

Matched Asymptotic Expansion for Spinning Black Hole Magnetospheres

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In 1977 Blandford & Znajek (BZ) initiated the analytic study of force-free magnetospheres by developing a perturbation scheme in the slow spin regime of a Kerr black hole, which led to the discovery of a viable electromagnetic Penrose-like process for extracting energy and angular momentum. In this talk we solve the BZ perturbation theory at higher orders by means of a matched asymptotic expansion scheme and discover the unavoidable presence of non-analytic terms in the perturbative parameter entering the expressions for the energy extracted by the magnetosphere. These terms allow us to reach an unprecedented agreement with past numerical simulations up to the near-extreme regime and can potentially predict new features about the non-perturbative structure of the BZ theory, showing how the construction of analytic models still constitutes a powerful tool in this field.

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