Adam Phenis

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Mr. Phenis is an Optical Engineering consultant with extensive experience in a broad range of optical systems working from conception through production and delivery. His design and development expertise focus on the pragmatic and practical aspects of optical and electro-optical system development. He is driven to deliver hardware that meets requirements, done on-time and within budget. Mr. Phenis is currently supporting his customers as the Lead Optical Engineer on multiple space-based Visible and Infrared Optical Payloads and material processing with high power lasers. Other experience examples of optical systems include electro-optical (UV through VLWIR), LiDAR, adaptive optics, hyperspectral, polarimetric, spectroscopic, low-light imaging and detection, fluorescence, directed energy, lasers and laser diodes. His systems have operated or are operating in environments from the lab to research facilities to harsh environments that include space, airborne, automotive, and weapon mounted. His knowledge of optical manufacturers and their capabilities allows him to design systems in a cost-effective manner with an eye on manufacturability from the start. Mr. Phenis serves as the Chair for the joint SPIE and Optics and Electro-Optics Standards Council (OEOSC) Infrared Materials Standards Working Group, Chair of OEOSC and is one of the authors of the chapter titled Infrared Optical Systems for the SPIE book titled "Review of Optical Manufacturing 2000-2020."

RELEVANT EXPERIENCE

AMP Optics, LLC, 2010 - Present
"Seems to me that the capability that distinguishes your company from many others is that you can go from "Blue-Sky" concept or solution to a problem to practical working hardware, taking into account, form, fit, function, financials, schedule, boundary conditions and pizzazz factor." Gene Cross, Lockheed Martin Advanced Technology Center

AMP Optics, LLC was founded by Mr. Phenis in 2010 to provide innovative, pragmatic and cost-effective optical engineering services in an effort to help his customers realize optical systems that meet their needs. Mr. Phenis supports his customers by performing system requirements derivation and analysis, optical design, optimization, performance, tolerance, and stray light analyses, optical element specifications, supplier identification and interfacing, build, alignment and testing to deliver a final optical system. In this role, he also works across functions to ensure project success. Areas of specialty include imaging systems, applied imaging systems including Hyperspectral and Polarimetric, spectroscopic, laser systems and physical optics propagation, wavefront sensors, interferometry, tolerance analysis, stray light analysis, illumination design, lens drawings, optical testing and alignment.

Projects Mr. Phenis has consulted on:

- NASA DEMETER IIP (0.2-50 µm) – Lead Optical Engineer – Optical design, analysis, AI&T
- Space-Based Overhead Non-Imaging Infrared Sensors (3-5 µm) – Lead Optical Engineer – Optical design and analysis, Stray Light, AI&T, radiometry, optical coatings, etc…
- Illumination design for robot UPC code scanner – Optical desgin
- Freeform optical testing interferometer – Optical engineer – Design, analysis, architecture
- Space-Based Free Space Laser Communications – Lead Optical Engineer
- Ground terminal for Space-Based Free Space Laser Communications – Stray Light analyst, Consulting Optical Engineer
- Lunar-Based Free Space Laser Communications – Lead Optical Engineer
- NASA SAGE IV IIP – Ground precursor for space-based ozone monitoring, unobscured telescope – Lead Optical Engineer
- Cost effective star camera baffle stray light analysis – Stray Light analyst
- Airborne LiDAR – Tolerance Analysis
- Space launched imager – STOP Analysis
- Weapon mounted riflescope display – Optical Design and Development

