SKA NL Science Meeting

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ASTRON is part of the Netherlands Organisation for Scientific Research (NWO)
# Pre-Construction Schedule

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telescope Manager CDR</td>
<td>17-20 April 2018</td>
</tr>
<tr>
<td>Signal and Data Transport CDR</td>
<td>15-18 May 2018</td>
</tr>
<tr>
<td>Infrastructure Australia CDR</td>
<td>27-29 June 2018</td>
</tr>
<tr>
<td>Infrastructure South Africa CDR</td>
<td>2-4 July 2018</td>
</tr>
<tr>
<td>Central Signal Processor CDR</td>
<td>25-28 September 2018</td>
</tr>
<tr>
<td>Low Frequency Aperture Array CDR</td>
<td>17-19 December 2018</td>
</tr>
<tr>
<td>Signal &amp; Data Transport CDR</td>
<td>17-19 December 2018</td>
</tr>
<tr>
<td>Dish CDR</td>
<td>2019</td>
</tr>
<tr>
<td>System CDR (incl. AIV)</td>
<td>March 2019</td>
</tr>
</tbody>
</table>
Signal and Data Transport

Signal and data transport is the backbone of the SKA telescope. The Signal and Data Transport (SaDT) Consortium is responsible for the design of three data transport networks. These include the Digital Data Backhaul (DDBH) that transports signals from the radio telescopes to the Central Signal Processor (CSP), and data products from the CSP to the Science Data Processor (SDP) and from the SDP to the regional SKA Data Centres. SaDT’s work also includes the design of clocks and a custom-made frequency distribution system. The consortium is led by the University of Manchester in the UK.

https://cdr.skatelescope.org
SKA Prototype Dish Assembled For The First Time

Shijiazhuang, China - Tuesday 4 February – The first fully assembled SKA dish was unveiled today at a ceremony in Shijiazhuang, China, by the Vice Minister of the Chinese Ministry of Science and Technology, in the presence of representatives from the countries involved and the SKA Organisation. This dish is one of two final prototypes that will be tested ahead of production of an early array.

In a major milestone for the SKA Project, the 54th Institute of China Electronics Technology Group Corporation (CETC54) has completed the structural assembly of the first SKA dish, bringing together components from China, Germany, and Italy.
AAVS1 - prototype SKA_low station
The Aperture Array Verification System (AAVS) is an initiative of the Aperture Array Design and Construction (AADC) Consortium that supports SKA pre-construction.

ICRAR

Astron

University of Cambridge

University of Oxford

MWA

KLAASA

From Lab To Outback: The Story of AAVS1 so far

Designing the SKA Telescopes

From lab to Outback: the story of AAVS1 so far

18 December 2021, SKA Office Headquarters, Joondalup, WA. - A new understanding is to say that designing and building a world-class scientific instrument comes with its challenges. The Aperture Array Verification System (AAVS1) is one of the major milestones in the journey towards delivering the first phase of the SKA, the first SKA telescope, that will eventually consist of 120,000 antennas receiving the radio signals emitted from the cosmos. The team designing the project recently reported on the successful mock-up station used to test antennas at the Murchison Radio-astronomy Observatory (MRO), located in Western Australia.

This journey leading up to this deployment and installation of a full antenna station has been a fascinating experience and a steep learning
The Central Signal Processor or CSP is the central processing “brain” of the SKA. It converts digitised astronomical signals detected by SKA receivers into the vital information needed by the Science Data Processor to make detailed images of deep space astronomical phenomena that the SKA is observing. It will also design a “non-image processor” in order to facilitate the most comprehensive and ambitious survey yet to find new pulsars and precisely time known pulsars. The lead organisation of the Consortium is the National Research Council of Canada (NRC).
SKA1 Cost Control Project

- **Cost Control project identified & ranked potential cost saving measures**
- **Defined Design Baseline & Deployment Baseline**

**SKA1 Construction Cost Cap:**

**November 2016 cost estimate:**
916.1 M€ (36% over)

<table>
<thead>
<tr>
<th>Design Baseline</th>
<th>Deployment Baseline</th>
<th>Re-instatement ‘+’ means add to system</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKA1-Mid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. dishes</td>
<td>133</td>
<td>130</td>
</tr>
<tr>
<td>Max. Baseline</td>
<td>150 km</td>
<td>120 km</td>
</tr>
<tr>
<td>Band 1 Feeds</td>
<td>133</td>
<td>130</td>
</tr>
<tr>
<td>Band 2 Feeds</td>
<td>133</td>
<td>130</td>
</tr>
<tr>
<td>Band 5 Feeds</td>
<td>133</td>
<td>67</td>
</tr>
<tr>
<td>Pulsar Search (PSS)</td>
<td>500 nodes</td>
<td>375 nodes</td>
</tr>
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**SKA1-Low**

