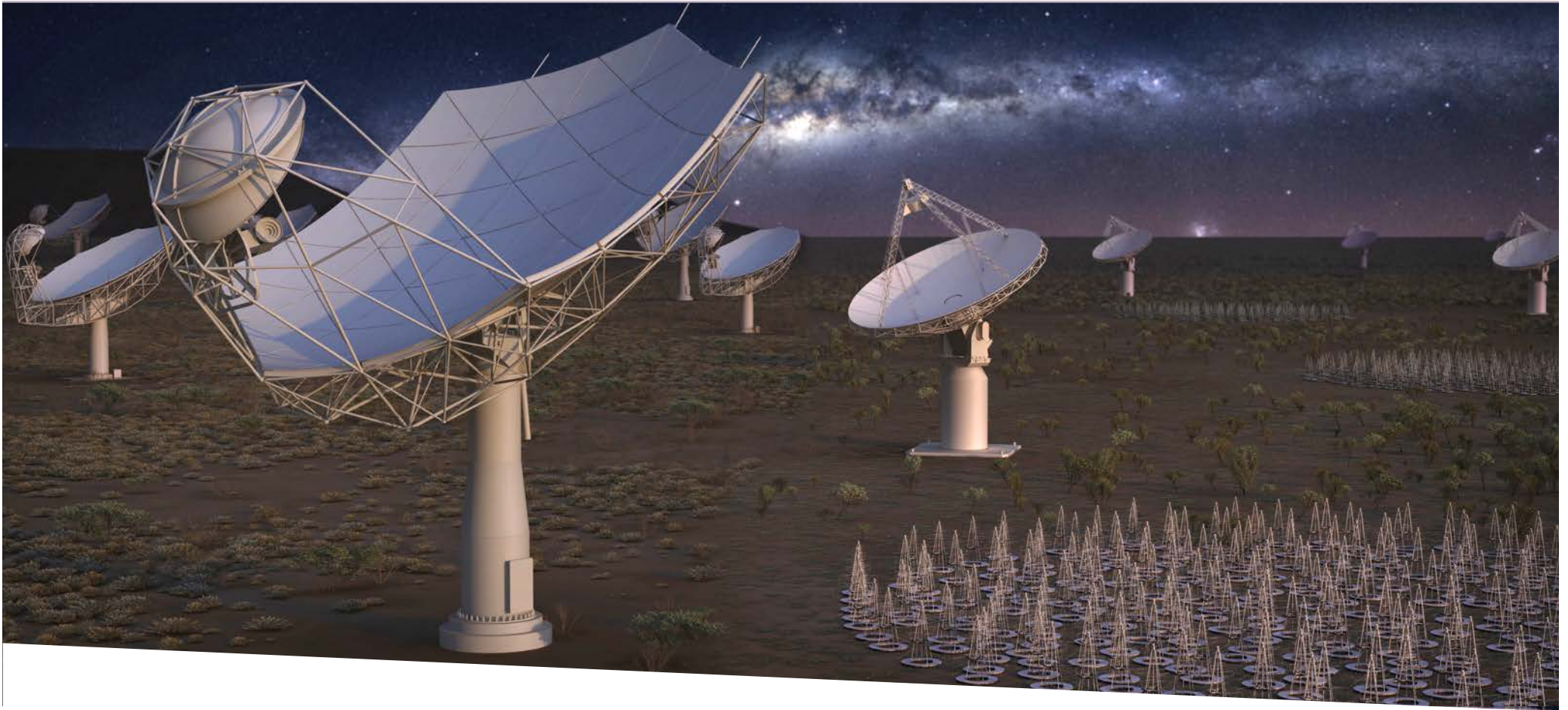


# SKA SWG Update



**SQUARE KILOMETRE ARRAY**

Exploring the Universe with the world's largest radio telescope

**Robert Braun, Science Director**

17 Nov 2020

# Science Activity Updates

- Next Science Meeting (Anna)
- Next Science Data Challenge (SDC2) (Anna, Philippa)
- SKA Observatory Development Programme, SODP (Tyler)
- AOB

