

Optical Identifications of High-Redshift Galaxy Clusters from the Planck Sunyaev–Zeldovich Survey

R. A. Burenin^{1*}, I. F. Bikmaev^{2,3}, I. M. Khamitov^{2,4}, I. A. Zaznobin¹,
G. A. Khorunzhev¹, M. V. Eselevich⁵, V. L. Afanasiev⁶, S. N. Dodonov⁶,
J.-A. Rubiño-Martín⁷, N. Aghanim⁸, and R. A. Sunyaev^{1,9}

¹*Space Research Institute, ul. Profsoyuznaya 84/32, Moscow, 117997 Russia*

²*Kazan Federal University, ul. Kremlevskaya 18, Kazan, 420000 Russia*

³*Academy of Sciences of Tatarstan, ul. Baumana 20, Kazan, Russia*

⁴*Observatory of Scientific and Technological Research Council of Turkey, Antalya, Turkey*

⁵*Institute of Solar–Terrestrial Physics, Russian Academy of Sciences, Siberian Branch, P.O. Box 291, Irkutsk, 664033 Russia*

⁶*Special Astrophysical Observatory, Russian Academy of Sciences, Nizhnii Arkhyz, Karachai–Cherkessian Republic, 369167 Russia*

⁷*Instituto de Astrofísica de Canarias, Tenerife, Spain*

⁸*Institut d'Astrophysique Spatiale, Orsay, France*

⁹*Max Planck Institut für Astrophysik, Karl-Schwarzschild-Str. 1, Postfach 1317, D-85741 Garching, Germany*

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Abstract—We present the results of optical identifications and spectroscopic redshift measurements for galaxy clusters from the second Planck catalogue of Sunyaev–Zeldovich sources (PSZ2) located at high redshifts, $z \approx 0.7–0.9$. We used the data of optical observations with the Russian–Turkish 1.5-m telescope (RTT-150), the Sayan Observatory 1.6-m telescope, the Calar Alto 3.5-m telescope, and the 6-m SAO RAS telescope (BTA). The spectroscopic redshift measurements were obtained for seven galaxy clusters, including one cluster, PSZ2 G126.57+51.61, from the cosmological sample of the PSZ2 catalogue. In the central regions of two clusters, PSZ2 G069.39+68.05 and PSZ2 G087.39–34.58, we detected arcs of strong gravitational lensing of background galaxies, one of which is at redshift $z = 4.262$. The data presented below roughly double the number of known galaxy clusters in the second Planck catalogue of Sunyaev–Zeldovich sources at high redshifts, $z \approx 0.8$.

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INTRODUCTION

In the Planck all-sky survey the most massive galaxy clusters in the observable Universe are detected more or less uniformly over the entire sky (Planck Collaboration 2014b, 2016c) through the observations of the Sunyaev–Zeldovich effect (Sunyaev and Zeldovich 1972). This sample is unique and is of enormous interest for various cosmological studies, such as constraining the cosmological parameters using the measurements of the galaxy cluster mass function (see, e.g., Vikhlinin et al. 2009a, 2009b; Burenin and Vikhlinin 2012; Planck Collaboration 2014a, 2016b). In particular, virtually all of

the clusters discovered in the Planck SZ survey will be included in the cosmological samples of galaxy clusters in the future Spectrum–Roentgen–Gamma (SRG)/eROSITA all-sky X-ray survey.

The second Planck catalogue of Sunyaev–Zeldovich sources released in 2015 (PSZ2, Planck Collaboration 2016c) contains 1653 objects, 1203 of which are confirmed massive galaxy clusters. Among the unidentified SZ sources there are some number of false detections, but there are also quite a few unidentified galaxy clusters. Our group participates in the work on optical identifications and redshift measurements of galaxy clusters from this survey (Planck Collaboration 2014b, 2015a, 2015b, 2016c,

*E-mail: rodion@hea.iki.rssi.ru