Bound state of a ^{3}He atom at ^{4}He crystal-superfluid interfaces

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The occurrence of a bound state of a single ^{3}He atom at the interface of superfluid and solid ^{4}He, is studied by means of large-scale Quantum Monte Carlo simulations. Both the case of a solid-superfluid interface of ^{4}He, as well as solid layers of ^{4}He adsorbed on lithium and glass substrates are considered. A bound state of the ^{3}He atom is observed, but its physical character differs significantly, depending on the substrate. In the case of a solid-superfluid ^{4}He interface, the ^{3}He atom resides in the proximity of the interface, but clearly in the superfluid region; on the other hand, in the presence of substrates more attractive than solid ^{4}He, the ^{3}He atom penetrates the intermediate region between the two phases, consisting of superfluid planes. Results for the binding energies are obtained for all cases from the long time decay of the Matsubara Green function.