# Updates on MC generation and important discussion

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# Information from France group

- According to the last week chat with the France group:
  - Currently they have submitted the central production for $t\bar{t}b\bar{b}/4b$ backgrounds.
  - Are we going to collaborate with them: share samples, exchange more ideas, and have regular meetings together, …
- What do we need to have the collaboration?

- In addition, we also need to setup a timeline, and discuss our next phase plan, to ensure a regular meeting on the Higgs subgroup $hbb$.

# Generator level gridpack production

- Generating gridpack:
  - Using package https://github.com/cms-sw/genproductions/tree/master.
  - `source gridpack_generation.sh <name of process> <dir of cards>`
  - Not requiring cmsrel setup
- lhe test production:
  - Extract the gridpack, and run: `source runcmsgrid.sh <number of events> <random seed> <CPU core numbers>`
  - Not requiring cmsrel setup, giving lhe for checking
- Nano production with parton shower:
  - Need cmsrel setup
  - Write the fragment file in the cmsrel workspace src/
  - Generate config from fragment files by cmsDriver.py.
  - Pilot using: `cmsRun config.py`

# Fragment files

```
import FWCore.ParameterSet.Config as cms

externalLHEProducer = cms.EDProducer("ExternalLHEProducer",
    args = cms.vstring('/eos/user/t/tiyang/CMS/gridpack/ggh012j_5f_NLO_FXFX_60_gridpack/
        ggh012j_5f_NLO_FXFX_60_el9_amd64_gcc11_CMSSW_13_2_9_tarball.tar.xz'),
    nEvents = cms.untracked.uint32(100),
    numberOfParameters = cms.uint32(1),
    outputFile = cms.string('cmsgrid_final.lhe'),
    scriptName = cms.FileInPath('GeneratorInterface/LHEInterface/data/run_generic_tarball_cvmfs.sh')
)
```

- Specifying IO and number of events
- Specifying generators

```
import FWCore.ParameterSet.Config as cms

from Configuration.Generator.Pythia8CommonSettings_cfi import *
from Configuration.Generator.MCTunes2017.PythiaCP5Settings_cfi import *
from Configuration.Generator.PSweightsPythia.PythiaPSweightsSettings_cfi import *

generator = cms.EDFilter("Pythia8HadronizerFilter",
    maxEventsToPrint = cms.untracked.int32(1),
    pythiaPylistVerbosity = cms.untracked.int32(1),
    filterEfficiency = cms.untracked.double(1.0),
    pythiaHepMCVerbosity = cms.untracked.bool(False),
    comEnergy = cms.double(13600.),
    PythiaParameters = cms.PSet(
        pythia8CommonSettingsBlock,
        pythia8CP5SettingsBlock,
        pythia8PSweightsSettingsBlock,
        parameterSets = cms.vstring('pythia8CommonSettings',
                                    'pythia8CP5Settings',
                                    'pythia8PSweightsSettings',
                                    )
    )
)
```

# $t\bar{t}HH$ generation test

- Prod card:

```
import model sm
define l+ = e+ mu+
define l- = e- mu-
define vl = ve vm
define vl~ = ve~ vm~

# Define the process: ttHH production
generate p p > t t~ h h [QCD]

# Output the process folder
output ttHH_WWbb_DL -nojpeg
```

- Madspin card for decay:

```
set max_weight_ps_point 400
set spinmode full

# Higgs decays
decay h > w+ w-, w+ > l+ vl, w- > l- vl~
decay h > b b~

# Top decays
decay t > w+ b, w+ > l+ vl
decay t~ > w- b~, w- > l- vl~
```

- I am still tuning the gridpack generation yet. The run card may have some issues causing lhe run failure.