σ and $R$ in $e^+e^-$ Collisions

Figure 39.6, Figure 39.7: World data on the total cross section of $e^+e^- \rightarrow \text{hadrons}$ and the ratio $R = \frac{\sigma(e^+e^- \rightarrow \text{hadrons})}{\sigma(e^+e^- \rightarrow \mu^+\mu^-}$, QED simple pole. The curves are an educative guide. The solid curves are the 3-loop pQCD predictions for $\sigma(e^+e^- \rightarrow \text{hadrons})$ and the $R$ ratio, respectively [see our Review on Quantum chromodynamics, Eq. (9.12)] or, for more details, K.G. Chetyrkin et al., Nucl. Phys. B586, 56 (2000), Eqs. (1)–(3)). Breit-Wigner parameterizations of $J/\psi$, $\psi(2S)$, and $\Upsilon(nS), n = 1, 4$ are also shown. Note: The experimental shapes of these resonances are dominated by the machine energy spread and are not shown. The dashed curves are the naive quark parton model predictions for $\sigma$ and $R$. The full list of references, as well as the details of $R$ ratio extraction from the original data, can be found in O.V. Zenin et al., hep-ph/0110176 (to be published in J. Phys. G). Corresponding computer-readable data files are available at http://wwwppds.ihep.su/~zenin_g/contents_plots.html. (Courtesy of the COMPAS (Protvino) and HEPDATA (Durham) Groups, November 2001.)