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**Techniques for the application of the analytical solution to the multicylinder somatic shunt cable model for passive neurones.** (English) [Zbl 0819.92003](#)

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Summary: The general solution for the voltage response to a generic impulse current input in a multicylinder somatic shunt cable model for passive neurones has been developed by *L. F. Abbott* [*Physica A* 185, 343-356 (1992)]. We consider the application of the multicylinder solution to examples previously considered by other authors for the single cylinder case: long and short current input and synaptic input modeled by an alpha-function and a multi-exponential function.

Simple expansions appropriate for small and large times are found and efficient means of obtaining these expansions are clearly demonstrated. The dependence of the small and large time solutions upon the dimensionless parameters appearing in the conservation of current condition at the soma is investigated. Relevant limits of these dimensionless parameters which further simplify the small and large time solutions are related back to equivalent dimensional problems of interest to the practitioner. The well-posedness of the dimensionless inverse problem is investigated and a method proposed for the solution of the dimensional inverse problem for the somatic shunt.

**MSC:**

[92C20](#) Neural biology

[92-08](#) Computational methods for problems pertaining to biology

[78A70](#) Biological applications of optics and electromagnetic theory

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**Keywords:**

voltage response; multicylinder somatic shunt cable model; passive neurones; multicylinder solution; long and short current input; synaptic input; alpha-function; multi-exponential function; expansions; well-posedness; dimensionless inverse problem

**Full Text:** [DOI](#)

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