

Technische Universität Chemnitz  
Physikalische Chemie

Laser Safety



Lasers and laser systems are classified by their ability to cause biological damage to the eye or skin during use.

#### Class I:

Lasers or laser systems incapable of producing damaging radiation during intended use.

#### Class II:

Lasers emitting radiation in the visible portion of the spectrum. The power of these lasers is such that they will normally be protected by a physiological aversion response (blink reflex). However, this is not reliable. Thus, personnel has to wear laser eyewear for protection. In case of class II lasers, the maximum permissible exposure limits can be exceeded if the beam is viewed directly for extended periods.

#### Class III

Lasers that produce radiation that cause eye damage when viewed directly, or when a specular reflection is viewed. A diffuse reflection is usually not a hazard.

#### Class IV

Lasers that produce radiation that may be dangerous to the eye even when viewing a diffuse reflection. The direct beam can produce skin damage and can also be a fire hazard.

In our group we have two instruments (FTIR-Spectrometer, Raman microscope) which contain Class II lasers. In normal operation these lasers are contained within the housing of the instrument.

The most severe danger of damage to Your eyes stems from the atomic force microscope in 007/h. This instruments utilizes an invisible class III laser to measure the deflection of the afm-tip. This laser exits the scanner at the centre of the scanning unit. In normal operation the scanner is positioned on his three legs onto a horizontal surface. In this case the Laser hits this surface at close distance in almost in vertical incidence. In normal operation You have to switch on the laser actively via the computer control, there is a indicator light on the scanner that is lit when the laser is on.

→ Switch the laser on only when You need it for Your measurements. Switch it off immediately when it is not needed any more.



invisible laser radiation

If the surface below the tip is non reflecting and IR-opaque, operation is safe.

→ Be careful if the scanner is positioned onto a reflecting surface or onto a surface bearing reflecting objects or spots, reflected light might case damage to Your eyes.

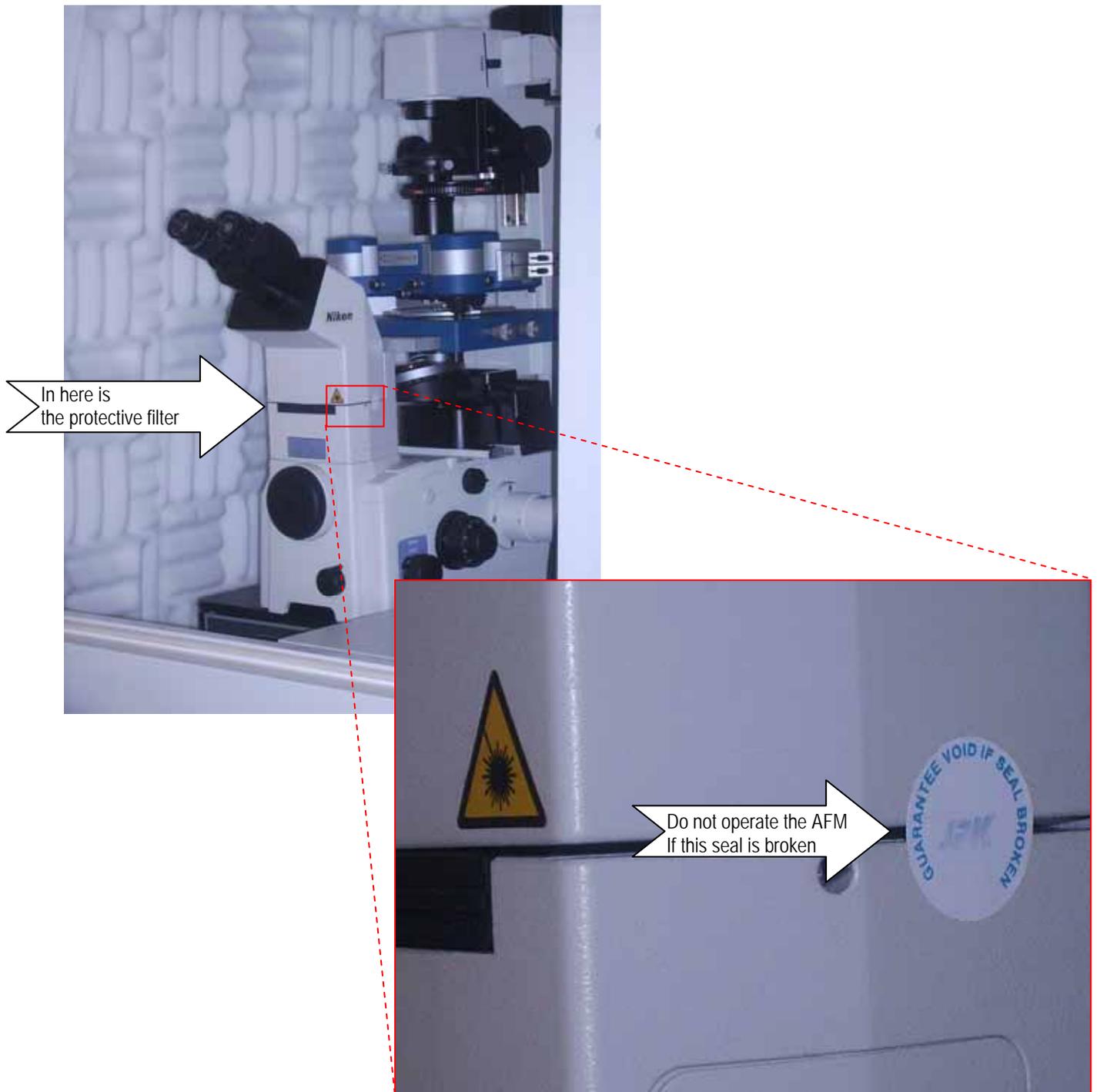
→ Be careful concerning reflecting objects on Yourself: reflecting jewellery and decoration like wedding rings, wristwatches, buttons cufflinks has to be taken off.

