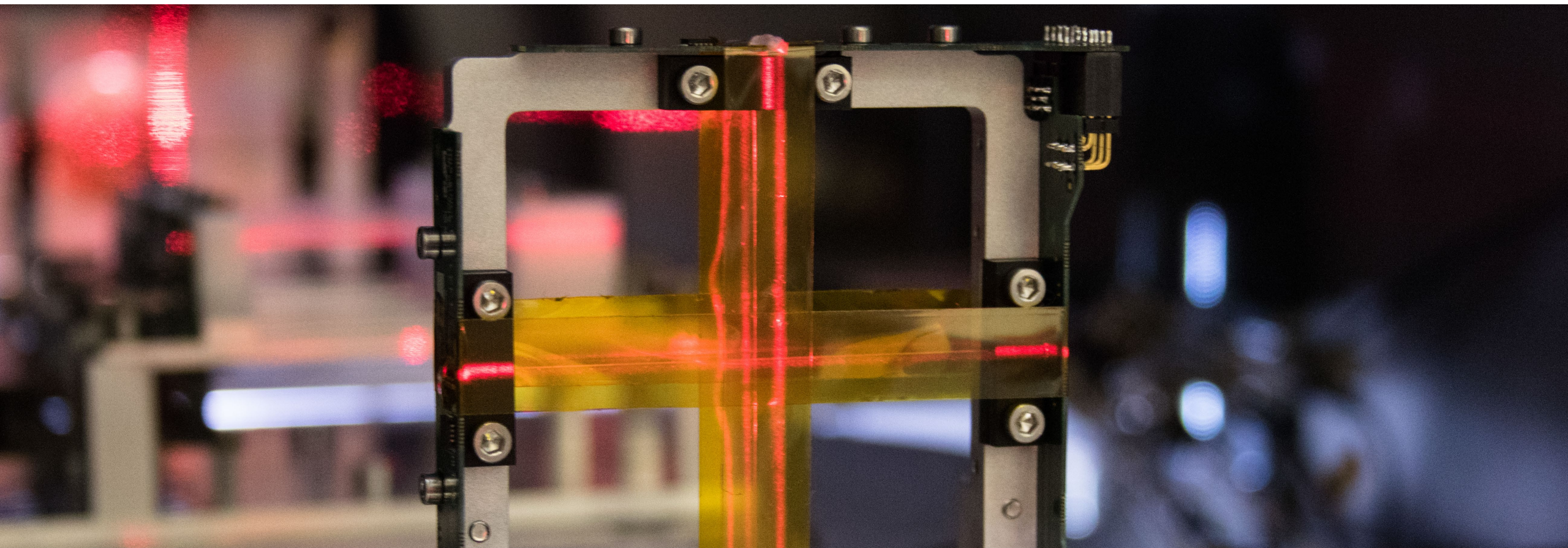# PCRM SciFi Update
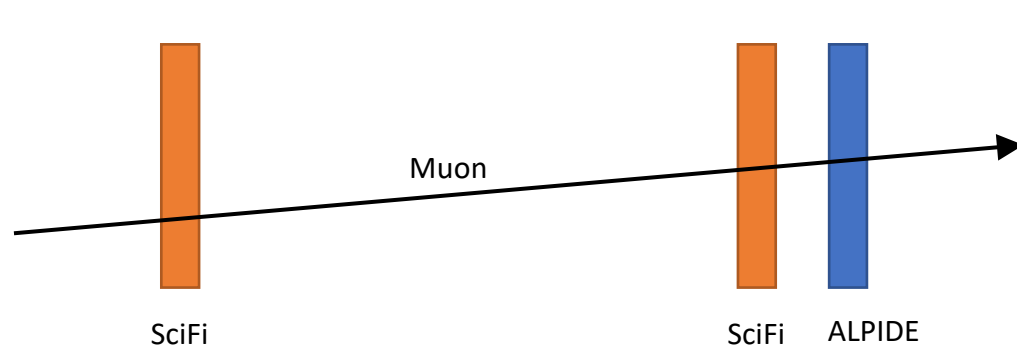
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January 19, 2021

