

Chris Wordingham



Education

Princeton University

PhD in Mechanical and Aerospace Engineering - *In Progress* (Expected 2017)
Electric Propulsion and Plasma Dynamics Laboratory



University of Alabama in Huntsville

BSE in Mechanical and Aerospace Engineering - *Completed* 2012
Summa Cum Laude (4.0 GPA)



Relevant Experience

Electric Propulsion and Plasma Dynamics Laboratory Princeton University - Sept. 2012 to Present



- Working toward the development of high-discharge-current hollow cathodes for use in the next generation of high-power (100-200 kW) Hall Thrusters.
- Currently attempting to characterize and predict the dense-plasma attachment length within orificed hollow cathodes using both experimental diagnostics and theoretical/computational modeling.
- Previously investigated the RF-Controlled Hollow Cathode (RF-CHC) concept in order to control dense-plasma contact with the thermionic emitter and increase the upstream plasma density within the hollow cathode insert region.
- Designed and prototyped a new, multiple-kilowatt-class graphite heater to reliably ignite the RF-CHC. Presented this work at the Joint Propulsion Conference 2015.
- Manufactured a large hollow cathode capable of a nominal discharge current of 1.3 kA, and tested up to 400 A with multiple propellants.
- Programmed and implemented a LabVIEW-controlled data acquisition system to obtain experimental data and control Telemakus RF components.
- Examined waveguide S-parameters and resonances using a vector network analyzer.
- Created and implemented a LabVIEW program to measure reflection (S11) and transmission (S21) over the available frequency range within the waveguide system.
- Operated and diagnosed problems with the high-vacuum system/vacuum chamber.
- Documented and submitted work to the International Electric Propulsion and AIAA/ASME/SAE/ASEE Joint Propulsion Conferences.
- Served as an Assistant in Instruction for undergraduate courses including engineering mathematics and engineering design.

Honors Thesis

University of Alabama in Huntsville - Spring 2012 to Summer 2012

- “Acceleration of SPH Plasma Simulations via GPU Computing”
- Developed a GPU-accelerated Nearest Neighbor Particle Search (NNPS) routine for a Smooth Particle Hydrodynamic (SPH) code written in MATLAB. Gained experience in CUDA/C++ GPU programming, MATLAB/C++ integration via MEX functions, and SPH modeling techniques.



Electric Propulsion Group at NASA Jet Propulsion Laboratory California Institute of Technology - Summer 2011

- Examined the effects of pulsed neutral gas addition on the plasma plume of a 200W Hall thruster. Measured plume ion fluxes with Faraday Probes automated using LabVIEW (GPIB commands).
- Processed and performed data visualizations using LabVIEW examining changes in ion flux angular distribution during neutral gas injection into the Hall thruster plasma plume.



Solver Group Cooperative Education Student ESI Group North America - Summer 2010 to Summer 2012

- Learned techniques for the successful application of commercial computational fluid dynamics software including grid generation/meshing, boundary condition application, scripting techniques for parametric case variation, and solver control.
- Performed validation cases and accompanying literature searches to verify software accuracy and facilitate model implementation.



Research Experience for Undergraduates Program University of Alabama in Huntsville - Summer 2009

- Investigated Finite Element Methods (FEM) and Flow-field Dependent Variation (FDV) techniques for computational fluid dynamics.



UAH Moon Buggy Team University of Alabama in Huntsville - Aug 2008 to Jan 2011

- Served as Steering Design Team Lead for first year, then Chief Engineer
- Intense teamwork, leadership, documentation, and presentation experience involving part design, analysis, and fabrication including CNC machining. Team won the Design and System Safety Awards for the 2010 competition.



Technical Experience

Programming Languages

- Proficient in MATLAB, LabVIEW, Python
- Experience with C/C++, CUDA, JAVA, G-Code, FORTRAN

Engineering Software

- Current: Mathematica 10, Creo 3.0, Comsol Multiphysics 4.4
- Past Experience: SolidEdge V20/ST, Surfcam Velocity 4.0, ESI CFD-ACE+ Suite, Patran/Nastran, Mathcad

Other Software

- Operating Systems: Windows (95/98/XP/Vista/7/8/10), Linux (predominantly Ubuntu)
- Document Generation: Microsoft Office, L^AT_EX
- Command Line Utilities: Bash, Git, GNU Make

Design and Manufacturing

- Extensive experience with part design and fabrication from several projects.
- Machined many of the experimental components used in my graduate work in-house.
- Spent hundreds of hours using manual lathes and milling machines.
- Programmed and operated a CNC milling machine using CAD/CAM software.

Conference Publications

1. **Wordingham, C. J.**, Taunay, P-Y. C., and Choueiri, E. Y., “Multiple-Kilowatt-Class Graphite Heater for Large Hollow Cathode Ignition,” 51st AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 2015.
2. Plasek, M., **Wordingham, C. J.**, Rojas Mata, S., Luzarraga, N., and Choueiri, E. Y., “Experimental Investigation of a Large-Diameter Cathode,” 50th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 2014.
3. Plasek, M., **Wordingham, C. J.**, and Choueiri, E. Y., “Modeling and Development of the RF-Controlled Hollow Cathode Concept,” 49th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 2013.
4. Plasek, M., **Wordingham, C. J.**, and Choueiri, E. Y., “Resonant Mode Transition in the RF-Controlled Hollow Cathode,” 33rd International Electric Propulsion Conference, 2013.

Honor Societies

- Tau Beta Pi Engineering Honor Society
- Omicron Delta Kappa Leadership Honor Society
- Pi Tau Sigma Engineering Honor Society, Chapter President 2009
- Sigma Gamma Tau Aerospace Engineering Honor Society
- Phi Kappa Phi University Honor Society
- Phi Theta Kappa International Honor Society

Awards, Scholarships, and Fellowships

- Francis Robbins Upton Fellowship, Princeton University
Highest honor an incoming graduate student can receive.
- UAH Presidential Scholarship
- Sen. Robert C. Byrd Honors Scholarship
- National Space Club Scholarship
- Glen May Memorial Scholarship
- Carolyne Pride and Robert Kirk Bell Scholarship
- Departmental Honors Award in Aerospace Engineering, UAH
- UAH Honors Scholar
- Outstanding Associate of Science Student, AB Tech
- Academic Achievement Award - Mathematics, AB Tech
- Academic Achievement Award - Physics, AB Tech