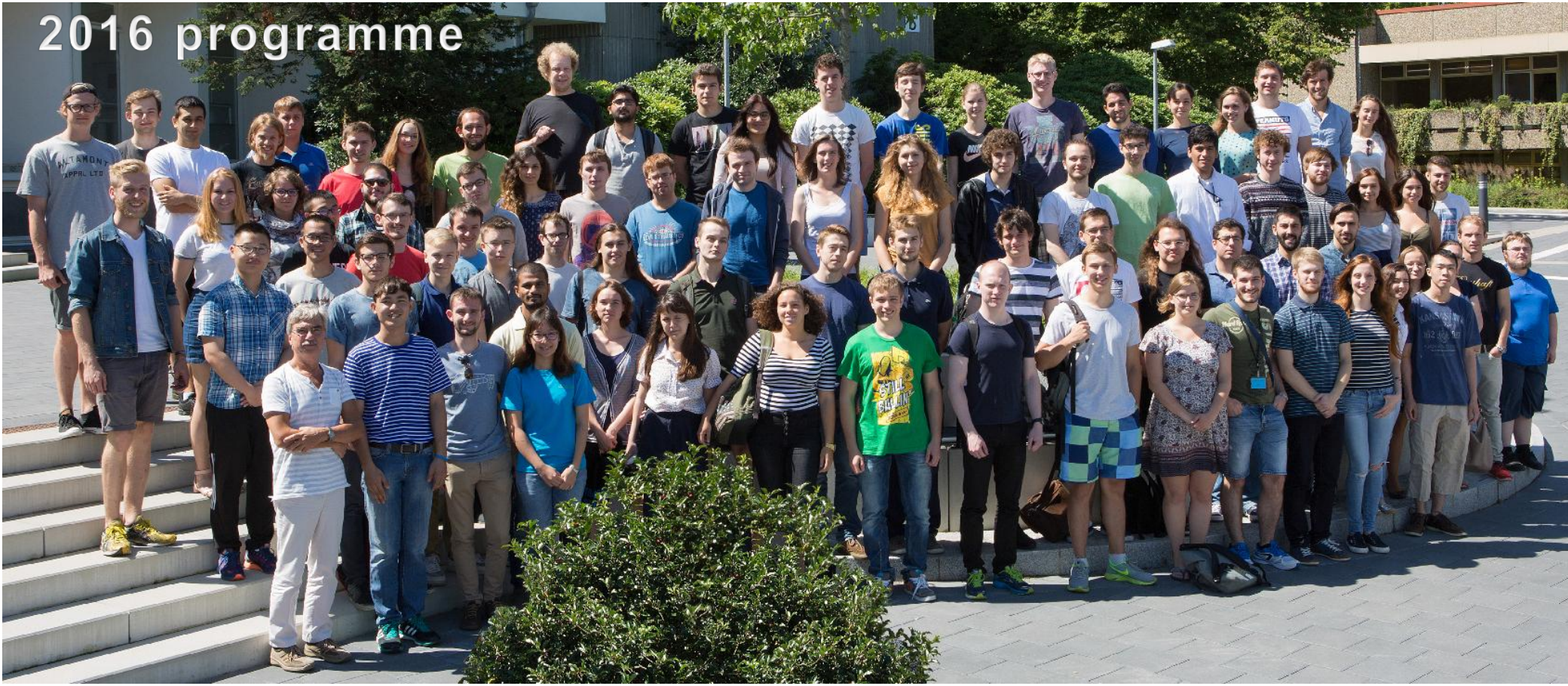
DESY Summerstudent programme

and the DESY-Mexico programme



Meeting with Prof. S. Carillo, June 6 2017, DESY

Olaf Behnke, Doris Eckstein (DESY)

History

- DESY summerstudent programme initiated 1968 by Prof. Peter Stähelin
- At start only for German students

