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Activation Products from Copper and Steel Samples Exposed to Showers Produced by 8 GeV Protons Lost at the Fermilab Main Injector Collimation System

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In conjunction with efforts to predict residual radiation levels, measurements of residual radiation were correlated with the time history of losses. Detailed examination suggested that the list of radioactive isotopes used for fitting was incomplete. We will report on activation studies of magnet steel and copper samples which we irradiated adjacent to the Fermilab Main Injector collimation system. Our results identified several additional radioactive isotopes of interest including ones due to small isotopic and small chemical components with disproportionate contributions to the residual radiation. The MARS15 studies using both realistic and simplified models have confirmed our understanding of these measurements. The long half-life isotopes will grow in importance as operation stretches to a second decade and as loss rates rise. These studies allow us to predict limits on these concerns.

Summary

This presentation will build on the radiation control efforts for the Fermilab Main Injector by examining the activation of materials for the magnet systems which experience activation by 8 GeV beam loss. Activation studies with samples of steel and copper exposed them to the radiation near one of the secondary collimators allow presentation of measured results and comparisons with MARS15 calculations. The cooldown studies at bar-coded residual radiation measurement locations will provide a framework for relating these measurements to the overall effort to quantitatively predict and understand radiation exposures during upgrade and maintenance efforts in the Main Injector tunnel.

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