Joining Single-Phase LAr TPC and Detector Beam Test at CERN

Kiev National University, Ukraine

April 26, 2016

Motivation

- We have young team: qualified physicists, and good students
- We are interested in cooperation with Fermilab and CERN
- We would like to contribute to physics, reconstruction studies and the analysis for the CERN test beam data samples.
- One part of our team participates in the dual-phase ProtoDUNE
- But other members is going to participate in the Single-Phase project (-> theses & publications based on DUNE)

A few words about us

Department of Nuclear Physics of the Kiev National university was established in 1945

Bachelors and Masters courses, Ph.D. course as well as fundamental research in:

- High Energy and Nuclear Physics;
- Nuclear Engineering;
- Medical Physics.

There are:

- the educational and scientific laboratories;
- halls with low voltage accelerators (including neutron source);
- experimental facilities and workshop for basic and applied research and manufacturing;

International cooperation and scientific activities

- **Fermilab, USA, full membership in the international neutrino DUNE experiment**
- **Fermilab, USA, full membership in the international D0 experiment (~20 students, PhD, postdocs and senior staff scientists from KNU worked at Fermilab)**
- **DESY, Germany: full membership in the international ZEUS collaboration (about 50 students, PhD, postdocs and senior staff scientists from KNU worked at DESY. ~ 30 Bachelor and Master theses)**
- **DESY (Zeuthen), FCAL- detector R&D collaboration of special calorimeters in the very forward region of future detectors at the ILC&CLIC e+e- colliders.**
- **GSI, Darmstadt, Germany, full membership in the international CBM experiment (several students, PhD, postdocs and senior staff scientists from KNU visited GSI)**
- **KEK, Japan , full membership in the international Belle2 & Belle experiments**
- **Also cooperation with LAL (Orsay) and CEA(Sacle), France; Argonne National Laboratory, USA (several students, PhD, postdocs and senior staff scientists from KNU visited these research centers)**
- **International Atomic Energy Agency (IAEA)**

a few words on our experience and potential

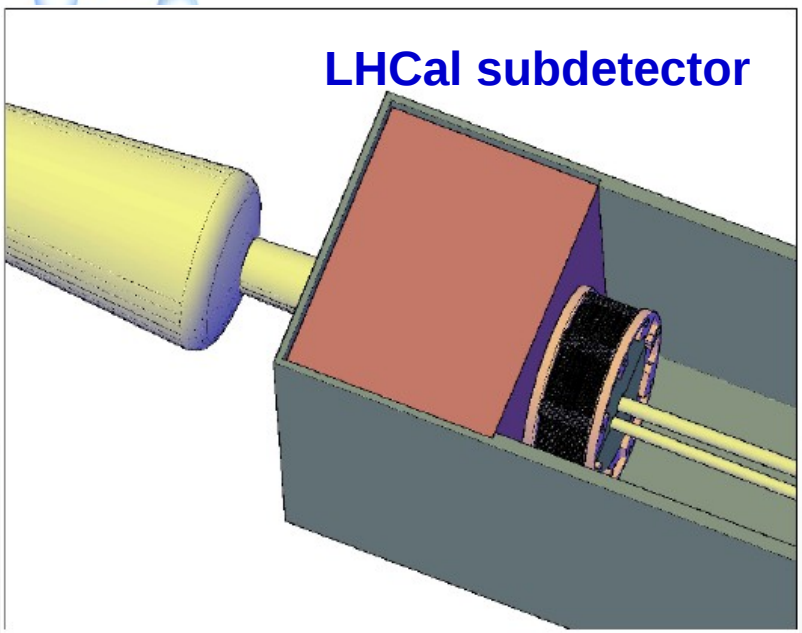
In different collaborations during last 10 years:
~ 30 students and postdocs
~ 100 publications

