Appendix 7 – LS Mount and Mirror Alignment

A7-1 Introduction

This appendix gives an overview on how the light sheet mount is assembled and the mirror aligned relative to the optical axis of the light sheet. In addition more detailed technical drawings are available on http://www.yaroc.ch/unsw/

A7-2 Assembling the Light Sheet Mount

The assembly is based on the back plate mounted onto the laser bench shown in Figure A7-1. In order to mount the base plate to the laser bench it is necessary to remove the laser as the screws are accessed from the back of the laser bench interface. By turning the base plate 90° the light sheet can be pointed downwards instead of sidewards. Letting the laser point on the opposite side (turning 180°) does not require removing the base plate as it is symmetric in one axis.

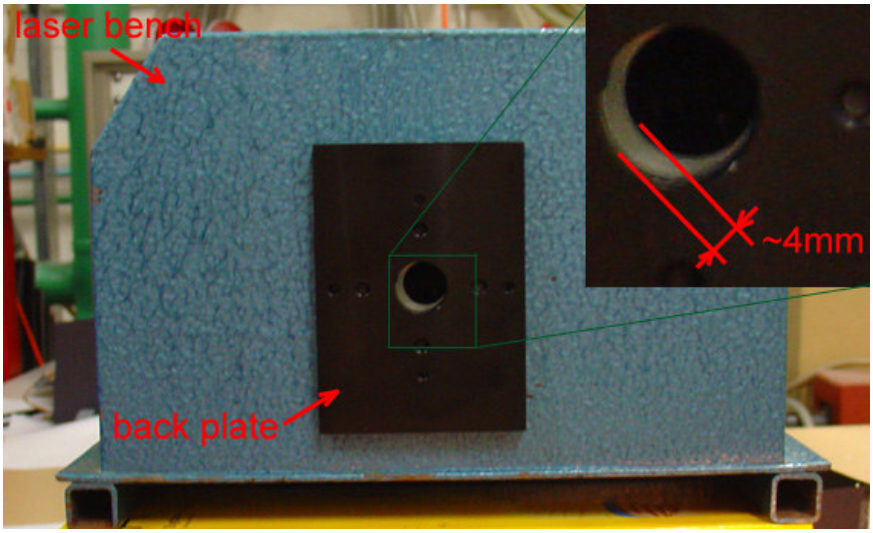

Figure A7-1 Base plate mounted to the laser bench.
(Laser bench misaligned to the laser)

Note that the laser bench is misaligned relative to the laser which unfortunately complicates alignment a bit and made it necessary to realign the laser beam inside the laser. An alternative (and better) solution would be to redesign the base plate so that it can be moved relative to the laser bench.

The back plate mounted to the laser bench served two (three) purposes: It connects to

the side plate holding the light sheet adaptor ring and to the base plate holding the mirror mount as shown in Figures A7-2 and A7-3. Another possibility is to mount the adaptor ring directly to the back plate and use the light sheet in a straight ahead configuration.

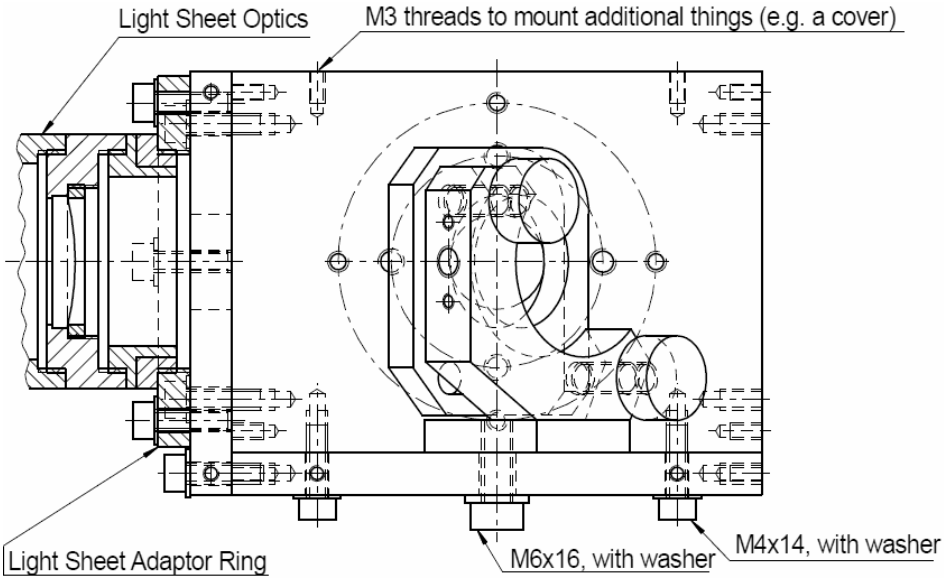

Figure A7-2 Light sheet assembly drawing 1.

