

CURRICULUM VITAE

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1. Name: Svetozar Popovic, Ph.D.

2. Address: 6056 River Road, Norfolk, VA 23505

3. Academic Education

1970 Diploma in Technical Physics, Faculty of Electrical Engineering,
University of Belgrade, Yugoslavia

1973 M.S. in Physics, Faculty of Science, University of Belgrade, Yugoslavia

1977 Ph.D. in Physics, Faculty of Science, University of Belgrade, Yugoslavia

4. Experience

1970 – 1973 Research Physicist, Institute of Physics, U. of Belgrade, Belgrade, YU

1973 – 1977 Research Fellow, Institute of Physics, U. of Belgrade, Belgrade, YU

1977 – 1985 Research Scientist, Institute of Physics, U. of Belgrade, Belgrade, YU

1985 – 1990 Director, Institute of Experimental Physics Division, Institute of Physics,
University of Belgrade, Belgrade, Yugoslavia

1990 – 1996 Research Scientist, Weber Research Inst., Polytechnic U., Brooklyn, NY

1996 – 2004 Research Associate Professor, Department of Physics,
Old Dominion University, Norfolk, Virginia

2004 - present Research Professor, Department of Physics, Old Dominion University.

5. Awards

1981 Scientific Excellence Award on the occasion of the 20th anniversary
of the Institute of Physics, University of Belgrade, Yugoslavia

1984 ETAN (Yugoslav equivalent to IEEE) award for:
The development of organic photochromatic materials.

1999 Arch T. Colwell Award for the best paper at the 27th International Conference on
Environmental Systems and published in SAE Transaction, J. of Aerospace, **107**,
28 (1998) selected by SAE in 1999.

2000 Outstanding Achievement Award for success in National Aeronautics and Space
Administration STTR (Phase II) Efforts, topic entitled "Weakly Ionized Shock
Wave Modification System," Commonwealth of Virginia, 2000.

2003 Hanscom Air Force Research Laboratory Summer Faculty Fellow.

2004 Hanscom Air Force Research Laboratory Summer Faculty Fellow.

2008 Research Expo 2008, Honorable Mention Award for Outstanding Graduate Poster
Presentation.

2010 Wright-Patterson Air Force Research Laboratory Summer Faculty Fellow.

2010 Ocean Lakes High School, Mathematics and Science Academy, Certificate of
Appreciation in recognition of significant contributions, outstanding dedication,
and valuable service, November 4, 2010.

6. Patents

Patent No. US6025200 issued Feb. 15, 2000
"Method for remote detection of volatile taggant," S. Popovic, co-inventor
Patent No. US6133694 issued Oct. 17, 2000
"High-pressure lamp bulb having fill containing multiple excimer combinations,"
S. Popovic, co-inventor
Patent Disclosure, September 1998, ODURF Disclosure 98009,
"Attenuation and Dispersion of Oblique Shock with Metastable Atom Beams –
Concept," S. Popovic, co-inventor
Patent Application, October 2001, Disclosure serial number 60/336,354,
"Pulsed Microwave Processing Method and Apparatus for Polymer Surface
Modification at Atmospheric Pressure," S. Popovic, co-inventor

7. Membership

1987-present American Physical Society
1999-present American Institute of Aeronautics and Astronautics (Senior Member)

8. Published Papers, Books, and *Reports (Reports from Yugoslavia are not listed)

Popović, M. M., S. Popović, and S. M. Vuković, "A Study of Electrical Conductivity in Heavy Noble Gases," *Fizika* **6**, 29 (1974).

Popović, S. and N. Konjević, "Correction for Refractive Ray Bending in Axially Symmetric Plasma Sources," *JQRST* **16**, 15 (1976).

Popović, S. and N. Konjević, "On the Thermal Conductivity of Hydrogen at Elevated Temperatures," *Z. für Naturforschung* **31a**, 1042 (1976).

Günther, K., M. Popović, S. Popović, and R. Radtke, "Electrical Conductivity of Highly Ionized Dense Hydrogen Plasma," *J. Phys. D* **9**, 1139 (1976).

Goldbach, C., G. Nollez, S. Popović, and M. Popović, "Electrical Conductivity of High Pressure Ionized Argon," *Z. für Naturforschung* **33**, 1 (1978).

Popović, S., "Electrical Conductivity of Weakly Non-ideal Plasmas," in *Proceedings of Invited Lectures, VIII International Conference and Yugoslav Summer School on the Physics of Ionized Gases, Dubrovnik 1972*, ed. by B. Navinšek (Jožef Stefan Institute, Ljubljana 1978).

Popović, S., Chapter 5 in *Electric Properties of Weakly Non-ideal Plasmas*, edition *Experientia Supplementum 49*, Akademie Verlag, Berlin and Birkhauser Verlag, Basel (1984).

Popović, M. and S. Popović, “Strongly-Coupled Plasma Diagnostics and Experimental Determination of DC Electrical Conductivity,” in *Strongly-Coupled Plasmas*, ed. by F. J. Rogers and H. E. Dowitt, NATO ASI, Series B **154**, Plenum Press (1987), p. 99.

Kunhardt, E. E., S. Popović, and J. Benson, “Electrical Breakdown in Space Environment,” in *SPEAR II, High Power Space Insulation*,” ed. by H. A. Cohen, F. M. Lehr, and T. G. Engel, Lubbock, TX: Texas Tech Univ. Press, 1995.

Kunhardt, E. E., S. Popović, and J. Benson, “Electrical Breakdown of the Space Vacuum,” *IEEE Trans. Plasma Sci.* **23**, 970 (1995).

Otugen, M. V., J. Kim, and S. Popović, “Nd:YAG Laser-Based Dual-Line Rayleigh Scattering System,” *AIAA Journal* **35**, 776 (1997).

Otugen, M. V., J. Kim, and S. Popović, “Turbulent Temperature Measurements Using an Nd:YAG Laser-Based Dual-Line Detection Rayleigh Scattering Technique,” *AIAA 97-0604* (1997).

Smart, K. M., I. M. Kalkhoran, and S. Popović, “Some Aspects of Streamwise Vortex Behavior during Oblique Shock Wave/Vortex Interaction,” *Shock Waves* **8**, 243 (1998).

