

VYACHESLAV (SLAVA) LUKIN
National Science Foundation, Division of Physics
e-mail: vlukin@nsf.gov; phone: (703) 292-7382

Professional Preparation

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| Swarthmore College | physics/mathematics | B.A. with High Honors, 2000 |
| Princeton University, Dept. of Astrophysical Sciences | computational plasma physics | M.A., 2003 Ph.D., 2008 |
| University of Washington | computational plasma physics | Postdoc Fellowship, 2007-09 |

Appointments

11/2014 – *present*, National Science Foundation, Division of Physics

Program Director

- Management of the Plasma Physics, Accelerator Science, and Computational and Data-Enabled Science & Engineering programs, including the NSF/DOE Partnership in Basic Plasma Science & Engineering. Stewardship of plasma science across US academic institutions.
- Management of NSF-wide initiatives, including “Windows on the Universe: The Era of Multi-Messenger Astrophysics” and “Harnessing the Data Revolution”.
- Coordination, cooperation, and new initiatives with other gov’t agencies including NASA, DOE, and DOD. Lead NSF POC on new joint solicitations with NASA, including NSF-led “Next Generation Software for Data-driven Models of Space Weather with Quantified Uncertainties” and “NASA/NSF Partnership on Science of Dusty Plasmas: Utilizing the PK-4 Facility on board the International Space Station”.
- Embassy Science Fellow appointments with the US State Department in Czech Republic (2018) & Hungary (2023).

10/2012 – 06/2015, University of Washington, Department of Aeronautics and Astronautics

Affiliate Assistant Professor

- Collaborative research on high performance computing in plasma physics and supervision of graduate student research within the Plasma Science and Innovation Center.

05/2009 – 11/2014, Naval Research Laboratory, Space Science Division

Astrophysicist

- Computational modeling of magnetized plasmas in solar, space and laboratory environments using fluid and kinetic numerical methods. Space weather modeling. Verification & Validation of computational models. Development of scalable, implicit, high order numerical methods.

07/2007 – 05/2009, University of Washington, Plasma Science and Innovation Center

Research Associate

- Lead development, verification and validation of HiFi – a high order adaptive implicit computational framework for multi-fluid modeling in complex geometries, with a team of research staff and students.

09/2001 – 06/2007, Princeton Plasma Physics Laboratory & Los Alamos National Laboratory

Graduate Research Assistant

- Simulations of the tokamak internal kink mode and sawtooth dynamics within a two-fluid MHD model; study of the magnetic reconnection problem in a variety of MHD-based systems.
- Development, verification and support of a two-dimensional parallel implicit spectral element plasma fluid code with adaptive computational grid and time advance for high performance computing applications.

Professional Memberships

- American Physical Society (APS): Division of Plasma Physics (DPP), Topical Group in Plasma Astrophysics (GPAP), Forum on International Physics (FIP).
- American Geophysical Union (AGU): Space Physics and Aeronomy Section (SPA).
- American Astronomical Society (AAS): Solar Physics Division (SPD).

Honors & Awards

- Selectee to the Forums for New Leaders in Space Science jointly held by the Chinese Academy of Sciences & US National Academy of Sciences (2014).
- US Department of Energy Fusion Energy Sciences Postdoctoral Appointee (2007-09).
- National Science Foundation Graduate Research Fellow (2001-06).
- US Department of Energy Fusion Energy Sciences Graduate Fellow (2001-03).
- Barry M. Goldwater Scholar (1999).

Professional Service

- SOC, Workshops on Computational Challenges in Hot Dense Plasmas and in Magnetized Plasma, UCLA IPAM program on Computational Methods in HEDP (March-June, 2012).
- Executive & Program Committees, Exploratory Plasma Research Workshops (2013-2014).
- Organizer and Chair of a joint session “Bridging Laboratory and Solar Plasma Studies” at the 224th AAS Meeting (June, 2014) co-sponsored by AAS LAD, AAS SPD, and APS GPAP.
- Organizer, Workshop on “Integrated Plasma Modelling of Solar Flares” at the Lorentz Centre, Leiden University, Netherlands (May, 2015).
- Executive Committee, APS DPP (2016-2018).
- Member of review panels for NASA, NSF and DOE.
- Guest Editor, “Self-organization in Magnetic Flux Ropes”, *Plasma Phys. Control. Fusion*.
[<http://iopscience.iop.org/0741-3335/page/SelfOrganizationMagneticFluxRopes>]
- Referee for:

Physics of Plasmas; The Astrophysical Journal & The Astrophysical Journal Letters; Monthly Notices of the Royal Astronomical Society; Journal of Computational Physics; Plasma Physics and Controlled Fusion; Computer Physics Communications; Nonlinear Processes in Geophysics.

