# Session 3

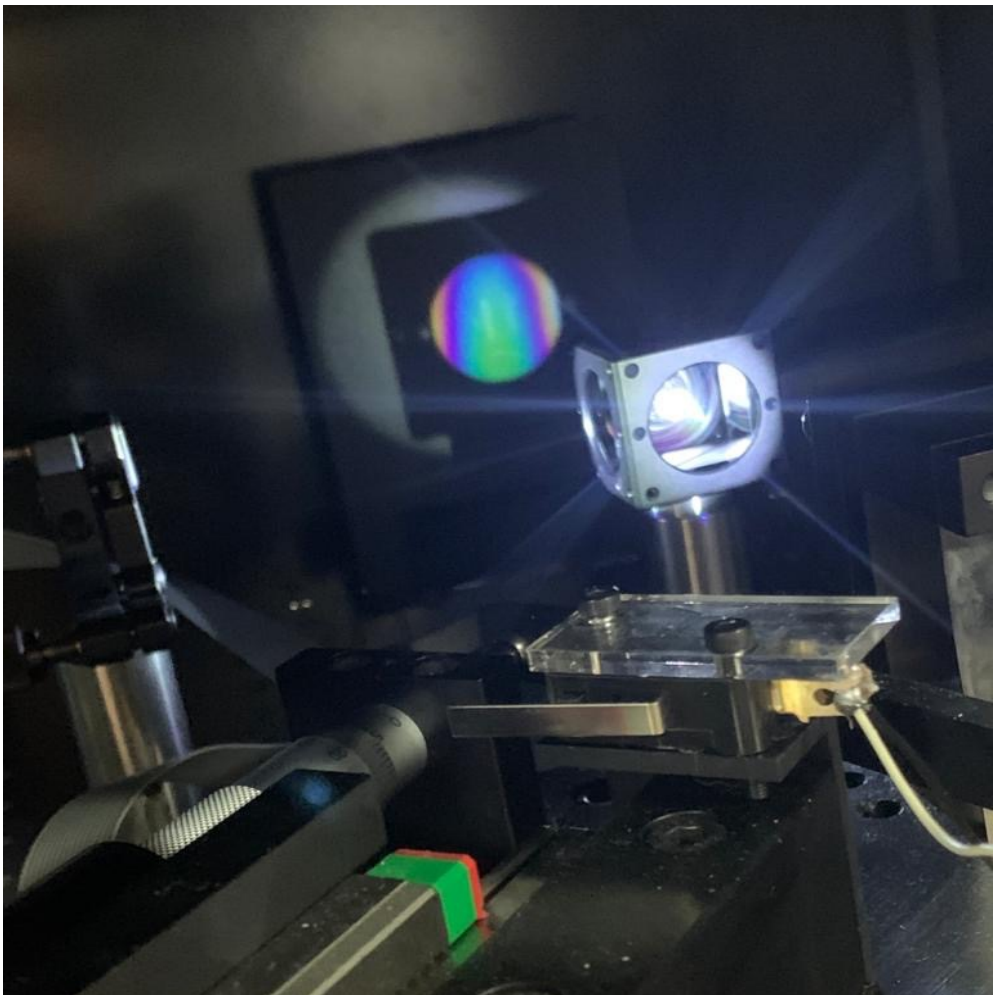
Tuesday, January 10, 2023 9:00 AM

Aims for sessions-
Find the actual null point using our range and scanning through
Take interferograms for white light, blue light and filtered light

**Task 8 cont**

Now we're going to find the actual null point by scanning through the range of 5.71 - 5.80 mm which should only take approx 5 mins.

Unfortunately, someone has touched our set up and now the null point is not within the range we specified.
Therefore, we have recalibrated it with a preliminary reading at 6.15 mm which is pictured in **fig 28.** and so we've decided to put our range is between 5.97 mm and 6.20 mm.



