Abstract for an Invited Paper for the DNP10 Meeting of The American Physical Society

Seniority in quantum many-body systems PIET VAN ISACKER, GANIL

Seniority in the structure of nuclei refers to the number of nucleons that are not in pairs coupled to angular momentum J=0, and therefore it probes the most important two-body correlation within nuclei, "pairing." Racah first introduced seniority in 1943 for the classification of complex atomic spectra and adapted it a few years later in the context of nuclear physics. Two key developments subsequent to Racah's original idea are: the treatment of neutrons and protons and the treatment of nucleons in several non-degenerate orbits. The conditions for seniority conservation will be reviewed and compared to those necessary for the full integrability of a system of interacting particles. The more recent possibility of "partial" seniority will be explored, where most states are of mixed seniority but some remain pure. This explains the occurrence of nuclear seniority isomers, characterized by electromagnetic decay hindered by selection rules related to seniority. Finally, the relevance of seniority as a generic concept will be illustrated with an application to Bose-Einstein condensates.