

1 Neutral Pion and  $\eta$  Meson Reconstruction with  
2 the sPHENIX Detector

3 Anthony Hodges for the sPHENIX Collaboration

4 sPHENIX is a new detector at the Relativistic Heavy-Ion Collider (RHIC)  
5 designed to make precision jet and upsilon measurements in 200 GeV  $p + p$ ,  
6  $p + Au$ , and  $Au + Au$  collisions and will begin taking data in 2023. Among  
7 its first measurements will be neutral pion ( $\pi^0$ ) and  $\eta$  meson spectra.  $\pi^0$ 's will  
8 serve to calibrate the sPHENIX electromagnetic calorimeter (EMCal) by cali-  
9 brating the initial measured  $\pi^0$  invariant mass to the known PDG value. Both  
10  $\pi^0$ 's and  $\eta$ 's are reconstructed from their two-photon decay channels by combi-  
11 natorially pairing EMCal clusters. While cluster merging will prevent reliable  
12  $\pi^0$  reconstruction beyond  $p_T \approx 10$  GeV/c, the heavier mass of the  $\eta$  meson al-  
13 lows for reliable reconstruction beyond 20 GeV/c, where jet-energy loss effects  
14 are expected to dominate. Thus, in addition to serving as a high-energy lever-  
15 arm for the EMCal's energy scale calibration, measurement of the  $\eta$  spectrum  
16 will also be one of sPHENIX's earliest jet modification measurements. Lastly,  
17 understanding sPHENIX's ability to successfully reconstruct  $\pi^0$ 's and  $\eta$ 's will  
18 be critical to future sPHENIX direct photon and direct photon-jet correlation  
19 measurements where photonic contributions from  $\eta$  and  $\pi^0$  decays must be re-  
20 jected. This poster will show the status of the sPHENIX EMCal energy scale  
21 calibration and of sPHENIX's first neutral meson analyses.