

Study on new possible variables to control QCD

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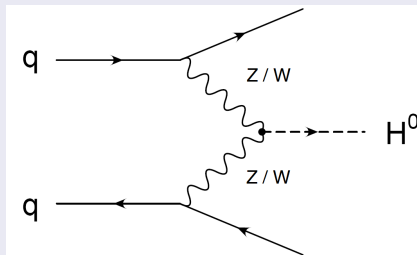
2013-06-17



Control of QCD

QCD is a major concern of our analysis, and the search for ways to control/estimate it a priority.

- The current event selection only uses variables over the dijet system of the the MET.
- Characteristics of the Dijet+MET system can be exploited to reduce the QCD background with minimal signal loss.
 - Total energy of selected objects (2 jets and MET).
 - Balance over MET and dijet system.



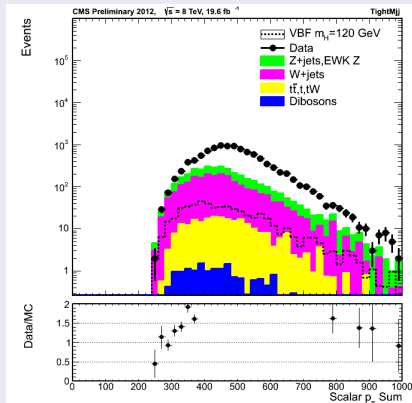
Control of QCD

Three variable are being analyzed for possible use on this analysis

- Scalar Tri-Object Sum = $|pT(jet1)| + |pT(jet2)| + |MET|$
 - Similar to HT
 - The higher it is the better is average selected object resolution
- Dijet pT fraction = $p_T(dijet)/(p_T(dijet) + MET)$
 - Reflects balance dijet+MET system
 - Signal should be highly concentrated around 0.5
- Vector Tri-Object Sum = $|VectorSum(pT(jet1) + pT(jet2) + MET)|$
 - Reflects balance dijet+MET system
 - Signal should be highly concentrated around zero
 - Study underway to possibly include the jet and MET resolution in the variable

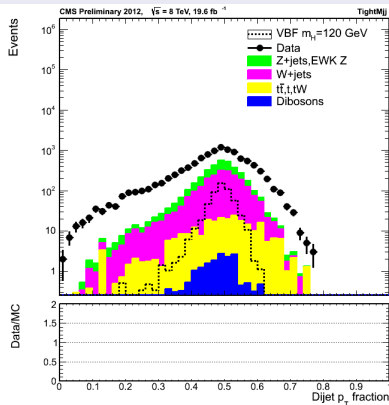
Scalar Tri-Object Sum

- Like expected this variable by itself will not allow a big signal discrimination but conjugated with other variables it may be helpful.
- It can have the same role that HT has in conjunction with alphaT in the SUSY analysis.

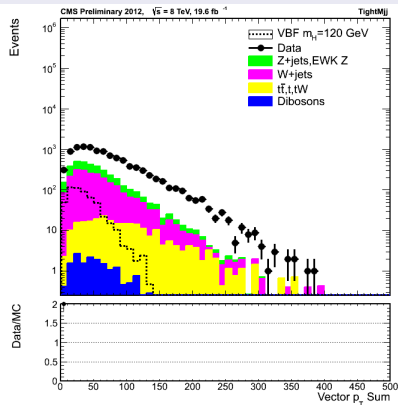


Individual Variables after TightMjj

After TightMjj cut

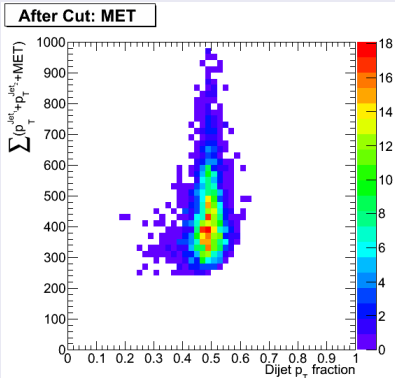


After DijetFraction cut

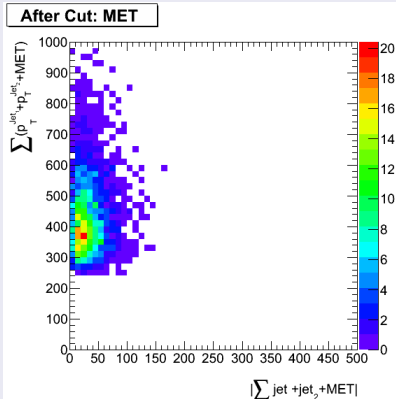


2D plots of variables on MC and Data at MET cut level

After MET cut



After MET cut



Dijet PT Fraction + scalar pT Sum

We can define a rectangle cut:

