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Tantalizing Structure in Long Range Correlations in High Multiplicity e+e- Collisions And Fourier Decomposition Using Archived ALEPH Data at 91-209 GeV

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We present measurements of two-particle angular correlations of charged particles emitted in high-energy e^+e^- collisions using data collected by the ALEPH detector at LEP between 1992 and 2000. The correlation functions are measured over a wide range of pseudorapidity and azimuthal angle as a function of charged particle multiplicity. Previous measurement with LEP1 data at 91 GeV shows no significant long-range correlations in lab coordinate or thrust coordinate analyses, with associated yield distributions in agreement with predictions from the archived PYTHIA v6.1 event generator. Higher collision energy LEP2 data allows access to higher event multiplicity and additional production channels beyond the $Z \to q\bar{q}$ process. The highest multiplicity bin suggests an intriguing deviation from archived MC and implies the potential to search for collective phenomena in small systems. This measurement is pushing the studies of long-range correlation to the smallest collision system limit. It includes the first flow coefficient measurement and a Fourier decomposition analysis in e^+e^- collisions to quantify the anisotropy in the azimuthal two-particle correlation as a function of charged particles' transverse momentum. It is also compared with modern MC generators. This work supplements our understanding of small-system references to long-range correlations observed in proton-proton, proton-nucleus, and nucleus-nucleus collisions.

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