

Final report on the short visit grant
Reference Number: 2801

Purpose of the visit: The purpose of my visit in Laboratoire de Physique Théorique (Université Paris-Sud, Orsay) was the collaboration with Prof. Bernard Jancovici in the field of statistical mechanics of classical and quantum Coulomb fluids. The subject of interest was the retardation effect on long-ranged correlation functions of the charge induced on the surface of a conductor or a dielectric. This subject is related to the calculation of the dielectric susceptibility tensor for spherical domains containing a Coulomb gas or a dielectric.

Description of the work carried out during the visit: The first problem studied during my visit in Orsay was the asymptotic large-distance behavior of the correlation function of the charge fluctuations on the surface of conductors or dielectrics. The problem was solved previously in the classical case and in the quantum case without retardation and with retardation, for a conductor, modeled by the one-component plasma, in contact with vacuum.

Our first task consisted in generalizing the formalism to conductors modeled by an arbitrary Coulomb system and to dielectrics, coupled to the electromagnetic radiation.

The second task was the calculation of the dielectric susceptibility tensor for spherical domains containing a Coulomb gas or a dielectric.

Description of the main results obtained: As concerns the analysis of the asymptotic large-distance behavior of the surface correlation function of the charge fluctuations, it has been generalized successfully to an arbitrary Coulomb system and to dielectrics. The generalization was based on general properties of the dielectric function and the contour techniques in the upper complex frequency half-plane. The paper about the obtained results will be submitted soon to Physical Review E.

Based on the above results, we made also some preliminary analysis of the corresponding dielectric susceptibility tensor for a spherical domain. Still more work in this field is necessary to reach the final result.

Future collaboration with host institution: We shall continue in our collaboration on various problems related to Coulomb and dielectric systems coupled to the electromagnetic radiation also in the near future.

Projected publications/articles resulting from the grant: The paper about the obtained results in the asymptotic large-distance analysis of the surface charge correlations will be soon submitted to Physical Review E.

Other comments: I have no comments.