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First measurement of two-particle angular correlations of charged particles and anti-KT jet spectra and substructure with the archived ALEPH e+e- data with $\sqrt{s}$ up to 209 GeV

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We present the first measurement of two-particle angular correlations of charged particles emitted in high energy e^+e^- annihilation up to $\sqrt{s}$ =209˜GeV and anti-kT jet energy spectrum and substructure measurements using the archived ALEPH e^+e^- data taken between 1992 and 2000.

The correlation functions are measured as a function of charged particle multiplicity for the first time with LEP2 data. The correlation is measured with both the lab- and the thrust coordinate systems, with the latter sensitive to potential medium expanding transverse to the color string in an $e^+e^- \to q\bar{q}$ topology. Results with e^+e^- data at higher collision energy up to 209 GeV will also be presented with a high event multiplicity reach. A hint of a tantalizing structure emerges in high multiplicity e^+e^- events that is not seen in their low multiplicity and low energy counterparts.

The jets are reconstructed with the anti-k$_T$ algorithm with a resolution parameter of 0.4. It is the cleanest test of jets and QCD without the complication of hadronic initial states. The fixed center-of-mass energy allows the first direct test of pQCD calculation. The measurements are compared to predictions from MC generators and two perturbative QCD calculations at NLO and with NLL'+R resummation.

These results also serve as important baseline to compare to similar measurements in other colliding systems, as well as expanding our search for collective phenomena in a new phase space in the e^+e^- collision system for a potential discovery. Future directions, including testing jet clustering algorithms designed for future electron-ion collider experiments, as well as connections to heavy ion collisions, will also be discussed.

Submitted on behalf of a Collaboration?

No

Participate in poster competition?

Primary authors: BATY, Austin Alan (Rice University (US)); MCGINN, Christopher (Massachusetts Inst. of Technology (US)); PEREPELITSA, Dennis (University of Colorado Boulder); THALER, Jesse (MIT); MAGGI, Marcello (Universita e INFN, Bari (IT)); CHANG, Paoti (National Taiwan University (TW)); SHENG, Tzu-An (Massachusetts Inst. of Technology (US)); Dr CHIEN, Yang-Ting (Georgia State University); LEE, Yen-Jie (Massachusetts Institute of Technology); CHEN, Yi (Massachusetts Inst. of Technology (US))

Presenter: CHEN, Yu-Chen (Janice) (Massachusetts Institute of Technology)

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