ASKAP Report for ATUC

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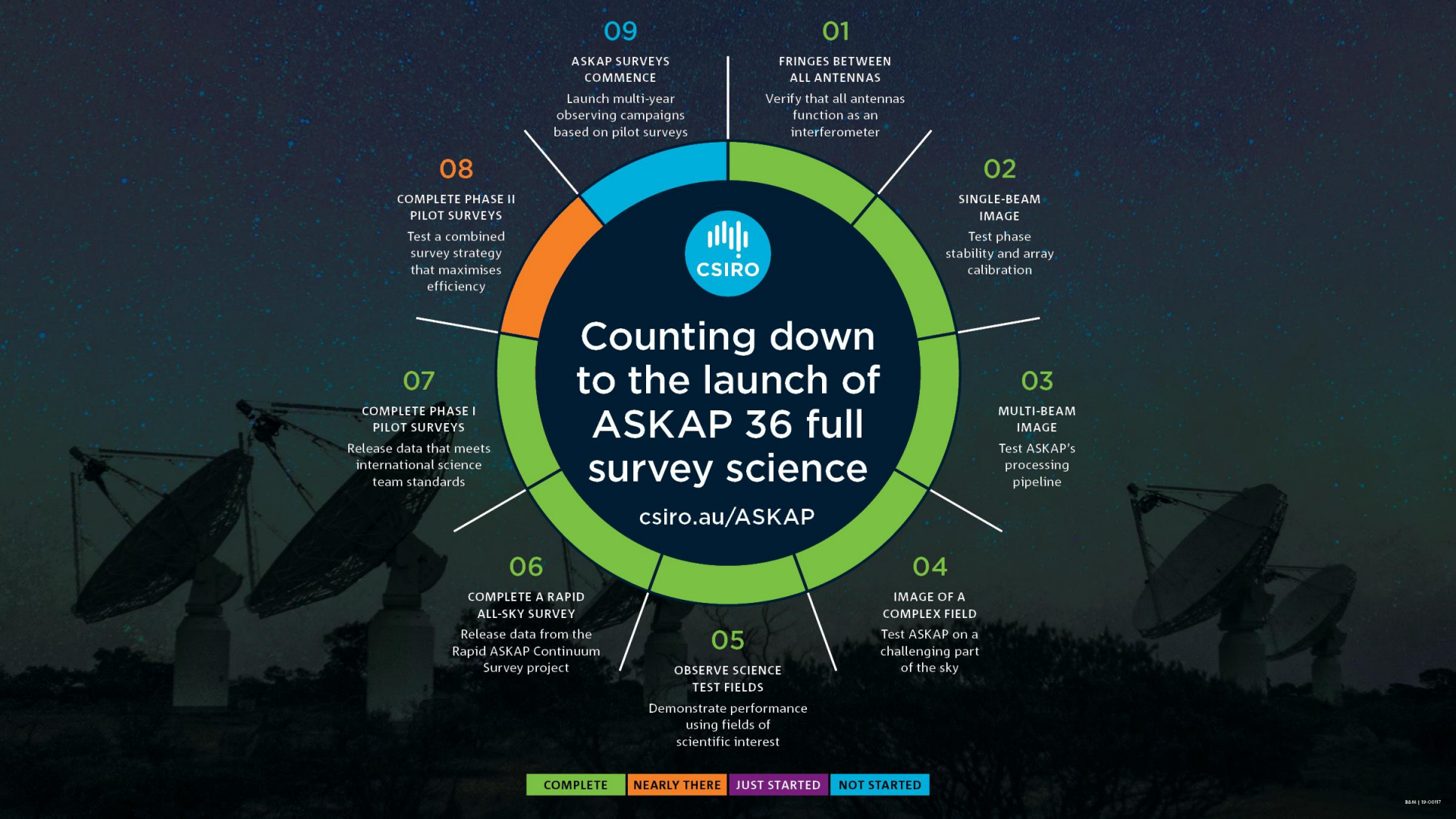
On behalf of the ASKAP team


