DEPARTMENT OF PHYSICS
PANJAB UNIVERSITY
CHANDIGARH
SIX-MONTHLY PROGRESS REPORT
PROFORMA FOR Ph.D. CANDIDATES

01.01.2015 to 30.06.2015
(To be submitted bi-annually by June, 30th and December, 31st)

1. Name of the candidate: Anterpreet Kaur
2. Faculty : Science
3. Department : Physics
4. Enrollment No. and Date : 13/1033 , 10-04-2013
5. Registration No. and Date : N.A.
6. Tentative/Approved Title : MEASUREMENT OF MULTIJET CROSS-SECTION RATIOS IN PROTON-PROTON COLLISIONS WITH THE CMS DETECTOR AT THE LHC (Tentative)
7. A summary of the work done during the last six months (Depending upon the stage of Ph.D. work) providing details of (i) Review of Literature (ii) Experimentation/Data Collection, Field work (iii) Data Processing (iv) Data Analysis and Interpretation and (v) Stage of thesis writing with specific reference to the goals set for the previous 6 months. (Separate sheet attached)
8. Did you complete the tasks and achieve the goals you had set for the period under report ? Yes/No : Yes
   If No : Difficulties, Constraints faced in achieving the objectives that had been formulated for the period under report.
9. Publications if any : N.A.

Certificate :

It is certified that the information provided above is correct to the best of my knowledge. I shall try my best to achieve the above targets during the next six months.

Name of the Candidate : Anterpreet Kaur

Signature :

Certificate:

Progress report of the candidate : Satisfactory/Unsatisfactory/Need to be improved

Supervisor Name : Prof. Manjit Kaur

Signature :

Counter –Signature of the Chairperson

PROGRESS REPORT

A measurement of the jet cross-sections, differential in average transverse momentum pT is carried out for at least two jets production as well as for at least three jets. The data from the LHC (Large Hadron Collider) proton-proton collisions at centre-of-mass energy of 8 TeV, corresponding to an integrated luminosity of 19.71/fb , have been collected with the CMS (Compact Muon Solenoid) detector. Jets are reconstructed with the anti-kt clustering algorithm for a jet size parameter R = 0.7 in a phase space region ranging up to an absolute rapidity of $|y| < 2.5$. Appropriate selection criteria has been designed for choosing the best event. The results from the data sample are compared with those from with Monte Carlo studies using the MadGraph+Pythia6 generator as well as that from the next-to-leading order (NLO) theory predictions. There is a good agreement for this comparison for at least two jets production as well as for at least three jets production.

The finite detector resolution along with the steeply falling jet pT spectrum distorts the measured cross-section with respect to the particle level cross-section. Each pT bin content is a composition of original events which are also in the same bin at the particle level and that of events which migrated from the neighbouring bins. In order to allow a direct comparison of experimental measurements with corresponding results from other experiments, without knowledge of the detector response for each experiment, an unfolding process of the data for detector effects is to be followed. A closure test is performed for the unfolding process. The Response Matrix is constructed which uses a custom Toy Monte Carlo (MC) by utilizing the fitted theory predictions and is used to unfold the smeared Toy MC spectrum by using the RooUnfold package. After unfolding, the smeared Toy MC matches exactly with the randomly generated spectrum which confirms that the unfolding procedure is working well.

I submitted the Synopsis under the title 'MEASUREMENT OF MULTIJET CROSS-SECTION RATIOS IN PROTON-PROTON COLLISIONS WITH THE CMS DETECTOR AT THE LHC'.

Other Activities :

- I was deputed to CERN from 9th February, 2015 to 7th May, 2015. I took DQM (Data Quality Monitoring) and DAQ (Data Acquisition) shifts at P5, CMS Experiment, Switzerland.
- A μTCA (Micro Telecommunications Computing Architecture) set-up for testing of μHTR (Hadron Calorimeter Trigger/Readout) cards was installed at Panjab University and we successfully tested one μHTR card. Also tested μHTR cards at 904 building (Prevessin site in France) and installed them at CMS P5 site. Tested Power Modules (PM) at 904 (Prevessin site) which will supply power to μTCA crates.

Goals for the next six months :

- To remove the detector effects from the data results using the results from the MC samples by unfolding the results from data and will study these results in details by comparing with the raw results. The various corrections such as jet energy correction (JEC), jet energy scale (JES) etc. will be applied.

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