

Evidence for associated production of a single top quark and W boson in pp collisions at $\sqrt{s} = 7 \text{ TeV}$

—Supplemental Material—

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SUPPLEMENTAL INFORMATION

This document presents additional material to the publication. Figure 1 shows the distributions of the two variables of the BDT not presented before, and Tables I and II contain information related to the systematic uncertainties that affect the analysis.

The distributions of the p_T of the jet with the highest energy and the difference in angular separation, ϕ , between the direction associated to the E_T^{miss} and the closest of the two selected leptons, in data and simulation, are presented in the signal region (1j1t) in Fig. 1.

Table I presents the impact of each individual source of systematic uncertainty on the rate of the different pro-

cesses in the signal region for each final state. When two numbers are listed for a single uncertainty, the upper number is the effect on the rate when the systematic uncertainty source is scaled up and the lower is for when it is scaled down. Entries marked with a “-” either do not apply for that particular final state/process, or have a negligible effect. Other processes refers to Z/γ^* and the rest of backgrounds, that have almost negligible contributions.

Table II presents the contribution to the uncertainty of the measured cross section of the different sources of uncertainty considered in the analysis. This is estimated by fixing each source one at a time and measuring the effect in the cross section uncertainty.

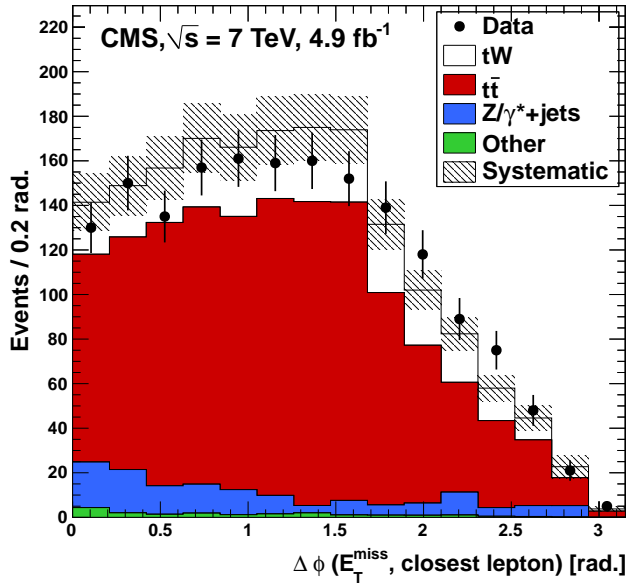
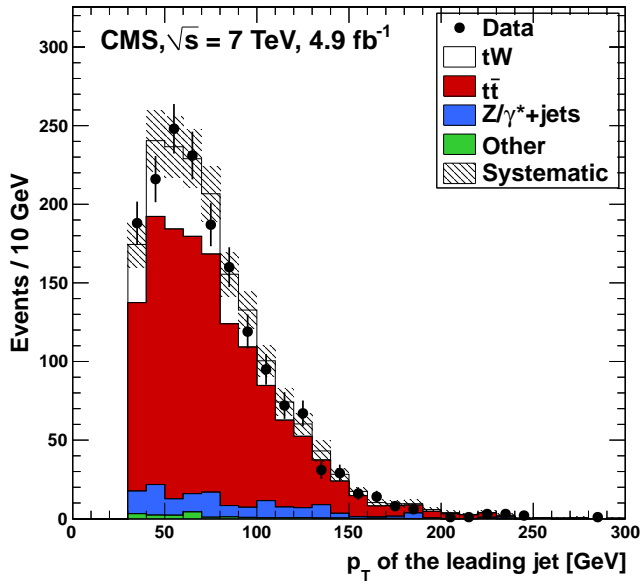


FIG. 1. Distributions of the p_T of the jet with the highest energy and the difference in ϕ between the direction associated to the E_T^{miss} and the closest lepton in data and simulation after jet selection in the signal region (1j1t).

