MTM Blessing Update

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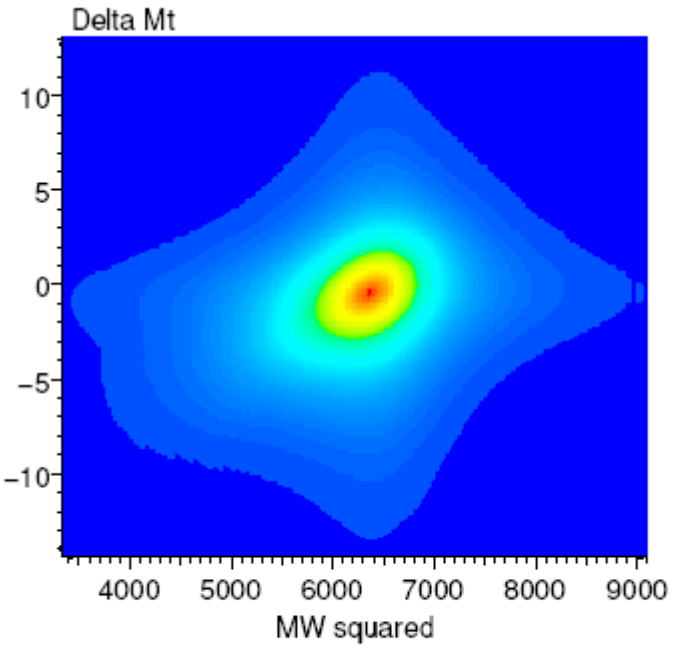
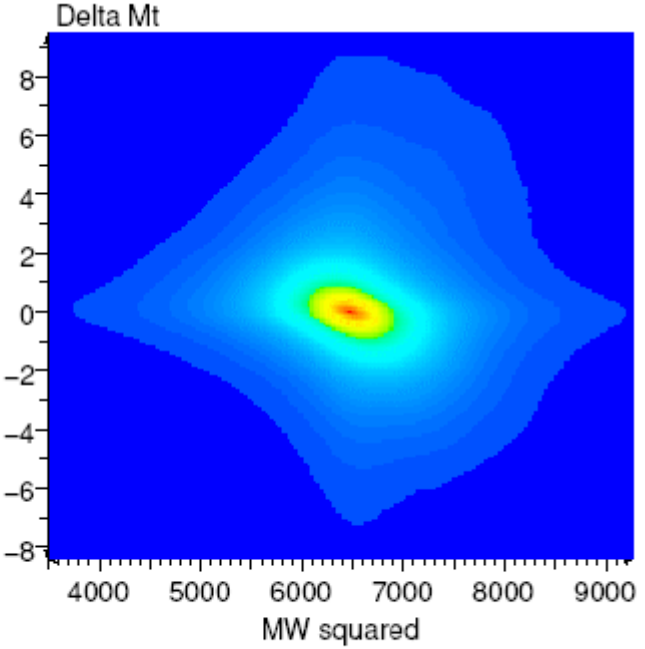
To Be Blessed

- A couple of plots illuminating our analysis
- The systematic, and the final measurement
- Also, note that some already-blessed plots have had minor alterations:
  - GeV -> GeV/c^2
  - JES linearity plots have intercept information added to them along with slope
  - Changes can be seen in www-cdf.fnal.gov/internal/physics/top/run2mass/multivar_analysis/mtm2/bless_plots.html

