

## Article

# TheHerschel-ATLAS Data Release 1 – II. Multi-wavelength counterparts to submillimetre sources

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Authors: [Bourne, N.](#) ; [Dunne, L.](#) ; [Maddox, S. J.](#) ; [Dye, S.](#) ; [Furlanetto, C.](#) ;  
[Hoyos, C.](#) ; [Smith, D. J. B.](#) ; [Eales, S.](#) ; [Smith, M. W. L.](#) ; [Valiante, E.](#)  
; [Alpaslan, M.](#) ; [Andrae, E.](#) ; [Baldry, I. K.](#) ; [Cluver, M. E.](#) ;  
[Cooray, A.](#) ; [Driver, S. P.](#) ; [Dunlop, J. S.](#) ; [Grootes, M. W.](#) ;  
[Ivison, R. J.](#) ; [Jarrett, T. H.](#) ; [Liske, J.](#) ; [Madore, B. F.](#) ; [Popescu, C. C.](#)  
; [Robotham, A. G.](#) ; [Rowlands, K.](#) ; [Seibert, M.](#) ; [Thompson, M. A.](#) ;  
[Tuffs, R. J.](#) ; [Viaene, S.](#) ; [Wright, A. H.](#)

Affiliation: AA(SUPA,HInstitute for Astronomy, University of Edinburgh, Royal Observatory, Edinburgh EH9 3HJ, UK nbourne22@gmail.com), AB(SUPA,HInstitute for Astronomy, University of Edinburgh, Royal Observatory, Edinburgh EH9 3HJ, UK; School of Physics and Astronomy, Cardiff University, The Parade, Cardiff CF24 3AA, UK), AC(SUPA,HInstitute for Astronomy, University of Edinburgh, Royal Observatory, Edinburgh EH9

3HJ, UK; School of Physics and Astronomy, Cardiff University, The Parade, Cardiff CF24 3AA, UK), AD(School of Physics and Astronomy, University of Nottingham, University Park, Nottingham NG7 2RD, UK), AE(School of Physics and Astronomy, University of Nottingham, University Park, Nottingham NG7 2RD, UK; CAPES Foundation, Ministry of Education of Brazil, Brasilia, DF 70040-020, Brazil), AF(School of Physics and Astronomy, University of Nottingham, University Park, Nottingham NG7 2RD, UK; Departamento de Física Teórica, Universidad Autónoma de Madrid, Crta de Colmenar Viejo. km 15.600, E-28049 Madrid, Spain; Departamento de Física, Universidad Carlos III de Madrid, Campus de Leganés, Avda. Universidad 30, E-28911 Madrid, Spain), AG(Centre for Astrophysics Research, School of Physics, Astronomy and Mathematics, University of Hertfordshire, College Lane, Hatfield, AL10 9AB, UK), AH(School of Physics and Astronomy, Cardiff University, The Parade, Cardiff CF24 3AA, UK), AI(School of Physics and Astronomy, Cardiff University, The Parade, Cardiff CF24 3AA, UK), AJ(School of Physics and Astronomy, Cardiff University, The Parade, Cardiff CF24 3AA, UK), AK(SUPA, School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, Fife, KY16 9SS, UK; International Centre for Radio Astronomy (ICRAR), University of Western Australia, Crawley, WA 6009, Australia), AL(Max-Planck-Institut für Kernphysik (MPIK), Saupfercheckweg 1, D-69117 Heidelberg, Germany), AM(Astrophysics Research Institute, Liverpool John Moores University, IC2, Liverpool Science Park, 146 Brownlow Hill, Liverpool L3 5RF, UK), AN(University of the Western Cape, Robert Sobukwe Road, Bellville 7535, South Africa), AO(Department of Physics and Astronomy, University of California, Irvine, CA 92697, USA), AP(SUPA, School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, Fife, KY16 9SS, UK; International Centre for Radio Astronomy (ICRAR), University of Western Australia, Crawley, WA 6009, Australia), AQ(SUPA, HInstitute for Astronomy, University of Edinburgh, Royal Observatory, Edinburgh EH9 3HJ, UK), AR(Max-Planck-Institut für Kernphysik (MPIK), Saupfercheckweg 1, D-69117 Heidelberg, Germany), AS(SUPA, HInstitute for Astronomy, University of Edinburgh, Royal Observatory, Edinburgh EH9 3HJ, UK; ESO, Karl Schwarzschild Strasse 2, D-85748 Garching, Germany), AT(Department of Astronomy, University of Cape Town, Private Bag X3, Rondebosch 7701, South Africa), AU(Hamburger Sternwarte, Universität Hamburg, Gojenbergsweg 112, D-21029 Hamburg, Germany), AV(The Observatories, Carnegie Institute of Washington, 813 Santa Barbara Street, Pasadena, CA 91101, USA), AW(Jeremiah Horrocks Institute, University of Central Lancashire, Preston PR1 2HE, UK), AX(SUPA, School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, Fife, KY16 9SS, UK; International Centre for Radio Astronomy (ICRAR), University of Western Australia, Crawley, WA 6009, Australia), AY(SUPA, School of Physics and Astronomy, University of St Andrews, North Haugh, St Andrews, Fife, KY16 9SS, UK), AZ(The Observatories, Carnegie Institute

