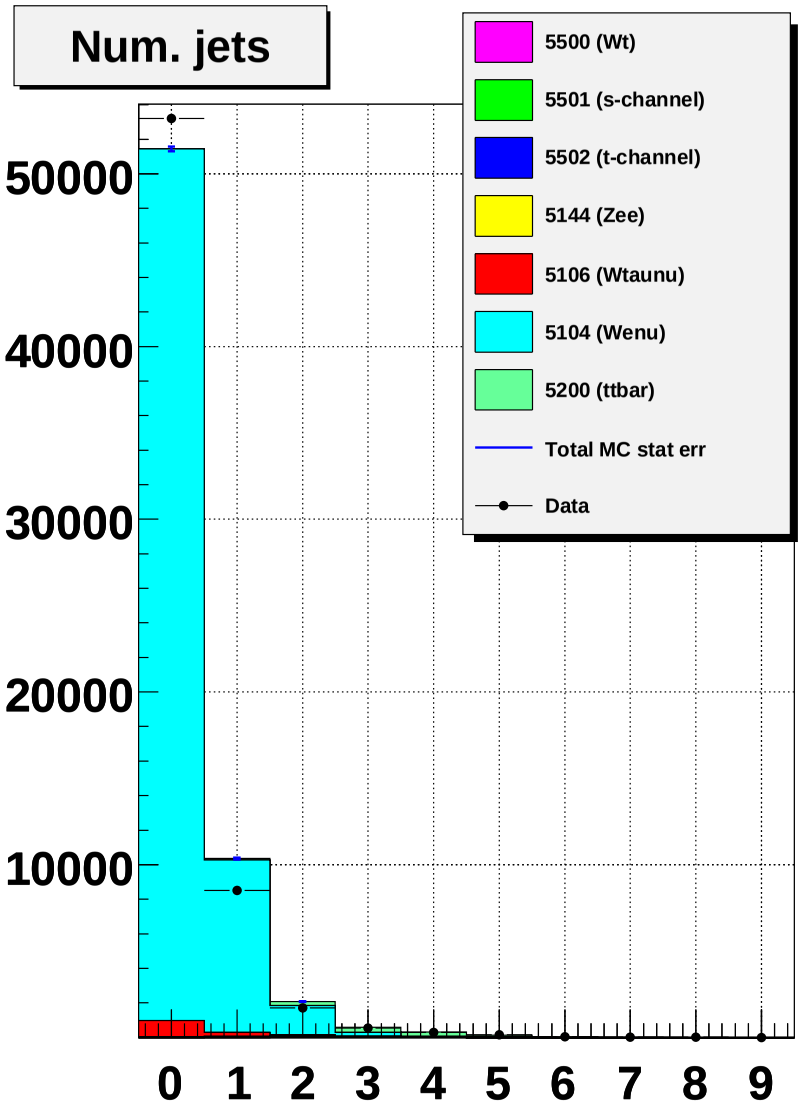
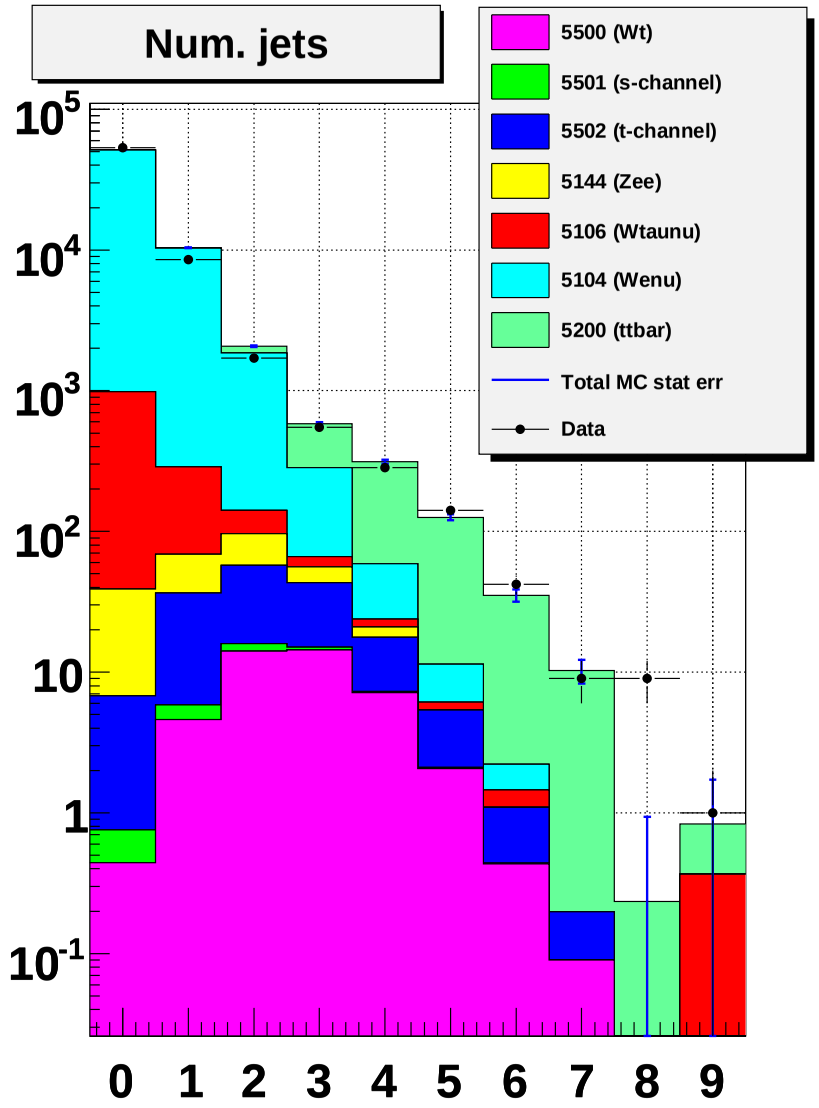