- Handheld, LWIR Hyperspectral Selfie (8-14 μm) – Lead Optical Engineer, Concept development, Design
- Mars Curiosity Rover Mastcam – STOP Analysis
- NASA ARCSTONE – VNIR and SWIR PGP Hyperspectral Imagers – STOP Analysis, Design Review and Consulting
- Cost effective magnification aid for the visually impaired – Project Lead, Optical Design
- NASA L'RALPH telescope – Tolerance analysis, fabrication, optical coatings, STOP analysis, alignment and optical testing
- Space-Based Free Space Laser Communications – Optical component design and development
- MWIR/LWIR Zoom lens (3-12 μm) – Optical design optimization and Narcissus reduction
- Spectral gas monitoring – Design and Analysis, 80% production unit cost reduction
- 400+ mm diameter telescope with eyepiece – Design, analysis, and optical systems engineering
- 400+ mm diameter LEO telescope – Design, analysis, STOP, and optical systems engineering
- UV Laser Machining System – Design, analysis, and optical systems engineering
- Scheimpflug imaging system
- Conceptual development of multiple optical systems

Optics and Electro-Optics Standards Council/SPIE Infrared Materials Working Group, 2012 – Present
Chair
Mr. Phenis is responsible for chairing the group that develops standards pertaining to Infrared optical materials as well as the group that advises the standards group as to how to measure and characterize these materials. He is currently coordinating an industry wide effort to determine refractive index uniformity of multiple IR optical materials throughout the material batch. He is also an acting director of OEOSC.

ISO/ TC 172/SC 3/ WG 2 Optical Materials and components – Optical Coatings working group, 2021 – 2023
Convenor
Mr. Phenis is responsible for leading the ISO working group on optical coating standards development.

Cymer, an ASML Company, 2014 – 2016
Staff Optical Engineer
Mr. Phenis supported EUV development by leading the metrology effort and the optical alignment tooling. The metrology being developed provided laser beam statistics, intensity profile, position and pointing information. Mr. Phenis also supported integration and testing of current systems via wavefront measurements and future systems by applying his expertise to yield efficient build, alignment, integration and testing as well as performing analysis of the systems sensors to determine performance. Mr. Phenis supports the optics department through authoring the Optical Design Rules, a document that lays out the optical design process, reviewing optical drawings as well as by serving as an optical design expert.

Leidos (formerly SAIC), 2011 – 2014
Senior Electro-Optical Engineer
Mr. Phenis is the optical engineer for the EO/IR Department and routinely performs optical design, analysis and testing of various imaging and applied imaging systems for space and airborne applications, including the CHIRP sensor, low-light, hyperspectral, and polarimetric sensors through the VNIR, SWIR, MWIR and LWIR spectral ranges. Lead development of "water-free" high-performance SWIR/MWIR AR optical coatings with multiple coating vendors.

B.E. MEYERS, INC., 2010 – 2011
Optical Engineering Lead
Mr. Phenis led a team of 5 employees and contractors to perform optical design, analysis, and testing of laser/LED targeting and illumination systems, night-vision and low-light imaging devices, long-range surveillance systems, laser range finders, and integrated laser systems. He focused particular attention on risk management through designs for extreme environments, ease of manufacture, and cost. Mr. Phenis also led an R&D group with an emphasis on Government-funded R&D projects.

AOPTIX TECHNOLOGIES, 2008 – 2010
Senior Optical Engineer

Mr. Phenis supported a $21M DARPA ORCA project as the lead optical engineer by designing a compact, un-obscured, free space, adaptive optics LaserCom terminal. He developed the primary optical design for the terminal and improved an existing system to function at low pressure with a high-power laser. His terminal design included three optical paths that share an NIR imager, a reflective optical system for data transmission and receipt, and a wavefront sensor to control the deformable mirror. He also developed the alignment plan and designed the test fixtures and the test plan. In addition, Mr. Phenis contributed to the development of a handheld biometrics iris recognition system that located, illuminated, and captured irises from 1 meter away in 1 second, a precursor to the AOptix Stratus.

