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Radiation environments in hadron collider experiments

Thursday 26 October 2023 14:00 (1 hour)

The high collision rates in modern high energy physics experiments can lead to challenging radiation environments for detector systems to operate in, so developing radiation resilient technologies is essential. In this lecture, I will begin by discussing the origin of these radiation backgrounds, driven by the high energy particles coming from collisions. Understanding the complex radiation environments generated in and around the various experiment detector systems requires the use of advanced Monte Carlo simulation codes such as FLUKA. I will describe how these are used to obtain the radiation quantities of interest needed so that technology choices can be validated in irradiation test facilities. Also explained will be how radiation damage manifests itself in detector systems and how it is mitigated, using the example of the LHC inner detector silicon systems. Finally, some discussion is given on how we verify the simulated predictions with in-situ measurements, allowing uncertainties in predictions to be assessed and used in future collider detector design studies.

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