THE UNIVERSITY OF MANCHESTER

PARTICULARS OF APPOINTMENT

FACULTY OF SCIENCE & ENGINEERING

SCHOOL OF NATURAL SCIENCE

DEPARTMENT OF PHYSICS & ASTRONOMY

RESEARCH ASSISTANT IN RADIO COSMOLOGY

VACANCY REF: SAE-020374

Salary:	Grade 6 £34,308 to £42,155 per annum, depending on relevant experience
Hours:	Full time
Duration:	September/October 2023 until August-December 2025
Location:	Oxford Road, Manchester

Enquiries about the vacancy, shortlisting and interviews:
Name: Dr Phil Bull
Email: Phil.bull@manchester.ac.uk

The University of Manchester

The University of Manchester (www.manchester.ac.uk) enjoys a global reputation for its research and its innovative approach to learning, with an on-going £1 billion investment in facilities, staff and buildings. This builds on our tradition of success that stretches back over 180 years. The birth of the modern computer, the splitting of the atom, the founding principles of modern economics, the discovery of graphene, and the birthplace of chemical engineering – these and many more world changing innovations have their roots at our University. We are at the forefront of the search for solutions to some of the world's most pressing problems, boasting strong collaborative links with industry and public services.

Manchester has the largest student community in the UK, with more than 28000 undergraduates and 11000 postgraduates attracted by the high international standing of the academic staff, by the superb research and teaching facilities, and by the cultural assets both of the university and the city of Manchester itself. For further information, please consult www.manchester.ac.uk.

MANCHESTER 1824
The University of Manchester

Faculty of Science and Engineering

The Faculty of Science and Engineering is one of the largest in the UK with over 10,000 students, 2,000 staff and strategic links with over 300 industrial companies. We are leading research efforts in energy, nuclear science and technology, computer science, atmospheric science, bioscience and biotechnology, photon science and photonic materials, imaging and visualisation, security, and advanced materials, attracting an annual income of over £200 million.

Founded in 1824, we have a history of breaking new ground in science and engineering. Rutherford began his work here on splitting the atom and later received the Nobel prize in 1908 for his work on radioactivity. The 'Baby', the world's first stored-program computer, and Manchester Mark 1 came into being here. It is the birthplace of Chemical Engineering. The world's first steerable radio telescope at Jodrell Bank was built here by Bernard Lovell. Since 1906, when former student Joseph Thomson won the Nobel prize for physics, the University has produced more than 20 Nobel Laureates, the most recent of which were Professor Andre Geim and Professor Konstantin Novoselov in 2010 - for their pioneering work with the world's thinnest material, graphene.

Department of Physics and Astronomy

The Department of Physics and Astronomy is one of five Departments in the School of Natural Sciences which is in the Faculty of Science and Engineering. There are 95 academic staff in the Department with expertise in areas such as condensed matter physics (which includes Prof. Andre Geim and Prof. Konstantin Novoselov who won the 2010 Nobel Prize in Physics for their work on graphene), atomic physics, liquid crystal physics, biological physics, accelerator physics, nuclear physics, particle physics, astrophysics, astronomy, cosmology, complexity and theoretical physics. Jodrell Bank Observatory (part of Jodrell Bank Centre for Astrophysics) also forms part of our Department. We have approximately 150 research staff, 250 PGR students and 1200 UG/PG students.

The Department has ranked in the top fifteen in the Academic Ranking of World Universities for Physics since 2011. In the Research Excellence Framework (REF) 2014 the Department was in the top three institutions for its proportion of "world-leading" components and was first for non-academic impact.

The Department values teaching highly and scored 90% in the 2019 National Student Survey. The Department has the largest undergraduate intake of any Physics department in the UK. Student cohorts are around 1120 and 100 for undergraduate and postgraduate taught programmes respectively. Taught postgraduate courses include Masters programmes in Photon Science, Nuclear Science and Technology, and Radio Imaging and Sensing.

P&A research is based in four topical divisions: Accelerator, Nuclear and Particle Physics; Condensed Matter (which includes Prof. Andre Geim and Prof. Konstantin Novoselov who won the 2010 Nobel Prize in Physics for their work on graphene); and Jodrell Bank Centre for Astrophysics. The Department operates the world-renowned Jodrell Bank Observatory (JBO). The Jodrell Bank site also provides the permanent home for the international headquarters of the Square Kilometre Array (SKA) Organisation. The Department is deeply involved in the £61 million National Graphene Institute (NGI), opened in 2015. The NGI building has 7350 m2 of research space over five floors and includes 1500m2 of cleanrooms, lab facilities, office space and seminar rooms.

