

# Experimental and Theoretical Demonstration of Tunable Few-Femtosecond UV Pulses Formed Via Soliton Dynamics

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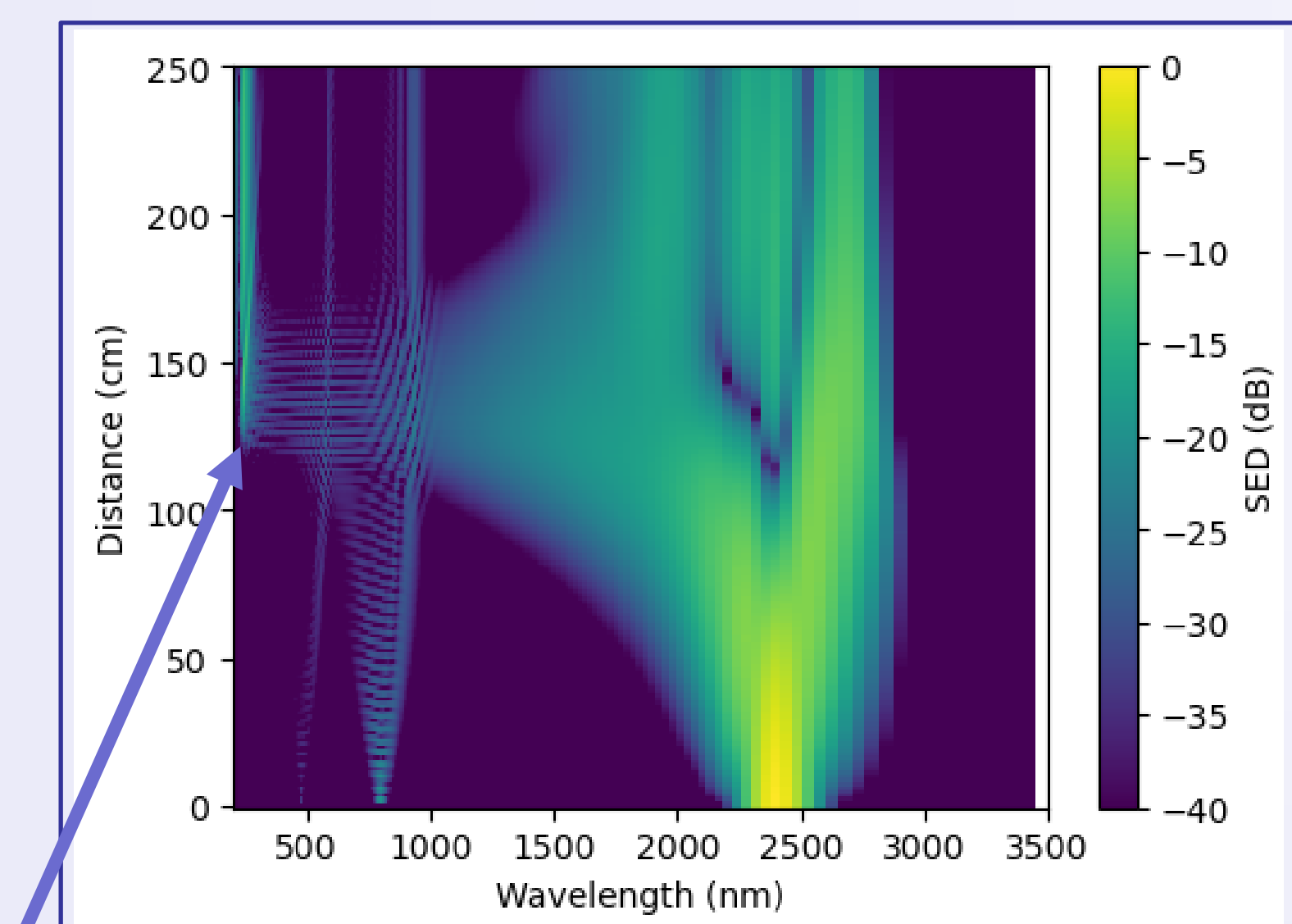
