Asymptotics of three-body radial wave functions of halo nuclei

D. Baye[1], C. Leclercq-Willain[1] and R. Yarmukhamedov[2,1],
[1] *Physique Nucléaire Théorique et Physique Mathématique, C.P. 229, Université Libre de Bruxelles, B 1050 Bruxelles, Belgium*
[2] *Institute of Nuclear Physics, Uzbekistan Academy of Sciences Tashkent 702132, Uzbekistan*

Asymptotic expressions for the radial partial waves of a bound-state wave function of a three-body system, expressed in relative coordinates, are obtained in explicit form, when the relative distance between two particles tends to infinity [1]. This formula can be applied, for instance, to wave functions of halo nuclei for large distances of at least one of the valence neutrons and the core. Besides a well-known exponential decrease as a function of a hyperradius [2,3], the derived asymptotic expressions involve factors that can influence noticeably the asymptotic values of the three-body radial wave functions for some directions in the configuration space. The obtained asymptotic forms are applied to the analysis of the asymptotic behaviour of accurate ^{6}He three-body αnn wave functions derived with the Lagrange-mesh method [4]. The agreement between the calculated wave function and the asymptotic formula is excellent up to distances close to 20 fm. Information is extracted about the values of the three-body asymptotic normalization factors.

[1] R. Yarmukhamedov, D. Baye and C. Leclercq-Willain, Nucl. Phys. A (2002) in press
[2] S.P. Merkur'ev, Sov. J. Nucl. Phys. 19 (1974) 222
[3] L.D. Blokhintsev, M.K. Ubaidullaeva and R. Yarmukhamedov, Phys. At. Nucl. 62 (1999) 1289
[4] D. Baye, Nucl. Phys. A627 (1997) 305