1 QQdirect

- Process: $pp \to \tilde{q}\tilde{q}, \tilde{q} \to q\tilde{\chi}_1^0$
- Parameters: $(m_{\tilde{q}}, m_{\tilde{\chi}_1^0}) = (1000, 400)\,\mathrm{GeV}$
- Number of Atom MC events: 7380
- Event Generator: `MadGraph5 + Pythia6`

#	cut name	$\epsilon_{\rm Exp}$ (%)	$\epsilon_{\rm Atom}$ (%)	$\frac{\rm Atom}{\rm Exp}$	$\frac{\rm (Exp-Atom)}{\rm Error}$	#/?	$R_{\rm Exp}$ (%)	$R_{\rm Atom}$ (%)	$\frac{\rm Atom}{\rm Exp}$	$\frac{\rm (Exp-Atom)}{\rm Error}$	$\partial \log \epsilon_{\rm Atom}/\partial \log x_{\rm cut}$
1	Preselection, MET >200, $p_T^{j1}>200$	84.78 0.65	$92.63^{+0.31}_{-0.3}$	1.09	10.95	0	84.78 0.65	$92.63^{+0.31}_{-0.3}$	1.09	10.95	$0.14^{+0.09}_{0.09}$
2	$N_j \geq 2$: 2jl	83.52 ± 0.65	$92.01^{+0.32}_{-0.31}$	1.1	11.85	1	98.51 ± 2.59	$99.33^{+0.47}_{-0.47}$	1.01	0.31	$0.0^{+0.0}_{0.0}$
3	$\Delta\phi_{min} > 0.8$: 2jl	66.05 ± 0.57	$51.2^{+0.59}_{-0.58}$	0.78	-18.04	2	79.09 ± 2.44	$55.65^{+0.67}_{-0.66}$	0.7	-9.27	$0.0^{+0.0}_{0.0}$
4	$p_T^{j2} > 200$: 2jl	49.25 ± 0.5	$44.0^{+0.58}_{-0.57}$	0.89	-6.88	3	74.57 ± 2.14	$85.94^{+1.49}_{-1.49}$	1.15	4.36	$0.0^{+0.0}_{0.0}$
5	MET/$\sqrt{H_T} > 15$: 2jl	31.8 ± 0.4	$40.3^{+0.57}_{-0.57}$	1.27	12.21	4	64.57 ± 1.78	$91.59^{+1.76}_{-1.77}$	1.42	10.75	$0.0^{+0.0}_{0.0}$
6	$m_{\rm eff}^{\rm inc} > 1200$: 2jl	28.8 ± 0.38	$37.6^{+0.57}_{-0.56}$	1.31	13.0	5	90.57 ± 1.56	$93.3^{+1.93}_{-1.92}$	1.03	1.11	$0.0^{+0.0}_{0.0}$
7	$p_T^{j1} > 300$: 2jm	77.0 ± 0.62	$89.57^{+0.36}_{-0.35}$	1.16	17.64	0	90.82 ± 78.44	$96.7^{+47.51}_{46.1}$	1.06	0.06	$0.0^{+0.0}_{0.0}$
8	$N_j \geq 2$: 2jm	75.92 ± 0.62	$89.01^{+0.37}_{-0.36}$	1.17	18.34	7	98.6 ± 2.47	$99.37^{+0.57}_{-0.57}$	1.01	0.3	$0.0^{+0.0}_{0.0}$
9	$\Delta\phi_{min} > 0.4$: 2jm	67.77 ± 0.58	$68.7^{+0.54}_{-0.54}$	1.01	1.17	8	89.26 ± 2.4	$77.18^{+0.68}_{-0.69}$	0.86	-4.85	$0.0^{+0.0}_{0.0}$
10	$p_T^{j2} > 50$: 2jm	67.77 ± 0.58	$68.7^{+0.54}_{-0.54}$	1.01	1.17	9	100.0 ± 2.33	$100.0^{+1.11}_{-1.11}$	1.0	0.0	$0.0^{+0.0}_{0.0}$
11	MET/$\sqrt{H_T} > 15$: 2jm	44.51 ± 0.47	$62.86^{+0.57}_{-0.56}$	1.41	25.07	10	65.67 ± 2.1	$91.5^{+1.1}_{-1.09}$	1.39	10.92	$0.0^{+0.0}_{0.0}$
12	$m_{\rm eff}^{\rm inc} > 1600 : 2jm$	20.79 ± 0.32	$49.2^{+0.59}_{-0.58}$	2.37	42.82	11	46.7 ± 1.57	$78.27^{+1.17}_{-1.16}$	1.68	16.12	$0.0^{+0.0}_{0.0}$
13	$Nj \geq 2$: 2jt	83.52 ± 0.65	$92.01^{+0.32}_{-0.31}$	1.1	11.85	0	98.51 ± 78.73	$99.33^{+44.55}_{43.14}$	1.01	0.01	$0.0^{+0.0}_{0.0}$
