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Using a [CII]-selected sample of companion galaxies to quantify the contribution of dust-obscured star formation at z ~ 6

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One of the most exciting frontiers in extragalactic astronomy is understanding how rapidly galaxies formed stars in the Early Universe. This involves us constraining the Star Formation Rate Density (SFRD) at z >~ 6. Given the much greater ease in surveying the z > 4 universe in the rest-UV, the SFRD at z > 4 is biased to the unobscured, less dusty sources. Recent work shows that the dust-obscured sources could contribute quite meaningfully, up to 40-60%, to the z > 6 SFRD. Here we present a new method for correcting the SFRD at z ~ 6 for dust-obscured galaxies missed by rest-UV surveys. This method uses serendipitous sources found through [CII] (158 μm) emission which is sensitive to both dust-obscured and unobscured star formation. The advantage of this method over using galaxies that are UV-selected is that we are not biased to unobscured sources. Using a sample of serendipitous sources detected by ALMA, we characterize the obscuration in galaxies as a function of their total star formation rate and derive a corrected UV luminosity function and SFRD at z ~ 6. We find that the obscured fraction of the SFR is larger than one would expect from commonly used dust-corrections, such as the IRX-M_*relation. This motivates investigating more resources probing the obscured SFR density at z > 4, both of use to techniques like our own and also for more direct searches of obscured star forming systems at z > 6.

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