PACS: 47.20.Qr, 52.30.Cv

Dynamics of nonisothermal plasma rotating near solid dielectric surfaces

D. A. Dolgolenko[1], G. E. Zotin[1], and E. P. Potanin[1,2]

[1] National Research Center «Kurchatov Institute», Center of Fundamental Research
1 Academician Kurchatov Square, Moscow, 123182, Russia
E-mail: potanin45@yandex.ru

[2] All-Russia Institute of Scientific and Technical Information, Russian Academy of Sciences
20 Usievich st., Moscow, 125219, Russia

Received April 25, 2022

We consider stationary motion of a plasma near an extended dielectric disk rotating with an angular velocity ω_0 in the presence of an external flow with an angular velocity $\omega_0 \neq \omega_1$ under the action of an external uniform axial magnetic field and an axial temperature gradient. The problem is analyzed in the gas-dynamic approximation, taking into account centrifugal forces and axial density redistribution. The profiles of the radial component of the velocity of the conducting gas near the dielectric surface of the disk are calculated for various parameters of the medium.

Keywords: rotating plasma, dielectric disk, temperature gradient, axial magnetic field, radial velocity profile.

DOI: 10.51368/2307-4469-2022-10-3-256-263

REFERENCES

1. S A. Balbus and J. F. Hawley, Rev. of Mod. Phys. **70** (1), 1 (1998).

2. A. B. Mikhailovskii, J. G. Lominadze, A. P. Churikove , and V. D. Pustovitov, Plasma Physics Reports **35** (4), 307 (2009).

3. V. Khalzov, A. I. Smolyakov, and V. I. Ilgisonis, Physics of Plasmas **15**, 054501 (2008).

4. **V**. . Pustovitov, Plasma Physics Reports **29**, 105 (2003).

5. . M. Gorshunov and E. P. Potanin, Usp. Prikl. Fiz. **2** (1), 18 (2014).

6. . P. Lakhin, E. A. Sorokina, V. I. Ilgisonis, and L. . Konovaltseva, Plasma Physics Reports **41** (12), 1054 (2015).

7. A. V. Timofeev, Plasma Physics Reports **46** (6), 564 (2020).

8. J. V. Whichello, V. D. Borisevich, and E. P. Potanin, J. Appl. Phys. **130**, 045106 (2021).

9. N. M. Gorshunov and E. P. Potanin, Plasma Physics Repots **46** (2), 147 (2020).

10. N. A Vorona, A. V. Gavrikov, S. D. Kuzmichev et al., IEEE Transactions on Plasma Science **47** (2), 1223 (2019).

11. J. M. Rax and R. J. Gueroult, Plasma Phys. **82**, 595820504 (2016).

12. A. . Kulikovskii and G. A. Lyubimov, *Magnetic hydrodynamics* (GIFML, Moscow, 1962) [in Russian].

13. G. W Sutton and A. Sherman, *Engineering Magnetohydrodynamics* (Dover Publications, January 1, 2001).

14. V. D. Borisevich and E. P. Potanin, Journal of engineering and thermophysics **88** (6), 1460 (2015).

15. A. A Dorodnichin, PMM **6** (6), 449 (1942).

16. V. P. Sh dlovskii, PMM **24** (1), 161 (1960).

17 A. Chandrasekhar and G. Nath, Acta Technica CSAV **1**, 58 (1989).

18. V. D Borisevich and E. P. Potanin, PMM **85** (6), 758 (2021).

19. V. D. Borisevich, E. P. Potanin, and J. V. Whichello, J. Fluid Mech. **829**, 328 (2017).