



Optical Science & Engineering Conference Agenda
Thursday, September 28, 2023

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, CWCA – Conference Coordinator

Presented by the MSU Optical Technology Center (OpTeC), with support from the MSU Vice-President for Research and Economic Development, Montana Photonics Industry Alliance, OptoSigma Corporation, Shimadzu Scientific Instruments, Keysight Technologies, Inc., the City of Bozeman Department of Economic Development, and the Montana Department of Commerce.



8:00 am **CHECK-IN and MORNING REFRESHMENTS**

8:20 am *Conference Opening Remarks*
Joseph Shaw
Optical Technology Center Director, Montana State University

Session 1

Chair: Christine Gobrogge

8:30 AM *Dynamic control of excitons in single-layer WSe₂ with surface acoustic waves*
Sheikh Parvez,¹ Samuel Berweger,² Nicholas Borys¹
¹Department of Physics, Montana State University
²National Institute of Standards and Technology

8:50 AM *Exciton formation from high-energy photoexcitations in 2D semiconductors*
Matthew Strasboug,¹ Emanuil Yanev,² Sheikh Parvez,¹ Sajia Afrin,³ Cory Johns,¹
Zoe Nobel,¹ Thomas P. Darlington,² Erik M. Grumstrup,³ James C. Hone,² P. James
Schuck,² Nicholas J. Borys¹
¹Department of Physics, Montana State University
²Department of Mechanical Engineering, Columbia University
³Department of Chemistry & Biochemistry, Montana State University

9:10 AM *Using mechanically detected magnetic resonance on silicon vacancy centers in sic for magnetometry in magneto-gravitational traps*
Connor Murphy, Brian D'Urso
Department of Physics, Montana State University

9:30 AM *Mitigating intrinsic photophysical limitations in graphitic carbon nitride*
Emma Orcutt, Erik Grumstrup, Shelton Varapragasam
Department of Chemistry & Biochemistry, Montana State University

9:50 AM *Quantifying noise effects in optical measures of excited state transport*
Joseph Thiebes, Erik M. Grumstrup
Department of Chemistry & Biochemistry, Montana State University

10:10 AM **BREAK & REFRESHMENTS**

Session 2

Chair: Nick Borys

10:40 AM *Orthogonal multichip DPSK*
Eric Fink,¹ Ioannis Roudas,² Jaroslaw Kwapisz¹
¹Department of Mathematical Sciences, Montana State University
²Electrical & Computer Engineering Department, Montana State University

11:00 AM *Practical implementation of hybrid classical/quantum network using multicore fibers*
Josh Dugre,¹ Sam Fritsch,² Andre Olearain,³ Krishna Rupavatharam³
¹Department of Physics, Montana State University
²Electrical & Computer Engineering Department, Montana State University
³Spectrum Lab, Montana State University

- 11:20 AM *Reduced direct-detection polarimetric receiver architectures*
Jaroslaw Kwapisz,¹ Eric Fink,¹ Ioannis Roudas²
¹Department of Mathematical Sciences, Montana State University
²Electrical & Computer Engineering Department, Montana State University
- 11:40 AM *Applications of variable focus MEMS mirror in a coherent lidar*
Andrew Oliver,¹ Stevens L. Shea,¹ Dylan Maxwell,¹ Michael Roddewig,² Joseph A. Shaw,¹
David Dickensheets¹
¹Electrical & Computer Engineering Department, Montana State University
²Geophysical Institute and Electrical Engineering Dept., University of Alaska Fairbanks
- 12:00 PM **LUNCH PROVIDED**
- Session 3 Chair: Krishna Rupavatharam
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- 1:10 PM *Phase compensation for range selective digital holographic imaging of vibrating targets*
Matthew Goodman, Krishna Rupavatharam, Wm. Randall Babbitt
Spectrum Lab, Montana State University
- 1:30 PM *Disk-resolved and disk-integrated polarization state of moonlight as a function of lunar phase*
Erica Venkatesulu,¹ Sierra L. J. Dabby,² Joseph A. Shaw¹
¹Electrical & Computer Engineering Department, Montana State University
²Math & Physical Sciences, University of California Berkeley
- 1:50 PM *Optics in agriculture, an opportunity for Montana*
Paul Nugent
Agricultural and Technology Education, Montana State University
- 2:10 PM *Estimation of daily high-resolution plant evapotranspiration using multispectral aerial imagery and geostatistical interpolation techniques*
Farshina Nazrul Shimim,¹ Mathieu Pagé Fortin,² Bradley M. Whitaker,¹ Mallika Nocco,³
Gaurav Jha⁴
¹Electrical & Computer Engineering Department, Montana State University
²Department of Computer Science, Laval University, Quebec, Canada
³Dept of Land, Air and Water Resources, University of California, Davis
⁴Dept of Agronomy, Kansas State University
- 2:30 PM *Preliminary analysis of drone propeller signals using wingbeat-modulation lidar*
John Fike, Trevor C. Vannoy, Nathaniel Sweeney, Joseph A. Shaw, Bradley M. Whitaker
Electrical & Computer Engineering Department, Montana State University
- 2:50 PM *Diode-laser-based doppler lidar for wind speed profiling*
Luke Colberg, Owen Cruikshank, Kevin Repasky
Electrical & Computer Engineering Department, Montana State University
- 3:10 PM **BREAK & REFRESHMENTS**

