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Streamlining ATLAS Monte-Carlo Generator Validation with PAVER

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In ATLAS and other high-energy physics experiments, the integrity of Monte-Carlo (MC) simulations is crucial for reliable physics analysis. The continuous evolution of MC generators necessitates regular validation to ensure the accuracy of simulations. We introduce an enhanced validation framework incorporating the Job Execution Monitor (JEM) resulting in the established Physics Modeling Group (PMG) Architecture for Validating Evgen with Rivet (PAVER). This setup automates the validation process, facilitating systematic evaluation of MC generator updates and their compliance with experimental data.

This approach allows for early detection of discrepancies in simulation outputs, ensuring that potential issues and bugs are addressed before the production of large-scale samples for the ATLAS collaboration. MC generator Validation is specially important to save energy and money and to reduce the carbon footprint in future simulation campaigns significantly which aligns very well with the importance of reaching sustainability within ATLAS. The result is a streamlined, robust, and accessible validation system that supports sustainable MC production in ATLAS.

This presentation will summarize the implementation of PAVER by highlighting its impact on enhancing simulation reliability and efficiency. It will furthermore include an overview of the massive validation program throughout the past years resulting in many successfully validated generator and software updates. In addition, this talk will present insights into the challenges and solutions in MC generator validation, with implications for future developments in high-energy physics simulations.

Primary author: ✉SCHMIDT, Mustafa Andre (Bergische Universitaet Wuppertal (DE))

Presenter: ✉SCHMIDT, Mustafa Andre (Bergische Universitaet Wuppertal (DE))

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