NOVEL 515nm DPSS-LASER STIMULATES FLUORESCENCE MICROSCOPY

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A continuous-wave diode-pumped solid-state (DPSS) laser operating at a fixed wavelength of 515 nm and with an output power of 25 mW was developed. The design includes an Ybdoped laser crystal emitting at 1030 nm and proprietary intra-cavity frequency conversion. Spectral filters enable the laser to operate in single longitudinal mode (<30 MHz bandwidth), which results in very low noise and stable output power over a wide temperature range. The use of a separate curved cavity mirror ensures a very high transversal mode quality in the output beam at all output power levels (cp. Fig. 1).

Figure 1: Schematic design of novel 515 nm DPSS laser (details see text)

We tested the laser by coupling it into a multibeam confocal microscope for life cell imaging [1]. The two example applications based on the yellow fluorescent protein eYFP are 3D-imaging of mitochondria as seen in Fig. 2 and protein kinase C translocation [2]. The novel 515 nm laser will enable to perform CFP-YFP Förster resonance energy transfer (FRET) based quantitative imaging.

Figure 2: 3D-organell morphology in living COS-1 cells. Mitochondria are labeled with eYFP. The dotted line outlines the cell shape. Mitochondria show highly complex shapes.