ATUC Report (November 2021)

1. ATUC members in attendance (all remote):

Ramesh Bhat (Chair), Vince McIntyre (Secretary), Ivy Wong, Ryan Shannon, Emil Lenc, Bi-Qing For, Nickolas Pingel, Michelle Cluver, Martin Bell, and James Leung

1.1 Apologies:

Philippa Patterson

2. Commendations for S&A:

- Parkes 60th anniversary celebrations
- ASKAP science productivity - 44 publications
- Keith Bannister for ASA Anne Green Prize and the Malcolm McIntosh Prime Minister's science prize
- Bronze Pleiades award for ATNF
- Gold employer status for LGBTQ inclusion

3. Diversity and Inclusion (D&I)

Creating a more diverse and inclusive community within the ATNF is beneficial not only to ATNF staff, but also the users who visit and make use of ATNF facilities. The *ATUC sees the work being done by S&A in this area as being very important* and hopes that the ATNF continues to spearhead new initiatives, such as *the S&A workplace culture survey run by the Inclusive Organization*. ATUC commends the D&I committee's work in achieving 26 of the 37 action items in the 2020-2021 Diversity & Inclusion Action Plan and the strong participation by S&A staff and Executive in both the Speak Up! Training and the voluntary workplace culture survey.

The ATUC was pleased with the Bronze Pleiades award for ATNF from the ASA IDEA Chapter and hopes S&A will explore the implementation of an 'exit survey' to address issues with staff retention. The additional Inclusive Leadership training undertaken by the S&A Executive and their agreement to take on individual accountability for each of the eight core principles of the 2021-2022 Diversity & Inclusion Annual Action Plan are key contributions towards addressing issues faced by diverse groups of people. *The ATUC strongly encourages the current activities*, particularly those initiated by the D&I

committee, in hopes that S&A will be seen as being a leader in championing diversity and inclusion.

Recommendation: *S&A present a report on the recent workplace culture survey and resultant 2021-2022 Action Plan at the next ATUC meeting. ATUC encourages future workplace culture surveys on the D&I committee's suggested cadence of 2 years, supplemented by additional evaluations of the effectiveness of the current Annual Action Plan in the interim.*

4. S&A Postdoc Committee

ATUC recognises that the *support for early career researchers* is important and was pleased to see the establishment of a postdoc committee following the ATNF science retreat in March 2020. The committee establishes a network for the postdocs to not just for career paths, but also aids in cohesion between the Marsfield and Perth sites. The committee also serves as a point of contact for providing feedback to the S&A postdoc coordinator.

ATUC understands that S&A postdocs are required to provide support for the ATNF facilities and operations. The ATUC feels it is important for S&A postdocs to have regular discussion with their immediate supervisors in regard to the required/appropriate FTE for such service roles and how that aligns with their career plans.

Recommendation: Encourage S&A postdocs to have regular discussions with their immediate supervisor with regard to the required/appropriate FTE for any service roles and how that aligns with their longer-term career plans.

5. ATCA

5.1 Green Time Request

ATUC noted a decrease in the requested observing time on the ATCA for the 2021OCT semester and will be keen to monitor this in the coming years. The ATNF reported that the requests for unallocated (green) time were substantial (17% of total observing time, 5% of which was NAPA time and 12% ToO time) and that for at least some, it would have been more appropriate for them to have been submitted as regular proposals.

ATUC noted there are clear guidelines around the consideration and allocation of time.

ATUC also noted that the increased requests for unallocated time may be because there is under-subscription for the ATCA with the completion of legacy projects.

Recommendation: ATNF to provide an update on the usage and allocation of green time at the next ATUC meeting (for transparency).

Recommendation: At the next call for proposals, ATUC recommends that *users are reminded of* the policy guiding green time allocation and that this should be adhered to.

Statistics in the 2019-2020 annual report (Figure 5) indicate that the international usage for the ATCA has decreased substantially from 2014 to 2019, with the percentage of international principal investigators *for all projects* decreasing from *50% to 20%* across that time span. In contrast, the international usage of Parkes has increased from 25% to 50%; this is likely associated with the deployment of the Ultra-Wideband Low Receiver system. This suggests there is an opportunity with the advent of *BIGCAT (discussed below) to regain international interest* in using the ATCA.

Recommendation: ATNF to *engage with the international community via* remote and in-person conferences and workshops to market the new capabilities of BIGCAT and to drive new science collaborations to exploit BIGCAT operations.

