

# W W + 2 jets Analysis



THE UNIVERSITY  
*of*  
**WISCONSIN**  
MADISON



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# Update

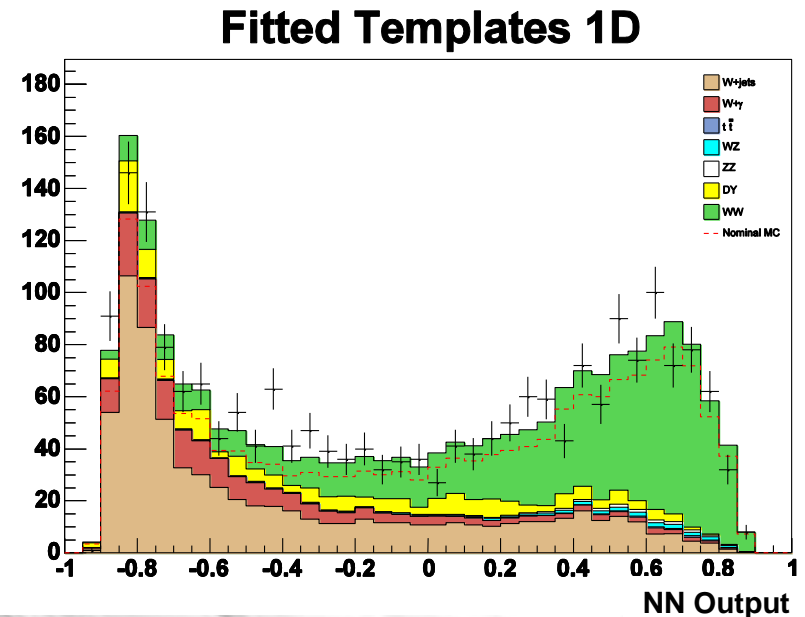
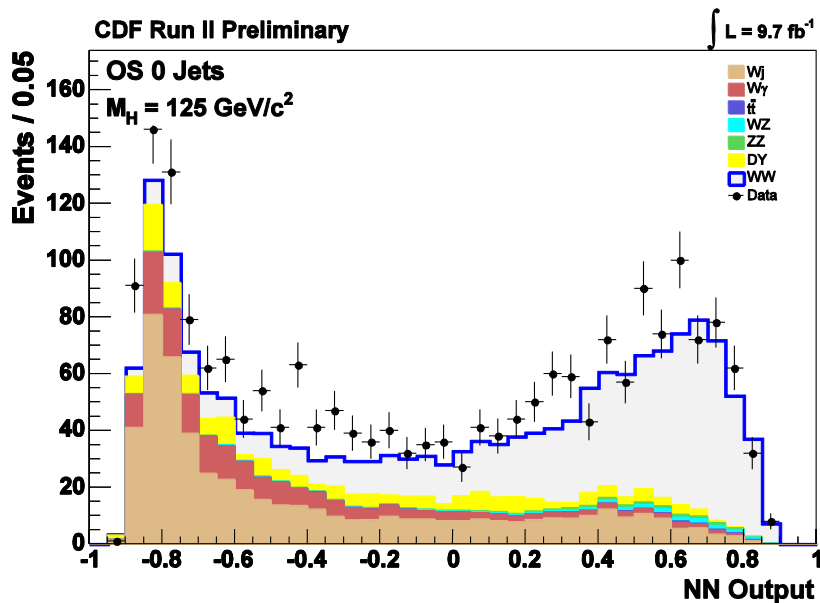
- Running Sergo's WW fit script – very preliminary results
- Rate uncertainties taken directly from HWW analysis
- No shape uncertainties yet

# 0J Results

0J-AIISB	MetModel	WyScale	Accept	TrigID	WW Pt Scale	WWptPDF	Fake	Lumi	Cross Section	JES
WW	0.000	0.000	0.100	0.043	0.000	0.011	0.000	0.059	0.060	0.031
WZ	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.060	0.064
ZZ	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.060	0.035
ttbar	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.070	0.268
DY	0.190	0.000	0.000	0.043	0.000	0.000	0.000	0.059	0.000	0.180
Wgamma	0.000	0.068	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.035
Wjets	0.000	0.000	0.000	0.000	0.000	0.000	0.172	0.000	0.000	0.000

