

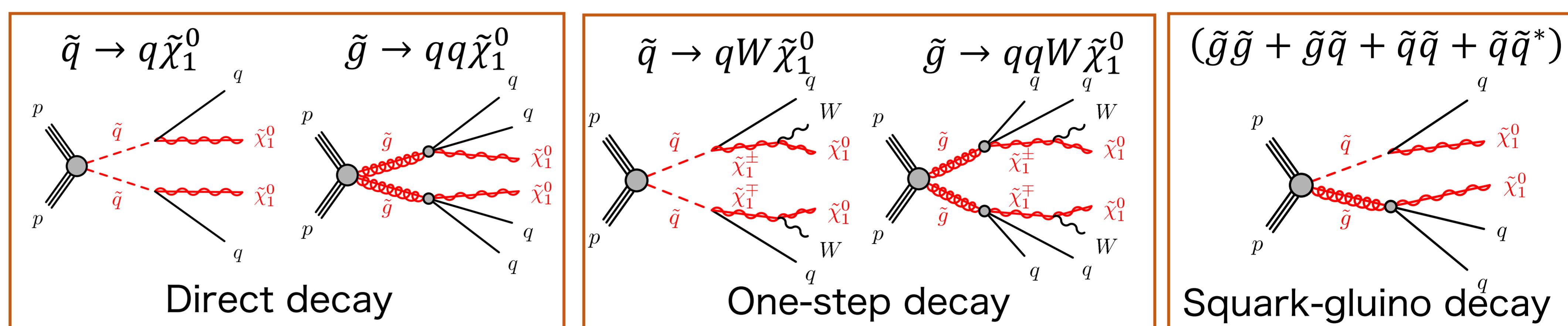
Search for squarks and gluinos in final states with jets and missing transverse momentum at $\sqrt{s} = 13 \text{ TeV}$ using 139 fb^{-1} data with the ATLAS detector

Introduction

Squarks and gluinos are one of the primary targets as their pair production may have a large cross section. The poster presents recent ATLAS results from searches for squarks and gluinos with jets and missing transverse momentum using 139 fb^{-1} data.

SUSY signal scenario

- Only 1st and 2nd generation
- Require 0-lepton
- Large m_{eff} and $E_T^{\text{miss}} + 2\text{-}6$ jets
 - $m_{\text{eff}} = H_T + E_T^{\text{miss}}$
 - H_T : Scalar of p_T sum of all jets



Analysis strategy

Two approaches are newly introduced

1. Multi-bin approach

- Categorized in different bins
- Each bin is kept orthogonal to all the others.
 - 60 Multi-bin signal regions in total

