Contribution ID: **102** Type: **Invited Talk**

Coulomb Excitation with Radioactive and Stable Beams

Friday, 23 August 2024 13:55 (25 minutes)

The atomic nucleus is a complex many-body system, with behaviour dictated predominantly by the strong nuclear force. These features give rise to the emergent property of nuclear collectivity, in which the nucleus deviates from sphericity, becoming deformed. Understanding the onset of this deformation, predominantly in its quadrupole and octupole forms, therefore requires modelling both the interaction and many-body nature of the nucleus, making it a challenge for nuclear theory. The observables providing the best signatures of deformation are transition strengths and, in the case of quadrupole deformation, spectroscopic quadrupole moments.

Experimentally, Coulomb excitation provides exceptional access to these properties, making use of the well-understood nature of the Coulomb interaction to extract them from the excitation probability. With the advent of radioactive beam facilities, a further benefit of the technique has become apparent, namely large cross-sections. Here, I will discuss recent results from TRIUMF, NSCL/FRIB and Argonne National Laboratory, presenting studies ranging from the sd-shell, strongly-deformed nuclei around N=Z=40, and nuclei in the vicinity of doubly-magic ^{208}Pb.

Funding Agency

UKRI

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Session Classification: Nuclear Structure II

Track Classification: Nuclear Structure from Collisions