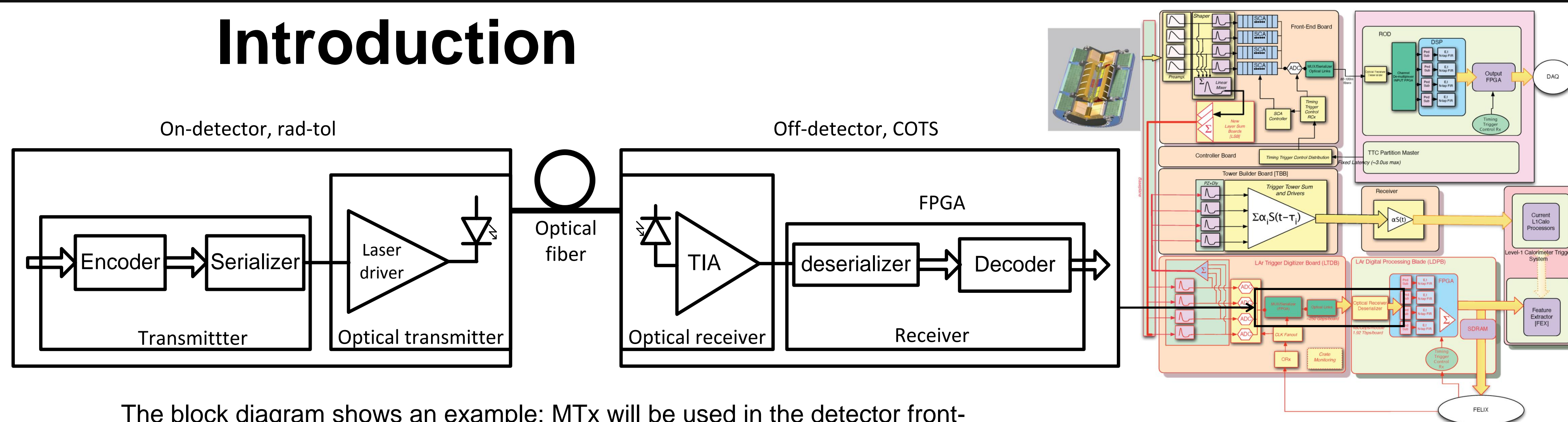


Board-mount miniature optical transmitters and transceivers for detector readout in particle physics experiments

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Introduction

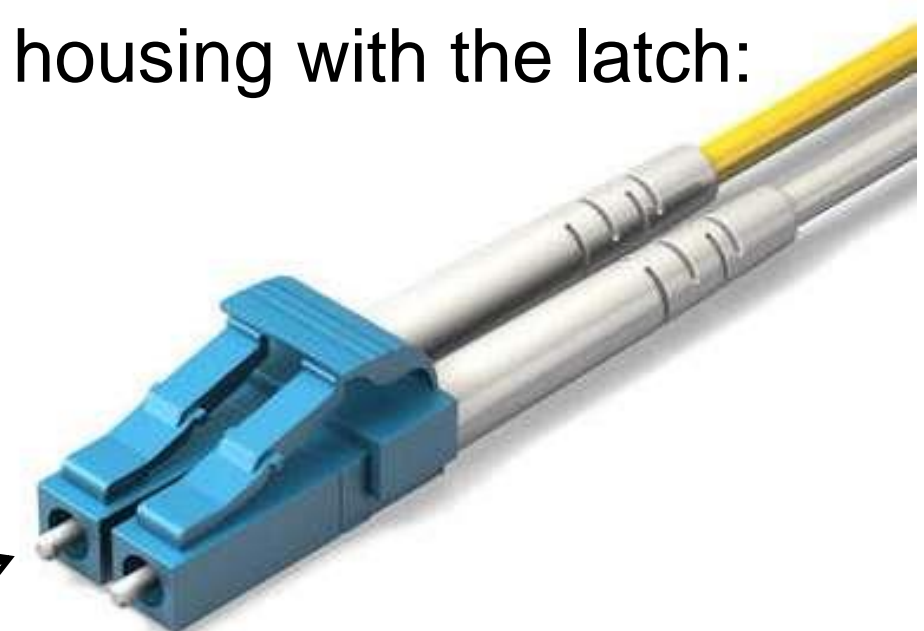
- We develop the board-mount miniature optical transmitter (MTx) and transceiver (MTRx) for the ATLAS Liquid Argon Calorimeter trigger upgrade in 2017-18.
- Board-mount optical transceivers eliminate the need of routing fast electrical traces from the front-panel to the IC chips (serializer and de-serializer). This is especially useful on a large board with many channels.
- MTx is a dual transmitter module to meet the needs in HEP detector front-end readout where the “traffic” is mostly from the detector to the back-end electronics.
- MTx and MTRx are only 6 mm tall. Using hermetic TOSA, ROSA and the standard LC fiber ferrule, we achieve reliable optical coupling and operation.



