

Outlook

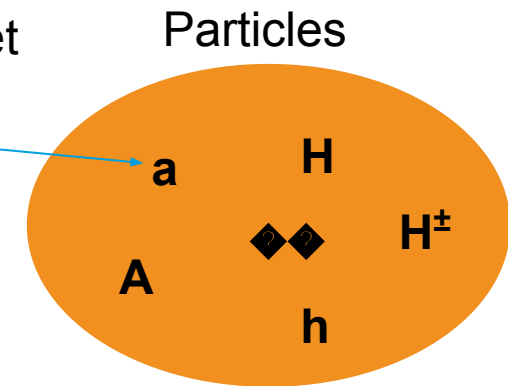
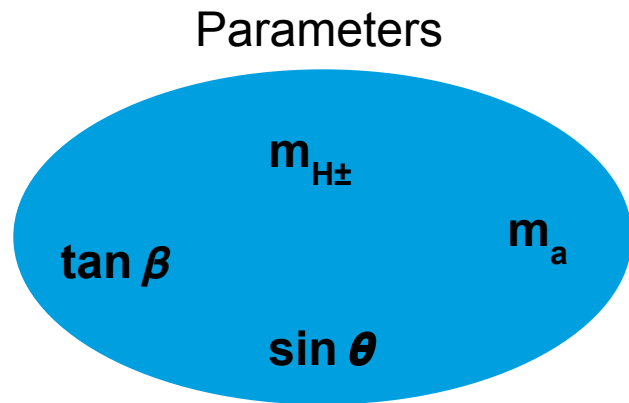
Group meeting, 28 October 2019

Martin Habedank, Priscilla Pani, David Berge

2HDM+a model.

Two-Higgs-doublet model with a pseudoscalar mediator

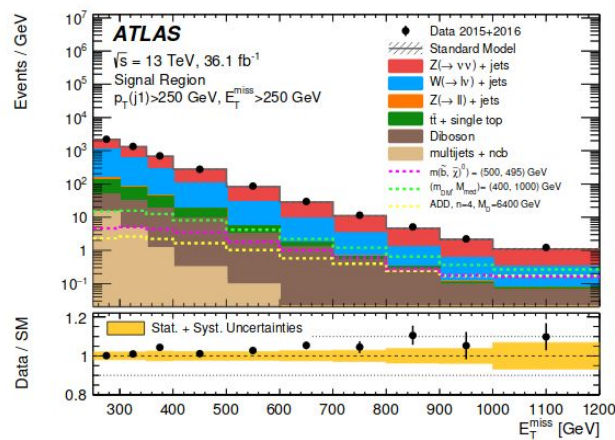
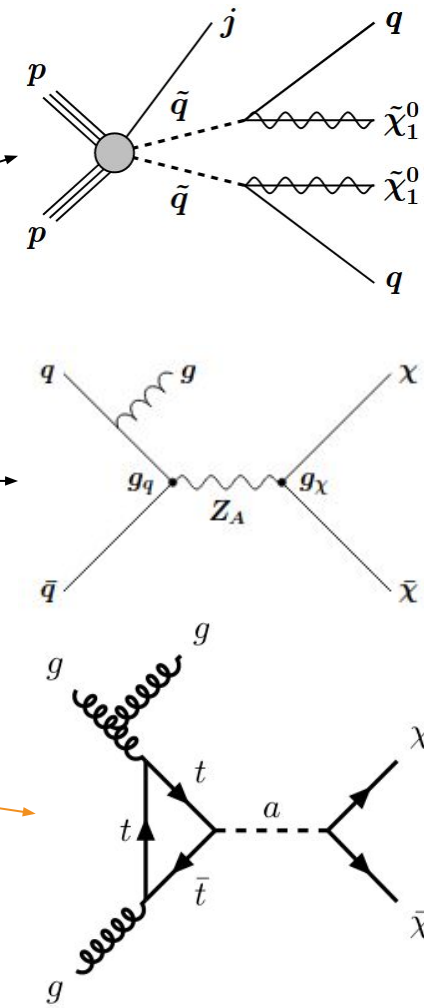
- pseudoscalar mediator that couples to DM and SM particles
 - strongly constrained by Higgs boson couplings
- additional second Higgs doublet (2HDM)
- mediator-SM coupling through mixing of mediator and second Higgs doublet



Physics of the Dark Universe 21 (2018) 8–15

MET+Jet Analysis.

