U.S. gravitational wave detection experiment looking at India as a possible site

R. Ramachandran

A golden opportunity has possibly come knocking at the doors of the steadily growing Indian gravitational wave (GW) research community with the Laser Interferometer Gravitational-wave Observatory (LIGO) at Caltech, U.S.A., recently identifying India as a potential site for locating its third interferometer.

GW research in India is coordinated by the Indian Initiative for Gravitational-wave Observations (IndIGO), a consortium of researchers from 11 institutions, including the Inter-University for Astronomy and Astrophysics (IUCAA), the Tata Institute of Fundamental Research (TIFR), Raman Research Institute (RRI), the Raja Ramanna Centre for Advanced Technology (RRCAT) and the Institute for Plasma Research (IPR). IndIGO has accordingly drawn up a roadmap for a phased Indian strategy towards building a third generation GW detector in India, as part of which building a 3 m prototype detector has already been initiated by the TIFR (*The Hindu*, September 19, 2010).

For more coverage

LIGO Laboratory already has two 4-km long baseline interferometer detectors in the U.S., one at Livingston and one at Hanford. The third interferometer was originally proposed to be part of the LIGO Laboratory itself by co-locating it in the same tunnel as the Hanford detector. However, in a reworked strategy in 2010, the LIGO Scientific Collaboration (LSC) proposed to its funding agency, the National Science Foundation (NSF), to locate it in foreign soil, such as Australia or India, to enhance the sky coverage and greatly enhancing the scientific returns from the experiment.

The latest development comes in the wake of LIGO Laboratory's assessment at the recent review of the LIGO project on October 7 that the original proposal of locating the third interferometer in Australia is unlikely to fructify because the Australian government is almost certain not to fund the project. According to the original proposal, LIGO was to ship all the equipment that is already ready to Australia and Australia was required raise funds to the tune of $140 m to build the infrastructure (including vacuum systems) and human resource and meet the operational cost over 10 years (about $60 m) through domestic resources as well as international collaboration with countries such as India, China, Germany, France and Italy.

As part of its phased-strategy IndIGO had entered into an MoU with the Australian Consortium for Interferometric Gravitational Astronomy (ACIGA) for enabling Indian researchers to participate in LIGO-Australia to gain experience in state-of-the-art high-precision techniques of GW detection. There was also an in-principle nod from the Indian funding agencies for Indian contribution in kind towards the project pending Australia's final decision. The deadline for Australia to decide was October 2011.\

Sole option

While Australian agencies saw the merits of LIGO-Australia, they could not find an appropriate funding channel to support it. The recent move by LIGO to look at India as a possible site means that we now have a proposal for LIGO-India in place of LIGO-Australia. LIGO has also now clearly indicated that LIGO-India will be sole option for locating the third detector on foreign soil and, accordingly, it has asked for NSF's concurrence to pursue the LIGO-India proposal. LIGO has also prepared a White Paper on the proposal. It has also initiated discussions with Indian researchers and institutions towards this end.

A seven-member NSF panel which heard the proposal on the October 7 review gave its initial statement on the science case for LIGO-India, which was positive. “The panel believes that the science case for LIGO-India is compelling, and reason enough to move forward in the near-term with the understanding that there are a number of outstanding issues with [regard to] funding, site selection, selection of institutional leadership, top management and technical expertise that must be resolved before making a deeper commitment,” it said. The panel will submit its final report by November 11, 2011.

Unlike Australia, India is perhaps in a better position to decide on the funding as the Planning Commission is currently in the process of considering mega-science projects (MSP) to be funded in the 12th Five-year Plan. It remains to be seen if LIGO-India finds a place in the MSP sub-committee's scheme of things for 2012-17.

Recognition

In recent months there have been other positive developments for the Indian GW research community. In July, IndIGO was accepted as the newest member of the Gravitational Wave International Committee (GWIC). “This marks an important recognition to the Consortium by the international GW community,” a GWIC statement said.

Last month, the IndIGO Consortium as a whole was accepted as a member research group of the LSC. Earlier only a couple of institutions were part of it. LSC is an international collaboration made up of over 800 scientists working on GW observation programme and is responsible for analysing the data from the LIGO detectors in the U.S. and the GEO600 detector in Germany. The VIGO detector in Italy has a data sharing arrangement with the LSC. It has already been decided that a significant share of the 20 teraflops high-performance computing facility at IUCAA will be available for data analysis by IndIGO scientists.

At a recent meeting of the LSC, the LSC Council too extensively discussed the benefits of LIGO-India proposal. On September 27 it adopted the following resolution: “The LSC strongly endorses the scientific advantage of a network with three LIGO detectors in different locations, including India, if NSF and the LIGO Laboratory consider it favourably.”

Major challenge

Direct detection GWs that Einstein's theory of gravitation predicts has been a major challenge for physics and at present there is only indirect evidence for their existence. The effect of GWs on instruments on the Earth is very feeble and decades of efforts have failed to pick up the signals. But with vast improvements in technology, current detectors have now reached the sensitivity close to the detection threshold and the time is right for the Indian research community to seize the opportunity. If it materialises, this would mean a major boost for Indian GW research and a mega project of this nature also has immense potential to attract young researchers into the field.

Keywords: U.S., gravitational wave detection, LIGO Scientific Collaboration, GW research

URL: http://www.thehindu.com/news/national/article2543646.ece