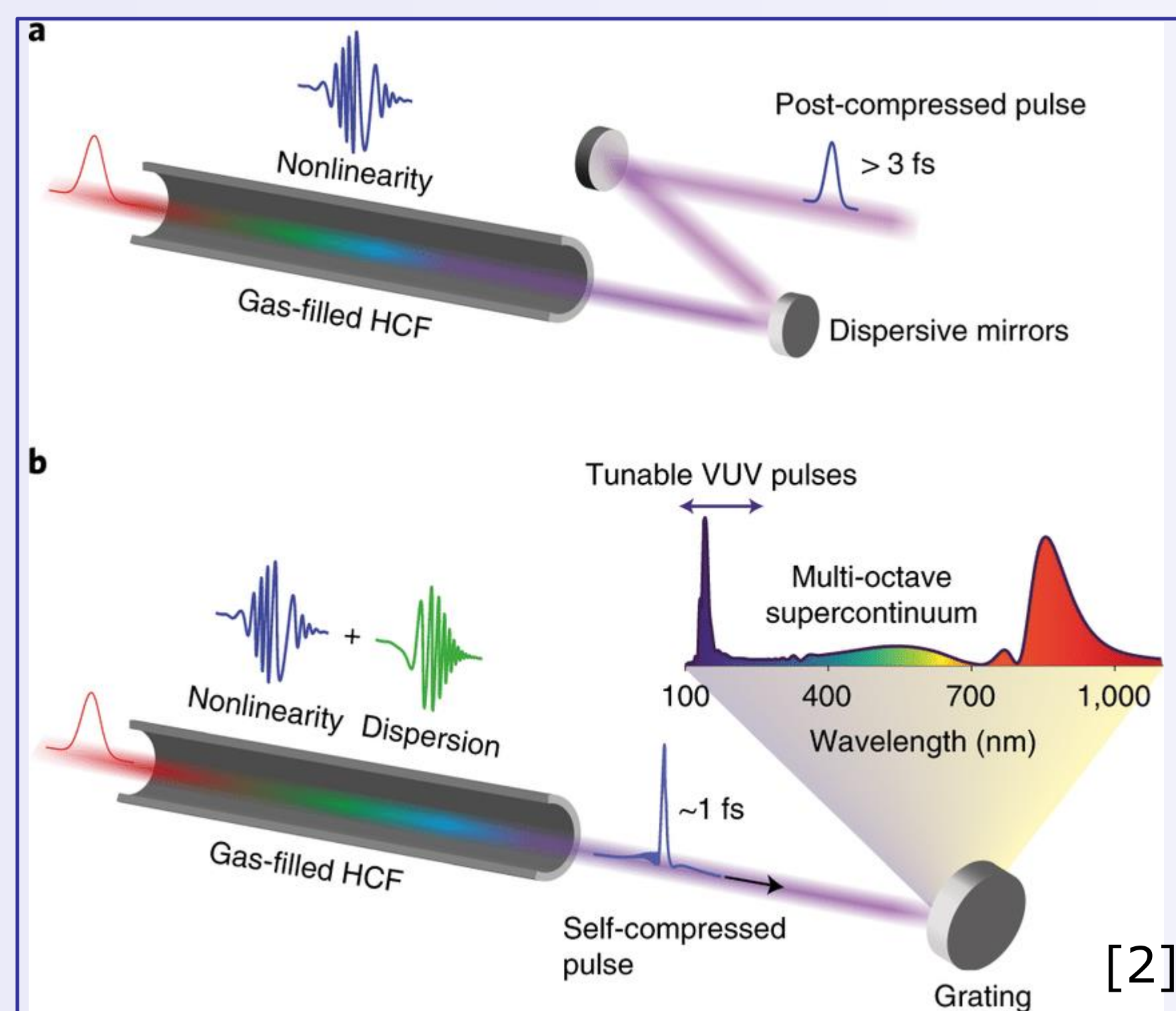
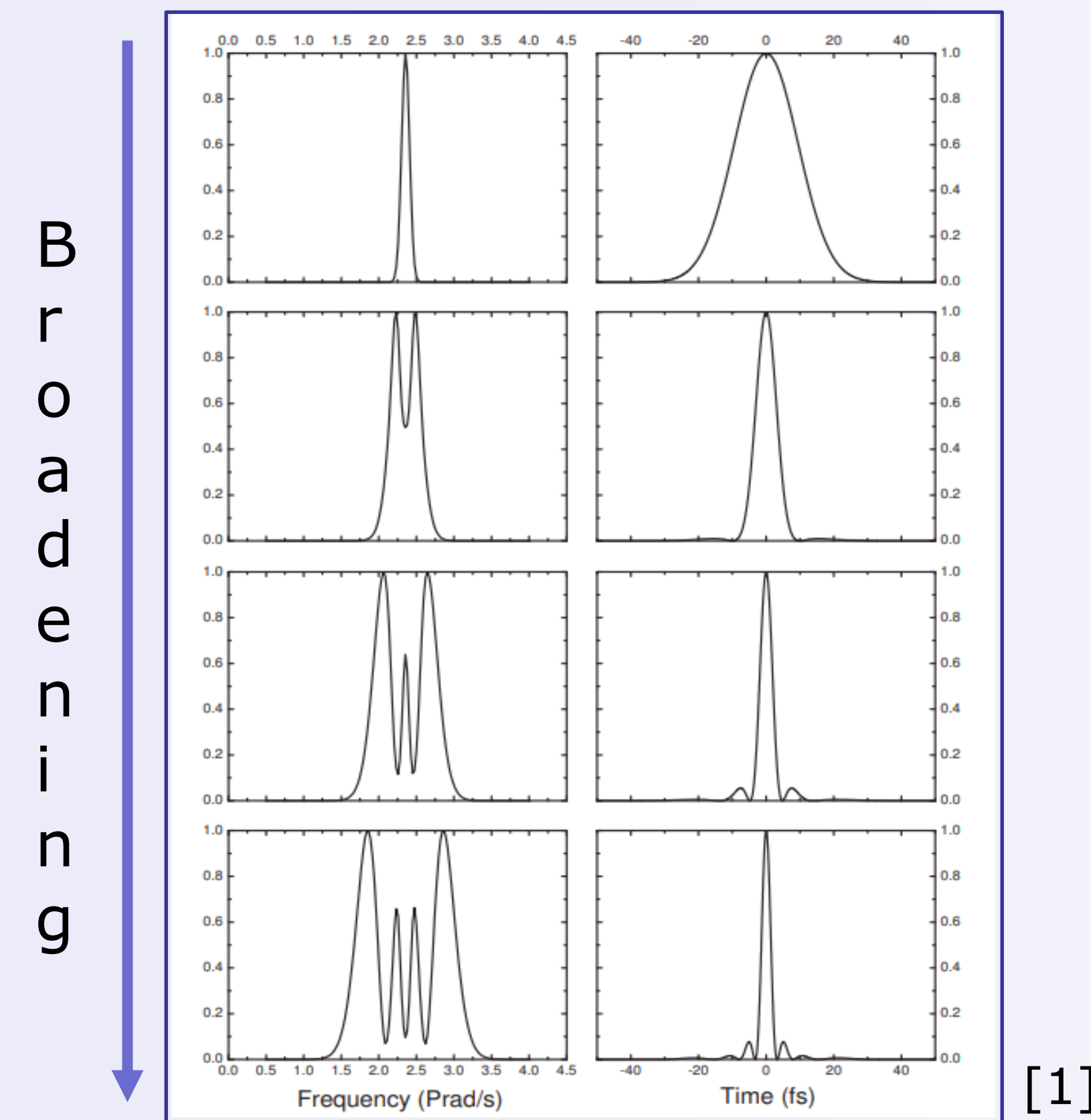