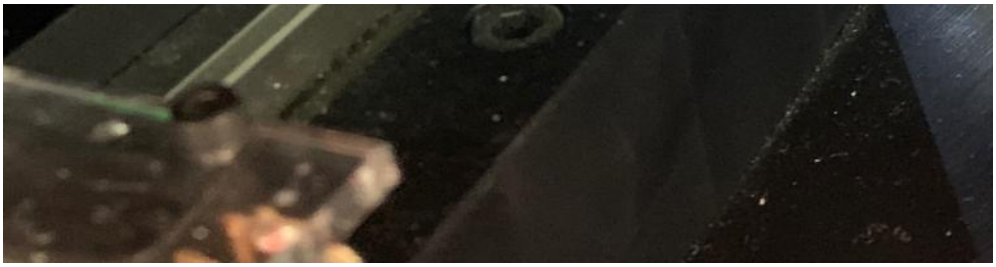


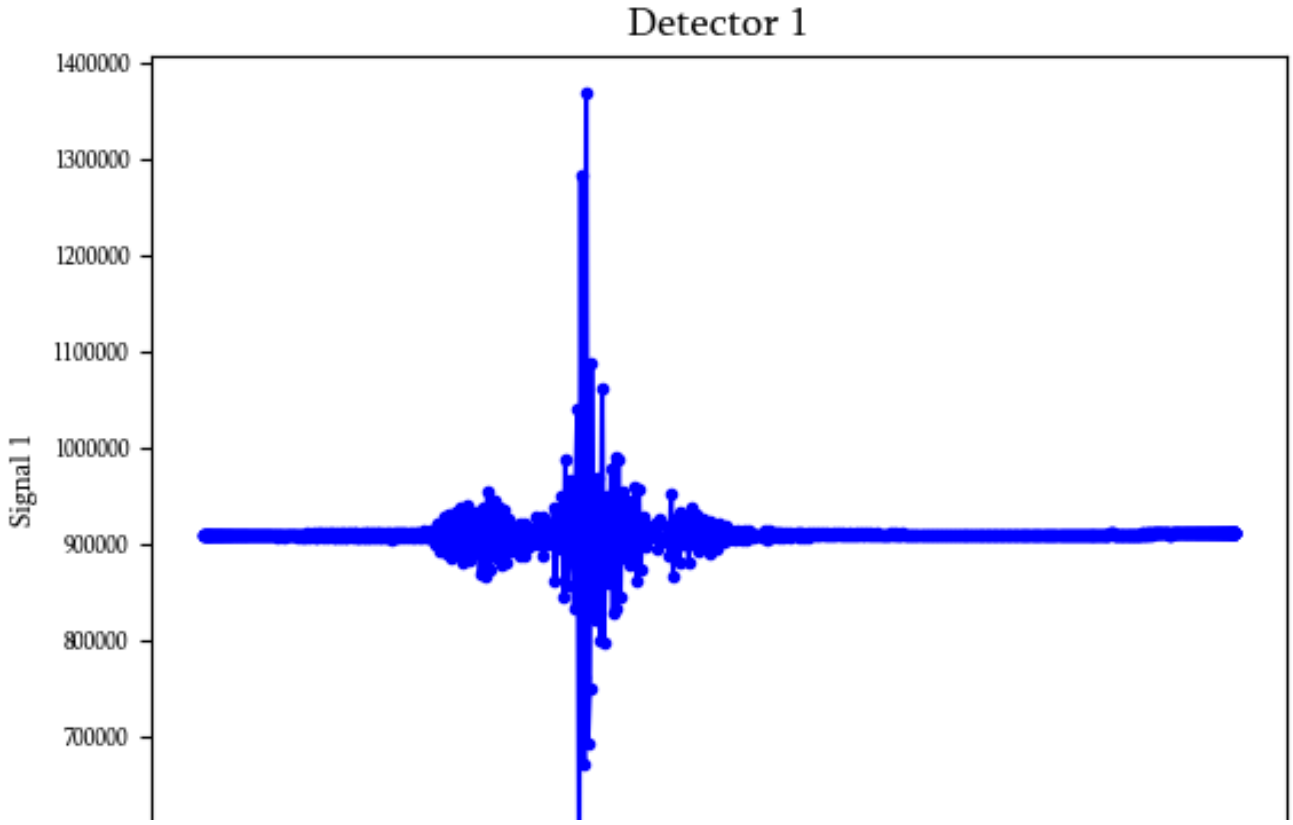
**Fig 28. Recalibration - preliminary null point found just by looking and slowly turning the micrometre by hand until the rainbow like interference is clear and visible.**

However, discovered that the motor was moving too quickly for us to then see the pattern and lowering the speed would mean turning the motor would take too long to run.