Vušković, L., C. H. Ying, Y. Wang, and S. Popović, “Low-Energy Electron Collision by Excited atoms,” in *Gaseous Dielectrics VIII*, p. 97, edited by L. G. Christophorou and J. K. Olthoff (Plenum Press, 1998).

Vušković, L., R. L. Ash, S. Popović, T. Dinh, and A. Van Orden, “Radio-Frequency Plasma Assisted Production of Carbon Monoxide/Oxygen Directly from Martian Atmosphere,” *AIAA Paper 983304* (1998). (American Institute of Aeronautics and Astronautics, Washington, DC).

Vušković, L., R. L. Ash, Z. Shi, S. Popović, and T. Dinh, “Radio-Frequency-Discharge Reaction Cell for Oxygen Extraction from Martian Atmosphere,” *Transactions of the Society of Automotive Engineers, J. of Aerospace*, **106**, 1041-1047 (1998).

Popović, S. and L. Vušković, “Anomalous Propagation of Planar Shock Wave in Weakly Ionized Gas,” *Physics of Plasmas*, **7**, 1448 (1999).

*Vuškovic, L., S. Popovic, and R. Ash, “Radio Frequency Dust Removal in Microgravity Conditions,” report of research results to the National Center for Microgravity Research on Fluids Combustion, July 1999.

*Vuškovic L. and S. Popovic, “Weakly Ionized Gas Generator, Phase I” report of research results to the Accurate Automation Corp., October 1999.

Popović, S. and L. Vušković, "Ionization-Recombination Model for the Supersonic Flow in Weakly Ionized Gas," AIAA Paper 99-4905 (1999). (American Institute of Aeronautics and Astronautics, Washington, DC).

S. Popović, L. Vušković, and A. Chow, "Interaction between Acoustic Shock Wave and Glow Discharge," AIAA Paper 2001-3049 (2001). (American Institute of Aeronautics and Astronautics, Washington, DC).

Vušković, L. and S. Popović "Collisions of excited atoms in gas discharges," 20th International Symposium on the Physics of Ionized Gases, full article in Book of Invited Talks, ed. N. Konjević, Z. Lj. Petrović, and G. Malović, SFIN year XIV Series A, No. A1 (2001) p. 347. YUISBN 86-82441-08-X.

Popović, S., P. Kessaratikoon, A. Markhotok, G. Brooke IV, and L. Vušković,, "Shock Wave Propagation and Dispersion in a Microwave Cavity Discharge," AIAA Paper 2002-2279 (2002). (American Institute of Aeronautics and Astronautics, Washington, DC).

*Vušković, L., and S. Popović, "Interaction of Acoustic Waves with Weakly Ionized Gas Generated by Microwave Discharge," report of research results to the NASA Langley Research Center, April 2002.

Popović, S., L. Vušković, I. I. Esakov, L. P. Gratchev, and K. V. Khodataev, "Subcritical Microwave Streamer Discharge at the Surface of a Polymer Foil," Appl. Phys. Lett. **81**, 1964-1965 (2002).

Vušković, L., and S. Popović, "Electron Scattering and Hydrodynamic Effects in Ionized Gas," in *Electron Scattering – From Atoms, Molecules, Nuclei and Bulk Matter*, edited by C. T. Whelan and N. J. Mason (2005 Kluwer Academic / Plenum Publishers, New York) 291-300.

Vušković, L., and S. Popović, "Excited Atoms and Molecules in High Pressure Gas Discharges," in *Application of Accelerators in Research and Industry*, edited by J. L. Duggan and I. L. Morgan (2003 American Institute of Physics, New York) 172-175.

Popović, S., and L. Vušković, "Nano-scale Dipole Electrodes for Subcritical Discharges," in *From the Atomic to the Nano-Scale*, edited by C. T. Whelan and J. H. McGuire, ISBN 0-9742874-0-7 (2003 Old Dominion University) 142-151.

Exton, R. J., R. J. Balla, G. C. Herring, Popović, S., and L. Vušković, "Volumetric Near Field Microwave Plasma Generation," AIAA Paper 2003-4181 (2003). (American Institute of Aeronautics and Astronautics, Washington, DC).

Jovičević, S., M. Ivković, N. Konjević, Popović, S., and L. Vušković, "On the Excessive Balmer Line Broadening in Microwave Induced Discharges," J. Appl. Phys. **95**, 24 2003.

*Vušković, L., and S. Popović, "Plasma Aerodynamics and Combustion," report of research results to the NASA Langley Research Center, February 2004.

*Vušković, L., and S. Popović, "Magnetohydrodynamic Power Generator," report of research results to the NASA Langley Research Center, March 2004.

Kuo, S. P., D. Bivolaru, H. Lai, W. Lai, S. Popović, and P. Kessarotkoon, "Characteristics of an Arc-Seeded Microwave Plasma Torch," *IEEE Trans. Plasma Science*, **32**, 1734-1741 (2004).

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Vušković, L., S. Popović, J. Drake, and R. W. Moses, "Magnetohydrodynamic Power Generation in the Laboratory Simulated Martian Entry Plasma," *Proc. XV International Conference on MHD Science and Applications*, ed. V. Bityrin, pp 150-155, IVTAN, Moscow, May 2005.

Exton, R. J., S. Popović, G. C. Herring, and M. Cooper, "Levitation using microwave-induced plasmas," *Appl. Phys. Lett.* **86**, 124103 (2005).

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Vušković L. and S. Popović, "Atomic Interactions in Weakly Ionized Gas: Ionizing Shock Waves," in *Advances in Atomic, Molecular, and Optical Physics*, edited by H. Stroke and P. Berman (2005 Elsevier B.V., ISBN 0-12-003851) **51**, 451-570 (2005).

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Kuo, S. P., M. Rubinraut, S. Popovic, and D. Bivolaru, "A portable Arc-Microwave Hybrid Plasma Torch Module," AIAA Paper 2006-1463 (2006). (American Institute of Aeronautics and Astronautics, Washington, DC).

Kuo, S. P., O. Tarasenko, S. Popovic, and K. Levon, "Killing of Bacterial Spores Contained in a Paper Envelope by a Microwave Plasma Torch," *IEEE Trans. Plasma Science* **34**, No. 4, 1-8 (2006).

