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

Table 33.1: Average hadron multiplicity per 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. (Updated April 1994 by S. Bethke and O. Biebel.)

Particle	$\sqrt{s} \approx 10$ GeV		$\sqrt{s} = 29$–35 GeV		$\sqrt{s} = 91$ GeV	
Pseudoscalar mesons:						
π^+	6.6	$\pm$ 0.2	10.3	$\pm$ 0.4	17.1	$\pm$ 0.4
π^0	3.2	$\pm$ 0.3	5.6	$\pm$ 0.3	9.9	$\pm$ 0.08 [a]
K^+	0.90	$\pm$ 0.04	1.48	$\pm$ 0.09	2.42	$\pm$ 0.13
K^0	0.91	$\pm$ 0.05	1.48	$\pm$ 0.07	2.12	$\pm$ 0.06
η	0.20	$\pm$ 0.04	0.61	$\pm$ 0.07	0.73	$\pm$ 0.07 [a]
$\eta\prime(958)$	0.03	$\pm$ 0.01	0.26	$\pm$ 0.10	0.17	$\pm$ 0.05 [a]
D^+	0.16	$\pm$ 0.03	0.17	$\pm$ 0.03	0.20	$\pm$ 0.03
D^0	0.37	$\pm$ 0.06	0.45	$\pm$ 0.07	0.40	$\pm$ 0.06
B^-, B^0		—		—	0.34	$\pm$ 0.06 [b]
Scalar mesons:						
$f_0(980)$	0.024	$\pm$ 0.006	0.11	$\pm$ 0.04	0.14	$\pm$ 0.06 [a]
Vector mesons:						
$\rho(770)^0$	0.35	$\pm$ 0.04	0.81	$\pm$ 0.08	1.4	$\pm$ 0.1 [c]
$K^*(892)^+$	0.27	$\pm$ 0.03	0.64	$\pm$ 0.05	0.78	$\pm$ 0.08
$K^*(892)^0$	0.29	$\pm$ 0.03	0.56	$\pm$ 0.06	0.77	$\pm$ 0.09
$\phi(1020)$	0.044	$\pm$ 0.006	0.085	$\pm$ 0.011	0.086	$\pm$ 0.018
$D^*(2010)^+$	0.22	$\pm$ 0.04	0.43	$\pm$ 0.07	0.17	$\pm$ 0.02
$D^*(2007)^0$	0.23	$\pm$ 0.06	0.27	$\pm$ 0.11		—
$\omega(782)$	0.30	$\pm$ 0.08		—		—
$J/\psi(1S)$		—		—	0.0036	$\pm$ 0.0006
Pseudovector mesons:						
$\chi_{c1}(1P)$		—		—	0.008	$\pm$ 0.003
Tensor mesons:						
$f_2(1270)$	0.09	$\pm$ 0.02	0.14	$\pm$ 0.04	0.31	$\pm$ 0.12
$K_2^*(1430)^+$		—	0.09	$\pm$ 0.03		—
$K_2^*(1430)^0$		—	0.12	$\pm$ 0.06		—
Baryons:						
p	0.253	$\pm$ 0.016	0.640	$\pm$ 0.050	0.92	$\pm$ 0.11
Λ	0.080	$\pm$ 0.007	0.205	$\pm$ 0.010	0.348	$\pm$ 0.013
Σ^0	0.023	$\pm$ 0.008		—		—
$\Delta(1232)^{++}$	0.040	$\pm$ 0.010		—		—
Ξ^-	0.0059	$\pm$ 0.0007	0.0176	$\pm$ 0.0027	0.0238	$\pm$ 0.0024
$\Xi(1530)^0$	0.0015	$\pm$ 0.006		—	0.0063	$\pm$ 0.0014
$\Sigma(1385)^-$	0.006	$\pm$ 0.002	0.017	$\pm$ 0.004		—
$\Sigma(1385)^+$	0.005	$\pm$ 0.001	0.017	$\pm$ 0.004		—
$\Sigma(1385)^\pm$	0.0106	$\pm$ 0.0020	0.033	$\pm$ 0.008	0.0380	$\pm$ 0.0062
Ω^-	0.0007	$\pm$ 0.0004	0.014	$\pm$ 0.007	0.0051	$\pm$ 0.0013
Λ_c^+	0.100	$\pm$ 0.030 [d]	0.110	$\pm$ 0.050		—
Λ_b^0		—		—	0.031	$\pm$ 0.016
$\Sigma_c^{++}, \Sigma_c^0$	0.014	$\pm$ 0.007		—		—
$\Lambda(1520)$	0.008	$\pm$ 0.002		—		—

(a) Extrapolation to the unobserved region using the shape predicted by JETSET.

(b) The Standard Model branching ratio $\mathrm{B}(Z \to b\bar{b}) = 0.220$ was used.

(c) Mass of $\rho(770)$ determined to 757 ± 2 MeV/c^2. The reason for that is possibly the Bose-Einstein effect affecting the pions from the $\rho(770)$ decay.

(d) The value was taken from the cross section of the $\Lambda_c^+ \to p\pi K$, assuming the branching fraction to be $(3.2 \pm 0.7)\%$ (RPP 1992).

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