Search for Dark Matter produced in association with a W or Z boson with the ATLAS Experiment at 13 TeV

Stanislav Suchek on behalf of the ATLAS collaboration
Kirchhoff-Institute for Physics, University of Heidelberg, stanislav.suchek@cern.ch

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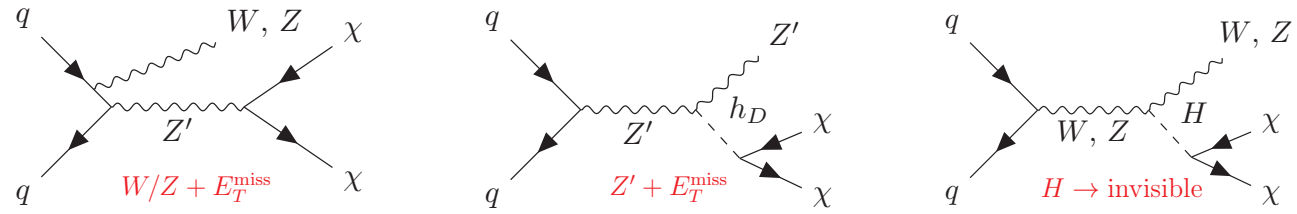
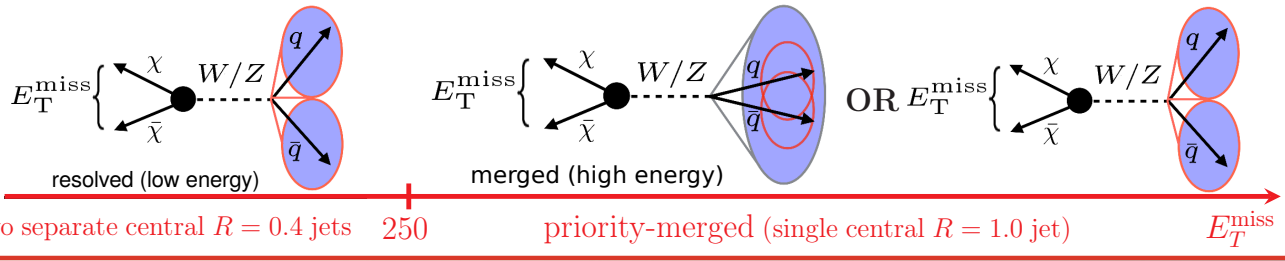
Signal models



Resolved and boosted topologies



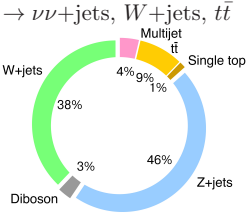
Analysis strategy

0/1/2 leptons ⊗ 0/1/2 b−tags ⊗ resolved + merged ⊗ W/Z mass window + upper sideband + substructure

} 40 regions (8 signal regions)

Dominant backgrounds:

