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Path-integral Monte Carlo Study on Weakly-Coupled ^{4}He Superfluids YONGKYUNG KWON, Div. of Quantum Phases and Devices, School of Physics, Konkuk University, K. BIRGITTA WHALEY, Department of Chemistry, University of California at Berkeley — We have performed path-integral Monte Carlo calculations to analyze the dynamics of flow between two weakly-coupled ^{4}He superfluids, employing a system of ^{4}He atoms inside a tube whose diameter and length are an order of a few nanometers. The two ^{4}He superfluids separated by a wall in the middle of the tube are connected to each other through an array of apertures created in the wall. For the case of a single aperture it is found that the local suppression of superfluidity near the wall is greatly dependent on the size of the aperture hole. The superfluid fraction computed through the local decomposition of the winding number estimator is reduced to about 30% at $T = 0.6$ K near the aperture hole with the diameter of 4 Å while it is hardly suppressed at all when the diameter of the hole is as large as 8 Å. For the case of an array of apertures, we investigate the effects of aperture-aperture coupling on the local superfluidity by varying the inter-aperture distance. The velocity-velocity correlation function is computed to analyze the correlation among the superflows through the different apertures. These results are discussed in relation with the synchronous phase slippages observed in recent experiments of Packard *et al.* for an array of apertures connecting two reservoirs of superfluid ^{4}He.

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