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Validation and Verification of Two Particle-In-Cells Codes for a Glow Discharge[1] JOHAN CARLSSON, ALEXANDER V. KHRABROV, IGOR D. KAGANOVICH, Princeton Plasma Physics Laboratory, TIMOTHY SOMMERER, General Electric Global Research — The two particle-in-cell codes EDIPIC and LSP were benchmarked and validated for a parallel-plate glow discharge in helium, in which the axial electric field had been carefully measured [1]. Both particle-in-cell codes reproduce very well cathode fall and negative glow regions of the discharge, including formation of high density plasma with very low-energy electrons in negative glow. A detailed code comparison was performed for several synthetic cases of electron-beam injection into helium gas and showed that the codes are in excellent agreement for ionization rate, as well as for elastic and excitation collisions with isotropic scattering pattern. However, electron velocity distribution is anisotropic in the cathode fall, and therefore, a more accurate model of anisotropic scattering in elastic and ionization cross sections needs to be taken into account. In the process of validation several issues with both codes were fixed, including necessity to use modern random generators in both codes, and choose efficient numerical model from EDIPIC for secondary electron emission and circuit model in LSP. [1] E A den Hartog, D A Doughty and J E Lawler, Physical Review A **38**, 2471 (1988).

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