ASKAP Operations

Current progress on the path to full surveys

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#TFOM

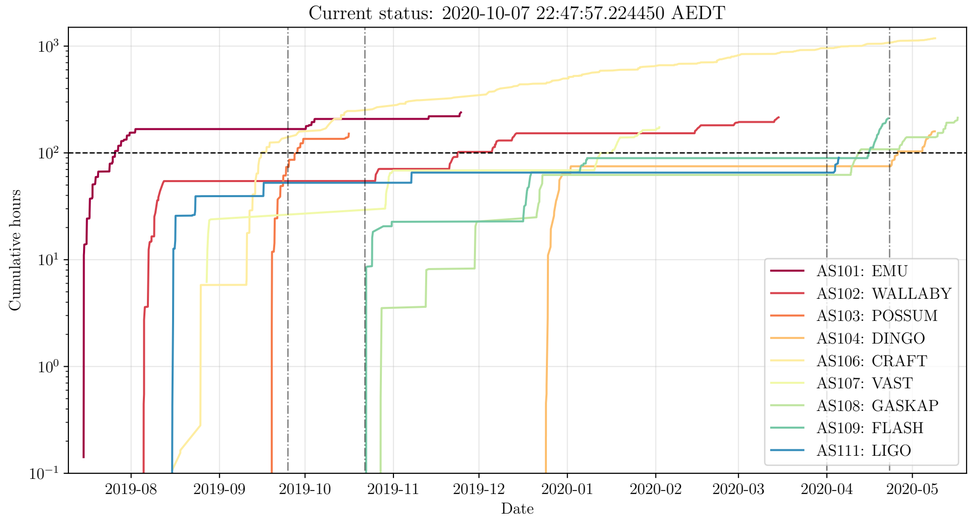
IMAGE CREDIT: A. CHERNEY

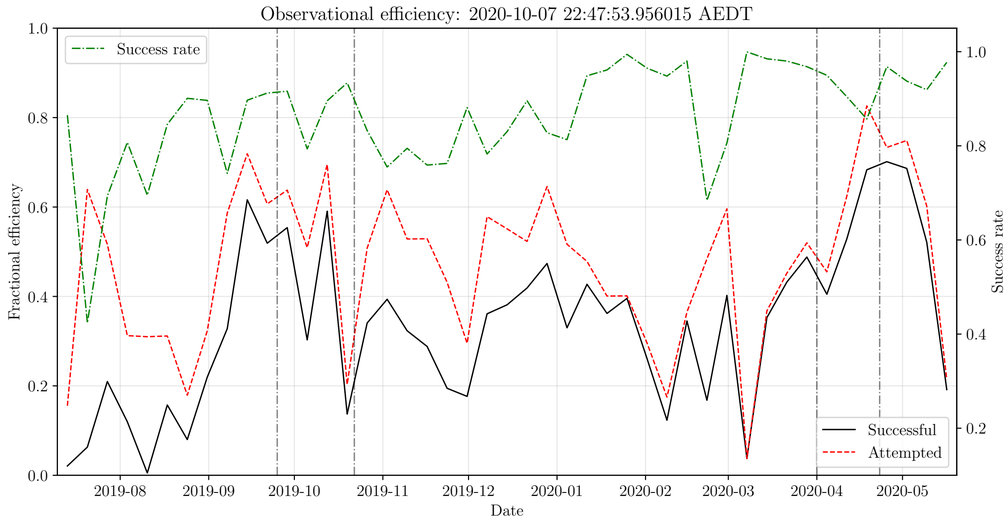
Overview of this talk

- **Pilot Surveys Phase I** complete as of May 2020, followed by a 6 month **consolidation** period
- Consolidation focused on adding features while improving robustness, stability and automation
- Science operations re-commenced officially at the end of 2020 with the **Christmas period**
- This period marked the start of automated and largely autonomous scheduling with **SAURON**
- Phase II is operationally focused on preparing ASKAP for **full-survey observations**
- **Guest science** requirements to be determined

