Australian SKA Regional Centre

Annual Report

Financial Year 2023 – 2024

aus | SRC

SKAO Regional Centre Australia

Australian Government

Curtin University

pawsey

THE UNIVERSITY OF WESTERN AUSTRALIA

AusSRC Acknowledgement Statement

The Australian SKA Regional Centre (AusSRC) is a joint venture between CSIRO – Australia's national science agency, Curtin University, the Pawsey Supercomputing Research Centre, and The University of Western Australia.

The AusSRC project is Australia's portion of the international SKA Regional Centre Network (SRCNet). This project received grant funding from the Australian Government.

Acknowledgement of Country

AusSRC pays respect to the Aboriginal and Torres Strait Islander members of our community by acknowledging the Traditional Owners of the land on which our AusSRC offices are located, the Whadjuk People of the Noongar Nation.

We also acknowledge the Wajarri Yamaji as the Traditional Owners and Native Title Holders of Inyarrimanha Ilgari Bundara, the CSIRO Murchison Radio-astronomy Observatory.

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1 Foreword from the Board Chair

This Annual Report covers the first nine months of operations of AusSRC. AusSRC represents the Australian node of the international computing network being established to facilitate user access to data from the SKA Observatory (SKAO).

AusSRC commenced operations in September 2023 following the signing of a Joint Venture Agreement by our four joint venture partner organisations, CSIRO – Australia's national science agency, Curtin University, the Pawsey Supercomputing Research Centre and The University of Western Australia. With $63.1M from the Australian Government and $28.8M from joint venture partner organisations, AusSRC has an initial 10-year funding envelope but expects to be active for the estimated 50-year life of the SKA telescopes.

As a key part of the user access interface for the SKAO, AusSRC needs to develop the software and expertise necessary to enable access by researchers, and acquire relevant hardware for data distribution, processing and storage.

The SKA telescopes, SKA-Low and SKA-Mid, are currently under construction in Australia and South Africa respectively, with significant data products expected to begin to flow by the end of the decade. A collaborative international effort is underway to ensure the SKA Regional Centre Network (SRCNet) data delivery network is in place to deliver those data products to researchers around the globe.

AusSRC's initial nine months has, in part, been devoted to establishing the organisation, hiring staff, developing policies and systems and working with partners, especially UWA as the centre agent that holds and manages our grant funds.

Our astronomy work has focused on working with the SKA precursor telescopes, CSIRO's ASKAP radio telescope and the Curtin University-led Murchison Widefield Array (MWA), developing data management strategies and workflows to build our capacity for the much larger data processing and storage task presented by the SKA telescopes. In addition, our staff are contributing to the SRCNet international design effort, and to prototyping and testing elements of the developing global data network.

AusSRC also seeks to share relevant information and knowledge with the broader research sector, industry and the public. From better understanding the Universe to practical innovation in computing, data management, sensors and more, the SKA project promises to advance our understanding and provide wider community benefits.

The Joint Venture Agreement establishes a governing Board made up of partner representatives and independent members. I thank the Board for its valuable contributions and diligent efforts over the initial months of AusSRC's operations. The SKA project is an exciting collaboration that promises to deliver transformational science. We appreciate the support of the Australian Government through the Department of Industry, Science and Resources (DISR) and our four foundation collaborator organisations in helping deliver on that promise.

Patricia Kelly

Chair, AusSRC Board

2 Foreword from the Director

It is with pride and enthusiasm that I present the first Annual Report of the AusSRC, marking the culmination of a great inaugural year (or at least a great first nine months)! Since commencing operations in September 2023, AusSRC has made rapid progress, laying the foundations for what is becoming a nationally significant capability supporting Australian and international science using the SKA and precursor telescopes.

The scope of work covered in this initial period has been vast, ranging from organisational establishment and team recruitment, to developing scientific workflows and technical infrastructure. With just nine staff at the close of FY2023/24, AusSRC has already demonstrated meaningful impact by enabling cutting-edge science from the ASKAP and MWA telescopes, and by contributing to the development of the international SRCNet.

The AusSRC Software Development and Science Support Teams continue to support multiple SKA precursor science projects, developing scalable data post-processing pipelines and strengthening global collaborations. Meanwhile, AusSRC has also begun establishing essential operational and financial frameworks, built new links with the wider research community, and engaged in outreach to inspire the next generation of scientists and engineers.

Our vision to empower transformative science within the SKA project, and to position Australia as a global leader in radio astronomy data infrastructure is already taking shape. The pace and scale of progress in just our first year is a testament to the dedication of our team, the support of our joint venture partner organisations, and the investment by the Australian Government.

