Early SKA science and community involvement


Image credit: SKAO

Kristine Spekkens

Queen's / 🍁 SKA Science Director

The telescopes being built:

Slide/image by SKAO

SKA-Low

257
Stations

Up to **48**
station beams

Up to **1440**
substations

74 km
Max Baseline

AA*

Up to **16** subarrays, commensal Observations
Two telescopes, frequency coverage of 50 MHz and 15.4 GHz

Continuum | Spectral Line | Pulsar Timing | Pulsar Search | Transient Buffer | VLBI

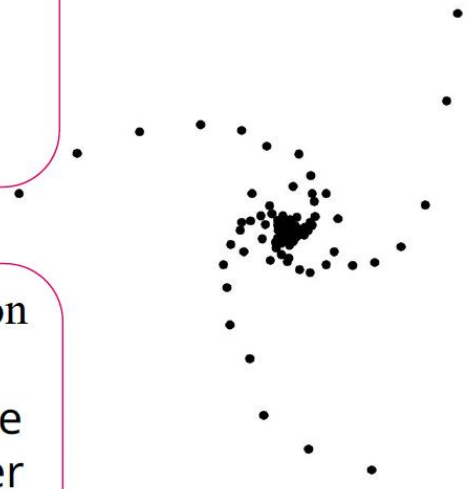
Observing modes

SKA will be highly flexible, complicated and delivered on an enormous scale. Plan to deliver highly processed Observatory Data Products adds to this complexity → we expect to build up to the full set of capabilities over time

Delivery of capabilities

SKA-Mid

144
Dishes



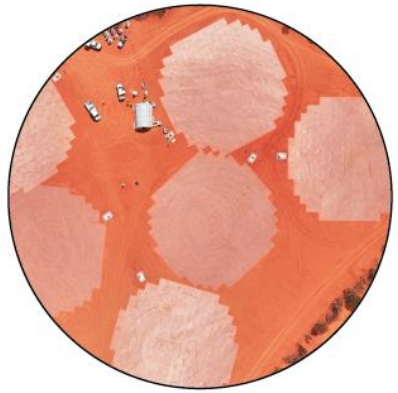
36 km
Max Baseline
*108 km including SKA008

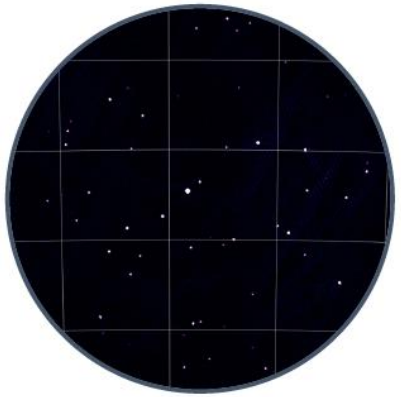
SKA Observatory

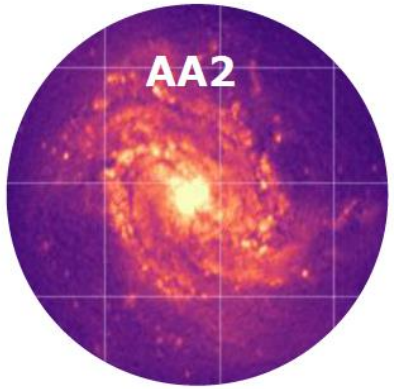
The SKA Timeline to Science

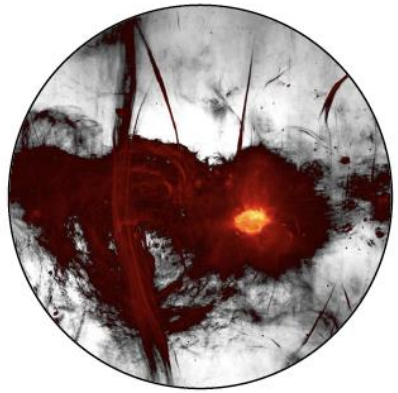
Community involvement

Full Science









Credit: I. Heywood, SARAO

Construction	Commissioning	Science Verification	Cycle 0

	Now	Now	Mid-2027	First-half 2029	2030
	Now	Now	First-half 2029	First-half 2031	2032

The SKA Timeline to Science

Credit: I. Heywood, SARAO

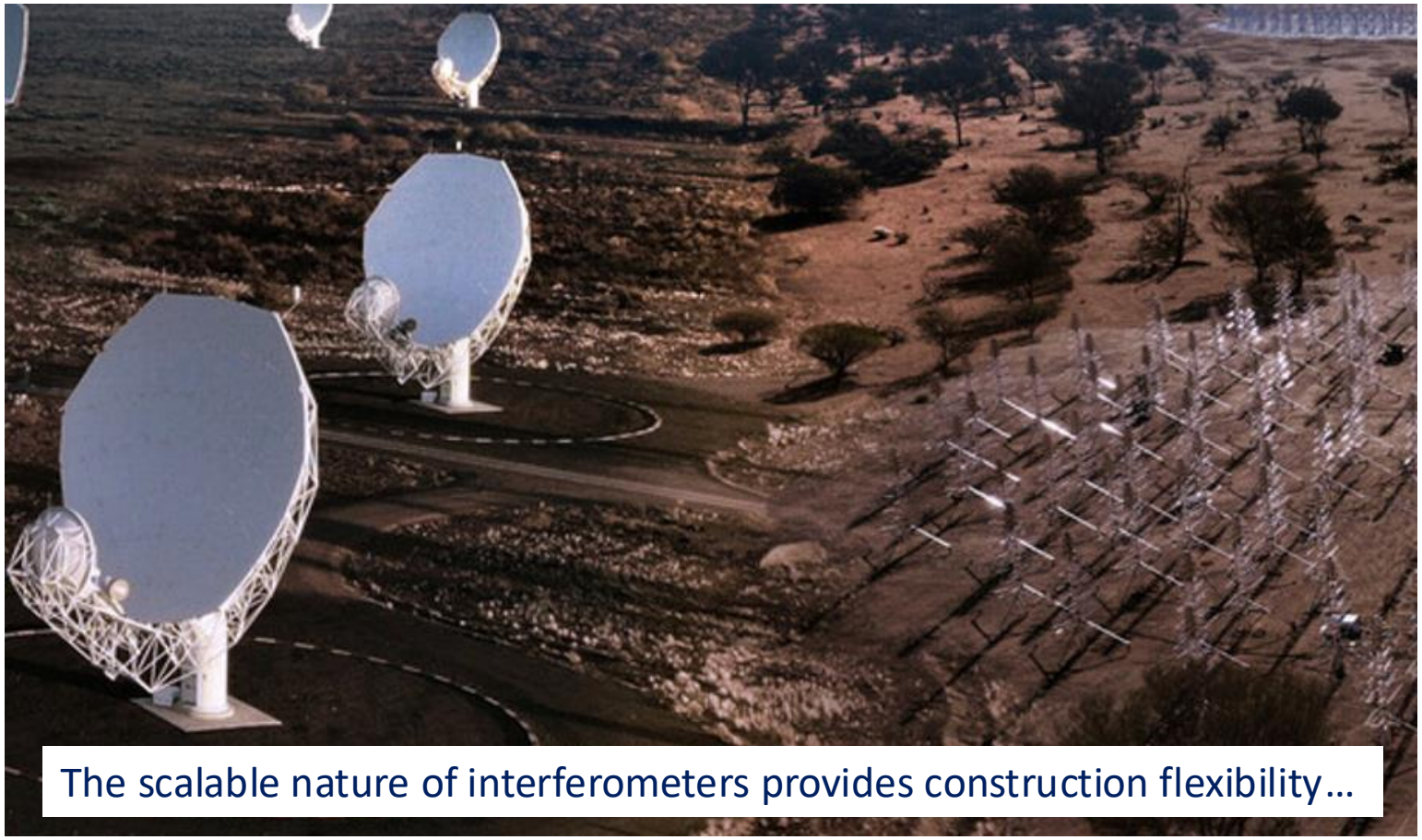
What do the dates and stages mean?