Efficiency of Track Reconstruction
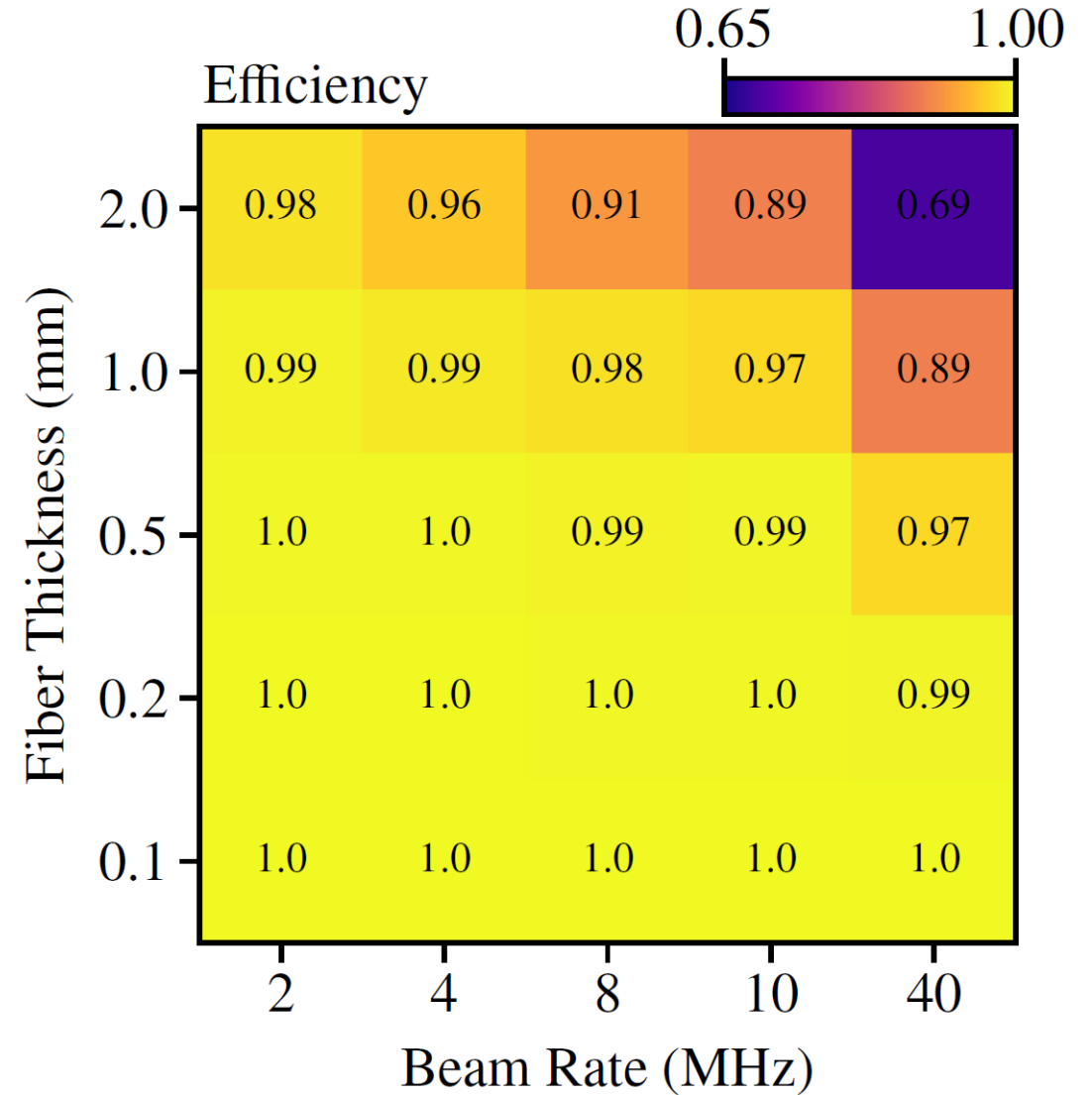
Do We Really Need 200 μm fibers?

