## X14b UV & Ly$\alpha$ halos around Ly$\alpha$ emitters at $z = 2.84$ across environments

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Diffuse Ly$\alpha$ emission around galaxies, or Ly$\alpha$ halo (LAH), is a valuable probe of their circumgalactic medium which regulates galaxy evolution. We present UV & Ly$\alpha$ radial surface brightness (SB) profiles of Ly$\alpha$ emitters (LAEs) at $z = 2.84$ detected with the Hyper Suprime-Cam on the Subaru Telescope. The depth of our data, together with the wide field coverage including a protocluster, enable us to study the dependence of LAHs on various galaxy properties, including Mpc-scale environments. UV and Ly$\alpha$ images of 3490 LAEs are extracted, and stacking the images yields SB sensitivity of $\sim 1 \times 10^{-20}$ erg s$^{-1}$ cm$^{-2}$ arcsec$^{-2}$ in Ly$\alpha$. Fitting of the two-component exponential function gives the scalelengths of 1.56 and 10.4 pkpc. Dividing the sample according to their photometric properties, we find that while the dependence of halo scalelength on environment outside of the protocluster core is not clear, LAEs in the central regions of protoclusters have very large LAHs and may be related to diffuse Ly$\alpha$ emission from abundant cool gas permeating the forming protocluster core irradiated by active members including a hyperluminous QSO. For the first time, we identify "UV halos" around bright LAEs which are probably due to a few lower-mass satellite galaxies. Through comparison with numerical simulations, we conclude that, while scattered Ly$\alpha$ photons from the host galaxies are the dominant contributor to LAHs, star formation in satellites evidently contributes significantly to LAHs, and that fluorescent Ly$\alpha$ emission may be boosted within protocluster cores at cosmic noon and/or near bright QSOs.