THE UNIVERSITY OF MANCHESTER

PARTICULARS OF APPOINTMENT

FACULTY OF SCIENCE & ENGINEERING

SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING

MARIE CURIE FELLOW:EARLY STAGE RESEARCHER (ESR) NETWORK CODING OPTIMIZATION

VACANCY REF: S&E-013093

Salary:	£34,773 to £47,823 (H9 –H12 Marie Curie Salary Scale) per annum
Hours:	Full TIme
Duration:	36 Months from start date
Location:	Sackville Street, Manchester

Enquiries about the vacancy, shortlisting and interviews:
Contact: Dr Emad Alsusa
Email: e.alsusa@manchester.ac.uk

BACKGROUND
This is an opportunity to join the EC Horizon 2020 funded Marie Skłodowska-Curie Initial Training Network on **'energy-autonomous Portable Access points for INfrastructure-LESS networks** - (PAINLESS).

About PAINLESS

The explosive growth of applications and industrial sectors that rely on broadband connectivit, is set to stretch the demand for wireless networks beyond the reach of the power grid infrastructure. Access points are being deployed on board of drones, while more than 84,000 hybrid-energy base stations are expected to be deployed annually in remote areas by 2020. Portable network nodes that are energy-autonomous and operate detached from the power grid will become indispensable in the coming applications of wireless networks. Energy-autonomy presents immense challenges for the wireless network design and imposes a complete re-think of technological solutions. PAINLESS has the visionary aim to establish a training and research platform to pioneer green, energy-autonomous portable network nodes which are self-subsistent and limitlessly-scalable, to satisfy future demands with minimal infrastructure. It promises a paradigm shift by integrating and jointly optimising wireless networks with renewable energy sources, radiated energy harvesting and airborne access points, as well as establishing disruptive performance benchmarks for the combined wireless power-and-information distribution. Our results will kick-start an innovation ecosystem for infrastructure and service providers of ICT to develop and commercialise a new generation of autonomous, sustainable and power-independent communication networks with self-organising functionality,

to enable 100% coverage in urban environments in a power-efficient manner; provide network access to all types of emergency, disaster and special events areas; and connect remote / developing areas with problematic infrastructure. PAINLESS relates to H2020-MSCA with a vision to produce the first generation of experts in a radically new wave of energy autonomous networks that will revolutionise the wireless networking technology landscape and the plethora of associated vertical business sectors.

The Post

The post holder will be enrolled on the PhD programme at the University of Manchester and will write his/her thesis on a topic related to **Network Coding Optimization**, supervised by Dr Emad Alsusa and Dr Khairi Hamdi and members of the industrial teams during the secondments.

Applicants must also be eligible to be appointed as an Early Stage Researcher in the UK.

Please note there are strict *eligibility requirements* which apply to all Marie Skłodowska- Curie Early Stage Researchers. At the time of the appointment, applicants should not hold a PhD or have more than 4 years' research experience after Undergraduate/Masters graduation and should not have resided or carried out their main activity (work, studies, etc.) in the UK for more than 12 months in the last 3 years immediately before appointment.

PhD

The ESR's PhD must be designed and conceived as an integral part of the overall PAINLESS project. The successful candidate will be a team player, prepared to work closely with the Project's senior staff and other ESRs. By the end of the third year the ESR will be expected to complete a publishable chapter for the volume constituting one of the major deliverables of PAINLESS. This chapter can be a part of the PhD dissertation, which, most likely, will be completed at a later date.

This is an outstanding opportunity to be part of a network of leading scholars working on state of the art technologies in Wireless Communications. In addition to PhD supervision, the successful candidate will benefit from a wide-ranging training programme, which will encompass:

- Regular summer/winter schools pertaining to both, technical skills on topics in wireless communications relevant to the scope of the PAINLESS project, and a range of transferrable skills (research management, entrepreneurship, patents, etc.);
- An overseas research secondment to one of the partner universities in the PAINLESS consortium;
- A secondment to a non-academic training partner;
- A number of career fares towards the end of their project, to assist in their future employment.

The ESR will help organise and present their research at a major international conference on the themes of the PAINLESS research programme.

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Job Description and Objectives

This ESR will focus on network optimisation at the PHY layer. It will explore and design low-polynomial complexity lattice (LNC) and physical (PLNC) layer network coding techniques for the case of large scale distributed and energy-autonomous access-point formations with the objective to maximise the longevity of all the network nodes. The selection of the optimal mapping function will take into consideration not only the channel characteristics but also the non-uniform power availability amongst the network nodes. Both compute and forward and integer forcing approaches will be considered and the trade-off between quantisation level, performance and longevity will be evaluated. A further objective of this work will be to address minimising side information exchange in T3.3 which could be a significant burden on power-limited networks. The ESR will utilise findings on energy models and performance bounds from Task 3.1.

Expected results:

- Novel low-complexity and energy-efficient LNC and PLNC techniques that complement T3.2
- Establishing the trade-off relationship between quantisation level, performance and energy longevity in the network
- Performance bounds of the established techniques

Planned Secondment(s): AIT - 3 months: to advance LNC and PLNC techniques using dynamic frequency mapping. CNRS–3 months: to utilize backhauling optimization results in refining the network level optimization.

