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Playing with charged particles: a way to understand kinetic effects intransport and in low-temperatureplasmas

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Particle-based simulations have been aiding for some time the understanding of fundamental phenomena in plasma physics. The rapid development of computational resources allows execution of precise simulations at the level of elementary processes. Details of particle kinetics in transport phenomena, in gas breakdown, as well as in low- temperature plasmas can be explored to great details in such studies, some of which (electron kinetics in the Franck-Hertz experiment and in drift tubes, gas breakdown under radio-frequency field, power absorption modes, particle kinetics, pattern formation, control of ion properties, and effects of surface coefficients in low-pressure capacitive plasmas) will be highlighted in the talk. As a rigorous test of the computational results comparisons will be given with the results of relevant recent experiments.