- MC Simulation:
  - Track 'prediction' via two SciFi stations
  - Check against hit in APLIDE begin second SciFi
  - ➢ Rather crude implementation, lots of room for improving track reconstruction / prediction

$$\text{Efficiency} = \frac{\text{Number of correctly predicted hits}}{\text{Total number of tracks}}$$

➢ **500 μm achieve an efficiency of 100% at 2 MHz beam rate and 99% at 10 MHz beam rate!**

Efficiency

Fiber Thickness (mm) \ Beam Rate (MHz)	2	4	8	10	40
2.0	0.98	0.96	0.91	0.89	0.69
1.0	0.99	0.99	0.98	0.97	0.89
0.5	1.0	1.0	0.99	0.99	0.97
0.2	1.0	1.0	1.0	1.0	0.99
0.1	1.0	1.0	1.0	1.0	1.0

Resulting Setup

500 µm Fibers

- Four SciFi stations, one in front of / behind every ALPIDE detector to resolve ambiguities

- Only FI02 and FI03 contribute to material budget relevant to Q^2 measurement

- Total material at 500 µm fiber thickness: 4 mm
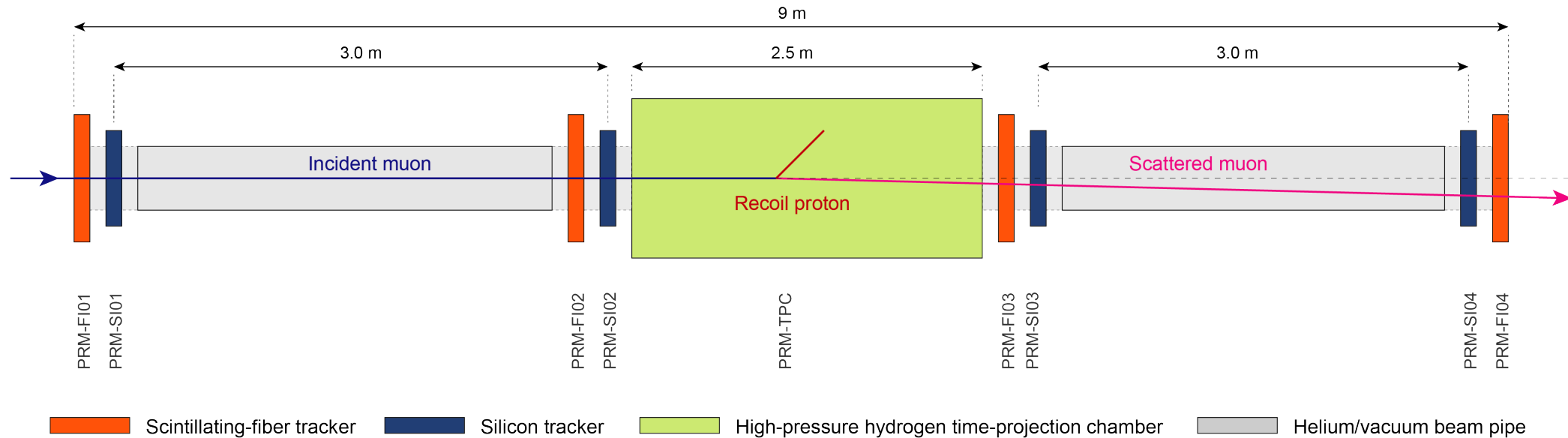
Q^2 Resolution

Reconstruction of Scattered Muon

- Checking effect of increased material budget on Q^2 reconstruction via scattered muons

- Setup as on previous slide, with FI02 and FI03 contributing to material budget

➤ Resolution decreases about 1% at 10^{-4}

➤ Almost no effect above 5×10^{-3}

➤ **We see no problem in using 500 μm fibers, which would yield about double the number of photons per muon and therefore significantly simplify the detector design (and reduce the number of readout channels required).**

