

Pulse Shape and Time Slew Update for MC

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To do list

- ttbar production by using PYTHIA8 — **done**
- pile-up, digitization and reconstruction — **done**
- Analyzing — **processing**

ttbar Production Without Any Pile-up Contribution

```
import FWCore.ParameterSet.Config as cms
from Configuration.Generator.Pythia8CommonSettings_cfi import *
from Configuration.Generator.Pythia8CUEP8M1Settings_cfi import *

process = cms.Process('RECO')

# import of standard configurations
process.load('Configuration.StandardSequences.Services_cff')
process.load('SimGeneral.HepPDTESSource.pythiapdt_cfi')
process.load('FWCore.MessageService.MessageLogger_cfi')
process.load('Configuration.EventContent.EventContent_cff')
process.load('SimGeneral.MixingModule.mixNoPU_cfi')
process.load('Configuration.StandardSequences.GeometryDB_cff')
process.load('Configuration.StandardSequences.MagneticField_38T_cff')
process.load('Configuration.StandardSequences.Generator_cff')
process.load('IOMC.EventVertexGenerators.VtxSmearedRealistic7TeV2011Collision_cfi')
process.load('GeneratorInterface.Core.genFilterSummary_cff')
process.load('Configuration.StandardSequences.SimIdeal_cff')
process.load('Configuration.StandardSequences.Digi_cff')
process.load('Configuration.StandardSequences.SimL1Emulator_cff')
process.load('Configuration.StandardSequences.DigiToRaw_cff')
process.load('HLTrigger.Configuration.HLT_GRun_cff')
process.load('Configuration.StandardSequences.RawToDigi_cff')
process.load('Configuration.StandardSequences.Reconstruction_cff')
process.load('Configuration.StandardSequences.EndOfProcess_cff')
process.load('Configuration.StandardSequences.FrontierConditions_GlobalTag_cff')
# process.load('SimGeneral.MixingModule.mix_POISSON_average_cfi')

process.maxEvents = cms.untracked.PSet(
    input = cms.untracked.int32(10)
)
```

As you can see there is no pile-up contribution to the production of ttbar

```
process.genstepfilter.triggerConditions=cms.vstring("generation_step")
from Configuration.AlCa.GlobalTag import GlobalTag
process.GlobalTag = GlobalTag(process.GlobalTag, 'auto:mc', '')

process.generator = cms.EDFilter("Pythia8GeneratorFilter",
    pythiaHepMCVerbosity = cms.untracked.bool(False),
    maxEventsToPrint = cms.untracked.int32(1),
    pythiaPylistVerbosity = cms.untracked.int32(1),
    filterEfficiency = cms.untracked.double(1.0),
    comEnergy = cms.double(13000.0),
    PythiaParameters = cms.PSet(
        pythia8CommonSettingsBlock,
        pythia8CUEP8M1SettingsBlock,
        processParameters = cms.vstring(
            'Top:gg2ttbar = on ',
            'Top:qqbar2ttbar = on ',
            '6:m0 = 175 ',
        ),
        parameterSets = cms.vstring('pythia8CommonSettings',
                                    'pythia8CUEP8M1Settings',
                                    'processParameters',
        )
    )
)

process.ProductionFilterSequence = cms.Sequence(process.generator)

# Additional output definition

# Path and EndPath definitions
process.generation_step = cms.Path(process.pgen)
process.simulation_step = cms.Path(process.psim)
process.digitisation_step = cms.Path(process.pdigi)
process.L1simulation_step = cms.Path(process.SimL1Emulator)
process.digi2raw_step = cms.Path(process.DigiToRaw)
process.raw2digi_step = cms.Path(process.RawToDigi)
process.reconstruction_step = cms.Path(process.reconstruction)
process.genfiltersummary_step = cms.EndPath(process.genFilterSummary)
process.endjob_step = cms.EndPath(process.endOfProcess)
process.FEVTDEBUGHLToutput_step = cms.EndPath(process.FEVTDEBUGHLToutput)
```

