

## Square Kilometre Array (SKA) Observatory

### Why in News?

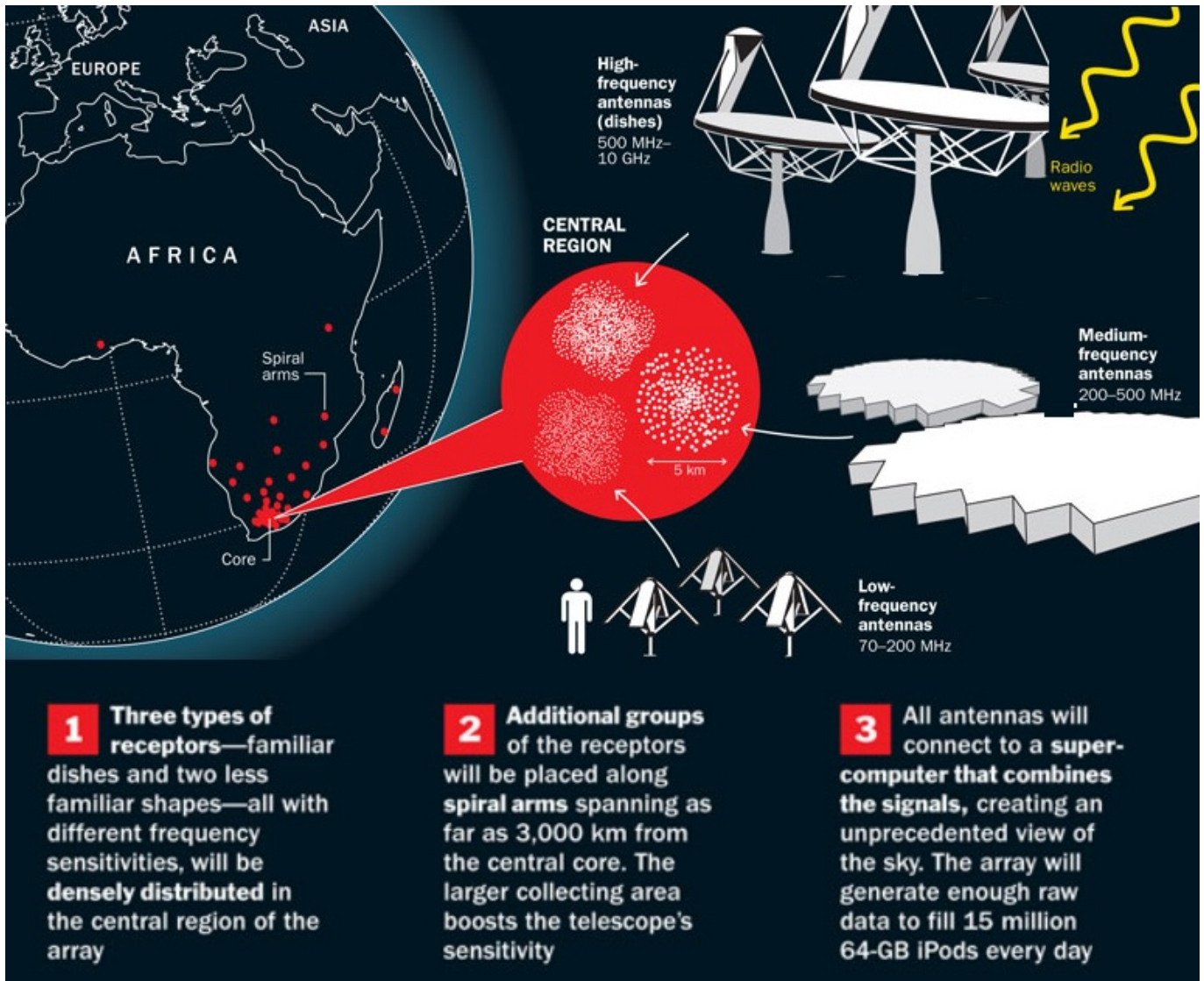
India had decided to formally join the Square Kilometre Array (SKA) project, an international scientific collaboration working to build the world's largest radio telescope.

### What is SKA?

- **SKA** - It will be the ***world's biggest and most advanced radio telescope*** ever constructed.
- It will not be a single large telescope, but a *collection of thousands of dish antennas* operating as a single unit.
- **SKA Observatory Convention** - The international treaty that established the facility as an intergovernmental organisation.
- **Objective** - To ***create 1 square kilometre*** of effective area for collecting radio waves using radio telescopes.
- **Mission** - To build and operate cutting-edge radio telescopes to transform our understanding of the Universe, and deliver benefits to society through global collaboration and innovation.
- **Headquarters**- United Kingdom (UK)
- **Implementation** - By installing *1000's of smaller antennas* in a specific array design that would make them function like a single radio telescope.
- **Budget** - USD 2.4-billion project
- **Distribution of antennas** - About 200 of them in South Africa and more than 130,000 in Australia.

