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Detailed balance of thermalization dynamics in a Rydberg quantum simulator[1] HYOSUB KIM, YEJE PARK, KYUNGTAE KIM, H.-S. SIM, JAEWOOK AHN, KAIST — By utilizing a ^{87}Rb single-atom array synthesizer using dynamic phase holograms, various size ($N < 25$) of defect-free zigzag chain was prepared. The chain was resonantly driven to 67S Rydberg state via two-photon transition. We fixed the interatom distance $d = 4.0(2)$ μm and changed the zigzag angle θ from 45° to 180° so that strong blockade effect only influences to the (next) nearest neighbor sites. In the experiment, we observed global sudden quench dynamics of classical observables, excitation density and density-density correlation. Those observables show saturation that obeys a master equation experimentally constructed from themselves and imposing the principle of the detailed balance (will be discussed). Our experiment demonstrates the detailed balance in a thermalization dynamics that does not require coupling to baths or postulated randomness.

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