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**Neutral Depletion in Collisional and Collisionless Plasmas** AMNON FRUCHTMAN, GENNADY MAKRINICH, Holon Institute of Technology, Holon 58102, Israel, PASCAL CHABERT, JEAN-MARCEL RAX, Ecole Polytechnique, Palaiseau 91128, France — Neutral depletion can affect dramatically the steady-state of low-temperature plasmas. For a plasma and neutral gas in pressure balance we showed that because of the inherent coupling of ionization and transport, an increase of the energy invested in ionization can nonlinearly enhance the transport process.<sup>1</sup> Such an enhancement of the plasma transport due to neutral depletion was shown to result in an unexpected *decrease* of the plasma density when power is *increased*, despite the *increase* of the flux of generated plasma. The effect of neutral depletion on collisionless plasma and neutrals, that are not in pressure balance and that are coupled through ionization only, will be analyzed. Implications of the collisionless case to helicon plasma sources and to the ionization region in the Hall thruster will be discussed. The effect of neutral gas heating will also be analyzed. It will be shown that this neutral gas heating can affect the plasma steady-state even if the plasma pressure is much lower than the neutral gas pressure.

<sup>1</sup>A. Fruchtman, G. Makrinich, P. Chabert, and J. M. Rax, Phys. Rev. Lett. **95**, 115002 (2005).

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