

SARAS 3 radio telescope

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In news-India's SARAS-3 radio telescope has "conclusively refuted" a recent claim of the discovery of a 21-cm radio wave signal from Cosmic Dawn, the time in the infancy of our Universe when the first stars and galaxies came into existence.

Background-

- In 2018 a team of researchers from Arizona State University (ASU) and MIT in the US detected a signal from stars emerging in the early universe using data from the EDGES radio telescope.
- ASU/MIT team had claimed the discovery of a radio wave signalling the birth of the First Stars, which was also hailed by Harvard astrophysicist Avi Loeb as worthy of two Nobel prizes.
- However, the world awaited confirmation from independent researchers.
- Utilizing the indigenously invented and built **SARAS 3 radio telescope, researchers from Raman Research Institute, an autonomous institute of the Department of Science & Technology, Govt. of India** has refuted this claim.

SARAS-3 radio telescope & its discovery-

- SARAS is a niche high-risk high-gain experimental effort of RRI initiated and led by Prof. Ravi Subrahmanyam, along with Prof. N. Udaya Shankar.
- SARAS is a correlation spectrometer designed for precision measurements of the cosmic radio background and faint features in the sky spectrum at long wavelengths and **operates in the octave band 87.5–175 MHz.**
- It was built to deploy in India a precision radio

telescope to detect extremely faint radio wave signals from the depths of time, from our **“Cosmic Dawn” when the first stars and galaxies formed in the early Universe.**

- **SARAS-3 is the first telescope worldwide to reach the required sensitivity** and cross-verify the claim of the signal detection.
- The **signal from Cosmic Dawn is expected to arrive on Earth stretched in wavelength to meters and lowered in frequency** by the expansion of the Universe to lie in the radio frequency band 50-200 MHz.
- **Detecting a faint signal from such an early period of the Universe is extremely difficult.**
- The celestial signal is exceptionally faint – buried in sky radio waves that come to us from the gas in our own Galaxy, the Milky Way, which are a million times brighter.
- Besides, this cosmic signal is in a radio wavelength band used by numerous terrestrial communications equipment and TV and FM radio stations, which makes detecting the extra-terrestrial signal extremely difficult.
- However, RRI scientists and engineers have risen to the challenge and designed and calibrated the SARAS radio telescope to discern signals from Cosmic Dawn.
- The **telescope was first deployed in rural Timbaktu Collective in Anantapur district.**
- The subsequent deployment took place in the wilderness of **trans-Himalayan Ladakh**, logistics supported by the Indian Astronomical Observatory, operated by the Indian Institute of Astrophysics.
- Recently, RRI astronomers came up with the **idea of floating the radio telescope on a raft on water, which** had never been conceived of in the world.
- This helped provide a homogenous medium of high dielectric constant below the antenna improving

sensitivity and reducing confusing radio waves emitted by the very ground beneath radio telescopes.

- **In 2020, the radio telescope was deployed in lakes in Northern Karnataka, on Dandiganahalli Lake and Sharavati backwaters.**
- After a rigorous statistical analysis led by Dr. Saurabh Singh, a research scientist at RRI, SARAS 3 did not find any evidence of the signal claimed by the EDGES experiment.
- The presence of the signal is decisively rejected after a careful assessment of the measurement uncertainties.
- Therefore, the finding implies that the detection reported by EDGES was likely contamination of their measurement and not a signal from the depths of space and time.