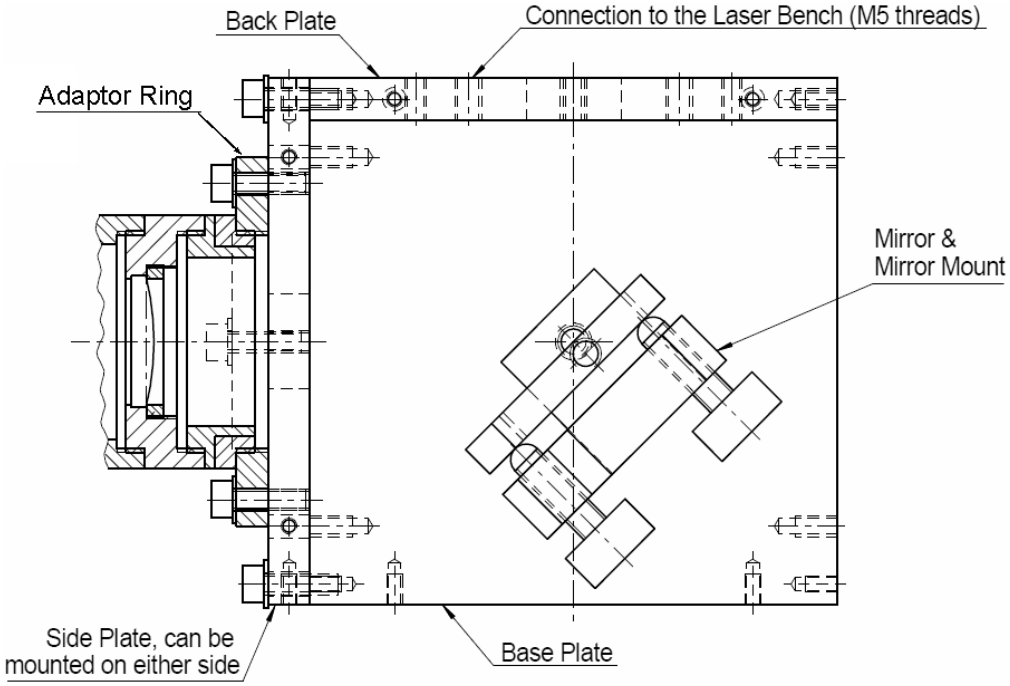

Figure A7-3 Light sheet assembly drawing 2.

A7-3 Aligning the Laser Beam

To align the light sheet a 100mm long extension tube covered by two apertures roughly the diameter of the laser beam is mounted in place of the light sheet as shown in Figures A7-4, A7-5 and A7-6.

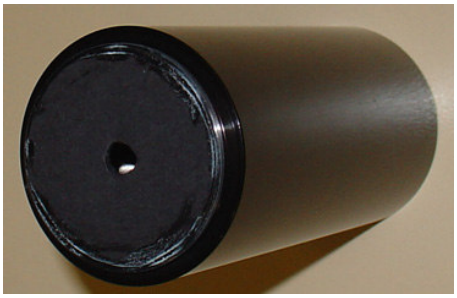

Figure A7-4 Alignment Tube.

The alignment procedure bears increased danger of laser eye damage as accidentally tilting the mirror can redirect the powerful laser beam in an uncontrolled way. To minimise chances of accidents the person aligning the laser (and others) should not have their eyes in the range the beam would move when rotating the mirror. It is further recommended, even stressed, to work with the strong laser eye protection goggles and use targets marked with orange text marker to visualise the laser beam.

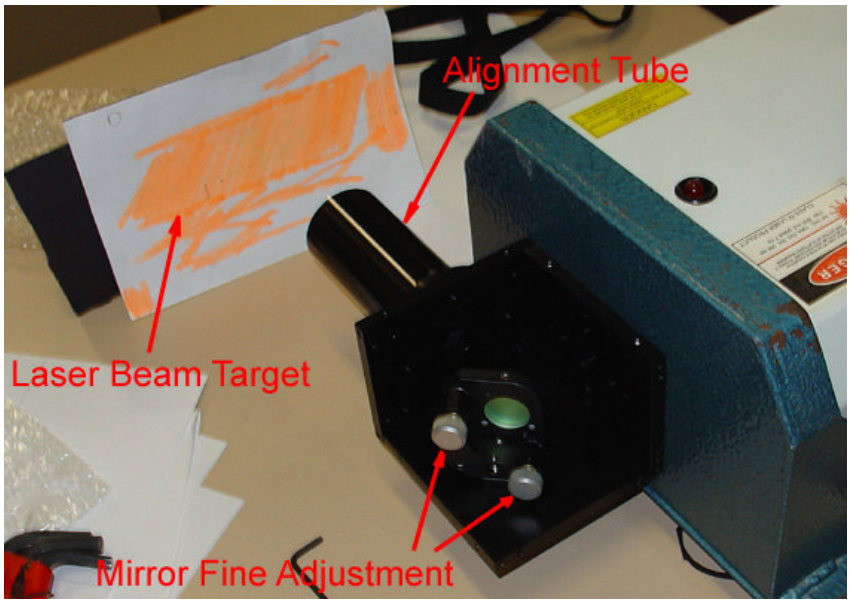

Figure A7-5 Assembled laser mount and alignment tube.

