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RCNP EXPERIMENT E

PROPOSAL FOR EXPERIMENT AT RCNP

July 11, 2011

TITLE:
Dipole Response in ^{70}Zn and ^{130}Te and Shell Evolution in Neutron-Rich Nuclei

SPOKESPERSONS:

Full Name	Norbert Pietralla
Institution	Institut für Kernphysik, Technische Universität Darmstadt,
Position	Professor
Address	Schlossgartenstr. 9, 64289 Darmstadt, Germany
E-mail	pietralla@ikp.tu-darmstadt.de

Full Name	Atsushi Tamii
Institution	Research Center for Nuclear Physics, Osaka University,
Position	Associate Professor
Address	10-1, Mihogaoka, Ibaraki, Osaka 567-0047, Japan
E-mail	tamii@rcnp.osaka-u.ac.jp

EXPERIMENTAL GROUP:

Name	Institution	Title or Position
N. Aoi	RCNP, Osaka Univ., Japan	Professor
B. Bilgier	Istanbul Univ., Turkey	PhD Student
J. Birkhan	IKP, Technische Universität Darmstadt, Germany	Doctoral student
B. Bozorgian	IKP, Technische Universität Darmstadt, Germany	Doctoral student
H. Fujita	RCNP, Osaka Univ., Japan	Research Fellow
Y. Fujita	Dep. of Physics, Osaka Univ., Japan	Associate Professor
E. Ganioglu	Istanbul Univ., Turkey	Assistant Professor
K. Hatanaka	RCNP, Osaka Univ., Japan	Professor
T. Hashimoto	RCNP, Osaka Univ., Japan	Assistant Professor
T. Itoh	Niigata Univ., Japan	Master Student
T. Kawabata	Dep. of Physics, Kyoto Univ., Japan	Associate Professor
H.C. Kozer	Istanbul Univ., Turkey	PhD Student
C. Kremer	IKP, Technische Universität Darmstadt, Germany	Doctoral student
A. Krugmann	IKP, Technische Universität Darmstadt, Germany	Doctoral student
J. Lee	RIKEN, Japan	Researcher
Y. Maeda	Miyazaki Univ., Japan	Assistant Professor
H. Matsubara	CNS, Univ. of Tokyo	Post-Doctor
K. Miki	RCNP, Osaka Univ., Japan	Post-Doctor
M. Nagashima	Niigata Univ., Japan	PhD Student
P. von Neumann-Cosel	IKP, Technische Universität Darmstadt, Germany	Professor
H.J. Ong	RCNP, Osaka Univ., Japan	Assistant Professor
I. Poltoratska	IKP, Technische Universität Darmstadt, Germany	Postdoc
C. Romig	IKP, Technische Universität Darmstadt, Germany	Doctoral student
H. Sakaguchi	RCNP, Osaka Univ., Japan	Research Fellow
T. Shima	RCNP, Osaka Univ., Japan	Assistant Professor
Y. Shimbara	Niigata Univ., Japan	Assistant Professor
G. Susoy	Istanbul Univ., Turkey	PhD Student
T. Suzuki	RCNP, Osaka Univ., Japan	Assistant Professor
C. Walz	IKP, Technische Universität Darmstadt, Germany	Doctoral student
M. Yosoi	RCNP, Osaka Univ., Japan	Associate Professor
J. Zenihiro	RIKEN, Japan	Post-Doctor

THEORETICAL SUPPORT:

Name	Institution	Title or Position
V.Yu. Ponomarev	IKP, Technische Universität Darmstadt, Germany	Senior Researcher
J. Wambach	IKP, Technische Universität Darmstadt, Germany	Professor

RUNNING TIME:

Installation time without beam	2 days
Beam tuning time for experiment	2 days
Data runs	15.5 days

BEAM LINE: Ring : WS course

BEAM REQUIREMENTS:

Type of particle	p
Beam energy	300 MeV
Beam intensity	$\leq$ 2-8 nA
Any other requirements	energy resolution $\leq$ 20 keV halo-free, small emittance

BUDGET:

Experimental expenses	500,000 yen

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SPOKESPERSON: Norbert Pietralla

SUMMARY OF THE PROPOSAL

Polarized proton scattering at 300 MeV at 0° has been experimentally established as a tool to extract the properties of low-energy electric and magnetic dipole modes in heavy nuclei. A decomposition of the (p, p') cross sections according to their electric or magnetic character can be achieved in two independent ways by either measuring angular distributions including 0° or by using polarized beam and measuring polarization transfer observables to distinguish spinflip and non-spinflip contributions. Good correspondence of these two methods is achieved as demonstrated recently in a case study of ^{208}Pb. We propose measurements of the spin-transfer coefficients D_{LL} and D_{NN} at 0° and of the cross section angular distributions in the nuclei ^{70}Zn and ^{130}Te to extract the spin-M1 response, which should carry signatures of the shell evolution due to the tensor force towards the exotic neutron-rich doubly magic nuclei ^{78}Ni and ^{132}Sn. The experiments will also provide important information on the evolution of the pygmy dipole resonance with neutron excess by comparison with data in the unstable neutron-rich isotones ^{68}Ni discovered recently at GSI and ^{128}Sn to be measured in the near future.