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Development of a hybrid single-photon imaging detector with encapsulated CMOS pixelated anode

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The development of a single-photon detector based on a vacuum tube, transmission photocathode, microchannel plate and CMOS pixelated read-out anode is presented. This imager will be capable of detecting up to 1 billion photons per second over an area of 7 cm^2, with simultaneous measurement of position and time with resolutions of about 5 microns and few tens of picosecond, respectively. The detector has embedded pulse processing electronics with data-driven architecture, producing up to 160 Gb/s data that will be handled by a high-throughput FPGA-based external electronics with flexible design. These performances will enable significant advances in particle physics, in particular for the realisation of future Ring Imaging Cherenkov detectors, capable of achieving high efficiency particle identification in environments with very high particle multiplicities, exploiting time-association of the photon hits at the level of tens of picoseconds.

Authors: COTTA RAMUSINO, Angelo (Universita e INFN, Ferrara (IT)); ALOZY, Jerome Alexandre (CERN); FIORINI, Massimiliano (Universita e INFN, Ferrara (IT)); CAMPBELL, Michael (CERN); GUARISE, Marco (Universita e INFN, Ferrara (IT)); BIESUZ, Nicolo Vladi (Universita e INFN, Ferrara (IT)); BOLZONELLA, Riccardo (Universita e INFN, Ferrara (IT)); CAVALLINI, Viola (Universita e INFN, Ferrara (IT)); LLOPART CUDIE, Xavi (CERN)

Presenter: FIORINI, Massimiliano (Universita e INFN, Ferrara (IT))

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