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REVIEW OF THE HABILITATION THESIS OF MGR. MARTIN SPOUSTA, PH.D.

To whom it may concern,

It is a pleasure to review the habilitation thesis of Dr. Spousta, who has been an active participant in establishing and developing the programme of measuring hard-probes, in particular jets, in ultrarelativistic proton-proton (pp) and heavy-ion (AA) collisions at the LHC. Measurements of QCD processes are highly relevant in the overall LHC physics programme, not only as backgrounds for searches for new physics but also as tools to study novel aspects of the strong interaction. Dr. Spousta's main topic of study, the modifications of jet observables in AA collisions, constitutes a dynamic field which combines a variety of physics analysis methods and which is currently experiencing vigorous growth largely driven by experimental efforts and theoretical activity.

Dr. Spousta is a member of the ATLAS Collaboration, which includes about 3000 scientists worldwide. Only a small fraction of those work on physics related to AA collisions at the LHC. Yet, the ATLAS team is one of three main groups, the other two being ALICE, the dedicated heavy-ion experiment, and CMS Collaborations (with LHCb joining only recently for data-taking in proton-lead collisions), that contribute to the programme of studying aspects of the quark-gluon plasma that is created in these collisions. This is an impressive feat by itself. In addition to being a central member of the team dealing with heavy-ion physics, Dr. Spousta has also played an active role at large in the collaboration, contributing to papers dealing with jet measurements in pp collisions. He is a young leader in the heavy-ion community, and is regularly being invited to give plenary talks at international conferences with high impact. He has also worked with and supervised Ph.D. students in his team, who have successfully attained postdoc positions abroad.

The thesis consists of a well-written introduction to the field of heavy-ion collisions and Dr. Spousta's work, and is accompanied by articles where he has provided key contributions. These are organised by topic and deal with the measurement of jet properties in pp collisions, experimental studies of jets in heavy-ion collisions, including aspects of background subtraction prescriptions, and finally phenomenological work on the interpretation of the measurements.

The main body of the thesis deals with jet reconstruction in AA collisions. Here, one of Dr. Spousta's important contributions is a particle-level subtraction scheme that performs well in very busy environments (JHEP 06 (2014) 092). This approach has generated significant interest in the community and the paper has currently 40 citations on INSPIRE. Dr. Spousta has also written an review article on jet reconstruction techniques in Modern Physics Letters A.

Moreover, the measurements of jet properties in heavy-ion collisions made by the ATLAS team, where Dr. Spousta has actively contributed, is of utmost importance. The published papers in the thesis include data on the suppression of jet spectra, including the jet radius dependence, di-jet energy asymmetry, intra-jet properties, azimuthal angle dependence of jet quenching and, finally, the rate of neighbouring jets. Each of these measurements shed light on a particular aspect of jet modifications that is crucial for phenomenological analyses. Currently, the entirety of the data poses challenges to all existing models and have triggered novel theoretical activity.

Dr. Spousta has also distinguished himself as an independent researcher and has taken an active role at interpreting the results of the measurements. The two last papers included in the thesis, demonstrate a good understanding of theoretical concepts and shed light on interesting aspects of jet quenching phenomenology, namely flavour dependence. This is an alley which can be pursued with great interest also in the future. In this context, Dr. Spousta has delivered a plenary talk at the international conference "Hard Probes 2016" in Wuhan, China.

The scope of the thesis of Dr. Spousta is therefore very impressive and the overall level of the published paper is very high. At this point, let me allow myself a critique of the organisation of the thesis. While the details certainly are included in the adjoining papers, it would benefit a non-expert reader to provide a brief introduction to the ATLAS experiment, and its main detectors, as well as the main experimental techniques, that are crucial for measuring jets and their properties in a busy AA environment. However, this is expertly covered in the review article and conference proceedings, included in the thesis.

In conclusions, I would like to strongly recommend the thesis and Dr. Spousta's work which is of excellent quality. It reflects not only knowledge of state-of-the-art experimental techniques, but demonstrate his talent to develop novel ideas and gain novel insight into theoretical aspects. I therefore support Dr. Spousta to be appointed as associate professor at Charles University.

Sincerely yours,

Konrad Tywoniuk