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# **7th Fermilab-CERN Hadron Collider Physics Summer School**

**Fermilab, August 6-17 2012**

## **Post-school report from Local Organizing Committee**

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### **Introduction**

The 7th annual Fermilab-CERN summer school took place at Fermilab from August 6-17. Approximately 130 students attended the school, these were predominantly graduate students on LHC/Tevatron experiments, although there was a small group of theorist and several junior postdocs also attending. The school consisted of 41 lectures on 16 different topics, as well as 6 discussion hours in which 2 discussion sessions ran in parallel. In addition to the school's lecture program, we also arranged for the regular Fermilab series of colloquia and lab-wide Joint Theory and Experimental Physics Seminars (the "wine and cheese") to be held on topics of interest to the students.

The link to the school Web page is

<http://projects.fnal.gov/hcpss/hcpss12/>

And the link to the school agenda is

<http://projects.fnal.gov/hcpss/hcpss12/agenda.pdf>

On the whole the organizers received very positive feedback from the students on the program of the school and the quality of the lectures. The lecturers did a superb job in presenting their material in an accessible and clear form and all seemed to enjoy the interaction with the students, especially during the discussion sessions. In addition to the well received academic program the students enjoyed the social side of the school which consisted of two barbeques, a reception, a conference banquet, a trip to Chicago and tours of 6 accelerator/experimental areas at Fermilab.

Although this document will highlight the ways in which improvements can be made for future iterations of the school this should not overshadow the success of this school. The suggestions and comments below should be viewed as minor alterations that will help the school improve and allow future organizers to avoid some pitfalls.

## Participants

The students were predominantly experimental graduate students with a small number of theorists and a few postdocs. During the review of the applications it was decided to only accept graduate students who were sufficiently senior to benefit from the advanced school, and encourage those that were not to apply in future years.

Of the students that filled out the evaluation form, 7% were from the Tevatron, 67% from ATLAS/CMS, 13% from LHCb and 13% theorists. This is to be compared with breakdown of the applicants: 13% from the Tevatron, 68% from LHC experiments, 10% theorists and the remainder a mix of (non-LHC) B-physics experiments, heavy ion and non-accelerator experiments.

## Scientific Program

The typical day at the school consisted of two lectures in the morning, separated by a 20 minute coffee break, a lunch break (1.5 hours), two afternoon lectures, a coffee break and then a discussion session (1hour 10 minutes). Although it would slightly lengthen the day it would be preferable to have a short break (but there is no need for coffee) of 10 minutes between the two afternoon lectures. The back-to-back lectures were too taxing for the students. On the whole the students were very happy with the length of the school, the length of the day and the number of lectures. There was a small number who thought the 75 minute lectures were too long and some who thought the question time could be longer. A solution would be to encourage the lecturers to prepare for 65 minutes of lecturing and have 10 minutes of question time at the end of each lecture.

The courses the students thought were most important were Electroweak, Statistics and Particle ID with these also featuring prominently as the ones they found most enjoyable, along with one of the “Analysis” lectures. The purpose of the analysis lectures, which were singled out for special praise by students, was to illustrate all the techniques from the other lectures working together. The aim was to explain why certain choices were made in particular analyses (here W mass measurement and Higgs to di-photon). Since they were so well received we would advocate for their inclusion, towards the end of the program, in future editions of the school.

Several topics, for instance statistics, might benefit from having some formal homework problems that could be discussed in the discussion sessions.

## **Discussion Sessions**

In addition to the lectures we arranged for six discussion sessions. These were six 1 hour and 10 minutes long sessions, during which there were two groups, run in parallel in two separate rooms, each containing a pair of lecturers. The setting was informal and students were encouraged to ask any questions they had not previously had time to ask and lecturers were able to address any issues they felt may need further clarification. This format worked extremely well, the students found discussions useful, and usually the lecturers were kept busy the entire time. It is our opinion that the sessions may not benefit from being made longer, since it also seemed the students stamina would not allow this. The students also reported they liked the timing.

One issue on which responses were mixed was the format of 6 parallel sessions of paired lecturers. However, there was no overwhelming preferred alternative, indeed the current format was most popular. The particular pairings and scheduling has to be carefully chosen so as to enable students to meet with all lecturers.

Students reported that they would have liked more time, of an informal nature to interact with lecturers. Lecturers should be encouraged to attend all coffee breaks, which may benefit from being lengthened.

## **Social Program and Tours**

The social program consisted of several barbeques, a welcome reception and the summer school banquet at Riverview Banquets in Batavia. The last was singled out for special praise, it was a good venue, and the food was nice. The social program was well received and we would urge future organizers to keep a reception as early in the program as possible, it is very useful for helping the students to meet one another and improves the level of interaction in lectures.

In addition to these meals we also arranged for tours of CDF, D0, the Muon Rings, the magnet Factory, the SRF test facility and the Tevatron and CMS control rooms. Each tour occurred twice on the Saturday accommodating 20 people, each student could attend 2 tours and signed up on a first-come-first-served basis. The CDF and D0 tours proved very popular, and in future years, should these tours still be available, it may be better to have several tours of CDF and D0 at the expense of other venues.

There was also an impromptu meet and greet, during one of the lunch breaks, for the theory students with the FNAL theory group, this was very successful and should be repeated in future years.

## **Logistics**

Overall the logistics of moving 120 students from hotel to Fermilab and on buses for the tours and dinners worked smoothly. However there were several complaints about the busses keeping to schedule. This should be emphasized to the bus company in the future.

## **Summary**

Overall the 7th Hadron Collider Physics Summer School was very successful which the students enjoyed and learnt a lot. The future high energy physicists were able to meet their peers from all over the world and form friendships and forge collaboration. The LOC, with guidance from the IAC, and assistance from the Fermilab, arranged a full schedule covering most of the important topics in modern high energy collider physics. However, there is always room for improvement and we hope the above notes will aid future organizers to improve, and to repeat those things that were successful.

Some of the above comments were extracted from an evaluation form the students were encouraged to fill out at the end of the school. The details of their responses are contained in the Appendix.