

## **Optical alignment for wavelength locking by use of a LuxxMaster™ element**

### **1. General comments**

- 1.1 The LuxxMaster™ elements should be handled like other optical components, e.g. lenses.
- 1.2 Regular cleaning procedures can be applied including the use of ultra-sonic tubs. The use of regular cleaning solutions (e.g. acetone, alcohols, soap etc.) is permitted without restrictions.
- 1.3 The hardness of the bare LuxxMaster™ glass is similar to BK7. However, most LuxxMaster™ elements are anti-reflection coated and these coatings can be damaged more easily than the bare glass. Use of the soft-tip tweezers or vacuum-picks is strongly advised to avoid chipping and/or scratching of the LuxxMaster™ elements.
- 1.4 No special storage conditions are necessary.
- 1.5 When performing the wavelength locking tests, the cylindrical lens can be either adjusted independently of the LuxxMaster™ (Method 1) or attached directly to the LuxxMaster™ surface (Method 2).

### **2. Installation**

- 2.1 Clean the LuxxMaster™ element and the lens.
- 2.2 If the experiments will be performed with the lens adjusted independently of the LuxxMaster™ element (Method 1), proceed to step 2.3.
  - 2.2.1 Attach the lens to the LuxxMaster™, if desired. To do so locate the coated sides of the LuxxMaster™.
  - 2.2.2 Place the lens directly on the surface of one of the coated LuxxMaster™ sides and align the axis of the lens parallel to the long side of the LuxxMaster™.
  - 2.2.3 Fix the lens at its ends using adhesive.
- 2.3 Mount the lens and the LuxxMaster™ in their holder(s).
- 2.4 Prepare the laser diode bar.
- 2.5 Position an integrating sphere so that it captures all the light from the laser diode bar.
- 2.6 Connect the fiber port of the integrating sphere to a spectrometer or an optical spectrum analyzer.

### 3. Alignment

In general, wavelength locking is achieved when the fast axis of a laser diode is near collimation and the LuxxMaster™ element is positioned behind the lens to reflect some of the laser diode light back into the laser cavity (see Figures 1 and 2). Note that “perfect” collimation of the fast axis is not necessary. The required degrees of freedom for the alignment Methods 1 and 2 are shown in Figure 3 a) and b), respectively.

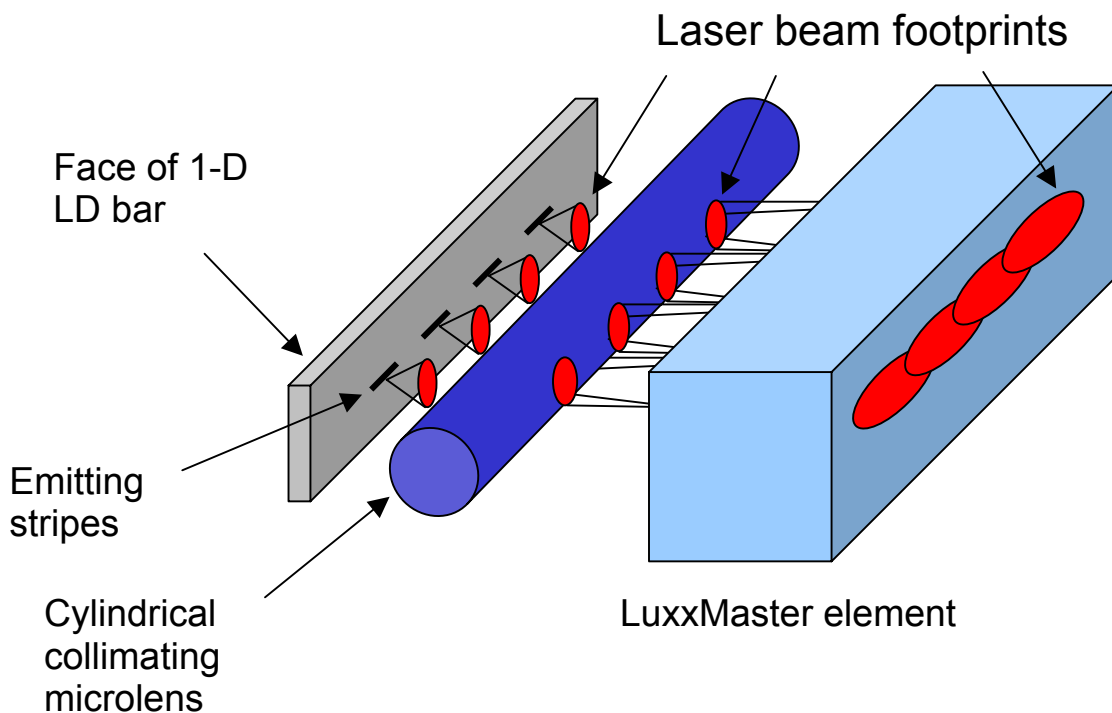


Fig. 1. LD bar wavelength locking using a single LuxxMaster™ element: general arrangement.