Rašković, M., L. Vušković, S. Popović, L. Phillips, A.-M. Valente-Feliciano, S. B. Radovanov, and L. Godet, "Plasma Treatment of Bulk Niobium Surface for SRF Cavities," *Nuclear Inst. & Methods in Physics Research A* **569**, 663-670 (2006).

R. Saeks, S. Popović, and A. S. Chow, "Shock Structure Analysis and Aerodynamics in a Weakly Ionized Gas Flow," NASA/TR-2006-214602 August 2006.

Kuo, S. P., M. Rubinraut, S. Popovic, and D. Bivolaru, "Characteristic Study of a Portable Arc Microwave Plasma Torch," IEEE Trans. Plasma Science **34**, No. 6, 2537-2544 (2006).

Popović, S. and L. Vušković, "Aerodynamic Effects in Weakly Ionized Gas: Phenomenology and Applications," in *The Physics of Ionized Gases*, edited by Lj. Hadžievski, B. P. Marinković, and N. S. Simonović (AIP Melville, New York, ISBN 978-0-7354-0377-2) **876**, 272-283 (2006).

Popović, S. and L. Vušković, "Studies of Flow in Ionized Gas: Historical Perspective, Contemporary Experiments, and Applications," in *Sixth International Conference of the Balkan Physical Union*, edited by S. Ali Cetin and I. Hikmet, (AIP Melville, New York, ISBN: 978-0-7354-0404-5) **899**, 61-77 (2007).

Kuo, S. P., S. Popović, O. Tarasenko, M. Rubinraut, and M. Rašković, "Fan-shaped microwave plasma for mail decontamination," Plasma Sources Science and Technology **16**, 581-586 (2007).

Popović, S., M. Rašković, S. P. Kuo, and L. Vušković, "Reactive Oxygen Emission from Microwave Discharge Plasmas," J. Phys.: Conf. Ser. **86**, 012013 (15pp) (2007).

Markhotok, A., S. Popović, and L. Vušković, "The boundary effects of the shock wave dispersion in discharges," Phys. Plasmas **15**, 032103 (5pp) (2008).

Drake, D. J., S. Popović, and L. Vušković, "Characterization of a supersonic microwave discharge in Ar/H₂/Air mixtures," J. Appl. Phys. **104**, 063305 (7pp) (2008).

Herring, G. C. and S. Popović, "Microwave air breakdown enhanced with metallic initiators," Appl. Phys. Lett. **92**, 131501 (2008).

Rašković, M., S. Popović, J. Upadhyay, L. Vušković, L. Phillips, and A-M. Valente-Feliciano, "High etching rates of bulk Nb in Ar/Cl microwave discharge," J. Vac. Sci. Technol. A **27(2)**, 301-305 (2009).

Rašković, M., L. Vušković, and S. Popović, "The High Quality Factor Niobium Cavities Preparation by Plasma Treatment," Phys. Scr. T **135**, 014018 (7pp) (2009).

Drake, D. J., S. Popović, L. Vušković, and T. Dinh, "Kinetic Description of Martian Atmospheric Entry Plasma," IEEE Trans. on Plasma Sci. **37**, 1646-1655 (2009).

Williams, S., S. Popović, and M. Gupta, "Microwave plasma generation and filtered transport of O₂ (a ¹Δ_g)," Plasma Sources Science and Technology **18**, 035014 (2009).

Kuo, S. P., O. Tarasenko, J. Chang, S. Popović, C. Y. Chen, H. W. Fan, A. Scott, M. Lahiani, P. Alusta, J. D. Drake, and M. Nikolić, "Contribution of a Portable Air Plasma Torch to Rapid Blood Coagulation as a Method of Preventing Bleeding," *New J. Phys.* **11**, 115016 (17pp) (2009).

Drake, D. J., S. Popović, and L. Vušković, "Characterization of a CO₂/N₂/Ar supersonic flowing discharge," *J. Appl. Phys.* **106**, 083305 (2009).

D. J. Drake, S. Popović, L. Vušković, and T. Dinh, "Effects of Water Vapor Presence in Martian Atmospheric Entry Plasma," AIAA-2010-1536 (American Institute of Aeronautics and Astronautics) (2010).

M. Nikolić, A. Samolov, J. Upadhyay, A. Godunov, S. Popović L. Vušković, A.-M. Valente-Feliciano, L. Phillips, "Tomographic Analysis of SRF Cavities as Asymmetric Plasma Reactors," *Proc. IPAC*, pp. 3072-3074 (2010) (Kyoto, Japan) (ISBN 978-92-9083-352-9).

S. Popović, M. Rašković, J. Upadhyay, L. Vušković, H.L. Phillips, A-M. Valente-Feliciano, "Plasma Treatment of Niobium SRF Cavity Surfaces," *Proc. IPAC*, pp. 3058-3060 (2010) (Kyoto, Japan) (ISBN 978-92-9083-352-9).

S. Popović, M. Nikolić, J. Upadhyay, and L. Vušković, "On Optimizing the Metastable Oxygen Production from Electrical Discharges," AIAA-2010-5042 (American Institute of Aeronautics and Astronautics) (2010).

A. Markhotok and S. Popović, "Refractive Phenomena in the Shock Wave Dispersion with Variable Gradients," *J. Appl. Phys.* **107**, 123302 (2010); doi:10.1063/1.3432565 [4 pages].

M. Rašković, J. Upadhyay, L. Vušković, S. Popović, A-M. Valente-Feliciano, and H.L. Phillips, "Plasma treatment of bulk niobium surface for superconducting rf cavities: Optimization of the experimental conditions on flat samples," *Phys. Rev. ST Accel. Beams* **13**, 112001 (2010) [7 pages].

9. Published Abstracts (Each Paper was presented at Professional Meeting.)

*Indicates Invited Talks

S. Popovic, "Excited States in Partially Ionized Hydrogen," 41st Annual Gaseous Electronic Conference (GEC), Minneapolis, Minnesota, October 18-20, 1988.

S. Popovic and J. Koceic, "Radial Temperature Distributions in High Pressure Xenon Discharges," 41st GEC, Minneapolis, Minnesota, October 18-20, 1988.

J. Koceic and S. Popovic, "Electrical Conductivity of High Pressure Ionized Xenon," 42nd GEC, Palo Alto, California, October 17-20, 1989. Bull. Am. Phys. Soc. **35**, 1810 (1990).

