

Gamow Shell Model interaction for p- (and maybe sd-) nuclei

The structure of weakly bound and unbound nuclei close to particle drip lines is one of the major science drivers of nuclear physics. A comprehensive understanding of these systems goes beyond the traditional nuclear shell model and requires an open quantum system description. The complex-energy Gamow Shell Model (GSM) (see [Mic09] for a review) provides such a framework as it is capable of describing resonant and non-resonant many-body states on equal footing. So far, the use of schematic two-body interactions has delivered solid proofs of principles for GSM with the description of various exotic nuclear features such as halo structures in ${}^6\text{He}$, ${}^{11}\text{Li}$ and ${}^8\text{B}$, cigar/dineutron configurations in ${}^6\text{He}$ and ${}^8\text{He}$, or states described as antibound in ${}^{10}\text{Li}$. Recently, an effective GSM interaction was optimized within the psdf shell model space in order to describe for the first time bound, resonant and unbound nuclei in the p-region of the nuclear landscape ($5 \leq A \leq 15$) [Jag17].

I will present some possible applications of this interaction which could be implemented experimentally in Poland. In particular, I will discuss a joint project with the experimental group in Krakow on the M4 resonance in ${}^{13}\text{C}$, whose decay could be measured in the near future locally at the Cyclotron Centre Bronowice (CCB) in Krakow. I will also show how such an interaction could be extended to describe bound and unbound sd-shell nuclei ($16 \leq A \leq 40$) which could be of interest for experimentalists in Poland.

[Mic09] N. Michel et al., J. Phys. G: Nucl. Part. Phys. 36, 013101 (2018).

[Jag17] Y. Jaganathen et al., PRC 96, 054316 (2017).