

## Control algorithm for a pulsed power buck-boost DC/DC voltage converter

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*The paper describes an algorithm of Buck/Boost DC/DC power converter control. The proposed technique can be used in methods of organizing power supply for various devices in many areas of technology, for example, in methods of organizing a battery charge on board an aircraft with a hybrid power plant by means of powerful Buck/Boost pulsed power converters for controlled voltage and current, as well as in organizing secondary power supply of equipment and functional equipment of aircraft with stabilized voltage and current limit value in the load.*

*Keywords:* DC/DC voltage converter, hybrid power plant, battery charging, average current mode.

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## REFERENCES

1. Tarrasón L., Jonson J. E., Berntsen T. K. and Rypdaz K., Study on air quality impacts of non-LTO emissions from aviation. Final report to the European Commission under contract B4-3040/2002/343093/MAR/C1. Norwegian Meteorological Institute, 2004.
2. Ritchie H., Roser M. and Rosado P. CO<sub>2</sub> and greenhouse gas emissions. Our world in data, 2020.
3. Miyagasheva V. A., Inshakov D. R., Ponomarev A. V. and Boyko O. G., Aktualnye problemy aviatsii i kosmonavtiki **1** (12), 808–810 (2016) [in Russian].
4. Swaminathan N. and Cao Y., IEEE Transactions on Transportation Electrification **6** (4), 1740–1754 (2020).
5. Channegowda P., Du Z. S., Dwari S. and Kshirsagar P. AIAA/IEEE Electric Aircraft Technologies Symposium. Indianapolis, 2019, p. 1–11.
6. Zhang Y. et al. IEEE Int. Conf. on Electrical Machines and Systems. Wuhan, 2008, pp. 2695–2697.
7. Lu Y., Hess H. L. and Edwards D. B. IEEE Int. Electric Machines & Drives Conf. Antalya, 2007, pp. 129–133.
8. Bradley T. H. et al. SAE Technical Paper, 01–3092 (2006).
9. Sharpe J. E. et al., Microporous and Mesoporous Materials **209**, 135–140 (2015).
10. Verstraete D., International Journal of Hydrogen Energy **38** (34), 14824–14831 (2013).
11. Gohardani A. S. Dunn R. and Millicam N. 54th AIAA Aerospace Sciences Meeting. San Diego, 2016, p. 08652016.
12. Varyukhin A. N., Gordin M. V., Dutov A. V., Moshkunov S. I., Khomich V. Yu. and Shershunova E. A., Elektrichestvo, № 8, 4–12 (2021) [in Russian].
13. Shershunova E. A., Moshkunov S. I., Varyukhin A. N. and Gordin M. V. 19th International Conference «Aviation and Cosmonautics». Moscow, 2020, pp. 232–233.
14. Moshkunov S. I., Khomich V. Yu. and Shershunova E. A., Letters to the Journal of Technical Physics **46** (15), 22–24 (2020) [in Russian].
15. Kreutzer O., Gerner M., Billmann M. and Maer M. IEEE Transportation Electrification Conference and Expo. Long Beach, 2018, p. 220.
16. Cheng Ch., Suey Tc., Van Kh. and Zhou Ch. Voltage converter with separate combined conversion circuits. Patent for invention № 2617991 (RF). 2017.
17. Dixon L. Average current mode control of switching power supplies, Unitrode Power Supply Design Handbook. P. 5.1.
18. Varyukhin A. N. et al. A method of control of a pulse power reducer in the mode of average current. Patent for invention 2767050 C1 (RF). 2022.
19. Varyukhin A. N., Gordin M. V., Dutov A. V., Moshkunov S. I., Khomich V. Yu. and Shershunova E. A., Applied Physics, № 1, 75–81 (2021) [in Russian].
20. Varyukhin A. N., Gordin M. V., Dutov A. V., Moshkunov S. I., Nebogatkin S. V., Khomich V. Yu. and Shershunova E. A., Doklady Physics **66** (4), 114–118 (2022) [in Russian].