Exact solution of the dynamo problem in the outer region of an artificial plasma ball

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The mathematical technique for treating dynamo processes in the expanding plasma balls is of primary importance in the interpretation of data by active space experiments, since the electromagnetic fields and currents generated by the expanding plasmas are the most frequently measured parameters. An efficient method for solving the dynamo equations *inside* the ball is based on the expansion in the generalized spherical functions, which were introduced in our earlier works, e.g. [1,2]. The aim of the present report is to demonstrate how such an expansion can be generalized to the *outer* region of the ball, thereby giving a complete analytical solution in the entire space.

The main practical advantage of this approach (as compared to numerical methods) is the ability to trace easily a dependence of the electric fields and currents in a given point (where the measuring apparatus is located) on the plasma parameters appearing in the dynamo equations. This is important both for optimization of the active space experiments and for solving the inverse dynamo problem (i.e./ determination of the electric conductivity and other plasma characteristics from the measured fields and currents).

References:

1. Yu.V. Dumin, *Phys. Chem. Earth (C)*, v.**25**, p.75 (2000).
2. Yu.V. Dumin, *XXV Int. Conf. on Phenomena in Ionized Gases: Proceedings*, v.**2**, p.189 (2001).