Contribution ID: **189** Type: **Poster**

The nuclear level density and γ -ray strength function in 64Fe

Tuesday, 26 June 2018 19:00 (1h 30m)

Neutron-capture rates are critical for models of the astrophysical r-process, yet are difficult to measure directly and often outside the current realm of capability for experimental facilities. Meanwhile, theoretical extrapolations can vary by orders of magnitude even near stability. For example, predicted rates in the Mn-Ga mass region can vary by factors of 10 or more \cite{Liddick}. Nuclei in this region exhibit enhanced collectivity, while an unexpected increase in the γ-ray decay probability has been observed in stable ^{56,57}Fe below {$\sim$}4 MeV \cite{Voinov}. The presence of this enhancement, or upbend, has a significant influence on extracted neutron-capture rates. It is unknown how the γSF behaves for neutron-rich nuclei. An indirect method known as the β-Oslo method has been developed to constrain neutron-capture rates \cite{Spyrou} for radioactive nuclei. With the β-Oslo method, the reaction product is populated in β-decay, then the nuclear level density and γSF are extracted simultaneously. The NLD and γSF are then used to constrain the neutron-capture cross section. At the NSCL, we studied the β-decay of ^{64}Mn to populate excited states in ^{64}Fe, a candidate for the upbend in the γSF. Gamma rays were recorded with the 4π Summing NaI(Tl) (SuN) total absorption spectrometer \cite{Simon}, which is an ideal detector for β-Oslo analysis. Results will be presented on the extracted γSF and level density for ^{64}Fe.

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Session Classification: Poster session