How to get the first SKA data?

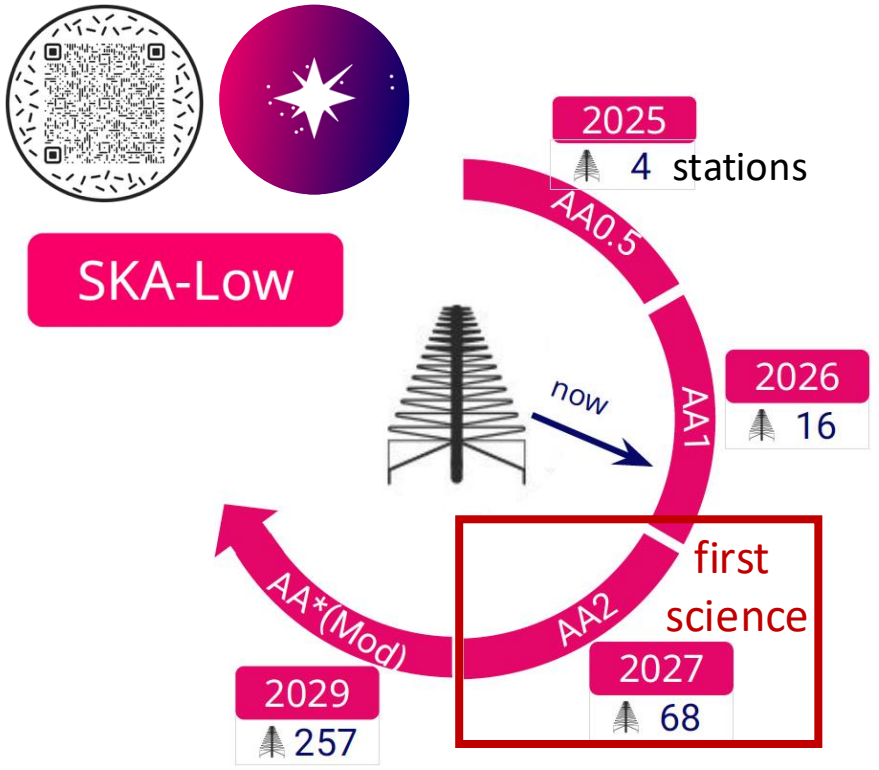
How to get the latest updates?

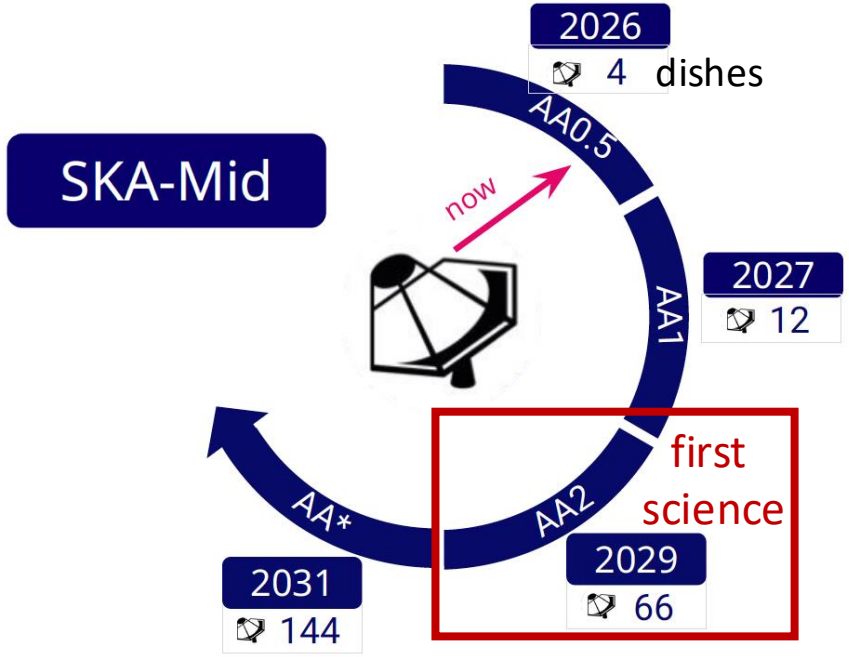
How to get involved?

SKA science rollout: Array Assemblies



The scalable nature of interferometers provides construction flexibility…



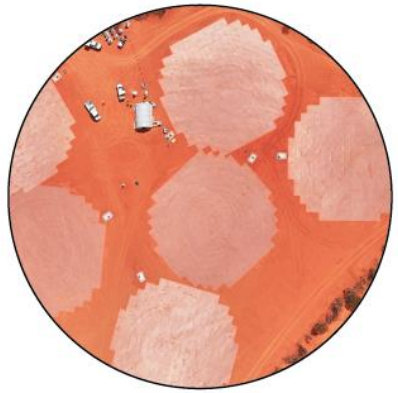


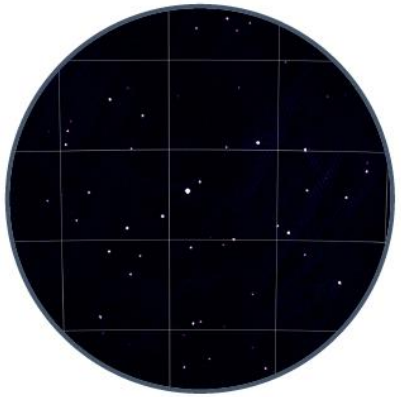
Construction/verification happens in stages called **Array Assemblies (AAs):** parts of the telescope can be used for science while the rest is being built.

