	$9.2 \pm 2.0 \pm 2.3$				9.2 ± 3.0
84	$\rho\gamma$	1.39 ± 0.25	$1.73^{+0.34}_{-0.32} \pm 0.17$	$1.21^{+0.24}_{-0.22} \pm 0.12$	< 14		$1.39^{+0.22}_{-0.21}$
85	$\rho/\omega\gamma$	1.30 ± 0.23	$1.63^{+0.30}_{-0.28} \pm 0.16$	$1.14 \pm 0.20^{+0.10}_{-0.12}$	< 14		$1.30^{+0.18}_{-0.19}$
119	se^+e^- ‡	4.7 ± 1.3	$7.69^{+0.82+0.71}_{-0.77-0.60}$		< 57		$7.69^{+1.08}_{-0.98}$
120	$s\mu^+\mu^-$ ‡	4.3 ± 1.2	$4.41^{+1.31+0.63}_{-1.17-0.50}$		< 58		$4.41^{+1.45}_{-1.27}$
121	$s\ell^+\ell^-$ ‡	4.5 ± 1.0	$6.73^{+0.70+0.60}_{-0.64-0.56}$		< 42		$6.73^{+0.92}_{-0.85}$
122	$\pi\ell^+\ell^-$	< 0.059	< 0.059	< 0.062			< 0.059
123	πe^+e^-	< 0.110	< 0.110				< 0.110
124	$\pi\mu^+\mu^-$	< 0.050	< 0.050				< 0.050
125	Ke^+e^-	0.44 ± 0.06	$0.39^{+0.09}_{-0.08} \pm 0.02$	$0.48^{+0.08}_{-0.07} \pm 0.03$			0.44 ± 0.06
126	$K^*e^+e^-$	1.19 ± 0.20	$0.99^{+0.23}_{-0.21} \pm 0.06$	$1.39^{+0.23}_{-0.20} \pm 0.12$			$1.19^{+0.17}_{-0.16}$
127	$K\mu^+\mu^-$	0.44 ± 0.04	$0.41^{+0.13}_{-0.12} \pm 0.02$	$0.50 \pm 0.06 \pm 0.03$		$0.42 \pm 0.04 \pm 0.02$	0.44 ± 0.04
128	$K^*\mu^+\mu^-$	1.06 ± 0.09	$1.35^{+0.35}_{-0.33} \pm 0.10$	$1.10^{+0.16}_{-0.14} \pm 0.08$		$1.01 \pm 0.10 \pm 0.05$	1.06 ± 0.09
129	$K\ell^+\ell^-$	0.48 ± 0.04	$0.47 \pm 0.06 \pm 0.02$	$0.48^{+0.05}_{-0.04} \pm 0.03$	< 1.7		0.48 ± 0.04
130	$K^*\ell^+\ell^-$	1.05 ± 0.10	$1.02^{+0.14}_{-0.13} \pm 0.05$	$1.07^{+0.11}_{-0.10} \pm 0.09$	< 3.3		1.05 ± 0.10
131	$K\nu\overline{\nu}$	< 17	< 17				< 17
132	$K^*\nu\overline{\nu}$	< 76	< 76				< 76
134	$\pi e^\pm\mu^\mp$	< 0.092	< 0.092		< 1.6		< 0.092
135	$\rho e^\pm\mu^\mp$	< 3.2			< 3.2		< 3.2
136	$Ke^\pm\mu^\mp$	< 0.038	< 0.038		< 1.6		< 0.038
137	$K^*e^\pm\mu^\mp$	< 0.51	< 0.51		< 6.2		< 0.51

† Results extrapolated to $E_\gamma > 1.6$ GeV, using the method of O.-L. Buchmuller *et al.*, Phys. Rev. D **73**, 073008 (2006).
[1] Average of several results, obtained with different methods.
[2] Only results originally measured in the interval $E_\gamma > 1.9$ GeV (also taken into account in the previous line).
‡ Belle: $m(\ell^+\ell^-) > 0.2$ GeV/c^2, BABAR: $m^2(\ell^+\ell^-) > 0.1$ GeV$^2/c^4$.
§ Product BF ($\times\mathcal{B}(K_3^* \to K\eta)$). PDG gives the BF assuming $\mathcal{B}(K_3^* \to K\eta) = 11^{+5}_{-4}\%$.
¶ $E_\gamma > 2.0$ GeV.