Effective Propagators



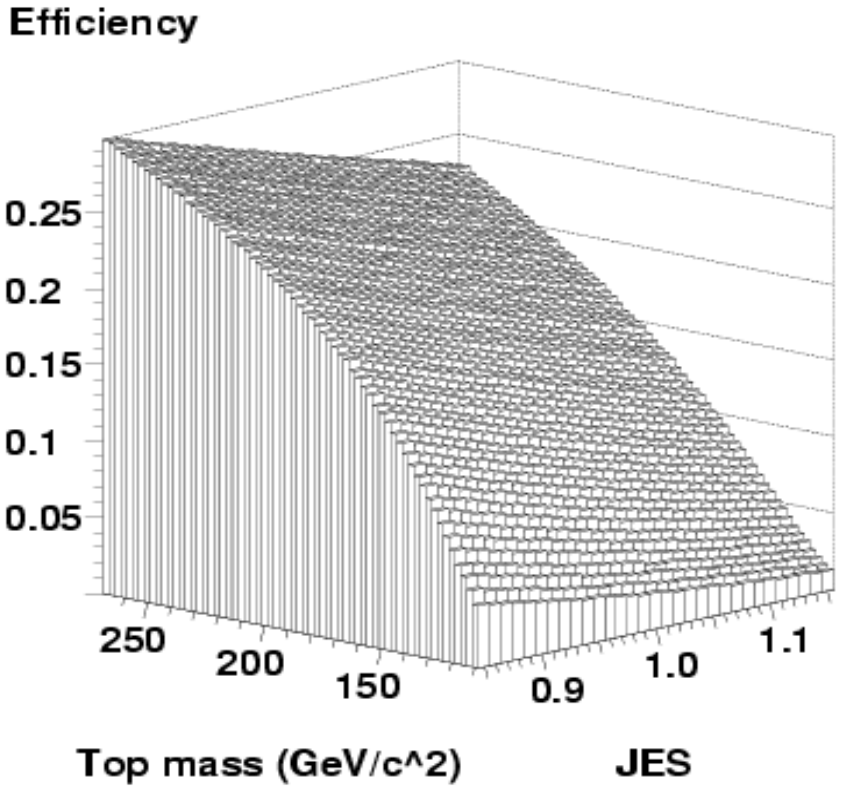
Hadronic-side propagator



Leptonic-side propagator

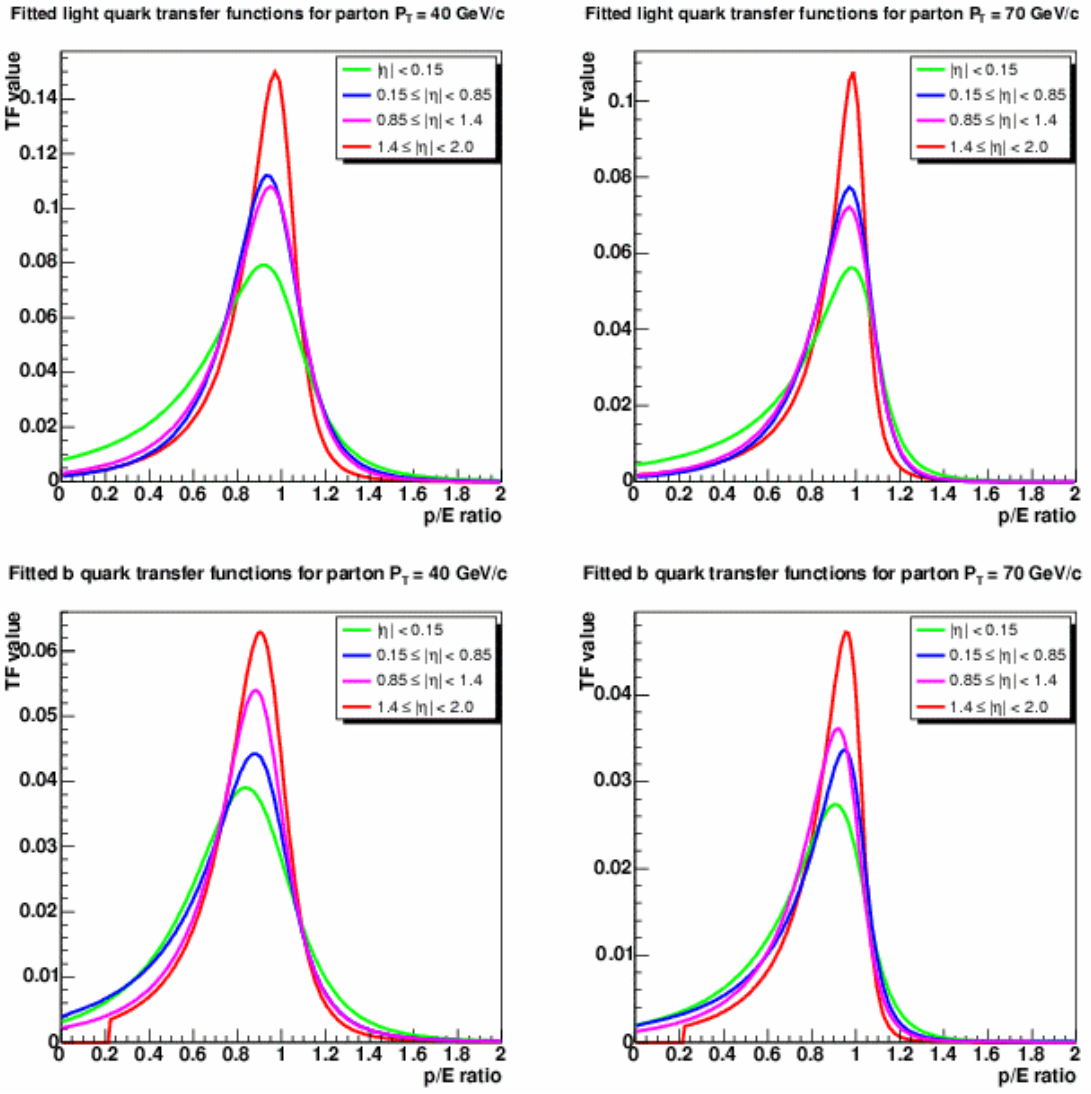
- Plot of our effective propagators on the hadronic