- 3:40 PM *EDA Tech Hub and Quantum*
 Jason Yager
 Montana Photonics Industry Alliance
- 4:00 PM *Conical diffraction and smile in imaging spectrometers*
 Slater Kirk
 Resonon Inc.
- 4:20 PM *Game of Drones*
 Shane Beams
 Vision Aerial, Inc.
- 4:40 PM *UAS: Detect, Track, ID, Defeat*
 Ben Keeley
 CACI International Inc.
- 5:00 PM *Practical applications of precision technology that are changing agriculture and construction*
 Adam Gilbertson
 RDO Equipment Co.
- 5:20 PM *Packaging Technologies of Integrated Photonics for Quantum Technology*
 Stefan Heinemann
 Phix, North America
- 5:40 PM *Brief Discussion: Academia & Industry Alignment*
 Joseph Shaw
 Montana State University

DINNER PROVIDED

Company Exhibits

AdvR, Inc.	Montana Innovation	Resonon
Altos Photonics, Inc.	Partnership	Shimadzu Scientific
CACI International	Montana Photonics Industry	Instruments
ILX Lightwave Corp/MKS	Alliance	Teledyne FLIR Laser Crystals
Instruments	Montana Science Center	and Components
Keysight Technologies, Inc.	OptoSigma Corporation	Vision Aerial
	Quartus Engineering	

- 6:00 pm Welcoming Remarks
 Joseph Shaw, OpTeC Director
 Alison Harmon, Vice President for Research & Economic Development
 Sponsor Remarks
 Jason Yager, President, Montana Photonics Industry Alliance

Research Posters

- Ultrafast Dynamics in PCN-222 and PCN-223 metal organic framework*
Sajia Afrin,¹ Erik Grumstrup²
¹Material Science, Montana State University
²Department of Chemistry & Biochemistry, Montana State University
- Operando optical studies of high-pressure monopropellant combustion*
Brahm Dean, Oliver Wolff
Department of Chemistry & Biochemistry, Montana State University
- Enhanced raman spectroscopy for trace environmental contaminant detection and quantification*
Kayode Fesomade,¹ Robert Walker²
¹Materials Science, Montana State University
²Department of Chemistry & Biochemistry, Montana State University
- Polarization-dependent absorption in monolayer moxw1-xs2 alloys*
Frank Schooner,¹ Kavika Faagau,² John Fix,¹ Nicholas Borys¹
¹Department of Physics, Montana State University
²Department of Physics, Whitworth University
- Fabrication of embedded plasmonic micropillars for nano-optomechanics and quantum light emission with 2D materials.*
Joe Stage,¹ Andrew Lingley,² Wataru Nakagawa,² Nicholas J. Borys¹
¹Department of Physics, Montana State University
²Electrical & Computer Engineering Department, Montana State University
- MEMS cantilevers for dynamic strain studies of 2d materials*
Masoud Hakimi Heris,¹ David L. Dickensheets,¹ Dinh Loc Duong,² Nicholas J Borys²
¹Electrical & Computer Engineering Department, Montana State University
²Department of Physics, Montana State University
- Investigation of strain-localized excitons in nanobubbles of single-layer WS₂ on a gold surface*
Mohammad Soroush,¹ Matthew Strasbourg,² Nicholas Borys,² Kiyoungh Jo,³ Deep Jariwala³
¹Electrical & Computer Engineering Department, Montana State University
²Department of Physics, Montana State University
³Department of Electrical and Systems Engineering, University of Pennsylvania
- Deterministically inducing single-photon emitters in 2D single-layer transition metal dichalcogenide alloys*
John Pierce Fix, Nicholas Borys
Department of Physics, Montana State University
- Strained generated quantum-emitters in transition-metal dichalcogenide nanoribbons*
Samuel Wyss,¹ Matthew Strasbourg,¹ Emanuil Yanev,² Xufan Li,³ Nicholas Borys,¹ P. James Schuck⁴
¹Department of Physics, Montana State University
²Department of Mechanical Engineering, Columbia University
³Honda Research Institute USA, San Jose, CA
⁴Department of Mechanical Engineering, Columbia University