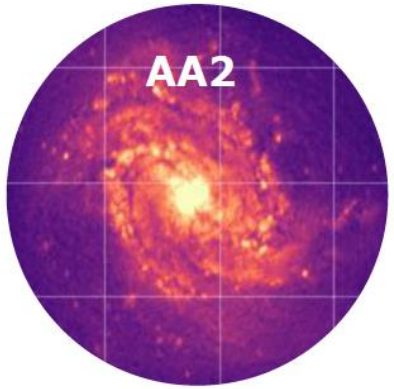
The SKA Timeline to Science

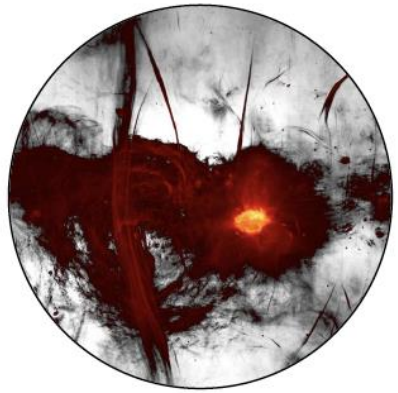
Community involvement

Full Science









Credit: I. Heywood, SARAO

Construction	Commissioning	Science Verification	Cycle 0

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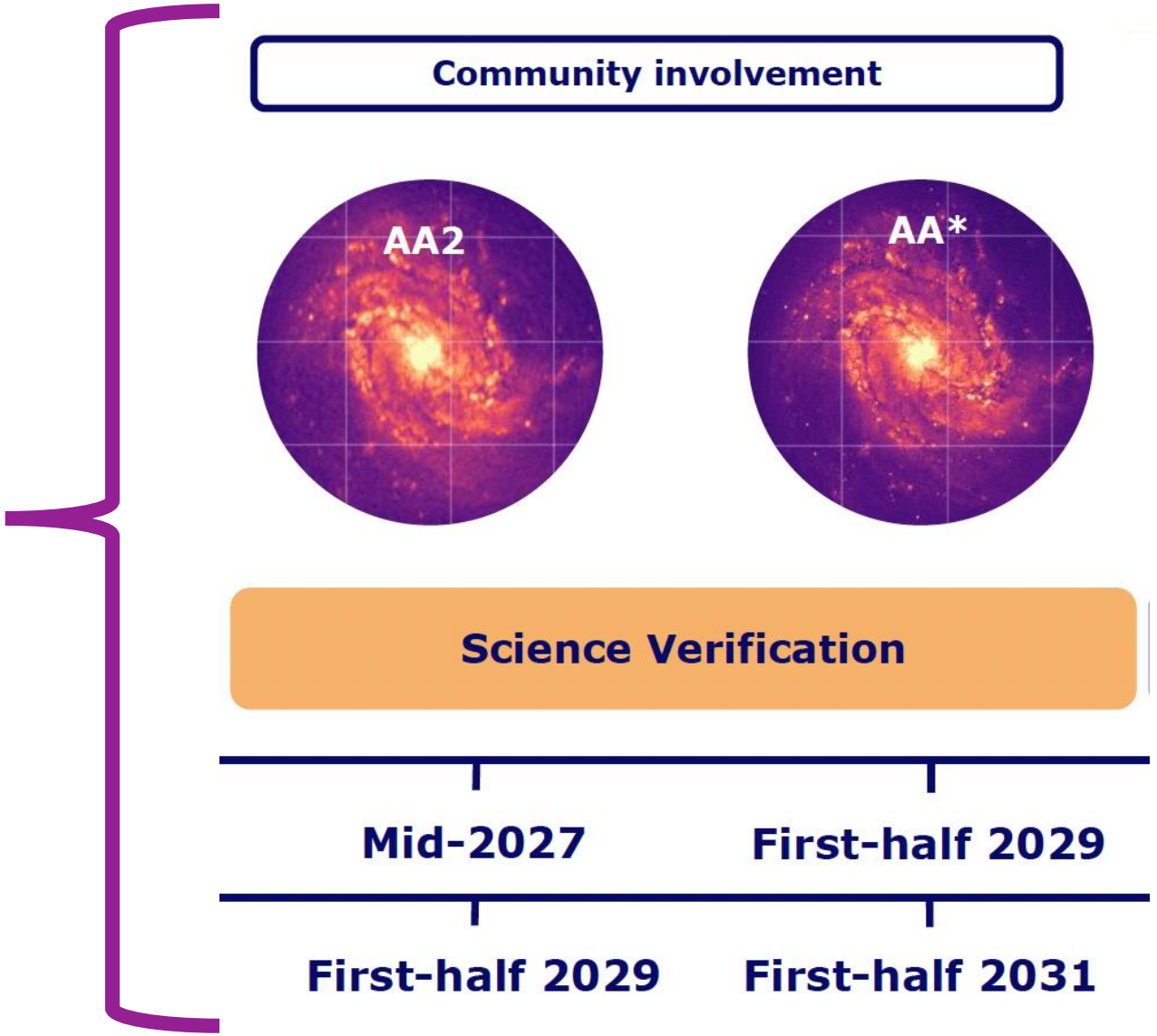
The SKA Timeline to Science

