Gregg McClure Gallatin

Education

The Pennsylvania State University, State College, PA
PhD, 1980
Theoretical Physics
Thesis Title: Spin Spectra of Unstable Particles
Thesis Advisor: Gordon Fleming

The Pennsylvania State University, State College, PA
BS, 1973
Physics

Professional Summary

Theoretical physicist with experience and background in optical physics, quantum physics, applied physics, engineering, nanotechnology, microlithography, optical design, and applied mathematics. Taught undergraduate and graduate courses in physics, engineering and mathematics.

Work Experience

Applied Math Solutions, Newtown, CT
Consultant, Jan 2014 – Present

- Contract research: Analysis, Modeling, Design and Development. Physics, Optics, Applied Mathematics, Nanotechnology, Nanofabrication, Nanometrology, Lithography.
- *Work for SMEE*: Analysis, modeling, and simulation of many aspects of a lithographic projection system including:
  - *Projection Optics*: Lithographic Performance, Lens Heating, Flare Analysis, Stray Light, Aberrations, Image Generation and Propagation to Final Resist Profile, Coating Design, Polarization Effects.
  - *Illumination System*: General Illuminator Design Principles and Options, Illumination Profile and Uniformity, Pupil Fill, Modeling Coherence Properly.
  - *Alignment Sensor*: Basic Sensor Design Principles and Options, Electromagnetics of Mark Signal Generation, Signal Processing, Collaborated on Development of the Alignment Sensor Error Budget.
  - *Wafer Stage Metrology and Control*: Analyzed Encoder Induced Errors, Collaborated on Development of the Error Budget for Encoder Mounting Requirements.
  - *Optics Metrology Systems*: Analyzed Environmental Effects for the Large Optics Metrology System, Collaborated on Development of the Error Budget for the Large Optics Metrology System, Working on the Error Budget for an Improved Shack-Hartmann Wavefront Sensor including CCD and Environmental Effects.

- *Lecture Presentations*: Systems Engineering (several), Required Math Background for Optics and Signal Processing, The Approximations Required to get from Maxwell to Geometrical Optics and Ray Tracing, Using the Sensitivity Matrix to Pick Lens Groups for Aberration Correction, Stochastics in Lithography (Illumination Coherence and Line Edge Roughness)

Quinnipiac University, Hamden, CT
Adjunct Faculty Member, Department of Physics, August 2014 –August 2015

- Taught introductory physics laboratories.

ASML, Wilton, CT
Senior Engineer, Jan 2013 – Jan 2014

- Alignment sensor modeling, design, development, trouble-shooting and analysis.

Center for Nanoscale Science and Technology,
National Institute of Standards and Technology, Gaithersburg, MD
Physical Scientist, April 2009 – Dec 2012

- Physicist/Project Leader: Analysis, modeling, simulation and development of nanofabrication techniques and processes, including block copolymer self-assembly, quantum dot binding to DNA origami, fluorescent nanoparticle tracking, and vortex electron beams.

Center for Nanoscale Science and Engineering,
SUNY, Albany
Adjunct Professor, April 2009 – Present

- Presented lectures on Lithographic fabrication processes and systems. Served on a doctoral committee.

Applied Math Solutions, Newtown, CT
Consultant, April 2005 - April 2009

- Performed contract research for companies and organizations including Zygo, Nikon, ASML, Sematech, and Ibrix.

IBM T J Watson Research Center, Yorktown Heights, NY
Research Staff Member, October 2000 – April 2005

- Analysis and modeling of advanced nanoscale lithographic optical imaging and resist exposure processes.

Lucent Bell Labs, Murray Hill, NJ
Research Staff Member, March 1998 – October 2000

- Design, development and modeling of a projection electron beam lithography system.

SVG Lithography, Wilton, CT
Senior Staff Physicist, October 1990 – March 1998

- Design, modeling, analysis and development of advanced DUV and X-ray lithography tools and subsystems.

Hughes Danbury Optical Systems (formerly Perkin-Elmer Optical Systems), Danbury, CT
Senior Researcher, June 1984 – October 1990

- Modeling and analysis of classical and quantum optical systems and materials including diode lasers, grated waveguides and etch and deposition processes.

