

Announcing the Final Examination of Mrs. Danielle L. Reyes for the degree of Doctor of Philosophy in Physics

Date: Nov. 17, 2020

Time: 1:00 pm

Room: Online (Join Zoom Meeting)

<https://ucf.zoom.us/j/99960713288?pwd=SVFwSFRsaWZwL0pQMXRRCmd4NkxPUT09>

Meeting ID: 999 6071 3288

Passcode: 147226

Dissertation title: Laser filament investigations: influence of preconditions and interactions

Abstract:

When an ultrashort laser pulse propagates with high peak power in a nonlinear medium, a combination of effects arise that contend and ultimately attain an active stabilization that manifests as a filament. This dynamic structure maintains narrow beam diameters over much greater distances than the typical diffraction length, able to deliver high intensities to long distances without any external focusing or guiding mechanism. In addition, filament propagation produces a string of plasma along the beam path. The unique features of laser filaments have inspired many compelling applications, from remote detection of pollutants to cloud seeding. Achieving these applications requires a thorough understanding of the influence of various conditions and interactions on filament behavior. The work presented in this dissertation aims to characterize the filament in both controlled and in real-world environments to identify the impact of diverse parameters on filamentation. First, a series of experiments and simulations were performed to investigate the effect of pulse-intrinsic and environmental factors on fundamental filament properties, including focal conditions and low-pressure atmospheres. The intent of a secondary series of experiments was to address the complex behavior of filaments in the interaction between neighboring nonlinear beams, both in space and time, concluding with the demonstration and study of a new paradigm of filamentation termed burst-mode filamentation.

Outline of Studies:

Major: Physics

Educational Career:

B.S. University of Central Florida, 2015

M.S. University of Central Florida, 2017

Committee in Charge:

Dr. Martin Richardson (Chair)

Dr. Eduardo Mucciolo

Dr. Michael Chini

Dr. Kathleen Richardson (External Committee Member)

Approved for distribution by Dr. Martin Richardson, Committee Chair, on Nov. 3, 2020.

The public is welcome to attend remotely.