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Measuring the Relativistic Sunyaev-Zeldovich Effect in Cluster RXJ1347.5-1145

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Understanding the thermodynamic evolution of the intra-cluster medium (ICM) is vital for future cluster cosmological studies. Current studies are limited by the scatter intrinsic in observables such as X-ray luminosity and temperature. One key way to reduce this scatter is to externally calibrate the ICM temperature using an alternate technique. In recent years, the Sunyaev-Zeldovich (SZ) Effect has emerged as a viable complement to existing cluster surveys due to its redshift independence and linear dependence on the ICM density. This talk will describe a method for measuring the cluster temperature using the Relativistic SZ (rSZ) Effect which can be used to calibrate X-ray measurements and reduce the uncertainty on cosmological parameters. We use three *Herschel*-SPIRE bands with centers at wavelengths of roughly 250, 350 and 500 microns to measure the rSZ effect in the galaxy cluster RX J1347.5-1145, and estimate the Compton y and temperature of the ICM. The SZ effect at SPIRE frequencies is heavily correlated with the cosmic infrared background (CIB), cirrus, and other far-infrared emitters. Additionally, the SPIRE instrument is confusion-limited making it even more difficult to separate individual constituents. We efficiently model the CIB and other map components, as well as estimate the SZ spectra amplitude using the crowded field point source cataloger, PCAT, reducing one of the biggest limitations on high frequency rSZ measurements. The SZ effect spatial profile is estimated from Bolocam and *Planck* observations of the cluster. To calculate the uncertainty from other sub-mm components and understand the bias introduced by our pipeline, we create mock SPIRE 3-band maps. These are used with the PCAT SZ amplitude estimates to perform a maximum likelihood analysis on a grid of potential Compton y and temperature values. The method used to estimate rSZ to low significance in this cluster will be applied to a larger sample of 40 clusters to get an unambiguous detection.

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