University of Connecticut, Storrs, CT
Adjunct Professor of Physics, September 1985 – June 1995

- Taught graduate level Quantum Mechanics, Quantum Optics, Laser Physics, Electricity and Magnetism and Light Interaction with Matter courses.

Fairfield University, Fairfield, CT
Assistant Professor of Physics, August 1982 – June 1984

- Taught introductory and advanced physics and engineering courses. Did research in quantum field theory.

University of Puerto Rico at Humacao, Humacao, PR
Assistant Professor of Physics, August 1980 – June 1982

- Taught physics and engineering courses. Did independent research in quantum field theory.

Edinburgh University, Edinburgh, Scotland
Postgraduate Worker, July 1978 – August 1980

- Completed PhD dissertation research and taught mathematical methods and engineering mathematics for the Mathematics Department.

Publications

1. Some one-loop calculations in a $g\varphi^4$ field theory, Gregg M. Gallatin, Physical Review **D25**, 434 (1982).
2. On the one-loop correction in Yang-Mills theories with external sources, Gregg M. Gallatin, Physical Review **D26**, 505 (1982).
3. A useful formula for evaluating commutators, Gregg M. Gallatin, Journal of Mathematical Physics **24**, 2564 (1983).
4. On zeta function regularization of operators with continuous spectra, Gregg M. Gallatin, Journal of Mathematical Physics **25**, 629 (1984).
5. Surface-emitting distributed feedback semiconductor laser, S. H. Macomber, J. S. Mott, R. J. Noll, G. M. Gallatin, E. J. Gratrix, S. L. O'Dwyer, and S. A. Lambert, Applied Physics Letters **51**, 472 (1987).

6. Modeling the images of alignment marks under photoresist, G. Gallatin, J. C. Webster, E. C. Kintner, and C. J. Morgan, Proceedings of SPIE **772**, 193 (1987).
7. Properties and applications of layered grating resonances, Gallatin, Proceedings of SPIE **815**, 158 (1987).
8. Scattering matrices for imaging layered media, G. Gallatin, J. C. Webster, E. C. Kintner, and C. J. Morgan, Journal of the Optical Society of America **A5**, 220 (1988).
9. Ranging and velocimetry signal generation in a backscatter-modulated laser diode, Peter J. de Groot, Gregg M. Gallatin, and Steven H. Macomber, Applied Optics **27**, 4475 (1988).
10. AlGaAs surface emitting distributed feedback laser, S. H. Macomber, J. S. Mott, R. J. Noll, G. M. Gallatin, E. J. Gratrix, S. L. O'Dwyer, and S. A. Lambert, Proceedings of SPIE **893**, (1988).
11. Predicted polishing behavior of plasma assisted chemical etching (PACE) from a unified model of the temporal evolution of etched surfaces, Gregg M. Gallatin and Charles B. Zarowin, Proceedings of SPIE **966**, 98 (1988).
12. Laser radar array used for improving image analysis algorithms, Cullen, et. al., Proceedings of SPIE **1002**, (1988).
13. Compact imaging system with ranging and velocimetry, de Groot, et. al., Proceedings of SPIE **1005**, 153 (1988).
14. Backscatter modulation velocimetry with an external cavity, Peter J. de Groot and Gregg M. Gallatin, Optics Letters **14**, 165 (1989).
15. Three-dimensional imaging coherent laser radar array, Gregg M. Gallatin; Peter J. de Groot, Optical Engineering **28**, 456 (1989).
16. Simulation of a ring resonator free-electron laser, Tokar, et. al., IEEE Journal of Quantum Electronics **QE25**, 73 (1989).
17. Backscatter-modulation semiconductor laser radar, Peter de Groot and Gregg Gallatin, Proceedings of SPIE **1103**, (1989).
18. Unified approach to the temporal evolution of surface profiles in solid etch and deposition processes, G. M. Gallatin and C. B. Zarowin, Journal of Applied Physics **65**, 5078 (1989).
19. Lattice symmetries and thermal expansion, Gregg M. Gallatin, Proceedings of SPIE **1112**, 268 (1989).
20. Laser feedback metrology of optical systems, Peter de Groot, Gregg Gallatin, George Gardopee, and Robert Dixon, Applied Optics **28**, 2462 (1989).
21. Optical testing using laser-feedback metrology, Peter de Groot, Gregg Gallatin, George Gardopee, and Robert Dixon, Proceedings of SPIE **1162**, (1990).
22. Laser diode backscatter modulation for machine vision, Peter J. de Groot; Gregg M. Gallatin, Proceedings of SPIE **1375**, 18 (1990).
23. Rapid, noncontact optical figuring of aspheric surfaces with plasma-assisted chemical etching, Lynn D. Bollinger; Gregg M. Gallatin; J. Samuels; G. Steinberg; Charles B. Zarowin, Proceedings of SPIE 1333, **44** (1990).
24. Laser lenses for neutral atomic beams, Gregg M. Gallatin; Phillip L. Gould, Proceedings of SPIE **1338**, 175 (1990).

