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Pileup Scenarios

2012 Pileup Scenario(s)

See twikis under CMS.PdmV documentation

Here are the actual values used in the 5_3_X Summer 12 MC production (the so-called S10 Scenario):

```
// Distribution used for S10 Summer2012 MC.
```

```
Double_t Summer2012_S10[60] = {  
    2.560E-06,  
    5.239E-06,  
    1.420E-05,  
    5.005E-05,  
    1.001E-04,  
    2.705E-04,  
    1.999E-03,  
    6.097E-03,  
    1.046E-02,  
    1.383E-02,  
    1.685E-02,  
    2.055E-02,  
    2.572E-02,  
    3.262E-02,  
    4.121E-02,  
    4.977E-02,  
    5.539E-02,  
    5.725E-02,  
    5.607E-02,  
    5.312E-02,  
    5.008E-02,  
    4.763E-02,  
    4.558E-02,  
    4.363E-02,  
    4.159E-02,  
    3.933E-02,  
    3.681E-02,  
    3.406E-02,  
    3.116E-02,  
    2.818E-02,  
    2.519E-02,  
    2.226E-02,  
    1.946E-02,  
    1.682E-02,  
    1.437E-02,  
    1.215E-02,  
    1.016E-02,  
    8.400E-03,  
    6.873E-03,  
    5.564E-03,  
    4.457E-03,  
    3.533E-03,  
    2.772E-03,  
    2.154E-03,  
    1.656E-03,  
    1.261E-03,  
    9.513E-04,  
    7.107E-04,  
    5.259E-04,  
    3.856E-04,  
    2.801E-04,  
}
```

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```
2.017E-04,  
1.439E-04,  
1.017E-04,  
7.126E-05,  
4.948E-05,  
3.405E-05,  
2.322E-05,  
1.570E-05,  
5.005E-06}
```

Here are the actual values used in the First Round of Summer 12 MC production (the so-called S7 Scenario):

```
// Distribution used for S7 Summer2012 MC.
```

```
Double_t Summer2012_S7[60] = {  
2.344E-05,  
2.344E-05,  
2.344E-05,  
2.344E-05,  
4.687E-04,  
4.687E-04,  
7.032E-04,  
9.414E-04,  
1.234E-03,  
1.603E-03,  
2.464E-03,  
3.250E-03,  
5.021E-03,  
6.644E-03,  
8.502E-03,  
1.121E-02,  
1.518E-02,  
2.033E-02,  
2.608E-02,  
3.171E-02,  
3.667E-02,  
4.060E-02,  
4.338E-02,  
4.520E-02,  
4.641E-02,  
4.735E-02,  
4.816E-02,  
4.881E-02,  
4.917E-02,  
4.909E-02,  
4.842E-02,  
4.707E-02,  
4.501E-02,  
4.228E-02,  
3.896E-02,  
3.521E-02,  
3.118E-02,  
2.702E-02,  
2.287E-02,  
1.885E-02,  
1.508E-02,  
1.166E-02,  
8.673E-03,  
6.190E-03,  
4.222E-03,  
2.746E-03,  
1.698E-03,  
9.971E-04,  
5.549E-04,
```

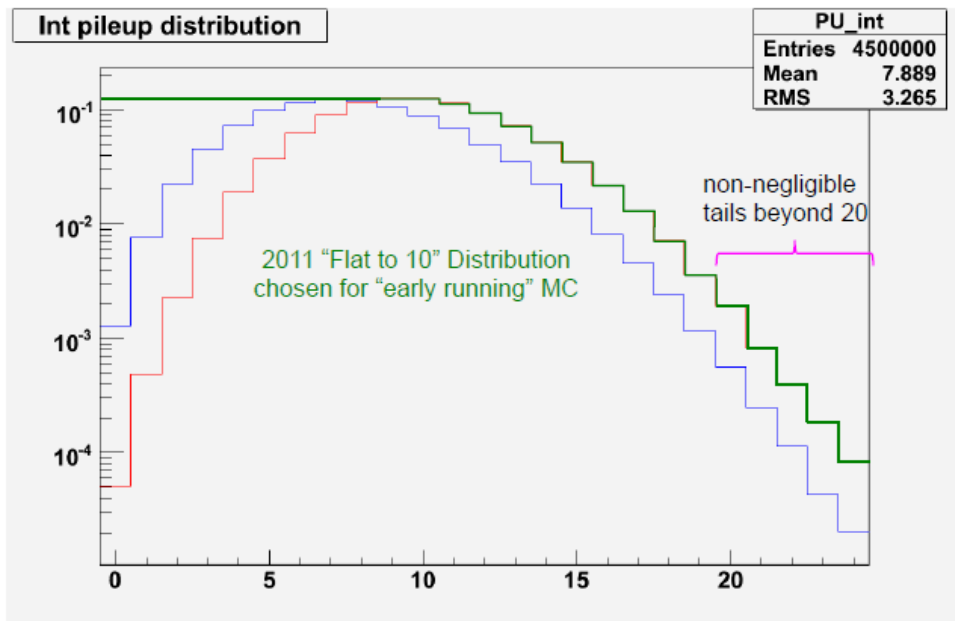
```