# SKA Science 2021

- 15-19 March 2021, virtual event
- Using the OnAir platform
- Plenary talks:
  - Abstract submission to open through the OnAir platform ASAP
  - Plenary talks pre-recorded, with live Q&A sessions, repeated in different time zones
- Splinter meetings
  - Organised independently by the SWGs
  - Live talks/ discussions, time zones set based on SWG geographical spread
- Poster sessions
  - We are exploring solutions for an effective virtual poster session experience

# SKA Science 2021: The Conference Day



UTC	Monday	Tuesday	Wednesday	Thursday	Friday
6:00 AM					
7:00 AM					
8:00 AM					
9:00 AM	P1	P2	P3	P4	P5
10:00 AM					
11:00 AM					
12:00 AM					
1:00 PM					
2:00 PM					
3:00 PM	P6	P7	P8	P9	P10
4:00 PM					
5:00 PM					
6:00 PM					
7:00 PM					
8:00 PM					
9:00 PM	P1 repeat	P2 repeat	P3 repeat	P4 repeat	P5 repeat
10:00 PM					
11:00 PM					
12:00 PM					
1:00 AM					
2:00 AM					
3:00 AM	P6 repeat	P7 repeat	P8 repeat	P9 repeat	P10 repeat
4:00 AM					
5:00 AM					

3h sessions

- 4 talks
- break
- 4 talks

2 such sessions  
per day

Repeat once over  
each 24h period

Some sessions  
dedicated  
splinter/poster



# SDC2 timeline

- October 31<sup>st</sup>: Close the expressions of interest call
- Mid November: Open challenge registration  
Pair teams and resources  
Test dataset transfer and scoring code
- December: Validation cube available
- **January 15<sup>th</sup>: Challenge processing begins**
- July 15<sup>th</sup>: Challenge ends  
Winners announced  
Feedback sought from participants  
Feedback sought from facilities

