



**4th International Workshop on
Frontiers in
Lasers and Applications
(FLA-4)**

Hotel Miyahira
Ishigaki, Okinawa, Japan
July 7-11, 2024

PROGRAM & TECHNICAL DIGEST

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Program at a Glance

	7-Jul-24	8-Jul-24	9-Jul-24	10-Jul-24	11-Jul-24
9:00			K7: Yusuke Ito	Free discussion & Networking	
9:20		Opening remarks	K8: Micheal Meunier		K22: Amy Mullin
9:40		K1: Xianfan Xu	K9: Mitsuhiro Terakawa		K23: Alexander Heisterkamp
10:00		K2: Stephan Barcikowski	K10: Ya Cheng		K24: Hiroaki Minamide
10:20		K3: Xinwei Wang			Break
10:50		Break	Break		
11:10		S1: Yasufumi Kawasuji	S2: Keming Du		K25: Henry Helvajian
11:30		K4: Godai Miyaji	K11: Yongfeng Lu		K26: Shuntaro Tani
11:50		K5: Katharine Moore Tibbetts	K12: Barbara Previtali		K27: Vassilia Zorba
12:10		K6: Koji Sugioka	K13: Nobuyuki Matsuda		Closing remarks
		Break	Break	Break	
14:00		Free discussion & Networking	K14: Shinsuke Fujioka	Excursion	
14:20			K15: Masoud Mahjouri Samani		
14:40			K16: Yoshiki Nakata		
15:00			K17: Mitchell Anthamatten		
15:20			Break		
15:50			K18: John T. Fourkas		
16:10			K19: Takanobu Kisu		
16:30			K20: Daisuke Nakamura		
16:50			K21: Nadezhda Bulgakova		
17:00	Registration & Welcome reception				Break
17:10			Break		
18:30			Transportation		
19:00			Banquet		
21:00					

Presentation Titles

July 8, 2024	
Xianfan Xu	Machine Learning for Rapid Projection Multi-photon 3D Printing
Stephan Barcikowski	Pulsed Laser Crushing in Liquid
Xinwei Wang	Atomic Scale Phonon and Electron Transport: Sensing by Energy Transport State-resolved Raman Scattering
Yasufumi Kawasuji	Enhancement of Glass Ablation Rate for Micro-via Processing using Very Long Pulse 248-nm KrF Excimer Laser for Semiconductor Interposer Packaging
Godai Miyaji	Direct Surface Nanopatterning with Few-cycle Femtosecond Laser Pulses
Katharine Moore Tibbetts	Better Laser Nanofabrication through Chemistry
Koji Sugioka	3D CYTOP Microfluidic Chips Fabricated by Femtosecond Laser for High Resolution Live Cell Imaging
July 9, 2024 (AM)	
Yusuke Ito	Ultrafast Material Removal of Transparent Dielectrics by Transient and Selective Laser Processing
Micheal Meunier	Pulsed Laser Gene/Drug Release from Lipid Nanoparticles Without Affecting the Integrity of the Cargo
Mitsuhiro Terakawa	Fabrication of Functional Structures in Hydrogels by Laser Processing
Ya Cheng	High-performance Lithium Niobate Photonic Integrated Devices: Fabrication by PLACE
Keming Du	Enhancements of Ultrashort Pulse Laser Performances and Application Examples in Industry
Yongfeng Lu	Diamond Coatings on Metals through Interface Engineering
Barbara Previtali	Benefits and Challenges of Implementing Metal Additive Manufacturing in the Civil Construction Industry
Nobuyuki Matsuda	Quantum Information Devices using Silicon Photonics
July 9, 2024 (PM)	
Shinsuke Fujioka	Direct-drive Fast Ignition Studies for Laser Fusion Energy Development
Masoud Mahjouri Samani	Additive Nanomanufacturing of Electronics
Yoshiki Nakata	Macro- and Micro- Beam Shaping and Fabrication of Nanomaterials
Mitchell Anthamatten	Molecular Engineering of Films for Polarization Control and Resins for High Resolution, Two-Photon Printing
John T. Fourkas	Electrolyte Solutions in Polar Aprotic Solvents at Polar Interfaces Exhibit Unexpected Behavior
Takanobu Kiss	A Novel Methodology for Mass Production of Rare-Earth High Temperature Superconducting Wires by High-Rate PLD Process Coupled with High Throughput Wire Performance Characterization and Machine Learning
Daisuke Nakamura	Development of Smart Laser Welding System for Copper
Nadezhda Bulgakova	Laser-Assisted Synthesis and Manipulation of 2D Materials
July 11, 2024	
Amy Mullin	Alignment and Collision Dynamics of Optically Centrifuged CO ₂ Molecules with J=244-282
Alexander Heisterkamp	Flexibly and Biocompatible Plasmonic Sensors
Hiroaki Minamide	Frequency Up-conversion for Phase Sensitive Terahertz Wave Detection using Backward Optical Parametric Photon-conversion
Henry Helvajian	Photonics Technologies can Facilitate the Development of a Sustainable Eco-System in Outer Space
Shuntaro Tani	In-situ Mid-infrared Emission Observation during Multiple-pulse Ultrashort Laser Ablation
Vassilia Zorba	Emerging Ultrafast Laser Plasma Approaches for Sensing