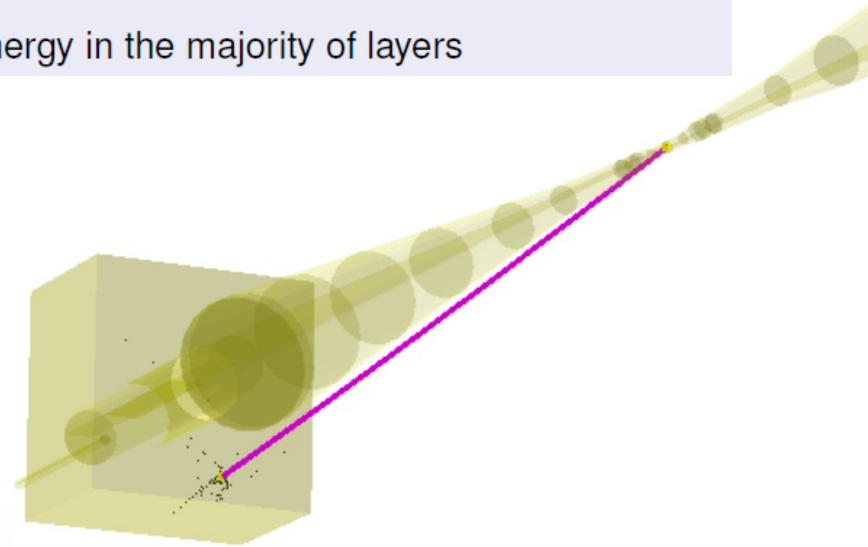
We can easily extend our team as we have a lot of students which are interested in high energy physics

Next pages: Some examples of our student activity during last months

Example: MC detector simulation. Results obtained by our Master student and reported recently at the FCAL collaboration meeting in Dubna (March 21, 2016)

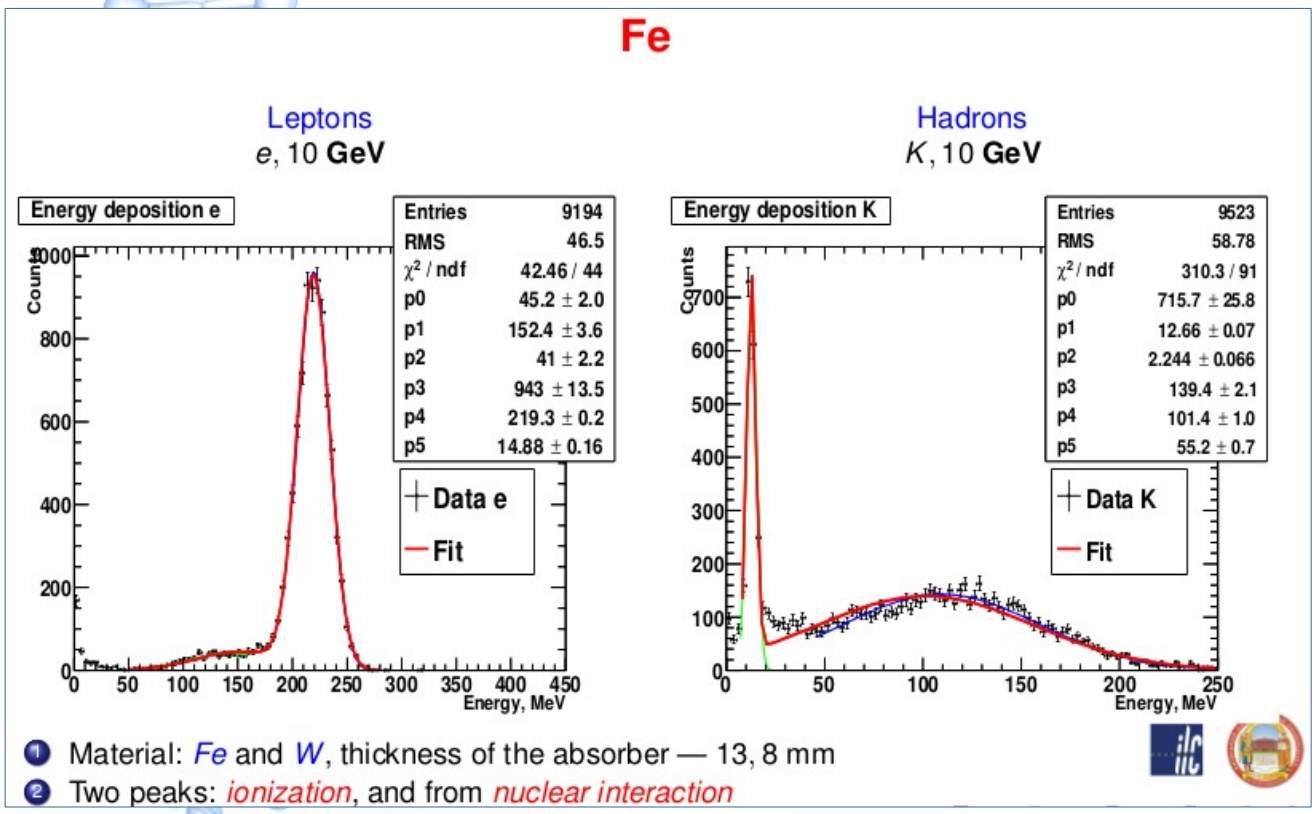
- Simulations for e, π, K within $1 - 20$ GeV have been done for Fe and W absorbers
- Linearity for e, π, K observed
- Energy resolution for e, π, K studied
- Both ionization and mainly nuclear interaction peaks observed for hadrons
- Electrons leave energy in the first layers of the calorimeter
- Muons go through all layers of the calorimeter and leave energy in ionization processes only ($\approx$ 10 MeV peak)
- Pions, kaons cause hadron shower and leave energy in the majority of layers



