

X03a Detections of [OIII] 88 μm in Two Quasars in the Reionization Epoch

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We present our recent results of Hashimoto et al. (2018c). With the Atacama Large Millimeter/sub-millimeter Array (ALMA), we report detections of the far-infrared (FIR) [OIII] 88 μm line and the underlying dust continuum in the two quasars in the reionization epoch, J205406.48-000514.8 (hereafter J2054) at $z = 6.0391 \pm 0.0002$ and J231038.88+185519.7 (hereafter J2310) at $z = 6.0035 \pm 0.0007$. The [OIII] luminosity of J2054 and J2310 are $L_{[\text{OIII}]} = 6.8 \pm 0.6 \times 10^9 L_{\odot}$ and $2.4 \pm 0.6 \times 10^9 L_{\odot}$, corresponding to $\approx 0.05\%$ and 0.01% of the total infrared luminosity, respectively. Combining these [OIII] luminosities with [CII] 158 μm luminosities in the literature, we find that J2054 and J2310 have the [OIII]-to-[CII] luminosity ratio of 2.1 ± 0.4 and 0.3 ± 0.1 , respectively, the latter of which is the lowest among objects so far reported at $z > 6$. The high (low) luminosity ratio in J2054 (J2310) would be due to its stronger (weaker) UV stellar radiation field as implied from the high (low) dust temperature heated by star-formation activity, 50 ± 2 K (37 ± 1 K), which is estimated from the FIR spectral energy distribution.