ASTRONOMY AND SPACE SCIENCE
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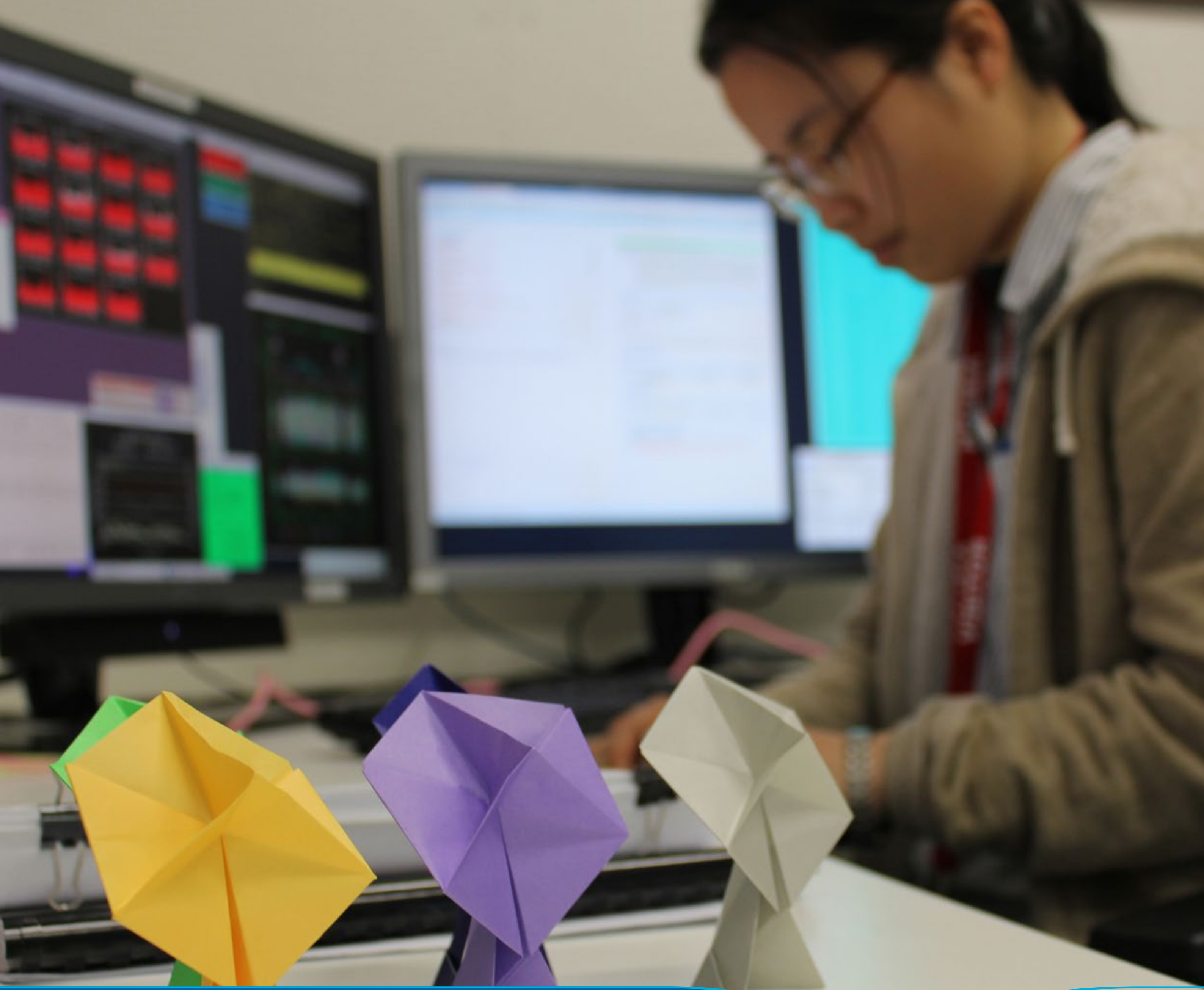
CSIRO Australia Telescope National Facility

Annual Report
2015



CSIRO Australia Telescope National Facility
Annual Report 2015

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This is the report of the CSIRO Australia Telescope National Facility for the calendar year 2015, approved by the Australia Telescope Steering Committee.

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Cover image: Work being done on an antenna of the Australian SKA Pathfinder. Credit: CSIRO
Inner cover image: An observer in the ATNF Science Operations Centre. Credit: Flornes Yuen

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Dr Douglas Bock, Acting Director, Australia Telescope National Facility. Credit: Wheeler Studios

Acting Director's report

This year saw great progress on the Australian SKA Pathfinder (ASKAP). The first ASKAP science papers appeared, demonstrating the potential of phased array feeds (PAFs) for radio astronomy and the uniqueness of the Murchison Radio-astronomy Observatory. While the Boolardy Engineering Test Array (ASKAP with six first-generation PAFs) was being used for commissioning, the second-generation phased array feeds began to roll off the production line. These feeds have improved performance and maintainability and reduced cost. In October the ASKAP PAF team received CSIRO's highest award, the Chairman's medal.

However, ASKAP will now remain a stand-alone instrument longer than envisaged. The Square Kilometre Array project was re-baselined early in 2015: SKA Survey, which was to have comprised ASKAP and 60 other antennas, was indefinitely deferred, and the low- and mid-frequency SKA telescopes were scaled down. Australia's SKA component will now be SKA-Low, an array of around 130,000 dipoles. With the SKA re-baselining done, negotiations began for the Convention under which the SKA Observatory will be constituted. Towards the end of the year the Australian Government announced $294m of funding for hosting the SKA, as part of its National Innovation and Science Agenda.

At Parkes and Narrabri this year we consolidated the changes of recent years and continued to support world-class science.

Instrumentation at the Parkes telescope had been reduced and all observing is now conducted remotely. However, as 2015's publication statistics indicate, Parkes remains a world-class facility. As part of a program to renew the telescope's instrumentation, we began this year to build an ultra-wideband low-frequency receiver and installed an ASKAP PAF at Parkes for commissioning tests. Proven Parkes technology was chosen for China's Five-hundred-metre Aperture Spherical Telescope (FAST), with CSIRO to produce a 19-beam multibeam receiver for FAST. We also signed a contract to observe for Breakthrough Listen, the first major SETI program to run on Parkes since Project Phoenix in 1995.

At the Compact Array, 2015 was the first year in which remote observing became the default. We have kept the 'user-operator' model, but have also begun the first trials of unattended observing. As at Parkes, the telescope systems worked well and scientific productivity has not shown any immediate change. However, if our instrumentation program is to flourish we must keep the connection between engineers and scientists, local or visiting, alive. A synergy of large research infrastructure, technology development and scientific excellence remains what the ATNF aims to deliver.

Dr Susan Barrell, Chair, ATNF Steering Committee. Credit: Bureau of Meteorology

Chair's report

The Steering Committee welcomed the operational and technological achievements of the Australia Telescope National Facility (ATNF) in 2015 and the high-quality science outcomes to which they contributed, and expressed appreciation for the leadership of the Director, Dr Lewis Ball, and his team in delivering them. The award of the CSIRO Chairman's Medal to the ASKAP team for the implementation of the phased array feeds (PAFs) was a significant acknowledgement of the innovation and engineering excellence of the team.

The committee convened on two occasions and consulted throughout the year, with the aim of providing high-level advice to guide the strategic directions, performance and allocation of observing resources for the facility. Advice to the Director and the CSIRO Board was especially focussed around three key areas: the Square Kilometre Array (SKA) strategy; operations and funding of the ATNF; and astronomy governance.

In response to the re-baselining of the international SKA project, especially the decision to defer SKA Survey, the committee highlighted the significant investment that CSIRO, the Australian Government and the astronomy community have made in ASKAP and in the development of the innovative PAF technology that provides its unique field of view, and acknowledged the world-class science it will deliver for many years to come. The committee emphasised the value of ongoing Australian engagement in the SKA, especially in SKA-Low. In relation to the future of ASKAP, it advised that the maximum benefit for Australia, in terms of scientific leadership and impact, technology development and intellectual property, would be derived through retaining Australian ownership and control of ASKAP and actively seeking to further develop the instrument, its technology and the survey science, including through international partnerships.

The Steering Committee recognised the need to sustain the current suite of radio astronomy facilities (Parkes, the Compact Array, ASKAP) for the next 5–10 years in order to deliver on the priorities of the 2016–25 Decadal Plan for Australian astronomy. The committee acknowledged the lean operations model implemented by CASS for Parkes, the remote operations of the Compact Array and the plan to cease funding Mopra operations from October 2015. It welcomed the arrangement reached with the Breakthrough Prize Foundation and encouraged investigation of further external funding opportunities, noting the need for careful consideration of the impact on other astronomy programs. The committee urged the ATNF to continue community consultation in the development of science priorities for the Compact Array and, with an eye to the foreseeable end of Compact Array science on the timescale of a decade, to additionally call for large-scale 'Legacy' science projects, which would feature an open-access data policy with no proprietary period.

The Steering Committee supports a consolidated astronomy governance model for the future of Australian astronomy as Australia engages in global-scale astronomy facilities, but recognises that close involvement with the entire community is critical to achieving a successful outcome. The committee expressed confidence that in the event such consolidation does occur, an appropriate governance and delivery structure could be implemented under CSIRO to deliver a broader range of astronomy infrastructure for the community. In order to maximise community alignment, the implementation of such a model should reflect the community's priorities articulated in the 2016–25 Decadal Plan and should include a representative community-based steering committee or equivalent.

The Steering Committee looks forward with enthusiasm to a positive future for the ATNF and for Australian astronomy more generally.

Dr Lewis Ball, Director Australia Telescope National Facility. Credit: Wheeler Studios

ATNF Director

After three successful years leading CSIRO Astronomy and Space Science, Dr Lewis Ball left CSIRO on 17 March 2016.

As CASS and ATNF Director Lewis secured the funding necessary to ensure that ASKAP will deliver on its primary science goals. He oversaw the successful demonstration of the wide field of view that can be delivered by an array of antennas equipped with phased array feeds, moving radio astronomy into a leading position in Big Data. Under Lewis's leadership CASS ensured the future of the Parkes Telescope as a world-leading pulsar instrument and key element of the new Breakthrough Listen SETI project, and led a community-driven process to identify the key science priorities for the Australia Telescope Compact Array into the next decade.

Lewis enhanced the external linkages of CSIRO astronomy, establishing partnerships with overseas observatories and astrophysical engineering groups and securing contracts that will see CSIRO deliver instruments to observatories around the world. He also worked to consolidate CSIRO's place in the global project to build and operate the Square Kilometre Array.

Following Lewis's departure, Dr Douglas Bock (Assistant Director, Operations) has taken on the role of Acting Director of CASS and the ATNF.

The ATNF in brief

Members of the SKA Science and Engineering Advisory Committee visiting the Murchison Radio-astronomy Observatory Credit: CSIRO

The ATNF in brief

The Australia Telescope National Facility (ATNF) is a set of world-class radio-astronomy observatories operated by CSIRO (the Commonwealth Scientific and Industrial Research Organisation).

LOCATIONS

ATNF observatories are located near the towns of Parkes, Narrabri and Coonabarabran in eastern Australia, and in the Mid West region of Western Australia. The ATNF is headquartered in Sydney, New South Wales, and has offices in Perth and Geraldton in Western Australia.

The Murchison Radio-astronomy Observatory (MRO) in Western Australia sits on land traditionally owned by the local Wajarri Yamatji community. CSIRO manages the MRO under an Indigenous Land Use Agreement (ILUA) for the site.

CSIRO also manages Australian astronomers' access to the antennas of NASA's Canberra Deep Space Communication Complex, which is located at Tidbinbilla in the Australian Capital Territory. These antennas are often used in conjunction with ATNF telescopes.

The Canberra Deep Space Communication Complex. CSIRO manages the host-country astronomical use of its 70-m and 34-m antennas. Approximately 5 per cent of time on the 70-m antenna is available for astronomy. Credit: CDSCC

OPERATIONS

ATNF telescopes support a broad range of studies in Galactic (interstellar medium, pulsar, X-ray binaries, star formation, stellar evolution, magnetic fields), extragalactic (galaxy formation, ISM, Magellanic Clouds, cosmic magnetism) and cosmological science.

The ATNF is a national facility, providing all astronomers at Australian and overseas institutions with the opportunity to use its telescopes. Access is given free of charge and is based on the scientific merit of the proposed observing project. This 'open skies' policy is the general practice of the international radio-astronomy community and Australian astronomers obtain access to overseas facilities on the same principle.

The proposals received each semester typically include about 600 authors: on average, about 50 are from CASS, 80 are from other Australian institutions and 470 are from 175 overseas institutions. The three overseas countries with the greatest numbers of proposers are the USA, UK and Germany.

About 60 per cent of the refereed publications derived from observations with ATNF telescopes result from collaborations between Australian and international researchers.

Observatories and support sites for CSIRO radio astronomy

Right: The 64-m diameter Parkes telescope, near the town of Parkes, New South Wales. This telescope has been used for an extremely wide range of Galactic and extragalactic science. Its major area of work is now studies of pulsars and fast radio bursts. It is also frequently used for joint observations with other telescopes. Credit: Cormac Purcell

The Australia Telescope Compact Array, six 22-m diameter dishes near the town of Narrabri in New South Wales. The Compact Array can operate at frequencies between 1.0 GHz and 105 GHz, and its antennas ride on a six-kilometre track that allows multiple configurations and observing baselines. Credit: Cormac Purcell

GOVERNANCE

The ATNF comprises the major part of CSIRO Astronomy and Space Science (CASS), one of CSIRO's business units. CASS also operates the Canberra Deep Space Communication Complex, a station of NASA's Deep Space Network, on behalf of NASA. The Director of CASS is also the ATNF Director.

CASS is part of CSIRO's Digital, National Facilities and Collections group, along with other national facilities that are owned and operated by CSIRO but used extensively by external researchers. The Executive Director, Digital National Facilities and Collections, reports to the Minister for Industry, Innovation and Science via the CSIRO Executive.

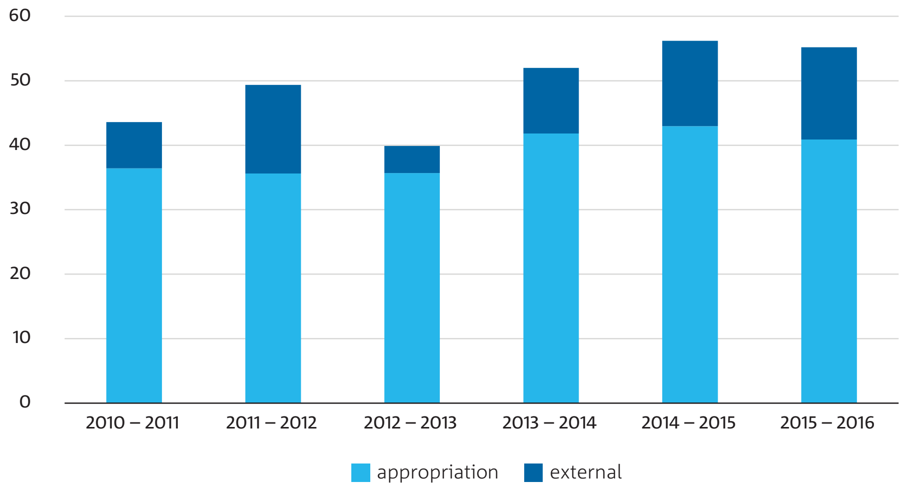
ATNF policy is shaped by the Australia Telescope Steering Committee (ATSC), an advisory body that usually meets twice a year. The ATSC advises the Director on long-term strategy. It also appoints the Australia Telescope Users Committee (ATUC), which represents the interests of astronomers who use ATNF telescopes, and the Time Assignment Committee (TAC), which reviews observing proposals. The members of these three committees are listed in Appendix A.

STAFF AND FUNDING

The ATNF receives CSIRO appropriation funding, supplemented by external (contract) funding. A financial summary appears in Appendix B.

In 2015 CSIRO employed about 190 staff on activities related to radio astronomy. Their names and locations are given in Appendix C.

Antennas of the Australian SKA Pathfinder, ASKAP, at the Murchison Radio-astronomy Observatory in Western Australia. ASKAP began operating in 2014 with the first six of its 12-m antennas to be outfitted with CSIRO-developed phased-array feeds. Its final form the telescope will comprise 36 antennas. (Details, pages 34–35.) Credit: Flornes Yuen



ATNF operating funding ($A millions)

Performance indicators

Antennas of the Compact Array at dusk.

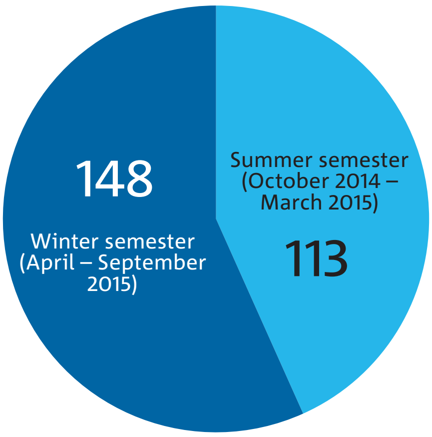
Photo: Karen Hodge Photography

Performance indicators

TELESCOPE USAGE

Observing time on ATNF telescopes is awarded twice a year to astronomers on the basis of the merits of their proposed research programs, as judged by the Australia Telescope Time Assignment Committee (members listed in Appendix A).

Observing proposals received



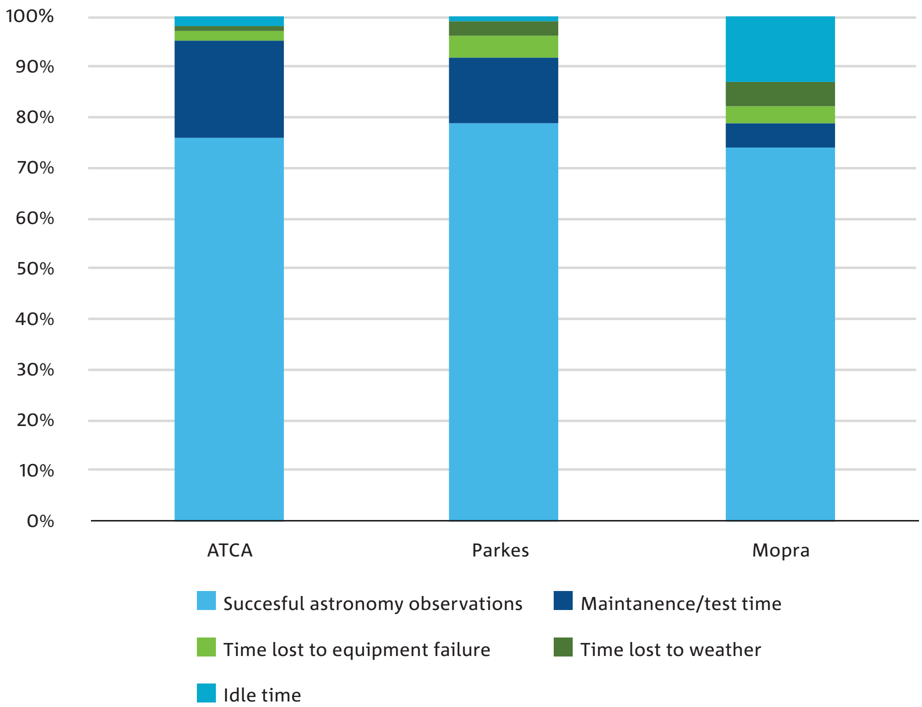


Figure 1: Telescope usage in 2015. Mopra statistics are for dates between 09 March and 31 October, which corresponded to the 'millimetre season' for 2015.

Demand for telescope time is higher in winter because the weather is better for higher-frequency (millimetre-wavelength) observations with Mopra and the Compact Array.

The 'oversubscription' rate (the factor by which proposals exceed the telescope time available) was 1.9 for the Compact Array for the winter season and 1.6 for the summer season; for Parkes it was 1.4. The Long Baseline Array (Parkes, Mopra and the Compact Array used together) continued to be in demand, with proposals exceeding available time by more than a factor of two.

On both the Compact Array and Parkes, approximately ten per cent of time is made available as 'Director's time'. This is time that is initially not allocated in the published version of the schedule, but which can be made available later for approved observing projects. The key performance goals for the Compact Array and Parkes are:

- at least 70 per cent of telescope time should be successfully used for observing
- no more than five per cent of observing time should be lost through equipment failure.

This year:

- time allocated to observing was 79 per cent at Parkes, 76 per cent at the Compact Array, and 74 per cent at Mopra (this is for all Mopra time, not just National Facility time). These are world-class levels of performance: they exceed, for instance, the observing-time figure for the world's largest radio telescope, the Karl G. Jansky Very Large Array in the USA
- time lost through equipment failure was four per cent at Parkes, three per cent at Mopra, and twoper cent at the Compact Array.

TIME ALLOCATION

This year observing proposals were received from 846 individual researchers from 31 countries. Sixteen per cent were led by ATNF staff, 26 per cent by staff of other Australian institutions, and 57 per cent by overseas researchers (rounded figures).

For the period from 1 October 2014 to 30 September 2015, 156 proposals were allocated time on ATNF telescopes (counting each proposal only once each calendar year even though some are submitted twice). This was fewer than in 2014 (when the figure was 207), partly because fewer proposals were received but also because more time was given to large projects. Eighty-five proposals were given time on the Compact Array, 39 on Parkes, eight on Mopra (in National Facility time) and 19 on the Long Baseline Array: they are listed in Appendix D.

The ATNF also handles proposals requesting service observations with the 70-m and 34-m antennas of the Canberra Deep Space Communication Complex (CDSCC), part of NASA's Deep Space Network. Five CDSCC projects were observed during the year.

Time allocated to observing teams on the Compact Array and Parkes, broken down in different ways, is shown in Figures 2–5. ATNF staff were allocated about 15 per cent of observing time on the Compact Array and 24 per cent on Parkes. Figures 4 and 5 show that the fraction of observing time allocated to ATNF staff has fallen over the last five years: this is both because the number of astronomers on staff has fallen, and because these staff have had (and continue to have) a strong focus on commissioning ASKAP.

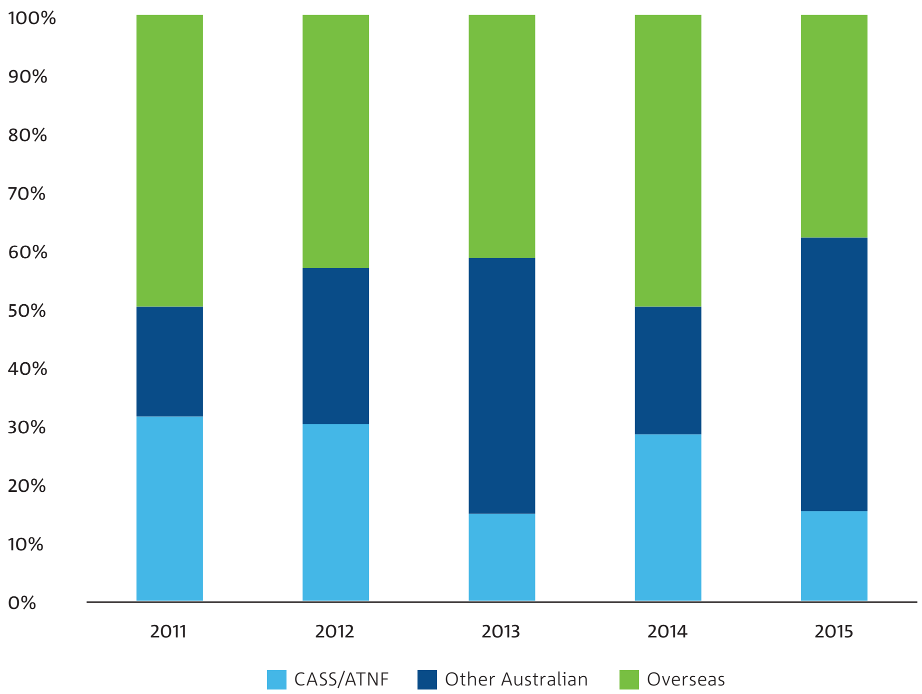


Figure 2: Compact Array time allocation by primary investigator, October 2011–September 2015. For each year the time allocation is for 12 months from October to September.

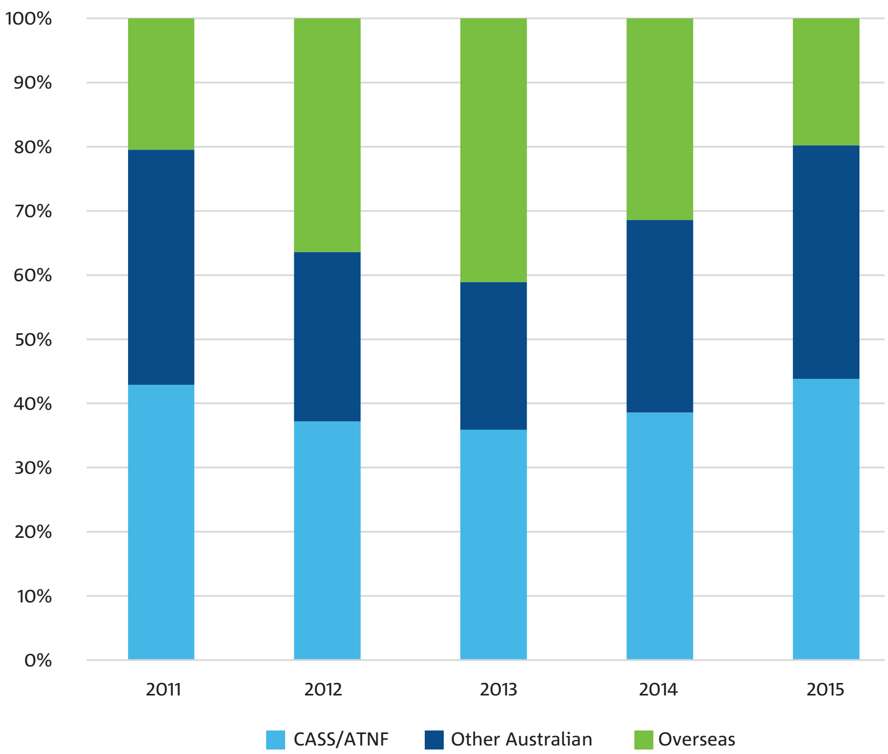


Figure 3: Parkes time allocation by primary investigator, October 2011–September 2015. For each year the time allocation is for 12 months from October to September.

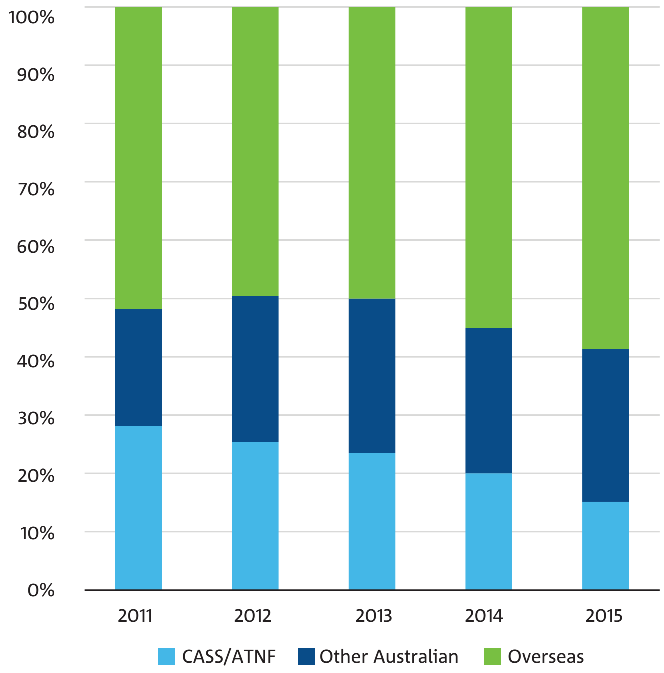


Figure 4: Compact Array time allocation by all investigators, October 2011–September 2015. Time allocated to each proposal has been divided evenly between all authors on the proposal. For each year the time allocation is for 12 months from October to September.

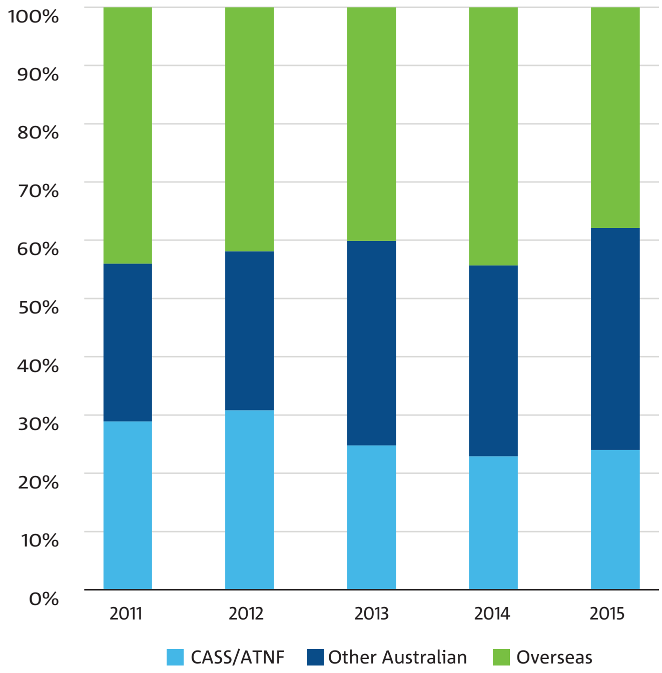


Figure 5: Parkes time allocation by all investigators October 2011–September 2015. Time allocated to each proposal has been divided evenly between all authors on the proposal. For each year the time allocation is for 12 months from October to September.

TEACHING

As of December 2015, 30 PhD students were being co-supervised by ATNF staff. Their affiliations and thesis titles are given in Appendix E. Eight students were awarded PhDs during the year: their theses are listed in Appendix F.

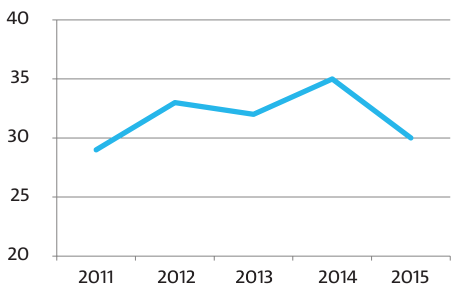


Figure 6: Numbers of postgraduate students affiliated with CASS.

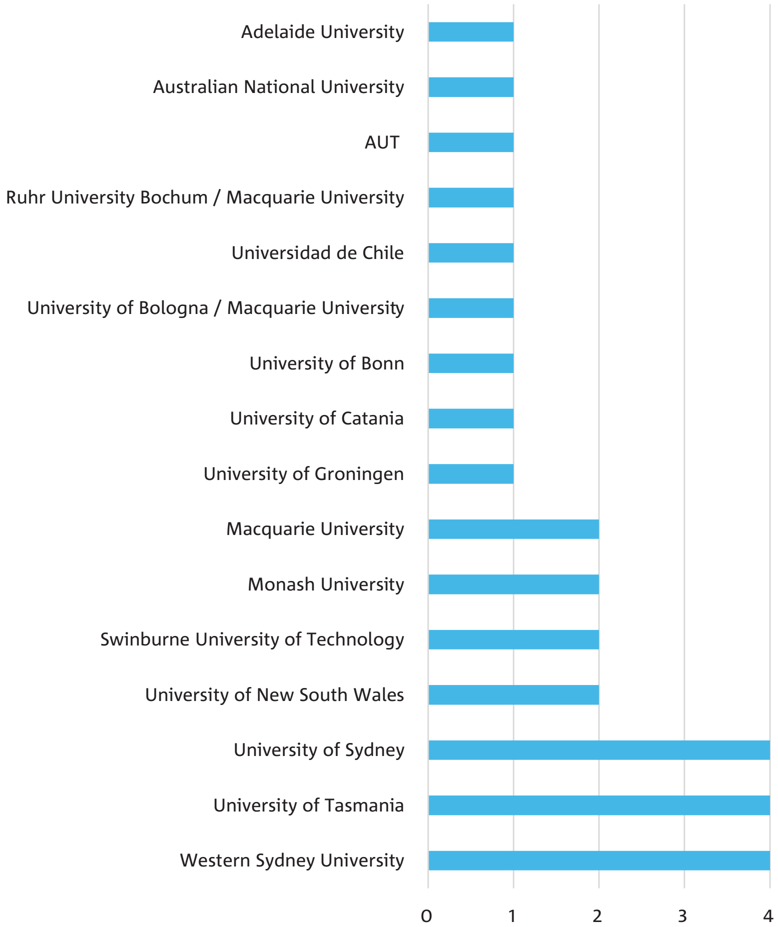


Figure 7: Postgraduate student affiliations 2015.

PUBLICATIONS AND CITATIONS

This year 138 papers using data from the National Facility were published in refereed journals. Approximately 65 per cent included a CASS author or authors.

In 2015 there were 185 refereed publications by CASS staff, including scientific papers with data from other facilities. In total, 235 refereed papers – both those using National Facility data and other papers by CASS staff – were published during the year. They are listed in Appendix G, which also lists 47 conference papers that were either derived from ATNF facilities or include CASS authors. The publication counts are very similar to those of the previous year.

Across CSIRO, citation performance is measured by the New Crown Index – the average number of citations per paper, body normalised to a baseline determined from the global average for all publications in a similar set of journals. (In astronomy the baseline is determined from papers published in refereed journals.) The index is calculated at least a year after the date of publication, to allow citations to accrue. For National Facility and other CASS staff papers published over the five-year period from 2010 to 2014, the new Crown Index (calculated over 906 refereed papers) is 1.8. This means that on average, papers published by CASS staff (including papers with National Facility data) receive around 80 per cent more citations per paper than the global average for refereed astronomy papers.