In a first step the mirror is roughly aligned by hand as follows:

- Position the mirror at the outer edge of the slot in the base plate; tighten the screw by hand only.
- Make sure the region around the aperture of the alignment tube is marked by some fluorescent paint (orange textmarker).
- Turn on the laser (low power, eye protection).
- Rotate the mirror by hand (don't use the fine adjustment screws yet) until the laser beam is roughly on the level of the aperture hole (the beam doesn't have to go through the alignment tube); tighten the screw by hand again.
- Position the laser beam height to roughly that of the aperture hole using the appropriate fine adjustment screw.
- Then loosen the screw and gradually move the mirror along the slot in the base plate, rotating it every now and then (make sure the mirror holder base sits on the base plate and doesn't tilt). Look for the position where the beam profile passing through the alignment tube looks best and tighten the screw, this time with an allen key (but with care!).
- If necessary some fine tuning can be made using the fine adjustment screws. The beam after the alignment tube doesn't have to look perfect but should give the impression that it more or less passes both aperture holes.

Figure A7-6 Laser beam alignment - different view

Once the mirror has been aligned it is best to cover the mirror region to prevent dust

from entering during operation and (safety!) to prevent scattered laser light to be set free.

Inspect the mirror surface for dirt before covering. Also generally take care not to pollute the mirror surface as cleaning is a hassle and high power laser light on a dirty surface can harm the mirror to the point that it has to be replaced.

A7-4 The Mounted Light Sheet

Figures A7-7 and A7-8 give a view of the sidewards mounted light sheet.

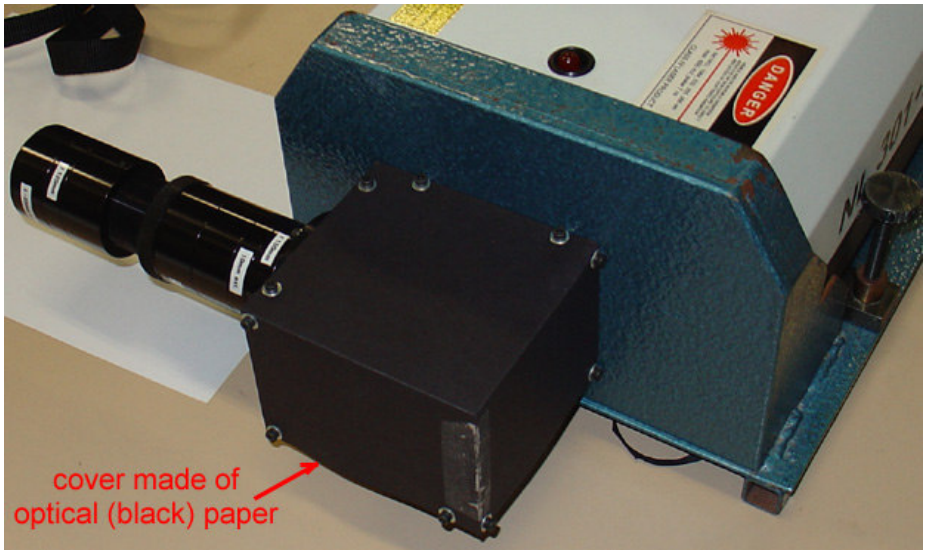

Figure A7-7 View of the mounted light sheet.

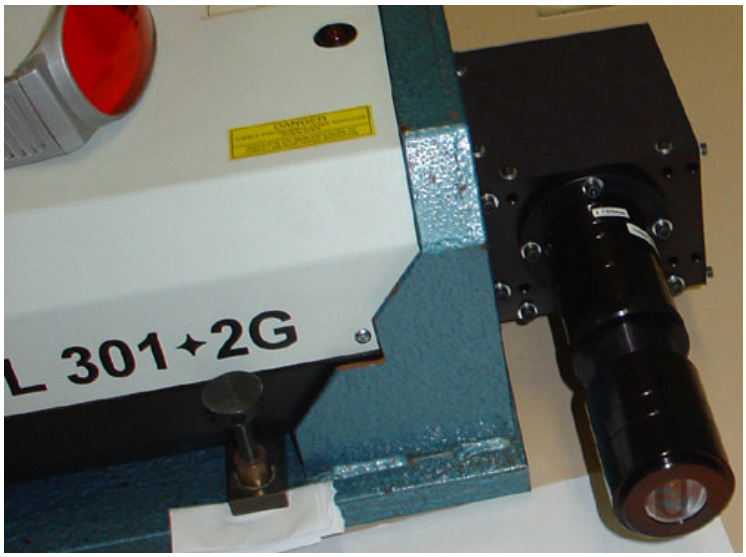

Figure A7-8 Different view of the mounted light sheet.