

GTC data exploitation in the search for the first galaxies.

Cabello, C.^{1,2}, Gallego, J.^{1,2}, Cardiel, N.^{1,2}, Pascual, S.^{1,2}, Guzmán, R.³, Herrero, A.^{4,5}, Manrique, A.⁶, Marín-Franch, A.⁷, Mas-Hesse, J.M.⁸, Rodríguez-Espinosa, J.M.^{4,5}, Salvador-Solé, E.⁶, and Eikenberry, S.⁹

¹ Universidad Complutense de Madrid (UCM)

² Instituto de Física de Partículas y del Cosmos (UCM-IPARCOS)

³ University of Florida (UF)

⁴ Instituto de Astrofísica de Canarias (IAC)

⁵ Universidad de La Laguna (ULL)

⁶ Institut de Ciències del Cosmos (UB-IEEC)

⁷ Centro de Estudios de Física del Cosmos de Aragón (CEFCA)

⁸ Centro de Astrobiología (CSIC-INTA)

⁹ The College of Optics and Photonics (CREOL)

Abstract

Detecting the first galaxies of the Universe has always been a goal in extragalactic astronomy because the study of these sources provides important constraints on cosmic reionization. In Cabello et al. 2022, we exploited the capabilities of the 10.4 m Gran Telescopio Canarias (GTC) to carry out the narrow-band (NB) Ly α survey at the highest redshift ever. The NB filter (FWHM = 11nm, $\lambda_c = 1257$ nm) targets the Ly α line of $z = 9.34$ galaxies and it was specially designed by the ALBA team to be used on the near-IR camera CIRCE@GTC for this work. After 18.3 hours of exposure time, we obtained an NB image of ~ 6.7 arcmin² within the Extended Groth Strip (EGS) field. No robust LAE candidates were found down to an emission-line flux of 2.9×10^{-16} erg s⁻¹ cm⁻², which allowed us to derive an exclusion zone of the Ly α luminosity function that agrees well with the previous observational constraints at $z \sim 9$. The current NB surveys at very high redshift probe only the most luminous rare sources, but wider and deeper observations are needed to address the scientific challenge of detecting galaxies at the cosmic dawn. In this context, the study of the early Universe is one of the main scientific cases of the upcoming facilities such as the JWST or the ELT, which will allow us to reach fainter magnitudes and detections at higher redshifts.

My poster is available at <https://zenodo.org/record/7015519#.Y1arRuxBw3l>