S. Popovic, E. Kunhardt, and M. Margulies, "Observations of Low Pressure DC Breakdowns in Weak Magnetic Fields," 43rd GEC, Champaign-Urbana, Illinois, October 16-19, 1990. Bull. Am. Phys. Soc. **36**, 192 (1991).

S. Popovic, E. Kunhardt, J. Bentson, and S. Barone, "Toroidal Discharges in Superimposed Electrical and Magnetic Fields," 44th GEC, Albuquerque, New Mexico, October 22-25, 1991, Book of Abs. p. 194.

E. Kunhardt, S. Barone, J. Bentson, and S. Popovic, "Electrical Breakdown in Partially Enclosed Structures," 44th GEC, Albuquerque, New Mexico, October 22-25, 1991, Book of Abs. p. 142.

A. Syljuasen, E. Kunhardt, J. Bentson, S. Popovic, and S. Barone, "Breakdown Characteristics of Non-Planar Plasma Sheaths," 44th GEC, Albuquerque, New Mexico, October 22-25, 1991, Book of Abs. p. 115.

S. Popovic. and E. Kunhardt, "Charge Particle Dynamics inside the Sheath of a Spherical Electrode in the Presence of Axial Magnetic Field," 45th GEC, Boston, Massachusetts, October 27-30, 1992, Book of Abs. p. 213.

S. Popovic and E. Kunhardt, "Low Density Breakdown Characteristics in the Presence of Axial Magnetic Field," 45th GEC, Boston, Massachusetts, October 27-30, 1992, Book of Abs. p. 143.

S. Popovic and E. Kunhardt, "Electron Energy Spectrum in a Hollow Anode Discharge," Proc. of Int. Conf. on Plasma Science, Vancouver, Canada, June (1993).

J. Bentson, E. Kunhardt, and S. Popovic, "Voltampere Characteristics from SPEAR III," 46th GEC, Montreal, Canada, October 19-22, 1993, Book of Abs. p. 38.

S. Popovic, "Solar Array Arc Dynamics in the Presense of Magnetic Fields" 47th GEC, Gaithersburg, Maryland, October 18-21, 1994. Bull. Am. Phys. Soc. **39**, 1448 (1994).

Hing, M., G. Brooke, S. Popovic, and L. Vuškovic, "Proton Donor Production and Transport" 49th Annual Gaseous Electronics Conference, Arrgon National Laboratory, Illinois, October 1996. Bull. Am. Phys. Soc. **41**, 1328 (1996).

Vuškovic, L., Z. Shi, R. L. Ash, S. Popovic, and T. Dinh, "Radio-Frequency-Based Glow-Discharge Extraction of Oxygen from Martian Atmosphere: Experimental Results and System Validation," *In Situ* Resource Utilization (ISRU I) Technical Interchange Meeting, Lounar and Planetary Intitute, Houston, Texas, February 1997. *Book of*

Abstracts, In Situ Resource Utilization (ISRU I) Technical Interchange Meeting,
Convened by D. Kaplan, p. 31 (1997).

Brooke, G., S. Popovic, and L. Vuškovic, "Direct Current Hollow Cathode Discharge for a Proton Transfer Production," 50th Annual Gaseous Electronics Conference, Madison, Wisconsin, October 1997. *Bull. Am. Phys. Soc.* **42**, 1714 (1997).

M. Cekic, J. Frank, and S. Popovic, "Microwave-excited Excimer Lamps," 50th Annual Gaseous Electronics Conference, Madison, Wisconsin, October 1997. *Bull. Am. Phys. Soc.* **42**, 1719 (1997).

Popovic, S. and L. Vuškovic, "Electron Energy and Neutral Gas Temperature in a Glow Discharge," 50th Annual Gaseous Electronics Conference, Madison, Wisconsin, October 1997. *Bull. Am. Phys. Soc.* **42**, 1713 (1997).

Vuškovic, L., R. L. Ash, S. Popovic, T. Dinh, and A. Van Orden, "Radio-Frequency Discharge in Martian Atmosphere," 50th Annual Gaseous Electronics Conference, Madison, Wisconsin, October 1997. *Bull. Am. Phys. Soc.* **42**, 1734 (1997).

Vuškovic, L., R. L. Ash, S. Popovic, T. Dinh, and A. Van Orden, "Oxygen Production and Separation from Martian Atmosphere by the Radio-Frequency Discharge," *In Situ Resource Utilization (ISRU II) Technical Interchange Meeting, Lunar and Planetary Institute, Houston, Texas, November 1997. Book of Abstracts, In Situ Resource Utilization (ISRU II) Technical Interchange Meeting,* Convened by D. Kaplan and R. S. Saunders, p. 33 (1997).

L. Vuškovic and S. Popovic, "Supersonic Motion of a Spherical Body in Weakly Ionized Gas," 2nd Weakly Ionized Gas Workshop, Norfolk, Virginia, April 1998. *AIAA Proceedings of 2nd Weakly Ionized Gas Workshop*, p. 101 (1998).

Vuškovic, L., R. L. Ash, S. Popovic, T. Dinh, and A. Van Orden, "Radio-Frequency Plasma assisted Production of Carbon Monoxide/Oxygen Propellant Directly from from Martian Atmosphere," 34th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, July 13-15, 1998, Cleveland, OH.

G. Brooke, S. Popovic, and L. Vuškovic, "Inductively Coupled Radio Frequency Discharge as a Source of Hydronium Ions," 51st Annual Gaseous Electronic Conference, Maui, Hawaii, October 1998. *Bull. Am. Phys. Soc.* **43**, 1435 (1998).

S. Popovic and L. Vuškovic, "Distribution of Electric Field across Shock Structure Propagating through a DC Glow Discharge," 51st Annual Gaseous Electronic Conference, Maui, Hawaii, October 1998. *Bull. Am. Phys. Soc.* **43**, 1466 (1998).

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S. Popovic, R. L. Ash, T. Dinh, and L. Vuškovic, "RF-ICP Discharge for a Hybrid Oxygen Production System," *In Situ Resource Utilization (ISRU III) Technical Interchange Meeting*, Lockheed Martin Astronautics Waterton Facility, Denver, Colorado. Proceedings, convened by D. Kaplan and L. D. Clark, p. 29 (1999).