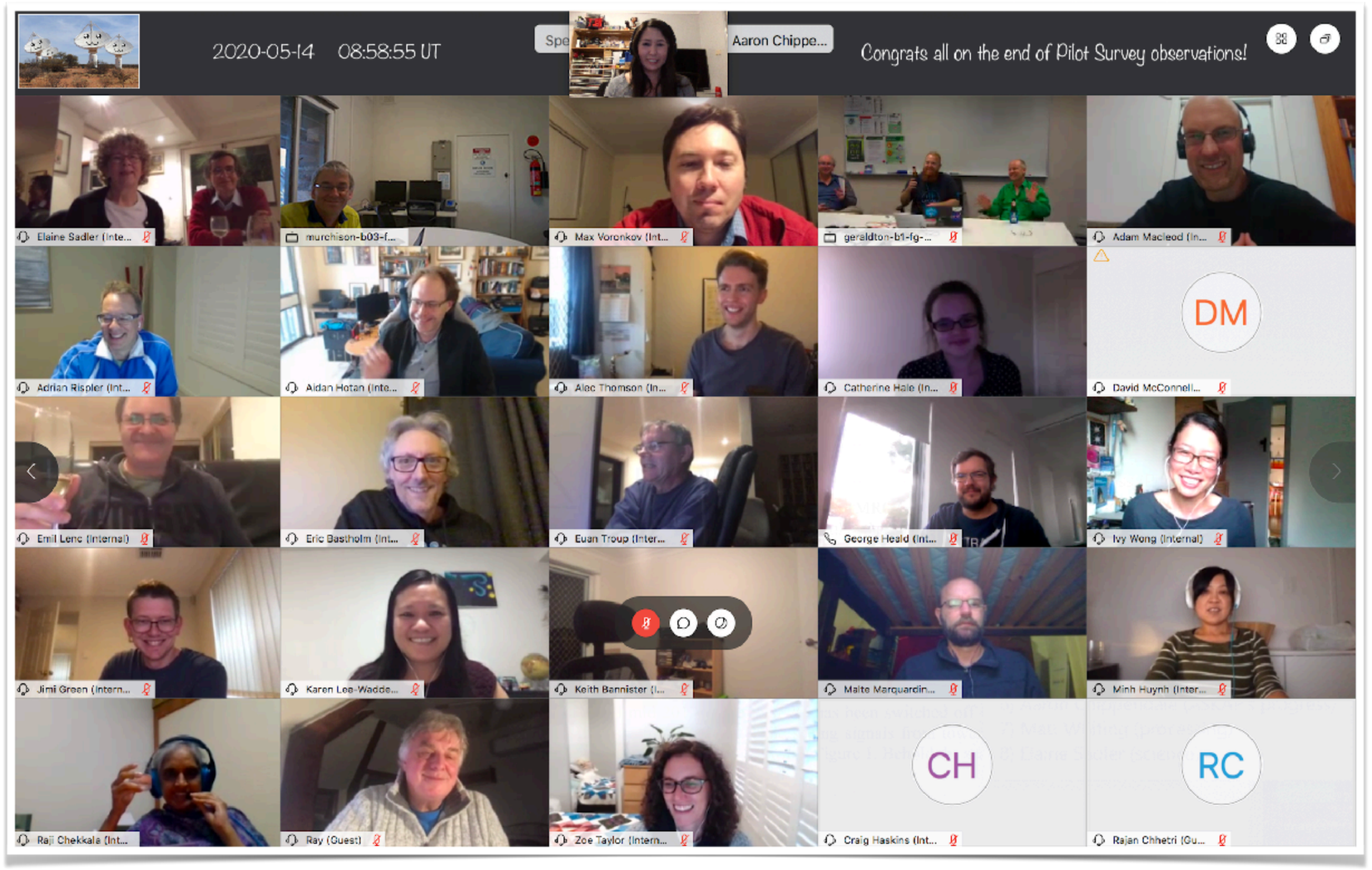
Pilot Surveys Phase I

- **Pilot Surveys Phase I:** July 2019 to May 2020
- Marked the **beginning** of the transition from commissioning to science operations, which is ongoing until full survey operations start
- Made clear the **requirements** needed to meet science goals, in terms of observations, processing and streamlined operations - leading into the **consolidation period**
- **50%** observing efficiency over the Phase I period, **36%** in terms of successful observing
- See: https://confluence.csiro.au/display/AKUP/Documents for the **Phase I report**



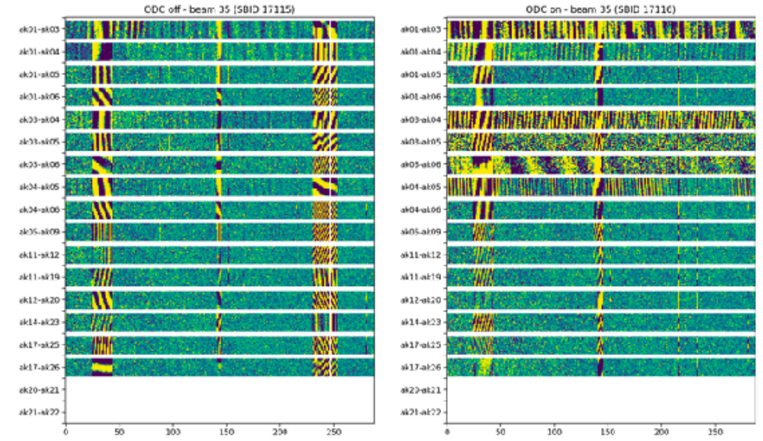


Pilot Surveys Phase I



Consolidation period

- Ran from **May to December 2020**, with testing, development and maintenance given the highest priority in terms of telescope access
- **Highlights during this period** included: weightsarchive, auto-array startup, weights calculation improvements, fringe rotator fixes, transition to new Ruby ingest cluster*, increased automation and stability, bandpass smoothing and integration of QA in ASKAPsoft
- **ASKAP commensality workshop** helped to prioritise Phase II development needs for SSTs
- **Preventative maintenance** took place to get array prepared for Phase II survey operations



