

Modelling the Kinematics of an Ultra Diffuse Galaxy to Determine its Dark Matter Content

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It has been suggested that ultra diffuse galaxy AGC 114905 contains little to no dark matter [1], a claim that stems from a 3D kinematic analysis of atomic gas maps of the system. My analysis aims to study the reliability of 3D-BAROLO, the software used to derive such claims, in the low-mass and low-resolution regime to look for sources of uncertainty within this calculation. By producing mock observations of ultra diffuse galaxies, the accuracy of the rotation curve, velocity dispersion profile, and surface density profile produced by 3D-BAROLO were quantified. It was found that the reliability of the 3D-BAROLO fitting algorithm is heavily dependent on the inclination value assumed in the models, implying that there could be dark matter in AGC 114905 if its galactic inclination is overestimated in ref. [1]. In addition, my analysis suggests that the velocity dispersion and surface density profile amplitudes can be systematically underestimated by 3D-BAROLO when it is applied to AGC 114905-like observations, which could alter the no-dark matter interpretation for this system.

Reference:

[1] P. E. M. Pina, F. Fraternali, T. Oosterloo, E. A. K. Adams, K. A. Oman, and L. Leisman, “No need for dark matter: resolved kinematics of the ultra-diffuse galaxy AGC 114905,” *Monthly Notices of the Royal Astronomical Society*, vol. 512, no. 3, pp. 3230–3242, dec 2021. [Online]. Available: <https://doi.org/10.1093%2Fmnras%2Fstab3491>

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