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MONOLITH - picosecond time stamping capabilities in fully monolithic highly granular silicon pixel detectors

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The MONOLITH ERC Advanced project aims at producing a monolithic silicon pixel ASIC with 50µm pixel pitch and picosecond-level time stamping. The two main ingredients are low-noise, fast SiGe BiCMOS electronics and a novel sensor concept, the Picosecond Avalanche Detector (PicoAD). The PicoAD uses a patented multi-PN junction to engineer the electric field and produce a continuous gain layer deep in the sensor volume. The result is an ultra-fast current signal with low intrinsic jitter in a full fill factor and highly granular monolithic detector. Testbeam measurements show that the proof-of-concept prototype is fully efficient and achieves time resolutions of 17ps averaged on the pixel surface, with 13ps at the center of the pixel and 25ps at the pixel edge.
A second prototype without gain layer but with improved electronics provides 20ps time resolution.

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