# SDC2 Data cube

Cube preparations almost complete

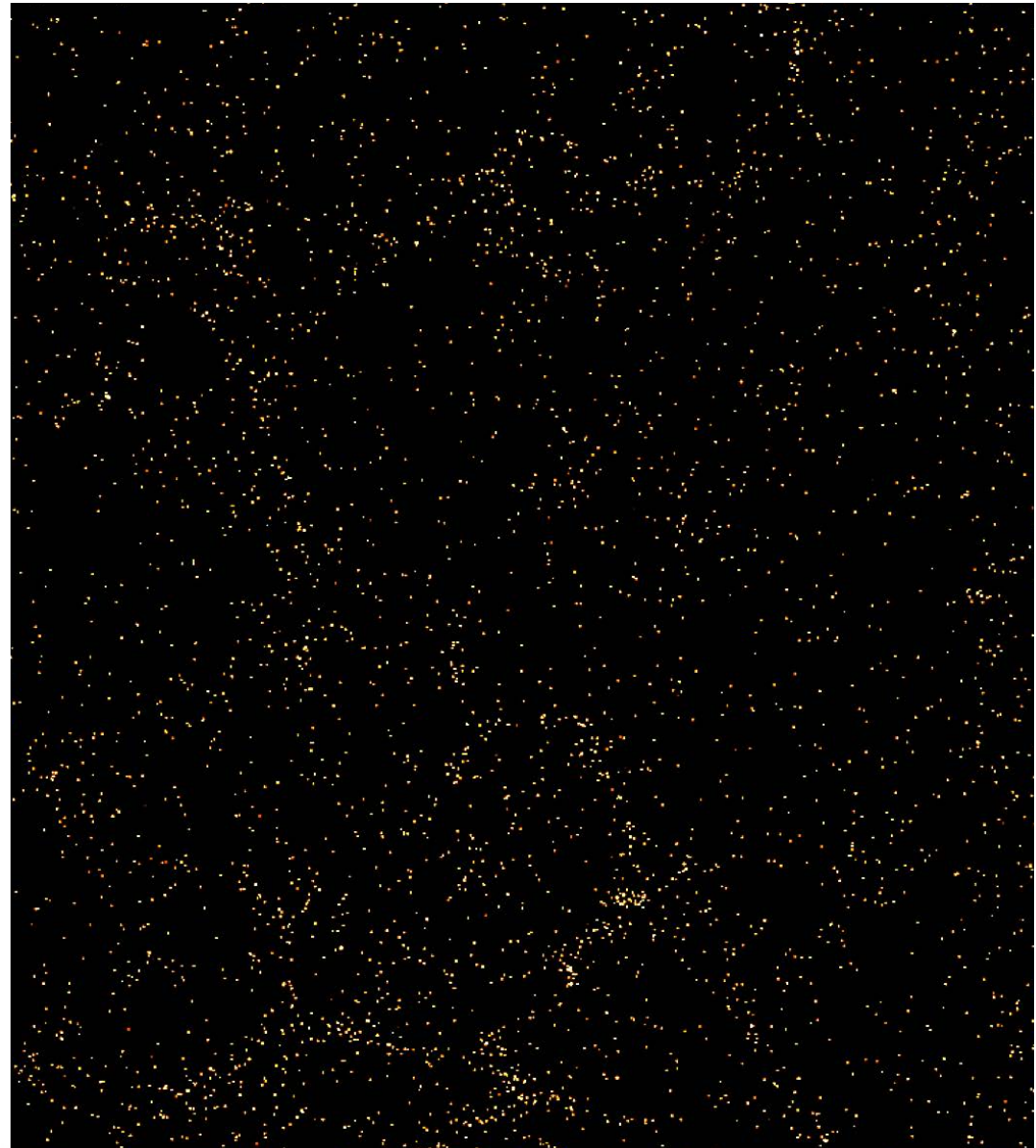
1TB neutral hydrogen (HI) data cube

Companion continuum images

Absorption signatures

Continuum subtraction artefacts

Simulated RFI flagging



# Call for expressions of interest now closed



Welcome to the second SKA Science Data Challenge. Our latest challenge will see participants analyse a simulated datacube 1 TB in size, in order to find and characterise the neutral hydrogen content of galaxies across a sky area of 20 square degrees.

Neutral hydrogen – or HI – exists in large quantities beyond the visible edges of most star-forming galaxies. Emitting light at a fixed radio wavelength during occasional electron ‘spin-flips’, HI traces the rotation of galaxies, allowing astronomers to infer the amount of mass – both visible and dark – contained within. The unprecedented sensitivity of the SKA will be used to map HI out to the formation of the first galaxies, just 380,000 years after the Big Bang. This period, known as “Cosmic Dawn”, began some 13.5 billion years ago. The challenge dataset will be a simulation of an SKA HI observation up to a distance of 4 billion light years.

In order to provide such a large dataset for analysis, we have teamed up with high performance computing facilities around the world. Participants will be invited to compete in teams and create accounts at one of those facilities, on which the data will be accessed and processed directly.

With the challenge launching soon, we now invite teams and individuals to find out more and register their interest in participating, using the link below.

**REGISTER YOUR INTEREST**

# Challenge registration opening soon

- Per team
- Choice of computing facility

## Challenge registration

### Team details

Please provide your team name \*

Please provide the names and emails of each team member \*

Name	Institution	Country	email	Team leader
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>
<input type="button" value="+"/>				



# Matching teams with resources



List of resource details will go live on website soon



SDC2 Challenge ▾ · Register your interest · Discussion forum · About the Challenges 🔍

