Optical Science & Engineering Conference Agenda

Thursday, September 29, 2022
Inspiration Hall, Norm Asbjornson Hall
Montana State University, Bozeman, Montana

Daytime: enter at the east end of the 3rd floor
Evening: enter at the east end of the 2nd floor

Conference Organizers:
Dr. Joseph Shaw – OpTeC Director
Michelle Leonti – Conference Coordinator

Presented by the MSU Optical Technology Center (OpTeC), with support from the MSU Vice-President for Research and Economic Development and with sponsorship by OptoSigma Corp. and the City of Bozeman Department of Economic Development.

8:00 am  CHECK-IN and MORNING REFRESHMENTS

8:15 am  Conference Opening Remarks
Joseph Shaw
MSU Optical Technology Center Director

8:20 am  Substrate-induced effects on the dynamics of quantum light emitters in 2D semiconductors
Matthew Strasbourg,1 Emanuil Yanev,2 Parvez Sheikh,1 Thomas P. Darlington,2 James C. Hone,2 P. James Schuck,2 Nicholas J. Borys1
1Physics Dept., Montana State University
2Mechanical Engineering Dept., Columbia University

8:40 am  Spectral hole burning optical filters for quantum information and coherent photonics applications
Thomas Rust,1 Thomas Böttger,2 Jason Scott,1 and Charles Thiel1
1Physics Dept., Montana State University
2University of San Francisco
9:00 am  Construction and optimization of a free-space Hong-Ou-Mandel interferometer  
Nathan Kuehl and Krishna Rupavatharam  
Spectrum Lab, Montana State University

9:20 am  Investigation of localized quantum dot-like states in single-layer WS2 on a gold surface  
Mohammad Soroush,1 Kiyoun Jo,2 Emanuil Yanev,3 P. James Schuck,3 Deep Jariwala,2  
Nicholas J. Borys1  
1Physics Dept., Montana State University  
2University of Pennsylvania  
3Columbia University

9:40 am  Fabrication of embedded plasmonic antennas for nano-optomechanics and quantum light emission with 2D materials  
Joe Stage,1 Andrew Lingley,2 Wataru Nakagawa,2 Nicholas J Borys1  
1Physics Dept., Montana State University  
2Electrical & Computer Engineering Dept., Montana State University

10:00 am  BREAK & REFRESHMENTS

Session 2  
Chair: Randy Babbitt

10:30 am  FMCW LIDAR enabled phase compensation for range selective digital holographic imaging  
Matt Goodman, Krishna Rupavatharam, Wm. Randall Babbitt  
Spectrum Lab, Montana State University

10:50 am  Interferometric readout for spatial spectral holographic LIDAR applications  
Owen Wolfe, Wm. Randall Babbitt, R. Krishna Mohan  
Spectrum Lab, Montana State University

11:10 am  Improved characterization and performance of a double-reflection transmissive beam scanner for 1550 nm  
Jordan Baker, Kenneth Lang, David Dickensheets, Wataru Nakagawa  
Electrical & Computer Engineering Dept., Montana State University

11:30 am  MicroPulse differential absorption lidar for thermodynamic profiling in the lower atmosphere  
Luke Colberg, Owen Cruikshank, Patrick F. Morgan, Kevin S. Repasky  
Electrical & Computer Engineering Dept., Montana State University

11:50 pm  Improving insect detection from LIDAR measurements with wavelet features and machine learning hyperparameter optimization  
Ryan C Ficken,1 Walden T Marshall,2 Trevor C Vannoy,3 Joseph A. Shaw,3 Bradley M Whitaker3  
1Electrical & Computer Engineering Dept., North Carolina State University  
1Thayer School of Engineering, Dartmouth University  
2Electrical & Computer Engineering Dept., Montana State University  
3Electrical & Computer Engineering Dept., Montana State University
12:10 pm  **Lunch on your own**

