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High frequency sheath modulation and higher harmonic generation in a low pressure very high frequency capacitively coupled plasma excited by sawtooth waveform NISHANT SIRSE, Institute of Science and Laboratory Education, IPS Academy, Indore -452012, India, SARVESHWAR SHARMA, Institute for Plasma Research and HBNI, Gandhinagar - 382428, India, MILES TURNER, Dublin City University, Dublin 9, Ireland — A particle-in-cell (PIC) simulation study is performed to investigate the discharge asymmetry, higher harmonic generations and electron heating mechanism in a low pressure very high frequency capacitively coupled plasma (CCP) excited by a saw-tooth like current waveform. Two current densities, 50 A/m^2 and 100 A/m^2 are chosen for a constant gas pressure of 5 mTorr in argon plasma. The driving frequency is varied from 13.56 MHz to 54.24 MHz. At a lower driving frequency, high frequency modulations on the instantaneous sheath edge position at the grounded electrode are observed. These high frequency oscillations create multiple ionization beam like structures near to the sheath edge that drives the plasma density in the discharge and responsible for discharge/ionization asymmetry at lower driving frequency. Conversely, the electrode voltage shows higher harmonics generation at higher driving frequencies and corresponding electric field transients are observed into the bulk plasma. At lower driving frequency, the electron heating is maximum near to the sheath edge followed by electron cooling within plasma bulk, however, alternate heating and cooling i.e. burst like structures are obtained at higher driving frequencies. These results suggest that electron heating in these discharges will not be described accurately by simple analytical models.

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