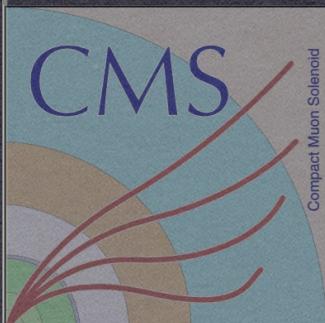


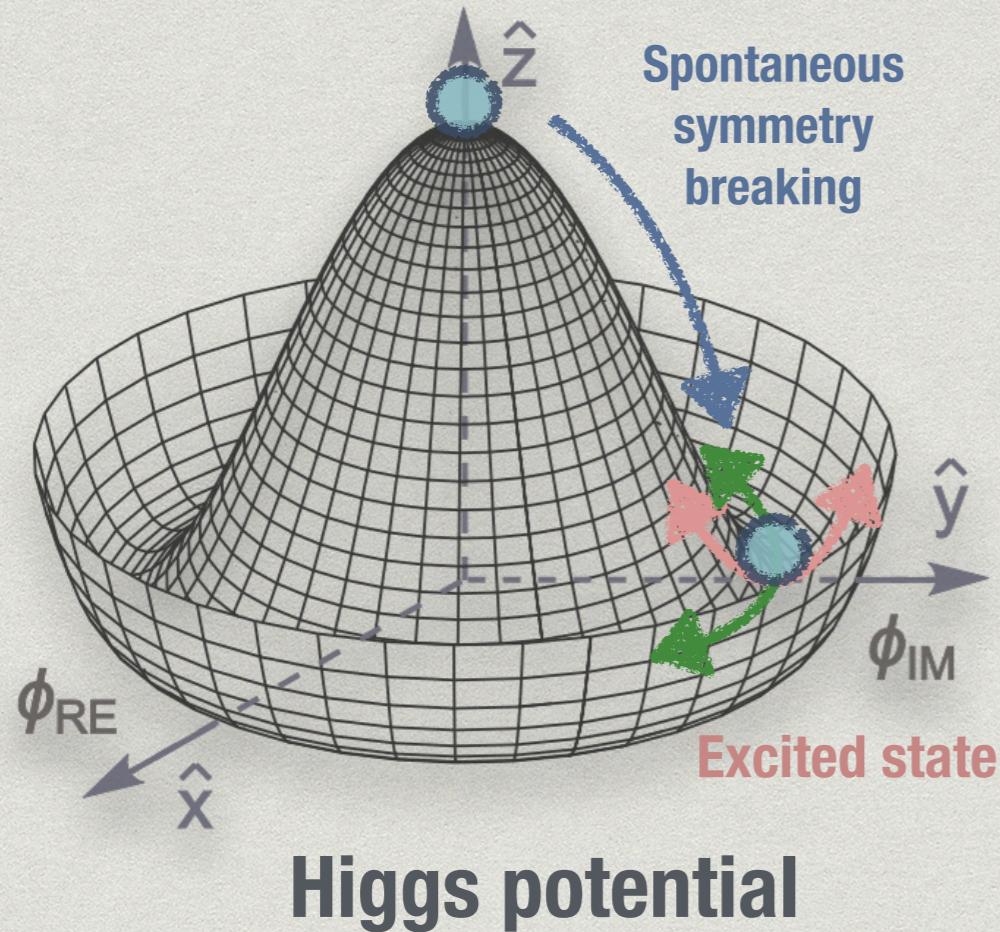
# Measurement of Higgs boson production in VH process with $H \rightarrow WW$ final state at $\sqrt{s} = 13$ TeV

2021 TW HEP meeting @Tainan, Taiwan  
Pei-Rong Yu (NTU)

Advisor: Kai-Feng Chen (NTU)