Refereed Publications

- B. Popescu Braileanu, V. S. Lukin, E. Khomenko, “Magnetic field amplification and structure formation by the Rayleigh-Taylor instability,” *Astronomy & Astrophysics* **670**, A31 (2023);
- B. Popescu Braileanu, V. S. Lukin, E. Khomenko, A. de Vicente, “Two-fluid simulations of Rayleigh-Taylor instability in a magnetized solar prominence thread. II. Effects of collisionality,” *Astronomy & Astrophysics* **650**, A181 (2021);
- B. Popescu Braileanu, V. S. Lukin, E. Khomenko, A. de Vicente, “Two-fluid simulations of Rayleigh-Taylor instability in a magnetized solar prominence thread. I. Effects of prominence magnetization and mass loading,” *Astronomy & Astrophysics* **646**, A93 (2021);
- B. Popescu Braileanu, V. S. Lukin, E. Khomenko, A. de Vicente, “Two-fluid simulations of waves in the solar chromosphere II: Propagation and damping of fast magneto-acoustic waves and shocks,” *Astronomy & Astrophysics* **630**, A79 (2019);
- B. Popescu Braileanu, V. S. Lukin, E. Khomenko, A. de Vicente, “Two-fluid simulations of waves in the solar chromosphere I: Numerical code verification,” *Astronomy & Astrophysics* **627**, A25 (2019);
- L. Ni, V. S. Lukin, “Onset of secondary instabilities and plasma heating during magnetic reconnection in strongly magnetized regions of the low solar atmosphere,” *Astrophysical Journal* **868**, 144 (2018);
- E. Provornikova, J. M. Laming, V. S. Lukin, “Reflection of fast magnetosonic waves near a magnetic reconnection region,” *Astrophysical Journal* **860**, 138 (2018);
- L. Ni, V. S. Lukin, N. A. Murphy, J. Lin, “Magnetic reconnection in the low solar chromosphere with a more realistic radiative cooling model,” *Physics of Plasmas* **25**, 042903 (2018);
- L. Ni, V. S. Lukin, N. A. Murphy, J. Lin, “Magnetic reconnection in strongly magnetized regions of the low solar chromosphere,” *Astrophysical Journal* **852**, 95 (2018);
- A. Kirk, *et al.*, “Overview of recent physics results from MAST,” *Nuclear Fusion* **57**, 102007 (2017);
- E. Provornikova, J. M. Laming, V. S. Lukin, “Plasma compressions in magnetic reconnection regions in the solar corona,” *Astrophysical Journal* **825**, 55 (2016);
- C. Akcay, W. Daughton, V. S. Lukin, Y.-H. Liu, “A Two-Fluid Study of Oblique Tearing Modes in a Force-Free Current Sheet,” *Physics of Plasmas* **23**, 012112 (2016);
- P. K. Browning, S. Cardnell, M. Evans, F. Arese Lucini, V. S. Lukin, K. G. McClements, A. Stanier, “Two-fluid and magnetohydrodynamic modeling of magnetic reconnection in the MAST spherical tokamak and the solar corona,” *Plasma Physics and Controlled Fusion* **58**, 014041 (2016);
- O. Ohia, J. Egedal, V. S. Lukin, W. Daughton, A. Le, “Scaling laws for magnetic reconnection, set by regulation of the electron pressure anisotropy to the firehose threshold,” *Geophysical Research Letters* **42**, 067117 (2015);
- N. A. Murphy and V. S. Lukin, “Asymmetric magnetic reconnection in weakly ionized chromospheric plasmas,” *Astrophysical Journal* **805**, 134 (2015);