5.2 BIGCAT

ATUC was pleased to be given an update on the BIGCAT project. The ATNF has engaged with the user community through a *consultation process* to ensure that BIGCAT can accommodate the diversity of use cases the community has requested.

ATNF noted that it is *not feasible to observe simultaneously* with both the CABB and BIGCAT, so there will likely be downtime with ATCA while BIGCAT is commissioned. The ATCA was undersubscribed during the 2021OCT semester, so commissioning during the 2022OCT semester seems to be appropriate.

ATUC is *concerned about the impact on users, especially student users,* if the downtime turns out to be longer than expected. ATUC also noted that the BIGCAT commissioning will likely overlap with LIGO O4.

Recommendation: ATNF to provide a timeline for the BIGCAT commissioning for the 2022APR semester call.

Recommendation: ATNF to include a projected commissioning timeline on the S&A Narrabri web page and update it as needed.

ATUC further noted that the *format of data* for BIGCAT *has not yet been settled*, but it has been made clear that the format is *not going to be RPFITS*. There may be users who will be interested in helping with the scientific commissioning and early science with BIGCAT, but they will need to be able to read data into their software and analysis tools for this to become feasible.

Recommendation: ATNF to provide a clear statement with respect to the data format that will be used for BIGCAT observations by default.

Recommendation: ATNF to *provide users with software tools to ingest data* into (if not already available for the chosen data format) e.g. CASA and/or MIRIAD, in advance of the BIGCAT being commissioned, to ensure commissioning is not impeded.

5.3 ATCA Legacy Surveys

As part of the April 2021 Meeting, ATUC was provided with an update from the Legacy Surveys. This was followed by an update at this meeting on the data release support that ATNF is providing for the Legacy Surveys. The status of these surveys and the community release of their data products continues to be of importance to ATUC.

Recommendation: ATUC requests a *status update (e.g. progress, publications) from each Legacy Survey, as well as an update on their planned data releases* (or current plan/timeline for how/when this will be achieved) at the next meeting.

5.4 ATCA Science Case

At previous meetings ATUC was briefed on a draft science case that is being developed for ATCA. ATUC further notes that, following the April 2021 report, the expectation was that an updated document would be made available to ATUC. In light of the imminent upgrade to BIGCAT, and a decline in subscription rate in the most recent semester as noted by ATUC, this science case will be a particularly valuable resource going forward, assisting in informing the development of the future user base, as well as key scientific priorities for ATCA.

Recommendation: ATUC seeks an *update regarding the current status* of the ATCA science case document and planned release to the wider community.

6. National Facility Observing Support

The ATNF has proposed a major change to the facility support, with users taking a more central role in supporting observing projects. The ATNF circulated a draft of the support model to ATUC in advance of the meeting. The changes would align support models across ATNF facilities. It builds on the existing Parkes model for user support so would result in the disbanding of the duty astronomer (DA) program that has been central to ATCA support.

The ATNF has proposed a phased strategy for changing the observing support model, with a soft start and a steady ramping through the 2021OCT and 2022APR semesters, with the model fully adopted by the 2022OCT semester. BIGCAT commissioning is anticipated during the 2022OCT semester, which provides a *natural time to change support models*, but *could also complicate support more generally* (as there will be no experts of the new system).

Recommendation: ATNF consults with ATUC to establish an appropriate timeline for transition, as the timeline for BIGCAT deployment becomes more definite.

Recommendation: ATNF socialise the plan during the upcoming call for proposals to alert users that a “soft-start” may be occurring in the upcoming semester.

*Active communication of plans t*o National Facility Support changes are recommended for the greater community who may not have attended the ATUC open session. ATUC commends ATNF for providing a comprehensive draft outlining the new National Facility Support model. The plan would benefit from a high-level summary.

Recommendation: ATUC recommends the inclusion of a *one-page summary to the current 17-page draft.*

The proposed model encourages external users to act as project support scientists. The DA system provides tangible benefits (e.g., ~one week at Narrabri or Marsfield, preferential access to Director’s time). The n*ew model provides formal training that could be listed on a CV*.

Recommendation: ATUC supports the formal training approach, but notes that this will only be CV-boosting for PhD students and junior postdocs.

Further clarification on the incentives and obligations to the proposed ATCA Project Astronomers concept would be useful. For example, would external (non-ATNF staff) ATCA/Parkes users be required to serve as a Project Expert for *projects in which they are not interested?* ATUC notes that non-early-career research astronomers are less likely to be incentivised by CV-enhancing formal qualification. In the current model, duty astronomers are given priority access to Director's time during their DA period.

