

Direct Detection of Lyman Continuum Escape from Local Starburst Galaxies with the Cosmic Origins Spectrograph

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We report on the detection of Lyman continuum radiation in two nearby starburst galaxies. Tol 0440-381, Tol 1247-232 and Mrk 54 were observed with the Cosmic Origins Spectrograph onboard the Hubble Space Telescopes. The three galaxies have radial velocities of $\sim 13,000$ km/s, permitting a ~ 35 Å window on the restframe Lyman continuum shortward of the Milky Way Lyman edge at 912 Å. The chosen instrument configuration using the G140L grating covers the spectral range from 912 to 2,000 Å. We developed a dedicated background subtraction method to account for temporal and spatial background variations of the detector, which is crucial at the low flux levels around 912 Å. This modified pipeline allowed us to significantly improve the statistical and systematic detector noise and will be made available to the community. We detect Lyman continuum in all three galaxies. However, we conservatively interpret the emission in Tol 0440-381 as an upper limit due to possible contamination by geocoronal Lyman series lines. We determined the current star-formation properties from the far-ultraviolet continuum and spectral lines and used synthesis models to predict the Lyman continuum radiation emitted by the current population of hot stars. We discuss the various model uncertainties such as, among others, atmospheres and evolution models. Lyman continuum escape fractions were derived from a comparison between the observed and predicted Lyman continuum fluxes. Tol 1247-232, Mrk 54 and Tol 0440-381 have absolute escape fractions of $(4.5 \pm 1.2)\%$, $(2.5 \pm 0.72)\%$ and $<(7.1 \pm 1.1)\%$, respectively.

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Comments:

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