No fitting, scaling EW backgrounds to match 0+1 jets bin.

Fitting

Need to include systematic uncertainties in the fit!

Likelihood fitting is a better aproach, especially when there are bins with small statistics. But accounting for systematic errors is more difficult.

- Use χ^2 minimization:
  $f(x) = x^T (V^{-1})\, x$, where $V_{ij} \equiv \mathrm{cov}[x_i, x_j]$
- Our fit variables x: number of i-jets events N_i.
- Statistical part of V is trivial: $V_{ij}^{\mathrm{stat}} = N_i \delta_{ij}$ (no sum).
- Need to compute V_{ij}^{sys} to do the fit.

Systematic errors: Jet energy scale

- Systematic random variable s (the scale).
- Number of i-jets events $N_i = N_i(s)$.
- $V_{ij} = \mathrm{cov}[N_i, N_j] \approx \mathrm{cov}[\frac{\partial N_i}{\partial s}\delta s, \frac{\partial N_j}{\partial s}\delta s]$

$$= \frac{\partial N_i}{\partial s}\frac{\partial N_j}{\partial s}\,\mathrm{cov}[\delta s, \delta s] = \frac{\partial N_i}{\partial s}\frac{\partial N_j}{\partial s}\,\sigma_s^2$$

$$\approx \Delta N_i \Delta N_j \frac{\sigma_s^2}{\Delta s}$$

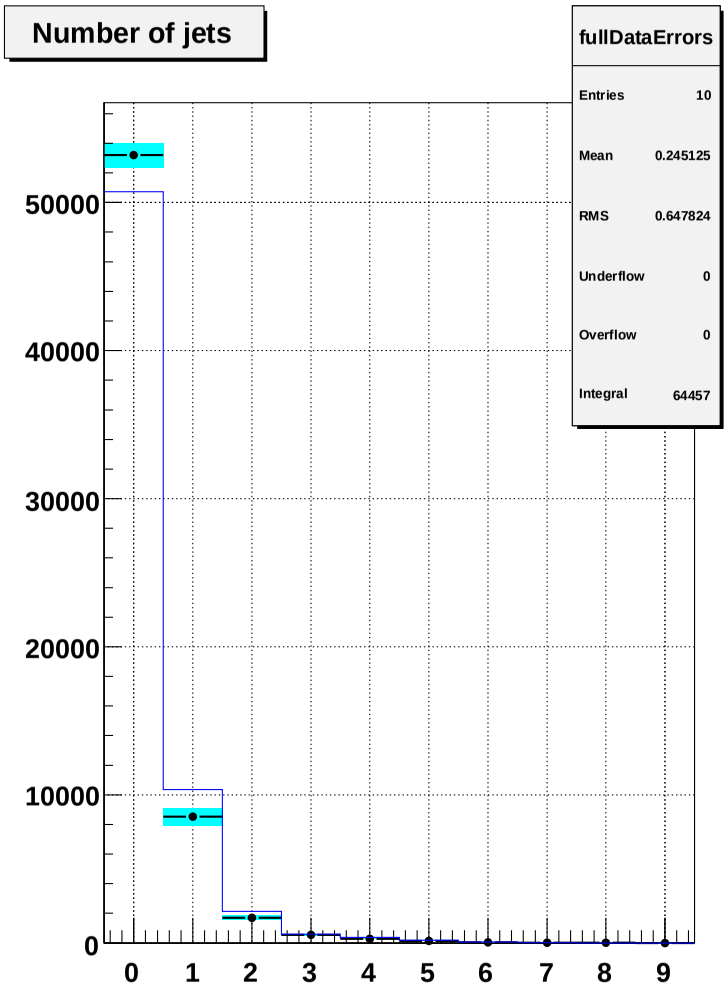
- Obtain N_j for s and $s + \Delta s$ and compute V_{ij}

