## Adsorption of Mixtures of Yukawa-Ions Near a Hard Wall: A Density Functional Study Based on the Third-Order Ornstein-Zernike Relation

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We examine the adsorption of primitive-model "ionic" mixtures modeled in terms of screened Debye potentials on a hard structureless wall. It is well-known that the screened Debye potentials are of the Yukawa form. They could approach the Coulomb potentials when the screen parameter  $\lambda$  vanishes. We have previously developed a thirdorder Ornstein-Zernike relation (OZ3) and have adapted it to the adsorption of many types of fluids on hard walls. In this work, we examine the applicability of the OZ3-inspired bridge functions to the adsorption of the "small- $\lambda$ " Yukawa fluids. The mixtures of these Yukawa fluids are, for simplicity, called the *Yukawa ions*, in contrast to the Coulomb ions. The results shall mimic the electrical double layers in electrochemistry. The Euler-Lagrange equations for the binary mixtures are solved with new OZ3 closures. Two types of closures are investigated: one derived from the Jackson-Feenberg approximation, and the other derived from the linear cavity approximation. The results are compared with the Monte-Carlo results on primitive-model symmetric ions and asymmetric ions on a neutral hard structureless wall. Satisfactory agreements are obtained. It is noted that the contact value theorems (i.e. the hardwall sum rules) play an instrumental role in obtaining the accurate results.