

- 2HDM $p p \rightarrow H \rightarrow h h \rightarrow W^+ W^- \gamma \gamma$ 8TeV collision study.
- MG5 + pythia + delphes 3.0.10.
- Signal($m_H = 300\text{GeV}$) and irreducible background.
- Sample path: /publicfs/atlas/atlasnew/higgs/hgg/duc/
wwyy8TeV/
pythia#.hep and delphes__output#.root files.

Project 1: Hadronic decay: $W^+ W^- \rightarrow j j j j$.

- Signal:

$$p p \rightarrow H, (H \rightarrow h h, h \rightarrow \gamma \gamma, h \rightarrow W^+ W^- \rightarrow q q q q).$$

add process:

$$p p \rightarrow H j, (H \rightarrow h h, h \rightarrow \gamma \gamma, h \rightarrow W^+ W^- \rightarrow q q q q).$$

where $q = u, d, c, s, \bar{u}, \bar{d}, \bar{c}, \bar{s}$.

- Background: $p p \rightarrow \gamma \gamma V V, (V \rightarrow q q, V \rightarrow q q)$.

add process: $p p \rightarrow \gamma \gamma V V j, (V \rightarrow q q, V \rightarrow q q)$.

where $V = W^+, W^-, Z$.

Project 2: Leptonic decay: $W^+ W^- \rightarrow \ell \nu \ell \nu$.

- Signal:

$$p p \rightarrow H, (H \rightarrow h h, h \rightarrow \gamma \gamma, h \rightarrow W^+ W^- \rightarrow \ell \nu \ell \nu).$$

add process:

$$p p \rightarrow H j, (H \rightarrow h h, h \rightarrow \gamma \gamma, h \rightarrow W^+ W^- \rightarrow \ell \nu \ell \nu).$$

where $\ell = e^+, e^-, \mu^+, \mu^-, \tau^+, \tau^-$;

$$\nu = \nu_e, \bar{\nu}_e, \nu_\mu, \bar{\nu}_\mu, \nu_\tau, \bar{\nu}_\tau.$$

- Background: $p p \rightarrow \gamma \gamma \ell \nu \ell \nu$.

add process: $p p \rightarrow \gamma \gamma \ell^+ \ell^-$.

Project 3: Semi-leptonic decay: $W W \rightarrow \ell \nu j j$.

- Signal:

$$p p \rightarrow H, (H \rightarrow h h, h \rightarrow \gamma \gamma, h \rightarrow W W \rightarrow \ell \nu q q).$$

add process:

$$p p \rightarrow H j, (H \rightarrow h h, h \rightarrow \gamma \gamma, h \rightarrow W W \rightarrow \ell \nu q q).$$

where $W = W^+, W^-$.

- Background: $p p \rightarrow \gamma \gamma q q \ell \nu$.