

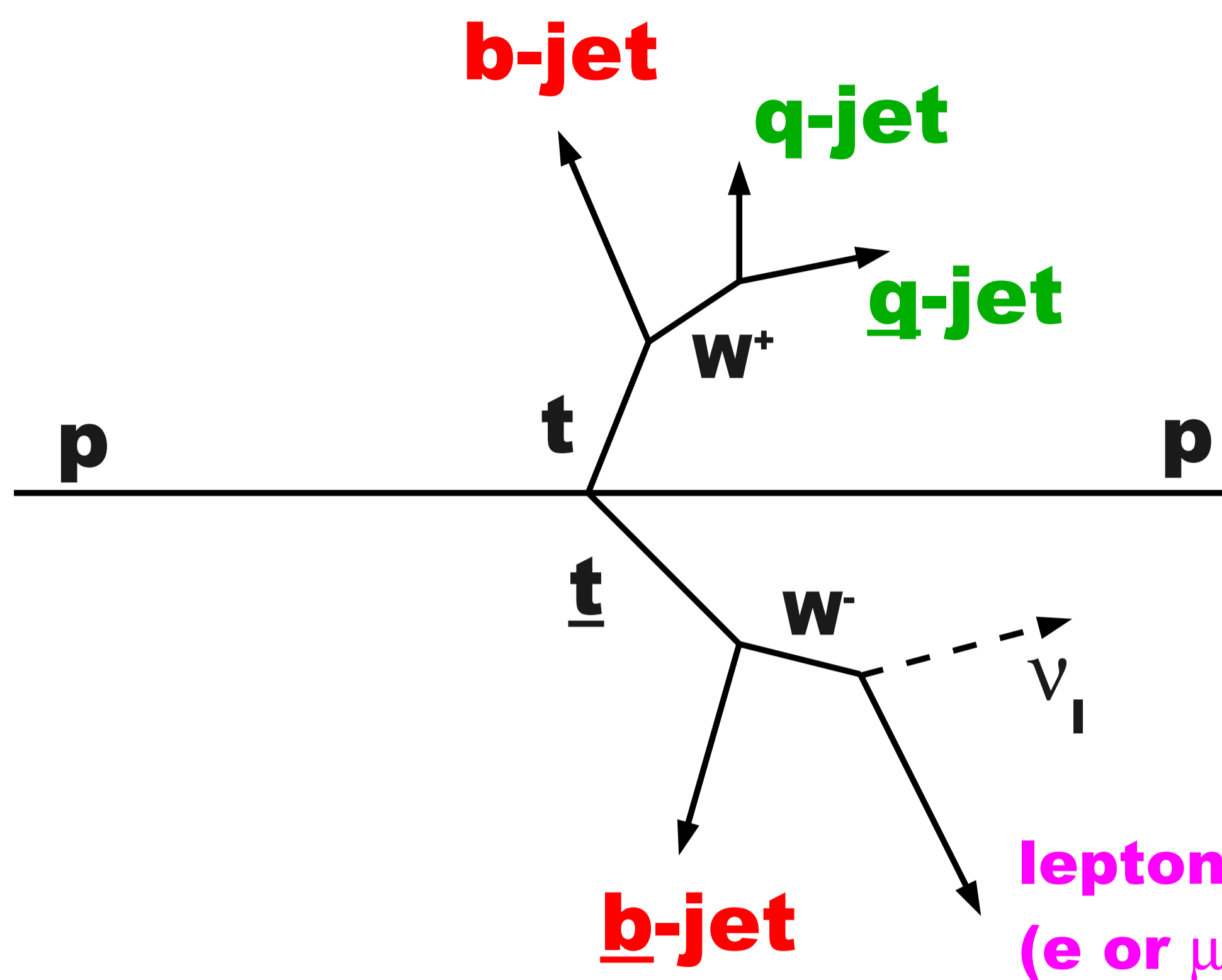
# New method for data-driven top quark mass measurement at the LHC

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$pp \rightarrow t\bar{t} \rightarrow$  "lepton+jets"

