H→4l CMS Baseline

H→ZZ→4l selection - Legacy paper

- ≥ 4 muons   with p_T > 5 GeV, $|\eta|$ < 2.4

- ≥ 4 electrons with p_T > 7 GeV, $|\eta|$ < 2.5

- Each lepton has to be identified, isolated from other particles in the event and originating from the primary vertex

- Relative isolation variable < 0.4

- Z_1 selection: l+l- pair with mass closest to the nominal Z boson mass 40 GeV < m_{Z1} < 120 GeV

- Z_2 selection: second l+l- pair
12 GeV < m_{Z2} < 120 GeV

- Among the 4 selected leptons: at least one with p_T>20 GeV and one with p_T>10 GeV

- QCD suppression: m(l+l-) > 4 GeV

- Kinematic cuts: m_{Z2} > 12 GeV, m_{4l} > 100 GeV

- A kinematic discriminant KD built to discriminate H→ZZ from ZZ bkg

H→4l ATLAS Baseline

- As used in upgrade work and Run 1 analysis (first uses simplified version of Z mass constraint)

- Combination of single and double-object lepton triggers

- ≥ 4 leptons (μμμμ, eeee, eeμμ)

  - pT > 20, 15, 10, (6 GeV for μ, 7 GeV for e)

- For leptons of the same flavour ΔR>0.1

- For leptons of different flavour ΔR>0.2

- 50 < m_{12} < 106 GeV (pair of oppositely charged lepton with mass nearest to Z)

  - Apply Z mass constraint on this pair

    - Done in -20; +30GeV around Z mass using BW+Gauss

- 12 < m_{34} < 115 GeV (other pair with opposite charge)

- BDT used for ZZ background rejection, for upgrade we only counted S/B in window around Higgs peak

H→2γ+ETmiss ATLAS Baseline

- Di-photon trigger selecting γ's with p_T> 35, 25 GeV
- Photon eta < 2.37 (avoid crack region [1.37-1.56])
- Photon p_T > 25 GeV
- Photon iso:
  - Calo: E_T <6 GeV in ΔR=0.4
  - Track: Sum of p_T(tracks) < 2.6 GeV in ΔR<0.2
    - tracks from diphoton vertex with p_T>1 GeV
- Scan region: M(γγ) [105,160]
- p_T(γ)>0.35(0.25) × $M_{γγ}$
- E_T^{miss}>90 GeV
- p_T(γγ)>90 GeV

- efficiency 0.56
- fiducial Limit 0.7 fb