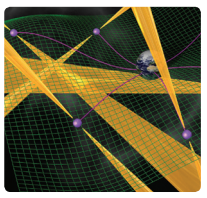
# The Square Kilometre Array

Exploring the Universe with the world's largest radio telescope

The Square Kilometre Array (SKA) is a mega-science project to build a revolutionary radio telescope with global involvement and unprecedented scientific and technical ambition. The SKA will be made of thousands of receptors linked together across an area the size of a continent. The total collecting area will be about one square kilometre, giving 50 times the sensitivity and 10 000 times the survey speed of the best current-day radio telescopes. The SKA will be built in Africa and Australia-New Zealand. The first astronomical observations will be made in 2019.

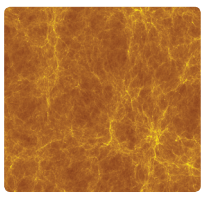
## The SKA will address five fundamental unanswered questions about the Universe:



### Was Einstein right?

✶ The SKA will investigate the nature of gravity and challenge the theory of general relativity. Pulsars, the collapsed spinning cores of dead stars, will be monitored to study gravitational waves and black holes.

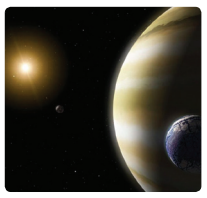
Picture: D. Champion, M. Kramer



### How were the first black holes and stars formed?

✶ The SKA will look back to the Dark Ages, a time before the Universe lit up. It will provide detailed pictures of the cosmic web of neutral gas to discover how the very first black holes and stars formed.

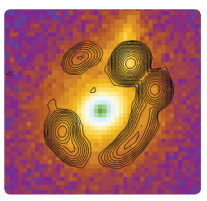
Picture: I.Iliev, G. Mellema



### Are we alone?

✶ The SKA will be able to detect extremely weak extraterrestrial signals and may even spot other planets capable of supporting life. Astrobiologists will use the SKA to search for amino acids, the building blocks of life, by identifying spectral lines at specific frequencies.

Picture: NASA



### How do galaxies evolve, what is dark energy?

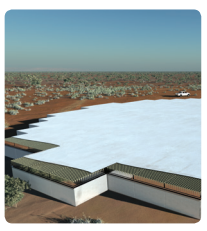
✶ Mysterious dark energy is thought to cause the increasing rate of expansion of the Universe. The SKA will investigate this expansion by mapping the cosmic distribution of hydrogen. This map will track young galaxies and help to identify the nature of dark energy.

Picture: HST/STScI, MERLIN

### What generates giant magnetic fields in space?

✶ By measuring the radio emissions of millions of distant galaxies, the SKA will create three-dimensional maps of cosmic magnets throughout the Universe and reveal their role in its evolution.

Picture: Hubble Heritage/NASA/STScI, R. Beck/MPIfR



### The ambition and scale of the SKA projects demand innovative technical developments.

✶ The SKA will use 3 000 dishes, each about 15 m wide. Two other types of receptor, known as aperture arrays, will also be used to observe very large areas of the sky simultaneously. The antennas will cover the frequency range 70 MHz to 10 GHz (4 m to 3 cm wavelength).

### Technical developments

- ✶ Renewable energy generation and distribution options.
- ✶ Wideband optic fibre signal transport.
- ✶ Data storage and innovative retrieval.
- ✶ Fast, high-resolution analogue to digital converters.
- ✶ Software development.
- ✶ High-performance computing engines.

### Spin off technologies

- ✶ Radio technology for satellite communications and navigation systems.
- ✶ High-tech electronics.
- ✶ Materials research applicable to the aerospace industry.
- ✶ IT systems for remote regions worldwide.
- ✶ Phased array antenna technologies.

**The SKA – a voyage into the unknown…** The continued multi-national partnership between engineers, astronomers, astrobiologists, physicists and industry on the SKA project will offer a new way to study the Universe and is sure to provide a wealth of discoveries.

For more information please contact: **Enquiries@skatelescope.org** Or visit: **www.skatelescope.org**