- Dijet PT Fraction $:= [0.46, 0.54]$
- Scalar pT Sum $:= [250, 600]$

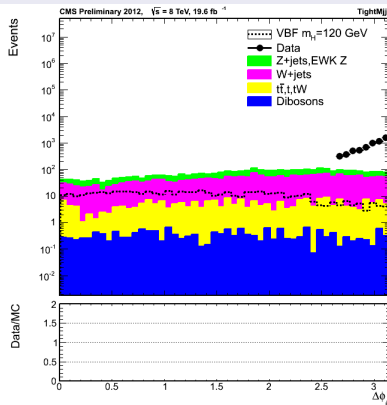
Vector pT sum + scalar pT Sum

We can define a rectangle cut:

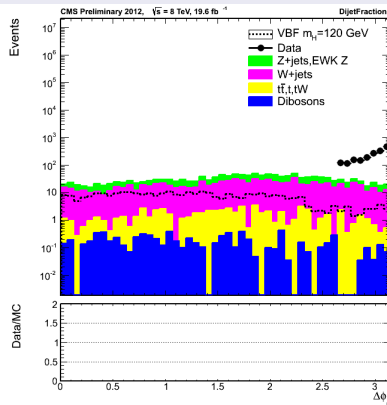
- Dijet PT Fraction $:= [0, 40]$
- Scalar pT Sum $:= [250, 550]$

Plots before and after cut on $d\phi_{ij}2.6$ for DijetFrac

After TightMjj cut



After DijetFraction cut



Event Yields DijetFraction

	QCD	γ +jets	Top	W+jets	Z+jets	VV	SumMC	Data	Signal 120
MetClean	13661242 \pm 836429	13687 \pm 51	44648 \pm 168	221636 \pm 597	52009 \pm 181	2504 \pm 14	13995726 \pm 837440	2198348	2745 \pm 32
onVeto	6566160 \pm 466165	5227 \pm 22	8563 \pm 53	68826 \pm 281	24109 \pm 103	739 \pm 6	6673625 \pm 466629	2140281	2067 \pm 25
air	1529141 \pm 103399	3306 \pm 18	4434 \pm 41	23443 \pm 107	10769 \pm 51	216 \pm 3	1571309 \pm 103619	1435063	1440 \pm 21
	23162 \pm 2055	262 \pm 6	816 \pm 23	5192 \pm 60	3534 \pm 32	51 \pm 2	33018 \pm 2179	32324	856 \pm 18
	605071 \pm 46654	755 \pm 12	1021 \pm 22	11333 \pm 83	5123 \pm 41	85 \pm 2	623389 \pm 46813	576792	1171 \pm 19
	8540 \pm 1778	95 \pm 5	457 \pm 16	4250 \pm 54	2795 \pm 30	48 \pm 2	16186 \pm 1885	16282	881 \pm 17
Mjj	6560 \pm 1445	59 \pm 4	230 \pm 12	2032 \pm 39	1357 \pm 21	17 \pm 1	10256 \pm 1521	10481	543 \pm 14
Fraction	3035 \pm 1163	20 \pm 2	64 \pm 6	895 \pm 27	584 \pm 14	7.6 \pm 0.8	4606 \pm 1213	3460	344 \pm 11
SIGNAL	688 \pm 688	1.3 \pm 0.7	17 \pm 3	217 \pm 14	130 \pm 7	3.1 \pm 0.5	1057 \pm 714	XXX	137 \pm 7
QCD	2206 \pm 927	5 \pm 1	7 \pm 2	129 \pm 10	73 \pm 4	0.4 \pm 0.1	2421 \pm 945	1873	22 \pm 3

Conclusions

