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EEDF evolution in pulsed radio-frequency plasmas[1] ZIAD EL OTELL, MARK BOWDEN, NICHOLAS BRAITHWAITE, Open University UK — We investigate the evolution of the electron energy distribution function (EEDF) in pulsed radio-frequency plasmas using a simple form of trace rare gas optical emission spectroscopy. For steady-state discharges, methods exist to determine electron temperatures and EEDFs using emission measurements and collisional radiative models. However, these methods rely on the EEDF being stable and are difficult to use in the rapidly changing transients in a pulsed discharge. We assess a simpler technique in which we compare the time-dependence of emission from different plasma species in order to infer information about the evolution of the EEDF. The study was carried out in a capacitively coupled rf discharge generated in a Gaseous Electronic Conference (GEC) reference reactor. The gas mixture consisted of mainly argon with small amounts of xenon and krypton. Emission was measured on specific lines from argon, krypton and xenon, chosen due to their emission being predominantly due to direct excitation from the ground state. For the case of square pulse excitation, the EEDF in the early part of each pulse was dominated by beam-like electrons with high energy. This beam-like EEDF phase was absent when a pulse with a less steep rise time was used.

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