



LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

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LIGO

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LDF Alignment Scanning of A1 Target

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1. Introduction

The purpose of this document is to show the boundaries and dimensions of the LDF scan on a one inch Al target. The aim was to show repeatability and that the scan square area remains constant after many trial.

2. Procedure

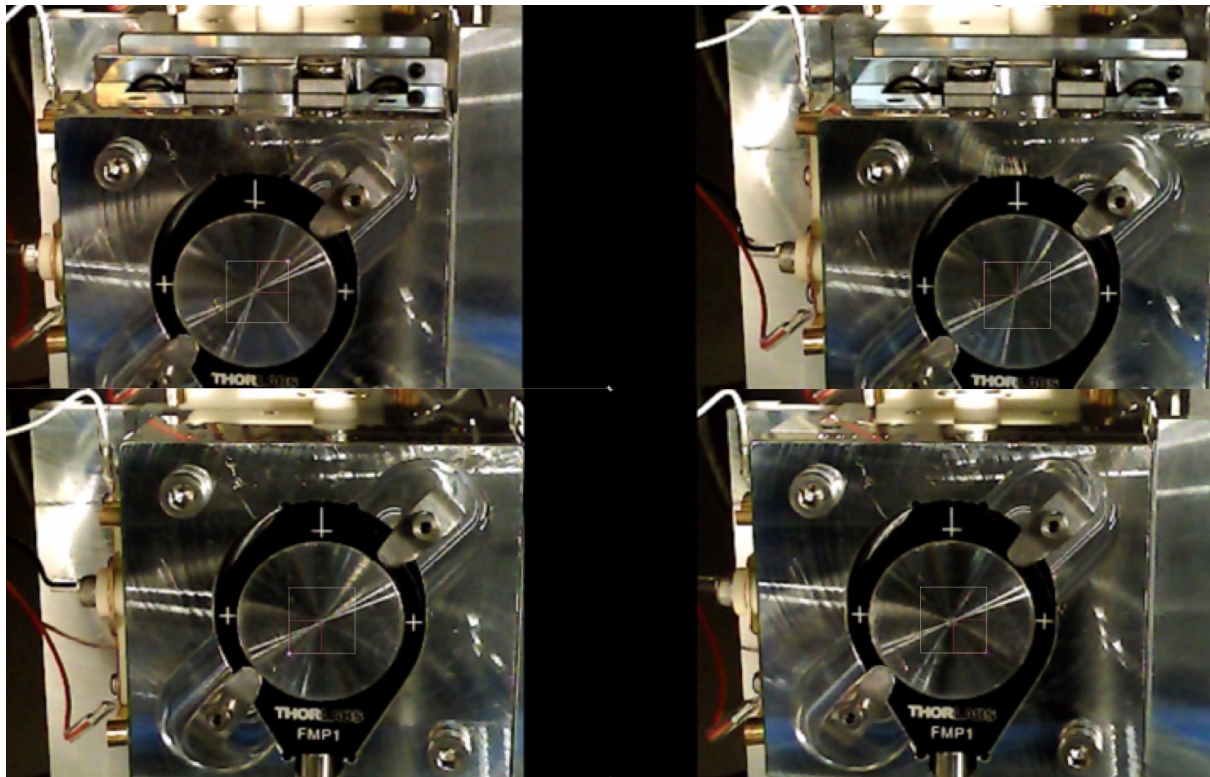
The procedure was completed by using the webcam's recording options to record video of the scan in progress at a visible input power for the laser. The video was then screen shotted and drawn on using mac software, Pages.