Looking ahead, we are excited to continue scaling up AusSRC operations, expanding our technical capabilities, and deepening our contributions to SRCNet. As we move into our second year, we remain focused on our mission and are grateful to be playing a vital role in

of the world's most ambitious scientific endeavours.

Dr Karen Lee-Waddell

Director, AusSRC

3 About AusSRC

AusSRC plays a central role in preparing Australia for the transformational science that will be delivered by the SKA Observatory (SKAO). The Australian Government has provided funding of $63.1 million to support the operations of AusSRC for a ten year period (2022-2031). AusSRC officially began operations in September 2023, with the finalisation of the Joint Venture Agreement between CSIRO – Australia's National Science Agency, Curtin University, the Pawsey Supercomputing Research Centre and The University of Western Australia (UWA).

As part of the SKA project, comprising the SKA-Low and SKA-Mid telescopes under construction in Australia and South Africa respectively, AusSRC's goals include developing software, acquiring hardware access (including computing capacity, network connections, and storage), and providing expertise to support all aspects of producing publishable scientific results. AusSRC seeks to make a positive difference for Australian researchers across various science and computing fields, as well as the broader community, through supportive activities and targeted initiatives.

AusSRC forms part of the SRCNet, the international computing and data delivery network that will enable the ground-breaking science of the SKAO. SRCNet has the critical role of providing the user-access interface researchers will use to conduct analysis on SKA data products. AusSRC is currently working with SKA precursor telescopes to develop the scalable data analysis strategies and automated workflows that will be required to analyse data from the SKA telescopes. AusSRC is also making contributions to the international program to prototype operational aspects of SRCNet, including testing data distribution mechanisms and archiving frameworks, and building data pipelines and user interfaces.

3.1 AusSRC's Goals

AusSRC's vision is to fundamentally enable the scientific output of the Australian SKA community. AusSRC will be at the forefront of the international SRC effort and lead the delivery of SKA-Low science for Australian and international research communities.

AusSRC's work is running in parallel to SKA construction and we aim to have data and analysis-ready systems in place to receive SKA data products once available. To build expertise and capabilities, AusSRC is supporting SKA precursor telescopes, primarily the Curtin University-led Murchison Widefield Array (MWA) and CSIRO's ASKAP radio telescope, in the lead up to the SKA telescopes becoming operational.

AusSRC's goals are to:

- Provide human resources, software, and access to hardware to enhance user interaction with existing precursor data processing, archiving, and analysis facilities.
- Enable the production of advanced SKA precursor data products and the development of scalable analysis tools.
- Play a leading role in developing a global strategy for the creation, storage, and delivery of advanced SKA data products.

- Expand the ability of the Australian SKA science community to define the forefront of large-scale science programs, enhancing Australia's ability to lead and innovate in radio astronomy.
- Enable engagement with science and research communities outside of the SKA project and provide AusSRC infrastructure to new communities for a broader range of research returns.
- Deliver translation and impact projects with industry through co-development of data/computing intensive innovations enabled by exposure to exascale datasets.
- Deliver education and STEM outreach, training and community engagement on big data, machine learning, advanced technology, and data driven discovery.

4 AusSRC's Organisational Structure

4.1 Board

For the financial year 2023 –2024, the AusSRC Board membership is as follows:

Table 1: AusSRC Board Membership FY2023 - 2024

Board Member	Affiliation
Ms. Patricia Kelly	Board Chair (Independent)
Mr. Mark Stickells	Pawsey Supercomputing Research Centre
Dr John Reynolds	CSIRO
Prof. Peter Quinn	University of Western Australia
Prof. Steven Tingay	Curtin University
Mr. Clive Rossiter	Independent (Geoscience Australia)
Prof. Mary-Anne Williams	Independent (University of New South Wales)

The Board also had the support of two Advisors:

- Dr. Lewis Ball, SKAO
- Mr. Mark McAuley, Astronomy Australia Ltd

4.2 Recruitment and Staff Organisation

As of June 2024, AusSRC employs nine personnel. The organisation chart below (Figure 1) reflects AusSRC staffing as of 30 June 2024 and outlines functional management structure. All personnel are formally employed through one of AusSRC's collaborator institutions. AusSRC plans to employ a total of 23 full time equivalent (FTE) staff by early 2026.

Figure 1: AusSRC organisational chart, June 2024.

5 AusSRC Activities and Management

5.1 Software Development Team

5.1.1 Summary

The Software Development Team works with scientists using SKA precursor data, in support of their software development and data management requirements. While many of the projects the Software Development Team supports date back to the period preceding AusSRC's formal establishment, AusSRC continues to support these projects as they deliver immediate science results to current researchers. These projects will also be scaled for use with SKA data. Training workshops and code demonstrations have been held in conjunction with the AusSRC joint venture organisations enabling attendance by the wider research community.