Summary
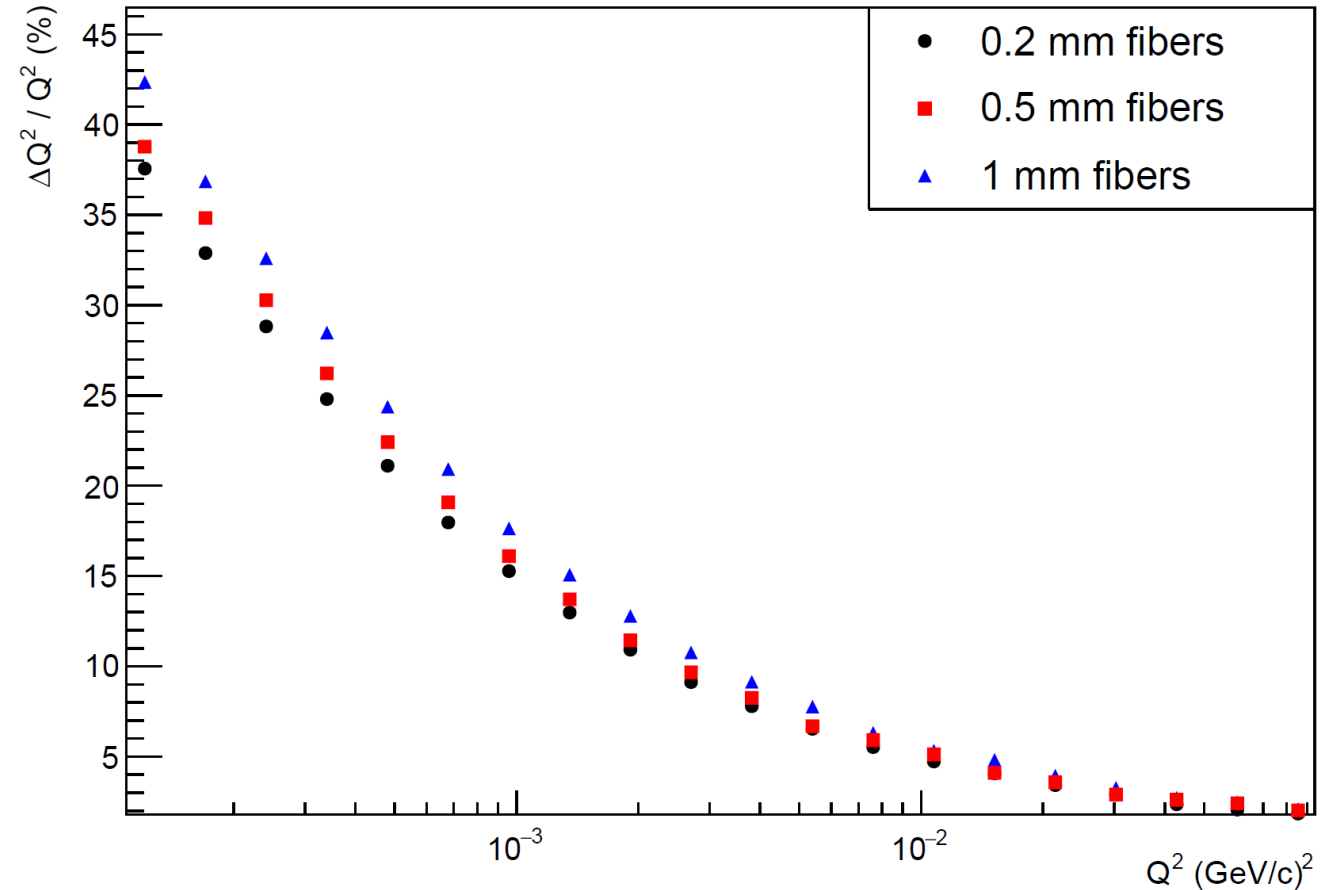
- Fiber detectors will (initially) only be used to resolve ambiguities/pile-up in ALPIDE silicon detectors, not for triggering (triggerless DAQ)

- Using 500 μm fibers (resulting in ~250 μm 'pixel' size) significantly reduces the complexity and number of channels of the detectors

- We recently initiated the purchase of 500 μm fibers, with a resulting delay of about three months

➤ **The simpler detector design will allow us to nevertheless have a prototype detector ready for the Pilot Run in September**