Higgs Searches: A Status Report

Abdualazem Fadol

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中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

ATLAS EXPERIMENT

INSTITUTE FOR COLLIDER PARTICLE PHYSICS
UNIVERSITY OF THE WITWATERSRAND

Contents

- $R \rightarrow SH \rightarrow 4\ell + E_{\mathrm{T}}^{miss}$ analysis
  - Background Yields on the side-band

- DiHiggs to Multilepton analysis
  - Fixing the problem of splitting the channel

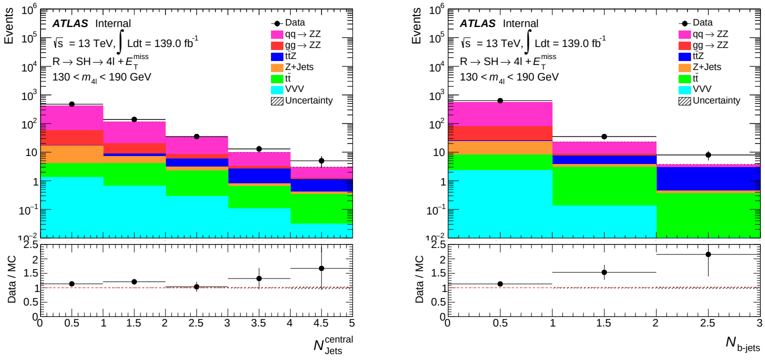
- The signal for *RSH* is for $m_{4\ell} > 200$ GeV;
- A control region is defined by $130 < m_{4\ell} < 190$ GeV

	$qq \to ZZ$	$gg \to ZZ$	$t\bar{t}Z$	Z+Jets	$t\bar{t}$	VVV	Observed	Expected
$2\mu 2e$	11.92±0.33	2.33±0.06	0.13±0.01	0.90±0.09	1.54±0.14	0.48±0.02	21.00±4.58	17.30±0.65
$4e$	5.07±0.21	0.91±0.04	0.07±0.00	0.43±0.06	0.44±0.07	0.22±0.01	4.00±2.00	7.13±0.40
4μ	8.21±0.27	1.45±0.05	0.06±0.00	0.46±0.06	0.19±0.05	0.31±0.02	10.00±3.16	10.68±0.45
4ℓ	25.19±0.47	4.69±0.08	0.26±0.01	1.79±0.13	2.17±0.17	1.01±0.03	35.00±5.92	35.11±0.89

Table: The expected yields of the background process in a control region defined by $130 < m_{4\ell} < 190$ GeV calculated from the state-of-the-art MC simulation with an integrated luminosity of 190 fb^{-1}. The observed number of events is calculated from Run 2 data at the side-band. The uncertainties included on the table are statistical uncertainty. The table show the result for the High Met 0 Central jet category

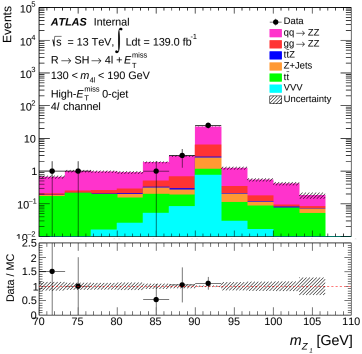
Update on $R \to SH \to 4\ell + E_{\mathrm{T}}^{miss}$ analysis

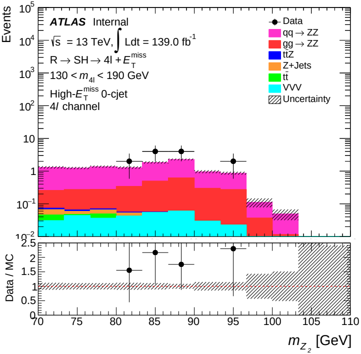
Kinematics of the jets on the control region



Update on $R \to SH \to 4\ell + E_T^{miss}$ analysis

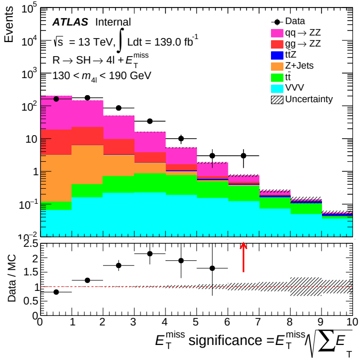
Kinematics of the Z mass on the control region

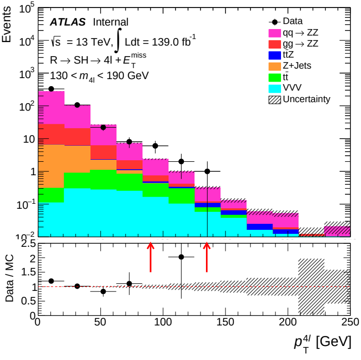




Update on $R \to SH \to 4\ell + E_T^{miss}$ analysis

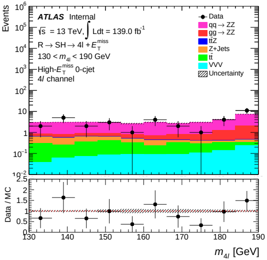
Kinematics of the 4-lepton on the control region

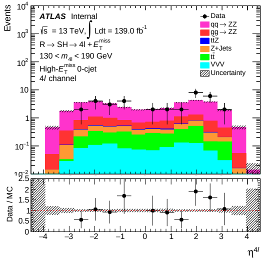


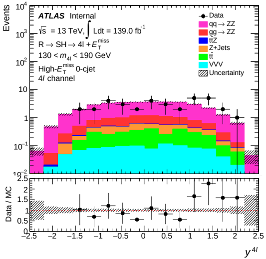


Update on $R \to SH \to 4\ell + E_T^{miss}$ analysis

Kinematics of the 4-lepton on the control region







- ☐ Data/MC comparison on the side-band looks good;
- ☐ But also shows us that we are missing a background process;
- ☐ So we will include the *WZ* background; jobs are submitted already;

Working on now ...

- ☐ Working on the statistics;
- ☐ I managed to get a testing workspace for one category;
- ☐ The plan is to get at least one fit with the Asimov data before the end of the year;

DiHiggs to Multilepton analysis

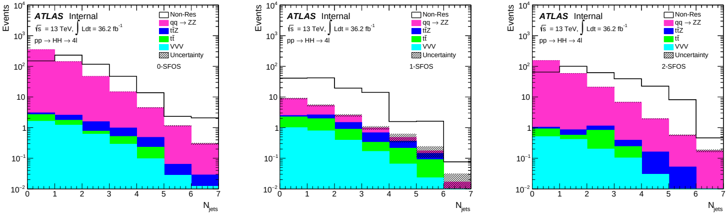
Cut-flow table

	Non-Res	$qq \to ZZ$	$t\bar{t}Z$	$t\bar{t}$	VVV	Total background
4ℓ	1757.97±61.79	1272.87±4.05	74.56±0.62	400.04±5.74	10.49±0.10	1757.96±10.52
Total charge = 0	1654.91±59.87	1238.84±3.99	66.10±0.58	317.33±5.12	9.79±0.10	1632.06±9.79
Trigger Match	1640.60±59.08	1202.70±3.94	65.56±0.58	296.34±4.95	9.75±0.10	1574.36±9.57
Iso FixedCutLoose	1268.06±52.69	1023.85±3.70	51.04±0.50	11.89±1.00	8.95±0.10	1095.73±5.29
$m_{\ell^+\ell^-}$(SFOS) $>$ 4 GeV	1182.34±50.83	846.44±3.44	46.97±0.48	11.21±0.97	8.18±0.09	912.80±4.98
b-jet-veto	1047.90±45.98	806.56±3.40	5.79±0.16	6.66±0.74	7.54±0.09	826.55±4.39
Efficiency	60%	63%	8%	2%	72%	47%

Table: The expected yields for non-resonant di-Higgs boson signal, and the total background calculated from the state-of-the-art MC simulation with an integrated luminosity of 36.2 fb^{-1}. The uncertainties included on the table are statistical uncertainty. The signal is normalised to the total number of background.

- ☐ No lepton identifications, and p_T-requirement are applied;
- ☐ Soft requirements on lepton identification and p_T are already implemented on the production level, no?
- ☐ Events with 4ℓ, total charge equal zero, and η cut are selected;
- ☐ For electrons: $|\eta^e| < 2.47$ excluding $1.37 < |\eta^e| < 1.52$; and
- ☐ Muons: $|\eta^e| < 2.5$.

- Events categorized depending on the SFOS lepton pairs;
- First category: $4e/4\mu/2\mu 2e \Rightarrow$ 2-SFOS;
- Second category: $e\mu 2e/e\mu 2\mu \Rightarrow$ 1-SFOS;
- Third category: $2(e\mu)$ and SFSS $\Rightarrow$ 0-SFOS;



- The motivation: Because of the difference in background composition and statistics for each category.

DiHiggs to Multilepton analysis

Events categorisation

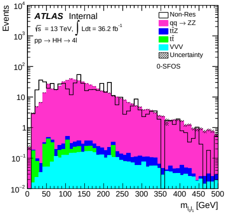
	Non-Res	$qq \to ZZ$	$t\bar{t}Z$	$t\bar{t}$	VVV	Total background
0-SFOS	833.32±45.29	686.36±3.19	27.18±0.37	115.19±3.09	4.59±0.07	833.32±6.72
Trigger Match	833.91±44.42	671.55±3.17	27.05±0.37	106.84±2.97	4.58±0.07	810.03±6.58
Iso FixedCutLoose	622.03±39.66	582.35±3.02	21.40±0.32	3.50±0.53	4.21±0.06	611.46±3.94
$m_{\ell^+\ell^-}$(SFOS) $>$ 4 GeV	622.03±39.66	582.35±3.02	21.40±0.32	3.50±0.53	4.21±0.06	611.46±3.94
b-jet-veto	564.03±34.89	555.20±2.99	2.72±0.11	2.08±0.41	3.85±0.06	563.86±3.57
Efficiency	68%	81%	10%	2%	84%	68%

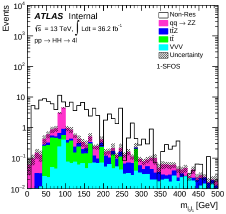
	Non-Res	$qq \to ZZ$	$t\bar{t}Z$	$t\bar{t}$	VVV	Total background
1-SFOS	174.99±11.06	19.21±0.54	22.27±0.34	130.66±3.28	2.85±0.06	174.99±4.22
Trigger Match	171.32±10.96	18.33±0.53	22.04±0.34	122.94±3.18	2.84±0.06	166.15±4.10
Iso FixedCutLoose	135.43±9.67	11.25±0.38	16.91±0.29	5.49±0.69	2.61±0.05	36.27±1.42
$m_{\ell^+\ell^-}$(SFOS) $>$ 4 GeV	135.43±9.67	11.25±0.38	16.91±0.29	5.49±0.69	2.61±0.05	36.27±1.42
b-jet-veto	120.13±9.06	10.68±0.37	2.03±0.10	3.27±0.53	2.42±0.05	18.40±1.06
Efficiency	69%	55%	9%	3%	85%	11%

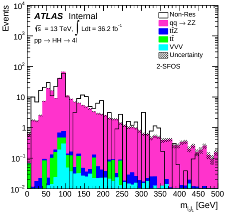
	Non-Res	$qq \to ZZ$	$t\bar{t}Z$	$t\bar{t}$	VVV	Total background
2-SFOS	623.75±46.51	533.27±2.33	16.65±0.29	71.48±2.43	2.35±0.05	623.75±5.10
Trigger Match	616.13±46.28	512.82±2.29	16.47±0.29	66.56±2.35	2.33±0.05	598.18±4.97
Iso FixedCutLoose	497.10±41.71	430.25±2.10	12.73±0.25	2.90±0.48	2.13±0.04	448.00±2.88
$m_{\ell^+\ell^-}$(SFOS) $>$ 4 GeV	358.22±35.13	252.83±1.59	8.66±0.21	2.23±0.43	1.35±0.04	265.07±2.26
b-jet-veto	297.60±32.57	240.68±1.56	1.04±0.07	1.31±0.32	1.26±0.04	244.29±1.99
Efficiency	48%	45%	6%	2%	54%	39%

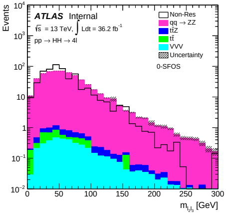
Table: For 0-SFOS (top), 1-SFOS (middle) and 2-SFOS (bottom). The signal is normalised to the total number of background for each category.

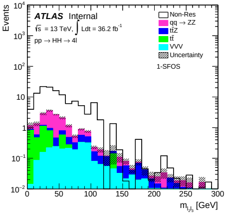
DiHiggs to Multilepton analysis
Kinematic distributions

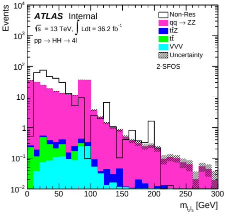






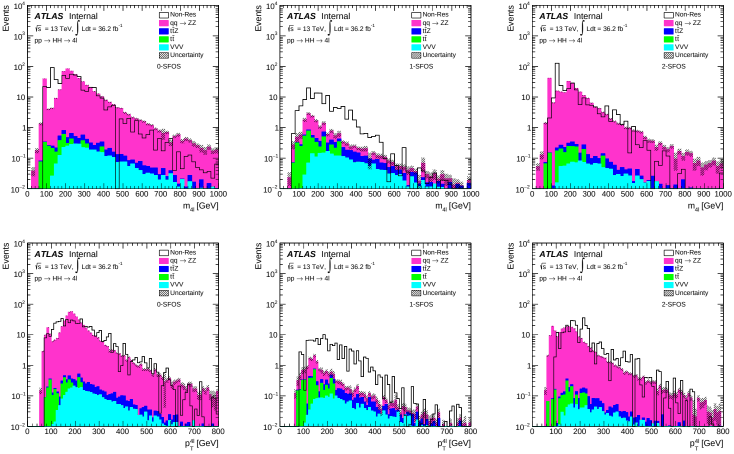






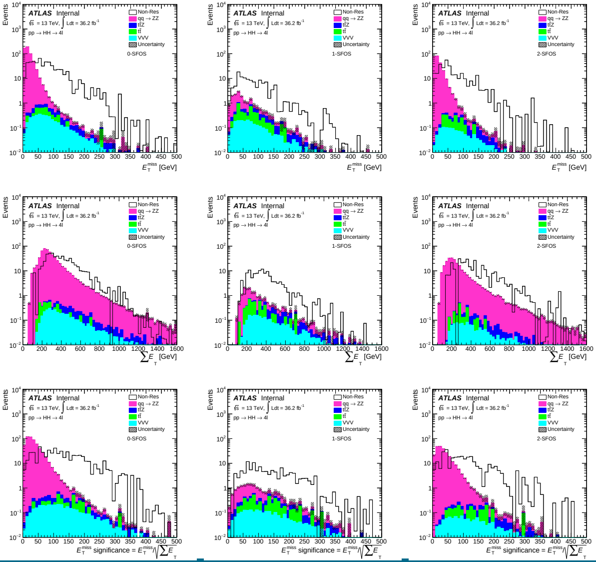
DiHiggs to Multilepton analysis

Kinematic distributions



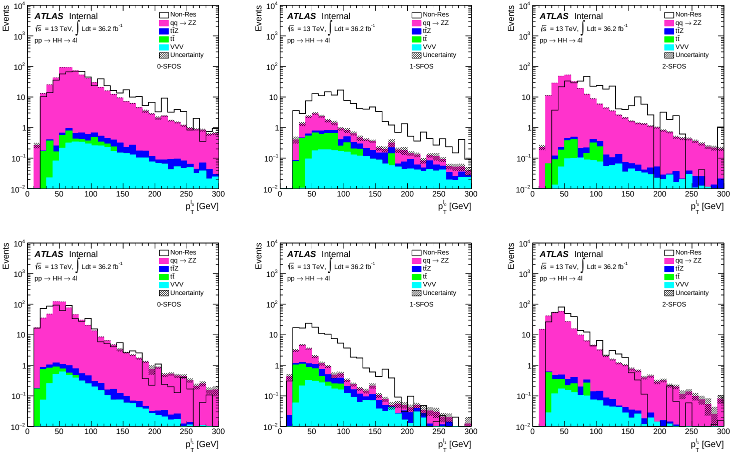
DiHiggs to Multilepton analysis

Kinematic distributions



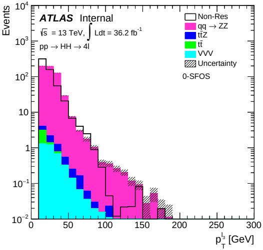
DiHiggs to Multilepton analysis

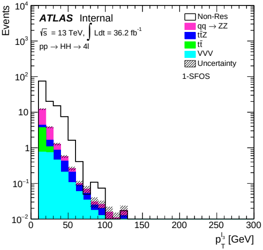
Kinematic distributions

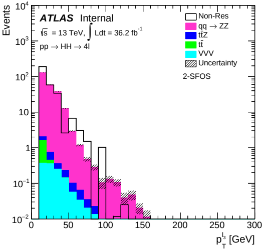


DiHiggs to Multilepton analysis

Kinematic distributions







- Events categorized depending on SFOS lepton pairs;

To do next . . .

