SES13-2013-020002

Abstract for an Invited Paper
for the SES13 Meeting of
the American Physical Society

Filamentation of Laser Light in Air

MARTIN RICHARDSON, University of Central Florida

Studies of filamentation are now entering a new phase of investigation. As we consolidate more our understanding of the dynamics of the creation and propagation of single stabilized filaments in air, we can begin to deploy new modalities in filamentation, and to consider how they may be used in specific applications. In this review we consider our current understand of single filament formation in air by conventional high intensity femtosecond lasers, describing in particular new investigations of the continuum emission and the impact molecular alignment can have on filament propagation. We describe the use of multiple filaments to both investigate the phase characteristics of filaments, and through multi-color filaments to generate remote coherent THz emission. This opens the scenario of remote detection of organic materials including explosives through THz REEF spectroscopy. By manipulating the initial phase of the originating laser beam, we describe how multiple organized arrays of filaments can be generated, and illustrate this with the recent demonstration of double helical rotating filaments. Structured arrays of filaments open the pathway to many air filament scenarios, including the guiding and manipulation of microwaves, and potentially electric discharges. Air filaments can project to significant distances, instantaneous intensities that are well above the ablation thresholds of all materials. We have a multi-component research program to characterize the ablation and plasmas created from several types of materials. These studies include determining the energy balance and plasma characteristics, and examining the emissions that emanate from the plasma.