

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

10.04.2013 to 30.06.2013

(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 : Synopsis not submitted yet
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

I studied about the Large Hadron Collider (LHC) which is the world's largest and highest-energy particle accelerator. In LHC, two beams of subatomic particles/ions travel in opposite directions with the speed close to the speed of light inside the circular accelerator and get accelerated in each gap. The LHC accelerates particles to high speeds and then collides head-on. These collisions are detected by six detectors - ALICE, CMS, ATLAS, TOTEM, LHCf and LHCb. The Compact Muon Solenoid (CMS) is a general-purpose detectors designed to study proton collisions at high centre-of-mass energies upto 14 TeV. The CMS is a very complex experiment and it contains subsystems to measure the energy and momentum of the particles produced in collisions. The Hadron Calorimeter (HCAL) measures the energy of hadrons (particles made of quarks and gluons). The Outer Hadron Calorimeter (HO) has been built outside the solenoid to contain the hadronic showers completely.

I have learnt the basic tools ROOT, PYTHIA, CMSSW for studying the event structures measured in a complex experiment.

I have studied the jet substructure in proton-proton (pp) collisions at center of mass energies, $\sqrt{s} = 7$ TeV and 14TeV by simulating events using event generators. We have measured the subjet multiplicity, an important variable to differentiate between gluons and quarks. Then we have calculated the color factor ratio, C_A/C_F by using $r = \langle M_g \rangle - 1/\langle M_q \rangle - 1$, where M_g , M_q are the average subjet multiplicities in gluon and quark jets respectively. We are compiling the results and planning to document it.

At present, the LHC is shut down for upgradation. As a part of Hardware work, I participated in the weekly Quality Certification Shifts of the HO Upgrade Analysis and analyzed the HO shifts data.

Goals for the next six months :

- I will analyse the CMS data at different centre-of-mass energies to study the jet substructure.
- To work with the HO Upgrade group to study the stability and the Peltier behavior of the SiPMs after their installation.
- To focus on my Physics Analysis problem.
- To attend various talks and lecture programs that would be helpful for my Ph.D degree.

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