

UNIVERSITY OF NOTRE DAME
DEPARTMENT OF PHYSICS

SPECIAL NUCLEAR SEMINAR

Monday, June 5

Two-proton radioactivity – a new nuclear structure tool beyond the drip line

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Two-proton radioactivity is the latest nuclear decay mode discovered. It consists of the emission of a pair of protons from a nuclear ground state. According to the definition by V. Goldanskii who was the first to discuss this new type of radioactivity extensively, one-proton radioactivity is not allowed to be an open decay channel for two-proton radioactivity (2p) candidates.

In pioneering experiments at GANIL and GSI, this new radioactivity was discovered in 2002 and meanwhile ^{45}Fe , ^{48}Ni and ^{54}Zn are established 2p emitters. These results allowed a detailed comparison with the theoretical models available and showed that, at the level of precision of the experimental data and of the predictive power of the models, nice agreement was obtained.

The latest step in the investigation of 2p radioactivity was the use of time-projection chambers to study the decay dynamics via measurements of the individual proton energies and the relative proton-proton emission angle. A first experiment at GANIL and a high-statistics experiment performed at MSU on ^{45}Fe allowed to gain first insights into the decay characteristics by comparison with a three-body model. Meanwhile ^{54}Zn has also been studied with a TPC at GANIL and 2p radioactivity was confirmed for ^{48}Ni at MSU.

In a recent experiment at the BigRIPS separator of RIKEN, a new 2p emitter, ^{67}Kr , was discovered and its basic decay characteristics have been established, whereas two other 2p radioactivity candidates, ^{59}Ge and ^{63}Se , have been shown to decay by β decay.

The talk will review the experimental results on ground-state two-proton radioactivity and compare these results with theoretical predictions. Future studies of new 2p emitters will also be discussed.

4 pm – 5 pm
**Nuclear
Science
Laboratory**

**124 Nieuwland
Science Hall**

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All interested  
persons are  
cordially invited  
to attend

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Refreshments will be
served prior to the
seminar in room 124