

[Talk 10] Maximum efficiency bound of the Feynman-Smoluchowski ratchet*Jaesung Lee, KIAS*

The Feynman-Smoluchowski ratchet (FSR) is a prototypical heat-engine model testifying the thermodynamic second law in microscopic scale. Physicist Richard Feynman argued that the FSR can be reversibly operated, so the Carnot efficiency can be obtained. After around 30 years later, this argument was criticized such that the Carnot efficiency is unattainable in an engine coupling to two heat baths simultaneously as the FSR. This debate has not been concluded yet, though the latter claim is widely accepted. Here, we present that there are two configurations for the FSR depending on existence of the thermal contact between a ratchet and a heat bath. We show that the Carnot efficiency is unattainable when the ratchet is affected by noise of a heat bath because a single degree of freedom connects two heat baths. However, when such effect is not considered, the Carnot efficiency is reachable although the FSR has simultaneous thermal contacts.