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NEW SPECTROGRAPH APPROVED

## ONE MILLION EUROS FOR INVENTORY OF GALAXIES

**The Universität Hamburg receives around 500,000 euros from the German Research Foundation (DFG) for a spectrograph and supports its acquisition with a further 500,000 euros. The device is intended for an astronomical instrument in Chile that will be used in the future to conduct so-called galaxy surveys, which can record millions of galaxies and limit the possible properties of dark matter.**

In former times, astronomers were able to concentrate exclusively on one particular celestial object for years. Today, sky surveys - a kind of inventory of the universe - can also be used to record and study millions of astronomical objects.

This will be made possible by equipment such as the multi-object spectrograph "4MOST", which will be installed at the Paranal Observatory of the European Southern Observatory (ESO) in northern Chile on the more than four-meter VISTA telescope. In contrast to previous models, 4MOST can simultaneously capture the spectra of thousands of celestial objects because their light is transmitted to three spectrographs via special optical fibers. One of them is funded by the DFG with 500,000 euros and another 500,000 euros by the Universität Hamburg.

The spectrographs break down the light emitted by the celestial bodies into their individual spectral colors and measure the intensity of the light at different wavelengths. This information allows conclusions to be drawn about the exact 3D position of astronomical objects in the sky and about many properties, such as the temperature or chemical composition.

"The spectrograph now approved represents the contribution of the Universität Hamburg to 4MOST," says Prof. Dr. Jochen Liske from the

Department of Physics of the Universität Hamburg. "It is identical to a second device. The parallel work doubles the number of objects that can be observed simultaneously and thus the speed at which a survey can be carried out. Without this speed advantage, it would not be possible to deal with our research questions, as it would take far too long." From 2022, Liske, together with an international team of 15 different institutions, will be able to use 4MOST to study more than 1.7 million galaxies.

The team is not only interested in how galaxies are formed, but also in the properties of dark matter - an invisible substance that holds galaxies together. Therefore, the project at the Universität Hamburg is embedded in the excellence cluster "Quantum Universe", which deals with fundamental questions surrounding the origin, history and composition of the universe. A major research topic of "Quantum Universe" is the search for dark matter.

"The mass of clusters and groups of galaxies can be determined during the screening of galaxies. If we measure many galaxies, we can draw conclusions about the properties of dark matter from the distribution of the mass of galaxy groups. These findings can then be used by other researchers to narrow down their own search for dark matter," says Liske.

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