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NUMERICAL EXPERIMENTS OF SINGLE MODE GYROTRON EQUATIONS[1]

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The present work continues our recent investigations of the stationary problem of the single mode gyrotron equation [1] using the implicit finite difference schemes and the method of lines. We consider two versions of the gyrotron equation. The amplitude $f(t,x)$ of the high frequency field in the gyrotron resonator and the transverse orbital momentum $p(T,x,\theta_0)$ of electrons can be described by the following system of two complex differential equations (new version):

$$\begin{cases} \frac{\partial p}{\partial x} + i\left(\Delta + |p|^2 - 1 - g_b\right)p = if(t,x) \\ \frac{\partial^2 f}{\partial x^2} - i(1+\delta_\omega)\frac{\partial f}{\partial t} + (1 + 0.5(\delta_\omega + g_c))g_d f = (1+\delta_\omega)(1+g_c)^2 I < p >, \end{cases} \quad (1)$$

where $i = \sqrt{-1}$, $x \in [0, L]$ and $t \geq 0$ are the axial and time coordinates, L - the length of the interaction space, $\Delta, \delta_\omega, \theta_0 \in [0, 2\pi]$ - the real constants, I - the current, $g_b(x)$, $g_c(x)$, $g_d(x)$ - given real functions and $< p >= \frac{1}{2\pi}\int_0^{2\pi} p\, d\theta_0$ averaged value of p. The system (1) is supplemented by the initial conditions $p(t,0,\theta_0) = \exp(i\theta_0)$, $f(0,x) = f_0(x)$, and by the boundary conditions in the gyrotron cavity

$$f(t,0) = 0, \quad \frac{\partial f(t,L)}{\partial x} = -i\gamma f(t,L),$$

where $f_0(x)$ is the given complex function, γ is a positive parameter.

REFERENCES

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