09
ASKAP SURVEYS COMMENCE
Launch multi-year observing campaigns based on pilot surveys
01
FRINGES BETWEEN ALL ANTENNAS
Verify that all antennas function as an interferometer
08
COMPLETE PHASE II PILOT SURVEYS
Test a combined survey strategy that maximises efficiency
02
SINGLE-BEAM IMAGE
Test phase stability and array calibration
CSIRO
Counting down to the launch of ASKAP 36 full survey science
csiro.au/ASKAP
07
COMPLETE PHASE I PILOT SURVEYS
Release data that meets international science team standards
03
MULTI-BEAM IMAGE
Test ASKAP's processing pipeline
06
COMPLETE A RAPID ALL-SKY SURVEY
Release data from the Rapid ASKAP Continuum Survey project
04
IMAGE OF A COMPLEX FIELD
Test ASKAP on a challenging part of the sky
05
OBSERVE SCIENCE TEST FIELDS
Demonstrate performance using fields of scientific interest
COMPLETE
NEARLY THERE
JUST STARTED
NOT STARTED

Timeline for 2022

- Key activities for this year include:
  - Complete Pilot Surveys Phase II in April (observing, processing and archiving)
  - Assessing, planning and conducting consolidation work to prepare for full surveys
  - Commissioning Setonix for full-scale ASKAP survey processing
  - Developing actionable survey plans in collaboration with the SSTs

- Planning to begin full surveys by the end of October 2022
  - Based primarily on Setonix availability and Galaxy decommissioning timeline
  - Depends on many uncertain factors including consolidation progress
  - Expecting a ramp-up towards 70% on-sky efficiency once we're underway

Consolidation and survey efficiency

- Pilot Surveys have tested data quality and workflows
  - Most SSTs have experience with survey operations, but at low-volume
- Maintaining 70% on-sky efficiency for 5 years will be difficult
  - Need > 2x processing speed-up from Setonix (which is expected)
- Several outstanding system reliability issues need to be addressed
  - Consolidation effort required between May and October
- Data quality is marginal in areas with bright sources or extended emission
  - Continuous software improvement will be necessary throughout surveys

ASKAP and the ATNF community

- Key questions for ATUC
  - What is the best process for managing guest science proposals?
  - How can we best support/encourage community awareness and uptake of observatory projects such as RACS?
  - How can we help the community (both inside and outside the SSTs) make prompt and effective use of ASKAP survey data?

Science Operations

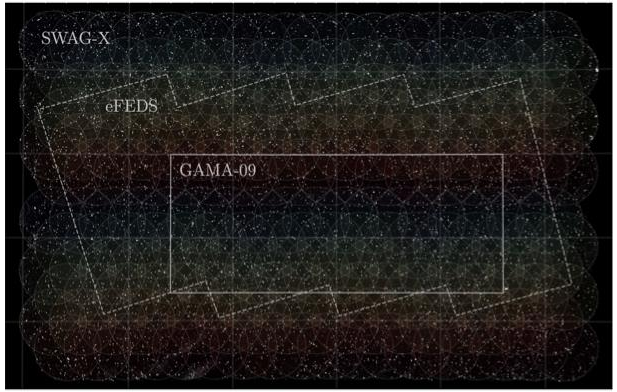
Vanessa Moss

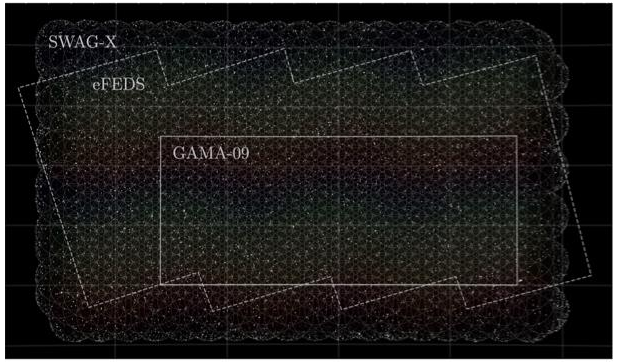
Phase II observation status

CRAFT: 56.67 of 56.67 hr (1.00)
DINGO: 45.10 of 153.30 hr (0.29)
EMU: 137.40 of 155.40 hr (0.88)
FLASH: 100.00 of 100.00 hr (1.00)
GASKAP-HI: 80.00 of 90.00 hr (0.89)
GASKAP-OH: 12.00 of 112.00 hr (0.11)
POSSUM: 60.00 of 60.00 hr (1.00)
VAST: 100.40 of 100.40 hr (1.00)
WALLABY: 96.00 of 96.00 hr (1.00)
Total: 760.32 of 923.77 hr (0.82)

