Search for dark matter candidates produced in $Z(\quad)+E_T^{miss}$ events with the ATLAS detector at the LHC

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Puzzle of Dark Matter Conference
DESY, Hamburg, Germany
October 29-31, 2018

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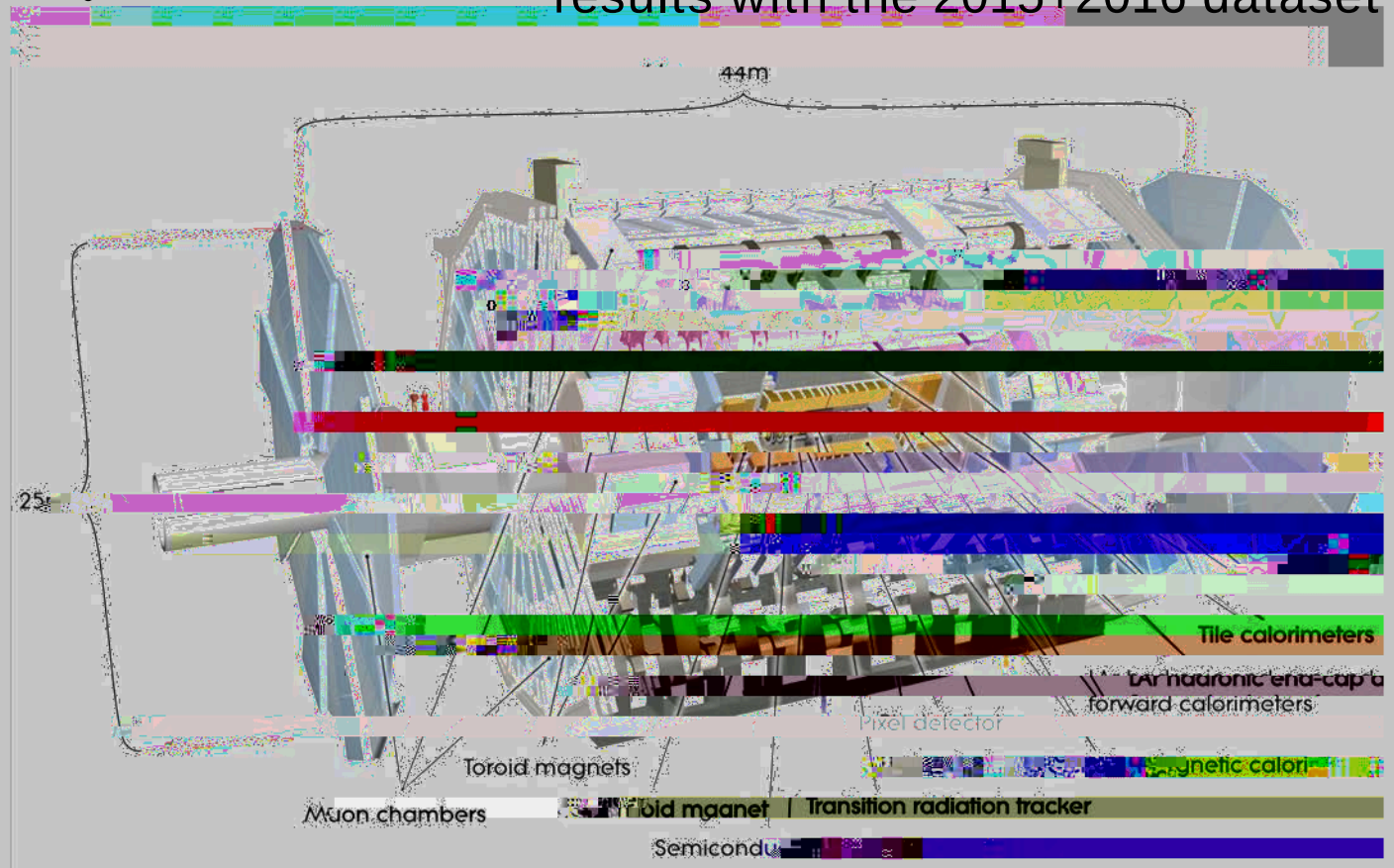
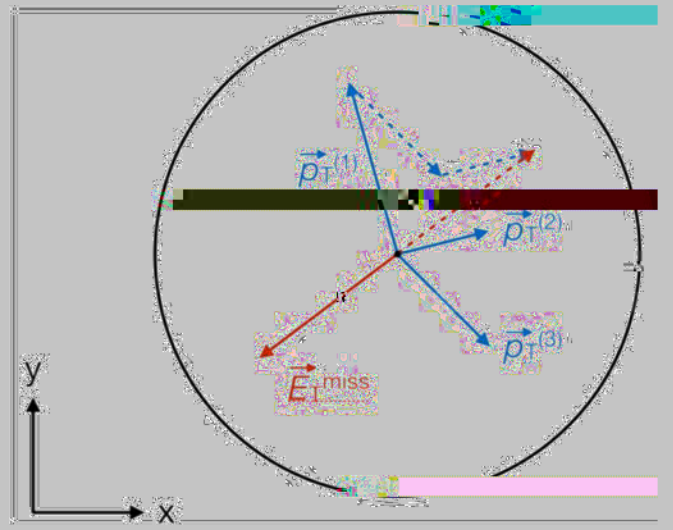
  - 149 fb^{-1}
  - results with the 2015+2016 dataset