MC@NLO  $t\bar{t}$  and ALPGEN W+jets

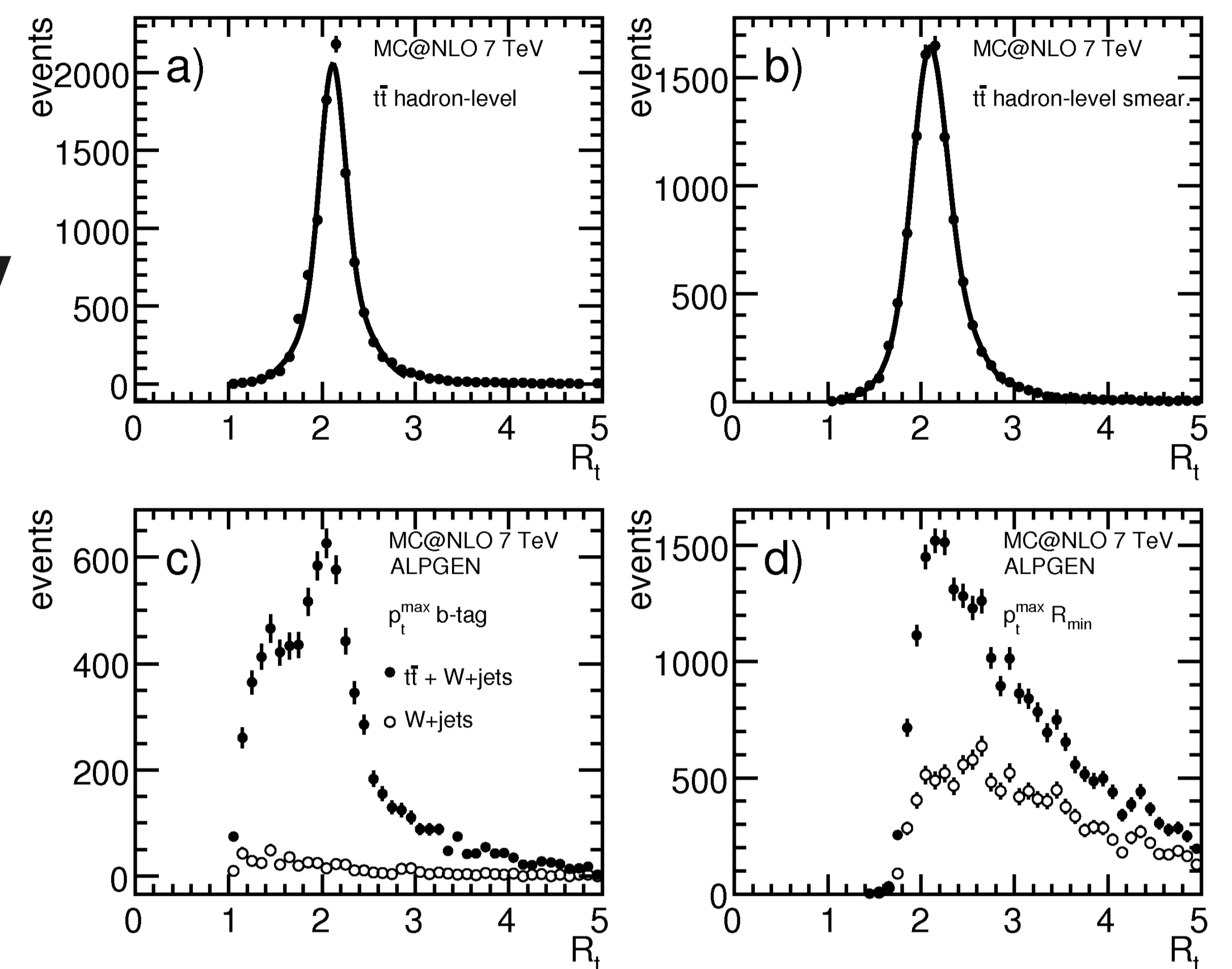
$R_t = m_t/m_w$   
Expect  $R_t = 170.9/80.4 = 2.126$



**Require:**  
all objects  $|\eta| < 2.5$   
1 lepton  $p_t > 20$  GeV  
3 jets  $p_t > 40$  GeV, 1 jet  $p_t > 20$  GeV

Jet finding w/o leptons  
Jet energy smearing  $\sim \sqrt{E_{jet}}$

$p_t^{max}$  jet triplet is hadronic top decay candidate, **b-tag** in triplet finds hadronic W decay, or take two jets with  $R_{min}$  in triplet cms

