

Validation of ATLAS_1501_07110

June 25, 2016

AUTHOR: Junjie Cao, Liangliang Shang, Peiwen Wu, Jin Min Yang, Yang Zhang

EMAIL: junjiec@itp.ac.cn,
shlwell1988@gmail.com,
peiwen.wu123@gmail.com,
jmyang@itp.ac.cn,
zhangyang@itp.ac.cn

Validation for signal region "SRlbb-1"			
	ATLAS	CheckMATE	Diff.
$m_{\tilde{\chi}_1^0}, m_{\tilde{\chi}_1^\pm, \tilde{\chi}_2^0}$ [GeV]	0,130	0,130	
$\sigma(pp \rightarrow \tilde{\chi}_1^\pm, \tilde{\chi}_2^0)$ [pb]	4.24	4.24	
Generated luminosity [fb^{-1}]	200	200	
Expected events for 20.3 fb^{-1}			
1 lepton + 2 b-jets	531.1	685.986	0.29109
$E_T^{miss} > 100GeV$	163.7	145.653	-0.11024
$m_{CT} > 160GeV$	70.4	71.659	0.017884
$m_T^W > 100GeV$	9.7	9.6425	-0.00593
$45GeV < m_{bb} < 195GeV$	9.6	9.541	-0.00615
SRlbb-1, central m_{bb} bin	7.2	6.09	-0.15417
SRlbb-1, m_{bb} sideband	2.0	2.5375	0.26875
SRlbb-2, central m_{bb} bin	0.3	-	
SRlbb-2, m_{bb} sideband	0.2	-	

Table 1: Validation for the signal region of the one lepton and two b-jets channel "SRlbb-1". The "Diff." stands for (Events of CheckMATE - Events of ATLAS) / (Events of ATLAS). We generated the simulation events with generated luminosity 200 fb^{-1} just as what ATLAS suggested. So the statistical errors are clear and for simplicity we do not show them here. And the signal region "SRlbb-1" is optimized for a mass splitting between $\tilde{\chi}_1^0$ and $\tilde{\chi}_2^0$ similar to the Higgs boson mass, while the signal region "SRlbb-2" targets larger mass splittings. So efficiency is quite low for "SRlbb-2" in the case ($m_{\tilde{\chi}_2^0}, m_{\tilde{\chi}_1^0} = (130GeV, 0GeV)$) and the statistical error is quite large. We don't show our simulation result for "SRlbb-2" in the case.

Validation for signal region "SRlbb-2"			
	ATLAS	CheckMATE	Diff.
$m_{\tilde{\chi}_1^0}, m_{\tilde{\chi}_1^\pm, \tilde{\chi}_2^0}$ [GeV]	0,250	0,250	
$\sigma(pp \rightarrow \tilde{\chi}_1^\pm, \tilde{\chi}_2^0)$ [pb]	0.32	0.32	
Generated luminosity [fb^{-1}]	2000	2000	
Expected events for $20.3 fb^{-1}$			
1 lepton + 2 b-jets	71.3	64.9498	-0.08906
$E_T^{miss} > 100 GeV$	45.2	36.0224	-0.20304
$m_{CT} > 160 GeV$	15.0	13.9969	-0.06687
$m_T^W > 100 GeV$	8.1	6.8817	-0.15041
$45 GeV < m_{bb} < 195 GeV$	8.0	6.7802	-0.15248
SRlbb-1, central m_{bb} bin	1.3	-	
SRlbb-1, m_{bb} sideband	0.4	-	
SRlbb-2, central m_{bb} bin	4.4	3.3292	-0.24336
SRlbb-2, m_{bb} sideband	1.9	1.65445	-0.12924

Table 2: Same as Table.1 but validation for the signal region of the one lepton and two b-jets channel "SRlbb-2". We don't show our simulation result for "SRlbb-1" in the case.

Validation for signal region "SRl $\gamma\gamma$ -1/2"			
	ATLAS	CheckMATE	Difference
$m_{\tilde{\chi}_1^0}, m_{\tilde{\chi}_1^\pm, \tilde{\chi}_2^0}$ [GeV]	0,150	0,150	
$\sigma(pp \rightarrow \tilde{\chi}_1^\pm, \tilde{\chi}_2^0)$ [pb]	2.45	2.45	
Generated luminosity [fb^{-1}]	8000	408	
Expected events for $20.3 [fb^{-1}]$			
1 lepton + 2 photons	-		
$100 GeV < m_{\gamma\gamma} < 160 GeV$	8.0	10.0962	0.262025
$E_T^{miss} > 40 GeV$	6.2	7.80839	0.259418
$\Delta\phi(W, h) > 2.25$	5.5	4.07827	-0.2585
$SRl\gamma\gamma - 1$	4.9	3.53118	-0.27935
$SRl\gamma\gamma - 2$	0.6	0.547085	-0.08819

Table 3: Validation for one lepton and two photons channel "SRl $\gamma\gamma$ -1/2". Due to the capability of our computing devices, we generate simulation events with generated luminosity $408 fb^{-1}$. And the information about the cutflow level "1 lepton + 2 photons" is incomplete in the report by ATLAS so we don't try to match the events by ATLAS with our simulation result at this level.

Validation for signal regions SRee, SRmm and SRem												
$m_{\tilde{\chi}_1^0}, m_{\tilde{\chi}_1^\pm}, \tilde{\chi}_2^0$ [GeV]	0,130											
$\sigma(pp \rightarrow \tilde{\chi}_1^\pm, \tilde{\chi}_2^0)$ [pb]	4.24											
generated luminosity [fb^{-1}]	487											
expected events for $20.3 fb^{-1}$												
	ee			mm			em					
	ATLAS	CheckMATE	Diff	ATLAS	CheckMATE	Diff	ATLAS	CheckMATE	Diff	ATLAS	CheckMATE	Diff
Same Sign	61.2	-		91.5	-		123.5	-		123.5	-	
Veto forward jet and b-jet	48.3	-		70.9	-		96.3	-		96.3	-	
1-3 central jets	27.9	-		37.9	-		53.8	-		53.8	-	
Z veto	22.4	26.2885	0.173594									
Lepton pt	21.4	22.8375	0.067173	28	32.3785	0.156375	34.5	37.2505	0.079725	37.2505	0.079725	
$\Delta\eta_{ll}$				23.2	27.3035	0.176875	29.4	31.871	0.084048	31.871	0.084048	
$E_T^{miss,rel}$	9.5	9.0335	-0.04911									
m_{eff}	8.61	8.323	-0.03333	14.9	16.9505	0.137617	21.4	23.142	0.081402	23.142	0.081402	
m_T^{max}	6.34	6.5975	0.040615	13	12.992	-0.00062	14.4	14.9205	0.036146	14.9205	0.036146	
m_{ij} or m_{ljj}	4.22	4.669	0.106398	7.97	8.0185	0.006085	8.93	10.4545	0.170717	10.4545	0.170717	

Table 4: Validation for the same-sign dilepton channel, i.e., "SRee" meaning two electrons, "SRmm" meaning two muons and "SRem" meaning one electron combined with one muon. Due to the capability of our computing devices we generated simulation events with generated luminosity $200 fb^{-1}$. There are no cut " $\Delta\eta_{ll}$ " for the signal region "SRee" and no cuts "Z veto" and " $E_T^{miss,rel}$ " for both signal regions "SRmm" and "SRem" in the report by ATLAS. For the same reason as that in Table. 3, we do not try to match our simulation results with those given by ATLAS in the first three cutflow levels.