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Radiation Protection study for the HIE-ISOLDE project at CERN

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The HIE-ISOLDE project will expand the physics program at ISOLDE with the possibility to post-accelerate a large variety of Radioactive Ion Beams to energies well below and significantly above the Coulomb barrier.

While this project contains three major elements: higher energies, improvements in beam quality and higher beam intensities, the most significant improvement is the replacement of the current post-accelerator (REX) by a new superconducting linear accelerator delivering ions of energy up to 10 MeV/u. This energy upgrade leads to new radiological hazards such as neutron emission when the post-accelerated beams at energies above the
Coulomb barrier interact with beam intercepting devices or the vacuum chamber walls in case of beam loss. The new superconducting cavities installed will also be a strong source of X-rays due to electron field emission. FLUKA simulations were performed to assess shielding requirements and the geometry of the tunnel hosting the superconducting cavities as well as to evaluate the maximum neutron dose rates expected in the event of beam losses. Activation of the machine components was also estimated to
determine the future waste classification.

During my presentation, an overview of the HIE-ISOLDE radiation protection study related to the post-accelerator will be given. FLUKA simulations for Xray, neutron emission and activation will be presented. Finally, I will show the technical shielding design chosen and the different mitigation measures taken to deal with the different hazards.

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