T. Dinh, S. Popovic, and L. Vuškovic, "Contribution of Dissociative Excitation to the Rate of CO₂ Decomposition in the RF Discharge of Martian Simulant Gas," 1999 Centennial Meeting of American Physical Society, Atlanta, Georgia, April 1999. Bull. Am. Phys. Soc. **44**, 1103 (1999).

G. Brooke, S. Popovic, and L. Vuškovic, "Production of Hydronium Ions for Proton Transfer Reaction Studies at Thermal Energies," 1999 Centennial Meeting of American Physical Society, Atlanta, Georgia, April 1999. Bull. Am. Phys. Soc. **44**, 1247 (1999).

S. Popovic and L. Vuškovic, "Acoustic Shock Wave Propagation in a Glow Discharge," 52st Annual Gaseous Electronic Conference, Norfolk, Virginia, October 1998. Bull. Am. Phys. Soc. **44**, 78 (1999).

T. Dinh, S. Popovic, R. Ash, and L. Vuškovic, "Influence of Gas Composition on the Dissociative Excitation Rate of CO₂ in RF Discharge," 52st Annual Gaseous Electronic Conference, Norfolk, Virginia, October 1998. Bull. Am. Phys. Soc. **44**, 25 (1999).

G. Brooke, S. Popovic, and L. Vuškovic, "Comparative Study of Ion Sources for Proton Transfer Reactions," 52st Annual Gaseous Electronic Conference, Norfolk, Virginia, October 1998. Bull. Am. Phys. Soc. **44**, 59 (1999).

M. Cekic and S. Popovic, "Processes in Microwave-Excited Lamps Containing Mercury and Noble Gas Based Excimers," 52st Annual Gaseous Electronic Conference, Norfolk, Virginia, October 1998. Bull. Am. Phys. Soc. **44**, 18 (1999).

*S. Popovic and L. Vuškovic, "Precursor Zone of an Acoustic Shock Wave in Weakly Ionized Gas," 2nd Workshop on Magneto- and Plasma Aerodynamics for Aerospace Applications, Moscow, Institute of High Temperatures, Russian Academy of Sciences, April 5-7, 2000.

*L. Vušković and Popović "Collisions of excited atoms in gas discharges," 20th Summer School and International Symposium on the Physics of Ionized Gases, September 4-8,

2000, Zlatibor, Yugoslavia. Book of Abstracts, p. 263, ed. Z. Lj. Petrović, M. M. Kuraica, N. Bibić, and G. Malović.

D. Djordjević, M. Popović, S. Popović, and L. Vušković, "Ion composition and acoustic effects in the expansion stage of high-pressure pulsed discharges," XVth Europhysics Conference on Atomic and Molecular Physics of Ionized Gases Miskolc-Lillafüred, Hungary, August 26-30, 2000. Book of Abstracts, p. 290, ed. Z. Donko, L. Jenik, and J. Szigeti.

D. Djordjević, M. Popović, S. Popović, and L. Vušković, "Molecular ions in noble-gas pulsed discharges," 20th SPIG, September 4-8, 2000, Zlatibor, Yugoslavia. Book of Abstracts, p. 405, ed. Z. Lj. Petrović, M. M. Kuraica, N. Bibić, and G. Malović.

T. Dinh, S. Popovic, and L. Vuškovic, "Decomposition Rate of CO₂ in a CCRF Discharge," 53rd Annual Gaseous Electronic Conference, Houston, Texas, October 2000. Bull. Am. Phys. Soc. **45**, 22 (2000).

S. Popvic and L. Vuškovic, "Interaction between Acoustic Shock Wave and Glow Discharge," 53rd Annual Gaseous Electronic Conference, Houston, Texas, October 2000. Bull. Am. Phys. Soc. **45**, 24 (2000).

S. Popvic, P. Kessaratikoon, and L. Vuškovic, "Ionization/Recombination Model for the Initial Stage of Pulsed Discharge," 53rd Annual Gaseous Electronic Conference, Houston, Texas, October 2000. Bull. Am. Phys. Soc. **45**, 40 (2000).

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L. Vušković, P. Kessaratikoon, and S. Popović, “Energy Pooling Processes in Partially Ionized Argon,” 2003 Annual DAMOP Meeting of The American Physical Society, Boulder, Colorado, May 2003. Bull. Am. Phys. Soc. **48**, 39 (2003).

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S. Popović, L. Vušković, and A. Mason “On Characterization of a Subcritical Microwave Discharge,” 57th Annual Gaseous Electronic Conference, Bunratty, Ireland, September 2004. Bull. Am. Phys. Soc. **49**, 23 (2004).

L. Vušković, S. Popović, and J. Drake “Laboratory Simulation of Martian Entry Plasma,” 57th Annual Gaseous Electronic Conference, Bunratty, Ireland, September 2004. Bull. Am. Phys. Soc. **49**, 68 (2004).

J. Drake, S. Popović, and L. Vušković, “Dispersion of a Stationary Acoustic Shock in a Supersonic Flowing Afterglow,” 58th Annual Gaseous Electronic Conference, San Jose, California, October 2005. Bull. Am. Phys. Soc. **50**, 54 (2005).

M. Rašković, R. Biazaran, S. Popović, and L. Vušković, “Niobium surface modification in a microwave discharge,” 58th Annual Gaseous Electronic Conference, San Jose, California, October 2005. Bull. Am. Phys. Soc. **50**, 20 (2005).

M. Rašković, S. Popović, and L. Vušković, “Electron-impact Ionization Rates of Niobium Oxides,” 2006 Annual DAMOP Meeting of the American Physical Society, Knoxville, Tennessee, May 2006. Bull. Am. Phys. Soc. **51**, 92 (2006).

M. Rašković, L. Vušković, S. Popović, L. Phillips, A.-M. Valente-Feliciano, S. B. Radovanov, and L. Godet, “Plasma Treatment of Bulk Niobium Surfaces for SRF

Cavities,” 10th European Particle Accelerator Conference (EPAC), Edinburgh, Scotland, 26-30 June 2006, poster MOPCH184, extended abstract at <http://epac06.org/general/poster/>

*S. Popović and L. Vušković, “Studies of Flow in Ionized Gas – Historical perspective, Contemporary Experiments, and Applications,” 6th International Conference of the Balkan Physical Union, Istanbul, Turkey, August 22-26, 2006, Book of abstracts (Invited Talk 8-I-001, Sec.8 Plasma and gas-discharge Physics) p. 55, University of Istanbul, Eds. S. A. Cetin and I. Hikmet.

