

Erratum: Is every strong lens model unhappy in its own way? Uniform modelling of a sample of 13 quadruply+ imaged quasars

by A. J. Shajib^{1,★}, S. Birrer¹, T. Treu^{1,†}, M. W. Auger², A. Agnello³, T. Anguita^{4,5}, E. J. Buckley-Geer⁶, J. H. H. Chan⁷, T. E. Collett⁸, F. Courbin⁷, C. D. Fassnacht⁹, J. Frieman^{6,10}, I. Kayo¹¹, C. Lemon², H. Lin⁶, P. J. Marshall¹², R. McMahon², A. More¹³, N. D. Morgan¹⁴, V. Motta¹⁵, M. Oguri^{16,17,18}, F. Ostrovski², C. E. Rusu^{19,‡}, P. L. Schechter²⁰, T. Shanks²¹, S. H. Suyu^{22,23,24}, G. Meylan⁷, T. M. C. Abbott²⁵, S. Allam⁶, J. Annis⁶, S. Avila⁸, E. Bertin^{26,27}, D. Brooks²⁸, A. Carnero Rosell^{29,30}, M. Carrasco Kind^{31,32}, J. Carretero³³, C. E. Cunha³⁴, L. N. da Costa^{29,30}, J. De Vicente³⁵, S. Desai³⁶, P. Doel²⁸, B. Flaugher⁶, P. Fosalba^{37,38}, J. García-Bellido³⁹, D. W. Gerdes^{40,41}, D. Gruen^{34,42}, R. A. Gruendl^{31,32}, G. Gutierrez⁶, W. G. Hartley^{28,43}, D. L. Hollowood⁴⁴, B. Hoyle^{45,46}, D. J. James⁴⁷, K. Kuehn⁴⁸, N. Kuropatkin⁶, O. Lahav²⁸, M. Lima^{29,49}, M. A. G. Maia^{29,30}, M. March⁵⁰, J. L. Marshall⁵¹, P. Melchior⁵², F. Menanteau^{31,32}, R. Miquel⁵³, A. A. Plazas⁵⁴, E. Sanchez³⁵, V. Scarpine⁶, I. Sevilla-Noarbe³⁵, M. Smith⁵⁵, M. Soares-Santos⁵⁶, F. Sobreira^{28,57}, E. Suchyta⁵⁸, M. E. C. Swanson³², G. Tarle⁴¹ and A. R. Walker²⁵

Affiliations are listed at the end of the paper

Key words: errata, addenda – gravitational lensing: strong – methods: data analysis – galaxies: elliptical and lenticular, cD – galaxies: structure.

The paper ‘Is every strong lens model unhappy in its own way? Uniform modelling of a sample of 13 quadruply+ imaged quasars’ was published in MNRAS, 483, 4, 5649–5671 (2019). The coordinate values of the image positions in table 4 were wrongly printed due to a clerical error. At a later stage of writing the manuscript, we have changed the zero-point definition of the lens coordinate systems, but the relative image positions were not accounted for this change of definition while printing out table 4. We provide the updated Table 4 below. This error does not impact any other results of the paper in any way, except for the table itself. We thank Collin Werner and Paul Schechter for helping us identify this error.

Table 4. Astrometric positions of the deflector light centroid and quasar images. The reported uncertainties are on relative astrometry and they are systematic and statistical uncertainties added in quadrature.