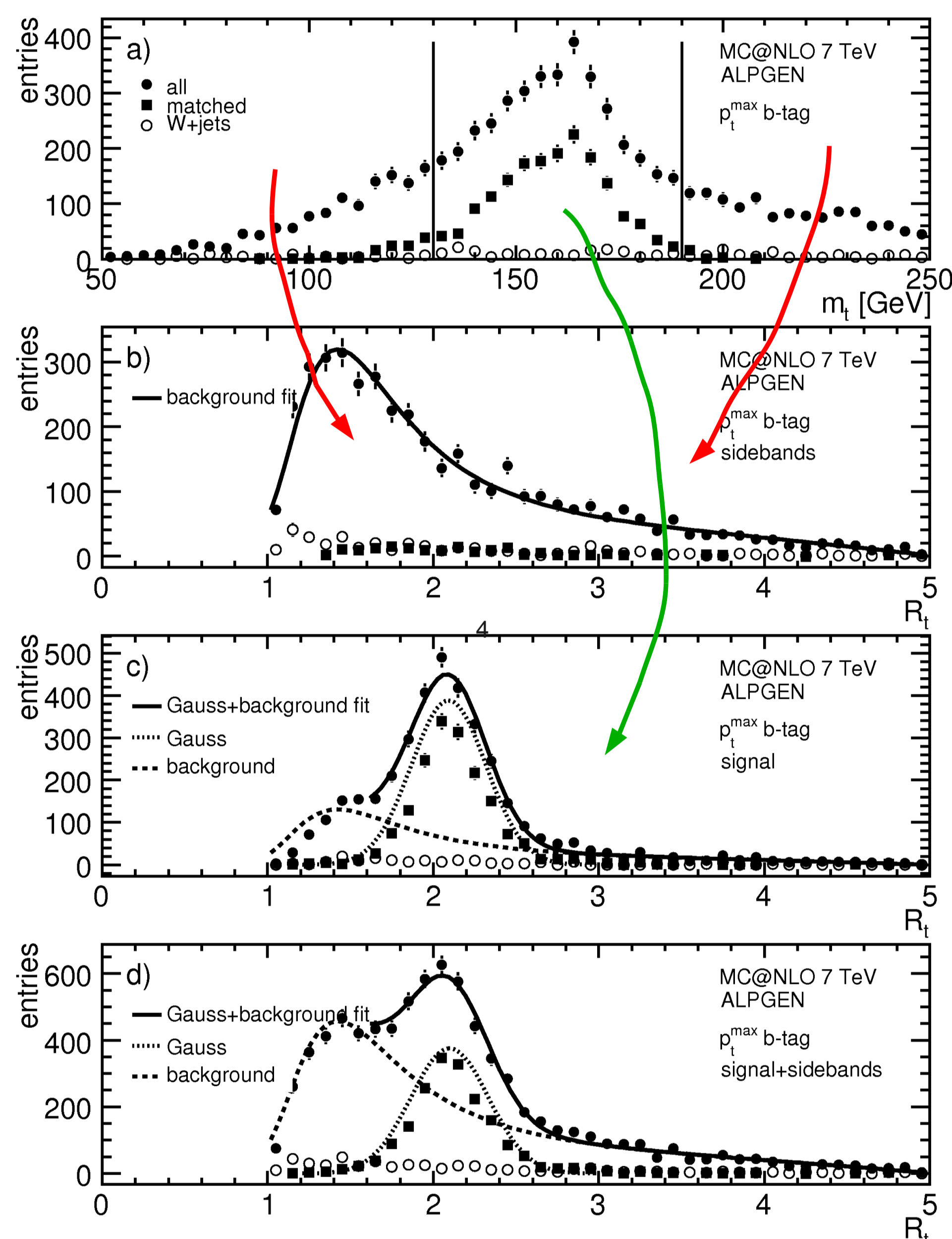


Sidebands in  $m_t$  separate signal and background

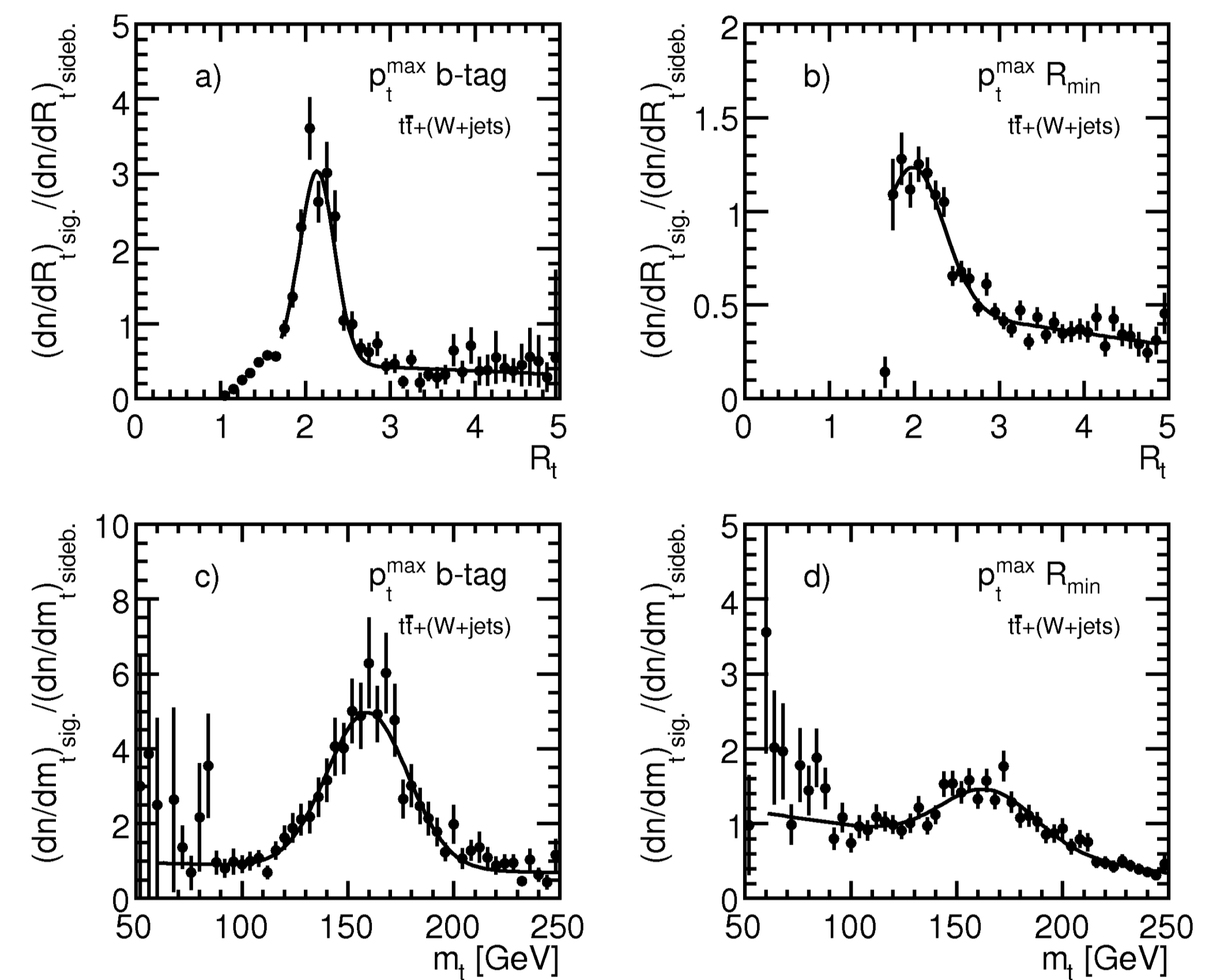
Parametrise bkg shape

Fit signal with  $N \cdot$  (bkg shape) + Gauss

Less sensitive to bkg simulation

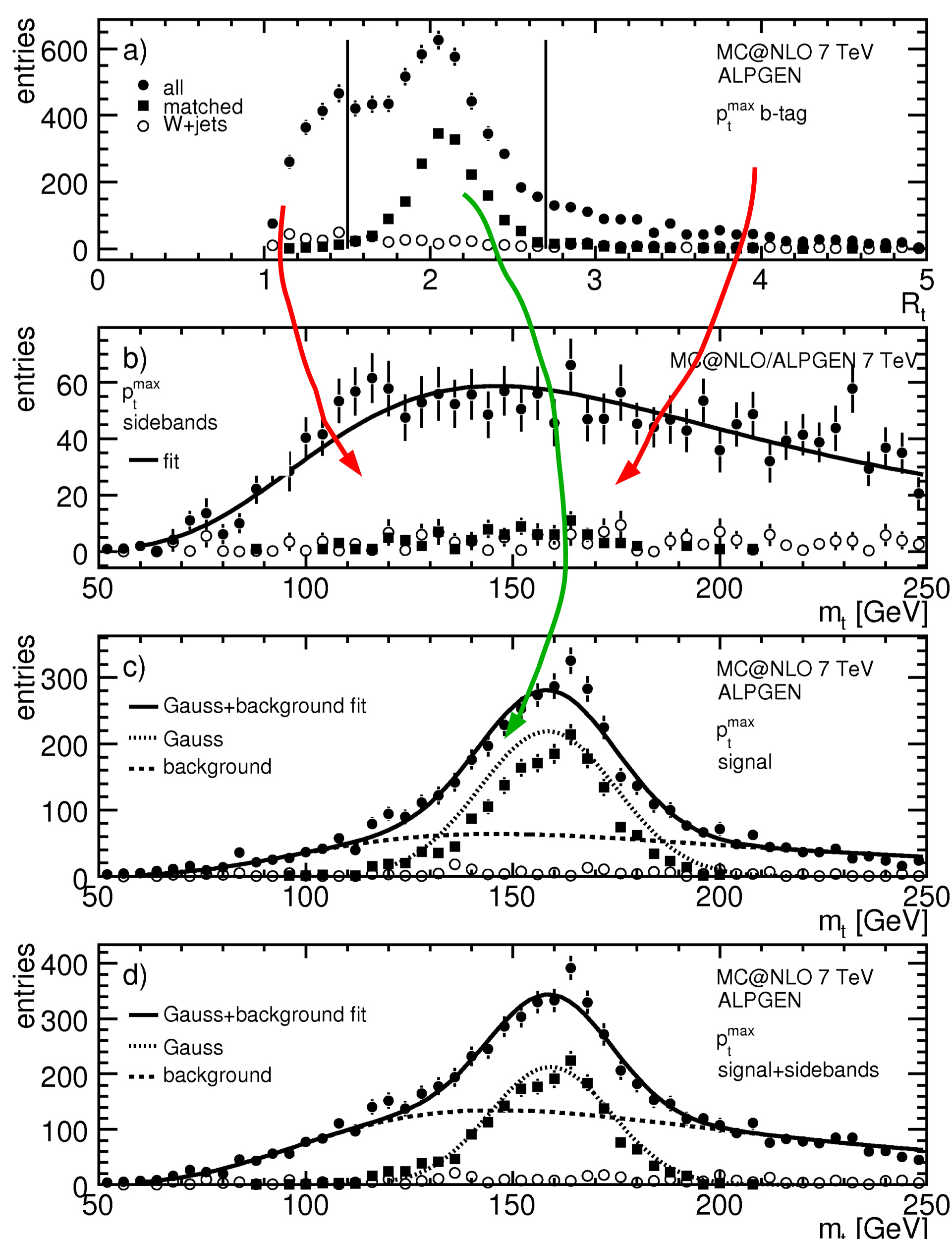


Exclude small  $R_t$



$R_{min}$ : use slope correction (bkg shape)(1+ax) in fits

Swap  $R_t$  and  $m_t$



[GeV]	b-tag				$R_{min}$			