- 1995-2010 Prof. Joachim Meyer coordinated the programme
- Since 2011 coordination by Dr. Olaf Behnke and Dr. Doris Eckstein; Dr. Rainer Gehrke (photon science part); Dr. Gernot Maier (Zeuthen)

- **Some statistics:**
  - 1995-2000 about 100 students applied and ~50 accepted
  - Since 2001 #of applicants increased to ~200
  - #of projects increased steadily to ~100 in 2010

  - Since 2012 online application

  → ~500 applications per year from all around the world

  → 2017: record number of 670 applications; Invited 86 students to Hamburg and 18 to Zeuthen

Motivation

From DESY's point of view:

- Outreach
- Scientific education of young researchers
  - Get them interested in our field(s)
  - First hand-on experiences in a real research environment
- Cultural education
  - How it is to work in research and in an international team
  - English as working language
  - Work independently, proactive, seek for advise
- Cultural exchange
  - With students from all over the world
  - Learn to know a foreign country/city
  - find friends
- Longer-term impact
  - students come back for PhD, Fellows, Post-Docs, visiting scientists
  - First step in setting up a network

Applicants qualification and origin

- Mostly physics students but also a few places for related natural science disciplines (e.g. engineers)

- Having just finished Bachelor or in their first year of master studies

- #of applications:
  1st place = EU
  2st = Russia
  3rd = Other asian countries (India, China, Thailand, ...)
  4th = America (~equal numbers from north, middle and south america)
  5th = Africa

The Programme

- ~7.5 weeks from ~July 20 – September 10

- Main pillars:
  1. Scientific research project work (major part of the programme)
  2. Lectures
  3. Tours and social events
  4. Self-organised by summer students : Cultural exchange and (evenings & weekends) leisure-time activities

1. Scientific research project work

- Students take part in the DESY research activities. Each student is integrated in one of the many DESY research groups and carries out a real research project under supervision of one or several experienced DESY researchers

1. Scientific research project work

- Particle physics projects: Summerstudents work in
  - Physics analysis, software or detector related fields of experiments:
    - ATLAS, CMS, ILC, BELLE II, ALPS II
  - Astroparticle physics (Zeuthen): CTA, IceCube
  - Development of particle accelerators
  - Theory: QCD, SM and BSM phenomenology, string theory, cosmology and astroparticles
  - Computing

- Fraction of projects: Analysis (30%), Software (10%), Detector (30%) Theory (15%) , Accelerators (10%), Computing (5%)

1. Scientific research project work

- Photon science projects (only Hamburg): Summerstudents join groups at DESY and European XFEL which address fundamental and applied questions in the fields of physics, biology, chemistry, crystallography, materials and geological scicence, computing and engineering. This includes research with
  - synchrotron radiation on molecules, soft matter, solid-state and nanomaterials
  - the development of new experimental techniques based on synchrotron radiation and lasers and
  - the theory of interaction of matter and light.

- Currently in Hamburg: ~55 projects in particle physics ~35 in Photon science

Student Selection for Projects

- Large variety of projects
  - Most of them are physics projects
  - All require different knowledge
  - Different technical, computational, analytical skills required (C++, Linux, quantum mechanics,...)
- Many different research groups
  - Larger or smaller and with different group cultures
  - With many or just a few potential supervisors
  - But all willing to supervise a summerstudent
- We select students matching to projects based on their
  - education and knowledge
  - interests
- Students should be willing to
  - learn, to ask, be proactive, to give talks in group meetings, etc.

Project reports and talks

- Towards the end of the programme all students
  - prepare a 6-15 pages write-up of their research project at DESY
  - present their studies/results in seminar(s)

2016 delegated mexican students

Transverse Momentum Dependent Parton Distribution Functions from Parton Shower in Pythia.

[1]Tania Martínez Cortés
Supervised by [2]Hannes Jung and [2]Aleksandra Lelek.
[1]Benemérita Universidad Autónoma de Puebla, Mexico
[2] Deutsches Elektronen-Synchrotron, Hamburg, Germany.

