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Position sensitive detectors with SiPM readout for measuring antiproton annihilations

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The ASACUSA experiment at CERN is now constructing 530-channel position-sensitive scintillation detectors and its FPGA-based readout electronics to measure and track high rates of charged pions emerging from antiproton annihilations in a future radiofrequency Paul trap for antiprotons. Each channel is read out by a wavelength shifting (WLS) fiber and 1600-pixel silicon photomultiplier (MPPC). We first optimized the light yields of five types of extruded and cast scintillator bars with various cross sections. Double-clad WLS fibers were embedded in grooves or holes fabricated within the scintillators, and they were read out by multichannel hybrid or ASIC monolithic charge-sensitive preamplifiers. The first assembled detectors were tested against the 100-keV pulsed $\overline{p}$ beam at the Antiproton Decelerator (AD) of CERN, where we found that the pixel saturation at high antiproton rates were an issue.

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