# Position Details

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

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| The following information is for applicants |
| Advertised Job Title | CSIRO Postdoctoral Fellowship in Radio Astronomy: Discovering Cosmic Dawn |
| Job Reference | 76147 |
| Tenure | Specified Term of 3 years Full-time or Part-time >55 hours/ftn |
| Salary Range | AU$88,163 to AU$96,573 pa (pro-rata for part-time) + up to 15.4% superannuation |
| Location(s) | Marsfield (Sydney)Kensington (Perth)Based at one with frequent interaction and visits (sometimes extended) to the other. |
| Relocation Assistance | Will be provided to the successful candidate, if required |
| Applications are open to | Australian/New Zealand Citizens, Australian Permanent Residents and Australian temporary residents currently residing in Australia (visa sponsorship may be provided to eligible onshore candidates) |
| Position reports to the | Group Leader, Signal Processing Technologies |
| Client Focus – Internal | 100% |
| Client Focus – External | 0% |
| Number of Direct Reports | 0 |
| Enquire about this job | Contact Dr. Aaron Chippendale via email at Aaron.Chippendale@csiro.au or phone +61 2 9372 4296 |
| 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 or call 1300 984 220. |

### Role Overview

**CSIRO Early Research Career (CERC) Postdoctoral Fellowships** provide opportunities to scientists and engineers who have completed their doctorate and have less than three years relevant postdoctoral work experience. These fellowships aim to develop the next generation of future science 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.

CERC Postdoctoral Fellows **are appointed for three years or part time equivalent.**

The Postdoctoral Fellow will build and deploy a sensitive spectral radiometer to detect the redshifted 21 cm radio signal from neutral hydrogen during the Cosmic Dawn.  They
will commission and observe with the new radiometer at the Square Kilometre Array (SKA) site in Western Australia before deploying to more remote sites at land and sea. Advanced mathematical statistical analysis will be required to detect and measure weak 21 cm signals in the recorded spectra. The challenge is in the necessary precision calibration of the instrument and the development of algorithms to detect weak spectral signatures predicted by cosmology.  The cosmic signatures must be carefully separated from the much brighter radio emissions of our Galaxy and our built environment.

Discovering the physics of the emergence of first stars and ultra-faint galaxies from primordial gas is a key goal of modern astrophysics and the Square Kilometre Array.   Single-antenna radiometer detection of cosmic dawn is a complementary effort.  It is a first step that will pave the way for more detailed studies with the SKA-Low that is being built in Western Australia.  At the project’s conclusion, the Postdoctoral Fellow will be empowered with the theoretical understanding and the experimental experience necessary to lead key science with SKA-Low.

CSIRO Space & Astronomy (S&A) is committed to providing a safe and inclusive workplace culture and implementing initiatives to improve diversity and equity within our workplace. CSIRO offers a range of flexible working arrangements to support these initiatives including part time and job-sharing options. You will have input on how, when and where you work.

### Duties and Key Result Areas:

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

* + Undertake system-level design and modelling of antennas, sensitive radio receivers, and associated digital systems for data acquisition and signal processing.
	+ Perform laboratory verification tests to iteratively advance the system design.
	+ Field test the radiometer on an existing SKA SKA-Low antenna at the SKA site.
	+ Deploy the precision instrument at a remote site, measuring the cosmic radio spectrum, and deciphering the physics of Cosmic Dawn.
	+ Develop an understanding of the theoretical foundations of physics of Cosmic Dawn and the following epoch of reionisation.
	+ Work with domain specialists towards development of new antennas and receiver architectures to surpass previous work.
	+ Establish offline calibration pipeline software, including RFI excision.
	+ Undertake statistical analysis of the data over models of the universe and the receiving system including frequentist and Bayesian (Markov chain Monte Carlo) approaches.
	+ Infer consequences of the data for astrophysics.
	+ Support the patenting of innovations in precision receiver and antenna design.
	+ Support the exploration of commercial applications beyond astronomy, including satellite communications, earth observation, and ground-penetrating sensing. This may include access to commercially sensitive information of CSIRO and/or research or commercial partners.
	+ 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 theoretical perspectives, and progress opportunities for the further development or creation of new lines of research.
	+ Utilise design thinking methodology to plan and prepare research proposals and apply non-academic impact methodology to research projects.
	+ Carry out research investigations requiring originality, creativity and innovation.
	+ Record, manage, and analyse data/information using relevant domain data science techniques.
	+ Proactively undertake development to grow effective researcher capabilities to support career goals.
	+ Adhere to the spirit and practice of CSIRO’s Code of Conduct, Health, Safety and Environment procedures and policy, Diversity initiatives and Making Safety Personal goals.
* Other duties as directed.

[**The CERC Postdoctoral Fellow learning and development program**](http://www.csiro.au/en/Careers/Student-and-graduate-programs/Postdoctoral-fellowships)is developed between the CERC Postdoctoral Fellow and their CSIRO supervisor. The program will focus on enhancing the Fellows’ 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

## **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.

## **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) in a relevant discipline area, such as electronic engineering, physics, astronomy or equivalent.

Please note: To be eligible for this role you must have **no more than 3 years** (or part time equivalent) of postdoctoral research experience.

1. A current driver’s licence and/or eligibility for an Australian Class C (car) driver’s licence.
2. Ability and willingness to work safely at remote (domestic) field sites.
3. Demonstrated computer programming experience in Python (or equivalent).
4. **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.**
5. 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.
6. A sound history of publication in peer reviewed journals and/or authorship of scientific papers, reports, grant applications or patents.
7. A record of science innovation and creativity, including the ability & willingness to incorporate novel ideas and approaches into scientific investigations.

## **Desirable:**

1. Knowledge of the principles and techniques of radio measurements including antennas, receivers, radio frequency systems, radiometers, digital signal processing, or any other instrumentation or techniques relevant to radio astronomy.
2. Knowledge of observational astrophysics and cosmology.
3. Knowledge of modern statistical methods.
4. Aptitude for system development, testing, integration and verification in a collaborative environment.
5. Experience with managing, visualising, and analysing data from real instruments.
6. Flexibility to periodically travel (or electronically interact across time zones) to foster strong research links with collaborators and attend international conferences and meetings.
7. Remain productive, positive and resilient in complex, ambiguous and/or uncertain environments.

To be appointed to this CERC Postdoctoral Fellowship role within CSIRO, candidates will be expected to commence employment by December 2021/January 2022. To be appointed as a CERC Postdoctoral Fellow within CSIRO, candidates are required to have **submitted** their PhD at the time of commencement, as a minimum requirement, if PhD conferment has not been obtained. If a candidate has submitted, but their PhD has not yet been formally attained, the starting salary will be CSOF4-1 ($85,361). Upon CSIRO receiving written confirmation that the PhD 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 may be subject to conditions including provision of a national police check as well as other security/medical/character clearance requirements.

* The successful candidate will be asked to obtain and provide evidence of a National Police Check or equivalent. Please note that people 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 Postdoc 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) Postdoctoral Fellow Experience Employee Value Proposition (EVP). Find out more [here](https://www.csiro.au/en/careers/postdoctoral-fellowships)!

## **About CSIRO:**

We solve the greatest challenges through innovative science and technology. To find out more visit us [online](http://www.csiro.au/)!

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

* 1. People First
	2. Further Together
	3. Making it Real
	4. Trusted

Find out more about [CSIRO Space and Astronomy](https://www.csiro.au/en/research/technology-space/astronomy-space)