Result:  $1.073^{+0.184}_{-0.153} * \sigma_{sm}$

3.6 fb<sup>-1</sup> Result:  $1.038^{+0.154}_{-0.137} * \sigma_{sm}$



# 0J Fitting

	Predicted Yield	Uncertainty (normalized)	Fit (normalized)
W+jets	543.38	0.172	1.315
W gamma	184.69	0.126	1.108
ttbar	3.60	0.303	1.164
WZ	20.61	0.152	1.050
ZZ	13.99	0.142	1.034
DY	159.41	0.272	1.193
WW	829.70	0.141	1.031*1.073

Total Scaled Events

	Yield	Uncertainty
Data	2090	45.72
MC Bkg (scaled)	1149.65	139.20
WW (scaled)	918.08	91.86

Counting Experiment with NN cut

	Yield	Uncertainty
Data - MC Bkg	880.2	87.34
WW	735.8	72.60
WW Scale Factor	1.20	0.22

# 0J Nuisance Params

	Value	Fit (normalized)	Fit Uncertainty (normalized)
MetModel	0.19	1.0730	0.1681
WgamScale	0.068	0.3754	0.9228
WgamAcc	0.1	0.4023	0.9861
DiboAcc	0.1	0.5746	0.9723
TopAcc	0.1	0.0132	1.0017
TrigID	0.043	-0.0009	1.0000
WWptScale	0.0	0.0958	0.9955
WWptPDF	0.011	0.0000	1.0000
Fake	0.172	0.0002	1.0000
Lumi	0.059	1.8315	0.5461
BTagVeto	0.0	0.1306	0.9916
XS_Diboson	0.06	0.0000	1.0000
XS_ttbar	0.07	0.0075	1.0006
JES	0.0 - 0.268	-0.0006	1.0000

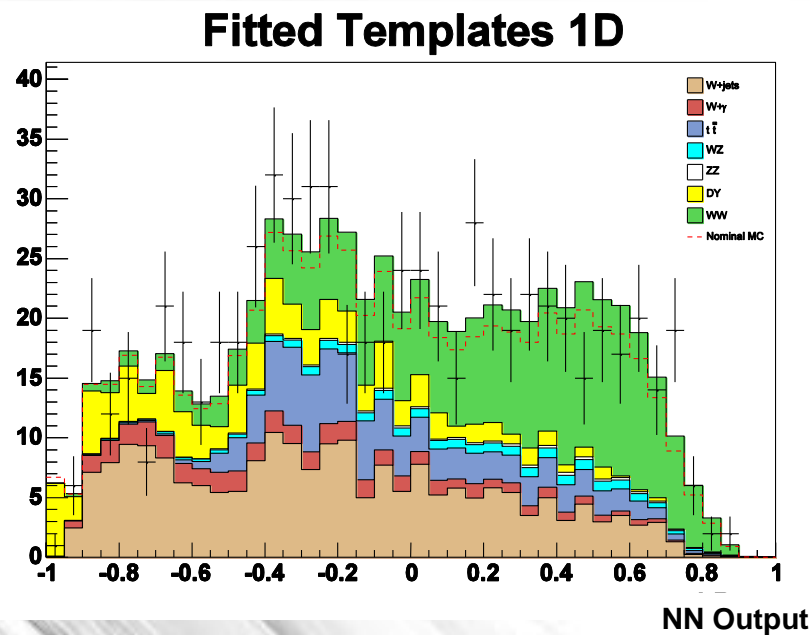
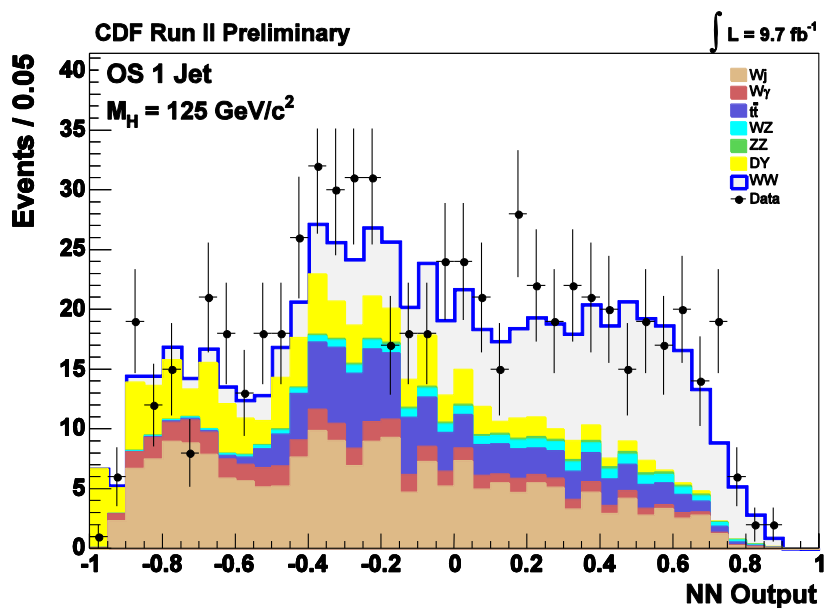
# 0J Correlation Matrix