System name	Deflector		Image A		Image B		Image C		Image D	
	α (degree)	δ (degree)	$\Delta\alpha$ (arcsec)	$\Delta\delta$ (arcsec)	$\Delta\alpha$ (arcsec)	$\Delta\delta$ (arcsec)	$\Delta\alpha$ (arcsec)	$\Delta\delta$ (arcsec)	$\Delta\alpha$ (arcsec)	$\Delta\delta$ (arcsec)
PS J0147+4630	26.792331	46.511559	0.1553 ± 0.0002	2.0513 ± 0.0001	1.3270 ± 0.0002	1.6419 ± 0.0001	−1.0840 ± 0.0002	1.9580 ± 0.0002	−0.1862 ± 0.0005	−1.1696 ± 0.0003
SDSS J0248+1913	42.203099	19.225246	−0.647 ± 0.001	−0.204 ± 0.001	−0.505 ± 0.001	0.629 ± 0.001	0.351 ± 0.001	−0.821 ± 0.001	0.401 ± 0.001	0.590 ± 0.001
ATLAS J0259−1635	44.928561	−16.595376	0.683 ± 0.003	−0.303 ± 0.001	0.357 ± 0.001	0.571 ± 0.001	−0.801 ± 0.001	0.253 ± 0.001	−0.043 ± 0.001	−0.700 ± 0.001
DES J0405−3308	61.498964	−33.147417	0.694 ± 0.001	−0.238 ± 0.001	−0.375 ± 0.001	−0.561 ± 0.002	0.344 ± 0.002	0.603 ± 0.002	−0.525 ± 0.001	0.454 ± 0.004
DES J0408−5354	62.090451	−53.899816	1.931 ± 0.002	−1.594 ± 0.001	−1.825 ± 0.001	0.270 ± 0.001	−1.944 ± 0.002	−0.954 ± 0.002	0.091 ± 0.001	1.367 ± 0.002
DES J0420−4037	65.194858	−40.624081	−0.697 ± 0.001	−0.350 ± 0.001	−0.457 ± 0.001	0.683 ± 0.001	0.711 ± 0.001	−0.568 ± 0.001	0.172 ± 0.002	0.788 ± 0.002
PS J0630−1201 ^a	97.537601	−12.022037	0.686 ± 0.001	−1.426 ± 0.001	1.204 ± 0.001	−0.859 ± 0.001	1.543 ± 0.001	0.260 ± 0.001	−0.977 ± 0.002	1.006 ± 0.001
SDSS J1251+2935	192.781427	29.594652	0.3460 ± 0.0005	−0.6163 ± 0.0005	0.707 ± 0.001	−0.257 ± 0.001	0.637 ± 0.001	0.335 ± 0.001	−1.080 ± 0.001	0.319 ± 0.002
SDSS J1330+1810	202.577755	18.175788	0.274 ± 0.001	−0.978 ± 0.001	−0.152 ± 0.001	−1.002 ± 0.001	−0.985 ± 0.001	0.180 ± 0.002	0.5212 ± 0.0004	0.597 ± 0.002
SDSS J1433+6007	218.345420	60.120777	−0.941 ± 0.002	2.058 ± 0.003	−0.943 ± 0.003	−1.691 ± 0.003	−1.721 ± 0.002	−0.083 ± 0.002	1.075 ± 0.003	−0.138 ± 0.003
PS J1606−2333	241.500982	−23.556114	0.833 ± 0.001	0.373 ± 0.001	−0.793 ± 0.001	−0.223 ± 0.001	0.040 ± 0.001	−0.541 ± 0.001	−0.296 ± 0.001	0.524 ± 0.001
DES J2038−4008	309.511379	−40.137024	−1.482 ± 0.001	0.499 ± 0.001	0.8340 ± 0.0005	−1.212 ± 0.001	−0.688 ± 0.001	−1.182 ± 0.001	0.704 ± 0.001	0.864 ± 0.001
WISE J2344−3056	356.070739	−30.940633	−0.452 ± 0.001	0.179 ± 0.001	0.133 ± 0.001	0.530 ± 0.001	−0.212 ± 0.001	−0.478 ± 0.001	0.421 ± 0.001	−0.140 ± 0.001

Note. ^aThe relative positions of the image E are $\Delta\alpha = -0^{\circ}.257 \pm 0^{\circ}.003$ and $\Delta\delta = 0^{\circ}.249 \pm 0^{\circ}.002$.

* E-mail: ajshajib@astro.ucla.edu

† Packard Fellow.

‡ Subaru Fellow.

ACKNOWLEDGEMENTS

Funding for the DES Projects has been provided by the U.S. Department of Energy, the U.S. National Science Foundation, the Ministry of Science and Education of Spain, the Science and Technology Facilities Council of the United Kingdom, the Higher Education Funding Council for England, the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign, the Kavli Institute of Cosmological Physics at the University of Chicago, the Center for Cosmology and Astro-Particle Physics at the Ohio State University, the Mitchell Institute for Fundamental Physics and Astronomy at Texas A&M University, Financiadora de Estudos e Projetos, Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro, Conselho Nacional de Desenvolvimento Científico e Tecnológico and the Ministério da Ciência, Tecnologia e Inovação, the Deutsche Forschungsgemeinschaft and the Collaborating Institutions in the Dark Energy Survey.