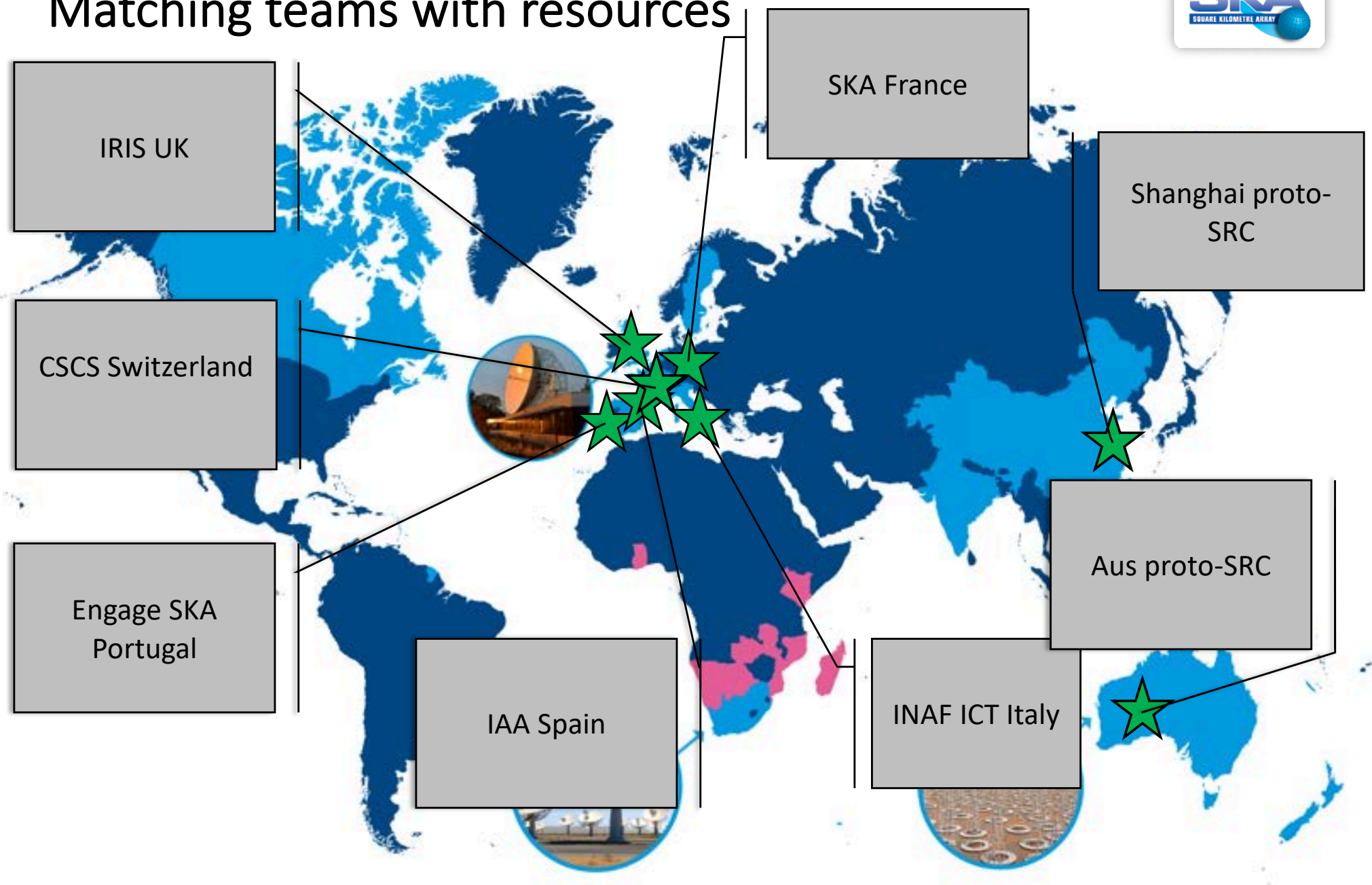
## Computational Resources

The challenge receives support from major international processing facilities, on which participants will be able to access and process the full challenge dataset. The list of available processing facilities will be made available here in due time.

Each team will have access to one processing facility. In order to help us estimate user needs, please register your interest [here](#).



# Matching teams with resources





# SDC2 Scoring Code:

## SDC1 scorer distributed via PyPI. SDC2 scorer under development

ska-sdc 1.0.0

`pip install ska-sdc`



Released: Aug 13, 2020

A package providing tools for the SKA Science Data Challenges.

