Abstract Submitted
for the APR06 Meeting of
The American Physical Society

Beta-decay of proton-rich nucleus ^{23}Al and astrophysical consequences[1] Y.J. ZHAI, V.E. IACOB, T. AL-ABDULLAH, C. FU, J.C. HARDY, N. NICA, H.I. PARK, G. TABACARU, L. TRACHE, R.E. TRIBBLE, Cyclotron Institute, Texas A&M University — We will present the results of a β-decay study that was motivated by a nuclear astrophysics problem. For the first time γ-rays have been observed following the β decay of pure samples of ^{23}Al. We used the ^{1}H(^{24}Mg,2n)^{23}Al reaction and the MARS recoil separator of Texas A&M University. β and $\beta - \gamma$ coincidence measurements were made with a fast tape-transport system and β and γ-ray detectors. The experiment allowed us to measure β branching ratios and deduce logft values for transitions to 14 final states in ^{23}Mg, including the isobaric analog state, and from them to determine unambigously the spin and parity of ^{23}Al ground state to be J^{π}=5/2^{+}. We will discuss how this excludes the large increase in the radiative proton-capture cross section for the reaction ^{22}Mg(p,γ)^{23}Al at astrophysical energies which was implied by claims that the spin and parity is $J^{\pi} = 1/2^{+}$ [1,2], claims that motivated this study in the first place. The reaction is possible candidate to explain why space-based gamma-ray telescopes do not observe γ-rays from the decay of long-lived ^{22}Na formed in ONe novae explosions [3]: a larger cross section would be required to divert significant flux from the A=22 into the A=23 mass chain. [1] X. Z. Cai et al, Phys. Rev. C 65, 024610 (2002). [2] H.-Y. Zhang et al., Chin. Phys. Lett. 19, 1599 (2002). [3] M. Wiescher et al., Astrophys. J. 343, 352 (1989).

[1]Work supported by DOE.

Livius Trache
Texas A&M University

Date submitted: 14 Jan 2006 Electronic form version 1.4