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Non-collisions background studies with the ATLAS detector during the LHC Run-2 data taking

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Physics collision events at the Large Hadron Collider (LHC) can be affected, or even mimicked by non-collision sources such as beam-induced backgrounds (BIB), cosmic particles, and detector noise. Data collected during unpaired and empty proton bunch crossings provide background-enriched samples used to characterize these effects. BIB can impact detector performance and fake signals in searches for missing transverse energy or new physics, such as neutral long-lived particles.

This talk presents detailed studies of BIB in the ATLAS detector and their rates throughout Run-2. The characteristics of these non-collision backgrounds in the inner detectors and calorimeters are analyzed to improve their identification in physics analyses. Correlations between residual gas pressure and beam-gas events observed in the Beam Conditions Monitors (BCM) are studied through bump-pressure tests, along with associated fake jet rates. The performance of ATLAS beam background monitors is compared with Fluka simulations, and new Run-3 monitoring triggers are discussed using results from Run-2 data.

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