X04a　遠赤外線輝線銀河のブラインド探査による星形成史の研究

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Though current observational results suggest that the dominant component of star-formation rate density (SFRD) alters from less dusty to dusty at redshift z $\sim$ 3, the SFRD earlier than $z \geq 5$ has been estimated only from rest-UV observations. In addition, the cold gas component has not yet been estimated at most of the redshift range. Therefore, blind searches for far-infrared (FIR) lines to estimate such a missing/hidden SFRD, especially in the early Universe, must be performed by current and next-generation mm/sub-mm telescopes. Before moving into such a new era, it is essential to develop a method to efficiently detect faint line-emitting sources whilst considering the completeness of source detection and contamination by false detections.

With our constructed method, two [CII]158μm candidates were detected blindly in a Cy-2 ALMA survey covering $\sim$ 5 arcmin^2, with a single tuning, along with two CO lines associated with galaxies at lower redshifts. Various tests suggested at least one of the two candidates should be robust. Nevertheless, our deeper observations in Cy-5 recover neither candidate, demonstrating a higher contamination rate than expected. We then construct a noise generation process in the visibility plane to reproduce a clump-like structure in ALMA datacube. The re-calculated contamination rate using 100 mock datacube expresses 0.43 $\pm$ 0.67 false-detection per datacube. We also investigate the detectability of line-emitting sources with various peak flux and line width by injecting artificial sources into the visibility plane. Finally, we develop a method to re-construct line LF and resultant SFRD upper limit shows good agreement with the previous studies.