Luis F. Ortega

Electro-Optical Engineering
Arlington, MA

Education

M.S. Physics 2019
University of Florida, Gainesville, Florida
IHEPA Grant, Grinter Fellow, CLAS Scholar

B.S. Physics 2016
University of Florida, Gainesville, Florida
Bright Futures Scholar, William G. Nash Scholar

Experience

MIT Lincoln Laboratory
Advanced Technology
2021 - 2025

Electro-optical Engineer
Laser Technology and Applications

DORY: Lead the development and testing of key fiber-optical components for applications in extreme environments with a quick turn-around in failure mode analysis and the development of solutions to resolve these technical challenges.

- Managed the project schedule, resources, and multi-disciplinary teams.
- Procured and implemented environmental, mechanical and electro-optical systems for device qualification and up-screening.
- Modified, matured and qualified key components in lifetime test campaigns.
- Worked with external vendor to improve part performance and up-screen them.
- Authorship of many internal test and assembly procedures.

Chipper: Assembly and operation of an ultra-short laser experiment to enable high-temperature superconductor (HTS) experiments.

- Investigated laser triggering on HTS rings, demonstrating release of stored energy within a superconducting ring.
- Configuration of an Electro-Optic sensing scheme to investigate the dynamic behavior of high-temperature superconducting rings illuminated by high energy pulses.

Deep Space Optical Communications (DSOC): Lead the technical development of a ns-class kW-level up-link laser-com demonstration system.

- Managed schedule and resources to meet project deadlines and propose development paths to sponsor.
- Modeled high-power amplifier performance and non-linearity for various modulation schemes.
- Conducted experimental studies of non-linear thresholds in a kW amplifier.
- Co-authored a paper detailing the optimization of large-mode-area Yb-doped fiber amplifiers for deep-space optical communications.

ASTRIX: Contributed to the development and fabrication of a pulsed HEL system.

- Component qualification for and implementation of several power amplifiers for a packaged HEL system.
- Assembly, integration and testing of the polarization combined 2-channel fiber MOPA system.
- Developed timing scheme which improves rise-time and implemented gain-switching peak suppression waveforms.
- Authorship of several internal technology disclosures and a provisional patent to facilitate technology transfer.

Multi-Core Fiber: Contributed to the development and fabrication of a multi-core tapered-fiber bundle and gain fiber assembly for high-power, low-SWAP, easily combined output.

- Spliced, assembled and tested a multi-core fiber system.
- Authored a paper demonstrating a pump-limited 1.2 kW of power output from a six-core amplifier.

University of Florida
Department of Physics
2015 - 2020

Research Assistant
Dark Cosmos Lab
Contributed to the very large effort of the LIGO community and developed new sensor technology for cavity auto-alignment.

- Model, design and implementation of a novel single photodiode alignment sensing and control for tilt and translation misalignment of an optical cavity.
- Design and fabrication of electro-optical beam deflectors for misalignment-mode modulation.
- Frequency-domain modeling and simulation of experimental tests and of the LIGO detectors in support of LSC activities and investigations.
- Materials Research for athermal structural design of future telescope and laser interferometer systems.
- Published several papers, posters and talks as part of the group and as part of the larger collaboration.

Max Planck Institute
Gravitational Physics
2016

IREU Researcher
Albert Einstein Institute 10-m Prototype
Analyzed and improved the differential wavefront system (alignment and actuation systems) of the frequency reference cavity in the 10-meter prototype interferometer

Technical Expertise

Programming	MATLAB, Python, LaTeX, C++, Arduino, git, bash.
Software	RP Fiber Power, Solidworks, Office Suite, Finesse, Jira, LabVIEW, Fusion360.
Skills	Ultrashort laser systems, fiber amplifier design and build, Fiber Splicing, High-Energy Laser Systems, Non-Linear Interactions in Fiber, Pulse Shaping Fiber Amplifier Design and Implementation, Laser Communication Systems, Environmental Testing for Space Applications, AI&T, Free-Space Optics, Optical Simulation, Interferometry, Electro-Optic Design and Manufacturing, Alignment Sensing and Control, Data Acquisition, Signal Processing, PID Systems, Analog Control Systems, Optical Cavity Design

