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Microfluidic scintillation detectors for hadron therapy and high energy physics

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Within the microScint project in the CERN Physics Department a new generation of microfabricated particle detectors based on liquid scintillators is being developed.
These novel devices consist of dense arrays of microfluidic channels acting as optical waveguides and feature high spatial resolution and increased radiation resistance, while minimizing the material budget. Experimental measurements on prototype detectors yielded light output efficiencies comparable to state of the art scintillating fiber trackers.
Several technological solutions for the fabrication of the microchannels, such as SU-8 photolithography and silicon DRIE, are being investigated within the cleanroom facilities at the EPFL Center for Micronanotechnology (CMi) with the Microsystems Laboratory 4 (LMIS4).
Potential applications include single particle tracking in high energy physics experiments and beam monitoring for hadron therapy applications. A collaboration with INFN Rome has just started to develop a common approach to the potential applications considered. A common system is foreseen, with custom parts dedicated to beam monitoring applications, based on silicon photodiodes, while silicon photomultipliers (SiPM) are being considered for single particle tracking.

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