Numerical Simulation of Current drive generation in a tokamak using slow and fast waves (helicons) of intermediate frequency rang in case of modelling the two-dimensional spectrum of the antenna [[1]](#footnote-1)\*)

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This paper presents the results of numerical simulation of current drive generation in a tokamak using intermediate frequency range waves using the updated numerical code FRTC incorporated into the ASTRA code[1].

To calculate the starting spectrum of the refractive index of an electromagnetic wave launched into plasma, taking into account the geometry of the antenna and plasma parameters in the tokamak, the numerical code Grill3D is used[2]. The calculated spectrum is two-dimensional, that is, it contains poloidal and toroidal components of the refractive index. In an earlier version of the numerical code FRTC[3, 4], the two-dimensional spectrum of starting decelerations was integrated in the direction perpendicular to the specified direction of orientation of the antenna in the experimental discharge. Thus, the beams were launched with only one mode, toroidal or poloidal. Such a simplification is permissible in the case of a classical tokamak, where the poloidal field is weak and the direction of the total magnetic field practically coincides with the toroidal direction. In a spherical tokamak, for example, Globus-M2, the magnetic field is directed at an angle to the toroidal direction, and both components of the field, toroidal and poloidal, must be taken into account for wave damping calculating.

In this paper, a new two-dimensional approach to accounting for the spectrum of starting decelerations of waves of the intermediate frequency range is used to simulate the generation of lower hybrid and helicon driven currents for hydrogen and deuterium experiments at the Globus-M2 tokamak. The simulation results are compared with experimental data and one-dimensional spectrum calculations. It was shown that two-dimensional spectrum accounting calculations allow to significantly increase the calculated driven current, which corresponds to experimental data.

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