

GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY
LOK SABHA
UNSTARRED QUESTION NO.2074
TO BE ANSWERED ON 04.03.2020

LIGO PROJECT

2074. SHRI SHANTANU THAKUR:

Will the PRIME MINISTER be pleased to state:

- (a) whether LIGO (Laser Interferometer Gravitation-Wave Observatory) helps to detect and analyse the information of gravitational waves that are caused by exploding stars, black holes, etc.;
- (b) if so, the details thereof;
- (c) whether LIGO India Project is multidisciplinary in nature and if so, the details thereof;
- (d) the details of the infrastructure that is likely to be set up to host the ambitious LIGO project; and
- (e) whether this project in India is likely to serve as a focal point to inspire students and young scientists and if so, the details thereof?

ANSWER

THE MINISTER OF STATE FOR PERSONNEL, PUBLIC GRIEVANCES & PENSIONS AND PRIME MINISTER'S OFFICE (Dr. JITENDRA SINGH):

- (a) Yes, Sir.
- (b) The LIGO detector is capable of detecting gravitational waves produced during the merger of binary black holes, binary neutron stars, merger of a neutron star with a black holes, etc. The scientific goals of the project are:-
 - 1) to study gravitational radiation as a fundamental physical phenomenon.
 - 2) to use gravitational radiation to observe the astrophysical universe. The **technical goals** include:- a) to construct and operate an international network of advanced gravitational wave observatories. b) to develop the technical and scientific capabilities necessary for such sensitive measurements, including industrial capacity for making such sensitive instruments.

- (c) Yes, Sir. The project is multidisciplinary in nature. This project gives opportunity to scientific community to participate in gravitational detector development, observations and data analysis. For construction of civil infrastructure, Directorate of Construction Services and Estate Management (a constituent unit of Department of Atomic Energy) has assumed the responsibility. It involves designing the buildings to isolate the interferometer from ambient disturbances. Architects and Civil Engineers are involved for this. The Institute for Plasma Research, Ahmedabad has assumed the responsibility of building vacuum chambers, which are 4 kms long on either side (i.e. totally 8 kms). It involves Mechanical and Electronic Engineers. Raja Ramanna Centre for Advanced Technology (RRCAT), Indore (a constituent unit of DAE) has assumed the responsibility of laser development and building the entire laser systems. Inter-University Centre for Astronomy and Astrophysics, Pune will be responsible for science run, taking data and analysing the same.
- (d) The Project requires identification, acquisition and development of a seismically low noise site, followed by construction of the civil facility required for housing the 4 km arm length Interferometer detector suitably designed to address all the vibration sources such as pumps, fans, High Voltage Air Conditioners etc. The scope of work also involves fabrication and installation of large vacuum chambers, Liquid Nitrogen cryo-pumps etc. with the required quality control and contamination control to achieve ultra-high vacuum suitable for installation of the detector.
- (e) Yes, Sir. Indian scientists and engineers, both inside and outside of the LIGO-India Project, can participate in the scientific and technical activities of LIGO-India and the LIGO Global Network. It will inspire students as well as young scientists and give them opportunity to participate in the gravitational wave detector and other equipment and electronics development, observations, and data analysis.