Recommendation: ATNF clarifies the requirements for external users in terms of the new facility support model.

Recommendation: ATNF considers priority access to green time to Project Experts as a means to incentivise serving in this role.

For international observers, *it would be useful to ensure that the new support model, and statements outlining the scheme and requirements, provide encouragement to propose,* even if they do not have experience with the system. As noted earlier in this report, there has been a drop in the international usage of the ATCA in recent years, and it is therefore important to ensure barriers remain low for this important cohort.

Recommendation: In calls for proposals, the ATNF makes clear that support will be provided to astronomers who are new to ATNF facilities so they are encouraged to apply.

The draft plan states the new model being trialed on projects being led by observatory staff. But this will likely be a biased sample, comprising experienced observers.

Recommendation: Soft runs include a representative sample of projects and the user abilities in order to obtain constructive feedback towards shaping the eventual structure of the new support model.

While the document provides an important structure for observer support going forward, the draft plan is lacking details in terms of how specifically observers will be trained.

Recommendation: ATNF to provide a *more concrete plan t*o improve the observer training model. The draft document provides a long-term plan of developing an online course for certification, steps towards which can be made by planning a video tutorial series.

6.1 Student Programme

In the fast-evolving landscape of instrumentation capabilities and career opportunities for radio astronomy-themed students and ECRs, this support model revamp presents an excellent opportunity for ATNF to identify new educational pathway(s) that encapsulates the benefits and advantages that existing students (and ECRs) have gained from the existing support model and affiliated training programmes. The new proposed changes to the National Facility Support (NFS) model will impact the ATNF student training programme directly. Complementary to the training provided via the ATNF Radio School, the DA training provides telescope operation training that furthers a student's understanding of how synthesis telescopes work.

The benefits currently gained by students from the current DA programme are:

1) valuable hands-on training and operational experience in radio interferometry;
2) cross-institutional and cross-disciplinary collaboration and networking opportunities; and
3) Funded opportunities (flights and accommodation) to visit co-supervisor(s) (or collaborators) in Marsfield or Kensington for an extended duration during their PhD.

Recommendations:

To ensure that the benefits to students gained under the current NFS model are also provided in the proposed new model, ATUC recommends that ATNF evaluate the potential impact on students with the implementation of the new support model. Efforts should be made to retain the current benefits and opportunities offered (or available) to current ATNF-affiliated students. These benefits and opportunities include:

1) ATNF radio school
2) Undergraduate vacation studentships
3) Telescope operation training via online and/or video training modules. In addition to passive online tutorials, sessions that can include live student interactions should be considered
4) A strong level of collaborative engagement with University colleagues. This is necessary to identify when the engagement of suitable student(s) in instrument development and/or commissioning is of benefit to all parties — the project, the student, ATNF and the University partner(s).

5) Funding opportunities for ATNF students to visit co-supervisors (and collaborators) in Marsfield or Kensington for extended periods of time, be continued.

7. Parkes/Murriyang

ATUC congratulates ATNF on the 60th year of Parkes operations. This marks a major milestone for this marvelous icon of Australian astronomy. Over the decades, steady upgrades of the telescope capabilities using the state-of-the-art technologies available at any given point of time has helped to ensure that Parkes remains at the forefront of astronomy research.

Plans to develop a UWH receiver, as a logical extension to the UWL receiver that spans up to 4 GHz, will further enhance science capabilities of Murriyang. ATUC notes that the UWH LIEF bid is currently pending, and will likely be resubmitted if not successful in the current round.

ATUC was pleased to hear that the Parkes telescope was given the indigenous name Murriyang. Many users now routinely refer to this new name in their publications and press releases. We note, however, that many ATNF web pages only include *reference to this name in a very limited way*.

Recommendation: ATNF consider updating the Parkes web pages and other Space & Astronomy web sites to include an explicit reference to Murriyang.

Recommendation: pursue the UWH development plan and prospective com resubmission of the LIEF bid.

8. ASKAP

ATUC commends S&A and the ASKAP teams on recent excellent science productivity, with 44 publications to date collectively from the SSTs. ATUC also welcomes the news of the Galaxy supercomputer upgrade to Setonix at Pawsey, which will help alleviate the current ASKAP data processing bottleneck.

