Australia Telescope National Facility

ASKAP User Policy: Principles, Issues & Development

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Revision history

30 May 2008: v1 passed to ATNF Leadership Team for comment

2 June 2008: v2 incorporating suggestions from BJB, LTB, DRD

4 June 2008: v3 incorporating changes from IF, SJ

17 June 2008: v4 incorporating changes from SJ

7 July 2008: v5, ASKAP Taskforce member amendments

1 Preamble

The Australian SKA Pathfinder (ASKAP) will be a software telescope and it is anticipated astronomers will interact solely with its archives. It is designed to be the world's fastest survey telescope at 0.7-1.8GHz with the expectation that a large fraction of time will be devoted to large (typically year-long) surveys. These features differentiate ASKAP from existing CSIRO radio astronomy facilities, and indeed from most existing telescopes. This prompts the need for a careful consideration of the operational model and User Policy for ASKAP, to ensure effective and efficient operations and the best scientific outcomes. An appropriate balance of consultation with the international astronomy community including interested ASKAP users is an essential component to the process.

The purpose of this document is to outline

- a proposed set of underpinning principles for the ASKAP User Policy;
- issues that need to be addressed in the development of the ASKAP User Policy;
- the process by which the User Policy will be developed, including the formation of an ASKAP User Policy Taskforce.

The proposed membership of the ASKAP User Policy Taskforce is

Ilana Feain (chair; ATNF)
Simon Johnston (ATNF)
Jessica Chapman (ATNF)
Ray Norris (ATNF)
Ron Ekers (ATNF)
Lister Staveley-Smith (UWA)
Ken Freeman (ANU)
John Dickey (UTAS)
Elaine Sadler (Usyd)
Ingrid Stairs (UBC, Canada)

2 Background

2.1 The Square Kilometre Array (SKA) and ASKAP

The future of centimetre-wave astronomy lies with the Square Kilometre Array (SKA), a telescope under development by a consortium of 17 countries. The SKA will be 50 times more sensitive than any existing radio facility. A majority of the key science for the SKA will be addressed through large-area imaging of the Universe at frequencies from 300MHz to a few GHz.

The Australian SKA Pathfinder (ASKAP) is aimed squarely in this frequency range, and achieves instantaneous wide-area imaging through the development and deployment of phased-array feed systems on parabolic reflectors. This large field-of-view makes ASKAP an unprecedented synoptic telescope poised to achieve substantial advances in SKA key science. The central core of ASKAP will be located at the Murchison Radio Observatory in inland Western Australia, one of the most radio-quiet locations on the Earth and one of the sites selected by the international community as a potential location for the SKA.

ASKAP has three main goals:

- To demonstrate and prototype the technologies for the mid-frequency SKA, including field-of-view enhancement by focal-plane phased arrays on new-technology 12-metre class parabolic reflectors,
- To carry out world-class, ground breaking observations directly relevant to SKA Key Science Projects (KSPs),
- To establish a uniquely radio-quiet site for radio astronomy in Western Australia where

observations can be carried out.

2.2 ASKAP Software Instruments

An ASKAP software instrument is a mode of telescope operation that enables high quality data (and/or data products) to be placed into the archive for users to retrieve. There are two basic software instruments that will be initially provided for science operations. These are:

- A continuum software instrument to produce calibrated images with a dynamic range of at least 10^3 over the full field of view for a large fraction of the sky (possibly excluding regions of the Galactic plane and the regions around very bright extragalactic sources) over a bandwidth of 300 MHz with a modest number of frequency channels (minimum 256);
- A spectral line software instrument to produce a catalogue of HI line-emitting galaxies over the field of view for a large fraction of the sky (possibly excluding regions of the Galactic plane) over a bandwidth of 300 MHz with high spectral resolution (16 000 channels).

CSIRO will endeavour to provide subsequent software instruments but the development of these will strongly depend on scientific priorities, budget, personnel and timescales. ASKAP strongly encourages interested third parties to actively participate in the design of these instruments through interaction with the computing group. Examples of future software instrument capabilities are:

- The ability to produce calibrated (to 1 part in 10^3) polarization images over the field of view for a large fraction of the sky;
- The ability to produce dynamic range limited images (i.e. dynamic range of 10^5 or more) over the field of view for a large fraction of the sky;
- The ability to process very long integration (days, weeks) spectral line data;
- The ability to extract HI absorption spectra towards bright background sources.
- The ability to process diffuse spectral line cubes (where the emission fills the entire cube).
- The ability to detect and monitor transient and variable sources, and to generate and respond to triggers.

