# Newsletter Focus

## LAYING OF THE FIRST STONE OF THE CAOS LABORATORY IN PERUGIA

The first prototype, at a scale of ten metres, of one of the arms of the third-generation gravitational wave detector Einstein Telescope will be produced in Perugia, in the future CAOS (Center for Applications on Gravitational Waves and Seismology) International Laboratory. On 19 March, the ceremony to lay its first stone was held and it was also attended remotely by the Minister of University and Research, Anna Maria Bernini.

The new laboratory of the University of Perugia will be built thanks to the collaboration between the Department of Physics and Geology and the Perugia INFN Division and an investment worth more than € 6 million overall. This includes € 5.7 million from NRRP funds of the ETIC (Einstein Telescope Infrastructure Consortium) project, funded as part of Mission 4 coordinated by the MUR (Ministry of University and Research), and approximately € 500 thousand from University of Perugia MUR Departments of Excellence funds, and University funds too.

CAOS will be specifically dedicated to developing optical suspension technologies and related control systems. Thanks to its extraordinary sensitivity, Einstein Telescope will be able to detect practically all the fusions of black holes and neutron stars that have occurred in our universe, as well as new astrophysical phenomena never observed before, like supernovae explosions. Einstein Telescope will, thus, perform extremely precise measurements for which technologies that go beyond the state of the art will need to be developed. Relying on the experienced acquired by the Italian scientific community with the VIRGO experiment, the main goal of CAOS will, therefore, be designing essential components for a gravitational laser interferometer: the optical suspension systems and their control systems. In addition, given the high sensitivity and the particular range of frequencies (from a few hundred millihertz to kilohertz) at which they'll be able to operate, these technologies may prove useful in other sectors too, first of all in geophysics and seismology. In fact, an agreement between EGO (the European Gravitational Observatory) and INGV (the National Institute for Geophysics and Volcanology) has already been signed to exploit these technologies in research into early warnings for earthquakes. The idea is to detect the smallest gravitational variations (that are propagated at the speed of light) caused by the movement of tectonic plates that cause, with their rubbing, the seismic waves of earthquakes (which, in contrast, propagate at speeds well below a few kilometres per second).

In addition, the CAOS laboratory will also have an important role in training young people who wish to specialise in this technological sector for their careers, both in research and in industry.

CAOS will be one of the nodes of the network of laboratories that will be strengthened or built from scratch as part of the ETIC project, at INFN, the ASI (Italian Space Agency), INAF (the National Institute for Astrophysics), and eleven Italian universities. It will become a piece of reference infrastructure internationally, thanks also to

the fundamental link with Japanese research bodies like ICRR and NAOJ and the close relationship between the University of Perugia, INFN, and the 2015 Nobel Prize in Physics Takaaki Kajita.