TWO-LOOP RESUMMATION IN (FRACTIONAL) ANALYTIC PERTURBATION THEORY*

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We show how to resum perturbative series in both the one- and two-loop fractional analytic perturbation theory.

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In my report I described the generalization of the Analytic Perturbation Theory (APT) approach for QCD observables, initiated in [1, 2, 3], to fractional powers of coupling — the so-called Fractional APT (FAPT) [4,5]. The basic aspects of FAPT are shortly summarized. After that, I discussed how to treat heavy-quark thresholds in FAPT [6] and then showed how to resum perturbative series in both the one-loop and two-loop (F)APT, provided that the generation function $P(t)$ of perturbative coefficients d_n is known [7,6,8,9]. As an application I considered the FAPT description of the Higgs boson decay $H^0 \to b\bar{b}$ and of the vector-current Adler function. The main conclusion is: to achieve an accuracy of the order of 1% it is enough to take into account up to the third correction — in complete agreement with Kataev–Kim analysis in [10]. The d_4 coefficient value calculated in [11] is needed only to estimate the generating function $P(t)$.

The full version of this report will be published in [12] (see also [13]). Here in Fig. 1 we show only the main result for the width $\Gamma_{H\to b\bar{b}}$: the width of the shaded strip takes into account the overall uncertainties due to the resummation procedure and the renormgroup-invariant b-quark mass, $\hat{m}_b$. The main source of a 5% reduction of the two-loop estimate as compared with the one-loop one is due to the reduction of the two-loop value of $\hat{m}_b^2$.

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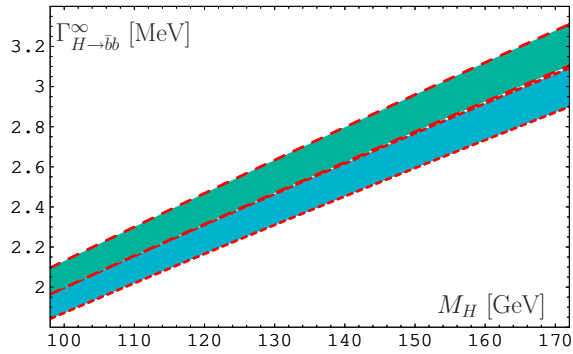

Fig. 1. The two-loop width $\Gamma^{\infty}_{H\to b\bar{b}}$ is shown (the lower strip) as a function of the Higgs-boson mass M_H in the resummed FAPT. The upper strip shows the corresponding one-loop result.

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