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Shell evolution in neutron-rich nuclei south-east of doubly-magic 48Ca

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The aim of this work is an investigation of the structural evolution in neutron rich nuclei “south and south-east” of doubly-magic ^{48}Ca, especially with respect to rapidly changing nuclear properties. Here, we want to investigate ^{46}Ar, ^{48}Ar and neighboring odd-A ^{47}Ar and ^{49}K that are accessible in the same experiment. We will deduce unique structural information from absolute transition strengths determined from level lifetimes that will be measured with the Recoil Distance Doppler-shift technique employing a new Cologne compact plunger device coupled to AGATA and PRISMA and employing multinucleon transfer reactions. The investigation of this region is particular interest: These nuclei are located along the path from doubly magic ^{48}Ca to collective nuclei, e.g., neutron-rich S and Si isotopes. Especially, an erosion of the N=28 shell closure is in the focus of this work. Such was observed in lighter isotopes in this region, but sparse and partly ambiguous data exists for neutron rich argon isotopes so far, even though newer results support a weakening of the N=28 closure already in argon. Thus this region is critical for the understanding of shell evolution and structural changes where shell model descriptions already turned out to be a challenge. Further, recent experimental findings in the neutron-rich Ti isotopes, which are valence proton partners for Ar with respect to Z=20, also give evidence for rapid structural changes for increasing neutron number. The results of this work will allow to judge a possible valence proton symmetry with respect to Z=20.

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