Session 3  

Chair: Erik Grumstrup

1:10 pm  **Impact of lattice strain on charge carrier dynamics of lead halide perovskites**  
Sajia Afrin, Erik Grumstrup  
Chemistry & Biochemistry Dept., Montana State University

1:30 pm  **Observing charge injection in silver-modified graphitic carbon nitride using ultrafast spectroscopic techniques**  
Emma Orcutt, Shelton Varapragasam, Erik Grumstrup  
Chemistry & Biochemistry Dept., Montana State University

1:50 pm  **Using UV/NIR pump-probe microscopy to investigate ligand influence on transport properties of perovskite quantum dots**  
Joseph J. Thiebes and Erik Grumstrup  
Chemistry & Biochemistry Dept., Montana State University

2:10 pm  **Effect of hydrogen content on rare earth fluorescence in lithium niobate**  
Steven Rehbein, Thomas Rust, Charles Thiel  
Physics Dept., Montana State University

2:30 pm  **Rotationally resolved flame emission from mono- and bi-propellant nitromethane combustion at elevated pressures**  
Joshua Sinrud and Robert A. Walker  
Chemistry & Biochemistry Dept., Montana State University

2:50 pm  **BREAK & REFRESHMENTS**

Session 4  

(move to NAH 165)  

Chair: Wataru Nakagawa

3:20 pm  **Real time, shot-noise limited, image-based particle tracking**  
Brian D'Urso,¹ Leonardo R Werneck,² Megan Nolan,³ Austin Brandenberger,⁴ Zachariah B. Etienne⁵  
¹Physics Dept., Montana State University  
²University of Idaho  
³University of Missouri – Kansas City  
⁴Purdue University

3:40 pm  **Automatic 2D material detection in optical images using deep learning based computer vision**  
Fereshteh Ramezani,¹ Sheikh Parvez,² J Pierce Fix,² Nicholas J Borys,³ Bradley Whitaker¹  
¹Electrical & Computer Engineering Dept., Montana State University  
²Material Science Program, Montana State University  
³Physics Dept., Montana State University
4:00 pm  
*Polarimetric direct-detection for superchannels*
Jaroslaw Kwapisz,¹ Ioannis Roudas,² Eric Fink,¹ Aishik Biswas⁴
¹Mathematical Sciences Dept., Montana State University
²Electrical & Computer Engineering Dept., Montana State University

4:20 pm  
*Mapping surface hoar with a hyperspectral imager at a laboratory scale*
James Dillon,¹ Evan Schehrer,² Kevin Hammonds¹
¹Civil Engineering Dept., Montana State University
²Material Science Program, Montana State University

4:40 pm  
*UAV-Based Hyperspectral Imaging for River Algae Pigment Estimation*
Riley D. Logan,¹ Shannon M. Hamp,¹ Madison A. Torrey,² Rafael Feijó de Lima,³ Benjamin P. Colman,³ H. M. Valett,⁴ and Joseph A. Shaw¹
¹Electrical & Computer Engineering Dept., Montana State University
²Environmental Engineering Dept., Montana State University
³Ecosystem and Conservation Sciences Dept., University of Montana
⁴Division of Biological Sciences, University of Montana

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**Session 5  6:00 – 8:00 pm  Poster / Company Session  Inspiration Hall (2nd floor)**

**Company Exhibits**

| Agile Focus Designs | Keysight Technologies | S2 Corporation |
| Altos Photonics, Inc. | Lumibird, Inc. | Teledyne FLIR Laser Crystals and Components |
| Bridger Photonics | OptoSigma Corporation |

**6:00 pm**  
Evening Welcoming Remarks
Joseph Shaw, OpTeC Director
Alison Harmon, Vice President for Research & Economic Development

**Research Posters**

1. *Design and optical analysis of an FMCW LIDAR and digital holographic system for object detection at 100 m - 5000 m*
   Zachary Lakin, Corey Pearson, Matthew Goodman, Wm. Randall Babbitt, R. Krishna Mohan, Christopher Ebbers
   Spectrum Lab, Montana State University