25. Functional integral representation of rough surfaces, Gregg M. Gallatin, Journal of the Optical Society of America **A8**, 97 (1991).
26. Laser focussing of atomic beams, Gregg M. Gallatin; Phillip L. Gould, Journal of the Optical Society of America **B8**, 502 (1991).
27. Micrascan II overlay error analysis, David J. Cronin; Gregg M. Gallatin, Proceedings of SPIE **219**6, 932 (1994).
28. Design and test of a through-the-mask alignment sensor for a vertical stage x-ray aligner, M. Nelson, J. L. Kreuzer, and G. Gallatin, Journal of Vacuum Science and Technology **B12**, 3251 (1994).
29. Micrascan III: 0.25-um resolution step-and-scan system, David M. Williamson; James A. McClay; Keith W. Andresen; Gregg M. Gallatin; Marc D. Himel; Jorge Ivaldi; Christopher J. Mason; Andrew W. McCullough; Charles Otis; John J. Shamaly; Carol Tomczyk, Proceedings of SPIE **2726**, 780 (1996).
30. Micrascan adaptive x-cross correlative independent off-axis modular (AXIOM) alignment system, Stan Drazkiewicz; Gregg M. Gallatin; Joe Lyons, Proceedings of SPIE **2726**, 886 (1996).
31. Alignment and Overlay, Gallatin, Chapter in "Handbook of Microlithography", Edited by J. Sheats and B. Smith, Marcel Dekker, 1998.
32. Analytical model of the "shot noise" effect in photoresist, Gallatin and Liddle, Proc. Micro and Nano Engineering, (1998).
33. Space-charge results from the SCALPEL proof-of-concept system, James A. Liddle; Myrtle I. Blakey; Gregg M. Gallatin; Chester S. Knurek; Masis M. Mkrtchyan; Anthony E. Novembre; Warren K. Waskiewicz, Proceedings of SPIE **3676**, 180 (1999).
34. Alignment mark detection in CMOS materials with SCALPEL e-beam lithography, Reginald C. Farrow; Warren K. Waskiewicz; Isik C. Kizilyalli; Gregg M. Gallatin; James A. Liddle; Masis M. Mkrtchyan; Avi Kornblit; Leonidas E. Ocola; Fred P. Klemens; Joseph A. Felker; Christopher J. Biddick; Joseph S. Kraus; Myrtle I. Blakey; Paul A. Orphanos; Nace Layadi; Sailesh M. Merchant, Proceedings of SPIE **3676**, 217 (1999).
35. Analytic 3D Greens function approach to scattering and diffraction from patterned and/or imperfect multilayers, Gallatin, Proc. Modeling and Simulation of Microsystems, 318 (1999).
36. Finite element analysis of SCALPEL wafer heating, Byungkyu Kim, Roxann L. Engelstad, Edward G. Lovell, Stuart T. Stanton, J. Alexander Liddle, and Gregg M. Gallatin, Journal of Vacuum Science and Technology **B17**, 2883 (1999).
37. Overlay error budgets for a high-throughput SCALPEL system, Stuart T. Stanton; Reginald C. Farrow; Gregg M. Gallatin; James A. Liddle; Warren K. Waskiewicz, Proceedings of SPIE **3676**, 543 (1999).
38. SCALPEL aerial image monitoring: Principles and application to space charge, G. M. Gallatin, R. C. Farrow, J. A. Liddle, W. K. Waskiewicz, M. M. Mkrtchyan, P. Orphanos, J. Felker, J. Kraus, C. J. Biddick, S. Stanton, A. E. Novembre, and M. Blakey, Journal of Vacuum Science and Technology **B18**, 2560 (2000).
39. Analytical evaluation of the intensity point spread function, Gregg M. Gallatin, Journal of Vacuum Science and Technology **B18**, 3023 (2000).

