

## PROPOSAL FOR EXPERIMENT AT RCNP

14 February 2008

**TITLE:**

**Complete Electric Dipole Response in  $^{120}\text{Sn}$ : A Test of the Resonance Character of the Pygmy Dipole Resonance**

**SPOKESPERSONS:**

Full Name Peter von Neumann-Cosel  
 Institution Institut für Kernphysik, Technische Universität Darmstadt,  
 Position Professor  
 Address Schlossgartenstr. 69, D-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 University, Japan                           | Researcher          |
| O. Burda       | IKP, Technische Universität Darmstadt, Germany          | Researcher          |
| J. Carter      | Phys. Dep., Wits University, Johannesburg, South Africa | Associate Professor |
| M. Chernykh    | IKP, Technische Universität Darmstadt, Germany          | Doctoral student    |
| H. Fujita      | iThembaLABs, Somerset West, South Africa                | Researcher          |
| Y. Fujita      | Dep. Phys., Osaka University, Japan                     | Associate Professor |
| K. Hatanaka    | RCNP, Osaka University                                  | Professor           |
| D. Ishikawa    | RCNP, Osaka University                                  | Master student      |
| T. Kawabata    | CNS, Univ. Tokyo  | Assistant Professor |
| H. Matsubara   | RCNP, Osaka University                                  | Doctoral student    |
| R. Neveling    | iThembaLABs, Somerset West, South Africa                | Researcher          |
| H. Okamura     | RCNP, Osaka University                                  | Professor           |
| B. Özel        | Dep. Phys., Çukurova University, Adana, Turkey          | Researcher          |
| I. Poltoratska | IKP, Technische Universität Darmstadt, Germany          | Doctoral student    |
| A. Richter     | IKP, Technische Universität Darmstadt, Germany          | Professor           |
| F.D. Smit      | iThembaLABs, Somerset West                              | Senior Scientist    |
| H. Sakaguchi   | Miyazaki University                                     | Professor           |
| Y. Sasamoto    | CNS, Univ. Tokyo  | Doctoral student    |
| Y. Shimbara    | Niigata University                                      | Assistant Professor |
| K. Suda        | RCNP, Osaka University                                  | Researcher          |
| Y. Tameshige   | RCNP, Osaka University                                  | Doctoral student    |
| M. Yosoi       | RCNP, Osaka University                                  | Associate Professor |
| J. Zenihiro    | Dep. Phys., Kyoto University                            | Doctoral student    |

**THEORETICAL SUPPORT:**

| Name            | Institution                                     | Title or Position   |
|-----------------|---|---------------------|
| C. Bertulani    | Dep. Phys., Texas A&M University, Commerce, USA | Assistant Professor |
| H. Lenske       | ITP, Universität Giessen, Germany               | Professor           |
| V.Yu. Ponomarev | IKP, Technische Universität Darmstadt, Germany  | Senior Researcher   |
| N. Tsoneva      | ITP, Universität Giessen, Germany               | Researcher          |

**RUNNING TIME:** Installation time without beam 3 days(for each beam time) Beam  
tuning time for experiment 2 days  
Data runs 11 days

**BEAM LINE:** Ring : WS course

**BEAM REQUIREMENTS:** Type of particle polarized p  
Beam energy 300 MeV  
Beam intensity  $\leq 10$  nA  
Any other requirements energy resolution  $\leq 20$  keV

**BUDGET:** Experimental expenses halo-free, small emittance  
1,000,000 yen

**TITLE:****Complete Electric Dipole Response in  $^{120}\text{Sn}$ : A Test of the Resonance Character of the Pygmy Dipole Resonance****SPOKESPERSON:** Peter von Neumann-Cosel**SUMMARY OF THE PROPOSAL**

A high-resolution study of the complete B(E1) strength distribution in  $^{120}\text{Sn}$  in the energy range  $E_x \simeq 5 - 25$  MeV is proposed utilizing the  $(p, p')$  reaction at  $E_p \simeq 300$  MeV. This can be achieved in two independent ways by either measuring angular distributions including  $0^\circ$  or by using a transversely polarized beam and measuring polarization transfer observables to distinguish spinflip and non-spinflip contributions. Such data are crucial to resolve conflicting predictions of relativistic and non-relativistic QRPA calculations on the evolution of the energy centroid and collectivity of the electric pygmy dipole resonance from stable to exotic neutron-rich in Sn isotopes. These have been studied experimentally at the S-DALINAC and at GSI, respectively, but the models cannot be distinguished with limitations of the presently available experimental methods (nuclear resonance fluorescence for stable nuclei, Coulomb breakup for exotic nuclei).