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Detector radiation studies

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In view of a new 100 km long hadron collider, which is expected to operate at a centre-of-mass energy of 100 TeV and to accumulate up to 30 ab^{-1}, with a peak instantaneous luminosity up to 30 10^{34} $cm^{-2}s^{-1}$, the evaluation of the radiation load on the detector is a key ingredient for the choice of materials and technologies.

The first concept of the detector foresees the presence of central and forward sub-detectors to study physics up to $|\eta|$=6 and of a magnetic field generated by the combination of a central solenoid and a forward dipole. This layout has been modelled and relevant fluence distributions have been calculated using the FLUKA Monte Carlo code.

In this contribution the detector model will be first discussed. Distributions of fluence rates will be then shown separately for different type of particles, like charged particles, charged hadrons, neutrons and photons. Dose distributions and 1 MeV neutron equivalent fluence, for the accumulated integrated luminosity, will be presented. The peak values of these quantities in the different sub-detectors will be highlighted, in order to allow to compare them to the limit of the material and technologies presently used in the LHC detectors. The effect of the magnetic field will be discussed.

Based on the first results obtained, a shielding has been conceived to minimise the background in the muon chambers, due to particles coming from the forward part of the detector. Its tentative design will be shown and its effectiveness will be discussed in term of neutron, photon and charged particles fluence rate reduction.

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