

# The Mock(ery of a ) Data Challenge<sup>1</sup>

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<sup>1</sup>All jokes are Konstantin's

# Signal

Can be generated with the MC4BSM machinery (see tutorial)

## Shortcut: Pythia8

```
Main:numberOfEvents = 100000      ! number of events to generate

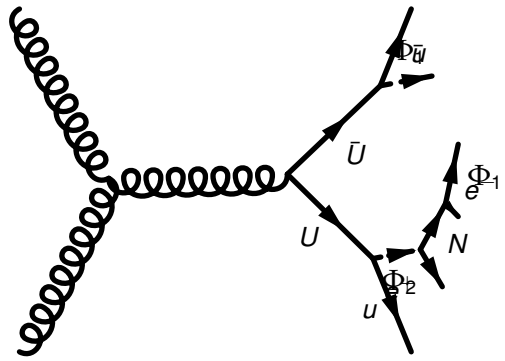
Beams:idA = 2212                  ! first beam, p = 2212, pbar = -2212
Beams:idB = 2212                  ! second beam, p = 2212, pbar = -2212
Beams:eCM = 13000.                ! CM energy of collision
PartonLevel:MPI = off

50:all = Phi1 void 1 0 0 200. 0. 0. 0. 0.
51:all = Phi2 void 1 0 0 400. 1. 0. 0. 0.
8:name = U
8:antiName = Ubar
17:name = E-
17:antiName = E+

FourthTop:gg2tPrimetPrimebar = on
FourthTop:qqbar2tPrimetPrimebar = on
FourthGeneration:VtPrimed = 0
FourthGeneration:VtPrimes = 0
FourthGeneration:VtPrimeb = 0
FourthGeneration:VtPrimebPrime = 0

SLHA:file = test.spc
SLHA:keepSM = off
```

Block MASS		# Mass spectrum				
#	PDG code	mass	particle			
	8	400.0	U			
	17	250.0	E			
	50	200.0	Phi1			
	51	300.0	Phi2			
DECAY	#	BR	NDA	ID1	ID2	# U decays
	8	1.000000000000				
	0.5		2	50	2	
	0.5		2	51	2	
DECAY	#	BR	NDA	ID1	ID2	# E decays
	17	1.000000000000				
	1.0		2	50	11	
DECAY	#	BR	NDA	ID1	ID2	# 2 decays
	51	0.100000000000				
	0.5		2	17	-11	
	0.5		2	-17	11	
DECAY	#	BR	NDA	ID1	ID2	# 1 stable
	50	0.000000000000				



# Delphes Simulation

delphesCMS tcl file

NO trigger (just output of Delphes)

Two outputs:

1. ttbar\_trim.root, mc4bsm0\_trim.root
2. ttbar.lhco.gz, mc4bsm0.lhco.gz

somedropboxlinks

<https://www.dropbox.com/s/pia2k1c6986ldb1m/mc4bsm0.lhco.gz?dl=0>

https:

[//www.dropbox.com/s/18veo7qvbavnq3k/ttbar.lhco.gz?dl=0](https://www.dropbox.com/s/18veo7qvbavnq3k/ttbar.lhco.gz?dl=0)

[https://www.dropbox.com/s/9b2wm3qn6dst6ht/mc4bsm0\\_trim.root?dl=0](https://www.dropbox.com/s/9b2wm3qn6dst6ht/mc4bsm0_trim.root?dl=0)

[https://www.dropbox.com/s/r9tjrym2bi5rpbv/ttbar\\_trim.root?dl=0](https://www.dropbox.com/s/r9tjrym2bi5rpbv/ttbar_trim.root?dl=0)

root files also at:

`/uscms_data/d2/mrenna`

# LHCO format

#	typ	eta	phi	pt	jmas	ntrk	btag	had/em	dum1	dum2
0		0	0							
1	0	-0.457	0.923	12.00	0.00	0.0	0.0	0.00	0.0	0.0
2	1	1.478	2.077	80.45	0.00	1.0	0.0	0.00	0.0	0.0
3	4	-0.503	-1.652	170.49	27.04	8.0	0.0	0.19	0.0	0.0
4	4	-1.721	1.262	78.16	13.85	10.0	0.0	0.74	0.0	0.0
5	4	2.755	-0.590	40.18	6.82	2.0	0.0	0.62	0.0	0.0
6	4	0.829	-0.046	31.04	3.83	4.0	0.0	0.00	0.0	0.0
7	6	0.000	2.361	56.37	0.00	0.0	0.0	0.00	0.0	0.0

0=photon, 1=electron, 2=muon, 3=tau, 4=jet, 6=met

# Root format

```
*****
*Tree   :Delphes   : Analysis tree                                     *
*Entries : 100000 : Total =      1637964972 bytes File Size = 695123780 *
*       :         : Tree compression factor = 2.36                    *
*****
*Br    0 :Event    : Int_t Event_                                     *
*Entries : 100000 : Total Size=    915866 bytes File Size =    144545 *
*Baskets :   132 : Basket Size=    64000 bytes Compression=    5.61   *
*.....*
*Br   20 :Track    : Int_t Track_                                     *
*Entries : 100000 : Total Size=   886126 bytes File Size =    309161 *
*Baskets :   132 : Basket Size=    64000 bytes Compression=    2.62   *
*.....*
*Br   45 :Tower    : Int_t Tower_                                     *
*Entries : 100000 : Total Size=   852593 bytes File Size =    313324 *
*Baskets :   132 : Basket Size=    64000 bytes Compression=    2.59   *
*.....*
*Br   58 :Jet      : Int_t Jet_                                       *
*.....*
*Br   87 :Electron : Int_t Electron_                                     *
*.....*
*Br   98 :Photon   : Int_t Photon_                                       *
*.....*
*Br  109 :Muon     : Int_t Muon_                                         *
*.....*
*Br  119 :MissingET : Int_t MissingET_                                     *
*.....*
*Br  126 :ScalarHT : Int_t ScalarHT_                                     *
*.....*
```



# Doing a Root analysis

```
/*  
Simple macro showing how to access branches from the delphes output root file,  
loop over events, and plot simple quantities such as the jet pt and the di-electron invariant  
mass.
```

```
root -l examples/Example1.C'("delphes_output.root")'
```

```
*/
```

```
//-----
```

```
void CMSMonoJet(const char *inputFile)
```

```
{
```

```
  gSystem->Load("libDelphes");
```

```
  // Create chain of root trees
```

```
  TChain chain("Delphes");
```

```
  chain.Add(inputFile);
```

```
  // Create object of class ExRootTreeReader
```

```
  ExRootTreeReader *treeReader = new ExRootTreeReader(&chain);
```

```
  Long64_t numberOfEntries = treeReader->GetEntries();
```

```
  double M_PI = 4.0*atan(1.0);
```

```
  // Get pointers to branches used in this analysis
```

```
  TClonesArray *branchJet = treeReader->UseBranch("Jet");
```

```
  TClonesArray *branchMissingET = treeReader->UseBranch("MissingET");
```

```
  // Book histograms
```

```
  TH1 *histJetPT = new TH1F("jet_pt", "jet P_{T}", 100, 0.0, 1000.0);
```

```
  Double_t norm = 1.0/numberOfEntries;
```

```
}
```

# Doing a Root analysis

```
// Loop over all events
for(Int_t entry = 0; entry < numberOfEntries; ++entry)
{
    // Load selected branches with data from specified event
    treeReader->ReadEntry(entry);

    MissingET *met;
    if(branchMissingET->GetEntriesFast() == 0) continue;
    met = (MissingET*) branchMissingET->At(0);

    double pTmiss = met->MET;

    histPtMiss->Fill( pTmiss , norm );
}
c1->Print("xxx.ps");
histPtMiss->Draw();
c1->Print("xxx.ps");
}
```