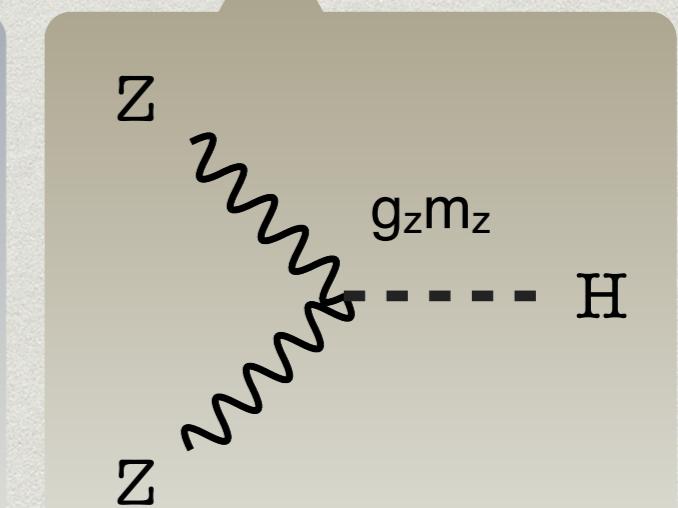
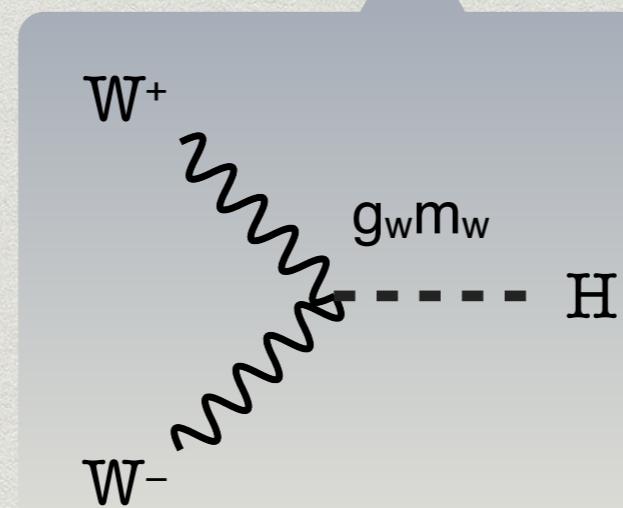