In April 2024, Hasan Rayan joined as the AusSRC Head of Software Development. In addition, the Software Development Team has three full time software developers based at CSIRO and Curtin University.

5.1.2 Activities

The AusSRC Software Development Team continues to support and enhance the scientific output of the SKA precursor telescopes, ASKAP and MWA, actively working with several science teams from AusSRC's collaborator organisations.

The user portal developed by the Software Development Team enables researchers to access, post-process, and analyse project-level data products from the ASKAP and MWA telescopes. AusSRC infrastructure is able to handle images, data cubes, spectra, and catalogues, as well as the user-facing software required to work with data products.

Several of the AusSRC-developed pipelines are automatically triggered when new telescope data is added to the respective archive. These pipelines combine, convert, and/or run analysis workflows on the new data to produce source catalogues, image cutouts, and other publishable data products, as per the user's requirements. More specifically, each team has been supported in the following manner:

- **EMU** (Evolutionary Map of the Universe) is the ASKAP radio continuum survey aiming to map the southern sky with high sensitivity and resolution. The AusSRC-developed EMU Value-added Catalogue (EMUCat) pipeline combines continuum data, runs source finding, catalogues sources, and then runs enhanced cross-matching algorithms on millions of ASKAP sources with databases from other telescopes for streamlined comparison and identification.
- **WALLABY** (Widefield ASKAP L-Band Legacy All-Sky Blind Survey) is the ASKAP neutral hydrogen (HI) survey of the Local Universe, which aims to map all nearby HI sources in the Southern Hemisphere. The AusSRC-developed WALLABY pipelines combine spectral line data cubes, run an AusSRC-enhanced source finder (SoFIA-X), catalogues sources and their cut-outs, and then replicates the database by sending data internationally as part of the Canadian Initiative for Radio Astronomy Data Analysis project (CIRADA) for researchers to

run further modelling processes. The modelling results are then fed back into the AusSRC archive.

- **FLASH** (First Large Absorption Survey in HI) is a wide-area survey using ASKAP to search for the HI line in absorption against background radio continuum sources. The AusSRC-developed FLASH pipeline extracts and plots spectra, runs proprietary line finding software, and catalogues (potential) detections. FLASH's Consolidated HI Absorption Database (CHAD) was amalgamated by AusSRC developers and is hosted on the AusSRC system.
- **DINGO** (Deep Investigations of Neutral Gas Origins) is an ASKAP survey studying the evolution of HI by focusing all observing time to get deep (i.e. high-sensitivity) image cubes on selected patches of the sky. AusSRC has supported DINGO by running the WALLABY validation pipeline on data products and through co-funded personnel who have investigated large volume data storage methods to enable retention of more intermediate data products, which can be used for improved analysis techniques.
- **POSSUM** (Polarisation Sky Survey of the Universe's Magnetism) is a continuum polarisation survey of the entire southern sky using ASKAP, supported by AusSRC as a legacy project following the development of data processing pipelines.
- For **MWA**, AusSRC personnel have improved the capability of the entire MWA processing system. The enhancements have sped up computational time (two to eight times faster than previous methods) and reduced resource usage by optimising and streamlining intensive processes such as reading and writing operations. The enhancements have also improved the quality of the resultant data products that directly benefit high-sensitivity experiments, such as Epoch of Reionisation (EoR) science, which aims to explore the period when the first stars and galaxies formed.

The systems developed by AusSRC continue to be available for current researchers and science teams to work with and publish SKA precursor data. As capacity allows, AusSRC will continue to support and scale up science-enabling pipelines.

On 31 May 2024, AusSRC held a workshop focused on enabling researchers to transfer, process, and visualise data from MeerKAT, South Africa's SKA-Mid precursor telescope. This event helped to position Australian researchers as expert users of MeerKAT, further enabling Australian leadership within SKA-Mid's key science projects.

5.2 Science Support Team

5.2.1 Summary

The broad and diverse SKA science community will drive the requirements for the science support systems and capabilities AusSRC delivers. The Science Support Team will provide the necessary tools, services, and expertise to facilitate high-impact science.

In February 2024, Dr. Jordan Collier joined the AusSRC Management Team as the Senior Project Scientist at Curtin University, taking up leadership of AusSRC's Science Support Team to support local and international researchers utilising the SKA precursors, and the future SKA telescopes. Following Jordan's appointment, AusSRC commenced the recruiting process for an AusSRC Support Scientist.

