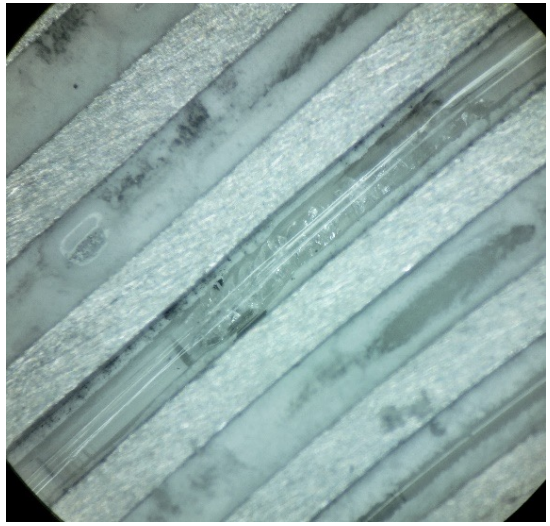
Failures During Testing

- In 2019 we encountered
  - 9 active HP fiber failures with bright spots which were revealed during our testing processes
  - 3 low efficiency failures
- At least 30 hours were spent troubleshooting and replacing components as well as engineering time
- Recently we were able to inspect fiber more carefully finding fiber anomalies in the process

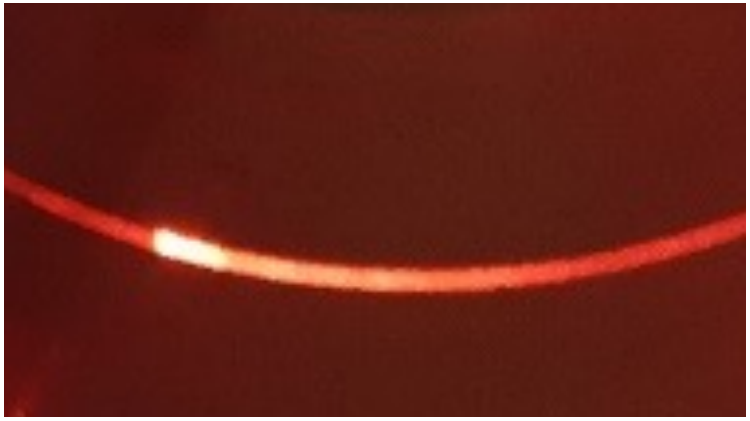
Fiber Anomaly 1

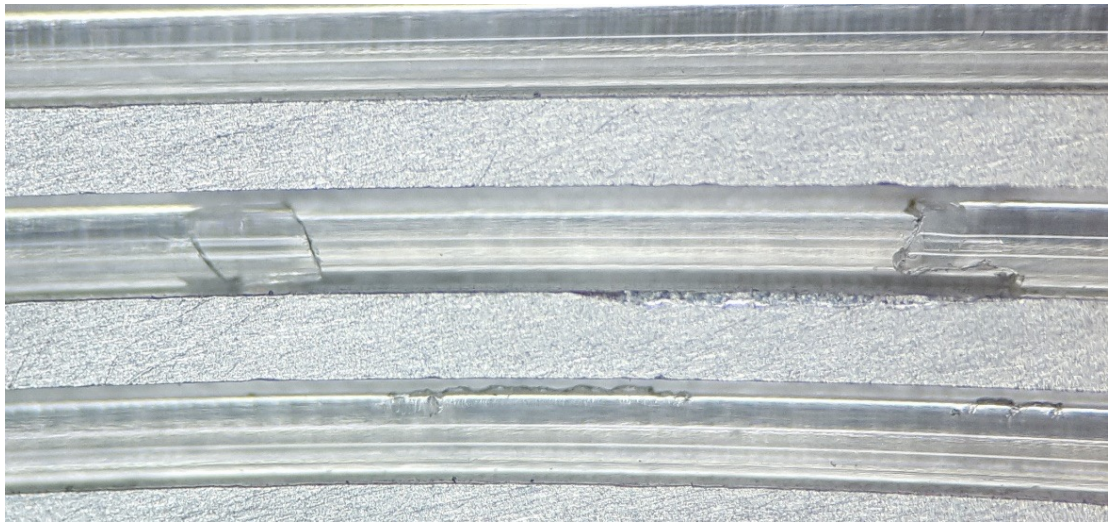
- (NCMR 1904-1955) Bright spot was shown after laser was turned on. When inspected the fiber it showed that coating was still intact, but glass had cracks; which formed over time, most likely due to imperfections in the core



Fiber Anomaly 2

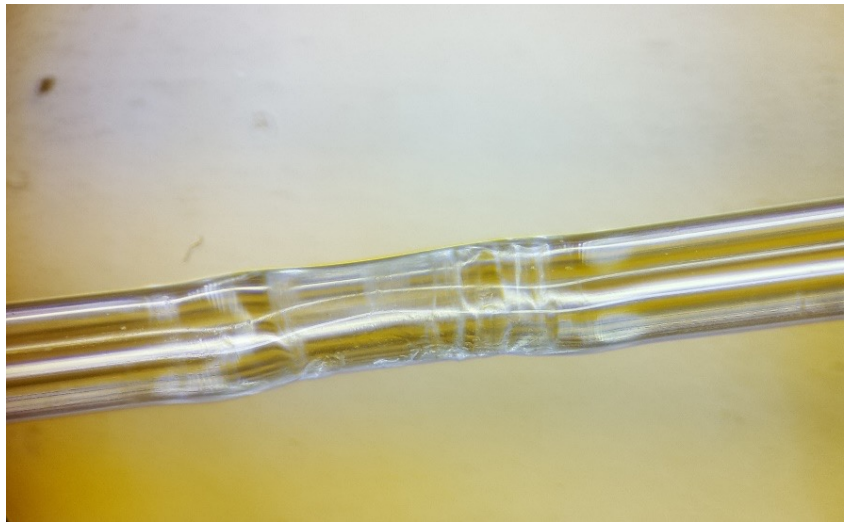
- (NCMR 1903-1938) During inspection of fiber noticed a bright spot. When examined under microscope, noticed that the section of fiber is missing coating