The Collaborating Institutions are Argonne National Laboratory, the University of California at Santa Cruz, the University of Cambridge, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas-Madrid, the University of Chicago, University College London, the DES-Brazil Consortium, the University of Edinburgh, the Eidgenössische Technische Hochschule (ETH) Zürich, Fermi National Accelerator Laboratory, the University of Illinois at Urbana-Champaign, the Institut de Ciències de l'Espai (IEEC/CSIC), the Institut de Física d'Altes Energies, Lawrence Berkeley National Laboratory, the Ludwig-Maximilians Universität München and the associated Excellence Cluster Universe, the University of Michigan, the National Optical Astronomy Observatory, the University of Nottingham, The Ohio State University, the University of Pennsylvania, the University of Portsmouth, SLAC National Accelerator Laboratory, Stanford University, the University of Sussex, Texas A&M University, and the OzDES Membership Consortium.

Based in part on observations at Cerro Tololo Inter-American Observatory, National Optical Astronomy Observatory, which is operated by the Association of Universities for Research in Astronomy (AURA) under a cooperative agreement with the National Science Foundation.

The DES data management system is supported by the National Science Foundation under Grant Numbers AST-1138766 and AST-1536171. The DES participants from Spanish institutions are partially supported by MINECO under grants AYA2015-71825, ESP2015-66861, FPA2015-68048, SEV-2016-0588, SEV-2016-0597, and MDM-2015-0509, some of which include ERDF funds from the European Union. IFAE is partially funded by the CERCA program of the Generalitat de Catalunya. Research leading to these results has received funding from the European Research Council under the European Union's Seventh Framework Program (FP7/2007-2013) including ERC grant agreements 240672, 291329, and 306478. We acknowledge support from the Australian Research Council Centre of Excellence for All-sky Astrophysics (CAASTRO), through project number CE110001020, and the Brazilian Instituto Nacional de Ciência e Tecnologia (INCT) e-Universe (CNPq grant 465376/2014-2).

This manuscript has been authored by Fermi Research Alliance, LLC under Contract No. DE-AC02-07CH11359 with the U.S. Department of Energy, Office of Science, Office of High Energy Physics. The United States Government retains and the publisher, by accepting the article for publication, acknowledges that the United States Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce the published form of this manuscript, or allow others to do so, for United States Government purposes.

¹*Department of Physics and Astronomy, University of California, Los Angeles, CA 90095-1547, USA*

²*Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, UK*

³*European Southern Observatory, Karl-Schwarzschild-Strasse 2, D-85748 Garching bei Muenchen, Germany*

⁴*Departamento de Ciencias Físicas, Universidad Andres Bello Fernandez Concha 700, Las Condes, Santiago, Chile*

⁵*Millennium Institute of Astrophysics, Chile*

⁶*Fermi National Accelerator Laboratory, PO Box 500, Batavia, IL 60510, USA*

⁷*Institute of Physics, Laboratoire d'Astrophysique, Ecole Polytechnique Fédérale de Lausanne (EPFL), Observatoire de Sauverny, CH-1290 Versoix, Switzerland*

⁸*Institute of Cosmology and Gravitation, University of Portsmouth, Portsmouth, PO1 3FX, UK*

⁹*Physics Department University of California, Davis, 1 Shields Ave., Davis, CA 95161, USA*

¹⁰*Kavli Institute for Cosmological Physics, The University of Chicago, Chicago, IL 60637, USA*

¹¹*Department of Liberal Arts, Tokyo University of Technology, Ota-ku, Tokyo 144-8650, Japan*

¹²*Kavli Institute for Particle Astrophysics and Cosmology, PO Box 20450, MS29, Stanford, CA 94309, USA*

¹³*Kavli IPMU (WPI), UTIAS, The University of Tokyo, Kashiwa, Chiba 277-8583, Japan*

¹⁴*Staples High School, Westport, CT 06880, USA*

¹⁵*Instituto de Física y Astronomía, Universidad de Valparaíso, Avda. Gran Bretaña 1111, Playa Ancha, Valparaíso 2360102, Chile*

¹⁶*Research Center for the Early Universe, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, 113-0033, Japan*

¹⁷*Department of Physics, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan*

¹⁸*Kavli Institute for the Physics and Mathematics of the Universe (WPI), The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa, Chiba 277-8583, Japan*

¹⁹*Subaru telescope, National Astronomical Observatory of Japan, 650 North Aohoku Place, Hilo, HI 96720, USA*

²⁰*MIT Kavli Institute for Astrophysics and Space Research, Cambridge, MA 02139, USA*

