RCNP SEMINAR

Title The Y-string confining potential and the permutation symmetric three-body variables

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Abstract:
We calculate the energies of three-quark states with definite permutation symmetry (i.e. of SU(6) multiplets) in the N=0,1,2 shells, confined by the Y-string three-quark potential. The exact Y-string potential consists of four terms: one ``central" Y-string term, and three ``two-string" terms, depending on the angles in the triangle. Due to this technical complication we treat the problem at three increasingly accurate levels of approximation.
We show that the exact energy differences between the $[20,1^{+}], [70,2^{+}], [56,2^{+}], [70,0^{+}]$-plets are shifted to 2:2:0.9, away from the Bowler and Tynemouth rule 2:2:1, and that the ``Roper" $[56^{¥prime},0^{+}]$- plet is always heavier than the odd-parity $[70,1^{-}]$-plet. We compare these results with those of the $¥Delta$-string.
In the process of studying these Y-junction string and $¥Delta$-string potentials we found a new integral of three-body motion G, when the three-body potential depends only on the hyper-radius (``moment of inertia") and the area of the triangle defined by the three quarks. This observation led us to search for the third independent three-body variable in this set: the new hyper-angle $¥phi$, that is conjugate to the new (fourth) integral of motion G.
We briefly discuss two illustrative examples of application of these new permutation symmetric three-body variables.