



The ASKAP Early Science Program

Update to ATUC

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ASTRONOMY & SPACE SCIENCE
www.csiro.au

CSIRO acknowledge the Wajarri Yamatji people as traditional owners of the MRO site





ASKAP Survey Science Projects

Highest Priority

EMU: All-sky radio continuum survey
(*Norris*)

WALLABY: All-sky HI emission survey
(*Korbalski/Steveley-Smith*)

Also supported

CRAFT: Fast transients (*Hall*)

COAST: Pulsars (*Stairs*)

FLASH: HI absorption against continuum sources (*Sadler*)

GASKAP: Galactic HI and masers
(*Dickey/McClure-Griffiths*)

DINGO: Deep HI survey (*Meyer*)

POSSUM: All-sky polarisation survey
(*Gaensler/Taylor/Landecker*)

VAST: Variables and slow transients
(*Murphy/Chatterjee*)

VLBI: Very Long Baseline Interferometry including ASKAP (*Tingay*)

ASKAP Early Science

CASS will carry out an 'ASKAP early science' program with 12 antennas, extending this incrementally as the number of receivers increases.

- *A coherent program of observations to deliver maximum scientific value*
- *No proprietary data – ASKAP data are available to the community***
- We expect ASKAP early science to initially use ~20-50% of 12-hour nights, ramping up as more receivers are deployed.
- The *ASKAP early science plan* is being developed and refined through a community consultation process.

** In reality, data access will require accounts on supercomputer and considerable acquired expertise!

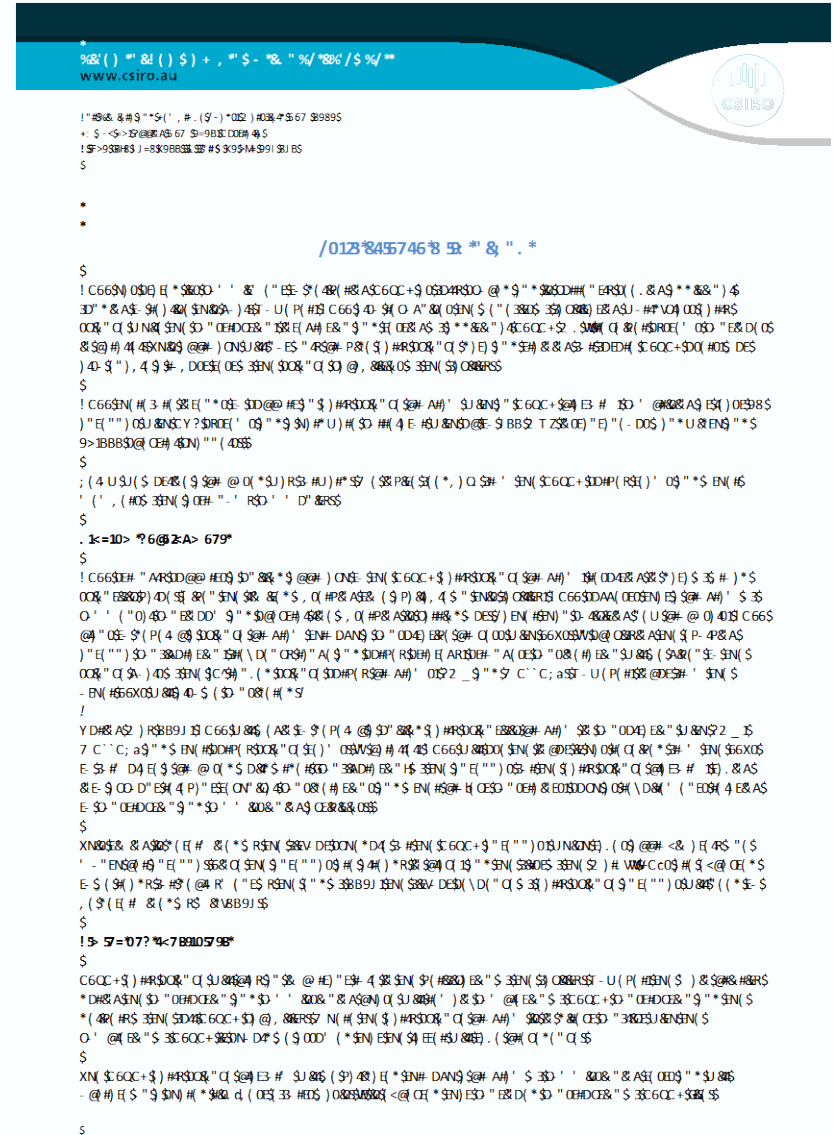
Consultation Process

May 2013: Consultation document distributed to:

