Sean McGuire

Maître de Conférences, CentraleSupélec
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Professional Information
CentraleSupélec
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Personal Information
Age: 35
Citizenship: USA

Education

Princeton University 2010 - 2015
PhD in Aerospace Engineering (*September 2015*)
GPA: 3.875 / 4.000
Supervisor: Prof. Richard Miles

Whitworth University 2006 - 2010
B.S. in Physics / B.A. in Mathematics
Graduated *summa cum laude* (GPA : 4.000 / 4.000)

Research Experience

Maître de Conférences, CentraleSupélec Sep. 2017 - present
Plasma research team, laboratoire EM2C
Research: Optical diagnostics for the study of plasma and gas dynamics.
Teaching: Heat Transfer, Thermodynamics, Fluid Mechanics, Student Workshops (Development of professional skills in engineering)

Postdoctoral Researcher, CNRS (EM2C/CentraleSupelec) Oct. 2015 - Aug. 2017
Application of laser and optical techniques to the study of high enthalpy flows and weakly ionized plasmas. Relevant techniques included absorption/emission spectroscopy, LIF and Raman scattering. Specific focus was on the application of these diagnostics to atmospheric reentry studies and identification of atomic/molecular species produced within the high temperature boundary layer of a reentry capsule as it reenters the earth's atmosphere.

Graduate Student, Princeton University Jul. 2010 - Aug. 2015
Development of nonintrusive gas diagnostic techniques for application to hypersonic flows, including new laser-based concepts for determining flow speed and sampling molecular population distributions.

Visiting Student, École Polytechnique Jun. 2013
Assessed the potential for using absorption spectroscopy to make concentration measurements in plasma assisted combustion systems. Implemented codes which simulated absorption spectra under various conditions and identified spectral features of interest.

Teaching Experience

Maître de Conférence, CentraleSupélec Sep. 2017 - present

- Teaching responsibilities: Organization of M2 level projects for Energy track students, Organization of weeklong course taught in collaboration with EDF
- Courses taught:
  - *Heat Transfer*: beginning and advanced courses (steady/unsteady heat transfer, radiation, convection and conduction)
  - *Thermodynamics*: thermodynamic cycles, power generation, phase changes for pure substances and mixtures, chemical composition
  - *Transport Phenomena*: heat transfer (radiation, conduction, convection), fluid mechanics (Navier-Stokes equations, compressible flow)
  - *Professional skills workshop*: leader/animator of student workshop which teaches students professional engineering skills such as leadership, working in a team, communicating and presenting results, etc...

Laboratory Instructor, CentraleSupélec / Physique des Plasmas et de la Fusion October 2015/2016
Designed and taught laboratory course for master's level students within the program Physique des Plasmas et de la Fusion (PPF). Course focused on the use of emission spectroscopy to study plasma systems.

Publications and Presentations

Journal Publications (last 5 years)

Tibère-Inglesse, A., **McGuire, S.**, and Laux, C., "Inferring gas temperature from N_2 emission via rotational distributions of the N_2 $B^3\Pi_g$ and $C^3\Pi_u$ states," *Plasma Sources Science & Technology*, *accepted (forthcoming).*

McGuire, S., Jacobs, C., Mariotto, P., Grimaldi, C., Tibère-Inglesse, A., and Laux, C., "Measurements and Modeling of Air Plasma Radiation in the VUV," *AIAA Journal of Thermophysics & Heat Transfer*, *accepted (forthcoming).*

Tibère-Inglesse, A., **McGuire, S.**, Mariotto, P., and Laux, C., "Measurements and Analysis of Rotational Temperatures obtained with Raman and Optical Emission Spectroscopy in a Nonequilibrium Nitrogen Plasma," *Plasma Sources Science & Technology*, 30 (125019), 2021.

Tibère-Inglesse, A., **McGuire, S.**, Mariotto, P., and Laux, C., "Experimental study of recombining nitrogen plasmas. Part II: Electronic population distributions and nonequilibrium radiation of atoms," *Plasma Sources Science & Technology*, 30 (125020), 2021.

McGuire, S., Tibère-Inglesse, A., Mariotto, P., Cruden, B., and Laux, C. "Measurements and modeling of CO 4th positive (A - X) radiation," *Journ. of Quant. Spect. and Rad. Transf.*, 245 (106855), 2020.

Tibère-Inglesse, A., **McGuire, S.**, Mariotto, P. and Laux, C., "Experimental study of recombining nitrogen plasmas: I. Vibronic population distributions and nonequilibrium molecular radiation," *Plasma Sources Science & Technology*, 28 (7), 2019.

Tibère-Inglesse, A., **McGuire, S.**, Mariotto, P., and Laux, C., "Validation cases for recombining nitrogen and air plasmas," *Plasma Sources Science & Technology*, 27 (11), 2018.

Journal Publications (older than 5 years)

McGuire, S., Tibère-Inglesse, A., and Laux, C., "Ultraviolet Raman spectroscopy of N_2 in a recombining atmospheric pressure plasma," *Plasma Sources Science & Technology*, 26 (11), 2017.

McGuire, S., Tibère-Inglesse, A., and Laux, C., "Infrared spectroscopic measurements of Carbon Monoxide within a high temperature ablative boundary layer," *Journ. Physics D: Applied Physics*, 49(48):485502, 2016.