14	$\Delta\phi_{min} > 0.8$: 2jt	66.05 ± 0.57	$51.2^{+0.59}_{-0.58}$	0.78	-18.04	13	79.09 ± 2.44	$55.65^{+0.67}_{-0.66}$	0.7	-9.27	$0.0^{+0.0}_{0.0}$
15	$p_T^{j2} > 200$: 2jt	49.25 ± 0.5	$44.0^{+0.58}_{-0.57}$	0.89	-6.88	14	74.57 ± 2.14	$85.94^{+1.49}_{-1.49}$	1.15	4.36	$0.0^{+0.0}_{0.0}$
16	MET/$\sqrt{H_T} > 20$: 2jl	19.64 ± 0.31	$21.6^{+0.48}_{-0.47}$	1.1	3.47	15	39.87 ± 1.6	$49.09^{+1.26}_{-1.25}$	1.23	4.54	$0.0^{+0.0}_{0.0}$
17	$m_{\rm eff inc} > 2000 : 2jt$	3.75 ± 0.14	$14.8^{+0.42}_{-0.41}$	3.94	25.55	16	19.12 ± 0.86	$68.52^{+2.45}_{-2.43}$	3.58	19.13	$0.0^{+0.0}_{0.0}$
18	$N_j \geq 4$: 4jt	29.75 ± 0.39	$59.06^{+0.58}_{-0.57}$	1.99	42.59	0	35.09 ± 75.52	$63.76^{+65.76}_{64.41}$	1.82	0.29	$0.0^{+0.0}_{0.0}$
19	$\Delta\phi_{min}$ cut: 4jt	24.13 ± 0.35	$36.9^{+0.57}_{-0.56}$	1.53	19.39	18	81.09 ± 1.46	$62.48^{+1.14}_{-1.13}$	0.77	-10.03	$0.16^{+0.14}_{0.14}$
20	$p_T^{j2} > 100$: 4jt	23.84 ± 0.35	$36.7^{+0.57}_{-0.56}$	1.54	19.54	19	98.84 ± 1.39	$99.46^{+2.16}_{-2.16}$	1.01	0.24	$0.0^{+0.0}_{0.0}$
21	$p_T^{j4} > 100$: 4jt	8.6 ± 0.21	$26.2^{+0.52}_{-0.51}$	3.05	31.97	20	36.07 ± 1.09	$71.39^{+1.79}_{-1.78}$	1.98	16.95	$0.0^{+0.0}_{0.0}$
22	Aplanarity > 0.04: 4jt	4.91 ± 0.16	$26.2^{+0.52}_{-0.51}$	5.34	39.92	21	57.03 ± 0.72	$100.0^{+2.78}_{-2.78}$	1.75	14.96	$0.0^{+0.0}_{0.0}$
23	MET/$\sqrt{H_T} > 0.2$" 4jt	4.36 ± 0.15	$18.2^{+0.45}_{-0.44}$	4.17	29.82	22	88.89 ± 0.61	$69.47^{+2.19}_{-2.17}$	0.78	-8.56	$0.0^{+0.0}_{0.0}$
24	$m_{\rm eff}^{\rm inc} > 2200 : 4jt$	0.99 ± 0.07	$16.2^{+0.43}_{-0.42}$	16.36	35.72	23	22.71 ± 0.42	$89.01^{+3.2}_{-3.19}$	3.92	20.61	$0.0^{+0.0}_{0.0}$
25	$N_j \geq 5$: 5j	11.29 ± 0.24	$37.1^{+0.57}_{-0.56}$	3.28	42.42	0	13.32 ± 73.21	$40.05^{+64.88}_{63.53}$	3.01	0.28	$0.0^{+0.0}_{0.0}$
26	$\Delta\phi_{min}$ cut: 5j	8.79 ± 0.21	$21.9^{+0.49}_{-0.48}$	2.49	25.03	25	77.82 ± 0.89	$59.03^{+1.59}_{-1.58}$	0.76	-10.29	$0.21^{+0.18}_{0.18}$
27	$p_T^{j2} > 100$: 5j	8.71 ± 0.21	$21.9^{+0.49}_{-0.48}$	2.51	25.2	26	99.09 ± 0.84	$100.0^{+3.13}_{-3.13}$	1.01	0.28	$0.0^{+0.0}_{0.0}$
28	$p_T^{j5} > 50$: 5j	4.78 ± 0.15	$21.9^{+0.49}_{-0.48}$	4.59	33.96	27	54.82 ± 0.72	$100.0^{+3.13}_{-3.13}$	1.82	14.06	$0.0^{+0.0}_{0.0}$
29	Aplanarity > 0.04: 5j	2.99 ± 0.12	$21.9^{+0.49}_{-0.48}$	7.34	38.19	28	62.51 ± 0.55	$100.0^{+3.13}_{-3.13}$	1.6	11.79	$0.0^{+0.0}_{0.0}$
