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

01.01.2016 to 30.06.2016
(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 : 4962, 4 February, 2016
6. Tentative/Approved Title : MEASUREMENT OF MULTIJET CROSS-SECTION RATIOS IN PROTON-PROTON COLLISIONS WITH THE CMS DETECTOR AT THE LHC (Approved)
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

The inclusive multijet event cross sections are measured as a function of average transverse momentum (pT) of two leading jets for at least two and three jets. The data from the LHC (Large Hadron Collider) proton-proton collisions at center of mass energy of 8 TeV, corresponding to an integrated luminosity of 19.71 fb^{-1}, 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 measured cross sections are corrected for detector effects and are compared to next-to-leading order (NLO) predictions as well as from Monte Carlo (MC) generators. The results agree within the uncertainties.

All the experimental and theoretical uncertainties have been calculated. The sources which contribute to experimental uncertainties are :

- statistical uncertainty of the data including correlations introduced by the unfolding
- Jet Energy Scale (JES) systematic uncertainty sources
- unfolding systematic uncertainty
- jet energy resolution (JER) uncertainty
- luminosity
- residual uncorrelated systematic uncertainty summarizing individual causes such as small trigger and identification inefficiencies, time dependence of the jet pT resolution, and uncertainty on the trigger prescale factors.

The sources of theoretical uncertainties are :

- statistical uncertainty caused by numerical integrations in the cross section computations
- the systematic uncertainty of the non-perturbative corrections
- Parton distribution function (PDF) uncertainties.

The analysis has been pre-approved on May 10, 2016 by the SMP physics group of CMS Collaboration.

Other Activities :

- I was deputed to CERN from 15th February, 2016 to 12th May, 2016. I took DAQ (Data Acquisition) shifts at P5, CMS Experiment, Switzerland.
- I am also working in Physics Performance and Dataset (PPD) with Data Quality Monitoring (DQM) group, CMS for Data Certification (Run II, 2016).

Goals for the next six months :

- To add the results from other Monte Carlo generators.
- To perform fits of $\alpha S(Mz)$ from differential inclusive 2-jet and inclusive 3-jet event cross-sections separately and in combined fit as well as for their ratio.
- To get the analysis approved in CMS Collaboration and to make the results public.

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