

3.1 Introduction

In the event the SolsTiS is not lasing, please follow the guide below to initiate lasing.

! **Danger!** The SolsTiS laser and the Equinox pump laser are Class IV, high power lasers whose beams, by definition, are a safety and fire hazard. Take precautions to prevent exposure to direct and reflected beams. Diffuse as well as specular reflections can cause severe skin or eye damage. This damage can be instantaneous and/or permanent.

! **Caution!** Pumping the SolsTiS at high powers when the pump beam is grossly misaligned may cause internal damage to the SolsTiS laser head.

3.2 SolsTiS lasing procedure

1. Verify the chiller is operating at the correct temperature.
2. With the Equinox set to idle. Go to the web interface (usually 192.168.1.222) Configure > Supervisor Options > click 'Reference BRF' and 'Reference Tuner' if applicable.
3. Go back to Control and set the wavelength to the reference wavelength, this is usually 780nm (For model specific reference wavelengths and lasing thresholds see 7.2).
4. Mark on a piece of white card the output beam height: Standalone SolsTiS 64.5mm, Equinox and SolsTiS on a single baseplate 77mm.
5. Secure a power metre 10cm from the SolsTiS output rated up to 10W.
6. Secure the piece of white card in front of the power metre.
7. Open the Equinox shutter and set the power to 1W.
8. Check for a faint green spot on the card as an indication the pump beam is aligned through the SolsTiS cavity. You may see two primary green spots separated in the horizontal plane (see Figure 3.2).
9. If no green spot is visible then:
 - Try $\pm \frac{1}{4}$ turn of the X-axis on PIK M2. Try to keep note of the starting point of rotation.
 - If the residual green spots are still not found then idle the Equinox and observe the brightness from within the SolsTiS input window using a camera (See Figure 3.1). There should be an area in the centre of the window where the brightness seen from within the cavity is at a minimum. Scan the X and Y axis of PIK M2 until a clear minimum can be found, this should also be approximately the centre of the metal pinhole also seen in Figure 3.1.

3. Initiate SolsTiS lasing

10. Once the green spots are visible. Set the Equinox to 1W output power. Use the adjustment screws on PIK M2 to slowly move the green spot as follows:

- Adjust the horizontal (X) position to the left until the beam can be seen to start to clip and mark this position on the card. If there is more than one beam, move until both primary beams are being clipped.
- Move the beam to the right, again until the beam(s) begin to clip and mark this position on the card.
- Centre the beam in the horizontal and repeat the above for the vertical axis (Y), marking the maximum displacement the beam can travel up and down before clipping occurs.
- Bisect the X and Y points noted above to identify the approximate centre of the adjustment range.
- Centre the beam in the horizontal and set the vertical to the beam height as marked on the card (either 64.5mm or 77mm).

This will set the limits that the beam can be moved to during the process to obtain lasing. Hereafter, under no circumstances should the beam be moved close to the positions where clipping occurs.

! The green light on the output is not collinear with the main IR output. Typically the amount of green light on the output is <50 μ W with the IR at 5W output.

11. Setup an IR viewer or IR card.

12. Provided the residual green spots exiting the SolsTiS output aperture do not appear to be clipping, carefully increase the Equinox output power to above threshold (see Figure 7.2 – Typical SolsTiS lasing threshold for SolsTiS-5000). For SolsTiS 5000 XF set to 5W.

13. Check for SolsTiS lasing on the IR card or on the white card with an IR viewer.

14. If no output is observed, try carefully $\pm \frac{1}{4}$ turn of the X axis on PIK M2 to move the fluorescence/ green spots around until lasing is found.

15. If SolsTiS laser output is still not observed carefully and methodically try an X,Y 'raster' scan of the pump beam using PIK M2. To perform this raster scan, make a very small adjustment of the Y axis of PIK M2, then scan the entire X axis for each vertical step, while looking for a 'flash' of IR laser output. Do not move the green spots to where clipping occurs. Continue to make small Y axis steps to cover the entire vertical range until lasing is found. If lasing cannot be achieved following 10 iterations of careful and methodical raster scans, contact M Squared Support.

16. Once lasing occurs, remove the white card and optimise the power on the power metre by making small ($<\pm \frac{1}{4}$) turns of the X and Y adjusts of PIK M2.

17. Idle the Equinox, close the shutter, replace the lid, extend and secure the beam tube and lid screws.

3. Initiate SolsTiS lasing

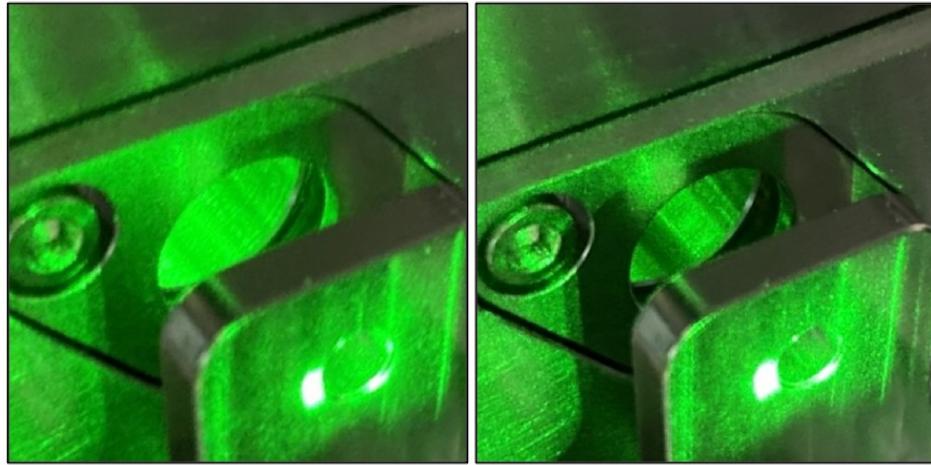


Figure 3.1: Brightness from within the SolsTiS input window can be observed as being at a maximum on the left and a minimum on the right



Figure 3.2: Green Spots on SolsTiS output with the positions of clipping marked on the card



Figure 3.3: Fluorescence as seen through IR viewer on white card, the main stripe on the left is where the laser beam will be located once lasing is found.