Miles, R.B., **McGuire, S.**, et al., "New diagnostic methods for laser plasma- and microwave-enhanced combustion," *Phil. Trans. R. Soc. A*, 373, 20140338 (2015)

McGuire, S. and Miles, R. B., "Collision induced ultraviolet structure in nitrogen radar REMPI spectra," *Journal of Chemical Physics*, 141, 244301 (2014)

Doctoral Thesis

Sean McGuire. *Stand-Off Gas Phase Diagnostics by Microwave Detection of Laser Generated Ionization.* PhD thesis, Princeton University, 2015.

Conference Proceedings

Grimaldi, C., **McGuire, S.**, and Laux, C. "Infrared emission measurements of a recombining CO_2 plasma at atmospheric pressure", 9th International Workshop on Radiation of High Temperature Gases, september 2022.

Grimaldi, C., **McGuire, S.**, and Laux, C. "Infrared emission measurements of a recombining CO_2 plasma at atmospheric pressure", 2022 AIAA Scitech Meeting, (AIAA 2022-1782).

Grimaldi, C., **McGuire, S.**, Tibère-Inglesse, A., and Laux, C. "Infrared radiation measurements of a recombining CO_2 plasma at atmospheric pressure", 2021 AIAA Scitech Meeting, (AIAA 2021-0104).

McGuire, S., Tibère-Inglesse, A., Mariotto, P., Cruden, B. and Laux, C. "VUV radiation of high temperature CO_2/Ar plasmas", 2020 AIAA Scitech Meeting, (AIAA 2020-0732).
- Presented at AIAA Scitech 2020

Grimaldi, C., **McGuire, S.**, and Laux, C. "Temperature and radiation measurements of an atmospheric pressure CO_2 plasma", 2020 AIAA Scitech Meeting, (AIAA 2020-1708).

McGuire, S., Tibère-Inglesse, A. and Laux, C. "Carbon monoxide radiation in an equilibrium plasma torch facility", 2019 AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2019-1775).
- Presented at 56th AIAA Aerospace Sciences Meeting

Tibère-Inglesse, A, **McGuire, S.**, and Laux, C. "Atomic radiation from a recombining nitrogen plasma", 2019 AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2019-2068).

McGuire, S., Bailet, G. and Laux, C. "Development of a probe for in-situ radiative heat flux measurements at the surface of an ablator", 2018 AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2018-0498).
- Presented at 56th AIAA Aerospace Sciences Meeting

Tibère-Inglesse, A., **McGuire, S.**, and Laux, C. "Nonequilibrium radiation from a recombining nitrogen plasma", 2018 AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2018-0241).

McGuire, S. and Laux, C., "Experimental analysis of atomic Carbon and Carbon Monoxide production within a high temperature ablative boundary layer," *55th AIAA Aerospace Sciences Meeting*, American Institute of Aeronautics and Astronautics, 2017.
- Presented at 55th AIAA Aerospace Sciences Meeting

McGuire, S. and Miles, R. B., "Methods for Enhancing Radar REMPI Sensitivity," *53rd Aerospace Sciences Meeting*, American Institute of Aeronautics and Astronautics, 2015.
- Presented at 53rd AIAA Aerospace Sciences Meeting

McGuire, S. and Miles, R. B., "Radar REMPI measurements of N_2 rotational temperature," *45th Plasmadynamics and Lasers Conference*, American Institute of Aeronautics and Astronautics, 2014.
- Presented at AIAA 45th Plasmadynamics and Lasers Conference

McGuire, S., Chng, T. L. and Miles, R. B., "Nanosecond time-resolved 2+2 Radar REMPI measurements performed in molecular nitrogen," *44th Plasmadynamics and Lasers Conference*, American Institute of Aeronautics and Astronautics, 2013.
- Presented at AIAA 44th Plasmadynamics and Lasers Conference

McGuire, S., Zaidi, S., Dogariu, A. and Miles, R. B., "The intrinsic phase shift and its effect upon the measurement of airflow velocities using LITRA," *51st AIAA Aerospace Sciences Meeting*, American Institute of Aeronautics and Astronautics, 2013.
- Presented at 51st AIAA Aerospace Sciences Meeting

McGuire, S., Zaidi, S., Dogariu, A., Howard, P. and Miles, R. B., "Measuring the Velocity of a Supersonic Airflow Using Laser Ionization Tagged Radar Anemometry (LITRA)," *50th AIAA Aerospace Sciences Meeting*, American Institute of Aeronautics and Astronautics, 2012.
- Presented at 50th AIAA Aerospace Sciences Meeting

Research Grants, Honors, and Awards

Principal Investigator: Labex LaSIPS grant "PlasmaCARS" Feb. 2022 - present
- 57 500 euros or research funding obtained in collaboration with ONERA

Principal Investigator: ANR research grant "CO2REC" Feb. 2018 - Dec. 2022
- JCJC ANR grant, 252,828 euros or research funding obtained

Centre National d'Études Spatiales (CNES) Postdoctoral Fellowship beginning Oct. 2016

Program in Plasma Science & Technology Fellowship Sep. 2012 - Aug. 2015
Princeton University

Wu Prize for Excellence Jun. 2014
Mechanical & Aerospace Engineering Dept., Princeton University

Cummins Merit Fellowship Mar. 2011 - May 2012
Mechanical & Aerospace Engineering Dept., Princeton University