2.924E-04,
1.457E-04,
6.864E-05,
3.054E-05,
1.282E-05,
5.081E-06,
1.898E-06,
6.688E-07,
2.221E-07,
6.947E-08,
2.047E-08
};

```

2011 Pileup Scenarios

The accelerator group has indicated that they plan to reach bunch currents and a machine configuration at approximately 10 interactions per crossing soon after LHC startup this spring. Since we don't know how the luminosity will evolve over this early period, the first batch of 2011 MC will be generated with a "flat" distribution from 0-10 interactions per crossing with a tail above 10 to higher values corresponding to a poisson distribution with a mean of 10 interactions. The plot below shows this distribution; the red histogram is a poisson distribution with a mean of ten interactions. The other histogram (blue) in the plot is a distribution that would be obtained with a peak luminosity corresponding to 10 interactions per crossing, decreasing linearly to 5 interactions per crossing during a fill.



For the "Flat to 10 plus tail" scenario shown above, the relative normalization of each bin is:

```

0: 0.069286816
1: 0.069286816
2: 0.069286816
3: 0.069286816
4: 0.069286816
5: 0.069286816
6: 0.069286816
7: 0.069286816
8: 0.069286816
9: 0.069286816
10: 0.069286816

```

```

11: 0.06518604
12: 0.053861878
13: 0.040782032
14: 0.030135062
15: 0.019550796
16: 0.012264707
17: 0.007449117
18: 0.004502075
19: 0.002194605
20: 0.001166276
21: 0.000476543
22: 0.000188109
23: 7.52436E-05
24: 1.25406E-05
    
```

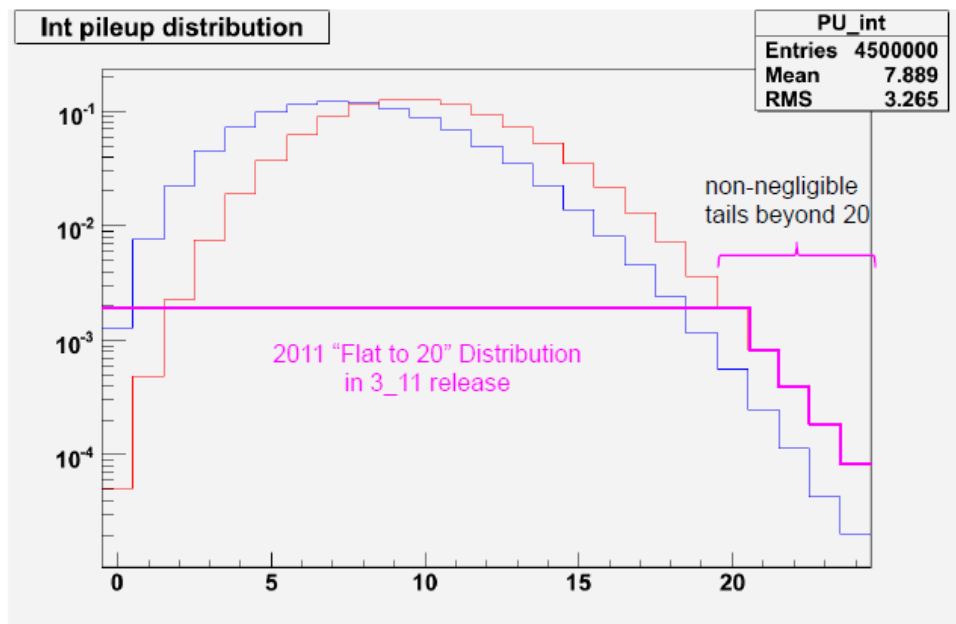
The corresponding pileup mixing scenario used in full simulation is

`mix_E7TeV_FlatDist10_2011EarlyData_50ns`. This was used for Spring11 production. The definition file can also be found in `SimGeneral/MixingModule/python`. The version of this file used for Summer11 production is `mix_E7TeV_FlatDist10_2011EarlyData_50ns_PoissonOOT`. This includes, when done correctly (i.e. PU_S4) out-of-time pileup selected from the same poisson distribution as the in-time bunch crossing.

In Fast Simulation, the corresponding scenario is named

`PileUpSimulator_FlatDist10_2011EarlyData_inTimeOnly`. The definition file can be found in `FastSimulation/PileUpProducer/python`.

Another full simulation scenario present in the release is "flat to 20 with tail", which looks like this:



The corresponding pileup mixing scenario to use is `mix_E8TeV_FlatDist10_2011EarlyData_50ns`. (The 8TeV is meaningless.)

Fall 2011 Pileup Scenario

The input distribution for the Fall 2011 (So called S6) production is as follows:

