

Update on Tagger Microscope Prototyping

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GlueX Tagged Beam
Working Group

September 10, 2009

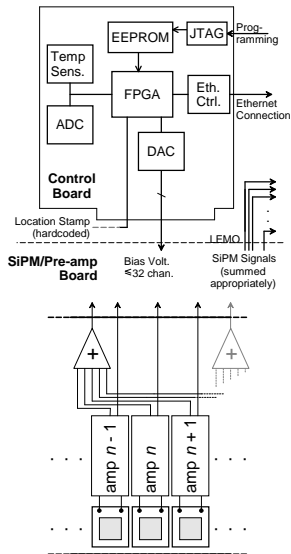
Electronics Overview

Control board:

- ▶ FPGA-centered design
- ▶ control through ubiquitous, robust, address-aware Ethernet
- ▶ V_{bias} via DAC: 32-chan., 14 bit, $\lesssim 200\text{ V}$
- ▶ on-board health sensors (Temp., ADC)

Amplifier boards contain:

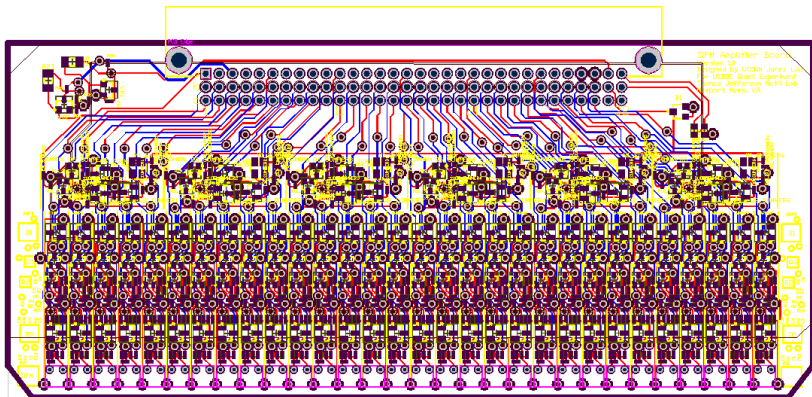
- ▶ array of up to 30 SiPMs
- ▶ fast, two-stage transimpedance amplifiers
- ▶ summing circuitry
- ▶ board temperature sensor ($\pm 0.5\text{ }^\circ\text{C}$)
- ▶ precision connectors for alignment with optics



Layout of SiPM amplifiers/summers

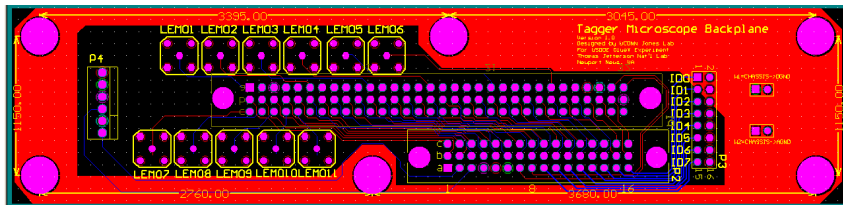
The layout for the Amplifier Board is complete and all bids have been received.

Submission for manufacture is expected next week.



Layout of Backplane

The design of the Backplane board is finished and ready for printing as well.



Review of board's functions:

- ▶ Control/Amp board patch-through with good light-seal
- ▶ power distribution
- ▶ analog output (LEMO connectors for wiring to fADC)
- ▶ board address encoding

Digital Control Board

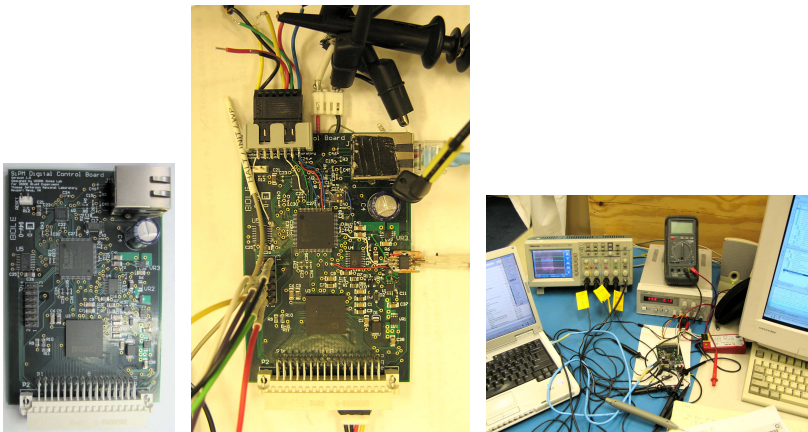


Figure: The populated Control Board is being tested using serial interface, packet sniffing, pin probing, triggered register shift-out etc.

