



# Review of ASKAP Survey Science Proposals

John Reynolds, August 2021

## Background

In 2008 CSIRO issued an international call for expressions of interest (EOIs) in ASKAP Survey Science Projects to make up a five-year observing program for our new telescope. In 2009 the Principal Investigators (PIs) of those 17 EOIs which broadly met ‘feasibility checks’ were invited to submit Survey Science Proposals (SSPs) for review by an expert panel. Two SSPs (EMU and WALLABY) were given an A grading and eight others were awarded A- for all or some components of the proposal. Two other proposals, COAST (pulsar timing) and VLBI, were not graded but placed in a special category of ‘strategic priority’, to be supported ‘to the extent possible’ (neither of these is expected to be included in the 2021 Review, as each requires ASKAP functionality that does not yet exist: that is, the tied-array mode). **Attachment 1** includes a description of the ratings and a list of the ten successful SSPs and their gradings.

## Motivation

There are several motivations for reviewing the original assessments of the SSPs.

- It is an entirely reasonable proposition that, in the time elapsed since the original review of 2009, the research landscape and available instrumentation (on ATNF and other telescopes) may have shifted significantly, making a reassessment of priorities desirable to maximise scientific impact.
- Certain critical technical specifications of the telescope have changed since the original assessment. In particular, the original target sensitivity ( $T_{\text{sys}}/\eta$ ) has not been achieved and the resulting instrumental survey speed is lower than hoped for.
- The grading scheme used in the 2009 review does not provide an adequate basis for allocating time between competing projects. The total time in supported projects, excluding any commensal observing (that is, observing for multiple SSPs simultaneously) amounts to 2033 days’ on-sky observing time, translating to 8-10 years’ duration with reasonable assumptions about availability and fraction of time reserved for non-survey projects. This represents a nominal oversubscription factor of 1.5 to 2 for a five-year survey program.
- The AT Steering Committee (ATSC) recommended at its October 2020 meeting that the time allocated to the ASKAP Guest Science Program (GSP) be capped initially at 10% of available time rather than 25%, which will relieve some pressure on observing time. Commensal observing could also alleviate the oversubscription, but it is unlikely to reduce it to unity. Moreover, the reduced sensitivity of ASKAP will mean significantly more observing time is required to reach the specified survey sensitivity.

- CSIRO has also signalled its intention to explore collaborations which could include special access rights to its telescopes, including ASKAP, when financially necessary.

The SSP PIs have been consulted regularly since March 2018 regarding CSIRO's intention to conduct a review. An important factor in the timing of the review is that our existing supercomputer, Galaxy, lacks the computing power to sustain full-time observing for ASKAP in spectral-line mode. This limitation will disappear in 2021 with delivery of the first phase of a new supercomputer, Setonix, expected to be fully operational for ASKAP by the end of the year. With a clear picture of the enhanced supercomputing capabilities and delivery timescales, the full surveys expected to start in early 2022, and the earlier endorsement of ATSC, we believe now is the time to move forward with the Review of the ASKAP SSPs (RASSP).

## Assessment panel

As agreed previously by the ATSC, an external RASSP Assessment Panel will formally be convened within these guidelines

- The Assessment Panel will comprise 8 members, each an acknowledged expert in their field.
- Appointments to the Assessment Panel (including Chair) will be made by the ATSC.
- The Assessment Panel will, if feasible, meet in person to discuss and assess the proposals. However, international travel restrictions may result in this meeting taking place virtually.
- Conflicts of Interest: the broad membership of many SSPs means it is difficult in some cases to identify suitable experts who are not listed as members of an SST. The approach taken has been to ensure that panel members will not be, or have not been, active members of any SST.
- Diversity and equity are key considerations in RASSP appointments and processes.

## Review process

The RASSP review is intended as a one-off process to closely guide allocation of time on the ASKAP telescope over the next five years. It will formally be convened under the aegis of the AT Steering Committee which oversees the allocation of time on ATNF facilities. A one-off RASSP panel was preferred over the regular AT Time Assignment Committee (TAC) for this review to, first, allow the careful selection of internationally-recognised expertise collectively covering the ASKAP Science projects and, secondly, to reduce potential conflicts of interest that would inevitably arise among the all-Australian members of the regular TAC. However the regular TAC will have an important role in regular annual reviews of the ASKAP surveys, within broad guidelines designed by the RASSP (Item 8 of Terms of Reference).

The RASSP Panel will be supported by a RASSP Advisory Committee, chaired by the Program Director of ATNF Science and including the ATNF Chief Scientist, Program Director ATNF Operations and the ASKAP Project Scientist. The Advisory Committee will report to the ATNF Director. The role of the Advisory Committee is to serve as the principal point of contact between the RASSP Panel and CSIRO, and to assist the Panel in making its assessment of the proposals and preparing its recommendations.

In August 2021, we will issue a formal request to the eight active SSTs to submit updated survey project plans, including responses to the items listed in **Attachment 2**. The SSTs will be given three months to respond. The request will include the latest technical information on ASKAP performance and the finalised Terms of Reference (ToR) for the review (**Attachment 3**). The request will be communicated through CSIRO-convened briefings, workshops, or other means. SSP PIs will be kept informed of progress through the regular PI coordination meetings and monthly ASKAP Science Forum meetings.