10. *Using nano-photoluminescence to determine the homogeneity of an excitonic moire superlattice.*
Tim Faltermeier, Joe Stage, Nicholas Borys, John Pierce Fix
Department of Physics, Montana State University
11. *Calibration of particle position and efficient manufacturing of composite pole pieces in a magneto-gravitational trap*
Tahereh Naderishahab Synnove Hunnes, Brian D'Urso
Department of Physics, Montana State University
12. *Linearized-complexity direct-detection receivers for mode vector modulation*
Aishik Biswas,¹ Ioannis Roudas,¹ Eric Fink,² Jaroslaw Kwapisz²
¹Electrical & Computer Engineering Department, Montana State University
²Department of Mathematical Sciences, Montana State University
13. *Experimental demonstration and optimization of M-ary Stokes-Vector modulation direct-detection*
Alexander Brisson, Ioannis Roudas
Electrical & Computer Engineering Department, Montana State University
14. *Probing turbulence effects on OAM-encoded LG beams for data transmission in free space*
Caleb Rohn, Oliver Licht, Wm. Randall Babbitt, Krishna Rupavatharam
Spectrum Lab, Montana State University
15. *Simulating effects of mie scattering on electric field propagation in foggy environments*
Charlie Tribble, Corey Pearson, Krishna Rupavatharam, Wm. Randall Babbitt
Spectrum Lab, Montana State University
16. *Simulation and analysis of single shot range selective digital holography using phase-shifted local oscillators with spatial light modulators*
Cole Hammond, R. Krishna Mohan, Wm. Randall Babbitt
Spectrum Lab, Montana State University
17. *Exploring vibration compensation in digital holography for use in range-selective imaging*
Corey Pearson,¹ Amy Hermann,² Krishna Rupavatharam,³ Wm. Randall Babbitt³
¹Electrical & Computer Engineering Department, Montana State University
²Department of Physics, Southern Methodist University
³Spectrum Lab, Montana State University
18. *Comparison of periodically poled and bulk crystals as a function of pump wavelength for SWIR and NIR SPDC generation*
Eric Pritchard, Christopher Ebbers, Nathan Kuehl, Jonah Arnold, Krishna Rupavatharam
Spectrum Lab, Montana State University
19. *Interferometric methods for spatial spectral holographic signal processing applications*
Owen Wolfe, R. Krishna Mohan, W. Randall Babbitt
Spectrum Lab, Montana State University

