Contribution ID: **185** Type: **Contributed Oral Presentation**

A structure-informed approach to analyzing scattering information

Monday, 26 May 2025 17:50 (15 minutes)

Analyses of low-energy elastic scattering cross-section data usually involve fitting the data with phenomenological models, such as R-matrix theory [1]. This popular technique allows for the modelling of resonances in the (A+1) compound nucleus in the scattering region from which resonance parameters such as centroids and widths are obtained.

A limitation of this approach is that the energy centroid and widths depend upon 'channel radius'parameters, which divide where wavefunctions have long-range asymptotic form, and in internal region where the system is confined, and thus in resonance. These parameters are arbitrary, and not guided by nuclear structure information.

Alternatives that obtain scattering observables from the underlying nuclear physics of colliding nuclei are thus highly desirable. One such approach is the multi-channel algebraic scattering (MCAS) method [2]. MCAS uses scattering potentials derived from structure models that account for the collective and microscopic considerations that give rise to resonances. The approach optimizes scattering potential strengths to obtain centroids of resonances and bound states only, with other observables such as widths and cross sections generated automatically. Because MCAS results stem from nuclear structure considerations, it is a predictive method, with MCAS results preceded experimental discovery [3].

This talk will detail recent progress in applying MCAS to light-mass nuclear systems.

[1] P. Descouvemont and D. Baye, Rep. Prog. Phys. 73, 036301 (2010).
[2] S. Karataglidis, K. Amos, P. R. Fraser, and L. Canton, A New Development at the Intersection of Nuclear Structure and Reaction Theory (Springer, 2019), ISBN 978-3-030-21069-4.
[3] P. R. Fraser, K. Amos, L. Canton, S. Karataglidis, D. van der Knijff, and J. P. Svenne, Phys. Rev. C100, 024609 (2019).

Primary author: FRASER, Paul (University of New South Wales)

Co-authors: BHATTACHARYYA, Deeparna (University of New South Wales); AMOS, Ken (The University of Melbourne); CANTON, Luciano (INFN Padova); MOSS, Robert (The University of Melbourne); KARATAGLIDIS, Steven (University of Johannesburg); MURULANE, Khuliso (University of Johannesburg)

Presenter: FRASER, Paul (University of New South Wales)

Session Classification: Parallel Session

Track Classification: Nuclear Reactions