



Contribution ID: 193

Type: Parallel talk

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

Tuesday, March 28, 2023 5:30 PM (20 minutes)

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-k_T 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 $e^+e^- \rightarrow q\bar{q}$ 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?

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Session Classification: WG4

Track Classification: WG4: QCD with Heavy Flavours and Hadronic Final States