$H \rightarrow ZZ^*$ @ 350 GeV and 3 TeV CLIC

continuation of the discussion on the paper to be submitted

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What is new?

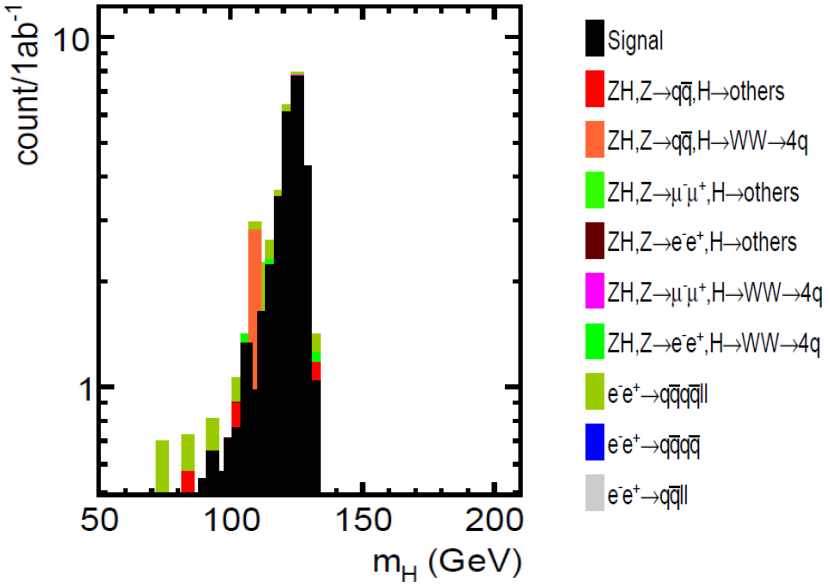
w.r.t. the last time

1. Lepton dressing

   - ✓ Done for signal
   - ▪ Now done for background at both energies

Statistical estimates after MVA 350 GeV

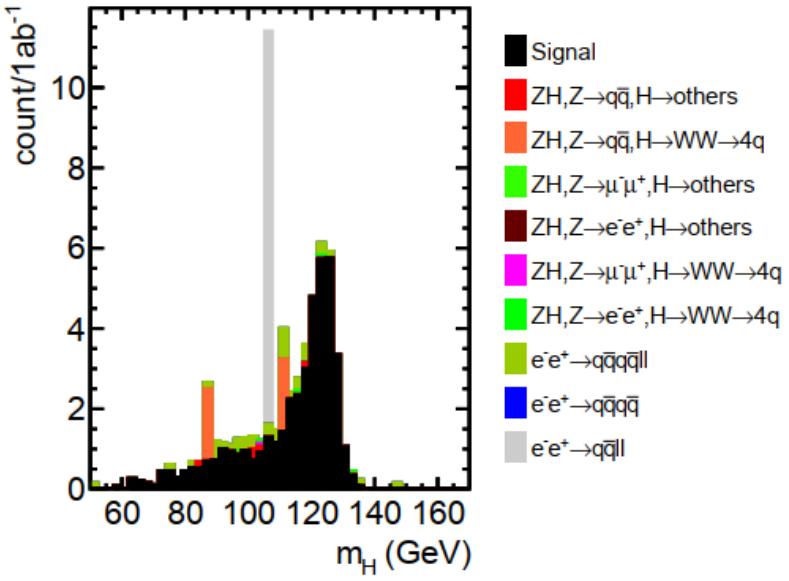
only signal is dressed



δ ≈ 18.1%

Process	ε_{BDT}	N_{BDT}
Signal @ 350 GeV	19%	35
Background process		
$e^-e^+ \to q\bar{q}q\bar{q}l^+l^-$	3‰	3
$e^-e^+ \to HZ;Z \to q\bar{q},H \to \mathrm{WW} \to 4q$	4.5%	2