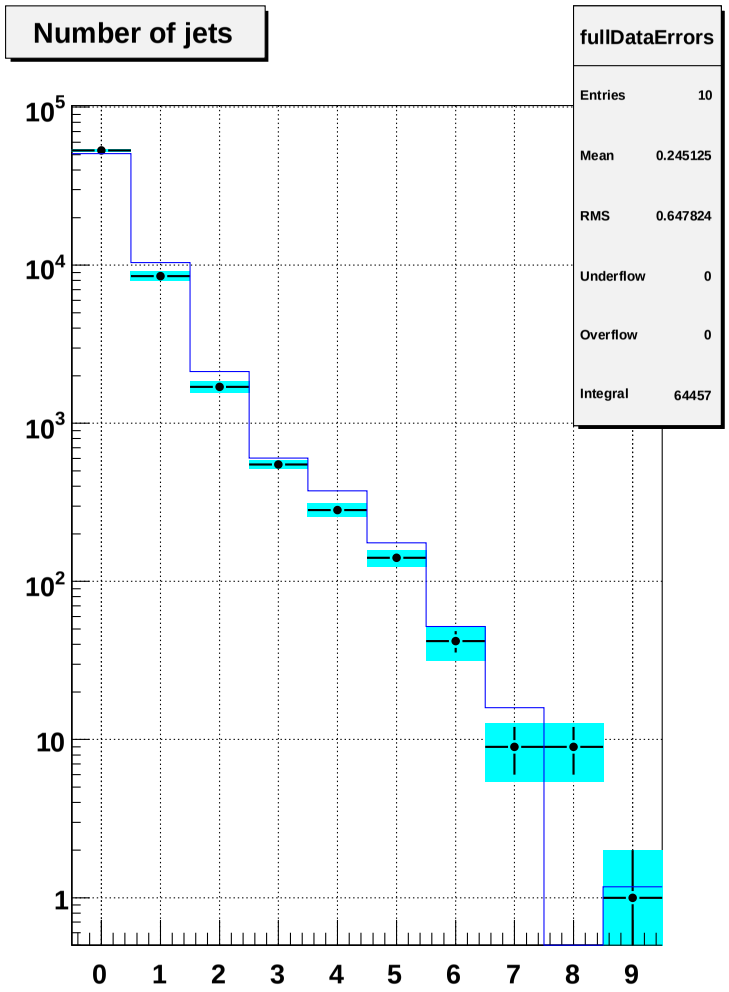
Full correlation matrix.

chi2correlations

	0	1	2	3	4	5	6
6	-0.746156	0.767702	0.741444	0.586758	0.606089	0.552017	1
5	-0.682505	0.702213	0.678195	0.536705	0.554387	1	0.552017
4	-0.749358	0.770997	0.744626	0.589277	1	0.554387	0.606089
3	-0.725458	0.746407	0.720877	1	0.589277	0.536705	0.586758
2	-0.916709	0.94318	1	0.720877	0.744626	0.678195	0.741444
1	-0.949174	1	0.94318	0.746407	0.770997	0.702213	0.767702
0	1	-0.949174	-0.916709	-0.725458	-0.749358	-0.682505	-0.746156

