SCOTT EGBERT, PhD

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SKILLS

Lasers/Optics: Optical Design (8 yrs), Fiber Lasers (6 yrs)
Programming: Python (8 yrs), MATLAB (4 yrs), GitHub (3 yrs)
DOD Security Clearance: Secret (June 2016)
CAD: Mechanical Design (12 yrs), Ray Tracing (2 yr)
MS Office: Excel (10+ yrs), PowerPoint (10+ yrs), Word (10+ yrs)
Communication: Public speaking, management, scientific writing

RELEVANT WORK EXPERIENCE

UNIVERSITY OF COLORADO, BOULDER | Post-Doc and Grad Researcher — Aug 2019 – Present

- Built the **first GHz repetition rate, Mid-InfraRed (MIR) Dual Comb Spectrometer (DCS)** and processed spectra to measure microsecond-scale chemical kinetics in a shock tube.
- Simplified and optimized the GHz MIR DCS into the **first portable MIR DCS**. **Created custom mounts for freespace optics, reducing the overall footprint by 80%** from the previous iterations, allowing the laser to fit a 19" rack.
- Developed a **Python Interface and GUI** for a legacy database optimizer, **accelerating spectral database processing times from months to process hundreds of parameters to 2 weeks to process over 24,118**. My updated database enabled the first single laser beam optical velocity calculations. by **reducing database errors from 23 to 1%**.
- Interviewed, trained, and **managed four undergraduate interns** to support design and testing of the MIR DCS.

SANDIA NATIONAL LABS | Laser Scientist Intern — Summer 2018

- **Independently learned Python** to process Nd:YAG measurements of LN_2 and LH_2 leak plumes (report).

BRIGHAM YOUNG UNIVERSITY, PROVO, UT | Graduate Researcher — Mar 2017 - Aug 2019

- Designed **fiber optic temperature probe** to measure industrial gas turbine engine combustor temperature (result).

LOCKHEED MARTIN AERONAUTICS | Aeronautical Design Engineer Intern — Summer 2015 and 2016

- Investigated design improvements to F-35 flaps and wing edges at Edwards AFB, discussed solutions with manufacturing and design teams, and incorporated changes using **Product Data Management** software.

EDUCATION

PhD Mechanical Engineering | University of Colorado, Boulder, CO — May 2024

- Enabling High-Temperature Measurements with Frequency Comb Laser and Spectral Database Development
- Advised by Dr. Greg Rieker in the Precision Laser Diagnostics Lab, funded by AFRL

MS Mechanical Engineering | Brigham Young University, Provo, UT — Aug 2019

- Pressurized Combustion Product Temperature Measurement Using Integrated Spectral Band Ratios
- Advised by Dr. Dale Tree, funded by Solar Turbines

BS Mechanical Engineering (Magna Cum Laude) | Brigham Young University, Provo, UT — June 2017

- Teaching Assistant (TA) for Mechanical Engineering Thermodynamics and Physics II (Thermodynamics and Optics)

AWARDS AND PATENT

AWARDS

- University of Colorado Vogel Family Fellowship (2023-2024)
- Gordon Research Conference - Laser Diagnostics in Energy "Hot Topic" Poster (2023)
- QUADMARTS Conference Bowling Champion (2023)
- 5th place, Colorado Photonics Industry Association University Meeting Poster Competition (2023)
- 2nd place, Colorado Photonics Industry Association University Meeting Poster Competition (2022)
- 4th place, Colorado Photonics Industry Association University Meeting Poster Competition (2021)

PATENT

"Optical Radiation Pyrometry Technique for Gas Turbine Engines", US Patent 11215508, 2022.

