2006 Vol.46 No.6 pp.1017-1022 DOI:

Υ Radiative Decays to Light Quark Jets and Color Octet Mechanism

GAO Ying-Jia,[1] ZHANG Yu-Jie,[1] and CHAO Kuang-Ta[1,2]

[1] Department of Physics, Peking University, Beijing 100871, China
[2] China Center of Advanced Science and Technology (World Laboratory), Beijing 100080, China
(Received: 2006-6-16; Revised:)

Abstract: We study radiative decays of Υ to light quark jets in nonrelativistic QCD by taking both the color singlet and color octet $b\bar{b}$ operators into consideration. The cut for quark jet energy and cut for the angle between two quark jets are introduced. The sensitivity to the soft and collinear singularities in the loop integrals are greatly reduced by these cuts. With the jet energy cut of about 1 GeV, and the jet angle cut of about 36°, the branching ratio for $\Upsilon \to \gamma q\bar{q}$ is found to be 8.2×10^{-4} from color singlet contributions. The color octet contributions could be much larger than that of color singlet, depending on the estimate of the color octet matrix elements. This process may provide a new test for the color octet mechanism in nonrelativistic QCD.

PACS: 12.38.Bx, 13.20.Gd, 14.40.Gx
Key words: radiative decay, jet, color octet