- J. E. Leake *et al.*, “Ionized plasma and neutral gas coupling in the Sun's Chromosphere and Earth's Ionosphere/Thermosphere,” *Space Science Reviews* **184**, 107-172 (2014);
- E. Lee, V. S. Lukin, M. G. Linton, “On flux rope stability and atmospheric stratification in models of coronal mass ejections triggered by flux emergence,” *Astronomy & Astrophysics* **569**, A94 (2014);
- D. A. Schaffner, M. R. Brown, V. S. Lukin, “Temporal and spatial turbulent spectra of MHD plasma and an observation of variance anisotropy,” *Astrophysical Journal* **790**, 126 (2014);
- P. Browning, A. Stanier, G. Ashworth, K. G. McClements, V. S. Lukin, “Self-organization during spherical torus formation due to flux rope merging in the Mega-Ampere Spherical Tokamak,” *Plasma Physics and Controlled Fusion* **56**, 064009 (2014);
- D. A. Schaffner, V. S. Lukin, A. Wan, M. R. Brown, “Turbulence analysis of an experimental flux rope plasma,” *Plasma Physics and Controlled Fusion* **56**, 064003 (2014);
- A. Stanier, P. Browning, M. Gordovskyy, K. G. McClements, M. P. Gryaznevich, V. S. Lukin, “Two-fluid simulations of driven reconnection in the Mega-Ampere Spherical Tokamak,” *Physics of Plasmas* **20**, 122302 (2013);
- J. E. Leake, V. S. Lukin, M. G. Linton, “Magnetic reconnection in a weakly ionized plasma,” *Physics of Plasmas* **20**, 061202 (2013);
- A. Le, J. Egedal, O. Ohia, W. Daughton, H. Karimabadi, and V. S. Lukin, “Regimes of the electron diffusion region in magnetic reconnection,” *Physical Review Letters* **110**, 135004 (2013);
- J. E. Leake, V. S. Lukin, M. G. Linton, E. T. Meier, “Multi-fluid simulations of chromospheric magnetic reconnection in a weakly ionized reacting plasma,” *Astrophysical Journal* **760**, 109 (2012);
- O. Ohia, J. Egedal, V. S. Lukin, W. Daughton, A. Le, “Demonstration of anisotropic fluid closure capturing the kinetic structure of magnetic reconnection,” *Physical Review Letters* **109**, 115004 (2012);
- E. T. Meier, A. H. Glasser, V. S. Lukin, U. Shumlak, “Modeling open boundaries in dissipative MHD simulation,” *Journal of Computational Physics* **231**, 2963 (2012);
- V. S. Lukin and M. G. Linton, “Three-dimensional magnetic reconnection through a moving magnetic null,” *Nonlinear Processes in Geophysics* **18**, 871 (2011);
- W. Lowrie, V. S. Lukin, U. Shumlak, “*A priori* mesh quality metric error analysis applied to a high-order finite element method,” *Journal of Computational Physics* **230**, 5564 (2011);
- X. Zhang, D. Dandurand, T. Gray, M. R. Brown, and V. S. Lukin, “Calibrated cylindrical Mach probe in a plasma wind tunnel,” *Review of Scientific Instruments* **82**, 033510 (2011);
- T. Gray, V. S. Lukin, M. R. Brown, C. D. Cothran, “Three-dimensional reconnection and relaxation of merging spheromak plasmas,” *Physics of Plasmas* **17**, 102106 (2010);
- Jill Dahlburg *et al.*, “Exploiting Laboratory and Heliophysics Plasma Synergies,” *Energies* **3**, 1014 (2010);
- C. D. Cothran, M. R. Brown, T. Gray, M. J. Schaffer, G. Marklin, V. S. Lukin, “Observation of a nonaxisymmetric magnetohydrodynamic self-organized state,” *Physics of Plasmas* **17**, 055705 (2010);

- E. T. Meier, V. S. Lukin, U. Shumlak, “Spectral element spatial discretization error in solving highly anisotropic heat conduction equation,” *Computer Physics Communications* **181**, 837 (2010);
- V. S. Lukin, “Stationary nontearing inertial scale electron magnetohydrodynamic instability,” *Physics of Plasmas* **16**, 122105 (2009);
- L. Chacon, A. N. Simakov, V. S. Lukin, A. Zocco, “On fast reconnection in nonrelativistic 2D electron-positron plasmas,” *Physical Review Letters* **101**, 025003 (2008);
- V. S. Lukin and S. C. Jardin, “Magnetohydrodynamic modeling of two-dimensional reconnection in the Magnetic Reconnection Experiment,” *Physics of Plasmas* **10**, 3131 (2003);
- M. R. Brown *et al.*, “Energetic particles from three-dimensional magnetic reconnection events in the Swarthmore Spheromak Experiment,” *Physics of Plasmas* **9**, 2077 (2002);
- G. Qin, V. S. Lukin, C. D. Cothran, M. R. Brown, W. H. Matthaeus, “Energetic particles and magnetohydrodynamic activity in the Swarthmore Spheromak Experiment,” *Physics of Plasmas* **8**, 4816 (2001);
- V. S. Lukin, G. Qin, W. H. Matthaeus, M. R. Brown, “Numerical modeling of magnetohydrodynamic activity in the Swarthmore Spheromak Experiment,” *Physics of Plasmas* **8**, 1600 (2001).

PhD Thesis

- Vyacheslav S. Lukin, “Computational study of the internal kink mode evolution and associated magnetic reconnection phenomena,” Princeton University (2008).