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Radiation environment assessment in the FCChh and FCCee machines

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FCC will require a significant amount of electronic components in the accelerator tunnel and in the side galleries to control and monitor different systems, e.g. power converters, QPS, interlocks, etc. An "a priori" evaluation of the radiation environment, the technology that would be required, the failure rate and the possible mitigation actions become strategic for the design, the future operation and the long-term planning of such complex accelerator. The CERN's R2E-project is currently involved in the study of critical areas for electronics for FCC, thanks to the solid experience cumulated with the LHC. This work presents a general overview of the radiation levels expected in both the hh and ee machine, evaluated through FLUKA Monte Carlo simulation. With regard to FCChh, the radiation levels in the Experimental Insertion Region (triplet-D2 region, L* = 40m), in the arc and in the betatron cleaning insertion will be discussed. Particular attention will be given to the impact of the radiation environment to the design of the infrastructure and to the effects on electronics (cumulative and stochastic effects), with respect to LHC and Hi-Lumi. The relevant quantities for R2E, i.e. the Total Ionizing dose, the High Energy Hadrons (>20 MeV) and 1MeV-neutron equivalent fluence, are considered for the discussion. The FCCee radiation environment assessment will be mainly focused on synchrotron radiation. Finally, a few considerations on the HE-LHC will be provided.

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