Time-Domain Forced Oscillations in a Cavity Filled with a Plasma Driven by the Dynamic Ohm's Law

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Statement of the problem involves the system of Maxwell's equations (with the time derivative) and the *motion equation* for a nonmagnetic quasi-neutral homogeneous plasma simultaneously. The motion equation governs the behavior of the charged particles that is conditioned by their interactions in the plasma with the electromagnetic field, which is governed by the Maxwell's equations, in turn. These processes are considered in a cylindrical cavity bounded by the closed surface of perfect electric conductivity. Within the cavity, an input item is placed that is meant for excitation of the forced oscillations by a given signal applied to that one. The signal has a beginning and an end. The time-domain problem is solved within the framework of the Evolutionary Approach to Electrodynamics (EAE). The EAE was recognized recently as an alternative to the classical time-harmonic field method: (O. A. Tretyakov and F. Erden, "Evolutionary approach to Electromagnetics as an alternative to the time-harmonic field method," *IEEE International Symposium on Antennas and Propagation and USNC-URSI National Radio Sci. Meeting*, 8-14 July, Chicago, US, 2012).

The solution is obtained as the modal field expansion where each term is a product of two factors. One factor is an element of the modal basis dependent on coordinates. The other one is a time-dependent modal amplitude, physically. The modal basis is specified in Hilbert space. In accordance with Weyl Theorem, that is a direct sum of four mutually orthogonal subspaces. Two of them correspond to the *solenoidal TE* and *TM* modes. Two other subspaces correspond to the *irrotational* modes of the electric and magnetic kind. As for the field amplitudes jointly with the modal amplitudes of the plasma current density, the Cauchy problems are obtained and solved explicitly. The results are illustrated graphically.