2. *Creation of entangled photons via spontaneous parametric down conversion (SPDC) for use in quantum communication systems*
   Jason Mickel, R. Krishna Mohan, Christopher Ebbers
   Spectrum Lab, Montana State University

3. *Construction and verification of fog emulator for lidar and digital holography measurements*
   Corey Pearson, Brianne Malchow, Jaime Neeley, Stephen Crouch, Krista Drummond, Matthew Goodman, Krishna Rupavatharam, Wm. Randall Babbitt
   Spectrum Lab, Montana State University
4. Single sideband suppressed carrier chirped optical waveform generation using I/Q modulator and RFSoc
   Caleb Rohn, Andre Olearain, R. Krishna Mohan, Wm Randall Babbitt
   Spectrum Lab, Montana State University

5. Range selective digital holography using time of flight cameras
   Cole Hammond, R. Krishna Mohan, Wm Randall Babbitt
   Spectrum Lab, Montana State University

6. Vibration Cancellation for Off Axis Digital Holography
   Amy Hermann,1 Corey Pearson,2 Wm. Randall Babbitt,2 Matthew Goodman,2 Krishna
   Rupavatharam,2 Benjamin Thiesing2
   1Southern Methodist University
   2Spectrum Lab, Montana State University

7. Using nano-photoluminescence to determine the homogeneity of an excitonic Moire superlattice
   Tim Faltermeier, Joe Stage, Nicholas J Borys
   Physics Dept., Montana State University

8. Inducing single-photon emitter formation in 2D single-layer transition metal dichalcogenide alloys
   J Pierce Fix and Nicholas J Borys
   Physics Dept., Montana State University

9. Dynamic control of excitons in single-layer WSe2 with surface acoustic waves
   Sheikh Parvez,1 Samuel Berweger,2 Nicholas J Borys1
   1Physics Dept., Montana State University
   2NIST, Boulder, CO

10. Quantum emission in strained MoS2 nanoribbons
   Samuel Wyss,1 Matthew Strasbourg,1 Xufan Li,2 Nicholas J Borys,1 James Schuck3
   1Physics Dept., Montana State University
   2Honda Research Institute
   3Mechanical Engineering Dept., Columbia University

11. Polarized dermoscopic wide field micro-camera for integration into a reflectance confocal microscope
   Joseph Aist,1 Valentine Tretter,1 Nicholas George,1 Randall Martin,1 Milind Rajadhyaksha,2 David
   Dickensheets1
   1Electrical & Computer Engineering Dept., Montana State University
   2Memorial Sloan Kettering Cancer Center

12. Step-stare technique for coherent lidar using mems mirrors
   Andrew Oliver, Samantha Hampshire, Edward Zingone, David Dickensheets
   Electrical & Computer Engineering Dept., Montana State University
13. *Optically detected electrochemical impedance microscopy (OD-EIM): impact of heterogeneity on charge transport of electrochemical devices*
   Mashrur Ahmed Chowdhury,¹ Erik Grumstrup,¹ Reed Boduch²
   ¹Chemistry & Biochemistry Dept., Montana State University
   ²Siena College

14. *Leveraging ultrafast microscopies to explore excited state dynamics and the structure-function relationship of organic systems*
   Skyler Hollinbeck and Erik Grumstrup
   Chemistry & Biochemistry Dept., Montana State University

15. *Charge-carrier transport in novel solid-state perylene diimide locked assemblies*
   Alexander King,¹ Erik Grumstrup,¹ Jean-Hubert Olivier²
   ¹Chemistry & Biochemistry Dept., Montana State University
   ²University of Miami

16. *Coherent raman activated cell sorting*
   Jonah Theisen,¹ Erik Grumstrup,¹ Hatzenpichler Lab,¹ Warnat Lab²
   ¹Chemistry & Biochemistry Dept., Montana State University
   ²Mechanical & Industrial Engineering Dept., Montana State University

