

Posudek vedoucího diplomové práce

Student: Vojtěch Zabloudil

Title: Performance of plastic scintillator in particle detection

Supervisor: Solangel Rojas Torres

Grade: A (výborně)

The work presented by Vojtěch Zabloudil describes the study of the performance of a set of custom-made plastic scintillators and studies the performance of the FDD detector (already installed in ALICE at CERN). The custom scintillators were made using standard and new promising materials, that is, the use of PPO and quantum dots as scintillating components and polystyrene and silicone as base matrices in different combinations and concentrations of the scintillator compound in the matrices. This part of the work was made in cooperation with the Nuclear Chemistry department at the FJFI, which prepared the quantum dots compounds, and the faculty of physics at Universidad Autonoma de Sinaloa in México, where the synthesis of the plastic scintillators was made. The characterization of the materials was made in the laboratory at the FJFI.

The study of the performance of the FDD detector was made using cosmic rays, and the information from this test was used to set the proper gain of all the channels of the detector. This configuration is being used for the data-taking of pp collisions in the ALICE experiment.

The thesis has six chapters where all the motivation, context, procedures and results are presented. In the first chapter, the context of the ALICE experiment at CERN is presented. Also, the FIT and FDD detector is described since it is part of the study objects and established some of the main motivations in this research. Chapter two contains an introduction to the properties and working principles of plastic scintillators, including the quantum dots (which are novel materials) and an explanation of photomultiplier tubes (PMTs). In chapter three is described in detail all the procedures followed to make custom plastic scintillators: from the synthesis of the quantum dots to the production of the final samples. Chapter four presents the test bench used to characterize the custom-made samples. Where in chapter five, all the tests, procedures, characterization studies and results obtained from the measurements are presented. Chapter six contains the performance studies of the FDD, which main output is the obtention of a calibration gain curve for all the FDD channels to set the proper configuration of the detector. As well as obtention of preliminary results of the overall performance with proton-proton collisions. At the end, a summary and outlook are given. In addition, four appendix sections can be found at the end of the thesis that complements the understanding of the work and goes into more detail about the many studies that were made to get the results.

The work presented in this thesis contributes to giving the first steps to develop new scintillators with promising properties that can fulfill the requirements expected in present and future experiments, where establishing contact for a new multidisciplinary cooperation of different departments and international institutions. Also, contribute to the current operation of the FDD. The student played a main role in contributing to outreach activities: one outreach article was written, and a video for an exhibition was prepared and successfully installed in the CVUT central library.

I consider that this Diploma Thesis was very well done. Therefore I assign an A (výborně).



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