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Microwave Soliton Generation and Propagation in a Cylindrical Partially Plasma Filled Waveguide SEYED MORAD-ALI HASHEMI, K. N. Toosi University of Technology, Tehran, Iran — A perfect electrical conductor (PEC) cylindrical waveguide with a radius of r_1 is considered as the main part of a basic microwave generator model in the cylindrical geometry which supports the axial movement of an electron beam of radius $r_2 \leq r_1$ inside it. Using fluid theory of plasma, it has been shown that this structure is capable of supporting nonlinear Schrödinger (NLS) soliton generation and propagation. The wave equation for the vector potential **A** has been derived using plasma dispersion relation. The equation has then been separated into two different equations in the transverse and axial directions, considering a solution in the form of a function of transverse variables multiplied by another time dependent function of axial variable, the latter itself having two components: a fast oscillation with a slowly varying amplitude. Once β, the propagation constant in the axial direction, obtained by applying boundary conditions in the former equation, the latter equation can be manipulated by imposing a perturbation on the dielectric constant. This will result in a perturbation on propagation constant which in turn will induce to the calculations the nonlinear term required for NLS equation in the form of a pondermotive force, completing derivation of the required NLS equation supporting the soliton formation and propagation.

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