

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

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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
11 using the specific energy loss and the time of flight method, while the forward scattered
12 protons are measured by the Roman Pot detectors. Exclusivity of the event is guaranteed
13 by requiring transverse momentum balance of all four final state particles. Differential cross
14 sections are measured as functions of observables related to the hadronic final state and
15 to 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 momentum and pseudorapidity as well as by the forward scattered protons momenta. This
18 fiducial region roughly corresponds to the square of the four-momenta transfers at the pro-
19 ton vertices in the range $0.04 < -t_1, -t_2 < 0.2$ GeV² and invariant masses of the charged
20 particle pairs up to a few GeV. The measured cross sections are compared to phenomenolog-
21 ical predictions based on the Double Pomeron Exchange (DPE) model. Structures observed
22 in the mass spectra of $\pi^+\pi^-$ and K^+K^- pairs are consistent with DPE model while an-
23 gular distributions of pions suggest dominant spin-0 contribution to $\pi^+\pi^-$ production. For
24 $\pi^+\pi^-$ production fiducial cross section is extrapolated to Lorentz invariant region which
25 allows decomposition of the invariant mass spectrum into continuum and resonant contri-
26 butions. Extrapolated cross section is well described by the continuum production and at
27 least three resonances, $f_0(980)$, $f_2(1270)$ and $f_0(1500)$, with a possible small contribution
28 of $f_0(1370)$. Fits to extrapolated differential cross section as a function of t_1 and t_2 enabled
29 the extraction of the exponential slope parameters in several bins of invariant masses of
30 $\pi^+\pi^-$ pairs.