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On quasinormal modes in 4D black hole solutions in the model with anisotropic fluid

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We consider a family of 4-dimensional black hole solutions
governed by natural number $q = 1, 2, 3, \ldots$, which appear in the model with anisotropic fluid and the equations of state: $p_r = -\rho(2q-1)^{-1}$, $p_t = -p_r$, where p_r and p_t are pressures in radial and transverse directions, respectively, and $\rho > 0$ is the density. These equations of state obey weak, strong and dominant energy conditions. For $q = 1$ the metric of the solution coincides with that of the Reissner-Nordstr\"om one. The global structure of solutions is outlined, giving rise to Carter-Penrose diagram of Reissner-Nordstr\"om or Schwarzschild types for odd $q = 2k + 1$ or even $q = 2k$, respectively. Certain physical parameters corresponding to BH solutions
(gravitational mass, PPN parameters, Hawking temperature and entropy) are calculated. We obtain and analyse the quasinormal modes for a test massless scalar field in the eikonal approximation. For limiting case $q = +\infty$, they coincide with the well-known results for the Schwarzschild solution. We show that the Hod conjecture which connect the Hawking temperature and the damping rate is obeyed for all $q \geq 2$ and all (allowed) values of parameters.

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