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The new monolithic ASIC of the preshower detector for di-photon measurements in the FASER experiment at CERN

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The FASER experiment at the LHC is designed to look for new, long-lived fundamental particles. To extend its discovery potential, a W-Si preshower detector is currently under construction, with the objective of enabling the discrimination of photon pairs with O(TeV) energies and separation down to 200 μm . The detector will be based on a new monolithic silicon pixel sensor in 130nm SiGe BiCMOS technology, featuring a matrix of N-on-P hexagonal pixels of 65 μm sides. The ASIC will integrate SiGe HBT-based fast front-end electronics with O(100) ps time resolution, and will feature an extended dynamic range for the charge measurement. Analog memories inside the pixel area will provide the capability of storing charge information for thousands of pixels per event, allowing for a frame-based event readout with minimum dead area. After a description of the preshower detector and its expected performance, the design of the monolithic ASIC and the test results on the ASIC prototypes will be presented.

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