### Navigation

Project description

Release history

Download files

### Project links

Homepage

### Statistics

View statistics for this project via [Libraries.io](#), or by using [our public dataset on Google BigQuery](#)

## Project description

### Science Data Challenge Scoring Code API

The SKA Science Data Challenge #1 (<https://astronomers.skatelescope.org/ska-science-data-challenge-1/>) tasked participants with identifying and classifying sources in synthetic radio images.

In addition to the synthetic images, participants were provided with a section of the 'truth catalogue' of sources used to generate the artificial data. Comparing the truth catalogue with the 'submission catalogue' produced by a participant's solution would provide a means of determining the success of the solution.

To evaluate the accuracy of the results, a program was developed to cross-match sources between the submission and truth catalogues, and calculate a 'score' based on the result of this cross-match.

This is an open-source implementation of the program used to score and rank the submissions for the first SKA Science Data Challenge (SDC). A number of improvements have been made, most notably the use of a more performant cross-match algorithm. As such it is not possible to make a direct comparison between the scores produced by this package and the original program. The original IDL code is available at: <https://astronomers.skatelescope.org/ska-science-data-challenge-1/>



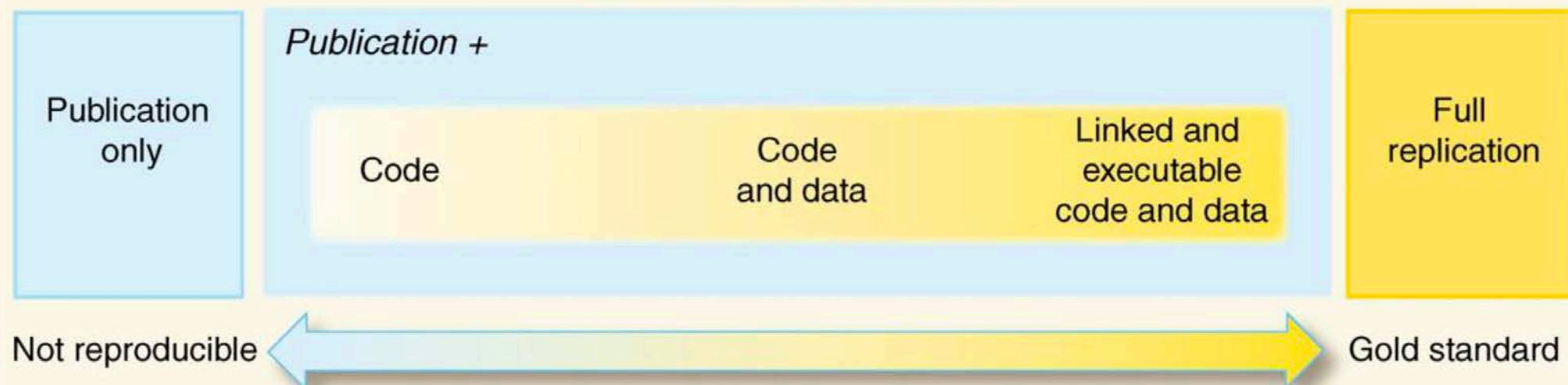
# Reproducibility awards

In partnership with the Software Sustainability Institute



[www.software.ac.uk](http://www.software.ac.uk)

