

# 'Gravitational waves are astronomy's holy grail'

Parth Shastri, TNN Sep 8, 2013, 02:55AM IST

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AHMEDABAD: India is now set to join a global scientific effort to detect gravitational waves emanating from various sources in the universe. Currently, the US and some European countries are the only nations involved in this enterprise. A project titled, 'Indian Initiative in Gravitational-Wave Observations (IndIGO)', is under consideration for initiation under the current Five-Year Plan.

Professor Bala Iyer, chairman of the IndIGO consortium, was participating in the 'Field Theoretic Aspects of Gravity' (FTAG) conference held on the campus of Indian Institute of Technology, Gandhinagar. He talked to TOI about the project's implications and how it could help the scientific community as well as the common man.

"After the Second World War, astronomy got out of telescopes as scientists started employing other tools to detect electromagnetic radiations such as gamma rays, x-rays and radio waves. However, even with all this effort, we could explain only 4 per cent of the total universe. What remains is dark energy and dark matter that need to be studied for a better understanding of the cosmos. Here is where gravitational waves come into the picture," said Iyer.

In 1915, Einstein had predicted in his General [Theory](#) of Relativity that gravitational waves are created when the 'space-time fabric' of the universe is disturbed by massive bodies such as neutron stars and black holes. The waves thus generated travel through the fabric like ripples on a water surface. As gravitational waves are  $10^{+2}\{+9\}+$  times weaker than electromagnetic waves, they have not been detected directly so far.

Projects such as Laser Interferometer Gravitational-Wave Observatory (LIGO) of the US and Virgo and GEO 600 in Europe are going for detection of the waves. The plan for the future is to create a network of such detectors so that the exact source of the waves can be pinpointed using trigonometry.

Iyer explained that such technology is not as 'exotic' as it may sound. "The rules laid down by Einstein are today helping thousands of GPS satellites navigate correctly. Likewise, apart from providing us a better understanding of the universe, detection of these waves will also push the boundary of current technology and cause gains in other spheres of science, apart from astronomy," Iyer said. He said that the IndiGO project is in collaboration with the US and is expected to show results by 2022.

## How IndiGO will work

Scientists said that a laser beam would be sent down two tunnels of the same length. The beam will return after being bounced off two mirrors suspended at the end of the two tunnels. Usually, no changes will be detected but scientists are waiting for that Eureka moment when, under the influence of gravitational waves, the laser beam leaves a residue on a photo detector.