

Design and simulation on depleted HVCMOS 50 μm ×50 μm sensor using 150 nm CMOS technology for particle detector

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Monolithic particle detector is expected to be used in ATLAS upgrade project and CEPC. Results of monolithic chip with pixel size 250 μm ×50 μm designed by CPPM using LFoundry 150nm technology show that the depleted HVCMOS sensor has good performance on particle detecting. To improve the spatial resolution, the research work of sensors with small pixel size of 50 μm ×50 μm was performed, and its performance was simulated and optimized by using Sentaurus TCAD tools. By using one Dnwell electrode and reducing the area of Dnwell, the size of the sensor can be reduced to 50 μm ×50 μm . The output capacitance of sensor will be improved from 280fF to less than 15fF. The depleted area of the sensor can be adjusted by applying high voltage from top Dnwell electrode and backside, but the total voltage that can be applied to the sensor is affected by the distance between two Dnwells. And sensor's performance after irradiation was simulated. The design of new sensor with different parameters was finished.

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Authors: Dr ZHAO, Mei (Chinese Academy of Sciences (CN)); JIANG, XIAOSHAN (I); WEI, Wei (IHEP, CAS, China); BARBERO, Marlon B. (CPPM, Aix-Marseille Université, CNRS/IN2P3 (FR)); Prof. PANGUAD, Patrick (Centre de Physique des Particules de Marseille); Dr CHEN, Zongde (Centre de Physique des Particules de Marseille)

Presenter: Dr ZHAO, Mei (Chinese Academy of Sciences (CN))

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