TABLE I. Impact of each individual source of systematic uncertainty on the rate of the different processes in the signal region for each final state. Other processes refers to Z/γ^* and the rest of backgrounds, that have almost negligible contributions.

Systematic Uncertainty ($ee/e\mu/\mu\mu$)	tW (%)	$t\bar{t}$ (%)	Other processes (%)
Luminosity	2.2/2.2/2.2	2.2/2.2/2.2	2.2/2.2/2.2
Pileup modeling	2.1/0.6/0.2	1.0/0.5/0.3	4.9/1.6/3.7
Electron Trigger Efficiency	1.5/1.1/-	1.5/1.1/-	1.5/1.1/-
Muon Trigger Efficiency	-/1.1/1.5	-/1.1/1.5	-/1.1/1.5
Electron Identification	2/2/-	2/2/-	2/2/-
Muon Identification	-/1/1	-/1/1	-/1/1
b-tagging	+2.6/+4.1/+4.1 -4.0/-3.7/-3.3	+3.2/+2.5/+2.6 -1.1/-3.3/-3.4	+3.9/+3.4/+3.2 -7.0/-3.6/-3.5
Jet Energy Scale	-1.1/-0.6/-1.8 +0.4/+1.7/+2.1	-4.3/-4.7/-3.6 +7.6/+3.7/+5.5	+13.2/-1.2/+11.2 +1.7/-0.1/+10.7
Jet Energy Resolution	+1.2/+0.1/+0.2 +1.4/+0.2/+0.8	+2.9/-0.5/+2.9 +0.5/-2.2/+0.1	+8.0/-4.4/+1.4 -5.3/+7.7/-11.9
E_T^{miss} modeling	-0.6/-/+1.0 +1.0/-/-0.2	+0.2/-/+0.3 -0.9/-/+0.5	+2.4/-0.1/+13.5 -7.7/+0.2/-2.5
Factorization and Normalization scale Q^2	+3.1/+3.4/+3.3 +0.4/+0.3/+0.4	+10.0/+10.1/+10.1 -6.5/-6.9/-6.9	-/-/-
ME/PS Matching Thresholds	-/-/-	+0.7/+0.5/+0.4 +2.0/+1.6/+1.8	-/-/-
tW DR/DS scheme	-5.4/+6.4/+1.7 -0.5/-0.5/-0.5	-/-/-	-/-/-
PDF uncertainties	2.2/2.0/2.0	-/-/-	-/-/-
$t\bar{t}$ cross-section	-/-/-	+6.2/+6.2/+6.2 -5.8/-5.8/-5.8	-/-/-
Z/γ^* modeling	-/-/-	-/-/-	30.5/1.2/23.5
Simulation Statistics	3.8/1.8/2.7	4.5/2.0/2.9	18.0/12.0/12.4

TABLE II. Contribution to the uncertainty of the measured cross section of the different sources of uncertainty considered in the BDT analysis.

Systematic Uncertainty	$\Delta\sigma$ (pb)	$\frac{\Delta\sigma}{\sigma}$
Luminosity	0.69	0.04
Pileup modeling	0.24	0.02
Electron trigger efficiency	0.35	0.02
Muon trigger efficiency	0.38	0.02
Electron identification	0.70	0.04
Muon identification	0.45	0.03
b-tagging	0.30	0.02
Jet Energy Scale	2.42	0.15
Jet Energy Resolution	0.58	0.04
E_T^{miss} modeling	0.40	0.05
tW Q^2	0.34	0.02
$t\bar{t}$ Q^2	0.29	0.02
ME/PS Matching Thresholds	1.62	0.10
tW DR/DS scheme	0.94	0.06
PDF uncertainties	0.34	0.02
$t\bar{t}$ cross section	0.96	0.06
Z/γ^* modeling	0.67	0.04
Statistical	3.33	0.21
Total	4.95	0.31