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On the Nature of the Ultrarelativistic Prompt Emission Phase of GRB 190114C and GRB 180720B

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We address the physical origin of the ultra-relativistic prompt emission (UPE) phase of GRB 190114C and GRB 180720B. We assume that during the UPE phase, the "inner engine"of the GRB, composed of a Kerr black hole (BH) and a uniform test magnetic field B_0, aligned with the BH rotation axis, a Wald - Papapetrou solution operates in an overcritical field |E| ≥ E_c, where E_c = m^2_ec^3 / (e ħ), being m_e and -e the mass and charge of the electron. We infer an e^+e^- pair electromagnetic plasma in presence of a baryon load, a PEMB pulse, originating from a vacuum polarization quantum process in the inner engine. This modifies both the boundary conditions and the physics interpretation of the pioneering work of Damour-Ruffini 1975. The new process determine the time-varying mass and spin of the Kerr BH in the inner engine, fulfilling the Christodoulou-Hawking-Ruffini mass-energy formula of a Kerr BH. For the first time, we quantitatively show how the inner engine, by extracting the rotational energy of the Kerr BH, produces a series of PEMB pulses and the overall GRBs MeV emissions (detailed in Phys. Rev. D: https://doi.org/10.1103/PhysRevD.104.063043).

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