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Single-particle states in 79Zn and the N=50 shell gap near 78Ni

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Neutron-rich nuclei with magic numbers of neutrons and protons are reference points to map and understand the reorganization of the shell structure away from the line of beta stability. Experiment IS491 aimed at the study of single-particle properties of 79Zn, which lies only 2 protons above and 1 neutron below the Z=28 and N=50 shell closures of 78Ni. The sizes of these shell gaps, from which depends to what extent 78Ni can be considered doubly-magic, are still disputed. Shell-model calculations which take into account the effect of the tensor force predict a weakening of the N=50 shell gap near 78Ni. Recent experimental evidence [1,2] suggests instead a persistence of the gap, and in fact even an increase by 700keV in going from 81Ge to 79Zn. In this experiment, low-lying states in 79Zn were populated via the 78Zn(d,p)79Zn single-neutron transfer reaction, in inverse kinematics. Transfer reactions are the ideal tool to determine effective single particle energy, and thus determine the extent of the shell gap. In this experiment, charged particles were detected using the T-REX silicon chamber coupled to the MINIBALL detector array. Preliminary results will be presented. [1] J. Van de Walle et al., Phys. Rev. Lett. 99 (2007) 142501. [2] Hakala et al., Phys. Rev. Lett. 101 (2008) 052502. *** This work was supported by the European Union Seventh Framework Programm through ENSAR, contract no. 262010.

Authors: Dr DE ANGELIS, Giacomo (LNL - INFN Legnaro, Italy); Dr ORLANDI, Riccardo (IEM - CSIC Madrid, Spain); Prof. CHAPMAN, Robert (University of the West of Scotland, Paisley, UK)

Co-authors: Mr GOTTARDO, Andrea (LNL - INFN Legnaro, Italy); Dr JUNGCLAUS, Andrea (IEM - CSIC Madrid, Spain); Prof. ANDREYEV, Andrei (University of the West of Scotland, Paisley, UK); Dr MENGONI, Daniele (University of the West of Scotland, Paisley, UK); Dr MUECHER, Dennis (Techinschen Universitaet Muenchen Germany); Dr SAHIN, Eda (LNL - INFN Legnaro, Italy); Dr RECCHIA, Francesco (Universita' di Padova, Padova, Italy and INFN Sezione di Padova); Mr JOHANSEN, Jacob (Aarhus Universtiy, Aarhus, Denmark); Mr DIRIKEN, Jan (IKS Katholieke Universiteit, Leuven, Belgium); Dr PAKARINEN, Janne (CERN, Geneva, Switzerland); Dr VALIENTE-DOBÓN, Javier (LNL - INFN Legnaro, Italy); Dr SMITH, John F. (University of the West of Scotland, Paisley, UK); Mr LANE, Joseph (University of the West of Scotland, Paisley, UK); Dr ELSEVIERS, Jytte (IKS Katholieke Universiteit, Leuven, Belgium); Dr WIMMER, Katrhin (Techinschen Universitaet Muenchen Germany); Dr FLANAGAN, Kieran (University of Manchester, Manchester, UK); Mr CAPPONI, Luigi (University of the West of Scotland, Paisley, UK); Prof. HUYSE, Mark (IKS Katholieke Universiteit, Leuven, Belgium); Mr VON SCHMID, Mirko (Techinschen Universitaet Darmstadt Germany); Dr WARR, Nigel (Universitaet zu Koeln, Koeln, Germany); Ms KATHARINA, Nowak (Techinschen Universitaet Muenchen Germany); Prof. REITER, Peter (Universitaet zu Koeln, Koeln, Germany); Prof. VAN DUPPEN, Piet (IKS Katholieke Universiteit, Leuven, Belgium); Prof. KRUECKEN, Reiner (Techinschen Universitaet Muenchen Germany); Dr GERNHAEUSER, Roman (Techinschen Universitaet Muenchen Germany); Dr PAIN, Steven (Oak Ridge National Laboratory, Oak Ridge, USA); Dr COCOLIOS, Thomas (CERN, Geneva, Switzerland); Dr ROGER, Thomas (IKS Katholieke Universiteit, Leuven, Belgium); Dr KROELL, Thorsten (Techinschen Universitaet Darmstadt Germany); Ms LIBERATI, Valentina (University of the West of Scotland, Paisley, UK); Dr BILDSTEIN, Vinzenz (Techinschen Universitaet Muenchen Germany)

Presenter: Dr ORLANDI, Riccardo (IEM - CSIC Madrid, Spain)

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