CIDMA CENTRO DE I&D EM MATEMÁTICA E APLICAÇÕES
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universidade de aveiro

Gravitational Geometry and Dynamics Group Seminar

Wed., May 20, 2026, at 11h00.

Room: Sala Sousa Pinto and **Teams ID:** 394 062 775 806 869
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New class of rotating charged black holes in the external Bertotti-Robinson (electro)magnetic field.

We present a large family of twisting and expanding solutions to the Einstein-Maxwell equations of algebraic type D, for which the two double principal null directions (PNDs) of the Weyl tensor are not aligned with the null eigendirections of the Faraday tensor. In addition to systematically deriving this new class, we present its various metric forms and convenient parameterizations. We show that in Boyer-Lindquist-type coordinates these solutions depend on 7 parameters, namely the Kerr and NUT (Newman-Unti-Tamburino) twist parameters a and l, mass parameter m, acceleration α, strength of the Maxwell field |c|, and angular parameters $ \beta$ γ that represent two duality rotations of the Faraday tensor, which include the rotation between the electric and magnetic charges generating the aligned part of the Maxwell field. This coordinate parameterization, analogous to the Griffiths-Podolský form of the Plebański-Demiański solutions, allows us to perform various limits, explicitly identify the subcases, and determine the physical interpretation of the new class. Interestingly, by considering the limit with no acceleration ($\alpha\to 0$), one obtains either the famous Kerr-Newman-NUT black holes (if the parameter $|c|$ remains constant) or the novel Kerr-Bertotti-Robinson black holes, announced recently in our work [Phys. Rev. Lett. 135 (2025) 18, 181401] (if $\alpha\to 0$ while $ \alpha |c|=const.$). We may thus conclude that this new class of spacetimes represents twisting charged accelerating black holes, immersed in an external magnetic (or electric) field. In the non-twisting subcase, we obtain the previously known solution of Van den Bergh-Carminati.

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