20. *Quantum entanglement testing: EPR Paradox, Bell's Theorem and CHSH Inequality*
Jonah Arnold, Nathan Kuehl, Krishna Rupavatharam
Spectrum Lab, Montana State University
21. *Characterizing the performance of QKD transceiver platforms in a hybrid quantum network testbed*
Samuel Fritsch, Andre Olearain, Joshua Dugre, Alexander Kaufman, Wm. Randall Babbitt, Krishna Mohan Rupavatharam
Spectrum Lab, Montana State University
22. *Design and implementation of a long range FMCW lidar system in combination with a telescopic FMCW digital holographic imaging system*
Zachery Lakin, Ector Ayala, Krishna Rupavatharam, Wm. Randall Babbitt
Spectrum Lab, Montana State University
23. *Step-stare technique for coherent lidar using MEMS mirrors*
Jasper Baily-Gould, Andrew Oliver, David Dickensheets
Electrical & Computer Engineering Department, Montana State University
24. *Fabrication of a MEMS Resonant Torsional Plate for a Transmissive Beam Scanner*
Samantha "Hunter" Hampshire, Andrew Oliver, David Dickensheets
Electrical & Computer Engineering Department, Montana State University
25. *Design and characterization of polarizing nanostructures for use in a MEMS laser beam scanner*
Jordan Baker, David Dickensheets, Wataru Nakagawa
Electrical & Computer Engineering Department, Montana State University
26. *Contrast enhancement through an air-water interface with polarization imaging*
Kyndra L. Buglione,¹ Erica Venkatesulu,¹ Nathaniel J. Field,¹ Kirstin D. Doney,²
Joseph A. Shaw¹
¹Electrical & Computer Engineering Department, Montana State University
² Advanced Technology Center, Lockheed-Martin Space
27. *Water Scene Polarization - Insights from an Extended Model*
Nathaniel J. Field, Erica Venkatesulu, Joseph A. Shaw
Electrical & Computer Engineering Department, Montana State University
28. *UAV-based hyperspectral imaging for identifying and monitoring riverine algal blooms in western Montana*
Riley Logan,¹ Shannon M. Hamp,¹ Madison A. Torrey,² Rafael Feijo-Lima,³ Benjamin P. Colman,³
H. Maurice Valett,⁴ Joseph A. Shaw¹
¹Electrical & Computer Engineering Department, Montana State University
²Civil Engineering Department, Montana State University
³Department of Ecosystem and Conservation Sciences, Montana State University
⁴Division of Biological Sciences, University of Montana
29. *Progress toward a low-cost multispectral imager for river algae monitoring*
Shannon Hamp, Charles D. Nicholson, Riley D. Logan, Joseph A. Shaw
Electrical & Computer Engineering Department, Montana State University

30. *Predicting quantum emitter fluctuations with time-series forecasting models*
Ramezani Fereshteh,¹ Matthew Strasbourg,² Sheikh Parvez,^{2,3} Ravinda Saxena,⁴ Deep Jariwala,⁴
Nicholas J. Borys,^{2,3} Bradley M. Whitaker¹
¹ Electrical & Computer Engineering Department, Montana State University
² Department of Physics, Montana State University
³ Materials Science Program, Montana State University
⁴ Electrical and Systems Engineering, University of Pennsylvania
31. *Hyperspectral remote sensing approach for rapid detection of potato virus Y*
Siddat Nesar,¹ Bradley Whitaker,¹ Paul Nugent,² Nina Zidack³
¹Electrical & Computer Engineering Department, Montana State University
²Precision Agriculture, Montana State University
³Potato Seed Lab, Montana State University
32. *Toward polarization-enhanced water quality remote sensing measurements from UAVs*
P. Flint Morgan,¹ Wyatt W. Weller,¹ Joseph A. Shaw,¹ Shannon M. Hamp,¹ Dylan Maxwell,¹ Bradley
M. Whitaker,¹ Michael R. Roddewig²
¹Electrical & Computer Engineering Department, Montana State University
²Geophysical Institute and Electrical Engineering Dept., University of Alaska Fairbanks
33. *Estimating aboveground biomass using combined SAR and NDVI*
Brett Griesbaum,¹ Paul Nugent,² Scott Powell¹
¹Land Resources and Environmental Sciences, Montana State University
²Precision Agriculture, Montana State University
34. *Computer vision with thermal and visible cameras for Improved livestock management.*
Courtlyn Wunneburger-Ramirez,¹ Dr. Paul Nugent,² Dr. Sam Wyffels,³ Dr. Tim DelCurto⁴
¹Agricultural & Technology Education, Montana State University
²Precision Agriculture, Montana State University
³Department of Animal & Range Sciences, Montana State University
35. *Accelerating barley breeding: high-throughput root trait analysis*
Trevor Palone
Plant Science and Plant Pathology Department, Montana State University