

RESEARCH ARTICLE |

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Fractal and Wada escape basins in the chaotic particle drift motion in tokamaks with electrostatic fluctuations

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The $\mathbf{E} \times \mathbf{B}$ drift motion of particles in tokamaks provides valuable information on the turbulence-driven anomalous transport. One of the characteristic features of the drift motion dynamics is the presence of chaotic orbits for which the guiding center can experience large-scale drifts. If one or more exits are placed

so that they intercept chaotic orbits, the corresponding escape basins structure is complicated and, indeed, exhibits fractal structures. We investigate those structures through a number of numerical diagnostics, tailored to quantify the final-state uncertainty related to the fractal escape basins. We estimate the escape basin boundary dimension through the uncertainty exponent method and quantify final-state uncertainty by the basin entropy and the basin boundary entropy. Finally, we recall the Wada property for the case of three or more escape basins. This property is verified both qualitatively and quantitatively using a grid approach.

Topics

[Fractals](#), [Dynamical systems](#), [Electrostatics](#), [Hamiltonian mechanics](#), [Numerical approximations](#), [Invariant manifold](#), [Plasma confinement](#), [Plasma](#)

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