X09a A kpc-scale ionized structure around an extremely metal-poor galaxy

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Local starburst dwarf galaxies, particularly extremely metal-poor galaxies (EMPGs), defined as having metallicities of $Z \leq 0.1\ Z_{\odot}$, are ideal laboratories to study feedback effects due to their shallow gravitational potentials and hard ionizing spectra. Simulations predict that such galaxies exhibit galactic-scale outflows that ionize the surrounding circumgalactic medium (CGM), which could be escape channels of LyC photons (e.g., Fujita et al. 2003; Wise et al. 2012). However, the phenomena and mechanisms have not yet been observationally confirmed and understood. So far, there is only one EMPG whose ionized CGM has been mapped with integral field spectroscopy with a large FOV, MUSE (SBS 0335-52E, Herenz et al. 2023). Recently, we launched the "EMUS (EMPG MUSE)" project to investigate the ionized CGM and outflows of starburst EMPGs (X32a in ASJ2024b). Among 10 sources at $z < 0.04$, we discovered a kpc-scale extended structure of ionized gas around another EMPG, J1044+0353 at $z = 0.013$ ($D = 56$ Mpc, X12b in ASJ2025a; Herenz, Kusakabe, and Maulick et al. 2025). The structure appears to consist of seven elliptical arcs with radii of $\sim$ 3–3.5 kpc, which could be projected giant shells of ionized bubbles. Kinematic maps reveal a velocity gradient perpendicular to the major axis and line broadening in the outskirts. The latter, when interpreted as line splitting of the expanding shells, suggests expansion velocities of ~ 40 km s^{-1}. In this talk, we will present the morphology and kinematics of the CGM structures and compare the bubble sizes and expansion velocities with expectations from classical analytical models of energy-driven and momentum-driven bubbles (e.g., Lancaster et al. 2021)