ATLAS detector

ongoing

36.1 fb^{-1}





missing transverse momentum, $\vec{E}_T^{miss}$

- da k a e de
- -Z Z(ℓℓ)+ E_T i ℓℓ =

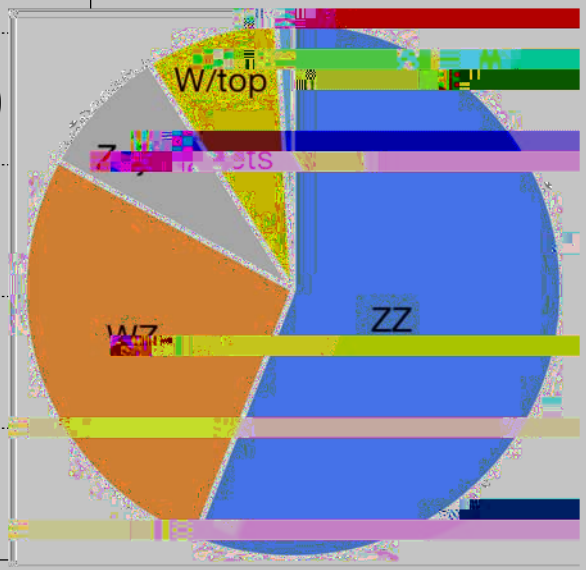
e

Backgrounds

- Standard Model **bac d ce e** also produce $Z(\quad)+E_T^{miss}$, mimicking the DM signal of interest