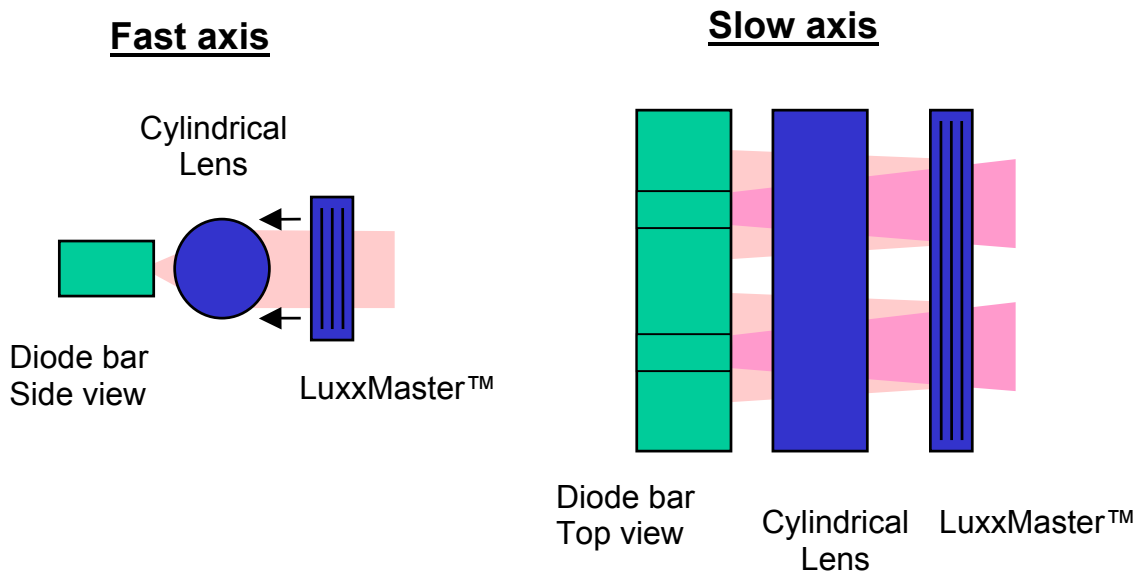
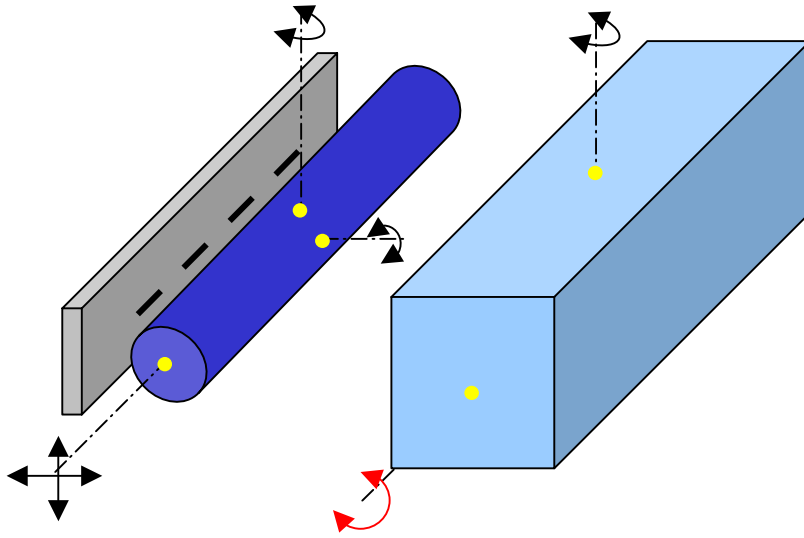


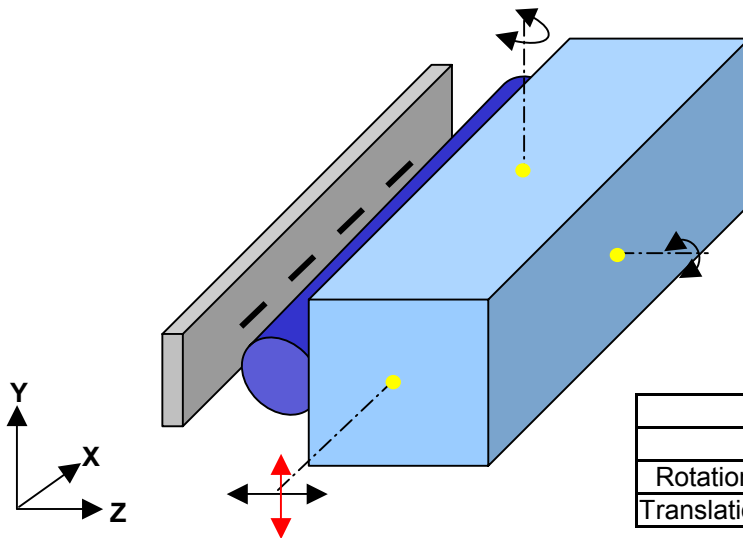
Fig. 2. Collimation schematic on the fast and the slow

- 3.1 Bring the lens into close proximity to the laser diode bar and achieve collimation for all the emitters in the bar. The light output of the laser diode bar should appear as a sharp straight line at this point, without significant curvature or blurred edges.
- 3.2 Observe the output spectrum of the laser diode bar and begin adjustments of the LuxxMaster™ element. The most sensitive adjustments are the LuxxMaster™ rotation around the long axis of the LuxxMaster™ element in Method 1 or its vertical translation in Method 2.
- 3.3 When the LuxxMaster™ position is near its optimum, an additional narrow peak will appear on the emission spectrum of the laser diode bar at the LuxxMaster™ peak wavelength. Once this peak is observed, utilize all the alignment degrees of freedom to maximize the optical power in that peak.

a) Method 1: lens and the LuxxMaster™ adjusted



b) Method 2: lens attached to the



Typical Positioning Tolerances			
	X-Axis	Y-Axis	Z-Axis
Rotation	~ ±0.5 mrad	~ ± 9 mrad	~ ± 9 mrad
Translation	~ 200 μm	~ 200 μm	~ 1-2 mm

Fig. 3. Alignment adjustments to achieve