- Exotics \rightarrow JDM
- signature: ≥ 1 jet, $E_T^{\text{miss}} \geq 200$ GeV, 0 leptons
- investigated models:
 - large extra spatial dimensions
 - supersymmetry (SUSY)
 - WIMPs (e.g. axial-vector mediator)
 - and others
 - not 2HDM+a
- unblinding approval on 18 October



Contur in general

- LHC precision measurements largely model-independent
 - provided in HEPDATA encoded in Rivet
 - most measurements in agreement with SM
- use those as pure SM-background for BSM model scans

disadvantages:

- not as fast or sensitive as dedicated searches
- cannot claim discovery

advantages:

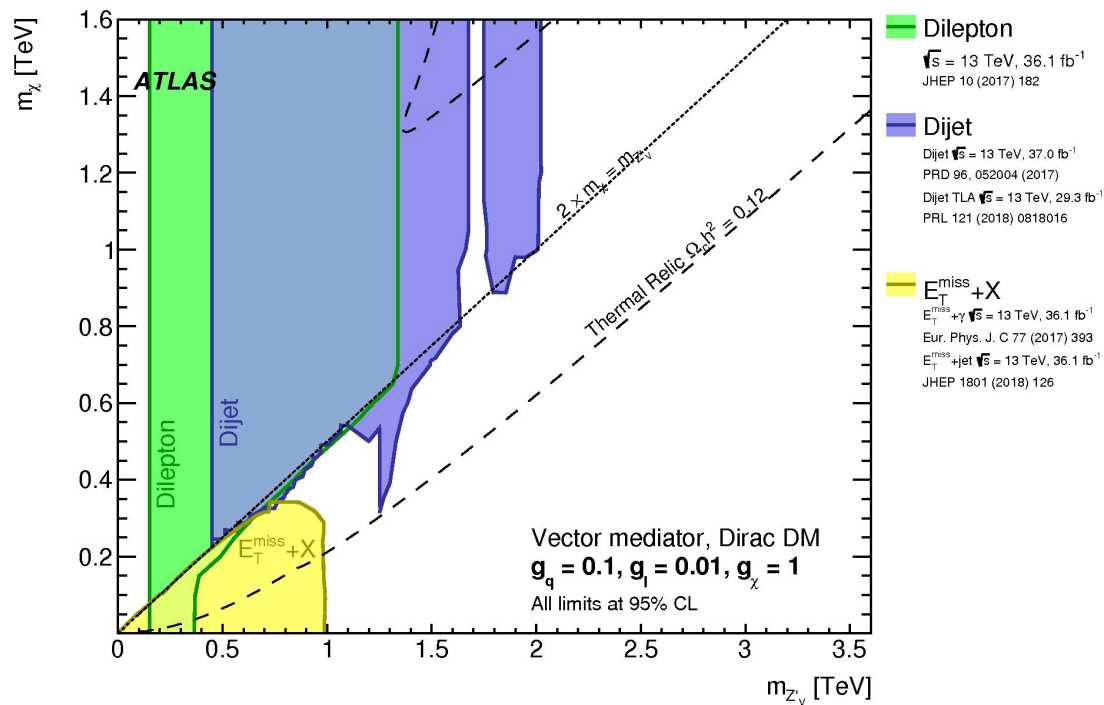
- can cover broad range of signatures and models
- can set limits on New Physics and indicate where (not) to investigate further

introduction to method: [JHEP 03 \(2017\) 078](#)

[Contur-Code](#)

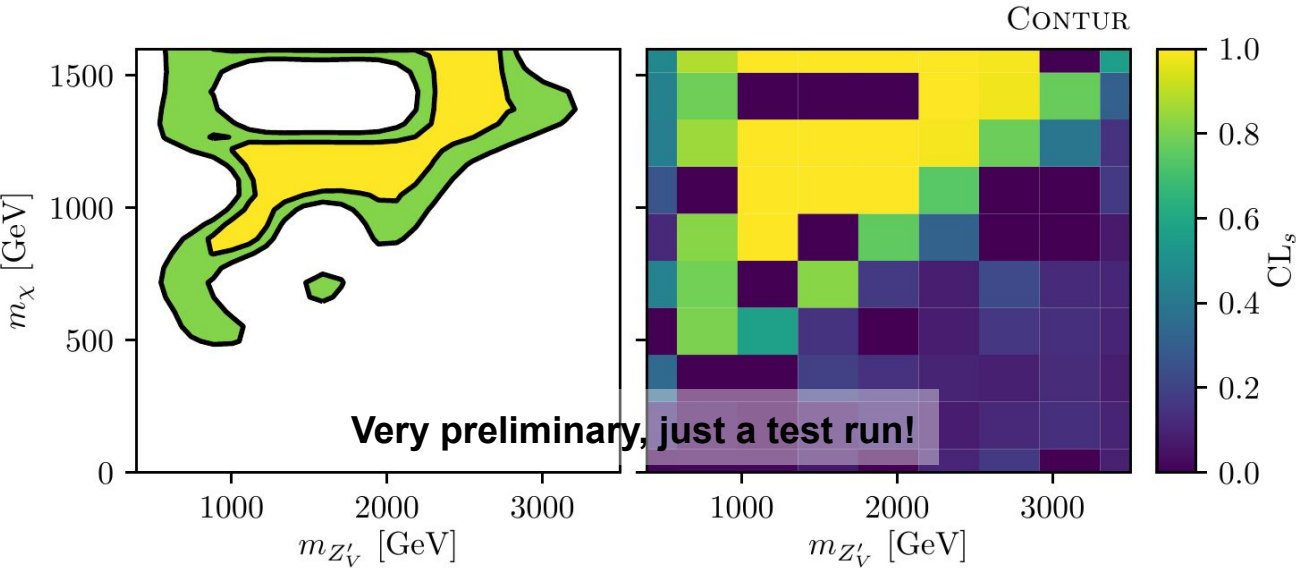
DM with a Vector mediator ($g_q=0.1, g_x=1$)