Science Verification (SV) = first release of SKA data



The SKA Timeline to Science

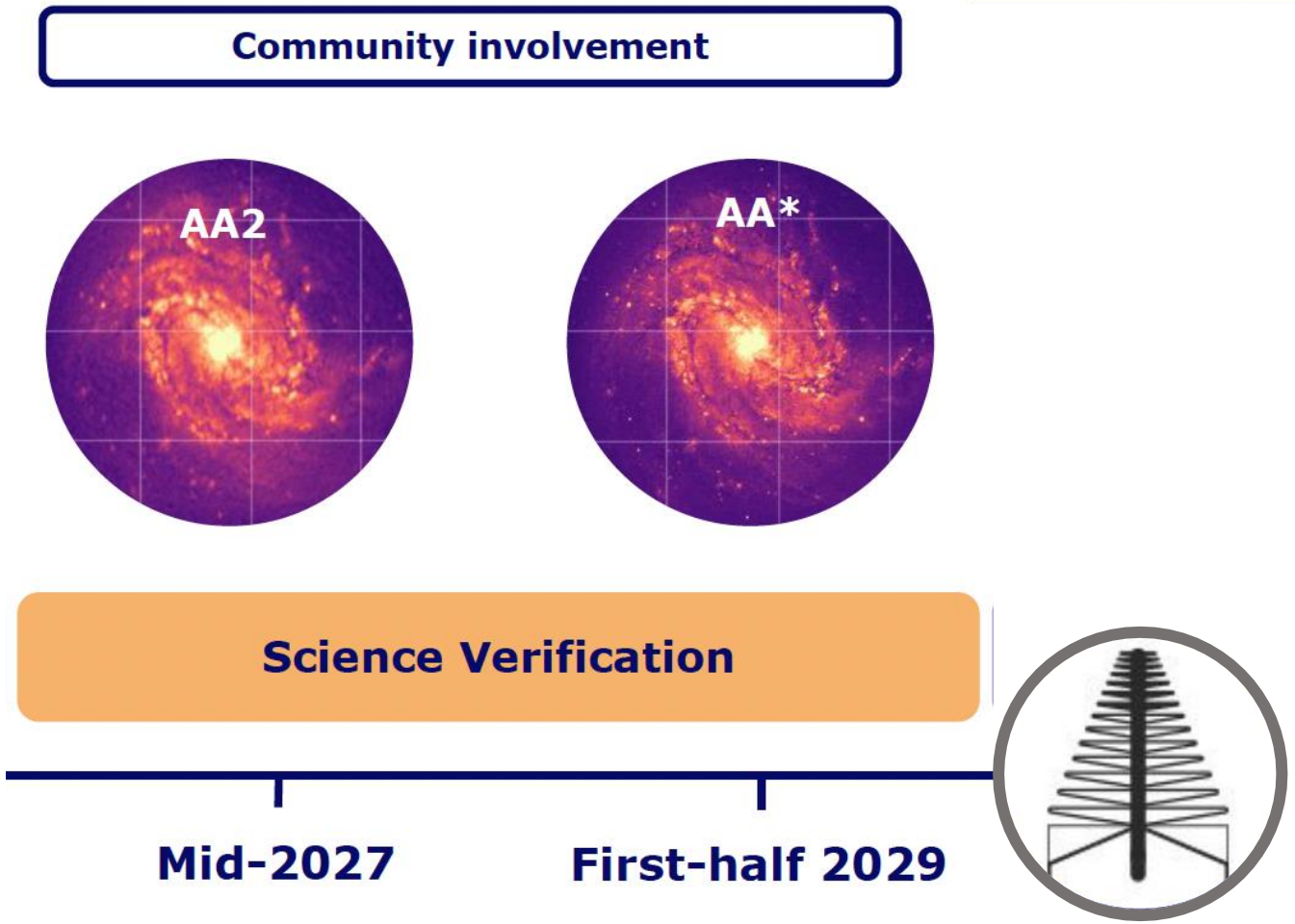
Science Verification

Community involvement

- Starts when Mid and Low are comparable to current state-of-the-art telescopes
- Primary purpose is to verify scientific capability, overall workflow and usability of the system → science is a bonus, not guaranteed.
- Provide an end-to-end test of the system for each mode/data product
- Get broad feedback on SKA data, SKAO operational model and SRCNet from a diverse user community → data will be publicly available for thorough scrutiny
- Science Verification data will not be owned by any person/group.

The SKA Timeline to Science

Science Verification (SV) = first release of SKA data



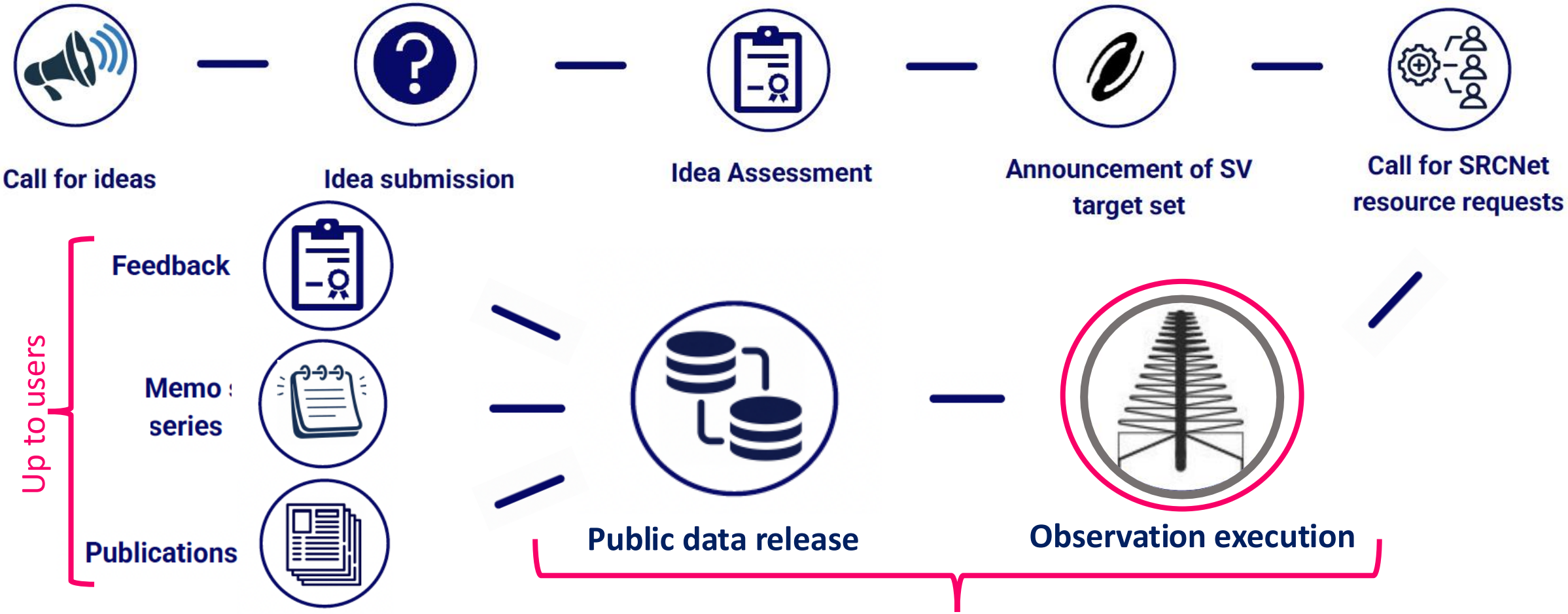
The first data will come from SKA-Low.

Science Verification - How will it work?