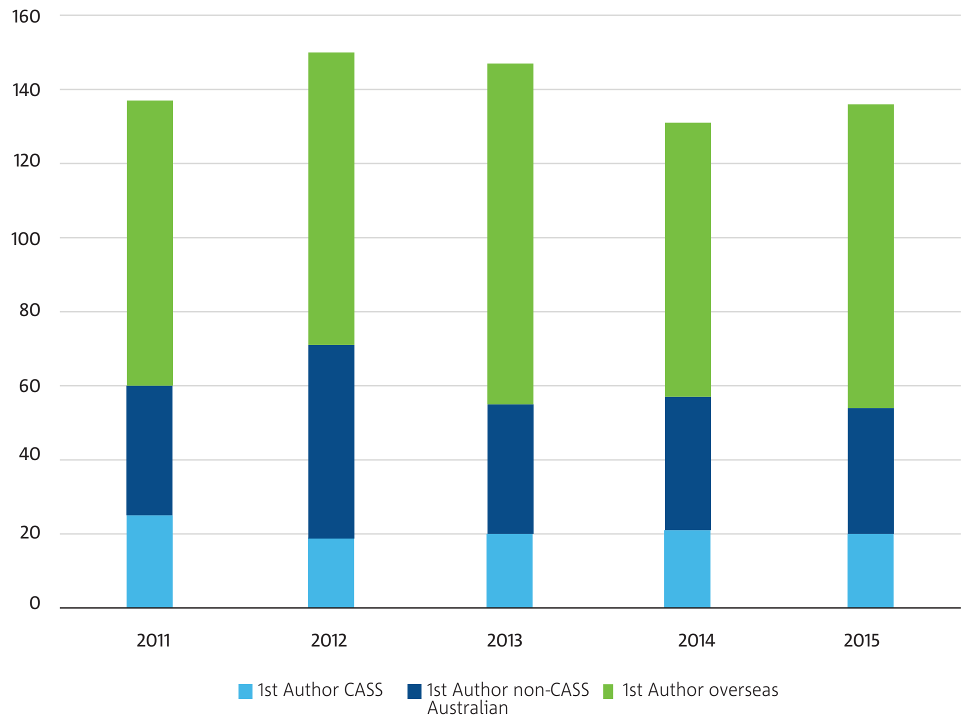


Figure 8: Publications that include data from, or are related to, ATNF facilities (Compact Array, Mopra, Parkes, VLBI, Tidbinbilla and ASKAP), published in refereed journals during 2011–2015. The count includes publications relating to the scientific goals or development of ASKAP but not IAU telegrams, abstracts, reports, historical papers or articles for popular magazines.

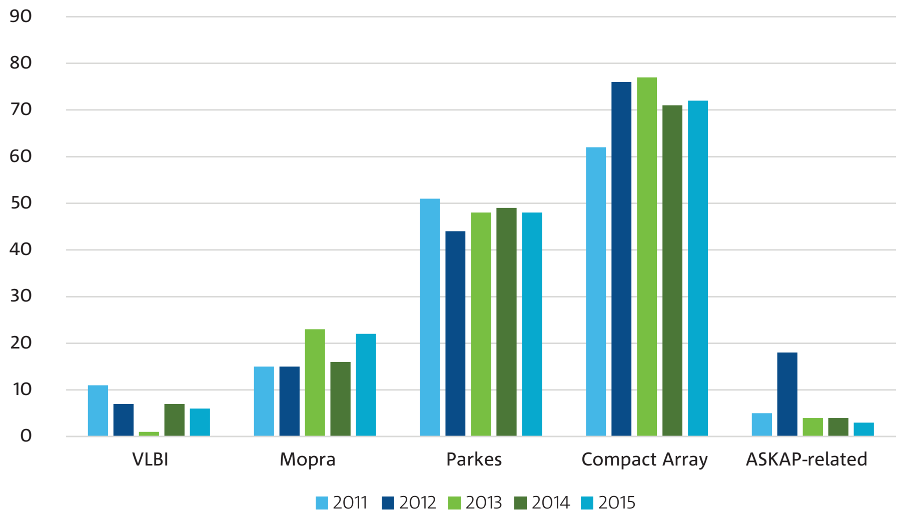


Figure 9: Publications that include data from, or are related to, the Compact Array, Mopra, Parkes, VLBI and ASKAP in 2011–2015. A small number of papers with data from more than one facility are counted more than once.

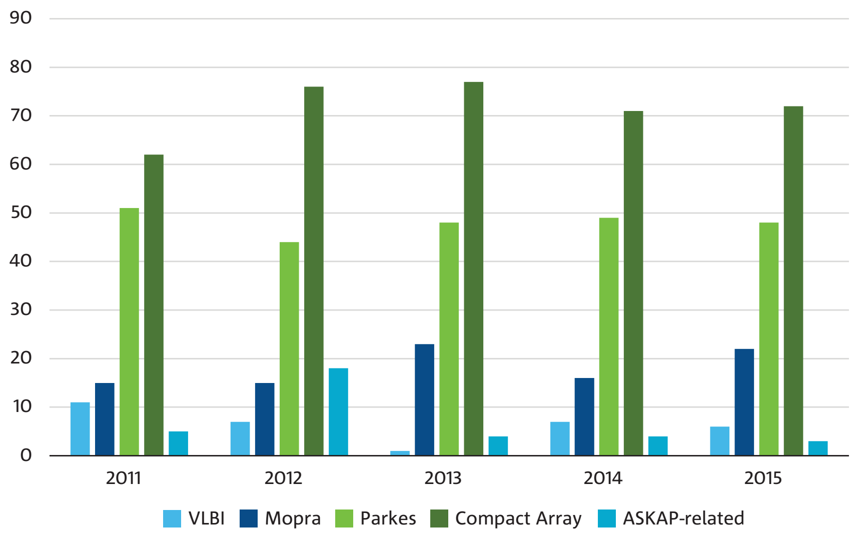


Figure 10: Publications that include data from, or are related to, the Compact Array, Mopra, Parkes, VLBI and ASKAP, grouped by year for 2011–2015. A small number of papers with data from more than one facility are counted more than once.

Science highlights

The Parkes telescope.
Photo: John Sarkissian

Foretelling the future of a star-forming cloud

ADAM AVISON

(University of Manchester)

Stars form within 'molecular clouds', clouds of hydrogen gas liberally laced with other molecular species and made dark by copious dust. The 'dark cloud' SDC335.579–0.292 is such a site. Observations with ALMA (the Atacama Large Millimeter/submillimeter Array) have recently shown it to be home to one of the most massive star-forming cores yet observed in our Galaxy, SDC335–MM1, and a less massive companion, MM2.

Both cores are infrared bright, and both are associated with 6.7-GHz class II methanol masers, MM1 with two masers and MM2 with one. Class II methanol masers trace massive star formation, meaning that SDC335 harbours young massive protostellar objects.

We set out to constrain the masses of the stars forming within these two cores, using Compact Array observations made at 6, 8, 23 and 25 GHz. These observations are of higher angular resolution than the ALMA data, revealed a surprise: the MM1 core is not one source but two, separated by about three arcseconds. We dubbed the two sources MM1a and MM1b. The directions of the outflows from MM1a suggest that they are independent objects. MM2, the less massive core, still appeared as a single source in our observations.

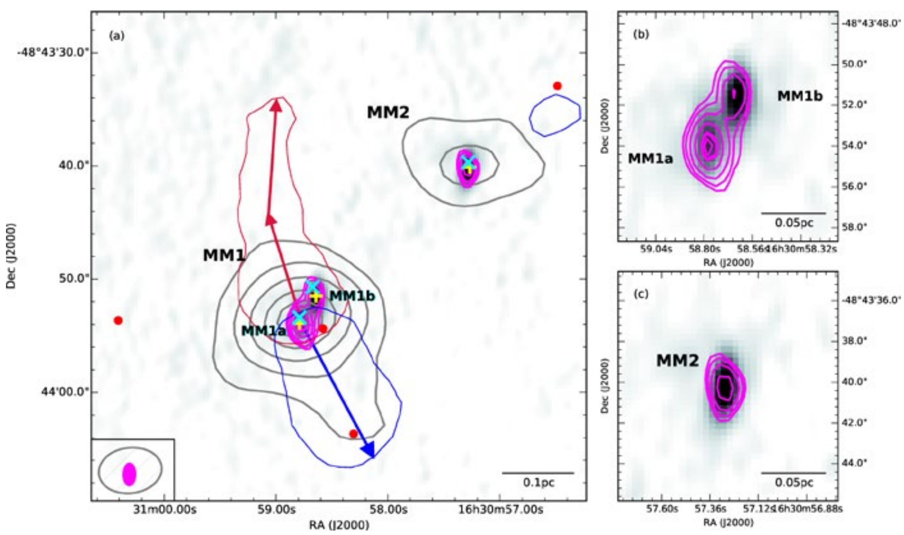
We had enough resolution to create partial spectral-energy distributions for each source at Compact Array frequencies, and we used these to classify the sources. MM1a is the simplest case: it appears to be a hyper-compact H II region. MM1b and MM2 are slightly less clear-cut, but on balance they are likely to be compact H II regions; their association with Class II methanol masers confirms that they are forming massive stars.

We fitted the free-free emission component of the spectral-energy distributions from each hyper-compact region, and used this to derive physical properties such as the sources' emission measure, ionising photon flux, and electron density. From these we assigned a spectral type to each of the protostellar objects creating the hyper-compact regions. SDC335 appears to house two protostars with characteristics of spectral type B1.5 and one with a lower limit of B1–B1.5.

Having characterised the protostars, we were able to put limits on the eventual number of stars this cloud could create – a minimum, we calculate, of 60 stars of between one and 120 solar masses. SDC335 looks as though it will eventually become a cluster at least roughly similar to the well-known Trapezium cluster in the Orion nebula.

PUBLICATION

Avison, A. *et al.* "Tightening the belt: Constraining the mass and evolution in SDC335⋆". A&A 577, A30 (2015)



The 'dark cloud' SDC335.579–0.292. The 8-GHz ATCA image is overlaid with ATCA 25GHz contours (magenta) and ALMA 3.2-millimetre continuum contours (grey). The symbols x, • and + indicate Class II (6.7 GHz) and Class I (44GHz) methanol and water (22 GHz) masers respectively. Red and blue contours represent the boundary of HNC emission; red and blue arrows show the directions of the HNC molecular outflow. (From Avison *et al.* 2015)

JULIE BANFIELD

(Australian National University and the ARC Centre of Excellence for All-sky Astrophysics)

Radio Galaxy Zoo: first fruits from a citizen-science program

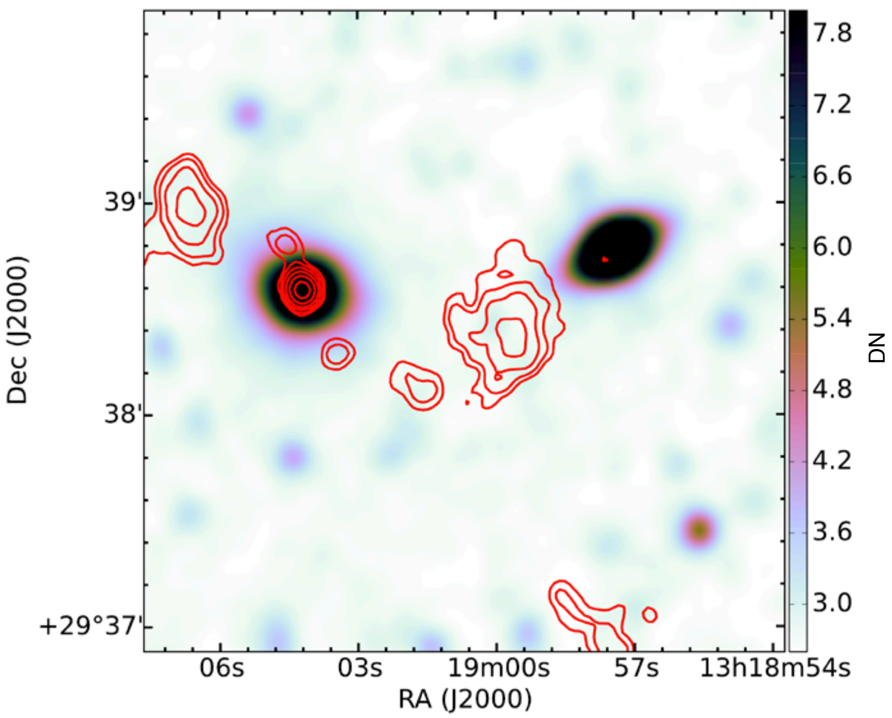
Large radio-continuum surveys help us understand how galaxies evolve over cosmic time. Most past surveys have been limited in sensitivity, and most radio sources they detected have been active galactic nuclei (AGN). More sensitive surveys pick up low-luminosity AGN and star-forming galaxies, but at present such surveys are time-consuming and can be carried out only over small patches of sky. In the coming decade, however, next-generation radio telescopes such as the Australian SKA Pathfinder (ASKAP) will perform sensitive surveys over huge swathes of the sky. These will find vastly more sources: for example, the EMU (Evolutionary Map of the Universe) survey to be done with ASKAP is expected to find 70 million, dwarfing the 2.5 million currently known.

To harvest new scientific knowledge from such surveys, we need to match the detected radio sources with galaxies observed at other wavelengths. This task is complicated by the large, complex structures often found in radio-loud AGN. (These complex sources are also likely to be the most scientifically interesting.) Cross-identifications have traditionally been made by eye. Automated radio classification algorithms are still in their infancy: 10 per cent of the radio sources expected from EMU are likely to be too complicated for current automated algorithms.

Would it work to bring more eyeballs to bear on the task? To test this idea we created Radio Galaxy Zoo, an online citizen-science project. In this, the public is asked to cross-match radio sources, often with complex structures, to galaxies observed in the infrared. We use data from two 1.4-GHz radio surveys (Faint Images of the Radio Sky at Twenty Centimeters, FIRST, and the Australia Telescope Large Area Survey, ATLAS) and mid-infrared images from the *Wide-field Infrared Survey Explorer* and the *Spitzer Space Telescope*. Radio Galaxy Zoo was launched in late 2013. When it is complete, participants will have inspected more than 170,000 radio sources.

In the project's first year more than 4000 participants produced more than 30,000 host identifications. There was greater than 75 per cent consensus among participants and, importantly, the project participants are as effective as the science team at identifying host galaxies for sources that are too complex for simple position-matching algorithms. Most of the identified host galaxies reside in the mid-infrared colour space dominated by elliptical galaxies, quasars and luminous infrared radio galaxies.

When all Radio Galaxy Zoo galaxies are identified we will have a measure of the relative populations of these hosts as a function of radio morphology and power. Already we have many interesting candidates to follow up: giant radio galaxies, late-type host galaxies with extended radio emission, and hybrid-morphology radio sources.



An example of a Radio Galaxy Zoo source requiring visual identification. Automated algorithms would have classified the non-core emission as independent sources, whereas Radio Galaxy Zoo volunteers (in agreement with the experts) found all five emission components in the upper half of the image to be related to the same source. (From Banfield *et al.* MNRAS, in press (2016).)

PUBLICATION

Banfield, J.K. *et al.*, "Radio Galaxy Zoo: host galaxies and radio morphologies derived from visual inspection", MNRAS 453, 2326–2340 (2015)

What makes GPS sources tick?

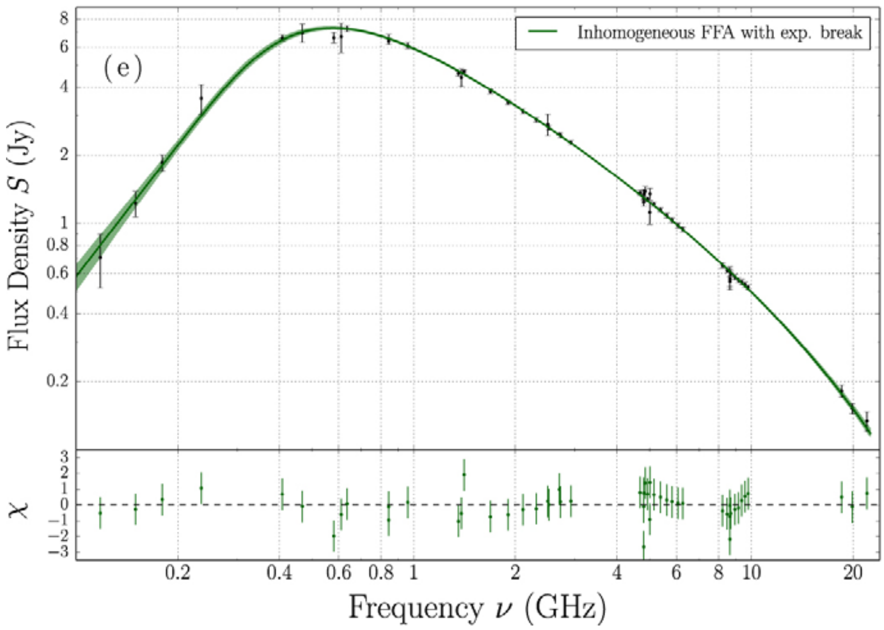
JOSEPH CALLINGHAM

(Co-supervised PhD student – University of Sydney)

Radio sources with spectra that peak around 1 GHz are called, rather predictably, *gigahertz peaked spectrum* (GPS) sources. GPS sources are compact, and remarkably constant in their power output on timescales from hours to decades.

What makes their characteristic peaked spectra? Since the 1960s the two contending mechanisms have been *free-free absorption*, in which radiation from the source is absorbed by a 'screen' of ionised gas, and *synchrotron self-absorption*, where the radiation is absorbed by relativistic electrons within the emitting medium itself. The latter has been more favoured but the question had not been definitively settled. This was something we decided to tackle by looking at a GPS source called PKS B0008–421.

This source has the steepest-known spectral slope on the low-frequency side of its peak, a slope that is close to the limit of what synchrotron self-absorption can explain. It also has the virtue of having been observed many times, at many frequencies: its constancy meant that it had been used as a calibrator by most of the radio telescopes in the southern hemisphere. To those many existing observations we have added new ones made with the Murchison Widefield Array (at low frequencies) and the Australia Telescope Compact Array (at high frequencies). This gave us an extremely well-sampled spectrum, covering the range 0.118–22 GHz.



The spectral energy distribution of PKS B0008–421, fitted with the inhomogeneous free-free absorption model. The width of the green line represents the 1σ uncertainty on the model fit. (From Callingham *et al.* 2015)

We tried fitting the data with nine models, all variants of synchrotron self-absorption (SSA) and free-free absorption (FFA). Free-free absorption with an inhomogenous absorbing screen gave the best fit. FFA is also bolstered by other arguments: for one, the source's calculated magnetic field is more in line with FFA than with SSA.

But to make either FFA or SSA fit well, we had to assume that the source's central black hole had stopped injecting high-energy electrons into the body of PKS B0008–421 about 550 years ago. When injection of new electrons stops, with time the high-energy electrons already in the source are preferentially depleted, and the radio spectrum changes shape. (The high-frequency observations in particular show this change.) That the source should turn off like this is not a complete surprise: some GPS sources show signs of intermittent activity.

Astronomers have long known that GPS sources and similar, related objects far outnumber giant radio galaxies, which the GPS sources and their relatives are thought to evolve into. Perhaps many GPS sources fail early and vanish. Once its central black hole had turned off, PKS B0008–421 might have been expected to fade rapidly. That it has not done so suggests that its central source of radiation is swathed in relatively dense gas (another argument in favour of free-free absorption being at work). Dying GPS sources with similar gas cocoons will be easily found by the new low-frequency radio telescopes. If we can find many GPS sources that have failed early, we will know why so few seem to grow into giant radio galaxies.

PUBLICATION

Callingham, J.R. *et al.* "Broadband spectral modelling of the extreme gigahertz-peaked spectrum radio source PKS B0008–421". ApJ 809, 168 (2015)

Untangling our Galaxy's 'starburst' region

JOANNA CORBY

(PhD student – University of Virginia)

Our Galaxy forms stars at a modest rate overall. But one star-forming region really stands out: Sagittarius B2 (Sgr B2), a massive complex of more than 50 clouds of H II (molecular hydrogen gas) in the Galactic Centre. Rich in X-rays and cosmic rays, and with a high magnetic field, in many ways it resembles the centre of a 'starburst' galaxy.

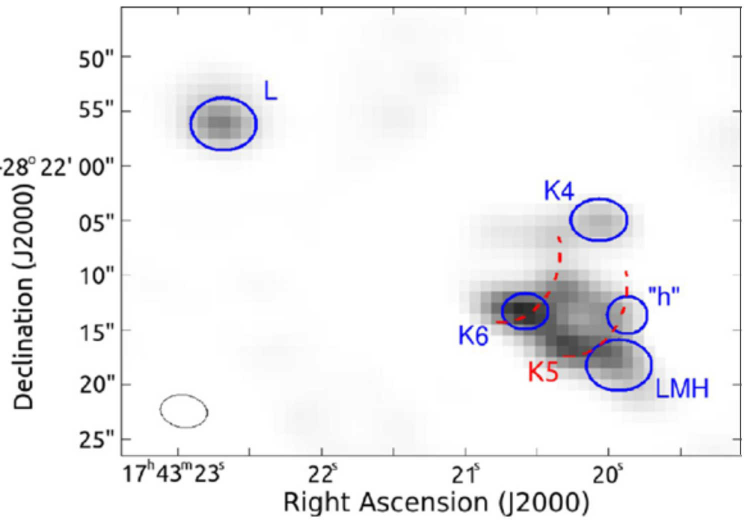
Most spectral-line surveys of Sgr B2 have been conducted with single-dish telescopes at frequencies above 80 GHz. At these frequencies it can be difficult to identify lines with specific physical features. The problem can be reduced both by going to longer (centimetre) wavelengths and by using an interferometer, which can pinpoint where lines from different molecules peak. The ideal situation is to observe the same portion of the spectrum with both a single dish (to capture weak lines in extended gas) and an interferometer (to distinguish between chemically distinct regions on small scales).

The advent of broadband radio interferometers such as the Australia Telescope Compact Array (ATCA) means that interferometric line surveys are now efficient, providing access to the spatial distributions of hundreds of molecular lines within a reasonable observing time. With the new wealth of information available, however, come new challenges in data analysis that require automated methods.

We have used the ATCA to carry out a 30–50-GHz spectral-line survey of the northern part of Sagittarius B2, Sgr B2(N). This is the first such (published) survey made with a new-generation broadband interferometer. The ATCA data, collected in just 24 hours of observing, complement existing single-dish data covering the same frequency range from the PRIMOS survey done with the Green Bank Telescope.

The ATCA data contain around a thousand spectral lines, with significant spatial and kinematic structure. To handle this profusion, we extracted mean spectra from physically distinct regions of Sgr B2(N), transforming a three-dimensional problem into a set of one-dimensional problems, then applied new automated line-fitting routines.

This has revealed the spatial distributions of more than 50 identified molecules and the locations where hydrogen and helium are recombining, giving us a comprehensive picture of the chemistry, excitation, and kinematic structure of clouds of molecular gas in Sgr B2. The survey has also served as a pathfinder for a planned science-verification project with ALMA Band 1 (35–50 GHz) and demonstrated methods that will be useful for this and other future projects.



A continuum image of Sgr B2(N) and a nearby cometary H II region, L. Ellipses mark the regions from which spectra were extracted for this study. The Large Molecule Heimat (LMH) shows no continuum emission at radio wavelengths but is bright in the submillimetre continuum. The dashed-line arcs mark two concentric shell-shaped regions, K5 and K6, which are likely to be expanding ionisation fronts; the more compact region K4 is thought to be a similar system. (From Corby *et al.* 2015)

PUBLICATION

Corby, J.F. *et al.* "An ATCA survey of Sagittarius B2 at 7 mm: chemical complexity meets broad-band interferometry", MNRAS 452, 3969–3993 (2015)

A distance to Circinus X-1 from light echoes

SEBASTIAN HEINZ

(University of Wisconsin-Madison)

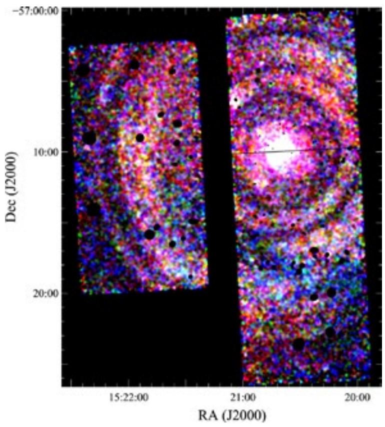
Circinus X-1 is a highly variable X-ray binary. Both its age and distance have been uncertain. Recent work (Heinz *et al*. 2013), placed an upper limit of 4600 years x (D_{Cir}/8 kpc) on the age of the system, where D_{Cir} is the distance to the source. This upper limit makes Circinus X-1 the youngest-known X-ray binary and an important test case for the study of both neutron-star formation and orbital evolution in X-ray binaries. But a firm distance to the system has remained elusive: because Circinus X-1 is deeply embedded in the Galactic disk, its distance can't be determined by most standard methods. Estimates have ranged from 4 to 11 kpc.

Fortunately, the source has played into our hands. In late 2013 it generated a bright X-ray flare. X-rays from bright point sources can scatter off interstellar dust grains as they travel toward the observer, creating an arcminute-sized X-ray halo. Following the flare, observations with *Chandra* and *XMM-Newton* revealed a bright X-ray light echo: four well-defined rings that grew with time.

By deconvolving the radial intensity profile of the echo with the X-ray light curve of the flare, we were able to reconstruct the dust distribution toward Circinus X-1 into four distinct regions of concentration, which were most likely to be in molecular clouds. We then compared the peak in dust-scattering intensity with the peak intensity in CO maps of molecular clouds from the Mopra Southern Galactic Plane CO Survey. The Mopra data allowed us to identify the two innermost rings with clouds at the radial velocities of around -74 and -81 km s^{-1}.

For a number of putative distances to Circinus X-1 we calculated the expected radial velocities of the cloud components and compared them to the observed velocities, to find the distance that best matched the observed distribution of the clouds. We place Circinus X-1 at a distance of 9.4 kpc.

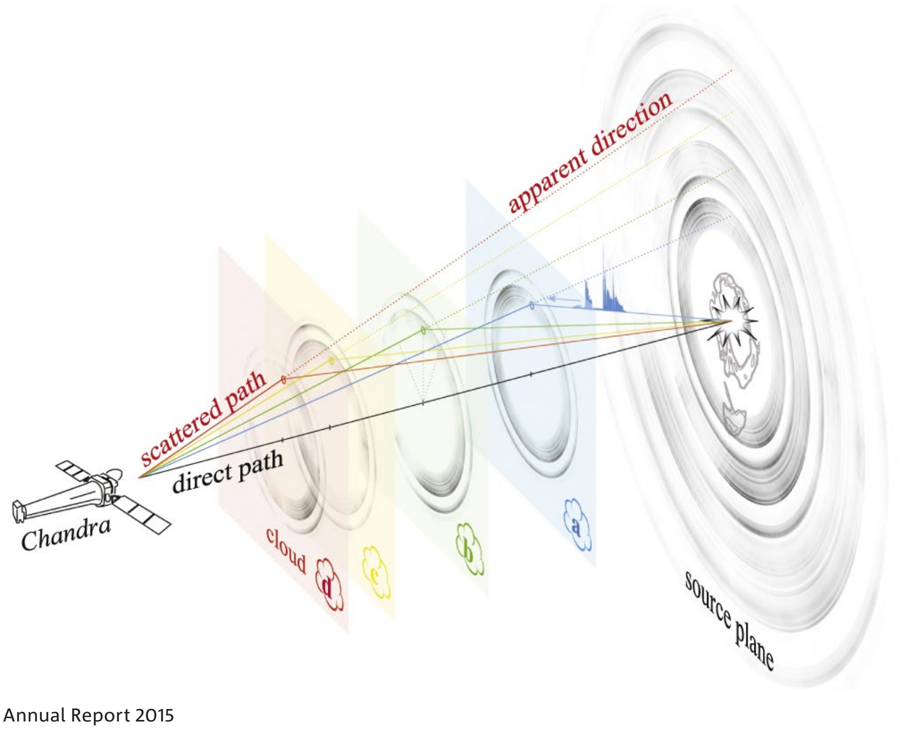
This result means that Circinus X-1 probably lies inside the far side of the Scutum-Centaurus arm of the Galaxy. Such a location, inside a star-forming spiral arm, accords with the young age of the binary.



The Chandra observation of Circinus X-1, showing four rings produced by dust scattering of the X-ray flare. (From Heinz *et al.* 2015)

PUBLICATION

Heinz, S. *et al*. "Lord of the rings: a kinematic distance to Circinus X-1 from a giant X-ray light echo." ApJ 806, 265 (2015)



How dust in interstellar clouds can scatter X-rays from a point source, producing light echoes in the form of well-defined rings. (From Heinz *et al.* 2015)

GEORGE HOBBS
(CASS)

Pulsar tests ASKAP transients pipeline

Pulsars are usually discovered through the detection of their regular sequence of pulses. However, some skip pulses, suddenly switch off, or emit giant pulses. Pulsar flux densities can also vary significantly because of interstellar scintillation or because the pulsar signal is eclipsed by a companion object. The Compact Objects with ASKAP – Surveys and Timing (COAST) survey team will carry out traditional-style pulsar surveys with ASKAP, but the ASKAP transient surveys may also find pulsars through their bright individual pulses or by monitoring their variability in the image plane.

The intermittent pulsar PSR J1107–5907 is a perfect object with which to test the prospects of detecting pulsars this way. First found and studied with the Parkes telescope, it moves irregularly between three states (‘off’, ‘weak’ and ‘strong’), sometimes remaining ‘off’ for up to 40 minutes before emitting a giant pulse. Using the Boolardy Engineering Test Array, BETA (six ASKAP antennas equipped with first-generation phased array feeds), we tracked the pulsar over 13 hours, taking snapshots of the field around it every two minutes. We also observed it simultaneously with the Parkes telescope.

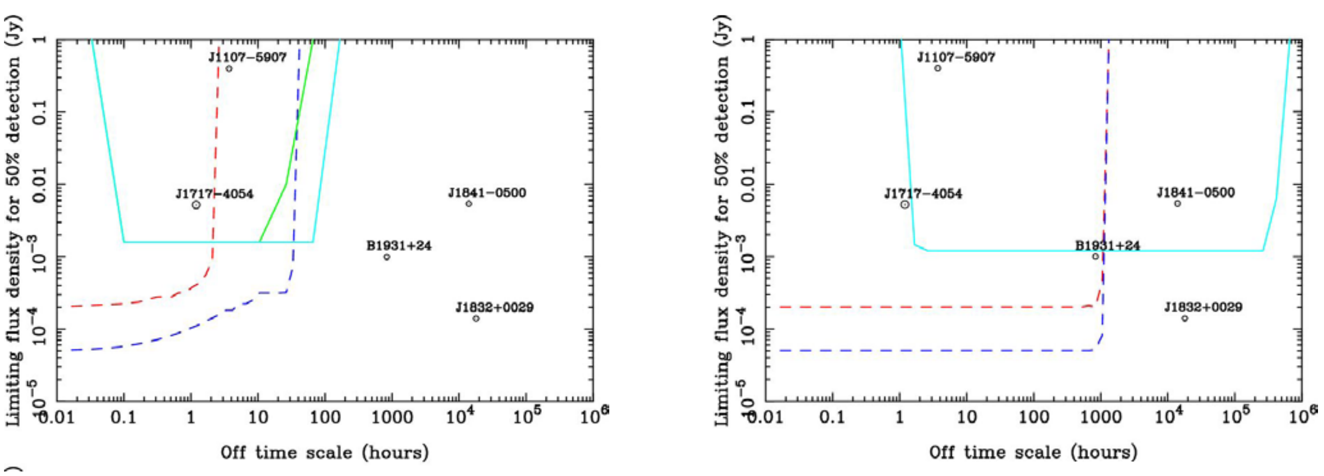
We analysed the snapshot images with three different transient-detection pipelines: one developed specifically for this study; the LOFAR transients pipeline (TRAP); and the VAST pipeline, developed to search for transients with the complete ASKAP telescope. All three easily detected the pulsar as a transient source.

Over the course of the observations, the pulsar switched into the strong emission state three times giving a typical timescale between the strong states of 3.7 hours. After the first switch it remained in the strong state for almost 40 minutes. The other strong states lasted less than four minutes. The second state change was confirmed with Parkes. The high-sensitivity Parkes observations enabled us to detect individual bright pulses during the weak state and to study the strong state over a wide observing band.

Traditional pulsar surveys are affected by radio-frequency interference and variations in telescope gain, and they are generally only sensitive to pulsars with periods of between a millisecond and ten seconds. We have simulated pulsars switching between ‘on’ and ‘off’ states on various timescales then determined whether different survey strategies – a traditional pulsar survey, and two types of transient survey – could detect them. The results are shown in the figure. Repeated, relatively short observations of the same region of sky appear to be the best survey strategy for discovering unknown intermittent pulsars. The advantages of using ASKAP for such a survey include its extremely radio-quiet environment and its sub-GHz frequency coverage, in which pulsars are likely to be brighter than at higher frequencies.

PUBLICATION

Hobbs, G. *et al*. “A pilot ASKAP survey of radio transient events in the region around the intermittent pulsar PSR J1107–5907”. MRNAS 456, 3948–3960 (2016)



The sensitivity of various surveys to intermittent pulsars. The pulsars are shown with their correct ‘off’ timescales. The top panel represents an ‘on’ period of 18 minutes and the bottom panel an ‘on’ period of 30 days. The surveys are: one similar to the Parkes Multibeam Survey (dashed red line); an EMU-style continuum survey (dashed blue line); a VAST-style survey, repeating 5-minute observations each week for five years (blue line); and a transient survey based on five-minute snapshots of the 12-hour EMU continuum observations. (From Hobbs *et al.* 2016)

Giant blasts dwarf

MEGAN JOHNSON

(CASS)

It used to be thought that dwarf galaxies were “builders’ rubble” – leftovers from the assembly of massive galaxies. Recent studies suggest at least some formed later than that period of assembly. But regardless of when they formed, many are now being accreted by their weighty neighbours. We have studied one that may be on its way to that fate.

The giant elliptical galaxy NGC 5128, known to radio astronomers as Centaurus A (Cen A), has huge radio lobes that span 9°x4° on the sky. This behemoth is surrounded by a bevy of irregular dwarf (dIrr) galaxies.