- No. stations: 512
- Max. Baseline: 65 km
- Pulsar Search: 167 nodes

**Common**

- Compute Power: 260 PFLOPs, 50 PFLOPs: +210 PFLOPs

Michiel van Haarlem / 24 May 2018
Negotiations to set up SKA Intergovernmental Organisation (IGO)
Convention now agreed
Signing mid-September 2018
SKA IGO active in 2020
SKA Construction start: 2021

Discussions on NL funding taking place
Coalition agreement provides opportunities

Vertrouwen in de toekomst

Regeerakkoord 2017 – 2021
VVD, CDA, D66 en ChristenUnie

Michiel van Haarlem / 24 May 2018
## SKA Project Schedule

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initialing SKA Convention</td>
<td>23 May - 20 July 2018</td>
</tr>
<tr>
<td>Signing SKA Convention</td>
<td>September 2018</td>
</tr>
<tr>
<td>Ratification Complete - SKA Observatory</td>
<td>early 2020</td>
</tr>
<tr>
<td>System CDR completed</td>
<td>mid 2019</td>
</tr>
<tr>
<td>Construction Proposal ready</td>
<td>late 2019-early 2020</td>
</tr>
<tr>
<td>SKA Council Approves Construction Plan</td>
<td>mid 2020</td>
</tr>
<tr>
<td>Start of Construction</td>
<td>early 2021</td>
</tr>
</tbody>
</table>
Other SKA Developments

- France, Spain set to join SKA Organisation
- Portugal to join when IGO is formed

- SKA KSP workshop & general science meeting
  - At the new SKA Headquarters
  - 8-12 April 2019

- MeerKAT inauguration - 13 July 2018
Themes for Today

- Updates from the Science Working Groups/Focus Groups
- What are the concerns or issues - important input to SKA Board
- Plans for Transition from SWG/FG to KSPs
  - How? When?
- How are pathfinders/precursors being used to prepare for SKA?
- Thoughts on SKA Regional Centres
Suggested Deep Field Initiative

Recommended by ILT board following Sept 16 meeting

Single group of KSP experts, focused on common analysis of a deep field

Intended to improve coordination of KSP commissioning activities

Catalyst to achieve best strategy to reach thermal-noise limited images

Shared early science results

Discussed with KSPs at PIs Meeting and in subsequent telecon

Consensus that single deep field and working group not optimal way forward

Does not address many outstanding high priority calibration issues
Title

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SKA Regional Centres

- SKA Regional Centres (SRCs) will host the SKA science archive
- Provide access and distribute data products to users
- Provide access to compute and storage resources
- Provide analysis capabilities
- Provide user support
- Multiple regional SRCs, locally resourced and staffed

**Primary interface for SKA data analysis**
Regional Centre Functionality

Data Discovery
- Observation database
- Associated metadata
- Quick-look data products
- Flexible catalog queries
- Integration with VO tools
- Publish data to VO

Data Processing
- Reprocessing and calibration
- High resolution imaging
- Mosaicing
- Source extraction
- Catalog re-creation
- DM searches

Data Analysis
- Multi-wavelength studies
- Catalog cross-matching
- Light-curve analysis
- Transient classification
- Feature detection
- Visualization
We need input from SKA Science Working Groups & Focus Groups
Regular Interactions to discuss use cases and functionality
Test Regional Centre “Design” as it progresses using pathfinders & precursor data

Design and specification of a distributed, European SKA Regional Centre to support the astronomical community in achieving the scientific goals of the SKA

Advanced European Network of E-infrastructures for Astronomy with the SKA

EC Horizon 2020 (€3 million)
13 countries, 28 partners, SKAO, host countries, e-infrastructures (EGI, GÉANT, RDA), NREN’s
Three year project (2017-2019)
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- How are pathfinders/precursors being used to prepare for SKA?

- Thoughts on SKA Regional Centres
  - Science engagement with Regional Centre design process
How to find relevant information

- https://astronomers.skatelescope.org/

- Check that documents aren’t out of date
  - Through SWG/FG or SKA.org science team

Contact us:
- Jess Broderick  
  NL SKA Project Scientist  
  broderick@astron.nl
- or haarlem@astron.nl
<table>
<thead>
<tr>
<th>Assembly, Integration &amp; Verification Event</th>
<th>Low Stations</th>
<th>Date for Low</th>
<th>Mid Dishes SKA+MK</th>
<th>Date for Mid</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA1</td>
<td>18</td>
<td>C0+35</td>
<td>8 + 0</td>
<td>C0+34</td>
</tr>
<tr>
<td>AA2</td>
<td>64</td>
<td>C0+47</td>
<td>64 + 0</td>
<td>C0+44</td>
</tr>
<tr>
<td>AA3</td>
<td>256</td>
<td>C0+58</td>
<td>120 + 8</td>
<td>C0+58</td>
</tr>
<tr>
<td>AA4</td>
<td>512</td>
<td>C0+70</td>
<td>133+64</td>
<td>C0+67</td>
</tr>
</tbody>
</table>

C0 = the date for construction contracts to be awarded