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Gaining greater control and understanding of processing plasmas through Tailored Voltage Waveforms

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The use of multiple harmonics of an RF frequency to generate the exciting voltage waveform for a capacitively coupled plasma has in recent years become a rich and diverse field of research. Initially proposed, observed, and named as the Electrical Asymmetry Effect by the Bochum group, the use of such Tailored Voltage Waveforms to sustain a plasma has gone beyond asymmetrizing the ion bombardment energy and flux to the electrodes. It is now clear that one can gain control over such plasma features as localization of ionization events and composition of species flux by using more counterintuitive waveforms. In this talk, progress in this field in three areas is discussed: (1) identification of new TVW's that give rise to more complex asymmetries (namely "slope-asymmetric" waveforms), (2) identifying applications of TVW's in plasma processing and metrology, and finally, (3) solving the technical challenges of using the technique in an industrially feasible way. The talk will focus on work done at the LPICM and LPP CNRS laboratories at the Ecole Polytechnique, but in collaboration with a number of partners from other institutes.