ID	footprint	pitch	rotation	band	skyfreq	res	ants	method
209	boresight	0.0	0.0	1200	864.5	0	35	AntennaWeightsUpdater
210	square_6x6	1.05	45.0	1200	864.5	0	35	AntennaWeightsUpdater
211	boresight	0.0	0.0	1200	864.5	0	34	AntennaWeightsUpdater
212	boresight	0.0	0.0	1200	864.5	0	36	AntennaWeightsUpdater
213	boresight	0.0	0.0	1200	864.5	0	36	AntennaWeightsUpdater
214	square_6x6	1.05	45.0	1200	864.5	0	36	AntennaWeightsUpdater
215	boresight	0.0	0.0	1200	832.5	0	36	AntennaWeightsUpdater
216	square_6x6	1.05	45.0	1200	832.5	0	36	AntennaWeightsUpdater
217	boresight	0.0	0.0	1200	832.5	0	36	AntennaWeightsUpdater
218	square_6x6	1.05	45.0	1200	832.5	0	36	AntennaWeightsUpdater
219	boresight	0.0	0.0	1200	920.5	0	36	AntennaWeightsUpdater
220	closepack36	0.9	45.0	1200	920.5	0	36	AntennaWeightsUpdater
221	boresight	0.0	0.0	1200	920.5	0	35	AntennaWeightsUpdater
222	closepack36	0.9	45.0	1200	920.5	0	35	AntennaWeightsUpdater
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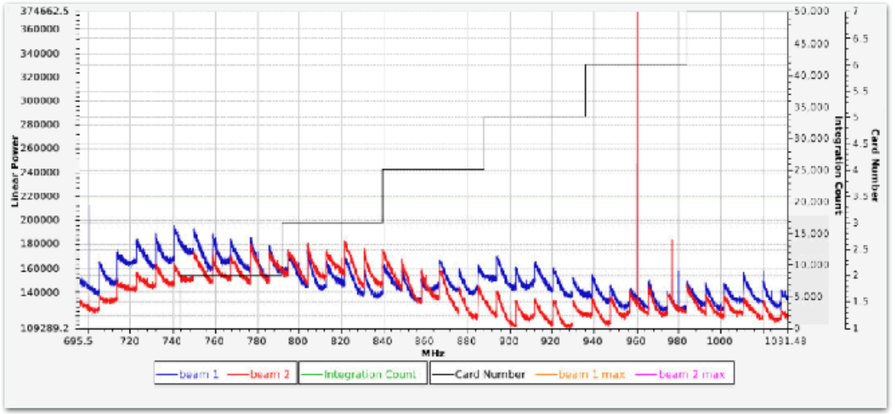
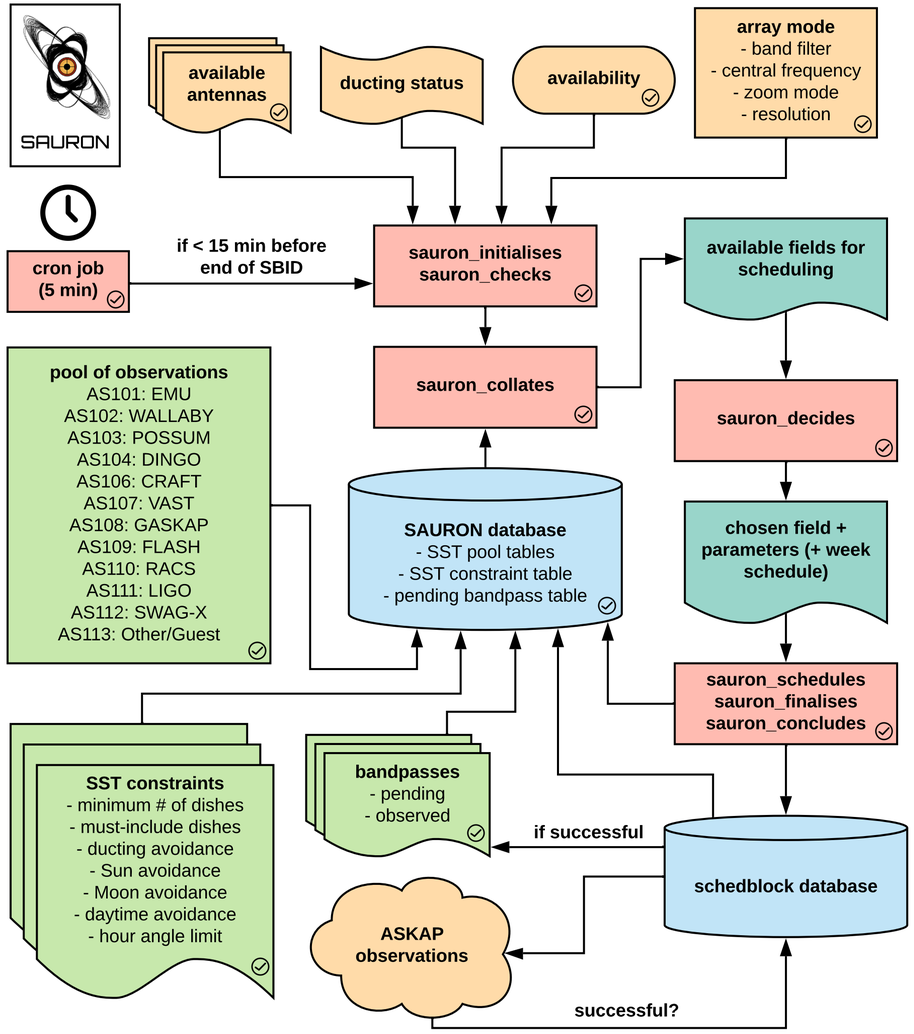