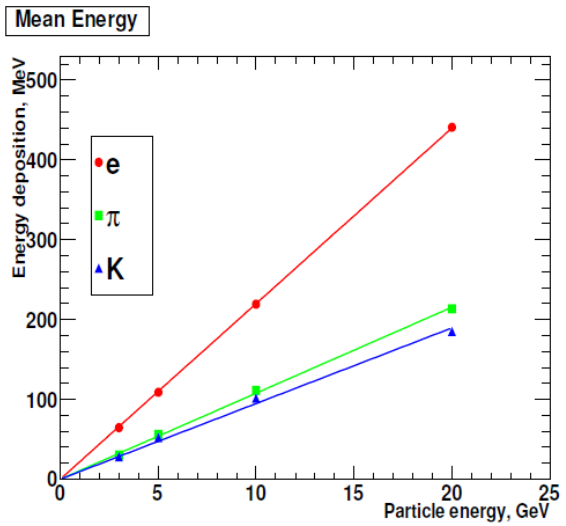


3D view: 10 GeV pion interaction with LHCal

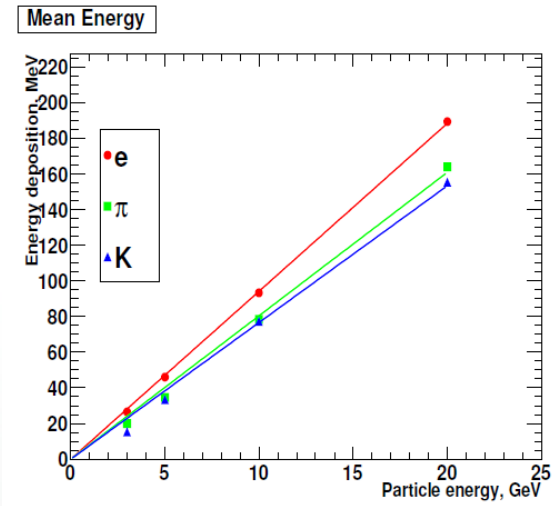
Example: Simulation of lepton and hadron energy deposition in the calorimeter and linearity studies.



Fe



W



Example: **results obtained by our Master student and reported recently at the Deep Inelastic Scattering conference DIS-2016 in Hamburg**

Prompt photon production in deep inelastic scattering at HERA

Olena Hlushchenko

(For the ZEUS collaboration)

