



Combination of preliminary dilepton mass measurements by the D0 experiment

The D0 Collaboration
<http://www-d0.fnal.gov>

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Introduction

D0 has carried out two measurements of the top quark mass in the dilepton channel using the Neutrino Weighting (vWT) method ¹ and the Matrix Weighting (MWT) method ². The individual results are

$$m_{\text{top}} = 172.5 \pm 5.8 \text{ (stat)} \pm 3.5 \text{ (syst)} \text{ GeV} \quad (\text{vWT})$$
$$m_{\text{top}} = 175.2 \pm 6.1 \text{ (stat)} \pm 3.4 \text{ (syst)} \text{ GeV} \quad (\text{MWT})$$

These are derived based on the same event samples. In order to obtain the most precise measurement we combine these two results. We use the BLUE method ³, using the same formalism as for the combination of the Run IIa results ⁴.

Ensemble tests

We determine the statistical correlation factor between the two measurements using 300 pseudo D0 experiments (ensembles) with the same number of ee, eμ, and μμ events as the data sample (16, 32, 9) with an input top quark mass of 170 GeV. These ensembles are analyzed exactly like the collider data sample. Figure 1 shows the scatter plot of the masses measured for each ensemble by the vWT and the MWT methods. The numerical result for the correlation factor is $r_{12} = 0.67$.

Combined result

Table 1 lists all the uncertainties and the correlation factors used in the combination. We assume that all systematic uncertainties from the same source are completely correlated and that all uncertainties from different sources are mutually uncorrelated. We obtain as the combined measurement of the top quark mass:

$$m_{\text{top}} = 173.7 \pm 5.4 \text{ (stat)} \pm 3.4 \text{ (syst)} \text{ GeV}$$

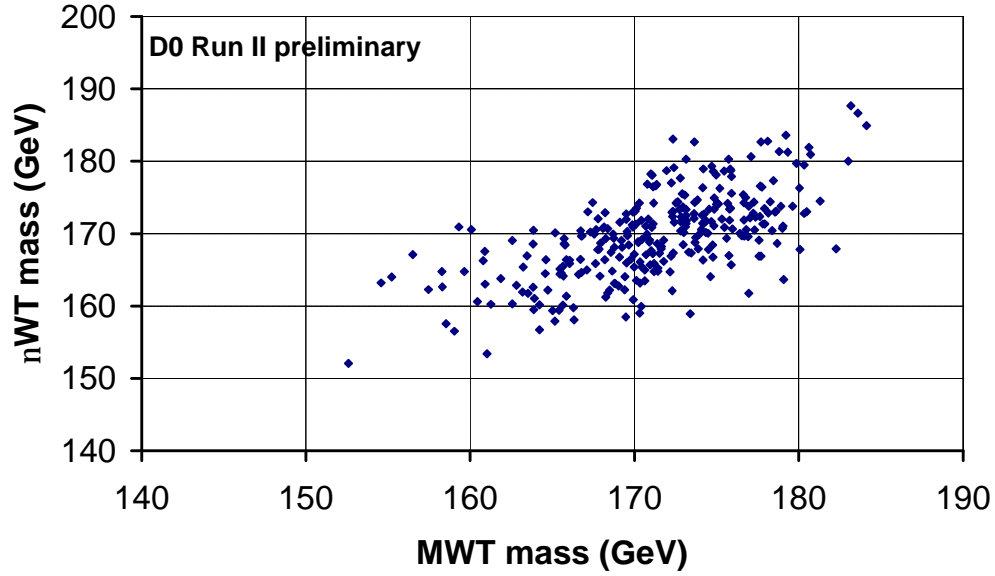


Figure 1: scatter plot of mass measurements from MC ensembles using both methods.

Table 1: summary of combination

	MWT (GeV)	vWT (GeV)	combined (GeV)	correlation
mass	175.2	172.5	173.7	
stat	6.1	5.8	5.4	0.67
jes	2.40	2.50	2.46	1.00
b-jet scale	1.70	2.00	1.87	1.00
template statistics	0.90	0.90	0.90	1.00
background	1.08	0.30	0.64	1.00
pdf	0.40	0.70	0.57	1.00
jet resolution	0.70	0.30	0.48	1.00
muon resolution	0.00	0.40	0.22	1.00
underlying event	0.30	0.13	0.20	1.00
gluon radiation	0.10	0.14	0.12	1.00
syst	3.4	3.5	3.4	
error	7.0	6.7	6.4	

¹ D0 Collaboration: “Measurement of the top quark mass in dilepton events with neutrino weighting“, D0 note 5347.

² D0 Collaboration: “Measurement of the top quark mass in the dilepton channel using the matrix weighting method at D0“, D0 note 5463.

³ L. Lyons, D. Gibaut, P. Clifford, Nucl. Inst. Meth., A270, 110 (1988).

⁴ D0 Collaboration: “Measurement of the top quark mass in the dilepton channel” submitted to Physics Letters B.