Hi professor

Through reset the components of the FIR system, we have finally seen the dawn of hope with good beam profile. This week, Jon took the metallic mesh and the scanning stage outside. And then we do alignment using the HeNe laser diffraction pattern from the mesh. After setting all down, I check the beam profile as shown in the figure. It is much better than previous.

Talking with Jon, we think set the mesh outside of the system could diminish the thermal expanding effect, which could cause the angle derivation and misalignment. Beside this, at this time when I do the cavity scanning to find the best position, the beam structure looks cleaner and smoother without the small fluctuation structure which stem from the CO2 laser interference. That structure would be more easy to automatic control the cavity shift at the best position.

The repeatability of beam profile adjustment still needs to check, but it would be easier compared to original setup. Beside this, I found the beam intensity sometimes very instable, I think this is caused due to the interference between the mesh and the flat window. Since the flat window has nearly 10% reflection, which could cause degrade of performance of cavity adjustment and the interference problem. Thus, using Brewster window would be a better choice.

Best regards

Xinhang

**Hi Professor,**

Through resetting the components of the FIR system, we have finally seen the dawn of hope with a good beam profile.

This week, Jon removed the metallic mesh and the scanning stage. Then, we did alignment using the HeNe laser diffraction pattern from the mesh. After setting everything up, I checked the beam profile, as shown in the figure. It is much better than before.

Talking with Jon, we believe that placing the mesh outside the system could diminish the thermal expansion effect, which might cause angular deviation and misalignment. Besides this, when I performed cavity scanning to find the best position, the beam structure appeared cleaner and smoother, without the small fluctuation structure caused by CO2 laser interference. This improvement would make it easier to automatically control the cavity shift at the optimal position.

The repeatability of beam profile adjustment still needs to be verified, but it should be easier compared to the original setup. Besides this, I found that the beam intensity was sometimes very unstable. I believe this is due to interference between the mesh and the flat window. Since the flat window has nearly 10% reflection, this could degrade the performance of cavity adjustment and cause interference issues. Therefore, using a Brewster window would be a better choice.

**Best regards,**  
Xinhang