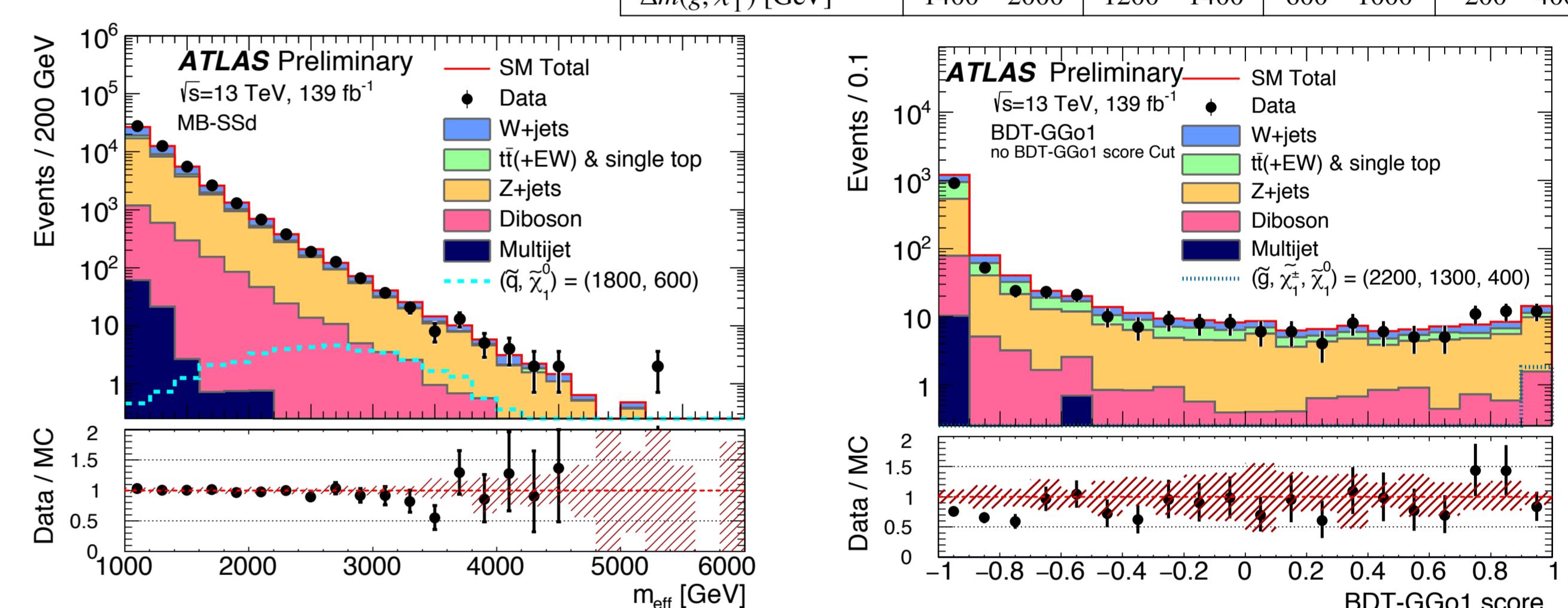
	MB-SSd	MB-GGd	MB-C	BDT-GGd1	BDT-GGd2	BDT-GGd3	BDT-GGd4
$N_{j(\text{pt}>50\text{GeV})}$	≥ 2	≥ 4	≥ 2				
$p_T(j_1) [\text{GeV}]$	> 200	> 200	> 600				
$p_T(j_{i=2,\dots,N_{\text{jmin}}}) [\text{GeV}]$	> 100	> 100	> 50				
$ \eta(j_{i=1,\dots,N_{\text{jmin}}}) $	< 2.0	< 2.0	< 2.8				
$\Delta\phi(j_{1,2,(3)}, E_T^{\text{miss}})$ min	> 0.8	> 0.4	> 0.4				
$\Delta\phi(j_{i>3}, E_T^{\text{miss}})$ min	> 0.4	> 0.4	> 0.2				
Aplanarity	-	> 0.04	-				
$E_T^{\text{miss}}/\sqrt{H_T} [\text{GeV}^{1/2}]$	> 10	> 10	> 10				
$m_{\text{eff}} [\text{GeV}]$	> 1000	> 1000	> 1600				
				≥ 4	≥ 0.4	≥ 0.4	≥ 0.87
				≥ 1400	≥ 800		
				≥ 0.97	≥ 0.94	≥ 0.94	
				$1600 - 1900$	$1000 - 1400$	$600 - 1000$	$200 - 600$
				≥ 6	≥ 0.4	≥ 0.2	≥ 0.2
				≥ 0.4	≥ 0.4	≥ 0.2	
				≥ 0.2			
				≥ 1400	≥ 800		
				≥ 0.96	≥ 0.87	≥ 0.92	≥ 0.84
				$1400 - 2000$	$1200 - 1400$	$600 - 1000$	$200 - 400$

2. BDT approach

- Consider variable correlations
- Prepared 8 BDT scores based on specific $\Delta m(\tilde{g}, \tilde{\chi}_1^0)$
- Input variables: 1st – 4th Jet(P_T, η), E_T^{miss} , m_{eff} , Aplanarity
 - 10 – 12 variables in total