Therefore, we're limiting the range further to 6.10 to 6.17.

Replacing the screen with the detector we decided to look at what interferogram we get when we pass through this range. This is because we've realised it's hard to find the null point precisely judging by eye and even then it's always going to be a bit of a range as it's hard to discern exactly when it's most visible. we figure that if we take an interferogram it will be a sinusoidal graph modulated by a since function- therefore we could look at the peak and work out our null point more precisely from this.

We decided to take a preliminary reading of the interferogram shown in **fig 29.**



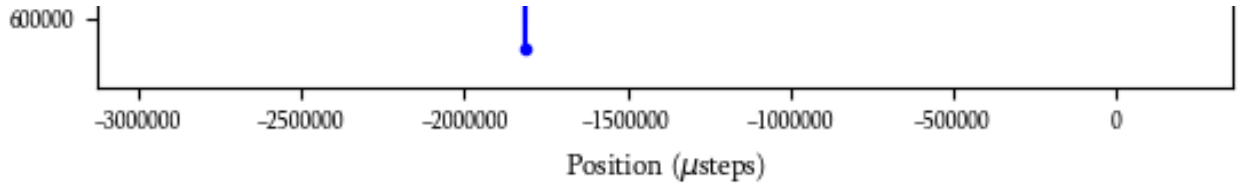
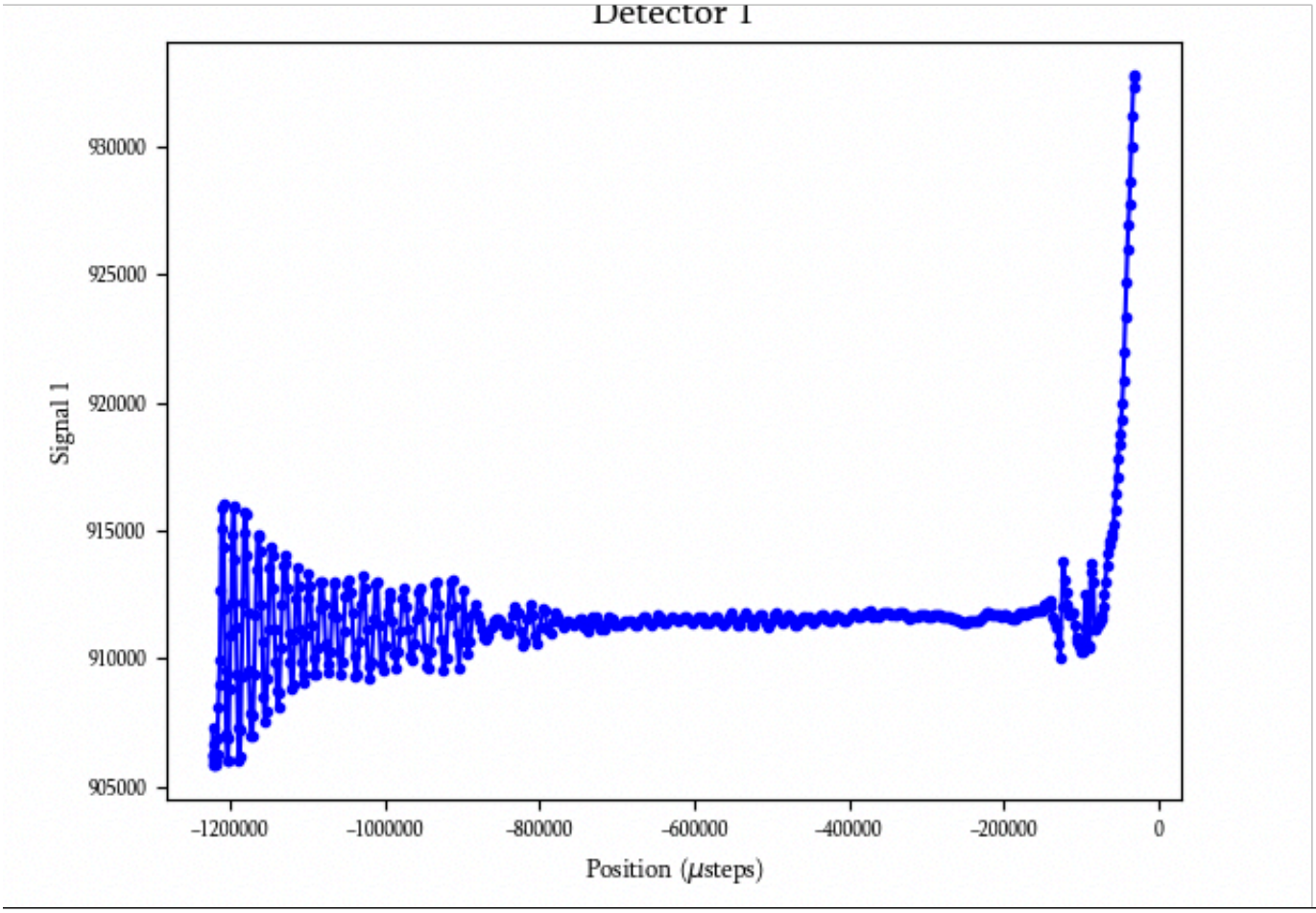



