



Contribution ID: 178

Type: **Talk**

Irradiation Studies of the Resistive AC-coupled Silicon Detectors

Thursday 20 February 2025 15:15 (20 minutes)

4D tracking will be a crucial component of any future collider experiment, as it provides pile-up discrimination (for high luminosity experiments) and time of flight (for precision experiments) without loss of spatial resolution. 4D tracking devices must be able to withstand the high radiation environment of the future collider experiments without a significant loss of precision. One such candidate is the Resistive AC-coupled Silicon Detector (RSD), a resistive AC-coupled LGAD developed for high-precision 4D tracking.

This contribution presents the studies of the properties of proton- and neutron- irradiated RSD sensors. Sensors from the latest RSD FBK production have been irradiated and characterized in the laboratory with static and dynamic (Transient Current Technique to simulate incident MIPs) measurements. These studies include quantifying gain layer deterioration and charge trapping within the sensor at fluences of $1.0e15$, $2.0e15$, and $3.5e15$ cm⁻² of 1 MeV neutron equivalences with protons and neutrons. The results of this detailed irradiation campaign show the feasibility of RSDs for use in future colliders and provide a path for further improvements of their radiation hardness.

Primary experiment

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Session Classification: Semiconductor LGAD 1

Track Classification: LGAD