of Washington, 813 Santa Barbara Street, Pasadena, CA 91101, USA),  
 BA(Centre for Astrophysics Research, School of Physics, Astronomy and  
 Mathematics, University of Hertfordshire, College Lane, Hatfield, AL10  
 9AB, UK), BB(Max-Planck-Institut für Kernphysik (MPIK),  
 Saupfercheckweg 1, D-69117 Heidelberg, Germany), BC(Sterrenkundig  
 Observatorium, Universiteit Gent, Krijgslaan 281, B-9000 Gent, Belgium),  
 BD(International Centre for Radio Astronomy (ICRAR), University of  
 Western Australia, Crawley, WA 6009, Australia)

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## Abstract

This paper is the second in a pair of papers presenting data release 1 (DR1) of the Herschel Astrophysical Terahertz Large Area Survey (H-ATLAS), the largest single open-time key project carried out with the Herschel Space Observatory. The H-ATLAS is a wide-area imaging survey carried out in five photometric bands at 100, 160, 250, 350 and 500  $\mu\text{m}$  covering a total area of 600  $\text{deg}^2$ . In this paper, we describe the identification of optical counterparts to submillimetre sources in DR1, comprising an area of 161  $\text{deg}^2$  over three equatorial fields of roughly 12 B 4.5  $\text{deg}$  centred at 9<sup>h</sup>, 12<sup>h</sup> and 14<sup>h</sup>5, respectively. Of all the H-ATLAS fields, the equatorial regions benefit from the greatest overlap with current multi-wavelength surveys spanning ultraviolet (UV) to mid-infrared regimes, as well as extensive spectroscopic coverage. We use a likelihood ratio technique to identify Sloan Digital Sky Survey counterparts at  $r < 22.4$  for 250- $\mu\text{m}$ -selected sources detected at  $\tilde{h}4$  ( $\tilde{u}28$  mJy). We find 'reliable' counterparts (reliability  $R \geq 0.8$ ) for 44 835 sources (39 per cent), with an estimated completeness of 73.0 per cent and contamination rate of 4.7 per cent. Using redshifts and multi-wavelength photometry from GAMA and other public catalogues, we show that H-ATLAS-selected galaxies at  $z < 0.5$  span a wide range of optical colours, total infrared (IR) luminosities and IR/UV ratios, with no strong disposition towards mid-IR-classified active galactic nuclei in comparison with optical selection. The data described herein, together with all maps and catalogues described in the companion paper, are available from the H-ATLAS website at [www.h-atlas.org](#).

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