***Fig 29. plot of signal (intensity) against the position in micro steps - we did this for preliminary data***

The interferogram shown in **fig 29.** is preliminary run at a higher motor rate so that we have a rough idea of how long to run the motor for in order to ensure we pass through the null point.

Our idea is that since we know the exact range in mm we will be travelling and the micro steps we travel we can find the peak of the amplitude in micro steps from the interferogram and hence work out the null point eactly.

Next we returned to the start and ran it again at a slower rate, for completeness I'm including our first attempt here where we didn't run the interferogram for long enough, shown in **fig 30.**



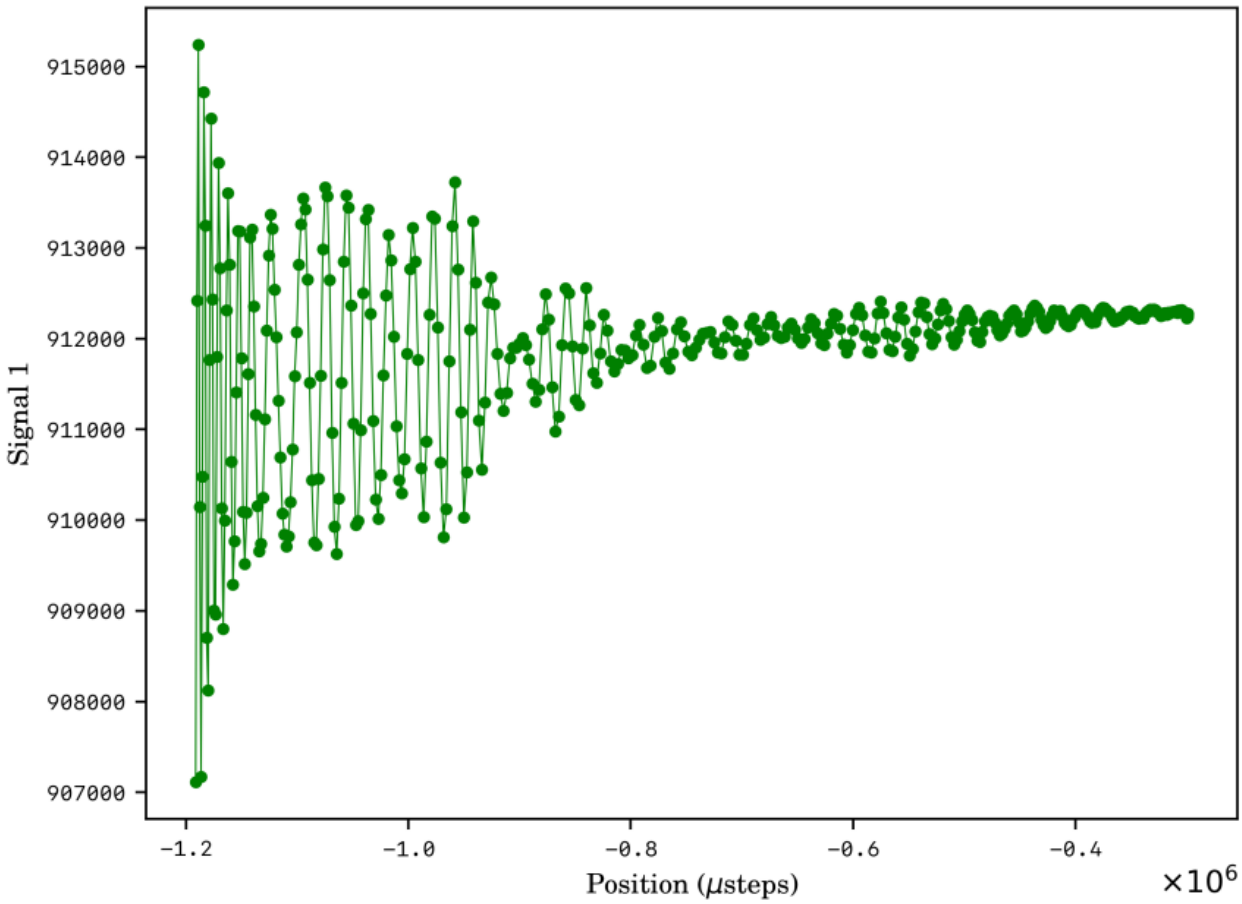
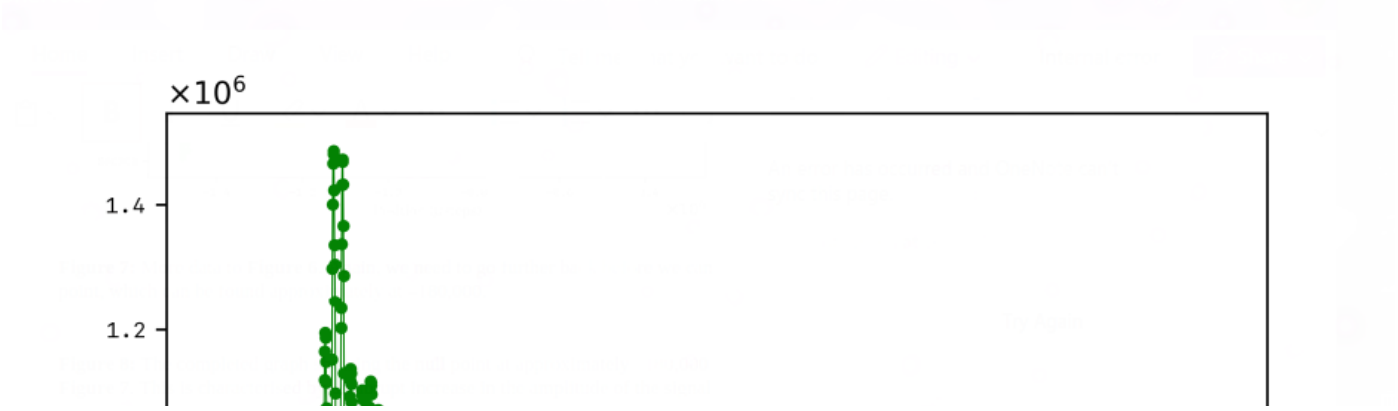



***Fig 30. plots of signal (intensity) against position in micro steps - clear to see that we didn't run it for long enough but these allowed us to better work out how many microsteps we need to run for. Included for completeness.***

From the interferograms shown in **fig 30.** we've realised that the theoretical value we calculated for microsteps to mm of 1 micros step to 1.5625 x 10^-8  wasn't correct. This makes sense to us when we reflect on what we did in task 6. This understanding helped us so we thought it prudent to include it as it was a helpful learning point for us.