Owing to uncertainty in the availability of an ASKAP “split band” mode, the GASKAP project may elect to submit separate survey plans for the HI and OH components as separate SSPs (“GASKAP HI” and “GASKAP OH”). Owing to the lack of any definite plans at the present time for a tied-array capability, it is not expected that the VLBI or COAST teams will submit updated survey plans.

We will provide the SST responses, and a technical assessment of each prepared by ASKAP operations staff, to the Assessment Panel well in advance of the Panel meeting. The RASSP Advisory Committee and Assessment Panel Chair will jointly determine a date for the Panel meeting, in late November or December. The Assessment Panel will review the updated proposals according to the ToRs and prepare a written report to the ATNF Director by late January or early February 2022, which will be used as a basis for allocating observing time from March 2022 onwards.

If agreed, the SSTs may each be invited to make a live presentation to the Assessment Panel to give a project overview and answer the Panel’s questions. The technical assessments prepared by ATNF will be made available to the respective PIs.

## Terms of Reference

Terms of Reference for the RASSP are at **Attachment 3**.

## Attachments

**Attachment 1:** Successful ASKAP SSPs and their original grades

**Attachment 2:** Information to be requested from SSTs for the updated proposals

**Attachment 3:** Terms of Reference

## Attachment 1: Successful ASKAP SSPs and their original grades

Each SSP was graded by the review panel into one the following four groups:

- **A** will progress to the Design Study phase. ATNF will provide full support to these projects.
- **A-** will progress to the Design Study phase. ATNF will make all reasonable efforts to support these projects.
- **Strategic priority (SP)** will progress to the Design Study phase. The science outcomes of these SSPs represent ‘essential capabilities’ for ASKAP in the context of an SKA demonstrator. The ATNF will work with the SSTs to ensure that these capabilities are enabled to the extent possible.
- **B** will not progress to the Design Study phase, but subsets of the SSP may represent worthwhile proposals for Guest Science Projects.

**Table 1 Successful ASKAP SSPs and their grading**

GRADE	SSP NAME	NUMBER
A	EMU - Evolutionary Map of the Universe	AS014
A	WALLABY - Widefield ASKAP L-Band Legacy All-Sky Blind Survey	AS016
A-	FLASH - First Large Absorption Survey in HI	AS002
A-	VAST - An ASKAP Survey for Variables and Slow Transients	AS004
A-	GASKAP - the Galactic ASKAP Spectral Line Survey	AS005
A-	POSSUM - Polarization Sky Survey of the Universe's Magnetism	AS007
A-	CRAFT - The Commensal Real-time ASKAP Fast Transients survey	AS008
A-	DINGO - Deep Investigation of Neutral Gas Origins	AS012
SP	COAST - Compact Objects with ASKAP: Surveys and Timing	AS015
SP	The High Resolution Components of ASKAP: Meeting the Long Baseline Specifications for the SKA (VLBI)	AS003

## Attachment 2 - Information to be requested from SSTs for the updated proposals

A template will be provided to SSTs for their updated proposals and a nominal 15-page limit set.

SSTs will be asked to supply:

1. Synopsis of the 2009 Science case
2. Overview of SSP activities and achievements 2009-2021
3. Updated science case
4. Observational strategy and updated time request. Requests for additional time must be clearly argued and compared against the original time request(s). Use of operational modes that have not been implemented should be clearly highlighted and justified.
5. SSTs are encouraged to identify coherent sub-projects or components that could be assessed individually to assist time assignment. One example would be to identify regions of the survey area with highest priority.
6. For SSPs originally envisaged to be observed commensally, including WALLABY, EMU and POSSUM, any proposals submitted for largely non-commensal programs shall include a detailed and objective assessment of options for commensality and clear scientific arguments for why this is not the preferred option.
7. Detailed requirements for any processed data products to be provided by the ASKAP operations team, including products deliverable in commensal modes, that may be required by the Panel to assess the trade-off between commensal observing time and commensal processing time constraints
8. A description of the Team's organisation and list of current members, with roles
9. The plan for creating and distributing the high value scientific data products derived from the standard products delivered by ASKAP operations team into CASDA.
10. Overview of expected long term benefits for the Australian and international astronomy communities
11. Overview of any opportunities to leverage benefits from the SKA, including any relationship with key science projects planned for the SKA
12. Plans to use ASKAP science to promote astronomy and careers in science, technology, engineering and maths through public education and outreach.

