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Statistical Properties of highly-deformed Samarium isotopes

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The rare-earth isotopic chain of Samarium provides an excellent opportunity to systematically investigate the evolution of nuclear structure effects from the near spherical (β2=0.09) 144Sm isotope to the highly-deformed system 154Sm (β2=0.34). As the nuclear shape changes, statistical properties such as the nuclear level density (NLD) and γ-strength function (γSF) are expected to be affected. In particular resonance modes, such as the Pygmy Dipole (PDR), Scissors Resonances (SR) and the recently discovered Low-Energy Enhancement (LEE) in rare-earth region may reveal interesting features when their evolution is investigated across several nuclei in an isotopic chain. Most reliable knowledge can be obtained when results from several different experiments are compared. An experiment was performed in September 2016 at Oslo Cyclotron Laboratory (OCL) where the NaI(Tl) γ-ray array, silicon particle telescopes and 6 high-efficiency LaBr3:Ce detectors were utilized to measure particle-γ coincidence events from which the NLDs and γSFs will be extracted below the neutron separation energy threshold, Sn, using the Oslo Method (A. Schiller et al. 2000). The deuteron beam with 13 and 15 MeV energies was used to populate excited states in 154,155Sm through the inelastic scattering (d,d'γ) and the transfer reaction (d,p). Based on the results from these measurements, the extracted NLDs and γSFs will be used to investigate the evolution of nuclear structure effects in 154,155Sm and provide complementary information to the 154Sm(p,p')154Sm and 154Sm(α,α'γ)154Sm data on resonance features that lie on the low-energy tail of the GDR. In addition, the results will further provide a near-complete picture on the evolution of the PDR, SR and/or the LEE as the isotopic chain transitions from near spherical to very deformed. In this talk I will present preliminary results of this investigation of statistical properties for 154,155Sm in comparison to the previous and recent measurements of 148,149Sm and 151,153Sm isotopes, respectively, and ongoing measurements of 152,153Sm at OCL.

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