- Increase the statistics by adding mc16d;
- Paring the the invariant mass of the dilepton; and
- Work on the signal optimization by using MVA.

Thank you!

Signal samples have already been produced, JIRA, as follows:

- ☐ The mass of S is fixed to 160 GeV;
- ☐ The masses of R are 390 GeV, 450 GeV, 800 GeV and 1500 GeV:
  - $m_R = 390$ GeV: $m_H = 220$ GeV
  - $m_R = 450$ GeV: $m_H = 220$ GeV and 250 GeV
  - $m_R = 800$ GeV: $m_H = 220$ GeV, 300 GeV and 500 GeV
  - $m_R = 1500$ GeV:$m_H = 220$ GeV, 250 GeV and 1000 GeV
- ☐ Requested HIGG2D1 derivation with cache: 21.2.55 and p-tag: p3782. All jobs are finished see here; and
- ☐ The mini-tree production is done using HZZAnalRun2Code.

Background samples

- ☐ $qqZZ^*$, $ggZZ^*$, $t\bar{t}Z$, $Z + jets$, $t\bar{t}$ and VVV.

- Signal and background are mc16a, mc16d and mc16e combined;
- The signal cross section (xsection$\times$BR) is 1 fb^{-1} (set by hand);
- The significance is calculated using $S/\sqrt{S+B}$ and $S/\sqrt{B}$;
- S, and B are the signal and background event, respectively;
- Background events are normalised to cross section for the $m_{4\ell} > 200$ GeV;
- Scaling background events by 20.3% uncertainty. It's calculated as follow:

The background scaled by a number extracted as follows: For instance, for $m_H = 220$, and $m_R = 390$: events in $m_{4\ell}(210-230)$ GeV over the full range of $m_{4\ell}(> 200)$ GeV.

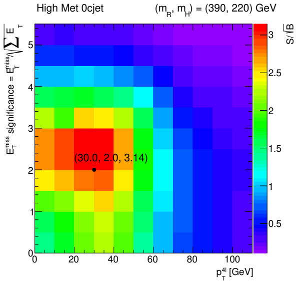
Additional slides

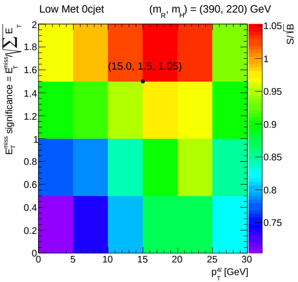
Event Selection	
QUADRUPLET SELECTION	- Require at least one quadruplet of leptons consisting of two pairs of same-flavour opposite-charge leptons fulfilling the following requirements: - p_T thresholds for three leading leptons in the quadruplet: 20, 15 and 10 GeV - At most 1 calo-tagged, stand-alone or silicon-associated muon per quadruplet - Leading di-lepton mass requirement: $50 < m_{12} < 106$ GeV - Sub-leading di-lepton mass requirement: $m_{\mathrm{threshold}} < m_{34} < 115$ GeV - $\Delta R(\ell, \ell') > 0.10$ for all lepton pairs in the quadruplet - Remove quadruplet if alternative same-flavour opposite-charge di-lepton gives $m_{\ell\ell} < 5$ GeV - Keep all quadruplets passing the above selection
ISOLATION NEEDS UPDATING	- Contribution from the other leptons of the quadruplet is subtracted - Muon track isolation ($\Delta R = 0.30$): $\Sigma p_T/p_T < 0.15$ - Muon calorimeter isolation ($\Delta R = 0.20$): $\Sigma E_T/p_T < 0.30$ - Electron track isolation ($\Delta R = 0.20$) : $\Sigma E_T/E_T < 0.15$ - Electron calorimeter isolation ($\Delta R = 0.20$) : $\Sigma E_T/E_T < 0.20$
IMPACT PARAMETER SIGNIFICANCE	- Apply impact parameter significance cut to all leptons of the quadruplet - For electrons: $d_0/\sigma_{d_0} < 5$ - For muons: $d_0/\sigma_{d_0} < 3$
BEST QUADRUPLET	- If more than one quadruplet has been selected, choose the quadruplet with highest Higgs decay ME according to channel: 4μ, $2e2\mu$, $2\mu 2e$ and $4e$
VERTEX SELECTION	- Require a common vertex for the leptons: - $\chi^2/\mathrm{ndof} < 5$ for 4μ and < 9 for others decay channels

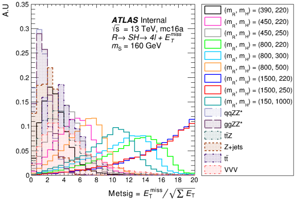
Update on $R \to SH \to 4\ell + E_{\mathrm{T}}^{miss}$ analysis

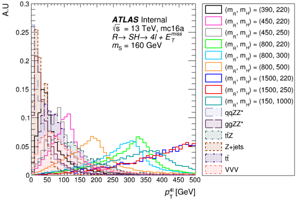
Signal optimisation

- Categorize event into 4 categories: Using $S/\sqrt{B}$ instead of $S/\sqrt{S+B}$ to avoid the cross-section dependency



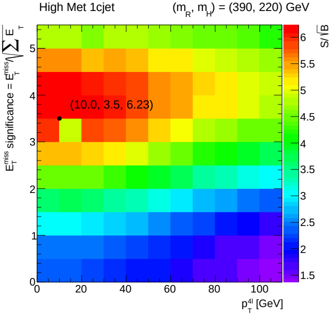


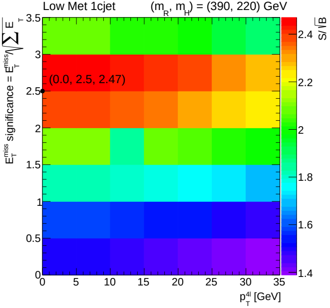


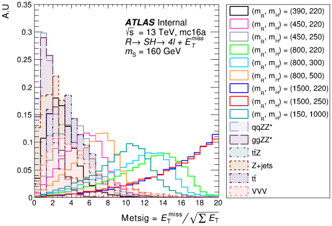


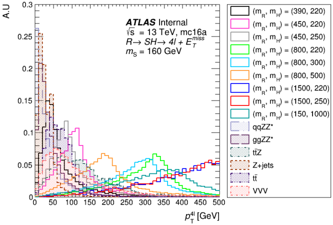
Update on $R \to SH \to 4\ell + E_T^{miss}$ analysis

Signal optimisation





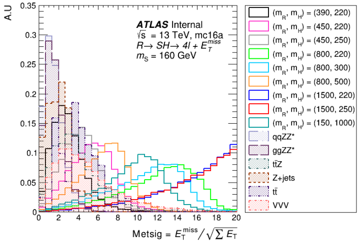




Remark

- We avoid the dependency of the cross-section by using $S/\sqrt{B}$. For the optimisation we used only $(m_R, m_H) = (390, 220)$ GeV mass point. So no need to use other mass points because the new categories cover the low and the high Met region.

- ☐ High met 0 central jet $\Rightarrow$ 30\2.0
- ☐ Low met 0 central jet $\Rightarrow$ 15\1.5
- ☐ High met 1 central jet $\Rightarrow$ 10\3.5
- ☐ Low met 1 central jet $\Rightarrow$ 0.0\2.5



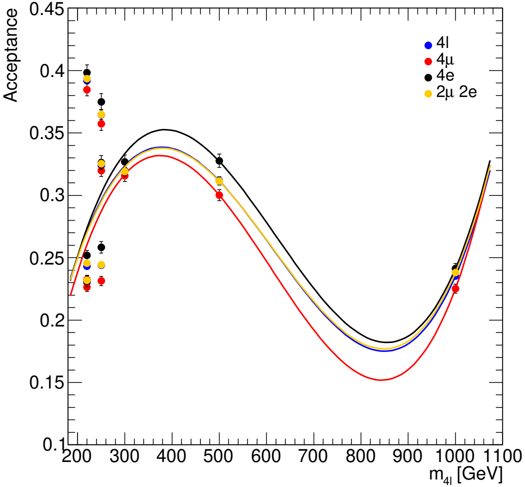
See tables for the categories on backup slides.

(m_R, m_H) GeV	4ℓ	4μ	$4e$	$2\mu 2e$
390, 220	23.01%	22.65%	23.11%	23.19%
450, 220	39.18%	38.46%	39.84%	39.34%
450, 250	36.46%	35.72%	37.50%	36.49%
800, 220	32.39%	31.97%	32.63%	32.53%
800, 300	31.97%	31.57%	32.67%	31.91%
800, 500	31.18%	30.01%	32.76%	31.15%
1500, 220	24.32%	23.24%	25.18%	24.56%
1500, 250	24.39%	23.14%	25.83%	24.44%
1500, 1000	23.53%	22.52%	24.13%	23.81%

Table: Signal efficiencies for the $4\ell + E_T^{\text{miss}}$ final states. The numbers recovered with simulated MC of mc16a, mc16d and mc16e for the High$-E_T^{\text{miss}}$ with zero central jet category. For the signal masses (m_R, m_H) of (390,220), (450,220), (450,250), (800, 220), (800, 300), (800, 500), (1500, 220), (1500, 220), and (1500, 1000) GeV. The efficiency is calculated by the ratio of the number of reconstructed events after all pre-selection requirements to the number of simulated events after the final selection the for inclusive lepton channel (4ℓ) and 4μ, $4e$, and $2\mu 2e$ channel

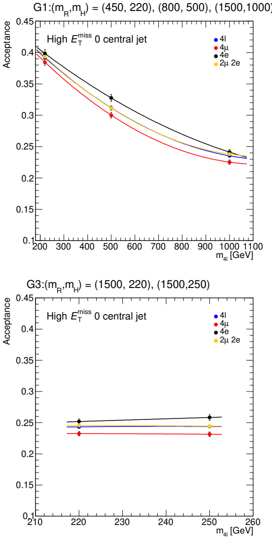
Update on $R \rightarrow SH \rightarrow 4\ell + E_{T}^{miss}$ analysis

Signal acceptance



Update on $R \to SH \to 4\ell + E_T^{miss}$ analysis

Signal acceptance



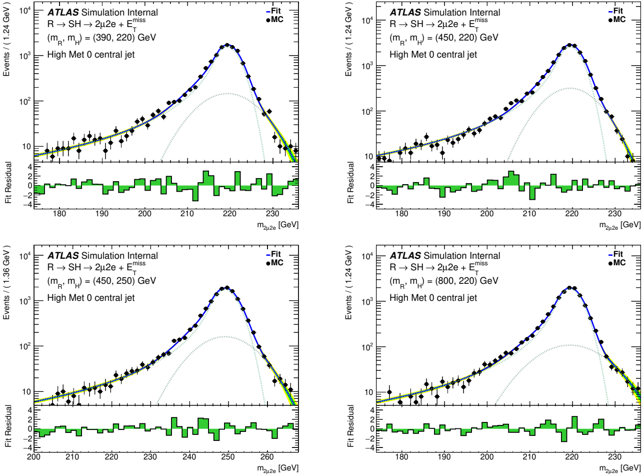
- The Crystal ball, CB, plus Gaussian, G, Pdf has the following form:

$$f(m_{4\ell}) = f_{\mathrm{CB}} \cdot \mathrm{CB}(m_{4\ell}; \mu, \sigma_{\mathrm{CB}}, \alpha_{\mathrm{CB}}, n_{\mathrm{CB}}) + (1 - f_{CB}) \cdot \mathrm{G}(m_{4\ell}; \mu, \sigma_G)$$

  - σ_{CB} and σ_G represent the invariant mass resolution;
  - μ is the mean value fixed to same parameter for both Pdf;
  - n_{CB} and α_{CB} model the shape and position of the non-Gaussian tail;
  - Where n_{CB} is the slop of the tail and α_{CB} measures how far from the peak the distribution become non-Gaussian;
  - f_{CB} is the relative normalisation of the Pdf.

Update on $R \to SH \to 4\ell + E_T^{miss}$ analysis

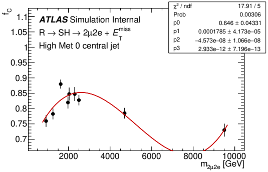
High Met 0 central jet for $2\mu2e$ channel

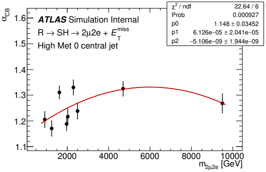


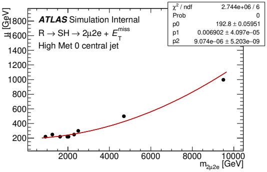
- ☐ The samples have more high p_T events will have different resolution of the mass.

