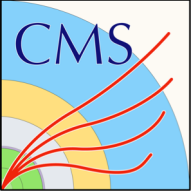
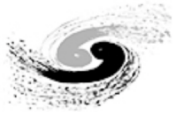




Institute of High Energy Physics
Chinese Academy of Sciences

Work process

Student: Jialin guo

Supervisor : Mingshui Chen

CMS

2022.9-2022.12

outline

Institute of High Energy Physics
Chinese Academy of Sciences

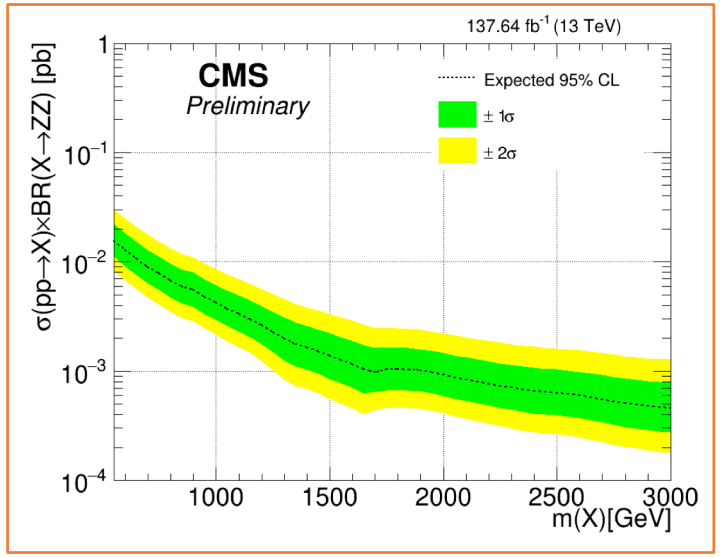
- **Analysis**
  - Search for high mass Higgs(500-3000GeV) in HZZ2L2Q final state with Full RunII Data
  - Search for aTGC in Semileptonic WV and ZV channels

HZZ2L2Q Analysis

Institute of High Energy Physics
Chinese Academy of Sciences

- **Status**
  - Go through all the steps with UL datasets
  - Preliminary Limit result
  - AN-Note(AN-21-172)

- **Plan**
  - Uncertainty study
  - Ask for CADI Line and prepare re-approval report



Available on the CMS information server

CMS AN-21-172

The Compact Muon Solenoid Experiment

CMS Draft Note

Mailing address: CMS CERN, CH-1211 GENEVA 23, Switzerland

2022/12/16
Archive Hash: 632f401-D
Archive Date: 2022/11/30

Search for spin-0 diboson resonances in the dilepton + jets final state at $\sqrt{s}$ = 13 TeV with full Run II dataset

Alessandra Cappati[4], Mingshui Chen[1], Tongguang Chen[2], Aloke Kumar Das[7], Jialin Guo[1], Mi Ran Kim[6], Prolay Mal[7], Predrag Milenovic[3], Vukasin Milosevic[1], Christophe Ochando[4], Giacomo Ortona[5], Axel Newton Buchot Perraguin[4], Roberto Salerno[4], and Ram Krishna Sharma[1]

[1] IHEP, Beijing
[2] Beihang University
[3] University of Belgrade
[4] Laboratoire Leprince-Ringuet
[5] INFN Torino
[6] Sungkyunkwan University
[7] NISER, India

Abstract

A search for a new boson decaying into two Z bosons with subsequent decay into two leptons and two quark-jets, $H \to ZZ \to ll q\bar{q}$ is performed. The analysis uses 137.64 fb^{-1} of data collected by the CMS experiment from proton-proton collisions produced in LHC at $\sqrt{s}$ = 13 TeV in Run II (2016, 2017, 2018). The analysis exploits the kinematic information and the flavour tagging of the leading particles of the event to isolate hypothetical Higgs boson signals with mass values in the range from 500 GeV to 3000 GeV. Dedicated categorisations are tailored, which is expected to be favoured by the VBF production mechanism of a scalar particle. The results are summarised in terms of upper limits on the production cross section for a spin-0 particle.

