

# Ali Mardan Dezfouli



## Personal Information

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## Education and Activities

2021-2024 **PhD**, Institute of Physics, coherent optics holography lab, Zagreb, Croatia

2017-2020 **Research assistant**, Institute for Advanced Studies in Basic Sciences (IASBS), optics research center, Zanjan, Iran

2014-2017 **M.Sc. in opto-electronic engineering (Laser)**, Maleke Ashtar University of Technology, Isfahan, Iran

2010-2014 **B.Sc. in solid state physics**, The University of Zanjan, Zanjan, Iran

2005-2009 **Diploma**, Payam enghelab school (national organization for development of exceptional talents), mathematics and physics, Ahvaz, Iran

## Phd Thesis / coursework and grades

Title Generation and detection of optical vortex beam

Abstract The thesis is dedicated to advancing methods for characterizing complex light fields carries orbital angular momentum (OAM). OAM beams, also known as vortex beams, have gained a significant attention over the past decade. Their ability to offer an infinite number of modes (theoretically) opens doors to develop new high data-rate and secure communication system. The thesis places a primary emphasis on the critical aspect of accurate detection of Laguerre-Gaussian (LG) modes and increasing the range of topological charge detection. The LG beams form a complete set of solutions to the paraxial Helmholtz equations in cylindrical coordinates. Our study introduces two novel methods for detecting OAM state of light. The first method utilizes diffractive techniques facilitated by digital holography using liquid crystal spatial light modulators (LC-SLMs). This approach demonstrates having high tolerance to misalignment and allows for precise fine-tuning to enhance detection efficiency. The second method employs off-axis parabolic mirror (OPM), offering distinct advantages over traditional approaches. Notably, it eliminates the need for expensive SLMs and presents opportunities for optical system miniaturization. Moreover, by employing OPM, we achieved high detection efficiency for the highest topological charge with high precision and detection robustness. (**Supervisor:** dr. sc. Hrvoje Skenderović)

- Introduction to Modern Atomic, Molecular and Optical physics: 5 (excellent)
- Seminar in Atomic, Molecular and Optical Physics: P (passed)
- Nonconventional Techniques in Atomic Spectroscopy: 5 (excellent)
- Femtosecond Laser Spectroscopy: 5 (excellent)
- Coherent Light-Atom Interaction: 5 (excellent)
- Low-temperature Plasmas and Applications: 5 (excellent)

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## Research activities and publication list

- 2019 Theory of diffraction of vortex beams from structured aperture and generation of elegant elliptical Hermite-Gaussian beams.  
Davud Hebri, Saifolah Rasouli, **Ali Mardan Dezfouli**  
Journal of the Optical Society of America A → [DOI: 10.1364/JOSAA.36.000839](https://doi.org/10.1364/JOSAA.36.000839)
- 2020 Efficient characterization of optical vortices via diffraction from curved-line linear grating (highlighted by 'OSA Spotlight on Optics').  
Pouria Amiri, **Ali Mardan Dezfouli**, Saifolah Rasouli  
Journal of the Optical Society of America B → [DOI: 10.1364/JOSAB.398143](https://doi.org/10.1364/JOSAB.398143)
- 2022 Detection of the orbital angular momentum state of light using sinusoidally shaped phase grating (Invited paper for oral presentation-Barcelona)  
**Ali Mardan Dezfouli**, Denis Abramovic, Mario Rakic, Hrvoje Skenderovic  
Applied Physics Letters → [DOI: 10.1063/5.0089735](https://doi.org/10.1063/5.0089735)
- 2023 Digital Holographic Interferometry for Micro-Deformation Analysis of Morpho Butterfly Wing  
**Ali Mardan Dezfouli**, Nazif Demoli, Denis Abramović, Mario Rakić, Hrvoje Skenderović  
[arXiv preprint](#) → [arXiv:2310.08214](https://arxiv.org/abs/2310.08214)
- 2023 Gold on glass as a sample for the calibration of digital holographic 3D Mapping (Conference paper)  
Mario Rakić, Borna Radatović, **Ali Mardan Dezfouli**, Denis Abramović, Ida Delač Iva Šrut Rakić and Hrvoje Skenderović
- 2023 Biological nanostructure in combination with holography for thermal imaging camera (Poster)  
Mario Rakić, **Ali Mardan Dezfouli**, Denis Abramović, Nazif Demoli, Dejan Pantelić, Hrvoje Skenderović
- 2023 Dynamic surface deformation measurement using digital holographic Interferometry (Poster presentation)  
**Ali Mardan Dezfouli**, Hrvoje Skenderović, Nazif Demoli, Denis Abramović, Mario Rakić
- 2024 Higher-order topological charge detection using off-axis parabolic mirror  
**Ali Mardan Dezfouli**, Hrvoje Skenderović  
Applied Physics Letters → [DOI: 10.1063/5.0194529](https://doi.org/10.1063/5.0194529)

