Contribution ID: **55** Type: **Parallel session talk**

Performance of the HADES T0 and beam tracking prototype system based on Ultra Fast Silicon Detectors

Tuesday 26 May 2020 09:18 (18 minutes)

The HADES collaboration [1] at GSI Darmstadt, Germany, is developing a new T0 and beam tracking system based on the Low Gain Avalanche Diodes (LGAD) [3,4], aka Ultra Fast Silicon Detectors (UFSD).
The group has prepared a demonstration system realized as a beam telescope consisting of two UFSD strip sensors with size of about 5mm x 5mm and the strip structure with a 140 μm pitch. They are equipped with multi-stage analog amplifying circuits connected to leading edge discriminators whose outputs were digitized by a TDC system based on the FPGA-TDC concept.
In a series of experiments conducted at COSY Synchrotron at Jülich, we have demonstrated a timing precision of 56 ps. To our knowledge, these are the best results obtained so far using this type of sensors integrated in a complete detection system.
We would like to acknowledge N. Cartiglia, V. Sola and M. Ferrero from INFN Torino for their help in the setup preparation.
[1] Agakishiev, G. et al. Eur. Phys. J. A41:243-277, 2009

Funding information

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Session Classification: Sensors: Solid-state position sensors

Track Classification: Sensors