1. Align the laser beam with the 3 o'clock position (DCC document T1600319-v2)
2. Go back to the shortcuts folder and click the file entitled "optosigma_stage_scn_ly1.llb" This should take you to a LabVIEW window.
3. Make sure the Controller Type is GSC-02 and the COM is the one connected to the XY controller (COM3 in this case).
4. Under "Scanning Points in Single X&Y" type 6 for both X and Y.
5. Under "Scanning Stepsize (mm)", type 4mm since we would like for the laser to move 2mm steps but the software consistently is off by a factor of .5. To make the laser complete the scan "backwards," i.e. from the bottom left corner to the top left corner, use a negative step (-4.00 mm)
6. Under "Starting Location in X,Y (mm)" write (18.00, 10.00). To continue having the laser complete the scan from the bottom left of the scan square to the top left, put the initial X,Y location as (38.00, 30.00) in mm.
7. Increase the delay time to 3 seconds (3000 ms)
8. Go to the other LabVIEW window and run the home position.
9. Open the "Debut Video Capture Software" which should be live feed from the webcam. Below the screen there are video options. Select the format you want to save your video based on what formats your desktop or personal computer can use. Click "Video options" to make sure the frame rate is at the highest it can be (30.00 fps) and use the 720p (1280 x 720 -HD) option for the video size.
10. Hit record, go back to your "optosigma_stage_scn_ly1.llb" window with the step size, delay time information etc. and press run. The run should take about 2 minutes and 15 seconds, and once the scan is complete, go to the webcam software and click the stop button. Run steps 8-10 as many times as trials you need.
11. The recording files are available by pressing the "Recordings" icon on the top bar of the live feed video window.
12. Play the videos and pause at the moments the laser beam is on each of the four corners of the scan square. Screenshot the window, making sure the window size does not change throughout the many shots you may take.

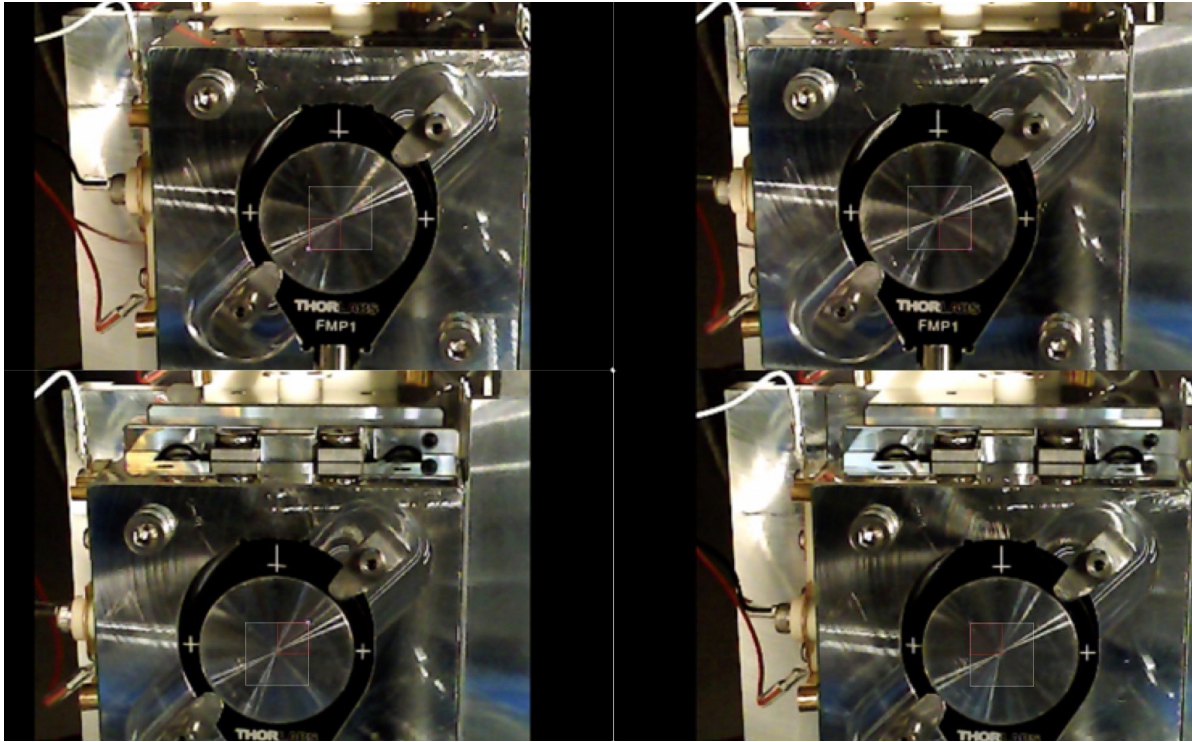
13. Save each of the four images together and separate from the corner images of the different trials that may have also been completed.
14. Open a word processing document with the capabilities to draw various shapes and lines. The most accurate outlines can be done if the software gives information on the size or dimensions of the shapes and lines. Group the four images together for convenience sake.
15. Make a square shape with a very thin red or green outline and with one corner on the laser point and the opposite diagonal corner on the center point of the Al target. Record the length of the square. Make three copies of this square. If the square's corner does not reach the center of the target (i.e. the diagonal line goes on either side of the center), do not turn the square into a rectangle.
16. Place each of the red or green square copies on each of the laser points.
17. Make a new square with twice the length of the small red square and white instead of colored. Overlay each of the four new squares over they're red counterparts, and group the entire picture together for convenience sake.