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## Background

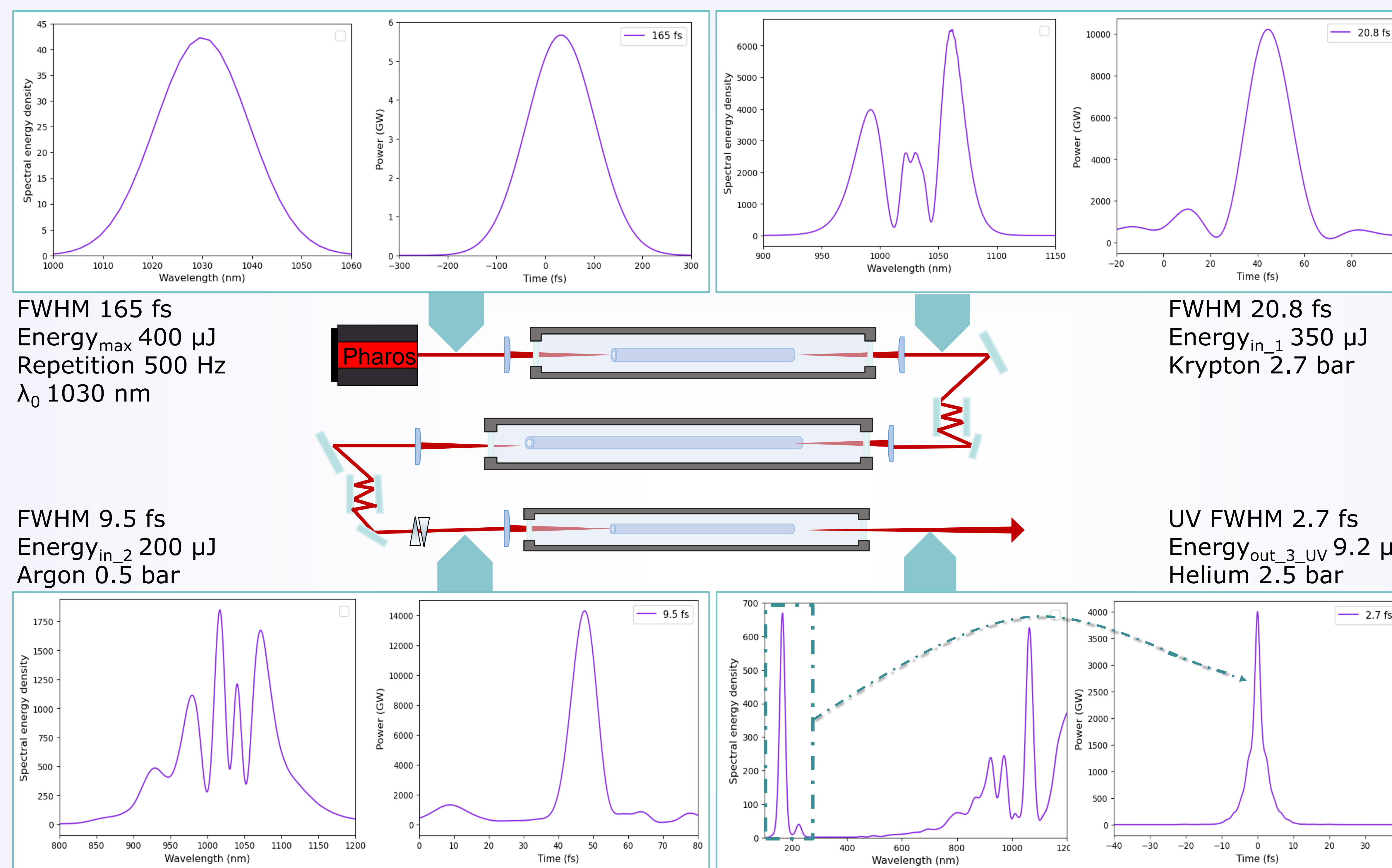


Shedding Resonant Dispersive Wave (RDW)

