

I. IDENTIFICATION DATA

Title:	Investigation of the impact of the edge radial electric field on turbulence and Zonal Flows in toroidal fusion devices
Author's name:	Bc. Filip Papoušek
Type of assignment:	Master Thesis
Faculty:	Faculty of Nuclear Sciences and Physical Engineering (FNSPE)
Department:	Department of Physics (DP)
Supervisor:	Ing. Ondřej Grover, Ph.D.
Supervisor's affiliation:	Max Planck Institute for Plasma Physics, Boltzmannstraße 2, 85748 Garching, Germany

II. ASSESSMENT OF CRITERIA

Work assignment and topic motivation	demanding
<i>Assess how demanding the assigned topic is. Brief introductory word on motivation for choosing the topic.</i>	
<p>One of the main aims of the work was to extend the experiments and analysis done by Bc. F. Papoušek (hereafter referred to as FP) during his Bachelor project in the GOLEM tokamak. Because FP wished to spend his ERASMUS stay at CIEMAT in MADRID the project was extended to also compare similar studies in the TJ-II stellarator under the lead of Dr. Carlos Hidalgo. As such, the comparison of similar studies focusing on affecting turbulence in the edge of these two toroidal devices offered a unique opportunity to investigate commonalities and differences between these experiments.</p>	

Fulfilling the assignment	not fulfilled
<i>Consider whether the work submitted meets the assignment topic. Comment, if necessary, on items of the assignment not fully answered, or mention whether the scope of the assignment has been broadened. If student failed to fully treat the assigned topic, try to assess the importance, impact and/or the reasons for failings.</i>	
<p>FP obtained valuable experimental data in both GOLEM and TJ-II in a systematic fashion. Particularly at the GOLEM tokamak FP contributed significant effort into improving the experimental setup (biasing sources control, probe tips fabrication) and planning and execution of experiments. However, due to poor execution of the pre-agreed time plan, insufficient effort was given to the final analysis of the obtained results and writing the thesis, particularly in the case of results from GOLEM, which progressed significantly only in the last weeks and days before handing in the thesis. Although some analysis of the results indeed was performed with interesting outcomes, too much of it was done at the last moment and is not adequately described or discussed in the thesis. Furthermore, although FP has indeed developed capability to apply advanced analysis techniques such as bootstrapping for statistics uncertainty quantification, due to a lack of remaining time they were not applied to the presented analysis.</p>	

Student's effort and independent approach to the topic solution	below average
<i>Assess whether student displayed constant effort while investigating the problem, whether they regularly consulted the issues and whether they attended consultations well prepared. Assess student's creativity and independence.</i>	
<p>Due to a demanding external employment and family situation of FP a time plan was agreed which reflected his limited time capabilities, particularly enabling him to work on the topic only in selected weeks. Furthermore, online collaboration tools such as Overleaf for thesis writing and GitLab for analysis code were set up to enable me direct overview of the progress, despite my remote supervision. However, the time plan was not being fulfilled and the gradual progress in the early months was limited. Communication from FP was unfortunately rather limited, unless I asked for status updates. Nevertheless, he did succeed in preparing and executing the experiments in GOLEM independently. During oral consultations I had the impression that FP clearly understands the tasks at hand and the underlying theory. He also developed a suite of analysis code in Python with above average code quality, enabling him to systematically analyse and process a larger database of</p>	

discharges and measured data. Overall, FP is clearly very capable of independent work, provided he devotes sufficient time to it.

Professional standard

below average

Give your opinion on the professional standard of the work, application of course knowledge, references, and data from student's practice.

Due to the limited time devoted to the writing of the thesis, the work is rather incomplete and some of the discussions insufficient. Particularly the TJ-II results are only very briefly discussed, although clearly a lot of analysis has gone into them. Nevertheless, the basis for a more complete work is clearly there.

Level of formality and of the language used

excellent

Assess the use of scientific formalism, the typography and language of the work.

Typographically the work uses an appealing visual style. Diagrams of experimental setups are quite clear and understandable. Figure labels are properly legible and include units where appropriate. The level of English is very good, though several small typos can be found. Sub- and superscripts in equations and symbols are properly non-italicized when they refer to labels ("pol", "rms").

Choice of references, citation correctness

below average

Give your opinion on student's effort in utilizing references in their investigation. Characterize the choice of references and say whether all relevant sources were utilized. Verify whether all resource facts were properly distinguished from student's own findings and results, whether there was no breach of citation ethics, and whether all reference citations are complete and agree with the citation usage and standards.

Especially in the introduction section many statements are not properly cited, not even from textbooks. In some parts probably a citation was intended (e.g. around the introduction of the ball-pen probe), but it is missing and the paragraph is incomplete. The formatting of some citations including larger author collectives should be shortened to "et al".

Further comments and assessment

Give your opinion on the quality of the main results obtained in the work, e.g. on the level of quality of theoretical results, or the applicability of the engineering and programming outputs of the solutions obtained, on publication activity, experimental skills, etc.

F. Papousek definitely demonstrated above average experimental and Python coding skills. In principle also his writing skills are rather good, provided he devotes sufficient time. Unfortunately, the other side of scientific work, namely proactive communication and time management is severely lacking.

III. OVERALL ASSESSMENT AND SUGGESTED GRADE

Summarize all aspects of the work most influential for the overall assessment. If adequate, write questions to be answered by student during the defence of their work before the board.

Although the experimental efforts by F. Papousek were highly commendable, the time devoted to the final analysis of results and the writing of the thesis was insufficient. Consequently, the thesis itself does not fully reflect the scope of all the work done and reads rather as an incomplete draft. Therefore, I suggest that the analysis and thesis is finalized into a more complete state before it can be defended.

Suggested grade: **F - failed.**

Date: 31.1.2024

Garching

Signature:

Andrzej Gmorn