

Average Hadron Multiplicities in Hadronic e^+e^- Annihilation Events

Table 37.1: Average hadronic multiplicities per hadronic e^+e^- annihilation event at $\sqrt{s} \approx 10$, 29–35, and 91 GeV. The rates given include decay products from resonances with $c\tau < 10$ cm, and include charge conjugated states. Correlations of the systematic uncertainties were considered for the calculation of the averages. (Updated July 1999 by O. Biebel.)

Particle	$\sqrt{s} \approx 10$ GeV	$\sqrt{s} = 29-35$ GeV	$\sqrt{s} = 91$ GeV
Pseudoscalar mesons:			
π^+	6.6 ± 0.2	10.3 ± 0.4	16.99 ± 0.27
π^0	3.2 ± 0.3	5.83 ± 0.28	9.47 ± 0.54
K^+	0.90 ± 0.04	1.48 ± 0.09	2.242 ± 0.063
K^0	0.91 ± 0.05	1.48 ± 0.07	2.013 ± 0.033
η	0.20 ± 0.04	0.61 ± 0.07	0.971 ± 0.030
$\eta'(958)$	0.03 ± 0.01	0.26 ± 0.10	0.156 ± 0.021
D^+	0.16 ± 0.03	0.17 ± 0.03	0.175 ± 0.016
D^0	0.37 ± 0.06	0.45 ± 0.07	0.454 ± 0.030
D_s^+	0.13 ± 0.02	0.45 ± 0.20 ^(a)	0.131 ± 0.021
B^+, B_d^0	—	—	0.165 ± 0.026 ^(b)
B_s^0	—	—	0.057 ± 0.013 ^(b)
Scalar mesons:			
$f_0(980)$	0.024 ± 0.006	0.05 ± 0.02 ^(c)	0.146 ± 0.012
$a_0(980)^\pm$	—	—	0.27 ± 0.11 ^(d)
Vector mesons:			
$\rho(770)^\pm$	0.35 ± 0.04	0.81 ± 0.08	1.231 ± 0.098
$\omega(782)$	—	—	2.40 ± 0.43 ^(d)
$K^*(892)^+$	0.27 ± 0.03	0.64 ± 0.05	0.715 ± 0.059
$K^*(892)^0$	0.29 ± 0.03	0.56 ± 0.06	0.738 ± 0.024
$\phi(1020)$	0.044 ± 0.003	0.085 ± 0.011	0.0963 ± 0.0032
$D^*(2010)^+$	0.22 ± 0.04	0.43 ± 0.07	0.183 ± 0.010
$D^*(2007)^0$	0.23 ± 0.06	0.27 ± 0.11	—
$D_s^*(2112)^+$	—	—	0.101 ± 0.048 ^(f)
B^* (e)	—	—	0.288 ± 0.026
$J/\psi(1S)$	—	—	0.0052 ± 0.0004 ^(g)
$\psi(2S)$	—	—	0.0023 ± 0.0004 ^(g)
$\Upsilon(1S)$	—	—	0.00014 ± 0.00007 ^(g)
Pseudovector mesons:			
$\chi_{c1}(3510)$	—	—	0.0041 ± 0.0011 ^(g)
Tensor mesons:			
$f_2(1270)$	0.09 ± 0.02	0.14 ± 0.04	0.166 ± 0.020
$f_2'(1525)$	—	—	0.012 ± 0.006
$K_2^*(1430)^+$	—	0.09 ± 0.03	—
$K_2^*(1430)^0$	—	0.12 ± 0.06	0.084 ± 0.022 ^(g)
B^{**} (h)	—	—	0.118 ± 0.024
Baryons:			
p	0.253 ± 0.016	0.640 ± 0.050	1.048 ± 0.045
Λ	0.080 ± 0.007	0.205 ± 0.010	0.374 ± 0.009
Σ^0	0.023 ± 0.008	—	0.070 ± 0.012
Σ^-	—	—	0.081 ± 0.010
Σ^+	—	—	0.099 ± 0.015
Σ^\pm	—	—	0.174 ± 0.009
Ξ^-	0.0059 ± 0.0007	0.0176 ± 0.0027	0.0258 ± 0.0010
$\Delta(1232)^{++}$	0.040 ± 0.010	—	0.085 ± 0.014
$\Sigma(1385)^-$	0.006 ± 0.002	0.017 ± 0.004	0.0240 ± 0.0017
$\Sigma(1385)^+$	0.005 ± 0.001	0.017 ± 0.004	0.0239 ± 0.0015
$\Sigma(1385)^\pm$	0.0106 ± 0.0020	0.033 ± 0.008	0.0462 ± 0.0028
$\Xi(1530)^0$	0.0015 ± 0.0006	—	0.0055 ± 0.0005
Ω^-	0.0007 ± 0.0004	0.014 ± 0.007	0.0016 ± 0.0003
Λ_c^+	0.100 ± 0.030 ⁽ⁱ⁾	0.110 ± 0.050	0.078 ± 0.017
Λ_b^0	—	—	0.031 ± 0.016
$\Sigma_c^{++}, \Sigma_c^0$	0.014 ± 0.007	—	—
$\Lambda(1520)$	0.008 ± 0.002	—	0.0222 ± 0.0027

All average multiplicities are per hadronic e^+e^- annihilation event.

- (a) $B(D_s \rightarrow \eta\pi, \eta'\pi)$ was used (RPP94).
- (b) The Standard Model $B(Z \rightarrow b\bar{b}) = 0.217$ was used.
- (c) $x_p = p/p_{\text{beam}} > 0.1$ only.
- (d) Both charge states.
- (e) Any charge state (*i.e.*, B_d^* , B_u^* , or B_s^*).
- (f) $B(D_s^* \rightarrow D_S^+\gamma)$, $B(D_s^+ \rightarrow \phi\pi^+)$, $B(\phi \rightarrow K^+K^-)$ have been used (RPP98).
- (g) $B(Z \rightarrow \text{hadrons}) = 0.699$ was used (RPP94).
- (h) Any charge state (*i.e.*, B_d^{**} , B_u^{**} , or B_s^{**}).
- (i) The value was derived from the cross section of $A_c^+ \rightarrow p\pi K$, assuming the branching fraction to be $(3.2 \pm 0.7)\%$ (RPP92).

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