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ATLASPIX3 –a reticle size HVCMOS pixel sensor designed for construction of multi chip modules

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High voltage CMOS pixel sensors will be used in several particle physics experiments for particle tracking. ATLASPIX3 is the first full reticle size monolithic HVCMOS sensor which has all necessary features for construction of multi chip modules. ATLASPIX3 has been designed for ATLAS pixel upgrade, layer 4, within ASTLAS CMOS collaboration. The size of the chip is 2cm x 2.1cm with periphery at one side which makes the chip 3-sides buttable. ATLASPIX3 has been implemented in a standard 180nm HVCMOS process. Each pixel has an area of 50µm x 150µm and contains a large charge collecting electrode implemented as a deep n-well. Pixel electronics is embedded inside the n-well. The p-substrate around the n-well is depleted by applying high voltage bias. To increase the depth of the depleted region, the chips have been implemented on high resistivity substrates. ATLASPIX3 implements the zero-suppressed readout. Upon particle hits, hit words containing time-, amplitude- and spatial information are generated. The readout electronics supports both triggered- and triggerless readout. Trigger latency is programmable up to 25µs and trigger window can be as small as 25ns. The readout electronics can cope with hit and trigger rates expected in the layer 4 of ATLAS high luminosity upgrade. The digital chip interface is based on two lines, one command-input and one data-output. ATLASPIX3 is compatible with RD53 ASIC in terms of physical interface and command and data format. ATLASPIX3 could be used for the construction of CMOS modules for ATLAS or similar experiment where high time resolution, high radiation tolerance, low power and thin sensors are required. The chip is already available and first measurement results are promising. The structure of the sensor and measurement results will be presented.

Submission declaration

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Author: SCHIMASSEK, Rudolf (KIT - Karlsruhe Institute of Technology (DE))

Co-authors: Prof. ANDREAZZA, Attilio (Università degli Studi e INFN Milano (IT)); BENOIT, Mathieu (UNIGE); Mr EHRLER, Felix (KIT - Karlsruhe Institute of Technology); IACOBUCCI, Giuseppe (Universite de Geneve (CH)); PANGAUD, Patrick (CPPM, Aix-Marseille Université, CNRS/IN2P3 (FR)); PRATHAPAN, Mridula (KIT - Karlsruhe Institute of Technology (DE)); SCHOENING, Andre (Ruprecht Karls Universitaet Heidelberg (DE)); VILELLA FIGUERAS, Eva (University of Liverpool (GB)); Ms WEBER, Alena (Ruprecht Karls University Heidelberg and KIT - Karlsruhe Institute of Technology); WEBER, Michele (Universitaet Bern (CH)); WONG, Winnie (Universite de Geneve (CH)); ZHANG, Hui (Karlsruhe Institute of Technology (KIT)); PERIC, Ivan (KIT - Karlsruhe Institute of Technology (DE))

Presenter: SCHIMASSEK, Rudolf (KIT - Karlsruhe Institute of Technology (DE))

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