

## Introducing the New Vanguard 2000-HM 532 – A New Solid-State Pump Source for Synchronously Pumped Dye Lasers

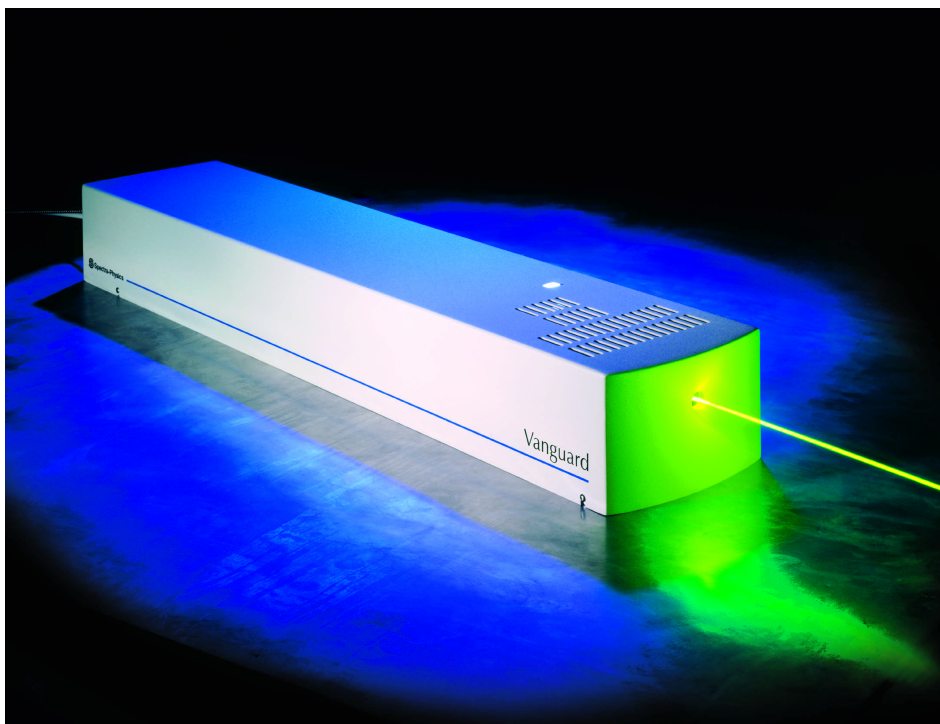


Figure 1. Vanguard 2000-HM 532.

Are you struggling to maintain your present synchronously pumped ultrafast dye laser experiments because your mode-locked pump laser is obsolete and no longer supported by the manufacturer? Maybe, given the lack of support, you've already "mothballed" your ultra-fast dye lasers altogether.

The good news for hundreds of researchers who've spent valuable funding dollars on ultra-fast dye

laser systems is that there is once again a commercially available pump source. The best news is that it's all solid-state, diode pumped and less expensive than the older flashlamp pumped mode locked YAG (or YLF) lasers ever were.

Spectra-Physics is proud to introduce the most recent addition to its quasi-CW mode-locked product line – the Vanguard 2000-HM532. The Vanguard 2000-

HM532 was specifically designed as a pump source for ultra-fast dye lasers. This rugged laser produces over 2 Watts at 532 nm and uses cutting edge passive mode locking technology to deliver ~10 picosecond pulses at either 76 or 80 MHz repetition rates.

A single ProLite™ series diode module pumps the laser head. As with all diode pumped solid-state lasers produced by Spectra-Physics, the diode is located remotely in the power supply. This makes replacement of the single diode module a simple task requiring no optical alignment of the laser head or down-stream optics (including your dye lasers).

### Ultrafast Dye Lasers vs. Ti:Sapphire

Why should scientists revitalize their old ultrafast dye lasers? Are there any advantages over newer Ti:Sapphire ultrafast technology? From an economic and legacy perspective the answer is clearly yes! In the last two decades a number of laser manufacturers, including Spectra-Physics, have sold hundreds of ultrafast dye lasers, the majority of which are still func-

tional. With the purchase of a new mode-locked pump source, you can revitalize an entire laboratory. Plus, ultrafast dye lasers do have certain advantages over Ti:Sapphire technology:

- **Wavelength Advantage** - many organic chromophores absorb at 580-660 nm and 290-330 nm. These wavelengths are ideal ranges for dye lasers and more difficult for Ti:S.

