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The monolithic ASIC for the high precision preshower detector of the FASER experiment at the LHC

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The FASER experiment at the LHC will be instrumented with a high precision W-Si preshower to identify and reconstruct electromagnetic showers produced by two O(TeV) photons at distances down to 200 μ m.

The new detector features a monolithic silicon ASIC with hexagonal pixels of 100 μ m pitch, extended dynamic range for the charge measurement and capability to store the charge information for thousands of pixels per event. The ASIC integrates SiGe HBT-based fast front-end electronics with O(100) ps time resolution. Analog memories inside the pixel area are employed to allow for a frame-based event readout with minimum dead area.

A description of the pre-shower and its expected performance will be presented together with the design of the monolithic ASIC and the lab and testbeam (August 2022, H2 beamline) results of the pre-production ASIC.

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