and leptonic sides (no longer Breit-Wigners)
- Rebless; this was shown by Paul at DPF '06

Efficiency



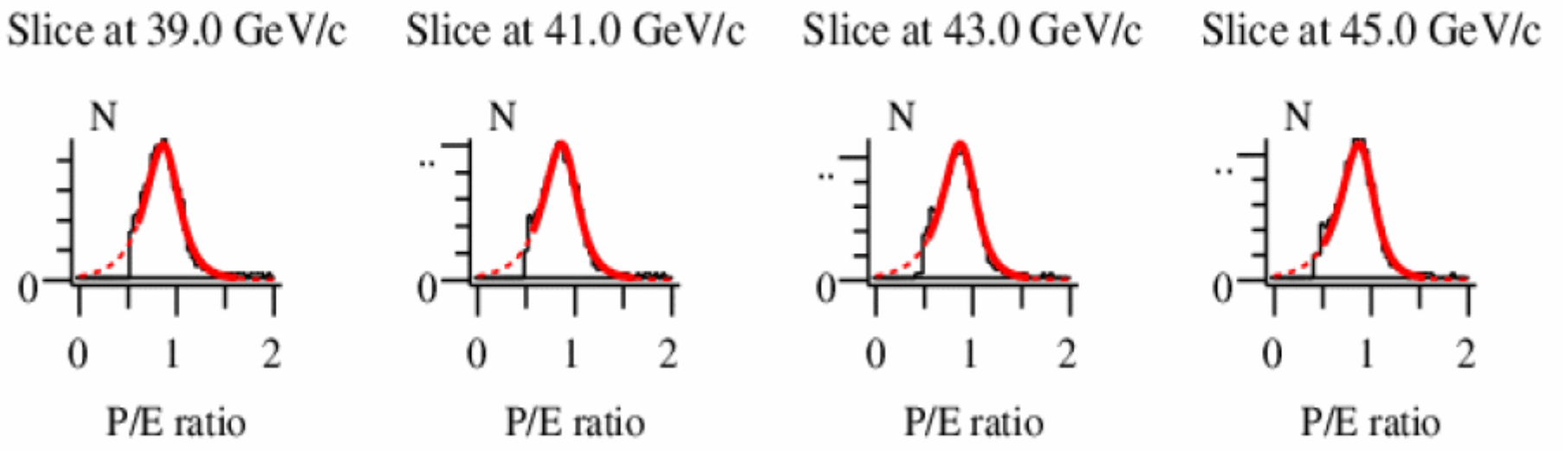
- A plot of our TF-based efficiency as function of top mass and JES

