

# New Developments of Ultra Fast Silicon Detectors at FBK

*Tuesday, 21 February 2017 15:45 (20 minutes)*

UFSD are silicon sensors based on the Low-Gain Avalanche Diodes (LGAD) design and, due to internal gain, exhibit a signal which is a factor of  $\sim 10$  larger than standard silicon detectors.

In this contribution we report on the design, fabrication and performances of the first fully double-sided production of segmented UFSD. The production was carried out at the FBK facility in Trento (Italy), in collaboration with the Trento University and INFN, Torino. This production houses two main type of devices: one type where a segmented gain layer is on the same side of the read-out electrodes, the other type where a uniform gain layer is on the side opposite to the pixelated electrodes (reverse-LGAD). In the latter case, we have also explored the possibility of obtaining position information via AC coupling with a segmented metal electrode.

We report an exhaustive characterization of the first samples in terms of internal gain and time resolution performance. In addition, a characterization of both reverse-LGAD and AC coupled devices will be reported. Starting from the analysis of the first produced samples results, a new production of UFSD, based on 50 $\mu$ m thick FZ silicon, has been designed and it is currently ongoing at FBK. This production implements different technological solutions aimed at increasing the timing performance and the radiation hardness of the detectors. Fabrication technology and numerical simulations of these new 50 $\mu$ m thick devices will be presented and discussed.

## TRACK

UFSD, LGAD

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**Session Classification:** Session 7: LGAD