SKA-Low AA2

First half 2027

Mid 2027



Mid – end 2027: data access for all!

SKA-Low AA2

1 subarray

1 pointing, **1** beam

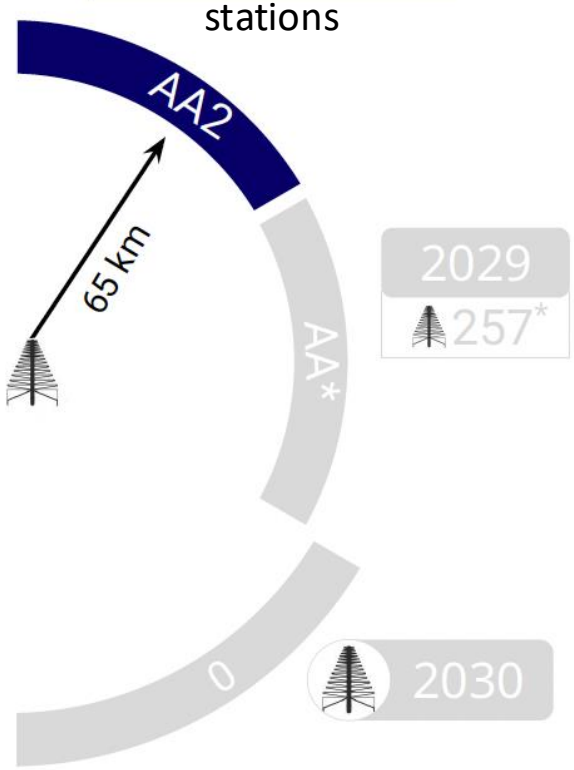
Max **4 hrs**

Bandwidth

150 MHz — 50%

2027 - 2029

68 stations



Science Verification

Continuum

Up to **40** channels imaged

Expecting to exclude (all?) Galactic observations at this stage as we build the GSM

Spectral Line

Up to **4000** channels

Continuum subtraction (early implementation)

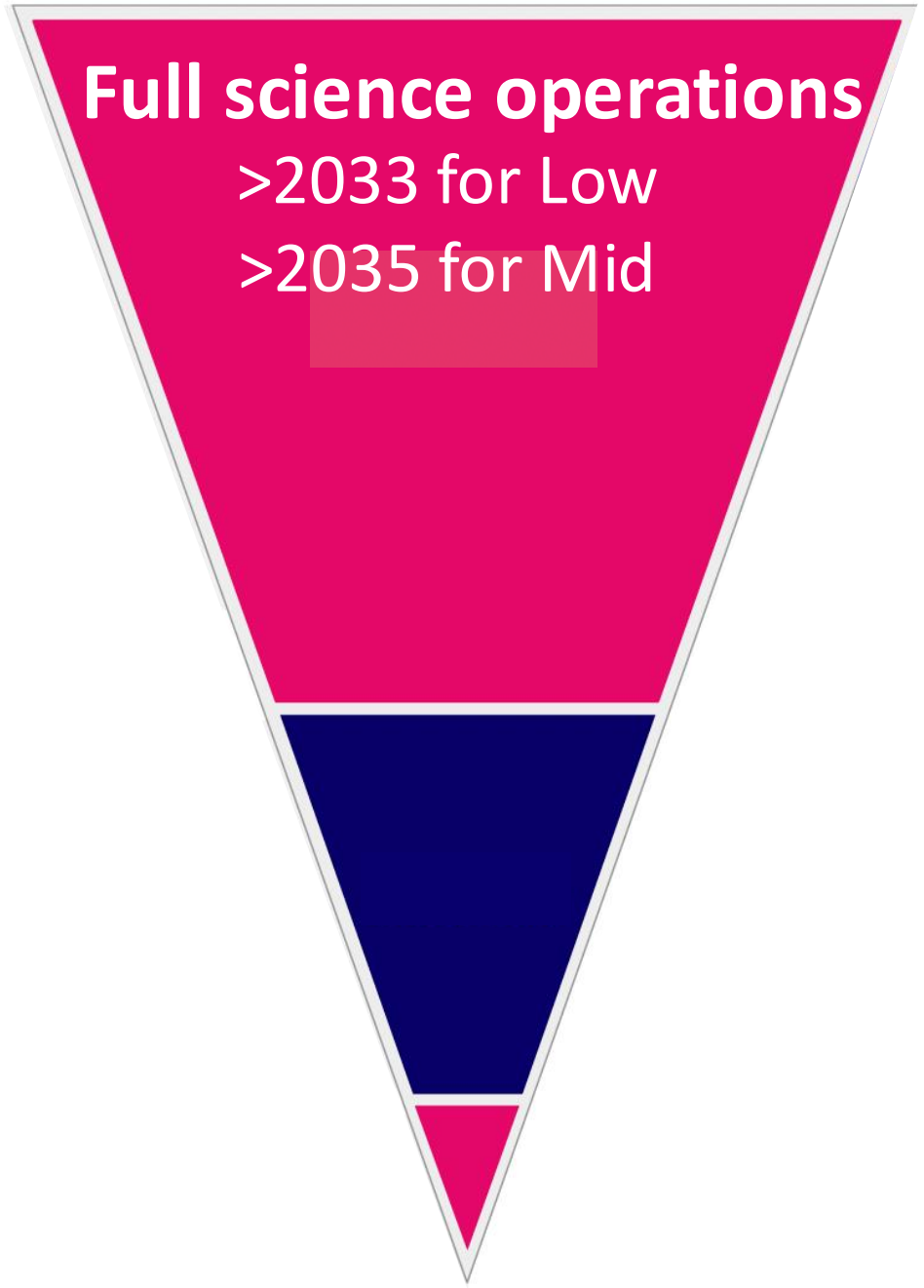
Spectral resolution up to **226 Hz**

PST (Pulsar timing)

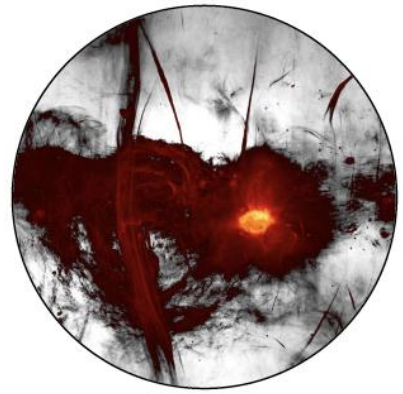
At least **1** beam

Flow through + detected filterbank

Both the telescope and compute are schedulable.