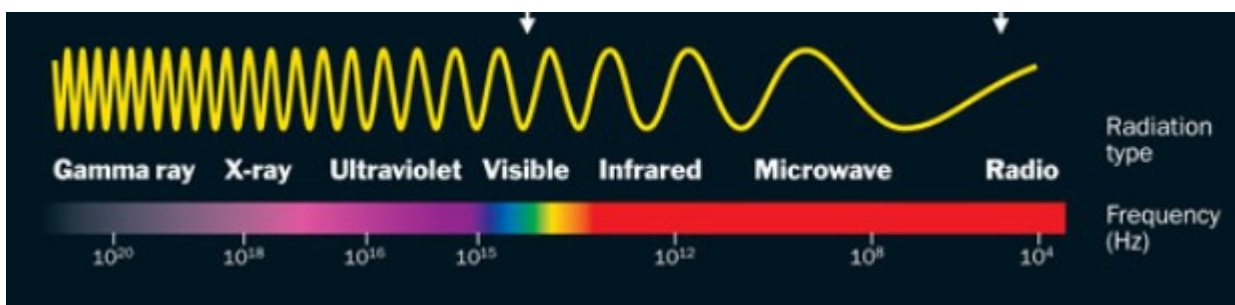
*In SKA Observatory, the South African array will focus on mid-frequency signals, while the Australian telescope will cover low-frequency ranges.*

- **Installation location** - In *sparsely populated areas* in order to *minimise signal interference* from undesirable Earth-based sources.
- **Consortium Members** - It includes **16 member countries**, such as Australia, South Africa, Canada, China, India, Japan, and several European nations.
- **Significance** - Once operational, it would be between ***5 to 60 times more powerful*** than the most advanced existing radio telescopes functioning in comparable frequency ranges.



## How does it work?

- The SKA telescopes will observe from 50 MHz to 15.4 GHz (with a goal of 24 GHz) in the radio frequency part of the electromagnetic spectrum.
- **Working** - It receive radio waves from space using antennas which are sent through a processing chain that enables the astronomical data ultimately to be turned into an image of the sky.



- **Advantage** - Unlike optical telescopes, radio telescopes can be used even in **cloudy skies**, as the longer wavelengths can pass through clouds unhindered.
- They can **detect invisible hydrogen gas**, the most abundant element in the Universe, which emits in the radio band at 1420 MHz.

- They can also reveal areas of space that may be obscured by cosmic dust, as radio waves are ***can travel through these dust clouds***.

**Radio astronomy** has led us to some amazing astronomical discoveries, such as pulsars, exoplanets and the cosmic microwave background (a remnant signal left over from The Big Bang).

## What is the role of India in SKA?

- **Indian participation** - India has been involved in the SKA project right from its inception in the 1990s.
- It is being led by Pune-based ***National Centre for Radio Astrophysics (NCRA)***.
- **India's contribution** - In design and development of the telescope and the main contribution has come in the development, and operation, of the Telescope Manager, the '***neural network***' or the software that will run the entire facility.
- **Benefits** - Though none of the SKA facilities would be located in India, there are immense science and technology gains to the Indian scientific community.
- It will promote ***research in radio astronomy*** where India is already taking leaps through
  - ***Giant Meterwave Radio Telescope (GMRT)***, Pune
  - Other similar facilities in Ooty, Nainital and Bengaluru
- It will get ***preferential allocation of time*** on the radio telescope, roughly in proportion to their contribution to the project, and only limited time slots would be available through competitive bidding.

Most existing telescopes operate under ***an open-use policy*** which allows research groups from any country to get time on the facility through competitive bidding by making a scientific case.

- The SKA would work on highest-end technologies and the ***intellectual properties would be accessible*** to all the member countries.
- Indian scientists can use SKA for studying concepts relating to the ***evolution of the early universe and galaxies, neutron star*** physics, and solar sciences.
- It helps in ***capacity building and training*** opportunities.
- **Future plans** - To set up an SKA regional centre in the country that will be part of the global network to process and store data and make it available for the scientific community.

## References

1. [The Indian Express| Significance of India's membership in SKA](#)
2. [SKAO| Square Kilometre Array Observatory](#)



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