Virtual Joint Nuclear and Astrophysics Seminar

- When: Friday December 10th at 12:00 PM (US Central Time)
- Where: ZOOM
- Speakers: Robin Smith and Stephanie Ho

Nuclear astrophysics with gamma beams and TPC detectors

By Robin Smith, Sheffield Hallam University, Sheffield, UK

State-of-the-art gamma beam facilities such as HIγS at Duke University and ELI-NP in Romania, along with emerging detector technologies, are permitting key advances nuclear structure and astrophysics. Here, I present a new measurement of the cross section for the $^{12}C(\alpha,\gamma)^{16}O$ reaction using an optical TPC detector at HIγS.

The carbon/oxygen ratio at the end of stellar helium burning is a hugely important nuclear input to stellar evolution calculations. However, it is not known accurately, due to significant uncertainties in the $^{12}C(\alpha,\gamma)^{16}O$ cross section. In our new study [1], angular distributions of the $^{12}C(\alpha,\gamma)^{16}O$ reaction were obtained by measuring the inverse $^{16}O(\gamma,\alpha)^{12}C$ reaction with gamma-beams and a Time Projection Chamber (TPC) detector. Data for the total reaction cross section and angular distributions from E_{cm} = 2 – 3.3 MeV are presented.

[1] R. Smith, M. Gai, et al. "Precision measurements on oxygen formation in stellar helium burning with gamma-ray beams and a Time Projection Chamber." Nature Communications 12 (2021).

Understanding the Galaxy Ecosystem: Gas Flow in The Circumgalactic Medium

By Stephanie Ho, Texas A&M University, College Station, TX

The reservoir of baryons and metals surrounding galaxies is known as the circumgalactic medium (CGM). The CGM plays a crucial role in the growth of galaxies; galaxies require a continuous gas supply to sustain star formation, and this gas accretion process is regulated by feedback from newly formed stars. However, observational analysis of the CGM is challenging. Not only because the low gas density makes the CGM difficult to image directly, but the CGM also consists of gas structures of different temperatures and densities. We will discuss recent efforts of studying the multiphase circumgalactic gas flow. We will also present analyses from cosmological simulations and explain the observational bias that possibly affects the interpretation of observed data. We will discuss how future telescope facilities can overcome some of the observational challenges and create exciting opportunities for future work on understanding the galaxy gaseous ecosystem.