MATTER AND TECHNOLOGIES

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The Tangerine Project: Monolithic Active Pixel Sensors in a 65 nm imaging process

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The implementation of new detector technologies is mandatory to continue the rapid evolution of High Energy Physics Experiments. The goal of the TANGERINE project is to develop the next generation of monolithic silicon pixel detectors using a 65 nm CMOS imaging process, which offers a higher logic density and overall lower power consumption compared to previously used processes. One objective of this project is to develop a telescope to potentially be used at the DESY test beam facility, in order to demonstrate the viability of the process for Particle Physics.

The performance aim of the project is to achieve excellent spatial and time resolutions, below 3 µm and around 1 ns respectively. In order to understand the processes and parameters that are involved in the developments in the new 65 nm technology, a combination of Technology Computer-Aided Design (TCAD) and Monte Carlo (MC) simulations are studied. These results can later be compared to results from test beam experiments.

The first prototype chips with a pitch of 16 µm and an array of 4 pixels with analog readout have been tested at DESY II, CERN SPS and MAMI test beam facilities. A different submission of prototype chips, the Analogue Pixel Test Structures (APTS), with a larger pixel array, various pixel sizes, different pixel layouts and biasing schemes have also been tested at DESY II and MAMI test beam facilities. An overview of the project's progress, the data obtained , the data analysis and simulation results will be presented.

Presenter: DEL RIO VIERA, Manuel Alejandro (ATLAS (ATLAS-Experiment))

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