Square Kilometre Array
3 sites; 2 telescopes + HQ
1 Observatory

Design Phase: > €170M; 600 scientists+engineers

Phase 1
Construction: 2019 – 2024
Construction cost cap: €674.1M (inflation-adjusted)
Operations cost: under development (see below)

MeerKat integrated
Observatory Development Programme (€20M/year planned)
SKA Regional centres out of scope of centrally-funded SKAO.

Phase 2: start mid-2020s
~2000 dishes across 3500km of Southern Africa
Major expansion of SKA1-Low across Western Australia
SKA: HQ in UK; telescopes in AUS & RSA

SKA1-LOW: 50 – 350 MHz
Phase 1: ~130,000 antennas across 65km

SKA1-Mid: 350 MHz – 24 GHz
Phase 1: 200 15-m dishes across 150 km

Construction: 2018 – 2024; Cost cap: €675M
Image Quality Comparison

- Single SKA1-Mid snap-shot compared to combination of snap-shots in each of VLA A+B+C+D
Image Quality Comparison

- Single SKA1-Low snap-shot compared to LOFAR-INTL snap-shot
Headline: SKA System PDR passed in December, subject to some work now underway.
SKA-LOW prototype antenna station deployed
MeerKAT
New SKA HQ building: work underway

£16.5M investment
Completion in June 2018
Exploring the Universe with the world's largest radio telescope
Exploring the Universe with the world's largest radio telescope
Future Governance
SKA Organisation: 10 countries, more to join

Australia (DoI&S)  
Canada (NRC-HIA)  
China (MOST)  
India (DAE)  
Italy (INAF)  
Netherlands (NWO)  
New Zealand (MED)  
South Africa (DST)  
Sweden (Chalmers)  
UK (STFC)

Interested Countries:  
• France  
• Germany  
• Japan  
• Korea  
• Malta  
• Portugal  
• Spain  
• Switzerland  
• USA

Contacts:  
• Mexico  
• Brazil  
• Ireland  
• Russia

Full members
- SKA Headquarters host country
- SKA Phase 1 and Phase 2 host countries

African partner countries
(non-member SKA Phase 2 host countries)

This map is intended for reference only and is not meant to represent legal borders.

Exploring the Universe with the world's largest radio telescope
SKA Office supported by:
- a joining fee (€1M) and
- cash ‘subscription’

Global design effort organised in consortia. Supported by:
- Local funding (total >€150M)
SKA Organisation Ltd
UK company structure

SKA Observatory IGO

Design Phase

2016

Construction/Ops Phase
Governance/organisational 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 Negotiation process

• 4 plenary meetings:
  – 14-16 October 2015
  – Jan 2016, April 2016, then September 2016

• Participation from all current SKAO members:
  – Majority as ‘negotiating parties’ – triggered by mandate being provided by a Member’s government (RSA, AUS, UK, IT, NL, CN, IN, NZ, SE)
  – ‘Observer’ status for those without that mandate (Canada, Germany)
  – Now potentially Portugal and Spain?

• Aim:
  – Negotiation of core texts of agreements
  – Negotiation on supporting concepts that input to agreements or supporting policies

• Working Groups dealing with financial models, procurement approach, telescope access, IP etc: now focused on ‘Task Force’ to finalise issues
Internal documents for the IGO: largely internally developed, focussed on day-to-day operations

Founding documents for the future IGO – need Parliaments to approve and 'ratify'
- Treaty (Convention)
- Privileges and Immunities Agreement
- Financial Protocol

Procurement policy
- Access policies
- Hosting Agreements
- IPR policy
- Staff procedures, rules and regulations
- Operational rules on procurement etc.
- Financial regulations
- Council rules of procedure etc.

Exploring the Universe with the world's largest radio telescope
High-level IGO timeline

• **Now to July:**
  - Finalising the Convention text and other ‘treaty-level’ documents
  - High-level discussions on procurement principles, access etc
  - Governments preparing to ‘initial’ the documents
  - Discussions about initial phases of funding the IGO (not SKA1 construction...)

