Compact NIR DPSS lasers for optical tweezers

The figure on the right shows a setup consisting of a steerable laser trap. The setup was geared towards calibration of trap stiffness and made use of a Cobolt Rumba™ 1064 nm, 500 mW laser to generate the trap.

The laser performed very well, allowing the customer to form a stable trap using only a low-cost and relatively low NA oil-immersion lens. The laser was used to trap and steer small (1 µm) polystyrene microspheres in aqueous solution and close to the flowcell surface.

The translation stage on which the oil-immersion trapping objective (O1) is mounted is visible, but not the oil-immersion lens itself, as it is hidden by the X-Y sample stage (S1). The objective used to collect light after the trap (O2) is followed by a second dichroic mirror (D2) used to reflect light into a position-sensitive detector (PSD).

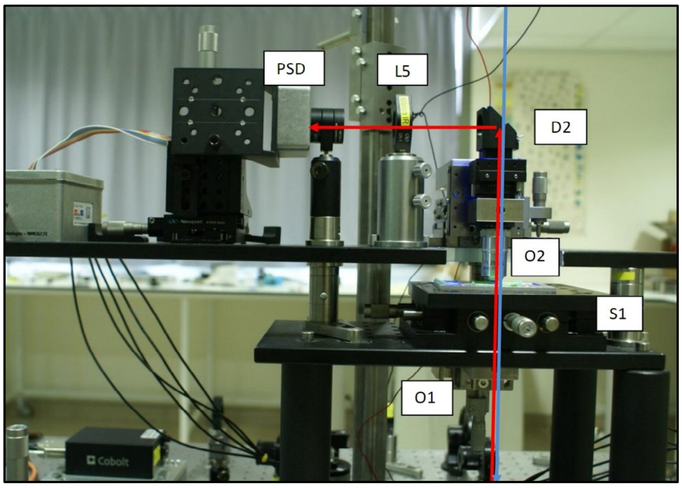


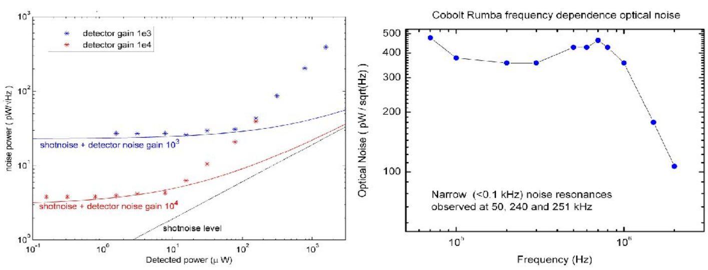
Figure 1. Cobolt Rumba™ 1064 nm in a steerable laser trap, stage and detection assembly. (Co of Terence Strick).

Cobolt Rumba™ 1064nm

The Cobolt Rumba™ is a compact NIR DPSS laser offering up to 2 W output powerat precisely 1064 nm from a hermetically sealed package, with very low intensity noise, and in a high quality TEM00-mode and low-divergent beam.

Typical noise performance of the Cobolt Rumba™ while temperature cycling from 20-50°C, is <0.5 % pk to pk and <0.1 % rms, making it an ideal laser source for particle trapping experiments.

Typical optical noise data at Ω = 500kHz



The above graph on the left shows that the noise scales linearly with power. The optical noise is a factor of 4-8 larger than shot noise in the tested range of powers.The graph on the right shows frequency dependence of the optical noise.
(The data was taken with detector: Femto InGasAs PIN diode, DHPCA-S and Lockin-detector: Stanford research system, SR844, courtesy of a Cobolt customer, doing optical tweezers experiments.)

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