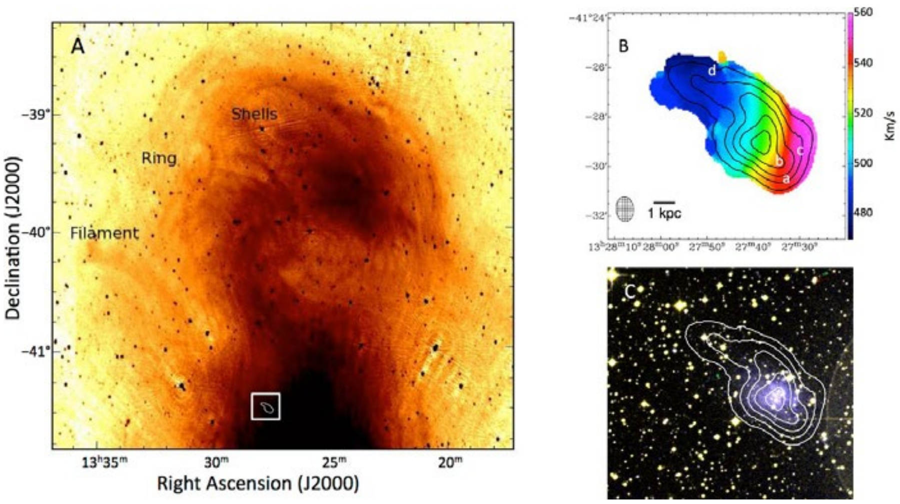
One, ESO 324–G024, was of particular interest to us. This dwarf has a peculiar H I morphology: a long, 3.5-kpc tail extending away from the core of NGC 5128. The distance to this dwarf is 3.37±0.43 Mpc, nearly the same as that to NGC 5128 (3.8±0.1 Mpc). And it lies a projected 104 kpc north of NGC 5128’s centre, meaning that it might be inside the giant’s northern radio lobe, which extends for ~300 kpc.

The orientation of Cen A’s radio lobes is not well known. By studying the characteristics of ESO 324–G024 we hoped to shed some light on this question, as well as on the dwarf’s unusual morphology. For this exploration we used H I spectral-line data from the Compact Array, data on the 1.4-GHz radio continuum and polarisation from the Compact Array and Parkes, and ancillary data from the SuperCOSMOS sky survey, *GALEX* and *WISE* (the Wide-field Infrared Survey Explorer).

To get a handle on whether ESO 324–G024 lies in front of, inside, or behind the northern radio lobe, we turned to the radio-continuum data of Cen A, in particular the Faraday rotation measure (RM), which is the angle through which linearly polarised radiation is turned as it passes through a magnetic field. If ESO 324–G024 were in front of the lobe, then we would expect the background emission from Cen A to be depolarised as it passes through the dwarf. But there is no sign of this in our data. Could the dwarf’s magnetic field be too weak to depolarise the Cen A signal? We considered this, but concluded that ESO 324–G024 probaby lies behind the lobe.

If that’s the case, it puts some constraint on the orientation of the lobe and also on the distance to NGC 5128 and ESO 324–G024: the closer ESO 324–G024 is to the observer (relative to NGC 5128), the larger the required orientation angle. If we assume that ESO 324–G024 and NGC 5128 are at the same distance, and that the lobe is as deep as it is wide, then the lobe is inclined towards us by 60°.

Then there’s the question of how ESO 324–G024 got its tail. If it were formed from tidal interactions, then we would expect the gas kinematics in the tail to be distinct from the circular rotation in the dwarf’s central disc. But if it were formed from stripping via ram-pressure forces, then the kinematics of the gas would probably resemble the circular rotation of the disc. Fitting the data with tilted-ring models, we found that the kinematics of the tail closely resemble those expected from circular rotation in the disc. So ram-pressure stripping appears to be the culprit. ESO 324–G024 has a slightly positive peculiar velocity, which suggests that it is receding from our line of sight, and that it may have passed through the northern radio lobe of Cen A.



Left: a 1.4-GHz radio-continuum image, made from Compact Array and Parkes data, of the northern lobe of Centaurus A (from Feain *et al*. 2011). The outermost H I contour of ESO 324–G024 is shown in white. Right: H I intensity contours overlaid on (top) the H I velocity field, and (bottom) an optical image made from SuperCOSMOS data. (From Johnson *et al.* 2015)

PUBLICATION

Johnson, M.C. *et al.* “Blasting away a dwarf galaxy: the ‘tail’ of ESO 324–G024” MNRAS 451, 3192–3209 (2015)

Have massive stars formed in H I reservoirs?

MICHAL MICHAŁOWSKI

(University of Edinburgh)

Long-duration gamma-ray bursts (GRBs) are generated by the collapse of massive stars. Such stars are short-lived, so these GRBs may trace star formation in the Universe. But are they an *unbiased* tracer? To determine this we have to measure the gas content of the GRB host galaxies, about which we have known relatively little.

Previous studies, mainly of gas in absorption, have suggested that GRB host galaxies have low levels of molecular hydrogen, H_2 (assumed to be the main fuel for star formation), but high levels of cool atomic hydrogen, H I. However, to measure the total gas content of these galaxies (as opposed to column densities along a single line of sight), we need to detect gas in emission. We have carried out such a study, using the ATCA to make the first detection of H I in GRB host galaxies.

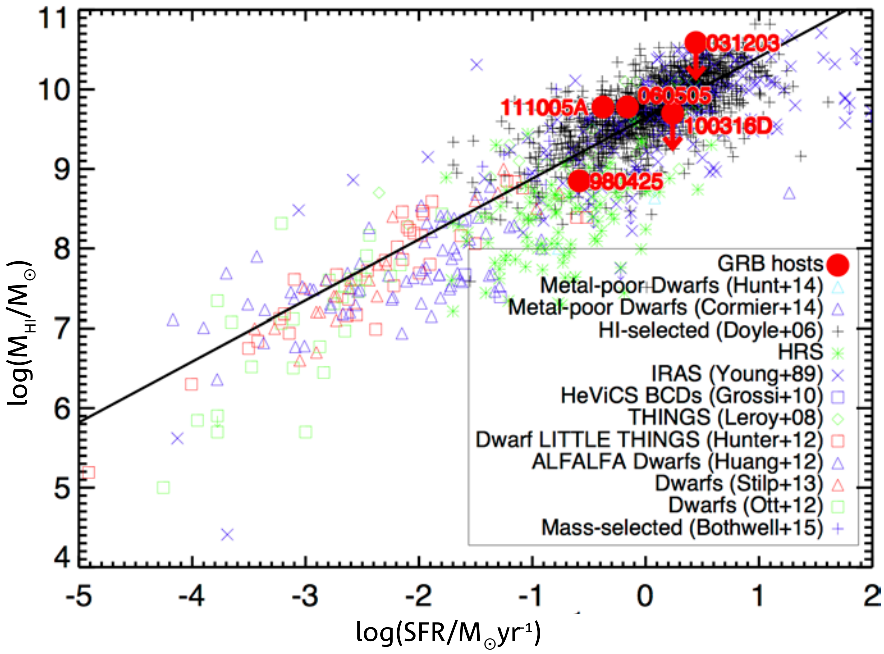
We targeted five nearby (z<0.12) GRB hosts in the southern hemisphere. Comparing their properties with those of galaxies from 22 previous studies, we found them to be normal star-forming galaxies.

However, while our galaxies have normal star-formation rates and H I masses, they have low stellar masses and H_2 masses. This suggests they have only recently started forming stars and have not yet had time to use up their H I and produce stars and dust (which catalyses the production of H_2). In this picture, star formation is directly fuelled by H I from the intergalactic medium. This has been shown to be theoretically possible, and must have been the case for the first stars in the Universe. It could also take place at any redshift, even in a galaxy not particularly metal-poor on average, as long as it happens at early stages of a star-formation episode, when the first stars are born in a collapsing cloud formed out of the newly accreted metal-poor gas.

We think it likely that GRB progenitors form in the first burst of star formation that takes place in low-metallicity gas freshly accreted from the intergalactic medium. (GRBs have been shown to explode in the most metal-poor regions of their hosts.) The progenitor would then end its life as a GRB before there is time for substantial H_2 to form. This would explain the paucity of H_2 absorption features seen in GRB afterglows and the low CO emission from host galaxies. The location of the H I emission in and around three of the host galaxies we studied also supports the ‘gas inflow’ scenario.

PUBLICATION

Michałowski, M.J. *et al.* “Massive stars formed in atomic hydrogen reservoirs: H I observations of gamma-ray burst host galaxies”. A&A 582, A78 (2015)



H I mass as a function of the star-formation rate of GRB hosts (red circles) and other galaxies. The solid line is a linear fit to all the data. (From Michałowski *et al*. 2015)

VIKRAM RAVI

(Co-supervised PhD student – University of Melbourne)

First 'fast radio burst' from a targeted search

Fast radio bursts (FRBs) are short, bright pulses of radio waves with remarkably large dispersion measures (DMs), which show that they have passed through a considerable amount of ionised material (chiefly free electrons in space). The high DMs seem to point to an extragalactic origin, as the Galaxy lacks the necessary electron density to generate them. Since FRBs were discovered in 2007 many ideas have been put forward to explain them, perhaps almost as many as the number of published FRBs (currently ~20).

The first FRB found, discovered in the Parkes archives by Lorimer *et al.* (2007), lay towards the Small Magellanic Cloud. This motivated us to observe towards another of the Milky Way's small companion galaxies, the Carina dwarf spheroidal (Car dSph), which lies 101±5 kpc away. Car dSph is unique among the Milky Way's dwarf satellites in having undergone three widely spaced episodes of star formation, and the Galaxy's contribution to the DM in its direction is expected to be low. We hoped to detect pulsars in Car dSph and use them to identify the Local Group's contribution to the DM along this line of sight.

We observed the Car dSph field with the multibeam receiver on the Parkes telescope, making a series of one-hour observations. Just 20 minutes into the second hour, our real-time detection pipeline (HEIMDALL, developed by Swinburne University) registered a transient event at a DM of 779 cm^{-3} pc, with a signal-to-noise ratio of 30. We had found FRB 131104.

We re-observed the Car dSph field for the following three hours, then over the next three days, and yet again over the next year, for 78 hours in all. But the FRB did not repeat and we saw no other unusual events.

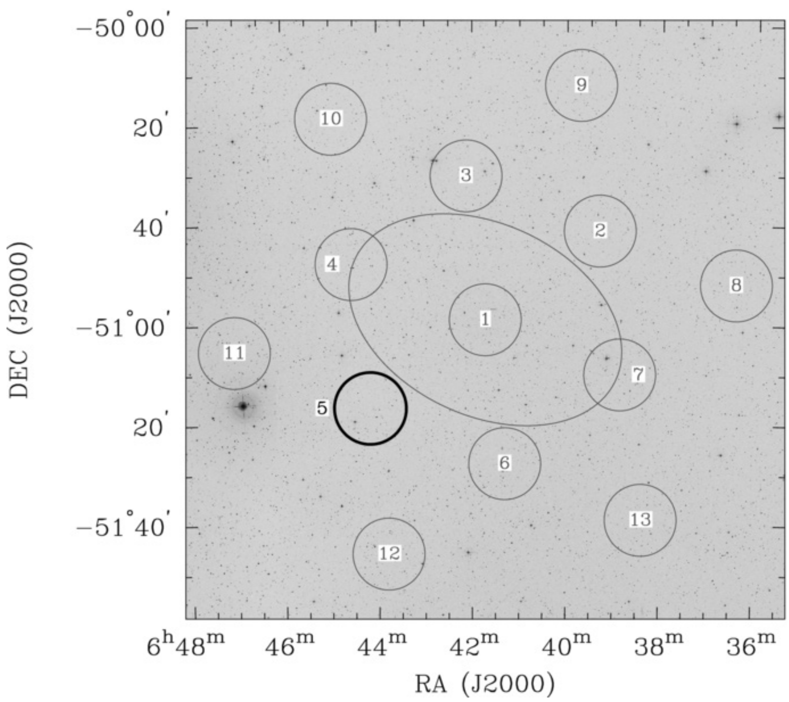
We detected FRB 131104 in only beam 5 of the 13-beam receiver. At the time, that beam was directed towards stellar debris associated with the Large Magellanic Cloud. But the beam was also close to Car dSph's tidal ellipse, so the FRB may also have come from the direction of that galaxy.

Given the high DM, if the FRB came from Car dSph then its source must lie behind gas with an electron density ten times that of the Milky Way's. This might be provided by the Magellanic Stream, part of which lies along the sightline to Car dSph.

If FRB 131104 did indeed originate so near the Milky Way, could it be a form of giant pulse emission? The brightest such event from the Crab pulsar was recorded with the Arecibo telescope: had it occurred at the distance of Car dSph, Parkes would have detected it with a signal-to-noise ratio of ~26. To investigate this possibility further, we need an independent estimate of the line-of-sight DM to Car dSph. For the moment, the origins of FRB 131104 remain open.

PUBLICATION

Ravi, V. *et al.* "A fast radio burst in the direction of the Carina dwarf spheroidal galaxy." ApJ Letters 799:L5 (2015)



The positions of the 13 beams of the Parkes multibeam at the time of the detection, and the tidal ellipse of the Carina dwarf spheroidal (from Irwin & Hatzidimitriou 1995). The FRB was detected only in beam 5. (From Ravi *et al.* 2015)

H I absorption detections: how many can we expect?

SARAH REEVES

(Co-supervised PhD student – University of Sydney)

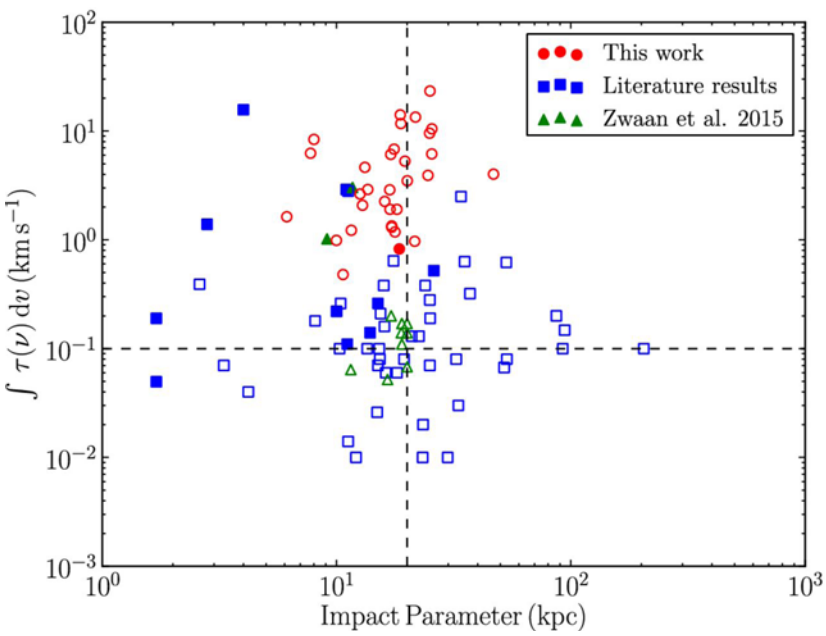
The 21-cm spectral line of neutral hydrogen (H I) can trace features showing interactions between galaxies and tell us about the size, mass and structure of galaxies at different epochs – clues as to how they have evolved over cosmic time. But H I in emission has been detected only out to z < 4 for individual galaxies. *Stacking* pushes detections to higher redshifts but gives the properties of ensembles, not individual galaxies. However, the H I absorption line can be detected at almost any redshift, provided there is a sufficiently bright background source against which to search.

Next-generation radio telescopes will conduct the first large-scale blind absorption-line surveys, such as FLASH (the 'First Large Absorption Survey in H I'). FLASH will use the Australian Square Kilometre Array Pathfinder to search for H I absorption along 150,000 sightlines, studying the evolution of neutral hydrogen in the redshift range 0.5<z<1.0 (look-back times of ~4–8 Gyr). How many detections can we expect from FLASH? To get an indication, we have used the Compact Array to carry out a small-scale study in two stages, using a total of 16 nearby (z<0.04), gas-rich galaxies, viewed along 23 sightlines.

Our sample consisted of galaxies drawn from the HIPASS (HI Parkes All-Sky Survey) Bright Galaxy Catalogue, cross-matched with background sources from the SUMSS (Sydney University Molonglo Sky Survey) catalogue. By selecting low-redshift galaxies we were able to map the targets in H I emission, allowing us to directly relate the gas distribution to the absorption-line detection rate.

We detected absorption in just one target, NGC 5156 (a barred spiral galaxy at z= 0.01), 19 kpc away from the galaxy's centre. Previous studies have estimated there is ~40–50 per cent chance of detecting an absorption line within 20 kpc of a galaxy's centre so why did we not detect more? First, the background radio sources in our sample were generally much fainter than those in other surveys. Second, while previous studies used bright, compact quasars as their background sources, we used an unbiased sample of radio sources, selecting the sources only by radio flux and not source type (meaning that ~90 per cent were radio galaxies and only ~10 per cent were quasars). Both factors meant that our background sources were less likely to show absorption than those in previous studies.

Our results are therefore likely to be more representative of the expected detection rate for future blind surveys such as FLASH. We estimate that for an unbiased sample of radio sources brighter than 50 mJy the expected detection rate is probably around 5–10 per cent. This means that with FLASH we can expect to detect thousands of new H I absorption-line systems.



Integrated optical depth plotted against impact parameter (distance from the centre of the target galaxy) for several absorption-line searches: Reeves *et al.* (2016) (red circles); previous searches using only quasar sightlines (blue squares); a search by Zwaan *et al.* (2015) that used both radio galaxies and quasars (green triangles). Filled symbols indicate detections, unfilled ones non-detections. (From Reeves *et al.* 2016)

PUBLICATIONS

Reeves, S.N. *et al.* "H I emission and absorption in nearby, gas-rich galaxies". MNRAS, 450, 926–942 (2015)

Reeves, S.N. *et al.* "H I emission and absorption in nearby, gas-rich galaxies – II. Sample completion and detection of intervening absorption in NGC 5156". MNRAS, 457, 2613–2641 (2016)

No rumble in the cosmic jungle

RYAN SHANNON

(Curtin University and CASS)

In 2015 the team operating LIGO (the Laser Interferometer Gravitational-Wave Observatory) made its first stunning discovery (announced in 2016) of gravitational waves from two merging black holes, each of about 30 solar masses. The confirmation of black holes in this mass range, and the rapidity with which LIGO detected the merger, sent scientists back to the drawing board. In 2015 we too published a study, based on observations from the Parkes telescope, which suggests that we need to revise ideas about a source of gravitational waves: in this case, supermassive black holes.

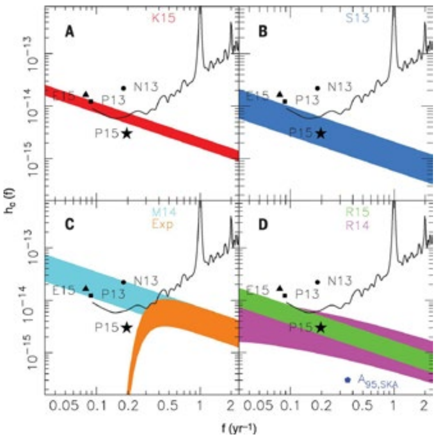
These black holes, of more than 10^6 solar masses, seem to be ubiquitous in large galaxies in today's Universe. The existence of quasars shows they also inhabited galaxies in the early Universe. Galaxy mergers, presumed to be common at that time, must create binary pairs of supermassive black holes that themselves eventually spiral together and coalesce. When the black holes get close enough together they become strong emitters of gravitational waves, sending space-time ripples on a billion-year trajectory toward Earth. The combined signal from all the binary supermassive black holes in the Universe creates a background rumble of gravitational waves.

We can search for this background by monitoring, over years to decades, a set of superfast 'millisecond' pulsars. When travelling across the line of sight between Earth and a pulsar, gravitational waves stretch and shrink the distance between the two by a tiny amount. This change should show up in the arrival times of the pulsar's radio pulses, which can be measured with a precision of around 20 nanoseconds. The gravitational-wave background should become clearer as an observing campaign grows longer.

As part of the Parkes Pulsar Timing Array (PPTA) program, we have been monitoring 24 pulsars with the Parkes telescope to search for gravitational waves. We now have a dataset spanning 11 years, three years longer than any comparable one: its longer duration (plus better methods of analysis) means that it is more sensitive to gravitational waves. But when we analysed it in 2015 we found no sign of the gravitational-wave background! Consequently, we have been able to use this dataset to place a very strong limit on the background, six times more stringent than any before.

Our result suggests that at least one of the assumptions underlying the models of gravitational-wave backgrounds is incorrect. For instance, the black holes may lose energy through viscous drag from surrounding gas and so come together and coalesce more rapidly than expected; if that were so, the binaries would spend less time emitting gravitational waves, reducing the amplitude of the gravitational-wave background at low frequencies.

Our result implies that detecting gravitational waves will probably require observations over many more years. Higher-cadence and shorter-wavelength observations may also help. In addition, our observing sensitivity will be boosted by new technology, such as the ultra-wideband receiver planned for Parkes (page 36).



Predictions and limits on the gravitational-wave background. The black stars show the 95% confidence limit obtained by this study, while the other symbols are previously published limits. Each panel shows a different prediction for the gravitational-wave background, based on four models for the evolution of supermassive black holes: the shaded regions show the 1σ uncertainty in each case. Panels (C) and (D) also show models that include the effects of environmentally-driven binary evolution. The black curve in each panel shows the nominal single-frequency sensitivities of our observations. In (D), the blue pentagon shows the predicted upper limit on the gravitational-wave background that the Square Kilometre Array could achieve with a single-pulsar timing campaign: it excludes all considered models with > 98% probability.

PUBLICATION

Shannon, R.M. *et al.* "Gravitational waves from binary supermassive black holes missing in pulsar observations". Science, 349 (6255), 1522–1525 (2015)

Viewing molecular gas at high redshifts

JUSTIN SPILKER

(PhD student – University of Arizona)

Since their discovery, dusty star-forming galaxies (DSFGs) at high redshifts have challenged models of galaxy evolution. Their infrared luminosities imply star-formation rates of 100–1000 solar masses per year, which would turn them into massive, quiescent galaxies in only a hundred million years. Dusty star-forming galaxies are faint, and only a handful of sources (mostly lensed) have been observed in detail. As a result, we have known little about the distribution and quantity of the star-forming gas within them.

A breakthrough occurred when the South Pole Telescope (SPT) discovered a population of rare but extremely bright millimetre-selected galaxies. Follow-up observations with several telescopes, including the Compact Array, showed that these objects are strongly gravitationally lensed. Using ALMA (the Atacama Large Millimeter/submillimeter Array) we obtained unambiguous CO-based redshifts for 19 SPT sources. This doubled the number of starbursts known at z>4; indeed, our sample has two of the highest-redshift DSFGs in the literature (z=5.7).

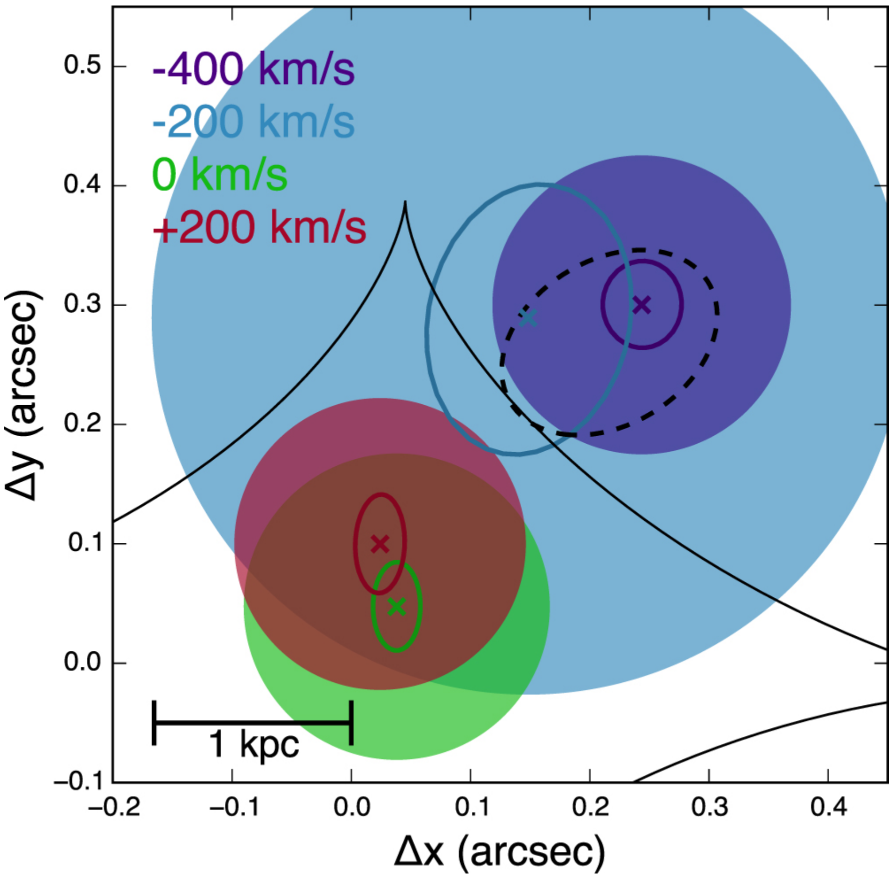
The Compact Array is the only facility that can access the critical low-J CO lines and so observe the cool gas reservoirs in galaxies at z=2–7. In a successful previous program with the Compact Array we detected low-J CO line emission with high significance in 17 of the 18 DSFGs from the SPT sample that we targeted (Aravena *et al.* 2016).

We have now used the Compact Array to image two of these 17 DSFGs at sub-kiloparsec scales. The sources were SPT0538–50 (z=2.78), which is representative of the DSFG population, and SPT0346–52 (z=5.66), which is one of the highest-redshift DSFGs known. Both have lens models that allow us to derive the galaxies' intrinsic gas and dust properties. SPT0538–50 appears to be a pair of merging galaxies (as Bothwell *et al.* 2013 posited), while SPT0346–52 looks more like a merger than like the massive rotating disks normally seen in star-forming galaxies at intermediate redshifts; however, deeper observations will be needed to confirm this.

With the wealth of high-resolution data provided by the Compact Array, we were also able to calculate the conversion factor between CO luminosity and molecular gas mass, α_{CO}, in more than one way (we used gas-to-dust ratio, the dynamical gas of the galaxies, and the CO luminosity surface density) and compare the results of the different methods. There was reasonably good agreement, giving an average value for α_{CO} of 1.3 for SPT0346–52 and 1.5 for SPT0538–50. These conversion factors are similar to those determined for other rapidly star-forming systems.

PUBLICATION

Spilker, J.S. *et al.* "Sub-kiloparsec imaging of cool molecular gas in two strongly lensed dusty, star-forming galaxies". ApJ, 811, 124 (2015)



A schematic representation of SPT0346–52. The coloured disks denote different CO(2–1) velocity channels (truncated at the half-light radius): 'x' marks the centroid of each, and the ellipses are the 1σ positional uncertainties. The dashed black line is the FWHM and location of the 870-μm dust emission, while the thin black line is the lensing caustic. (From Spilker *et al.* 2015)

Facility operations

CSIRO Chief Executive Larry Marshall admiring a feedhorn under construction at CASS

Students at the International Pulsar Timing Array student workshop in July. Photo: Matthew Bailes, Swinburne University

Indigenous participants Leonie Boddington (CASS's Aboriginal Liaison Officer) and Russell Simpson at the *Towards an SKA for WA* seminar in October. Photo: Phil Crosby

Input from the user community

The users of ATNF telescopes contribute to ATNF decision-making through an advisory group, the Australia Telescope User Committee (ATUC), the members of which are listed in Appendix A. ATUC considers current operations, priorities for future developments, and other matters raised by the user community, then makes recommendations to the ATNF Director: most recommendations are accepted and implemented. This year ATUC met in June and November. Its reports to the ATNF Director, and the Director's replies, can be found at: *http://www.atnf.csiro.au/management/atuc/index.html.*

WORKSHOPS, MEETINGS AND COLLOQUIA

In 2015 the ATNF hosted a number of workshops and meetings for the benefit of the astronomical community:

- **ATNF data-reduction workshop** (2–5 June) – for all researchers needing to process data from ATNF telescopes
- **Australia Telescope Users Committee science discussion** (1 June) – an open discussion for all researchers on the use of ATNF facilities
- ***H I in Dwarf Galaxies*** (15–16 July) – for researchers studying dwarf galaxies
- **International Pulsar Timing Array student workshop** (19–24 July) – for students (primarily at PhD level) to hear from IPTA experts
- ***International Pulsar Timing Array 2015* meeting** (20–31 July) – for international researchers using millisecond-pulsar timing to search for gravitational waves
- ***Supermassive Black Hole Growth and Evolution* workshop** (27 July) – for researchers working on the evolution of supermassive black holes
- ***Radio Astronomy School*** (28 September–2 October) – techniques of radio astronomy, mainly for postgraduate students
- ***ASKAP Early Science* community workshop** (8 October) – for all researchers involved in ASKAP's Early Science program
- ***Towards an SKA for WA* seminar** (21 October) – the first major event held by CASS in Perth, this meeting was to update stakeholders and project partners about activities and planning for Square Kilometre Array project
- **Combined Bolton and student symposium** (2 December) – an event to showcase work carried out with Australian facilities.

In addition, at its Marsfield headquarters the ATNF runs a program of regular colloquia, usually given by researchers visiting from other countries or other parts of Australia. Thirty-three (33) talks were given this year.

FACILITY REPORT: AUSTRALIA TELESCOPE COMPACT ARRAY

Prototype feedhorns for the 4cm band were installed on the Compact Array in late 2012. These extended the top end of the receiver range from 10.8 GHz to 12 GHz. Following this successful upgrade, this year we added two further feeds to the array, leaving only antennas CA01 and CA06 with the old feeds.

An intermittent problem with occasional phase jumps, seen initially on antenna CA03, was finally traced to an on-board oscillator and we began a program of replacing this component.

During a two-week shutdown in May and June we replaced the control-building switchboard and installed a new generator.

The array's cryogenic compressors are cooled by fans. In previous summers, hot westerly winds have sometimes overwhelmed these fans, leading the array to perform a 'heat stow'. This December we solved the problem by installing new fan shrouds, which provide extra air movement. And, after many years of service, the last of the active hydrogen masers used at the Compact Array and Mopra were refurbished.

To supplement the existing documentation for the Compact Array, this year we made the first two of a series of planned observer-training videos. These have been well received by telescope users.

In November CASS informed the user community of its intention to implement a program of ATCA Legacy Projects from the 2016OCT semester. Legacy Projects will be large, coherent science investigations, not reproducible by any combination of smaller projects, that generate data of general and lasting importance to the broad astronomical community.

Legacy Projects will typically each require more than 2000 hours of observing time, with probably more than 300 hours being allocated each semester.

Legacy Projects recognise that the ATCA is a mature, highly versatile radio interferometer, and is set to remain a forefront instrument until at least the completion of SKA phase 1. Its broadband instrumentation provides high sensitivity for spectral-line, continuum and polarisation studies over an exceptionally wide frequency range (1–105 GHz), a range that complements those of ASKAP (0.7–1.8 GHz) and the Atacama Large Millimeter/submillimeter Array, ALMA (> 90 GHz). Up to 25 per cent of observing time may be allocated to Legacy Projects from 2016OCT onwards. A call for Expressions of Interest was issued in December to gauge the level of community interest and to help CASS put appropriate arrangements in place to conduct Legacy Projects.

Four antennas of the Compact Array. Photo: Vanessa Moss

DST Global founder Yuri Milner (at podium) at the Royal Society, London, on 20 July, announcing the Breakthrough *Life In The Universe* Initiatives.
Photo: Breakthrough Initiatives

The Parkes telescope.
Photo: Alessandro Ridolfi

FACILITY REPORT: PARKES

The Parkes telescope enjoyed another productive year of observations in 2015, with pulsar timing and searches for pulsars and fast radio bursts (FRBs) accounting for most of the observing time. Parkes remote observing has gone well, aided by the Telescope Protection System. Following feedback from telescope users, the remote-observing requirements were modified during the year. First-time observers still need to come to the Science Operations Centre (SOC) in Sydney for training ahead of their observations, but the many Parkes users who are frequent observers no longer have to visit the SOC annually to re-qualify.

A significant piece of sleuthing this year identified the source of *perytons*: transient radio signals, lasting for just milliseconds, which were first detected at Parkes in 2011. From the beginning, researchers had suspected that perytons were terrestrial in origin, yet they showed frequency-swept emission, mimicking (although imperfectly) fast radio bursts. They were detected only a handful of times every year, making them difficult to track down. But the installation of the new radio-frequency interference monitor at the observatory in December 2014 made it possible to clearly establish that they were terrestrial interference (from microwave ovens). The same work clearly distinguished them from the FRBs, which still appear to be genuine extragalactic transients.

Parkes will be used to commission a phased array feed (PAF) that CASS is building for the Max Planck Institute for RadioAstronomy (MPIfR) in Germany. The PAF is to be used on the Effelsberg 100-m telescope near Bonn. By testing the PAF on Parkes we will gain a more detailed understanding of PAF performance and ensure that the MPIfR will receive a fully characterised PAF. We prepared for the PAF's installation during a two-week shutdown at Parkes in late November/early December, running optical fibre from the focus cabin to the telescope tower. The PAF will replace the 20-cm multibeam receiver for up to eight months from early 2016: users were advised of this in the proposal calls for the 2015APR and 2015OCT observing semesters. To allow pulsar timing to continue during this period there will be regular (monthly) changes of receiver, the 10-cm/50-cm and H-OH receivers being used alternately.

In November and December Parkes and the Compact Array were used together with the 70-m antenna of the Canberra Deep Space Communication Complex at Tidbinbilla to conduct bistatic radar observations of two near-Earth asteroids, the Tidbinbilla antenna transmitting while Parkes and the Compact Array received the reflected signals. During this experiment the data stream was recorded on both a NASA-format recorder and VLBI (very long baseline interferometry) data recorders, to test the feasibility of using the latter for future experiments.

In July it was announced that Parkes would be a key element of the *Breakthrough Listen* project, a search for extraterrestrial intelligence (SETI) program funded by the Breakthrough Prize Foundation. *Breakthrough Listen* will use 25 per cent of the available observing time from October 2016. Opportunities for commensal use of this time are being explored.

FACILITY REPORT: MOPRA

For the past three years, the National Astronomical Observatory of Japan (NAOJ) and a consortium of the University of New South Wales and the University of Adelaide have contributed to the funding of Mopra's operations, and in return have been allocated blocks of observing time. Some observing time has been reserved as 'National Facility time': this has been used for a number of single-dish programs and for Mopra's participation in Long Baseline Array projects (see below). The agreement that governed this operating arrangement came to an end in October this year.

