# Position Details

## CSIRO Early Research Career (CERC) Engineering Fellowship– CSOF4

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| The following information is for applicants | |
| Advertised Job Title | CSIRO Engineering Fellowship in Superfast, Wide-field Radio Cameras for Aperture Arrays |
| Job Reference | 99215 |
| Tenure | Specified Term of 2 years  Full-time |
| Salary Range | AU$99,990 - AU$109,527 pa (pro-rata for part-time)  plus up to 15.4% superannuation |
| Location(s) | Marsfield, NSW (or Kensington, WA) |
| Relocation Assistance | Will be provided to the successful candidate if required |
| Applications are open to | All Candidates |
| Position reports to the | Team leader, Space & Astronomy |
| Client Focus – Internal | 80% |
| Client Focus – External | 20% |
| Number of Direct Reports | 0 |
| Enquire about this job | Contact Dr. Nithyanandan Thyagarajan via email at Nithyanandan.Thyagarajan@csiro.au or phone +61 8 6436 8626 |
| How to apply | Apply online at <https://jobs.csiro.au/>  Internal applicants please apply via **Jobs Central**  If you experience difficulties when applying, please email [careers.online@csiro.au](mailto:careers.online@csiro.au) or call 1300 984 220. |

**Acknowledgement of Country**

CSIRO acknowledges the Traditional Owners of the land, sea and waters, of the areas that we live and work on across Australia. We acknowledge their continuing connection to their culture and pay our respects to their Elders past and present. View our [vision towards reconciliation](https://www.csiro.au/en/about/Indigenous-engagement/Reconciliation-Action-Plan).

**Child Safety**

CSIRO is committed to the safety and wellbeing of all children and young people involved in our activities and programs. View our [Child Safe Policy](https://www.csiro.au/en/about/policies/child-safe-policy).

### Role Overview

**CSIRO Early Research Career (CERC) Fellowships** provide opportunities to scientists and engineers who have completed their doctorate or masters and have less than three years relevant research experience. These Fellowships aim to develop the next generation of future leaders of the innovation system through:

* A differentiated career development program to deliver capability excellence and breadth across all facets of the national innovation system.
* Research training via strategic research and development projects with a clear focus that will deliver real impact through science and engineering excellence;
* An innovative culture supporting the development and demonstration of original thinking and expertise leading to peer-recognition; and
* Opportunities to develop skills and experience in collaborative research teams to effectively work within national and global multi/transdisciplinary and multi-stakeholder environments.

The CERC Fellow will develop an FPGA prototype of a groundbreaking all-sky radio camera for large aperture arrays that will occupy the landscape of modern radio astronomy. This innovative radio camera prototype will generate high-speed (over 1000 FPS) real-time images while consuming less than 5% of the energy of current methods. It addresses computational and bandwidth challenges, making it energy-efficient and cost-effective for discovering explosive and transient astrophysical phenomena. This high-speed, all-sky radio camera will be the first of its kind, revolutionizing our understanding of the fundamental nature of matter and high-energy phenomena in the universe.

This project will directly support several aperture array initiatives at CSIRO Space & Astronomy, including all-sky transient monitors, future lunar radio arrays, and a Low-frequency Australian Megametre Baseline Demonstrator Array (LAMBDA) concept that aims to extend Square Kilometre Array (SKA-low) by constructing SKA-low-like stations at CSIRO sites like Parkes and Narrabri. The prototype --designed for dense, large-N arrays-- will enhance LAMBDA’s capabilities and amplify the impact potential of large upcoming arrays like SKA-low. Compared to existing alternatives, the FPGA technology will be leveraged to achieve a larger processing and memory bandwidth when working with large aperture arrays. The project will be a pathfinder for fast, all-sky imaging with future mid-frequency aperture arrays consisting of thousands to tens of thousands of antennas being conceived by CSIRO Space & Astronomy and several international groups for monitoring the sky for transient phenomena at radio wavelengths.

The CERC Fellow will work in close collaboration with the principal investigator and radio astronomer, Dr. Nithyanandan Thyagarajan, and co-principal investigator and digital hardware engineering expert, Dr. David Humphrey, at CSIRO Space & Astronomy to develop a novel prototype addressing the extreme computational and data rate challenges faced by large aperture arrays of modern radio astronomy. The CERC Fellow will have the unique advantage of working with co-located engineers and astronomers at CSIRO Space & Astronomy, which is world-renowned for its technological and scientific innovations.

### Duties and Key Result Areas

Under the direction of senior research scientists and engineers, this CERC Fellow will:

* Develop the FPGA-based all-sky, high frame rate radio camera prototype for large aperture arrays, with initial focus on existing or imminent arrays like SKA-low precursors and LAMBDA.
* Benchmark and optimise the performance of the prototype for real deployment.
* Commission the deployment and analyse initial science data.
* Extend the prototype development to future large arrays for monitoring transient phenomena.
* Explore applications on other aperture array systems outside astronomy that require ultrafast, wide field-of-view imaging such as space situational awareness, multi-satellite communication, etc.
* Publish the prototype in relevant international engineering journals and conferences
* Publish results and methods in relevant international journals (and conferences) and release codes on repositories such as GitHub.
* Explore IP and commercialisation opportunities where applicable.
* Collaborate with members of a diverse project team and external partners to ensure research leads to lasting application impact.
* Carry out innovative, impactful research of strategic importance to CSIRO that will, where possible, lead to novel and important scientific outcomes.
* Recognise and exploit opportunities for innovation and the generation of new technological approaches, and progress opportunities for the further development or creation of new lines of research.
* Carry out research investigations requiring originality, creativity and innovation.
* Record, manage, and analyse data/information using relevant domain technologies and data science techniques
* Proactively undertake development to grow effective researcher capabilities to support career goals.
* Adhere to the spirit and practice of CSIRO’s Values, Code of Conduct, Health, Safety and Environment procedures and policy and diversity initiatives.
* Other duties as directed.