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

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

RPP#	Mode	PDG2014 Avg.	BABAR	Belle	CDF	LHCb	CMS	ATLAS	Our Avg.
29	$e^+\nu$	< 0.98	< 1.9	< 0.98 †					< 0.98 †
30	$\mu^+\nu$	< 1.0	< 1.0	< 1.7 †					< 1.0
31	$\tau^+\nu$	114 ± 27	179 ± 48 ‡	$91 \pm 19 \pm 11$ ‡					106 ± 19
32	$\ell^+\nu_\ell\gamma$	< 15.6	< 15.6	< 3.5					< 3.5
33	$e^+\nu_e\gamma$	< 17	< 17	< 6.1					< 6.1
34	$\mu^+\nu_\mu\gamma$	< 24	< 24	< 3.4					< 3.4
457	$\gamma\gamma$	< 0.32	< 0.32	< 0.62					< 0.32
458	e^+e^-	< 0.083	< 0.113	< 0.19	< 0.083				< 0.083
459	$e^+e^-\gamma$	< 0.12	< 0.12						< 0.12
460	$\mu^+\mu^-$	< 0.00063	< 0.052	< 0.16	< 0.0038	< 00074 *	< 00110 *	< 0.00042 *	$0.00039^{+0.00016}_{-0.00014}$ §
461	$\mu^+\mu^-\gamma$	< 0.16	< 0.16						< 0.16
462	$\mu^+\mu^-\mu^+\mu^-$	< 0.0053				< 0.0053			< 0.0053
464	$\tau^+\tau^-$	< 4100	< 4100						< 4100
482	$e^\pm\mu^\mp$	< 0.0028	< 0.092	< 0.17	< 0.064	< 0.0028			< 0.0028
488	$e^\pm\tau^\mp$	< 28	< 28						< 28
489	$\mu^\pm\tau^\mp$	< 22	< 22						< 22
490	$\nu\bar{\nu}$	< 24	< 24	< 130					< 24
491	$\nu\bar{\nu}\gamma$	< 17	< 17						< 17

† More recent results exist, with hadronic tagging (PRD 91, 052016 (Belle)). It does not improve the limits (< 3.5 and < 2.7 for $e^+\nu$ and $\mu^+\nu$, respectively).

‡ The authors make the average with their previous results, derived from statistically independent samples. BABAR: PRD 81, 051101(R) (2010), Belle: PRL 110, 131801 (2013).

* Limit at 95% C.L.

§ This is the combined result obtained by the LHCb and CMS collaborations (Ref. [109]).

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Compilation of B^+ Relative Semi-leptonic and Radiative Branching Fractions

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

RPP#	Mode	PDG2014 AVG.	Belle	BABAR	LHCb	Our Avg.
–	$10^4 \times \mathcal{B}(K^+\pi^+\pi^-\mu^+\mu^-)/\mathcal{B}(\psi(2S)K^+)$	New			$6.95^{+0.46}_{-0.43} \pm 0.34$	$6.95^{+0.57}_{-0.55}$
–	$10^4 \times \mathcal{B}(K^+\phi\mu^+\mu^-)/\mathcal{B}(\psi(2S)K^+)$	New			$1.58^{+0.36+0.19}_{-0.32-0.07}$	$1.58^{+0.41}_{-0.33}$
469	$\mathcal{B}(\pi^+\mu^+\mu^-)/\mathcal{B}(K^+\mu^+\mu^-)^1$	$0.053 \pm 0.014 \pm 0.01$			$0.038 \pm 0.009 \pm 0.001$	0.038 ± 0.009
473	$\mathcal{B}(K^+\mu^+\mu^-)/\mathcal{B}(K^+e^+e^-)^2$	New			$0.745^{+0.090}_{-0.074} \pm 0.036$	$0.745^{+0.097}_{-0.082}$
473	$\mathcal{B}(K^+\mu^+\mu^-)/\mathcal{B}(K^+e^+e^-)^3$	New	$1.03 \pm 0.19 \pm 0.06$			1.03 ± 0.20
473	$\mathcal{B}(K^+\mu^+\mu^-)/\mathcal{B}(K^+e^+e^-)^4$	New		$1.00^{+0.31}_{-0.25} \pm 0.07$		$1.00^{+0.32}_{-0.26}$
–	$\mathcal{B}(K^*\mu^+\mu^-)/\mathcal{B}(K^*e^+e^-)^3$	New	$0.83 \pm 0.17 \pm 0.08$			0.83 ± 0.19
–	$\mathcal{B}(K^*\mu^+\mu^-)/\mathcal{B}(K^*e^+e^-)^4$	New		$1.013^{+0.34}_{-0.26} \pm 0.010$		$1.013^{+0.340}_{-0.260}$

