



Introduction

Jannicke Pearkes FIPs in the ALPs School





- I'm Canadian
- Moved to US for PhD



 Currently based @ CERN for post-doc



- Have also lived:



Hobbies:

Hiking, skiing, long back-packing trips, climbing, and reading wikipedia pages about food



PhD Work on ATLAS

🔶 Data HH (SM) Single Higgs tīγγ

γγbb γγ+other jets DataDriven γj DataDriven jj

HH to $bb\gamma\gamma$

BDT Tight

ATLAS √s = 13 TeV, 139 fb⁻¹ HH→b̄bγγ m^{*}_{b̄bγγ} ≥ 350 GeV

120

ATLAS Preliminary

 $\sqrt{s} = 13 \text{ TeV}, 139 \text{ fb}^{-1}$

Observed: $\kappa_{\lambda} \in [-1.0, 6.6]$

Expected: $\kappa_{\lambda} \in [-1.2, 7.2]$

ATLAS Preliminary

HH → bb¯τ⁺τ⁻ + bb¯γγ

Asimov data ($\kappa_{\lambda} = 1$)

Projection from Run 2 data

1500

 $\sqrt{s} = 14 \text{ TeV}$

HH Combination

130

HH HL-LHC Projections

---- No syst. unc.

---- Run 2 syst. unc.

---- Theoretical unc. halved

2500

Integrated Luminosity [fb-1]

3000

---- Baseline

140

---- Observed limit (95% CL)

--- Expected limit (95% CL)

bbyy

bbτ+τ-

Kλ

Comb. exp. limit ±1σ Comb. exp. limit ±2σ Theory prediction

Events / 2.5 GeV

² 10⁴ (HH) [tb]

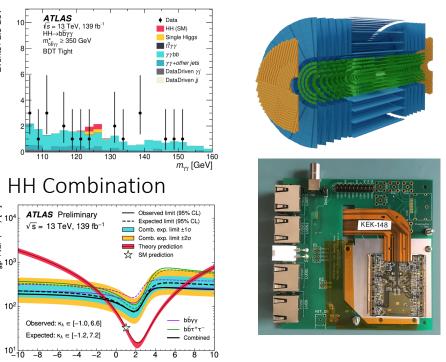
10²

Significance [0]

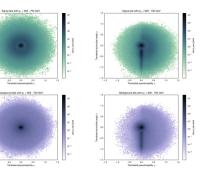
10

8

ITk Pixel upgrade



Machine learning



PhD Work on ATLAS

Data HH (SM) Single Higgs ttγγ

γγbb γγ+other jets DataDriven γj DataDriven jj

 Observed limit (95% CL) --- Expected limit (95% CL)

Comb. exp. limit ±1σ Comb. exp. limit ±2σ

Theory prediction

SM prediction

---- No syst. unc.

---- Run 2 syst. unc.

Theoretical unc. halved

- Baseline

150 160 *m*_{γγ} [GeV]

bbvv

bbτ+τ-

Combine

HH to $bb\gamma\gamma$

BDT Tight

Events / 2.5 Ge\

[qj] (HH)

'ங் 10³

ATLAS √s = 13 TeV, 139 fb⁻¹ HH→bb̄γγ m^{*}_{b̄b̄γγ} ≥ 350 GeV

HH Combination

ATLAS Preliminary

 $\sqrt{s} = 13 \text{ TeV}$. 139 fb⁻¹

Observed: $\kappa_{\lambda} \in [-1.0, 6.6]$

Expected: $\kappa_{\lambda} \in [-1.2, 7.2]$

ATLAS Preliminary

HH → b b̄τ⁺τ⁻ + b b̄γγ

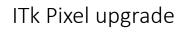
Asimov data ($\kappa_{\lambda} = 1$)

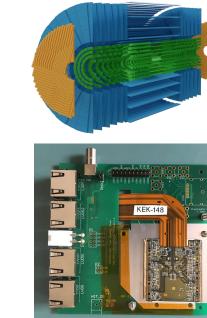
Projection from Run 2 data

 $\sqrt{s} = 14 \text{ TeV}$

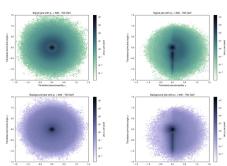
 10^{1} -10^{-8} -6^{-4} -2^{-0} 2^{-4}

HH HL-LHC Projections



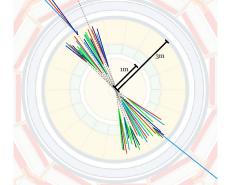


Machine learning



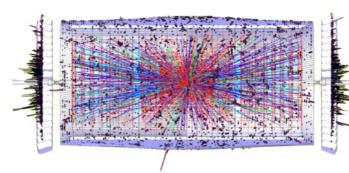


Emerging jets / dark QCD searches

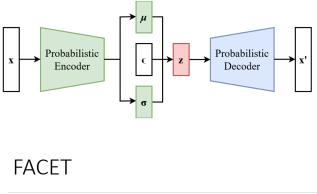


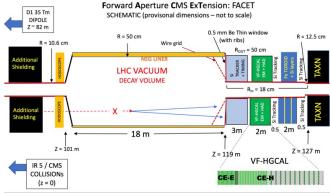
Now: Post-doc on CMS

HL-LHC Track trigger upgrade



Anomaly detection in the trigger





Integrated Luminosity [fb-1]