# MOTIVATION

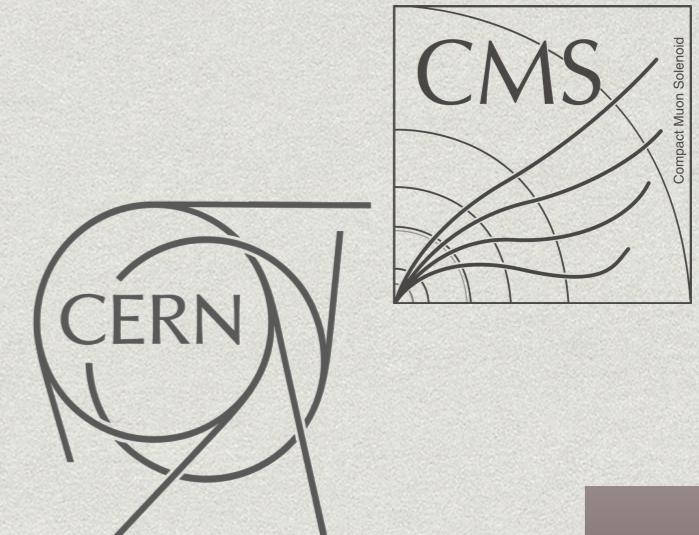


## The Standard Model Lagrangian

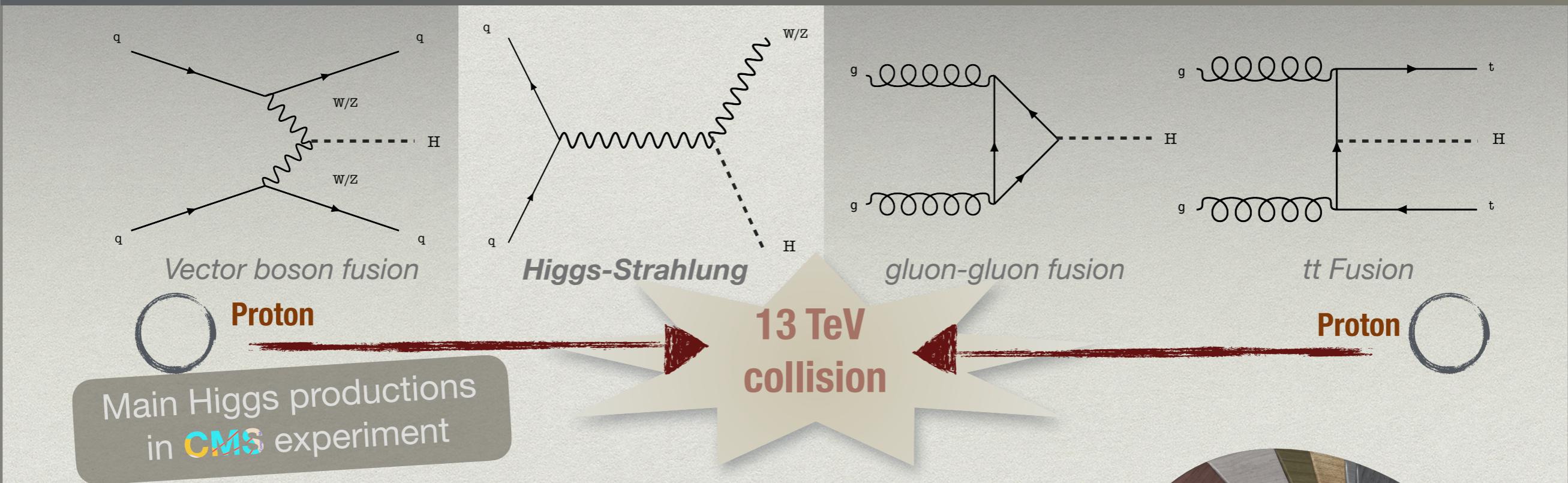
$$L_{SM} = \dots + g_W m_W W_\mu^\mu H + g_Z m_Z Z^\mu Z_\mu H + \dots$$



- \* Measurements of **HW** coupling strength in the SM Higgs are important.
- \* The CMS experiment@CERN
  - \* Existence of the Higgs boson is confirmed in 2013 by CERN.
  - \* It is worthy to look into other properties in the Higgs boson