Control Software

Work has begun on the Ethernet-based control software.

Modular design:

- ▶ Low level packet parsing/writing (based on libpcap) and protocol encapsulation - [in progress](#)
- ▶ Simple GUI will be added for the prototype
- ▶ Integration into detector control software to be discussed

The packet reading/writing functions are nearly complete and await test with the digital board, whose packet transmission errors are being debugged.

Polishing and Gluing Fibers

The fiber polishing/coating/gluing project is being carried forward by new students.

Much progress in developing the fiber mass-production techniques

- ▶ End-milling technique shows less damage (better yield) compared to fly-cutting.
- ▶ Mass gluing techniques based on a newly-machined tool is a significant improvement in yield and labor intensiveness.
- ▶ New compressor-based paint spray equipment promises thinner coats.

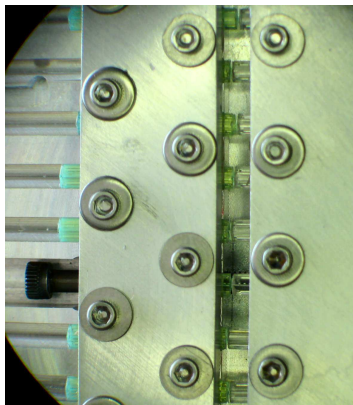


Figure: Parallel scintillator to waveguide fiber gluing stand. Note the gap adjustment screw to ensure precise and uniform glue volume.

Polishing and Gluing Fibers

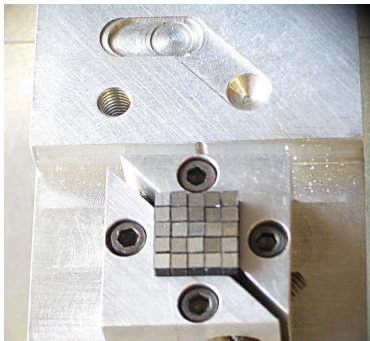


Figure: Assembly for machine cutting/polishing.

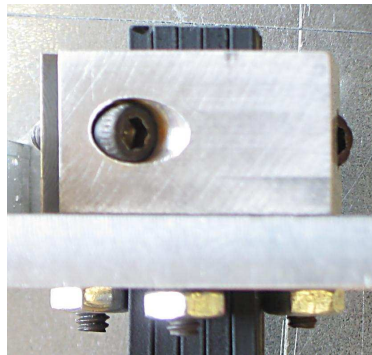
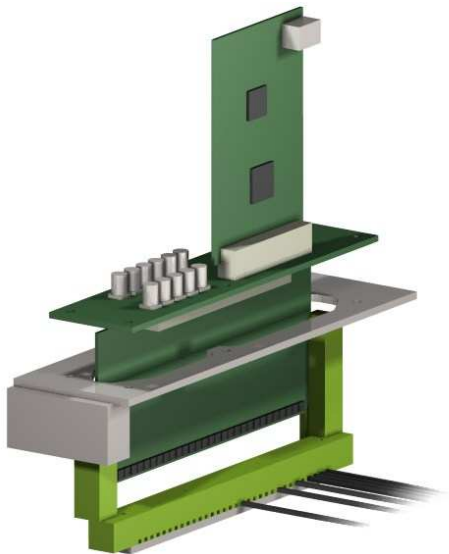


Figure: End-milling shows less damage to outside fibers. These were previously considered "sacrificial".

Assembly and Installation of Electronics

- ▶ The fit of all electronics boards with the microscope chassis checked
- ▶ Alignment with fibers checked and tolerances understood.
- ▶ Drawings being finalized for machining.



Outlook

Tentative work schedule on the prototype for the next months:

1. testing of the digital control board: *underway*
2. layout amplifier and backplane boards is ready: *to be submitted next week*
3. amplifier board population and testing: *~ 3 months*
4. full software for prototype: *~ 2 months*
5. mechanical and optical fabrication/assembly underway: *2-3 months*
6. Expected beam test: Hall B, March 2010 (parasitically with g9 Frost)
7. Data analysis and design modification: *subsequent 2-6 months*

Full microscope construction is on track.