

Qualification summary:

Solution driven and resourceful Optical Engineer with demonstrated expertise in optical metrology, freeform and diffractive optics design, fabrication and test. Work experience in Apple's Subject Matter Expert Surface Metrology team. Work experience in Cymer's EUV Systems Engineering team. Research produced solutions to characterize and specify tool signatures on freeform optics to guarantee optical performance.

Work experience:

Manufacturing Design intern, Subject Matter Expert Surface Metrology team (Sep. 2015-Dec. 2015)
Apple Inc. Cupertino, CA

- Worked closely with vendors in different time zones and cross-functional teams to evaluate high-speed non-contact 3D metrology tools in terms of their robustness, stability, capability, intuitiveness and statistical quality control visualization. Identified and quantified surface roughness metrics to represent visual, tactile and functional characteristics.

EUV systems design engineering intern (June. 2015-Aug. 2015)
Cymer Inc. (an ASML company), San Diego, CA

- Developed new beam metrics and a MATLAB toolbox to analyze main pulse beam quality. Investigated the impact of calculated beam metrics on overall EUV source energy and stability of different systems.

Graduate research assistant (Jan. 2014-Present)
Center for Freeform Optics (CeFO), University of North Carolina at Charlotte, Charlotte, NC

- Developed methodology and software to fully characterize freeform surfaces and specify their mid-spatial frequency. Currently investigating the optical performance degradation associated with freeform surface errors.

Graduate research assistant (Jan. 2012-Dec. 2013)
Micro Photonics Lab (MPL), Clemson University, Clemson, SC

- Designed and fabricated Fresnel axicon and vortex phase element using the techniques in micro-fabrication and photolithography. Those optical elements were successfully tested for generation of double helical beams.

Education:

| Degree | University | Major | Year | GPA |
|---------------|--|---------------------------------|----------------------|------------|
| Ph.D. | University of North Carolina Charlotte, NC, USA | Optical Science and Engineering | May. 2016 (Expected) | 4.00 |
| M.Sc. | University of North Carolina Charlotte, NC, USA | Optical Science and Engineering | May 2015 | 3.88 |
| M.Sc. | Shahid Beheshti University, Tehran, Iran | Photonics Science | 2010 | 3.41 |
| B.Sc. | K. N. Toosi University of Technology, Tehran, Iran | Solid State Physics | 2007 | 3.1 |

Awards and scholarships:

- SPIE Optics and Photonics Education Scholarship (May 2015)
- Finalist for Siemens energy scholarship (May 2015)

Skills:

- MATLAB, Zemax, familiar with LightTrans (VirtualLab), SolidWorks
- Surface metrology software: MountainsMap, MetroProX
- Specification of optical surfaces, MTF, rms
- Surface metrology instruments: phase shifting interferometry (Zygo Verifire), 3D optical profilometry (Zygo NexView, Sensofar Plu neox, Sensofar S neox), confocal microscopy
- Freeform optics fabrication: QED magnetorheological finishing
- Photolithography instruments: GCA stepper, Unaxis RIE plasma etcher, Quintel contact aligner, SEM, ellipsometry

Research experience:

Precision metrology for freeform optics (UNC Charlotte)

- Dissertation topic: **“Mid-spatial frequency characterization and specification for freeform surfaces”**
- Development of in-house MATLAB tool to characterize and specify form and mid-spatial frequency of freeform surfaces based on very large orders of Zernike polynomials
- Characterization of precision surfaces with different tool fingerprints
- MATLAB based data analysis and uncertainty in measurement of optical elements
- Surface height reconstruction algorithms from slope measurement
- Evaluation of artificial mid-spatial frequency structure added to the surface due to noise in slope measurement

Diffraction optics for structured light (Clemson University)

- Three dimensional micro-optical element design and fabrication for non-diffracting beams (high order Bessel beams)
- Process development for fabrication of meta-optics with spatial and polarization selectivity
- Additive and analog lithography in a class 100 and 1000 cleanroom
- Characterization of MEMS type devices for Fused Silica and Silicon

Laser Induced Breakdown Spectroscopy (LIBS) (Shahid Beheshti University)

- Spectral analysis of biological samples: samples were categorized in different groups based on their LIBS spectra

Selected publications:

1. *“Considering a Zernike polynomial representation for spatial frequency content of optical surfaces”*, Z. Hosseinimakarem, H. Aryan, A. D. Davies, C. J. Evans, *Freeform Optics*, June (2015).
2. *“Evaluation of spurious mid-spatial frequency structure on optical surfaces reconstructed from surface slope measurements”*, Y. Dong, Z. Hosseinimakarem, C. Evans, A. Davies, *SPIE Optical Engineering + Applications*, Aug (2014).
3. *“Helical Filaments”*, N. Barbieri, Z. Hosseinimakarem, K. Lim, M. Durand, B. Webb, J. Bradford, E. McKee, N. Bodnar, L. Shah, M. Baudelet, E. Johnson, M. Richardson, *Applied Physics Letters* 104 (26), 261109 (2014).
4. *“Necklace ring beam shaping with optical phase element at 2.94 μm in Er:YAG solid state system”*, R. H. Woodward, Z. Hosseinimakarem, *et. al.*, *Frontiers in Optics/LS*, Orlando, FL, USA (2013).
5. *“Photoresist roughness characterization in additive lithography processes for the fabrication of phase-only optical vortices”*, Z. Hosseinimakarem, M. K. Poutous, E. G. Johnson, *SPIE 8249, Advanced fabrication technologies for Micro/Nano optics and photonics V*, 82491M (2012).
6. *“A study of association between fingernail elements and osteoporosis by laser-induced breakdown spectroscopy”* M. Bahreini, Z. Hosseinimakarem, S. H. Tavassoli, *Journal of Applied Physics* 112, 054701 (2012).
7. *“Analysis of human nails by laser-induced breakdown spectroscopy”*, Z. Hosseinimakarem and S. H. Tavassoli, *Journal of biomedical optics* 16, 057002 (2011).

Training:

- Photolithography at Cornell NanoScale Science & Technology Facility (CNF) (2012-2013)
- EUV training at Cymer Inc. (2015)

Selected conferences:

- 5th International Summer School “New Frontiers in Optical Technologies”, Tampere, Finland Aug. 2009
- SPIE Photonics West, San Francisco, CA, USA, Feb. 2012
- Center for Freeform Optics (CeFO) IAB meeting, Rochester, NY, USA, Nov. 2014

Leadership and Affiliations:

- The International Society for Optics and Photonics (SPIE): President and founder of Clemson University student chapter (2012), UNC Charlotte chapter secretary (2015)
- Optical Society of America (OSA), member since 2013
- American Society for Precision Engineering (ASPE), member since 2014