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Capacitively coupled radio-frequency discharges in nitrogen at low-pressure[1] L.L. ALVES, L. MARQUES, C.D. PINTASSILGO, IPFN/IST-UTL, Portugal, G. WATTIEAUX, J. BERNDT, L. BOUFENDI, GREMI/CNRS, France, E.T. ES-SEBBAR, N. CARRASCO, G. CERNOGORA, LATMOS-UVSQ/ CNRS, France — This paper studies capacitively coupled radio-frequency discharges (13.56 MHz frequency) in pure nitrogen, produced within the LATMOS and the GREMI cylindrical parallel-plate reactors, surrounded by a lateral grounded grid, at 2-30 W coupled powers and 0.2-1 mbar pressures. Simulations use an hybrid code [1] that couples a 2D (r,z) time-dependent fluid module for the charged particles and a 0D kinetic module for the nitrogen (atomic and molecular) neutral species. The coupling between these modules adopts the local mean energy approximation to define space-time dependent electron parameters for the fluid module and to work-out space-time average rates for the kinetic module. The model gives good predictions for the self-bias voltage and for the intensities of radiative transitions (average and spatially-resolved OES measurements) with the nitrogen SPS and FNS, and with the argon 811nm atomic line (present as an actinometer). Model results underestimate the experimental electron density (average resonant-cavity measurements) by a factor of 3-4.

[1] L. Marques et al, J. Appl. Phys. 102, 063305 (2007).

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