	WW	Met Mod	Wy Scale	Wy Acc	Dibo Acc	Top Acc	Trig ID	WW Scale	WW PDF	Fake	Lumi	BTag Veto	XS Dibo	XS ttbar	JES
WW	1.000	-0.012	0.014	0.020	-0.665	-0.004	-0.290	0.000	-0.071	0.082	-0.397	0.000	-0.400	-0.002	-0.227
Met Mod	-0.012	1.000	-0.037	-0.052	-0.001	0.001	-0.024	0.000	0.000	-0.286	-0.033	0.000	0.000	0.000	-0.114
Wy Scale	0.014	-0.037	1.000	-0.003	0.000	0.000	-0.009	0.000	0.000	-0.189	-0.012	0.000	0.000	0.000	-0.035
Wy Acc	0.020	-0.052	-0.003	1.000	0.000	0.000	-0.012	0.000	0.000	-0.267	-0.017	0.000	0.000	0.000	-0.049
Dibo Acc	-0.665	-0.001	0.000	0.000	1.000	0.000	0.001	0.000	0.000	-0.002	0.002	0.000	0.002	0.000	0.001
Top Acc	-0.004	0.001	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Trig ID	-0.290	-0.024	-0.009	-0.012	0.001	0.000	1.000	0.000	0.000	-0.069	-0.007	0.000	0.001	0.000	-0.027
WW Scale	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WW PDF	-0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Fake	0.082	-0.286	-0.189	-0.267	-0.002	0.001	-0.069	0.000	0.000	1.000	-0.094	0.000	-0.001	0.000	-0.368
Lumi	-0.397	-0.033	-0.012	-0.017	0.002	0.000	-0.007	0.000	0.000	-0.094	1.000	0.000	0.001	0.000	-0.037
BTagVeto	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
XS Dibo	-0.400	0.000	0.000	0.000	0.002	0.000	0.001	0.000	0.000	-0.001	0.001	0.000	1.000	0.000	0.000
XS ttbar	-0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
JES	-0.227	-0.114	-0.035	-0.049	0.001	0.000	-0.027	0.000	0.000	-0.368	-0.037	0.000	0.000	0.000	1.000

# 1J Results

0J-AIISB	MetModel	WyScale	Accept	TrigID	WW Pt Scale	WWptPDF	Fake	Lumi	Cross Section	JES
WW	0.000	0.000	0.100	0.043	0.000	0.047	0.000	0.059	0.060	-0.059
WZ	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.060	-0.010
ZZ	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.060	-0.046
ttbar	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.700	-0.129
DY	0.210	0.000	0.000	0.043	0.000	0.000	0.000	0.059	0.000	-0.065
Wgamma	0.000	0.068	0.100	0.000	0.000	0.000	0.000	0.000	0.000	-0.095
Wjets	0.000	0.000	0.000	0.000	0.000	0.000	0.189	0.000	0.000	0.000

Result:  $1.173^{+0.269}_{-0.220} * \sigma_{sm}$



# 1J Fitting

	Predicted Yield	Uncertainty (normalized)	Fit (normalized)
W+jets	194.66	0.189	1.057
W gamma	39.38	0.154	1.024
ttbar	82.56	0.192	1.028
WZ	17.94	0.138	0.998
ZZ	4.62	0.145	1.0002
DY	92.40	0.232	0.924
WW	204.66	0.157	1.004*1.173