ATLAS result (JHEP 1905 (2019) 142)



$g_l=0.01$

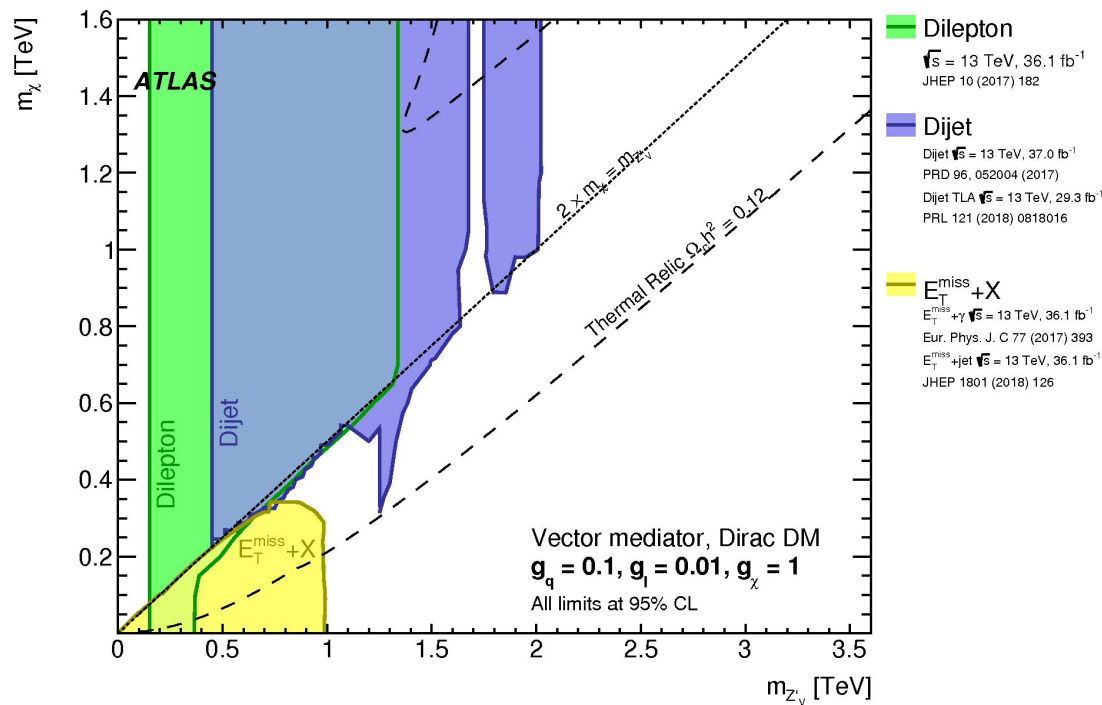
Contur - “out of the box”
main impact by CMS differential jet cross section measurement
(JHEP11 (2018) 113)



