Anatomy of an Early-Type Minor Merger: Modelling the Young Stars and their Kinematics in NGC4150 Using the Wide Field Camera 3 (WFC3) and SAURON

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Recent studies using ultraviolet (UV) and optical data have demonstrated the widespread presence of recent star formation in early-type galaxies (ETGs) since $z = 1$. This star formation, plausibly driven by the accretion of gas-rich satellites, contributes a few percent in mass to individual ETGs. Combining the unprecedented UV/optical field-of-view and sensitivity of the WFC3 with integral-field spectroscopy from SAURON, we perform a detailed, spatially-resolved analysis of young stars and their kinematics in the lenticular galaxy NGC4150, a suspected recent merger remnant. A 'pixel-by-pixel analysis in 5 WFC3 filters, spanning UV to i-band, reveals a central 0.9 Gyr old young stellar population, with a median metallicity of 0.5 solar, that contributes around 3% of the stellar mass. A lack of Hα emission indicates that there is no ongoing star formation in this galaxy. Assuming that the metallicity of the young stars traces the gas-phase metallicity of the satellite that fuels the star formation, we estimate the mass ratio of the merger to be $1 : 15$. The young stars coincide spatially with a kinematically-decoupled core (KDC), observed in the stellar kinematics. A dynamical model for the KDC, assuming that it forms from the young stars, reproduces all the SAURON kinematic observables with high precision, including a double peak in velocity dispersion, the core stellar velocities and the velocity RMS. In summary, NGC4150 is a post-starburst remnant, of a minor merger with a mass ratio of $1 : 15$, where the young stars reside in a central KDC containing around 3% of the total stellar mass. This study demonstrates the potentially powerful combination of high-resolution imaging and integral-field units on future telescopes.