Total Scaled Events

	Yield	Uncertainty
Data	682	26.12
MC Bkg (scaled)	438.98	50.95
WW (scaled)	241.06	29.20

Counting Experiment with NN cut

	Yield	Uncertainty
Data - MC Bkg	199.7	50.52
WW	177.7	22.31
WW Scale Factor	1.12	0.41



# 1J Nuisance Params

	Value	Fit (normalized)	Fit Uncertainty (normalized)
MetModel	0.21	1.1734	0.2428
WgamScale	0.068	-0.3793	0.8754
WgamAcc	0.1	0.0578	0.9983
DiboAcc	0.1	0.0848	0.9963
TopAcc	0.1	0.0007	1.0006
TrigID	0.043	0.1078	0.9767
WWptScale	0.0	-0.0238	0.9906
WWptPDF	0.047	0.0000	1.0000
Fake	0.189	-0.0006	1.0001
Lumi	0.059	0.3034	0.7618
BTagVeto	0.0	-0.0329	0.9822
XS_Diboson	0.06	0.0000	1.0000
XS_ttbar	0.07	-0.0005	1.0002
JES	-0.129 – 0.0	0.0755	0.9884

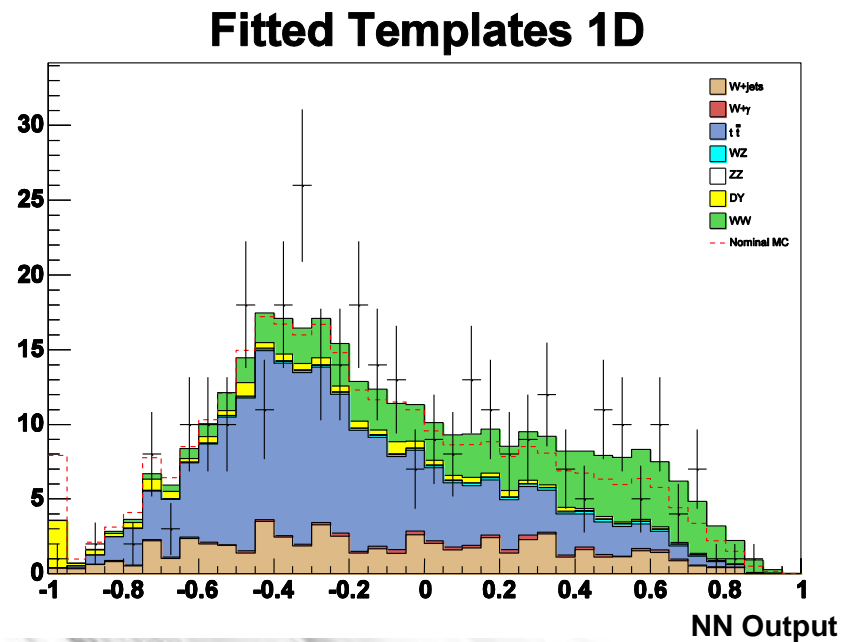
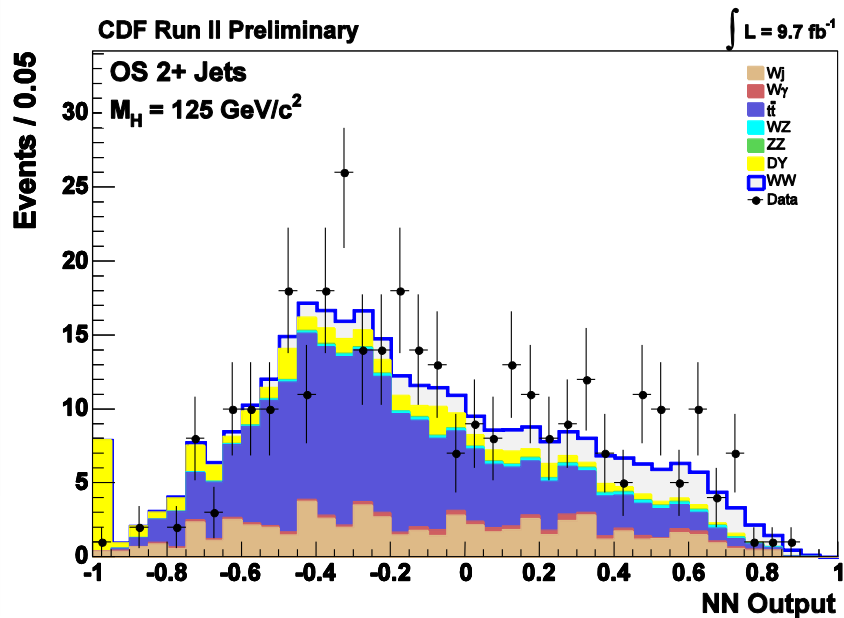
# 1J Correlation Matrix