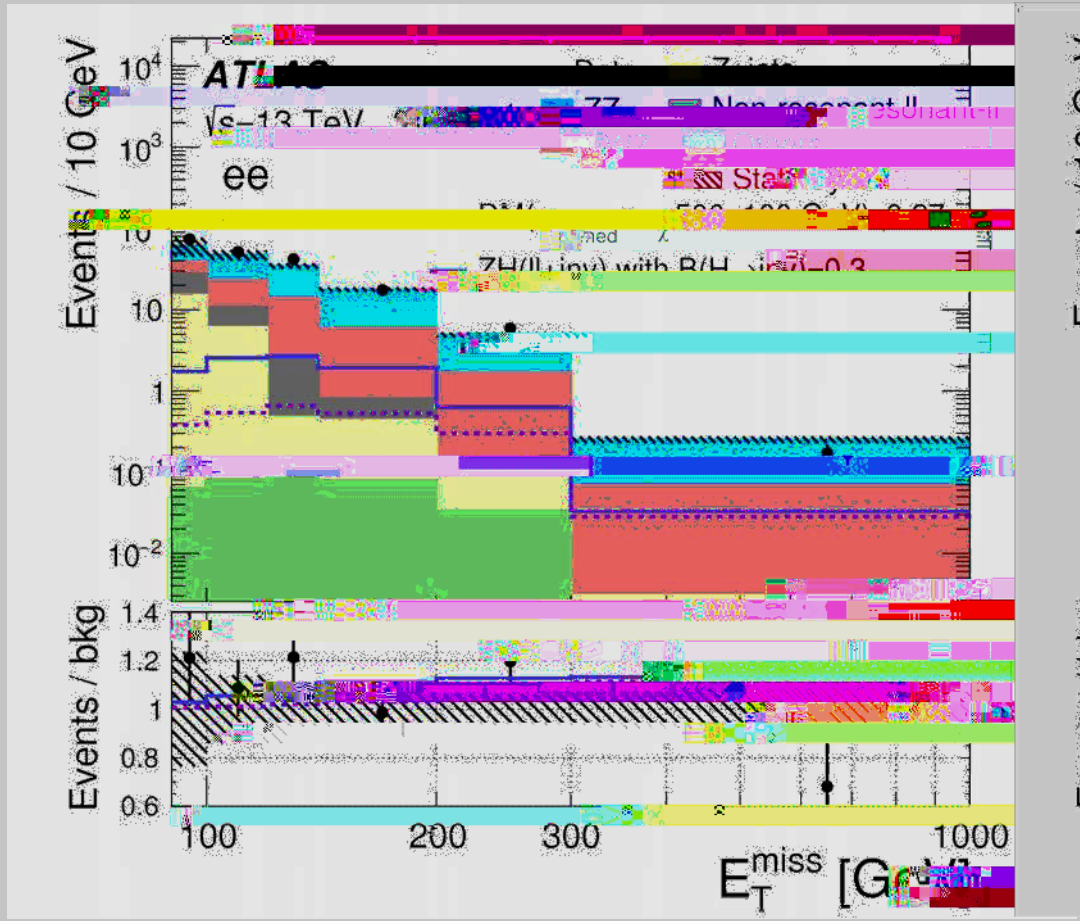
ZZ	ZZ $\ell\ell\nu\nu$, irreducible	MC
WZ	WZ $\ell\nu\ell^+\ell^-$ ℓ from W not reconstructed	Data (yield), MC (shape)
Z+jets	Z(ee) / Z(μμ) + jets jets mis-measured as fake E_T^{miss}	Data (yield), MC (shape)
W/top	WW / Wt / tt / Z(ττ) $\ell^+\nu\ell^-\nu$ $\ell\ell$ do not come from a Z	Data
W+jets	W($\ell\nu$) + jets ℓ mis-identified from a jet	Data
ttV/ttVV/VVV (V=Z,W)	e.g. ttW $(\ell^+\nu b)(q_1q_2b)(\ell^-\nu)$	MC

