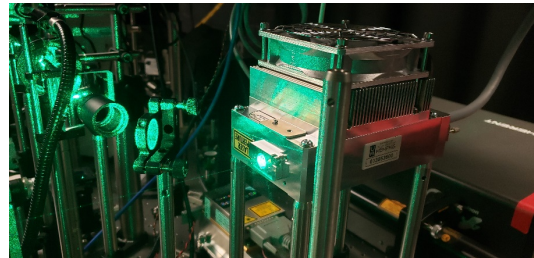


## Instrument Capabilities and Usage Policy

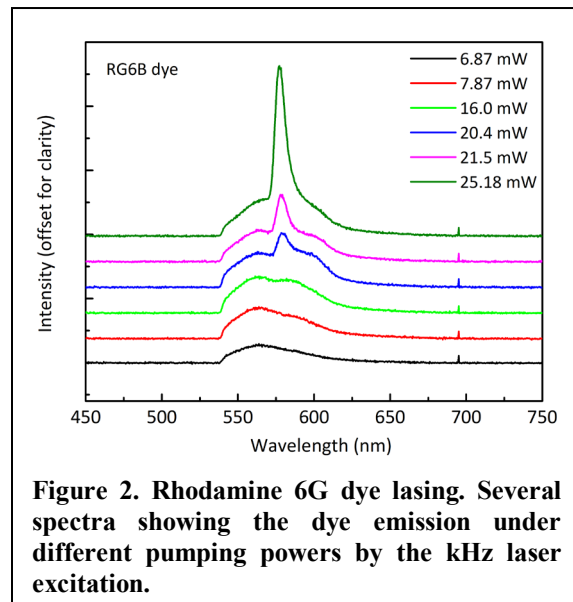
A kHz Flare NX 515-0.6-2 Air Laser System (Figure 1) was acquired from Coherent Inc during the Spring semester, 2019. The laser system allows for the measurements of physical and chemical processes that occur at nanosecond to microsecond time scales. Due to its high pulse energy (up to 300  $\mu\text{J}/\text{pulse}$ ) and short pulse duration ( $\sim 1$  ns,) the laser will allow exploration of laser induced fluorescence spectroscopy, materials processing, time-resolve spectroscopy and more. Currently, this is the only kHz system available on UofM Campus. The proposed laser allows a direct integration with several other instrument (micro- and time-resolve photoluminescence setups, confocal imaging and timing) of the Nanophosnics Lab, which extends the possibilities for complicated cutting edge studies.

The instrument offers a powerful capability to study of the broad areas of physics, materials science, chemistry, and biology in the time domain. These include the studies of single nanomaterial structures such as nanocrystals, semiconductor nanowires and rods, 2-dimensional dichalcogenides, organic dye molecules, and especially single photonic, plasmonic nanostructures at an extended time frame. Figure 2 shows an example of an optical pumping experiment using the newly acquired laser system. The laser was used to pump a Rhodamine 6G solution and the stimulated emission was detected, showing the resulted lasing emission.

The kHz laser system includes a laser head and a power supply controller. The system produces a laser radiation at 515 nm, which is suitable for excitation of many materials, with pulses on demand from single shot to 2 kHz. The pulse energy can be as high as 300  $\mu\text{J}/\text{pulse}$  and pulse duration of 1 nanoscond. The solid-state technology ensures long lifetimes, increasing quality and throughput and superior performance. The requested laser system can easily be integrated with current optical setups of the Nanophotnics Lab. For example, by integrating with the existing bright/dark field microscope



**Figure 1. Picture of the newly installed laser system, which has been integrated with other optical components in the Nanophotonics Lab (MN 107).**



**Figure 2. Rhodamine 6G dye lasing. Several spectra showing the dye emission under different pumping powers by the kHz laser excitation.**

Located in MN 107 | Contact: Dr. Thang Hoang, [tbhoang@memphis.edu](mailto:tbhoang@memphis.edu), 901.678.3122

(equipped with a set of 5X, 10X, 20X, 50X and 100X objective lens) will allow optical access to optical spectroscopy of single nanostructures

For user access from outside of the Department Physics and Materials Science, no special arrangement is needed. Users will first need to contact appropriate personnel (Presently, Dr. Hoang, email [tbhoang@memphis](mailto:tbhoang@memphis.edu) is responsible for maintaining of the system) for available time. The system can be used together with other spectroscopic equipment in the Nanophotonics Laboratory, including an ultrafast laser, high spectral, temporal and spatial resolution spectroscopic setups and other polarization optics. To this end, the users are required to have some basic training regarding the laser safety and operations, and uses of spectroscopic equipment.

A fee structure is established for use of above facilities for both internal and external users. The fee structure is determined with reference to Integrated Microscopic Center (IMC) on campus as shown below. For those faculty who contributed their own research funds to the purchase of facilities in the Nanophotonic Lab, their contributed funds will be considered as prepaid user fees for future service. The recovered cost will go towards regular maintenance, contract service, and consumable items.

**All rates hourly. Fees are charged in whole hour increments with the minimum charge of 1 hour.**

<b>Instrument</b>	<b>Internal User Rates</b>	<b>External User, Non-Profit Organization Rates</b>	<b>External User, For Profit Organization Rates</b>
Nanophotonics Lab	\$50	\$80	\$100
Technical Assistance	\$50	\$80	\$120

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