In Fig. 3, we plot $A_{12}(y_1, y_2, P_\perp, z_1, z_2)$ for the dihadron production in mid-rapidity $y_1 = y_2 = 0$ region at RHIC energy $\sqrt{S} = 200$ GeV. In the figure on the left, we plot $A_{12}$ as a function of $z_2$ at the jet transverse momentum $P_\perp = 4$ GeV with $z_1$ integrated from three different ranges $0.3 < z_1 < 0.5$ (dotted), $0.5 < z_1 < 0.7$ (dashed), and $0.7 < z_1 < 0.9$ (solid), respectively. On the right, we present the same plot but with $P_\perp = 6$ GeV. We find that the asymmetry $A_{12}$ is largest when both $z_1$ and $z_2$ become large, same as what has been observed in $e^+e^-$ experiments [5]. On the other hand, $A_{12}$ decreases when increasing $P_\perp$. This is also consistent with what BELLE observed if one realizes that $\hat{s}/4P_\perp^2 = \sin^2\theta$ in parton CM frame. Though it has similar features as that in $e^+e^-$ collision, the asymmetry in hadronic collision is smaller. This is due to the fact that there is copious $gg \to gg$ and $qg \to qg$ contribution to the azimuthal angle independent cross section, while they do not contribute to the azimuthal dependent part since there is no gluon Collins function. However, the asymmetry is still around several percent and shall be measurable at RHIC.

These results can be extended to general kinematics, for example, in two different rapidity regions: $|y_1| \neq |y_2|$. In this case, although the azimuthal angular dependence is not exactly as $\cos(\phi_1 + \phi_2)$ in Eq. (23), the Collins fragmentation functions will nevertheless lead to a nonzero mean value of $\langle\cos(\phi_1 + \phi_2)\rangle$. This can be seen from the differential cross section expression in Eq. (7). The experimental observation of this nonzero effects can be used as signal of the Collins effects, since the normal fragmentation functions $D(z, p_T)$ will not contribute to a nonzero $\langle\cos(\phi_1 + \phi_2)\rangle$. We hope that the future RHIC experiments can carry out these measurements, and provide more information on the Collins fragmentation functions, which will help us to pin down the mechanism for the single spin asymmetry in hadronic collisions as we discussed in the Introduction.

## IV. SUMMARY

In this paper, we have studied the dihadron azimuthal correlation produced nearly back-to-back in unpolarized hadron collision, arising from the product of two Collins fragmentation functions. Using the latest Collins fragmentation function extracted from the global analysis of available experimental data, we make predictions for the azimuthal correlation of two-pion production in unpolarized $pp$ collisions at RHIC energies. We find that the feature of the asymmetry is similar to those observed in $e^+e^-$ annihilation. The asymmetry