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LAB-AO: Alignment of the Beam Sampler Dichroic

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ABSTRACT: This document describes how to use the LAB-AO Wave front sensor (WFS) to align the dichroic on the beam sampler.

1. INTRODUCTION

The alignment procedure in the lab has not changed for some time, but with the introduction of the LAB-AO system it will start to evolve significantly. This document describes how to use the LAB-AO system to automatically align the dichroic on the beam sampler. At the time of writing this document this process appears to be stable. If you find it doesn't work please let me know.

2. LAYOUT OF THE LAB-AO OPTICS

Figure 1 shows the layout of the LAB-AO system as installed in the S2 line. This picture doesn't include the spherical mirror on the other side of the BRT primary. Note that the wave front sensor (WFS) camera does not have the lens cover on in this picture. Please leave this cover on when the system is not being used. Note also that at the time of writing this document the shutter is not under computer control and needs to be moved manually.

3. ALIGNMENT PROCESS

Begin the process by aligning the relevant beam with the target at the northern end of the beam sampler area in the normal fashion:

1. Move the beam sampler out of the way.
2. Ensure you have the visbeams system on the right beam, for example you might use B1&2 for beam 2.
3. Select the correct mirror using PICO3. In this case we are using B1&2 for beam 2 so you would move B1&2-2.

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4. Center the beam on the target.
5. Check this by sending the Iris to BEAM so it closes and opens.
6. Move the beam sampler back into position for that telescope and that beam.

The next part of the process ensures that the beam is entering the WFS at the correct angle.

1. Close the Laser shutter and set the ND to 5.0.
2. Remove the cover from the WFS and open the shutter in the LAB-AO system. Note that this shutter has yet to have a computer interface and you will need to move it by hand.
3. Start the LAB-AO server if it isn't already running.
4. Start the LAB-AO GTK.
5. In the WFS menu, start the camera (START WFS) and the camera display (START DISPLAY).
6. Create a dark frame (MAKE DARK)
7. You can now open the Laser shutter and move to less ND until you see spots on the WFS display. An example of what you should see is given in Figure 2. Don't turn up the light level too high as you can damage the camera. An ND of 3 or 4 is normally fine.
8. if you can't see all spots there may be an alignment issue - go back and check everything.
9. Make sure the PICO1 and PICO3 controllers are turned on.
10. You will see at the bottom of the GUI a row of number for tip/tilt, position, focus, and the first two astigmatism terms. It is likely that the tip/tilt will be wrong, that is non-zero. The others should be close to zero. If they are not, it means the default 'FLAT' is no longer right. The idea now is to move the dichroic until the tip/tilt is close to zero.
11. There is an automated way of doing this - hit the START AUTOALIGN button. You will see a place to enter the number of steps, by default 50. This means it will try 50 times to get the alignment right and then give up. You can also stop the alignment at any time by hitting STOP AUTOALIGN.
12. The software should now move the dichroic until the tip/tilt is less than 0.01 in both axis. If it gives up but seemed to be doing the right thing it is safe to restart the process.
13. Once this is complete, turn off the display, then turn off the WFS, and close the LAB-AO shutter. Note that this shutter has yet to have a computer interface and you will need to move it by hand.

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14. You can now go to 0 ND and check the alignment on the rails with the standard target. There may be a small beam shift on the front of the target, but the return beam on the back should be very close, if not exactly on, the target. A small error is OK (1mm or so).
15. If you think the BRT primary needs to be move it means something has gone wrong or there has been a large temperature change in the lab. Please resist the temptation to move the BRT primary unless you have double checked everything and the beam is many mm away from the rear of the target. Instead just report the fact that you have found this problem and we can check it during the day.

4. CONCLUSION

You should now be ready to move on. Under no circumstances should you ever move the BRT secondary, or any optics in the LAB-AO system. It is better to lose a telescope for a night than to mess with these optics. The only optic you might move on the beam sampler table is the BRT primary but only if you are very sure that this is required and you have double checked everything else.

