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Frame dragging, unipolar induction and Kerr black hole magnetospheres

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Making use of $3+1$ formulation of black hole electrodynamics, it is argued that the frame-dragging effect combines with unipolar induction, to sustain the double-structured magnetosphere consisting of the outer and inner domains, and high-energy activities therein. The emf's,
$calE_{\rm out}$ and
$calE_{\rm in}$, of a pair of unipolar induction batteries driving electric currents in the two domains are equivalent to those due to a pair of magnetized rotators spinning anti-parallelly each other with $\Omega_{\rm F}$ and $-(\Omega_{\rm H}-\Omega_{\rm F})$, located back-to-back at both sides of the interface $S_{\rm N}$ at $\omega=\Omega_{\rm F}$ in-between, where $\Omega_{\rm F}$, $\Omega_{\rm H}$ and ω are the angular velocities of field lines, the Kerr hole and the frame dragging due to the hole's spin. The difference,
$calE_{\rm out}-$
$calE_{\rm in}=\Delta V=-(\Omega_{\rm H}/2\pi c)\Delta\Psi$, corresponding to the difference of the two angular velocities of hypothetical rotators at $S_{\rm N}$, $\Omega_{\rm F}-[-(\Omega_{\rm H}-\Omega_{\rm F})]=\Omega_{\rm H}$, will provide a voltage drop strong enough to develop a magnetized gap in which pair-creation discharges will take place to provide copious charged particles to out- and in-flows in both domains and allow field lines pinned down to fix $\Omega_{\rm F}$ with the local frame-dragging angular velocity, i.e., $\Omega_{\rm F}=\omega_{\rm N}$. Such a situation will allow one to present the hole's double structure in terms of a twin-pulsar model, consisting of a pulsar-type wind flowing toward infinity and an anti-pulsar-type wind flowing in toward the horizon, with the common particle/current sources where field lines are pinned down (see I. Okamoto, PASJ, 2015, 67, 69)

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