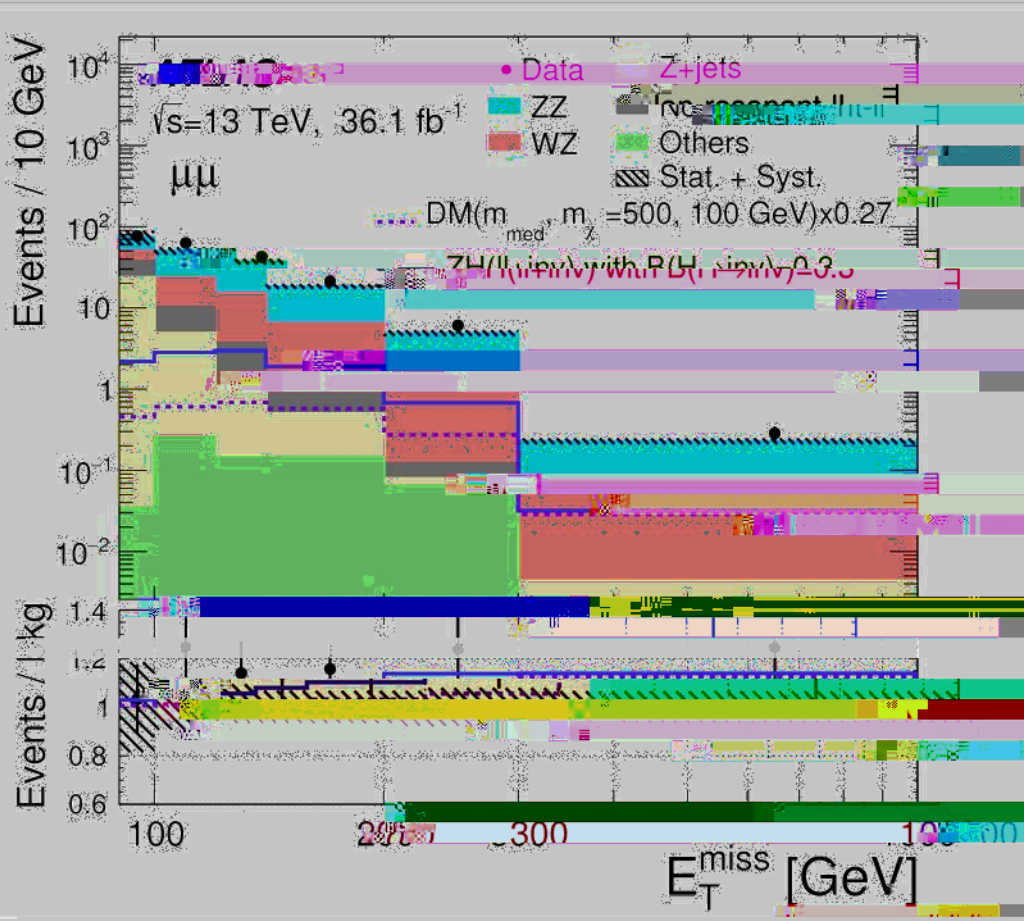
% in signal region



E

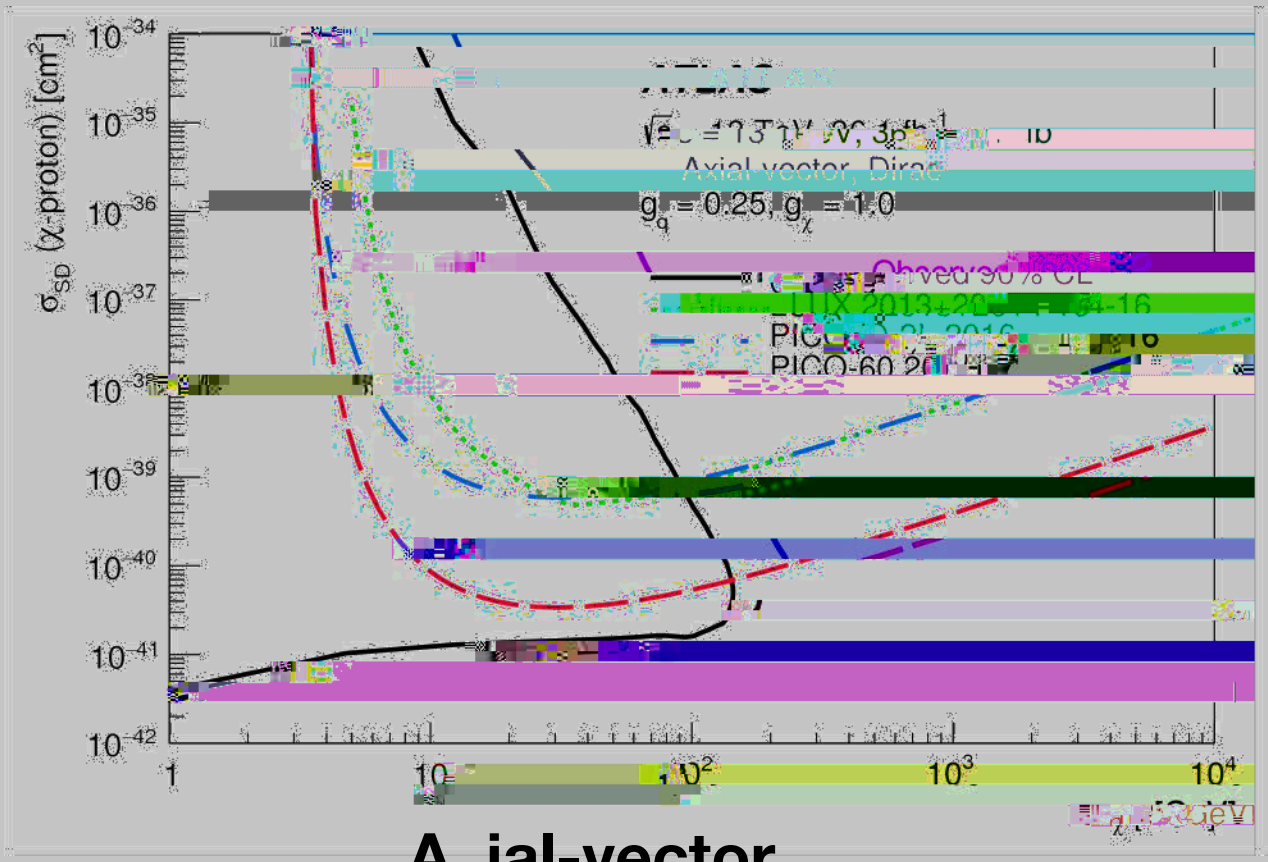
