anzska
Square Kilometre Array ▸
Australia ▸ New Zealand

Fact sheet

What is the SKA?

The Square Kilometre Array (SKA) is a next-generation radio telescope that will be vastly more sensitive than the best present-day instruments. It will give astronomers remarkable insights into the formation of the early Universe, including the emergence of the first stars, galaxies and other structures. This will shed light on the birth, and eventual death, of the cosmos.

The SKA will require new technology and progress in fundamental engineering in fields such as information and communication technology, high performance computing and production manufacturing techniques. It will comprise a vast array of antennas, arranged in clusters to be spread over 3000 kilometres or more. The antennas will be linked electronically to form one enormous telescope. The combination of unprecedented collecting area, versatility and sensitivity will make the SKA the world's premier imaging and survey telescope over a wide range of radio frequencies, producing the sharpest pictures of the sky of any telescope.

The SKA will:

- be the next-generation radio telescope for the international scientific community
- revolutionise our understanding of the Universe by providing answers to questions about its complexity and the fundamental laws of physics
- have up to one square kilometre of effective collecting area and be the largest telescope in the world
- have up to 50 times the sensitivity and 10,000 times the survey speed of present radio telescopes
- use new technology antennas, signal transport, signal processing and computing provided by innovations in radio frequency and information communication technology.

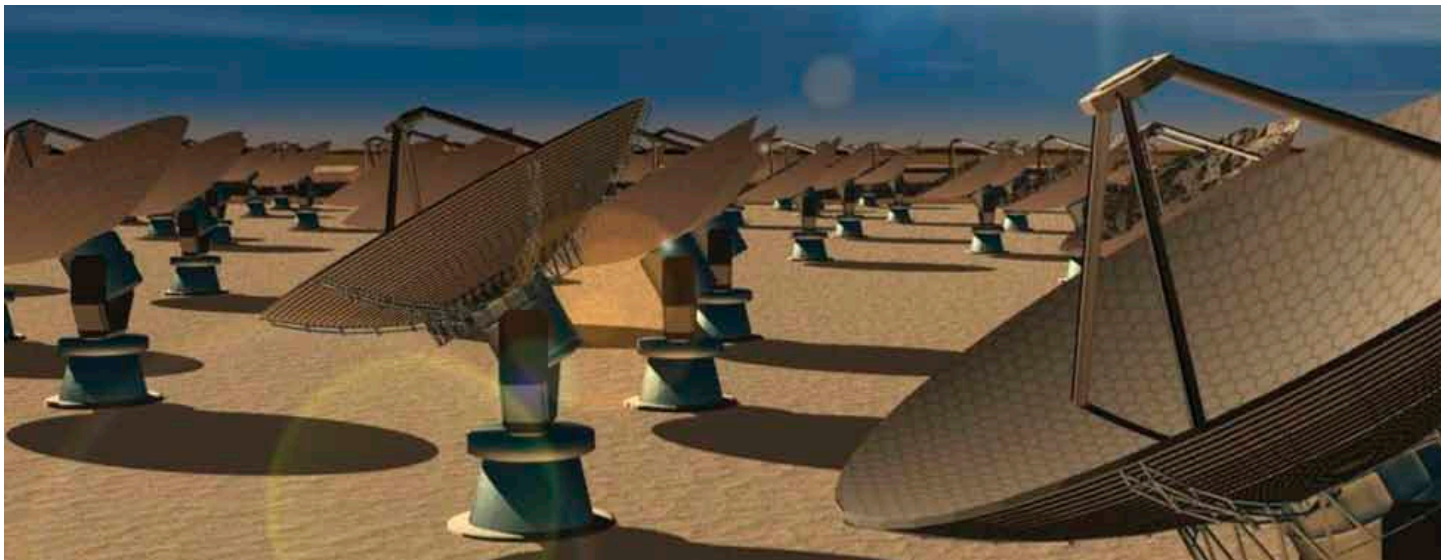
Why build the SKA?