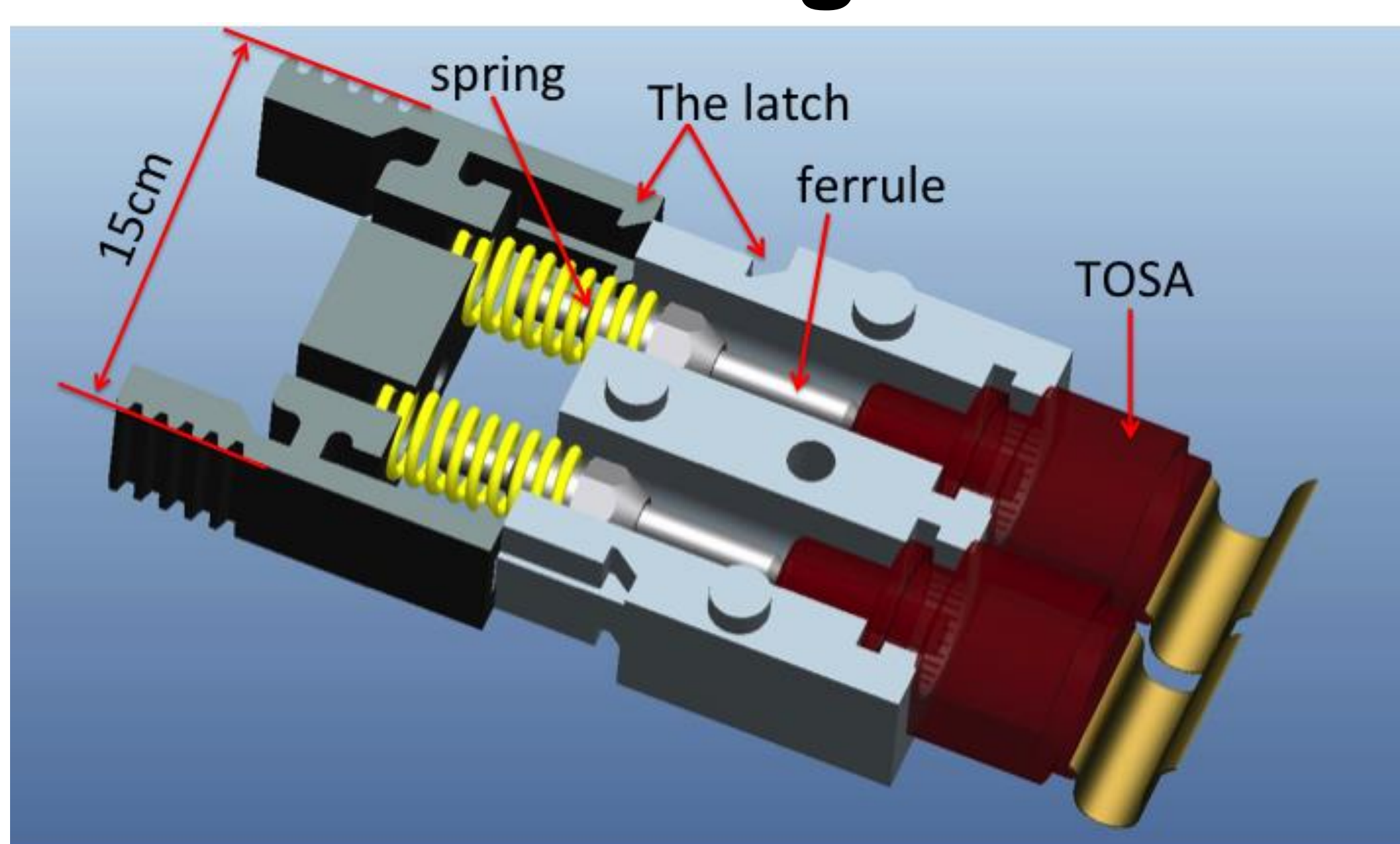
The block diagram shows an example: MTx will be used in the detector front-end readout in the ATLAS Liquid Argon Calorimeter trigger upgrade.