2.3 Key Science Projects & Teams

ASKAP is designed to be a fast survey telescope. The headline science goals for ASKAP, as outlined in the science case (Johnston et al., 2007, PASA, 24, 174), can be achieved through a number of independent, approximately 1 year long, large area surveys. It is expected that a great deal of observing time will be allocated to at least some of these large surveys. A set of Key Science Projects that are closely aligned with the large surveys and/or the headline science goals should be defined to ensure the best science outcomes with the most efficicent use of telescope time. The Key Science Projects will each have its own Key Science Team who will interact and collaborate with the ATNF and especially the ASKAP computing group. Examples of the large surveys that will achieve the headline science goals for ASKAP are:

- A ~30″ resolution shallow HI all-sky survey to detect 10^6 galaxies to z=0.2;
- A ~30″ resolution deep pencil beam HI survey to detect 10^5 galaxies to z=0.7;
- A ~5″ resolution continuum all-sky survey to detect $60x10^6$ galaxies;
- A ~30″ resolution low-surface brightness continuum all-sky survey;
- A ~2′ resolution HI all-sky survey.
- A ~2′ resolution pulsar all-sky survey.

3 Principles

The following set of operational principles is proposed within which the details of the operational plan and user policy are to be developed. Feedback on these principles is welcomed, but input on the issues detailed in Section 4 should be the focus of the User Policy Taskforce.

The operational principles that are expected to define the framework within which ASKAP is operated are:

- ASKAP telescope time will be assigned to astronomical research projects subject only to scientific merit and to technical and operational feasibility;
- No a priori guaranteed science time will be allocated to particular countries, institutions, nor to any individuals currently on existing (2008) working groups;
- ASKAP will not be a user-operated telescope; users interact with the data archives;
- CSIRO-ATNF is committed to the provision of a core set of software instruments, outlined in this document;
- Community involvement in the development of further software instruments is encouraged but CSIRO-ATNF must be the key contact;
- ASKAP data products will be available to astronomers from all over the world;
- Release of archive data will follow a suitable quality control period;
- The archive will include full data products from the software instruments.
- Parallel observing programs will be encouraged where possible;
- The anticipated lifetime of ASKAP is 30 years; although it is anticipated that its scientific functionality will be enhanced and eventually incorporated into the phased deployment of the SKA at a significantly earlier date.

4 Issues

4.1 Key Science Projects & Teams

In order for ASKAP to achieve the best science outcomes and the most efficient use of telescope time, expert Key Science Teams will be established for each Key Science Project. The Key Science Team will take the lead in designing and implementing (in close collaboration with the ASKAP computing group) the survey, and analysing the science products for each Key Science Project. A number of models for creating the Key Science Projects & Teams deserve consideration, including the following possibilities.

1) CSIRO-ATNF define the Key Science Projects based on the ASKAP science case and call for expressions of interest for Team members and leaders
2) CSIRO-ATNF define the Key Science Projects based on the ASKAP science case, allocate a Team leader for each Project and call for expressions of interest for Key Science Team members.
3) A general call for proposals for Key Science Projects is made and a "Key Science Committee" ranks them according to some criteria that may include scientific, technical merit, operational feasibility, resource management and benefit to the community (including PhDs). The proposers then form the Key Science Team.

The Taskforce is asked to provide advice on the following

- *What is the best model to create the best science?*
- *How should the Key Science Projects be defined and how should they be created?*
- *How the Key Science Team leader and members should be identified and what they should be responsible for.*
- *Whether the Key Science Teams should have any privileged access to the data, for example extended proprietary periods.*

4.2 The role of the Time Assignment Committee (TAC)

ASKAP will not be a user-operated telescope and it is anticipated that a significant fraction of

time will be allocated to time intensive large surveys during which the telescope will operate in a campaign mode requiring limited operator intervention. Some time will be allocated to less time-intensive non-campaign programs (including VLBI and 'over-ride' requests).

