Optimal Parameters for Toroidal Flow Plasma Confinement, Using Electrodes

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The optimal parameters are considered for effective plasma confinement, using additional magnetic coils and cylindrical electrodes. Improvement of toroidal flow plasma confinement is performed by additional magnetic coils and cylindrical electrodes on which electrical potential is distributed. Short magnetic coils are used. One additional element represents the cylinder of finite length. It is in a magnetic field of short coil. The structure of a short coil magnetic field provides shifting of plasma electrons to coil axis at their motion from the ends of the cylinder to its center. The cylinder is divided along its length on some azimuthally symmetrical rings, on which electrical potential is distributed. The main part of plasma electrons neutralizes the plasma ion volume charge. Small part of electrons are kept inside system by magnetic field of additional short coil and by electrical potential, distributed on ring-type electrodes. These electrons create radial electrical field, focusing plasma ions to axis.

It is shown that there is optimal magnetic field. For the smaller and larger magnetic field value the control of the plasma flow is worse. For the smaller magnetic field the radial velocity of plasma particles is larger due to collisions. For the larger magnetic field the oscillated fields are excited and lead to anomalous radial plasma particle transport. The expression for optimal magnetic field is derived.