

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

**01.07.2016 to 31.12.2016**

(To be submitted bi-annually by June, 30<sup>th</sup> and December, 31<sup>st</sup>)

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 ( $H_{T,2}/2$ ), for two and more number of jets. Data from the LHC (Large Hadron Collider) proton-proton collisions at center of mass energy of 8 TeV, corresponding to an integrated luminosity of  $19.71 \text{ fb}^{-1}$ , 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  $|\eta| < 2.5$ . 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.
- The cross-section ratio is derived from Data, NLO theory and MC .
- All the experimental and theoretical uncertainties have been calculated.
- The fits of the strong coupling constant performed  $\alpha_s(M_z)$  are performed from differential inclusive 2-jet and inclusive 3-jet event cross-sections separately and in combined fit as well as cross section ratio, employing various Parton Distribution Function (PDF) sets provided, in the range in  $H_{T,2}/2$  of 0.3 TeV up to 1.00 TeV.
- MSTW2008 and MMHT2014 PDF sets provide a large enough range in  $\alpha_s(M_z)$  values and give similar results in full range in  $H_{T,2}/2$  of 0.3 TeV up to 1.68 TeV and for scale variations in this range, and also for subranges in  $H_{T,2}/2$ .

Worked on the documents : Analysis Note (AN-15-102) and PAS (SMP-16-008) to get the analysis approved by the CMS Collaboration.

### Other Activities :

- I am also working in Physics Performance and Dataset (PPD) with Data Quality Monitoring (DQM) group, CMS for Data Certification (Run II, 2016).
- Presented Poster in **International Workshop on Frontiers in Electroweak Interactions of Leptons and Hadrons**, Aligarh, India, 2-6 November, 2016 on “Inclusive jets results from CMS”.
- Presented a talk in **XXII DAE-BRNS High Energy Physics Symposium**, Delhi, India, 12-16 December, 2016 on “Extraction of the strong coupling constant from the measurement of inclusive multijet event cross-sections in pp collisions at center of mass energy of 8 TeV”.

### Goals for the next six months :

- To get the analysis approved in CMS Collaboration and to make the results public.
- To participate in workshops, seminars and to attend academic lectures.

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