If the scanner is positioned on the microscope stage, be aware of the fact that the laser radiates directly into the optical system. Without safety filter, it would be focussed through the ocular directly into Your eyes. To prevent this from happening there is a safety filter (Schott BG39) installed preceding the ocular.

→ Do never remove this safety filter.

→ Do not use the microscope in combination with the afm, if the seal at the side of the microscope is broken

→ Do not operate the afm on any other microscope that lacks this safety filter

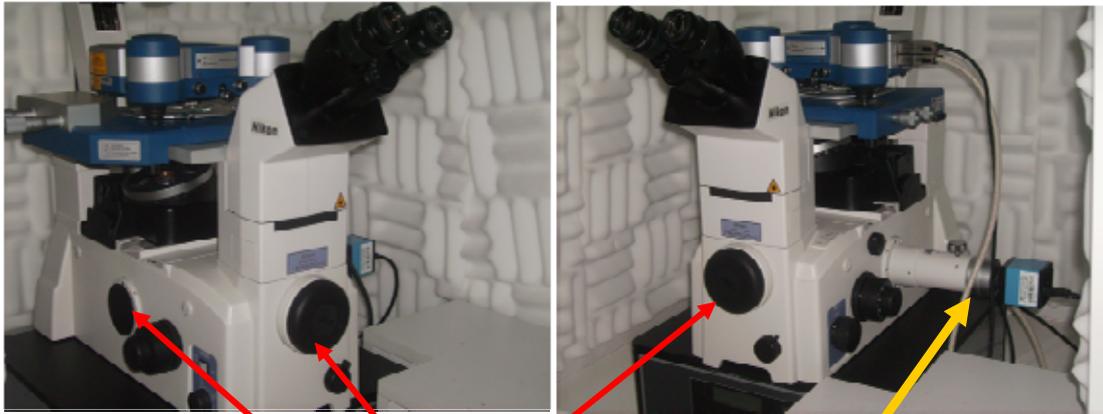


The safety filter is placed immediately preceding the ocular. It does not affect the front or side ports of the microscope.

→ Do not open the front or the side ports when the laser is on.

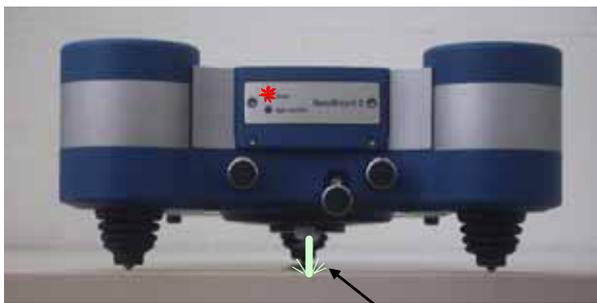
The side port at the right side currently is used for the camera. This camera is sensitive to visible and infrared light and is beside others needed to visualize the laser for alignment.

→ If You detach the camera for service, be aware that You open a port for the laser light.

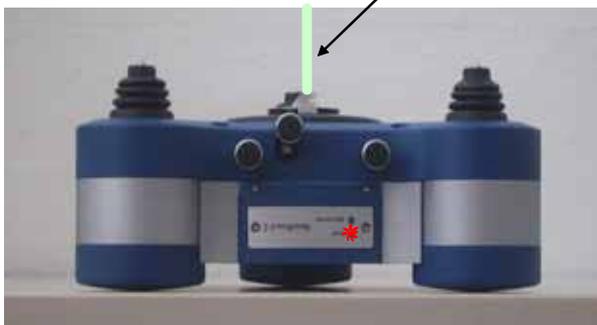


Do not open these ports

Do not detach the camera while the afm is on



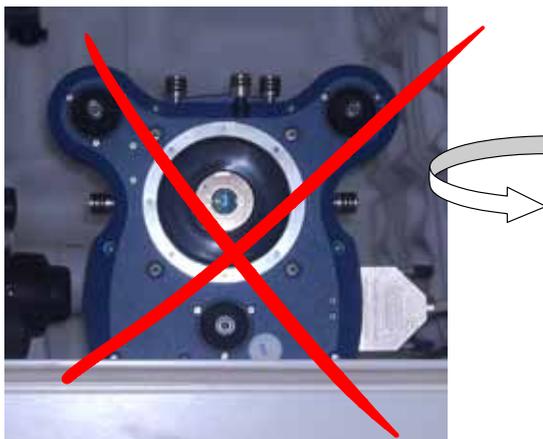
The scanner has an electronic orientation sensor. The laser is on when the scanner has horizontal orientation, it is automatically interrupted when the scanner is tilted out of the horizontal orientation- However it is again on, when the scanner is upside down! This safety feature can be disabled within the controlling software by an appropriate direct command !



→ Detach the scanner from the cables before You turn it upside down

→ Do not disable the orientation dependent safety switch. [strictly forbidden at any time ! by the head of the group].

→ Do not position the scanner in such a way that the laser is pointing towards the room or people – even if the scanner is expected to be shut off.



Thickness in mm : 1.0  
Wavelength in nm :  
Transmittance :  
Internal Transmittance :

**BG 39**

**SCHOTT**  
TOTAL CUSTOMER CARE