TF Plots (I)



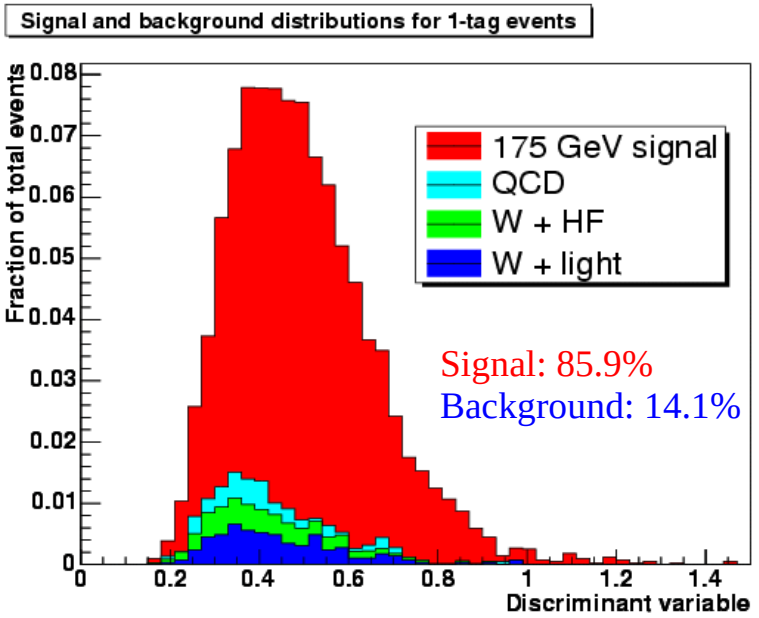
- TF's: for light/b quarks, for each of the four detector regions, and for parton pt = 40 GeV/c and 70 GeV/c

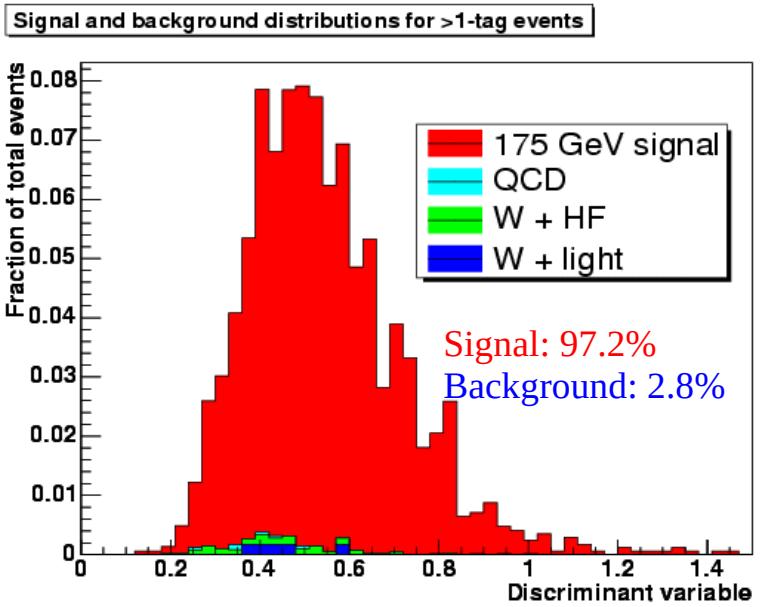
TF Plots (II)



