



Rensselaer



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OBJECTIVE

Postdoctoral position in the study of ultrafast laser-matter interaction through novel light sources and observation methods, combined with non-perturbative calculation.

CURRENT RESEARCH

- Study of the generation of terahertz (far infrared) transients during the ionization of atoms and molecules by high-intensity femtosecond optical pulses:
 - Experiments in a pulsed gas jet ionized by dual-color, phase controlled, femtosecond pulses
 - Quantum mechanical simulation of the ionization process through numerical solution of the three-dimensional time-dependent Schrödinger equation
- Broadband terahertz time-domain spectroscopy using generation and detection in gases, and utilizing a novel heterodyne detection technique allowing for coherent measurements spanning from millimeter waves to the mid-infrared

QUALIFICATIONS

- Experience in the use and alignment of Ti:Sapphire regenerative amplifiers (2005-2009)
- Design, construction and use of a vacuum system and laser-synchronized pulsed gas jet for laser-atom interaction study (2007-2009)
- Design, construction and use of terahertz time domain spectrometers for the study of solid state materials (2003-2009)
- Writing non-perturbative numerical simulations of high-intensity laser-atom interactions through solution of the time-dependent Schrödinger equation, in the MATLAB and C programming environments, and interpreting the results (2008-2009)
- Writing experimental automation software in LabView (2005-2009)
- Setup and use of a high-vacuum thermal evaporator (cryopump), and use of photo-lithography (2002-2004)
- Imaging and tomography with far-infrared radiation (2003-2006)

EDUCATION

Ph.D., Physics, 2009
Rensselaer Polytechnic Institute, Troy, NY
Thesis: Physics and Utilization of Terahertz Gas Photonics
Adviser: Xi-Cheng Zhang

B.S., Physics and Philosophy (dual major), 2003
Rensselaer Polytechnic Institute, Troy, NY
Research Adviser: Roland Kersting

AWARDS

- The Karen & Lester Gerhardt Prize in Science and Engineering, 2009
- The Hillard B. Huntington Award (1976), 2009
- National Science Foundation IGERT Traineeship, 2005-2009
- Workshop on Frontiers in Electronics Best Paper Award, 2008
- Rensselaer Founders Award for Excellence, 2007
- Coherent, Inc. Award, 2006

REFEREED JOURNAL PUBLICATIONS

15. J. Dai, **N. Karpowicz** and X.-C. Zhang, "Coherent Polarization Control of Terahertz Waves Generated from Two-Color Laser-Induced Gas Plasma," *Phys. Rev. Lett.* **103**, 023001 (2009).
14. **N. Karpowicz**, X. Lu and X.-C. Zhang, "The Role of Tunnel Ionization in Terahertz Gas Photonics," *Laser Phys.* **19**, *in press*.
13. **N. Karpowicz**, X. Lu and X.-C. Zhang, "Terahertz gas photonics," *J. Mod. Opt.* **56**, 1137 (2009).
12. X. Lu, **N. Karpowicz** and X.-C. Zhang, "Broadband terahertz detection with selected gases," *JOSA B* **25**, A66 (2009).
11. **N. Karpowicz** and X.-C. Zhang, "Coherent Terahertz Echo of Tunnel Ionization in Gases," *Phys. Rev. Lett.* **102**, 093001 (2009).
10. X. Lu, **N. Karpowicz**, Y. Chen and X.-C. Zhang, "Systematic study of broadband terahertz gas sensor," *Appl. Phys. Lett.* **93**, 261106 (2009).
9. **N. Karpowicz**, J. Chen, T. Tongue and X.-C. Zhang, "Coherent millimeter wave to mid-infrared measurements with continuous bandwidth reaching 40 THz," *Electronics Lett.* **44**, 544 (2008).
8. L.L. Zhang, **N. Karpowicz**, C.L. Zhang, Y.J. Zhao and X.-C. Zhang, "Real-time nondestructive imaging with THz waves," *Opt. Comm.* **281**, 1473 (2008).
7. **N. Karpowicz**, J. Dai, X. Lu, Y. Chen, M. Yamaguchi, H. Zhao, X.-C. Zhang, L.L. Zhang, C.L. Zhang, M. Price-Gallagher, C. Fletcher, O. Mamer, A. Lesimple, and K. Johnson, "Coherent heterodyne time-domain spectrometry covering the entire terahertz gap," *Appl. Phys. Lett.* **92**, 011131 (2008).
6. H.-B. Liu, H. Zhong, **N. Karpowicz**, Y. Chen and X.-C. Zhang, "Terahertz spectroscopy and imaging for defense and security applications," *Proc. IEEE* **95**, 1514 (2007).
5. H. Zhong, **N. Karpowicz** and X.-C. Zhang, "Terahertz emission profile from laser-induced air plasma", *Appl. Phys. Lett.* **88**, 261103 (2006).
4. R. Kersting, H.-T. Chen, **N. Karpowicz** and G.-C. Cho, "Terahertz microscopy with submicrometre resolution", *J. Opt. A: Pure Appl. Opt.* **7**, 184 (2005).
3. G.-C. Cho, H.-T. Chen, S. Kraatz, **N. Karpowicz** and R. Kersting, "Apertureless terahertz near-field microscopy," *Semicond. Sci. Technol.* **20**, 286 (2005).
2. **N. Karpowicz**, H. Zhong, J. Xu, K.-I Lin, J.-S. Hwang and X.-C. Zhang, "Comparison between pulsed terahertz time-domain imaging and continuous wave terahertz imaging," *Semicond. Sci. Technol.* **20**, 293 (2005).
1. **N. Karpowicz**, H. Zhong, C.L. Zhang, K.-I Lin, J.-S. Hwang, J. Xu, and X.-C. Zhang, "Compact continuous-wave subterahertz system for inspection applications," *Appl. Phys. Lett.* **86**, 054105 (2005).

CONFERENCES ATTENDED

- 2nd International Symposium on Filamentation, September 22 - 25, 2008, Paris, France
- OSA Nonlinear Optics, July 30 - August 4, 2007, Kona, HI, USA
- Joint 31st International Conference on Infrared and Millimeter Waves and 14th International Conference on Terahertz Electronics, September 18-21, 2006, Shanghai, China
- SURA Terahertz Applications Symposium, June 1-2, 2006, Washington, DC, USA
- International School of Solid State Physics 35th Workshop: Physics and Technology of THz Photonics. July 20-26, 2005, Erice, Italy
- SPIE Defense and Security Symposium, March 28-April 1, 2005, Orlando, FL, USA
- OSA Frontiers in Optics 2004, Laser Science XX. October 10-14, 2004, Rochester, NY, USA

PROFESSIONAL AFFILIATIONS

Optical Society of America (OSA)
American Association for the Advancement of Science (AAAS)

REFERENCES

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