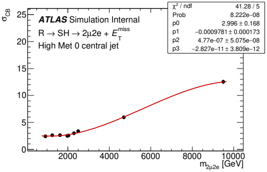
Update on $R \to SH \to 4\ell + E_T^{miss}$ analysis

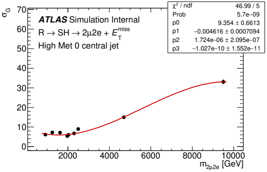
Interpolation of μ, $f_C B$, σ_G, σ_{CB} and α_{CB} parameters





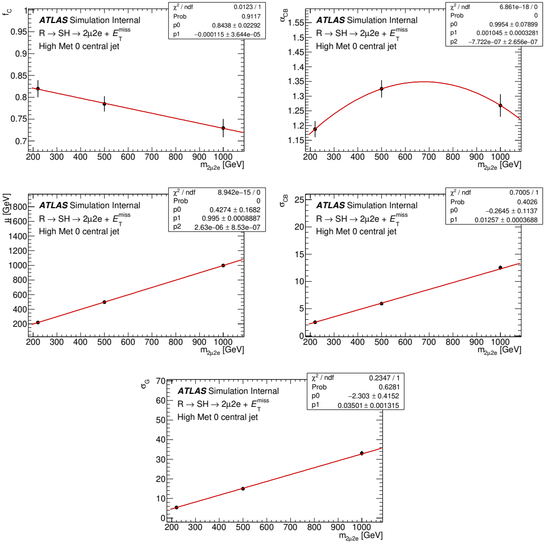






Update on $R \rightarrow SH \rightarrow 4\ell + E_T^{miss}$ analysis

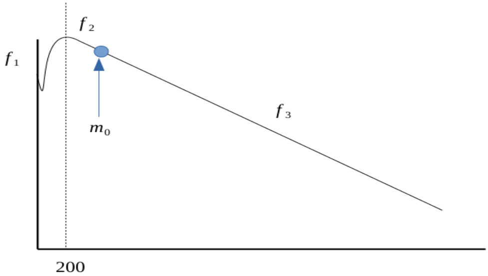
Interpolation of μ, $f_C B$, σ_G, σ_{CB} and α_{CB} parameters



$$f^{ggZZ/qqZZ}(m_{4\ell}) = (f_1(m_{4\ell}) + f_2(m_{4\ell})) \times H(m_0 - m_{4\ell}) \times C_0 + f_3^{ggZZ/qqZZ}(m_{4\ell}) \times H(m_{4\ell} - m_0),$$

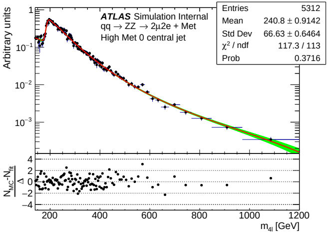
where:

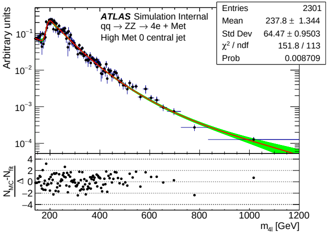
$$\begin{aligned}
f_1(m_{4\ell}) &= \exp(a_1 + a_2 \cdot m_{4\ell} + a_3 \cdot m_{4\ell}^2), \\
f_2(m_{4\ell}) &= \left\{\frac{1}{2} + \frac{1}{2}\,\mathrm{erf}\left(\frac{m_{4\ell} - b_1}{b_2}\right)\right\} \times \frac{1}{1 + \exp\left(\frac{m_{4\ell} - b_1}{b_3}\right)}, \\
f_3^{qqZZ/ggZZ}(m_{4\ell}) &= \exp\left(c_1 + c_2 \cdot m_{4\ell} + c_3 \cdot m_{4\ell}^2 + c_4 \cdot m_{4\ell}^3 + c_5 \cdot m_{4\ell}^4 + c_6 \cdot m_{4\ell}^5\right), \\
C_0 &= \frac{f_3(m_0)}{f_1(m_0) + f_2(m_0)}.
\end{aligned}$$

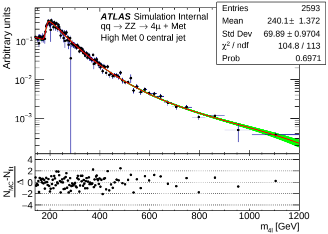


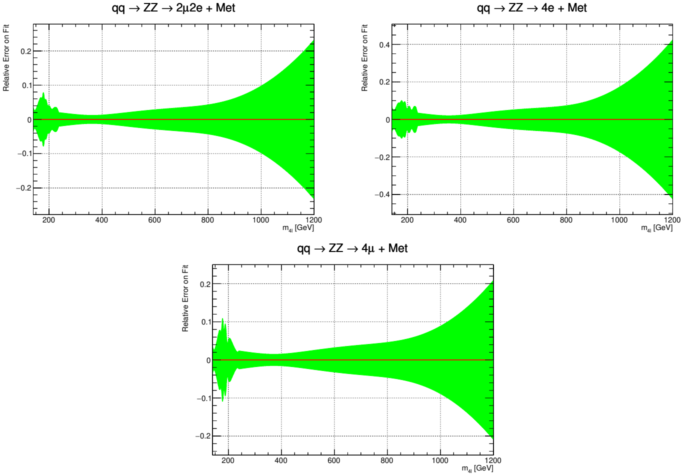
Update on $R \to SH \to 4\ell + E_{\mathrm{T}}^{miss}$ analysis

Background parametrisation





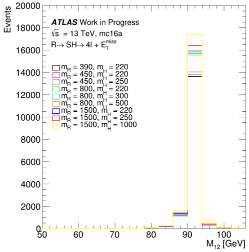


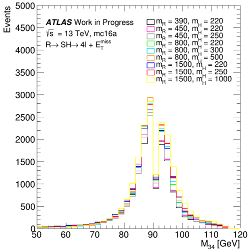


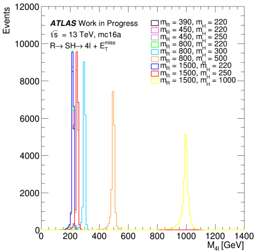
qq → ZZ → 2μ2e + Met
Relative Error on Fit
m4l [GeV]
qq → ZZ → 4e + Met
Relative Error on Fit
m4l [GeV]
qq → ZZ → 4μ + Met
Relative Error on Fit
m4l [GeV]

Additional slides

Kinematic distributions for the signal

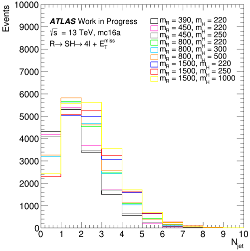


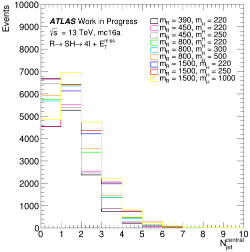


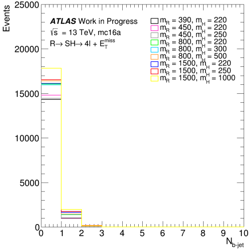


Additional slides

Kinematic distributions for the signal

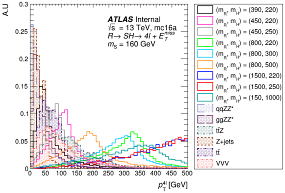


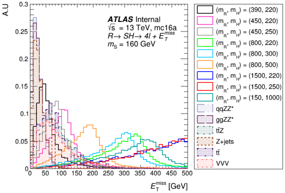


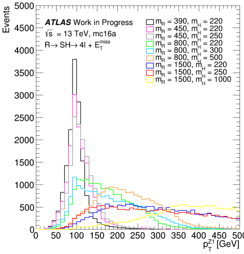


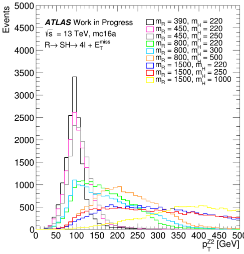
Additional slides

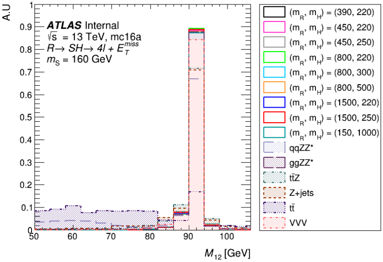
Kinematic distributions for the signal











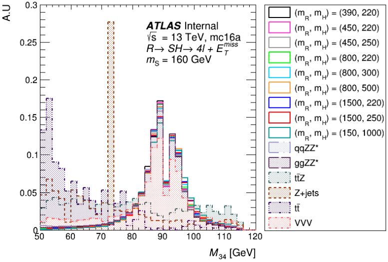


Figure: The invariant mass of the first (left) and the second (right) lepton pairs.

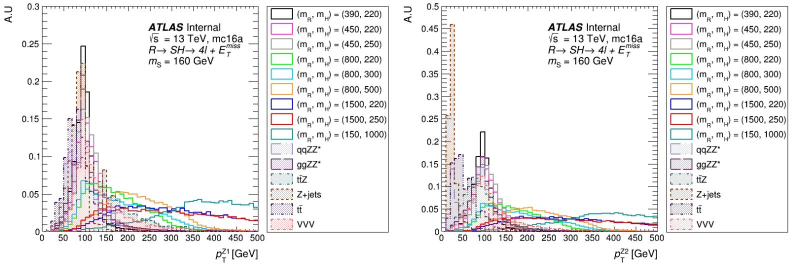
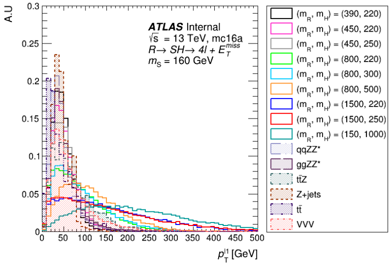
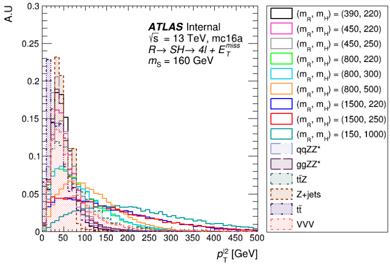


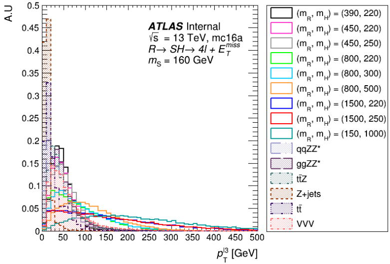
Figure: The invariant mass of the first (left) and the second (right) lepton pairs.