Full Science



Credit: I. Heywood, SARAO

Cycle 0

2030

2032

Key Science Projects (KSPs)

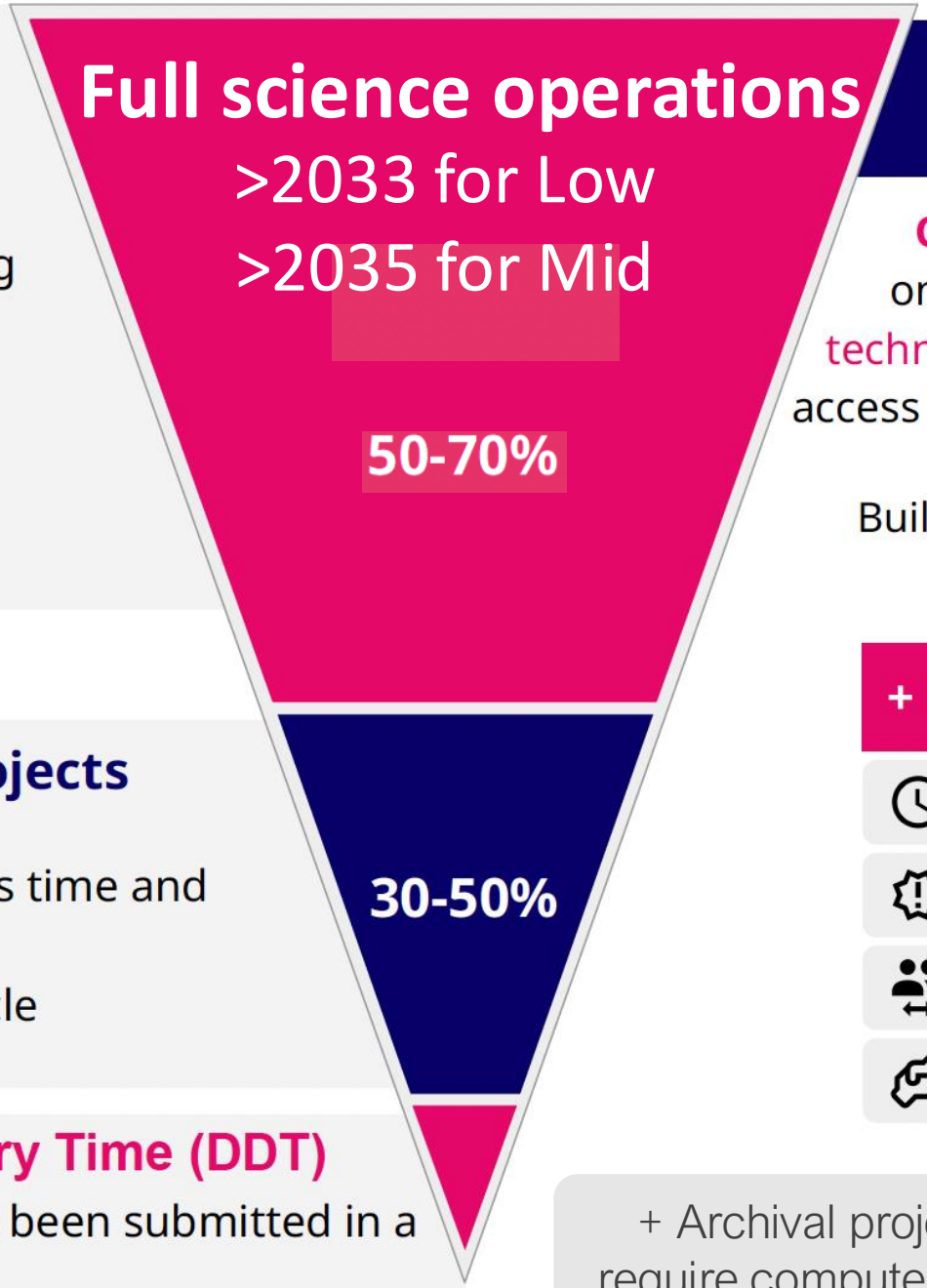
- Truly transformational & exciting science
- Significant resources and observing time (>1 observing cycle)
- Leadership team restricted to people from member countries
- Co-Is from non-member countries are possible

Principal Investigator (PI) Projects

- Observing projects that require less time and resources than a KSP
- Typically allocated over a single cycle

Director-General's Discretionary Time (DDT)

- Timely projects that could not have been submitted in a standard cycle



Access to SKA

Observing time will be allocated on the basis of scientific merit and technical feasibility while maintaining access in proportion to member shares

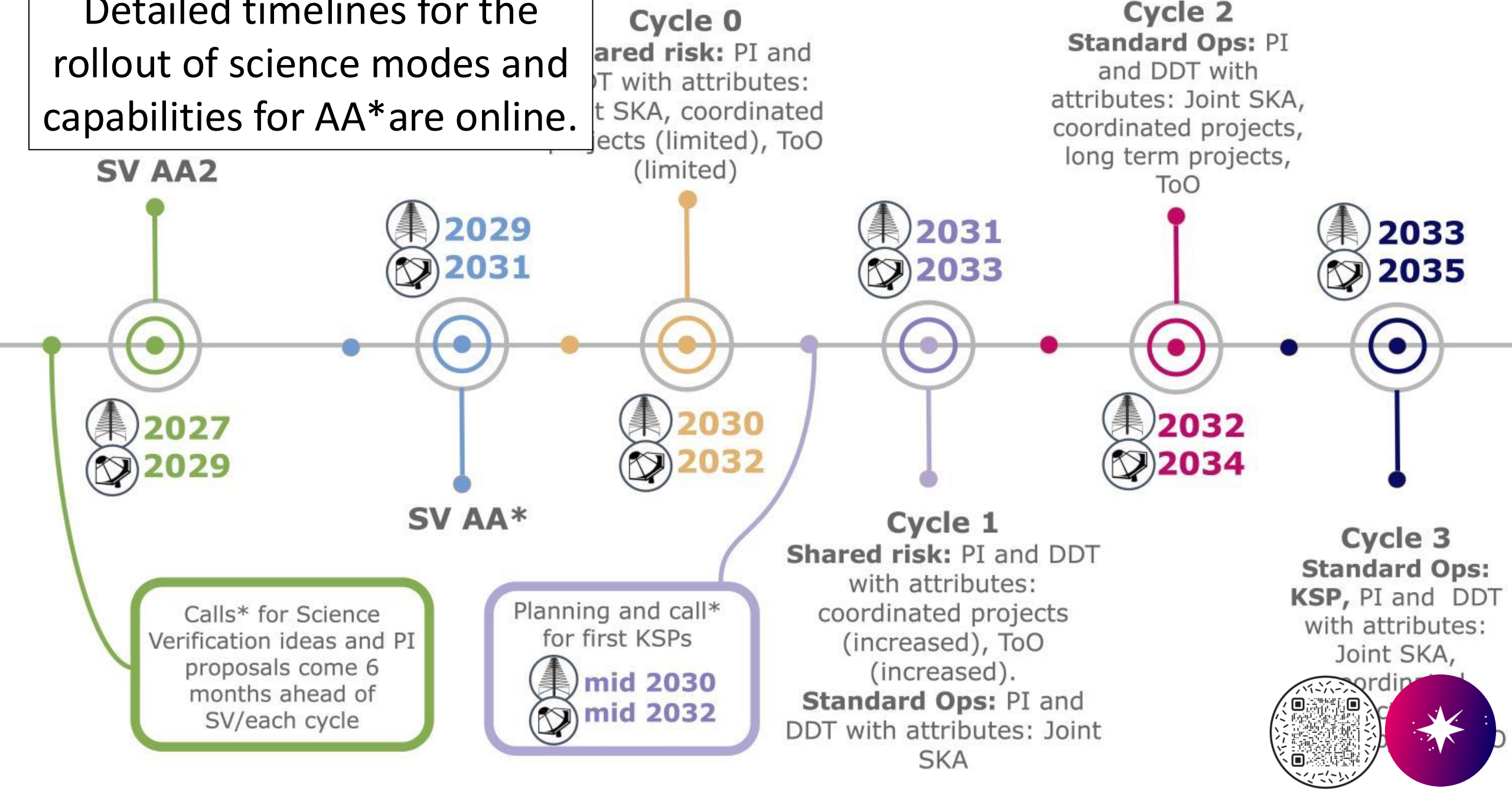
Building to **a small amount of Open Time**