5.2.2 Activities

AusSRC has engaged with the Inter-University Institute of Data-Intensive Astronomy (IDIA) in South Africa, which has built capacity and expertise in data-intensive research using the MeerKAT telescope, South Africa's SKA-Mid precursor. AusSRC and IDIA are exploring collaboration on technologies to facilitate SKA precursor science, including an emphasis on big data visualisation using the Cube Analysis and Rendering Tool for Astronomy (CARTA; https://cartavis.org), a next-generation image visualisation and analysis tool, scalable to big data in the era of the SKAO.

AusSRC will host a workshop in October 2024 for the CARTA development team, who are globally distributed between IDIA (South Africa), the Academia Sinica Institute of Astronomy and Astrophysics (ASIAA) (Taiwan), the National Radio Astronomy Observatory (NRAO) (USA), and the University of Alberta (Canada). This annual meeting allows CARTA developers to discuss the software's technical developments and roadmap, with an eye toward strategic future requirements, such as those for the SKAO. Key Australian researchers and software developers will be invited to contribute to the face-to-face sessions, focused on key areas such as time-domain astronomy.

The workshop will include an AusSRC-run showcase event for the Australian community, enabling researchers to directly interact with the CARTA software developers to learn about new features and discuss future improvements. As terabyte-scale images can be visualised within CARTA, engagement is strategically targeting Australia's large community of radio astronomers, some of whom are already using CARTA, and many of whom will drive its future requirements.

AusSRC is also working with DUG Technology (DUG), a commercial provider of High-Performance Computing on demand. An initial project is being undertaken to migrate processing of data from the GLEAM-X survey to DUG. This survey covers the entire Southern Sky using the MWA telescope, and the migration of survey data has begun in accordance with a project management framework designed to reduce cost and optimise throughput.

AusSRC support and development is ongoing for the MWA EoR project, as well as various large surveys from the ASKAP (i.e. WALLABY, POSSUM, EMU, FLASH, DINGO), enabling the production of advanced SKA precursor data products and analysis tools. AusSRC has also been prototyping improved data transfer methods using observations from the MeerKAT telescope, in order to support Australian-based researchers accessing these products.

Building on the current support model, AusSRC is in the early planning phase of issuing a future call for proposals to support SKA precursor science. We have started engaging with members of the Astronomy Data and Computing Services (ADACS), to inform and collaborate on our approach to this round of proposals, building on their successful Merit Allocation Program. Some other highlights include more efficient MWA data processing pipeline code developed by AusSRC software developers, allowing for an improvement in MWA science results. A list of AusSRC supported papers is provided in Table 2.

Table 2: AusSRC Publication List to end of financial year 2023-2024.

Year	Authors	Title	Journal
2024	Deg et al., including **Lee-Waddell**	WALLABY Pilot Survey: Gas-rich Galaxy Scaling Relations from Marginally Resolved Kinematic Models	The Astrophysical Journal DOI: 10.3847/1538-4357/ad84ba
2024	Murugeshan et al., including **Shen** and **Lee-Waddell**	WALLABY Pilot Survey: Public data release of ∼ 1800 H I sources and high-resolution cut-outs from Pilot Survey Phase 2	Publications of the Astronomical Society of Australia DOI: 10.1017/pasa.2024.91
2024	Sokolowski M, Aniruddha G, Di Pietrantonio C, et al.	High-time resolution GPU imager for FRB searches at low radio frequencies	Publications of the Astronomical Society of Australia DOI: 10.1017/pasa.2024.46
2024	Mould et al., including **Lee-Waddell** and **Shen**	WALLABY pilot survey: the Tully-Fisher relation in the NGC 4808, Vela, and NGC 5044 fields	Monthly Notices of the Royal Astronomical Society DOI: 10.1093/mnras/stae1522
2024	Yoon et al., including **German** and **Lee-Waddell**	The First Large Absorption Survey in HI (FLASH): II. Pilot Survey data release and first results	Publications of the Astronomical Society of Australia DOI: 10.1017/pasa.2025.10046
2024	Parra-Royon et al., including**Shen**	Asymmetric distribution of data products from WALLABY, an SKA precursor neutral hydrogen survey	Astronomical Data Analysis Software and Systems XXXI (proceedings) https://doi.org/10.48550/arXiv.2303.11670
2024	**Shen**, Reynolds	A globally distributed and scalable data post-processing framework for WALLABY science	Astronomical Data Analysis Software and Systems XXXI (proceedings)
2024	Heywood et al., including **Collier**	MIGHTEE-H I: deep spectral line observations of the COSMOS field	Monthly Notices of the Royal Astronomical Society DOI: 10.1093/mnras/stae2081
2023	Deg et al., including **Lee-Waddell**	WALLABY pilot survey: the potential polar ring galaxies NGC 4632 and NGC 6156	Monthly Notices of the Royal Astronomical Society https://doi.org/10.1093/mnras/stad2312
2023	Hartley, et al., including **Shen**	SKA Science Data Challenge 2: analysis and results	Monthly Notices of the Royal Astronomical Society https://doi.org/10.1093/mnras/stad1375
2023	Glowacki, **Lee-Waddell**, et al., including **Shen**	WALLABY Pilot Survey: H I in the Host Galaxy of a Fast Radio Burst	The Astrophysical Journal
2022	Deg et al., including **Shen** and **Lee-Waddell**	WALLABY Pilot Survey: Public release of HI kinematic models for more than 100 galaxies from phase 1 of ASKAP pilot observations	Publications of the Astronomical Society of Australia https://doi.org/10.1017/pasa.2022.43
2022	Westmeier et al., including **Shen** and **Lee-Waddell**	WALLABY pilot survey: Public release of H I data for almost 600	Publications of the Astronomical Society of Australia