- Example of Johnson curve fits used to create the TF's - here, the central eta region for light quark TF's is shown
- Also note that we fit only to region where jets are expected to pass selection cuts

Background Handling





- Plots of our discrimination variable for signal and background, for 1 tag and >1 tag cases

Likelihood Cut Efficiency

Type of event	1-tag	>1-tag
Good signal	94.7%	94.1%
Bad signal	73.7%	80.2%
Background	63.1%	57.5%

- Efficiencies for different types of event given our likelihood cut – nice indication of how useful this cut is

Systematics

- Changes since March 8
  - ISR, FSR, generator systematics all recalculated with new ttopel reconstructed mass of mt = 178.70 +/- 0.22 GeV
  - Multiple Interaction systematic taken to be 0.05 GeV, rather than calculated from ttopzl sample
  - PDF reweighting systematics recalculated with updated, high-stats ttopel sample
- *Final systematic: 1.4 GeV/c^2*

Systematic source	2-D systematic (GeV)
ISR	0.75
FSR	0.67
MC generator	0.44
Gluon fraction	0.05
PDF re-weighting	0.46
Background fraction	0.39
Background composition	0.20
Background shape	0.29
Calibration	0.14
JES residual	0.28
Multiple interactions	0.05
b-JES	0.23
b-tag E_T dependence	0.02
Charm tag ratio	0.06
Lepton P_T	0.05
Background Q^2	0.30
Total	1.39

Conclusions

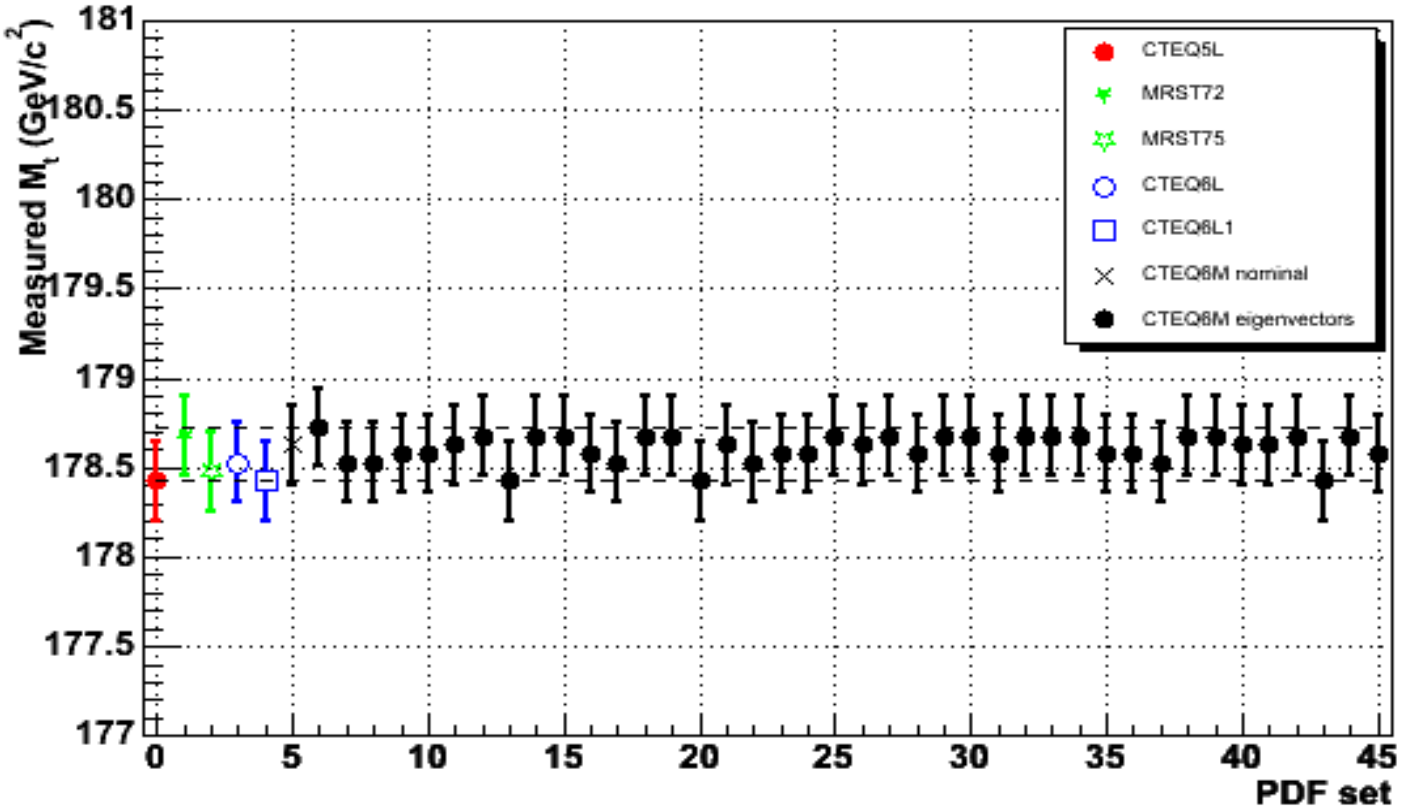
- Systematic error had been dominated by a mass measurement in ttopel which had a surprisingly high mass bias (A) compared to other Pythia samples (blind, ISR/FSR, etc.), and (B) compared to its higher stats re-measurement .
- With updated ttopel result, final systematic of 1.4 GeV; final measurement is :

