

8 TeV Release 1

- The **ATLAS Open Data project** produces data, simulated datasets, tools, software, documentation, tutorials and an educational website
- Allows anyone to **access** and **analyse** ATLAS data
- People can run ATLAS **lab courses** and **workshops** for **university students**

ATLAS Open Data **Release 1** (July 2016) [1, 2]:

- Datasets:** 1 fb⁻¹ pp $\sqrt{s} = 8$ TeV pp collisions collected in 2012, with 42 MC processes
- Tools:** virtual machines, ROOT Notebooks, skeleton example analysis codes
- Documentation:** tutorials, videos, web platform, GitBooks

Analysis W Z $t\bar{t}$ WZ ZZ $H \rightarrow WW$ $Z' \rightarrow t\bar{t}$

Signature Particles $\ell\nu$ $\ell\ell$ $\ell\nu b q \bar{q} \bar{b}$ $\ell\nu\ell\ell$ $\ell\ell\ell\ell$ $\ell\nu\ell\nu$ $\ell\nu b q \bar{q} \bar{b}$

Moving from 8 TeV Release 1 → 13 TeV Release 2

We are preparing ATLAS Open Data **Release 2** (summer 2019):

- 10 fb⁻¹ pp collisions at $\sqrt{s} = 13$ TeV collected in 2016

New **analyses**:

- $H \rightarrow \gamma\gamma$, boosted, hadronic taus, single top, SUSY, DM, $Z' \rightarrow \ell\ell$, Graviton
- New** software, tools, documentation, tutorials, videos, web platform

DATASETS

10 fb⁻¹ real data
~100 MC datasets
SM, Z' , SUSY, DM,
Mono- Z , Graviton
ROOT flat **n-tuples**
~100 GB total

TOOLS

Python analysis code
C++ analysis code
Virtual Machines
ROOT Jupyter
Notebooks

DOCS

Online
documentation
Example **analyses**
YouTube **videos**
GitBook **tutorials**

Improved Analyses

High statistics SM analyses

$W \rightarrow \ell\nu$, $Z \rightarrow \ell\ell$, $t\bar{t} \rightarrow \ell\nu b q \bar{q} \bar{b}$

given as examples of high statistics analyses

We provide example code to create **SM validation plots**

Student activities

- Rediscover bosons** & other processes
- Extract boson **mass**
- Estimate boson **lifetime**
- Modify cuts** to observe effect on plots & yields
- Optimise **selection requirements**
- Calculate **cross sections**
- Compare **derived quantities** to PDG values
- Extend example analyses** to further processes