In May 2014 CSIRO announced it would cease funding Mopra. We have since held discussions with parties interested in operating Mopra. We expect that routine maintenance of the facility will be contracted back to CASS on a full cost-recovery basis.

The bushfire of 2013 damaged Mopra's site (although the telescope itself was little affected). This year we completed the final tidying-up, replacing the switchboard and putting a permanent roof over the remaining portion of the old control building.

FACILITY REPORT: LONG BASELINE ARRAY

The ATNF's Long Baseline Array (LBA) is a set of telescopes used together for simultaneous observations, a technique called *very long baseline interferometry* (VLBI). The core elements of the LBA are the ATNF's three telescopes in New South Wales (Parkes, Mopra and the Compact Array) and two telescopes of the University of Tasmania: the Hobart 26-m antenna (in Tasmania) and the Ceduna 30-m (in South Australia). Other telescopes that can be used in the VLBI network are: the 70-m and 34-m antennas at the Canberra Deep Space Communication Complex at Tidbinbilla; a single ASKAP antenna with a traditional 'single-pixel' feed; the Hartebeesthoek 26-m and 15-m antennas in South Africa; and the Warkworth 12-m and 30-m antennas in New Zealand. Since 2008, data from the Long Baseline Array has been correlated at Curtin University under a contract with ATNF. This arrangement came to an end in September 2015, and the task of correlating the data has returned in-house. Cormac Reynolds, previously at Curtin University, joined CASS in October and is putting his experience and expertise in operating the DiFX software correlator to good use in his new role.

The capabilities of the LBA have been enhanced by the AuScope antennas of the University of Tasmania, which join our telescopes for observations at 2.3 and 8.4 GHz when their other commitments allow. A new 15-m antenna at Hartebeesthoek (South Africa), operating at the same bands, has allowed that site to join observations too, even when the main 26-m antenna at the site has been unavailable. Auckland University of Technology has recently taken ownership of a 30-m antenna, previously used for telecommunications, at Warkworth in the South Island of New Zealand. The antenna's 6.7-GHz receiver means it can join in observations of the 6.7-GHz spectral line from cosmic methanol masers, the subject of several ongoing LBA projects.

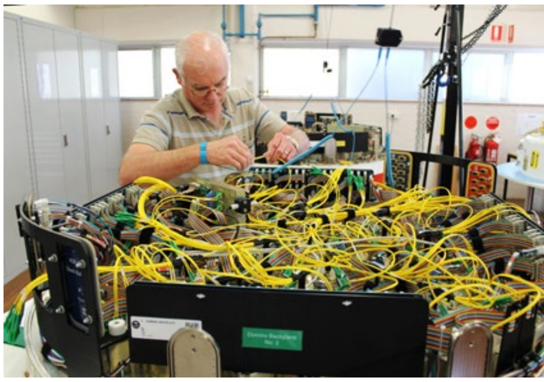
An out-of-session observation was made in September in support of Russia's RadioAstron space VLBI mission, with a ground array that included the Australian LBA; the Green Bank Telescope, the Karl G. Jansky Very Large Array and the Very Long Baseline Array (all in the USA); the Korean VLBI Network; and the new 65m Tianma Shanghai telescope in China – possibly the largest network the LBA has ever observed with.

The Mopra telescope. Photo: Cormac Purcell

FACILITY REPORT: AUSTRALIAN SKA PATHFINDER (ASKAP)

As the year opened, the ASKAP commissioning team was continuing to work with the Boolardy Engineering Test Array, or BETA – six ASKAP antennas equipped with first-generation CSIRO phased array feed (PAF) receivers. In January the team produced a 150-square-degree image of the Tucana constellation that demonstrated the telescope's rapid, wide-area survey capability. This image was over three times the size of previous efforts. It was soon followed by images created with the second-generation PAFs, six of had been installed on the ASKAP antennas at the end of 2015. With this set of six, the commissioning team created the first-ever 16-beam image to be made with PAF receivers. Then, eclipsing its own efforts, it produced a 25-beam image, made with five second-generation systems.

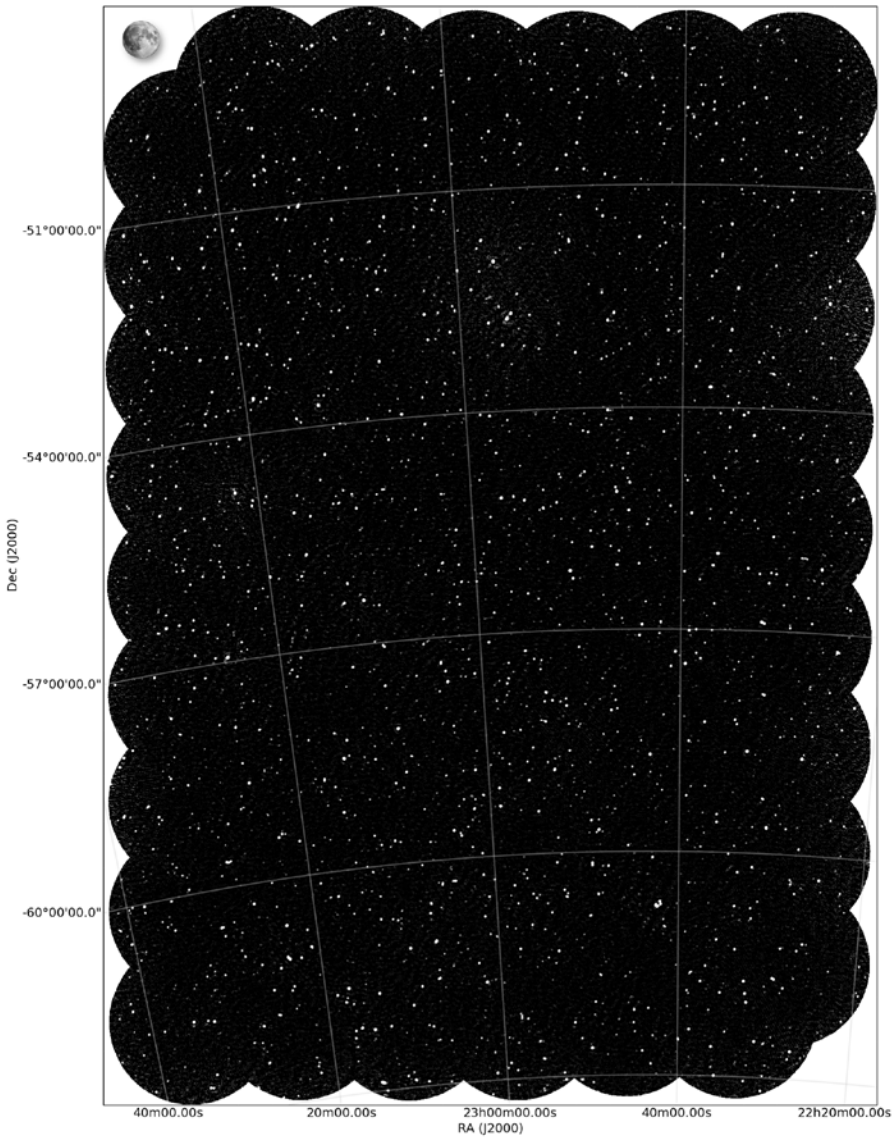
At the year's end there were around 20 more second-generation PAFs on the production line in the Sydney workshop, and a number of completed systems undergoing final tests or crated-up and ready for shipping to site.



Les Reilly at work on a second-generation phased-array feed. Photo: Flornes Yuen

Andrew Brown with ASKAP firmware crated for shipping to the Murchison Radio-astronomy Observatory.
Photo: Flornes Yuen

This year the ASKAP commissioning team collected about 192 TB of BETA data. Three terabytes (3 TB) have been publicly released as demonstration data and will be used by the team developing the CSIRO ASKAP Science Data Archive (CASDA), the first version of which was released in November. Another team is working closely with the commissioning team and the ASKAP Survey Science Teams to deliver the bespoke data-reduction software, *ASKAPsoft* (details, page 37).



The 150-square-degree image of the Tucana field produced during commissioning observations with the Boolardy Engineering Test Array (BETA). This image contains around 2000 sources above five sigma. Credit: Keith Bannister (observations) and Ian Heywood

The ASKAP Early Science program will begin in 2016, using ASKAP antennas equipped with the second-generation PAFs. In December, a project team led by CASS's Lisa Harvey-Smith secured 750,000 core hours of processing time for the Early Science data on the *Magnus* supercomputer at the Pawsey Supercomputing Centre in Perth, Western Australia. The time was awarded through the competitive National Computational Merit Allocation Scheme.

The first science papers based on BETA commissioning data were published this year:

- Allison, J.R. and 102 co-authors. "Discovery of H I gas in a young radio galaxy at z = 0.44 using the Australian Square Kilometre Array Pathfinder". MNRAS, 453, 1249–1267 (2015)
- Serra, P. and 79 co-authors. "ASKAP H I imaging of the galaxy group IC 1459". MNRAS, 452, 2680–2691 (2015).

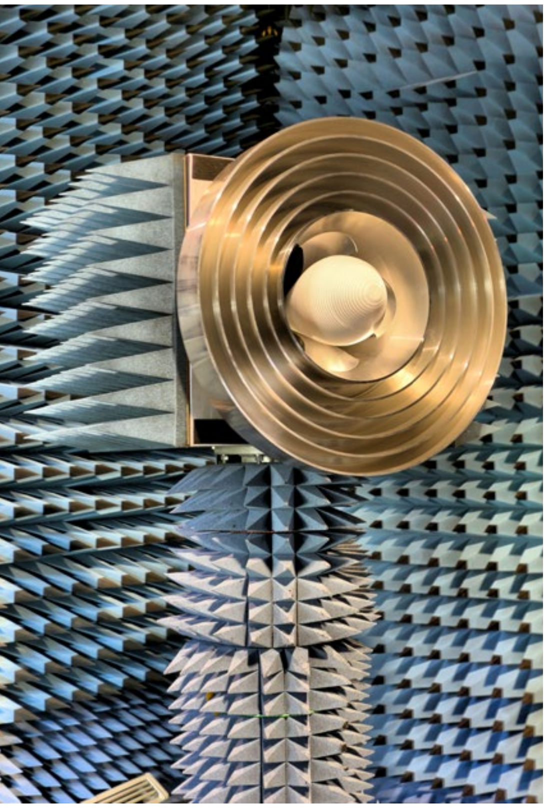
Big strides were taken this year towards securing a permanent power supply for ASKAP's site, the Murchison Radio-astronomy Observatory. CSIRO appointed Perth-based company EMC (Energy Made Clean) to supply around 6000 panels for a 1.6 solar array and a 2.5-MWh lithium storage battery (one of the largest in Australia), while the WA State Government approved a power supply agreement between Horizon Power and CSIRO for the supply of electricity to the MRO. Construction of a permanent hybrid (solar and diesel) power station will begin in 2016.

Installing a second-generation phased-array feed on an ASKAP antenna at the MRO Credit: CSIRO

James Hannah installing ASKAP firmware at the MRO Credit: CSIRO

Technology and software development

Alex Dunning setting up the prototype ultra-wideband Parkes feed for testing. Credit: Alex Dunning



The ultra-wideband feed in the antenna range for testing. Credit: Ray Moncay

AN ULTRA-WIDEBAND FEED FOR PARKES

About half the observing time on Parkes is used for pulsar studies that require a single beam, either the central beam of the multibeam receiver or the 10-cm/50-cm receiver. Making these observations more efficient would make the telescope significantly more efficient overall.

To do this, and to improve the sensitivity and precision of low-frequency observations, CASS is developing an ultra-wideband receiver that covers the band 0.7–4.0 GHz. CASS's Alex Dunning has designed a new feed with exceptional polarisation properties and close to constant beamwidth (that is, dish illumination) and focal position over this nearly 6:1 frequency range. CSIRO has applied for a patent for this new design.

A new digital signal-processing system will complement the feed and receiver. This year CASS's Paul Roberts developed both hardware and firmware for this, and assembled a prototype signal chain.

A PHASED ARRAY FEED FOR EFFELSBERG

Through an agreement with the Max Planck Institute for Radioastronomy in Germany (MPIfR), CSIRO has been building a phased array feed (PAF) receiver for the 100-m Effelsberg telescope in Germany. This PAF will operate in the 1150–1800 MHz band. It will be commissioned on the Parkes telescope from early 2016, remaining there for up to eight months. A specially designed GPU cluster and Ethernet switch will be installed as the system's backend; MPIfR will coordinate the coding of the processing software. While on Parkes the PAF will be used to search for 'fast radio bursts' – cosmic radio signals, lasting on the order of a millisecond, that have so far resisted explanation.

CASS engineer Aaron Chippendale and Professor Michael Kramer, Director of the Max Planck Institute for Radioastronomy, examining a phased-array feed under construction at CASS. Photo: Helen Sim

DATA REDUCTION FOR ASKAP

In its final form, ASKAP will produce an enormous data rate: 70 TB of correlated visibilites in an eight-hour observation. Handling this torrent will require high-performance calibration and imaging pipelines. The *ASKAPsoft* package has been developed to meet the challenge. The imaging algorithms and framework are designed to accord with the processing requirements on memory and run-time, and scientific requirements such as dynamic range.

ASKAPsoft will run in pipelines on the Galaxy supercomputer at the Pawsey Supercomputing Centre in Perth, Western Australia. Because ASKAP will be primarily a survey telescope, these pipelines will run in near real-time, starting when an observation is complete and finishing in time to process the next.

The Boolardy Engineering and Test Array (BETA) – six ASKAP dishes equipped with first-generation phased array feeds (PAFs) – was able to generate nine dual-polarisation beams. BETA datasets were small enough to not require real-time processing and could be processed by other, more established (if not high-performance) software packages. This has allowed us to validate the *ASKAPsoft* algorithms by comparing their performance with well-understood workflows.

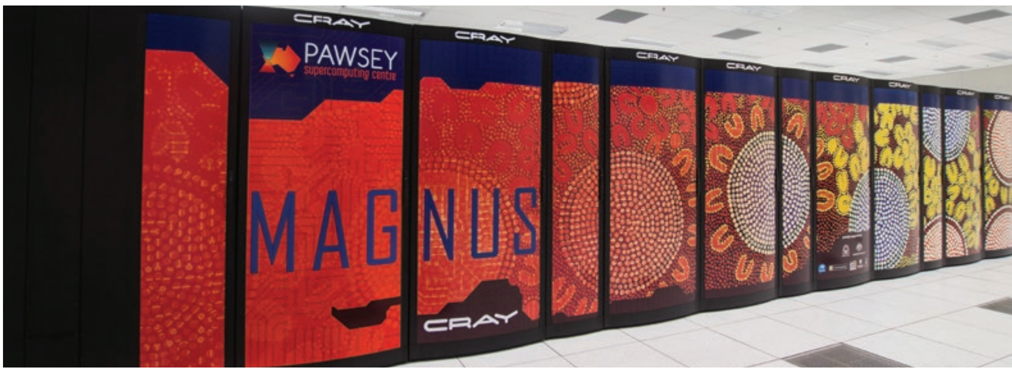
We developed a pipeline that reflects the typical observing strategy used for BETA: dedicated calibrator observations, followed by a target or science field. Separate PAF beams were processed independently prior to mosaicing to form the final image.

The next-generation PAFs are now being deployed on ASKAP antennas, and will be used to conduct the ASKAP Early Science program. Early Science data will be processed by *ASKAPsoft* pipelines built on those used for BETA, and which incorporate improvements identified in commissioning.

As the ASKAP array grows, its increased sensitivity will mean a real-time calibration pipeline becomes more feasible, and the progressively larger data rates will eventually require a move to online (rather than offline, user-driven) processing.

NEW SOURCE-FINDING SOFTWARE

CASS's Paolo Serra and colleagues have developed and made available for download new software, SOFIA, which is designed to detect and parameterise sources in 3D spectral-line datasets. SOFIA has been developed with future H I surveys in mind – surveys such as WALLABY and DINGO that will be done with the Australian SKA Pathfinder, and the APERTIF survey on the Westerbork telescope in the Netherlands. However, the software can be used on a wide range of datasets. It can search for line emission, on multiple scales, to detect 3D sources in a complete and reliable way; estimate the reliability of individual detections; look for signal in arbitrarily large data cubes; and provide output products that can be further analysed. SOFIA is modular, and can be expanded as new methods become available.



The Magnus supercomputer at the Pawsey Supercomputing Centre in Perth, Western Australia, which will be used to process ASKAP Early Science data. Photo: Pawsey Supercomputing Centre

SPECTRUM MANAGEMENT

Both radio telescopes and the antennas of NASA's Deep Space Network use extremely sensitive radio receivers, and both radio astronomy and spacecraft communications are impeded by man-made radio-frequency interference (RFI). For these activities to continue, the frequency bands allocated to them need to be protected. More general 'spectrum management' is also increasingly important because new telescopes such as the Square Kilometre Array will attempt to access most of the radio spectrum.

At the international level, the radio spectrum is regulated by the International Telecommunication Union (ITU); the international treaty called the 'Radio Regulations' is updated every four years via the World Radiocommunication Conference (WRC). In Australia, spectrum regulation is handled by the Australian Communications and Media Authority (ACMA).

CSIRO strives to protect spectrum for both radio astronomy and space research. This requires a good working relationship with ACMA, the ITU and other regional and international forums, and with the Department of Defence and other major users of the radio spectrum. CSIRO also works to gain more specific protection for radio observatories and deep-space facilities. These efforts have led to the establishment of a 'Radio Quiet Zone' around the Murchison Radio-astronomy Observatory in Western Australia and 'Radio Notification Zones' around other radio observatories.

Highlights of this work in 2015 were:

- active participation in the ITU-R World Radiocommunication Conference, which made substantial changes to international spectrum allocations. Prior to the WRC (held in November), CSIRO was involved in ACMA processes to develop Australia's position for WRC agenda items, to ensure protection of radio astronomy and space research spectrum. CSIRO also participated in ITU meetings leading up to the WRC, developing studies relevant to the agenda items
- leading the ITU-R studies in Working Party 7D and Working Party 3M
- election of Carol Wilson from CSIRO as Chairman of ITU-R Study Group 3 (Radiowave Propagation)
- representing radio-astronomy and space research interests in the Department of Communications' review of the spectrum-management framework.

The extreme radio quietness of the Murchison Radio-astronomy Observatory is protected by a Radio Quiet Zone. Photo: Pete Wheeler (ICRAR)

SQUARE KILOMETRE ARRAY PROJECT

The international Square Kilometre Array (SKA) project experienced a number of key events during the year that carried the telescope a step closer to the construction phase: these included the release of the SKA Science Book, the announcement of a permanent headquarters in the UK and annual meetings for the science and engineering communities.

In March, the SKA Board of Directors met to discuss Phase 1 design (SKA1) of the future mega-science project. A recommendation was made for a re-baselined SKA1, in which the design of the €650M first phase would consist of two complementary SKA instruments:

- SKA1-mid: 200 parabolic antennas in South Africa (including the 64 MeerKAT dishes)
- SKA1-low: 130,000 low-frequency aperture-array (dipole) antennas in Australia.

CSIRO continued its involvement in the SKA project through seven of the 11 SKA R&D consortia, as lead of the *Dish* and *Infrastructure-Australia* consortia, and as a key partner in *Assembly, Integration and Verification* (AIV).

Implications of the re-baselining process included a change to CSIRO's involvement in the *Central Signal Processing* (CSP) Consortium. As of 2015, CSIRO now leads the CSP sub-element design team, *Low.CBF*, which is focused on the design of the correlator and beamformer for SKA1-Low. Collaborators from ASTRON (Netherlands) and the Auckland University of Technology (New Zealand) are also part of this team.

Negotiations also began with SKA member governments, including Australia, to establish the SKA Organisation as an Inter-Governmental Organisation (IGO) regulated by a convention. The IGO convention will ensure strong governance for the project and a structure for the 50-year lifetime of the observatory. Negotiations will continue in 2016.

Toward the end of the year, an announcement by Australian Prime Minister Malcolm Turnbull included a provisional funding allocation for the SKA as part of the *National Innovation and Science Agenda*.

As part of the announcement, $293.7 million over 10 years was set aside to meet Australia's initial commitment to the SKA. The allocation means that, contingent on a successful conclusion to the Convention negotiations and the development of a satisfactory business case, funding is available to meet Australia's obligations to the construction and initial operation of SKA1.

The Low.CBF team at work. Photo: Andre Gunst, ASTRON

Participants at the first round of discussions for the SKA Inter-Governmental Organisation treaty, held in Rome in October. Photo: Simon Berry

CASS's Education and Outreach Officer, Rob Hollow (left), with visitors at the Perth Astrofest

CASS's Bärbel Koribalski giving a talk at the Murchison Astrofest

Outreach and education

VISITORS CENTRES

In 2015 the Visitors Centre at the Parkes observatory attracted 87,139 visitors, significantly more than in 2014 (68,427). The number of students and teachers rose to 1,396 (from 1,183 in 2014), while the number of tour-group visitors fell to 1,636 (from 1,893 in 2014). The revenue from the Visitors Centre shop (and the online shop) rose to $730,191, up significantly from the $602,640 received in 2014.

This year the Compact Array received 11,316 visitors, a number essentially unchanged from 2014 (11,600). With fewer staff on site, not all groups can be given a structured talk by a staff member; however, coach operators still consider the site a good destination.

OUTREACH

In addition to outreach that took place at the observatory visitors centres, CASS staff contributed to the following key events:

Perth Astrofest

This annual event, held on 28 March, attracted 3,000 people for a half-day of astronomy talks, exhibitions and sky viewing. Several CASS staff ran a CASS/SKA booth at which visitors were able to build Lego ASKAP antennas and learn more about ASKAP, the MRO and the SKA

Geraldton Science Festival

At this two-day event (30–31 March), CASS staffed a booth and ran a marathon ten-hour PULSE@Parkes observing run for students, teachers then the public. This festival drew 1,000 people from the local region.

Murchison Astrofest

CASS speakers were well represented at this biannual event, held on 5 September. Bärbel Koribalski and James Allison gave talks about their work while Rob Hollow gave a tour of the night sky and ran daytime activities for the children.

CASS's Keith Bannister speaking at a panel session during the Vivid Festival in Sydney on 24 May. Photo: Helen Sim

COMMUNICATIONS

The ATNF uses a variety of channels for external communications.

Media releases

This year CSIRO issued four media releases related to the ATNF:

- *Cosmic radio burst caught red-handed* (19 January)
- *We've revealed a galaxy far, far away …* (6 July)
- *CSIRO and Internet investor Yuri Milner strike deal for ET research* (21 July)
- *Eleven year cosmic search leads to black hole rethink* (25 September).

The release of 6 July, which concerned a detection by ASKAP of neutral hydrogen in absorption, resulted in more than 200 hits on traditional media (print, radio, TV) and an estimated reach of many millions across social-media platforms. A co-ordinated approach with partner organisations within the international SKA project contributed to the impact of this release.

Campaigns

In 2015 CSIRO Communications ran themed campaigns to highlight older stories and long-running projects. The *#CSIROspace* campaign, which ran from mid June to mid July, saw an average increase in views to the profiled web pages of 69 per cent. A link posted to the ATNF's ASKAP page as the first instalment of the series on Facebook received over 400 likes, almost 60 shares, and reached an audience of 19,000 people; the ASKAP page itself saw a 286 per cent jump in traffic after the link was posted, and received more visits than the CSIRO home-page features did during that week.

Websites

Visits to the central ATNF website reached 2.5 million this year, an increase of 22 per cent on 2014 numbers.

Blogs

The *CSIROnews* and *CSIROuniverse* blogs were merged in 2015 to become the *CSIRO blog*. During the year CASS contributed 28 posts, of which 19 were focused on the ATNF and nine on the CDSCC.

Internal CSIRO news

In 2015 we contributed 10 articles featuring ASKAP, ATNF people or sites/facilities to the CSIRO internal newsletter, *Monday Mail*.

ASKAP communications

CASS handles communication related to the Australian SKA Pathfinder project. In 2014 we generated 48 issues of the internal ASKAP weekly newsletter, two issues of the bulletin ASKAP Update and one ASKAP Commissioning Update, and provided support for public talks, visits to the Murchison Radio-astronomy Observatory, and other events.

ATNF Daily Astronomy Picture (ADAP)

The ATNF Daily Astronomy Picture (ADAP), which started in December 2014, has now launched more than 500 images to show ATNF science and engineering results, telescopes, colloquia and workshop announcements, and research highlights. Each day's image can be accessed at *www.atnf.csiro.au/ATNF-DailyImage*, which has a link on the ATNF home page (*www.atnf.csiro.au*). The pictures also reach a broad audience through Twitter under the 'handles' of @CSIRO_ATNF and @HIgalaxies, and through Facebook and Feedly.

***Sunrise* at The Dish at sunrise: on 31 July the Parkes telescope was featured on the *Sunrise* morning television program, with Glen Nagle and John Sarkissian being interviewed. Photo: Glen Nagle**

CASS engineer Mary D'Souza talking at the Pia Wadjarri Remote Community School

Students at the Pia Wadjarri Remote Community School during their visit to the MRO

CASS's Shi Dai (at left) and Matthew Kerr leading a PULSE@Parkes session in China. Photo: Rob Hollow

EDUCATION

The key education activities this year were:

Teacher workshops

Our Education and Outreach Specialist Rob Hollow ran a variety of workshop sessions at several science teacher events in Melbourne, Sydney and Geraldton.

School visit

In November students and staff from the Pia Wadjarri Remote Community School visited the Murchison Radio-astronomy Observatory and toured ASKAP. This followed a day of hands-on astronomy activities at the school led by CASS staff.

PULSE@Parkes program

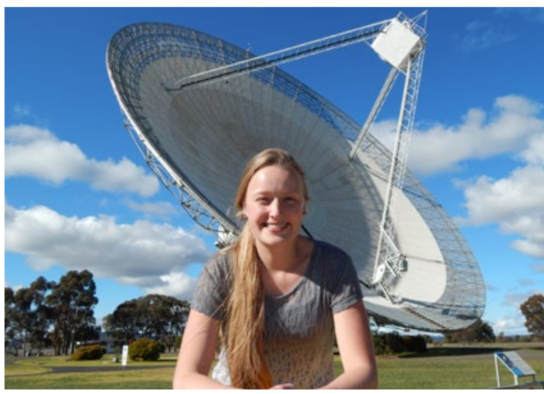
This program allows school students to observe with the Parkes telescope. A busy year of regular PULSE@ Parkes sessions ended with a tour to Guangzhou, China, in December where team members Matthew Kerr, Shi Dai and Rob Hollow ran three sessions for students from a number of high schools in the Guangdong region. The sessions were webcast in China and attracted local media interest. The visitors also gave talks to students at Guangzhou University and public talks at the Guangdong Science Center. The tour was funded by Guangzhou University and organised by the University's Professor Hongguang Wang.

Undergraduate Vacation Scholars

The 2015–2016 Undergraduate Vacation Scholarship Program saw 12 students from eight universities working on research projects with CASS staff over the summer. Their projects covered a diverse range of engineering and astrophysics topics, with several being related to PAFs and ASKAP. As well as working on their research projects the scholars visited the Australia Telescope Compact Array and in groups tackled an observing project of their choice, guided by Martin Bell and Robin Wark. The ten-week program concluded in mid-February with a student symposium.

The program continues to attract talented students eager to gain experience at CASS. Charlotte Ward, one of the 2015–2016 students, has now commenced an Honours project at the University of Sydney, co-supervised by CASS astronomer Matthew Kerr.

Undergraduate Vacation Scholars during their visit to the Compact Array with program coordinators Robin Wark (at left) and Martin Bell (at right)



Charlotte Ward, a former Vacation Scholar who is now doing an Honours project at the University of Sydney, co-supervised by the ATNF. Photo: John Sarkissian

STAFFING

CASS's Perth office grew to eight staff by the year's end. However, total ATNF staff levels rose only slightly, as recruitment was largely offset by cessations. Twenty-four staff ceased employment in 2015 as a result of resignation (8), retirement (3), term employment ending (11) and redundancy (2).

DIVERSITY AND EQUITY

In 2014 CASS formed a Diversity Committee to identify, implement, and monitor issues and initiatives related to diversity and equity, and to ensure that all staff are treated fairly and equitably. Chaired by Dr Jill Rathborne, the committee is itself diverse, with members from different sites, research programs and levels of the organisation.

Through its initial consultations the committee learned that staff were largely unaware of CSIRO's policies and support related to diversity and equity, so as its first task this year the committee established a new CASS diversity website, http://www.atnf.csiro.au/resources/diversity.html. This is now the repository for information around diversity and inclusion, including CASS initiatives.

The topic of sexual harassment was vigorously discussed in the international astronomical community in 2015. This prompted the CASS Director, Lewis Ball, to clearly set out CASS policies and procedures in a notice to staff in October. The message sent a clear statement of support to anyone who had been the target of harassment or had reported inappropriate behaviour. It further reminded staff of our commitment to developing and maintaining a culture that respects, values and actively pursues the benefits of a diverse workforce, and in which discriminatory policies and practices are not tolerated.

The Diversity Committee has discussed developing and implementing a Code of Conduct that sets out appropriate behaviour for all the conferences we organise. At the committee's recommendation, this was trialled at a CASS-organised event (the Supermassive Black Hole Workshop) in 2015. It was well received by the participants and provoked discussions about diversity issues throughout the week. The Astronomical Society of Australia (ASA) recently updated its own Code of Conduct for participants at ASA-endorsed meetings or activities. CASS will adopt this 'community' version of the Code of Conduct for all future meetings we host: we have already adopted it for the ASKAP conference planned for 2016.

The activities of the Diversity Committee are outlined in its annual report, http://www.atnf.csiro.au/CASS_Diversity_Committee_AR15.pdf. This also includes results of the annual demographic review and updates on other actions taken by the committee.

Brett Hiscock and Wilfredo Pena at the Murchison Radio-astronomy Observatory

Jill Rathborne receiving CASS's bronze Pleiades Award for 2014 from Sarah Brough (Chair of the ASA's Women in Astronomy chapter) at the annual Scientific Meeting of the Astronomical Society of Australia in July 2015. The Pleiades Awards are a new national scheme, set up by the Astronomical Society of Australia, to improve gender equity in Australia's astronomy departments and research institutes.

Health, Safety and Environment (HSE)

We carried out 19 reviews of HSE-related issues within CASS. This is similar to the number of reviews last year (23).

Reported lost-time injuries (LTI) in 2015 related to insect bites, verbal conflict and a fractured finger. The two medical-treatment injuries (MTI) related to manual handling.

Table 2. ATNF Health and Safety training sessions

COURSE NAME	ATTENDEES
Advanced Resuscitation	5
Asbestos Awareness and Management	7
Emergency Management Overview	1
HSE Principles of Contractor Management	17
ICAM Lead Investigator Course	2
Introduction to Emergency Management	1
Managing Mental Health at Work – Leaders	11
Mental Health Awareness for Managers	1
Starting with Your Safety	8
Total	**53**

Table 3. CASS health and safety incidents, 2012–2015. (1) E incidents = environmental incidents (2) H&S = health and safety (3) LTI = lost-time injuries: injuries that resulted in the loss of one or more whole days after the date of the injury (4) MTI = medical-treatment injury: an injury requiring medical treatment other than first-aid.

PERIOD	E INCIDENTS	H&S INCIDENTS *	LTI	MTI
Jan 2012 to Dec 2012	0	16	4	3
Jan 2013 to Dec 2013	1	10	1	3
Jan 2014 to Dec 2014	1	14	1	0
Jan 2015 to Dec 2015	2	4	3	2

* Injuries only (not inclusive of hazards and near miss incidents)

Training sessions on HSE issues were well attended this year (see Table 2).

ASKAP TEAM WINS 2015 CHAIRMAN'S MEDAL

In October the team behind ASKAP received CSIRO's highest honour, the Chairman's Medal. This award recognises exceptional research teams that have made significant scientific or technological advances of national, international and/or commercial importance. The citation for the award reads,

"For revolutionising astronomy by developing a spectacular new capability for observing wide areas of the sky using the world's first widefield imaging receivers for radio astronomy on the antennas of the ASKAP radio telescope."

Eleven team members attended the awards ceremony in Canberra while the rest of the team, spread across six sites, celebrated simultaneously.

L'ORÉAL FELLOWSHIP

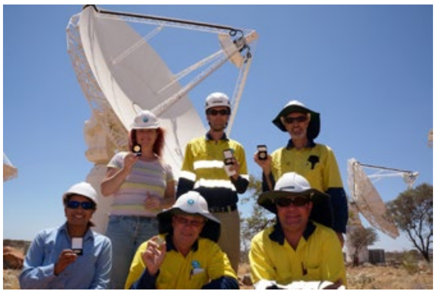
In September CASS's Shari Breen was named as a L'Oréal–UNESCO *For Women in Science* Fellow, for her work on providing an evolutionary timeline for high-mass star formation. Along with three other outstanding female scientists, Shari was selected from a field of over 240 applicants from Australia and New Zealand. The Fellowship comes with a prize of $25,000 to help recipients further their research. L'Oréal and UNESCO founded the program in 1998 to promote greater participation of women in science.

EUREKA PRIZE FINALIST

In October CASS's Lisa Harvey-Smith, the ASKAP Project Scientist, was named as one of three finalists in the *Science Communication and Journalism* section of the prestigious Australian Museum Eureka Prizes. The citation described her as "a dynamic communicator bringing to life astronomy and its real-world impacts, particularly for girls and Indigenous Australian students."

The CSIRO Chairman's Medal

CASS's Lisa Harvey-Smith speaking to the crowd at *An evening with Buzz Aldrin: Mission to Mars* **in Sydney on 28 November, before the appearance of the man himself. Photo: Flornes Yuen**



ASKAP team members at the MRO with their medals

CASS's Shari Breen (fourth from left) with her L'Oréal–UNESCO Fellowship Award. Credit: L'Oréal Australia

Members of the ASKAP team at the CSIRO Awards ceremony. Credit: CSIRO

Lisa Harvey-Smith with Buzz Aldrin. Photo: Live on Stage Australia

ATNF management team

ATNF DIRECTOR AND DIRECTOR CSIRO ASTRONOMY AND SPACE SCIENCE

Lewis Ball

DEPUTY DIRECTOR

Sarah Pearce

ASSISTANT DIRECTOR, OPERATIONS

Douglas Bock

ASSISTANT DIRECTOR, ASKAP

Antony Schinckel

ASSISTANT DIRECTOR, ENGINEERING

Tasso Tzioumis

ASSISTANT DIRECTOR, ASTROPHYSICS

Simon Johnston

ASSISTANT DIRECTOR, WESTERN AUSTRALIA

Phil Crosby

OPERATIONS MANAGER

Warren Bax

Appendices

Wildflowers at the MRO.