Mt = 169.8 +/- 1.6 (stat.) +/- 1.7 (JES) +/- 1.4 (syst.) GeV/c^2

→ Mt = 169.8 +/- 2.7 GeV/c^2

BACKUP SLIDES

PDF Systematic



- Result updated using the high-stats ttopel sample
- Final systematic: 0.46 GeV

1-d vs. 2-d Systematic

Systematic source	1-D systematic (GeV)	2-D systematic (GeV)
ISR	0.74	0.75
FSR	0.48	0.67
MC generator	0.30	0.44
Gluon fraction	0.13	0.05
PDF re-weighting	0.18	0.46
Background fraction	0.22	0.39
Background composition	0.19	0.20
Background shape	0.55	0.29
Calibration	**	0.14
JES residual	**	0.28
Multiple interactions	0.05	0.05
b-JES	**	0.23
b-tag E_T dependence	0.28	0.02
Charm tag ratio	0.11	0.06
Lepton P_T	0.09	0.05
Background Q^2	0.34	0.30
Total	1.29	1.39

- Using 2-d systematic for b-JES, JES residual and calibration systematics, 1-d and 2-d systematics are actually quite close in value – 1.3 GeV (1-d case) vs. 1.4 GeV (2-d case)

ISR/FSR in 1-d and 2-d

Sample	1-d Mass Bias (GeV)	2-d Mass Bias (GeV)	JES Bias (1e-4)
Nominal	0.06 +/- 0.14	0.70 +/- 0.22	76 +/- 15
Less ISR	0.03 +/- 0.19	-0.05 +/- 0.29	3 +/- 21
More ISR	0.80 +/- 0.25	0.50 +/- 0.35	-18 +/- 27

Sample	1-d Mass Bias (GeV)	2-d Mass Bias (GeV)	JES Bias 1e-4
Nominal	0.06 +/- 0.14	0.70 +/- 0.22	76 +/- 15
Less FSR	0.13 +/- 0.22	0.03 +/- 0.34	0 +/- 24
More FSR	0.54 +/- 0.24	0.81 +/- 0.37	39 +/- 27