<http://opendata.atlas.cern>

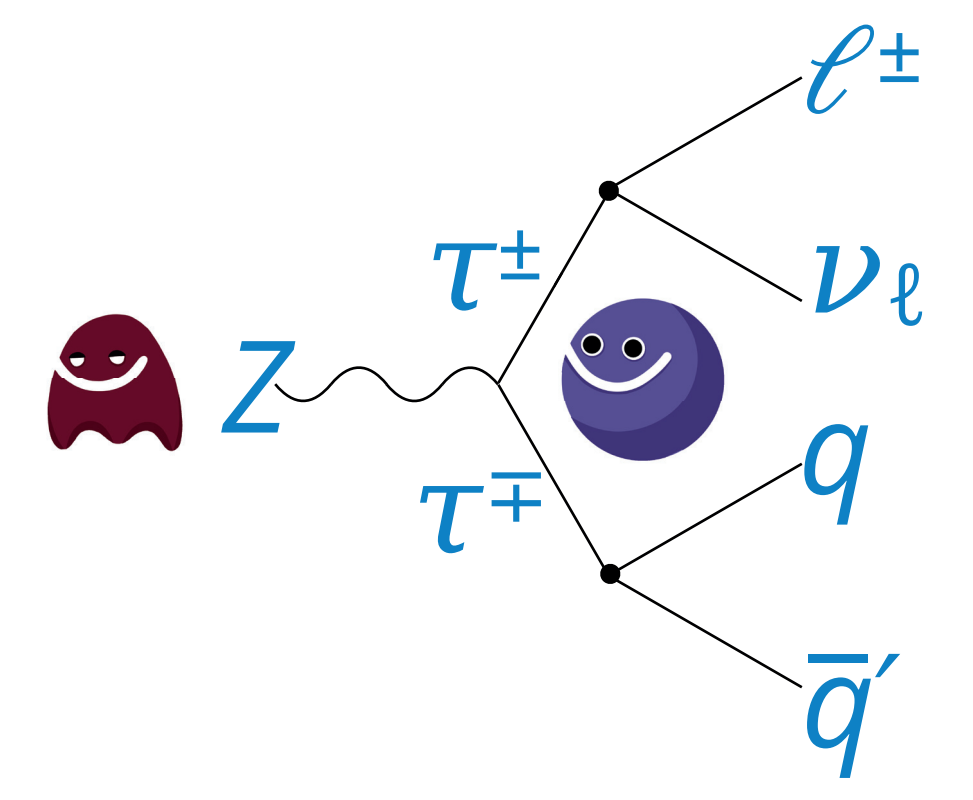
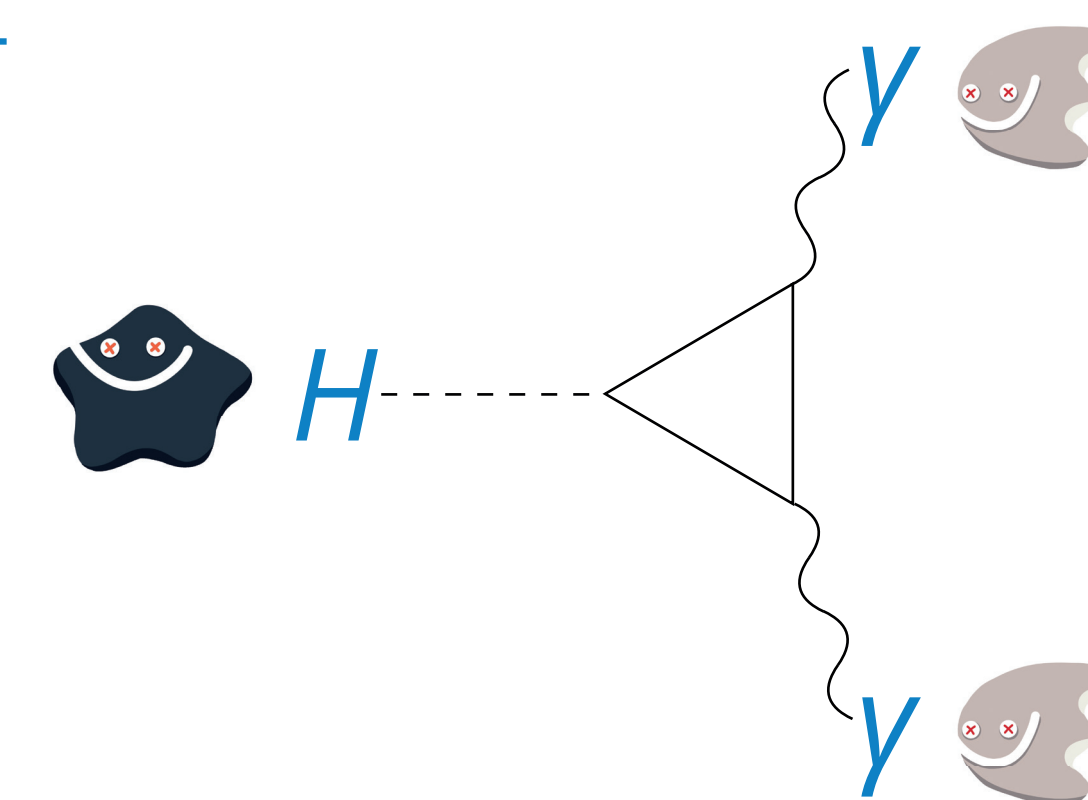
<http://opendata.cern.ch>