Photo: Mark Leach

A: Committee membership

ATNF Steering Committee in 2015

CHAIR

Dr Susan Barrell, Bureau of Meteorology

MEMBERS

Ex-officio

Professor Warrick Couch, Australian Astronomical Observatory

Mr Brendan Dalton, CSIRO Chief Information Officer

Dr David Williams, CSIRO National Facilities and Collections

Australian-based astronomers

Professor Elaine Sadler, University of Sydney

Professor Mark Wardle, Macquarie University

Professor Stuart Wyithe, University of Melbourne

International advisers

Professor Neal Evans, University of Texas at Austin, USA

Professor Raffaella Morganti, ASTRON, The Netherlands

Professor Na Wang, Xinjiang Astronomical Observatory, China

Broader community

Dr Susan Barrell, Bureau of Meteorology

Professor Robyn Owens, University of Western Australia

Australia Telescope User Committee in 2015

CHAIR

Associate Professor Virginia Kilborn, Swinburne University of Technology (2014–2017)

SECRETARY

Dr Joanne Dawson, (Oct 2014–May 2017) Macquarie University and CSIRO Astronomy and Space Science

MEMBERS

Dr Minh Huynh, University of Western Australia (Oct 2012–May 2015)

Dr Evan Keane, Swinburne University of Technology*(Oct 2014–May 2017)

Dr Vanessa Moss, University of Sydney (Oct 2015–May 2018)

Dr James Miller-Jones, Curtin University (Oct 2014–May 2017)

Dr Paolo Serra, CSIRO Astronomy and Space Science (Oct 2014–May 2017)

Dr Stuart Ryder, Australian Astronomical Observatory (Oct 2015–May 2018)

Dr Stas Shabala, University of Tasmania (Oct 2014–May 2017)

Dr Willem van Straten, Swinburne University (Oct 2015–May 2018)

Dr Tobias Westmeier, University of Western Australia (Oct 2012–May 2015)

STUDENT MEMBERS

Mr Andrew Butler, University of Western Australia (Oct 2015–May 2016)
Ms Claire-Elise Green, University of New South Wales (Oct 2014–Nov 2015)

Mr Vasaant Krishnan, University of Tasmania (Oct 2014–May 2015)

*Now at the Square Kilometre Array Organisation in Manchester, UK

The Australia Telescope Steering Committee appoints the members of the Australia Telescope User Committee (ATUC). New ATUC members usually start their three-year term with the October/November meeting in their first year and finish their term after the May/June meeting in their last year. Students are usually appointed for one year (two meetings). Dates of the first and last meetings are given.

Australia Telescope Time Assignment Committee (as of December 2015)

CHAIR

Professor Sarah Maddison, Swinburne University of Technology

MEMBERS

Ex-officio

Dr Douglas Bock, CSIRO Astronomy and Space Science (Assistant Director, Operations)

Dr Philip Edwards, CSIRO Astronomy and Space Science (Head of Science Operations)

Dr Jill Rathborne, CSIRO Astronomy and Space Science (TAC Executive Officer)

Voting members

Dr James Allison, CSIRO Astronomy and Space Science

Dr Hayley Bignall, Curtin University

Dr Julia Bryant, Australian Astronomical Observatory

Dr Joanne Dawson, Macquarie University and CSIRO Astronomy and Space Science

Dr Alan Duffy, Swinburne University of Technology

Professor Sarah Maddison, Swinburne University of Technology

Dr Ryan Shannon, Curtin University and CSIRO Astronomy and Space Science

Dr Roberto Soria, Curtin University

Dr Ivy Wong, University of Western Australia

Administrative support

Amanda Gray, CSIRO Astronomy and Space Science

B: Financial summary

The table below summarises the revenue and expenditure applied to CSIRO's radio astronomy activities, also including related activities resourced from the CSIRO Digital Productivity Flagship.

	YEAR TO 30 JUNE 2011	YEAR TO 30 JUNE 2012	YEAR TO 30 JUNE 2013	YEAR TO 30 JUNE 2014	YEAR TO 30 JUNE 2015
	(A$'000)	(A$'000)	(A$'000)	(A$'000)	(A$'000)
Revenue					
External	7,181	13,726	4,213	10,179	13,209
Appropriation	36,419	35,623	35,668	41,803	40,473
Total revenue	**43,600**	**49,349**	**39,881**	**51,982**	**53,682**
Expenses					
Salaries	14,046	14,884	16,688	17,723	19,545
Travel	1,080	1,093	1,432	1,325	1,429
Other operating	5,028	5,081	5,143	7,157	9,334
Overheads*	12,914	13,055	12,725	14,709	14,506
Corporate support services	0	0	0	0	0
Depreciation and amortisation	3,953	4,081	4,628	7,095	7,513
Doubtful debt expense	0	0	0	0	0
Total expenses	37,021	38,194	40,616	48,009	52,327
Profit/(Loss) on sale of assets	0	0	0	0	0
Operating result	**6,579**	**11,155**	**– 735**	**3,973**	**** 1,355**

Notes

*Overheads include corporate support services and business-unit support services. Appropriation includes the amount of approved loss to CSIRO representing the amount of unfunded depreciation on assets (for 2014–2015 the figure was $7,480k).

**Operating surplus in 2014 and 2015 is predominately a result of actual depreciation being lower than forecast.

C: Staff list

ALL STAFF WHO WORKED FOR CASS ON RADIO-ASTRONOMY RELATED ACTIVITIES, AS OF DECEMBER 2015

This list includes casual staff and honorary fellows, but not students or contractors.

MARSFIELD		
Allen	Graham	Engineering
Allison	James	Astrophysics
Amy	Shaun	Operations
Ball	Lewis	CASS Director and ATNF Director
Bannister	Keith	Astrophysics
Barker	Stephen	Engineering
Bateman	Tim	Engineering
Bax	Warren	Finance
Beresford	Ron	Engineering
Bock	Douglas	Operations
Bourne	Michael	Engineering
Bowen	Mark	Engineering
Breen	Shari	Astrophysics
Broadhurst	Steven	Operations
Broadhurst	Sue	Reception
Brothers	Michael	Engineering
Brown	Andrew	Engineering
Bunton	John	Engineering
Castillo	Santiago	Engineering
Chapman	Jessica	Operations
Chekkala	Raji	Engineering
Cheng	Wanxiang	Engineering
Chippendale	Aaron	Engineering
Chow	Kate	Project Specialist
Chung	Yoon	Engineering
Clampett	Keith	Stores
Cooper	Paul	Engineering
Craig	Daniel	Operations
D'Amico	Andy	Stores
Death	Michael	Engineering
Doherty	Paul	Engineering
Drazenovic	Vicki	Operations
Dunning	Alexander	Engineering
Edwards	Leanne	Operations
Edwards	Philip	Operations
Ekers	Ron	Fellow
Ferris	Richard	Fellow
Forsyth	Ross	Engineering
Franzen	Thomas	Astrophysics
Gough	Russell	Fellow
Gray	Amanda	Administration
Green	James	Astrophysics
Hampson	Grant	Engineering
Hartmann	Carmel	Administration
Harvey-Smith	Lisa	Astrophysics
Haskins	Craig	Operations
Hellbourg	Gregory	Engineering
Heywood	Ian	Astrophysics
Hill	Alex	Astrophysics
Hobbs	George	Astrophysics
Hollow	Robert	Communications and Outreach
Humphreys	Ben	Operations
Huynh	Minh	Engineering
Indermuehle	Balthasar	Operations
Jeganathan	Kanapathippillai	Engineering
Johnson	Megan	Astrophysics
Johnston	Simon	Astrophysics
Kachwalla	Elsa	Reception
Kanoniuk	Henry	Engineering
Kerr	Matthew	Astrophysics
Kesteven	Michael	Engineering
Kiraly	Dezso	Engineering
Koribalski	Bärbel	Astrophysics

Kosmynin	Arkadi	Operations
Largent	Marcia	Health, Safety and Environment
Leach	Mark	Engineering
Li	Li	Engineering
Lie	Jennifer	Engineering
Lim	Boon	Engineering
Mackay	Simon	Engineering
Macleod	Adam	Project Specialist
Maher	Tony	Operations
Manchester	Dick	Fellow
Marquarding	Malte	Operations
McConnell	David	Operations
McIntyre	Vincent	Operations
McKinnon	Mark	SKA
Merrick	Sarah	Finance
Mitchell	Daniel	Operations
Moncay	Ray	Engineering
Neuhold	Stephan	Engineering
Norris	Ray	Fellow
O'Loughlin	Vicki	Administration
O'Toole	Sally	Reception
Pearce	Sarah	CASS Deputy Director
Phillips	Chris	Operations
Pope	Nathan	Operations
Poshoglian	Meg	Reception
Rathborne	Jill	Astrophysics
Reilly	Les	Engineering
Reynolds	John	Project Specialist
Roberts	Paul	Engineering
Rosolen	Grahame	Engineering
Sanders	Aaron	Engineering
Schinckel	Antony	Project Specialist
Serra	Paolo	Astrophysics
Seymour	Nicholas	Astrophysics
Shannon	Ryan	Astrophysics
Shaw	Robert	Engineering
Shields	Matthew	Engineering
Smith	Stephanie	Engineering
Soo	Susan	Administration
Storey	Michelle	Fellow
Stuart	Wayne	Engineering
Tesoriero	Julie	Administration
Toomey	Lawrence	Operations
Troup	Euan	Operations
Tuthill	John	Engineering
Tzioumis	Tasso	Engineering
Voronkov	Maxim	Operations
Wark	Robin	Operations
Whiting	Matthew	Operations
Wieringa	Mark	Operations
Wilson	Warwick	Fellow
Wilson	Carol	Engineering
Wright	Andrew	Human Resources
Wu	Xinyu	Operations
Yuen	Flornes	Communications and Outreach
NARRABRI		
Bateman	John	Operations
Cole	James	Operations
Dodd	Susan	Operations
Forbes	Kylee	Operations
Hill	Michael	Operations
Hiscock	Brett	Operations
Hiscock	Jennifer	Operations
Johnson	Brian	Property Services
Kelly	Pamela	Operations
Lennon	Brett	Operations
McFee	John	Operations
McFee	Margaret	Operations
McPherson	Liza-Jane	Operations
Mirtschin	Peter	Operations
Munting	Scott	Operations
Rex	Jordan	Operations
Shields	Mick	Health, Safety and Environment
Stevens	Jamie	Operations
Sunderland	Graeme	Operations
Tough	Bruce	Operations
Wilson	John	Operations

Wilson	Tim	Operations
Wilson	Christine	Operations
PARKES		
Abbey	Alex	Operations
Crocker	Jonathan	Operations
D'Mello	Glen	Operations
Hoyle	Simon	Operations
Hunt	Andrew	Fellow
Kaletsch	Robert	Operations
Kinsela	Leonie	Communications
Lees	Tom	Operations
Lensson	Erik	Fellow
Mader	Stacy	Operations
Marshall	Margaret	Operations
Milgate	Lynette	Communications and Outreach
Preisig	Brett	Operations
Reeves	Ken	Operations
Ruckley	Timothy	Operations
Sarkissian	John	Operations
Smith	Malcolm	Operations
Trim	Tricia	Communications and Outreach
Tye	Alison	Communications and Outreach
Unger	Karin	Communications and Outreach
Veale	Roxanne	Communications and Outreach
GERALDTON		
Armstrong	Brett	Operations
Boddington	Leonie	Operations
Brem	Christoph	Operations
D'Souza	Mary	Operations
Cox	Thomas	Operations
Desmond	Rochelle	Operations
Hanna	James	Operations
Halleen	Ben	Operations
Harding	Alex	Operations
Hayden	Rowan	Operations
Jackson	Suzy	Operations
McDougall	Geoffrey	Operations
McConigley	Ryan	Operations
Morris	John	Operations
Pena	Wilfredo	Health, Safety and Environment
Puls	Lou	Operations
Reay	Michael	Operations
Simpson	Godfrey	Project Specialist
MURCHISON		
Hawkins	Rikki	Operations
Merry	Clarence	Operations
Merry	Jolene	Operations
Merry	Shaydene	Operations
PERTH		
Brooks	Kate	Operations
Crosby	Phil	Business Strategy
Drake	Marilyn	Administration
Guzman	Juan Carlos	Operations
Haskins	Craig	Operations
Hotan	Aidan	Project Specialist
Ogden	Ian	Operations
Reynolds	Cormac	Operations
CANBERRA		
Zamora-Pullin	Kobi	Astrophysics
CANBERRA DEEP SPACE COMMUNICATION COMPLEX		
Horiuchi	Shinji	Astrophysics
Nagle	Glen	Communications and Outreach

D: Observing programs

OBSERVATIONS ALLOCATED TIME BY THE TIME ASSIGNMENT COMMITTEE

A small number of 'Target of Opportunity' observations are not listed. Proposal cover sheets are available through the ATNF proposal application system, OPAL (http://opal.atnf.csiro.au).

OBSERVATIONS MADE WITH THE COMPACT ARRAY, OCTOBER 2014 TO SEPTEMBER 2015

OBSERVERS	PROGRAM	NO.
Stevens, Edwards, Wark, Wieringa	ATCA Calibrators	C007
Staveley-Smith, Zanardo, Ng, Gaensler, Tzioumis	Supernova Remnant 1987A	C015
Corbel, Tzioumis, Kaaret, Tomsick, Orosz, Loh, Fender	Large scale radio/X-ray jets in microquasars	C1199
Ryder, Kool, Stockdale, Kotak, Polshaw, Romero-Canizales, Amy, Burlon, Van Dyk, Immler	NAPA observations of core-collapse supernovae	C1473
Edwards, Stevens, Ojha, Lovell, Kadler, Blanchard, Macquart, Hungwe, Mueller, Wilms, Boeck	ATCA monitoring of gamma-ray loud AGN	C1730
Lumsden, Purser, Hoare, Cunningham	Ionised jets from massive young stellar objects	C1862
Voronkov, Goedhart, Maswanganye, Caswell, Ellingsen, Sobolev, Green, Breen, van der Walt, Parfenov	Understanding periodic flares of the methanol masers	C1929
Agliozzo, Buemi, Leto, Umana, Trigilio, Ingallinera, Pignata	Radio detection of Luminous Blue Variable nebulae in the Magellanic Clouds	C1973
Corbel, Edwards, Wieringa, Tingay, Sadler, Thompson, Grenier, Cheung, Cameron, Ojha, Schinzel, Gehrels, Chaty, Dubus, Abraham	ATCA follow-up of unidentified flaring Fermi gamma-ray sources	C2051
Possenti, Wieringa, Esposito, Burgay, Israel, Rea	Continuum radio emission from magnetars in outburst	C2456
Rebolledo, Green, Brooks, Gaensler, Burton, Smith, Purcell, Reiter, Rathborne, Breen, Voronkov, Garay, O'Sullivan	Carina Parkes–ATCA Radio Centimetre-wavelength Survey (CARPARCS)	C2489
Soria, Blair, Long, Godfrey, Miller-Jones, Kuntz, Winkler, Plucinsky, Stockdale, Dopita	Young supernova remnants in the spiral galaxy M83	C2494
Miller-Jones, Maria, Migliari	The disc wind–jet connection in black hole transients	C2514
Miller-Jones, Jonker, Maccarone, Nelemans, Sivakoff, Tzioumis	Constraining black-hole formation with triggered LBA astrometry	C2538
Shimwell, Duong, O'Sullivan	Resolving the origin of filaments in radio galaxies: the special case of the Centaurus A 'vertex'	C2575
Miller-Jones, Sivakoff, Altamirano, Krimm, Russell, Curran, Soria, Tingay, Moin	Jet–disc coupling in black-hole X-ray binary outbursts	C2601
Petrov, Edwards, Kovalev, Mahony, Mcconnell, Murphy, Sadler, Schinzel, Taylor	Study of the population of steady Fermi emitters found in 3FGL	C2624
Delhaize, Smolcic, Huynh, Baran, Novak, Birkinshaw, Rottgering, Horellou, Lidman, Pierre, Chiara, McGee, Raychaudhury, Pacaud, Comastri, Bremer, Tothill, O'Brien, Norris, Bondi, Ciliegi	ATCA–XXL: Feedback processes through cosmic time	C2627
Hancock, Bell, Murphy, Gaensler, de Ugarte Postigo, Burlon	ATCA observations of the brightest and highest-redshift GRB/SNe	C2689
Maddison, Ricci, Marshall, Thilliez, Wilner, MacGregor, Matthews, Holland	PLATYPUS: a southern debris disk survey at 7mm	C2694
Kilborn, Lutz, Koribalski, Catinella, Cortese, Denes, Wong, Jozsa, Garel, Brown, Wolfinger	Gas accretion in nearby spiral galaxies	C2705

OBSERVERS	PROGRAM	NO.
Hancock, Murphy, Gaensler, Kulkarni, Schmidt	The GRB/SNe central engines as revealed by relativistic SNe	C2707
Emonts, Villar-Martin, Norris, Dannerbauer, Lehnert, Miley, Mao, de Breuck, Seymour, Ekers, Sadler, van Moorsel, Rottgering, Carilli	Cold gas filling a cosmic 'Spiderweb' of proto-galaxies: witnessing the in-situ birth of a giant cluster elliptical?	C2717
Burlon, Hancock, Murphy, Ghirlanda, Bell, Greiner, Klose, Bannister, Gaensler	The quest for short GRB radio afterglows	C2721
Johanson, Migenes	Low-frequency follow-up observations of high-mass star-forming regions in the LMC	C2773
Trigilio, Umana, Leto, Buemi	Is Alpha Centauri revealed by the new generation of radio telescopes?	C2836
Nicuesa Guelbenzu, Klose, Michalowski, Palazzi, Greiner, Hunt, Rossi, Savaglio	Revealing the dust-obscured star-formation rate in short-GRB host galaxies	C2840
Qiao, Walsh, Green, Dawson, Jones, Cunningham, Jones, Gomez, Imai, Ellingsen, Breen, Lowe, Shen	SPLASH: Accurate OH maser positions	C2872
Miller-Jones, Strader, Chomiuk, Heinke, Sivakoff, Maccarone, Shishkovsky, Huizenga	A comprehensive ATCA survey for black holes in southern globular clusters	C2877
Miller-Jones, Strader, Chomiuk, Heinke, Sivakoff, Maccarone, Shishkovsky, Tudor, Huizenga	A comprehensive ATCA survey for black holes in southern globular clusters	C2877
Chen, Ellingsen, Qiao, Breen, Baan, Xu	A search for Class I methanol megamasers	C2879
Motogi, Walsh, Sugiyama, Hirota, Honma, Niinuma, Sorai, Yonekura, Fujisawa, Hachisuka	High-sensitivity survey of a pole-on disk-jet system around high-mass YSOs	C2883
Edge, Hogan, McDonald, Hlavacek-larrondo, Benson, Carlstrom, Holzapfel, Marrone, Sadler, Mahony, Allen, Stadler, Forman, Mcnamara, von der Linden, Brodwin, Stark, Reichardt	AGN feedback in SPT cluster cores	C2884
Bignall, Reynolds, Koay, Macquart, Schnitzeler, Cimo, Hodgson, Jauncey, Kovalev, Gurvits, McCallum, Shabala	ATCA monitoring in support of RadioAstron observations of high-brightness-temperature AGN	C2898
Sivakoff, Miller-Jones, Bahramian, Chomiuk, Heinke, Maccarone, Strader	Searching for the first transient black-hole X-ray binary in a Galactic globular cluster	C2902
Dunne, Ivison, Maddox, Oteo, Zhang, Stevens, Manilla Robles	The most distant starburst: 13 Gyr or bust	C2905
Fujii, Dawson, Mizuno, Minamidani, Kawamura, Muller, Onishi, Fukui	Dense molecular clump formation in the collisional region of the LMC supergiant shells	C2908
Bannister, Walker, Stevens, Johnston, Bignall, Reynolds, Tuntsov	ATESE: An ATCA survey for Extreme Scattering Events	C2914
Shimwell, Stroe, Hoang	Ultra-deep observations to map the diffuse radio emission from a sample of merging galaxy clusters.	C2915
Ott, Mills, Meier, Weiss, Henkel, Staveley-Smith, Rathborne, Contreras, Walsh, Burton, Crocker, Longmore, Yusef-Zadeh, Lang, Jones, Morris, Zhang, Ginsburg, Rosolowsky, Corby, Schilke, Goldsmith, Battersby, Bihr, Bally, Beuther, Menten, Anderson, Morabito, Edwards, Kruijssen	Survey of Water and Ammonia in the Galactic Center (SWAG)	C2927
Schnitzeler, Eatough, Noutsos, Shannon, Lee, Spitler, Falcke, Champion, Kramer	Probing the magnetic field surrounding the nearest supermassive black hole	C2933
Lumsden, Hoare, Cunningham, Purser, Urquhart	Discs around massive protostars	C2935
Suarez, Gomez, Bendjoya, Miranda, Green	Monitoring the real-time birth of a planetary nebula	C2949
Greiner, Moin, Tingay, Wieringa, Klose, Schady, van Eerten, van der Horst	Testing the gamma-ray burst fireball scenario	C2955
Dickey, Bania, Brown, Dawson, Jordan, Mcclure-Griffiths, Anderson, Armentrout, Balser, Johnstone, Wenger	Southern H II Region Discovery Survey (SHRDS)	C2963
Bannister, Walker, Johnston, Stevens, Bignall, Reynolds, Tuntsov	Daily monitoring of ATCA Extreme Scattering Events	C2965
Cunningham, Lumsden, Purser	Probing the evolution of MYSOs using methanol maser emission	C2967
Mao, Norris, Middelberg, Lacy, Herzog, Emonts, Collier, Carilli, van Moorsel	CO in infrared-faint radio sources	C2982

OBSERVERS	PROGRAM	NO.
Aravena, Spilker, Marrone, de Breuck, Aguirre, Bethermin, Bothwell, Carlstrom, Chapman, Crawford, Fassnacht, Gonzalez, Greve, Gullberg, Hezaveh, Ma, Malkan, McIntyre, Murphy, Seymour, Stark, Strandet, Tothill, Vieira, Weiss	Resolved CO imaging in bright gravitationally lensed galaxies at z=2–6	C2983
Murray, Stanimirovic, Lindner, Mcclure-Griffiths, Dickey	The formation of dark molecular gas from cold atomic hydrogen in the Magellanic System	C2984
Fissel, Ashton, Cunningham, Devlin, Dober, Elia, Friesen, Giannini, Galitzki, Jones, Zhi-Yun, Lorenzetti, Lourie, Lowe, Massi, Netterfield, Novak, Olmi, Pascale, Poidevin, Soler, Tucker, Ward-Thompson, Green, Hill	Do magnetic fields provide support against the gravitational collapse of starless cores in Vela C?	C2988
Tothill, Norris, Seymour, O'Brien, Collier, Galvin, Crawford, Filipovic, Holzapfel, Huynh, Malkan, Marrone, McIntyre, Murphy, Spilker, Stark, Vieira, Walsh, Reiprich, Clerc, Salvato, Smolcic	Extended cluster emission in the SPT Deep Field	C2992
Galvin, Seymour, Filipovic, Tothill	Characterising the thermal and non-thermal emission of star-forming galaxies	C2993
Massardi, Lopez-Caniego, de Zotti, Gonzalez-Nuevo, Bonavera, Casasola, Negrello, Herranz, Lapi, Ricci, Michalowski, Birkinshaw, Jarvis, Temi	Completion of the ATCA follow-up of blazar candidates in the H-ATLAS fields	C2994
Goldman, van Loon, Green, Imai, Groenewegen, Nanni, Wood	Locating circumstellar masers in metal-deficient environments	C2996
Dodson, Stevens, Rioja, Jung, Kino, Hada, Lee, Zhao, Lee	Testing the innermost collimation structure of the M87 jet at ~10R_s from the black hole with microarcsecond astrometry	C2997
Musaeva, Koribalski, Farrell, Sadler	Searching for intermediate-mass black holes in dwarf galaxies using jet emission	C3000
Piro, Ricci, Troja, Gendre, Fiore, Piranomonte, Bannister, Wieringa	ATCA observations of the new class of ultra-long GRBs: a local proxy of Pop III explosions?	C3001
Stanway, Levan, Davies	Infrared-Bright GRB hosts: a nearby, dusty population?	C3002
Dannerbauer, Kurk, de Breuck, Emonts, Wylezalek, Santos, Koyama, Seymour, Tanaka, Altieri, Coia, Galametz, Lehnert, Matiz, Miley, Kodama, Rottgering, Sanchez-Portal, Valtchanov, Venemans, Ziegler	Characterizing dusty starbursts at z=2.2 in a high-density field	C3003
Corbel, Tzioumis, Kaaret, Tomsick, Orosz, Loh, Fender	Large scale radio/X-ray jets in microquasars (NAPA part)	C3004
Kirichenko, Voronkov, Shibanov, Danilenko, Zyuzin	High-angular-resolution study of the J1400–6325 pulsar wind nebula and its host remnant G310.6–1.6 with the ATCA	C3005
Guzman, Garay, Rodriguez, Contreras	Disk mediated high-mass star formation inside a hyper-compact H II region	C3006
Papitto, Migliari, Rea, Torres, Bozzo, Ferrigno, Pavan	Coupling accretion and ejection in transitional millisecond pulsars	C3007
Sathyanarayana Rao, Subrahmanyan, Briggs	Astrophysics of the 2p-2s fine-structure line of hydrogen	C3009
Miller-Jones, Diaz trigo, Migliari, Rahoui, Russell	Exploring the nature of relativistic jets in neutron star X-ray binaries	C3010
Miller-Jones, Heinke, Bogdanov, Strader, Chomiuk, Maccarone, Sivakoff	A new black-hole candidate in the globular cluster 47 Tucanae	C3012
Gelfand, Ransom, Kouveliotou, Roberts, Gogus, Granot, Zhang, Al Ali	The radio emission of Galactic Center magnetar SGR J1745–29	C3014
Chomiuk, Bannister, Finzell, Rupen	ATCA observations of the complex explosions driving gamma-ray detected novae	C3015
Moss, Tingay, Sadler, Allison, Maccagni, Stevens, Edwards, Macquart, Morganti, Oosterloo	Rocking the cradle: a case study in continuum and spectral variability in young radio AGN	C3019
Mcclure-Griffiths, Dawson, Denes, Dickey, Lindner, Stanimirovic	Taking the temperature of the Riegel-Crutcher cloud	C3020

OBSERVERS	PROGRAM	NO.
Contreras, Rathborne, Jackson, Sanhueza, Gomez, Whitaker	Determining the temperature structure of a massive proto-cluster	C3021
Avison, Peretto, Fuller, Traficante, Duarte Cabral, Pineda, Cunningham, Guesten	Outflows from the massive stars of SDC335	C3023
Green, Cunningham, Dawson, Walsh, Jones, Lowe, Fissel, Friesen, Novak, Olmi, Lo, Bronfman, Toth, Leurini, Urquhart, Pillai, Kauffmann, Henkel, Hill, Minier, Redman, Wiles	Characterising the properties and evolutionary stages of two unusual Vela C molecular cloud filaments with ATCA ammonia observations	C3024
Vlemmings, Olofsson	The OH masers of the post-common envelope binary HD 101584	C3025
Huynh, Emonts, Smail, Swinbank, Thomson, Kimball, Ivison, Brandt, Casey, Chapman, Dannerbauer, Hodge, Schinnerer, Walter, Wardlow, van der Werf	Fundamental studies of molecular gas in $z > 2$ ALMA-identified submillimeter galaxies	C3026
Heywood, Whittam, Jarvis, Smirnov, Deane	What is the nature of the faint source population at high radio frequencies?	C3027
Callingham, Gaensler, Ekers, Wayth, Tingay, Allison, Seymour	Broadband spectral modelling of Gigahertz-Peaked Spectrum sources: Dying young and frustrated?	C3030
Loomis, Oberg, Wilner, Remijan	Imaging the complex chemical evolution around a solar-type protostar	C3034
Shimonishi, Bekki, Motogi, Nishimura, Kawamura, Watanabe, Sakai, Aikawa, Yamamoto	Molecular chemistry of high-mass star-forming clumps in the Large Magellanic Cloud	C3037
Johnson, Kamphuis, Kepley, Kimball, Koribalski, Marvil, Serra, van Vliet Wiegert, Wang, Green	CHILLING: Continuum Halos In LVHIS Local Irregular Nearby Galaxies	C3041
Kaczmarek, Purcell, Mao, Hunstead, Gaensler, Mcclure-Griffiths	Observing the pan-Magellanic magnetic field	C3043
Bhandari, Keane, van Straten, Bailes	Localisation of fast radio bursts	C3044
Ginsburg, Walsh, Dawson, Rathborne, Menten, Henkel, Immer, Battersby, Mills, Ott, Kruijssen, Jones, Cunningham, Pillai, Kauffmann, Longmore, Testi, Contreras	Geometry of clouds and H II regions in the CMZ using H_2CO	C3045
Sahai, Vlemmings, Nyman	Millimeter-sized grains at the center of the coldest place in the Universe	C3046

OBSERVATIONS MADE WITH THE PARKES RADIO TELESCOPE, OCTOBER 2014 TO SEPTEMBER 2015

OBSERVERS	PROGRAM	NO.
Bhat, Bailes, Haase, Van straten, Venkataraman, Verbiest	Timing the neutron star-white dwarf binary PSR J1141–6545	P361
D'Amico, Possenti, Lyne, Manchester, Corongiu, Burgay, Camilo, Sarkissian, Bailes, Van Straten, Johnston, Kramer	Timing of millisecond pulsars in globular clusters	P427
Burgay, Kramer, Stairs, Manchester, Lorimer, McLaughlin, Lyne, D'Amico, Possenti, Ferdman, Camilo, Yuen	Timing and geodetic precession in the double pulsar	P455
Hobbs, Bailes, Bhat, Burke, Coles, Keith, Levin, Manchester, Oslowski, Sarkissian, Shannon, Ravi, van Straten, Wang, Kerr, Zhu, Wen, Dai, Reardon	A millisecond pulsar timing array	P456
Titov, Edwards, Reynolds, Reynolds, Shabala, Tzioumis, Jauncey, Dickey, Lovell, Ellingsen, Quick, de Witt, Gulyaev, Natusch, Bignall, Watson	Improving the terrestrial and celestial reference frame through Southern Hemisphere geodetic VLBI observations	P483
Mader, Cersosimo, Azcarate	A 20-cm radio recombination-line survey of the 4th Galactic quadrant	P486
Kerr, Johnston, Shannon, Weltevrede, Manchester, Hobbs, Petroff, Brook, Romani, Thompson, Possenti	Young pulsar timing and the Fermi mission	P574
Hobbs, Hollow, Shannon, Kerr, Petroff, Ravi, Bannister	PULSE@Parkes (Pulsar Student Exploration online at Parkes)	P595

OBSERVERS	PROGRAM	NO.
Camilo, Reynolds, Sarkissian, Halpern, Ransom, Johnston	The remarkably active radio magnetar 1E 1547.0–5408	P602
Burgay, Israel, Rea, Possenti, Esposito, Sarkissian	Searching for radio pulsations triggered by the X-ray outburst of magnetars	P626
Reynolds, Chippendale, Hotan	64-m/PTF 12-m tests	P628
Champion, Bailes, Johnston, Kramer, Possenti, Stappers, Keith, Burgay, Van straten, Bhat, Burke, Bates, D'amico, Levin, Milia, Ng, Thornton, Coster, Barsdell, Tiburzi, Petroff, Flynn, Barr	The High Time Resolution Universe	P630
Ridley, Lorimer, Mclaughlin, Kondratiev	A high time resolution survey of the Small Magellanic Cloud	P682
Hobbs, Van Straten, Manchester, Keith, Bailes, Carretti, Reynolds, Johnston, Jameson, Sarkissian, Shannon	Instrumental calibration for pulsar observing at Parkes	P737
Petroff, Keane, Burke-Spolaor, Miller, Kramer, Stappers, McLaughlin, Johnston, Bailes	Transient radio neutron stars	P786
Barr, Bailes, Burgay, Camilo, Champion, Cromartie, Eatough, Hobbs, Jankowski, Johnston, Keane, Keith, Kerr, Kramer, Levin, Lorimer, Manchester, Ng, Ferdman, Possenti, Ransom, Ray, Stairs, Stappers, van Straten, Burke-Spolaor	Timing of binary and millisecond pulsars discovered at Parkes	P789
Breen, Green, Caswell	The final slice of the ***pi***: polarimetric observations of OH masers at 13.4 GHz	P808
Shannon, Ravi, Hobbs	A Parkes transit survey for pulsed radio emission during windstows and maintenance	P855
Keane, Bailes, Barr, Bates, Bhandari, Bhat, Burgay, Burke-Spolaor, Caleb, Eatough, Flynn, Jameson, Jankowski, Johnston, Keith, Kramer, Levin, Lyon, Morello, Ng, Petroff, Possenti, Stappers, van Straten, Tiburzi	SUPERB - A SUrvey for Pulsars and Extragalactic Radio Bursts	P858
Toomey, Hobbs, Johnston, Bhat, Shannon	Searching towards the Galactic Centre region for pulsed radio emission	P859
Ng, Champion, Kramer, Bailes, Johnston, Possenti, Stappers, Keith, Burgay, van Straten, Bhat, Bates, Petroff, Flynn, Barr, Keane, Jameson, Cameron, Caleb, Bhandari	Initial follow-up of Pulsar discoveries from the HTRU Galactic Plane Survey	P860
Hobbs, Kerr, Shannon, Ravi, Johnston, Hollow, Dai	Analysis of state-switching pulsars	P863
Barr, Burgay, Caleb, Champion, Eatough, Flynn, Freire, Possenti, Jameson, Johnston, Keane, Kerr, Kramer, Morello, Ng, van Straten, Tiburzi	Candy from the 47 Tuc shop	P866
Possenti, Mereghetti, Bhat, Ord, Ransom, Esposito, Tiengo, Turolla, Burgay	Simultaneous X-ray/radio observations of the mode-switching PSR B0943+10	P868
Jankowski, Bailes, van Straten, Keane, Barr	A snapshot survey of 500 pulsar spectral indices	P875
Shannon, Kerr, Hobbs, Bhat, Johnston, Cordes, Lam, Ravi	Measuring the bandwidth of the pulsar emission mechanism	P877
You, Hobbs, Shannon, Coles	Detection the dispersion and rotation measure caused by the solar wind using millisecond pulsars	P878
Burke-Spolaor, Bhat, Champion, Flynn, Kasliwal, Kramer, Kulkarni, Petroff, Wolf, Yuan	Exploring the progenitors of fast radio bursts	P879
Possenti, de Martino, Belloni, Burgay, Papitto, Pellizzoni	Investigating the ‘transitional’ binary pulsar XSS J12270−4859	P880
Cordiner, Milam, Charnley, gilles, Smith, Wirstrom	Quantifying nitrogen isotope enrichment around the young protostar Chamaeleon MMS1	P881
Dai, Hobbs, Shannon, Kerr, Tiburzi	To investigate the frequency evolution of PSR J1713+0747's pulse profile in order to develop a frequency-dependent timing technique	P882
Shannon, Ravi, Carretti, Kerr, Bailes, Jameson, Bannister, Burke-Spolaor, Lasky	The Parkes All Radio Transients in the skY (PARTY) survey	P883
McGuire, Carroll, Blake, Remijan	Propylene oxide: The first interstellar chiral molecule	P884