		galaxies from phase 1 of ASKAP pilot observations	https://doi.org/10.1017/pasa.2022.50
2021	Westmeier, **Kitaeff**, **Pallot**, et al., including **Lee-Waddell**	SOFIA 2 - an automated, parallel H I source finding pipeline for the WALLABY survey	Monthly Notices of the Royal Astronomical Society https://doi.org/10.48550/arXiv.2106.15789

5.3 Operations Team

Recruitment is currently underway for AusSRC's Head of Operations position, hosted by the Pawsey Supercomputing Research Centre. Following this appointment, the remaining four team positions will be recruited and major agreements to access and utilise computing services will be established.

In the interim, the AusSRC Head of Software Development is managing current compute resources, while continuing to liaise with commercial compute providers on potential usage (e.g. DUG, Green Square DC, Amazon) and academic providers (e.g. Pawsey, National Computational Infrastructure, OzSTAR).

AusSRC is running minor benchmarking/prototyping tests on different external computing systems and keeping a close watch on the technical tests being run by SRCNet; this includes benchmarking data transmission and storage capabilities between three to nine other SRC nodes to ensure that AusSRC systems and any supporting infrastructure can connect to the international network.

5.4 Administration Team

The Administration Team supports AusSRC activities such as managing financial and contractual matters, supporting recruitment activities, handling issues and queries requiring legal advice, and liaising with the joint venture partner organisations with daily business requirements.

Business Manager, Dr. Kathryn Barker, started with AusSRC in November 2023. She is supported by a part-time Finance Manager.

A Communications and Outreach Coordinator is anticipated to commence in July 2024. The role will directly engage with other aligned national organisations and leverage opportunities for engagement, outreach and cross promotion of astronomy related activities.

Recruitment is currently underway for an Industry and External Engagement Lead to deliver broader economic and social impact across Australia through industry translation and impact reaching beyond radio astronomy.

5.4.1 Activities

Financial reporting and management processes have been implemented with the four joint venture partner organisations, in particular with UWA which is the 'centre agent', i.e. the recipient and custodian of AusSRC's grant funding from the Australian Government. Partner budgets and payment schedules have been created and formalised through Letters of Agreement signed with the joint venture partner organisations. These outline each organisation's payment schedules, reporting requirements and expectations.

The AusSRC Board have initiated a risk register to capture, address, and monitor matters that could negatively affect the AusSRC. Risks are identified as part of the quarterly Board reporting process, assessed during the Board meetings, and then categorised with a severity rating system to facilities ongoing monitoring.

5.4.2 AusSRC Finances

The main purpose of the Commonwealth grant for AusSRC ($63.1 million) is predominantly to fund:

1. Salaries and associated on-costs, travel expenses (domestic and international), and other personnel expenses (e.g. computers, training, professional development, office supplies).
2. Operational expenditures – compute and storage access, required software, all other eligible expenses (e.g. general operating expenses, outreach activities, industry engagement initiatives).

Matching the value of salaries and on-costs ($28 million), the four partners also contribute in-kind to cover office spaces, administrative support (e.g. HR, finance, legal), and other relevant contributions.

A reporting template was developed in conjunction with payment schedules to track all AusSRC-related expenses for auditing and reporting purposes. The templates are updated regularly to help all parties involved track expenses against each budget category required by DISR.

At the closure of each calendar year, AusSRC is required to conduct an external audit. The first of these audits was carried out by Quantum Assurance in December 2023.