• **~July:**
  - Documents ‘initialled’ to mark end of negotiation process; governments prepare to sign the Convention

• **Best guess – September:**
  - Signing event for negotiating governments – most sign in one go, others when ready
  - Ratification of Convention by governments begins
  - ‘Proto IGO Council’ starts work preparing for IGO – policies, the transition from the company etc
Creating the SKA IGO

The things we know:

- IGO ‘enters into force’ when 5 countries (including UK, AUS and SA) complete ratification of the Convention

- At some point TBD we transition assets and responsibility for the project to the IGO: between now and then, much preparatory discussion on all issues

- Once there is a critical mass of ratified countries (and money and ‘a plan’) the IGO Council can approve SKA1 construction

- Once that happens, we move into a phase of preparing for procurement – it will be a phased procurement
Creating the SKA IGO

The things we don’t know:

• When will the IGO ‘enter into force’?  **Best guess 12 months after signing**

• When do we transition and have an operating IGO?  **Best guess early 2019**

• When will there be a critical mass of ratified countries (and money and ‘a plan’) so that the IGO Council can approve SKA1 construction?  **Best guess later in 2019**

• When do the procurement opportunities start for SKA1?  **Best guess much later in 2019 – SDP’s procurement in particular will be phased and ongoing through SKA1 construction**
Engineering timeline

Key points and caveats:
• Current timeline through CDR to construction proposal.....but:
• Schedule under close scrutiny at present:
  • Office and Board examining cost control options for SKA1
  • Considerable work underway in Office and design consortia (including SDP)
  • Expect updated view of programme schedule post July Board meeting....
• For now: assume SKA1 approval in 2019 – move to procurement phase thereafter
The full picture...

Key Dates as of today:
- IGO in operation: early 2019
- Design process ‘complete’ ~mid/late 2018
- IGO Council approves construction: early/mid 2019
- SKA1 construction procurement begins: ~late 2019
Summary

• Overall progress is very positive:
  • Technical progress moving well, dealing with challenges
  • Precursors/pathfinders being delivered; delivering science
  • Route to an IGO now appears firm
  • HQ construction started
  • Real money being spent now by governments, real commitment being made at political level

• Involvement in pre-construction phase strong and visible:
  • Development and organisation of science community
  • Technical involvement in design activities

• ~2020 timescale for potential Federal contribution in SKA1 construction potentially well aligned with actual project schedule, if building on preparatory links/interaction
A word on Procurement

**Key founding points:**
- Each Member should receive ‘fair work return’ from investment
- Ability to manage both ‘cash procurement’ and ‘in-kind’ activities

**Excellent progress made:**
- Methodology and convergence on what constitutes ‘fairness’ in terms of process
- The steps around an initial exploratory expression of interest to inform SKA1 Procurement Plan
  - Note likely to be preparatory discussions, which will impact approach to SDP, after signature
- Managing the approach to varying interest in cash and in-kind tender responses – general support for draft process, but further discussion needed
Organisation membership summary

- Current SKA Organisation (SKA Ltd) – to completion of design phase in 2017-2018:
  - **Members** (paying membership fee to Organisation):
    - Open to ‘Organisations of national scale’
    - Current membership a mix of government and national institute bodies
    - Membership fee for Switzerland potentially €500k/yr, plus a joining fee
    - Secures membership of the Board, involvement in all major project decisions
    - Exposure to project information as SKA moves towards construction (eg privileged information in preparation for procurement)
    - Opens door to participation at IGO negotiation process (at least, observer status)

- **Associate members** (‘intending to move to becoming members’)
  - No direct funding contribution but expectation of contribution in becoming member
  - Attendance at Board, but not involved in decision-making processes

- Process: begins with informal discussions, then approach to DG and Board Chair and formal application to join
Organisation membership summary

• Future organisation (IGO) – 2018 onwards:

• Assumes ‘State’ involvement in project, and representation by federal body

• Detailed process still in discussion at present, but some areas clear on membership:

  – **Members** (States) contributing to construction and operations → full access/industry access rights
  – **Associate Members** (access/industry etc terms to be agreed.....)
  – **Collaborating bodies** (.............much less clear.....)

• Joining process (and perhaps financial assumptions) depends on timing –