

GRAVITATIONAL WAVES DETECTED FROM SECOND PAIR OF COLLIDING BLACK HOLES

EMBARGOED FOR RELEASE AT 10:15 AM PDT/1:15 PM EDT ON WEDNESDAY, JUNE 15, 2016

The LIGO Scientific Collaboration and the Virgo collaboration identify a second gravitational wave event in the data from Advanced LIGO detectors

Washington State University physicists are part of this discovery

On December 25, 2016 at 7:38:53 p.m. Pacific Standard Time, scientists observed gravitational waves—ripples in the fabric of spacetime—for the second time.

The gravitational waves were detected by both of the twin Laser Interferometer Gravitational-wave Observatory (LIGO) detectors, located in Hanford, Washington, and Livingston, Louisiana, USA. The discovery, accepted for publication in the journal *Physical Review Letters*, was made by the LIGO Scientific Collaboration and the Virgo Collaboration using data from the two LIGO detectors. WSU physicists Professor Sukanta Bose, postdoctoral researcher Nairwita Mazumder, and graduate students Ryan Magee and Bernard Hall are part of this discovery. Dr. Fred Raab, Head of the LIGO-Hanford site, and Dr. Greg Mendell, LIGO senior scientist, who are both Adjunct Professors at WSU, contributed to this discovery as well.

Gravitational waves carry information about their origins and about the nature of gravity that cannot otherwise be obtained, and physicists have concluded that the detected gravitational waves once again were produced during the final fraction of a second of the merger of two black holes—14 and 8 times the mass of the sun—to produce a single, more massive spinning black hole that is 21 times the mass of the sun.

During the merger, which occurred approximately 1.4 billion years ago, nearly as much mass as that of the sun was converted into gravitational waves in a fraction of a second. The detected signal reveals the last 27 orbits before the merger.

The two LIGO detectors first observed gravitational waves on September 14 last year. Those waves too were from a pair of colliding black holes and their discovery was announced on February 11. Bose offered, “This second observation was made within months of the first one and shows that the September 14 discovery was not a one-off event but that more detections can be expected to be made by these detectors in the coming years.” Those observations will shed more light on how black holes and their binaries are formed.

Bose and his group have been engaged in improving the understanding of these detectors’ noise and discriminating astrophysical signals, such as the ones that were detected, from noise. “Unlike the first detection this signal is well buried in noise, was produced by smaller black holes and is of a longer duration,” said Mazumder. LIGO is funded by the National Science Foundation (NSF), and was conceived, built, and is operated by Caltech and MIT.

More information on gravitational wave research at WSU can be found at <http://pleiades.physics.wsu.edu/>.

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