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Theory of feedback cooling of nuclear spins in diamond nitrogen-vacancy center[1] PING WANG, WEN YANG, Beijing Computational Science Research Center — We develop a microscopic theory for the feedback cooling of nuclear spins in the diamond nitrogen-vacancy center at low temperature. By adiabatically eliminating the fast motion of the NV center, we derive an analytical rate equation to describe the dynamics of the nitrogen and ^{13}C nuclei. This equation is solved both numerically and analytically using the Fokker-Planck equation. The results provide a good explanation to the recently observed nitrogen and ^{13}C nuclear spin cooling in nitrogen-vacancy center by coherent population trapping [E. Togan *et al.*, Nature 478, 497 (2011)]. They also suggest an optimal pumping power for optimcal cooling effect.

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