In FY 2023-24, recruitment was in its early stages. As such there is minimal expenses for the reporting period, as summarised in Table 3 to Table 7

Table 3: Total AusSRC expenditures FY 2023-2024

	Original Budget	Actual expenditures
Salaries & on-costs	$622,050	$581,119
Personnel expenses	$234,998	$42,880
General operations	$142,500	$53,418
Total of all cash expenditures (A)	**$999,548**	**$677,418**
In-kind overheads (B)	$622,050	$673,619
All AusSRC expenditures (C = A+B)	**$1,621,598**	**$1,351,036**

Table 4: AusSRC expenditures FY 2023-2024 – CSIRO

	Original Budget	Actual expenditures
Salaries & on-costs	$170,334	$193,569
Personnel expenses	$61,666	$6,997
In-kind overheads	$170,334	$193,569

Table 5: AusSRC expenditures FY 2023-2024 – Curtin University

	Original Budget	Actual expenditures
Salaries & on-costs	$174,634	$154,468

Personnel expenses	$61,666	$20,785
In-kind overheads	$174,634	$154,468

Table 6: AusSRC expenditures FY 2023-2024 – Pawsey Supercomputing Research Centre

	Original Budget	Actual expenditures
Salaries & on-costs	$32,666	$0
Personnel expenses	$30,000	$0
In-kind overheads	$32,666	$194,016

Table 7: AusSRC expenditures FY 2023-2024 – UWA (centre agent)

	Original Budget	Actual expenditures
Salaries & on-costs	$244,416	$233,082
Personnel expenses	$81,666	$15,098
General operations	$142,500	$53,418
In-kind overheads	$244,416	$131,566

6 Global contribution: SRCNet

6.1 Background

Given the unprecedented data rates generated by the SKAO (approximately 700 PB/year of scientific data products), a simple "download here" approach is insufficient. Instead, it is essential to provide functionality that enables users to discover, evaluate, manipulate, and visualise SKA data products through shared computational resources.

To address this requirement, the SKAO will be supported by a globally distributed network of SRCs located within its member states. These centres will collectively form an interoperable ecosystem, referred to as SRCNet, designed to support a paradigm where users and their workflows are directed to the data's location. This approach minimizes data transfer bottlenecks and ensures efficient utilization of resources, irrespective of the user's geographic or national affiliation.

The SRCs will facilitate access to data products, provide platforms for advanced scientific analysis, and offer user support and training to astronomers working with SKA telescope data. The development and engagement of the scientific community will be achieved through three primary avenues:

- collaboration on global software development initiatives through community-funded teams associated with national SRC projects;
- providing user support for pathfinder and precursor data and incorporating these insights into the design of the SRCNet systems, and;
- fostering participation in SKA Science Data Challenges, which offer opportunities for the community to engage with simulated SKA data products and evaluate scientific workflows on the evolving SRC platforms.

6.2 AusSRC in SRCNet

AusSRC is participating in SRCNet prototyping activities, working with proto-SRC facilities in Japan and South Korea to implement and test technologies to effectively work with large quantities of astronomical data. To facilitate SKA precursor science, AusSRC is also working closely with CanSRC (Canada) and ChinaSRC, enabling scientists in each country to effectively collaborate on Australian-led research projects. AusSRC personnel will continue prototyping efforts to help to fully establish SRCNet.

To support the SRCNet Program Team, which is leading the broader SRCNet efforts, AusSRC appointed an SRCNet Product Manager in May 2024. This position is internationally focused, ensuring alignment and integration of AusSRC activities with those of the SRCNet. The objective for the coming year is to further develop SKAO end-to-end Science Operations. The SRCNet Product Manager will travel to the UK to meet with the teams at the SKAO Global Headquarters, and will begin to develop a roadmap and essential documentation and operational procedures. The roadmap will include software and networking deployment timelines and priority areas for each of the specialised teams contributing to network development.

7 Supporting Australia's Research Community

AusSRC actively supports researchers working with SKA precursors, ASKAP and the MWA. Data post-processing pipelines are becoming more robust and scientists using AusSRC tools are able to focus more on the science and less on the technical aspects of working with large volumes of radio astronomy data. AusSRC also provided support for external workshops and meetings that enhance astronomy research between Australian and international collaborators.

7.1 Training and workshops

2023 Australia Telescope National Facility Radio School

The 2023 Australia Telescope National Facility Radio School was held at CSIRO's Paul Wild Observatory on Gomeroi Country near Narrabri, NSW from 25-29 September. The school was attended by approximately 50 participants at various career stages in disciplines across astronomy and computing, including graduate students, early career researchers, and technical personnel such as software developers and SKA team members new to radio astronomy. AusSRC personnel taught theory lectures on radio data processing and held two hands-on tutorial sessions, enabling participants to work directly with raw radio astronomy data.

International Virtual Observatory Alliance (IVOA) 2024

AusSRC sponsored the International Virtual Observatory Alliance 2024 meeting (IVOA 2024; https://rds.org.au/events/ivoa-2024/) organised by Australian Astronomical Optics (AAO), which took place in May 2024 in Sydney, NSW. The IVOA aims to create seamless connections between astronomical data sets. The IVOA meeting had 146 international participants and focused on interoperability between astronomy data centres. Although SRCNet has yet to formally engage with

the IVOA, the science that will emerge from the SKA telescopes will require access to multiwavelength datasets for a more complete understanding of the Universe.

