

## FUNDAMENTAL PROPERTIES TOROIDAL ТОКОВЫХ STRUCTURES.

*Existence of an external magnetic field and structure of the internal is shown*

*Magnetic field in toroidal structures with полоидальным a current.*

For the first time in a science numerical calculations of an external magnetic field (MF) of toroidal structures with a poloidal current (a Fig. 1) are made. The arrows which have been marked out  $\mathbf{i}$ , vectors of elements of a current are shown. Toruses with relation  $R/r \approx 1$  and  $R/r \approx 2$  were observed. Results of calculations are inferred in the form of schedules of the Cantor. Lines on schedules show cross-section of surfaces of level of equal stress level of MF. Schedules – in standard units.

The direction of a vector of stress level of MF – is perpendicular to an image plane as power lines of MT have exclusively azimuthal (either tangential or tangential to a round which lies in plane XY and with the centre on a Z-axis) a component.

In the beginning paid off MF in torus.

Torus with relation  $R/r \approx 1$  (a Fig. 1).

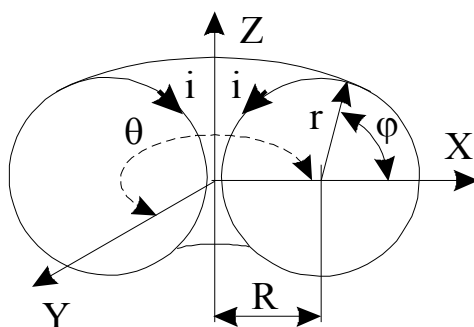
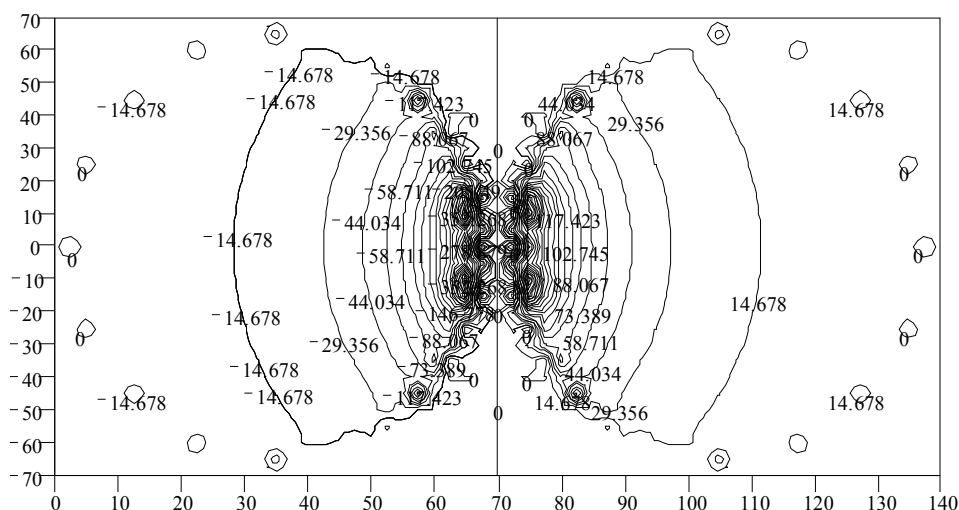


Fig. 1



B

Fig. 2

Torus with relation  $R/r \approx 2$  (a Fig. 3).

