HQ in UK; telescopes in AU & SA

- **SKA1-LOW**: 50 – 350 MHz
  - ~130,000 antennas
  - across 65km

- **SKA1-Mid**: 350 MHz – 24 GHz
  - 200 15-m dishes
  - across 150 km
SKA—Key Science Drivers:
The history of the Universe

- Cosmic Dawn
  (First Stars and Galaxies)
- Galaxy Evolution
  (Normal Galaxies $z\sim2-3$)
- Cosmology
  (Dark Energy, Large Scale Structure)
- Exploration of the Unknown
- Testing General Relativity
  (Strong Regime, Gravitational Waves)
- Cradle of Life
  (Planets, Molecules, SETI)
- Cosmic Magnetism
  (Origin, Evolution)
A Global Research Infrastructure

Future Members:

- Full Members
  - SKA Headquarters Host Country
  - SKA Phase 1 and Phase 2 Host Countries
- African Partner Countries
  - (Non-Member SKA Phase 2 Host Countries)
- Observer Countries

Exploring the Universe with the world’s largest radio telescope
Future SKA governance structure

• IGO = ‘Convention’ agreed between governments
  • Government commitment: Long-term political stability, funding stability
  • A level of independence in structure
  • Availability of ‘supporting processes’ through Privileges and Immunities from members: functional support for project
  • ‘Freedom to operate’, specifically through procurement process, employment rules and so on
IGO Development

Exploring the Universe with the world’s largest radio telescope
## IGO Development Schedule

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release of Final Record of Negotiation</td>
<td>March 2018</td>
</tr>
<tr>
<td>Initialing</td>
<td>Now</td>
</tr>
<tr>
<td>Signing of Convention</td>
<td>~September 2018</td>
</tr>
<tr>
<td>Ratification of Convention</td>
<td>~September 2018-September 2019</td>
</tr>
<tr>
<td>IGO created (5 countries ratified) (first meeting of IGO Council)</td>
<td>Mid 2019</td>
</tr>
<tr>
<td>Transition from Company to IGO</td>
<td>Mid 2019 – Q2 2020</td>
</tr>
<tr>
<td>Construction Proposal Approved</td>
<td>Q2 2020</td>
</tr>
</tbody>
</table>
Design Development
International Design Teams

- Project Management and System Engineering based at Jodrell Bank, Manchester, UK
- ~500 scientists & engineers in institutes and industry in 11 Member countries of the SKA
System Overview

South Africa

8.8 Tbits/s

SKA Regional Centres

300 PB/yr

2x 5 Tbits/s

~50 PFlop

Desert

Cape Town (SA) and Perth (AU)

~250 PFlop

2 Pbits/s

7.2 Tbits/s

Australia

SIGNAL AND DATA TRANSPORT

LOW-FREQUENCY APERTURE ARRAY

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### Project Schedule

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
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<tbody>
<tr>
<td>AIV CDR close</td>
<td>December 2018</td>
</tr>
<tr>
<td>CSP CDR close</td>
<td>July 2018</td>
</tr>
<tr>
<td>DSH CDR close (Element &amp; Band 2)</td>
<td>December 2018</td>
</tr>
<tr>
<td>DSH CDR close (Bands 1 &amp; 5)</td>
<td>April 2019</td>
</tr>
<tr>
<td>INAU CDR close</td>
<td>July 2018</td>
</tr>
<tr>
<td>INSA CDR close</td>
<td>July 2018</td>
</tr>
<tr>
<td>LFAA CDR close (SKALA4 delays?)</td>
<td>Sept 2018</td>
</tr>
<tr>
<td>SaDT CDR close</td>
<td>June 2018</td>
</tr>
<tr>
<td>SDP CDR close</td>
<td>December 2018</td>
</tr>
<tr>
<td>TM CDR close</td>
<td>June 2018</td>
</tr>
<tr>
<td>System CDR close</td>
<td>July 2019</td>
</tr>
<tr>
<td>Construction Proposal submission</td>
<td>March 2020</td>
</tr>
</tbody>
</table>
CDR Process

• Readiness review 4-8 weeks before submission.
• Design consortia submits design documentation
• Review panel convened
• 4-8 weeks reviewing documentation
  • Each reviewer submits observations individually.
  • Design consortia responds to observations as they are raised.
• Panel develops scenarios to illustrate architectural qualities and their concerns.
• Review divided into two parts:
  • SEI ATAM process. Documentation is assessed by the design team using the documentation to demonstrate how the system would react to the scenario.
  • Discussion and closeout of the major observations.
ATAM overview

- Business Drivers
- Quality Attributes
- Scenarios
- Architectural Decisions
- Architectural Approaches
- Analysis

impacts

Risk Themes

distilled into

- Tradeoffs
- Sensitivity Points
- Non-Risks
- Risks
## Putting it all together

<table>
<thead>
<tr>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
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<tbody>
<tr>
<td>1</td>
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### Design
- Element CDRs

### Procurement
- System CDR
- Const. Prop

### Construction
- Transition
- Enters into force

### IGO Development
- Initialing
- Signing
- Ratification
- Negotiation

### Project Development
- Core Array
- Core Array
- System CDR
- Const. Prop

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**Expanding the Universe with the world's largest radio telescope**
Towards Construction
Construction Cost Breakdown
Work Breakdown Structure
Scaled Agile Framework
Summary

• SKA is in undergoing a major transition from design to looking towards construction.

• This year sees major progress in the CDR’s and in the Governance area.

• The use of scenarios to evaluate architecture and design documentation has proved very valuable.

• We will be using the Scaled Agile Framework for construction.