## Attachment 3: Terms of Reference

1. CSIRO will prepare a summary of the updated SSP proposals for the Assessment Panel well in advance of its meeting. This document will include an assessment of technical feasibility, options for commensality and requirements of each proposal, including demand for computing resources. It will also note and clarify any special project technical requirements. Copies of the 2009 proposals and associated documentation, including letters to the PIs, will also be provided.
2. The Assessment Panel will jointly consider all proposals and attempt to reach a consensus on their grading, and that of any proposal components, according to the criteria defined below, and by a process to be determined by the Chair. The Chair will be responsible for ensuring that minutes are kept summarising significant discussions and capturing decisions. CSIRO will provide administrative support as required.
3. The Assessment Panel will provide a written report to the ATNF Director to be shared in confidence with the Advisory Committee and relevant ASKAP Operations staff. It will note the final grading of each proposal and proposal component and may include additional comments and recommendations, or any other remark that the Assessment Panel sees fit to include. All significant ancillary material, including meeting minutes, shall also be provided in confidence.
4. The Chair of the Assessment Panel may request additional information or advice from the Advisory Committee or invite ASKAP Operations staff or other CSIRO staff to their meeting(s) to seek clarification or guidance on matters of technical feasibility, telescope performance and operation. As an ex-officio member of the TAC, the ATNF Director, or their delegate, may attend all or part of the panel meeting(s).
5. The Chair of the Assessment Panel may determine, in consultation with the Advisory Committee, the process by which the Panel assembles the final report. It is expected that each Panel member will read all eight updated proposals and provided a written assessment prior to the first full panel meeting. The Chair may wish to obtain consensus prior to the Panel meeting on the grading scheme to be used so each Panel member can assign a preliminary grade to each proposal and components. The Chair may also request a more detailed assessment from Panel members with particular expertise.
6. The final report should include a ranked list of proposals with sufficient detail to closely guide allocation of observing time for the next five years. The Assessment Panel is encouraged to assign different grades to individual components within a proposal where this increases overall science impact. The SSPs will be encouraged to identify distinct sub-projects in their resubmitted proposal to assist the Assessment Panel in this process but, where a compelling case exists, the Panel itself may identify individual components within a proposal and rank them separately. For example, the Assessment Panel may recommend splitting an all-sky survey into two partial surveys, or into an initial shallower survey, followed by a second component to achieve full sensitivity.
7. The final report should note the degree of unanimity achieved among Panel members for each proposal, and the essential points of divergence, where relevant.

8. Scheduling of ASKAP time will be revised annually based on progress reports submitted to the TAC. SSPs will be required to demonstrate they are making satisfactory progress in pursuit of their science objectives and data release plans. To assist in this process, the Assessment Panel may choose to define milestones or 'gates' for some proposals or proposal components, which must be completed before further observing time is awarded. These could be in the form of pilot or demonstrator sub-project(s) with specific performance targets.
9. The Assessment Panel may wish to comment on the commitment of up to 10% of ASKAP observing time for the Guest Science Program and may recommend whether this should be varied as a fixed or time-variable fraction.
10. CSIRO will, in a timely manner, notify each SSP PI of the outcome of the review of the resubmitted proposal, including grading and notes and recommendations relevant to that Proposal.

### **Assessment criteria**

In making its recommendations, the Assessment Panel will consider the following criteria:

1. The proposal should aim to maximise the scientific output of ASKAP within the first five years, while acknowledging the substantial effort already invested by the existing SSTs during ASKAP's design, construction and commissioning.
2. The proposals will be assessed on the importance of the stated scientific objectives and the extent to which the proposed observing program is likely to advance understanding within five years.
3. Are the scientific objectives broadly 'in the spirit' of the SSP approved in 2009? The Assessment Panel may recommend that project components deviating too far beyond the scope of the original proposal not be ranked but be resubmitted under the Guest Science Program.
4. Are there any major changes to the observing strategy, including the time requested, from 2009 and, if so, are these justified? Have alternative strategies requiring less overall observing time been adequately considered?
5. In 2009 it was generally understood that WALLABY, EMU and POSSUM would be scheduled largely commensally. Any proposal submitted by these teams for a largely non-commensal observing program, or program component, should include a detailed and objective assessment of options for commensality with clear arguments for why this is not the preferred option. How compelling is the resubmitted case for a non-commensal vs a commensal strategy?
6. The Assessment Panel is encouraged to make recommendations regarding commensal observing and may consider proposing alternative scenarios with different degrees of commensality (including none), giving separate gradings for each and providing detailed advice on their relative scientific merits.
7. The expected time available for observing during the first five years of ASKAP surveys is 1150 days (3.15 years), taking into account the estimated availability of ASKAP of 70% and assuming 10% of time allocated to Guest Science Projects.

8. Project feasibility:
  - a. Is the proposed observing strategy, including source selection and time request well matched to the scientific objectives?
  - b. Are the proposed calibration and data analysis schemes, including mitigation of radio frequency interference, feasible and practical?
  - c. Does the SST possess the required expertise and access to computing and other resources?
  - d. Has the SST demonstrated the project management expertise required to execute their proposed program, including publishing and promoting their scientific data products?
  - e. Does the proposed strategy rely on any development, capability or feature that has not yet been delivered or demonstrated?
9. What long term benefits does the proposal offer for building or sustaining the Australian and international astronomy communities? In particular what opportunities are presented for leveraging science impact from the SKA?
10. What opportunities are presented for promoting astronomy and careers in science, technology, engineering and maths more generally in the wider community?