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Quantum thermodynamics in circuits

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In the two lectures, we investigate both experimentally and theoretically phenomena and devices in quantum thermodynamics realized by superconducting and metal circuits on a chip at low millikelvin temperatures, which is a novel area of research that we call circuit quantum thermodynamics, cQTD.

We start by briefly introducing the building blocks in the experiments such as harmonic oscillators (superconducting cavities), non-linear oscillators (Josephson junctions), and heat baths formed of resistors and phonons on the chip substrate, thermometers and local coolers. Then we build useful devices out of them including heat valves, rectifiers, refrigerators, and detectors with ultimate resolution and try to give a full thermal description of them.

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