ATUC recognises that the implementation of split-band mode is a challenging upgrade which would require considerable down time and operational resources that would also delay the start of full survey operations beyond the first quarter of 2022. However, the

decision on delaying the implementation of this mode has indeed a significant impact on the scientific goals of several SSTs and the long-term observing efficiency of ASKAP. Examples of ASKAP SSTs that are significantly impacted include:

- GASKAP — the HI and OH components of GASKAP have split into two separate surveys. GASKAP-OH can no longer simultaneously observe all four 18-cm transitions of ground-state OH, hampering their core science goal of providing new insights into the structure of the local interstellar medium.
- DINGO — the survey strategy has also been split into 2 separate time requests in order to cover the low- (deep) and high-redshift (ultra-deep) component of the survey. The ultra-deep field becomes continuous in the integration time over the deep fields. There is also a reduced science capacity in terms of its reliance on stacking science as opposed to direct detections at high redshifts. Without the implementation of the split-band mode, DINGO would need to double its observing time.
- Wider bandwidths are key for polarisation science and thus probing magnetic field properties. The additional bandwidth afforded by the split-band mode will also benefit POSSUM's sensitivity in a (lambda^2) fashion.

Furthermore, two or more independently tuned spectral windows provide a greater flexibility for avoiding satellite RFI. Implementing the split-band mode will enable commensality for a greater number of ASKAP surveys. For example, EMU and VAST will improve by sqrt(2) in sensitivity if commensal with WALLABY observations. Currently the implementation of this mode has been pushed back to late 2022 but it is unclear how this implementation will be coordinated with the start of full surveys in Q1 2022.

The Director's Reply to the report in Nov 2020, 7(c), indicated that the split band mode would be assessed and an update would be given in the April 2021 ATUC meeting. ATUC was pleased at the time to note that a tiger team will be set up and a timeline of two to 12 months for the split-band mode implementation. However, the detailed path towards a possible split-band mode remains unclear.

In summary, considering the longer-term benefits of the split band mode, which will also ensure the longevity of ASKAP as a world-class telescope, ATUC would like to seek further detailed clarifications on the feasibility, timeline and possible strategies that may help minimise the operations downtime during the implementation of a split-band mode. If the RASSP review committee also advocates in support of a split-band mode, ATUC would like to request a plan detailing how it affects the Q1 2022 observation and how to

ensure equitable ability to maximise the science for each survey team. It is important to communicate with the SSTs via the monthly ASKAP science forum about its status. This will provide a clear path for the SSTs to move forward.

Recommendation: ATUC would like to seek further clarifications on the feasibility, timeline and possible strategies for minimising the operations downtime during the implementation of a split-band mode.

Recommendation: If the RASSP review also advocates for a split-band mode, ATUC would like to request a plan outlining how the implementation of spit-band mode affects the planned observations in Q1 2022 and how to ensure ability to maximise the science for various survey projects. ATUC further recommends ATNF communicates the details with the SSTs via the monthly ASKAP science forum about its status.

9. Technologies

ATNF presented an updated version of the technology roadmap, outlining the plans for instrumentation and related technology developments in the coming decade. The plan is ambitious, and focuses on the development of broadband and phased array frontends, high performance backends based on commercial off-the-shelf technology, and *spin-off companies*. The engineering group has also grown in size in the past year, *which is very encouraging,* especially given additional work outside radio astronomy. ATUC supports this long-term vision and development plans around the state-of-the-art technologies for ATNF facilities.

The roadmap contains plans to develop phased-array feeds for ATCA to operate at high frequency (4-20 GHz). Such a plan would benefit from *discussion for a correlator that can be designed to use such a system*, given the large data rates expected from such broadband technologies.

An important consideration is to do with high data volume data products provided by all these new systems, which will require substantial planning and support for handling the archives, and computing necessary, in order to take advantage of the new technology.

Recommendation: ATNF to invest adequate resources into RFI mitigation development in order to ensure that these new technologies can be maximally exploited for science.

Recommendation: ATNF considers suitable plans for the archives and post-processing systems that will be necessary to support the large data rates that will result from these new systems.

9.1 Low-frequency VLBI (LAMBDA)

ATUC was pleased to see an update on ATNF's low frequency VLBI plans and the *development of the pilot station* at Paul Wild Observatory. VLBI is going to be an important extension of SKA-Low, and the technical developments underway are *showing great promise.* The VLBI network (and the SKA) benefit from east-west baselines across Australia and north-south baselines with east Asian properties.

Recommendation: ATUC recommends ATNF explore collaboration with the MWA, east-asian VLBI network, the GMRT.

