

# MC VBF+MET QCD Samples

J. Pela

Imperial College London

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## Motivation

- Create a set of QCD MC samples that would model adequately events passing our selection.
- Generate enough statistics to represent 2012 dataset (  $20 \text{ fb}^{-1}$  )

## Caveats:

- Huge cross section of QCD
- We cannot do post RECO selection since this would too time consuming.
- Need to define a QCD Hard scattering minimum to avoid rising cross section of low  $p_T$  interactions where VBF+MET type events are not likely anyway

We will be looking at gen level particles only to avoid the RECO process

## MET

- Select all produced neutrinos and add them vectorially.
- Determine their  $p_T$ .

## VBF Jets

- Run AK5 genJets (without neutrinos) over gen-particles.
- Select all jets with a given  $p_T$  and  $|\eta|$ .
- Calculate  $\Delta\eta$  and  $M_{jj}$  for all possible dijet combinations.
- Accept event if one of combinations passes all requirements.

## Caveats:

- Thresholds must be set carefully and low enough to represent the QCD that actually passes the analysis (at some cut L1+HLT, dijet, etc).
- Trigger/variable turn on and efficiency should be taken into account.

# QCD Cross Sections and event predictions for $20 \text{ fb}^{-1}$

From the current samples and cross sections we can easily extrapolate what would be the expected number of events for each  $p_T$  hat for an integrated luminosity of  $20 \text{ fb}^{-1}$ .

Sample	Cross Section (pb)	Events for $20 \text{ fb}^{-1}$
QCD-Pt-30to50-pythia6	66285328	1325706560000
QCD-Pt-50to80-pythia6	8148778	162975560000
QCD-Pt-80to120-pythia6	1033680	20673600000
QCD-Pt-120to170-pythia6	156293,3	3125866000
QCD-Pt-170to300-pythia6	34138,15	682763000
QCD-Pt-300to470-pythia6	1759,549	35190980
QCD-Pt-470to600-pythia6	113,8791	2277582
QCD-Pt-600to800-pythia6	26,9921	539842
QCD-Pt-800to1000-pythia6	3,550036	71000,72
QCD-Pt-1000to1400-pythia6	0,737844	14756,88
QCD-Pt-1400to1800-pythia6	0,03352235	670,45
QCD-Pt-1800-pythia6	0,001829005	36,58

If we consider a minimum  $p_T$  for hard scattering of 80 GeV the total cross section for 1226016 pb which implies we need a rejection factor of 10000 to be able to produce a  $20 \text{ fb}^{-1}$  sample with 2.5M events.



table and discussion of choice of values

# Filter Efficiency per $p_T$ hat

Cross Sections						
Sample	Gen. Ev	Pass MET	Pass Dijet	Factor	Sample	Ev. S
QCD-Pt-50to80-pythia6	1000000	127	3	0,000003	488927	82,0
QCD-Pt-80to120-pythia6	1000000	1172	41	0,000041	847618	70,7
QCD-Pt-120to170-pythia6	1000000	4276	293	0,000293	915879	68,2
QCD-Pt-170to300-pythia6	1000000	9315	1012	0,001012	690956	66,2
QCD-Pt-300to470-pythia6	1000000	17956	2598	0,002598	91426	67,3
QCD-Pt-470to600-pythia6	1000000	23913	4187	0,004187	9536	68,5

Explain steps to be done and CMSSW versions

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PU etc.

