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Shockwave interactions with ionization waves in argon glow discharges NICHOLAS SIEFERT, BISWA GANGULY — We report measurements of enhancement in both optical emission and electric field at the shock front of weak shock waves (M$\sim$2) propagating in a 2 Torr argon glow discharge. The enhancements depend on when the shockwave arrives at the observation point because of the electric field modulation by the ionization wave. The ionization waves create large-amplitude fluctuations of the electron temperature and electron number density, which are modulated out of phase in order to conserve discharge current. This creates a plasma where the local electron Debye length fluctuates by nearly an order of magnitude without changing global properties, such as Mach number, gas pressure, and gas temperature. Depending on the timing between the ionization wave and the shockwave arrival, the local electron Debye length at the shock front can fluctuate between being either greater than or less than the shock thickness. The shockwave-induced enhancement in optical emission intensity and the electric field were found to exceed the modulation caused by the ionization wave itself only if the shockwave arrives when the Debye length is a maximum in the ionization wave. These measurements shows that, under a certain range of electron Debye length, shock thickness, and electron-neutral collision mean free path, there is an increase in the already non-equilibrium energy of the electrons at the shock front.

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