```

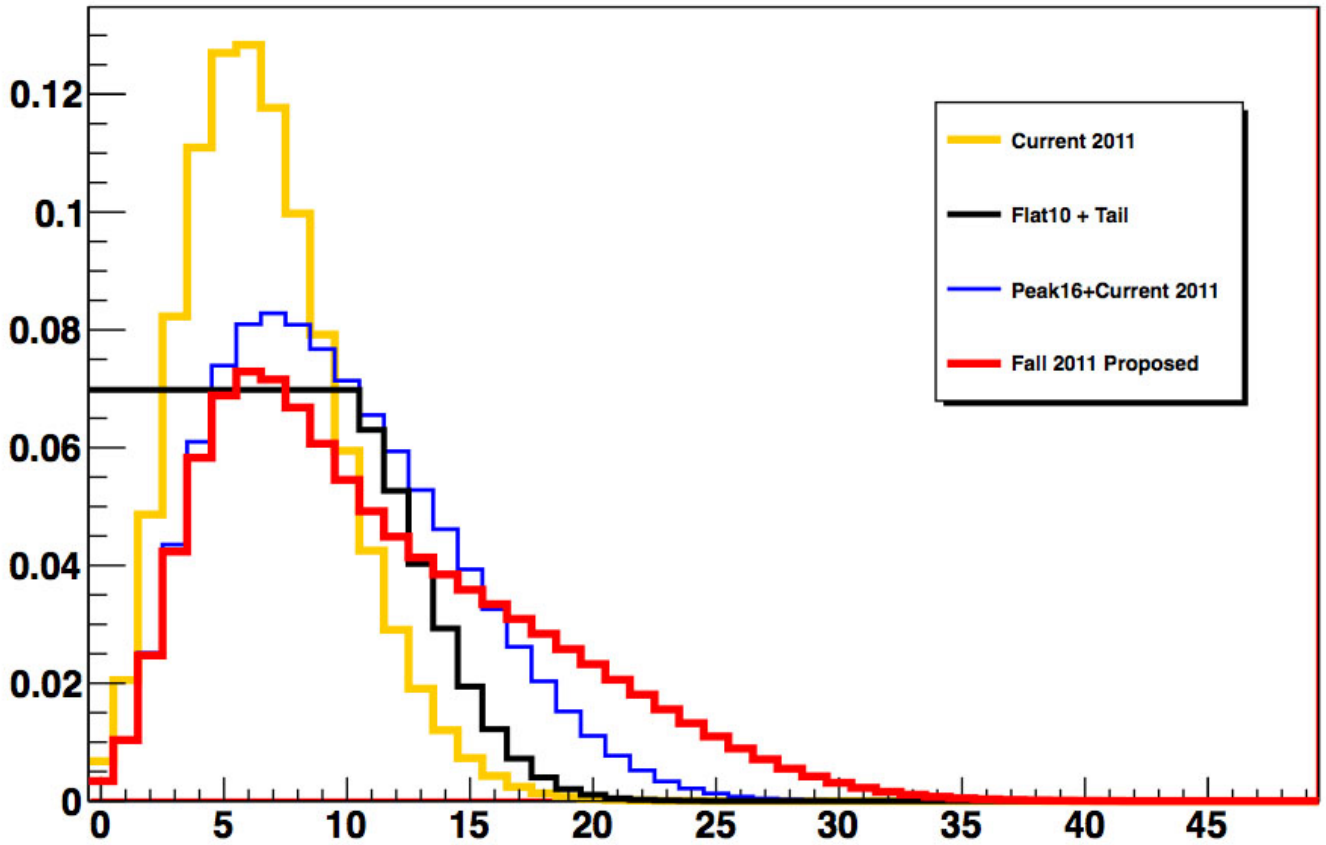
Double_t Fall2011[50] = {
    0.003388501,
    0.010357558,
    0.024724258,
    0.042348605,
    
