Abstract Submitted
for the SES17 Meeting of
The American Physical Society

Sensitivity of stellar electron-capture rates to parent neutron number: A case study on a continuous chain of twenty Vanadium isotopes G.W. HITT, Department of Physics Engineering Science, Coastal Carolina University, P.O. Box 261954 Conway, SC 29528, USA, S.S. GUPTA, Indian Institute of Technology Ropar, Nangal Road, Rupnagar (Ropar), Punjab 140 001, India, R.G.T. ZEGERS, R. TITUS, C. SULLIVAN, B. A. BROWN, National Superconducting Cyclotron Laboratory, Michigan State University, East Lansing, Michigan 48824, USA, A.L. COLE, Physics Department, Kalamazoo College, Kalamazoo, Michigan 49006, USA, S. SHAMS, Department of Applied Mathematics Sciences, Khalifa University, Abu Dhabi 127788, UAE — Gamow-Teller (GT) strength distributions (B(GT)) in electron-capture (EC) daughters stemming from the parent ground state are computed with the shell-model in the full pf-shell space, with QRPA in the formalism of Krumlinde and M\"oller and with an Approximate Method for assigning an effective B(GT). These are compared to data available from decay and charge-exchange (CE) experiments across titanium isotopes in the pf-shell from A=43 to A=62, the largest set available for any chain of isotopes in the pf-shell. The present study is the first to examine B(GT) and the associated EC rates across a particular chain of isotopes with the purpose of examining rate sensitivities as neutron number increases. EC rates are also computed for a wide variety of stellar electron densities and temperatures providing concise estimates of the relative size of rate sensitivities for particular astrophysical scenarios. This work underscores the need for CE experiments in inverse kinematics on neutron-rich nuclei at future RIB Facilities.

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Date submitted: 04 Oct 2017 Electronic form version 1.4