OBSERVERS	PROGRAM	NO.
Camilo, Scholz, Reynolds, Sarkissian, Johnston	Understanding the remarkable behaviour of radio magnetars	P885
Hobbs, Dai, Yuen, Li, Wang, Toomey, Zic, Obst, Pan, Wang, Ngoc, Zhang, Dempsey	Searching for pulsars using the CSIRO Pulsar Data Archive	P886
Kerr, Johnston, Shannon, Camilo, Ray, Ferrara	Probing the gamma-ray pulsar population with Parkes	P887
Petroff, Caleb, Keane, Johnston, van Straten	Expanding the rotating-radio-transient parameter space	P888
Said, Kraan-Korteweg, Jarrett, Staveley-Smith, Springob, Williams	Cosmic flows in the Zone of Avoidance	P890
Keane, Bailes, Barr, Bates, Bhandari, Bhat, Burgay, Burke-Spolaor, Caleb, Eatough, Flynn, Jameson, Jankowski, Johnston, Keith, Kramer, Levin, Lyon, Morello, Ng, Petroff, Possenti, Stappers, van Straten, Tiburzi	SUPERBx – The SUrvey for Pulsars and Extragalactic Radio Bursts Extension	P892

OBSERVATIONS MADE WITH THE MOPRA RADIO TELESCOPE, OCTOBER 2014 TO SEPTEMBER 2015

OBSERVERS	PROGRAM	NO.
Indermuehle, Edwards	Maser and flux monitoring at 3 mm, 7 mm and 12 mm	M426
Barnes, Muller, Lowe, Cunningham, Indermuehle, Hernandez, Fuller, O'Dougherty, Nguyen Luong, Sharpe, Mizuno, Jones, Schuller, Nakanishi, Umemoto, Chibueze, Wakker, Crutcher, Whitney, Brogan, Molinari, Benjamin, Goodman, Bosi, Lo, Longmore	The Three-mm Ultimate Mopra Milky Way Survey (MALT110): Completion of phase II	M566
Indermuehle, McIntosh	Monitoring SiO maser emissions in high time resolution	M668
Maxted, Renaud, Rowell, Puehlhofer, Chaves, Collaboration	A CO survey of the newly-discovered supernova remnant G323.7–1.0	M677
Fuller, Traficante, Lackington, Peretto	The structure and kinematics of a 90-pc-long massive filament	M679
Contreras, Rebolledo, Breen, Green, Burton, Rathborne, Purcell	Physical and chemical evolution of high-mass star-forming clumps in the Carina Nebula	M680
Itam-Pasquet, Maxted, Lowe, Jasniewicz, Puy	A 3-mm survey of the region in front of the globular cluster NGC 4833	M681
Andre, Shimajiri, Konyves, Schneider, Bontemps, Braine, Peretto, Roy, Arzoumanian, Ladjelate	Probing the detailed connection between dense gas and star formation in the Ophiuchus main cloud	M682

VLBI OBSERVATIONS, OCTOBER 2014 TO SEPTEMBER 2015

OBSERVERS	PROGRAM	NO.
Ryder, Tingay, Smith, Lenc, Kotak, Polshaw, Boettcher	LBA imaging of Supernova 1978K in NGC 1313	V157
Ojha, Kadler, Edwards, Carpenter, Team	Physics of gamma-ray-emitting AGN	V252
Ellingsen, Reid, Krishnan, Zhang, Green, Honma, Dawson, Zheng, Menten, Fujisawa, Phillips, Goedhart, Xu, Breen, Voronkov, Dodson, Shen, Walsh, Brunthaler, Chen, Rioja, Sakai, Sanna	Astrometric observation of methanol masers: Determining Galactic structure and investigating high-mass star formation	V255
Bhat, Bailes, Deller, Tingay, Verbiest	Measuring the proper motion of the relativistic binary PSR J1141–6545	V256
Petrov, Phillips, Bertarini, Fomalont, Tzioumis, Murphy, Sadler, Burke-Spolaor, Booth, Pogrebenko, De witt, Bietenholz	LBA Calibrator Survey – 8	V271

OBSERVERS	PROGRAM	NO.
Miller-Jones, Jonker, Maccarone, Nelemans, Sivakoff, Tzioumis	Constraining black-hole formation with LBA astrometry	V447
Horiuchi, Phillips, Stevens, Jacobs, Sotuela, Garcia Miro	32-GHz Celestial Reference Frame Survey for declinations below −45 degrees	V463
Dodson, Rioja, Hobbs, Tzioumis, Reynolds, Godfrey	Multiview Pathfinder: The LBA demonstration	V464
Miller-Jones, Moldon, Deller, Shannon, Dubus, Johnston, Paredes, Ribo, Tomsick, Dodson	Mapping the orbit of PSR B1259−63 with LBA astrometry	V486
Ellingsen, Macquart, Bignall, Dawson, Breen, Reynolds, Imai, Keller, Bekki, Krishnan, Cioni	Measuring the proper motions of the Large and Small Magellanic Clouds	V490
Sugiyama, Inayoshi, Tanaka, Hosokawa, Motogi, Fujisawa, Yonekura, Momose, Ellingsen, Green	Astrometry of the 6.7-GHz methanol masers showing periodic flux variation around the high-mass YSO	V499
Deller, Johnston, Burke-Spolaor, Romani, Kerr	LBA parallaxes to probe gamma-ray pulsar physic	V507
Reynolds, Kovalev, Kardashev, Bignall, Sokolovsky, Bietenholz, Gurvits, Garrett, Deller, Cimo, Macquart, Jauncey, Edwards, Tingay, Horiuchi, Tzioumis, Shabala, Lovell, McCallum, Koay	RadioAstron–LBA Space VLBI survey of AGN at the highest angular resolution	V511
Bannister, Walker, Johnston, Stevens, Bignall, Reynolds, Tuntsov	VLBI follow-up of ATCA Extreme Scattering Events	V516
de Witt, Bertarini, Charlot, Bourda, Quick	Southern-hemisphere observations towards the accurate alignment of the VLBI frame and the future Gaia frame	V518
Maini, Norris, Parker, Prandoni, Giovannini	Assessing the origin of the radio emission in radio-quiet AGN	V519
de Witt, Bertarini, Jacobs, Quick, Horiuchi, McCallum, Jung, Phillips	Completing the K-band CRF in the southern hemisphere – 2	V521
Burns, Imai, Dodson, Ellingsen, Honma, Orosz, Handa, Omodaka, Sugiyama, Sakai	6.7-GHz maser parallax of a particularly interesting high-mass star-forming region	V527
Zaw, Greenhill, Dopita, Burtscher, Lopez-Gonzaga	Geometry of an AGN on parsec scales: NGC 5506	V533

CSDCC OBSERVATIONS, OCTOBER 2014 TO SEPTEMBER 2015

OBSERVERS	PROGRAM	NO.
Heise, Green, Horiuchi, Engels	A search for water masers in silicate-carbon star candidates	T208
Castangia, Tarchi, Caccianiga, Severgnini, Della Ceca, Horiuchi	Water maser in Compton-thick AGN	T212
Orosz, Gomez, Imai, Horiuchi	Monitoring of H_2O masers in all known water fountains	T215
Camarata, Miller-Jones, Jackson	The connection between anomalous NH_3 spectra and high-mass star formation	P870
Cordiner, Smith, Charnley, Milam, Gilles, Wirstrom	Quantifying nitrogen isotope enrichment around the young protostar Chamaeleon MMS1	P881

Note: Two proposals were originally submitted for 22 GHz observations with Parkes but transferred to Tidbinbilla.

E: PhD students

PHD STUDENTS CO-SUPERVISED BY CASS STAFF (AS OF DECEMBER 2015)

NAME	UNIVERSITY	PROJECT TITLE
Shaila Akhter	University of New South Wales	Turbulence in the interstellar medium and its relationship to massive star formation
Tui Britton	Macquarie University	Methanol masers in star-forming regions
Joseph Callingham	University of Sydney	An MWA source catalogue: CSS and GPS sources at low radio frequencies
Francesco Cavallaro	University of Catania	Stellar radio emission in the SKA era: surveys of the Galactic plane
Jordan Collier	Western Sydney University	The history of supermassive black holes in the Universe
Phoebe de Wilt	Adelaide University	Investigating the connection between star forming regions and unidentified TeV gamma-ray sources
Timothy Galvin	Western Sydney University	Radio emission from star-forming galaxies at high and low redshift
Marcin Glowacki	University of Sydney	Study of H I absorption against distant radio sources through ASKAP
Claire-Elise Green	University of New South Wales	Milky Way dynamics and structure
Sarah Hegarty	Swinburne University of Technology	Accelerating and enhancing knowledge discovery for the 'petascale astronomy' era
Andreas Herzog	Ruhr University Bochum/ Macquarie University	The broadband spectra of infared-faint radio sources
Dane Kleiner	Monash University	The large-scale structure's effect on the H I content of galaxies
Vasaant Krishnan	University of Tasmania	Astrometric observation of methanol masers
Katharina Lutz	Swinburne University of Technology	How do galaxies accrete gas and form stars?
Alessandro Maini	University of Bologna/ Macquarie University	Modelling the faint radio sky: the pathway to SKA
Aina Musaeva	University of Sydney	Intermediate-mass black holes in dwarf galaxies
Andrew O'Brien	Western Sydney University	ATCA–SPT: A survey of 100 square degrees of the southern sky
Daniel Reardon	Monash University	Bayesian analysis of pulsar timing array data to study noise properties of pulsars
Glen Rees	Macquarie University	Cosmology using next-generation radio telescopes
Sarah Reeves	University of Sydney	H I and OH absorption line studies of nearby galaxies
Elise Servajean	Universidad de Chile	The physical and kinematical structure of massive and dense cold cores
Jesse Swan	University of Tasmania	The evolution of star formation and black-hole activity across cosmic time
Anita Titmarsh	University of Tasmania	Investigating the earliest stages of massive star formation
Ross Turner	University of Tasmania	Dynamical and cosmological evolution of radio AGN and AGN feedback
Stuart Weston	Auckland University of Technology	Data mining for statistical analysis of the faint radio sky: the pathway to EMU
Marion Wienen	University of Bonn	Galactic high-mass star formation at submillimetre wavelengths
Graeme Wong	Western Sydney University	Physics and chemistry of molecular gas in the Milky Way galaxy
Mustafa Yildiz	University of Groningen	Star formation in the outer regions of early-type galaxies
Tye Young	Australian National University	Multi-wavelength properties of dwarf galaxies in the Local Volume

F: PhD theses

THESES AWARDED IN 2015 TO STUDENTS CO-SUPERVISED BY CASS STAFF

Brook, Paul (University of Oxford, September 2015). "Variability in pulsars".

Brown, Courtney (née Jones) (University of Tasmania, July 2015).
"H I absorption in the fourth Galactic quadrant".

Dai, Shi (Peking University, January 2015). "High precision pulsar timing".

Fujii, Kosuke (The University of Tokyo, December 2015). "Giant molecular cloud formation at the interface of colliding supershells in the Large Magellanic Cloud".

Jordan, Christopher (University of Tasmania, September 2015). "CS(1–0) observations with MALT-45: a 7-mm survey of the southern galaxy".

Petroff, Emily (Swinburne University of Technology, September 2015). "Study of the interstellar medium through radio phenomena of short duration".

Ravi, Vikram (University of Melbourne, February 2015). "Evincing the histories of the cosmic supermassive black hole and galaxy populations with gravitational waves".

Zhu, Xingjiang (The University of Western Australia, July 2015). "Searching for continuous gravitational waves in the Parkes pulsar timing array data sets".

G: Publications

***Indicates publications with CASS staff (not including CASS staff based at CDSCC).**
C – Compact Array, M = Mopra, P = Parkes, V = VLBI, A = ASKAP, S = SKA, T = Tidbinbilla, O = other staff paper

REFEREED PAPERS WITH DATA FROM, OR RELATED TO, ATNF FACILITIES AND OTHER STAFF PAPERS

*Adrián-Martínez, S.; Albert, A.; André, M.; Anton, G.; Ardid, M.; Aubert, J.-J.; Baret, B.; Barrios, J.; Basa, S.; and 157 coauthors. "ANTARES constrains a blazar origin of two IceCube PeV neutrino events". A&A, 576, L8 (2015). (O)

*Akhter, S.; Cunningham, M.R.; Harvey-Smith, L.; Jones, P.A. "How do massive stars form? Infall and outflow in dense cores in the Milky Way". PKAS, 30, 99–101 (2015). (M)

*Allison, J.R.; Sadler, E.M.; Moss, V.A.; Whiting, M.T.; Hunstead, R.W.; Pracy, M.B.; Curran, S. J.; Croom, S.M.; Glowacki, M.; Morganti, R.; and 93 coauthors. "Discovery of H I gas in a young radio galaxy at z = 0.44 using the Australian Square Kilometre Array Pathfinder". MNRAS, 453, 1249–1267 (2015). (A)

*Alves, M.I.R.; Calabretta, M.; Davies, R.D.; Dickinson, C.; Staveley-Smith, L.; Davis, R.J.; Chen, T.; Barr, A. "The HIPASS survey of the Galactic plane in radio recombination lines". MNRAS, 450, 2025–2042 (2015). (P)

*Anderson, C.S.; Gaensler, B.M.; Feain, I.J.; Franzen, T.M.O. "Broadband radio polarimetry and Faraday rotation of 563 extragalactic radio sources". ApJ, 815, A49 (2015). (C)

Anderson, L.D.; Deharveng, L.; Zavagno, A.; Tremblin, P.; Lowe, V.; Cunningham, M.R.; Jones, P.; Mullins, A.M.; Redman, M.P. "Mopra CO observations of the Bubble H II region RCW 120". ApJ, 800, A101 (2015). (M)

*Antonopoulou, D.; Weltevrede, P.; Espinoza, C.M.; Watts, A.L.; Johnston, S.; Shannon, R.M.; Kerr, M. "The unusual glitch recoveries of the high-magnetic-field pulsar J1119–6127". MNRAS, 447, 3924–3935 (2015). (P)

*Ao, Y.; Matsuda, Y.; Beelen, A.; Henkel, C.; Cen, R.; De Breuck, C.; Francis, P.J.; Kovács, A.; Lagache, G.; Lehnert, M.; and seven coauthors. "What powers Ly-alpha blobs?" A&A, 581, A132 (2015). (C)

Arabsalmani, M.; Roychowdhury, S.; Zwaan, M.A.; Kanekar, N.; Michalowski, M.J. "First measurement of H I 21-cm emission from a GRB host galaxy indicates a post-merger system". MNRAS, 454, L51–L55 (2015). (C)

Armijos-Abendaño, J.; Martín-Pintado, J.; Requena-Torres, M.A.; Martín, S.; Rodríguez-Franco, A. "3-mm spectral line survey of two lines of sight towards two typical cloud complexes in the Galactic Centre". MNRAS, 446, 3842–3862 (2015). (M)

*Arora, B.S.; Morgan, J.; Ord, S.M.; Tingay, S.J.; Hurley-Walker, N.; Bell, M.; Bernardi, G.; Bhat, N.D.R.; Briggs, F.; Callingham, J.R.; and 49 coauthors. "Ionospheric modelling using GPS to calibrate the MWA. I: Comparison of first order ionospheric effects between GPS models and MWA observations". PASA, 32, A029 (2015). (O)

Avison, A.; Peretto, N.; Fuller, G.A.; Duarte-Cabral, A.; Traficante, A.; Pineda, J.E. "Tightening the belt: Constraining the mass and evolution in SDC335". A&A, 577, A30 (2015). (C)

*Azulay, R.; Guirado, J.C.; Marcaide, J.M.; Martí-Vidal, I.; Ros, E.; Jauncey, D.L.; Lestrade, J.-F.; Preston, R.A.; Reynolds, J.E.; Tognelli, E.; Ventura, P. "Dynamical masses of the low-mass stellar binary AB Doradus B". A&A, 578, A16 (2015). (V)

*Banfield, J.K.; Wong, O.I.; Willett, K.W.; Norris, R.P.; Rudnick, L.; Shabala, S.S.; Simmons, B.D.; Snyder, C.; Garon, A.; Seymour, N.; and 26 coauthors. "Radio Galaxy Zoo: host galaxies and radio morphologies derived from visual inspection". MNRAS, 453, 2326–2340 (2015). (C)

*Barnes, J.E.; Wood, K.; Hill, A.S.; Haffner, L.M. "Models of diffuse Hα in the interstellar medium: the relative contributions from in-situ ionization and dust scattering". MNRAS, 447, 559–566 (2015). (O)

*Barnes, P.J.; Muller, E.; Indermuehle, B.; O'Dougherty, S.N.; Lowe, V.; Cunningham, M.; Hernandez, A.K.; Fuller, G.A. "The Three-mm Ultimate Mopra Milky Way Survey – I. Survey overview, initial data releases, and first results". ApJ, 812, A6 (2015). (M)

*Bates, S.D.; Thornton, D.; Bailes, M.; Barr, E.; Bassa, C.G.; Bhat, N.D.R.; Burgay, M.; Burke-Spolaor, S.; Champion, D.J.; Flynn, C.M.L.; and 13 coauthors. "The High Time Resolution Universe survey – XI. Discovery of five recycled pulsars and the optical detectability of survey white dwarf companions". MNRAS, 446, 4019–4028 (2015). (P)

*Battistelli, E.S.; Carretti, E.; Cruciani, A.; de Bernardis, P.; Génova-Santos, R.; Masi, S.; Naldi, A.; Paladini,R.; Piacentini, F.; Tibbs, C.T.; and two coauthors. "New radio observations of anomalous microwave emission in the H II region RCW175". ApJ, 801, A111 (2015). (P)

*Behar, E.; Baldi, R.D.; Laor, A.; Horesh, A.; Stevens, J.; Tzioumis, T. "Discovery of millimetre-wave excess emission in radio-quiet active galactic nuclei". MNRAS, 451, 517–526 (2015). (C)

*Bell, M.E.; Huynh, M.T.; Hancock, P.; Murphy, T.; Gaensler, B.M.; Burlon, D.; Trott, C.; Bannister, K. "A search for variable and transient radio sources in the extended Chandra Deep Field South at 5.5 GHz". MNRAS, 450, 4221–4232 (2015). (C)

*Benaglia, P.; Marcote, B.; Moldón, J.; Nelan, E.; De Becker, M.; Dougherty, S.M.; Koribalski, B.S. "A radio map of the colliding winds in the very massive binary system HD 93129A". A&A, 579, A99 (2015). (C)

*Bihr, S.; Beuther, H.; Ott, J.; Johnston, K.G.; Brunthaler, A.; Anderson, L.D.; Bigiel, F.; Carlhoff, P.; Churchwell, E.; Glover, S.C.O.; and 23 coauthors. “THOR: The H I, OH, Recombination line survey of the Milky Way. The pilot study: H I observations of the giant molecular cloud W43”. A&A, 580, A112 (2015). (O)

*Blair, D.; Ju, L.; Zhao, C.; Wen, L.; Chu, Q.; Fang, Q; Cai, R.; Gao, J.; Lin, X. and 31 coauthors. “Gravitational wave astronomy: the current status”. Sci.China Phys.Mech. Astron., 58, A120402 (2015). (O)

Bozzetto, L.M.; Filipovic, M.D.; Haberl, F.; Sasaki, M.; Kavanagh, P.; Maggi, P.; Urosevic, D.; Sturm, R. “Supernova remnants in the Magellanic Clouds”. PKAS, 30, 149–153 (2015). (C)

Braiding, C.; Burton, M.G. “An update on the Mopra Southern Galactic Plane CO survey”. PKAS, 30, 103–105 (2015). (M)

*Braiding, C.; Burton, M.G.; Blackwell, R.; Glück, C.; Hawkes, J.; Kulesa, C.; Maxted, N.; Rebolledo, D.; Rowell, G.; Stark, A.; and six coauthors. “The Mopra Southern Galactic Plane CO Survey — Data release 1”. PASA, 32, e020 (2015). (M)

*Bray, J.D.; Ekers, R.D.; Roberts, P.; Reynolds, J.E.; James, C.W.; Phillips, C.J.; Protheroe, R.J.; McFadden, R.A.; Aartsen, M.G. “A lunar radio experiment with the Parkes radio telescope for the LUNASKA project”. APh, 65, 22–39 (2015). (P)

*Bray, J.D.; Ekers, R.D.; Roberts, P.; Reynolds, J.E.; James, C.W.; Phillips, C.J.; Protheroe, R.J.; McFadden, R.A.; Aartsen, M.G. “Limit on the ultrahigh-energy neutrino flux from lunar observations with the Parkes radio telescope”. PhRvD, 91, A063002 (2015). (P)

*Breen, S.L.; Fuller, G.A.; Caswell, J.L.; Green, J.A.; Avison, A.; Ellingsen, S.P.; Gray, M.D.; Pestalozzi, M.; Quinn, L.J.; Richards, A.M.S.; and two coauthors. “The 6-GHz methanol multibeam maser catalogue – V. Galactic longitudes 20°-60°”. MNRAS, 450, 4109–4136 (2015). (P)

*Budding, E.; Slee, O.B.; Johnston-Hollitt, M. “Possible radio-emission signatures of exoplanets”. SouSt., 54, 3–6 (2015). (O)

Burton, M.G.; Ashley, M.C.B.; Braiding, C.; Freeman, M.; Kulesa, C.; Wolfire, M.G.; Hollenbach, D.J.; Rowell, G.; Lau, J. “Extended carbon line emission in the Galaxy: Searching for dark molecular gas along the G328 sightline”. ApJ, 811, A13 (2015). (M,P,C)

*Callingham, J.R.; Gaensler, B M.; Ekers, R.D.; Tingay, S.J.; Wayth, R.B.; Morgan, J.; Bernardi, G.; Bell, M. E.; Bhat, R.; Bowman, J.D.; and 33 coauthors. “Broadband spectral modeling of the extreme gigahertz-peaked spectrum radio source PKS B0008–421”. ApJ, 809, A168 (2015). (C)

*Camilo, F.; Kerr, M.; Ray, P.S.; Ransom, S.M.; Sarkissian, J.; Cromartie, H.T.; Johnston, S.; Reynolds, J.E.; Wolff, M.T.; Freire, P.C.C.; and six coauthors. “Parkes radio searches of Fermi gamma-ray sources and millisecond pulsar discoveries”. ApJ, 810, A85 (2015). (P)

*Carton, D.; Brinchmann, J.; Wang, J.; Bigiel, F.; Cormier, D.; van der Hulst, T.; Józsa, G.I.G.; Serra, P.; Verheijen, M.A.W. “Gas-phase metallicity profiles of the Bluedisk galaxies: Is metallicity in a local star formation regulated equilibrium?” MNRAS, 451, 210–235 (2015). (O)

Casassus, S.; Wright, C.M.; Marino, S.; Maddison, S.T.; Wootten, A.; Roman, P.; Pérez, S.; Pinilla, P.; Wyatt, M.; Moral, V.; and four coauthors. “A compact concentration of large grains in the HD 142527 protoplanetary dust trap”. ApJ, 812, A126 (2015). (C)

*Chen, X.; Ellingsen, S.P.; Baan, W.A.; Qiao, H.-H.; Li, J.; An, T.; Breen, S.L. “Detection of a methanol megamaser in a major-merger galaxy”. ApJ, 800, L2 (2015). (C)

*Chhetri, R.; Ekers, R.D.; Kimball, A.; Miszalski, B.; Cohen, M.; Manick, R. “High radio frequency sample of bright planetary nebulae in the Southern hemisphere detected in the AT20G survey”. MNRAS, 451, 3228–3236 (2015). (C)

*Coles, W.A.; Kerr, M.; Shannon, R.M.; Hobbs, G.B.; Manchester, R.N.; You, X.-P.; Bailes, M.; Bhat, N.D. R.; Burke-Spolaor, S.; Dai, S.; and ten coauthors. “Pulsar observations of extreme scattering events”. ApJ, 808, A113 (2015). (P)

Corby, J.F.; Jones, P.A.; Cunningham, M.R.; Menten, K.M.; Belloche, A.; Schwab, F.R.; Walsh, A.J.; Balnozan, E.; Bronfman, L.; Lo, N.; Remijan, A.J. “An ATCA survey of Sagittarius B2 at 7 mm: chemical complexity meets broad-band interferometry”. MNRAS, 452, 3969–3993 (2015). (C)

Courtois, H.M.; Tully, R.B. “Update on H I data collection from Green Bank, Parkes and Arecibo telescopes for the Cosmic Flows project”. MNRAS, 447, 1531–1534 (2015). (P)

*Crocker, R.M.; Bicknell, G.V.; Taylor, A.M.; Carretti, E. “A unified model of the Fermi bubbles, microwave haze, and polarized radio lobes: Reverse shocks in the Galactic center’s giant outflows”. ApJ, 808, A107 (2015). (O)

Cseh, D.; Webb, N.A.; Godet, O.; Barret, D.; Corbel, S.; Coriat, M.; Falcke, H.; Farrell, S.A.; Körding, E.; Lenc, E.; Wrobel, J.M. “On the radio properties of the intermediate-mass black hole candidate ESO 243–49 HLX–1”. MNRAS, 446, 3268–3276 (2015). (C)

*Dai, S.; Hobbs, G.; Manchester, R.N.; Kerr, M.; Shannon, R.M.; van Straten, W.; Mata, A.; Bailes, M.; Bhat, N.D.R.; Burke-Spolaor, S.; and 16 coauthors. “A study of multifrequency polarization pulse profiles of millisecond pulsars”. MNRAS, 449, 3223–3262 (2015). (P)

*Dai, S.; Smith, M.C.; Lin, M.X.; Yue, Y.L.; Hobbs, G.; Xu, R.X. “Gravitational microlensing by neutron stars and radio pulsars: Event rates, timescale distributions, and mass measurements”. ApJ, 802, A120 (2015). (O)

*Davis, T.A.; Rowlands, K.; Allison, J.R.; Shabala, S.S.; Ting, Y.-S.; Lagos, C.D.P.; Kaviraj, S.; Bourne, N.; Dunne, L.; Eales, S.; and five coauthors. “Molecular and atomic gas in dust lane early-type galaxies – I. Low star formation efficiencies in minor merger remnants”. MNRAS, 449, 3503–3516 (2015). (O)

*Dawson, J.R.; Ntormousi, E.; Fukui, Y.; Hayakawa, T.; Fierlinger, K. “A young giant molecular cloud formed at the interface of two colliding supershells: Observations meet simulations”. ApJ, 799, A64 (2015). (C,P,M)

*de Villiers, H.M.; Chrysostomou, A.; Thompson, M.A.; Urquhart, J.S.; Breen, S.L.; Burton, M.G.; Ellingsen, S.P.; Fuller, G.A.; Pestalozzi, M.; Voronkov, M.A.; Ward-Thompson, D. “6.7-GHz methanol maser associated outflows: an evolutionary sequence”. MNRAS, 449, 119–128 (2015). (O)

*Deane, R.P.; Obreschkow, D.; Heywood, I. “Strongly lensed neutral hydrogen emission: detection predictions with current and future radio interferometers”. MNRAS, 452, L49–L53 (2015). (O)

*Deharveng, L.; Zavagno, A.; Samal, M.R.; Anderson, L.D.; LeLeu, G.; Brevot, D.; Duarte-Cabral, A.; Molinari, S.; Pestalozzi, M.; Foster, J.B.; and two coauthors. “Bipolar H II regions – Morphology and star formation in their vicinity. I. G319.88+00.79 and G010.32–00.15”. A&A, 582, A1 (2015). (M)

*den Heijer, M.; Jozsa, G.I.G.; Kerp, J.; Serra, P., van der Hulst, Th.; Kauffmann, G.; Wang, J.; Bigiel, F.; Brinchmann, J.; Carton, D.; and two coauthors. “A study of the kinematics of unusually H I-rich galaxies”. Astron. Nachr., 336, 284–311 (2015). (O)

*den Heijer, M.; Oosterloo, T.A.; Serra, P.; Józsa, G.I.G.; Kerp, J.; Morganti, R.; Cappellari, M.; Davis, T.A.; Duc, P.-A.; Emsellem, E.; and two coauthors. “The H I Tully-Fisher relation of early-type galaxies”. A&A, 581, A98 (2015). (O)

*Dillon, J.S.; Neben, A.R.; Hewitt, J.N.; Tegmark, M.; Barry, N.; Beardsley, A P.; Bowman, J.D.; Briggs, F.; Carroll, P.; de Oliveira-Costa, A.; and 45 coauthors. “Empirical covariance modeling for 21-cm power spectrum estimation: A method demonstration and new limits from early Murchison Widefield Array 128-tile data”. PhRvD, 91, A123011 (2015). (O)

*Dopita, M.A.; Ho, I.-T.; Dressel, L.L.; Sutherland, R.; Kewley, L.; Davies, R.; Hampton, E.; Shastri, P.; Kharb, P.; Jose, J.; and nine coauthors. “Probing the physics of narrow-line regions in active galaxies – III. Accretion and cocoon shocks in the Liner NGC 1052”. ApJ, 801, A42 (2015). (O)

*Dopita, M.A.; Shastri, P.; Davies, R.; Kewley, L.; Hampton, E.; Scharwächter, J.; Sutherland, R.; Kharb, P.; Jose, J.; Bhatt, H.; and seven coauthors. “Probing the physics of narrow line regions in active galaxies – II. The Siding Spring Southern Seyfert Spectroscopic Snapshot Survey (S7)”. ApJS, 217, A12 (2015). (O)

Drappeau, S.; Malzac, J.; Belmont, R.; Gandhi, P.; Corbel, S. “Internal shocks driven by accretion flow variability in the compact jet of the black hole binary GX 339–4”. MNRAS, 447, 3832–3839 (2015). (C)

*Duc, P.-A.; Cuillandre, J.-C.; Karabal, E.; Cappellari, M.; Alatalo, K.; Blitz, L.; Bournaud, F.; Bureau, M.; Crocker, A.F.; Davies, R.L.; and 17 coauthors. “The ATLAS3D project – XXIX. The new look of early-type galaxies and surrounding fields disclosed by extremely deep optical images”. MNRAS, 446, 120–143 (2015). (O)

*Duronea, N.U.; Vasquez, J.; Gómez, L.; Cappa, C.E.; Firpo, V.; López-Caraballo, C.H.; Rubio, M. “870-μm continuum observations of the bubble-shaped nebula Gum 31”. A&A, 582, A2 (2015). (O)

*Edwards, P.G. “The Australia Telescope National Facility”. PKAS, 30, 655–657 (2015). (C, M, P, T)

*Edwards, P.G.; Phillips, C. “The Long Baseline Array”. PKAS, 30, 659–661 (2015). (V)

*Emonts, B.H.C.; Mao, M.Y.; Stroe, A.; Pentericci, L.; Villar-Martín, M.; Norris, R.P.; Miley, G.; De Breuck, C.; van Moorsel, G.A.; Lehnert, M.D.; and ten coauthors. “A CO-rich merger shaping a powerful and hyperluminous infrared radio galaxy at z = 2: the Dragonfly Galaxy”. MNRAS, 451, 1025–1035 (2015). (C)

*Fan, D.; Budavári, T.; Norris, R.P.; Hopkins, A.M. “Matching radio catalogues with realistic geometry: application to SWIRE and ATLAS”. MNRAS, 451, 1299–1305 (2015). (C)

*Foster, G.; Karastergiou, A.; Paulin, R.; Carozzi, T.D.; Johnston, S.; van Straten, W. “Intrinsic instrumental polarization and high-precision pulsar timing”. MNRAS, 453, 1489–1502 (2015). (O)

*Franzen, T.M.O.; Banfield, J.K.; Hales, C.A.; Hopkins, A.; Norris, R.P.; Seymour, N.; Chow, K.E.; Herzog, A.; Huynh, M.T.; Lenc, E.; and two coauthors. “ATLAS – I. Third release of 1.4 GHz mosaics and component catalogues”. MNRAS, 453, 4020–4036 (2015). (C)

*Garay, G.; Mardones, D.; Contreras, Y.; Pineda, J.E.; Servajean, E.; Guzmán, A.E. “G305.136+0.068: A massive and dense cold core in an early stage of evolution”. ApJ, 799, A75 (2015). (O)

*George, L.T.; Dwarakanath, K.S.; Johnston-Hollitt, M.; Hurley-Walker, N.; Hindson, L.; Kapińska, A.D.; Tingay, S. ; Bell, M.; Callingham, J.R.; For, B.-Q.; and 42 coauthors. “An analysis of the halo and relic radio emission from Abell 3376 from Murchison Widefield Array observations”. MNRAS, 451, 4207–4214 (2015). (O)

*George, M.; Orchiston, W.; Slee, B.; Wielebinski, R. “The history of early low frequency radio astronomy in Australia – 2: Tasmania”. JAHH, 18, 14–22 (2015). (O)

*George, M.; Orchiston, W.; Slee, B.; Wielebinski, R. “The history of early low frequency radio astronomy in Australia – 3: Ellis, Reber and the Cambridge field station near Hobart”. JAHH, 18, 177–189 (2015). (O)

