

# **500 physicists are looking for dark matter, gravitational waves and neutrinos in Vienna**

**Small particles and an infinite universe: Researchers from all over the world will attend the conference on Astroparticle physics in Vienna from August 28 to September 1, 2023. The Public Lecture will be held by Nobel Prize winner Arthur McDonald.**

Almost one hundred years after the theory of dark matter was first postulated, it remains one of the great mysteries of modern physics. It has become clear that more gravitational forces are at play in the universe than expected. Thus, there must be a non-visible - "dark" - matter which, however, has never been proven. At the International Conference on Topics in Astroparticle and Underground Physics (TAUP) in Vienna, new experimental methods and theoretical approaches will now be presented.

## **European "Einstein Telescope" to measure gravitational waves**

Gravitational waves have already been detected. In 2015, scientists succeeded in observing such waves which were created by the collision of two black holes for the first time. However, only a few experiments worldwide are able to measure gravitational waves to date.

In the coming decade, Europe is planning to build the "Einstein Telescope" in order to measure gravitational waves more precisely. Approximately 500 physicists are expected to visit the TAUP conference at the University of Vienna to discuss the plans for the telescope which will even capture the tiniest cosmic vibrations from hundreds of meters below the earth's surface.

Neutrinos are as difficult to detect as gravitational waves. They are the least measured elementary particles. Not even their weight is known. "We have now discovered all the particles of the Standard Model of particle physics, but we have not yet determined all the parameters of this model. These include the properties of neutrinos. By measuring them more precisely, we hope to gain a better understanding of these particles," says Jochen Schieck, of the Austrian Academy of Sciences (ÖAW) and Vienna University of Technology, who heads the conference's local organising committee.

## **Nobel laureate on the evolution of the universe**

The various topics of TAUP 2023 will be discussed in a Public Lecture by Nobel Laureate Arthur McDonald on August 31 at 6:30 p.m. in the Great Hall of the Austrian Academy of Sciences. McDonald was awarded the Nobel Prize in Physics in 2015 for discovering the mass of neutrinos. During his public talk, he will discuss how we might gain more insight into the universe by measuring cosmic events with different signals.

TAUP has been held at various locations around the world every two years since 1989. For the first time, this major physics event will now take place in Vienna. The conference is jointly organised by the Institute of High Energy Physics (HEPHY) at the OeAW, the

University of Technology Vienna (TU Wien), the Universities of Vienna and Innsbruck, as well as the Comenius University Bratislava.