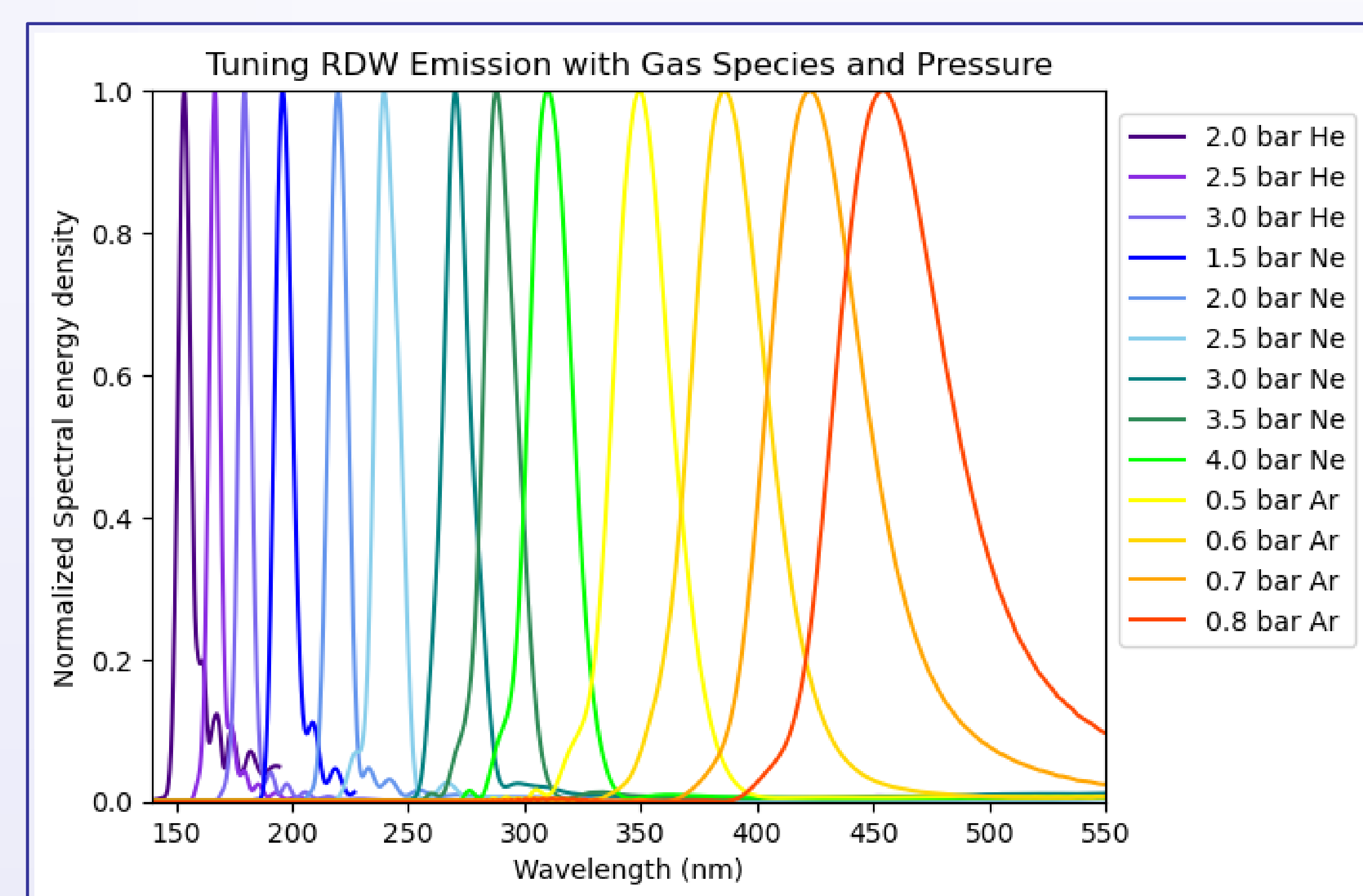
## Impacts

Broadly tunable ultrashort laser sources across the UV/Vis will have a profound impact on AMO, Chemical and Material Science ultrafast experiments at LCLS