- statistical analysis
-



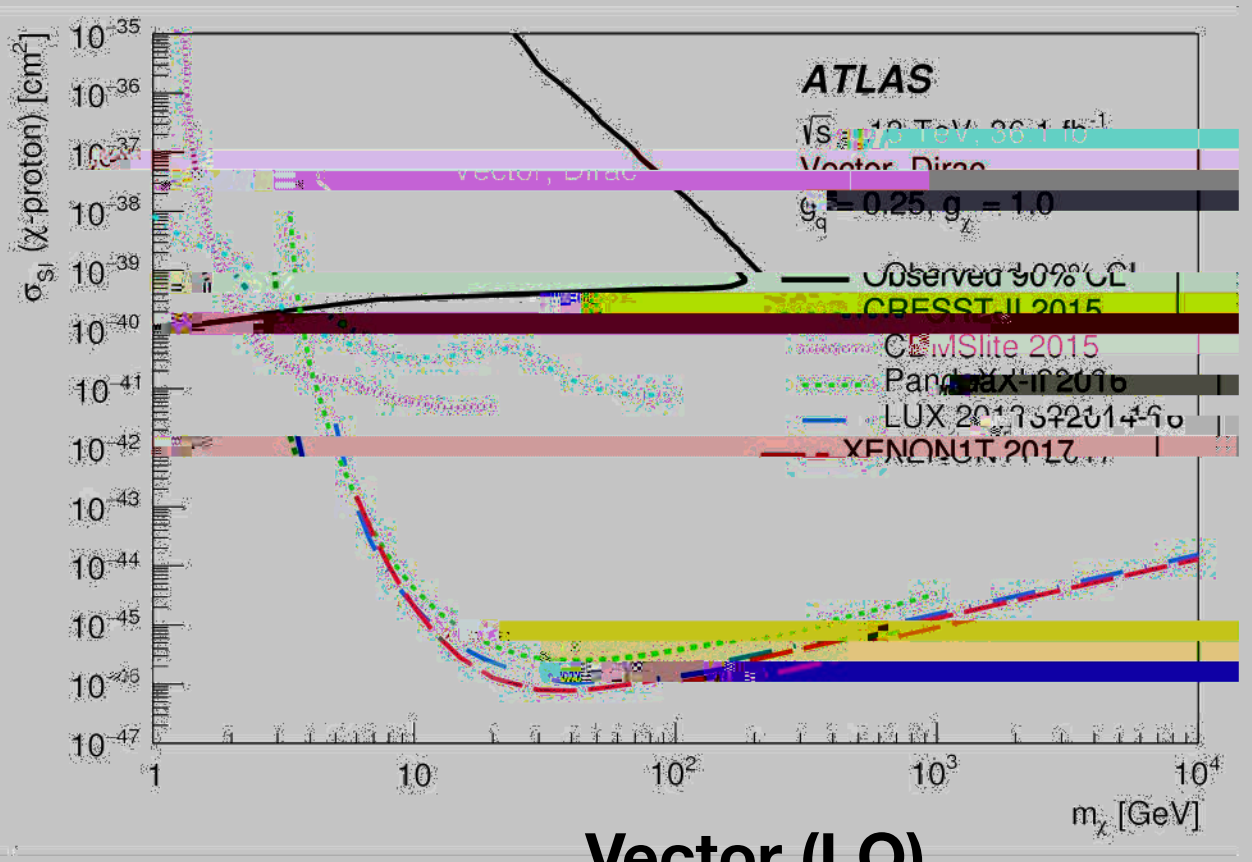


