

Kiev Group In The LHCAL Detector Studies: Potential And Intentions

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Taras Shevchenko National University of Kyiv

➤ University of Kyiv has been established in year 1834 and has now 14 departments. Over 350 professors and more than 1,000 associate professors, over 30,000 students

➤ University of Kyiv is recognized as a leading higher educational institution in Ukraine.

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Department of Nuclear Physics

Department of Nuclear Physics was established in 1945 by prominent nuclear physicist Alexey Leypunskiy. When moved to IPPE, Obninsk, Russia, A. Leypunskiy became the “Farther” of the Soviet program of fast breeder reactors.

About 20 - 25 students are being graduated after Department annually (Bachelors, Masters and Ph.D.)

The department has a long and distinguished history of research in the field of nuclear and high energy physics, which continues to the present.

Our research and and training of students is focused in such areas:

- **High Energy Physics:** *collider experiments and neutrino physics, detector physics;*
- **Nuclear Physics:** *neutron physics, photonuclear processes, nuclear astrophysics, nuclear theory, ... ;*
- **Medical Physics and Nuclear Engineering:** *Reactor Physics, Nuclear Power Plants (NPP) Equipment operation, Probabilistic Safety Assessment (PSA), dose planning and optimization ...;*

International cooperation in high energy physics

- **DESY-Zeuthen, Germany:** FCAL collaboration
- **DESY, Germany:** ZEUS collaboration
- **KEK, Japan** Belle/Belle-II experiment
- **Fermilab, USA:** D0 experiment
- **Fermilab, USA:** DUNE neutrino experiment
- **CERN:** WA105/ProtoDUNE-DP
- **GSI, Darmstadt, Germany:** CBM experiment
- **Kamiokande, Japan:** Hyper-K neutrino experiment
- **Also cooperation with LAL (Orsay) and CEA(Saclé), France; Argonne National Laboratory, USA**



*E.g., about 50 our students, PhD, postdocs and senior staff scientists from our department worked at **DESY** and ~15 ones visited **Fermilab** during last years. Dozens of students have visited various scientific centers of France, especially **LAL**, in recent years.*



Reminder: our activity in the FCAL during last years (More information in today's report by Yuriy Onishchuk)

Our team:

Two senior scientists + four diploma students.

Strong support from the head of the nuclear physics department Prof. I. Kadenko.

Reports at the FCAL seminars and meetings: ~ 10;

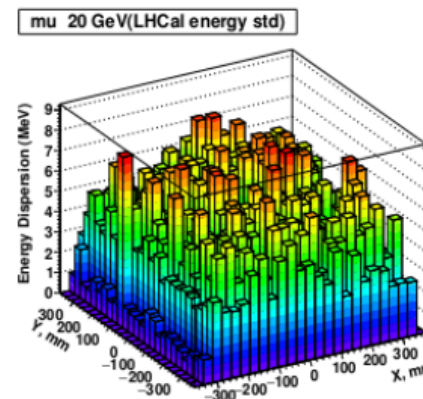
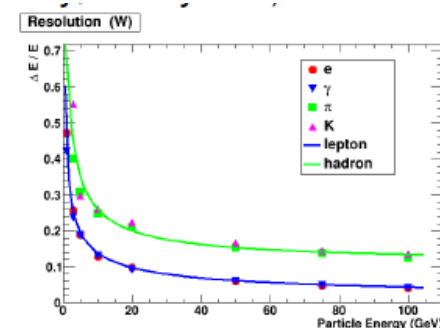
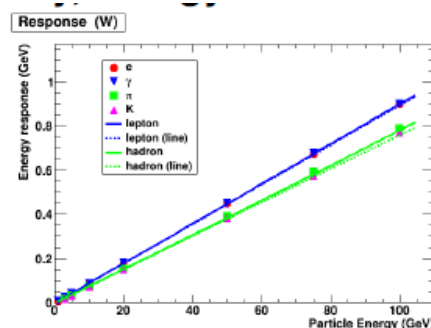
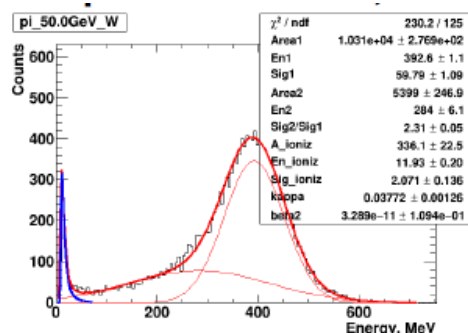
Main research topics:

- Response function
- Linearity
- Energy resolution
- Particle identification
- Machine Learning possibilities for PID
- The sensitivity in XY -plane of the LHCAL
- Participation in the test Beam at DESY

Started, but practically frozen:

- LHCAL geometry implementation into the ILD
- PID in LumiCal+LHCAL configuration
- FCAL in ILD MC simulation

- Main problem: complete lack of funding for scientific work at the university.



Our plans for participation in LHCAL studies

Our Team this year: Two senior scientists + two diploma students

We plan to involve at this stage at least two new students. But we can easily expand our group if supported. The motivation of our students depends crucially on the ability to visit research centres and cooperate directly with leading experts in this field.

(Remark: we feel strong competition from our colleagues who cooperate with French scientific centres, especially Orsay and Saclay, e.g. LAL. These centers attract our talented students, providing good support.)

Field of our interests:

further study of LHCAL in order to optimize the detector design, e.g.,

- Use machine learning for detector studies.
- different segmentation of sensitive layers of the calorimeter,
- the sensitive region of LHCAL overlaps with LumiCal and it would be nice to see how this affects the development of the shower and the measurement in LHCAL.
- simulations with the entire ILD detector to see the effect of various backgrounds on real loading.
- Participation in other FCAL detectors
- Study at the FLC scale (?)
- Participation in the test Beam

Of course, the plans will be corrected and concretized after discussions at this meeting.

Conclusion

Kiev group has a good potential and experience; obtained good results in previous years and we are interested in continuing in LHCAL studies to optimize the detector design.