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## Radiation protection studies for the FCC-ee

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The radiation protection study for the FCC-ee shall assure the FCC-ee design compatibility with radiation protection objectives and constraints and provides input to the radiological environmental impact study.

In this particular contribution it provides an evaluation of the relevant radiological parameters in the arc section of FCC-ee, covering its entire operational life, including the Z pole (45.6 GeV), WW threshold (80 GeV), HZ production peak (120 GeV), and tt threshold (182.5 GeV) modes.

During the operation of the facility, two distinct source terms, namely beam gas interaction and synchrotron radiation, may contribute to stray radiation and subsequent activation of materials in the machine tunnel. The residual dose rates resulting from this activation can significantly impact the maintenance scheduling and accessibility of the area, whereas the release of activated air may pose radiological risks to the environment.

The primary objective is to conduct a comprehensive assessment of the radiological parameters in the FCC-ee arc section by estimating the levels of prompt and residual radiation and activation to evaluate their impact on the operation and maintenance of the facility (operational objective) and ensure that the FCC-ee design aligns with the environmental objectives and constraints (environmental objective).

FLUKA Monte Carlo simulations are performed across multiple operational modes, along with the implementation of a ventilation model to analyse the impact of air activation during tunnel access and the release of activated air into the environment.

The operational objective is attained through the evaluation of the residual dose rate, inhalation dose and immersion dose during a beam stop scenario. The environmental objective is accomplished by estimating the activity released into the surrounding environment through the ventilation system and by comparing the activation levels of the accelerator materials to the established clearance limits.

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