- no significant excess limits

-Z( )



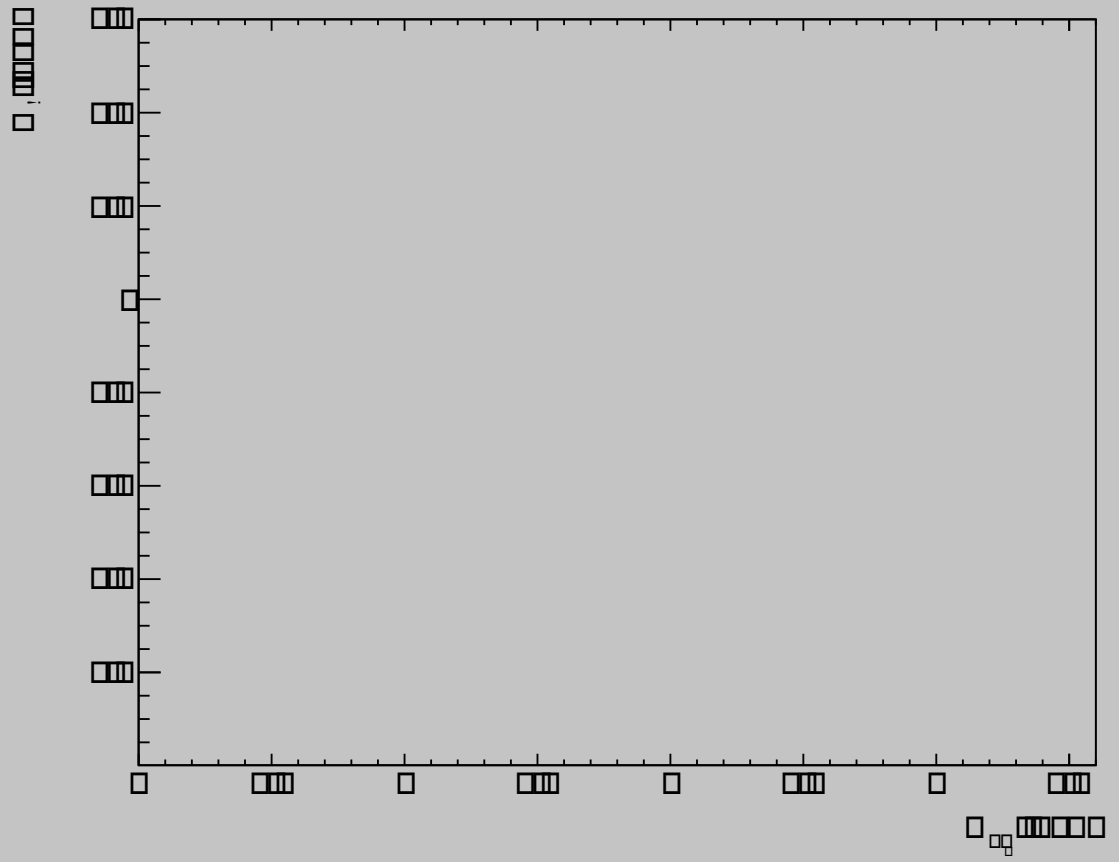
A ial-vector (LO)