- ASKAP Survey Science Teams
- Department of Innovation
- ANZSCC
- Australia Telescope User's Committee
- AT Steering Committee
- ATNF Time Assignment Committee
- Astronomy Australia Limited

May-July 2013: Face-to-face presentations to:

- Universities
- AAL
- ATUC
- ASA Annual Science Meeting



Community Workshop (August 2013)

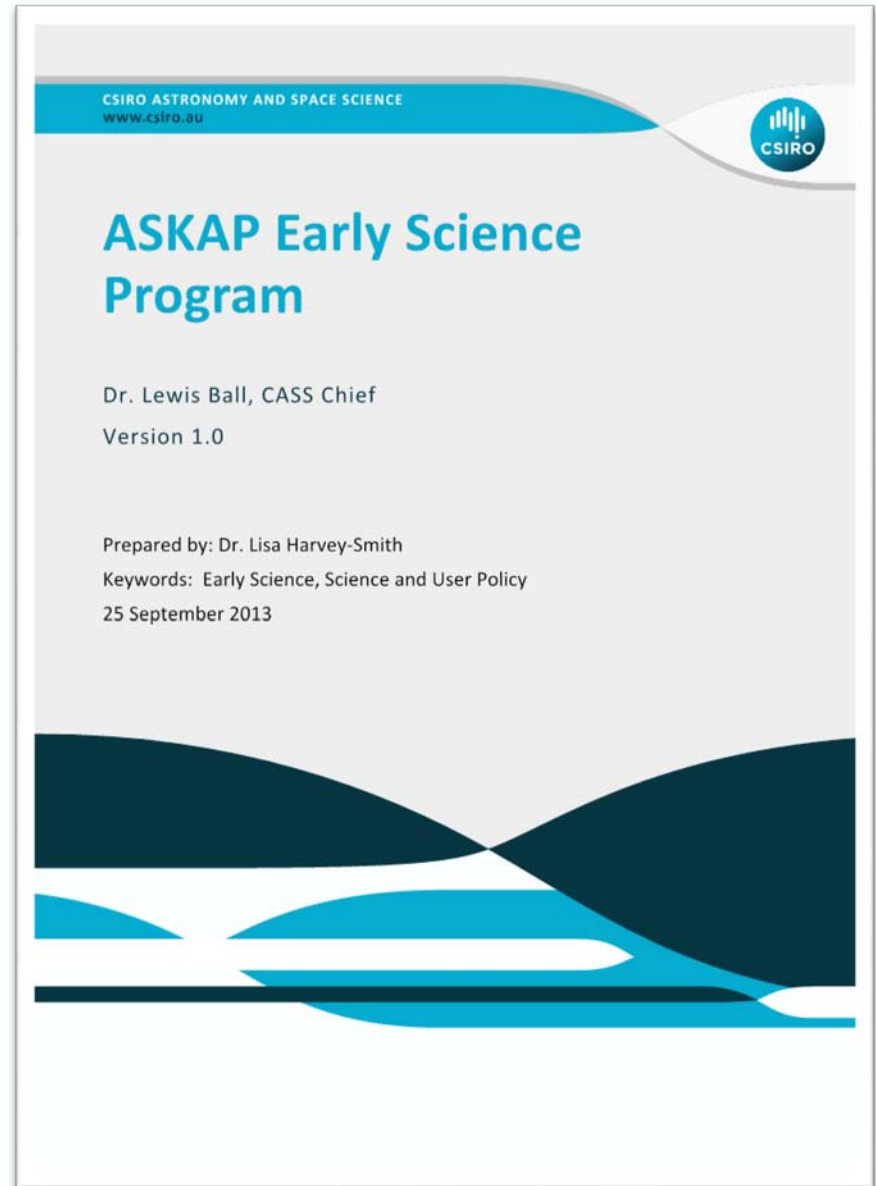


- 70 participants
- 16 talks
- 14 institutes
- 5 countries

Outcomes

ASKAP Early Science Program v1.0

Released 25th September 2013



ASKAP Early Science Program

Two major streams identified:

1. *Wide area 1 MHz and 18.5 kHz survey. IQUV, 700 -1800 MHz, 6-12 hrs*

Science: Continuum - Spectral Indices - HI absorption - Broadband Polarimetry

2. *Targeted 18.5 kHz spectral line survey, 1150-1450 MHz, 50-60 hrs/ field.*

**Science: Galaxy evolution, star formation vs. environment in local universe.
Interactions & clustering of galaxies via HI morphology & kinematics.**

Other streams to investigate:

- A deep observation (50 hrs) in 2-4 fields at 18.5 kHz resolution, 1000-1300 MHz
- Search for variables and slow transients
- Fast transient capture (not currently supported but discussions underway)



Technical Assessment

How good can we expect ASKAP-12 data to be given what we know?