$Z \rightarrow \nu\nu$+jets, W+jets, $t\bar{t}$

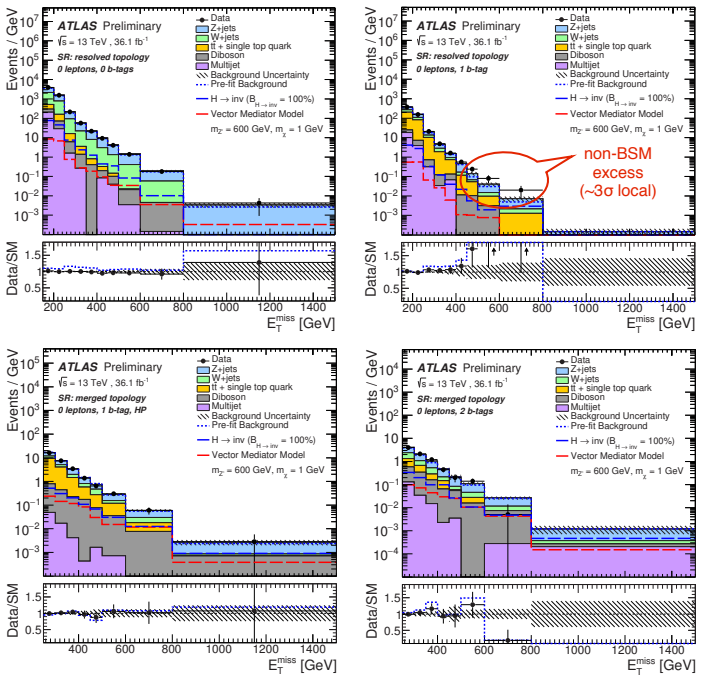


0 lepton signal region (SR)
signal and constrain $Z(\rightarrow \nu\nu)$+jets
1 lepton control region
constrain $W(\rightarrow l\nu)$+jets and $t\bar{t}$
2 lepton control region
constrain $Z(\rightarrow \nu\nu)$+jets from $Z(\rightarrow ll)$+jets

Combined binned profile likelihood fit

Is there any excess in data?

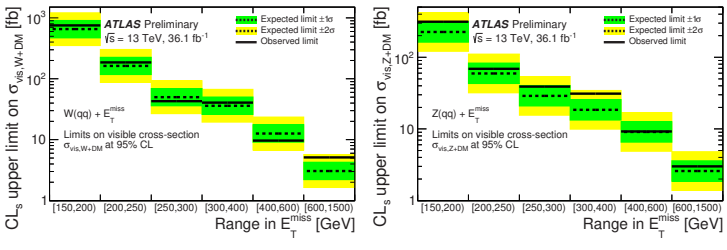
Good agreement between data and SM backgrounds



Other $W/Z + E_T^{\text{miss}}$ models? ⇒ generic limits!

$$\sigma_{\text{vis},W/Z+\text{DM}} \equiv \sigma \times \mathcal{B}(W/Z \rightarrow qq) \times A \times \varepsilon(E_T^{\text{miss}})$$

Minimal dependence on model



Make life of theorists easier: translate to parton level

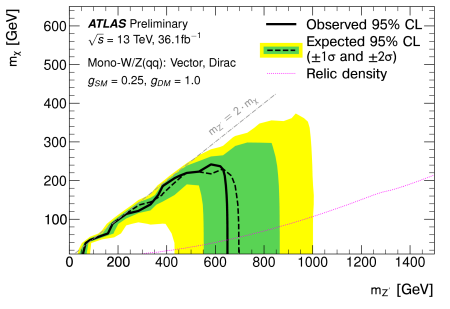
$A \times \varepsilon$ ranges in bins of E_T^{miss} [%]	
E_T^{miss}/[GeV]	W(qq) + E_T^{miss}
[150, 200)	20%
[200, 250)	20%
[250, 300)	30%
[300, 400)	45%
[400, 600)	55%
[600, 1500)	60%

Reconstruct in the same E_T^{miss} bin as generated

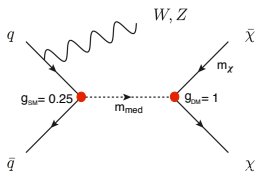
Pass selection

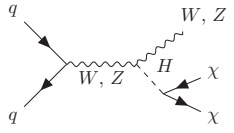
Parton-level σ × $A \times \varepsilon$ in a given E_T^{miss} bin = Detector-level σ

No excess ⇒ model-dependent exclusion limits



Vector mediator simplified models with W/Z from initial state radiation



$H \rightarrow$ invisible interpretation: limits on $\mathcal{B}(H \rightarrow \text{invisible})$:

Exclusion limit at 95% CL on $\mathcal{B}(H \rightarrow \text{invisible})$		
	Observed	Expected
Run 1 VH	0.78	0.86
Run 2 VH+ggH+VBF	0.83	$0.58^{+0.23}_{-0.16}$