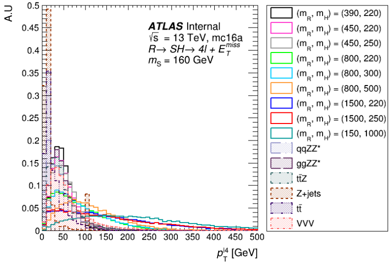
Additional slides

Kinematic distributions









Additional slides

High Met 0 central jet

	$(m_R, m_H) = (390, 220)$	$qqZZ^*$	$ggZZ^*$	$t\bar{t}Z$	$Z + jets$	$t\bar{t}$	VVV	$s/\sqrt{b}$
4ℓ	64.51±0.24	2510.45±5.75	349.64±0.71	8.94±0.05	3.87±0.84	3.55±0.23	19.08±0.11	2.661
B-veto	60.07±0.23	2394.48±5.70	334.96±0.69	1.72±0.02	3.63±0.84	2.27±0.16	17.79±0.11	2.540
$N_{jet}^{central} = 0$	28.02±0.16	1607.35±5.06	211.64±0.55	0.42±0.01	2.10±0.15	0.99±0.10	9.30±0.07	1.453
$p_T^{4\ell} > 0.00$ & Metsig > 0.00	28.02±0.00	1607.35±0.00	211.64±0.00	0.42±0.00	2.10±0.00	0.99±0.00	9.30±0.00	1.453
$p_T^{4\ell} > 0.00$ & Metsig > 0.50	27.47±0.00	1236.12±0.00	180.35±0.00	0.41±0.00	1.98±0.00	0.94±0.00	9.16±0.00	1.613
$p_T^{4\ell} > 0.00$ & Metsig > 1.00	25.61±0.00	685.37±0.00	117.69±0.00	0.40±0.00	1.62±0.00	0.90±0.00	8.77±0.00	1.991
$p_T^{4\ell} > 0.00$ & Metsig > 1.50	22.60±0.00	346.29±0.00	66.12±0.00	0.38±0.00	1.27±0.00	0.79±0.00	8.19±0.00	2.439
$p_T^{4\ell} > 0.00$ & Metsig > 2.00	18.26±0.00	172.22±0.00	34.04±0.00	0.35±0.00	0.79±0.00	0.68±0.00	7.50±0.00	2.761
$p_T^{4\ell} > 0.00$ & Metsig > 2.50	12.83±0.00	83.44±0.00	16.71±0.00	0.33±0.00	0.53±0.00	0.60±0.00	6.77±0.00	2.736
$p_T^{4\ell} > 0.00$ & Metsig > 3.00	7.52±0.00	39.01±0.00	8.01±0.00	0.29±0.00	0.30±0.00	0.55±0.00	6.02±0.00	2.267
$p_T^{4\ell} > 0.00$ & Metsig > 3.50	3.71±0.00	18.93±0.00	3.77±0.00	0.26±0.00	0.17±0.00	0.46±0.00	5.32±0.00	1.533
$p_T^{4\ell} > 0.00$ & Metsig > 4.00	1.74±0.00	9.25±0.00	1.79±0.00	0.22±0.00	0.08±0.00	0.38±0.00	4.66±0.00	0.954
$p_T^{4\ell} > 0.00$ & Metsig > 4.50	0.81±0.00	4.19±0.00	0.79±0.00	0.18±0.00	0.06±0.00	0.26±0.00	4.02±0.00	0.583
$p_T^{4\ell} > 0.00$ & Metsig > 5.00	0.39±0.00	2.29±0.00	0.38±0.00	0.16±0.00	0.05±0.00	0.22±0.00	3.47±0.00	0.336
$p_T^{4\ell} > 10.00$ & Metsig > 0.00	27.17±0.00	1063.48±0.00	180.22±0.00	0.42±0.00	1.82±0.00	0.95±0.00	9.15±0.00	1.702
$p_T^{4\ell} > 10.00$ & Metsig > 0.50	26.74±0.01	913.21±1.03	159.88±0.12	0.41±0.00	1.76±0.02	0.93±0.02	9.04±0.00	1.802
$p_T^{4\ell} > 10.00$ & Metsig > 1.00	25.12±0.02	567.10±1.44	109.46±0.18	0.40±0.00	1.49±0.04	0.89±0.02	8.69±0.01	2.125
$p_T^{4\ell} > 10.00$ & Metsig > 1.50	22.26±0.02	291.10±1.55	62.42±0.20	0.38±0.00	1.20±0.05	0.78±0.02	8.14±0.01	2.590
$p_T^{4\ell} > 10.00$ & Metsig > 2.00	18.03±0.02	142.89±1.60	32.18±0.21	0.35±0.00	0.77±0.05	0.67±0.02	7.47±0.01	2.947
$p_T^{4\ell} > 10.00$ & Metsig > 2.50	12.67±0.02	68.91±1.62	15.83±0.21	0.32±0.00	0.52±0.05	0.59±0.02	6.75±0.01	2.918
$p_T^{4\ell} > 10.00$ & Metsig > 3.00	7.43±0.03	31.91±1.64	7.58±0.21	0.29±0.00	0.29±0.05	0.54±0.02	6.00±0.01	2.414
$p_T^{4\ell} > 10.00$ & Metsig > 3.50	3.65±0.03	15.05±1.64	3.53±0.21	0.26±0.00	0.17±0.05	0.45±0.02	5.31±0.01	1.627
$p_T^{4\ell} > 10.00$ & Metsig > 4.00	1.71±0.03	7.19±1.64	1.66±0.21	0.22±0.00	0.08±0.05	0.37±0.02	4.65±0.01	1.008
$p_T^{4\ell} > 10.00$ & Metsig > 4.50	0.79±0.03	3.09±1.65	0.73±0.21	0.18±0.00	0.06±0.05	0.25±0.02	4.02±0.01	0.611
$p_T^{4\ell} > 10.00$ & Metsig > 5.00	0.38±0.03	1.84±1.65	0.35±0.21	0.16±0.00	0.05±0.05	0.21±0.02	3.47±0.01	0.345
$p_T^{4\ell} > 20.00$ & Metsig > 0.00	24.47±0.00	571.61±0.00	118.61±0.00	0.40±0.00	1.25±0.00	0.93±0.00	8.72±0.00	2.051
$p_T^{4\ell} > 20.00$ & Metsig > 0.50	24.17±0.02	510.65±1.31	107.98±0.17	0.40±0.00	1.22±0.03	0.91±0.03	8.64±0.01	2.138
$p_T^{4\ell} > 20.00$ & Metsig > 1.00	23.06±0.03	368.70±3.95	81.82±0.29	0.39±0.00	1.08±0.06	0.87±0.03	8.39±0.01	2.383
$p_T^{4\ell} > 20.00$ & Metsig > 1.50	20.91±0.04	217.03±4.13	51.37±0.33	0.37±0.00	0.96±0.07	0.77±0.03	7.97±0.01	2.781
$p_T^{4\ell} > 20.00$ & Metsig > 2.00	17.13±0.05	110.51±4.19	27.50±0.35	0.34±0.00	0.68±0.08	0.66±0.03	7.38±0.02	3.136
$p_T^{4\ell} > 20.00$ & Metsig > 2.50	12.10±0.05	53.17±4.22	13.63±0.36	0.32±0.00	0.45±0.09	0.59±0.03	6.69±0.02	3.103
$p_T^{4\ell} > 20.00$ & Metsig > 3.00	7.05±0.05	24.27±4.23	6.54±0.36	0.28±0.00	0.27±0.10	0.54±0.03	5.98±0.02	2.544
$p_T^{4\ell} > 20.00$ & Metsig > 3.50	3.41±0.05	11.15±4.24	3.03±0.36	0.25±0.00	0.17±0.10	0.45±0.03	5.30±0.02	1.678
$p_T^{4\ell} > 20.00$ & Metsig > 4.00	1.59±0.06	5.22±4.24	1.41±0.37	0.21±0.00	0.07±0.10	0.37±0.03	4.65±0.02	1.019
$p_T^{4\ell} > 20.00$ & Metsig > 4.50	0.73±0.06	2.19±4.24	0.62±0.37	0.18±0.00	0.05±0.10	0.25±0.03	4.01±0.02	0.598
$p_T^{4\ell} > 20.00$ & Metsig > 5.00	0.36±0.06	1.40±4.24	0.29±0.37	0.15±0.00	0.04±0.10	0.21±0.03	3.47±0.02	0.336
$p_T^{4\ell} > 30.00$ & Metsig > 0.00	19.78±0.00	312.75±0.00	70.36±0.00	0.39±0.00	0.85±0.00	0.80±0.00	8.07±0.00	2.214
$p_T^{4\ell} > 30.00$ & Metsig > 0.50	19.56±0.02	280.94±1.50	64.29±0.19	0.38±0.00	0.84±0.03	0.78±0.03	8.00±0.01	2.304
$p_T^{4\ell} > 30.00$ & Metsig > 1.00	18.79±0.04	211.83±4.16	50.32±0.32	0.37±0.00	0.77±0.06	0.77±0.03	7.82±0.01	2.529
$p_T^{4\ell} > 30.00$ & Metsig > 1.50	17.41±0.05	140.82±4.48	34.97±0.40	0.36±0.00	0.69±0.08	0.69±0.03	7.54±0.02	2.840
$p_T^{4\ell} > 30.00$ & Metsig > 2.00	14.87±0.07	80.74±4.61	20.88±0.43	0.33±0.00	0.55±0.10	0.63±0.04	7.13±0.02	3.143
$p_T^{4\ell} > 30.00$ & Metsig > 2.50	10.87±0.07	41.23±4.66	10.95±0.44	0.31±0.00	0.39±0.10	0.55±0.04	6.57±0.02	3.114
$p_T^{4\ell} > 30.00$ & Metsig > 3.00	6.35±0.08	19.35±4.69	5.36±0.45	0.28±0.00	0.24±0.11	0.51±0.04	5.91±0.03	2.507
$p_T^{4\ell} > 30.00$ & Metsig > 3.50	3.06±0.08	9.12±4.70	2.49±0.45	0.24±0.00	0.13±0.11	0.44±0.04	5.26±0.03	1.614
$p_T^{4\ell} > 30.00$ & Metsig > 4.00	1.41±0.08	4.58±4.70	1.15±0.45	0.21±0.00	0.07±0.11	0.36±0.04	4.63±0.03	0.942
$p_T^{4\ell} > 30.00$ & Metsig > 4.50	0.65±0.08	2.17±4.71	0.50±0.45	0.18±0.00	0.04±0.11	0.24±0.04	4.01±0.03	0.538
$p_T^{4\ell} > 30.00$ & Metsig > 5.00	0.32±0.09	1.10±4.74	0.22±0.45	0.15±0.00	0.03±0.11	0.21±0.04	3.46±0.03	0.312
$p_T^{4\ell} > 40.00$ & Metsig > 0.00	13.20±0.00	167.47±0.00	40.51±0.00	0.37±0.00	0.49±0.00	0.67±0.00	7.29±0.00	1.989
$p_T^{4\ell} > 40.00$ & Metsig > 0.50	13.04±0.02	150.71±1.61	37.07±0.20	0.36±0.00	0.47±0.03	0.67±0.03	7.24±0.01	2.065
$p_T^{4\ell} > 40.00$ & Metsig > 1.00	12.49±0.04	114.34±4.25	29.04±0.34	0.35±0.00	0.44±0.06	0.65±0.03	7.09±0.01	2.249
$p_T^{4\ell} > 40.00$ & Metsig > 1.50	11.61±0.06	78.22±4.60	20.74±0.42	0.34±0.00	0.39±0.08	0.58±0.03	6.89±0.02	2.490
$p_T^{4\ell} > 40.00$ & Metsig > 2.00	10.18±0.08	49.60±4.77	13.39±0.46	0.31±0.00	0.32±0.10	0.56±0.04	6.63±0.03	2.686
$p_T^{4\ell} > 40.00$ & Metsig > 2.50	8.04±0.09	28.94±4.84	7.88±0.48	0.29±0.00	0.26±0.11	0.49±0.05	6.30±0.03	2.684
$p_T^{4\ell} > 40.00$ & Metsig > 3.00	5.10±0.11	14.89±4.88	4.14±0.49	0.27±0.00	0.17±0.12	0.46±0.05	5.79±0.03	2.232
$p_T^{4\ell} > 40.00$ & Metsig > 3.50	2.55±0.11	7.20±4.90	1.97±0.49	0.24±0.00	0.11±0.13	0.44±0.06	5.20±0.03	1.452
$p_T^{4\ell} > 40.00$ & Metsig > 4.00	1.18±0.11	3.55±4.90	0.93±0.49	0.20±0.00	0.04±0.13	0.36±0.06	4.60±0.03	0.845
$p_T^{4\ell} > 40.00$ & Metsig > 4.50	0.55±0.11	1.75±4.90	0.40±0.50	0.17±0.00	0.02±0.13	0.24±0.06	3.99±0.03	0.472
$p_T^{4\ell} > 40.00$ & Metsig > 5.00	0.27±0.11	0.89±4.94	0.18±0.50	0.15±0.00	0.02±0.13	0.21±0.06	3.45±0.03	0.275
$p_T^{4\ell} > 50.00$ & Metsig > 0.00	7.20±0.00	93.28±0.00	23.52±0.00	0.34±0.00	0.29±0.00	0.58±0.00	6.55±0.00	1.431
$p_T^{4\ell} > 50.00$ & Metsig > 0.50	7.09±0.02	83.38±1.64	21.41±0.20	0.33±0.00	0.28±0.03	0.58±0.03	6.50±0.01	1.485
$p_T^{4\ell} > 50.00$ & Metsig > 1.00	6.72±0.04	63.17±4.28	16.71±0.35	0.32±0.00	0.26±0.06	0.58±0.03	6.38±0.01	1.596
$p_T^{4\ell} > 50.00$ & Metsig > 1.50	6.16±0.06	43.20±4.64	12.00±0.44	0.31±0.00	0.23±0.09	0.50±0.03	6.23±0.02	1.729
$p_T^{4\ell} > 50.00$ & Metsig > 2.00	5.31±0.08	27.89±4.82	7.92±0.48	0.29±0.00	0.19±0.11	0.48±0.05	6.04±0.03	1.800
$p_T^{4\ell} > 50.00$ & Metsig > 2.50	4.27±0.10	17.28±4.90	4.93±0.50	0.27±0.00	0.17±0.12	0.46±0.06	5.83±0.03	1.760
$p_T^{4\ell} > 50.00$ & Metsig > 3.00	3.05±0.12	9.99±4.95	2.85±0.51	0.25±0.00	0.13±0.13	0.44±0.06	5.50±0.04	1.545
$p_T^{4\ell} > 50.00$ & Metsig > 3.50	1.82±0.13	5.36±4.96	1.49±0.52	0.22±0.00	0.09±0.13	0.42±0.07	5.06±0.04	1.135
$p_T^{4\ell} > 50.00$ & Metsig > 4.00	0.91±0.13	2.72±4.97	0.74±0.52	0.19±0.00	0.04±0.13	0.34±0.07	4.53±0.04	0.687
$p_T^{4\ell} > 50.00$ & Metsig > 4.50	0.43±0.14	1.39±4.97	0.33±0.52	0.17±0.00	0.02±0.13	0.24±0.07	3.96±0.04	0.389
$p_T^{4\ell} > 50.00$ & Metsig > 5.00	0.21±0.14	0.73±5.00	0.14±0.52	0.14±0.00	0.02±0.14	0.20±0.07	3.44±0.04	0.221
$p_T^{4\ell} > 60.00$ & Metsig > 0.00	3.81±0.00	56.14±0.00	14.19±0.00	0.31±0.00	0.17±0.00	0.47±0.00	5.75±0.00	0.963
$p_T^{4\ell} > 60.00$ & Metsig > 0.50	3.73±0.02	49.33±1.65	12.79±0.21	0.30±0.00	0.16±0.03	0.47±0.03	5.70±0.01	1.000
$p_T^{4\ell} > 60.00$ & Metsig > 1.00	3.46±0.04	36.45±4.29	9.82±0.36	0.30±0.00	0.14±0.07	0.47±0.03	5.61±0.02	1.057
$p_T^{4\ell} > 60.00$ & Metsig > 1.50	3.09±0.06	24.45±4.66	7.01±0.44	0.28±0.00	0.13±0.09	0.41±0.04	5.48±0.02	1.117
$p_T^{4\ell} > 60.00$ & Metsig > 2.00	2.59±0.09	15.88±4.84	4.62±0.49	0.27±0.00	0.12±0.11	0.39±0.05	5.35±0.03	1.115
$p_T^{4\ell} > 60.00$ & Metsig > 2.50	2.05±0.11	10.04±4.92	2.89±0.51	0.25±0.00	0.11±0.12	0.38±0.06	5.21±0.03	1.045
$p_T^{4\ell} > 60.00$ & Metsig > 3.00	1.49±0.13	6.08±4.97	1.72±0.52	0.23±0.00	0.09±0.13	0.37±0.06	5.01±0.04	0.898
$p_T^{4\ell} > 60.00$ & Metsig > 3.50	1.01±0.14	3.61±4.99	1.02±0.53	0.21±0.00	0.05±0.14	0.35±0.07	4.74±0.04	0.712
$p_T^{4\ell} > 60.00$ & Metsig > 4.00	0.58±0.14	2.05±4.99	0.55±0.53	0.18±0.00	0.03±0.14	0.30±0.07	4.36±0.04	0.474
$p_T^{4\ell} > 60.00$ & Metsig > 4.50	0.31±0.15	1.14±5.00	0.25±0.53	0.16±0.00	0.02±0.14	0.21±0.07	3.89±0.04	0.289
$p_T^{4\ell} > 60.00$ & Metsig > 5.00	0.17±0.15	0.64±5.03	0.11±0.53	0.14±0.00	0.02±0.14	0.18±0.07	3.40±0.04	0.174