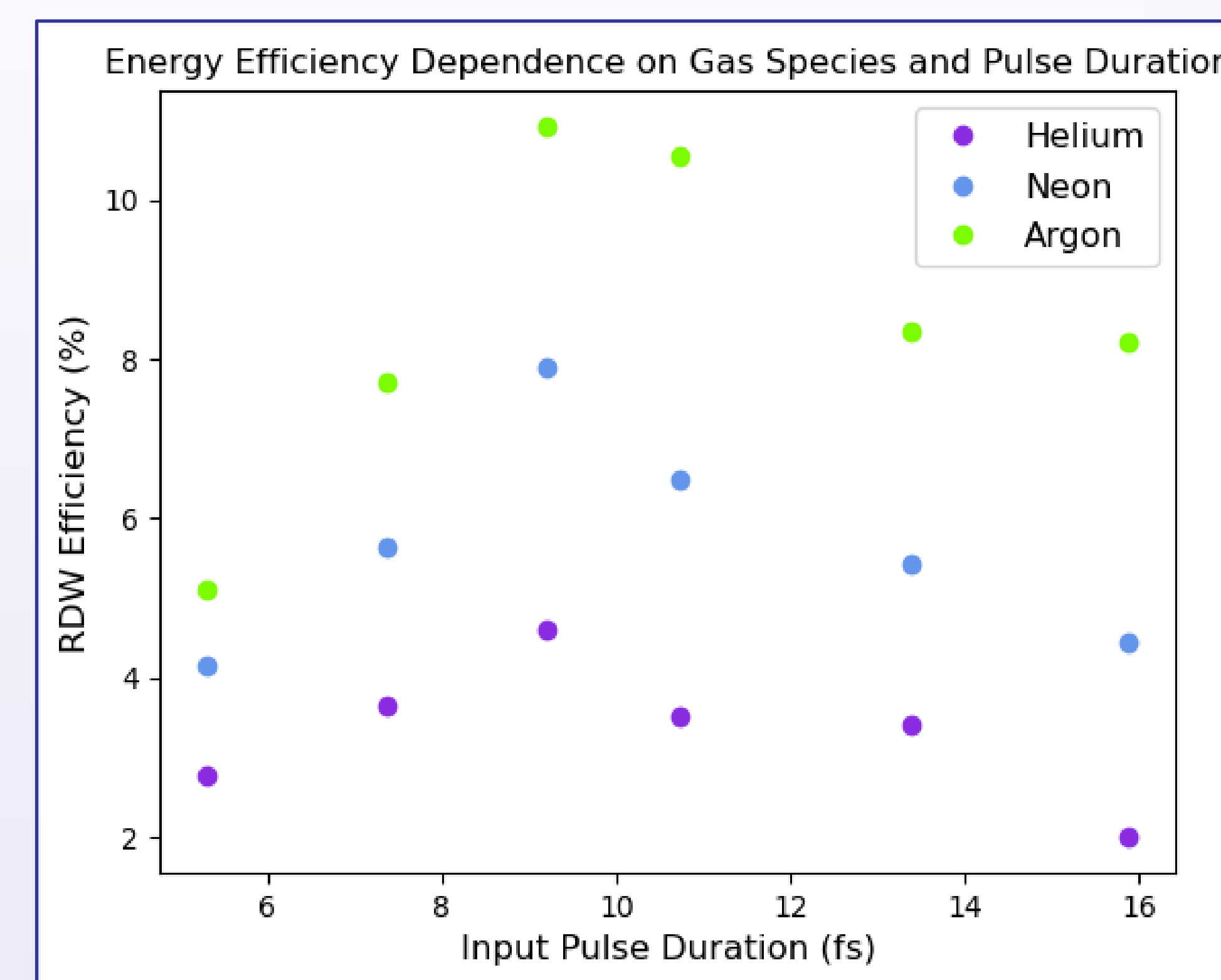
## Experiment Setup



## Results

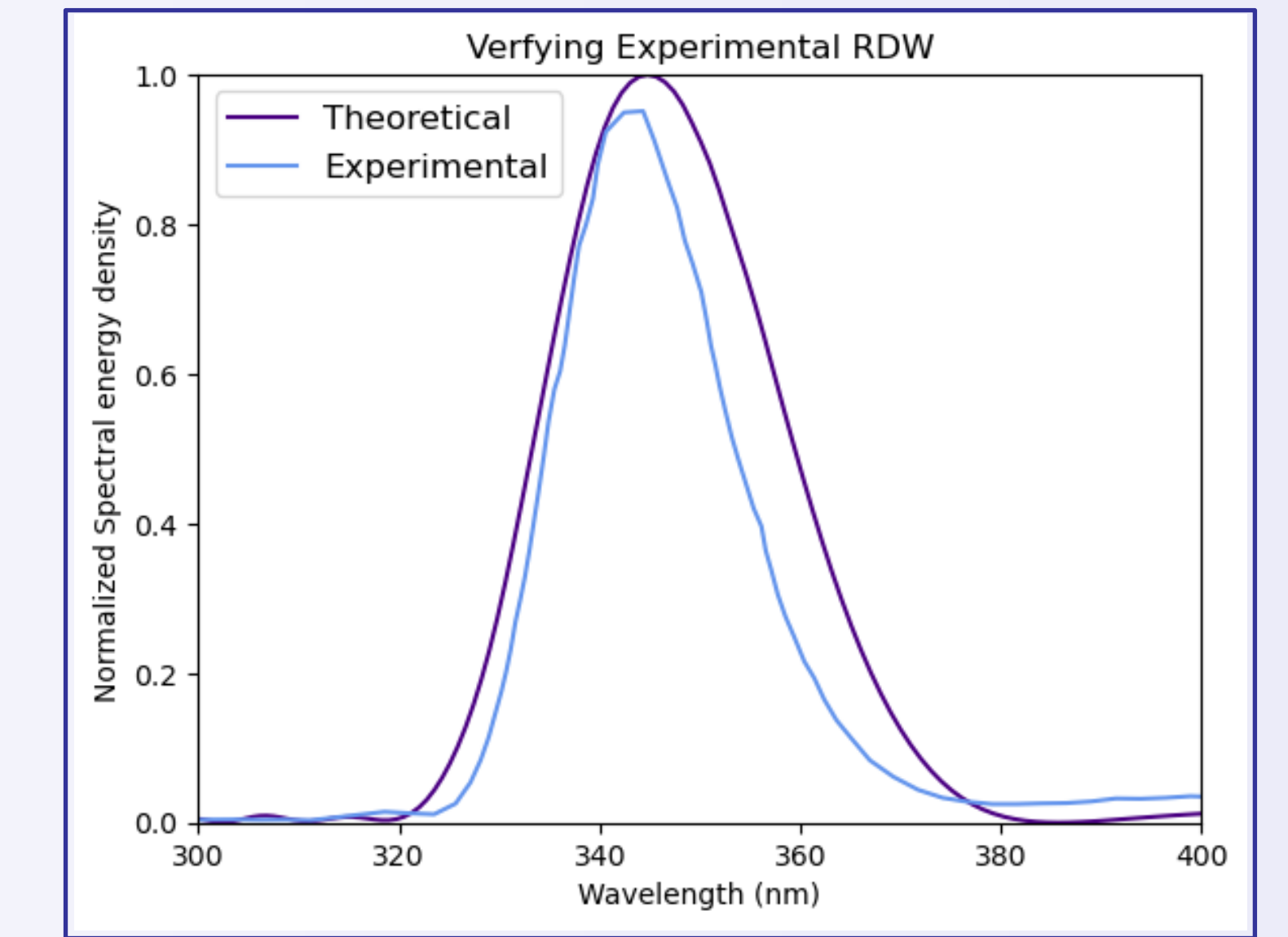


Balance dispersion and nonlinearity to tune pulses from Vacuum UV to Visible with relatively high energy conversion