aTGC Analysis

Institute of High Energy Physics
Chinese Academy of Sciences

Effective field theory(EFT): the natural way to extend the standard model

- Satisfy the S-matrix axioms of unitary, symmetries of the standard model(SM)
- Recover the standard model $\Lambda \gg m, \mathcal{L}_{eff} \rightarrow \mathcal{L}_{SM}$
- General enough to capture any physics beyond the standard model

Theoretical Description

$$\mathcal{L}_{eff} = \mathcal{L}_{SM} + \sum_i \frac{c_i}{\Lambda^2}\mathcal{O}_i + \cdots$$
$$= \mathcal{L}_{SM} + \frac{c_{www}}{\Lambda^2}\mathcal{O}_{www} + \frac{c_w}{\Lambda^2}\mathcal{O}_w + \frac{c_B}{\Lambda^2}\mathcal{O}_B$$

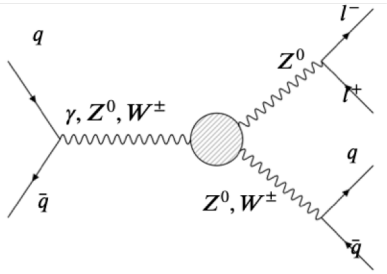
Where:

$$\mathcal{O}_{www} = Tr\left[W_{uv}W^{v\rho}W^{u}_{\rho}\right], \mathcal{O}_w = (D_u\phi)^\dagger W^{v\rho}(D_v\phi), \mathcal{O}_B = (D_u\phi)^\dagger B^{v\rho}(D_v\phi)$$

Lead to:

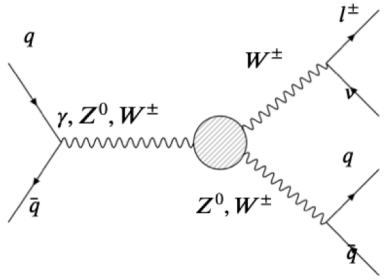
$$\frac{c_w}{\Lambda^2} = \frac{2}{M_Z^2}\left(tan^2\theta_w\Delta\kappa_\gamma + \Delta\kappa_z\right), \frac{c_B}{\Lambda^2} = \frac{2}{M_Z^2}\left(\Delta\kappa_\gamma - \Delta\kappa_z\right)$$

ZV Channel



IHEP
★First analysis with ZV semi-leptonic

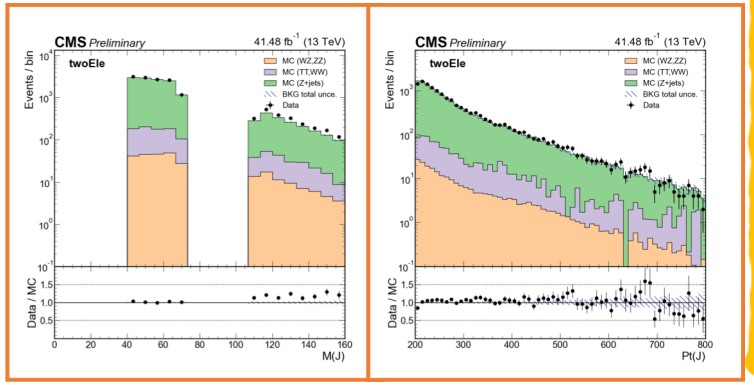
WV Channel



University Of Hamburg

Status

- NanoAOD Framewok is ready
- Datasets produce & basic event selections
- Preliminary Data MC looks fine



Available on CMS information server — CMS AN -2022/091

The Compact Muon Solenoid Experiment

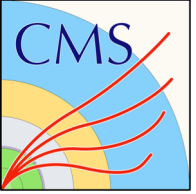
Analysis Note

The content of this note is intended for CMS internal use and distribution only

12 July 2022

Search for aT(N)GC in Semileptonic WV and ZV channels

Mingshui Chen, Tongguang Cheng, Jialin Guo, Andreas Hinzmann, Ankita Mehta, Vukasin Milosevic, Ram Krishna Sharma



Thanks