Vector (LO)

LB 776 (2017) 318
:1708.09624 -

Mono-*Z*( ) limits compared to other ATLAS searches



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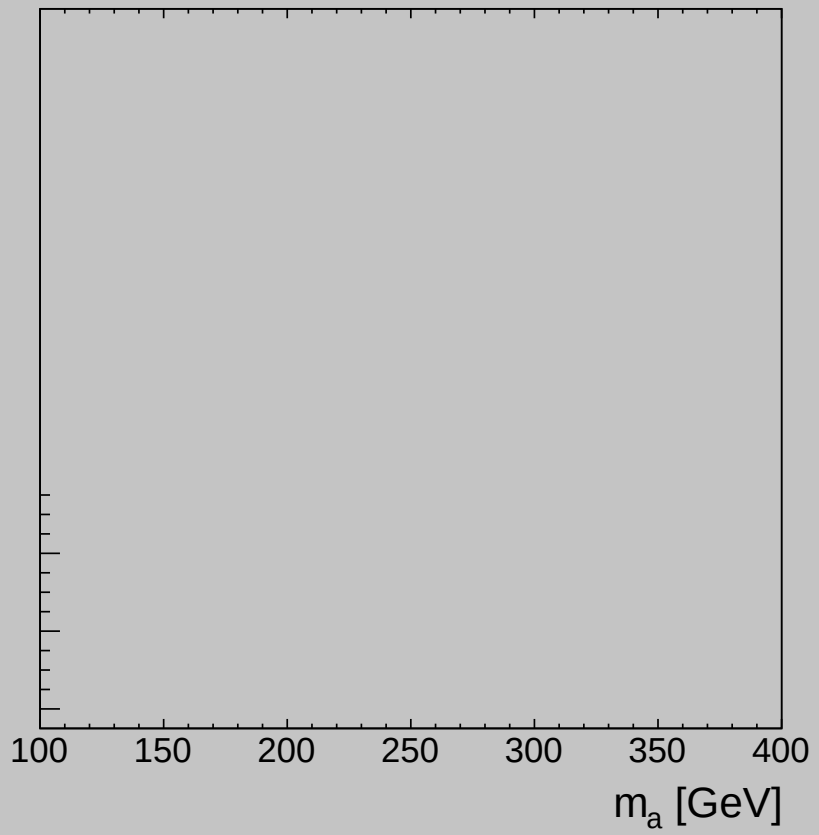

- -*Z*( )

2 +

Conclusions

- Overview of the analysis and results with 36.1 fb^{-1} (2015+16) has been presented

- Work is ongoing in the mono-*Z*( ) analysis towards unblinding the full dataset = 149 fb^{-1}
  - More DM models to be studied
    - In addition to simplified models, pursue models with diagrams unique to mono-*Z* (2HDM+a, *t*-channel, …)
  - Signal region optimization
    - New object-based E_T^{miss} significance – better discriminating power for events with fake E_T^{miss} (see Dilia's mono-*H(bb)* talk later today)
  - New background estimation techniques being studied
    - ***Zγ*** data-driven estimate of *ZZ* background
    - ***γ***+jet data-driven estimate of *Z*+jet background
  - More potential for discovery than ever before!

Backup

Invisible Higgs limits

- Look for deviations in SM BR(H ! ZZ ! 4ν) = 1.06x10^{-3} = 0.1%
- **At most** the branching ratio is 67% or else we would have seen something… at the 95% confidence level
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