PYTHIA8 Settings

Adding pile-up - Generating MinBias Events -1-

- Firstly we generated MinBias events.

```
process = cms.Process('SIM')

# import of standard configurations
process.load('Configuration.StandardSequences.Services_cff')
process.load('SimGeneral.HepPDTESource.pythiapdt_cfi')
process.load('FWCore.MessageService.MessageLogger_cfi')
process.load('Configuration.EventContent.EventContent_cff')
process.load('SimGeneral.MixingModule.mixNoPU_cfi')
process.load('Configuration.StandardSequences.GeometryRecoDB_cff')
process.load('Configuration.Geometry.GeometrySimDB_cff')
process.load('Configuration.StandardSequences.MagneticField_38T_cff')
process.load('Configuration.StandardSequences.Generator_cff')
process.load('IOMC.EventVertexGenerators.VtxSmearNominalCollision2015_cfi')
process.load('GeneratorInterface.Core.genFilterSummary_cff')
process.load('Configuration.StandardSequences.SimIdeal_cff')
process.load('Configuration.StandardSequences.EndOfProcess_cff')
process.load('Configuration.StandardSequences.FrontierConditions_GlobalTag_condDBv2_cff')

process.maxEvents = cms.untracked.PSet(
    input = cms.untracked.int32(10)
)

# Input source
process.source = cms.Source("EmptySource")

process.options = cms.untracked.PSet(
)

# Production Info
process.configurationMetadata = cms.untracked.PSet(
    annotation = cms.untracked.string('MinBias_13TeV_pythia8_cff nevts:1'),
    name = cms.untracked.string('Applications'),
    version = cms.untracked.string('$Revision: 1.19 $')
)
```

Adding pile-up - Generating MinBias Events -2-

```
process.genstepfilter.triggerConditions=cms.vstring("generation_step")
from Configuration.ALCa.GlobalTag_condDBv2 import GlobalTag
process.GlobalTag = GlobalTag(process.GlobalTag, 'auto:upgradePLS1', '')

process.generator = cms.EDFilter("Pythia8GeneratorFilter",
    PythiaParameters = cms.PSet(
        parameterSets = cms.vstring('pythia8CommonSettings',
            'pythia8CUEP8M1Settings',
            'processParameters'),
        processParameters = cms.vstring('SoftQCD:nonDiffractive = on',
            'SoftQCD:singleDiffractive = on',
            'SoftQCD:doubleDiffractive = on'),
        pythia8CUEP8M1Settings = cms.vstring('Tune:pp 14',
            'Tune:ee 7',
            'MultipartonInteractions:pT0Ref=2.4024',
            'MultipartonInteractions:ecmPow=0.25208',
            'MultipartonInteractions:expPow=1.6'),
        pythia8CommonSettings = cms.vstring('Tune:preferLHAPDF = 2',
            'Main:timesAllowErrors = 10000',
            'Check:epTolErr = 0.01',
            'Beams:setProductionScalesFromLHEF = off',
            'SLHA:keepSM = on',
            'SLHA:minMassSM = 1000.',
            'ParticleDecays:limitTau0 = on',
            'ParticleDecays:tau0Max = 10',
            'ParticleDecays:allowPhotonRadiation = on')
    ),
    comEnergy = cms.double(13000.0),
    crossSection = cms.untracked.double(71390000000.0),
    filterEfficiency = cms.untracked.double(1.0),
    maxEventsToPrint = cms.untracked.int32(0),
    pythiaHepMCVerbosity = cms.untracked.bool(False),
    pythiaPylistVerbosity = cms.untracked.int32(1)
)
```

```
process.ProductionFilterSequence = cms.Sequence(process.generator)
```

Path and EndPath definitions

```
process.generation_step = cms.Path(process.pgen)
process.simulation_step = cms.Path(process.psim)
process.genfiltersummary_step = cms.EndPath(process.genFilterSummary)
process.endjob_step = cms.EndPath(process.endOfProcess)
process.RAWSIMoutput_step = cms.EndPath(process.RAWSIMoutput)
```

