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Measurements of |Vus| and Second Class Currents and Searches for Violation of Lepton Universality and CPT in Tau Decays at BABAR

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We report on a variety of results involving decays of the tau lepton using the very large sample of tau+tau- pairs produced in e+e- annihilation data collected with the BaBar detector at the PEP-II asymmetric-energy B Factory near a center-of-mass energy of 10.58 GeV. From measurements of the ratios of branching fractions: B(tau -> mu nu nubar) / B(tau -> e nu nubar), B(tau -> pi nu) / B(tau -> e nu nubar), and B(tau -> K nu) / B(tau -> e nu nubar) we test with high precision the Standard Model assumption of mu-e and tau-mu charged current lepton universality and provide a determination of the Cabibbo-Kobayashi-Maskawa matrix element |V_{us}|. Furthermore, we report on preliminary measurements of tauˆ- –> Kˆ- n piˆ0 nu{tau} with n = 0,1,2,3 and tauˆ- –> piˆ- n piˆ0 nu_{tau} with n = 3,4 as well as on the measurements of the branching fractions and hadronic mass distributions of tau- -> KS0 pi- nu_tau, tau -> KS0 pi- pi0 nu_tau, tau -> KS0 pi- K0L nu_tau. Data from the inclusive strange tau decay results are used in a different determination of |V_{us}|. We also report on our search for second class currents in tau– > pi- eta nu_tau, where the eta decays into pi+pi-pi0 and our measurement of the tau mass. We obtain a test of CPT by measuring the difference between the masses of the tau+ and tau-.

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