*George, M.; Orchiston, W.; Wielebinski, R.; Slee, B. “The history of early low frequency radio astronomy in Australia – 5: Reber and the Kempton Field Station in Tasmania”. JAHH, 18, 312–324 (2015). (O)

Giannetti, A.; Wyrowski, F.; Leurini, S.; Urquhart, J.; Csengeri, T.; Menten, K.M.; Bronfman, L.; van der Tak, F.F.S. “Infrared dark clouds on the far side of the Galaxy”. A&A, 580, L7 (2015). (M)

*Ginsburg, A.; Walsh, A.; Henkel, C.; Jones, P.A.; Cunningham, M.; Kauffmann, J.; Pillai, T.; Mills, E.A.C.; Ott, J.; Kruijssen, J.M.D.; and eight coauthors. "High-mass star-forming cloud G0.38+0.04 in the Galactic center dust ridge contains H_2CO and SiO masers". A&A, 584, L7 (2015). (C)

Gómez, J.F.; Rizzo, J.R.; Suárez, O.; Palau, A.; Miranda, L.F.; Guerrero, M.A.; Ramos-Larios, G.; Torrelles, J.M. "A search for water maser emission toward obscured post-AGB star and planetary nebula candidates". A&A, 578, A119 (2015). (P)

*Gómez, J.F.; Suárez, O.; Bendjoya, P.; Rizzo, J.R.; Miranda, L.F.; Green, J.A.; Uscanga, L.; García-García, E.; Lagadec, E.; Guerrero, M.A.; Ramos-Larios, G. "The first 'water fountain' collimated outflow in a Planetary Nebula". ApJ, 799, A186 (2015). (C)

*Green, J.A.; Caswell, J.L.; McClure-Griffiths, N.M. "Excited-state hydroxyl maser polarimetry: who ate all the πs?" MNRAS, 451, 74–92 (2015). (C)

Gullberg, B.; De Breuck, C.; Vieira, J.D.; Weiß, A.; Aguirre, J.E.; Aravena, M.; Béthermin, M.; Bradford, C. M.; Bothwell, M.S.; Carlstrom, J.E.; and 17 coauthors. "The nature of the [C II] emission in dusty star-forming galaxies from the SPT survey". MNRAS, 449, 2883–2900 (2015). (C)

*Guzmán, A.E.; Sanhueza, P.; Contreras, Y.; Smith, H.A.; Jackson, J.M.; Hoq, S.; Rathborne, J.M. "Far-infrared dust temperatures and column densities of the MALT90 molecular clump sample". ApJ, 815, A130 (2015). (O)

*Hagiwara, Y.; Edwards, P.G. "High-resolution imaging of water maser emission in the active galaxies NGC 6240 and M51". ApJ, 815, A124 (2015). (O)

*Heald, G.H.; Pizzo, R.F.; Orrú, E.; Breton, R.P.; Carbone, D.; Ferrari, C.; Hardcastle, M.J.; Jurusik, W.; Macario, G.; Mulcahy, D.; and 140 coauthors. "The LOFAR Multifrequency Snapshot Sky Survey (MSSS) – I. Survey description and first results". A&A, 582, A123 (2015). (O)

Heinz, S.; Burton, M.; Braiding, C.; Brandt, W.N.; Jonker, P.G.; Sell, P.; Fender, R.P.; Nowak, M.A.; Schulz, N.S. "Lord of the Rings: A kinematic distance to Circinus X-1 from a Giant X-Ray Light Echo". ApJ, 806, A265 (2015). (M)

*Henley, D.B.; Shelton, R.L.; Kwak, K.; Hill, A.S.; Mac Low, M.M. "The origin of the hot gas in the galactic halo: Testing galactic fountain models' X-ray emission". ApJ, 800, A102 (2015). (O)

*Herzog, A.; Middelberg, E.; Norris, R.P.; Spitler, L.R.; Deller, A.T.; Collier, J.D.; Parker, Q.A. "Active galactic nuclei cores in infrared-faint radio sources: Very Long Baseline Interferometry observations using the Very Long Baseline Array". A&A, 578, A67 (2015). (V)

*Herzog, A.; Norris, R.P.; Middelberg, E.; Spitler, L.R.; Leipski, C.; Parker, Q.A. "Infrared-faint radio sources remain undetected at far-infrared wavelengths. Deep photometric observations using the Herschel Space Observatory". A&A, 580, A7 (2015). (O)

*Hobbs, G. "The Parkes Pulsar Timing Array Project". PKAS, 30, 577–581 (2015). (P)

Hogan, M.T.; Edge, A.C.; Hlavacek-Larrondo, J.; Grainge, K.J.B.; Hamer, S.L.; Mahony, E.K.; Russell, H.R.; Fabian, A.C.; McNamara, B.R.; Wilman, R.J. "A comprehensive study of the radio properties of brightest cluster galaxies". MNRAS, 453, 1201–1222 (2015). (C,V)

*Hopkins, A.M.; Whiting, M.T.; Seymour, N.; Chow, K.E.; Norris, R.P.; Bonavera, L.; Breton, R.; Carbone, D.; Ferrari, C.; Franzen, T.M.O.; and 24 coauthors. "The ASKAP/EMU source finding data challenge". PASA, 32, e037 (2015). (A)

*Hoppmann, L.; Staveley-Smith, L.; Freudling, W.; Zwaan, M.A.; Minchin, R.F.; Calabretta, M.R. "A blind H I mass function from the Arecibo Ultra-Deep Survey (AUDS)". MNRAS, 452, 3726–3741 (2015). (O)

*Howell, E.J.; Rowlinson, A.; Coward, D.M.; Lasky, P.D.; Kaplan, D.L.; Thrane, E.; Rowell, G.; Galloway, D.K.; Yuan, F.; Dodson, R.; and five coauthors. "Hunting gravitational waves with multi-messenger counterparts: Australia's role". PASA, 32, e046 (2015). (O)

*Hummel, C.A.; Stanke, T.; Galván-Madrid, R.; Koribalski, B.S. "Massive envelopes and filaments in the NGC 3603 star forming region". A&A, 582, A66 (2015). (C)

*Hurley-Walker, N.; Johnston-Hollitt, M.; Ekers, R.; Hunstead, R.; Sadler, E.M.; Hindson, L.; Hancock, P.; Bernardi, G.; Bowman, J.D.; Briggs, F.; and 34 coauthors. "Serendipitous discovery of a dying Giant Radio Galaxy associated with NGC 1534, using the Murchison Widefield Array". MNRAS, 447, 2468–2478 (2015). (O)

*Huynh, M.T.; Bell, M.E.; Hopkins, A.M.; Norris, R.P.; Seymour, N. "The ATLAS 5.5 GHz survey of the extended Chandra Deep Field South: the second data release". MNRAS, 454, 952–972 (2015). (C)

Indu, G.; Subramaniam, A. "H I kinematics of the Large Magellanic Cloud revisited: Evidence of possible infall and outflow". A&A, 573, A136 (2015). (C,P)

*Johnson, M.C.; Hunter, D.; Wood, S.; Oh, S.-H.; Zhang, H.-X.; Herrmann, K.A.; Levine, S.E. "The shape of LITTLE THINGS dwarf galaxies DDO 46 and DDO 168: Understanding the stellar and gas kinematics". AJ, 149, A196 (2015). (O)

*Johnson, M.C.; Kamphuis, P.; Koribalski, B.S.; Wang, J.; Oh, S.-H.; Hill, A.S.; O'Sullivan, S.; Haan, S.; Serra, P. "Blasting away a dwarf galaxy: the 'tail' of ESO 324–G024". MNRAS, 451, 3192–3209 (2015). (C)

*Johnson, T.J.; Ray, P.S.; Roy, J.; Cheung, C.C.; Harding, A.K.; Pletsch, H.J.; Fort, S.; Camilo, F.; Deneva, J.; Bhattacharyya, B.; and two coauthors. "Discovery of gamma-ray pulsations from the transitional Redback PSR J1227–4853". ApJ, 806, A91 (2015). (O)

Jones, D.I.; Braiding, C.R. "Discovery of luminous star formation in PMN 1452–5910/IRAS 14482–5857: the Pterodactyl Nebula". AJ, 149, A70 (2015). (C, M)

*Jones, S.F.; Blain, A.W.; Lonsdale, C.; Condon, J.; Farrah, D.; Stern, D.; Tsai, C.-W.; Assef, R.J.; Bridge, C.; Kimball, A.; and four coauthors. "Submillimetre observations of WISE/radio-selected AGN and their environments". MNRAS, 448, 3325–3338 (2015). (O)

*Jordan, C.H.; Walsh, A.J.; Lowe, V.; Voronkov, M.A.; Ellingsen, S.P.; Breen, S.L.; Purcell, C.R.; Barnes, P. J.; Burton, M.G.; Cunningham, M.R.; and five coauthors. "MALT-45: a 7 mm survey of the southern Galaxy – I. Techniques and spectral line data". MNRAS, 448, 2344–2361 (2015). (C)

*Jung, T.; Dodson, R.; Han, S.-T.; Rioja, M.J.; Byun, D.-Y.; Honma, M.; Stevens, J.; de Vincente, P.; Sohn, B.W. "Measuring the core shift effect in AGN jets with the extended Korean VLBI network". JKAS, 48, 277–284 (2015). (O)

Kalberla, P.M.W.; Haud, U. "GASS: The Parkes Galactic All-Sky Survey. Update: improved correction for instrumental effects and new data release". A&A, 578, A78 (2015). (P)

*Kamphuis, P.; Józsa, G.I.G.; Oh, S.-. H.; Spekkens, K.; Urbancic, N.; Serra, P.; Koribalski, B.S.; Dettmar, R.-J. "Automated kinematic modelling of warped galaxy discs in large H I surveys: 3D tilted-ring fitting of H I emission cubes". MNRAS, 452, 3139–3158 (2015). (C)

*Kaplan, D.L.; Rowlinson, A.; Bannister, K.W.; Bell, M.E.; Croft, S.D.; Murphy, T.; Tingay, S.J.; Wayth, R. B.; Williams, A. "A deep search for prompt radio emission from the short GRB 150424A with the Murchison Widefield Array". ApJ, 814, L25 (2015). (O)

*Kaplan, D.L.; Tingay, S.J.; Manoharan, P.K.; Macquart, J.P.; Hancock, P.; Morgan, J.; Mitchell, D.A.; Ekers, R.D.; Wayth, R.B.; Trott, C.; and 27 coauthors. "Murchison Widefield Array observations of anomalous variability: A serendipitous night-time detection of interplanetary scintillation". ApJ, 809, L12 (2015). (O)

Kavanagh, P.J.; Sasaki, M.; Bozzetto, L.M.; Filipović, M.D.; Points, S D.; Maggi, P.; Haberl, F. "XMM–Newton study of 30 Doradus C and a newly identified MCSNR J0536–6913 in the Large Magellanic Cloud". A&A, 573, A73 (2015). (C)

Kavanagh, P.J.; Sasaki, M.; Bozzetto, L.M.; Points, S.D.; Filipović, M.D.; Maggi, P.; Haberl, F.; Crawford, E.J. "Multi-frequency study of the newly confirmed supernova remnant MCSNR J0512–6707 in the Large Magellanic Cloud". A&A, 583, A121 (2015). (C)

*Keane, E.F.; Petroff, E. "Fast radio bursts: search sensitivities and completeness". MNRAS, 447, 2852–2856 (2015). (P)

*Kerr, M. "Improving pulsar timing precision with single pulses". MNRAS, 452, 607–615 (2015). (P)

*Kerr, M.; Johnston, S.; Hobbs, G.; Shannon, R.M. "Limits on planet formation around young pulsars and implications for supernova fallback disks". ApJ, 809, L11 (2015). (P)

*Kerr, M.; Ray, P.S.; Johnston, S.; Shannon, R.M.; Camilo, F. "Timing gamma-ray pulsars with the Fermi Large Area Telescope: Timing noise and astrometry". ApJ, 814, A128 (2015). (P)

Kim, J.; Sung, E.-C.; Chung, A.; Staveley-Smith, L. "A Study of a Tidally Interacting BCD Pair: ESO 435–IG20 and ESO435–IG16". PKAS, 30, 513–515 (2015). (C)

*Kimball, A.E.; Lacy, M.; Lonsdale, C.J.; Macquart, J.-P. "ALMA detection of a disc-dominated [C II] emission line at z=4.6 in the luminous QSO J1554+1937". MNRAS, 452, 88–98 (2015). (O)

*Kirichenko, A.; Shibanov, Yu.; Shternin, P.; Johnston, S.; Voronkov, M.A.; Danilenko, A.; Barsukov, D.; Lai, D.; Zyuzin, D. "Observations of PSR J1357–6429 at 2.1 GHz with the Australia Telescope Compact Array". MNRAS, 452, 3273–3280 (2015). (C)

*Krishnan, V.; Ellingsen, S.P.; Reid, M.J.; Brunthaler, A.; Sanna, A.; McCallum, J.; Reynolds, C.; Bignall, H. E.; Phillips, C.J.; Dodson, R.; and 16 coauthors. "First parallax measurements towards a 6.7-GHz methanol maser with the Australian Long Baseline Array: Distance to G339.884–1.259". ApJ, 805, A129 (2015). (V)

Kumari, N.; Fox, A.J.; Tumlinson, J.; Thom, C.; Westmeier, T.; Ely, J. "A compact high velocity cloud near the Magellanic Stream: Metallicity and small-scale structure". ApJ, 800, A44 (2015). (P)

*Lasky, P.D.; Melatos, A.; Ravi, V.; Hobbs, G. "Pulsar timing noise and the minimum observation time to detect gravitational waves with pulsar timing arrays". MNRAS, 449, 3293–3300 (2015). (P)

*Lelli, F.; Duc, P.-A.; Brinks, E.; Bournaud, F.; McGaugh, S.S.; Lisenfeld, U.; Weilbacher, P.M.; Boquien, M.; Revaz, Y.; Braine, J.; and two coauthors. "Gas dynamics in tidal dwarf galaxies: Disc formation at z=0". A&A, 584, A113 (2015). (O)

*Lentati, L.; Shannon, R.M. "Profile stochasticity in PSR J1909–3744". MNRAS, 454, 1058–1072 (2015). (P)

Lindner, R.R.; Aguirre, P.; Baker, A.J.; Bond, J.R.; Crichton, D.; Devlin, M.J.; Essinger-Hileman, T.; Gallardo, P.; Gralla, M.B.; Hilton, M.; and 17 coauthors. "The Atacama Cosmology Telescope: The LABOCA/ACT survey of clusters at all redshifts". ApJ, 803, A79 (2015). (C)

Lo, N.; Wiles, B.; Redman, M. P.; Cunningham, M.R.; Bains, I.; Jones, P.A.; Burton, M.G.; Bronfman, L. "Infall, outflow, and turbulence in massive star-forming cores in the G333 giant molecular cloud". MNRAS, 453, 3245–3256 (2015). (M,C)

*Loi, S.T.; Murphy, T.; Bell, M.E.; Kaplan, D.L.; Lenc, E.; Offringa, A.R.; Hurley-Walker, N.; Bernardi, G.; Bowman, J.D.; Briggs, F.; and 32 coauthors. "Quantifying ionospheric effects on time-domain astrophysics with the Murchison Widefield Array". MNRAS, 453, 2731–2746 (2015). (O)

*Loi, S.T.; Murphy, T.; Cairns, I.H.; Menk, F.W.; Waters, C.L.; Erickson, P.J.; Trott, C.M.; Hurley-Walker, N.; Morgan, J.; Lenc, E.; and 31 coauthors. “Real-time imaging of density ducts between the plasmasphere and ionosphere”. GeoRL, 42, 3707–3714 (2015). (O)

*Loi, S.T.; Trott, C.M.; Murphy, T.; Cairns, I.H.; Bell, M.; Hurley-Walker, N.; Morgan, J.; Lenc, E.; Offringa, A.R.; Feng, L.; and 38 coauthors. “Power spectrum analysis of ionospheric fluctuations with the Murchison Widefield Array”. RaSc., 50, 574–597 (2015). (O)

*Lonsdale, C.J.; Lacy, M.; Kimball, A.E.; Blain, A.; Whittle, M.; Wilkes, B.; Stern, D.; Condon, J.; Kim, M.; Assef, R.J.; and ten coauthors. “Radio jet feedback and star formation in heavily obscured, hyperluminous quasars at redshifts ~0.5–3. – I. ALMA observations”. ApJ, 813, A45 (2015). (O)

*López-Sánchez, Á.R.; Westmeier, T.; Esteban, C.; Koribalski, B.S. “Ionized gas in the XUV disc of the NGC 1512/1510 system”. MNRAS, 450, 3381–3409 (2015). (O)

*Lorimer, D.R.; Esposito, P.; Manchester, R.N.; Possenti, A.; Lyne, A.G.; McLaughlin, M.A.; Kramer, M.; Hobbs, G.; Stairs, I.H.; Burgay, M.; and seven coauthors. “The Parkes multibeam pulsar survey – VII. Timing of four millisecond pulsars and the underlying spin-period distribution of the Galactic millisecond pulsar population”. MNRAS, 450, 2185–2194 (2015). (P)

*Lyne, A.G.; Stappers, B.W.; Keith, M.J.; Ray, P.S.; Kerr, M.; Camilo, F.; Johnson, T.J. “The binary nature of PSR J2032+4127”. MNRAS, 451, 581–587 (2015). (O)

MacGregor, M.A.; Wilner, D.J.; Andrews, S.M.; Lestrade, J.-F.; Maddison, S. “The Epsilon Eridani system resolved by millimeter interferometry”. AJ, 809, A47 (2015). (C)

*Macquart, J.-P.; Johnston, S. “On the paucity of fast radio bursts at low Galactic latitudes”. MNRAS, 451, 3278–3286 (2015). (P)

Maitra, C.; Ballet, J.; Filipović, M.D.; Haberl, F.; Tiengo, A.; Grieve, K.; Roper, Q. “IKT 16: the first X-ray confirmed composite SNR in the SMC”. A&A, 584, A41 (2015). (C)

Malarecki, J.M.; Jones, D.H.; Saripalli, L.; Staveley-Smith, L.; Subrahmanyan, R. “Giant radio galaxies – II. Tracers of large-scale structure”. MNRAS, 449, 955–986 (2015). (C)

*Manchester, R.N. “Pulsars and gravity”. IJMPD, 24, 52 p. (2015). (P)

*Mao, M.Y.; Owen, F.; Duffin, R.; Keel, B.; Lacy, M.; Momjian, E.; Morrison, G.; Mroczkowski, T.; Neff, S.; Norris, R.P.; and three coauthors. “J1649+2635: a grand-design spiral with a large double-lobed radio source”. MNRAS, 446, 4176–4185 (2015). (O)

*McDermid, R.M.; Alatalo, K.; Blitz, L.; Bournaud, F.; Bureau, M.; Cappellari, M.; Crocker, A.F.; Davies, R. L.; Davis, T.A.; de Zeeuw, P.T.; and 13 coauthors. “The ATLAS3D Project – XXX. Star formation histories and stellar population scaling relations of early-type galaxies”. MNRAS, 448, 3484–3513 (2015). (O)

*McIntosh, G.; Indermuehle, B. “A comparison of the velocity parameters of Sio V=1, J=1–0, and J=2–1 maser emission in semiregular variables”. AJ, 149, A100 (2015). (M)

*McKinley, B.; Yang, R.; López-Caniego, M.; Briggs, F.; Hurley-Walker, N.; Wayth, R.B.; Offringa, A.R.; Crocker, R.; Bernardi, G.; Procopio, P.; and 45 coauthors. “Modelling of the spectral energy distribution of Fornax A: leptonic and hadronic production of high-energy emission from the radio lobes”. MNRAS, 446, 3478–3491 (2015). (O)

Meyer, E.T.; Georganopoulos, M.; Sparks, W.B.; Godfrey, L.; Lovell, J.E.J.; Perlman, E. “Ruling out IC/CMB X-rays in PKS 0637–752 and the implications for TeV emission from large-scale quasar jets”. ApJ, 805, A154 (2015). (C)

*Michałowski, M.J.; Gentile, G.; Hjorth, J.; Krumholz, M.R.; Tanvir, N.R.; Kamphuis, P.; Burlon, D.; Baes, M.; Basa, S.; Berta, S.; and 23 coauthors. “Massive stars formed in atomic hydrogen reservoirs: H I observations of gamma-ray burst host galaxies”. A&A, 582, A78 (2015). (C)

Miller-Jones, J.C.A.; Strader, J.; Heinke, C.O.; Maccarone, T.J.; van den Berg, M.; Knigge, C.; Chomiuk, L.; Noyola, E.; Russell, T.D.; Seth, A.C.; Sivakoff, G.R. “Deep radio imaging of 47 Tuc identifies the peculiar X-ray source X9 as a new black hole candidate”. MNRAS, 453, 3918–3931 (2015). (C)

*Moldón, J.; Deller, A.T.; Wucknitz, O.; Jackson, N.; Drabent, A.; Carozzi, T.; Conway, J.; Kapińska, A.D.; McKean, J.P.; Morabito, L.; and 75 coauthors. “The LOFAR long baseline snapshot calibrator survey”. A&A, 574, A73 (2015). (O)

*Murphy, T.; Bell, M.E.; Kaplan, D.L.; Gaensler, B.M.; Offringa, A.R.; Lenc, E.; Hurley-Walker, N.; Bernardi, G.; Bowman, J.D.; Briggs, F.; and 32 coauthors. “Limits on low-frequency radio emission from southern exoplanets with the Murchison Widefield Array”. MNRAS, 446, 2560–2565 (2015). (O)

*Murray, C.E.; Stanimirov, S.; McClure-Griffiths, N.M.; Putman, M.E.; Liszt, H.S.; Wong, T.; Richter, P.; Dawson, J.R.; Dickey, J.M.; Lindner, R.R.; and two coauthors. “First detection of HCO^+ absorption in the Magellanic System”. ApJ, 808, A41 (2015). (C)

*Musaeva, A.; Koribalski, B.S.; Farrell, S.A.; Sadler, E.M.; Servillat, M.; Jurek, R.; Lenc, E.; Starling, R.L.C.; Webb, N.A.; Godet, O.; and two coauthors. “H I study of the environment around ESO 243–49, the host galaxy of an intermediate-mass black hole”. MNRAS, 447, 1951–1961 (2015). (C)

*Neben, A.R.; Bradley, R.F.; Hewitt, J.N.; Bernardi, G.; Bowman, J.D.; Briggs, F.; Cappallo, R.J.; Deshpande, A.A.; Goeke, R.; Greenhill, L.J.; and 19 coauthors. “Measuring phased array antenna beampatterns with high dynamic range for the Murchison Widefield Array using 137 MHz ORBCOMM satellites”. Radio Sci., 50, 614–629 (2015). (O)

*Nelles, A.; Hörandel, J.R.; Karskens, T.; Krause, M.; Buitink, S.; Corstanje, A.; Enriquez, J.E.; Erdmann, M.; Falcke, H.; Haungs, A.; and 67 coauthors. “Calibrating the absolute amplitude scale for air showers measured at LOFAR”. JInst., 10, P11005 (2015). (O)

*Ng, C.; Champion, D.J.; Bailes, M.; Barr, E.D.; Bates, S.D.; Bhat, N.D.R.; Burgay, M.; Burke-Spolaor, S.; Flynn, C.M.L.; Jameson, A.; and 11 coauthors. “The High Time Resolution Universe Pulsar Survey – XII. Galactic plane acceleration search and the discovery of 60 pulsars”. MNRAS, 450, 2922–2947 (2015). (P)

*Nguyen, H.; Nguyen, L.Q.; Martin, P.G.; Barnes, P.J.; Muller, E.; Lowe, V.; Lo, N.; Cunningham, M.; Motte, F.; Indermühle, B.; and three coauthors. “The Three-mm Ultimate Mopra Milky Way Survey – II. Cloud and star formation near the filamentary ministarburst RCW 106”. ApJ, 812, A7 (2015). (M)

Nicuesa Guelbenzu, A.; Klose, S.; Palazzi, E.; Greiner, J.; Michałowski, M.J.; Kann, D.A.; Hunt, L.K.; Malesani, D.; Rossi, A.; Savaglio, S.; and 17 coauthors. “Identifying the host galaxy of the short GRB 100628A”. A&A, 583, A88 (2015). (C)

*Noutsos, A.; Sobey, C.; Kondratiev, V. I.; Weltevrede, P.; Verbiest, J.P.W.; Karastergiou, A.; Kramer, M.; Kuniyoshi, M.; Alexov, A.; Breton, R.P.; and 45 coauthors. “Pulsar polarisation below 200 MHz: Average profiles and propagation effects”. A&A, 576, A62 (2015). (P)

*Novak, M.; Smolcic, V.; Civano, F.; Bondi, M.; Ciliegi, P.; Wang, X.; Loeb, A.; Banfield, J.; Bourke, S.; Elvis, M.; and five coauthors. “New insights from deep VLA data on the potentially recoiling black hole CID-42 in the COSMOS field”. MNRAS, 447, 1282–1288 (2015). (O)

*O’Sullivan, S.P.; Gaensler, B.M.; Lara-López, M.A.; van Velzen, S.; Banfield, J.K.; Farnes, J.S. “The magnetic field and polarization properties of radio galaxies in different accretion states”. ApJ, 806, A83 (2015). (O)

*Offringa, A.R.; Wayth, R.B.; Hurley-Walker, N.; Kaplan, D.L.; Barry, N.; Beardsley, A.P.; Bell, M.E.; Bernardi, G.; Bowman, J.D.; Briggs, F.; and 55 coauthors. “The low-frequency environment of the Murchison Widefield Array: Radio-frequency interference analysis and mitigation”. PASA, 32, e008 (2015). (O)

*Oh, S.-H.; Hunter, D.A.; Brinks, E.; Elmegreen, B.G.; Schruba, A.; Walter, F.; Rupen, M.P.; Young, L.M.; Simpson, C.E.; Johnson, M.C.; and six coauthors. “High-resolution mass models of dwarf galaxies from LITTLE THINGS”. AJ, 149, A180 (2015). (O)

*Oppermann, N.; Junklewitz, H.; Greiner, M.; Enßlin, T.A.; Akahori, T.; Carretti, E.; Gaensler, B.M.; Goobar, A.; Harvey-Smith, L.; Johnston-Hollitt, M.; and four coauthors. “Estimating extragalactic Faraday rotation”. A&A, 575, A118 (2015). (O)

*Orchiston, W.; George, M.; Slee, B., Wielebinski, R. “The history of early low frequency radio astronomy in Australia. 1: The CSIRO Division of Radiophysics”. JAHH, 18, 3–13 (2015). (P)

*Orchiston, W.; Slee, B.; George, M.; Wielebinski, R. “The history of early low frequency radio astronomy in Australia – 4: Kerr, Shain, Higgins and the Hornsby Valley field station near Sydney”. JAHH, 18, 285–311 (2015). (O)

*Ord, S.M.; Crosse, B.; Emrich, D.; Pallot, D.; Wayth, R.B.; Clark, M.A.; Tremblay, S.E.; Arcus, W.; Barnes, D.; Bell, M.; and 57 coauthors. “The Murchison Widefield Array correlator”. PASA, 32, A006 (2015). (O)

*Oronsaye, S .; Ord, S.M.; Bhat, N.D.R.; Tremblay, S.E.; McSweeney, S.J.; Tingay, S.J.; van Straten, W.; Jameson, A.; Bernardi, G.; Bowman, J.D.; and 21 coauthors. “Simultaneous observations of giant pulses from the Crab Pulsar, with the Murchison Widefield Array and Parkes Radio Telescope: Implications for the giant pulse emission mechanism”. ApJ, 809, A51 (2015). (P)

*Orrù, E.; van Velzen, S.; Pizzo, R. F.; Yatawatta, S.; Paladino, R.; Iacobelli, M.; Murgia, M.; Falcke, H.; Morganti, R.; de Bruyn, A.G.; and 76 coauthors. “Wide-field LOFAR imaging of the field around the double-double radio galaxy B1834+620: A fresh view on a restarted AGN and doubeltjes”. A&A, 584, A112 (2015). (O)

*Osten, R.A.; Melis, C.; Stelzer, B.; Bannister, K.W.; Radigan, J.; Burgasser, A.J.; Wolszczan, A.; Luhman, K.L. “The deepest constraints on radio and X-ray magnetic activity in ultracool dwarfs from WISE J104915.57–531906.1”. ApJ, 805, L3 (2015). (C)

Paladini, R.; Ingallinera, A.; Agliozzo, C.; Tibbs, C.T.; Noriega-Crespo, A.; Umana, G.; Dickinson, C.; Trigilio, C. “Anomalous microwave emission in H II regions: Is it really anomalous? The case of RCW 49”. ApJ, 813, A24 (2015). (C)

*Palau, A.; Ballesteros-Paredes, J.; Vázquez-Semadeni, E.; Sánchez-Monge, Á.; Estalella, R.; Fall, S.M.; Zapata, L.A.; Camacho, V.; Gómez, L.; Naranjo-Romero, R.; and two coauthors. “Gravity or turbulence? – III. Evidence of pure thermal Jeans fragmentation at ~0.1 pc scale”. MNRAS, 453, 3785–3797 (2015). (O)

*Pan, Z.; Li, J.; Lin., W.; Wang, J.; Fan, L.; Kong, X. “From outside-in to inside-out: Galaxy assembly mode depends on stellar mass”. ApJ, 804, L42 (2015). (O)

Peracaula, M.; Torrent, A.; Masias, M.; Lladó, X.; Freixenet, J.; Martí, J.; Sánchez-Sutil, J.R.; Muñoz-Arjonilla, A.J.; Paredes, J.M. “Exploring three faint source detections methods for aperture synthesis radio images”. NewA., 36, 86–99 (2015). (C)

*Perrott, Y.C.; Olamaie, M.; Rumsey, C.; Brown, M.L.; Feroz, F.; Grainge, K.J.B.; Hobson, M.P.; Lasenby, A.N.; MacTavish, C.J.; Pooley, G.G.; and 32 coauthors. “Comparison of Sunyaev-Zel’dovich measurements from Planck and from the Arcminute Microkelvin Imager for 99 galaxy clusters”. A&A, 580, A95 (2015). (O)

*Petroff, E.; Bailes, M.; Barr, E.D.; Barsdell, B.R.; Bhat, N.D.R.; Bian, F.; Burke-Spolaor, S.; Caleb, M.; Champion, D.; Chandra, P.; and 25 coauthors. “A real-time fast radio burst: polarization detection and multiwavelength follow-up”. MNRAS, 447, 246–255 (2015). (P)

*Petroff, E.; Keane, E.F.; Barr, E.D.; Reynolds, J.E.; Sarkissian, J.; Edwards, P.G.; Stevens, J.; Brem, C.; Jameson, A.; Burke-Spolaor, S.; and four coauthors. "Identifying the source of perytons at the Parkes radio telescope". MNRAS, 451, 3933–3940 (2015). (P)

Pierbattista, M.; Harding, A.K.; Grenier, I.A.; Johnson, T.J.; Caraveo, P.A.; Kerr, M.; Gonthier, P.L. "Light-curve modelling constraints on the obliquities and aspect angles of the young Fermi pulsars". A&A, 575, A3 (2015). (P)

*Prabu, T.; Srivani, K.S.; Roshi, D.A.; Kamini, P.A.; Madhavi, S.; Emrich, D.; Crosse, B.; Williams, A.J.; Waterson, M.; Deshpande, A.A.; and 48 coauthors. "A digital receiver for the Murchison Widefield Array". ExA, 39, 73–93 (2015). (O)

E.; Oliver, S.J.; and five coauthors. "HerMES: disentangling active galactic nuclei and star formation in the radio source population". MNRAS, 452, 4111–4127 (2015). (O)

*Reeves, S.N.; Sadler, E.M.; Allison, J.R.; Koribalski, B.S.; Curran, S.J.; Pracy, M.B. "H I emission and absorption in nearby, gas-rich galaxies". MNRAS, 450, 926–942 (2015). (C, P)

Regis, M.; Richter, L.; Colafrancesco, S.; Massardi, M.; de Blok, W.J.G.; Profumo, S.; Orford, N. "Local Group dSph radio survey with ATCA (I): observations and background sources". MNRAS, 448, 3731–3746 (2015). (C)

Regis, M.; Richter, L.; Colafrancesco, S.; Profumo, S.; de Blok, W.J.G.; Massardi, M. "Local Group dSph radio survey with ATCA – II. Non-thermal diffuse emission". MNRAS, 448, 3747–3765 (2015). (C)

Reid, W.A.; Stupar, M.; Bozzetto, L.M.; Parker, Q.A.; Filipović, M.D. "Optical discovery and multiwavelength investigation of supernova remnant MCSNR J0512–6707 in the Large Magellanic Cloud". MNRAS, 454, 991–999 (2015). (C)

Reynoso, E.M.; Walsh, A.J. "Radio spectral characteristics of the supernova remnant Puppis A and nearby sources". MNRAS, 451, 3044–3054 (2015). (C)

Ricci, L.; Maddison, S.T.; Wilner, D.; MacGregor, M.A.; Ubach, C.; Carpenter, J.M.; Testi, L. "An ATCA survey of debris disks at 7 millimeters". ApJ, 813, A138 (2015). (C)

*Romani, R.W.; Graham, M.L.; Filippenko, A.V.; Kerr, M. "Keck spectroscopy of millisecond pulsar J2215+5135: A moderate-MNS, high-inclination binary". ApJ, 809, L10 (2015). (O)

*Rookyard, S.C.; Weltevrede, P.; Johnston, S. "Constraints on viewing geometries from radio observations of X-ray-loud pulsars using a novel method". MNRAS, 446, 3367–3388 (2015). (P)

*Rookyard, S.C.; Weltevrede, P.; Johnston, S. "Investigating the magnetic inclination angle distribution of gamma-ray-loud radio pulsars". MNRAS, 446, 3356–3366 (2015). (P)

*Rots, A.H.; Bunclark, P.S.; Calabretta, M.R.; Allen, S.L.; Manchester, R.N.; Thompson, W.T. "Representations of time coordinates in FITS. Time and relative dimension in space". A&A, 574, A36 (2015). (O)

Roy, J.; Ray, P.S.; Bhattacharyya, B.; Stappers, B.; Chengalur, J.N.; Deneva, J.; Camilo, F.; Johnson, T.J.; Wolff, M.; Hessels, J.W.T.; and 5 coauthors. "Discovery of PSR J1227–4853: A transition from a low-mass X-ray binary to a Redback Millisecond Pulsar". ApJ, 800, L12 (2015). (P)

