

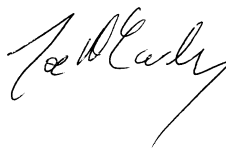


RadioNet support for Short Term Missions (staff exchange)

Application form

STM INFORMATION	
APPLICANT 'S NAME	P.J. McCauley
APPLICANT'S AFFILIATION	<i>School of Physics, Trinity College, Dublin, Ireland</i>
HOST INSTITUTE	<i>ASTRON, Hans Jense, jense@astron.nl</i>
DATE OF THE STM	Q3 2018
TOTAL COST OF STM	~€900
OTHER SOURCES OF FUNDING	<i>n/a</i>
Request <i>(max. 2,5 pages without signature part)</i>	
Topic	<p><i>The purpose of this STM is twofold.</i></p> <ol style="list-style-type: none"> <i>1. The exchange of information on science and technical operating practices, the current state of the LOFAR software platform and the roadmap for its evolutionary development.</i> <i>2. As part of the LOFAR Efficiency improvement project, to investigate the development of the automated handover of international LOFAR stations to local mode during normal ILT time for opportunistic observations during times when such stations are not actually in use for ILT observations. For IE613, this would allow space weather monitoring during ILT time when the Irish station is not actually in use for ILT observations. This also affords the possibility of more maintenance windows should those be necessary</i>
Proposed work	<p><i>ASTRON proposes initially to host a 2-day meeting with I-LOFAR staff in the second half of 2018 to exchange information on aspects of technical operations of an International LOFAR station. In addition, this meeting will establish the feasibility and timeline for the work required to develop the International LOFAR station automated handover capability described above. Further visits may be necessary as this aspect of the work develops.</i></p>
Cross-disciplinary	<p><i>Although staff at the Irish LOFAR station have been running the station for almost a year, this is being done with no training or background in the LOFAR system and LOFAR operations. This STM would help rectify this deficit in local knowledge.</i></p>
Impact	<p><i>A solution to automated handover of International stations (topic two above) to local operators would be applicable to <u>all</u> International LOFAR stations thus increasing the utility and efficiency of the LOFAR infrastructure across Europe by utilisation of gaps in the ILT schedule during which individual international stations are not being used.</i></p>
Curriculum Vitae	<p><i>A CV is enclosed</i></p>

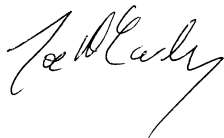
Privacy Policy: With signing this template and applying for RadioNet funding, I accept the Privacy Policy of RadioNet, which is based on the EU General Data Protection Regulation (GDPR).



Place & Date: Dublin, June 30th

Signature of the applicant:

30 June 2018, Joe McCauley,
joe.mccauley@tcd.ie



.....
Date and Signature
of the applicant

I confirm that the proposed STM is in compliance with the agenda of my organisation

30 June 2018, Prof Peter T. Gallagher,
peter.gallagher@tcd.ie

.....
Date and Signature
of the director of the home institute

Background

In April 2018 work has started on the LOFAR Efficiency Improvement project, which has the following objective: *To provide a robust, future-proof, evolvable and efficient architecture and software environment for monitoring and control of the current LOFAR system.*

Phase I of the project, scheduled to be completed by April 2019, aims to redesign the overall architecture of the system and in particular replace or re-implement a number of databases, software modules and interfaces, which is expected to significantly enhance the operational and developmental efficiency of the LOFAR software platform.


One of the opportunities to be offered by the improved and enhanced LOFAR s/w platform is the development of the automated handover of international LOFAR stations to local mode during normal ILT time for opportunistic observations, thereby further increasing the productive use of the ILT infrastructure.

Approach

ASTRON proposes to host a 2-day meeting with I-LOFAR staff in the second half of 2018 in order to

- exchange information on science and technical operating practices, the current state of the LOFAR software platform and the roadmap for its evolutionary development, and
- establish the feasibility, scope and schedule for the work required to develop an automated handover capability.

This meeting will be supported by ASTRON staff from all relevant departments and groups, e.g., Astronomy, the Radio Observatory, and Research and Development.



29.06.2018

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Brief Bio:

Joe McCauley is a Senior Experimental Officer for the School of Physics and the Rosse Solar Terrestrial Observatory, with responsibility for instrument design and implementation. He is also Station Manager for the Low Frequency Array (LOFAR) at Birr Castle. He has extensive experience in electronics and instrumentation for solar radio astronomy, and is responsible RFI surveying and mitigation at the Rosse Observatory and ILOFAR.

Qualifications

Post Graduate Diploma in Project Management, Trinity College Dublin, (2012)

M.Sc. Trinity College Dublin. *The design and Construction of a 25 Tesla Pulsed Magnetic Field System.* (2008)

NCEA Diploma in Electronics. Dundalk IT. (1982)

Current Employer	From	To
The School of Physics, Trinity College.	1985	To date

Current position Senior Experimental Officer

Current Duties

My duties include research support, teaching, electronics design and software design. In addition to this, I have served as school safety officer since 2000.