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## Awards

- 2013 Selected by Iranian ministry of science (from entrance exam) for master in photonics at institute of advanced studies in basic sciences (IASBS), Iran
- 2017 Top graduated student in master education
- 2020 My publication in the Journal of the Optical Society of America B (JOSA B) has been recognized by the Optical Society of America in the "Spotlight on Optics" as one of the two selected papers for the month of October.

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## Scientific Visits

- 2016 International workshop on "structured light and matter, concept and applications", IASBS, Iran
- 2019 Scientific workshop on the occasion of the international day of light, Tarbiat Modares university, Iran
- 2022 Laser Congress and Exhibition, Barcelona, Spain (Oral Presentation-Invited paper)
- 2023 Siegman International school on Lasers, Ireland, Dublin (Poster presentation)
- 2023 Laser World of Photonics (26<sup>th</sup> congress), Munich, Germany
- 2024 SPIE Photonics Europe technical conference, Strasbourg, France (Poster presentation)

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## Languages

Persian	<b>native</b>
English	<b>fluent -IELTS certification with overall score: 6.0 (S=7, W=6, L=6, R=6)</b>
German	<b>intermediate</b>

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## Teaching Experiences

- 2011-2012 Physics lab assistant, Zanzan University, Zanzan, Iran
- 2013-2014 Calculus & analytic geometry assignment tutors, Zanzan University, Zanzan, Iran
- 2013-2014 Fundamentals of physics assignment tutors, Zanzan University, Zanzan, Iran

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## Professional Experience

- Experience of programming and simulation in Matlab, Python, LabView, Mathematica, Zemax, C++.
- Evaluation of new technologies, pursue innovative solutions. Plan and conduct test of new technologies under evaluation in team. Execute feasibility studies of new technologies and provide results/analysis supporting the decision making process. Execute feasibility studies of complete systems/ sub systems, leveraging new design concepts. Prepares the demonstration of new capabilities and conduct performance analysis.

- knowledge of a broad range of physics including, computational imaging, microscopy, fourier optics, interferometry, diffraction theory, geometric optics, digital holography (DH), digital holography microscopy (DHM), optical micro-manipulation, computer generated holography (CGH), ultra-cold atoms and Bose-Einstein Condensation (BEC), femtosecond laser pulses.
- Professional experience in diverse experimental optics: proficient in various experimental optics technologies, including optical components, electro-optical modulators such as acousto-optic modulators, liquid crystal spatial light modulators (LC-SLMs), digital micro-mirror devices (DMD)
- Programming and professional working experience with LC-SLMs and DMD for generation of complex light fields in advanced light technology
- Experienced in the design of optical setups and execution of optical experiments, with ability to integrate simulation techniques to validate and optimize optical system performance
- Design and performance analysis of systems, budgeting of systems and/or component performance parameters, modeling of optical testing configurations, and participation in system integration/alignment
- Contribute to the development, and support, and continues improvement of automated test design based on computer simulation
- Design optical test algorithms and implement them in modulator test programs for validating the system optical performance
- Proficient in designing and developing opto-mechanical system, features and/or systems that integrates advanced lighting technology and wavefront beam shaping
- Investigate, develop and prototype new practical concepts, processes and applications that will raise organization competitive position with the intent of commercializing the technology
- Educate peers on developed technologies
- Interface with material suppliers to establish advanced material direction for the design and development of current and future products
- Identifies and pursues new products concepts for development through benchmarking activities
- Support/Develops project costs and timing constraints
- Collaborate proficiently to safeguard and execute intellectual property (IP) strategies
- Collaborate with scientists and mechanical, electrical and software engineers to maintain and modify unique tools necessary for industry and the ability to communicate with business units

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## Accomplished Research Projects

- Building spatial light modulator for advanced complex wavefront shaping (Funded by Iran National Science Foundation) // Project leader: Dr. Mohammad Yeganeh
- Biological and bioinspired structures for multispectral surveillance (Funded by NATO - Science for Peace and Security Program) // Project leader: Dr. Hrvoje Skenderović

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## Other Activities

- Proficient in working with Microsoft Office, Power Point, Excel
- Proficient in utilizing Inkscape for graphic design and vector illustration tasks
- Experienced in utilizing ImageJ for image analysis and processing tasks