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VBF Higgs to Invisible
## HIG-14-038, AN-14-243

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Overview

- ▶ Pub comm and physics coordination intend that our result is made public as a PAS only
- ▶ There are a few points we would like to make them aware of before this decision is finalised:
  - We hope to reduce the uncertainty on the $Z \to \nu\nu$ background from the extrapolation from the $Z \to \mu\mu$ region
  - The final limit from combining with the ZH channel searches is also significantly improved
  - This is not an intermediate result, due to reduced trigger acceptance we don't expect to improve our expected limit until at least the end of 2016

VBF only limit

▶ We hope to improve the $Z/\gamma^* \to \mu\mu$ to $Z \to \nu\nu$ extrapolation uncertainty

- This could double our improvement in expected limit over the prompt analysis
- It could allow us to reproduce the prompt data combined limit in the VBF channel alone

	Observed (expected) limit on B($H \to$ inv)
Prompt analysis	0.65 (0.49)
Parked analysis (current $Z \to \nu\nu$ unc.)	0.60 (0.45)
Parked analysis (improved $Z \to \nu\nu$ unc.)	0.58 (0.41)
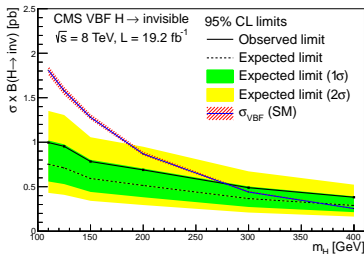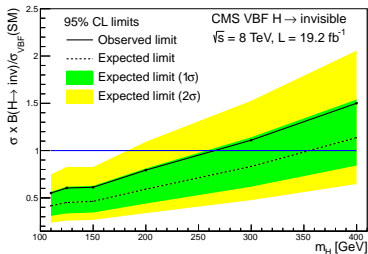
Combination with ZH

- The improvement to the combined result is greater than that in VBF only
  - Prompt limit was 0.58 (0.44) observed (expected)
  - With the parked VBF analysis this becomes 0.48(0.39)
- We believe this to be due to the new VBF best fit signal strength being more similar to that from ZH.

Combination with ZH
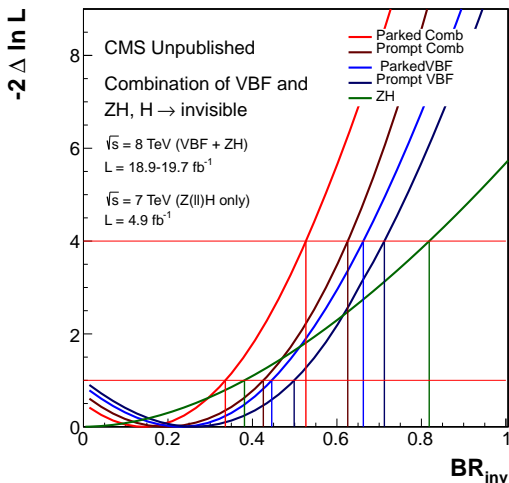
Summary

- The parked data VBF analysis allows us to set our first direct limit on B(H→ inv) below 50%
  - a relative improvement of 17% on the previous combined observed limit and 11% on the expected limit
- This is the run I legacy result not an intermediate step
- Reduced trigger acceptance means that this is likely to be the strongest limit until at least late 2016
- We therefore believe that this analysis warrants a journal article

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