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

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We report on the measurement of the Central Exclusive Production of charged particle pairs h^+h^- ($h = \pi, K, p$) with the STAR detector at RHIC in proton-proton collisions at $\sqrt{s} = 200$ GeV. The charged particle pairs produced in the reaction $p + p \rightarrow p' + h^+h^- + p'$ are reconstructed from the tracks in the central detector and identified using the specific energy loss and the time of flight method, while the forward scattered protons are measured by the Roman Pot detectors. Exclusivity of the event is guaranteed by requiring transverse momentum balance of all four final state particles. Differential cross sections are measured as functions of observables related to the hadronic final state and to the forward scattered protons. They are measured in a fiducial region corresponding to the acceptance of the STAR detector and determined by the central particles' transverse momentum and pseudorapidity as well as by the forward scattered protons momenta. This fiducial region roughly corresponds to the square of the four-momenta transfers at the proton vertices in the range $0.04 < -t_1, -t_2 < 0.2$ GeV² and invariant masses of the charged particle pairs up to a few GeV. The measured cross sections are compared to phenomenological predictions based on the Double Pomeron Exchange (DPE) model. Structures observed in the mass spectra of $\pi^+\pi^-$ and K^+K^- pairs are consistent with DPE model while angular distributions of pions suggest dominant spin-0 contribution to $\pi^+\pi^-$ production. For $\pi^+\pi^-$ production fiducial cross section is extrapolated to Lorentz invariant region which allows decomposition of the invariant mass spectrum into continuum and resonant contributions. Extrapolated cross section is well described by the continuum production and at least three resonances, $f_0(980)$, $f_2(1270)$ and $f_0(1500)$, with a possible small contribution of $f_0(1370)$. Fits to extrapolated differential cross section as a function of t_1 and t_2 enabled the extraction of the exponential slope parameters in several bins of invariant masses of $\pi^+\pi^-$ pairs.

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