SWAG-X DR1 available on CASDA

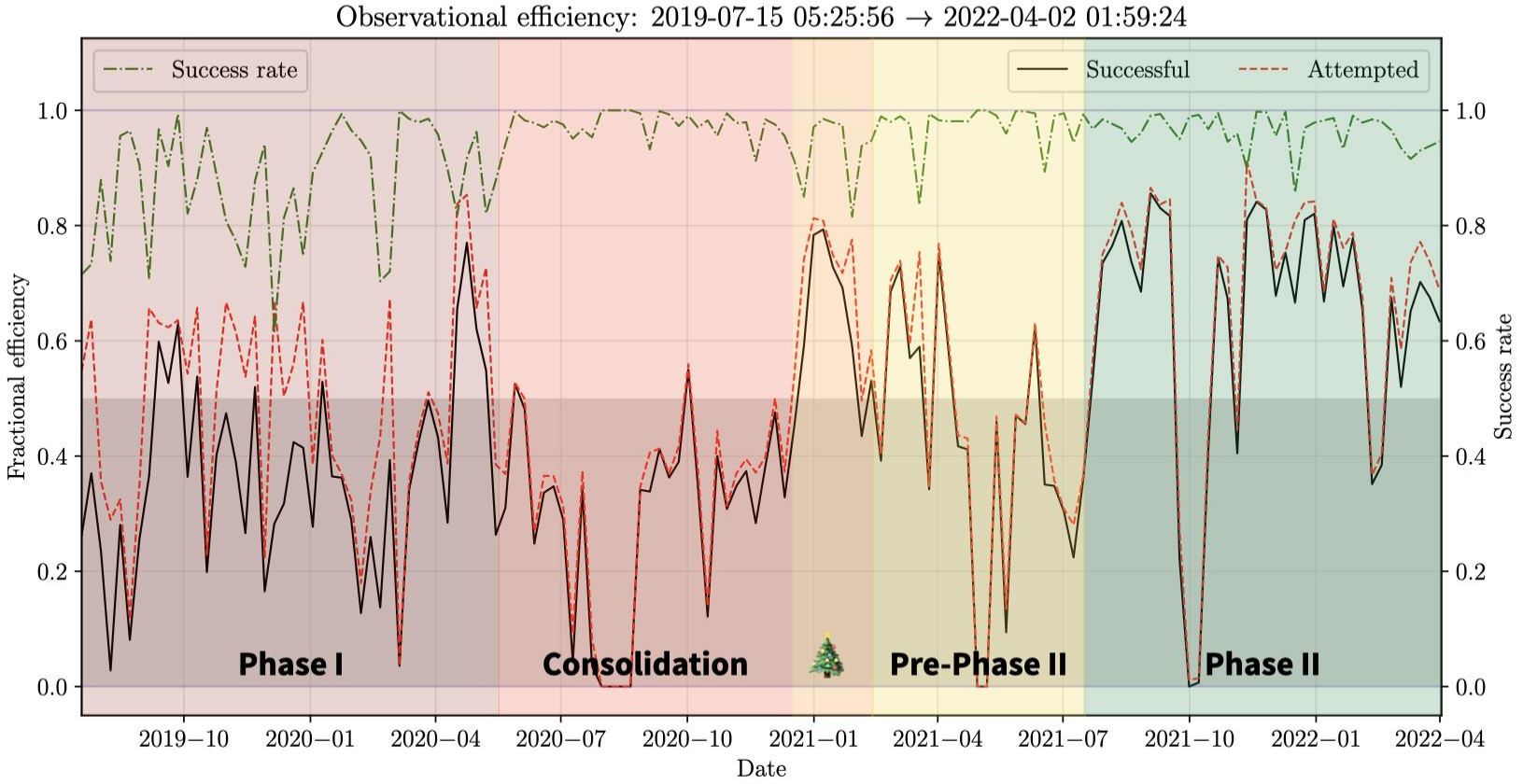
- **SWAG-X DR1** released as of **2022-01-12**, with announcements via AAL, CASDA and CSIRO
- This release includes **12/24 of the total fields**, 6 fields at 888 MHz and 1296 MHz, representing half of the total SWAG-X integration time
- Data released includes **continuum and full-resolution data**, as well as spectra towards bright continuum sources
- The remaining 12 fields are observed but not yet processed - aiming to release **later in 2022**
- Data release paper: **Moss et al (in prep)**





