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Building a light sheet microscope around an AZ100 microscope, part 2

By admin · February 11, 2017

In [my previous post](#) I talked about the basics of building a light sheet microscope from an AZ100 scope. After our initial successes with the microscope, we wanted to upgrade it to multicolor imaging and add a motorized Z stage to allow easy sample movements and potential image stitching.

For the multicolor laser source, we added a 4-line (405 / 488 / 561 / 640 nm) [Vortran VersaLase](#) laser launch. Vortran was easy to work with; since they're located in Sacramento, they even drove up to install it for us. It's fiber coupled; we use a doublet lens to collimate the beam from the fiber and then a cylindrical lens to produce the light sheet. A slit in front of the cylindrical lens allows trading off the width at the beam waist and the convergence of the sheet, allowing you to choose whether you want a thin sheet over a small area or a wider sheet over a larger area.

To add an emission filter wheel, we turned to Ebay. I've [mentioned before](#) that you can get cheap ASI parts from old GAIIX sequencers. We bought one such set of parts for the light sheet system, and then designed mounts for the filter wheel between the objective nosepiece and the filter turret, where a DIC slider housing formerly went. I'm pretty sure that this is in infinity space, and in any event the filter wheel mount isn't that much thicker than the DIC slider housing was, so I don't expect this to add much aberration. I had a lot of fun designing the filter wheel adapter in Autocad Inventor; I 3D printed parts of it to test the fit, and then had it machined in aluminum by [proto labs](#). The total cost for the custom machining was around \$700 and the turnaround was around a week, so I would definitely use them again.

The ASI stage mounts on the transmitted light illuminator base in place of the manual stage that had been there, via a 3D printed adapter. A second adapter mounts to the top of the plate and allows interchangeable 3D printed holders for different size cuvettes to be installed. We started with a 30 mm ID cuvette from [Hellma \(type 704-QG\)](#), but it was too tall to fit underneath the 5x / 0.5 objective, so we now mostly use a custom made 2 cm x 2 cm x 1 cm cuvette from [FireflySci](#).

Files for all the custom parts are [available at Github](#), as is the source code for the plugin we use to specify the relationship between the cuvette and objective position..

Bidirectional Z-scanning with Micro-manager and an ASI Z-stage