## Reproducibility Spectrum

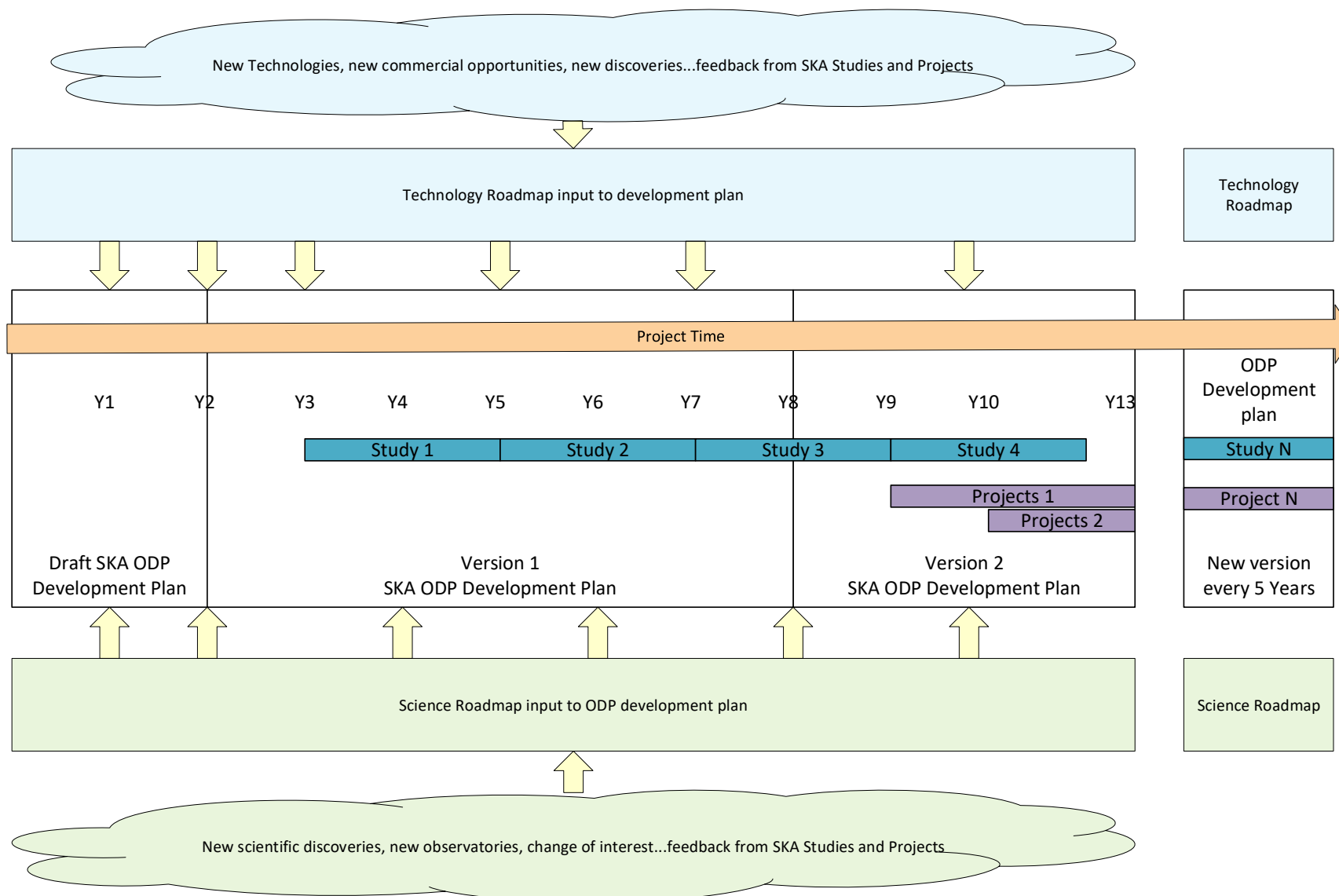




# SODP Background

- **Science Road Map (SciMap)**
  - New science enabled by ODP
  - External Advisory Group Chaired by Science Director
  - Maintains a list of science opportunities and priorities
- **Technology Road Map (TechMap)**
  - Survey of new technology relevant to SKA
  - External Advisory Group Chaired by Project Engineer
  - Surveys new technological opportunities, with a rough assessment of TRL and cost
- **Development Plan**
  - Evolving Plan for the ODP, informed by the road maps
  - Balances restoration of capability (if required) against new ideas
  - External Advisory Group Chaired by SKAO System Scientist
  - Plan presented to SEAC for approval
  - Circulated to the wider SKA Community

