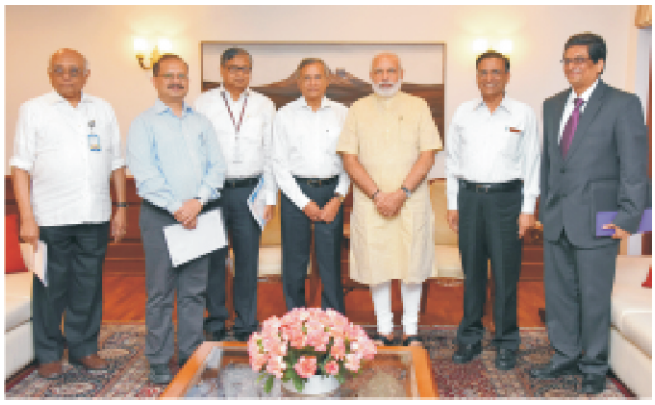
N.1: LIGO-India Project

The LIGO-India project is for setting up of an advanced Laser Interferometric gravitational wave observatory in India under a joint collaboration with LIGO Laboratory, USA. The Advanced LIGO (aLIGO) detector is a laser interferometer comprising of two perpendicular arms each of 4 km length and capable of detecting a change in length as small as 10^{-20} m between its two arms. Once completed, this detector will be operated as part of a global network along with the other two aLIGO detectors currently operating in the U.S.A. LIGO-India is a national mega-science project to be jointly funded by the Department of Atomic Energy (DAE) and Department of Science and Technology (DST). Subsequent to the in-principle approval of the Government of India, an MoU has been signed between NSF, USA and DAE-DST, India for collaboration on this project. A Joint Oversight Group has been constituted with members from NSF and DAE-DST to oversee the execution of the project on behalf of the funding agencies. Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, Institute for Plasma Research (IPR), Gandhinagar, Raja Ramanna Centre for Advanced Technology (RRCAT), Indore, and Directorate of Construction, Services and Estate Management (DCSEM), Mumbai are the four centres that would be responsible for the construction, installation, commissioning and operation of the LIGO-India Observatory in India. RRCAT is primarily responsible for the interferometer detector, its installation and commissioning, and concomitant development of narrow line width laser and ultra-precise optics expertise. It is also responsible for R&D towards upgrades to the aLIGO detector and the next-generation gravitation wave detectors.



Photograph showing meeting of Secretary DAE and the Directors of the lead institutions of the LIGO-India Project with hon'ble Prime Minister and Principle Scientific Advisor, prior to signing of the MOU between NSF and DAE-DST.

Gravitational waves are emitted by accelerating "astrophysical" masses such as spiralling neutron star and black-hole binary systems. Predicted from Einstein's General Theory of Relativity (GTR) almost a century ago, gravitational waves were recently detected for the first time by the two aLIGO detectors in the U.S.A last year. Apart from putting the GTR on a sound footing and providing conclusive proof for the existence of black holes, the detection of gravitational waves is of fundamental importance to physics and has opened up a new window to study astrophysical phenomena inaccessible to electromagnetic wave based astronomy. The addition of the LIGO-India detector to the global network will contribute to the detection of a larger number of gravitational wave sources and their more precise localization in the sky. For triangulating the gravitation wave source location, at least three detectors kept at separate locations are required. The LIGO-India detector, which will be located almost diametrically opposite on the globe to the other two detectors in the U.S.A, will allow a very precise localization. This will allow quick follow-up observations of gravitational wave sources with optical-telescopes, radio-telescopes, x-ray telescopes, and gamma-ray telescopes which have very small fields of view. This, in turn, will facilitate finding answers to some of the deepest mysteries of the cosmos such as the origin of gamma ray bursts, quantum nature of gravity, black-hole dynamics, existence of dark matter and dark energy, etc.

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