Title:	Observation of τ − → π − ν τ e + e − and search for τ − → π − ν τ μ + μ −
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Abstract:	We present the first measurements of branching fractions of rare tau-lepton decays, τ − → π − ν τ ℓ + ℓ − (ℓ = e or μ), using a data sample corresponding to 562 fb − 1 collected at a center-of-mass energy of 10.58 GeV with the Belle detector at the KEKB asymmetric-energy e + e − collider. The τ − → π − ν τ e + e − decay is observed for the first time with 7.0 σ significance. The partial branching fraction determined by the structure-dependent mechanisms mediated by either a vector or an axial-vector current for the mass region M π e e > 1.05 GeV / c 2 is measured to be B (τ − → π − ν τ e + e −) [M π − e + e − > 1.05 GeV / c 2] = (5.90 ± 0.53 ± 0.85 ± 0.11) × 10 − 6 , where the first uncertainty is statistical, the second is systematic, and the third is due to model dependence. In the full phase space, due to the different detection efficiencies for the structure-dependent mechanisms mediated by axial-vector and vector currents, the branching fraction varies from B A (τ − → π − ν τ e + e −) = (1.46 ± 0.13 ± 0.21) × 10 − 5 to B V (τ − → π − ν τ e + e −) = (3.01 ± 0.27 ± 0.43) × 10 − 5 , respectively. An upper limit is set on the branching fraction of the τ − → π − ν τ μ + μ − decay, B (τ − → π − ν τ μ + μ −) < 1.14 × 10 − 5 , at the 90% confidence level.
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