Additional slides

Low Met 0 central jet

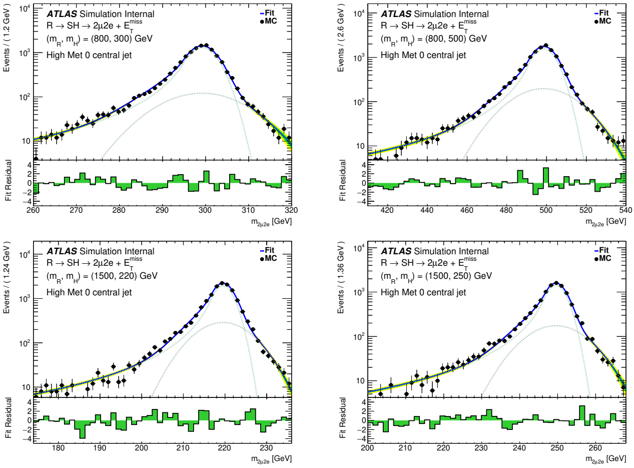
	$(m_R, m_H) = (390, 220)$	$qqZZ^*$	$ggZZ^*$	$t\bar{t}Z$	$Z+jets$	$t\bar{t}$	VVV	$s/\sqrt{b}$
4ℓ	64.51±0.24	2510.45±5.75	349.64±0.71	8.94±0.05	3.87±0.84	3.55±0.23	19.08±0.11	2.661
B-veto	60.07±0.23	2394.48±5.70	334.96±0.69	1.72±0.02	3.63±0.84	2.27±0.16	17.79±0.11	2.540
$N_{\text{jet}}^{\text{central}} = 0$	28.02±0.16	1607.35±5.06	211.64±0.55	0.42±0.01	2.10±0.15	0.99±0.10	9.30±0.07	1.453
$p_T^{4\ell} > 0.00$ & Metsig > 0.00	13.15±0.00	1526.61±0.00	190.77±0.00	0.09±0.00	1.55±0.00	0.36±0.00	2.17±0.00	0.703
$p_T^{4\ell} > 0.00$ & Metsig > 0.50	12.60±0.00	1155.38±0.00	159.47±0.00	0.08±0.00	1.43±0.00	0.31±0.00	2.03±0.00	0.770
$p_T^{4\ell} > 0.00$ & Metsig > 1.00	10.74±0.00	604.62±0.00	96.81±0.00	0.07±0.00	1.07±0.00	0.27±0.00	1.64±0.00	0.898
$p_T^{4\ell} > 0.00$ & Metsig > 1.50	7.73±0.00	265.55±0.00	45.24±0.00	0.05±0.00	0.73±0.00	0.16±0.00	1.06±0.00	0.970
$p_T^{4\ell} > 10.00$ & Metsig > 0.00	12.30±0.00	982.74±0.00	159.35±0.00	0.08±0.00	1.27±0.00	0.32±0.00	2.03±0.00	0.807
$p_T^{4\ell} > 10.00$ & Metsig > 0.50	11.88±0.01	832.47±1.03	139.00±0.12	0.08±0.00	1.21±0.02	0.30±0.02	1.91±0.00	0.844
$p_T^{4\ell} > 10.00$ & Metsig > 1.00	10.25±0.02	486.36±1.44	88.59±0.18	0.07±0.00	0.94±0.04	0.26±0.02	1.56±0.01	0.946
$p_T^{4\ell} > 10.00$ & Metsig > 1.50	7.39±0.02	210.36±1.55	41.54±0.20	0.05±0.00	0.65±0.05	0.15±0.02	1.01±0.01	1.030
$p_T^{4\ell} > 15.00$ & Metsig > 0.00	11.22±0.00	689.13±0.00	128.27±0.00	0.08±0.00	0.96±0.00	0.31±0.00	1.83±0.00	0.869
$p_T^{4\ell} > 15.00$ & Metsig > 0.50	10.86±0.01	600.82±1.18	113.76±0.15	0.07±0.00	0.91±0.03	0.30±0.03	1.74±0.01	0.900
$p_T^{4\ell} > 15.00$ & Metsig > 1.00	9.49±0.02	386.30±1.79	76.84±0.25	0.06±0.00	0.73±0.05	0.26±0.03	1.45±0.01	0.976
$p_T^{4\ell} > 15.00$ & Metsig > 1.50	6.89±0.03	172.44±1.98	36.85±0.28	0.04±0.00	0.53±0.06	0.15±0.03	0.95±0.01	1.052
$p_T^{4\ell} > 20.00$ & Metsig > 0.00	9.60±0.00	490.87±0.00	97.73±0.00	0.07±0.00	0.70±0.00	0.30±0.00	1.59±0.00	0.877
$p_T^{4\ell} > 20.00$ & Metsig > 0.50	9.31±0.02	429.91±1.31	87.10±0.17	0.07±0.00	0.67±0.03	0.28±0.03	1.51±0.01	0.906
$p_T^{4\ell} > 20.00$ & Metsig > 1.00	8.19±0.03	287.96±3.95	60.95±0.29	0.06±0.00	0.53±0.06	0.24±0.03	1.26±0.01	0.970
$p_T^{4\ell} > 20.00$ & Metsig > 1.50	6.04±0.04	136.29±4.13	30.49±0.33	0.04±0.00	0.41±0.07	0.14±0.03	0.84±0.01	1.033
$p_T^{4\ell} > 25.00$ & Metsig > 0.00	7.54±0.00	345.05±0.00	70.89±0.00	0.07±0.00	0.53±0.00	0.25±0.00	1.29±0.00	0.818
$p_T^{4\ell} > 25.00$ & Metsig > 0.50	7.29±0.02	300.51±1.44	62.89±0.18	0.06±0.00	0.51±0.03	0.23±0.03	1.21±0.01	0.846
$p_T^{4\ell} > 25.00$ & Metsig > 1.00	6.37±0.03	202.95±4.09	44.15±0.31	0.05±0.00	0.38±0.06	0.22±0.03	1.00±0.01	0.896
$p_T^{4\ell} > 25.00$ & Metsig > 1.50	4.64±0.05	98.43±4.36	22.49±0.37	0.03±0.00	0.28±0.08	0.13±0.03	0.66±0.02	0.932
$p_T^{4\ell} > 5.00$ & Metsig > 0.00	12.94±0.00	1333.50±0.00	182.83±0.00	0.09±0.00	1.45±0.00	0.36±0.00	2.14±0.00	0.737
$p_T^{4\ell} > 5.00$ & Metsig > 0.50	12.42±0.01	1058.18±0.68	154.94±0.07	0.08±0.00	1.34±0.01	0.31±0.00	2.00±0.00	0.791
$p_T^{4\ell} > 5.00$ & Metsig > 1.00	10.61±0.01	568.66±0.88	95.02±0.09	0.07±0.00	1.01±0.02	0.27±0.00	1.62±0.00	0.912
$p_T^{4\ell} > 5.00$ & Metsig > 1.50	7.64±0.01	247.18±0.93	44.36±0.10	0.05±0.00	0.69±0.02	0.16±0.00	1.05±0.00	0.990

	$(m_R, m_H) = (390, 220)$	$qqZZ^*$	$ggZZ^*$	$t\bar{t}Z$	$Z + jets$	$t\bar{t}$	VVV	$s/\sqrt{b}$
4ℓ	64.51±0.24	2510.45±5.75	349.64±0.71	8.94±0.05	3.87±0.84	3.55±0.23	19.08±0.11	2.661
B-veto	60.07±0.23	2394.48±5.70	334.96±0.69	1.72±0.02	3.63±0.84	2.27±0.16	17.79±0.11	2.540
$N_{\rm jet}^{\rm central} \geq 1$	32.05±0.17	787.13±2.63	123.31±0.42	1.30±0.02	1.53±0.83	1.27±0.13	8.49±0.08	2.341
$p_T^{4\ell} > 0.00$ GeV & Metsig > 0.00	32.05±0.17	787.13±2.63	123.31±0.42	1.30±0.02	1.53±0.83	1.27±0.13	8.49±0.08	2.341
$p_T^{4\ell} > 0.00$ GeV & Metsig > 0.50	31.46±0.17	657.01±2.45	106.88±0.39	1.28±0.02	1.49±0.83	1.27±0.13	8.32±0.08	2.506
$p_T^{4\ell} > 0.00$ GeV & Metsig > 1.00	29.70±0.16	409.28±1.53	72.34±0.32	1.23±0.02	1.43±0.83	1.21±0.12	7.89±0.08	2.968
$p_T^{4\ell} > 0.00$ GeV & Metsig > 1.50	26.92±0.16	217.56±1.12	41.32±0.25	1.15±0.02	1.29±0.82	1.15±0.12	7.29±0.08	3.638
$p_T^{4\ell} > 0.00$ GeV & Metsig > 2.00	23.40±0.15	104.71±0.82	21.23±0.18	1.04±0.02	0.25±0.05	1.04±0.12	6.55±0.07	4.473
$p_T^{4\ell} > 0.00$ GeV & Metsig > 2.50	19.58±0.13	48.63±0.61	10.13±0.12	0.93±0.02	0.18±0.04	0.95±0.11	5.79±0.07	5.324
$p_T^{4\ell} > 0.00$ GeV & Metsig > 3.00	15.63±0.12	22.57±0.33	4.78±0.08	0.81±0.01	0.09±0.03	0.86±0.11	5.06±0.06	5.932
$p_T^{4\ell} > 0.00$ GeV & Metsig > 3.50	11.99±0.10	10.40±0.23	2.21±0.06	0.69±0.01	0.05±0.03	0.67±0.09	4.40±0.06	6.198
$p_T^{4\ell} > 0.00$ GeV & Metsig > 4.00	8.99±0.09	4.83±0.15	0.98±0.04	0.58±0.01	0.03±0.02	0.55±0.08	3.78±0.05	6.079
$p_T^{4\ell} > 0.00$ GeV & Metsig > 4.50	6.61±0.08	2.36±0.10	0.45±0.03	0.49±0.01	0.01±0.02	0.43±0.07	3.25±0.05	5.553
$p_T^{4\ell} > 0.00$ GeV & Metsig > 5.00	4.74±0.07	1.14±0.07	0.18±0.02	0.40±0.01	-0.01±0.01	0.39±0.07	2.77±0.05	4.769
$p_T^{4\ell} > 10.00$ GeV & Metsig > 0.00	31.54±0.17	768.05±2.61	121.50±0.42	1.29±0.02	1.51±0.83	1.26±0.13	8.42±0.08	2.331
$p_T^{4\ell} > 10.00$ GeV & Metsig > 0.50	30.95±0.17	639.68±2.43	105.22±0.39	1.27±0.02	1.48±0.83	1.26±0.13	8.26±0.08	2.496
$p_T^{4\ell} > 10.00$ GeV & Metsig > 1.00	29.20±0.16	395.34±1.51	71.01±0.32	1.22±0.02	1.42±0.83	1.20±0.12	7.83±0.08	2.965
$p_T^{4\ell} > 10.00$ GeV & Metsig > 1.50	26.44±0.16	207.68±1.10	40.38±0.24	1.14±0.02	1.29±0.82	1.14±0.12	7.24±0.07	3.647
$p_T^{4\ell} > 10.00$ GeV & Metsig > 2.00	22.97±0.14	99.05±0.80	20.70±0.17	1.04±0.02	0.25±0.05	1.03±0.12	6.50±0.07	4.496
$p_T^{4\ell} > 10.00$ GeV & Metsig > 2.50	19.23±0.13	46.06±0.60	9.89±0.12	0.92±0.02	0.18±0.04	0.94±0.11	5.75±0.07	5.345
$p_T^{4\ell} > 10.00$ GeV & Metsig > 3.00	15.35±0.12	21.45±0.32	4.67±0.08	0.81±0.01	0.09±0.03	0.86±0.11	5.03±0.06	5.940
$p_T^{4\ell} > 10.00$ GeV & Metsig > 3.50	11.80±0.10	9.81±0.22	2.15±0.06	0.69±0.01	0.05±0.03	0.66±0.09	4.37±0.06	6.221
$p_T^{4\ell} > 10.00$ GeV & Metsig > 4.00	8.88±0.09	4.54±0.15	0.95±0.04	0.58±0.01	0.03±0.02	0.54±0.08	3.76±0.05	6.107
$p_T^{4\ell} > 10.00$ GeV & Metsig > 4.50	6.56±0.08	2.24±0.10	0.44±0.03	0.48±0.01	0.01±0.02	0.43±0.07	3.24±0.05	5.563
$p_T^{4\ell} > 10.00$ GeV & Metsig > 5.00	4.72±0.06	1.06±0.06	0.18±0.02	0.40±0.01	-0.01±0.01	0.39±0.07	2.76±0.05	4.789
$p_T^{4\ell} > 20.00$ GeV & Metsig > 0.00	30.03±0.17	727.67±2.20	115.32±0.41	1.27±0.02	1.49±0.83	1.24±0.13	8.24±0.08	2.279
$p_T^{4\ell} > 20.00$ GeV & Metsig > 0.50	29.45±0.16	602.83±1.99	99.52±0.38	1.25±0.02	1.45±0.83	1.24±0.13	8.08±0.08	2.446
$p_T^{4\ell} > 20.00$ GeV & Metsig > 1.00	27.75±0.16	368.32±1.43	66.64±0.31	1.20±0.02	1.39±0.83	1.18±0.12	7.67±0.08	2.915
$p_T^{4\ell} > 20.00$ GeV & Metsig > 1.50	25.08±0.15	190.63±1.02	37.62±0.23	1.12±0.02	1.27±0.82	1.12±0.12	7.09±0.07	3.601
$p_T^{4\ell} > 20.00$ GeV & Metsig > 2.00	21.75±0.14	89.86±0.76	19.19±0.17	1.02±0.02	0.23±0.05	1.02±0.12	6.39±0.07	4.449
$p_T^{4\ell} > 20.00$ GeV & Metsig > 2.50	18.20±0.13	41.70±0.58	9.15±0.12	0.91±0.02	0.15±0.04	0.93±0.11	5.65±0.07	5.282
$p_T^{4\ell} > 20.00$ GeV & Metsig > 3.00	14.59±0.11	19.25±0.30	4.33±0.08	0.79±0.01	0.08±0.03	0.85±0.11	4.95±0.06	5.885
$p_T^{4\ell} > 20.00$ GeV & Metsig > 3.50	11.28±0.10	8.85±0.21	1.99±0.05	0.67±0.01	0.05±0.03	0.66±0.09	4.32±0.06	6.154
$p_T^{4\ell} > 20.00$ GeV & Metsig > 4.00	8.56±0.09	4.09±0.14	0.88±0.04	0.57±0.01	0.03±0.02	0.54±0.08	3.72±0.05	6.062
$p_T^{4\ell} > 20.00$ GeV & Metsig > 4.50	6.40±0.08	2.02±0.09	0.41±0.02	0.47±0.01	0.01±0.02	0.43±0.07	3.21±0.05	5.549
$p_T^{4\ell} > 20.00$ GeV & Metsig > 5.00	4.64±0.06	0.95±0.06	0.16±0.01	0.39±0.01	-0.01±0.01	0.39±0.07	2.74±0.05	4.788
$p_T^{4\ell} > 30.00$ GeV & Metsig > 0.00	27.84±0.16	669.92±2.06	104.23±0.39	1.23±0.02	1.44±0.83	1.18±0.12	7.97±0.08	2.204
$p_T^{4\ell} > 30.00$ GeV & Metsig > 0.50	27.29±0.16	552.48±1.85	89.67±0.36	1.21±0.02	1.41±0.83	1.18±0.12	7.82±0.08	2.369
$p_T^{4\ell} > 30.00$ GeV & Metsig > 1.00	25.66±0.15	335.10±1.31	59.69±0.29	1.16±0.02	1.36±0.83	1.12±0.12	7.42±0.07	2.827
$p_T^{4\ell} > 30.00$ GeV & Metsig > 1.50	23.14±0.15	172.38±0.93	33.51±0.22	1.08±0.02	1.24±0.82	1.06±0.12	6.87±0.07	3.493
$p_T^{4\ell} > 30.00$ GeV & Metsig > 2.00	20.02±0.13	80.88±0.69	17.03±0.16	0.99±0.02	0.21±0.05	0.97±0.11	6.20±0.07	4.310
$p_T^{4\ell} > 30.00$ GeV & Metsig > 2.50	16.73±0.12	37.05±0.54	8.04±0.11	0.88±0.02	0.14±0.04	0.89±0.11	5.50±0.07	5.126
$p_T^{4\ell} > 30.00$ GeV & Metsig > 3.00	13.43±0.11	16.77±0.26	3.79±0.07	0.77±0.01	0.07±0.03	0.81±0.10	4.82±0.06	5.736
$p_T^{4\ell} > 30.00$ GeV & Metsig > 3.50	10.47±0.10	7.70±0.18	1.74±0.05	0.66±0.01	0.04±0.02	0.61±0.09	4.22±0.06	6.010
$p_T^{4\ell} > 30.00$ GeV & Metsig > 4.00	8.08±0.09	3.56±0.12	0.77±0.03	0.56±0.01	0.02±0.02	0.53±0.08	3.65±0.05	5.951
$p_T^{4\ell} > 30.00$ GeV & Metsig > 4.50	6.13±0.07	1.77±0.08	0.36±0.02	0.46±0.01	-0.00±0.01	0.42±0.07	3.16±0.05	5.476
$p_T^{4\ell} > 30.00$ GeV & Metsig > 5.00	4.52±0.06	0.79±0.05	0.14±0.01	0.38±0.01	-0.01±0.01	0.39±0.07	2.70±0.05	4.784
$p_T^{4\ell} > 40.00$ GeV & Metsig > 0.00	25.03±0.15	591.10±1.71	90.10±0.36	1.17±0.02	1.34±0.82	1.16±0.12	7.60±0.07	2.111
$p_T^{4\ell} > 40.00$ GeV & Metsig > 0.50	24.54±0.15	488.41±1.53	77.71±0.33	1.15±0.02	1.32±0.82	1.16±0.12	7.46±0.07	2.267
$p_T^{4\ell} > 40.00$ GeV & Metsig > 1.00	23.06±0.14	296.51±1.17	51.80±0.27	1.11±0.02	1.28±0.82	1.10±0.12	7.08±0.07	2.702
$p_T^{4\ell} > 40.00$ GeV & Metsig > 1.50	20.77±0.14	151.47±0.84	29.01±0.21	1.03±0.02	1.17±0.82	1.05±0.12	6.56±0.07	3.342
$p_T^{4\ell} > 40.00$ GeV & Metsig > 2.00	17.93±0.13	70.10±0.63	14.65±0.15	0.94±0.02	0.19±0.04	0.96±0.11	5.94±0.07	4.131
$p_T^{4\ell} > 40.00$ GeV & Metsig > 2.50	15.04±0.12	31.61±0.50	6.90±0.10	0.84±0.02	0.13±0.03	0.88±0.11	5.28±0.06	4.941
$p_T^{4\ell} > 40.00$ GeV & Metsig > 3.00	12.17±0.10	14.29±0.23	3.22±0.07	0.74±0.01	0.08±0.03	0.79±0.10	4.64±0.06	5.542
$p_T^{4\ell} > 40.00$ GeV & Metsig > 3.50	9.61±0.09	6.49±0.16	1.47±0.05	0.63±0.01	0.05±0.02	0.61±0.09	4.08±0.06	5.840
$p_T^{4\ell} > 40.00$ GeV & Metsig > 4.00	7.53±0.08	2.96±0.10	0.65±0.03	0.53±0.01	0.03±0.01	0.52±0.08	3.54±0.05	5.824
$p_T^{4\ell} > 40.00$ GeV & Metsig > 4.50	5.83±0.07	1.53±0.07	0.30±0.02	0.45±0.01	0.01±0.01	0.42±0.07	3.08±0.05	5.376
$p_T^{4\ell} > 40.00$ GeV & Metsig > 5.00	4.37±0.06	0.69±0.04	0.12±0.01	0.37±0.01	0.00±0.00	0.39±0.07	2.65±0.05	4.720
$p_T^{4\ell} > 50.00$ GeV & Metsig > 0.00	22.01±0.14	507.48±1.49	74.79±0.33	1.11±0.02	0.42±0.06	1.02±0.12	7.22±0.07	2.008
$p_T^{4\ell} > 50.00$ GeV & Metsig > 0.50	21.57±0.14	421.04±1.33	64.74±0.31	1.10±0.02	0.39±0.06	1.02±0.12	7.08±0.07	2.151
$p_T^{4\ell} > 50.00$ GeV & Metsig > 1.00	20.25±0.14	256.89±1.04	43.40±0.25	1.05±0.02	0.35±0.06	0.97±0.11	6.74±0.07	2.556
$p_T^{4\ell} > 50.00$ GeV & Metsig > 1.50	18.23±0.13	130.96±0.76	24.23±0.19	0.99±0.02	0.26±0.05	0.92±0.11	6.26±0.07	3.164
$p_T^{4\ell} > 50.00$ GeV & Metsig > 2.00	15.78±0.12	60.20±0.58	12.23±0.13	0.90±0.02	0.18±0.04	0.84±0.11	5.68±0.07	3.914
$p_T^{4\ell} > 50.00$ GeV & Metsig > 2.50	13.29±0.11	26.95±0.47	5.79±0.09	0.81±0.01	0.12±0.03	0.77±0.10	5.07±0.06	4.691
$p_T^{4\ell} > 50.00$ GeV & Metsig > 3.00	10.83±0.10	12.23±0.20	2.70±0.06	0.70±0.01	0.08±0.03	0.70±0.10	4.47±0.06	5.260
$p_T^{4\ell} > 50.00$ GeV & Metsig > 3.50	8.69±0.09	5.56±0.14	1.24±0.04	0.60±0.01	0.05±0.02	0.53±0.08	3.93±0.06	5.591
$p_T^{4\ell} > 50.00$ GeV & Metsig > 4.00	6.94±0.08	2.62±0.09	0.53±0.03	0.51±0.01	0.03±0.01	0.44±0.07	3.43±0.05	5.599
$p_T^{4\ell} > 50.00$ GeV & Metsig > 4.50	5.45±0.07	1.36±0.06	0.24±0.02	0.43±0.01	0.01±0.01	0.36±0.07	2.99±0.05	5.211
$p_T^{4\ell} > 50.00$ GeV & Metsig > 5.00	4.17±0.06	0.60±0.04	0.10±0.01	0.36±0.01	0.00±0.00	0.33±0.06	2.58±0.04	4.650
$p_T^{4\ell} > 60.00$ GeV & Metsig > 0.00	18.99±0.13	431.79±1.28	60.82±0.30	1.04±0.02	0.30±0.05	0.89±0.11	6.79±0.07	1.882
$p_T^{4\ell} > 60.00$ GeV & Metsig > 0.50	18.62±0.13	358.85±1.13	52.82±0.28	1.03±0.02	0.29±0.05	0.89±0.11	6.67±0.07	2.016
$p_T^{4\ell} > 60.00$ GeV & Metsig > 1.00	17.51±0.13	219.69±0.87	35.56±0.23	0.99±0.02	0.25±0.05	0.84±0.11	6.35±0.07	2.393
$p_T^{4\ell} > 60.00$ GeV & Metsig > 1.50	15.81±0.12	112.76±0.60	19.94±0.17	0.93±0.02	0.17±0.04	0.81±0.11	5.91±0.07	2.959
$p_T^{4\ell} > 60.00$ GeV & Metsig > 2.00	13.76±0.11	51.85±0.41	10.05±0.12	0.85±0.02	0.12±0.03	0.73±0.10	5.38±0.06	3.678
$p_T^{4\ell} > 60.00$ GeV & Metsig > 2.50	11.70±0.10	23.52±0.28	4.75±0.08	0.76±0.01	0.07±0.03	0.66±0.10	4.82±0.06	4.417
$p_T^{4\ell} > 60.00$ GeV & Metsig > 3.00	9.68±0.09	10.50±0.18	2.25±0.06	0.67±0.01	0.04±0.02	0.59±0.09	4.26±0.06	5.022
$p_T^{4\ell} > 60.00$ GeV & Metsig > 3.50	7.91±0.08	4.80±0.12	1.02±0.04	0.57±0.01	0.02±0.01	0.43±0.07	3.75±0.05	5.395
$p_T^{4\ell} > 60.00$ GeV & Metsig > 4.00	6.42±0.08	2.27±0.08	0.44±0.03	0.49±0.01	0.01±0.01	0.36±0.07	3.28±0.05	5.443
$p_T^{4\ell} > 60.00$ GeV & Metsig > 4.50	5.14±0.07	1.15±0.05	0.19±0.02	0.41±0.01	0.01±0.01	0.33±0.06	2.88±0.05	5.113
$p_T^{4\ell} > 60.00$ GeV & Metsig > 5.00	4.00±0.06	0.51±0.03	0.07±0.01	0.34±0.01	0.00±0.00	0.31±0.06	2.50±0.04	4.599

