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Microwave-driven plasmas in Hollow-Core Photonic Crystal Fibres[1] L.L. ALVES, IPFN/IST-UTL, Portugal, O. LEROY, C. BOISSE-LAPORTE, P. LEPRINCE, LPGP-UPS/CNRS, France, B. DEBORD, F. GEROME, R. JAMIER, F. BENABID, GPPMM/XLIM, CNRS-UNILIM, France — This paper reports on a novel solution to ignite and maintain micro-plasmas in gas-filled Hollow-Core Photonic Crystal Fibres (HC-PCFs), using CW microwave excitation (2.45 GHz) [1]. The original concept is based on a surfatron, generating argon micro-plasmas of few centimetres in length within a 100 μm core-diameter Kagome HC-PCF, at $\sim$1 mbar on-gap gas-pressure using low powers ($<$ 50 W). Diagnostics of the coupled power evidence high ionization degrees ($\sim 10^{-2}$), for moderate gas temperatures ($\sim$1300 K at the centre of the fibre, estimated by OES), with no damage to the host structure. This counter intuitive result is studied using a 1D-radial fluid model that describes the charged particle and the electron energy transport, the electromagnetic excitation and the gas heating [2,3]. We analyze the modification of the plasma and the gas heating mechanisms with changes in the work conditions (core diameter, pressure and electron density).

[1] B. Debord et al, ECOC conference Mo.2.LeCervin.5. (2011)
[2] L.L. Alves et al, Phys. Rev. E **79**, 016403 (2009)
[3] J. Gregório et al, Plasma Sources Sci. Technol. **21**, 015013 (2012)

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