

THE PHYSICAL CONDITIONS OF A LENSED STAR-FORMING GALAXY AT $Z=1.7$

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Abstract: We report rest-frame optical Keck/NIRSPEC spectroscopy of the brightest lensed galaxy yet discovered, RCSGA 032727-132609 at $z=1.7037$. From precise measurements of the nebular lines, we infer a number of physical properties: redshift, extinction, star formation rate, ionization parameter, electron density, electron temperature, oxygen abundance, and N/O, Ne/O, and Ar/O abundance ratios. The limit on [O III] 4363 Å tightly constrains the oxygen abundance via the “direct” or Te method, for the first time in an average-metallicity galaxy at $z\sim 2$. We compare this result to several standard “bright-line” O abundance diagnostics, thereby testing these empirically-calibrated diagnostics in situ. Finally, we explore the positions of lensed and unlensed galaxies in standard diagnostic diagrams, to explore the diversity of ionization conditions and mass-metallicity ratios at $z=2$.