40. Analytical-based solutions for SCALPEL wafer heating, N. Fares, S. Stanton, J. Liddle, and G. Gallatin, Journal of Vacuum Science and Technology **B18**, 3115 (2000).
41. Continuum model of shot noise and line edge roughness, Gallatin, Proceedings of SPIE **4404**, 123 (2001).
42. Generalized Goldstone theorem: Automatic imposition of the Higgs mechanism and application to scale and conformal symmetry breaking, Chodos and Gallatin, Journal of Mathematical Physics **42**, 3282 (2001).
43. Space-charge effects in projection electron-beam lithography: Results from SCALPEL proof-of-lithography system, J. A. Liddle, M. I. Blakey, K. Bolan, R. C. Farrow, G. M. Gallatin, R. Kasica, V. Katsap, C. S. Knurek, J. Li, M. Mkrtchyan, A. E. Novembre, L. Ocola, P. A. Orphanos, M. L. Peabody, S. T. Stanton, K. Teffeau, W. K. Waskiewicz, and E. Munro, Journal of Vacuum Science and Technology **B19**, 476 (2001).
44. High-numerical aperture scalar imaging, Gregg M. Gallatin, Applied Optics **40**, 4958 (2001).
45. Methodology for generating exposure tool specifications for alternating phase-shift mask application for 70-nm node, Kafai Lai; Gregg M. Gallatin; Alan E. Rosenbluth; Carlos A. Fonseca; Lars W. Liebmann; Christopher J. Progler, Proceedings of SPIE **4691**, 336 (2002).
46. Resist requirements and limitations for nanoscale electron-beam patterning, J. Alexander Liddle, Gregg M. Gallatin, and Leonidas E. Ocola, Proc. MRS Fall Meeting, **739** (2002).
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51. Statistical limitations of printing 50 and 80 nm contact holes by EUV lithography, G. M. Gallatin, F. A. Houle, and J. L. Cobb, Journal of Vacuum Science and Technology **B21**, 3172 (2003).
52. Line-Edge roughness transfer function and its application to determining mask effects in EUV resist characterization, Patrick P. Naulleau and Gregg M. Gallatin, Applied Optics **42**, 3390 (2003).
53. Effect of reduction ratio on polarization impact for imaging, Ronald L. Gordon; Timothy A. Brunner; Nakgeuon Seong; Michael J. Lercel; Gregg M. Gallatin, Proceedings of SPIE **5377**, 1499 (2004).
54. New paradigm in lens metrology for lithographic scanner: evaluation and exploration, Kafai Lai; Gregg M. Gallatin; Mark A. van de Kerkhof; Wim de Boeij; Haico Kok; Martin Schriever; Jaime D. Morillo; Robert H. Fair; Stephanie Bennett; Daniel A. Corliss, Proceedings of SPIE **5377**, 160 (2004).