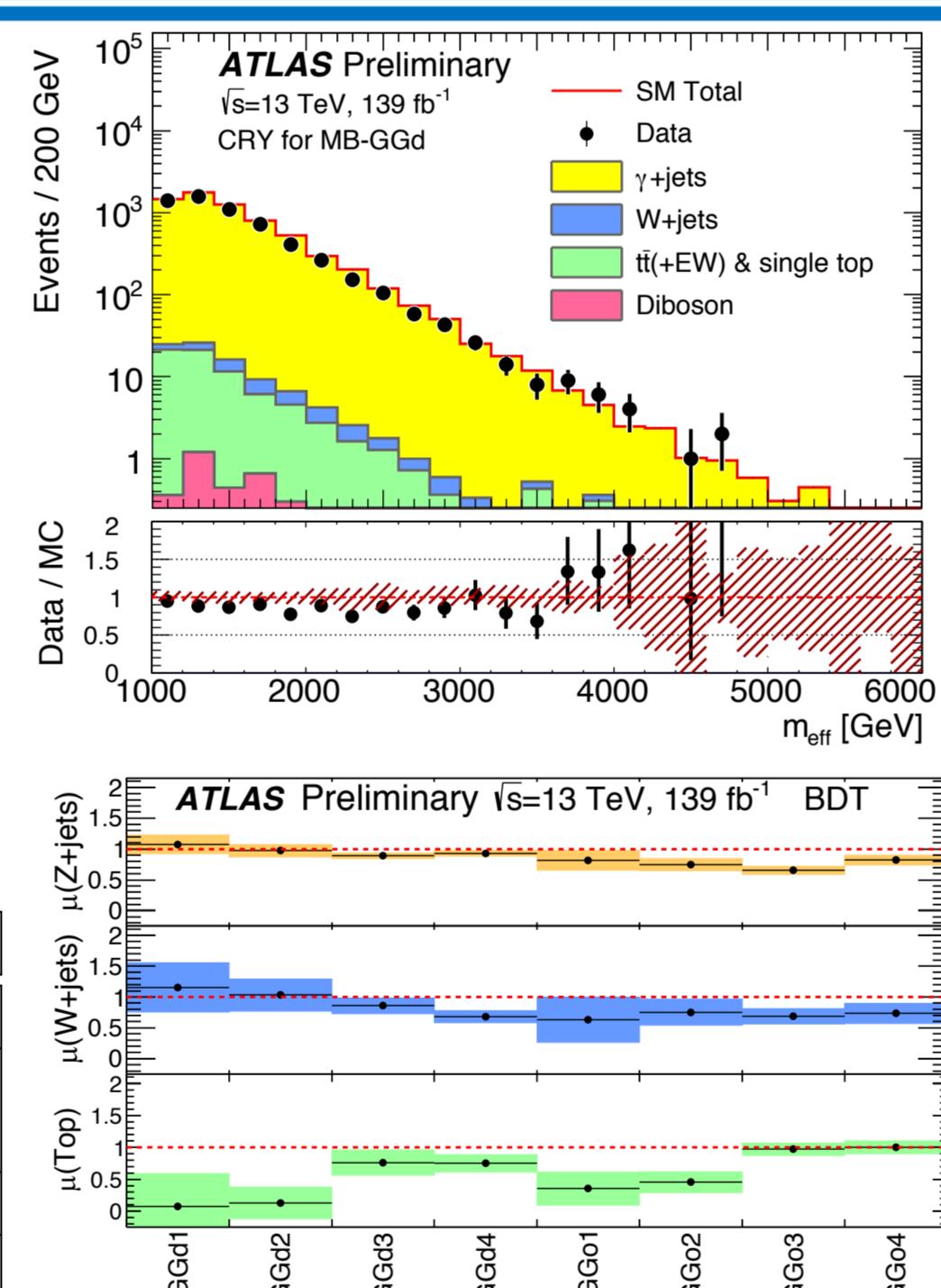
In addition to them, 10 single-bin discovery are defined

