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【155】 Ultra-low electronic temperature measurement in a cryogen-free dilution refrigerator with an He4 immersion cell

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The investigation of quantum phenomena in solid state systems requires the ability to cool down macroscopic samples to low temperature. Lowering the temperature allows said quantum phenomena to develop and emerge in experiments. In semiconducting devices and at millikelvin temperatures, the cool down of an electron gas is increasingly challenging due to vanishing thermal conductivities and the freezing-out of phonons. We measured ultra-low electronic temperatures in a cryogen-free dilution refrigerator with a base temperature below 4 mK, achieved by using low-noise read-out and an innovative He4 immersion cell for improved thermalization of the sample. With this setup we can perform experiments at extremely low electronic temperatures and in high magnetic field on gate-controllable nanostructures.

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