$g_l=0.00?$

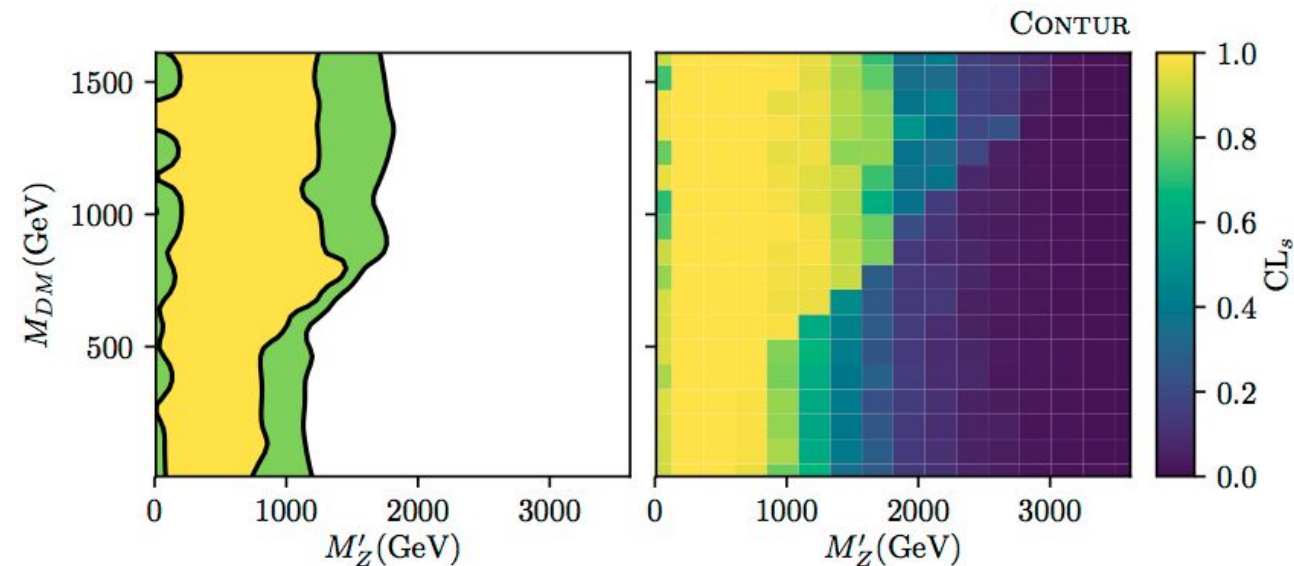
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ATLAS result ([JHEP 1905 \(2019\) 142](#))



$g_l=0.01$

Contur - [refined](#)



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Our aims and progress

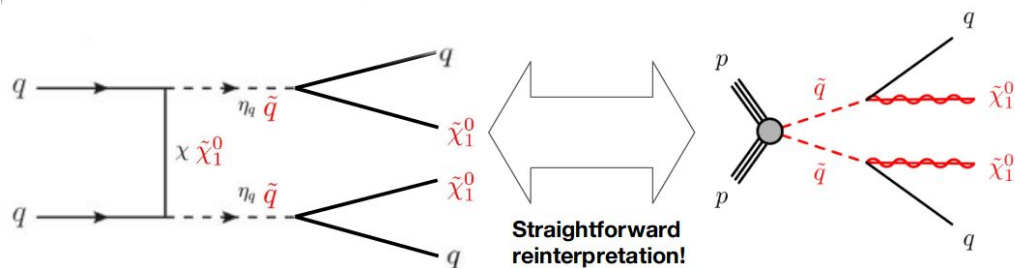
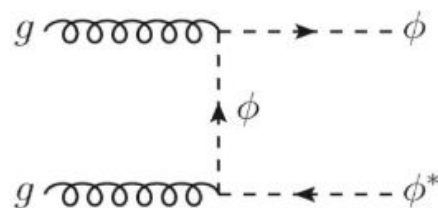
- building our own knowledge base on [Confluence](#)
 - MET+Jet analysis does not cover 2HDM+a model yet
- Mono-jet analysis and 2HDM+a model
- check current exclusion limits
 - investigate general sensitivity

introduction to method: [JHEP 03 \(2017\) 078](#)

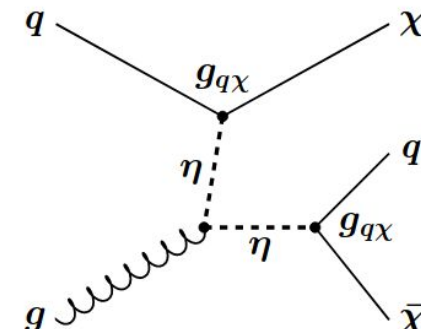
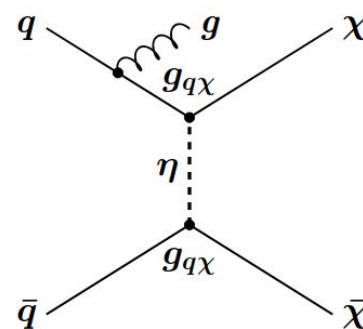
[Contur-Code](#)

t-channel.

- accompanying [LHC DM WG's t-channel effort](#)
- t-channel strongly motivated, but not as easy as s-channel
- LHC DM WG creating [Über-UFO](#) (Universal FeynRules Output)



- also interesting in relation to MET+Jet Analysis:



- requires colour-charged mediator