```

```
0.058279812,  
0.068851751,  
0.072914824,  
0.071579609,  
0.066811668,  
0.060672356,  
0.054528356,  
0.04919354,  
0.044886042,  
0.041341896,  
0.0384679,  
0.035871463,  
0.03341952,  
0.030915649,  
0.028395374,  
0.025798107,  
0.023237445,  
0.020602754,  
0.0180688,  
0.015559693,  
0.013211063,  
0.010964293,  
0.008920993,  
0.007080504,  
0.005499239,  
0.004187022,  
0.003096474,  
0.002237361,  
0.001566428,  
0.001074149,  
0.000721755,  
0.000470838,  
0.00030268,  
0.000184665,  
0.000112883,  
6.74043E-05,  
3.82178E-05,  
2.22847E-05,  
1.20933E-05,  
6.96173E-06,  
3.4689E-06,  
1.96172E-06,  
8.49283E-07,  
5.02393E-07,  
2.15311E-07,  
9.56938E-08  
};
```

The .cfi file used is `mix_E7TeV_Fall2011_Reprocess_50ns_PoissonOOTPU_cfi.py`.

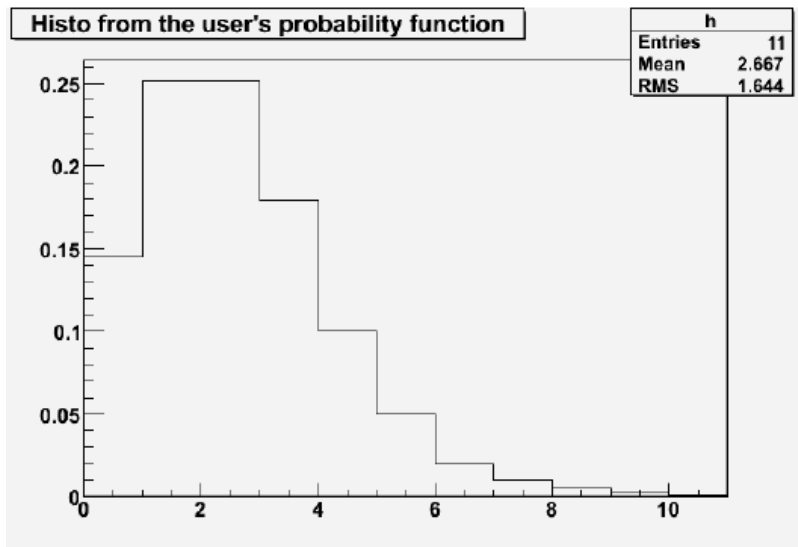
A comparison of various 2011 distributions is shown in this figure. Here "Current 2011" refers to the pre-Technical-Stop data, so it's the first 2.5 fb-1.

Luminosity Distributions



2010 Pileup Scenarios

The following plot shows the pileup distribution in the 2010 data sample, estimated using the `estimate_pileup` script from Charles Plager. It matches the observed `nvtx` distribution if one assumes a fixed efficiency of primary vertex reconstruction for minbias events of about 70%.



For the scenario shown above, here is a list of the relative normalization for each bin:

- 0: 0.145168
- 1: 0.251419
- 2: 0.251596

3: 0.17943
4: 0.10
5: 0.05
6: 0.02
7: 0.01
8: 0.005
9: 0.002
10: 0.001

This distribution was included in the 3_9_7 MC production for Winter10

The corresponding pileup mixing scenario used is `mix_E7TeV_ProbDist_2010Data_BX156`. The definition file can be found in `SimGeneral/MixingModule/python`.

-- MichaelHildreth - 09-Mar-2012

This topic: CMSPublic > Pileup_MC_Gen_Scenarios

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