55. Fast calculation of images for high numerical aperture lithography, Alan E. Rosenbluth; Gregg M. Gallatin; Ronald L. Gordon; William Hinsberg; John Hoffnagle; Frances Houle; Kafai Lai; Alexey Lvov; Martha Sanchez; Nakgeuon Seong, Proceedings of SPIE **5377**, 615 (2004).
56. Assessing the impact of intrinsic birefringence on 157-nm lithography, Nakgeuon Seong; Kafai Lai; Alan E. Rosenbluth; Gregg M. Gallatin, Proceedings of SPIE **5377**, 99 (2004).
57. Effect of thin-film imaging on line edge roughness transfer to underlayers during etch processes, Dario L. Goldfarb, Arpan P. Mahorowala, Gregg M. Gallatin, Karen E. Petrillo, Karen Temple, and Marie Angelopoulos, Journal of Vacuum Science and Technology **B22**, 647 (2004).
58. Resist Blur and Line Edge Roughness, Gregg M. Gallatin, Proceedings of SPIE **5754**, 38 (2005).
59. Topics in polarization ray tracing for image projectors, Alan E. Rosenbluth; Gregg Gallatin; Kafai Lai; Nakgeuon Seong; Rama N. Singh, Proceedings of SPIE **5875** (2005).
60. Fundamental limits to EUV photoresist, Gregg M. Gallatin; Patrick Naulleau; Robert Brainard, Proceedings of SPIE **6519** (2007).
61. Alignment and Overlay, Gregg M. Gallatin, Chapter in "Microlithography: Science and Technology (2nd Ed.)", K. Suzuki and B. Smith, Eds., CRC Press **2007.**
62. Resolution, LER and sensitivity limitations of photoresists, Gregg M. Gallatin; Patrick Naulleau; Dimitra Niakoula; Robert Brainard; Elsayed Hassanein; Richard Matyi; Jim Thackeray; Kathleen Spear; Kim Dean**,** Proceedings of SPIE **6921** (2008).
63. Film quantum yields of EUV and ultra-high PAG photoresists, Elsayed Hassanein; Craig Higgins; Patrick Naulleau; Richard Matyi; Gregg Gallatin; Gregory Denbeaux; Alin Antohe; Jim Thackeray; Kathleen Spear; Charles Szmanda; Christopher N. Anderson; Dimitra Niakoula; Matthew Malloy; Anwar Khurshid; Cecilia Montgomery; Emil C. Piscani; Andrew Rudack; Jeff Byers; Andy Ma; Kim Dean; Robert Brainard, Proceedings of SPIE **6921** (2008).
64. Influence of base and photoacid generator on deprotection blur in extreme ultraviolet photoresists and some thoughts on shot noise, Christopher N. Anderson, Patrick P. Naulleau, Dimitra Niakoula, Elsayed Hassanein, Robert Brainard, Gregg Gallatin, and Kim Dean, Journal of Vacuum Science and Technology B **26,** 2295 (2008).
65. Spatial scaling metrics of mask-induced line-edge roughness, Patrick P. Naulleau and Gregg Gallatin, Journal of Vacuum Science and Technology B **26,** 1903 (2008).
66. Residual Speckle in an Lithographic Illumination System, Gregg M. Gallatin; Naonori Kita; Tomoko Ujike; William N. Partlo, Journal for Micro/Nanofabrication, MEMS and MOEMS, **8**, 043003 (2009).
67. Effect of resist on the transfer of line-edge roughness spatial metrics from mask to wafer, P. P. Naulleau and G. M. Gallatin, Journal of Vacuum Science and Technology B **28**, 1259 (2010).
68. Modeling the transfer of line edge roughness from an EUV mask to the wafer, G. M. Gallatin and P. P. Naulleau, in Proceedings of SPIE **7969,** 796903 (2011).
69. Lithography, metrology and nanomanufacturing, J. A. Liddle and G. M. Gallatin, Nanoscale **3**, 2679 (2011).
70. Efficiency enhancement of copper contaminated radial p-n junction solar cells, A. Boukai, P. Haney, A. Katzenmeyer, G. M. Gallatin, A. A. Talin, and P. Yang, Chemical Physics Letters **501**, 153-158 (2011).

