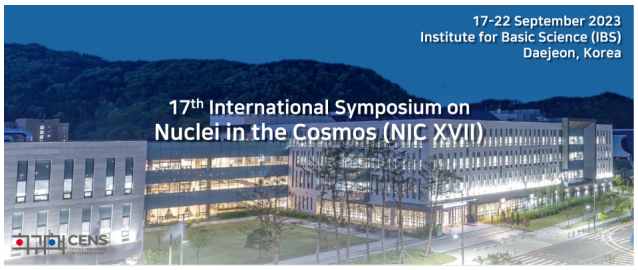

Contribution ID: **58** Type: **Poster**

Plasma Induced Variation of Bound State β-Decay Rates in PANDORA

Tuesday, 19 September 2023 17:00 (5 minutes)

PANDORA (Plasmas for Astrophysics, Nuclear Decay Observations and Radiation for Archaeometry) is an upcoming facility at INFN - LNS aiming to use an electron cyclotron resonance ion source (ECRIS) as a compact magnetoplasma to measure in-plasma β-decay lifetimes of radioisotopes. Decay rates are susceptible to changes in atomic configuration of the parent and daughter systems and are consequently modified inside plasmas due to the surrounding electron cloud, ion charge state distribution (CSD) and level population distribution (LPD). Since the CSD and LPD are strongly non-homogeneous in ECRIS, so are the decay rates, and calculating them is a complex process involving sequential simulations modelling space-resolved properties of electrons, ions and nuclei respectively. We present here a detailed study of the plasma induced nuclear lifetime variation, taking as a test case the orbital electron capture of ^{7}Be in a range of plasma density and temperatures. The results confirm the contribution of the atomic configuration to the decay rate and underline the importance of precisely calculating ion CSD/LPD. Using a Particle-in-Cell Monte Carlo (PIC-MC) code to model ECR dynamics, we extend the analysis to a realistic laboratory plasma and demonstrate expected spatial gradients of ^{7}Be decay rates in the plasma chamber.

Primary author: MISHRA, Bharat (INFN-LNS and University of Catania)

Presenter: MISHRA, Bharat (INFN-LNS and University of Catania)

Session Classification: Poster session (New facilities, instruments and tools)

Track Classification: Nuclear reaction rates and stellar abundances