- The purpose is to provide model independent upper limits

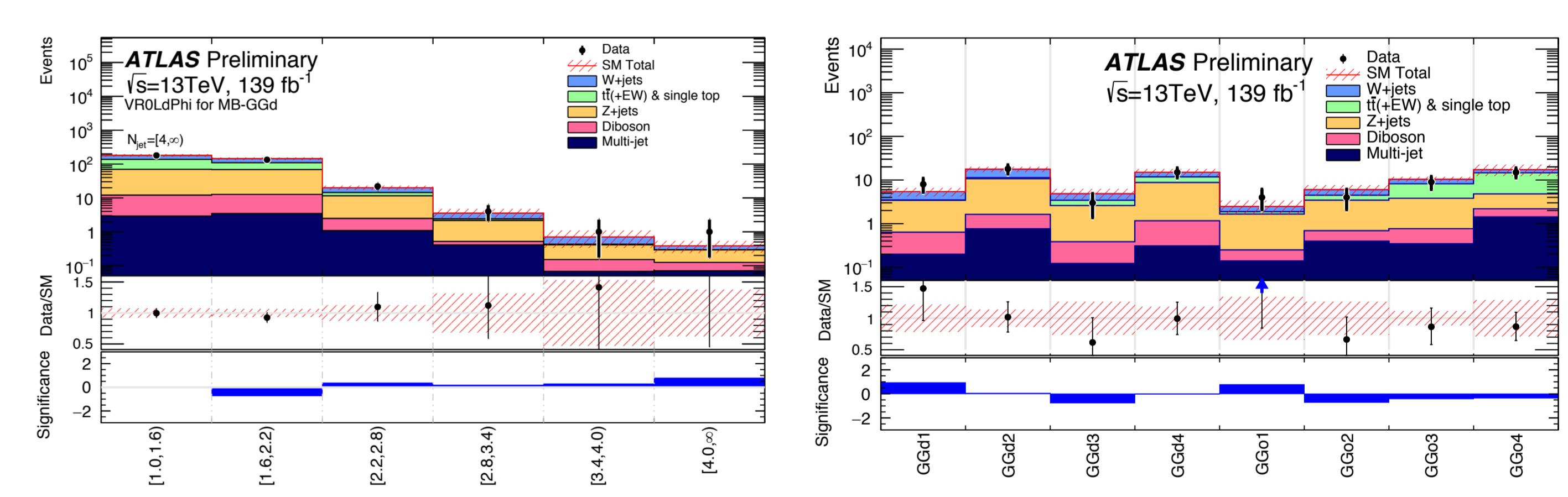


Background estimation

- V + Jets (main background!)
 - $t\bar{t}$, single t , diboson and Multi-jets
- Prepare 4 CRs for each SR
- Normalize MC by using data in CRs
 - $N_{\text{SR}}^{\text{pred}} = N_{\text{SR}}^{\text{MC}} * [N_{\text{CR}}^{\text{data}} / N_{\text{CR}}^{\text{MC}}]$



VR: Check the extrapolation from CRs to SR.

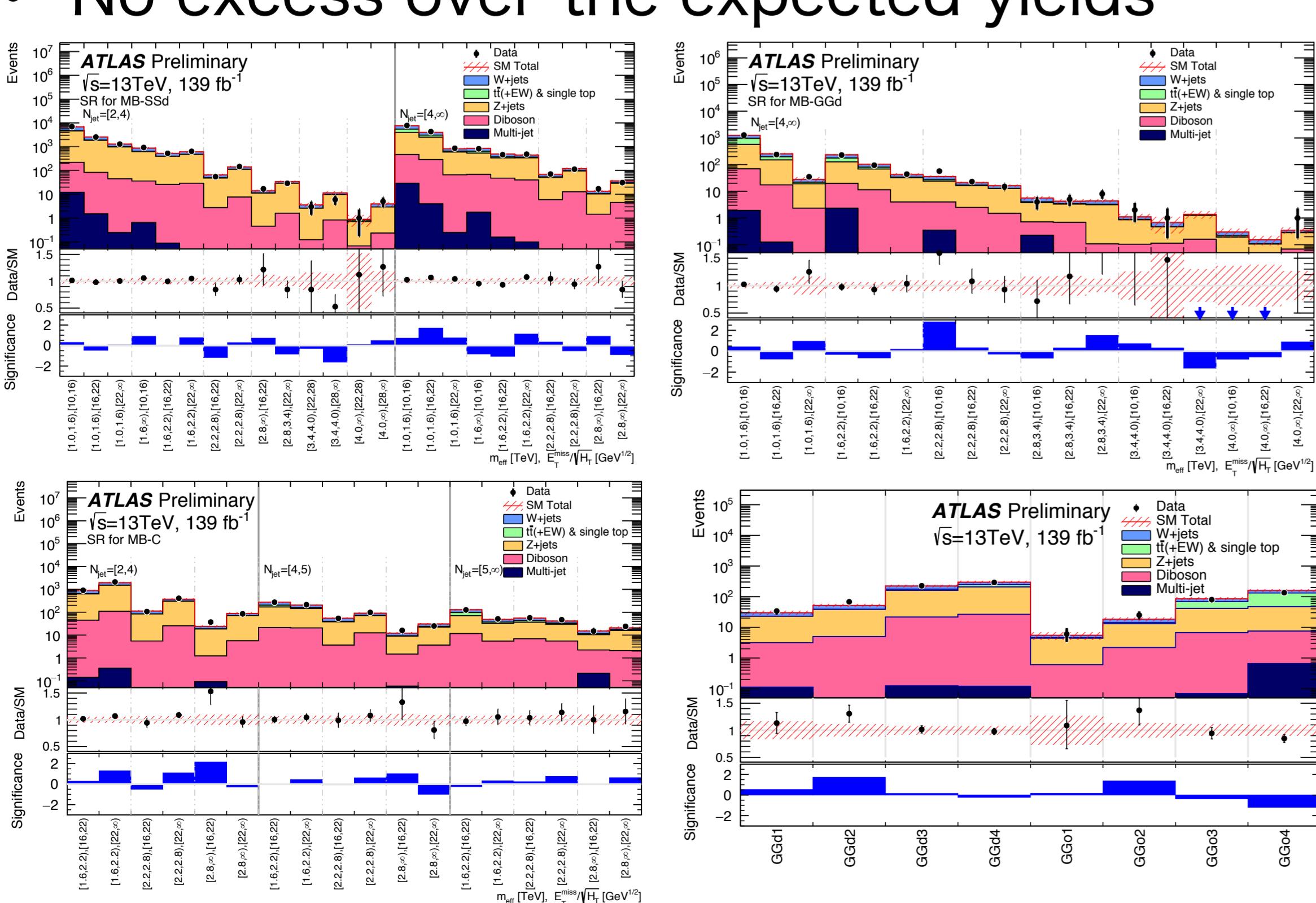


A good agreement with data!