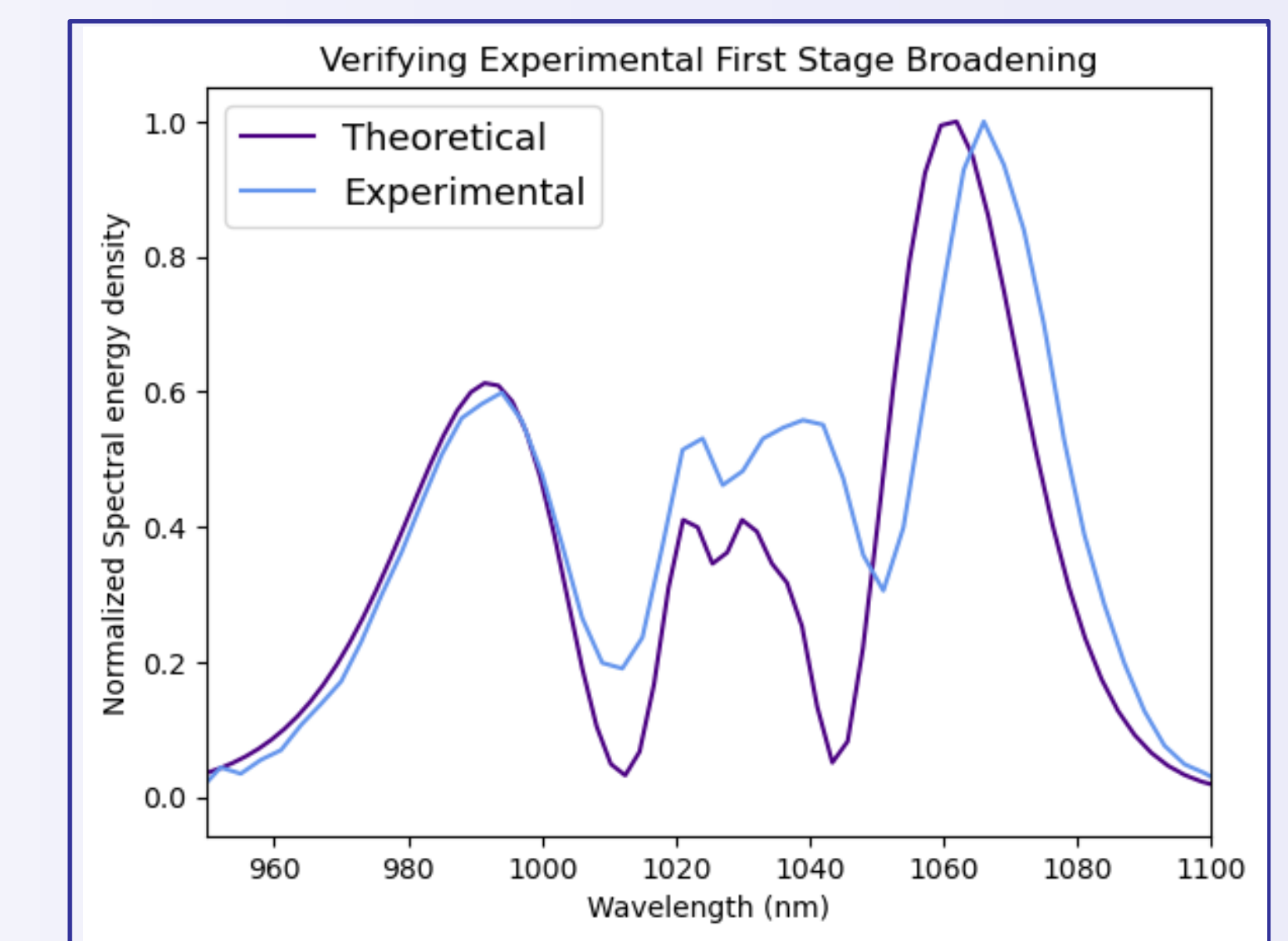


Efficiency highly dependent on gas species, input pulse duration, and physical parameters such as alignment

## Benchmarking Simulation Results



Theoretical simulations used in lab environment to identify mode, spectral broadening, tuning parameters for specified wavelength, and efficiency limits



## Conclusions

- RDW emissions range from Vacuum UV to Visible – 143 to 474 nm
- Ultrashort UV pulses from 1.5 to 4.5 fs
- Efficiencies up to 12%, energy up to 11 μJ
- Scalability to high repetition rates and average power

## References

- [1] Robinson, Joseph. The generation and application of intense, few-cycle laser pulses. University of London, London, UK (2006).  
 [2] Travers, J.C., Grigorova, T.F., Brahms, C., Belli, F. High-energy pulse self compression and ultraviolet generation through soliton dynamics in hollow capillary fibres. Nat. Photon Articles. 13, 547-554 (2019).

## Acknowledgments

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