IMAGE: E. LENC, VNC/CSS

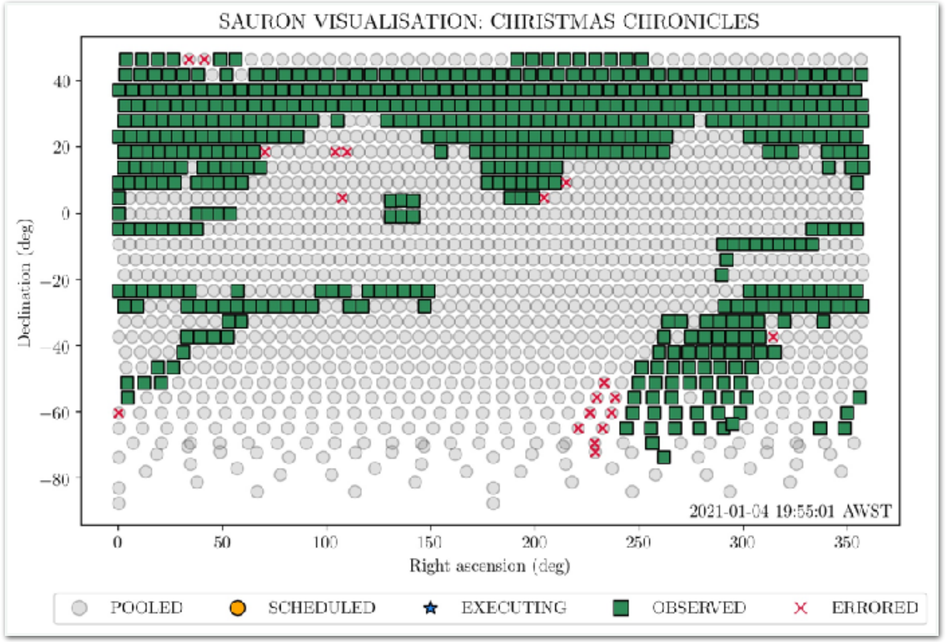
Development of SAURON

- ASKAP as a survey instrument requires **remote management** that is also reliable and efficient
- Radio observatories around the world used the **operator** model, while historically ATNF did not
- A unique opportunity to explore, define and demonstrate **next-gen telescope operations**
- **SAURON:** Scheduling Autonomously Under Reactive Observational Needs
- Operating ASKAP in this way is possible thanks to improvements in **stability**, **robustness** and **automation** as part of the consolidation period
- Development and improvement is **ongoing**

