Neutral Pion and η Meson Reconstruction with the sPHENIX Detector

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sPHENIX is a new detector at the Relativistic Heavy-Ion Collider (RHIC) designed to make precision jet and upsilon measurements at high luminosity in 200 GeV $p + p$, $p + Au$, and $Au + Au$ collision systems and will be the first new detector at RHIC in twenty years. sPHENIX is scheduled to begin data taking operations in 2023, and among the first measurements sPHENIX will make is that of neutral meson spectra, in particular the nuetral pion (π^0) and η meson. Produced in abundance in high-energy particle collisions, π^0's will serve firstly to calibrate the absolute energy scale of the sPHENIX electromagnetic calorimeter (EMCal) by calibrating the initial measured π^0 invariant mass to the known PDG value. Neutral pions are reconstructed from their two-photon decay channel using pairs of clusters within the EMCal with a minimum energy above a threshold chosen to eliminate noise clusters, and an additional cut is made on the asymmetry between the energies of the π^0 decay photons given by the parameter $\alpha = \frac{|E_{\gamma_1} - E_{\gamma_2}|}{E_{\pi^0}}$. To reject clusters from hadronic showers, a cut on the cluster shape variable from the EMCal's clusterization protocol will be imposed. Above $p_T \approx 6$ GeV/c, clusters formed from π^0 decay products will begin to overlap and merge, decreasing the overall reconstruction efficiency, however the same cluster shape variable can be used to identify such merged clusters and extend the measurement out to $p_T \approx 10$ GeV/c. Beyond 10 GeV/c, the heavier mass of the η meson will result in increased spatial separation of its two daughter photons, allowing for reliable reconstruction beyond 20 GeV/c, where jet-energy loss effects are expected to dominate. Thus, in addition to serving as a high-energy lever-arm for the EMCal's energy scale calibration, measurement of the η spectrum at RHIC will also be one of sPHENIX's earliest jet modification measurements. Lastly, understanding sPHENIX's ability to successfully reconstruct neutral mesons such as π^0's and η's will be critical to future sPHENIX direct photon and direct photon-jet correlation measurements where photonic contributions from the decay of such particles must be identified and rejected. This poster will show the stats of the calibration of the absolute energy scale of the sPHENIX EMCal and sPHENIX's first neutral meson analyses.