

Planck intermediate results: II. Comparison of sunyaev-zeldovich measurements from planck and from the arcminute microkelvin imager for 11 galaxy clusters

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Abstract

A comparison is presented of Sunyaev-Zeldovich measurements for 11 galaxy clusters as obtained by Planck and by the ground-based interferometer, the Arcminute Microkelvin Imager. Assuming a universal spherically-symmetric Generalised Navarro, Frenk and White (GNFW) model for the cluster gas pressure profile, we jointly constrain the integrated Compton-Y parameter (Y_{500}) and the scale radius (θ_{500}) of each cluster. Our resulting constraints in the Y_{500} - θ_{500} 2D parameter space derived from the two instruments overlap significantly for eight of the clusters, although, overall, there is a tendency for AMI to find the Sunyaev-Zeldovich signal to be smaller in angular size and fainter than Planck. Significant discrepancies exist for the three remaining clusters in the sample, namely A1413, A1914, and the newly-discovered Planck cluster PLCKESZ G139.59+24.18. The robustness of the analysis of both the Planck and AMI data is demonstrated through the use of detailed simulations, which also discount confusion from residual point (radio) sources and from diffuse astrophysical foregrounds as possible explanations for the discrepancies found. For a subset of our cluster sample, we have investigated the dependence of our results on the assumed pressure profile by repeating the analysis adopting the best-fitting GNFW profile shape which best matches X-ray observations. Adopting the best-fitting profile shape from the X-ray data does not, in general, resolve the discrepancies found in this subset of five clusters. Though based on a small sample, our results suggest that the adopted GNFW model may not be sufficiently flexible to describe clusters universally. © ESO, 2013.

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Keywords

Cosmic background radiation, Cosmology: observations, Galaxies: clusters: general, Galaxies: clusters: intracluster medium, X-rays: galaxies: clusters