September 8, 2016

Abstract

We present an approach to obtain Transverse Momentum Dependent Parton Distribution Functions (TMDPDF) from Parton Shower (PS) from Pythia Monte Carlo (MC) generator. We implement a special process in Pythia where we fix Bjorken x of one of the incoming partons to make the calculations of k_T of the second incoming parton possible. We perform detailed studies on the effects of using different definitions of internal evolution variable (the longitudinal momentum fraction of the proton carried by the second incoming parton). We conclud that depending on the definition of internal evolution variable one gets different TMDPDFs. We also check the relation between TMDPDFs and PDFs, i.e. we study the integrated TMDPDFs and compar them with *cteq*61*l* PDFs.

Charged and leading-charged particle spectra in different final states at $\sqrt{s} = 13$ TeV

Laila Vleeschower Calas
Universidad Autónoma de Chiapas (UNACH)

Supervisors: Juan M. Grados Luyando, Hannes Jung.

Summer, 2016.

Abstract

To have a better understanding on the transition from the perturbative to the non-perturbative region, we studied the effects of different phenomenological parameters included in modern Monte Carlo event generators, and also the importance of Multi Parton Interactions (MPI). All these studies were done for charged particle spectra in an event selection where we included an inclusive sample, and Single Diffractive (SD) and Non-Single Diffractive (NSD) dissociation enhanced samples, at $\sqrt{s} = 13$ TeV. The predictions were done using Monte Carlo generator, PYTHIA 8 with the tune CUETP8s1. The different studies are compared with experimental data.

Project reports and talks

- Towards the end of the programme all students
  - prepare a 6-15 pages write-up of their research project at DESY
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Note: based on her excellent qualification we selected in 2016 a third mexican student!

Study of the performance of Analog to Digital Converters at FLASH

Ivette J Bermudez Macias, Benemerita Universidad Autonoma de Puebla, Mexico

Supervisor: Stefan Duesterer, DESY-FLASH

September, 2016

Abstract

Experiments at FLASH require a well established DAQ system. That is why in this project it is studied the performance of the ADCs provided at FLASH I and II. It is analysed the performance of the DAQ when we have different kind of devices in between the signal and the ADC. On the other hand, it is studied the amount of data that can be acquired by the DAQ.

2. Lecture programme

- Students attend a lecture programme:
  - During the first 5 weeks:
    - 4 days a week: 2x45 min lectures in the morning
  - Providing physics background on the DESY research activities:
    - Common lectures: intro lectures to particle physics, photon science, astroparticle physics, accelerators
    - Separate lectures for particle physics and photon science students: e.g. for particle physics:
      - Detectors, Standard model and BSM physics, plasma wakefield acceleration, string theory, cosmology and more

3. Guided tours and social events

- Offer students guided tours around DESY, XFEL and several social events (welcome dinner, Barbecue, Harbour round trip)

Total workload

- Students are expected to work 39 hours/week (including lectures). This is the regular 1.0 FTE workload of people working at DESY or other publicly funded research laboratories in Germany.
- Students get a salary of 1100 Euro per month; accommodation in DESY hostel (at reduced prices); travel costs are subsidized up to 50%, etc.

This year

- We are welcoming two students from Mexico:
  - Omar Mancilla Martinez → will work on commissioning of the AIDA2020 Slow Control System (DESY ATLAS group), this is for the EUDAQ data acquisition framework (primarily for the EUDET Pixel Telescope)
  - Vladimir Ruiz → will work on a TPC readout for an ILC detector (DESY FLC group)

Summary

The DESY Summer Student Programme is

- An excellence programme
- Education in physics
- Education in science culture
- Education in social culture
- Networking

- Therefore it benefits from international students
- It has a positive impact for the students and for DESY
- We offer projects to ~100 students per year
- Two students come from Mexico and can well integrate into the programme

Backup slides