Duties and Responsibilities

- Undertake postgraduate research in support of the agreed doctoral research project.
- Work closely with the academic supervisors to ensure the compatibility of the individual project with the overall goals of PAINLESS.
- Present and publish research to both academic and non-academic audiences.
- Attend and participate in academic and non-academic conferences, events and seminars.
- Attend and participate in all training events and supervisory meetings.
- Be seconded to other network partners as necessary to fulfil the grant obligations.
- Prepare progress reports and similar documents on research for funding bodies, as required.
- Contribute to the delivery and management of the wider Programme, including attending and participating in programme committee meetings.

As job descriptions cannot be exhaustive, the ESR may be required to undertake other duties, which are broadly in line with the above duties responsibilities.

Person Specification

- A good Undergraduate degree and a postgraduate Master’s degree (or equivalent) in electronic or electrical engineering, or a physical sciences subject.
- Excellent written and verbal communication, including presentation skills.

- Highly proficient English language skills.
- Excellent organisational skills, attention to detail and the ability to meet deadlines.
- Ability to think logically, create solutions and make informed decisions.
- Willingness to work collaboratively in a research environment.
- A strong commitment to your own continuous professional development.
- Ability to travel and work across Europe.

Essential:

- Early-Stage Researchers (ESRs) shall at the time of recruitment by the host organisation be in the first four years (full-time equivalent research experience) of their research careers and not yet have been awarded a doctoral degree. Full-time equivalent research experience is measured from the date when a researcher obtained the degree which would formally entitle him or her to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the researcher is recruited.
- At the time of recruitment by the host organisation, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation for more than **12** months in the three years immediately prior to the recruitment date. Compulsory national service and/or short stays such as holidays are not taken into account.

How to apply

Application must be must submitted online to HR.

The application must include:

- A cover letter explaining your motivation for applying.
- A Curriculum Vitae setting out your educational qualifications as well as any additional scientific achievements and publications.
- Evidence of Advanced-level English – IELTS (or equivalent) overall grade of 6.5 with a minimum of 5.5 in each of the subtests. See also: https://www.manchester.ac.uk/study/postgraduate-research/programmes/list/04620/phd-electrical-and-electronic-engineering/entry-requirements/.
- A copy of your Master's certificate (or equivalent) or certificate of graduation.
- An official transcript of the completed subjects and grades achieved in the course of the Master's programme.
- Two letters of recommendation from researchers familiar with your academic activities, e.g. the advisor of your Master's thesis. The referees must e-mail their recommendations directly to (your university's HR link).
- A short research proposal on the project's theme (max. 2,000 words)

Selection process

The selection and recruitment processes of the ESRs will be in accordance with the European Charter and Code of Conduct for the Recruitment of Researchers. The recruitment process will be open, transparent, impartial, equitable, and merit-based. There will be no overt/covert discrimination based on race, gender, sexual orientation, religion or belief, disability or age. To this end, the following selection criteria for the recruitment of the ESRs will be considered:

- Curriculum vitae
- Academic performance (diplomas, university transcripts, etc.)
- Research and industrial experience
- Awards and fellowships
- Publications and patents
- Research, leadership, and creativity potential
- English knowledge
- Other relevant items based on the specific candidate

The recruitment process will adhere to the guidelines described in the Grant Agreement of the PAINLESS project. At the network's level, the recruitment panel will include a minimum of 3/6 members of the project in order to guarantee gender- and sector-balance.

Applications close on **31/12/2018** and interviews are anticipated to be held **Feb 2019**.

The applications will be analysed after the application deadline, and the shortlisted candidates will be invited to a Skype interview.

Further Information

For more information about the post, please contact Dr Emad Alsusa:
e.alsusa@manchester.ac.uk.

ADDITIONAL INFORMATION

The University of Manchester

Website:
http://www.manchester.ac.uk

Manchester's mission is to be one of the top 25 research universities in the world by 2020, and to remain thereafter a world leader in the quality of higher education offered, the excellence and impact of the research undertaken and the value of the contributions made to the economic, social and cultural life and environmental sustainability of the wider society. It is currently ranked 35th in the Jiao Tong Ranking of World Universities.

The University has three faculties, seventeen academic schools and hundreds of specialist research groups undertaking pioneering multi-disciplinary teaching and research of worldwide significance. More than 6000 academic and research staff, and a further 5000 support staff spearhead the research and teaching activity in the university. Manchester has the largest student community in the UK, with more than 26000 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.

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THE CITY

Manchester is an exciting and vibrant city which has earned an international reputation for its imaginative approach to urban regeneration and its lively, contemporary music and club scene. Once famous as the birthplace of the Industrial Revolution and a centre for manufacturing, it is now an international centre for business, retailing, banking and financial services. The city has award- winning museums, galleries and theatres, including the Imperial War Museum North, the City Art Gallery, the University's own Manchester Museum and Whitworth Art Gallery, the Museum of Science and Industry, the Royal Exchange Theatre and the Lowry Centre.

THE REGION

Manchester is a tourist centre in itself, and is within easy reach of the Peak District National Park, the Lake District, the towns of the Lancashire coast, the ancient town of Chester and the mountains of North Wales. Its national and international network of airline routes, rail links and motorways, means that Manchester has a significant role as a gateway to all areas of the country. Easily accessed by Manchester Airport, the second largest in the UK, the city is only two and a half hours from London and there are direct flight connections to many North American and European cities, as well as to destinations such as Hong Kong, Johannesburg, and Singapore.