

# Moving away from the Near-Horizon Attractor of the Extreme Kerr Force-Free Magnetosphere

*Thursday, 24 September 2020 17:15 (20 minutes)*

Force-free electrodynamics is a non-linear regime of Maxwell's equations capable to provide the minimal non-trivial level of description for pulsar and black hole magnetospheres. For this system to be hyperbolic it is necessary that the field is magnetically dominated,  $F^2 = B^2 - E^2 > 0$ . Despite its crucial role in explaining energy and angular momentum extraction from slowly spinning black holes (via the celebrated Blandford & Znajek mechanism) no force-free analytic solution, which is also magnetically dominated, is known in the highly spinning regime.

Any stationary and axisymmetric solution in the extreme Kerr background converges to a force-free attractor when the near-horizon extreme Kerr (NHEK) region is resolved. We use this attractor solution as a universal starting point for perturbing away from the NHEK region and show that at the second order in perturbation theory it is possible to find magnetically dominated magnetospheres around the extreme Kerr black hole.

A similar attractor solution emerges in the near-horizon near-extreme Kerr (near-NHEK) region of a nearly-extreme Kerr spacetime, thus providing a more sensible model for astrophysical settings.

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**Session Classification:** Relativistic Astrophysics