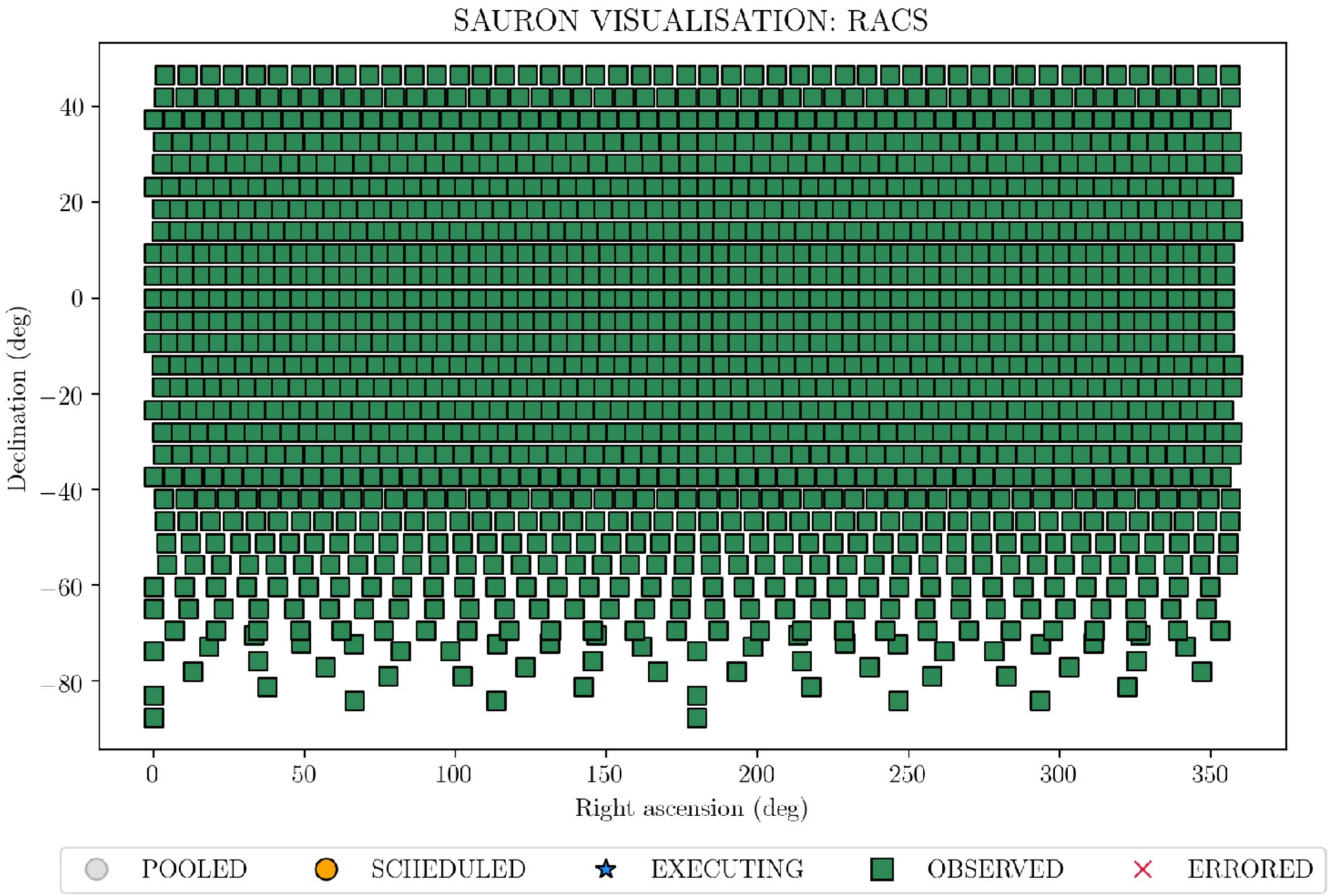


The Christmas period

- Ran **18th Dec 2020 till Jan 4th 2021** (power outage delayed the true start till 21st Dec)
- First "roadtest" of the telescope system **post-consolidation** and SAURON for scheduling
- Simplified observational pool: **RACS-MID**, **SWAG-X** and **CRAFT** filler over this period
- Overall this was a very successful period of observing - an **80%** efficiency in observing with a **95%** success rate (manually adjusted to **90%**)
- Improvements to the telescope system boosted the **success rate**, and autonomous scheduling raises the **on-sky efficiency** of the telescope

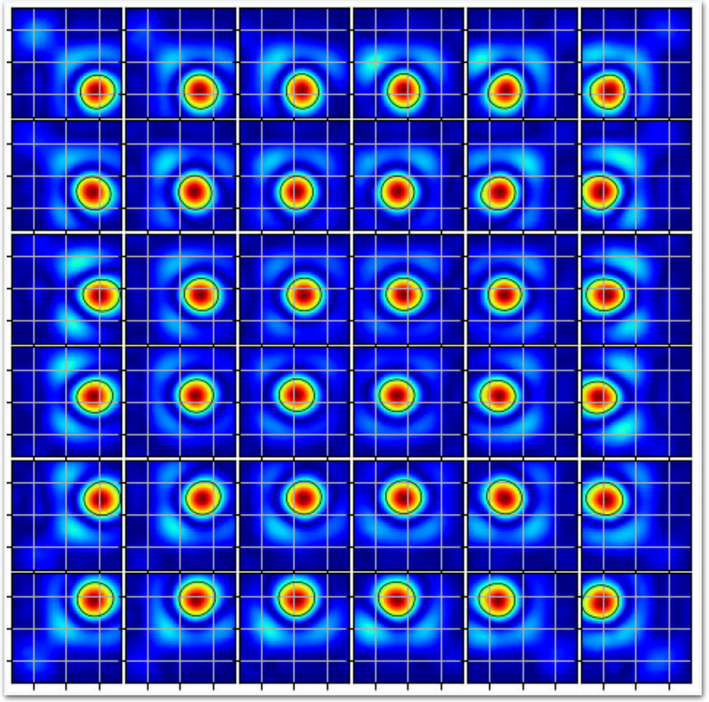


	$f_{attempt}$	$f_{success}$	$\mu_{attempt}$	$\mu_{success}$	η_f	η_μ
Phase I $_{all}$	0.502	0.358	0.487	0.349	0.713	0.716
Phase I $_{surveys}$	0.394	0.290	0.382	0.282	0.737	0.739
SAURON $_{all}$	0.830	0.785	0.824	0.777	0.946	0.943
SAURON $_{surveys}$	0.823	0.780	0.816	0.772	0.948	0.946


SAURON VISUALISATION: RACS
Declination (deg)
40
20
0
−20
−40
−60
−80
0
50
100
150
200
250
300
350
Right ascension (deg)
POOLED
SCHEDULED
EXECUTING
OBSERVED
ERRORED

The path to Phase II

- **Technical tests** were established to ensure that the telescope was prepared for ASKAP SSPs
- **Quality gates** are the first field/s of a Phase II survey which can be iterated on in order to streamline the SST processing workflow
- **Phase II fields** follow the successful release of the preceding quality gate/s for a given SST
- Some **Phase I** and **SWAG-X** data is pending, and is intended to fit in alongside quality gates
- So far, we have actioned **VAST** and **WALLABY** quality gates, plus **GASKAP**, **FLASH**, **EMU** and **POSSUM** technical tests