The Taskforce is asked to provide advice on the following:

- *The value of distinguishing between Key Science Projects and other proposals for ASKAP, and the extent to which there is value in differentiating between these categories in terms of User Policy;*
- *Whether there is value in attempting to define a priori the fraction of time to be given to Key Science Projects versus other projects;*
- *Whether Key Science Projects should be guaranteed all the time up front;*
- *If Key Science Projects should be subject to staged reviews, and if so, how such reviews should be implemented;*
- *How time-critical over-ride requests might be accommodated.*

4.3 Data archive access

CSIRO-ATNF current policy is that archived data will be available to other users on request 18 months after the date of an observation, unless a special case for an extended proprietary period is accepted by the Director or the TAC. The ATNF Director may override the release of data at his discretion.

Since users of ASKAP will not operate the telescope themselves, thereby collecting their own data, but will obtain their data from the ASKAP archive once the observations have been completed by the ATNF and the data processed and quality control effected, it may be appropriate to have different policies for access to ASKAP data.

The Taskforce is asked to provide advice on the following data access issues:

- *Should any proprietary period apply for data obtained as part of a Key Science Project? If so, how long should this be?*
- *Should all added value products from Key Science Projects be released into the archive and should they have the same proprietary period as the Key Science Project data products?*
- *Should a (different) proprietary period apply to data obtained for other science projects?*
- *Should data from the KSPs be publicly released in a staged manner? And if so how should the data release be staged, in terms of fraction of time or fraction of area?*

4.4 Commissioning and early science verification

It is anticipated that commissioning of a 6-element Boolardy Engineering Test Array (BETA) will begin in 2010 and that there will be a staged rollout of further antennas over several years until ASKAP becomes fully operational in late 2012 with the basic software instruments as described in Section 2.2. Commissioning of other software instruments will occur gradually as they come online after first light in 2012. There are plans for science verification with BETA but it will primarily be an engineering test bed. ATNF staff will be charged with science verification tests and the data will be released into the ASKAP archive (if appropriate) once adequate quality control is performed. There will not be a call for proposals for BETA although ATNF will seek user consultation regarding targets for early science verification.

The Taskforce is asked to comment on and suggest alternatives for the science verification process.

4.5 Externally provided software or hardware

CSIRO-ATNF is committed to the provision of a core set of software instruments, outlined in this document. Other hardware and software instruments could be provided by external partners, for example, fast transient hardware, software and pulsar timing machinery.

The Taskforce is asked to provide advice on whether there should be specifically different rules for access to data obtained using software (or hardware) developed in collaboration with external partners.

5 Terms of Reference

The terms of reference for the ASKAP User Policy Taskforce are as follows:

- The Taskforce will provide advice to the ATNF Director, reporting through the ATNF Deputy Director.
- The key CSIRO contact and Chair of the Taskforce will be Ilana Feain, ASKAP Project Scientist;
- Members of the Taskforce will draw on their broad expertise as astronomers and their experience with the use, administration and management of major radio and other astronomical facilities around the world;
- The Taskforce is asked to consider each of the issues raised in Section 4 of this document and to advise CSIRO on the optimal User Policy for ASKAP subject to the Principles outlined in Section 3;
- The Taskforce may choose to comment on the Principles detailed in Section 3 of this document but this is not its primary role;
- The Taskforce is asked to complete its report by 30 November 2008.

6 Timeline

6 June: ASKAP User Policy Development v3 forwarded to ATSC for comment.

18 June: Response incorporated from ATSC, proposed members of the ASKAP UP Taskforce are contacted and invited to participate.

July – September: Monthly (telecon) meetings of the ASKAP UP Taskforce are coordinated by Ilana Feain, who will provide regular updates to the ATNF Leadership Team and who will in turn provide feedback to the User Policy team and to the Taskforce.

July – September: In parallel, consultation with the astronomy community on ASKAP User Policy and operations issues will be effected through relevant forums including the Astronomical Society of Australia and the Australia Telescope User Committee.

End October: Face-to-face meeting of the ASKAP UP Taskforce.

30 November 2008: The Chair of the Taskforce will submit a report on ASKAP User Policy to the ATNF Director consistent with the principles outlined in this document and reflecting the input received from the Taskforce and the astronomy community.

February 2009: The ATNF Director will provide a proposed ASKAP User Policy to the ATSC (or the equivalent advisory body) and to the Australian SKA Coordination Committee for comment.

March 2009: ASKAP User Policy adopted by CSIRO.