THE UNIVERSITY OF MANCHESTER

PARTICULARS OF APPOINTMENT

FACULTY OF SCIENCE & ENGINEERING

SCHOOL OF NATURAL SCIENCES

DIVISION OF PHYSICS AND ASTRONOMY

POSTDOCTORAL RESEARCH ASSOCIATE IN COLLIDER PHENOMENOLOGY: EFT

VACANCY REF: SAE-020355

Salary:	Grade 6 £34,308-£42,155
Hours:	1 FTE
Duration:	2 Years (24 months)
Location:	Oxford Road, Manchester

Enquiries about the vacancy, shortlisting and interviews:
Manager: Dr. Eleni Vryonidou
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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 m^2 research space over five floors and includes 1500m^2 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.

Particle Physics Group

The University of Manchester's Particle Physics group supports a broad research programme in both experimental and theoretical particle physics. The group comprises 24 academic staff, 30 researchers, 10 engineers and technicians, and nearly 50 post-graduate students. Academic staff play a leading role in many international experiments, including ATLAS, LHCb, DUNE, MicroBooNE/SBND, SuperNEMO, g-2, Mu2e, BES-III, and Darkside. The current

spokespersons of the LHCb, DUNE and Microboone collaborations are from the University of Manchester. Our experimental physicists are heavily involved in the operation and exploitation of current experiments, as well as the design and construction of future detectors. Our theoretical physicists are internationally renowned for their work in Quantum Chromodynamics, neutrino physics, Higgs Physics, CP violation, supersymmetry and string phenomenology, and in the physics of the early Universe.

BACKGROUND

EFT4NP is a European Research Council funded project which aims at probing New Physics at the Large Hadron Collider using the Effective Field Theory framework. The project will provide precise theoretical predictions within Effective Field Theory and exploit the wide range of measurements at the Large Hadron Collider to constrain the parameters of Effective Field Theory. The ultimate goal is to reliably and precisely probe the scale and nature of New Physics.

The EFT4NP team will consist of the PI, Dr Eleni Vryonidou, 3 PDRAs and 3 PhD students. This team will be embedded in the Manchester Particle Physics Theory Group, which currently comprises 8 staff members, 6 PDRAs and PhD students. The research interests of the group include a broad range of topics from BSM model building to collider phenomenology and QCD. This group is an integral part of the Manchester Particle Physics Research Group whose experimenters are members of the ATLAS, LHCb, DØ, g-2, Mu2e, MINOS, SuperNemo and IceCube experiments and performs R&D towards the next generation of neutrino experiments.

The PDRA will work in particle physics phenomenology within the Particle Theory group of the Department of Physics & Astronomy. The focus of the project will be Effective Field Theory as a probe of new physics at the Large Hadron Collider.

Overall Purpose of the Job:

The PDRA will conduct research in Effective Field Theory for collider physics, focussing on the top and Higgs sectors in the computation of higher order corrections for collider observables, Monte Carlo generators as well the use of measurements to constrain new physics through global Efffective Field Theory interpretations. The PDRA will also be involved in the supervision of PhD students.

Key Responsibilities, Accountabilities or Duties:

The range of duties will include: (delete/amend as appropriate to role)

- Conduct research projects within the goals set by the EFT4NP proposal, in particular work on Effective Field Theory at the Large Hadron Collider.
- Write up research work for publication.
- Continually update knowledge and understanding in particle physics phenomenology and Effective Field Theory relevant for Large Hadron Collider studies.
- Translate knowledge of advances in the subject area into research activity.
- Deal with routine communication using a range of media.
- Communicate complex information, orally, in writing and electronically.
- Communicate material of a specialist or highly technical nature.
- Be involved in the assessment of student knowledge and supervision of projects.
- Assist in the development of student research skills.

- Liaise with colleagues and students.
- Build internal contacts and participate in internal networks for the exchange of information and to form relationships for future collaboration.
- Join external networks to share information.
- Manage own research and administrative activities, with guidance if required.
- Work with colleagues on joint projects set by the EFT4NP project, as required.
- Collaborate with academic colleagues on areas of shared research interest.
- Attend and contribute to relevant meetings.
- Use new research techniques and methods.
- Use initiative and creativity to develop new research methods to achieve the goals of the ERC project.
- Use creativity to analyse and interpret research data and draw conclusions on the outcomes.
- Contribute to collaborative decision making with research colleagues Use research resources, as appropriate.
- Plan and manage own research activity in collaboration with others.

PERSON SPECIFICATION

Essential Knowledge, Skills and Experience*:*

- Have, or be about to obtain, a relevant PhD (or equivalent)
- Specialist knowledge in the discipline of collider phenomenology
- Experience in research methods and techniques to work within established research programmes of Effective Field Theory and Monte Carlo generators
- Excellent communication and interpersonal skills
- Excellent time management and organisational skills
- Ability to work independently and as part of a team
- Ability to liaise confidently and effectively with a range of individuals
- Flexible approach to dealing with research problems as they arise
- Willingness to learn and develop
- Ability to present in both written and oral publications
- Ability to meet deadlines
- Strong journal publication record.
- The ability to evaluate complex data
- Ability to contribute to broader management and administrative processes.
- Ability to assess and organise resources
- Understand equal opportunity issues as they may impact on areas of research content.

Additional Information:

The Manchester particle theory group is part of the Particle Physics Research Group, which includes theorists and experimenters who play leading roles in the ATLAS and LHCb experiments at the LHC collider, and in several neutrino experiments. The theorists are Mrinal Dasgupta, Jeff Forshaw, Jonathan Gaunt, Mike Seymour, (with research interests mainly in QCD), Eleni Vryonidou (collider phenomenology), Richard Battye (Cosmology), Apostolos Pilaftsis (mainly BSM phenomenology), Peter Millington (QFT & particle cosmology) and Stefan Schacht (flavour physics).