X30a The general presence of a Lyα halo around high-z galaxies and its high incidence rate

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While integral field units like MUSE and KCWI have made it possible to study individual Lyα haloes (LAHs) of high-redshift galaxies (e.g., Wisotzki+16; Leclercq+17, 20; Chen+21), it is still unknown whether star-forming galaxies generally have a Lyα halo. Following our talk in the 2021a ASJ meeting (X31a), we individually search for LAHs around UV-continuum-selected galaxies with a spec-z at $z = 2.9$–4.4 ($F775 < 27.5$, $N = 21$), using MUSE adaptive optics data in MUSE Extremely Deep Field with ∼100- to 140-hour integration (MXDF; Bacon+21; Bacon+ in prep.). We find 17 LAHs and 4 non-LAHs and report the first individual detections of LAHs around non Lyα emitters including Lyα absorbers. The fraction of LAHs is thus estimated to be $81.0^{+10.3}_{-11.2}$% ($91.7^{+5.1}_{-13.2}$%) for all the sources (for a $M_{UV} < -18.4$ subsample). It implies that UV-selected galaxies generally have a large amount of hydrogen in their CGM at high redshifts. Using UV luminosity functions and the typical halo size, we calculate the incidence rate of the CGM gas detected in Lyα emission, $\frac{dn}{dz}$ (e.g., Wisotzki+18 for Lyα emitters). The $\frac{dn}{dz}$ for LAHs with $M_{UV} < -18$ at $z \sim 3$–4 is found to be $0.76^{+0.09}_{-0.09}$, which is in between the $\frac{dn}{dz}$ for damped Lyα systems (DLAs) and sub-DLAs (Zafar+13). It suggests, based on abundance matching, that LAHs trace the same gas as the DLAs and sub-DLAs (Kusakabe et al. resubmitted).