Nanotechnologies

ENORA ULTRAFAST LASER

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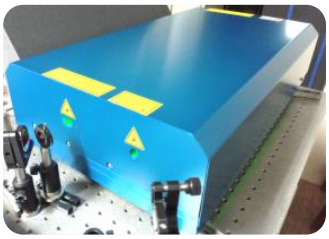
OVERVIEW

Here we address the development and characterization of an **ultra-broadband 7 fs laser oscillator** (ENORA, Sphere ultrafast Photonics) for **multicolor non-linear imaging**, namely, the SyncRGB-FLIM technique[1,2]. The spectral phase of the pulses will be controlled by a **pulse shaper** coupled to the SyncRGB-FLIM microscope developed at INL.

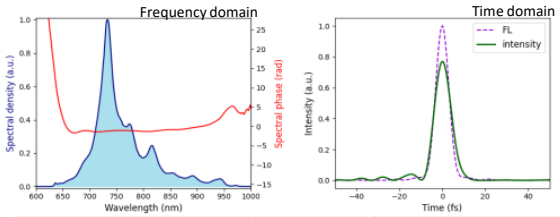
Motivation	Why	How
Broadband femtosecond laser for multicolor nonlinear imaging.	Takes advantage of the broad spectrum to excite multiple two-photon absorption dyes.	Using a compact custom-built a sub-7 fs tabletop ultrafast laser and a pulse shaper.

Key point: The shorter the pulse, the larger the spectrum



LASER CHARACTERIZATION

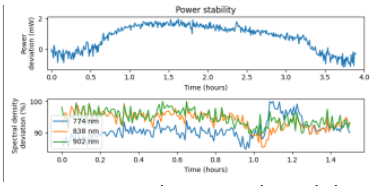
1. Using d-scan technique [3]



Central wavelength	TL pulse width	Spectral range*	Repetition rate	Avg Power *
760 nm	7 fs	630-1040 nm	80 MHz	100-180 mW

*Laser spectra (and power) can be tuned moving intracavity wedges.

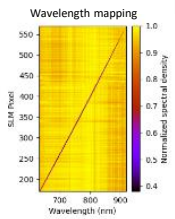
2. Laser stability over time



Power and spectral stability under air conditioning airflow. Absence of CW and stable mode-locking.

PULSE SHAPER

A pulse shaper to control the spectral phase of ultrashort pulses was built and is being tested.



CONCLUSIONS

➞ The compact laser system was designed, built and characterized for multicolor imaging;

➞ Laser power and mode-lock spectrum are stable under small variations of temperature and humidity.

Future work: Couple the pulse shaper with the SyncRGB microscope to enhance two-photon excitation.

REFERENCES

[1] C. Maibohm *et al.*, *Biomedical Optics Express*, **10**, 2019, 1891-1904.
[2] R. Weigand *et al.*, *Optica Pura y Aplicada*, **46**, 2013, 105-110.
[3] M. Miranda *et al.*, *Optics Express*, **20**, 2012, 18732-18743.

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