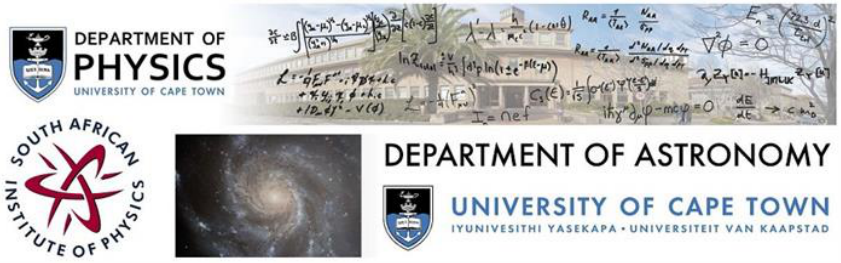

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Change in the Angular Momentum Distribution due to Nuclear Plasma Interactions

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Abstract content
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Electron-mediated nuclear plasma interactions (NPIs), such as Nuclear Excitation by Electron Capture (NEEC) or Transition (NEET), can have significant impact on nuclear cross sections in High Energy Density Plasmas (HEDPs). These HEDP environments are found in National Ignition Facility's shots and in the cosmos where nucleosynthesis takes place. Attempts have failed so far in measuring the NEEC process [1, 2], while NEET has recently been observed experimentally [3, 4]. Further, NPIs have not been observed due to the narrowness of nuclear transitions (Γ≤1 μeV) . The NPIs will occur on highly excited nuclear states in the quasi-continuum which is populated in nuclear reactions prior to their decay by spontaneous gamma;gamma;-ray emission. Direct observation of NPIs are hindered by the lack of a clear signature of the effect in HEDP environments. Hence, a new signature [5] for NPIs on highly excited nuclei will be tested by investigating isomeric to ground state feeding from the quasi-continuum region. An experiment was performed using the reactions 197Au(13C,12C)198Au and 197Au(13C,12C 2n)196Au at Lawrence Berkeley National Laboratory in inverse kinematics with a 197Au beam of 8.5 MeV/u energy. Several measurements were performed with different target configurations. The activated foils were counted at the low-background counting facility of Lawrence Livermore National Laboratory. In this talk I will present theoretical concepts, experimental details and preliminary results.

Reference
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[5] D. L. Bleuel et al., Plasma and Fusion Research (in publication)

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