# SODP Background



# SODP Background

Year	Cost (M€)	Activity
1	0	Road map and plan process starts
2	0	Initial draft road maps and development plan made available by SKAO. Deadline for Study Cycle 1 proposals
3	1	Study cycle 1
4	1	Study cycle 1 (continued); Deadline for Study cycle 2 proposals
5	1.5	Study cycle 2
6	1.5	Study cycle 2 (continued); Deadline for Study cycle 3 proposals
7	1.5	Study cycle 3 (project preparation)
8	1.5	Study cycle 3 (continued); Approved Development Plan available. Deadlines for Study cycle 4 and Project cycle 1
9	12	Project Cycle 1
	1	Study cycle 4
10	18	Project Cycle 1 (continued)
	1	Study Cycle 4 (continued)
11+	18.5	Projects
(steady state)	1.5	Studies

# SODP Current Focus

Year	Cost (M€)	Activity
2021/22	0	Road map and plan process starts
2022/23	0	Initial draft road maps and development plan made available by SKAO. Deadline for Study Cycle 1 proposals
2023/4	1	Study cycle 1
4	1	Study cycle 1 (continued); Deadline for Study cycle 2 proposals
5		
6		
7		
8		
9	12	Project Cycle 1
	1	Study cycle 4
10	18	Project Cycle 1 (continued)
	1	Study Cycle 4 (continued)
11+	18.5	Projects
(steady state)	1.5	Studies

- assume mid-2021 is start of “year 1”
  - Advisory Group in place, know what is expected of them
- 2030-2035 first SODP deliverables

Deadlines



# SODP Current Focus

- Science Advisory Group Membership
- Boundary Conditions and Constraints for the Group
- Immediate (near-term) focus of the Group

# SODP Roadmap Advisory Group

- **Science Advisory Group Membership**
  - Balance of countries, diversity, backgrounds
    - national interests
    - senior/junior
    - science expertise
  - Size
    - small, but “large enough”
    - sufficient to cover SWG science, but not tied to SWGs

# SODP Roadmap Advisory Group

- **Science Advisory Group Membership**
  - Invite applications (self-nomination ok)
    - Statement from applicant/nominator as to how their capabilities and experience equip them for the role
    - Statement on commitment to serve
    - Letter of support from e.g mentor, SWG chair, peer ?
    - Rationale: attract applicants who are willing to give their time and have appropriate background, wider pool of talent

# SODP Roadmap Advisory Group

- **Science Advisory Group Membership**
  - SEAC are not members (independent review of outcomes)
  - Avoid duplication with Technology Roadmap Membership
  - Role of SKAO Science Team
    - Observers of SciMap process?
    - Observers of TechMap process?
  - Selection committee is SD + Science Team
    - DG approves



# SODP Constraints/Boundary Conditions

- Initial SKA1 construction scope may not be adequate for Design Baseline (DB)
  - First years of SciMap may need to assess DB completion alongside new possibilities
- Extensive list of technical upgrade options (with high TLR) already available
  - Indicative, not exhaustive
  - Includes PAFs, wide-band SPFs, but not MFAA
- Very limited scope for low TLR or mega-budget (SKA2) ideas
  - Focus most effort on the specific time-frame under consideration (in this case, deployment ready in 2030 – 2035)
  - Future SciMaps updates will extend the timeline further

## SODP Near-term focus (2030 – 2035)

- SKA Science landscape well captured in e.g. Science Books, SKA science meetings
- Broad Astrophysics landscape also well captured in e.g.:
  - Decadal Reviews in many countries (notably US)
  - Roadmaps by e.g. NASA, ALMA, ESA, ESO, ...
- Anticipate most astronomy questions/themes for the next decade or so already identified

## SODP Near-term focus (2030 – 2035)

- SciMap to focus on high TLR upgrade(/DB completion) options:
  - What is the science enabled by each of these options?
  - Where is SKA essential to address the science questions/themes, and/or where is SKA a significant complement to other facilities?
  - What upgrade options with significant science return (and with medium/high TLR) are missing from consideration?
  - Example: SKA Mid Band prioritisation
    - What is the relative science return of deploying any of:
      - Band 3
      - Band 4
      - Band 6
      - Wideband 3+4
      - Wideband Band 5a+5b

# SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