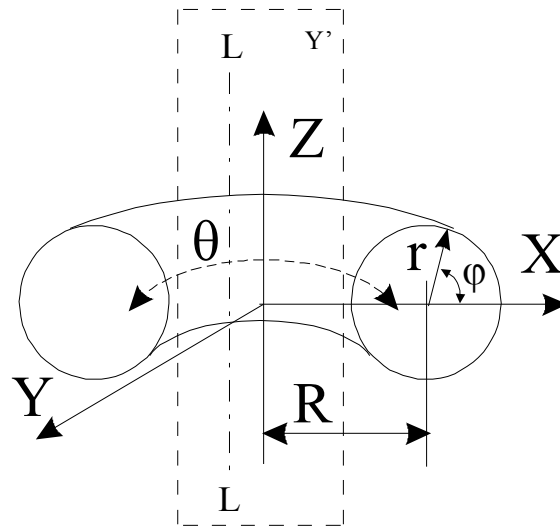


Fig. 3

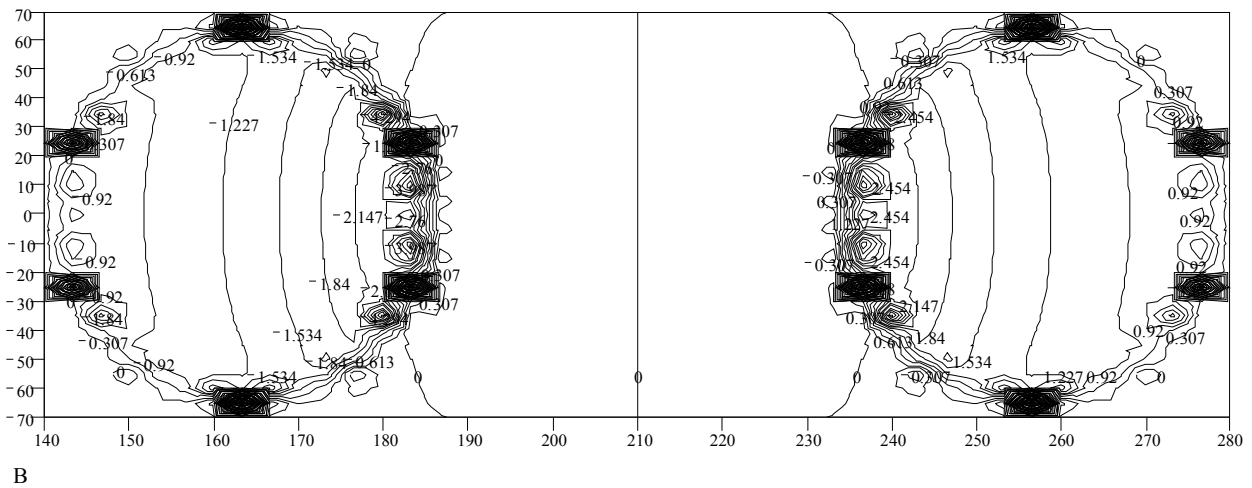


Fig. 4

On schedules (a Fig. 2, a Fig. 4) it is visible that the structure of MF in torus does not match to structure of MT of an infinite direct conductor with a current as was considered till now in the classical theory of electromagnetism. This structure of MF matches to a field created by a separate element of a current, had in the torus centre on its principal axis and directed along this axis. The schedule of this MF is shown in a Fig. 5.

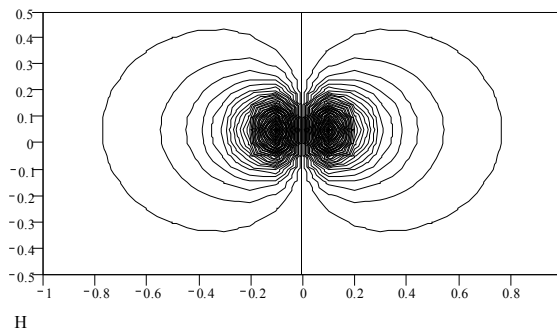


Fig. 5

Then it has been counted external MF out of torus in plane XZ in its part Y' (the Fig. 3 see).

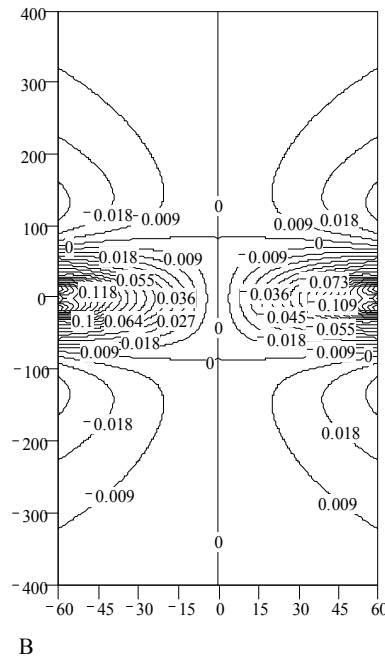


Fig. 6

Stress level of MF in plane  $Y'$  ( $y = 0$ ) in the form of the schedule of the Cantor.

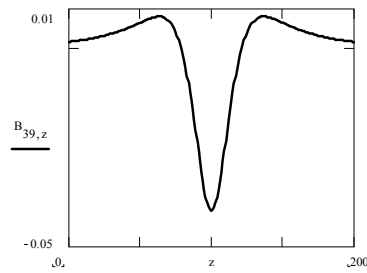


Fig. 7

Stress level of MT along straight line  $L - L$ ; [ $at = 0, x = \text{const}, B = f(z)$ ].

On the schedule (a Fig. 6) it is visible that external torus MF exists. The schedule in a Fig. 7 reveals feature of this MF - three extremes and two nulls. From a Fig. 7 it is visible that at axial rapprochement of two toruses in the beginning there is their pushing away, and after potential barrier overcoming - an attraction. The system is included into a condition with the minimum magnetic stream (the minimum energy) and becomes resistant to.

