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POSTER TEASER TALK

PARTIKELDAGARNA 2019

**EXPLORING SELECTIONS ACROSS CHANNELS
IN DARK MATTER SEARCHES WITH TOP QUARKS
AT THE ATLAS EXPERIMENT OF THE LHC**

The tW +MET and $t\bar{t}$ +MET analyses

- ▶ Interested in two similar final states with **top-quarks** and **Dark Matter**:

- ▶ tW +DM and $t\bar{t}$ +DM

- ▶ $t\bar{t}$ and tW signals mix at NLO in the SM

- ▶ Two independent ATLAS searches:

- ▶ tW +MET: ongoing in the exotics group

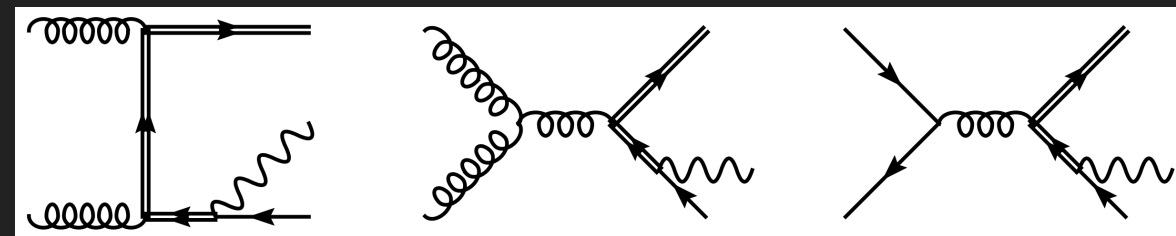
- ▶ $t\bar{t}$ +MET: ongoing in the SUSY group

- ▶ Two different Dark Matter models:

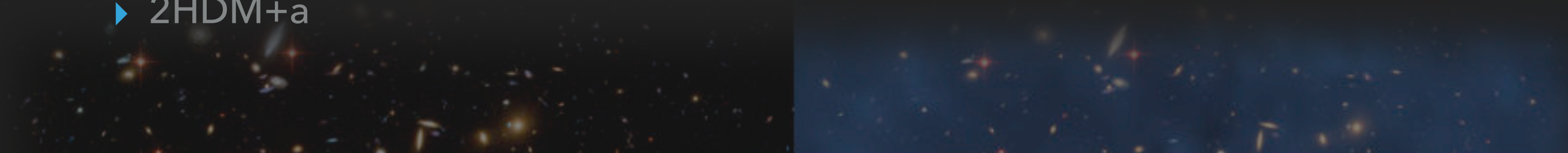
- ▶ Simplified spin-0 pseudoscalar model

- ▶ 2HDM+a

[JHEP11\(2009\)074](#)



Some diagrams contributing to tW at NLO with a $t\bar{t}$ pair



FIRST STUDY OF THE OVERLAP BETWEEN THE ANALYSES

- ▶ 10 000 events generated for each final state, in each model, for two different benchmarks
 - ▶ MadGraph5_AMC@NLO and Pythia8
- ▶ Simplified signal regions
- ▶ Generation level only
- ▶ LO study – more overlap expected at NLO

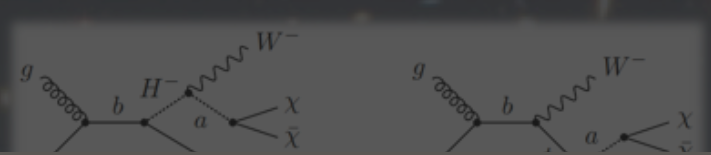




Exploring selections across channels in Dark Matter searches with top quarks at the ATLAS experiment of the LHC

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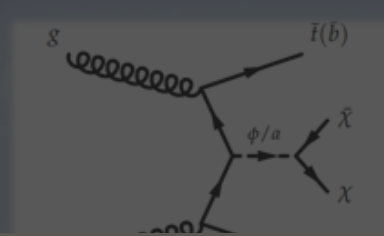
Interpreted in 2HDM+a



Exactly one lepton which is a muon
Muon $p_T > 30$ GeV
Muon $|\eta| < 2.7$
Number of jets ≥ 3
Number of b-jets ≥ 1
Jet $p_T > 20$ GeV
Leading b-jet $p_T > 50$ GeV
MET > 250 GeV

Exactly one lepton which is a muon
Muon $p_T > 27$ GeV
Muon $|\eta| < 2.7$
Number of jets ≥ 4
Number of b-jets ≥ 2
Jet $p_T > (80,60,30,25)$ GeV
Leading b-jet $p_T > 80$ GeV
MET > 220 GeV

Interpreted in simplified model but also rescaled to 2HDM+a



OVERLAP FOUND

WILL QUANTIFY THIS STATEMENT AT MY POSTER

COME AND DISCUSS WHAT THIS IMPLIES — AND WHAT IT DOESN'T IMPLY

- Is there overlap between the signal regions of the two analyses?
- How do the models compare to each other?

		generated events		(pb)	efficiency
Simplified	tt + DM	10,000	-	0.1165	0.6707
Simplified	tW + DM	10,000	-	0.0300	0.7907
2HDM+a	tt + DM	10,000	350 GeV	0.0433	0.7265
2HDM+a	tW + DM	10,000	350 GeV	0.0335	0.5457
2HDM+a	tt + DM	10,000	1200 GeV	0.0308	0.7217
2HDM+a	tW + DM	10,000	1200 GeV	0.0230	0.8723