

## X05a Kinematics in a $z = 7.15$ Lyman Alpha Emitter Revealed by the [OIII] 88 micron and [CII] 158 micron Lines Detected with ALMA

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We present a kinematics result of a Ly $\alpha$  emitter at  $z = 7.15$  revealed by our ALMA observations (PI. A. K. Inoue). Our target is a very bright ( $M_{UV} = -22.4$ ) galaxy whose weak Ly $\alpha$  (EW= 3.7Å) has been spectroscopically identified (Furusawa et al. 2016). With our ALMA Band 6 observations, we have detected [CII] 158  $\mu\text{m}$  (S/N $\sim$  11) and dust continuum emission (S/N $\sim$  5). Furthermore, with our ALMA Band 8 observations, we have detected [OIII] 88  $\mu\text{m}$  (S/N $\sim$  8). The [OIII] and [CII] lines have consistent redshifts of  $z = 7.1517$ . We find that [OIII] exhibits a luminosity twice that of [CII], showing that [OIII] is a powerful tracer of high- $z$  galaxies. With these spectral lines, we discuss two kinematics results. Firstly, with Ly $\alpha$ , we derive the Ly $\alpha$  velocity offset with respect to the systemic redshift defined by [CII] and [OIII]. The velocity offset is measured to be very large,  $677 \pm 85 \text{ km s}^{-1}$ . We discuss the implications for reionization studies. Secondly, we show that flux-weighted velocity maps of [CII] and [OIII] reveal velocity gradients. Combining the velocity gradients with an HST image, we discuss a presence of merger, outflow/inflow, and or rotation in the target.