²¹*Department of Physics, Durham University, South Road, Durham DH1 3LE, England*

²²*Max-Planck-Institut für Astrophysik, Karl-Schwarzschild-Str. 1, D-85748 Garching, Germany*

²³*Physik-Department, Technische Universität München, James-Frank-Straße 1, D-85748 Garching, Germany*

²⁴*Institute of Astronomy and Astrophysics, Academia Sinica, PO Box 23-141, Taipei 10617, Taiwan*

²⁵*Cerro Tololo Inter-American Observatory, National Optical Astronomy Observatory, Casilla 603, La Serena, Chile*

²⁶*CNRS, UMR 7095, Institut d'Astrophysique de Paris, F-75014, Paris, France*

²⁷*Sorbonne Universités, UPMC Univ. Paris 06, UMR 7095, Institut d'Astrophysique de Paris, F-75014, Paris, France*

²⁸*Department of Physics & Astronomy, University College London, Gower Street, London, WC1E 6BT, UK*

²⁹*Laboratório Interinstitucional de e-Astronomia - LIneA, Rua Gal. José Cristino 77, Rio de Janeiro, RJ-20921-400, Brazil*

- ³⁰Observatório Nacional, Rua Gal. José Cristino 77, Rio de Janeiro, RJ-20921-400, Brazil
- ³¹Department of Astronomy, University of Illinois at Urbana-Champaign, 1002 W. Green Street, Urbana, IL 61801, USA
- ³²National Center for Supercomputing Applications, 1205 West Clark Str, Urbana, IL 61801, USA
- ³³Institut de Física d'Altes Energies (IFAE), The Barcelona Institute of Science and Technology, Campus UAB, E-08193 Bellaterra (Barcelona), Spain
- ³⁴Kavli Institute for Particle Astrophysics and Cosmology, PO Box 2450, Stanford University, Stanford, CA 94305, USA
- ³⁵Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), Madrid, Spain
- ³⁶Department of Physics, IIT Hyderabad, Kandi, Telangana 502285, India
- ³⁷Institut d'Estudis Espacials de Catalunya (IEEC), E-08193 Barcelona, Spain
- ³⁸Institute of Space Sciences (ICE, CSIC), Campus UAB, Carrer de Can Magrans, s/n, E-08193 Barcelona, Spain
- ³⁹Instituto de Física Teórica UAM/CSIC, Universidad Autónoma de Madrid, E-28049 Madrid, Spain
- ⁴⁰Department of Astronomy, University of Michigan, Ann Arbor, MI 48109, USA
- ⁴¹Department of Physics, University of Michigan, Ann Arbor, MI 48109, USA
- ⁴²SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA
- ⁴³Department of Physics, ETH Zurich, Wolfgang-Pauli-Strasse 16, CH-8093 Zurich, Switzerland
- ⁴⁴Santa Cruz Institute for Particle Physics, Santa Cruz, CA 95064, USA
- ⁴⁵Max Planck Institute for Extraterrestrial Physics, Giessenbachstrasse, D-85748 Garching, Germany
- ⁴⁶Universitäts-Sternwarte, Fakultät für Physik, Ludwig-Maximilians Universität München, Scheinerstr. 1, D-81679 München, Germany
- ⁴⁷Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138, USA
- ⁴⁸Australian Astronomical Observatory, North Ryde, NSW 2113, Australia
- ⁴⁹Departamento de Física Matemática, Instituto de Física, Universidade de São Paulo, CP 66318, São Paulo, SP, 05314-970, Brazil
- ⁵⁰Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19104, USA
- ⁵¹George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy, and Department of Physics and Astronomy, Texas A&M University, College Station, TX 77843, USA
- ⁵²Department of Astrophysical Sciences, Princeton University, Peyton Hall, Princeton, NJ 08544, USA
- ⁵³Institució Catalana de Recerca i Estudis Avançats, E-08010 Barcelona, Spain
- ⁵⁴Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, CA 91109, USA
- ⁵⁵School of Physics and Astronomy, University of Southampton, Southampton, SO17 1BJ, UK
- ⁵⁶Brandeis University, Physics Department, 415 South Street, Waltham, MA 02453, USA
- ⁵⁷Instituto de Física Gleb Wataghin, Universidade Estadual de Campinas, 13083-859, Campinas, SP, Brazil
- ⁵⁸Computer Science and Mathematics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA

This paper has been typeset from a $\text{\TeX}/\text{\LaTeX}$ file prepared by the author.