July 8, 2024

9:10 – 9:20 Opening Remarks

K. Sugioka (RIKEN, Japan)

Session 1

Session Chair: A. Heisterkamp (Gottfried Wilhelm Leibniz University Hannover, Germany)

9:20 – 9:40 Machine Learning for Rapid Projection Multi-photon 3D Printing

J. Johnson¹, G. Lin², X. Xu¹

1- School of Mechanical Engineering and Birck Nanotechnology Center, Purdue University, USA

2- Department of Mathematics and School of Mechanical Engineering, Purdue University, USA

9:40 – 10:00 Pulsed Laser Crushing in Liquid

S. Barcikowski^{*1}, T. Friedenauer¹, H. Huber², C. Rehbock¹, S. Reichenberger¹, M. Spellaue², N. Stratmann¹, M. Tack¹, M. Willeke¹, A. Ziefuß¹

1-Technical Chemistry I and Center for Nanointegration Duisburg-Essen (CENIDE), University of Duisburg-Essen, Germany

2-Department of Applied Sciences and Mechatronics, Munich University of Applied Sciences HM, Germany

10:00 – 10:20 Atomic Scale Phonon and Electron Transport: Sensing by Energy Transport State-resolved Raman Scattering

X. Wang

Department of Mechanical Engineering, Iowa State University, USA

Coffee Break

Session 2

Session Chair: X. Xu (Purdue University, USA)

10:50 – 11:10 Enhancement of Glass Ablation Rate for Micro-via Processing using Very Long Pulse 248-nm KrF Excimer Laser for Semiconductor Interposer Packaging

Y. Kawasuji¹, A. Suwa¹, Y. Adachi¹, T. Tanaka¹, K. Kakizaki¹, M. Washio²

1- Gigaphoton Inc., Japan

2- Waseda University, Japan

11:10 – 11:30 Direct Surface Nanopatterning with Few-cycle Femtosecond Laser Pulses

G. Miyaji

Tokyo University of Agriculture and Technology, Japan

11:30 – 11:50 Better Laser Nanofabrication through Chemistry

N. Simpson, C. Weththasingha, E. Kaplan, K. M. Tibbetts

Department of Chemistry, Virginia Commonwealth University, USA

11:50 – 12:10 3D CYTOP Microfluidic Chips Fabricated by Femtosecond Laser for High Resolution Live Cell Imaging

K. Sugioka¹, M. Hanzawa^{1,2}, K. Obata¹, F. Sima^{1,4}, H. Kawano^{1,3}, T. Tojima¹, D. Miyashiro¹, A. Nakano¹, G. Miyaji², A. Miyawaki^{1,3}

1- RIKEN Center for Advanced Photonics (RAP), Japan

2- Tokyo University of Agriculture and Technology, Japan

3- RIKEN Center for Brain Science (CBS), Japan

4- INFLPR, Romania

July 9, 2024 (AM)

Session 3

Session Chair: S. Tani (The University of Tokyo, Japan)

9:00 – 9:20 Ultrafast Material Removal of Transparent Dielectrics by Transient and Selective Laser Processing

Y. Ito, G. Ren

Department of Mechanical Engineering, School of Engineering, The University of Tokyo, Japan

9:20 – 9:40 Pulsed Laser Gene/Drug Release from Lipid Nanoparticles Without Affecting the Integrity of the Cargo

M. Meunier

Polytechnique Montreal, Department of Engineering Physics, Montreal, Canada

9:40 – 10:00 Fabrication of Functional Structures in Hydrogels by Laser Processing

