Tracing HI distribution and ionizing photon escape in star-forming galaxies across cosmic time with current and upcoming IFUs

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Lyman alpha (Ly α) is now widely used to trace and characterize the HI distribution in star-forming galaxies, notably through integral field spectroscopy (IFU). Probing the spatial configuration of HI in and around galaxies provides key insights into gas flows, which are essential for understanding galaxy growth and evolution. Additionally, it helps determine how ionizing radiation (Lyman continuum, LyC) propagates through the ISM and CGM before reaching our telescopes. This is particularly important for assessing how ionizing photons escape from galaxies into the IGM, helping to constrain cosmic reionization.

In this talk, I will present how the current IFU instruments (e.g., MUSE) have revolutionized gas mapping around high-redshift galaxies using the Ly α emission. I will also discuss recent work connecting gas distribution — as traced by both Ly α (HST/COS) and other nebular lines (Mg II and [O II] maps from IFUs) — with the escape of ionizing photons in a statistical sample of confirmed low-z LyC emitters (Leclercq et al. 2024 and in prep.). Finally, I will conclude with an outlook on future instruments that will allow us to further characterize the gaseous galactic ecosystem, and thus advance our understanding of galaxy growth and evolution (e.g., BlueMUSE, HARMONI, WST).