PRODUCTION OF MUON PAIRS AND TAU PAIRS AT ENERGIES ABOVE THE Z^0 MASS USING THE OPAL DETECTOR AT LEP

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Synopsis

The production cross-sections, angular distributions and asymmetries of the processes $e^+e^- \rightarrow \mu^+\mu^-$ and $e^+e^- \rightarrow \tau^+\tau^-$ at energies between 130 and 189 GeV have been measured with data taken between 1995 and 1998 using the OPAL detector at LEP.

For each process two selections have been made. The first selection consists of only the full energy events. The second also includes events in which an initial-state photon has been emitted, thus reducing the collision energy. Monte Carlo data have been used to optimise the selection efficiency and backgrounds for these two processes. The measurements have been compared with similar results from other experiments and the Standard Model.

Additionally, the measurements using the full energy events have been used, together with other OPAL measurements at the same energies, to measure the running of the electromagnetic coupling constant.

Events from both processes which have undergone initial-state radiation and have a collision energy in the region of the Z^0 resonance peak have been fitted to a Breit-Wigner function. The results of this fit are compared to the precisely known shape of the Z^0 resonance and thus the LEP beam energy has been determined.