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New Analyses

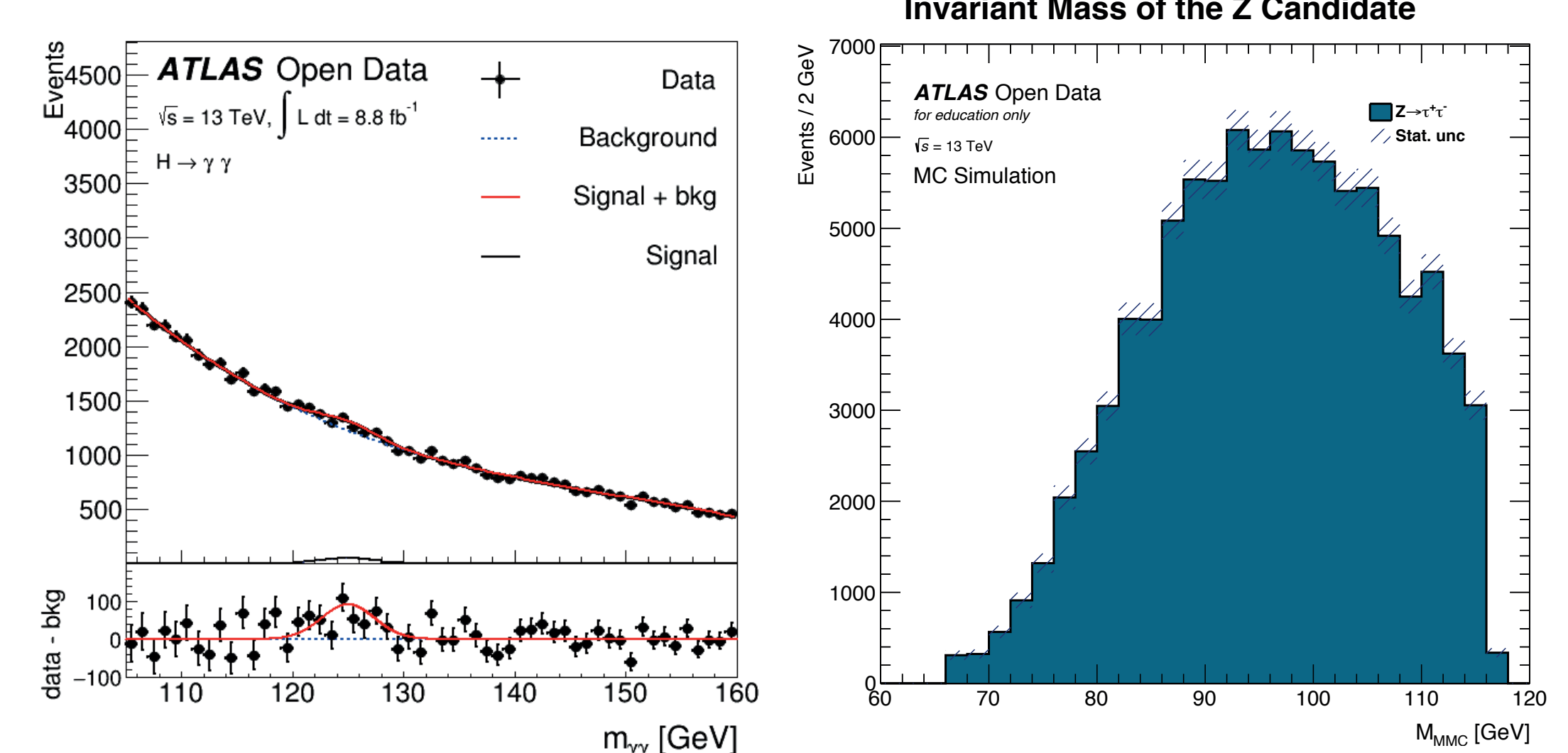
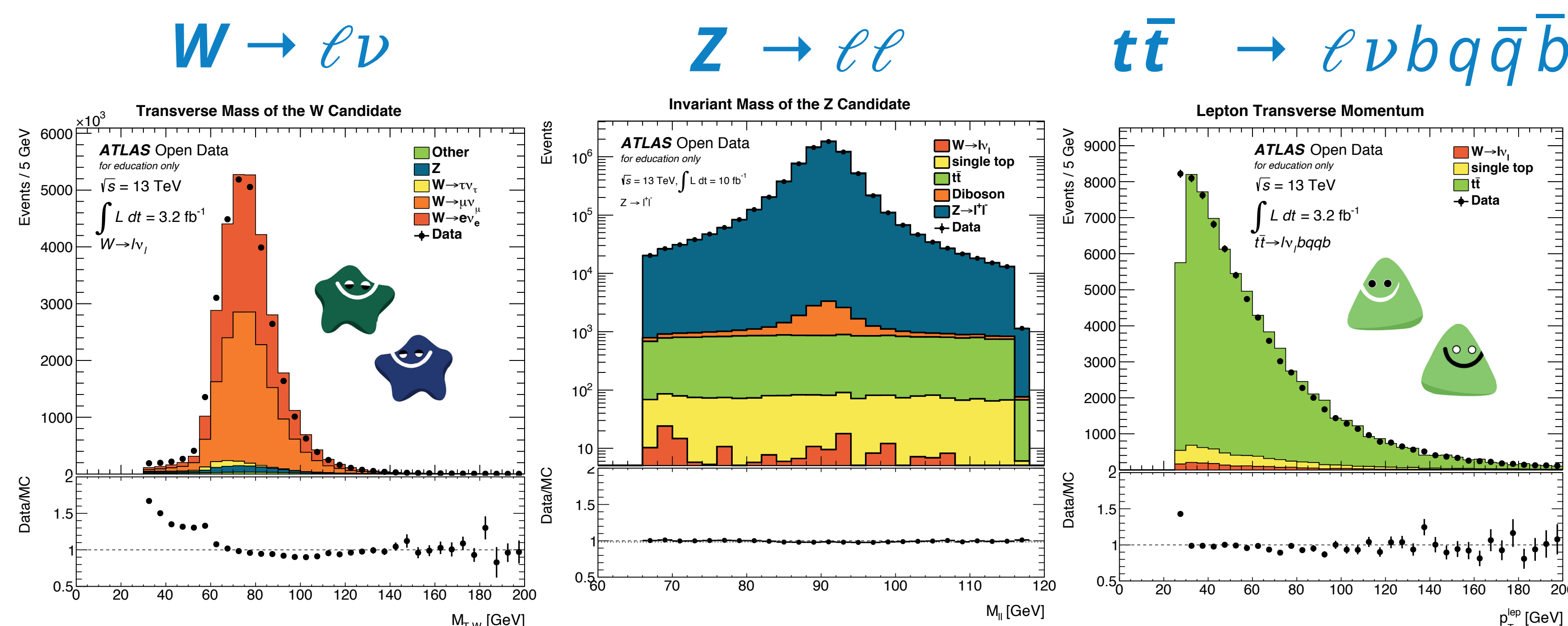
$H \rightarrow \gamma\gamma$ & $Z \rightarrow \tau\tau$

