**MHD Generator Concept**

- Energy is extracted in the form of a Hall current generated via the motion of the plasma torch through an externally applied B-field.
- No moving parts
- Can augment existing fossil fuel plants to increase fuel efficiency
- End goal of this project: utilize schlieren imaging diagnostic to obtain radial density profile of an MHD generator’s plasma jet

**The Schlieren System**

- Two-color schlieren allows evaluation of electron (e), ion (+), and neutral (n) refractivities \((N = n_1 + n_2 + n_n)\) separately.
- \(N_{el} = N_e + N_i + N_n\)
- \(N_{el} \propto \lambda n_1\)
- \(N_{el} \propto \alpha_{el}(\lambda) n_1\)
- Blue \(\lambda = 450\) nm at the resonant frequency for ions and/or neutrals
- Near-infrared \(\lambda = 830\) nm to image the electrons
- Z-type 2-mirror system
- No coma or chromatic aberrations
- Cost effective

**System Diagnostics and Sensitivity Analysis**

- Image of target card used to evaluate spatial resolution. Setup can distinguish at least 6.8 lp/mm, or lines that relief-cuts in high-Z PFC material are 147\(\mu m\) apart.
- Index of refraction profile for various errors in choice of center. Demonstrates that diagnostic is extremely sensitive to choice of center.

**Conclusions and Further Research**

- Python image analysis software developed to evaluate index of refraction, and hence densities of different species, in axisymmetric plasma jets
- Next step: apply image analysis to MHD generator relevant plasma jet burning with hydrocarbon combustion products and seed metals
- Will aid in investigations of arcing behavior near MHD generator electrodes

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**References**


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