

Report of doctoral thesis advisor

Ph.D. student: **Mgr. Vít Kučera**

Doctoral thesis: **Study of strange particle production in jets
with the ALICE experiment at the LHC**

I know Vít since October 2010, when he joined the Ultra-Relativistic Heavy Ion Group (URHIG) in the Nuclear Physics Institute of the Czech Academy of Sciences and at the same time also the ALICE experiment at the LHC. At that time Vít was enrolled in MSc. studies at the Faculty of Mathematics and Physics, Charles University in Prague. His MSc. thesis was devoted to study of charged jet production in Pb-Pb collisions at the center of mass energy of 2.76 TeV per nucleon pair with ALICE. During his MSc. thesis Vít was also helping with monitoring of Silicon Drift Detectors of the ALICE Inner Tracker System. Already at this early stage of his research Vít showed his talent and very good skills to perform an own independent research.

After defending very successfully his MSc. thesis in 2012, Vít decided to stay in the ALICE experiment and use his experience and continue the study of jet properties with a focus on strange particle production in jets. He enrolled in a double doctorate programme between the Czech Republic (Charles University in Prague) and France (University of Strasbourg). During his Ph.D. studies Vít was co-supervised by Dr. C. Kuhn (IPHC Strasbourg) in a close collaboration with Dr. B. Hippolyte (IPHC Strasbourg) on the French side and by me on the Czech side.

Particle identification in the ALICE experiment is truly unique among all LHC experiments. Vít in his research in particular focuses on study of Λ and K^0_s production in jets and its comparison to inclusive particle production, the so called “bulk”, which is known to manifest a strong baryon/meson enhancement both in p-Pb and Pb-Pb collisions relative to proton-proton collisions. This study is expected to bring important insights to understanding of hadronization mechanisms in hot and dense nuclear matter.

Vít plays the key role in the studies of strange particle production in jets in ALICE. He performed the analysis in Pb-Pb collisions and also significantly contributed with his ideas to the analysis in p-Pb collisions. He optimized topological selection rules for reconstruction of strange particles and evaluated reconstruction efficiency of strange particles inside and outside of jets. In the next phase of his research, he combined the knowledge on strange particles with the jet reconstruction and developed several methods for background subtraction of strange particles in the underlying event from those in the jet in order to access in detail systematic uncertainties on the background subtraction procedure. The final physics results of this analysis are corrected transverse momentum spectra of Λ and K^0_s particles in jets and bulk and the related baryon/meson ratio which are reported in his Ph.D. thesis.

Vít presented preliminary results of his own research on strange particle production in jets at the international workshop for young scientists „Hot Quarks 2014“ as well as last year

at the prestigious international conference „Hard Probes 2015“ on behalf of the ALICE Collaboration.

The results on strange particle production in jets in p-Pb collisions at the center of mass energy per nucleon pair of 5.02 TeV are currently in internal review process of the ALICE Collaboration and Vít is one of the four primary authors of this collaboration paper under preparation. The second paper with Vít's principal authorship will focus on results on strange particle production in jets in Pb-Pb collisions. The preparation work on this paper manuscript has started and the publication is expected in 2017.

Vít is very active in the ALICE Physics Working Group of Jets and regularly presents updates on his analysis at group meetings and contributes to physics discussions and software development. At NPI Vít also helped to supervise undergraduate students, in particular he closely worked with Vojtěch Pacík on extension of the strange particle in jets analysis to p+p collisions. As every student in the ALICE collaboration, Vít also took an active part in the so called „service task“. During his Ph.D. service task Vít contributed to tests of irradiation resistance of the chip prototypes for the new Inner Tracking System (ITS) of the ALICE experiment, which were performed at the NPI cyclotron at Řež. Last but not least, during the data taking period at the LHC in 2015, Vít served in a very responsible role of an on-call expert for the Silicon Strip Detector of the current ALICE ITS.

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