ATLAS EXPERIMENT LECTURE SERIES

Counting collisions: the luminosity measurement at the ATLAS experiment

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Dr. Giulia Ripellino
Uppsala University
giulia.ripellino@cern.ch

A precise measurement of the luminosity is a crucial input for many ATLAS physics analyses, and represents the leading uncertainty for W, Z and top cross-section measurements. ATLAS employs several detectors and methods to measure the relative luminosity and the absolute scale is determined using van der Meer scans during dedicated low-luminosity running periods in each year. In this lecture, I will explain the basics of luminosity at hadron colliders and the strategy of the luminosity measurement in ATLAS. The measurement requires detailed knowledge of detector and machine related systematic effects, and I will show how careful studies of all these aspects in Run 2 led to one of the most precise luminosity calibrations at a hadron collider to date. I will also discuss the luminosity challenges and opportunities that lie ahead during the HL-LHC phase.