- The innovations in the design are:
 - Use the standard LC fiber ferrule with the spring, remove the housing with the latch:
- The custom designed latch couples the fibers with the TOSA and ROSA, and hold them to the PCB.
- If LOCx2, a dual channel serializer ASIC, is used with MTx, LOCx2 sits under MTx, minimizing fast signal copper traces and the whole optical link footprint.
- The latch is injection molded with the same plastic that makes up the body of the TOSA and ROSA.
- The electric connector is from Samtec.
- The mechanical part and the electric connector are the same for both MTx and MTRx. The difference is the PCB and pin definition in the electric connector.
- MTx and MTRx are anchored to the “mother board” with a screw.

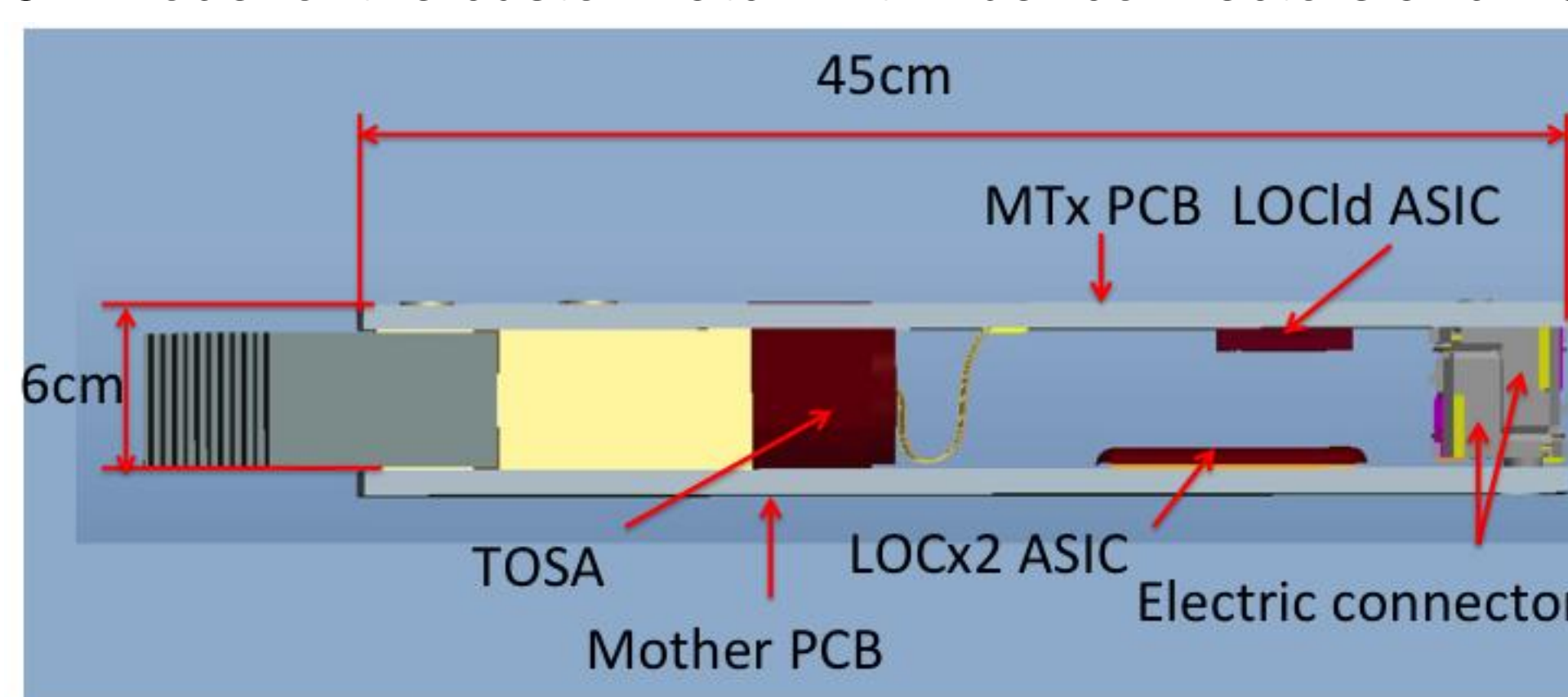
The design



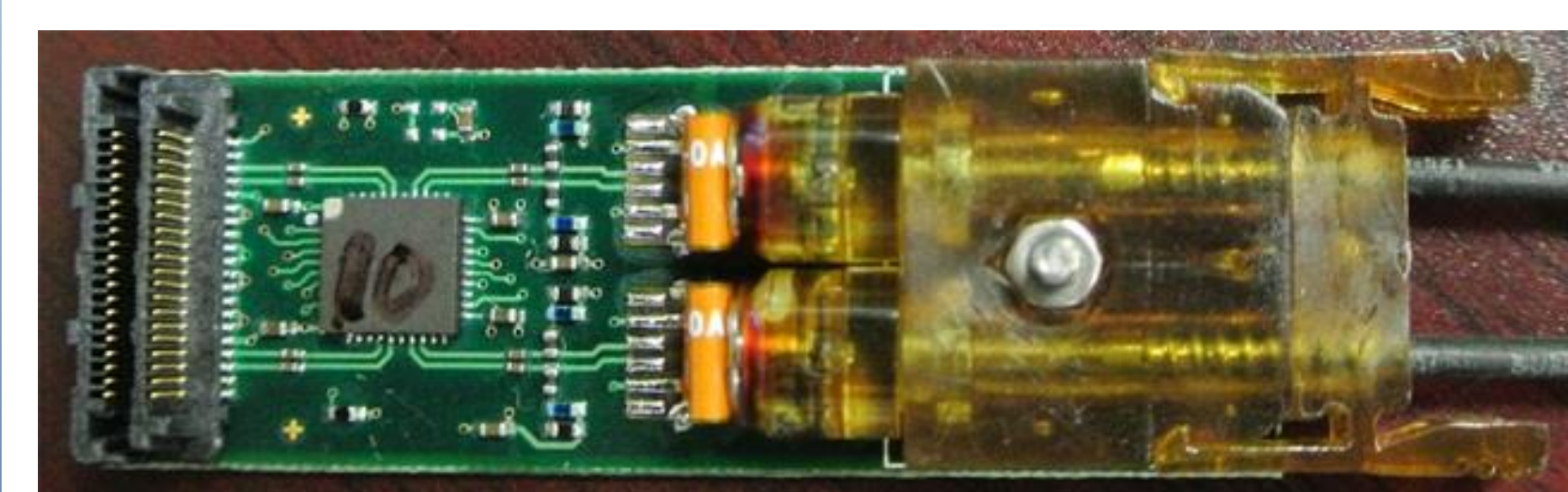
Only keep the ferrule and spring that is inside the housing. This can be custom ordered easily.



A 3D model of the custom latch with fiber connectors and TOSAs



A side view of MTx on its “mother board”. MTx only stands out by 6 mm.

