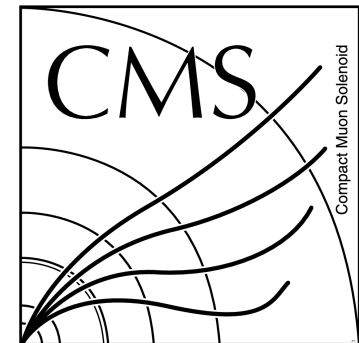


# Dark Matter Workshop



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Sasha Belayaev  
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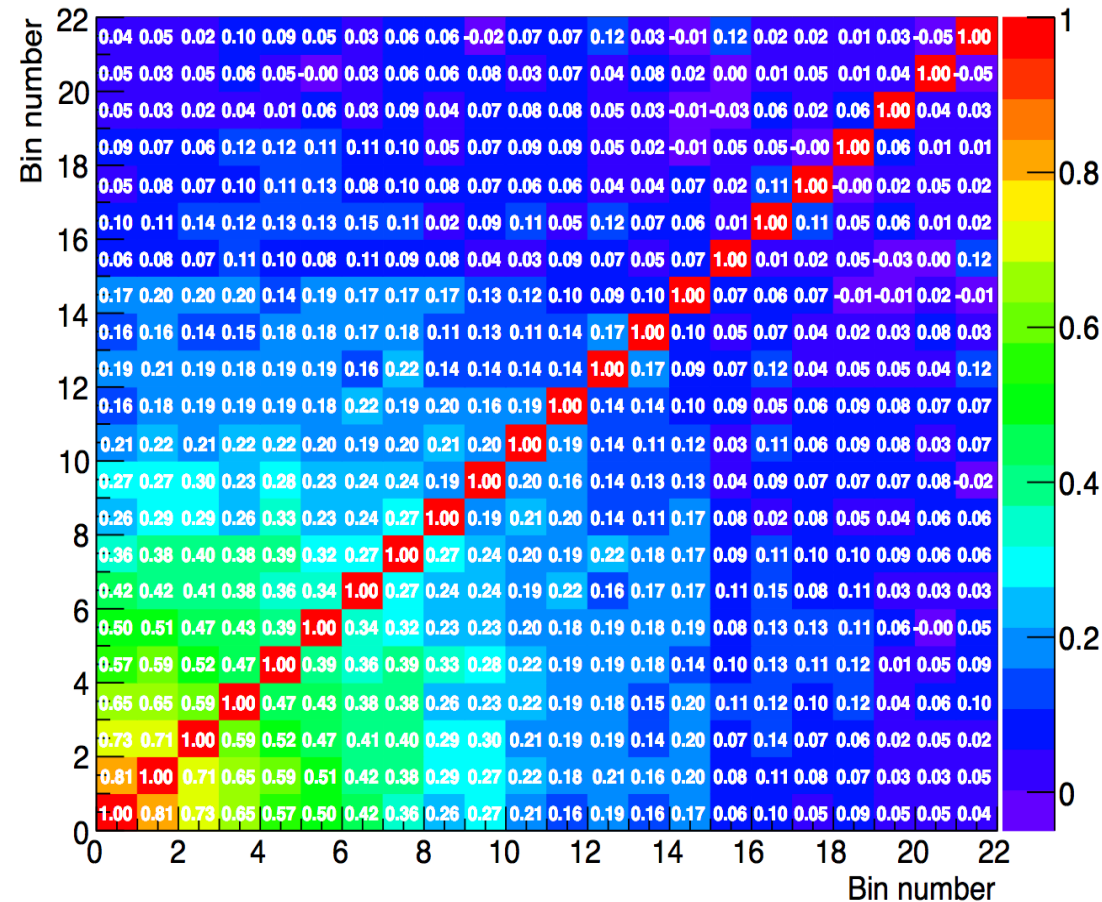
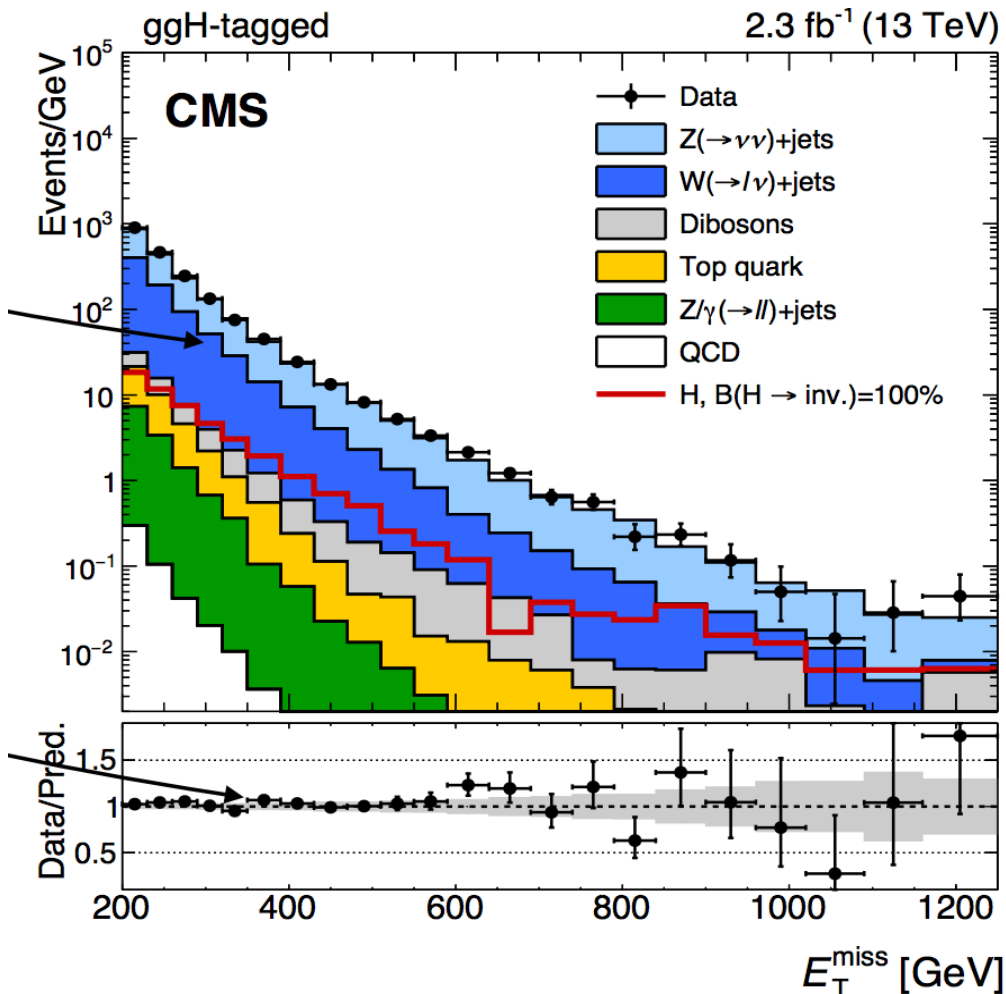
# Re-interpreting the Analysis

