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The heavy meson lifetimes

Thursday, June 9, 2022 4:00 PM (30 minutes)

(Part of the CRC project **C1b**)

In this talk, I plan to discuss the current status of theory predictions for lifetimes of heavy $H = B, D$ -mesons (containing a heavy quark $Q = b, c$), which can be presented schematically within the Heavy Quark Expansion (HQE) framework as:

$$\Gamma(H) = \Gamma_3 + \Gamma_5 \frac{\langle \text{cal} O_5 \rangle}{m_Q^2} + \Gamma_6 \frac{\langle \text{cal} O_6 \rangle}{m_Q^3} + \dots + 16\pi^2 \left[\tilde{\Gamma}_6 \frac{\langle \tilde{O}_6 \rangle}{m_Q^3} + \tilde{\Gamma}_7 \frac{\langle \tilde{O}_7 \rangle}{m_Q^4} + \dots \right], \text{ where}$$

$\text{cal } O_d$ denotes the effective operator of dimension d , with the matrix element $\langle \text{cal} O_d \rangle \equiv \langle H | \text{cal} O_d | H \rangle$, and Γ_d is the corresponding short-distance Wilson coefficient. Then I will discuss more in detail the recent first determination of Darwin operator contribution Γ_6 . In addition, I will present some results on the phenomenology, and will discuss further prospects and plans on improvement of the HQE predictions for these lifetimes - both from perturbative and non-perturbative side - by the Siegen and Karlsruhe Universities.

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