- Some examples of new analyses are $H \rightarrow \gamma\gamma$ & $Z \rightarrow \tau\tau$
- Students will be able reconstruct a **Higgs peak**
- They will be able to recreate their own version of a **discovery plot**



$H \rightarrow \gamma\gamma$

$Z \rightarrow \tau\tau$



Improvements over 8 TeV release

- Simple **systematics estimations** for error quantification
- Truth information** for better data vs. MC comparison
- New **physics objects**: photons, hadronic taus, fatjets ($R=1.0$)
- New **variables**: tight reconstruction bools, BDT scores, # tracks
- New **MC**: SUSY, DM (Mono- Z), $Z' \rightarrow \ell\ell$, Graviton $\rightarrow ZZ \rightarrow \ell\ell\ell\ell$
- Estimate background **QCD** contribution in $W \rightarrow \ell\nu$ example analysis

Future Plans

Fatjets ($R=1.0$) to reconstruct **boosted** W , Z , H , top

Truth info to reconstruct **top mass** in single top analysis

SUSY:

- gluino-mediated stop
- chargino-neutralino
- chargino-chargino
- direct slepton

to extend SM analyses + MET

DM:

(Mono- Z)

Exotics:

$Z' \rightarrow t\bar{t} \rightarrow \ell\nu b q \bar{q} \bar{b}$

$Z' \rightarrow \ell\ell$

Graviton $\rightarrow ZZ \rightarrow \ell\ell\ell\ell$