

2 Measurement of the central exclusive production of
 3 charged particle pairs in proton-proton collisions at
 4 $\sqrt{s} = 200$ GeV with the STAR detector at RHIC

5 Rafal Sikora for the STAR Collaboration



7 ABSTRACT: We report on the measurement of the Central Exclusive Production of charged
 8 particle pairs h^+h^- ($h = \pi, K, p$) with the STAR detector at RHIC in proton-proton
 9 collisions at $\sqrt{s} = 200$ GeV. The charged particle pairs produced in the reaction $pp \rightarrow$
 10 $p' + h^+h^- + p'$ are reconstructed from the tracks in the central detector and identified using
 11 the specific energy loss and the time of flight method, while the forward-scattered protons
 12 are measured in the Roman Pot system. Exclusivity of the event is guaranteed by requiring
 13 the transverse momentum balance of all four final-state particles. Differential cross sections
 14 are measured as functions of observables related to the central hadronic final state and to
 15 the forward-scattered protons. They are measured in a fiducial region corresponding to
 16 the acceptance of the STAR detector and determined by the central particles' transverse
 17 momenta and pseudorapidities as well as by the forward-scattered protons' momenta. This
 18 fiducial region roughly corresponds to the square of the four-momentum transfers at the pro-
 19 ton vertices in the range $0.04 \text{ GeV}^2 < -t_1, -t_2 < 0.2 \text{ GeV}^2$, invariant masses of the charged
 20 particle pairs up to a few GeV and pseudorapidities of the centrally-produced hadrons in
 21 the range $|\eta| < 0.7$. The measured cross sections are compared to phenomenological pre-
 22 dictions based on the Double Pomeron Exchange (DPE) model. Structures observed in the
 23 mass spectra of $\pi^+\pi^-$ and K^+K^- pairs are consistent with the DPE model, while angular
 24 distributions of pions suggest a dominant spin-0 contribution to $\pi^+\pi^-$ production. For
 25 $\pi^+\pi^-$ production, the fiducial cross section is extrapolated to the Lorentz-invariant region,
 26 which allows decomposition of the invariant mass spectrum into continuum and resonant
 27 contributions. The extrapolated cross section is well described by the continuum produc-
 28 tion and at least three resonances, the $f_0(980)$, $f_2(1270)$, and $f_0(1500)$, with a possible
 29 small contribution from the $f_0(1370)$. Fits to the extrapolated differential cross section as
 30 a function of t_1 and t_2 enabled extraction of the exponential slope parameters in several
 31 bins of the invariant mass of $\pi^+\pi^-$ pairs. These parameters are sensitive to the size of the
 32 interaction region.