	$(m_R, m_H) = (390, 220)$	$qqZZ^*$	$ggZZ^*$	$t\bar{t}Z$	$Z + jets$	$t\bar{t}$	VVV	$s/\sqrt{b}$
4ℓ	64.51±0.24	2510.45±5.75	349.64±0.71	8.94±0.05	3.87±0.84	3.55±0.23	19.08±0.11	2.661
B-veto	60.07±0.23	2394.48±5.70	334.96±0.69	1.72±0.02	3.63±0.84	2.27±0.16	17.79±0.11	2.540
$N_{jet}^{central} \geq 1$	32.05±0.17	787.13±2.63	123.31±0.42	1.30±0.02	1.53±0.83	1.27±0.13	8.49±0.08	2.341
$p_T^{4\ell} > 0.00$ GeV & Metsig > 0.00	20.25±0.14	777.32±2.62	121.16±0.42	0.61±0.01	1.47±0.83	0.61±0.09	4.12±0.05	1.494
$p_T^{4\ell} > 0.00$ GeV & Metsig > 0.50	19.66±0.13	647.21±2.44	104.73±0.39	0.59±0.01	1.44±0.83	0.61±0.09	3.96±0.05	1.584
$p_T^{4\ell} > 0.00$ GeV & Metsig > 1.00	17.90±0.13	399.48±1.52	70.19±0.32	0.54±0.01	1.37±0.83	0.54±0.08	3.52±0.05	1.822
$p_T^{4\ell} > 0.00$ GeV & Metsig > 1.50	15.12±0.12	207.75±1.10	39.17±0.24	0.46±0.01	1.24±0.82	0.49±0.08	2.92±0.05	2.114
$p_T^{4\ell} > 0.00$ GeV & Metsig > 2.00	11.60±0.10	94.91±0.79	19.08±0.17	0.36±0.01	0.20±0.04	0.37±0.07	2.18±0.04	2.379
$p_T^{4\ell} > 0.00$ GeV & Metsig > 2.50	7.78±0.08	38.83±0.57	7.99±0.11	0.24±0.01	0.12±0.03	0.28±0.06	1.42±0.03	2.469
$p_T^{4\ell} > 0.00$ GeV & Metsig > 3.00	3.83±0.06	12.77±0.25	2.64±0.06	0.13±0.01	0.04±0.02	0.20±0.06	0.69±0.02	2.093
$p_T^{4\ell} > 5.00$ GeV & Metsig > 0.00	20.12±0.14	771.50±2.61	120.76±0.42	0.61±0.01	1.47±0.83	0.61±0.09	4.10±0.05	1.490
$p_T^{4\ell} > 5.00$ GeV & Metsig > 0.50	19.54±0.13	641.99±2.43	104.36±0.39	0.59±0.01	1.43±0.83	0.61±0.09	3.94±0.05	1.580
$p_T^{4\ell} > 5.00$ GeV & Metsig > 1.00	17.78±0.13	395.31±1.51	69.90±0.32	0.54±0.01	1.37±0.83	0.54±0.08	3.51±0.05	1.818
$p_T^{4\ell} > 5.00$ GeV & Metsig > 1.50	15.01±0.12	204.76±1.09	38.96±0.24	0.46±0.01	1.23±0.82	0.49±0.08	2.91±0.05	2.112
$p_T^{4\ell} > 5.00$ GeV & Metsig > 2.00	11.50±0.10	93.23±0.79	18.94±0.17	0.36±0.01	0.19±0.04	0.37±0.07	2.17±0.04	2.377
$p_T^{4\ell} > 5.00$ GeV & Metsig > 2.50	7.70±0.08	38.05±0.57	7.92±0.11	0.24±0.01	0.12±0.03	0.28±0.06	1.41±0.03	2.464
$p_T^{4\ell} > 5.00$ GeV & Metsig > 3.00	3.76±0.06	12.47±0.25	2.60±0.06	0.12±0.01	0.04±0.02	0.20±0.06	0.68±0.02	2.081
$p_T^{4\ell} > 10.00$ GeV & Metsig > 0.00	19.74±0.13	758.25±2.60	119.35±0.41	0.60±0.01	1.46±0.83	0.60±0.09	4.05±0.05	1.473
$p_T^{4\ell} > 10.00$ GeV & Metsig > 0.50	19.15±0.13	629.87±2.42	103.07±0.39	0.59±0.01	1.42±0.83	0.60±0.09	3.89±0.05	1.563
$p_T^{4\ell} > 10.00$ GeV & Metsig > 1.00	17.40±0.13	385.54±1.49	68.86±0.32	0.53±0.01	1.36±0.83	0.54±0.08	3.46±0.05	1.800
$p_T^{4\ell} > 10.00$ GeV & Metsig > 1.50	14.64±0.12	197.87±1.07	38.24±0.24	0.45±0.01	1.23±0.82	0.48±0.08	2.87±0.05	2.092
$p_T^{4\ell} > 10.00$ GeV & Metsig > 2.00	11.17±0.10	89.24±0.77	18.55±0.16	0.35±0.01	0.19±0.04	0.37±0.07	2.13±0.04	2.354
$p_T^{4\ell} > 10.00$ GeV & Metsig > 2.50	7.43±0.08	36.26±0.56	7.75±0.11	0.24±0.01	0.12±0.03	0.28±0.06	1.38±0.03	2.430
$p_T^{4\ell} > 10.00$ GeV & Metsig > 3.00	3.55±0.06	11.65±0.24	2.52±0.06	0.12±0.01	0.04±0.02	0.19±0.06	0.66±0.02	2.023
$p_T^{4\ell} > 15.00$ GeV & Metsig > 0.00	19.32±0.13	740.77±2.58	116.98±0.41	0.60±0.01	1.45±0.83	0.59±0.09	4.01±0.05	1.458
$p_T^{4\ell} > 15.00$ GeV & Metsig > 0.50	18.73±0.13	613.95±2.40	100.89±0.38	0.58±0.01	1.41±0.83	0.59±0.09	3.85±0.05	1.548
$p_T^{4\ell} > 15.00$ GeV & Metsig > 1.00	17.01±0.13	373.09±1.46	67.16±0.31	0.53±0.01	1.35±0.83	0.53±0.08	3.42±0.05	1.787
$p_T^{4\ell} > 15.00$ GeV & Metsig > 1.50	14.28±0.11	189.70±1.04	37.14±0.23	0.45±0.01	1.23±0.82	0.47±0.08	2.83±0.05	2.081
$p_T^{4\ell} > 15.00$ GeV & Metsig > 2.00	10.87±0.10	84.88±0.76	17.98±0.16	0.35±0.01	0.18±0.04	0.37±0.07	2.11±0.04	2.345
$p_T^{4\ell} > 15.00$ GeV & Metsig > 2.50	7.21±0.08	34.46±0.55	7.49±0.10	0.24±0.01	0.11±0.03	0.28±0.06	1.36±0.03	2.413
$p_T^{4\ell} > 15.00$ GeV & Metsig > 3.00	3.45±0.06	10.96±0.23	2.45±0.06	0.12±0.01	0.04±0.02	0.19±0.06	0.65±0.02	2.015
$p_T^{4\ell} > 20.00$ GeV & Metsig > 0.00	18.75±0.13	718.82±2.19	113.33±0.40	0.59±0.01	1.43±0.83	0.58±0.09	3.93±0.05	1.437
$p_T^{4\ell} > 20.00$ GeV & Metsig > 0.50	18.18±0.13	593.98±1.98	97.53±0.37	0.58±0.01	1.39±0.83	0.58±0.09	3.77±0.05	1.527
$p_T^{4\ell} > 20.00$ GeV & Metsig > 1.00	16.47±0.12	359.47±1.42	64.65±0.31	0.52±0.01	1.33±0.83	0.52±0.08	3.35±0.05	1.763
$p_T^{4\ell} > 20.00$ GeV & Metsig > 1.50	13.80±0.11	181.78±1.00	35.63±0.23	0.45±0.01	1.21±0.82	0.46±0.08	2.77±0.05	2.054
$p_T^{4\ell} > 20.00$ GeV & Metsig > 2.00	10.47±0.10	81.00±0.73	17.20±0.16	0.35±0.01	0.17±0.04	0.37±0.07	2.07±0.04	2.310
$p_T^{4\ell} > 20.00$ GeV & Metsig > 2.50	6.92±0.08	32.84±0.54	7.16±0.10	0.24±0.01	0.10±0.03	0.28±0.06	1.34±0.03	2.373
$p_T^{4\ell} > 20.00$ GeV & Metsig > 3.00	3.31±0.06	10.40±0.22	2.34±0.06	0.12±0.01	0.03±0.02	0.19±0.06	0.63±0.02	1.981
$p_T^{4\ell} > 25.00$ GeV & Metsig > 0.00	18.08±0.13	693.64±2.13	108.53±0.39	0.58±0.01	1.42±0.83	0.58±0.09	3.85±0.05	1.411
$p_T^{4\ell} > 25.00$ GeV & Metsig > 0.50	17.51±0.13	571.60±1.92	93.22±0.37	0.57±0.01	1.39±0.83	0.58±0.09	3.69±0.05	1.501
$p_T^{4\ell} > 25.00$ GeV & Metsig > 1.00	15.84±0.12	344.28±1.36	61.60±0.30	0.52±0.01	1.32±0.83	0.51±0.08	3.28±0.05	1.733
$p_T^{4\ell} > 25.00$ GeV & Metsig > 1.50	13.24±0.11	173.81±0.96	33.86±0.22	0.44±0.01	1.20±0.82	0.45±0.08	2.71±0.05	2.017
$p_T^{4\ell} > 25.00$ GeV & Metsig > 2.00	10.01±0.10	77.39±0.70	16.32±0.15	0.34±0.01	0.17±0.04	0.37±0.07	2.02±0.04	2.261
$p_T^{4\ell} > 25.00$ GeV & Metsig > 2.50	6.59±0.08	31.16±0.52	6.76±0.10	0.23±0.01	0.10±0.03	0.28±0.06	1.31±0.03	2.319
$p_T^{4\ell} > 25.00$ GeV & Metsig > 3.00	3.13±0.05	9.72±0.20	2.21±0.06	0.12±0.01	0.03±0.02	0.19±0.06	0.62±0.02	1.938
$p_T^{4\ell} > 30.00$ GeV & Metsig > 0.00	17.36±0.13	662.22±2.06	102.50±0.38	0.57±0.01	1.40±0.83	0.56±0.09	3.76±0.05	1.388
$p_T^{4\ell} > 30.00$ GeV & Metsig > 0.50	16.81±0.12	544.79±1.85	87.93±0.36	0.55±0.01	1.38±0.83	0.56±0.09	3.60±0.05	1.477
$p_T^{4\ell} > 30.00$ GeV & Metsig > 1.00	15.19±0.12	327.41±1.30	57.95±0.29	0.50±0.01	1.32±0.83	0.50±0.08	3.20±0.05	1.705
$p_T^{4\ell} > 30.00$ GeV & Metsig > 1.50	12.66±0.11	164.68±0.91	31.77±0.21	0.43±0.01	1.20±0.82	0.45±0.08	2.65±0.04	1.982
$p_T^{4\ell} > 30.00$ GeV & Metsig > 2.00	9.54±0.09	73.18±0.66	15.29±0.15	0.33±0.01	0.17±0.04	0.36±0.07	1.98±0.04	2.216
$p_T^{4\ell} > 30.00$ GeV & Metsig > 2.50	6.26±0.08	29.35±0.50	6.30±0.10	0.22±0.01	0.10±0.03	0.28±0.06	1.28±0.03	2.268
$p_T^{4\ell} > 30.00$ GeV & Metsig > 3.00	2.96±0.05	9.07±0.19	2.05±0.05	0.11±0.01	0.03±0.02	0.19±0.06	0.61±0.02	1.891