Selected Publications

1. "High-Performance Deep-Space Optical Communications System Based on High-Power Yb-Doped Fiber Amplifiers" John J. Zayhowski and Luis F. Ortega. *To be published in the IEEE ICSOS 2023 Conference Proceedings, a copy of the future publication is available.*

2. "1.2-kW All-Fiber Yb-Doped Multicore Fiber Amplifier" Luis F. Ortega, Thomas Feigenson, Yin Wan Tam, Peter Reeves-Hall, Tso Yee Fan, Michael Messerly, Charles X. Yu, and Kyung-Han Hong. Opt. Lett. 48, 712-714 (2023)

3. "Hydroxide catalysis bonding of Allvar Alloy 30, a negative thermal expansion alloy" Kaden J. Loring, Luis F. Ortega, James A. Monroe, Jeremy S. McAllister, Xavier R. Huerta-San Juan, Guido Mueller, and Paul Fulda. J. Astron. Telesc. Instrum. Syst. 6(1) 015007 (2020)

4. "Alignment Sensing for Optical Cavities Using Radio-Frequency Jitter Modulation" P. Fulda, D. Voss, C. Mueller, L. F. Ortega, G. Ciani, G. Mueller, and D. B. Tanner. Appl. Opt. 56, 3879-3888 (2017)

5. "GWTC-1: A Gravitational-Wave Transient Catalog of Compact Binary Mergers Observed by LIGO and Virgo during the First and Second Observing Runs" B.P. Abbott et al. Phys. Rev. X 9, 031040 (2019)

6. "GW170817: observation of gravitational waves from a binary neutron star inspiral" B.P. Abbott et al. Phys. Rev. Lett. 119, 161101 (2017)

7. "GW170104: Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2" B.P. Abbott et al. Phys. Rev. Lett. 118, 221101 (2017)

Talks and Posters

1. *"High-Performance Deep-Space Optical Communications System Based on High-Power Yb-Doped Fiber Amplifiers"* L.F. Ortega and John J. Zayhowski*. IEEE International Conference on Space Optical Systems and Applications, Vancouver, Canada. 11-13 October, 2023.

2. *"High-Power, All-Fiber, Yb-Doped Multi-Core Fiber Amplifier"* L.F. Ortega, T. Feigenson, Y.W. Tam, P. Reeves-Hall, M. Messerly, T.Y. Fan, C.X. Yu, and K. Hong*. 2022 Conference on Lasers and Electro-Optics, San Jose, California, United States. 15-20 May, 2022.

3. *"Experimental Techniques for Future Gravitational Wave Detectors"* L.F. Ortega*, M. Diaz-Ortiz, H.Y. Chia, K. Loring, C. Perkins, F. Magana-Sandoval, P. Fulda, J. Conklin, and D.B Tanner. LVK Collaboration Meeting, Warsaw, Poland. 2 September, 2019.

4. *"Cavity Dynamics Calculator"* M. Diaz-Ortiz* and L.F. Ortega. FINESSE Workshop 2019, Birmingham, UK. 28 August 2019.

5. *"High Power Electro-Optic Beam Deflector for Precision Beam Control"* T. Uehara*, D. Voss, P. Fulda, L.F. Ortega, M.D. Ortiz, G. Ciani, G. Mueller, and D.B. Tanner. ICO 24, Tokyo, Japan. 24 August, 2017.

6. *"RF Jitter Modulation Alignment Sensing"* L.F. Ortega*, P. Fulda, M. Diaz-Ortiz, G. Perez Sanchez, G. Ciani, D. Voss, G. Mueller, and D. B. Tanner. APS April Meeting 2017, Washington, D.C. January 28-31, 2017.

7. *Modeling and Comissioning of the 10m Prototype Autoalignment System"* L.F. Ortega* IREU debriefing meeting, Gainesville, Florida. 10 August, 2016.

   * indicates speaker.