+ Proposal attributes

- Long Term Projects
- Target of Opportunity
- Joint SKA projects
- Coordinated Projects

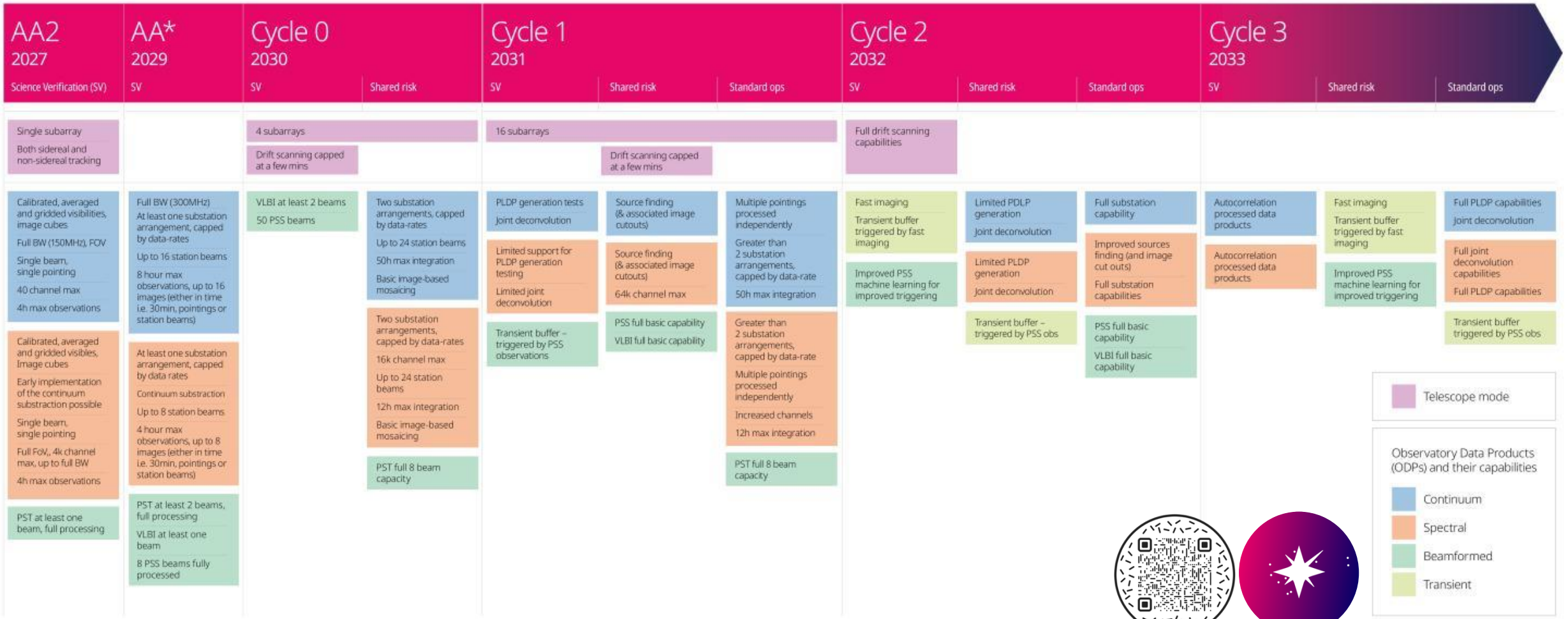
+ Archival projects that require compute resources

Detailed timelines for the rollout of science modes and capabilities for AA*are online.



