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Physikalisches Institut

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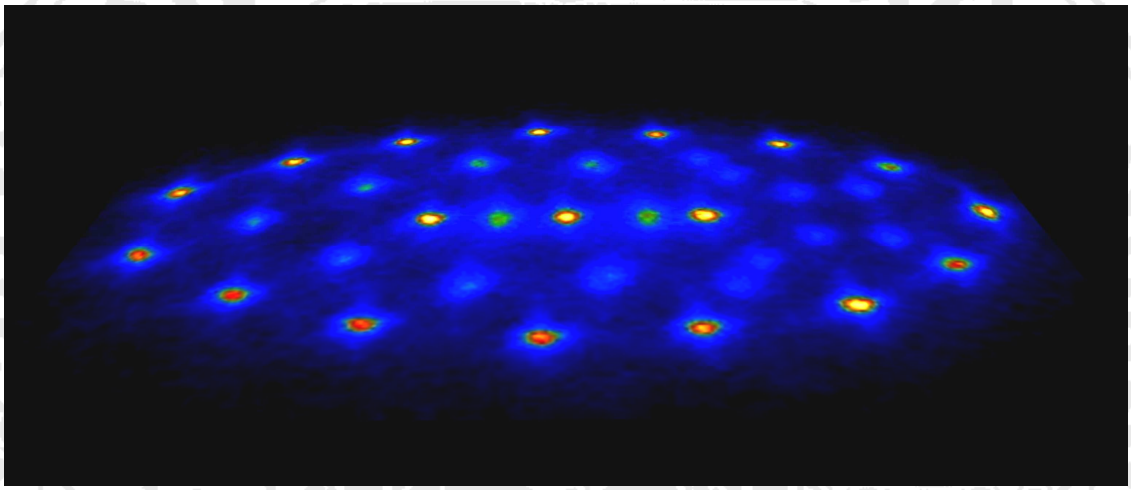
IM GROßEN HÖRSAAL



EINSTEIN'S NIGHT MARE
NEW CONCEPTS FOR EXPERIMENTAL QUANTUM SIMULATIONS

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Direct experimental access to some of the most intriguing and puzzling quantum phenomena is difficult due to their fragility to noise. Their simulation on conventional computers is impossible, since quantum behaviour is not efficiently translatable in classical language. However, one could gain deeper insight into complex quantum dynamics via experimentally simulating the quantum behaviour of interest in another quantum system, where not all but the relevant parameters and interactions can be controlled and robust effects detected sufficiently well. One example is simulating quantum-spin systems with trapped ions.
After proof of principle experiments based on few ions/spins only, we aim to explore the limitations and prospects and the options for scaling to larger and two dimensional systems. On the one hand, we propose our new trapping architectures based on arrays of radio-frequency traps. On the other hand, we aim to trigger the discussion how to merge the advantages for quantum simulations with ions and optical lattices.