



## INTERNATIONAL COLLABORATIONS

### VIRGO AND LIGO OBSERVE THE FIRST MERGERS OF BLACK HOLES AND NEUTRON STARS

On 29 June, the scientific collaborations of LIGO, KAGRA and VIRGO, which the INFN is part of, announced the first detection of two gravitational wave events produced by the merger of two mixed binary systems composed of a black hole and a neutron star. The results, published in the journal *The Astrophysical Journal Letters* confirms the existence of a class of phenomena that was already predicted by astrophysicists several decades ago. Until today, however, they had never been observed. These results also open the window onto physics mechanisms responsible for the coupling and successive merger of black holes and neutron stars. The interferometers Advanced LIGO, in the United States, and Advanced Virgo, in Italy, detected the two events. In both cases, the form of the signal recorded made it possible to attribute it to the coalescence of a black hole and a neutron star, the result of which was the creation of an extremely compact body.

Thanks to the study of the two signals, called GW200105 and GW200115, respectively observed on 5 and 15 January 2020, it was possible to establish the masses of the primary sources and the distance of the latter from our planet. In the case of GW200105, an event that resulted from a merger that happened 900 million years ago, the masses of the black hole and the neutron star were estimated to be approximately 8.9 and 1.9 times that of our sun, respectively. For the second signal, characterised by a greater statistical significance than that of the previous one, the black hole was estimated to have a mass of 5.7 solar masses and the neutron star 1.5, with a temporal collocation of the merger at approximately one billion years ago. ■