	all	sig.	all	sig.	all	sig.	all	sig.
$m_t$	168.77	168.27	159.08	158.43	169.55	172.03	162.30	162.68
stat.	0.84	0.59	0.69	0.57	1.25	0.90	0.87	0.81
energy scale	0.45	0.04	7.65	7.56	0.16	0.23	8.16	7.57
b energy scale	1.65	1.32	1.40	1.34	0.98	1.23	1.35	1.43
b-tag eff.	0.13	0.00	0.13	0.10	0.00	0.00	0.00	0.00
b-tag fakes	0.54	0.96	0.65	0.28	0.00	0.00	0.00	0.00
$p_t$ cut	0.27	0.28	1.88	2.28	1.44	0.14	1.16	0.73
jet alg.	0.79	0.60	2.27	3.01	1.42	1.46	2.41	2.44
scales	0.36	0.67	1.50	1.64	2.15	1.73	1.41	1.41
pdf	0.36	0.67	1.50	1.64	2.15	1.73	1.41	1.41
UE	0.08	0.40	1.12	1.59	0.69	0.46	0.81	0.98
tot. syst.	2.05	2.04	8.68	9.01	3.85	3.14	8.95	8.42
tot. syst. red.	1.42	1.26	8.46	8.88	2.67	2.52	8.65	8.15

$R_t$  with sidebands:

reduced sensitivity to jet energy scale

reduced dependence on bkg simulation

expect reduced systematics (~2%) in expt

Calibration vs input  $m_t$

