

Spatially inhomogeneous fluid: field theory approach

I. Kravtsiv^a, M. Holovko^a, and D. di Caprio^b

^a*Institute for Condensed Matter Physics, NAS of Ukraine, 1 Svientsitskii Str., 79011 Lviv, Ukraine. E-mail: ivankr@icmp.lviv.ua*

^b*École nationale supérieure de chimie de Paris, Case 39, 4, Pl. Jussieu, 75005 Paris, France. E-mail: dung.di_caprio@yahoo.fr*

In the framework of statistical field theory we describe a neutral fluid in the presence of a confining interface. In our model the pair interaction potential consists of a repulsive and an attractive Yukawa terms, and there is no direct interaction between the particles and the wall. Different simple analytic expressions of the density profile are compared with the numerical estimation of the mean field results. Unlike our previous results for a fluid interacting with one Yukawa potential [1], the density profile is non-monotonous even in this simplest approximation. Beyond the mean field approximation, we show that fluctuations can significantly alter the mean field predictions. Notably they lead to depletion of density profile everywhere in the vicinity of the wall and as a result, a layered structure is possible. Our results verify the density contact theorem. Analytical expression for the adsorption coefficient is derived and analyzed.

1. D.di Caprio, J. Stafiej, M. Holovko, I. Kravtsiv. Yukawa fluid at a hard wall: Field theory description. *Mol. Phys.*, 2011, vol. 109, 5, p. 695-708.