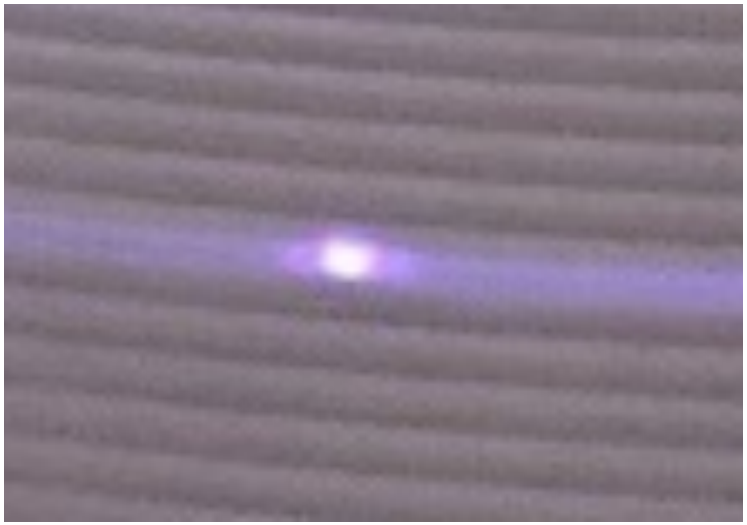




Fiber Anomaly 3

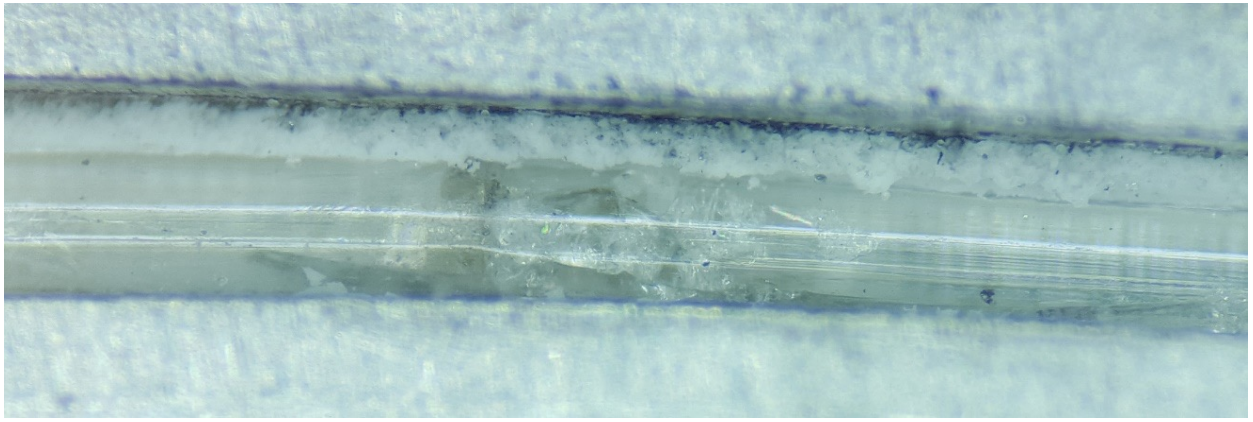
- (NCMR 1905-2024) As fiber came out of spool, immediately noticed section with irregular shape. When checked under microscope, fiber appears tapered in that section. RGB laser revealed bright spot

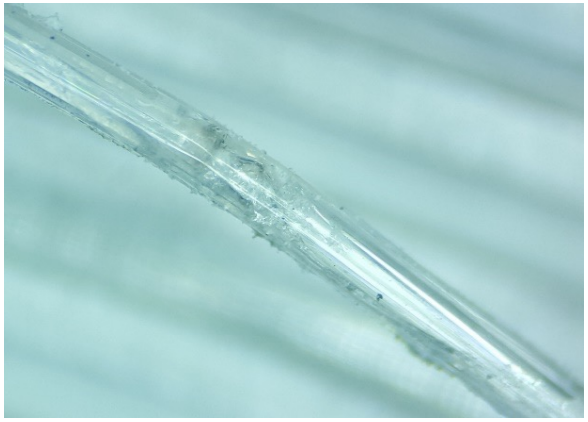




Fiber Anomaly 4

- (NCMR 1906-2029) Bright spot was shown after laser ran for 64 hours. When inspected the fiber it was apparent that coating was still intact, but glass had cracks that formed over time, most likely due to imperfections in the core





Conclusion

- For the last two failures fiber came out of same batch
- Internal impact: increased costs in production for rework and lower fiber yield, which effectively turns into higher cost of fiber we purchase
- Field Impact:
  - Upon failure of active fiber whole FLM shuts down and has to be sent back (from all around the world) for repairs
  - Costs are significant when failures occur including: service engineers' time, shipping, repairs and most of all customer down time