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Study of the spin-orbit splitting in n-rich Nitrogen isotopes with active targets.

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In quantum mechanics the coupling of a particle's velocity with its own spin is at the origin of the spin-orbit effect that creates many fundamental phenomena in mesoscopic systems. In nuclear physics, a sizeable spin-orbit interaction, that breaks energy levels with the same
orbital momentum (l) but different spin value (s) apart, is responsible for the observed shell structure and generates the well known sequence of magic numbers [1]. From all the magic numbers that emerge as a consequence of the spin-orbit splitting, the gaps at 6 and 14, were already considered by Goepper-Mayer and Jensen as very weak [1]. Just recently, experimental results published in Nature [2] showed evidence for a Z=6 shell closure. However, a (p,2p) experiment [3] was performed later and supported a moderate reduction of the 1p1/2 and 1p3/2 splitting. Yet not direct measurement of the gap has been obtained so far and therefore direct probes that are sensitive to the single-particle configurations need to be used in order to shed light on the role of the different forces at play. In this talk, I will present the results from the single-proton removal reaction 20O(d,3 He)19N which aimed at probing the Z=6 shell gap towards the neutron dripline. The goal of the 20O(d,3 He)19N [4] experiment with ACTAR TPC [5–7] at GANIL is twofold: First, the experiment will provide a unique way of determining the gap between the 1p1/2 and 1p3/2 single-particle states in 19 N and will bring crucial information on the Z=6 shell gap. Second, this experiment is the first transfer experiment with the new generation of active targets. Originally, these transfer experiments required the use of complex arrays for particle and
gamma detection systems to improve selectivity. The use of active targets overcomes the aforementioned difficulties and is specially well adapted to explore new regions of the nuclear chart with unprecedented resolution using a much more compact detection system.

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session

I. Nuclear Structure and Reactions

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