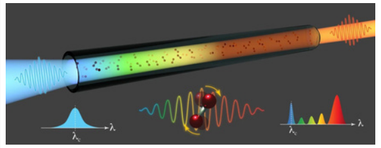
Modeling Pulse Propagation Through Gas-Filled Fibers

By Elyse Cabrera

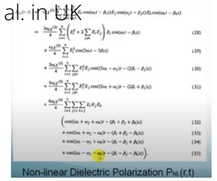
Introduction

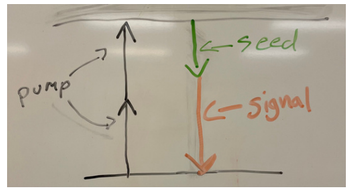
- Simulation of laser propagation through hollow capillary fibers filled with pressurized gas
- Induce nonlinear effects like Four Wave Mixing



Process

- Learned how to perform basic coding in Julia
- Luna = simulation developed by John Travers et al. in UK

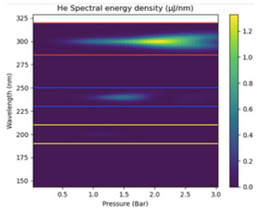


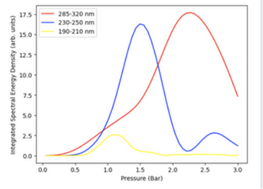


- Edited program to produce Wavelength vs. Pressure plots at different seed wavelengths

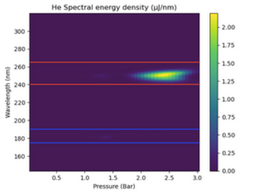
Results: Pressure (He)

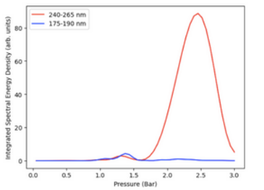
600 nm





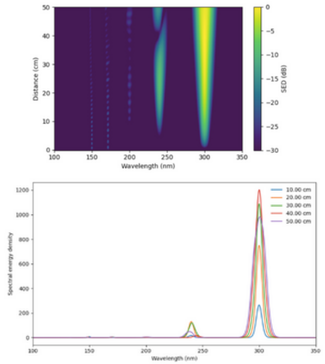
1000 nm



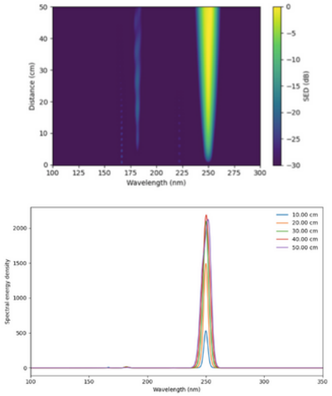


- Variation in the optimal pressure at which phase-matching occurs

600 nm 2.45 bar

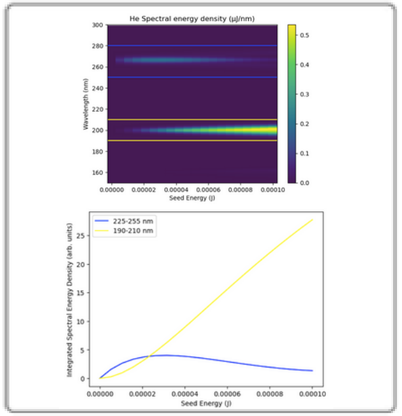


1000 nm 2.5 bar



Results: Wavelength

- Seed energy influences signal wavelength at different pressures



Conclusion

Applications:
- UV pulses needed to study photochemical reactions
- Four Wave Mixing replacing more conventional methods like nonlinear crystals

Extend Work:
- Explore with different parameters: type of gas, pump pulse energy etc.

Acknowledgements

I would like to thank my mentor, Ruaridh Forbes, for supporting my work this summer.
https://github.com/LupoLab/Luna.jl