3. Results

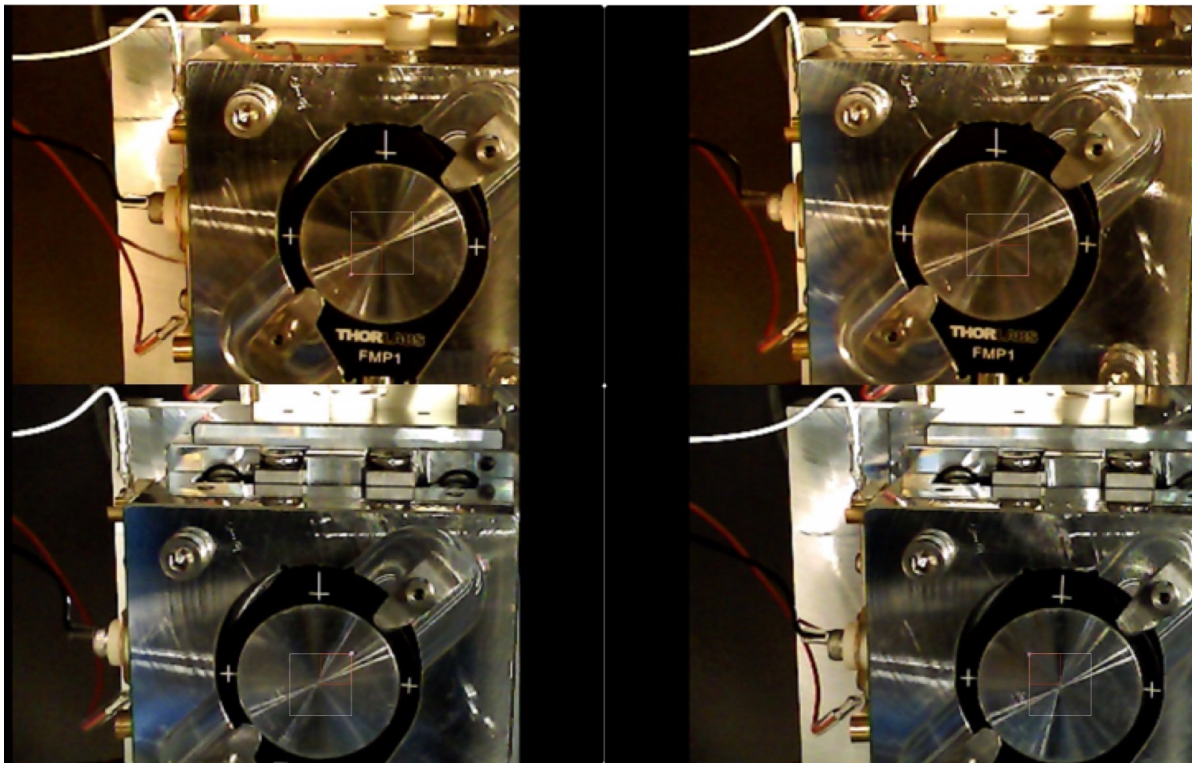
Scan Trial 1:



Scan Trial 2:



Scan Trial 3:



Notes on the image results:

The third scan was taken after the camera had been knocked down and re-mounted in a slightly different position.

The white squares may not appear to match up with the center point of the Al target when the laser is scanning the top two corners during the run. This is because the camera angle remains the same as the XY stage moves up and down around it (i.e. it is the XY stage moving, not the laser beam) . However, these discrepancies in scan area dimensions look to be consistent among the three trials, and thus they are attributed to the camera's inability to have a perfect angled view of the Al target.