The first optical [OII] and far-IR [CII] analysis of the ISM conditions of a galaxy at z $\sim$ 4.58

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Dust and metals manifest themselves at various wavelengths in the spectrum of a galaxy, hence a multi-wavelength approach for the study of galaxies is crucial. Specifically, the joint analysis of the UV continuum emission together with emission lines in the rest-frame optical and far-IR is a promising tool to decipher the dust and metal properties of galaxies. Such an analysis has never been carried out for galaxies in the early Universe, at $z > 4$, whose detailed dust and metal properties largely remain unknown. The 158um data from the ALMA Large Program to Investigate [CII] at Early Times (ALPINE) provides, together with ancillary data at UV and optical wavelengths, the foundation of such an analysis for 118 galaxies at $4 < z < 6$. I present the first analyses of a galaxy at z = 4.58 with detected optical [OII]3727A emission from the MOSFIRE instrument on Keck and [CII]158μm and FIR emission measurements from ALPINE. Interestingly, the SFRs analyzed by the UV continuum, optical [OII], and FIR [CII] and continuum emission are consistent within errors indicating no significant dust obscuration of nebular emission lines, although significant dust emission is present in the FIR. This puts interesting and important constraints on the distribution of dust and gas in this galaxy. This unique combination of data lets us also model the metallicity and ionization properties of this galaxy using photoionization modeling codes. Being the first galaxy with such unique data, this study remains a pilot investigation. With the upcoming launch of JWST we will observe a more statistically sound sample of galaxies with this combination of data which will develop into a more detailed picture of the dust and gas properties in $z > 4$ galaxies.