17. *Modeling the response of the CAPRI-SUN x-ray sensor to a solar flare*
   Max Johnson and Charles Kankelborg
   Physics Dept., Montana State University

18. *Auger electron spectroscopy mapping of ferroelectric domains in periodically poled lithium niobate*
   Torrey McLoughlin,¹ Wm. Randall Babbitt,¹ Wataru Nakagawa²
   ¹Physics Dept., Montana State University
   ²Electrical & Computer Engineering Dept., Montana State University

19. *Progress towards a polarimetric frequency-modulated continuous-wave (FMCW) LIDAR*
   Steve Shea, Dylan J. Maxwell, Michael R. Roddewig, Andrew D. Oliver, David L. Dickensheets, and Joseph A. Shaw
   Electrical & Computer Engineering Dept., Montana State University

20. *Lambertian surfaces with over- and under-filled sensor field of view*
    Nathaniel J Field and Joseph A Shaw
    Electrical & Computer Engineering Dept., Montana State University

21. *Low-cost multispectral imager for monitoring algal blooms*
    Shannon Hamp, Riley D. Logan, and Joseph A. Shaw
    Electrical & Computer Engineering Dept., Montana State University
22. **Extinction Coefficients and Lidar Feasibility to Aid Algal Monitoring via Drone-Based Hyperspectral Imaging**  
   Madison Torrey,1 Andrew Rodriguez,2 Riley D. Logan,3 Rafael Feijo de Lima,4 and Joseph A. Shaw3  
   1Environmental Engineering Dept., Montana State University  
   2Environmental Engineering Dept., Cal Poly Humboldt  
   3Electrical & Computer Engineering Dept., Montana State University  
   4Ecosystem and Conservation Sciences Dept., University of Montana

23. **Imaging of moon polarization in support of nighttime cloud phase remote sensing**  
   Sierra L. J. Dabby, Erica Venkatesulu, and Joseph A. Shaw  
   1Atmospheric Sciences, University of California - Berkeley  
   2Electrical & Computer Engineering Dept., Montana State University

24. **Rare-earth and transition metal ions for photonic applications in semiconductor hosts**  
   Adam Olivera, Jason Scott, Thomas Rust, Rufus Cone, and Charles Thiel  
   Physics Dept., Montana State University

25. **Investigation of transition metal doping of semiconductors for quantum technologies**  
   Jason Scott, Adam Olivera, Thomas Rust, Rufus Cone, and Charles Thiel  
   Physics Dept., Montana State University

26. **In situ characterization of LLZO synthesis using complementary Raman, XRD and TGA**  
   Steven Montoya and Robert Walker  
   Chemistry & Biochemistry Dept., Montana State University

27. **Time resolved emission studies of amino acid partitioning into model biological membranes**  
   Rhys Trousdale and Robert Walker  
   Chemistry & Biochemistry Dept., Montana State University

28. **Gypsum dissolution under the effect of surfactant and analysis of environmentally related ions in water**  
   Galip Yiyen, Kodie Duck, and Robert Walker  
   Chemistry & Biochemistry Dept., Montana State University

29. **LiDAR image analysis using changepoint detection**  
   Nathaniel Sweeney,1 Caroline Xu,2 Joseph A. Shaw,1 Bradley M Whitaker,1 Toby Dylan Hocking3  
   1Electrical & Computer Engineering Dept., Montana State University  
   2University of Michigan  
   3School of Informatics, Computing, and Cyber Systems, Northern Arizona University

30. **Facial feature identification in thermal images using deep learning methods**  
   Caleb Schreier,1 Fereshteh Ramezani,2 Bradley M Whitaker2  
   1School of Engineering and Engineering Technology, LeTourneau University  
   2Electrical & Computer Engineering Dept., Montana State University

31. **Configurable strain lattices in WSe2**  
   Artie Battaglin, Joseph Stage, J Pierce Fix, and Nicholas J Borys  
   Physics Dept., Montana State University

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