*S. Popović and L. Vušković, “Aerodynamic Effects in Weakly Ionized Gases: Phenomenology and Applications,” 23rd Summer School and International Symposium on the Physics of Ionized Gases, Kopaonik, Serbia, August 28 – September 1, 2006, Book of Abstracts of Invited Lectures, p. 269 (Institute of Physics, Beograd, Serbia).

M. Rašković, S. Popović, S. P. Kuo, and L. Vušković, “Atomic Oxygen Emission from an Arc-Seeded Microwave Plasma Torch,” 23rd Summer School and International Symposium on the Physics of Ionized Gases, Kopaonik, Serbia, August 28 – September 1, 2006, Book of Contributed Papers, p. 487 (Institute of Physics, Beograd, Serbia, 2006).

M. Rašković, S. Popović, and L. Vušković, “Plasma Treatment of Bulk Niobium Surfaces,” 59th Annual Gaseous Electronic Conference, Columbus, Ohio, October 2006. Bull. Am. Phys. Soc. **51**, 20 (2006).

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*S. Popović, “Aerodynamic Effects in Weakly Ionized Gas: Phenomenology and Applications,” 59th Annual Gaseous Electronic Conference, Columbus, Ohio, October 2006. Bull. Am. Phys. Soc. **51**, 13 (2006).

M. Rašković, S. Popović, and L. Vušković, “Modification of Bulk Nb Surfaces using Ar/BF₃ and Ar/Cl₂ Plasmas,” 73th Annual Meeting of the Southeastern Section of the APS, Williamsburg, Virginia, November 2006. Bull. Am. Phys. Soc. **51**, 31 (2006).

D. J. Drake, J. Upadyay, S. Popović, and L. Vušković, “Stationary Shock Wave Structures in a Microwave Flowing Afterglow,” 73th Annual Meeting of the Southeastern Section of the APS, Williamsburg, Virginia, November 2006. Bull. Am. Phys. Soc. **51**, 32 (2006).

*S. Popović, M. Rašković, S. P. Kuo, and L. Vušković, “Reactive Oxygen Emission from Microwave Discharge Plasmas,” 5th EU-Japan Joint Symposium on Plasma Processing: Radicals and Non-Equilibrium Processes in Low-Temperature Plasmas, Serbian

Academy of Sciences and Arts, Belgrade, Serbia, March 6-10, 2007, Abstracts of Invited Lectures, p. I-22, Institute of Physics, Zemun, Serbia, Eds. Z. L.J. Petrovic, N. Mason, S. Hamaguchi, M. Radmilovic-Radjenovic.

M. Rašković, S. Popović, and L. Vušković, "Electron-impact Ionization Rates for BF_3 and its Fragments," 60th Annual Gaseous Electronic Conference, Arlington, Virginia, October 2007. Bull. Am. Phys. Soc. **52**, 42 (2007).

J. Upadhyay, M. Rašković, S. Popović, and L. Vušković, "Modification of Biased Bulk Nb Surface with Ar/Cl_2 Microwave Discharge Plasma," 60th Annual Gaseous Electronic Conference, Arlington, Virginia, October 2007. Bull. Am. Phys. Soc. **52**, 57 (2007).

D. J. Drake, B. Rodgers, S. Popović, and L. Vušković, "Structures of Stationary Shock Waves in Weakly Ionized Gas," 60th Annual Gaseous Electronic Conference, Arlington, Virginia, October 2007. Bull. Am. Phys. Soc. **52**, 62 (2007).

M. Rašković, L. Vušković, S. Popović, L. Phillips, and A.-M. Valente-Feliciano, "Plasma treatment of bulk niobium surface for SRF cavities," Research Expo 2008, Book of Abstracts p. 22, Norfolk VA, April 9 (2008).

J. Drake, L. Vušković, and S. Popović, "Kinetic and Experimental Studies of Martian Entry Plasma," Research Expo 2008, Book of Abstracts p. 22, Norfolk VA, April 9 (2008).

M. Rašković, L. Vušković, and S. Popović, "The High Quality Factor Niobium Cavities Preparation by Plasma Treatment", 15th Central European Workshop on Quantum Optics (CEWQO 2008), May 30- June 03, 2008, Belgrade.

J. Upadhyay, M. Rašković, S. Popović, and L. Vušković, L. Phillips, and A.-M. Valente-Feliciano "Mechanism of Niobium Etching in Ar/Cl_2 Microwave Discharge," 61th Annual Gaseous Electronic Conference, Dallas, Texas, October 2008. Bull. Am. Phys. Soc. **53**, 26 (2008).

D. J. Drake, S. Popović, and L. Vušković, "Characterization of $\text{Ar}/\text{H}_2/\text{Air}$ Supersonic Flowing Microwave Discharges," 61th Annual Gaseous Electronic Conference, Dallas, Texas, October 2008. Bull. Am. Phys. Soc. **53**, 66 (2008).

D. J. Drake, S. Popović, and L. Vušković, "Microwave Discharge in a Supersonic Flow of Simulated Martian Atmospheric Gas," 61th Annual Gaseous Electronic Conference, Dallas, Texas, October 2008. Bull. Am. Phys. Soc. **53**, 77 (2008).

J. Drake, L. Vušković, and S. Popović, " $\text{Ar}/\text{H}_2/\text{Air}$ Supersonic Flowing Microwave Discharges," 8th Graduate Research Symposium, March 2009, Williamsburg, VA. Book of abstracts, p.57 (2009).

