

1 Title: Directed Flow of Protons and Anti-Protons in RHIC Beam Energy Scan II

2 Directed flow of particles is an important feature seen in heavy-ion collisions and is a sensitive probe to  
3 the equation of state (EoS) of the matter produced in the collisions. Model calculations have also  
4 predicted that directed flow could be sensitive to the softening of EoS associated with a first order  
5 phase transition. Directed flow of protons and anti-protons are also of interest as they offer sensitivity  
6 to both the contributions from the transported quarks and the component generated by medium  
7 interactions at the later stage. Measurements of proton and net proton directed flow from BES-I have  
8 shown that there is a non-monotonous dependence on collision energy.

9 In this poster, We will present measurements of the directed flow of protons and antiprotons from 19.6,  
10 14.5, 11.5, 9.2, and 7.7 GeV Au+Au collisions, using high statistics BES-II data from STAR. We will also  
11 present a decomposition of proton directed flow into a medium interaction generated component and a  
12 component ( $v_1^{\text{excess}}$ ) attributed to transported protons. The  $v_1^{\text{excess}}$  component is found to show a simple  
13 scaling between collision energies of 200 GeV to  $\sim 10$  GeV, but to break the scaling at energies below  
14 that. The new results have significantly reduced uncertainties and also allow differential measurements  
15 in centrality and transverse momentum. Results will be compared to different model calculations and  
16 implications to the understanding of the QCD phase structure and EoS of the medium will be discussed.