

What is LIGO-India Project?

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About LIGO-India Project:

- **What is Laser Interferometer Gravitational-wave Observatory (LIGO)?**
 - LIGO is the **world's most powerful observatory** that exploits the physical properties of light and of space itself to **detect and understand the origins of gravitational waves**.
 - **At the moment, there are two such observatories in the US** that are separated by a distance of 3000 kilometres that work in tandem to pick up these gravitational waves.
 - **Each LIGO detector consists of two arms, each 4 kilometres long**, comprising **1.2-meter-wide steel vacuum tubes** arranged in an "L" shape and **covered by a 10-foot wide, 12-foot tall** concrete shelter that protects the tubes from the environment.
- **What is LIGO-India Project?**
 - LIGO-India will be an **advanced gravitational-wave observatory** to be **located in Maharashtra, India**, as part of a worldwide network.

- It is envisaged as a **collaborative project between a consortium of Indian research institutions and the LIGO Laboratory in the USA**, along with its international partners.
- It will be **built by the Department of Atomic Energy and the Department of Science and Technology**, with a memorandum of understanding (**MoU**) with the **National Science Foundation, the US**, along with several national and international research and academic institutions.
- LIGO-India is a **collaboration between the LIGO Laboratory (operated by Caltech and MIT in the US) and three Institutes in India**: the Raja Ramanna Center for Advanced Technology (RRCAT, in Indore), the Institute for Plasma Research (IPR in Ahmedabad), and the Inter-University Centre for Astronomy and Astrophysics (IUCAA, in Pune).
- **Significance**: The information gathered by LIGO India could be used in the **field of gravitation, relativity, astrophysics, cosmology, particle physics**, and nuclear physics.

What is a Gravitational Wave?

- It is an **invisible (yet incredibly fast) ripple in space**.
- They travel at the **speed of light**.
- These waves **squeeze and stretch anything** in their path as they pass by.
- **Albert Einstein predicted** the existence of gravitational waves in 1916 **in his general theory of relativity**.
- Einstein's mathematics showed that **massive accelerating objects** (such as neutron stars or black holes orbiting each other) **would disrupt space-time in such a way that 'waves' of undulating space-time would propagate in all directions** away from the source.

Q1) What is a neutron star?

Neutron stars are formed when a massive star runs out of fuel and collapses. The very central region of the star – the core – collapses, crushing together every proton and electron into a neutron.

Source: [Science for all: On the road ahead for the LIGO-India project](#)

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