A RECOIL-BETA TAGGING STUDY OF THE N=Z NUCLEUS ^{66}As

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A Recoil-Beta Tagging (RBT) experiment was recently performed at the University of Jyväskylä Accelerator Laboratory in order to study excited states in the medium-heavy N=Z=33 nucleus ^{66}As. To date, there are two experimentally observed isomeric states ($I^{\pi} = (5^{+})$ and $I^{\pi} = (9^{+})$) in ^{66}As, first discovered by Grzywacz et al. [2]. The existence of two states was confirmed in the recent experiment. In addition, the ordering of the isomeric states was established by comparing the time stamps of the decay events. This comparison indicates the (9^{+}) isomer to be higher lying in excitation energy. A spherical shell model study by Hasegawa et al. [3] predicted a third low-lying 3^{+} isomeric state arising from shape co-existence. However, the experimental confirmation of this shape isomer has been unsuccessful. This might indicate that the isomer is extremely short lived, if it exists.

The experiment was performed utilising the JUROGAM II γ-ray spectrometer in conjunction with the gas-filled recoil separator RITU and the GREAT focal plane spectrometer system. The ^{66}As nuclei were produced via a ^{40}Ca(^{28}Si,pn)^{66}As reaction at a beam energy of 75 MeV. This experiment was successful due to the technical developments in the measurement set-up. New 50 μm thick Mylar windows were installed in the multi-wire proportional counter at the focal plane, which allowed a higher gas pressure to be used in RITU, thereby improving the separation between the recoils of interest and beam like projectiles. The planar Ge detector of GREAT was used to detect the beta particles as well as γ-rays.
This presentation will discuss the structures of the isomeric states, along with the most recent results regarding ^{66}As, the lightest nucleus ever studied at RITU.

[1] R. Grzywacz et al., Nucl. Phys. A 682, 41 (2001)
[2] R. Grzywacz et al., Phys. Lett. B 429, 247 (1998)
[3] M. Hasegawa et al., Phys. Lett. B 617, 150 (2005)