

# CMS Analysis

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Bachelor/Master Students

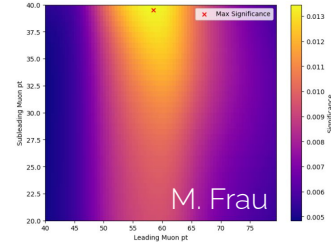
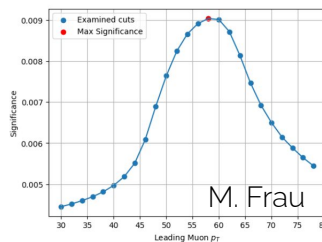
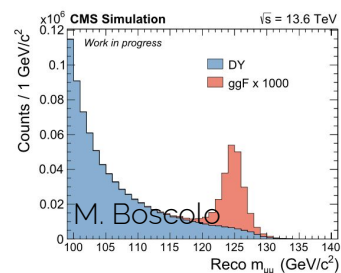
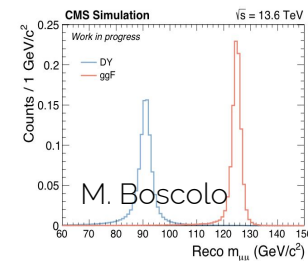
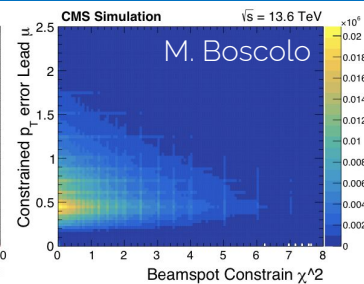
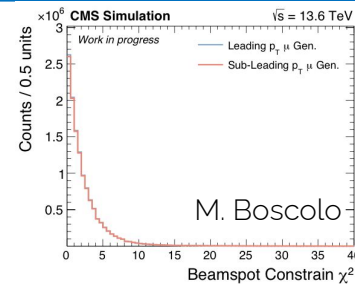
M.Frau, M.Boscolo, E. Da Silva Costa

UniCa

UniPD

# Higgs to Muons

- VH, **Hcc** published - *Phys. Rev. Lett.* 131 (2023) 041801
- H To **Muons** - Run3
  - MC availability and coordination with other groups involved
  - Run3 MC validation of signals (ggF, VBF) and main backgrounds (DYJets, ttbar) using NanoAOD (Bachelor thesis - M. Boscolo - 11/4/2024 - UniPd)
  - Validation and Study of the impact on the Higgs peak resolution of the muon refitting with beamspot (Bachelor thesis - M. Boscolo - 11/4/2024 - UniPd)
  - Cut and count optimisation of the significance for GGF signal using Run3 MC (Bachelor thesis M. Frau - 26/7/2024 - UniCa)
  - Muon FSR corrections studies and their impact of the resolution and sensitivity of the analysis (Master thesis - UniPd)

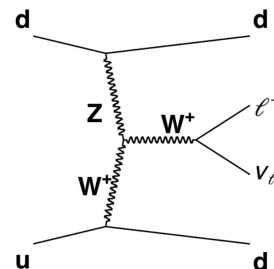


## Motivation:

- Test of the SM gauge sector, **complementary** to Higgs boson measurements
- Sensitive to new (BSM) physics: **aTGC, EFT**

## Signature:

- 2 highly energetic jets ("tagging" jets) :
  - Large gap in  $\eta$  ( $|\Delta\eta_{jj}|$ )
  - high jet invariant mass ( $m_{jj}$ )
- 1 charged lepton and neutrino pTmiss
  - Central with respect to the VBF jets



## Signal Extraction:

- **Control regions** used to constrain the normalizations of the main backgrounds. **Signal region** used to perform the fit.
- Combined binned maximum likelihood fit of the **DNN output** distribution with signal and background templates
- DNN trained with **10** physical variables and 3 hidden-layer with 64 neurons each
- Expected 10% precision on cross-section measurement for both channels (only with 2018 data)
- Results include **unfolding** and **EFT** interpretation

