PRATUSH

Prelims – *Current events of National and International importance| Science & Technology.*

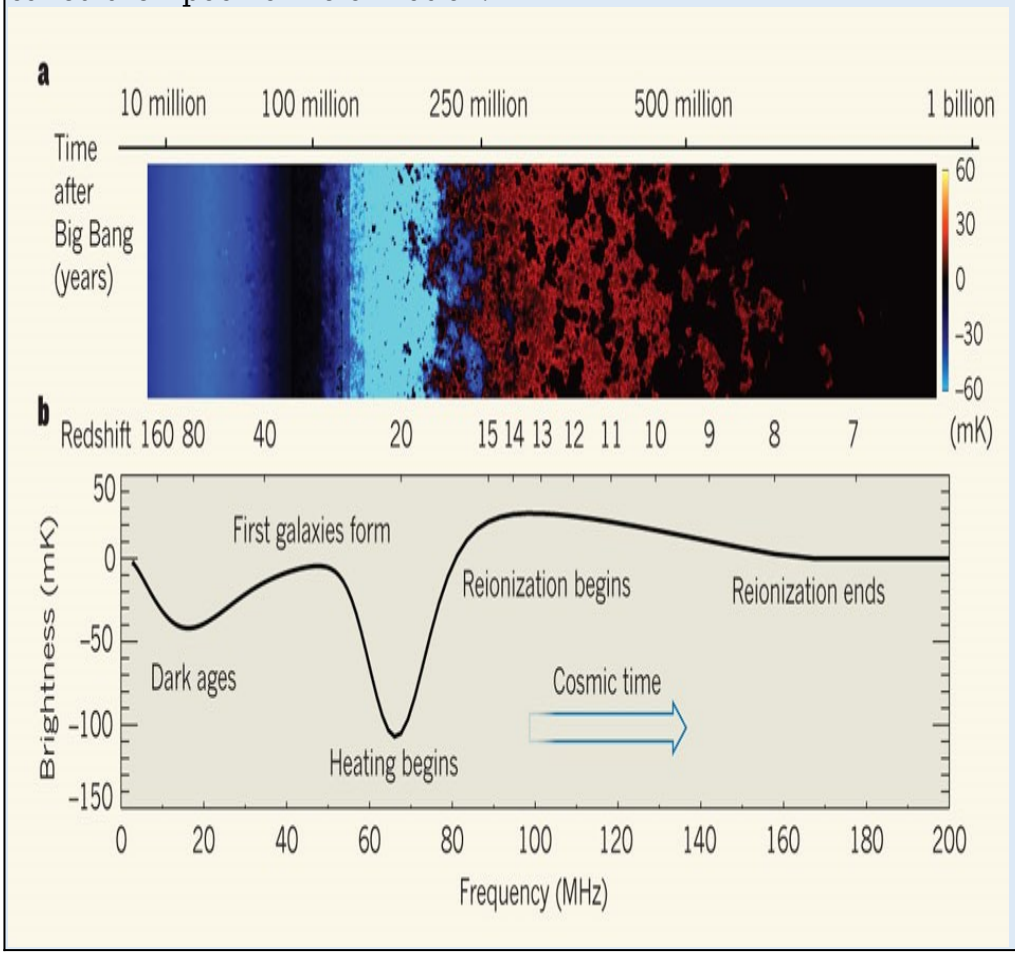
Why in News?

Recently, Researchers at the Raman Research Institute (RRI), Bengaluru, have developed a laboratory model of a digital receiver system for PRATUSH.

- **PRATUSH –** Probing ReionizATion of the Universe using Signal from Hydrogen.
- It is a future radiometer planned for lunar orbits far side that will reveal the Cosmic Dawn of our Universe.

Cosmic Dawn

• The period when the first sources of radiation such as stars and galaxies first formed is appropriately called the ‘Cosmic Dawn’.
• After the Big Bang event, the Universe expanded and cooled, to form the very first atoms - Hydrogen and Helium, and the ionized Universe became almost fully neutral.
• The end of this period marked the beginning of the dark ages where there were no sources of radiation other than the light released in the initial moments of the Universe.
• This light today is observed at microwave frequencies and is called the Cosmic Microwave Background (CMB)
• The radiation from these sources eventually re-ionized most of the Hydrogen atoms to result in mostly protons and electrons.
• The duration over which this re-ionization is thought to have occurred is called the Epoch of Reionization.



- **Developed by –** Raman Research Institute (RRI), Bengaluru , an autonomous institute funded by the Department of Science and Technology (DST).
- It has built a laboratory model of their radiometer to demonstrate its suitability for detecting the faint cosmological signal.
- **Objectives –** To study the Cosmic Dawn and to understand the process of **reionization** and the evolution of the early Universe.
- To detect a faint 21-cm signal radio signal emitted by the early hydrogen atoms.
- **Digital Receiver System** - The **PRATUSH** team has developed a digital receiver system based on a compact single-board computer (SBC) built around a *Raspberry Pi*.

Raspberry Pi is the name of a series of single-board computers made by the

Raspberry Pi foundation that runs on Linux.

- **Single Board Computer (SBC) –** It acts as the master conductor of radiometer and coordinates the antenna, receiver, and a powerful chip called an FPGA.
- It is scaled-down versions of desktop or laptop computers, deliver an appealing balance of size, performance, and efficiency.
- It records and stores this information and performs crucial calibrations to ensures capturing high-speed data streams and carrying out preliminary data processing.
- **Antenna -** It will carry a wideband frequency-independent antenna, operating over the frequency band 30-250 MHz.
- The radio signals are captured by the antenna, amplified by the analog receiver, and turned into digital data by the digital receiver.
- **Field Programmable Gate Array (FPGA) –** It is an advanced chip that converts the digital data into fine fingerprints representing how bright the sky is at different radio frequencies.

References

1. PIB| PRATUSH
2. Raman Research Institute| PRATUSH a Future Radiometer.

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