[1] For $0.1 < m^2(\ell^+\ell^-) < 6.0\,\mathrm{GeV}^2/c^4$
[2] For $1.0 < m^2(\ell^+\ell^-) < 6.0\,\mathrm{GeV}^2/c^4$
[3] For the full $m^2(\ell^+\ell^-)$ range
[4] For $0.10 < m^2(\ell^+\ell^-) < 8.12\,\mathrm{GeV}^2/c^4$ and $m^2(\ell^+\ell^-) > 10.11\,\mathrm{GeV}^2/c^4$

Heavy Flavor Averaging Group - October 2016

Compilation of $B \to \bar{b} \to \bar{q}$ gluon Branching Fractions ($\times 10^{-6}$) - UL at 90% CL

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

RPP#	Mode	PDG2014 Avg.	BABAR	Belle	CLEO	Our Avg.
80	ηX	260^{+50}_{-80}		$261 \pm 30^{+44}_{-74}$ §	< 440	261^{+53}_{-79}
81	$\eta' X$	420 ± 90	$390 \pm 80 \pm 90$ †		$460 \pm 110 \pm 60$ †	423 ± 86
82	$K^+ X$	< 187	< 187 ‡			< 187 ‡
83	$K^0 X$	195^{+71}_{-67}	$195^{+51}_{-45} \pm 50$ ‡			195^{+71}_{-67}
94	$\pi^+ X$	370 ± 80	$372^{+50}_{-47} \pm 59$ ¶			372^{+77}_{-75}

§ $0.4 < m_X < 2.6$ GeV/c.
† $2.0 < p^*(\eta') < 2.7$ GeV/c.
‡ $m_X < 1.69$ GeV/c.
¶ $m_X < 1.71$ GeV/c.

Heavy Flavor Averaging Group - October 2016

Isospin Asymmetry

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

Parameter	PDG2014 Avg.	BABAR	Belle	LHCb	Our Avg.
$\Delta_{0^-}(X_s\gamma)$	-0.01 ± 0.06	-0.01 ± 0.06 [§]			-0.01 ± 0.06
$\Delta_{0^+}(K^*\gamma)$	0.052 ± 0.026	$0.066 \pm 0.021 \pm 0.022$	$0.012 \pm 0.044 \pm 0.026$		0.012 ± 0.051
$\Delta_{\rho\gamma}$	-0.46 ± 0.17	$-0.43^{+0.25}_{-0.22} \pm 0.10$	$-0.48^{+0.21+0.08}_{-0.19-0.09}$		$-0.48^{+0.23}_{-0.21}$
$\Delta_{0^-}(K\ell\ell)$ [†]	-0.37 ± 0.13	$-0.41 \pm 0.25 \pm 0.01$	$-0.41^{+0.25}_{-0.20} \pm 0.07$	$-0.10^{+0.08}_{-0.09} \pm 0.02$*	$-0.13^{+0.08}_{-0.09}$
$\Delta_{0^-}(K^*\ell\ell)$ [†]	-0.22 ± 0.10	$-0.20^{+0.30}_{-0.23} \pm 0.03$	$0.33^{+0.37}_{-0.43} \pm 0.08$	$0.00^{+0.12}_{-0.10} \pm 0.02$*	$0.02^{+0.12}_{-0.10}$

[§] Average of two independent measurements from BABAR.
[†] Results given for the bin $1 < m^2(\ell^+\ell^-) < 6\,\mathrm{GeV}^2/c^2$, see references for the other bins.
*Only muons are used.

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