

SEARCH FOR SQUEEZED-PAIR CORRELATIONS AT RHIC

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Squeezed correlations of particle-antiparticle pairs (also known as Back-to-Back Correlations) are predicted to appear if the masses of the quanta involved are modified in the hot and dense hadronic medium formed in high energy nucleus-nucleus collisions. One of the amazing theoretical discoveries is that both the femionic (fBBC) and the bosonic (bBBC) Back-to-Back Correlations are very similar, and can be treated by analogous formalisms [1]. Both are in fact positive correlations and have unlimited intensity, differently from what is observed in the two-identical-particle (bosons/fermions) correlations. More recently, it was shown that, in the case of finite-size systems and moderate flow, the squeezed correlations still survive [2] with enough strength to be observed experimentally.

However, although well-established theoretically, the squeezed-particle correlations have never been observed, clearly requiring optimized forms to experimentally search for the effect in a prospective way. This is investigated in this phenomenological study. Yet within the non-relativistic treatment developed in Ref.[2], we show that one promising way to search for the BBC signal is to look into the squeezed correlation function of pairs of ϕ 's (ϕ is its own antiparticle) at RHIC energies, plotted in terms of the average momentum of the pair, $\mathbf{K}_{12} = \frac{1}{2}(\mathbf{k}_1 + \mathbf{k}_2)$, for high values of their relative momentum, $\mathbf{q}_{12} = (\mathbf{k}_1 - \mathbf{k}_2)$. The ϕ -mesons are chosen due to their abundance at RHIC and to the large value of their asymptotic mass, validating the non-relativistic approach adopted in this study. It is also shown that this variable represents the non-relativistic limit of a more general invariant variable, to be used in situations where the non-relativistic approach is not applicable.

References

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