Contribution ID: **106** Type: **Oral**

Radiation Damage studies with the LHCb VELO

The VELO detector at the LHCb experiment is a silicon microstrip detector, and has operated for the first two periods of LHC running, with the most irradiated regions receiving fluences of over 4E14, 1MeV n_{eq} cm^{-2} by the end of this period. We review the impact of this radiation on the sensors, considering the impact on the leakage current, charge collection efficiency, cluster finding efficiency, and the depletion voltages, comparing this behaviour to predictions.

A loss of signal amplitude is observed with a dependency on the distance to the routing lines. Using the Perugia n-type bulk model and the Peltola surface damage model it is shown that up to 60% of the charge is collected by routing lines. This is caused by trapping of the otherwise mobile electron accumulation layer at the oxide-silicon interface, causing the shielding effect on the routing lines to be reduced. The observed drop in cluster finding efficiency can be explained by the angular dependence of charge loss to the second metal layer. The efficiency drop as function of track radius and angle is reproduced combining 2D and 3D TCAD simulations.

Authors: BARTER, William James (Imperial College (GB)); CARVALHO AKIBA, Kazuyoshi (Nikhef); COLLINS, Paula (CERN)

Presenter: BARTER, William James (Imperial College (GB))

Session Classification: Session 3: Radiation effects in HEP experiments