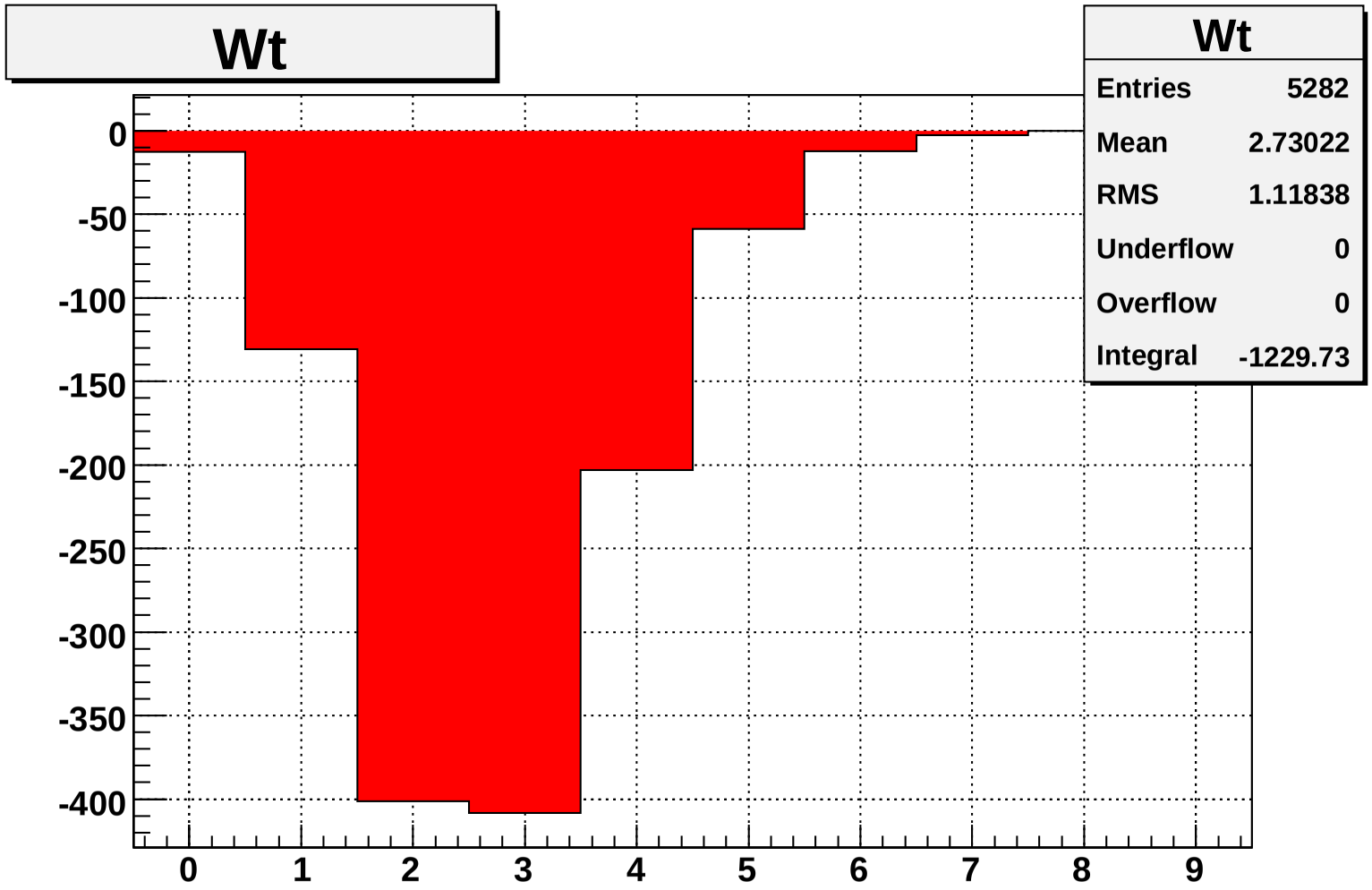
Fit result, free pars.



