Feedback from the Reviewers

C. Clarity of presentation:

English grammar and spelling are proper ------------------------------------------ [3 - I agree]

Mathematical symbols and equations are easy to understand ------------------------ [3 - I agree]

Figures and tables are well constructed and informative -------------------------- [2 - I am neutral]

The paper is well organized ------------------------------------------------------ [3 - I agree]

Considering the issues above, the paper is readable ------------------------------ [3 - I agree]

T. Technical innovation and relevance

The authors cite other relevant publications ------------------------------------- [4 - I strongly agree]

Authors describe relevance of work to the research field ------------------------- [4 - I strongly agree]

The authors apply sound technical approaches ------------------------------------- [4 - I strongly agree]

New ideas are convincingly and logically described ------------------------------- [2 - I am neutral]

Results are convincing ----------------------------------------------------------- [2 - I am neutral]

Considering the issues above, this work should be presented --------------------- [4 - I strongly agree]

Comments:

Dear author, using concentrate winding motor with IMMD structure is a great idea. The only thing I have concern is how good the final hardware design can work. There are many practical things to think about, and this is why I would highly recommend the author to conduct some hardware experiments. The following items come to my mind that can only be verified in experiment.

1) Potential circulating current between parallel modules, and some voltage mismatch between series modules.

Bunları açıklayalım

2) Coupling effect has impact on interleaving, and current ripple will be different due to interleaving.

???

3) GaN at 650V has a really crazy dv/dt which can kill the motor insulation quickly and cause high spikes. Some researchers prefer to use LC filter for GaN.

Açıklayalım

4) The author thinks the interleaving only benefits DC link capacitor current in parallel modules, I totally agree. However, at higher switching frequency, due to parasitic inductance, the DC link current is very difficult to cancel each other. At 100kHz, parasitic inductance 'blocks' the current sharing between modules (which is square-shape current). You may get a worse DC-link current due to resonance.

Bunu açıklayalım

In addition, I have one more suggestion for Figure 11-13. I think it would be better if the author can use frequency analysis FFT plot for the ripples. The time domain waveform provides little information. The analysis methods in EMI research area might help.

FFT grafiği ekle

C. Clarity of presentation:

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Figures and tables are well constructed and informative -------------------------- [1 - I disagree]

The paper is well organized ------------------------------------------------------ [0 - I strongly disagree]

Considering the issues above, the paper is readable ------------------------------ [0 - I strongly disagree]

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Results are convincing ----------------------------------------------------------- [0 - I strongly disagree]

Considering the issues above, this work should be presented --------------------- [0 - I strongly disagree]

Comments:

The submitted work is presenting the design of an IMMD base on GaN devices.

In the abstract, the authors are mentioning "Various slot/pole combinations and winding configurations" and a comparison "to reduce the space harmonics on the motor". However, such comparison is missing. As a general comment, in the reviewer opinion, the authors should try to

focus on one or two topics rather than trying to investigate many different ones. Focusing on a couple of issues, findings could be better presented and readability would increase. Among all the different topics, the authors are trying to consider "space harmonics on the motor", device losses (GaN vs IGBT), converter topologies (2-level VSI, NPC, CHB), converter connections (series vs parallel), and multi-three-phase machine winding arrangements. However, they forgot to consider the controllability and its impact on the fault tolerance.

Considering the above, overall the results are not convincing and not logically described. For example, in the introduction the authors are saying:

"With modularization, the overall system is segmented with modules sharing the total power equally. By this way, the fault tolerance of the system is increased [2]", which is true.

However, the proposed topology in Fig. 4 is not fault tolerant. In case of faulty module (short circuit on the DC link), the overall system is compromised. Furthermore, considering diagram in Fig. 4, the authors are not mentioning the need for balancing the voltage across the two series capacitors nor harmonic circulation among the converters.

In the reviewer's opinion, the paper could be improved with the following modifications:

1)[1] is not introducing any novel concept, it is an exhaustive literature review regarding integrated motor drives;

2)In the introduction, sentence "By this way, the fault tolerance of the system is increased [2]." is in contrast with the proposed diagram in Fig. 4;

3)In the introduction, sentence "However, high frequency operation highlights the parasitic components on the power stage and gate drive circuits which makes layout design critical." is not clear;

4)Reference [8] is fine. Perhaps, the authors might consider the suggested references [S1] [S2] [S3];

5)Last two sentences of Sec II does not sound technical;

6)When mentioning the "LC DC link pre-filter" provide a reference, please;

7)In Sec. III, sentence "This also ensures the total number of modules an even number." does not sound technical nor clear;

8)Paragraph before Table I ("There are various parameters...is shown in Fig. 4") is not clear to the reviewer;

9)Eqs. (1,7) should be closer to sub-sec. IIIA;

10) In Fig. 8, according to Table IV, the average torque should be 127.0Nm and not 122.5Nm;

11)Torque ripple and cogging torque limits mentioned before Table IV are not given;

12)Line current shown in Fig. 13b is lower than the one shown in Fig. 7;

13)Capacitor size of Figs. 12a,b is not given nor the part number;

14)According to Fig. 12b, the total voltage is 540V. Why before authors mentioned 810V?

15)In Sec. IV, the authors are mentioning a thermal model, where is it?

16)Concepts in paragraph below Fig.13 are not logically described;

Suggested references:

[S1] A. Tessarolo, L. Branz and M. Bortolozzi, "Stator inductance matrix diagonalization algorithms for different multi-phase winding schemes of round-rotor electric machines part I. theory," IEEE EUROCON 2015 - International Conference on Computer as a Tool (EUROCON), Salamanca, 2015, pp. 1-6.

[S2] A. Tessarolo, L. Branz and M. Bortolozzi, "Stator inductance matrix diagonalization algorithms for different multi-phase winding schemes of round-rotor electric machines part II. Examples and validations," IEEE EUROCON 2015 - International Conference on Computer as a Tool (EUROCON), Salamanca, 2015, pp. 1-6.

[S3] E. A. Klingshirn, "High Phase Order Induction Motors - Part I-Description and Theoretical Considerations," in IEEE Transactions on Power Apparatus and Systems, vol. PAS-102, no. 1, pp. 47-53, Jan. 1983.

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Comments:

This is a very interesting paper of integrated drive. Is it possible to discuss more thermal design in the paper?