Square Kilometre Array: status

Philip Diamond
SKA Director-General
7th October 2013
Great Observatories for the coming decades

E-ELT optical/IR

Construction approved
Great Observatories for the coming decades

Atacama Large Millimetre Array (ALMA): mm/submm
Chajnantor Plateau @ 17,000 ft
Early science now
Inaugurated on 13\textsuperscript{th} March 2013
Great Observatories for the coming decades

James Webb Space Telescope: due for launch in 2018
Great Observatories for the coming decades

Square Kilometre Array: radio
Construction start 2017/18
SKA: the project
SKA2 Key Science Drivers

• ORIGINS
  – Neutral Hydrogen in the Universe from the Epoch of Re-ionisation to now
    • When did the first stars and galaxies form?
    • How did galaxies evolve?
    • Dark Energy, Dark Matter
  – Astro-biology

• FUNDAMENTAL FORCES
  – Pulsars, General Relativity and gravitational waves
  – Origin and evolution of cosmic magnetism

• TRANSIENTS (new phenomenon)
SKA1 Key Science Drivers

• ORIGINS
  – Neutral Hydrogen in the Universe from the Epoch of Re-ionisation to now
    • When did the first stars and galaxies form?
    • How did galaxies evolve?
    • Dark Energy, Dark Matter

• FUNDAMENTAL FORCES
  – Pulsars, General Relativity and gravitational waves

*Science with the Square Kilometre Array*
SKA Phase 1 (SKA1)  
Cost: €650M, construction start 2017

**Southern Africa**
- SKA1_MID
  - 254 Dishes including:
    - 64 x MeerKAT dishes
    - 190 x SKA dishes

**Australia**
- SKA1_LOW
  - Low Frequency Aperture Array Stations
  - 96 Dishes including:
    - 36 x ASKAP
    - 60 x SKA dishes

Exploring the Universe with the world’s largest radio telescope
SKA Phase 1 (SKA1)
Cost: €650M, construction start 2017

- **Southern Africa**
  - SKA1_MID
  - 254 Dishes including:
    - 64 x MeerKAT dishes
    - 190 x SKA dishes

- **Australia**
  - SKA1_LOW
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    - 36 x ASKAP
    - 60 x SKA dishes

Exploring the Universe with the world’s largest radio telescope
SKA Phase 2 (SKA2)
Cost: TBD; construction start 2022

Southern Africa
SKA2_MID
2500 Dishes

Australia
SKA2_AA
Mid Frequency Aperture Array Stations

SKA2_LOW
Low Frequency Aperture Array Stations

Exploring the Universe with the world’s largest radio telescope
SKA: the structure
SKA Members and Governance

Australia (DIISRTE)
China (MOST)
Italy (INAF)
New Zealand (MED)
Sweden (Chalmers)

India (Tata/DAE)

Canada (NRC-Herzberg)
Germany (BMBF)
Netherlands (NWO)
South Africa (DST)
UK (STFC)

- UK Company Limited by Guarantee
- (Expedient solution to enable SKA project to proceed; long-term governance structure under review)
SKA Members and Governance

- Members
- Board of directors
- Director-General
- SKA Office
- Work Package Consortia

Committees:
- Finance Committee
- Executive Committee
- Science & Engineering Committee
- Strategy & Bus. Dev. Committee
- Science Working Group

Funding:
- €23.4 M (cash)
- > €97.2 M (in kind)
SKA Office: 48
Design consortia: > 350
SKA Office: 48
Design consortia: > 350
Recruitment

- Head of Project/Deputy D-G: Alistair McPherson, currently E-ELT Project Manager; 1 Feb 2014.
- Science team: in place
- Policy Team: recruited, begin in November/December
- Power Engineer
- Eng Proj Mgr: Dishes, CSP, Site & Infr
- Sys Eng: Dishes, LFAA
- Configuration Mgr

- 3 more jobs to be offered today
- Several interviews last week, more to come.
SKA: status
Design process

• Design of SKA to be undertaken in global consortia, which act as contractors to the central office.
• SKA Office will run system engineering, receive and review designs from consortia, monitor progress, analyse Earned Value.
• SKA Office issued a **baseline conceptual design** to serve as starting point for design, based on previous work and CoDRs.
• 10 consortia formed to undertake the design.
• SKA Office holds the design authority for the project.
Work Packages

- Led by SKA Office
  - Management
  - Science
  - System Design and system engineering
  - Maintenance & Support and Operations
- Carried out by Work Package Consortia
  - Dish Array
  - Aperture Arrays
  - Signal and Data Transport (including synchronisation and timing)
  - Central Signal Processor
  - Science Data Processor
  - Telescope Manager
  - Infrastructure, including power
  - Assembly, Integration and Verification
- Advanced Instrumentation Programmes (to be integrated with Dish & AA WPs)
  - Mid Frequency Aperture Array
  - Wide Band Single Pixel Feeds

Exploring the Universe with the world’s largest radio telescope
Boundary conditions

- Members’ decision May 2012:
  - SKA1-low – Australia
  - SKA1-survey – Australia
  - SKA1-mid – South Africa

- Incorporate precursors to re-use as much existing infrastructure as possible

- SKA Board has set a cost-cap for SKA1 construction
  - Imposes discipline on the design process
  - Unit costs have been provided, where appropriate, to design consortia.
  - Evolution of design guided by scientific and engineering assessments – re-baselining in ~1 year.
  - Enables Members to engage with governments to seek construction funding.
Timeline

- Request for Proposals
- Proposal responses
- Proposal evaluation
- Cost ceiling established
- Design consortia start
- Preliminary Design Review
- Prototype systems deployed
- Critical Design Review
- Seek SKA1 funding
- Develop SKAO governance
- SKA1 construction approved
- Tender & procure construction
- SKA1 construction
- Detailed design of SKA2
- SKA1 early science

3 years
Thank-you for your attention

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