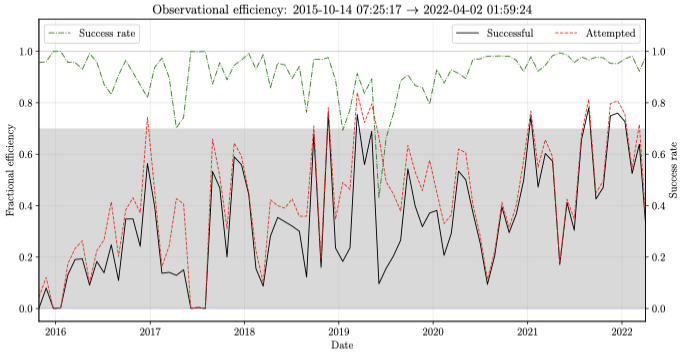
IMAGES: V. MOSS/E. LENC

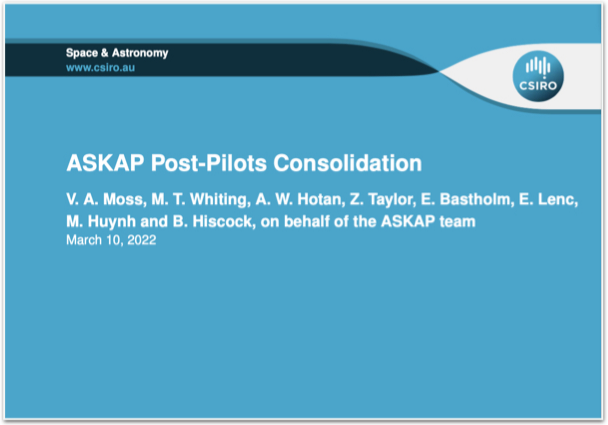
From Pilots to full ASKAP Surveys



Post-Pilots consolidation plan

- Pilot Surveys Phase I/II have been critical for **informing the transition** from commissioning to operations for ASKAP
- Post Phase I consolidation period enabled a successful jump in **efficiency** and **success rate**
- There are still many steps in the operational workflow that are **inefficient** or **unreliable**, resulting in lower data quality than required
- We are currently finalising a document to summarise the **required work prior to full surveys start** in order to maintain a chance at 70% survey efficiency over the survey period





IMAGES: SAURON, V. MOSS

Expected timeline*

✓ **Dec 2020** — intensive Christmas observing period

✓ **Jan 2021** — call for submission of technical tests
+ assessment of ASKAP's readiness for Phase II

✓ **late Jan 2021** - technical test observations begin

✓ **Feb 2021** - call for submission of quality gate observations

✓ **Mar 2021** - quality gate observations begin

✓ **Jul 2021** - Pilot Surveys Phase II begins

🔄 **Apr 2022*** - Pilot Surveys Phase II ends (tbd)

🔄 **May 2022*** - Post Pilots consolidation begins (tbd)

🔄 **Oct 2022*** - Full ASKAP surveys begin (tbd)

Data Operations

Matt Whiting

Pilot Survey Processing

Processing for Pilot Phase 2 surveys well advanced:

- Running more efficiently than phase 1, with generally faster turnaround
- Several teams have all processing completed
- Some with small numbers of fields outstanding
- Working with remaining teams to define final aspects of processing

Still some challenges that impact performance & throughput:

- Managing data flow from ingest disks to processing
- Managing available disk space in processing area
- Occasional compute node failures

Development in consolidation phase

Following pilot surveys, planning a range of features for development:

- Sky model integration & peeling support
- Improved commensal-processing support within pipeline
- Better integrated rapid-mode processing
- Joint imaging (wait for Setonix before implementing at Pawsey)
- Data quality monitoring and checkpointing within pipeline
- Larger degree of pipeline automation
- Setonix migration (next page...)

Setonix Migration

- Setonix Phase 1 Specs – relevant to ASKAP
  - 500+ AMD “Milan” CPU nodes (128 cores, 256 GB/node)
  - 8 High-Mem AMD CPU nodes (128 cores, 1 TB/node)
  - 14 PB Lustre scratch file system
- ASKAP estimated allocation (150 – 180 CPU nodes) – no high-memory node at the start
- Access for ASKAP Software Developers expected at the ***end of April*** – Full migration will run for ~6 months
- Benchmarking on Joey, single beam (Joey, 4 CPU/nodes) : >1.3x speed-up for continuum imaging (2nodes/beam), >1.7x for spectral imaging (3 nodes/beam)
- Next Steps:
  - Continuing testing on Joey – containers, continuum cube, continuum subtraction, linmos, selavy, fast imaging (RACS)
  - Preparing for full scale testing on Setonix Phase 1 – look at whole-of-pipeline efficiency

