E422

RCNP EXPERIMENT E

PROPOSAL FOR EXPERIMENT AT RCNP

February 13, 2014

TITLE:
Systematics of the Electric Dipole Response in Stable Tin Isotopes

SPOKESPERSONS:

Full Name	Peter von Neumann-Cosel
Institution	Institut für Kernphysik, Technische Universität Darmstadt,
Position	Professor
Address	Schlossgartenstr. 9, 64289 Darmstadt, Germany
E-mail	vnc@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
T. Adachi	RCNP, Osaka Univ., Japan	Research Fellow
S. Adachi	Dep. Phys., Kyoto Univ., Japan	D3
N. Aoi	RCNP, Osaka Univ.m Japan	Professor
S. Aslanidou	IKP, Technische Universität Darmstadt, Germany	PhD student
S. Bassauer	IKP, Technische Universität Darmstadt, Germany	MSc student
J. Carter	School Phys., Wits University, Johannesburg, South Africa	Professor
L. Donaldson	School Phys., Wits University, Johannesburg, South Africa	PhD student
H. Fujita	RCNP, Osaka Univ., Japan	Research Fellow
Y. Fujita	RCNP, Osaka Univ., Japan	Associate Professor
T. Furuno	Dep. Phys., Kyoto Univ., Japan	M2
S. Gotanda	Miyazaki Univ., Japan	M1
T. Hashimoto	RCNP, Osaka Univ., Japan	Assistant Professor
K. Hatanaka	RCNP, Osaka Univ., Japan	Professor
E. Ideguchi	RCNP, Osaka Univ., Japan	Associate Professor
Y. Ishii	Dep. Phys., Kyoto Univ., Japan	M1
T. Ito	RCNP, Osaka Univ., Japan	D2
C. Iwamoto	RCNP, Osaka Univ., Japan	Research Fellow
Y. Kanaya	Miyazaki Univ., Japan	M1
T. Kawabata	Dep. Phys., Kyoto Univ., Japan	Associate Professor
A. Krugmann	IKP, Technische Universität Darmstadt, Germany	PhD student
B. Liu	RCNP, Osaka Univ., Japan	D3
A.M. Krumbholz	IKP, Technische Universität Darmstadt, Germany	PhD student
Y. Maeda	Miyazaki Univ., Japan	Assistant Professor
M. Matsuda	RCNP, Osaka Univ. Japan	Post-Doctor
M. Miura	RCNP, Osaka Univ. Japan	M1
K. Miki	RCNP, Osaka Univ., Japan	Post-Doctor

M. Murata	Dep. Phys., Kyoto Univ., Japan	M1
R. Neveling	iThemba LABS, Somerset West, South Africa	Researcher
H.J. Ong	RCNP, Osaka Univ., Japan	Assistant Professor
P. Papka	Dep. Phys., Stellenbosch University, South Africa	Professor
N. Pietralla	IKP, Technische Universität Darmstadt, Germany	Professor
H. Sakaguchi	RCNP, Osaka Univ., Japan	Research Fellow
T. Shima	RCNP, Osaka Univ., Japan	Assistant Professor
Y. Shimbara	RCNP, Osaka Univ., Japan	Research Fellow
M. Singer	IKP, Technische Universität Darmstadt, Germany	MSc student
R. Smit	iThemba LABS, Somerset West, South Africa	Senoir Researcher
T. Suzuki	RCNP, Osaka Univ., Japan	Assistant Professor
M. Tsumura	Dep. Phys., Kyoto Univ., Japan	M2
I. Usman	School Phys., Wits University, Johannesburg, South Africa	Lecturer
V. Werner	IKP, Technische Universität Darmstadt, Germany	Senior Researcher
T. Yamamoto	RCNP, Osaka Univ., Japan	M2
M. Yosoi	RCNP, Osaka Univ., Japan	Associate Professor

THEORETICAL SUPPORT:

Name	Institution	Title or Position
E. Litivinova	University of Western Michigan, USA	Assistant Professor
P. Papakonstantinou	Institute for Basic Science, Daejeon, South Korea	Senior Researcher
V.Yu. Ponomarev	IKP, Technische Universität Darmstadt, Germany	Senior Researcher
R. Roth	IKP, Technische Universität Darmstadt, Germany	Associate Professor
J. Wambach	IKP, Technische Universität Darmstadt, Germany	Professor

RUNNING TIME:

Installation time without beam	2 days
Beam tuning time for experiment	2.0 days
Data runs	10.0 days

BEAM LINE: Ring : WS course

BEAM REQUIREMENTS:

Type of particle	(unpol.) p
Beam energy	300 MeV
Beam intensity	$\sim$ 4 nA
Any other requirements	energy resolution $\leq$ 25 keV halo-free, small emittance

BUDGET:

Experimental expenses	800 kilo-yen

TITLE:
Systematics of the Electric Dipole Response in Stable Tin Isotopes

SPOKESPERSON: Peter von Neumann-Cosel

SUMMARY OF THE PROPOSAL

Small-angle proton scattering at a few hundred MeV/nucleon has been experimentally established as a new tool to extract the properties of electric and spin-magnetic dipole modes in heavy nuclei. A decomposition of the (p,p') cross sections according to their electric or magnetic character can be achieved by a multipole decomposition of the angular distributions at forward angles including 0°. We propose a measurement of the ^{112,116,124}Sn in order to establish, together with data taken previously on ^{120}Sn, the systematics of the E1 response in stable tin isotopes both in the energy region of the Pygmy Dipole Resonance (PDR) and the Giant Dipole Resonance (GDR). These results will complement a recent experimental effort at GSI studying relativistic Coulomb excitation of neutron-rich tin isotopes $^{124-134}$Sn. The complete data of both experiments will span a huge variation of the neutron-to-proton ratios with similar underlying structure and thus present a unique testing ground for the theoretical understanding of the low-energy electric dipole strength in heavy nuclei. The complete E1 response allows to extract variations of the neutron skin along the tin chain and to constrain parameters of the symmetry energy. The (p,p') data also promise insight into the poorly established systematics of the spin-M1 resonance in heavy nuclei.