International Journal of Modern Physics A
Vol. 19, No. 11 (2004) 1771–1791

SPECTROSCOPY OF B_c MESON IN A SEMI-RELATIVISTIC QUARK MODEL USING THE SHIFTED LARGE-N EXPANSION METHOD

SAMEER M. IKHDAIR

Department of Electrical and Electronic Engineering,
Near East University, Nicosia, North Cyprus, Mersin 10, Turkey
sameer@neu.edu.tr

RAMAZAN SEVER

Department of Physics, Middle East Technical University, Ankara, Turkey
sever@metu.edu.tr

Received 11 May 2003
Revised 28 July 2003

We calculate the $c\bar{b}$ mass spectrum, the splitting values and some other properties in the framework of the semirelativistic equation by applying the shifted large-N expansion technique. We use seven different central potentials together with an improved QCD-motivated interquark potentials calculated to two loops in the modified minimal-subtraction ($\overline{\text{MS}}$) scheme. The parameters of these potentials are fitted to generate the semirelativistic bound states of $c\bar{b}$ quarkonium system in close conformity with the experimental and the present available calculated center-of-gravity (c.o.g.) data. Calculations of the energy bound states are carried out up to third order. Our results are in excellent fit with the results of the other works.

Keywords: B_c meson; mass spectrum; leptonic constant; hyperfine splittings; heavy quarkonium.

PACS numbers: 11.10.St, 12.39.Pn, 14.40.-n

1. Introduction

The spectroscopy of the $c\bar{b}$ system have already been widely studied before in the framework of the heavy quarkonium theory.[1] After discovery of the B_c was reported in 1998 by the (CDF) collaboration,[2] the observed mass $M_{B_c} = 6.40^{\pm 0.39}_{\pm 0.13}$ GeV has inspired new theoretical interest.[1,3–9] Bound state masses have been estimated for the B_c system which consists of heavy quarks.[1,3–9] Hence, it can be reliably described by the use of the methods developed for the $c\bar{c}$ and the $b\bar{b}$ spectra.

Quite recently, the revised analysis of the B_c spectroscopy has been performed in the framework of the potential approach[1,4,7,9] and QCD sum rule.[3,6] Kwong