- M. Rašković, K. Brannick, S. Popović, and L. Vušković, "Plasma Etching of Cu in Ar/Cl₂ Microwave Discharge," 8th Graduate Research Symposium, March 2009, Williamsburg, VA. Book of abstracts, p.60 (2009).
- J. Upadhyay, M. Rašković, S. Popović, and L. Vušković, "Mechanism of Niobium Etching in Ar/Cl₂ Microwave Discharge," 8th Graduate Research Symposium, March 2009, Williamsburg, VA. Book of abstracts, p.62 (2009).
- Drake, D. J., M. Nikolić, S. Miller, S. Popović, and L. Vušković, "Characterization of a Plasmoid in the Afterglow of a Supersonic Flowing Microwave Discharge," Proc. XXIX International Conference on Phenomena in Ionized Gases, Ed. A. M. J. Reyes, pp. 84, Cancun, Mexico, July 2009.
- S. Popović, M. Rašković, J. Upadhyay, L. Vušković, A-M. Valente-Feliciano, and H.L. Phillips, "Plasma Etching of a Single-Cell RF Cavity Asymmetric Electronegative Discharge," SRF 2009, Berlin, Germany. Proceedings of SRF, p. 427, September 2009.
- M. Rašković, S. Popović, J. Upadhyay, L. Vušković, H.L. Phillips, and A-M. Valente-Feliciano, "Plasma Treatment of Bulk Niobium Surface for SRF Cavities - Optimization of the Experimental Conditions on Flat Samples," Proceedings of SRF 2009, p. 751, Berlin, Germany, September 2009.
- Drake, D. J., M. Nikolić, S. Miller, S. Popović, and L. Vušković, "Characterization of a Plasmoid in the Afterglow of a Supersonic Flowing Microwave Discharge," Proc. XXIX International Conference on Phenomena in Ionized Gases, Ed. A. M. J. Reyes, pp. 84, Cancun, Mexico, July 2009.
- D. J. Drake, S. Popović, and L. Vušković, "Characterization of a Martian Simulated Discharge," 62nd Annual Gaseous Electronics Conference, Saratoga, NY, October 2009. Bull. Am. Phys. Soc. **54**, 45 (2009).
- M. Nikolić, D. J. Drake, P. Laurent, S. Popović, and L. Vušković, "Electron Density Measurements in a Supersonic Flowing Ar/H₂/Air Discharge," 62nd Annual Gaseous Electronics Conference, Saratoga, NY, October 2009. Bull. Am. Phys. Soc. **54**, 86 (2009).
- M. Raskovic, K. Brannick, S. Popović, and L. Vušković, "Plasma Etching of Cu in an Ar/Cl₂ Microwave Discharge," 62nd Annual Gaseous Electronics Conference, Saratoga, NY, October 2009. Bull. Am. Phys. Soc. **54**, 80 (2009).
- J. Uphdhyay, M. Raskovic, S. Popović, and L. Vušković, "Spectroscopic Characterization and Modeling of Ar/Cl₂ Microwave Glow Discharge," 62nd Annual Gaseous Electronics Conference, Saratoga, NY, October 2009. Bull. Am. Phys. Soc. **54**, 81 (2009).

D. J. Drake, S. Popović, L. Vušković, and T. Dinh, "Effects of Water Vapor Presence in Martian Atmospheric Entry Plasma," 48th AIAA Aerospace Sciences Meeting Including the New Horizons Forum and Aerospace Exposition, Orlando, Florida, Jan. 4-7 (2010).

D. J. Drake, M. Nikolić, S. Popović, L. Vušković, and T. Dinh, "Experimental and Kinetic Study of the Martian Atmospheric Entry Plasma," Proc. IEEE 37th International Conf. On Plasma Science, p. 153, Norfolk, VA, June 20-24 (2010).

J. Upadhyay, M. Rašković, S. Popović, L. Vušković, A-M. Valente-Feliciano, and H.L. Phillips, "Plasma Modification of Bulk Niobium Surface for SRF Cavities," Proc. IEEE 37th International Conf. On Plasma Science, p. 178, Norfolk, VA, June 20-24 (2010).

A. Samolov, M. Nikolić, J. Upadhyay, A. Godunov, S. Popović, and L. Vušković, "Tomographic Analysis of Plasma Sources with Distorted Cylindrical Symmetry," Proc. IEEE 37th International Conf. On Plasma Science, p. 195, Norfolk, VA, June 20-24 (2010).

M. Nikolić, D. J. Drake, P. Laurent, S. Popović, and L. Vušković, "Electron Density Measurements in Supersonic Flowing Discharges," Proc. IEEE 37th International Conf. On Plasma Science, p. 195, Norfolk, VA, June 20-24 (2010).

S. Popović, M. Nikolić, J. Upadhyay, and L. Vušković, "On Optimizing the Metastable Oxygen Production from Electrical Discharges," 41th AIAA Plasmadynamics and Laser Conference, p. 57, Chicago, IL, June 28-30 (2010).

M. Nikolic, S. Popović, R. Leiweke, B. Ganguly, and L. Vušković, "Dielectric Barrier Discharge and a Microwave Cavity Discharge in Synchronous Operation," 63rd Annual Gaseous Electronics Conference, Paris, France, October 2010. Bull. Am. Phys. Soc. **55**, 38 (2010).

M. Nikovic, A. Samolov, S. Popović, A. Godunov, and L. Vušković, "Tomographic Analysis of a Plasmoid in Supersonic MW Post-Discharge," 63rd Annual Gaseous Electronics Conference, Paris, France, October 2010. Bull. Am. Phys. Soc. **55**, 55 (2010).

D. Drake, M. Nikolic, S. Popović, and L. Vušković, "On the Kinetic Dispersion of Martian Entry Plasma," 63rd Annual Gaseous Electronics Conference, Paris, France, October 2010. Bull. Am. Phys. Soc. **55**, 67 (2010).

J. Uphadhyay, S. Popović, L. Vušković, L. Phillips, and A.-M. Valente-Feliciano, "Optimization of Plasma Parameters for Etching of Suprconducting Radio Frequency Cavity Surfaces in an Ar/Cl₂ Plasma," 63rd Annual Gaseous Electronics Conference, Paris, France, October 2010. Bull. Am. Phys. Soc. **55**, 118 (2010).