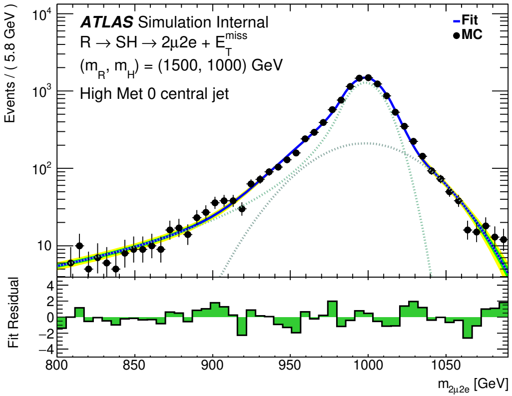
Signal parametrisation

High Met 0 central jet for $2\mu 2e$ channel



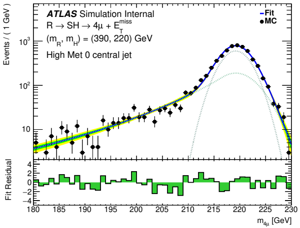
Signal parametrisation

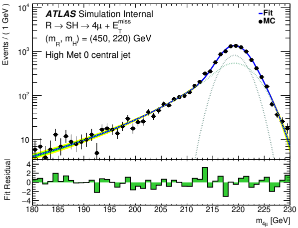
High Met 0 central jet for $2\mu 2e$ channel

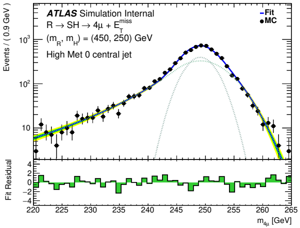


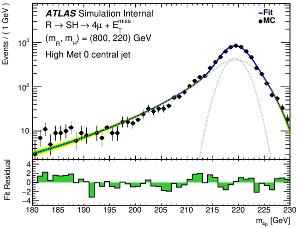
Signal parametrisation

High Met 0 central jet for 4μ channel

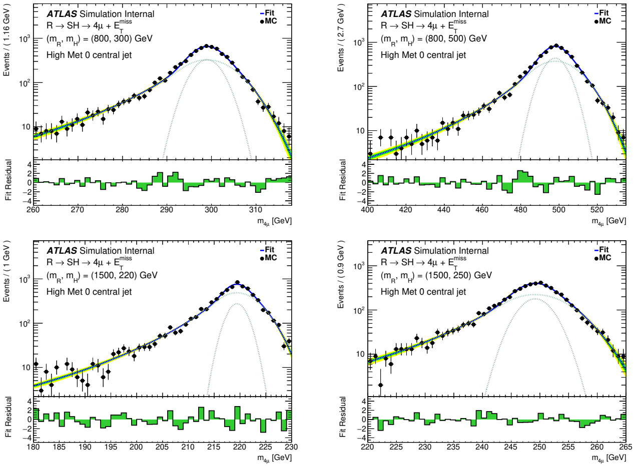






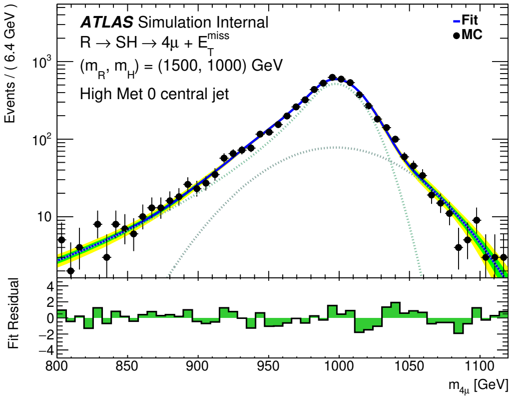


Signal parametrisation
High Met 0 central jet for 4μ channel



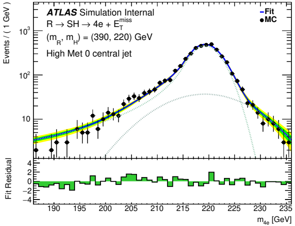
Signal parametrisation

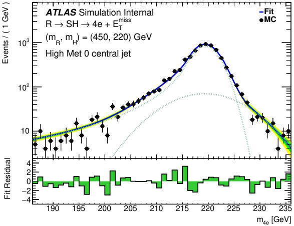
High Met 0 central jet for 4μ channel

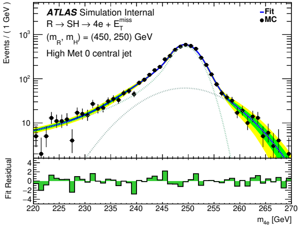


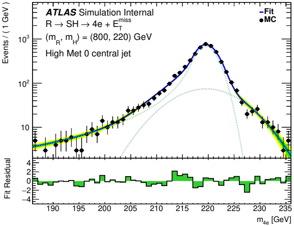
Signal parametrisation

High Met 0 central jet for 4e channel



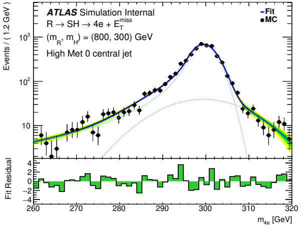


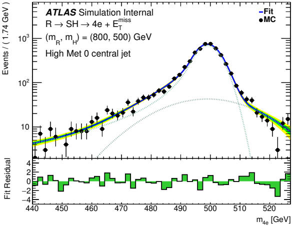


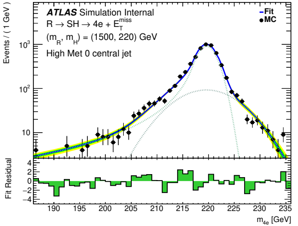


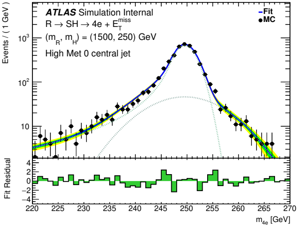
Signal parametrisation

High Met 0 central jet for 4*e* channel



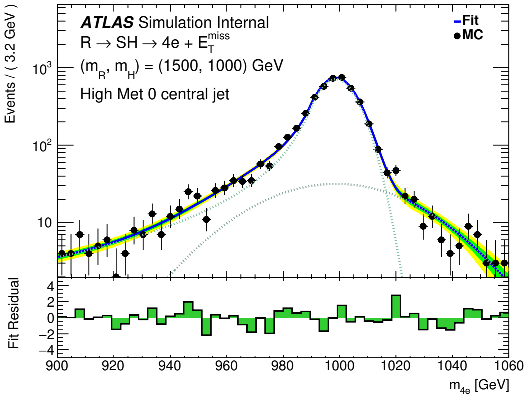






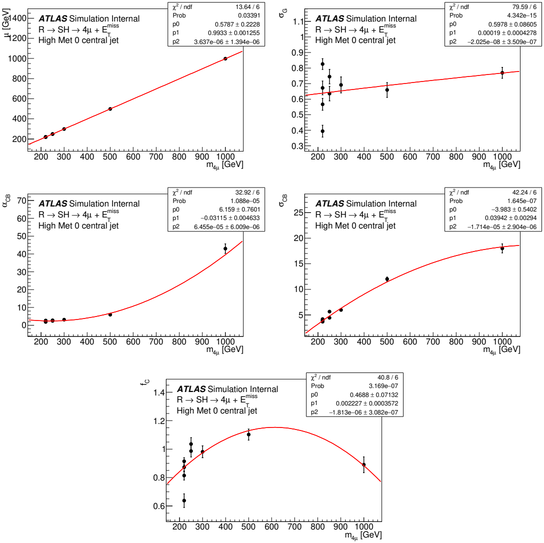
Signal parametrisation

High Met 0 central jet for 4*e* channel

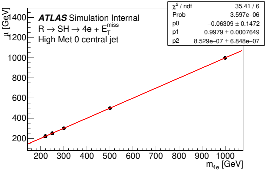


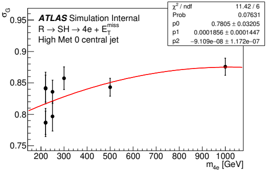
Interpolation of μ, f_C, σ_G, σ_C and α_C parameters

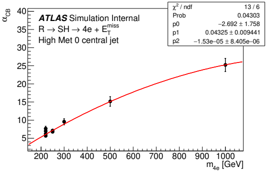
4μ-channel

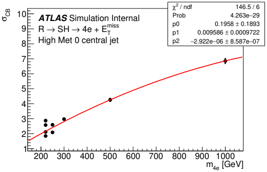


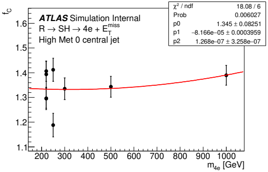
Interpolation of μ, f_C, σ_G, σ_C and α_C parameters
4e-channel





