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Spatially-resolved electron temperature in a helium cold RF discharge up to atmospheric pressure JEAN-SEBASTIEN BOISVERT, Institut national de la recherche scientifique, Varenne, Canada, NATHAN MAUGER, LUC STAFFORD, Departement de physique, Universite de Montreal, Montreal, Canada, FRANCOIS VIDAL, Institut national de la recherche scientifique, Varenne, Canada, JOELLE MARGOT, Departement de physique, Universite de Montreal, Montreal, Canada — A cold plasma is generated inside a dielectric tube (inner diameter of 2 mm) using two long linear electrodes painted on diametrically opposed sides of the tube. The plasma can be sustained in helium from 10 to 760 Torr without any gas flow. In order to evaluate the electron temperature, a collisional-radiative model is coupled with optical emission spectroscopy of He ($n = 3$) lines. At atmospheric pressure, the spatially averaged T_e increases from 0.2 to 2 eV when the power density is increased from 2 to 12 W cm^{-3} (associated to the transition from the Ω to γ mode). With the help of a camera equipped with different bandpass filters (around 667 and 728 nm), the same collisional-radiative model is used to obtain the spatially-resolved electron temperature in the γ mode. It is about 0.5 eV in the bulk but 4 eV in the sheath region, this is in agreement with modelling of plane-parallel CCRF discharges in the literature. When the pressure is decreased below atmospheric pressure, the sheaths broaden and the region of high electron temperature (> 2 eV) fills the whole tube diameter. In addition, below 100 Torr, a plasma column is generated outside the electrode area, T_e in this region being much lower than between the electrodes.

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