# $H \rightarrow WW$ DECAY IN VH PRODUCTION

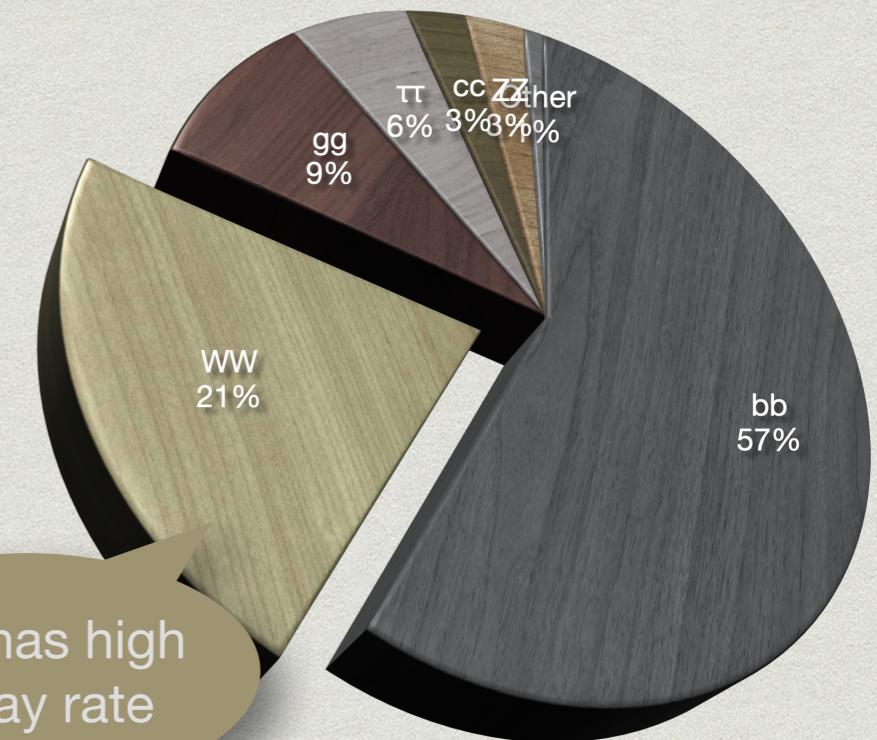


## Focus on VH production with H in WW decay

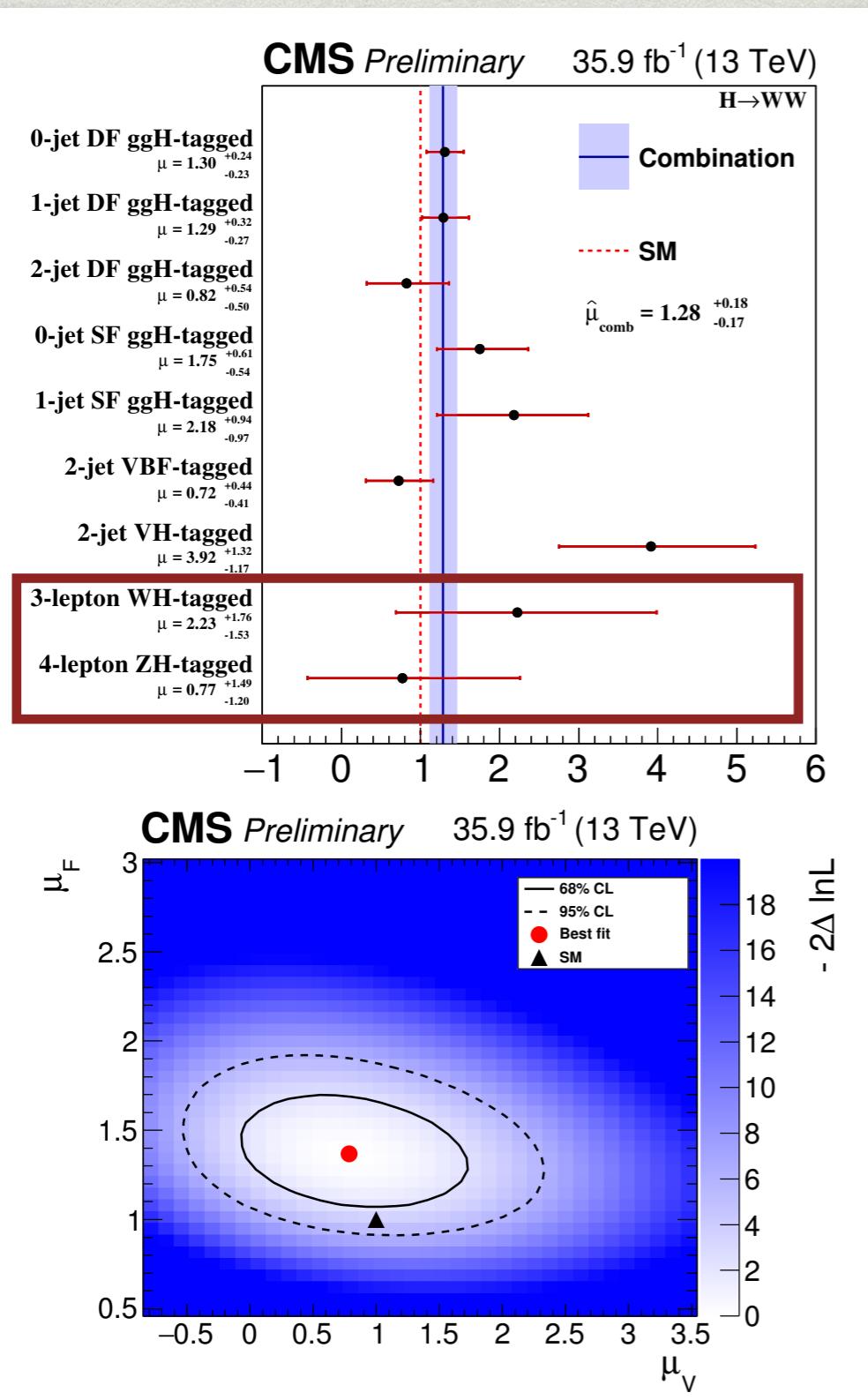
- $H \rightarrow WW$  has high decay rate
- Leptonic decay is easy probed
- .....
- **Measure cross section by signal strength**
- Direct probe of Higgs boson coupling to vector bosons