	WW	Met Mod	Wy Scale	Wy Acc	Dibo Acc	Top Acc	Trig ID	WW Scale	WW PDF	Fake	Lumi	BTag Veto	XS Dibo	XS ttbar	JES
WW	1.000	0.112	-0.001	-0.001	-0.516	-0.043	-0.226	0.000	-0.228	-0.062	-0.314	0.000	-0.309	-0.030	0.338
Met Mod	0.112	1.000	-0.025	-0.036	-0.002	-0.012	-0.072	0.000	0.000	-0.348	-0.100	0.000	-0.001	-0.009	0.156
Wy Scale	-0.001	-0.025	1.000	0.001	-0.001	-0.004	-0.006	0.000	0.000	-0.045	-0.008	0.000	0.000	-0.002	0.010
Wy Acc	-0.001	-0.036	0.001	1.000	-0.001	-0.005	-0.008	0.000	0.000	-0.066	-0.011	0.000	0.000	-0.004	0.015
Dibo Acc	-0.516	-0.002	-0.001	-0.001	1.000	-0.004	-0.002	0.000	0.001	-0.008	-0.002	0.000	0.000	-0.003	0.006
Top Acc	-0.043	-0.012	-0.004	-0.005	-0.004	1.000	-0.020	0.000	0.000	-0.064	-0.027	0.000	-0.002	-0.026	0.058
Trig ID	-0.226	-0.072	-0.006	-0.008	-0.002	-0.020	1.000	0.000	0.000	-0.084	-0.028	0.000	-0.001	-0.014	0.051
WW Scale	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WW PDF	-0.228	0.000	0.000	0.000	0.001	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Fake	-0.062	-0.348	-0.045	-0.066	-0.008	-0.064	-0.084	0.000	0.000	1.000	-0.117	0.000	-0.005	-0.045	0.236
Lumi	-0.314	-0.100	-0.008	-0.011	-0.002	-0.027	-0.028	0.000	0.000	-0.117	1.000	0.000	-0.001	-0.019	0.071
BTagVeto	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
XS Dibo	-0.309	-0.001	0.000	0.000	0.000	-0.002	-0.001	0.000	0.000	-0.005	-0.001	0.000	1.000	-0.002	0.003
XS ttbar	-0.030	-0.009	-0.002	-0.004	-0.003	-0.026	-0.014	0.000	0.000	-0.045	-0.019	0.000	-0.002	1.000	0.041
JES	0.338	0.156	0.010	0.015	0.006	0.058	0.051	0.000	0.000	0.236	0.071	0.000	0.003	0.041	1.000

# 2J Results

OJ-AIISB	MetModel	WyScale	Accept	TrigID	WW Pt Scale	WW Pt PDF	Fake	Lumi	BTagVeto	Cross Section	JES
WW	0.000	0.000	0.100	0.043	0.000	0.042	0.000	0.059	0.000	0.060	-0.205
WZ	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.000	0.060	-0.132
ZZ	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.000	0.060	-0.133
ttbar	0.000	0.000	0.100	0.043	0.000	0.000	0.000	0.059	0.036	0.070	-0.017
DY	0.260	0.000	0.000	0.043	0.000	0.000	0.000	0.059	0.000	0.000	-0.327
Wgamma	0.000	0.068	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.220
Wjets	0.000	0.000	0.000	0.000	0.000	0.000	0.190	0.000	0.000	0.000	0.000