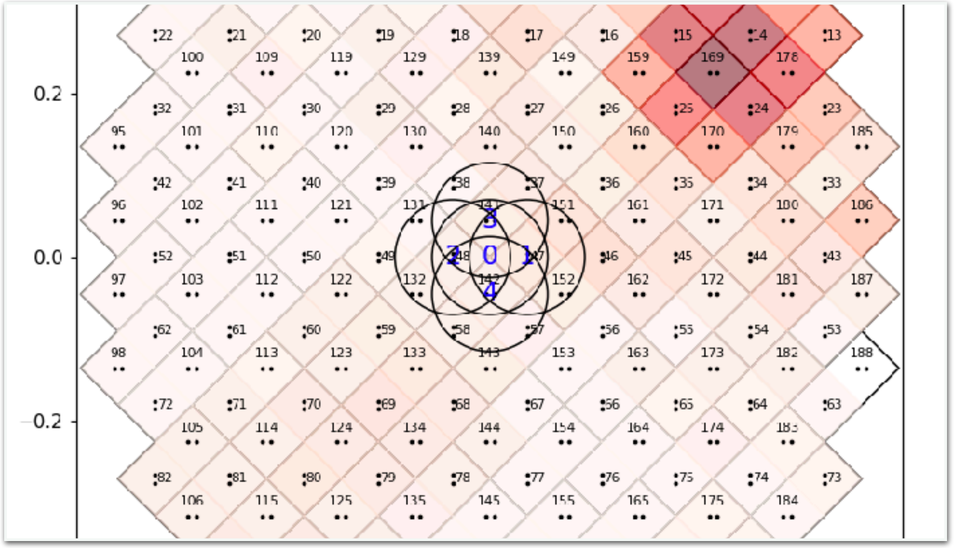


IMAGE:A.HOTAN, A.CHIPPENDALE

The path to Phase II

Survey	Code	Phase I DOI confirmed?	Technical tests submitted?	Technical tests finalised?	Observing strategy finalised?	All team data cleared from askapbuffer?	All quality gate/s submitted?	All of Phase II submitted?	
EMU	AS101	Y	Y	P	P	N	Y	P	QUALITY GATES CAN PROCEED
WALLABY	AS102	Y	N/A	N/A	Y	Y	Y	Y	
POSSUM	AS103	?	P			N			
DINGO	AS104	N	N/A	N/A		N	Y	Y	
CRAFT	AS106	N/A	?			Y			
VAST	AS107	Y	N/A	N/A	Y	Y	Y	Y	
GASKAP-HI	AS108	?	?			N			
GASKAP-OH	AS108	?	Y	P		N			
FLASH	AS109	N	Y	P		N			

survey	sst	min_total	min_inner	min_outer	must_dish	ducting_avoidance	sun_avoidance	moon_avoidance	planet_avoidance	day_avoidance	sun_riseset_avoidance	ha_limit	cal_ha_limit	epoch_offset_tolerance	epoch_window
EMU	AS101	32	5	5		TRUE	0-40|90-135	0-10	0-10	FALSE	TRUE		5		
EMU_NORTH	AS101	32	5	5		TRUE	0-40|90-135	0-10	0-10	FALSE	TRUE		5		
EMU_SOUTH	AS101	32	5	5		TRUE	0-40|90-135	0-10	0-10	FALSE	TRUE		5		
WALLABY	AS102	33	5	5		FALSE	0-40|90-135	0-10	0-10	FALSE	FALSE		5		
WALLAMU	AS102	33	5	5		FALSE	0-40|90-135	0-10	0-10	FALSE	FALSE		5		
WALLAKAP	AS102	33	6	3	1,2,3,4,5,6	FALSE	0-40|90-135	0-10	0-10	FALSE	FALSE		5		
POSSUM	AS103	32	6	5	1,2,3,4,5,6	TRUE	0-40|90-135	0-10	0-10	TRUE	TRUE		5		
DINGO	AS104	33	5	5		FALSE	0-40|90-135	0-10	0-0	FALSE	FALSE		5		
CRAFT	AS106	12	0	5		FALSE	0-10	0-0	0-0	FALSE	FALSE		5		
VAST	AS107	30	0	0		TRUE	0-10	0-10	0-0	FALSE	FALSE	1	5	5	3
GASKAP-HI	AS108	33	6	5	1,2,3,4,5,6	FALSE	0-40|90-135	0-10	0-0	FALSE	FALSE		5		
GASKAP-OH	AS108	30	0	0		FALSE	0-40|90-135	0-10	0-0	FALSE	FALSE		5		
FLASH	AS109	32	0	0		TRUE	0-10	0-0	0-0	FALSE	FALSE	4	5		
RACS-LOW	AS110	30	0	0		FALSE	0-10	0-10	0-0	FALSE	FALSE	1	5		
RACS-MID	AS110	30	0	0		FALSE	0-10	0-10	0-0	FALSE	FALSE	1	5		
RACS-HIGH	AS110	30	0	0		FALSE	0-10	0-10	0-0	FALSE	FALSE	1	5		
LIGO	AS111	30	0	0		FALSE	0-10	0-10	0-0	FALSE	FALSE		5		
SWAGX-LOW	AS112	32	5	5		TRUE	0-40|90-135	0-10	0-10	FALSE	FALSE		5		
SWAGX-HIGH	AS112	33	5	5		FALSE	0-40|90-135	0-10	0-10	FALSE	FALSE		5		

