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Integral jump conditions for time-dependent Debye layer phenomena[1] PHILIPP G. MARTHALER, ANDREAS G. CLASS, Karlsruhe Institute of Technology — In lab-on-chip systems, flow propulsion, mixing and control can be performed by induced electrohydrodynamic (EHD) effects, such as AC electro-osmosis (ACEO). Close to charged solid walls or electrodes, Debye layers emerge, inhabiting strong gradients of the relevant physical parameters. In many numerical simulations of EHD flow, the detailed solution of Debye layers is avoided, due to the high computational effort. We present integral jump conditions that can be utilized for cheap simulations of such Debye layer phenomena. Our asymptotic approach is applied to the model by Yariv et al. (2011) who were able to re-establish the Smoluchowski slip condition. In addition to their results, obtained by matched asymptotics, we derive jump conditions of integral form for the set of governing equations. We follow a theoretical procedure published e.g. by Class et al. (2003). Our scaling takes time-dependent effects into account, which are crucial for the understanding and computation of flow excited by time-variant electrodynamics like ACEO.

[1] Yariv et al. (2011) J. Fluid Mech. **685**.

[2] Class et al. (2003) J. Fluid Mech. **491**.

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