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A monolithic silicon pixel sensor in SiGe BiCMOS for the FASER high granularity pre-shower detector.

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A monolithic silicon pixel detector is being designed in 130nm SiGe BiCMOS process of IHP to realize a pre-shower detector for the FASER experiment at CERN.
The pre-shower is designed to discriminate electromagnetic showers produced by two primary photons with an energy in the range 100 GeV to 1 TeV and with a separation as small as 200 micron. The monolithic ASIC will have hexagonal pixels of 65 micron of side, each capable to measure a charge in the range of 1 fC to 60 fC. To reconstruct the profile of the electromagnetic shower, the sensor must be able to read hundreds of pixels firing at the same time. The detector planes will have a time resolution of approximately 200 ps. The power budget is limited to less than 150 mW/cm2.
The pre-production prototypes, submitted in June 2021, implement two alternative architectures to enable the readout of many pixels with a very large dynamic range.

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