- Future plans from LHC → simplified likelihoods

- What is it? => Reduced control fit to 2 objects

*MET* distribution

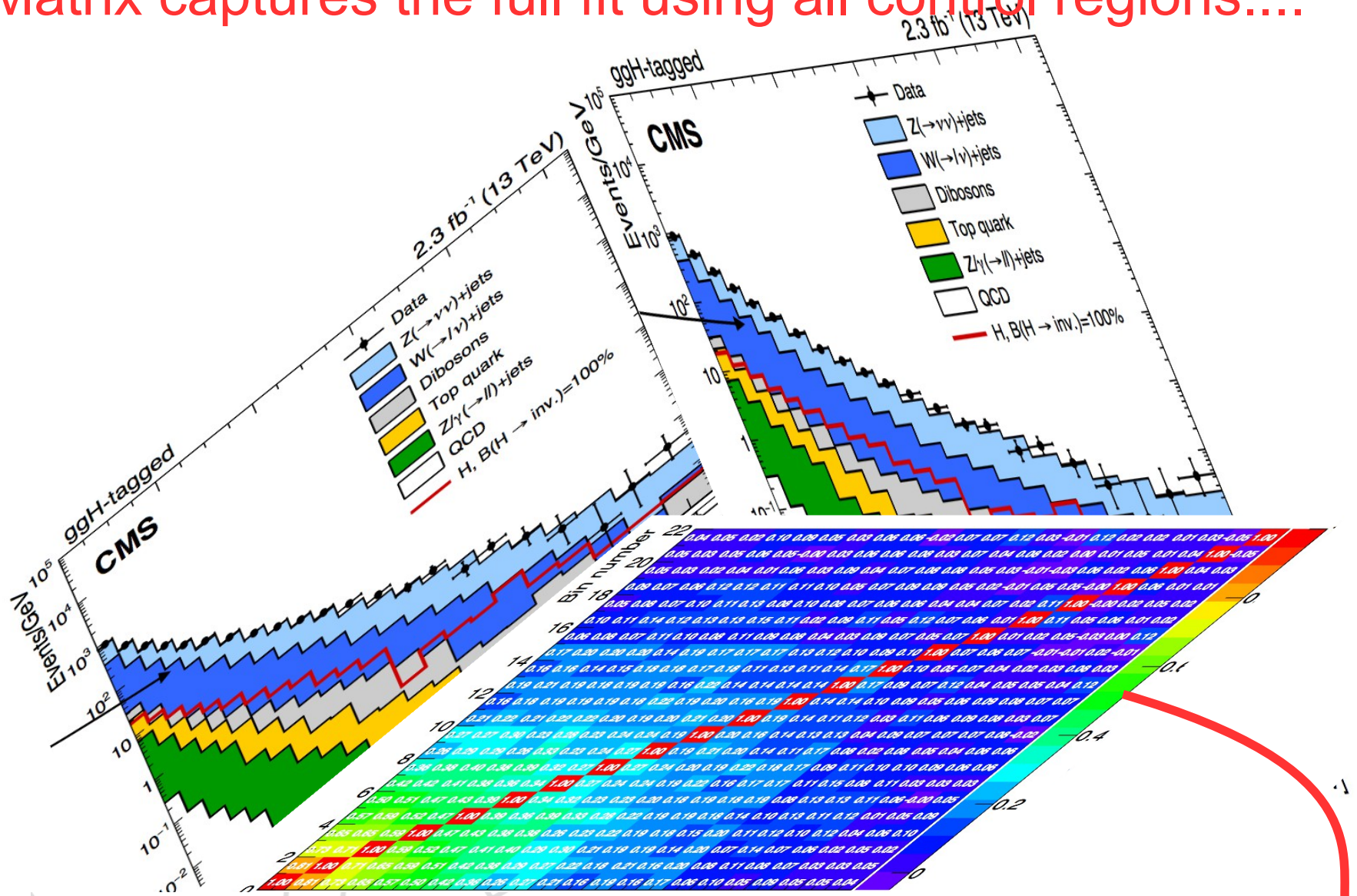
Toy Bin by bin covariance



From this: setup full  $\text{CL}_s$  get both expected and observed

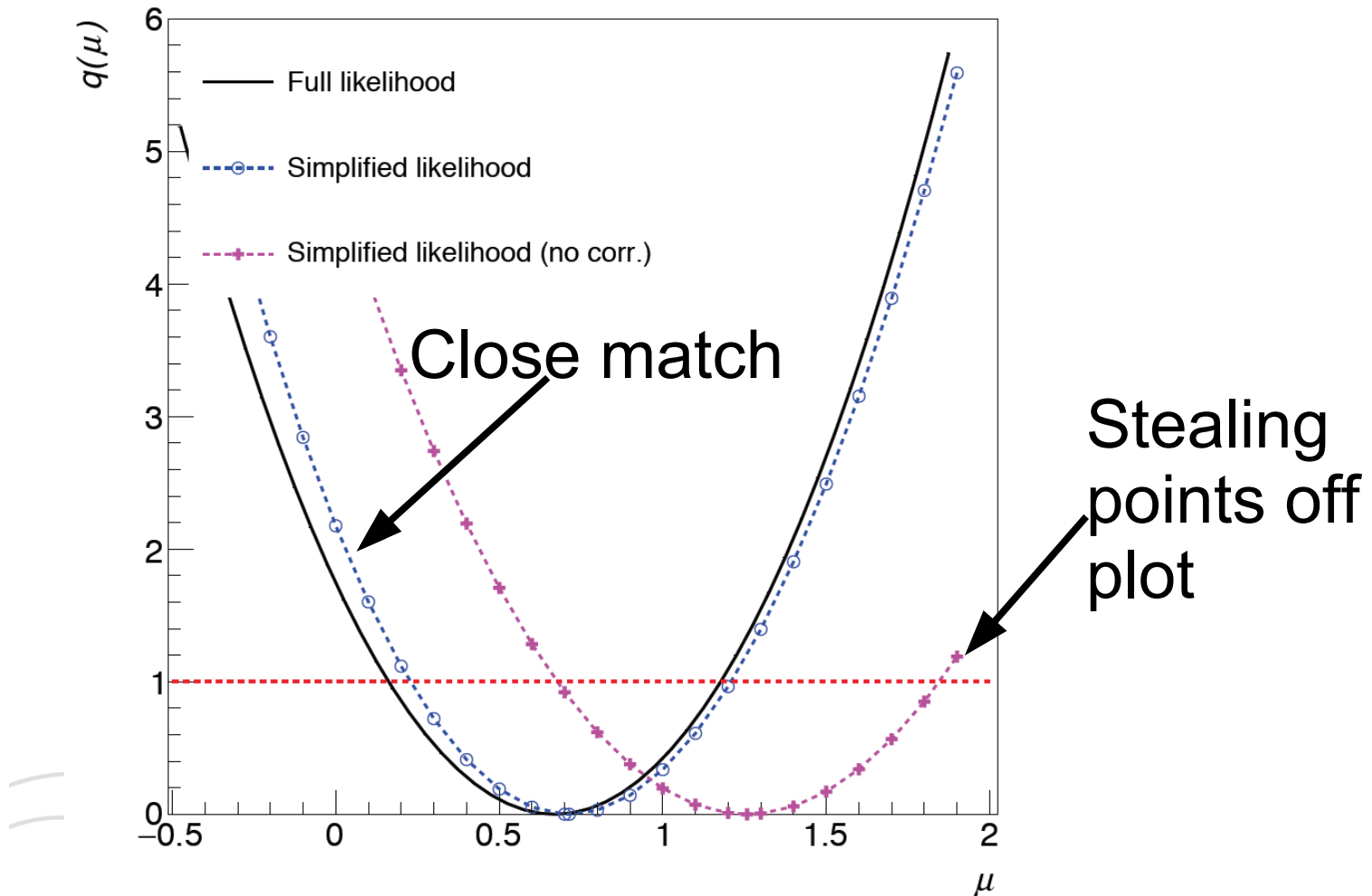
# Simplified likelihood<sup>3</sup>

Matrix captures the full fit using all control regions....



$$\mathcal{L}_S(\mu, \theta) = \prod_{i=1}^N \frac{(\mu \cdot \underset{\text{Signal}}{s_i} + \underset{\text{background}}{b_i} + \theta_i)^{n_i} e^{-(\mu \cdot s_i + b_i + \theta_i)}}{n_i!} \cdot \exp \left( -\frac{1}{2} \theta^T \mathbf{V}^{-1} \theta \right)$$

# Whats the accuracy?



CMS is aiming to release simplified likelihoods for  
all future SUSY and Dark matter searches

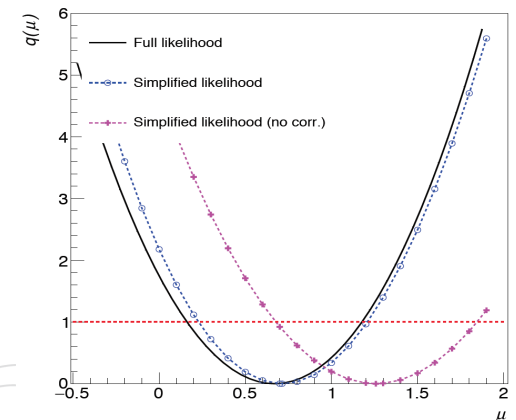
# What does this mean?

Lets say you have a new model

Final States  
You generate

Likelihood fit

“Almost”  
Actual LHC  
exclusion



CMS data cast into simplified  
covariance matrix

Real reason for this :

We are tired of running every theorists' model

# Details on Recasting

- See Details here :
  - <https://indico.cern.ch/event/571190/contributions/2392235>
  - <https://cds.cern.ch/record/2242860>
- Ongoing work to integrate this to recast tools :
  - CHEKMATE
  - GAMBIT
- Aim to establish this as a more modern benchmark
  - Allows us to port complicated fits to recast



# General biased concerns

- Anytime we have a new model we should :
  - Establish roughly the LHC sensitivity
  - Understand bounds from direct and indirect detection
  - Compute the relic density
  - Between the two we can make benchmarks
    - Its hard to promote a model without clear benchmarks
- Models without benchmarks need extra motivation
  - Probing untouched phase space
  - Solutions to problems beyond DM