Application Note to Generate Optimal Beam Quality from the Free Space Laser Module RO-XXX–PLR–XX-X

The free space Laser Module contains a TO-can laser diode with a short external cavity to generate single frequency output. The external cavity is illustrated in the figure 1 below.

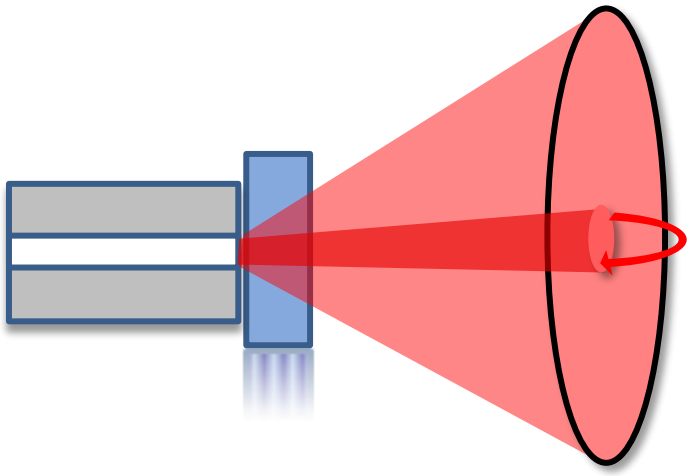

Figure 1: short external cavity laser

A reflective volume holographic grating is placed near the emission facet of the laser diode in the diverging beam. As a result of the feedback occurring in a narrow