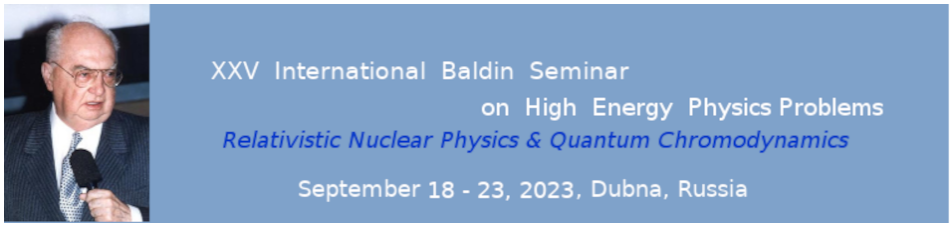


Contribution ID: **137** Type: **not specified**

# Impact of Long-Distance Contributions on Semileptonic $B^+ \to \pi^+\ell^+\ell^-$ Decay

*Thursday, 21 September 2023 11:40 (20 minutes)*

Rare $B$-meson decays due to the Flavor Changing Neutral Current (FCNC) $b \to s$ and $b \to d$ quark transitions are quite sensitive to New Physics effects because of the smallness of their decay width. The $b \to s$ transition has been intensively studied both experimentally and theoretically thanks to an enormous sample of $B$-mesons produced at electron-positron and hadron colliders. $B$-meson decays originated by the $b \to d$ transition, being CKM suppressed, get less theoretical attention and experimental data about them are very restricted, in particular, the exclusive $B^+ \to \pi^+\mu^+\mu^-$ decay was observed by the LHCb collaboration in 2012 only. This decay is well studied theoretically and predictions are in agreement with experimental data obtained by the same collaboration in 2015. An observation of its electronic counterpart at the LHC is a matter time while additional datasets of $B$-meson will require for its tauonic analogue to be found at the LHC and SuperKEKB. Theoretical predictions for the $B^+ \to \pi^+\ell^+\ell^-$ branching fraction, where $\ell = e, \mu, \tau$, are presented based on the effective electroweak Hamiltonian approach and its dependence on the choice of the $B \to \pi$ transition formfactor parametrizations is explicitly analyzed. This decay is also sensitive to long-distance contributions of vector mesons decaying to the $\tau^+\tau^-$ pair. Their impact on the tauonic invariant-mass distribution and total decay width are evaluated. A possibility of the $B \to \pi\tau^+\tau^-$ observation at the LHC and SuperKEKB is discussed.

**Primary author:** PARKHOMENKO, Alexander (P.G.Demidov Yaroslavl State University)

**Co-author:** PARNOVA, Irina (P.G. Demidov State Universtiy)

**Presenter:** PARKHOMENKO, Alexander (P.G.Demidov Yaroslavl State University)

**Session Classification:** Parallel: Quantum chromodynamics at large distances