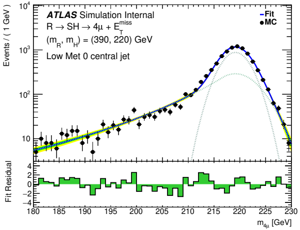


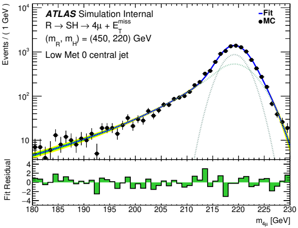


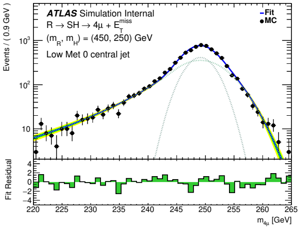


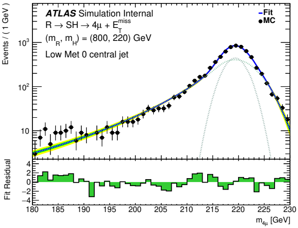
Signal parametrisation

Low Met 0 central jet for 4μ channel

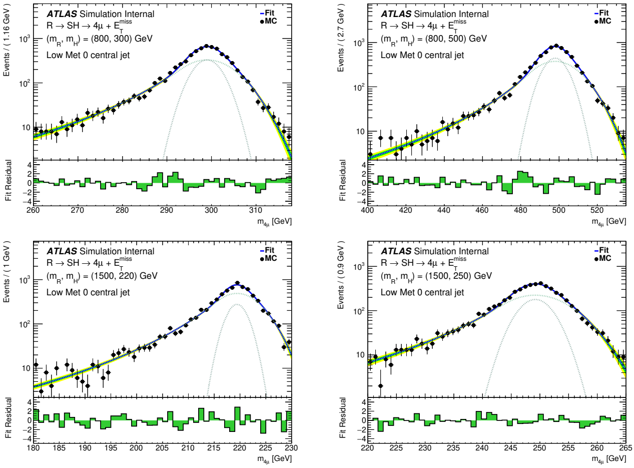






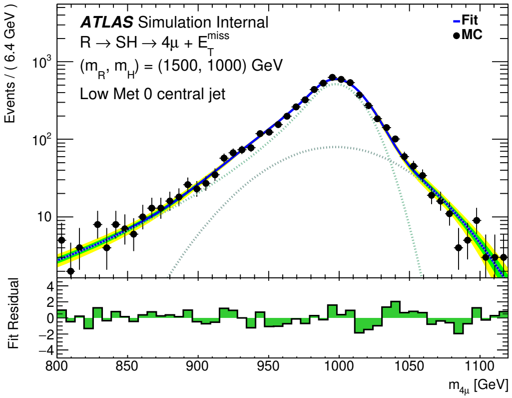


Signal parametrisation
Low Met 0 central jet for 4μ channel



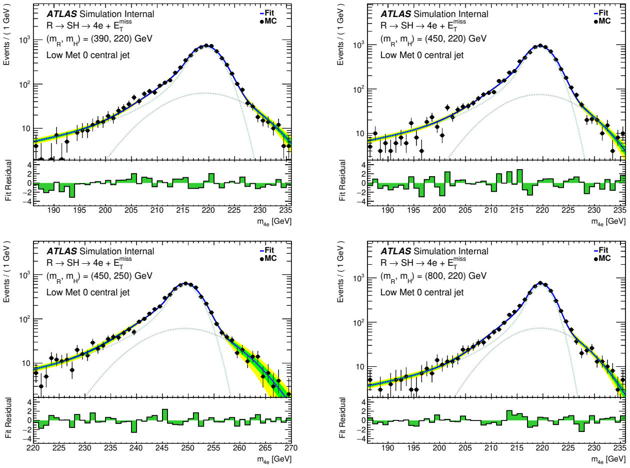
Signal parametrisation

Low Met 0 central jet for 4μ channel



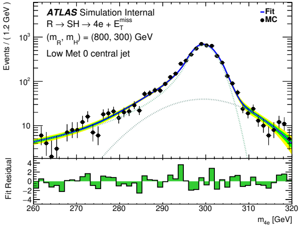
Signal parametrisation

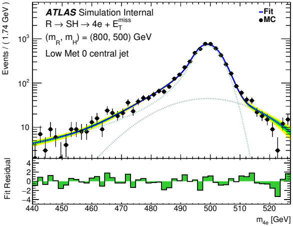
Low Met 0 central jet for 4*e* channel

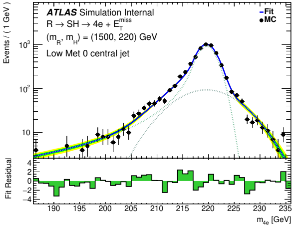


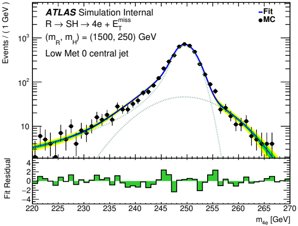
Signal parametrisation

Low Met 0 central jet for 4e channel



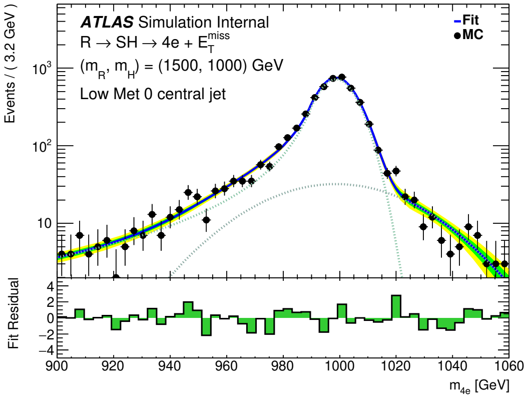






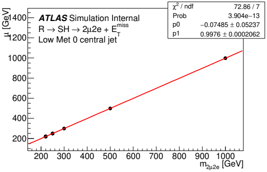
Signal parametrisation

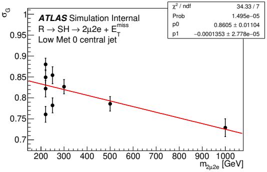
Low Met 0 central jet for 4e channel

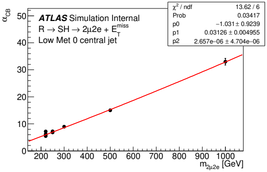


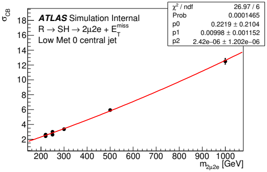
Interpolation of μ, f_C, σ_G, σ_C and α_C parameters

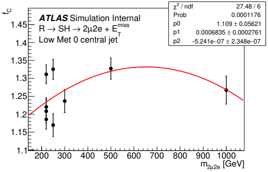
$2\mu 2e$-channel





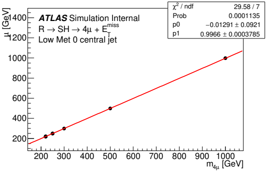


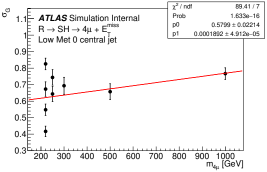


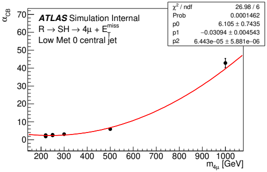


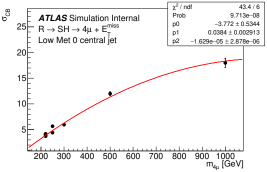
Interpolation of μ, f_C, σ_G, σ_C and α_C parameters

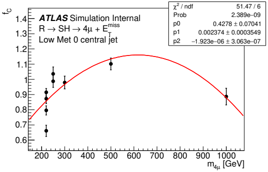
4μ-channel





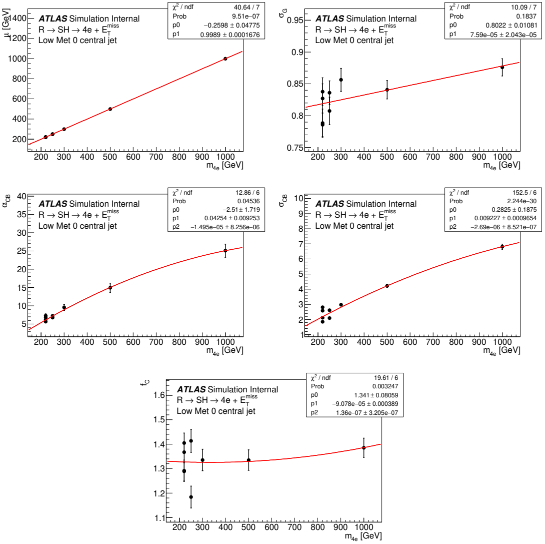






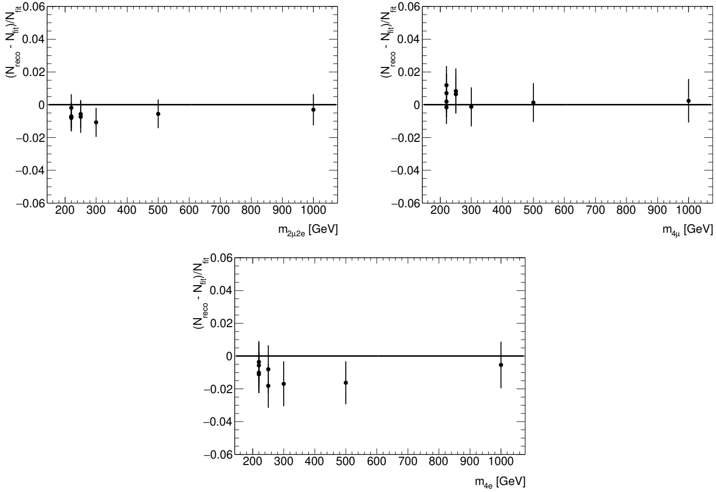
Interpolation of μ, f_C, σ_G, σ_C and α_C parameters

4e-channel



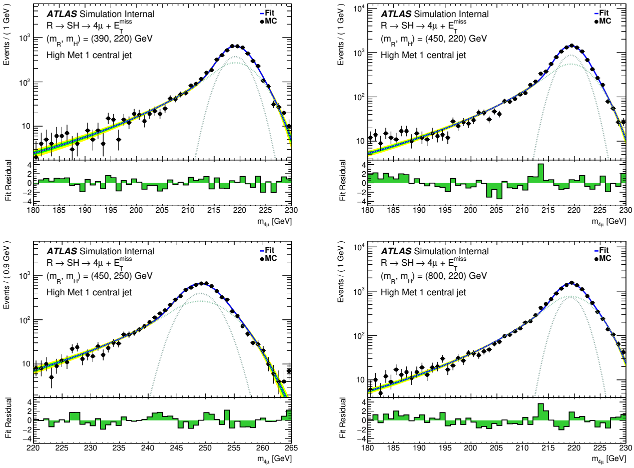
Study the bias induced by the signal extraction

Low Met 0 central jet for all the channels



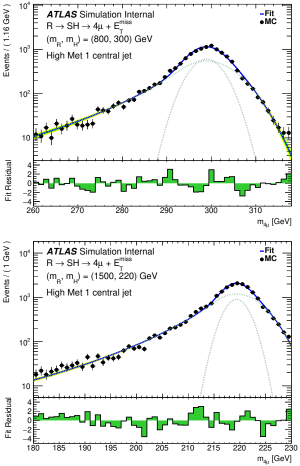
Signal parametrisation

High Met 1 central jet for 4μ channel



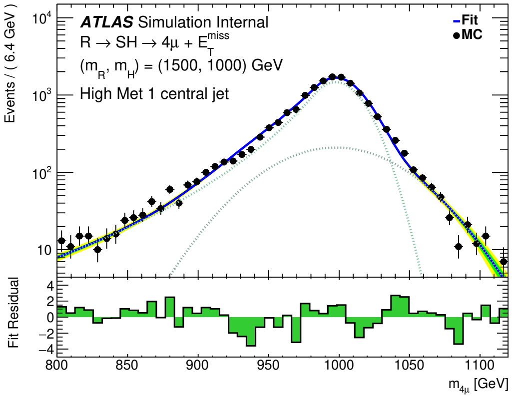
Signal parametrisation

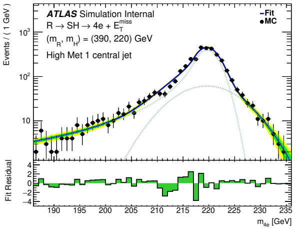
High Met 1 central jet for 4μ channel



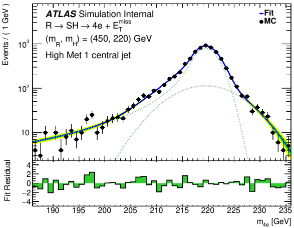
Signal parametrisation

High Met 1 central jet for 4μ channel

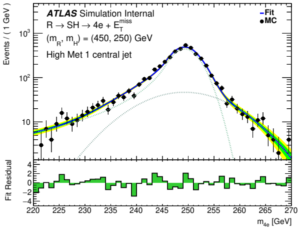




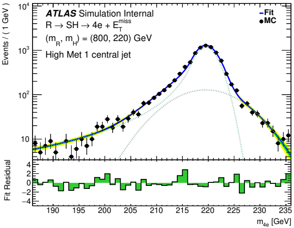
ATLAS Simulation Internal
R → SH → 4e + E_T^miss
(m_R, m_H) = (390, 220) GeV
High Met 1 central jet
Fit
MC
Events / (1 GeV)
Fit Residual
m_4e [GeV]



ATLAS Simulation Internal
R → SH → 4e + E_T^miss
(m_R, m_H) = (450, 220) GeV
High Met 1 central jet
Fit
MC
Events / (1 GeV)
Fit Residual
m_4e [GeV]



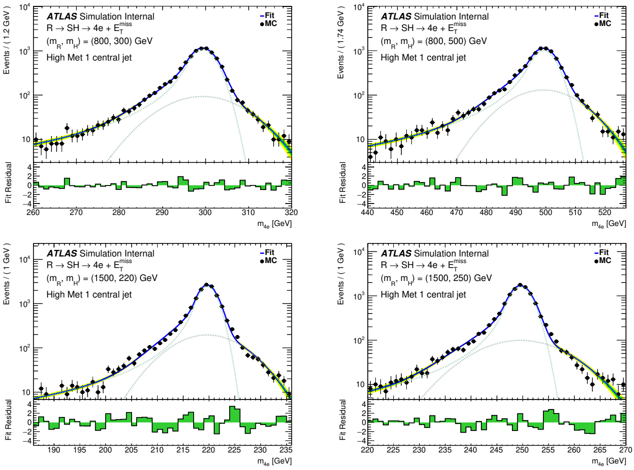
ATLAS Simulation Internal
R → SH → 4e + E_T^miss
(m_R, m_H) = (450, 250) GeV
High Met 1 central jet
Fit
MC
Events / (1 GeV)
Fit Residual
m_4e [GeV]



ATLAS Simulation Internal
R → SH → 4e + E_T^miss
(m_R, m_H) = (800, 220) GeV
High Met 1 central jet
Fit
MC
Events / (1 GeV)
Fit Residual
m_4e [GeV]

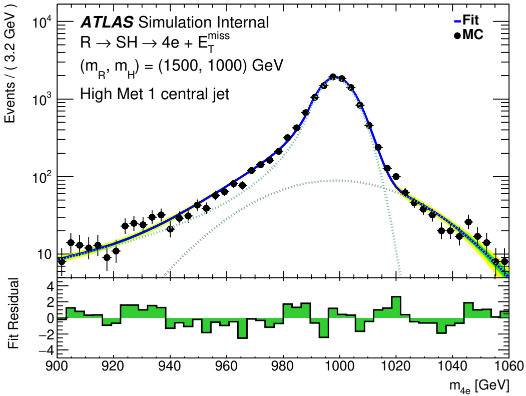
Signal parametrisation

High Met 1 central jet for 4*e* channel



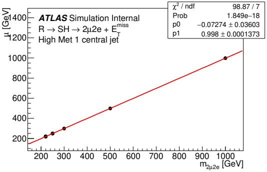
Signal parametrisation

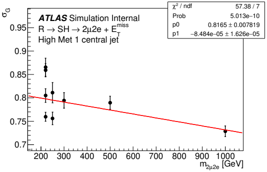
High Met 1 central jet for 4*e* channel

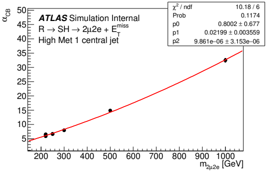


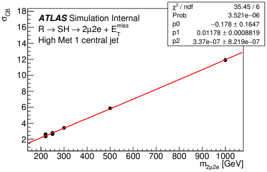
Interpolation of μ, f_C, σ_G, σ_C and α_C parameters

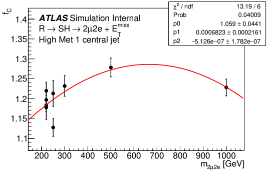
$2\mu 2e$-channel





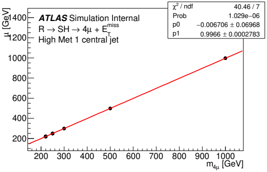


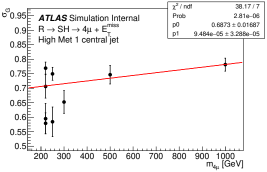


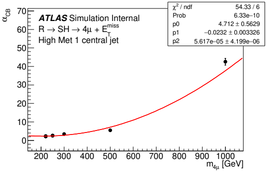


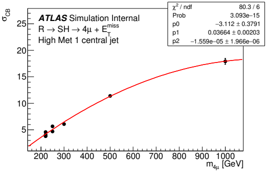
Interpolation of μ, f_C, σ_G, σ_C and α_C parameters

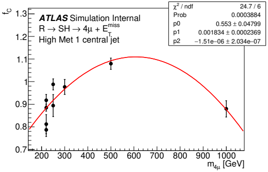
4μ-channel



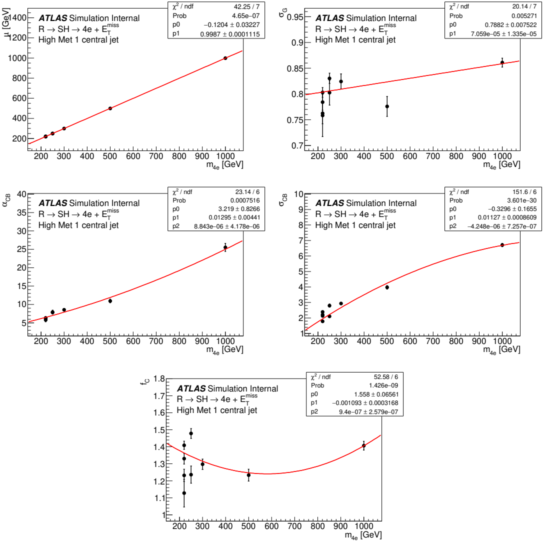








Interpolation of μ, f_C, σ_G, σ_C and α_C parameters
4e-channel



Study the bias induced by the signal extraction

High Met 1 central jet for all the channels