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07/06/23

After doing the littrow configuration yesterday, I compared the current of my diode laser vs. the poweroutput for a littman-metcalf ECDL, (feedback vs. no feedback).

The results were similar, with higher power measured ~~for~~ with feedback, and a lower lasing point.

I also learnt how to attach my ECDL setup to optical fibre.

08/06/23

This morning I worked together with my team in assembling, configurating and tuning our DIY spectrometer. After some buffering difficulties with our CCD were fixed, we attempted to calibrate our spectrometer. We ran into an issue with the calibrating device, as the light it ~~emitted~~ emits is too dim.

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also ~~were~~ are dealing with too much noise in our measurements.

12/06/23 11:30 AM.

Due to the issues we ~~eee~~ encountered calibrating our spectrometer, we have decided to attempt doing this theoretically. This entails using a flashlight and the grating formula, while keeping track of the possibly large uncertainties.

Calibrating theoretically turned out to be more difficult than we expected, as measuring the angles in the spectrometer lacked precision, resulting in uncertainties which rendered our results practically useless.

In the mean time, we have ~~found~~ successfully reduced the noise of our CCD, and have detected a faint peak on the oscilloscope from the neon lamp. This means that we can again attempt to calibrate our spectrometer with this lamp, but to do this we must resolve the peaks better.

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13/06/23

After speaking to Max, I've redone the experiments on lasing with both the Littman-Metcalf setup and the Littrow configuration, setting the experiments up in such a way that the power outputs before lasing in both configurations was similar. While I was doing my measurements I noticed that an aperture I had used to tune the diode laser was still a part of the setup, and at ~~higg~~ higher currents was blocking some of the laser ray. I removed the aperture and redid all the measurements. After I had collected my data, I plotted all 4 curves in a python plot.

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15/06/23

Hiccups in the calibration of the spectrometer are seemingly resolved (or close ~~to~~ to being done), which means I have to set-up the ECDL with an optical fibre ~~be~~ by the time the spectrometer is ready for inputs. I have previously ~~a~~ hooked my setup to an optical fibre, but had to disassemble this to conduct my experiments on the 13th. Optical fibres are notoriously difficult to work with, so I hope I will be able to replicate my earlier succes.

After noticing that ~~the laser was~~ ~~leaving~~ the zeroth order of the laser was exiting the grating at a slight negative angle relative to the horizontal. This coincided with struggles in getting an outputs from my optical fibre, so I decided to take apart and rebuild my ECDL, making sure that all the apparatus are at a consistent height.

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I soon noticed the issue: the laser was exiting the diode at a very slight negative angle relative to the horizontal. It would be a serious pain to fix this, so I decided to adjust the grating such that the zeroth order beam was travelling horizontally, while dismissing the issues that non-horizontal beams have on the setup (I was still able to give optical feedback). I was not able to notice a direct effect on my ability to get an output from an optical fibre.

I did feel I was getting closer, however by the end of the day I still had no output, and the calibration of the spectrometer was done.

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16/06/23

When I arrived in the morning I noticed that Daniel had successfully gotten an output from the optical fibre. Sadly this victory did not last long, as it turns out that while rebuilding the ECDL yesterday, I ~~do~~ did not clamp down the grating effectively. At some point the grating moved, which means there was no more output from the fibre. I clamped down the grating correctly, and set out (again) on getting an output from the optical fibre. This time I implemented a technique I picked up from observing Daniel, using an open aperture and closing the iris ever so slightly, ~~and~~ noticing which part of the light beam disappears first. With this technique I was able to reach a near perfect alignment, and after connecting the optical fibre to the setup and with some slight adjustments to some knobs, Daniel and I were able to produce an output from the optical fibre.

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At this point the spectrometer was fully operational, so after a quick calibration, we were able to use the ECDL as an input to the spectrometer, and measure the effect that optical feedback has on the output of a ~~laser~~ laser. We collected data ~~at~~ while the diode was not lasing without feedback, while the laser was lasing without feedback, and while the laser was lasing with feedback. The data was captured on the Oscilloscope in CSV files, with live updates being made in Emils' lab journal.

We focused mainly on lasing with feedback, while adjusting the angle of the reflective mirror in the Littmann-metcalf setup to select certain wavelengths to be sent back into the diode for feedback. We ~~observed clear results~~ clearly observed the effect that optical feedback has on the output of a laser. One thing we noticed which we perceived as odd was that the ~~stimulated wavelength(s) did not~~ magnitude of the stimulated wavelength(s) did not seem to always decrease as we changed the angle of the grating. This was true for the overall trend, with longer wavelengths

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being stimulated at first, and as we increased the angle of the mirror we saw a trend towards shorter wavelengths being stimulated. However this trend was not consistent, as the readings on the oscilloscope would often ~~jump~~ momentarily jump to higher ~~travel~~ stimulated wavelengths while the angle was being increased. I asked Daniel if he ~~maybe~~ had an explanation for this, ~~but~~ but it did not seem familiar to him either.

For the rest of the day, Robin, Emils and I planned the content and design ~~too~~ for our poster.

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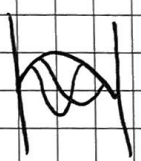
19/06/23

In the morning Emils and I set out to improve upon the measurements we made last friday. We did this by adjusting the integration time for each ~~spec~~ specific reading. This way the peaks measured by the CCD were displayed sharper on the oscilloscope. This is the data we intend to use for our poster.

The rest of this day will be spent on writing an Introduction to the poster, and beginning the schematic diagram of our setup.



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