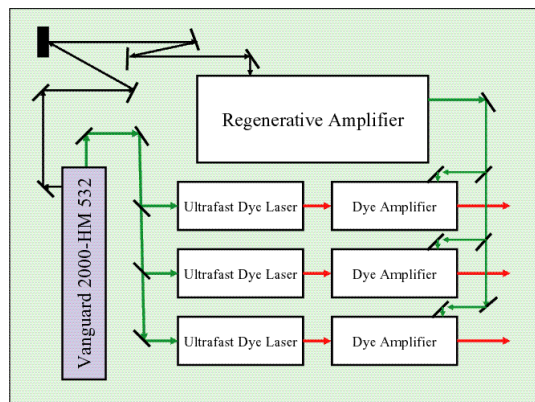
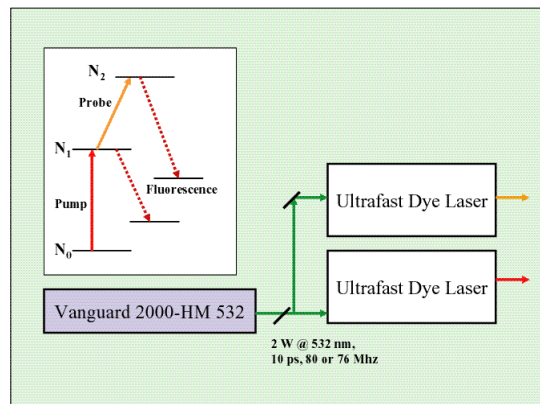
- **Cavity Dumping Advantage** - allows one to select pulses at repetition rates less than that intrinsic to the laser cavity length - this is critical for molecules (especially bio-molecules) that do not recover between two subsequent pulses (~12 ns at 80 MHz)

- **Synchronization Advantage** - more than one dye laser can be easily synchronized. This is more complicated with Ti:S sources.

## Typical Experiments

Pump-probe spectroscopic techniques using synchronized lasers have been used in many applications over the past two decades. The basic principle behind the pump-probe technique is illustrated in the inset of Figure 2. A fast laser pulse on a given transition excites the molecules under investigation from ground to excited state. A probe pulse with a variable delay  $\tau$  against the pump pulse probes the time evolution of the population density  $N_1$  ( $\tau$ ). Fixed frequency synchronized lasers can be used if the energy lev-

**Figure 2.** Typical mode-locked synchronously pumped dye laser experimental set-up where multiple dye lasers are pumped by a single Vanguard 2000-HM 532 mode locked laser. The inset illustrates the pump-probe technique where fluorescence is used to monitor the fast time evolution of the population density  $N_1$  ( $\tau$ )



Approximately 1 Watt of residual IR (stretched to 60 ps) is used to seed a regenerative amplifier which pumps 3 separate dye amplifiers. The resulting amplified dye output conversion efficiency is ~ 20%. Amplified dye laser pulsewidths were measured shorter than 500 fs.

els happen to be in resonance with the laser frequencies. However, a broader application range is opened by a system that uses two (or more) independently tunable mode-locked dye lasers, pumped by the same pump laser (see Figure 2). A dye amplifier system can be added to each system to amplify the picosecond pulses from the mode-locked pump source. A typical configuration is shown in Figure 3.

**Figure 3.** Typical configuration for a dye amplifier system pumped using the green (532 nm) and residual IR (1064 nm) output of the Vanguard 2000-HM 532. Approximate performance levels from a recent installation where the 2-Watt, 10 ps, 532 nm output of the Vanguard is used to pump three ultrafast dye lasers.

So if you're looking for a new and exciting way to revitalize your ailing sync. pumped dye laser laboratory (on a budget), contact your local Spectra-Physics office and ask about the Vanguard 2000-HM 532.

Contact us to see how you can integrate this exciting new technology into your research or into your industrial/OEM application. In North America, call 1-800-SPL-LASER (775-5273) E-mail: [sales@splasers.com](mailto:sales@splasers.com) Web: <http://www.spectra-physics.com>