Search for Dark Matter produced in association with a Higgs boson decaying to $b\bar{b}$ using 36 fb$^{-1}$ of $pp$ collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector

**Introduction**

Search for events with large missing transverse momentum (MET) recoiling against a Standard Model (SM) particle is a probe for detecting Dark Matter (DM) at the LHC. The discovery of the Higgs boson $h$ opens a new opportunity through the $h+\text{MET}$ signature, with the $h\rightarrow b\bar{b}$ being the most probable decay channel. The results are interpreted in the context of a simplified model Z$'$-2HDM and also less model-dependent limits on the visible cross section are provided for $h\rightarrow b\bar{b}+\text{DM}$ beyond SM processes.

**Analysis Strategy**

Depending on the transverse momentum of the Higgs boson (and hence MET), the Higgs candidate is reconstructed as a system of two b-tagged small radius jets or as a single large radius jet containing two b-tagged subjets.

**Resolved:** MET $\leq 500$ GeV

**Merged:** MET $> 500$ GeV

A Type-II two-Higgs-doublet model (2HDM), where the $h+\text{DM}$ signal is produced through a Z$'$ mediator coupling to $h$ and to the pseudo-scalar $A$, is used as a benchmark signal model.

**Event selection and background estimation**

The events are divided in different categories depending on the lepton multiplicity:
- 0-lepton Signal Region
- 1-lepton Control Region: estimation of W+jets and t\bar{t}bar background
- 2-lepton Control Region: estimation of Z+jets background

x 4 MET bins
x 1,2 b-tag

**Interpretation of the results**

Less model-dependent limits on visible production cross-section of $h+\text{DM}$ events

Expected sensitivity gain at high $m_{Z'}$ from b-tagging on Variable-Radius track jets.