

Belle II excess in $B^+ \rightarrow K^+ \nu \nu^-$ and Muon $g-2$ Illuminating Light Dark Sector with Higgs Portal

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The Belle II collaboration recently announced that they observed the $B^+ \rightarrow K^+ \nu \nu^-$ decay process for the first time. This dineutrino mode of $B^+ \rightarrow K^+ \nu \nu^-$ has been theoretically identified as a very clean channel. However, their result encounters a 2.7σ deviation from the Standard Model (SM) calculation. On the other hand, last year, Fermilab released new data on muon $g-2$ away from the SM expectation with 5σ . In this letter, we study the simplest UV-complete $U(1)_{\mu-\tau}$ -charged complex scalar Dark Matter (DM) model. Thanks to the existence of light dark Higgs boson and light dark photon, we can explain the observed relic density of DM and resolve the results reported by both Belle II and Fermilab experiments simultaneously. As a byproduct, the Hubble tension is alleviated by taking $\Delta N_{\text{eff}} \approx 0.3$ induced by the light dark photon.

Primary authors: KIM, Jongkuk (Chung Ang University); KO, Pyungwon (Korea Institute for Advanced Study); HO, Shu-Yu (KIAS)

Presenter: KO, Pyungwon (Korea Institute for Advanced Study)

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