angular range, the output beam profile of the diverging beam contains an area of lower intensity.

The near field image in figure 2 (left) illustrates the output beam quality at the output of a typical free space module. The area of lower beam intensity can clearly be seen.
The beam quality at a distance of 50 mm is shown in figure 2 (right). The area of lower intensity can no longer be seen.

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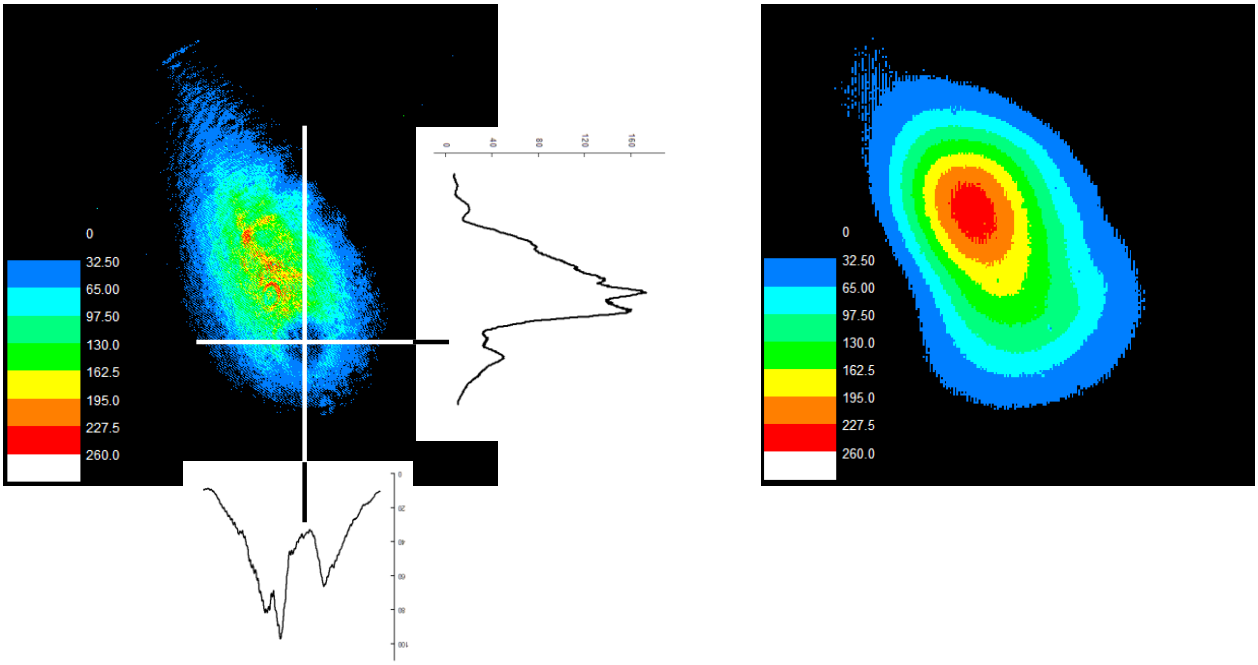
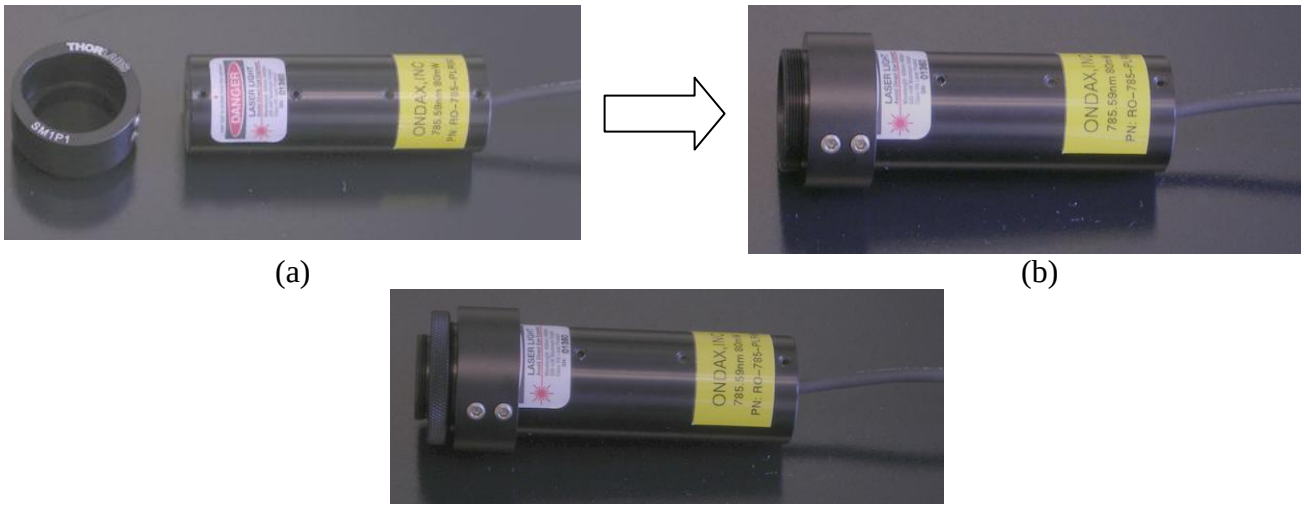