LOCKHEED MARTIN ADVANCED TECHNOLOGY CENTER, 2003 – 2008
Senior Optical Engineer

Mr. Phenis took the first-ever polarimetric images of launch phase rockets, including the shuttle from NASA's Kennedy Space Center utilizing his Stokes imaging polarimeter that he designed, developed, built and tested. He worked on various tasks and projects that required advanced skill in interferometry, wavefront sensing, field work, optical testing, optical alignment, phased telescope arrays, polarimetry, polarimetric imaging, optical coatings, active spectroscopy, specifying and procuring custom high-quality optics, directed energy, and imaging Fourier Transform Spectroscopy. He also performed image-processing routines for various imaging-based projects.

EDUCATION

Master of Science, Optical Sciences University of Arizona
Master's Thesis: "A Comparison of Two Wavefront Sensing Interferometers: Radial Shear and Point Diffraction"
Master's Thesis Advisers: Dr. Jim Wyant and Dr. Richard Tansey

Bachelor of Science, Optical Science and Engineering University of California, Davis

SKILLS

Zemax, CodeV, FRED, ISO 10110, MATLAB, MathCad, Fringe Tracing Software, Optical Testing, Optical Alignment, Optical System Development, EO Sensor Optical Design, Optical Testing, Optical Alignment, Optical Tolerancing, Optical Analysis, Directed Energy, Polarimetry, Spectroscopy, Wavefront Sensing, Adaptive Optics, Interferometry, Polarization, Star tracking, Phased Array, Lasers, Free-Space Laser Communications, Experimental setups, Field Work, Vendor Relations and custom optics, Solar, Concentrated Photovoltaic

PUBLICATIONS:

1. Jason Mudge, Adam Phenis, "LiDAR receiving three-element range-compensating lens optical design for automotive autonomy and advanced driver assist," Opt. Eng. 63(8) 085101 (5 August 2024) https://doi.org/10.1117/1.OE.63.8.085101
2. Jason Mudge, Adam Phenis, Andrew Nichols, Alicia Maccarrone, and Alexander Cheff Halterman "Polarization uncertainty and error equivalent radiance for an ultra-broadband, wide field-of-view push-broom imaging radiometer", Proc. SPIE 12232, Earth Observing Systems XXVII, 1223206 (30 September 2022); https://doi.org/10.1117/12.2631991
3. Adam Phenis, Alexander Cheff Halterman, Andrew Nichols, Alicia Maccarrone, and Jason Mudge "Design of an ultra-broadband, wide-field-of-view push-broom imaging radiometer", Proc. SPIE 12078, International Optical Design Conference 2021, 120781J (19 November 2021); https://doi.org/10.1117/12.2603670
4. Phenis, Adam & Mudge, Jason. (2021). Chapter 6 – Infrared Optical Systems, Aizhong Zhang & Richard N. Youngworth (Eds.), *Review of Optical Manufacturing 2000 to 2020*. SPIE Press.
5. Jason Mudge and Adam Phenis "Range-compensating lens design, implementation and experimental results", Proc. SPIE 11744, Laser Radar Technology and Applications XXVI, 117440F (12 April 2021); https://doi.org/10.1117/12.2591764
6. Manal Khreishi, Raymond G. Ohl, Joseph M. Howard, Jonathan C. Papa, Ryan McClelland, Clark Hovis, Theodore Hadjimichael, Patrick Thompson, Kenneth Ranson, Rongguang Liang, and Nicolas Gorius "Enabling precision coordinate metrology for universal optical testing and

