GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY
LOK SABHA
UNSTARRED QUESTION NO. 3912
TO BE ANSWERED ON 10.08.2016

DETECTION OF GRAVITATIONAL WAVES

3912. SHRIMATI RAKSHATAI KHADSE:
SHRI NANA PATOLE:

Will the PRIME MINISTER be pleased to state:

(a) whether a team of scientists across the world has confirmed detection of gravitational waves from binary black hole merger and if so, the details thereof;

(b) whether Indian scientists too have hailed the said phenomenon and if so, the details thereof; and

(c) the studies made by Indian scientists in this area along with the outcome thereof?

ANSWER

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

(a) Yes, Sir. Two Laser Interferometric Gravitational-wave Observatories (LIGO) in the USA have detected signals from two confirmed events involving merger of black holes in the distant universe. The first on September 14, 2015 and the second on December 24, 2015. The international LIGO Science collaboration consisting of about 1000 scientists from universities and research institutes from about 15 countries, including India, announced the first detection on February 5, 2016 and second one on June 15, 2016.

(b) The Indian science community has hailed these discoveries and is proud of the significant contribution from India. There was a very significant presence of Indian scientists in this milestone scientific achievement. There are 37 authors from 9 Indian Institutions in the scientific publication presenting the first discovery of Gravitational waves published in the Physical Review letters by the LIGO Scientific Collaboration and Virgo Collaboration. There were 39

authors from the same 9 Indian institutions in the publication for the detection of the second black hole merger event. Currently, Indian participation in the international LIGO Science Collaboration (LSC), has over 60 researchers, constituting 5% of the members of the LSC, making us the fourth largest national participant. Indian has 5 members on the LIGO Science Collaboration Council.

(c) India can boast of three decades of research at Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune and Raman Research Institute (RRI), Bengaluru, at the frontiers of theoretical modelling, and developing algorithms for signal extraction, in the quest for discovering gravitational waves. Some of these contributed directly to the detection and are prominently cited in these discovery publications. Specific contributions by Indian researchers include the development of a signal processing method called Matched Filtering – a key analysis technique needed for this detection, (pioneered at IUCAA) the estimation of black hole binary parameters, in improving the estimation accuracy of black hole spins, efficient methods for handling instrumental artefacts, and electromagnetic follow-up with X-ray instrument onboard AstroSat, which is a space borne facility launched by Indian Space Research Organisation (ISRO). India is also committed to the mega science LIGO-India project, to build and operate an advanced gravitational wave observatory on Indian soil.

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