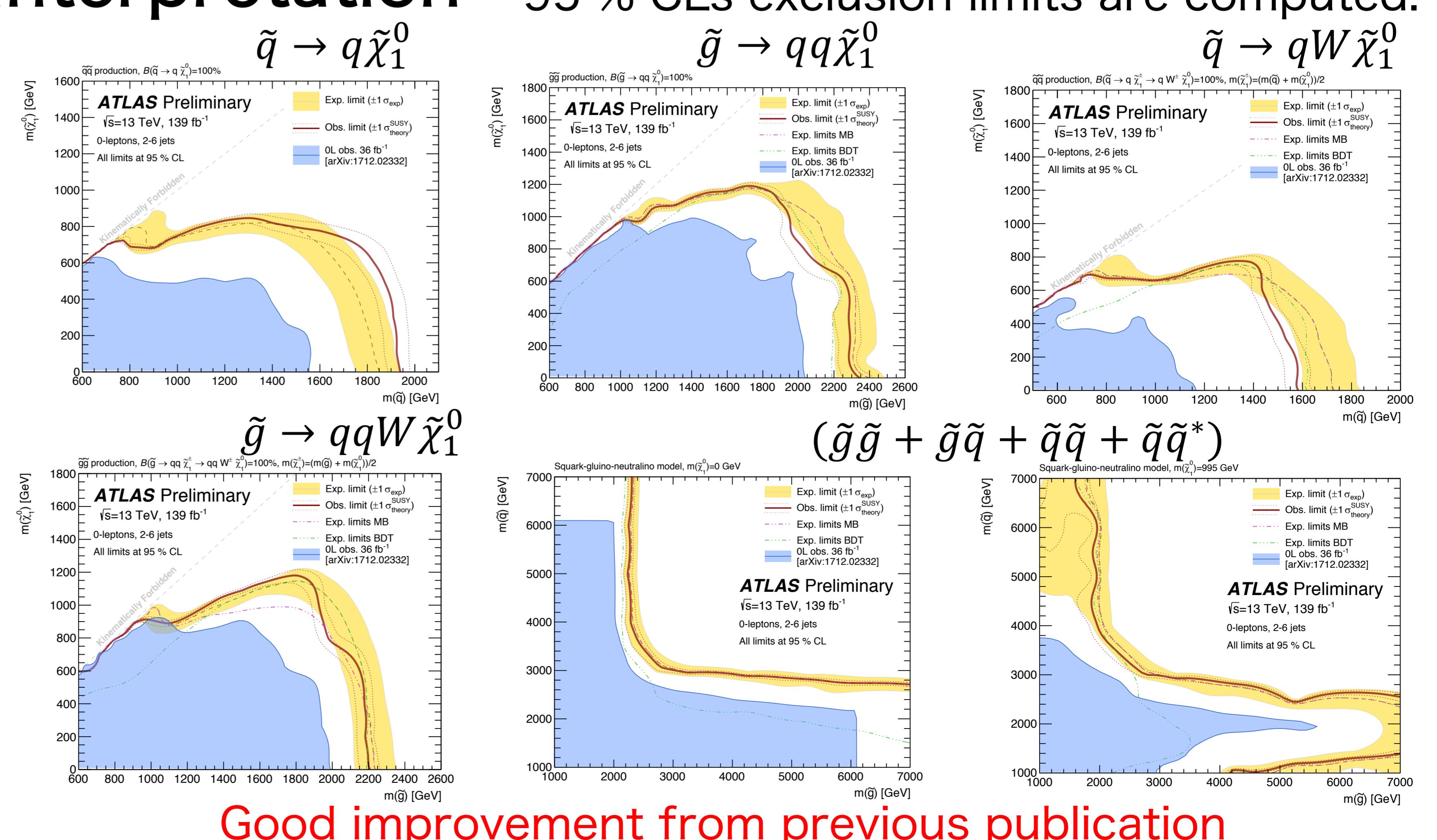
Result

The yield of 139 fb^{-1} data and the predicted SM background is shown.

- No excess over the expected yields



Interpretation



Good improvement from previous publication