Now we our true interferogram is shown in **fig 31.** where we have returned to the point where we started and run a long enough interferogram to go from 6.10 to 6.17 mm.



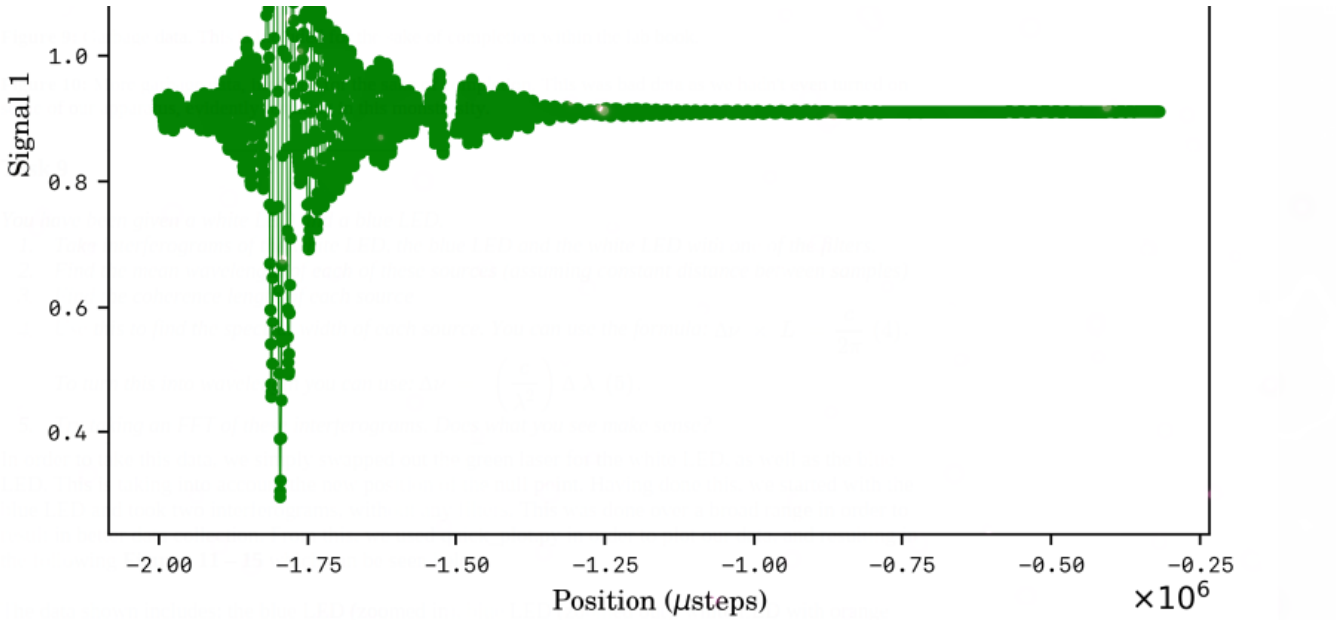



***Fig 31. plot of signal (intensity) against position. Here we can clearly see that we have run it past the null point. From this we have taken the null point to be at 1,800,000 micro steps from our starting point (the lower end of our range 6.00 to 6.17 mm). Note, we trimmed this plot so that the data irregularities due to the motor accelerating are not included but it started at 0.***

Therefore, we can calculate our null point to accurately be at **6.63 mm** along our micrometre.

Note, upon reflection we think this was unnecessary for what the task was asking of us but we decided to include it all for completeness.

**Task 9**

We have already found the interferogram of white light as shown in **fig 29** and **31.** As we used it to find our exact null point, we decided to redo white taking more data points by using smaller steps and using a larger ranger, shown in **fig .** We then used the exact same set up and range for the blue light and white light with a green filter and then a yellow one. These are shown in **fig . Fig .** And **fig .** Respectively.