M. Terakawa

Department of Electronics and Electrical Engineering, Keio University, Japan

10:00 – 10:20 High-performance Lithium Niobate Photonic Integrated Devices: Fabrication by PLACE

Y. Cheng^{1,2}

1-State Key Laboratory of High Field Laser Physics and CAS Center for Excellence in Ultra-intense Laser Science, Shanghai Institute of Optics and Fine Mechanics (SIOM), Chinese Academy of Sciences (CAS), China

2-The Extreme Optoelectromechanics Laboratory (XXL), School of Physics and Electronic Science, East China Normal University, China

Coffee Break

Session 4

Session Chair: A. Mullin (University of Maryland College Park, USA)

10:50 – 11:10 Enhancements of Ultrashort Pulse Laser Performances and Application Examples in Industry

K. Du

EdgeWave GmbH, Germany

11:10 – 11:30 Diamond Coatings on Metals through Interface Engineering

Y. Lu^{1,*}, Z. Wu^{1,#}, W. Sun^{1,#}, A. Mao¹, Q. Zhu¹, X. Chen², X. Zhang², L. Trinh², N. Li¹, X. Huang¹, N. Kraiem^{1,3}, J-F. Silvain^{1,3}, B. Cui²

1- Department of Electrical and Computer Engineering, University of Nebraska, Lincoln, USA.

2- Department of Mechanical and Materials Engineering, University of Nebraska, Lincoln, USA.

3- CNRS, Univ. Bordeaux, Bordeaux INP, ICMCB, France.

11:30 – 11:50 Benefits and Challenges of Implementing Metal Additive Manufacturing in the Civil Construction Industry

B. Previtali¹, A.G. Demir¹, A. Kanyilmaz²

1- Department of Mechanical Engineering, Politecnico di Milano, Milan, Italy

2- Department of Architecture, Built Environment and Construction Engineering, Politecnico di Milano, Milan, Italy

11:50 – 12:10 Quantum Information Devices using Silicon Photonics

N. Matsuda

Department of Communications Engineering, Graduate School of Engineering, Tohoku University, Japan

July 9, 2024 (PM)

Session 5

Session Chair: S. Barcikowski (University of Duisburg-Essen, Germany)

14:00 – 14:20 Direct-drive Fast Ignition Studies for Laser Fusion Energy Development

S. Fujioka^{1,*}, R. Takizawa¹, Y. Abe^{2,1}, A. Morace¹, Z. Lan¹, H. Morita^{3,1}, K. F. F. Law¹, J. Dun¹, T. Maekawa¹, T. Tsuido¹, X. Han¹, H. Azechi¹, N. Iwata¹, T. Sano¹, A. Yogo¹, A. Iwamoto^{5,1}, Y. Arikawa¹, H. Nagatomo¹, T. Johzaki^{4,1}, Y. Sentoku¹, R. Kodama¹

1- Institute of Laser Engineering, Osaka University, Japan

2- Graduate School of Engineering, Osaka University, Japan

3- Faculty of Engineering, Utsunomiya University, Japan.

4- Graduate School of Advanced Science and Engineering, Hiroshima University, Japan.

5- National Institute for Fusion Science, Japan

14:20 – 14:40 Additive Nanomanufacturing of Electronics

A. Taba, A. Patel, S. Jaiswal, Z. Ahmadi, M. Mahjouri-Samani*

Electrical and Computer Engineering Department, Auburn University, USA.

14:40 – 15:00 Macro- and Micro- Beam Shaping and Fabrication of Nanomaterials

Y. Nakata

Osaka University, Japan

15:00 – 15:20 Molecular Engineering of Films for Polarization Control and Resins for High Resolution, Two-Photon Printing

M. Anthamatten¹, D. R. Harding¹, S. H. Chen¹, Y. F. Lu²

1- Department of Chemical Engineering, University of Rochester, USA

2- Department of Electrical Engineering and Computer Engineering, University of Nebraska-Lincoln, USA

Coffee Break

Session 6

Session Chair: K. M. Tibbetts (Virginia Commonwealth University, USA)

15:50 – 16:10 Electrolyte Solutions in Polar Aprotic Solvents at Polar Interfaces Exhibit Unexpected Behavior