Figure 2: (left) beam quality at the output of the free space collimated module (right) beam quality of the free space collimated module 50mm away

The procedure described below provides an example of a method that yields a spatially filtered, perfect single frequency TEM00 beam (e.g. for imaging and interferometric applications).

The free space module featured in figure 3a. below has a diameter of 25.4mm (1 inch). An adapter with SM1 threading (Thorlabs SM1P1) can secure the round module with two set screws. The mount has external SM1 threads (figure 3b).



(a) (b)

(c)

Fig. 3 Free space module secured in a threaded adapter

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An additional adapter with standard RMS threads (Thorlabs SM1A4) can be added to mount the free-space module onto standard mounts. (Figure 3c and figure 4.)

The following arrangement illustrates how to use this "threaded" module to quickly generate a spatially filtered beam with existing components: Figure 4 shows the "threaded module" mounted on one side of a microscope objective holder (SB19.25.4, Newport). The polarization direction of the laser can be changed by simply rotating the round laser module (loosing up and setting the two set screws). The modular beam expander and spatial filter from Newport was tested with the laser module (figure 5.).

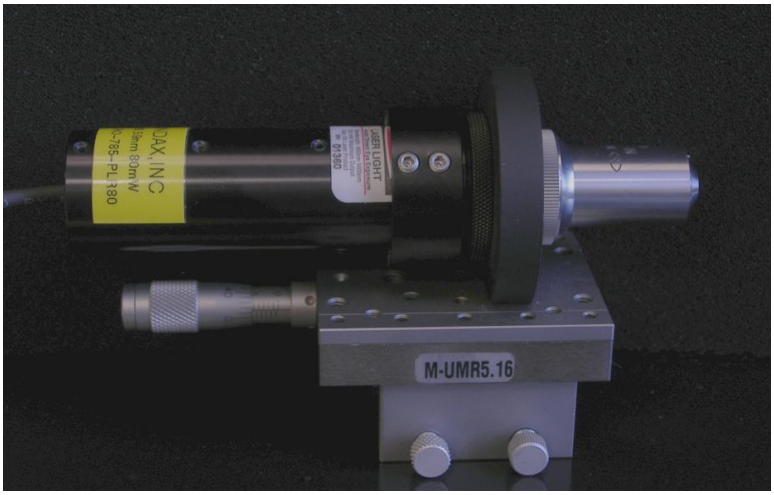

Figure 4:free space module secured in a threaded adapter

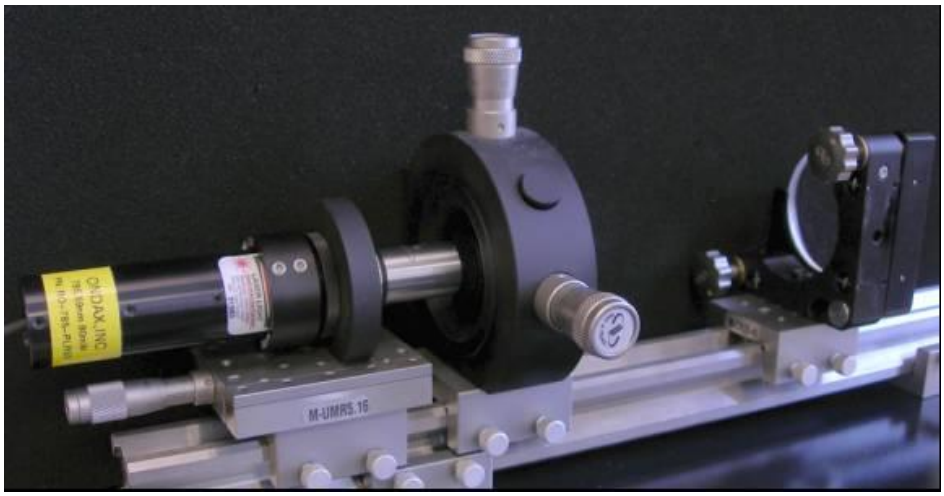

Figure 5. Modular spatial filter and beam expander for the Ondax free space collimated single frequency module.

A combination of microscope objective 20X and 10 micrometer pinhole provides excellent beam quality and greater than 80% of the laser power after the pinhole.

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The beam quality after spatial filtering is TEM00 as shown in figure 6.

By mounting the laser directly on the same mount as the microscope objective, the system is rugged (less susceptible to misalignment) and can be set-up in 5 minutes.

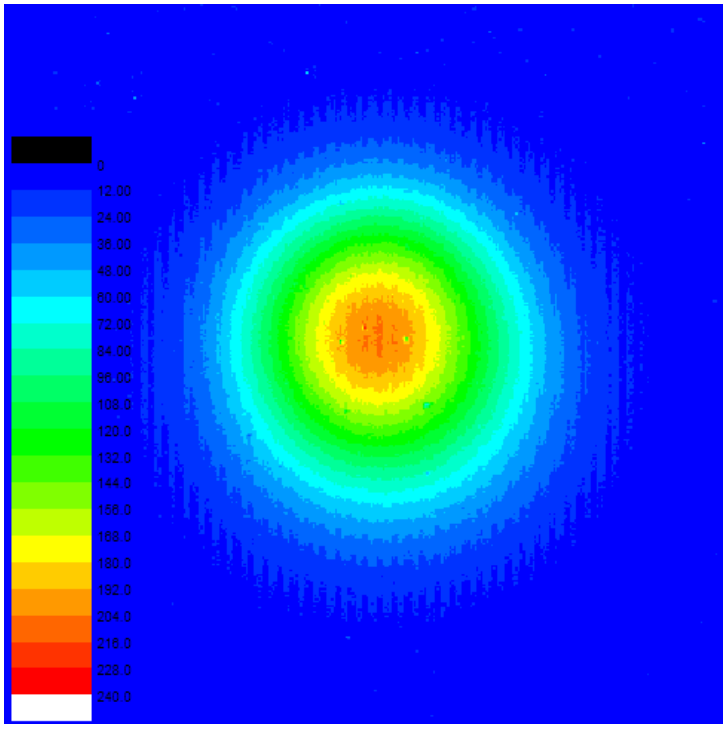

Figure 6. TEM 00 Beam quality after spatial filtering.

Other types of spatial filter systems can also be used with the threaded laser module, such as Thorlabs KT310 or 910A Newport.

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