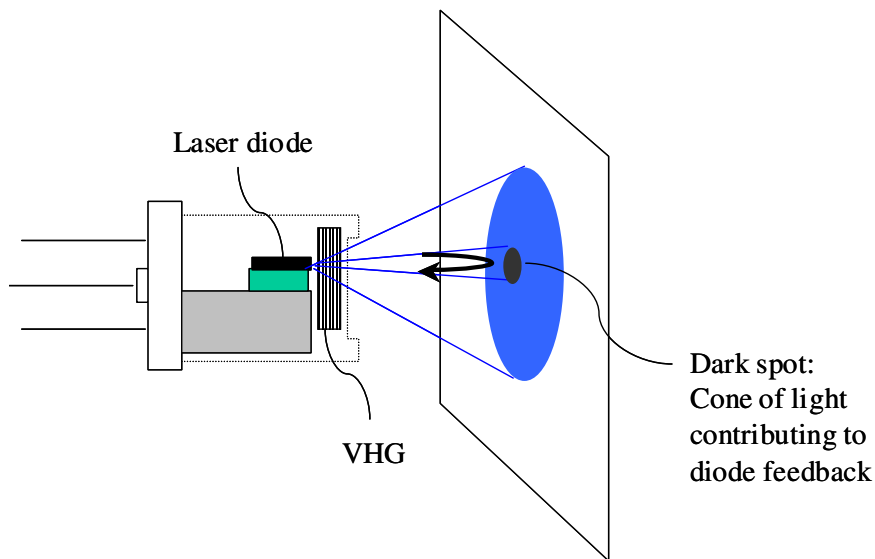




## Wavelength stabilized laser diode Instruction manual

### 1. Principle of wavelength stabilization



**Figure 1: schematic of the short external cavity laser with VHG**

All TO-can wavelength stabilized lasers available at Ondax use the technology described below.

Figure 1 is a schematic of the short external cavity with a reflective volume holographic grating (VHG). The VHG provides wavelength selection by reflecting a spectrally narrow-band portion of the emitted light, which is fed back into the laser diode.

The diverging beam emitted from the semi-conductor laser diode propagates through the VHG. Only the rays propagating within a cone whose center is parallel with the grating vector (the vector normal to the reflecting planes) are reflected back into the laser diode and lock the wavelength of the laser diode to the wavelength of the VHG.

The bandwidth of the VHG is narrower than the mode-spacing of the laser cavity thus only selecting one spectral mode in the laser cavity (single longitudinal mode).



## 2. Wavelength locking

At the appropriate temperature and current, the laser diode is locked and operating in single longitudinal mode.

Within the temperature locking range, the elliptical beam profile has a dark spot approximately centered in the ellipse (see figure 2). The presence of a dark spot indicates that the laser is locked by the VHG and operating single longitudinal mode. The full elliptical beam area has the same wavelength.

Lasers other than blue-violet (~405 nm) are shipped with a minimum temperature locking range of 5 degrees Celsius. For example, a central locking temperature of 30 degrees and a typical temperature locking range of 10 degrees Celsius means that the laser is operating in single mode from 25 degree Celsius to 35 degree Celsius.

Blue-violet lasers have a lower temperature locking range. These lasers are shipped with a typical locked temperature range of 3 degrees Celsius.

**Note that the operating temperature, indicated in the test report shipped with each laser, is measured with the TO-can diode laser mounted in a Thorlab mount TCLDM9 and a laser diode driver/temperature controller from Thorlabs ITC510.**

**Please adjust and fine tune the temperature of your laser diode mount to a value near the recommended factory value. This is to avoid a temperature mis-calibration between our factory and the user, especially when operating a blue-violet laser, which has a short temperature locking range.**

**At temperatures below stabilized operating temperature, a black ring can be seen. In general, as the temperature is increased, the black ring becomes smaller and smaller until it suddenly becomes a black dot. Visually, you can observe the presence of the dark spot that indicates single mode longitudinal operation.**

**At temperatures above stabilized operating temperature, there is neither a black dot nor a black ring. This is because the specified wavelength is the maximum diffracted wavelength possible by the VHG.**

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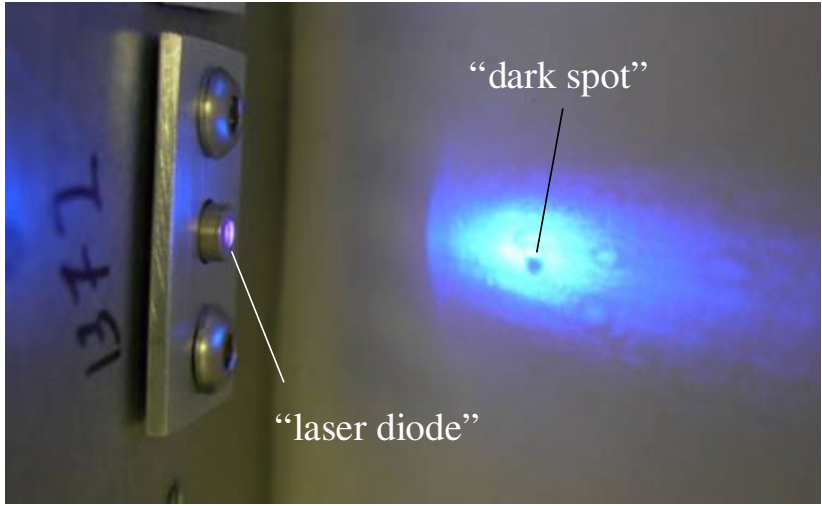


Figure 2: Presence of a dark spot in the beam profile indicating single longitudinal mode operation