# Search for Heavy Higgs Bosons with the CMS Detector in the $t\bar{t}$ and Missing Transverse Momentum Final State

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In this talk, a double-resonance search for heavy Higgs bosons in the jets + missing transverse momentum final state is presented utilizing $41.5\,\mathrm{fb}^{-1}$ of proton-proton collision data recorded by the CMS experiment. The analysis targets a heavy Higgs boson $A$, which decays first into a second heavy Higgs boson $H$ and a $Z$ boson and subsequently into a top-antitop pair and neutrinos – a final state that is yet unexplored at the LHC.

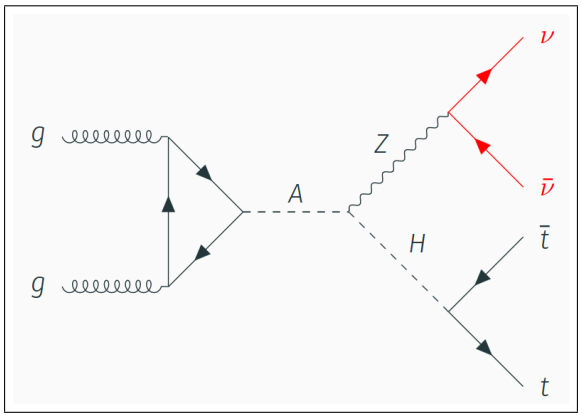


Figure 1: Leading order Feynamn diagram showing the production of a heavy Higgs boson $A$ via the gluon-gluon fusion production mode. It decays into a $Z$ boson and second heavy Higgs boson $H$ decaying further into neutrinos and a $t\bar{t}$ pair.

Based on the expected signal event signature of jets and missing transverse momentum, a phase space region is selected with reduced background contribution, while maintaining a high signal efficiency. In addition, control regions with no or only residual signal expectation are defined, in order to validate the modeling of the Standard Model background processes. To reduce the QCD-multijet background contribution, a selection criterion is developed based on the angular separation between the missing transverse momentum vector and all reconstructed jets.
After the event selection, different sensitive variables based on missing transverse momentum and the (transverse) Higgs boson masses are reconstructed. The obtained distributions are finally used to the derive expected exclusion limits on the production cross section times branching ratio.The results are used to constrain the parameter space of Two-Higgs-Doublet-Models (2HDMs), which provide a generic description of the phenomenology arising in scenarios with a second Higgs doublet. Additionally, this talk will provide a short introduction on how to compute (and read) expected exclusion limits.