

TUESDAY

DECEMBER 8

4:00 P.M.

RM 415 NSH

## New-Physics Searches in B-meson semileptonic decays with Lattice QCD

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B-meson decays provide a wealth of complementary observables that enable tests of the Standard Model and probe different new-physics scenarios, provided sufficiently precise and reliable experimental measurements and theoretical calculations. Recently several tantalizing  $2-3\sigma$  tensions have been observed in B-meson decays; new experimental measurements, including observations of heretofore unseen processes have also appeared. The Fermilab Lattice and MILC Collaborations recently completed lattice-QCD calculations of the underlying hadronic form factors for  $B \rightarrow \pi$  and  $B \rightarrow K$  semileptonic decays. Here I summarize the numerical form-factor computations and then discuss the phenomenological implications. Using the FNAL/MILC form factors, I present results for observables in the Standard Model for  $B \rightarrow \pi(K)l+l-$ ,  $B \rightarrow \pi(K)\nu\bar{\nu}$ , and  $B \rightarrow \pi\tau\nu$  decays. For  $B \rightarrow \pi(K)l+l-$ , I then compare the Standard-Model expectations with experimental measurements. Assuming the Standard Model, I determine the Cabibbo-Kobayashi-Maskawa matrix elements  $|V_{td}|$ ,  $|V_{ts}|$ , and their ratio from B-meson semileptonic decays. Alternatively, taking the CKM matrix elements from unitarity, I constrain new-physics contributions at the electroweak scale.