alignment applications," Optical Engineering 60(3), 035106 (15 March 2021). https://doi.org/10.1117/1.OE.60.3.035106
7. John H. Burnett, Eric C. Benck, Simon G. Kaplan, Erik Stover, and Adam Phenis, "*Index of refraction of germanium*," Appl. Opt. 59, 3985-3991 (2020)
8. Adam Phenis, Jason Mudge, *"A variety of range compensating lens designs for active optical systems"*, Proc. SPIE to be published
9. M. Khreishi, R. Ohl, J. Howard, J. Papa, C. Hovis, A. Howe, T. Hadjimichael, P. Thompson, R. Shiri, G. West, A. Phenis, and R. Liang, "*Freeform Surface Characterization and Instrument Alignment for Freeform Space Applications*," in Optical Design and Fabrication 2019 (Freeform, OFT), OSA Technical Digest (Optical Society of America, 2019), paper FM4B.6.
10. Alexander Cheff Halterman, Robert Damadeo, Charles Hill, Christine Buleri, Luke Murchison, Michael Obland, Adam Phenis, Shimshone Yacoby, "*SAGE IV Pathfinder multi-spectral imaging spectrometer telescope paves the way for semi-custom CubeSat imaging missions*," Proc. SPIE 10986, Algorithms, Technologies, and Applications for Multispectral and Hyperspectral Imagery XXV, 109860H (14 May 2019); doi: 10.1117/12.2518971
11. Christine Buleri, Mike Kehoe, Constantine Lukashin, Trevor Jackson, Jeff Beckman, Adam Curtis, Britney Edwards, Trevor Owen, Adam Phenis, Mike Stebbins, "*Structural, Thermal, and Optical Performance (STOP) analysis of the NASA ARCSTONE instruments*," Proc. SPIE 10925, Photonic Instrumentation Engineering VI, 1092503 (4 March 2019); doi: 10.1117/12.2506656
12. A. Phenis, "*An International Effort to Standardize Infrared Material Properties and their Characterization Techniques*," Proc. SPIE 0277-786X, International Optical Design Conference 2017, 105900I (2017)
13. John H. Burnett, Simon G. Kaplan, Eric Stover, Adam Phenis, "*Refractive index measurements of Ge*", Proc. SPIE 9974, Infrared Sensors, Devices, and Applications VI, 99740X (20 September 2016); doi: 10.1117/12.2237978; http://dx.doi.org/10.1117/12.2237978
14. David W. Tyler, Adam M. Phenis, Alan B. Tietjen, Miguel Virgen, Jason D. Mudge, John S. Stryjewski, Jeff A. Dank, "*First high-resolution passive polarimetric images of boosting rocket exhaust plumes*", Proc. SPIE 7461, Polarization Science and Remote Sensing IV, 74610J (12 August 2009); doi: 10.1117/12.828438; http://dx.doi.org/10.1117/12.828438
15. Erich de Leon, Rebekah Brandt, Adam Phenis, Miguel Virgen, "*Initial results of a simultaneous Stokes imaging polarimeter*", Proc. SPIE 6682, Polarization Science and Remote Sensing III, 668215 (13 September 2007); doi: 10.1117/12.734938; http://dx.doi.org/10.1117/12.734938
16. R. Tansey, H.M. Chan, M. Virgen, A. Phenis, "*Measurement of Atmospheric Turbulence over a Horizontal Path Using the Black Fringe Wavefront Sensor*," AMOS, September 2007
17. R. Tansey, A. Phenis, K. Shu, "*Use of a Radial Shear Interferometer as a Self Reference Interferometer in Adaptive Optics*," AMOS, September 2006
18. Adam M. Phenis, Miguel Virgen, Erich E. de Leon, "*Achromatic instantaneous Stokes imaging polarimeter*", Proc. SPIE 5875, Novel Optical Systems Design and Optimization VIII, 587502 (30 August 2005); doi: 10.1117/12.617360; http://dx.doi.org/10.1117/12.617360
19. Eric H. Smith, Erich de Leon, Peter Dean, Jake Deloumi, Alan Duncan, Warren Hoskins, Richard Kendrick, James Mason, Jeff Page, Adam Phenis, Joe Pitman, Christine Pope, Bela Privari, Doug Ratto, Enrique Romero, Ker-Li Shu, Robert Sigler, David Stubbs, Francisc Tapos, Albert Yee, "*Multiple instrument distributed aperture sensor (MIDAS) testbed*", Proc. SPIE 5882, Earth Observing Systems X, 58821F (22 August 2005); doi: 10.1117/12.632473; http://dx.doi.org/10.1117/12.632473