Research related work

2011 – date. Irish member at the Committee on Radio Astronomy Frequencies (CRAF).
CRAF is an expert committee of the European Science Foundation whose function is to defend allocated radio astronomy frequencies.

Project manager for the construction of the Irish Low Frequency Array radio telescope ILOFAR (www.lofar.ie) at the Rosse Solar Terrestrial Observatory at Birr, Co. Offaly, Ireland. LOFAR is a European wide (centred in the Netherlands) radio telescope system.

Station manager for ILOFAR since it began operations in 2017. Responsible for radio interference monitoring and mitigation, developing station operations code, training, maintenance and all other aspects of station operation.

Responsible for all aspects of the implementation of a radio observatory in Birr Co. Offaly as part of the research effort of the Astrophysics research group in the School of Physics. This observatory currently forms part of an international network performing solar radio observations between 10 and 400MHz. The data are displayed on the observatory website in real time and sent to the international hub in Zurich for archiving.

A selection of other research projects I have been involved with include:

- Design of a system to measure the response of a novel graphene based force sensor.
- Design of an experiment for shear exfoliation of graphene nanosheets.
- Design of an automated light pollution monitoring/data collection system.
(Hardware/Software)
- Design of a system for evaluation of the breakdown of oxides in suspension under high voltage fields. (Hardware/Software)
- Design of a system for evaluating hydrogen storage in nano-materials.
(Hardware/Software)
- Design and implementation of an apparatus to study the sedimentation processes of nanowires in solvents. (Hardware/Software)
- Design and implementation of an apparatus for electrospinning nanotube membranes. (Hardware)
- An experiment for the study of granular media (foams). (Hardware/Software)
- Design & implementation of a 25 Tesla pulsed magnetic field system. This system was the subject of my M.Sc. thesis and involved the following:
 - Design and implementation of a high voltage charging system with all safety systems.
 - Design and construction of the high field magnet coil.

- Design of the cryogenic cooling handling system.
- Design and implementation of magnetometer pick-up coils and a sample magnetization measurement system.
- Design and implementation of a 3-axis magneto resistance measurement system.
- Writing all associated control and data acquisition software (both for PC and the embedded controllers used in the system hardware)
- A vibrating-sample magnetometer using permanent magnets. (Hardware/Software)
- A portable soil magnetometer using permanent magnets. (Hardware)
- An 8 Tesla short duration pulsed field magnet. (Hardware)

I have been responsible for the design and implementation of an astronomical observatory for the School of Physics.

(<http://www.tcd.ie/Physics/Astrophysics/observatory.php>) The observatory currently includes a low frequency solar activity monitor, a 21 cm radio telescope, a solar telescope and a 3 meter observatory dome housing a 14 inch Schmitt-Cassegrain telescope.

Teaching

Currently teaching half of the JS (third year) instrumentation course. (16 hours + tutorials & examinations.)

Working with 4th year undergraduate students, on astrophysics projects.

Safety

I also serve as the school safety officer, which involves responsibility for all aspects of safety in the school including:

- Training of staff & students
- Recordkeeping
- Lab inspections

Previous Employment

Mostek Ireland Ltd. From January 1985 to June 1985

Maintenance technician. I was responsible for maintenance of equipment on a semiconductor production line. The equipment included automatic wire bonding and automatic die placement machines.

Video Games (Ireland) Ltd. From August 1983 to December 1985

Workshop technician. I was responsible for the repair of microprocessor logic boards based on the following processor architectures:

68000, 6800, 6502, 6805, 6809, TMS9900, 1820 etc.

I was also responsible for the repair of video monitors and power supplies.

Computer skills

I am familiar with the following programming languages:

Labview, Python, Microsoft Visual Basic, IDL, Lab Windows, Borland C and Microsoft Visual C. I write all the software necessary for equipment/experiments I design.

I am also competent in database development, web development, PHP and ASP programming for the World Wide Web.

I also use the following software on a regular basis:

- Microsoft Office. (Word, Excel, Access and Powerpoint.)
- Autocad (General purpose mechanical/Architectural drafting program.)
- Solidworks. (Mechanical CAD)
- Altium (Schematic capture and PCB design.)
- Isocam (Isolation milling software for production of PCBs.)
- National Instruments Multisim (Electronic circuit simulation.)
- Mathcad (Equation solving/documenting software)
- Origin (Graph plotting software)
- Adobe Photoshop.