MeerKAT data workshop

AusSRC also held a workshop on 31 May 2024, focused on enabling researchers to transfer, process, and visualise data from MeerKAT, South Africa's SKA-Mid precursor. Nine researchers from four Australian universities, including Curtin University, UWA, the University of Sydney, and the Swinburne University of Technology, attended the live presentation (in-person and online), while several others – who were travelling or otherwise unavailable – requested access to the recording of the meeting.

7.2 Other Collaborations

AAO Data Central - Australia

AusSRC has regular meetings with AAO Data Central regarding development projects with common benefits. Data Central (part of AAO) will be analysing and extending the AusSRC-developed EMUCat pipeline so it can query and crossmatch radio detections with optical/infrared sources in a large-scale manner (i.e. processing millions of astronomical objects in short timescales while minimising resource requirements).

Canadian Astronomy Data Centre (CADC) – Canada

Through the support of POSSUM and WALLABY science, AusSRC works directly with the CADC to co-develop science enabling pipelines, transfer data between centres in Australia and Canada, and synchronise databases so researchers in Australia and Canada can work together more effectively.

IDIA – South Africa

As previously mentioned, AusSRC has engaged with IDIA, which has built capacity and expertise in data-intensive research using the MeerKAT telescope, South Africa's SKA-Mid precursor. AusSRC is working towards partnership status for CARTA, a next-generation image visualisation and analysis tool, scalable to big data in the era of the SKAO.

South Korea SKA Regional Centre (KorSRC) – South Korea

Through SRCNet prototyping efforts, AusSRC is working directly with personnel in South Korea who are working towards building KorSRC. In December 2023, AusSRC hosted two visitors: Dr Hyeseung Lee, who is part of KorSRC, and her student. During the month, they visited AusSRC's collaborator institutions and gave talks about their science research.

Shanghai Astronomy Observatory (SHAO)/China SKA Regional Centre (ChinaSRC) – China

Supporting SRCNet objectives to better connect proto-SRCs in Asia and Oceania, the UWA node of ICRAR (on behalf of AusSRC) and the SHAO (on behalf of ChinaSRC) have signed a MoU for scientific collaboration using SKA precursor data, specifically ASKAP data. AusSRC has also hosted members of SHAO during their visits to Australia.

7.3 Engagement and Outreach

AusSRC engages with local schools and the general public to inspire the next generation of researchers and STEM professionals.

Participating in CSIRO's STEM Professionals in Schools program, AusSRC team members delivered education and outreach activities at WA schools, covering diverse subjects including the Universe, our Solar System, the night sky, artificial intelligence and machine learning technologies and the future of astronomy in Australia.

In addition, AusSRC's Director Dr. Karen Lee-Waddell took time to speak to high school students visiting collaborator institutions as part of the ICRAR Stargirls+ STEM Camp in January 2023, discussing possible career paths as well as the exciting science that is being facilitated by AusSRC.

In November 2023, AusSRC participated in Perth Astrofest – the largest free astronomy event in the Southern Hemisphere – at Curtin University. AusSRC team members were part of the 'SKA Project in Australia' stall and participated in panel discussions about career paths and future job opportunities with the SKAO and AusSRC.

AusSRC's Director Dr. Karen Lee-Waddell was a panellist during the 'Better, faster, further: cosmic origins and the SKAO' panel at South by South West (SXSW) Sydney in October 2023. The panel discussion covered various aspects of the SKA project including the Wajarri Yamajiled Indigenous Land Use Agreement, and aspirations of the international SRC Network. The audience had various backgrounds in technology, computing, research, and the arts.