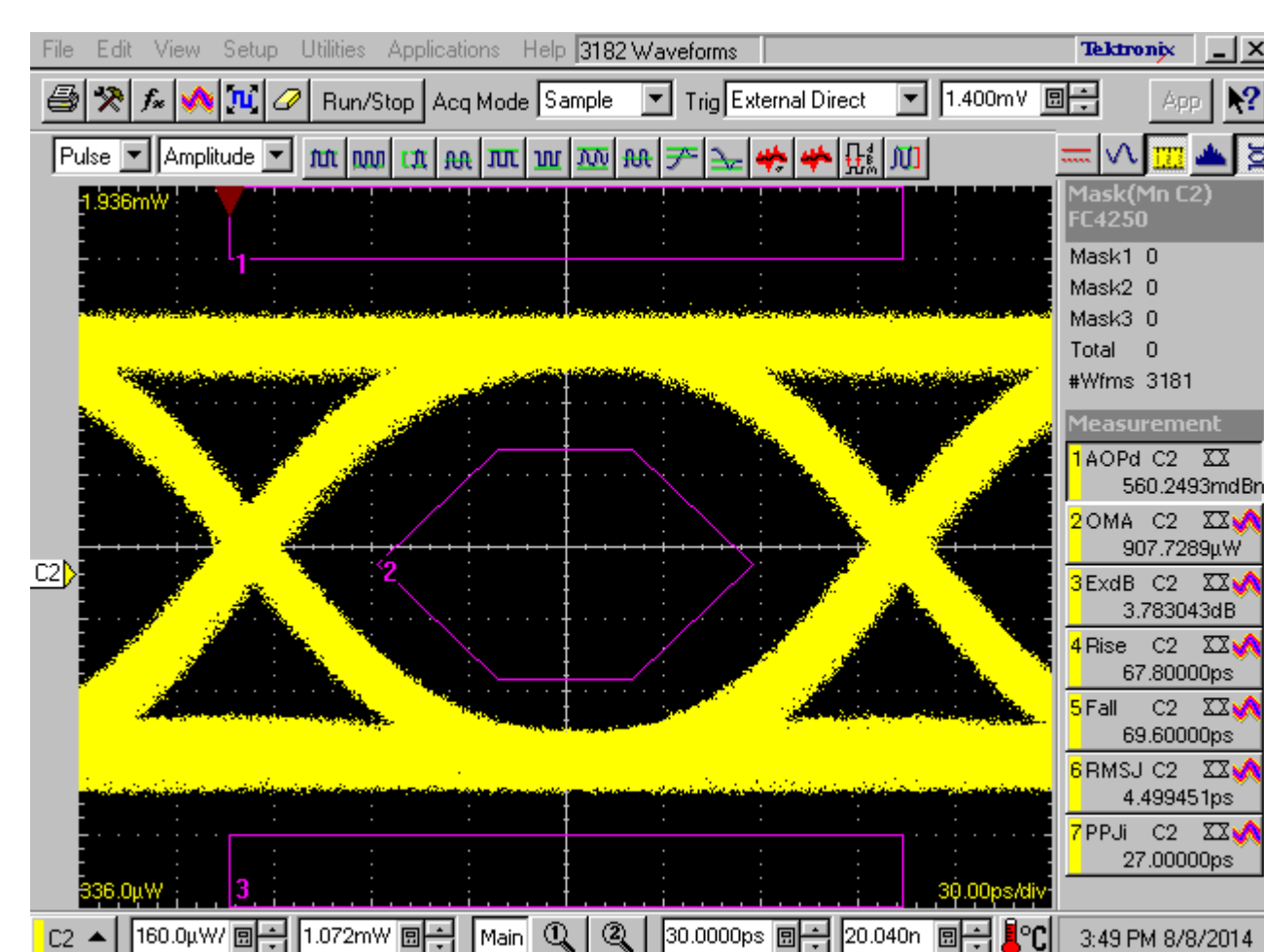


A photo of MTx. The ferrules and springs are visible through the latch



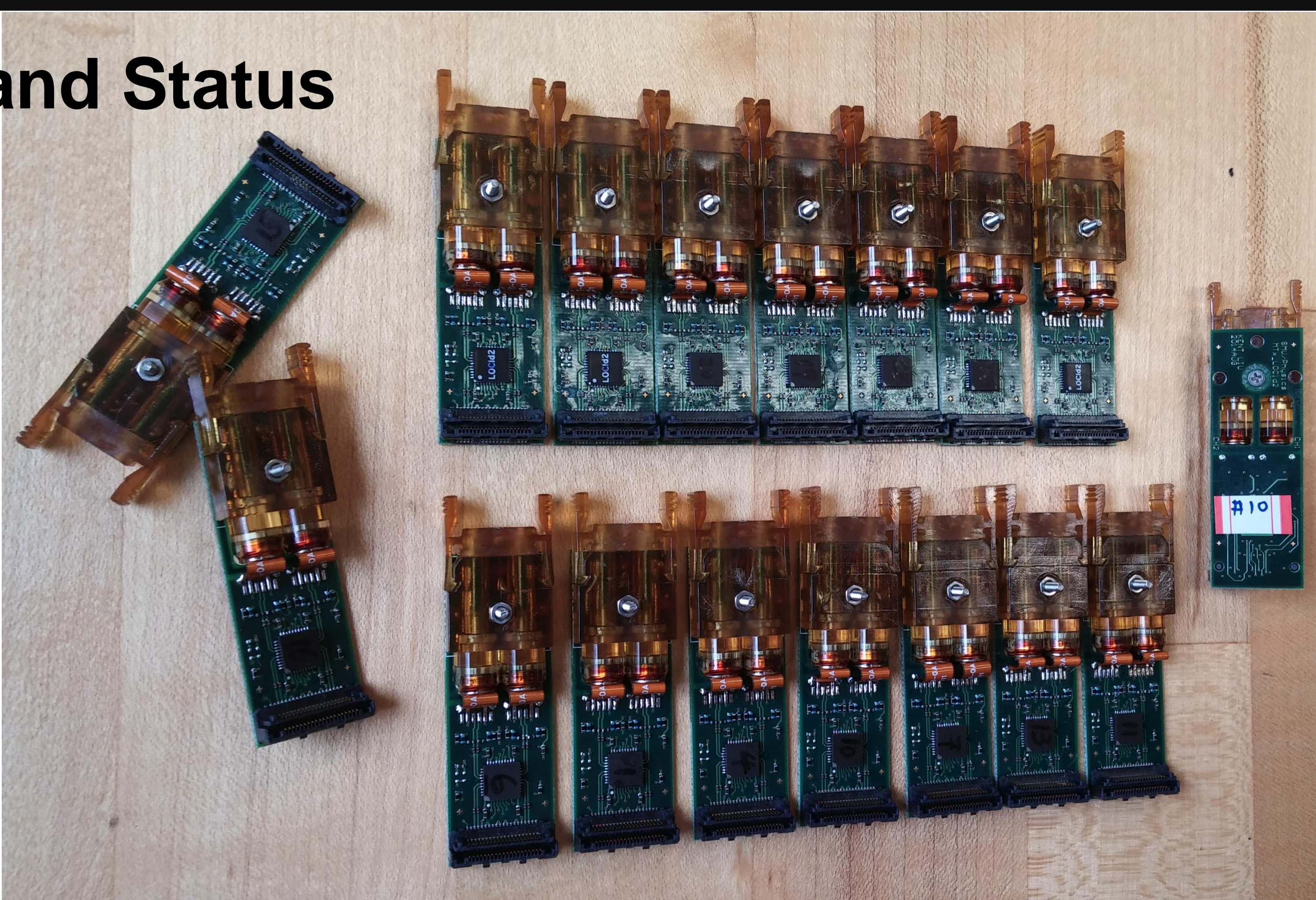
A photo of the fibers one part of the latch attached.

- MTx and MTRx prototypes have passed extensive tests and function to design specifications.
- A small pre-production batch is finished. Prototypes are available for system developments.
- Production will be organized soon once the design passes the production readiness review.



An eye diagram of MTx at 5Gbps

Results and Status



Acknowledgments

The MTx and MTRx idea initially comes from the SF-VTRx design of the Versarile Link project. We would like to thank Csaba Soos for many constructive discussions. We also would like to thank Prof. Ming Qi of Nanjing University for the help on the latch injection molding.

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