KSETA-Arbeitsbericht 2015

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Work in CMS

Setting limits on triple gauge couplings

The topic of my thesis is setting limits on anomalous triple gauge couplings in WW/WZ in CMS experiment at LHC at $\sqrt{s} = 13\ TeV$. The idea of the analysis is based on the effective field theory approach which is one of the ways for probing new physics. The effective field theory adds higher dimensional operators to the Standard Model Lagrangian. In this analysis we focus only on dimension 6 operators that don't violate CP-symmetry. The final state we are interested in is WW/WZ where one of W-bosons or Z-boson decays hadronically and another W-boson decays into lepton and neutrino. We are looking for events where W-boson or Z-boson is boosted. Basically this means that W(Z)-boson is reconstructed not as 2 jets coming from 2 quarks but as a single jet. For reconstruction of properties of these bosons we use grooming techniques (e.g. so called pruned mass).

During 2015 I was preparing the software for this analysis which includes event reconstruction and basic event selection and systematics uncertainties. As soon as the first data arrived we have started looking into the control regions keeping blinding policy of SMP-VV group in CMS. Analysing control regions is important for testing Monte-Carlo simulation. The data we have analysed in 2015 seems to be in a reasonable agreement with Monte Carlo simulation.

Work for Egamma group in CMS

During 2015 I was working on several things in Egamma group in CMS:

- Development and validation of Common Isolation Toolkit (CITK) which is used for electron identification in CMS software for computation of isolation sums. I have written the module to compute isolation for photons with proper footprint removal.

Also validation of module for electrons with respect to the standard tool in CMS software is being done (still work in progress).

- PUPPI-based (PUPPI stands for "PileUp Per Particle Identification") isolation for electron and photons: PUPPI-based isolation is the isolation sum weighted by weights computed by PUPPI algorithm. This was investigated for electrons and photons: generally it was found that improvement is reached when photon or electron are required to pass certain identification criteria. However, for electrons there is only slight improvement in high signal efficiency region while for photons significant improvement is observed at the moment (still work in progress). All the work was developed within CITK framework.

- Measurement of electron identification scale factors for triggering electron identification criteria for 25 ns data: efficiencies of electron identification in data and Monte-Carlo simulation are different. This requires application of scale factors for an analysis with electron in the final state. I have done the measurement of these scale factors for triggering electron identification criteria for 2015 data of CMS with 25 ns scenario. Results can be found in CERN-CMS-DP-2015-067 (here).

Data acquisition shifts in CMS

Since July 2015 I'm based at CERN and I'm doing DAQ shifts on a regular base. The work basically consists of: monitoring Data Acquisition of CMS for 8 hours at CMS (Point 5 of LHC), starting/stopping runs, diagnosing the Data Acquisition system, configuring the system if conditions are changed.

Conferences, workshops

I have participated in the following conferences and workshops during 2015:

- Deutsche Physikalische Gesellschaft Conference, Wuppertal, 9th − 13th March 2015 "Jet-substructure tools and boosted hadronic boson identification in CMS".

- SM@LHC,Florence, 21st − 24th of April, 2015, "CMS results on jet properties (Jet mass, jet substructure)", QCD session.

KSETA courses

I have taken the following KSETA courses during 2015:

- Memorizing, reading and working strategies
- Applying Python in Scientific Computing