*Roychowdhury, S.; Huang, M.-L.; Kauffmann, G.; Wang, J.; Chengalur, J.N. "The spatially resolved Kennicutt-Schmidt relation in the H I-dominated regions of spiral and dwarf irregular galaxies". MNRAS, 449, 3700–3709 (2015). (O)

*Russell, T.D.; Miller-Jones, J.C.A.; Curran, P.A.; Soria, R.; Altamirano, D.; Corbel, S.; Coriat, M.; Moin, A.; Russell, D.M.; Sivakoff, G.R.; and 18 coauthors. "Radio monitoring of the hard state jets in the 2011 outburst of MAXI J1836–194". MNRAS, 450, 1745–1759 (2015). (C)

Sanna, A.; Menten, K.M.; Carrasco-González, C.; Reid, M.J.; Ellingsen, S.P.; Brunthaler, A.; Moscadelli, L.; Cesaroni, R.; Krishnan, V. "The environment of the strongest Galactic methanol maser". ApJ, 804, L2 (2015). (C)

Saul, M.; Tothill, N.F.H.; Purcell, C.R. "Observations of warm carbon chain chemistry in NGC 3576". ApJ, 798, A36 (2015). (M,C)

*Schinzel, F.K.; Petrov, L.; Taylor, G.B.; Mahony, E.K.; Edwards, P.G.; Kovalev, Y.Y. "New associations of gamma-ray sources from the Fermi Second Source Catalog". ApJS, 217, A4 (2015). (V,C)

Schneiter, E.M.; Velázquez, P.F.; Reynoso, E.M.; Esquivel, A.; De Colle, F. "3D MHD simulation of polarized emission in SN 1006". MNRAS, 449, 88–93 (2015). (C)

*Schnitzeler, D.H.F.M.; Banfield, J.K.; Lee, K.J. "Polarization signatures of unresolved radio sources". MNRAS, 450, 3579–3596 (2015). (O)

*Serra, P.; Koribalski, B.; Kilborn, V.; Allison, J.R.; Amy, S.W.; Ball, L.; Bannister, K.; Bell, M. E.; Bock, D. C.-J.; Bolton, R.; and 69 coauthors. "ASKAP H I imaging of the galaxy group IC 1459". MNRAS, 452, 2680–2691 (2015). (A)

*Serra, P.; Westmeier, T.; Giese, N.; Jurek, R.; Flöer, L.; Popping, A.; Winkel, B.; van der Hulst, T.; Meyer, M.; Koribalski, B.S.; and two coauthors. "SOFIA: a flexible source finder for 3D spectral line data". MNRAS, 448, 1922–1929 (2015). (O)

*Shannon, R.M.; Ravi, V.; Lentati, L.T.; Lasky, P.D.; Hobbs, G.; Kerr, M.; Manchester, R.N.; Coles, W.A.; Levin, Y.; Bailes, M.; and 12 coauthors. "Gravitational waves from binary supermassive black holes missing in pulsar observations". Sci., 349, 1522–1525 (2015). (P)

*Shao, L.; Li, C.; Kauffmann, G.; Wang, J. "The nature of obscuration in AGNs – II. Insights from clustering properties". MNRAS, 448, L72–L76 (2015). (O)

*Shimwell, T.W.; Markevitch, M.; Brown, S.; Feretti, L.; Gaensler, B.M.; Johnston-Hollitt, M.; Lage, C.; Srinivasan, R. "Another shock for the Bullet cluster, and the source of seed electrons for radio relics". MNRAS, 449, 1486–1494 (2015). (C)

*Shulevski, A.; Morganti, R.; Barthel, P.D.; Murgia, M.; van Weeren, R.J.; White, G.J.; Brüggen, M.; Kunert-Bajraszewska, M.; Jamrozy, M.; Best, P.N.; and 78 coauthors. "The peculiar radio galaxy 4C 35.06: a case for recurrent AGN activity?" A&A, 579, A27 (2015). (O)

Smith, C.L.; Zijlstra, A.A.; Fuller, G.A. "A molecular line survey of a sample of AGB stars and planetary nebulae". MNRAS, 454, 177–200 (2015). (M)

*Smolčić, V.; Karim, A.; Miettinen, O.; Novak, M.; Magnelli, B.; Riechers, D.A.; Schinnerer, E.; Capak, P.; Bondi, M.; Ciliegi, P.; and 24 coauthors. "Physical properties of $z > 4$ submillimeter galaxies in the COSMOS field". A&A, 576, A127 (2015). (O)

*Sobey, C.; Young, N.J.; Hessels, J.W.T.; Weltevrede, P.; Noutsos, A.; Stappers, B.W.; Kramer, M.; Bassa, C.; Lyne, A.G.; Kondratiev, V.I.; and 84 coauthors. "LOFAR discovery of a quiet emission mode in PSR B0823+26". MNRAS, 451, 2493–2506 (2015). (O)

*Sokolowski, M.; Tremblay, S.E.; Wayth, R.B.; Tingay, S.J.; Clarke, N.; Roberts, P.; Waterson, M.; Ekers, R.D.; Hall, P.; Lewis, M.; and five coauthors. "BIGHORNS – Broadband Instrument for Global HydrOgen ReioNisation Signal". PASA, 32, e004 (2015). (O)

*Spilker, J.S.; Aravena, M.; Marrone, D.P.; Béthermin, M.; Bothwell, M.S.; Carlstrom, J.E.; Chapman, S.C.;Collier, J.D.; de Breuck, C.; Fassnacht, C.D.; and 13 coauthors. "Sub-kiloparsec imaging of cool molecular gas in two strongly lensed dusty, star-forming galaxies". ApJ, 811, A124 (2015). (C)

*Stephens, I.W.; Jackson, J.M.; Sanhueza, P.; Whitaker, J.S.; Hoq, S.; Rathborne, J.M.; Foster, J.B. "Interferometric observations of high-mass star-forming clumps with unusual N_2H^+/HCO^+ line ratios". ApJ, 802, A6 (2015). (C)

*Strader, J.; Chomiuk, L.; Cheung, C.C.; Sand, D.J.; Donato, D.; Corbet, R.H.D.; Koeppe, D.; Edwards, P.G.; Stevens, J.; Petrov, L.; and five coauthors. "1FGL J1417.7–4407: A likely gamma-ray bright binary with a massive neutron star and a giant secondary". ApJ, 804, L12 (2015). (O)

*Suárez, O.; Gómez, J.F.; Bendjoya, P.; Miranda, L.F.; Guerrero, M.A.; Uscanga, L.; Green, J.A.; Rizzo, J.R.; Ramos-Larios, G. "Time-variable non-thermal emission in the planetary nebula IRAS 15103–5754". ApJ, 806, A105 (2015). (C)

*Sun, X.H.; Landecker, T.L.; Gaensler, B.M.; Carretti, E.; Reich, W.; Leahy, J.P.; McClure-Griffiths, N.M.; Crocker, R.M.; Wolleben, M.; Haverkorn, M.; and two coauthors. "Faraday tomography of the North Polar Spur: Constraints on the distance to the spur and on the magnetic field of the galaxy". ApJ, 811, A40 (2015). (O)

*Swinbank, J.D.; Staley, T.D.; Molenaar, G.J.; Rol, E.; Rowlinson, A.; Scheers, B.; Spreeuw, H.; Bell, M.E.; Broderick, J.W.; Carbone, D.; and 17 coauthors. "The LOFAR transients pipeline". A&C, 11, 25–48 (2015). (O)

*Thyagarajan, N.; Jacobs, D.C.; Bowman, J.D.; Barry, N.; Beardsley, A.P.; Bernardi, G.; Briggs, F.; Cappallo,R.J.; Carroll, P.; Deshpande, A.A.; and 45 coauthors. "Confirmation of wide-field signatures in redshifted 21 cm power spectra". ApJ, 807, L28 (2015). (O)

*Thyagarajan, N.; Jacobs, D.C.; Bowman, J.D.; Barry, N.; Beardsley, A.P.; Bernardi, G.; Briggs, F.; Cappallo, R.J.; Carroll, P.; Corey, B.E.; and 54 coauthors. "Foregrounds in wide-field redshifted 21 cm power spectra". ApJ, 804, A14 (2015). (O)

*Tingay, S.J.; Edwards, P.G. "The multifrequency parsec-scale structure of PKS 2254–367 (IC 1459): a luminosity-dependent break in morphology for the precursors of radio galaxies"? MNRAS, 448, 252–257 (2015). (O)

*Tingay, S.J.; Macquart, J.-P.; Collier, J.D.; Rees, G.; Callingham, J.R.; Stevens, J.; Carretti, E.; Wayth, R.B.; Wong, G.F.; Trott, C.M.; and 35 coauthors. "The spectral variability of the GHz-peaked spectrum radio source PKS 1718–649 and a comparison of absorption models". AJ, 149, A74 (2015). (C,P)

*Tingay, S.J.; Trott, C.M.; Wayth, R.B.; Bernardi, G.; Bowman, J.D.; Briggs, F.; Cappallo, R.J.; Deshpande, A.A.; Feng, L.; Gaensler, B.M.; and 19 coauthors. "A search for fast radio bursts at low frequencies with Murchison Widefield Array high time resolution imaging". AJ, 150, A199 (2015). (O)

Torii, K.; Hasegawa, K.; Hattori, Y.; Sano, H.; Ohama, A.; Yamamoto, H.; Tachihara, K.; Soga, S.; Shimizu, S.; Okuda, T.; and four coauthors. "Cloud–cloud collision as a trigger of the high-mass star formation: a molecular line study in RCW120". ApJ, 806, A7 (2015). (M)

*Tremblay, S.E.; Ord, S.M.; Bhat, N.D.R.; Tingay, S.J.; Crosse, B.; Pallot, D.; Oronsaye, S.I.; Bernardi, G.; Bowman, J.D.; Briggs, F.; and 30 coauthors. "The high time and frequency resolution capabilities of the Murchison Widefield Array". PASA, 32, e005 (2015). (O)

Tsitali, A.E.; Belloche, A.; Garrod, R.T.; Parise, B.; Menten, K.M. "Star formation in Chamaeleon I and III: a molecular line study of the starless core population". A&A, 575, A27 (2015). (M)

*Umana, G.; Trigilio, C.; Franzen, T.M.O.; Norris, R.P.; Leto, P.; Ingallinera, A.; Buemi, C.S.; Agliozzo, C.; Cavallaro, F.; Cerrigone, L. "SCORPIO: a deep survey of radio emission from the stellar life-cycle". MNRAS, 454, 902–912 (2015). (C)

*Vedantham, H.K.; Koopmans, L.V.E.; de Bruyn, A.G.; Wijnholds, S.J.; Brentjens, M.; Abdalla, F.B.; Asad, K.M.B.; Bernardi, G.; Bus, S.; Chapman, E.; and 85 coauthors. "Lunar occultation of the diffuse radio sky: LOFAR measurements between 35 and 80 MHz". MNRAS, 450, 2291–2305 (2015). (O)

*Vernstrom, T.; Norris, R.P.; Scott, D.; Wall, J.V. "The deep diffuse extragalactic radio sky at 1.75 GHz". MNRAS, 447, 2243–2260 (2015). (C)

*Walker, D.L.; Longmore, S.N.; Bastian, N.; Kruijssen, J.M.D.; Rathborne, J.M.; Jackson, J.M.; Foster, J.B.; Contreras, Y. "Tracing the conversion of gas into stars in young massive cluster progenitors". MNRAS, 449, 715–725 (2015). (O)

*Wang, E.; Wang, J.; Kauffmann, G.; Józsa, G.I.G.; Li, C. "H I scaling relations of galaxies in the environment of H I-rich and control galaxies observed by the Bluedisk project". MNRAS, 449, 2010–2023 (2015). (O)

*Wang, J.; Serra, P.; Józsa, G.I.G.; Koribalski, B.; van der Hulst, T.; Kamphuis, P.; Li, C.; Fu, J.; Xiao, T.; Overzier, R.; and two coauthors. "An H I view of galaxy conformity: H I-rich environment around H I-excess galaxies". MNRAS, 453, 2399–2411 (2015). (O)

*Wang, J.B.; Hobbs, G.; Coles, W.; Shannon, R.M.; Zhu, X.J.; Madison, D.R.; Kerr, M.; Ravi, V.; Keith, M.J.; Manchester, R.N.; and 10 coauthors. "Searching for gravitational wave memory bursts with the Parkes Pulsar Timing Array". MNRAS, 446, 1657–1671 (2015). (P)

*Wayth, R.B.; Lenc, E.; Bell, M.E.; Callingham, J.R.; Dwarakanath, K.S.; Franzen, T.M.O.; For, B.-Q.; Gaensler, B.; Hancock, P.; Hindson, L.; and 45 coauthors. "GLEAM: The GaLactic and Extragalactic All-Sky MWA Survey". PASA, 32, e025 (2015). (O)

*Westmeier, T.; Staveley-Smith, L.; Calabretta, M.; Jurek, R.; Koribalski, B.S.; Meyer, M.; Popping, A.; Wong, O.I. "On the neutral gas content of nine new Milky Way satellite galaxy candidates". MNRAS, 453, 338–344 (2015). (P)

*Wiegert, T.; Irwin, J.; Miskolczi, A.; Schmidt, P.; Mora, S.C.; Damas-Segovia, A.; Stein, Y.; English, J.; Rand, R.J.; Santistevan, I.; and 14 coauthors. "CHANG-ES – IV. Radio continuum emission of 35 edge-on galaxies observed with the Karl G. Jansky Very Large Array in D configuration – Data release 1". AJ, 150, A81 (2015). (O)

*Wienen, M.; Wyrowski, F.; Menten, K.M.; Urquhart, J.S.; Csengeri, T.; Walmsley, C.M.; Bontemps, S.; Russeil, D.; Bronfman, L.; Koribalski, B.S.; Schuller, F. "ATLASGAL – Kinematic distances and the dense gas mass distribution of the inner Galaxy". A&A, 579, A91 (2015). (O)

Wright, C.M.; Maddison, S.T.; Wilner, D.J.; Burton, M.G.; Lommen, D.; van Dishoeck, E.F.; Pinilla, P.; Bourke, T.L.; Menard, F.; Walsh, C. "Resolving structure of the disc around HD100546 at 7 mm with ATCA". MNRAS, 453, 414–438 (2015). (C)

*Xu, C.K.; Cao, C.; Lu, N.; Gao, Y.; Diaz-Santos, T.; Herrero-Illana, R.; Meijerink, R.; Privon, G.; Zhao, Y.-H.; Evans, A.S.; and 13 coauthors. "ALMA observations of warm dense gas in NGC 1614 – breaking of the star formation law in the central kiloparsec". ApJ, 799, A11 (2015). (O)

*Yan, Z.; Shen, Z.-Q.; Wu, X.-J.; Manchester, R.N.; Weltevrede, P.; Wu, Y.-J.; Zhao, R.-B.; Yuan, J.-P.; Lee, K.-J.; Fan, Q.-Y.; and 10 coauthors. "Single-pulse radio observations of the Galactic center magnetar PSR J1745–2900". ApJ, 814, A5 (2015). (O)

*Yıldız, M.K.; Serra, P.; Oosterloo, T.A.; Peletier, R.F.; Morganti, R.; Duc, P.-A.; Cuillandre, J.-C.; Karabal, E. "Star formation in the outer regions of the early-type galaxy NGC 4203". MNRAS, 451, 103–113 (2015). (O)

Yu, N.; Wang, J.-J.; Li, N. "Physical and chemical properties of Red MSX Sources in the southern sky: H II regions". MNRAS, 446, 2566–2581 (2015). (C)

*Yuan, F.; Lidman, C.; Davis, T.M.; Childress, M.; Abdalla, F.B.; Banerji, M.; Buckley-Geer, E.; Carnero Rosell, A.; Carollo, D.; Castander, F.J.; and 92 coauthors. "OzDES multifibre spectroscopy for the Dark Energy Survey: first-year operation and results". MNRAS, 452, 3047–3063 (2015). (O)

Zhang, J.S.; Sun, L.; Riquelme, D.; Henkel, C.; Lu, D.R.; Zhang, Y.; Wang, J.Z.; Wang, M.; Li, J. "Isotopic ratios of 18O/17O in the galactic central region". ApJS, 219, A28 (2015). (M)

*Zhu, X.-J.; Wen, L.; Hobbs, G.; Zhang, Y.; Wang, Y.; Madison, D.R.; Manchester, R.N.; Kerr, M.; Rosado, P.A.; Wang, J.-B. "Detection and localization of single-source gravitational waves with pulsar timing arrays". MNRAS, 449, 1650–1663 (2015). (P)

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C = Compact Array, M = Mopra, P = Parkes, V = VLBI, A = ASKAP, S = SKA, T = Tidbinbilla, O = other staff paper

*Bignall, H.; Macquart, J.-P.; Godfrey, L.; Hodgson, J.; Jauncey, D. "Microarcsecond structure of an AGN Jet via Interstellar Scintillation". In: ***IAU 313: Extragalactic jets from every angle,*** Galapagos Islands, Ecuador, 15–20 September, 2014, 10, 143–144 (eds. F. Massaro, C.C. Cheung, E. Lopez, A. Siemignowska) (2015). (C)

*Blyth, S.; van der Hulst, T.M.; Verheijen, M.A.W.; Catinella, B.; Fraternali, F.; Haynes, M.P.; Hess, K.M.; Koribalski, B.; Lagos, C.; Meyer, M.; and five coauthors. "Exploring neutral hydrogen and galaxy evolution with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A128 (2015). (S)

*Bonafede, A.; Vazza, F.; Brüggen, M.; Akahori, T.; Carretti, E.; Colafrancesco, S.; Feretti, L.; Ferrari, C.; Giovannini, G.; Govoni, F.; and seven coauthors. "Unravelling the origin of large-scale magnetic fields in galaxy clusters and beyond through Faraday Rotation Measures with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A95 (2015). (S)

*Bray, J.; Alvarez-Muniz, J.; Buitink, S.; Dagkesamanskii, R.; Ekers, R.D.; Falcke, H.D.E.; Gayley, K.; Huege, T.; James, C.W.; Mevius, M.; and six coauthors. "Lunar detection of ultra-high-energy cosmic rays and neutrinos with the Square Kilometre Array". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A144 (2015). (S)

*Bunton, J.D. "SKA correlators and beamformers". In: ***Acoustics, Speech and Signal Processing (ICASSP)*** 2015, Brisbane, Australia, 19–24 April, 2015, 5650–5653 (2015). (S)

*Chippendale, A.; Brown, A.J.; Beresford, R.J.; Hampson, G.A.; Macleod, A.; Shaw, R.D.; Brothers, M.L.; Cantrall, C.; Forsyth, A.R.; Hay, S.G.; Leach, M. "Measured sensitivity of the first Mark II phased array feed on an ASKAP antenna". In: ***International Conference on Electromagnetics in Advanced Applications***, Turin, Italy, 7–11 September, 2015, 541–544 (2015). (A)

*de Blok, W.J.G.; Fraternali, F.; Heald, G.H.; Adams, E.A.K.; Bosma, A.; Koribalski, B.S. "The SKA view of the neutral interstellar medium in galaxies". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A129 (2015). (S)

*Deane, R.; Paragi, Z.; Jarvis, M.; Coriat, M.; Bernardi, G.; Frey, S.; Heywood, I.; Kloeckner, H.R. "Multiple supermassive black hole systems: SKA's future leading role". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A151 (2015). (S)

*Dopita, M.A.; Shastri, P.; Scharwachter, J.; Kewley, L.J.; Davies, R.; Sutherland, R.; Kharb, P.; Jose, J.; Bhatt, H.; Ramya, S.; and six coauthors. "S7: Probing the physics of Seyfert Galaxies through their ENLR & H II Regions". In: ***IAU 309: Galaxies in 3D across the Universe,*** Vienna, Austria, 7–11 July, 2014, 10, 200–205 (eds. B.L. Ziegler, F. Combes, H. Dannerbauer, M. Verdugo) (2015). (O)

*Dunning, A.; Bowen, M.; Bourne, M., Hayman, D.; Smith, S.L. "An ultra-wideband dielectrically loaded quad-ridged feed horn for radio astronomy". In: ***International Conference on Electromagnetics in Advanced Applications***, Turin, Italy, 7–11 September, 2015, 787–790 (2015). (O)

Etoka, S.; Engels, D.; Imai, H.; Dawson, J.; Ellingsen, S.; Sjouwerman, L.; van Langevelde, H. "OH masers in the Milky Way and Local Group galaxies in the SKA era". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A125 (2015). (S)

*Fuller, G.; Forbrich, J.; Rathborne, J.; Longmore, S.; Molinari, S. "Star and Stellar Cluster Formation: ALMA-SKA Synergies". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A152 (2015). (S)

*Gaensler, B.; Agudo, I.; Akahori, T.; Banfield, J.; Beck, R.; Carretti, E.; Farnes, J.; Haverkorn, M.; Heald, G.; Jones, D.; and 8 coauthors. "Broadband polarimetry with the Square Kilometre Array: A unique astrophysical probe". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A103 (2015). (S)

*Govoni, F.; Murgia, M.; Xu, H.; Li, H.; Norman, M.; Feretti, L.; Giovannini, G.; Vacca, V.; Bernardi, G.; Bonafede, A.; and 10 coauthors. "Cluster magnetic fields through the study of polarized radio halos in the SKA era". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A105 (2015). (S)

*Green, J.A.; McClure-Griffiths, N.M.; Caswell, J.L.; Robishaw, T.; Harvey-Smith, L.; Mao, S.A. "MAGMO: Mapping the Galactic Magnetic field through OH masers". In: ***Highlights of Astronomy,*** 16, 402 (ed. T. Montmerle) (2015). (O)

*Hagiwara, Y.; Horiuchi, S.; Doi, A.; Miyoshi, M. "Extragalactic sub-millimeter H_2O maser – detection of a 321 GHz water maser in Circinus Galaxy". In: ***Revolution in Astronomy with ALMA: The Third Year***, Tokyo, Japan, 8–11, December, 2014, 499, p 131 (eds D. Iono, K.-I. Tatematsu et. al.) (2015) (T)

*Hampson, G.A.; Roberts, P.P.; Leach, M.; Brown, A.J.; Bateman, T.; Neuhold, S.; Beresford, R.J.; Cheng, W.; Tuthill, J.; Bunton, J.D.; Gough, R.G.; Bowen, M.A.; Kanapathippillai, J. "Microwave phased array digital beamforming system design challenges for SKA". In: ***Microwave Conference (EuMC), 2015 European,*** Paris, France, 7–10 September 2015, 710–713 (2015). (S)

*Hampson, G.A.; Tuthill, J.; Brown, A.J.; Bunton, J.D.; Bateman, T. "A reconfigurable optically connected beamformer and correlator processing node for SKA". In: ***IEEE Signal Processing & SP Education Workshop***, Salt Lake City, USA, 9–12 August, 2015, 267–271 (2015). (A)

*Haverkorn, M.; Akahori, T.; Carretti, E.; Ferrière, K.; Frick, P.; Gaensler, B.; Heald, G.; Johnston-Hollitt, M.; Jones, D.; Landecker, T.; and 10 coauthors. "Measuring magnetism in the Milky Way with the Square Kilometre Array". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A96 (2015). (S)

*Hazard, C.; Jauncey, D.; Goss, W.M.; Herald, D. "The sequence of events that led to the 1963 publications in Nature of 3C273, the first quasar and the first extragalactic radio jet". In: ***IAU 313: Extragalactic jets from every angle,*** Galapagos Islands, Ecuador, 15–20 September, 2014, 10, 183–189 (eds. F. Massaro, C.C. Cheung, E. Lopez, A. Siemignowska) (2015). (P)

*Hellbourg, G. "Subspace smearing and interference mitigation with array radio telescopes". In: ***IEEE Signal Processing & SP Education Workshop***, Salt Lake City, USA, 9–12 August, 2015, 278–282 (2015). (O)

*Hellbourg, G.; Chippendale, A.P.; Tuthill, J.; Jeffs, B.D. "Statistical performance of reference antenna based spatial RFI mitigation for radio astronomy". In: ***2015 IEEE International Symposium on Antennas and Propagation and North American Radio Science Meeting***, Vancouver, Canada, 19–24 July, 2015, 1518–1519 (2015). (O)

*Hill, A.; Reynolds, R.; Haffner, L.; Wood, K.; Madsen, G. "Modern view of the warm ionized medium". In: ***Highlights of Astronomy***, 16, 574–575 (ed. T. Montmerle) (2015). (O)

Hobbs, G. "Developing a pulsar-based time standard". In: ***Highlights of Astronomy,*** 16, 207–208 (ed. T. Montmerle) (2015). (P)

*Huege, T.; Bray, J.; Buitink, S.; Dallier, R.; Ekers, R.D.; Falcke, H.D.E.; James, C.W.; Martin, L.; Revenu, B.; Scholten, O.; Schroeder, F. "Precision measurements of cosmic ray air showers with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A148 (2015). (S)

*Janssen, G.; Hobbs, G.; McLaughlin, M.; Bassa, C.; Deller, A.; Kramer, M.; Lee, K.; Mingarelli, C.; Rosado, P.; Sanidas, S.; and five coauthors. "Gravitational wave astronomy with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A37 (2015). (S)

*Jarvis, M.; Seymour, N.; Afonso, J.; Best, P.; Beswick, R.; Heywood, I.; Huynh, M.; Murphy, E.; Prandoni, I.; Schinnerer, E.; and three coauthors. "The star-formation history of the Universe with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A68 (2015). (S)

*Karastergiou, A.; Johnston, S.; Karastergiou, A.; Andersson, N.; Breton, R.; Brook, P.; Gwinn, C.; Lewandowska, N.; Keane, E.; and nine coauthors. "Understanding pulsar magnetospheres with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A38 (2015). (S)

*Kimball, A.; Lacy, M.; Condon, J.; Lonsdale, C.; Macquart, J.P.; Seymour, N. "Sub-millimeter/far-infrared properties of the most optically luminous QSOs". In: ***Demographics and environment of AGN from multi-wavelength surveys***, Crete, Greece, 21–24 September, 2015, A53 (2015). (O)

*Koribalski, B.S. "The Local Universe: Galaxies in 3D". In: ***IAU 309: Galaxies in 3D across the Universe,*** Vienna, Austria, 7–11 July, 2014, 10, 39–46 (eds B.L. Ziegler, F. Combes, H. Dannerbauer, M. Verdugo) (2015). (C)

*López-Sánchez, A.; Koribalski, B. S.; Westmeier, T.; Esteban, C. "Ionized and neutral gas in the XUV discs of nearby spiral galaxies". In: ***IAU 309: Galaxies in 3D across the Universe,*** Vienna, Austria, 7–11 July, 2014, 10, 65–68 (eds B.L. Ziegler, F. Combes, H. Dannerbauer, M. Verdugo) (2015). (C)

*Makhathini, S.; Jarvis, M.; Smirnov, O.; Heywood, I. "Morphological classification of radio sources for galaxy evolution and cosmology with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A81 (2015). (S)

*Mao, S.A.; McClure-Griffiths, N.M.; Gaensler, B.M.; Brown, J.C.; van Eck, C.L.; Haverkorn, M.; Kronberg, P.P.; Stil, J. M.; Shukurov, A.; Taylor, A.R. "Magnetic Fields in the Milky Way Halo". In: ***Highlights of Astronomy,*** 16, 403 (ed. T. Montmerle) (2015). (O)

*Maxted, N.; Rowell, G.; de Wilt, P.; Burton, M.; Renaud, M.; Fukui, Y.; Hawkes, J.; Blackwell, R.; Voisin, F.; Lowe, V.; Aharonian, F. "A dense gas survey of the gamma-ray sources HESS J1731–347 and HESS J1729–345". In: ***Cosmic Rays and the InterStellar Medium,*** Montpellier, France, 24–27 June, 2014, 6 p. (2015). (M)

*McClure-Griffiths, N.M.; Stanimirovic, S.; Murray, C.; Li, D.; Dickey, J.M.; Vazquez-Semadeni, E.; Peek, J. E.G.; Putman, M.; Clark, S.E.; Miville-Deschenes, M.A.; and two coauthors. "Galactic and magellanic evolution with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A130 (2015). (S)

*Murphy, E.; Sargent, M.; Beswick, R.; Dickinson, C.; Heywood, I.; Hunt, L.; Huynh, M.; Jarvis, M.; Karim, A.; Krause, M.; and five coauthors. "The astrophysics of star formation across cosmic time at >10 GHz with the Square Kilometre Array". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A85 (2015). (S)

*Norris, R.; Basu, K.; Brown, M.; Carretti, E.; Kapinska, A. D.; Prandoni, I.; Rudnick, L.; Seymour, N. "The SKA Mid-frequency All-sky Continuum Survey: Discovering the unexpected and transforming radioastronomy". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A86 (2015). (S)

*Patel, P.; Harrison, I.; Makhathini, S.; Abdalla, F.B.; Bacon, D.; Brown, M.; Heywood, I.; Jarvis, M.; Smirnov, O. "Weak lensing simulations for the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14),*** Giardini Naxos, Italy, 9–13 June 2014, A30 (2015). (S)

Pratley, L.; Johnston-Hollitt, M.; Dehghan, S.; Sun, M. "Using radio jets of PKS J0334–3900 to probe the intra-cluster medium in A3135". In: ***IAU 313: Extragalactic jets from every angle,*** Galapagos Islands, Ecuador, 15–20 September, 2014, 10, 301–302 (eds. F. Massaro, C.C. Cheung, E. Lopez, A. Siemignowska) (2015). (C)

*Salomé, Q.; Salomé, P.; Combes, F.; Hamer, S.; Heywood, I. "Star formation efficiency in the outer filaments of Centaurus A". In: ***SF2A-2015: Proceedings of the Annual meeting of the French Society of Astronomy and Astrophysics***, Toulouse, France 2–5 June, 2015, 445–447 (eds S. Boissier, V. Buat, L. Cambrésy, F. Martins, P. Petit) (2015). (C)

Sano, H.; Fukui, Y.; Yoshiike, S.; Fukuda, T.; Tachihara, K.; Inutsuka, S.; Kawamura, A.; Fujii, K.; Mizuno, N.; Inoue, T.; and three coauthors. "Revealing the large-scale structures of interstellar gas associated with the Magellanic SNR N132D". In: ***Revolution in Astronomy with ALMA: The Third Year***, Tokyo, Japan, 8–11 December, 2014, 499, 257–258 (eds D. Iono, K.-I. Tatematsu et. al.) (2015). (M)

*Schwartz, D.A.; Marshall, H.L.; Worrall, D.M.; Birkinshaw, M.; Perlman, E.; Lovell, J.E.J.; Jauncey, D.; Murphy, D.; Gelbord, J.; Godfrey, L.; Bicknell, G. "A survey of X-ray emission from 100 kpc radio jets". In: ***IAU 313: Extragalactic jets from every angle***, Galapagos Islands, Ecuador, 15–20 September, 2014, 313, 219–224 (eds. F. Massaro, C.C. Cheung , E. Lopez, A. Siemiginowska) (2015). (O)

*Shaw, R.; Hay. S. "Transistor noise characterization for an SKA low-noise amplifier". In: ***European Conference on Antennas and Propagation***, Lisbon, Portugal, 12–16 April, 2015, 4 p. (2015). (A)

*Tuthill, J.; Hampson, G.; Bunton, J.; Harris, F.J.; Brown, A.; Ferris, R.; Bateman, T. "Compensating for oversampling effects in polyphase channelizers: A radio astronomy application". In: ***IEEE Signal Processing & SP Education Workshop 2015***, Salt Lake City, USA, 9–12 August, 2015, 255–260 (2015). (A)

*Vacca, V.; Oppermann, N.; Ensslin, T. A.; Selig, M.; Junklewitz, H.; Greiner, M.; Jasche, J.; Hales, C.A.; Reneicke, M.; Carretti, E.; and 11 coauthors. "Statistical methods for the analysis of rotation measure grids in large scale structures in the SKA era". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A114 (2015). (S)

*Wagg, J.; da Cunha, E.; Carilli, C.; Walter, F.; Aravena, M.; Heywood, I.; Hodge, J.; Murphy, E.; Riechers, D.; Sargent, M.; Wang, R. "Enabling the next generation of cm-wavelength studies of high-redshift molecular gas with the SKA". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A161 (2015). (S)

*Zwart, J.; Wall, J.; Karim, A.; Jackson, C.; Norris, R.; Condon, J.; Afonso, J.; Heywood, I.; Jarvis, M.; Navarrete. F. and eight co-authors. "Astronomy below the survey threshold in the SKA era". In: ***Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)***, Giardini Naxos, Italy, 9–13 June 2014, A172 (2015). (S)

H: Abbreviations

AGN	Active Galactic Nuclei
ALMA	Atacama Large Millimeter/submillimeter Array
ASKAP	Australian Square Kilometre Array Pathfinder
ATCA	Australia Telescope Compact Array
ATLAS	Australia Telescope Large Area Survey
ATNF	Australia Telescope National Facility
BETA	Boolardy Engineering Test Array
CASS	CSIRO Astronomy and Space Science
CDSCC	Canberra Deep Space Communication Complex
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EMU	Evolutionary Map of the Universe
GRB	Gamma-Ray Burst
H I	Neutral Hydrogen
HIPASS	H I Parkes All Sky Survey
IAU	International Astronomical Union
ICRAR	International Centre for Radio Astronomy Research
IEEE	Institute of Electrical and Electronics Engineers
ISM	Interstellar Medium
LBA	Long Baseline Array, used for Australian VLBI observations
LMC	Large Magellanic Cloud
LOFAR	Low Frequency Array
MALT	Millimetre Astronomers Large-area multi-Transition
MNRAS	Monthly Notices of the Royal Astronomical Society
MRO	Murchison Radio-astronomy Observatory
MWA	Murchison Widefield Array
MYSO	Massive Young Stellar Object
NAPA	Non A-Priori Assignable
NASA	National Aeronautics and Space Administration
PTF	Parkes Testbed Facility
RFI	Radio Frequency Interference
SCORPIO	Spectral Camera with Optical Reducer for Photometrical and Interferometrical Observations
SKA	Square Kilometre Array
SNe	Supernovae
SNR	Supernova Remnant
SPT	South Pole Telescope
VLBI	Very Long Baseline Interferometry

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