Contribution ID: **202** Type: **Oral**

Structure of Stellar Halos Across Dark Matter Models in Milky Way-like Galaxies Using the EAGLE Simulation.

The cold dark matter (CDM) model predicts that galaxies like the Milky Way grow through a series of mergers with smaller satellites, leaving behind extended stellar halos filled with tidal streams and shells. These relics of past mergers act as a fossil record of galaxy assembly. Alternative dark matter models change this picture: warm dark matter (WDM) suppresses the smallest mergers, while self-interacting dark matter (SIDM) produces diffuse halos whose satellites are more easily disrupted. As a result, the structures that survive in the stellar halo can provide a sensitive probe of the underlying dark matter physics.

In this work, we use cosmological simulations with EAGLE galaxy formation physics to compare the merger histories and stellar halos of Milky Way–like galaxies across CDM, WDM, and SIDM scenarios in the action-angle space. We analyze how individual mergers deposit material in action–angle space, and connect these signatures to the timing and mass of the events. Using power spectrum methods, we test whether different dark matter models leave measurable differences in the resulting substructure.

Our preliminary results indicate that in CDM, dense subhalos resist disruption and leave behind a rich variety of long-lived tidal features. In contrast, in SIDM, diffuse satellites are stripped more rapidly, resulting in distinct shell-like patterns. WDM halos, by comparison, appear smoother due to the lack of low-mass accretions. These findings suggest that the detailed imprint of mergers in the stellar halo provides a new way to test the nature of dark matter.

Author: Ms ANISHA, Anisha (University of Hamburg, Max Planck Institute for Astrophysics)

Presenter: Ms ANISHA, Anisha (University of Hamburg, Max Planck Institute for Astrophysics)

Track Classification: Physical Sciences