Seminarium Astrofizyczne

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Dark Matter under the Gravitational Lens

Dark Matter (DM) is the clearest sign that the Standard Model of particle physics is incomplete. A determination of the DM particle mass will rule out entire classes of hypothetical extensions to the Standard Model, thus pointing the correct path towards New Physics. In this talk, I describe how gravitational lensing can differentiate between the two top contenders for DM: ultra-massive (WIMPs) versus ultra-light (Axion or Axion-like) particles, both hypothesized in different theoretical extensions to the Standard Model. Specifically, I show how DM in the form of ultra-light particles (mass ~10-22 eV) can resolve a two-decade old problem in gravitational lensing, whereby galaxy DM models based on ultra-massive particles leave discrepancies between the predicted and observed properties of multiply-lensed images. The increasing success of ultra-light DM particles in explaining astronomical observations, naturally predicting cores in dwarf galaxies and a suppression of low-mass halos thus resolving the missing satellite problem, together with observational evidence for solitonic cores in galaxies, is starting to tilt the scale to new physics involving ultra-light particles.

Serdecznie zapraszam,
William Pearson, on behalf of the SOC