71. Lithography and chemical modeling of acid amplfiers for use in EUV photoresists, S. Kruger, C. Higgins, G. Gallatin, and R. Brainard, in Proceedings of the 28th International Conference of Photopolymer Science and Technology(CPST-28), Materials & Processes for Advanced Lithography and Nanotechnology **24**, 143-152 (2011).
72. Common misconceptions about photolithography, G. M. Gallatin and J. A. Liddle, Nature Nanotechnology, submitted October 2011.
73. Fourier, Gauss, Fraunhofer, Porod and the shape from moments problem, G. M. Gallatin, Journal of Mathematical Physics **53**, 013509 (2012).
74. Factors affecting the rate and yield of Qdot binding to DNA origami, S. Ko, G. Gallatin, and J. A. Liddle, Advanced Functional Materials, **22**, 1015 (2012).
75. Modeling the effects of acid amplifiers on photoresist stochastics, G. M. Gallatin, P. P. Naulleau, and R. Brainard, Proceedings of the SPIE **8322**, 83221C (2012).
76. Modeling line edge roughness in lamellar block copolymers, P. N. Patrone and G. M. Gallatin, Proceedings of SPIE **8323**, 83232Q (2012).
77. Optimal laser scan path for localizing a fluorescent particle in two or three dimensions, G. M Gallatin and A. J. Berglund, Optics Express **20**, 16381 (2012).
78. Propagation of Vortex Electron Wave Functions in a Magnetic Field, Gregg M. Gallatin and Ben McMorran, Phys. Rev. A **86**, 012701 (2012).
79. Modeling Line Edge Roughness in Templated, Lamellar Block Copolymer Systems, P. N. Patrone and G. M. Gallatin, Macromolecules **45**, 9507-9516 (2012)
80. Quantum dot-DNA origami binding: a single particle tracking study, Kan Du , Seung Hyeon Ko , Gregg M. Gallatin , Heayoung P. Yoon , J. Alexander Liddle and Andrew J. Berglund, Chemical Communications **49**, 907-909 (2013).
81. Block-copolymer healing of simple defects in a chemoepitaxial template, P. N. Patrone and G. M. Gallatin, Proceedings of SPIE **8680**, 86801R (2013).
82. Response of Block Copolymer Thin-Film Morphology to Line-Width Roughness on a Chemo-Epitaxial Template, P. N. Patrone and G. M. Gallatin, Macromolecules **47**, 4824-4829 (2014).
83. Nanomanufacturing: A Perspective, J. A. Liddle and G. M. Gallatin, ACS Nano **10**, 2995-3014 (2016).

Patents

Printability verification by progressive modeling accuracy,
Gallatin; Gregg M. (Newtown, CT), Lai; Kafai (Poughkeepsie, NY), Mukherjee; Maharaj (Wappingers Falls, NY), Rosenbluth; Alan E. (Yorktown Heights, NY),
US Patent No. **7,512,927**.

Renesting interaction map into design for efficient long range calculations, Gallatin; Gregg M (Newtown, CT), Gofman; Emanuel (Haifa, IL), Lai; Kafai (Poughkeepsie, NY), Lavin; Mark A (Katonah, NY), Mukherjee; Maharaj (Wappingers Falls, NY), Ramm; Dov (D.N. Menashe, IL), Rosenbluth; Alan E (Yorktown Heights, NY), Shlafman; Shlomo (Haifa, IL),
US Patent No. **7,434,196**, **7,055,126.**

Simultaneous computation of multiple points on one or multiple cut lines, Gallatin; Gregg M. (Newtown, CT), Gofman; Emanuel (Haifa, IL), Lai; Kafai (Poughkeepsie, NY), Lavin; Mark A. (Katonah, NY), Mukherjee; Maharaj (Wappingers Falls, NY), Ramm; Dov (Menashe, IL), Rosenbluth; Alan E. (Yorktown Heights, NY), Shlafman; Shlomo (Haifa, IL),
US Patent No. **7,366,342**.

Incorporation of a phase map into fast model-based optical proximity correction simulation kernels to account for near and mid-range flare,
Gallatin; Gregg M. (Newtown, CT), Gofman; Emanuel (Haifa, IL), Lai; Kafai (Poughkeepsie, NY), Lavin; Mark A. (Katonah, NY), Mukherjee; Maharaj (Wappingers Falls, NY), Ramm; Dov (Menashe, IL), Rosenbluth; Alan E. (Yorktown Heights, NY), Shlafman; Shlomo (Haifa, IL),
US Patent No. **7,343,271**.

Interferometer and method for measuring characteristics of optically unresolved surface features,
De Groot; Peter (Middletown, CT), Darwin; Michael J (Beaverton, OR), Stoner; Robert T (Duxbury, MA), Gallatin; Gregg M. (Newtown, CT), De Lega; Xavier Colonna (Middletown, CT),
US Patent No. **7,324,214.**

Performance in model-based OPC engine utilizing efficient polygon pinning method,
Gallatin; Gregg M. (Newtown, CT), Gofman; Emanuel (Haifa, IL), Lai; Kafai (Poughkeepsie, NY), Lavin; Mark A. (Katonah, NY), Mukherjee; Maharaj (Wappingers Falls, NY), Ramm; Dov (Menashe, IL), Rosenbluth; Alan E. (Yorktown Heights, NY), Shlafman; Shlomo (Haifa, IL),
US Patent No. **7,287,239.**