Embedded systems development

I have 30+ years of experience in embedded systems design and programming using both assembly and C. I have designed systems using the following processor architectures:

- Microchip PIC based MCUs (16C54, 16C74, 16F876, 16F877, 17C44, PIC18F4550, PIC24F family etc.)
- Arduino & related systems
- Atmel AVR CPUs
- Intel 8051 based MCUs (8051, 8751, 80535, 80537 etc.)
- Z80 based systems
- 6502 based systems

- 6800 based systems

Publications

Papers:

- Laura A. Hayes, Peter T. Gallagher, Joseph McCauley, Brian R. Dennis, Jack Ireland, Andrew Inglis. "Pulsations in the Earth's Lower Ionosphere Synchronized with Solar Flare Emission", *Journal of Geophysical Research: Space Physics*. 122. 10.1002/2017JA024647
- Blake, Seán. P.; Gallagher, Peter T.; McCauley, Joe; Jones, Alan G.; Hogg, Colin; Campanyà, Joan; Beggan, Ciarán. D.; Thomson, Alan W. P.; Kelly, Gemma S.; Bell, David . "Geomagnetically induced currents in the Irish power network during geomagnetic storms", *Space Weather*, Volume 14, Issue 12, pp. 1136-1154
- Eswaraiah Varrla, Keith R. Paton, Claudia Backes, Andrew Harvey, Ronan J. Smith, Joe McCauley and Jonathan N. Coleman. "Turbulence-assisted shear exfoliation of graphene using household detergent and a kitchen blender", [Nanoscale](#), 2014, 6, 11810-11819
- B. Espey, J. McCauley, "Initial Irish light pollution measurements and a new Sky Quality Meter-based data logger", *Lighting Res. Technol.* 2014; Vol 46: 67–77
- Eoin P. Carley, David M. Long, Jason P. Byrne, Pietro Zucca, D. Shaun Bloomfield, Joseph McCauley and Peter T. Gallagher, "Quasiperiodic acceleration of electrons by a plasmoid-driven shock in the solar atmosphere", *Nature Physics* 9, 811–816 (2013)
- P. Zucca, E.P. Carley, J. McCauley, P.T. Gallagher, C. Monstein, R.T.J. McAteer. "Observations of Low Frequency Solar Radio Bursts from the Rosse Solar-Terrestrial Observatory", *Sol Phys* (2012) 280: 591.
- Blond D, Blighe F, Walshe W, McCauley J, Carpenter L, Almecija D, Blau WJ, Coleman JN, "Strong, tough electrospun polymer-nanotube composite membranes with extremely low density". *Advanced Functional Materials*, 2008 Volume 18, Issue 17, p. 2618-2624.
- V. Nicolosi, D. Vrbancic, A. Mrzel, J. McCauley, S. O'Flaherty, D. Mihailovic, W. J. Blau and J. N. Coleman, "Solubility of Mo₆S_{4.5}I_{4.5} nanowires", *Chemical Physics Letters* 401 13 (2005).

- V. Nicolosi, D. Vrbancic, A. Mrzel, J. McCauley, S. O'Flaherty, D. Mihailovic, W. J. Blau and J. N. Coleman, "Solubility of $\text{Mo}_6\text{S}_{4.5}\text{I}_{4.5}$ nanowires in common solvents: A sedimentation study", *Journal of Physical Chemistry B*, 2005, 109, 7124-7133.
- Ranno, L.; Viret, M.; Valentin, F.; McCauley, J.; Coey, J. M. D., "Transport and magnetic properties of $\text{A}_{1-x}\text{B}_x^{2+}\text{MnO}_3$ (A = La, Y or Nd, B = Ca, Sr or Ba) magnetic perovskites", *Journal of Magnetism and Magnetic Materials*, Volume 157, p. 291-292
- O. Cugat, R. Byrne, J. McCaulay, and J. M. D. Coey, "A compact vibrating-sample magnetometer with variable permanent magnet flux source", *Rev. Sci. Instrum.* 65, 3570
- J.M.D. Coey, O. Cugat, J. McCauley and J.D. Fabris, "A portable soil magnetometer.", *Revista de Física Aplicada e Instrumentação* 7 (1992) 25.
- MCCAULAY J., BYRNE H., DENNIS W. M., SHEN G., BLAU W., "Thyratron-based pockel cell driver for single pulse switch-out in mode-locked lasers", *Optics and laser technology (Opt. laser technol.)*, vol. 21, n°6, pp. 401-405 (6 ref.)

Conference Posters:

- ASGI Spring 2010, Queens University Belfast. Preliminary Results of Night-Sky Brightness Using a Unihedron Sky Quality Meter (SQM)
- CNTNET 07 in Cambridge, UK from the 10th to the 12th September: -
"Mechanical Properties of Carbon Nanotubes / polyvinyl Alcohol Composites Produced by Electrospinning"
- MRS fall meeting conference in Boston USA (November 27th to December 1st 2006) – "Mechanical Properties of Carbon Nanotubes / polyvinyl Alcohol Composites Produced by Electrospinning"
- European Foam Conference (EUFOAM) in July 2006 in Potsdam (Germany) –
Wet foam – a soft granular medium?

Languages

French

Interests and hobbies

Electronics, astronomy/astrophotography, swimming, photography, walking, reading, scuba diving and travel.