PYTHIA8 Settings

Com Energy

Cross Section

Adding pile-up - MinBias to the ttbar Production -1-

- Than we added MinBias events to the ttbar production as a pile-up.

```
import FWCore.ParameterSet.Config as cms
from Configuration.Generator.Pythia8CommonSettings_cfi import *
from Configuration.Generator.Pythia8CUEP8M1Settings_cfi import *

process = cms.Process('RECO')

# import of standard configurations
process.load('Configuration.StandardSequences.Services_cff')
process.load('SimGeneral.HepPDTESSource.pythiapdt_cfi')
process.load('FWCore.MessageService.MessageLogger_cfi')
process.load('Configuration.EventContent.EventContent_cff')
#process.load('SimGeneral.MixingModule.mixNoPU_cfi')
process.load('Configuration.StandardSequences.GeometryDB_cff')
process.load('Configuration.StandardSequences.MagneticField_38T_cff')
process.load('Configuration.StandardSequences.Generator_cff')
process.load('IOMC.EventVertexGenerators.VtxSmearedRealistic7TeV2011Collision_cfi')
process.load('GeneratorInterface.Core.genFilterSummary_cff')
process.load('Configuration.StandardSequences.SimIdeal_cff')
process.load('Configuration.StandardSequences.Digi_cff')
process.load('Configuration.StandardSequences.SimL1Emulator_cff')
process.load('Configuration.StandardSequences.DigiToRaw_cff')
process.load('HLTrigger.Configuration.HLT_GRun_cff')
process.load('Configuration.StandardSequences.RawToDigi_cff')
process.load('Configuration.StandardSequences.Reconstruction_cff')
process.load('Configuration.StandardSequences.EndOfProcess_cff')
process.load('Configuration.StandardSequences.FrontierConditions_GlobalTag_cff')
process.load('SimGeneral.MixingModule.mix_POISSON_average_cfi')

process.maxEvents = cms.untracked.PSet(
    input = cms.untracked.int32(10)
)
```

Adding pile-up - MinBias to the ttbar Production -2-

```
process.genstepfilter.triggerConditions=cms.vstring("generation_step")
from Configuration.AlCa.GlobalTag import GlobalTag
process.GlobalTag = GlobalTag(process.GlobalTag, 'auto:mc', '')

process.generator = cms.EDFilter("Pythia8GeneratorFilter",
    pythiaHepMCVerbosity = cms.untracked.bool(False),
    maxEventsToPrint = cms.untracked.int32(1),
    pythiaPylistVerbosity = cms.untracked.int32(1),
    filterEfficiency = cms.untracked.double(1.0),
    comEnergy = cms.double(13000.0),
    PythiaParameters = cms.PSet(
        pythia8CommonSettingsBlock,
        pythia8CUEP8M1SettingsBlock,
        processParameters = cms.vstring(
            'Top:gg2ttbar = on ',
            'Top:qqbar2ttbar = on ',
            '6:m0 = 175 ',
        ),
        parameterSets = cms.vstring('pythia8CommonSettings',
            'pythia8CUEP8M1Settings',
            'processParameters',
        )
    )
)

process.ProductionFilterSequence = cms.Sequence(process.generator)

# Additional output definition

process.mix.input.nbPileupEvents.averageNumber = cms.double(35.000000)
process.mix.bunchspace = cms.int32(25)
process.mix.minBunch = cms.int32(-12)
process.mix.maxBunch = cms.int32(3)
process.mix.input.fileNames = cms.untracked.vstring(['file:MinBias_13TeV_pythia8_cff_GEN_SIM.root'])

# Path and EndPath definitions
process.generation_step = cms.Path(process.pgen)
process.simulation_step = cms.Path(process.psim)
process.digitisation_step = cms.Path(process.pdigi)
process.L1simulation_step = cms.Path(process.SimL1Emulator)
process.digi2raw_step = cms.Path(process.DigiToRaw)
process.raw2digi_step = cms.Path(process.RawToDigi)
process.reconstruction_step = cms.Path(process.reconstruction)
process.genfilterssummary_step = cms.EndPath(process.genFilterSummary)
process.endjob_step = cms.EndPath(process.endOfProcess)
process.FEVTDEBUGHLToutput_step = cms.EndPath(process.FEVTDEBUGHLToutput)
```