$$\mu = \frac{\sigma_{obs}}{\sigma_{SM}}$$

$$\mu_V$$

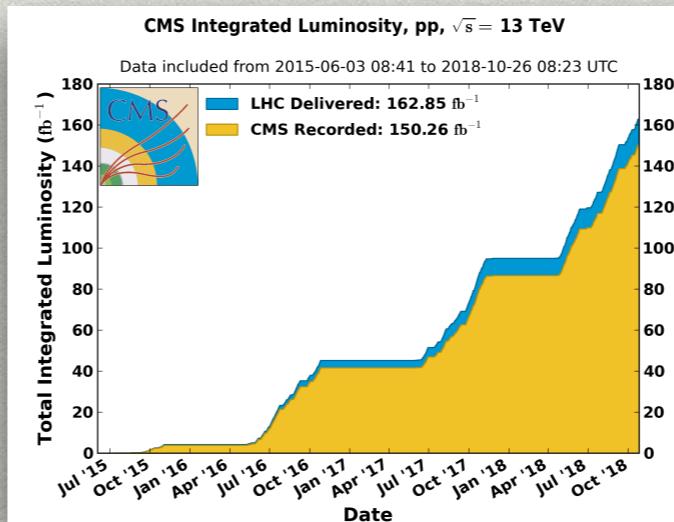


# OVERVIEW OF VH ANALYSIS



HIG-16-042  
 $H \rightarrow WW$

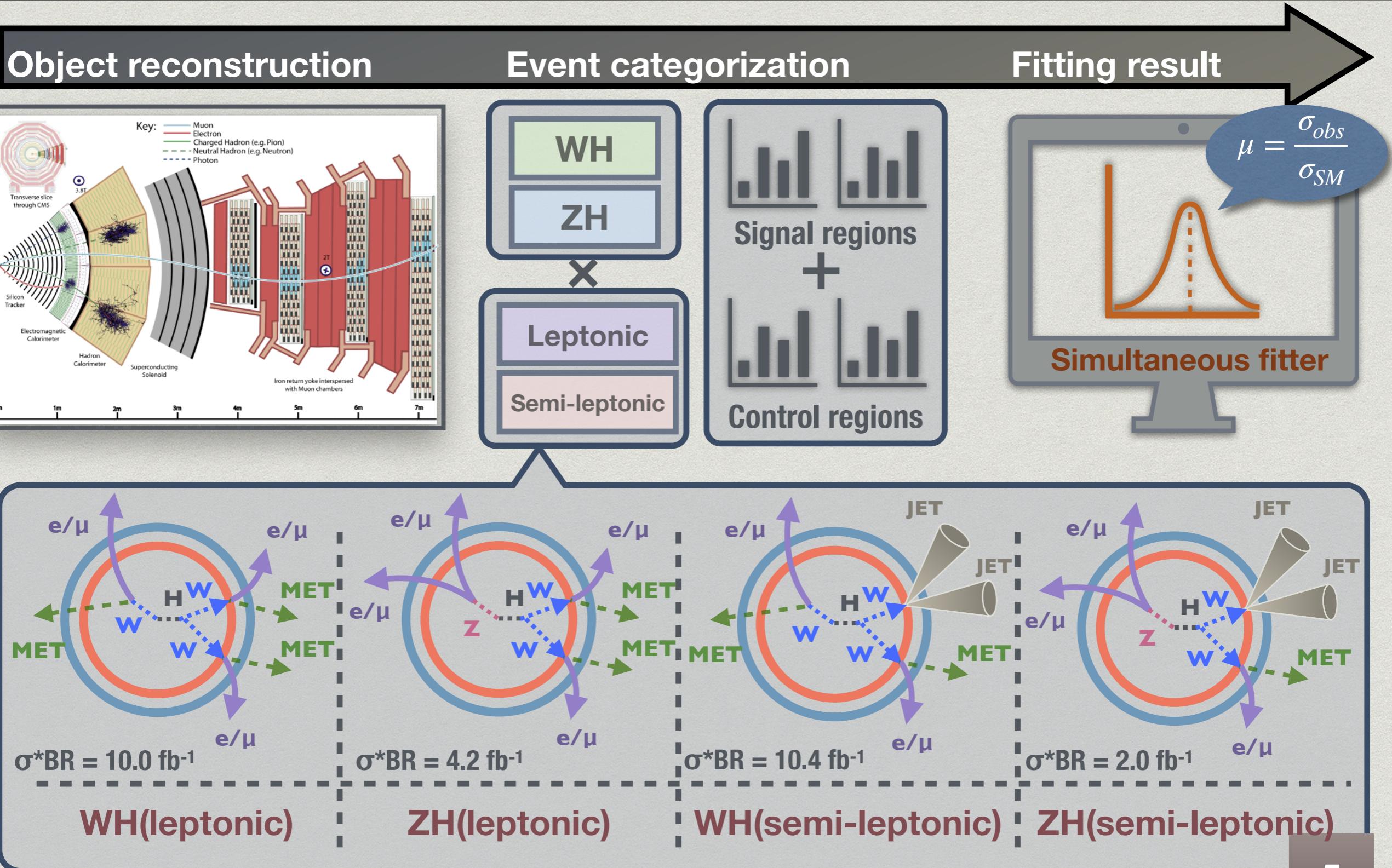
Result with **2016** data is published at **2017**



