



Walther-Meißner-Institut

Bayerische Akademie der Wissenschaften



Walther-Meißner-Seminar

Walther-Meißner-Institut, Seminar Room 143

Date: **Special date: Tuesday, 28 August 2018, 14:30 h**

Speaker: **Matti Partanen**

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Title: **Heat Control Techniques for Superconducting
Microwave Circuits**

Abstract:

Circuit quantum electrodynamics is a versatile architecture for various experiments in fundamental physics, as well as for different applications, including extremely sensitive detectors and, ultimately, even a large-scale quantum computer. Since these devices work at cryogenic temperatures and excess heat is a substantial source of errors, it is of vital importance to reduce heat. In this talk, I will discuss our experimental results on different heat control techniques. The first part of the talk focuses on how to use photons in a superconducting microwave transmission line to efficiently transfer heat between two heat baths [1]. Ideally, the thermal conductance is quantum limited even in the macroscopic scale. The second part introduces techniques that can be used to control microwave photons in superconducting resonators. In particular, we have two approaches: we can emit and absorb photons utilizing photon-assisted tunneling through hybrid tunnel junctions [2], and we can absorb photons in a heat sink based on a resistor in a frequency-tunable resonator [3]. In the future, these methods may find applications in different cryogenic devices, including fast initialization of qubits [4].

[1] M. Partanen *et al.*, Nat. Phys. **12**, 460–464 (2016).

[2] K.Y. Tan *et al.*, Nat. Comm. **8**, 15189 (2017).

[3] M. Partanen *et al.*, Sci. Rep. **8**, 6325 (2018).

[4] J. Tuorila *et al.*, npj Quantum Inf. **3**, 27 (2017).