
(Sub)millimeter Line Intensity Mapping Surveys with the CCAT-prime Observatory

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Abstract

We provide an update on line intensity mapping surveys to be carried out with the CCAT-prime extreme field-of-view submillimeter telescope, which will begin operations at a 5600m site on Cerro Chajnantor overlooking the ALMA array in 2021. The first light survey with the EoR-Spec instrument module is anticipated to cover an area of 8 deg², probing [CII] 158 micron emission at redshifts $\sim 3.5-9.0$, [OIII] 88 micron emission at redshifts beyond 7, and multiple CO lines covering all cosmic epochs where galaxies are known to exist. State-of-the-art models suggest that the first light survey will yield detections of the [CII] signal to $z > 6$ under the most conservative assumptions, and to $z > 8$ under optimistic assumptions, achieving potentially as much as ten times higher signal-to-noise ratio as other contemporary measurements. Most of the survey area is anticipated to overlap with the HERA HI 21cm field, enabling cross-correlation between the distribution of the rest-frame far-infrared fine structure line emission from star-forming galaxies in the epoch of reionization and that of the neutral intergalactic medium. All data products from the surveys will be made publicly available to the community.

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