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Vertex detectors: beyond CMOS sensors pixel detectors

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CMOS sensors (MIMOSA like) were successfully implemented in the STAR tracker. LHC experiments have shown that efficient B tagging, reconstruction of displaced vertices and identification of disappearing tracks are necessary (1-2). An improved vertex detector is justified for the ILC. To achieve a point-to-point resolution below the one-µm range while improving other characteristics (radiation hardness and eventually time resolution) we will need the use of 1-micron pitch pixels. Therefore, we propose a single MOS transistor that acts as an amplifying device and a detector with a buried charge-collecting gate. Device simulations both classical and quantum, have led to the proposed DotPiX structure. With the evolution of silicon processes, far well below 100 nm line feature, this pixel should be feasible. We will present this pixel detector and the present status of its development in both our institution (IRFU) and in other collaborating labs (CNRS/C2N).
References:
1- Low Mass Dark Sector Searches at ATLAS and at CMS , Monica Verducci , INFN and University of Roma Tre, Light Dark Matter 2017, 24-28 May 2017 La Biodola-Isola d'Elba
2-Performance of tracking and vertexing techniques for a disappearing track plus soft track signature with the ATLAS detector, The ATLAS Collaboration, ATL-PHYS-PUB-2019-011, 29th March 2019
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