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Re: Comments on the abstract of the thesis “The CDF II (FNAL) and ATLAS (CERN) Muon Detecting System” by Kovtun V. E. who is applying for the Candidate of Science Degree in Nuclear Physics, Elementary Particles and High Energy Physics

The thesis is dedicated to development of High Energy Physics instrumentation, especially scintillator detector technology and the muon detection system on leading collider experiments.

The muon detection system is a crucial component of every modern collider detector. Recent discoveries in High Energy Physics collider experiments such as top quarks, Higgs boson, and new particles built out of heavy quarks require both reliable measurements of muon properties and fast muon trigger systems.

Upgrade of the CDF detector for the Tevatron Run II (Fermi National Accelerator Laboratory) included install of the muon system comprised of large-area plastic scintillator detectors. A higher instantaneous luminosity after the Tevatron Run II upgrade posed challenging requirements for the muon system. In addition to providing high timing properties the scintillators should be able to withstand high levels of radiation exposure. To improve the hermicity of the muon system the design includes use of wavelength shifting fibers for the readout. V. E. Kovtun carried out key studies of the properties of candidate scintillator materials to fulfill the design goals.

Chapter 4 of the thesis describes the complexity of problems of the development of radiation resistant plastic scintillators and comprehensive solutions developed by V. E. Kovtun and his colleagues. At the same time, our group from the Kharkov Institute of Physics and Technology was conducting similar studies during the research and development of the Endcap hadron calorimeter for the Compact Muon Solenoid (CERN) and collaborated with V. E. Kovtun and his colleagues. V. E. Kovtun played a leading role in the scintillator detector development. The scope included studies of materials of the scintillator materials, primary and secondary dopants. V. E. Kovtun was directly involved with the design of the technology of the manufacturing of scintillator samples. He designed and installed an experimental setup in his “Valter” lab in the department of Physics and Technology of Kharkov State University. He turned his lab into a full-scale scientific center that covered all aspects of High Energy Physics instrumentation. V. E. Kovtun also was playing an important role as a link between Kharkov scientists and Dubna and Protvino scientific centers.

V. E. Kovtun developed novel methods for the measurement of properties of the scintillator samples and detector prototypes. Chapter 2 of the thesis summarizes methods of precise measurements of light signals using modern photodetectors. V. E. Kovtun developed a comprehensive mathematical model of photodetectors. The model allowed measurements of the amount of light collected from the samples in absolute values of the number of photoelectrons. Applications of the model for the data analysis provided the precision needed for the study of the details of the scintillators of different compounds as well as detector elements and complete prototypes.

Bold evidence of the high level of work of V. E. Kovtun and Kharkov scientists is the fact that the upgraded detector CDF II fully accomplished the Run II program with the muon system built out of Kharkov scintillator UPS-923.

The design of the ATLAS detector at the Large Hadron Collider posed a new challenge for the muon detection system: muon detection in the hadron calorimeter needed to fulfill new trends in particle physics instrumentation such as “particle flow” detection algorithms. Chapter 3 of the thesis shows the contribution of V. E. Kovtun in the solution of this problem. This chapter highlights his skills in analysis of the data obtained from the beam tests carried out at SPS accelerator at CERN. The success of the ATLAS collaboration such as discovery of the Higgs boson based on work the whole collaboration without any doubts can be also attributed to the contribution made by V. E. Kovtun.

In my opinion, Vladimir Evgenievich Kovtun deserves the Degree of Candidate of Science in Nuclear Physics, Elementary Particles and High Energy Physics.

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