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Two-particle correlation in e^+e^- collisions at 91-209 GeV with archived ALEPH data

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The first measurement of two-particle angular correlations of charged particles emitted in high energy e^+e^- annihilation up to $\sqrt{s} = 209$ GeV is presented. The archived hadronic e^+e^- scattering data at a center-of-mass energy of 91-209 GeV were collected with the ALEPH detector at LEP between 1992 and 2000. The correlation functions are measured over a broad range of pseudorapidity and full azimuth as a function of charged particle multiplicity for the first time with LEP2 data. At 91 GeV, no significant long-range correlation is observed in either the lab coordinate analysis or the thrust coordinate analysis, where the latter is sensitive to a medium expanding transverse to the color string between the outgoing $q\bar{q}$ pair from Z boson decays. The associated yield distributions in both analyses are in better agreement with the prediction from the PYTHIA v6.1 event generator than from HERWIG v7.1.5. These results provide new insights to showering and hadronization modeling. They also serve as an important reference to the observed long-range correlation in proton-proton, proton-nucleus, and nucleus-nucleus collisions. Results with e^+e^- data at higher collision energy than 91 GeV will also be presented.

This data set provides higher event multiplicity reach up to around 50 and a chance to sample different underlying hard scattering processes. Studies of the high energy annihilation data will expand our search for collective phenomena in e^+e^- collisions to a new phase space for a potential discovery.

In-person participation

Yes

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