

Ulacia Rey, A.; Pérez Martínez, A.; Sussman, Roberto A.

Local dynamics and gravitational collapse of a self-gravitating magnetized Fermi gas. (English) Zbl 1148.83328

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Summary: We use the Bianchi-I spacetime to study the local dynamics of a magnetized self-gravitating Fermi gas. The set of Einstein-Maxwell field equations for this gas becomes a dynamical system in a 4D phase space. We consider a qualitative study and examine numeric solutions for the degenerate zero temperature case. All dynamic quantities exhibit similar qualitative behavior in the 3D sections of the phase space, with all trajectories reaching a stable attractor whenever the initial expansion scalar H_0 is negative. If H_0 is positive the trajectories end up in a curvature singularity that can be, depending on initial conditions, isotropic or anisotropic. In particular, if the initial magnetic field intensity is sufficiently large the collapsing singularity will always be anisotropic and pointing in the same direction of the field.

MSC:

83C75 Space-time singularities, cosmic censorship, etc.

83C22 Einstein-Maxwell equations

85A15 Galactic and stellar structure

Cited in **2** Documents

Full Text: [DOI](#) [arXiv](#)

References:

- [1] Cardall, C.Y., Prakash, M., Lattimer, J.M.: *Astrop. J.* 554, 322–339 (2001) · [doi:10.1086/321370](#)
- [2] Broderick, A., Prakash, M., Lattimer, J.M.: *Astrop. J.* 537, 351–367 (2000) · [doi:10.1086/309010](#)
- [3] Bednarek, L., Brzezina, A., Manka, R., Zastawny-Kubica, M.: Theoretical model of a magnetic white dwarf Preprint astro-ph/0212483 v1 (2005)
- [4] Canuto, V., Chiu, H.-Y.: *Phys. Rev.* 173(5), 1210 (1968) · [doi:10.1103/PhysRev.173.1210](#)
- [5] Canuto, V., Chiu, H.-Y.: *Phys. Rev.* 173(5), 1220 (1968) · [doi:10.1103/PhysRev.173.1220](#)
- [6] Canuto, V., Chiu, H.-Y.: *Phys. Rev.* 173(5), 1229 (1968) · [doi:10.1103/PhysRev.173.1229](#)
- [7] Gonzalez, F.R., Mosquera, C.H.J., Pérez, M.A., Pérez, R.H.: *Chin. J. Astron. Astrophys.* 5(399), (Preprint astro-ph/0207150) (2005)
- [8] Pérez, M.A., Pérez, R.H., Mosquera, C.H.J.: *Eur. Phys. J. C* 29, 111–123 (2003) · [Zbl 01943481](#) · [doi:10.1140/epjc/s2003-01192-6](#)
- [9] Chaichian, M., Masood, S.S., Montonen, C., Martínez, A.P., Rojas, H.P.: *Phys. Rev. Lett.* 84, 5261 (2000) · [doi:10.1103/PhysRevLett.84.5261](#)
- [10] Chakrabarty, S.: *Phys. Rev. D* 43(2) (1991)
- [11] Chakrabarty, S.: *Phys. Rev. D* 54(2) (1996)
- [12] Rey, A.U., Martínez, A.P., Sussman, R.A.: *Int. J. Mod. Phys. D*, 16(2–3), 481–487 (Preprint gr-qc/0605054) 2007
- [13] Shapiro, S.L., Teukolsky, S.A. (eds): *Black Holes, White Dwarfs, and Neutron Stars*. Wiley, New York (1983)
- [14] Shapiro, S.L.: Preprint gr-qc/0509094v1 (2005)
- [15] Duez, M.D., Liu, Y.T., Shapiro, S.L., Stephens, B.C.: *Phys. Rev. D* 69, 104030 (2004) · [doi:10.1103/PhysRevD.69.104030](#)
- [16] Wainwright, J., Ellis, G.F.R. (eds): *Dynamical Systems in Cosmology*. Cambridge University Press, Cambridge (1997) · [Zbl 1072.83002](#)
- [17] Misner C.W., John, K.T. (ed.): *Archibald Wheeler 1973 Gravitation*. W.H. Freeman and Company, New York
- [18] Collins, C.B., Ellis, G.F.R.: *Phys. Rep.* 56(2), 65–105 (1979) · [doi:10.1016/0370-1573\(79\)90065-6](#)

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