

Letter to the Editor

Comment on “Storage and Dissipation Limits in Resonant Switched-Capacitor Converters”

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The purpose of this note is (i) to point to a reference missing in the paper (Mayo-Maldonado et al., 2018) and (ii) to show that some of its content is covered in a more general setting by the results in that reference (Göknar, 1972).

1. Introduction

As explained in the sequel, some of the results developed for specific circuits in Sections 5 and 7 of the paper given in [1] can simply be obtained as applications of results in [2] presented for arbitrary passive circuits containing inductor only cut-sets and/or capacitor only loops.

2. Comments

With **Theorem 1** (typo, first Theorem 2 should be Theorem 1) in [2], a measure for the jump in energy is given for a general circuit consisting of inductors (L) and/or capacitors (C) at a time of discontinuity and shown to be positive.

With **Theorem 2** for a nonsingular L (C) matrix, it is shown that the necessary and sufficient condition for the jump in energy to be zero is that L currents (C voltages) satisfy Kirchhoff Laws before the jump (at t_0^-) [2].

In case of a singular L (C) matrix, **Theorem 3** gives a necessary and sufficient condition for the energy at t_0^+ to be zero showing how essential is the nonsingularity of L (C) matrix.

Thus there is no need for all the lengthy derivations for a circuit consisting of two capacitors in **Section 5 of paper [1]**; they can all be derived simply from the general formulation in [2].

For a circuit N consisting of inductors (capacitors) only, an **augmented circuit** N_a is obtained from N by including resistors into N in such a way that all L cut-sets (all C loops)

are destroyed and when all resistors are open (short) circuited the topology of N is obtained.

Theorem 4 in [2] shows that all L currents (C voltages) in N_a tend to L currents (C voltages) in N as $t \rightarrow \infty$. Furthermore, the fact that the energy jump in N is equal to the energy consumed on the interval $[0, \infty)$ in the resistors of N_a is demonstrated in **Theorem 5 [2]**, giving a physical interpretation to the energy jump in N .

It is expected that results in Section 7 of paper [1] can profit from Theorems 4 and 5 of [2].

3. Conclusions

Referring to paper [2] will do justice to it and profiting from its results may shorten the paper [1]. Also, it is quite possible that these results open new horizons for developing further outcomes.

Conflicts of Interest

The author declares that he has no conflicts of interest.

References

- [1] J. C. Mayo-Maldonado, T. M. Maupong, J. E. Valdez-Reséndiz, and J. C. Rosas-Caro, “Storage and Dissipation Limits in Resonant Switched-Capacitor Converters,” *Mathematical Problems in Engineering*, vol. 2018, Article ID 1054179, 10 pages, 2018.

- [2] I. C. Göknaç, "Conservation of Energy at Initial Time for Passive RLCM Network," *IEEE Transactions on Circuit Theory*, vol. 19, pp. 365–367, 1972.

