Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Rahim Samanbakhsh

PhD Program: Engineering Systems

Title of Thesis: Design of power converters for renewable energy sources

Supervisor: Assistant Professor Federico Martin Ibanez, Skoltech

Name of the Reviewer: Dr. Pallavee Bhatnagar, Dean Academics IES College of Technology Bhopal India

I confirm the absence of any conflict of interest	**Date: 19-10-2022**

The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the reportat least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.

If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.

Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

I congratulate the Author and the Supervisor for their research work. Both the converters which are proposed by the authors are novel up to my knowledge and the work proposed is well validated experimentally. There are no major comments or issues in the research work and thesis except few minor observations which I have mentioned page wise and chapter wise. I would advise the author to incorporate following suggestions in the thesis.

Comments:

1. Abstract is well written with few grammatical mistakes
2. Page 12 some formatting errors are there
3. Page16_17_Chapter 5 why uppercase is used?
4. Page18_This proposed converter was validated in the lab and the results were published_ Try to rewrite in present tense like: The proposed converter is validated …… (similar corrections are required at many places)
5. Page 22_Voltage source inverters (VSIs) have been extensively applied in various power electronic applications, including, among others, distributed generations, energy-storage systems, and uninterruptable power supplies (UPS) [3, 4].????? Rewrite this.
6. Page 23_However, the input three DC sources should be constant, if the DC voltages are reduces, output voltage will be lower. In the Abstract it is written that: The structure has three unequal input sources and ten switches that can generate a 15-level output voltage. Please clarify. Grammatical mistakes also there.
7. Page 49_ In some cases, a three-level approach is inappropriate, and a five level inverter produces better results. As a result, a four-level inverter is the most inappropriate approach. Clarify.
8. Chapter 2 is well written except that there is no 15 level topology reviewed although literature is available on 15 level inverters also. Since the proposed topology is on 15 levels it is appreciated to involve some review on 15 levels inverter also.
9. Chapter 2_ in the comparison presented in this chapter no comparison at a level of 15 is made
10. Page_57_That is, a currency converter cannot be used instead of a voltage converter, and vice versa. ???? Correct this.
11. Page_59_In the following, this section discusses the impedance source (abbreviated as Z-source) converters introduced in the last few years. ???? Rewrite.
12. Page 69_71_..... Figure 3.12: Trans Quasi Z-Source Inverter, Figure 3.13: General topology of Improved Trans Z-Source Inverter [20]……_ should draw these figures instead of copying it.
13. Chapter 3 is rest fine
14. Page_82_PWM makes simpler to control the output voltage than other methods and does not

require any extra par_ rewrite.

15. Page_85_“Here are some basic descriptions for reference when explaining the modulation scheme. Initially, the duty cycle is demarcated by changing and scaling the commanded voltage, considering multiple voltage levels. The adjusted duty cycles are-” Can’t understand what is conveyed. Please explain.
16. Page90-91-92_.....98_ 4.2.1.2 Space vector modulation_..... figures and equations are mostly copied, either rewrite and redraw or cite them.
17. Page_123_ There is a difference in the efficiency theoretically calculated and simulated value. Calculations and comparisons in section 5.5 and 5.6 are done for different parameters??
18. Page 123-124 There is a difference in the peak value of voltage in the simulation results in Fig.5.7: 84 volts shown and rms value choosen Vorms =56V (Peak= $56\sqrt{2}$) Clarify.
19. Page_127_Rewrite equation 5.19. (It is copied) Style and font must be same. Also on the same page somewhere it is written E1 somewhere E_1
20. Page_131_Table 5.4 Comparison of several cascaded multilevel topologies (Nl= Number of levels) while at all other places in the table NL is written???
21. Page_132_Table IV includes the conventional cascaded H-bridge converter (CHB), multilevel DC links (NCML) [9], Table IV???
22. Page_135_Table 4.5 shows a comparison of several multilevel topologies. It can be seen that the proposed topology offers better characteristics than the other structures. Table 4.5 is wrongly written.
23. Page_134_Figure 5.10 Comparative studies: The number of (a) DC links, (b) switches, and (c) TSV in terms of the number of levels. It is well explained.
24. Page-135_Table VI lists the converter’s main components. Where is table VI? Please correct it.
25. Page_137_Figure 5.11 Hardware to create multiple DC sources (a) Multi tap transformer, (b) DC/DC converters [19], [28], (c) Prototype of the proposed structure.This experimental setup is highly confusing. Kindly clarify: from where you are taking main DC supply? Are you converting ac into dc using multi-winding transformers and then converting them into dc using ac to dc converters? Or you are using power supply as shown in figure 5.11 c to generate 12, 24 and 48 volts. Please explain. As in the figure both the configurations are seen. Please explain different parts in figure c as you have explained in figure 6.16.
26. Chapter-6 is well written and well explained; the proposed topology is well explained and validated experimentally.
27. Plagiarism report can also be included (not mandatory)?

Provisional Recommendation
☐ *I recommend that the candidate should defend the thesis by means of a formal thesis defense*
☐ *I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*
☐ *The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*

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