10. RFI

ATUC is pleased to receive a comprehensive (and very informative) update on the RFI related developments at ATNF. This included the introduction of a new internal working group within CSIRO to characterise RFI and investigate mitigation methods and a brief summary of the state of RFI at ASKAP, ATCA, and Murriyang. The group has had an initial meeting that involved ~ 40 astronomers and engineers and established a number of communication channels to explore RFI characterisation and mitigation across the facilities.

ATUC is concerned that science opportunities are being lost due to significant RFI and that this may become worse in the coming years; e.g. *lack of RFI mitigation for ASKAP spectral line surveys* puts the burden on teams to extract science in an increasingly challenging RFI landscape which is impacting survey science decisions (e.g. WALLABY and DINGO RASSP submissions).

The group has drafted an internal CSIRO document ("Radio frequency interference: current projects"). The users would benefit from reviewing this (or a similar) document when it is in a mature state. ATUC would be happy to comment on the current draft version, if that may be useful.

Recommendation: The ATNF provides a copy of the RFI document (or equivalent) to the user community when it is mature.

The ATNF requested feedback from ATUC on how to determine the significant concerns and requirements the users face with RFI. Given the broad user base and diversity of facilities, such information at first would be best captured through a survey.

Recommendation: ATNF develop a questionnaire on RFI and broadly survey the user community.

After the survey the ATNF may like to consider holding a short workshop on this subject, for example, like the one that was held last year to engage the user community to define BIGCAT observing modes and use cases.

The ATNF noted that astronomers often switch off on-line RFI mitigation techniques for fear of losing an interesting signal or corrupting their data. ATUC notes that in the case of the CASPSR instrument which implemented online RFI mitigation, two data streams were recorded simultaneously allowing for the comparison of mitigated and unmitigated data.

Recommendation: *ATUC suggests a case study approach* might be useful in encouraging astronomers to adopt RFI excision tools; in particular demonstrating how such tools could be applied to UWL observations. These could also serve as useful documentation for prospective users of such tools. Another possibility is a specific session on *mitigating RFI* from one of the ATNF telescopes, e.g., in a *Radio School setting.*

11. User feedback

ATUC received a user comment regarding pulsar observations with UWL/Medusa indicating that the current displays make it difficult to assess the quality of data or the presence of a signal. The user suggested that an improved display of the processed data may help, e.g. plots spanning different sub-bands across the large UWL range.

ATUC was happy to note that by the time of submitting this report, the UWL/Medusa pages for pulsar observing were already improved with the addition of such useful features and currently display multiple sub-bands spanning the large frequency range.

In relation to the above request, ATUC also received questions regarding whether or not there was sufficient support planned for the development/maintenance of processing software for new instrumentation (CryoPAF, BIGCAT, etc). ATUC notes that the initial uptake of UWL by the community was delayed as a result of the unavailability of tools to work with the new data format and/or to import data into existing packages. Adequate

planning and resourcing is recommended to ensure that a timely transition is possible towards the use of any new instrumentation.

ATUC received another question regarding resourcing for the development of online courses and video tutorials as part of the new National Facility Observing Support model. Will there be resources available to actively work on these?

During the open session there was discussion concerning the difficulty of securing resourcing for the development of operations software for new instrumentation. ATUC suggests that the ATNF investigate the potential for re-use of operational software between ASKAP, Murriyang, ATCA BIGCAT and other upcoming systems where it can save development lead time.

12. ATUC and S&A interaction

ATUC was pleased to be consulted in drawing the agenda for the current meeting and to see a better balance and diversity in terms of both topics and representation. That being said, some of the topics were largely informative in nature (e.g., presentation on the S&A postdoc committee, and an update on AusSRC). While useful, perhaps these can be limited to periodic (e.g., annual) updates. ATUC would welcome such closer interaction with S&A in planning the future ATUC meetings and drawing the relevant agenda. It was evident from the current meeting that longer discussion times would have been useful, but at the same ATUC also acknowledges that this may need to be considered without significantly departing from the primary purpose of ATUC meetings. As mentioned in a previous report, ATUC would also be happy to convene occasional out-of-session meetings (via short closed sessions), as and when needed, and engage in discussions with ATNF leaders.

Recommendation: *S&A consults ATUC with the planning of future meetings and in finalising agenda and the topics.*

13. Date and format of next meeting

As noted in previous reports, ATUC is keen to return to holding in-person meetings, as they have proven more fruitful and efficient. It looks like travel out of WA will become possible starting February 2022 and the restrictions will likely be eased in the coming months. If not the next meeting, perhaps the October 2022 ATUC meeting should be planned as an in-person (or hybrid) meeting, which can also be combined with a dual science-instrumentation day that was proposed last year.