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Coulomb Excitation of Rn Isotopes in the Region of Large Octupole Collectivity

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Reflection-asymmetric nuclei are of considerable interest for the understanding of nuclear structure. Reflection asymmetry arises as a consequence of strong octupole correlations which occur when states with $\Delta j=\Delta l=3\hbar$ lie close to the Fermi surface for both neutrons and protons. Octupole correlations are largest in the region with octupole magic numbers Z=88 and N=134. The Z=86 radon isotopes lie close to the centre of the octupole-deformed region but have been very difficult to study experimentally. Excited states have previously been identified in the N=136 isotope 222Rn[1], forming a characteristic alternating-parity octupole band, while the first observation of excited states in the more neutron-rich 224,226Rn isotopes was recently presented [2] using data from our experiment. An experiment has been performed using the Miniball spectrometer at ISOLDE, CERN to investigate the E3 moments of some Ra and Rn nuclei. The radioactive Rn isotopes were post-accelerated using the HIE-ISOLDE beam line to approximately 5 MeV/A and were incident upon stable Sn and Ni targets in separate measurements. Excited states in these nuclei were populated via Coulomb excitation. Analysis of the intensities of transitions using the multiple Coulomb-excitation code GOSIA will provide a direct measurement of both electric quadrupole (E2) and octupole (E3) moments.

[1] J.F.C.Cocks, Nucl. Phys. A645, 61 (1999).
[2] P. A. Butler, Nature Comm. 10, 2473 (2019)

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Please select: Experiment or Theory

Experiment

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