# Three-Dimensional measurements of pion HBT correlations and their Lévy parameters in $\sqrt{s_{NN}} = 200$ GeV Au+Au collisions at STAR

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**Abstract**

In this work, we present new results on the three-dimensional pion-pion femtoscopic correlation measurements and their Lévy parameters in heavy-ion collisions, utilizing data from the STAR experiment at RHIC in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV. These measurements aim to deepen our understanding on the space-time structure of hadron emission sources and their role in the behavior of the strongly interacting quark-gluon plasma. The three-dimensional approach enables a more comprehensive investigation of the emission source properties. We focus on analyzing the transverse mass ($m_T$) dependence of the Lévy source parameters, including the Lévy scale parameters in the Bertsch-Pratt frame, $R_{\rm out}$, $R_{\rm side}$, $R_{\rm long}$, the correlation strength parameter $\lambda$, and the Lévy exponent $\alpha$. The Lévy scale parameters provide insights into the homogeneity structure of the source, while the parameters $\lambda$ and $\alpha$ offer information about the correlation strength and source shape, respectively. In this talk, our 3D results are compared with previous one-dimensional studies, highlighting the differences and potential implications for understanding the space-time evolution of the system.