The Department of Physics and Astronomy is committed to promoting Equality, Diversity, Inclusion and Access through contributing to the University's social responsibility agenda, demonstrating a commitment to its policies, activities and delivery of initiatives including the Athena SWAN charter for promoting women's careers in STEMM subjects (science, technology, engineering, mathematics and medicine) in higher education. The Department has held JUNO Champion status since 2016 for its commitment to achieving gender equality which positively promotes inclusivity for all.
Further information on the Department of Physics and Astronomy can be found at www.physics.manchester.ac.uk.

Jodrell Bank Centre for Astrophysics

Jodrell Bank Centre for Astrophysics (JBCA) is one of the largest academic astronomy research groups in Europe, studying a very broad range of astrophysical research, in particular Cosmology, Galaxy formation and evolution, AGN and Star-formation, Galactic Astronomy, Time-domain astrophysics (including Pulsars, Masers and Exoplanets) and Solar Physics. Research staff are located in the Alan Turing Building on the main Manchester campus, and comprises around 30 academic staff, 50 postdoctoral researchers, and 60 post-graduate students. The Group publishes in excess of 400 refereed papers per year with many appearing in the highest-impact journals. Academic staff are involved in many international collaborations with colleagues in Europe and North America but increasingly involve developing countries in Africa, Asia and South America. JBCA operates both the 76-metre Lovell Telescope and the UK national radio astronomy facility, e-MERLIN/VLBI. JBCA's telescope facilities are located at Jodrell Bank Observatory, which also hosts the Headquarters of the Square Kilometre Array (SKA) organisation. JBCA and SKA staff have close links, with several SKA staff enjoying honorary university appointments. Several large compute facilities are operated by the group both on campus and at the observatory.

Overall Purpose of the Job:

The successful applicant will play an important role in analysing MeerKAT 21cm data for cosmology, with a further opportunity to contribute to the HERA project as well. The former will involve developing and applying statistical data analysis and simulation tools, particularly map-making codes and associated foreground removal methods, to current and forthcoming data from a MeerKAT autocorrelation (single-dish) 21cm intensity mapping survey, MeerKLASS. A key goal of this research is to introduce more sophisticated Bayesian statistical approaches to the map-making process, as well as studying and mitigating important systematic effects such as foreground contamination, calibration errors, and similar. Contributing to HERA data analysis along similar lines will also be possible.

Key Responsibilities, Accountabilities or Duties:

- Contribute to the MeerKLASS and Hydrogen Epoch of Reionization Array survey projects, under the supervision of Dr Bull.
- Develop, in collaboration with other group members, new techniques that may be necessary to achieve the objectives of the research.
- To pursue topics of interest arising from the above work and develop new research directions, according to their own interests.

- To write and contribute to published papers and technical reports/memos relating to the above work, and the accompanying public release of software and/or data products.
- To present their work at national and international conferences and via seminar opportunities.
- To develop and maintain a good knowledge of cutting-edge research in radio astronomy and cosmology.
- To play an active role in the life of JBCA through discussions, seminars and meetings with other members.
- To play an active role in the MeerKLASS and HERA Collaborations, including attendance at telecons and collaboration meetings.
- To collaborate with, when appropriate, other researchers, graduate students and Masters students within the group.
- Contribute to the social responsibility agenda of the University and demonstrate a commitment to Equality, Diversity and Inclusion policies and activities and support the development and delivery of related initiatives.

PERSON SPECIFICATION

- Essential Knowledge, Skills and Experience:
- Experience with any of the following: statistical data analysis (e.g. optimal estimators, MCMC); CMB map-making or similar; analysis or simulation of radio telescope data or instrumentation; single-dish radio observations.
- A good working knowledge of recent developments in relevant sub-fields of observational cosmology and/or radio astronomy.
- Record of relevant publications in international journals.
- Ability to collaborate effectively and communicate scientific results with team members.
- A strong personal commitment to equality, diversity, inclusion and accessibility.

Desirable Knowledge, Skills, Experience and Qualifications:

- Experience working with radio or microwave astronomy data and/or simulations.
- Familiarity with running data analysis and/or simulation code on high-performance computers.
- Fluency in Python programming.
- Experience using collaborative software development tools (git, unit testing, continuous integration etc.)