

# Application of the Decoupling Scheme to the Decay $h \rightarrow \ell\ell$ in the 2HDM within FlexibleDecay

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FlexibleDecay is an extension of the spectrum-generator FlexibleSUSY which allows to calculate Higgs boson decay rates and branching ratios for their respective decay channels in arbitrary BSM models. For that purpose, the so-called Decoupling Renormalization Scheme is employed. It is constructed such that non-decoupling effects in the case of heavy BSM-physics are circumvented, while advantageous features of the  $\overline{\text{MS}}/\overline{\text{DR}}$  scheme in the context of spectrum generators are kept. The publicly available version of FlexibleDecay currently implements a LO calculation amended by some important NLO corrections. It is to be extended to a complete NLO calculation for the leptonic decay channel  $h \rightarrow \ell^+ \ell^-$ . This requires a reconsideration of details of the Decoupling Scheme in order to ensure its desired properties.

While the first of the two complementary talks on FlexibleDecay focusses on the philosophy behind the construction of the decoupling scheme in the context of a complete NLO calculation as well as the application to simple extensions beyond the SM, this talk is dedicated to present some subtleties in more complex models. As a concrete example, the type-II Two-Higgs-Doublet Model will be discussed. After recapitulating the decoupling limit in this model, the definition of the renormalization scheme will be elucidated. Especially complications occurring in extended Higgs sectors like the treatment of mixing angles describing the mixing among Higgs states will be clarified. Finally, also numerical results will be presented.

**Primary authors:** Prof. STÖCKINGER, Dominik (IKTP, TU Dresden); WÜNSCHE, Johannes (IKTP, TU Dresden); LANG, Jonas (National Center for Nuclear Research Poland); KOTLARSKI, Wojciech (National Centre for Nuclear Research (PL))

**Presenter:** WÜNSCHE, Johannes (IKTP, TU Dresden)

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