

Physics Cases and Instrumentation for the EURISOL-DF, next step towards Eurisol



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Microscopic description of proton emitters

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Explaining the properties of exotic nuclei is a challenging task, but one can obtain information about the nuclear structure and the residual interaction, at the limits of stability. We undertake such investigation pertaining to proton emitting nuclei with the aid of available data. Apart from building a robust nuclear model, this task is motivated by other crucial implications of proton emitters in nucleosynthesis and in astrophysics [1,2,3]. Microscopic studies of proton emission can provide detailed information about the structure and decay, in a unified way. With such studies, in most of the cases, we can unambiguously ascertain the configuration of the proton emitting states.

In a microscopic approach, the decay width is calculated from the overlap of parent (particle+core) and daughter (core) wave functions. In this regard, with the inclusion of Coriolis interaction, the nonadiabatic quasiparticle approach is quite successful to unveil the structure and decay properties of proton emitters [4,5,6]. The recent extensions of our approach are multifaceted including the cases of odd-odd nuclei and triaxial nuclei [7,8]. For the first time the covariant density functional theory has been utilized to calculate the decay width of proton emitters [9]. Having such a versatile tool, employing microscopic meson-baryon interactions and well tested by explaining low lying excited states in exotic nuclei, opens up new avenues in the understanding of nuclear forces.

The progress in this direction will be reviewed, having in mind possible applications to future data obtained in the facilities discussed in the meeting.

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