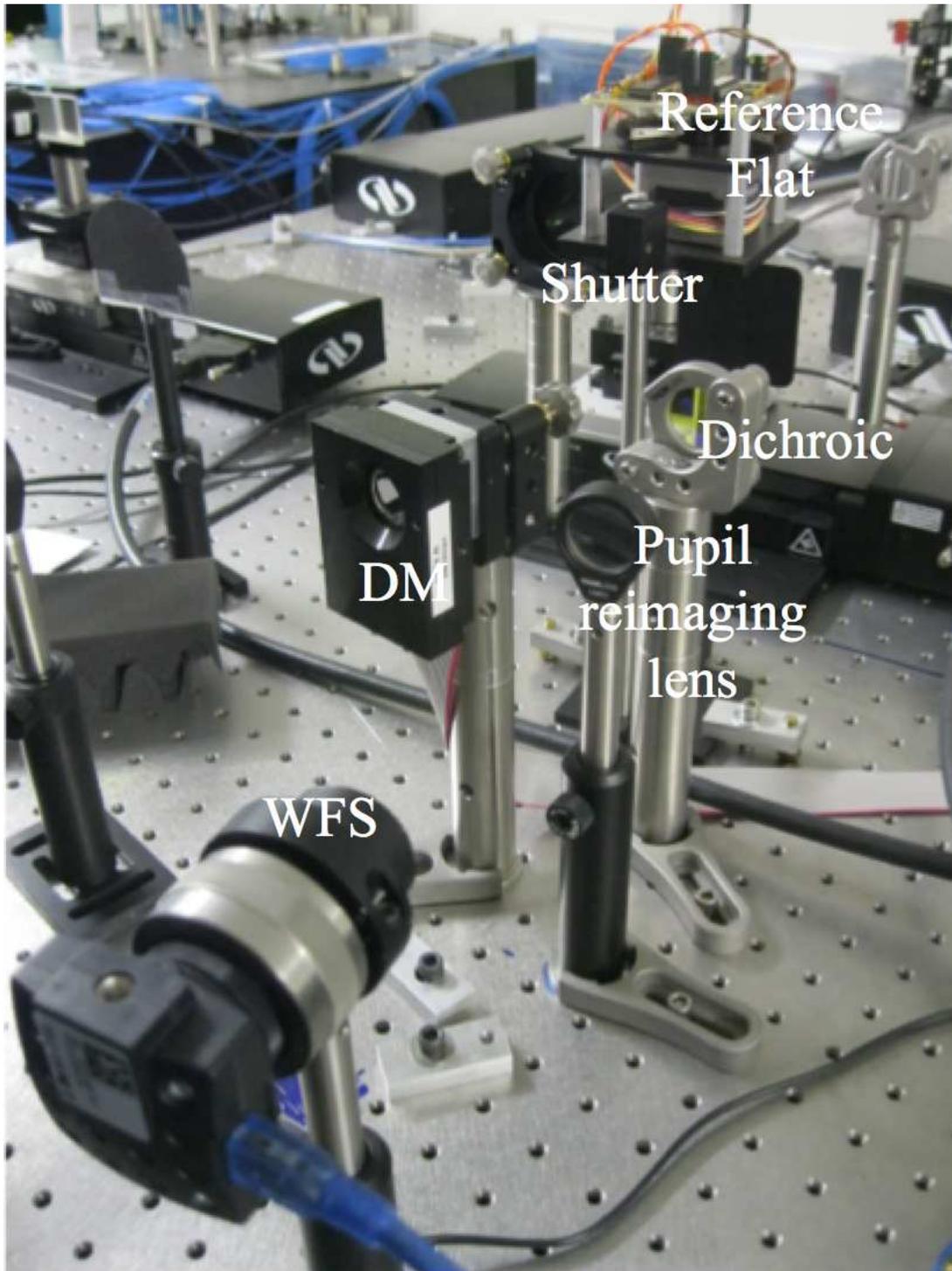


FIGURE 1. Picture of the Optics installed in the S2 telescope system. Each part of the LAB-AO system is labeled using the terminology used in this document.

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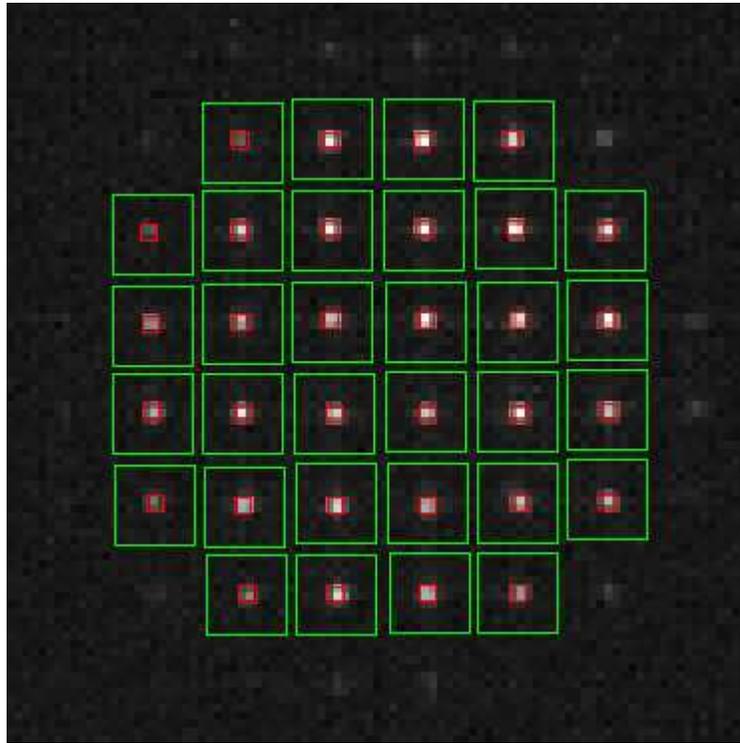


FIGURE 2. The wave front sensor showing all sub-apertures. Here, we show the system locked onto the laser reference pupil. Note that some of the top of the beam is missing, which is probably due to poor alignment of the WFS - we are working on this. If the WFS doesn't look something like this when you are looking at the laser reference pupil there is something wrong - do not proceed.