Search for Higgs boson in the final state with two leptons and a photon produced in pp collisions at √s=13 TeV with the ATLAS detector.

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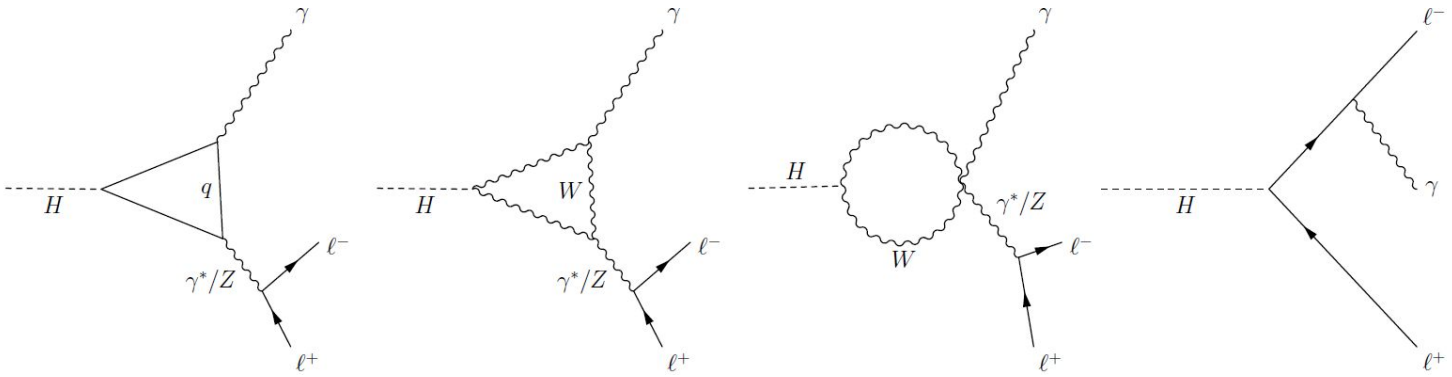
HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

DESY.

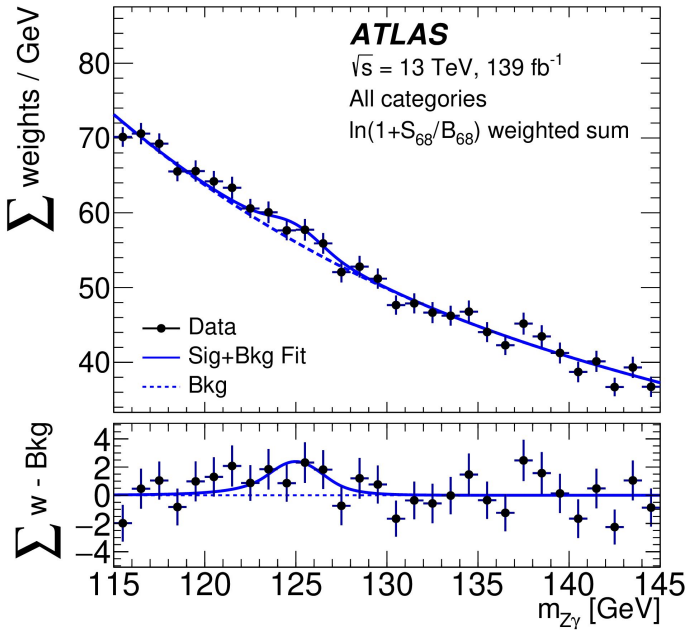
Higgs in the llγ final state



- Why search for Higgs in llγ final state:
  - **Complementary** to other SM Higgs searches
    - Clean final state, but low BR (<0.002)
  - **3 bodies** in the final state: can probe CP and CPT measuring forward-backward asymmetry
  - **Loops in the diagrams**: can probe SM at higher order
- How to search:
  - Best strategy is searching for **Zγ** or **γ*γ** intermediate states
  - Next slides: **H→Zγ→llγ search**

H→Zγ→llγ search: overview

- Selecting events with a good Z candidate and a photon
  - Splitting in 6 categories to increase sensitivity
- Constructing signal and background functions:
  - Signal: from MC simulation
  - Background from MC simulation and data control regions
- Estimating signal strength and setting an upper limit on Higgs cross-section times BR



Signal + background fit (line), background only fit (dashed) and data (dots)

H→Zγ→llγ search: results

- Observed 95%CL upper limit on the $\sigma(pp \rightarrow H) \cdot B(H \rightarrow Z\gamma)$ is **3.6** times the SM prediction.
  - Expected: **2.6** (assuming SM Higgs)
- Best-fit value for the signal yield normalised to the SM prediction is $\mathbf{2.0^{+1.0}_{-0.9}}$

Conclusion:

- **Data consistent with SM**, the result is very **statistically limited**: need more data!
- Good potential for Run3 and beyond!

See poster for more info & tag me in Mattermost if you have any questions!