# Calibrating the sPHENIX Hadronic Calorimeter with Cosmic Ray Muons

Hanpu Jiang

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The sPHENIX experiment is comprised of two layers of hadronic calorimeters (HCal). The outer HCal is the outermost layer located outside the solenoid coil, and the inner HCal is positioned between the solenoid magnet and the Electromagnetic Calorimeter. The sPHENIX program, aimed at achieving precise jet measurements and analyzing the microscopic properties of the strongly interacting quark-gluon plasma, requires a well-calibrated energy scale for the calorimeters.

This poster will present the advancements made in calibrating both the inner and outer HCals utilizing cosmic ray muons. Energy deposited by muons traversing the sectors is recorded, and events in which muons pass through all scintillator tiles in a tower are selected for analysis. The primary diagnostic is the Most Probable Value (MPV) of the ADC distributions associated with these events. Subsequently, MPVs undergo corrections to account for temperature variations and the tower tiles' response to LED signals. These corrected MPVs determine the gain of each tower.

A Monte Carlo study, based on Geant4 simulations, will establish a reference for the relative calibration of the gains on a tower-by-tower basis. The bias voltage applied to the silicon photomultipliers (SiPM) will be adjusted to fine-tune the gain and eliminate the outliers, resulting in a more accurate calibration of the HCals. This calibration process is essential for understanding the calorimeter response and contributes broadly to the sPHENIX experiment's goals.