

Mass spectra of singly bottom baryon Ω_b^- using the Hypercentral Constituent Quark Model

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Abstract

The mass spectra of singly bottom baryon Ω_b^- is determined using the Hypercentral Constituent Quark Model [1]. We first determine ground state masses and then established the radial(L=0) and orbital (L=1,2,3) excited state masses. The confinement potential is assumed in the hyper central co-ordinates of the coulomb plus power potential for unequal masses. We also introduced first order correction to the potential. Ω_b^- with quark content ssb has SU(3) 6_F symmetry. Our calculated mass spectra for Ω_b^- is obtained by varying potential index ν value from 0.5 to 2.0. Only ground state is found till now experimentally [2] $m_{\Omega_b^-} = 6048.8 \pm 3.2$ MeV with $J^P = \frac{1}{2}^+$. Recent Lattice QCD results [3] are $m_{\Omega_b^-}(1/2)^+ = 6056(47)(20)$ MeV and $m_{\Omega_b^-}(3/2)^+ = 6085(47)(20)$ are close to our results $m_{\Omega_b^-}(1/2)^+ = 6048$ MeV and $m_{\Omega_b^-}(3/2)^+ = 6086$ MeV at potential index $\nu = 1.0$. Radially excited states are calculate for $J^P = \frac{1}{2}^+, \frac{1}{2}^+, \frac{3}{2}^+$ and orbitally excited states are calculated for $\frac{5}{2}^+, \frac{7}{2}^+, \frac{1}{2}^-, \frac{3}{2}^-, \frac{5}{2}^-, \frac{7}{2}^-, \frac{9}{2}^-$ at $\nu = 1.0$. We also plot Regge trajectory($M^2 \rightarrow n$) for higher excited states. We also compare our results with other theoretical models [4, 5, 6] and they are in good agreement.

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