Calculation of the external MF created by system from two coaxial toruses (a Fig. 8) shows that it has a minimum on three co-ordinates in the system centre (a Fig. 9). All it shows hopelessness of deduction of plasma to internal MF in the closed traps with a toroidal configuration of MF of type "Tokamak" and "Stellarator" - deduction is possible only external MT of system of two coaxial toruses of any configuration.

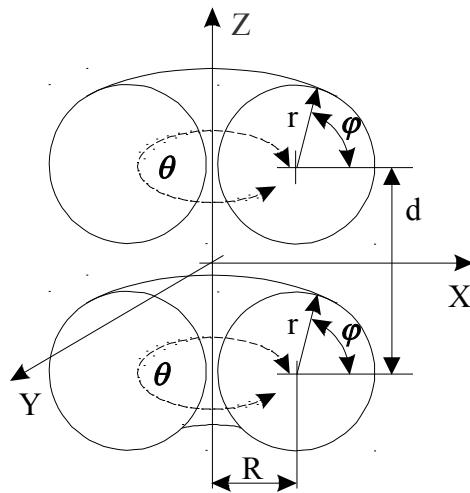


Fig. 8

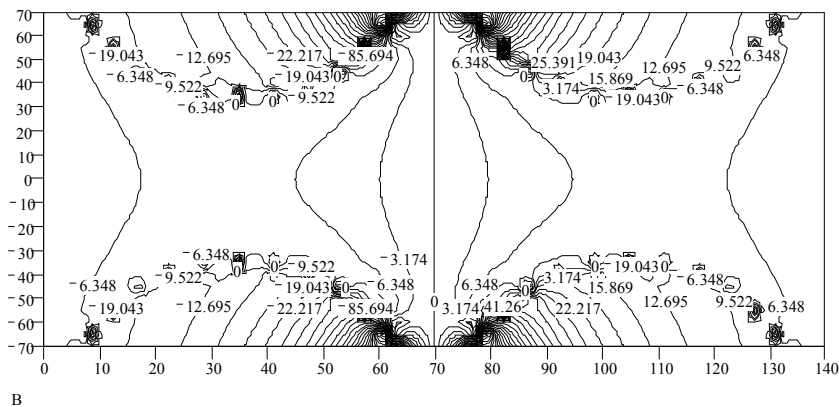


Fig. 9

The previous calculations have been made for continuous current surfaces. Now we make calculation for the torus consisting of separate right-angled convolutions with a current (the segmented torus) a Fig. 10, a Fig. 11. It becomes for check of possibility of reproduction of MF of continuous torus by a field of the segmented (real) toruses. Schedules – in standard units

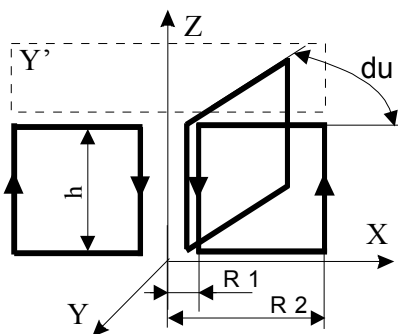


Fig. 10

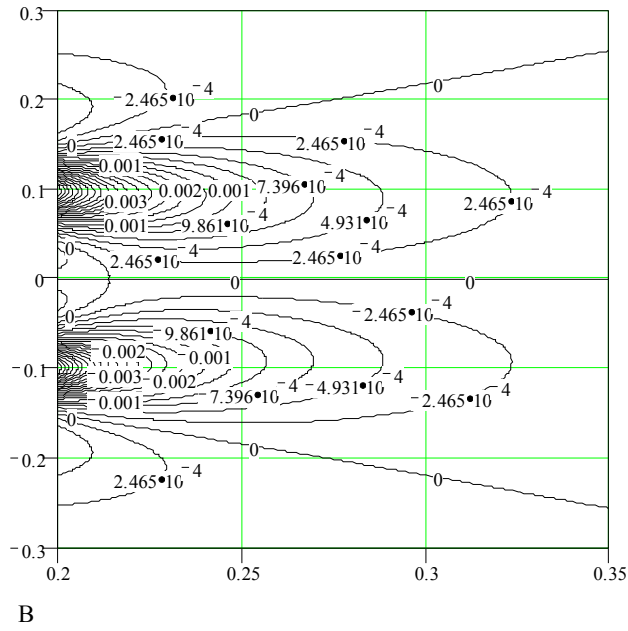


Fig. 11

Structure of an external magnetic field of the segmented torus in plane Y' (XZ) in the form of the schedule of the Cantor.

Cross-sections of surfaces of level of equal stress level of MF are shown.  
 The stress level vector is directed perpendicularly to a drawing plane.