SQUARE KILOMETER ARRAY (SKA)

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Context:

Square Kilometer Array (SKA), the world's largest radio telescope in the making, has carried out its first observations, signalling that at least a part of the yet-to-be-completed facility has become functional.

Background:

The SKA is an international science project with headquarters in the United Kingdom. In December last year, India, which has been collaborating on the project since its inception, became a full member country in the international consortium building this telescope across two continents.

About Square Kilometer Array (SKA):

1. The Square Kilometre Array (SKA) is an ambitious international project aimed at building the world's largest and most sensitive radio telescope.
2. Purpose: The SKA is designed to explore the universe in unprecedented detail, addressing fundamental questions in astrophysics, cosmology, and even the search for extraterrestrial life.
3. Location: The SKA will be split between two primary sites: the Karoo region in South Africa and the Murchison region in Western Australia.

Structure and Technology:

1. Components: The SKA will consist of two main arrays:
    - SKA-Mid: Located in South Africa, this array will include 197 large dish antennas to observe mid-frequency radio waves (350 MHz to 15.4 GHz).
    - SKA-Low: Located in Australia, this array will feature 131,072 low-frequency (50 – 350 MHz) antennas designed to detect radio waves from the early universe.
    - Collecting Area: The combined collecting area of the SKA will be approximately one square kilometre, making it 50 times more sensitive than any current radio telescope.
    - Interferometry: The SKA will use a technique called aperture synthesis, linking multiple telescopes to act as a single, large telescope. This will provide extremely high-resolution images.

Scientific Goals:

1. Cosmology: Study the formation and evolution of the first stars and galaxies after the Big Bang.
2. Dark Matter and Dark Energy: Investigate the nature of dark matter and dark energy, which make up most of the universe's mass-energy content.
3. Astrobiology: Search for signs of extraterrestrial life by detecting bio-signatures and techno-

signatures.

4. Fundamental Physics: Test Einstein’s theories of gravity and explore the properties of gravitational waves.