

AKADEMIEVORLESUNGEN

HEDY LAMARR-LECTURE

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QUANTUM SIMULATORS FOR EARLY UNIVERSE AND BLACK HOLE PHYSICS

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The evolution of the early universe and black holes are fundamental reflections of the interplay between gravitational and quantum physics. New physical processes are predicated to occur when gravitational interactions are strong, and quantum effects are important. Unfortunately, these situations are difficult to observe and impossible to experiment with. We will explore the possibility to set up tabletop experiments to reconstruct some of the most elusive and fascinating processes related to the early universe and black holes in the lab by employing analogue quantum simulators.

Silke Weinfurter is leading a UK network on Quantum Simulators for Fundamental Physics, which is one out seven initiatives funded through the UK Quantum Technology for Fundamental Physics special programme. She is holding two prestigious individual fellowships, a Royal Society University Research Fellowship and a Leverhulme Trust Research Leaders Fellowship. She is also a visiting Fellow at the Perimeter Institute (Canada), a leading centre in foundational theoretical physics. She was the first to successfully carry out experiments to explore Hawking radiation, superradiance and black hole ringdown in the lab. She developed several optical detection schemes, including high-sensitivity interferometers, for studying the dynamics of free fluid interfaces at room temperature and pressure. One led to a patent application (in review) for a High-speed 3D air-fluid interface sensor with EnShape GmbH (Jena, Germany). The combination of deep fundamental-science goals and cutting-edge technology puts Silke Weinfurters work in a natural position to communicate to the general public the excitement and importance of fundamental research, for example, her Black Hole Laboratory was featured in the award-winning Netflix documentary „Black Holes: The Edge of All We Know“.

The Hedy Lamarr Lectures, a part of the Academy Lectures of the Austrian Academy of Sciences, bring internationally renowned experts to Vienna who deal with the effects of new technologies on society.

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