DIS2016
12 April 2016
Hamburg

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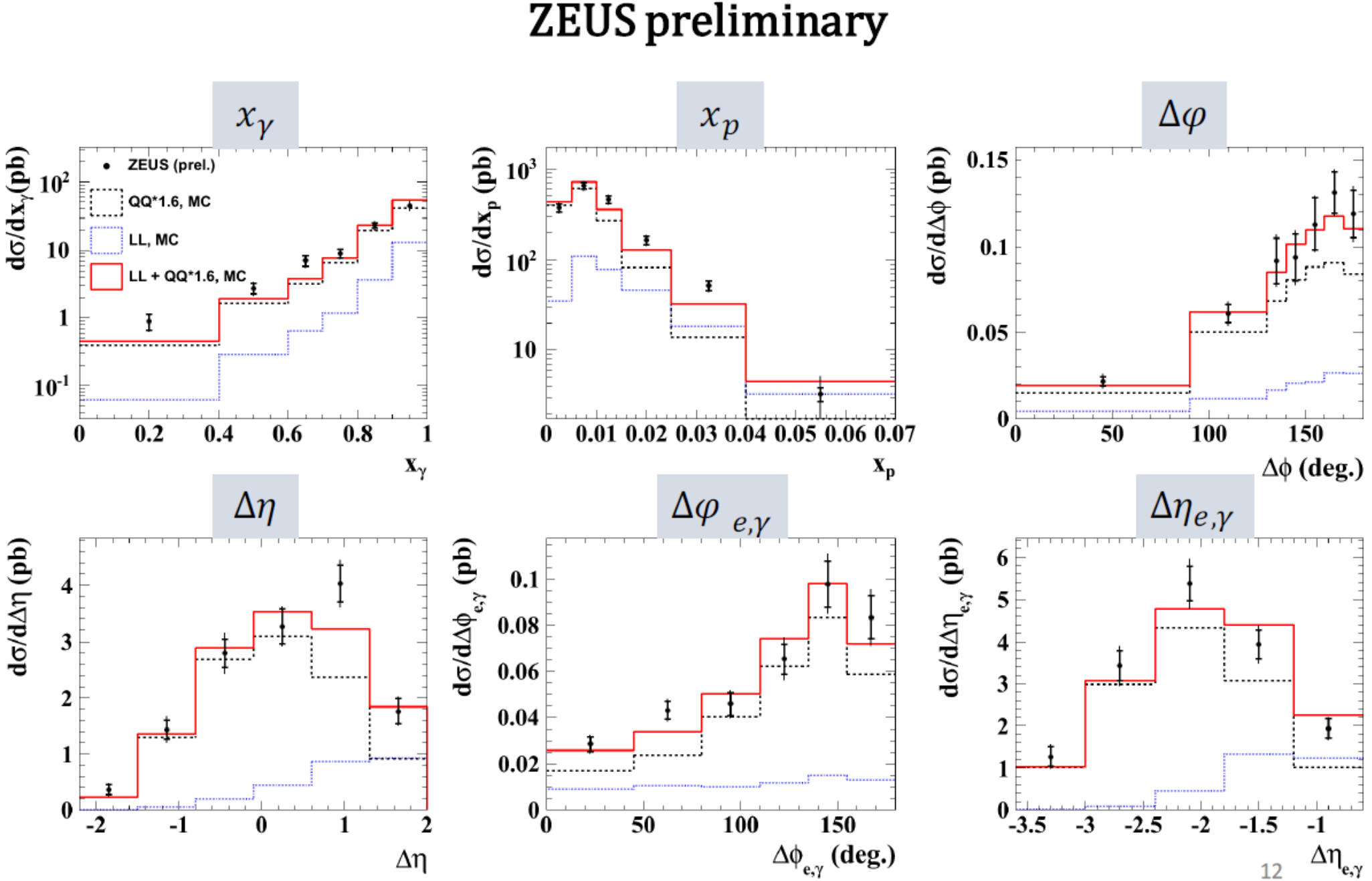
Cross Sections



Example Analysis in progress:

Top quark measurements at Tevatron

DØ note 6482
Version 1.6

Combination of the matrix element and neutrino weighting measurements of the top quark mass in dilepton final states

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IRFU, CEA-Saclay, France

(Dated: March 24, 2016)

We discuss the combination of two measurements of the top quark mass in dilepton final states. One measurement uses the neutrino-weighting technique and another utilizes the matrix-element approach. Both measurements use the full integrated luminosity of 9.7 fb^{-1} accumulated by the D0 experiment at the Tevatron $p\bar{p}$ collider at $\sqrt{s} = 1.96$ TeV. The result of the combination is a top

Our team in DUNE-PT

We plan, our group in DUNE-PT will include 4 senior researchers with solid background in physics, detectors and data analysis in high energy physics and good knowledge of software tools for simulations using GEANT4) and several students want to write their theses based on ProtoDUNE.

Prof. Vladimir Aushev <aushev@mail.desy.de> **-> physics, reconstruction studies, the analysis for the CERN test beam data samples.**

Postdoc Yuriy Shyrma <iuriish@yahoo.com> **-> has interest in contributing to online systems for protoDUNE (DAQ, storage systems,...)**

Postdoc Yuriy Onishchuk <yuno@univ.kiev.ua> **-> physics, reconstruction studies, the analysis for the CERN test beam data samples.**

Postdoc Maryna Borysova <ma@voliacable.com> **-> reconstruction studies, the analysis for the CERN test beam data samples.**

Students: Oleksandr Kot, Andriy Rybalko, Mike Ieresko, Sergiy Liaskovets