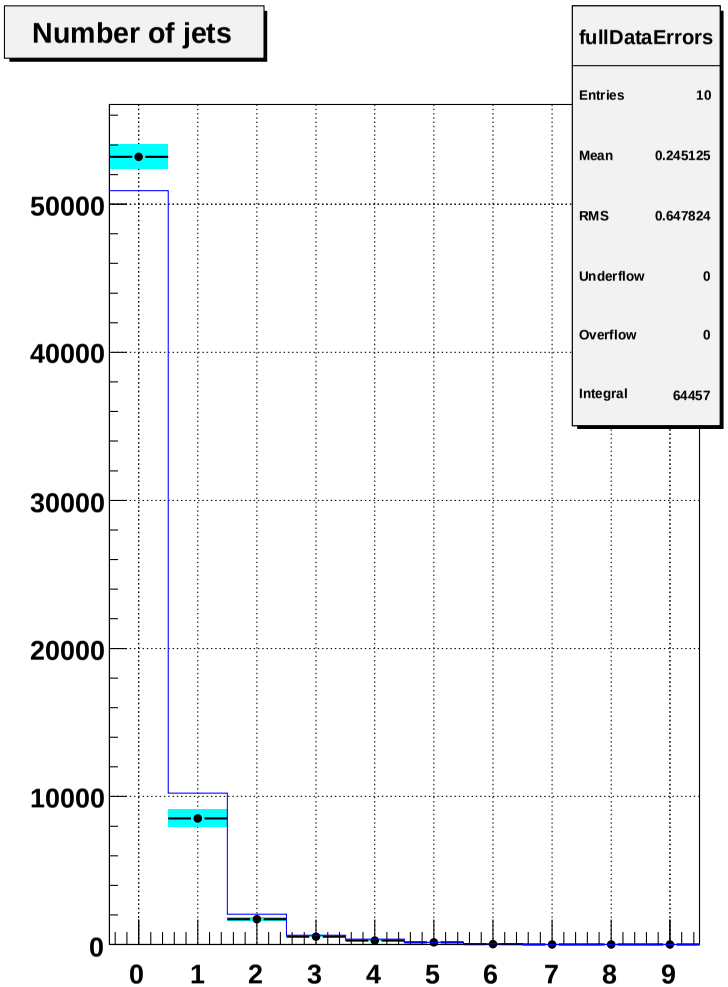


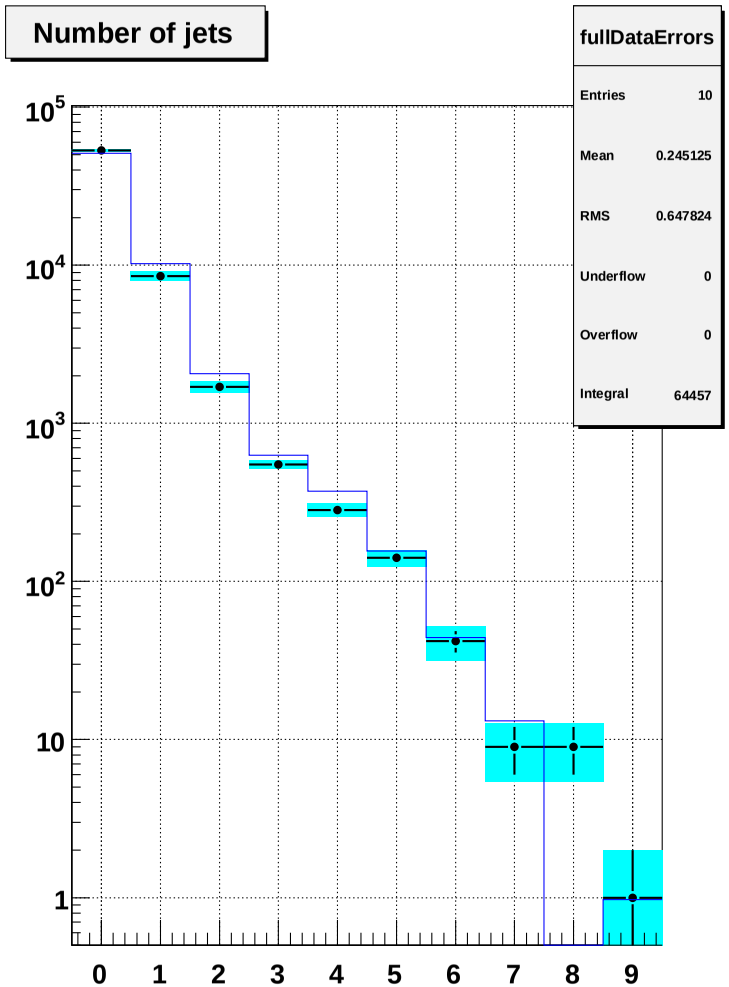
$$\chi^2 = 18.529, \text{ NDF} = 3.$$

Fit result, free pars: Wt fraction.



Constrain parameters ≥ 0





$$\chi^2 = 23.914, \text{ NDF} = 3.$$

Constrained fit result.

# ext.	Name	type	Value	Error +/-
0	ttbar	limited	1309.6318	46.64109
1	EW	limited	63104.174	252.92262
2	Wt	limited	0.00013904627	9.0435009
3	t-chan	limited	1.7281089e-05	11.646773