

Time performance of large dynamic range SiPM

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The silicon photomultiplier (SiPM) is a novel developed device with excellent single photon detection ability. Large dynamic range SiPM has been studied in high granularity calorimeter due to the advantages of insensitivity to magnetic fields, compactness, robustness, low bias voltage and low power. The Novel Device Laboratory (NDL) developed a low cost and large dynamic range SiPM with high micro cell density. The time performance of the NDL SiPMs was studied in this paper. A 403 nm picosecond laser was used as the light source with a time jitter of 45 ps. When the number of photoelectrons is large (>10), the light source jitter can be neglected. The SiPMs of three manufacturers with different microcell sizes were compared. The results show that as the number of photoelectrons increases, the rise time and transition time spread (TTS) decreased. For a 10 micron SiPM, the time resolution is better than 15 ps with multi-photoelectrons. This time resolution enables calorimeter to do excellent particle identification.

Author: QIAN, Sen (Institute of High Energy Physics,CAS)

Co-author: WANG, Zhigang (Chinese Academy of Sciences (CN))

Presenter: QIAN, Sen (Institute of High Energy Physics,CAS)

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