ASKAP projects at Pawsey & user accounts

- Looking to consolidate ASKAP projects at Pawsey to focus more on operational needs
  - Cut back 'askap' project from >200 members to just those directly involved in operational work
- There is a Magnus project 'ja3' that provides compute resources for particular post-processing projects, covering all ASKAP science teams
- Pawsey are retiring the /group filesystem, in favour of the new *Acacia* object store – science team data will be affected

The Rapid ASKAP Continuum Survey

Stefan Duchesne

The Rapid ASKAP Continuum Survey (RACS)

- Observatory-run project with a goal to:
  1. Provide a quick sky survey for general science use
  2. Create a global sky model for calibration of future ASKAP* observations
  3. Test ASKAP systems and processing techniques on a large scale (e.g., holography for primary beam corrections)

- Covering the entire ASKAP frequency coverage from ~ 800 to 1700 MHz in three bands

*And other instruments such as the MWA

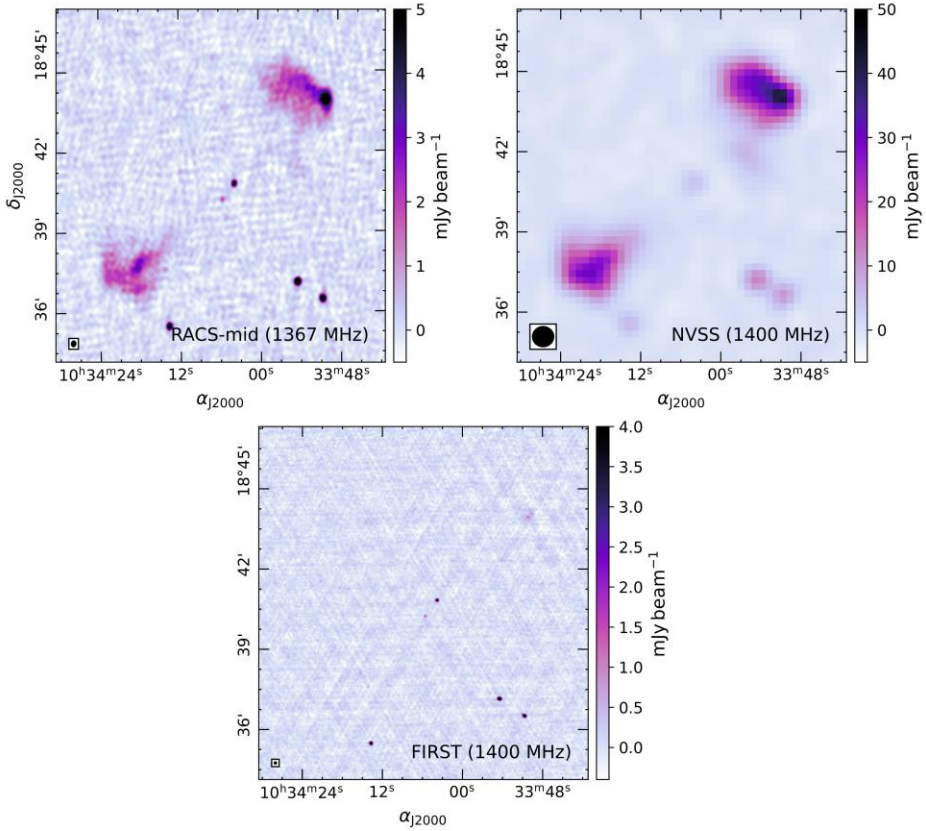
RACS-LOW (888 MHz)

- First release completed in 2020; images and survey description: McConnell et al. (2020)
- Combined catalogue soon after: Hale et al. (2021)

- So far included in science ranging from
  - High-redshift radio sources (e.g., Luca et al. 2022)
  - Variability of peaked spectrum sources (e.g., Ross et al., 2022)
  - Giant radio galaxy catalogues (e.g., Andernach et al. 2021)
  - Radio emission in galaxy clusters (e.g., Duchesne et al. 2021,2022)

RACS-MID (1367 MHz)

- Full survey covers the sky South of decl. = +46
- Ready to upload to CASDA in the coming weeks
- Cataloguing underway – preliminary source counts at >3M sources
- Survey and catalogue description paper in preparation for finer details



RACS-HIGH (1632 MHz) and more RACS-LOW

- Full sky (decl. ≤ +46) observed for RACS-HIGH
- First pass of survey processed for testing purposes
- Work being done to understand the application of holographic measurements for primary beam correction

- Second epoch of RACS-LOW observing underway
- Further epochs of RACS-MID and HIGH also likely