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Electron density measurements in very electronegative plasmas using different diagnostic techniques: theory and experiments DMYTRO RAFALSKYI, Laboratoire de Physique des Plasmas, Ecole Polytechnique, Palaiseau FRANCE, TREVOR LAFLEUR, CNES, Ecole Polytechnique, ANE AANESLAND, CNRS, Ecole Polytechnique — Very electronegative plasmas (known as "ion-ion" plasmas) are used in different applications including material processing, space propulsion and thermonuclear fusion. Diagnostics of ion-ion plasmas can be performed using different probe techniques, including Langmuir and hairpin probes, RF, microwave and optical diagnostics. However, in certain applications (for example, in the electronegative thruster PEGASES [*Plasma Sources Sci. Technol.* **23** 044003 (2014)]), the electron density is too low ($<10^{12}\mathrm{m}^{-3}$) to be reliably measured by these standard techniques. This is further complicated by the presence of strong, non-homogeneous, magnetic fields in the plasma (˜200 G) and the relatively small plasma size (few cm). In this work we compare results achieved with a Langmuir probe, and with an independent measurement of the electron density using a matched dipole probe [*Phys. Plasmas*, **22**, 073504 (2015)]. Measurements are performed in an SF6 plasma with an electronegativity in the range between a few hundred to a few thousand. We show here that though the model itself can correctly describe the plasma-probe interactions, there is a critical value of plasma electronegativity above which the electron density measured with a Langmuir probe can give only an upper limit estimation.

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