signal and background dressed



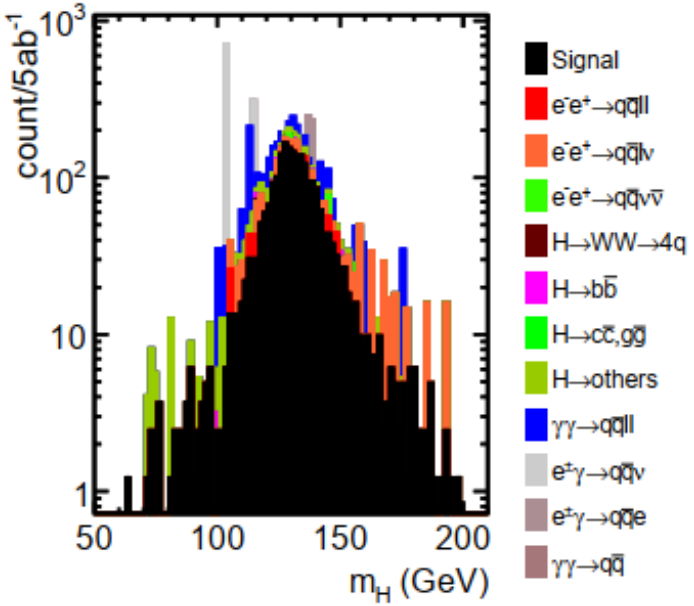
δ = 18.3%

Process	ε_{BDT}	N_{BDT}
Signal @ 350 GeV	23%	43
Background process		
$e^-e^+ \to q\bar{q}l^+l^-$	0.05‰	10
$e^-e^+ \to q\bar{q}q\bar{q}l^+l^-$	5‰	5
$e^-e^+ \to HZ;Z \to q\bar{q},H \to \mathrm{WW} \to 4q$	9%	4

Statistical estimates after MVA 3 TeV

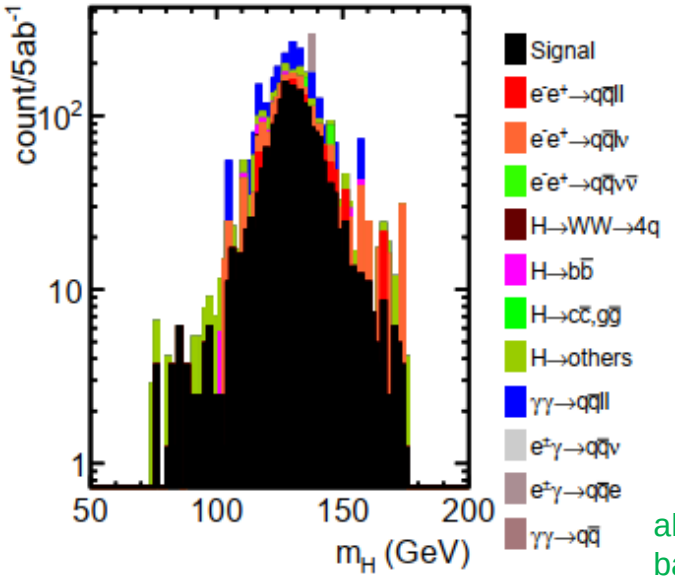
only signal is dressed

signal and background dressed



δ = 3.2%

Process	ε_{BDT}	N_{BDT}
Signal @ 3 TeV	60%	2281
Background process		
$e^{\pm}\gamma \to q\bar{q}\nu$	5‰	930
$\gamma\gamma \to q\bar{q}l^+l^-$	0.5‰	820
$e^-e^+ \to q\bar{q}l\nu$	6‰	482
$e^-e^+ \to H\nu\bar{\nu}; H \to others$	2%	345
$e^{\pm}\gamma \to q\bar{q}e$	0.4‰	232
processes with N_{BDT}<100	1.3‰	170



δ = 2.9%

almost 40% background less

Process	ε_{BDT}	N_{BDT}
Signal @ 3 TeV	59%	2232
Background process		
$\gamma\gamma \to q\bar{q}l^+l^-$	0.4‰	672
$e^-e^+ \to q\bar{q}l\nu$	6‰	509
$e^-e^+ \to H\nu\bar{\nu}; H \to others$	1.6%	328
$e^-e^+ \to q\bar{q}l^+l^-$	1‰	126
$e^{\pm}\gamma \to q\bar{q}e$	0.2‰	116
processes with N_{BDT}<100	1.7%	98

Summary

1. Lepton dressing

   ✓ Done for signal
   ✓ Now done for background at both energies

   @ 3 TeV: better MVA performance (less background leptons can mimic signal), slight improvement of statistical significance
   @ 350 GeV: no relevant changes, relative uncertainty 18%, in some cases insufficient background samples → large scaling factors