Measurement of $|V_{ub}|$ and $|V_{cb}|$

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June 19, 1998

Abstract

New measurements of the CKM matrix elements $|V_{ub}|$ and $|V_{cb}|$ have been made, using the $\sim$ 3 million hadronic Z^0 decays collected by the DELPHI detector at LEP1. The analyses exploit the latest theoretical parametrisations to reduce the systematic errors, and the overall error in each case is comparable to or better than the present world average.

The $|V_{ub}|$ measurement uses the observation that for the majority of $b \to ul\nu$ decays the invariant mass of the hadronic system recoiling against the lepton lies below the D mass. Moreover, the model dependence in predicting the shape of the mass spectrum is expected to be small. $|V_{ub}|$ is extracted by a fit to the full spectrum of the lepton energy in the B hadron rest frame, for semileptonic B decays with a sufficiently small hadronic mass. The experimental systematics are controlled by using alternative techniques to enrich or deplete the sample in $b \to u$ decays.

The $|V_{cb}|$ measurement is based on an analysis of the semileptonic decays $b \to D^{*+}l\overline{\nu}X$, using the identified soft pion from $D^{*+} \to D^0\pi^+$. Precise measurements of the branching ratios $BR(\overline{B}^0 \to D^{*+}l\overline{\nu})$ and $BR(b \to D^{*+}l\overline{\nu}X)$ are presented. The extraction of $|V_{cb}|$ is made with low theoretical uncertainty from a fit to the kinematics of the decay. The result is compatible with the previous DELPHI result but with a much reduced error, and robust against all cross checks.