Benefit from Run2 dataset (2016~2018, Luminosity = **137 fb<sup>-1</sup>**), improvements are expected.

- VH (**WH-tagged** and **ZH-tagged**) leptonic analysis are independent from other channels.
- A single W boson doing **hadronic** decay are included in the new analysis

# ANALYSIS FLOW



# BLINDED VH INCLUSIVE RESULT

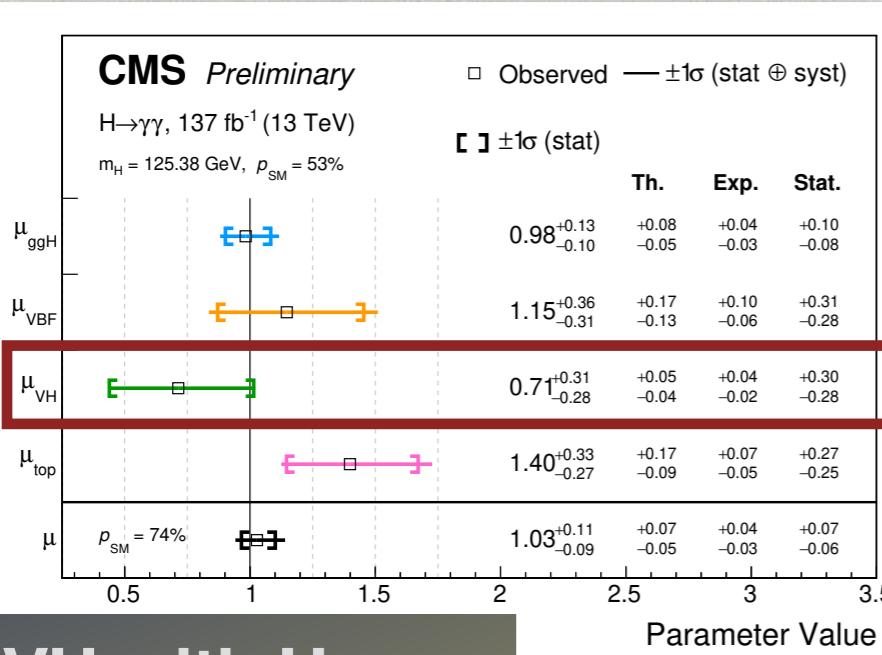
## ◆ Signal strength and significance in each channel

