Spatially resolved emission of a z~3 damped Lyman alpha galaxy with Keck/OSIRIS IFU

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Damped Lyman alpha systems (DLAs) are high-redshift reservoirs of neutral hydrogen (HI) gas
HI gas provides the raw material for star formation

Delims

Are DLAs the progenitors of today’s modern spiral galaxies?
What is the nature of DLA host galaxies?

Laser guide star adaptive optics and integral field spectroscopy make directly detecting DLAs possible
We observed a DLA previously detected in absorption with a total exposure time of ~3 hours.
The Keck/OSIRIS Integral Field Spectrograph (IFU) and Laser Guide Star Adaptive Optics system spatially resolve the galaxy’s [OIII] λ5007 Å emission.

With emission measurements, we can constrain physical properties of DLA host galaxies
• At z~3, this galaxy is one of the most distant DLA host galaxies detected directly in emission
• We measure its star formation rate, dynamical mass, and gas mass:
  • SFR: 4.6 M☉ yr⁻¹
  • Dynamical mass: 5.2×10⁹ M☉
  • Gas mass: 2.8×10⁹ M☉

Map of DLA emission and kinematics
• Flux (top left), velocity (bottom left), SNR (top right), and velocity dispersion (bottom right) maps
• By comparing absorption and emission measurements, we can constrain the physical properties of this DLA host galaxy and look for kinematic signatures

Acknowledgements
This work is supported by NSF grant AST-1358980, the Theodore Dunham Fund for Astrophysical Research, and the Nantucket Maria Mitchell Association.