Optical Redshift and Richness Estimates for Galaxy Clusters Selected with the Sunyaev-Zel'dovich Effect from 2008 South Pole Telescope Observations

F. W. High, B. Stalder, J. Song, P. A. R. Ade, K. A. Aird, S. S. Allam, R. Armstrong, W. A. Barkhouse, B. A. Benson, E. Bertin, S. Bhattacharya, L. E. Bleem, M. Brodwin, E. J. Buckley-Geer, J. E. Carlstrom, P. Challis, C. L. Chang, T. M. Crawford, A. T. Crites, T. de Haan, S. Desai, M. A. Dobbs, J. P. Dudley, R. J. Foley, E. M. George, M. Gladders, N. W. Halverson, M. Hamuy, S. M. Hansen, G. P. Holder, W. L. Holzapfel, J. D. Hrubes, M. Joy, R. Keisler, A. T. Lee, E. M. Leitch, H. Lin, Y.-T. Lin, A. Loehr, M. Lueker, D. Marrone, J. J. McMahon, J. Mehl, S. S. Meyer, J. J. Mohr, T. E. Montroy, N. Morell, C.-C. Ngeow, S. Padin, T. Plagge, C. Pryke, C. L. Reichardt, A. Rest, J. Ruel, J. E. Ruhl, K. K. Schaffer, L. Shaw, E. Shirokoff, R. C. Smith, H. G. Spieler, Z. Staniszewski, A. A. Stark, C. W. Stubbs, et al. (8 additional authors not shown) You must enabled JavaScript to view entire author list.

(Submitted on 1 Mar 2010)

We present redshifts and optical richness properties of 21 galaxy clusters uniformly selected by their Sunyaev-Zel'dovich signature. These clusters, plus an additional, unconfirmed candidate, were detected in a 178 square-degree area surveyed by the South Pole Telescope in 2008. Using griz imaging from the Blanco Cosmology Survey and from pointed Magellan telescope observations, as well as spectroscopy using Magellan facilities, we confirm the existence of clustered red-sequence galaxies, report red-sequence photometric redshifts, present spectroscopic redshifts for a subsample, and derive R_200 radii and M_200 masses from optical richness. The clusters span redshifts from 0.15 to greater than 1, with a median redshift of 0.74; three clusters are estimated to be at z > 1. Redshifts inferred from mean red-sequence colors exhibit 2% RMS scatter in sigma_z/(1+z) with respect to the spectroscopic subsample for z < 1. We show that M_200 cluster masses derived from optical richness correlate with masses derived from South Pole Telescope data and agree with previously derived scaling relations to within the uncertainties. Optical and infrared imaging is an efficient means of cluster identification and redshift estimation in large Sunyaev-Zel'dovich surveys, and exploiting the same data for richness measurements, as we have done, will be useful for constraining cluster masses and radii for large samples in cosmological analysis.

Comments: Main body: 2 tables, 6 figures, 12 pages. Appendix: 22 full-color images, 11 pages. Submitted to ApJ
Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Cite as: **arXiv:1003.0005v1 [astro-ph.CO]**

Submission history

From: Fredrick High [view email]
[v1] Mon, 1 Mar 2010 20:19:00 GMT (4175kb,D)

Which authors of this paper are endorsers?