Hi Professor

This week Jon and I are working on the laser optical and figure out some problems and these problems have solved.

First of all, we found that when we run the CO2 laser with low flow and normal CO2 pressure, the pattern of CO2 laser has donut shape with obvious hole on the center, which we didn’t realize before. This maybe the reason caused the donut shape of formic acid laser since we used to operate the CO2 laser with low flow to for saving gas. When the CO2 laser run under full flow and normal CO2 pressure , the beam profile would be better despite there still has a decreased power spot in the middle.

Second is the issue from the combined mirror for combing the reference diode laser and CO2 laser, this mirror causes great loss of CO2 laser energy, and also deform the beam pattern. So, Jon replace the optical setup with the simplest 2 copper mirrors system instead of old combined mirror system. This simple optical not only solve the energy loss, but also simplify the alignment procedure.

The third issue is there having some corrosion near the joint of FIR laser cooling tube caused by formic acid laser, the corrosion part connect with the vacuum and the vapor water has the possibility leaking to the FIR system. Jon has taken out the cooling tube and replace with the new joint.

In Friday, we will assemble the new rear mirror and output coupler, check the alignment and get everything ready to run the whole laser system.

Hi Professor,

This week, Jon and I have been working on the laser optics, identifying some issues, and resolving them.

First of all, we found that when we ran the CO₂ laser with low flow and normal CO₂ pressure, its beam pattern displayed a donut shape with an obvious hole in the center, which we hadn’t noticed before. This might be the reason for the donut-shaped beam of the formic acid laser since we used to operate the CO₂ laser with low flow to conserve gas. When the CO₂ laser is run at full flow and normal CO₂ pressure, the beam profile improves, although there is still a slightly decreased power spot in the middle.

Secondly, there was an issue with the combined mirror used for merging the reference diode laser and the CO₂ laser. This mirror caused significant energy loss and deformation of the CO₂ laser beam. Jon replaced the optical setup with a simpler system using two copper mirrors instead of the old combined mirror system. This simpler optical setup not only resolved the energy loss issue but also simplified the alignment procedure.

The third issue was corrosion near the joint of the FIR laser cooling tube, caused by the formic acid laser. The corroded part was connected to the vacuum, raising the possibility of water vapor leaking into the FIR system. Jon removed the cooling tube and replaced the joint with a new one.

On Friday, we will assemble the new rear mirror and output coupler, check the alignment, and prepare the entire laser system for operation. Once these problems are fully resolved, we expect to achieve better beam quality for the FIR laser.

Best regards,  
[Your Name]