- Sensitivity, PSF, confusion, dynamic range, ha/declination, weighting etc.
- What might stop us reaching desired performance?

Some questions can be answered by simulations

Others need real data and on-sky experience

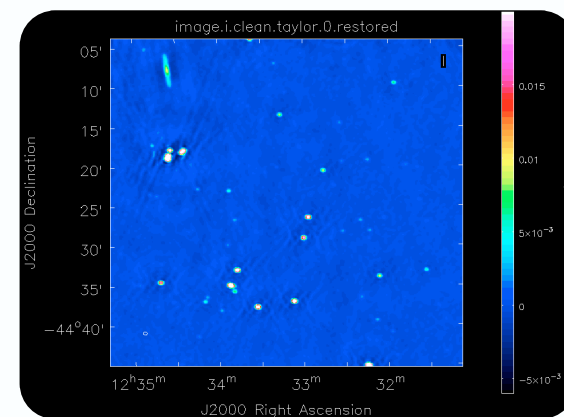
BETA commissioning will help shed light on some issues (e.g. bf & calibration)

Mk II system commissioning will inform likely performance specs.

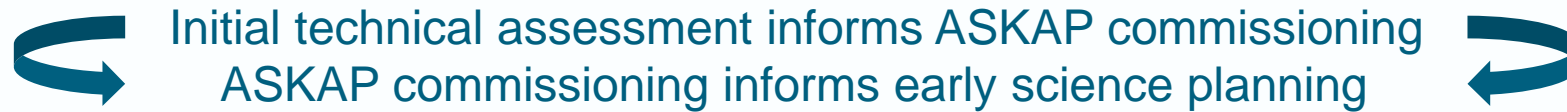
Ongoing process – ASKAP WG1 closely involved

Recent Activities

- PSF simulations for a range of declinations, integration times (Whiting)
- Simulations by Westmeier (WALLABY) that used different weighting schemes
- Classical confusion limits investigated (Heywood) for various observing times and declinations and weighting schemes
- Image simulations for a variety of declinations (Whiting)
- Simulations of receiver behaviour using MeqTrees (Heywood, ongoing)
- Simulations of dynamic range (Braun, H-S, McConnell) for ASKAP-12 given reasonable estimates of beam stability, source modeling errors, etc.
- Characterising beams (commissioning team)



Next steps



- Design pilot observations for Early Science (2014).
 - Identify suitable regions, integration time etc.
 - BETA commissioning continues throughout 2014
 - ADE deployment expected late 2014
 - What can we learn from BETA commissioning?
 - Consider initial pilot observations with 6 antennas?
- Carry out pilot observations (2014-15)
 - Work on data, somewhat iterative process
- Second ASKAP Early Science Workshop
 - Pilot results considered, inform detailed early science planning
- Early science observations begin (2015-)



Planning Effectively

- SST members working on ASKAP data need to work closely with CASS
- Secondments to ASKAP Commissioning & Early Science team (McConnell)
- ACES team (Commissioning – Science Demonstration - Early Science)

Communicating Effectively

- Streamline current ASKAP SST Working Group structure
- Currently WG4b (BETA & Commissioning), WG1 (Simulations), PI meetings, *ASKAP Commissioning Update (every 4-6 weeks, 3000+ recipients)*

Develop effective ways to:

- 1) communicate technical commissioning results to SSTs and
- 2) to plan early science pilot observations *without generating more meetings*



Summary

ASKAP Early Science Program will be carried out with ASKAP-12 (Mk II)

Community consultation began in May 2013.

Two major streams:

1. *Wide area 1 MHz and 18.5 kHz survey. IQUV, 700 -1800 MHz, 6-12 hrs*
2. *Targeted 18.5 kHz spectral line survey, 1150-1450 MHz, 50-60 hrs/ field.*

Other streams (HI deep field, fast and slow transients, to be investigated

Technical assessment underway – simulations, commissioning results

Pilot observations planned and carried out (2014-15)

Early science observations begin 2015