



**Figure 40.6:** World data on the total cross section of  $e^+e^- \rightarrow \text{hadrons}$  and the ratio  $R(s) = \sigma(e^+e^- \rightarrow \text{hadrons}, s) / \sigma(e^+e^- \rightarrow \mu^+\mu^-, s)$ .  $\sigma(e^+e^- \rightarrow \text{hadrons}, s)$  is the experimental cross section corrected for initial state radiation and electron-positron vertex loops,  $\sigma(e^+e^- \rightarrow \mu^+\mu^-, s) = 4\pi\alpha^2(s)/3s$ . Data errors are total below 2 GeV and statistical above 2 GeV. The curves are an educative guide: the broken one is a naive quark-parton model prediction and the solid one is 3-loop pQCD prediction (see “Quantum chromodynamics” section of this *Review*, Eq. (9.12) or, for more details, K. G. Chetyrkin et al., [hep-ph/0005139](https://arxiv.org/abs/hep-ph/0005139), p.3, Eqs. (1)-(3)). Breit-Wigner parameterizations of  $J/\psi$ ,  $\psi(2S)$ , and  $\Upsilon(nS), n = 1..4$  are also shown. The full list of references to the original data and the details of the  $R$  ratio extraction from them can be found in [hep-ph/0312114](https://arxiv.org/abs/hep-ph/0312114). Corresponding computer-readable data files are available at <http://pdg.ihp.su/xsect/contents.html>. (Courtesy of the COMPAS(Protvino) and HEPDATA(Durham) Groups, March 2004. Corrections by P. Janot (CERN) and M. Schmitt (Northwestern U.))