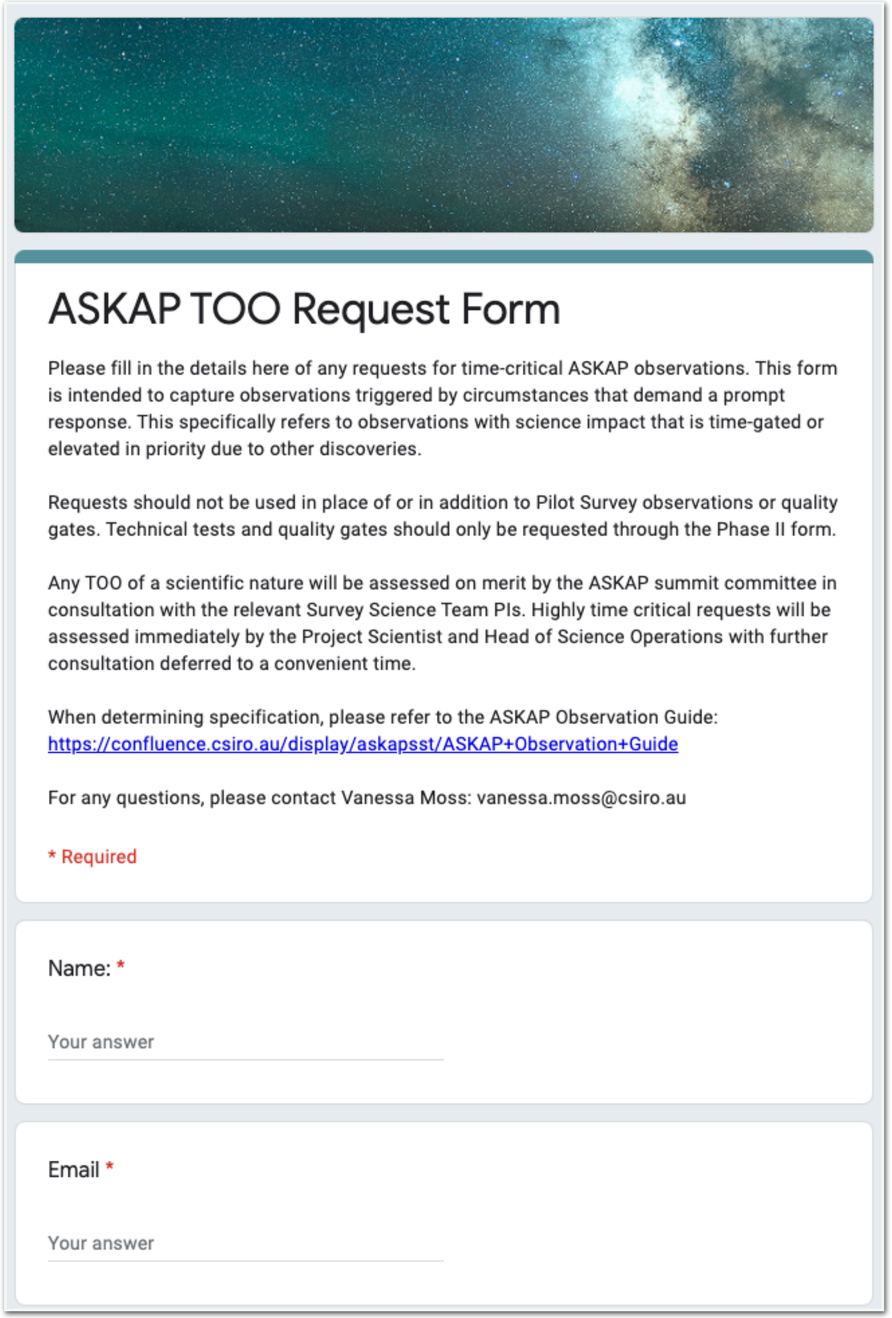
Expected outcomes of Phase II

- Each SST will have at least **100 hr of science-ready data** to distribute within team
- ASKAP will have conducted the observations with a **minimum of 40%** efficiency
- Any **further development** required prior to starting full surveys will be clear and defined
- Data will be processed **within a week** of being observed with more automated workflows
- Phase II technical workflows will provide a **definitive blueprint** to scale for full surveys
- Useful input feeds into **RASSP** where feasible