10. Research Experience

- 1973 - 1981 Strongly-coupled plasmas
1981 - 1989 Laser diagnostics of gases and plasmas (LIF, interferometry, scattering)
1983 - 1989 Photophysics of organic photochromatic materials
1982 - 1984 Optical and particle-beam diagnostics of rarefied gas and supersonic flows
1990 – 1994 Low density magnetized plasma; Chaos;
Nonlinear dynamics of charged particles
1990 – 1991 Conducted the experimental part of project “SDI Power Conditioning,”
sponsored by SDIO/DNA
1991 – 1995 Conducted the exper. part of project “Pulse Power Physics in Space,”
sponsored by SDIO/DNA
1992 – 1996 Conducted the experimental part of project “Propellant Plume Effects on
Advanced Lightweight Sensors,” sponsored by BMDO/ONR 1
1993 – 1996 Optical diagnostics of vortex-surface interaction in supersonic flow based
on the pulsed laser planar sheet Rayleigh Scattering.
1996 – present Atomic and molecular excited states relevant for high-pressure discharges.
1996 – present Microwave and RF induced plasmas and applications.
1996 – present Physical Chemistry of interstellar space and planetary atmospheres.

11. Teaching Experience

- 1977 – 1989 Lectures at Technical University, Niš, Yugoslavia
Undergrad. courses: Electrodynamics, Optics, and General Physics
Graduate courses: Plasma Science, Electrodynamics, Optics, and
Magnetohydrodynamics
1996 – present Recitations and substitute lectures in undergraduate Physics courses.
1996 – present Co-advising graduate students in the Physics Ph.D. program.

12. Member of Ph.D. Committees (Only those at Old Dominion University listed.)

Students graduated:

Thao Hoang Dinh, George M. Brooke IV, Prasong Kessaratikoon, Jan Drake

Students currently working on Ph.D. dissertation:

Ana Samolov, Bayram Torayev, Mustafa Canan

13. Managing Experience

- 1978 – 1981 Head, Light Sources R\&D Group (10 empl., 2 PhD)
1981 – 1985 Head, Laser R\&D Group (50 empl., 10 PhD)
1985 – 1989 Director, Institute of Experimental Physics (120 empl., 25 PhD)

14. Product Development

- 1976 – 1985 Xe flashlamps, Kr arc lamps, power supplies, triggering devices
1979 - 1985 Organic photochromatic materials and devices
1981 – 1989 Switching power supplies
1983 – 1987 Spot-welding and engraving laser machines

15. Custom Design

- Laboratory non-coherent light sources (up to 10 kW or 20 kJ)
- Capacitor banks (from 2 to 1000 kJ)
- Laser systems (up to 300 W or 30 J)
- Test equipment for lamps, lasers, power supplies and photochromatic filters
 - Rail gun (150 kJ, 3.34 km/sec)

16. Research Grants Awarded

Vušković, L., PI, and S. Popović, CoPI, December 1997 - November 1998, NASA Langley Research Center, ODURF No. 198117, “Shock Wave Propagation in Weakly Ionized Gas,” \$35,000.

Vušković, L., PI, S. Popovic, CoPI, and R. Ash, CoPI, October 1998 – April 1999, funded by University Space Research Association, ODURF 790421 “Radio Frequency Dust Removal in Microgravity Conditions,” \$40,000.

Vušković, L., PI, and S. Popović, CoPI, December 1998 – November 1999, ODURF 791711, funded by Accurate Automation Corp., “Weakly Ionized Gas Generator, Phase I,” \$40,000.

Vušković, L., PI, and S. Popović, CoPI, October 2000 – November 2002, ODURF 703451, funded by Accurate Automation Corp. / NASA, “Weakly Ionized Gas Generator, Phase II,” \$173,529.

Vušković, L., PI, and S. Popović, CoPI, April 2001 – February 2002, ODURF 112121, funded by NASA Langley Research Center, “Interaction of Acoustic Wave with Weakly Ionized Gas Generated by Microwave Discharge,” \$70,000.

Vušković, L., PI, and S. Popović, CoPI, June 2002 – June 2003, ODURF 124380, funded by NASA Langley Research Center, “Plasma Aerodynamics and Combustion,” \$90,000.

Vušković, L., PI, and S. Popović, CoPI, May 2003 – November 2003, ODURF 133931, funded by NASA Langley Research Center, “Magnetohydrodynamic Power Generator in Martian Simulant Gas for Regenerative Aerobreaking,” \$89,667.

Vušković, L., PI, and S. Popović, CoPI, June 2003 – September 2004, ODURF 133951, funded by NASA Langley Research Center, “Plasma Aerodynamics and Combustion,” \$36,992.

Vušković, L., PI, and S. Popović, CoPI, May 2004 – January 2005, ODURF 145731, funded by NASA Langley Research Center, “Magnetohydrodynamic Power Generator,” \$92,961.

Vušković, L., PI, and S. Popović, CoPI, October 2004 – March 2006, ODURF 151481, funded by NASA Langley Research Center, “Plasma Aerodynamics and Combustion,” \$17,000.

Vušković, L., PI, and S. Popović, CoPI, March 2006 – July 2007, ODURF 163581, funded by NASA Langley Research Center (NNL06AC57P), “Research of the Effect of Microwave-Generated Plasmas on Aerodynamic Flow,” \$33,132.

Vušković, L., PI, and S. Popović, CoPI, June 2007 – September 2009, ODURF 176071, funded by NASA Langley Research Center (NNL07AE36P), “Define and Characterize the Research & Development of Microwave Generated Surface Plasmas,” \$133,000.

17. Department of Physics Service (Only those at Old Dominion University are listed.)

2001-present Member of Graduate Recruitment and Admissions Committee
2001 Member of Safety Committee

18. Professional Service (Only those at Old Dominion University are listed.)

1996-present Paper Reviewer, Physical Review A
1996-present Paper Reviewer, Physical Review Letters
1999 Co-organizer of the Workshop on Non-Coherent Light Sources, held in October in conjunction with 1999 Gaseous Electronics Conference
1999-present Proposal Reviewer, U.S. Civilian Research and Development Foundation
2001-present Paper Reviewer, IEEE Transactions on Dielectric Materials and Devices
2001-present Paper Reviewer, Referee for scientific and scholarly journals
2003-present Paper Reviewer, Physical Review C
2003-present Paper Reviewer, Physics of Plasmas
2005-present Paper Reviewer, IEEE Transaction on Plasma Science
2005-present Paper Reviewer, Applied Physics Letters
2006-present Paper Reviewer, J. of Applied Physics
2007-present Paper Reviewer, European J. of Physics
2009-present Paper Reviewer, J. of Physics D – Applied Physics

19. Community Service

2010 FLL-Robotics, judge of high school proposals for Virginia/DC region