A. J. Souana¹, J. W. Polster², M. H. Motevaselian³, S. Singh¹, S. Silva², R. A. Lucas², J. D. Tran¹, E. Cao², Z. S. Siwy², N. Aluru^{3,4}, B. Coasne⁵, J. T. Fourkas¹

1- University of Maryland, College Park, USA

2- University of California Irvine, USA

3- University of Illinois at Urbana-Champaign, USA

4- The University of Texas at Austin, USA

5- Université Grenoble-Alpes, CNRS, France

16:10 – 16:30 A Novel Methodology for Mass Production of Rare-Earth High Temperature Superconducting Wires by High-Rate PLD Process Coupled with High Throughput Wire Performance Characterization and Machine Learning

T. Kiss^{1,2}, Z. Wu², K. Higashikawa^{1,2}, S. Sera², Y. Tanaka², R. Valikov³, M. Nakamura^{2,3}, V. Petrykin³, S. Lee³

1- Research Institute of Superconductor Science and Systems, Kyushu Univ., Japan

2- Dept. of Electrical Engineering, Kyushu Univ., Japan

3- Faraday Factory Japan LLC, Japan

16:30 – 16:50 Development of Smart Laser Welding System for Copper

D. Nakamura

Department of Electrical Engineering, Graduate School of Information Science and Electrical Engineering, Kyushu University, Japan

16:50 – 17:10 Laser-Assisted Synthesis and Manipulation of 2D Materials

I. Mirza¹, J. Hrabovský^{1,2}, A.V. Bulgakov¹, N.T. Goodfriend^{1,3}, A.I. Bertoni⁴, K. Gazdová¹, T. J. Y. Derrien¹, N.M. Bulgakova¹

1- HiLASE Centre, FZU - Institute of Physics ASCR, Czech Republic

2- Charles University, Faculty of Mathematics and Physics, Czech Republic

3- Energy Saving Trust, Prospect House, UK

4- Universidad Nacional de Cuyo, Instituto Interdisciplinario Ciencias Básicas, Argentina

July 11, 2024

Session 7

Session Chair: M. M. Samani (Auburn University, USA)

9:20 – 9:40 Alignment and Collision Dynamics of Optically Centrifuged CO₂ Molecules with J=244-282

S. A. DeSouza, M. E. Ritter, A. S. Mullin

Department of Chemistry and Biochemistry, University of Maryland College Park, USA

9:40 – 10:00 Flexibly and Biocompatible Plasmonic Sensors

A. Ahmed^{1,2}, T. Amend^{1,2}, C. Wenck^{1,2}, M. Stiesch^{2,3}, M. Terakawa⁴, M. L. Torres-Mapa^{1,2}, A. Heisterkamp^{1,2}

1Institute of Quantum Optics, Gottfried Wilhelm Leibniz University Hannover, Hannover, Germany

2Lower Saxony Centre for Biomedical Engineering, Implant Research and Development (NIFE), Hannover, Germany

3Department of Prosthetic Dentistry and Biomedical Materials Science, Hannover Medical School, Germany

4Department of Electronics and Electrical Engineering, Keio University, Kanagawa, Japan

10:00 – 10:20 Frequency Up-conversion for Phase Sensitive Terahertz Wave Detection using Backward Optical Parametric Photon-conversion

H. Minamide

RIKEN center for Advanced Photonics, Japan

Coffee Break

Session 8

Session Chair:

Y. Cheng (Chinese Academy of Sciences (CAS), China)

10:50 – 11:10 Photonics Technologies can Facilitate the Development of a Sustainable Eco-System in Outer Space

H. Helvajian

Physical Sciences Laboratories, The Aerospace Corporation, USA

11:10 – 11:30 In-situ Mid-infrared Emission Observation during Multiple-pulse Ultrashort Laser Ablation

S. Tani^{1,*}, Y. Kobayashi¹

1- The Institute for Solid State Physics, The University of Tokyo, Japan

**Current Address: RIKEN Center for Advanced Photonics, Japan*

11:30 – 11:50 Emerging Ultrafast Laser Plasma Approaches for Sensing

C. Kim^{1,2}, J. Chirinos¹, M. Park¹, X. Mao¹, B. Zhang^{1,2}, Z. Alvidrez^{1,2}, V. Zorba^{1,2}

1- Laser Technologies Group, Lawrence Berkeley National Laboratory, USA

2- Department of Mechanical Engineering, University of California at Berkeley, USA

11:50 – 12:00 Closing Remarks

Y. Nakata (Osaka University, Japan)