

First Radio Signal from Moon's Far Side

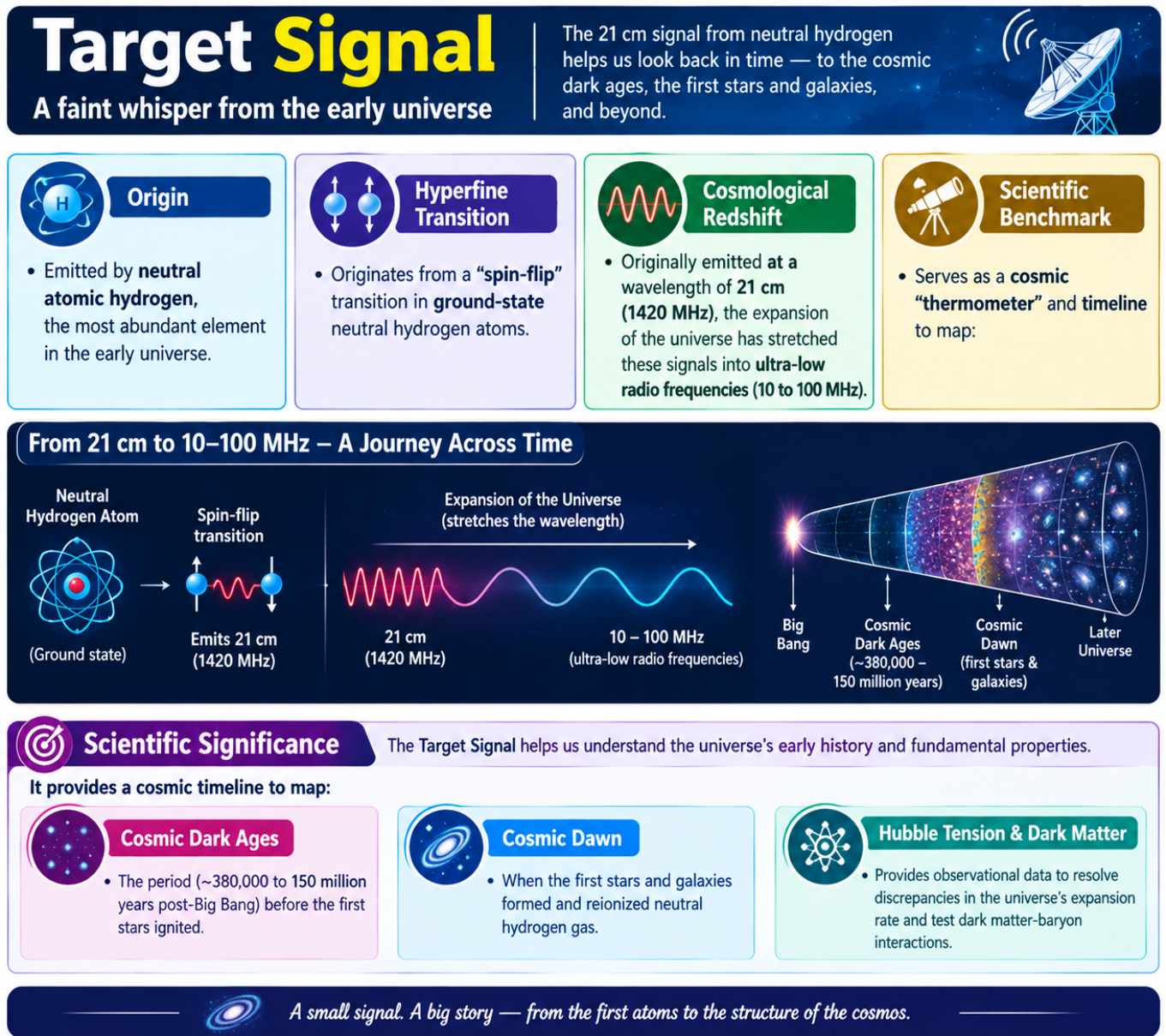
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Why in News?

Scientists are preparing to deploy miniature space observatories, primarily the UK-led CosmoCube mission along with India's proposed PRATUSH project into lunar orbit.

Target Signal

- **Origin** - Emitted by neutral atomic hydrogen, the most abundant element in the early universe.
- **Hyperfine Transition** - Originates from a "spin-flip" transition in ground-state neutral hydrogen atoms.
- **Cosmological Redshift** - Originally emitted at a wavelength of 21 cm (1420 MHz), the expansion of the universe over ~13.5 billion years has stretched these signals into ultra-low radio frequencies (**10 to 100 MHz**).
- **Scientific Benchmark** - Serves as a cosmic "thermometer" and timeline to map:
- **Cosmic Dark Ages** - The period (~380,000 to 150 million years post-Big Bang) before the first stars ignited.
- **Cosmic Dawn** - When the first stars and galaxies formed and reionized neutral hydrogen gas.
- **Hubble Tension & Dark Matter** - Provides observational data to resolve discrepancies in the universe's expansion rate and test dark matter-baryon interactions.



Far Side of the Moon

- **Radio-Quiet Zone** - The far side of the Moon is the most pristine, radio-quiet environment in the inner Solar System.
- **Earth Noise Shielding-** The Moon acts as a physical shield against human-made **Radio-Frequency Interference (RFI)**, such as FM radio, satellite networks, and aircraft communications.
- **Ionospheric Bypass** - Ground-based radio telescopes struggle to detect these low-frequency signals because Earth's **ionosphere** refracts and blocks radio waves below 30 MHz.
- **Observation Window** - During a typical 2-hour lunar orbit, a satellite gets approximately **40 minutes** of absolute radio silence while positioned behind the lunar far side.

Feature	CosmoCube	PRATUSH
Lead Organization	UK-led international consortium (University of Cambridge, STFC RAL Space)	Raman Research Institute (RRI) , Bengaluru (supported by ISRO/DST)
Form Factor	Suitcase-sized small satellite (CubeSat class)	Space-borne radio telescope payload

Target Orbit	Lunar Orbit (collecting data behind the far side)	High Earth Orbit / Lunar Orbit
Instrumentation	Ultra-sensitive RF-System-on-Chip (RFSoc) radiometer and deployable antenna	Precision wideband radiometer designed for sub-microvolt cosmological signals

Reference

[The Hindu | A satellite to look for the first radio signal](#)