In order to answer some fundamental questions about the origin and evolution of the Universe, a more sensitive radio telescope is needed that can detect the very weak signals coming from the edge of the cosmos. A telescope such as the SKA will be able to "see" distant objects in the very young Universe and provide answers to questions such as the emergence of the first stars, galaxies and other structures. Because the speed of light is finite and the size of the Universe is so large, telescopes are effectively time machines, enabling astronomers to look into the past and study the Universe as it was billions of years ago.

Five key science projects have been identified for the SKA, namely:

- extreme tests of general relativity from the study of pulsars and black holes
- evolution of galaxies, cosmology, dark matter and energy
- probing the Dark Ages – the first black holes and stars
- the Cradle of Life – searching for life and planets
- the origin and evolution of cosmic magnetism.

Artist's impression of SKA antennas. Credit: *skatelescope.org.*



Who is involved in the project?

The SKA is a collaboration between institutions in 19 countries (including Australia, New Zealand, countries in Europe, Asia, Africa, and North and South America), led by an international science and engineering committee and a jointly-funded SKA Project Office. The cost of the telescope (about A$2.5 billion) will be shared by the participating countries. Scientists are also collaborating with industry partners to develop the necessary technologies to design and build the telescope.

Where will the SKA be built?

The international astronomy community has identified two suitable places for locating the SKA – Australia and Southern Africa. The Australian candidate core site is in the Mid West of Western Australia, within the Shire of Murchison. This region is one of the few places in the world today that is suitable in terms of its radio quietness and its radio-astronomy observational qualities.

The Australian Government is cooperating closely with the Western Australian Government, the Government of New Zealand and CSIRO on the Australian bid. A final decision on the location of the SKA will be made around 2012.

View over part of the proposed SKA candidate site in Western Australia. Credit: *Dave DeBoer, CSIRO.*

For further information

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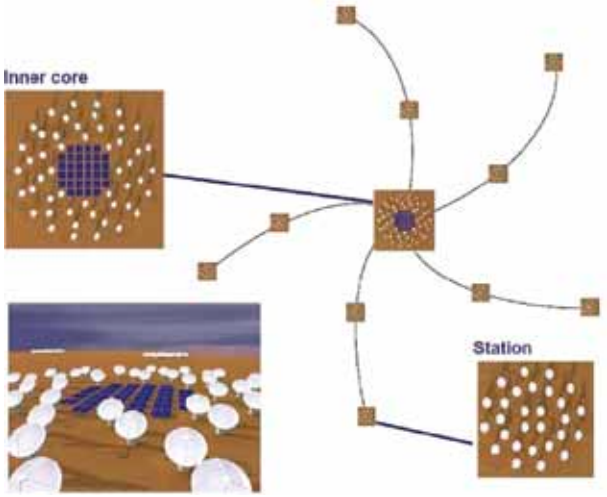
International SKA website:
www.skatelescope.org



Schematic view of the proposed SKA configuration. Credit: *skatelescope.org.*

What will the SKA look like?

It is proposed that the SKA will have an inner core, comprising a set of "flat phased arrays" surrounded by several hundred dish-shaped antennas.

Two different kinds of antenna at the core are necessary to enable the telescope to receive a wider frequency range and to enable wide fields-of-view at low frequencies. In addition to this core site, a series of remote array stations (clusters of dishes) forming a five-arm spiral configuration will be built. The addition of the remote stations means that the signals from the separate antennas can be digitally combined to simulate a single telescope with a diameter equal to the distance separating the two furthest antennas. Since the Australian proposal provides for array stations to potentially be sited as far away as New Zealand, this could be more than 5000 km.

Computing

The telescope's computing and communications systems will need to cope with very high data transport rates. In the inner array the data will be transported to a central processor at the rate of 80 Gigabytes per second per antenna, while long haul links servicing the outer and remote array stations may need a capacity of 2 Terabytes per second per station. This is more than the current total internet traffic in Europe!

Australian Government

New Zealand Government

CSIRO

THE GOVERNMENT OF WESTERN AUSTRALIA

11/09