Result:  $2.771^{+1.415}_{-0.927} * \sigma_{sm}$



# 2J Fitting

	Predicted Yield	Uncertainty (normalized)	Fit (normalized)
W+jets	62.70	0.190	0.934
W gamma	6.93	0.251	0.679
ttbar	162.13	0.148	1.010
WZ	4.74	0.191	0.809
ZZ	1.49	0.191	0.807
DY	34.18	0.424	0.423
WW	44.38	0.250	0.703*2.771

Total Scaled Events

	Yield	Uncertainty
Data	331	18.19
MC Bkg (scaled)	246.53	28.93
WW (scaled)	86.41	19.84

Counting Experiment with NN cut

	Yield	Uncertainty
Data - MC Bkg	48.6	19.66
WW	28.4	7.13
WW Scale Factor	1.71	0.94

# 2J Nuisance Params

	Value	Fit (normalized)	Fit Uncertainty (normalized)
MetModel	0.26	-0.7460	1.1271
WgamScale	0.068	-0.0127	1.0000
WgamAcc	0.1	-0.0186	0.9999
DiboAcc	0.1	0.0059	1.0004
TopAcc	0.1	0.2173	0.8752
TrigID	0.043	-0.0015	0.9790
WWptScale	0.0	0.0000	1.0000
WWptPDF	0.042	0.0000	1.0000
Fake	0.19	-0.3486	0.9468
Lumi	0.059	-0.0020	0.9600
BTagVeto	0.036	0.0797	0.9836
XS_Diboson	0.06	0.0035	1.0001
XS_ttbar	0.07	0.1538	0.9384
JES	-0.327 – 0.0	1.4524	0.9923

# 2J Correlation Matrix

	WW	Met Mod	Wy Scale	Wy Acc	Dibo Acc	Top Acc	Trig ID	WW Scale	WW PDF	Fake	Lumi	BTag Veto	XS Dibo	XS ttbar	JES
WW	1.000	0.405	-0.001	-0.001	-0.256	0.011	-0.061	0.000	-0.103	-0.077	-0.085	0.004	-0.154	0.007	0.758
Met Mod	0.405	1.000	0.002	0.004	-0.001	0.028	0.006	0.000	0.000	0.012	0.009	0.009	-0.001	0.019	0.532
Wy Scale	-0.001	0.002	1.000	-0.001	0.000	-0.001	0.000	0.000	0.000	-0.001	0.000	0.000	0.000	-0.001	0.006
Wy Acc	-0.001	0.004	-0.001	1.000	0.000	-0.002	0.000	0.000	0.000	-0.002	-0.001	-0.001	0.000	-0.001	0.008
Dibo Acc	-0.256	-0.001	0.000	0.000	1.000	-0.003	-0.001	0.000	0.000	-0.001	-0.001	-0.001	0.001	-0.002	-0.001
Top Acc	0.011	0.028	-0.001	-0.002	-0.003	1.000	-0.110	0.000	0.000	-0.108	-0.153	-0.093	-0.002	-0.186	0.108
Trig ID	-0.061	0.006	0.000	0.000	-0.001	-0.110	1.000	0.000	0.000	-0.043	-0.061	-0.036	0.000	-0.073	0.105
WW Scale	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WW PDF	-0.103	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	-0.001
Fake	-0.077	0.012	-0.001	-0.002	-0.001	-0.108	-0.043	0.000	0.000	1.000	-0.060	-0.036	-0.001	-0.072	0.073
Lumi	-0.085	0.009	0.000	-0.001	-0.001	-0.153	-0.061	0.000	0.000	-0.060	1.000	-0.051	-0.001	-0.102	0.147
BTagVeto	0.004	0.009	0.000	-0.001	-0.001	-0.093	-0.036	0.000	0.000	-0.036	-0.051	1.000	-0.001	-0.062	0.036
XS Dibo	-0.154	-0.001	0.000	0.000	0.001	-0.002	0.000	0.000	0.000	-0.001	-0.001	-0.001	1.000	-0.001	-0.001
XS ttbar	0.007	0.019	-0.001	-0.001	-0.002	-0.186	-0.073	0.000	0.000	-0.072	-0.102	-0.062	-0.001	1.000	0.072
JES	0.758	0.532	0.006	0.008	-0.001	0.108	0.105	0.000	-0.001	0.073	0.147	0.036	-0.001	0.072	1.000