The CERC Fellow learning, development and training programis developed between the CERC Fellow and their CSIRO supervisor. The program will focus on enhancing the Fellow’s capabilities to the level expected of an independent researcher and will include on-the-job and course-based development encompassing:

* Discipline-specific techniques and protocols
* Professional growth
* Project management
* Communication and influencing skills
* Working and collaborating with others

## **Selection Criteria**

#### Essential

*Under CSIRO policy only those who meet all essential criteria can be appointed.*

1. A doctorate (or will shortly satisfy the requirements of a PhD) OR hold an engineering degree plus a Master of Science (MSc) or Master of Engineering (MEng) qualifications (or will shortly satisfy the requirements of a masters) plus equivalent levels of original and significant contributions to research and development to that expected of someone of a new PhD graduate. The doctorate or masters must be in a relevant discipline area, such as Electrical engineering, Computer Science/engineering, Astrophysics/Physics, Mathematics, Software Engineering, or similar.

Please note: To be eligible for this role you must have at least one year of relevant research experience, but no more than six full-time equivalent years of relevant experience since confirmation of your doctorate at the end of this postdoctoral term or conferral of your masters degree (in the case of a masters graduate)

1. Demonstrated expertise in implementation of real-time Signal Processing algorithms.
2. Demonstrated expertise in high-level programming language(s) such as Python or similar.
3. High level written and oral communication skills with the ability to represent the research team effectively internally and externally, including the presentation of research outcomes at national and international conferences.
4. A sound history of publication in peer reviewed journals and/or authorship of scientific papers, reports, grant applications or patents.
5. A record of science innovation and creativity, including the ability & willingness to incorporate novel ideas and approaches into scientific investigations.

## **Desirable**

1. Experience with FPGA programming.
2. Experience with GPU programming.
3. Reasonable understanding of interferometry and Fourier transforms.
4. Reasonable understanding of image processing.
5. The ability to remain productive, positive and resilient in complex, ambiguous and/or uncertain environments.
6. **The ability to work effectively as part of a multi-disciplinary, potentially regionally dispersed research team, plus the motivation and discipline to carry out autonomous research.**

## **Required Competencies**

* **Teamwork and Collaboration:** Cooperates with others to achieve organisational objectives and may share team resources in order to do this. Collaborates with other teams as well as industry colleagues.
* **Influence and Communication:** Uses knowledge of other party's priorities and adapts presentations or discussions to appeal to the interests and level of the audience. Anticipates and prepares for others reactions.
* **Resource Management/Leadership:** Allocates activities, directs tasks and manages resources to meet objectives. Provides coaching and on the job training, recognises and supports staff achievements and fosters open communication in the team.
* **Judgement and Problem Solving:** Investigates underlying issues of complex and ill-defined problems and develops appropriate response by adapting/creating and testing alternative solutions.
* **Independence:** Recognise and makes immediate changes to improve performance (faster, better, lower cost, more efficiently, better quality, improved client satisfaction).
* **Adaptability:**Copes with ambiguity or situations that lack clarity. Adapts readily to changing circumstances and new responsibilities (which may include activities outside own preferences) in the interests of achieving team objectives. Recognises the need for and undertakes personal development as a result of changes.

To be appointed to this CERC Fellowship role within CSIRO, candidates are required to have **submitted** their doctoral or master thesis at the time of commencement with a minimum of one year and maximum of 4 years’ relevant research experience. If a candidate has submitted, but their PhD or Masters has not yet been formally attained, the starting salary will be CSOF4-1. Upon CSIRO receiving written confirmation that the PhD or masters has been awarded (within a six month period from commencement date), the salary will be increased to the negotiated level and the difference will be back-paid to the Officer’s start date.

Special Requirements

Appointment to this role is subject to provision of a pre-employment background check and may be subject to other security/medical/character clearance requirements.

* The successful candidate will undertake a pre-employment background check. Please note that individuals with criminal records are not automatically deemed ineligible. Each application will be considered on its merits.
* If the successful candidate is not an Australian Citizen or Permanent Resident, they may be required to undergo additional security clearances, which may include medical examinations and an international standardised test of English language proficiency (i.e. IELTS test).- https://ielts.com.au/

**Our value proposition**

We want CERC Fellows to join our world class science, engineering and digital teams to solve big, complex problems that make a real difference to the future of Australia and the world.

You'll get to work with some of the most talented minds in their fields, not just in Australia, but in the world. At CSIRO, we spark off each other, learn from each other, trust each other and collaborate closely to achieve more than we could individually.

CSIRO Early Research Career (CERC) Fellow Experience Employee Value Proposition (EVP). Find out more [here](https://www.csiro.au/en/careers/career-opportunities/Postdoctoral-fellowships)!

## **About CSIRO**

We solve the greatest challenges through innovative science and technology. Visit [CSIRO Online](http://www.csiro.au/) and [Space and Astronomy](https://www.csiro.au/en/about/people/business-units/Space-and-Astronomy) for more information.

CSIRO is a values-based organisation.  In your application and at interview you will need to demonstrate behaviours aligned to our values of:

* People First
* Further Together
* Making it Real
* Trusted