

## Roadmap of Dark Matter models for Run 3



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### Novel signatures in the Type-I 2HDMa model (12'+3')

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The 2HDMa model is one of the main models used in the Dark Matter searches at the LHC. So far, all the 2HDMa benchmarks used by the LHC experiments feature a Type-II Yukawa sector with degenerate Higgses ( $m_A = m_H = m_{H^\pm}$ ). The latter implies, together with the fact that flavour observables put lower bounds on the mass of the charged Higgses, that the  $A/H/H^\pm$  bosons are all constrained to be heavy ( $m_{A/H/H^\pm} \gtrsim 600$  GeV).

In this talk, we present the first detailed study of a 2HDMa model with a Type-I Yukawa sector, which, for moderate values of  $\tan \beta$ , lifts the constraints from flavour observables, allowing the extra Higgs bosons to be even lighter than the SM Higgs boson. We discuss four benchmarks with degenerate and non-degenerate Higgses and the signatures that arise in this model, some of which have not yet been explored by the LHC experiments. The talk will present the dominant channels in these benchmarks and the expected sensitivity in Run 2 data using a truth-level analysis and will discuss potential improvements in the experimental searches for Run 3.

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