Category	$\mu$ with uncertainty (68% CL)	Significance
WHSS	$1.0^{+1.67}_{-1.56}$	$0.63 \sigma$
WH3L	$1.0^{+0.64}_{-0.67}$	$1.52 \sigma$
ZH3L	$1.0^{+1.96}_{-1.91}$	$0.59 \sigma$
ZH4L	$1.0^{+0.68}_{-0.58}$	$1.87 \sigma$

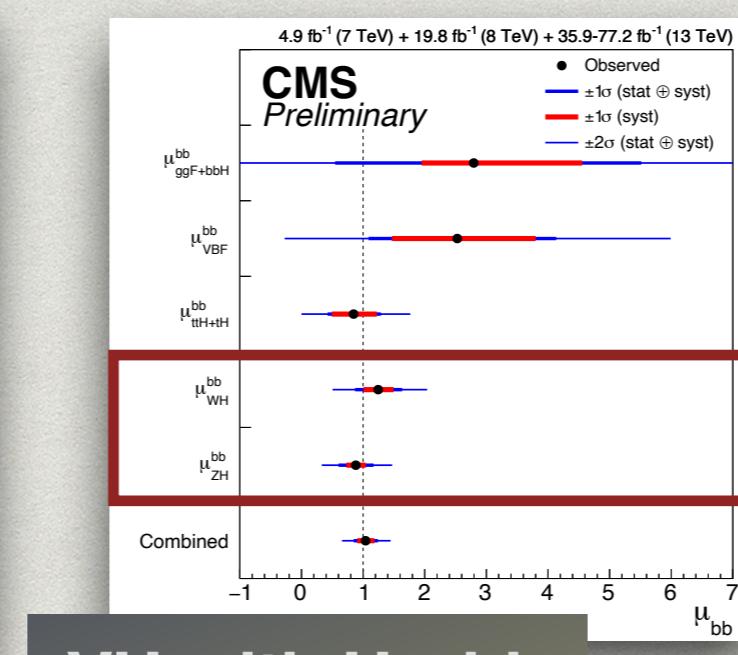
Unblinded  
VH( $H \rightarrow WW$ )  
results will  
come soon!

## ◆ Combined signal strength

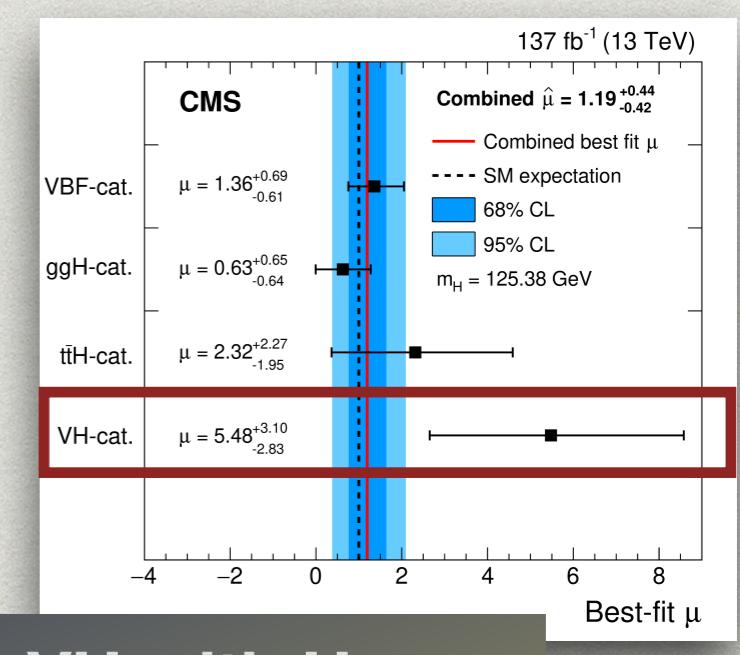
$$\mu = 1.0^{+0.49}_{-0.45} \text{ with expected significance of } 2.8 \sigma$$



VH with  $H \rightarrow \gamma\gamma$



VH with  $H \rightarrow bb$



VH with  $H \rightarrow \mu\mu$



Thank you!