30	MET/$m_{\rm efff}(N_j) > 0.25$" 5j	2.17 ± 0.1	$11.7^{+0.38}_{-0.37}$	5.39	24.79	29	72.7 ± 0.45	$53.42^{+2.09}_{-2.07}$	0.73	-9.0	$0.0^{+0.0}_{0.0}$
31	$m_{\rm eff}^{\rm inc} > 1600$: 5j	1.65 ± 0.09	$11.2^{+0.37}_{-0.36}$	6.79	25.72	30	76.04 ± 0.39	$95.73^{+4.38}_{-4.37}$	1.26	4.48	$0.0^{+0.0}_{0.0}$
32	$N_j \geq 6$: 6jm	3.62 ± 0.13	$19.7^{+0.47}_{-0.46}$	5.43	33.54	0	4.28 ± 71.16	$21.27^{+56.3}_{54.92}$	4.97	0.19	$0.0^{+0.0}_{0.0}$
33	$\Delta\phi_{min}$ cut: 6jm	2.71 ± 0.12	$11.3^{+0.37}_{-0.36}$	4.16	22.69	32	74.9 ± 0.5	$57.36^{+2.31}_{-2.28}$	0.77	-7.43	$0.23^{+0.25}_{0.24}$
34	$p_T^{j2} > 100$: 6jm	2.71 ± 0.12	$11.3^{+0.37}_{-0.36}$	4.17	22.7	33	99.82 ± 0.47	$100.0^{+4.57}_{-4.57}$	1.0	0.04	$0.0^{+0.0}_{0.0}$
35	$p_T^{j6} > 50$: 6jm	1.92 ± 0.1	$11.3^{+0.37}_{-0.36}$	5.9	25.16	34	70.66 ± 0.43	$100.0^{+4.57}_{-4.57}$	1.42	6.39	$0.0^{+0.0}_{0.0}$
36	Aplanarity > 0.04: 6jm	1.32 ± 0.08	$11.3^{+0.37}_{-0.36}$	8.53	27.03	35	69.19 ± 0.36	$100.0^{+4.57}_{-4.57}$	1.45	6.72	$0.0^{+0.0}_{0.0}$
37	MET/$m_{\rm efff}(N_j) > 0.25$" 6jm	0.91 ± 0.07	$5.49^{+0.27}_{-0.26}$	6.07	17.07	36	68.3 ± 0.3	$48.58^{+2.85}_{-2.8}$	0.71	-6.89	$0.0^{+0.0}_{0.0}$
38	$m_{\rm eff}^{\rm inc} > 1600$: 6jm	0.74 ± 0.06	$5.35^{+0.27}_{-0.26}$	7.23	17.26	37	81.77 ± 0.26	$97.45^{+6.74}_{-6.74}$	1.19	2.33	$0.0^{+0.0}_{0.0}$
39	$N_j \geq 6$: 6jt	3.62 ± 0.13	$19.7^{+0.47}_{-0.46}$	5.43	33.54	0	4.28 ± 71.16	$21.27^{+56.3}_{54.92}$	4.97	0.19	$0.0^{+0.0}_{0.0}$
40	$\Delta\phi_{min}$ cut: 6jt	2.71 ± 0.12	$11.3^{+0.37}_{-0.36}$	4.16	22.69	39	74.9 ± 0.5	$57.36^{+2.31}_{-2.28}$	0.77	-7.43	$0.23^{+0.25}_{0.24}$
41	$p_T^{j2} > 100$: 6jt	2.71 ± 0.12	$11.3^{+0.37}_{-0.36}$	4.17	22.7	40	99.82 ± 0.47	$100.0^{+4.57}_{-4.57}$	1.0	0.04	$0.0^{+0.0}_{0.0}$
42	$p_T^{j2} > 100$: 6jt	1.92 ± 0.1	$11.3^{+0.37}_{-0.36}$	5.9	25.16	41	70.66 ± 0.43	$100.0^{+4.57}_{-4.57}$	1.42	6.39	$0.0^{+0.0}_{0.0}$
43	Aplanarity > 0.04: 6jt	1.32 ± 0.08	$11.3^{+0.37}_{-0.36}$	8.53	27.03	42	69.19 ± 0.36	$100.0^{+4.57}_{-4.57}$	1.45	6.72	$0.0^{+0.0}_{0.0}$
44	MET/$m_{\rm efff}(N_j) > 0.25$: 6jt	1.06 ± 0.07	$7.29^{+0.31}_{-0.3}$	6.88	20.18	43	80.0 ± 0.31	$64.51^{+3.43}_{-3.39}$	0.81	-4.5	$0.0^{+0.0}_{0.0}$
45	$m_{\rm eff}^{\rm inc} > 1600$: 6jt	0.48 ± 0.05	$6.83^{+0.3}_{-0.29}$	14.08	21.57	44	45.75 ± 0.24	$93.69^{+5.64}_{-5.63}$	2.05	8.51	$0.0^{+0.0}_{0.0}$

Table 1: