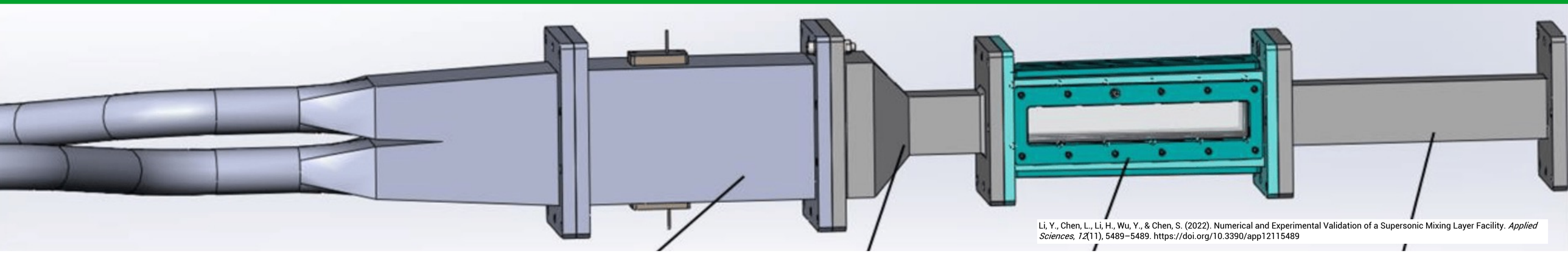
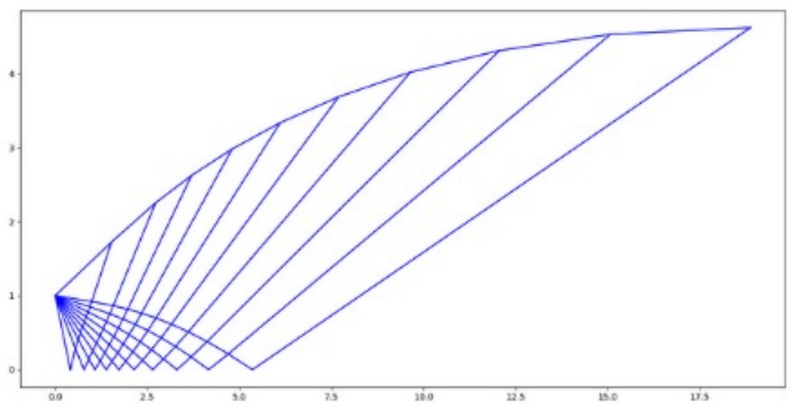
AUTONOMY RESEARCH CENTER FOR STEAHM

Autonomy for Sustainability

High-Pressure Turbulent Reactive Flows



Li, Y., Chen, L., Li, H., Wu, Y., & Chen, S. (2022). Numerical and Experimental Validation of a Supersonic Mixing Layer Facility. *Applied Sciences*, *12*(11), 5489–5489. https://doi.org/10.3390/app12115489



Synopsis

- Design test apparatus for use in supersonic research.
- Optimize components used under various conditions.
- Shock tube manufacturing for supersonic mixing and general high-speed aerodynamics.
- Generate guidelines for future experiments to improve understanding of mixing layer flow fields.

Research Objective

- Further the understanding of turbulent compressible layer flow fields.
- Improved efficiency in supersonic mixing (i.e., ramjet engines, rocket propulsion, etc.).
- Generate plans to build CSUN's first multifaceted supersonic wind tunnel.

Research Approach

- Create preliminary designs using fundamentals of fluid mechanics.
- Validate fluid behavior utilizing CFD simulations & peer-reviewed content.
- Manufacture equipment conforming to physical demands.
- Conduct experiments to validate simulations.

Research Results and Products

- Developed Python script for rapid prototyping of nozzle wall contours.
- Validated various nozzle cases ranging from Mach 3 to Mach 7.
- Compared frictionless simulations with isentropic solutions.

Commercialization and/or Societal Impact Opportunities

- **Application:** Aerospace
- **Key Values:** Development of mixing technology, increasing mixing efficiency, and decreasing emissions.
- **Potential Consumers:** Commercial Aviation, Defense, Other research institutions.

Team Names & Collaborators

ARCS Student:
Raphael Perez-Magallon, B.S., Mechanical Engineering
Faculty:
Dr. Vinicius Maron Sauer, Mechanical Engineering
Collaborators:
Josette Bellan

Citations

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