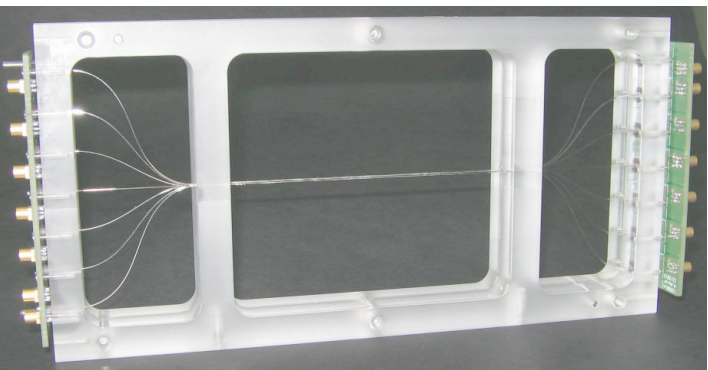


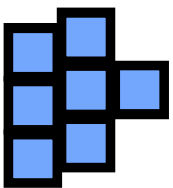
Scintillating fibres coupled to silicon photomultiplier prototypes for fast beam monitoring and thin timing detectors

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3 layers of square $250 \times 250 \mu\text{m}^2$ fibers
length/fiber $\sim 25 \text{ cm}$
Saint-Gobain multi-clad BFC12 fibers
100 nm of Al coating around fibers
2 SiPM/fiber
SiPM: Hamamatsu S12825-050C $1.3 \times 1.3 \text{ mm}^2$



Fiber assembly
(lateral view)



Result 1: The prototype performances...

Collected light (m.i.p.): 8.5 Nphe/fiber (AND)

Detection efficiency:
single fiber: ϵ (AND) $\sim 74\%$ ϵ (OR) $\sim 92\%$
single layer: ϵ (AND) $\sim 79\%$ ϵ (OR) $\sim 96\%$
double layer: ϵ (OR) $> 99.9\%$

Fiber optical cross-talk $< 1\%$

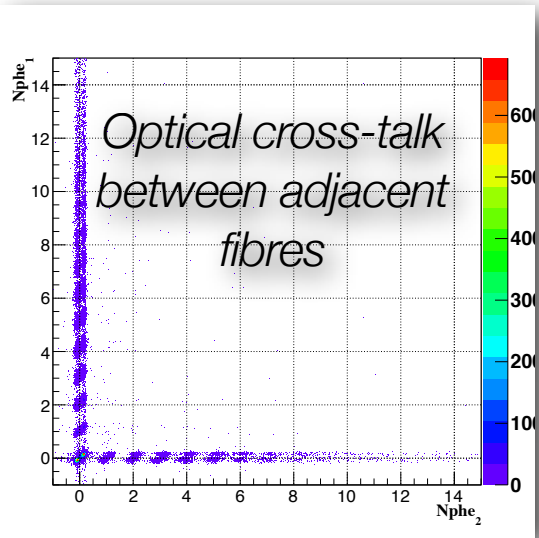
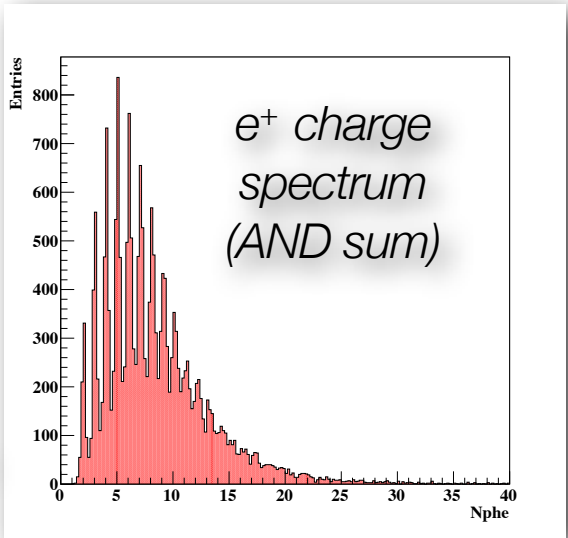
Result 2: ...as Beam monitoring:

The high detector segmentation combined with the fast detector response allows to work at the highest continuous muon beam intensity in the world ($2 \times 10^8 \mu/\text{s}$)

Result 3: ...as Timing detector:

Timing resolutions of the order of 500 ps already achieved with a single layer (250 μm thick) prototype detecting m.i.p.

Thin standalone timing detector either Scintillating fiber trackers and scintillating fiber timing detector complementing trackers made either by wire chambers or by silicon wafers are straightforward applications of this technology



Single hit: timing resolution
 $\text{thr} > 0.5 \text{ Nphe}$

Double hit: timing resolution
 $\text{thr} > 0.5 \text{ Nphe}$

Particle ID: clear separation
between e^+ and μ^+

μ^+ beam profile : 3D view