IMAGE: V.MOSS, PAWSEY

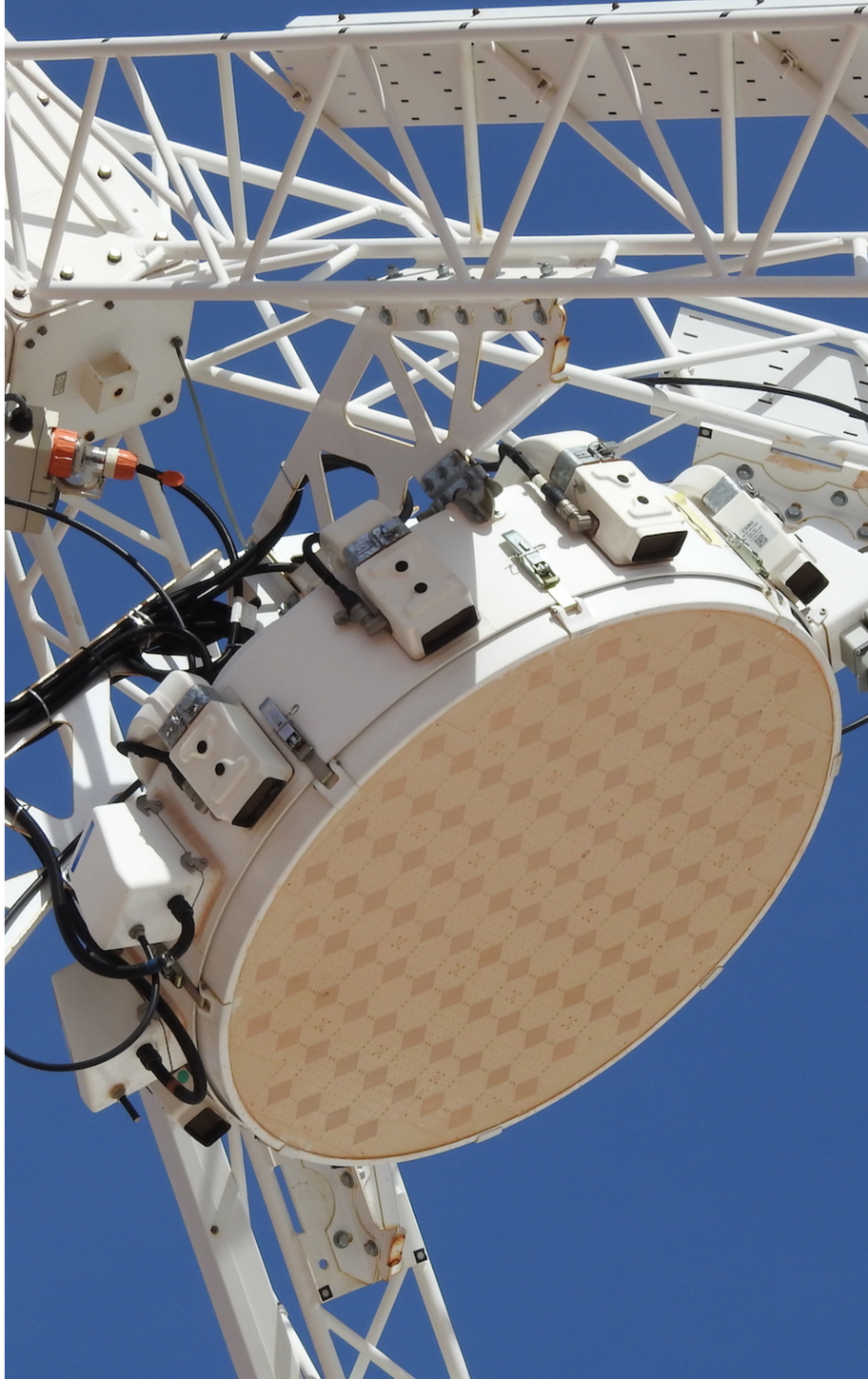
Time-critical TOOs

- See: https://tinyurl.com/askaprequest
- TOOs should only be submitted if they can be **associated** with an existing ASKAP survey/s
- **Communication** regarding TOO requests will be sent to the person who submits the TOO, plus the associated PIs of the relevant survey/s
- TOOs will be actioned on a **best efforts basis**, with priority determined by an internal committee based on comparison with the existing observation pool
- It is expected that the ability to support TOOs will **drop** once Phase II starts in earnest



Guest science

- There are **no existing structures** for guest science yet, but this will be put in action as part of the path towards full survey operations
- Previous ATUC meeting indicated a **planned cap of 10%** for guest science proposals
- Guest science will likely tag along with the **existing ATNF semesters** e.g. Apr/Oct
- **Existing ASKAP SST science parametrisation** is likely to be sufficient to cover guest science needs, but need input from the community on whether there might be exceptions to this
- **ATUC/community feedback** requested



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

🔄 **Apr 2021** - Pilot Surveys Phase II begins

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Sep 2021* - Pilot Surveys Phase II ends (at latest)

Questions for the community

- Is the current process of **specification** for surveys meeting the needs of the SSTs?
- In what ways could **observational status** be better communicated to SSTs and beyond? Are there other things needing communicating?
- Does the current means of **supporting TOOs** meet the needs of the community?
- Is there an expectation that **guest science** may have different observational requirements?
- Is there interest in **educational opportunities** for the community in ASKAP operations, and if so, what form might these usefully take?

IMAGE: UGC 6945, NASA/ESA