PYTHIA8 Settings

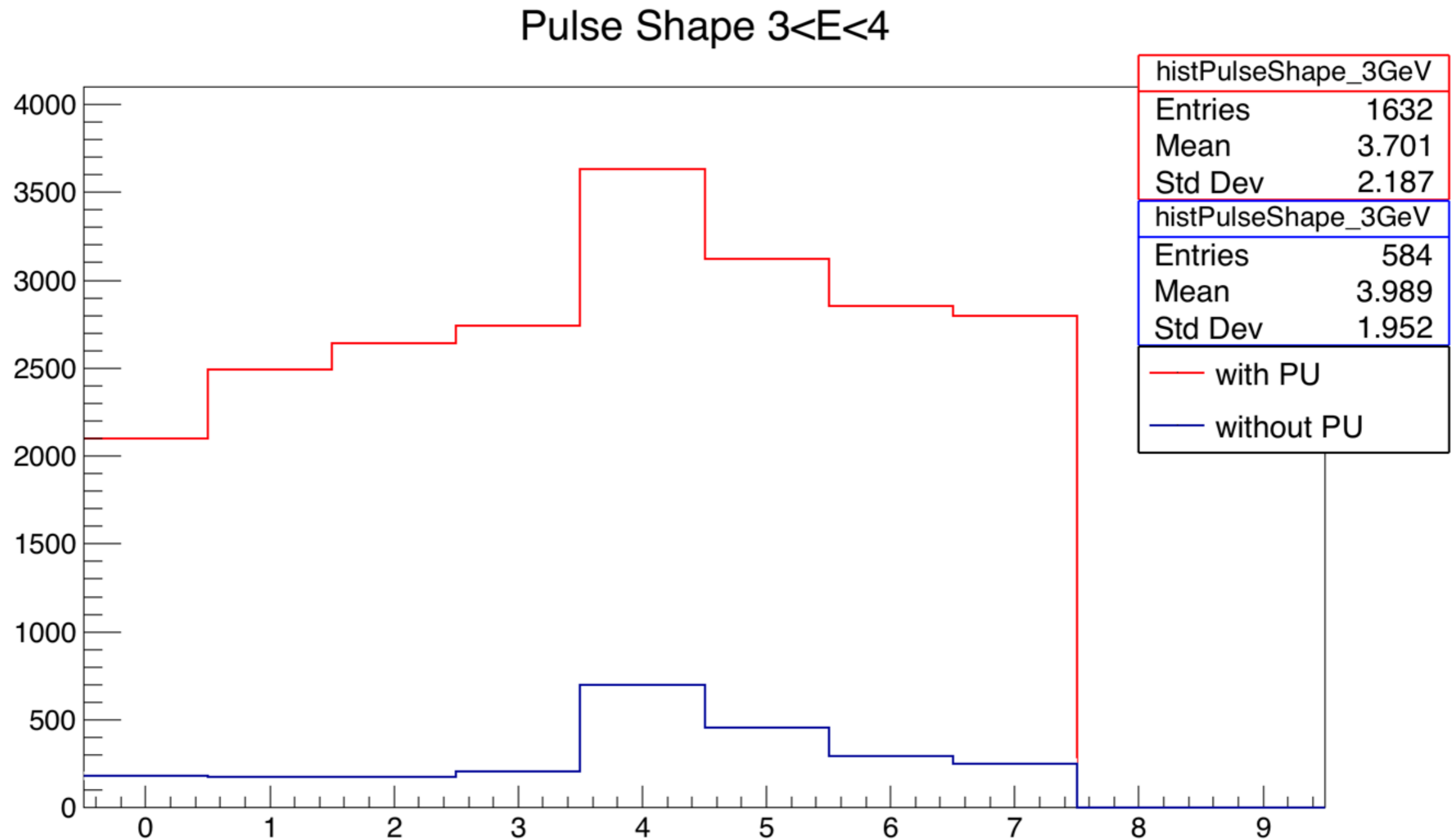
ttbar Production

pile-up Process

MinBias Events

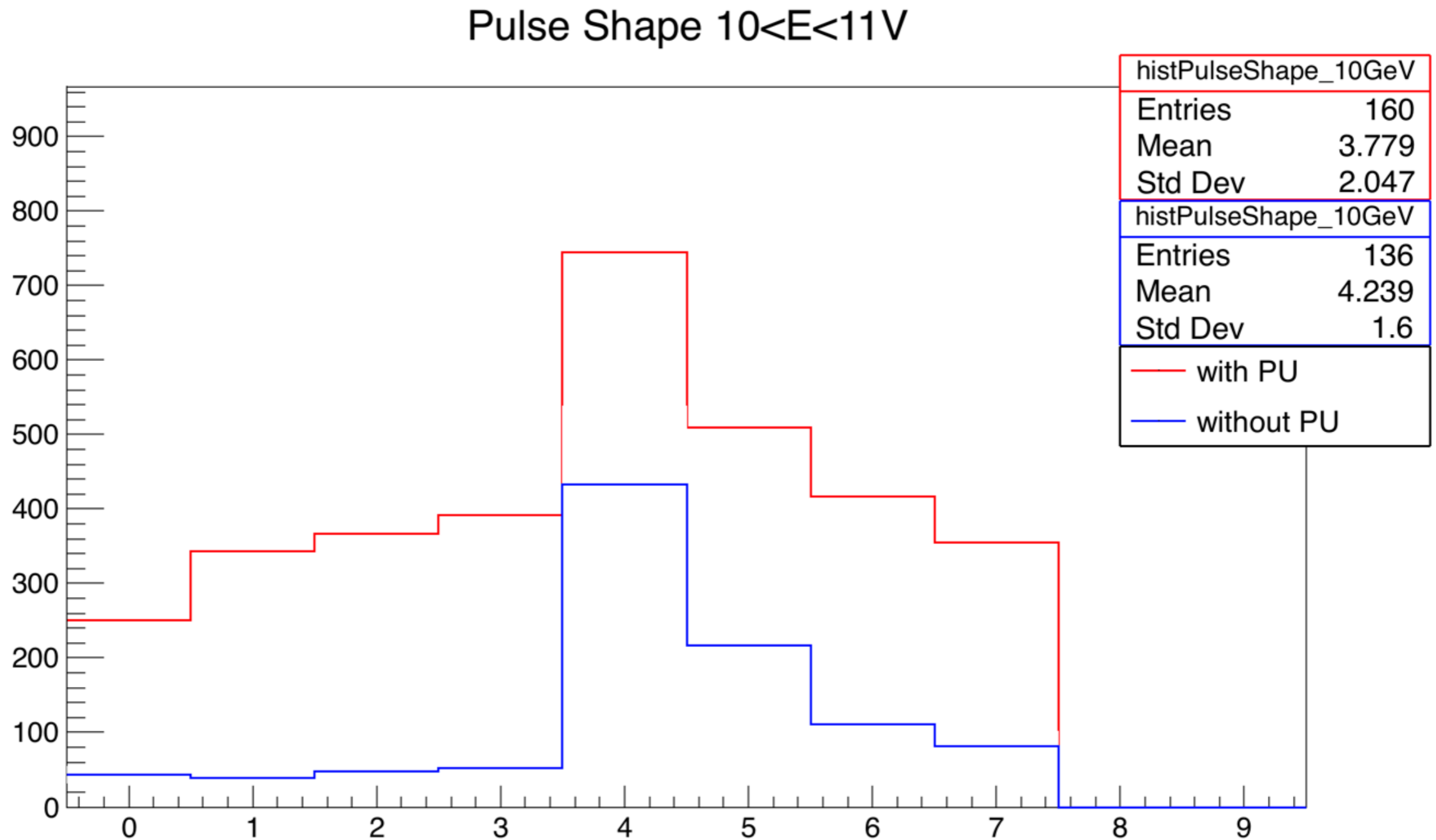
Pulse Shape -1-

- Very first result from our study with 10 events.



Pulse Shape -2-

- Very first result from our study with 10 events.



Conclusion

- We will generate more events.
- Your comments and suggestions for next step are welcomed.

THANKS