PEER-REVIEWED PUBLICATIONS

- **S.C. Egbert**, K. Sung, S.C. Coburn, B.J. Drouin, G.B. Rieker, "Water-Vapor Absorption Database using Dual Comb Spectroscopy from 300-1300 K Part II: Air-Broadened H_2O, 6600 to 7650 cm-^{1}," J. of Quantitative Spectroscopy and Radiative Transfer, 2024.
- **S.C. Egbert**, K. Sung, S.C. Coburn, B.J. Drouin, G.B. Rieker, "Water-vapor absorption database using dual comb spectroscopy from 300 to 1300 K part I: Pure H_2O, 6600 to 7650 cm-^{1}," J. of Quantitative Spectroscopy and Radiative Transfer, 2024.
- P. Chang, R. Ishrak, N. Hoghooghi, **S.C. Egbert**, et al., G.B. Rieker, R. Reddy, S.A. Diddams, "Mid-Infrared Hyperspectral Microscopy with Broadband 1-GHz Dual Frequency Combs," in review, 2024.
- N. Hoghooghi, P. Chang, **S.C. Egbert**, et al., S.A. Diddams, P. Lynch, G.B. Rieker, "GHz repetition rate mid-infrared frequency comb spectroscopy of fast chemical reactions," Optica, 2024.
- M. Walsh, E. Baumann, N. Malarich, **S.C. Egbert**, R.K. Cole, G.B. Rieker, N.R. Newbury, I. Coddington, K. Cossel, J. Genest, "Pulse interaction induced systematic errors in dual comb spectroscopy," Optics Express, 2024.
- D. Yun, **S.C. Egbert**, et al., G.B. Rieker, "Single-beam velocimetry with dual frequency comb absorption spectroscopy," Optics Express, 2024.
- D. Yun, **S.C. Egbert**, et al., G.B. Rieker, "Temperature, Pressure, Velocity, and Water Vapor Mole Fraction Profiles in a Ramjet Combustor using Dual Frequency Comb Spectroscopy and a High Temperature Absorption Database," in review, 2024.
- X. Li, C. Yao, **S.C. Egbert**, Q. He, Z. Zhao, D.M. Christopher, E.S. Hecht, "Self-similar characteristics of underexpanded, cryogenic hydrogen and methane jets," International Journal of Hydrogen Energy, 2023.
- D. Yun, N.A. Malarich, R.K. Cole, **S.C. Egbert**, et al., G.B. Rieker, "Supersonic combustion diagnostics with dual comb spectroscopy," Proceedings of the Combustion Institute, 2023.
- N.A. Malarich, D. Yun, K. Sung, **S.C. Egbert**, S.C. Coburn, B.J. Drouin, G.B. Rieker, "Dual frequency comb absorption spectroscopy of CH_4 up to 1000 Kelvin from 6770 to 7570 cm-^{1}," J. of Quantitative and Radiative Spectroscopy, 2021.
- **S.C. Egbert**, D. Zeltner, M. Rezasoltani, D.R. Tree, "High Pressure Optical Measurements of Temperature at Turbine Rotor Inlet Conditions," ASME Turbo Expo, 2020.
- D.R. Tree, J.R. Tobiasson, **S.C. Egbert**, B.R. Adams, "Measurement of radiative gas and particle emissions in biomass flames," Proceedings of the Combustion Institute, 2019.
- X. Li, Q. Ba, **S.C. Egbert**, L. Cheng, "Measurements and modeling of fluid flow and thermal processes in an industrial precalciner," Fronties in Heat and Mass Transfer, 2018.
- **S.C. Egbert**, X. Li, M.L. Blaylock, E. Hecht, "Mixing of Liquid Methane Releases," Sandia National Lab Report, 2018.
- J.R. Tobiasson, **S.C. Egbert**, B.R. Adams, D.R. Tree, "An optical method for the measurement of combustion gas temperature in particle laden flows," Experimental Thermal and Fluid Science, 2018.
- B.R. Adams, J.R. Tobiasson, **S.C. Egbert**, D.R. Tree, "Determining Total Radiative Intensity in Combustion Gases Using an Optical Measurement," Energy and Fuels, 2018.

CONFERENCE PRESENTATIONS

- **S.C. Egbert**, K. Sung, S.C. Coburn, B.J. Drouin, G.B. Rieker, "Water-Vapor Absorption Database using Dual Comb Spectroscopy from 300-1300 K: Self- and Air-Broadened H_2O, 6600 to 7650 cm-^{1}," Combined HITRAN and ASA Conference, 2024.
- **S.C. Egbert**, N. Hoghooghi, ... G.B. Rieker, "Broadband, High-resolution, Portable Dual Comb Spectrometer for Measuring Combustion in the Mid-IR," **(Invited - only student talk)**, Gordon Research Conference - Laser Diagnostics in Energy, 2023.
- **S.C. Egbert**, N. Hoghooghi, P. Chang, M. Burch, R. Shaik, P. Lynch, S.A. Diddams, G.B. Rieker, "Broadband, High-resolution Dual Comb Spectrometer for Measuring Chemical Reactions in a Shock Tube," QUADMARTS Conference, 2023.
- **S.C. Egbert**, S.C. Coburn, K. Sung, B.J. Drouin, G.B. Rieker, "High-resolution Dual Comb Spectroscopy to Validate High-temperature H_2O Absorption Models," Conf. on Lasers and Electro Optics (CLEO), 2023.
- **S.C. Egbert**, P. Chang, S. Diddams, G.B. Rieker, N. Hoghooghi, "High-Speed, High-Resolution, Broadband Dual-Comb Spectrometer From 3-5 μm," Int. Symposium on Molecular Spectroscopy (ISMS), 2022.