Contribution ID: **18** Type: **Oral Contribution**

Nuclear structure of exotic nuclei in the 132Sn region

Wednesday, 26 October 2022 16:10 (15 minutes)

The r-process produces roughly half of all nuclei heavier than iron, thus understanding the mechanism in which these nuclei are produced is an important topic of research. Properties of nuclei with magic numbers of neutrons are key to understanding the r-process. N=82 nuclei below ^{132}Sn are connected to the mass abundance peak at A˜130. In addition, studies of nuclei in this difficult to reach region provide information on nucleon-nucleon interactions and possible shell evolution.

Here we present experimental results obtained during the RIBF-189 experiment at RIKEN utilising the HiCARI high resolution germanium array. Particle identification was achieved on an event-by-event basis by the BigRIPS and Zero Degree spectrometers. New gamma-ray transitions have been observed for a large number of nuclei. Transitions from previously unseen configurations of ^{130}Cd $\pi g_{9/2}p_{1/2}$ to the known yrast 4+ state $\pi g^2_{9/2}$ have been observed. This allows for the investigation of the proton-proton interaction below Z=50. Two tentative lines associated with single particle states decaying to the $\pi g_{9/2}$ ground state and $\pi p_{1/2}$ isomer have also been observed in ^{129}Ag. This can be used to establish the proton single particle energies. Transitions observed in ^{132}In and ^{130}In provide information about the proton-neutron interaction above and below N=82 respectively. The obtained level schemes are supported by modern shell model and particle removal reaction calculations. Experimental details and physics results on these extremely neutron-rich nuclei will be presented.

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Session Classification: P2 Nuclear Structure, Spectroscopy, and Dynamics

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