7.4 Timeline of AusSRC Events

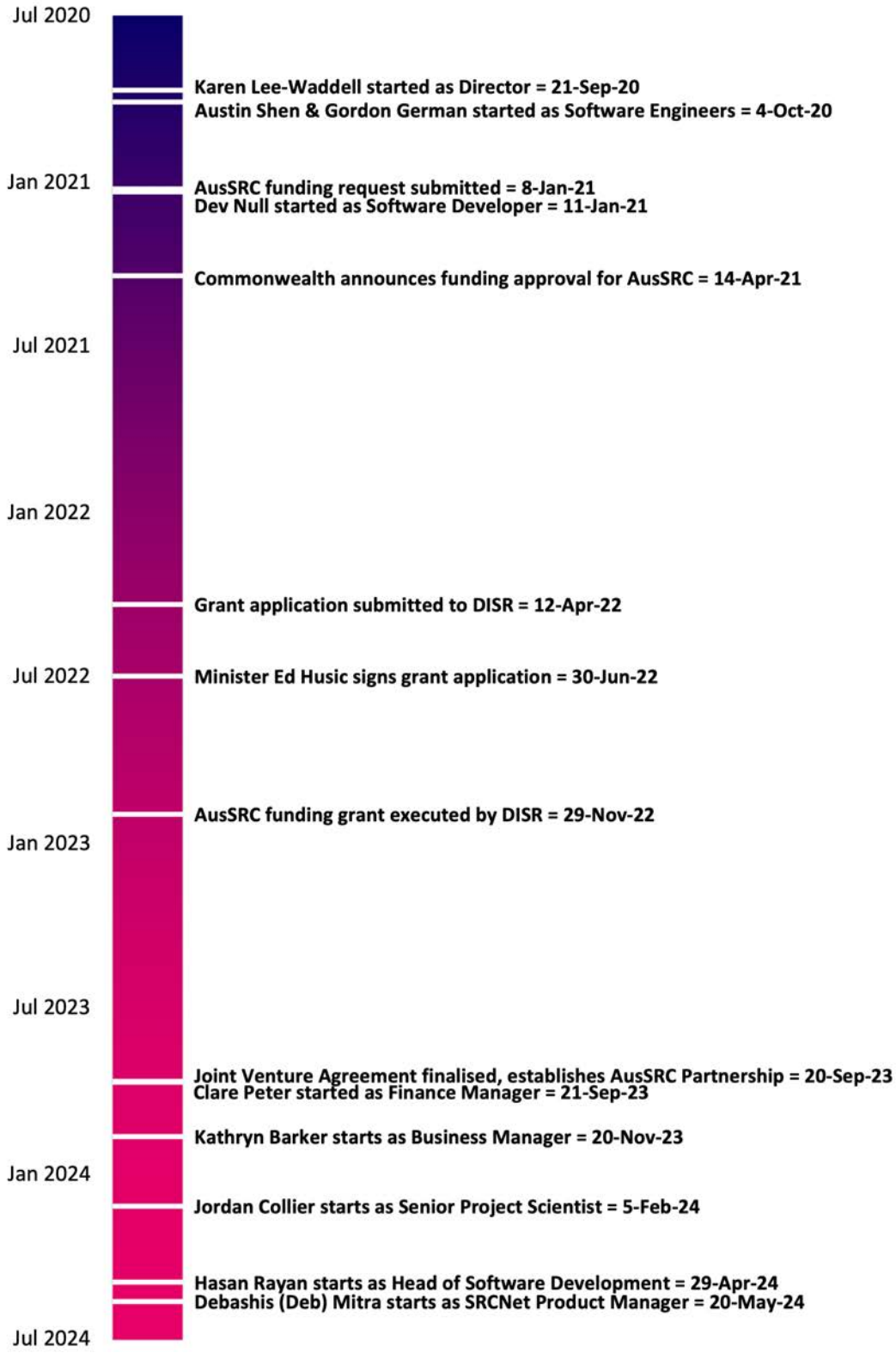

Figure 2: Notable events leading up to the formal establishment of AusSRC and covering the reporting period.

8 Conclusions

8.1 Summary

The first nine months of AusSRC's formal operation have been highly productive. Since the Joint Venture was formally established in September 2023, AusSRC has grown from a Design Study Program into a capability that is actively supporting science, developing critical infrastructure, and contributing to the global SKA ecosystem.

Key achievements during this initial reporting period include the recruitment of core personnel across all teams, the deployment of automated data processing pipelines for SKA precursor science, and the establishment of financial and governance systems in collaboration with partner institutions. AusSRC has already demonstrated its value to Australia's research community by enabling access to, and analysis of, large radio astronomy datasets, and by coordinating training, outreach, and strategic international collaborations.

AusSRC is starting to position itself as a credible voice within the international SRCNet, contributing directly to global design efforts and building the operational foundations needed to support SKA data delivery over the next few years.

This progress would not have been possible without the support of the Australian Government, the joint efforts of AusSRC's joint venture partner organisations and the commitment of the AusSRC Board.

As we look to the future, AusSRC remains focused on scaling our capabilities, deepening engagement with the scientific community, and preparing for the transformative science that the SKA telescopes will soon deliver.

8.2 Priorities for FY 2024 -2025

As AusSRC matures and moves into year two of the project, a number of priorities have been identified for FY2024-2025:

- Continuation of personnel recruitment, following the hiring plan and team structure shown in Section 4.2.
- Procurement of dedicated compute and storage resources.
- Supporting additional SKA precursor science projects.
- Broader outreach and engagement activities.