

# B-Mesogenesis meets Lifetime

ALI MOHAMED

*Siegen University*

The aim of our work is to explore the implications of the Baryogenesis model, based on the B-Mesogenesis paradigm proposed by G. Elor, M. Escudero, and A. E. Nelson, on the phenomenological observables of the B-meson. Specifically, we focus on analyzing the non-standard decay channels of the B-meson into a Standard Model (SM) baryon and a dark sector antibaryon. These decay channels were proposed by the model to address the matter-antimatter asymmetry and the origin of dark matter in the Universe.

Building upon recent work by Alonso-Álvarez, G. Elor, and M. Escudero [PRD 104, 035028 (2021), arXiv:2101.02706], which scrutinizes the model further, we employ the Heavy Quark Expansion (HQE) framework to investigate the contributions of these new decay channels to the lifetime ratio  $\tau(B^+)/\tau(B^0)$ .

Moreover, we examine the ratio of the exclusive to inclusive decay of  $B^+ \rightarrow \psi p^+$ . Using exclusive calculations up to twist-six [arXiv:2311.13482] and incorporating the lower limit constraints on the inclusive decay, we set a lower bound on the decay width  $\Gamma(B^+ \rightarrow \psi p^+)$ , which can be tested at Belle.

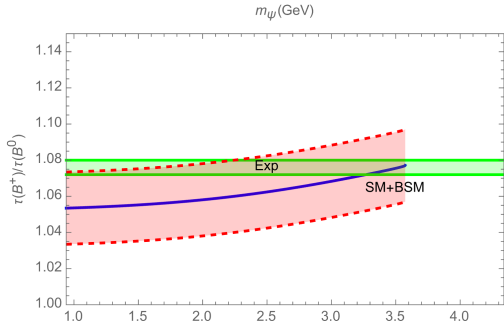


Figure 1: Contribution of model  $\mathcal{L}_{2/3}$  to the total ratio  $\tau(B^+)/\tau(B^0)$  as a function of the dark sector mass range, allowed by the B-Mesogenesis model.

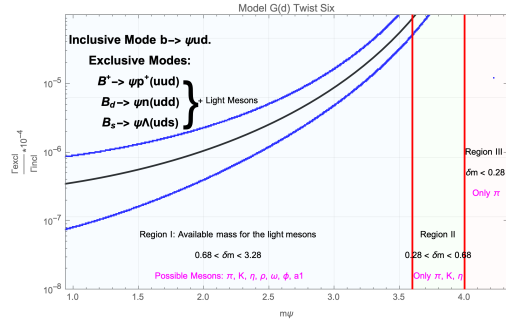


Figure 2: Lower bounds on The decay  $\Gamma(B^+ \rightarrow \psi p^+)$  as a function of the dark sector mass range, allowed by the B-Mesogenesis model.