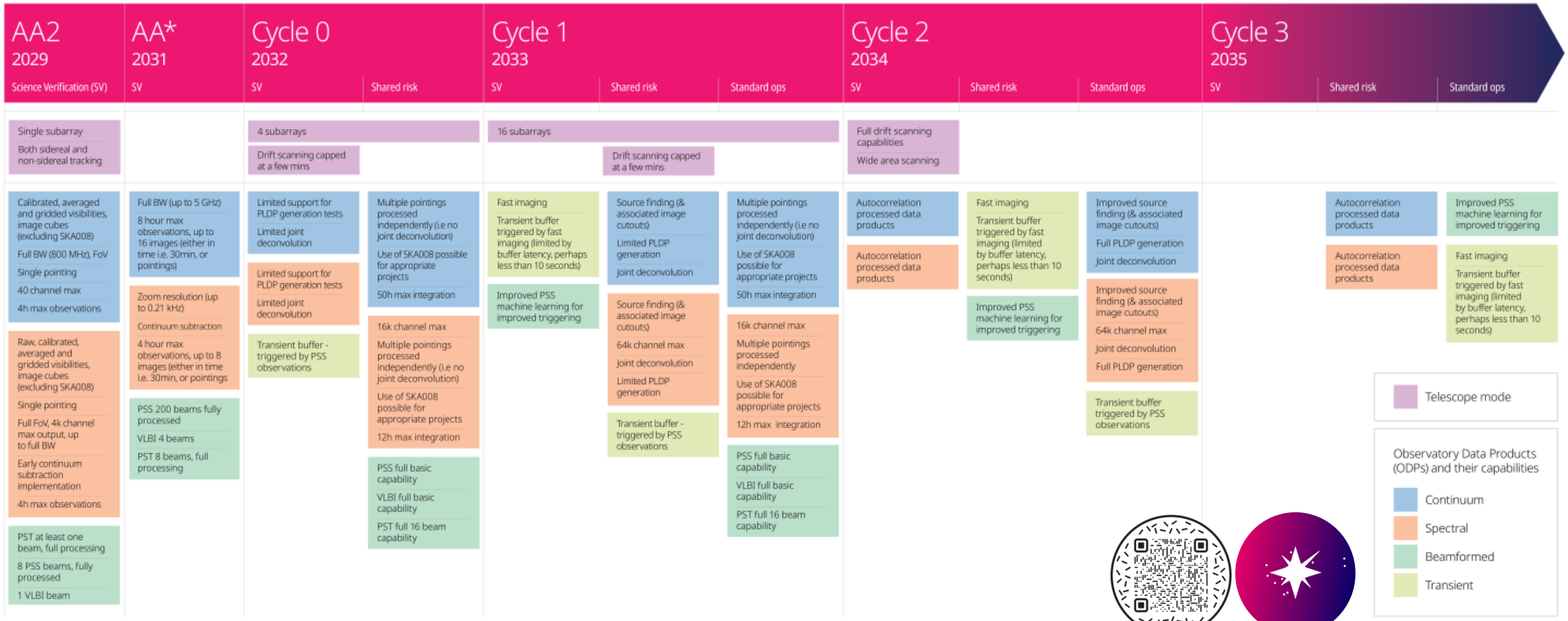
Detailed timelines for the rollout of science modes and capabilities for AA*are online.

SKA-Low: Delivery of observing modes and data to the astronomy community



Detailed timelines for the rollout of science modes and capabilities for AA*are online.

SKA-Mid: Delivery of observing modes and data to the astronomy community



SKAO Science Users

These webpages are intended for the use of professional astronomers. The main information can be accessed through the various cards below.

Lots of information available on the SKAO Science Users site.

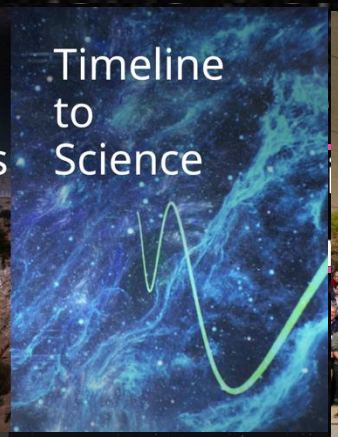
Science Community

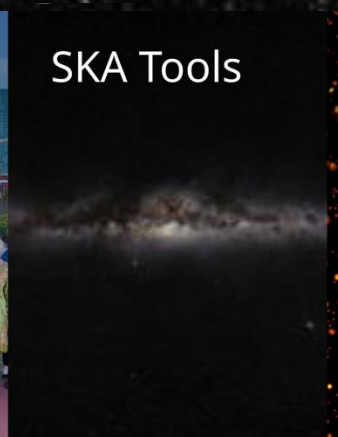
Advancing Astrophysics

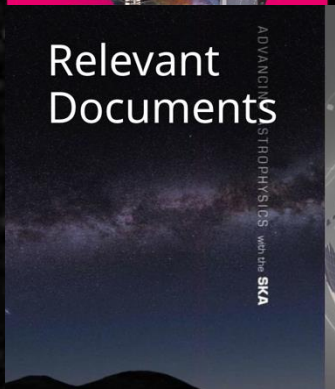
SKA Telescope

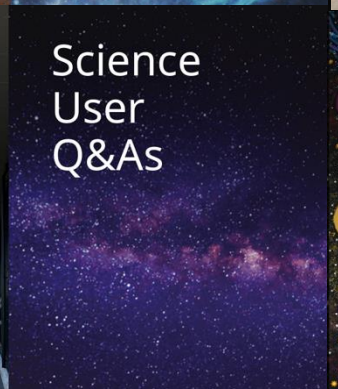
Timeline to

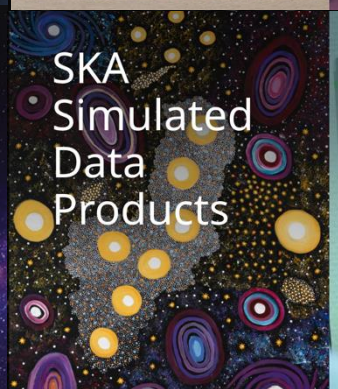
SKAO Science Users

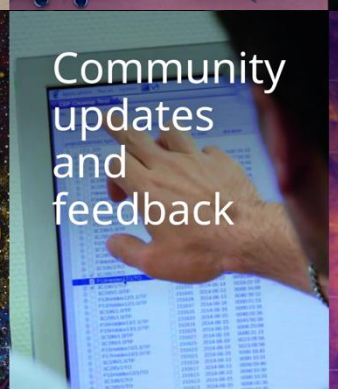


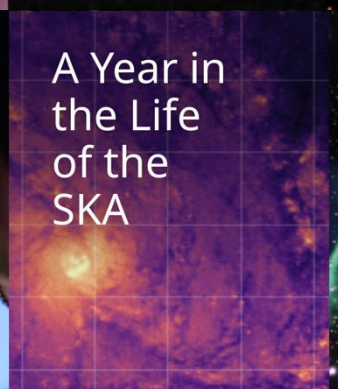












- SKA data are coming soon! Anyone can access the very first SKA data (ie. Science Verification from “AA2”) as soon as they are released!
- Science Verification (“SV”) will involve both observatory-curated data and community-requested data: the first call for ideas for SKA-Low AA2 SV is expected in early 2027. SKA-Mid AA2 SV is anticipated in 2029.
- In Science Verification, both advanced data products and the datasets that produced them will be publicly available. There are many tools on the SKAO website to help the community prepare.
- Plans for the rollout of modes and capabilities through SKA Early Science are available on the SKAO Science Users pages. Information about how to engage in large Key Science Projects (“KSPs”; >2033) should be shared by SKAO near the end of this year.

Credit: I. Heywood, SARAO

Ways to get involved:

1

Sign up for SKAO webinars and newsletters!

SKAO webinars page

2

Join an SKAO Science Working Group!

SKAO SWG page

3

Follow Canadian community activities!

Next up: CASCA@ Montreal!

CASCA ACACS page