

# **Quantum field simulators: How they evolve in time, how they can be read out, and in what way they may realize quantum thermal machines**

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Quantum systems out of equilibrium pose some of the most intriguing problems in quantum many-body physics, and presumably they constitute the basis for notions of quantum statistical mechanics [1, 2]. In this talk, we discuss in what precise way quantum many-body systems tend to equilibrium and provably relax to instances of maximum entropy states [3, 4]. Challenged by questions how such a behavior can be observed in the laboratory with quantum field simulators allowing for high levels of control, we will look at new ways of reading out such devices to achieve instances of quantum measurements [5]. We will end the talk by investigating the potential of using such quantum systems to realize genuinely quantum thermal machines [6].

- [1] Nature Physics 11, 124 (2015).
- [2] Rep. Prog. Phys. 79, 056001 (2016).
- [3] Phys. Rev. Lett. 117, 190602 (2016).
- [4] arXiv:1809.08268.
- [5] arXiv:1807.04567.
- [6] In preparation.