Fast and accurate optical proximity correction engine for incorporating long range flare effects,
Gallatin; Gregg M. (Newtown, CT), Gofman; Emanuel (Haifa, IL), Lai; Kafai (Poughkeepsie, NY), Lavin; Mark A. (Katonah, NY), Ramm; Dov (Menashe, IL), Rosenbluth; Alan E. (Yorktown Heights, NY), Shlafman; Shlomo (Haifa, IL), Chen; Zheng (Poughkeepsie, NY), Mukherjee; Maharaj (Wappingers Falls, NY)
US Patent No. **7,131,104.**

Method for optimizing a number of kernels used in a sum of coherent sources for optical proximity correction in an optical microlithography process,
Gallatin; Gregg M. (Newton, CT), Gofman; Emanuel (Haifa, IL), Lai; Kafai (Poughkeepsie, NY), Lavin; Mark A. (Katonah, NY), Mukherjee; Maharaj (Wappingers Falls, NY), Ramm; Dov (Menashe, IL), Rosenbluth; Alan Edward (Yorktown Heights, NY), Shlafman; Shlomo (Haifa, IL),
US Patent No. **7,127,699.**

Illumination system with spatially controllable partial coherence compensating for line width variances,
McCullough; Andrew W. (Newtown, CT), Gallatin; Gregg M. (Newton, CT),
US Patent No. **7,092,070, 6,822,728.**

Fast model-based optical proximity correction,
Rosenbluth; Alan E. (Yorktown Heights, NY), Gallatin; Gregg M. (Newtown, CT), Gordon; Ronald L. (Poughkeepsie, NY), Seong; Nakgeuon (Wappingers Falls, NY), Lvov; Alexey Y. (Tarrytown, NY), Hinsberg; William D. (Fremont, CA), Hoffnagle; John A. (San Jose, CA), Houle; Frances A. (Fremont, CA), Sanchez; Martha I. (Menlo Park, CA),
US Patent No. **7,079,223.**

Extending the range of lithographic simulation integrals,
Gallatin; Gregg M. (Newtown, CT), Gofman; Emanuel (Haifa, IL), Lai; Kafai (Poughkeepsie, NY), Lavin; Mark A. (Katonah, NY), Mukherjee; Maharaj (Wappingers Falls, NY), Ramm; Dov (Menashe, IL), Rosenbluth; Alan E. (Yorktown Heights, NY), Shlafman; Shlomo (Haifa, IL),
US Patent No. **7,010,776.**

Illumination system with spatially controllable partial coherence compensation for line width variances in a photolithographic system,
McCullough; Andrew W. (Newtown, CT), Gallatin; Gregg M. (Newtown, CT),
US Patent No. **6,822,728, 6,628,370.**

Illumination system with spatially controllable partial coherence,
Gallatin; Gregg (Newtown, CT), McCullough; Andrew W. (Newtown, CT),
US Patent No. **6,259,513.**

Hybrid illumination system for use in photolithography,
Stanton; Stuart (Bridgewater, NJ), Gallatin; Gregg (Newtown, CT), Oskotsky; Mark (Marmaroneck, NY), Zernike; Frits (Norwalk, CT),
US Patent No. **5,631,721.**

Laser diode radar with extended range,
de Groot; Peter (Bethel, CT), Gallatin; Gregg M. (Monroe, CT), Roychoudhuri; Chandra (Sandy Hook, CT),
US Patent No. **5,594,543.**

Mask and wafer diffraction grating alignment system wherein the diffracted light beams return substantially along an incident angle,
Gallatin; Gregg M. (Newtown, CT), Kreuzer; Justin L. (Trumbull, CT), Nelson; Michael L. (W. Redding, CT),
US Patent No. **5,559,601.**

Off axis alignment system for scanning photolithography,
Angeley; David (Bridgeport, CT), Drazkiewicz; Stan (Newtown, CT), Gallatin; Gregg (Newtown, CT),
US Patent No. **5,477,057.**

Laser diode interferometer,
de Groot; Peter J. (Bethel, CT), Gallatin; Gregg M. (Monroe, CT), Gardopee; George (Southbury, CT),
US Patent No. **5,135,307.**